RANGE ROVER SPORT

OWNER'S HANDBOOK

Publication Part No. LRL 10 02 54 701

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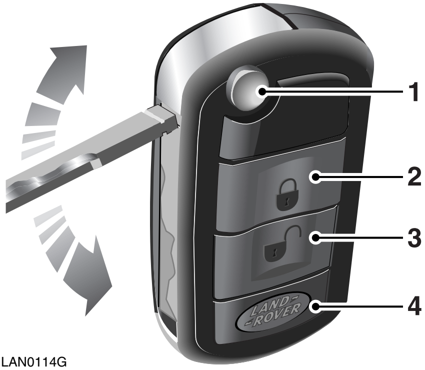
THE REMOTE CONTROL



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1. Key release button.
   Press to release the folded key.
2. Lock button.
   Superlocks all doors and activates perimetric alarm. If interior space protection and tilt sensor options are fitted, they can be over-ridden by pressing the button twice within 3 seconds.
   See **Superlocking, 44**, **Perimetric alarm, 44**, **Interior space protection, 46**, and **Tilt sensor, 46**.
3. Unlock button.
   Press once to disarm all alarm features and unlock driver's door only. Press twice to open all doors.

   Note: *The above applies unless configured for multi-point entry. See **Single-point entry, 42**.*
4. Land Rover button.
   The remote control can be programmed to initiate one of 5 features; Panic alarm, Headlamp courtesy delay, Tailgate release, Tailglass release or Air suspension control.
   See **LAND ROVER BUTTON, 40**.

Single point entry

This is a security feature that unlocks only the driver's door. It can be disabled on individual remote controls by simultaneously pressing and holding buttons **2** and **3** for three seconds. The vehicle will lock and then unlock in the currently selected mode to confirm the change.
You can now unlock all doors with a single press. Repeating the procedure will re-enable Single point entry.

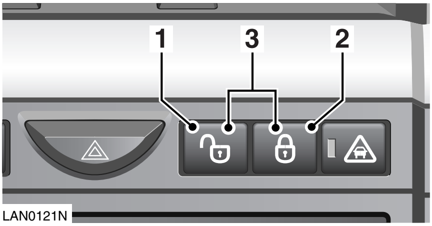
Automatic relock

If the vehicle is unlocked with the remote control, it will automatically relock and arm the alarm if a door or the tailgate is not opened within one minute.

Partial arming

If an aperture (door, bonnet or tailgate) is not fully closed when the remote control lock button is pressed, the horn will sound briefly to signal that an aperture is still open. The alarm will remain disarmed and all of the closed apertures will lock.
As soon as the open aperture is closed, the system will automatically arm, signalled by three flashes of the hazard warning lamps, with interior space protection activating 30 seconds later.

CENTRAL LOCKING



Master lock and unlock switches

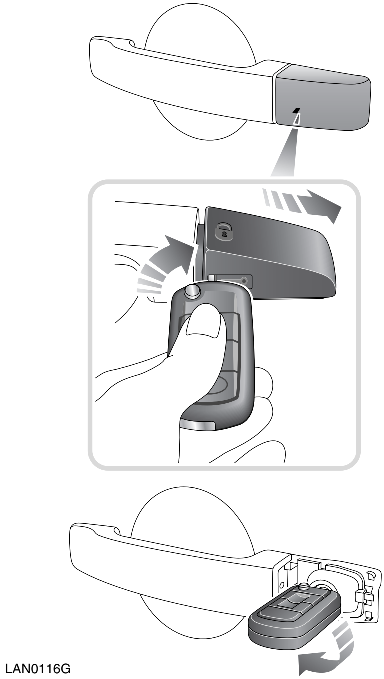
1. Press to unlock all doors and tailgate.
2. Press to lock all doors and tailgate.
3. Press both buttons simultaneously for three seconds to release the tailgate.

Speed related locking

If enabled, the doors and tailgate will automatically lock when the vehicle's speed exceeds 8 km/h (5 mph).

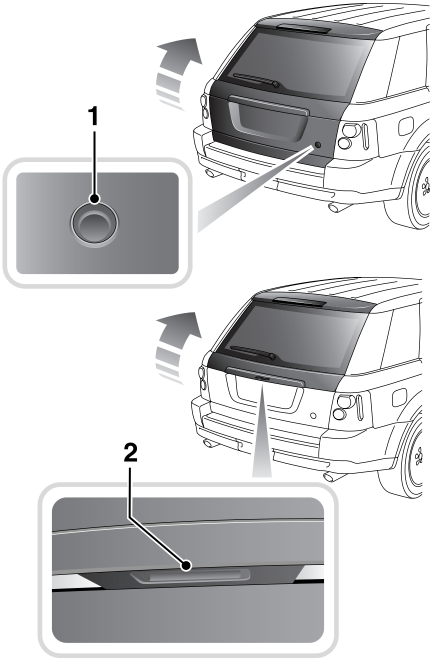
This feature can be disabled or enabled in the **SETTINGS** menu of the trip computer.
See **SELECTING SETTINGS OPTION, 88**.

EMERGENCY UNLOCKING



If the remote control should fail, there is an emergency access feature on the left-hand front door lock. With the key inserted into the slot beneath the handle cap, the cap can be pulled outwards slightly and then moved backwards to unhook it. The key can now be used to unlock the vehicle.
See **Emergency locking/unlocking, 49**.

TAILGATE



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Opening the tailgate

With all the doors unlocked, press the release button **1** on the tailgate to release.

The tailgate incorporates a 'Power closure' feature, which removes the need to 'slam' the tailgate when closing.

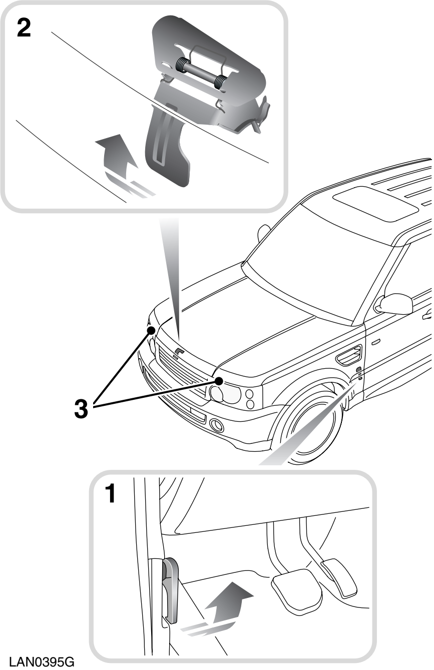
Opening the tailglass

With all the doors unlocked, press the touch pad **2** on the exterior handle and pull to open.

Operating note

If the vehicle is locked/unlocked 10 times within a short period, the door and tailgate latches will be disabled for approximately one minute, to protect the battery and lock mechanism.

BONNET



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Opening

Pull the bonnet release lever **1** located on the left-hand side of the vehicle.

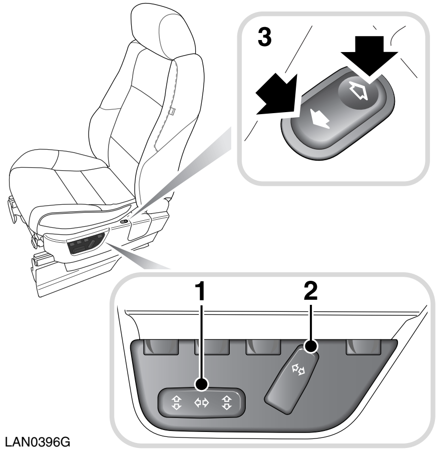
Lift the bonnet safety catch lever **2**, located on the front edge of the bonnet beneath the centre point of the words LAND ROVER and raise the bonnet.

Closing

Lower the bonnet until it is 300 mm (12 inches) from its closed position. Using the palms of both hands positioned on the front edge of the bonnet on either side of the radiator grille, push down until the catches 'click'.

Check that both catches **3** are engaged by trying to lift the front edge of the bonnet.

SEAT ADJUSTMENT - POWER SEATS



To adjust the seats, the starter switch must be in position **I** or **II**.

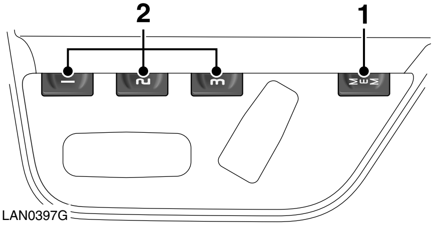
1. Seat recline.
2. Seat fore/aft, cushion height and front tilt control.
3. Lower backrest lumbar support.

Power operated memory driver's seat also has a 10 minute active period (Non-memory power operated seats up to 15 minutes) initiated when:

- The driver's door is opened/closed.
- The starter key is turned to the off position.

See **FRONT SEAT ADJUSTMENT, 54**.

DRIVING POSITION MEMORY



Once you have adjusted the driver's seat and exterior mirrors, the vehicle can memorise these settings for future use.

1. Press the memory store button **1** to activate the memory function for five seconds.
2. Press one of the preset buttons **2** within five seconds to memorise the current settings. **MEMORY STORED** will be displayed in the message centre accompanied by an audible chime to confirm the settings have been memorised.

To recall a stored driving position, press the appropriate preset button **2**.

Operating note

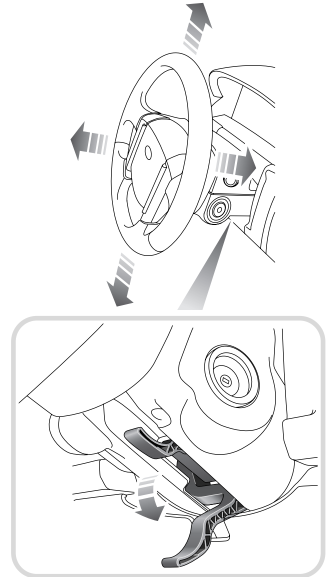
A seat position will only be memorised during the five second active period.
Any existing settings will be over-written when programming a memory position.

Lazy entry

When this feature is enabled, the vehicle stores the seating and mirror positions for each remote control. Next time the vehicle is unlocked using a remote control, the position of the seat and mirrors will adjust to the last used position.

This feature can be disabled or enabled in the **Settings** option accessed via the trip computer.

STEERING COLUMN ADJUSTMENT

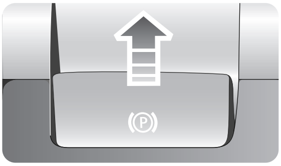

LAN0398G

1. Move the lever located under the steering wheel fully downward.
2. Adjust the height and reach of the steering wheel to the desired position.
3. Move the lever fully up to lock the position of the wheel.

See **STEERING COLUMN ADJUSTMENT, 81**.

PARKBRAKE (EPB)

Applying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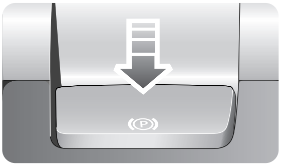
With the vehicle stationary, pull up the parkbrake leverand then release it. The lever will return to a neutral position and the red warning indicator in the instrument pack will illuminate.

Releasing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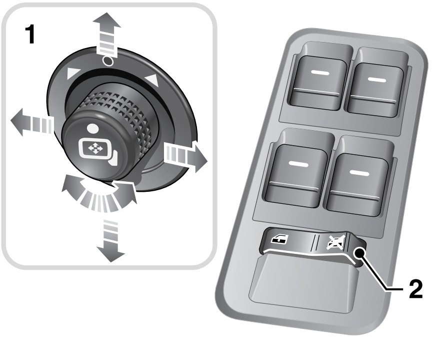
The starter switch must be in position **I** or **II**. Apply the footbrake and press down on the parkbrake lever.

If the vehicle is stationary with the parkbrake applied and either **D** (Drive) or **R** (Reverse) selected, pressing the accelerator will automatically release the parkbrake.

For more detailed information on the parkbrake, see **PARKBRAKE (EPB), 177**.

WINDOWS/DOOR MIRRORS



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Windows

- To open a window, press and hold the respective switch.
- To close the window, pull and hold the switch.

Window movement can be stopped at any time by releasing the switch.

The driver's window has a one touch facility that allows it to be opened or closed with a single operation of the switch. Firmly press the switch and release. Movement can be stopped by pressing the switch again.

Press the right-hand side of switch **2** to inhibit the operation of the rear window switches. See **ELECTRIC WINDOWS, 119**.

Resonance with lowered windows
If a resonance/booming sound occurs when a rear window is open, lowering an adjacent front window about 25 mm (1 inch) will eliminate the condition.

Door mirror adjustment

To adjust the mirrors, rotate the mirror adjustment knob **1** left or right to select the appropriate mirror. Move the knob in any direction to adjust the position of the mirror glass. See **EXTERIOR MIRRORS, 82**.

Power fold mirrors

Allows the mirrors to be electrically folded towards the door for better clearance/protection.

With the mirror adjustment knob in the central position, push the knob downwards to fold/unfold the mirrors.
See **Folding the mirror body, 83**.

Reverse automatic mirror dip

With the feature enabled, when reverse gear is selected the door mirrors will dip.

The dip position of the door mirrors can be personalised. See **Reverse mirror dipping, 84**.

This feature can be disabled or enabled in the **Settings** option accessed via the trip computer. See **SELECTING SETTINGS OPTION, 88**.

SEAT BELTS/CHILD RESTRAINTS

A warning indicator in the instrument pack will illuminate to alert you that the driver's and/or front passenger's seat belt is unbuckled. An intermittent chime may also be heard.

Automatic Locking Reels (ALR)

All passenger seat belts have ALR fitted for use with child seats or securing large items.

- To engage: extend seat belt to maximum length to enable locking mechanism.
- Allow seat belt to retract onto the child seat/large item (a clicking sound will be heard as the belt retracts). Ensure there is no slack by pressing the seat/item firmly into the vehicle seat.
- To disengage: unbuckle belt and allow belt to fully retract.

With ALR enabled, as the seat belt retracts, it will automatically lock, preventing re-extension.
Ensure passengers do not fully extend the restraints and inadvertently engage this feature during normal use.

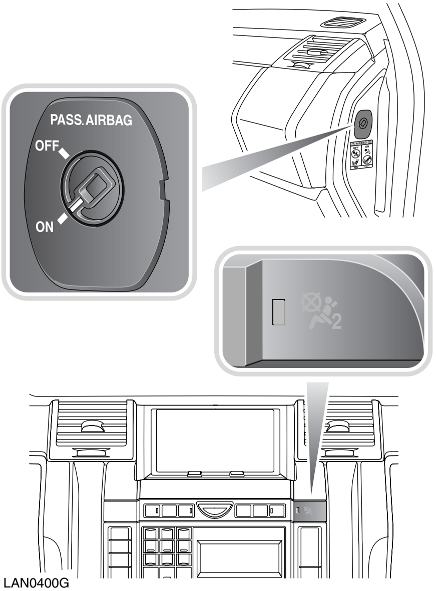
Child Seats

It is important to remember that the child's weight, rather than age, determines the type of seat that is required.

See **Child safety seating and positions, 68**.

Recommended child seat
Land Rover's recommended Group 1 seat is the Land Rover ISOFIX child restraint with a top tether.
The ISOFIX child seat can only be fitted in the outer, rear seating positions.

PASSENGER AIRBAG DISABLING



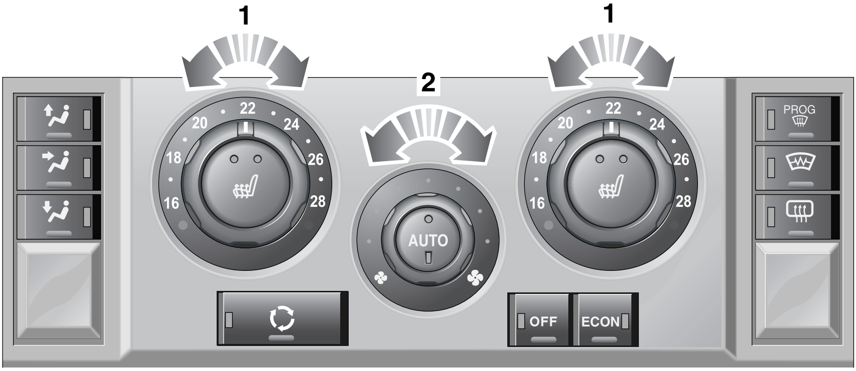
If it becomes necessary to fit a child restraint on the front passenger seat, the passenger airbag must be disabled.

To disable the airbag, open the front passenger door and use the starter key to turn the **PASS. AIRBAG** switch (located on the end of the facia) to the **OFF** position.See **PASSENGER AIRBAG DISABLING SWITCH, 78**

With the airbag disabled, the status indicator will illuminate whenever the starter key is turned to position **II**.

Operating note
When an adult is seated in the front passenger seat, ensure the **PASS. AIRBAG** switch is turned to the **ON** position.

HEATING AND VENTILATION



LAN0402G

AUTO (Automatic) MODE

Press **AUTO** to select automatic operation of the system, both LEDs in the switch will illuminate.

The system adjusts heat output, blower speed, air intake and airflow distribution to maintain your the selected temperature(s) and reduce misting without further adjustments.

Use the air distribution and blower controls to adjust the automatic settings. The appropriate LED in the **AUTO** control will extinguish.

Recommended mode
Select **AUTO** as the normal operating mode. This will help prevent window misting and odours from the climate control system.

Air conditioning

Air conditioning provides cooled and dehumidified air for occupant comfort. Dry airflow is effective in preventing misting of windows and is also beneficial at low external temperatures.

Air conditioning is automatically switched on and controlled whenever the system is not operating in ‘Economy’ mode.

External water deposits
The air conditioning system removes moisture from the air and deposits excess water beneath the vehicle. Puddles may form, but this is normal and no cause for concern.

Temperature selection

Rotate the controls **1** to adjust the temperature for the respective side of the passenger compartment.

Operating note
It is not possible to achieve a temperature differential of more than 4°C (7°F) between left and right.

MANUAL MODE

Blower speed

Rotate the control **2** to adjust the airflow. LEDs will illuminate to indicate which of the eight possible speeds is currently selected.

Air distribution control

Press to select a distribution setting. An LED will illuminate in the switch.

Windscreen and side window vents

Face level vents

Foot level vents

More than one setting can be selected.

Air recirculation

Press to activate air recirculation. An LED will illuminate in the switch. Press again to return to fresh air intake.

OFF

OFF

Press to switch the system off. An LED will illuminate in the switch.

Press again to return the system to its previous operating mode. The system will also be reactivated by using the **AUTO**, blower speed, air distribution or defrost controls.

Economy mode

ECON

Press to select ‘Economy’ mode. An LED will illuminate in the switch.

Air conditioning is switched off to reduce load on the engine and improve fuel consumption.

Seat heaters

Press the relevant button to operate the required seat heater at high level. Both LEDs in the switch will illuminate.

Press a second time to heat the seat at a lower level. One LED will extinguish.

Press a third time to switch off.

Defrost mode

PROG

Press to remove frost or heavy misting from the windscreen. The system will automatically adjust the blower output for maximum clearing, in addition the rear window and windscreen heaters will be activated.

Press again to switch off defrost mode. The rear window and windscreen heaters will remain on for a preset interval.

Heated windscreen/rear window

Press to operate. An LED will illuminate in the switch.

The heaters will automatically switch off after a preset interval.

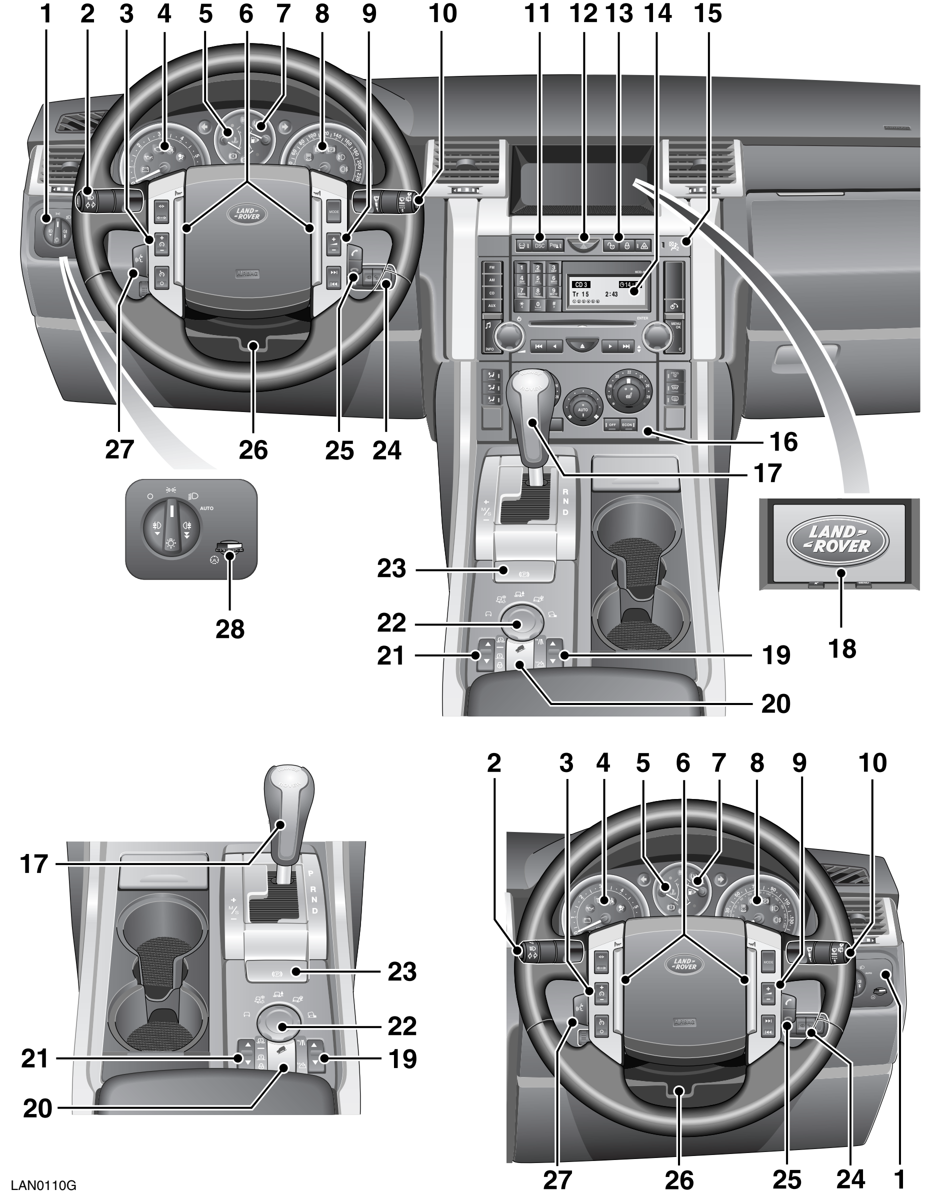
For more information, see **TEMPERATURE CONTROLS, 123**.

AUXILIARY FUEL-BURNING HEATER

When the heater automatically switches on, exhaust fumes may be seen coming from under the bonnet. This is normal and no cause for concern.

See **AUXILIARY FUEL-BURNING HEATER, 126**.

FACIA CONTROLS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AUTO
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LAND ROVER
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FACIA CONTROLS KEY

1. Lamps master switch
2. High beam/Direction indicators/Trip computer
3. Cruise control switches
4. Tachometer
5. Temperature gauge
6. Horn buttons
7. Fuel gauge
8. Speedometer
9. Audio/Telephone remote controls
10. Wiper/washer controls
11. Dynamic Stability Control (DSC) switch
12. Hazard warning lamp switch
13. Door lock/unlock switches
14. Audio display/controls
15. Passenger airbag status indicator
16. Heater/Air conditioning controls
17. Gear selector
18. Display screen
19. Transfer gearbox switch
20. Hill Descent Control (HDC) switch
21. Air suspension switch
22. Terrain Response^{TM} control switch
23. Electric parkbrake (EPB) switch
24. Starter switch
25. Telephone switch
26. Steering column adjustment
27. Voice recognition switch
28. Dimmer control

WARNING INDICATORS

Battery charging - RED.

Low oil pressure - RED.

Parkbrake - RED.

Brakes - RED/AMBER.

Anti-lock braking system - AMBER.

Airbag - RED.

Engine - AMBER.

Diesel glow plugs active - AMBER.

Suspension/Dynamic response - RED/AMBER.

Low tyre pressure - AMBER.

Dynamic Stability Control (DSC) - AMBER.

Adaptive front lighting system - AMBER.

Adaptive Cruise Control (ACC) - AMBER.

Seat belts - RED.

Low gear range selected - GREEN.

Hill Descent Control (HDC) on - GREEN.

Cruise control active - AMBER.

Direction indicator - GREEN.

Trailer direction indicator - GREEN.

Side lamps/Headlamps on - GREEN.

Headlamp high beam on - BLUE.

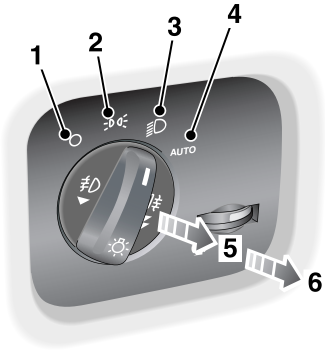
Rear fog lamps on - AMBER.

Front fog lamps on - GREEN.

If a red warning indicator illuminates while driving, a serious fault is indicated. Stop the vehicle and refer to the main section of this handbook.

For a full description of warning indicators and their functions, see **Warning Indicators, 104**.

LAMPS MASTER SWITCH



LAN0403G

1. Side lamps and headlamps off.
2. Side lamps on.
3. Low beam headlamps on.
4. Automatic control lamps on.

   In **AUTO** mode and the starter switch in position **II**, a sensor monitors the exterior light levels and will automatically switch the side lamps and low beam headlamps on or off as required.
5. Front fog lamps on.
6. Front and rear fog lamps on.

If front fog lamps are not fitted, the rear fog lamps will come on at position **5**.

Fog lamps cannot be operated if the lamps master switch is at position **4** Auto.

For a full description of these functions, see **EXTERIOR LAMPS, 110**.

Headlamp courtesy delay

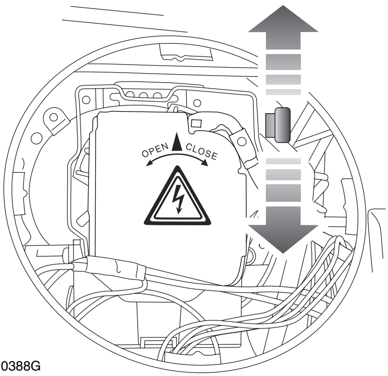
With the master switch in positions **2**, **3** or **4**, turn the starter switch off and remove the key. Turn the master switch to the off position. The headlamps will remain on for up to 240 seconds. For a full description of this feature and how to set the time delay, see **Headlamp courtesy delay, 112**.

HEADLAMP TOURING ADJUSTMENT

Position of the lever illustrated will vary depending on type of headlamps and side of vehicle. It may be on either side of the headlamp bulb aperture.

When touring in a country where traffic drives on the opposite side of the road to where you normally drive, use the tourist lever mechanism within each headlamp unit to alter the beam pattern. This enables the vehicle to be driven without having to stick blanking decals onto the headlamp lens.

Xenon headlamps



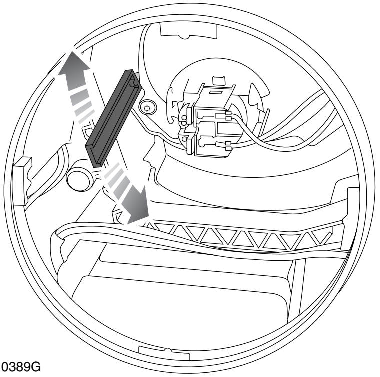
LAN0388G

Follow the process shown in **HEADLAMP UNIT, 272**, to gain access to the inside of the headlamp unit. Move the lever to adjust the beam.

Lever default position - Xenon headlamps

Right hand headlamp	Up
Left hand headlamp	Up

Halogen headlamps



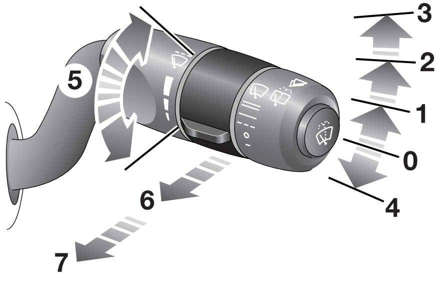
LAN0389G

Follow the process shown in **HEADLAMP UNIT, 272**, to gain access to the inside of the headlamp unit. Move the lever to adjust the beam.

Lever default position - Halogen headlamps

Right hand headlamp	Down
Left hand headlamp	Up

STEERING COLUMN LEVERS



LAN0519G

1. Rain sensor variable delay or Intermittent wipe.
2. Normal speed wipe.
3. Fast speed wipe.
4. Single wipe.
5. Rotate collar to adjust rain sensor/Intermittent variable delay.

Rear wiper and washer

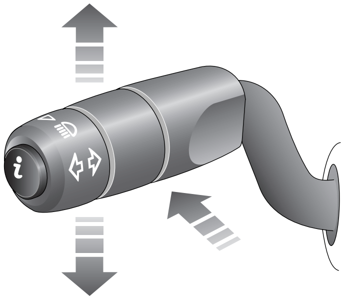
Pull the lever to position **6** for intermittent operation of the rear wiper. Pull and hold the lever in position **7** to operate the rear washer and wiper.

Windscreen washer

Push the button on the end of the lever to operate the wndscreen washer.

For more detailed information on the wash/wipe system, see **WINDSCREEN WIPERS, 114**.

Direction indicators/Headlamp high beam



LAN0405G

Move the lever up or down to activate the direction indicators.

Push the lever away from you to select headlamp high beam. A blue warning indicator will illuminate on the instument pack.

Trip computer

Press the button on the end of the lever to cycle through the trip computer functions displayed on the message centre.
See **TRIP COMPUTER - FUNCTION SELECTION, 87**

CONFIGURABLE FEATURES

Settings options (trip computer)

These are displayed on the main message centre. See **SELECTING SETTINGS OPTION, 88**.

SETTINGS	**CHOICE**
TRIP DISTANCE UNITS (odometer)	MILES/KM
FUEL USAGE UNITS	MPG l/100km Km/l
EXTERNAL TEMPERATURE	°C or °F
OVERSPEED WARNING (Set a personal speed limit - Warnings are displayed in the message centre)	Off 20 - 250 km/h or 15 to 140 mph in 5-unit steps (units set as trip distance)
HEADLAMP OFF DELAY	30/60/120/240 seconds
AUTO DOOR LOCK (speed related locking)	ON/OFF
REVERSE MIRROR DIP	ON/OFF
LAZY ENTRY	ON/OFF
RESTORE DEFAULT SETTINGS	YES/NO

Remote control

The remote control can be configured to operate the following features:

- Panic alarm, for personal protection. See **Panic alarm, 41**.
- Headlamp courtesy delay, providing lighting for personal safety. See **Headlamp courtesy delay, 41**.
- Air suspension control, allows remote operation of the air suspension. See **Air suspension control, 42**.
- Tailgate release function, releases the tailgate as a whole. See **Tailgate release, 43**.
- Tailglass release function, releases only the tailglass. See **Tailglass release, 43**.
- Single point entry, allowing only the drivers door to be opened remotely. See **Single-point entry, 42**.

Passenger airbag disabling

The safest place for a child seat is fitted to the rear seating. However, if it is necessary to fit a child seat to the front passenger seat the front passenger airbag must be disabled. See **PASSENGER AIRBAG DISABLING SWITCH, 78**.

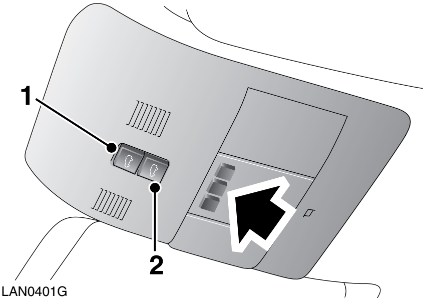
Daytime running lamps

Unless prevented by legislation, it is possible to automatically switch on the exterior lamps whenever the engine is running. See **Daytime running lamps, 112**.

Speed dependent wiper mode

The wiper speed in all modes can be automatically varied according to vehicle speed. See **Speed-dependent mode, 115**.

OVERHEAD CONSOLE



Courtesy lamps

If automatic mode is enabled, the front and rear courtesy lamps will operate in conjunction with the vehicle being unlocked/locked or when a door is opened.

Automatic mode
Automatic mode for the courtesy lamps can be enabled/disabled by pressing and holding the centre lamp switch for more than three seconds.
A message will be displayed in the message centre advising you of the mode currently set.

The courtesy lamps can be manually switched on/off by pressing and releasing the centre lamp switch (arrowed in illustration).
See **Front Interior lamps, 131**.

Interior lamps

The interior lamps can be switched on/off by pressing the switch adjacent to the lamp.

Sunroof

Open/close sunroof:

- Press and release the switch **1** to open the sunroof fully.
- Press the switch **2** to close.

Tilt sunroof:

- Press and release the switch **2** to open the sunroof to the tilt position.
- Press and hold the switch **1** to close.

If the sunroof is moving, it can be stopped by pressing the swich again.

See **SUNROOF OPERATION, 121**.

Operating note
The sunroof can be operated with the starter key in position **I** or **II** and for 40 seconds after position **0** has been selected, providing that neither front door has been opened.
With the starter key in position **I** or **0**, the switch will need to be pressed and held until the roof reaches the desired position.

REAR VIEW MIRROR

Automatic dimming

Some rear view mirrors are fitted with a feature that will automatically darken to counteract glare from the headlamps of a following vehicle.

This feature is temporarily switched off while reverse gear is selected.

See **REAR VIEW MIRRORS, 137**.

AUTOMATIC TRANSMISSION

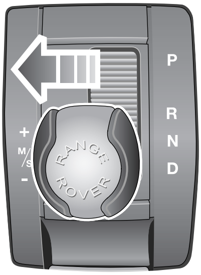
Gearshift interlock

The starter switch must be in position **II**, the foot brake applied and the selector release button pressed before the gear selector can be moved from **P** (Park) to **R** (Reverse).

The gear selector must be in **P** before the starter key can be removed.

See **AUTOMATIC TRANSMISSION USE, 157**.

Sport mode



LAN0408G

In Sport mode, automatic gear changing is maintained but the gearshift changes are modified to improve performance.

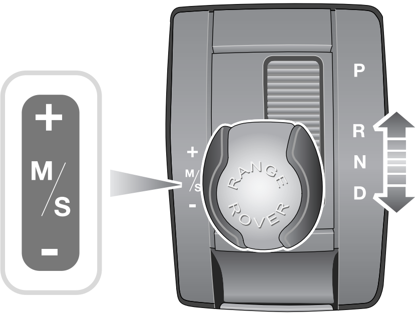
To select Sport mode, move the gear selector from **D** towards the left-hand side of the vehicle.

The word **SPORT** will appear in the instrument pack display and the LED in the gear selector surround will illuminate.

With the gear selector in Sport, the transmission will stay in lower gears for longer with downshifts occurring more readily.
Fuel consumption will be adversely affected.
If Terrain Response is fitted, Sport mode is only available if the **General** program is selected.

CommandShift

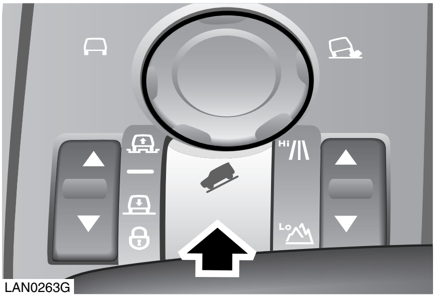
CommandShift gear selection can be used as an alternative to automatic gear selection and is particularly effective when rapid acceleration or engine braking is required.



LAN0422G

1. Select Sport mode. The transmission will automatically select the gear most appropriate to the vehicle's road speed and accelerator position.
2. Moving the selector lever forward (**+**) or backward (**-**) and then releasing will manually select a higher or lower gear (when available). The message **TRANSMISSION COMMANDSHIFT SELECTED** will appear in the message centre.
3. Subsequent gear selections will shown in the instrument pack display.
4. To deselect CommandShift mode, move the selector lever back to **D**.

HILL DESCENT CONTROL (HDC)



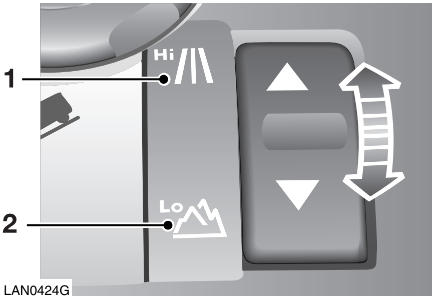
HDC operates in conjunction with the anti-lock braking system to provide greater control in off-road situations, particularly when descending severe gradients.

Press the switch (arrowed in illustration) to select HDC. HDC can be selected at speeds below 80 km/h (50 mph), but will not be fully active until the vehicle speed reduces below 50 km/h (30 mph), confirmed by a continuously illuminated HDC indicator in the instrument pack.

Press the switch again to deselect HDC.

See **HILL DESCENT CONTROL, 181**.

TRANSFER GEARBOX



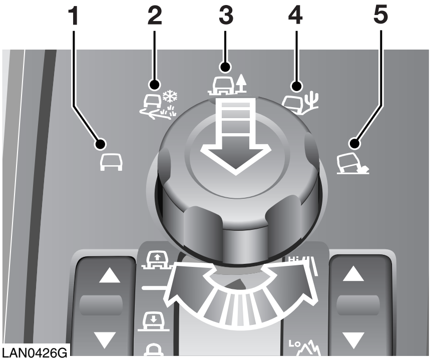
1. **HIGH** range should be used for all normal road driving and also for off-road driving across dry level terrain.
2. **LOW** range should be used in situations where low speed manoeuvring is necessary, or in extreme off-road conditions.

Range changing

The recommended method for range changing is with the vehicle stationary. With the engine running and the main gearbox in **N** (Neutral), press and release the front/rear of the transfer gearbox switch to select the range required. The indicators on the switch and instrument pack display will flash during range changing. When range changing is complete, a chime will sound and a message displayed in the message centre.

See **TRANSFER GEARBOX, 162**.

TERRAIN RESPONSE SYSTEM



1. **General:** Suitable for surfaces that match typical road surfaces.
2. **Grass-Gravel-Snow:** Suitable for surfaces which are firm, but have a slippery surface, e.g. grass, snow, loose gravel, pebbles or icy conditions.
3. **Mud-Ruts:** Suitable for soft, muddy, uneven or deeply rutted ground. It is recommended that LOW range is selected on the Transfer gearbox.
4. **Sand:** Suitable for soft, predominantly dry, yielding sandy ground, e.g. sand dunes and deserts. If the sand is damp or wet, the Mud-Ruts program may be more beneficial.
5. **Rock Crawl:** Only selectable when the Transfer gearbox is in LOW range. Suitable for crossing wet or dry, solid unyielding ground requiring high levels of wheel displacement, e.g. clusters of boulders or rocky river beds.

See **TERRAIN RESPONSETM, 191**.

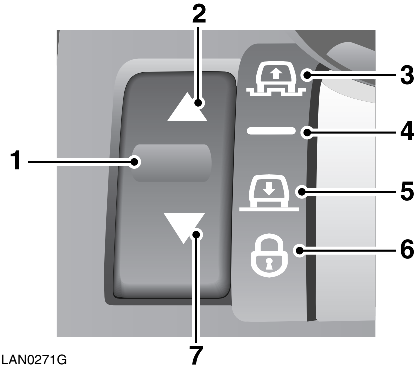
The Terrain Response system is always active and cannot be switched off. When the vehicle is started, the system will normally start in its **General** program.

To raise the rotary knob, press down lightly and release. Manual selection of a special program, by rotating the knob, will provide benefits in how the vehicle can be driven over different surfaces or terrains by automatically adjusting the vehicle's drive and suspension systems.

It is recommended that a special program be engaged whenever driving conditions could become difficult and cancelled once the conditions for use are no longer present. To lower the rotary knob press down until a 'click' is heard.

Wading
When driving through water less than 490 mm (19 inches) deep, select the program suitable for the surface beneath the water.

AIR SUSPENSION



Vehicle height can be manually adjusted via the raise/lower switch **1**. Height changes may only be made when the the engine is running and the driver and passenger doors are closed.

Indicators **2** or **7** will illuminate to show the direction of movement. They extinguish when the height change is complete.

Off-road height **3**, provides improved ground clearance and approach, departure and break-over angles.

On-road height **4**, is the normal height for the vehicle.

Access height **5**, lowers the vehicle to provide easier entry, exit and loading of the vehicle. This position may be selected up to 40 seconds after the starter switch is turned off.

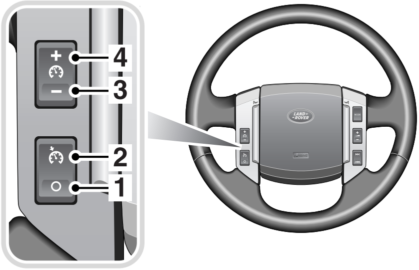
Crawl (locked at Access height) **6**, allows the vehicle to be driven at low speeds at access height, to give increased roof clearance.

Vehicle height will be automatically adjusted according to road speed in order to maintain driveability and handling.
If Terrain Response is fitted, some of its programs will automatically adjust the suspension height.

See **AIR SUSPENSION, 184**.

CRUISE CONTROL

Cruise control enables the driver to maintain a constant road speed without using the accelerator pedal.



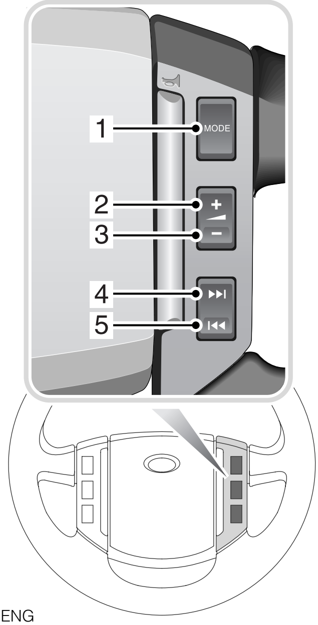
1. **CANCEL:** cancel cruise control, but retains the set speed in memory.
2. **RESUME:** resumes a SET speed retained in memory.
3. **SET - :** to set a road speed or decrease the speed in 2 km/h (1 mph) steps when cruise control is operating.
4. **SET + :** to set a road speed or increase the speed in 2 km/h (1 mph) steps when cruise control is operating.

Cruise control will automatically disengage when the brake pedal is used or when the vehicle speed falls below 30 km/h (18 mph).

See **CRUISE CONTROL, 165**.

AUDIO SYSTEM

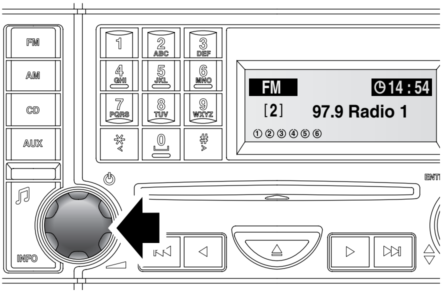
Steering wheel controls



ICE1579 ENG

1. Mode select
2. Volume up
3. Volume down
4. Channel up
5. Channel down

Switching on the audio unit

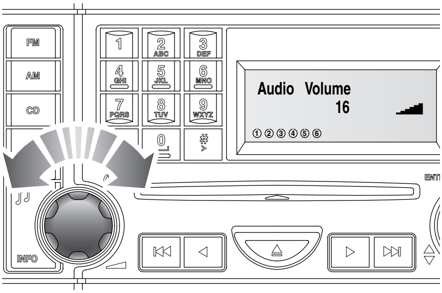

FM
AM
CD
AUX
INFO
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
#
FM
14 : 54
[2]
97.9 Radio 1
① ② ③ ④ ⑤ ⑥
ENT

ICE1614 ENG

To turn on the audio unit, press the rotary control.

To make any of the changes to settings, as shown in the following pages, the unit must be switched on.

Volume control

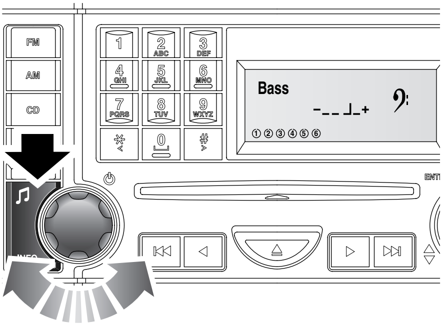

FM
AM
CD
INFO
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
#
Audio Volume
16
① ② ③ ④ ⑤ ⑥
ENT

ICE1615 ENG

To increase or decrease the volume level, rotate the control.

With the engine running, the volume level can be adjusted between 0 and 35. If the audio unit is turned off, it will re-start at the previously selected volume level, provided that this is not too loud or too quiet.

Tone and balance settings


FM
AM
CD
Bass
-‗‗┘‗+
①②③④⑤⑥
INFO
ENT

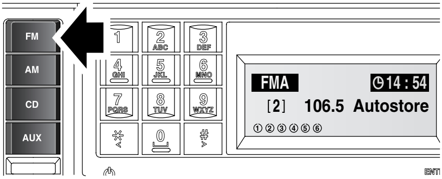
ICE1618 ENG

To change the Bass, Treble, Balance, Fader, Subwoofer and Logic 7 settings, press the Tone button repeatedly until the required setting is displayed, then use the rotary control to adjust the setting as required.

For further information, see **TONE AND BALANCE ADJUSTMENT, 311**.

RADIO OPERATION

Autostore


FM
AM
CD
AUX
FMA
14 : 54
[2] 106.5 Autostore
①②③④⑤⑥
ENT

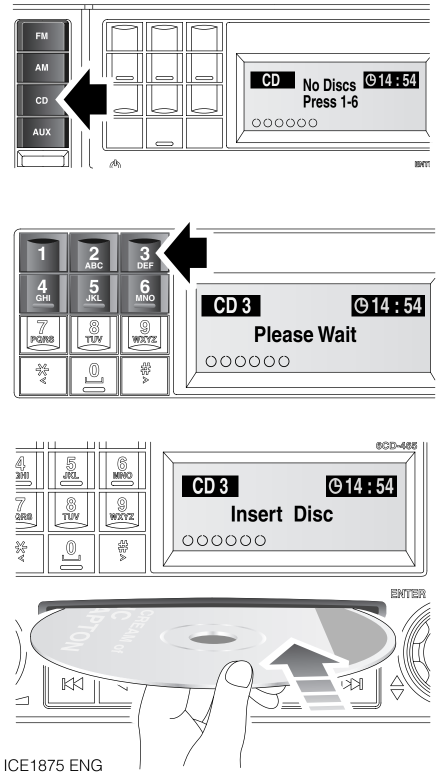
ICE2135 NAS

To autostore FM or AM stations, press and hold the **FM** or **AM** buttons. **Autostore** will be shown in the information display and the stations will be stored under the pre-set numbers, in the order that they are found.

To access the stations once stored, press the required pre-set number briefly.

CD OPERATION

Inserting a CD



Premium audio unit illustrated

Before inserting a CD into the audio unit, select CD mode by pressing the **CD** button.

Note: *On Premium audio units it is necessary to then select an empty CD slot, by pressing the appropriate disc selection button (e.g.* ***3****). The six circles at the bottom left-hand side of the screen represent the six available CD slots. As soon as one has a CD in it, its number will appear in the circle. Empty slots are, therefore, those without numbers.*

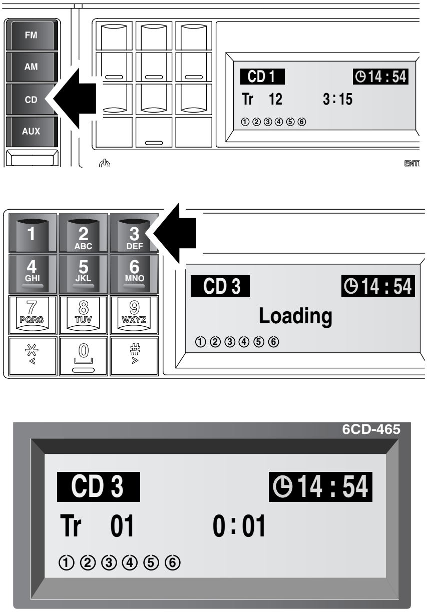
When inserting a disc into either player, ensure that the label side of the disc is facing upwards and present the disc to the slot. Do not push it into the slot, the player mechanism will draw the disc in automatically.

There will be a short pause whilst the player reads the information from the disc, which will then be displayed on the screen. Play will commence at the first track on the newly inserted disc.

Dual and DVDPlus discs

Please be aware that a new generation of DVD discs is being adopted by the music industry. They are known as **Dual Discs** or **DVDPlus** discs. They have digital music on one side and video content on the other. Current in-car audio systems with a front loading CD player may load and play this type of disc, however, it is likely that the disc will not eject and will block up the player. Such damage to a CD player will not be covered under warranty.

CD playback


FM
AM
CD
AUX
CD 1
14 : 54
Tr 12
3 : 15
① ② ③ ④ ⑤ ⑥
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
CD 3
14 : 54
Loading
① ② ③ ④ ⑤ ⑥
6CD-465
CD 3
14 : 54
Tr 01
0 : 01
① ② ③ ④ ⑤ ⑥

ICE1887 ENG

Premium audio unit illustrated

Premium audio: To start CD playback, briefly press the **CD** mode button, followed by the disc number required. If no disc number is selected, playback will begin at one of two places:

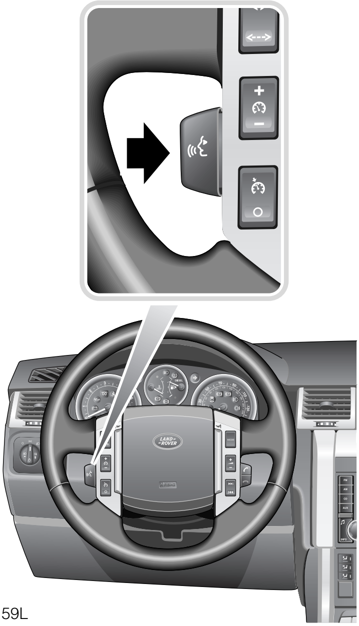
- If the discs contained in the player have not been removed since their last use, playback will begin from the point at which it was stopped previously.
- If the discs contained in the player have not been used since they were inserted, playback will begin at the start of disc one.

Standard audio: CD playback will commence automatically when a CD is inserted.

If a CD is already inserted but the audio system is currently in radio mode, press the **CD** mode button to commence playback.

VOICE RECOGNITION

Activating the system



To activate voice control:

- Briefly pull the control paddle (your Audio system will mute at this point). A brief acoustic signal will be heard, and **LISTENING** will be displayed on the main message centre to indicate that the system is now waiting for a voice command.

Note: *It is only necessary to use the steering wheel voice control paddle at the beginning of each voice session.*

Defined voice commands

The voice control system understands predefined commands which need to be quoted word for word.

An audio feedback of voice commands is available. To activate the feedback, pull the voice control paddle briefly and give one of the following commands:

General commands

- **Voice help** - To list all commands.
- **Notepad Help** -To list Notepad commands.

  See **Voice Recognition, 142**.

Audio commands

- **Radio help -** To list Radio commands.
- **CD help -** To list CD commands.

  See **Audio Voice Recognition, 337**.

Navigation and Telephone commands

- **Phone help** - To list telephone commands.
- **Navigation help -** To list Navigation commands.

  Please refer to the **Navigation, TV and Telephone Systems** Handbook.

FUEL FILLER FLAP

Note: *The fuel filler flap has a spring loaded release, do not force it open.*

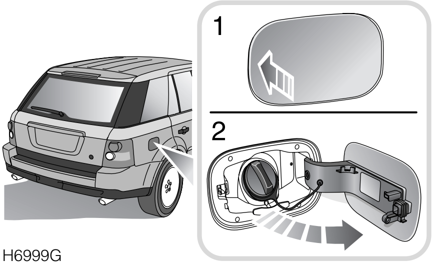
The fuel filler is located in the rear right-hand wing. With the vehicle fully unlocked, press and release the centre of the left edge of the fuel filler flap to open. See arrow position (1).

The fuel filler flap springs out, revealing the filler cap (2).

Unscrew the filler cap and place it on the projection on top of the hinge of the fuel filler flap.

Insert the pump nozzle into the filler neck, pushing aside the spring-loaded cover.

When delivery is complete, withdraw the nozzle and replace the cap. Tighten the cap clockwise until you hear it click three times. Return the fuel filler flap to its closed position.



Note: *For more detailed information, see* ***FUEL FILLER, 151****.*

Fuel type	
Petrol vehicles	Premium unleaded 95 RON
Diesel vehicles	To EN590 specification. Maximum allowable Bio-diesel mix is 5%.

Engine oil top-up	
V8 petrol vehicles	Use a 5W/30 oil to specification ACEA A3 Land Rover WSS-M2C913-B preferred.
Diesel vehicles	Use a 5W/30 oil to specification ACEA B1 or B3
Cooling system top-up	
All vehicles to -40°C (-40°F)	50% mix of water and an approved antifreeze

Note: *For more detailed information, see* ***LUBRICANTS AND FLUIDS, 286****.*

TYRE PRESSURES

Air pressure naturally increases in warm tyres (after the vehicle has been driven for a while). If you have to check warm tyres, you should expect the pressures to have increased by between 30 and 40 kPa (0.3 to 0.4 bar) (4 to 6 lbf/in^2). In this circumstance, NEVER let air out of the tyres in order to match the recommended pressures.

Loading condition		**kPa**	**bar**	**lbf/in^2**
Temporary spare wheel (All operating conditions)		420	4.2	60

Note: *For more detailed information, see* ***Tyre pressure and loading label, 239****.*

SYMBOLS GLOSSARY

The following warnings, cautions and symbols used within the handbook call your attention to specific types of information.

Warnings

WARNING

Safety warnings are included in this handbook. These indicate either a procedure which must be followed precisely, or information that should be considered with great care in order to avoid the possibility of personal injury.

Cautions

Caution: Cautions are included in this handbook. These indicate either a procedure which must be followed precisely, or information that should be considered with great care in order to avoid the possibility of damage to your vehicle.

Symbols

This recycling symbol identifies those items that must be disposed of safely in order to prevent unnecessary damage to the environment.

This symbol identifies those features that can be adjusted or disabled/enabled by a Land Rover Dealer/Authorised Repairer.

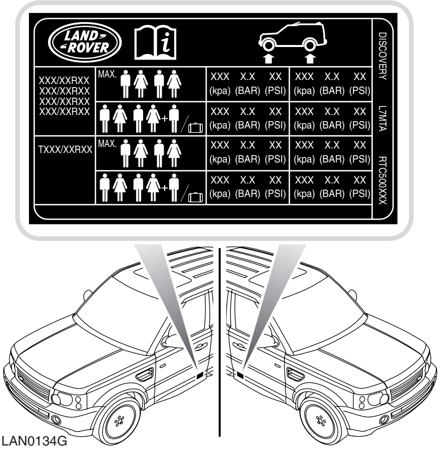
WARNING LABELS ATTACHED TO THE VEHICLE

Warning labels attached to your vehicle bearing this symbol mean: DO NOT touch or adjust components until you have read the relevant instructions in the handbook.

Labels showing this symbol indicate that the ignition system utilises very high voltages. DO NOT touch any ignition components while the starter switch is turned on.

Warning labels

Labels are attached to your vehicle at several positions. These are applied to draw your attention to important subjects, e.g. tyre pressures, tow bar use, airbags, roll-over risk, engine compartment hazards, etc.



Examples of left/right-hand drive.

It is important that you are familiar with these subjects to ensure that your vehicle and its features are used safely. Using the index at the back of this handbook, refer to the relevant topic for more information.

WARNING

Your vehicle has a higher ground clearance and hence, a higher centre of gravity than ordinary passenger cars, to enable the vehicle to perform in a wide variety of off-road applications. An advantage of the higher ground clearance is a better view of the road allowing you to anticipate problems.

The vehicle is not designed for cornering at the same speed as conventional passenger cars any more than a low-slung sports car is designed to perform satisfactorily under off-road conditions. If at all possible, avoid sharp turns or abrupt manoeuvres. As with other vehicles of this type, failure to operate the vehicle correctly may result in loss of control or vehicle roll-over.

DATA RECORDING

Service data recording

Service data recorders in your vehicle are capable of collecting and storing diagnostic information about your vehicle. This potentially includes information about the performance or status of various systems and modules in the vehicle, such as engine, accelerator, steering or brakes.

In order to properly diagnose and service your vehicle, Land Rover and service and repair facilities may access vehicle diagnostic information through a direct connection to your vehicle.

Event data recording

Event data recorders are capable of collecting and storing data during a crash or near-crash event. The recorded information may assist in the investigation of such an event. The modules may record information about both the vehicle and the occupants, potentially including information such as:

- How various systems in your vehicle were operating.
- Whether or not the driver and passenger seat belts were buckled.
- How far, if at all, the driver was depressing the accelerator and/or the brake pedal.
- How fast the vehicle was travelling.
- Where the driver was positioning the steering wheel.

To access this information special equipment must be connected directly to the recording modules. Land Rover do not access event data recorder information without obtaining consent, unless pursuant to court order or where required by law enforcement, other government authorities or third parties acting with lawful authority. Other parties may seek to access the information independently of Land Rover.

PARTS AND ACCESSORIES

WARNING

The fitting of non-approved parts and accessories, or the carrying out of non-approved alterations or conversions, may be dangerous and could affect the safety of the vehicle and occupants and also invalidate the terms and conditions of the vehicle warranty.

Land Rover will not accept any liability for death, personal injury or damage to property which may occur as a direct result of fitment on non-approved accessories or the carrying out of non-approved conversions to Land Rover vehicles.

Land Rover strongly advise against making any modifications to the suspension or steering system. This could seriously affect the handling and stability of the vehicle leading to loss of control or roll-over.

The vehicle has been designed, built and tested to cope with a variety of off-road driving conditions, some of which can place the severest possible demands on control systems and components. As such, fitting replacement parts and accessories that have been developed and tested to the same stringent standards as the original components will safeguard the continued reliability, safety and performance of your vehicle.

To augment the vehicle's already impressive performance, a comprehensive range of Land Rover-approved spare parts and accessories is available, enabling the vehicle to fulfil a wide variety of roles, and enhancing and protecting the vehicle in the many tasks to which it can be applied.

Land Rover parts are the only parts built to original equipment specifications AND approved by Land Rover designers; this means that every single part and accessory has been rigorously tested by the same engineering team that designed and built the vehicle and can therefore be guaranteed for twelve months with unlimited mileage.

A full list and description of all accessories is available from your Land Rover Dealer/ Authorised Repairer.

Electrical equipment

WARNING

It is extremely hazardous to fit or replace parts or accessories, the installation of which requires the dismantling of, or addition to, either the electrical or fuel systems.

ALWAYS consult a Land Rover Dealer/ Authorised Repairer before fitting any accessory.

Fitting inferior quality parts or accessories, may be dangerous and could invalidate the vehicle warranty.

It is recommended that you always consult a Land Rover Dealer/Authorised Repairer for advice regarding the approval, suitability, installation and use of any parts or accessories before fitting.

Parts and Accessories

Airbag

WARNING

The components that make up the airbag are sensitive to electrical or physical interference, either of which could easily damage the system and cause inadvertent operation or a malfunction of the airbag module.

To prevent any airbag malfunction, ALWAYS consult a Land Rover Dealer/ Authorised Repairer before fitting any of the following:

- **Electronic equipment such as a mobile phone, two-way radio or in-car entertainment system.**
- **Accessories attached to the front of the vehicle.**
- **Any modification to the front of the vehicle.**
- **Any modification involving the removal or repair of any wiring or component in the vicinity of any of the airbag components, including the steering wheel, steering column, instrument or facia panels.**
- **Any modification to the facia panels or steering wheel.**

After-sales service

The After Sales Parts service is of paramount importance, both in the UK and across the world. In the UK there are over 100 authorised Land Rover Dealer/Authorised Repairer, all computer linked for rapid ordering of parts and accessories.

In addition, with franchised representation in over 100 countries worldwide, Land Rover are able to support your vehicle wherever you go.

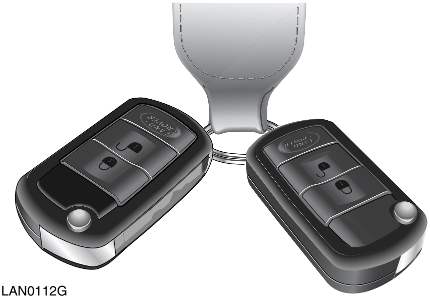
Travelling abroad

In certain countries, it is illegal to fit parts which have not been made to the vehicle manufacturers' specification.

Owners should ensure that any parts or accessories fitted to the vehicle while travelling abroad will also conform to the legal requirements of their own country when they return home.

KEYS AND REMOTE CONTROLS

Caution: Keep the spare remote control in a safe place - NOT IN THE VEHICLE.



LAN0112G

You have been supplied with two remote controls, with integral keys which operate all of the vehicle's locks.

The operation of all remote control buttons, on all remote controls, will be inhibited while a key is in the starter switch.

Note: *The remote control may not operate correctly in areas that are subject to interference from other radio equipment operating on a similar frequency. Areas where, for example, equipment such as amateur radio, medical devices, telecommunications equipment or other remotely operated alarms are in use may cause difficulty. If such difficulties are experienced, try to operate the remote control as close as possible to the vehicle, or use the key in the door lock. See* ***Emergency locking/unlocking, 49****.*

The remote controls supplied with your vehicle are programmed to your security system - the engine cannot be started without a remote control programmed to your vehicle.

Note: *Should a remote control be lost or damaged, a replacement can only be obtained from your Land Rover Dealer, where it will be programmed to your vehicle. The dealer will require proof of ownership, and keep a log of all enquiries for replacement remote controls.*

It is advisable to notify your dealer as soon as possible if a remote control is lost or stolen, and have the remaining remote control reprogrammed. This will prevent access to the vehicle using the lost/stolen remote control.

Remote control battery

Caution: The remote control contains delicate electronic circuits and must be protected from impact and water damage, high temperatures and humidity, direct sunlight and the effects of solvents, waxes and abrasive cleaners.

The battery is rechargeable. The fact that the battery needs recharging will be apparent from the following:

- **KEY BATTERY LOW** will be displayed in the main message centre.
- A gradual deterioration in range and performance will be noticed.

Battery recharge

Insert the key into the starter switch and start the engine. This will start to recharge the remote control battery.

SECURITY SYSTEM

The security system fitted to your vehicle is Thatcham category one approved, and meets European regulation 97 and directive 95/56/EC.

Security Information

For your own safety, and that of the vehicle, when the vehicle is left unattended:

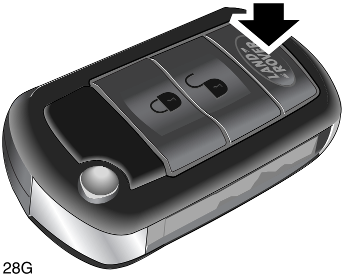
- Apply the parkbrake.
- Remove all keys and remote controls from the vehicle prior to locking the doors.
- Close all doors, windows, luggage compartment (including blind), sunroof, and glovebox.
- Park the vehicle where it is visible (a well lit area after dark).
- Keep your vehicles keys safely out of sight.
- NEVER leave children or pets unattended in the vehicle.
- NEVER leave luggage or valuables on display.

LAND ROVER BUTTON

Customer programmable button

WARNING

Be aware that the previously programmed feature will be activated when the button is initially pressed to start the programming sequence.



LAN0128G

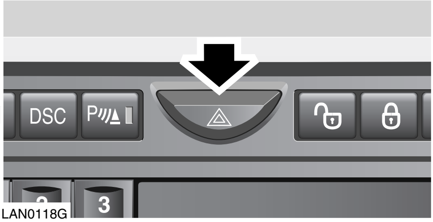
The fourth button on the remote control - marked with the Land Rover logo - can be programmed to give remote operation of one of the following functions:

- panic alarm.
- headlamp courtesy delay.
- air suspension control.
- tailgate release.
- tailglass release.

Note: *Programming and subsequent use of the Land Rover button will not occur if the key is in the starter switch.*

REMOTE CONTROL PROGRAMMING

Panic alarm



LAN0118G

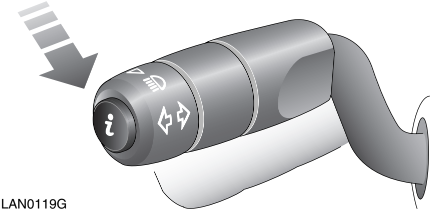
Programme by keeping the Land Rover button pressed and also pressing the hazard warning lamps button on the instrument panel. A chime from the instrument panel will confirm successful programming.

A short press of the button will now cause the vehicle's alarm to be sounded and the hazard warning lamps to flash.

The alarm is turned off by inserting the key in the starter, or pressing the lock or unlock buttons on the remote control.

Note: *In some countries it is an offence to activate the panic alarm for any purpose other than an emergency.*

Headlamp courtesy delay



LAN0119G

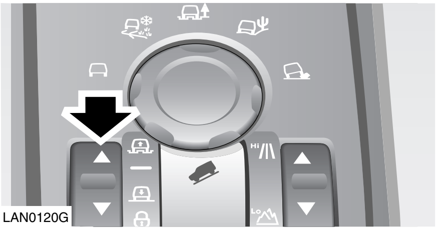
Programme by keeping the Land Rover button pressed and also flashing the headlamps. A chime from the instrument panel will confirm successful programming.

A short press of the Land Rover button will now cause the vehicle's headlamps to illuminate for the length of time specified in Settings. See **SELECTING SETTINGS OPTION, 88**.

A second press of the button after three seconds will deactivate the lamps.

Air suspension control

Programme by keeping the Land Rover button pressed and also pressing the suspension control switch. A chime from the instrument panel will confirm successful programming.



Programming of this function must be done within one minute of switching off the engine.

After programming, to change the suspension height via the remote control, remove the starter key, turn on the hazard warning lamps and close all the doors. Remote operation is not possible unless this is done.

To raise the vehicle, press and hold the Land Rover button and Lock button.

To lower the vehicle, press and hold the Land Rover button and Unlock button.

If any button is released during the raising or lowering of the suspension, all movement of the suspension will stop. It will restart once the buttons are pressed again.

The height will initially change slowly but, after three seconds, the speed will increase. While the height is changing, a symbol on the raise/lower switch will be lit according to the direction of movement. See **Adjusting suspension heights, 185**.

If the starting height is above or below On-road height, movement will stop when On-road height is reached. Further movement can be achieved by releasing the buttons and pressing them again.

See **AIR SUSPENSION, 184**.

Single-point entry

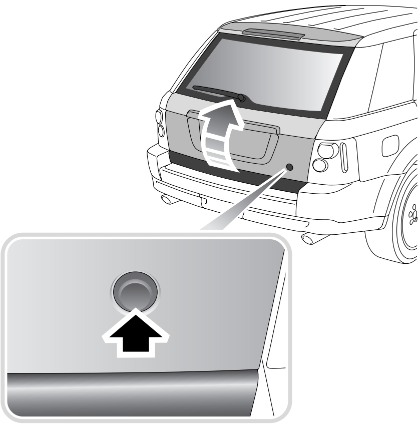
This is a personal security feature, which enables only the driver's door to be unlocked, leaving the other doors in a locked state.

Single-point entry can be disabled on individual remote control keys by pressing and holding the lock and unlock buttons together for three seconds.

Repeating the procedure will re-enable the feature.

Each time single-point entry is turned on or off, the vehicle will lock then unlock into the selected mode (all doors unlocked or just the driver's door unlocked).

Tailgate release

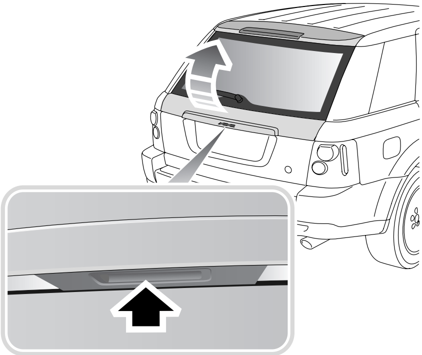


LAN0125G

Programme by keeping the Land Rover button pressed and also pressing the main tailgate release button on the rear tailgate. A chime from the instrument panel will confirm successful programming.

A short press of the button will now cause the vehicle's tailgate to release.

Tailglass release

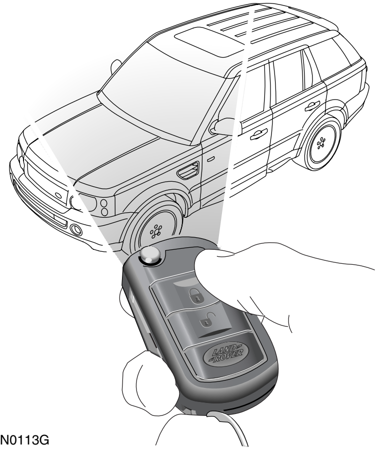


LAN0124G

Programme by keeping the Land Rover button pressed and also pressing the main tailglass release button situated under the rear number plate plinth. A chime from the instrument panel will confirm successful programming.

A short press of the button will now cause the vehicle's tailglass to release.

ALARM SYSTEM



LAN0113G

Your vehicle is fitted with a sophisticated electronic anti-theft alarm and engine immobilisation system. There are also a number of additional security features, some of which are selectable options and some are standard features of the vehicle.

In order to ensure maximum security and operating convenience, you are strongly advised to gain a full understanding of the features and alternatives available, by thoroughly reading this section of the handbook.

Note: *FOR MAXIMUM SECURITY ALWAYS SUPERLOCK THE VEHICLE. If passengers or animals are to be left in the vehicle, windows and/or sunroof are left open, or the vehicle is on a moving platform, e.g. a ferry, lock the vehicle by pressing the lock button twice within three seconds. This disables the superlocking, tilt sensing and interior space protection.*

Superlocking

WARNING

For safety, NEVER use Superlocking if passengers are to remain inside the vehicle - in an emergency they would not be able to escape, or be released by emergency services. Also, any movement from within the vehicle would activate the interior space protection alarm.

Superlocking is activated by one press of the lock button on the remote control.

When the vehicle is superlocked, the doors can only be opened (from inside or outside of the vehicle) with the correct key or remote control.

Superlocking immobilises the interior door handles, thereby preventing an intruder from gaining entry by smashing a window and reaching inside the vehicle to operate the door handles.

Perimetric alarm

This feature is activated automatically, whenever the vehicle is locked using the remote control and protects the doors, bonnet and tailgate.

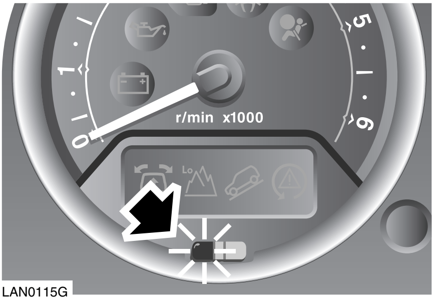
If any of these apertures are opened, or if a key that has not been programmed to the vehicle is inserted into the starter switch while the feature is activated, the alarm will be triggered.

When the perimetric alarm is activated, the direction indicators will flash three times and the security system status indicator will flash.

Mislock

If an aperture is open when an attempt is made to lock the vehicle an audible warning will sound once to indicate that the vehicle is not secure.

Anti-theft alarm indicator



The indicator provides information about the status of the alarm and immobiliser systems, as follows:

When the alarm is armed with interior space protection:

The indicator will triple flash for 10 seconds then continue to single flash until the vehicle is disarmed and immobilised.

When the alarm is armed without interior space protection:

The indicator will double flash for 10 seconds, then continue to single flash until the vehicle is disarmed and immobilised.

When the alarm is disarmed but the vehicle is immobilised (key out of starter switch):

The indicator will single flash until the alarm is armed or the vehicle is mobilised.

When the alarm is disarmed and the vehicle is mobilised (key in starter switch):

The indicator gives a one-second flash on remobilisation.

If the alarm sounds

If the alarm is triggered, the alarm will sound and the hazard warning lamps will flash for 30 seconds, before resetting to the same protection status that existed prior to the alarm being triggered.

To silence the alarm, press the lock or unlock button on the remote control or insert the key into the starter switch. Pressing the lock button will keep the alarm armed.

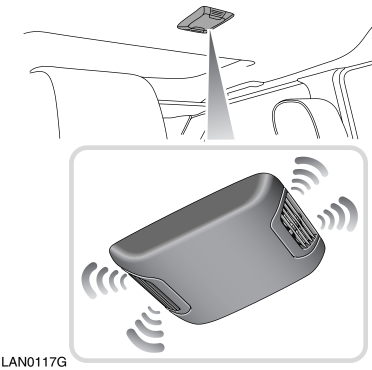
When the vehicle is disarmed, the hazard warning lamps will quickly flash eight times if the alarm has sounded since the vehicle was last armed.

Interior space protection

Interior space protection is activated whenever the vehicle is superlocked.

Note: *Never activate interior space protection if windows or sunroof are to be left open, or if passengers or animals are to be left inside the vehicle - any movement will activate the alarm.*

Interior space protection is designed to protect the interior of the vehicle from intrusion (entry by a thief through a smashed window, for example).



Four roof-mounted sensors monitor the interior space and activate the alarm if air movement is detected in the passenger compartment.

Note: *Interior space protection cannot be activated if a door is open.*

Disabling interior space protection:

If there is a requirement to disable interior space protection (if a window or sunroof is to be left open, for example), press the lock button on the remote control twice within three seconds.

Tilt sensor

Your vehicle is fitted with a tilt sensor which activates the alarm if the vehicle is tilted fore and aft, or side to side, after it has been superlocked.

The alarm will sound if theft is attempted by hoisting onto another vehicle or if a side is lifted to attempt wheel removal.

Disabling tilt sensor protection:

If you wish to have the doors locked but the tilt sensor disabled (e.g. when aboard a ferry or having the vehicle transported on a recovery truck) press the lock button twice within three seconds.

Battery-backed sounder

This device will sound the full alarm if the alarm is activated, or if the vehicle’s battery or the sounder is disconnected whilst the security system is armed.

ENGINE IMMOBILISATION

Engine immobilisation is an important aspect of the security system. It is designed to safeguard the vehicle from theft, should the driver forget to lock the doors. The system prevents the engine from being started unless the GENUINE remote control key is inserted into the starter switch.

Engine immobilisation is automatic five seconds after the key is removed from the starter switch.

***Note:** The engine will be re-mobilised automatically whenever the genuine remote control key is inserted into the starter switch. When this happens, the anti-theft alarm indicator will illuminate for one second and then extinguish.*

LOCKING/UNLOCKING

While it is not necessary to point the remote control at the vehicle, the remote control must be within range of the vehicle when a button is pressed.

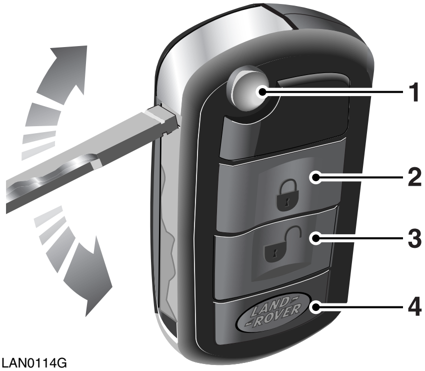
***Note:** If the remote control fails to work even when close to the vehicle, it could be that it is not synchronised with the system, see **Emergency locking/unlocking, 49**. Putting the key in the starter switch and running the engine for six minutes will restore full operation.*

The operating range may vary, depending upon remote control battery condition and may sometimes be limited by physical and geographical factors beyond your control.

***Note:** If a key is in the starter switch, the vehicle will not respond to remote control commands.*

Locking with the remote control

Remove the key from the starter switch and shut all doors, the bonnet and the tailgate.



The four buttons on the remote control are used as follows:

1. Key release button.
2. Lock button: Press to superlock all doors and to activate the perimetric alarm and interior space protection and activate the tilt sensor. See **Superlocking, 44**, **Tilt sensor, 46**.

   Press twice within three seconds to lock all doors and activate the perimetric alarm, but NOT activate interior space protection or the tilt sensor.

   The direction indicators will flash three times.
3. Unlock button: Press once to disarm the alarm and unlock the driver's door and to activate the Lazy entry feature. See **Lazy entry, 57**. Press again to unlock the remaining doors. See **Single-point entry, 42**.

   In either case, the interior lamps illuminate and the direction indicators flash once.

   The hazard warning lamps will quickly flash eight times when the vehicle is disarmed if the alarm has sounded since the vehicle was last armed.
4. Customer configuration - Land Rover button: This button can be configured to operate panic alarm, headlamp courtesy delay, tailgate release, tailglass release or suspension control. See **LAND ROVER BUTTON, 40**.

Partial arming

If an aperture (door, bonnet or tailgate) is not fully closed when the remote control lock button is pressed, the horn will sound briefly to signal that an aperture is still open. The alarm will remain disarmed and all of the closed apertures will lock.

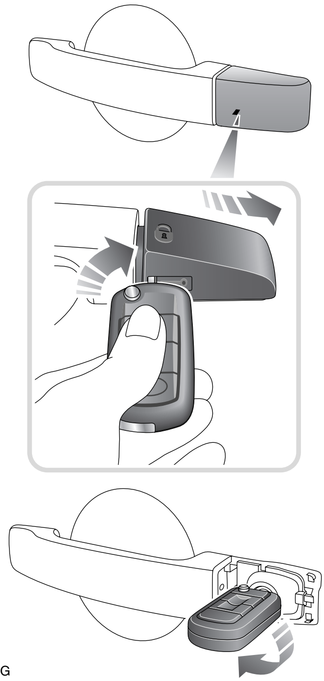
As soon as the open aperture is closed, the system will automatically arm, signalled by three flashes of the hazard warning lamps, with interior space protection activating 30 seconds later.

Note: *The vehicle will not superlock if an aperture (other than the bonnet) is open.*

Emergency locking/unlocking

Under a removable cap on the left front door outer handle, there is an emergency-use door lock.

Removing the cap



1. Insert the key fully into the slot under the handle cap.
2. The cap can now be removed at the forward edge and unhooked from the rear edge.
3. Remove the key from the slot and use it in the emergency lock. Turn the key anti-clockwise to unlock.

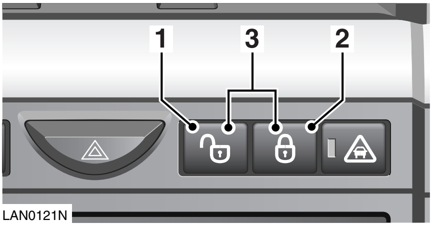
   Note: *If the alarm was previously armed, the alarm will sound when the door is unlocked. To disable it, insert the key into the starter switch.*

4. To lock the door, turn the key clockwise. The alarm system will not be armed.

Refitting the cap

1. Insert the key fully into the slot in the handle cap.
2. Hook the cap onto the lock barrel at the rear edge.
3. Push the front edge of the cap onto the panel.
4. Remove the key from the slot.

Master lock and unlock switches



1. Pressing the master unlock switch will unlock all of the doors.
2. Pressing the master lock switch will lock all of the doors.
3. Simultaneously pressing both the master lock and unlock switches for three seconds will cause the whole tailgate to release.

Note: *If the locks have already been superlocked using the key, the switch will not release the locks.*

Speed related locking

This security feature locks all the doors automatically when the vehicle speed exceeds 8 km/h (5 mph).

Note: *The speed at which speed-related locking occurs is not selectable by the driver. Any presses of the master lock or unlock switches will over-ride the speed locking function, and will remain in that state for the whole journey.*

Speed-related locking can be selected or deselected by a Land Rover Dealer/Authorised Repairer or by the driver.

See **SELECTING SETTINGS OPTION, 88**.

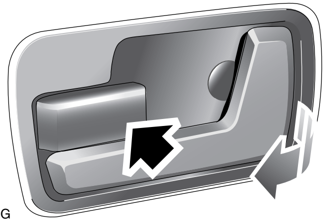
Automatic relock

If the vehicle is unlocked using the remote control and one minute elapses before a door or the tailgate is opened, the vehicle will relock and the alarm will re-arm.

Automatic unlocking

If the vehicle is involved in a collision forceful enough to cause a restraints device to deploy, all door locks will automatically be unlocked and the hazard warning lamps will start to flash. The interior lamps will also illuminate.

Interior door handles and locking levers



LAN0122G

From inside the vehicle, each door can be individually locked by pushing the appropriate lever (arrowed).

To unlock and open a front door, simply pull the door handle.

To open a rear door, first return the locking lever to its unlocked position, then pull the door handle.

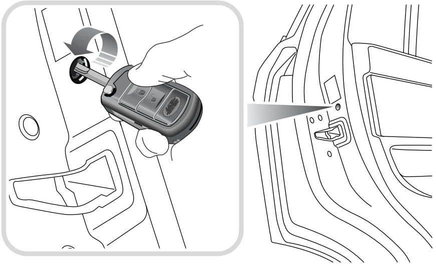
When the master lock or unlock switch is used, or speed related locking is activated, all door locking levers will activate automatically.

These locking levers will only operate if the doors have not been secured using the remote control or door key.

CHILD SAFETY LOCKS

WARNING

NEVER leave children unsupervised in the vehicle.



LAN0123G

Child safety locks are fitted to the rear doors.

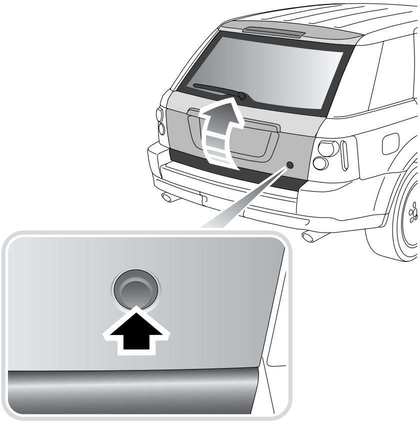
Open a rear door and insert the starter key into the child safety keyhole. Turn the key one quarter of a turn so that the top of the key moves away from the vehicle. Repeat for the other door.

With the child safety locks engaged, the rear doors cannot be opened from inside the vehicle. This prevents a door from being opened accidentally.

Inserting the key and turning it in the opposite direction disengages the lock.

TAILGATE

Opening the tailgate



LAN0125G

With all doors unlocked, press the tailgate release button on the right-hand side of the tailgate.

If the tailgate fails to open, an emergency procedure is available.

Note: *If the tailgate is open, the system prohibits the tailglass release, and vice versa. It will only accept another release when the open panel has been closed.*

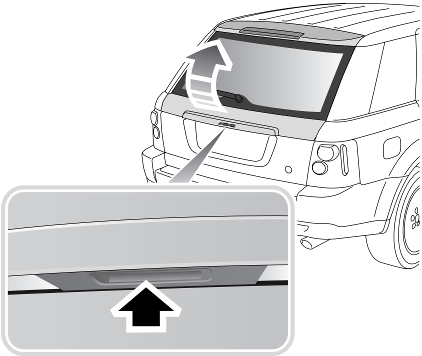
Tailgate emergency unlock

Simultaneously pressing both the master lock and unlock switches for three seconds will cause the whole tailgate to release. This is an emergency release function in case the tailgate exterior release switch becomes inoperative.

Power closure

The tailgate incorporates a ‘Power closure’ feature, which removes the need to ‘slam’ the tailgate when closing.

Opening the tailglass



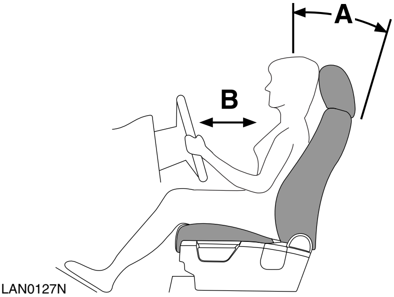
LAN0124G

With all doors unlocked, press the touch pad on the underside of the exterior handle and pull to open.

FRONT SEATS

WARNING

To reduce the risk of loss of control and personal injury, DO NOT adjust the driver's seat while the vehicle is in motion.



Sitting correctly

The seats, head restraints, seat belts and airbags all contribute to the protection of the occupants. Optimal use of these components will give you more protection. Therefore, observe the following points:

- Sit in the most upright position with the base of your spine as far back as possible and the backrest reclined not more than 30 degrees (**A**).
- Do not move the driver’s seat too close to the steering wheel. Ideally, a minimum distance (**B**) of at least 254 mm (10 in) between the centre of the breastbone and the cover of the steering wheel airbag is recommended. The driver should hold the steering wheel with slightly bent arms. The legs should also be slightly bent so that the pedals can be pressed to the floor.
- The seat belt should rest in the centre of the shoulder. The lap part should fit tightly across the hips and not on the stomach.

Make sure your driving position is comfortable and enables you to maintain full control of the vehicle. A properly adjusted seat helps reduce the risk of injury from sitting too close to an inflating airbag.

Note: *For information on adjusting the steering column, see* ***STEERING COLUMN ADJUSTMENT, 81****.*

FRONT SEAT ADJUSTMENT

WARNING

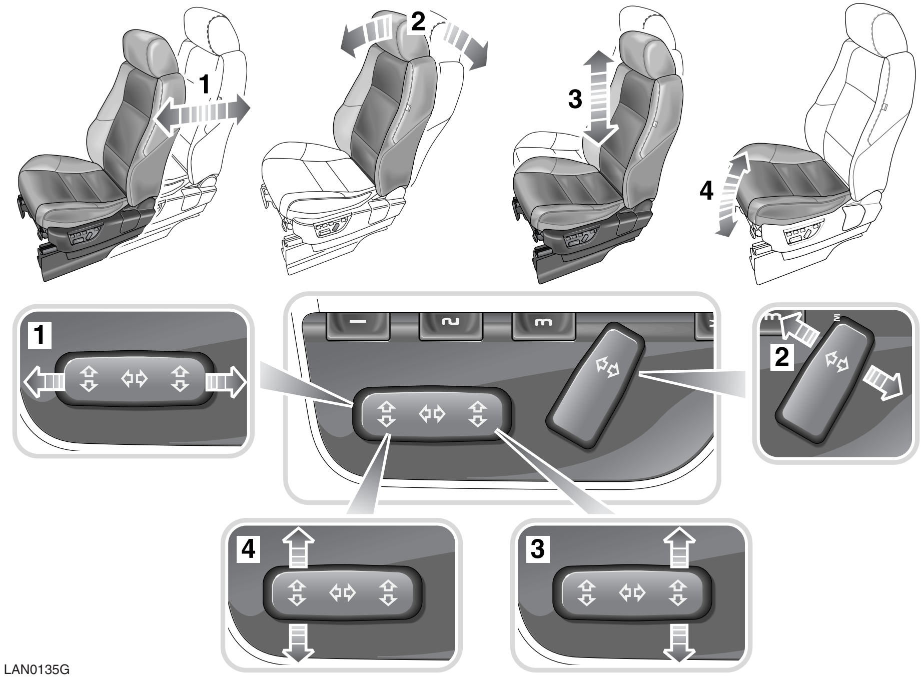
DO NOT adjust any part of a seat while the vehicle is in motion.

Vehicle movement may cause the seat to suddenly shift, potentially causing injury.

The seat adjustment controls are situated on the outboard side of the seat cushion.

Note: *The position of any part of the power operated seats can be changed with the starter key in positions **I** or **II**. Power operated memory driver's seat also has a 10 minute active period (Non-memory power operated seats up to 15 minutes) initiated when:*

- *The driver's door is opened/closed.*
- *The starter key is turned to the off position.*



1. Forward/backward adjustment

Push and hold the switch to move the seat to the desired position. Release the switch to stop adjustment.

2. Seat back adjustment

WARNING

DO NOT travel with the seat backs reclined steeply rearwards. Optimum benefit is obtained from the seat belt with the seat back angle set to no more than 30 degrees from the upright (vertical).

Failure to maintain the correct seat back angle will reduce the effectiveness of the seat belts and increase the risk of serious injury or death in a crash.

Twist the switch until the desired seat back angle is achieved. Release the switch to stop adjustment.

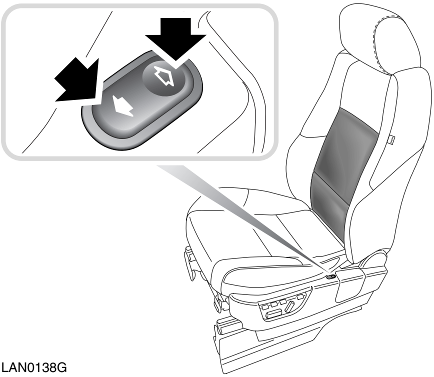
3. Seat cushion height adjustment

Push the switch up or down to raise or lower the cushion. Release the switch to stop adjustment.

4. Seat cushion edge adjustment (Driver's seat only)

Push the switch up or down to raise or lower the front edge of the cushion. Release the switch to stop adjustment.

Lumbar support adjustment

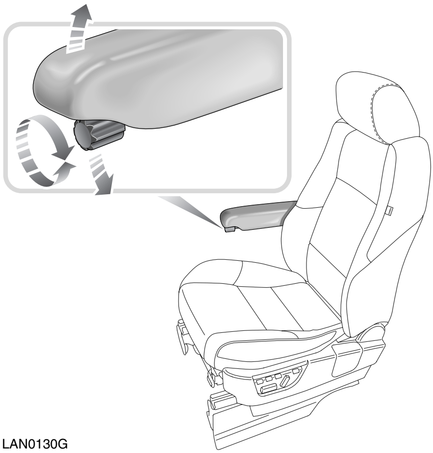


LAN0138G

A separate switch located in the side of the seat provides for adjustment of lumbar support.

Press the front end of the switch to stiffen the support or the rear end of the switch to relax the support. Release the switch to stop adjustment.

Folding armrest



LAN0130G

Some vehicles are fitted with adjustable front seat armrests. These are used in the horizontal position or can be stowed vertically alongside the seat backrest.

The horizontal position can be adjusted for height by turning the knob set into the end of the armrest. Turning the knob clockwise raises the armrest; anti-clockwise lowers it.

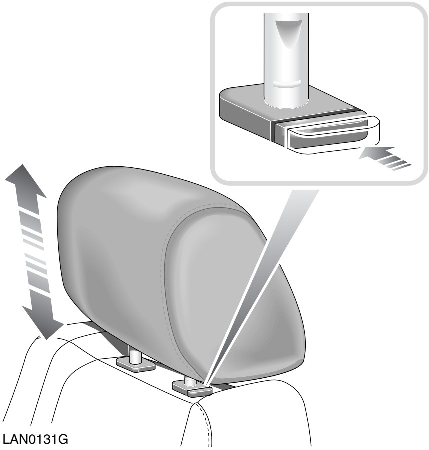
Head restraint adjustment and removal

WARNING

Head restraints are designed to support the back of the head (NOT THE NECK), and to restrain rearward movement of the head in the event of a collision. The restraint must be positioned as described to be effective.

DO NOT drive or carry passengers with the head restraints removed from occupied seats, or adjust the head restraints while the vehicle is in motion.

Failure to have the head restraint installed and properly positioned will increase the potential for serious injuries.



Adjust the head restraint correctly, up or down by pressing the collar button as indicated. The top of the head restraint should be level with the top of the head.
See **Sitting correctly, 53**.

Remove the head restraint by pressing the collar button as indicated, whilst lifting the restraint clear of the seat.

To replace the head restraint, engage the guide posts into the collars and press the restraint downwards until a click is heard.

Rear seat entertainment

WARNING

The video display screens contain toxic substances including Mercury. These substances can cause severe illness and possibly death.

In the event that a video display screen is damaged, avoid all contact with it, and contact your dealer as soon as possible.

Caution: When rear seat passengers are entering or leaving the vehicle it is important that they do not hold the head restraint to ease entry/exit. This may damage the video display screens.

The video display screens fitted to the rear of the front seat head restraints are NOT touch-screens. Avoid contact with the screen wherever possible.

Only clean the screens using the Land Rover approved cleaning materials available from your Land Rover Dealer/Authorised Repairer.

If rear seat entertainment is fitted, the front head restraints can be adjusted for height, but cannot be removed from the seat.

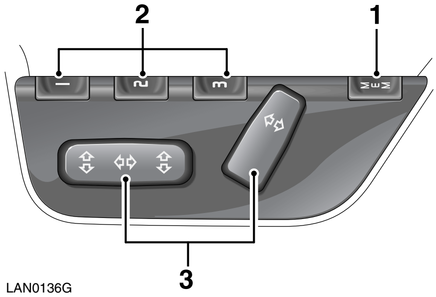
HEATED SEATS

For information on operating the front and rear seat heaters, refer to **SEAT HEATERS, 126**.

DRIVER'S SEAT MEMORY FACILITY

WARNING

Before activating the seat memory, ensure that the area immediately surrounding the seat is clear of obstructions and that all occupants are clear of moving parts.



1. Memory store button.
2. Memory pre-set buttons.
3. Seat adjustment controls. See **FRONT SEAT ADJUSTMENT, 54**.

Your vehicle can memorise up to three different driver seating positions for each of three possible starter keys. This enables three separate drivers to achieve optimum comfort at the touch of a button.

Setting the memory pre-sets

1. Insert the starter key and turn it to position **I** or **II**.
2. Adjust the seat and exterior mirrors to the desired position.

   Note: *For information on adjusting the mirrors, see* ***EXTERIOR MIRRORS, 82****.*
3. Press the memory store button **1** to activate the memory function.
4. Within five seconds, press the desired pre-set button **2**.
5. **Memory Stored** will be displayed on the message centre to confirm the storing action. A single chime will sound from the instrument panel to confirm storing.

Recalling a stored seat position

Providing the power operated memory seat is active, press the pre-set button associated with the desired driving position. The seat and mirrors will move to the position stored on that pre-set.

A confirmation message will display in the message centre and a double chime will sound when adjustments are complete.

Note: *To stop seat movement at any time when recalling a memory setting, press any seat adjustment control.*

Lazy entry

When the lazy entry option is selected and the vehicle is unlocked using the remote control, the vehicle adjusts the driver's seat and the exterior mirrors to the position associated with that particular remote control.

Lazy entry and associated options can be selected or deselected by a Land Rover Dealer/Authorised Repairer or by selecting Settings. See **SELECTING SETTINGS OPTION, 88**.

REAR SEATS

WARNING

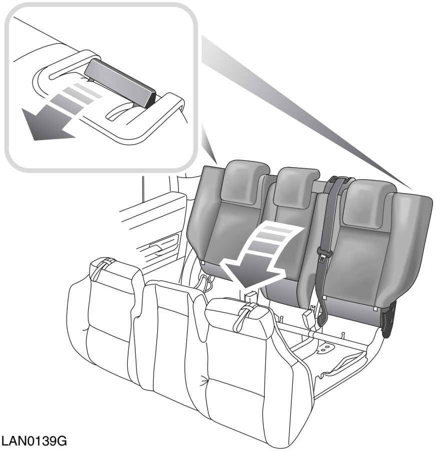
DO NOT adjust any part of a seat while the vehicle is in motion.

Vehicle movement may cause the seat to suddenly shift, potentially causing injury.

WARNING

It is extremely dangerous to ride in the loadspace. In a collision, anyone riding in this area is more likely to be injured or killed. Do not allow anyone to ride in any area of your vehicle that is not equipped with seats and seat belts. Be sure that everyone in your vehicle is in a seat and using a seat belt properly.

Folding down the seats



One or both parts of the split rear seat can be fully folded to further increase the rear loadspace.

Before attempting to fold down the seats, remove the outboard seat belts from the seat belt guides and remove any items from the rear seats and footwell.

If the front seats are in their rearmost position, move them forward. They can be returned to their original position after the rear seat backs have been folded down.

Ensure that the head restraints are fully lowered. Press in the collar at the base of the head restraint support, and push the head restraint down.

Using the strap at the rear of each cushion, pull the required cushions forwards as far as they will travel.

To fold a backrest forwards, pull the seat backrest release lever(s). While pulling the lever(s) located on the top edges of the backrests, tip the seat backrest(s) forwards as far as possible.

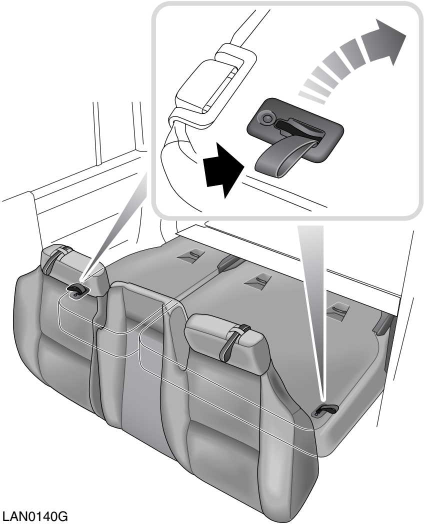
Note: *Only Land Rover approved seat covers and accessories should be used on these seats.*

Returning the seats to the upright position

WARNING

After the seat is returned to the upright position, the latching mechanism should be checked and physically tested to ensure that both the seat base and backrest are secure before driving.

Also, ensure that the head restraint is adjusted correctly for each passenger (the top of the head restraint should be level with the top of the head).



LAN0140G

If the front seats are in their rearmost position, move them forward. They can be returned to their original position after the rear seats have been returned to the upright position.

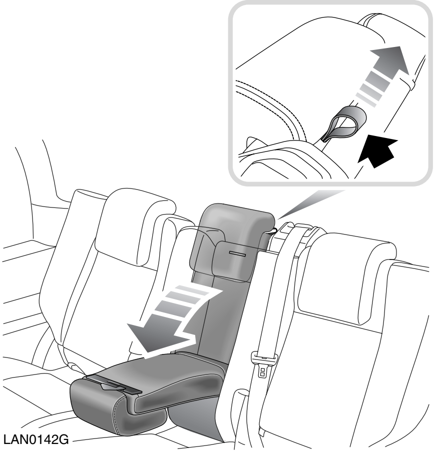
Pull the strap vertically on the back of the seat to unlock the seat. Continue to pull to raise the backrest(s) until they click into position. Push the seat cushion(s) firmly back into position.

Visually check that the lever is fully in place. If it has not returned to its locked position, red flags will be visible around the lever sides.

To raise the head restraint, pull it upwards to the required height.

Replace the outboard seat belts back into the seat belt guides.

Rear seat armrest



LAN0142G

To release the armrest, first pull the loop at the top of the centre seat/armrest (see inset.), then push the armrest downwards to the required position.

To replace, raise the armrest and push until a click is heard when latched.

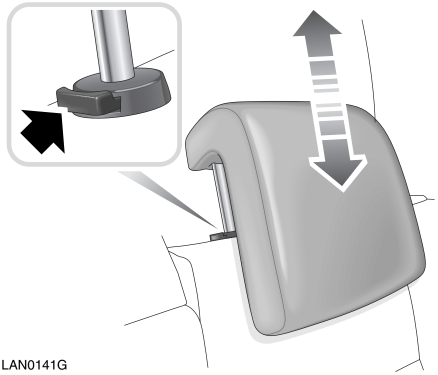
Head restraint adjustment and removal

WARNING

Head restraints are designed to support the back of the head (NOT THE NECK), and to restrain rearward movement of the head in the event of a collision. The restraint must be positioned as described to be effective.

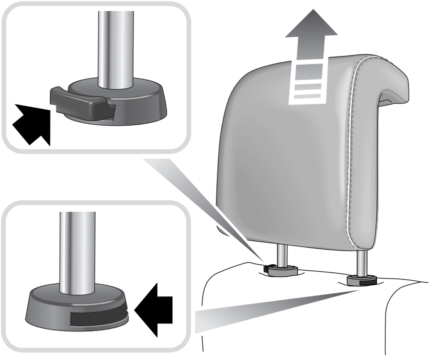
DO NOT drive or carry passengers with the head restraints removed from occupied seats, or adjust the head restraints while the vehicle is in motion.

Failure to have the head restraint installed and properly positioned will increase the potential for serious injuries.



LAN0141G

Adjust the head restraint correctly (up or down) for each passenger by pressing the collar button as indicated. The top of the head restraint should be level with the top of the head.



LAN0143G

Remove the head restraint by pressing the collar button and indented button as indicated, whilst lifting the restraint clear of the seat.

To replace the head restraint, engage the guide posts into the collars and press the restraint downwards until a click is heard.

SEAT BELTS

The use of front and rear seat belts is mandatory in most countries. Using seat belts saves lives. They should be worn by all occupants whenever the vehicle is in use, for maximum protection.

Lap/shoulder inertia reel seat belts are provided for both front seat occupants and all rear seat positions.

The inertia reel operating mechanism of the seat belts allows the wearers to move their upper bodies to reach various controls. The seat belt locks automatically with accelerated body movement or in the event of emergency braking.

The front seat belt assemblies are fitted with pre-tensioners. The pre-tensioners operate with the airbags as part of the Airbag Supplementary Restraint System (SRS). See **HOW THE AIRBAGS WORK, 75**.

Seat belt warning indicator

Driver Beltminder commences when the starter switch is turned to position **II** and the driver belt is unbuckled.

In certain markets the seat belt reminder feature also applies to the passenger seat and will be activated if the seat is occupied and the occupant is unbuckled.

The visual and audible warnings applicable to either driver or passenger Beltminder are market dependent to meet individual market requirements. The warning signals given may also change depending on whether the vehicle is stationary or when the vehicle speed exceeds a pre-determined threshold. See **AUDIBLE WARNINGS, 109**.

Note: *Objects placed on the passenger seat may activate the seat belt warning system.*

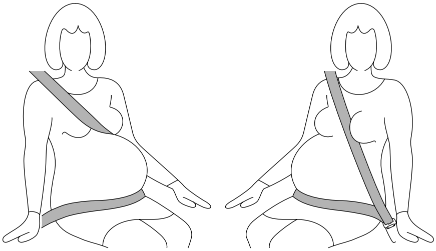
Although not advisable, it is possible to disable the Beltminder function. Please see a Land Rover Dealer/Authorised Repairer to disable or reinstate the function.

SEAT BELT USE DURING PREGNANCY

WARNING

Pregnant women must wear a correctly positioned seat belt; it is safer for mother and unborn child.

Never place anything between you and the seat belt in an attempt to cushion the impact in the event of an accident. It can be dangerous and reduce the effectiveness of the seat belt in preventing injury.



LAN0144G

During pregnancy, women should wear the lap belt across the hips below the baby, with the diagonal belt passing across the shoulder, between the breasts and to one side of the baby - if in doubt, consult a doctor.

SEAT BELT PRE-TENSIONERS

WARNING

The seat belt pre-tensioners will only be activated once and then MUST BE REPLACED by a Land Rover Dealer/Authorised Repairer. Failure to replace the pre-tensioners will reduce the efficiency of the vehicle's front restraint systems.

After any impact, always have the seat belts and pre-tensioners checked and, if necessary, replaced by a Land Rover Dealer/ Authorised Repairer.

In the interests of safety, it is recommended that removal or replacement of the front seats and seat belts should only be carried out by a Land Rover Dealer/Authorised Repairer.

The seat belt pre-tensioners activate in conjunction with the airbag and provide additional protection in the event of a severe frontal impact on the vehicle. See **HOW THE AIRBAGS WORK, 75**. The pre-tensioners automatically retract the seat belts fitted to the front seats. This reduces any slack in both the lap and diagonal portions of the belts, thereby reducing forward movement of the belt wearer in the event of a severe frontal collision.

The airbag warning indicator on the instrument pack will alert you to any malfunction of the seat belt pre-tensioners.

If the pre-tensioners have been activated, the seat belts will still function as restraints, and must be worn in the event that the vehicle remains in a driveable condition.

Note: *The seat belt pre-tensioners will be activated in major side and frontal impacts and in roll-overs.*

AUTOMATIC LOCKING MECHANISM

WARNING

Where possible, use the seat belt automatic locking mechanism to secure large items that are to be carried on the seats. In the event of an accident, loose items become projectiles capable of causing serious injury. Care must be taken to prevent any sharp edges damaging the belt.

Use the seat belt automatic locking mechanism to restrain pets in harnesses or pet carriers when not utilising the loadspace.

The passenger seat belts have a special locking mechanism which retains large items securely.

To use:

1. Place the item on the seat.
2. Put the seat belt around the item, using both the lap and shoulder parts of the belt.
3. Fasten the seat belt.
4. Pull on the shoulder part of the belt, to unreel all of the remaining belt. This will engage the automatic locking feature, which only allows the belt to retract.
5. Allow the seat belt to retract onto the item (a clicking sound will confirm that the ratchet has engaged).
6. Ensure that there is no slack in the seat belt by pulling upwards on the shoulder belt immediately above the item. The item will now be held firmly in position by the belt.

When the seat belt is released and is allowed to retract, the seat belt locking mechanism reverts to normal operation.

SEAT BELT SAFETY

WARNING

Seat belts are life saving equipment. In a collision, occupants not wearing a seat belt can be thrown around inside, or possibly thrown out of the vehicle. This is likely to result in more serious injuries than would have been the case had a seat belt been properly worn. It may even result in loss of life.

Make sure ALL occupants are securely strapped in at all times - even for the shortest journeys.

The airbag supplemental restraint system (SRS) is designed to add to the overall effectiveness of the seat belts. It does not replace them. SEAT BELTS MUST ALWAYS BE WORN.

Seat belts are designed to bear upon the bony structure of the body and should be worn low across the pelvis, chest and shoulders, as applicable; wearing the lap section of the belt across the abdominal area must be avoided.

DO NOT wear seat belts over hard, sharp or fragile items in clothing, such as pens, keys, spectacles, etc.

Seat belts should be adjusted as firmly as possible, consistent with comfort, to provide the protection for which they are designed. A slack belt will greatly reduce the protection afforded to the wearer.

DO NOT allow front seat occupants to travel with the seat backs reclined steeply rearwards. Optimum benefit is obtained from the seat belt with the seatback angle set to no more than 30 degrees from the upright.

WARNING

Ensure that all seat belts are worn correctly - an improperly worn seat belt increases the risk of death or serious injury in the event of a collision.

Belts should not be worn with the straps twisted.

Each belt assembly must only be used by one occupant; it is dangerous to put a belt around a child being carried on the occupant's lap.

It is essential to replace the entire assembly after it has been worn in a severe impact even if damage to the assembly is not obvious.

No modifications or additions should be made by the user which will either prevent the seat belt adjusting devices from operating to remove slack, or prevent the seat belt assembly from being adjusted to remove slack.

Should the seat belt not retract and remain at its static length, consult your Land Rover Dealer/Authorised Repairer immediately.

Care should be taken to avoid contamination of the webbing with polishes, oils and chemicals, and particularly battery acid. Cleaning may safely be carried out using mild soap and water. The belt should be replaced if webbing becomes frayed, contaminated or damaged.

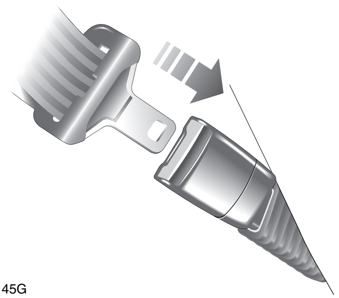
Where possible, use the seat belt automatic locking mechanism to secure large items that are to be carried on the seats. In the event of an accident, loose items become projectiles capable of causing serious injury. Care must be taken to prevent any sharp edges damaging the belt.

FRONT SEAT BELTS

Fastening the seat belts

WARNING

Never wear just the lap strap of a lap/shoulder diagonal seat belt and never sit on the lap strap using just the shoulder strap. Both of these actions are extremely dangerous and may increase your risk of serious injury.



LAN0145G

Pull the belt over the shoulder and across the chest and, ensuring that the webbing is not twisted, insert the metal tongue plate into the buckle nearest the wearer - a CLICK indicates that the belt is securely locked.

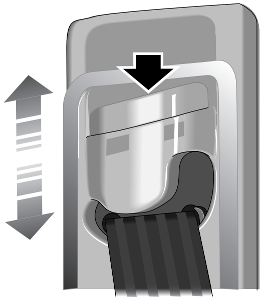
Releasing the belt

Press the RED button on the seat belt buckle.

Upper anchorage adjustment

WARNING

Maladjustment of the seat belt could reduce its effectiveness in a crash. Always ensure that the anchorage is correctly located and properly locked in one of the height positions before driving and DO NOT adjust the height once the vehicle is in motion.



LAN0146G

The height of the seat belt upper anchorage can be adjusted for comfort AND safety on both front seats. Press down (solid arrow) to release the catch, then lift or push down to adjust the height of the anchorage. For safety, the seat belt should always be worn with the webbing crossing the shoulder MIDWAY BETWEEN THE NECK AND THE EDGE OF THE SHOULDER.

Ensure the anchorage has clicked into one of the locked positions before driving.

Where possible, rear seat passengers should adjust their position on the seat to enable the seat belt webbing to cross the shoulder without pressing on the neck.

CARING FOR SEAT BELTS

WARNING

Always replace a seat belt that shows signs of webbing damage or has withstood the strain of a severe vehicle impact.

Regularly inspect the belt webbing for signs of fraying, cuts and wear; also pay particular attention to the condition of the fixing points and adjusters.

DO NOT bleach or dye the webbing and avoid contaminating the webbing with polish, oil or chemicals. See **Seat belts, 248**.

Testing inertia reel belts

- With the seat belt fastened, give the webbing near the buckle a quick upward pull. The buckle must remain securely locked.
- With the seat belt unfastened, unreel the webbing to the limit of its travel. Check that unreeling is free from snatches and snags and then allow the belt to FULLY retract.
- Partially unreel the webbing, then hold the tongue plate and give it a quick forward pull. The mechanism must lock automatically and prevent any further unreeling.

If a seat belt should fail any of these tests, contact your Land Rover Dealer/Authorised Repairer immediately.

Note: *If the vehicle is parked on ground that is not level, the seat belt mechanism may lock. This is not a fault; gently ease the belt from its upper anchorage to release.*

Service information

WARNING

DO NOT attempt to service, repair, replace, modify or tamper with any part of the pre-tensioner and airbag, or wiring in the vicinity of a pre-tensioner or airbag component; this could cause the system to activate, resulting in personal injury.

In addition, ALWAYS contact your Land Rover Dealer/Authorised Repairer if:

- An airbag inflates.
- A pre-tensioner activates.
- The front or side of the vehicle is damaged, even if the pre-tensioner has not activated.

CHILD SEATS

WARNING

Original text according to ECE R94.01.

Extreme Hazard! Do not use a rearward facing child restraint on a seat protected by an airbag in front of it.

There is a risk of death or serious injury when the airbag deploys.

The safest place for children is properly restrained in the rear seats.

WARNING

DO NOT allow a baby or infant to be carried on the lap. The force of a crash can increase effective body weight by as much as 30 times, making it impossible to hold onto the child.

Children typically require the use of a booster seat appropriate to their age and size, thereby enabling the seat belts to be properly fitted. This reduces the risk of injury in a crash. Children could be endangered in a crash if their restraints are not properly secured in the vehicle.

DO NOT use a child seat that hooks over the seat back. This type of seat cannot be satisfactorily secured and is unlikely to be safe for a child.

The seat belts fitted to your vehicle are designed for adults and larger children. For their safety, it is very important that all infants and children under 12 are restrained in a suitable child safety seat appropriate to their age and size (see table). Child safety seats approved for use in your vehicle are available from your Land Rover Dealer/Authorised Repairer.

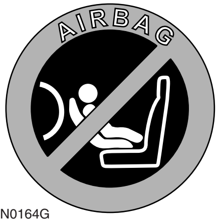
Only fit a child seat that has been approved for use in your vehicle, and ensure that the manufacturer's fitting instructions are followed exactly.

Note: *Crash statistics show that children are safer when properly restrained in the rear seating positions, than they are in the front.*

For optimum safety, children should travel in the rear of the vehicle at all times, front passenger seat travel is NOT recommended. However, if it is essential that a child should travel in the front passenger seat, Land Rover recommends that when installing child restraints, the vehicle front passenger seat be positioned fully rearward, the lumbar adjusted to its minimum support position and the cushion adjusted to its highest position. Additionally, if your vehicle is also fitted with front cushion rake adjustment, this should be adjusted to its lowest position. The seat belt upper adjustable anchorage should be set to its lowest position. Disable the airbag using the switch on the end of the instrument panel. See **PASSENGER AIRBAG DISABLING SWITCH, 78**.

Always use an approved child seat, suitable for a child’s age and size.

Holding a baby or child in a person’s arms is not a substitute for a child restraint system. In an accident, a baby or child held in a person’s arms can be crushed between the vehicle’s interior and a restrained person.



LAN0164G

This symbol affixed to the passenger side **B** post of your vehicle, warns against the use of a REAR-FACING child seat in the front passenger seat, when a passenger airbag is fitted and operational.

Child Restraints

Child safety seating and positions

The following table shows the suitability of each passenger seat position for the carriage of children up to 12 years of age or 1.5 m (5 feet) tall and the installation of suitable child restraint systems.

Mass group (with approximate age) *As indicated on child restraint*	**0** = Up to 10 kg (22 lb) (0-10 months)	**0+** = Up to 13 kg (29 lb) (0-18 months)	**I** = 9 to 18 kg (20 to 40 lb) (9 months - 5 years)	**II and III** = 15 to 36 kg (33 to 80 lb) (4-12 years)
Seating positions				
Front passenger†	U†	U†	U†	U†
Rear seats, rear outboard	U	U	U	U
Rear seats, rear centre	U	U	U	U

U = Suitable for universal category restraints approved for this mass group.
† Never place a child seat in the front passenger seating position unless the airbag has been disabled. See **PASSENGER AIRBAG DISABLING SWITCH, 78.**

WARNING

DO NOT use a forward-facing seat until a child is above the minimum weight of 9 kg (20 lb.) and able to sit up unaided. Up to the age of two, a child's spine and neck are not sufficiently developed to avoid injury in a frontal impact.

Caution: Information given in the table is correct at the time of going to press. However, availability of child restraints may change. Please refer to your Land Rover Dealer/Authorised Repairer for the latest recommendation.

In many countries, legislation governs how and where children should be carried when travelling in a vehicle.

It is the responsibility of the driver to comply with all regulations in force in the country where the vehicle is being used.

Seat belt locking mechanism

The passenger seat belts have a special locking mechanism which aids the retention of child seats. See **AUTOMATIC LOCKING MECHANISM, 70**.

Child restraints for larger children

In a situation where a child is too large to fit into a child safety seat, but is still too small to safely fit the 3 point seat belt properly, a booster seat is recommended for maximum safety. Follow the manufacturer's fitting instructions exactly, then adjust the seat belt to suit.

ISOFIX table of installation

Note:

ISOFIX anchorages are provided for both outer rear seating positions. ISOFIX child restraints should be securely attached following the manufacturers instructions at these locations only.

Mass group as shown on child restraint	Size Classes	Fixtures	Vehicle ISOFIX positions
Carrycot	F/ G	ISO L1/ L2	X
0 = Up to 10 kg (22lb)	E	ISO R1	IL
0+ = Up to 13 kg (29lb)	C/ D/ E	ISO R1/ R2/ R3	IL
I = 9 to 18 kg (20 to 40 lb)	C/ D A/ B1/ B	ISO R2/ R3 ISO F2/ F2X/ F3	IL IUF
II = 15 to 25 kg (33 to 55 lb)	-	N/A	N/A
III = 22 to 36 kg (48 to 79 lb)	-	N/A	N/A

- IUF = suitable for ISOFIX forward child restraint systems of universal category approved for use in the mass group.
- IL = suitable for particular ISOFIX child restraint systems (CRS) given in the attached list. These ISOFIX CRS are those of the “specific vehicle”, “restricted” or “semi-universal” categories.
- X = ISOFIX position not suitable for ISOFIX child restraint systems in this mass group and/or this size class.

AUTOMATIC LOCKING MECHANISM

WARNING

Where possible, use the seat belt automatic locking mechanism to secure large items that are to be carried on the seats. In the event of an accident, loose items become projectiles capable of causing serious injury. Care must be taken to prevent any sharp edges damaging the belt.

Use the seat belt automatic locking mechanism to restrain pets in harnesses or pet carriers when not utilising the loadspace.

The passenger seat belts have a special locking mechanism which aids the retention of child seats and large items. The procedure to install a child seat is as follows;

1. Place a child seat in the vehicle, attach the seat belt and secure the buckle in accordance with the manufacturers fitting instructions.
2. Pull on the shoulder section of the belt to reel out all of the remaining webbing to the limit of its travel. This will engage the automatic locking feature, which then acts as a ratchet, allowing the webbing ONLY to retract.
3. Allow the seat belt to retract onto the child seat (a clicking sound will confirm that the ratchet has engaged), while firmly pushing the child seat into the vehicle seat.
4. Ensure that there is no slack in the seat belt by pulling upwards on the shoulder belt immediately above the child restraint. The seat belt should now be locked and the child seat held firmly in position.

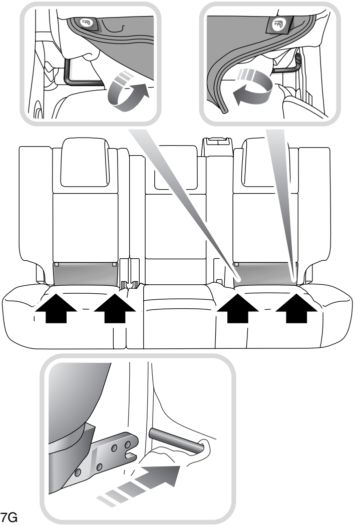
When the child seat belt is renovating all of the seat belt is allowed to retract, the seat belt locking mechanism reverts to normal operation.

ISOFIX CHILD RESTRAINTS

WARNING

DO NOT attempt to fit ISOFIX restraints to the centre seating position - the anchor bars are not designed to hold an ISOFIX restraint in this position.

In some markets, child restraint systems complying with International Standard Organisation regulations and approved for fitting in your vehicle may be available. These restraints are different from conventional child seats, requiring anchor bars built into the vehicle seat in order to accept the ISOFIX locking mechanism.



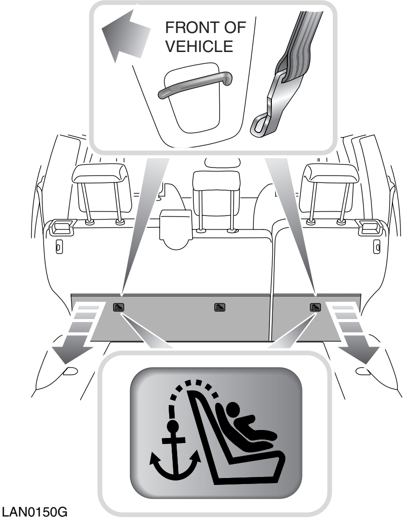
LAN0147G

Both outer rear seating positions in your vehicle are equipped to accept ISOFIX restraints.

To install your child seat with an ISOFIX restraint system:

- Raise or remove the head restraint.
- Lift the velcro strap, exposing the ISOFIX locking mechanism.
- Slide the child seat into the locking mechanism.

The tether anchorages are provided at each seating position equipped to accept Isofix child restraints (shown in the illustrations).



Note: *Always ensure that, if an upper tether is provided, it is secured and tightened properly as this provides the maximum protection for a child.*

Fitting ISOFIX child restraints

WARNING

If the restraint is not correctly anchored, there is a significant risk of injury to the child in the event of a collision or emergency braking.

Child restraint anchorages are designed to withstand only loads imposed by correctly fitted child restraints. Under no circumstances are they to be used for adult seat belts, harnesses or for attaching other items or equipment to the vehicle.

ISOFIX child restraints should only be fitted in the two **outer** rear seating positions. Anchor bars built into the rear seat frame, enable the ISOFIX restraints to be securely attached to the vehicle seat only in these positions.

In addition, two tether anchor bars are fitted to back of the rear seats, to secure child restraint anchor straps.

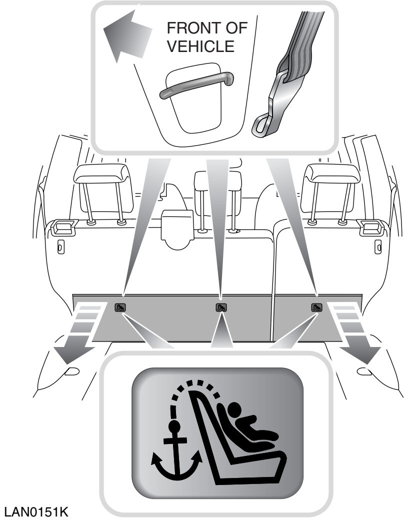
When fitting ISOFIX child restraints, always follow the instructions supplied by the manufacturer of the restraint.

Once the ISOFIX restraint is installed, you are recommended to test the security of the installation before seating the child. Attempt to twist the restraint from side to side and to pull the restraint away from the vehicle seat; then check that the anchors are still securely in place.

TETHER STRAP ANCHORAGES (Australia only)

WARNING

Child restraint anchorages are designed to withstand only loads imposed by correctly fitted child restraints. Under no circumstances are they to be used for adult seat belts, harnesses or for attaching other items or equipment to the vehicle.



Provision is made in the rear seats for the fitting of up to three child seats, of the type that requires tether strap anchorage points.

There are three tether strap anchorage points. These should be used to attach tether straps from child seats or restraint systems. Three anchorage points are located in the floor panel of the luggage area behind the rear seats.

CHILD RESTRAINT CHECK LISTS

Non-ISOFIX child restraints

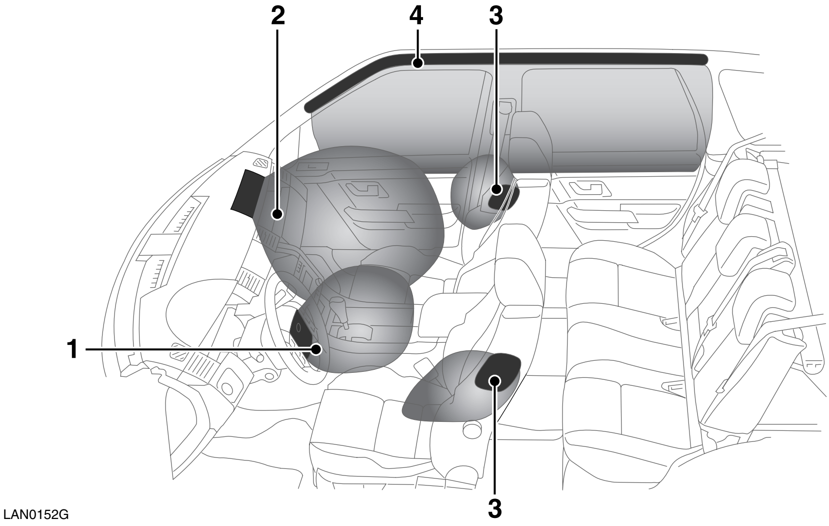
Follow the check list every time a child travels in the vehicle:

- Carefully follow the instructions provided by the manufacturer of the restraint system.
- Always use the appropriate child restraints and adjust harnesses for every child, every trip.
- Avoid dressing a child in bulky clothing and do not place any objects between the child and the restraint system.
- Regularly check the fit of a child seat and replace seats or harnesses that show signs of wear.
- Ensure that you have removed all slack from the adult seat belt.
- No child seat is completely child-proof. Encourage a child not to play with the buckle or harness.
- Never leave a child unsupervised in the vehicle.
- Activate the rear door child safety locks. See **CHILD SAFETY LOCKS, 51**.
- Ensure that a child does not exit the vehicle from the side where there is traffic.
- Set children a good example - always wear your seat belt.

ISOFIX child restraints

Follow the check list every time a child travels in the vehicle:

- **Always attach the top tether when installing the ISOFIX seat.**
- Carefully follow the instructions supplied with the child seat.
- Always give the ISOFIX seat a final pull to ensure that the lower anchors are secure.
- Always use the appropriate child restraints and adjust the harnesses for every child, every trip.
- Make sure that a child falls into the correct weight range for the seat.
- Avoid dressing a child in bulky clothing and do not place any objects between the child and the restraint system.
- Regularly check the fit of a child seat and replace seats and harnesses that show signs of wear.
- No child seat is completely child-proof. Encourage children not to play with the buckle or harness.
- Never leave a child unsupervised in the vehicle.
- Activate the rear door child safety locks. See **CHILD SAFETY LOCKS, 51**.
- Ensure that a child does not exit the vehicle from the side where there is traffic.
- Set children a good example - always wear your seat belt.



WARNING

The airbag is a supplementary restraint system that provides ADDITIONAL protection in a severe impact only - it does NOT replace the need to wear a seat belt. To reduce the risk of severe injury or death in the event of a crash, all occupants in all seating positions, including the driver, should always wear their seat belt, whether or not an airbag is present at that seating position.

An inflating airbag can cause facial abrasions and other injuries. Minimise the risk of injury by ensuring that front seat occupants are wearing their seat belts and are seated correctly, with the seat as far back as is practical.

Ensure that a gap is maintained between the side of the vehicle and the head and torso, to enable unobstructed inflation of the curtain and seat mounted side airbags. DO NOT lean out of the window.

INTRODUCTION

The airbag supplementary restraint system (SRS) incorporates front airbags **1** and **2**, seat mounted side airbags **3** and curtain airbags **4** for the driver and front passenger and curtain airbags **4** for the rear seat outboard passengers (see illustration for airbag locations). These are indicated by the word **AIRBAG** on the trim.

Provided occupants are correctly seated, with seat belts properly worn, the airbags will provide additional protection to the chest and facial areas of the front seat occupants in the event of the vehicle receiving a severe frontal impact, and also to the side of the body facing the impact, if a severe side collision occurs.

In the event of a side collision or a roll-over, curtain airbags will afford additional protection to the side of the head facing the impact for the front seat and outer rear seat occupants.

Disability modifications

Occupants with disabilities that may require the vehicle to be modified must contact a Land Rover Dealer/Authorised Repairer before any modifications are made.

Airbag warning indicator

A warning indicator mounted in the instrument pack will alert you to any malfunction of the airbag, see **Warning Indicators, 104**. The airbag should always be checked by a Land Rover Dealer/Authorised Repairer if any of the following symptoms occurs:

- The warning indicator fails to illuminate when the starter switch is turned to position **II**.
- The warning indicator fails to extinguish within approximately four seconds after the starter switch is turned to position **II**.
- The warning indicator illuminates after the engine is started, or while the vehicle is being driven.

HOW THE AIRBAGS WORK

In the event of a collision, the airbag control unit monitors the rate of deceleration induced by the collision, to determine whether the airbags should be deployed.

Operation of the airbag is dependent on the rate at which the vehicle's passenger compartment changes speed as a result of a collision. The circumstances affecting different collisions (vehicle speed, angle of impact, type and size of object hit, for example), vary considerably and will affect the rate of deceleration accordingly.

Note: *Airbags will only deploy when they are required to supplement the restraining force of the front seat belts.*

Note: *The airbag is not designed to operate as a result of:*

- *Rear collisions.*
- *Minor front impacts.*
- *Minor side impacts.*
- *Heavy braking.*
- *Driving over bumps and potholes.*

It follows, therefore, that significant superficial damage can occur without the airbags deploying or, conversely, that a relatively small amount of structural damage may cause the airbags to be deployed.

Dual stage deployment

The front airbags deploy in two stages, depending on the severity of the frontal collision. The unit monitors the rate of deceleration during the impact.

In a moderately severe frontal impact, the airbags inflate sufficiently to protect the front seat passengers and reduce the risk of injury.

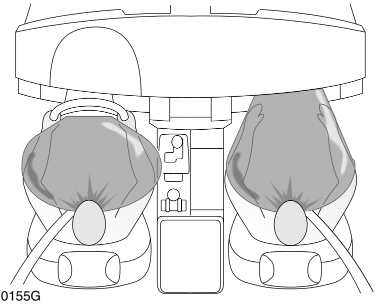
In a severe frontal impact, the airbags will fully inflate thereby providing maximum protection.

Airbag inflation is virtually instantaneous and occurs with considerable force, accompanied by a loud noise. The inflated bag, together with the seat belt restraint system, limit the movement of an occupant, thereby reducing the risk of injury to the head and upper torso.

In the case of a severe frontal collision, both front airbags will be deployed. In the case of a severe side collision, only the seat mounted side airbags and curtain airbags on the impacted side of the vehicle will inflate.

However, there may also be impact conditions whereby one set of side and both front airbags deploy at the same time, or where front and side airbags respond separately as a result of a secondary impact occurring after the initial collision has taken place.

1 and 2. Front mounted airbags

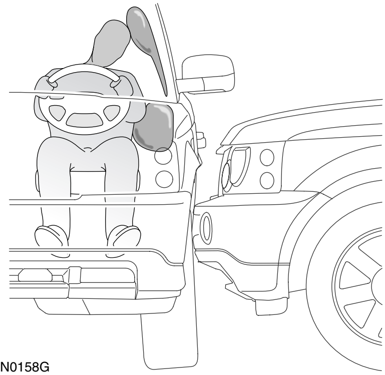


LAN0155G

3 and 4. Side and Curtain airbags

WARNING

For the curtain airbags to deploy correctly, the roof lining and A post trim must be undamaged and fitted correctly. Any damage or suspect fitting should be referred to a Land Rover Dealer/Authorised Repairer for examination.



LAN0158G

Curtain airbags are designed to protect the head in the event of a severe side impact or roll-over event. They will NOT inflate as a result of frontal or rear impacts alone.

The curtain airbag modules are located behind the roof lining and pillar finisher, above the doors. In the event of a severe side collision, the airbag pushes out from behind the roof lining and pillar finisher as it inflates. The curtain airbag remains inflated for longer than the other airbags, to provide additional head protection in the event of a secondary impact/vehicle roll-over.

Deployment effects

WARNING

When an airbag inflates, a fine powder is released. This is not an indication of a malfunction. However, the powder may cause irritation to the skin and should be thoroughly flushed from the eyes and any cuts or abrasions of the skin.

Activation of an airbag creates dust, causing possible breathing difficulties for asthma sufferers or other people with respiratory problems. If an airbag is activated, any occupant who suffers from breathing difficulties should either leave the vehicle as quickly as possible, or obtain fresh air by fully opening the windows and doors.

Following inflation, some airbag components are hot - DO NOT touch until they have cooled.

After inflation, the front and seat mounted side airbags deflate immediately (curtain airbags deflate slowly). This provides a gradual cushioning effect for the occupant and also ensures that the driver's forward vision is not obscured.

WARNING

Even with airbag equipment fitted, seat belts must ALWAYS be worn because:

- **An airbag will only provide additional protection in certain types of frontal collisions. NO protection is afforded against the effects of rear impacts, or minor frontal impacts.**
- **Inflation and deflation take place instantaneously and will not provide protection against the effects of secondary impacts that can occur during multiple vehicle collisions.**

Obstruction of airbags

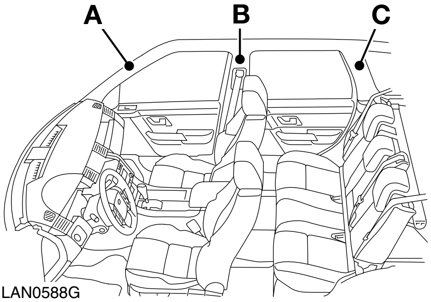
WARNING

Do not allow passengers to obstruct the operation of the airbags by placing feet, knees or any other part of the person, or any other objects in contact with, or in close proximity to, an airbag module.

DO NOT attach or position items on, or close to the roof lining, A, B and C post finishers, front seat backs or to an airbag cover, which could interfere with the inflation of the airbag or, if the airbag inflates, be propelled inside the vehicle causing injury to the occupants.

Caution: If a non-approved phone system is to be fitted, ensure that the installer is aware of the airbag system.

To ensure correct deployment of the airbags, it is essential that obstructions are not allowed to intervene between an airbag and the occupant. The following are examples of the type of obstructions that could either, impede correct operation of the airbags, or jeopardise personal safety in the event of an airbag deployment:



- Accessories attached to or obscuring an airbag cover, including; the roof lining, A, B and C post finishers and the seat backs of the front seats.
- Items of hand luggage, or other objects placed on an airbag cover.
- Feet, knees or any other part of the anatomy in contact with, or in close proximity to, an airbag cover.
- Head, arms or any part of the anatomy in contact with, or in close proximity to, a seat mounted side airbag.
- Items of clothing hanging from the grab handle attached to the roof.
- Items of clothing or cushions draped over the part of the front seat containing the airbag.
- Non-approved seat covers/accessory seat covers over a front seat; in particular, seat covers that have not been designed for use with side airbag. If in doubt, consult your Land Rover Dealer/Authorised Repairer.

Note: *Unauthorised modification of the vehicle or parts may invalidate the vehicle's warranty.*

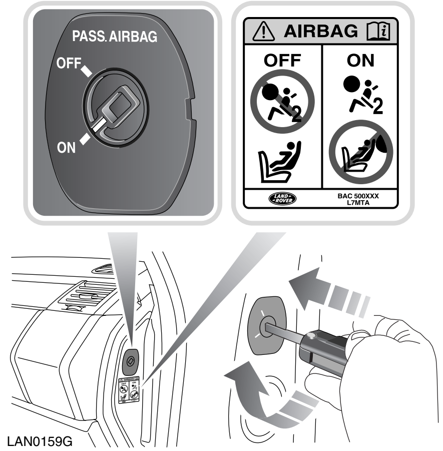
PASSENGER AIRBAG DISABLING SWITCH

WARNING

Do not use a child restraint on a seat protected by an operational airbag in front of it.

There is a risk of death or serious injury when the airbag deploys.

The safest place for children is properly restrained in the rear seats.



If it becomes necessary to fit a child restraint on the front passenger seat, the airbag must be de-activated using the switch located on the end of the instrument panel on the passenger's side. Access to the switch can only be obtained with the passenger's door open.

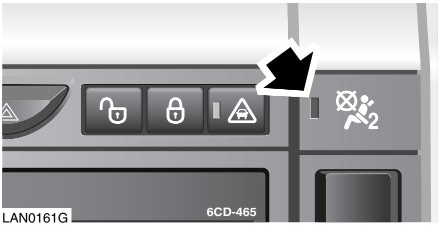
This switch is operated using the starter key.

To use a child restraint in the front, make sure that the key switch is turned to the OFF position.

Operational status indicator

WARNING

When checking the status of the airbag using the operational status lamp, always ensure that the starter key is in position II.



The passenger airbag operational status indicator is an oblong lamp which illuminates amber when the passenger airbag disabling switch has been turned to the OFF position to de-activate the passenger's airbag.

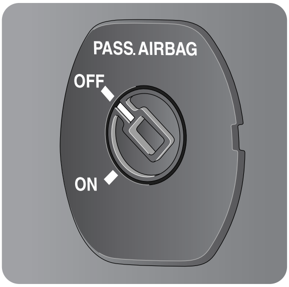
After the airbag has been de-activated, the indicator does not illuminate until the starter key has been turned to position **II**.

Airbag switched off

WARNING

To avoid the risk of injury, NEVER use a child restraint in the front of the vehicle unless the passenger airbag has been switched OFF.

To ensure that the adult restraint system performs as intended, make sure that the passenger airbag is switched ON



LAN0162G

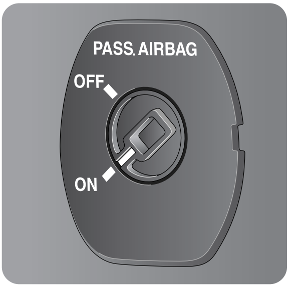
In order to fit a child restraint to the front passenger seat, use the starter key to turn the airbag disabling switch to the OFF position.

Check that when the vehicle has been switched on (position **II**), the operational status lamp on the instrument panel is illuminated indicating that the passenger airbag is NOT operational.

If the airbag warning indicator in the instrument cluster illuminates continuously, it means that there is a malfunction of the system, see **Warning Indicators, 104**.

Remove the child restraint from the front seat and consult your Land Rover Dealer/Authorised Repairer.

Airbag switched on



LAN0163G

When an adult is seated in the front passenger seat of your vehicle, ensure that the airbag disabling switch is turned to the ON position.

This will ensure that the airbag will perform as intended in the event of a crash.

Check that, when the vehicle is switched on (position **II**), the operational status lamp on the instrument panel is NOT illuminated, indicating that the passenger airbag is operational.

The safest place in your vehicle for a child, is in the rear seat.

SERVICE INFORMATION

WARNING

DO NOT attempt to service, repair, replace, modify or tamper with any part of the airbag, or wiring in the vicinity of an airbag component; this could cause the system to activate, resulting in personal injury.

WARNING

For your safety it is recommended that you seek the assistance of a Land Rover Dealer/Authorised Repairer to carry out any of the following:

- **Removal or repair of any wiring or component in the vicinity of any of the airbag components, including the steering wheel, steering column, door trim, roof lining, instrument pack and instrument panel.**
- **Installation of electronic equipment such as a mobile phone, two-way radio or in-car entertainment system.**
- **Modification to the front or side of the vehicle, including the bumper and chassis.**
- **Attachment of accessories to the front or side of the vehicle.**

Caution: The components that make up the airbag are sensitive to electrical or physical interference, either of which could easily damage the system and cause inadvertent operation or a malfunction of the airbag.

In addition, ALWAYS contact your Land Rover Dealer/Authorised Repairer if:

- an airbag inflates.
- the front or side of the vehicle is damaged, even if the airbag has not inflated.
- any part of an airbag module cover shows signs of cracking or damage.
- any trim containing airbags - front seat back, headlining or pillar trims - becomes damaged.

STEERING COLUMN ADJUSTMENT

WARNING

DO NOT adjust the steering wheel position while the vehicle is in motion. This is extremely dangerous!

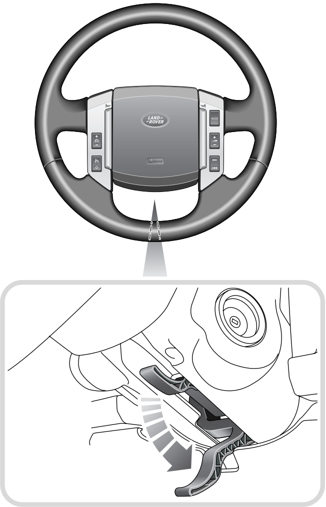
Ensure that the lever is fully up. Inadvertent movement of the wheel might occur if the lever is not fully tightened.

The steering wheel position can be adjusted in two directions.

Move the lever located under the steering wheel fully downwards (see inset).

Adjust the steering wheel up or down, in or out.

Move the lever fully up to lock.

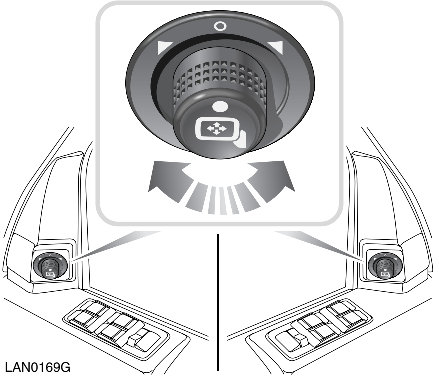


LAN0168G

EXTERIOR MIRRORS

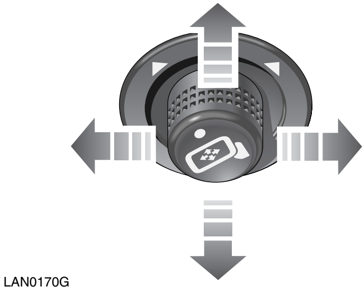
Caution: Objects viewed in exterior mirrors may appear further away than they actually are.

Mirror adjustment



Left and right hand drive.

With the starter switch turned to position **I** or **II**, rotate the knob to select either the left or right-hand mirror. Push the knob in the appropriate direction to tilt the mirror glass up/down/left or right.

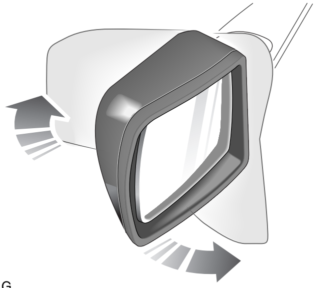


The door mirrors have integral heating elements which disperse ice or mist from the glass. These will operate automatically with the starter switch in position **II** and are controlled according to the external temperature and wiper status.

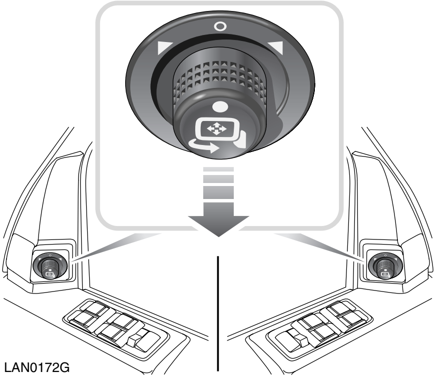
Note: *On vehicles fitted with the driver's seat memory facility, up to three exterior mirror positions for each of three possible starter keys can be stored. See* ***DRIVER'S SEAT MEMORY FACILITY, 57****.*

Folding the mirror body

The door mirrors are designed to fold forwards or rearwards on impact. They can also be folded in towards the side windows into a park position.



Manual operation: On some vehicles this operation can be carried out manually, by physically pushing the mirror bodies towards the side windows.



Left and right hand drive.

Electric operation: With the rotary knob in the central position, push the knob downwards to fold the mirrors. Push the knob downwards again to unfold the mirrors.

If the mirrors are accidentally knocked out of position (i.e. with one mirror folded and the other in the normal position), an additional operation of the switch will re-synchronise them.

Door Mirrors

Reverse mirror dipping

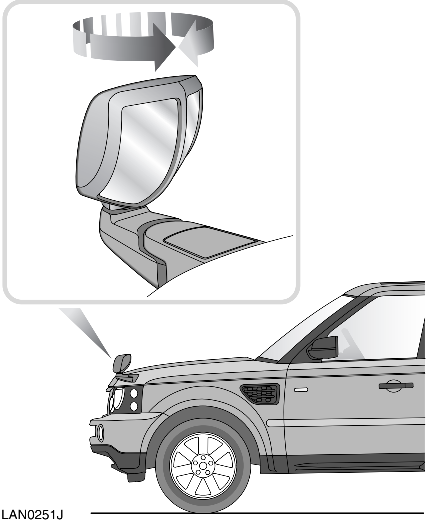
Vehicles with driver's seat memory have a pre-stored function, which causes the door mirrors to dip whenever reverse gear is selected, giving the driver a view of the kerbside.

When this feature is first turned on, the mirrors will dip to a pre-set amount. See **SELECTING SETTINGS OPTION, 88**. The degree of dipping can be programmed using the following sequence:

1. Insert the starter key and turn it to position **I** or **II**. Do not start the engine.
2. Adjust the seat and the exterior mirrors to the correct position and perform a memory-store routine. See **Setting the memory pre-sets, 57**.
3. Select reverse gear - the mirrors will dip to a pre-set level.
4. Adjust the mirrors to the required dipped position.
5. Perform a memory-store sequence.
6. Within 5 seconds, press the pre-set button you previously stored the seat and mirror positions on.
7. **DOOR MIRROR DIP STORED** will be displayed on the message centre.
8. A single chime will sound from the instrument pack.

This feature can be enabled or disabled by a Land Rover Dealer/Authorised Repairer or by the driver. See ***SELECTING SETTINGS OPTION, 88****.*

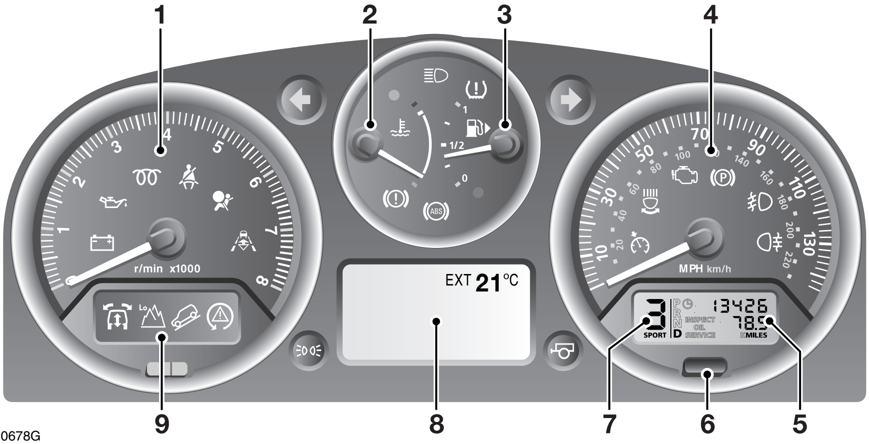
Proximity mirror (Japan only)



The proximity mirror has a split lens, providing views along the left side and immediately ahead of the vehicle. Correct adjustment of the mirror will reduce blind spots.

Adjust the mirror by rotating the head to the left or right. The mirror should be adjusted a few degrees at a time and the view checked from the driver's seat before making further adjustments.

INSTRUMENT PACK



LAN0678G

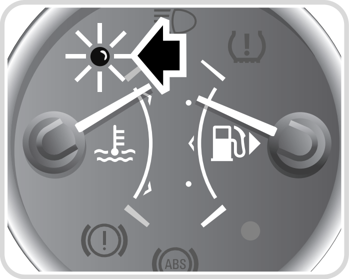
1. Tachometer

Indicates engine speed in revolutions per minute (x 1000). In normal driving conditions the engine is most fuel efficient between 2000 and 3000 rev/min.

2. Temperature gauge

At normal operating temperature, the pointer will be positioned midway between the RED and BLUE segments of the gauge (the precise position will vary according to climatic conditions).

If the pointer moves above the mid point, the engine coolant is becoming too hot. Should the pointer move INTO the RED segment and the RED warning indicator within the gauge illuminates, severe engine damage could occur.



LAN0175G

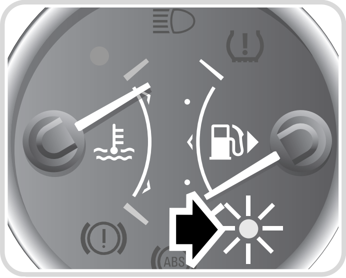
Idle the engine and allow to cool down until the temperature gauge recovers. If the problem persists, seek qualified assistance before continuing.

Note: *If the engine is in danger of overheating, the air conditioning may switch off and engine performance may reduce, in order to minimise engine load.*

3. Fuel gauge

Caution: NEVER allow vehicles to run out of fuel as the resultant misfire may destroy the catalytic converter.

When the starter switch is turned to position **II**, the pointer quickly rises to show the level of fuel in the tank.



LAN0176G

When the remaining fuel reaches a minimum of 12 litres (3 gallons) on petrol vehicles, the AMBER low fuel warning indicator in the fuel gauge illuminates (arrowed).

The remaining fuel should give a range of 80 km (50 miles).

The small arrow visible alongside the fuel pump symbol on the gauge indicates the side of the vehicle on which the fuel filler is located - a useful reminder to help you position the vehicle on the correct side of the forecourt pumps before refuelling.

4. Speedometer

Indicates road speed.

5. Total distance (odometer) and trip recorder

Indicates the total distance travelled, and also shows the most recent individual journey distance. See **ODOMETER DISPLAY, 103**.

6. Trip recorder reset switch

With the starter switch in position **II**, pressing this button resets the trip recorder to zero.

7. Gear selector position display

Displays the current gear selector position. See **GEAR SELECTOR DISPLAY, 102**.

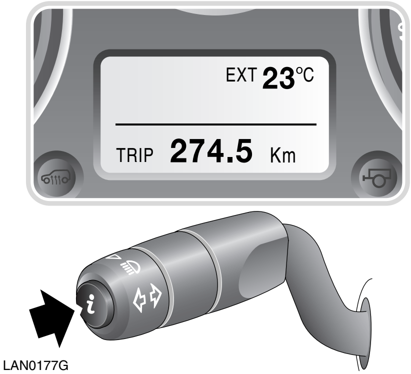
8. Main message centre

Displays all warning and information messages. See **MAIN MESSAGE CENTRE, 90**.

9. Tachometer indicators panel

Displays four system status indicators.

TRIP COMPUTER - FUNCTION SELECTION



LAN0177G

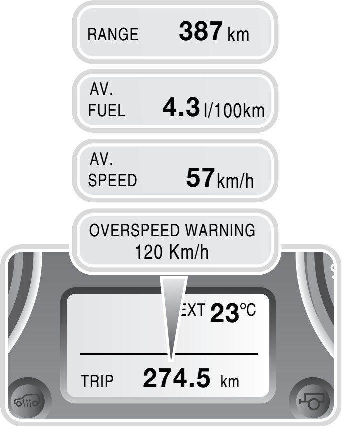
The trip computer functions can be set by the user to give a wide range of information, with the units used by the displays being chosen by the driver. See **SELECTING SETTINGS OPTION, 88**.

The system is also used to display any warning messages generated by the vehicle's self-checking facility.

At engine start-up, the screen shows **SYSTEM CHECK IN PROGRESS**. When this check is completed, the screen will show the outside temperature. If the vehicle is in motion, the screen will also show the current trip distance.

Trip computer statistics can be viewed by pressing the **i** button on the end of the direction indicator stalk.

A long press of the button (over two seconds) will zero the trip distance recorder which will then start to record distance from that point.



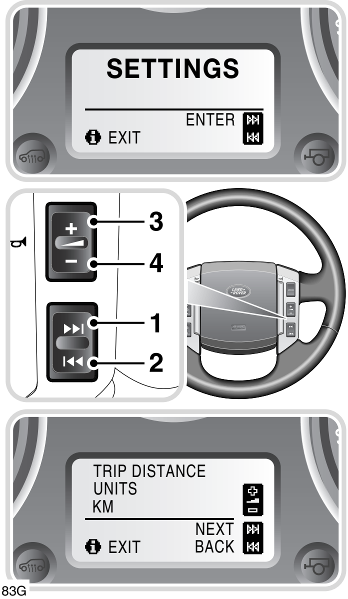
LAN0180G

A series of short presses of the button (less than two seconds) will scroll through the following:

- Available range (with current fuel tank contents)
- Average fuel consumption
- Average speed
- The option to activate/de-activate the overspeed warning function (A long press of the button turns the function on or off)
- A review of active warning messages
- A blank trip computer window (screen shows outside temperature)
- Settings option menu
- A display of trip distance
- Time display

SELECTING SETTINGS OPTION

Various vehicle functions can be selected to suit personal requirements. These can be set by the driver.



LAN0183G

With the starter key in any position, but with the vehicle stationary and a blank screen displayed, a short press (less than two seconds) on the **i** (information) button on the end of the direction indicator stalk brings up the **SETTINGS** display.

Once this screen is displayed, pressing button **1** gives access to the menu of options that can be personalised.

Move through the Settings menu by pressing buttons **1** or **2**, and make choices by pressing buttons **3** or **4**.

When you have finished making adjustments, a short press (less than two seconds) on the **i** button will return you to the trip computer display.

Settings Option

SETTINGS	CHOICE
TRIP DISTANCE UNITS (odometer)	MILES/KM
FUEL USAGE UNITS	MPG l/100km Km/l
EXTERNAL TEMPERATURE	^{0}C or ^{0}F
OVERSPEED WARNING	Off 20 - 250 km/h or 15 to 140 mph in 5-unit steps (units set as trip distance)
HEADLAMP OFF DELAY	30/60/120/240 seconds
AUTO DOOR LOCK (speed related locking)	ON/OFF
REVERSE MIRROR DIP	ON/OFF
LAZY ENTRY	ON/OFF
RESTORE DEFAULT SETTINGS	YES/NO

Confirming choices

After making any changes to the Settings options, press the information button again to save settings and exit.

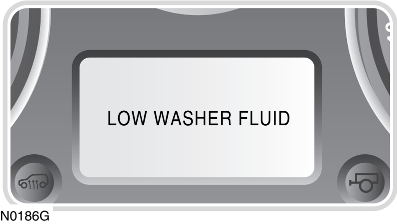
Note: *If the vehicle is moved while any changes are being made to the Settings options, the system will prevent any further input until the vehicle is stationary again.*

Key memory

All of the choices made during Settings are stored within the vehicles memory. The choices are referenced to the remote control that was used during the process.

These choices are recalled when the vehicle is next unlocked using that remote control.

MAIN MESSAGE CENTRE



LAN0186G

Driver warning and information messages are displayed in the main message centre.

They are displayed when a fault is detected and also when the starter switch is turned off. It is possible, by pressing the **i** button on the direction indicator stalk, to view messages for up to 3 minutes after the key has been removed from the starter switch.

Messages have different priority levels and are grouped into the following categories.

Critical warning messages

Critical warning messages are accompanied by an audible warning and may have the handbook symbol next to it.

DO NOT ignore these messages - TAKE CORRECTIVE ACTION IMMEDIATELY!

Warning messages

Warning messages are non-critical, but must be treated with some urgency. They will also be accompanied by an audible warning each time the message is displayed.

DO NOT ignore these messages - TAKE CORRECTIVE ACTION AS SOON AS POSSIBLE.

All Warning messages are displayed for approximately 4 seconds, after which the i▸ symbol is displayed in the main message centre for as long as the message exists. there are current warning messages waiting to be reviewed. Review the messages by pressing the **i** button on the direction indicator stalk until the list of messages appears. The message centre will then automatically cycle through the messages, until the **i** button is pressed again.

Information messages will be displayed as and when applicable, and also when the starter switch is turned on or off. Where the message requires action by the driver - TAKE CORRECTIVE ACTION AS SOON AS POSSIBLE.

Messages are displayed in order of importance with critical warnings taking priority.

Information messages

Information messages will be displayed as and when applicable, and also when the starter switch is turned on or off. Where the message requires action by the driver - TAKE CORRECTIVE ACTION AS SOON AS POSSIBLE.

Messages are displayed in order of importance with critical warnings taking priority.

Languages

The language displayed in the main message centre is a dealer configurable feature.

The languages supported are:

- English
- English US
- French
- German
- Italian
- Spanish

If your vehicle has the navigation option, the language you select for navigation display will also be displayed in the main message centre, if it is one of the supported languages in the above list. If the main message centre does not support the selected navigation language, English will be displayed.

MESSAGE CENTRE MESSAGES

The following table is a comprehensive list of all messages that could appear in the message centre. Market criteria mean that some messages will not apply to your vehicle and will therefore not appear.

Message	Meaning	What to do?
The i▸ icon appears in the display	There are current warning messages waiting to be reviewed.	Press the **i** button on the end of the direction indicator stalk to view the list of messages.
AIRBAG FAULT	Fault in supplementary restraint system.	Seek qualified assistance immediately.
CANNOT EDIT ON THE MOVE	Driver has attempted to access the Customer Settings menu when the vehicle is moving.	Stop the vehicle before entering Customer Settings menu.
CAUTION PARKBRAKE APPLIED	Parkbrake has been applied while the vehicle is moving.	Only use this function in an emergency.
CAUTION! RISK OF GROUNDING WITH SUSPENSION AT NORMAL HEIGHT	Displayed when the Terrain Response system would normally have provided off-road height but the driver has manually lowered the vehicle (or the system cannot raise the vehicle).	Raise suspension manually to off-road height if possible and appropriate.
CHECK ALL TYRE PRESSURES	Advisory message, pressure in a running tyre decreased to first warning threshold.	Check tyre pressures.
CHECK BRAKE FLUID	Brake fluid in reservoir below recommended level.	Seek qualified assistance immediately.
CHECK BRAKE PADS	Brake pads worn beyond the service limit.	Seek qualified assistance immediately.
CHECK SPARE TYRE PRESSURE	Pressure in spare tyre decreased to warning threshold.	Check pressure of spare tyre.
COOLING SYSTEM FAULT MONITOR GAUGE	Low coolant level	Stop the vehicle and check level. Top up with engine coolant. If the problem persists, consult your Dealer.
CRUISE CANCELLED	Driver has switched off cruise control.	Nothing.

Message Centre

Message	Meaning	What to do?
DRIVER OVERRIDE	Driver is pressing the accelerator pedal during cruise control.	Nothing, message will clear when the driver releases the accelerator, then cruise control will resume.
CRUISE NOT AVAILABLE	System not available due to system fault.	Consult your Land Rover Dealer/Authorised Repairer.
CRUISE CONTROL NOT PERMITTED	System fault or vehicle operating parameters outside threshold for operation of cruise control.	Consult cruise control section of this handbook for guidance.
SET SPEED XXX MPH KM/H	Speed set for Adaptive Cruise Control.	Nothing.
CRUISE GAP 🚙 <--> 🚙	Adaptive Cruise Control set distance (time gap).	Adjust to required distance. (4 settings).
ACC SENSOR BLOCKED	Adaptive Cruise Control field of view may be obstructed.	Check to make sure nothing is covering the ACC sensor.
FWD ALERT ON (or OFF)	Forward alert feature has been turned on or off.	Nothing.
FWD ALERT <---->	Forward alert sensitivity adjustment.	Adjust to required sensitivity. (4 settings).
DOOR MIRROR DIP STORED	Memory system - confirmation that memory has stored driver information.	Nothing.
DRIVER INTERVENE	Alert that action by the driver to apply the brakes is required.	If required, the driver should apply the brakes.
DRIVER'S DOOR OPEN	Driver's door open or not fully closed.	Close driver's door.
DSC SWITCHED OFF	System not available - switched off by driver.	To reselect, press DSC switch.
ENGINE SYSTEM FAULT	Engine management system registers a serious fault - reduced performance may be experienced.	Avoid high speeds and consult your Land Rover Dealer/ Authorised Repairer.
ENGINE SYSTEM SERVICE REQUIRED	The relevant service interval has elapsed and your vehicle requires servicing.	Arrange as soon as possible.
FASTEN SEAT BELTS	Seat occupied and safety belt not fastened.	Fasten safety belt.

Message	Meaning	What to do?
GRASS GRAVEL SNOW	If you leave the rotary knob in this position then you will activate the highlighted Terrain Response special program.	Nothing.
GRASS GRAVEL SNOW PROGRAM SELECTED	The rotary knob has been left in one position for longer than two seconds and Grass Gravel Snow special program has been activated.	Nothing.
HDC FAULT SYSTEM NOT AVAILABLE	System fault.	Drive with care and do not attempt to descend steep slopes. Seek assistance immediately.
HDC NOT AVAILABLE IN THIS GEAR	HDC not operative because of incorrect gear selection. HDC is fully functional in **1**, **R** and **D** in HIGH range. It operates in all gears in LOW range.	Select correct gear if HDC is required. In LOW range, HDC operates in all gears.
HDC NOT AVAILABLE SPEED TOO HIGH	HDC unavailable, speed threshold exceeded. Max HDC operating speed is 50 km/h, max speed for HDC selection is 80 km/h.	Reduce vehicle speed.
HDC SWITCHED OFF	HDC switched off by driver, Terrain Response system or speed threshold exceeded.	Nothing.
HDC TEMPORARILY NOT AVAILABLE SYSTEM COOLING	HDC switched off while brake system is cooling.	Wait until message disappears before attempting to descend steep slopes.
HIGH ENGINE SPEED FOR COOLING	Engine idle speed increasing to improve cooling and/or air conditioning performance.	Nothing.
HIGH/LOW RANGE SELECTED	Advises driver that transfer box has engaged HIGH/LOW range.	Nothing.
INTERIOR LIGHTS OFF	Courtesy lamps can only be operated manually, and will not illuminate when a door is opened.	Nothing
INTERIOR LIGHTS AUTOMATIC	All courtesy lamps have been enabled.	Nothing

Message	Meaning	What to do?
KEY BATTERY LOW PLACE KEY IN IGNITION TO CHARGE	Remote control battery charge low.	Insert key in starter switch and start the engine to recharge the remote control battery.
LOW COOLANT LEVEL	Coolant level in header tank below recommended level.	Stop the vehicle and check level in the header tank. Top up with correct mixture of antifreeze and water at the earliest opportunity. If the problem persists, consult your Land Rover Dealer/Authorised Repairer.
LOW WASHER FLUID	Washer fluid quantity below 1 litre.	Top up washer fluid.
MEMORY 1/2/3 STORED/SELECTED	Memory system - confirmation that memory has been stored/selected.	Nothing.
MUD RUTS	If you leave the rotary knob in this position then you will activate the highlighted Terrain Response special program.	Nothing.
MUD RUTS SELECTED	The rotary knob has been left in one position for longer than two seconds and Mud Ruts special program has been activated.	Nothing.
PARKBRAKE BEDDING CYCLE ACTIVE	A garage technician has requested a bedding cycle.	If not required, an ignition reset will cancel the function.
PARKBRAKE FAULT	Supports the amber warning indicator - electric parkbrake functions may not be available.	Seek qualified assistance.
PARKBRAKE FAULT AUTO RELEASE NOT FUNCTIONAL	Drive-away release function is not available.	Use manual release.
PARKBRAKE FAULT SYSTEM NOT FUNCTIONAL	Supports the red warning indicator - electric parkbrake functions are not available.	Seek qualified assistance immediately.
PARKBRAKE FAULT TO HOLD VEHICLE REMOVE KEY THEN APPLY PARKBRAKE	Electric parkbrake has lost vehicle speed information.	Follow the instructions to park the vehicle.

Message Centre

Message	Meaning	What to do?
PARKBRAKE OFF LIFT SWITCH TO APPLY	An emergency release operation is detected.	Once original faults have been corrected, apply the switch to reinstate electric parkbrake.
PARK LOCK FAILURE APPLY HANDBRAKE	Automatic transmission park lock function ineffective due to transfer box being out of HIGH or LOW range.	Seek qualified assistance immediately.
PRESS FOOT BRAKE AND PARKBRAKE SWITCH TO RELEASE	A switch release has been detected without brake pedal contact.	Follow the instructions to achieve a manual release.
PRESS FOOT BRAKE OR CLUTCH AND PARKBRAKE SWITCH TO RELEASE	A switch release has been detected without brake pedal contact.	Follow the instructions to achieve a manual release.
PROGRAM CHANGE IN PROGRESS	Conditions prevail which make it temporarily impossible to select a new Terrain Response program. This can be due to ABS or DSC activity or the overheating of the electronic differentials.	Be patient. If conditions change within 60 seconds, the chosen program will be activated. If the message is prompted by electronic differential overheat, then it will take longer but there will be separate advice about this. Once the differentials have cooled and this advice is no longer present, try to reselect the required special program.
RECOMMEND LOW RANGE IS SELECTED FOR MUD-RUTS PROGRAM	LOW range is usually better for Mud-Ruts special program.	Select LOW range if required.
RECOMMEND RAISING SUSPENSION TO OFF ROAD HEIGHT IN DEEP MUD-RUTS	In deep ruts it is beneficial to raise the vehicle to off-road height. This is done automatically in LOW range but has to be done manually if mud/ruts program is used in HIGH range.	Raise suspension manually to off-road height.

Message	Meaning	What to do?
RECOMMEND STARTING IN 2ND/3RD GEAR FOR SLIPPERY CONDITIONS	For slippery conditions it can be beneficial to start off in a higher gear than usual.	Select second/third gear.
REDUCED ENGINE PERFORMANCE	Engine management system registers a serious fault - reduced engine performance may be experienced.	Avoid high speeds and consult your Land Rover Dealer/Authorised Repairer.
RESET SUSPENSION HEIGHT IF CLEAR OF OBSTACLE	Suspension still in extended mode.	Check if vehicle is clear of obstacle. If clear, select required suspension.
ROCK CRAWL	If you leave the rotary knob in this position then you will activate the highlighted Terrain Response special program.	Nothing.
ROCK CRAWL SELECTED	The rotary knob has been left in one position for longer than two seconds and Rock Crawl special program has been activated.	Nothing.
SAND	If you leave the rotary knob in this position then you will activate the highlighted Terrain Response special program.	Nothing.
SAND SELECTED	The rotary knob has been left in one position for longer than two seconds and Sand special program has been activated.	Nothing.
SELECT LOW RANGE TO ACTIVATE ROCK CRAWL	Vehicle is not in LOW range, so Rock Crawl cannot be activated.	Select LOW range if Rock Crawl is required.
SELECT NEUTRAL FOR RANGE CHANGE	Alerts driver that range change will not occur until neutral is selected on the transmission.	Select neutral.
SLOW DOWN OR VEHICLE WILL LOWER/RAISE	Vehicle will automatically lower/raise if vehicle speed increases.	Choose to slow down or accept height change.
SPECIAL PROGRAMS OFF	You have deselected a Terrain Response special program and the general program has now been activated.	Nothing.

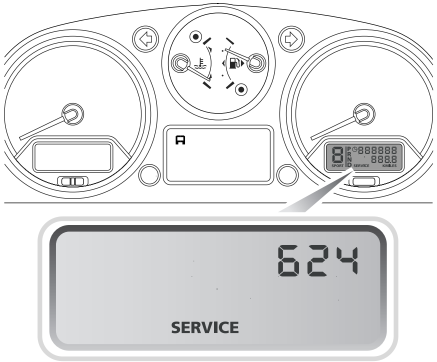
Message	Meaning	What to do?
SPEED TOO HIGH FOR RANGE CHANGE	Driver has requested range change when vehicle speed is too high.	Reduce speed to 40 km/h.
SUSPENSION ACCESS HEIGHT SELECTED	Access height selected.	Nothing.
SUSPENSION CLOSE DOOR TO CHANGE HEIGHT	Air suspension height change is prevented because a door is open.	Close all doors.
SUSPENSION FAULT	A fault has been detected in the air suspension system. System may still operate normally.	Seek qualified assistance immediately.
SUSPENSION FAULT MAX SPEED 50 KM/H (MAX SPEED 30 MPH)	A major fault has been detected in the air suspension system. Height cannot be controlled.	Drive slowly until fault can be rectified.
SUSPENSION FAULT NORMAL HEIGHT ONLY	A fault has been detected in the air suspension system. Only normal height is available.	
SUSPENSION FAULT STOP SAFELY STOP ENGINE	Major component failure.	Stop vehicle immediately and seek qualified assistance.
SUSPENSION FAULT VEHICLE LEAN WHEN CORNERING	A fault has been detected in the Dynamic Response system.	Drive slowly and take additional care until fault can be fixed.
SUSPENSION IN EXTENDED MODE	Vehicle body has become trapped on an obstacle and will raise automatically.	Nothing.
SUSPENSION LOCKED AT ACCESS HEIGHT	Crawl mode selected and suspension locked.	Nothing.
SUSPENSION NORMAL HEIGHT SELECTED	Normal height selected.	Nothing.
SUSPENSION SPEED TOO HIGH TO CHANGE HEIGHT	A height change has been requested but is prevented because speed is too high.	Reduce vehicle speed.
SUSPENSION START ENGINE TO RAISE VEHICLE	Vehicle height can only be raised with the engine running.	Start the engine.

Message	Meaning	What to do?
SUSPENSION VEHICLE RAISING SLOWLY	Vehicle is raising slowly because reservoir is empty (only displayed if lift time exceeds 24 seconds. This is NOT a system fault).	Nothing.
SUSPENSION WILL RAISE WHEN SYSTEM COOLED	Air suspension compressor is cooling. Lifting will resume when compressor has cooled.	Wait for suspension to carry out lifting sequence.
SYSTEM CHECK IN PROGRESS	Instrument cluster internal diagnostic routine.	Nothing.
SYSTEM FAULT SOME PROGRAMS NOT AVAILABLE	Some Terrain Response special programs are not available because of a system fault.	Be careful going off-road as Terrain Response may not function in the program required. Get the vehicle checked and rectified.
SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE	There is a fault on the vehicle which makes the Terrain Response special programs unavailable.	Be careful going off-road as Terrain Response cannot function in any of its special programs. Get the vehicle checked and rectified.
TERRAIN RESPONSE SPECIAL PROGRAMS OFF	If you leave the Terrain Response rotary knob in this position, you will activate the general program and any active Terrain Response special program will be deselected.	Nothing.
TRAILER CONNECTED OFF ROAD HEIGHT NOT SELECTED AUTOMATICALLY	Advisory message that vehicle has not selected off-road height as trailer socket is being used.	If a trailer is connected, do nothing, as it may not be safe to raise the vehicle to off-road height. If no trailer is connected electrically but something else is, such as a bike rack, then the vehicle can be raised to off-road height manually. If nothing is connected, then the socket needs checking for faults.
TRANSMISSION FAULT	Advises driver that automatic transmission has a fault.	Seek qualified assistance immediately.

Message	Meaning	What to do?
TRANSMISSION FAULT AND OVERHEAT	Advises driver that an automatic transmission fault has occurred and the temperature is too high.	Seek qualified assistance immediately.
TRANSMISSION FAULT LIMITED GEARS AVAILABLE	Advises driver that automatic transmission has a fault and performance may be affected.	Seek qualified assistance immediately.
TRANSMISSION FAULT STOP SAFELY	Advises driver that a fault has occurred with the electronic rear differential.	Stop the vehicle as soon as it is safe to do so.
TRANSMISSION FAULT TRACTION REDUCED	Advises driver that a fault has occurred with the transfer box control system.	Reduce speed and seek qualified assistance immediately. ***Note:*** *Off-road performance will be reduced.*
TRANSMISSION OVERHEAT SLOW DOWN	Rear differential temperature has reached or is approaching the overheat threshold.	Reduce speed and seek qualified assistance immediately.
TRANSMISSION RANGE CHANGE NOT AVAILABLE	Advises driver that a fault has occurred which prevents the transfer box from changing range.	Reduce speed and seek qualified assistance immediately.
TRANSMISSION TRACTION REDUCED	Transfer box control module fault.	Reduce speed and seek qualified assistance immediately.
TYRE PRESSURE NOT MONITORED	Possible loss of RF transmission or defective sensor battery.	Seek assistance immediately.
TYRE PRESSURE TOO HIGH	Pressure in a running tyre too high, threshold reached.	Adjust to correct pressure as soon as possible.
TYRE PRESSURE VERY LOW	Pressure in a running tyre decreased to warning threshold.	Adjust to correct pressure as soon as possible.
TYRE PRESSURE MONITORING SYSTEM FAULT	TPM system fault has occurred.	Seek qualified assistance immediately.
TYRE PRESSURES TOO HIGH		Adjust to correct pressure as soon as possible.
TYRE PRESSURES VERY LOW		Adjust to correct pressure as soon as possible.

Message	Meaning	What to do?
TYRE PRESSURE MONITORING SET FOR HEAVY LOAD	Indicates the system is set to monitor the tyre pressures for heavily laden conditions.	Ensure setting is correct for the current tyre pressures and loading conditions.
TYRE PRESSURE MONITORING SET FOR LIGHT LOAD	Indicates the system is set to monitor the tyre pressures for normally laden conditions.	Ensure setting is correct for the current tyre pressures and loading conditions.

SERVICE INTERVAL INDICATOR



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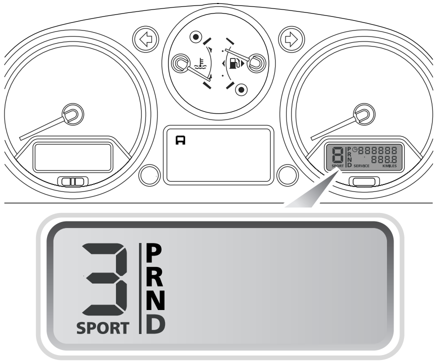
The service interval indicator is a market configurable feature and may not be enabled. If the feature is enabled, the display will become active when a pre-determined distance or time before service is reached. These pre-determined values are market dependent.

When the starter switch is turned to position **I** and the pre-determined value is reached, a distance countdown to the next service appears in the display. A minus sign preceding the distance indicates that the service interval point has been exceeded by that distance.

After approximately five seconds, the display reverts to show the total distance travelled.

Note: *After the completion of each service, the Land Rover Dealer/Authorised Repairer will reset the distance display for the countdown to the next service.*

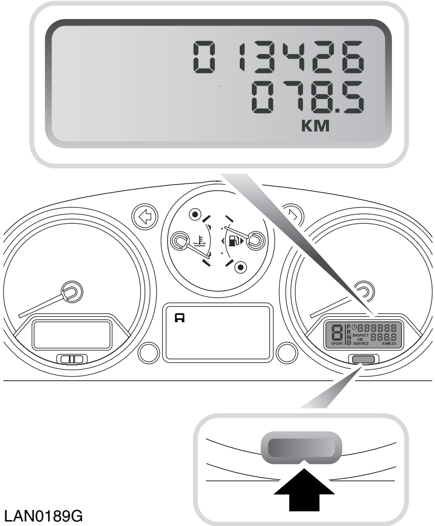
GEAR SELECTOR DISPLAY



LAN0188G

This shows the current gear lever position and indicates when SPORT has been selected.

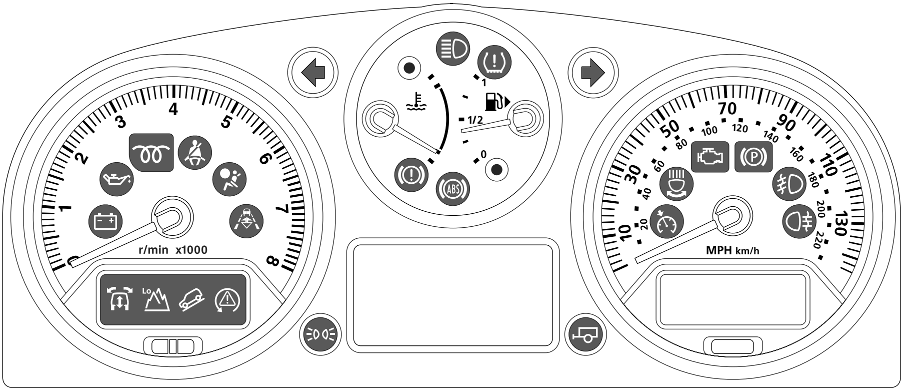
ODOMETER DISPLAY



With the starter switch turned to position **II**, the display indicates the total distance travelled by the vehicle, and also shows the most recent individual journey distance. See **SELECTING SETTINGS OPTION, 88**. Pressing the trip recorder reset button (see inset), resets the trip recorder to zero.

Warning Indicators

INDICATOR GROUPING



LAN0677G

Caution: RED warning indicators are of particular importance; their illumination indicates that a fault exists. If a RED warning indicator illuminates, stop the vehicle safely and review the specific instructions given in this section.

The location and specification of the warning indicators may vary according to model and market requirements.

For ease of identification, the warning indicator descriptions have been grouped into the five locations on the instrument pack.

These are:

- background
- tachometer
- fuel/temperature gauge
- message centre
- speedometer

BACKGROUND

Direction indicators - GREEN

An indicator flashes in time with the corresponding left or right direction indicator, whenever they are operated. If the warning indicator fails to flash, or flashes very rapidly, this may indicate a bulb failure in one of the direction indicator lamps.

If the hazard switch is pressed, both warning indicators will flash in conjunction with the direction indicators.

Side lamps/Headlamps - GREEN

The indicator illuminates when the side lamps or headlamps are turned on.

Trailer - GREEN

The indicator illuminates as a bulb check when the starter switch is turned to position **II** and extinguishes when the engine is started.

If a trailer is attached to the vehicle and the direction indicators are used, this indicator will flash in synchronisation with the direction indicators. If it does not flash, this indicates that a trailer bulb is defective.

TACHOMETER

Battery charging - RED

Illuminates as a bulb check when the starter switch is turned to position **II** and extinguishes once the engine is running. If it remains on, or illuminates whilst driving, a fault with the battery charging system is indicated. Seek qualified assistance urgently.

Low oil pressure - RED

Illuminates as a bulb check when the starter switch is turned to position **II** and extinguishes when the engine is started. If the indicator remains on, flashes on and off, or illuminates whilst driving, stop the vehicle as soon as safety permits and SWITCH OFF THE ENGINE IMMEDIATELY. Seek qualified assistance before driving. Always check the oil level when this indicator illuminates.

Glow plug - AMBER (diesel only)

Illuminates when the starter switch is turned to position **II**. When the engine is cold, wait for the lamp to extinguish before starting. If the engine is warm, the lamp will not illuminate.

Seat belt - RED

Illuminates when the starter switch is turned to position **II** and extinguishes after approximately 6 seconds, even if the driver's seat belt remains unfastened. In some markets illumination of the indicator will be accompanied by a warning chime. See **AUDIBLE WARNINGS, 109**.

Note: *In certain markets, the indicator will illuminate until the driver's seat belt is fastened correctly.*

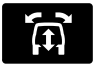
Airbag - RED

The indicator illuminates when the starter switch is turned to position **II** and extinguishes after about 4 seconds. If the indicator illuminates at any other time, there is a fault with the system - seek qualified assistance urgently.

Adaptive Cruise Control (ACC) active

Illuminates when Adaptive Cruise Control detects a vehicle in front and will react to it.

Suspension- AMBER/RED



This lamp is shared between the Air suspension system and Dynamic Response.

The lamp illuminates both RED and AMBER briefly as a bulb check when the starter switch is turned to position **II**.

If illumination occurs whilst driving, a fault with one of the systems is indicated, as follows:

- If the lamp shows RED (a flashing red lamp which changes to constant illumination after two minutes, and is accompanied by a warning chime): This indicates a system fault that may result in serious damage to vehicle components and reduced Dynamic Response performance. Stop the vehicle as soon as safety permits and switch off the engine. DO NOT CONTINUE DRIVING! Seek qualified assistance immediately.

The following message will be displayed in the message centre window to accompany a red warning lamp for a dynamic response system failure:

SUSPENSION FAULT, STOP SAFELY, STOP ENGINE.

If the following message is displayed in the message centre:

SUSPENSION FAULT, MAX SPEED 50KPH (MAX SPEED 30MPH).

This indicates an air suspension fault, with the system not being able to control ride height. In which case the maximum speed indicated should not be exceeded until the fault has been rectified.

- If the lamp shows AMBER (constant illumination): This indicates a system fault that will result in reduced Dynamic Response performance but will not leave the vehicle in a dangerous condition. You may continue driving, but reduce speed, take additional care, and consult a Land Rover Dealer/Authorised Repairer at the earliest opportunity. The ride quality of the vehicle may be reduced in this condition.

The following message will be displayed in the message centre window to accompany an amber warning lamp:

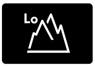
SUSPENSION FAULT, VEHICLE LEAN, WHEN CORNERING.

If the following message is displayed in the message centre:

SUSPENSION FAULT, NORMAL HEIGHT ONLY.

This indicates an air suspension fault, but the vehicle can still be driven normally.

LOW gear- GREEN



Illuminates when LOW range has been selected; flashes during range change.

Hill Descent Control (HDC) information - GREEN

Illuminates briefly as a bulb and system check when the starter switch is turned to position **II** and also illuminates when HDC is selected.

If HDC is selected and all operating conditions are met, the indicator will illuminate continuously.

If HDC is selected and all operating conditions are not met (vehicle in neutral gear, vehicle speed above HDC operating range) the indicator will flash.

If a fault with the HDC system occurs, HDC will fade-out and then deselect, or deselect immediately (depending on the type of fault and whether or not HDC is in operation). The green indicator will extinguish and the message **SYSTEM NOT AVAILABLE** will be displayed in the message centre.

Dynamic Stability Control (DSC) and Electronic Traction Control (ETC) - AMBER

Illuminates briefly as a bulb check when the starter switch is turned to position **II**. The indicator also illuminates when DSC is switched off. De-activating DSC has no effect on traction control.

The indicator will flash while DSC and/or ETC is activated and will remain flashing until the system is no longer active.

If the indicator illuminates constantly, and does not extinguish when the DSC switch is pressed, a fault has been detected in the system and DSC and/or ETC will be inactive - drive with care and seek qualified assistance as soon as possible.

FUEL/TEMPERATURE GAUGE

Headlamp high beam - BLUE

Illuminates when the headlamps are switched to high beam or headlamps are flashed.

TPM system operation

The tyre pressure warning comprises a yellow warning indicator (telltale) within the instrument pack and an associated message within the message centre.

Brake systems - AMBER/RED

This indicator shares its position and symbol with four brake system warnings and illuminates briefly as a bulb check when the starter switch is turned to position **II** (the indicator will illuminate red and amber during bulb check).

Emergency Brake Assist (EBA) - AMBER

If the indicator remains amber after starting, or illuminates whilst driving, a fault with the EBA system is indicated. Drive with care and seek qualified assistance urgently.

Brake pad wear - AMBER

It illuminates when brake pad wear has reached a predetermined limit.

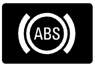
Electronic Brake force Distribution (EBD) - RED

A fault with the EBD system is indicated by illumination of the red brake warning indicator. If this illuminates while the vehicle is being driven, stop the vehicle gently, as soon as safety permits, check and top up brake fluid if necessary. If the lamp remains illuminated, seek qualified assistance before continuing.

Brake fluid level - RED

Low brake fluid level is indicated by illumination of the red brake warning indicator. If this illuminates while the vehicle is being driven, stop the vehicle gently, as soon as safety permits. Check and top up brake fluid if necessary. If the lamp remains illuminated, seek qualified assistance before continuing. Have the problem checked by your Land Rover Dealer/Authorised Repairer.

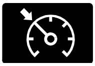
Anti-lock Braking System (ABS) - AMBER



Illuminates as a bulb check when the starter switch is turned to position **II**. If the indicator remains on or illuminates whilst driving, a fault with the ABS system is indicated. Drive with care, avoiding heavy brake application, and seek qualified assistance urgently.

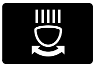
SPEEDOMETER

Cruise control active - AMBER



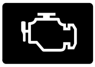
Illuminates when Cruise Control is operating.

Adaptive Front lighting System (AFS) - AMBER



Flashes when a fault occurs with the Adaptive Front Lighting System.

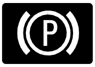
Check engine - AMBER



Illuminates as a bulb and system check when the starter switch is turned on and extinguishes as soon as the engine is started. Illumination at any other time indicates an engine fault. If the indicator illuminates continuously while driving, the emission performance of the engine management system is impaired - seek qualified assistance.

If the indicator flashes while driving, immediately reduce engine power to avoid catalytic converter damage.

Parkbrake system - RED

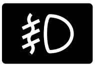


Illuminates for about 3 seconds as a bulb check when the starter switch is turned to position **II**.

If the indicator flashes red, a fault with the parkbrake system is indicated, seek qualified assistance before continuing.

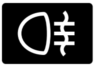
When parking the vehicle in this condition, ensure that the vehicle is secured stationary without reliance on the parkbrake.

Front fog lamps - GREEN



Illuminates when the front fog lamps are switched on.

Rear fog lamps - AMBER



Illuminates when the rear fog lamps are switched on.

AUDIBLE WARNINGS

The market specification will determine which of the following audible warnings are appropriate to your vehicle.

Electronic air suspension warnings

A warning chime will sound:

- Whenever the air suspension raise/lower switch is operated to raise the vehicle to off-road height, or to return it to standard ride height.
- If changes to or from off-road height are requested but not permitted.
- Whenever the speed threshold for the current ride height is reached.
- Whenever the air suspension is lowered to crawl mode.

Dynamic Response warning

A warning chime will sound:

- If a fault with the Dynamic Response system is detected. The chime will coincide with the suspension warning lamp flashing RED then turning solid after 2 minutes, with the following message in the message centre **SUSPENSION FAULT, STOP SAFELY, STOP ENGINE.** This indicates a system fault that may result in serious damage to vehicle components and reduced Dynamic Response performance. Stop the vehicle as soon as safety permits and switch off the engine. DO NOT CONTINUE DRIVING! seek qualified assistance immediately.

Dynamic Stability Control (DSC) warning

A warning chime will sound once:

- If a fault with the DSC system is detected, and the appropriate warning indicator(s) illuminates (DSC, ABS, Amber Brake Warning or HDC fault text message). The vehicle may still be driven with care, but seek qualified assistance at the earliest opportunity.

Adaptive Cruise Control (ACC) warning

A warning chime will sound:

- When the driver must intervene and take control.

Electric parkbrake

A warning chime will sound:

- If the driver selects electric parkbrake whilst the vehicle is moving.

Starter key reminder

A warning will chime continuously:

- If the key is left in the starter switch while the driver's door is open. The chime stops as soon as the door is closed or the key is removed from the starter switch.

Seat belt reminder

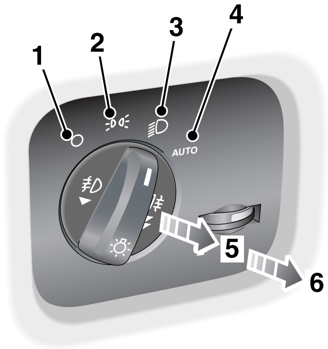
In some markets, a warning chime will sound (one second frequency):

- If the driver's seat belt has not been fastened when the starter switch is turned on. The chime operates in conjunction with the seat belt warning indicator and sounds for 6 seconds, or until the seat belt is fastened (whichever occurs first).

If the seat belt remains unfastened, the chime will sound at intervals of 15 seconds.

EXTERIOR LAMPS

Lamps master switch



LAN0403G

1. Side lamps and headlamps off.
2. Side lamps on.
3. Low beam headlamps on.
4. Automatic control lamps on.
5. Front fog lamps on.
6. Front and rear fog lamps on.

If front fog lamps are not fitted, the rear fog lamps will come on at position **5**.

Note: *Fog lamps cannot be operated if the lamps master switch is at position **4** Auto.*

Side lamps

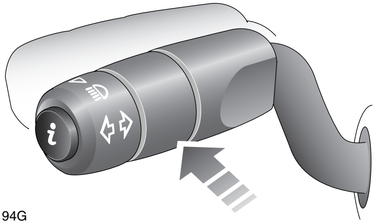
The front and rear side lamps, along with licence plate lamps, illuminate when the lamps master switch is turned to positions **2** or **3**, regardless of the position of the starter switch.

Automatic control lamps

With the lamps master switch in position **4** and starter switch in position **II**, the side lamps, low beam headlamps and licence plate lamps will illuminate automatically when the ambient light falls below a pre-defined level.

All of the lamps will go out when the ambient light rises above that level.

High beam



LAN0194G

With the lamps master switch in position **3** and starter switch in position **II**, push the left-hand steering column lever away from the steering wheel as far as it will go to select high beam, and release it.

To cancel high beam, pull the lever towards the steering wheel again and release it.

While high beam is selected, a blue indicator will be illuminated in the instrument pack.

Headlamp high beam flash

To flash the headlamps on high beam, pull the lever towards the steering wheel and release it.

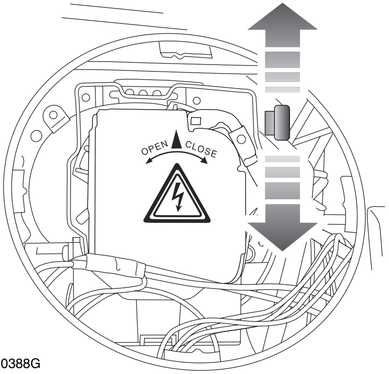
The blue indicator in the instrument pack illuminates when the headlamps are flashed.

Headlamp touring adjustment

Position of the lever illustrated will vary depending on type of headlamps and side of vehicle. It may be on either side of the headlamp bulb aperture.

When touring in a country where traffic drives on the opposite side of the road to where you normally drive, use the tourist lever mechanism within each headlamp unit to alter the beam pattern. This enables the vehicle to be driven without having to stick blanking decals onto the headlamp lens.

Xenon headlamps

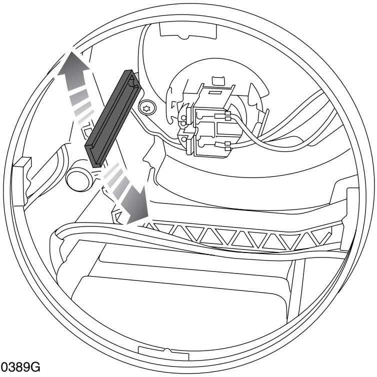


LAN0388G

Follow the process shown in **HEADLAMP UNIT, 272** to gain access to the inside of the headlamp unit. Move the lever to adjust the beam.

Lever default position - Xenon headlamps	
Right hand headlamp	Up
Left hand headlamp	Up

Halogen headlamps

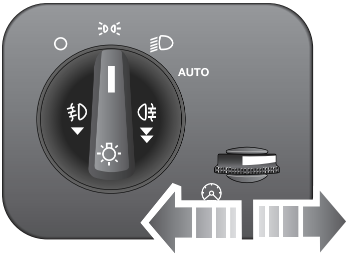


LAN0389G

Follow the process shown in **HEADLAMP UNIT, 272** to gain access to the inside of the headlamp unit. Move the lever to adjust the beam.

Lever default position - Halogen headlamps	
Right hand headlamp	Down
Left hand headlamp	Up

Dimmer control



LAN0195G

Rotate the dimmer control to vary the level of instrument pack illumination.

Headlamp courtesy delay

As a driver convenience feature the headlamps can be kept on for a short time after the vehicle is parked. Turn the starter switch off with the headlamps still switched on. The lamps master switch can be in positions **2**, or **3**. With the switch in position **4** the Headlamp delay works in automatic mode.

Remove the key from the starter switch and turn lamps master switch fully anticlockwise to the Off position. The headlamps will remain illuminated for up to 240 seconds. This automatic time delay is configurable. See **SELECTING SETTINGS OPTION, 88**.

The courtesy delay may be cancelled at any time by turning the starter switch to position **I** or **II** or the lamps master switch from position **1** to **2**.

Note: *If Automatic Control Lamps are switched on, the headlamp courtesy delay will operate automatically.*

Headlamp courtesy delay can be enabled or disabled by a Land Rover Dealer/Authorised Repairer or by the driver. See **SELECTING SETTINGS OPTION, 88***.*

Cornering lamps

The cornering lamps produce an angled beam on the relevant side of the vehicle at speeds below 40 km/h (25 mph) when the headlamps are on and the turn indicator stalk is moved to indicate a turn.

Daytime running lamps

In certain markets, with the engine running and the main lighting switch turned off, the front and rear side lamps, the licence plate lamps and the headlamp low beams will illuminate. The instrument pack illumination remains off.

Unless they are required or prohibited by law, daytime running lamps can be disabled/enabled by a Land Rover Dealer/Authorised Repairer.

Note: *The following lamps operate only with the starter switch in position* ***II****.*

Stop lamps

The stop lamps will illuminate when the brake pedal is pressed and will remain on while the brake pedal is pressed.

The stop lamps also illuminate when Hill Descent Control is braking the vehicle or during Electronic Parkbrake dynamic deceleration.

Reversing lamps

Selection of reverse gear will operate the reversing lamps.

Front fog lamps

WARNING

Fog lamps should ONLY be used when visibility is severely restricted - as soon as conditions clear, switch off fog lamps to prevent dazzling of other road users.

With the lamps master switch in positions **2** or **3**, pull out the switch to position **5** to operate the front fog lamps.

An indicator will illuminate in the instrument pack.

Rear fog lamps (with front fog lamps fitted)

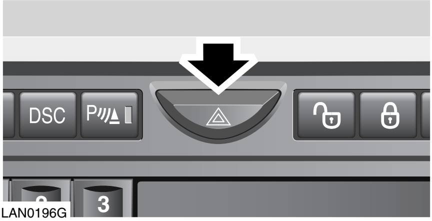
With the lamps master switch in positions **2** or **3**, pull out the switch to position **6**. An indicator will illuminate in the instrument pack.

Rear fog lamps (no front fog lamps fitted)

With the lamps master switch in position **3**, pull out the switch to position **6**. An indicator will illuminate in the instrument pack.

ALWAYS remember to switch the fog lamps off as soon as visibility permits.

HAZARD WARNING LAMPS

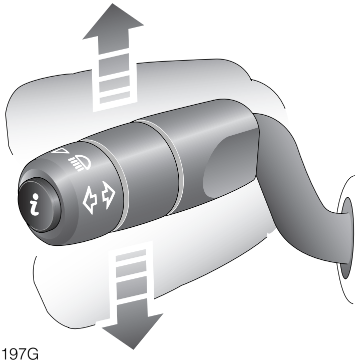


LAN0196G

Press the switch to operate the hazard warning lamps. All of the direction indicator lamps (including the instrument pack warning indicators and those fitted to a trailer) will flash together.

Use ONLY in an emergency to warn other road users when your stationary vehicle is causing an obstruction, or is in a hazardous situation. Remember to switch off before moving away.

DIRECTION INDICATORS



LAN0197G

With the starter switch in position **II**, the left-hand steering column lever will operate the direction indicators (a GREEN warning indicator on the instrument pack will flash in time with the direction indicators).

Note: *Bulb failure of any front or rear direction indicator lamp (not side repeaters) will cause the instrument pack warning indicator to flash rapidly and the audible indicator signal to double in speed.*

Lane change flash

Move the lever partially up or down against spring pressure then release, to indicate a lane change. The relevant direction indicator flashes three times.

If the lever is held against spring pressure, the direction indicators will continue to operate until the lever is released.

Lane change flash can be disabled/enabled by a Land Rover Dealer/Authorised Repairer.

OPERATING

The wipers and washers will only operate when the starter switch is turned to position **I** or **II**.

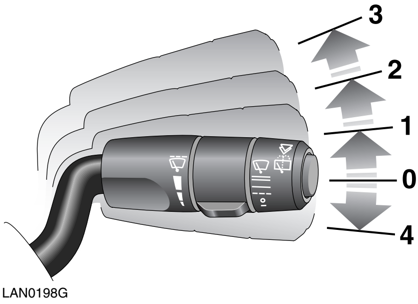
Note:

- *DO NOT operate the wipers on a dry screen.*
- *In freezing or very hot conditions, ensure that the blades are not stuck to the glass.*
- *In winter, remove any snow or ice from around the arms and blades, including the wiped area of the windscreen and the heater air intakes.*

Note: *If the wiper blades have stuck to the glass, an electronic cut-out may temporarily prevent the wiper motor from operating. If this is the case, switch the wipers off and turn the starter switch off. Clear the obstruction and try again.*

Semi-automatic operation of the wiper blades is possible by setting the wiper lever to the rain sensor variable delay mode. In this mode, the wipers operate only when the rain sensor detects moisture on the windscreen and remain inactive whilst the screen is dry.

WINDSCREEN WIPERS



Rain sensor/Intermittent variable delay

Push the lever up to position **1**.

Normal speed wipe

Push the lever up to position **2**.

Fast speed wipe

Push the lever up to position **3**.

Single wipe

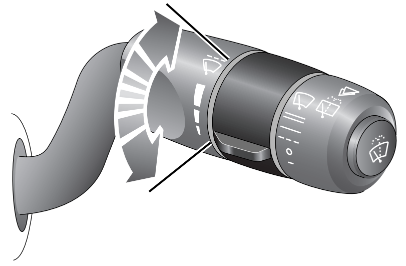
Pull the lever down to position **4** and release immediately.

Note: *With the lever held down, the wipers will operate at fast speed until the lever is released.*

Auto park

If the starter switch is turned to the Off position while the wipers are operating, they will continue to the Park position and stop.

Intermittent variable delay



With the lever in position **1**, rotate the delay switch clockwise to increase (a wipe will occur immediately), and anticlockwise to decrease, the frequency of the intermittent wipe.

Speed-dependent mode

When speed dependent mode is configured, the operation of all wiper modes will be affected by vehicle speed.

If the vehicle's speed drops below 8 km/h (5 mph) with the wipers operating, the wiper frequency automatically reduces. The wipers will switch to the next lowest operating speed. When the vehicle's speed increases to over 8 km/h (5 mph), the original wiper speed setting is restored automatically.

This setting can be configured by a Land Rover Dealer/Authorised Repairer.

Speed-dependent-intermittent mode

The frequency of intermittent variable delay is also adjusted automatically according to road speed on those vehicles not equipped with a rain sensor.

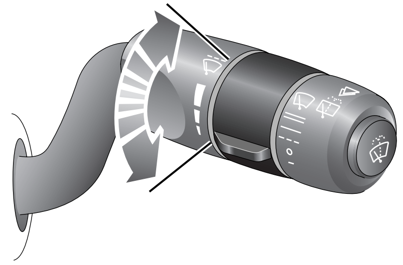
The intermittent period can be adjusted for each of the speed-dependent modes by rotating the delay switch either clockwise or anticlockwise.

This setting can be configured by a Land Rover Dealer/Authorised Repairer.

Rain sensor variable delay

WARNING

BEFORE entering an automatic car wash, ensure that the wipers are switched off-otherwise, they could operate during the car wash programme and be damaged.



The rain sensor is fitted to the inside of the windscreen, immediately ahead of the rear view mirror. The sensor is able to detect varying amounts of dirt or water on the outside of the screen.

With the wiper switch in position **1**, the variable delay automatically adjusts the frequency of the wiper operation according to the information supplied by the rain sensor.

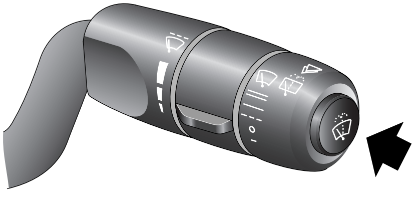
You can increase (a wipe will occur immediately) or decrease the sensitivity of the rain sensor, and therefore the frequency of wiper operation, by rotating the delay switch-either clockwise or anticlockwise.

If the sensor detects constant rain, the wipers will operate continuously.

FRONT WINDSCREEN WASHER

WARNING

If you operate your vehicle in temperatures below 5°C (40°F), use washer fluid with anti-freeze protection. In cold weather, failure to use washer fluid with anti-freeze protection, could result in impaired windscreen vision and increase the risk of a vehicle crash.



LAN0200G

Push the wiper stalk button to operate the front screen washer. If the button is pressed for more than 0.5 seconds, the washer will continue to operate while the button is pressed. When the button is released, the wipers will complete the current stroke and then complete two further strokes before parking automatically.

If the button is pressed for less than 0.5 seconds, only the washer will operate.

Note: *National or local regulations may restrict the use of volatile organic compounds (VOCs), which are commonly used as anti-freeze agents in washer fluid. A washer fluid with limited VOC content should be used only if it provides adequate freeze resistance for all regions and climates in which the vehicle will be operated.*

HEADLAMP POWER WASH

If the headlamps are on, and there is sufficient liquid in the washer reservoir, operating the screen washer will also power-wash the headlamps.

The headlamp power wash will operate on every fifth operation of the screen washer, provided that the headlamps are still switched on and 10 minutes have elapsed since the last headlamp wash.

Switching the headlamps off and back on again will reset the cycle.

The headlamp wash will operate every third operation of the screen washer in all Special Programs. See **Terrain Response, 191**.

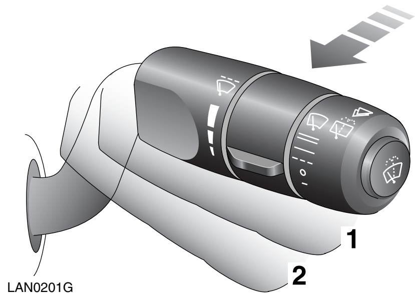
Note: *In the screen washer reservoir, if the fluid level sensor detects a low level, the headlamp power wash is inhibited.*

Heated washer jets

If the ambient temperature falls to a point where icing of the washer jets could occur, power is applied to heat the jets provided that the starter switch is in position **II**.

An approved screenwash is necessary to prevent freezing in very cold weather. See **LUBRICANTS AND FLUIDS, 286**.

REAR WINDOW WIPER AND WASHER



Wiper - intermittent operation

Pull the lever position **1**. The intermittent delay period will vary according to the delay switch setting and with the vehicle's speed, if speed-dependent-intermittent mode has been enabled. See **Speed-dependent-intermittent mode, 115**.

Wiper - continuous operation

If preferred the rear wiper operation can be configured by a Land Rover Dealer/Authorised Repairer to operate continuously.

Washer

Pull the lever to position **2** and hold it there. The wiper and washer will both operate. When the lever is released, the washer will stop and the wiper will complete a further two wipe cycles and then return to intermittent operation, provided that the continuous function has not been set.

Reverse gear input

If reverse gear is selected while the front wipers are operating, the rear wiper will operate accordingly.

If reverse gear is selected while the rain sensor is operational and the front windscreen wipers are in use, the rear wiper will operate accordingly.

Tailgate open disable

If the rear wiper is switched on or already running and the tailgate is opened, the wiper will:

- Stop immediately.
- Not start to move if it is already stationary.

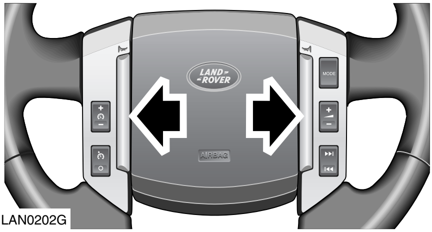
If the tailgate is subsequently closed, the wiper will resume its normal operation after a delay of three seconds.

If the tailgate is open and the vehicle's speed is above 3 km/h (2 mph), the wiper will operate as if the tailgate were closed.

Auto park

If the starter switch is turned to the **Off** position while the wiper is operating, it will continue to the Park position and stop.

HORN


LAND ROVER
AIRBAG
MODE
LAN0202G

To operate, press either of the horn switches.

ELECTRIC WINDOWS

WARNING

Closing of an electrically operated window on fingers, hands or any vulnerable part of the body, can result in serious injury. Always observe the following precautions:

ISOLATE the rear window switches when carrying children.

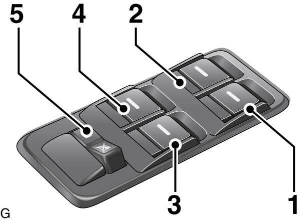
ENSURE that children are kept clear whilst raising or lowering windows.

ENSURE that all adult passengers are familiar with the controls and the potential dangers of electrically operated windows.

DO NOT allow passengers to extend any part of their bodies through a window aperture while the vehicle is moving - injury from flying debris, branches of trees or other obstructions could occur.

It is recommended that the starter key be removed when leaving the vehicle.

Switch operation



1. Right-hand front window.
2. Left-hand front window.
3. Right-hand rear window.
4. Left-hand rear window.
5. Isolating switch for rear door window switches.

Operating the windows

The electric windows can be operated when the starter switch is at position **I** or **II** and for up to 40 seconds after the starter switch is turned to position **0** (provided a front door is not opened).

If a front door is opened, the windows become inoperable.

To lower a window, press and hold the front of the switch until the desired position is reached.

To raise a window, lift and hold the front of the switch until the desired position is reached.

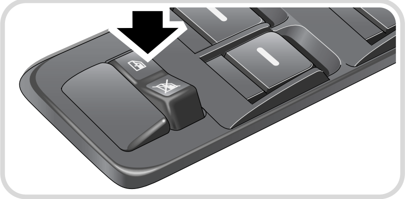
One touch operation (front door's only)

Press/lift the switch briefly to open or close the window in one movement. Window movement can be stopped at any time by pressing the switch again.

Resetting one touch operation

Disconnecting the power when the window is moving will cause memory loss. To reset the memory, drive the window to the top and keep the switch pressed for one second.

Rear window isolation switch



LAN0205G

Press the right-hand side of the switch to isolate the window switches in the rear doors; press the left-hand side to restore independent control.

Anti-trap mechanism (front door's only)

If the anti-trap sensor detects an obstruction during window closing, the closing operation is interrupted and the window backs off.

This is a safety feature designed to prevent inadvertent closing of a window on vulnerable parts of the body or other obstructions. Remove any obstruction and then close the window.

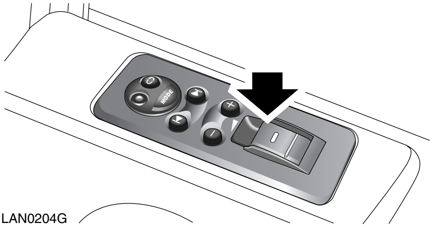
If, for any reason, it is required to override the anti-trap mechanism the following procedure should be used:

After the initial attempt to close the window, attempt it twice more with less than 10 seconds between switch presses.

On the next (fourth attempt) the window will move up a short distance with increased force to override the blockage.

If this fails to move the blockage the anti-trap feature will be lost and must be reset. See **Resetting one touch operation, 120**.

Rear window operation



LAN0204G

The rear windows can also be operated from the switches on the rear passenger doors. The rear door window switches will not operate if the isolating switch in the driver's door has been activated. See **Rear window isolation switch, 120**.

SUNROOF OPERATION

WARNING

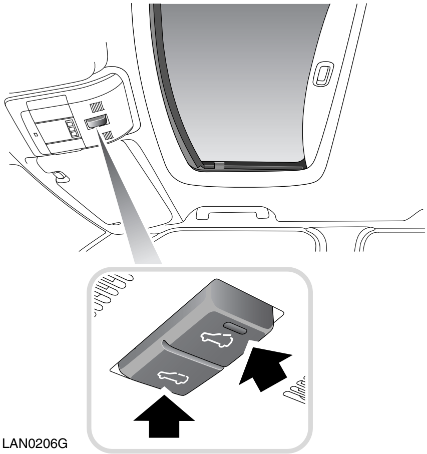
Accidental closure of a sunroof on fingers, hands or any vulnerable part of the body, can result in serious personal injury. Always observe the following precautions:

ENSURE that children are kept clear and that the sunroof is not obstructed when opening or closing.

ENSURE that all adult passengers are familiar with the controls and the potential dangers of operating an electrically operated sunroof.

DO NOT allow passengers to extend any part of their bodies through the sunroof aperture while the vehicle is moving - injury from flying debris, branches of trees or other obstructions could occur.

Caution: ALWAYS close the sunroof when the vehicle is unattended.



The electric sunroof can be operated when the starter switch is at positions **I** or **II** and for 40 seconds after position **0** has been selected, provided that neither front door has been opened.

- **To tilt the sunroof:** With the sunroof closed, press the front of the switch. The roof will move towards its fully tilted position.To close the sunroof from the tilt position, press and hold the rear of the switch.
- **To open the sunroof:** With the sunroof in the closed position, press the rear of the switch momentarily. If the starter key is not in position **II**, the switch will have to be held pressed.
- **To close the sunroof:** With the sunroof open, press the front of the switch. If the starter key is not in position **II**, the switch will have to be held pressed.

Note: *At any time while the sunroof is moving, a further press of the switch will stop the movement.*

Anti-trap mechanism

WARNING

It is possible to override the anti-trap mechanism by pressing and holding the front of the switch whilst the sunroof is closing.

Extreme care must be taken to ensure that none of the vehicles occupants have any part of their body in a position where it can be trapped by the roof.

The override allows the sunroof to be closed when movement is restricted by ice or dirt.

If the sunroof encounters resistance while travelling anywhere between the fully open and the closed position, the closing operation is interrupted and the sunroof opens slightly. This is a safety feature designed to prevent inadvertent closing of the sunroof on vulnerable parts of the body or other obstructions. Remove any obstruction and then close the sunroof.

This anti-trap feature does not apply while the sunroof is closing from the tilted position.

Operation after power supply interruption

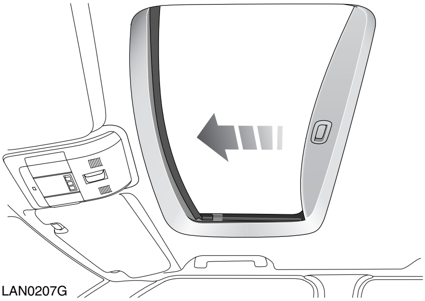
Under certain unusual circumstances, the sunroof may lose its calibration which will render it inoperable. If this happens, it needs to be recalibrated as follows:

- WIth the power supply reconnected, turn the starter switch to position **II**.
- Depress the front of the switch for 20 seconds. The sunroof will start to move. Continue to hold the switch until the sunroof completes one full open and closing cycle. When the sunroof stops moving, release the switch.

The sunroof can then be operated as normal.

Note: *Calibration will not function if the vehicle battery voltage is low.*

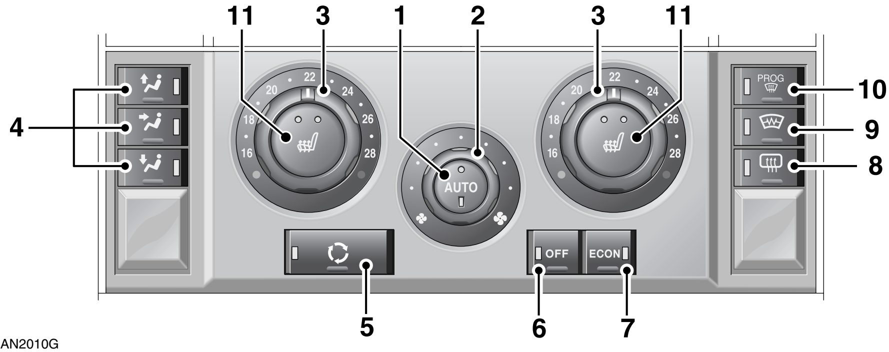
Sunroof blind



Pull the sunroof blind, across the sunroof aperture to open and close.

Note: *The sunroof blind can be opened and closed manually, but will retract automatically when the sunroof is opened, and will open slightly if the roof is tilted.*

TEMPERATURE CONTROLS



LAN2010G

The air conditioning system features automatic temperature and air distribution control and is programmed to maintain optimum levels of comfort within the vehicle in all but the most severe climatic conditions.

The configuration of controls may vary depending on the specification of your system. The variants are shown as insets to the main illustration.

The system may be fitted with the options of seat heating and front screen heating.

Note: *The indicators in the switches illuminate when that feature is operational.*

OPERATION OF CONTROLS

1. Auto mode

Allowing the system to function automatically is by far the simplest method of operation for the owner and is preferable in most operating conditions.

- Press AUTO (1) for fully automatic operation.
- Rotate the temperature controls (3) to select the required temperature.
- Let the automatic temperature control system do the rest.

In Auto mode, air conditioning, air distribution, blower speeds and air recirculation are adjusted automatically to achieve, and then maintain, a thermal environment consistent with prevailing conditions.

The air distribution and blower controls can be operated independently to override the automatic setting.

In this case, the appropriate indicator in the AUTO switch extinguishes. The circular indicator represents the blower, the rectangular indicator represents air distribution.

Press AUTO again to re-establish automatic operation.

Note: *If the air distribution and blower controls are operated independently, the system may not be able to achieve or maintain the required temperature settings.*

2. Blower control

Rotate the blower control (2) to adjust airflow through the vents.

3. Temperature controls

Rotate the controls (3) to set the required temperature for the corresponding side of the passenger compartment.

Temperatures within the range 16°C (60°F) to 28°C (83°F) can be set. The blue dot gives maximum cooling and the red dot maximum heating (depending on prevailing conditions).

Note: *Because of the mixing of air within the vehicle, the system will not achieve a temperature differential from left to right of more than 4°C (7°F).*

To obtain maximum air conditioning, rotate the temperature controls fully anticlockwise.

This mode automatically activates the air conditioning and air recirculation, and sets the blower speed at maximum and the air distribution to the face-level vents.

Note: *Rotating the temperature controls fully clockwise provides maximum heating to the foot/screen vents.*

When in stationary traffic, select **P** or **N** to maximise air conditioning efficiency.

4. Air distribution control

Press to select the desired distribution setting:

↑ Windscreen and side window vents

→ Face level vents

↓ Foot level vents

More than one setting can be selected to achieve the desired distribution.

5. Air recirculation

Air recirculation prohibits the entry of air from outside the vehicle, recirculating the air inside the vehicle instead. This is useful to prevent the entry of traffic fumes.

Air recirculation also significantly influences the dehumidifying and cooling performance of the air-conditioning system.

Note: *Prolonged recirculation at low ambient temperatures may cause the windows to mist.*

⟳ Press the button (5) once to activate air recirculation (switch indicator illuminates). Press the button a second time to deselect recirculation and return to fresh air intake (switch indicator extinguishes).

With recirculation deselected, the ventilation system may automatically re-activate recirculation, if necessary, to enable optimum air conditioning performance. When this occurs, the switch indicator will not illuminate.

6. Off

OFF Press to switch the system off; the indicator in the switch will illuminate to show this condition. Pressing the button again returns the system to its previous mode.

7. Economy mode

ECON With the engine running, press the button (7) to put the air conditioning system into Economy mode. This turns off the air conditioning compressor which reduces the power consumed by the system and system performance. Prolonged use may cause the windows to mist.

8. Heated rear screen

WARNING

DO NOT stick labels over the heating elements on the rear screen, and DO NOT scrape or use abrasive materials to clean the inside of the rear screen.

Press to operate.

Note: *Heated front and rear screen functions are only available while engine is running.*

9. Heated front screen

Press to operate. If the vehicle is not fitted with a heated front screen, this button will be blank.

10. Defrost mode

If the windscreen is misting or covered in ice, press button (10) to activate the automatic defrost programme; the system will immediately direct its output to achieve maximum screen clearing by:

- setting the blower speed to an appropriate level.
- distributing air flow to the screen only.
- deactivating air recirculation (in certain circumstances).

In addition, the rear and front screen heaters will be switched on (or their timed operating cycle will recommence if they are already switched on).

Press the button a second time (or select AUTO or any air distribution control) to leave the Defrost mode. Heated screens will remain on until their time-out period has expired.

11. Front seat heaters

Press the left or right button once to operate the relevant seat heater at a high level, press twice to heat the seat at a lower level. For further information concerning the operation of both front and rear seat heaters, please refer to **SEAT HEATERS, 126**.

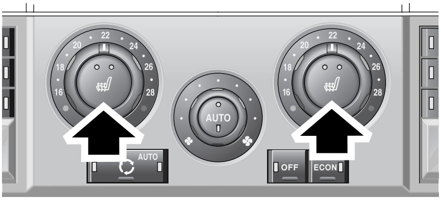
Note: *If the vehicle is not fitted with front seat heaters, these buttons will be blank.*

General notes

- For optimum operating efficiency, ensure all the air vents (including those in the rear of the vehicle) are open.
- For the automatic temperature control system to function efficiently, all windows (and the sunroof) should be closed, and the air intake vents free from ice, snow, leaves or other debris.
- In very humid conditions, slight screen misting may be experienced when the air conditioning system is turned on. This is a natural occurrence on most automotive air conditioning systems. It is not a fault and misting will clear after a few seconds once the air conditioning system is operating.
- The air conditioning compressor will not function unless the engine is running.
- Surplus water produced by the dehumidifying process is expelled from the system via drain tubes beneath the vehicle. This may result in a small pool of water forming on the road when the vehicle is stationary and is not a cause for concern.

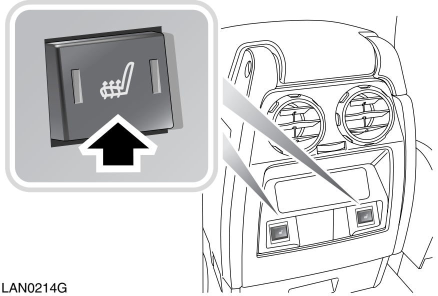
SEAT HEATERS

Caution: The seat heaters consume considerable power from the battery. For this reason, they should ONLY be operated while the engine is running.



LAN0212G

Front seat heaters



LAN0214G

Rear seat heaters

With the starter switch turned on, the seat cushion and seat back can be heated at two different levels.

- Press once to operate at a high level (both indicators illuminate).

  After a period based on cabin temperature, the high level will end and one lamp will extinguish.
- Press twice to heat the seats at a lower level (right-hand indicator extinguishes).
- Press the switch a third time to turn off the heater manually (both indicators will extinguish).

The seat heaters are thermostatically controlled and will operate to maintain a factory-set temperature. The indicators in the switches will remain illuminated until the heaters are manually turned off, the high level has timed out, or the engine is turned off.

AUXILIARY FUEL-BURNING HEATER

WARNING

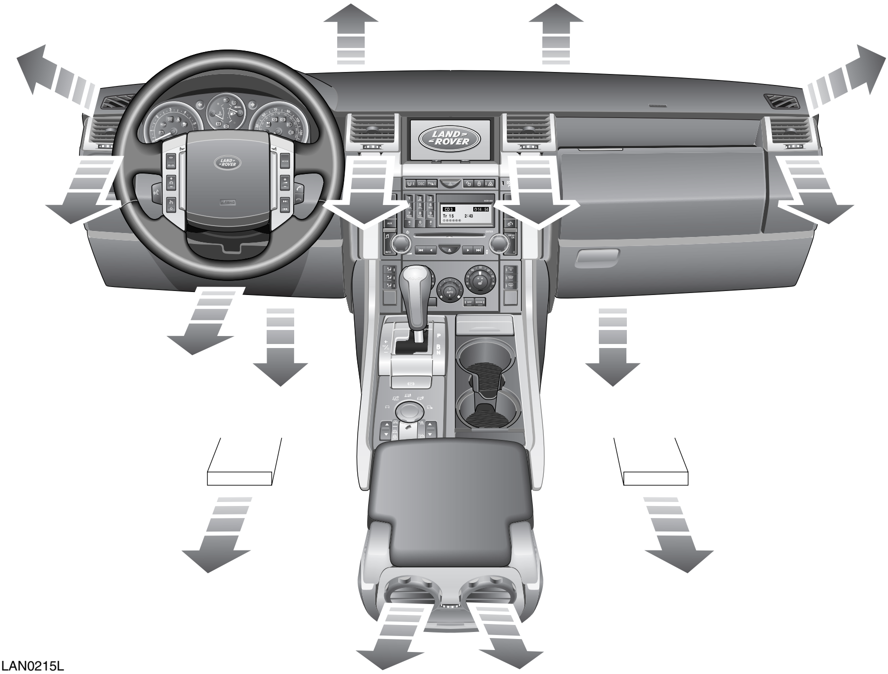
Turn the starter switch off, to ensure that the fuel-burning heater is switched off when refuelling the vehicle.

If the fuel-burning heater has been used recently, take care not to touch the unit's exhaust when performing any checks/servicing under the bonnet.

When the engine is started in very cold weather, the auxiliary fuel-burning heater is automatically switched on to provide extra heat to help warm up the engine.

During this period, exhaust fumes from the heater may be seen coming from under the bonnet. This is normal and no cause for concern.

VENTILATION


LAN0215L

The ventilation system provides fresh, conditioned and/or heated air to the interior of the vehicle from the air intake grille in front of the windscreen.

Note: *Always keep the air intake grille clear of obstructions such as leaves, snow or ice.*

Air outlets are provided to the windscreen, face, lap (driver only) and feet - the location of these vents is shown in the illustration above. The temperature of the air supplied to the vents is controlled by the heater.

Particulate air filter

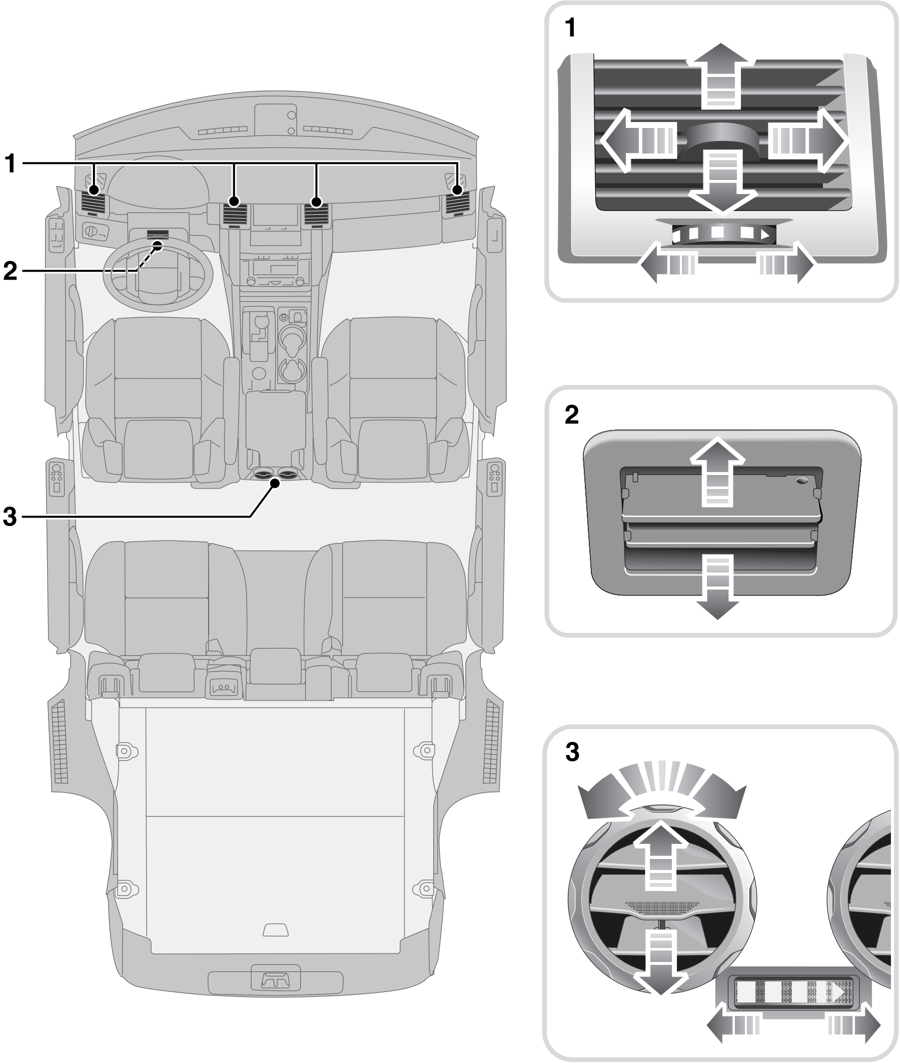
The ventilation system is fitted with a particulate air filter to remove most potentially harmful particles such as pollen, industrial fall-out and road dust from the air entering the vehicle's interior.

Combined filter

Vehicles fitted with automatic temperature control have a combined carbon and particulate air filter.

The carbon layer reduces the level of odours coming through the heater system from outside.

AIR VENTS



LAN0217

Air temperature from all vents is controlled by the temperature settings of the heater.

1. Face level vents

Direct the air flow by moving the control in the centre of the louvres. Rotate the thumbwheel towards the right to fully open, or the left to fully close the vents.

To ensure best ventilation and minimum noise, the vents should be fully open when the air distribution control is set to face level.

2. Driver's lap vent

Airflow can be directed to the driver's lap via an outlet located below the steering wheel. Control the airflow by adjusting the louvres.

3. Centre console rear vent controls

Move the louvres to adjust the direction and volume of airflow. Rotate the bezel to direct the air flow.

Note: *The temperature cannot be set by the rear occupants.*

LAMP TYPES

The vehicle's interior lighting falls into two categories:

- Courtesy lighting consists of approach lamps, footwell lamps, puddle lamps, starter switch glow ring and loadspace lamp. They enable safe entry into, or exit from the vehicle in low light conditions without the need to switch on individual lamps.
- Demand lighting consists of interior lamps, map lamps, glovebox and vanity mirror lamps. They offer lighting at the touch of a switch, usually part of the lamp fitting.

Courtesy lighting

Front footwell lamps

These illuminate the front footwell areas of the vehicle.

Starter switch glow ring

This surrounds and illuminates the starter key slot.

Loadspace lamp

This illuminates the rear loadspace area during entry to and exit from the vehicle, also when the tailgate is opened.

Automatic activation

All of the courtesy lighting comes on when:

- The position of the starter switch is changed to **0**, from **I** or **II**.
- Any door, including the tailgate is ajar.
- The vehicle receives an Unlock signal.

The courtesy lamp feature automatically turns off these lamps if:

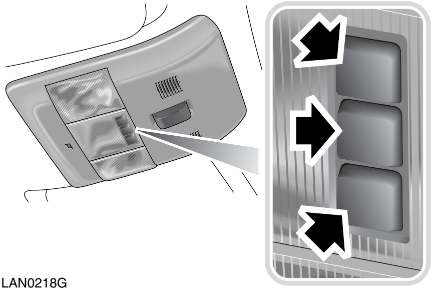
- 60 seconds (customer adjustable) have elapsed since the courtesy lamps were activated.
- 60 seconds (customer adjustable) have elapsed since the last door was closed.
- the starter switch is switched to **II** with all doors closed.
- the last door is closed after the car is externally locked.

A battery-saving feature turns off all interior lamps 15 minutes after the starter switch has been turned from **II** or **I** to **0**. This timing feature will be restarted if any of the automatic switch-on criteria occur.

Collision illumination

In the event of a collision occurring at a speed of less than 5 km/h (3 mph), all of the courtesy lamps (except approach lamps) will be turned on.

Front Interior lamps


LAN0218G

The front interior lamps are grouped together centrally above the front windscreen.

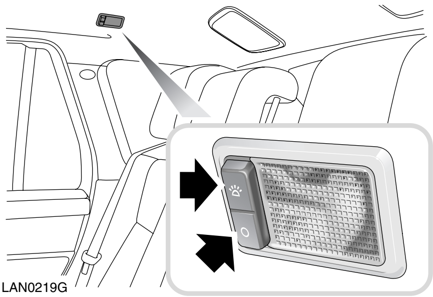
Any of the interior lamps can be switched on or off by pressing the switch adjacent to the lamp required.

It is possible to de-activate the courtesy lamps automatic mode by pressing the centre switch. The message **INTERIOR LIGHTS OFF** will flash in the message centre.

To switch the lamps off without disabling automatic mode briefly press the centre switch.

To enable automatic mode press the front centre switch for more than three seconds. The message **INTERIOR LIGHTS AUTOMATIC** will flash in the message centre.

Rear interior lamps


LAN0219G

Map lamp operation

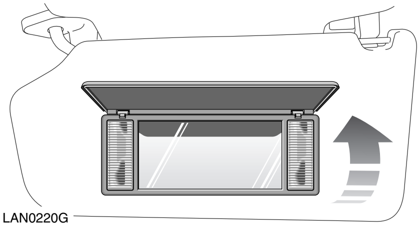
Press the required map lamp switch to turn on and off.

Glovebox lamp

Illuminates automatically (with headlamps on) whenever the glovebox is opened and extinguishes when the glovebox is closed.

Vanity mirror lamps

The vanity mirror lamps are turned on when the corresponding vanity mirror cover is opened and turned off when it is closed.


LAN0220G

Pivot the sun visor downward and raise the cover on the vanity mirror, to illuminate the mirror. Close the cover to extinguish the lamps.

Note: *Map lamps, glovebox lamps and vanity mirror lamps will extinguish automatically after 15 minutes to prevent battery drain provided that the starter switch is in position* ***0****.*

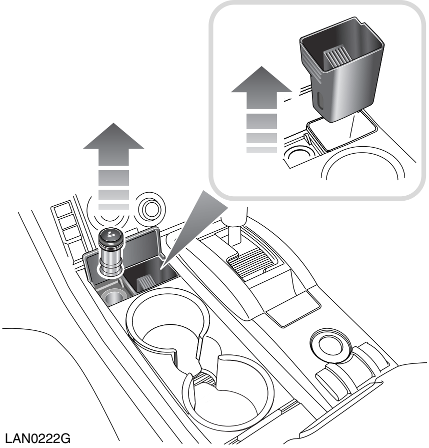
Low-level night-time illumination

With the main lighting switch turned to side lamps or headlamps, LEDs in the front interior lamps provide very low level illumination. The level of illumination can be adjusted using the instrument pack illumination dimmer switch. See **Dimmer control, 111**.

Low level lighting provides very limited illumination for the interior of the vehicle, whilst the vehicle is being driven, without affecting the driver's night vision.

SMOKERS' EQUIPMENT

Lighter



With the starter switch turned on, press the lighter in to heat up. When it has reached the correct temperature it will partially eject and can then be withdrawn for use.

- ONLY hold the lighter by the handle.

After use, push the lighter back in to the first position.

Ashtrays

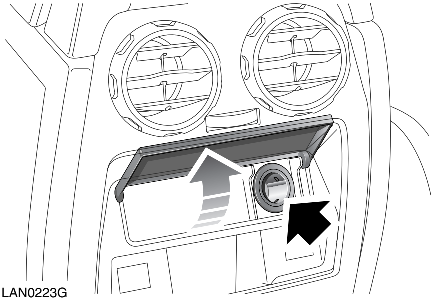
WARNING

DO NOT use the ashtrays for disposing of waste paper or other combustible items.

To remove the ashtray, open fully, then pull the ashtray upwards.

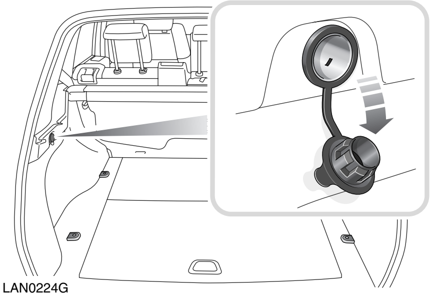
AUXILIARY POWER SOCKETS

Rear auxiliary power socket



A power socket is located on the rear face of the centre console.

Loadspace auxiliary power socket



Another power socket is fitted in the left-hand side trim in the loadspace area.

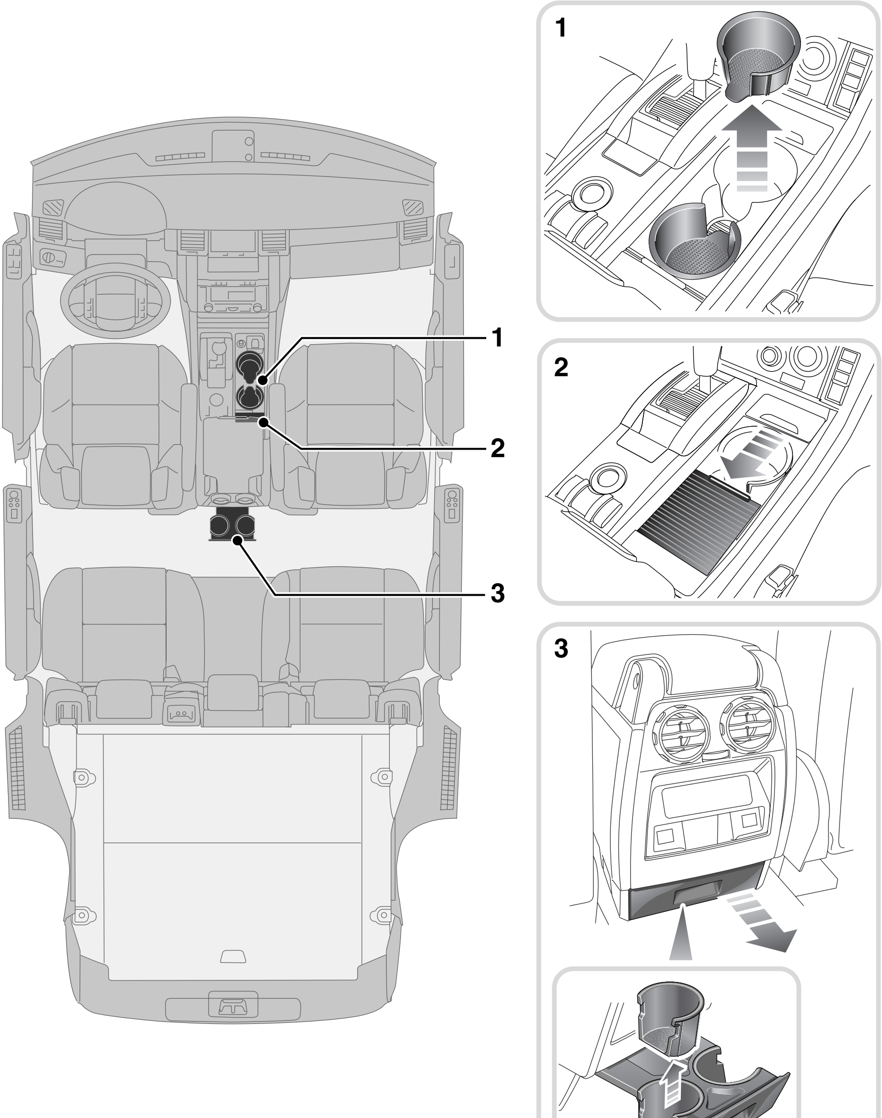
Using a power socket

Caution: NEVER plug non-approved accessories into a power socket - damage to the vehicle's electrical systems could occur.

Always run the engine during prolonged use of electrical accessories, otherwise the battery may become discharged.

The power sockets can be used to power Land Rover approved accessories that use a maximum of 180 Watts.

CUP HOLDERS



LAN0225G

WARNING

The driver should not drink and should not use the cup holder while driving.

If the cup holder is retractable, it should be kept closed when not in use.

Do not carry open-top drink containers in the cup holders while the vehicle is in motion; a spilled hot drink could cause personal injury. Spilled drinks can also damage upholstery, carpeting and electrical components.

Use only for soft containers. DO NOT use to hold cups made of glass, china or hard plastic, as these may cause injury in the event of an accident or emergency manoeuvre. Unopened, sealed containers (drinks cans, for example) are hard objects and may also cause injury.

---

1 and 2. Front seat cup holders

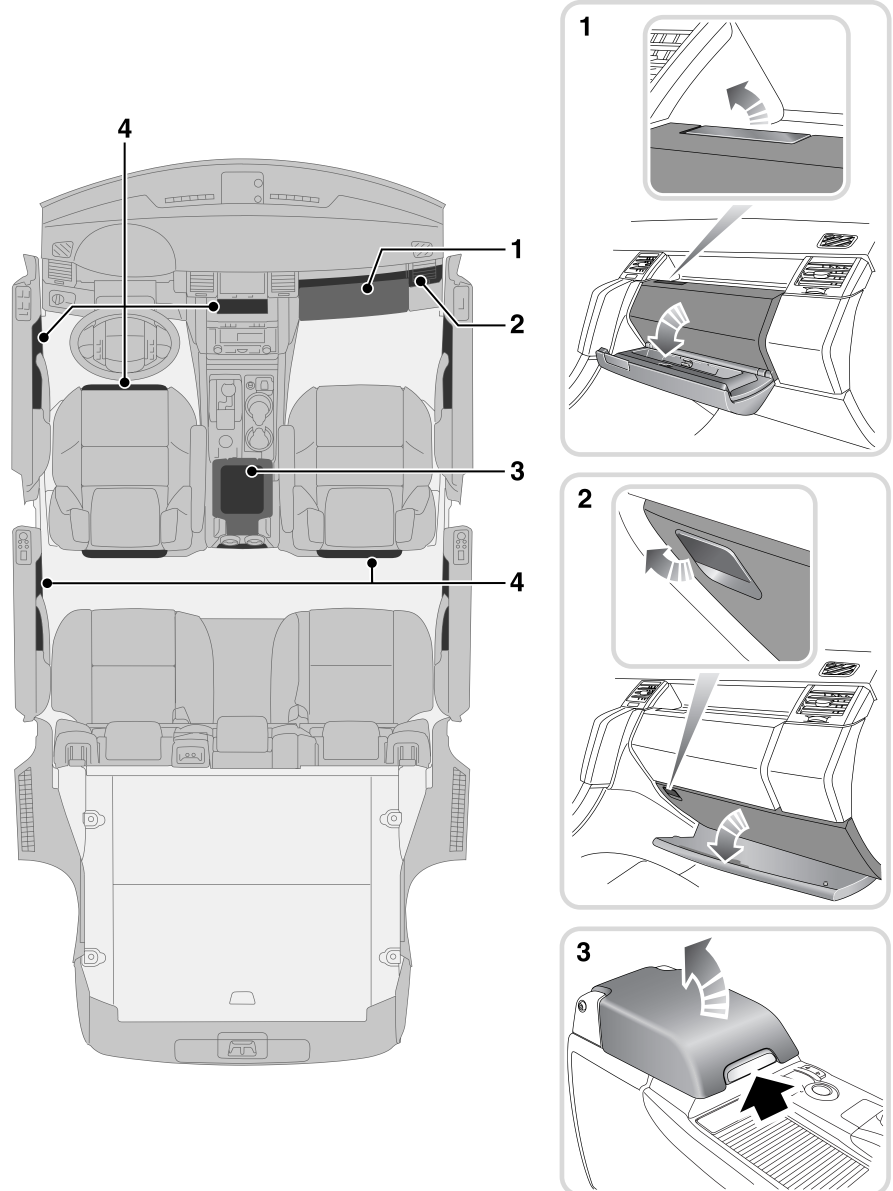
The inner core of the front passenger's cup holder can be lifted out for cleaning or to make a holder for a larger drinks container.

3. Rear seats cup holders

The cup holders for the occupants of the rear seats are in the centre console. Pull out the tray to gain access to the cup holders. Press in again to close.

The inner cores of the cup holders can be lifted out for cleaning or to make a holder for a larger drinks container.

STORAGE COMPARTMENTS


4
1
2
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4
1
2
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LAN0226G

1 and 2. GLOVEBOX

Lift the release catch to open the upper glovebox. The lid will naturally be returned by a spring to its closed position. It should be pushed fully closed.

Pull the release catch to open the lower glovebox. Close the lid by pushing it until it clicks.

CD storage rack

If the optional cool box has been specified a CD storage rack is available for the glovebox.

The rack can be removed by pressing down the lock tab, and pulling the rack out of the glovebox.

3. CUBBY BOX

Lift the catch at the front of the cubby box lid to access the main cubby box.

Card holder

On the front inside face of the cubby box is a feature to hold a credit/toll card.

CD storage

A rubber mat in the bottom of the cubby box is designed to hold CD cases and is removable for cleaning.

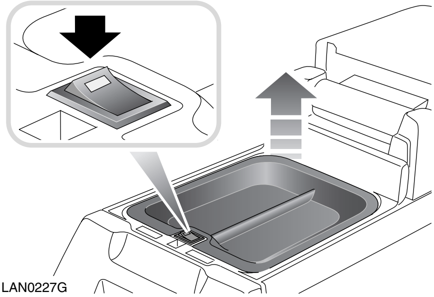
3. COOL BOX

Switch on/off using the switch on the inside front lip of the cool box. This switch has a built-in indicator which will illuminate to show that the cool box is operating. There is a short delay (1-2 seconds) between pressing the switch, and illumination of the indicator.

If the indicator does not illuminate when the cool box is switched on, or it goes out while the cool box is operating, battery voltage is low and the cool box has switched off. This will only happen when the engine is not running.

If the engine is started, the indicator will illuminate and the cool box will operate.

To protect the vehicle's battery, the cool box should be switched off when not needed.



The tray on top of the cool box should always be in place to ensure maximum cooling performance. This tray can be inverted to allow the storage of taller bottles while still maintaining the sealing.

The tray can be clipped onto the inside of the main lid when not required.

The cool box is most effective when filled with cold or pre-chilled items.

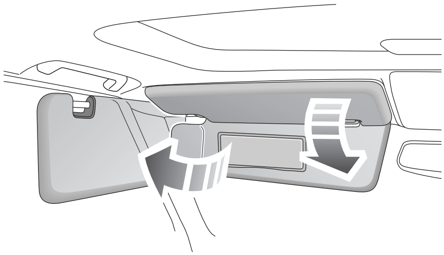
The cool box must be cleaned regularly to remove any condensation or contamination that could lead to odours.

Note: *The cool box will continue to operate for a short period after the starter switch is turned to position **0**.*

4. ADDITIONAL STORAGE

Further storage areas as indicated.

SUN VISOR



H6136L

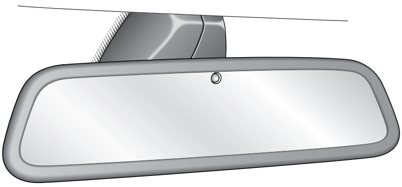
Pivot the sun visor downward to reduce sun glare through the front windscreen. If required, the visor can then be pivoted towards the side window to reduce sun glare from that side of the vehicle.

Vanity mirror

Lifting the cover of the vanity mirror switches on the lamp; closing the cover switches off the lamp.

REAR VIEW MIRRORS

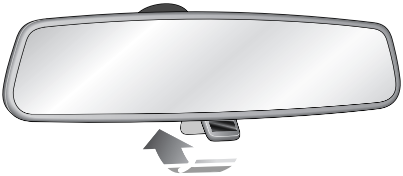
Automatic dipping mirror



LAN0231G

A light sensor detects excessive light and automatically dips the mirror, to reduce glare from the headlamps of following vehicles in dark or low light conditions.

Manual rear view mirror



LAN0230G

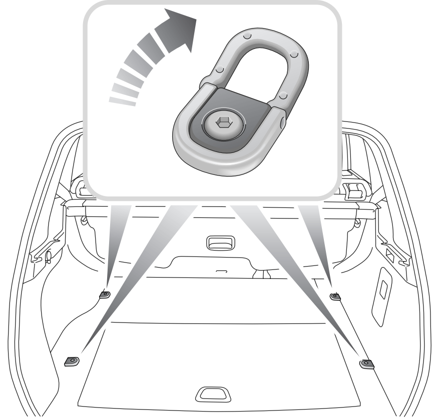
Adjust the mirror manually to suit.

Moving the lever at the bottom of the mirror forwards or backwards changes the mirror’s position to and from dimmed.

LUGGAGE ANCHOR POINTS

WARNING

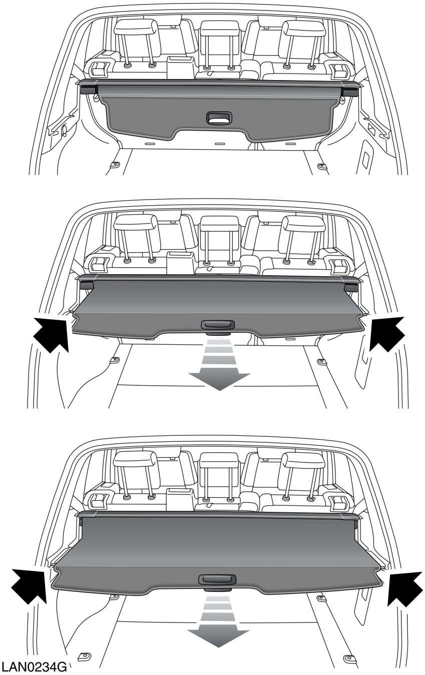
DO NOT carry unsecured equipment, tools or luggage, which could move and cause personal injury in the event of an accident or emergency manoeuvre either on or off-road.



LAN0232G

Four fixing points are provided in the rear loadspace floor, to assist in safely securing large items of luggage. Land Rover provide a range of approved luggage retention accessories.

LOADSPACE COVER



The loadspace cover is a roller-blind type of cover which can be extended to cover the rear loadspace.

To operate the loadspace cover

Caution: When retracting the cover ensure that nothing is left on top. If any items a left on top, including paper or fabrics, they may be drawn into the mechanism and cause it to jam.

Caution: If the cover is damaged in any way it should not be used as the damaged area may prevent the cover from operating correctly.

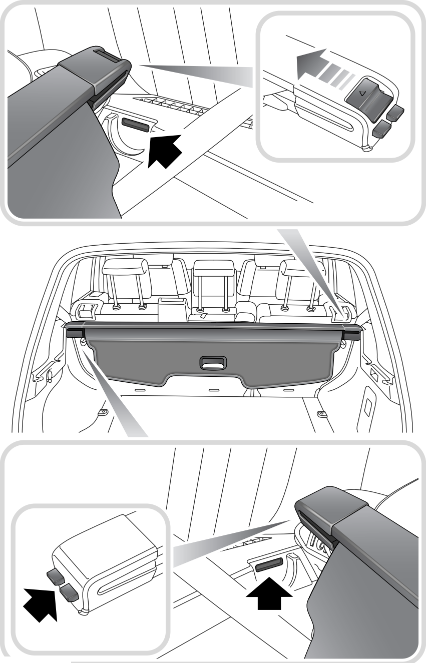
1. Pull the rigid portion of the blind to unroll the cover.
2. Engage the end pieces into the recessed features moulded into the loadspace sides.

Loadspace Cover

To remove the deployed loadspace cover

WARNING

When fitting the loadspace cover position ensure that the location pegs on the left hand side are fully engaged and the release button on the right hand side has returned fully home to ensure engagement. Failure to do so may allow the cartridge to move when the vehicle is in motion.



1. Disengage the ends from the recess and fully retract the cover into the cassette unit.
2. Push the release button on the right hand side of the cassette housing and lift to release the right hand side of the cassette from the loadspace trim.
3. Manoeuvre the complete loadspace cover to the right hand side to release the left hand side location pegs and extract from the vehicle.
4. Installation of the loadspace cover is the reverse of the removal procedure above.

IN-CAR TELEPHONES

WARNING

Using any hand-held appliance while driving can be dangerous. Always stop the vehicle before making a call and ensure that the telephone is switched off while you are driving.

For your safety, always note the following precautions before fitting an in-car telephone, or any mobile communication equipment.

- Only use an installation kit incorporating an aerial external to the vehicle.
- Ensure that the installation is carried out by a competent installer and that the installer is aware of the Airbag System.

VOICE RECOGNITION

Voice control provides a safe and convenient way of operating certain vehicle systems without the need to operate the controls manually. This enables you to concentrate fully on driving the vehicle, and removes the need to divert your attention from the road ahead in order to change settings, or receive feedback from the systems.

A number of voice commands are available, and with a little experience you will find them easy and convenient to use. Whenever you issue one of the defined commands with the system active, voice control converts your command into a control signal for the appropriate system. Your inputs take the form of dialogues or commands. You are guided through these dialogues by announcements or questions.

Defined voice commands

The voice control system understands predefined commands which need to be quoted word for word.

An audio feedback of voice commands is available. To activate the feedback, pull the voice control paddle briefly and give one of the following commands:

General commands

- **Voice help** - To list all commands.
- **Notepad help** - To list Notepad commands.

Audio commands

- **Radio help** - To list Radio commands.
- **CD help** - To list CD commands.

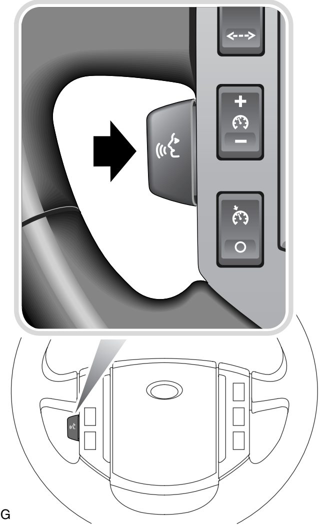
  See **Audio Voice Recognition, 337**.

Navigation and Telephone commands

- **Phone help** - To list telephone commands.
- **Navigation help** - To list Navigation commands.

  Please refer to the **Navigation, TV and Telephone Systems** Handbook.

Activating the system



LAN0237G

To activate voice control:

- Briefly pull the control paddle (your Audio will mute at this point). A brief acoustic signal will be heard, and **LISTENING** will be displayed on the main message centre to indicate that the system is now waiting for a voice command.

Note: *It is only necessary to use the steering wheel voice control paddle at the beginning of each voice session.*

Using Notepad

Notepad is a feature for recording short messages as memory aids or reminders.

You can record up to 10 notes for up to 30 seconds each in length.

Pull the voice paddle towards the steering wheel, wait for **LISTENING** to appear in the message centre, then give the Notepad command.

The voice recording will automatically be stopped if the note is longer than 30 seconds. To stop voice recording at any time, pull the voice button towards the steering wheel.

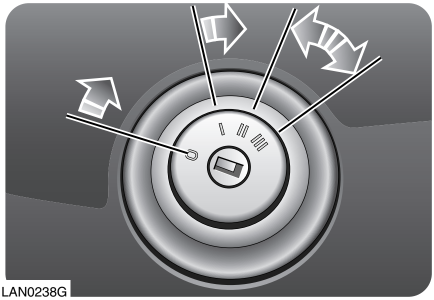
Command	System response	Action
Record note or **Notepad record**.	The system gives a beep to indicate the start of recording.	You may start your recording after the beep. To stop recording, pull and hold in the steering wheel voice paddle.
Play notepad or **Read notepad**.	Notepad audio will read out each note in turn. You can say Replay, Delete or Cancel after each beep, or remain silent to hear the next note.	Saying **Replay** will replay the previous message. Saying **Delete** will delete the previous message. Saying **Cancel** will end the Notepad session.
Clear Notepad or **Notepad delete**.	Do you want to clear the notepad?	Say **Yes** to delete all stored notes. Say **No** to cancel the command.
Notepad help.	The system will read out Notepad information and all the commonly used commands.	

STEERING COLUMN LOCK

WARNING

Once the steering lock is engaged, it is impossible to steer the vehicle. DO NOT remove the key while the vehicle is in motion.

Caution: The gear selector MUST be in the P (park) position, before the starter key can be removed. If the starter key is left in place, a continuous battery drain occurs which could completely discharge the battery.



The starter switch and steering column lock are located in the side of the steering column cover.

To unlock the steering column

Insert the key into the starter switch and rotate key to position **I**. If the key will not rotate, turn the steering wheel left or right while rotating the key.

To lock the steering column

Remove the key from the starter switch.

The lock is now set to operate. Rotate the steering wheel until the lock operates.

STARTER SWITCH

The starter switch uses the following sequence of key positions to operate the steering lock, electrical circuits and starter motor:

Position 0

- Steering locked.
- Some lighting circuits are operational, including: side lamps and hazard warning lamps.
- With the driver’s door open, seat memory facility operational.

Position I

- Steering unlocked.
- Clock, audio system and lighter can now be operated.
- Wipers/washers are operational.

Position II

- All instruments, warning indicators and electrical circuits are operational.

Position III

- The starting sequence is initiated. Note that operation of position **I** electrical functions will be interrupted during engine cranking.

Note: *The gear selector position* ***P*** *or* ***N*** *must be selected before the engine can be started.*

STARTING - Petrol models

WARNING

Never start or leave the engine running in an unventilated building - exhaust gases are poisonous and contain carbon monoxide, which can cause unconsciousness and may even be fatal.

If the engine fails to start, continued use of the starter may result in unburnt fuel damaging the catalytic converter.

1. Check that the parkbrake is applied and that the gear selector is in the **P** (Park) or **N** (Neutral) position.
2. Switch off all unnecessary electrical equipment.
3. Turn the starter switch to position **II** and then on to position **III** and immediately release it. The starter will automatically switch off when the engine starts. DO NOT press the accelerator pedal while starting.

Note: *The battery charging and oil pressure warning indicators should extinguish as soon as the engine is running.*

Cold climates

In very cold climates the oil pressure warning indicator may take several seconds to extinguish. Similarly, engine cranking times will also increase. At -25°C (-13°F) the starter motor may require continuous operation for as long as 30 seconds before the engine will start. For this reason, ensure that all non-essential electrical equipment is switched off to maximise the available battery effort for starting.

After starting

Ensure that the parkbrake AND FOOT BRAKE are firmly applied and the accelerator pedal is not depressed while moving the gear selector lever from **N** or **P**. An interlock will prevent this movement if the foot brake is not applied.

STARTING - Diesel models

WARNING

Never start or leave the engine running in an unventilated building - exhaust gases are poisonous.

WARNING

The diesel engine must not be run above idle speed until the oil pressure warning lamp extinguishes. This will ensure that the engine and turbo-charger bearings are properly lubricated before being run at speed.

Similarly, ALWAYS allow the engine to idle for 10 seconds before switching off.

Caution: Continued use of the starter will not only discharge the battery, but may cause damage to the starter motor.

1. Check that the parkbrake is applied and that the gear selector is in the **P** (Park) or **N** (Neutral) position.
2. Switch off all non-essential electrical equipment.
3. Insert the starter key and turn the switch to position **II**. Wait until the glow plug warning lamp extinguishes.
4. Turn the key to position **III** and immediately release it. The starter will automatically switch off when the engine starts. DO NOT press the accelerator pedal while starting.

Note: *The waiting time will vary according to the engine coolant temperature (when the engine is hot, the glow plug warning lamp will extinguish almost immediately, or may not illuminate at all).*

In temperate climates DO NOT operate the starter for longer than 10 seconds. If the engine fails to start, switch off and wait 10 seconds before re-using the starter.

Note: *The battery charging and oil pressure warning indicators should extinguish as soon as the engine is running.*

Cold climates

In very cold climates the oil pressure warning lamp may take several seconds to extinguish. Similarly, engine cranking times will also increase. At -25°C (-13°F) the starter motor may require continuous operation for as long as 30 seconds before the engine will start. For this reason, ensure that all non-essential electrical equipment is switched off to maximise the available battery effort for starting.

After starting

Ensure that the parkbrake AND FOOT BRAKE are firmly applied and the accelerator pedal is not depressed while moving the gear selector lever from **N** or **P**. An interlock will prevent this movement if the foot brake is not applied.

GENERAL DRIVING ADVICE

Instruments and warning indicators

Caution: Red warning indicators are of particular importance, their illumination indicating that a fault exists. If a red indicator illuminates, always stop the vehicle and seek qualified assistance before continuing.

In the case of the parkbrake, the above only applies if the vehicle is moving when the indicator illuminates.

Before driving, it is important to fully understand the function of the instruments and warning indicators. See **INSTRUMENT PACK, 85**.

Power assisted steering

Note: *Power assistance is dependent on the engine running. If the engine is not running, a much greater effort will be required to steer the vehicle.*

Warming-up

In the interests of fuel economy and of reducing engine wear, it is advisable to drive the vehicle straight away, remembering that harsh acceleration or labouring the engine before the normal operating temperature has been reached, can damage the engine.

When the engine is cold, engine idle speeds will be faster than normal. Under these circumstances, use the foot brake to control the vehicle while idling, until the engine is warm and running at normal speed and be aware of the need to take additional care when manoeuvring the vehicle.

Vehicle height

Caution: The overall height of your vehicle exceeds that of ordinary passenger cars, see DIMENSIONS, 292. Always be aware of the height of your vehicle and check the available headroom before driving through low entrances. This is particularly important if the vehicle is fitted with a roof rack or if the sunroof is tilted open.

Vehicle stability

WARNING

Utility vehicles have a significantly higher roll-over rate than other types of vehicles. Since theses vehicles are designed to be operated off-road, they have a higher ground clearance and, hence, a higher centre of gravity. Such a feature has been associated with increased risk of vehicle roll-over. An advantage associated with higher ground clearance vehicles, is a better view of the road, allowing the driver to anticipate problems. Another factor shown to significantly increase roll-over risk, is unauthorised vehicle modifications, such as fitting incorrect specification tyres, oversize tyres, body lifting, incorrect springs/dampers and incorrect vehicle loading/trailer towing. However, on-road crash data also indicates that driver behaviour is a greater factor than a high centre of gravity, in determining a vehicle's overall roll-over rate. The single most effective driver behaviour, that can reduce the risk of injury or death in all crashes including roll-over, is to ALWAYS WEAR YOUR SEAT BELT and to properly restrain all child passengers in the rear seat, in an appropriate child safety seat. In a roll-over crash, an unbelted person is significantly more likely to die than a person wearing a seat belt.

Other measures that can reduce the risk of injury and death from vehicle crashes and roll-over are:

- Limit speed. Posted speed limits should never be exceeded, and you should always drive below these limits whenever traffic, weather, road or other conditions dictate. Always use your common sense and good judgement.
- Take curves at reasonable speeds, avoiding unnecessary braking.
- Drive defensively. Be aware of traffic, road and weather conditions. Avoid risk-taking behaviour such as following too close, rapid lane changing or abrupt manoeuvres.
- Assume that pedestrians or other drivers are going to make mistakes. Anticipate what they might do. Be ready for their mistakes.
- Avoid distractions such as cellular phone calling, reading, eating, drinking or reaching for items on the floor.
- Before changing lanes, check your mirrors and use your direction indicators.
- Always leave room for unexpected events such as sudden braking.
- Never operate your vehicle when you have consumed alcohol, are sleepy or fatigued or have taken any medication that affects judgement, reflexes or alertness.

WARNING

Many vehicle roll-overs occur when a driver attempts to bring a vehicle back onto the road after some or all of the wheels drift onto the shoulder of the road, especially when the shoulder is unpaved. If you find yourself in such a situation, do not initiate any sharp or abrupt steering and/or braking manoeuvres to re-enter the roadway. Instead, let the vehicle slow down as much as safely possible before attempting to re-enter the roadway and keep your wheels as straight as possible while re-entering the roadway.

Breakdown safety

If a breakdown occurs while travelling:

- Wherever possible, consistent with road safety and traffic conditions, the vehicle should be moved off the main thoroughfare, preferably onto the shoulder as far as possible. If a breakdown occurs on a motorway, pull well over to the inside of the hard shoulder.
- Switch on hazard warning lamps.
- If possible, position a warning triangle or a flashing amber lamp at an appropriate distance from the vehicle to warn other traffic of the breakdown (note the legal requirements of some countries).
- Consider evacuating passengers through the doors facing away from traffic, to a safe area away from the vehicle, as a precaution in case your vehicle is accidentally struck by another one.

Fuel economy

Fuel consumption is influenced by two major factors:

- How your vehicle is maintained.
- How you drive your vehicle.

To obtain optimum fuel economy, it is essential that your vehicle is maintained in accordance with the manufacturer's service schedule.

Items such as the condition of the air cleaner element, tyre pressures and wheel alignment will have a significant effect on fuel consumption. But, above all, the way in which you drive is most important. The following hints may help you to obtain better value from your motoring:

- Avoid unnecessary, short, start-stop journeys.
- Avoid fast starts by accelerating gently and smoothly from rest.
- Do not drive in the lower gears for longer than necessary.
- Decelerate gently and avoid sudden and heavy braking.
- Anticipate obstructions and adjust your speed accordingly well in advance.
- When stationary in traffic, select neutral to improve fuel economy and air conditioning performance.

Running-in

Proper running-in will have a direct bearing on the reliability and smooth running of your vehicle throughout its life.

In particular, the engine, gearbox, brakes and tyres need time to bed-in and adjust to the demands of everyday motoring. During the first 800 km (500 miles), it is essential to drive with consideration for the running-in process and heed the following advice:

- LIMIT maximum road speed to 110 km/h (68 mph) or 3,000 rev/min. Initially, drive the vehicle on a light accelerator and only increase engine speeds gradually once the running-in distance has been completed.
- DO NOT operate at full accelerator or allow the engine to labour in any gear. It is advisable NOT to use Sport mode when running in.
- AVOID fast acceleration and heavy braking except in emergencies.
- Remember! Regular servicing is vital to ensure that the brake pads are examined for wear and changed periodically to ensure long term safety and optimum performance.

Servicing requirements

Vehicles operated in arduous conditions, particularly on dusty, muddy or wet terrain, and vehicles undergoing frequent or deep wading conditions will require more frequent servicing. Contact a Land Rover Dealer/Authorised Repairer for advice.

After wading in salt water or driving on sandy beaches, use a hose to wash the underbody components and any exposed body panels with fresh water. This will help to protect the vehicle's cosmetic appearance and prevent impairment of parkbrake efficiency.

Wading

Caution: The maximum advisable wading depth is normally 490 mm (19 in.). but can be increased to 540 mm (21 in.), when the air suspension system is operated at Off-road height. Wading at a depth greater than the maximum advisable wading depth is not recommended.

Severe electrical damage may occur, if the vehicle remains stationary for any length of time with the water level above the door sills.

Do not switch off the engine during wading. If the engine stalls during wading, restart it immediately and, as soon as possible, get the vehicle checked by a Land Rover Dealer/ Authorised Repairer.

If, during wading, it is thought that water may have entered the engine air intake, switch off the engine immediately. Have the vehicle towed out and delivered to a Land Rover Dealer/Authorised Repairer for checking.

BEFORE DRIVING OFF ROAD

Before venturing off-road, it is absolutely essential that inexperienced drivers become fully familiar with the vehicle's controls, in particular the transfer gear switch, CommandShift, Hill Descent Control (HDC) and the Terrain Response system.

Basic information and Off-Road driving techniques can be found in the Off-Road driving handbook, available on-line at:
http//:www.ownerinfo.landrover.com

It is strongly recommended that off-road driver training is undertaken by anyone intending to drive off-road. Training is available at your nearest Land Rover Experience centre. More details can be found at:
http://www.landroverexperience.com

AUXILIARY EQUIPMENT

Caution: DO NOT use auxiliary equipment, such as roller generators, that are driven by only one or two wheels of the vehicle, as they will cause failure of the transfer gearbox.

EMISSION CONTROL SYSTEM

WARNING

Exhaust fumes contain poisonous substances and inhalation can cause unconsciousness and may even be fatal.

- **DO NOT drive with the tailgate open.**
- **DO NOT modify the exhaust system from the original design.**
- **ALWAYS have exhaust system leaks repaired immediately.**
- **If you think exhaust fumes are entering the vehicle, have the cause determined and corrected immediately.**

Land Rover vehicles are fitted with emission and evaporative control equipment necessary to meet a number of territorial requirements.

In many countries it is against the law for vehicle owners to modify or tamper with emission control equipment, or to sanction the unauthorised replacement or modification of this equipment. In such cases the vehicle owner and the repairer may both be liable for legal penalties.

It is important to remember that all Land Rover Dealer/Authorised Repairer are properly equipped to perform repairs and to maintain the emission control system on your vehicle.

SAFETY ON THE FORECOURT

WARNING

Petroleum gases are highly inflammable and, in confined spaces, are also extremely explosive.

Always take sensible precautions when refuelling:

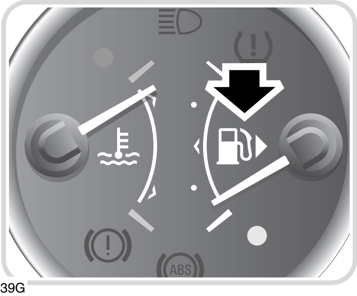
- Switch off the engine.
- Switch off mobile phones.
- Do not smoke or use a naked flame or light.
- Take care not to spill fuel.
- Do not overfill the tank.
- Do not fill petrol containers in the vehicle.

FUEL FILLER

WARNING

To avoid any sudden discharge of fuel, caused by excessive fuel vapour pressure, DO NOT fully remove the filler cap until any captive tank pressure has been released.

Take careful note of warning labels located around the filler cap.



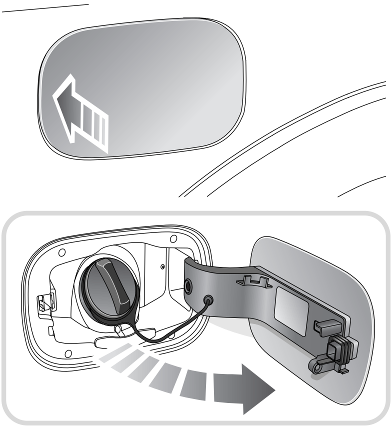
LAN0239G

The fuel filler is located behind the rear right-hand wheel arch. An arrow on the fuel gauge points to that side of the vehicle.

Caution: The fuel filler flap has a spring loaded release, do not force it open. If the flap has been forced open, it may fail to close properly. In this eventuality, take your vehicle to your Land Rover Dealer for attention, as this condition may be due to damaged or misaligned components.

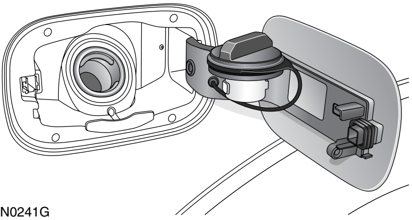
Caution: When replacing the fuel filler cap ensure that it is tightened until it clicks. Failure to do so may result in the engine warning lamp illuminating due to evaporative emission levels increasing.

With the vehicle fully unlocked (all doors and tailgate), press the left side of the fuel filler flap to open (shown in inset).



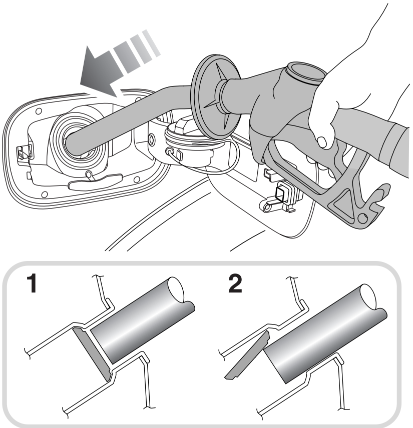
LAN0240G

The fuel filler flap springs out revealing the filler cap.



LAN0241G

Unscrew the filler cap and place it on the projection on top of the hinge of the fuel filler flap.



LAN0242G

Insert the pump nozzle (1) into the filler neck, pushing aside the spring-loaded cover (2).

When delivery is complete, withdraw the nozzle and replace the cap. Tighten the cap clockwise until you hear it click three times.

TYPE OF FUEL

Fuel specification - petrol engines

Caution: On petrol engine vehicles fitted with a catalytic converter, serious damage to the catalyst will occur if LEADED fuel is used!

See **ENGINES, 288**.

The RON value (octane rating) and type of petroleum available at garage forecourts will vary in different parts of the world.

During manufacture, engines are tuned to suit the fuel supplies commonly available in the country for which the vehicle is destined. However, if a vehicle is later exported to a different country, or is used to travel between different territories, the owner should be aware that the available fuel supplies may not be compatible with the engine specification.

Your engine will run on a lower grade of fuel but performance and fuel economy will be reduced.

Using petrol with a lower octane rating than 91 RON, however, can cause persistent, heavy engine knock (a metallic rapping noise). If severe, this can lead to engine damage.

If in doubt, seek advice from the territory concerned.

If heavy engine knock is detected when using the recommended octane rated fuel, or if steady engine knocking is present while maintaining a steady speed on level roads, contact your Land Rover Dealer/Authorised Repairer for advice.

Note: *An occasional, light, engine knock while accelerating or climbing hills is acceptable.*

Fuel specification - diesel engines

Caution: Maximum allowable Bio-diesel mix is 5%. To EN590 specification.

See **ENGINES, 288**.

Caution: If the fuel tank is accidentally filled with petrol, it is ESSENTIAL that you contact your Land Rover Dealer/Authorised Repairer BEFORE attempting to start the engine!

The quality of diesel fuel (Derv) can vary in different countries and only clean, good quality fuel should be used. It is important that the sulphur content of diesel fuel does not exceed 0.3%. In Europe all supplies should be within this limit, but in other parts of the world, you should check with your supplier.

In markets where the sulphur content exceeds 0.3%, more frequent engine oil and filter changes will be required.

FUEL FILLING

WARNING

DO NOT attempt to fill the tank beyond its maximum capacity. If the vehicle is to be parked on a slope, in direct sunlight, or high ambient temperature, expansion of the fuel could cause spillage.

Filling station pumps are equipped with automatic cut-off sensing to avoid fuel spillage. Fill the tank until the filler nozzle automatically cuts-off the supply. DO NOT attempt to fill the tank beyond this point.

Diesel engine vehicles

The use of commercial vehicle diesel pumps with a higher fill rate, may result in premature pump cut-off and fuel spillage.

EMPTY FUEL TANK

Caution: DO NOT RUN THE FUEL TANK DRY.

Running the fuel tank dry could create an engine misfire capable of damaging the engine, the catalytic converter or the fuel pump.

Note: *Should the vehicle run out of fuel, it will be necessary to add a minimum of 4 litres (0.8 gallons) of fuel in order to restart the vehicle. In some circumstances it will be necessary to drive a short distance, typically 1.6 - 5 km (1 - 3 miles) in order for the vehicles monitoring systems to register the additional fuel.*

FUEL CUT-OFF SYSTEM

In the event of an accident, the Supplementary Restraint System (airbag system) may stop the operation of the fuel pump, depending on the severity and type of the impact.

If this happens, the system must be reset before attempting to restart the engine.

Resetting the fuel cut-off system

WARNING

To avoid the possibility of fire or personal injury, do not reset the fuel cut-off system if you see or smell fuel.

If no fuel leak is apparent, reset the system as follows:

1. Turn the starter switch to position **0** and wait for 1 minute.
2. Turn the starter switch to position **II** and wait for 30 seconds.
3. Make a further check for fuel leaks.
4. If no leak is found, start the engine as normal.

CATALYTIC CONVERTER

WARNING

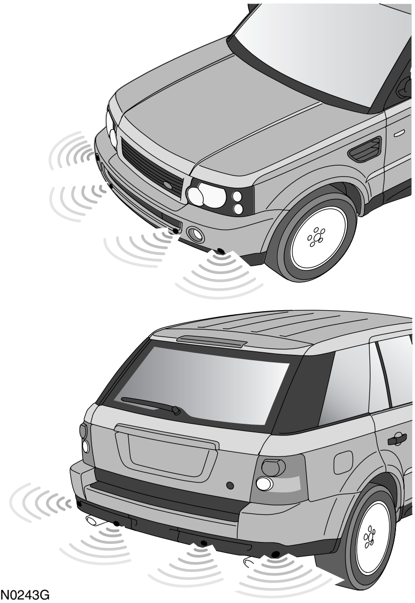
Exhaust system temperatures can be extremely high - DO NOT park on ground where combustible materials such as dry grass or leaves could come into contact with the exhaust system.

Caution: Catalytic converters can be easily damaged through improper use, particularly if the wrong fuel is used, or if an engine misfire occurs.

USING PARK DISTANCE CONTROL (PDC)

Caution: The Park Distance Control is a parking aid for guidance only. It remains the driver's responsibility to detect obstacles and estimate the vehicle's distance from them. The sensors may not be able to detect certain types of obstruction (narrow posts or small narrow objects, small objects close to the ground and some objects with dark, non-reflective surfaces, for example). Always be vigilant when reversing.

Caution: Keep the sensors free from dirt, ice and snow. If deposits build up on the surface of the sensors, their performance may be impaired. When washing the vehicle, avoid aiming high pressure jets directly at the sensors at close range.



Park Distance Control (PDC) is a system that assists the driver when manoeuvring the vehicle into a parking space, or anywhere that there are obstacles that need to be avoided, warning the driver accordingly.

The vehicle is fitted with four ultrasonic sensors on each of the bumpers. (some vehicles are fitted with sensors only in the rear bumpers.)

The range of the front sensors, and the two sensors on the corners of the rear bumper is approximately 0.6 metres (2 feet). The two centre rear sensors have a range of approximately 1.5 metres (5 feet).

PDC in operation

Caution: PDC is automatically switched off at the rear when a trailer is attached to the vehicle.

The distance from an obstruction is identified by an intermittent tone sounding (higher pitch for the front sensors and a lower pitch for the rear). As the vehicle moves closer to an obstruction, the repetition frequency of the tones increases proportionally.

When the distance between the sensor and the obstruction is less than approximately 0.30 metres (1 foot), the tone becomes continuous.

Activating PDC

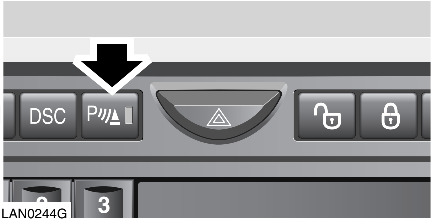
PDC is automatically activated whenever **R** (Reverse) is engaged, while the starter switch is turned on.

If **R** is selected, both front and rear sets of sensors become activated and a short confirmation tone sounds after one second.

In **R**, the sensors remain on regardless of speed.

If the driver selects **N** from **R**, both sets of sensors remain active.

Selection of Park **P**, or applying the EPB while the vehicle is stationary, will override other inputs and turn off the PDC system.



PDC is automatically cancelled when **D** (Drive) is selected and the vehicle exceeds 16 km/h (10 mph). When driving into a limited space, front PDC can be enabled manually.

Front PDC can be manually selected or deselected by pressing the switch (illustrated) on the centre front instrument panel. The switch indicator illuminates and a short tone sounds as confirmation.

Note: *The confirmation tone only sounds when the rear PDC is activated by selecting reverse, or when the system is re-activated by pressing the switch.*

If a long, high-pitched tone sounds and the switch indicator flashes when PDC is activated, then a fault in the system has been detected - first check that the sensors on the bumpers are not obscured by dirt, ice or snow. If the fault persists after cleaning the sensors, contact your Land Rover Dealer/Authorised Repairer for assistance.

AUTOMATIC TRANSMISSION USE

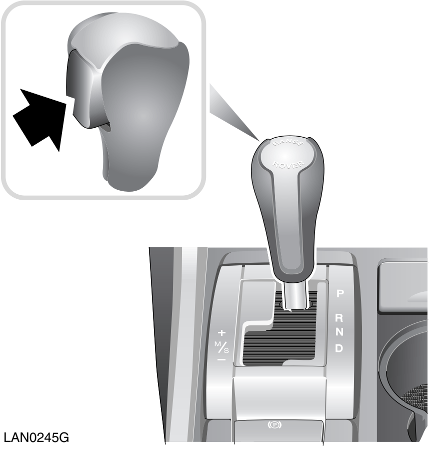
Starting

The engine can only be started with the selector lever in the **P** (Park) or **N** (Neutral) positions.

- ALWAYS apply the parkbrake and foot brake before starting the engine.
- KEEP THE BRAKES APPLIED while moving the selector lever into a drive position (the selector lever cannot be moved from the **P** or **N** position unless the foot brake is applied).

Note: *If pressure is applied to the selector lever before the foot brake is applied, any gear selected may not be available irrespective of the lever position. In this situation, remove pressure from the selector lever, ensure that the foot brake is applied and select the required gear.*

- The selector release button (see inset) must be pressed while selecting **P** and **R**, and also to enable the lever to be moved between the **P** and **R** positions.
- DO NOT rev the engine or allow it to run above normal idle speed while selecting **D** or **R**, or while the vehicle is stationary with any gear selected.
- ALWAYS keep the brakes applied until you are ready to move off - remember, once a drive gear has been selected, an automatic vehicle will tend to creep forward (or backward if reverse is selected).
- DO NOT allow the vehicle to remain stationary for any length of time with a drive gear selected and the engine running (always select **N** if the engine is to idle for a prolonged period).



Note: *The gear selector lever MUST be in the* ***P*** *position before the starter key can be removed.*

Note: *For maximum air conditioning performance while stationary, select* ***P*** *or* ***N****.*

AUTOMATIC TRANSMISSION

Selector lever positions

WARNING

Do not leave children unattended in the vehicle, especially with keys in the starter switch.

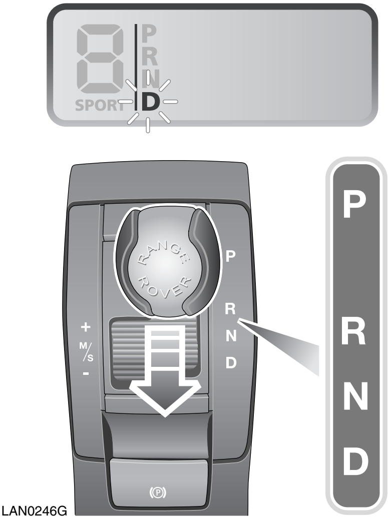
Select P and shut off the engine prior to exiting the vehicle.

Caution: DO NOT select P or R if the vehicle is moving.

DO NOT select a forward drive gear when the vehicle is moving backwards.

Do not select reverse gear when the vehicle is moving forwards.

An illuminated indicator on the selector panel and a number or letter on the gear selector display in the instrument pack, identify the selected gear position.



P - Park:

This position locks the transmission and should be selected before switching the engine off. To avoid transmission damage, ensure that the vehicle is completely stationary, with the parkbrake applied, before selecting **P**.

The selector release button MUST be pressed before moving the selector lever into **P.**

Press the selector release button and foot brake to move the selector lever out of **P**.

Note: *The selector lever will not be released from* ***P*** *unless the engine starter switch is in position* ***II****.*

R - Reverse:

Before selecting **R**, ensure that the vehicle is stationary, with the brakes applied. The selector release button MUST be pressed before moving the selector lever into **R** position.

N - Neutral:

Select **N** when the vehicle is stationary and the engine is required to idle for a brief period (at traffic lights, for example). In **N**, the transmission is not locked, so the parkbrake must be applied whenever **N** is selected.

If the vehicle remains stationary, the selector lever becomes locked in **N** and it is then necessary to depress the brake pedal in order to release the selector lever.

Press the selector release button and foot brake to move from **N** to **R** or **D**.

D - Drive:

Select for all normal driving; full automatic gear changing occurs on all six forward gears, according to road speed and accelerator position.

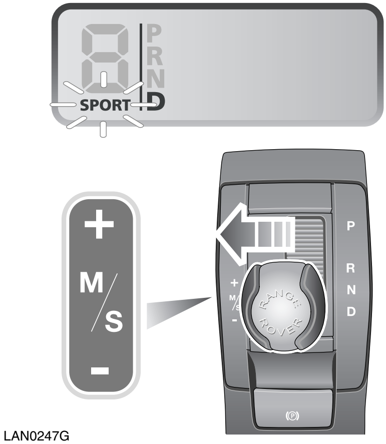
Kick-down in automatic mode

To provide rapid acceleration for overtaking, push the accelerator pedal to the full extent of its travel (this is known as kick-down), a click will be felt through the accelerator pedal. Up to a certain speed, this will cause an immediate downshift to the lowest appropriate gear, followed by rapid acceleration. Once the pedal is relaxed, normal gear change speeds will resume (dependent upon road speed and accelerator pedal position).

Note: *Moderate accelerator pressure may also result in a downshift in the transmission, depending on vehicle speed.*

Sport mode

In Sport mode, full automatic progression through the gear ratios is retained and the transmission will stay in the lower gears for longer. This improves mid-range performance with downshifts occurring more readily.



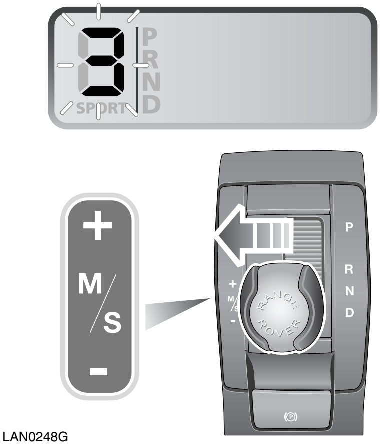
To select Sport mode, move the gear lever from the **D** position towards the left hand side of the vehicle (see illustration). The word **SPORT** will appear in the gear selector display in the instrument pack (for approximately 6 seconds) and the LED in the selector display to the side of the selector lever illuminates.

Sport mode can be deselected at any time, by returning the lever to the **D** position.

To return to Sport mode after CommandShift has been selected move the selector into the **D** position. Then move it back into Sport mode.

CommandShift ™

CommandShift gear selection can be used as an alternative to fully automatic transmission and is particularly effective when rapid acceleration or engine braking are required.



LAN0248G

1. With **D** selected, move the gear selector from the **D** position towards the left-hand side of the vehicle (this is the same as selecting Sport mode).
2. The transmission then automatically selects the ratio most appropriate to the vehicle's road speed and accelerator depression. Move the selector forward or backward to manually select a higher or lower gear (when available). The message **TRANSMISSION COMMANDSHIFT SELECTED** appears in the main message centre.
3. A single forward (**+**) movement of the selector lever will change the transmission to a higher gear. Rearward (**-**) movement of the lever will change down to a lower gear. The selected gear will be indicated in the digital display in the instrument pack (see inset).
4. To deselect CommandShift, simply move the selector lever sideways, back to the **D** position. Automatic gear changing will then resume.

Note: *In CommandShift, kick-down is still available for increased acceleration. See* ***Kick-down in automatic mode, 159****.*

Note: *When the Terrain Response is selected, the automatic transmission will go straight into CommandShift if the lever is moved into sport/CommandShift in any Special Program.*

Using CommandShift in HIGH range

If CommandShift is selected in HIGH range, 1st gear must be selected to move off from stationary. Normal sequential gear changing can be utilised once the vehicle is moving.

Using CommandShift in LOW range

If CommandShift is selected in LOW range, the vehicle can move off from stationary in 1st, 2nd or 3rd gear - this is particularly useful to improve traction when driving off-road.

Kick-down in CommandShift

When in CommandShift, kick-down overrides the manual gear selection, to provide increased acceleration.

In HIGH range, with CommandShift selected, kick-down will cause a downshift to the lowest gear possible for current vehicle speed.

ELECTRONICALLY SELECTED AUTOMATIC MODES

In automatic or Sport modes (not available in CommandShift), the transmission control system will electronically adjust gear change points to suit a variety of driving conditions.

Hill ascent, trailer and high altitude mode

A suitable gear change pattern is selected to retain lower gears for longer. This is to counter momentum loss caused by more frequent gear changing during hill ascent or when towing. This gear change pattern is also selected at high altitudes to combat reduced engine torque.

Hill descent mode

When in manual CommandShift mode, with the optimum gear for engine braking selected, the selector lever can then be moved across to the **D** position. The transmission will retain the previously selected manual gear until the descent is completed, then the transmission will automatically change to **D**.

High coolant temperature mode

In high ambient temperatures during extreme load conditions, it is possible for the engine and the gearbox to overheat. At a certain temperature the transmission will select a gear change pattern designed to aid the cooling process, whilst enabling the gearbox to continue performing normally in high temperatures.

Note: *When the Terrain Response system is used, automatic transmission change points/patterns will change depending on which mode has been selected.*

Limp-home mode

Should the transmission develop a fault, **F** is displayed in the gear position display and only limited gears are available. Seek immediate assistance from your Land Rover Dealer/ Authorised Repairer.

TRANSFER GEARBOX

Your vehicle is equipped with an electronically controlled transfer gearbox allowing the driver to select HIGH or LOW range driving gears.

HIGH range

HIGH range should be used for all normal road driving and also for off-road driving across dry, level terrain.

LOW range

LOW range should ONLY be used in situations where low speed manoeuvring is necessary, such as reversing a trailer or negotiating a boulder-strewn river bed, or when moving off while heavily loaded or towing.

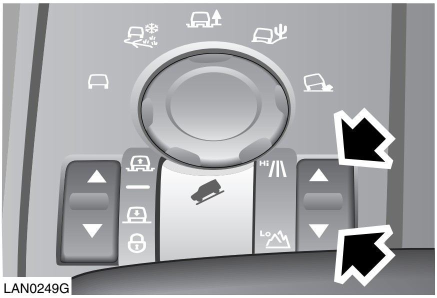
Also use LOW range for more extreme off-road conditions, such as steep ascents and descents. DO NOT attempt to use the LOW range for normal road driving.

Range changing

The recommended method of changing range is with the vehicle stationary. For vehicles equipped with a message centre, the messages displayed will assist the experienced driver in carrying out a range change on-the-move.

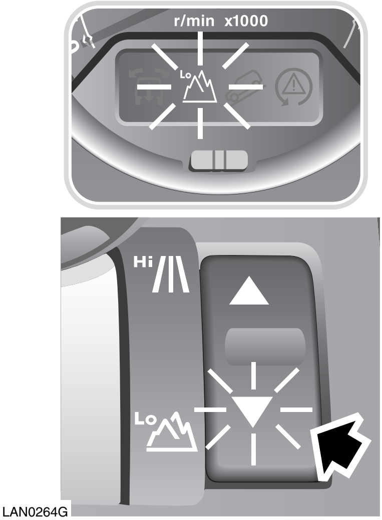
Stationary method

With the vehicle stationary and the engine running, apply the foot brake and move the automatic gearbox selector to **N** (neutral). Press the transfer gear switch to select HIGH or LOW and release it.



While the vehicle is in HIGH range, the range indicator in the instrument pack display is extinguished and the HIGH range indicator at the switch is illuminated.

The range indicator in the instrument pack display illuminates continuously to act as a reminder that LOW range is engaged. It flashes to indicate a range change in progress and extinguishes once the vehicle is in HIGH range.



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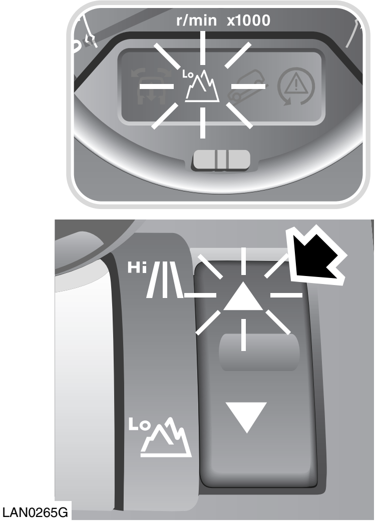
While a HIGH to LOW range change is in progress, the HIGH range indicator in the switch will remain illuminated. The LOW range indicators in both the switch and the instrument pack display will flash.

When the range change is complete, the HIGH range indicator in the switch extinguishes. The LOW range indicators in both the switch and the instrument pack display will illuminate constantly.

A warning chime will sound, and **LOW RANGE ENGAGED** is displayed in the message centre for a few seconds.



LAN0265G

While a LOW to HIGH range change is in progress, the LOW range indicator in the switch will remain illuminated. The HIGH range indicators in both the switch and the instrument pack display will flash.

When the range change is complete, the LOW range indicator in both the switch and the instrument pack display extinguishes. The HIGH range indicator in the switch will illuminate constantly.

A warning chime will sound, and **HIGH RANGE ENGAGED** is displayed in the message centre for a few seconds.

RANGE CHANGING ON THE MOVE

Note: *If the vehicle speed is too high when a range change is requested, a warning chime sounds and* ***SPEED TOO HIGH FOR RANGE CHANGE*** *appears in the message centre.*

If **N** is not selected before using the transfer gear switch, the message **SELECT NEUTRAL FOR RANGE CHANGE** is displayed and a warning chime sounds.

Note: *Do not attempt to make moving range changes at speeds of 3 km/h (2 mph) or less.*

Changing from HIGH to LOW on the move

With the vehicle slowing down and travelling NO FASTER THAN 40 km/h (24 mph), first select **N** in the main gearbox. Press the rear of the transfer gear switch to the LOW position and release it.

Indication of the range change status is the same as for the Stationary method.

Now select **D** or manual CommandShift mode. The transmission interlock prevents the engagement of a drive gear until the range change is complete.

Changing from LOW to HIGH on the move

Caution: If the range change indicator still flashes when the starter key is turned from position II to position I, apply the parkbrake.

With the vehicle travelling NO FASTER THAN 60 km/h (38 mph), select **N** in the main gearbox. Press the front of the transfer gear switch to the HIGH position and release it.

Indication of the range change status is the same as for the stationary method.

Now select **D** (drive). The transmission interlock prevents the engagement of a drive gear until the range change is complete.

Transmission fault message

If a fault occurs within the transmission, a message will be displayed in the main message centre. See **MESSAGE CENTRE MESSAGES, 92**.

AUXILIARY EQUIPMENT

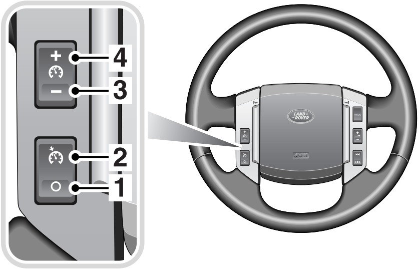
Caution: DO NOT use auxiliary equipment, such as roller generators, that are driven by only one or two wheels of the vehicle, as they will cause failure of the transfer gearbox.

CRUISE CONTROL

Caution: Always observe the following precautions:

- **DO NOT use cruise control in traffic conditions where a constant speed cannot easily be maintained.**
- **DO NOT use cruise control on winding or slippery road surfaces, or in off-road conditions such as rough tracks or on sand.**
- **Use of Sport mode is not recommended when cruise control is selected.**

Cruise control enables the driver to maintain a constant road speed without using the accelerator pedal. This is particularly useful for motorway cruising or for any journey where a constant speed can be maintained for a lengthy period.



The steering wheel switches operate as follows:

1. **CANCEL:** Cancels without erasing memorised speed.
2. **RESUME:** Resume set speed.
3. **SET - :** Set the speed (**-**) or decrease.
4. **SET + :** Set the speed (**+**) or increase.

Note: *Cruise control is NOT available when the vehicle is being driven in LOW range.*

It is also not available when using the Terrain Response system, when Mud Ruts, Sand or Rock Crawl is selected and also when Hill Descent Control (HDC) is selected.

To operate

Accelerate until the desired cruising speed is reached. This must be above the system's operational minimum speed of 30 km/h (18 mph).

Press the **+** switch (4) to set the vehicle speed in the system's memory. Cruise control will now maintain that road speed.

The warning indicator in the instrument pack illuminates. With cruise control operating, speed can be increased by normal use of the accelerator e.g. for overtaking. When the accelerator is released, road speed will return to the previously set cruising speed.

Note: *When cruise control speed is set and the accelerator pedal is pressed for more than 60 seconds, cruise control will be cancelled.*

A speed can be set and stored whilst the vehicle speed is below 30 km/h (18 mph), or the vehicle is stationary but the gear selector is in **D** or **N**. Once the vehicle speed exceeds 30 km/h (18 mph) the set speed can be achieved by pressing the resume switch (2).

Suspending cruise control

Cruise control can be suspended by a single press of the **CANCEL** switch (1). The warning indicator in the instrument pack extinguishes.

Cruise control will also suspend when the brake pedal is pressed, when the gear selector is moved into neutral or if HDC or DSC becomes active.

To resume cruise control at the previously set speed, press the **RESUME** switch (2).

Note: *The set speed will NOT be erased by pressing the* ***CANCEL*** *switch (1). The set speed will only be erased when the starter switch is turned to position* ***0****, or the gear selector lever is moved to* ***R*** *or* ***P****.*

Reducing the cruise speed

Press and hold the **-** switch (3); the vehicle will decelerate. Release the switch as soon as the desired speed is reached. The vehicle speed at the point of switch release becomes the new set speed.

Alternatively, the set speed can be decreased incrementally by tapping the **-** switch (3). Each press of the switch will decrease the speed by 2 km/h (1 mph).

Increasing the set cruising speed

WARNING

When setting cruise control to the speed limit it is important to remember that it is possible for the vehicle speed to increase when travelling downhill. This may result in the vehicle speed exceeding the speed limit.

The driver must ALWAYS ensure that a safe speed is maintained below the speed limit, taking account of traffic and road conditions.

Press and hold the **+** switch (4); the vehicle will accelerate. Release the switch as soon as the desired speed is reached.

The vehicle speed at the point of switch release becomes the new set speed.

Alternatively, the set speed can be increased incrementally by tapping the **+** switch (4). Each press of the switch will increase the speed by 2 km/h (1 mph).

A further alternative is to increase speed by normal use of the accelerator. When the desired speed is reached, press the **+** switch (4) to set the cruise control.

Note: *If the accelerator pedal is pressed to increase speed, but the* ***+*** *switch (4) is not pressed, cruise control will be cancelled after 60 seconds.*

ADAPTIVE CRUISE CONTROL (ACC)

WARNING

Adaptive Cruise Control is not a collision warning or avoidance system. Additionally, Adaptive Cruise Control will not detect:

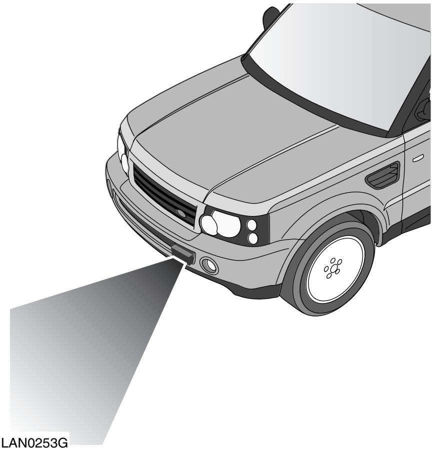
- **Stationary or slow moving vehicles below 10 km/h (6 mph).**
- **Pedestrians or objects in the roadway.**
- **Oncoming vehicles in the same lane.**

A radar sensor mounted in the front bumper, projects a beam directly forward to detect objects ahead.

ACC utilises this radar sensor to maintain a gap between your vehicle and a vehicle ahead. The gap can be adjusted to one of four distance settings to suit your driving style. If there is no vehicle ahead within radar range, a set road speed can be maintained. Any speed between 30 km/h (18 mph) and 180 km/h (110 mph) can be stored in the ACC memory.

When ACC is active, a set gap can be maintained behind a leading vehicle even if your stored speed is higher. If the road situation allows you to move into an adjacent lane, your vehicle will automatically accelerate up to your stored speed as long as there is no vehicle ahead within radar range.

In a situation where your set gap is reduced by a slowing lead vehicle, ACC will automatically apply the brakes to re-establish the gap.

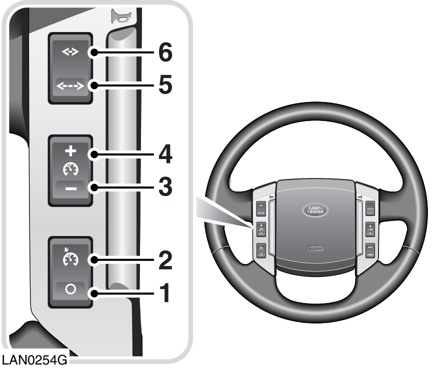


- Only use ACC when conditions are favourable, that is, straight, dry, open roads with light traffic.
- Do not use in poor visibility, specifically fog, heavy rain, spray or snow.
- Do not use on icy or slippery roads.
- It is the driver's responsibility to stay alert, drive safely and be in control of the vehicle at all times.
- Keep the front of the vehicle free from dirt, metal badges or objects, including vehicle front protectors, which may prevent the sensor from operating.
- Do not use ACC when entering or leaving a motorway.

Adaptive Cruise Control (ACC)

Steering wheel switches

The system is operated by switches mounted on the steering wheel. The driver can also intervene at any time by use of the foot brake or accelerator pedals.



The steering wheel switches operate as follows:

1. **CANCEL:** Cancels without erasing memorised speed.
2. **RESUME:** Resume set speed.
3. **SET - :** Set the speed **-** or decrease.
4. **SET + :** Set the speed **+** or increase.
5. **GAP <---> :** Gap increase.
6. **GAP <-> :** Gap decrease.

Setting a speed

Accelerate as normal until the required speed is reached.

Press the **SET +** button (4) briefly and the vehicle speed will then be stored in the memory and the system activated. The set speed will be displayed on the message centre (e.g. **SET SPEED 80KM/H 50MPH**).

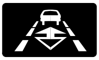
Entering the follow mode

WARNING

When in follow mode the vehicle will not decelerate automatically to a stop, nor will the vehicle always decelerate quickly enough to avoid a collision without driver intervention.

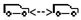
Once a set speed has been selected, the driver can release the accelerator and the set road speed will be maintained.

When a vehicle ahead enters the same lane or a slower vehicle is ahead in the same lane and travelling in the same direction, the vehicle speed will be adjusted automatically until the gap to the vehicle ahead corresponds to the preset gap. The vehicle is now in follow mode.



The warning lamp in the instrument cluster will be illuminated.

CRUISE GAP



The message centre will display the gap set.

The vehicle will then maintain the constant time gap to the vehicle ahead until:

- The vehicle ahead accelerates to a speed above the set speed.
- The vehicle ahead moves out of lane or out of view.
- The vehicle ahead slows so that low speed automatic switch off occurs.
- A new gap distance is set.

If necessary, the vehicle brakes will be automatically applied to slow the vehicle to maintain the gap to the vehicle in front.

The maximum braking which is applied by the ACC system is limited and can be overridden by the driver applying the brakes, if required.

Note: *Driver braking will cancel ACC.*

If the ACC system predicts that its maximum braking level will not be sufficient, then an audible warning will sound while the ACC continues to brake. **DRIVER INTERVENE** will be displayed on the message centre. The driver should take IMMEDIATE action.

When in follow mode the vehicle will automatically return to the set speed when the road ahead is clear, for instance when:

- The vehicle in front accelerates or changes lane.
- The driver changes lane to either side or enters an exit lane.

The driver should intervene if appropriate.

Low speed automatic switch off

If the speed of the vehicle decreases below 30 km/h (18 mph), the ACC system will be automatically switched OFF and the instrument warning lamp will go out.

If the brakes were being applied by the ACC system, they will be slowly released.

This will be accompanied by an audible warning, and **DRIVER INTERVENE** will be displayed on the message centre. The driver must take control.

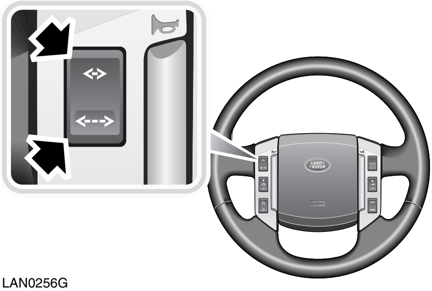
Overriding the set speed/follow mode

WARNING

Whenever the driver is overriding the ACC by depressing the accelerator pedal, the ACC will not automatically apply the brakes to maintain separation from any vehicle ahead.

The set speed and gap can be overridden by pressing the accelerator pedal when cruising at constant speed or in follow mode. If the vehicle is in follow mode, the instrument warning lamp will go out when the ACC is overridden by the driver using the accelerator and **CRUISE OVERRIDE** will be displayed on the message centre. When the accelerator is released the ACC function will operate again and vehicle speed will decrease to the set speed, or a lower speed if follow mode is active.

Adjusting the gap



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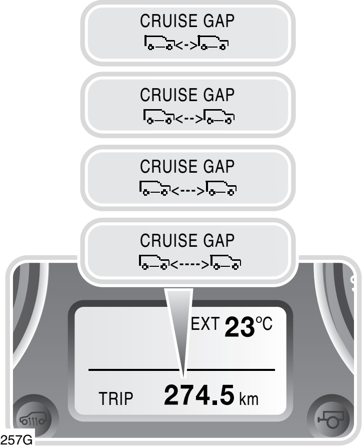

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The gap from the vehicle ahead can be decreased or increased by pressing the rocker switch (5) or (6), on the steering wheel.

Four gaps are available and the selected gap setting will be displayed on the message centre when either button is pressed. After the starter is switched ON the default gap will be automatically selected ready for ACC operation.

Note: *It is the driver's responsibility to select a gap appropriate to the driving conditions.*

Adjusting the set speed

There are three ways to change the set speed:

- Accelerate or brake to the required speed and press the **SET +** button (4).
- Increase or decrease the speed by pressing and holding either the **SET +** or **-** button (4) or (3) until the required set speed is shown on the message centre. The vehicle speed will gradually change to the selected speed.
- Increase or decrease the speed in steps of 2 km/h (1 mph) by briefly pressing the **SET +** (4) or **SET -** button (3).

ACC operates between approximately 30 km/h and 180 km/h (18 mph and 110 mph) dependent on the country specification.

Set speeds outside this range will not be captured.

The ACC may apply the brakes to slow down the vehicle to the new set speed. The new set speed will be displayed on the message centre for four seconds after it has been changed.

ACC automatic switch off

ACC will disengage, but not clear the memory when:

- The CANCEL button (1), is pressed.
- The brake pedal is pressed.
- The vehicle speed falls below 30 km/h (18 mph).
- **N** is selected.
- Dynamic Stability Control (DSC) activates.
- Electronic Traction Control (ETC) activates.
- Hill Descent Control (HDC) is selected.

ACC will disengage, and clear the memory when:

- The starter switch is set to position **0**.
- Maximum vehicle speed is reached.
- A fault occurs in the ACC system.

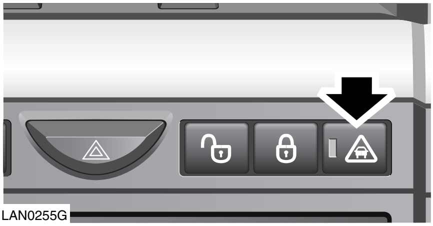
Resuming the set speed/follow mode

Caution: RESUME should only be used if the driver is aware of the set speed and intends to return to it.

By pressing the resume button (2), after ACC has been cancelled, for example, after braking, the ACC will become active again provided that the set speed memory has not been erased. The set speed will be displayed for four seconds and the original set speed will be resumed, unless a vehicle ahead causes the follow mode to become active.

Forward alert

Limited warning of vehicles ahead is provided during ACC operation by the ACC **DRIVER INTERVENE** warning. The forward alert feature additionally provides warnings whilst ACC is not engaged; if a vehicle is detected close ahead, then the warning tone and message will be issued. The brakes will not be applied.



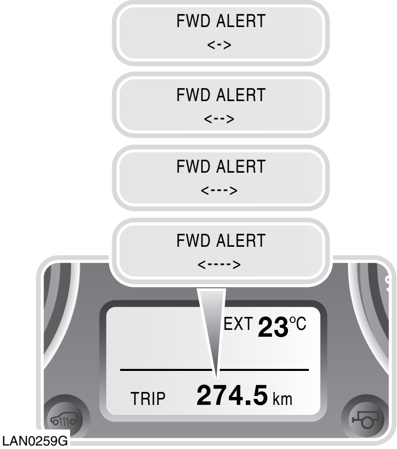
This additional feature may be switched on or off using the forward alert switch as indicated

When the indicator lamp in the switch is on, forward alert is active.

The sensitivity of the warning may be changed:

- Press the gap decrease button when ACC is disengaged to display and then decrease the sensitivity of the alert.
- Press the gap increase button to display and then increase the sensitivity of the alert.

Both of these alerts are accompanied by the **FWD ALERT <---->** message in the message centre.



Driving with ACC active

The system acts by regulating the speed of the vehicle using engine control and the brakes. Gear changes may occur in response to deceleration or acceleration whilst in ACC.

ACC is not a collision avoidance system, however, during some situations the system may provide the driver with an indication that intervention is required.

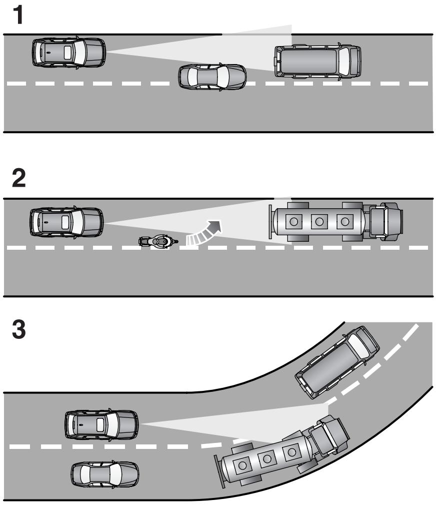
An audible alarm will sound, accompanied by the message **DRIVER INTERVENE** if the ACC detects:

- A failure has occurred whilst the system is active.
- That using maximum ACC braking only is not sufficient.
- That the vehicle speed has decreased below the minimum for ACC operation.

Note:

- *ACC operates when the gear selector lever is in position **D**.*
- *When engaged, the accelerator pedal rests in the raised position. Fully release the pedal to allow normal ACC operation.*
- *When braking is applied by the ACC the brake pedal may move down and up as braking is applied or removed. The vehicle brake lamps will be switched on while braking is applied.*

Detection limitations



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Detection limitations can occur:

1. When driving on a different line to the vehicle in front.
2. With vehicles which edge into your lane which can only be detected once they have moved fully into your lane.
3. There may be issues with the detection of vehicles in front when going into and coming out of a bend.

In these cases ACC may brake late or unexpectedly. The driver should stay alert and intervene if necessary.

ACC failure

If a fault occurs during operation of the system in cruise or follow modes, the ACC system will switch OFF and cannot be used until the fault is cleared. The message **DRIVER INTERVENE** appears briefly, and is then replaced by the message **CRUISE NOT AVAILABLE**.

If failure of the ACC or any related system occurs at any other time the message **CRUISE NOT AVAILABLE** will be displayed. It will not be possible to activate the ACC system in any mode.

Accumulations of dirt, snow or ice on the sensor or cover may inhibit ACC operation. Fitting of a vehicle front protector or metallised badges may also affect ACC operation.

If this occurs in ACC cruise/follow mode, the audible alarm sounds and the message **DRIVER INTERVENE** appears briefly. The message **ACC SENSOR BLOCKED** is then displayed. The system is no longer active.

Clearing the obstruction allows the system to return to normal operation. If the obstruction is present when ACC is inactive, e.g. on initial starting or with the ACC system switched off, the message **ACC SENSOR BLOCKED** will be displayed.

Tyres other than those recommended may have different sizes. This can affect the correct operation of the ACC.

FOOT BRAKE

WARNING

DO NOT rest your foot on the brake pedal while travelling as this may overheat the brakes, reduce their efficiency and cause excessive wear.

NEVER allow the vehicle to freewheel with the engine turned off, as braking assistance will not be available. The pedal brakes will still function, but more pressure will be required to operate them.

If the RED brake warning indicator should illuminate while the vehicle is in motion, bring the vehicle to a halt as quickly as traffic conditions and safety allow and seek qualified assistance before continuing. See Warning Indicators, 104.

Never place non-approved floor matting or any other obstructions, under the brake pedal. This restricts pedal travel and braking efficiency.

For your safety, the hydraulic braking system operates through dual circuits. If one circuit should fail, the other will continue to function.

However, in the event of brake failure where only one circuit is operational, the vehicle should only be driven at slow speed to the nearest qualified Land Rover Dealer/Authorised Repairer.

In these circumstances, exercise extreme caution and be aware that increased brake pedal travel, greater pedal pressure, and longer stopping distances will be experienced.

Servo assistance

The braking system is servo assisted, but ONLY when the engine is running. Without this assistance greater braking effort is necessary to safely control the vehicle, resulting in longer stopping distances. Always observe the following precautions:

- ALWAYS take particular care when being towed with the engine turned off.
- If the engine should stop for any reason while the vehicle is in motion, bring the vehicle to a halt as quickly as traffic conditions safely allow, and DO NOT pump the brake pedal as the braking system may lose any remaining assistance available.

Brake pads

Brake pads require a period of bedding in. For the first 800 km (500 miles), you should avoid situations where heavy braking is required.

Remember! Regular servicing is vital to ensure that the brake pads are examined for wear and changed periodically to ensure long term safety and optimum performance.

Wet conditions

Driving through water or even very heavy rain may adversely affect braking efficiency. Always dry the braking surfaces by intermittent light application of the brakes, first ensuring that you are at a safe distance from other road users.

ANTI-LOCK BRAKES

WARNING

ABS cannot overcome the physical limitations of braking distance, or the danger of aquaplaning, i.e. where a layer of water prevents adequate contact between the tyres and the road surface.

The fact that a vehicle is fitted with ABS must never tempt the driver into taking risks that could affect safety. In all cases, it remains the driver's responsibility to drive within normal safety margins, having due consideration for prevailing weather and traffic conditions.

The driver should always take account of the surface to be travelled over and the fact that brake pedal reactions will be different to those experienced on a non-ABS vehicle.

The purpose of the anti-lock braking system (ABS) is to allow efficient braking without wheel locking - thereby allowing the driver to retain steering control of the vehicle.

Under normal braking conditions, where sufficient road surface friction exists to slow the vehicle without the wheels locking, ABS will not be activated. However, if the wheels begin to lock under braking, then ABS will automatically come into operation. This will be recognisable by a rapid pulsation felt through the brake pedal.

In an emergency situation, ABS functions most effectively when full braking effort is applied even when the road surface is slippery. The ABS system constantly monitors the speed of each wheel and varies the brake pressure to each, according to the available grip.

No matter how hard you brake, you should be able to continue steering the vehicle as normal.

- DO NOT pump the brake pedal at any time; this will interrupt operation of the system and may increase the stopping distance.
- NEVER place additional floor matting or any other obstruction under the brake pedal. This restricts pedal travel and may impair brake efficiency.

Warning indicator

A fault with the ABS system is indicated by illumination of the amber ABS warning indicator. If the indicator illuminates, drive with care, avoiding heavy brake applications and seek qualified assistance urgently. See **Anti-lock Braking System (ABS) - AMBER, 108**.

Off-road driving

While anti-lock braking will operate in off-road driving conditions, on certain surfaces total reliance on the system may be unwise. It cannot reliably compensate for driver error or inexperience on difficult off-road surfaces.

Note the following:

- On soft or deep surfaces such as powdery snow, sand or gravel, and on extremely rough ground, the braking distance required by the anti-lock braking system may be greater than for normal braking, even though improved steering would be experienced. This is because the natural action of locked wheels on soft surfaces is to build up a wedge of surface material in front which assists the wheels to stop.
- If the vehicle is stopped on a very steep slope where little traction is available, it may slide with the wheels locked as there is no wheel rotation to provide a signal to the ABS. To counteract this, briefly release the brakes to permit some wheel movement, then re-apply the brakes to allow ABS to gain control.

Cornering Brake Control (CBC)

Cornering Brake Control (CBC) is an advanced form of ABS, which maintains vehicle stability and steerability during braking whilst cornering or changing lanes at speed.

Emergency Brake Assist (EBA)

If rapid full brake application is made, EBA automatically boosts the braking force to the maximum and helps to stop the vehicle. Also, if the driver brakes more slowly, but with sufficient brake pressure to activate ABS on both front wheels, the system automatically increases the braking force so that all four wheels are in ABS control, optimising the performance of the ABS system.

Pressure should be maintained on the brake pedal during the entire brake application. If the brake pedal is released, EBA will cease operation.

A fault with the EBA system is indicated by illumination of the amber brake warning indicator. See **INDICATOR GROUPING, 104**.

In the event of a fault, the system should be checked by a Land Rover Dealer/Authorised Repairer at the earliest opportunity.

Electronic Brake Force Distribution (EBD)

Your vehicle is equipped with Electronic Brake Force Distribution (EBD), which balances the distribution of braking forces between front and rear axles to maintain maximum braking efficiency under all vehicle loading conditions.

For example; under light loads EBD applies less effort to the rear brakes to maintain vehicle stability; conversely allowing full braking effort to the rear wheels when the vehicle is towing or is heavily laden.

A fault with the EBD system is indicated by illumination of the red brake warning indicator. If this illuminates while the vehicle is being driven, gently stop the vehicle as soon as safety permits and seek qualified assistance.

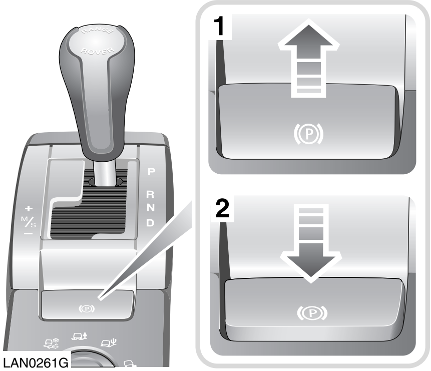
PARKBRAKE (EPB)

WARNING

DO NOT rely on the parkbrake system to hold the vehicle stationary if the amber parkbrake warning indicator is illuminated and/or the red warning indicator is flashing. Seek qualified assistance urgently.

Caution: Driving the vehicle with the parkbrake applied or repeated use of the parkbrake to decelerate the vehicle may cause serious damage to the brake system.

Your vehicle is equipped with an electrically operated parkbrake (EPB).



Applying the parkbrake manually

With the vehicle stationary, pull up the lever (1) and release it. The lever will return to the neutral position and the red parkbrake warning indicator in the instrument pack will illuminate.

If the lever is operated while the vehicle is travelling at less than 3 km/h (2 mph), the vehicle will be brought to a stop abruptly. The stop lamps will not illuminate.

If the system detects a fault with the parkbrake, the amber parkbrake warning indicator will illuminate and the message **PARKBRAKE FAULT** will appear on the instrument pack. If a fault is detected while EPB is operated, the red warning indicator will flash and the amber indicator will illuminate. Also the message **PARKBRAKE FAULT. SYSTEM NOT FUNCTIONAL** will appear in the main message centre. The red indicator will continue to be illuminated for at least ten seconds after the starter switch has been turned off.

Dynamic operation

In an emergency, the parkbrake can be applied dynamically, i.e. with the vehicle travelling at more than 3 km/h (2 mph). Pulling up on the lever and holding it up gives a gradual reduction in speed. The brake warning indicator will illuminate accompanied by a harsh sound and **CAUTION! PARKBRAKE APPLIED** appears on the main message centre. The stop lamps will illuminate.

Releasing or depressing the lever will cancel the parkbrake application.

Releasing the parkbrake manually

WARNING

The parkbrake operates on the rear wheels of the vehicle and hence secure parking of the vehicle is dependent on being on a hard and stable surface.

DO NOT rely on the parkbrake to operate effectively if the vehicle has been subjected to immersion in mud and water.

To disengage the parkbrake, the starter key must be in position **I** or **II**. Apply pressure to the foot brake while pressing down on the parkbrake lever.

It is not possible to manually release the parkbrake without pressing the foot brake.

If the parkbrake cannot be released manually, seek qualified assistance immediately.

Releasing the parkbrake automatically

If the vehicle is stationary with the parkbrake applied and in **D** or **R**, pressing the accelerator will release the parkbrake and allow the vehicle to move off.

To delay the automatic release feature, hold the lever in the apply position, then at the desired point, release it.

To assist in a smooth drive-away, the system anticipates the requirement and reduces the system load depending on the gradient (it may be possible to hear this pre-arm operation).

If the reduction in load causes the vehicle to move after a valid gear is engaged, the full system load will be re-applied to the parkbrake. This may cause a small reduction in the refinement of the subsequent drive-away. It is also possible to override this load reduction by lifting the parkbrake lever after gear engagement.

In the event of a fault, **PARKBRAKE FAULT. AUTO RELEASE NOT FUNCTIONAL** will appear in the main message centre. In this event, release the parkbrake manually.

Under most conditions the EPB system will release seamlessly as the accelerator is applied, allowing the vehicle to move forward. However, release times may be extended for an initial time period at the start of a journey when changing into gear from **P** or **N**. This is normal and is to allow for the extended gear engagement times that may occur under certain circumstances.

If the vehicle is used in severe off-road conditions, such as wading, deep mud, etc., additional maintenance and adjustment of the parkbrake will be required. Consult your Land Rover Dealer/Authorised Repairer.

Fault management

If a fault is diagnosed by the system when the starter is on but the parkbrake is not in use, the amber parkbrake warning indicator will flash and the message **PARKBRAKE FAULT** will be displayed in the main message centre.

Note: *Under some transmission fault conditions the parkbrake may not function, or may not operate automatically.*

DYNAMIC STABILITY CONTROL (DSC)

WARNING

Dynamic Stability Control (DSC) is unable to compensate for driver misjudgement. It remains the driver's responsibility to adopt a suitable driving style in every driving situation. Risks should never be taken on account of the additional security afforded by the DSC system.

DSC helps to optimise dynamic stability, even in critical driving situations. The system controls dynamic stability when accelerating. Additionally, it identifies unstable driving behaviour, such as understeering and oversteering and helps to keep the vehicle under control by manipulating the engine output and applying the brakes at individual wheels. Some noise may be generated when the brakes are applied. The system is ready to operate each time the engine is started.

Warning indicator

The indicator illuminates briefly as a bulb and system check when the starter switch is turned to position **II**.

If the warning indicator flashes, the system is active, regulating engine output and brake forces.

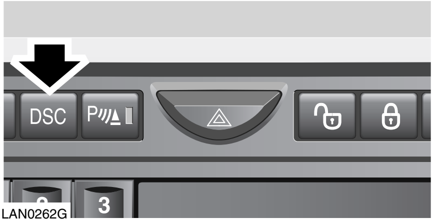
If the indicator illuminates constantly, and does not extinguish when the DSC switch is pressed, a fault has been detected in the system. Any fault will deactivate DSC. Drive with care and seek qualified assistance as soon as possible.

Deactivating DSC operation

Land Rover recommend that DSC is operational in all normal driving conditions.

In some driving conditions, to maximise traction, it may be beneficial to deactivate DSC. Such conditions include:

- To rock the vehicle out of a hollow or out of a soft surface.
- Starting in deep snow or on a loose surface.
- Driving in deep sand.
- Driving on tracks with deep longitudinal ruts.
- Driving through deep mud.



To deactivate DSC, press and briefly hold the DSC switch on the instrument panel (the DSC warning indicator will illuminate continuously). Deactivating DSC has no effect on traction control operation.

Note: *Driving with DSC deactivated, may add additional loads on the brakes - always drive with DSC switched on if possible.*

Reactivating DSC

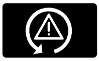
To reactivate DSC, press and briefly hold the DSC switch on the instrument panel. DSC will automatically reactivate when the engine is started.

ELECTRONIC TRACTION CONTROL (ETC)

ETC is continuously available to boost vehicle traction when one or more wheels has a tendency to spin, while others do not. It operates in conjunction with the DSC system.

If a wheel is spinning, ETC automatically brakes that wheel until it regains grip. This braking activity allows the engine power to be transmitted to the remaining wheels. Some noise may be generated when the brakes are applied.

Warning indicator



A fault with the ETC system is indicated by illumination of the amber DSC warning indicator. This could also indicate that the DSC has been manually deactivated. See **INDICATOR GROUPING, 104**.

If the indicator illuminates constantly, and does not extinguish when the DSC switch is pressed, a fault has been detected in the system. Any fault will deactivate ETC. Drive with care and seek qualified assistance as soon as possible.

HILL DESCENT CONTROL

Hill Descent Control (HDC) operates in conjunction with the anti-lock braking system to provide greater control in off-road situations particularly when descending severe gradients.

HDC is fully functional and should only be used in first and reverse gears in HIGH range and all gears in LOW range.

HDC is fully functional and should only be used in **D**, **R** and CommandShift **1** in HIGH range and in **D**, **R** and all CommandShift gears in LOW range. When in **D**, the vehicle will automatically select the most appropriate gear. The vehicle should not be driven with the HDC active in **N** neutral.

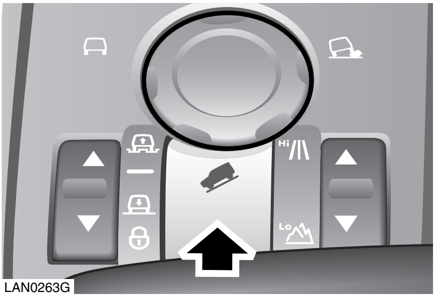
Note: *Some of the Terrain response program/range combinations will activate or deactivate HDC automatically.*

Warning indicator

HDC can be selected at speeds below 80 km/h (50 mph). The green warning indicator will illuminate continuously when vehicle speed reduces below 50 km/h (30 mph) and full HDC function is activated.

If the vehicle speed exceeds 80 km/h (50 mph), HDC will deselect and the green HDC indicator will extinguish.

If HDC is already selected and vehicle speed rises above 50 km/h (30 mph) in HIGH range, HDC function is suspended and the green HDC indicator will flash. A message will also appear in the main message centre.



To select HDC

Press and release the switch (arrowed) to select HDC. To deselect, press and release again.

The green information indicator will extinguish. If HDC is deselected when HDC is operating, the system fades out, allowing the vehicle to gradually increase in speed.

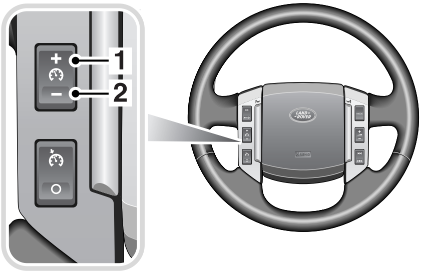
When used in LOW range, HDC controls the vehicle speed more aggressively. Use LOW range gears when steep descents are to be attempted.

Note: *HDC is automatically deselected if the vehicle starter is switched off for more than 6 hours.*

HDC in action

HDC should be used in conjunction with an appropriate gear selection.

During a hill descent, if engine braking is insufficient to control the vehicle speed, HDC automatically operates the brakes to slow the vehicle and maintain a speed relative to the selected gear range and the accelerator pedal position.



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While HDC is controlling the vehicle speed, descent speeds can be varied using the steering-wheel-mounted cruise control (1) **+** and (2) **-** switches. To reduce the descent speed, press and hold the **-** switch. The vehicle speed at the point of switch release will become the new descent speed.

To increase the descent speed, press and hold the **+** switch. The vehicle speed at the point of switch release will become the new descent speed. Alternatively, the descent speed can be adjusted by tapping the **+** or **-** switches. Each press of the switch will adjust the descent speed by approximately 0.5 km/h (0.3 mph).

Note: *Each gear has a pre-defined minimum descent speed.*

Note: *The descent speed will only increase if the gradient is sufficiently steep to cause the vehicle to accelerate as the braking effect is reduced. On a shallow slope, pressing the **+** switch may result in no speed increase.*

When driving off-road, HDC can be permanently selected to ensure that control is maintained. ABS and traction control are still fully operational and will assist if the need arises.

Note: *With HDC selected, gear changes can be carried out in the normal way.*

If the brake pedal is depressed when HDC is active, HDC is overridden and the brakes will perform as normal (a pulsation might be felt through the brake pedal). If the brake pedal is then released, HDC will recommence operating at the speed at which the brakes were released.

In extreme circumstances, the HDC system may cause brake temperatures to exceed their pre-set limits. If this occurs, **HDC TEMPORARILY NOT AVAILABLE SYSTEM COOLING** will be displayed in the message centre. HDC will then fade out and become temporarily inactive. HDC will not be available until the brakes reach an acceptable temperature, at which time the warning message will disappear from the message centre and HDC will, if required, resume operating.

If a fault is detected in the HDC system, **HDC FAULT SYSTEM NOT AVAILABLE** will appear in the display. If the fault is detected while the system is active, HDC will fade out. Do not attempt a steep descent when HDC is unavailable or use a very low gear and/or the foot brake. If a fault has been detected, consult your Land Rover Dealer/Authorised Repairer at the earliest opportunity.

HDC fade-out

HDC fade-out gradually decreases the HDC function with the effect that the rate of hill descent will increase. HDC will be disabled completely once the descent is complete.

If required (e.g. the angle of the descent levels out significantly), fade-out may be achieved deliberately by deselecting HDC while the system is operating.

HDC information indicator - GREEN

If HDC is selected and the operating conditions are met, the indicator will illuminate continuously.

If the indicator flashes while HDC is active, HDC operating conditions are not met.

AIR SUSPENSION

The air suspension system maintains the correct vehicle height by controlling the quantity of air in the vehicle's air springs.

Unless stated otherwise, height changes may only be made while the engine is running and the driver and passenger doors are closed.

When the air suspension system lifts the vehicle, it normally uses compressed air stored in its reservoir. The suspension will rise much more slowly if this reservoir is depleted due to repeated raising and lowering of the suspension.

On-road height

The normal height for the vehicle.

Off-road height

This is 55 mm (2.2 in.) higher than On-road height. It provides improved ground clearance and approach, departure and break-over angles. See **DIMENSIONS, 292**.

Off-road height can be selected at any speed up to 40 km/h (24 mph). When the system is at Off-road height, the system will automatically select On-road height if the vehicle speed exceeds 50 km/h (30 mph).

Note: *When using Terrain Response, some of its programs/range combinations will adjust suspension height automatically*

Extended mode

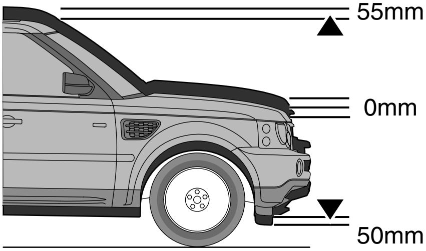
If the vehicle is grounded while at off-road height and traction control is induced, the system provides additional lift to clear the obstruction. Extended mode is activated automatically and cannot be selected manually.

Access height

WARNING

The driver should ensure that the vehicle is clear of obstacles and people before lowering the vehicle. Remember that, for example, the clearance under the floor and bumpers, and in the wheel arches, will be 105 mm (4.1 in.) less at Access height than at Off-road height.

This is 50 mm (2 in.) lower than On-road height. It provides easier entry, exit and loading of the vehicle.



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Access height can be selected at any time, but the system response will depend on the vehicle's speed:

- If the vehicle speed is greater than 20 km/h (12 mph), the suspension will wait for up to one minute for the vehicle to slow down. If the vehicle does not slow down to below 20 km/h (12 mph) within this time, the Access height request will be cancelled.
- If the vehicle speed is less than 20 km/h (12 mph), the suspension will move to a part-lowered height and remain at this height for up to one minute. If the vehicle does not slow down to 8 km/h (5 mph) within this time, the Access height request will be cancelled.

- If the vehicle speed is lower than 8 km/h (5 mph), the suspension will be lowered to Access height immediately.

Access height may be selected up to 40 seconds after the starter is turned off, provided that the driver's door has not been opened within this time.

The suspension will automatically rise from Access height when the vehicle speed exceeds 10 km/h (6 mph).

If Access height was selected directly from Off-road height, the system will return to Off-road height when the vehicle speed exceeds 10 km/h (6 mph). Otherwise the system will lift the suspension to On-road height.

High speed height

This feature lowers the suspension ride height by 20 mm if the vehicle exceeds 160 km/h (100 mph) for longer than five seconds. This action is automatic and cannot be over-ridden. Ride height will return to normal when vehicle speed remains below 130 km/h (80 mph) for 30 seconds.

Note: *NEVER exceed the speed limits.*

Crawl (locked at Access height)

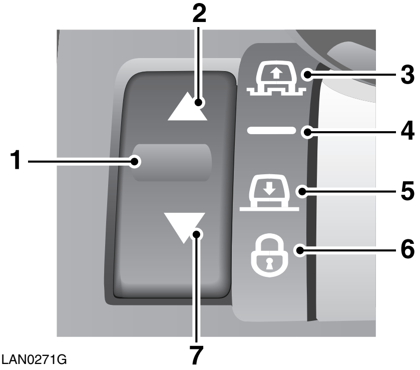
This mode enables the vehicle to be driven at low speeds at Access height to give increased roof clearance in low car parks, etc.

Crawl can be selected when the vehicle speed is below 35 km/h (22 mph), but will not be activated until vehicle speed drops below 10 km/h (6 mph). When the vehicle is in Crawl, On-road height will be selected automatically if the vehicle speed exceeds 40 km/h (24 mph).

Messages

When a message centre is fitted to the vehicle, messages relating to the air suspension system may be displayed. See **MAIN MESSAGE CENTRE, 90**

Adjusting suspension heights



1. Raise/lower switch
2. Raising indicator
3. Off-road indicator
4. On-road indicator
5. Access indicator
6. Lock indicator
7. Lowering indicator

Suspension heights

The raise/lower switch (1) is used to move up or down through the suspension heights. Indicators (3), (4) or (5) will be lit to show the height selected. A message indicating the suspension height will also be displayed in the message centre when Off-road, Access or Crawl is selected.

Indicators (2) or (7) will be lit to show the direction of movement. They extinguish when the height change movement is completed.

If a height change is requested that is not allowed, such as attempting to raise the height of the vehicle with the engine not running, indicators (2) and (7) will flash twice and a chime will sound. A message will be displayed on the message centre.

A flashing indicator (2) or (7) indicates that the system is in a waiting state or shows that it will automatically override the driver's choice if speed criteria are exceeded.

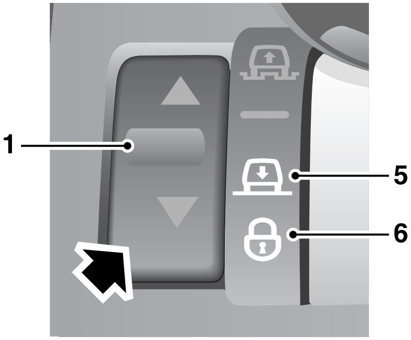
Selecting Access height

If Access height is selected above 20 km/h (12 mph), indicators (5) and (7) will flash while the system waits for the vehicle to slow down.

When the vehicle slows down to 20 km/h (12 mph), indicator (4) will extinguish as the system goes to the part-lowered height. indicator (5) will be lit and indicator (7) will continue to flash.

When the vehicle slows down to 8 km/h (5 mph), indicators (5) and (7) will be lit. When Access height is reached, indicator (7) will extinguish.

Selecting and cancelling Crawl (locked at Access height)



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When the suspension is at On-road or Access height and the vehicle speed is below 10 km/h (6 mph), press the raise/lower switch (1) in the down direction for one second. Indicators (5) and (6) will be lit to confirm the selection.

Crawl can be cancelled manually by pressing the raise/lower switch in the up direction for one second. Indicator (6) will extinguish.

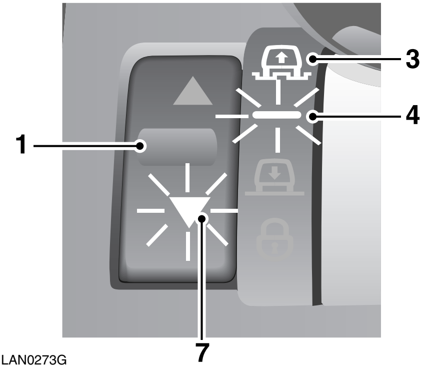
Note: *When Crawl is cancelled, the suspension will rise to On-road height if the vehicle speed is greater than 10 km/h (6 mph).*

Selecting Access height directly from Off-road height

When the suspension is at Off-road height, press switch (1) down, then press it again before indicator (7) goes out.

The system will remember to return the suspension to Off-road height automatically if the vehicle is driven above 10 km/h (6 mph).

Automatic height change warnings



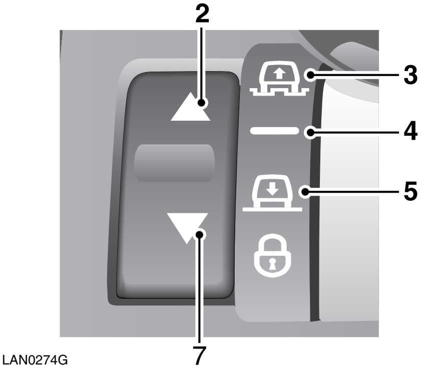
When the suspension is at Off-road height, Access or Crawl, the suspension height will change automatically when vehicle speed exceeds predetermined levels.

When the suspension is at Off-road height or Crawl, it warns the driver that the vehicle is approaching a speed threshold. A chime will sound, a message will be displayed on the message centre and the On-road indicator (4) and either (2) or (7) will flash.

The Off-road height speed warning is shown above. If the vehicle slows down, the warning will disappear.

Door open override

If a door is opened during a height change while the vehicle is at rest, the height change will be restricted.



The indicator for the target height (3, 4 or 5) will remain lit and the raising indicator (2) or the lowering indicator (7) will flash.

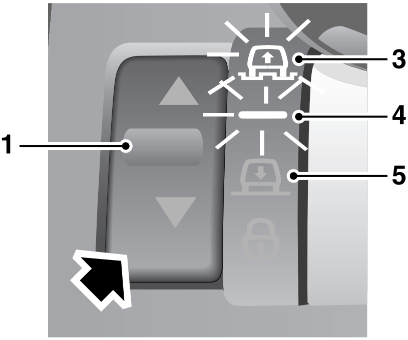
The height change will resume if all of the doors are closed within 90 seconds.

If the doors are not closed within this time, the raising indicator (2) or the lowering indicator (7) will extinguish and the indicators showing the heights above and below the current position will be illuminated.

Selecting a new height using the raise/lower switch (1), or driving off will reset the system.

Extended mode

If the vehicle is grounded and traction control is induced, the system raises the vehicle by 35 mm (1.4 in.) to clear the obstruction. Extended mode is activated automatically and cannot be selected manually.



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When Extended mode is activated, indicator (3) will flash if the suspension is above Off-road height. Indicators (3) and (4) will flash if the suspension is between Off-road and On-road heights. Indicators (4) and (5) will flash if the suspension is between On-road and Access heights. A message will be displayed on the message centre.

To exit Extended mode, either press the raise/lower switch (1) briefly up or down, or drive the vehicle at a speed greater than 5 km/h (3 mph) for 30 seconds.

Additional lift whilst in Extended mode

When Extended Mode has been invoked and the automatic lifting of the vehicle has been completed, the driver can request an additional lift in order to clear the obstacle. This can be particularly useful when Extended Mode has been invoked on soft surfaces.

To request additional lifting wait for the raising indicator (2) to extinguish, then press and hold the switch (1) in the up direction for 3 seconds whilst ALSO pressing the brake pedal. A chime will sound to confirm that the request has been accepted. The raising indicator (2) will be illuminated while the vehicle is being lifted.

Suspension freeze

If the system is attempting to change the suspension height and it detects that the suspension is prevented from moving, the system will freeze all movements.

This can be caused by attempting to lower the vehicle onto an obstacle or attempting to lift the vehicle against an obstruction.

The symbols behave in the same way as described in Extended mode and the same message will be displayed on the message centre. As in Extended mode, to exit this freeze state, either press the switch (1) up or down, or drive the vehicle at a speed greater than 20 km/h (12 mph).

Remote operation

WARNING

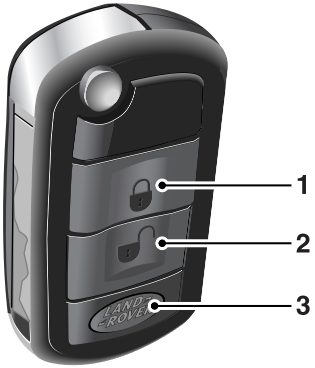
The remote control will operate effectively from inside the vehicle. It is therefore important to keep it out of reach of children at all times.

When operating the remote control from inside the passenger compartment, ensure that the underside of the vehicle has been checked for obstructions before lowering, and that a responsible adult has been posted outside the vehicle to supervise the lowering process.

Care should be taken with all suspension height changes when a trailer is attached to the vehicle.

The remote control is programmable to give a range of functions. See **REMOTE CONTROL PROGRAMMING, 41**. If the vehicle's remote control has been configured to operate the air suspension, height may be controlled remotely to assist in loading the vehicle or attaching a trailer.

After programming, to change the suspension height via the remote control, remove the starter key, turn on the hazard warning lamps and close all doors. Remote operation is not possible unless this is done.



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To raise the vehicle, press and hold the Land Rover button (3) and Lock button (1).

To lower the vehicle, press and hold the Land Rover button (3) and Unlock button (2).

If any button is released during the raising or lowering of the suspension, all movement of the suspension will stop. It will restart once the buttons are pressed again.

The height will initially change slowly but, after three seconds, the speed will increase. While the height is changing, a indicator on the raise/lower switch will be lit according to the direction of movement.

If the starting height is above or below On-road height, movement will stop when On-road height is reached. Further movement can be achieved by releasing the buttons and pressing them again.

Normal height control will resume when the vehicle is driven away.

Note: *Remote operation is disabled when the vehicle is moving.*

DYNAMIC RESPONSE

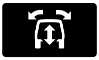
Caution: If the warning lamp illuminates RED a system fault has occurred that may result in serious damage to vehicle components. Stop the vehicle and switch off the engine as soon as safety permits. Seek qualified assistance immediately.

Dynamic Response is a patented feature unique to Land Rover. The system is designed to eliminate vehicle body roll at low cornering speeds and reduce body roll at higher cornering speeds, while maintaining a soft, car-like, suspension for straight line travelling. On uneven surfaces and rough tracks, the Dynamic Response system will adjust the suspension according to the vehicle speed and roughness of the surface to provide improved passenger comfort.

At very low speeds the roll bars are effectively decoupled, giving significant benefits in off-road axle articulation and improved traction.

The system is entirely automatic in operation and cannot be influenced by the driver in any way. However, the functionality of the warning indicator in the instrument panel is very important and drivers should be aware of the following:

Warning indicator



The warning indicator illuminates RED when the starter switch is turned to position **II**. After two seconds, the RED illumination changes to AMBER and, after a further two seconds, the indicator extinguishes. This process is a system check that takes place every time the vehicle is used. Provided the Dynamic Response system and air suspension system are operating correctly, illumination will not occur at any other time.

If illumination occurs while driving, a fault with the system is indicated, as follows:

- **If the indicator shows RED** (a flashing red indicator, which changes to constant illumination after two minutes, and is accompanied by a warning chime):

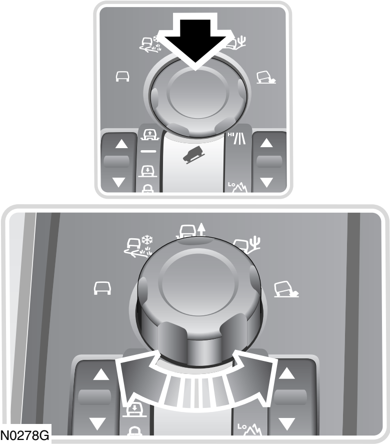
  This indicates a system fault that may result in serious damage to vehicle components and reduced Dynamic Response performance. You must stop the vehicle as soon as safety permits and switch off the engine. DO NOT CONTINUE DRIVING! Seek qualified assistance immediately

- **If the indicator shows AMBER** (constant illumination):

  This indicates a system fault that will result in reduced Dynamic Response performance, but will not leave the vehicle in a dangerous condition. You may continue driving, but reduce speed, take additional care, and consult a Land Rover Dealer/Authorised Repairer at the earliest opportunity.

TERRAIN RESPONSE™

The Terrain Response system is permanently active, continuously providing benefits in traction and driveability. These can be further enhanced for specific on and off-road driving conditions by the selection of special programs, using one simple driver interface.



To raise the rotary knob, press down on it lightly and release. To lower the rotary knob, press down until it clicks.

This interface allows the driver to tell the vehicle what sort of terrain is to be driven over. Based on the selected special program, the system optimises the vehicle set-up for the prevailing conditions, providing the optimum in traction, driveability and vehicle composure.

The Terrain Response special programs, automatically bring in changes in vehicle drive and suspension systems, that have until now been only individually and manually controllable by the driver.

The suspension and drive systems comprising Terrain Response are:

- Engine management.
- Gearbox management.
- Intelligent differential control.
- Dynamic stability, traction control and HDC systems.
- Air suspension.

The system will provide a variable accelerator response, ranging from very cautious for slippery conditions (where a large pedal movement has only a small effect on engine power) to very responsive, e.g. for sand, where engine power is allowed to rise more quickly.

This further extends the breadth of off-road capability of Land Rover vehicles. In addition, Terrain Response offers control of systems that have previously not been manually controllable.

***Note:** Since each Terrain Response special program uses the optimum settings of each drive component - accelerator response, suspension, transmission, etc. - relative to the terrain being driven over, it follows that changing from one special program to another brings in a different set of criteria.*

This means that, for instance, the engine revs produced by the current accelerator position might increase or decrease slightly in the new program, or the suspension could change height. The changes are not dramatic, but are noticeable.

To obtain the maximum benefits from the system, it is suggested that you first try it out in circumstances where any distraction will not affect other road users.

Terrain Response is designed to benefit the driver, regardless of the level of off-road driving experience. The enhanced traction system, with the control of many system parameters through one simple driver input, coupled with specific advice from the message centre, will aid drivers with limited off-road experience. Additionally, the system can back-up the skills of experienced drivers, who will also benefit from the wider performance envelope available through the special programs.

Using Terrain Response

WARNING

When towing, the automatic vehicle height rise associated with using the system in low range, will be automatically prevented by the system. This will be indicated by a message in the message centre. However, this function relies on the fitting of a Land-Rover approved towing electrical socket. Failure to fit a Land-Rover approved towing electrical socket or to follow these guidelines may lead to the vehicle being raised to off-road height even with a trailer attached.

The Terrain Response system is always active and can not be switched off. When the vehicle is started, the system will normally start in its General program. Using the correct special program, will provide benefits in how the vehicle can be driven over different surfaces or terrains. It is recommended that a special program be engaged whenever driving conditions could become difficult.

Depending on the terrain, it may be beneficial for the automatic transmission to change gear under different speed and load conditions. Each special program will provide the most appropriate gear-shift points for the terrain, including the most appropriate gear to set off in (i.e., second, HIGH range, or third, LOW range, in Grass-Gravel-Snow or first, LOW range, when in Rock Crawl).

The amount of slip allowed in the electronically controlled differentials will be optimised continuously, both from the point of view of traction and vehicle stability.

Depending on the Terrain Response program selected, the control of the differentials will vary to provide the optimum settings.

Note: *Special programs should be engaged pro-actively - before starting to drive in particular conditions. They are not intended as a means of extracting a vehicle that has been driven into difficulties.*

The system has been designed to instil confidence regarding choice of special program, despite the fact that conditions associated with each program are distinctly different. However, the vehicle will be very capable under all circumstances, even when no special program is selected, as some sub-systems will re-act to the conditions where possible. In case of any uncertainties about the most appropriate special program selection, it will be best to leave the system in Terrain Response General program until terrain conditions become more distinct and a program choice can be made with more confidence.

The system is of particular use when driving off-road, but, even here, it should be used pro-actively and not be used as a means of retrieving control.

If a Terrain Response special program has been selected, then the transmission can be left in **D**. If descending a slippery slope, CommandShift **1** or **2** should be considered.

Driver over-ride options

WARNING

This height increase will start regardless of whether the vehicle is moving or not.

All systems will be set to optimum parameters for the terrain conditions reflected in the choice of control program. Two of the systems controlled by Terrain Response may also be operated independently by the driver:

- Air suspension.
- Hill Descent Control.

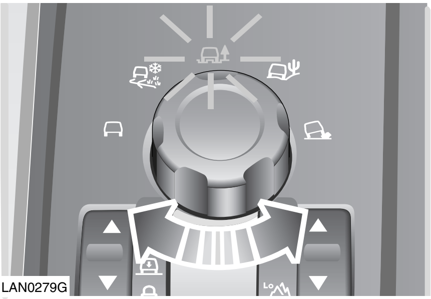
In some special programs, the Terrain Response system will switch on HDC and in LOW range the system will automatically move the suspension to Off-road height.

Both the HDC and ride height automatic selections can be cancelled by the driver at any time. Conversely, if HDC or a specific ride height has not been automatically selected by the system, the driver can always choose to operate it as normal at any time.

Whether the HDC or ride height options are being brought in automatically by the system, or manually by the driver, the changes of state will be confirmed through the message display and by the individual system information indicators. Use of the system in the special programs, particularly in low range, may prompt some driving advice and warnings as well as additional information to be displayed on the message centre.

Note: *Gear selection can be overridden, by using the CommandShift function on the gearbox to lock the vehicle in a particular gear.*

Operation



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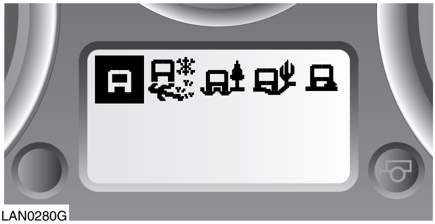
A rotary knob just behind the gear lever is rotated to select the required special program. When the selector reaches either end of the selection range, it can be turned further, but doing so has no effect.

In addition to the Terrain Response General setting, four special programs are available:

- Grass/gravel/snow (also includes ice).
- Mud/ruts.
- Sand.
- Rock Crawl.

When the starter switch is turned on, the graphics around the control knob are illuminated, with the active program highlighted in amber. The brightness of the graphics night illumination is controlled as part of the instrument illumination control; the brightness of the amber lighting is high or low, depending on the use of the headlamps.

If a special program is active, the special program symbol will also be displayed on the message centre.



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If the starter switch is turned off when any special program is selected, then the system will remember for approximately six hours which program was selected, and return to that program once the starter switch is turned back on.

The system indicates, via the message centre that the previously selected special program is still selected. After more than six hours, the system will automatically revert back to the General program (special programs off).

Terrain Response general

When the Terrain Response special programs are off, the system will be in its General program. This will be indicated by the above symbol being displayed briefly on the message centre. Sub-systems will adapt to the prevailing terrain conditions and select control settings based on the conditions sensed.

This program setting is compatible with all on and off-road terrain conditions. Normal conditions in which it is not necessary to select a specific program include driving on surfaces that closely match a hard road surface. Dry cobbles, Tarmac or even wooden planks are all included in the scope which consists of hard supportive surfaces with no loose coating of water, dust or similar material.

It is recommended that a special program be de-selected, once the specific conditions for its use no longer prevail. This is done by turning the selector knob back to the General program position.

When a special program is de-selected, all vehicle systems will be returned to their normal control settings. The one exception is HDC, which will remain active if it was manually selected previously. Also, as a precaution, the vehicle will change from raised to Normal ride height only when moving.

Grass-Gravel-Snow

Use this program for surfaces where the underlying base is fairly firm, but a coating of other material gives a tendency to slip. The coating can be water, slime, grass, snow or loose gravel, shale or pebbles, or even a thin coating of sand. This program should also be selected in icy conditions.

In this special program the Terrain Response systems will select settings to give the best traction, handling and driveability for predominantly slippery conditions. Hill Descent Control will be engaged automatically in low range, but can be manually de-selected. See **HILL DESCENT CONTROL, 181**.

In slippery conditions, it is often beneficial to start off in a higher gear than usual, for example, CommandShift **2** in HIGH range or CommandShift **3** in LOW range.

For use of the vehicle with snow chains fitted, see **SNOW CHAINS, 241**.

Note: *When in deep snow, if the vehicle is struggling for forward traction or is stuck, then switching off Dynamic Stability Control (DSC) may be an advantage. If DSC is switched off, then it must be switched back on as soon as the difficulty is overcome.*

Mud-Ruts

Use this program when traversing ground that is not only muddy or deeply rutted, but possibly soft and uneven to the point of demanding maximum axle displacement. This unevenness can also be that brought about by sizeable wooden debris in the form of roots, brushwood, small logs, etc.

This acts like the previous program, except that it selects settings for the individual systems that optimise traction and driveability for muddy/rutted driving conditions, with driver over-ride options as before. The program is available in HIGH and LOW range, but LOW range is recommended.

It is anticipated that this program will usually be used in low range. If not, the driver will be prompted to consider selecting low range. If the Mud-Ruts program and low range are selected together, the vehicle ride height will be raised automatically.

Sand

Use this program to drive on soft and predominantly dry, yielding sandy ground, such as dry beaches, dunes and sand deserts. Also consider using this program for deep gravel.

The Sand special program uses the control settings and software logic best suited to driving on sand, with the driver-override option as before.

In instances where the sand is damp or wet and soggy, the conditions are better addressed by the use of mud/ruts special program.

Where the sand is extremely soft and dry and of a depth that allows the wheels to sink well into it, there may be additional benefit in switching off the Dynamic Stability Control. See **Deactivating DSC operation, 179**.

Rock Crawl

Caution: Selection of a wholly inappropriate special program for the prevailing terrain conditions, will not endanger the driver or immediately damage the vehicle. However, if continued, such an action will impair vehicle response to those conditions and will reduce the durability of the suspension and drive systems.

Use this program to cross wet or dry, solid, unyielding ground, such as clusters of boulders, which demands high levels of road-wheel displacement and careful vehicle control. This program would also be used for crossing river beds strewn with large rock features submerged below water.

Unlike the other options, Rock Crawl is only selectable in LOW range. If selection is attempted in HIGH range, the special program selection will NOT be accepted and the driver will be prompted to select LOW range. This special program will utilise system control settings to optimise the vehicle suspension and traction system for the conditions, which are likely to require extreme suspension articulation and good low-speed control.

When a special program requires increased air suspension height, the system will automatically select it, unless it suspects that a trailer is attached because an electric load is seen on the trailer socket.

A message will be displayed on the message centre.

Inappropriate special program selection

If an inappropriate special program is attempted to be selected - such as choosing Rock Crawl while in HIGH range - the symbol of that program will flash amber, an audio warning will sound, and the message centre will advise that the chosen special program is unavailable and will suggest corrective action to be taken.

If, after 60 seconds, the requirements have not been met, the warnings will cease and the message centre will show which program remains active.

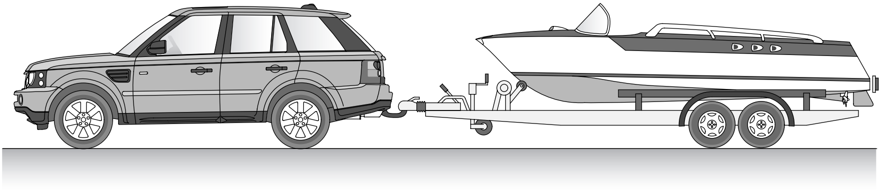
Should the system become partly inoperable for any reason, it may not be possible to select certain special programs and a warning will be given when selection of an affected program is attempted. If the system should become totally inoperable, all of the control program symbols will be switched off and the message centre will display a message.

The air suspension system provides an automatic levelling function. See **AIR SUSPENSION, 184**. In circumstances where the system is used in LOW range, it is most likely that mobility and vehicle composure would benefit from increased ground clearance.

System messages

Messages relating to the Terrain Response system are displayed on the message centre.

For an explanation of those messages, see **MAIN MESSAGE CENTRE, 90**.



LAN0282G

TOWING

WARNING

To preserve vehicle handling and stability, only fit towing accessories that have been designed and approved by Land Rover.

DO NOT use lashing eyes or vehicle recovery towing eyes to tow a trailer. Use of the towing eyes for purposes other than their designed intention could result in damage or injury.

Caution: An equalising or other form of weight distributing hitch should NOT be used with your vehicle.

The torque ranges of Land Rover engines allow maximum-weight loads to be pulled smoothly from standstill and reduce gear changing on hills or rough terrain.

It is the driver's responsibility to ensure that the towing vehicle and trailer/caravan are loaded and balanced, so that the combination is stable when in motion. When preparing your vehicle for towing, pay attention to any instructions provided by the trailer/caravan manufacturer as well as to the information that follows.

Balancing the combination

To ensure optimum stability, it is essential that the trailer adopts a level aspect. In other words, the trailer must be level with the ground, with the towing hitch and trailer drawbar set at the same height (note the illustration above).

This is particularly important when towing twin axle trailers!

- The trailer should be level with the ground when loaded.
- The height of the drawbar hitch point should be set so that the trailer is level when connected to the loaded vehicle.

Points to remember:

- When calculating the laden weight of the trailer, remember to include the weight of the trailer PLUS the load.
- The recommended trailer nose weight, plus the combined weight of the vehicle's load-carrying area and rear seat passengers, must never exceed the specified maximum rear axle load. See **Vehicle Weights, 291**.
- Before balancing the combination, ensure that:

  All doors are closed.

  The engine is running.

  On-road ride height is selected.

  This ensures that the towing hitch is at the correct height.
- Where the load can be divided between trailer and tow vehicle, loading more weight into the vehicle will generally improve the stability of the combination.
- Towing regulations vary from country to country. Always ensure national regulations governing towing weights and speed limits are observed (refer to the relevant national motoring organisation for information). The vehicle's maximum permissible towed weight refers to its design limitations and NOT to any specific territorial restriction. See **Vehicle Weights, 291**.

***Note:** When towing do not exceed 100 km/h (60 mph), or 80 km/h (50 mph) when the temporary spare wheel is in use. See **WHEELS AND TYRES, 290**.*

Gear range selection

To avoid overheating the gearbox, it is not advisable to tow heavy trailer loads at speeds of less than 32 km/h (21 mph) using the transfer gearbox in HIGH range. Select LOW range instead.

Vehicle weights

WARNING

In the interest of safety, the gross vehicle weight, maximum rear axle weight, maximum trailer weight and tow hitch load (nose weight) must not be exceeded.

The nose weight, plus the combined weight of the vehicle's load carrying area and rear seat passengers, must never exceed the specified maximum rear axle load. See Vehicle Weights, 291.

Exceeding allowable vehicle and axle loads will increase the risk of tyre and suspension failure, increase stopping distance and adversely affect vehicle handling and stability. This may result in a crash or roll-over.

When loading a vehicle to its maximum weight (gross vehicle weight), ensure that axle loading does not exceed the permitted maximum values. It is the driver's responsibility to limit the vehicle load in such a way, that neither the maximum axle loads, nor the gross vehicle weight, are exceeded. The most accurate method of determining load distribution is by using a public weighbridge.

Nose weight must be the greater of 50 kg or 7% of the actual trailer laden weight, up to the maximum tow hitch load. Nose weight can be measured using a proprietary brand of nose weight indicator.

Trailer socket

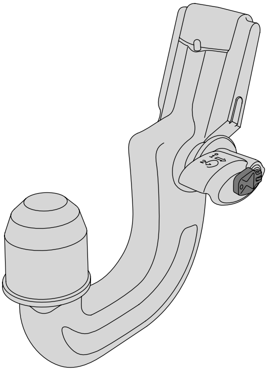
The trailer socket is located alongside the rear towing eye, behind the rear bumper cover. See **Removing the rear cover, 207**.

The vehicle's electrical system is configured to support all towing requirements and the electrical socket fitted complies with legal requirements for the specific territory in which the vehicle was sold.

All towing circuits are independently fused in a satellite fusebox located in the lower loadspace trim panel. See **Tow hitch fuses, 270**.

ESSENTIAL TOWING CHECKS	
Tyre pressures:	Increase rear pressures of towing vehicle to those for Maximum gross vehicle weight conditions. See **WHEELS AND TYRES, 290**. Ensure trailer/caravan tyres are at recommended pressures.
Nose weight:	If the vehicle is loaded to the Gross Vehicle Weight (GVW), the nose weight is limited to 150 kg (330 lb). If a greater nose weight is necessary (up to 250 kg (550 lb) maximum), vehicle load should be reduced to ensure the GVW and rear axle weights are not exceeded. See **Vehicle Weights, 291**.
Breakaway cable or secondary coupling	A breakaway cable or secondary coupling MUST be attached. If the trailer/caravan is fitted with brakes, it is usual for an attached breakaway cable to operate the brakes in the event of the coupling becoming detached. See your trailer manufacturer's literature. If your trailer does not have a breakaway cable, a secondary coupling must be attached. Use a suitable point on the towing bracket to securely attach the coupling. It is not advisable to loop cables or couplings around the neck of the tow ball as they could slide off.

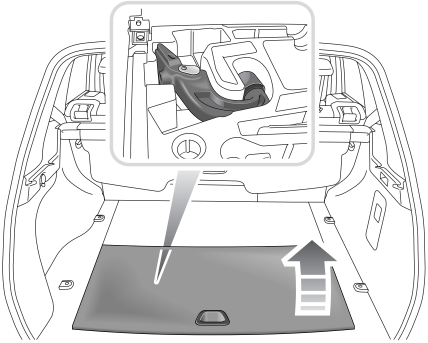
TOW BAR



LAN0284G

Your vehicle is fitted with a towing housing which will accept a detachable tow bar.

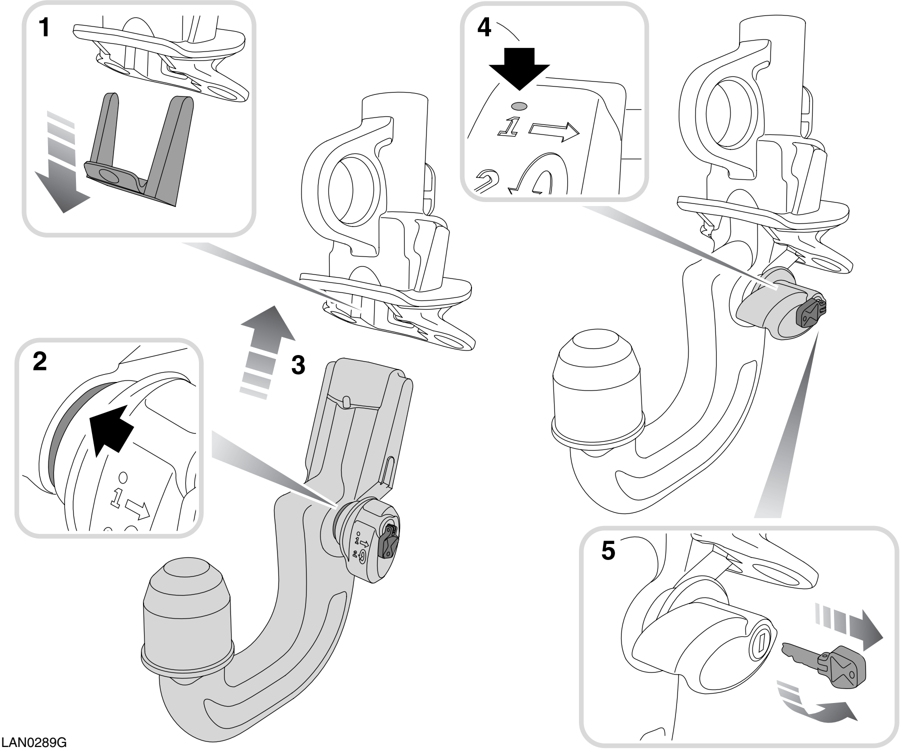
Detachable tow bar stowage



LAN0287G

The tow bar is stowed under an access hatch in the rear loadspace floor.

Fitting the detachable tow bar



WARNING

The tow bar is heavy. Care must be taken when handling it.

WARNING

When handling the tow bar, hold the bottom of the component. Locking into position occurs automatically and causes the locking lever to rotate under spring pressure.

1. Remove the protective cover from the tow bar mounting.

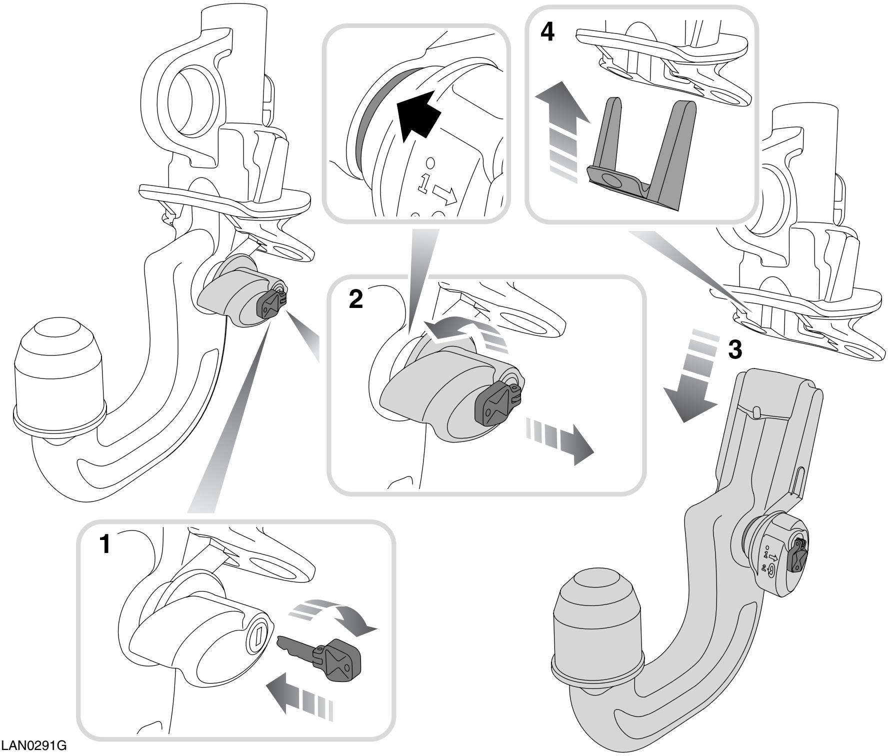
   Note: *The protective cover should be stowed in the tow bar stowage area, while the tow bar is installed.*

2. The tow bar can only be installed when the green locking lever is in the unlocked position.
3. Insert the tow bar into the mounting and push firmly upwards until the tow bar locks into position.
4. The red marker should be completely covered by the green locking lever.
5. A key is provided to prevent theft from the vehicle. Turn the key anticlockwise to lock the tow bar. Remove the key and store in a safe place.

The tow bar must be locked in position before towing. The tow bar can only be locked if it is installed correctly into the tow bar mounting.

It is advised that the tow bar be removed and stored within the vehicle stowage when not in use.

Removing the tow bar



WARNING

The tow bar is heavy. Care must be taken when handling it.

1. Insert the key and turn it clockwise to unlock the tow bar.
2. To remove the tow bar, pull the handle outwards and rotate the handle anticlockwise until a click is heard. The marker on the handle should show red.
3. Carefully lower the tow bar and place it in its stowage area and fully secure it.
4. Replace the protective towing cover in the tow bar mounting. Press the bottom of the cover to fix it in position.

TOWING EYES

WARNING

The towing eyes at the front and rear of the vehicle are designed for on-road vehicle recovery purposes only and must NOT be used to tow a trailer or caravan.

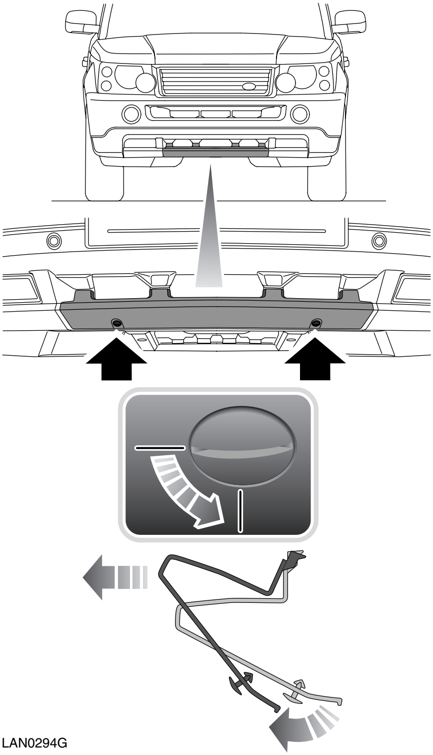
Use of the towing eyes for purposes other than their designed intention could result in damage or injury.

Front towing eye

A front towing eye, set behind a removable panel in the lower front bumper, is provided at the front of the vehicle for on-road recovery.

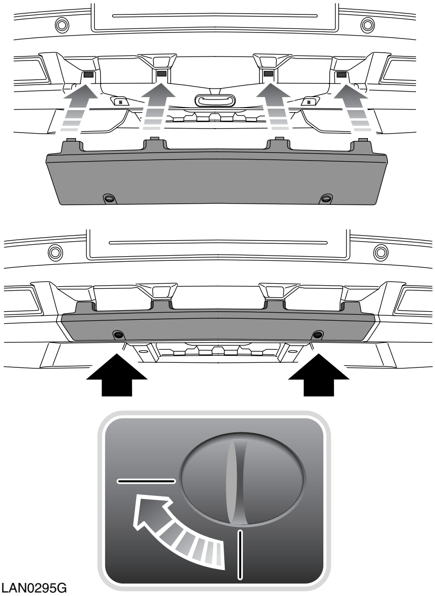
Before driving off-road, remove the panel from the lower front bumper, as a precaution against accidental loss.

Removing the panel



Rotate each of the fasteners through a quarter turn with a coin (or something similar), to loosen the panel. Rotate the lower edge forwards then pull the panel to release the four top edge hooks from their locating holes.

Refitting the panel

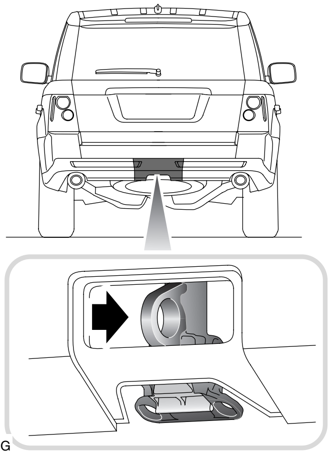


LAN0295G

Offer up the panel to the bumper and ensure that the four hooks on the top edge engage with the holes in the bumper. Rotate the lower edge backwards ensuring that the lower edge is located in the bumper channel.

Tighten the fasteners by turning each clockwise through a quarter turn.

Rear towing eye

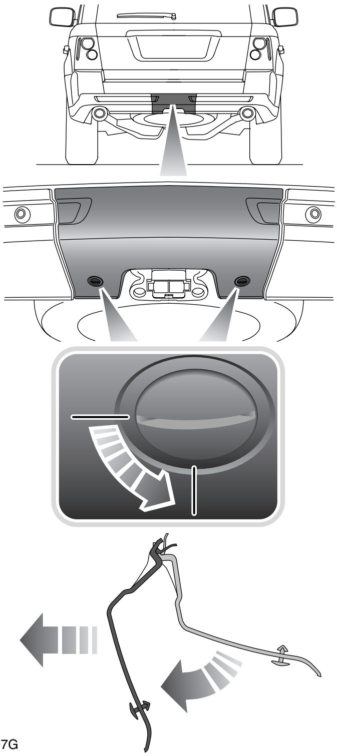


LAN0299G

The towing eye provided at the rear of the vehicle can be used for towing your vehicle or towing another vehicle in recovery situations.

Towing Eyes

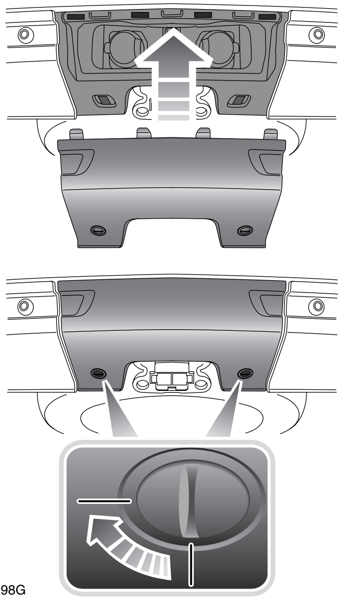
Removing the rear cover



LAN0297G

Rotate each of the fasteners through a quarter turn with a coin (or something similar) to release the lower edge. The cover can then be rotated to release the hooks at the top.

Refitting the rear cover



LAN0298G

Offer up the cover and ensure that the four hooks on the top edge engage with the holes in the bumper.

Tighten the fasteners by turning each clockwise through a quarter turn.

TOWING FOR RECOVERY

Caution: Under no circumstances must your vehicle be towed with only two wheels in contact with the ground. It must be towed with all four wheels on the ground, recovered onto a trailer, or have a combined wheel lift and towing dolly arrangement to lift it clear of the ground.

Most vehicle recovery specialists will load your vehicle onto a trailer - this is the recommended method. However, if it is necessary to recover the vehicle by towing with all four wheels on the ground, use the following procedure:

Towing the vehicle on four wheels

WARNING

DO NOT remove the key or turn the starter switch to position 0 while the vehicle is in motion.

Without the engine running, the brake servo and power steering pump cannot provide assistance; greater effort will therefore be required to operate the brake pedal and turn the steering wheel. Longer stopping distances will also be experienced.

Caution: ALWAYS adhere to the following procedure when towing the vehicle with all four wheels on the ground. Failure to do so could result in unintended vehicle movement or unanticipated vehicle conditions.

When preparing to tow the vehicle on four wheels, it is essential that N is selected on the transmission. Before selecting N, ensure that the parkbrake is applied and properly secured.

Note: *Your vehicle has permanent four-wheel drive and is fitted with a steering lock. The following procedure must be carried out carefully to prevent damage to the vehicle.*

1. Secure the towing attachment from the recovery vehicle to the front towing eye. See **TOWING EYES, 205**.
2. With the parkbrake applied, insert the starter key and turn it to position **II**.
3. Apply the foot brake and place the gear selector lever into the **N** (neutral) position.
4. Turn the starter switch to position **I**. Do not turn the starter switch to position **0**.
5. If required, the starter switch may be turned to position **II**, to operate the brake lamps and direction indicators.

   Note: *Leaving the starter switch in position* ***I*** *or* ***II*** *for extended periods may drain the vehicle battery.*
6. Release the parkbrake before towing the vehicle.

If the above conditions are met, the vehicle may only be towed for a distance of 50 km (30 miles) at a maximum speed of 50 km/h (30 mph).

If the gearbox cannot be set in **N**, the vehicle must not be towed under any circumstances.

If the rear electronic differential has failed while locked, the vehicle must not be towed under any circumstances.

After towing on four wheels

After towing, perform the following steps:

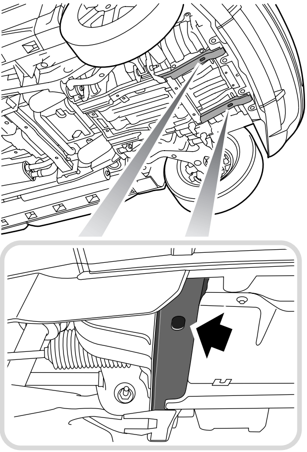
1. Apply the parkbrake.
2. Turn the starter switch to position **II** and apply the foot brake.
3. Place the auto selector lever in the Park position.
4. Turn the starter switch to position **0**.
5. Remove the towing attachment and replace the panel in the front bumper.

RECOVERY ON A TRAILER

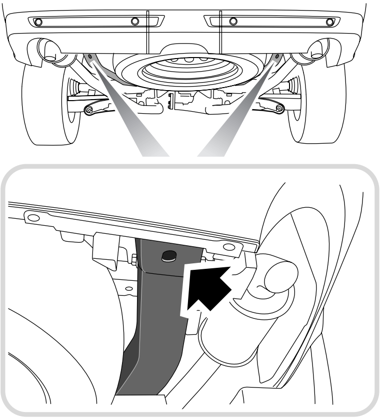
Caution: Once the vehicle is loaded onto the trailer and if the vehicle electronics are operational, the air suspension must be set to Access height. This should be done BEFORE securing the vehicle to the trailer.

Recovery by trailer is the recommended method. Most vehicle recovery specialists will load the vehicle onto a trailer or have a combined wheel lift and dolly arrangement, to lift it clear of the ground.

Lashing eyes



Front lashing eyes



Rear lashing eyes

Pairs of lashing eyes are fixed to the underside of the vehicle - at the front (to the rear of the front wheels) and at the rear (either side of the towbar attachment bracket). DO NOT secure lashing hooks or trailer fixings to any other part of the vehicle.

Note: *The front and rear lashing eyes are for lashing only and must NOT be used for towing.*

ROOF RACKS

WARNING

The MAXIMUM load for approved roof rack systems is 75 kg (165 lb). This weight includes the mass of the roof rack system.

A loaded roof rack can reduce the stability of the vehicle, particularly when cornering and encountering cross winds.

Check to ensure the roof rack and load are secure after 50 km (30 miles) of any journey.

Driving off-road with a loaded roof rack is not recommended. If it is necessary to stow luggage on the roof rack while driving off-road, all loads must be removed before traversing side slopes.

A range of roof rack systems are available as Land Rover approved accessories. For further information about roof rack systems approved for use with your vehicle and advice as to which system would suit your requirements best, please consult your Land Rover Dealer/ Authorised Repairer.

Always observe the following precautions:

- Only fit a roof rack that have been designed for your vehicle. If in doubt, consult your Land Rover Dealer/Authorised Repairer.
- All loads should be evenly distributed, side to side, with any weight bias towards the front of the roof rack system.
- Ensure all loads are secured within the periphery of the roof rack system.

HEADLAMPS

WARNING

Bi-Xenon lamp units operate at a high temperature. If they have recently been in use, allow sufficient time for them to cool down before touching them.

Used Xenon lamp units contain mercury, which is hazardous and can be injurious to health.

The Xenon system generates up to 28 000 volts and contact with this voltage could lead to fatality. Ensure that the headlamps are switched off and turn off the starter switch, before working on the system.

Replacement or maintenance of Xenon lamps should be carried out only be qualified personnel.

There are three types of headlamp systems:

- Halogen high/low beam main lamp with a fill-in high beam halogen lamp alongside.
- Bi-Xenon high/low beam main lamps with a fill-in high beam halogen lamp alongside.
- An Adaptive Front Lighting System (AFS).

Bi-Xenon headlamps

Bi-Xenon units use a Xenon bulb for both high beam and low beam, while a halogen bulb is used for high-beam fill-in. A shutter, operated by a solenoid, changes the direction of the Xenon light beam, to give either low or high beam.

The operational life of a Bi-Xenon lamp is significantly longer than that of a conventional or halogen bulb.

♻ *Seek advice about the proper disposal of Bi-Xenon lamp units, from a Land Rover dealer or your local authority.*

Adaptive Front lighting System (AFS)

AFS is a new lighting system designed to give the driver improved visibility. It has two main components: A swivelling headlamp unit and a static bending lamp, with a beam set to 45 degrees from the centre line of the vehicle.

The headlamp units can swivel left or right, to improve light spread on bends in the road and they operate throughout the vehicle speed range. They also react to braking or acceleration in the vertical plane, to maximise headlamp performance. Additional lighting is supplied by the static bending lamps, at speeds between 30 km/h (18 mph) and 70 km/h (44 mph). If the higher speed is exceeded, the static bending lamps will only reactivate when speed reduces to 60 km/h (37 mph). These headlamps broaden the beam of the headlamps when cornering.

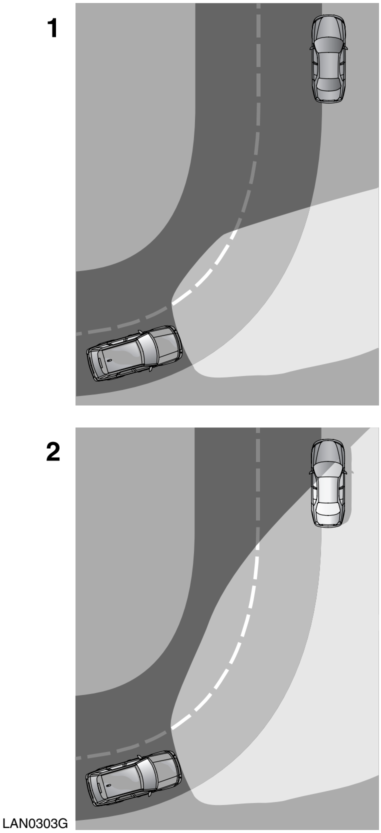
The system takes inputs from the vehicle's road speed and steering angle, to determine the amount of horizontal swivel. The amount of swivel is highest at low manoeuvring speeds and reduces as speed increases.

Static bending lamps operate when the system detects a steering wheel rotation of 70 degrees or more.

If reverse gear is selected, the lamps return to the central position and the unit's swivelling capability is disabled.

The AFS advantage

1. Shows the light spread of a vehicle not fitted with AFS.
2. Shows the light spread of a vehicle fitted with AFS.



Static bending lamps

These lamps broaden the beam of the headlamps when cornering during normal night driving.

Additional lighting comes from the static bending lamps which have a beam set to 45 degrees outward from the centre line of the vehicle.

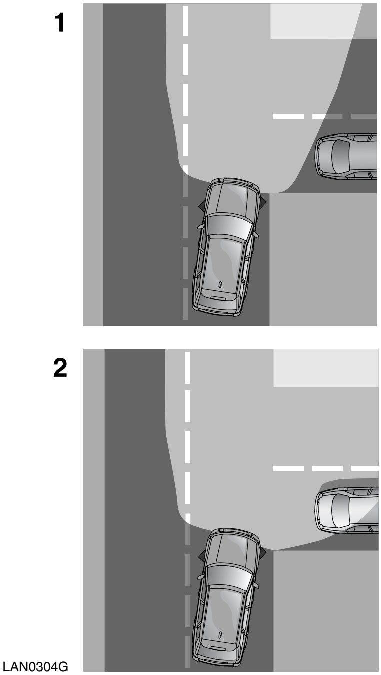
The system switches on the lamp if it has received an input from the direction indicator. As the system is ignition-based, the lamps will not stay on, even if the vehicle is parked with the direction indicator lever in the operating position.

Only the lamp on the same side as the operating direction indicator comes on.

Operating the direction indicators will also activate the relevant lamp.

If reverse gear is selected, the lamps return to the central position and the unit's swivelling capability is disabled unless the direction indicators are operating.

1. Shows the light spread of a vehicle not fitted with AFS.
2. Shows the light spread of a vehicle fitted with AFS.



ROUTINE MAINTENANCE

Regular systematic maintenance is the key to ensuring the continued reliability and efficiency of your vehicle.

Maintenance is the owner's responsibility and you must ensure that owner maintenance operations, oil services, inspections and brake fluid and coolant changes are carried out when required and according to the manufacturer's recommendations.

The routine maintenance requirements for your vehicle are shown in the Service Portfolio book. Most of this necessary workshop maintenance requires specialised knowledge and equipment, and should preferably be entrusted to a Land Rover Dealer/Authorised Repairer.

Service Portfolio

The Service Portfolio book includes a Service Record section, which enables a record to be kept of all the oil services and inspections that are carried out on the vehicle. This section of the book also provides a facility for the Land Rover Dealer/Authorised Repairer to record brake fluid changes.

Ensure your Land Rover Dealer/Authorised Repairer signs and stamps the book after each oil service and inspection.

OWNER MAINTENANCE

Caution: Any significant or sudden drop in fluid levels, or uneven tyre wear, should be reported to a Land Rover Dealer/Authorised Repairer without delay.

In addition to the routine services and inspections referred to previously, a number of simple checks must be carried out more frequently. You can carry out these checks yourself and advice is given on the pages that follow.

Daily checks

- Operation of lamps, horn, direction indicators, wipers, washers and warning indicators.
- Operation of seat belts and brakes.
- Look for fluid deposits underneath the vehicle that might indicate a leak.

Weekly checks

- Engine oil level.

  Note: *The engine oil level should be checked more frequently if the vehicle is driven for prolonged periods at high speeds.*
- Brake fluid level.
- Power steering fluid level.
- Dynamic Response fluid level.
- Screen washer fluid level.
- Tyre pressures and condition.
- Operate air conditioning.

All fluid specifications and capacities are shown in **LUBRICANTS AND FLUIDS, 286**.

SAFETY IN THE GARAGE

WARNING

Under no circumstances should any part of the fuel system be dismantled or replaced by anyone other than a suitably qualified motor vehicle technician. Failure to comply with this instruction may result in fuel spillage with a consequent serious risk of fire.

- **DO NOT work beneath the vehicle with the wheel changing jack as the only means of support.**
- **Ensure sparks and naked lights are kept away from the engine compartment.**
- **Wear protective clothing, including, where practicable, gloves made from an impervious material.**
- **Remove metal wrist bands and jewellery before working in the engine compartment.**
- **DO NOT allow tools or metal parts of the vehicle to make contact with the battery leads or terminals.**
- **NEVER leave the engine running in an unventilated area - exhaust gases are poisonous and extremely dangerous.**

WARNING

- **Keep clear of all fans while working in the engine compartment.**
- **Keep your hands and clothing away from drive belts and pulleys.**
- **If the vehicle has been driven recently, DO NOT touch exhaust and cooling system components until the engine has cooled.**
- **DO NOT touch electrical leads or components while the engine is running, or with the starter switch turned on.**

Poisonous fluids

Fluids used in motor vehicles are poisonous and should not be consumed or brought into contact with open wounds. These include; battery acid, antifreeze, brake and power steering fluid, petrol, diesel, engine oil and windscreen washer additives.

For your own safety, ALWAYS read and obey all instructions printed on labels and containers.

Used engine oil

Prolonged contact with engine oil may cause serious skin disorders, including dermatitis and cancer of the skin. ALWAYS wash thoroughly after contact.

♻ *It is illegal to pollute drains, water courses or soil. Use authorised waste disposal sites to dispose of used oil and toxic chemicals.*

EMISSION CONTROL

Your vehicle is fitted with various items of emission and evaporative control equipment designed to meet specific territorial requirements. You should be aware that unauthorised replacement, modification or tampering with this equipment by an owner or repair shop may be unlawful and subject to legal penalties.

In addition, engine settings must not be tampered with. These have been established to ensure that your vehicle complies with stringent exhaust emission regulations. Incorrect engine settings may adversely affect exhaust emissions, engine performance and fuel consumption, as well as causing high temperatures, which will result in damage to the catalytic converter and the vehicle.

ROAD TESTING DYNAMOMETERS (rolling roads)

Because your vehicle is equipped with anti-lock brakes and permanent four-wheel drive, it is essential that any dynamometer testing is carried out ONLY by a qualified person familiar with the dynamometer testing and safety procedures practised by Land Rover Dealers/Authorised Repairers. Contact your Land Rover Dealer/Authorised Repairer for further information.

DRIVING IN ARDUOUS CONDITIONS

Special operation conditions

When a vehicle is operated in extremely arduous conditions, more frequent attention must be paid to servicing requirements.

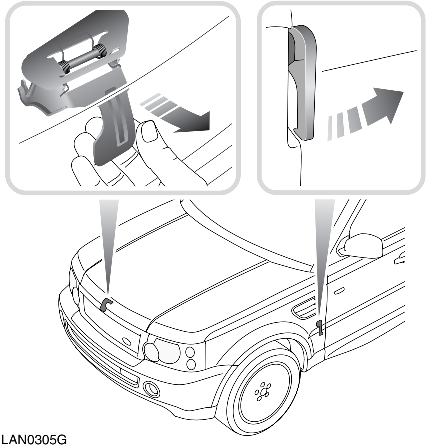
For example: if your vehicle experiences deep wading conditions, even DAILY servicing could be necessary to ensure the continued safe and reliable operation of the vehicle.

Arduous driving conditions include:

- Driving in dusty and/or sandy conditions.
- Driving on rough and/or muddy roads and/or wading.
- Driving in extremely hot conditions.
- Towing a trailer or driving in mountainous conditions.

Contact a Land Rover Dealer/Authorised Repairer for advice.

BONNET OPENING



1. From inside the vehicle on the left hand side, pull the bonnet release handle (see upper inset).
2. Lift the bonnet safety catch lever located below the centre point of the words LAND ROVER (lower inset). While holding the lever, raise the bonnet.

Closing the bonnet

WARNING

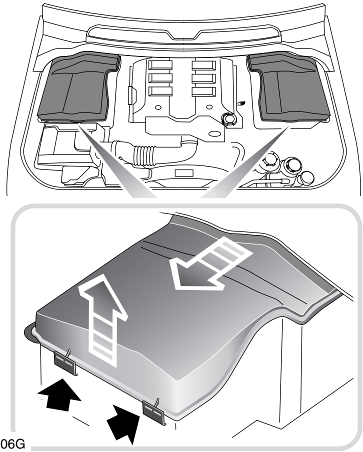
DO NOT drive with the bonnet retained by the safety catch alone.

Lower the bonnet until the safety catch engages, then using both hands, press the bonnet down until the catches click.

After closing the bonnet, check that the lock is fully engaged by attempting to lift the front edge of the bonnet. This should be free from all movement.

UNDER-BONNET COVERS

Removal



Press the two forward tabs and lift the front edge of the cover. Once the front edge of the cover is free, slide the cover towards the front of the vehicle.

Fitting

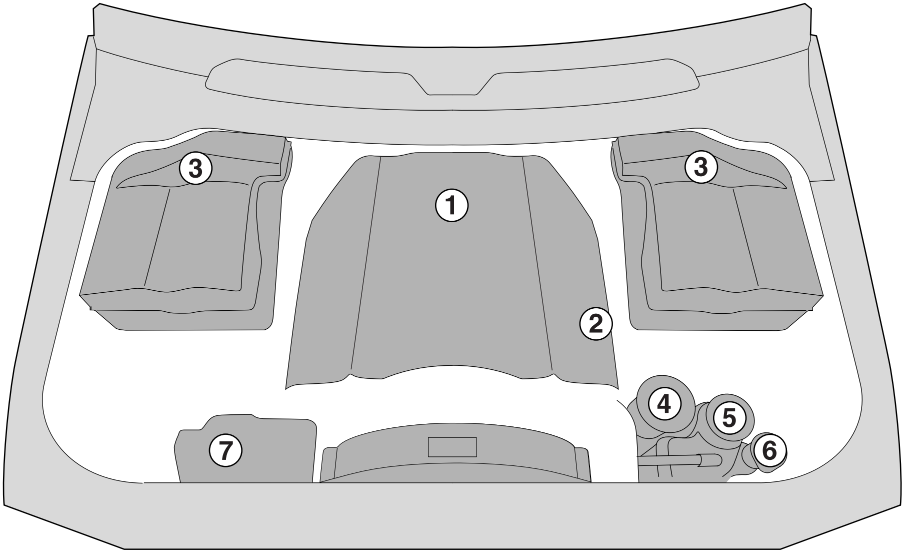
Caution: Ensure that no pipes, cables, or other items have been trapped between the cover and casing.

Slide the rear edge of the cover under the rubber trim fitted to the scuttle panel. Once the front edge of the cover is aligned with the front edge of the casing, press the front of the cover down until the two tabs click into place.

WEEKLY FLUID CHECKS

WARNING

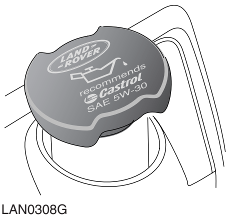
While working in the engine compartment, ALWAYS observe the safety precautions listed under SAFETY IN THE GARAGE, 215.



LAN0307G

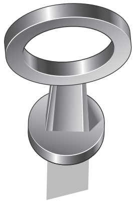
Typical Engine Compartment

1. Engine oil filler (Black cap)


LAND ROVER
recommends
Castrol
SAE 5W-30

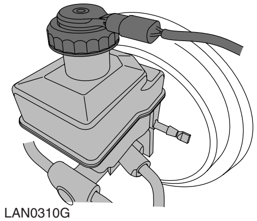
LAN0308G

2. Engine oil dipstick (Yellow)



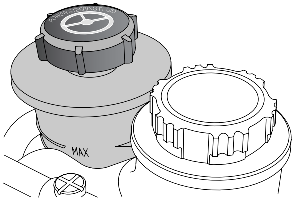
LAN0309G

3. Brake fluid reservoir (White cap)



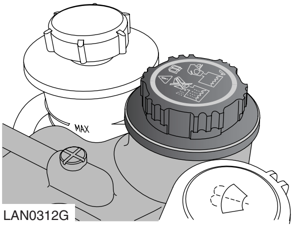
LAN0310G

4. Power steering reservoir (Yellow cap)


POWER STEERING FLUID
MAX

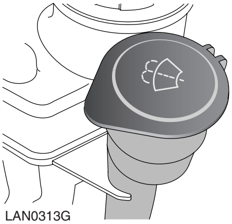
LAN0311G

5. Cooling system reservoir (Black cap)



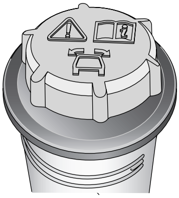
LAN0312G

6. Washer reservoir (Blue cap)



LAN0313G

7. Dynamic Response reservoir (Yellow cap)



LAN0314G

CHECK AND TOP-UP

The oil consumption of your engine is influenced by many factors. Diesel engines consume slightly more oil than petrol engines. Under high loads your engine will also consume more oil.

Check the oil level at least every 400 km (250 miles), when the engine is COLD and with the vehicle resting on level ground.

Note: *If it is necessary to check the oil level when the engine is hot, switch off the engine and let the vehicle stand for five minutes to allow the oil to drain back into the sump. DO NOT start the engine.*

As a general guide, if the level on the dipstick:

- is nearer to the upper mark or hole than the lower, add no oil.
- is nearer to the lower mark or hole than the upper, add half a litre (one pint) of oil.
- is below the lower mark or hole, add one litre (two pints) of oil and re-check the level after a further five minutes.

Oil specification

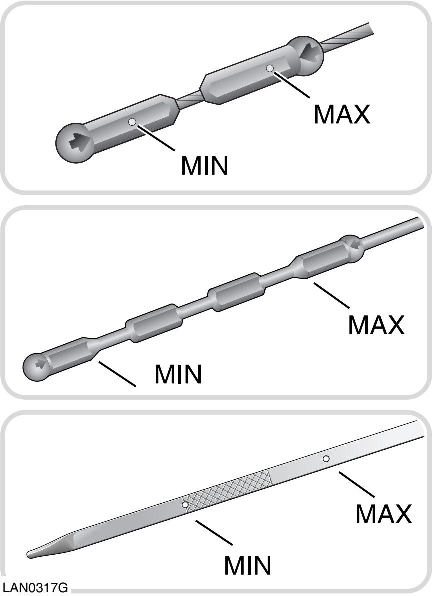
Caution: Your vehicle warranty may be invalidated if damage is caused by use of improper engine oil. Low quality or obsolete oils DO NOT provide the protection required by modern, high performance engines. Failure to use an oil that meets the required specification could cause excessive engine wear, a build up of sludge and deposits, and increase pollution. It could also lead to engine failure.

It is essential to use an oil suitable for the climatic conditions in which the vehicle is to be operated. Precise specifications are shown in **LUBRICANTS AND FLUIDS, 286**. If in doubt, contact your Land Rover Dealer/Authorised Repairer.

Checking oil level

1. Withdraw the dipstick and wipe the blade clean.
2. Fully re-insert the dipstick and withdraw again to check the level, which should NEVER be allowed to fall below the lower mark or hole on the dipstick.
3. To top-up, unscrew the oil filler cap and add oil to maintain the level between the UPPER and LOWER marks or holes on the dipstick.

   DO NOT OVERFILL! Clean up any oil spillage incurred when topping-up.
4. Check the oil level again.



ENGINE COOLANT

WARNING

NEVER remove the filler cap when the engine is hot - escaping steam or scalding water could cause serious personal injury.

Unscrew the filler cap slowly, allowing the pressure to escape before removing completely.

Avoid spilling antifreeze onto a hot engine - a fire may result.

Caution: NEVER run the engine without coolant.

Antifreeze will damage painted surfaces; soak up any spillage with an absorbent cloth immediately and wash the area with a mixture of car shampoo and water.

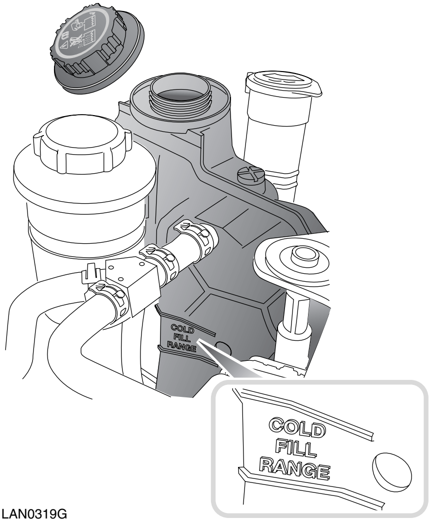
NEVER top-up with salt water. When travelling in territories where the water supply contains salt, always ensure you carry a supply of fresh (rain or distilled) water.

The coolant level in the expansion tank should be checked at least weekly (more frequently in high mileage or arduous operating conditions).

Always check the level WHEN THE SYSTEM IS COLD. Coolant expands when hot and may cause the level to extend beyond the upper level indicator mark.

If it is necessary to remove the filler cap before the system has fully cooled, loosen the cap slowly, allowing the air pressure to escape gradually.

TOP-UP



Top-up with a 50% mixture of antifreeze and water. See **LUBRICANTS AND FLUIDS, 286**. Top-up to the upper level indicator mark located above the COLD FILL RANGE text, on the side of the expansion tank. This should be viewed from standing in front of the vehicle. Ignore any coolant visible in the top section of the tank.

Ensure the cap is tightened fully after top-up is completed by turning the cap until the ratchet cap clicks.

If the level has fallen appreciably, suspect leakage or overheating and arrange for your Land Rover Dealer/Authorised Repairer to examine the vehicle.

ANTIFREEZE

WARNING

Antifreeze is poisonous and can be fatal if swallowed - keep containers sealed and out of the reach of children. If accidental consumption is suspected, seek medical attention immediately.

If the fluid comes into contact with the skin or eyes, rinse immediately with plenty of water.

Antifreeze contains important corrosion inhibitors. The antifreeze content of the coolant must be maintained at 50% ± 5% all year round (not just in cold conditions). To ensure the anti-corrosion properties of the coolant are retained, the antifreeze content should be checked once a year and completely renewed every ten years, regardless of distance travelled. Failure to do so may cause corrosion of the radiator and engine components.

The specific gravity of a 50% antifreeze solution at 20°C (68°F) is 1.075 and protects against frost down to -40°C (-40°F).

Coolant specification

Use ONLY a 50% mix of water and an approved antifreeze. See **LUBRICANTS AND FLUIDS, 286**.

In an emergency - and only if this type of antifreeze is unavailable - top-up the cooling system with clean water, but be aware of the resultant reduction in frost protection. DO NOT top-up or refill with conventional antifreeze formulations. If in doubt consult a Land Rover Dealer/Authorised Repairer.

BRAKE FLUID

WARNING

Brake fluid is highly toxic - keep containers sealed and out of the reach of children. If accidental consumption of fluid is suspected, seek medical attention immediately.

If the fluid comes into contact with the skin or eyes, rinse immediately with plenty of water.

Take care not to spill the fluid onto a hot engine - a fire may result.

DO NOT drive the vehicle with the fluid level below the MIN mark.

WARNING

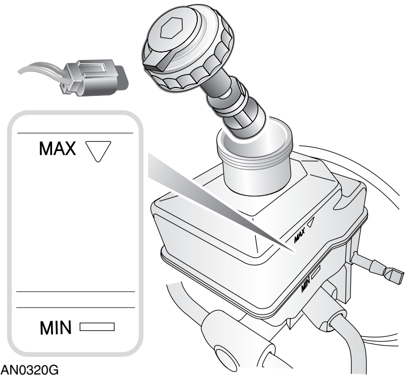
Contact your Land Rover Dealer/Authorised Repairer immediately if brake pedal travel is unusually long or if there is any appreciable drop in brake fluid level.

Caution: Brake fluid will damage painted surfaces; soak up any spillage with an absorbent cloth immediately and wash the area with a mixture of car shampoo and water.

The fluid level may fall slightly during normal use as a result of brake pad wear but should not be allowed to fall below the **MIN** mark. Any substantial drop in fluid indicates a leak in the system, in which case the vehicle must NOT be driven and you should contact your Land Rover Dealer/Authorised Repairer.

With the vehicle on level ground, check the fluid level at least every week (more frequently in high mileage or arduous operating conditions). Check the level visually through the side of the transparent reservoir without removing the filler cap.

Top-up



Wipe the filler cap clean before removing to prevent dirt from entering the reservoir.

Disconnect the electrical lead.

Unscrew the cap (1/8 turn) and top-up the reservoir to the **MAX** mark using a specified brake fluid. See **LUBRICANTS AND FLUIDS, 286**.

Use only new fluid from an airtight container. Old fluid from opened containers or fluid previously bled from the system will have absorbed moisture, which will adversely affect performance, and must NOT be used. **DO NOT OVERFILL!**

Replace the cap and reconnect the electrical lead, ensuring that the lead points to the centre-line of the vehicle.

Brake fluid must be completely renewed every two years regardless of distance travelled.

Brake pedal free travel: No adjustable free travel.

POWER STEERING FLUID

WARNING

Power steering fluid is highly toxic - keep containers sealed and out of reach of children. If accidental consumption of fluid is suspected, seek medical attention immediately.

If the fluid comes into contact with the skin or eyes, rinse immediately with plenty of water.

Do not spill the fluid onto a hot engine - a fire may result.

Caution: Power steering fluid will damage painted surfaces: Soak up any spillage with an absorbent cloth immediately and wash the area with a mixture of car shampoo and water.

Caution: The engine must NOT be started if the fluid level has dropped below the lower mark - severe damage to the steering pump could result.

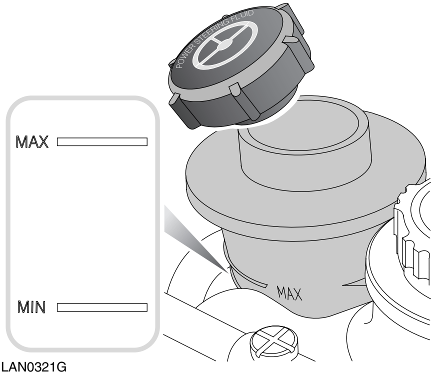
Any large or sudden drop in the fluid level must be investigated by a qualified Land Rover Dealer/Authorised Repairer.

If it can be established that fluid loss is slow, then the reservoir may be topped-up to the upper level mark to enable the vehicle to be driven to the nearest qualified Land Rover Dealer/Authorised Repairer for examination.

Driving of the vehicle to repair should not be attempted if there is danger that the leaked fluid will come into contact with a hot surface such as the exhaust.

Check and top-up

Check and top-up the fluid level ONLY with the engine switched off and the system cold, and ensure that the steering wheel is not turned after stopping the engine.



LAN0321G

The level of fluid can be seen through the translucent body of the reservoir which has two marks on it to indicate maximum and minimum levels.

If necessary, add fluid to the reservoir until the level is between the upper and the lower marks. **DO NOT fill above the upper mark.** See **LUBRICANTS AND FLUIDS, 286**.

DYNAMIC RESPONSE FLUID

WARNING

Dynamic Response fluid is highly toxic - keep containers sealed and out of reach of children. If accidental consumption of fluid is suspected, seek medical attention immediately.

If the fluid comes into contact with the skin or eyes, rinse immediately with plenty of water.

Do not spill the fluid onto a hot engine - a fire may result.

Caution: Dynamic Response fluid will damage painted surfaces: Soak up any spillage with an absorbent cloth immediately and wash the area with a mixture of car shampoo and water.

Caution: The engine must NOT be started if the fluid level has dropped below the lower mark - severe damage to the Dynamic Response system could result.

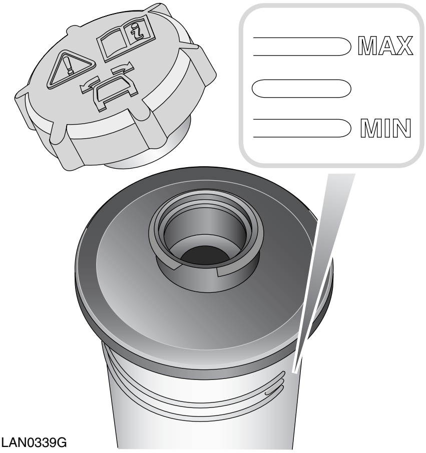
Any large or sudden drop in the fluid level must be investigated by a qualified Land Rover Dealer/Authorised Repairer.

If it can be established that fluid loss is slow, then the reservoir may be topped-up to the upper level mark to enable the vehicle to be driven to the nearest qualified Land Rover Dealer/Authorised Repairer for examination.

Driving of the vehicle to repair should not be attempted if there is danger that the leaked fluid will come into contact with a hot surface such as the exhaust.

Check and top-up

Check and top-up the fluid level ONLY with the engine switched off and the system cold.



The level of fluid can be seen through the translucent body of the reservoir which has two marks on it to indicate maximum and minimum levels.

If more fluid is needed, first wipe the filler cap clean to prevent dirt from entering the reservoir, then twist the cap a quarter turn anti-clockwise and pull to remove. Add fluid to the reservoir until the level is between the upper and the lower marks. **DO NOT fill above the upper mark.** See **LUBRICANTS AND FLUIDS, 286**.

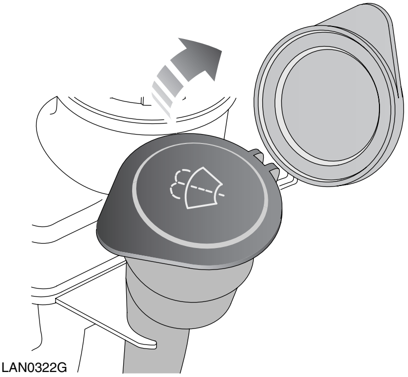
WINDSCREEN WASHER TOP-UP

WARNING

Some windscreen wash products are inflammable, particularly if high or undiluted concentrations are exposed to sparking. DO NOT allow windscreen wash to come into contact with naked flames or sources of ignition.

Caution: DO NOT use an antifreeze or vinegar/water solution in the washer reservoir - antifreeze will damage painted surfaces, while vinegar can damage the windscreen washer pump.

Body panels may suffer discolouration as a result of screenwash spillage. Take care to avoid spillage, particularly if an undiluted or high concentration is being used. If spillage occurs, wash the affected area immediately with water.



The windscreen washer reservoir supplies both front and rear screen washer jets and headlamp washer jets.

Check the reservoir level at least every week and top-up with a mixture of water and Land Rover Parts STC 8249 Screenwash. Preferably mix the recommended quantities of water and screenwash in a separate container before topping-up, and always follow the instructions on the container. Note that an approved screenwash is necessary to prevent freezing in very cold weather.

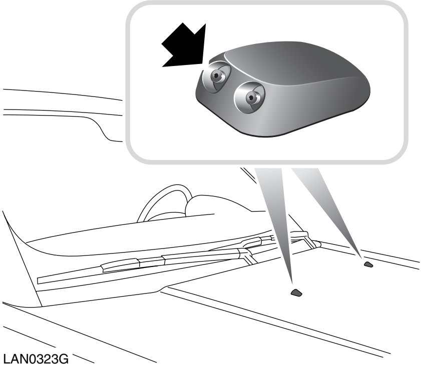
Operate the washer switches periodically to check the nozzles are clear and properly directed.

Note: *Ensure an approved screen washer solvent is used in the windscreen washer reservoir to prevent freezing.*

WASHER JETS

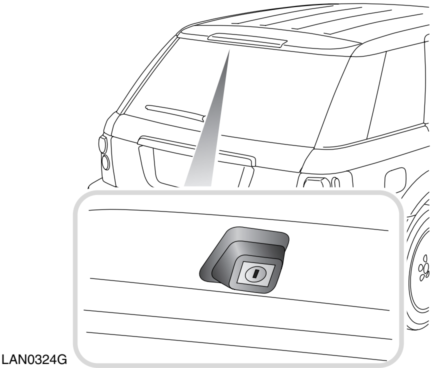
Front

The windscreen washer jets are set during manufacture and should not need adjusting. However, if adjustment is ever necessary, insert a needle into the jet orifice and lever gently to position each jet, so that the spray is directed towards the centre of the windscreen.



Should any jet become obstructed, insert a needle or thin strand of wire into the orifice to clear the blockage.

Rear



Headlamp

The spray jets are set during manufacture and should not need to be adjusted.

WIPER BLADE REPLACEMENT

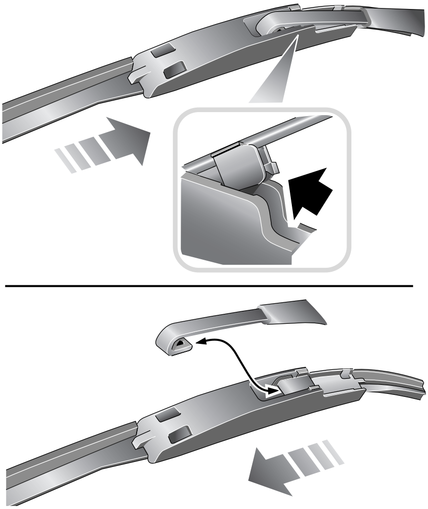
Only fit replacement wiper blades that are identical to the original specification.

Grease, silicone and petrol-based products impair the blade's wiping capability. Wash the wiper blades in warm soapy water and periodically check their condition.

If signs of hardness or cracking in the rubber are found, or if the wipers leave streaks or unwiped areas on the windscreen during use, then the wiper blades should be replaced.

Clean the windscreen regularly with an approved glass cleaner and ensure the screen is thoroughly cleaned before fitting replacement wiper blades.

Front

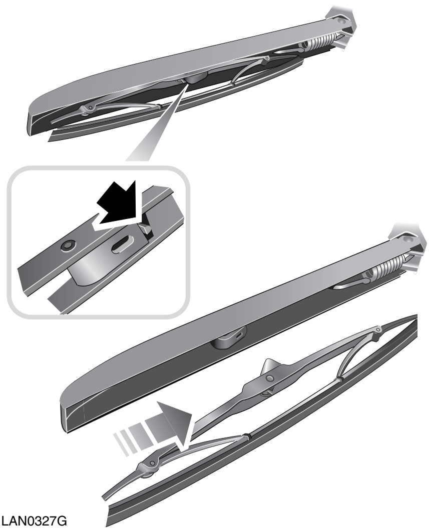


LAN0325G

Lift the wiper arm away from the screen and pivot the blade assembly away from the arm. Press the tab (arrowed in inset), to release the blade assembly and slide the assembly off the end of the wiper arm. Carefully replace the arm to its stowed position.

To replace, position the wiper arm into the aperture in the middle of the blade assembly and push firmly into position until the blade clips into place.

Rear



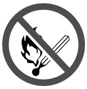
Lift the wiper arm away from the rear window.

Press the tab (arrowed in inset), to release the blade assembly and slide the assembly off the end of the wiper arm. Carefully replace the arm to its stowed position.

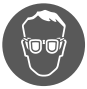
To replace, position the blade assembly onto the inside of the wiper arm and push firmly into position until the blade clips into place.

BATTERY WARNING SYMBOLS

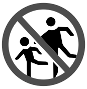
There is a label on the battery, depicting a number of warning symbols. The warning symbols are as follows:



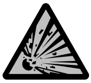
No smoking, flames, no sparks (Red).



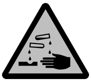
Shield eyes (Blue).



Keep away from children (Red).



Explosive gas (Yellow).



Battery acid (Yellow).

BATTERY CARE

WARNING

Batteries contain acid, which is both corrosive and poisonous. If spillage occurs:

- **On clothing or the skin - remove any contaminated clothing immediately, flush the skin with large amounts of water, and seek medical attention urgently.**
- **In the eyes - flush with clean water immediately for at least 15 minutes. Seek medical attention urgently.**

Swallowing battery acid can be fatal unless immediate action is taken - seek medical attention urgently.

Always wear eye protection when working with batteries.

For your safety, remove all metal wrist bands and jewellery before working in the engine compartment and never allow the battery terminals or vehicle leads to make contact with tools or metal parts of the vehicle.

Battery posts, terminals and related accessories contain lead and lead compounds. Wash hands after handling.

A low maintenance battery, specifically designed for use with this vehicle, is fitted in the engine compartment.

In hot climates, more frequent checks of the battery electrolyte level are required. If necessary, the battery cells can be topped up with distilled water.

The exterior of the battery should occasionally be wiped clean, to remove any dirt or grease.

If a new battery is to be fitted, it must be the same type as the original. The use of unapproved batteries is not recommended and could invalidate the vehicle warranty.

We recommend that the battery charge is checked frequently if the vehicle is used mostly for short distance trips or if it is not used for long periods of time.

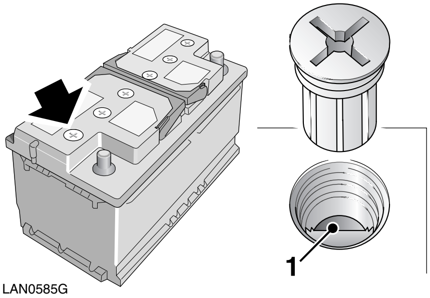
Note: *The service life of the battery is dependent on its condition of charge. It must always be sufficiently charged for the battery to last the optimum length of time.*

Note: *Do not connect any 12 volt equipment (for example, a 12 volt lamp), directly to the battery terminals. Use one of the accessory sockets located within the vehicle for connecting Land Rover approved accessories.*

Check and replenish battery electrolyte

WARNING

Do not allow naked lights near the battery (batteries generate hydrogen gas which is highly flammable).



Unscrew the six cell plugs.

Check that the electrolyte is level with the plastic level indicator **1**. If necessary, top up with distilled water, but do not overfill.

Note: *In normal climates this must be carried out at least once a year. During hot weather or in hot climates the electrolyte level must be checked at least every three months.*

Note: *If illumination is required, use a hand held flashlight to inspect the electrolyte level.*

Refit the six cell plugs.

CHARGING THE VEHICLE BATTERY

WARNING

Batteries generate explosive gases, contain corrosive acid and produce levels of electric current sufficient to cause serious injury.

While charging, shield your eyes or avoid leaning over the battery and keep the area around the top of the battery well ventilated.

While charging, always heed the precautions:

- Before charging, disconnect and remove the battery from the vehicle - charging the battery with the cables connected may damage the vehicle's electrical system.
- Make sure the battery charger leads are securely clamped to the battery terminals before switching on the battery charger. Do not move the leads once the charger is switched on.
- When charging is finished, switch off the battery charger before disconnecting the leads from the battery terminals.

Note: *Be aware that a battery will take longer to charge in a cold environment.*

After charging, leave the battery for one hour before reconnecting to the vehicle - this will allow time for explosive gases to disperse, thereby minimising the risk of fire or explosion.

Disconnecting the battery

If the vehicle is already locked and alarmed, you will first have to unlock and disarm it using the remote control.
See **LOCKING/UNLOCKING, 47**.

Note: *If the battery is flat and the vehicle is locked and alarmed, you will first have to unlock the left-hand front door using the starter key.*

Insert the starter key and turn it to position **II**.

Engage the Electric Parking Brake (EPB) or fit wheel chocks. See **CHANGING A WHEEL, 255**.

Remove the starter key and wait two minutes for the engine management system to power down.

Open the bonnet. See **BONNET OPENING, 217**.

Disconnect only the negative (**-**) terminal of the battery.

Reconnecting the battery

Ensure that everything requiring power from the battery - lights, audio, etc - is switched off.

Reconnect the battery lead.

Note: *If the battery was disconnected while it had an insufficient charge to disarm the alarm, the alarm could sound on reconnecting. Operating the remote control or inserting the key into the starter switch will disarm the alarm.*

Insert the starter key and turn to position **II**.

Operate the Electric Parking Brake (EPB) to extinguish the amber warning lamp.

Effects of battery disconnection

After reconnecting the battery, a number of the vehicle systems will be reset automatically. This may take a few minutes. Some systems have to detect certain conditions while the vehicle is being driven before full operability returns. This in no way affects the safe operation of the vehicle.

Battery warning indicator

The red warning indicator in the instrument pack illuminates as a bulb check when the starter switch is turned to position **II** and extinguishes once the engine is running. If it remains on, or illuminates whilst driving, a fault with the battery charging system is indicated. Seek qualified assistance urgently.

CHANGING THE VEHICLE BATTERY

WARNING

Always remove the starter key before disconnecting the battery. Failure to do this may cause a failure of the airbag SRS.

Do not reverse the polarity of the battery - the electrical system may be damaged if the battery leads are connected to the wrong terminals.

Caution: Keep the battery upright at all times - damage will be caused if the battery is tilted more than 45 degrees.

Do not run the engine with the battery disconnected; or disconnect the battery with the engine running.

Disconnect the negative (-) cable first and then the positive (+) cable. When reconnecting, connect the positive cable first and then the negative cable. Do not allow the battery terminals to make contact with metal parts of the vehicle.

Removal

To release the battery from the vehicle, undo the nuts securing the battery clamping plate and remove the clamping plate.

Replacement

Ensure that the battery is fitted the right way round (terminal posts towards the rear of the vehicle) and that the clamping plate is secure. Tighten the clamping plate nuts until the clamping plate is free from movement, but do not over tighten.

Replacement batteries

Only fit a replacement battery of the same type and specification as the original - other batteries could cause a fire hazard when connected to the vehicle's electrical system.

Petrol vehicles	H7 75 amp/hr
Diesel vehicles	H8 90 amp/hr

Battery disposal

Used batteries should be recycled. However, batteries are hazardous - you should seek advice about disposal from a Land Rover Dealer or your Local Authority.

TYRE CARE

WARNING

Defective tyres are dangerous. Do not drive the vehicle if a tyre is damaged, excessively worn, or incorrectly inflated.

Avoid contaminating the tyres with vehicle fluids, as they may cause damage to the tyre.

Avoid spinning the wheels. The forces released, can damage the structure of the tyre and cause it to fail.

If wheel spin is unavoidable due to loss of traction (in deep snow, for example), do not exceed the 50 km/h (30 mph) point on the speedometer.

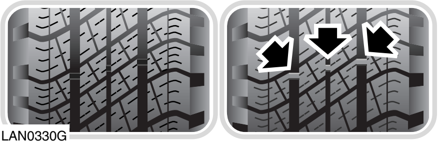
All of the vehicle's tyres (including the spare) should be checked regularly for damage, wear and distortion. If you are in any doubt about the condition of a tyre, have it checked immediately by a tyre repair centre or your Land Rover Dealer/Authorised Repairer.

Tyre wear

Good driving practise will improve the distance you obtain from your tyres and avoid unnecessary damage.

- Always ensure that the tyre pressures are correctly adjusted.
- Always observe the posted speed limits and advisory speeds for bends.
- Avoid pulling away quickly and hard acceleration.
- Avoid making fast turns or braking sharply.
- Wherever possible, avoid potholes and obstacles on the road.
- Do not drive up kerbs or rub the tyres against them when parking.

Wear indicators



WARNING

Wear indicators show at the point of minimum tread. Tyres which have worn to this point will have reduced grip and poor water displacement characteristics.

Caution: If tread wear is uneven across a tyre, or if the tyre wears excessively, the vehicle should be checked by your Land Rover Dealer/Authorised Repairer as soon as possible.

Note: *Tyre condition should be checked after the vehicle has been used off-road. As soon as the vehicle returns to a normal, hard road surface, stop the vehicle and check for damage to the tyres.*

When the tread has worn down to approximately 1.6 mm, wear indicators start to appear at the surface of the tread pattern. This produces a continuous band of rubber across the tread as a visual indicator.

The tyre must be replaced as soon as the wear indicator becomes visible, or sooner, if legislation requires replacement.

Note: *Tread depth should be checked regularly, in some cases more frequently than the service intervals.*

Age degradation

Tyres degrade over time, even when they are not being used. It is recommended that tyres generally be replaced after six years of normal service. Degradation can be caused by ultra violet (U.V.) exposure, hot climates or frequent high loading conditions.

Replace the spare tyre when you replace the other road tyres, due to ageing of the spare tyre.

Punctured tyres

WARNING

Do not drive the vehicle with a punctured tyre. Even if the punctured tyre has not deflated, it is unsafe to use as the tyre may deflate suddenly at any time.

Not all punctures result in the tyre deflating immediately. Therefore, it is important to check the tyres for damage and foreign objects regularly.

When driving, if a sudden vibration or change to the vehicle's handling is noticed, reduce speed immediately. Do not brake or make any sudden manoeuvres or direction changes. Drive slowly to an area away from the main highway and stop the vehicle.

***Note:** Driving the vehicle to a safe area may cause damage to the punctured tyre, but occupant safety is far more important.*

Inspect the tyres for signs of punctures, damage or under-inflation. If any damage or deformity is detected, the tyre should be replaced. If a spare tyre is not available, then the vehicle should be recovered to a tyre repair centre or Land Rover Dealer/Approved repairer.

Replacement tyres

WARNING

Do not fit cross-ply tyres.

Do not fit tubed tyres.

Do not swap tyres around the vehicle. Tyres bed in to the specific characteristics of each wheel position. Swapping them around may affect the vehicle's handling and traction.

Always fit replacement tyres of the same type, and wherever possible, of the same make and tread pattern.

Replacement wheels should be genuine Land Rover parts. This will maintain the designed driving characteristics, both on and off road.

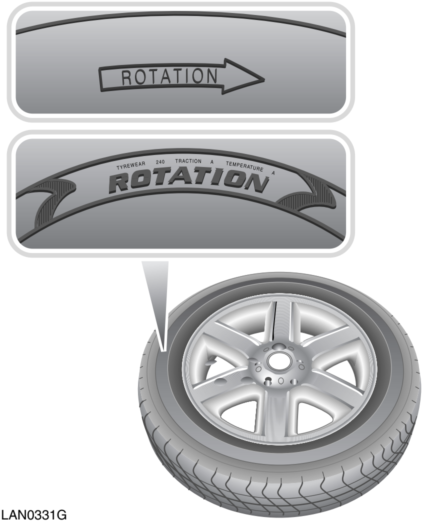
If the use of tyres not recommended by Land Rover is unavoidable, ensure that you read and fully comply with the tyre manufacturer's instructions.

Ideally, tyres should be replaced in sets of four. If this is not possible, replace the tyres in pairs (front and rear). When tyres are replaced, the wheels should always be re-balanced and alignment checked.

The correct tyre specification for your vehicle can be found on the tyre information label. See **Tyre pressure and loading label, 239**. For an explanation of the label information, see **WHEELS AND TYRES, 290**.

Directional tyres

Directional tyres are designed to operate correctly when rotating forwards (when the vehicle is travelling forwards).


ROTATION
TYREWEAR 240 TRACTION A TEMPERATURE A
ROTATION
LAN0331G

Typical directional tyre indicators

Temporary spare tyre

WARNING

If a temporary spare is in use, the vehicle must be driven with caution at reduced speed (80 km/h [50 mph] maximum). A standard wheel and tyre should be fitted as soon as possible, and only one temporary spare wheel should be fitted to the vehicle at any one time.

Tyre pressures

WARNING

If the vehicle has been parked in strong sunlight or used in high ambient temperatures, do not reduce tyre pressures; instead, move the vehicle into the shade and allow the tyres to cool before checking.

Under-inflation causes excessive flexing and uneven wear to the tyre. This can lead to sudden failure. Over-inflation causes a harsh ride, uneven tyre wear and poor handling.

A hot tyre, at or below the recommended cold inflation pressure, is dangerously under-inflated.

Correctly inflated tyres will ensure that you enjoy the best combination of tyre life, ride comfort, fuel economy and road handling.

Under-inflated tyres wear more rapidly, can seriously affect the vehicle's road handling characteristics and fuel consumption, as well as increasing the risk of tyre failure. Over-inflated tyres give a harsher ride and wear unevenly.

Tyre pressures should be checked at least once a week with normal road use, but should be checked daily if the vehicle is used off-road.

It is impossible to determine if a tyre is properly inflated just by looking at it.

The recommended tyre pressures are listed on a label on the B pillar on the driver's side (visible with the driver's door open). See **Tyre pressure and loading label, 239**.

Tyre pressures listed on the tyre information label are considered to be the recommended cold tyre inflation pressure, at maximum gross vehicle weight condition, measured when the tyres are **cold**, after the vehicle has been parked for at least 3 hours or driven less than 3 miles (5 km).

Check the pressures (including the spare wheel) when the tyres are cold - be aware that it only takes 1.5 km (1 mile) of driving to warm up the tyres sufficiently to affect the tyre pressures.

When you drive for more than 3 miles (5 km), the tyres and the air inside them, warm up and it is normal for the tyre pressure to increase above the recommended cold pressure. When checking tyre pressure in this condition, never reduce air pressure.

Note: *Air pressure naturally increases in warm tyres; if it is necessary to check the tyres when they are warm (after the vehicle has been driven for a while), you should expect the pressures to have increased by up to 30 - 40 kPa (0.3 - 0.4 bar/4 - 6 lbf/in^2). In this circumstance, do not let air out of the tyres in order to match the recommended cold tyre pressures.*

Note: *The pressure for your spare tyre should be set to the highest value given for your vehicle's wheel/tyre size combination, and adjusted after fitment.*

Note: *When towing heavy trailers or with the tow vehicle loaded, the additional imposed nose weight may cause the GVW tyre loading to be exceeded. This is permissible provided that road speeds are limited to 100 km/h (60 mph) and rear tyre pressures are increased by at least 20 kPa (3 lbf/in^2). This excludes the temporary spare, where 80 km/h (50 mph) is the maximum permitted speed and tyre pressure should be maintained at the pressures shown on the tyre information label. See* ***Tyre pressure and loading label, 239****.*

Checking tyre pressures

Where possible, always check the tyre pressures when the tyres are cold, using the following procedure:

1. Remove the valve cap.
2. Firmly attach a tyre pressure gauge/inflator to the valve.
3. Read the tyre pressure from the gauge. If required add air to the tyre.
4. If air is added to the tyre, remove the gauge from the valve and re-attach it before checking that the pressure is correct.

   Failure to remove and re-attach the gauge to the valve could cause the gauge to show an incorrect reading.
5. If too much air is added, remove the gauge from the valve and allow air out of the tyre by pressing the centre of the valve.

   Reconnect the gauge to the valve and check that the air pressure is correct. If the pressure is still not correct, repeat this process and re-check.
6. Refit the valve cap.

Note: *It is an offence in certain countries to drive a vehicle with tyres that are not properly inflated in accordance with the vehicle’s proper use.*

Valves

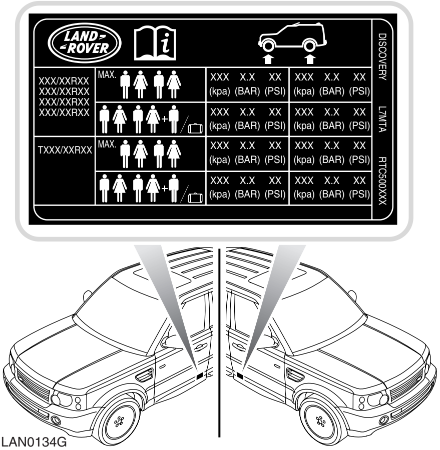
Keep the valve caps screwed down firmly - they prevent dirt from entering the valve. Check the valve for leaks (listen for a tell-tale hissing) when you check the tyre pressure.

Tyre pressure and loading label

WARNING

Tyre pressures should be checked regularly, when cold, using an accurate pressure gauge.

Failure to properly maintain your pressures could increase the risk of tyre failure, with consequential loss of vehicle control and personal injury.

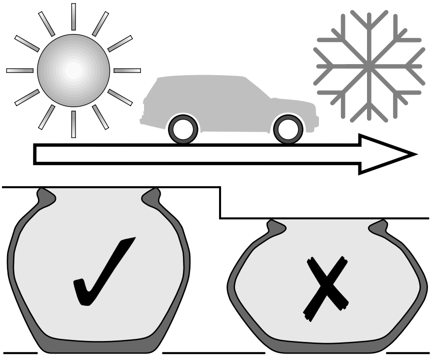


LAN0134G

The tyre pressure and loading label is visible on the pillar behind the drivers door (also known as the B pillar), giving information specific to the wheel and tyre equipment fitted to the vehicle when it was built.

This label contains information relating to tyre and wheel sizes along with recommended pressures for all wheel and tyre combinations.

Pressure compensation for ambient temperature changes



LAN0599G

If the ambient temperature drops, the tyre pressures will decrease, which may cause under-inflation. This should be borne in mind when travelling to, or through, areas of lower temperature.

Under-inflation causes the tyre side wall height to reduce which, in turn, results in uneven tyre wear and a risk of tyre failure.

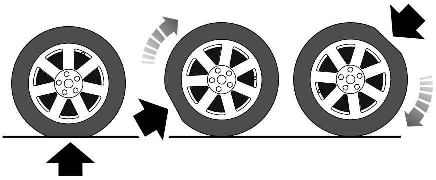
Tyre pressures may be adjusted before setting off on a journey to, or through, areas of low temperature. Alternatively, the tyre pressures can be adjusted when low temperature areas are reached.

Note: *If the tyre pressures are to be adjusted in the lower temperature area, the vehicle should be left standing for at least one hour prior to adjustment.*

Tyre pressures should be increased by 0.14 bar/14 kPa (2 lbf/in^2) for each 10°C (20°F) temperature decrease.

Flat spots

If the vehicle is stationary for a long period when the ambient temperature is high, the tyres may form flat spots. When the vehicle is driven, these flat spots will cause a vibration, which will steadily disappear as the tyres regain their original shape.



LAN0600G

In order to minimise flat-spotting, the tyre pressures can be increased.

Tyre pressures should be increased by 0.14 bar/14 kPa (2 lbf/in^2) for each 10°C (20°F) temperature increase.

Long-term storage

Flat-spotting can be minimised during long-term storage, by increasing the tyre pressures to the maximum indicated on the tyre sidewall.

Note: *The tyre pressures should be reduced to the correct pressure, before the vehicle is driven.*

High performance tyre and wheel combinations

Caution: This vehicle may be fitted with a high performance wheel and low profile tyre combination, designed to give enhanced dry road performance, with consideration for aquaplaning resistance.

Low profile, high speed rated tyres have a softer tread compound. If driven aggressively, they may suffer increased tread wear and a shorter life than can be expected from other tyre types. This wheel and tyre combination is susceptible to damage if driven off-road. This combination has less performace in snow and ice conditions than M and S tyres. High performance tyres must be replaced with winter tyres when weather conditions dictate.

USING WINTER TYRES

Winter tyres are more suitable during extremes of low temperatures, snow and ice and will considerably improve the vehicle's handling during these conditions.

Winter tyres must be fitted on all four wheels.

Approved winter tyres

18 inch wheels:
235/65 R18 110H Dunlop Winter Sport M3

235/65 R18 110H Michelin Pilot Alpine XSE

19 inch wheels:
255/55 R19 111H Goodyear Ultra Grip

Note: *If your vehicle is fitted with 20 inch wheels, it will be necessary to fit a set of 18 or 19 inch wheels before winter tyres can be fitted.*

Winter tyre pressures

The cold tyre inflation pressures for winter tyres are the same as those for normal tyres of the same size.

SNOW CHAINS

WARNING

DO NOT fit unapproved snow chains - this could damage tyres, wheels, suspension and brake components and could result in damage to the bodywork of the vehicle.

Snow chains are designed for use on hard-surface roads in extreme snow conditions only, and are not recommended for off-road use.

Snow chains MUST NOT be fitted to a temporary spare wheel.

NEVER exceed 50 km/h (30 mph).

If it is necessary to fit snow chains to your vehicle, ALWAYS observe the following:

- **Front wheels:** Snow chains can only be fitted to the front wheels of vehicles equipped with 17, 18 and 19 x 8 inch wheels.

  Note: *If your vehicle is fitted with 20 inch wheels, it will be necessary to fit a set of 19 inch wheels before snow chains can be used.*
- **Rear wheels:** Snow chains MUST NOT be fitted to the rear wheels of any vehicle.
- ONLY Land Rover approved chains should be used. These are designed for your vehicle and will eliminate any risk of damage to other components. Approved snow chains are only available from a Land Rover Dealer/Authorised Repairer.
- Always adhere to the snow chain fitting and retensioning instructions and the speed limitations recommended for varying road conditions. NEVER exceed 50 km/h (30 mph).
- ONLY fit snow chains in pairs.
- Avoid tyre damage by removing the chains as soon as the road is free from snow.
- In some driving conditions, it may be beneficial to deactivate Dynamic Stability Control (DSC) in order to maximise traction.

TYRE PRESSURE MONITORING (TPM) SYSTEM

WARNING

The Tyre Pressure Monitoring (TPM) system is not a substitute for manually checking tyre pressures.

The TPM system only provides a low tyre pressure warning and does NOT re-inflate the tyres.

The TPM system cannot register damage to a tyre. Regularly check the condition of your tyres, especially if the vehicle is driven off-road.

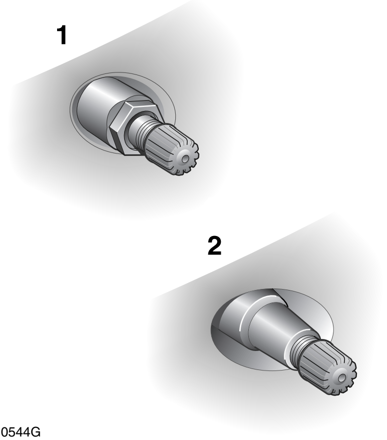
Caution: When inflating tyres, care should be taken to avoid bending or damaging the TPM system valves. Always ensure correct alignment of the inflation head to the valve stem.

Note: *Non-approved accessories may interfere with the system. If this occurs,* ***TYRE MONITORING SYSTEM FAULT*** *is displayed in the message centre.*
See ***MESSAGE CENTRE MESSAGES, 92****.*

Different types of tyre may affect the performance of the TPM system. Always replace tyres in accordance with recommendations.
See ***Tyre pressure and loading label, 239****.*

Your vehicle may be equipped with a TPM system which monitors pressure in each tyre, including the full-size spare tyre. Temporary spare tyres are not fitted with sensors and are consequently not monitored.

Note: *The TPM system only provides a low tyre pressure warning and does* ***NOT*** *re-inflate the tyres.*



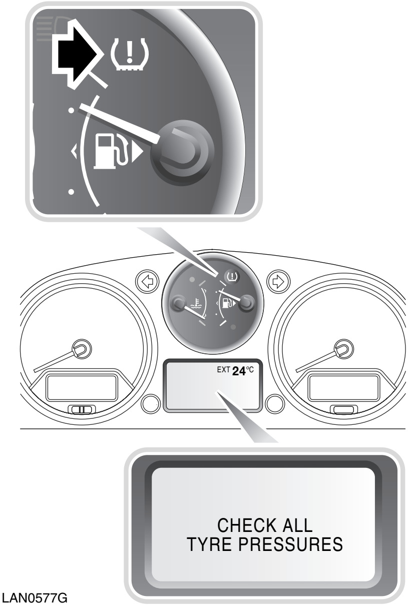
Wheels fitted with a TPM system can be easily visually identified by the external metal lock nut and valve **1**. All Land Rover non-TPM system wheels have a rubber valve fitted **2**.

TPM system operation

The TPM system monitors the pressure of the tyres via sensors located in each wheel and a receiver located within the vehicle. Communication between sensor and receiver is via Radio Frequency (RF) signals.

(!) The tyre pressure warning comprises a yellow warning indicator (telltale) within the instrument pack and an associated message within the message centre.

Each tyre, including the spare (if provided), should be checked regularly, when cold, and inflated to the recommended pressure. When the low tyre pressure warning is indicated, one or more of your tyres is significantly under-inflated.



If the telltale light illuminates, you should stop and check your tyres as soon as possible and inflate them to the recommended pressure. See **Tyre pressure and loading label, 239**. If low pressure warnings occur frequently, the cause must be determined and rectified. Driving on a significantly under-inflated tyre causes the tyre to overheat and can lead to tyre failure. Under-inflation also reduces fuel efficiency and tyre tread life, and may affect the vehicle's handling and stopping ability.

The TPM system also monitors the full size spare tyre pressure. If the pressure for the spare tyre is incorrect, the message **CHECK SPARE TYRE PRESSURE** will be displayed, accompanied by illumination of the warning telltale.

When driving through variable climatic conditions, the TPM system warnings may be intermittent.

TPM system malfunction

Your vehicle will also indicate a TPM system malfunction by initial flashing and subsequent continuous illumination of the warning telltale. A text message will accompany the system malfunction and will display **TYRE MONITORING SYSTEM FAULT**. The TPM system fault sequence will be activated at every ignition cycle until the fault is rectified. When a malfunction occurs, the system may not be able to detect or signal low tyre pressure as intended.

TPM system malfunctions may occur for a variety of reasons which may include other radio frequency systems causing interference or the installation of incompatible replacement tyres on the vehicle.

Spare tyre pressure

The full size spare tyre should be inflated to the highest pressure for the specified tyre size, when not in use on the vehicle.

Full size spare wheel and tyre change

Should it be necessary to change a wheel and tyre with the spare then the system will automatically recognise the change in wheel positions. The vehicle needs to be stationary for 15 minutes during the wheel and tyre change, before the system is ready to detect the change in positions. After driving above 25 km/h (18 mph) any deflation warning will clear typically within 5 minutes.

Temporary spare wheel and tyre change

If the temporary spare wheel is fitted, the system will automatically recognise the change in wheel positions. Then, after approximately ten minutes of driving above 18 mph (25 km/h), the message **TYRE FRONT (REAR) RIGHT (LEFT) NOT MONITORED** will be displayed, accompanied by illumination of the warning telltale.

The warning telltale will initially flash and will subsequently revert to continuous illumination. Extended use of the temporary spare wheel, will produce an additional text message **TYRE MONITORING SYSTEM FAULT**.

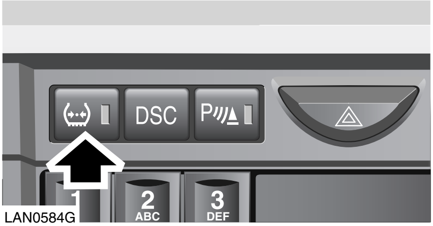
This TPM system display sequence will be activated at every ignition cycle until the temporary spare wheel is replaced by a fully operational full size wheel and tyre assembly.

Always replace the temporary spare wheel before having TPM system faults investigated. The fault may well be rectified with the fitment of a fully operational full size running tyre in lieu of the temporary spare wheel assembly.

Vehicle loading

It is possible to select different pressure levels that correspond to the placard pressures for a lightly laden and a heavily laden vehicle. The indicator on the TPM system button will display the system status.

If the indicator is illuminated, the system is in lightly laden mode and if the indicator is not illuminated then the system is in heavily laden mode. If the vehicle is to be used heavily laden or for towing, the tyre pressures must be increased to cope with the additional load, and the tyre pressure monitoring system must be set into heavily laden mode.



This can be accomplished by pressing the TPM system button on the switch pack for at least 4 seconds with the ignition in position **II** and the engine NOT running.

To indicate that the system has switched to heavily laden mode, the indicator in the switch will extinguish and the message **TYRE PRESSURE MONITORING SET FOR HEAVY LOAD** will be displayed in the message centre.

When the vehicle load is returned to normal and the tyre pressures are reset, the system should be put back into lightly laden mode by pressing the button as before. The indicator indicator in the switch will lluminate and the message **TYRE PRESSURE MONITORING SET FOR LIGHT LOAD** will be displayed in the message centre. This change to and from heavily laden mode can be operated only when the ignition is in position **II** and the engine is not running.

See **Tyre pressures, 237**, **Tyre pressure and loading label, 239**, **WHEELS AND TYRES, 290** and **VEHICLE WEIGHTS, 291**.

If a tyre needs to be changed

It is recommended that you should always have your tyres serviced by a dealer or qualified technician. If a TPM system is fitted, each wheel and tyre assembly, with the exception of a temporary spare is equipped with a tyre pressure sensor connected to the tyre valve stem.

In order to avoid damage to the sensor, the tyres must be removed and refitted to the road wheel in a specified manner. Care must be taken to avoid contact between the bead of the tyre and the sensor during removal and refitting of the tyre, otherwise the sensor may become damaged and/or inoperable.

Caution: Valve stem seal, washer, nut, valve core and cap should be replaced at every tyre change.

Valve stem seal, washer and nut must be replaced if valve retention nut is loosened.

Sensor units and nuts must be refitted using the correct torque figures and associated profile.

Sensors can be removed from the wheel by the unscrewing of the valve retention nut.

Damage to the vehicle may result if these precautions are not taken.

Replacement sensor fitment procedure

Sensor replacement should be carried out by a Land Rover Dealer/Authorised Repairer.

A replacement sensor must be fitted to a running wheel in order to be recognised by the TPM system. Recognition only occurs when the vehicle is driven above 25 km/h (18 mph) for approximately ten minutes.

Should the TPM system warning for any wheel not clear, even after ensuring correct inflation and driving for more than ten minutes above 25 km/h (18 mph), consult your Land Rover Dealer/Authorised Repairer.

WASHING YOUR VEHICLE

Caution: Never aim a high pressure water jet directly at the engine air intake, heater air intakes, body and sunroof seals, or at any components that might easily be damaged. Do not use a high pressure washer in the engine bay area. Damage to components could occur.

Remove heavy deposits of mud and dirt with a hose, before washing the vehicle.

Wash your vehicle frequently using a sponge and generous quantities of cold or lukewarm water containing a car shampoo. Rinse and dry off with a chamois leather.

- Do not use hot water.
- Do not use detergent soap products or washing-up liquid.
- In hot weather, do not wash the vehicle in direct sunlight.

Removing tar spots

Use white spirit to remove tar spots and stubborn grease stains from paintwork. Then wash immediately with soapy water to remove all traces of spirit.

Underbody maintenance

Corrosive materials used for snow and ice removal and dust control can collect on underbody parts. If these materials are not removed, accelerated rusting can occur. Use a hose to regularly flush the underbody with plain water, taking particular care to thoroughly clean those areas where mud and other debris can easily collect.

Similarly, after off-road driving or wading in muddy or salt water conditions, use a hose to wash underbody components and other exposed parts of the vehicle.

When using a hose, do not direct the jet into the engine air intake, which is located on the right-hand-side front wing (viewed from driver's position), or the heater air intake ducts, or through the wheel trim apertures onto the brake components, or at the door, window or sunroof seals, where water pressure could penetrate the seals.

If damage or corrosion to the underbody area is detected, please have the vehicle checked by a Land Rover Dealer/Authorised Repairer at the earliest opportunity.

Cleaning after off-road driving

Caution: After driving off-road, ensure that areas around air intakes and the front grille are clean and clear of debris. Failure to do so may cause the engine to overheat.

Ensure that the vehicle and underside is cleaned soon after off-road driving, taking particular care to clean areas where mud and debris has compacted.

Use a low pressure hose to flush water through the lower grille area, to clean the cooling system components.

Body protection

After washing, inspect the paintwork for damage. Any stone chips, fractures or deep scratches in the bodywork should be repaired promptly. Bare metal will corrode quickly and can develop into major repair expense. Some exterior panels of your vehicle are made of aluminium which will not corrode in the same manner as steel. However, any damage should still receive prompt attention. Minor chips and scratches can be repaired with touch-up materials available from your Land Rover Dealer/Authorised Repairer. Larger areas of damage need to be corrected to professional standards immediately.

Polishing

Caution: DO NOT apply car polish to the unpainted areas of the bumper mouldings - polish will become ingrained in the textured finished.

Occasionally treat the paint surface with an approved polish containing the following properties:

- Very mild abrasives to remove surface contamination without removing or damaging the paint.
- Filling compounds that will fill scratches and reduce their visibility.
- Wax to provide a protective coating between the paint and the elements.

Glass and mirrors

Clean the rear window with a soft cloth to avoid damaging the heating elements. DO NOT scrape the glass or use an abrasive cleaning fluid.

Mirror glass is particularly susceptible to damage. Wash with soapy water. DO NOT use abrasive cleaning compounds or metal scrapers to remove ice.

CLEANING THE INTERIOR

WARNING

Read individual product warnings before using any car cleaning or washing products.

CAR CARE PRODUCTS	
Facia cleaner (300 ml aerosol)	STC4683
Fabric cleaner (300 ml aerosol)	STC4685
Leather cleaning kit	BAC500490
Insect remover (300 ml aerosol)	STC4686
Glass cleaner (300 ml aerosol)	STC4681
Bumper cleaner (300 ml aerosol)	STC4679
De-icer (300 ml aerosol)	STC4677
De-icer (500 ml trigger spray)	STC4676
Screenwash (250 ml bottle)	STC4672
Screenwash (500 ml bottle)	STC4687
Alloy wheel cleaner (500 ml trigger spray)	STC4675
Wash and Wax (300 ml bottle)	STC4680
Wax polish (300 ml bottle)	STC4682

Plastic materials

WARNING

DO NOT polish instrument panel components - for safety, these should remain non-reflective.

Clean plastic-faced or cloth-covered surfaces with warm water and a non-detergent soap and wipe with a clean cloth.

Leather

Caution: Some materials/fabrics are prone to dye-transfer which can cause unsightly discolouration of lighter coloured leathers. Affected areas should be cleaned and re-protected as soon as possible.

Land Rover recommends that leather is cleaned and protected at least every six months, but maybe as often as every one to two months for high mileage vehicles, or vehicles kept in a hostile environment.

Leather cleaning kit, BAC500490, is recommended and endorsed by Land Rover for this purpose. Use in accordance with the instructions printed on the label.

DO NOT use chemical or abrasive materials to clean leather. Petrol, white spirit, alcohol, detergents, washing-up liquid, household cleaners, furniture polishes/creams or solvents should never be used on leather. While these products may give initially impressive results, their use will lead to rapid deterioration of the leather and will invalidate the warranty.

Carpet and fabrics

Clean with diluted nylon upholstery cleaner - test on a concealed area first.

Instrument pack, clock and radio

Clean with a dry cloth only. DO NOT use cleaning fluids or sprays.

Seat belts

Extend the belts, then use warm water and a non-detergent soap to clean. Allow the belts to dry naturally, and do not retract them or use the vehicle until they are completely dry.

Airbag module covers

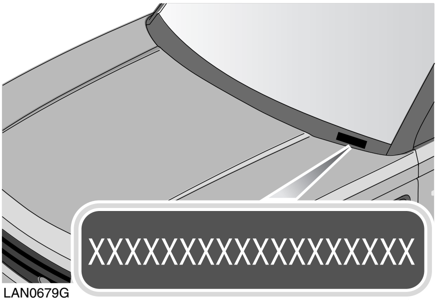
WARNING

To prevent airbag damage, the steering wheel centre pad, side airbags and area of the instrument panel containing the passenger airbag should ONLY be cleaned sparingly with a damp cloth and upholstery cleaner.

DO NOT allow these areas to be flooded with liquid, and DO NOT use petrol, detergent, cleaning solvents, furniture cream or polishes.

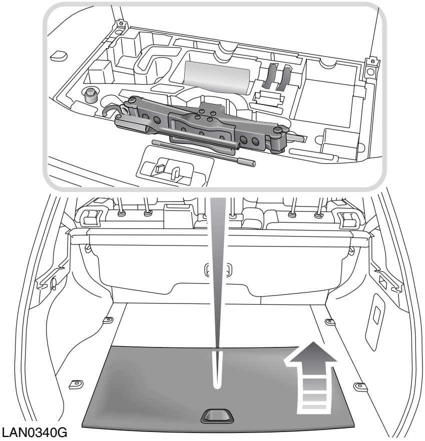
VEHICLE IDENTIFICATION NUMBER (VIN)

If you need to communicate with a Land Rover Dealer/Authorised Repairer, you may be asked to quote the Vehicle Identification Number (VIN).



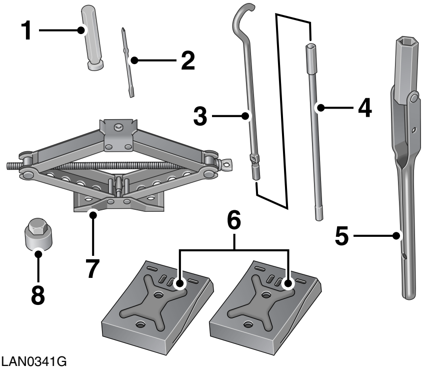
The VIN is stamped on a plate which is visible through the lowest part of the left side of the windscreen (this should match the VIN recorded in the Service Portfolio book). VIN information may also be found in areas such as: Bonnet locking platform, Suspension tower and Door shut faces.

TOOL KIT



The tool tray is located under a lift-up panel set in the loadspace floor.

Note: *Take careful note of the stowage position of each of the tools as it is important to return them to their correct position after use.*



The tool kit consists of:

1. Screwdriver handle.
2. Screwdriver blade.
3. Jack screw rotating hook.
4. Extension piece.
5. Wheel nut brace.
6. Wheel chocks.
7. Wheel change jack.
8. Locking wheel nut key.

Care of the jack

WARNING

After wheel changing, always secure tools, chocks, jack and replaced wheel in their correct storage positions.

Examine the jack occasionally, clean and grease the moving parts, particularly the screw thread, to prevent corrosion.

To avoid contamination, the jack should always be stowed in its fully closed position.

PUNCTURED TYRES

If you have a flat tyre while driving:

- Do not brake heavily.
- Gradually decrease the vehicle's speed.
- Hold the steering wheel firmly.
- Slowly move to a safe and suitable place at the side of the road.

Wheel changing safety

WARNING

Switch on the hazard warning lamps and set the hazard warning triangle a suitable distance behind the vehicle to alert other road users.

If possible, choose a safe place to stop away from the main road. Always ask your passengers to get out of the vehicle and wait in a safe area away from other traffic.

Before changing a wheel, ensure that the front wheels are in the straight-ahead position (if possible), apply the parkbrake, select **P** (Park) and select LOW range in the transfer box.

Turn off the starter switch, remove the key and engage the steering lock. Observe the following precautions:

- Ensure that the jack will be positioned on firm, level ground; NEVER on soft ground, or over metal gratings or manhole covers. DO NOT place additional material between the jack and the ground; this may jeopardise the safety of the jacking operation.
- Chock the wheel(s). See **Using wheel chocks, 252**.
- NEVER raise the vehicle with passengers inside, or with a caravan or trailer connected!

Tilt sensor

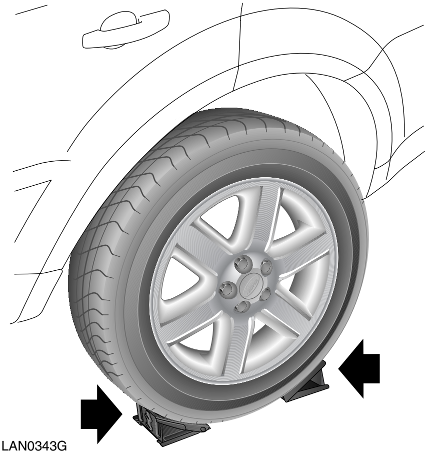
Your vehicle is fitted with a tilt sensor which activates the alarm if the vehicle is tilted fore and aft, or side to side, after it has been locked.

If you wish to have the doors locked while jacking up the vehicle, for any reason, lock the doors by pressing the lock button on the remote control twice within three seconds.

Using wheel chocks

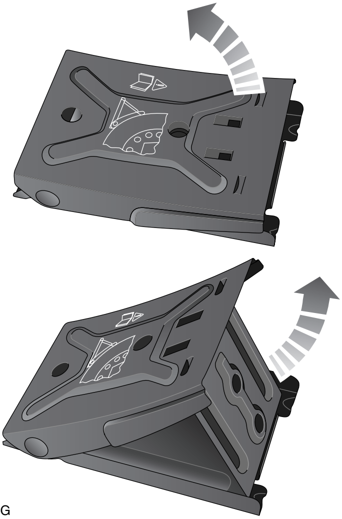
WARNING

As an additional safety precaution, it is necessary to chock the road wheels in two places before raising the vehicle.



LAN0343G

If possible, position the vehicle on level ground, chocking both sides of the wheel diagonally opposite the one to be removed.



LAN0344G

If jacking the vehicle on a slope is unavoidable, place the chocks on the downhill side of the two opposite wheels.

The wheel chocks are stowed in the tool kit, as shown in **TOOL KIT, 250**.

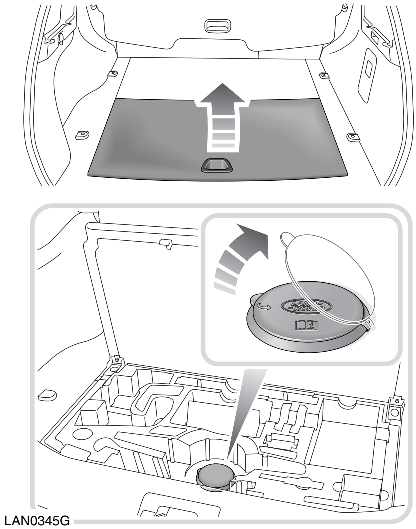
REMOVING THE SPARE WHEEL

WARNING

The wheels are extremely heavy. Take care when manoeuvring the spare wheel.

Always remove the spare wheel before jacking up the vehicle.

Note: *Before removing the spare wheel from the vehicle, take a look at the position that the spare wheel is stowed in, as you will need to check that the wheel about to be removed from the vehicle is returned to the correct storage position.*

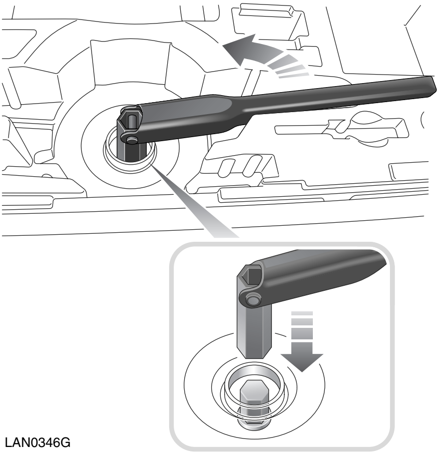


LAN0345G

With the tailgate open:

1. Lift open the spare wheel mechanism access hatch in the rear loadspace.

   Remove the jack from the tool tray.
2. Tilt up the circular locking cap covering the spare-wheel storage nut.



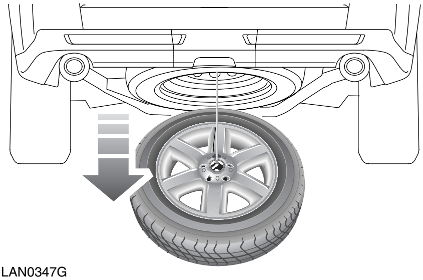
LAN0346G

3. Fit the wheel nut brace to the wheel-hoist winch nut and rotate anticlockwise to lower the spare wheel.

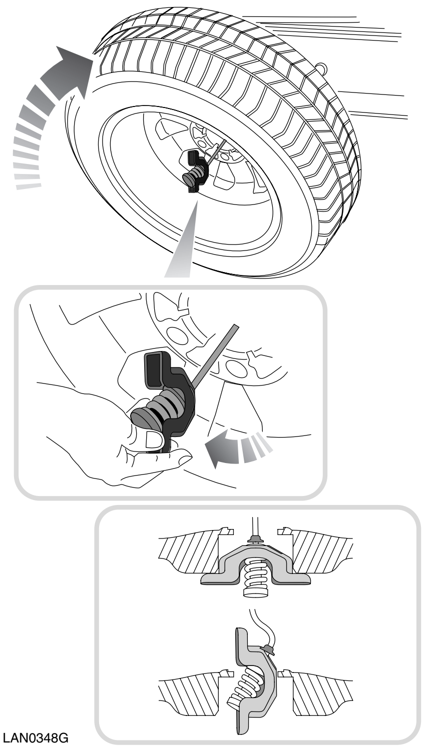
Caution: The mechanism has been designed for use with the wheel nut brace. DO NOT use power tools on the wheel-hoist winch.

When the wheel has reached the ground, continue to wind the handle until the cable is slack.

Do not attempt to turn the winch beyond the physical stop.



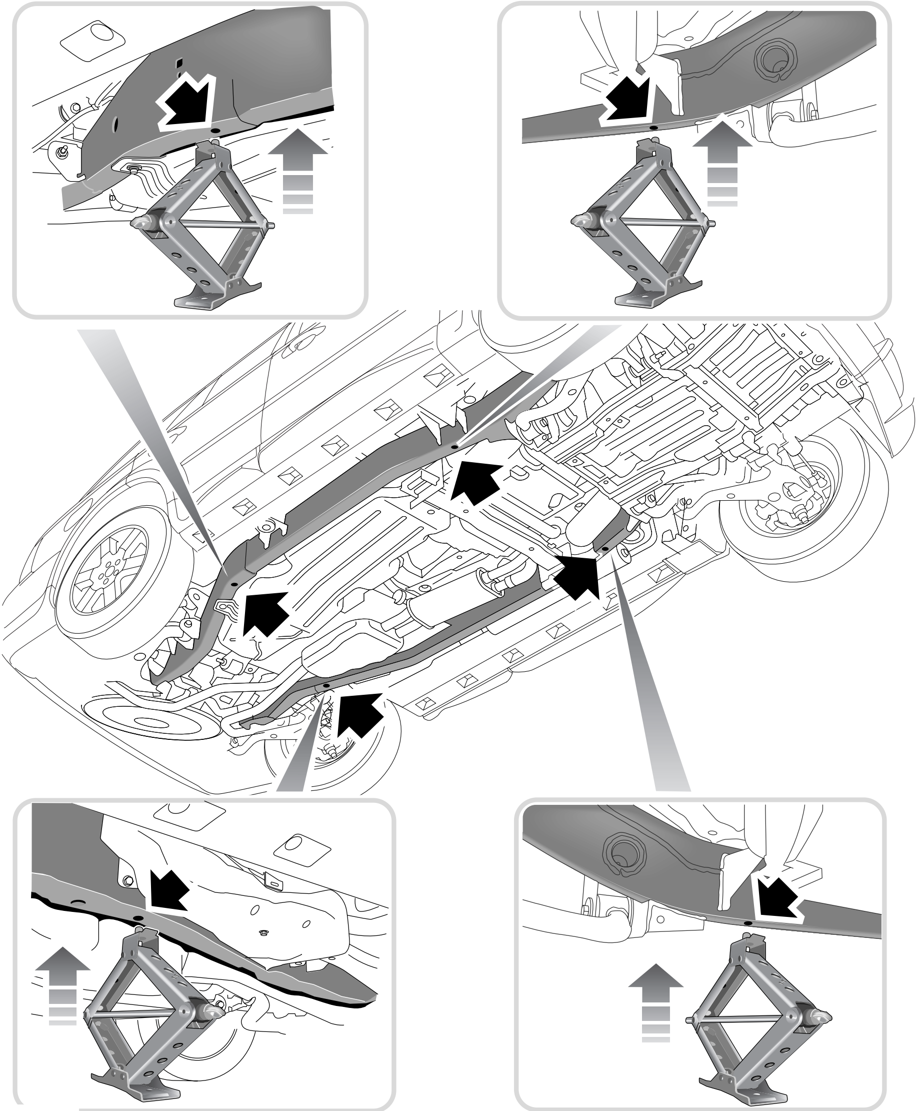
LAN0347G



4. Hold the cable and tilt the lifting lug until it can be lifted through the hole in the wheel, as shown above.

CHANGING A WHEEL

Positioning the jack



WARNING

NEVER work beneath the vehicle with the jack as the only means of support. The jack is designed for wheel changing only.

Always remove the spare wheel before jacking up the vehicle.

WARNING

Always:

- **Place the jack on firm, level ground.**
- **Position the jack from the side of the vehicle, in line with the appropriate jacking point.**
- **Raise the jack so that the pin in the head of the jack engages with a hole in the chassis rail at the points shown in the illustrations.**

WARNING

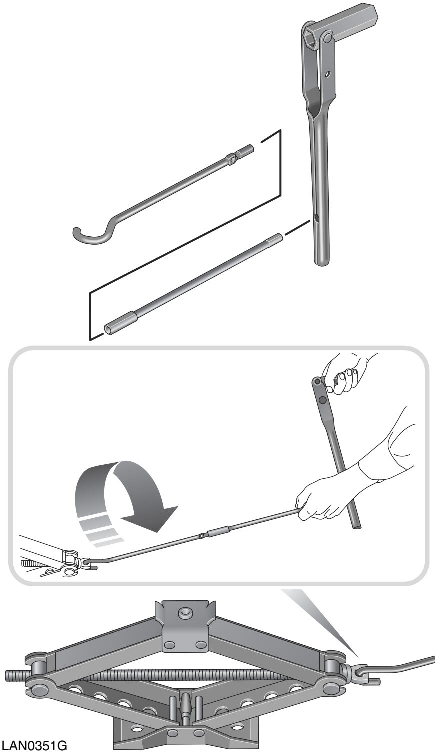
ALWAYS use the complete, two-piece, jack lever throughout to minimise any chance of accidental damage or injury.

WARNING

ONLY jack the vehicle using the jack location points described, or damage to the vehicle could occur.

Caution: Before positioning the jack under the vehicle, ensure that the air suspension is set to Off-road height.

Operating the jack



Before raising the vehicle, use the wheel nut brace to slacken the wheel nuts half a turn anticlockwise.

Attach the jack cranking lever to the jack. Fit the wheel nut brace onto the end of the cranking lever.

Turn the jack lever clockwise to raise the jack cradle until it engages with the jacking point. Ensure that the base of the jack is in full contact with the road surface.

Changing a wheel

WARNING

When fitting a wheel, ensure that the mating faces of the hub and wheel are clean and free from rust or anti-seize compound - any accumulation of dirt or rust could cause the wheel nuts to become loose.

Always remove the spare wheel before jacking up the vehicle.

1. Raise the vehicle until the tyre is clear of the ground.
2. Remove the wheel nuts and place to one side to prevent them from being lost.
3. Remove the road wheel.

   Note: *DO NOT damage the style surface of the wheel by placing it face down on the road.*
4. On alloy wheels, use an approved anti-seize compound to treat the wheel mounting bore. This will minimise any tendency for adhesion between the wheel and the bore.

   Ensure that no compound comes into contact with the brake components or the flat mounting surfaces of the wheel.

   If, due to an emergency situation, this treatment is not practicable; refit the spare wheel for the time being, but remove and treat the wheel at the earliest opportunity.
5. Fit the spare wheel with the valve stem outwards and lightly tighten the wheel nuts, ensuring they are firmly seated. DO NOT fully tighten whilst the tyre is clear of the ground.

6. Ensure that the space under and around the vehicle is free from obstructions then lower the vehicle and remove the jack and wheel chocks.
7. Fully tighten the wheel nuts in an alternating pattern until all are tightened. DO NOT OVERTIGHTEN by using foot pressure or extension bars on the wheel nut brace, as this could overstress the wheel nuts. Check the wheel nut torque at the earliest opportunity.

Road wheel nut torque to hub	140 Nm (± 10 Nm)

8. Using a suitable blunt tool, apply light pressure to the rear of the displaced wheel centre cap and remove. Using hand pressure only, fit the centre cap into the newly fitted wheel. Return tools, chocks, jack and the displaced wheel to their correct storage positions.
9. REMEMBER to change to **H** (HIGH range) before driving.
10. Finally, check the tyre pressure at the earliest opportunity. See **WHEELS AND TYRES, 290**.

Note: *During jacking, the air suspension system may enter an automatic freeze state. See* ***Suspension freeze, 188****.*

Temporary spare wheel

WARNING

The following precautions must be observed when the temporary spare wheel is in use:

- **DRIVE CAUTIOUSLY; the temporary spare wheel tyre is smaller in size and higher in pressure than a regular tyre. It will cause a harsher ride and may have less traction on some road surfaces. If driving off-road on a temporary spare wheel, drive with extra caution.**
- **The temporary spare wheel is for TEMPORARY use only. It MUST be replaced by a normal-sized wheel and tyre as soon as possible.**
- **Only ONE temporary spare wheel is to be used on the vehicle at any one time.**
- **DO NOT drive at a speed exceeding 80 km/h (50 mph).**
- **The tyre pressure in the temporary spare wheel/tyre should be as detailed on the tyre pressures label. See Tyre pressure and loading label, 239.**
- **The temporary spare wheel has a shorter life than a regular tyre. Replace the tyre with one of the same type and specification.**
- **The use of snow chains is not permitted on a temporary spare wheel.**

Stowing the changed wheel

WARNING

DO NOT stow the wheel while the vehicle is still raised on the jack.

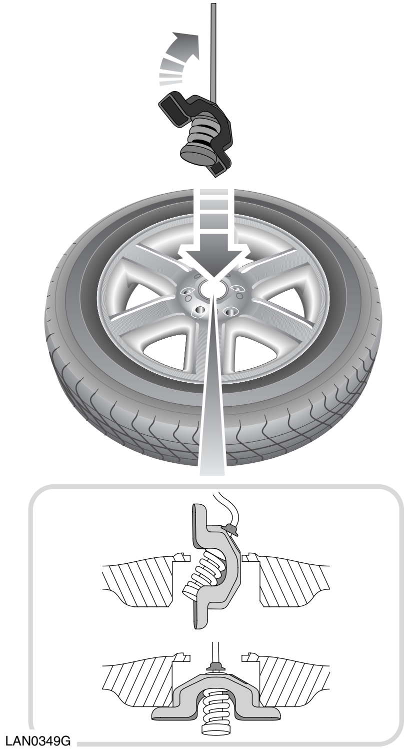
WARNING

The wheel must be securely retained in its correct position by the winch mechanism or it could become loose.

Caution: DO NOT stow 20 inch wheel and tyre assemblies under the vehicle as this may result in damage to the wheel face.

1. Place the wheel under the rear of the vehicle with its style surface uppermost.
2. Place the lifting lug through the wheel aperture and locate it in position.
3. Winch up the wheel using the wheel-hoist mechanism.

   The mechanism has been designed for use with the wheel nut brace. DO NOT use power tools on the wheel-hoist winch.
4. Continue to wind up until the mechanism clutches out. This is confirmed by a clear physical feedback from the wheel nut brace and an audible noise.
5. Check that the wheel has returned to the same position as the spare wheel as previously noted. If in any doubt, unwind the winch slightly and repeat the previous step.
6. Replace the circular locking cap over the wheel-hoist nut. As the underside of this cap is exposed to the same conditions as the underside of the vehicle, ensure that it is firmly in place.
7. Place the tools back into their stowage location.

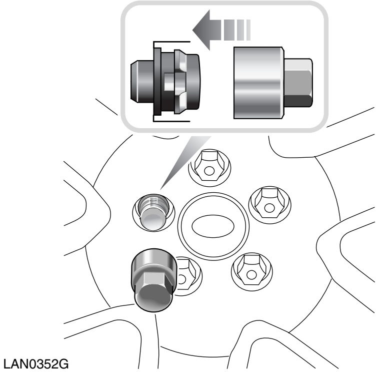


Note: *If, for any reason, the spare wheel is not to be fitted back under the vehicle, the wheel hoist should be rewound as follows.*

Position the lifting lug level on the cable and wind up the wheel hoist mechanism until it clutches out.

LOCKING WHEEL NUTS

Vehicles may be equipped with a locking wheel nut on each wheel. These are similar to standard wheel nuts, and can only be removed using the special adaptor provided in the tool kit.



Note: *A code number is stamped on the side of the side of the locking nut. Ensure the number is recorded on the Security Information card supplied with the literature pack. Quote this number if a replacement is required. DO NOT keep the Security Information card in the vehicle.*

Insert the adaptor firmly onto the locking wheel nut.

Using the wheel nut brace, unscrew the wheel nut and adaptor.

Be sure to return the locking wheel nut adaptor to the correct storage position.

STARTING AN ENGINE WITH A DISCHARGED BATTERY

WARNING

Always wear eye protection when working around batteries.

During normal operation batteries emit explosive hydrogen gas - ensure sparks and naked lights are kept away from the engine compartment.

DO NOT attempt to start the vehicle if the electrolyte in the battery is suspected of being frozen.

Make sure BOTH batteries are of the same voltage (12 volts), and that the booster cables have insulated clamps and are approved for use with 12 volt batteries.

DO NOT disconnect the discharged battery.

DO NOT connect positive (+) terminals to negative (-) terminals, and ensure booster cables are kept away from any moving parts in the engine compartment.

Take care when working near rotating parts of the engine.

WARNING

DO NOT use a 24 volt booster start system.

These produce excessive voltage and can damage the vehicles electrical system.

Caution: DO NOT push or tow start!

Using booster cables

Using booster cables (jump leads) from a donor battery, or a battery fitted to a donor vehicle, is the only approved method of starting a vehicle with a discharged battery.

Boosting from another vehicle

If a donor vehicle is to be used, both vehicles should be parked with their battery locations adjacent to each other. Ensure that the two vehicles do not touch.

Apply the handbrakes and ensure that the transmission of both vehicles is set in neutral (**P** or Park for vehicles with automatic transmission).

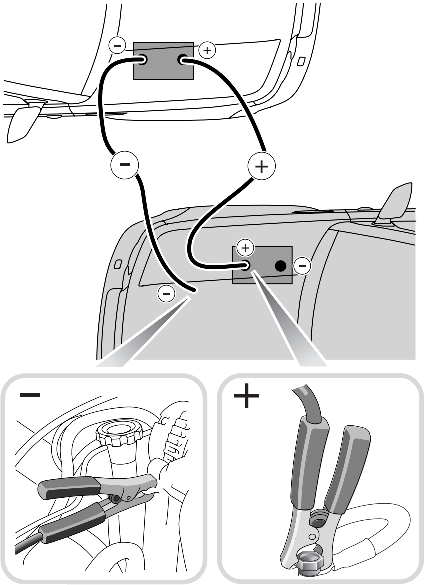
Turn off the starter switch and ALL electrical equipment of BOTH vehicles.

Boosting procedure

WARNING

For safety reasons:

- **DO NOT connect the black cable to the negative terminal of the discharged battery. If in doubt, seek qualified assistance.**
- **ENSURE that each connection is securely made and that there is no risk of the clips accidentally slipping or being pulled from the battery terminals. This could cause sparking, which can lead to a fire or explosion.**



LAN0353G

Always adopt the following procedure, ensuring the cables are connected in the order shown below:

1. On the donor vehicle, connect one end of the RED booster cable to the positive (+) terminal of the battery or the vehicle's positive (+) connection point.
2. On the disabled vehicle, connect the other end of the RED booster cable to the positive (+) battery terminal.
3. On the donor vehicle, connect one end of the BLACK booster cable to the negative (-) terminal of the battery or the vehicle's negative (-) connection point.
4. On the disabled vehicle, connect the other end of the BLACK booster cable to a good earth point (e.g. an engine mounting or other unpainted metal surface) at least 0.5 m (20 in.) from the battery and well away from fuel and brake lines.

Check that the cables are clear of any moving parts of both engines, then start the engine of the donor vehicle and allow it to idle for a few minutes.

Now start the vehicle with the discharged battery. Once both engines are running normally, allow them to idle for two minutes before switching off the donor vehicle engine.

DO NOT switch on any electrical circuits on the previously disabled vehicle until AFTER the booster cables have been removed.

Disconnecting the booster cables must be an EXACT reversal of the procedure used to connect them, i.e. disconnect the black cable from the negative (-) connection terminal on the donor vehicle first.

FUSES

Fuses are simple circuit devices which protect electrical equipment against the effects of excess current.

A blown fuse is indicated when the electrical equipment it protects becomes inoperative.

Fuses are colour coded to help identify their amperage, as follows:

Blade fuse colours

VIOLET	3 amp
TAN	5 amp
BROWN	7.5 amp
RED	10 amp
BLUE	15 amp
YELLOW	20 amp
WHITE	25 amp
GREEN	30 amp

Cartridge fuse colours (engine bay only)

BLUE	20 amp
PINK	30 amp
GREEN	40 amp
RED	50 amp
YELLOW	60 amp

Note: *Owners are advised against removing or replacing the relays (identified as R1-R19 on the relays) and fusible links (identified as FL1-FL20 on the fusible links). Failure of any of these items should be investigated by a qualified technician.*

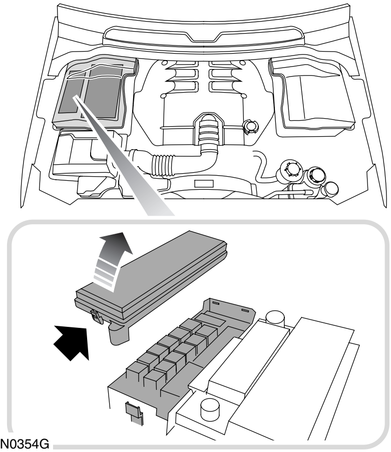
Checking or renewing a fuse

WARNING

To prevent a possible fire or damage to the electrical system, fit only replacement fuses of the same rating and type. Do not replace a blown fuse with a fuse of a higher amperage rating. Always rectify the cause of the failure before replacing a fuse. Seek qualified assistance if necessary.

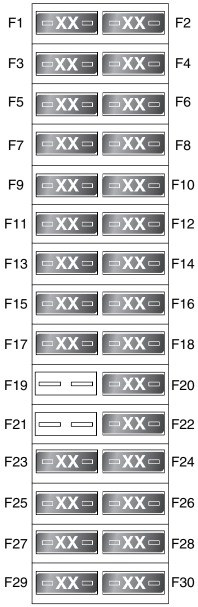
Always turn the starter switch to position **O** and switch off the affected electrical circuit before removing a fuse.

Engine compartment fuse box



The engine compartment fuse box is located at the rear of the engine bay. To view the fuse box, the under-bonnet cover will have to be removed. See **UNDER-BONNET COVERS, 218**. The plastic lid of the box is removed by pressing the plastic tabs in.

Engine compartment fuses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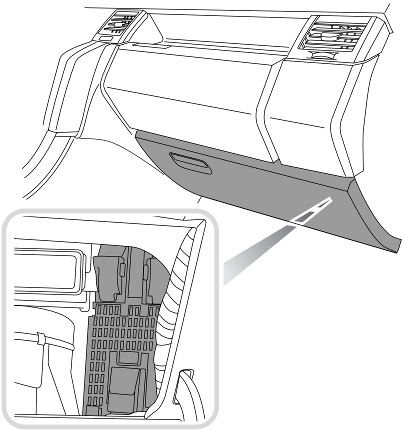
LAN0356G

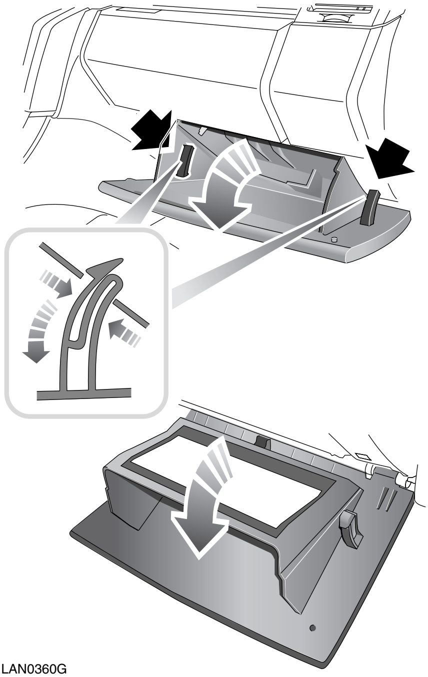
Note: *Fuse removal tweezers and spare blade fuses are located in the passenger compartment fuse box. See* ***Passenger compartment fuse box, 266****.*

Engine compartment fuse specification

Fuse number	Rating (amps)	Circuit protected
1	25	Fuel pump
2	-	
3	5	Air suspension ECU
4	25	Petrol - V8 Supercharged - supercharger cooling pump
4	25	Diesel - EMS (ECU and fuel pump relay control)
5	10	Petrol - EMS (purge valve, EGR, inlet manifold tune valve), E-Box fan, Adaptive cruise control
5	10	Diesel - Adaptive cruise control
6	15	Petrol - EMS (coils), Diesel - EMS, glow plug relays
7	25	Hevac - front seat heat
8	25	Rear seat heat
9	15	Dynamic response
10	15	Petrol - EMS (throttle motor, MAF), cool fan
10	15	Diesel - cool fan
11	15	Petrol - EMS (rear oxygen sensors)
12	10	Heated washer jets
13	10	Petrol - EMS (ECU, VVT's and fuel pump relay control)
13	10	Diesel - EMS (PCV, VCV)
14	20	Petrol - EMS (front oxygen sensors)
15	30	Heated front screen
16	10	Heated door mirrors
17	15	Petrol - EMS (injectors)
17	15	Diesel - EMS (MAF, EGR), E-Box fan, Dual MAF sensors, MTV
18	30	Heated front screen
19	-	
20	5	Alternator
21		
22	-	
23	25	Dynamic Stability Control system
24	20	Petrol - brake boost pump
25	10	Lighting switch
26	20	Air suspension ECU
27	5	Engine control module (EMS)
28	20	Diesel - Fuel burning heater
29	30	Front wipers
30	10	Auto transmission ECU

Passenger compartment fuse box


LAN0357G


LAN0360G

The passenger compartment fuse box is fitted behind the glovebox. To access the fuses, open the glovebox to the service position.

This is done by opening the glovebox normally and then pinching the top of the support stays located either side of the hopper. This allows the glovebox to be lowered into the footwell.

A label on the rear of the glovebox shows the circuits protected, the fuse values and their locations. They are also listed on the following page.

Checking or renewing a fuse

WARNING

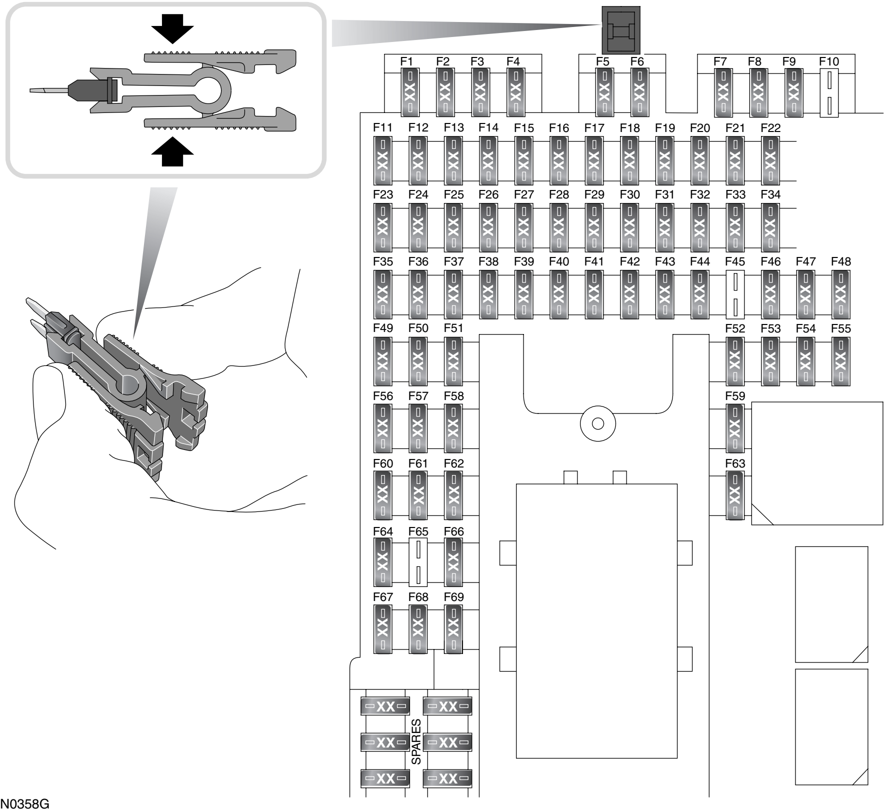
To prevent a possible fire or damage to the electrical system, fit only replacement fuses of the same rating and type. Do not replace a blown fuse with a fuse of a higher amperage rating. Always rectify the cause of the failure before replacing a fuse. Seek qualified assistance if necessary.

Always turn the starter switch to position **O** and switch off the affected electrical circuit before removing a fuse.

Passenger compartment fuses

The fuse removal tweezers are located in the passenger compartment fusebox. Place the tweezers onto the head of the suspect fuse (as shown), squeeze the middle (arrowed) and pull to remove. A break in the wire inside the fuse indicates that the fuse has blown and must be replaced.

Always replace a fuse with another of the same value, however, if the replacement fuse blows immediately the circuit MUST be checked by a qualified Land Rover Dealer/Authorised Repairer.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F11 F12 F13 F14 F15 F16 F17 F18 F19 F20 F21 F22
F23 F24 F25 F26 F27 F28 F29 F30 F31 F32 F33 F34
F35 F36 F37 F38 F39 F40 F41 F42 F43 F44 F45 F46 F47 F48
F49 F50 F51 F52 F53 F54 F55
F56 F57 F58 F59
F60 F61 F62 F63
F64 F65 F66
F67 F68 F69
XX
SPARES

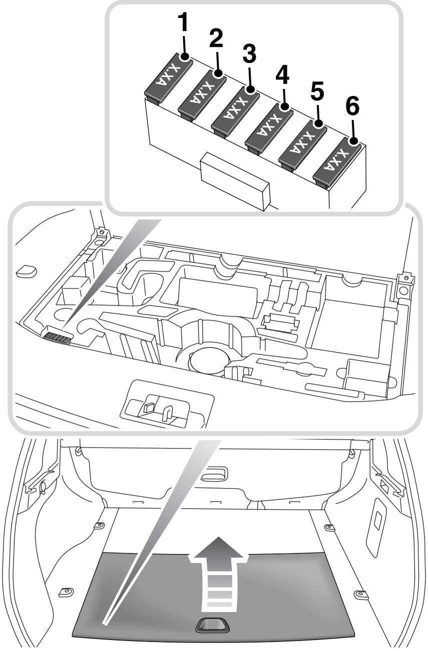
LAN0358G

Passenger compartment fuse specification

Fuse number	Rating (amps)	Circuit protected
1	10	Interior lamps - glovebox lamp, vanity mirror lamp, map lamps, switchable roof lamps
2	10	RH side lamps
3	-	
4	10	LH side lamps
5	10	Reverse lamps
6	10	Tow reverse lamp
7	25	Driver's window
8	30	Trailer pick-up (battery feed)
9	5	SRS
10	-	
11	15	Washer pump
12	15	Horn
13	25	Heated Rear Window
14	10	Tow sidelamp
15	15	Brake lamps, Brake switch
16	10	Powerfold mirror
17	20	Rear RH window
18	5	Rain sensor, ambient light sensor (auto lamps)
19	15	Auxiliary power socket - centre console
20	15	Sunroof
21	25	Passenger window
22	10	Trailer pick-up (starter feed)
23	5	Adaptive cruise control
24	5	Transfer box - centre diff, Terrain Response
25	5	Engine control module
26	5	Battery back-up sounder
27	10	Adaptive front lighting / Headlamp levelling
28	5	Fusebox engine compartment - starter
29	30	Passenger electric seat
30	-	
31	20	Rear LH window
32	15	Rear fog lamps
33	5	Mirror adjust, PRNDS - Auto transmission selector, passenger electric seat, driver non memory electric seat
34	15	

Fuse number	Rating (amps)	Circuit protected
35	5	Air suspension ECU/Speed variable steering
36	5	Park Distance Control, Tyre Pressure Monitoring system
37	5	Dynamic Stability Control
38	15	Front fog lamps
39	5	Instrument pack
40	5	Key in sensor
41	5	Electric parkbrake
42	30	Audio amp
43	10	RF receiver, Tyre Pressure Monitoring system
44	5	PRNDS Auto transmission selector
45	-	
46	30	Driver’s electric seat
47	15	Auxiliary power socket - loadspace
48	15	Rear wiper
49	30	CDL (central door locking)
50	10	Electric fuel flap actuator
51	10	Heating/ventilation/air conditioning (HeVAC) ECU
52	5	Telephone, traffic message centre
53	15	Head module, media player, infotainment display, DVD player
54	5	Electric seat - memory, lumbar pump
55	15	Lighter
56	10	Adaptive front lighting (Left hand unit)
57	10	Rear seat entertainment module
58	10	Telephone, infotainment display, multi-media module, TV tuner
59	10	Cubby box cooler
60	5	Engine control module (ECM) - starter signal
61	10	Adaptive front lighting (Right hand unit)
62	5	Low beam, auto lamps
63	10	Diagnostic socket
64	5	Auto transmission
65	10	Tailgate power striker
66	5	HDC switch, Brake switch, Steering angle sensor/DSC switch
67	5	Auto lamps
68	5	Instrument pack
69	5	Electrochromatic mirror

Tow hitch fuses



LAN0359G

Fuse number	Rating (amps)	Circuit protected
1	7.5	Brake lamp
2	15	Ignition feed
3	15	Battery feed
4	7.5	Rear fog lamps
5	5	Right-hand tail lamp
6	5	License plate and left-hand tail lamp

The supplementary fuse box that protects the tow hitch circuits, is located under the cover in the luggage compartment.

REPLACING BULBS

Caution: Before replacing a bulb, always switch off the starter switch and appropriate lighting switch to prevent any possibility of a short circuit. Only replace bulbs with the same type and specification.

Check the operation of all exterior lamps before you drive the vehicle.

Replacement bulbs

Note: *All bulbs must be rated at 12 volts.*

Bulb	Watts
Headlamps, low and high beam (Halogen)	55 (H7)
Headlamps, low and high beam (Xenon)	55 (D2S)
Cornering lamps (Halogen)	35 (H8)
Front side lamps	W5W
Front direction indicators	S8
Rear direction indicators	P21
Front fog lamps (Halogen)	55 (H11)
Side repeater lamps	W5W
Reverse lamps	P21
Rear fog guard lamps	P21
Stop/tail lamps	P21/5
Number plate lamps	W5W
Door/puddle lamps	W5W
Interior lamps	W5W
Luggage/footwell lamps	W5W
Luggage/tailgate lamps	W5W
Glovebox lamp	W5W
Vanity mirror lamp	1.2

Note: *In certain territories it is a legal requirement to carry spare bulbs, in case of bulb failure. A replacement bulb kit is available as an approved accessory from your Land Rover Dealer/Authorised Repairer.*

Halogen bulbs

Halogen bulbs are used for high beam, low beam and front fog lamps. Take care NOT to touch this type of bulb with your fingers; always use a cloth to handle them. If necessary, clean the bulb with methylated spirits to remove fingerprints.

Xenon lamp units

WARNING

- **Used Xenon lamp units contain mercury, which is hazardous and can be injurious to health.**
- **A very high voltage is required to ignite the gas and metal vapour used to power Xenon lamps. Contact with this voltage could cause very serious injury.**
- **Replacement or maintenance of Xenon lamps should be carried out only by qualified personnel.**

Some vehicles are fitted with Xenon low/high beam headlamp units. Xenon lamps provide significantly improved visibility, especially during adverse weather and driving conditions.

The operational life of a Xenon lamp is significantly longer than that of a conventional or Halogen bulb.

Seek advice about the proper disposal of Xenon lamp units from a Land Rover Dealer/Authorised Repairer or your local disposal authority.

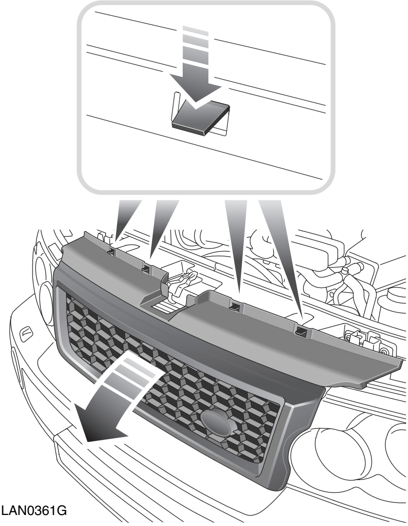
HEADLAMP UNIT

WARNING

Do not attempt to change any bulb with the lighting switched on. If the lighting has just been switched off, give the bulbs time to cool down. Handling them in a hot condition may cause personal injury.

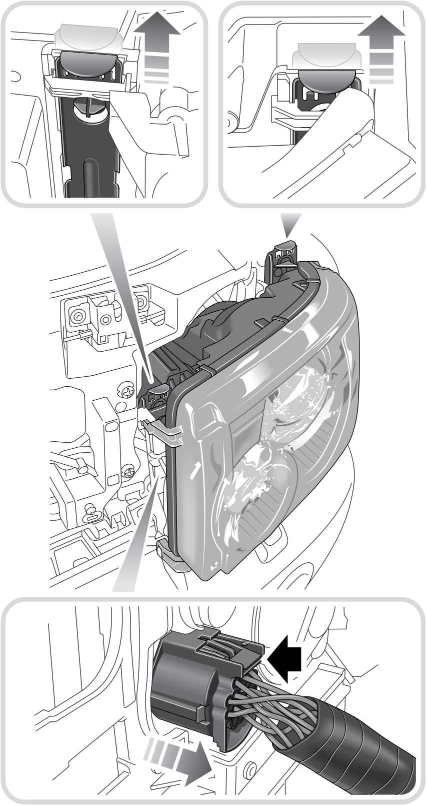
The headlamp unit contains four lamps and it is necessary to completely remove the unit from the vehicle in order to change any of the bulbs.

To remove the headlamp unit



LAN0361G

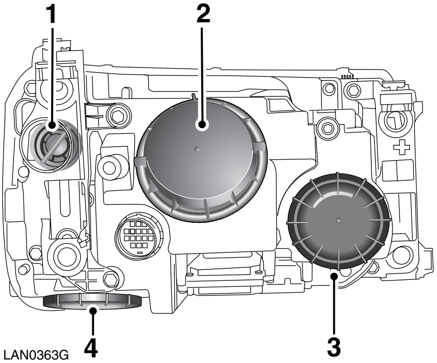
1. Remove the grille by pressing down on the four upper clips securing the grille to the vehicle body. Lift the grille clear of the vehicle and place it where it will not sustain any damage.



LAN0362G

2. Carefully pull up the two locking bars.
3. Disconnect the wiring plug from the back of the unit and remove the unit from the vehicle. Place face down on a flat surface covered in a soft material to prevent damage to the unit’s lenses.

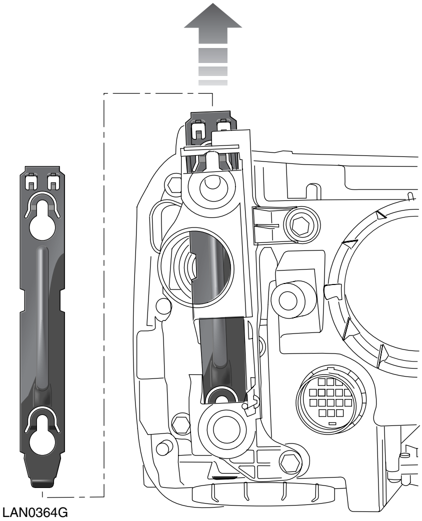
Bulb access



The four bulbs within the headlamp unit, accessible under domed caps are:

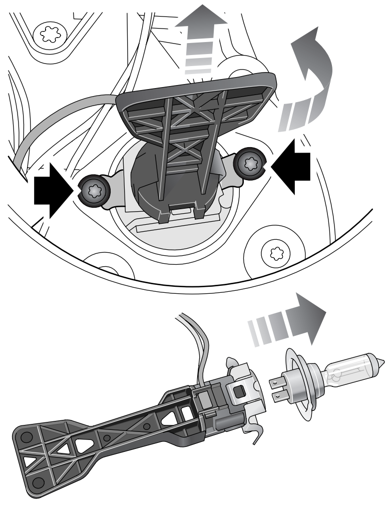
1. Direction indicator
2. Low beam/xenon
3. High beam
4. Side lamp and static bending lamp

See **Replacement bulbs, 271**.

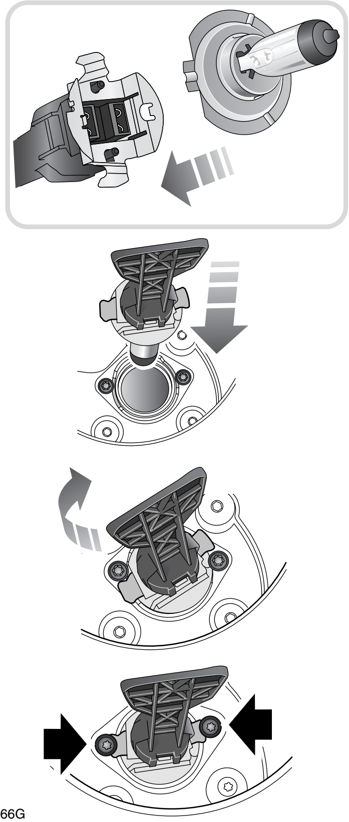


Note: *To access the direction indicator, the headlamp unit locking slide must be completely removed from the unit.*

To change a high beam bulb (Halogen only)



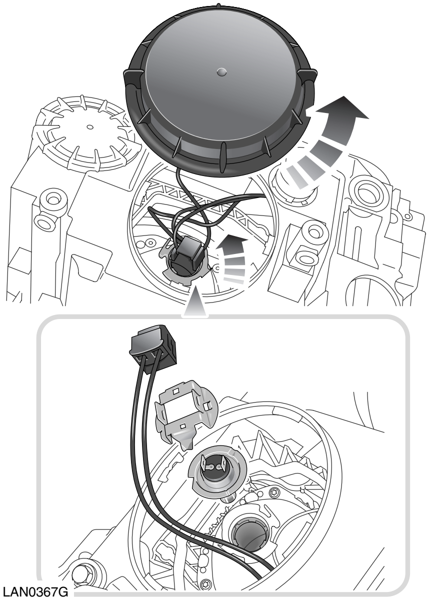
1. Twist and lift off the domed cap.
2. Note the position of the bulb locator extension. Two locking tabs at the sides of the locking ring locate under small bolt heads.
3. Turn the locator extension counter-clockwise and withdraw it, complete with bulb, from the headlamp unit.
4. Prise the bulb from the holder.



5. The new bulb will only fit in one position. As you press the new bulb into the electrical connections, squeeze the locking ring so that the two protruding pins locate with the bulb correctly.
6. Replace the bulb holder and locator extension into the headlamp unit and turn clockwise, ensuring the two locking ring tabs locate under the small bolt heads.

See **Replacement bulbs, 271**.

To change low beam bulb (Halogen only)



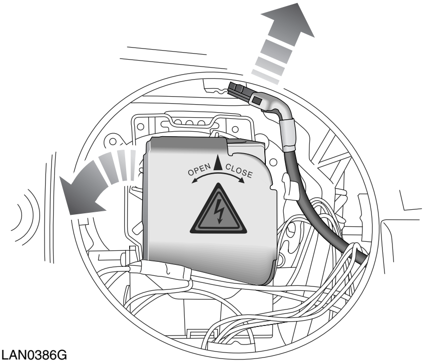
1. Twist and lift off the domed cap.
2. Pull off the electrical connector.
3. Release the spring clip holding the bulb in place and lift out the bulb.
4. Insert the new bulb and repeat the above procedure in reverse order. When replacing the cap, align the arrowheads on the cap and the body of the unit.

See **Replacement bulbs, 271**.

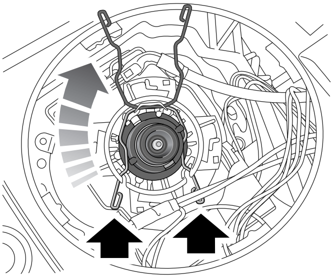
Note: *After the replacement of any high or low beam bulb, the alignment of the headlamps should be checked by a Land Rover Dealer/Authorised Repairer.*

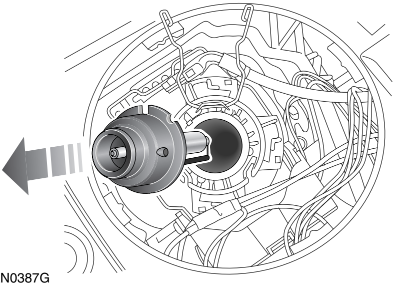
Bulb Replacement

To change a Xenon bulb



LAN0386G





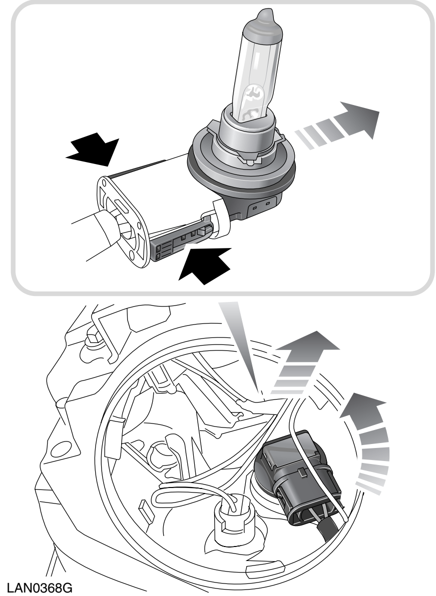
LAN0387G

1. Twist and lift off the domed cap.
2. Pull off the electrical connector.
3. Twist the connector cap anti-clockwise to unlock it. Pull clear of the bulb.
4. Release the spring clip holding the bulb in place and lift out the bulb.
5. Insert the new bulb and repeat the above procedure in reverse order. When replacing the cap, ensure that the lugs are in contact with the bulb base.

See **Replacement bulbs, 271**.

Note: *After the replacement of any main or dipped beam bulb, the alignment of the headlamps should be checked by a Land Rover Dealer/Authorised Repairer.*

To change a static bending bulb

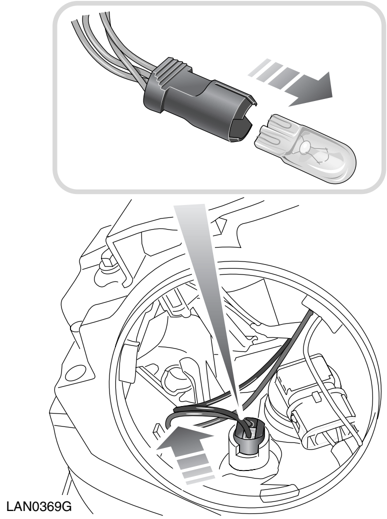


1. Twist and lift off the domed cap.
2. Twist the bulb holder anti-clockwise to unlock, then pull out the bulb complete with electrical connector.
3. To release the bulb, depress the two catches (solid arrows in inset), then pull to remove the bulb from the holder.
4. Insert the new bulb and repeat the above procedure in reverse order.

   See **Replacement bulbs, 271**.

   When replacing the cap, align the arrowheads on the cap and the body of the unit.

To change a front side lamp bulb



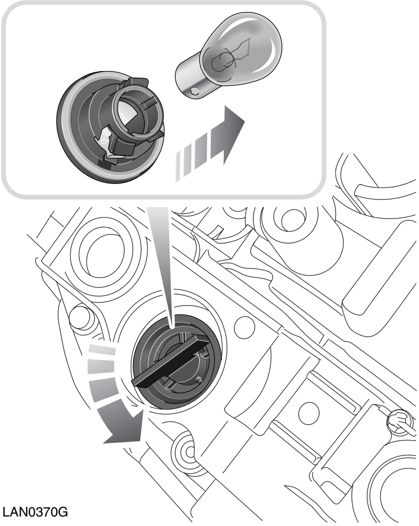
1. Twist and lift off the domed cap.
2. Pull out the bulb complete with electrical connector.
3. Pull the bulb out of the electrical connector.
4. Insert the new bulb and repeat the above procedure in reverse order.

   See **Replacement bulbs, 271**.

   When replacing the cap, align the arrowheads on the cap and the body of the unit.

Bulb Replacement

To change a front indicator lamp bulb

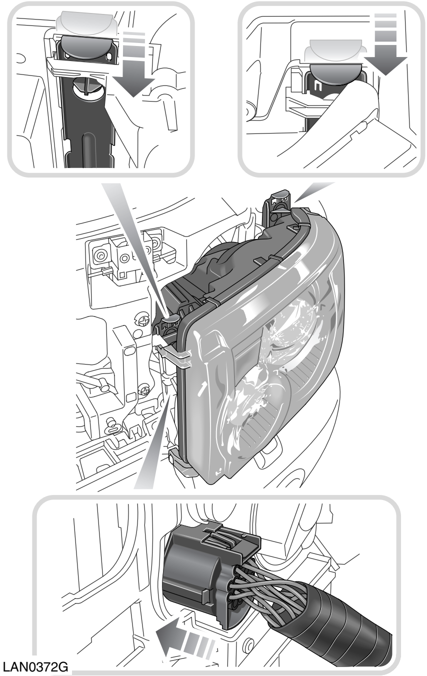


1. Twist and lift off the domed cap.
2. Twist the bulb holder anti-clockwise to unlock, then pull out the bulb complete with electrical connector.
3. Pull the bulb out of the electrical connector.
4. Insert the new bulb and repeat the above procedure in reverse order.

   See **Replacement bulbs, 271**.

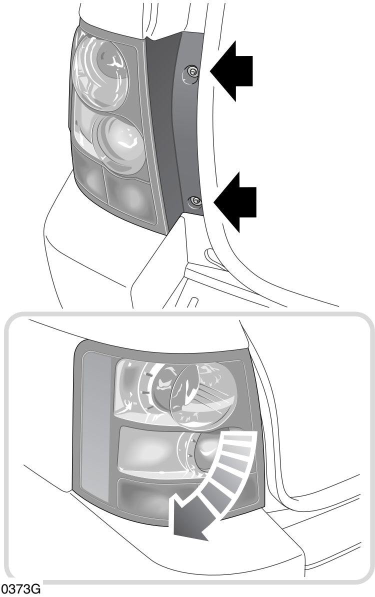
   When replacing the cap, align the arrowheads on the cap and the body of the unit.

To refit the headlamp unit



1. Reconnect the wiring plug.
2. Offer up the unit into position.
3. Push down on the two locking slides as shown.
4. Refit the grille.

REARLAMP UNIT

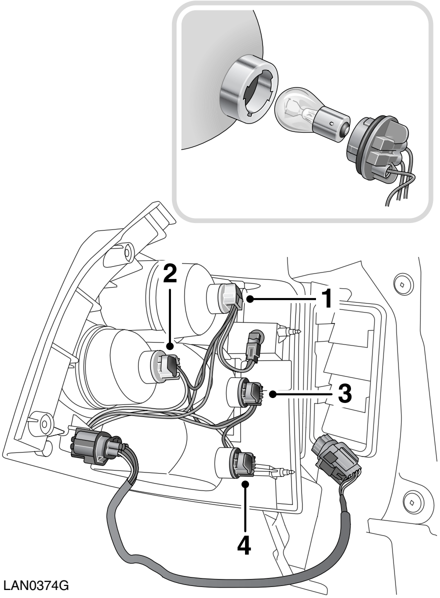


LAN0373G

The rearlamp unit contains four lamps and it is necessary to completely remove the unit from the vehicle in order to change any of the bulbs.

Removal of rearlamp unit

1. With the tailgate open, remove two screws from the edge of the unit nearer the tailgate aperture.
2. Pull the unit away from the vehicle.
3. Disconnect the wiring multi-plug and remove the unit from the vehicle. Place face down on a flat surface covered in a soft material to prevent damage to the unit's lenses.



LAN0374G

Each bulb is now accessible by twisting off its electrical connection cap. See **Replacement bulbs, 271**.

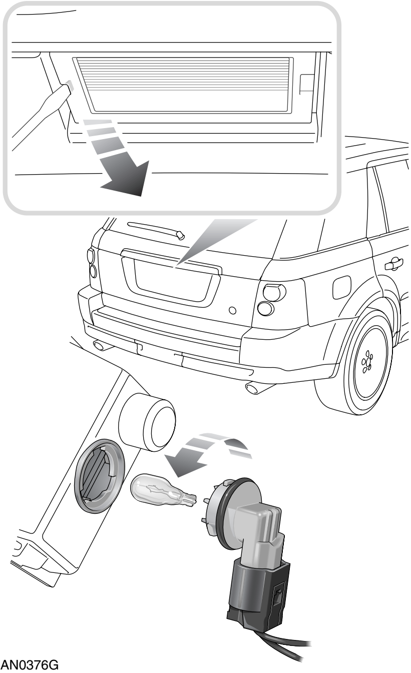
1. Stop/tail lamp
2. Reversing lamp
3. Direction indicator
4. Rear fog guard lamp

Refitting the rearlamp unit

1. Reconnect the electrical multi-plug.
2. Locate the unit's two studs in the sockets at the outer side of the mounting face.
3. Insert and tighten the two screws on the side of the unit nearer the tailgate aperture.
4. Check that all of the bulbs work.

NUMBER PLATE LAMP

To change a number plate lamp bulb



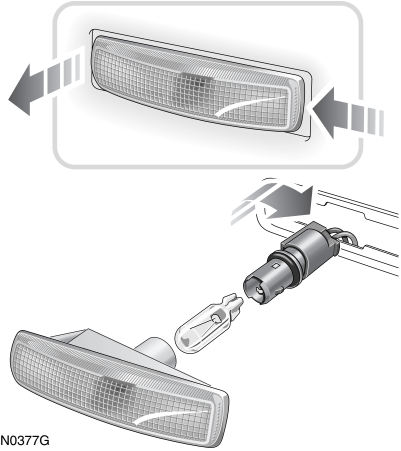
LAN0376G

1. Using a suitable tool, carefully lever the lens from the number plate lamp.
2. Twist the bulb holder anti-clockwise to unlock, then pull out the bulb complete with electrical connector.
3. Pull the bulb to remove it from the connector.
4. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

SIDE REPEATER LAMP

To change a side repeater lamp bulb



LAN0377G

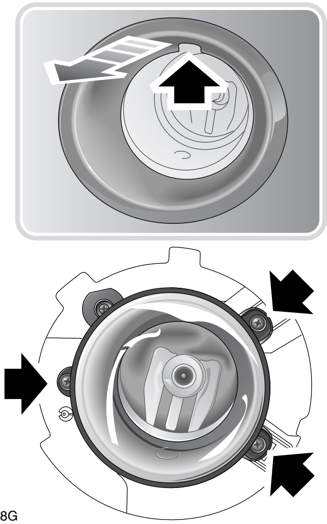
1. Push the lens firmly towards the front of the vehicle and withdraw the lamp unit from the wing.
2. Twist to release the bulb holder from the lens unit, then pull the bulb from its socket.
3. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

FRONT FOG LAMPS

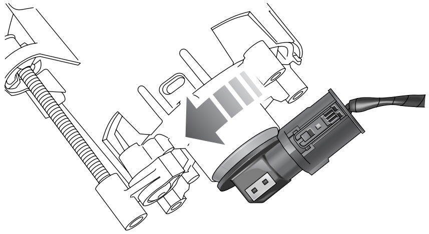
To change a front fog lamp bulb

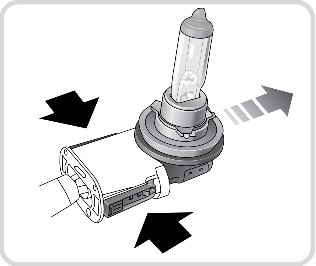
1. To gain access, use the finger slot at the top of the fog lamp surround and pull it forward to remove.



LAN0378G

2. Remove the three securing screws to release the lamp unit. Ease the unit out of the front bumper.
3. Twist the bulb holder counter-clockwise to unlock, then pull out the bulb complete with electrical connector.



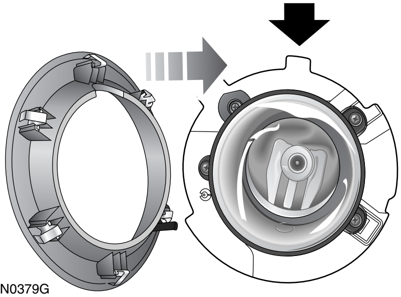


LAN0380G

4. To release the bulb, depress the two catches (solid arrows in inset), then pull to remove the bulb from the holder.
5. Before fitting the replacement bulb, note the flat and the tab on the otherwise circular shape of the bulb mounting flange. The tab acts as a key to enable correct positioning of the bulb in the bulb holder.

   Note: *Do not touch the bulb glass with your fingers. If necessary, clean the bulb with methylated spirits.*
6. Insert the new bulb and repeat the above procedure in reverse order.

   See **Replacement bulbs, 271**.



LAN0379G

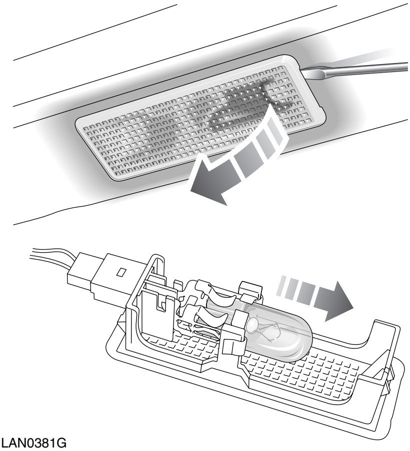
7. The fog lamp surround is uniquely shaped and will only fit in one position.

   Align the spring clip above the finger slot with the upper receiver shape in the bumper and push it into place. Now push the lower part of the fog lamp surround into place, applying some upward pressure.

Note: *After the replacement of a fog lamp bulb, the alignment of the lamp should be checked by a Land Rover Dealer/Authorised Repairer.*

DOOR/PUDDLE/FOOTWELL LAMPS

To change a door/puddle/footwell lamp bulb



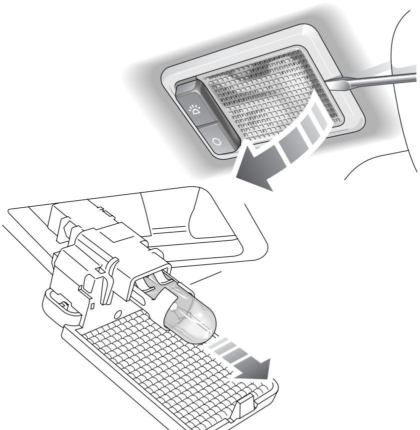
LAN0381G

1. With the relevant door open, insert a small flat-bladed screwdriver under the forward edge of the lens to carefully lever the lamp unit out.
2. Pull the bulb out of the electrical connector.
3. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

COURTESY LAMPS

To change a courtesy lamp bulb

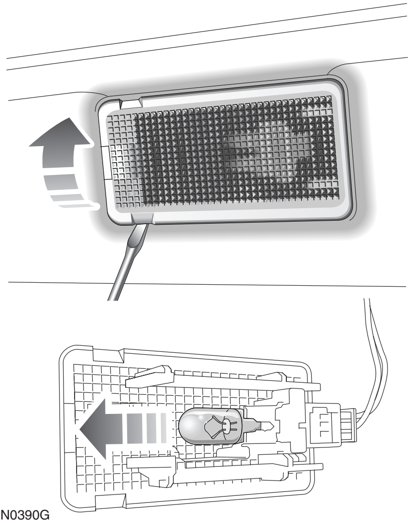

LAN0382G

1. Insert a small flat-bladed screwdriver into the indent on the side of the lens and carefully prise the lens from the lamp unit.
2. Pull the bulb out of the electrical connector.
3. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

TAILGATE LAMP

To change a tailgate lamp bulb

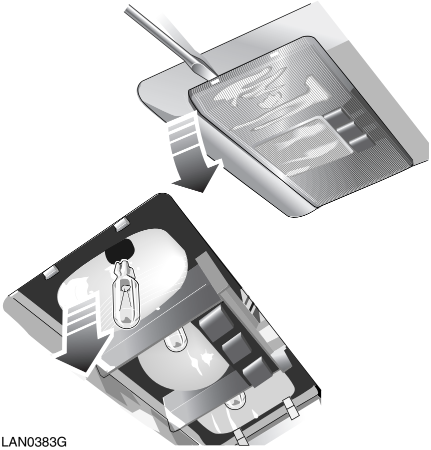

LAN0390G

1. Insert a small flat-bladed screwdriver under the lens and carefully prise the lens from the lamp unit.
2. Pull the bulb out of the electrical connector.
3. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

MAP LAMP

To change a map lamp bulb



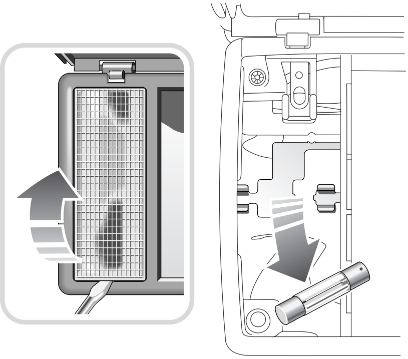
LAN0383G

1. Insert a small flat-bladed screwdriver into the indent on the side of the lens and carefully prise the lens from the lamp unit.
2. Pull the bulb out of the electrical connector.
3. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

VANITY MIRROR LAMP

To change a vanity mirror lamp bulb



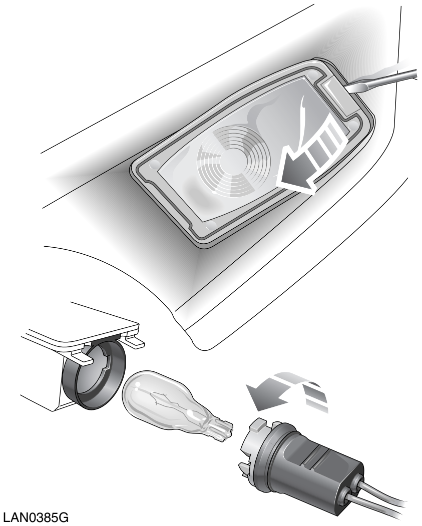
LAN0384G

1. With the vanity mirror cover open, use a small flat-bladed screwdriver to carefully lever the relevant lens from the mirror/lamp unit.
2. Pull the bulb out of the electrical connector.
3. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

MIRROR DOWNLIGHTER

To change a mirror downlighter bulb



1. Use a small flat-bladed screwdriver to carefully lever the lens from the mirror/ lamp unit.
2. Twist the bulb holder to reveal the bulb. Pull the bulb out of the electrical connector.
3. Insert a new bulb and refit the components.

See **Replacement bulbs, 271**.

LUBRICANTS AND FLUIDS

Recommendations for all climates and conditions.

Note: *Recommended oils are complete in themselves and additives should not be used.*

Note: *It is essential to change oil much more frequently if the vehicle is operated under severe conditions, especially if deep wading is carried out.*

Engine oil - Petrol vehicles

Use a 5W/30 oil meeting specification ACEA A3.

Land Rover oil to specification WSS M2C913B is recommended.

Engine oil - Diesel vehicles

Use 5W/30 oil meeting ACEA B1 or B3.

Power steering

Texaco Cold Climate PAS fluid.

Dynamic Response

Texaco Cold Climate PAS fluid.

Brake reservoir

Use Shell DOT4 ESL or a low viscosity DOT4 brake fluid that meets ISO 4925 class 6.

Brake pedal free travel: No adjustable free travel.

Windscreen washers

Screen washer fluid.

Engine cooling system

Caution: Be aware that different types of antifreeze are VERY different from each other; even different types from the same manufacturer.

The use of non-approved antifreeze will have an adverse effect on the engine cooling system and therefore engine durability.

Antifreeze: Use Havoline XLC to WSS-M97B44 (Texaco XLC), orange colour, with one part antifreeze to one part water for protection down to -40°C (-40°F).

CAPACITIES

The following capacities are approximate and provided as a guide only. All oil levels must be checked using the dipstick or level plugs as applicable.

Fuel tank:		
- Diesel vehicles	84 litres	18.4 gall
- Petrol vehicles	88 litres	19.3 gall
Engine oil refill and filter change:		
- Diesel vehicles	5.45 litres	9.6 pints
- Petrol vehicles	7.7 litres	13.6 pints
Washer reservoir	5.0 litres	8.8 pints
Cooling system (refill):		
- V6 Diesel vehicles	8 litres	14 pints
- V8 Diesel vehicles	12 litres	21.1 pints
- V8 NA Petrol vehicles	9.5 litres	16.7 pints
- V8 SC Petrol vehicles	12 litres	21.1 pints

ENGINES

V6 Diesel

Recommended fuel	Diesel or Automotive Gas Oil (AGO) to EN 590 specification. Maximum allowable Bio-diesel mix is 5%.
Capacity	2720 cm^3
Firing order	1-4-2-5-3-6
Bore	81.0 mm
Stroke	88.0 mm
Number of cylinders	6
Compression ratio	18.0:1

V8 Diesel

Recommended fuel	Diesel or Automotive Gas Oil (AGO) to EN 590 specification. Maximum allowable Bio-diesel mix is 5%.
Capacity	3626 cm^3
Firing order	1-5-4-2-6-3-7-8
Bore	81.0 mm
Stroke	88.0 mm
Number of cylinders	8
Compression ratio	17.3:1

V8 Petrol Naturally aspirated (NA)

Recommended fuel	UNLEADED 95 RON to EN 228 specification. Unleaded with a RON no lower than 90 may be used.
Capacity	4394 cm^3
Firing order	1-5-4-2-6-3-7-8
Bore	88.0 mm
Stroke	90.3 mm
Number of cylinders	8
Compression ratio	10.5:1
Spark plugs	NGK IFR5N10
Spark plug gap	Non-adjustable

Engines

V8 Petrol Supercharged (SC)

Recommended fuel	UNLEADED 95 RON to EN 228 specification Unleaded with a RON no lower than 90 may be used.
Capacity	4197 cm^3
Firing order	1-5-4-2-6-3-7-8
Bore	86.0 mm
Stroke	90.3 mm
Number of cylinders	8
Compression ratio	9.1:1
Spark plugs	NGK IFR5N10
Spark plug gap	Non-adjustable

WHEELS AND TYRES

Wheel size and tyre specification

Wheel size	Tyre	Load index
7J x 17 (alloy wheel)	235/65 R17 - All terrain tyre	108H
8J x 18 (alloy wheel)	255/55 R18 - All terrain tyre	109V
8J x 19 (alloy wheel)	255/50 R19 - All terrain tyre	107Y
9J x 19 (alloy wheel)	255/50 R19 - All terrain tyre	107Y
9.5J x 20 (alloy wheel)	275/40 R20 - All terrain tyre	106Y
5.5J x 19 (steel wheel)	T175/80 R19 - Temporary spare tyre	122M

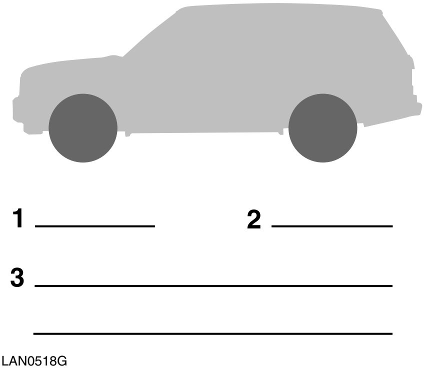
Caution: If a 9J x 19 alloy wheel requires balancing, the inner surface of the wheel must only be fitted with adhesive balance weights. Other types of weights will cause damage to the vehicle.

Tyre pressures

Tyre pressures are listed on a label on the B pillar on the driver's side (visible with the driver's door open). See **Tyre pressure and loading label, 239**.

Temporary spare tyre pressure	kPa	bar	lbf/in^2
Any position or load condition	420	4.2	60

Accessory wheels and tyres - insert details



1. Front tyre pressure.
2. Rear tyre pressure.
3. Wheel/tyre size, type and specification

Note: *Accessory fit off-road tyres (with a speed rating of Q or T) are subject to speed restrictions. Q-rated tyres should not be used at speeds greater than 160 km/h (100 mph), T-rated tyres should not be used at speeds greater than 190 km/h (118 mph).*

Note: *Consult your Land Rover Dealer/Authorised Repairer before you fit any accessory wheel or tyre.*

Vehicle Weights

VEHICLE WEIGHTS

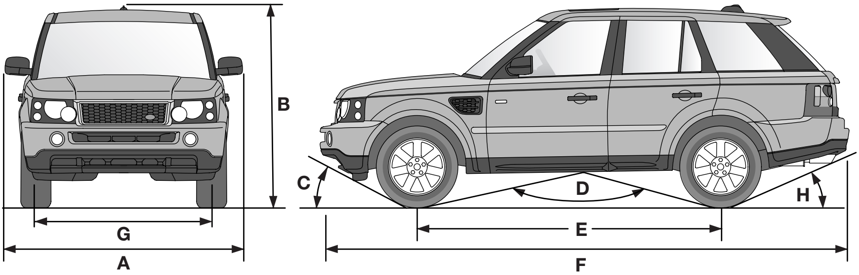
Approximate unladen vehicle weight (full fuel tank, excluding options)		
Petrol engine vehicles (NA)	2 480 - 2 485 kg	5 467 - 5 478 lb
Petrol engine vehicles (SC)	2 572 - 2 614 kg	5 671 - 5764 lb
Diesel engine vehicles	2 455 - 2 479 kg	5 412 - 5 465 lb
Maximum gross vehicle weight (GVW)		
Petrol engine vehicles (NA)	3 070 kg	6 768 lb
Petrol engine vehicles (SC)	3 125 kg	6 889 lb
V6 Diesel engine vehicles	3 070 kg	6 768 lb
V8 Diesel engine vehicles	3 175 kg	7 000 lb
Maximum front axle load		
All vehicles	1 470 kg	3 241 lb
Maximum rear axle load		
All vehicles	1 710 kg	3 770 lb
Gross Train Weight (Weight of vehicle plus trailer with overrun brakes)		
Petrol engine vehicles (NA)	6570 kg	14484 lb
Petrol engine vehicles (SC)	6625 kg	14605 lb
Diesel engine vehicles	6570 kg	14484 lb
Roof rack load (including the mass of roof rack)		
All vehicles	75 kg	165 lb

Note: *Axle weights are non-additive. The individual maximum axle weights and gross vehicle weight must not be exceeded.*

TOWING WEIGHTS

Maximum permissible towing weights	On-road	Off-road
Unbraked trailers	750 kg (1 654 lb)	750 kg (1 654 lb)
Trailers with overrun brakes	3 500 kg (7 716 lb)	1 000 kg (2 205 lb)
Nose weight	250 kg (550 lb)	250 kg (550 lb)

DIMENSIONS

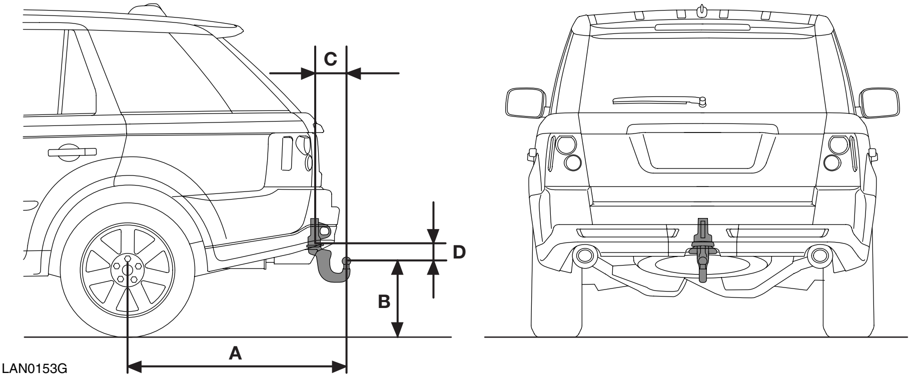


LAN0391G

Dimensions

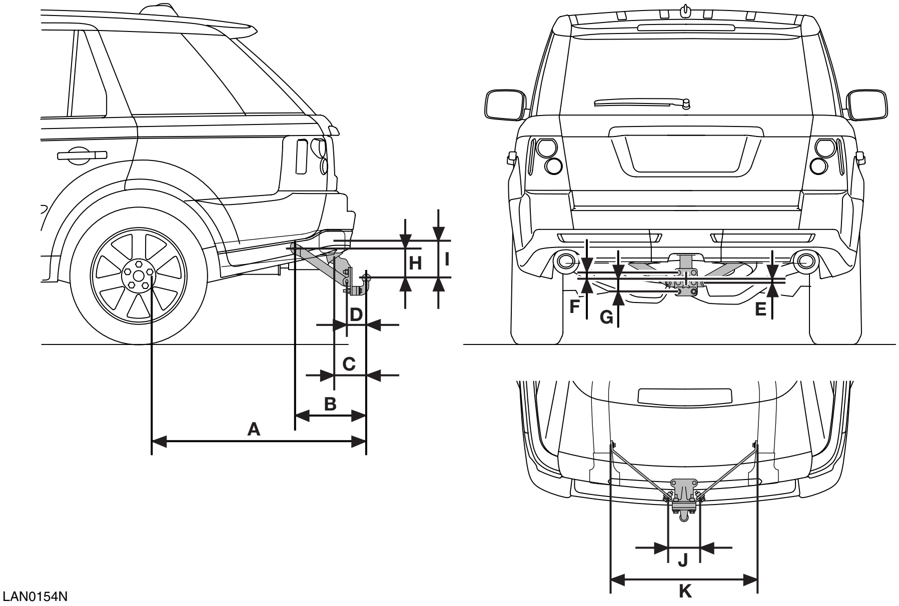
A	Overall width	2 170 mm	85.4 in.
	Overall width (mirrors folded)	1 928 mm	75.9 in.
B	Overall height (including roof rails) - Access height - Standard height - Off-road height - Including roof antenna at Standard height	 1 734 mm 1 784 mm 1 839 mm 1 812 mm	 68.3 in. 70.2 in. 72.4 in. 71.3 in.
C	Approach angle (at EEC kerb weight and Off-road height)	34°	
D	Ramp breakover angle (at EEC kerb weight and Off-road height)	130°	
E	Wheelbase	2 745 mm	108 in.
F	Overall length	4 788 mm	188.5 in.
	Overall length (including number plate plinth)	4 798 mm	188.9 in.
G	Track: - Front - Rear	 1 605 mm 1 612.5 mm	 63.2 in. 63.5 in.
H	Departure angle without tow hitch (at EEC kerb weight): - On-road - Off-road	 26.0° 29.0°	
H	Departure angle with tow hitch (at EEC kerb weight): - On-road - Off-road	 15.1° 17.8°	
	Maximum gradient (at EEC kerb weight) - Continuous operation - Drive through operation	 35° 45°	
	Turning circle	10.96 m	35.96 ft.
	Wheel alignment: - Front - Rear	 -0.16° ±0.20° 0.16° ±0.20°	 -10' ±12' 10' ±12'

TOW BAR DIMENSIONS



A	Wheel centre to centre of towball	1,191 mm	46.9 in.
B	Ground to centre of towball	395 mm	15.55 in.
C	Centre of towball to tow bar attachment	170 mm	6.7 in.
D	Centre of towball to tow bar attachment	124 mm	4.9 in.

MULTI-HEIGHT DROP PLATE TOW BAR DIMENSIONS



A	Wheel centre to centre of towball (horiz)	1,210 mm	47.64 in.
B	Centre of outer attachment points to centre of towball (horiz)	403.6 mm	15.89 in.
C	Centreline of housing bayonet slot tip radius to centre of towball (horiz)	192.4 mm	7.57 in.
D	Centre of inner attachment points to centre of towball (horiz)	108 mm	4.25 in.
E	Centre of inner attachment points to centre of towball (vert)	20 mm	0.79 in.
F	Centre of upper towball plate bolt to centre of towball (vert)	36 mm	1.42 in.
G	Centre of lower towball plate bolt to centre of towball (vert)	70 mm	2.76 in.
H	Centre of outer attachment points to centre of towball (horiz)	167.3 mm	6.59 in.
I	Centreline of housing bayonet slot tip radius to centre of towball (vert)	174.3 mm	6.86 in.
J	Distance between inner attachment point centres	180.5 mm	7.10 in.
K	Distance between outer attachment point centres	822.5 mm	32.38 in.
Dimensions refer to towing equipment officially released by Land Rover			

FUEL CONSUMPTION

The fuel consumption figures shown below have been calculated using a standard testing procedure (the new EC test procedure from Directive 99/100/EC), and produced in accordance with The Passenger Car Fuel Consumption (Amendment) Order 1996.

Under normal use, a vehicle's actual fuel consumption figures may differ from those achieved through the test procedure, depending on driving technique, road and traffic conditions, environmental factors, vehicle load and condition.

Fuel consumption figures

	URBAN		EXTRA-URBAN		COMBINED	
	l/100km	mpg	l/100km	mpg	l/100km	mpg
Petrol S/Charged	22.8	12.4	11.9	23.8	15.9	17.8
Petrol	21.1	13.4	11.4	24.8	14.9	18.9
Diesel	13.2	21.4	8.5	33.2	10.2	27.6

Urban cycle

The urban test cycle is carried out from a cold start and consists of a series of accelerations, decelerations and periods of steady speed driving and engine idling. The maximum speed attained during the test is 50 km/h (30 mph) with an average speed of 19 km/h (12 mph).

Extra-urban cycle

The extra urban test cycle is carried out immediately after the urban test. Approximately half of the test comprises steady-speed driving, while the remainder consists of a series of accelerations, decelerations and engine idling. The maximum test speed is 120 km/h (75 mph) and the average speed 63 km/h (39 mph). The test is carried out over a distance of 7 km (4.3 miles).

Combined

The combined figure is an average of the urban and extra-urban test cycle results, which has been weighted to take account of the different distances covered during the two tests.

Note: *These figures should not be compared with the figures produced using the ECE/EEC procedure previously required by The Passenger Car Fuel Consumption Order 1983. Because of the changes in test procedure, even the urban figures would differ if the same car were subjected to both tests.*

DECLARATIONS OF CONFORMITY

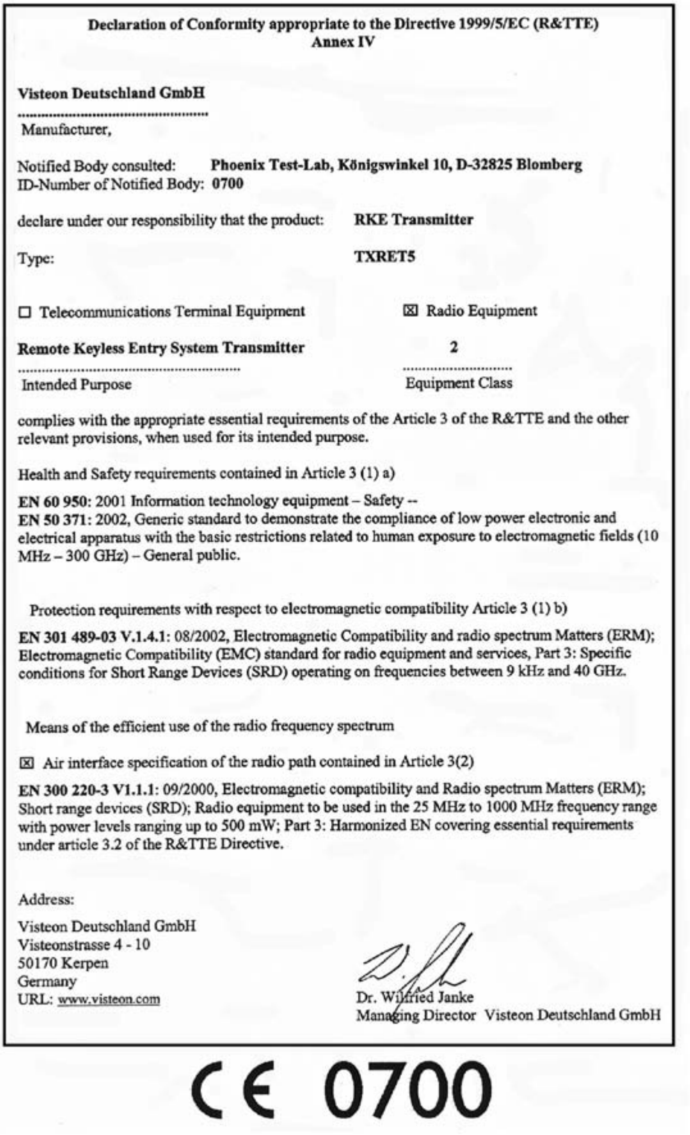
The Declarations of Conformity are from manufacturers of RF (Radio Frequency) equipment, whose components are used in the manufacture of your Range Rover Sport.

These manufacturers state that their components comply with relevant rules of the R and TTE (Radio and Telecommunication Terminal Equipment) directive.

The directive requires the manufacturer of short range radio devices to self-certify that RF parts fitted to Land Rover vehicles are fit for use and that the declarations are supplied with the vehicle documentation. If at a future date a technical inspection is required, the declarations will provide all necessary information.

Note: *The Declarations of Conformity are published in the native language of the RF equipment manufacturer, in compliance with the R and TTE Directive.*

Conformity



Declaration of Conformity appropriate to the Directive 1999/5/EC (R&TTE)
Annex IV

Visteon Deutschland GmbH
....
Manufacturer,

Notified Body consulted: **Phoenix Test-Lab, Königswinkel 10, D-32825 Blomberg**
ID-Number of Notified Body: **0700**

declare under our responsibility that the product: **RKE Transmitter**

Type: **TXRET5**

☐ Telecommunications Terminal Equipment ☒ Radio Equipment

Remote Keyless Entry System Transmitter **2**
....
Intended Purpose Equipment Class

complies with the appropriate essential requirements of the Article 3 of the R&TTE and the other relevant provisions, when used for its intended purpose.

Health and Safety requirements contained in Article 3 (1) a)

EN 60 950: 2001 Information technology equipment – Safety --
EN 50 371: 2002, Generic standard to demonstrate the compliance of low power electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (10 MHz – 300 GHz) – General public.

Protection requirements with respect to electromagnetic compatibility Article 3 (1) b)

EN 301 489-03 V.1.4.1: 08/2002, Electromagnetic Compatibility and radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services, Part 3: Specific conditions for Short Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz.

Means of the efficient use of the radio frequency spectrum

☒ Air interface specification of the radio path contained in Article 3(2)

EN 300 220-3 V1.1.1: 09/2000, Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices (SRD); Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 3: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

Address:

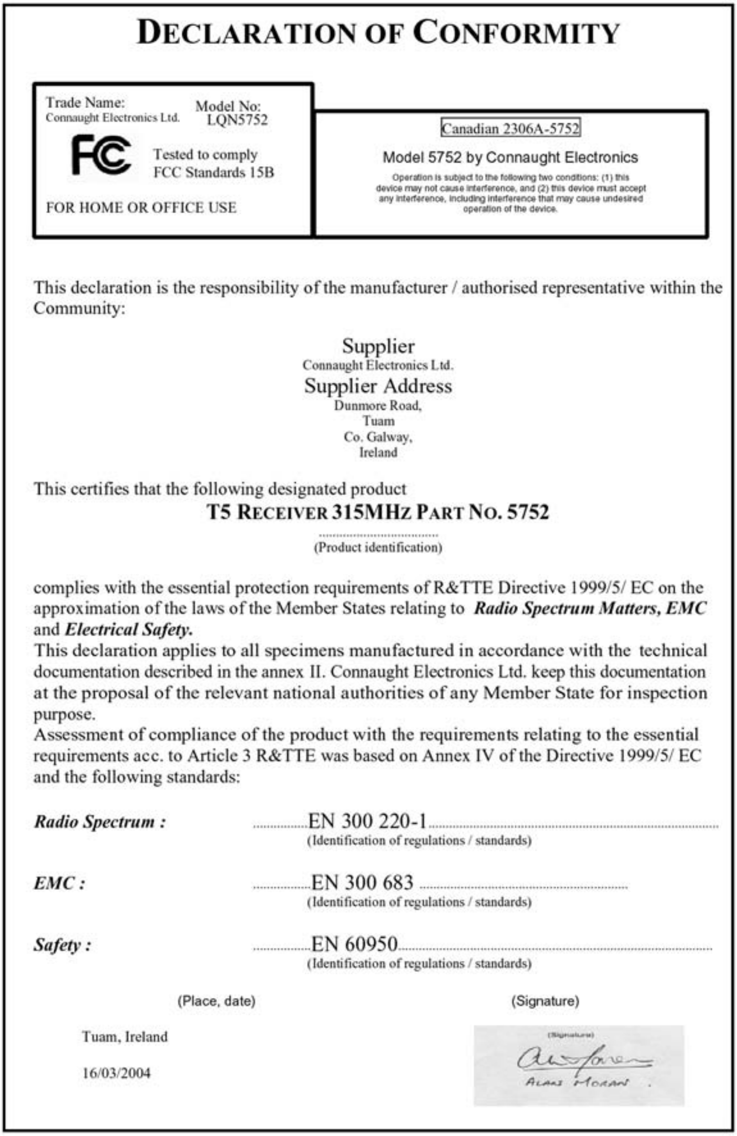
Visteon Deutschland GmbH
Visteonstrasse 4 - 10
50170 Kerpen
Germany
URL: www.visteon.com

Dr. Wilfried Janke
Managing Director Visteon Deutschland GmbH

CE 0700

LAN0505G

Conformity



DECLARATION OF CONFORMITY

Trade Name:
Connaught Electronics Ltd.

Model No:
LQN5752

Tested to comply
FCC Standards 15B

FOR HOME OR OFFICE USE

Canadian 2306A-5752

Model 5752 by Connaught Electronics

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This declaration is the responsibility of the manufacturer / authorised representative within the Community:

Supplier
Connaught Electronics Ltd.
Supplier Address
Dunmore Road,
Tuam
Co. Galway,
Ireland

This certifies that the following designated product

T5 RECEIVER 315MHZ PART NO. 5752
(Product identification)

complies with the essential protection requirements of R&TTE Directive 1999/5/ EC on the approximation of the laws of the Member States relating to ***Radio Spectrum Matters, EMC*** and ***Electrical Safety.***
This declaration applies to all specimens manufactured in accordance with the technical documentation described in the annex II. Connaught Electronics Ltd. keep this documentation at the proposal of the relevant national authorities of any Member State for inspection purpose.
Assessment of compliance of the product with the requirements relating to the essential requirements acc. to Article 3 R&TTE was based on Annex IV of the Directive 1999/5/ EC and the following standards:

Radio Spectrum : ....EN 300 220-1..............
(Identification of regulations / standards)

EMC : ....EN 300 683..............
(Identification of regulations / standards)

Safety : ....EN 60950..............
(Identification of regulations / standards)

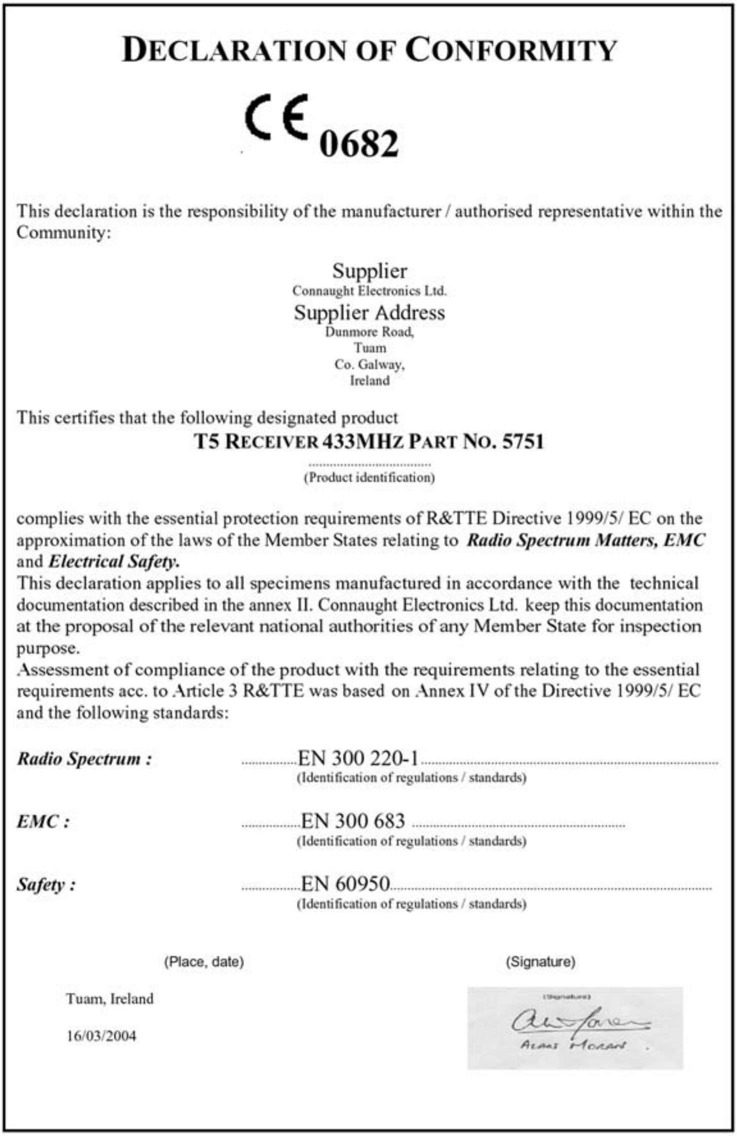
(Place, date)

Tuam, Ireland
16/03/2004

(Signature)

(Signature)
ALAN MORAN

LAN0506G



DECLARATION OF CONFORMITY

CE 0682

This declaration is the responsibility of the manufacturer / authorised representative within the Community:

Supplier
Connaught Electronics Ltd.
Supplier Address
Dunmore Road,
Tuam
Co. Galway,
Ireland

This certifies that the following designated product

T5 RECEIVER 433MHZ PART NO. 5751

(Product identification)

complies with the essential protection requirements of R&TTE Directive 1999/5/ EC on the approximation of the laws of the Member States relating to ***Radio Spectrum Matters, EMC*** and ***Electrical Safety.***
This declaration applies to all specimens manufactured in accordance with the technical documentation described in the annex II. Connaught Electronics Ltd. keep this documentation at the proposal of the relevant national authorities of any Member State for inspection purpose.
Assessment of compliance of the product with the requirements relating to the essential requirements acc. to Article 3 R&TTE was based on Annex IV of the Directive 1999/5/ EC and the following standards:

Radio Spectrum : EN 300 220-1
(Identification of regulations / standards)

EMC : EN 300 683
(Identification of regulations / standards)

Safety : EN 60950
(Identification of regulations / standards)

(Place, date)

Tuam, Ireland

16/03/2004

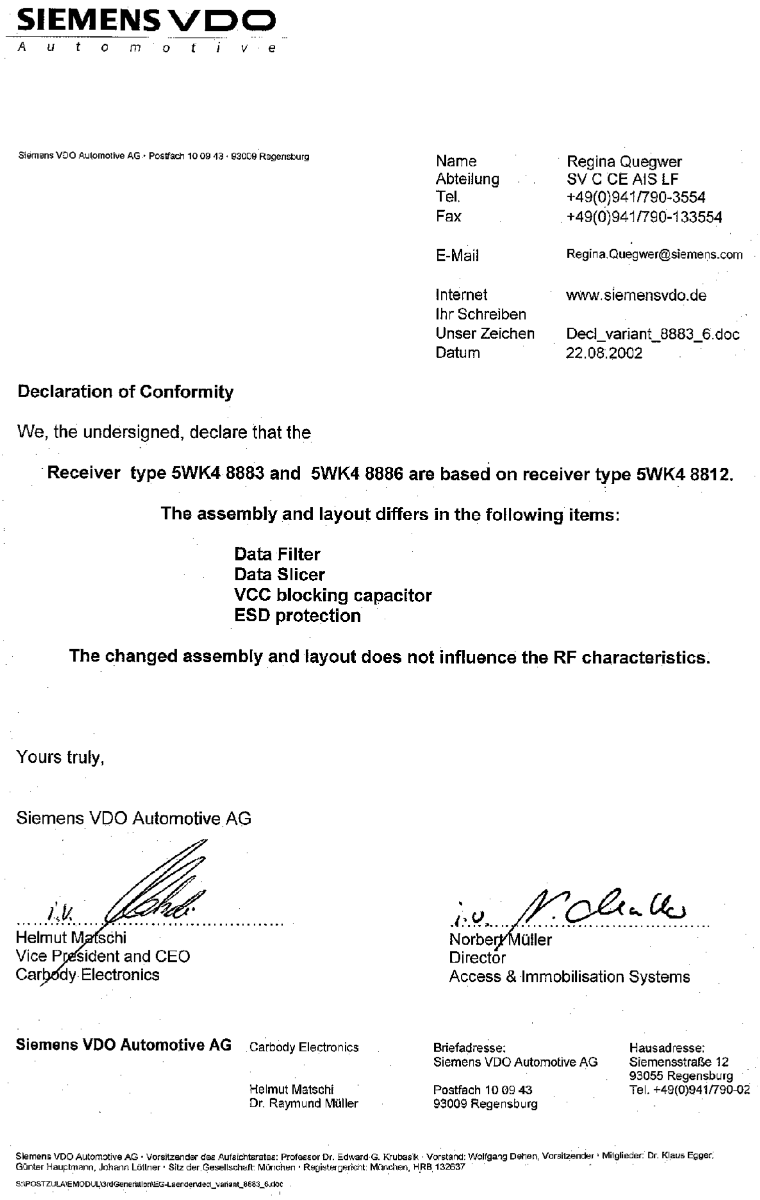
(Signature)

(Signature)

ALAN MORAN

LAN0507G

Conformity



SIEMENS VDO
Automotive

Siemens VDO Automotive AG · Postfach 10 09 43 · 93009 Regensburg

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Fax	+49(0)941/790-133554
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Internet	www.siemensvdo.de
Ihr Schreiben	
Unser Zeichen	Decl_variant_8883_6.doc
Datum	22.08.2002

Declaration of Conformity

We, the undersigned, declare that the

Receiver type 5WK4 8883 and 5WK4 8886 are based on receiver type 5WK4 8812.

The assembly and layout differs in the following items:

Data Filter
Data Slicer
VCC blocking capacitor
ESD protection

The changed assembly and layout does not influence the RF characteristics.

Yours truly,

Siemens VDO Automotive AG

i.V.
Helmut Matschi
Vice President and CEO
Carbody Electronics

i.V.
Norbert Müller
Director
Access & Immobilisation Systems

Siemens VDO Automotive AG

Carbody Electronics

Helmut Matschi
Dr. Raymund Müller

Briefadresse:
Siemens VDO Automotive AG

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93009 Regensburg

Hausadresse:
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93055 Regensburg
Tel. +49(0)941/790-02

Siemens VDO Automotive AG · Vorsitzender des Aufsichtsrates: Professor Dr. Edward G. Krubasik · Vorstand: Wolfgang Dehen, Vorsitzender · Mitglieder: Dr. Klaus Egger, Günter Hauptmann, Johann Löttner · Sitz der Gesellschaft: München · Registergericht: München, HRB 132637

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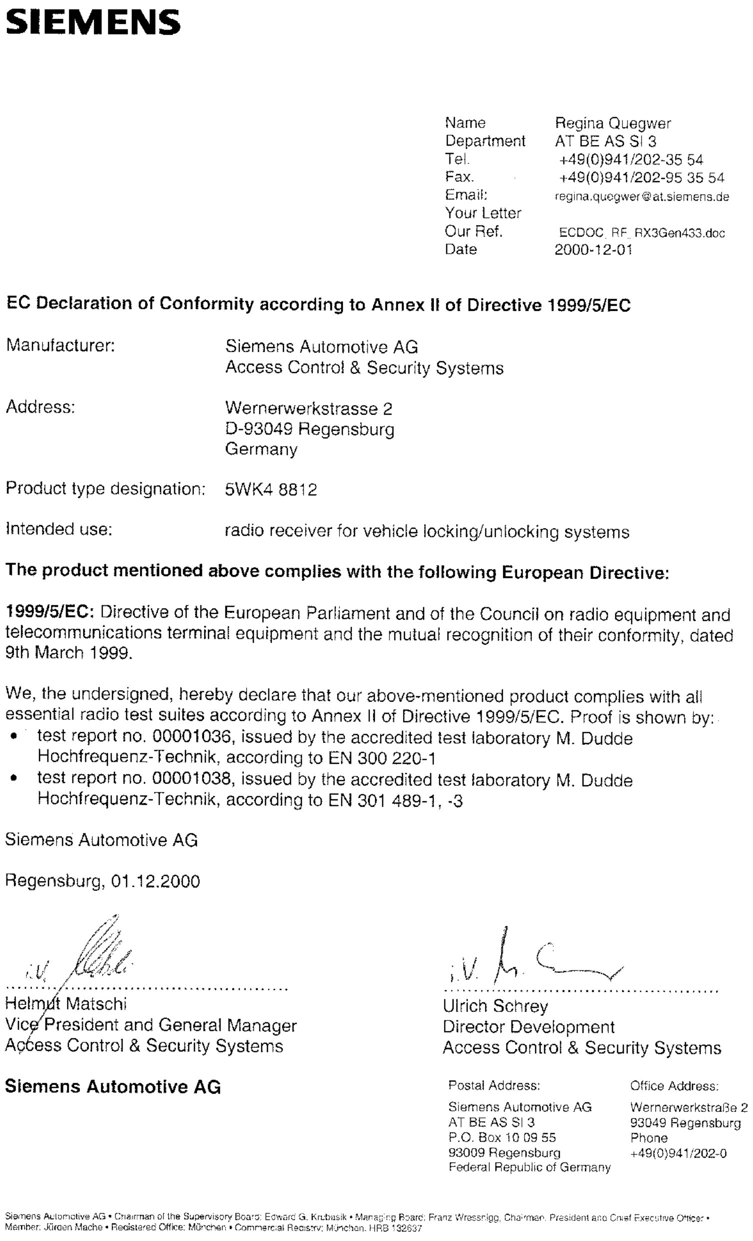
Conformity



SIEMENS

Name	Regina Quegwer
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Email:	regina.quegwer@at.siemens.de
Your Letter	
Our Ref.	ECDOC_RF_RX3Gen433.doc
Date	2000-12-01

EC Declaration of Conformity according to Annex II of Directive 1999/5/EC

Manufacturer:	Siemens Automotive AG Access Control & Security Systems
Address:	Wernerwerkstrasse 2 D-93049 Regensburg Germany
Product type designation:	5WK4 8812
Intended use:	radio receiver for vehicle locking/unlocking systems

The product mentioned above complies with the following European Directive:

1999/5/EC: Directive of the European Parliament and of the Council on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity, dated 9th March 1999.

We, the undersigned, hereby declare that our above-mentioned product complies with all essential radio test suites according to Annex II of Directive 1999/5/EC. Proof is shown by:

- test report no. 00001036, issued by the accredited test laboratory M. Dudde Hochfrequenz-Technik, according to EN 300 220-1
- test report no. 00001038, issued by the accredited test laboratory M. Dudde Hochfrequenz-Technik, according to EN 301 489-1, -3

Siemens Automotive AG

Regensburg, 01.12.2000

i.V.
Helmut Matschi
Vice President and General Manager
Access Control & Security Systems

i.V.
Ulrich Schrey
Director Development
Access Control & Security Systems

Siemens Automotive AG

Postal Address:
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AT BE AS SI 3
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Federal Republic of Germany

Office Address:
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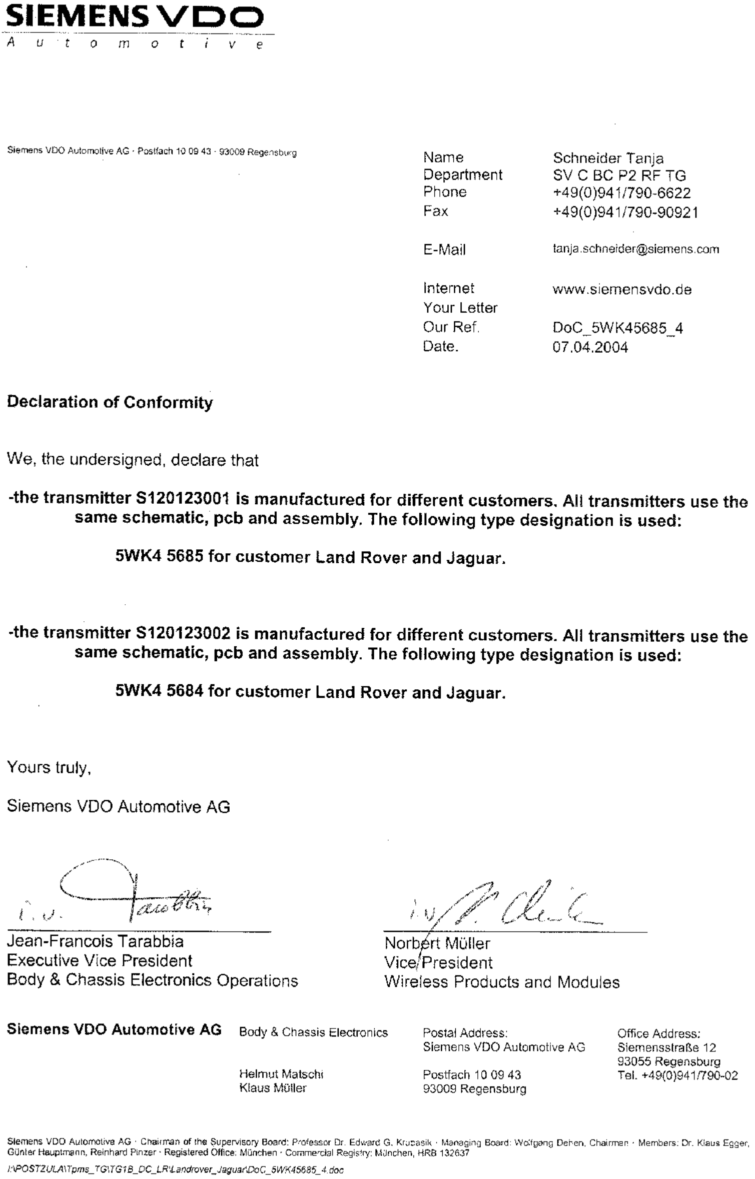
Phone
+49(0)941/202-0

Siemens Automotive AG • Chairman of the Supervisory Board: Edward G. Krubasik • Managing Board: Franz Wressnigg, Chairman, President and Chief Executive Officer • Member: Jürgen Mache • Registered Office: München • Commercial Registry: München, HRB 132637

Conformity



SIEMENS VDO
Automotive

Siemens VDO Automotive AG · Postfach 10 09 43 · 93009 Regensburg

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Internet	www.siemensvdo.de
Your Letter	
Our Ref.	DoC_5WK45685_4
Date.	07.04.2004

Declaration of Conformity

We, the undersigned, declare that

-the transmitter S120123001 is manufactured for different customers. All transmitters use the same schematic, pcb and assembly. The following type designation is used:

5WK4 5685 for customer Land Rover and Jaguar.

-the transmitter S120123002 is manufactured for different customers. All transmitters use the same schematic, pcb and assembly. The following type designation is used:

5WK4 5684 for customer Land Rover and Jaguar.

Yours truly,

Siemens VDO Automotive AG

Jean-Francois Tarabbia
Executive Vice President
Body & Chassis Electronics Operations

Norbert Müller
Vice President
Wireless Products and Modules

Siemens VDO Automotive AG Body & Chassis Electronics

Helmut Matschi
Klaus Müller

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Office Address:
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93055 Regensburg
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Siemens VDO Automotive AG · Chairman of the Supervisory Board: Professor Dr. Edward G. Krubasik · Managing Board: Wolfgang Dehen, Chairman · Members: Dr. Klaus Egger, Günter Hauptmann, Reinhard Pinzer · Registered Office: München · Commercial Registry: München, HRB 132637

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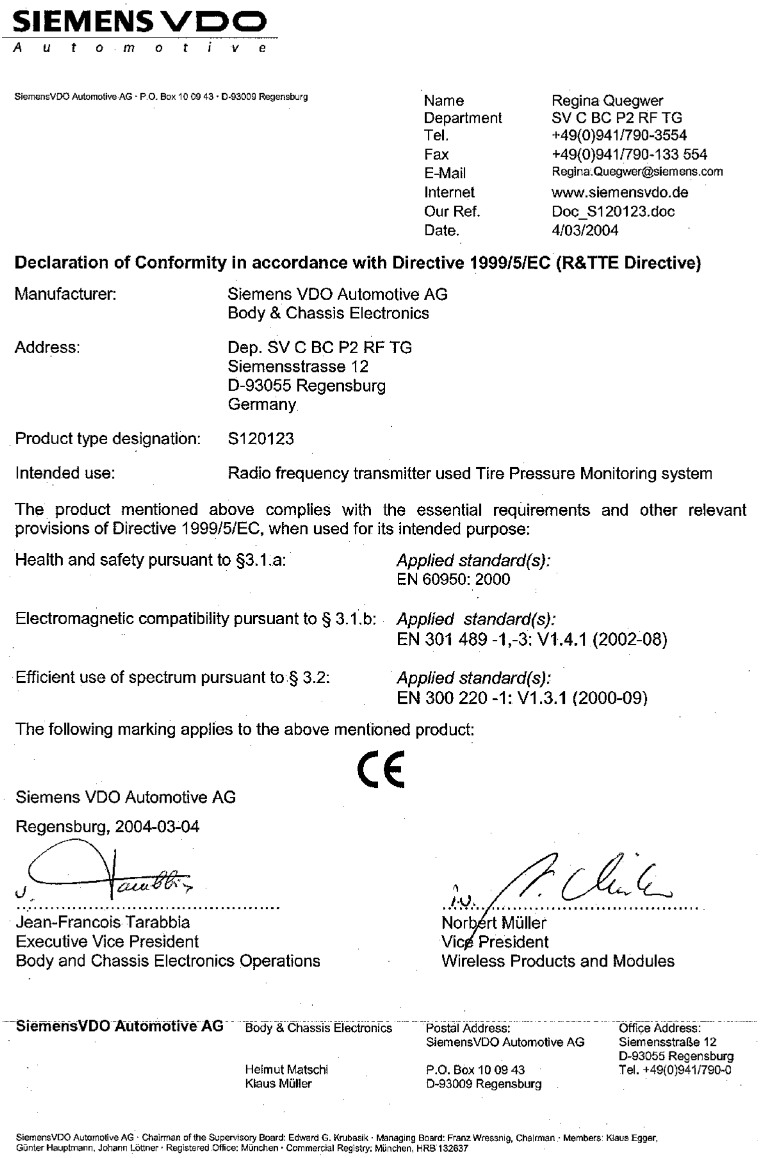

SIEMENS VDO
Automotive

SiemensVDO Automotive AG · P.O. Box 10 09 43 · D-93009 Regensburg

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Fax	+49(0)941/790-133 554
E-Mail	Regina.Quegwer@siemens.com
Internet	www.siemensvdo.de
Our Ref.	Doc_S120123.doc
Date.	4/03/2004

Declaration of Conformity in accordance with Directive 1999/5/EC (R&TTE Directive)

Manufacturer:	Siemens VDO Automotive AG Body & Chassis Electronics
Address:	Dep. SV C BC P2 RF TG Siemensstrasse 12 D-93055 Regensburg Germany
Product type designation:	S120123
Intended use:	Radio frequency transmitter used Tire Pressure Monitoring system

The product mentioned above complies with the essential requirements and other relevant provisions of Directive 1999/5/EC, when used for its intended purpose:

Health and safety pursuant to §3.1.a:	*Applied standard(s):* EN 60950: 2000
Electromagnetic compatibility pursuant to § 3.1.b:	*Applied standard(s):* EN 301 489 -1,-3: V1.4.1 (2002-08)
Efficient use of spectrum pursuant to § 3.2:	*Applied standard(s):* EN 300 220 -1: V1.3.1 (2000-09)

The following marking applies to the above mentioned product:

CE

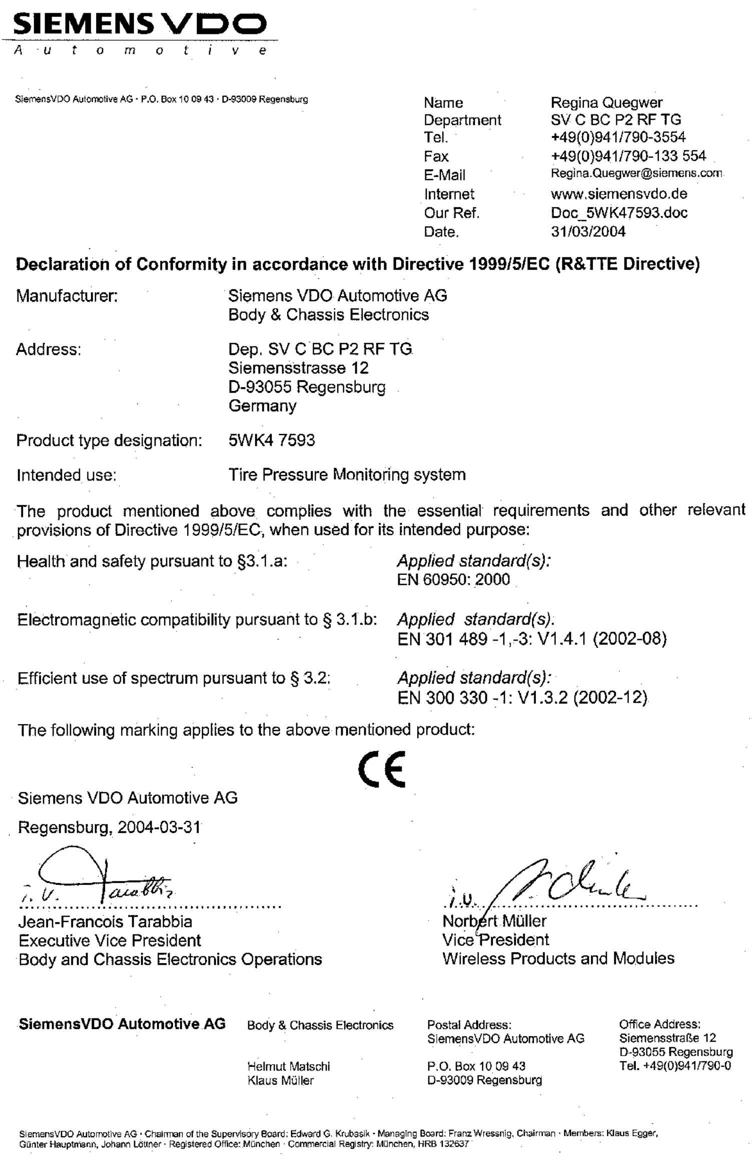
Siemens VDO Automotive AG

Regensburg, 2004-03-04

Jean-Francois Tarabbia Executive Vice President Body and Chassis Electronics Operations	i.V. Norbert Müller Vice President Wireless Products and Modules

SiemensVDO Automotive AG	Body & Chassis Electronics Helmut Matschi Klaus Müller	Postal Address: SiemensVDO Automotive AG P.O. Box 10 09 43 D-93009 Regensburg	Office Address: Siemensstraße 12 D-93055 Regensburg Tel. +49(0)941/790-0

SiemensVDO Automotive AG · Chairman of the Supervisory Board: Edward G. Krubasik · Managing Board: Franz Wressnig, Chairman · Members: Klaus Egger, Günter Hauptmann, Johann Löttner · Registered Office: München · Commercial Registry: München, HRB 132637



SIEMENS VDO
Automotive

SiemensVDO Automotive AG · P.O. Box 10 09 43 · D-93009 Regensburg

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Internet	www.siemensvdo.de
Our Ref.	Doc_5WK47593.doc
Date.	31/03/2004

Declaration of Conformity in accordance with Directive 1999/5/EC (R&TTE Directive)

Manufacturer:	Siemens VDO Automotive AG Body & Chassis Electronics
Address:	Dep. SV C BC P2 RF TG Siemensstrasse 12 D-93055 Regensburg Germany
Product type designation:	5WK4 7593
Intended use:	Tire Pressure Monitoring system

The product mentioned above complies with the essential requirements and other relevant provisions of Directive 1999/5/EC, when used for its intended purpose:

Health and safety pursuant to §3.1.a:	*Applied standard(s):* EN 60950: 2000
Electromagnetic compatibility pursuant to § 3.1.b:	*Applied standard(s).* EN 301 489 -1,-3: V1.4.1 (2002-08)
Efficient use of spectrum pursuant to § 3.2:	*Applied standard(s):* EN 300 330 -1: V1.3.2 (2002-12)

The following marking applies to the above mentioned product:

CE

Siemens VDO Automotive AG

Regensburg, 2004-03-31

i. V.	i.V.
Jean-Francois Tarabbia Executive Vice President Body and Chassis Electronics Operations	Norbert Müller Vice President Wireless Products and Modules

SiemensVDO Automotive AG

Body & Chassis Electronics

Helmut Matschl
Klaus Müller

Postal Address:
SiemensVDO Automotive AG
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D-93009 Regensburg

Office Address:
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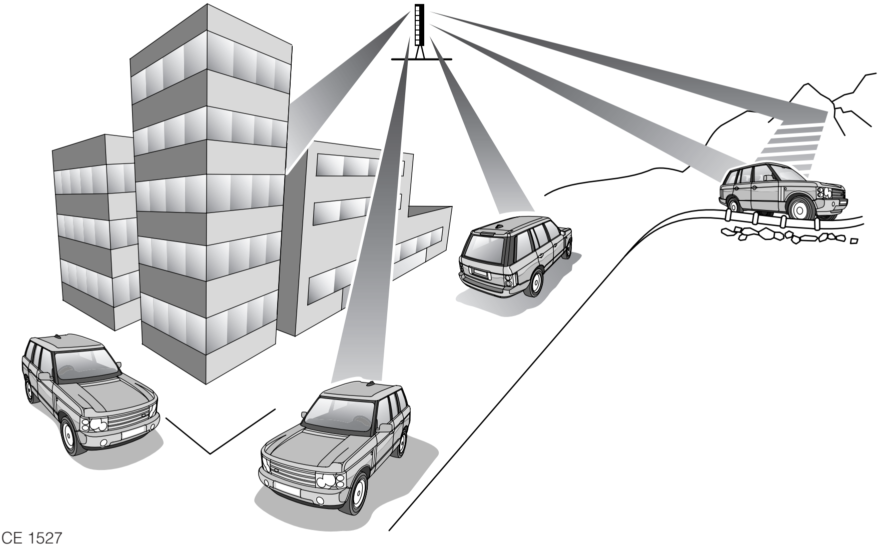
D-93055 Regensburg
Tel. +49(0)941/790-0

SiemensVDO Automotive AG · Chairman of the Supervisory Board: Edward G. Krubasik · Managing Board: Franz Wressnig, Chairman · Members: Klaus Egger, Günter Hauptmann, Johann Löttner · Registered Office: München · Commercial Registry: München, HRB 132637



ICE 1527

RADIO RECEPTION

Your radio receives signals whilst on the move, and may experience widely differing reception characteristics. Because of this, some interference is to be expected from time to time during a journey.

FM transmitters can only broadcast over a limited range, and good clear signals will only be received in the immediate area of the transmitter. When travelling, occasionally it may be necessary to re-tune the radio to offset the effects of moving from one transmitter area to another.

While RDS automatic retuning helps to reduce the effects of signal changes, some manual retuning may still be required (especially for local stations) in areas of weak reception.

The broadcast range for good stereo reception is within approximately 48 - 64 km (30 - 40 miles) of the transmitter.

FM Signals travel in a straight line, so large obstacles, such as tall buildings, can shield the car from the signal causing distortion or loss of reception (known as dead spots).

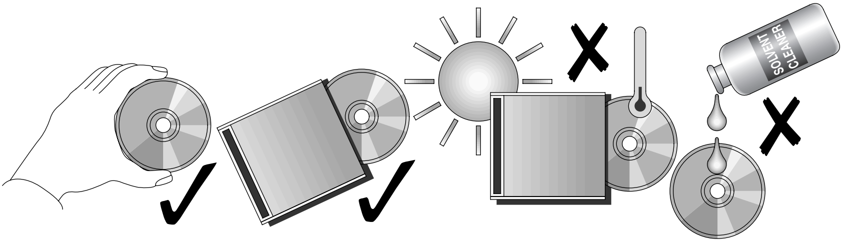
Distortion can also occur if FM signals received directly from the transmitter, mix with signals deflected by obstructions such as mountains, hills, and tall buildings. This is known as multi-path distortion.

Note: *Although distortion, interference and lack of signal clarity are sometimes attributed to a fault in the radio, this is rarely the case.*

RADIO AERIAL

The aerial is etched onto the surface of the glass of the left-hand rear side window.

No maintenance is possible; however it is important to ensure that the interior surface of the glass is protected from possible damage caused by contact with hard objects or from the injurious effects of abrasive cleaners.



ICE 0022

CARE OF COMPACT DISCS

Dirt, dust, condensation and heat can damage discs. Always observe the following precautions:

NEVER touch the playing surface (the unlabelled side) of a disc. Handle discs by holding the outer edges, or the edge of the central hole and the outer edge, between finger and thumb.

ALWAYS return discs to their case after use to prevent contamination reducing playback quality.

NEVER leave the disc or case exposed to excessive heat or direct sunlight.

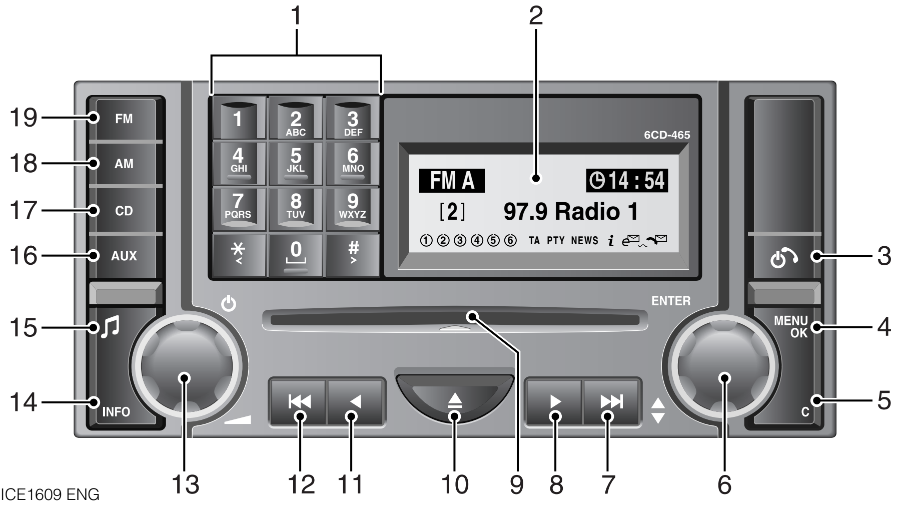
NEVER use a solvent or abrasive cleaner. Dust or dirt should be removed from the playing surface by wiping with a clean, dry, lint-free cloth. Always wipe in a straight line from the centre to the edge of the disc.

If left, minor scratches on the surface of a compact disc can cause skipping or mis-tracking. It may be possible to use CD restorer polish to remove the scratches and improve the performance of the disc. When using CD restorer polish, always follow the manufacturer’s instructions.

Note: *Some music CD manufacturers are using data encryption to copy-protect their recordings and prevent the production of counterfeit copies. These CDs differ from the internationally agreed CD audio standard, RedBook, a standard that serves as the operating basis for all CD players and changers. Copy-protected CDs may fail to play in your CD changer or may be played subject to various limitations, e.g. sound quality may be impaired. If you do experience a problem, try the CD in other players before contacting the CD vendor.*

AUDIO CONTROLS

Main controls


1
2
19
FM
18
AM
17
CD
16
AUX
15
14
INFO
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
*<
0
#>
6CD-465
FM A
14 : 54
[2]
97.9 Radio 1
① ② ③ ④ ⑤ ⑥ TA PTY NEWS i
ENTER
MENU OK
C
3
4
5
ICE1609 ENG
13
12
11
10
9
8
7
6

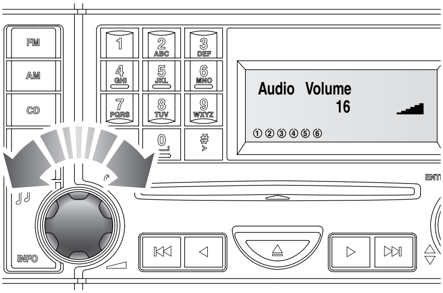
1. Input keypad. Function depends on options fitted (frequency, track number, telephone numbers, text etc.).
2. Information display screen.
3. Telephone.
4. Access menu.
5. Back or exit in menu, clear input.
6. Press to accept a selection. Rotate to move up or down a menu.
7. Skip, forward (CD). Automatic seek/search up.
8. Manual fast forward, search/scan up.
9. CD slot.
10. Disc eject.
11. Manual search/scan down.
12. Return to start previous (CD). Automatic seek/search down.
13. Press On/Off. Rotate to increase/decrease volume.
14. Short press for Traffic announcement, long press for News announcement.
15. Short press to access tone settings menu, long press to access Volume settings menu.
16. Select Auxiliary input.
17. Select CD player.
18. Short press to select AM waveband, long press for AM autostore.
19. Short press to select FM waveband, long press for FM autostore.

Note: *For information on radio reception quality, see* ***RADIO RECEPTION, 305****.*

Note: *On Premium audio units, there are six circles at the bottom left-hand side of the display, which represent the six available CD slots. As soon as one has a CD in it, its number will appear in the circle.*

VOLUME SETTINGS

Volume control



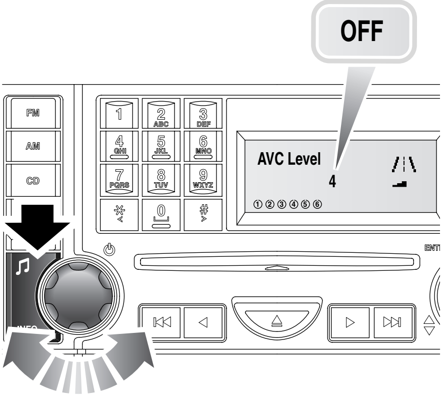
ICE1615 ENG

To increase or decrease the volume level, rotate the control.

With the engine running, the volume level can be adjusted between 0 and 35. If the audio unit is turned off, it will re-start at the previously selected volume level, provided that this is not too loud or too quiet.

The audio unit can be used with the engine off, but the volume available will be restricted. If the volume control is not adjusted during use with the starter switch off, the volume will resume at the last selected level when the starter switch is turned on.

Automatic Volume Control (AVC)



ICE1633 ENG

AVC adjusts the volume level to allow for the changes in road noise as the vehicle speed increases or decreases.

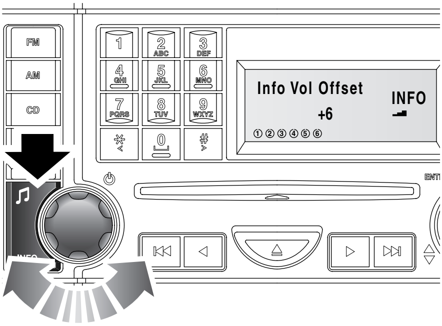
Note: *The AVC value (0-9) represents the volume increase, and not the volume level.*

The volume increase is proportional to speed increase. If the AVC level is set to zero, there will be no volume increase. An AVC setting of **1** will increase the volume by a small amount as the vehicle speed increases. An AVC setting of **9** will increase the volume by a large amount as the vehicle speed increases.

The AVC setting required will depend upon the expected speed (high or low) and the expected road conditions (rough or smooth).

To access the AVC Level settings, press the **Tone** button for approximately five seconds until the current **AVC Level** setting is displayed. Use the rotary control to increase or decrease the value.

Information volume offset


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Info Vol Offset
+6
INFO
①②③④⑤⑥
ENT

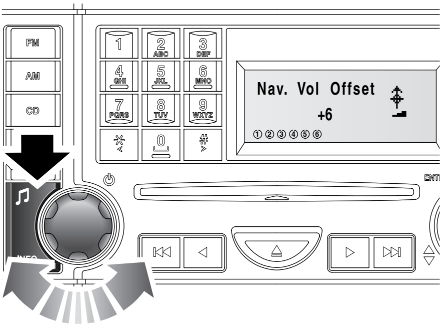
ICE1635 ENG

The Information Volume Offset allows an increased volume level to be set for announcements (Alerts). The figure set determines the number of steps above the current output. So, if for example the Info Volume Offset is currently 6, and the audio output is 14, the announcement will be made at a volume level equal to 20.

To access the Info Volume Offset settings, press the **Tone** button for approximately five seconds until the **AVC Level** setting is displayed. Use short presses of the **Tone** button to scroll through the menu until **Info Vol Offset** is displayed.

The current Info Volume Offset value will be displayed. Use the rotary control to increase or decrease the value.

Navigation volume offset


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Nav. Vol Offset
+6
①②③④⑤⑥
ENT

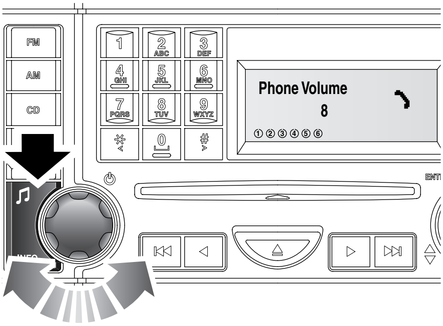
ICE1895 ENG

The Navigation Volume Offset allows you to set an independent level for the volume of Navigation announcements.

To access the Navigation Volume Offset settings, press the **Tone** button for approximately five seconds until the **AVC Level** setting is displayed. Use short presses of the **Tone** button to scroll through the menu until **Nav Vol Offset** is displayed.

The current Navigation Volume Offset value will be displayed. Use the rotary control to increase or decrease the value.

Phone volume



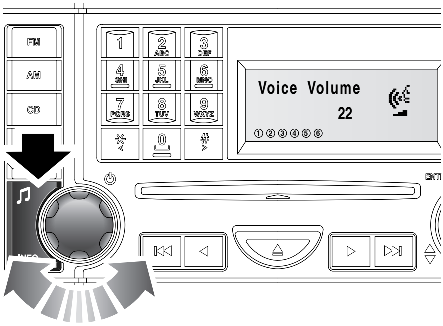
ICE1636 ENG

The Phone Volume allows you to set an independent level for the volume of the telephone output.

To access the Phone Volume settings, press the **Tone** button for approximately five seconds until the **AVC Level** setting is displayed. Use short presses of the **Tone** button to scroll through the menu until **Phone Volume** is displayed.

The current Phone Volume value will be displayed. Use the rotary control to increase or decrease the value.

Voice volume



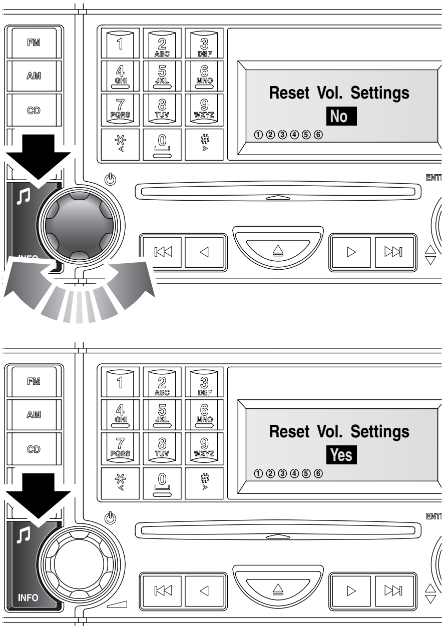
ICE1897 ENG

The Voice Volume allows you to set an independent level for the volume of the unit's voice output.

To access the Voice Volume settings, press the **Tone** button for approximately five seconds until the **AVC Level** setting is displayed. Use short presses of the **Tone** button to scroll through the menu until **Voice Volume** is displayed.

The current Voice Volume value will be displayed. Use the rotary control to increase or decrease the value.

Reset volume settings


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Reset Vol. Settings
No
Yes
① ② ③ ④ ⑤ ⑥
INFO

ICE2072 ENG

It is possible to reset all of the volume settings to the original factory values.

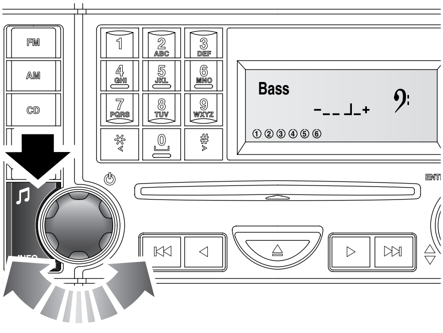
To access the Reset Volume Settings, press the **Tone** button for approximately five seconds until the **AVC Level** setting is displayed. Use short presses of the **Tone** button to scroll through the menu until **Reset Vol Settings** is displayed. Use the rotary control to highlight **Yes** or **No** as required. Press the **Tone** button to confirm your choice and exit the menu.

Note: *If an Alert announcement is received during a phone call, the phone call will be terminated.*

TONE AND BALANCE ADJUSTMENT

Note: *A new setting will be stored automatically when the Tone button is pressed again, or after 5 seconds with no User input (the screen returns to the previously displayed source screen.*

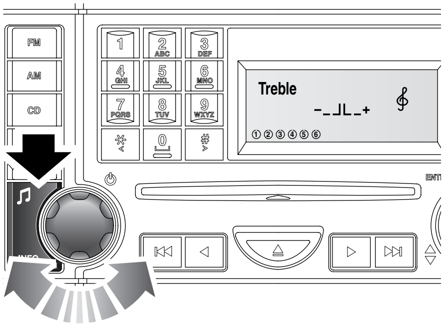
Bass response adjustment


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Bass
① ② ③ ④ ⑤ ⑥

ICE1618 ENG

To access the Bass setting, press the **Tone** button briefly. When the current **Bass** setting is displayed, use the rotary control to increase or decrease the level.

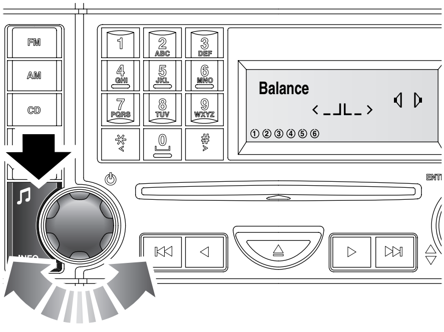
Treble response adjustment


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Treble
①②③④⑤⑥

ICE1617 ENG

To access the Treble setting, press the **Tone** button repeatedly until the current **Treble** setting is displayed. Use the rotary control to increase or decrease the level.

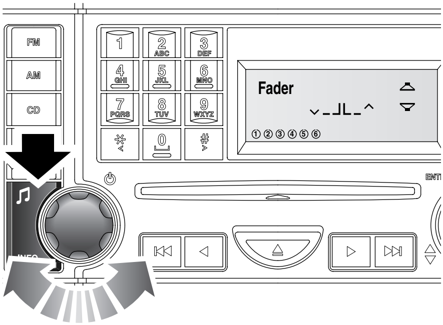
Balance adjustment


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Balance
①②③④⑤⑥

ICE1619 ENG

To access the Balance setting, press the **Tone** button repeatedly until the current **Balance** setting is displayed. Use the rotary control to increase or decrease the left or right sound level.

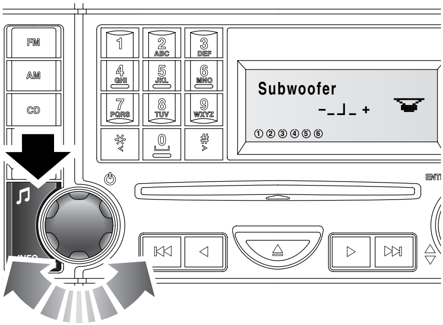
Fader adjustment


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Fader
①②③④⑤⑥

ICE1620 ENG

To access the Fader setting, press the **Tone** button repeatedly until the current **Fader** setting is displayed. Use the rotary control to increase or decrease the front or rear sound level.

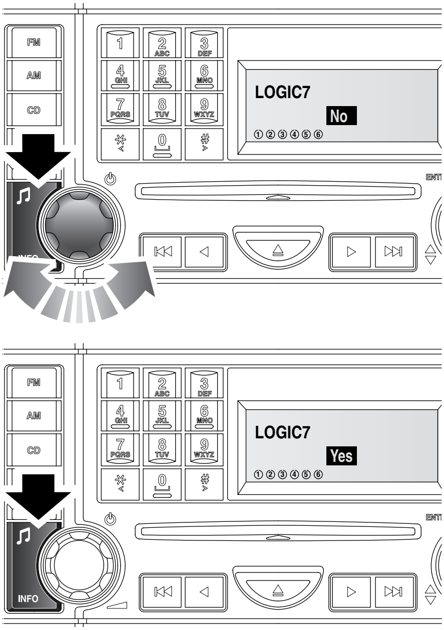
Subwoofer settings


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Subwoofer
①②③④⑤⑥

ICE1894 ENG

To access the Subwoofer setting, press the **Tone** button repeatedly until the current **Subwoofer** setting is displayed. Use the rotary control to increase or decrease the setting.

Logic 7 settings

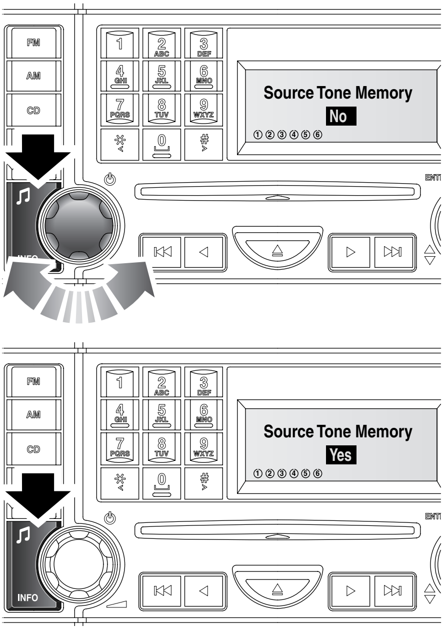

LOGIC7
No
LOGIC7
Yes
FM
AM
CD
INFO

ICE2140 ENG

To access the LOGIC7 setting, press the **Tone** button repeatedly until the current **LOGIC7** setting is displayed. Use the rotary control to highlight **Yes** or **No** as required.

Press the **Tone** button to confirm your choice.

Source tone memory

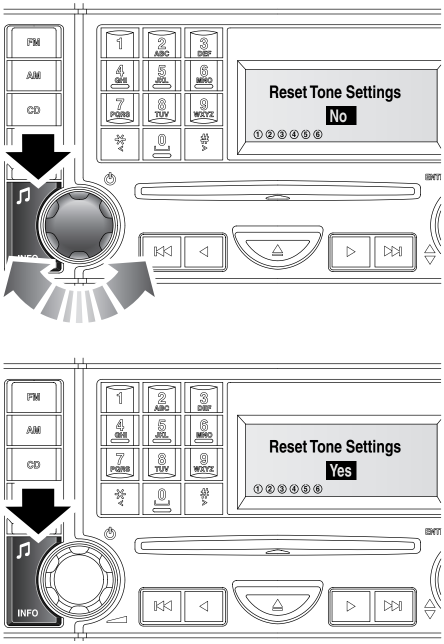

Source Tone Memory
No
Source Tone Memory
Yes
FM
AM
CD
INFO

ICE1898 ENG

To access the Source Tone Memory setting, press the **Tone** button repeatedly until the current **Source Tone Memory** setting is displayed. Use the rotary control to highlight **Yes** or **No** as required.

Press the **Tone** button to confirm your choice.

Resetting tone values


FM
AM
CD
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
Reset Tone Settings
No
① ② ③ ④ ⑤ ⑥
Reset Tone Settings
Yes
① ② ③ ④ ⑤ ⑥
INFO

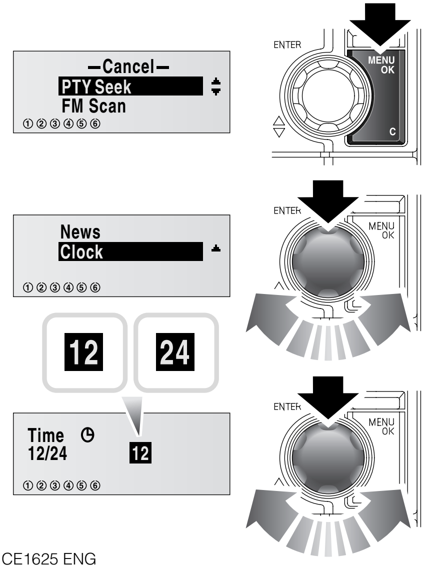
ICE1621 ENG

To return the tone settings to the factory defaults, press the **Tone** button repeatedly until **Reset Tone Settings** is displayed. Use the rotary control to scroll between **Yes** and **No**, then press the **Tone** button when your choice is highlighted.

All settings will be reset to the neutral (central) value.

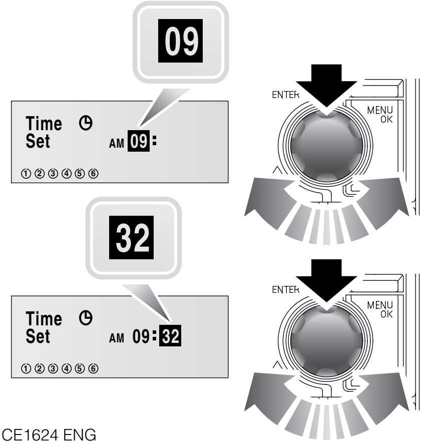
CLOCK

Adjusting the clock


—Cancel—
PTY Seek
FM Scan
①②③④⑤⑥
ENTER
MENU
OK
C
News
Clock
①②③④⑤⑥
12
24
Time
12/24
12
①②③④⑤⑥

ICE1625 ENG

Access the clock set menu by pressing the **Menu/OK** button. Use the rotary control to scroll to **Clock**, then press the control to select. Rotate the control to scroll between **12** and **24**, then press the control to select the required format.


09
Time
Set
AM 09:
①②③④⑤⑥
ENTER
MENU
OK
32
Time
Set
AM 09:32
①②③④⑤⑥

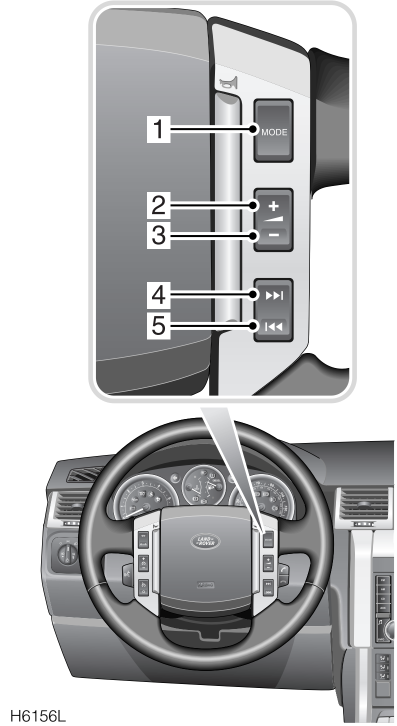
ICE1624 ENG

To adjust the hours, rotate the control clockwise to increase, or anti-clockwise to decrease. Press the rotary control to accept the value shown.

Once the hours have been set and accepted, the minutes will be highlighted and are set in the same way. Having set both hours and minutes, the display will return to the main menu.

Note: *The clock will remain illuminated for ten minutes after the starter key is turned to position **0**.*

AUDIO REMOTE CONTROLS



1. Audio mode switch

Press to change audio modes (radio to CD for example).

2. Volume increase control

Press to increase volume.

3. Volume decrease control

Press to decrease volume.

4. Search forward/track select control

Press to change to the next radio station on the selected waveband.

During CD play, press the control to move forward to the beginning of the next track. Operate the control repeatedly to move forwards through several tracks at a time.

5. Search backward/track select control

Press to change to the previous radio station on the selected waveband.

During CD play, press the control to move backward to the beginning of the current track on the disc. Operate the control repeatedly to move backwards through several tracks at a time.

REAR AUDIO CONTROLS

With the starter key in position **I** or **II**, the rear audio controls can operate, regardless of whether the audio system is switched on or not. However, the output can only be heard through the headphones.

If you are listening to the same source as the main audio unit, only the volume can be adjusted via the rear audio controls.

For example, if a music CD is selected on the main audio unit, you can also listen to that music and adjust the volume to suit your requirement. No other CD functions will be available. If however, the main audio unit is switched to another source, all CD adjustments achievable with the rear audio controls become available. If the main audio source is subsequently switched back to CD operation, the rear audio controls will again be limited to volume control only.

The same logic applies to radio functions.

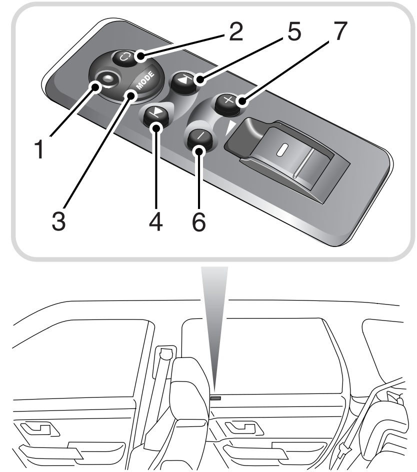
Adjustments can be made to other parts of the audio system.

For example, if a music CD is selected on the main audio unit, radio can be selected and controlled by a passenger using the rear audio controls. All radio adjustments achievable with the rear audio controls become available.

Headphones with volume control

The maximum volume available to this type of headphones is limited to the volume set at the rear audio controls.

Note: *Only headphones compatible with a 3.5 mm jack plug socket can be used. To obtain optimum sound quality, use headphones with an impedance of 32 ohms.*



H6158G

1. 3.5 mm headphone jack.
2. Pre-set/Disc select.
   During radio play, a short press will select the next pre-set radio station. A long press will change the frequency band (MW, FM, etc.).
   During CD play, a short press will select the next disc.
3. Mode control.
   A long press will select AUX.
   When in AUX mode, a short or long press will return to the previously selected mode.
   Press to toggle between radio, CD and Rear Seat Entertainment.

   Note: *When Rear Seat Entertainment is selected, all adjustments are made through the remote control.*

4. Seek down.
   During radio play, press to seek down through the frequency band to the next available station with good signal strength.
   During CD play, a short press will skip back to the beginning of the track being played. Press again to skip back to the previous track. A long press will search back through the track being played, until the button is released.
5. Seek up.
   During radio play, press to seek up through the frequency band to the next available station with good signal strength.
   During CD play, press to skip forward to the beginning of the next track.
   A long press will search forward through the track being played, until the button is released.
6. Volume decrease.
   Press to lower the headphone volume level.
7. Volume increase.
   Press to increase the headphone volume level.

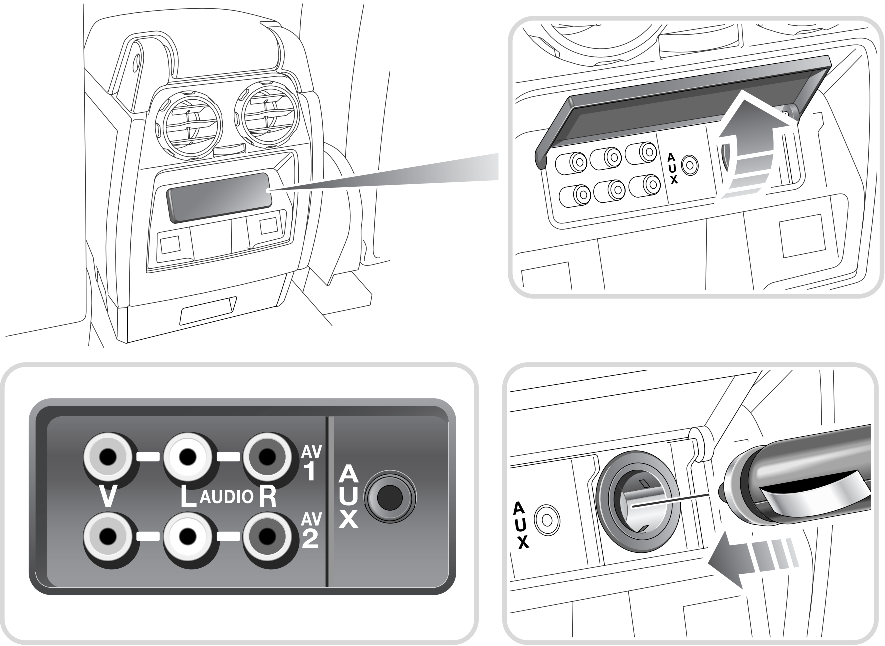
Note: *When the headphones are not connected, the buttons remain operational. This means that it is still possible to select CD, for example, whilst the radio is playing through the cabin speakers. The CD unit will remain operational until the mode control is pressed to select another mode.*

The mode in use when the starter key is removed will resume if the starter switch is turned on again (position ***I*** *or* ***II****) within two minutes. If the starter switch is turned off for longer than two minutes* ***AUX*** *mode will be selected when the starter switch is next turned on.*

Note: *Adjusting the volume on the main audio unit, does not alter the headphone volume. The volume level of each controller can be adjusted independently.*

Note: *Only headphones compatible with a 3.5 mm jack plug socket can be used. To obtain optimum sound quality, use headphones with an impedance of 32 ohms.*

AUXILIARY EQUIPMENT CONNECTIONS



ICE2254 ENG

AUX (Auxiliary Input) mode allows additional equipment to be connected to the vehicle's audio system. Items such as a personal stereo, MP3 player, hand-held navigation unit etc. can be plugged in to the vehicle's audio system.

The auxiliary connector is situated at the rear of the centre console. To gain access, lift the lower edge of the cover.

Auxiliary audio devices are connected via the 3.5 mm stereo jack plug marked **AUX**.

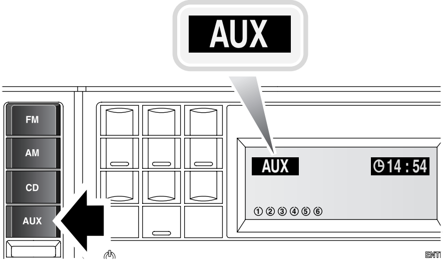
The auxiliary power socket, situated next to the auxiliary input connector, can be used to power or charge any suitable device.

Auxiliary mode

WARNING

- **Ensure that any auxiliary devices are stored securely whilst the vehicle is in motion. Any loose objects can present a serious hazard during sudden manoeuvres, emergency braking, or an accident.**
- **Do not place any item connected to the auxiliary input socket, or the auxiliary power socket, on the vehicle's seats, carpets, or other upholstery. The heat generated by these devices may cause damage to the upholstery, or in extreme cases, a vehicle fire.**
- **Do not leave any auxiliary input devices connected whilst the vehicle is left unattended. There is a risk of heat damage or fire, in addition to the risk of theft.**

Caution: Read the manufacturer's instructions for any device BEFORE it is connected to the vehicle's audio system. Ensure that the device is suitable, and comply with any instructions regarding connection and operation. Failure to do so may result in damage to the vehicle's audio/electrical system, and/or the auxiliary device.



ICE1864 ENG

To listen to an auxiliary input source, connect the device and briefly press the **AUX** button. The unit will playback audio via the 3.5 mm stereo jack plug.

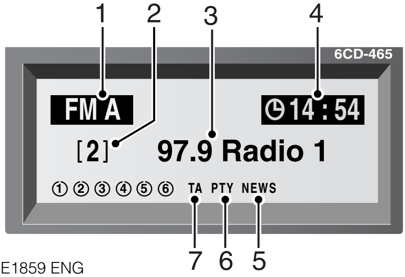
Alternatively, press and hold the **MODE** button on the steering wheel or the rear audio controls.

Volume is controlled using the left rotary control, and tone settings are as described previously.

Note: *The volume levels and sound quality available from devices connected to the auxiliary inputs may vary widely.*

RADIO SETTINGS

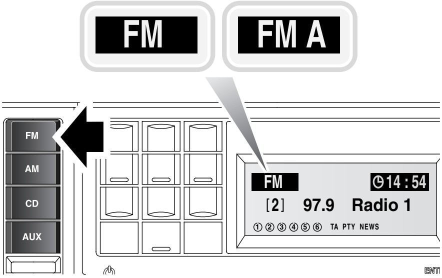
Information display screen


1
2
3
4
6CD-465
FM A
14 : 54
[2]
97.9 Radio 1
① ② ③ ④ ⑤ ⑥
TA PTY NEWS
7
6
5

ICE1859 ENG

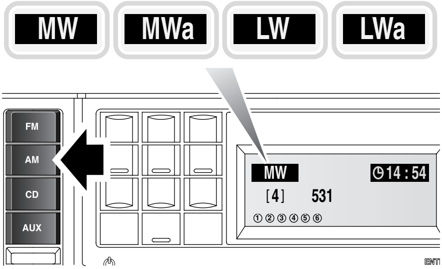
1. Current wave band selected.
2. Position that the current station is stored under, within pre-sets.
3. Station name (only available when RDS is on) and frequency.
4. Clock display.
5. When shown, news programmes will be selected when available.
6. Displayed when searching for a PTY station.
7. When displayed, indicates that Traffic Announcements will be selected when they are available.

Waveband selection


FM
FM A
FM
AM
CD
AUX
FM
14 : 54
[2]
97.9
Radio 1
① ② ③ ④ ⑤ ⑥
TA PTY NEWS

ICE1861 ENG

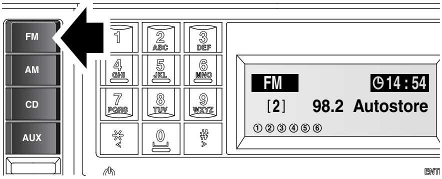
To select the FM waveband, press the **FM** button briefly. Repeated presses will toggle between **FM**, and **FMA**. The selection will be shown in the top left corner of the information display.


MW
MWa
LW
LWa
FM
AM
CD
AUX
MW
14 : 54
[4]
531
① ② ③ ④ ⑤ ⑥

ICE1862 ENG

To select the AM waveband (includes MW and LW) press the **AM** button briefly. Repeated presses will scroll through **MW, MWa, LW** and **LWa**. The selections will be shown in the top left corner of the information display.

Autostore

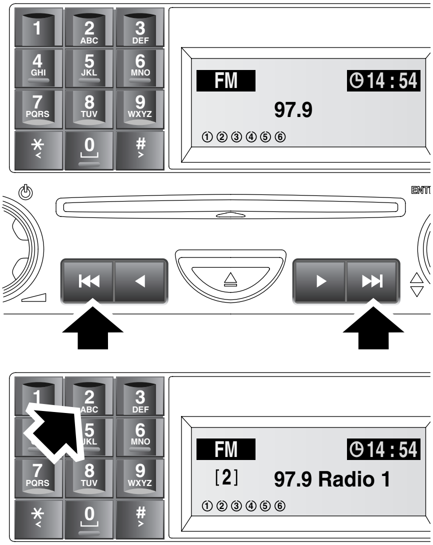


ICE1866 ENG

To autostore stations, press and hold the chosen waveband button. **Autostore** will be shown in the information display and the stations will be stored under the pre-set numbers in the order in which they are found.

To access the stored stations, press the required pre-set number briefly.

Storing stations manually



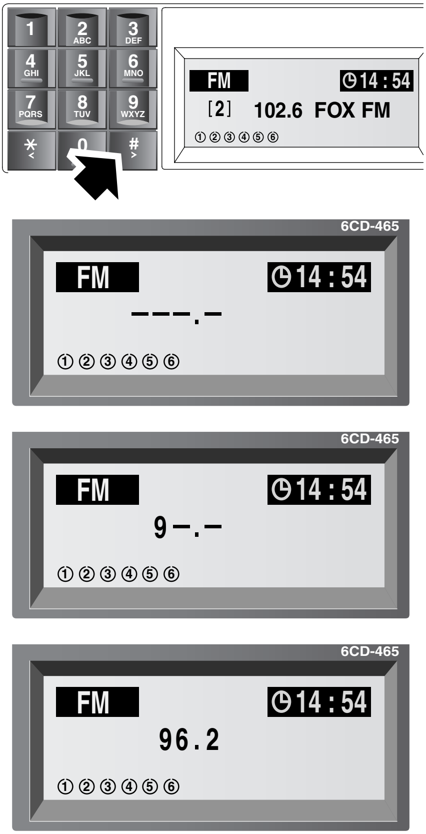
ICE1865 ENG

To select a station, press either of the **search up** or **search down** buttons to scan up or down to the next available station. Having tuned to the desired station, press and hold the pre-set number that you would like the station to be stored under.

The audio output will be muted when the button is pressed. When the audio output can be heard again, the station has been stored.

To access the stored stations, press the required pre-set number briefly.

Direct frequency input


1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
* <
0
# >
FM
14 : 54
[2] 102.6 FOX FM
① ② ③ ④ ⑤ ⑥
6CD-465
FM
14 : 54
– – – . –
① ② ③ ④ ⑤ ⑥
6CD-465
FM
14 : 54
9 – . –
① ② ③ ④ ⑤ ⑥
6CD-465
FM
14 : 54
96.2
① ② ③ ④ ⑤ ⑥

ICE2142 ENG

A frequency in either FM or AM can be directly input from the preset keypad.

Select a radio station in the desired waveband and give a short press on the **#** button. This will clear the frequency display.

Dial in the frequency required using the numbered keys (during this exercise, the unit will remained tuned to the current station).

Ignore the fact that the previous frequency might have had more, or fewer, digits than the new one as the system will cater for this.

Any inputs that are outside the frequency range will be ignored. If there is no user action for 5 seconds during the process, the display will return to the previous station display.

When the frequency has been full input, the tuner will change to the newly selected frequency. Once the change has been made, the new frequency can be stored manually.

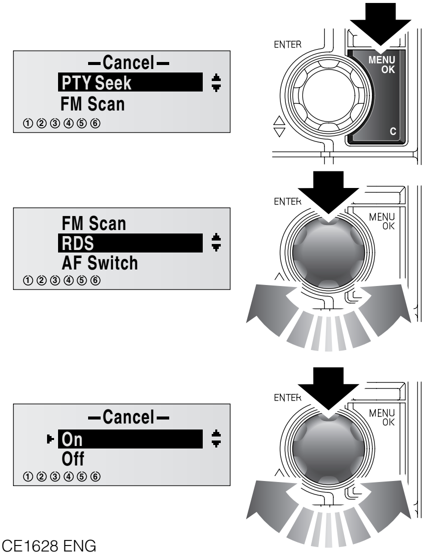
RDS (RADIO DATA SYSTEM)

Your radio is equipped with RDS (Radio Data System), which enables the audio unit to receive additional information with the normal radio signals.

On the FM waveband, RDS enables the radio to receive information broadcasts. RDS also allows the radio to automatically re-tune to stations that are linked to the same network if that network allows this.

Note: *Not all FM radio stations broadcast RDS. If a non-RDS station is selected, RDS features will not be available.*

Selecting RDS


—Cancel—
PTY Seek
FM Scan
①②③④⑤⑥
ENTER
MENU OK
C
FM Scan
RDS
AF Switch
①②③④⑤⑥
ENTER
MENU OK
—Cancel—
On
Off
①②③④⑤⑥
ENTER
MENU OK

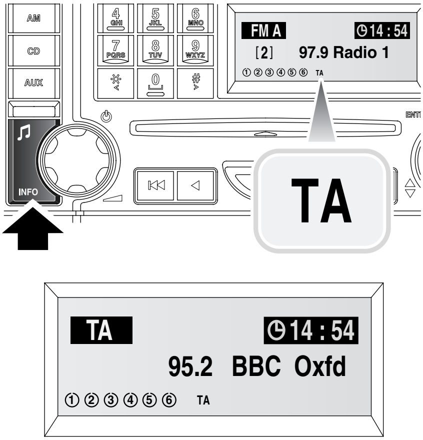
ICE1628 ENG

To turn RDS on or off, press the **MENU/OK** button to display the menu. With the settings menu displayed, rotate the control until **RDS** is displayed. Press the rotary control to display the **On** or **Off** options. Use the control to make your selection, and press the control to set the RDS status.

Note: *If RDS is turned off, the name of the selected radio station will not be displayed.*

INFORMATION BROADCASTS

Selecting traffic information



ICE1632 ENG

To toggle TA (Traffic Announcement) on or off, briefly press the **INFO** button.

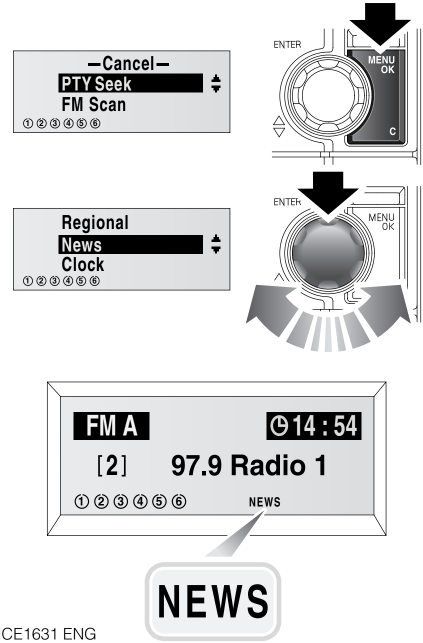
As soon as a traffic announcement is received, normal radio reception (or CD play) is interrupted and **TA** appears in the main display area, along with the name of the station providing the information. At the end of the traffic announcement, radio, or CD play, will resume.

Tuning difficulties

- If the radio is tuned to a weak FM signal (in remote areas, for example) or a radio station that cannot provide traffic information, when the **INFO** button is pressed, the display will show **No TA/TP**.
- If a traffic information station cannot be found, the words **No Station** will be displayed. In this case the radio will return to the previously tuned frequency.
- If the signal from a traffic information station weakens, the **TP** indicator in the left side of the display will start to flash. In this case, press either of the Search controls to start searching for another radio station. If the traffic information signal weakens during CD play, the radio will automatically attempt to locate and re-tune to a traffic information station with a stronger signal.

Note: *If a non-traffic information station has been stored on one of the pre-set buttons, and is selected while the traffic information facility is switched on, the radio will remain on the selected station unless TA is turned off and on again.*

NEWS INFORMATION


—Cancel—
PTY Seek
FM Scan
① ② ③ ④ ⑤ ⑥
ENTER
MENU OK
C
Regional
News
Clock
① ② ③ ④ ⑤ ⑥
ENTER
MENU OK
FM A
14 : 54
[2] 97.9 Radio 1
① ② ③ ④ ⑤ ⑥
NEWS
NEWS

ICE1631 ENG

Selecting news information

Press the **MENU/OK** button to display the menu. Use the rotary control to scroll up or down through the menu to **NEWS**. Press the **MENU/OK** button to change the status to **ON** or **OFF**.

Alternatively, press and hold the **INFO** button to toggle news broadcasts on or off.

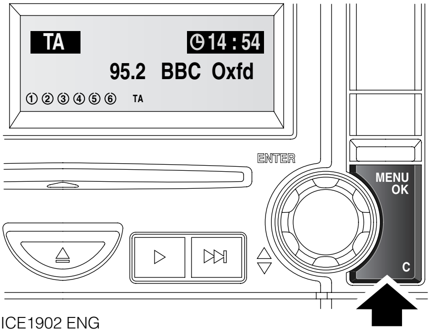
During news broadcasts the display shows **NEWS** with the name of the radio station providing the news information.

When the news information mode is active, and a news information broadcast is received, normal radio reception (or CD play) is interrupted and the display flashes **NEWS** alternately with the name of the radio station providing the news information.

The display will alternatively flash the station name and **NEWS**. At the end of each broadcast, CD play will resume from the point at which CD play was interrupted.

Note: *Both traffic and news information can be selected at the same time. However, the radio will always give priority to traffic information.*

Cancelling an announcement


TA
14 : 54
95.2 BBC Oxfd
① ② ③ ④ ⑤ ⑥ TA
ENTER
MENU OK
C

ICE1902 ENG

To cancel an announcement during its broadcast, briefly press the **C** button.

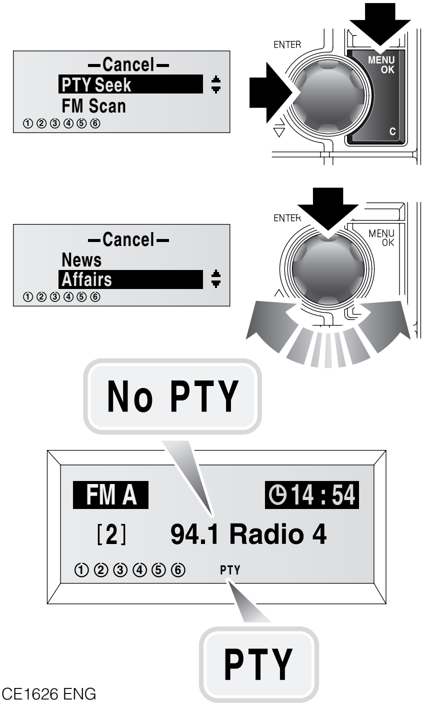
Note: *Cancelling the announcement in this way will not prevent further announcements from being played when they become available.*

PTY (PROGRAMME TYPE)

The RDS (Radio Data System) allows programmes to be categorised by the broadcast type (rock music, current affairs, news etc.).

This in turn, allows you to search for a station by choosing the type of broadcast that you wish to listen to.

PTY search


ENTER
MENU OK
C
–Cancel–
PTY Seek
FM Scan
① ② ③ ④ ⑤ ⑥
ENTER
MENU OK
–Cancel–
News
Affairs
① ② ③ ④ ⑤ ⑥
No PTY
FM A
14 : 54
[2] 94.1 Radio 4
① ② ③ ④ ⑤ ⑥ PTY
PTY

ICE1626 ENG

To search for a station by programme type RDS must be set to ON. Press the **MENU/OK** button to enter the menu. Use the rotary control to scroll through the menu until **PTY Seek** is highlighted, then press the rotary control.

Having entered the PTY menu, use the rotary control to scroll through the programme types until your choice is highlighted. Press either the rotary control, or the **MENU/OK** button to select the programme type and start the search.

Once a matching station is found, it will continue to play. If you wish to continue searching, press the seek up or seek down button within thirty seconds. To continue listening to the station, no action is required as it will remain tuned, and can be stored as a pre-set if required.

If the system is unable to tune to a PTY station, **No PTY** will be displayed.

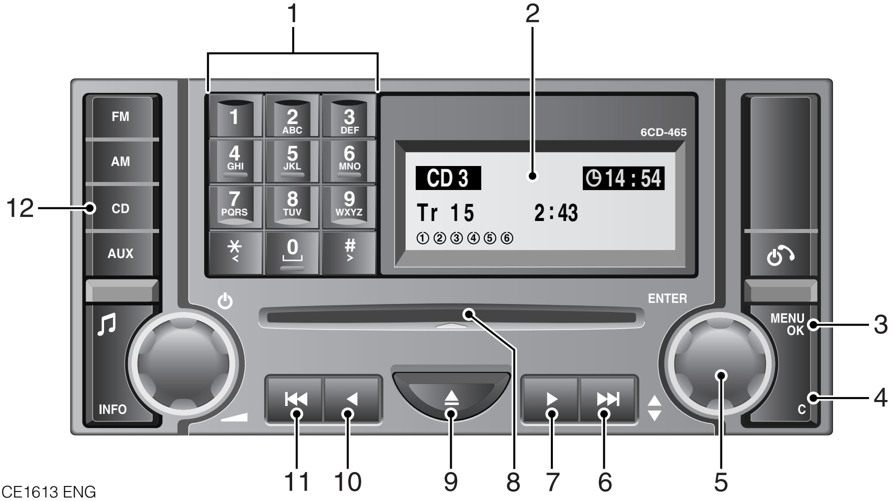
To abort a PTY search, press the **C** button.

PTY Programme Types

NEWS	News services
AFFAIRS	Current affairs
INFO	Information
SPORT	Sport
EDUCATE	Educational
DRAMA	Drama
CULTURE	Cultural
SCIENCE	Scientific
VARIED	Varied programming
POP M	Pop music
ROCK M	Rock music
EASY M	Easy listening music
LIGHT M	Light music
CLASSICS	Classical music
OTHER M	Other music
WEATHER	Weather information
FINANCE	Financial information
CHILDREN	Children’s programming
SOCIAL	Religious music
RELIGION	Religious talk/music
PHONE IN	Phone-in
TRAVEL	Travel
LEISURE	Leisure
JAZZ	Jazz music
COUNTRY	Country music
NATION M	National music
OLDIES	Older music
FOLK M	Folk music
DOCUMENT	Documentaries

CD CONTROLS

Main controls

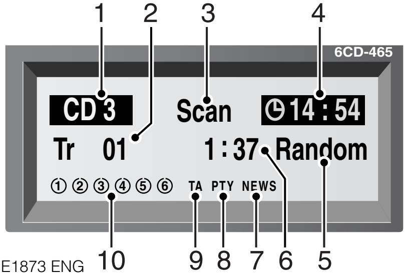

1
2
FM
AM
CD
AUX
INFO
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
*
0
#
6CD-465
CD 3
14 : 54
Tr 15
2:43
① ② ③ ④ ⑤ ⑥
ENTER
MENU OK
C
12
3
4
11
10
9
8
7
6
5
ICE1613 ENG

1. Disc select (1 - 6) - Premium audio only.
2. Information display screen.
3. Access menu.
4. Back or exit in menu, clear input.
5. Press to accept a selection. Rotate to move up or down a menu.
6. Skip forward/next track.
7. Manual fast forward.
8. CD slot.
9. Disc eject.
10. Manual search/rewind.
11. Return to start/previous.
12. Main source select.

Note: *On Standard (single CD play) audio units, the numerical keypad (1) has no CD functionality.*

Note: *For information on CD care and handling, see* ***CARE OF COMPACT DISCS, 306****.*

Information display screen


1
2
3
4
6CD-465
CD 3
Scan
14 : 54
Tr 01
1 : 37
Random
① ② ③ ④ ⑤ ⑥
TA PTY NEWS
10
9
8
7
6
5

ICE1873 ENG

1. Disc number (Premium audio).
2. Track number.
3. Play function.
4. Clock display.
5. Play order, random, repeat.
6. Time elapsed on current track.
7. News broadcast on.
8. PTY (Programme Type Information) on.
9. TA (Traffic Announcement) broadcast on.
10. Number of discs in unit (Premium audio).

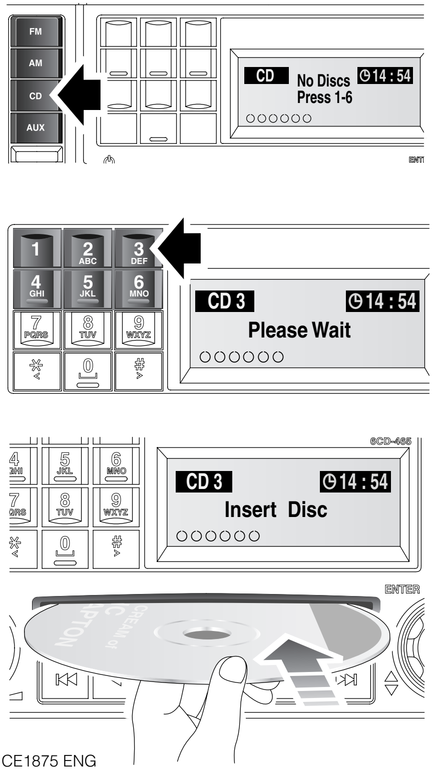
***Note:** On Premium audio units, the six circles at the bottom left-hand side of the screen represent the six available CD slots. As soon as one has a CD in it, its number will appear in the circle.*

INSERTING AND EJECTING DISCS

Dual and DVDPlus discs

Please be aware that a new generation of DVD discs is being adopted by the music industry. They are known as **Dual Discs** or **DVDPlus** discs. They have digital music on one side and video content on the other. Current in-car audio systems with a front loading CD player may load and play this type of disc, however, it is possible that the disc will not eject and will therefore block up the player. Such damage to a CD player will not be covered under warranty.

Inserting a single disc


FM
AM
CD
AUX
CD
No Discs
Press 1-6
14 : 54
○○○○○○
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
CD 3
14 : 54
Please Wait
○○○○○○
6CD-465
CD 3
14 : 54
Insert Disc
○○○○○○
ENTER

ICE1875 ENG

To insert a single disc into the CD player, first press the **CD** mode button.

***Note:** On Premium audio units, it is then necessary to use the numerical keypad to select the disc position number in which the CD is to be stored.*

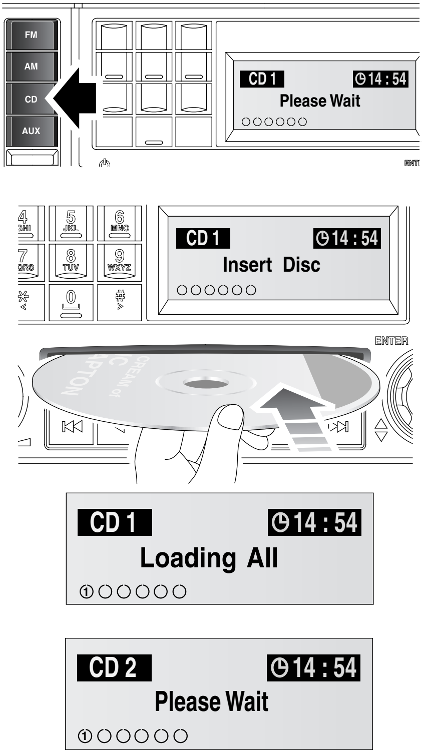
A message will appear in the display screen asking you to wait, followed by the instruction to **Insert Disc**.

Ensure that the label side of the disc is facing upwards then partially insert it without pushing it into the slot; the player mechanism will draw the disc in automatically.

Caution: DO NOT force the disc into the slot.

There will be a short pause whilst the player reads the information from the disc. Play will commence at the first track on the newly inserted disc.

Inserting multiple discs (Premium audio)



ICE1891 ENG

To insert more than one disc, briefly press the **CD** mode button. Then press and hold the **CD** mode button. The information display will show **Loading All**, followed by **Please Wait**.

When the message **Insert Disc** is displayed, the first disc can be presented to the player. The disc's position number will be highlighted on the Information display screen both during and after loading.

Note: *If a CD fails to be drawn in and the message **CD Error** is displayed, press the eject button to clear the error.*

If the error fails to clear, contact your Land Rover Dealer/Authorised Repairer.

This process is repeated until all six CD positions are occupied. If one or more of the disc positions is already occupied, that position will be skipped in the loading process.

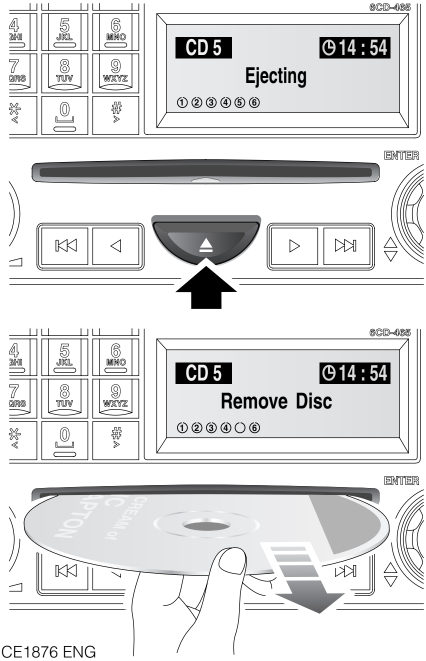
Caution: DO NOT force the disc into the slot.

Note: *To stop the loading process for multiple discs, either press and hold the **CD** mode button or press the **C** button.*

Note: *If there is a problem with a disc that has been loaded (inserted upside down, wrong format etc.) **Disc Error** will appear in the message display, and the disc in question will be ejected. If the problem is obvious, and can be corrected (disc upside down for example), then re-insert the disc in the correct manner. If it cannot be rectified, or the problem is not apparent, do not re-insert the disc.*

Ejecting a single disc

Caution: Do not pull the disc from the player before it has stopped moving, as this may cause damage to the player mechanism.


6CD-465
CD 5
14 : 54
Ejecting
① ② ③ ④ ⑤ ⑥
ENTER
CD 5
14 : 54
Remove Disc
① ② ③ ④ ○ ⑥

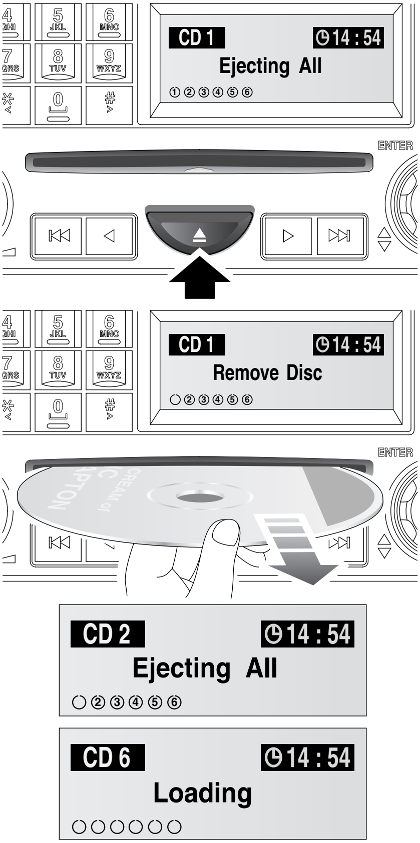
ICE1876 ENG

It is only possible to eject a single disc, if it is currently selected or playing.

To eject a disc, press the eject button briefly. **Ejecting** will be shown on the display screen, and, after a short pause, the disc will be presented. When the disc has stopped moving **Remove Disc** is displayed. The disc should now be removed.

Note: *If the disc is not removed from the slot within fifteen seconds, it will be drawn back into the player.*

Ejecting multiple discs (Premium audio)


CD 1
14 : 54
Ejecting All
① ② ③ ④ ⑤ ⑥
ENTER
CD 1
14 : 54
Remove Disc
○ ② ③ ④ ⑤ ⑥
CD 2
14 : 54
Ejecting All
○ ② ③ ④ ⑤ ⑥
CD 6
14 : 54
Loading
○ ○ ○ ○ ○ ○

ICE1893 ENG

All of the discs contained in the player can be ejected in sequence. To eject all of the discs, press and hold the eject button.

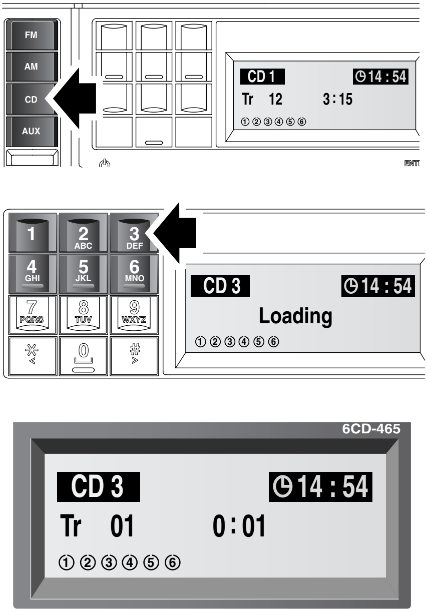
The discs will be ejected one at a time with a short pause in between each. Following the removal of the last disc, **Loading** will be shown in the display screen.

To stop the process, press any number key.

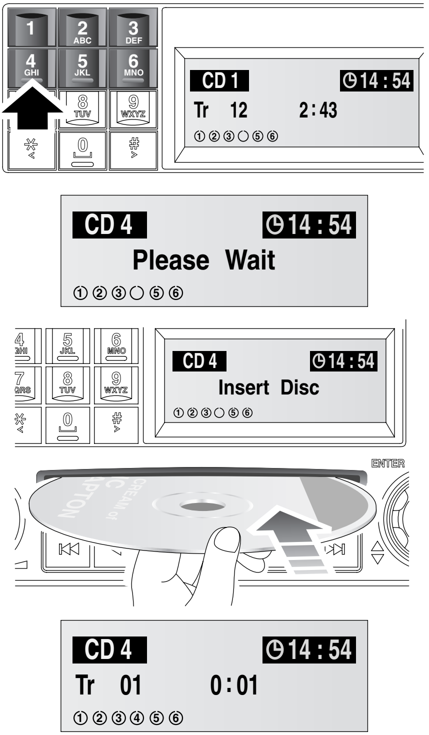
Note: *If a disc is not removed from the slot within fifteen seconds, it will be drawn back into the player.*

CD PLAYBACK

Play


FM
AM
CD
AUX
CD 1
14 : 54
Tr 12 3 : 15
① ② ③ ④ ⑤ ⑥
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0
CD 3
14 : 54
Loading
① ② ③ ④ ⑤ ⑥
6CD-465
CD 3
14 : 54
Tr 01 0 : 01
① ② ③ ④ ⑤ ⑥

ICE1887 ENG


1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
8 TUV
9 WXYZ
0
CD 1
14 : 54
Tr 12 2 : 43
① ② ③ ○ ⑤ ⑥
CD 4
14 : 54
Please Wait
① ② ③ ○ ⑤ ⑥
CD 4
14 : 54
Insert Disc
① ② ③ ○ ⑤ ⑥
ENTER
CD 4
14 : 54
Tr 01 0 : 01
① ② ③ ④ ⑤ ⑥

ICE1888 ENG

Standard audio: With a CD loaded, start CD playback by briefly pressing the **CD** mode button. Playback will begin from the point at which it was stopped previously or, if the CD is newly inserted, from the beginning of the CD.

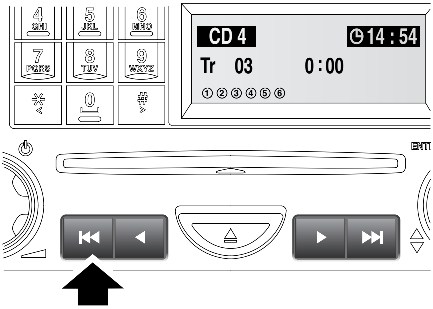
Premium audio: To start CD playback, briefly press the **CD** mode button, then select the required disc number. If no disc number is selected, playback will begin at one of two places:

- If the discs contained in the player have not been removed since their last use, playback will begin from the point at which it was stopped previously.
- If the discs contained in the player have not been used since they were inserted, playback will begin at the start of disc one.

If the slot position selected does not contain a disc, there will be a pause followed by a message on the display screen **Insert Disc**.

Once a disc has been inserted, there will be a pause whilst the unit reads the disc information. Playback will then begin at the start of track one.

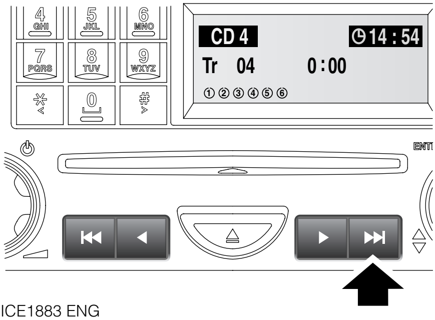
Start of track


CD 4
14 : 54
Tr 03 0 : 00
① ② ③ ④ ⑤ ⑥
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0

ICE1882 ENG

To return to the start of a track during playback, briefly press the **Return to Start/Previous** button.

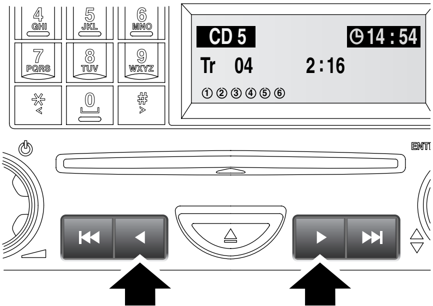
Next track


CD 4
14 : 54
Tr 04 0 : 00
① ② ③ ④ ⑤ ⑥
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0

ICE1883 ENG

To skip forward to the beginning of the next track on the disc, briefly press the **Skip Forward/Next track** button.

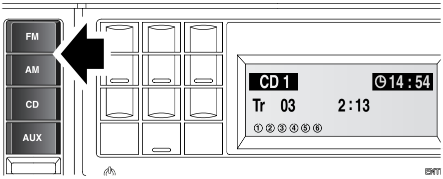
Forward/Reverse (search track)


CD 5
14 : 54
Tr 04 2 : 16
① ② ③ ④ ⑤ ⑥
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
0

ICE1890 ENG

To search forwards or backwards through the current track, briefly press the relevant **Search** button.

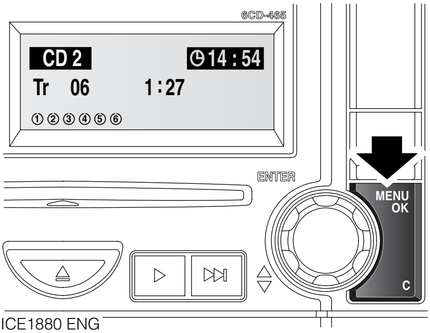
Pause/Stop


FM
AM
CD
AUX
CD 1
14 : 54
Tr 03 2 : 13
① ② ③ ④ ⑤ ⑥

ICE2399 ENG

To end CD playback, briefly press one of the other mode buttons, **FM** for example.

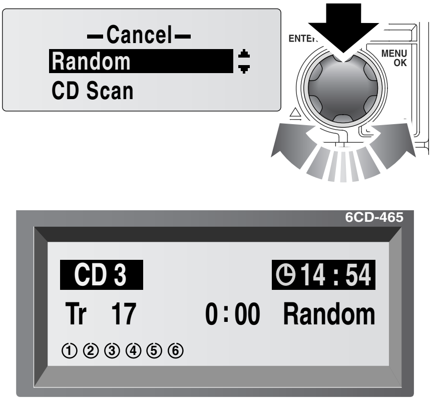
CD FUNCTIONS MENU


6CD-465
CD 2
14 : 54
Tr 06 1:27
① ② ③ ④ ⑤ ⑥
ENTER
MENU
OK
C

ICE1880 ENG

Some of the additional functions are available from the CD menu. To access the menu when in CD mode, briefly press the **MENU/OK** button, then use the right-hand rotary control to scroll to the required function. Press the control to enable or disable the function.

Random


–Cancel–
Random
CD Scan
ENTER
MENU
OK
6CD-465
CD 3
14 : 54
Tr 17 0:00 Random
① ② ③ ④ ⑤ ⑥

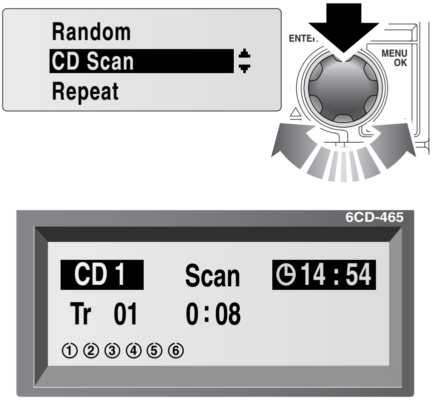
ICE1877 ENG

Random alters the playback sequence for the currently playing disc. Instead of working through the tracks in numerical order, the tracks are selected randomly by the player.

Use the right rotary control to scroll to **Random**. Press the control to enable or disable the random function as required.

Pressing the **C** button will also disable the function.

CD scan


Random
CD Scan
Repeat
ENTER
MENU
OK
6CD-465
CD 1
Scan
14 : 54
Tr 01 0:08
① ② ③ ④ ⑤ ⑥

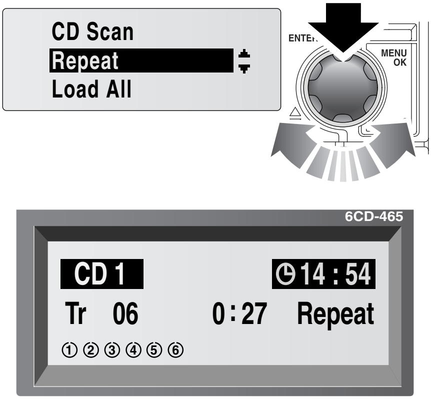
ICE1878 ENG

CD Scan will work through the tracks on the current CD in numerical order. Each track will be played for ten seconds, before moving on to the next track. Play will then begin at the start of track one. This feature is designed to allow you to sample the music available on a CD.

Use the right rotary control to scroll to **CD Scan**. Press the control to enable or disable the function as required.

Pressing the **C** button, or the **Skip Forward/Next Track** or **Return to Start/Previous** buttons, will also disable the function.

Repeat



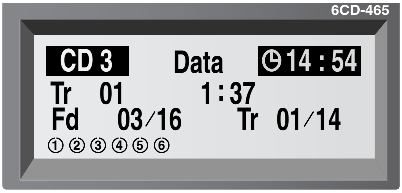
ICE1879 ENG

Repeat puts the current track into a loop. The track will play repeatedly until it is stopped or cancelled.

Use the right rotary control to scroll to **Repeat**. Press the control to enable or disable the function as required.

Pressing the **C** button, or the **Skip forward/Next track** or **Return to Start/Previous** buttons, will also disable the function.

DATA CD (MP-3)



ICE2141 ENG

When a data disc (containing MP-3 encrypted music data) is inserted into the unit, the display will show additional folder and track information.

The first line of the display shows that a data CD is inserted. The second line shows which track is being played and the play time of that track.

The third line shows which folder out of the total number of folders (03/16) and which track out of the total number of tracks available (01/14) is currently playing.

A short press on the **#** or ***** keys selects the next or previous folder respectively. The number of that folder will change accordingly.

When a new folder is selected, play will commence at the first track in that folder.

Within the current folder, track selection can be changed by use of the **Return to start/previous** and **Skip forward/next track** buttons. Track number in the display will change accordingly.

VOICE CONTROL

IMPORTANT

Voice control provides a safe and convenient way of operating the audio system without the need to operate the controls manually. This enables you to concentrate fully on driving the vehicle, and removes the need to divert your attention from the road ahead in order to change settings, or receive feedback from the system.

A number of voice commands are available, and, with a little experience, you will find them easy and convenient to use. Whenever you issue one of the defined commands with the system active, the voice control system converts your command into a control signal for the audio system. Your inputs take the form of dialogues or commands. You are guided through these dialogues by announcements or questions.

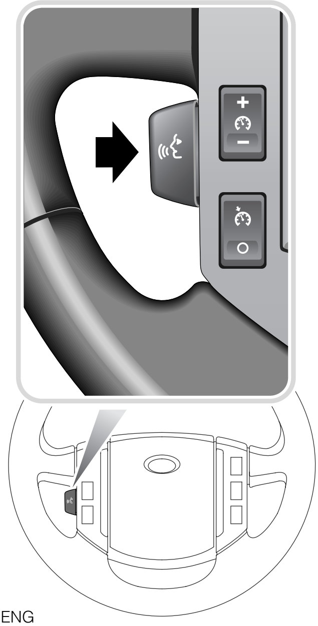
Please familiarise yourself with the functions of the audio system before using voice control.

Making yourself clearly understood

The voice control system includes a hands-free microphone mounted in the roof lining at the front of your vehicle. Although the microphone filters out some ambient noise, there are a few points to observe to ensure that the system understands your commands:

- Speak continuously and at normal volume, avoiding unnatural emphasis and pauses between words.
- Do not speak while the voice control system itself is giving an output. The voice system displays **LISTENING** on the message centre, and gives a beep when it is waiting for a speech input.
- It is possible that noise interference from outside the vehicle could affect commands. To avoid this, keep the doors, windows, and sunroof closed.
- If a command is not heard, or misunderstood, the voice system responds with >Sorry, Command not recognised< or >No speech detected<. If this happens, repeat the command.
- Avoid causing background noise in the vehicle while you are speaking, and ask your passengers not to talk while you are issuing voice commands.
- The hands-free microphone is positioned to pick up the driver’s voice. Commands made by other occupants may be picked up, but clarity and accuracy will be reduced.

Activating the system



ICE1900 ENG

To activate voice control:

- Briefly pull the control paddle (your Audio system will mute at this point). A brief acoustic signal will be heard, and **LISTENING** will be displayed on the main message centre to indicate that the system is now waiting for a voice command.

Note: *It is only necessary to use the steering wheel voice control paddle at the beginning of each voice session.*

Defined voice commands

The voice control system understands predefined commands which need to be quoted word for word.

An audio feedback of voice commands is available. To activate the feedback, pull the voice control paddle briefly and give one of the following commands:

- **Voice help** - To list all commands.
- **Radio help** - To list Radio commands.
- **CD help** - To list CD commands.
- **Navigation help** - To list Navigation commands.

  Please refer to the **Navigation, TV and Telephone Systems** Handbook.
- **Notepad Help** - To list Notepad commands.

  See **Using Notepad, 143**.

Interrupting voice control

A command can be interrupted by saying the word **Cancel** or by pressing the voice control paddle until the system responds by saying >Command cancelled<.

If you receive a telephone call (or Navigation route guidance instruction or TA announcement) while conducting a dialogue by voice control, the voice control dialogue is interrupted.

Command not recognised

If a command is not recognised by the speech recognition system, it responds with:

>Sorry. Please say your command again<.

GENERAL COMMANDS

Activating the user help function

The command
Radio help - recites a list of radio commands.

The command
CD help - recites a list of CD player commands.

Activating the user help function		
You say	**System response**	**Message centre display**
Radio help	Quotes the list of radio commands.	RADIO HELP
CD help	Quotes the list of CD commands.	CD HELP

STATION TUNING

Starting a dialogue

Hold the voice control paddle on the multi-functional steering wheel until the acoustic signal is heard. Any audio sources in the vehicle are muted.

Radio stations

Frequencies are said as in the following examples:

- **Radio Tune five thirty one AM**, or **Radio Tune five thirty one (531).**
- **Radio Tune nine hundred (900).**
- **Radio Tune fourteen forty (1440).**
- **Radio Tune fifteen oh three AM (1503).**
- **Radio Tune fifteen ten AM (1510).**
- **Radio Tune ten eighty (1080).**
- **Radio Tune eighty nine point nine FM** or **Radio Tune eighty nine point nine (89.9).**
- **Radio Tune eighty seven point nine FM** or **Radio Tune eighty seven point nine (87.9).**
- **Radio Tune ninety point zero** or **Radio Tune ninety (90.0).**
- **Radio Tune ninety point one (90.1).**
- **Radio Tune one hundred point five (100.5).**
- **Radio Tune one oh one point one FM (101.1).**
- **Radio Tune one oh eight point oh, Radio Tune one oh eight point zero**, or **Radio Tune one oh eight (108.0).**
- **Radio Tune one oh seven point nine (107.9).**

Note: *The word* ***Select*** *can be used in place of the word* ***Tune*** *if preferred.*

Nametags

Nametags are a unique name or phrase of your choice which can be used to recall a radio station. The nametags used can be the station name, or a completely separate name of your choosing.

Tuning to a radio station		
You say	**System response**	**Message centre display**
Radio play	>Radio play<	RADIO PLAY
Radio tune ninety six point nine (96.9) FM (or AM or Medium Wave)	>Radio tune 96.9 FM (or AM or Medium Wave)<	96.9 FM
Radio tune <nametag>	>Radio tune <nametag><	Station frequency

STORING RADIO STATIONS

Storing via voice command

Once you have tuned to a radio station, it is possible to store that station for future use as a pre-set. The following commands apply to the currently tuned station.

The command
Radio store preset <say number (1-9)>
calls up the dialogue for storing a pre-set station.

The command
Radio autostore
enters the autostore function for the selected frequency band (e.g. FM).

Nametags

Nametags are a unique name or phrase of your choice which can be used to recall a radio station. The nametags used can be the station name, or a completely separate name of your choosing.

The names are stored in a directory by using the **Radio store name** command. The system responds with >Name please<. You say the name that you have chosen (e.g. Radio 1).

The system will read out a list of current nametags when given the command **Radio directory**.

Radio tune <nametag> is used to select a station that has been previously stored.

Storing via voice command		
You say	**System response**	**Message centre display**
Radio store preset <preset number (1-9)>	>Radio store preset< <preset number (1-9)>	RADIO STORE PRESET (1-9).
1. Radio store name **2.Name**	>Radio store name, name please< >Name<	RADIO STORE NAME, NAME PLEASE STORED
Radio autostore	>Radio autostore<	RADIO AUTOSTORE
Radio tune <name>	>Radio tune <name><	RADIO TUNE

RADIO PLAY DIRECTORY

Tune or Delete from the radio directory

The commands **Radio play directory** or **Radio directory** prompt the system to read aloud the entire list of nametag entries in the radio directory.

The nametag list is read out in stored order, and commands can be entered during the system response.

Replay

After a nametag has been read out by the system, give the command **Replay** and the nametag will be repeated.

Tune

After a nametag has been read out by the system, give the command **Tune** and the radio tunes to the station saved under that nametag.

Delete

After a nametag has been read out by the system, give the command **Delete** and the nametag will be removed from the directory.

Cancel

After a nametag has been read out by the system, give the command **Cancel** and the current Voice session will end.

Tuning from the radio directory		
You say	**System response**	**Message centre display**
Radio play directory You can say **Replay, Tune, Delete** or **Cancel** after each name.	>Radio play directory< Reads out directory.	RADIO DIRECTORY Station frequency

RADIO DELETE DIRECTORY

Deleting the directory

The command **Radio delete directory** deletes all entries in the radio directory.

Deleting the radio directory		
You say	**System response**	**Message centre display**
1. Radio delete directory	>Radio delete directory, confirm yes or no<	DELETE DIRECTORY SAY YES OR NO
2. Yes	>Are you sure that you want to delete the whole directory?<	SAY YES OR NO
3. Yes	>Directory deleted<	DIRECTORY DELETED

CD Commands

CD OPERATION

Selecting disc and track numbers
For CD player commands, say disc and track numbers as in the following examples:

- **CD play disc one.**
- **CD play disc six track ten**.
- **CD play track twenty five**.
- **CD play track forty seven**.

Note: *Commands relating to disc numbers and selection, refer only to Premium audio units.*

Operating the CD player via voice command		
You say	**System response**	**Message centre display**
CD help	>List of CD commands<	CD HELP
CD play	>CD play<	CD PLAY
CD play disc <say number (1-6)>	>CD play disc <say number (1-6)><	DISC <disc number (1-6)>
CD play next disc	>CD play next disc<	NEXT DISC
CD play previous disc	>CD play previous disc<	PREVIOUS DISC
CD play track <say number (1-99)>	>CD play track <say number (1-99)><	TRACK <track number (1-99)>
CD play disc <say number (1-6)> Track <say number (1-99)>	>CD play disc <say number (1-6) track <say number (1-99)><	DISC <disc number (1-6)> TRACK <track number (1-99)>

REAR SEAT ENTERTAINMENT

Rear seat entertainment operation

When rear seat entertainment is fitted, it can be controlled by the following voice commands:

Operating the rear seat entertainment via voice command		
You say	**System response**	**Message centre display**
Radio auxiliary on/play	Selects auxiliary input to allow an external device, such as a portable CD/MD player plugged into the Aux socket, to be played through the cabin speakers	AUXILIARY PLAY
Headphones on/play	Switches on both headphone outputs	HEADPHONES PLAY
Headphones off	Switches off both headphone outputs	HEADPHONES OFF
Rear entertainment on/play	Switches on rear entertainment system	RSE PLAY
Rear entertainment off	Switches off rear entertainment system	RSE OFF

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General Information - About This Manual

Description and Operation

Notes, Cautions and Warnings

Throughout this manual, important information is highlighted by the use of NOTES, CAUTIONS and WARNINGS. NOTES give additional information on a topic or procedure, CAUTIONS are given to prevent damage to the vehicle, and WARNINGS are given to prevent personal injury.

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General Information - About This Manual

Description and Operation

Introduction

This manual has been written in a format that is designed to meet the needs of technicians worldwide. The objective is to use common formats and include similar content in each manual.

This manual provides general descriptions for accomplishing diagnosis and testing, service and repair work with tested and effective techniques. Following them will help to ensure reliability.

Important Safety Instructions

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual carrying out the work.

Anyone who departs from the instructions provided in this manual must first establish that personal safety or vehicle integrity is not compromised by the choice of method, tools or components.

Warnings, Cautions and Notes in This Manual

⚠ WARNING: Warnings are used to indicate that failure to follow a procedure correctly may result in personal injury.

⚠ CAUTION: Cautions are used to indicate that failure to follow a procedure correctly may result in damage to the vehicle or equipment being used.

• NOTE: Notes are used to provide additional essential information required to carry out a complete and satisfactory repair.

Generic warnings or cautions are in their relevant description and operation procedure within section 100-00. If the generic warnings or cautions are required for a procedure, there will be a referral to the appropriate description and operation procedure.

If a warning, caution or note only applies to one step, it is placed at the beginning of the specific step.

Trustmark Authoring Standards (TAS) Removal and Installation Procedures

• NOTE: TAS style procedures can be identified by steps that have no accompanying step text and the magenta color of the electrical connectors and fasteners such as nuts, bolts, clamps or clips.

A TAS removal and installation procedure uses a sequence of color illustrations to indicate the order to be followed when removing/disassembling or installing/assembling a component.

Many of the TAS procedures will have the installation information within the removal steps. These procedures will have the following note at the beginning of the procedure:

• NOTE: Removal steps in this procedure may contain installation details.

Items such as O-ring seals, gaskets, seals, self-locking nuts and bolts are to be discarded and new components installed unless otherwise stated within the procedure. Coated nuts or bolts are to be reused, unless damaged or otherwise stated within the procedure.

Specification procedures will contain all technical data that are not part of a repair procedure.

TAS Graphics

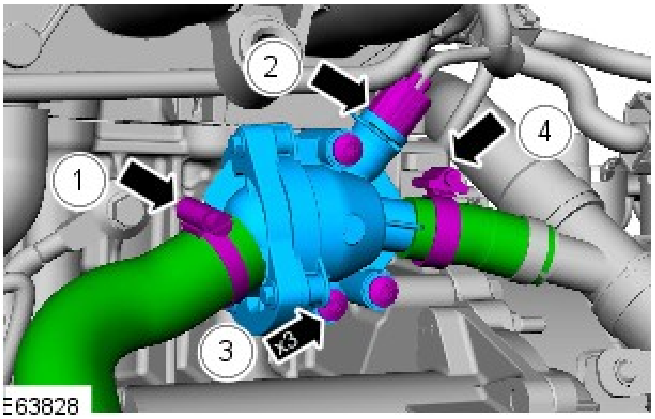
Colors used in the graphic are as follows:

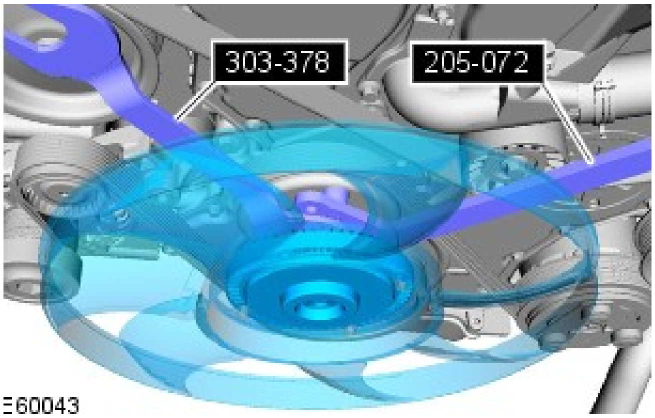
- Blue - Indicates the target item, item to be removed/installed or disassembled/assembled
- Green and Brown - Indicates a secondary item that needs to be detached, removed/installed or disassembled/assembled prior to the target item
- Magenta - Indicates electrical connectors and fasteners such as nuts, bolts, clamps or clips
- Pale Blue - is for the special tool(s) and general equipment.

There may be multiple steps assigned to one illustration.

Numbered pointers are used to indicate the number of electrical connectors and fasteners such as nuts, bolts, clamps or clips.

Items in the illustration can be transparent or use cutouts to show hidden detail(s).

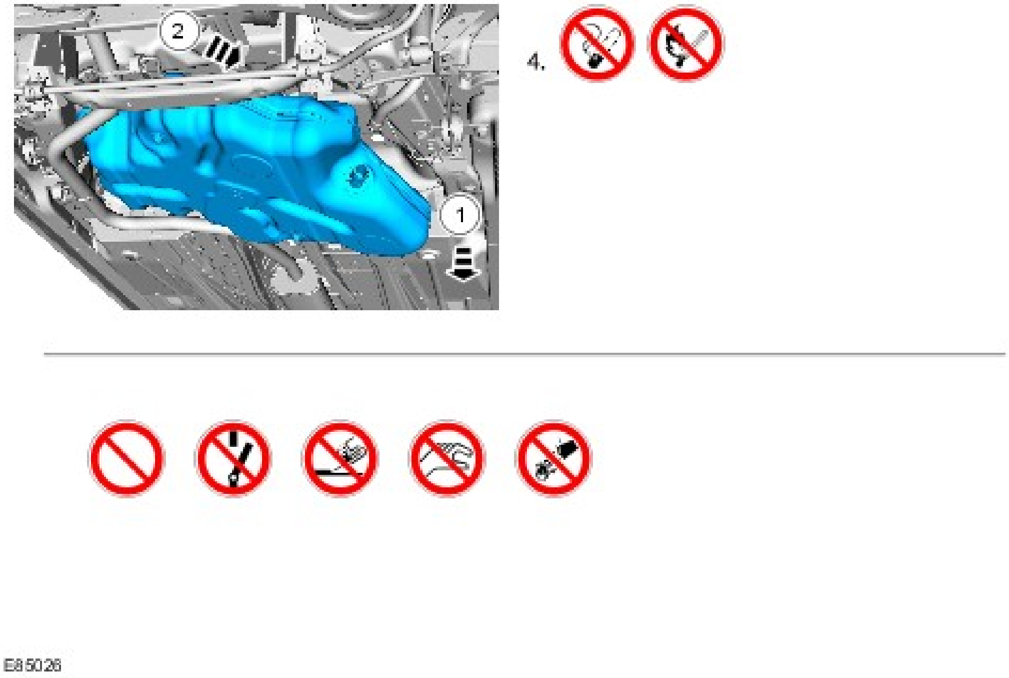




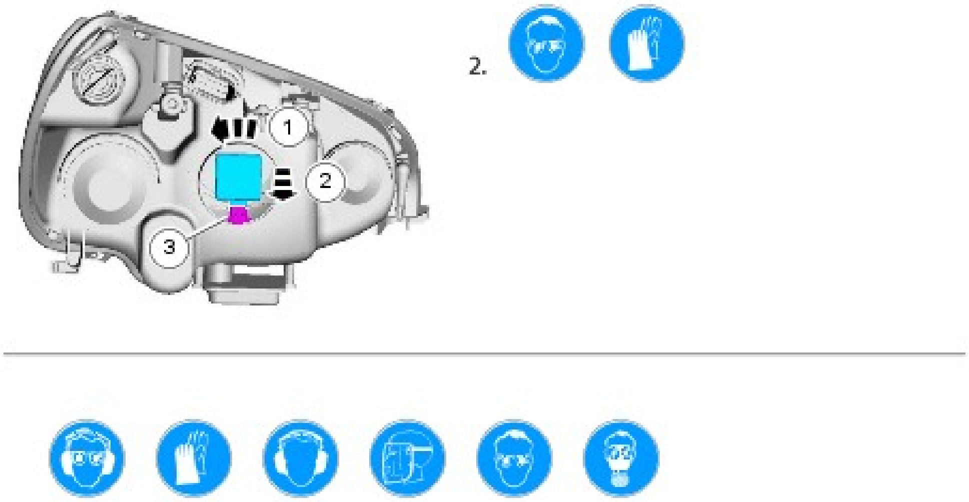
TAS Symbols

Symbols are used inside the graphics and in the text area to enhance the information display. The following paragraphs describe the various types and categories of symbols.

Prohibition symbols advise on prohibited actions to either avoid damage or health and safety related risks.

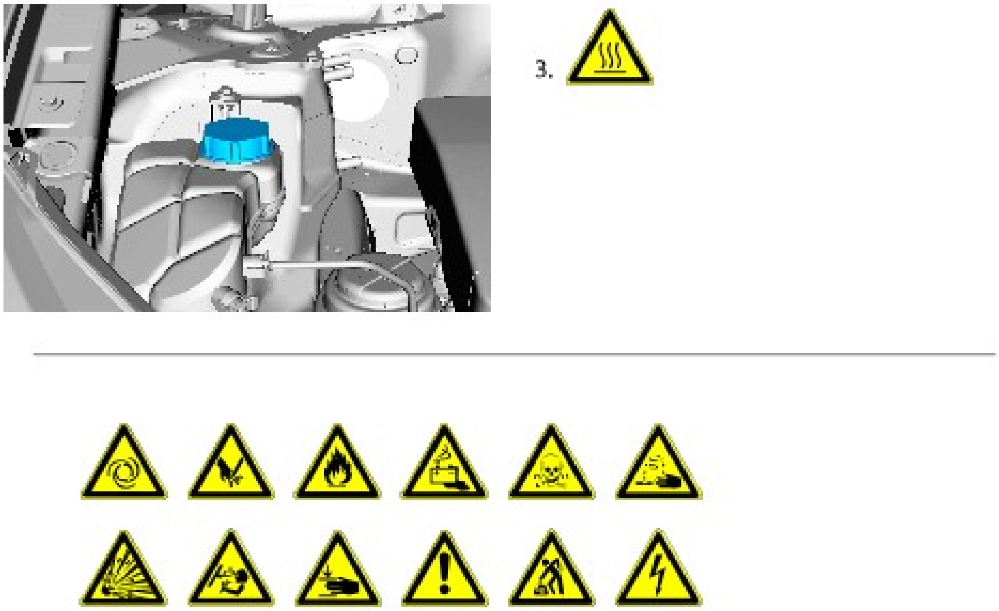


Health and Safety symbols recommend the use of particular protection equipment to avoid or at least reduce the risk or severity of possible injuries.



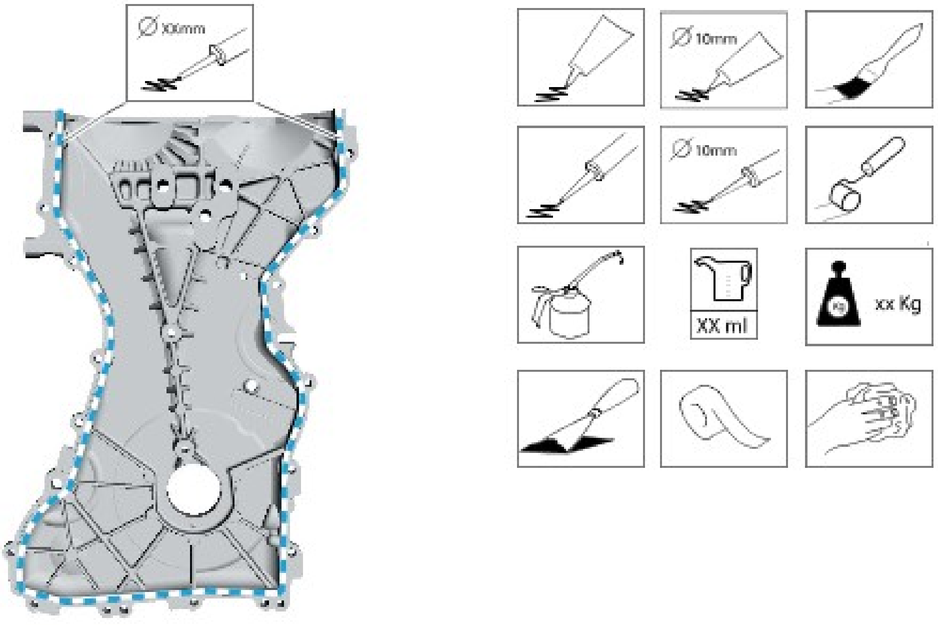
E85027

Warning symbols are used to indicate potential risks resulting from a certain component or area.



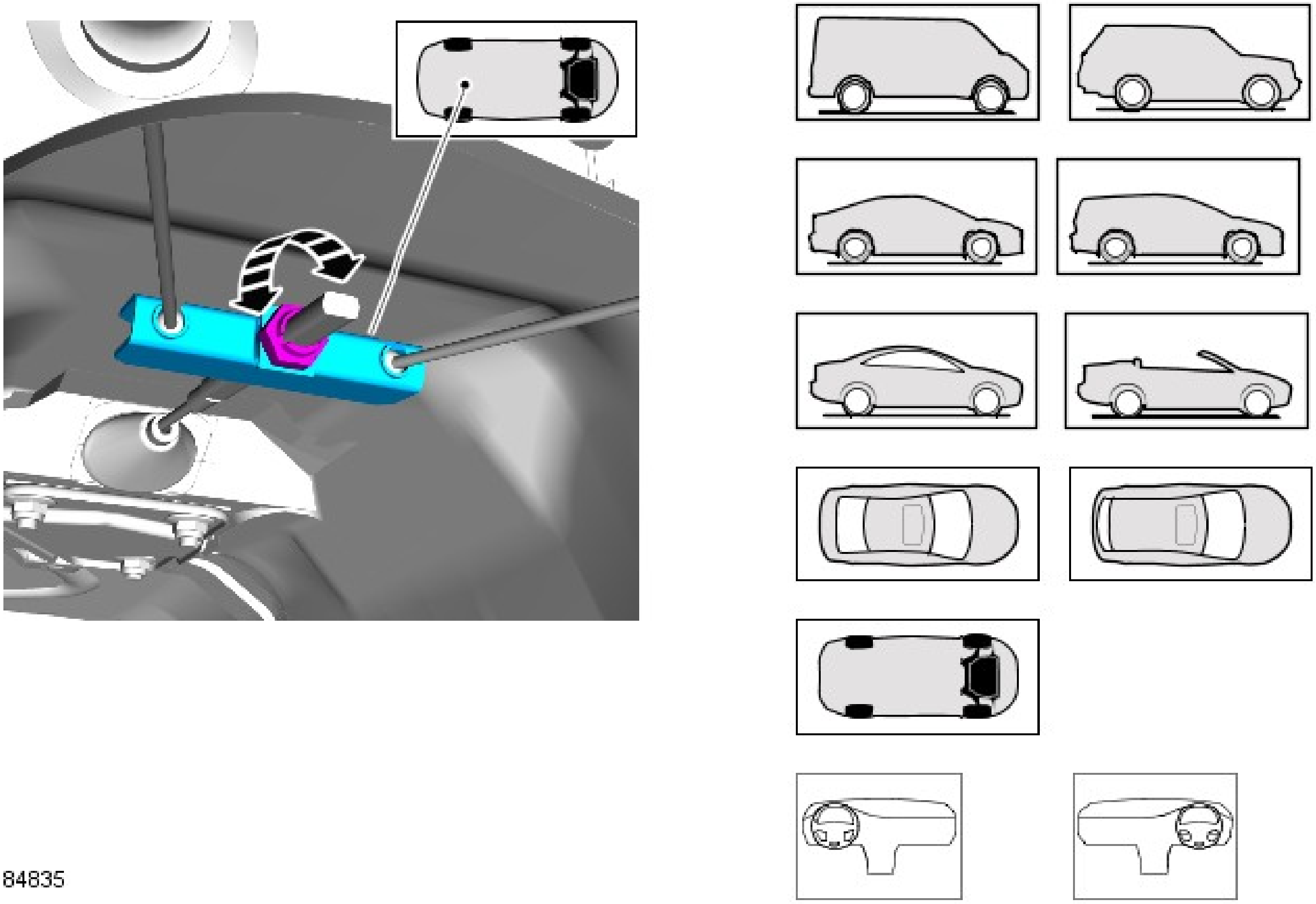
E85028

Instruction symbols are used to apply sealer, lubricant, weight, tape or cleaning detergent to a component.


Ø XXmm
Ø 10mm
Ø 10mm
XX ml
xx Kg

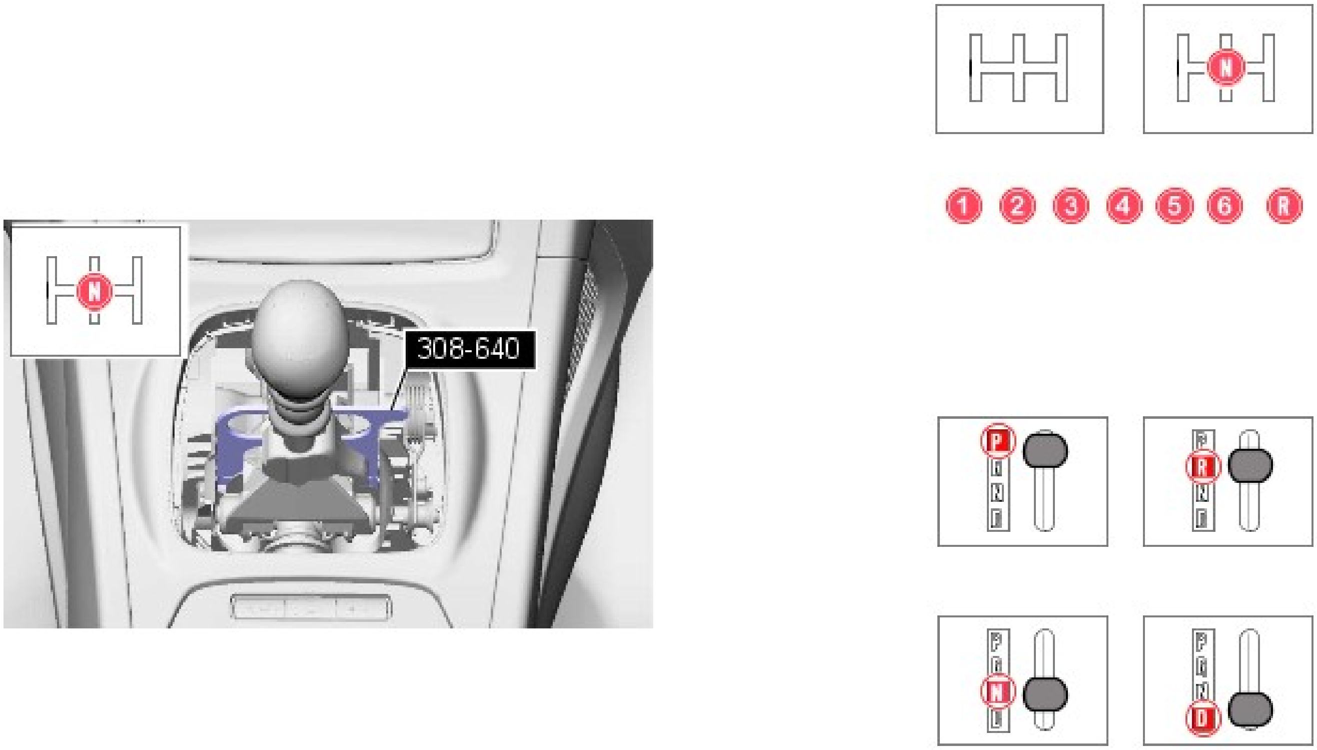
E84834

Location symbols are used to show the location of a component or system within the vehicle.



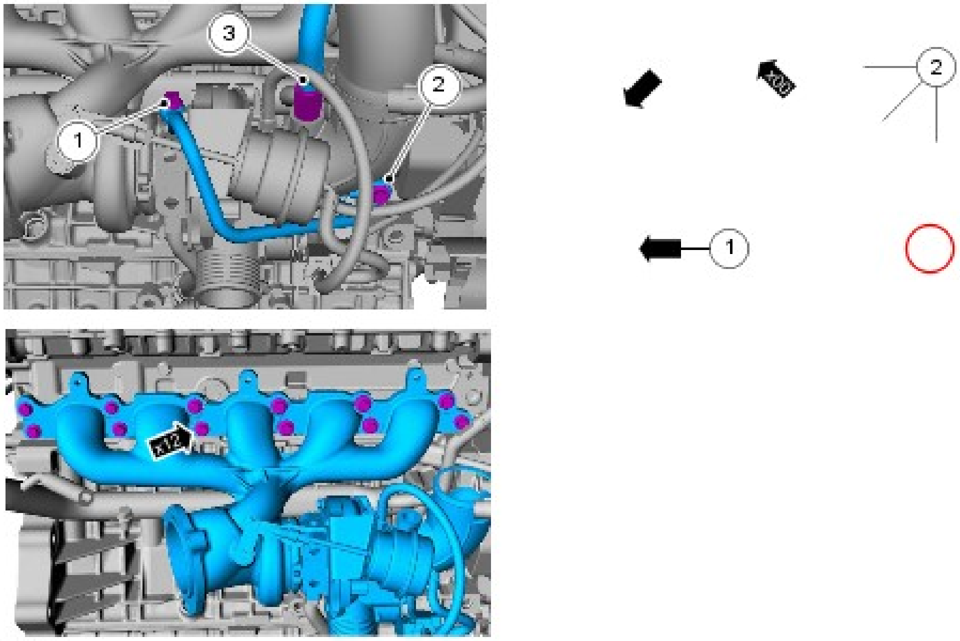
E84835

Gearshift lever or selector lever position symbols are used to show which gearshift lever or selector lever position is to be set.



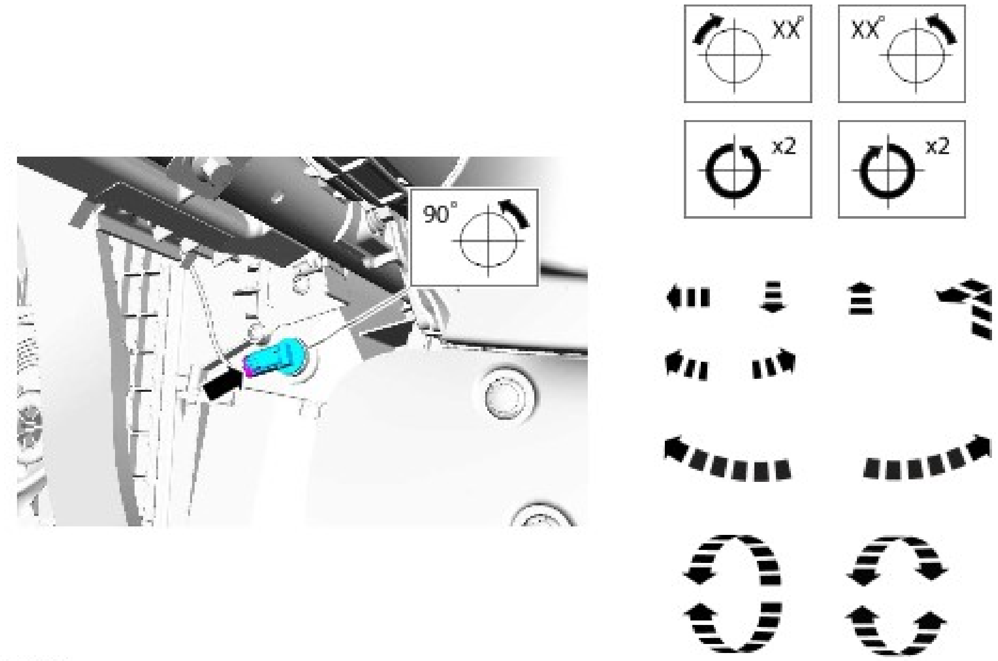
E84836

Pointer symbols are used to draw the attention to components and give special instructions such as a required sequence or number of components. The number of components is reflected by the value inside the luty arrow. A sequence number is located inside the circle. Numbers inside circles are also used to allocate special information such as tightening torques or chemicals to a particular component.



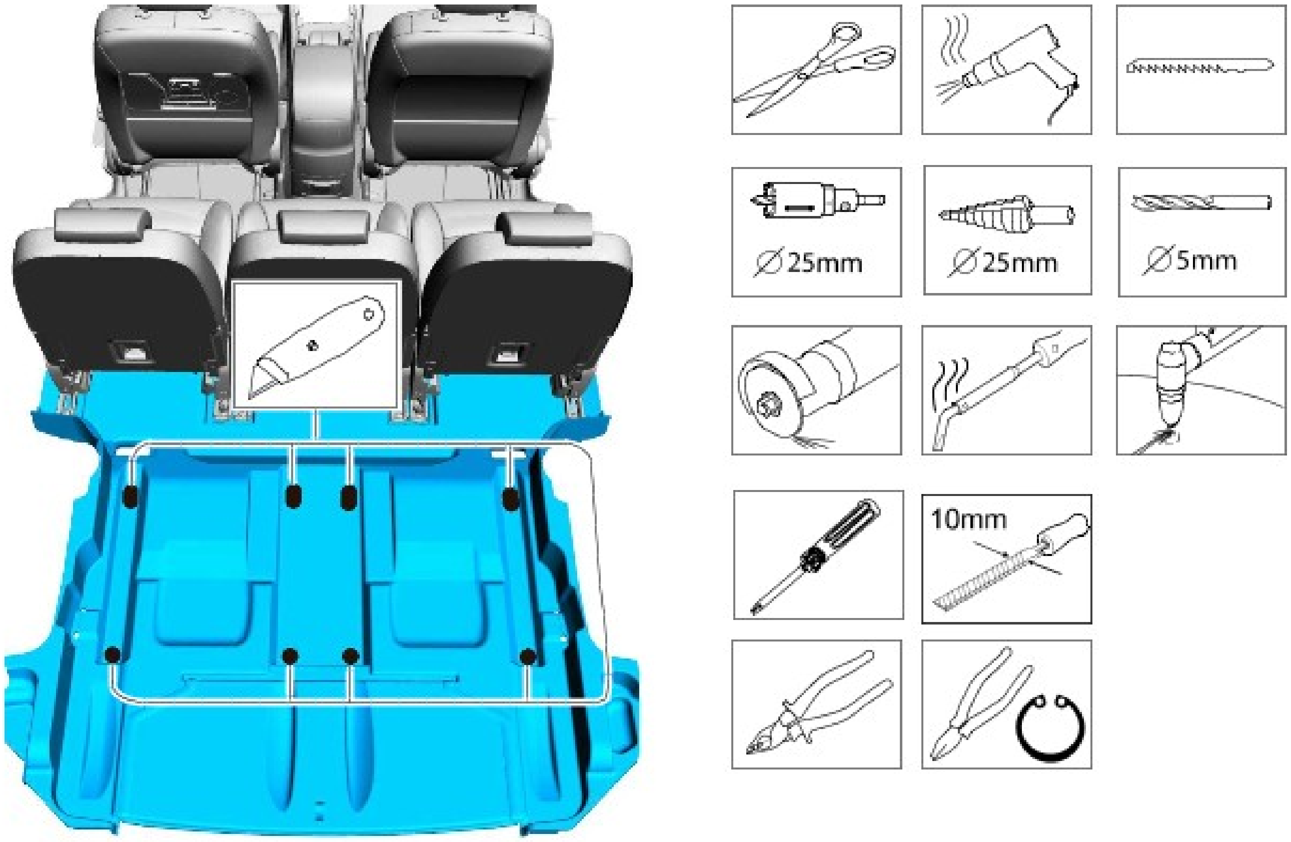
E84837

Movement arrows are used to show three dimensional or rotational movements. These movements can include specific values inside the symbol if required.


90°
XX°
XX°
x2
x2

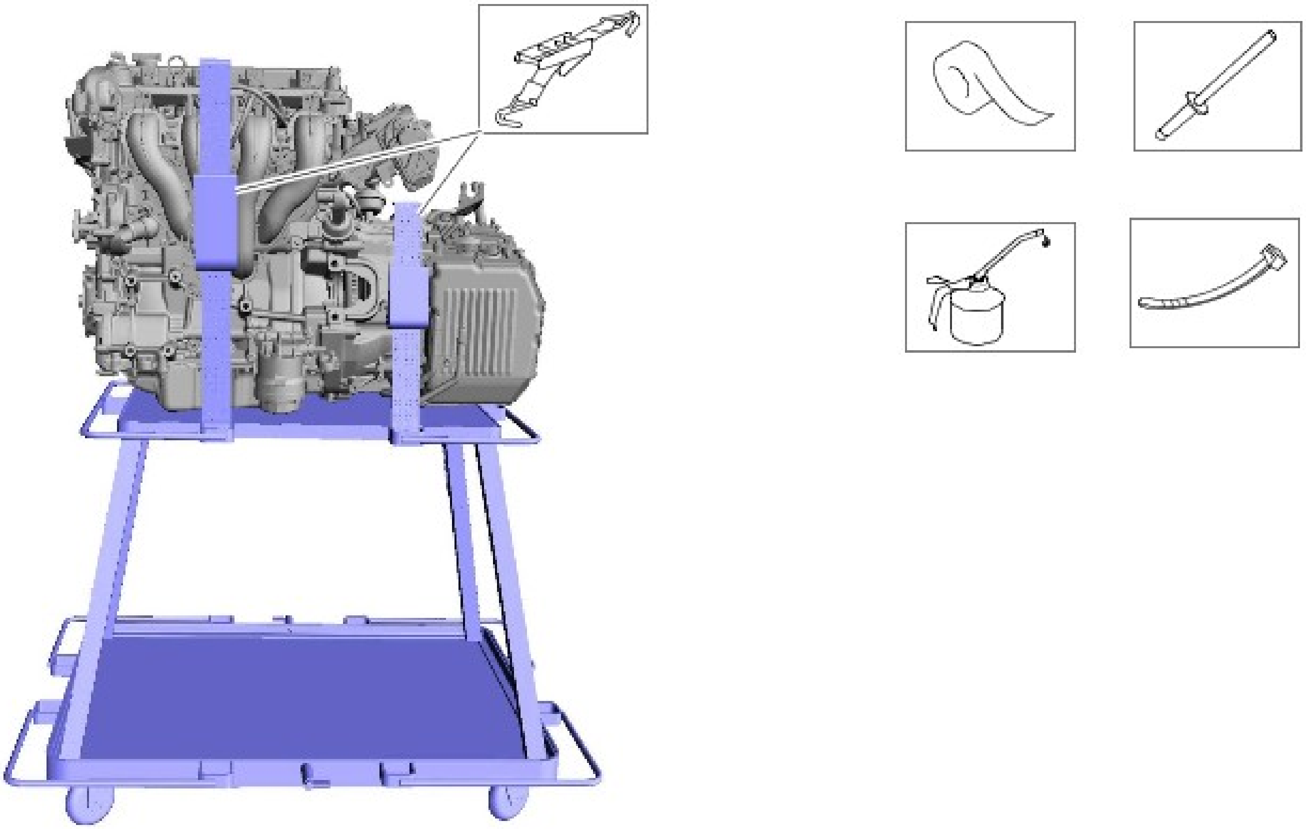
E84838

Standard tool symbols recommend the use of certain standard tools. These tools can include dimension values if required.


Ø25mm
Ø25mm
Ø5mm
10mm

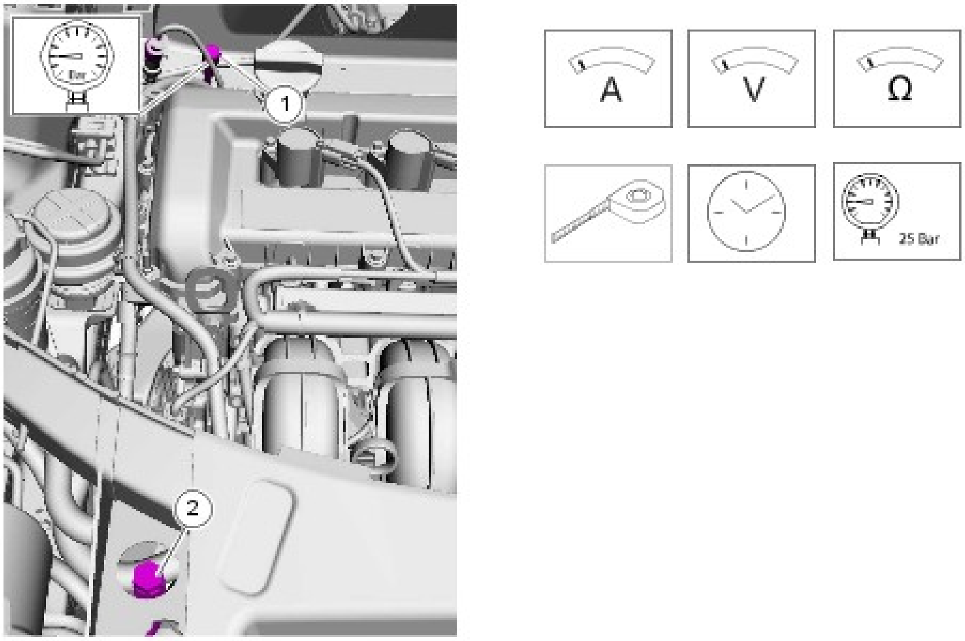
E84839

The following graphic illustrates a set of symbols that are used to provide detailed information on where to apply a material.



E84840

Measurement symbols provide detailed information on where to carry out a specific measurement. These symbols can include specific values if required.



E84841

Special Tools and Torque Figure(s)

Special tools will be shown with the tool number in the illustration. The special tool number(s), general equipment, material(s) and torque figure(s) used for the procedure step will be shown in the text column.

Published: 11-May-2011

General Information - Important Safety Instructions

Description and Operation

Safety Notice

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles, as well as the safety of the person doing the work. This manual provides general directions for accomplishing service and repair work with tested effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the person doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in the manual must first establish that neither personal safety or vehicle integrity is compromised from choices of methods, tools or parts.

General Information - How To Use This Manual

Description and Operation

Copyright Statement

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How to use This Manual

This manual covers all aspects necessary in order to service the vehicle effectively.

The manual is structured into five main sections, General Information, Chassis, Powertrain, Electrical and Body and Paint with each section dealing with a specific part of a vehicle system.

Each of the five main sections contain sub-sections dealing with items which form a part of that specific system.

Pages at the start of the manual list all sections available. Each section has a contents list detailing, where applicable, Specifications, Description and Operation, Diagnosis and Testing, General Procedures and Repair Procedures.

Where components need to be removed or disassembled in sequence, each operation in the sequence will be identified numerically and also graphically in an accompanying illustration.

- NOTE: Dimensions quoted are to design engineering specifications with service limits quoted, where applicable.

Workshop Manual Organization

The five main sections, together with the areas which they cover are given below:

- **Section 1** - General Information.
- **Section 2** - Chassis.
- **Section 3** - Powertrain.
- **Section 4** - Electrical.
- **Section 5** - Body and Paint.

Sub-section numbers appear after the initial section number, for example, **Section 412-03** covers air conditioning, which is part of the electrical section.

In the number given above, the first digit of the number **'4'** indicates the section **i.e. Electrical**.

The second and third digits **'12'** of the number indicate the vehicle system **i.e. Air Conditioning**.

The last two digits of the number **'03'** indicate the part of the system covered by the sub-section **i.e. Air Conditioning Compressor**.

Published: 11-May-2011

General Information - General Service Information

Description and Operation

Introduction

This manual has been written in a format that is designed to meet the needs of Land Rover technicians worldwide and to assist them in the efficient repair and maintenance of Land Rover vehicles.

This manual provides descriptions and methods for accomplishing adjustment, service and repair work using tested and effective procedures. Following these procedures will help ensure product reliability.

Special Tools

The Special Tool(s) Table provided at the beginning of each procedure lists the special tool(s) required to carry out repair operations within that specific procedure. Wherever possible, illustrations are provided which will assist technicians in identifying the special tool(s) required and also showing such tool(s) in use.

Special tools may be obtained from the manufacturer, SPX Tools, the addresses of their branches will be found in the Special Tools Glossary contained within this Section.

Important Safety Instructions

Appropriate service methods and correct repair procedures are essential for the safe and reliable operation of all motor vehicles as well as ensuring the personal safety of the individual carrying out the work.

This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Any person who departs from the instructions provided in this manual must first establish that they compromise neither their personal safety nor the vehicle integrity by their choice of methods, tools or parts.

Individuals who undertake their own repairs should have some skill or training and limit repairs to components which could not affect the safety of the vehicle or its passengers. Any repairs required to safety critical items such as steering, brakes, suspension or supplemental restraint system should be carried out by a Land Rover Dealer. Repairs to such items should NEVER be attempted by untrained individuals.

Warnings, Cautions and Notes which appear in this manual

As you read through this manual, you will come across Warnings, Cautions and Notes. A Warning, Caution or Note is placed at the beginning of a series of steps. If the warning, caution or note only applies to one step, it is placed at the beginning of the specific step after the step number.

Warnings, Cautions and Notes have the following meanings:

Warning: Procedures which must be followed to avoid the possibility of personal injury.

Caution: Calls attention to procedures which must be followed to avoid damage to components.

Note: Gives helpful information.

References

References to the Left Hand (LH) or Right Hand (RH) side given in this manual are made when viewing the vehicle or unit from the rear.

Fault Diagnostic Equipment

The vehicle is equipped with a number of electronic control systems to provide optimum performance of the vehicle's systems.

Diagnostic Equipment (T4) is available and must be used where specified. The use of this equipment will assist with the fault diagnostic abilities of the Dealer workshop. In particular, the equipment can be used to interrogate the electronic systems for diagnosis of faults which may become evident during the life of the vehicle.

This manual is produced as a reference source to supplement T4.

Features of the equipment include:

a. Fully upgradeable support for the technician

b. Structured diagnostics to accommodate all skill levels

c. Direct print-out of screen information and test results

Testing the vehicle

Operations covered in this manual do not include reference to testing the vehicle after repair. It is essential that work is inspected and tested after completion and if necessary, a road test of the vehicle is carried out, particularly where safety related items are concerned.

Repairs and Replacement Parts

Land Rover parts are manufactured to the same exacting standards as the original factory fitted components. For this reason, it is essential that only genuine Land Rover parts are used during maintenance or repair.

Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories.

Safety features and corrosion prevention treatments embodied in the vehicle may be impaired if other than Land Rover recommended parts are fitted. In certain territories, legislation prohibits the fitting of parts not to manufacturer's specification. Torque wrench setting figures, where given, must be adhered to and locking devices, where specified must be used. If the efficiency of a locking device is impaired during removal it must be replaced.

Owners purchasing accessories whilst travelling abroad must ensure that the accessory and its fitted location on the vehicle conform to legal requirements.

The terms of the vehicle warranty may be invalidated by the fitting of parts other than those recommended by Land Rover.

- NOTE: The fitting of non-approved Land Rover parts and accessories or the carrying out of non-approved alterations or conversions may be dangerous. Any of the foregoing could affect the safety of the vehicle and occupants; also, the terms and conditions of the vehicle warranty may also be invalidated .

All Land Rover recommended parts have the full backing of the vehicle warranty.

Land Rover Dealers are obliged to supply only Land Rover recommended parts.

Specifications

Land Rover are constantly seeking to improve the specification, design and production of their vehicles and alterations take place accordingly. Whilst every effort is made to ensure the accuracy of this Manual, it should not be regarded as an infallible guide to current specifications of any particular vehicle.

This Manual does not constitute an offer for sale of any particular vehicle. Land Rover dealers are not agents of Land Rover and have no authority to bind the manufacturer by any expressed or implied undertaking or representation.

Published: 11-May-2011

General Information - Standard Workshop Practices

Description and Operation

Vehicle in Workshop

When working on a vehicle in the workshop always make sure that:

- Where practicable, the parking brake is applied and the wheels are securely chocked to prevent the vehicle moving forwards or backwards.
- Whenever possible, the ignition key is removed before any work is carried out on the vehicle.
- If the engine is to be run, there is adequate ventilation, or an extraction hose is used to remove exhaust fumes.
- There is adequate room to raise the vehicle and remove the wheels, if necessary.
- Fender covers are always installed if any work is to be carried out in the engine compartment.
- Where practicable, the battery is disconnected if working on the engine, underneath the vehicle, or if the vehicle is raised.

• CAUTIONS:

⚠ Prior to disconnecting the battery, refer to the Electrical Section of this manual - Battery disconnection/connection.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

⚠ When electric arc welding on a vehicle, always disconnect the generator wiring to prevent the possibility of a surge of current causing damage to the internal components of the generator.

- If using welding equipment on the vehicle, a suitable fire extinguisher is readily available.

Towing the Vehicle

⚠WARNING: When towing is necessary, reference must be made to the Jacking, Lifting and Towing Section of this Manual.

When the vehicle is being towed the ignition switch must be in position II (steering lock released and warning lights illuminated). Only then will the steering, turn signal lamps, horn and stop lamps be operational. Failure to follow these instructions may result in personal injury. It must be noted that with the engine not running, the power steering and brake booster will be inoperative therefore, greater effort will be needed to steer the vehicle and apply the brakes.

Battery - General

• CAUTIONS:

⚠ Prior to carrying out any procedures which involve disconnecting/ or connecting the battery, refer to the Electrical Section of this manual - Battery disconnection/connection.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

⚠ A discharged battery condition may have been caused by an electrical short circuit. If this condition exists there will be an apparently live circuit on the vehicle even when all normal circuits are switched off. This can cause arcing when the jumper cables are connected.

⚠ While it is not recommended that the vehicle is jump started, it is recognized that this may occasionally be the only practical way to mobilize a vehicle. Prior to attempting a jump start, refence must be made to the Electrical Section of this manual - Jump Starting.

Following jump starting of a disabled vehicle, the discharged battery must be checked for serviceability and recharged off the vehicle as soon as possible to avoid permanent damage.

Do not rely on the generator to restore a discharged battery. For a generator to recharge a battery, it would take in excess of eight hours continuous driving with no additional loads placed on the battery.

- Always make sure that the jumper cables are adequate for the task.
- Always make sure that the slave battery is of the same voltage as the vehicle battery. The batteries must be connected in parallel.

- Always make sure that switchable electric circuits are switched off before connecting jumper cables. This reduces the risk of arcing occurring when the final connection is made.

General Installation Instructions

Component removal

Whenever possible, clean components and the surrounding area before removal.

- Blank off openings exposed by component removal.
- Following disconnection, seal fuel, oil or hydraulic lines immediately using suitable blanking plugs or caps.
- Seal open ends of exposed oilways using suitable tapered hardwood plugs or conspicuous plastic plugs.
- Immediately a component is removed, place it in a suitable container; use a separate container for each component and its associated parts.
- Clean bench and provide marking materials, labels and containers before disassembling components.

Disassembling

Observe scrupulous cleanliness when disassembling components, particularly when brake, fuel, air suspension or hydraulic system parts are disassembled. A particle of dirt or cloth fragment could cause a serious malfunction if trapped in these systems.

- Blow out all tapped holes, crevices, oilways and fluid passages with dry, compressed air.

⚠ WARNING: Suitable eye protection must be worn.

- Use suitable marker ink to identify mating parts, do not use a scriber or centre punch as they could initiate cracks or distortion.
- Wire or tape mating parts together where necessary to prevent accidental interchange.
- Suitably identify parts which are to be renewed and to those parts requiring further inspection. Keep these parts separate.
- To make sure that the correct replacement part has been obtained, do not discard a part due for renewal until after comparing it with the new part.

Cleaning components

Always use cleaning agents which are suitable for the work being undertaken and the components being cleaned. NEVER use gasoline (petrol) as a cleaning agent (degreaser). Always make sure that the component being cleaned is compatible with the cleaning agent.

Always follow the manufacturer's instructions regarding the use of cleaning agents and make sure that the environment in which the work is being undertaken is suitable. See Health and Safety Precautions for further information regarding cleaning.

General inspection of components

All components should be inspected for wear or damage before reassembling.

- Always make sure that component to be inspected is clean and free from oil or grease.
- When a component is to be checked dimensionally against design specified values, use the appropriate measuring equipment i.e. micrometers, verniers, surface plates, dial test indicators (DTI).
- Always make sure that all measuring equipment is correctly calibrated before use.
- Reject a component which is not within specified values/limits or if it appears to be damaged.
- A component may be reinstalled if dimensions obtained during checking are at the maximum tolerance limit and it is in an undamaged condition.
- Bearing journal clearances should be checked where necessary using Plastigage.
- Gaskets, seals and O-ring seals are to be re-used unless damaged.

Joints and Joint Faces

All gaskets should be installed dry unless stated otherwise. Always apply the specified lubricant to O-rings and install O-rings using the fingers only.

Use gasket removal spray and/or plastic scrapers to remove traces of old gasket.

⚠ CAUTION: DO NOT use metal scrapers or emery cloth as these may damage the sealing surfaces.

Many joints use sealants instead of gaskets as the sealing medium. Where this is the case, the sealant together with its part number will be found listed in the relevant repair operation and also in the sealants table.

⚠CAUTION: Always remove all traces of the old sealant prior to reassembly. Use plastic scrapers, specified solvents where available or dry, lint free cloth. DO NOT use metal scrapers or emery cloth as these may damage the sealing surfaces. Make sure that sealing surfaces are free from oil or grease as sealants will not adhere properly to contaminated surfaces.

Do not allow sealant to enter tapped holes or oilways.

Locking Devices

Always replace locking devices with one of the same design and of the correct size.

Tab washers

Always release locking tabs before loosening fixings, do not reuse tab washers.

Locknuts

Always use a backing spanner when loosening and tightening locknuts, brake and fuel pipe unions.

Roll pins

Always install new roll pins of the correct size.

Circlips

Always install new circlips ensuring that they are of the correct size for the groove.

Woodruff keys

Woodruff keys may be reused provided there is no indication of wear or distortion.

Remove any burrs from edges of keyways using a fine file.

Split pins

Never attempt to straighten and reuse a split pin, always make sure that replacement pins are of the correct size for the hole in which they are to be installed.

Screw Threads

- Damaged nuts, bolts and screws must always be discarded. Attempting to recut or repair damaged threads with a tap or die impairs the strength and fit of the threads and is not recommended.

• NOTE: During certain repair operations, it may be necessary to remove traces of thread locking agents using a tap. Where this is necessary, the instruction to do so will appear in the relevant operation and it is essential that a tap of the correct size and thread is used.

- Some bolts are coated with a thread locking agent and unless stated otherwise, they must not be reused. New bolts having the same part number as the original must always be installed. When nuts or bolts are to be discarded, the repair operation and relevant torque chart will include an instruction to that effect. Do not use proprietary thread locking agents as they may not meet the specification required. See also Encapsulated ('Patched') Bolts and Screws.
- Always make sure that replacement nuts and bolts are at least equal in strength to those that they are replacing. Castellated nuts must not be loosened to accept a split pin except in recommended cases when this forms part of an adjustment.
- Do not allow oil or grease to enter blind holes, the hydraulic action resulting from tightening the bolt or stud can split the housing and also give a false torque reading.
- Always tighten a nut, bolt or screw to the specified torque figure, damaged or corroded threads can give a false torque reading.
- Nut and bolt loosening and tightening sequences, where given, must ALWAYS be followed. Distortion of components or faulty sealing of joints will result if the sequences are not followed. Where an instruction is given to tighten in stages, these stages must be adhered to; do not attempt to combine stages particularly where certain stages involve tightening by degrees.
- To check or re-tighten a fixing to a specified torque, first loosen a quarter of a turn, then retighten to the specified torque figure.
- Unless instructed otherwise, do not lubricate bolt or nut threads prior to installing.

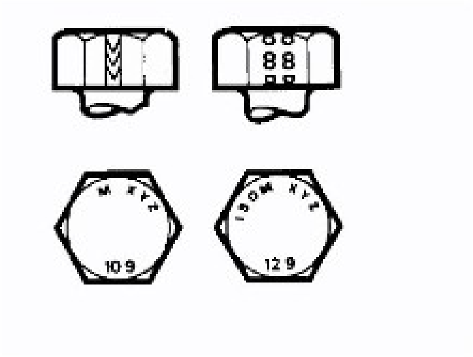
Where it is stated that bolts and screws may be reused, the following procedures must be carried out:

- Check that threads are undamaged.
- Remove all traces of locking agent from the threads.

CAUTION: DO NOT use a wire brush; take care that threads are not damaged.

- Make sure that threads are clean and free from oil or grease.
- Apply the specified locking agent to the bolt threads.

Bolt and Nut Identification

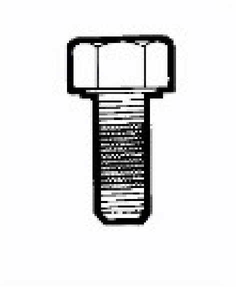


E48627

An ISO metric bolt or screw made of steel and larger than 6 mm in diameter can be identified by either of the symbols ISO M or M embossed or indented on top of the bolt head.

In addition to marks identifying the manufacturer, the top of the bolt head is also marked with symbols indicating the strength grade e.g. 8.8, 10.9, 12.9, 14.9. Alternatively, some bolts and screws have the M and strength grade symbol stamped on the flats of the hexagon.

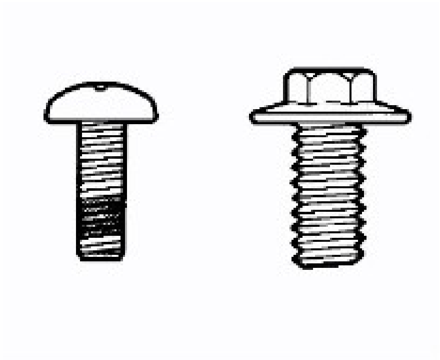
Encapsulated ('Patched') bolts and screws



E48628

Encapsulated ('patched') bolts and screws have a thread locking agent applied to the threads during manufacture. Most thread locking agents are colored, the band of color extending for 360 degrees around the thread. Some locking agents however, are neutral in color and may not be so easily identified apart from a slightly darker area of thread where the locking agent has been applied. The locking agent is released and activated by the tightening process and is then chemically cured to provide the locking action.

Self-locking bolts and screws



E48629

Unless stated in a specific repair procedure, self-locking bolts and screws i.e. nylon patched or trilobular thread can be reused provided that resistance is felt when the locking portion enters the female thread.

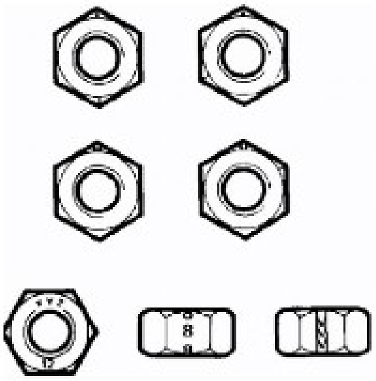
Nylon patched bolts and screws have a locking agent either applied to, or inserted in the threaded portion. They are identified by the presence of a colored section of thread extending approximately 180 degrees around the thread or by a colored plug inserted into the bolt.

Trilobular bolts have a special thread form which creates a slight interference with the thread of the hole or nut into which it is screwed.

CAUTION: Do Not reuse self-locking fasteners in critical locations e.g. drive plates/flywheel or engine bearings. Do not install non self-locking fasteners where a self-locking fastener is specified.

Trilobular bolts should not be used as a substitute for patched bolts.

Nut identification



E48630

A nut with an ISO metric thread is marked on one face or one of the hexagonal flats with the strength grade symbol 8, 12, 14. Some nuts with the strength grade 4, 5 or 6 are also marked and some have the metric symbol M on the hexagonal flat opposite the strength grade marking.

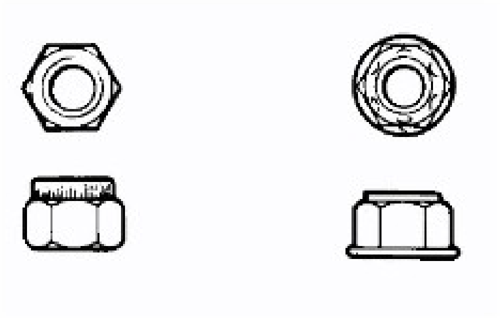
A clock face system is sometimes used as an alternative method of indicating the strength grade. The external chamfers or a face of the nut is marked in a position relative to the appropriate hour mark on a clock face to indicate the strength grade.

A dot is used to locate the 12 o'clock position and a dash to indicate the strength grade. If the grade is above 12, two dots identify the 12 o'clock position.

When tightening a slotted or castellated nut, never loosen it to insert a split pin except where specified as part of an adjustment procedure. If difficulty is experienced in correctly positioning the slot, alternative washers or nuts should be selected.

Where a nut is tightened to adjust or maintain bearing pre-load, the tightening procedure must be adhered to.

Self-locking nuts



E48631

Unless stated otherwise, self-locking nuts once removed must be discarded and new nuts of the same type and strength grade installed.

Air Suspension

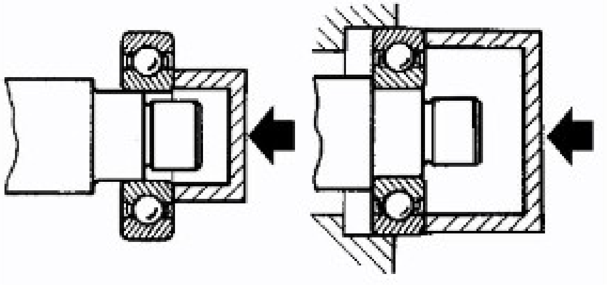
Always make sure that suitable eye protection is worn when working on the air suspension system.

Ball and Roller Bearings

When removing and installing bearings, make sure that the following practices are observed to make sure component serviceability:

⚠CAUTION: Service tools have been developed for removing the majority of bearings; these must always be used where specified.

- Remove all traces from bearing under inspection by cleaning with a suitable degreasant; maintain absolute cleanliness throughout operations.
- Conduct a visual inspection for markings on rolling elements, raceways, outer surfaces of outer or inner surfaces of inner rings. Reject any bearings found to be marked since marking in these areas indicates onset of wear.
- Hold inner race of bearing between finger and thumb of one hand and rotate outer race to check that it revolves absolutely smoothly. Repeat holding outer race and rotating inner race. DO NOT spin the bearing.
- Rotate outer ring gently using a reciprocating movement whilst holding inner ring; feel for any check or obstruction to rotation. Reject bearing if movement is not absolutely smooth.
- Check bearing for blueing or signs of overheating.
- Lubricate bearing with the specified lubricant.
- Inspect bearing surface of shaft and bearing housing for discoloration or other markings which indicate overheating of bearing or movement between bearing and seating.
- Before installing bearing, make sure that shaft and bearing housing are clean and free from burrs.
- If one bearing of a pair shows signs of wear, overheating etc., it is advisable to replace bearings as a pair unless it is suspected that one bearing may have been faulty when installed, was installed incorrectly or the fault arose due to oil seal failure.
- Never reinstall a bearing unless it is in a fully serviceable condition.



E48560

- When installing a bearing to a shaft, only apply force to the inner ring of the bearing. When installing a bearing into a housing, only apply force to the outer ring of the bearing.

⚠CAUTION: Service tools have been developed for installing the majority of bearings; these must always be used where specified.

- In the case of grease lubricated bearings, fill the space between the bearing and outer seal with the recommended grade of grease before installing the seal.

⚠CAUTION: When a waxed oil seal (installed dry) type of oil seal is to be installed, take great care that grease does not contaminate the running surface of the seal.

- Always make suitable reference marks between the components of separable bearings e.g. taper roller bearings when disassembling to make sure correct location of components when assembling. Never install new rollers in an outer ring, always install a new bearing assembly.

Brake Pads and Linings

Always install the correct grade and specification of brake pads and linings. When replacing these items, always replace as complete axle sets.

Brake Hydraulics

Always observe the following recommendations when working on the braking system:

⚠WARNING: Do not intermix brake fluid of different specifications.

- Always use two spanners when loosening or tightening brake pipes or hose connections.
- Make sure that hoses run in a natural curve and are not kinked or twisted.
- Install brake pipes and hoses securely in their retaining clips and make sure that they cannot contact a potential chafing point.
- Containers used for brake fluid must be kept absolutely clean.
- Do not store brake fluid in unsealed containers, the fluid will absorb water which will lower the boiling point of the fluid.
- Do not allow brake fluid to be contaminated with other fluids such as mineral oil and do not put brake fluid in a container which has previously been used for storing other fluids.
- Do not reuse brake fluid which has been bled from the system.
- Always use brake fluid or a suitable brake cleaning fluid to clean hydraulic components.
- Unless stated otherwise, use only clean brake fluid to lubricate hydraulic seals and components.
- Always install blanking plugs to hoses, pipes or components immediately after disconnection.
- Check thread compatibility of original equipment with replacement components.
- Observe absolute cleanliness when working with hydraulic components.

Pipes and Hoses

When removing or installing flexible hydraulic pipes and hoses, make sure that the following procedures are observed to make sure component serviceability:

- Prior to removal, clean area around hose or pipe end which is to be disconnected.
- Obtain appropriate blanking plugs or caps before disconnecting hose or pipe end fittings in order that connections can be plugged immediately following disconnection.
- Always install blanking plugs or caps to pipes and unions immediately following disconnection.
- Clean hose or pipe and blow through with an air line.

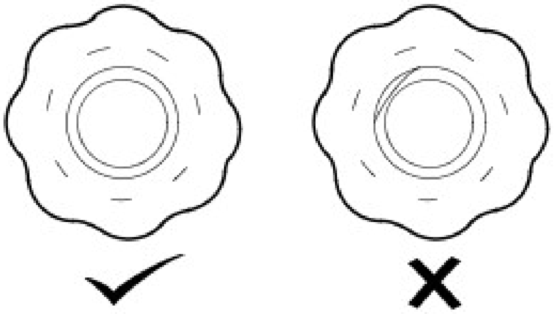
⚠WARNING: Suitable eye protection must be worn.

- Check hoses externally for cracks, separation of plies, security of end fittings and external damage; replace faulty hoses.
- Check pipes for signs of corrosion and chafing, replace as necessary.

⚠CAUTION: If pipes are found to be chafed, rectify clips, mounting points etc., to prevent further problems in service.

- When installing hoses, make sure that no unnecesary bends are introduced and that hoses are not kinked, twisted or positioned close to potential chafing points.
- When installing pipes, make sure that pipes are positioned and clipped clear of potential chafing points.
- Always replace sealing washers installed to banjo bolts, sealing plugs etc.
- Always use a backing spanner when tightening unions and do not overtighten union nuts or banjo bolts.
- After any work on hydraulic systems, always check for fluid leaks whilst a second operator applies working pressure to the brake pedal or operates the system that has been worked on.

Fuel system hoses

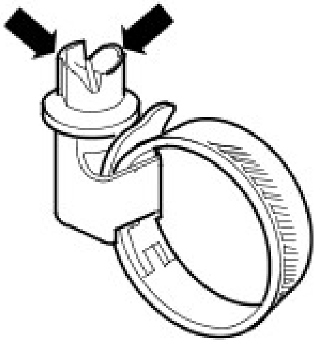


E48632

All fuel hoses are made up of two laminations, an armored rubber outer sleeve and an inner viton core. Whenever a hose is removed, make sure that the inner bore is inspected to check that the viton lining has not become separated from the outer sleeve.

WARNING: Never attempt to repair fuel foses or rectify leaking 'quick-fit' connectors the fuel hose and connectors must be replaced as an assembly.

Fuel system hose clips



E48636

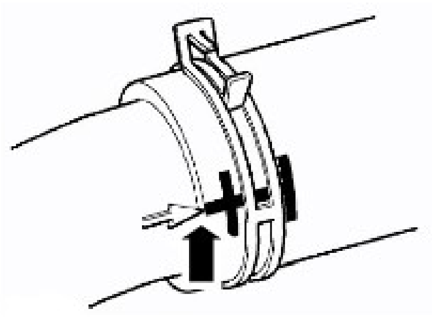
Certain fuel system hose clips are of the 'break-off head' type where a slot in the screw head shears off when the clip is tightened to a specific torque. These clips may be removed using a screwdriver and must be replaced with new clips on reassembly. Clips must be tightened until the portion of the slot shears off. Do not attempt to tighten clips by any other method, do not install any other type of clip.

Cooling system hoses

CAUTION: The following precautions must be observed to make sure that the integrity of the cooling system hoses and their connection to the system is maintained.

Hose orientation and connection

Correct orientation of cooling system hoses is important to make sure that hoses do not become fatigued or damaged through contact with adjacent components.



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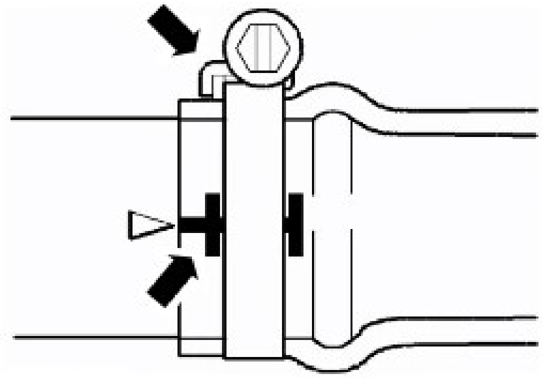
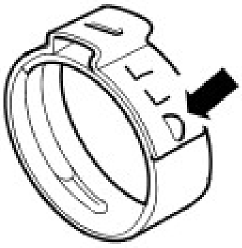
Where orientation marks are provided on the hose and corresponding component, the marks must be aligned when the hose is installed. Hoses must be installed fully on to their connection points, usually a moulded form on a pipe provides a positive indicator.

Hose clips



E48634

Markings are usually provided on the hose to indicate the correct clip position. If no markings are provided, position the clip directly behind the retaining lip at the end of the stub pipe. Worm drive clips should be orientated with the crimped side of the drive housing facing towards the end of the hose or the hose may become pinched between the clip and the stub pipe retaining lip. Unless otherwise stated, worm drive clips should be tightened to 3 Nm (2 lbf.ft). Make sure that hose clips do not foul adjacent components.



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Oetiker clips may be removed by bending the tag (arrowed) and releasing the free end of the clip. Clips must not be reused. When installing new clips, make sure clip is positioned on hose before tightening and make sure that when clip is tightened, the tag is located in the longitudinal slot in the free end of the clip (arrowed in illustration).

Heat protection

Always make sure that heatshields and protective sheathing are in good condition; replace if damage is evident. Particular care must be taken when routing hoses close to hot engine components such as the exhaust manifolds and exhaust gas recirculation (EGR) pipes. Hoses will relax and deflect slightly when hot, make sure this movement is taken into account when routing and securing hoses.

Electrical Precautions

General

The following guidelines are intended to make sure the safety of the operator whilst preventing damage to the electrical and electronic components of this vehicle.

Equipment

Prior to commencing any test procedure on the vehicle, make sure that the relevant test equipment is working correctly and that any harness or connectors are in good condition. It is particularly important to check the condition of all plugs and leads of mains operated equipment.

Polarity

Never reverse connect the vehicle battery and always make sure the correct polarity when connecting test equipment.

High voltage circuits

Whenever disconnecting live ht circuits, always use insulated pliers and never allow the open end of the ht lead to contact other components, particularly ECU's.

Vehicles installed with Bi-Xenon headlamp bulbs

WARNING: The following precautions must be observed as failure to comply may result in exposure to ultra-violet rays, severe electric shock, burns or risk of an explosion.

- Safety goggles and gloves must be worn.
- Make sure that headlamps are switched off before removing bulbs.
- Do not touch the glass portion of the bulb.
- On no account should headlamps be switched on with the bulb removed from the headlamp.
- Bulb testing may only be carried out with the bulb installed in the headlamp.
- Bulbs must be disposed of in accordance with the local authority bye-laws.

Connectors and harnesses

The engine compartment of a vehicle is a particularly hostile environment for electrical components and connectors. Always observe the following:

- Make sure electrically related items are dry and oil free before disconnecting/connecting test equipment.
- Make sure that disconnected multiplugs and sensors are protected from any possible oil, coolant or other liquid contamination. Any such contamination could impair performance or lead to component failure.
- Never force connectors apart or pull on the wiring harness.
- Always make sure locking tabs are disengaged before disconnecting multiplugs etc. and make sure that correct orientation is achieved before connection.
- Make sure that any protection covers, insulation etc. are replaced if disturbed.

Having confirmed that a component is faulty, carry out the following:

- Switch off the ignition and disconnect the battery.
- Remove the component and support the disconnected harness.
- When replacing electrical components, keep oily hands away from electrical connections and make sure that locking tabs on connectors are fully engaged.

Battery Disconnection/Connection

Always refer to the Electrical Section of this manual - Battery Connection/Disconnection prior to attempting to connect or disconnect the battery.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Fuel Handling Precautions

The following information lists basic precautions which must be observed if fuel is to be handled safely. It also outlines other areas of risk which must not be ignored. As this information is issued for basic guidance only, consult your local Fire Department where any doubt as to personal and environmental safety exists - See also Health and Safety Precautions.

General precautions

Always have the correct type of fire extinguisher containing Foam, CO2, Gas or powder accessible when handling or draining fuel or dismantling fuel systems. Fire extinguishers must also be located in areas where fuel is stored.

Make sure that suitable warning signs are exhibited.

Keep all sources of ignition well away from areas where fuel is being handled.

Make sure that any leadlamps are flameproof and kept clear of spillage.

- WARNINGS:

⚠ Do not disassemble or reassemble fuel system components whilst vehicle is over a pit.

⚠ No one should be permitted to repair components associated with fuel without first having specialist training.

Always disconnect the vehicle battery before carrying out disassembly, reassembly or draining work on a fuel system.

Fuel tank and system draining

Draining must be carried out in accordance with the procedures given in the relevant Fuel System section of this manual.

- WARNINGS:

⚠ Never drain fuel or work on a fuel system while the vehicle is over a pit. Extraction or draining of fuel must be carried out in a well ventilated area.

⚠ Always attach fuel vapor warning labels to fuel tanks immediately after draining.

⚠ Containers used for storing fuel must be clearly marked with the contents and placed in a safe storage area which meets the requirements of the local authority.

⚠CAUTION: Some fuel lines are now installed with 'quick release' connectors. If a connector is damaged, no attempt must be made to repair the connector, a new fuel line and connector(s) assembly must be installed.

Always release pipe clips fully before attempting to disconnect fuel pipes.

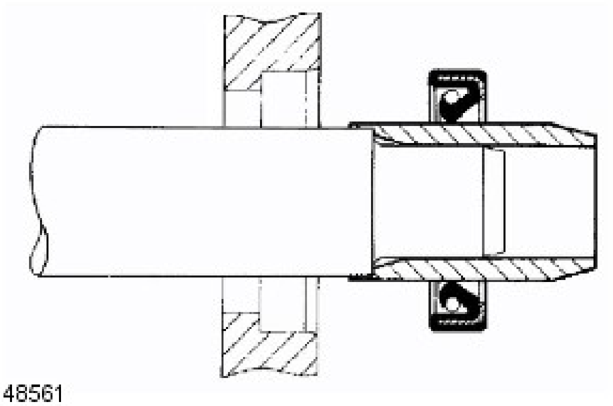
Fuel tank repairs

⚠CAUTION: No attempt should be made to repair a plastic fuel tank. If the structure of the tank is damaged, a new tank must be installed.

Oil seals

Never use a seal which has been improperly stored or handled.

- Take great care when removing old seals that the sealing surfaces and seal housing are not damaged.
- Carefully examine seal before installing to make sure that it is clean and undamaged.
- Make sure that the surface on which the seal is to run and also the seal housing is clean and free from burrs or scratches. Renew the component if the sealing surface cannot be restored.
- Special tools and protection sleeves are provided for installing the majority of seals and must be used when specified.
- Many seals are now coated with a protective wax and DO NOT need to be lubricated prior to installing. Always check the relevant repair procedure which will state if a seal must be installed dry. Never touch these seals with oily hands as the oil will contaminate the protective coating and affect the sealing properties of the seal; also, make sure that installing tools and protection sleeves are free from oil and grease. Seals which must be lubricated prior to installing should have the recommended lubricant applied to the areas specified in the repair procedure.
- Make sure that a seal is installed the correct way round. For example, the lip of the seal must face towards the lubricant which it is sealing.
- When installing an oil seal, make sure that it is positioned square to shaft and housing. Where the seal is to be installed to a housing prior to installing over a shaft, take care not to allow the weight of an unsupported shaft to rest on the seal.



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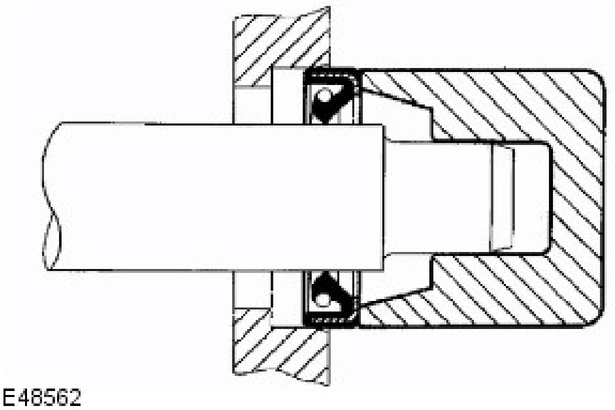
- Always use the recommended special tool and protection sleeve to install an oil seal. If no tool is specified, use a suitable mandrel approximately 0.4 mm (0.015 in) smaller than the outside diameter of the seal. Use adhesive tape on the shaft to protect the sealing lip of the seal.



E48562

- Press or drift the seal in to the depth of its housing if the housing is shouldered or flush with the face of the housing where no shoulder is provided. Make sure that the seal is not tilted in the housing when it is installed.

Supplementary Restraint System (SRS) Precautions

WARNING: Do not install rear facing child seats in the front passenger seat.

The SRS contains components which are potentially hazardous to service personnel if not handled correctly. The following guidelines and precautions are intended to alert personnel to potential sources of danger and emphasise the importance of ensuring the integrity of the SRS components installed to the vehicle.

WARNING: The following precautions MUST be adhered to when working on the SRS system:

- **The correct procedures must always be used when working on SRS components.**
- **Persons working on the SRS system must be fully trained and have been issued with the safety guidelines.**
- **The airbag modules contain extremely flammable and hazardous compounds. Contact with water, acids or heavy metals may produce harmful or explosive results. Do not dismantle, incinerate or bring into contact with electricity before the unit has been deployed.**
- **Always replace a seat belt assembly that has withstood the strain of a severe vehicle impact or if the webbing shows signs of fraying.**
- **Always disconnect the vehicle battery before carrying out any electric welding on a vehicle installed with an SRS system.**

CAUTION: Do not expose airbag modules or seat belt pre-tensioners to temperatures exceeding 85° C (185° F).

It should be noted that these precautions are not restricted to operations performed when servicing the SRS system. The same care should be exercised when working on ancillary systems and components located in the vicinity of SRS components; these include but are not limited to:

- Steering wheel airbag, rotary coupler.

- Passenger front airbag.
- Head airbag modules - front and rear.
- Seat belt pre-tensioners.
- SRS harnesses, link leads and connectors.
- Side (thorax) air bags.

Making the system safe

Before working on or in the vicinity of SRS components, make sure the system is rendered safe by performing the following operations:

- Remove the ignition key.
- Disconnect battery, earth lead first.
- Wait 2 minutes for the SRS power circuit to discharge before commencing work.

• NOTE: The SRS uses energy reserve capacitors to keep the system active in the event of electrical supply failure under crash conditions. It is necessary to allow the capacitors sufficient time to discharge (2 minutes) in order to avoid the risk of accidental deployment.

Installation

In order to make sure system integrity, it is essential that the SRS system is regularly checked and maintained so that it is ready for effective operation in the event of a collision. Carefully inspect SRS components before installation. Do not install a part that shows signs of being dropped or improperly handled, such as dents, cracks or deformation.

⚠WARNING: The integrity of the SRS systems is critical for safety reasons. Make sure the following precautions are always adhered to:

- **Do not install accessories or other objects to trim panels which cover ITS airbags.**
- **Never install used SRS components from another vehicle or attempt to repair an SRS component.**
- **When repairing an SRS system, only use genuine new parts.**
- **Never apply electrical power to an SRS component unless instructed to do so as part of an approved test procedure.**
- **Special fixings are necessary for installing an airbag module – do not use other fixings and make sure that all fixings are tightened to the correct torque.**
- **Always use new fixings when replacing an SRS component.**

• CAUTIONS:

⚠ Take care not to trap airbag modules when installing interior trim components.

⚠ Make sure SRS components are not contaminated by oil or grease.

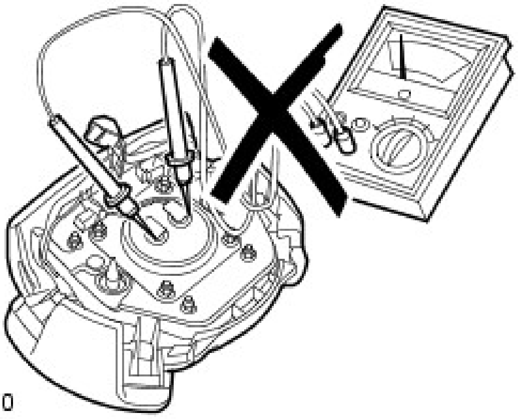
• NOTE: Following seat belt pre-tensioner deployment, the seat belts can still be used as conventional seat belts but will need to be replaced as soon as possible to make sure full SRS protection.

• NOTE: If the SRS components are to be replaced, the part number/bar code of the new unit must be recorded.

SRS component testing precautions

The SRS components are triggered using relatively low operating currents, always adhere to the following :

⚠WARNING: Never use a multimeter or other general purpose equipment on SRS components. Use only T4 to diagnose system faults.



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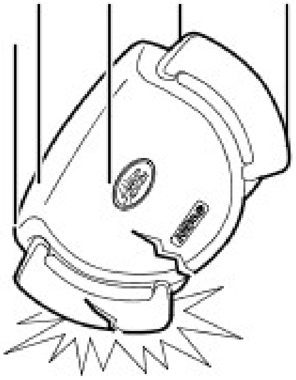
WARNING: Do not use electrical test equipment on the SRS harness while it is connected to any of the SRS components, it may cause accidental deployment and injury.

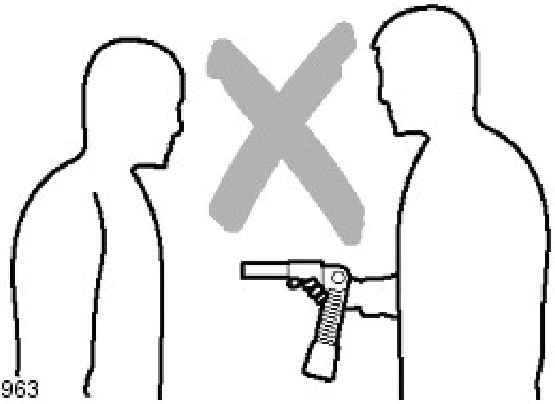
Handling and storage

Always observe the following precautions when handling SRS components:



E48961

- Never drop an SRS component. The airbag diagnostic control unit is a particularly shock sensitive device and must be handled with extreme care. Airbag modules and seat belt pre-tensioners could deploy if subjected to a strong shock.
- Never wrap your arms around an airbag module. If a module has to be carried, hold it by the cover with the cover uppermost and the base away from your body.
- Never transport airbag modules or seat belt pre-tensioners in the passenger compartment of a vehicle. Always use the luggage compartment of the vehicle for carrying airbag modules and seat belt pre-tensioner units.
- Never attach anything to an airbag cover or any trim component covering an airbag module. Do not allow anything to rest on top of an airbag module.
- Always keep components cool, dry and free from contamination.
- Never apply grease or cleaning solvents to seat belt pre-tensioner units, component failure could result.
- Always store an airbag module with the deployment side uppermost. If it is stored deployment side down, accidental deployment will propel the airbag module with sufficient force to cause serious injury.
- Keep new airbag modules in their original packaging until just prior to installing. Place the old module in the empty packaging for carriage.


E48963

- WARNINGS:

⚠ When handling an inflatable tubular structure (ITS) airbag module, hold by the gas generator housing, DO NOT hold by the airbag. Do not wrap the thumb around the gas generator while holding. Do not drape airbag over shoulder or around neck. For seat buckle type pre-tensioners, hold by the piston tube, with the open end of the piston tube pointing towards the ground and the buckle facing away from your body. Do not cover the end of the piston tube. DO NOT hold buckle type pre-tensioners by the bracket assembly or cable. Never point the piston tube towards your body or other people.

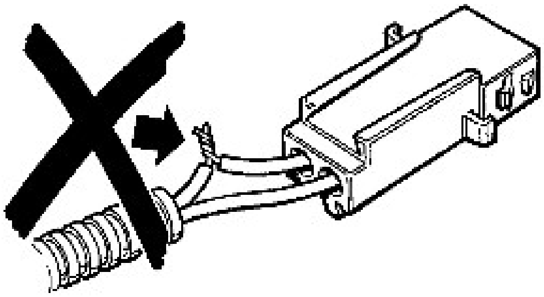
⚠ Airbag modules and seat belt pre-tensioners are classed as explosive devices. For overnight and longer term storage, they must be stored in a secure steel cabinet which has been approved as suitable for the purpose and has been registered with the local authority.

⚠ Store airbag modules or seat belt pre-tensioners in a designated storage area. If there is no designated storage area available, store in the locked luggage compartment of the vehicle and inform the workshop supervisor.

⚠CAUTION: Improper handling or storage can internally damage the airbag module making it inoperative. If you suspect the airbag module has been damaged, install a new module and refer to the deployment/disposal procedures for disposal of the damaged module.

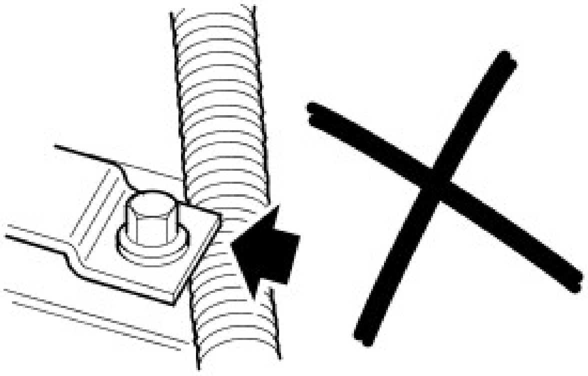
SRS harness and connectors

Always observe the following precautions with regards to SRS system electrical wiring:


E48965

- Never attempt to modify, splice or repair SRS wiring.
- Never install electrical equipment such as a mobile telephone, two-way radio or in-car entertainment system in such a way that it could generate electrical interference in the airbag harness. Seek specialist advice when installing such equipment.

- NOTE: SRS wiring can be identified by a special yellow outer sleeve protecting the wires (black with yellow stripe protective coverings are sometimes used).



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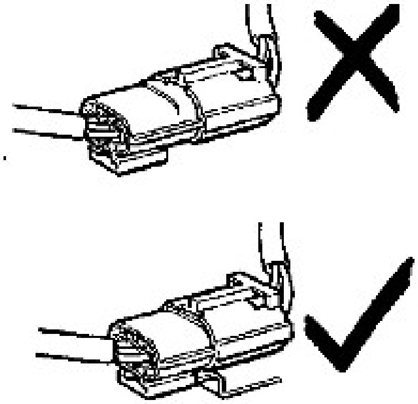
⚠WARNING: Always make sure SRS wiring is routed correctly. Be careful to avoid trapping or pinching the SRS wiring.



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⚠WARNING: Do not leave the connectors hanging loose or allow SRS components to hang from their harnesses. Look for possible chafing points.

Side impact crash sensor inspection

After any degree of side body damage, inspect the side impact crash sensors. Replace a crash sensor if there is any sign of damage.

⚠CAUTION: Take extra care when painting or carrying out bodywork repairs in the vicinity of the crash sensors. Avoid direct exposure of the crash sensors or link harnesses to heat guns, welding or spraying equipment. Take care not to damage sensor or harness when reinstalling components.

Rotary coupler

⚠CAUTION: Always follow the procedure for installing and checking the rotary coupler as instructed in the SRS repairs section. Comply with all safety and installation procedures to make sure the system functions correctly. Observe the following precautions:

- Do not unlock and rotate the rotary coupler when it is removed from the vehicle.
- Do not turn the road wheels when the rotary coupler is removed from the vehicle.
- Always make sure the rotary coupler is removed and installed in its central position and with the front road wheels in the straight ahead position - refer to SRS repair section for the correct removal and installation procedure.
- If a new rotary coupler is being installed, make sure the locking tab holding the coupler's rotational position is not broken; units with a broken locking tab must not be used.

Airbag location labels

WAITING AIRBAG LOCATION AND DESIGN LABELS - DUE MARCH - NEIL HARRISON 46404

Airbag and pre-tensioner deployment

WARNING: During deployment parts of the airbag module become hot enough to burn you. Wait 30 minutes after deployment before touching the airbag module.

Deployment procedures and precautions as detailed in this manual should be strictly adhered to. Only personnel who have undergone the appropriate training should undertake deployment of airbag and pre-tensioner modules. The following precautions must be complied with:

- Only use deployment equipment approved for the intended purpose.
- Deployment of airbag / pre-tensioner modules must be performed in a well ventilated area which has been designated for the purpose.
- Make sure airbag / pre-tensioner modules are not damaged or ruptured before attempting to deploy.
- Where local legislation exists, notify the relevant authorities of intention to deploy airbag and pretensioner units.
- When deploying airbag pre-tensioner units, make sure that all personnel are at least 15 metres (45 feet) away from the deployment zone.
- Make sure deployment tool is connected correctly, in compliance with the instructions detailed in the SRS section of this manual. In particular, make sure deployment tool is NOT connected to battery supply before connecting to airbag module connector.
- When deploying seat belt pre-tensioners, make sure pre-tensioner unit is secured correctly to the seat.
- When removing deployed airbag modules and pre-tensioner units, wear protective clothing. Use gloves and seal deployed units in a plastic bag.
- Following deployment of any component of the SRS system within the vehicle, all SRS components must be replaced. DO NOT reuse or salvage any parts of the SRS system.
- Do not lean over an airbag module when connecting deployment equipment.

If a vehicle is to be scrapped, undeployed airbag modules and pre-tensioner units must be manually deployed. In this case airbags can be deployed in the vehicle. Before deployment, make sure the airbag module is secure within its correct mounting position. Deployment of the driver's airbag in the vehicle may damage the steering wheel; if the vehicle is not being scrapped, deploy the module outside of the vehicle.

SRS Component Replacement Policy

• CAUTIONS:

The Restraints Control Module (RCM) will log a crash fault after every impact which is severe enough to cause airbag deployment. **It is possible to have three crashes/impacts logged after one event where, for example, a front, side and rollover has occurred. After the third fault is logged, the SRS warning lamp will be illuminated and the restraints control module (RCM) must be replaced.**

The SRS side impact sensor must be replaced if there are any signs of physical damage or if the restraints control module (RCM) is registering a fault.

The following information details the policy for replacement of SRS components as a result of a vehicle accident.

Impacts which do not deploy the airbags or pre-tensioners

Check for structural damage in the area of the impact paying particular attention to bumper armatures, longitudinals and bracketry.

Impacts which deploy the airbags or pre-tensioners

The replacement and inspection policy is dependent on the type and severity of the crash condition. The following guidelines are the minimum that should be exercised as a result of the deployment of specific SRS components.

Check for structural damage in the area of impact paying particular attention to bumper armatures, longitudinals and bracketry.

Front Airbag Deployment - Driver and Passenger

CAUTION: If the front airbags are deployed, the following components must be replaced:

- Driver airbag module
- Passenger airbag module
- Fly leads (where applicable) connecting front airbag modules to SRS harness
- Front seat belt buckle pre-tensioner
- Rear seat belt pre-tensioners - if installed
- Driver's seat belt retractor - if installed
- Rotary coupler
- Any front impact sensors that have been physically damaged or if a fault is being registered

- Restraints control module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Front passenger's seat belt retractor and webbing, tongue latching function, 'D' loop and body anchorage point
- Rear seat belt buckles, webbing, buckle covers, body anchorage points and tongue latching function
- Fascia moulding adjacent to passenger airbag module
- Steering wheel
- Front seat frames and head restraints
- Steering column - if adjustment is lost or if there are signs of collapse
- Seat belt height adjusters
- Rear seat belts

Side Air Bags

CAUTION: If the side (thorax) air bags are deployed, the following components must be replaced on the side of the vehicle on which the deployment occurred:

- Side (thorax) airbag
- Any side impact sensors that have been physically damaged or if a fault is being registered
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points
- Front seat frame and head restraints
- Door trim casing
- Seat belt height adjusters
- Rear seat belts

Head airbag modules

CAUTION: If the head airbag modules are deployed, the following components must be replaced on the side of the vehicle on which the deployment occurred:

- Head airbag modules
- Link lead between airbag gas generator and restraints control module (RCM) harness
- Airbag retaining clips
- Internal trim finisher
- Front seat belt buckle pre-tensioners
- Any side impact sensors that have been physically damaged or if a fault is being registered
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Headlining
- Component mounting brackets
- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points
- Adjacent trim components
- Seat belt height adjusters

Rear impacts

CAUTION: If the seat belt pre-tensioners are deployed during a rear impact, the following components must be replaced:

- Seat belt pre-tensioners
- Front and rear seat belt retractors used during the impact
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Seat belt height adjusters
- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points

Air Conditioning System Precautions

The air conditioning system contains fluids and components which could be potentially hazardous to the service engineer or the environment if not serviced and handled correctly. The following guidelines are intended to alert the service engineer to potential sources of danger and emphasise the importance of ensuring the integrity of the Air Conditioning operating conditions and components installed to the vehicle.

Where necessary, additional specific precautions are detailed in the relevant sections of this Manual and also in the Health and Safety Section. These precautions must be referred to prior to commencing repair operations.

The refrigerant used in the air conditioning system is HFC-134a (Hydrofluorocarbon) R134a.

- WARNINGS:

Servicing must only be carried out by personnel familiar with both the vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.

R134a is a hazardous liquid and when handled incorrectly can cause serious injury. Suitable protective clothing, consisting of face protection, heat proof gloves, rubber boots and rubber apron or waterproof overalls, must be worn when carrying out operations on the air conditioning system.

Remedial actions

WARNING: Due to its low evaporating temperature, R134a must be handled with care. R134a splashed on any part of the body will cause immediate freezing of that area. Also, refrigerant cylinders and replenishment trolleys when discharging will freeze skin to them if contact is made.

If an accident involving R134a should occur, conduct the following remedial actions:

- If liquid R134a enters the eye, do not rub it. Gently run large quantities of eye wash over affected eye to raise the temperature. If an eye wash is not available, cool, clean water may be used to flush the eye. After rinsing, cover the eye with a clean pad and seek immediate medical attention.
- If liquid R134a is splashed onto the skin, run large quantities of water over the affected area to raise the temperature. Implement the same action if the skin comes in contact with discharging cylinders. Wrap the contaminated body parts in blankets (or similar materials) and seek immediate medical attention.
- If the debilitating effects of inhalation of R134a vapour are suspected, seek fresh air. If the affected person is unconscious, move them away from the contaminated area to fresh air and apply artificial respiration and/or oxygen and seek immediate medical attention.

Service precautions

Observe the following precautions when handling components used in the air conditioning system:

- Air conditioning units must not be lifted by their hoses, pipes or capillary lines.
- Hoses and lines must not be subjected to any twist or stress; the efficiency of the system will be impaired by kinks or restrictions. Make sure that hoses are correctly positioned before tightening couplings, and make sure that all clips and supports are utilised.
- Flexible hoses should not be positioned closer than 100 mm (4.0 in) to the exhaust manifold unless protected by heat shielding.
- Completed assemblies must be checked for refrigeration lines touching metal panels. Any direct contact of components and panels may transmit noise and so must be eliminated.
- The appropriate torque wrench must be used when tightening refrigerant connections to the stipulated value. An additional spanner must be used to hold the union to prevent twisting of the pipe when tightening connections.
- Before connecting any hose or pipe, make sure that refrigerant oil is applied to the seat of the new O-rings, **BUT NOT** to the threads of the connection.
- All protective plugs or caps must remain in place in the component until immediately prior to connection.
- Make sure components are at room temperature before uncapping/unplugging, to prevent condensation of moisture from the air that enters it.
- When disconnecting, immediately plug or cap all air conditioning pipes to prevent ingress of dirt and moisture into the system.
- Components must not remain uncapped/unplugged, if a system has been left uncapped/unplugged for 20 minutes or longer, a new receiver/drier must be installed.
- The receiver/drier contains desiccant which absorbs moisture. It must be positively sealed at all times. A receiver/drier that has been left uncapped for longer than 20 minutes must not be used; install a new unit.
- The receiver/drier should be the last component connected to the system to make sure optimum dehydration and maximum moisture protection of the system.
- Whenever a component of the refrigeration system is replaced, it will also be necessary to install a new receiver/drier unit.
- Use alcohol and a clean lint-free cloth to clean dirty connections.
- Make sure that all new parts installed are marked for use with R134a.
- When a major repair has been completed, a leak test should be conducted; refer to the Repairs Section of this

manual for the correct procedure.

Refrigerant oil

CAUTION: Refrigerant oil easily absorbs water and must not be stored for long periods. Do not pour unused refrigerant oil back into the container. Always use an approved refrigerant oil.

When replacing components in the air conditioning system, drain the refrigerant oil from the component being replaced into a graduated container. On assembly, add the quantity of refrigerant oil drained to the new component - See Air Conditioning Compressor Replacement in this Section.

Compressor

A new compressor is sealed and pressurised with Nitrogen gas. When installing a new compressor, slowly release the sealing cap; gas pressure should be heard to vent as the seal is broken.

CAUTION: A new compressor should always be sealed and could be pressurised with nitrogen gas. To avoid possible oil loss, release the sealing cap(s) slowly. Do not remove the cap(s) until immediately prior to connecting the air conditioning pipes to the compressor.

Rapid refrigerant discharge

If the air conditioning system is involved in accident damage and the system is punctured, the refrigerant will discharge rapidly. The rapid discharge of refrigerant will also result in the loss of most of the oil from the system. The compressor must be removed and all the remaining oil in the compressor drained and refilled as instructed in the air conditioning section of this manual.

Precautions for refrigerant recovery, recycling and recharging

When the air conditioning system is recharged, any existing refrigerant is first recovered from the system and recycled. The system is then charged with the required weight of refrigerant and volume of refrigerant oil.

WARNING: Refrigerant must always be recycled before reuse to make sure that the purity of the refrigerant is high enough for safe use in the air conditioning system. Recycling should always be carried out with equipment which is design certified by Underwriter Laboratory Inc. for compliance with SAE J1991. Other equipment may not recycle refrigerant to the required level of purity.

- CAUTIONS:

A R134a Refrigerant Recovery Recycling Recharging Station must not be used with any other type of refrigerant. Refrigerant R134a from domestic and commercial sources must not be used in motor vehicle air conditioning systems.

The system must be evacuated immediately before recharging commences. Delay between evacuation and recharging is not permitted.

Air Conditioning Compressor Replacement

A new compressor is supplied filled with a full charge (X cm^3) of refrigerant oil.

A calculated quantity of oil must be drained from the new compressor before installing. To calculate the quantity of oil to be drained:

- Remove the drain plug from the old compressor.
- Invert the compressor and gravity drain the oil into a calibrated measuring cylinder. Rotate the compressor clutch to make sure the compressor is completely drained.
- Note the quantity of oil drained (Y cm^3).
- Calculate the quantity of oil to be drained from the new compressor using the following formula:**$X\ cm^3 - (Y\ cm^3 + 20\ cm^3) = Q\ cm^3$**
- Remove the drain plug from the new compressor and drain Q cm3 of oil. install and tighten the compressor drain plug.

Vehicle Weights

Item	kg	lb
Maximum Gross Vehicle Weight (GVW)		
Petrol engine vehicles naturally aspirated	3070	6768
Petrol engine vehicles supercharged	3125	6889

Diesel engine vehicles	3070	6768
Maximum weight of unbraked trailer:		
On-road	750	1650
Off-road	750	1650
Maximum towable weight (mass) - Trailers with overrun brakes		
On-road	3500	7700
Off-road	1000	2205
Maximum roof rack load (Including the mass of the roof rack):		
On-road	75	110
Off-road	75	110

Vehicle Dimensions

Item	mm	in
Length - including number plate plinth - All models	4798	188.9
Width - All models:		
Mirrors extended	2170	85.4
Mirrors folded	1983	78.1
Maximum height - At standard ride height - All models:		
With roof rack and rails	1784	70.2
With roof antenna module	1812	71.3
With sunroof open	1817	71.5
Wheelbase - All models	2745	108
Front overhang - All models	880	45.8
Rear overhang - All models	1163	44.5
Track - All models:		
Front	1605	63.2
Rear	1612	63.5
Underbody Clearences:		
Standard ride height - Running clearance to exhaust - Minimum - Kerb weight	172	6.8
Standard ride height - Ground to front undertray clearance	188	7.4
Standard ride height - Ground to rear differential casing clearance	200	7.9
Off-road height - Running clearance to exhaust - Minimum - Kerb weight	227	8.9
Off-road height - Ground to front undertray clearance	243	9.6
Off-road height - Ground to rear differential casing clearance	255	10
Suspension articulation - All models:		
Front	255	10.03
Rear	310	12.2
Departure angle - Towbar NOT installed:		
Standard ride height with full size spare wheel	24.1°	24.1°
Standard ride height with space saver wheel	26°	26°
Off-road height with full size spare wheel	27.4°	27.4°
Off-road height with full space saver wheel	29°	29°
Departure angle - Towbar installed - NOT NAS vehicles:		
Standard ride height	15.1°	15.1°
Off-road ride height	17.8°	17.8°
Departure angle - Towbar installed - NAS vehicles:		
Standard ride height	13.9°	13.9°
Off-road ride height	16.9°	16.9°
Departure angle - Adjustable height towbar installed:		
Standard ride height	13.3°	13.3°
Off-road ride height	16°	16°
Wading depth:		
Off-road height	700	27.5
Approach angle:		
Standard ride height	30.2°	30.2°
Off-road ride height	34°	34°
Ramp angle:		
Standard ride height	20°	20°
Off-road ride height	25°	25°

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General Information - Health and Safety Precautions

Description and Operation

Introduction

Modern vehicles contain many materials and liquids which if not handled with care can be hazardous to both personal health and the environment. Also, many of the procedures associated with vehicle maintenance and repair involve physical hazards or other risks to health.

This subsection lists some of these hazardous operations and the materials and equipment associated with them. Precautions necessary to avoid these hazards are identified.

The list is not exhaustive and all operations and procedures and the handling of materials, should be carried out with health and safety in mind.

Before using any product the Materials Safety Data Sheet supplied by the manufacturer or supplier should be consulted.

WARNING: Many liquids and other substances used in motor vehicles are poisonous and should under no circumstances be consumed and should, as far as possible, be kept from contact with the skin. These liquids and substances include acid, anti-freeze, brake fluid, fuel, windscreen washer additives, lubricants, refrigerants and various adhesives.

Acids and Alkalis

For example - alkalis such as caustic soda used in cleaning materials; acids such as sulphuric acid used in batteries.

Both alkalis and acids are irritant and corrosive to the skin, eyes, nose and throat. They cause burns and can destroy ordinary protective clothing.

Avoid splashes to the skin, eyes and clothing. Wear suitable protective impervious apron, gloves and goggles. Do not breath mists.

Make sure access to eye wash bottles, shower and soap are readily available for splashing accidents.

Display Eye Hazard sign.

Air Bags

Highly flammable, explosive – observe No Smoking policy.

Used within the vehicle as safety restraints.

The inflator contains a high-energy propellant which, when ignited, produces a VERY HOT GAS (2500°C).

The gas inflator (generator) used in air bags is Sodium Azide. This material is hermetically sealed in each air bag module and is completely consumed during deployment. No attempt should be made to open an air bag inflator as this will lead to the risk of exposure to Sodium Azide. If a gas generator is ruptured, full protective clothing should be worn when dealing with the spillage.

After normal deployment, gloves and safety goggles should be worn during the handling process.

Deployed air bags should be disposed of in a plastic bag in accordance with local regulations at an approved chemical waste site.

Following any direct contact with Sodium Azide:

- Wash affected areas thoroughly with water.
- **SEEK IMMEDIATE MEDICAL ASSISTANCE.**

Air Bags - Do's

- Do store modules in an upright position.
- Do keep modules dry.
- Do carry modules with the cover side pointing away from the body.
- Do place modules with their cover side upwards.
- Do carefully inspect modules for damage.
- Do stand to one side when connecting modules.
- Do make sure all test equipment is properly calibrated and maintained.
- Do wash hands after handling deployed air bags.

Air Bags - Do Not

- Do Not store highly flammable material together with modules or gas generators.
- Do Not store gas generators at temperatures exceeding 80°C.
- Do Not store modules upside down.
- Do Not attempt to open a gas generator housing.
- Do Not expose gas generators to open flame or sources of heat.
- Do Not place anything on top of a module cover.
- Do Not use damaged modules.
- Do Not touch a fired module or gas generator for at least 10 minutes after firing.
- Do Not use any electrical probes on the wiring circuit.

Air Suspension

Whenever work is being undertaken on the air suspension system, suitable eye protection must be worn.

Air Conditioning Refrigerant

Highly flammable, combustible – observe No Smoking policy.

Skin contact may result in frostbite.

Instructions given by the manufacturer must be followed. Avoid naked lights, wear suitable protective gloves and goggles.

If refrigerant comes into contact with the skin or eyes, rinse the affected areas with water immediately. Eyes should also be rinsed with an appropriate irrigation solution such as a solution of 9% Sodium Chloride and Purified Water. **DO NOT RUB THE EYES AND SEEK IMMEDIATE MEDICAL ATTENTION.**

Air Conditioning Refrigerant

Do Not

- Do Not expose refrigerant bottles to sunlight or heat.
- Do Not expose refrigerant bottles to frost.
- Do Not drop refrigerant bottles.
- Do Not vent refrigerant to atmosphere under any circumstance.
- Do Not mix refrigerants.

Adhesives and Sealants

Many adhesives and sealants are highly flammable – OBSERVE NO SMOKING POLICY. These items, should be stored in flameproof cabinets in No Smoking areas. Cleanliness and tidiness in use should be observed, for example disposable paper covering benches. All adhesives and sealants should be dispensed from applicators where possible; containers, including secondary containers, should be labelled appropriately.

Anaerobic, Cyanoacrylate (super-glues) and other Acrylic Adhesives

Many are irritant, sensitizing or harmful to the skin and respiratory tract. Some are eye irritants.

Skin and eye contact should be avoided and the manufacturer's instructions followed.

Cyanoacrylate adhesives (super-glues) MUST NOT contact the skin or eyes. If skin or eye tissue is bonded, cover with a clean moist pad and **SEEK IMMEDIATE MEDICAL ATTENTION.** Do not attempt to pull skin tissue apart. Use in well ventilated areas as vapors can cause irritation to the nose and eyes.

For two-pack systems see Resin-based and Isocyanate Adhesives/Sealers.

Solvent-based Adhesives/Sealers - See Solvents

Follow manufacturers instructions.

Water-based Adhesives/Sealers

Those based on polymer emulsions and rubber/latex may contain small amounts of volatile, toxic and harmful chemicals. Skin and eye contact should be avoided and adequate ventilation provided during use.

Hot Melt Adhesives

In the solid state, they are safe. In the molten state they may cause burns and health hazards may arise from the inhalation of toxic fumes.

Use appropriate protective clothing and a thermostatically controlled heater with a thermal cut-out and adequate extraction.

Resin-based Adhesives/Sealers, for example Epoxide and Formaldehyde Resin-based

Mixing should be carried out in well ventilated areas as harmful or toxic volatile chemicals may be released.

Skin contact with uncured resins and hardeners can result in irritation, dermatitis, and absorption of toxic or harmful chemicals through the skin. Splashes can damage the eyes.

Provide adequate ventilation and avoid skin and eye contact.

Isocyanate (Polyurethane) Adhesives/Sealers

See also Resin-based Adhesives

Individuals suffering from asthma or respiratory allergies should not work with or near these materials as sensitivity reactions can occur.

Over exposure is irritating to the eyes and respiratory system. Excessive concentrations may produce effects on the nervous system including drowsiness. In extreme cases, loss of consciousness may result. Long term exposure to vapour concentrations may result in adverse health effects.

Prolonged contact with the skin may lead to skin irritation and in some cases, dermatitis.

Splashes entering the eye will cause discomfort and possible damage.

Any spraying should preferably be carried out in ventilated booths which incorporate facilities for removing vapors and spray droplets from the breathing zone.

Wear appropriate gloves, eye and respiratory protection.

Antifreeze

May be flammable when undiluted.

Vapors may be given off from coolant antifreeze when heated. Avoid breathing these vapors.

Antifreeze may be absorbed through the skin in toxic or harmful quantities. Antifreeze, if swallowed, can be fatal; **SEEK IMMEDIATE MEDICAL ATTENTION.**

Battery Acids

See also Alkalis and Acids.

Gases released during battery charging are explosive. Always remove the battery from the vehicle prior to charging. Never use naked flames or allow sparks near charging or recently charged batteries. NEVER add acid to a battery, the chemical reaction produced will be violent and explosive. In cases of eye contact, wash affected area with copious amounts of water and **SEEK IMMEDIATE MEDICAL ATTENTION.**

Make sure there is adequate ventilation during battery charging, observe NO SMOKING POLICY.

Brake Pads and Linings

Always fit the correct grade and specification of brake pads and linings. When renewing pads and linings, always replace as complete axle sets.

Brake and Clutch Fluid

Splashes to the skin and eyes are irritating and in the long term can be damaging, avoid prolonged skin contact. In cases of eye contact, wash affected area with copious amounts of water and SEEK IMMEDIATE MEDICAL ATTENTION.

Chemical Materials

All chemical materials should always be used with caution and stored and handled with care. They may be toxic, harmful, corrosive, irritant or highly flammable and give rise to hazardous fumes and dusts.

The effects of excessive exposure to chemicals may be immediate or delayed; briefly experienced or permanent; cumulative; superficial; life threatening; or may reduce life expectancy.

Chemical Materials - Do's

- Do carefully read and observe hazard and precaution warnings given on material containers (labels) and in any accompanying leaflets, posters or other instructions. Material health and safety data sheets can be obtained from manufacturers.

- Do remove chemical materials from the skin and clothing as soon as practicable after soiling. Change heavily soiled clothing and have it cleaned.
- Do organise work practices and protective clothing to avoid soiling of the skin and eyes.
- Do avoid breathing vapors, aerosols, dusts or fumes; inadequate container labelling; fire and explosion hazards.
- Do wash before job breaks, before eating, smoking, drinking or using toilet facilities when handling chemical materials.
- Do keep work areas clean, uncluttered and free of spills.
- Do store chemical materials according to national and local regulations.
- Do keep chemical materials out of the reach of children.

Chemical Materials - Do Not

- Do Not mix chemical materials except under the manufacturers instructions; some chemicals can form other toxic or harmful chemicals, give off toxic or harmful fumes or become explosive when mixed together.
- Do Not spray chemical materials, particularly those based on solvents, in confined spaces, for example when people are inside a vehicle.
- Do Not apply heat or flame to chemical materials except under the manufacturers instructions. Some are highly flammable and some may release toxic or harmful fumes.
- Do Not leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas such as pits.
- Do Not transfer chemical materials to unlabelled containers.
- Do Not clean hands or clothing with chemicals. Chemicals, particularly solvents and fuels, will dry skin and may cause irritation leading to dermatitis or be absorbed through the skin in toxic or harmful quantities.
- Do Not use emptied containers for other materials except when they have been cleaned under supervised conditions.
- Do Not sniff or smell chemical materials, even brief exposure to high concentrations of fumes can be toxic or harmful.

Corrosion Protection Materials

Some corrosion protection materials are highly flammable – observe NO SMOKING POLICY.

These materials are varied and the manufacturers instructions must always be followed. The materials may contain solvents, resins or petroleum products. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation and not in confined spaces.

Dust

Dust or powder produced during repair operations may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

Fine dusts of combustible material can present an explosion hazard. Avoid explosive limits and sources of ignition.

Electrical Equipment

Electric shock can result from the use of faulty electrical equipment or from the misuse of equipment in good condition.

Make sure that electrical equipment is maintained in good condition and frequently tested. Faulty equipment should be labelled and preferably removed from the work station.

Make sure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged. If using cable reel extension equipment, ALWAYS ensure that the cable is fully unwound from the reel.

Make sure that electrical equipment and flexes do not come into contact with water.

Make sure that electrical equipment is protected by the correct rated fuse.

Never misuse electrical equipment and never use equipment which is in any way faulty. The results could be fatal.

Make sure that the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.

Make sure that the designated electrical workers are trained in basic First Aid.

In cases of electrocution:

- Switch off the power supply before approaching the victim.
- If this is not possible, **DO NOT TOUCH THE VICTIM** but push or drag the person from the source of electricity using dry, non-conductive material.
- Commence resuscitation if trained to do so.
- **SEEK IMMEDIATE MEDICAL ATTENTION.**

Exhaust Fumes

These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, lead and aromatic hydrocarbons. Engines should be run only under conditions of adequate exhaust extraction or general ventilation and not in confined spaces.

Gasoline (Petrol) engine

There may not be adequate warning of odour or of irritation before toxic or harmful effects arise. These may be immediate or delayed.

Gas Oil (Diesel engine)

Soot, discomfort and irritation usually give adequate warning of hazardous fume concentrations.

Fibre Insulation

The fibrous nature of surfaces and cut edges can cause skin irritation. This is usually a physical and not a chemical effect.

Precautions should be taken to avoid excessive skin contact through careful organization of work practices and the use of gloves.

Fire

Many of the materials found on or associated with the repair of vehicles are highly flammable. Some give off toxic or harmful fumes if burnt; others such as fluoroelastomers when burnt or damaged by excessive heat can break down and produce highly corrosive hydrofluoric acid - See Fluoroelastomers.

Should any material be in a burnt or overheated condition, handle with extreme caution and wear protective clothing when handling such items. Dispose of such material in accordance with local regulations.

Decontaminate and dispose of protective clothing immediately after use.

Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.

Make sure, before using electrical or welding equipment, that there is no fire hazard present.

Have a suitable fire extinguisher available when using welding or heating equipment.

First Aid

Apart from meeting any legal requirements it is desirable for someone in the workshop to be trained in First Aid procedures.

Splashes in the eye should be flushed carefully with clean water for at least ten minutes.

Soiled skin should be washed with soap and water.

In case of cold burns, from alternative fuels, place affected area in cool to cold water.

Individuals affected by inhalation of gases and fumes should be removed to fresh air immediately. If effects persist, consult a doctor.

If liquids are swallowed inadvertently, consult a doctor giving him the information on the container or label. Do not induce vomiting unless this action is indicated on the label.

Fluoroelastomers (Synthetic Rubber)

Many 'O' rings, seals, hoses, flexible pipes and other similar which appear to be manufactured from natural rubber are, in fact, made of synthetic materials called Fluoroelastomers.

Under normal operating conditions, these materials are safe and do not constitute a health hazard. However, if the materials are damaged by burning or exposure to excessive heat, they can break down and produce highly corrosive hydrofluoric acid.

⚠ WARNING: Contact with hydrofluoric acid can cause serious burns on contact with the skin. If skin contact does occur, carry out the following steps immediately:

Remove any contaminated clothing.

SEEK IMMEDIATE MEDICAL ATTENTION

Irrigate affected area of skin with copious amounts of cold water or limewater for 15 to 60 minutes.

Foams - Polyurethane

Used in sound and noise insulation. Cured foams used in seat and trim cushioning.

Unreacted components are irritating and may be harmful to the skin and eyes. Wear gloves and goggles.

Individuals with chronic respiratory diseases, asthma, bronchial medical problems, or histories of allergic diseases should not work in or near uncured materials.

The components, vapors or spray mists can cause direct irritation, sensitivity reactions and may be toxic or harmful.

Vapors and spray mists must not be inhaled. These materials must be applied with adequate ventilation and respiratory protection. Do not remove the respirator immediately after spraying, wait until the vapour/mists have cleared.

Burning of the uncured components and the cured foams can generate toxic and harmful fumes. Smoking, naked flames or the use of electrical equipment during foaming operations and until vapors/mists have cleared should not be allowed. Any heat cutting of cured foams or partially cured foams should be carried out in areas having suitable fume extraction equipment.

Fuels

Avoid skin contact with fuel where possible. Should contact occur, wash the affected skin with soap and water.

Gasoline (Petrol)

Highly flammable - OBSERVE NO SMOKING POLICY.

Swallowing gasoline (petrol) can result in mouth and throat irritation and absorption from the stomach can result in drowsiness and unconsciousness. Small amounts can be fatal to children. Inhalation into the lungs, through vomiting, is a very serious hazard.

Gasoline (petrol) dries the skin and can cause irritation and prolonged or repeated contact may cause dermatitis; if it is allowed to enter the eyes, it will cause severe smarting. Wash affected area with copious amounts of water and **SEEK IMMEDIATE MEDICAL ATTENTION.**

Gasoline (petrol) may contain appreciable quantities of benzene, which is toxic upon inhalation and the concentration of vapors must be kept very low. High concentrations will cause eye, nose and throat irritation, nausea, headache, depression and symptoms of drunkenness. Very high concentrations will result in rapid loss of consciousness.

Make sure there is adequate ventilation when handling and using gasoline (petrol). Great care must be taken to avoid the serious consequences of inhalation in the event of vapour build up arising from spillages in confined spaces.

Special precautions apply to cleaning and maintenance operations on gasoline (petrol) storage tanks.

Gasoline (petrol) should not be used as a cleaning agent. It must not be siphoned by mouth.

Gas-oil (Diesel Fuel)

Combustible.

Prolonged skin contact with high boiling point gas oils (diesel fuel) may cause serious skin disorders including skin cancer.

Inhalation into the lungs will cause internal bleeding **- SEEK IMMEDIATE MEDICAL ATTENTION.**

If swallowed, DO NOT induce vomiting - SEEK IMMEDIATE MEDICAL ATTENTION.

Kerosene (Paraffin)

Used also as heating fuel, solvent and cleaning agent.

Flammable - OBSERVE NO SMOKING POLICY.

Irritation of the mouth and throat may result from swallowing. The main hazard from swallowing arises if liquid aspiration into the lungs occurs.

Liquid contact dries the skin and can cause irritation or dermatitis. Splashes in the eye may be slightly irritating.

In normal circumstances the low volatility does not give rise to harmful vapors. Exposure to mists and vapors from kerosene at elevated temperature should be avoided (mists may arise in dewaxing). Avoid skin and eye contact and make sure there is adequate ventilation.

If swallowed, DO NOT induce vomiting - SEEK IMMEDIATE MEDICAL ATTENTION.

Gas Cylinders

Gases such as oxygen, acetylene, argon and propane are normally stored in cylinders at pressures of up to 138 bar (13800 kPa) (2000 lbf/in^2) and great care should be taken in handling these cylinders to avoid mechanical damage to them or to the valve gear attached. The contents of each cylinder should be clearly identified by appropriate markings.

Cylinders should be stored in well ventilated enclosures, and protected from ice and snow or direct sunlight. Fuel gases, for example acetylene and propane should not be stored in close proximity to oxygen cylinders.

Care should be exercised to prevent leaks from gas cylinders and lines and also to avoid sources of ignition.

Only trained personnel should undertake work involving gas cylinders.

General Workshop Tools and Equipment

It is essential that all tools and equipment are maintained in good condition and the correct safety equipment is used where required.

Never use tools or equipment for any purpose other than that for which they were designed. Never overload equipment such as hoists, jacks, axle and chassis stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time that the equipment is used.

Do not use damaged or defective tools or equipment, particularly high speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning and cause serious injury.

Wear suitable eye protection when using grinding, chiselling or sand blasting equipment.

Wear a suitable breathing mask when using abrasive blasting equipment or using spraying equipment.

Make sure there is adequate ventilation to control dusts, mists and fumes.

High Pressure Air, Lubrication and Oil Test Equipment

Always keep high pressure equipment in good condition, and regularly maintained, particularly at joints and unions.

Never direct a high pressure nozzle, for example diesel injector, at the skin as the fluid may penetrate to the underlying tissue and cause serious injury.

Jacking

Always refer to the Jacking and Lifting section of this manual prior to raising the vehicle off the ground.

When vehicle is to be raised by means of a jack, ensure that it is standing on level ground, that parking brake is applied and wheels are chocked. ALWAYS use the recommended jacking points and ensure that vehicle jack has sufficient load capacity for the weight of the vehicle.

⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Ensure that hoists have sufficient load capacity for the weight of the vehicle.

Legal Aspects

There are many laws and regulations relating to health and safety in the use and disposal of materials and equipment in a workshop.

For a safe working environment and to avoid environmental pollution, workshops should be familiar, in detail, with the many health and safety laws and regulations within their country, published by both national and local authorities.

Lubricants and Greases

Avoid all prolonged and repeated contact with mineral oils. All lubricants and greases may be irritating to the eyes and skin.

Used Engine Oil

Prolonged and repeated contact with engine oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Do not employ used engine oils as lubricants or for any application where appreciable skin contact is likely to occur.

Health Protection Precautions

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable.
- Do not put oily rags into pockets.
- Avoid contaminating clothes, particularly underpants, with oil.
- Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
- First Aid treatment should be obtained immediately for open cuts and wounds.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
- Wash with soap and water to make sure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanoline replace the natural skin oils which have been removed.
- Do not use gasoline (petrol), kerosene (paraffin), diesel fuel (gas oil), thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay.
- Where practicable, degrease components prior to handling.
- Where there is a risk of eye contact, eye protection should be worn, for example chemical goggles or face shields; in addition an eye wash facility should be provided.

Environmental Precautions

This section provides general information which can help to reduce the environmental impacts from the activities carried out in workshops.

Emissions to air

Many of the activities that are carried out in workshops emit gases and fumes which can contribute to global warming, depletion of the ozone layer and/or the formation of photochemical smog at ground level. By considering how the workshop activities are carried out, these gases and fumes can be minimised, thus reducing the impact on the environment.

Exhaust fumes

Running car engines is an essential part of workshop activities and exhaust fumes need to be ventilated to atmosphere. However, the amount of time engines are running and the position of the vehicle should be carefully considered at all times, to reduce the release of poisonous gases and minimise the inconvenience to people living nearby.

Solvents

Some of the cleaning agents used are solvent based and will evaporate rapidly to atmosphere if used carelessly, or if containers are left unsealed. All containers must be firmly closed when not required and solvent should be used sparingly. Wherever possible, solvents having a low toxicity and flammability should be selected. Always follow the instructions supplied by the solvent manufacturer. Similarly, many paints are solvent based and the spray should be used in such a way as to reduce emissions to a minimum.

Refrigerant

It is illegal to release any refrigerant into the atmosphere. Discharge and replacement of these materials from air conditioning units should only be carried out using the appropriate equipment.

Discharges to water

Most workshops will have two systems for discharging waste water - storm drains and foul drains. Storm drains should only receive clean water i.e. rainwater. Foul drains will accept many of the normal waste water i.e. washing water, detergents and domestic type waste BUT NOT oil, petrol, solvent, acids, hydraulic fluid, antifreeze and similar fluids. If in doubt, always consult the local authority or water company.

Spillages

Every precaution must be taken to prevent spillage of oil, fuel, solvents etc., reaching the drains. All handling of such materials must take place well away from drains and preferably in an area with a suitable containing wall to prevent discharge into drains or watercourses. If a spillage occurs, it must be soaked up immediately using a spill kit where provided.

Checklist

Spillage prevention:

- Store liquids in a secure area.
- Make sure that taps on liquid containers are secure and cannot be accidentally turned on.
- Protect bulk storage tanks from vandalism by locking the valves.

- Transfer liquids from one container to another in an area away from open drains.
- Ensure lids are replaced securely on containers.
- Have spill kits available near to points of storage and liquid handling areas.

Spill Kits

Special materials are available to absorb a number of different substances. They can be in granular form, ready to use and are supplied in suitable containers. Disposal of used spill absorbing material is dealt with in Waste management.

Land contamination

Oils, fuels and solvents etc. can contaminate any soil with which they come into contact. Such materials MUST never be disposed of by pouring on to soil and every precaution must be taken to avoid spillage reaching soil. Waste materials stored on open ground could either leak or have contaminating substances washed off them that would contaminate the land. Always store these materials in suitable skips or similarly robust containers.

Legal compliance

Some sites may have a discharge consent for effluent discharge to the foul drain for a car wash etc. It is essential to know the types of effluent which are allowed to be discharged into the drain and to check the results of any monitoring carried out by the Water Company.

Where paint spraying operations are carried out it may be necessary to apply to the Local Authority for an air emissions licence to operate the plant. If such a licence is necessary, additional precautions will be necessary to comply with the requirements and the results of any air quality monitoring must be checked regularly.

Checklist

Always adhere to the following:

- Know what legal consents and licences apply to the operations.
- Check that the emissions and discharges comply with legal requirements.

Waste Management

Pollution can be reduced by careful handling, storage and disposal of all waste materials that occur on sites. Legislation makes it illegal to dispose of waste materials other than to licensed waste carriers and disposal sites.

This means that it is necessary to not only know what the waste materials are but also to have the necessary documentation and licences.

Handling and storage of waste

Ensure that waste materials are not poured down the drain or on to soil and are stored in such a way that they do not escape on to land or soil.

All waste must be segregated into individual types e.g. oils, metals, batteries, scrap components etc. This will prevent any reaction between different materials and assist in disposal.

Disposal of waste

Dispose of waste in accordance with the following guidelines:

- **Fuel, hydraulic fluid, anti-freeze and oil:** Keep separate and dispose of to specialist contractors.
- **Refrigerant:** Collect in specialist equipment and reuse.
- **Detergents:** Safe to pour down the foul drain if diluted.
- **Paint, thinners:** Keep separate and dispose of to specialist contractor.
- **Components:** Return to supplier for refurbishment or disassemble and reuse any suitable parts. Dispose of remainder in ordinary waste.
- **Small parts:** Reuse any suitable parts, dispose of the remainder in ordinary waste.
- **Metals:** Can be sold if separate from general waste.
- **Tyres:** Keep separate and dispose of to specialist contractor. DO NOT attempt to dispose of tyres by burning.
- **Components/materials containing asbestos:** Keep separate and dispose of to specialist contractor.

- **Oil and fuel wastes (e.g. rags, used spill kit material):** Keep separate and dispose of to specialist contractors.
- **Air filters:** Keep separate and dispose of to specialist contractors.
- **Rubber/plastics:** Dispose of in ordinary waste.
- **Hoses:** Dispose of in ordinary waste.
- **Batteries:** Keep separate and dispose of to specialist contractors.
- **Air bags - DANGER EXPLOSIVES:** Keep separate and dispose of to specialist contractors.
- **Electrical components:** Return to supplier for refurbishment or disassemble and reuse any suitable components. Dispose of remainder in ordinary waste.
- **Catalytic converters:** May be sold if kept separate from general waste.
- **Packaging:** Compact/recycle as much as possible and dispose of in ordinary waste.
- **Office/paper waste:** Recycle paper and toner and ink cartridges, dispose of remainder in ordinary waste.

Noise

Car alarm testing, panel beating, running engines, using air tools etc. are operations which invariably produce a large amount of noise. The location of such activities and also the time of day must be carefully considered having regard to the proximity of houses schools etc.

Some operations may produce high noise levels which could, in time, damage hearing. In these cases, suitable ear protection must be worn.

Solder

Solders are mixtures of metals such that the melting point of the mixture is below that of the constituent metals (normally lead and tin). Solder application does not normally give rise to toxic lead fumes, provided a gas/air flame is used. Oxy-acetylene flames should not be used, as they are much hotter and will cause lead fumes to be produced.

Some fumes may be produced by the application of any flame to surfaces coated with grease, and inhalation of these should be avoided.

Removal of excess solder should be undertaken with care, to make sure that fine lead dust is not produced, which can give toxic effects if inhaled. Respiratory protection may be necessary.

Solder spillage and filings should be collected and removed promptly to prevent general air contamination by lead.

High standards of personal hygiene are necessary in order to avoid ingestion of lead or inhalation of solder dust from clothing.

Solvents

For example acetone, white spirit, toluene, xylene, trichloroethane.

Used in cleaning and dewaxing materials, paints, plastics, resins and thinners.

Some may be highly flammable or flammable.

Skin contact will degrease the skin and may result in irritation and dermatitis following repeated or prolonged contact. Some can be absorbed through the skin in toxic or harmful quantities.

Splashes in the eye may cause severe irritation and could lead to loss of vision.

Brief exposure of high concentrations of vapors or mists will cause eye and throat irritation, drowsiness, dizziness, headaches and, in the worst circumstances, unconsciousness.

Repeated or prolonged exposure to excessive but lower concentrations of vapors or mists, for which there might not be adequate warning indications, can cause more serious toxic or harmful effects.

Aspiration into the lungs, for example through vomiting, is the most serious consequence of swallowing.

Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing if necessary.

Make sure there is good ventilation when in use, avoid breathing fumes, vapors and spray mists and keep containers tightly sealed. Do not use in confined spaces.

When spraying materials containing solvents, for example paints, adhesives, and metal coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.

Do not apply heat or flame except under specific and detailed manufacturers instructions.

Suspended Loads

⚠CAUTION: Never improvise lifting tackle.

There is always a danger when loads are lifted or suspended. Never work under an unsupported, suspended or raised load, for example a suspended engine.

Always make sure that lifting equipment such as jacks, hoists, axle stands and slings are adequate and suitable for the job, in good condition and regularly maintained.

Viton

In common with many other manufacturers vehicles, some components installed to Land Rover vehicles have seals, 'O' rings or gaskets which contain a material known as 'Viton'.

Viton is a fluoroelastomer, that is a synthetic rubber type which contains Fluorine. Although Viton is the most well known fluoroelastomer, there are others, including Fluorel and Tecmoflon.

When used under design conditions fluoroelastomers are perfectly safe. If, however, they are exposed to temperatures in excess of 400°C, the material will not burn, but will decompose, and one of the products formed is hydrofluoric acid.

This acid is extremely corrosive and may be absorbed directly, through contact, into the general body system. **WHERE CASES OF SKIN CONTACT OCCUR, SEEK IMMEDIATE MEDICAL HELP.**

O-rings, seals or gaskets which have been exposed to very high temperatures will appear charred or as a black sticky substance.

DO NOT, under any circumstances touch them or the attached components.

Enquiries should be made to determine whether Viton or any other fluoroelastomer has been used in the affected O-ring, seal or gasket. If they are of natural rubber or nitrile there is no hazard. If in doubt, be cautious as the material may be Viton or any fluoroelastomer.

If Viton or any other fluoroelastomers have been used, the affected area should be decontaminated before the commencement of work.

Disposable heavy duty plastic gloves should be worn at all times, and the affected area washed down using wire wool and a limewater (calcium hydroxide) solution to neutralise the acid before disposing of the decomposed Viton residue and final cleaning of the area. After use, the plastic gloves should be discarded carefully and safely.

Welding

Welding processes include Resistance Welding (Spot Welding), Arc Welding and Gas Welding.

Resistance Welding

This process may cause particles of molten metal to be emitted at a high velocity, and the eyes and skin must be protected.

Arc Welding

This process emits a high level of ultra-violet radiation which may cause arc-eye and skin burns to the operator and to other persons nearby. Gas-shielded welding processes are particularly hazardous in this respect. Personal protection must be worn, and screens used to shield other people.

CONTACT LENS WEARERS ARE ADVISED TO REVERT TO ORDINARY SPECTACLES WHEN ARC WELDING as the arc spectrum is believed to emit microwaves which dry out the fluid between the lens and the eye. This may result in blindness when the lens is removed from the eye.

Metal spatter will also occur, and appropriate eye and skin protection is necessary.

The heat of the welding arc will produce fumes and gases from the metals being welded, the rods and from any applied coatings or contamination on the surfaces being worked on. These gases and fumes may be toxic and inhalation of these should be avoided. The use of extraction ventilation to remove the fumes from the working area may be necessary particularly in cases where the general ventilation is poor, or where considerable welding work is anticipated. In extreme cases or confined spaces where adequate ventilation cannot be provided, air-fed respirators may be necessary.

⚠CAUTION: Some of the components installed to the vehicle e.g. the interior cross beam and underbonnet cross member are manufactured from magnesium alloy. On no account should any welding operations be attempted on these components.

Gas Welding (and Cutting)

Oxy-acetylene torches may be used for welding and cutting, and special care must be taken to prevent leakage of these gases, with consequent risk of fire and explosion.

The process will produce metal spatter and eye and skin protection is necessary.

The flame is bright, and eye protection should be used, but the ultra-violet emission is much less than that from arc welding, and lighter filters may be used.

The process itself produces few toxic fumes, but such fumes and gases may be produced from coatings on the work, particularly during cutting away of damaged body parts, and inhalation of the fumes should be avoided.

In brazing, toxic fumes may be produced from the metals in the brazing rod, and a severe hazard may arise if brazing rods containing cadmium are used. In this event particular care must be taken to avoid inhalation of fumes and expert advice may be required.

SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, FOR EXAMPLE BOILING OR STEAMING OUT OF FUEL TANKS.

Warning Symbols on Vehicles

Decals showing warning symbols will be found on various vehicle components.

These decals must not be removed. The warnings are for the attention of owners/operators and persons carrying out service or repair operations on the vehicle.

Published: 11-May-2011

General Information - Solvents, Sealants and Adhesives

Description and Operation

Solvents

WARNING: Always handle all solvents, sealers and adhesives with extreme care. Some contain chemicals or give off fumes which can be dangerous to health. Always follow the manufacturers instructions. If in doubt about any substance, particularly a solvent, DO NOT use it.

CAUTION: If in doubt about the suitability of any proprietary solvent or sealer for a particular application, contact the manufacturer of the product for information.

The Health and Safety Precautions subsection refers to some commonly used chemicals and materials, hazards associated with their use, and safety measures to be taken. Some of these chemicals may be included as an ingredient in a sealer or adhesive.

Sealers

Certain procedures in this manual involve the use of sealants during installation of components. Where a sealant is required, the application, together with the Land Rover part number is given in the General Specification at the start of each section and an instruction that a sealant must be used appears in the relevant repair procedure.

It is essential that the sealant(s) specified for a particular procedure are used, DO NOT use any other sealant.

Always remove traces of old sealant using a plastic scraper or suitable solvent, never use emery cloth or metal scrapers.

Adhesives

Whenever a procedure involves the use of an adhesive, the adhesive specified must be used and the manufacturer's instructions regarding application together with any health and safety precautions must be followed.

Published: 11-May-2011

General Information - Road/Roller Testing

Description and Operation

Road or rolling road testing may be carried out for various reasons and a procedure detailing pre-test checks, through engine starting and stopping, pre-driving checks, on-test checks to final checks on completion of the test are given.

Unless complete vehicle performance is being checked, the full road test procedure need not be carried out. Instead, those items particularly relevant to the system(s) being checked can be extracted.

Pre-Test Checks

WARNING: If the brake system hydraulic fluid level is low, pedal travel is excessive or a hydraulic leak is found, do not attempt to road test the vehicle until the reason for the low fluid level, excessive pedal travel or hydraulic leak is found and rectified.

It is suggested that pre-test and functional tests of those systems/circuits which affect the safe and legal operations of the vehicle, such as brakes, lights and steering, should always be carried out before the road or rolling road test.

- Engine oil level
- Engine coolant level
- Tires, for correct pressure, compatible types and tread patterns, and wear within limits.
- There is sufficient fuel in the tank to complete the test.
- Check all around the engine, transmission and under the vehicle for oil, coolant, hydraulic and fuel leaks. Make a note of any apparent leaks and wipe off the surrounding areas to make it easier to identify the extent of the leak on completion of the test.

Starting the Engine

• NOTE: On initial drive away from cold and within the first 1.5 km (1 mile), do not depress accelerator pedal beyond half travel until the vehicle has attained a minimum speed of 25 km/h (15 miles/h). Never operate at high engine speed or with the accelerator pedal at full travel whilst the engine is cold.

With the ignition switched off, check:

- The parking brake is applied.
- **Automatic gearbox:** The selector lever is in 'P' - Park
- **Transfer case:** 'H' - High is selected
- All instrument gauges read zero.

With the ignition switched on, check:

- Ignition controlled warning lights come on.
- Engine temperature gauge registers a reading compatible with the engine temperature.
- Fuel gauge registers a reading appropriate to the fuel level in the tank.
- The operation of the parking brake warning light and fluid level warning indicator light.

On Road Test Check:

CAUTION: At commencement of road testing, check the brake operation while still travelling at low speed before continuing with the test. If the brakes pull to one side, or appear to be otherwise faulty, do not continue with the road test until the fault has been found and rectified.

- The parking brake releases completely.
- Gear changing is smooth, and there are no abnormal noises or vibrations from the gearbox.
- The engine power output is satisfactory, acceleration is smooth and accelerator pedal operation is not stiff or heavy, and engine speed returns to idle correctly.
- There is no excessive or abnormally colored smoke from the engine under normal driving, heavy load or overrun conditions.
- Steering operation is smooth, accurate, not excessively heavy or with excessive free play or vibration. Does not pull to one side and self centres smoothly after cornering.
- All instruments register the correct readings and operate correctly.
- Switches and controls operate smoothly and positively, warning or indicator lights operate correctly and the direction indicator control self cancels when the steering is returned to the straight ahead position.
- Heating and ventilation systems work correctly and effectively.
- Brakes operate efficiently.

Brake Testing

Avoid brake testing on busy roads where it can cause inconvenience or danger to other road users.

CAUTION: Brake testing which includes heavy brake applications should not be carried out with new brake pads/discs until the components have bedded-in. New brake friction components will not reach full efficiency until the bedding-in process is complete. Note that when new parking brake shoes or rear brake discs have been installed, it is essential that the 'bedding-in' procedure given in Section 206-05 - Parking Brake Removal and Installation is carried out.

Test the brakes at several speeds within the normal operating range using both light and heavy pedal pressure. Note any tendency to snatch, pull or drag, and any undue delay in application or release.

Allow the vehicle to coast and note any tendency to pull to one side, or evidence that the brakes are binding.

After stopping the vehicle (not immediately after a period of heavy braking), carefully check the brake temperature. A disc which feels appreciably hotter than the others, could indicate that the pads on that disc are binding.

After completion of the test, check for:

- Oil, coolant, hydraulic, air and fuel leaks.
- Abnormal temperature of any moving components or assemblies, e.g. wheel hubs, transmission etc., which might indicate over tightness or lack of lubrication.

Rolling Road Testing

Four-Wheel Rolling Road

CAUTION: When utilising a four-wheel rolling road for testing, ensure all relevant health and safety requirements are adhered to.

Provided that front and rear rollers are rotating at identical speeds and that normal workshop safety standards are applied, there is no speed restriction during testing except any that may apply to the tires.

Ensure that the parking brake is released prior to engaging roller driving mechanism.

Two-Wheel Rolling Road

CAUTION: On no account should an attempt be made to carry out any form of testing on a two-wheel rolling road.

General Information - Special Tool Glossary

Description and Operation

Service Tools

Special service tools have been developed to facilitate removal, dismantling and assembly of mechanical components in a cost effective and time efficient manner. The use of such special tools also helps prevent the potential for damage to components.

Some operations described in this manual cannot be carried out properly without the aid of the relevant service tools.

All orders and enquiries from the United Kingdom and European countries except Germany, Austria, Switzerland and Spain and countries not in the following list should be sent direct to:

SPX UK Ltd.,

Genoa House,

Everdon Park,

Daventry,

Northants,

NN11 5YJ

England

Tel: 0044 (0) 1327 303467/303455

Fax: 0044 (0) 1327 706632

e-mail: spxsalesuk@servicesolutions.spx.com

Overseas orders for the following countries should be placed with the local distributor.

Germany, Austria and Switzerland

SPX Europe GMBH,

Porschestrasse 4,

63512 Hainburg,

Germany

Tel: 0049 61829590

Fax: 0049 6182959299

Spain

SPX Iberica SA,

C/Francisco Aritio,

158 nave 72 (Nudo Oeste),

19004 Guadalajara,

Spain

Tel: 0034 949208381

Fax: 0034 949208327

North America

SPX Corporation

665, Eisenhower Drive,

Owatonna,

MN 55060,

USA

Tel: 0018 772979110

Fax: 0018 005787375

Australia

SPX Australia,

28, Clayton Road,

Notting Hill,

Victoria 3168,

Australia

Tel: 0061 00395446222

Fax: 0061 00395445222

e-mail: sales@spx.com.au

Japan and East Asia

Jatek Ltd.,

5 - 53, Minawacho 2-chome,

Kohoku-ku,

Yokohama,

Kanagawa 223-0051,

Japan

Tel: 0081 455627700

Fax: 0081 455627800

Published: 05-Jul-2011

Identification Codes - Identification Codes

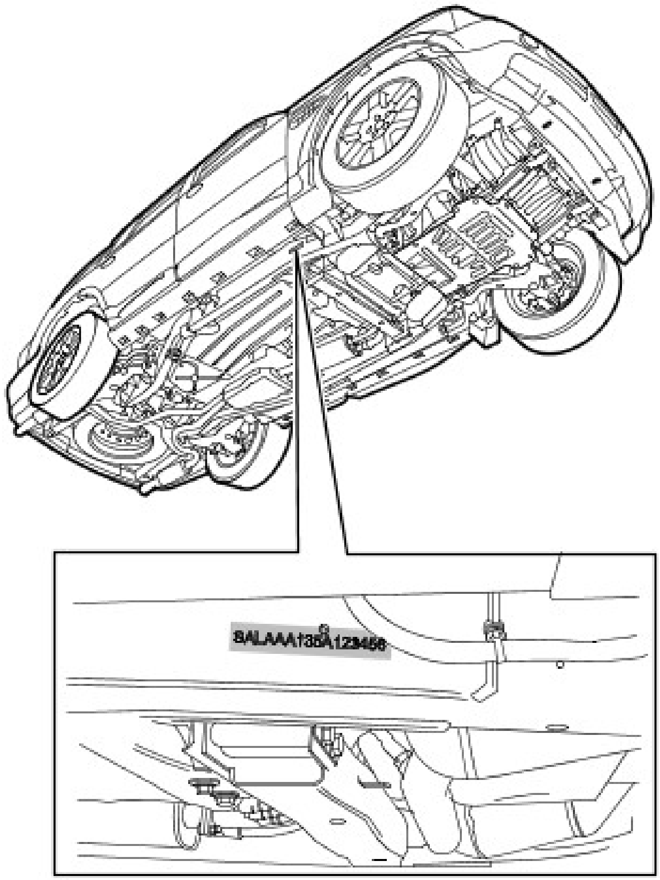
Description and Operation

VIN Number

The VIN number will be found in three locations:

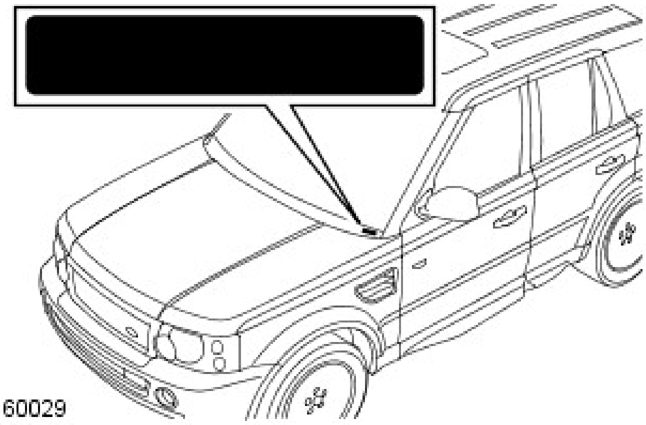
- **1.** Stamped on the side of the RH longitudinal member, rearward of the body front mounting.
- **2.** At the bottom of the windshield glass on the LH side of the vehicle and visible from the outside.
- **3. UK, Europe and ROW - Not NAS/Canada -**On the VIN plate attached to the bonnet locking platform.
- **4. NAS/Canada -** On the Tire Data/Specification label attached to the front of the LH B-pillar.

Longitudinal Member VIN



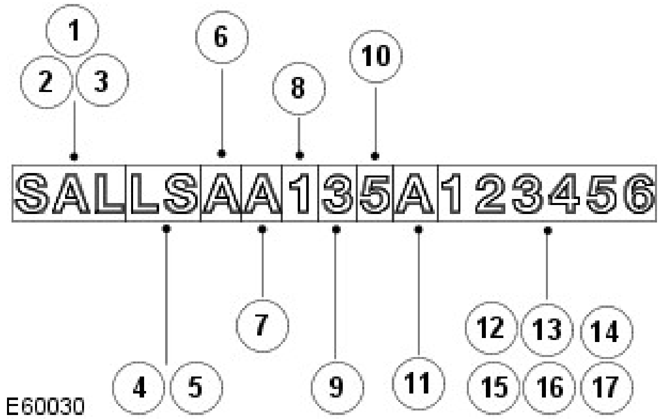
E60028

Windscreen VIN



E60029

VIN number - UK, EU and ROW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SALLSAA135A123456
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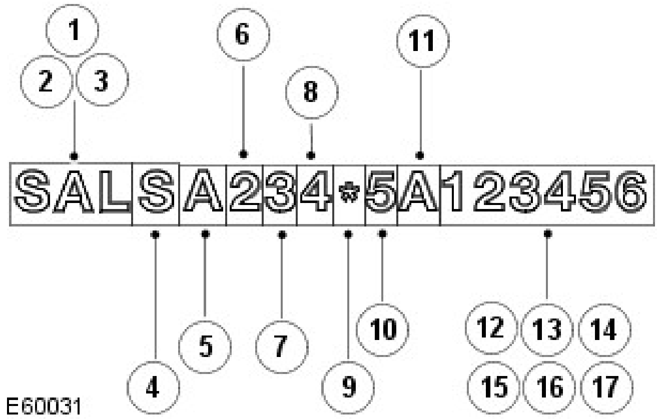
E60030

VIN Position	Character	Identifies
1 - 3 - World identifier	SAL	Land Rover (UK)
4,5 - Vehicle type	LS	Range Rover Sport
6 - Class	A	Standard
7 - Body style	A	4 Door
8 - Engine	1	276DT - V6 2.7 Diesel
8 - Engine	3	428PS - AJV8 4.2 SC Petrol
8 - Engine	5	448PN - AJV8 4.4 Petrol
9 - Transmission and steering	3	RHD Automatic
9- Transmission and steering	4	LHD Automatic
10 - Model year	5	2005
10 - Model year	6	2006
10 - Model year	7	2007
10- Model year	8	2008
11 - Plant	A	Solihull
12 - 17 - Serial number	1 2 3 4 5 6	Unique six digit serial number

VIN number - NAS and Canada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SALSA234*5A123456
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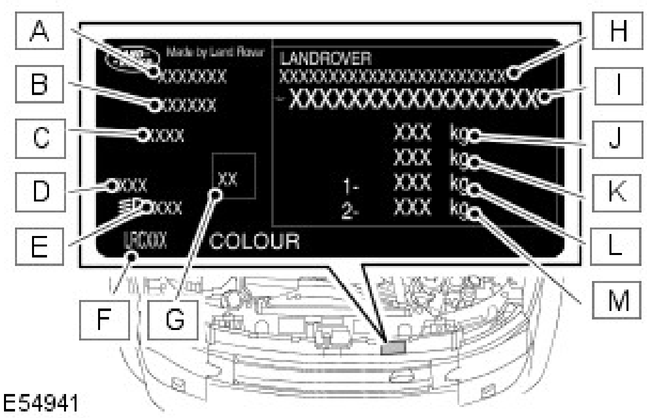
E60031

VIN Position	Character	Identifies
1 - 3 - World identifier	SAL	Land Rover (UK)
4 - Model range	S	Range Rover Sport
5 - Class	A	Standard
6 - Body style	2	4 Door
7 - Engine	3	428PS - AJV8 4.2 SC Petrol
7 - Engine	5	448PN - AJV8 4.4 Petrol
8- Transmission and steering	4	LHD Automatic
9 - Check digit	*	Derived by calculation
10 - Model year	5	2005
10 - Model year	6	2006
10 - Model year	7	2007
10- Model year	8	2008
11 - Plant	A	Solihull

12 -17 - Serial number	1 2 3 4 5 6	Unique six digit serial number

Bonnet locking platform VIN plate - Not NAS/Canada


A
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Made by Land Rover
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LANDROVER
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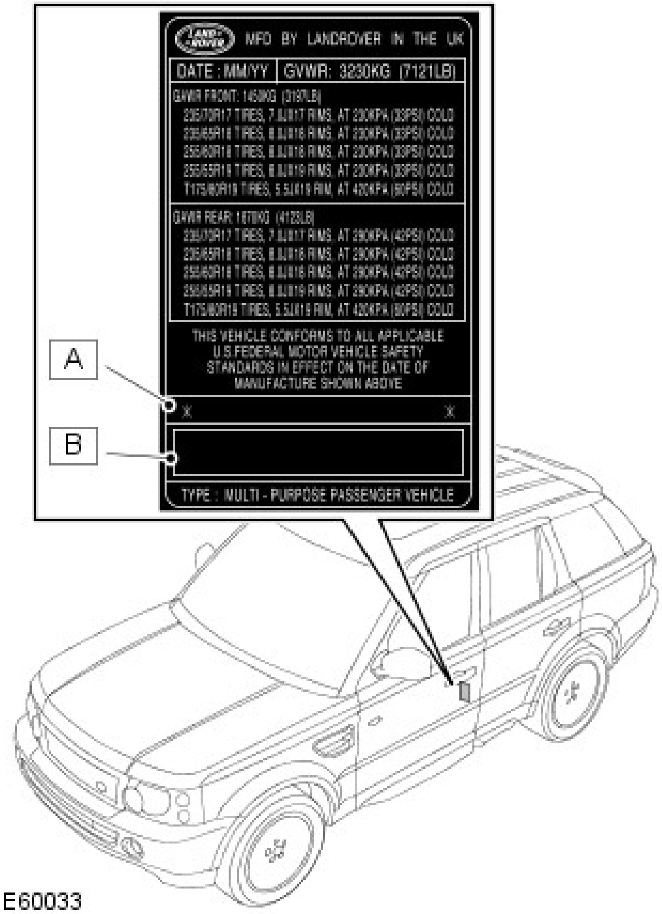
XXX kg
1- XXX kg
2- XXX kg
E54941

The VIN plate contains the following information:

- **A -** Reserved
- **B -** Engine Description
- **C -** Country
- **D -** Diesel Indicator
- **E -** Reserved
- **F -** Headlamp Code/initial aim value - If shown
- **G -** Colour code/group
- **H -** Type/Approval Number - If shown
- **I -** VIN Number
- **J -** Gross Vehicle Weight
- **K -** Gross Train Weight
- **L -** Front Axle Weight
- **M -** Rear Axle Weight

VIN/Certification/Tire Data Label - NAS only



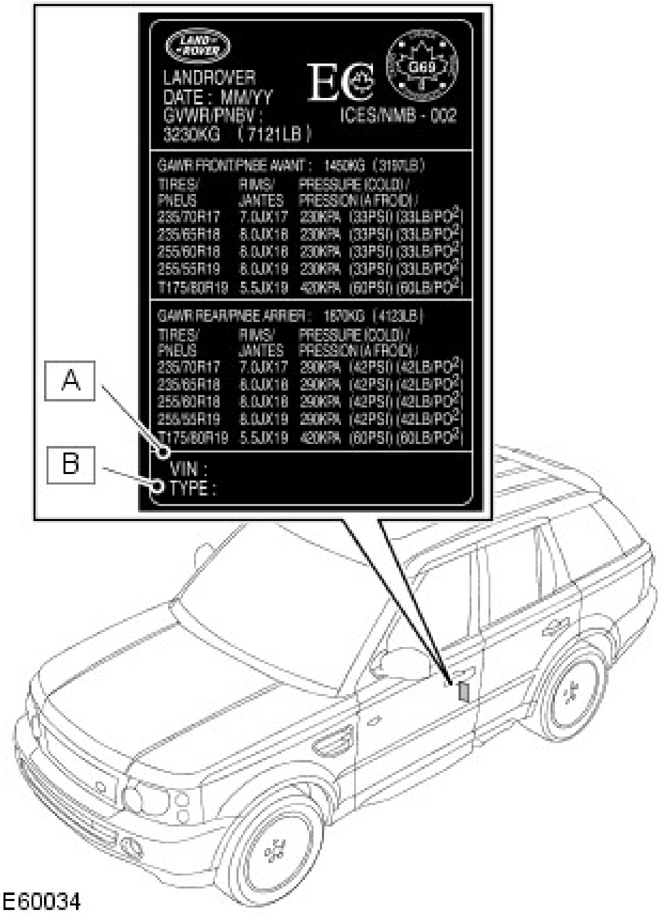
MFD BY LANDROVER IN THE UK
DATE : MM/YY
GVWR: 3230KG (7121LB)
GAWR FRONT: 1450KG (3197LB)
235/70R17 TIRES, 7.5JX17 RIMS, AT 230KPA (33PSI) COLD
235/65R18 TIRES, 8.0JX18 RIMS, AT 230KPA (33PSI) COLD
255/60R18 TIRES, 8.0JX18 RIMS, AT 230KPA (33PSI) COLD
255/65R19 TIRES, 8.0JX19 RIMS, AT 230KPA (33PSI) COLD
T175/80R19 TIRES, 5.5JX19 RIM, AT 420KPA (60PSI) COLD
GAWR REAR: 1870KG (4123LB)
235/70R17 TIRES, 7.5JX17 RIMS, AT 290KPA (42PSI) COLD
235/65R18 TIRES, 8.0JX18 RIMS, AT 290KPA (42PSI) COLD
255/60R18 TIRES, 8.0JX18 RIMS, AT 290KPA (42PSI) COLD
255/65R19 TIRES, 8.0JX19 RIMS, AT 290KPA (42PSI) COLD
T175/80R19 TIRES, 5.5JX19 RIM, AT 420KPA (60PSI) COLD
THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE
X
X
TYPE : MULTI - PURPOSE PASSENGER VEHICLE
A
B

E60033

The Certification Label contains the following VIN information:

- **A -** Vehicle VIN Number
- **B -** Bar code identification

VIN/Tire Pressure Specification Label - Canada only


LANDROVER
DATE : MM/YY
GVWR/PNBV :
3230KG (7121LB)
EC
ICES/NMB - 002
G69
GAWR FRONT/PNBE AVANT : 1450KG (3197LB)
TIRES/ PNEUS
RIMS/ JANTES
PRESSURE (COLD) / PRESSION (A FROID) /
235/70R17 7.0JX17 230KPA (33PSI) (33LB/PO2)
235/65R18 8.0JX18 230KPA (33PSI) (33LB/PO2)
255/60R18 8.0JX18 230KPA (33PSI) (33LB/PO2)
255/55R19 8.0JX19 230KPA (33PSI) (33LB/PO2)
T175/80R19 5.5JX19 420KPA (60PSI) (60LB/PO2)
GAWR REAR/PNBE ARRIER : 1870KG (4123LB)
TIRES/ PNEUS
RIMS/ JANTES
PRESSURE (COLD) / PRESSION (A FROID) /
235/70R17 7.0JX17 290KPA (42PSI) (42LB/PO2)
235/65R18 8.0JX18 290KPA (42PSI) (42LB/PO2)
255/60R18 8.0JX18 290KPA (42PSI) (42LB/PO2)
255/55R19 8.0JX19 290KPA (42PSI) (42LB/PO2)
T175/80R19 5.5JX19 420KPA (60PSI) (60LB/PO2)
VIN :
TYPE :
A
B

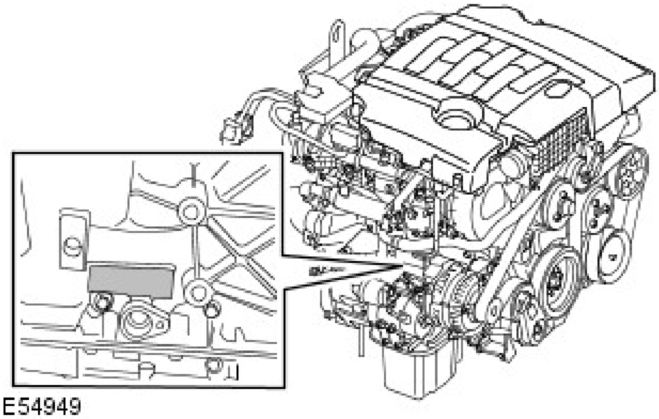
E60034

The Tire Pressure Certification Label contains the following VIN information:

- **A -** Vehicle VIN Number
- **B -** Vehicle Type

Unit/Assembly Serial Number Locations

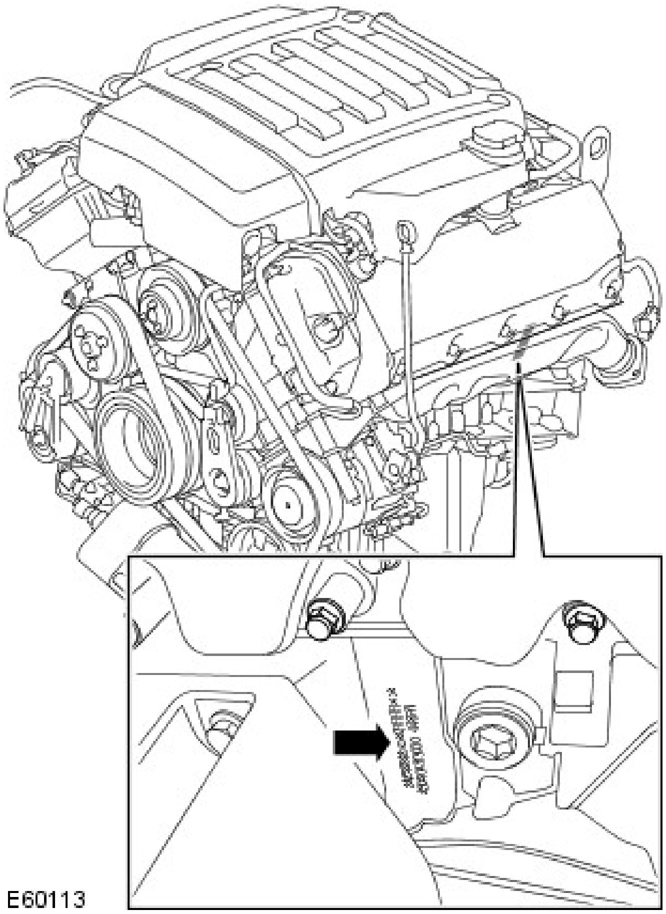
2.7 Litre V6 Diesel Engine Serial Number



E54949

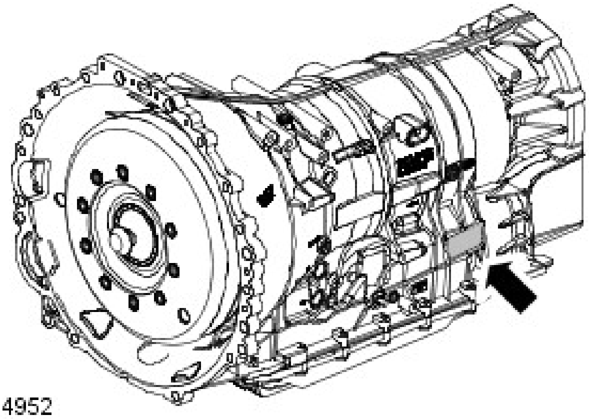
The 2.7 Litre V6 Diesel Engine Serial Number is stamped on the RH side of the cylinder block.

4.4 Litre V8 and 4.2 Litre V8 SC Petrol Engine Serial Number


E60113

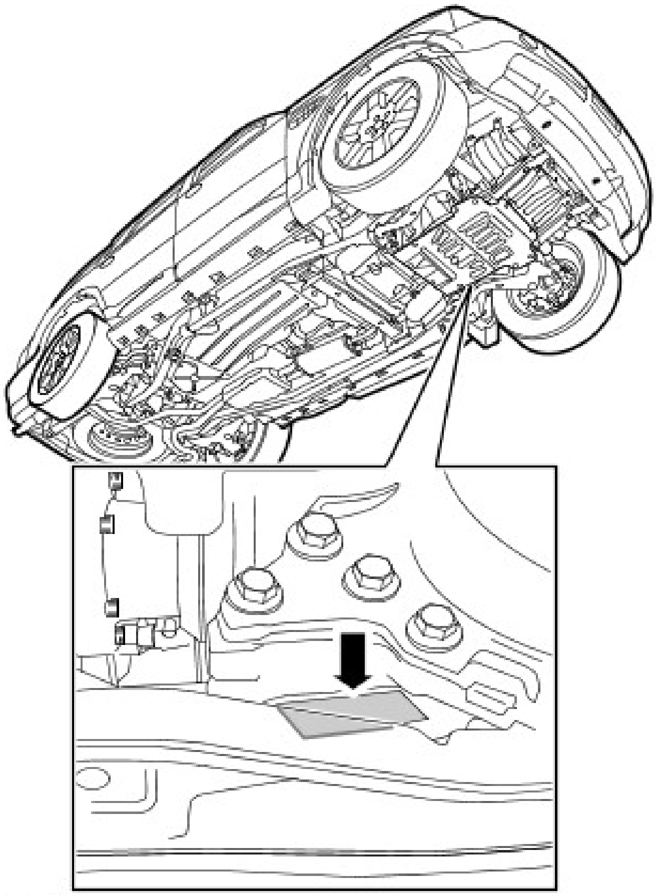
The 4.4 Litre V8 and 4.2 Litre V8 SC Petrol Engine Serial Number is etched into the LH side of the engine block.

Automatic Transmission Serial Number


E54952

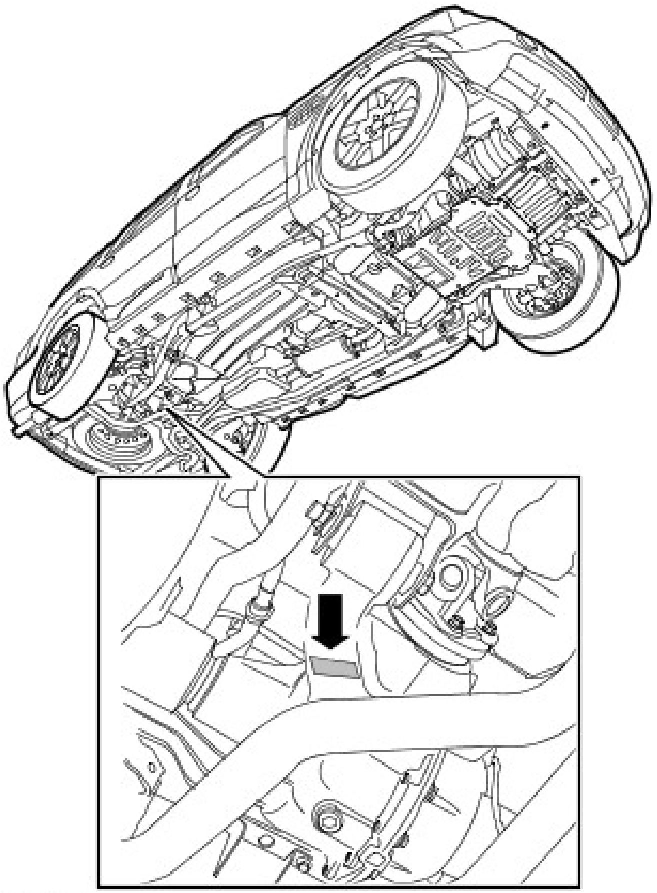
The Automatic Transmission Serial Number is stamped on the rear LH side of the transmission casing.

Front Differential Serial Number


E60036

The Front Differential Serial Number is stamped on the underside of the differential casing and is located above the removable cross member.

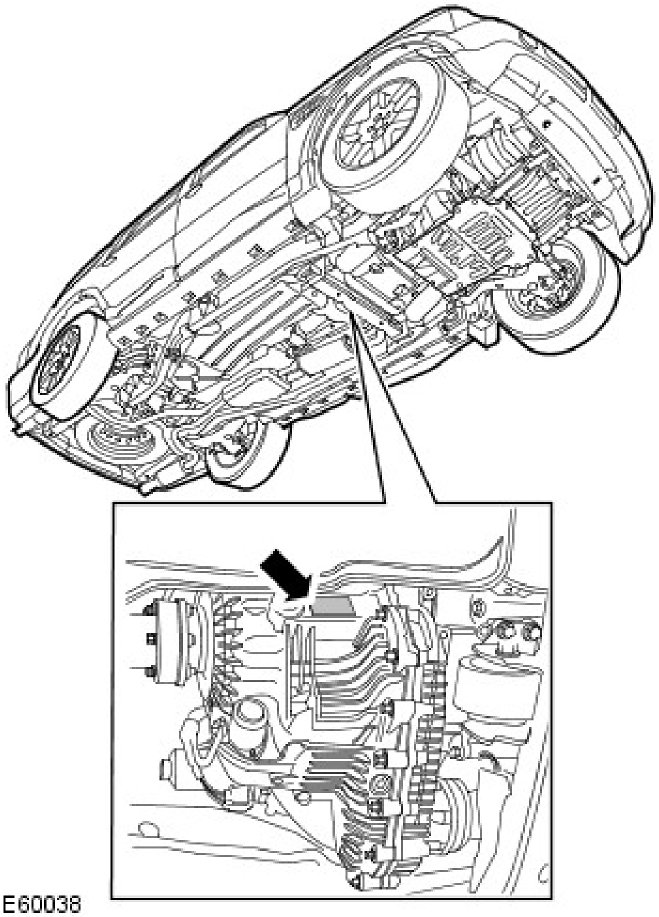
Rear Differential Serial Number



E60037

The Rear Differential Serial Number is stamped on the underside of the differential casing adjacent to the front mounting.

Transfer Case Serial Number



The Transfer Case serial number is stamped on the RH side of the transfer case and may also be on a bar coded self-adhesive label attached to the case.

Published: 11-May-2011

Jacking and Lifting - Jacking

Description and Operation

General

⚠ WARNING: The following instructions must be adhered to before raising the vehicle off the ground:

- Position vehicle on a solid, level surface.
- Apply the parking brake.
- Select 'P' - PARK on automatic transmission selector and 'H' High on transfer case.

⚠ WARNING: If the drive shaft(s) are to be disconnected, it will be necessary to raise all four wheels off the ground in order that the shaft(s) can be rotated. DO NOT use the customer jack and ensure that the vehicle is adequately supported on axle stands. With the vehicle raised, it will be necessary to release the park brake and select Neutral - 'N' in the main transmission to enable the drive shaft(s) to be rotated

• CAUTIONS:

⚠ To avoid damage to the underbody components of the vehicle, the following instructions must be adhered to:

⚠ Do not position jacks or axle stands under the following components:

- Body structure other than any approved jacking or lifting points
- Bumpers
- Fuel lines
- Fuel tank
- Brake lines
- Front or rear suspension arms
- Steering linkage
- Transfer case
- Front or rear differential units
- Transmission
- Engine oil pan - See note below

• NOTE: For certain repair operations, it may be necessary to support the engine under the oil pan. In this case, a block of hardwood or a rubber pad must be positioned on the jack lifting pad to protect the oil pan.

Vehicle jack

The jack provided with the vehicle is only intended for use in an emergency such as changing a tire. DO NOT use the jack for any other purpose. Refer to the Owner's Handbook for the vehicle jack location points and jacking procedures.

⚠ WARNING: Never work under a vehicle supported solely by the vehicle jack.

Hydraulic jack

A hydraulic jack with a minimum lifting capacity of 1500 kg, (3,300 lbs) must be used.

• WARNINGS:

⚠ Do not commence work on the underside of the vehicle until suitable axle stands have been placed in the correct position.

⚠ Always chock the wheels when jacking. The parking brake may be ineffective when the wheel(s) are off the ground.

Raising and Supporting the Vehicle

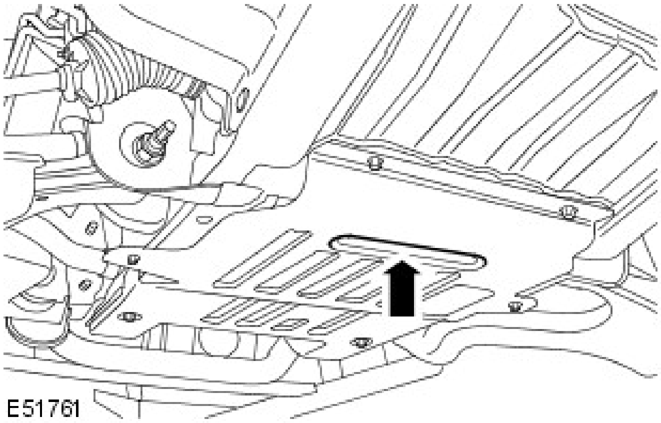
To assist in raising the vehicle, jacking points are provided as shown in the following illustrations.

Raising the Front of the Vehicle

Apply the parking brake.

Select 'P' - PARK on automatic transmission selector.

WARNING: Always chock the rear wheels when jacking the front of the vehicle.

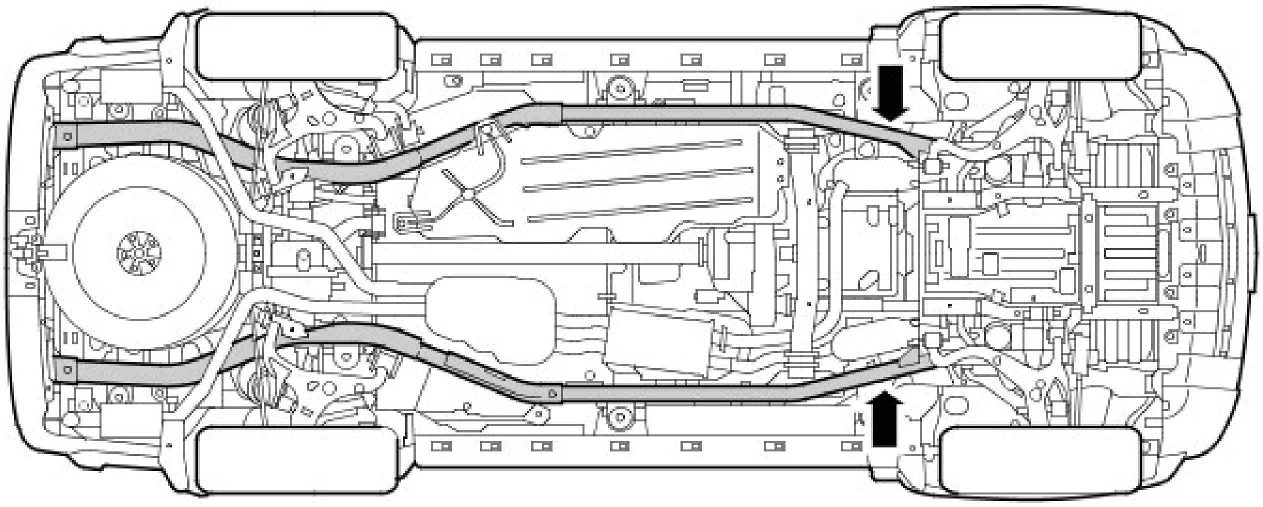


E51761

Position the lifting pad of the hydraulic jack in the centre of the recess in the engine undershield.

• NOTE: If the engine undershield has been removed, position the jack lifting pad in the centre of the front cross beam.

With the vehicle raised to the desired height, position axle stands at positions shown.



E53784

CAUTION: Position suitable material between axle stands and longitudinal members to prevent damage to the longitudinal members.

Carefully lower jack until vehicle rests on axle stands.

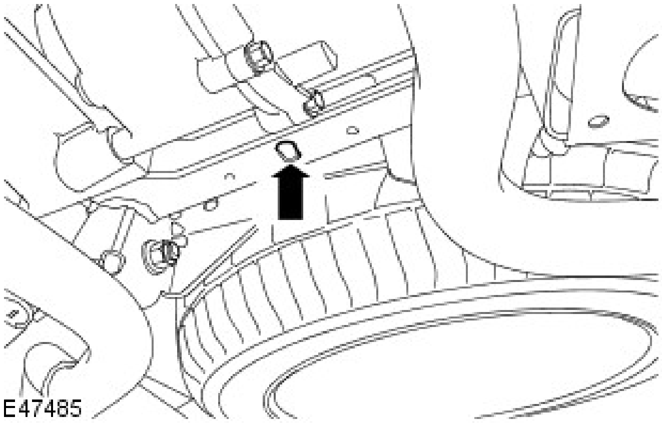
WARNING: Before commencing work on the underside of the vehicle, ensure that axle stands are correctly positioned and vehicle is securely supported.

Reverse procedure when removing vehicle from stands.

Raising the Rear of the Vehicle

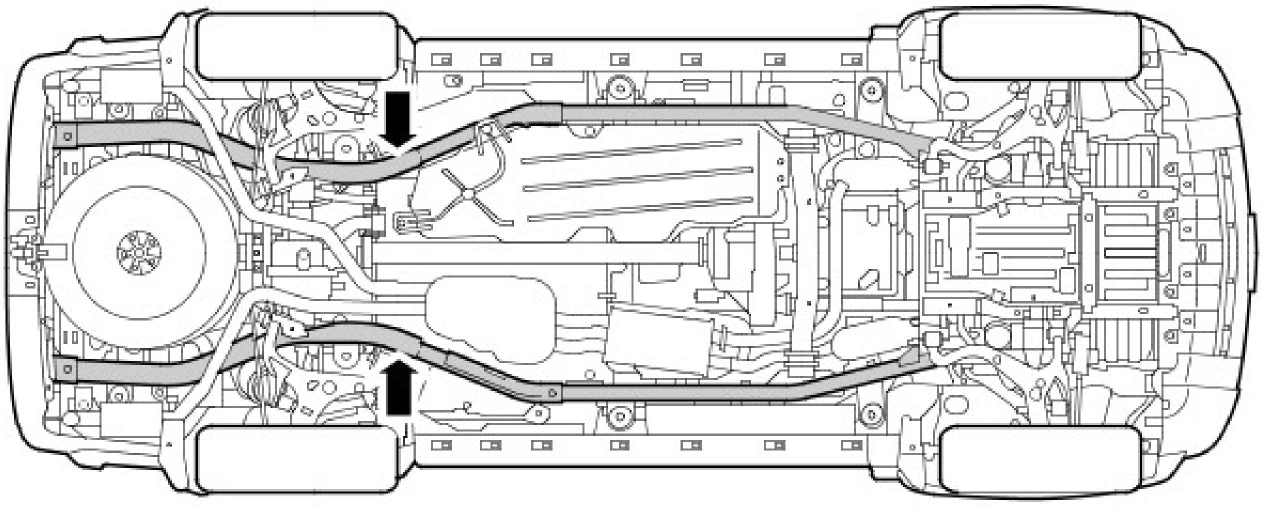
Select 'P' - PARK on automatic transmission selector.

WARNING: Always chock the front wheels when jacking the rear of the vehicle.



Position the lifting pad of the hydraulic jack under the centre of the rear cross member as shown.

CAUTION: Take care that the lifting pad of the jack is of a suitable size to avoid damaging the heat shield. It is not advisable to use a spacer block between the lifting pad and the rear cross member as this may result in some vehicle instability.



With vehicle raised to desired height, position axle stands at positions shown.

CAUTION: Position suitable material between axle stands and longitudinal members to prevent damage to the longitudinal members.

Carefully lower jack until vehicle rests on axle stands.

WARNING: Before commencing work on underside of vehicle, ensure that axle stands are correctly positioned and vehicle is securely supported.

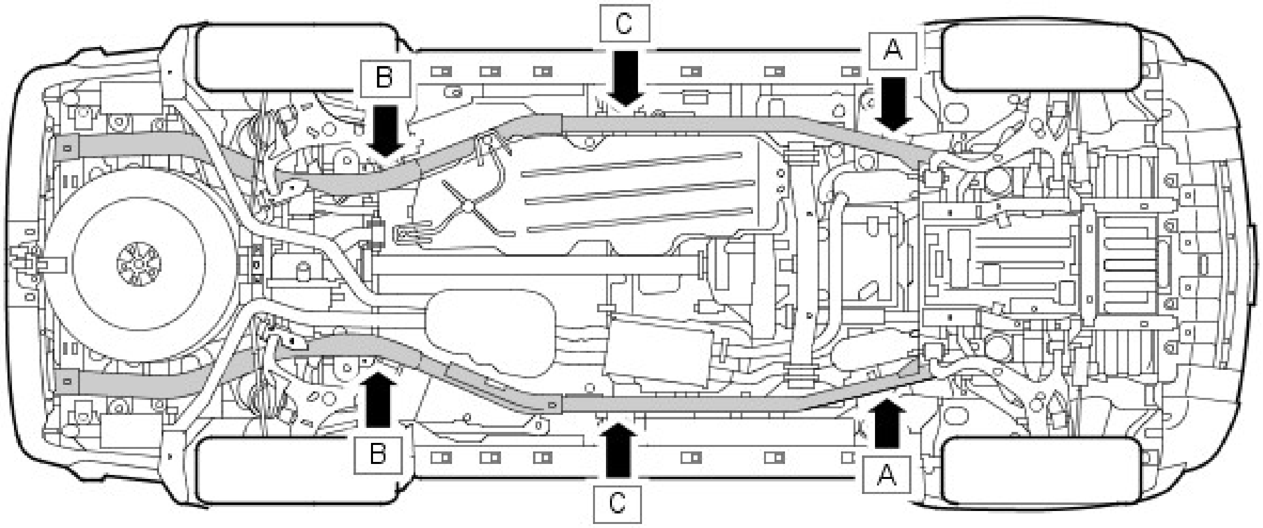
Reverse procedure when removing vehicle from stands.

Raising Vehicle - One Wheel/side

Apply the parking brake.

Select 'P' - PARK on automatic transmission selector.

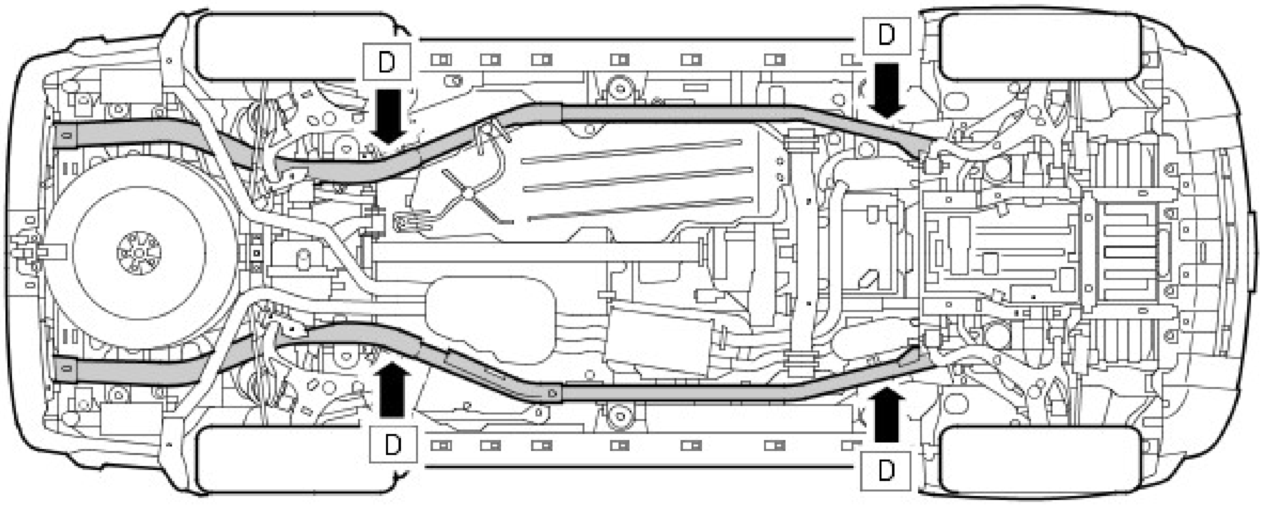
WARNING: Always chock the wheels which are not to be raised.



E47487

- **One front wheel** - position lifting pad of hydraulic jack beneath longitudinal member on the side to be raised at Point 'A'
- **One rear wheel** - position lifting pad of jack beneath longitudinal member on the side to be raised at Point 'B'
- **Front and rear wheels - ONE SIDE** - position lifting pad of jack beneath longitudinal member on the side to be raised at Point 'C'

• NOTE: Point 'C' is in line with number 3 body mounting.



E47488

With vehicle at desired height, position axle stand(s) beneath longitudinal members and adjacent to the lifting pad of the jack at appropriate point(s) D.

CAUTION: Position suitable material between axle stands and longitudinal members to prevent damage to the longitudinal members.

Carefully lower jack until vehicle rests on axle stands.

⚠ WARNING: Before commencing work on underside of vehicle, ensure that axle stands are correctly positioned and vehicle is securely supported.

Reverse procedure when removing vehicle from stands.

Published: 11-May-2011

Jacking and Lifting - Lifting

Description and Operation

Vehicle on Wheels - Four Post Ramp

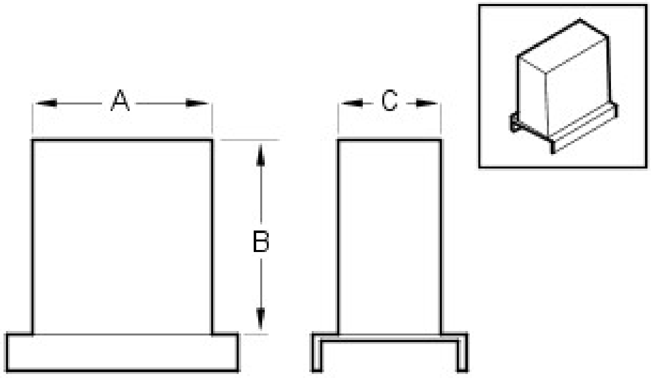
WARNING: If the drive shaft(s) are to be disconnected, it will be necessary to raise all four wheels off the ramp in order that the shaft(s) can be rotated. If the wheel free facility is not to be used, raise the vehicle off the ramp using suitable equipment. With the vehicle raised, position axle stands in the positions shown for the front and rear support blocks - see illustration in Jacking. With the axle stands positioned, release the parking brake and select NEUTRAL 'N' in the transmission.

WARNING: Do not push the vehicle backwards and forwards along the ramp in order to gain access to the drive shaft fixings.

Position the vehicle on the ramp with the front and rear of the vehicle equidistant from the ends of the ramp. Chock the wheels, select NEUTRAL in the transmission and where practicable, apply the parking brake.

Wheel Free Lift - Four Post Ramp

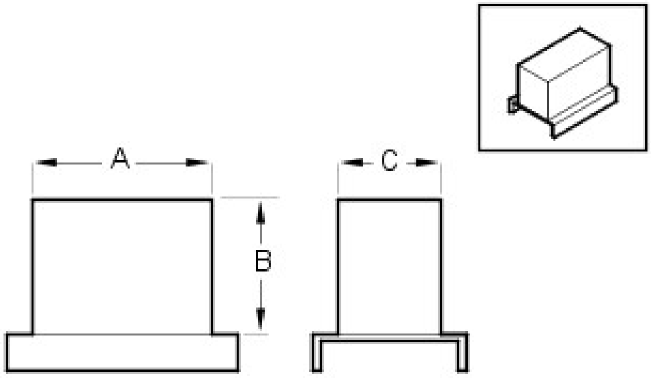
• NOTE: To enable the vehicle to be supported correctly on the wheel free longitudinals, it will be necessary to produce 2 off each of the support blocks to the dimensions given in the accompanying illustrations. The supporting part of each block must be manufactured from suitable hardwood or metal and the 'U' shaped base of each block must be manufactured from metal. Note that it is essential to ensure that the 'U' shaped base of each block is wide enough to fit over the wheel free longitudinals.



E48763

Front Support Block Dimensions

- **'A'** = 127.0 mm (5.0 in)
- **'B'** = 146.0 mm (5.75 in)
- **'C'** = 89.0 mm (3.5 in)



E48764

Rear support block dimensions

- **'A'** = 152.0 mm (6.0 in)
- **'B'** = 101.0 mm (4.0 in)
- **'C'** = 76.0 mm (3.0 in)

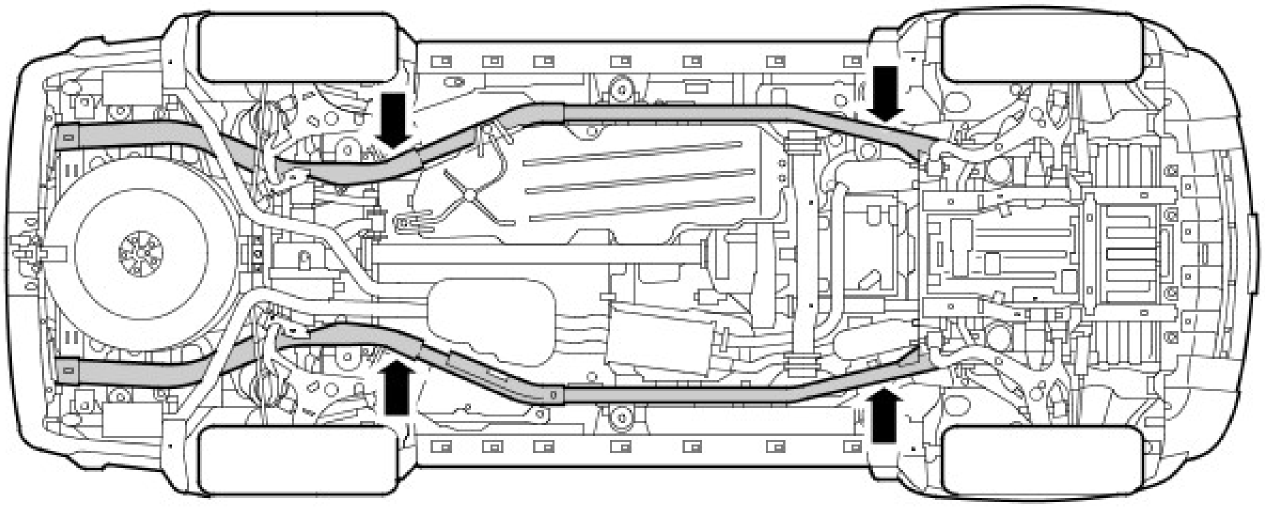
Raising and Supporting the Vehicle

1. Position vehicle on ramp.

2. Position suspension in 'off-road' height.

3. Apply parking brake.

4. Raise ramp to desired height.



E47489

5. Align the wheel free longitudinals beneath the body frame longitudinals and position the support blocks beneath the longitudinals in the positions shown.

⚠ CAUTION: Ensure that the front and rear support blocks are correctly oriented to front and rear of vehicle.

6. Engage wheel free and lower ramp slowly until weight of vehicle rests on support blocks and road wheels are just clear of ramp.

7. Ensure that the vehicle is correctly supported on all four support blocks, that blocks are still correctly positioned and are in full contact with the body frame longitudinals.

8. Lower the ramp.

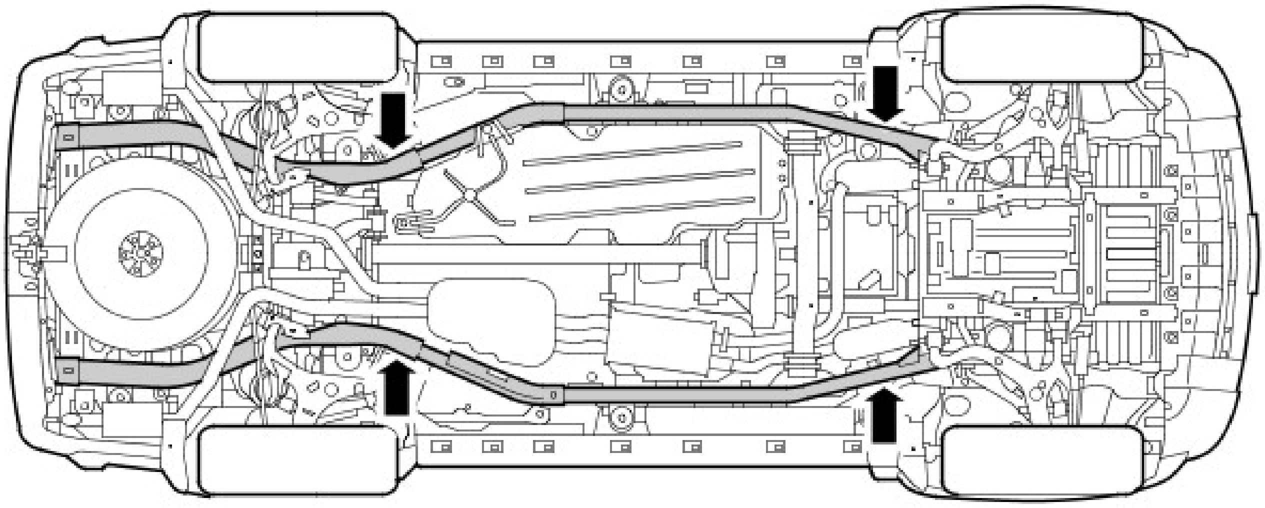
⚠ WARNING: Make sure that the vehicle is stable before commencing work.

• NOTE: Return the suspension to 'normal ride height' when the vehicle is removed from the ramp.

Two Post Lift

⚠ CAUTION: If the drive shaft(s) are to be removed, release the parking brake and select NEUTRAL 'N' in the transmission in order that the shaft(s) can be rotated when the vehicle is raised to the desired height.

1. Position the vehicle with the centre of the lift pillars aligned approximately with the front of the driver/passenger seat cushions.



E47489

2. Extend the lifting arms and position the pad of each lifting arm beneath the body frame longitudinal lifting points.

3. Raise the vehicle until the wheels are just clear of the ground and check that the pads of each lifting arm are still correctly positioned.

4. Raise the vehicle to the desired height.

5. Ensure that vehicle is correctly supported on all four lifting pads, that pads are still correctly positioned and are in full contact with the body frame longitudinals.

WARNING: Make sure that the vehicle is stable before commencing work.

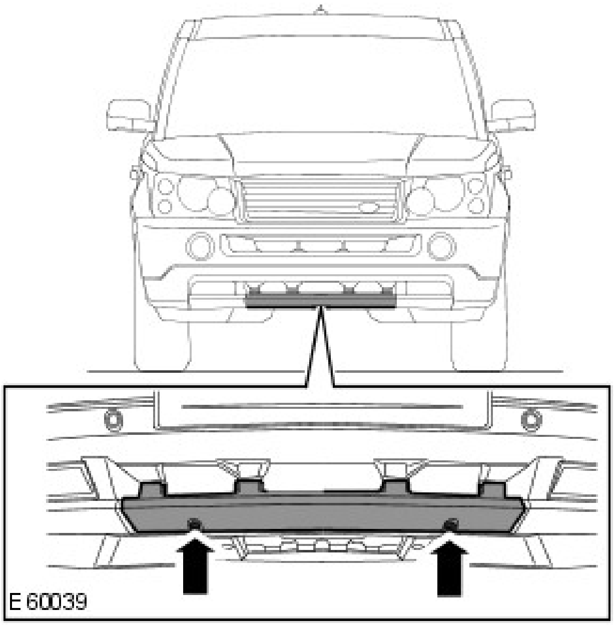
Published: 11-May-2011

Jacking and Lifting - Vehicle Recovery

Description and Operation

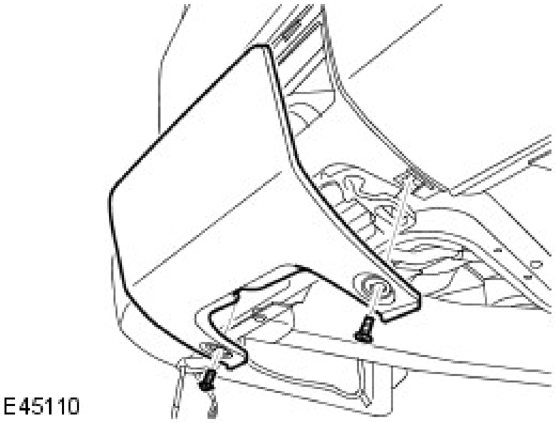
Towing/Lashing eyes

⚠CAUTION: The single towing/lashing eyes at the front and rear of the vehicle are designed for vehicle recovery purposes only and MUST not be used to tow a trailer or caravan.



The front towing/lashing eye is accessible after releasing the 2 toggle fasteners securing the towing eye access panel and removing the panel.

⚠CAUTION: Ensure that during towing, the towing attachment does not contact the bumper.



The rear towing/lashing eye 'A' is accessible after releasing the 2 fasteners securing the access panel to the bumper and removing the panel.

⚠CAUTION: This towing/lashing eye should only be used for towing another vehicle or for recovery purposes to enable this vehicle to be positioned in order that the front towing eye may be used for recovery/towing.

4 Wheel Towing

- CAUTIONS:

⚠ Suspended towing of this vehicle MUST NOT be attempted, if 4 wheel towing is not possible, vehicle must be recovered on a suitable trailer.

⚠ The vehicle may be towed for a maximum of 3 hours or 90 miles (150 km) at a maximum speed of 30 mph (50 km/h), these limits MUST NOT be exceeded.

⚠ The following procedures must be followed to ensure that the vehicle is towed in a safe condition and damage to the vehicle transmission system is prevented.

1. Remove the front towing/lashing eye access panel.

2. Secure the towing attachment from the recovery vehicle to the towing/lashing eye.

⚠CAUTION: Ensure that the towing attachment will not contact the front bumper during towing.

3. Apply the parking brake.

4. Insert ignition key and turn the ignition switch to position 'II'.

⚠CAUTION: If 'N' - Neutral cannot be selected, front and rear propeller shafts must be removed before vehicle is towed.

6. Apply the footbrake and move the selector lever to the 'N' Neutral position.

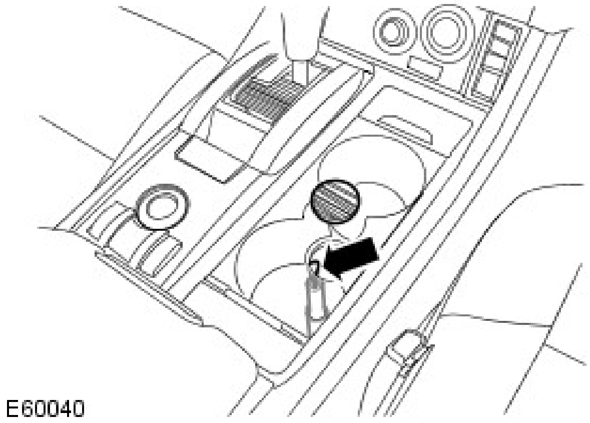
- NOTE: If electrical power is not available, use the manual interlock release tab on the selector lever to move the selector lever to the Neutral position.

7. Select 'H' - HIGH on the transfer case.

⚠CAUTION: If electrical power is not available, and 'H' - HIGH cannot be selected, the vehicle may not be towed but must be recovered on a suitable trailer. If, however, transfer case was in 'H' - HIGH when electrical power was lost, vehicle may still be towed.

8. Release the parking brake.

- NOTE: If electrical power is not available, it will be necessary to release the parking brake manually using the following procedures:



- NOTE: Left hand drive illustrated, right hand drive on opposite side of centre console.

9. Lift out the cup holder inserts from the centre console

10. Remove the access panel from the centre console.

11. Locate the electric parking brake release cable, insert a suitable tool through the cable eye and pull the cable upwards to release the parking brake.

⚠CAUTION: The electric parking brake will not function until electrical power is restored. It will, therefore, be necessary to chock the wheels when vehicle is at a standstill.

⚠WARNING: Do not release the parking brake until towing is about to commence. Whilst towing, do not attempt to remove the ignition key and do not turn the key to any position other than 'II'. With the engine switched off, the power assisted steering system and brake booster will be inoperative thereby resulting in an increase in the effort required to turn the steering wheel and apply the brakes.

⚠CAUTION: The vehicle tow connections should only be used in normal road conditions, 'snatch' recovery must be avoided.

On completion of 4 wheel towing

1. Apply the parking brake or if electrical power is not available, securely chock the wheels.

2. Detach towing equipment from towing/lashing eyes.

3. Fit the towing eye access panel and secure the toggle fasteners.

Transporting by trailer

⚠CAUTION: Use the towing/lashing eyes at the front and rear of the vehicle, DO NOT secure lashing hooks or restraints to any other part of the vehicle.

Position the vehicle, apply the parking brake and select 'N' - Neutral on the automatic transmission selector lever

⚠CAUTION: If electrical power is not available and the parking brake is released, it will not be possible to re-apply the parking brake. It will, therefore be necessary to select 'P' Park and ensure that the vehicle wheels are adequately chocked to prevent vehicle movement.

Published: 11-May-2011

Maintenance Schedules - Maintenance Schedules - Gasoline Engines

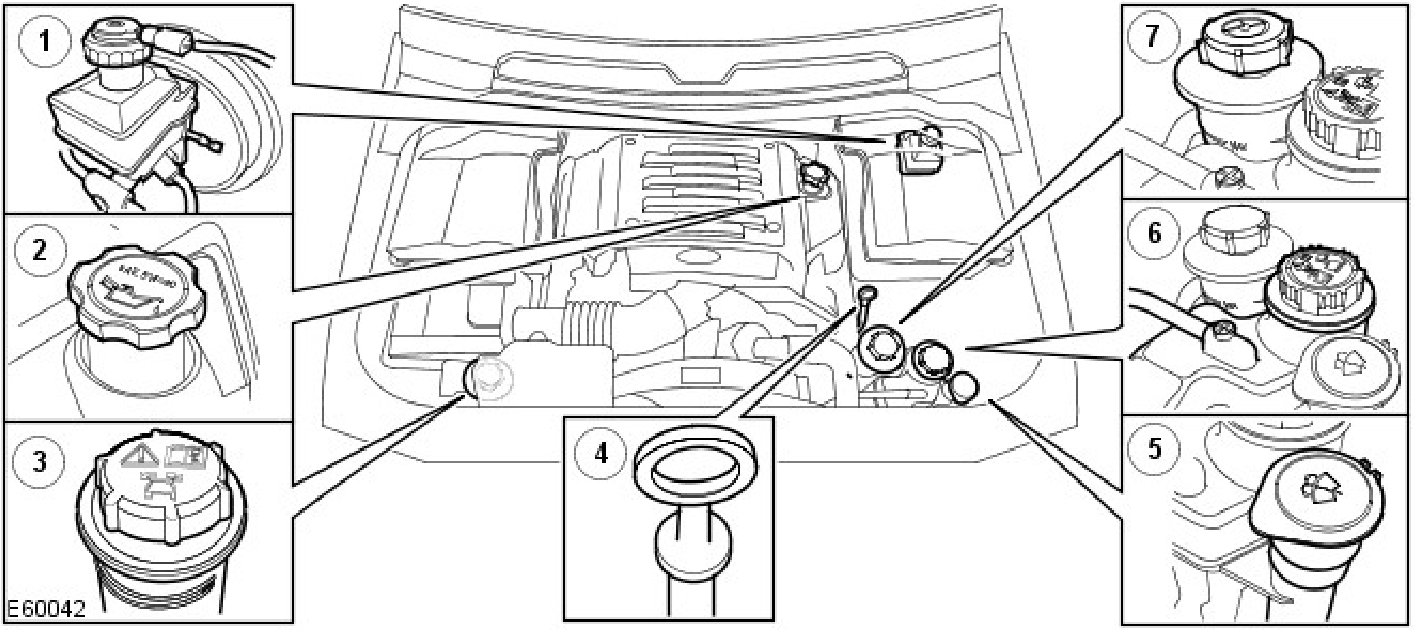
Description and Operation

Torque Specifications

Description	Nm	lb-ft
Seat frame fixing Torx screws	40	30
Seat belt fixing Torx screws	40	30
Road wheel nuts	140	103
M12 tie rod end nuts	76	56

⚠ CAUTION: Unless stated otherwise, the following operations must be carried out at every service interval. Note that the 'A' and 'B' Service Intervals listed on the 'Maintenance Check Sheet' for vehicles operating under arduous conditions, vary from those specified for vehicles operating under normal conditions. Reference must therefore, always be made to the 'Arduous Conditions Maintenance Check Sheet' for vehicles operating under these conditions.

Under Bonnet View - 4.4 Litre and 4.2 Litre Supercharged

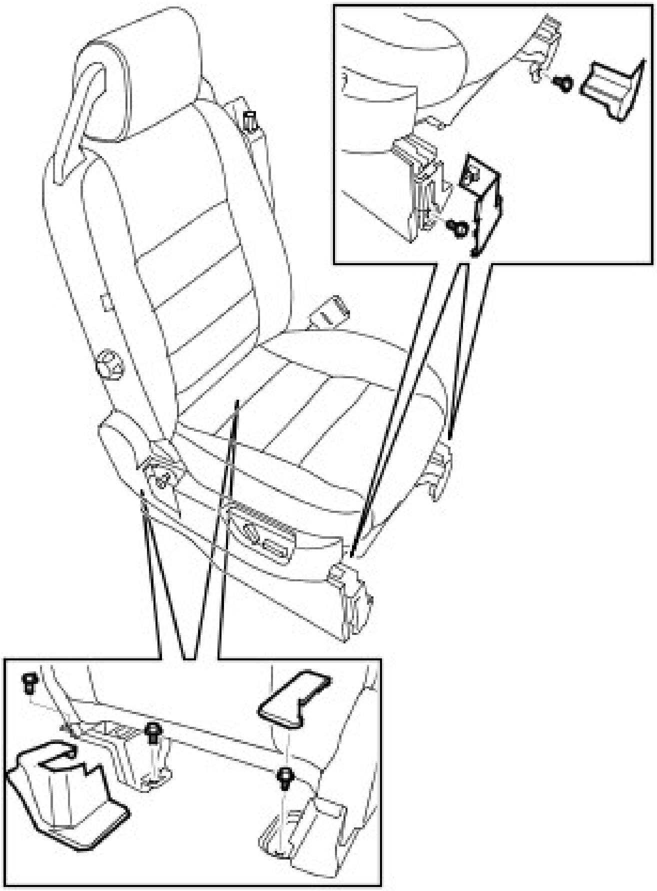


- **1.** Brake fluid reservoir (LH drive illustrated - RH drive on opposite side)
- **2.** Engine oil filler cap
- **3.** Dynamic Response fluid reservoir
- **4.** Engine oil level indicator
- **5.** Windshield washer fluid reservoir
- **6.** Coolant expansion tank
- **7.** Power steering fluid reservoir

Maintenance Operations

Seats and Safety Belts

Front seat frame fixings - Every 2 years or 30,000 miles (48,000 km)



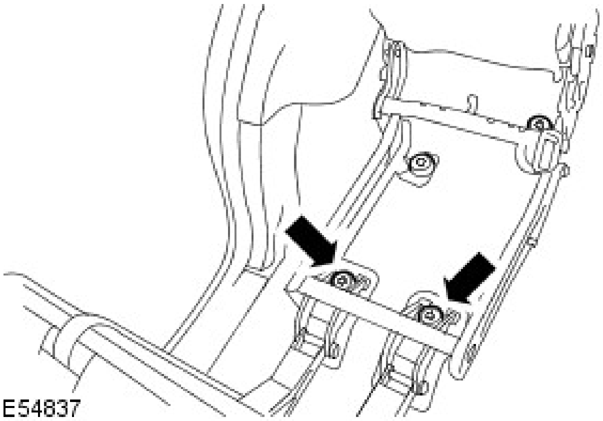
E45101

1. Carefully remove the trim panels covering the seat frame fixing Torx screws.

2. Check that the front seat frame fixing Torx screws are secure and that the seat frames show no signs of movement.

3.Install the trim panels on completion.

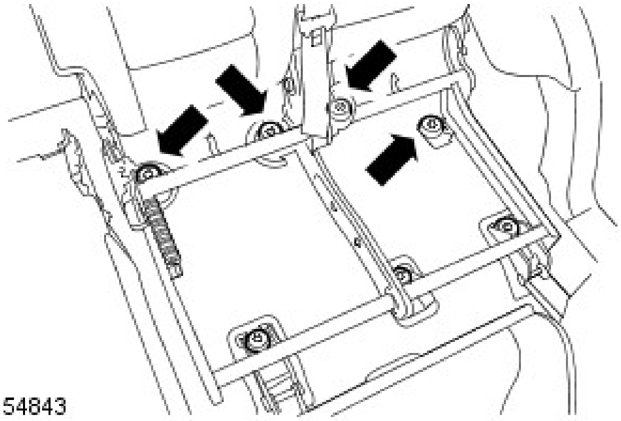
Rear seat frame front fixings - Every 2 years or 30,000 miles (48,000 km)



E54837

4. Check that the rear seat frame front fixings are secure and that the seat frames show no signs of movement.

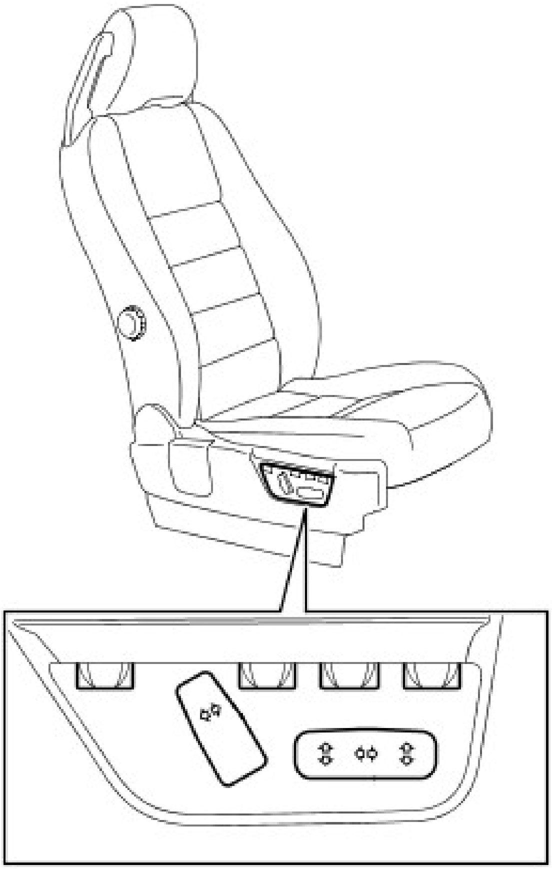
Rear seat frame rear fixings - Every 2 years or 30,000 miles (48,000 km)



5. Fold the seat cushions forwards and check that the rear seat frame rear fixings are secure and that the seat frames show no signs of movement.

6. Fold the seat cushions back on completion.

Front seat controls



7. Check operation of all seat controls.

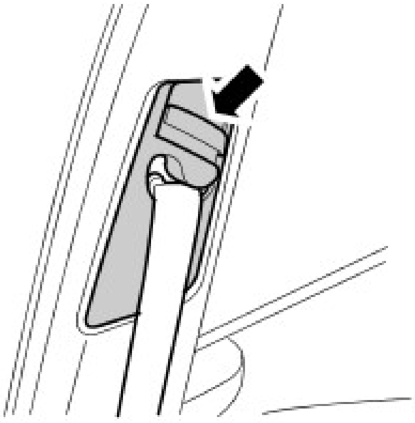
Safety belts - Every 2 years or 30,000 miles (48,000 km)

8. Fully extend each safety belt and check that it returns unassisted; repeat for all belts.

9. Check entire length of safety belt webbing for signs of fraying or damage; repeat for all belts.

10. Connect each safety belt to the correct buckle, check safety belt buckle and tongue are secure; check that buckle releases tongue correctly.

11. Check all safety belt and buckle mountings and fixings for security.


E54871

12. Check front safety belt height adjusters for correct operation.

Lamps, Horns and Warning Indicators

1. Check side, head, fog, reversing and tail lamps for correct operation.

2. Check operation of headlamp automatic levelling system - if installed.

3. Check turn signals and hazard warning lamps for correct operation.

4. Check brake (stop) lamps for correct operation.

5. Check all exterior lamp lenses for clarity and condition; pay particular attention to headlamp and fog lamp lenses for stone chips or damage.

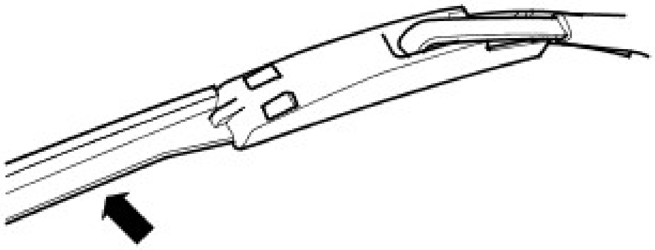
6. Check horn for loud, clear sound.

7. Switch on headlamps and check that side/headlamp reminder warning sounds when door is opened.

8. Check operation of interior courtesy lamps.

9. Check operation of all instrument pack warning and indicator lamps.

Washers and Wipers


E54838

1. Check all wiper blades for condition and signs of splits or damage.

2. Check security of wiper arms.

3. Operate front and rear screen washers, check that jets are clear and correctly aimed.

4. Operate front and rear wipers at all speeds and check for smooth, smear free operation.

Check High/Low Gear Engagement

1. Select LOW range gear, drive vehicle forwards 3 to 4 vehicle lengths, stop vehicle and select HIGH range gear - gears must engage smoothly.

Pollen Filter

1. Replace pollen filter.
For additional information, refer to: Pollen Filter (412-01 Air Distribution and Filtering, Removal and Installation).

Corrosion/Cosmetic Inspection

1. Carry out the annual corrosion/cosmetic inspection using the Annual Corrosion Inspection Sheet.

Wheels and Tires

1. Check that tires comply with manufacturer's specification.
For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation).

2. Check/adjust tire pressures including spare.
For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation).

3. Vehicle fitted with Uni-directional tires: Mark the wheel to stud relationship of each road wheel and note location of each road wheel to its respective hub.

4. Loosen road wheel nuts. Raise vehicle to a wheel free condition.
For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

5. Remove the road wheels.

6. Visually check tires for condition, lumps or bulges. Check tread depth across the width of the tire and around the circumference; make sure that remaining tread depth does not contravene local legislative requirements.

- NOTE: Do not install wheels at this stage.

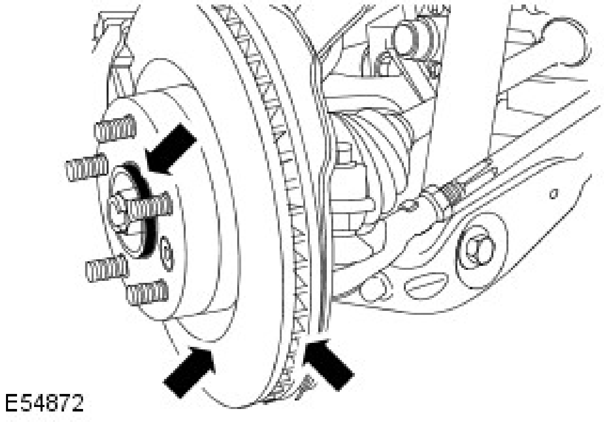
Braking System

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service items must be carried out every 3 months or 3,750 miles (6,000 km)**

1. Inspect front brake pads for wear.
For additional information, refer to: Specifications (206-03 Front Disc Brake, Specifications).

2. Inspect rear brake pads for wear.
For additional information, refer to: Specifications (206-04 Rear Disc Brake, Specifications).

3. Check brake calipers for signs of fluid leaks.



4. Check brake discs for condition.

5. Check all brake booster and brake system pipes and hoses for condition, chafing and leaks.

6. Clean road wheel hub spigots and apply grease, Land Rover Part Number RYL 105020 to the wheel mating surface of each spigot.

7. Vehicles fitted with Uni-directional tires: Install road wheels on their respective hubs ensuring that stud to wheel relationship is maintained.

8. Vehicles fitted with NON uni-directional tires: Install wheels on the opposite side of the vehicle but make sure that they are on the same axle as they were originally installed.

9. Install road wheel nuts and tighten to 140 Nm (103 lb-ft).

CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 2 years or 30,000 miles (48,000 km).**

10. Every 3 years or 45,000 miles (72,000 km): Replace brake fluid.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures) /
Brake System Pressure Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

11. Every 6 years or 90,000 miles (144,000 km): Replace all flexible brake hoses.

Electric Parking Brake

CAUTION: **When vehicles are operating under arduous conditions, the following service items must be carried out every 3 months or 3,750 miles (6,000 km)**

1. Check the adjustment of the electric parking brake.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

2. Vehicles operating under arduous conditions: Check the condition of the electric parking brake system.

Road Wheel Speed Sensors

CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 3 months or 3,750 miles (6,000 km).**

1. Inspect the road wheel speed sensor harnesses for damage.

Radiator and Cooling Fan

1. Vehicles operating under arduous conditions: Visually check radiator for external obstructions, check cooling fan blades for damage.

Air Suspension

1. Every 5 years or 75,000 miles (120,000 km) - Vehicles operating under arduous conditions: Replace air suspension compressor filter.
For additional information, refer to: Air Suspension Air Filter (204-05 Vehicle Dynamic Suspension, Removal and Installation).

Door Locks and Hinges

1. Check operation of all door locks, bonnet lock and fuel filler flap.

2. Lubricate all door check straps, bonnet catch and fuel filler flap catch.

Cooling System

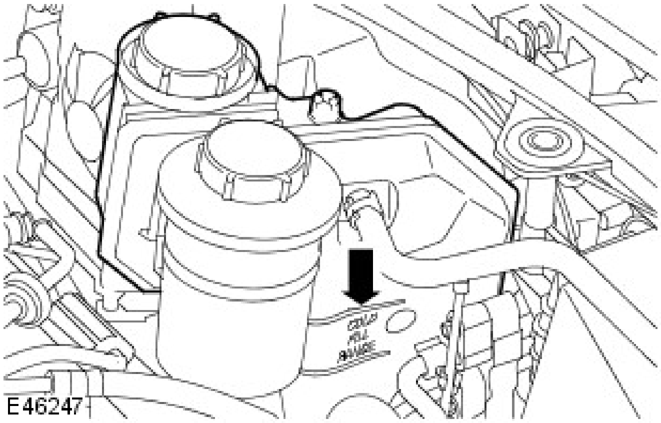
1. Check specific gravity of coolant using a hydrometer.

- NOTE: A suitable hydrometer is available from the Equipment Programme under Part Number 511 3302 001 00.

2. Top-up cooling system if necessary.
For additional information, refer to: Specifications (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Specifications) /
Specifications (303-03B Engine Cooling - V8 4.4L Petrol, Specifications).

CAUTION: **Anti-freeze concentration must be maintained at 50%.**

Cooling system - Check/Top-up



WARNING: **Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank whilst the system is hot.**

CAUTION: **Engine coolant will damage the paint finished surfaces. If coolant is spilled, immediately remove the coolant and wash the area with water.**

1. Check the level of coolant in the expansion tank. With the engine cold, the coolant level must be to the **'UPPER LEVEL'** indicator mark above the **'COLD FILL RANGE'** text on the side of the expansion tank. Ignore any coolant which may be visible in the top section of the tank.

2. If topping-up is required, remove expansion tank filler cap and top-up coolant level to the **'UPPER LEVEL'** indicator mark.
For additional information, refer to: Specifications (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Specifications) /
Specifications (303-03B Engine Cooling - V8 4.4L Petrol, Specifications).

CAUTION: **Always top-up with a 50% mixture of anti-freeze and water.**

3.Install expansion tank filler cap, tighten cap until ratchet is heard to 'click'.

Coolant - Replace

1. Every 10 years or 150,000 miles (240,000 km): Replace the coolant.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures) /
Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

Ignition System

1. Every 12 months or 15,000 miles (24,000 km) Vehicles using LEADED fuel or those fitted with COPPER spark plugs: Replace spark plugs.
For additional information, refer to: Specifications (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Specifications) /
Spark Plugs (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and Installation) /
Specifications (303-07B Engine Ignition - V8 4.4L Petrol, Specifications) /
Spark Plugs (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).

2. Every 3 years or 45,000 miles (72,000 km) - Vehicles operating under arduous conditions: Replace spark plugs.
For additional information, refer to: Specifications (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Specifications) /
Spark Plugs (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and Installation) /
Specifications (303-07B Engine Ignition - V8 4.4L Petrol, Specifications) /
Spark Plugs (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).

3. Every 7 years or 105,000 miles (168,000 km) - 4.4 litre and 4.2 Litre Supercharged V8 engines: Replace spark plugs.
For additional information, refer to: Specifications (303-07B Engine Ignition - V8 4.4L Petrol, Specifications) /
Spark Plugs (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).

Air Filtering

CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 12 months or 15,000 miles (24,000 km).**

1. Every 4 years or 60,000 miles (96,000 km) - 4.4 Litre engine: Replace the air filter element.
For additional information, refer to: Air Cleaner Element (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

2. Every 3 years or 45,000 miles (72,000km) - 4.2 Litre Supercharged engine: Replace the air filter element.
For additional information, refer to: Air Cleaner Element (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

Ancillary Drive Belt

1. Check the condition of the ancillary drive belt.

2. Remove all traces of mud and dirt from the drive belt and pulleys.

3. Check the drive belt for signs of splitting and wear.

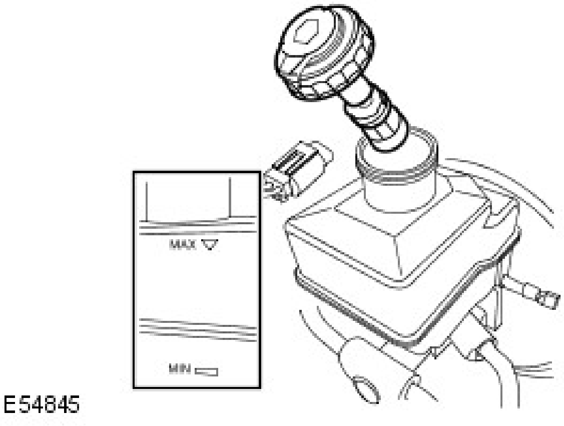
⚠ CAUTION: **When vehicles are operating under arduous conditions, the following service items must be carried out every 5 years or 75,000 miles (120,000 km).**

4. Every 7 years or 105,000 miles (168,000 km) - Vehicles with Dynamic Response installed: Replace the ancillary drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

5. Every 10 years or 150,000 miles (240,000 km) - Vehicles without Dynamic Response installed: Replace the ancillary drive belt.
For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

Fluid Levels

Brake fluid reservoir



1. Remove the brake fluid reservoir cover.

2. Check the fluid level in the brake fluid reservoir, the level must be to the **'MAX'** mark on the reservoir; top-up if necessary.

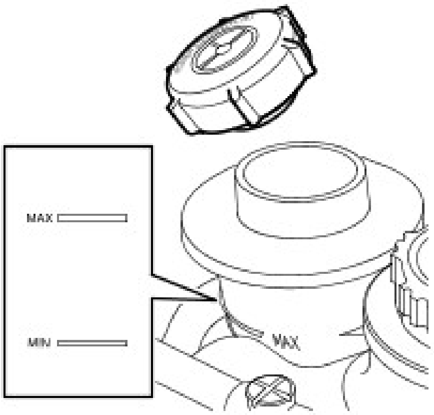
3. Clean the area around the reservoir filler cap, remove cap.

4. If necessary, top-up using the recommended fluid to the **'MAX'** mark on the reservoir.
For additional information, refer to: Specifications (206-00 Brake System - General Information, Specifications).

5. Install the reservoir filler cap.

6. Install the brake fluid reservoir cover.

Power steering fluid reservoir



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⚠CAUTION: **To prevent over filling, check/top-up the system with the engine switched off and the system cold. Make sure that the steering wheel is in the straight ahead position, do not turn the steering wheel prior to checking the fluid level.**

1. Check that the fluid level is to the mid-way mark between the **'MAX'** and **'MIN'** marks on the fluid reservoir, top-up if necessary.

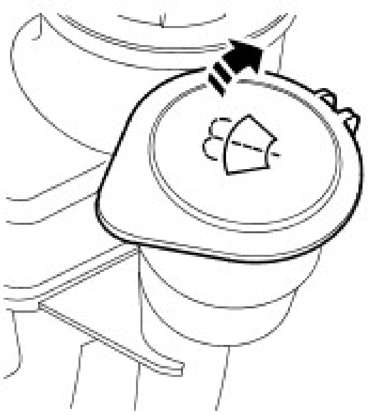
2. Clean the area around the reservoir filler cap, remove cap.

3. If necessary, top-up using the recommended fluid to the mid-way mark on the reservoir.
For additional information, refer to: Specifications (211-02 Power Steering, Specifications).

⚠CAUTION: **Do not fill reservoir above the 'MAX' mark.**

4. Install the reservoir filler cap.

Windshield washer reservoir



E54847

1. Remove the windshield washer reservoir filler cap.

2. Top-up the reservoir using a mixture of an approved windshield washer fluid and water until the level is to the bottom of the gauze filter in the reservoir filler neck.

3. Install the reservoir filler cap.

Dynamic Response reservoir

1. Check that the fluid level is to the mid-way mark between the **'MAX'** and **'MIN'** marks on the fluid reservoir, top-up if necessary.

2. Clean the area around the reservoir filler cap, remove cap.

3. If necessary, top-up using the recommended fluid to the mid-way mark on the reservoir.

Engine Oil and Filter

- CAUTIONS:

⚠ **NAS and Rest of World Vehicles - Not UK and Europe: The following service items must be carried out every 6 months or 7,500 miles (12,000 km).**

⚠ **When vehicles are operating under arduous conditions, the following service items must be carried out every 3 months or 3,750 miles (6,000 km).**

1. Renew engine oil and filter - 4.2 litre supercharged engine.
For additional information, refer to: Specifications (303-01A Engine - V8 S/C 4.2L Petrol, Specifications) /
Engine Oil Draining and Filling (303-01A Engine - V8 S/C 4.2L Petrol, General Procedures).

2. Renew engine oil and filter - 4.4 litre engine.
For additional information, refer to: Specifications (303-01B Engine - V8 4.4L Petrol, Specifications) /
Engine Oil Draining and Filling (303-01A Engine - V8 S/C 4.2L Petrol, General Procedures).

Automatic Transmission

1. Every 10 years or 150,000 miles (240,000 km): Renew automatic transmission fluid - 4.4 litre engine. For additional information, refer to:

> Specifications (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, Specifications),
> Transmission Fluid Drain and Refill (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Renew automatic transmission fluid - 4.2 Litre supercharged engine.
For additional information, refer to: Specifications (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, Specifications) /
Transmission Fluid Drain and Refill (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Transfer Case

1. Every 5 years or 75,000 miles (120,000 km): Renew transfer case oil.
For additional information, refer to: Specifications (308-07B Transfer Case, Specifications) /
Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

Differential Assemblies

1. Every 10 years or 150,000 miles (240,000 km): Renew front differential oil.
For additional information, refer to: Specifications (205-03 Front Drive Axle/Differential, Specifications) /
Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

2. Every 5 years or 75,000 miles (120,000 km): Renew rear 'Electronic Torque Managed (ETM)' differential oil.
For additional information, refer to: Specifications (205-02 Rear Drive Axle/Differential, Specifications) /
Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

3. Every 10 years or 150,000 miles (240,000 km): Renew rear 'OPEN' differential oil.
For additional information, refer to: Specifications (205-02 Rear Drive Axle/Differential, Specifications) /
Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

Suspension and Body Mountings

1. Check for free play in all suspension and body mounting rubbers.

2. Check condition of suspension rubber boots and gaiters.

3.Lift the vehicle so that front wheels are clear of ground/ramp to enable insertion of a suitable lever (e.g. a 1200mm long steel tube). Check the lower ball joints for free play by placing the lever between the ground/ramp and the tire, and lifting the wheel assembly with the lever. A second person will be required to check simultaneously for any ball joint lift. If free play (knock) is noted in the ball joint, replacement is required.

Fuel System

1. Check fuel system pipes, hoses and unions for chafing, leaks and corrosion.

Electrical Harnesses

1. Check all electrical harnesses for chafing.

Oil/Fluid Leaks

1. Check for oil/fluid leaks.

Exhaust System

1. Check exhaust system for leaks, security and damage.

Power Steering

1. Check power steering rod ball joint fixings, gaiters and condition of ball joints and dust covers.

2. Check power steering pipes, hoses and unions for chafing, leaks and corrosion.

- NOTE: M14 tie rod end nuts **do not** require checking.

3. Check torque of the tie rod end nuts - M12 nuts tighten to 76 Nm (56 lb.ft).

Fault Lamp(s)

1. If fault lamp(s) are illuminated, test the associated system using approved Land Rover diagnositc equipment and report findings.

Road Test

1. Carry out road test of vehicle.
For additional information, refer to: Road/Roller Testing (100-00 General Information, Description and Operation).

General

1. Endorse Service Record.

2. Report any unusual features of vehicle condition and any additional work required.

Additional Items That May Require Attention

It is recommended that:

1. Every 6 years: All brake fluid hydraulic seals are replaced.

- NOTE: This is in addition to the maintenance requirement that flexible brake hoses MUST be replaced at this service interval.

2. After 50 miles (80 km) continuous use in severe off-road conditions i.e. wading, deep mud and abrasive grit/slurry: The electric parking brake should be cleaned and inspected.

3. After 50 miles (80 km) continuous use in severe off-road conditions i.e. wading, deep mud and abrasive grit/slurry: The ancillary drive belt should be cleaned and inspected.

4. Vehicles with air suspension: Vehicles used extensively in arduous or off road conditions will require the compressor air inlet filter to be renewed more frequently.

5. Vehicles used in dusty or field conditions or deep wading: More frequent attention to the air cleaner will be required.

Published: 11-May-2011

Maintenance Schedules - Maintenance Schedules - Diesel Engines

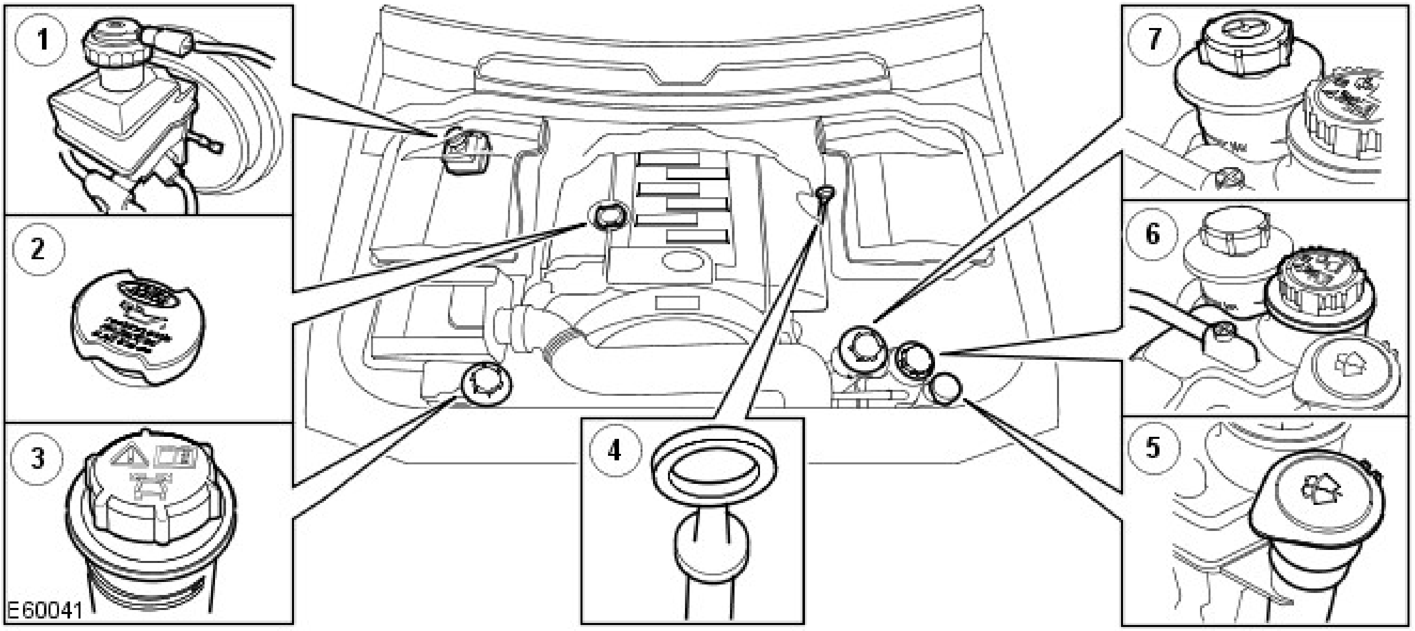
Description and Operation

Torque Specifications

Description	Nm	lb-ft
Seat frame fixing Torx screws	40	30
Seat belt fixing Torx screws	40	30
Road wheel nuts	140	103
M12 tie rod end nuts	76	56

⚠ CAUTION: Unless stated otherwise, the following operations must be carried out at every service interval. Note that the A and B Services listed on the Maintenance Check Sheet, applicable to vehicles operating under arduous conditions, vary both in period and mileage (kilometres) to the intervals specified for those vehicles operating under normal conditions. Reference must therefore, always be made to the 'Arduous Conditions Maintenance Check Sheet' for vehicles operating under these conditions.

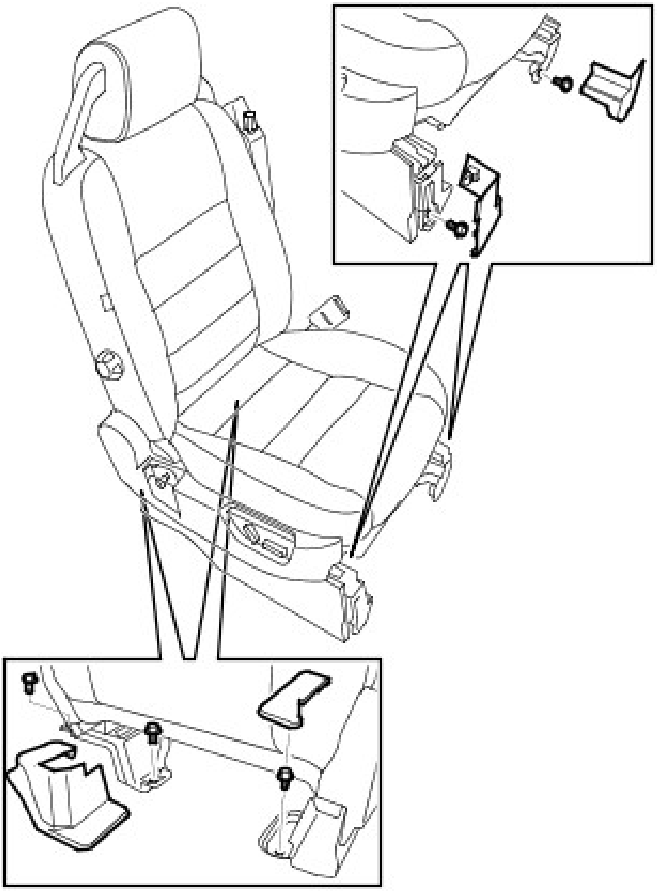
Under Bonnet View - 2.7 Litre



- **1.** Brake fluid reservoir (RH drive illustrated - LH drive on opposite side)
- **2.** Engine oil filler cap
- **3.** Dynamic Response fluid reservoir
- **4.** Engine oil level indicator
- **5.** Windshield washer reservoir
- **6.** Coolant expansion tank
- **7.** Power steering fluid reservoir

Maintenance Operations

Seats and Safety Belts

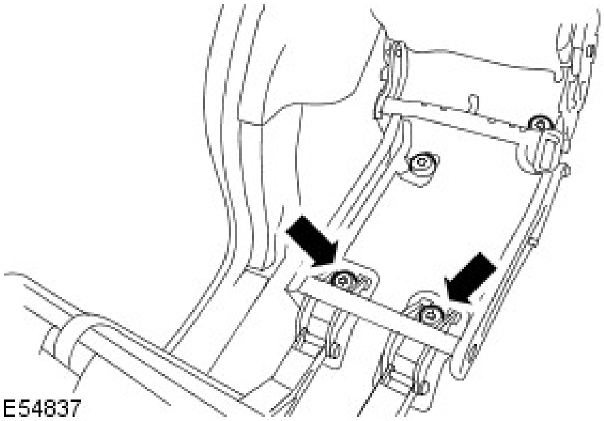


Front seat frame fixings - Every 2 years or 30,000 miles (48,000 km)

1. Carefully remove the trim panels covering the seat frame fixing Torx screws.

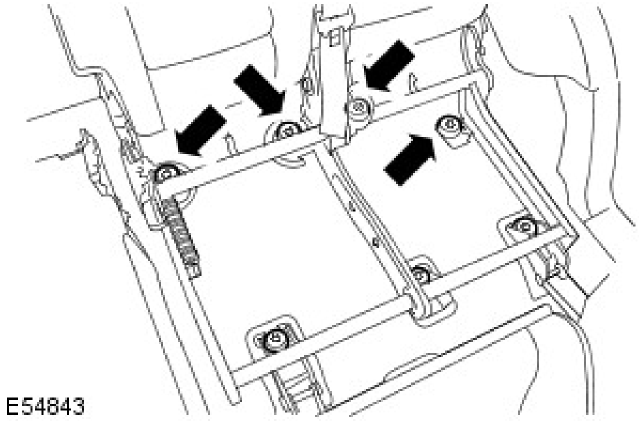
2. Check that the front seat frame fixing Torx screws are secure and that the seat frames show no signs of movement.

3. Reinstall the trim panels on completion.



Rear seat frame front fixings - Every 2 years or 30,000 miles (48,000 km)

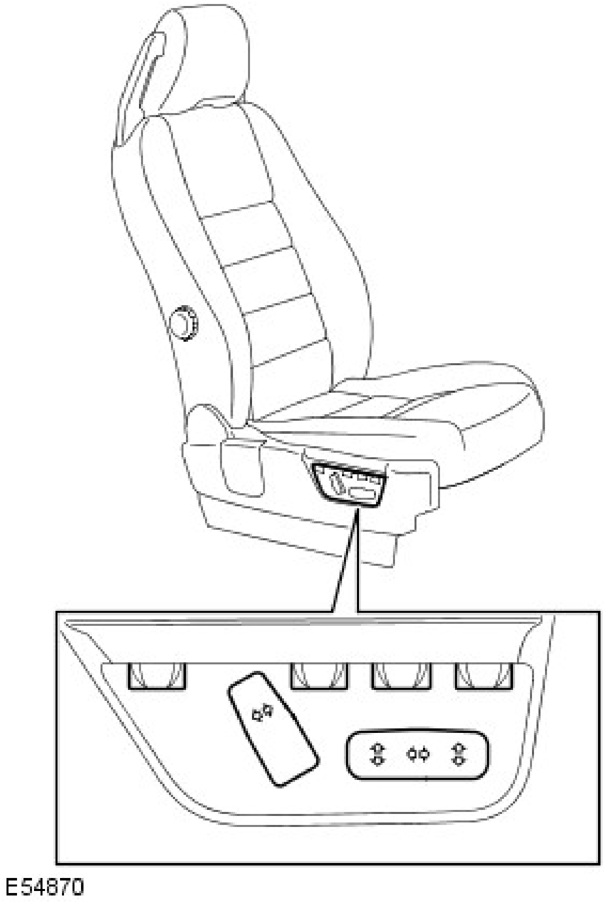
4. Check that the rear seat frame front fixings are secure and that the seat frames show no signs of movement.



Rear seat frame rear fixings - Every 2 years or 30,000 miles (48,000 km)

5. Fold the seat cushions forwards and check that the rear seat frame rear fixings are secure and that the seat frames show no signs of movement.

6. Fold the seat cushions back on completion.



Front seat controls

7. Check operation of all seat controls.

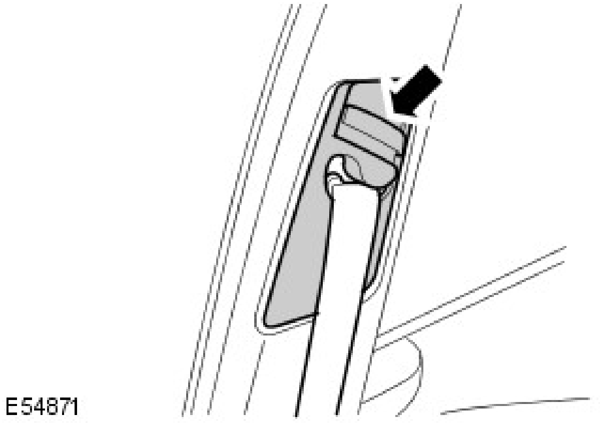
Safety belts - Every 2 years or 30,000 miles (48,000 km)

8. Fully extend each safety belt and check that it returns unassisted; repeat for all belts.

9. Check entire length of safety belt webbing for signs of fraying or damage; repeat for all belts.

10. Connect each safety belt to the correct buckle, check safety belt buckle and tongue are secure; check that buckle releases tongue correctly.

11. Check all safety belt and buckle mountings and fixings for security.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12. Check front safety belt height adjusters for correct operation.

Lamps, Horns and Warning Indicators

1. Check side, head, fog, reversing and tail lamps for correct operation.

2. Check operation of headlamp automatic levelling system - if installed.

3. Check turn signals and hazard warning lamps for correct operation.

4. Check brake (stop) lamps for correct operation.

5. Check all exterior lamp lenses for clarity and condition; pay particular attention to headlamp and fog lamp lenses for stone chips or damage.

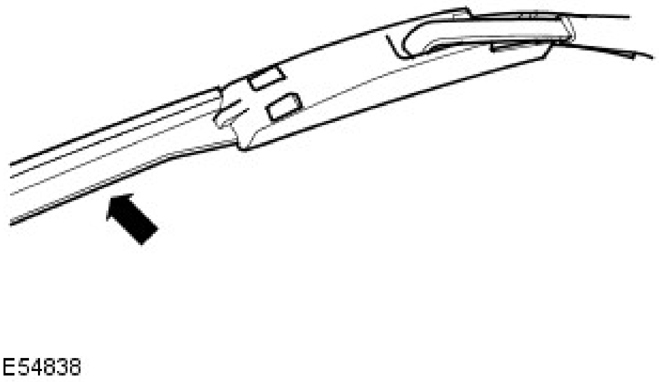
6. Check horn for loud, clear sound.

7. Switch on headlamps and check that side/headlamp reminder warning sounds when door is opened.

8. Check operation of interior courtesy lamps.

9. Check operation of all instrument pack warning and indicator lamps.

Washers and Wipers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1. Check all wiper blades for condition and signs of splits or damage.

2. Check security of wiper arms.

3. Operate front and rear screen washers, check that jets are clear and correctly aimed.

4. Operate front and rear wipers at all speeds and check for smooth, smear free operation.

Check High/Low Gear Engagement

1. Select LOW range gear, drive vehicle forwards 3 to 4 vehicle lengths, stop vehicle and select HIGH range gear - gears must engage smoothly.

Pollen Filter

1. Replace pollen filter.
For additional information, refer to: Pollen Filter (412-01 Air Distribution and Filtering, Removal and Installation).

Corrosion/Cosmetic Inspection

1. Carry out the annual corrosion/cosmetic inspection using the Annual Corrosion Inspection Sheet.

Wheels and Tires

1. Check that tires comply with manufacturer's specification.
For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation).

2. Check/adjust tire pressures including spare.
For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation).

3. Vehicles fitted with Uni-directional tires: Mark the wheel to stud relationship of each road wheel and note location of each road wheel to its respective hub.

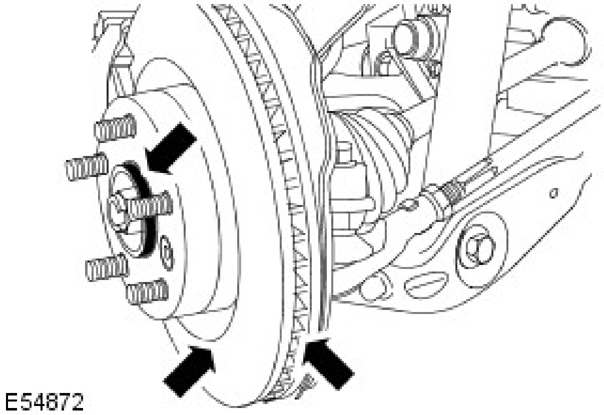
4. Loosen road wheel nuts. Raise vehicle to a wheel free condition.
For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).

5. Remove the road wheels.

6. Visually check tires for condition, lumps or bulges. Check tread depth across the width of the tire and around the circumference; make sure that remaining tread depth does not contravene local legislative requirements.

- NOTE: Do not install wheels at this stage.

Braking System



CAUTION: **When vehicles are operating under arduous conditions, the following service items must be carried out every 3 months or 3,750 miles (6,000 km).**

1. Inspect front brake pads for wear.
For additional information, refer to: Specifications (206-03 Front Disc Brake, Specifications).

2. Inspect rear brake pads for wear.
For additional information, refer to: Specifications (206-04 Rear Disc Brake, Specifications).

3. Check brake calipers for signs of fluid leaks.

4. Check brake discs for condition.

5. Check all brake booster and brake system pipes and hoses for condition, chafing and leaks.

6. Clean road wheel hub spigots and apply grease, Land Rover Part Number RYL 105020 to the wheel mating surface of each spigot.

7. Vehicles fitted with Uni-directional tires: Install road wheels to their respective hubs ensuring that stud to wheel relationship is maintained.

8. Vehicles fitted with NON uni-directional tires: Install wheels on the opposite side of the vehicle but make sure that they are on the same axle as they were originally fitted.

9. Install road wheel nuts and tighten to 140 Nm (103 lb-ft).

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 2 years or 30,000 miles (48,000 km).**

10. Every 3 years or 45,000 miles (72,000 km): Replace brake fluid.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures) /
Brake System Pressure Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

11. Every 6 years or 90,000 miles (144,000 km): Replace all flexible brake hoses.

Electric Parking Brake

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service items must be carried out every 3 months or 3,750 miles (6,000 km)**

1. Check the adjustment of the electric parking brake.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

2. Vehicles operating under arduous conditions: Check the condition of the electric parking brake system.

Road Wheel Speed Sensors

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 3 months or 3,750 miles (6,000 km).**

1. Inspect the road wheel speed sensor harnesses for damage.

Fuel Filter Element

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 12 months or 15,000 miles (24,000 km).**

1. Every 2 years or 30,000 miles (48,000 km): Replace fuel filter element.
For additional information, refer to: Fuel Filter Element - VIN Range: SALLS900302->END OF 06MY (310-01C Fuel Tank and Lines - TDV6 2.7L Diesel, Removal and Installation).

Fuel Sedimentor

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 3 months or 3,750 miles (6,000 km).**

1. Drain the fuel sedimentor.

Radiator/intercooler and Cooling Fan

⚠CAUTION: **Vehicles operating under arduous conditions:**

1. Visually check the radiator/intercooler for external obstructions, check cooling fan blades for damage.

2. Remove any debris from the intercooler using a low pressure hose.

Air Suspension

1. Every 5 years or 75,000 miles (120,000 km) - Vehicles operating under arduous conditions: Replace the air suspension compressor filter.
For additional information, refer to: Air Suspension Air Filter (204-05 Vehicle Dynamic Suspension, Removal and Installation).

Door Locks and Hinges

1. Check operation of all door locks, bonnet lock and fuel filler flap.

2. Lubricate all door check straps, bonnet catch and fuel filler flap catch.

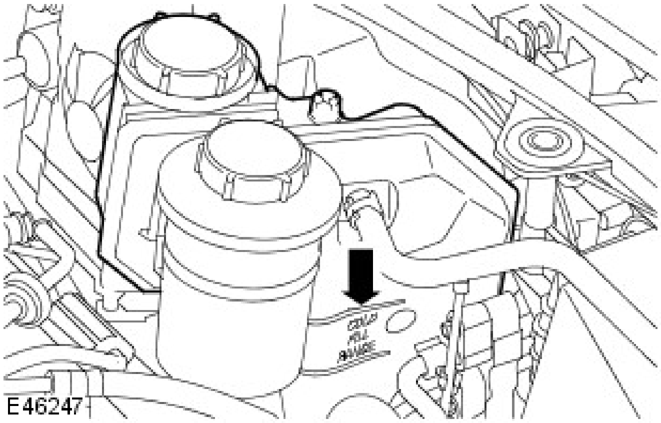
Cooling System

1. Check specific gravity of coolant using a hydrometer.

- NOTE: A suitable hydrometer is available from the Equipment Programme under Part Number 511 3302 001 00.

2. Top-up cooling system if necessary.
For additional information, refer to: Specifications (303-03C Engine Cooling - TDV6 2.7L Diesel, Specifications).

CAUTION: **Anti-freeze concentration must be maintained at 50%.**



Cooling system - Check/Top-up

WARNING: **Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank whilst the system is hot.**

CAUTION: **Engine coolant will damage the paint finished surfaces. If coolant is spilled, immediately remove the coolant and wash the area with water.**

1. Check the level of coolant in the expansion tank. With the engine cold, the coolant level must be to the**'UPPER LEVEL'** indicator mark above the **'COLD FILL RANGE'** text on the side of the expansion tank. Ignore any coolant which may be visible in the top section of the tank.

2. If topping-up is required, remove expansion tank filler cap and top-up coolant level to the **'UPPER LEVEL'** indicator mark.
For additional information, refer to: Specifications (303-03C Engine Cooling - TDV6 2.7L Diesel, Specifications).

CAUTION: **Always top-up with a 50% mixture of anti-freeze and water.**

3. Install expansion tank filler cap, tighten cap until ratchet is heard to 'click'.

Coolant - Replace

1. Every 10 years or 150,000 miles (240,000 km): Replace the coolant.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

Air Filtering

CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 12 months or 15,000 miles (24,000 km).**

1. Every 3 years or 45,000 miles (72,000 km): Replace the air cleaner element.
For additional information, refer to: Air Cleaner Element (303-12C Intake Air Distribution and Filtering - TDV6 2.7L Diesel, Removal and Installation).

Ancillary Drive Belt

1. Check the condition of the ancillary drive belt.

2. Remove all traces of mud and dirt from the drive belt and pulleys.

3. Check the drive belt for signs of splitting and wear.

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 3 years or 45,000 miles (72,000 km).**

4. Every 7 years or 105,000 miles (168,000 km): Replace the ancillary drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

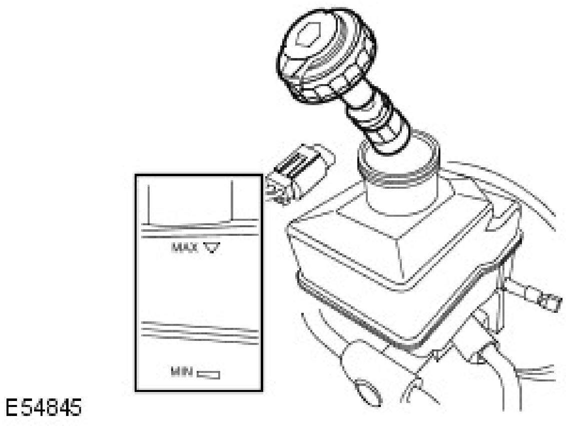
Camshaft Timing Belt and High Pressure Fuel Pump Drive Belt

⚠CAUTION: **When vehicles are operating under arduous conditions, the following service item must be carried out every 4 years or 60,000 miles (96,000 km).**

1. Every 7 years or 105,000 miles (168,000 km): Replace camshaft timing belt.
For additional information, refer to: Timing Belt (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).
Replace High pressure fuel pump drive belt.
For additional information, refer to: Fuel Injection Pump Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

Fluid Levels

Brake/clutch fluid reservoir



1. Remove the brake/clutch fluid reservoir cover.

2. Check the fluid level in the brake/clutch fluid reservoir, the level must be to the **'MAX'** mark on the reservoir; top-up if necessary.

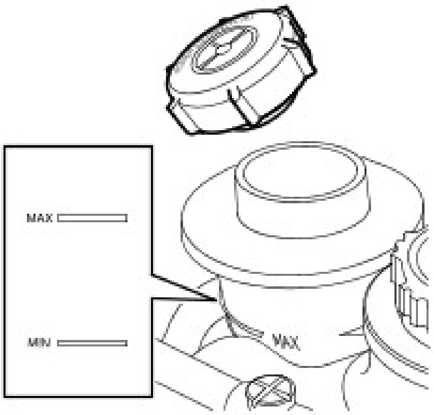
3. Clean the area around the reservoir filler cap, remove the cap.

4. If necessary, top-up using the recommended fluid to the **'MAX'** mark on the reservoir.
For additional information, refer to: Specifications (206-00 Brake System - General Information, Specifications).

5. Install the reservoir filler cap.

6. Install the brake/clutch fluid reservoir cover.

Power steering fluid reservoir



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CAUTION: To prevent over filling, check/top-up the system with the engine switched off and the system cold. Make sure that the steering wheel is in the straight ahead position, do not turn the steering wheel prior to checking the fluid level.

1. Check that the fluid level is to the mid-way mark between the **'MAX'** and **'MIN'** marks on the fluid reservoir, top-up if necessary.

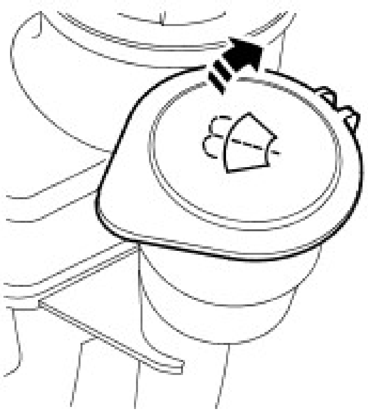
2. Clean the area around the reservoir filler cap, remove the cap.

3. If necessary, top-up using the recommended fluid to the mid-way mark on the reservoir.
For additional information, refer to: Specifications (211-02 Power Steering, Specifications).

CAUTION: **Do not fill reservoir above the 'MAX' mark.**

4. Refit the reservoir filler cap.

Windshield washer reservoir



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1. Remove the windshield washer reservoir filler cap.

2. Top-up the reservoir using a mixture of an approved windshield washer fluid and water until the level is to the bottom of the gauze filter in the reservoir filler neck.

3. Install the reservoir filler cap.

Dynamic Response reservoir

1. Check that the fluid level is to the mid-way mark between the **'MAX'**and **'MIN'**marks on the fluid reservoir, top up if necessary.

2. Clean the area around the reservoir filler cap, remove the cap.

3. If necessary, top-up using the recommended fluid.

Engine Oil and Filter

- CAUTIONS:

⚠ **When vehicles are operating under arduous conditions, the following service item must be carried out every 3 months or 3,750 miles (6,000 km).**

⚠ **Vehicles operating on high sulphur content fuel - above 0.7%, the oil and filter change period MUST NOT exceed 3 months or 3,750 miles (6,000 km).**

⚠ **Vehicles operating on moderate sulphur content fuel - 0.3 to 0.7%, the oil and filter change period MUST NOT exceed 6 months or 7,500 miles (12,000 km).**

1. Renew engine oil and filter.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures) /
Oil Filter Housing (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

Automatic Transmission

1. Every 10 years or 150,000 miles (240,000 km): Renew automatic transmission fluid.
For additional information, refer to: Specifications (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, Specifications) /
Transmission Fluid Drain and Refill (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Transfer Case

1. Every 5 years or 75,000 miles (120,000 km): Renew transfer case oil.
For additional information, refer to: Specifications (308-07B Transfer Case, Specifications) /
Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

Differential Assemblies

1. Every 10 years or 150,000 miles (240,000 km): Renew front differential oil.
For additional information, refer to: Specifications (205-03 Front Drive Axle/Differential, Specifications) /
Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

2. Every 5 years or 75,000 miles (120,000 km): Renew rear 'Electronic Torque Managed (ETM)' differential oil.
For additional information, refer to: Specifications (205-02 Rear Drive Axle/Differential, Specifications) /
Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

3. Every 10 years or 150,000 miles (240,000 km): Renew rear 'OPEN' differential oil.
For additional information, refer to: Specifications (205-02 Rear Drive Axle/Differential, Specifications) /
Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

Suspension and Body Mountings

1. Check for free play in all suspension and body mounting rubbers.

2. Check condition of suspension rubber boots and gaiters.

3.Lift the vehicle so that front wheels are clear of ground/ramp to enable insertion of a suitable lever (e.g. a 1200mm long steel tube). Check the lower ball joints for free play by placing the lever between the ground/ramp and the tire, and lifting the wheel assembly with the lever. A second person will be required to check simultaneously for any ball joint lift. If free play (knock) is noted in the ball joint, replacement is required.

Fuel System

1. Check fuel system pipes, hoses and unions for chafing, leaks and corrosion.

Electrical Harnesses

1. Check all electrical harnesses for chafing.

Oil/Fluid Leaks

1. Check for oil/fluid leaks.

Exhaust System

1. Check exhaust system for leaks, security and damage.

Power Steering

1. Check power steering rod ball joint fixings, gaiters and condition of ball joints and dust covers.

2. Check power steering pipes, hoses and unions for chafing, leaks and corrosion.

- NOTE: M14 tie rod end nuts **do not** require checking.

3. Check torque of the tie rod end nuts - M12 nuts tighten to 76 Nm (56 lb.ft).

Clutch

1. Check clutch pipes and unions for chafing, leaks and corrosion.

Fault Lamp(s)

1. If fault lamp(s) are illuminated, test the associated system using approved Land Rover diagnositc equipment and report findings.

Road Test

1. Carry out road test of vehicle.
For additional information, refer to: Road/Roller Testing (100-00 General Information, Description and Operation).

General

1. Endorse Service Record.

2. Report any unusual features of vehicle condition and any additional work required.

Additional Items That May Require Attention

It is recommended that:

1. Every 6 years: All brake fluid hydraulic seals are replaced.

- NOTE: This is in addition to the maintenance requirement that flexible brake hoses MUST be replaced at this service interval.

2. After 50 miles (80 km) continuous use in severe off-road conditions i.e. wading, deep mud and abrasive grit/slurry: The electric parking brake should be cleaned and inspected.

3. After 50 miles (80 km) continuous use in severe off-road conditions i.e. wading, deep mud and abrasive grit/slurry: The ancillary drive belt should be cleaned and inspected.

4. Vehicles fitted with air suspension: Vehicles used extensively in arduous or off road conditions will require the compressor air inlet filter to be renewed more frequently.

5. Vehicles used in dusty or field conditions or deep wading: More frequent attention to the air cleaner will be required.

6. Vehicles used in areas where fuel quality is poor: Where vehicles are used in these areas, the fuel sedimentor may require draining at more frequent intervals.

Suspension System - General Information -

Air Spring Suspension

Item	Specification
Type	Independent with standard/Dynamic Response stabilizer bars, and air springs with multiple, driver selectable ride heights - Standard, off-road and access.

Steering Geometry - Front

⚠CAUTION: When checking or adjusting front or rear steering geometry, the vehicle must either have a full fuel tank or have sufficient weight placed in the vehicle's load space to give the equivalent weight of a full fuel tank. The weight must be evenly distributed at the front and the right hand side of the load space. The fuel tank capacity is 86.3 litres (18.9 Imperial gallons) (22.7 US gallons). Depending on the amount of fuel in the tank, calculate the amount of weight which must be added:

- 1 litre of fuel weighs 0.8 kg (1.7 pounds)
- 1 Imperial gallon of fuel weighs 3.6 kg (8.0 pounds)
- 1 US gallon of fuel weighs 3.0 kg (6.7 pounds)

Front Suspension at Standard Ride Height	Dynamic (Air) Suspension
Castor	4º 01' ± 45'
	(4.02º ± 0.75º)
Cross Castor	0º ± 45' - Maximum
	(0º ± 0.75º - Maximum)
Camber	-30' ± 45'
	(-0.50º ± 0.75º)
Cross Camber	0º ± 45' - Maximum
	(0º ± 0.75º - Maximum)
King Pin Inclination (KPI)	13º 54'
	(13.9º)
Total Toe - all models except TdV8	- 0º 10' ± 12'
	(- 0.16º ± 0.20º)
Total Toe - TdV8 models only	- 0º 05' ± 12'
	(- 0.08º ± 0.20º)

Steering Geometry - Rear

Rear Suspension at Standard Ride Height	Dynamic (Air) Suspension
Camber	-1° ± 45'
	(-1° ± 0.75º)
Cross Camber	0° ± 51' - Maximum
	(0° ± 0.85º - Maximum)
Total Toe - all models except TdV8	0º 14' ± 0.08'
	(0.24º ± 0.14º)
Total Toe - TdV8 models only	0º 24' ± 0.12'
	(0.40º ± 0.20º)
Thrust Angle	0º ± 8' - Maximum
	(0º ± 0.14º - Maximum)

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Suspension System - General Information - Suspension System

Diagnosis and Testing

Inspection and Verification

WARNING: Before carrying out a road test, make sure the vehicle is safe to do so. Failure to follow this instruction may result in personal injury.

1. **1.** Gather as much information from the driver as possible and verify the customer concern by carrying out a road test, as closely as possible reproducing the conditions under which the fault occurs.
2. **2.** Visually inspect for obvious signs of mechanical damage.

Visual inspection

Mechanical
• Tire pressures • Damaged wheels or tires • Wheel bearing(s) • Loose or damaged front or rear suspension components • Loose, damaged or missing suspension fastener(s) • Damaged or leaking air suspension components • Worn or damaged suspension bushing(s) • Loose, worn or damaged steering system components • Damaged axle components

3. **3.** If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.

Symptom chart

Symptom	Possible causes	Action
Crabbing	• Incorrect rear thrust angle • Front or rear suspension components	Check the rear alignment. REFER to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures). Check the front and rear suspension for signs of damage or wear.
Drift/Pull/Wander	• Tire pressures • Uneven tire wear • Damaged steering components • Wheel alignment • Brake drag • Unevenly loaded or overloaded vehicle	Check and adjust the tire pressures (see visual inspection). Check for uneven tire wear, investigate the cause and rectify as necessary. Check the steering for wear/damage. Check and adjust the wheel alignment as necessary. Check for binding brakes, rectify as necessary. Advise the driver of the load issues.
Front bottoming or riding low	• Damaged suspension components • Air spring fault	Check the suspension components for damage. Check the dynamic suspension. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).
Uneven tire wear	• Incorrect tire pressure (rapid center rib or inner and outer edge	Check and adjust the tire pressures (see visual inspection). Check and adjust the wheel alignment as necessary. REFER to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures). Balance the wheels and tires as necessary.

	wear) - Incorrect front or rear toe (rapid inner or outer edge wear) - Incorrect camber (rapid inner or outer edge wear) - Tires out of balance (tires cupped or dished)	
Harsh ride	- Damaged suspension components - Air spring fault	Check the suspension components for damage. Check the dynamic suspension. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).
Shimmy or wheel tramp	- Wheels/tires - Loose wheel nut(s) - Loose front suspension fasteners - Front wheel bearing(s) fault - Worn or damaged suspension component bushing - Loose, worn or damaged ball joint(s) - Loose, worn or damaged steering components - Front wheel alignment	Check the wheels and tires for condition and balance. Check and tighten the wheel nuts and suspension fasteners to specification. Check the front wheel bearings, suspension bushings, ball joints and steering components for wear or damage. Check and adjust the wheel alignment as necessary. REFER to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).
Poor returnability of the steering (self-centering)	- Steering column - Ball joints - Steering components	Check the steering column universal joints, etc. Check the ball joints and other steering components.
Sway or roll	- Loose front or rear stabilizer bar - Worn lower suspension arm stabilizer bar insulators - Air spring fault	Check the stabilizer bar security and condition. Rectify as necessary. Check the function of the active stabilization system (where fitted). REFER to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Diagnosis and Testing). Check the air springs. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).
Vehicle leans to one side	- Front or rear suspension	Check the front and rear suspension. Check the air springs. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).

	components - Air spring fault	

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Suspension System - General Information - Four-Wheel Alignment

General Procedures

• CAUTIONS:

⚠ Make sure the vehicle is on a flat level surface.

⚠ Make sure the tire pressures are within specification.

⚠ Make sure that only the manufacturers' recommended four wheel alignment equipment is used.

⚠ Make sure there are no heavy objects in the vehicle.

⚠ Make sure the air suspension is set to NORMAL ride height.

⚠ Make sure the steering is in the straight ahead position.

⚠ Make sure the slip plates (turntables) are free to move before adjusting the geometry.

1. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.

- Adjust or repair any worn, damaged or incorrectly adjusted components.

2. Check and adjust tire pressures.

3. Position the vehicle on a calibrated, level, vehicle lift.

4. Release the vehicle parking brake.

5. Using the approved diagnostic tool, check the air suspension control module for fault codes and clear as required.

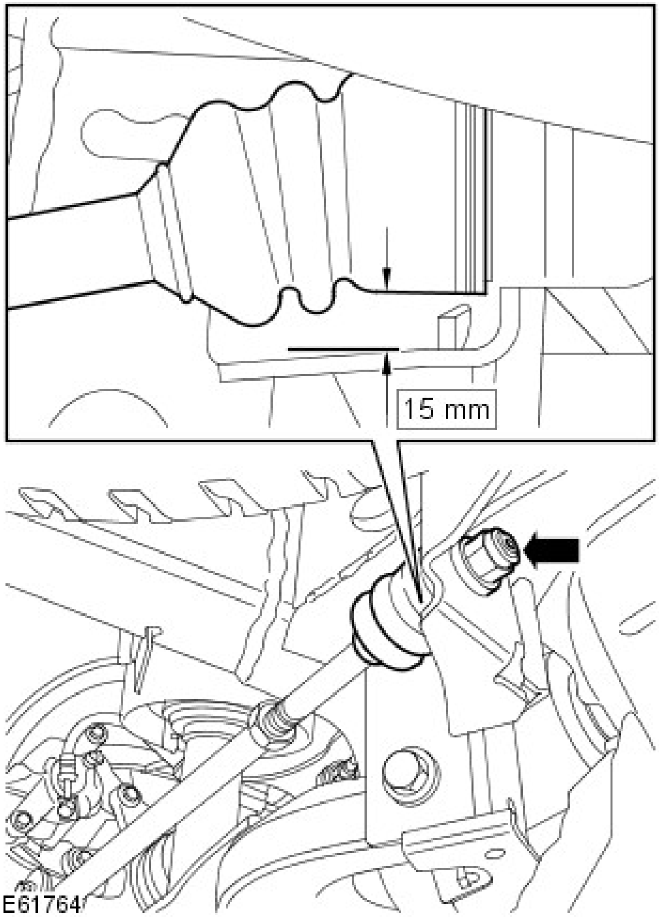
6. Using the diagnostic tool, set vehicle to 'Geometry Set Mode', using the instructions below. Putting the vehicle into this mode will make sure that the ride heights are controlled more accurately.

1. Select the 'Configuration' tab
2. Select 'Set up and Configure'.
3. Select 'Air Suspension'.
4. Select 'Suspension Geometry Set Up'.
5. Select 'Tight Tolerance Mode'.
6. Follow the on-screen instructions until the set up process has finished.

7. NOTE: If rear camber adjustment is required, loosen the rear camber adjustment bolts enough to allow adjustment before starting any other wheel alignment adjustments. Do not fully loosen the rear camber adjustment bolts.

Using only four wheel alignment equipment approved by Land Rover, check and adjust the wheel alignment.

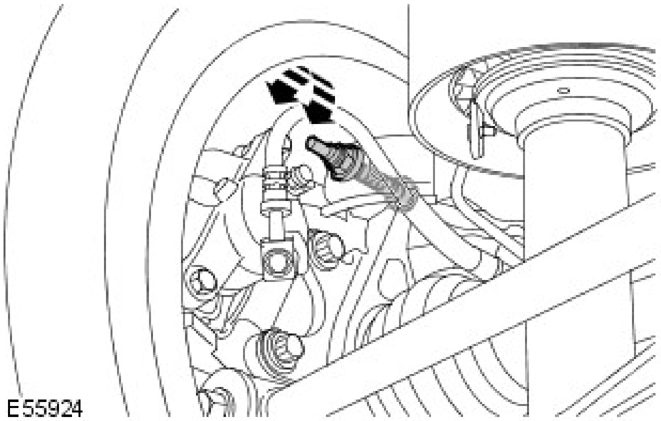
8. ⚠ CAUTION: Make sure the toe link anti-rotation tang is fully seated in the integrated body frame before tightening the toe link retaining nut. Failure to follow this instruction will result in damage to the toe link or integrated body frame.



• NOTE: This step is only required if the toe links have been removed or replaced.

Adjust the rear bump steer.

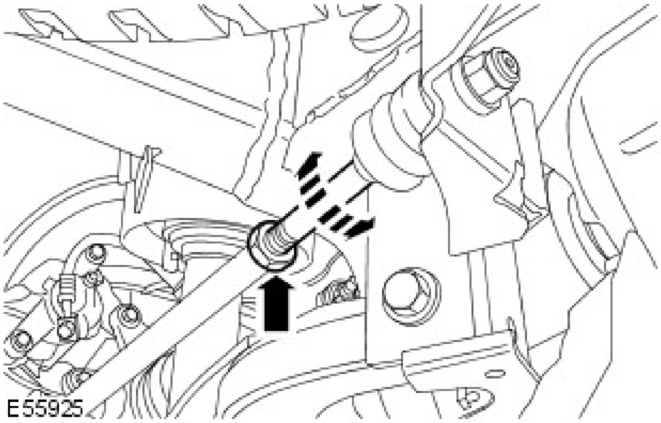
- Loosen the toe link inner ball joint retaining nut.
- Set the gap, between the underside of the toe link rubber boot and the integrated body frame bracket, to 15 mm (0.473 in).
- Tighten the toe link inner ball joint retaining nut to 133 Nm (98 lb.ft)
- Repeat the above procedure for the other side.



9. NOTE: The rear camber adjustment bolts cannot be fully tightened with the rear wheels installed. Do not remove the rear wheels to tighten the rear camber adjustment bolts until all other wheel alignment adjustments have been completed.

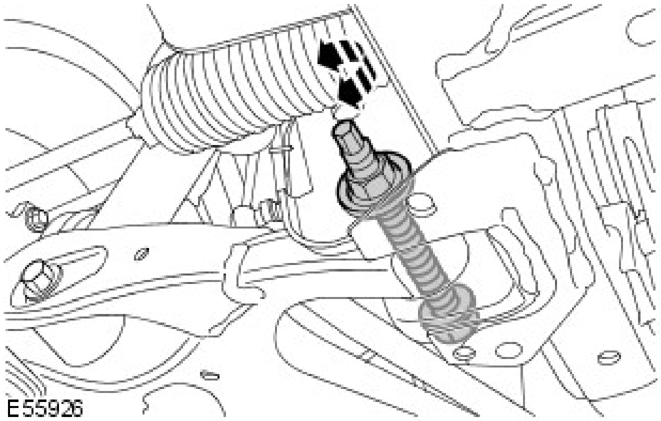
Adjust the rear camber.

- Loosen the rear camber adjusting bolts.
- Rotate the rear camber adjusting bolt until the correct value is obtained.
- Repeat the above procedure for the other side.
- Tighten the rear camber adjusting bolts.



10. Adjust the rear toe.

- Loosen the toe link adjustment locking nut.
- Rotate the toe link inner ball joint until the correct rear toe value is obtained.
- Tighten the toe link adjustment locking nut to 130 Nm (96 lb.ft).
- Repeat the above procedure for the other side.
- Repeat the rear toe measurement.



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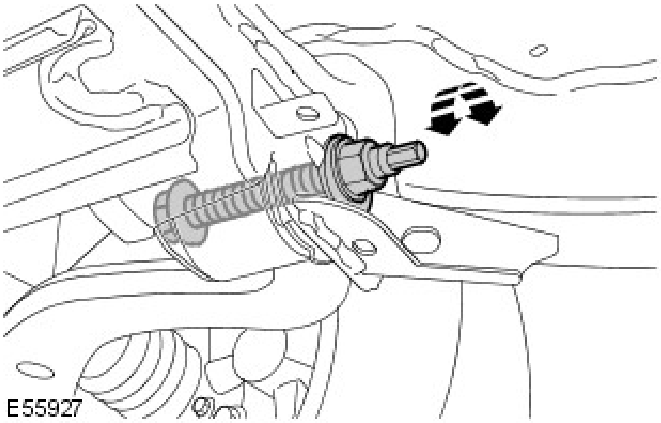
11. ⚠CAUTION: Make sure the slip plates (turntables) are free to move before adjusting the geometry.

Adjust the front camber.

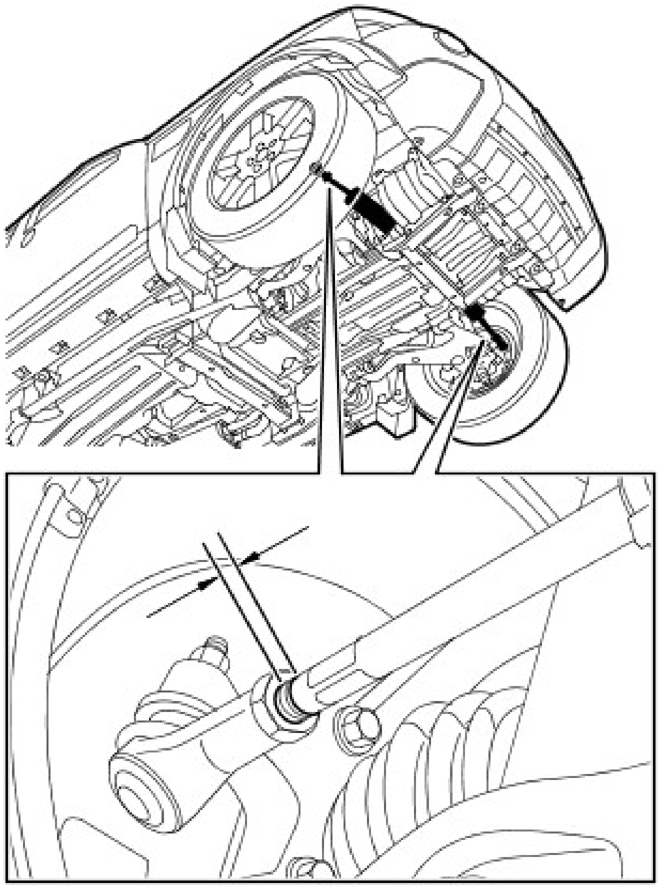
- Loosen the lower arm front camber adjusting bolt.
- Rotate the front camber adjusting bolt until the correct value is obtained.
- Tighten the lower arm front camber adjusting bolt to 275 Nm (203 lb.ft).
- Repeat the above procedure for the other side.



E55927

12. Adjust the front castor.

- Loosen the lower arm rear castor adjusting bolt.
- Rotate the castor adjusting bolt until the correct value is obtained.
- Tighten the lower arm rear castor adjusting bolt.
- Repeat the above procedure for the other side.
- Repeat the castor measurement.
- Repeat the above procedure until both castors achieve the correct value.
- Tighten the lower arm rear castor adjusting bolts to 275 Nm (203 lb.ft).



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13. Align the steering to straight ahead.

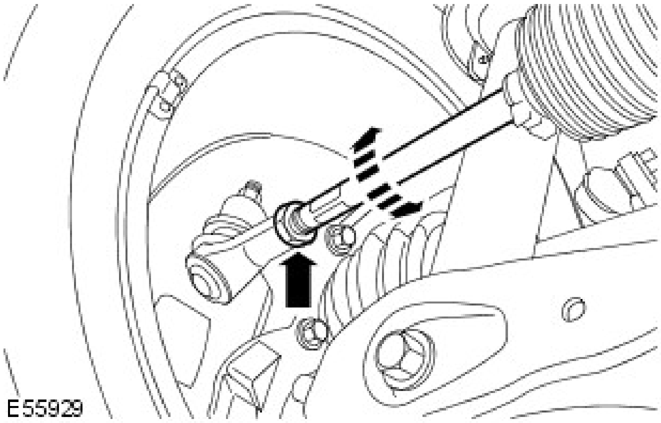
- Measure the length of the exposed thread on each track rod.
- If the exposed thread lengths differ by more than two millimeters:
- Stage one: Loosen one track rod end locking nut.
- Stage two: Rotate the track rod until the lengths of the exposed threads on both track rods are equal.
- Stage three: Tighten the track rod end locking nut.
- Stage four: Rotate the steering wheel until both front toe measurements are equal.

14. If the steering wheel is more than three degrees from the

straight ahead position, remove the steering wheel and reposition on the nearest spline to the straight ahead position.
For additional information, refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).

- Align the steering wheel to straight ahead.

15. Adjust the front toe.



- Loosen the track rod end locking nuts.
- Rotate the track rods to adjust each individual front toe to the correct value.
- Tighten the track rod end locking nuts to 53 Nm (39 lb.ft).

16. Using the diagnostic tool, return the vehicle to 'Normal Mode'.

1. Select the 'Configuration' tab
2. Select 'Set up and Configure'.
3. Select 'Air Suspension'.
4. Select 'Suspension Geometry Set Up'.
5. Select 'Normal Mode'.
6. Follow the on-screen instructions until the normal mode process has finished.

17. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

18. Remove the rear wheels and tires.

19. Tighten the rear camber adjusting bolts to 133 Nm (98 lb.ft).

20. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

21. Calibrate the steering angle sensor using the diagnostic tool.

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Front Suspension -

General Specifications

Item	Specification
Gap between underside of the toe link rubber boot and the chassis bracket	12.0 mm (0.473 in)
Height/distance between centre of halfshaft and edge of the fender trim	462 mm (18.19 in)

Torque Specifications

Description	Nm	lb-ft
* Stabilizer bar link nuts	175	129
Stabilizer bar clamp nuts	115	85
Front axle crossmember bolts	115	85
Shock absorber and spring assembly to lower arm bolt	300	221
Shock absorber top mounting nuts	70	52
* Shock absorber upper bush rebound plate nut	98	72
Heat shield bolts	10	7
* Upper arm and wheel knuckle nut	70	52
* Tie-rod end ball joint nut	70	52
Brake hose retaining bracket to wheel knuckle bolt	25	18
*+ Halfshaft retaining nut	230	169
Brake hose to upper arm bolt	22	16
Upper arm nuts and bolts	175	129
Radiator access panel bolts	10	7
Wheel hub bolts	115	85
Brake disc dust shield bolts	10	7
Lower arm bolts	275	203
Lower arm ball joint retaining nut	115	85
Lower arm front camber adjusting bolt	275	203
Lower arm rear castor adjusting bolts	275	203
Toe link inner ball joint retaining nut	133	98
Rear camber adjusting bolts	133	98
Track rod end locking nuts	53	39
Wheel speed sensor bolt	10	7
Axle carrier bushing bolt - M14	105	77
Axle carrier bracket bolts	80	59
Road wheel nuts	140	103

*** New nut/bolts must be installed**

+ Stake nut on completion

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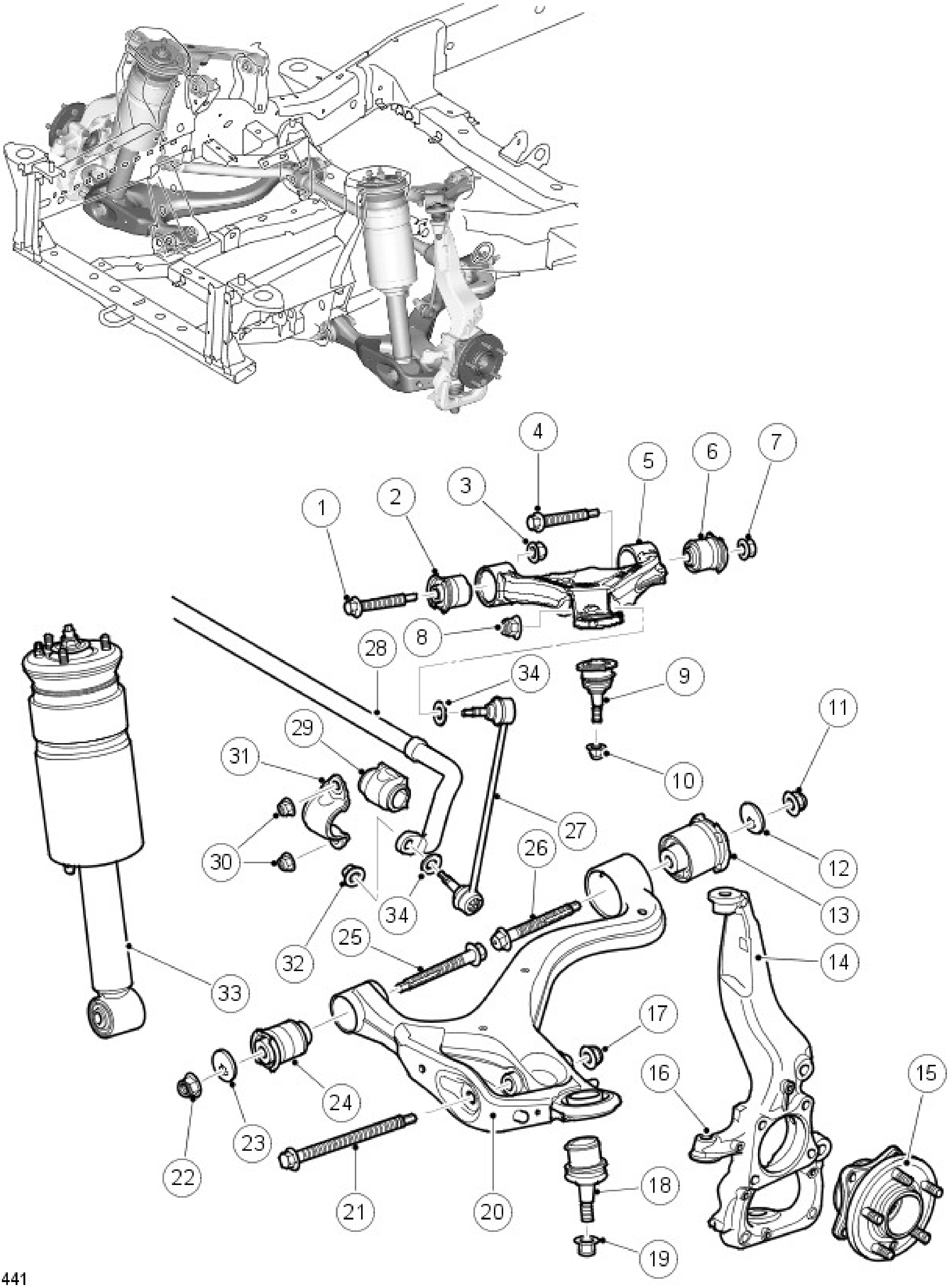
Front Suspension - Front Suspension

Description and Operation

Front Suspension Component Layout

- NOTE: Without Dynamic Response version shown



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E52441

Item	Part Number	Description
1	-	Flanged bolt (Upper arm forward bush)
2	-	Bush - forward (Upper arm)
3	-	Nut (Upper arm forward bush)

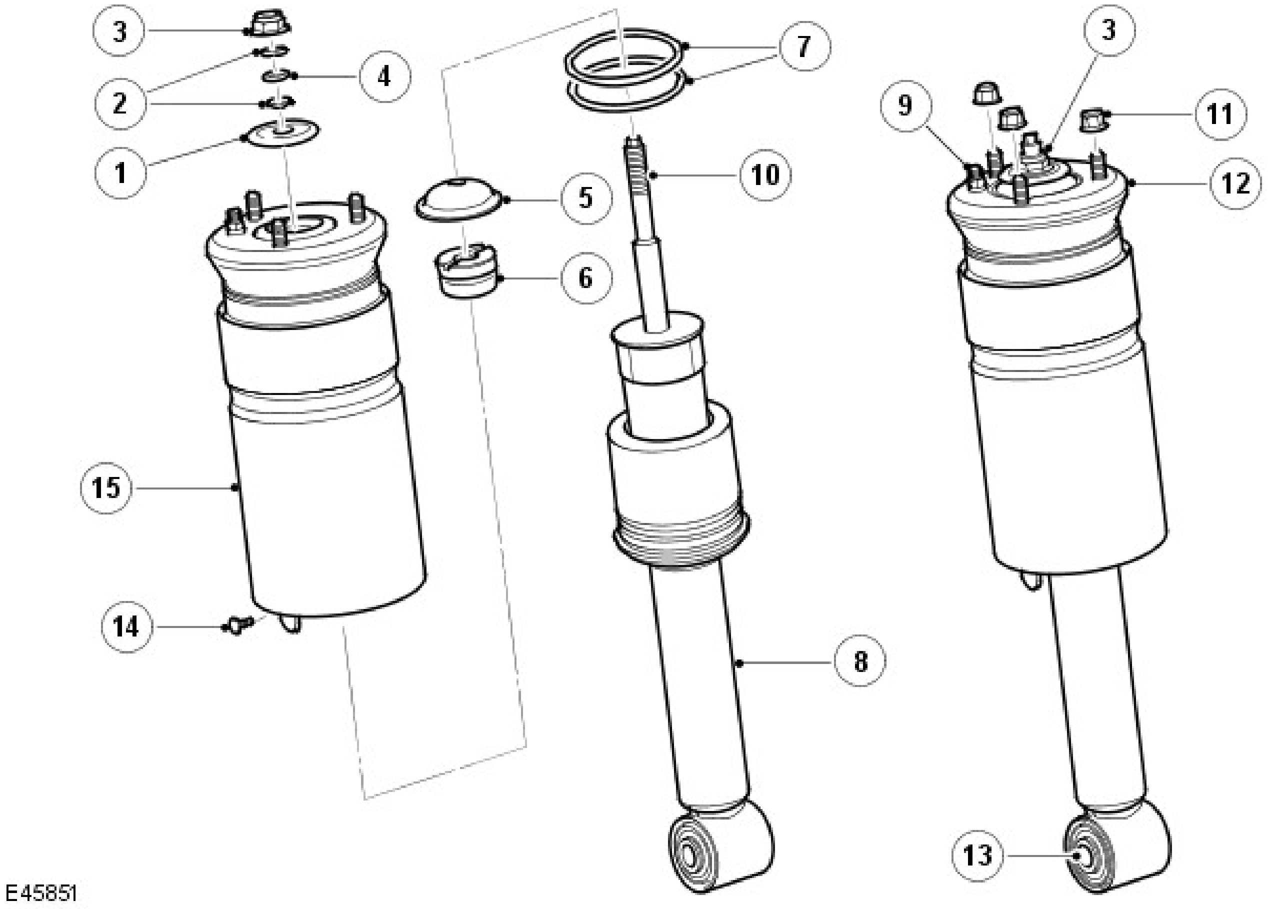
4	-	Flanged bolt (Upper arm forward bush)
5	-	Bush - rearward (Upper arm)
6	-	Nut (Upper arm rearward bush)
7	-	Nut (Stabilizer bar link to upper arm)
8	-	Upper arm
9	-	Ball joint (Upper arm to swivel hub)
10	-	Nut (Ball joint to swivel hub attachment)
11	-	Nut (Lower arm rearward bush)
12	-	Cam washer (Lower arm rearward bush)
13	-	Bush - rearward (Lower arm)
14	-	Wheel knuckle
15	-	Wheel hub and bearing assembly
16	-	Steering gear attachment
17	-	Nut (Damper assembly lower attachment)
18	-	Ball joint (Lower arm to swivel hub)
19	-	Nut (Ball joint to swivel hub attachment)
20	-	Lower arm
21	-	Bolt (Damper assembly lower attachment)
22	-	Nut (Lower arm forward bush)
23	-	Cam washer (Lower arm forward bush)
24	-	Lower arm forward bush
25	-	Bolt (Lower arm forward bush)
26	-	Bolt (Lower arm rearward bush)
27	-	Stabilizer bar link
28	-	Stabilizer bar
29	-	Stabilizer bar bush
30	-	Nut (Stabilizer bar bracket)
31	-	Stabilizer bar bracket
32	-	Nut (Stabilizer bar link to stabilizer bar)
33	-	Damper assembly
34	-	Hardened washer (2 off per link)

GENERAL

The front suspension is a fully independent design which offers a reduction in unsprung weight over the beam axle design. The front suspension comprises an upper arm, a lower arm, a wheel knuckle and hub, a stabilizer bar and links assembly and an air damper assembly. A conventional stabilizer bar is fitted to some models, with a Dynamic Response stabilizer bar system available as a standard or optional fitment.
For additional information, refer to: Active Stabilization System (204-06 Ride and Handling Optimization, Description and Operation).

The suspension lower arms have been designed for maximum ground clearance and also allow for adjustment of the camber and castor using cam adjusters.

AIR SUSPENSION DAMPER MODULE



Item	Part Number	Description
1	-	Rebound washer*
2	-	O-ring - damper rod (2 off)*
3	-	Self-locking nut*
4	-	Spacer - damper rod*
5	-	Bump washer
6	-	Spring aid*
7	-	O-ring - air spring sleeve support (2 off)*
8	-	Damper assembly*
9	-	Voss air fitting
10	-	Damper rod
11	-	Self-locking nut (3 off)
12	-	Top mount
13	-	Bush
14	-	Retaining pin - air spring assembly*
15	-	Air spring assembly*

- NOTE: * shows service items

The damper module comprises an air spring assembly, top mount and a damper assembly. The damper and air spring are only serviceable as complete assemblies.

Damper

The damper assembly is a mono tube design with an air spring. The lower end of the damper is fitted with a bush and is attached to the lower arm with a bolt and nut.

The damper functions by restricting the flow of hydraulic fluid through internal galleries within the damper. The damper rod moves axially within the damper, its movement limited by the flow of fluid through the galleries, providing damping of undulations in the terrain. The damper rod is sealed at its exit point from the damper body to maintain the fluid within the unit and to prevent the ingress of dirt and moisture. The seal also incorporates a wiper to keep the rod clean.

Air Spring

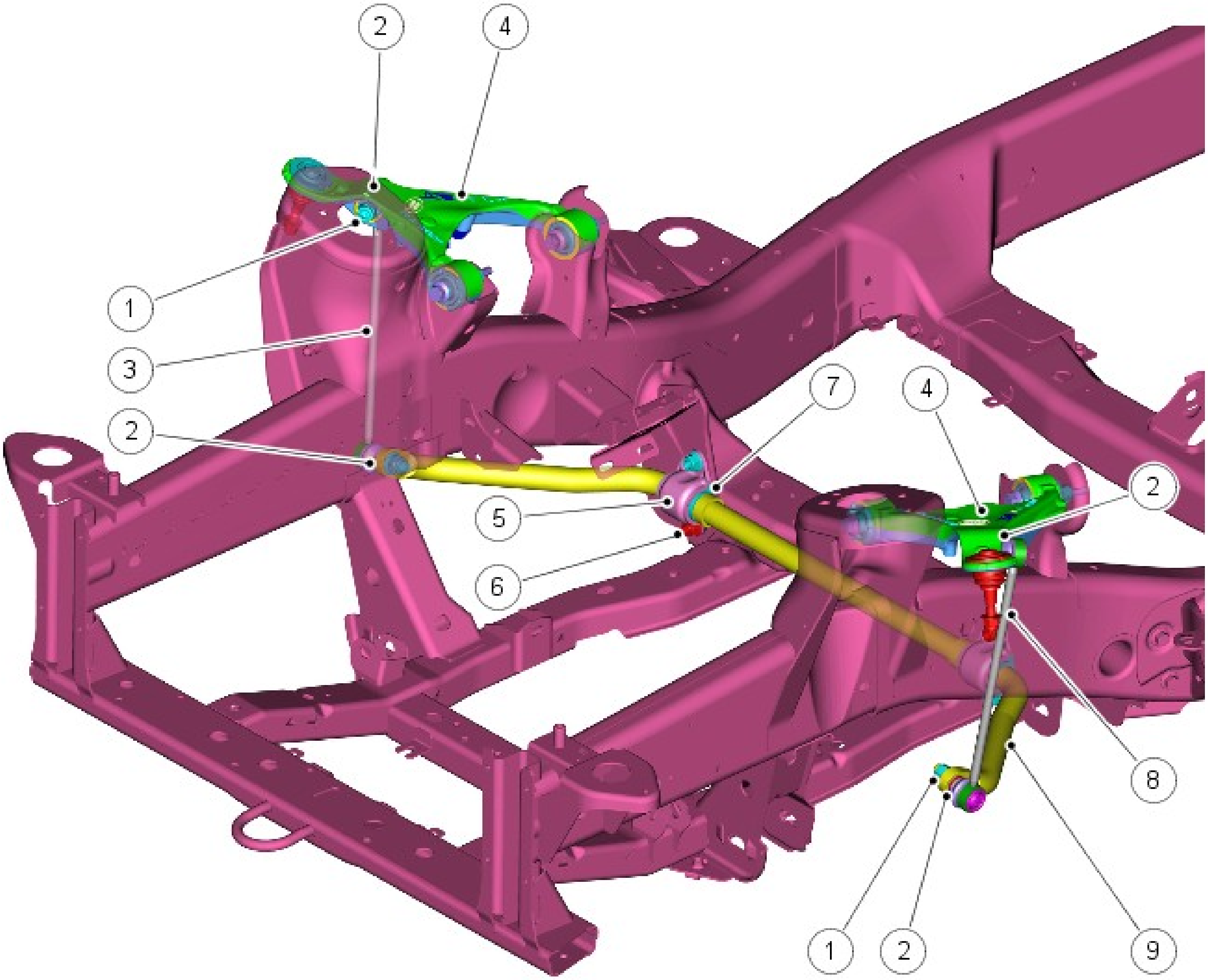
The air spring comprises an aluminium restraining cylinder, top mount, spring aid, air sleeve and an inner support sleeve.

The air sleeve is made from a flexible rubber material which allows the sleeve to roll up and down the air spring piston as the vehicle changes height. The air sleeve is attached to the restraining cylinder and support sleeve by crimp rings which provide an air tight seal. The support sleeve contains a seal carrier which has two O-rings sealing the support sleeve and two O-rings sealing to the damper body. The top of the air sleeve is crimped to the top mount which attaches to the chassis frame with three integral studs and self-locking nuts.

A spring aid is fitted to the damper rod and prevents the top mount contacting the top of the damper during full suspension compression and assists the suspension tune. The lower end of the air spring is located over the damper body and seats on a fabricated seat on the damper body. The air sleeve is positively attached to the seat with a retaining pin. The damper rod is located through a central hole in the top mount. The rod is threaded at its outer end. A self-locking nut secures the air spring to the damper rod.

The top mount is an integral part of the air spring and is fitted with a bush and a rebound washer. A bump washer is located between the top mount plate and the damper rod. The top mount is secured to the damper rod with a self-locking nut. The top mount attaches to a housing on the chassis with three integral studs and self-locking nuts. The top mount also incorporates a 6 mm Voss air fitting which allows for the attachment of the air harness.

STABILIZER BAR



E56035

Item	Part Number	Description
1	-	Nut - link to stabilizer bar/upper arm (4 off)
2	-	Hardened washer (4 off)
3	-	Right hand Link
4	-	Upper arm
5	-	Bracket (2 off)
6	-	Locknut (4 off)
7	-	Bush (2 off)
8	-	Left hand link
9	-	Stabilizer bar

Vehicles with the Dynamic Response system use an active stabilizer bar.
For additional information, refer to: Active Stabilization System (204-06 Ride and Handling Optimization, Description and Operation).

The stabilizer bar is fabricated from induction hardened, 31 mm diameter solid spring steel bar. The stabilizer bar operates, via a pair of links, from their attachment to the upper arm.

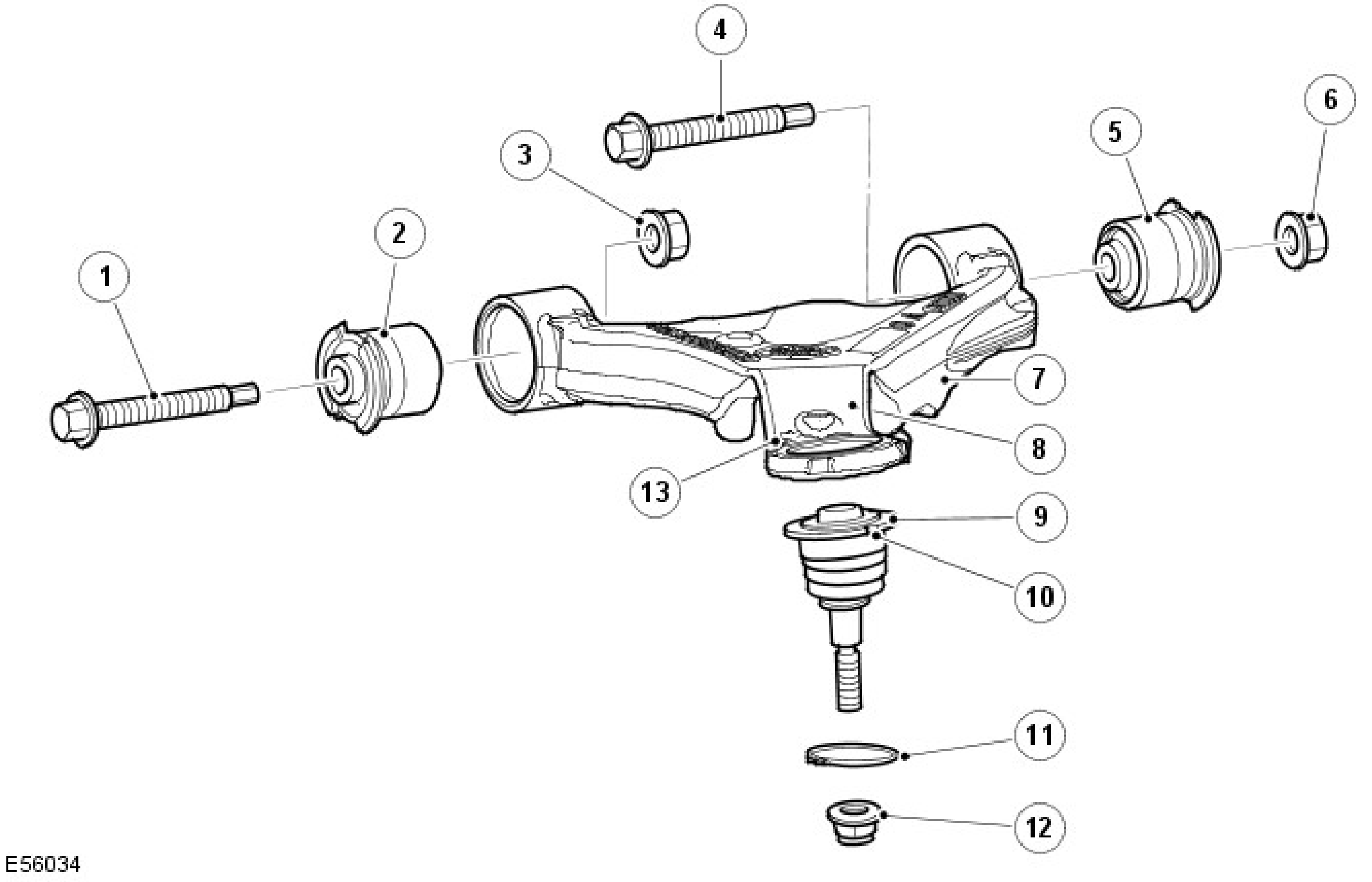
The stabilizer bar is mounted on the forward face of the chassis front cross member and is attached to the cross member with two, Teflon lined bushes. Brackets, which are pressed onto the bushes, are attached to the cross member with nuts, screwed onto studs in the cross member. The stabilizer bar has crimped, 'anti-shuffle' collars pressed in position on the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

The links, which are handed and have a ball joint at each end, are fitted with hardened steel washers at both ends. The top ball joint is attached to the link at 90 degrees to the link axis. The ball joint is located in a hole in the side of the upper arm and secured with the hardened steel washer on one side of the interface and a slef-locking nut on the other. The bottom ball joint is attached to the link at 90 degrees to the link axis. The ball joint is located in a hole in the end of the stabilizer bar and secured with the hardened steel washer on one side of the interface and the self-locking nut on other.

It is important that hardened steel washer is in the correct position between the stabilizer bar and the link ball joint and the upper arm and the link ball joint and the correct, hardened washer is fitted.

⚠ CAUTION: Failure to fit the washer or using an incorrect washer will result in relaxation of the torque on the self-locking nut and damage will be caused to the stabilizer bar, link and suspension upper arm.

UPPER ARM



Item	Part Number	Description
1	-	Flanged bolt
2	-	Bush
3	-	Self locking nut
4	-	Flanged bolt
5	-	Bush
6	-	Self locking nut
7	-	Upper arm
8	-	Stabilizer bar link attachment hole (hidden)
9	-	Ball joint
10	-	Timing mark
11	-	Circlip
12	-	Self locking nut
13	-	Timing mark

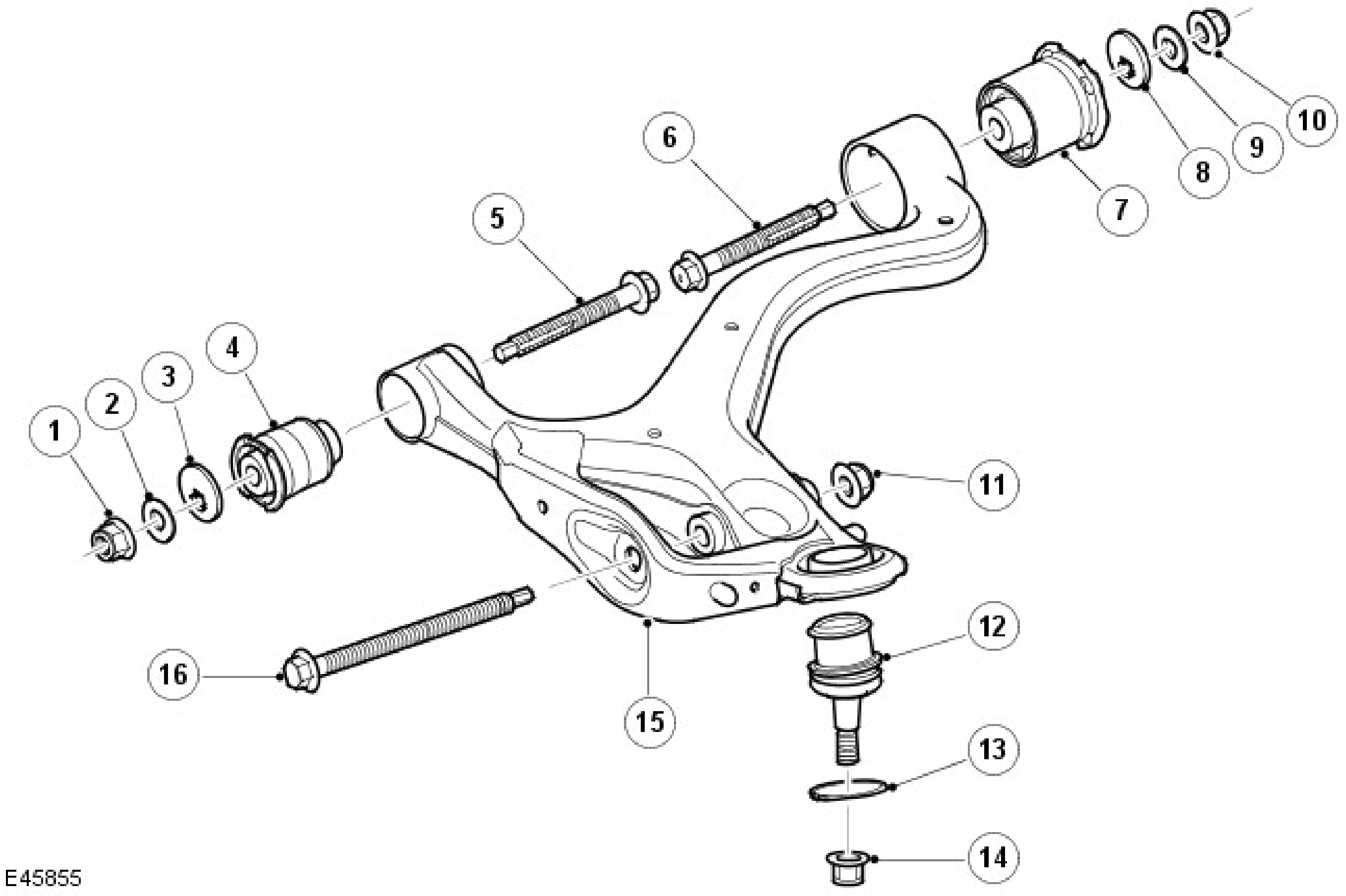
The upper arm assembly comprises, the upper arm, two bushes and a ball joint. The upper arm is made from cast and machined iron. Its outer end has a hole to accept the ball joint. A small indentation is located adjacent to the ball joint hole and is used to obtain the correct orientation of the ball joint. A hole on the rear side of the arm provides for the attachment of the stabilizer bar link.

The inner end of the arm has two bush housings which are machined in the arm casting. A bush is pressed into each housing. The bushes are located between lugs on the chassis and are secured with bolts and self-locking nuts through metal inserts in the centre of the bushes.

The ball joint is pressed into the upper arm. The ball joint is an interference fit in the hole which prevents the ball joint from moving. A circlip is fitted to the ball joint to retain it in the hole. The top face of the ball joint has two semi-circular cut-outs. One of these cut-outs must be aligned with the small indentation in the upper arm to ensure the correct operation of the ball joint.

A bracket, located on on the underside of the upper arm, provides for the attachment of the air suspension height sensor drop link.

LOWER ARM



Item	Part Number	Description
1	-	Self locking nut
2	-	Washer
3	-	Cam washer
4	-	Bush
5	-	Bolt
6	-	Bolt
7	-	Hydrobush
8	-	Cam washer
9	-	Washer
10	-	Self locking nut
11	-	Self locking nut - damper lower attachment
12	-	Ball joint
13	-	Circlip
14	-	Self locking nut
15	-	Lower arm
16	-	Bolt - damper lower attachment

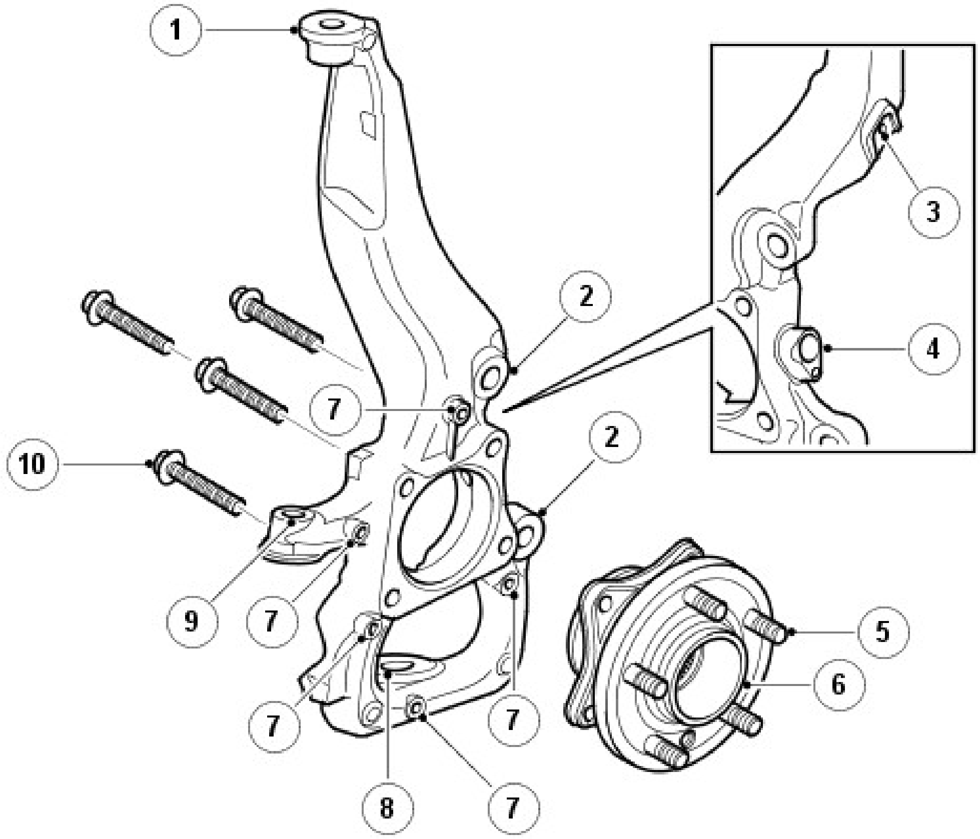
The lower arm assembly comprises, the lower arm, two bushes and a ball joint. The lower arm is a pressed steel fabrication with a hole at its outer end to accept the ball joint.

The inner end of the arm has two fabricated bush housings which are welded to the arm pressing. A bush is pressed into each housing. The rear bush is a hydrobush which provides a progressive increase in the hardness of the bush as the deflection of the wheel increases. The bushes are located between lugs on the chassis and are secured with bolts and self-locking nuts through metal inserts in the centre of the bushes. The forward bush, self-locking nut, has a cam washer located beneath it. The cam washer is located between lugs on the chassis bracket and its orientation can be adjusted to set the front camber. The rear bush, self-locking nut, also has a cam washer located beneath it. The cam washer is located between lugs on the chassis bracket and its orientation can be adjusted to set the front castor.

A central aperture in the arm provides for the attachment of the damper module lower bush. The damper is secured with a long bolt which is positioned through holes in the lower arm and secured with a self-locking nut.

The ball joint is pressed into the lower arm. The ball joint is an interference fit in the hole which prevents the ball joint from moving. A circlip is fitted to the ball joint to retain it in the hole.

WHEEL KNUCKLE, HUB AND BEARING ASSEMBLY



E45856

Item	Part Number	Description
1	-	Upper arm attachment
2	-	Brake caliper attachment holes
3	-	Brake hose bracket attachment point
4	-	Wheel speed sensor location
5	-	Wheel studs
6	-	Wheel hub
7	-	Brake disc dust shield attachment holes
8	-	Lower arm ball joint attachment
9	-	Steering gear ball joint attachment
10	-	Wheel hub bolts (4 off)

The wheel knuckle is a machined casting which is located between the ball joints of the upper and lower arms. The knuckle has four clearance holes which allow for the fitment of four bolts which secure the wheel hub housing. A cast boss on the forward edge of the knuckle provides for attachment of the steering gear, tie rod ball joint.

The wheel hub and bearing assembly comprises the wheel hub housing, wheel hub and taper roller bearing. The wheel hub and bearing assembly is a non-serviceable component. Five M14 studs are pressed into the wheel hub and provide for the attachment of the road wheel with wheel nuts.

The wheel hub housing is a machined forging which houses a taper roller bearing. The housing has four threaded holes which provide for the attachment to the wheel knuckle with four bolts.

The wheel hub has a splined centre bore which mates with corresponding splines on the half shaft. Rotation of the half shaft is passed, via the splines, to the wheel hub which rotates on the taper roller bearing.

Front Suspension - Front Suspension

Diagnosis and Testing

For additional information:
REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Front Suspension - Front Stabilizer Bar

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the wheels and tires.

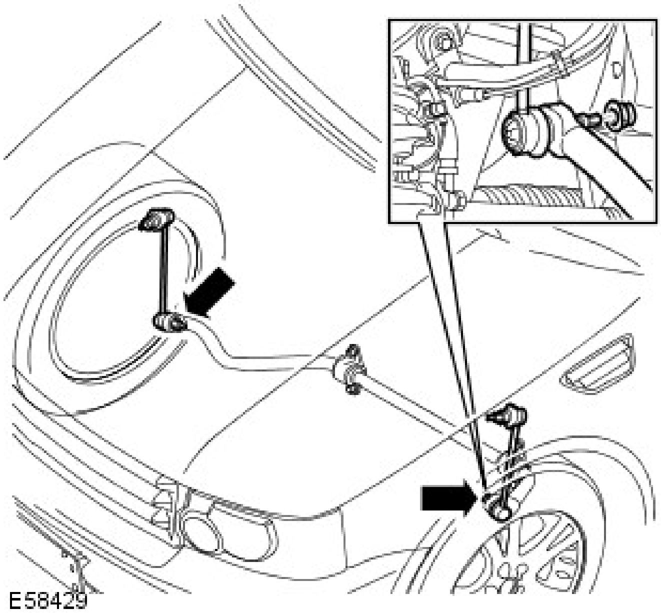
3. CAUTIONS:

   ⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

   ⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

   Disconnect both the stabilizer bar links from the stabilizer bar.

   - Remove and discard the 2 nuts.

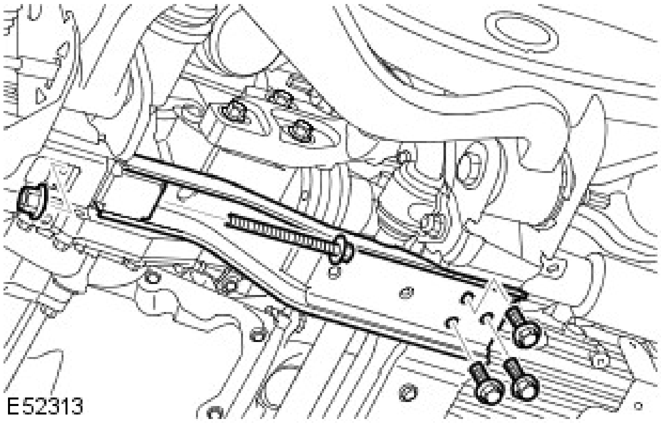


E58429

4. Remove the engine undershield.
   For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Remove the front axle crossmember.

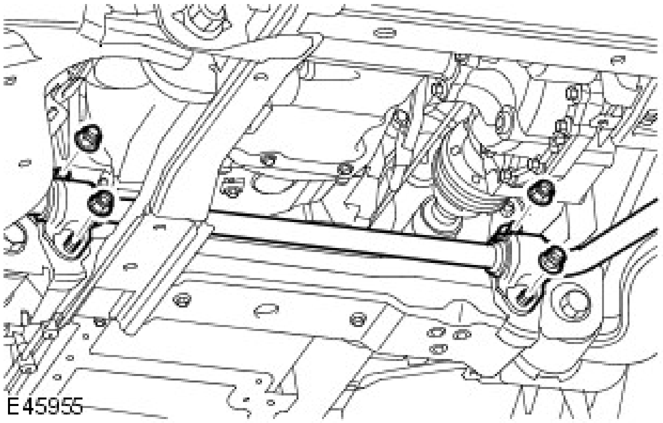
   - Remove the 4 bolts.



E52313

6. Remove the stabilizer bar bushing.

   - Remove the 4 nuts.
   - Remove the stabilizer bar clamps.



7. Remove the stabilizer bar.

- Remove the stabilizer bar out through the LH side wheel arch.

Installation

1. Install the stabilizer bar.

- Install the stabilizer bar through the LH side wheel arch.

2. Install the stabilizer bar bushing.

- Install the stabilizer bar clamps.
- Tighten the nuts to 115 Nm (85 lb.ft).

3. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

4. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Connect both stabilizer bar links to the stabilizer bar.

- Install new nuts and tighten to 175 Nm (129 lb.ft).

6. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Suspension - Front Stabilizer Bar Link

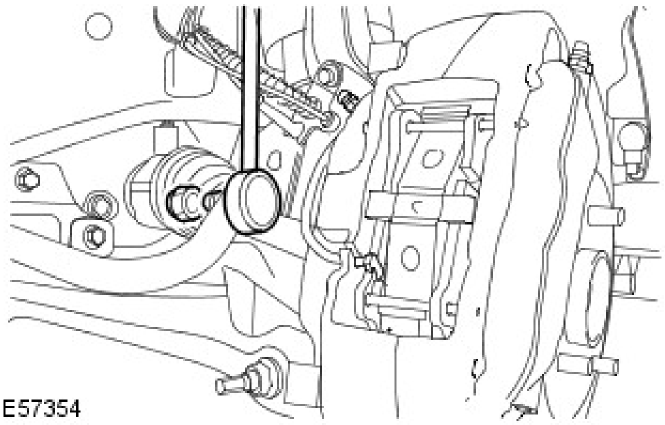
Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the wheel and tire.



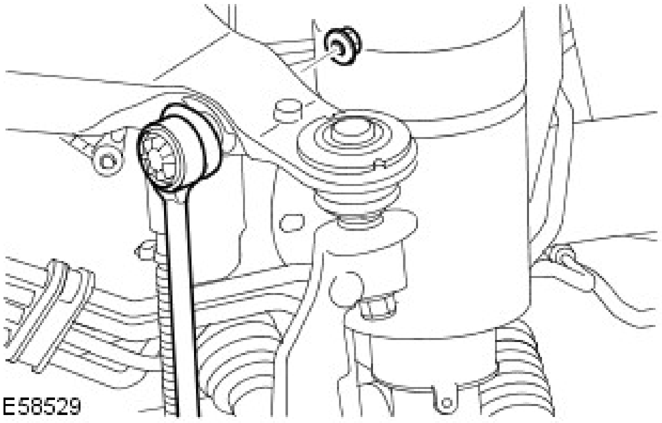
3. CAUTIONS:

   ⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

   ⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

   Release the stabilizer bar link.

   - Remove and discard the nut.



4. CAUTIONS:

   ⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

   ⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

   Remove the stabilizer bar link.

   - Remove and discard the nut.

Installation

Vehicles without Active Stabilization

1. CAUTIONS:

   ⚠ Make sure the hardened steel washers are installed between the stabilizer bar link and the stabilizer bar, and between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

   ⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

   Install the stabilizer bar link.

   - Install new nuts and tighten to 175 Nm (129 lb.ft).

Vehicles with Active Stabilization

2. CAUTIONS:

⚠ Make sure the hardened steel washers are installed between the stabilizer bar link and the stabilizer bar, and between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Install the stabilizer bar link.

- Install new nuts and tighten to 175 Nm (129 lb.ft).

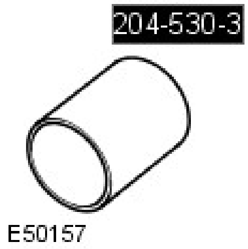
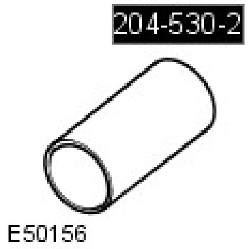
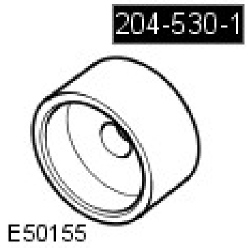
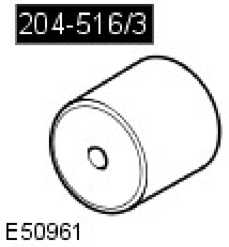
All vehicles

3. Install the wheel and tire.

Published: 11-May-2011

Front Suspension - Upper Arm Ball Joint

Removal and Installation

Special Tool(s)	
 204-530-3 E50157	Ball joint remover/installer 204-530-3
 204-530-2 E50156	Ball joint remover/installer 204-530-2
 204-530-1 E50155	Ball joint remover/installer 204-530-1
 204-516/3 E50961	Ball joint remover/installer 204-516/3 (LRT-64-026/3)

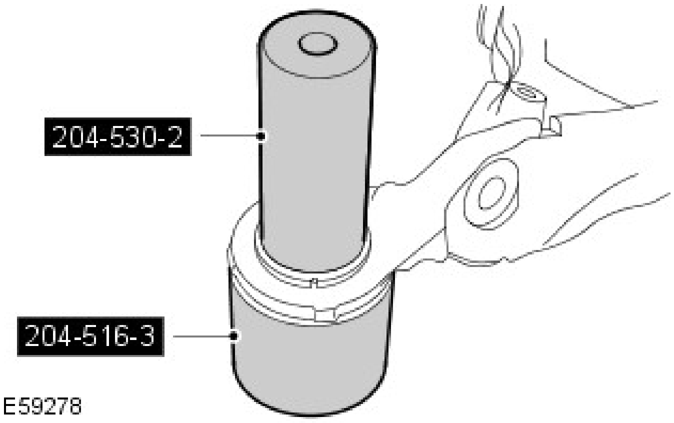
Removal

1. Remove the upper arm.
For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).

2. Remove the dust seal.

- Remove the seal retainer.
- Remove the circlip.

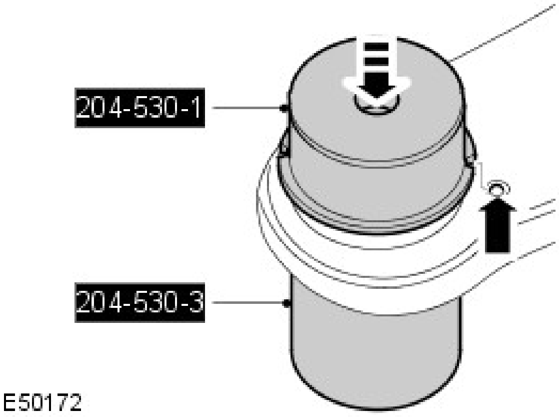
3. Using the special tools, remove the ball joint.


204-530-2
204-516-3
E59278

Installation

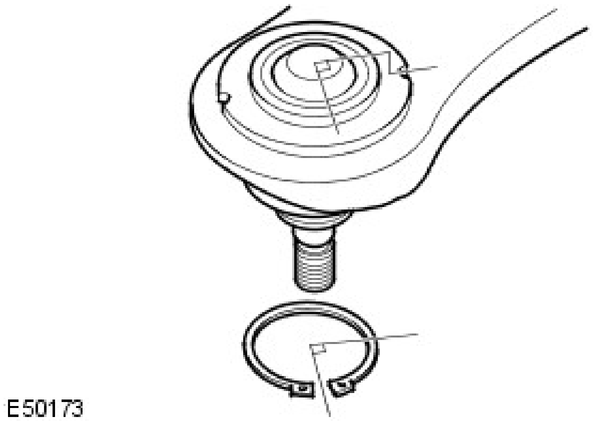
1. ⚠ CAUTION: Make sure the timing marks are aligned.

   Using the special tools, install the ball joint.


204-530-1
204-530-3
E50172

2. ⚠ CAUTION: Circlip holes to be 90 degrees rotated from timing marks.

   Install the circlip.

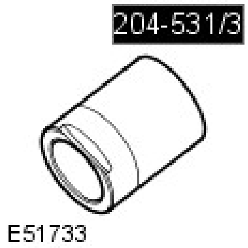
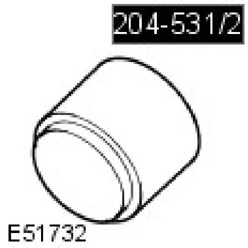
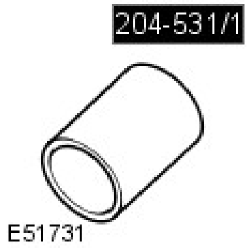
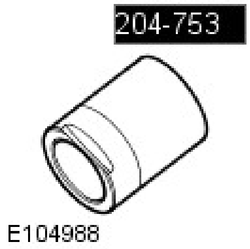
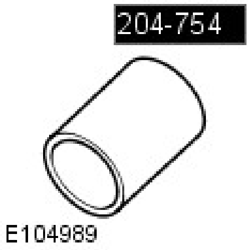


3. Install the upper arm.
   For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).

Published: 11-May-2011

Front Suspension - Lower Arm Ball Joint

Removal and Installation

Special Tool(s)	
 204-531/3 E51733	Remover/installer front lower arm ball joint 204-531/3
 204-531/2 E51732	Remover/installer front lower arm ball joint 204-531/2
 204-531/1 E51731	Remover/installer front lower arm ball joint 204-531/1
 204-753 E104988	Remover/installer front lower arm ball joint 204-753
 204-754 E104989	Remover/installer front lower arm ball joint 204-754

Removal

All vehicles

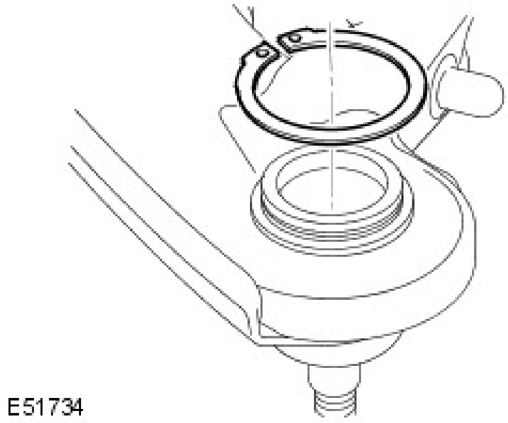
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

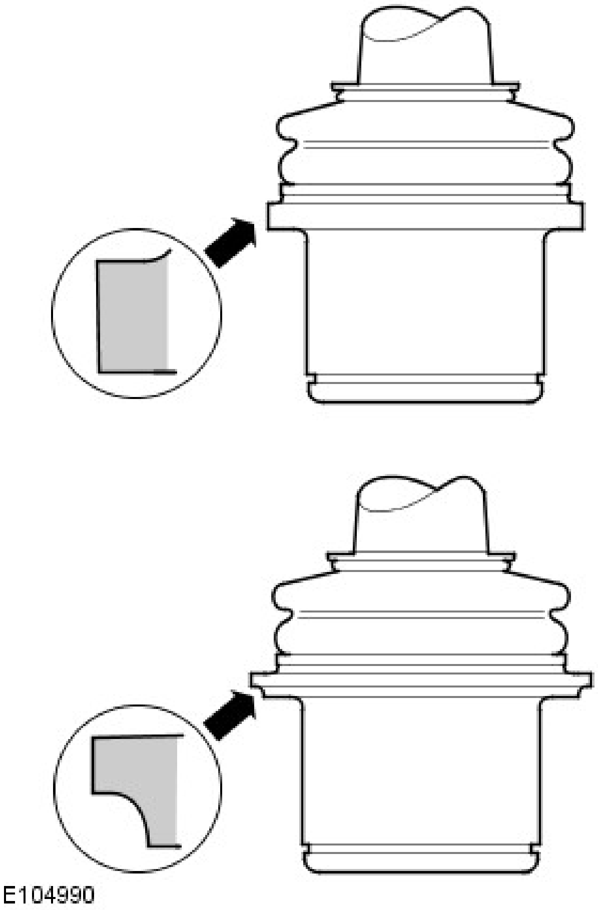
2. Remove the wheel and tire.

3. Remove the lower arm.

For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).



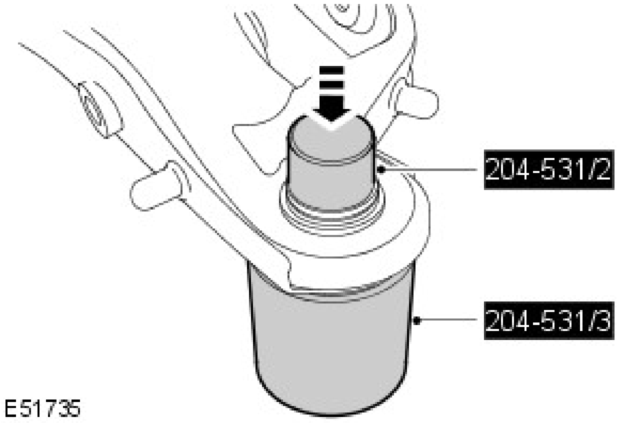
4. Remove the circlip.



5. Inspect the installed ball joint to determine if a radius is present.

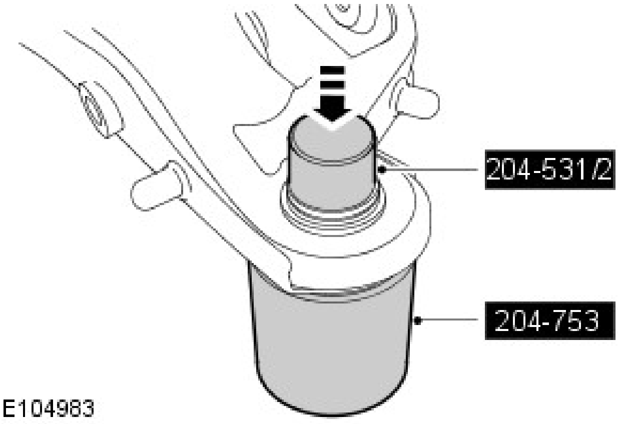
Ball joint without radius

6. Using the special tools, remove the ball joint.


204-531/2
204-531/3
E51735

Ball joint with radius

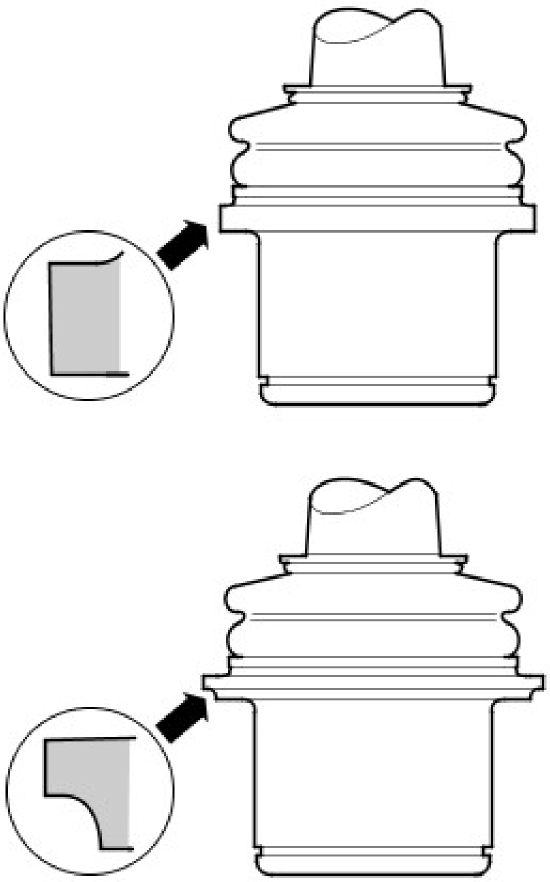
7. Using the special tools, remove the ball joint.


204-531/2
204-753
E104983

Installation

All vehicles

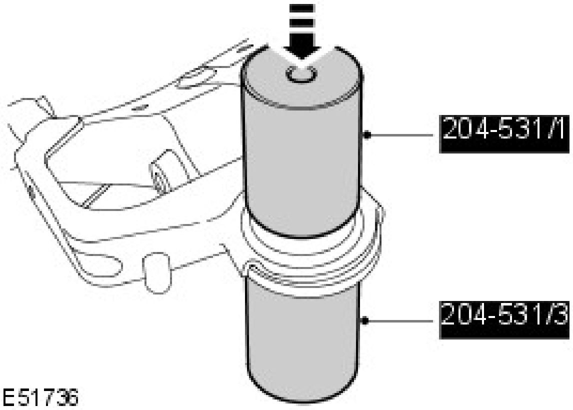
1. Clean the components.
2. Inspect the new ball joint to determine if a radius is present.



E104990

Ball joint without radius

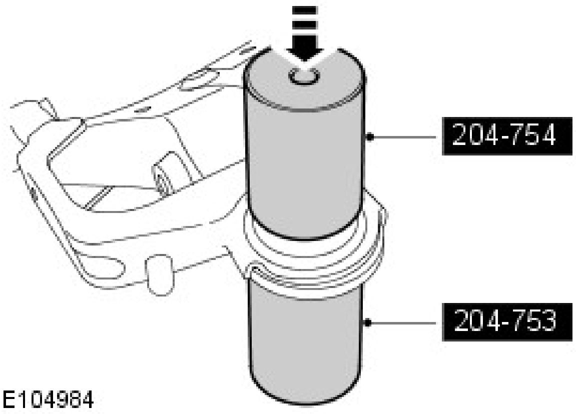
3. Using the special tools, install the ball joint.



E51736

Ball joint with radius

4. Using the special tools, install the ball joint.



All vehicles

5. Install the circlip.

6. Install the lower arm.
For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).

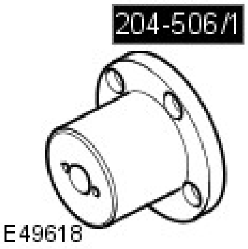
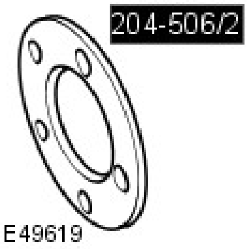
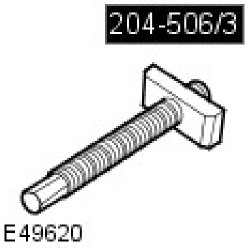
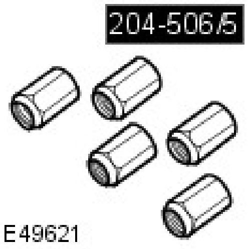
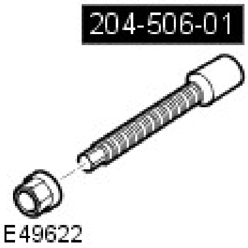
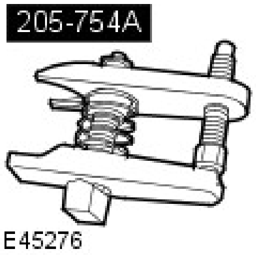
7. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 05-Sep-2011

Front Suspension - Wheel Knuckle

Removal and Installation

Special Tool(s)	
 204-506/1 E49618	Halfshaft remover/replacer 204-506/1 (LRT-60-030/1)
 204-506/2 E49619	Halfshaft remover/replacer 204-506/2(LRT-60-030/2)
 204-506/3 E49620	Halfshaft remover/replacer 204-506/3 (LRT-60-030/3)
 204-506/5 E49621	Retainers - halfshaft remover/replacer 204-506/5 (LRT-60-030/5)
 204-506-01 E49622	Halfshaft installer adapter 204-506-01
 205-754A E45276	Ball joint separator 205-754 (LRT-54-027)

Removal

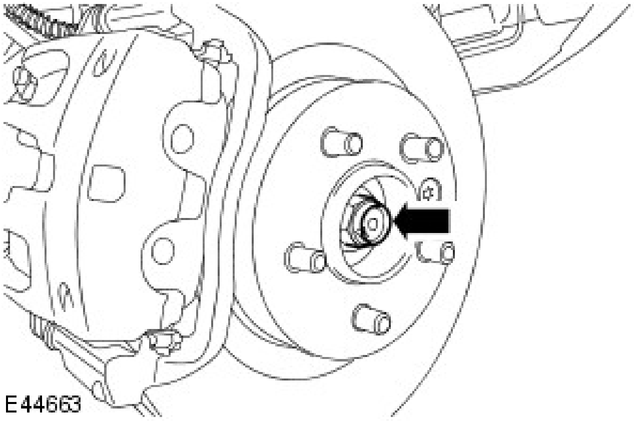
All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. Loosen the halfshaft retaining nut.



Vehicles with standard brakes

4. Remove the brake disc.
For additional information, refer to: Brake Disc - Vehicles Without: Brembo Brakes (206-03 Front Disc Brake, Removal and Installation).

Vehicles with high performance brakes

5. Remove the brake disc.
For additional information, refer to: Brake Disc - Vehicles With: Brembo Brakes (206-03 Front Disc Brake, Removal and Installation).

All vehicles

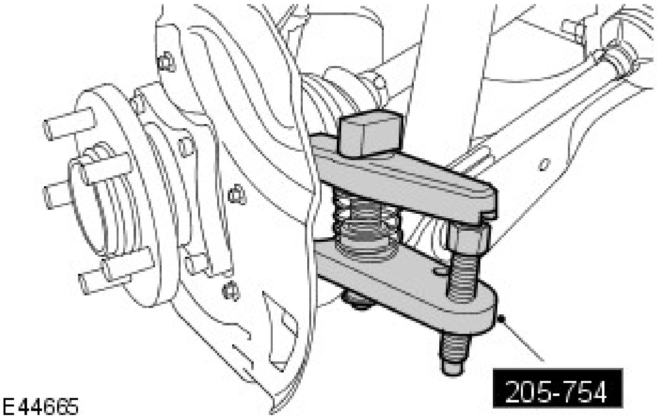
6. Remove the halfshaft retaining nut.

- Discard the nut.

7. Loosen the tie-rod end ball joint retaining nut.

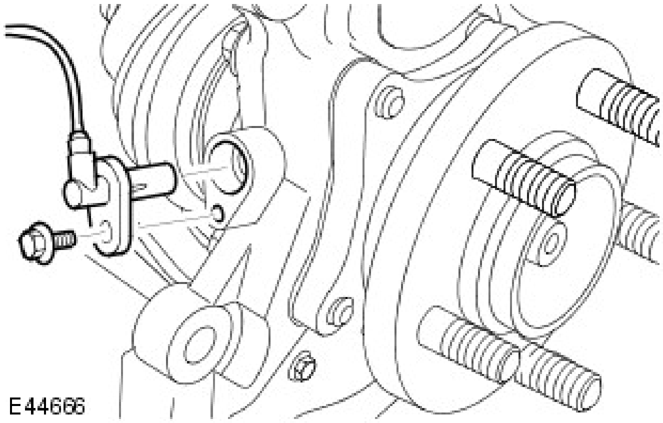
8. Using the special tool, release the tie-rod end ball joint from the wheel knuckle.

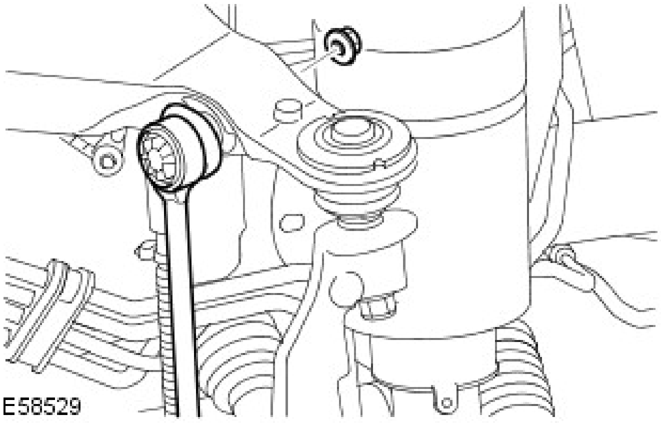
- Discard the nut.



9. Release the wheel speed sensor from the wheel knuckle.

- Remove the bolt.





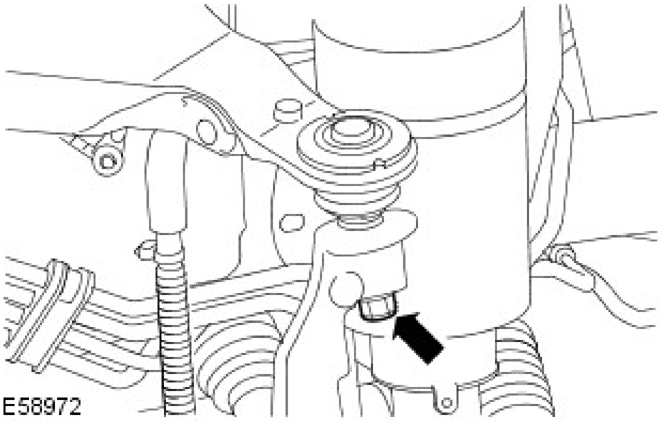
10. CAUTIONS:

⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

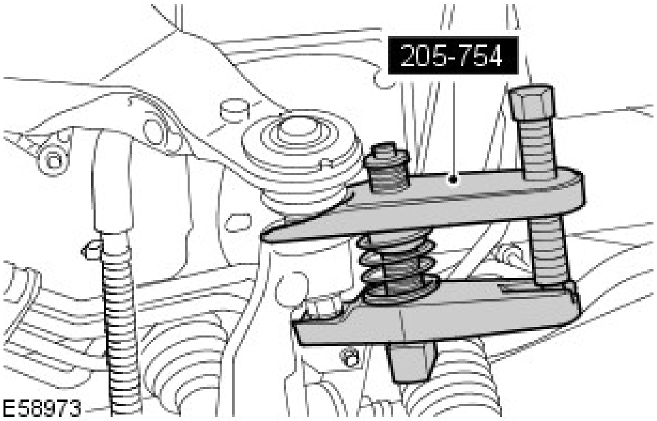
⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

Release the stabilizer bar link.

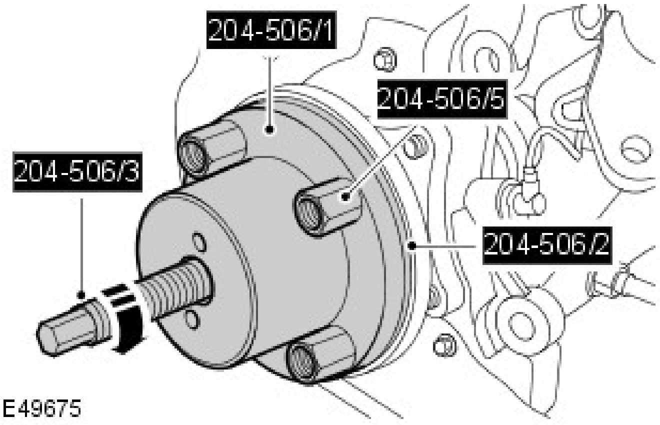
- Discard the nut.



11. Loosen the upper arm retaining nut.



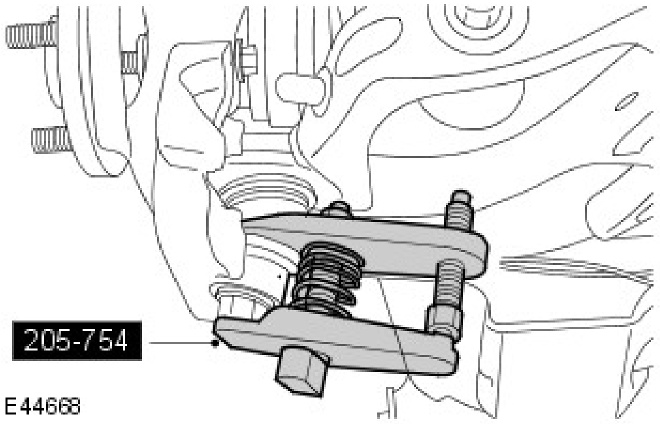
12. Using the special tool, release the upper arm ball joint.



13. ⚠ CAUTION: Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Using the special tools, release the halfshaft from the drive flange.

14. Remove the lower ball joint retaining nut.



15. Using the special tool, release the lower ball joint from the steering knuckle.

16. Remove the upper arm retaining nut.

- Discard the nut.

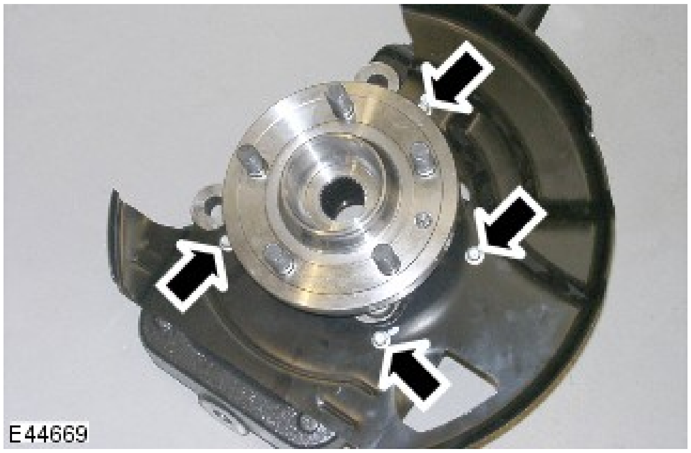
17. ⚠ CAUTION: The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

• NOTE: Do not disassemble further if the component is removed for access only.

Remove the wheel knuckle.

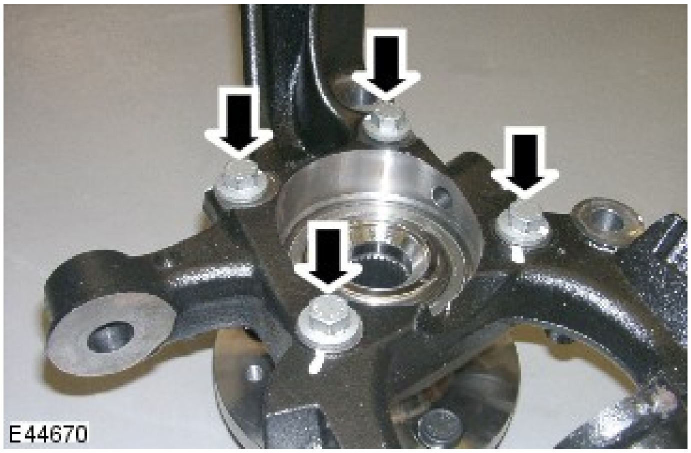
18. Remove the brake disc dust shield.

- Remove the five retaining bolts.



19. Remove the wheel hub.

- Remove the 4 bolts.

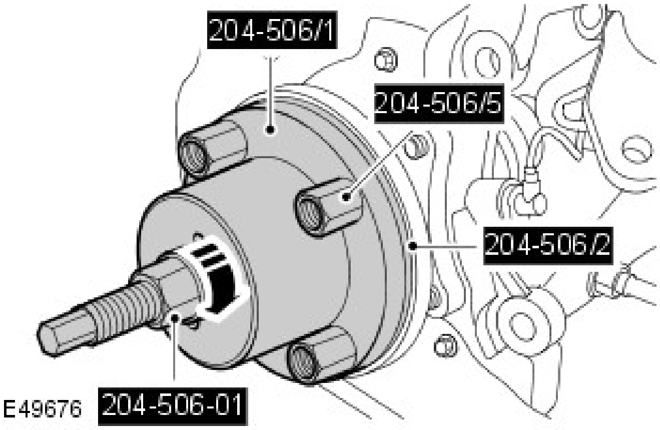


Installation

All vehicles

1. Clean the components.
2. Install the wheel hub.
   - Tighten the 4 bolts to 115 Nm (85 lb.ft).
3. Install the brake disc dust shield.
   - Tighten the 5 bolts to 10 Nm (7 lb.ft).
4. ⚠ CAUTION: The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

   With assistance, install the wheel knuckle.
5. Using the special tools, install the halfshaft in the wheel hub.



6. Connect the upper arm and wheel knuckle.
   - Install a new nut and tighten to 70 Nm (52 lb.ft).

Vehicles without Active Stabilization

7. CAUTIONS:

   ⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Secure the stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

Vehicles with Active Stabilization

8. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Secure the stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

9. Tighten the lower arm ball joint retaining nut to 115 Nm (85 lb.ft).

10. Connect the tie-rod end ball joint.

- Install a new nut and tighten to 76 Nm (56 lb.ft).

11. Install a new halfshaft retaining nut and lightly tighten.

12. Install the wheel speed sensor.

- Tighten the bolt to 10 Nm (7 lb.ft).

Vehicles with standard brakes

13. Install the brake disc.
For additional information, refer to: Brake Disc - Vehicles Without: Brembo Brakes (206-03 Front Disc Brake, Removal and Installation).

Vehicles with high performance brakes

14. Install the brake disc.
For additional information, refer to: Brake Disc - Vehicles With: Brembo Brakes (206-03 Front Disc Brake, Removal and Installation).

All vehicles

15. Tighten the new halfshaft retaining nut to 230Nm (170 lb.ft).

15. ⚠ CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

- Stake the nut to the halfshaft.

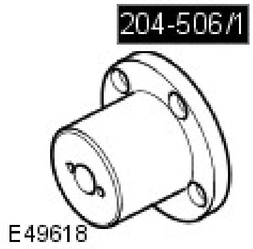
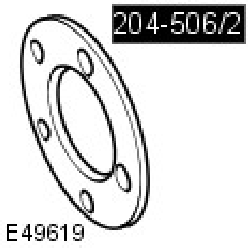
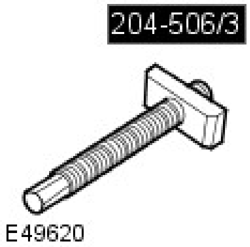
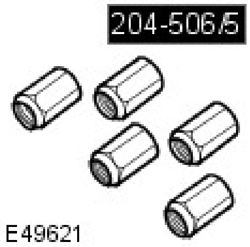
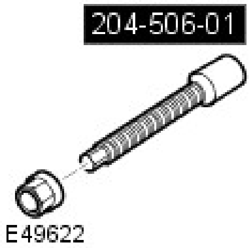
16. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 05-Sep-2011

Front Suspension - Front Wheel Bearing and Wheel Hub

Removal and Installation

Special Tool(s)	
 204-506/1 E49618	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
 204-506/2 E49619	Halfshaft remover/replacer 204-506/2(LRT-60-030/2)
 204-506/3 E49620	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
 204-506/5 E49621	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
 204-506-01 E49622	Halfshaft installer adapter 204-506-01(LRT-60-030/4)

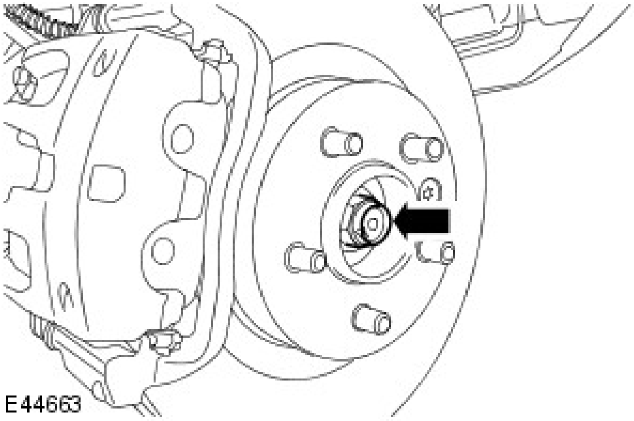
Removal

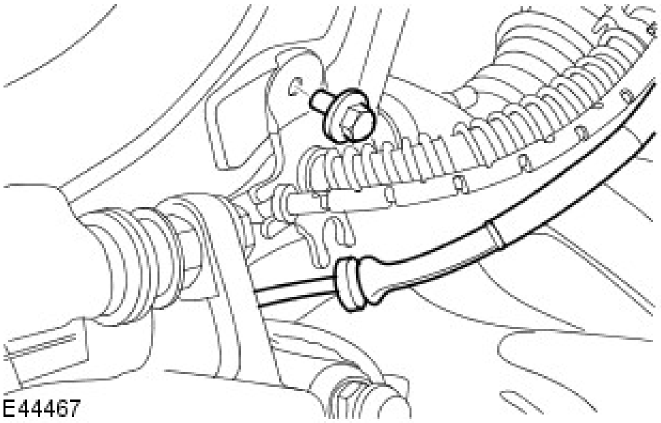
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. Loosen the halfshaft retaining nut.





4. Release the brake hose bracket from the wheel knuckle.

- Remove the bolt.

5. Remove the wheel speed sensor retaining bolt.

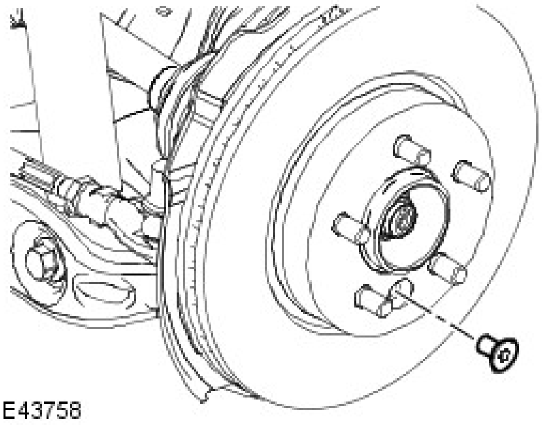
6. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper anchor plate from the wheel knuckle and tie the caliper aside.

- Tie aside complete with the wheel speed sensor.

7. Remove the brake disc.

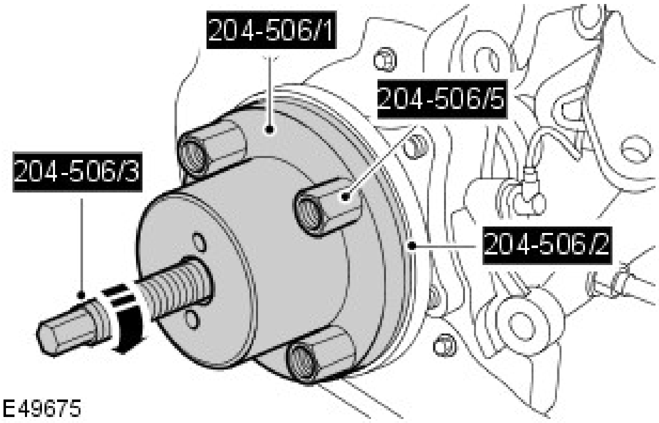
- Remove the Torx screw.



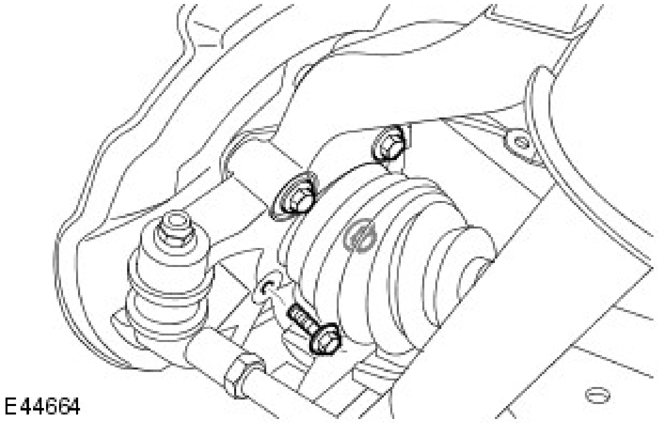
8. Remove the halfshaft retaining nut.

- Discard the nut.

9. ⚠CAUTION: Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.


204-506/1
204-506/5
204-506/3
204-506/2
E49675

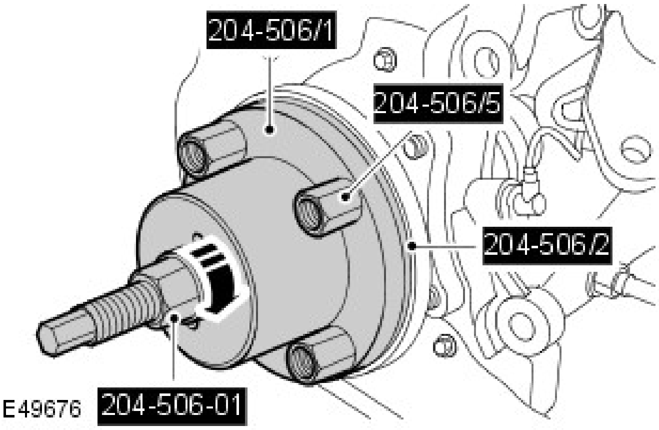
Using the special tools, release the halfshaft from the wheel hub.



10. Remove the wheel hub.
    - Remove the 4 bolts.

Installation

1. Clean the components.
2. Install the wheel hub.
    - Using the special tools, install the halfshaft in the wheel hub.
    - Tighten the 4 bolts to 115 Nm (85 lb.ft).


204-506/1
204-506/5
204-506/2
E49676
204-506-01

3. Install a new halfshaft retaining nut and lightly tighten.
4. Make sure the brake disc and hub mating surfaces are clean.
5. Install the brake disc.
    - Tighten the Torx screw to 35 Nm (26 lb.ft).
6. Install the brake caliper and anchor plate.
    - Install the wheel speed sensor.
    - Tighten the bolts to 275 Nm (203 lb.ft).
7. Install the wheel speed sensor retaining bolt.

8. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

9. ⚠ CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Tighten the new halfshaft retaining nut to 230 Nm (170 lb.ft).

- Stake the nut to the halfshaft.

10. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

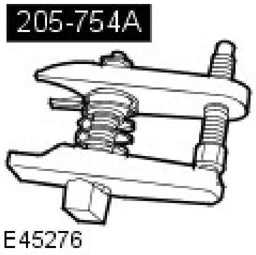
11. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Suspension - Upper Arm

Removal and Installation

Special Tool(s)	
	Ball joint separator 205-754(LRT-54-027)

Removal

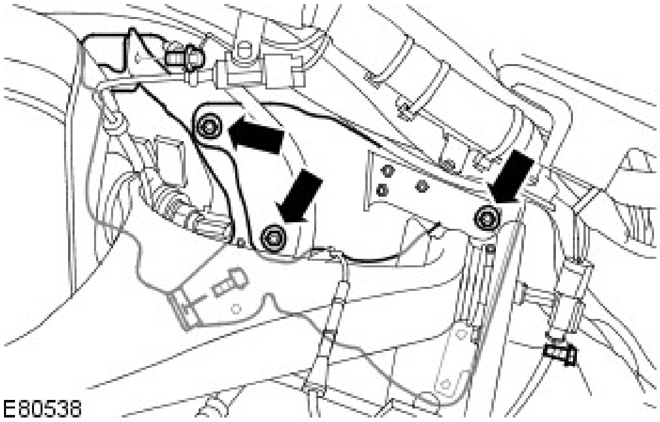
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

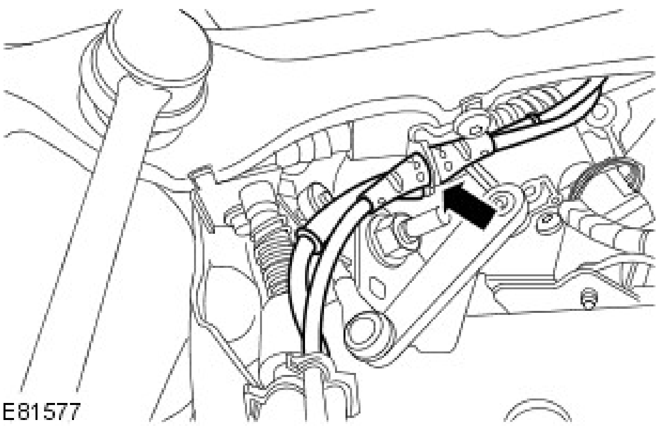
3. Remove the upper arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.



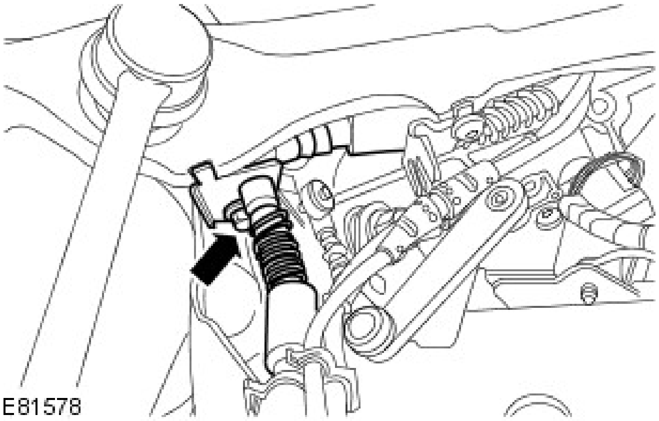
4. NOTE: Note the orientation of the wheel speed sensor leads.

Release the wheel speed sensor leads from the upper arm.

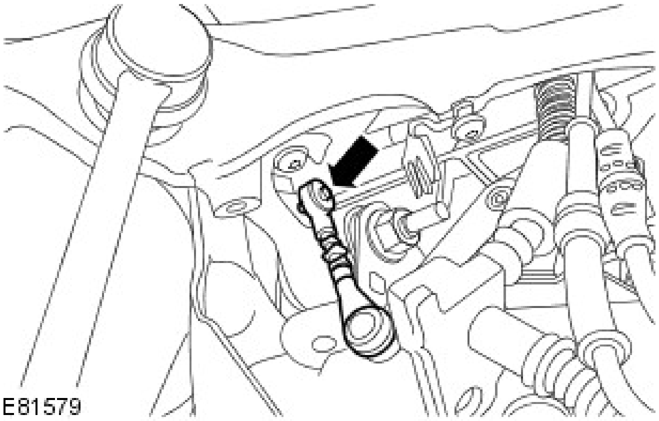


5. Release the brake hose from the upper arm.

- Remove the bolt.



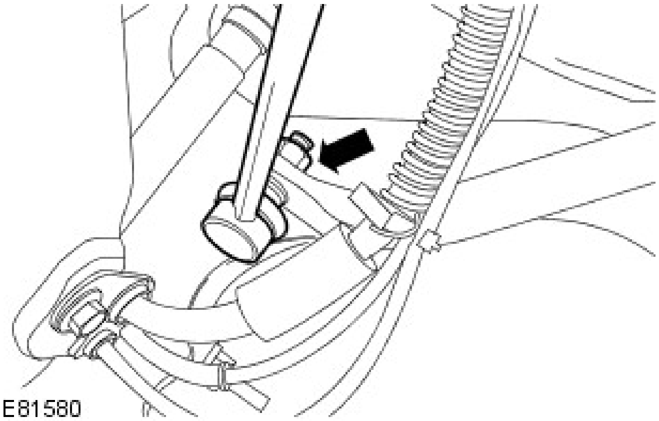
E81578



E81579

6. ⚠ CAUTION: Do not use excessive force to disconnect the height sensor link.

Disconnect the height sensor link arm.

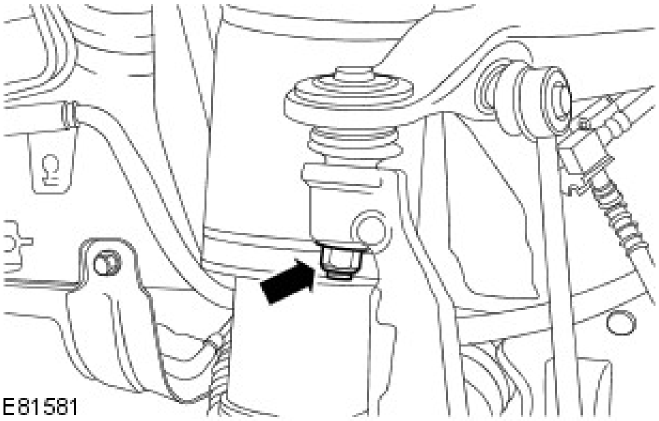


E81580

7. ⚠ CAUTION: Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

Release the stabilizer bar link.

- Remove and discard the nut.



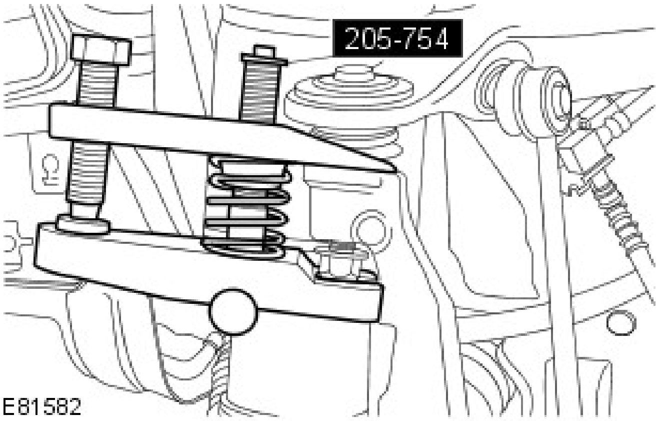
E81581

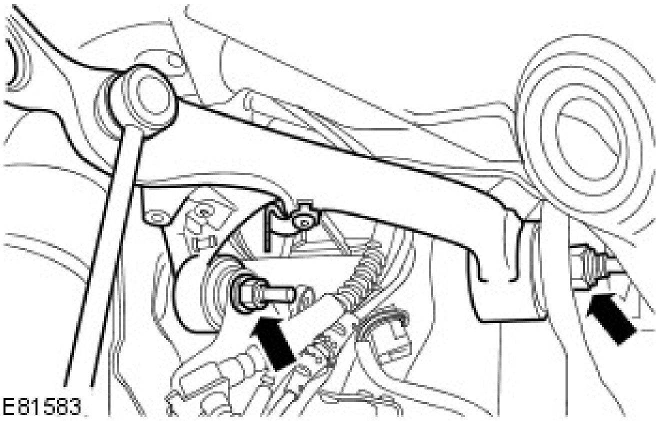
8. ⚠ CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

Loosen the upper arm retaining nut.

9. Using the special tool, release the upper arm ball joint.

- Remove and discard the nut.





10. Remove the upper arm.

- Remove and discard the 2 nuts.

Installation

1. Install the upper arm.

- Fit the bolts but do not fully tighten at this stage.
- Install new nuts.

2. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

3. Secure the stabilizer bar link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

4. Connect the height sensor link.

5. Secure the brake hose to the upper arm.

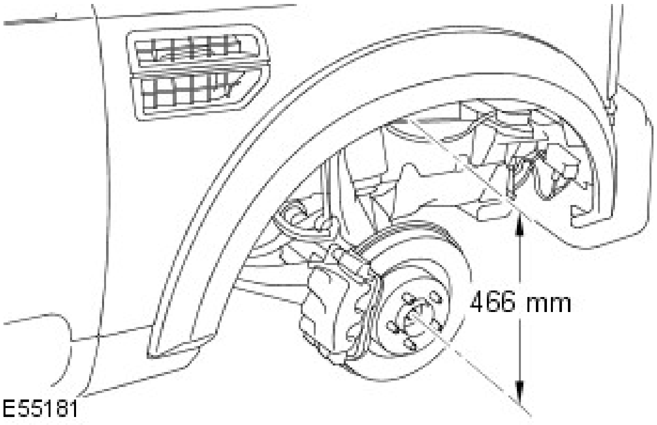
- Tighten the bolt to 23 Nm (17 lb.ft).

6. Secure the wheel speed sensor leads to the upper arm.

7. Install the upper arm and brake line heat shields.

- Install the 3 bolts.
- Install the 3 nuts.

8. Set the height distance between the centre of the halfshaft end and the edge of the fender trim to 466 mm (18.34'').



9. Tighten the 2 upper arm nuts and bolts to 175 Nm (129 lb.ft).

10. Install the wheel and tire.

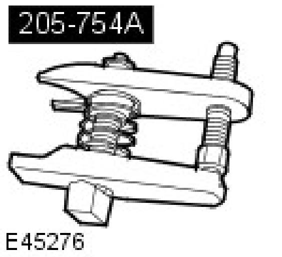
    - Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Using the Land Rover approved diagnostic system, calibrate the suspension ride height.
    For additional information, refer to: Ride Height Adjustments (204-05, General Procedures).

Published: 11-May-2011

Front Suspension - Lower Arm

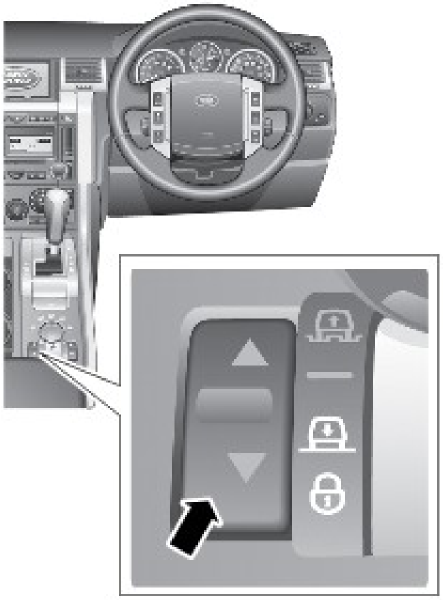
Removal and Installation

Special Tool(s)	
	Ball joint separator 205-754(LRT-54-027)

Removal

All vehicles

1. Place vehicle into access mode.



E99855

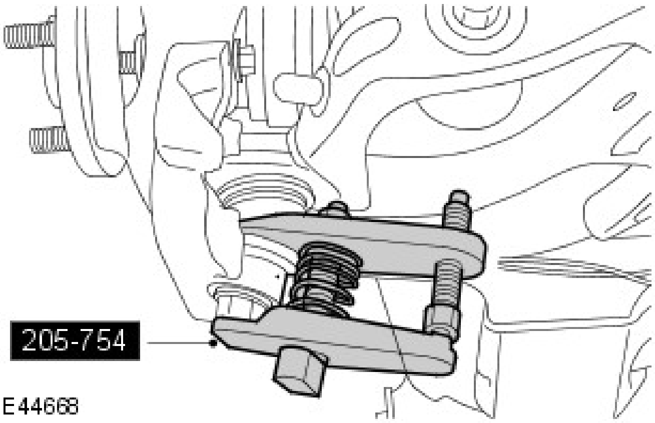
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

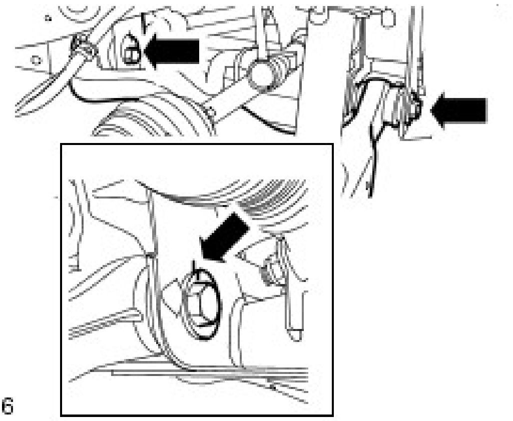
Raise and support the vehicle.

3. Remove the wheel and tire.

4. Remove the lower ball joint retaining nut.

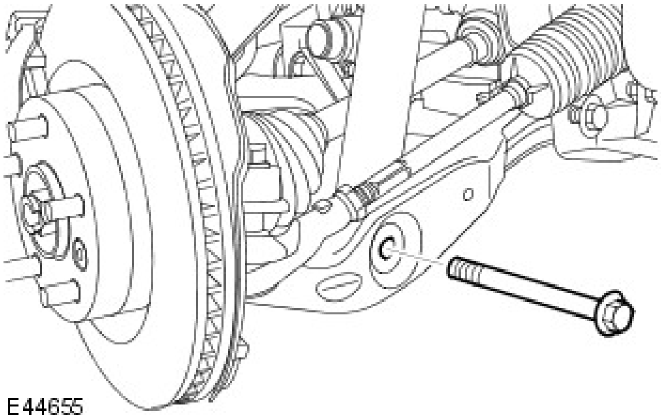
5. Using the special tool, release the lower ball joint from the steering knuckle.





6. Mark the position of the bolts in relation to the chassis brackets.

- Remove the 2 bolts.



7. Disconnect the shock absorber and spring assembly from the lower arm.

- Remove the nut and bolt.

8. ⚠CAUTION: Only displace the wheel knuckle sufficiently outboard to release the lower arm past the undertray. This will prevent the inboard driveshaft joint from separating. Failure to follow this instruction may result in damage to the vehicle.

- NOTE: Make sure the steering is in the straight ahead position.

Remove the lower arm.

- Release the lower arm from the subframe and reposition downwards.
- Rotate the lower arm and position forward to release from the wheel knuckle.

Vehicles with Active Stabilization

9. Position a transmission jack to support the hub assembly.

Installation

Vehicles with Active Stabilization

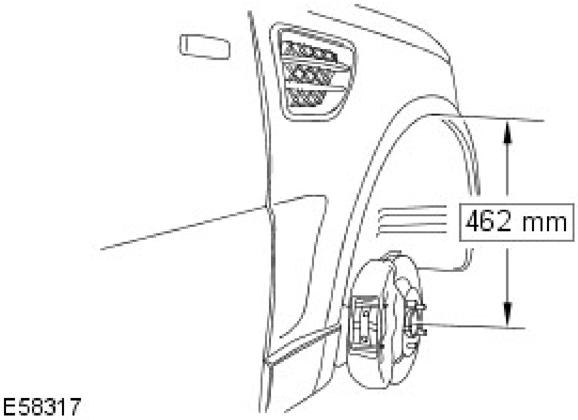
1. Remove the transmission jack.

All vehicles

2. Install the lower arm.
   - Fit the bolts but do not fully tighten at this stage.

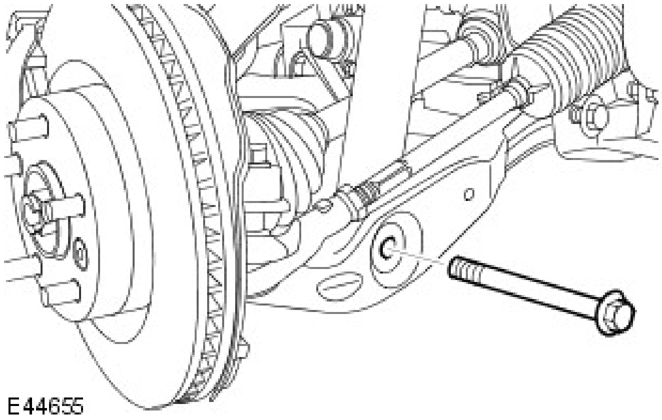
3. ⚠ CAUTION: The lower arm ball joint can be damaged by excessive articulation. Do not over articulate the ball joint. Failure to follow this instruction will result in damage to vehicle.

   Connect the lower arm to the wheel knuckle.
   - Tighten the lower arm ball joint retaining nut to 115 Nm (85 lb.ft).



4. Set the height distance, between the center of the halfshaft end, and the edge of the fender to 462 mm (18.19'').

5. Tighten the lower arm bolts to 275 Nm (203 lb.ft).
   - Align the bolts to the marks made previously.



6. Connect the shock absorber and spring assembly to the lower arm.
   - Tighten the nut and bolt to 300 Nm (221 lb.ft).

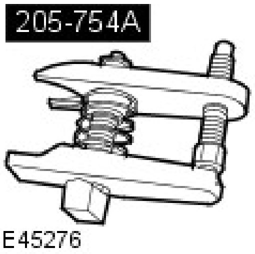
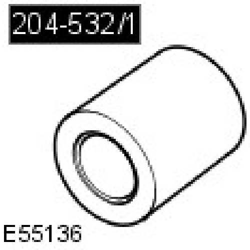
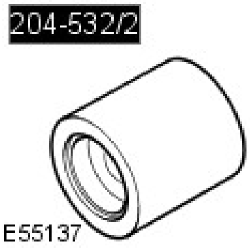
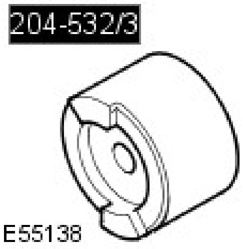
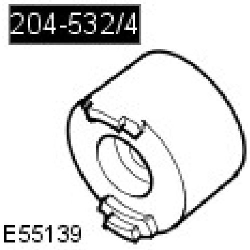
7. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

8. Carry out the wheel alignment procedure.

Published: 11-May-2011

Front Suspension - Upper Arm Bushing

Removal and Installation

Special Tool(s)	
 205-754A E45276	Ball joint separator 205-754 (LRT-54-027)
 204-532/1 E55136	Receiver cup upper arm bushes 204-532/1
 204-532/2 E55137	Remover upper arm bushes 204-532/2
 204-532/3 E55138	Installer upper arm front bush 204-532/3
 204-532/4 E55139	Installer upper arm rear bush 204-532/4

Removal

- NOTE: The bushings must be replaced in pairs, LH and RH sides.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

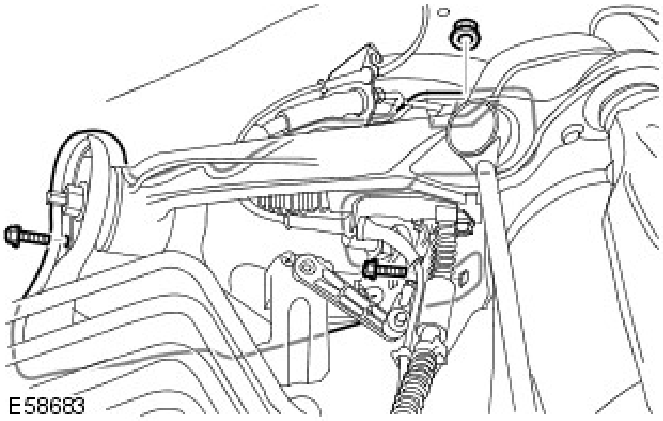
2. Remove the front wheels and tires.

3. Remove the LH upper arm.

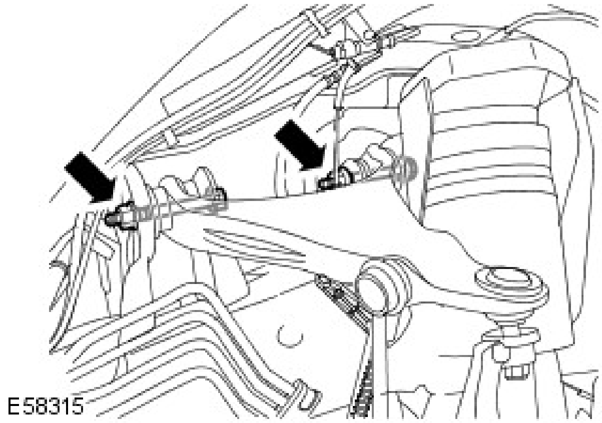
For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).

4. Release the heat shield for access to the upper arm bolts.

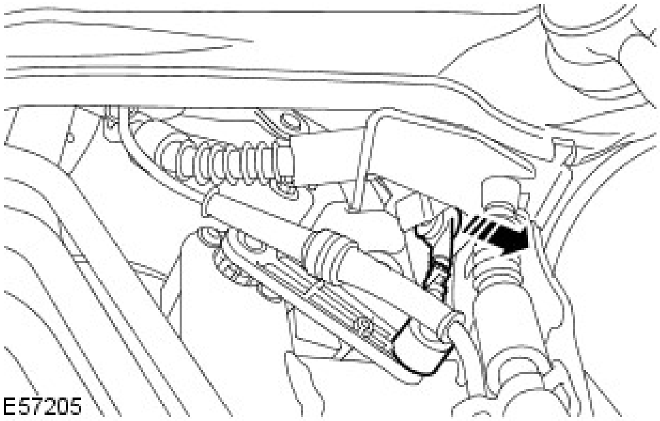
- Remove the retaining nut and two bolts.



5. Loosen the upper arm bolts.



6. Disconnect the height sensor link.



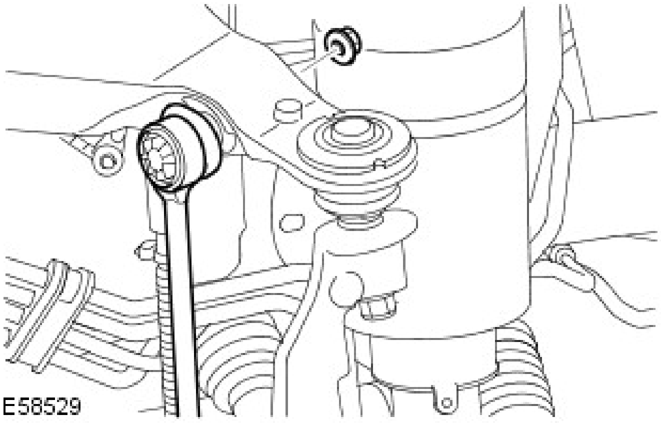
7. CAUTIONS:

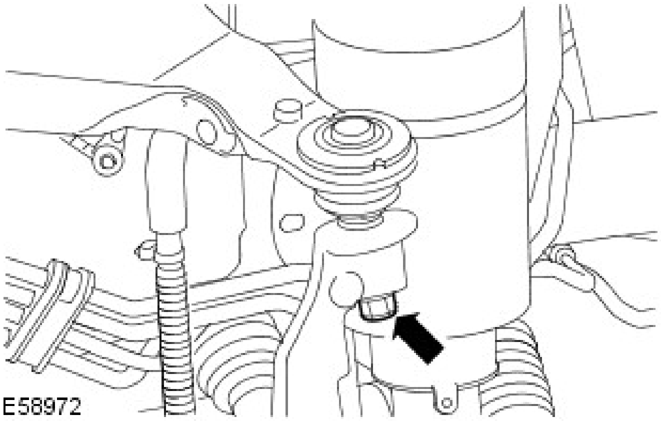
⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

Remove the stabilizer bar link nut.

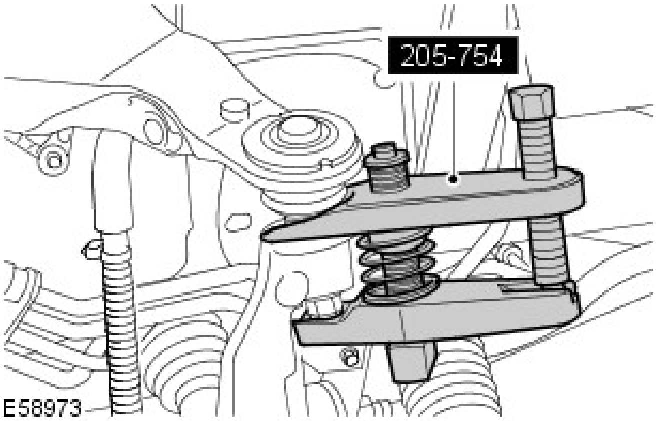
- Discard the nut.





8. ⚠ CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

Loosen the upper arm retaining nut.



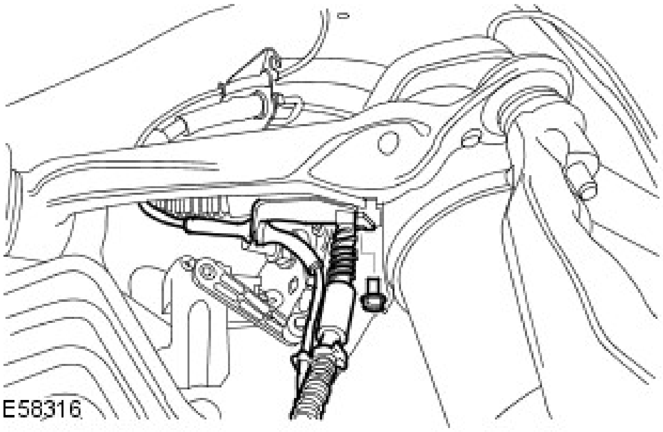
9. Using the special tool, release the upper arm ball joint.

- Remove and discard the retaining nut.

10. Release the brake hose from the upper arm.

11. Release the wheel speed sensor lead from the upper arm.

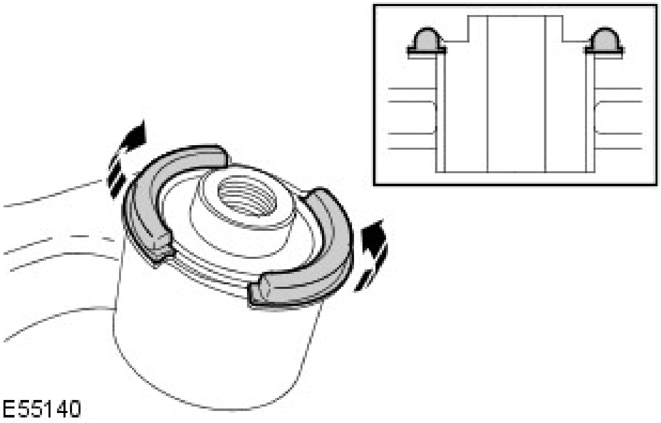
12. Remove the RH upper arm.



13. Note the position of the bushing in relation to the upper arm.

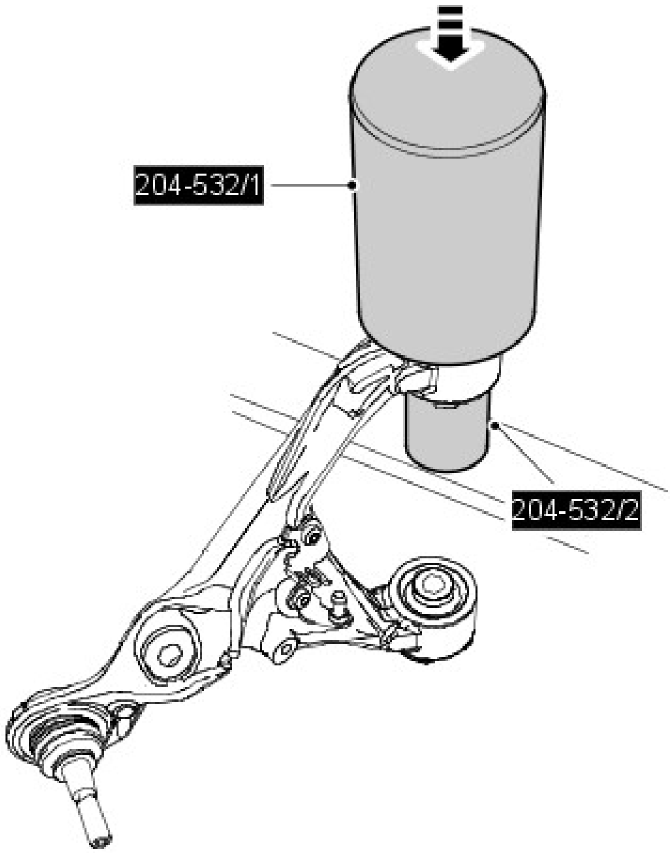
14. CAUTION: The bush flanges need to be removed to allow bush removal.

Using a suitable tool, bend over the bush flanges.



15. Using a hacksaw, remove the flange from the bushing, making sure the upper arm is not damaged.

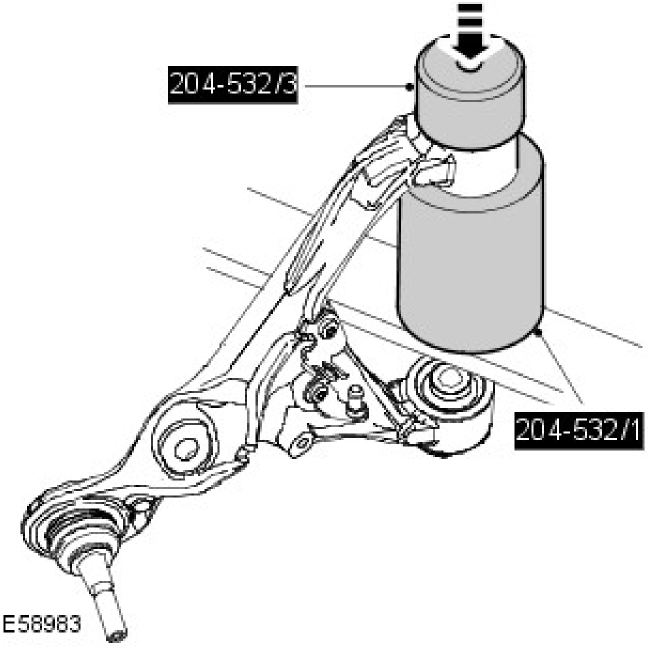
16. Using the special tools, remove and discard the upper arm bushings.



E58982

Installation

All vehicles



E58983

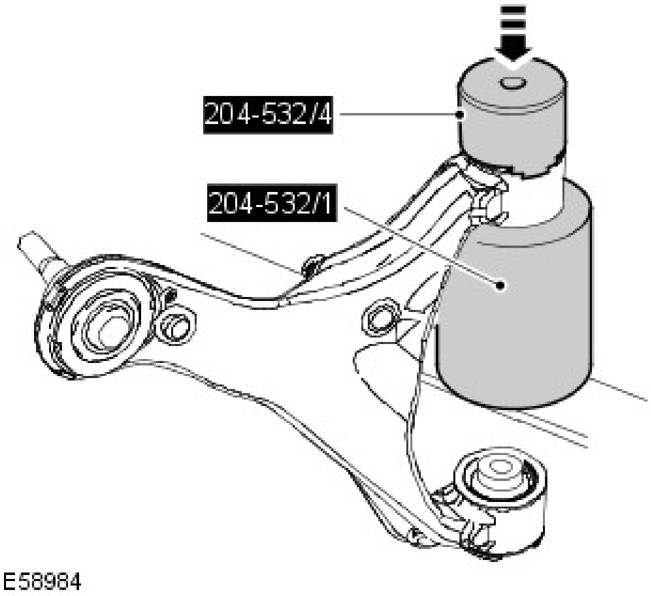
1. ⚠CAUTION: Make sure the correct special tool is used to install the bushings to the correct depth.

Using the special tools, install the upper arm rear bushings.

- Align the arrow on the bush with the mark, previously made on the upper arm.

2. Using the special tools, install the upper arm front bushings.

- Align the arrow on the bush with the mark, previously made on the upper arm.



3. Install the RH upper arm.

- Fit the bolts but do not fully tighten at this stage.

4. Secure the brake hose to the upper arm.

- Tighten the bolt to 23 Nm (17 lb.ft).

5. Secure the wheel speed sensor lead to the upper arm.

6. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

Vehicles without Active Stabilization

7. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Secure the stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

Vehicles with Active Stabilization

8. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

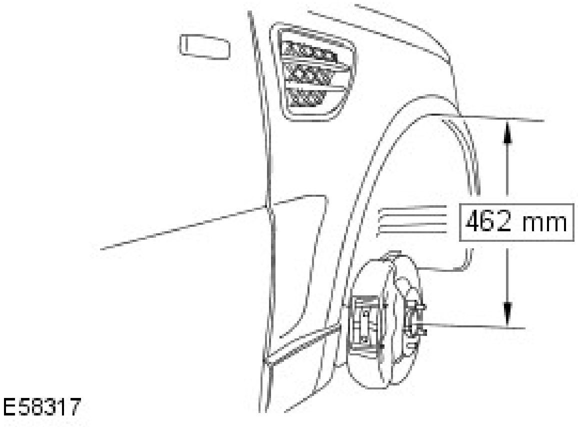
Secure the stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

All vehicles

9. Connect the height sensor link.

10. Set the height distance, between the center of the halfshaft end, and the edge of the fender to 462 mm (18.19'').



11. Tighten the 2 upper arm nuts and bolts to 175 Nm (129 lb.ft).

12. Secure the heat shield.

- Tighten to 10 Nm (7 lb.ft).

13. Install the LH upper arm.
For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).

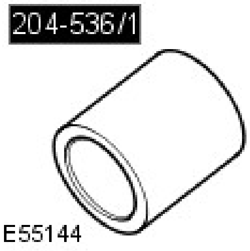
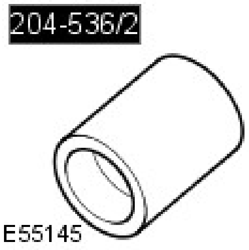
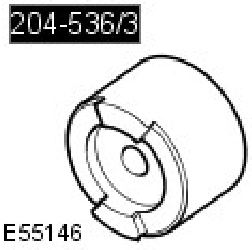
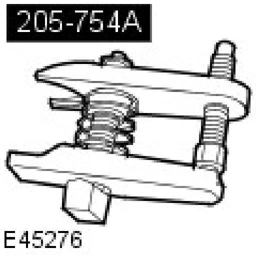
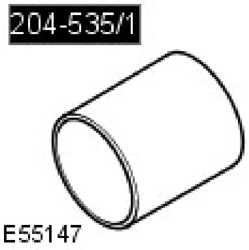
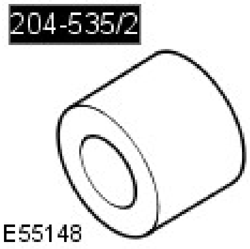
14. Install the front wheels and tires.

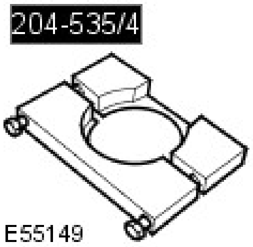
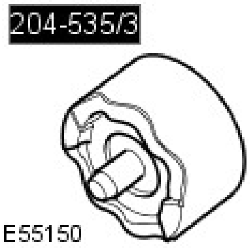
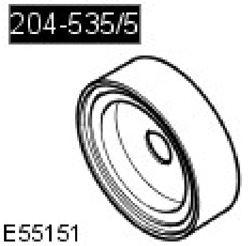
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 23-Sep-2011

Front Suspension - Lower Arm Bushing

Removal and Installation

Special Tool(s)	
 204-536/1 E55144	Receiver front lower arm front bush 204-536/1
 204-536/2 E55145	Remover front lower arm front bush 204-536/2
 204-536/3 E55146	Installer front lower arm front bush 204-536/3
 205-754A E45276	Ball joint separator 205-754(LRT-54-027)
 204-535/1 E55147	Receiver lower arm rear bush 204-535/1
 204-535/2 E55148	Remover lower arm rear bush 204-535/2
	Remover plate lower arm rear bush

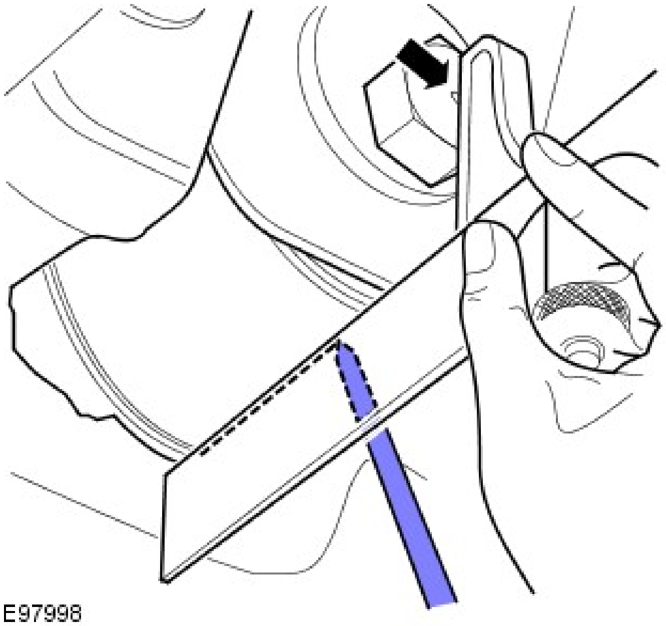
	204-535/4
	Installer lower arm rear bush 204-535/3
	Installer/depth setter lower arm rear bush 204-535/5

Removal

- NOTE: If installing the front bushes, both front bushes must be replaced.
- NOTE: If installing the rear bushes, both rear bushes must be replaced.
- NOTE: Take note of the fitted position of the bush.

All vehicles

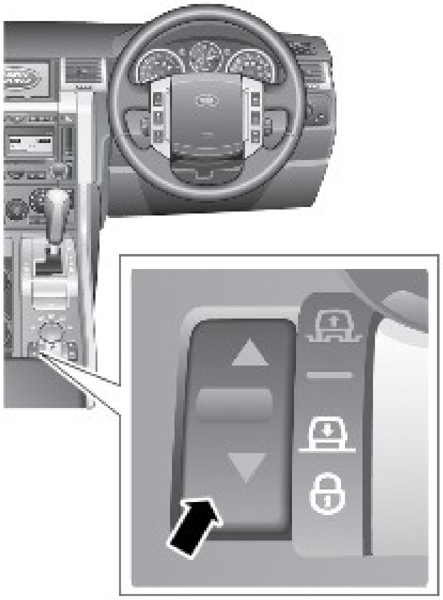
1. Make sure that the tire pressures are correct and that the vehicle is at the correct ride height.



2. Mark the position of the bushing in relation to the lower arm.

1. Using a spirit level type engineers square, align through the center of the bolt head retaining the lower arm rear bush with a perpendicular drop.
2. Align the rule of the engineers square along the lowest point on the circumference of the lower arm rear bush boss.
3. Apply a piece of tape to the arm and mark a horizontal line along the underside of the lower arm rear bush boss (parallel with the bush axis).
4. Make sure that the process is carried out on both right-hand side and left-hand side.

3. Place vehicle into access mode.



E99855

4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

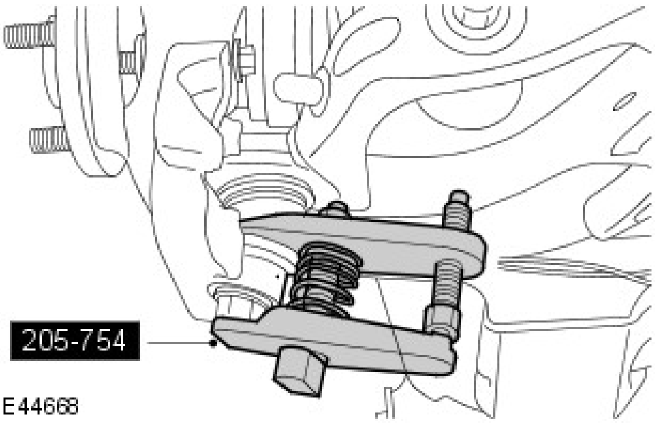
Raise and support the vehicle.

5. Remove the RH lower arm.
For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).

6. Remove the wheel and tire.

7. Remove the lower ball joint retaining nut.

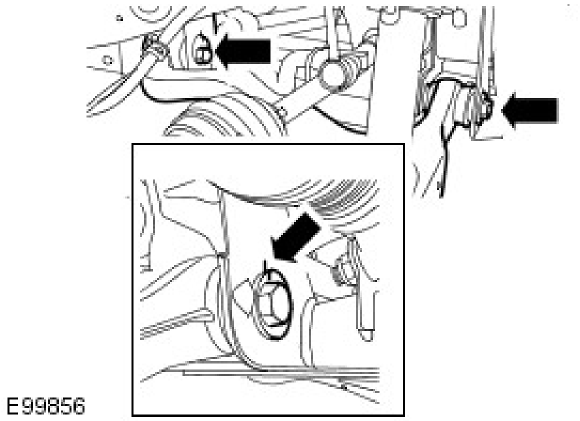
8. Using the special tool, release the lower ball joint from the steering knuckle.



E44668

9. Mark the position of the bolts in relation to the chassis brackets.

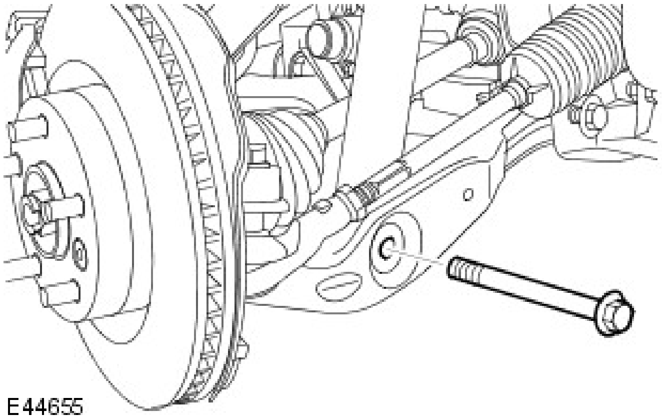
- Remove the 2 bolts.



E99856

10. Disconnect the shock absorber and spring assembly from the lower arm.

- Remove the nut and bolt.



E44655

11. Remove the lower arm.

- Release the lower arm from the subframe and reposition downwards.
- Rotate the lower arm and position forward to release from the wheel knuckle.

Vehicles with Active Stabilization

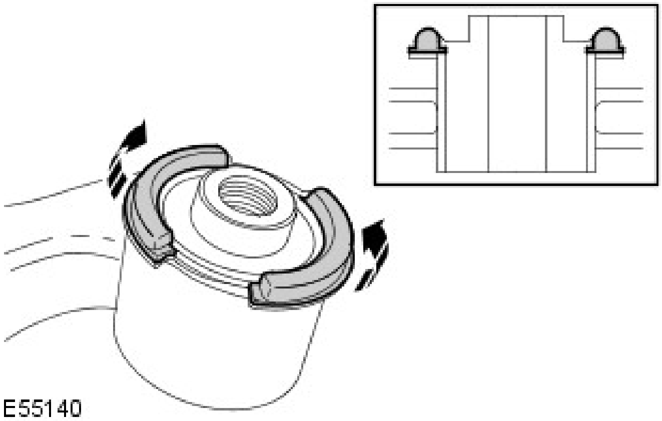
12. Position a transmission jack to support the hub assembly.

All vehicles

13. Note the position of the bushing in relation to the lower arm.

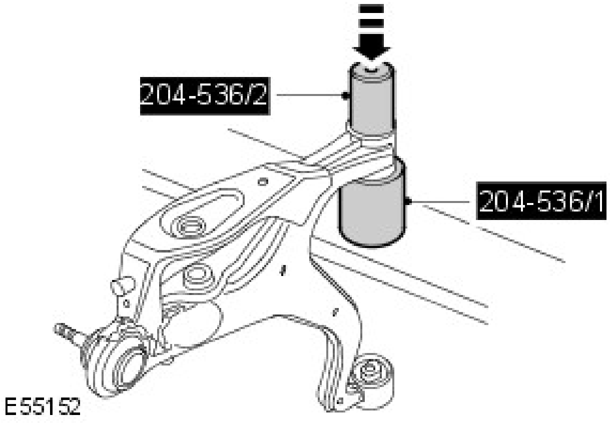
14. ⚠CAUTION: The bush flanges need to be removed to allow bush removal.

Remove the lower arm front bushing flanges.



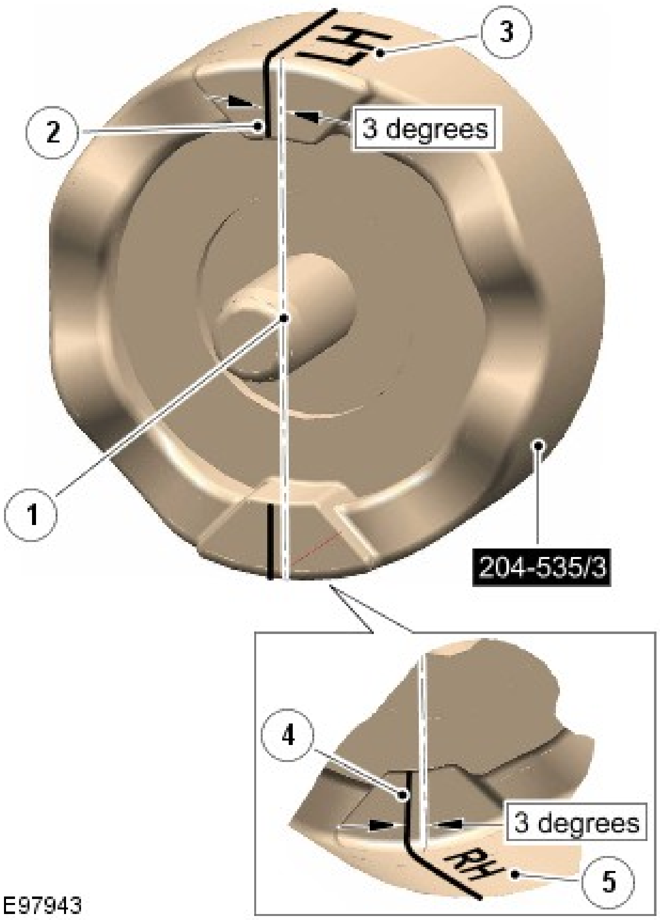
E55140

15. Using the special tools, remove and discard the lower arm front bushings.


204-536/2
204-536/1
E55152

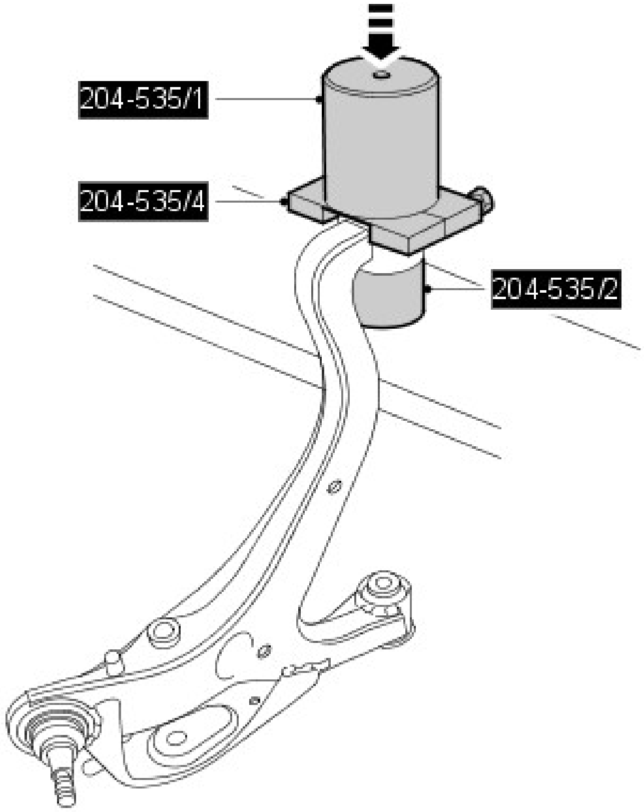
16. Apply alignment guide lines to installer tool (204-535/3).

    1. Mark center line on installer tool.
    2. Mark line across top surface 3 degrees to the left of center line.
    3. Mark 'LH' on top surface.
    4. Mark line across bottom surface 3 degrees to the left of the center line.
    5. Mark 'RH' on bottom surface.


LH
3
2
3 degrees
1
204-535/3
4
3 degrees
RH
5
E97943

17. Using the special tools, remove and discard the lower arm rear bushings.

    - Prior to bush removal place install tool (204-535/3) on bush and make sure 'RH' marked line (for right-hand bush) or 'LH' marked line (for left-hand bush) on special locator tool align with scribed line on arm boss dependent on side being replaced.



E55153

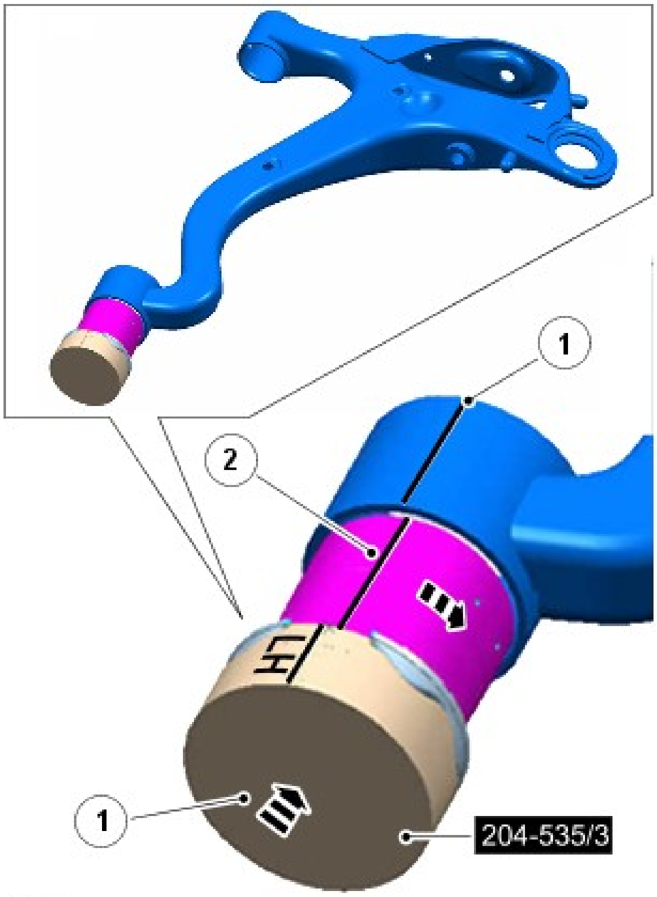
Installation

All vehicles

1. ⚠ CAUTION: Make sure the bush is correctly aligned.

   Mark the position of the bushing in relation to the lower arm.

   1. Make sure the correct marked side line 'RH' or 'LH' on the special tool (204-535/3) is aligned with the scribed line on the RH or LH bush to be installed.
   2. Extend the line from the installer tool onto the bush using a marker pen. Using the marked line, align the bush to the lower arm before installing the bush.


1
2
LH
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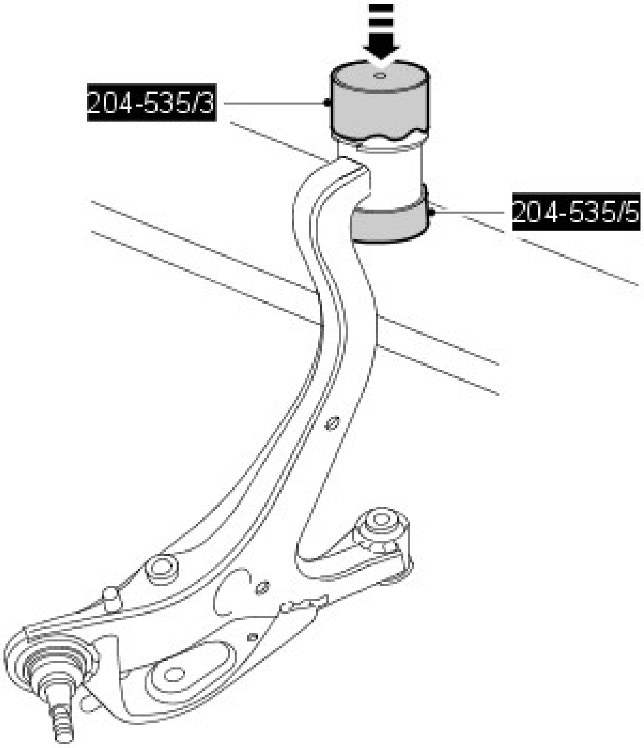
204-535/3

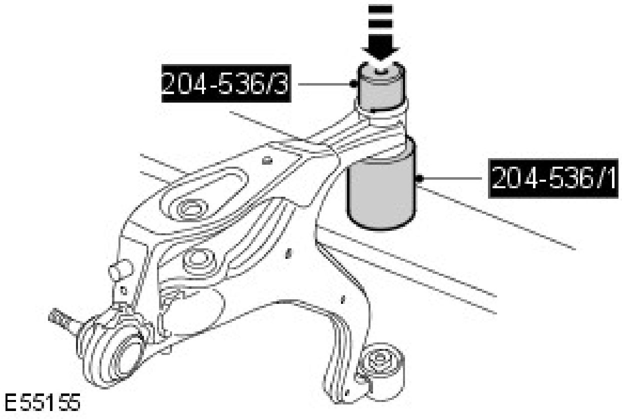
E97944

2. ⚠ CAUTION: Make sure the correct special tool is used to install the bushings to the correct depth.

Using the special tools, install the lower arm rear bushings.


204-535/3
204-535/5

E55154



3. ⚠ CAUTION: Make sure the bush is correctly aligned.

Using the special tools, install the lower arm front bushings

Vehicles with Active Stabilization

4. Remove the transmission jack.

All vehicles

5. Install the lower arm.

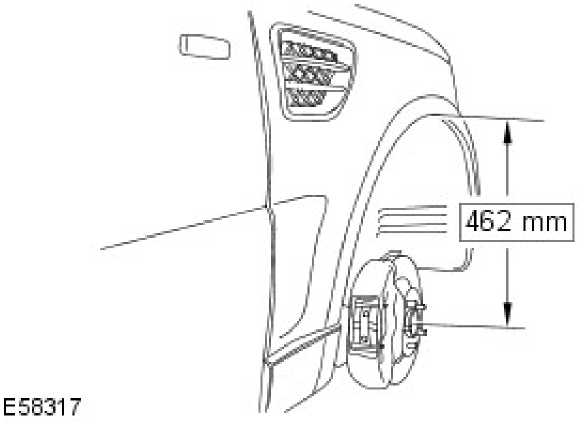
- Fit the bolts but do not fully tighten at this stage.

6. NOTE: The lower arm ball joint can be damaged by excessive articulation. Failure to follow this instruction will result in damage to vehicle.

Connect the lower arm to the wheel knuckle.

- Tighten the lower arm ball joint retaining nut to 115 Nm (85 lb.ft).

7. Set the height distance, between the center of the halfshaft end, and the edge of the fender to 462 mm (18.19'').

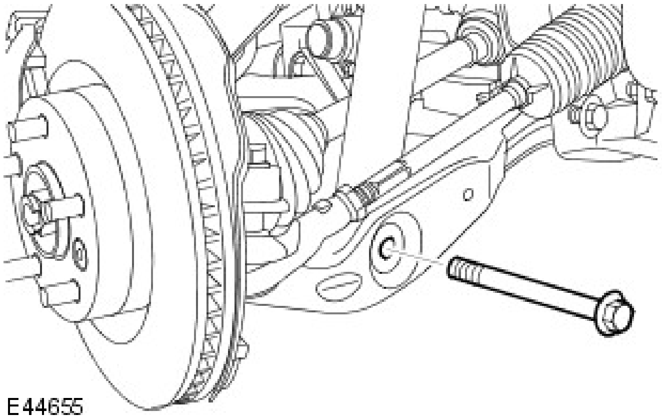


8. Tighten the lower arm bolts to 275 Nm (203 lb.ft).

- Align the bolts to the marks made previously.

9. Connect the shock absorber and spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).



10. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Install the RH lower arm.
For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).

12. Carry out the wheel alignment procedure.

Published: 11-May-2011

Rear Suspension -

General Specifications

Item	Specification
Gap between underside of the toe link rubber boot and the integrated body frame bracket	15.0 mm (0.591 in)
Height between the center of the halfshaft end and the edge of the fender trim	463 mm (18.19 in)

Torque Specifications

Description	Nm	lb-ft
** Toe link bolt	175	129
* Toe link inner ball joint retaining nut	133	98
* Stabilizer bar link nuts	115	85
Stabilizer bar clamp bolts	62	46
Body mount retaining bolts	133	83
Shock absorber to the lower suspension arm nut and bolt	300	221
Shock absorber to suspension turret nuts	70	52
Lower arm to wheel knuckle bolt	175	129
Lower arm bolts	275	203
*+ Halfshaft retaining nut	350	258
Upper arm to wheel knuckle nut	133	98
Upper arm front bolt	175	129
Upper arm rear bolt	275	203
Brake tube unions	18	13
Rear camber adjusting bolts	133	98
Wheel speed sensor	9	7
Brake disc dust shield bolts	9	7
Parking brake cable coupling	8	6
Road wheel nuts	140	103

*** New nut must be installed**

+ Nut must be staked after tightening

**** Bolts may be reinstalled a maximum of 4 times, the bolt head must be marked using a centre punch each time the bolt is refitted. When 4 centre punch marks are visible, a new, 'Patched' bolt must be installed.**

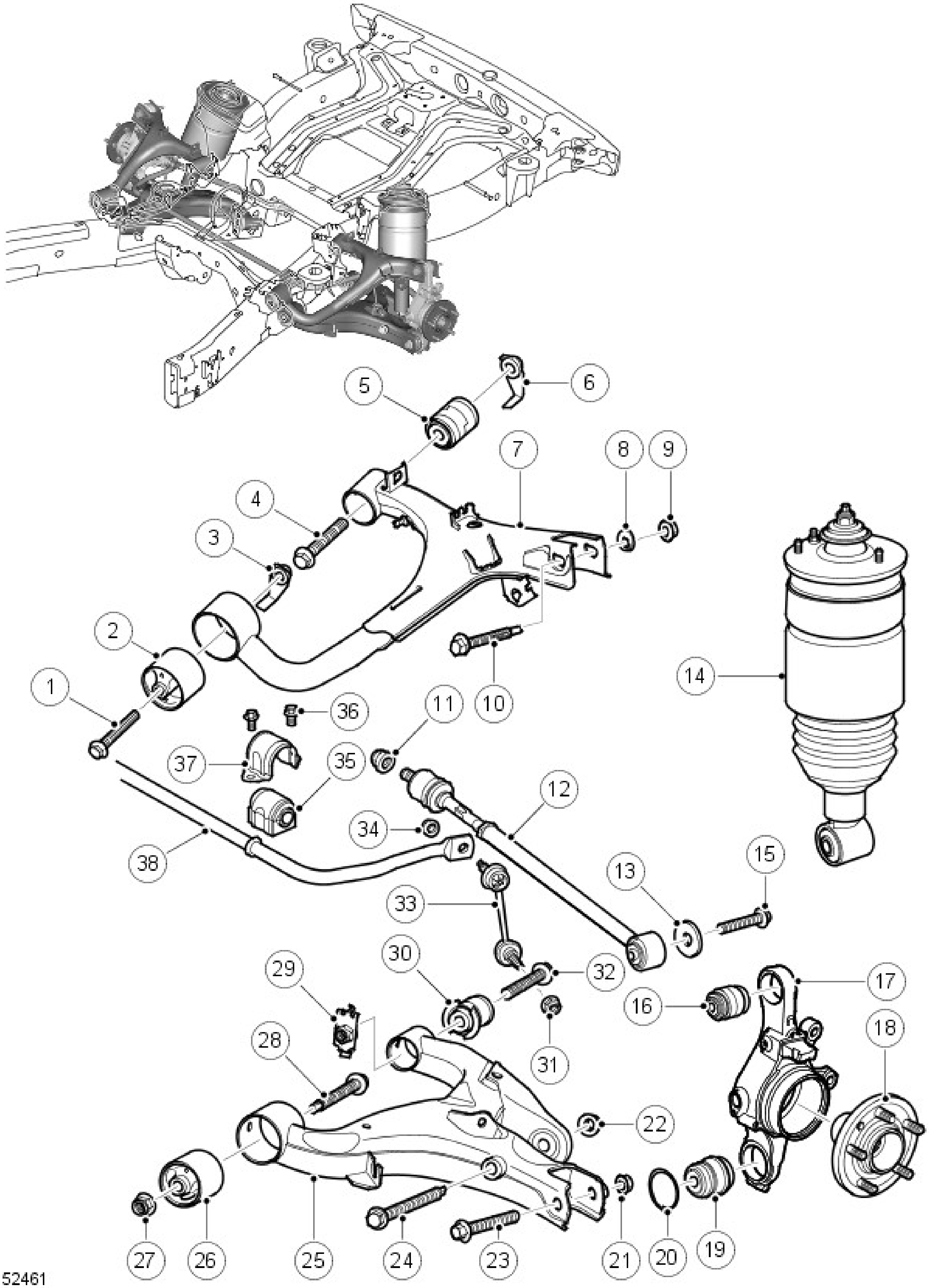
Published: 11-May-2011

Rear Suspension - Rear Suspension

Description and Operation

Rear Suspension Component Location

- NOTE: Without Dynamic Response version shown



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E52461

Item	Part Number	Description
1	-	Bolt (Upper arm forward bush)
2	-	Bush - Forward (Upper arm)

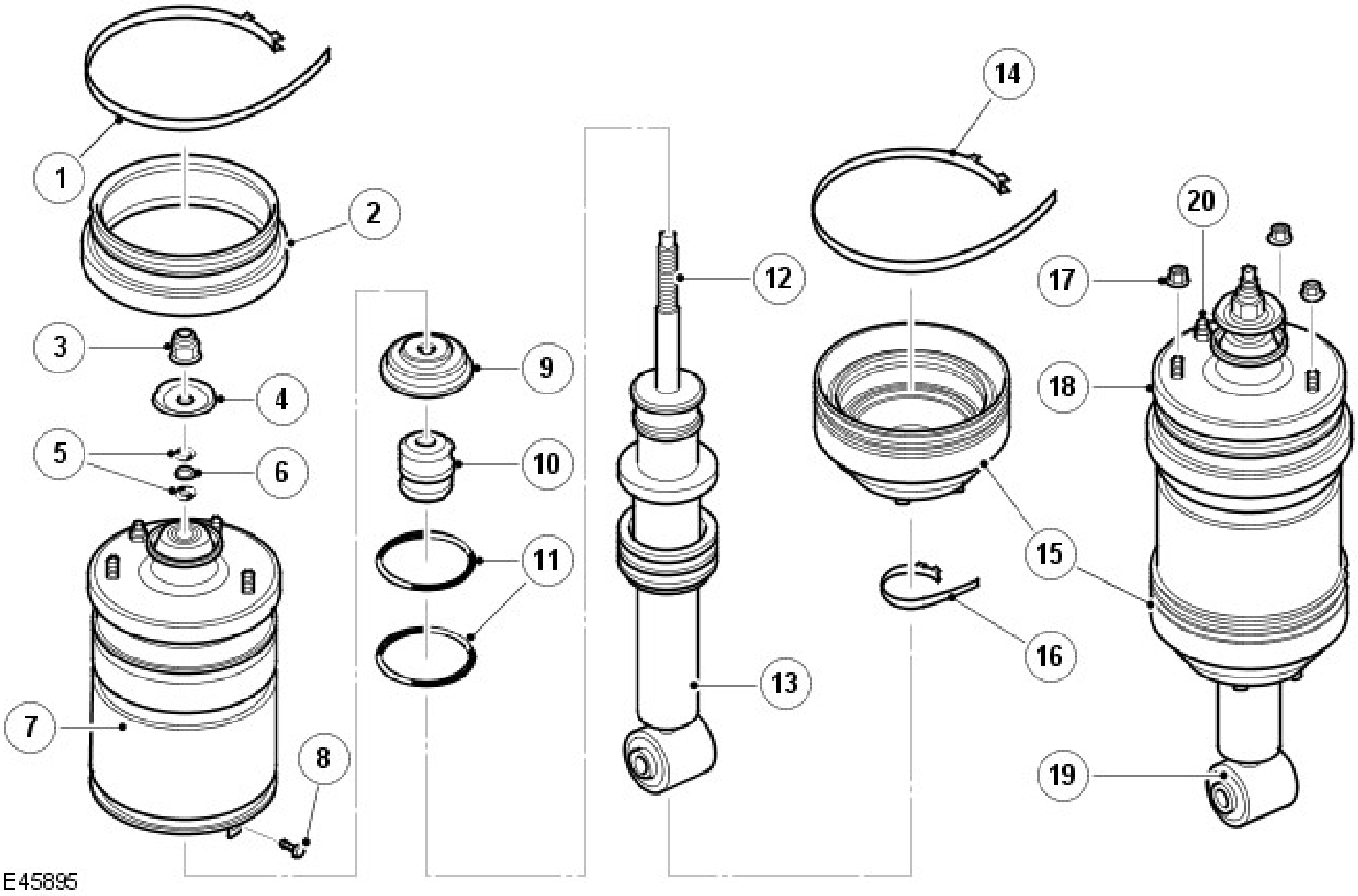
3	-	Caged nut (Upper arm forward bush)
4	-	Bolt (Upper arm rearward bush)
5	-	Bush - Rearward (Upper arm)
6	-	Caged nut (Upper arm rearward bush)
7	-	Upper arm
8	-	Eccentric washer (Wheel knuckle upper ball joint)
9	-	Nut (Wheel knuckle upper ball joint)
10	-	Bolt (Wheel knuckle upper ball joint)
11	-	Special nut (Adjustable transverse toe link)
12	-	Adjustable transverse toe link
13	-	Washer (Adjustable transverse toe link)
14	-	Damper module assembly
15	-	Bolt (Adjustable transverse toe link)
16	-	Ball joint (Wheel knuckle upper)
17	-	Wheel knuckle and bearing assembly
18	-	Wheel hub
19	-	Ball joint (Wheel knuckle lower)
20	-	Circlip (Wheel knuckle lower ball joint)
21	-	Self-locking nut (Wheel knuckle lower ball joint)
22	-	Self-locking nut (Damper assembly lower attachment)
23	-	Bolt (Wheel knuckle lower ball joint)
24	-	Bolt (Damper assembly lower attachment)
25	-	Lower arm
26	-	Bush - Forward (Lower arm)
27	-	Self-locking nut (Lower arm forward bush)
28	-	Bolt (Lower arm forward bush)
29	-	Nut and retainer (Lower arm rearward bush)
30	-	Bush - Rearward (Lower arm)
31	-	Self-locking nut (Stabilizer bar link to lower arm)
32	-	Bolt (Lower arm rearward bush)
33	-	Stabilizer bar link
34	-	Self-locking nut (Stabilizer bar link to stabilizer bar)
35	-	Stabilizer bar bush
36	-	Bolt (Stabilizer bar bracket)
37	-	Stabilizer bar bracket
38	-	Stabilizer bar

GENERAL

The independent rear suspension offers a reduction in unsprung weight over the beam axle design. The rear suspension comprises an upper arm, a lower arm, a wheel knuckle and wheel hub, two air spring damper modules and a stabilizer bar and links assembly.

The rear suspension arms have been designed to give maximum ground clearance. The suspension geometery can be adjusted for camber using a cam bolt and toe and bump steer adjustment can be corrected via an adjustable transverse link.

AIR SUSPENSION DAMPER MODULE



Item	Part Number	Description
1	-	Strap*
2	-	Upper gaitor*
3	-	Self-locking nut*
4	-	Rebound washer*
5	-	O-ring - Damper rod*
6	-	Spacer - Damper rod*
7	-	Air spring*
8	-	Retaining pin - Air spring sleeve support*
9	-	Bump washer*
10	-	Spring aid*
11	-	O-ring - Air sleeve support (2 off)*
12	-	Damper rod
13	-	Damper assembly
14	-	Strap*
15	-	Lower gaitor*
16	-	Strap*
17	-	Self-locking nut (3 off)
18	-	Top mount assembly
19	-	Bush
20	-	Voss connector

- NOTE: * Shows service items

The damper module comprises an air spring assembly, top mount and a damper assembly. The damper and air spring are only serviceable as complete assemblies.

Damper

The damper assembly is a mono tube design with an air spring. The lower end of the damper is fitted with a bush and is attached to the lower arm with a bolt and nut.

The damper functions by restricting the flow of hydraulic fluid through internal galleries within the damper. The damper rod moves axially within the damper, its movement limited by the flow of fluid through the galleries, providing damping of undulations in the terrain. The damper rod is sealed at its exit point from the damper body to maintain the fluid within the unit and to prevent the ingress of dirt and moisture. The seal also incorporates a wiper to keep the rod clean.

Air Spring

The air spring is similar in design to the air spring used on the front suspension.

The air spring comprises an aluminium restraining cylinder, top mount, spring aid, air sleeve and an inner support sleeve.

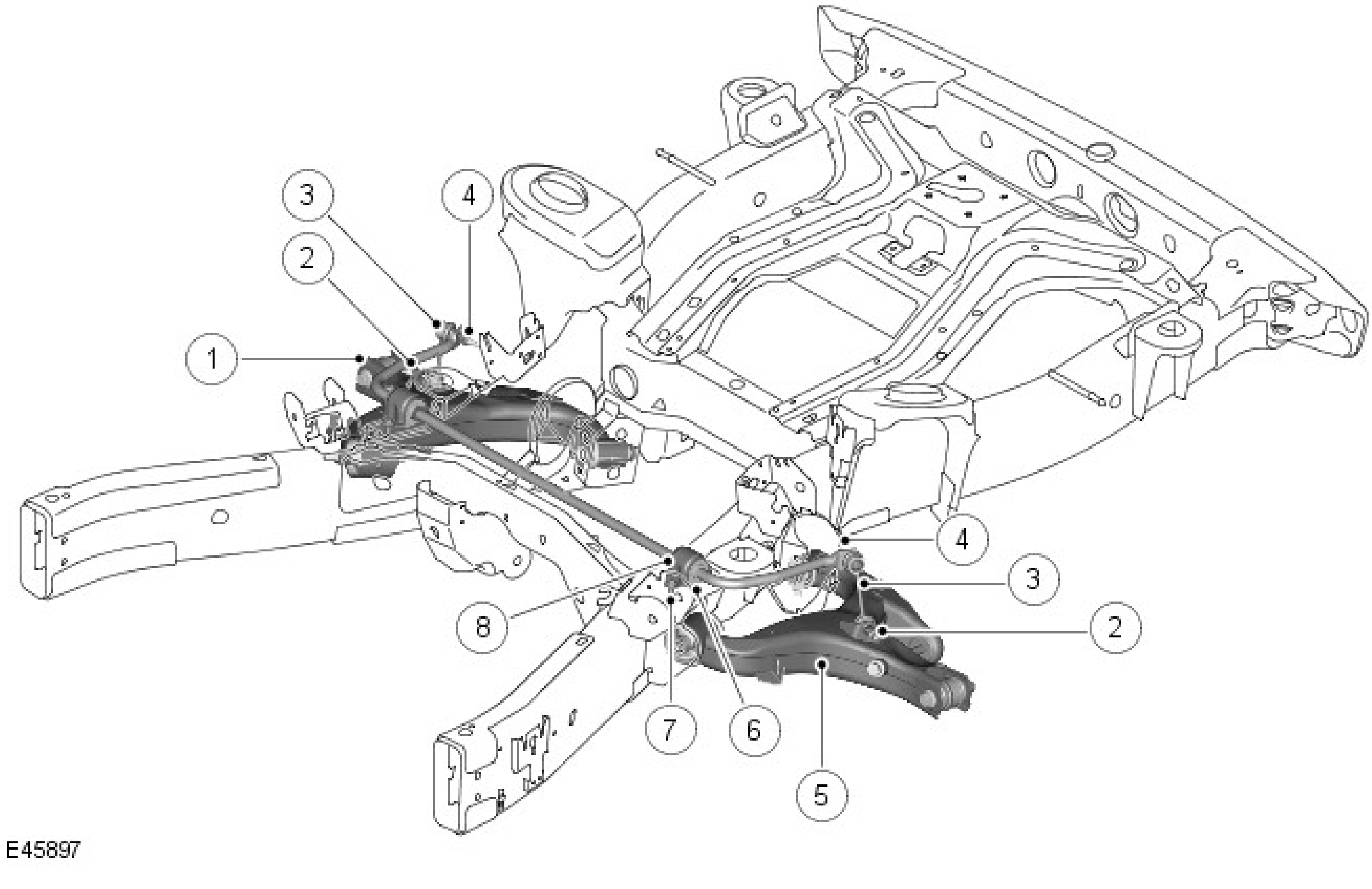
The air sleeve is made from a flexible rubber material which allows the sleeve to roll up and down the air spring piston as the vehicle changes height. The air sleeve is attached to the restraining cylinder and the support sleeve with crimp rings which provide an air tight seal. The support sleeve contains a seal carrier which has two O-rings sealing the support sleeve and two O-rings sealing to the damper body. The top of the air sleeve is crimped to the top mount which attaches to a mounting on the chassis with 3 integral studs and self-locking nuts.

A spring aid is fitted to the damper rod and prevents the top mount contacting the top of the damper during full suspension compression and assists the suspension tune. The lower end of the air spring is located over the damper body and seats on a fabricated seat on the damper body. The air sleeve is positively attached to the seat with a retaining pin. The damper rod is located through a central hole in the top mount. The rod is threaded at its outer end and accepts a self-locking nut which secures the air spring to the damper rod.

The top mount is an integral part of the air spring. A bump washer is located between the top mount plate and the damper rod. A self locking nut secures the damper rod to the top mount. The top mount attaches to a housing on the chassis with 3 integral studs and self-locking nuts. The top mount also incorporates a 6 mm Voss air fitting which allows for the attachment of the air harness.

The air spring is fitted with two gaitors. The upper gaitor is fitted between the top mount and the air spring restraining cylinder. The lower gaitor is secured to the lower end of the restraining cylinder and the damper body with metal straps. The gaitors prevent dirt and debris becoming trapped between the air sleeve and the restraining cylinder.

STABILIZER BAR



Item	Part Number	Description
1	-	RH lower arm

2	-	Nut - link to lower arm (2 off)
3	-	Link (2 off)
4	-	Nut - link to stabilizer bar (2 off)
5	-	LH lower arm
6	-	Bush (2 off)
7	-	Bolt (4 off)
8	-	Bracket (2 off)

Vehicles without the Dynamic Response stabilizer bar system use a conventional stabilizer bar. The Dynamic Response system is detailed in a separate section.
For additional information, refer to: Active Stabilization System (204-06 Ride and Handling Optimization, Description and Operation).

The stabilizer bar is fabricated from heat treated, 23 mm diameter solid, spring steel bar. The stabilizer bar operates, via a pair of links, from their attachment to the lower arm.

The stabilizer bar is located on the upper face of a combined body mount and stabilizer bar bracket which is welded to each chassis side member. The stabilizer bar is attached to the brackets with two, Teflon lined bushes. The bushes are fitted with brackets, which are pressed onto the bushes and secured to the chassis brackets with bolts.

The stabilizer bar has crimped, 'anti-shuffle' collars pressed into position on the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

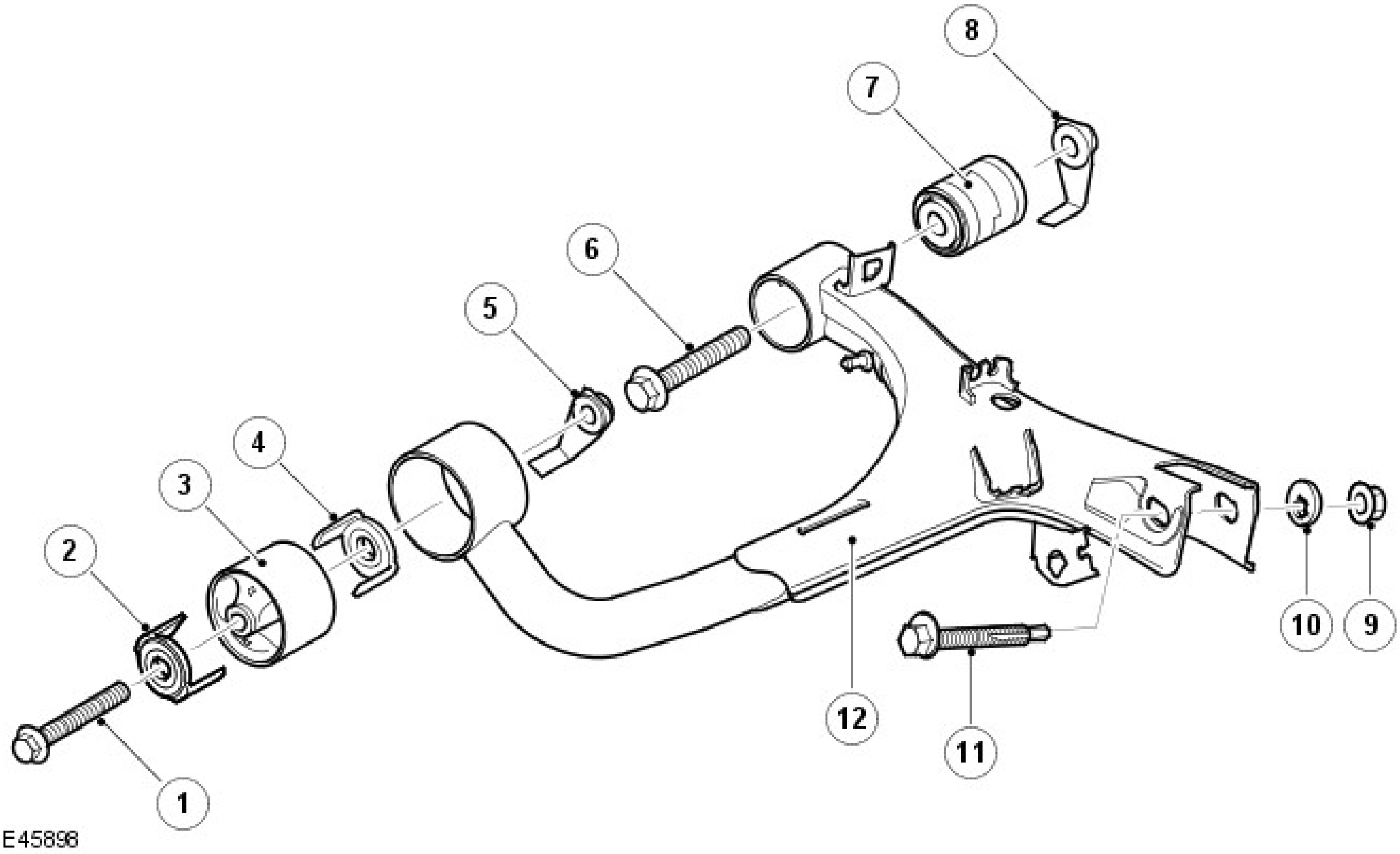
The ends of the stabilizer bar are attached to the lower arms via links. These allow the stabilizer bar to move with the wheel travel providing maximum effectiveness.

The rear stabilizer links are unique to vehicles with a passive (non-Dynamic Response) stabilizer bar. The passive (non-Dynamic Response) links can be identified by a white colored plastic bearing moulding. The Dynamic Response rear links are identified by a grey color plastic bearing moulding.

Each link has a ball joint at each end. The top ball joint is attached to the link at 90 degrees to the link axis. The ball joint is located in a hole in the end of the stabilizer bar and secured with a self locking nut.

The bottom ball joint is also attached to the link at 90 degrees to the link axis. The ball joint is located a hole in a bracket on the lower arm and secured with a self-locking nut. The links are not handed and therefore can be fitted to either side of the stabilizer bar.

UPPER ARM

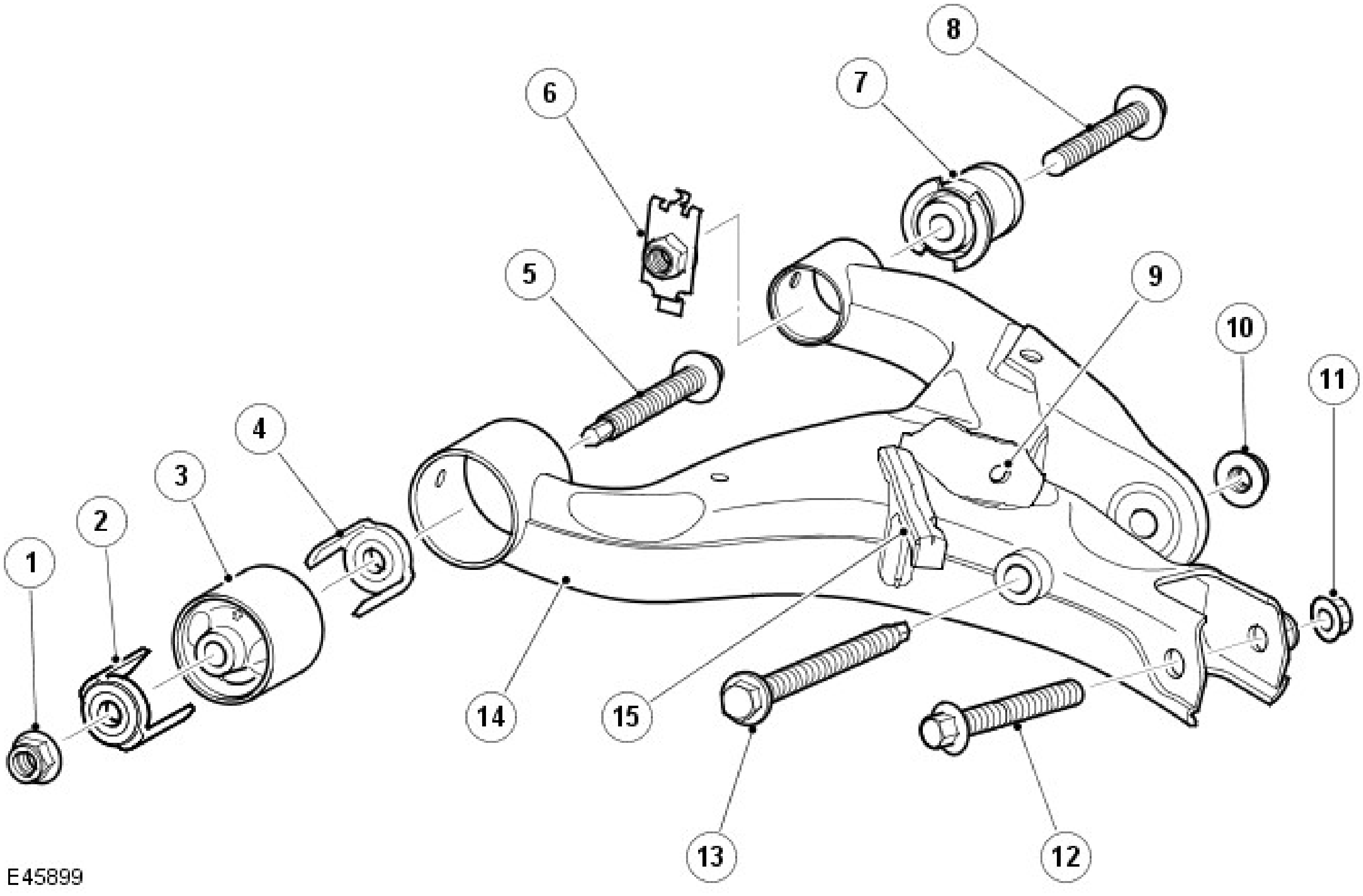


Item	Part Number	Description
1	-	Bolt
2	-	Bumpstop clip
3	-	Forward bush
4	-	Bumpstop clip
5	-	Caged nut
6	-	Bolt
7	-	Rearward bush
8	-	Caged nut
9	-	Self-locking nut - upper knuckle ball joint
10	-	Eccentric washer - upper knuckle ball joint
11	-	Cam bolt - upper knuckle ball joint
12	-	Upper arm

The upper arm locates in brackets on the upper surface of each chassis side member. The upper arm assembly comprises the upper arm and two bushes. The upper arm is a pressed steel fabrication. Its outer end has two brackets with slotted holes which locate the upper ball joint of the knuckle. The ball joint is secured in the upper arm with a cam bolt, eccentric washer and a self-locking nut. The cam bolt and the eccentric washer allow for the adjustment of the wheel camber.

Two fabricated tubular housings provide the location for the forward and rearward bushes. The bushes, which are pressed into the housings, locate between brackets on the chassis side members and are secured with bolts and caged nuts through metal inserts in the centre of the bushes.

LOWER ARM



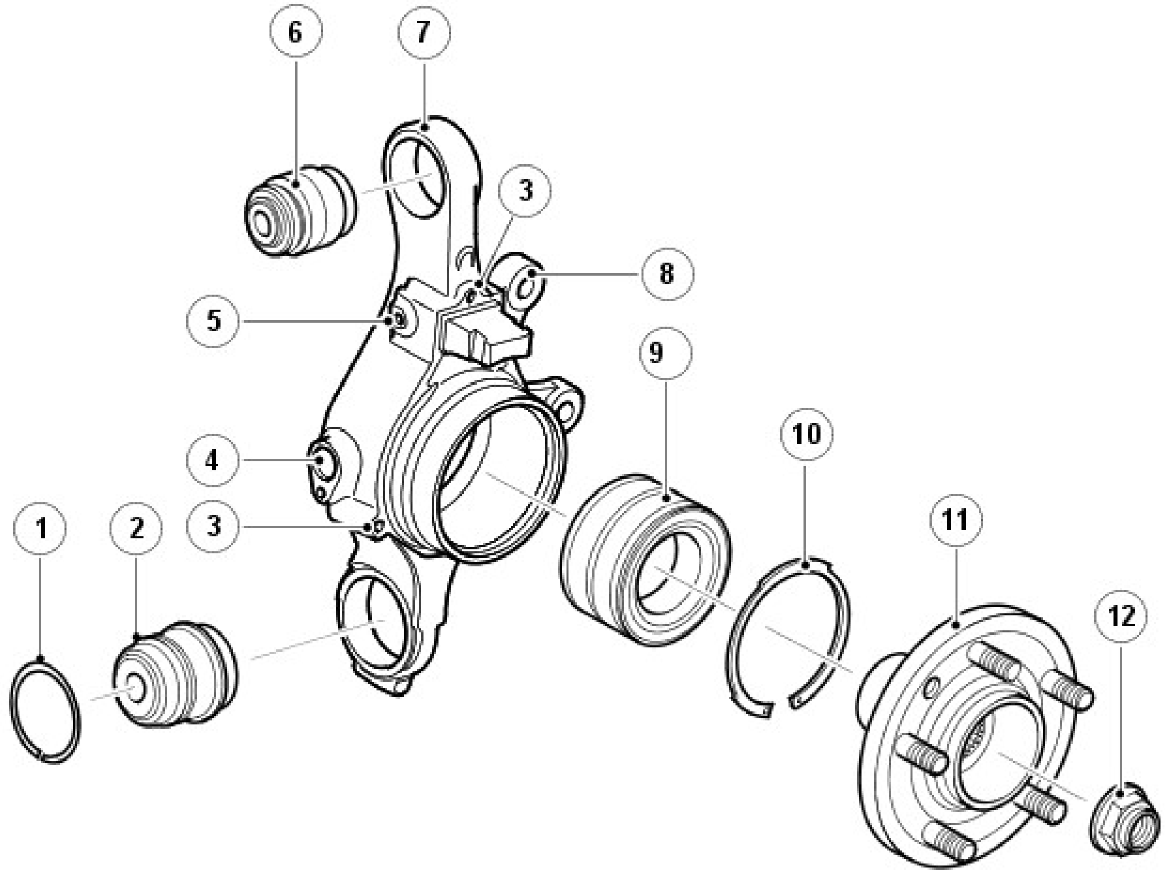
Item	Part Number	Description
1	-	Self-locking nut
2	-	Bumpstop clip
3	-	Forward bush
4	-	Bumpstop clip
5	-	Bolt
6	-	Nut and retainer
7	-	Rearward bush
8	-	Bolt
9	-	Stabilizer bar link bracket
10	-	Self-locking nut - damper lower attachment
11	-	Self-locking nut - knuckle lower ball joint attachment
12	-	Bolt - knuckle lower ball joint attachment
13	-	Bolt - damper lower attachment
14	-	Lower arm

The lower arm locates in brackets on the lower surface of each chassis side member. The lower arm assembly comprises the lower arm and two bushes. The lower arm is a pressed steel fabrication. Its outer end has two brackets which locate the lower ball joint of the knuckle. The ball joint is secured with a bolt and self-locking nut. The lower control arm also provides for the attachment of the damper bush which is secured with a bolt and a self-locking nut.

A bracket, welded to the upper surface of the lower arm, allows for the attachment of the bottom ball joint of the stabilizer bar link. The ball joint is secured to the bracket with a self-locking nut.

Two fabricated tubular housings provide the location for the forward and rearward bushes. The bushes, which are pressed into the housings, locate between brackets on the chassis side members. The forward bush is secured to the chassis bracket with a bolt and self-locking nut. The rearward bush is secured to the chassis bracket with a bolt and a nut with retainer. The nut and retainer allows for easy installation or removal of the bolt by removing the requirement to hold the self-locking nut when installing or removing the bolt.

WHEEL KNUCKLE, WHEEL HUB AND BEARING ASSEMBLY



E45900

Item	Part Number	Description
1	-	Circlip - lower ball joint
2	-	Ball joint - lower
3	-	Park brake assembly attachment holes
4	-	Wheel speed sensor location
5	-	Wheel speed sensor cable bracket attachment
6	-	Ball joint - upper
7	-	Knuckle
8	-	Brake caliper attachment holes
9	-	Wheel bearing
10	-	Circlip - wheel bearing retention
11	-	Wheel hub
12	-	Nut - halfshaft

The wheel knuckle is a machined forging which is located between the upper and lower arms. The knuckle is fitted with two ball joints which are pressed into the knuckle, with the lower ball joint being secured with a circlip. The ball joints are positioned between brackets on the upper and lower arms and secured to the arms with a bolt and self-locking nut.

The wheel knuckle provides the location for the rear wheel taper roller bearing, which is pressed into a machined bore and retained with a circlip. The wheel bearing is a serviceable item. The knuckle has a machined bore which provides the location for the wheel speed sensor. Four threaded holes allow for the attachment of the park brake assembly. A cast boss on the knuckle provides positive location for the park brake assembly. Two bosses on the knuckle casting provide the attachment points for the rear brake caliper.

The wheel hub is a machined casting which is pressed into the wheel bearing in the knuckle. The hub has a splined centre bore which mates with corresponding splines on the halfshaft. Five M14 studs are pressed into the wheel hub and provide for the attachment of the road wheel with wheel nuts. Rotation of the halfshaft is passed, via the splines, to the wheel hub which rotates on the taper roller bearing.

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Rear Suspension - Rear Suspension

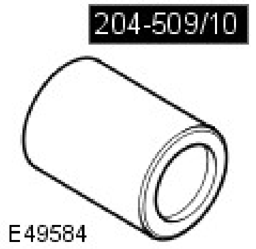
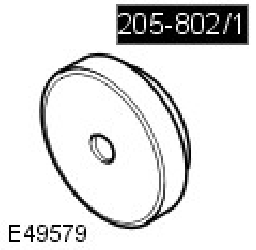
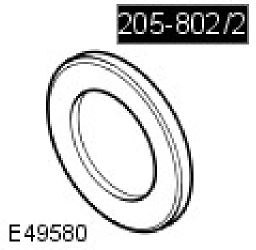
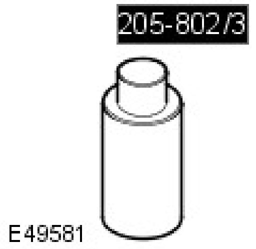
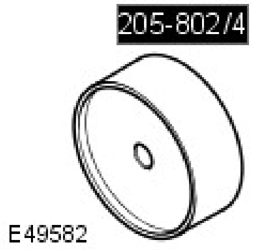
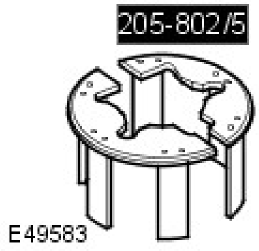
Diagnosis and Testing

For additional information:
REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Rear Suspension - Wheel Bearing and Wheel Hub

Removal and Installation

Special Tool(s)	
 204-509/10 E49584	Rear wheel bearing remover/installer 204-509/10 (LRT-60-033/10)
 205-802/1 E49579	Rear wheel bearing remover/installer 205-802/1
 205-802/2 E49580	Rear wheel bearing remover/installer 205-802/2
 205-802/3 E49581	Rear wheel bearing remover/installer 205-802/3
 205-802/4 E49582	Rear wheel bearing remover/installer 205-802/4
 205-802/5 E49583	Rear wheel bearing remover/installer 205-802/5

Removal

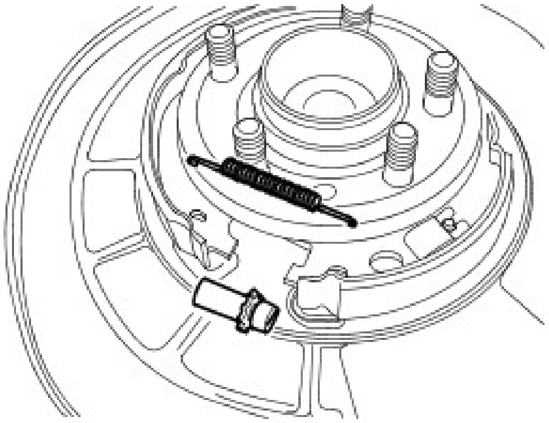
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. Remove the wheel knuckle.
For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).

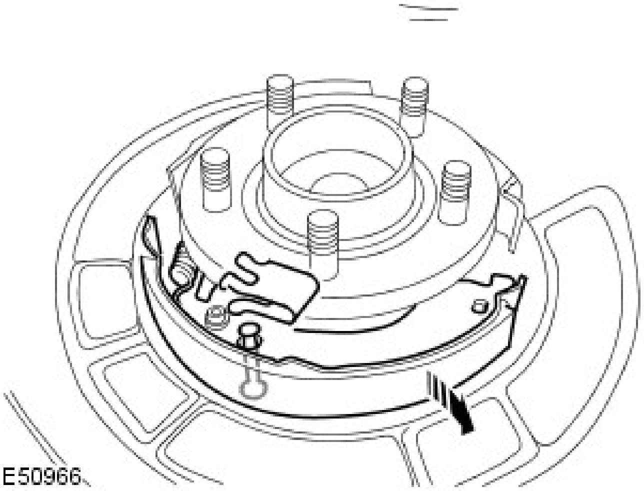
4. Remove the adjuster and return spring.



E50965

5. Remove the primary brake shoe.

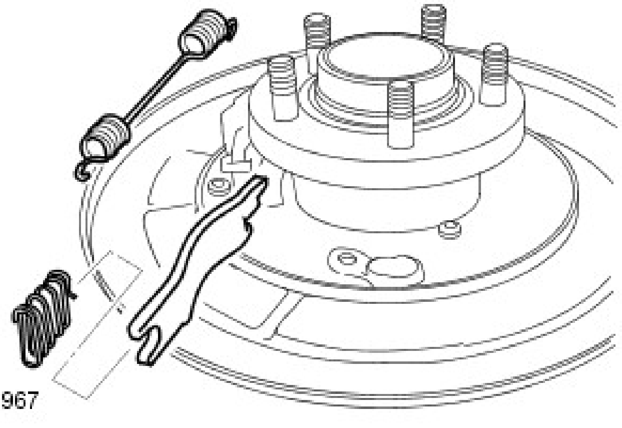
- Remove the hold-down spring and retaining pin.
- Pivot the shoe to release it from the spreader plate and return spring.



E50966

6. Remove the spreader plate and spring.

7. Remove the return spring.

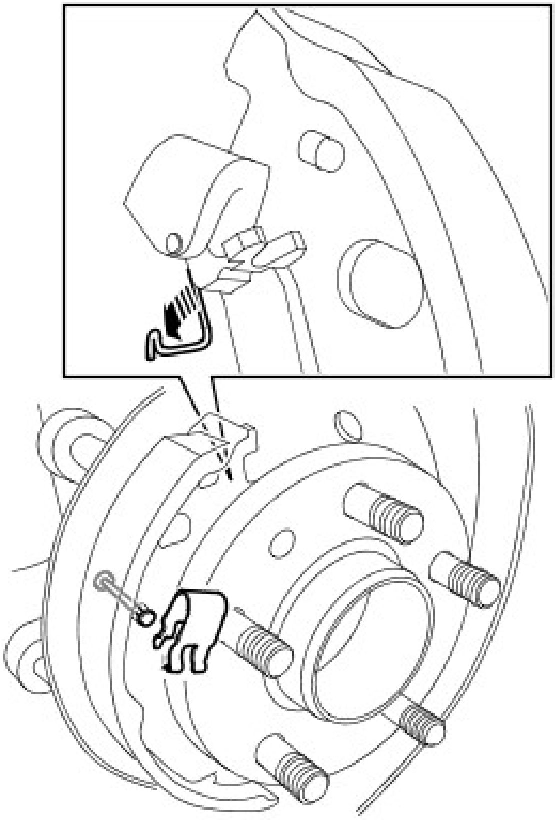


E50967

8. Remove the secondary brake shoe.

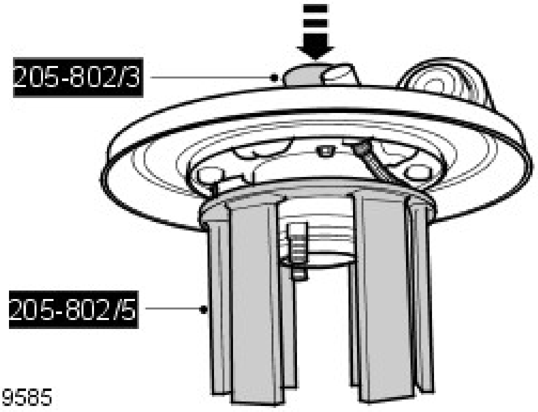
- Remove the hold-down spring and retaining pin.

- Disconnect the parking brake cable retaining spring from the brake shoe lever.



E50181

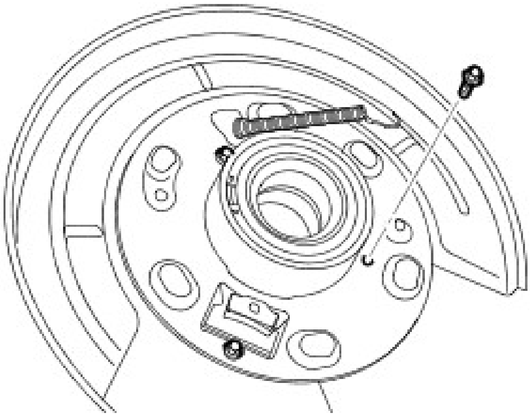
9. Using the special tools, remove the drive flange.



E49585

10. Remove the brake disc dust shield.

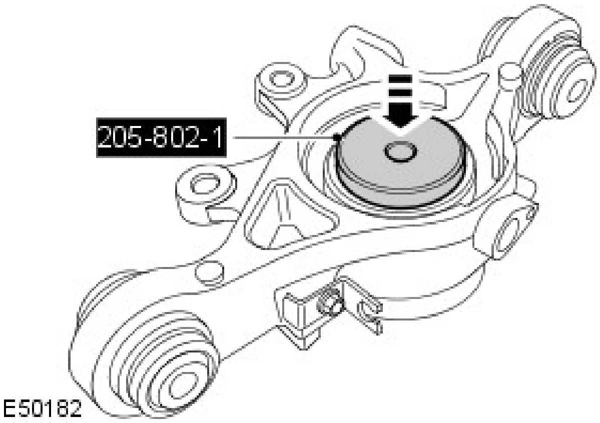
- Remove the 3 screws.



E49586

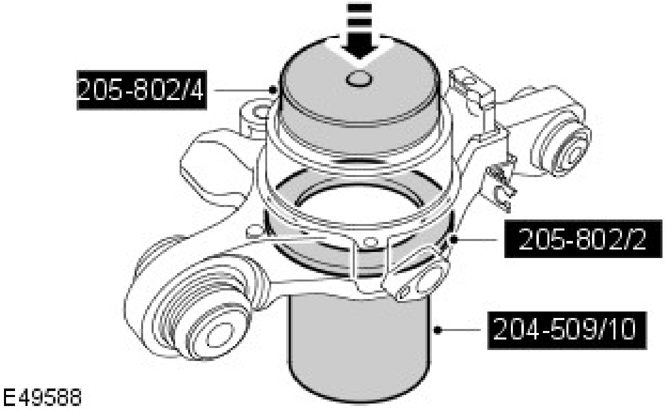
11. Using the special tools, remove the wheel bearing.

- Remove the circlip.


205-802-1
E50182

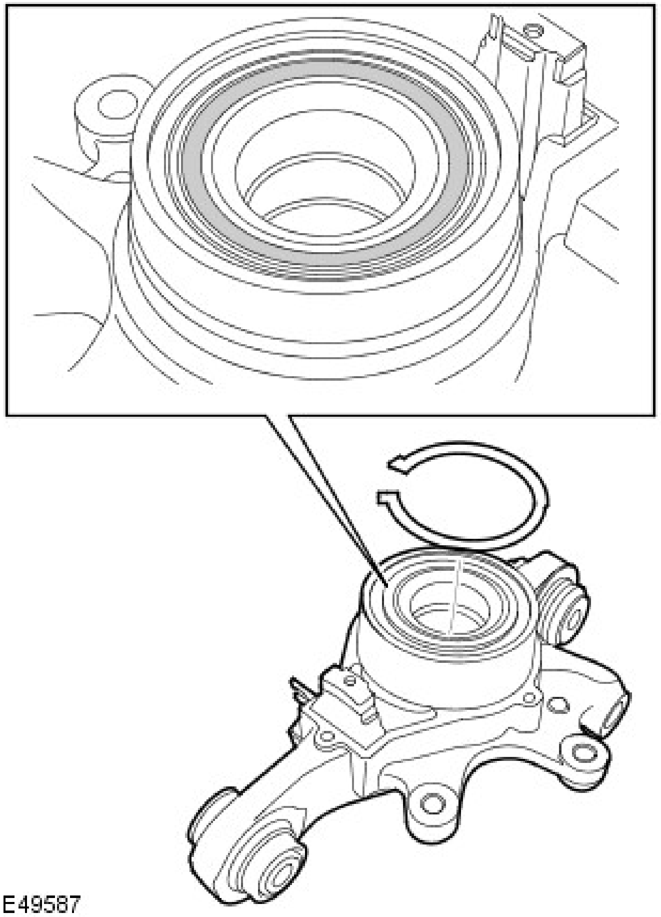
Installation

1. Clean the components.
2. Using the special tools, install the wheel bearing.


205-802/4
205-802/2
204-509/10
E49588

3. ⚠ CAUTION: Make sure that the bearing seal is not damaged when installing the circlip.

Install the circlip.



4. Install the brake disc dust shield.

- Tighten the bolts to 9 Nm (7 lb.ft).

5. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the backing plate and apply grease to the brake shoe contacts.

6. Clean the adjuster and set it to its minimum extension.

7. Install the secondary brake shoe.

- Connect the parking brake cable retaining spring to the brake shoe lever, making sure the spring is not twisted.
- Install the hold-down spring and retaining pin.

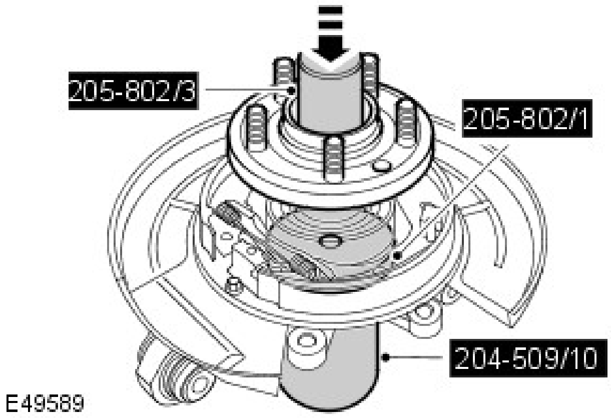
8. Install the primary brake shoe.

- Install the spreader plate and the spring.
- Install the return spring.
- Install the hold-down spring and retaining pin.

9. Install the return spring.

10. Install the brake shoe adjuster.

11. Using the special tools, install the drive flange.


205-802/3
205-802/1
204-509/10
E49589

12. Install the wheel knuckle.
For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).

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Rear Suspension - Upper Arm

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

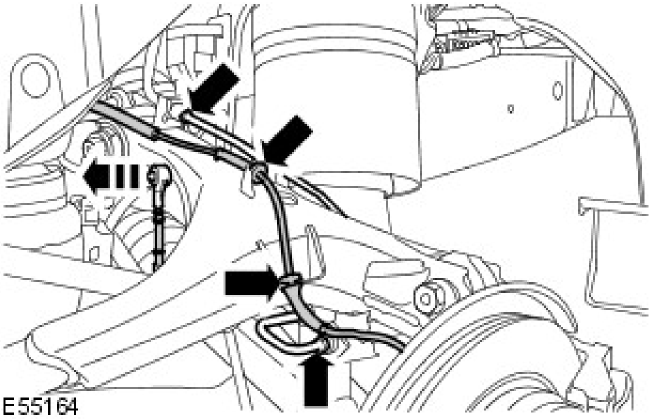
2. Remove the wheel and tire.

3. ⚠ CAUTION: Always plug any open connections to prevent contamination.

   Remove the brake tube.

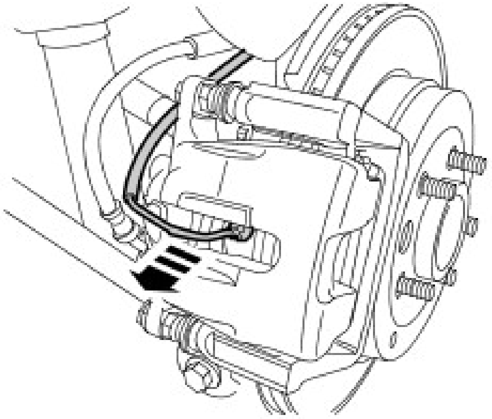
   - Disconnect the 2 brake tube unions.
   - Remove the brake hose clips and release the hoses.
   - Release the brake tube from the clip.

4. Disconnect the height sensor link.



E55164

5. Release the wheel speed sensor lead.

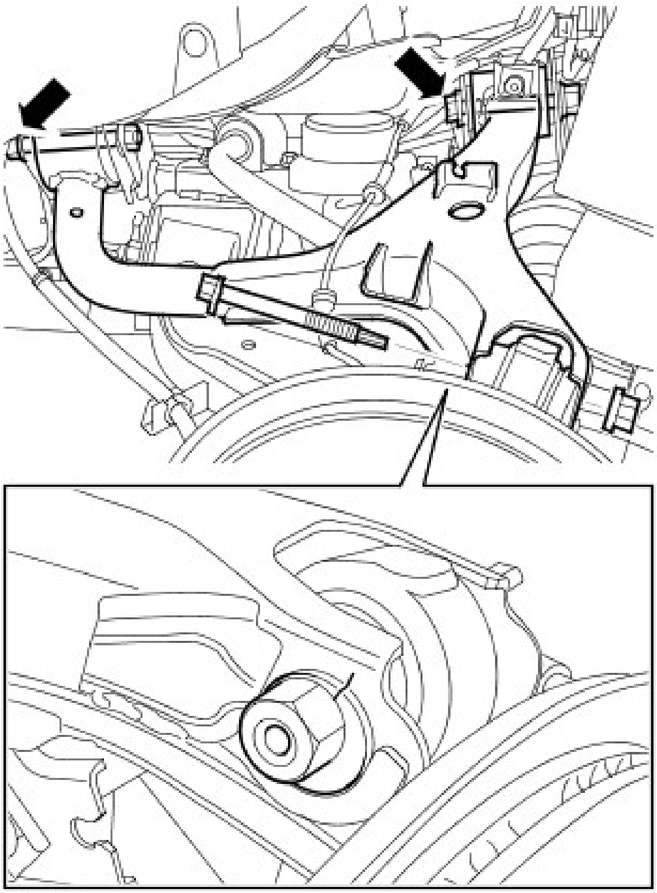


E55165

6. RH side only: Release the brake pad wear indicator sensor lead.

7. Remove the upper arm.

   - Loosen the upper arm bolts.
   - Mark the position of the bolt in relation to the upper arm.
   - Remove the nut and bolt, then release the upper arm from the wheel knuckle.

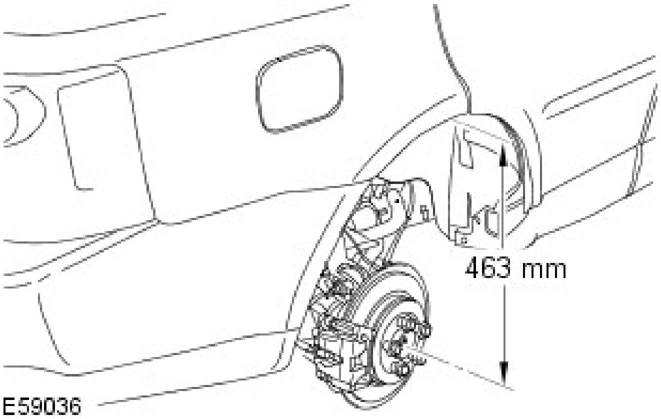


- Remove the upper arm bolts.

Installation

1. Install the upper arm.

- Fit the bolts but do not fully tighten at this stage.



2. Set the height, between the center of the halfshaft end and the edge of the fender trim, to 463 mm (18.23'').

- Support with an axle stand.

3. CAUTION: Ensure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Connect the upper arm and wheel knuckle.

- Align the bolt to the marks made previously.
- Tighten the bolt to 133 Nm (98 lb.ft).

4. Tighten the upper arm front bolt to 175 Nm (129 lb.ft).

5. Tighten the upper arm rear bolt to 275 Nm (203 lb.ft).

6. Secure the wheel speed sensor lead.

7. Secure the brake pad wear indicator sensor lead.

8. Connect the height sensor link.

9. Install the brake tube.

- Tighten the brake tube unions to 18 Nm (13 lb.ft).

10. Bleed the brake system.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

11. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

12. Carry out the wheel alignment procedure.

Published: 11-May-2011

Rear Suspension - Lower Arm

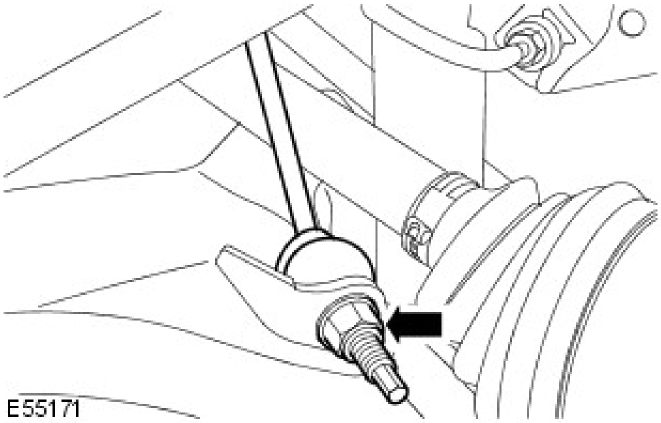
Removal and Installation

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.



3. CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Release the stabilizer bar link.

- Remove and discard the retaining nut.

4. Loosen the 2 lower arm bolts.

5. Disconnect the shock absorber and spring assembly from the lower arm.

- Remove the nut and bolt.

6. Release the parking brake cable.

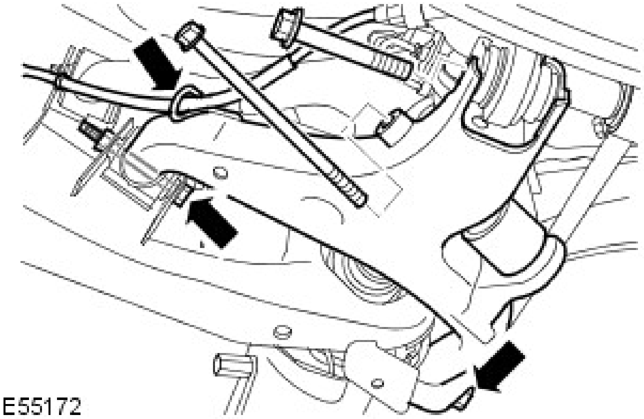
7. Remove the 2 lower arm bolts.

8. CAUTION: Ensure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Release the knuckle from the lower arm.

- Remove the bolt.

9. Remove the lower arm.



Installation

1. Install the lower arm.

- Fit the bolts but do not fully tighten at this stage.

2. ⚠ CAUTION: Ensure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

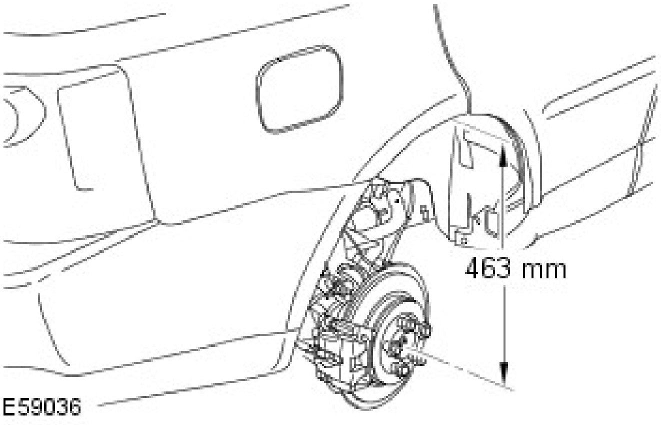
Connect the lower arm to the wheel knuckle.

- Tighten the bolt to 175 Nm (129 lb.ft).

3. Connect the shock absorber and spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

4. Set the height, between the center of the halfshaft end and the edge of the fender trim, to 463 mm (18.23'').



5. Tighten the lower arm bolts to 275 Nm (203 lb.ft).

6. Secure the parking brake cable.

7. Connect the stabilizer link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

8. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Carry out the wheel alignment procedure.

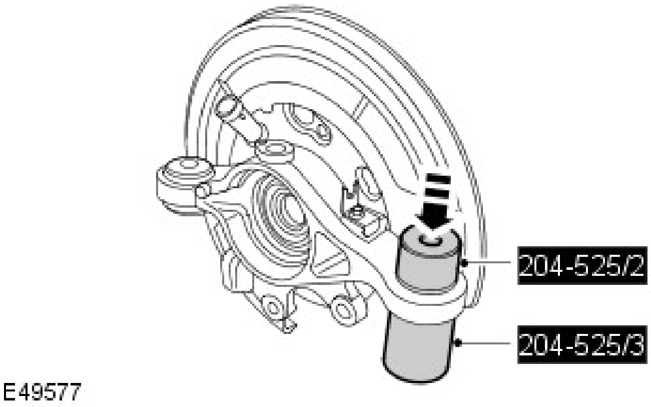
Rear Suspension - Upper Arm Ball Joint

Removal and Installation

Special Tool(s)	
204-525-1 E49576	Remover/installer rear upper arm ball joint 204-525/3
204-525-2 E49575	Remover/installer rear upper arm ball joint 204-525/2
204-525-1 E49574	Remover/installer rear upper arm ball joint 204-525/1

Removal

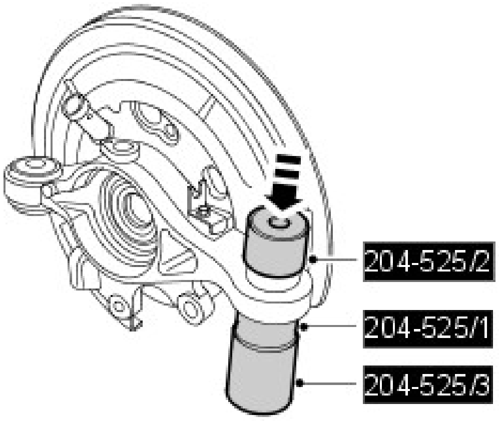
1. Remove the wheel knuckle.
   For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).
2. Using the special tools, remove the ball joint.
   - Position machined face against the special tool.



Installation

1. Clean the components.
2. CAUTIONS:

⚠ Ensure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.



E49578

⚠ If the push in force is less than 10 kN the wheel knuckle must be replaced.

Using the special tools, install the ball joint.

- Position machined face against the special tool.

3. Install the wheel knuckle.
For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).

Published: 11-May-2011

Rear Suspension - Rear Stabilizer Bar

Removal and Installation

Removal

⚠ CAUTION: It is possible to install the stabilizer bar incorrectly. Note the position of the stabilizer bar before removal.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

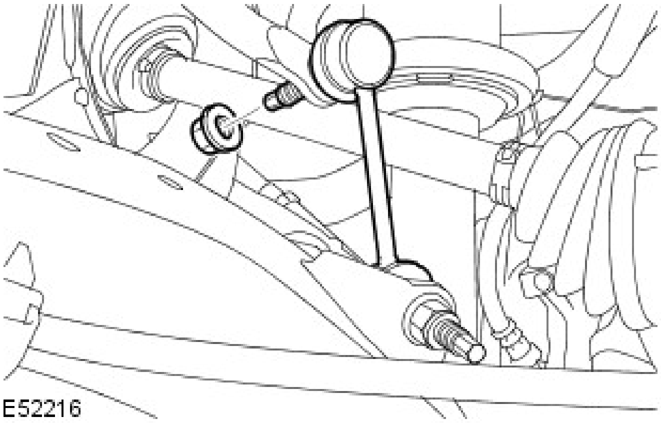
Raise and support the vehicle.

2. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

3. Remove the spare wheel and tire.

4. Raise the vehicle.

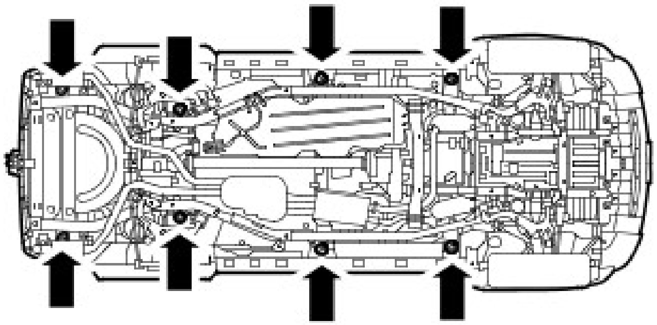
5. Remove the rear wheels and tires.


E52216

6. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Release both stabilizer bar links.

- Remove and discard the 2 nuts.


E52217

7. Remove the body mount retaining bolts.

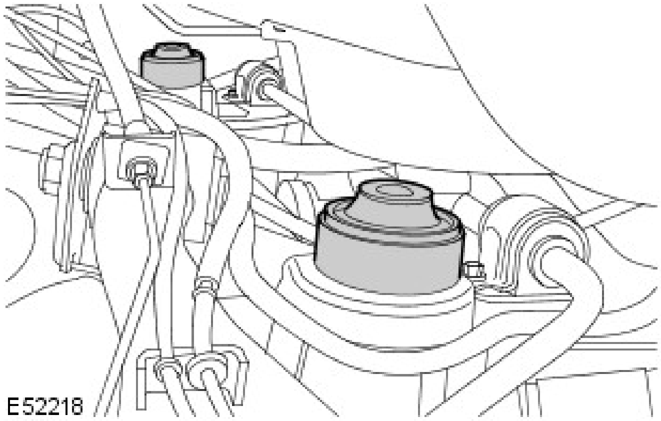
- Remove the 8 bolts.

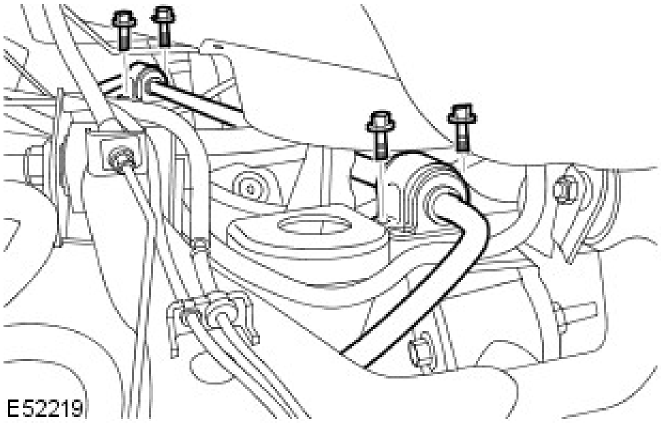
8. ⚠ CAUTION: Only raise the body sufficiently to remove the body mount.

Carefully raise the body.

- Using suitable stands, raise the body to release the body mounts.

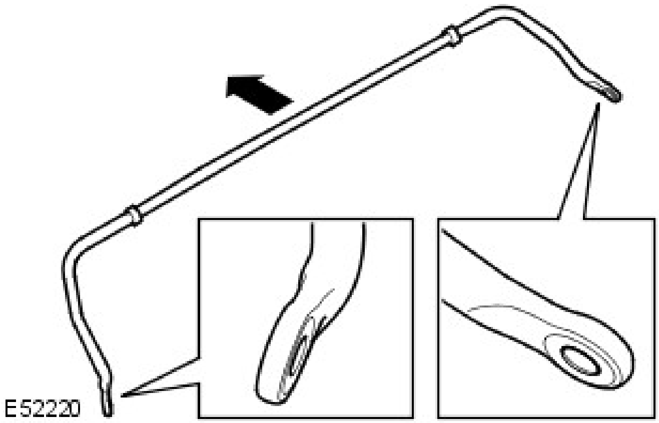
9. Remove the 2 rear body mounts.





10. Remove the stabilizer bar bushing.

- Remove the stabilizer bar clamps.
- Remove the 4 bolts.



11. ⚠CAUTION: Mark the position of the stabilizer bar.

Remove the stabilizer bar.

Installation

1. ⚠CAUTION: Make sure the stabilizer bar is correctly installed.

Install the stabilizer bar.

2. Install the stabilizer bar bushing.

3. Install the stabilizer bar clamps.

- Tighten the 4 retaining bolts to 62 Nm (46 lb.ft).

4. Install the body mounts.

5. Lower the body.

- Remove the stands.

6. Install the body mount retaining bolts.

- Tighten the 8 retaining bolts to 133 Nm (98 lb.ft).

7. Attach both stabilizer bar links.

- Tighten the nuts to 115 Nm (85 lb.ft).

8. Install the wheels and tires.

9. Lower the vehicle.

10. Install the spare wheel and tire.

11. Install the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

Published: 11-May-2011

Rear Suspension - Rear Stabilizer Bar Link

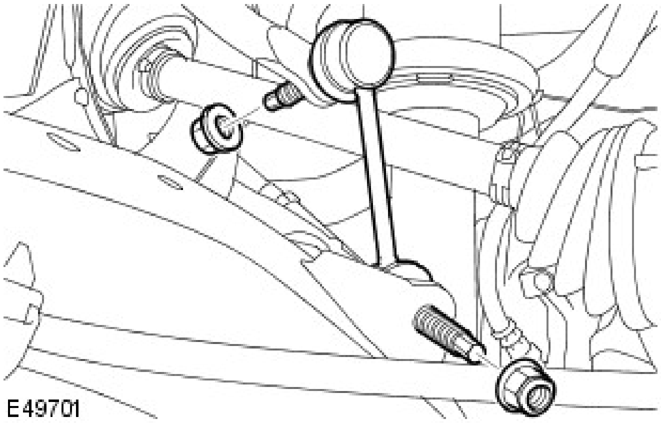
Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the wheel and tire.



3. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

   Remove the stabilizer bar link.

   - Remove and discard the 2 nuts.

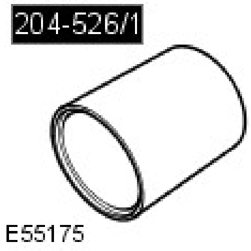
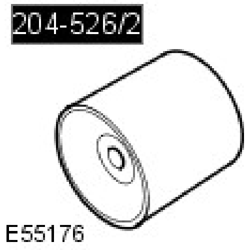
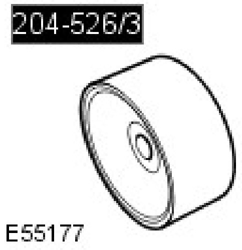
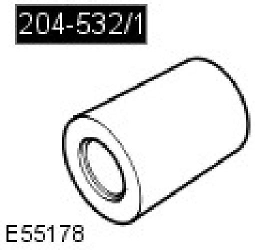
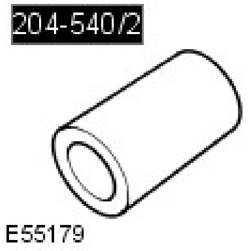
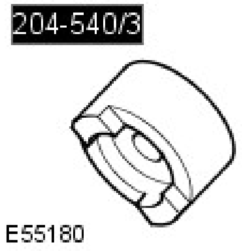
Installation

1. Install the stabilizer bar link.
   - Tighten the nuts to 115 Nm (85 lb.ft).
2. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Rear Suspension - Lower Arm Bushing

Removal and Installation

Special Tool(s)	
 204-526/1 E55175	Receiver rear lower arm front bush 204-526/1
 204-526/2 E55176	Remover rear lower arm front bush 204-526/2
 204-526/3 E55177	Installer rear lower arm front bush 204-526/3
 204-532/1 E55178	Receiver rear lower arm rear bush 204-540/1
 204-540/2 E55179	Remover rear lower arm rear bush 204-540/2
 204-540/3 E55180	Installer rear lower arm rear bush 204-540/3

Removal

- NOTE: The bushings must be replaced in pairs, LH and RH sides.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

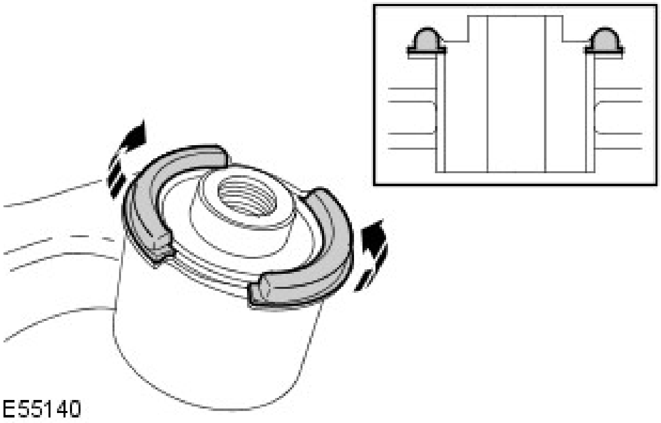
   Raise and support the vehicle.

2. Remove the wheels and tires.
3. Remove the LH lower arm.
   For additional information, refer to: Lower Arm (204-02, Removal and Installation).
4. Remove the RH lower arm.
5. Note the position of the bushing in relation to the lower arm.
6. CAUTION: The bush flanges need to be removed to allow bush removal.

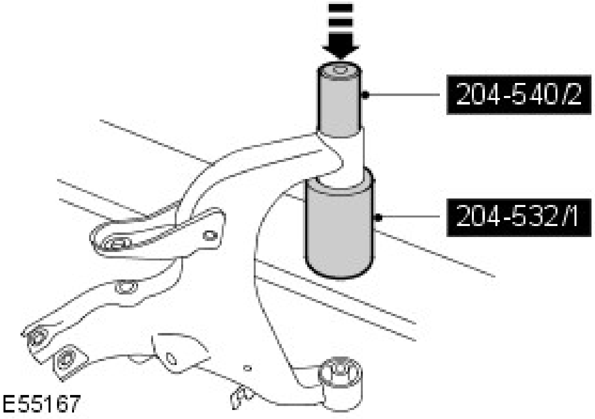
- NOTE: Take note of the fitted position of the bush.

   Using a suitable tool, bend over the bush flanges.

7. Using a hacksaw, remove the flange from the bushing, making sure the upper arm is not damaged.

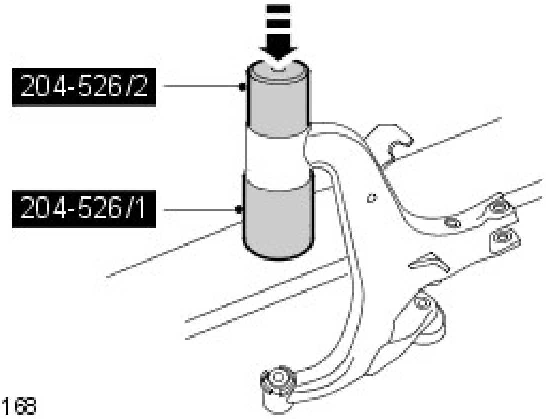

E55140

8. Using the special tools, remove and discard the lower arm rear bushings.



E55167

9. Using the special tools, remove and discard the lower arm front bushings.



E55168

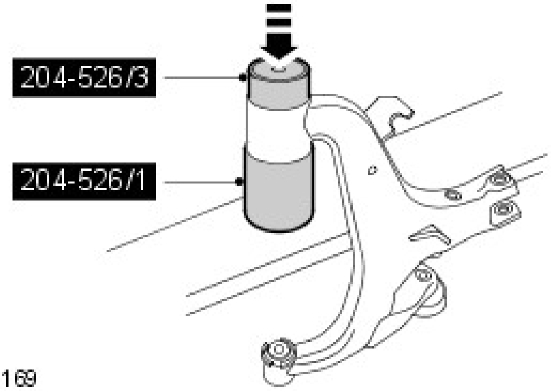
Installation

1. CAUTIONS:

⚠ Make sure the bush is correctly aligned.

⚠ Make sure the correct special tool is used to install the bushings to the correct depth.

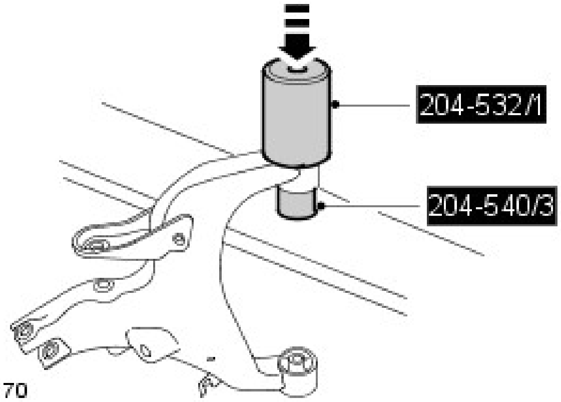
Using the special tools, install the lower arm front bushings



E55169

2. ⚠ CAUTION: Make sure the bush is correctly aligned.

Using the special tools, install the lower arm rear bushings.



E55170

3. Install the LH lower arm.
For additional information, refer to: Lower Arm (204-02, Removal and Installation).

4. Install the RH lower arm.

5. Install the wheels and tires.

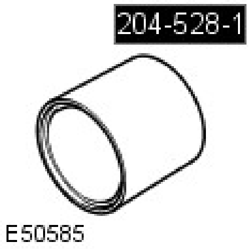
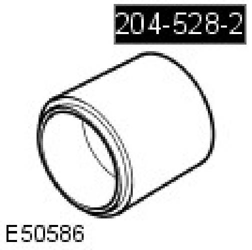
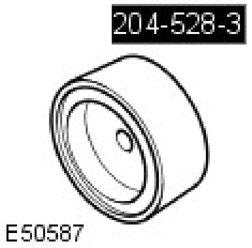
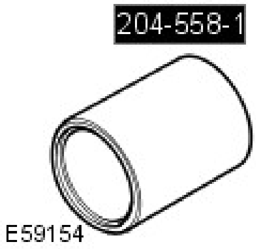
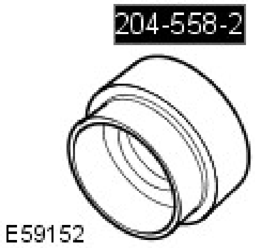
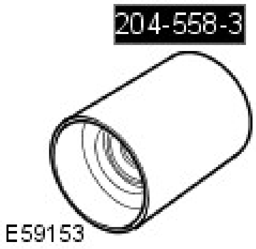
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

6. Check the wheel alignment.
For additional information, refer to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).

Published: 11-May-2011

Rear Suspension - Upper Arm Bushing

Removal and Installation

Special Tool(s)	
 204-528-1 E50585	Remover/installer - rear suspension upper arm front bushing 204-528/1
 204-528-2 E50586	Remover/installer - rear suspension upper arm front bushing 204-528/2
 204-528-3 E50587	Remover/installer - rear suspension upper arm front bushing 204-528/3
 204-558-1 E59154	Remover/installer rear suspension upper arm rear bushing 204-558/1
 204-558-2 E59152	Remover/installer rear suspension upper arm rear bushing 204-558/2
 204-558-3 E59153	Remover/installer rear suspension upper arm rear bushing 204-558/3

Removal

- NOTE: The bushings must be replaced in pairs, LH and RH sides.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheels and tires.

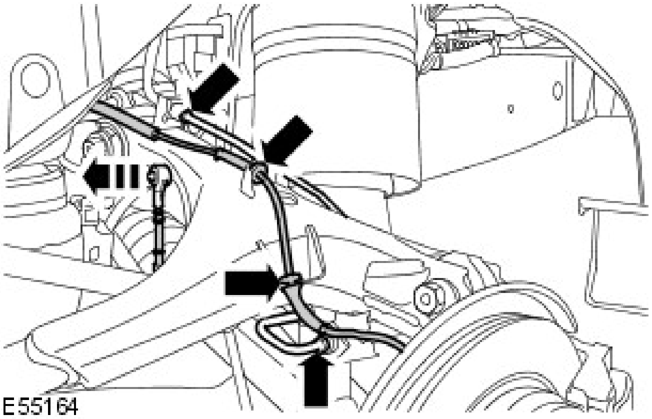
3. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the brake tube.

- Disconnect the 2 brake tube unions.
- Remove the brake hose clips and release the hoses.
- Release the brake tube from the clip.

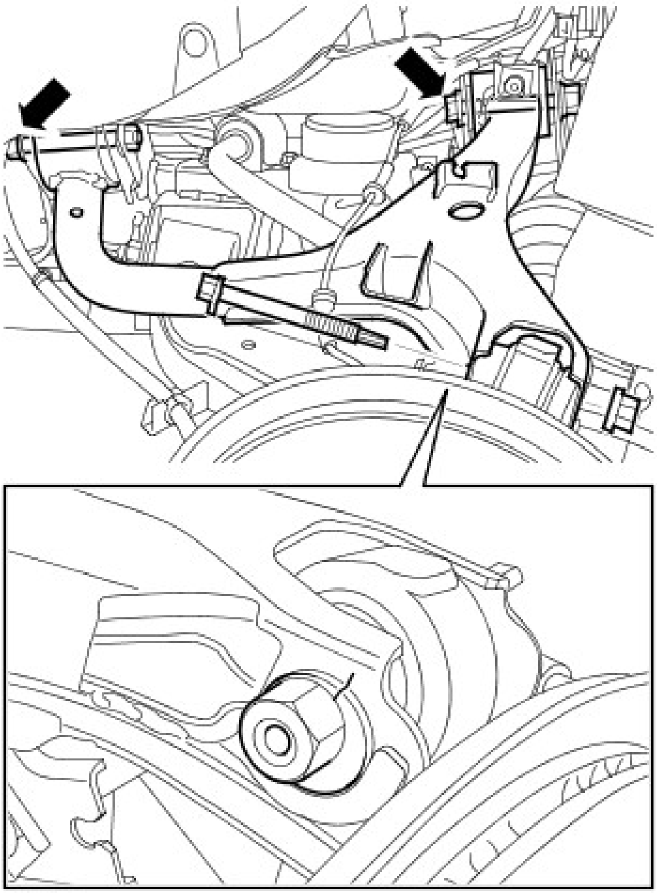
4. Disconnect the height sensor link.

5. Release the wheel speed sensor lead.

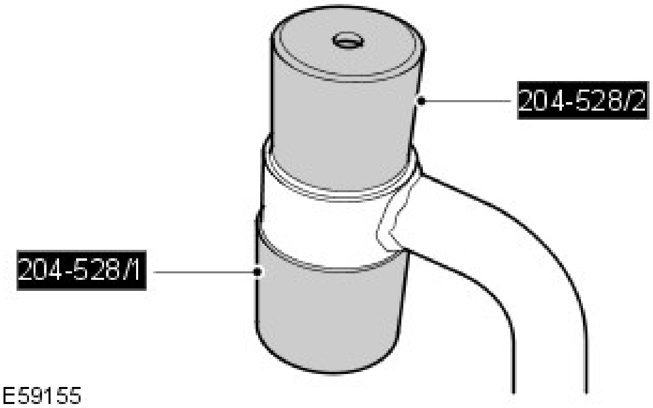


6. Remove the LH upper arm.

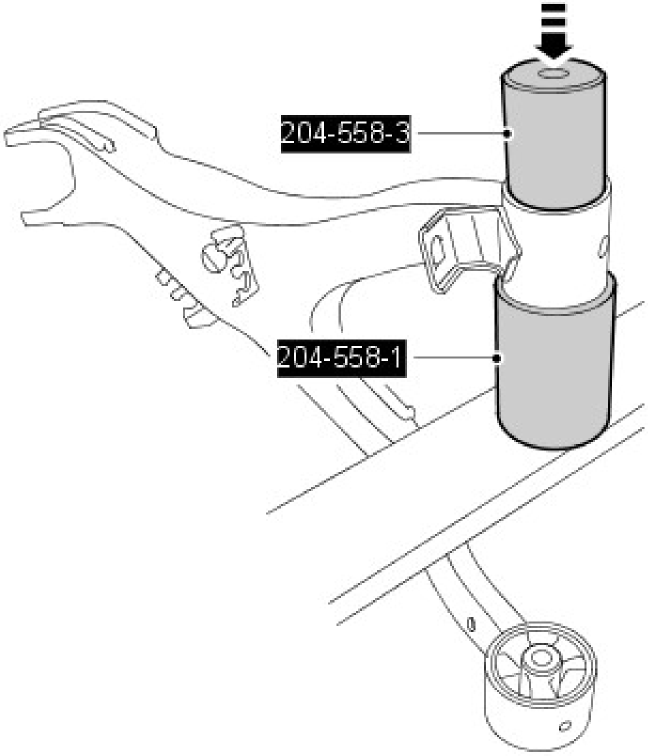
- Loosen the upper arm bolts.
- Mark the position of the bolt in relation to the upper arm.
- Disconnect the upper arm from the wheel knuckle.
- Remove the upper arm bolts.



7. Remove the RH upper arm.
   For additional information, refer to: Upper Arm (204-02 Rear Suspension, Removal and Installation).
8. Mark the position of the front bushing in relation to the upper arm.
9. Using the special tools, remove and discard the rear upper arm front bushing.



10. Using the special tools, remove and discard the rear upper arm rear bushing.



E59156

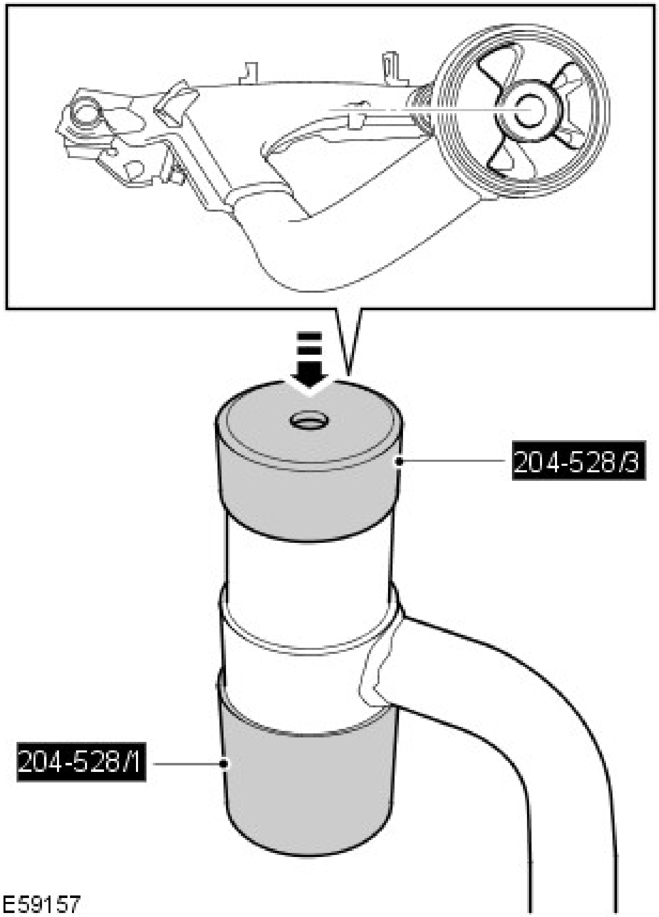
Installation

1. CAUTIONS:

⚠ Make sure the bush is correctly aligned.

⚠ Make sure the correct special tool is used to install the bushings to the correct depth.

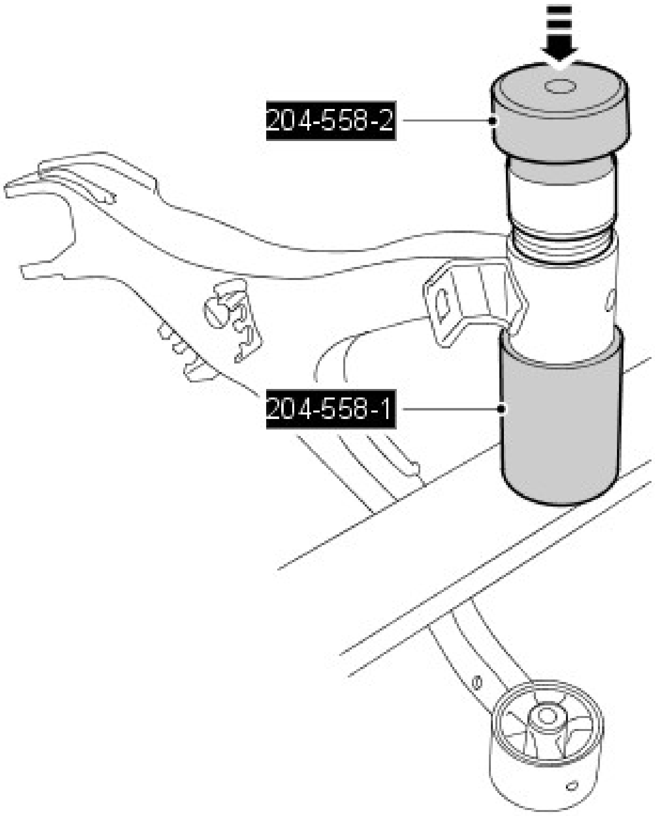
Using the special tools, install the rear upper arm front bushing.


204-528/3
204-528/1

E59157

2. ⚠ CAUTION: Make sure the chamfered side of the ball joint is installed to the chamfered side of the rear upper arm.

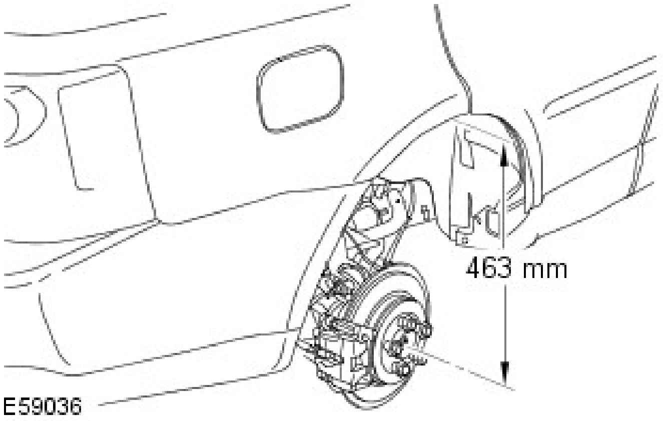
Using the special tools, install the rear upper arm rear bushing.


204-558-2
204-558-1

E59158

3. Install the LH upper arm.

- Fit the bolts but do not fully tighten at this stage.



4. Set the height, between the center of the halfshaft end and the edge of the fender trim, to 463 mm (18.23'').

- Support with an axle stand.

5. ⚠ CAUTION: Ensure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Connect the upper arm and wheel knuckle.

- Align the bolt to the marks made previously.
- Tighten the bolt to 133 Nm (98 lb.ft).

6. Tighten the upper arm front bolt to 175 Nm (129 lb.ft).

7. Tighten the upper arm rear bolt to 275 Nm (203 lb.ft).

8. Secure the wheel speed sensor lead.

9. Secure the brake pad wear indicator sensor lead.

10. Connect the height sensor link.

11. Install the brake tube.

- Tighten the brake tube unions to 18 Nm (13 lb.ft).

12. Install the RH upper arm.
For additional information, refer to: Upper Arm (204-02 Rear Suspension, Removal and Installation).

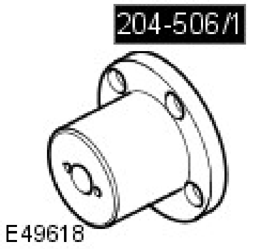
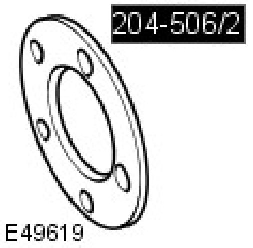
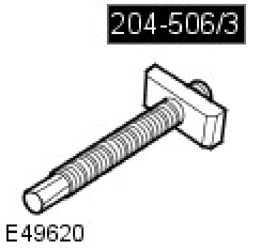
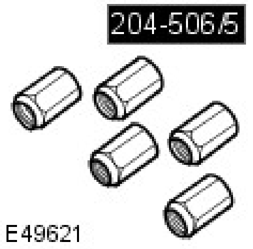
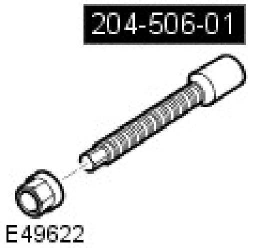
13. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 25-May-2011

Rear Suspension - Wheel Knuckle

Removal and Installation

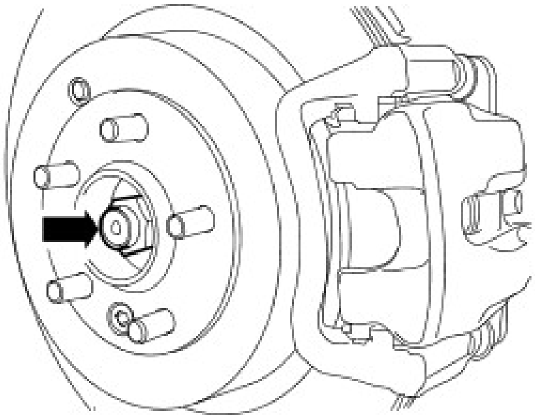
Special Tool(s)	
 204-506/1 E49618	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
 204-506/2 E49619	Halfshaft remover/replacer 204-506/2(LRT-60-030/2)
 204-506/3 E49620	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
 204-506/5 E49621	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
 204-506-01 E49622	Halfshaft installer adapter 204-506-01(LRT-60-030/4)

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

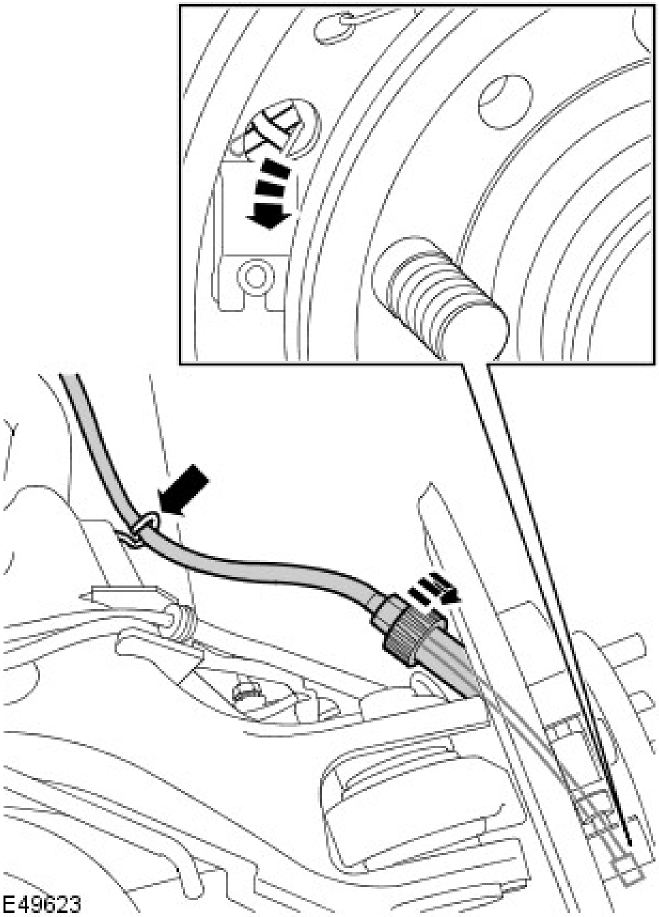
2. Remove the wheel and tire.
3. Loosen the halfshaft retaining nut.



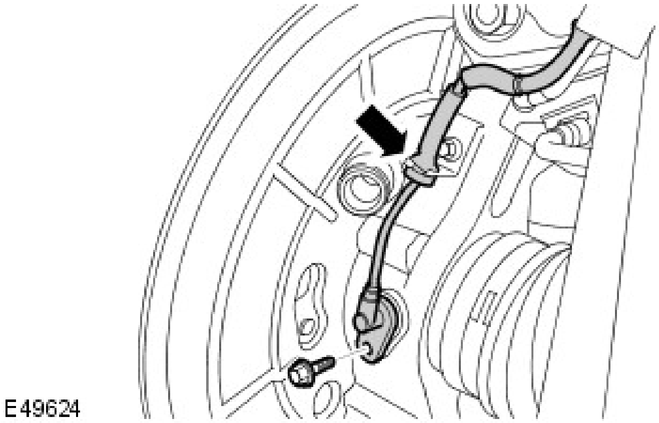
4. Remove the brake disc.
For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

5. Release the parking brake cable.

- Disconnect the parking brake cable from the brake shoe lever.
- Disconnect the parking brake cable from the backplate.
- Release the cable from the lower arm.

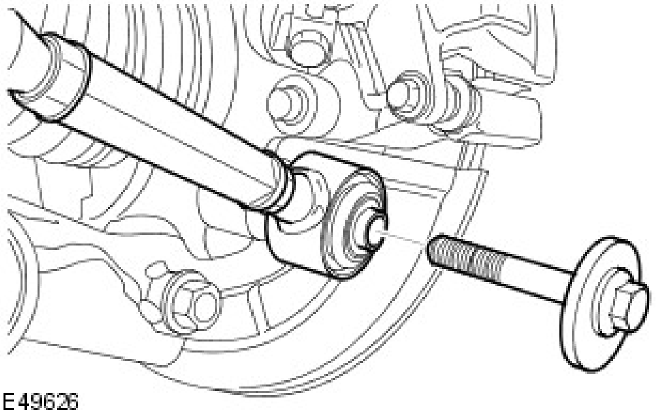


6. Release the wheel speed sensor from the wheel knuckle.


E49624

7. Disconnect the toe link.

- Remove and discard the bolt.

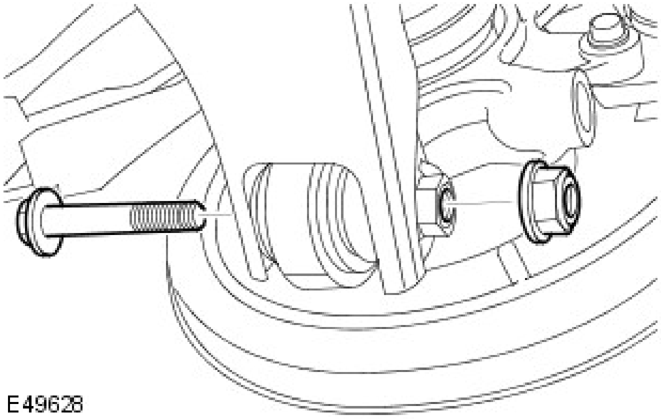

E49626

8. Remove the halfshaft retaining nut.

9. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

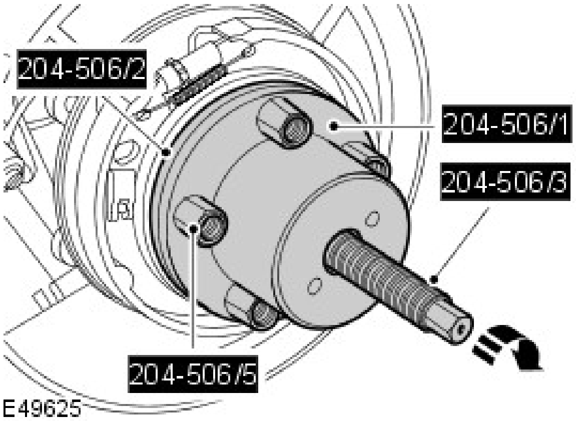
Release the knuckle from the lower arm.

- Remove the bolt.

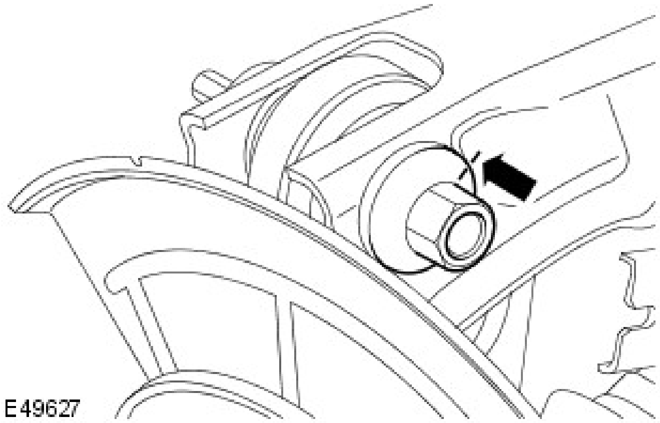

E49628

10. ⚠ CAUTION: Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Using the special tools, release the halfshaft from the wheel hub.



E49625



11. ⚠CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Disconnect the upper arm from the wheel knuckle.

- Mark the position of the bolt in relation to the upper arm.
- Remove the nut and bolt.
- Discard the nut.

12. ⚠CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Remove the wheel knuckle.

Installation

1. Clean the components.

2. ⚠CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

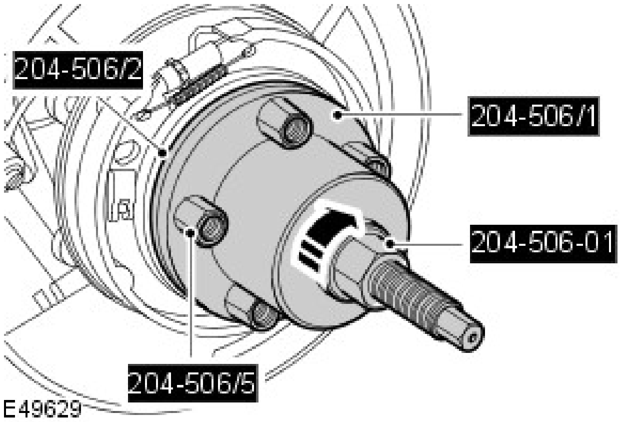
Install the wheel knuckle.

- Locate the halfshaft.

3. Connect the upper arm and wheel knuckle.

- Align the bolt to the marks made previously.
- Install a new nut and tighten to 133 Nm (98 lb.ft).

4. Using the special tools, install the halfshaft in the wheel hub.



5. ⚠CAUTION: Install the halfshaft nut finger tight.

Install a new halfshaft retaining nut and lightly tighten.

6. ⚠CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Connect the lower arm to the wheel knuckle.

- Tighten the nut and bolt to 175 Nm (129 lb.ft).

7. Connect the toe link.

- Tighten the new bolt to 175 Nm (129 lb.ft).

8. Install the wheel speed sensor.

- Tighten the bolt to 9 Nm (7 lb.ft).

9. Locate the parking brake cable to the backplate.

- Connect the cable to the brake shoe lever.
- Tighten the coupling to 8 Nm (6 lb.ft).
- Secure the parking brake cable to the lower arm.

10. Install the brake disc.
For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

11. ⚠ CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Tighten the halfshaft retaining nut to 350 Nm (258 lb.ft).

- Stake the nut to the halfshaft.

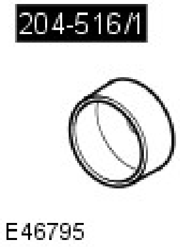
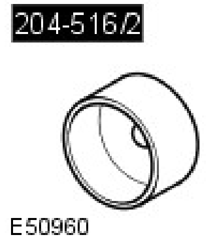
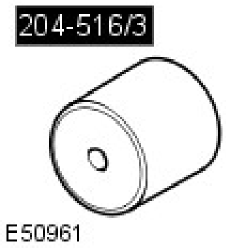
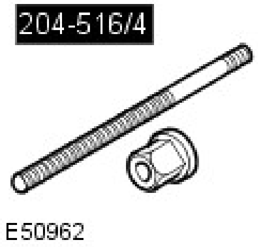
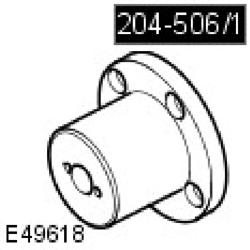
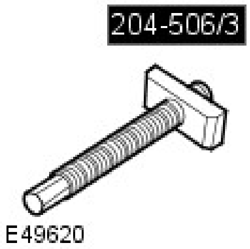
12. Install the wheel and tire.

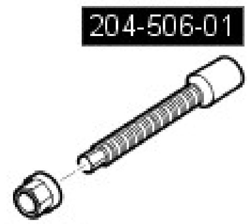
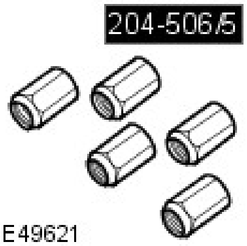
13. Carry out the wheel alignment procedure.

Published: 11-May-2011

Rear Suspension - Lower Arm Ball Joint

Removal and Installation

Special Tool(s)	
 204-516/1 E46795	Ball joint remover/installer 204-516/1 (LRT-64-026/1)
 204-516/2 E50960	Ball joint remover/installer 204-516/2 (LRT-64-026/2)
 204-516/3 E50961	Ball joint remover/installer 204-516/3 (LRT-64-026/3)
 204-516/4 E50962	Ball joint remover/installer 204-516/4 (LRT-64-026/4)
 204-506/1 E49618	Halfshaft remover/replacer 204-506/1 (LRT-60-030/1)
 204-506/3 E49620	Halfshaft remover/replacer 204-506/3 (LRT-60-030/3)
	Halfshaft installer adapter 204-506-01

 E49622	
 E49621	Retainers - halfshaft remover/replacer 204-506/5 (LRT-60-030/5)

Removal

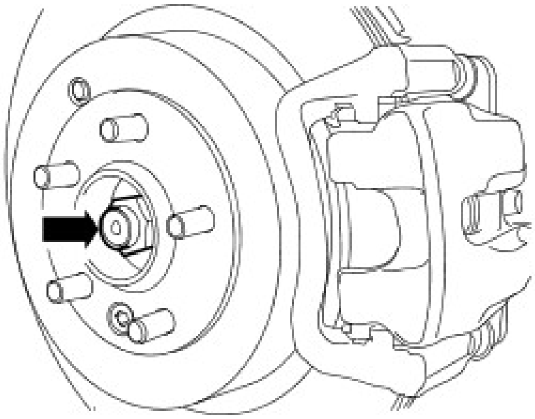
CAUTION: The bolt securing the toe link to the wheel knuckle must not be used more than 5 times. Mark the bolt head with a suitable centre punch.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

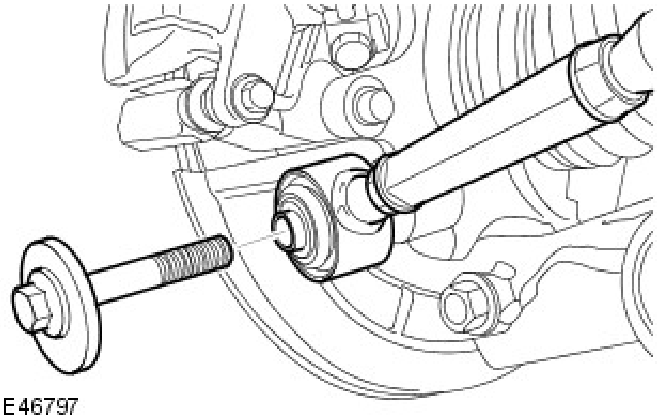
3. Loosen the halfshaft retaining nut.



E46796

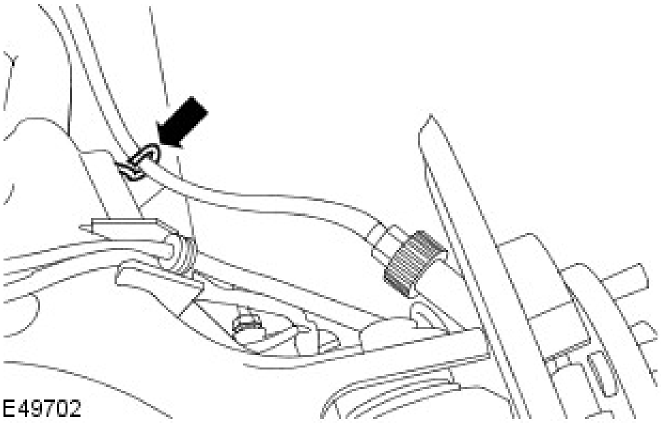
4. Disconnect the toe link.

- Remove the bolt.



E46797

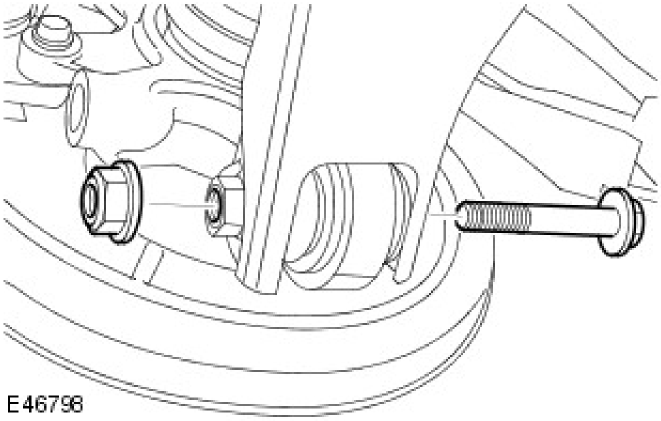
5. Release the parking brake cable from the lower arm.



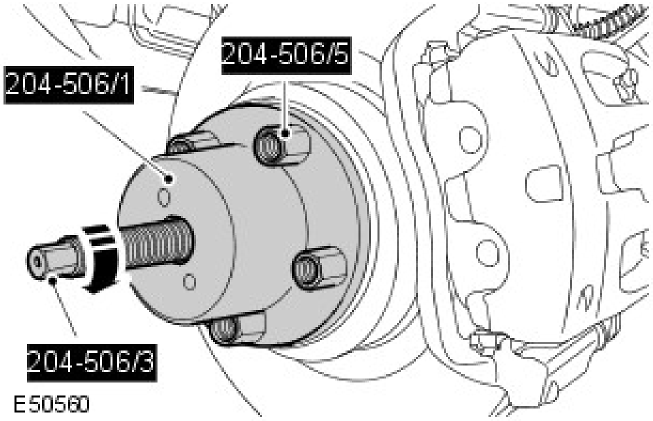
6. Remove the halfshaft retaining nut.

7. Release the knuckle from the lower arm.

- Remove the bolt.

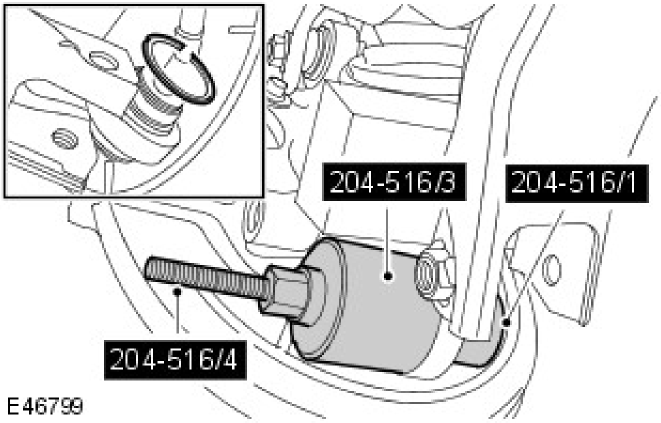


8. Using the special tools, release the halfshaft from the wheel hub.

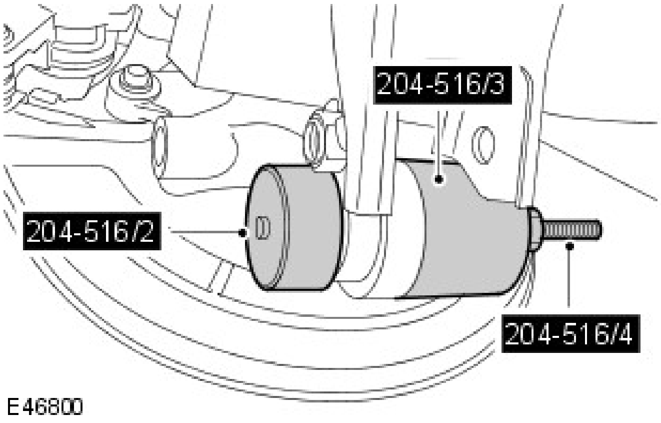

204-506/5
204-506/1
204-506/3
E50560

9. Using the special tool, remove the lower arm ball joint.

- Support the wheel knuckle to give access to the lower ball joint.
- Remove and discard the snap ring.


204-516/3
204-516/1
204-516/4
E46799

Installation



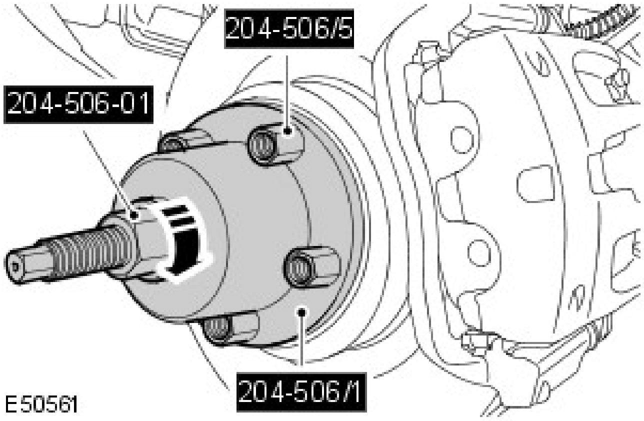
1. CAUTIONS:

⚠ If the push in force is less than 17 kN the wheel knuckle must be replaced.

⚠ Make sure the ball joint in installed from the chamfered side of the wheel knuckle.

Using the special tool, install the lower arm ball joint.

- Install the snap ring.



2. Using the special tools, install the halfshaft in the wheel hub.

3. ⚠ CAUTION: Ensure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Connect the lower arm to the wheel knuckle.

- Tighten the bolt to 175 Nm (129 lb.ft).

4. Install a new halfshaft retaining nut and lightly tighten.

5. Secure the parking brake cable.

6. ⚠ CAUTION: Do not use a bolt that has been installed more than 5 times. Check the bolt head for centre punch marks. A bolt head with 4 centre punch marks indicates the bolt has been installed 5 times and must be replaced.

Connect the toe link.

- Tighten the bolt to 175 Nm (129 lb.ft).
- Mark the bolt head with a centre punch, to indicate the number of times it has been used.

7. Tighten the halfshaft retaining nut to 350 Nm (258 lb.ft).

- Stake the nut to the halfshaft.

8. Install the wheel and tire.

9. Carry out the wheel alignment procedure.

Rear Suspension - Toe Link

Removal and Installation

Removal

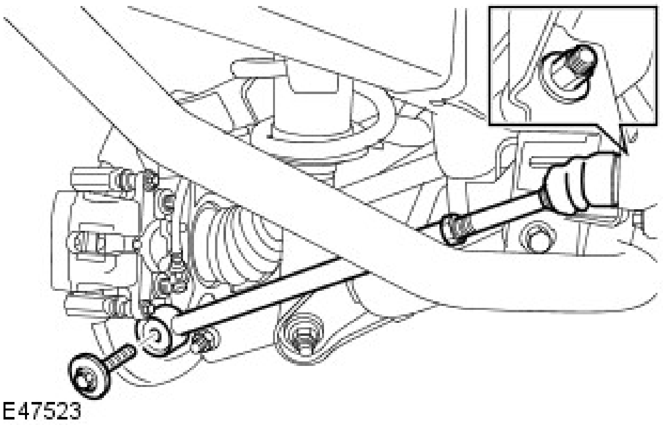
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. Disconnect the toe link.

- Remove and discard the bolt.



4. Remove the toe link.

- Remove and discard the nut.

Installation

1. ⚠ CAUTION: Make sure the toe link anti-rotation tang is fully seated in the integrated body frame before tightening the toe link retaining nut. Failure to follow this instruction will result in damage to the toe link or integrated body frame.

Install the toe link.

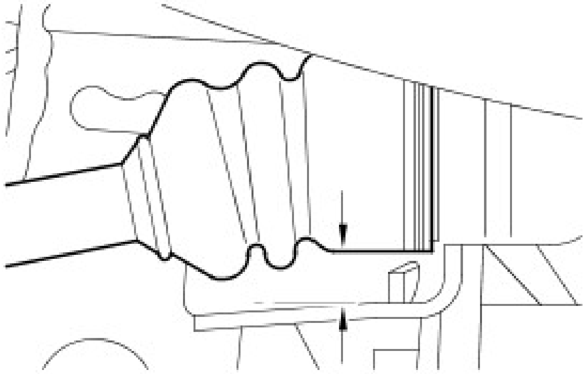
- Install a new nut and lightly tighten.

2. Connect the toe link.

- Using a M14 x 2 tap, clean the threads of the knuckle fixing hole. Blow out debris with an air-line.
- Tighten the new bolt to 175 Nm (129 lb.ft).

3. Set the gap, between the underside of the toe link rubber boot and the integrated body frame bracket, to 15 mm (0.590 in).

- Tighten the toe link inner ball joint retaining nut to 133 Nm (98 lb.ft)



E47524

4. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

5. Carry out the wheel alignment procedure.

Published: 02-Dec-2011

Wheels and Tires - Wheels and Tires

Diagnosis and Testing

Principle of Operation

For a detailed description of the wheels and tires, refer to the relevant Description and Operation section in the workshop manual. REFER to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation) / Safety Precautions (204-04 Wheels and Tires, Description and Operation).

Inspection and Verification

⚠CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. **1.** Verify the customer complaint. As much information as possible should be gathered from the driver to assist in diagnosing the cause(s). Confirm which of the following two warning types (A or B) exist for the Tire Pressure Monitoring System when the ignition status is switched from 'OFF' to 'ON'.
   - **(A) Check Tire Pressure Warnings.** A low tire pressure warning will **continuously** illuminate the low tire pressure warning lamp. This warning may be accompanied by a text message such as CHECK TIRE PRESSURE (refer to owner literature). The manufacturer approved diagnostic system does NOT need to be used. Diagnostic Trouble Codes (DTCs) are not generated with this type of warning. To extinguish this warning it is essential that, with the ignition 'ON', all vehicle tires (including the spare) are to be set to the correct pressure as stated in the vehicle handbook or as indicated on the placard label in the passenger/driver door aperture. **It is not necessary to drive the vehicle to clear 'check tire pressure' warnings - just changing the tire pressure causes the tire low pressure sensor to transmit new data.**
     • NOTE: The tire pressures should be set by:
     - Using a calibrated tire pressure gauge
     - With 'cold' tires (vehicle parked in the ambient temperature for at least one hour, not in a garage with an artificial ambient temperature)

     • NOTE: If the tire pressure warning does not clear within two minutes, it is likely that the gauge is not correctly calibrated or the tires are 'warm'. Carry out the following steps until the warning has cleared:
     - Increase the tire pressures by 3psi
     - Wait a further two minutes
     - When the tires are at ambient temperature and a **calibrated** gauge is available, reset the tire pressures to the correct pressure

     • NOTE: Tire pressure adjustments are part of routine owner maintenance. Tire pressure adjustments that are required due to a lack of owner maintenance are not to be claimed under vehicle warranty.
   - **(B) System Fault Warnings.** When a system fault is detected, the low tire pressure warning lamp will flash for approximately 75 seconds prior to being continuously illuminated. Visually inspect for obvious signs of damage and system integrity. Check for the presence of tire low pressure sensors on all four wheels (note: a tire low pressure sensor has a metal valve stem rather than a rubber one).
2. **2.** Check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

• NOTE: If the tester fails to communicate with the Tire Pressure Monitoring System module, the following actions are recommended:

- Remove the Tire Pressure Monitoring System power supply fuse, inspect and re-install (if intact). Test to see if communications have been re-established.
- Remove the Tire Pressure Monitoring System ignition fuse (if applicable), inspect and re-install (if intact). Test to see if communications have been re-established.
- With ignition status set to 'ON', refer to the electrical circuit diagrams and check Tire Pressure Monitoring System module for power, ignition and ground supplies.
- Carry out CAN network integrity test using the manufacturer approved diagnostic system.

DTC Index

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

• NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. If this is the case, match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

• NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
C1A0111	LED-circuit short to ground	● Center facia switch pack - tire pressure monitoring switch status indicator LED circuit, short to ground	Refer to the electrical wiring diagrams and check Center facia switch pack - tire pressure monitoring switch status indicator LED circuit for short to ground. Repair as required. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.
C1A0112	LED-circuit short to battery	● Center facia switch pack - tire pressure monitoring switch status indicator LED circuit, short to power	Refer to the electrical wiring diagrams and check Center facia switch pack - tire pressure monitoring switch status indicator LED circuit for short to power. Repair as required. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.
C1A0113	LED-circuit open	● Center facia switch pack - tire pressure monitoring switch status indicator LED circuit, open circuit	Refer to the electrical wiring diagrams and check Center facia switch pack - tire pressure monitoring switch status indicator LED circuit for open circuit. Repair as required. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.
C1A2992	Switch Activation Too Long-performance or incorrect operation	● Center facia switch pack - tire pressure monitoring switch contact closed for excessive duration	Check the switch for correct operation, the switch status indicator LED will toggle state after each ignition on, if the switch is constantly closed. Replace Center facia switch pack as necessary. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.
C1A5512	Ignition Switch Input Circuit-circuit short to battery	● Ignition switch input circuit short circuit to power	Refer to the electrical wiring diagrams and check the ignition switch and circuits for short to power. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.
C1A5514	Ignition Switch Input Circuit-circuit short to ground or open	● Ignition switch input circuit short circuit to ground ● Ignition switch input circuit high resistance, open circuit	Refer to the electrical wiring diagrams and check the ignition switch and circuits for short to ground, high resistance, open circuit. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.
C1A5631	Left Front Tire Pressure Sensor and Transmitter Assembly-no signal	● Missing, incompatible or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test E.
C1A5668	Left Front Tire Pressure Sensor and Transmitter Assembly-event information	● Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required
C1A5691	Left Front Tire Pressure Sensor and Transmitter Assembly-parametric	● Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration	Replace defective tire low pressure sensor. Refer to the relevant section of the workshop manual
C1A5693	Left Front Tire Pressure Sensor and Transmitter Assembly-no operation	● No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	GO to Pinpoint Test F.

DTC	Description	Possible Cause	Action
C1A5711	Left Front Initiator-circuit short to ground	- Left front initiator circuit is short to ground	GO to Pinpoint Test A. Refer to Pinpoint test A1
C1A5712	Left Front Initiator-circuit short to battery	- Left front initiator circuit is short to power	GO to Pinpoint Test A. Refer to Pinpoint test A2
C1A5713	Left Front Initiator-circuit open	- Left front initiator circuit open	GO to Pinpoint Test A. Refer to Pinpoint test A9
C1A5831	Right Front Tire Pressure Sensor and Transmitter Assembly-no signal	- Missing, incompatible or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test E.
C1A5868	Right Front Tire Pressure Sensor and Transmitter Assembly-event information	- Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required
C1A5891	Right Front Tire Pressure Sensor and Transmitter Assembly-parametric	- Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration	Replace defective tire low pressure sensor. Refer to the relevant section of the workshop manual.
C1A5893	Right Front Tire Pressure Sensor and Transmitter Assembly-no operation	- No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	GO to Pinpoint Test F.
C1A5911	Right Front Initiator-circuit short to ground	- Right front initiator circuit is short to ground	GO to Pinpoint Test B. Refer to Pinpoint test B1
C1A5912	Right Front Initiator-circuit short to battery	- Right front initiator circuit is short to power	GO to Pinpoint Test B. Refer to Pinpoint test B2
C1A5913	Right Front Initiator-circuit open	- Right front initiator circuit open	GO to Pinpoint Test B. Refer to Pinpoint test B9
C1A6031	Left Rear Tire Pressure Sensor and Transmitter Assembly-no signal	- Missing, incompatible or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test E.
C1A6068	Left Rear Tire Pressure Sensor and Transmitter Assembly-event information	- Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required
C1A6091	Left Rear Tire Pressure Sensor and Transmitter Assembly-parametric	- Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration	Replace defective tire low pressure sensor. Refer to the relevant section of the workshop manual.
C1A6093	Left Rear Tire Pressure Sensor and Transmitter Assembly-no operation	- No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	GO to Pinpoint Test F.
C1A6111	Left Rear Initiator-circuit short to ground	- Left rear initiator circuit short to ground	GO to Pinpoint Test C. Refer to Pinpoint test C1

DTC	Description	Possible Cause	Action
C1A6112	Left Rear Initiator-circuit short to battery	- Left rear initiator circuit short to power	GO to Pinpoint Test C. Refer to Pinpoint test C2
C1A6113	Left Rear Initiator-circuit open	- Left rear initiator circuit open	GO to Pinpoint Test C. Refer to Pinpoint test C9
C1A6231	Right Rear Tire Pressure Sensor and Transmitter Assembly-no signal	- Missing, incompatible or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test E.
C1A6268	Right Rear Tire Pressure Sensor and Transmitter Assembly-event information	- Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required
C1A6291	Right Rear Tire Pressure Sensor and Transmitter Assembly-parametric	- Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration	Replace defective tire low pressure sensor. Refer to the relevant section of the workshop manual.
C1A6293	Right Rear Tire Pressure Sensor and Transmitter Assembly-no operation	- No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	GO to Pinpoint Test F.
C1A6311	Right Rear Initiator-circuit short to ground	- Right rear initiator circuit short to ground	GO to Pinpoint Test D. Refer to Pinpoint test D1
C1A6312	Right Rear Initiator-circuit short to battery	- Right rear initiator circuit short to power	GO to Pinpoint Test D. Refer to Pinpoint test D2
C1A6313	Right Rear Initiator-circuit open	- Right rear initiator circuit open	GO to Pinpoint Test D. Refer to Pinpoint test D9
C1A6468	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-event information	- Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required
C1A6491	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-parametric	- Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration	Replace defective tire low pressure sensor. Refer to the relevant section of the workshop manual.
C1A6493	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-no operation	- Missing, incompatible or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test G.
U001088	Medium Speed CAN Communication Bus-bus off	- CAN bus fault	Carry out CAN network integrity tests. Refer to the electrical wiring diagrams and check CAN network for short, open circuit
U014000	Lost communication with body control module-no sub type information	- CAN bus fault - Central Junction Box fault	Refer to the electrical wiring diagrams and check Central Junction Box power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U015500	Lost Communications With Instrument Panel Cluster (IPC) Control Module-no sub type information	- CAN bus fault - Instrument cluster fault	Refer to the electrical wiring diagrams and check instrument cluster power and ground supplies for short, open circuit. Carry out CAN network integrity tests.

DTC	Description	Possible Cause	Action
U016400	Lost Communication With HVAC Control Module-no sub type information	- CAN bus fault - Climate control module fault	Refer to the electrical wiring diagrams and check climate control module power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U030000	Internal Control Module Software Incompatibility-no sub type information	- Incompatible tire pressure monitoring system module for vehicle CAN network	Check correct tire pressure monitoring system module is installed to vehicle specification, otherwise suspect the instrument cluster.
U041600	Invalid Data Received From Vehicle Dynamics Control Module-no subtype information	- Invalid data received from Anti lock Braking System module - CAN Bus fault - Anti lock Braking System fault	Check Anti lock Braking System module and instrument cluster for related DTCs and refer to the relevant DTC Index. Carry out CAN network integrity test using manufacturer approved diagnostic system.
U1A1449	CAN Initialisation Failure-internal electronic failure	- Tire pressure monitoring system module fault	Install a new tire pressure monitoring module. Refer to the new module/component installation note at the top of the DTC Index
U300055	Control Module-not configured	- Tire pressure monitoring system configuration data is invalid	Check and amend the car configuration file.
U300087	Control Module-missing message	- Tire pressure monitoring system configuration data not received	Check the instrument cluster for related DTCs and refer to the relevant DTC Index. Carry out CAN network integrity test.
U300281	Vehicle Identification Number - invalid serial data received	- Tire pressure monitoring system module and vehicle VIN mis-match	• NOTE: This DTC indicates that the tire pressure monitoring system module is not the original part installed to the vehicle at the factory/dealer and could have been substituted. Refer to the note above the DTC index about replacing components which may remain under manufacturer warranty. Re-install the original or a new tire pressure monitoring system control module

Component Tests

Wheels and Tires

For wheel and tire specification information (pressures, torques, etc).
REFER to: Specifications (204-04 Wheels and Tires, Specifications).

When replacing wheels or tires, local legislation regarding health and safety must be complied with.

If the vehicle has a Tire Pressure Monitoring System installed, only Land Rover approved wheels and tires should be used. If the wheel and tire size is changed (for example from R18 to R20) the Tire Pressure Monitoring System module should be updated with the correct pressure information appropriate to the new wheel and tire set. Update the Tire Pressure Monitoring System module using the Land Rover approved diagnostic system.

As a general guideline, only replace tires in pairs or as a set, and only with tires of equivalent size and specification.

Confirm the symptoms of the customer complaint.

As much information as possible should be gathered from the driver to assist in diagnosing the cause(s).

1. **1.** Before a road test, carry out a basic inspection to make sure the vehicle is safe and legal to drive.

   Basic inspection

- Correct tire inflation.
  REFER to: Specifications (204-04 Wheels and Tires, Specifications).
- Legal tire tread depth
- Cuts/Bulges in tire sidewall(s)
- Tire ply separation
- Embedded objects
- Wheel rim damage
- Correct tire installation (specification, direction of rotation, etc)
- Any obvious distortion of the tire (flat/high spots)
- Worn/Damaged steering or suspension components

Road test

If the results of the basic inspection are acceptable, carry out a road test to confirm the symptoms.

To reproduce the symptoms, test the vehicle on similar roads to those on which the fault occurs and at similar speeds (provided it is legal to do so).

If the vibration or noise can be reproduced, note the speed at which it occurs and see if it is possible to drive through the symptom, meaning, is it possible to alter the fault by driving faster or slower than the speed at which it occurs?

If it **is** possible, it is likely that the fault is caused by an imbalance in the wheel or tire.

If the vibration or noise gets worse as the vehicle speed increases, it is likely that the fault is caused by distortion in the wheel or tire, or worn or damaged components.

Distortion checks

Check for distortion by raising the vehicle so that the wheels are free and placing an axle stand or similar fixed object next to each wheel in turn.

If the stand is placed at the tread of the tire, the tire can be checked for ovality by turning the wheel by hand and checking for high or low spots where the gap between the tread and the stand increases or reduces.

If the stand is placed next to the wheel rim or tire sidewall, the wheel and tire can be checked for run-out in a similar way.

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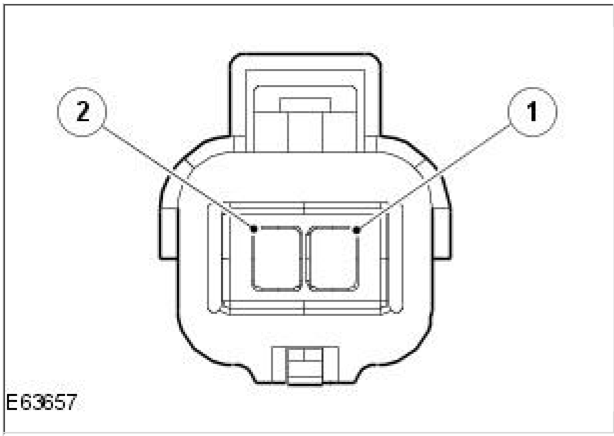
If the stand is placed next to the wheel rim or tire sidewall, the wheel and tire can be checked for run-out in a similar way.

Pinpoint Tests

PINPOINT TEST A : LEFT FRONT LOW-FREQUENCY INITIATOR CIRCUIT	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND	
	1 Key off.
	2 Disconnect the left hand front low-frequency initiator electrical connector, C2198.



3 Measure the resistance between:

C2198, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to A5.

No

GO to A3.

A2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2198, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

GO to A6.

No

GO to A4.

A3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1 Measure the resistance between:

C2198, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to A7.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

A4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2198, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

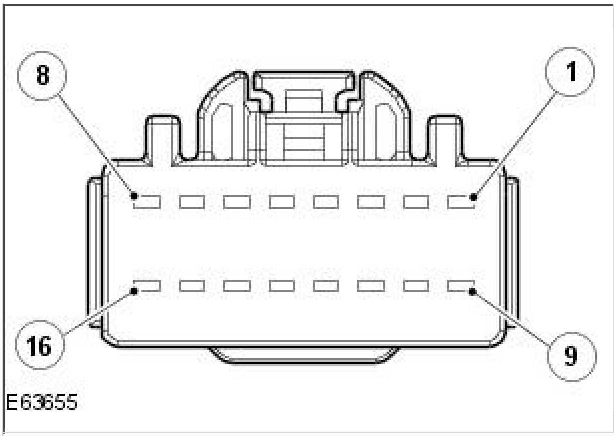
GO to A8.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

A5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2198, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

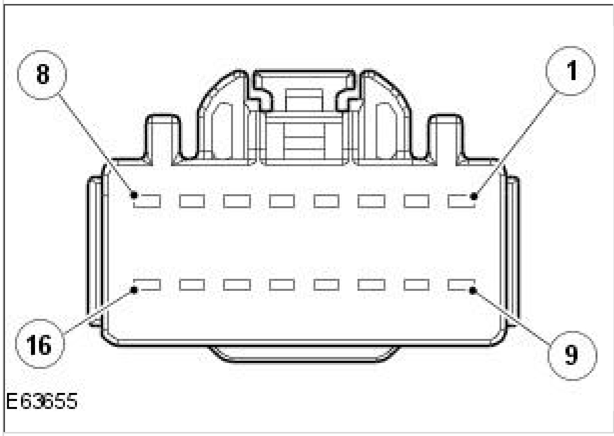
REPAIR the short circuit. This circuit contains intermediate connectors, C2243 and C2245. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

A6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2198, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

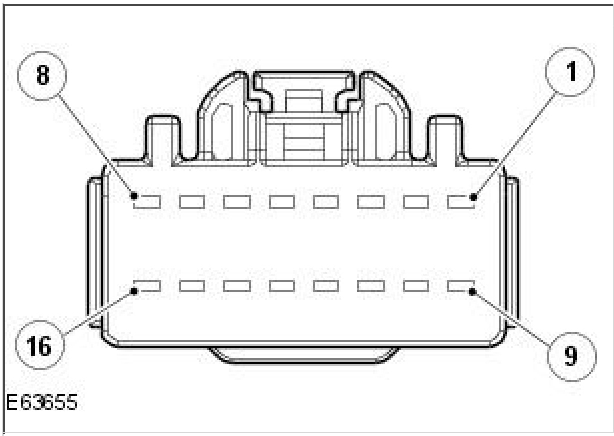
REPAIR the short circuit. This circuit contains intermediate connectors, C2243 and C2245. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

A7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2198, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

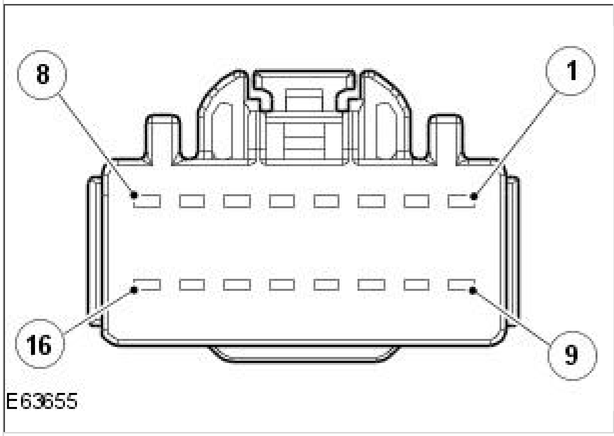
REPAIR the short circuit. This circuit contains intermediate connectors, C2243 and C2245. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

A8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2198, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

REPAIR the short circuit. This circuit contains intermediate connectors, C2243 and C2245. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

A9: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C2447, harness side	C2198, harness side
Pin 14	Pin 2

Is the resistance greater than 5 ohms?

Yes

REPAIR the high resistance circuit. This circuit contains intermediate connectors, C2243 and C2245. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

GO to A10.

A10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C2447, harness side	C2198, harness side
Pin 13	Pin 1

Is the resistance greater than 5 ohms?

Yes

REPAIR the high resistance circuit. This circuit contains intermediate connectors, C2243 and C2245. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new left hand front low-frequency initiator.

REFER to: Tire Pressure Monitoring System (TPMS) Front Antenna (204-04 Wheels and Tires, Removal and Installation).

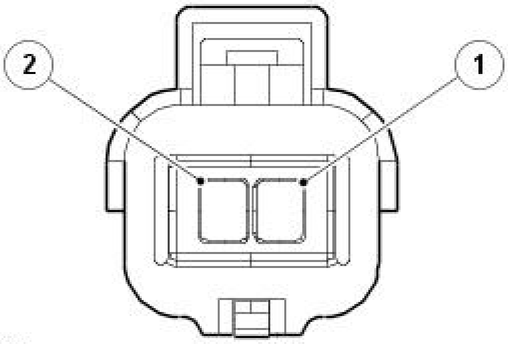
PINPOINT TEST B : RIGHT FRONT LOW FREQUENCY INITIATOR CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS

B1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1 Key off.

2 Disconnect the right hand front low-frequency initiator electrical connector, C2199.



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3 Measure the resistance between:

C2199, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to B5.

No

GO to B3.

B2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2199, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

GO to B6.

No

GO to B4.

B3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1 Measure the resistance between:

C2199, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to B7.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

B4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2199, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

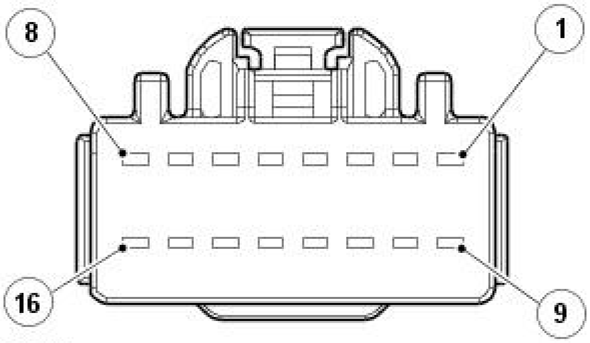
GO to B8.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

B5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



E63655

2 Measure the resistance between:

C2199, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

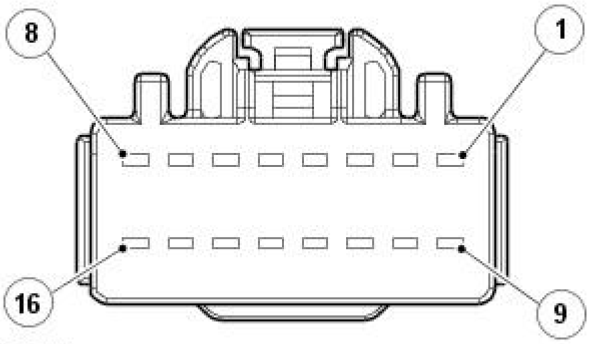
REPAIR the short circuit. This circuit contains intermediate connectors, C2242 and C2244. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

B6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



E63655

2 Measure the resistance between:

C2199, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

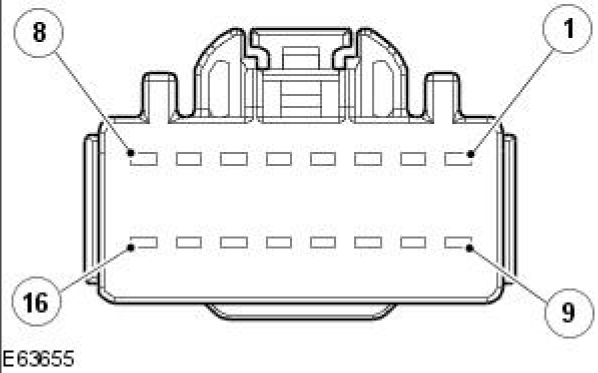
REPAIR the short circuit. This circuit contains intermediate connectors, C2242 and C2244. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

B7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2199, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

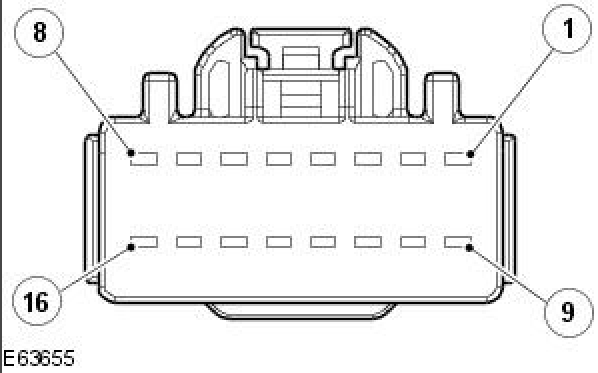
REPAIR the short circuit. This circuit contains intermediate connectors, C2242 and C2244. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

B8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2199, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

REPAIR the short circuit. This circuit contains intermediate connectors, C2242 and C2244. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.

REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

B9: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C2447, harness side	C2199, harness side
Pin 16	Pin 2

Is the resistance greater than 5 ohms?

Yes

REPAIR the high resistance circuit. This circuit contains intermediate connectors, C2242 and C2244. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

GO to B10.

B10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C2447, harness side	C2199, harness side
Pin 15	Pin 1

Is the resistance greater than 5 ohms?

Yes

REPAIR the high resistance circuit. This circuit contains intermediate connectors, C2242 and C2244. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new right hand front low-frequency initiator.
REFER to: Tire Pressure Monitoring System (TPMS) Front Antenna (204-04 Wheels and Tires, Removal and Installation).

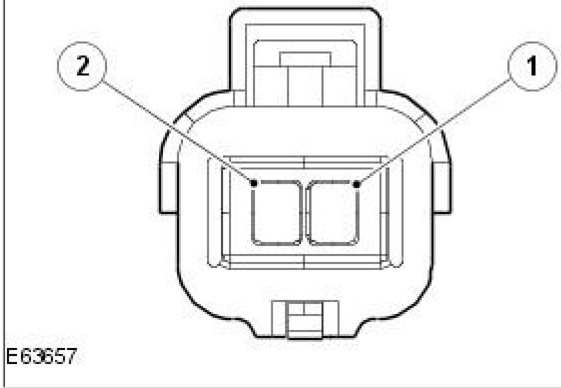
PINPOINT TEST C : LEFT REAR LOW-FREQUENCY INITIATOR CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS

C1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1 Key off.

2 Disconnect the left hand rear low-frequency initiator electrical connector, C2200.



3 Measure the resistance between:

C2200, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to C5.

No

GO to C3.

C2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2200, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

GO to C6.

No

GO to C4.

C3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1 Measure the resistance between:

C2200, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to C7.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

C4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2200, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

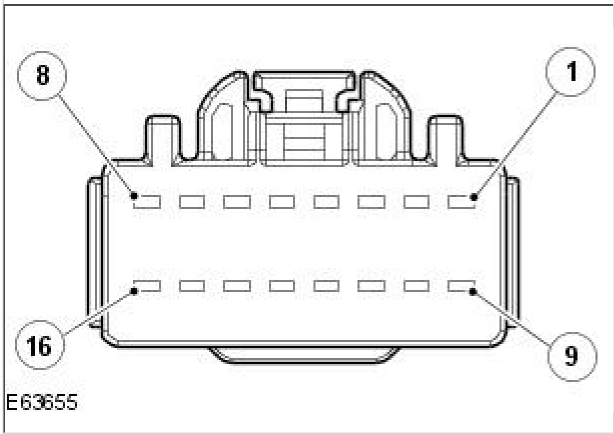
GO to C8.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

C5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2200, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

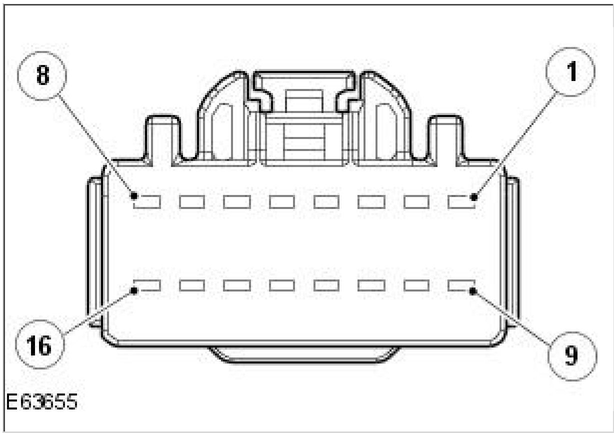
REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

C6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2200, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

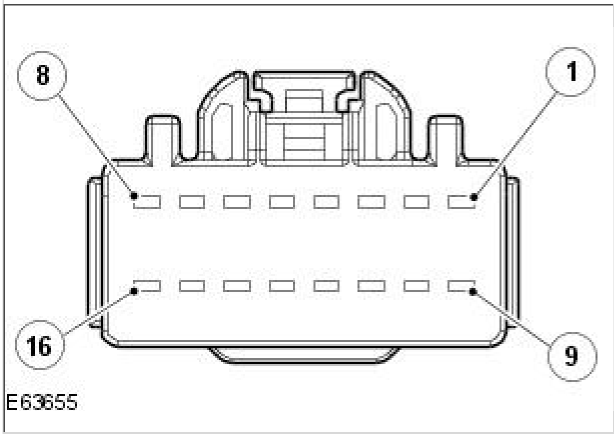
REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

C7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2200, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

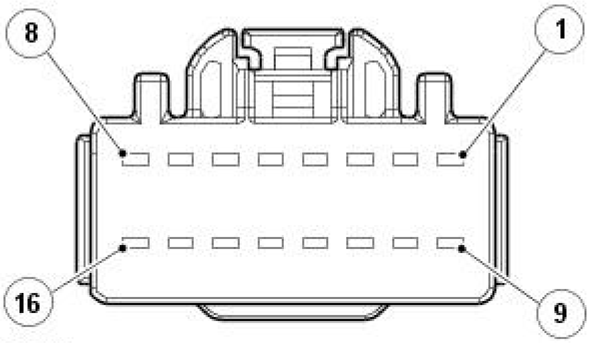
REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

C8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2200, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

C9: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C2447, harness side	C2200, harness side
Pin 6	Pin 2

Is the resistance greater than 5 ohms?

Yes

REPAIR the high resistance circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

GO to C10.

C10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C2447, harness side	C2200, harness side
Pin 5	Pin 1

Is the resistance greater than 5 ohms?

Yes

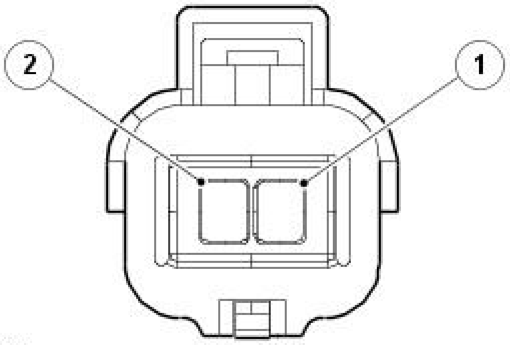
REPAIR the high resistance circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new left hand rear low-frequency initiator.
REFER to: Tire Pressure Monitoring System (TPMS) Rear Antenna (204-04 Wheels and Tires, Removal and Installation).

PINPOINT TEST D : RIGHT REAR LOW-FREQUENCY INITIATOR CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND	
	1 Key off.
	2 Disconnect the right hand rear low-frequency initiator electrical connector, C2201.



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3 Measure the resistance between:

C2201, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to D5.

No

GO to D3.

D2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2201, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

GO to D6.

No

GO to D4.

D3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1 Measure the resistance between:

C2201, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

GO to D7.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

D4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C2201, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

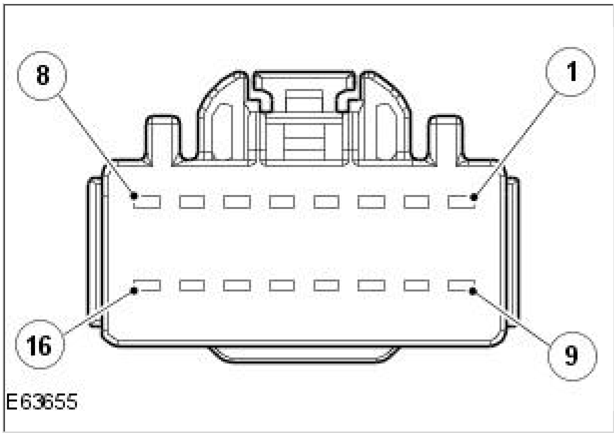
GO to D8.

No

Fault not present run On Demand Self Test (ODST) to confirm. Investigate cause of possible intermittent fault.

D5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2201, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

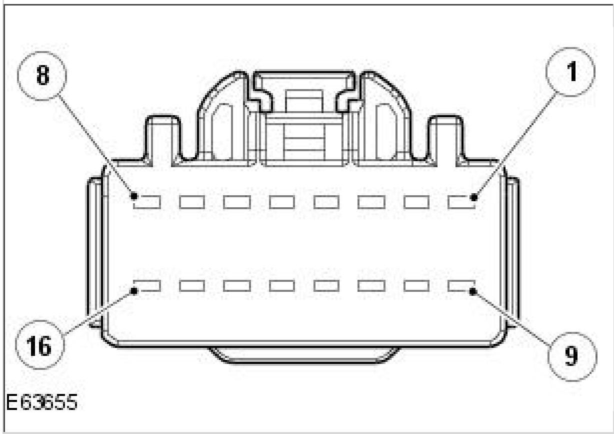
REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

D6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2201, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

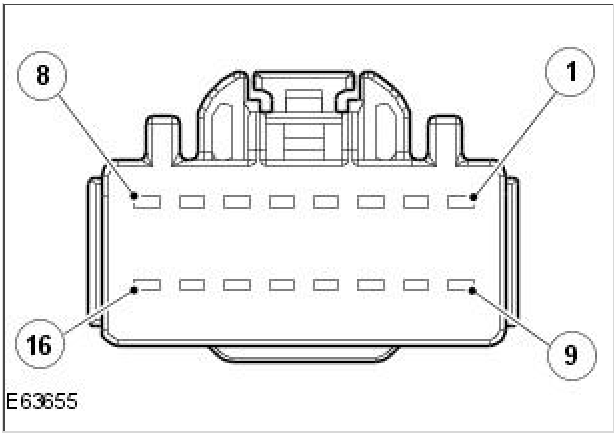
REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

D7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2201, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?

Yes

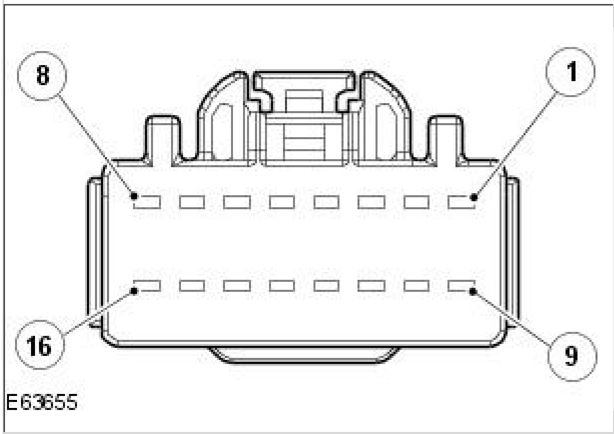
REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

D8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C2447.



2 Measure the resistance between:

C2201, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes

REPAIR the short circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module.
REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).

D9: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C2447, harness side	C2201, harness side
Pin 8	Pin 2

Is the resistance greater than 5 ohms?

Yes

REPAIR the high resistance circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

GO to D10.

D10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

	1 Measure the resistance between:

C2447, harness side	C2201, harness side
Pin 7	Pin 1

	Is the resistance greater than 5 ohms? **Yes** REPAIR the high resistance circuit. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification. **No** INSTALL a new right hand rear low-frequency initiator. REFER to: Tire Pressure Monitoring System (TPMS) Rear Antenna (204-04 Wheels and Tires, Removal and Installation).

PINPOINT TEST E : MISSING, INCOMPATIBLE OR DEFECTIVE RUNNING TIRE LOW PRESSURE SENSOR OR RECEIVER	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: CHECK FOR CORRECT WHEEL AND TIRE ASSEMBLY AND TIRE LOW PRESSURE SENSOR	
	1 Establish that a full size running wheel and tire assembly has a tire low pressure sensor installed. As a visual confirmation, a tire low pressure sensor has a metal valve stem rather than a rubber one and cannot be installed to a mini/space saver spare wheel.
	Is a full size wheel and tire assembly with tire low pressure sensor installed? **Yes** GO to E2. **No** Install the correct wheel and tire assembly or tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application.
E2: CHECK FOR ADDITIONAL DTCS	
	1 Remove the Tire Pressure Monitoring System power supply fuse and re-install it. Clear DTCs and leave the vehicle stationary for 15 minutes, then drive it at a speed greater than 15.5 mph (25 kph) continuously for at least 10 minutes. (Note: If the vehicle speed drops below this value, the drive time to complete the test will need to be increased.) The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status – learn mode status' will verify the completion of the test when the value returns to 'Inactive'.
	2 Check for additional DTCs C1A5631, C1A5831, C1A6031, C1A6231, with identical time stamps.
	Have all four DTCs logged with identical time stamps in the tire pressure monitoring system module? **Yes** Replace the tire pressure monitoring system module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation). **No** GO to E3.
E3: VERIFY THE POSITION OF THE DEFECTIVE TIRE LOW PRESSURE SENSOR	
	1 Check tire pressure monitoring system DTCs.
	Are any C1AXX31 DTCs logged? **Yes** Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position identified by the logged DTC. REFER to: Tire Low Pressure Sensor (204-04 Wheels and Tires, Removal and Installation). **No** No further action is required. (Note: The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status – learn completed successfully' will verify the successful completion of the test.)

PINPOINT TEST F : LOCALIZATION FAILURE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
F1: CHECK FOR ADDITIONAL DTCS	
	1 Check for additional DTCs: C1A5711, C1A5712, C1A5713. C1A5911, C1A5912, C1A5913, C1A6111, C1A6112, C1A6113, C1A6311, C1A6312, C1A6313.

	Are any of the DTCs listed above also logged? **Yes** Refer to the DTC Index and remedial actions. **No** GO to F2.
F2: CHECK FOR ADDITIONAL DTCS	
	1 Check for additional DTCs: C1A5631, C1A5831, C1A6031 or C1A6231
	Is a C1A5631, C1A5831, C1A6031 or C1A6231 DTC also logged? **Yes** Refer to the DTC Index and remedial actions. **No** GO to F3.
F3: CHECK INITIATOR INSTALLATION	
	1 Check for correct installation of Initiator. REFER to: (204-04 Wheels and Tires) Tire Pressure Monitoring System (TPMS) Front Antenna (Removal and Installation), Tire Pressure Monitoring System (TPMS) Rear Antenna (Removal and Installation).
	Is the Initiator correctly installed? **Yes** GO to F4. **No** Rectify as required. REFER to: (204-04 Wheels and Tires) Tire Pressure Monitoring System (TPMS) Front Antenna (Removal and Installation), Tire Pressure Monitoring System (TPMS) Rear Antenna (Removal and Installation).
F4: CHECK FOR SHORT CIRCUIT IN INITIATOR HARNESS	
	1 Locate and remove module blue connector L.
	2 Measure the resistance across the relevant initiator circuits within the blue connector.
	Is the resistance less than 1 Ohm? **Yes** A value of less than 1 Ohm indicates a short circuit, rectify the short circuit as required. **No** Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position identified by the logged DTC. REFER to: Tire Low Pressure Sensor (204-04 Wheels and Tires, Removal and Installation).

PINPOINT TEST G : SPARE TIRE LOW PRESSURE SENSOR NO OPERATION

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: ESTABLISH THE TYPE OF SPARE WHEEL AND TIRE ASSEMBLY INSTALLED	
	1 Establish the type of spare wheel and tire assembly installed.
	Is the spare wheel a mini/space saver type? **Yes** Tire low pressure sensors are not installed to mini/space-saver spare wheels. Tire low pressure sensors are installed to full size spare wheels only. The DTC is to be ignored and no repair action is required. **No** GO to G2.
G2: ESTABLISH THAT THE SPARE WHEEL HAS A TIRE LOW PRESSURE SENSOR INSTALLED	
	1 Establish that the spare wheel has a tire low pressure sensor installed, considering the following additional information: ● a) As a visual confirmation, the tire low pressure sensor has a metal valve stem rather than a rubber one.
	Is a tire low pressure sensor installed? **Yes** GO to G3. **No** A new spare tire low pressure sensor should be installed. Note: Refer to the note above the DTC index about replacing components which may remain under manufacturer warranty. Refer to the relevant section of the workshop manual.
G3: CONFIRM OPERATION OF THE SPARE WHEEL PRESSURE SENSOR	
	1 Deflate the spare tire, in close proximity to the vehicle, until it is completely deflated.
	2 Complete an ignition cycle to ignition on and verify that the instrument cluster reports a spare tire pressure warning for approximately 20 seconds.
	3 Re-inflate the spare tire, in close proximity to the vehicle, to the recommended spare tire pressure. Refer to the Inspection and Verification, Check Tire Pressure Warnings notes.

	4 Complete an ignition cycle to ignition on and verify that the instrument cluster no longer reports a spare tire pressure warning.
	Does the instrument cluster continue to report a spare tire pressure warning? **Yes** GO to G4. **No** No repair action is required. It is possible that the customer may have placed items in the vehicle's luggage compartment that prevented correct RF reception.
G4: VERIFY THAT THE SPARE TIRE LOW PRESSURE SENSOR ID HAS BEEN CORRECTLY PROGRAMMED TO THE MODULE	
	1 Remove tire low pressure sensor. Record the 8 character hexadecimal ID written on the casing.
	2 Use the approved diagnostic system to read the spare tire sensor ID from the module. Refer to the relevant procedure in the workshop manual.
	3 Compare the IDs from steps 1 & 2.
	Do the IDs match? **Yes** Replace the spare tire low pressure sensor. Refer to the relevant installation section in the workshop manual. The identification for the sensor must be programmed into the tire pressure monitoring system module using the manufacturer approved diagnostic system. The identification code is provided on a label with the complete assembly and is also printed on the casing of each sensor. **No** Program the spare tire sensor ID, recorded in step 1, to the module using the approved diagnostic system. The identification code is provided on a label with the complete assembly and is also printed on the casing of each sensor. Repeat test to ensure correct operation. GO to G3.

Published: 16-Aug-2011

Wheels and Tires - Tire Low Pressure Sensor

Removal and Installation

Removal

• NOTE: It is strongly recommended that the valve seal and steel washer is replaced each time a tire is changed to avoid a seal failure. The seal and washer must be replaced if the sensor is removed. Removal of the sensor retaining nut must be regarded as sensor removal. The valve cap must always be in place except when inflating, releasing pressure or checking pressure.

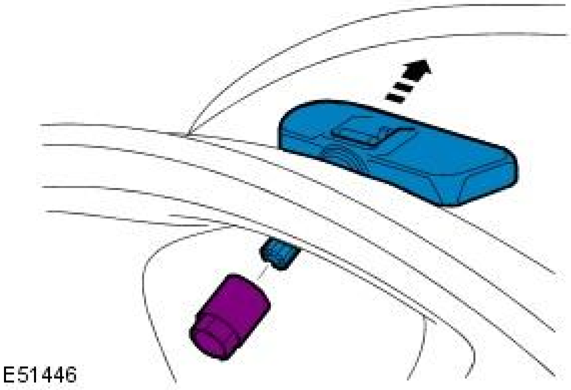
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. ⚠ CAUTION: To avoid damage to the tire low pressure sensor, release the tire bead from the rim, 180 degrees from the valve.

Remove the tire from the wheel.



E51446

4. CAUTIONS:

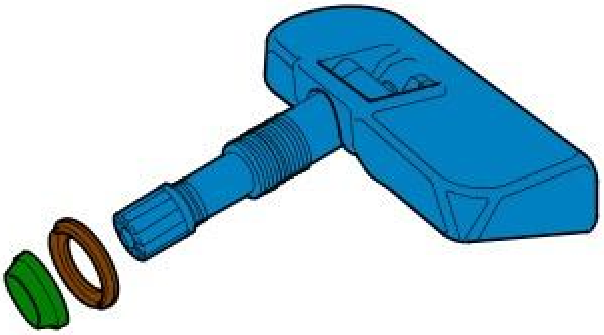
⚠ Do not push on the valve.

⚠ If the tire low pressure sensor is to be re-installed, a new washer, seal and nut must be installed.

⚠ If the tire low pressure sensor is to be re-installed, a new washer, seal, nut and silver coloured nickel valve core must be installed.

Remove the tire low pressure sensor.

- Remove the nut.
- Release and withdraw the sensor along the valve axis.



E51447

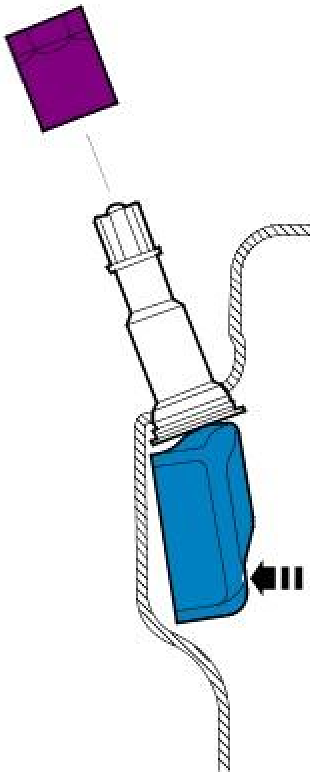
5. If necessary, install a new seal and washer.

- Remove and discard the seal and washer.
- Install a new washer and seal, making sure the valve remains pressed fully onto its seat.

Installation

1. ⚠ CAUTION: Do not use compressed air to clean the sensor. Do not clean the sensor with solvents or cleaning agents of any type, use a clean dry cloth.

Clean the component mating faces.



E51449

2. ⚠ CAUTION: Do not apply any lubricant to the new valve.

• NOTE: If the sensor is replaced on a 'running' wheel, the new sensor identification will be learnt when the vehicle is first driven. If a new sensor is fitted to the spare wheel the identification for that sensor must be programmed into the Tire Pressure Monitoring System (TPMS) module using T4. The identifcation code is provided on a label with the complete assembly and is also printed on the casing of each sensor.

Install the tire low pressure sensor.

- Install and hand tighten the nut whilst keeping the sensor in place.
- Tighten the nut to 6.5 Nm (4.8 lb.ft).

3. Install the tire and balance the wheel.
4. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Rear Antenna

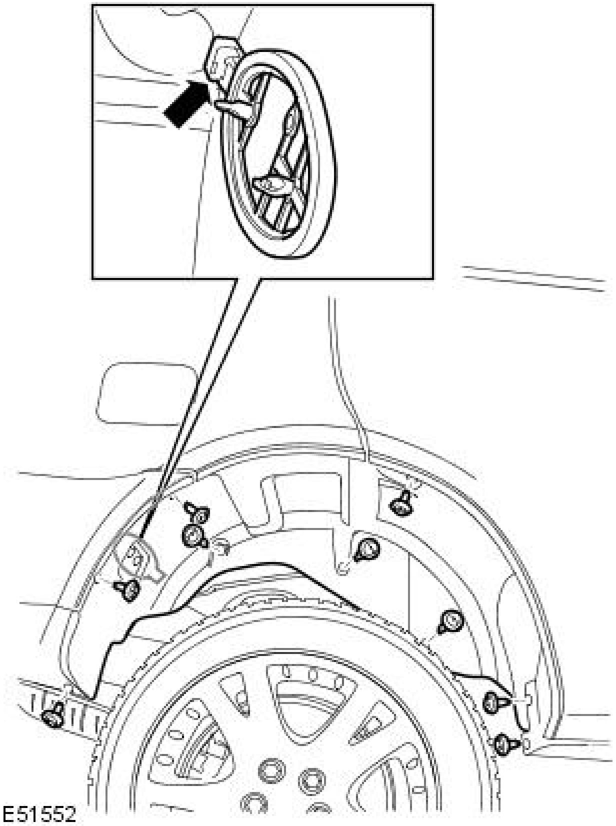
Removal and Installation

Removal

1. Raise and support the vehicle.

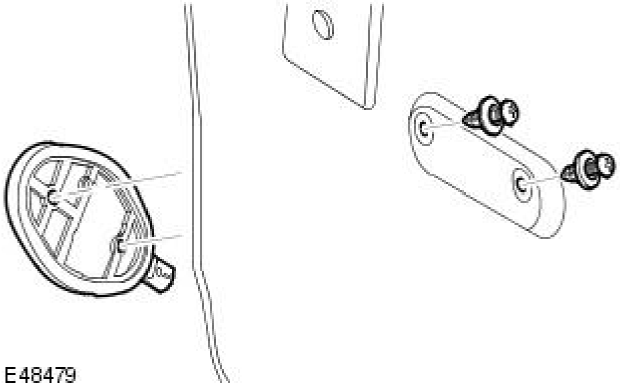
2. Remove the fender splash shield.

- Remove the 9 screws.
- Disconnect the electrical connector.



3. Remove the tire pressure antenna.

- Remove the 2 retainers.



Installation

1. To install, reverse the removal procedure.

2. Initiate a new tire pressure antenna using T4.

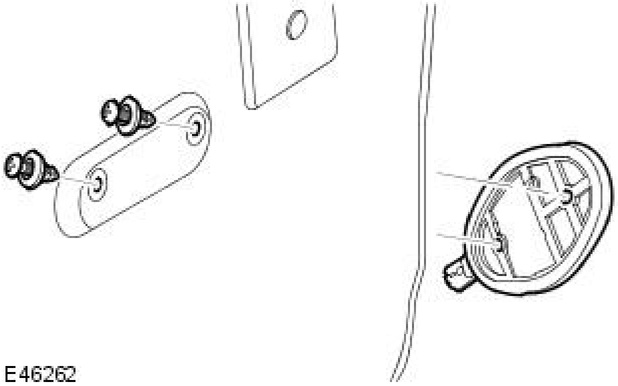
Published: 11-May-2011

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Front Antenna

Removal and Installation

Removal

1. Raise and support the vehicle.
2. Remove the fender splash shield.
   For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).
3. Remove the tire pressure antenna.
   - Remove the 2 retainers.



Installation

1. To install, reverse the removal procedure.
2. Initiate a new tire pressure antenna using T4.

Published: 11-May-2011

Wheels and Tires -

Wheels

Wheel type	Wheel size
Alloy wheel	7J x 17
Alloy wheel	8J x 18
Alloy wheel	8J x 19
Alloy wheel	9J x 19
Alloy wheel	9.5J x 20
Reduced size spare wheel - Steel	5.5J x 19

- CAUTIONS:

⚠ With reduced size spare wheel installed, do not exceed 50 mph (80 kph) and replace with standard size wheel at earliest opportunity.

⚠ Do not use power tools when operating the spare wheel winch, raise and lower winch manually using hand tools only.

Tire Sizes - Standard Fit

Wheel size	Tire size	Tire load index
7J x 17 - Alloy	235/65 R17H - All terrain	108
8J x 18 - Alloy	255/55 R18V - All terrain	109
8J x 19 - Alloy	255/50 R19Y - All terrain	107
9J x 19 - Alloy	255/50 R19Y - All terrain	107
9.5J x 20 - Alloy	275/40 R20M - All terrain	106

⚠ CAUTION: Inner tubes must not be installed with any of these tires.

Tire Pressures - Not NAS Vehicles

Loading condition	bar	lb/in^2	kPa
Normal operating conditions - Up to 4 people:			
Front	2.3	34	230
Rear	2.5	36	250
Vehicle loaded to maximum gross vehicle weight:			
Front	2.6	38	260
Rear	2.9	42	290
Reduced size spare wheel	4.2	60	420
*** Standard size spare wheel**	2.9	42	290

⚠ CAUTION: * The standard size spare wheel tire should be inflated to the maximum gross vehicle weight pressure and the pressure for the front or rear wheel locations must be adjusted accordingly if the wheel is to be used under conditions other than with the vehicle loaded to maximum gross vehicle weight.

Tire Pressures - NAS Vehicles

Loading condition	bar	lb/in^2	kPa
All conditions:			
Front	2.6	38	260
Rear	2.9	42	290
Reduced size spare wheel	4.2	60	420
*** Standard size spare wheel**	2.9	42	290

⚠ CAUTION: * The standard size spare wheel tire should always be inflated to the highest loading condition pressure which must be adjusted accordingly if the wheel is to be installed to the front wheel locations.

General Specification

Item	Make	Location
Tire low pressure sensor	Siemens	On inside of wheel rim
Tire pressure sensor initiator:		
Front	Siemens	Attached to the fender splash shield adjacent to the front bumper
Rear	Siemens	Attached to the fender splash shield adjacent to the rear bumper
Module	Siemens	Attached to the roof behind the roof opening panel.

Recommended Lubricant

Application	Land Rover Part No.

Application	Land Rover Part No.
Wheel hub spigot	RYL 105020

Torque Specifications

Description	Nm	lb-ft
* Road wheel nuts	140	103
Tire low pressure sensor	6	4

*** Wheel nuts must be tightened by diagonal selection**

Published: 11-May-2011

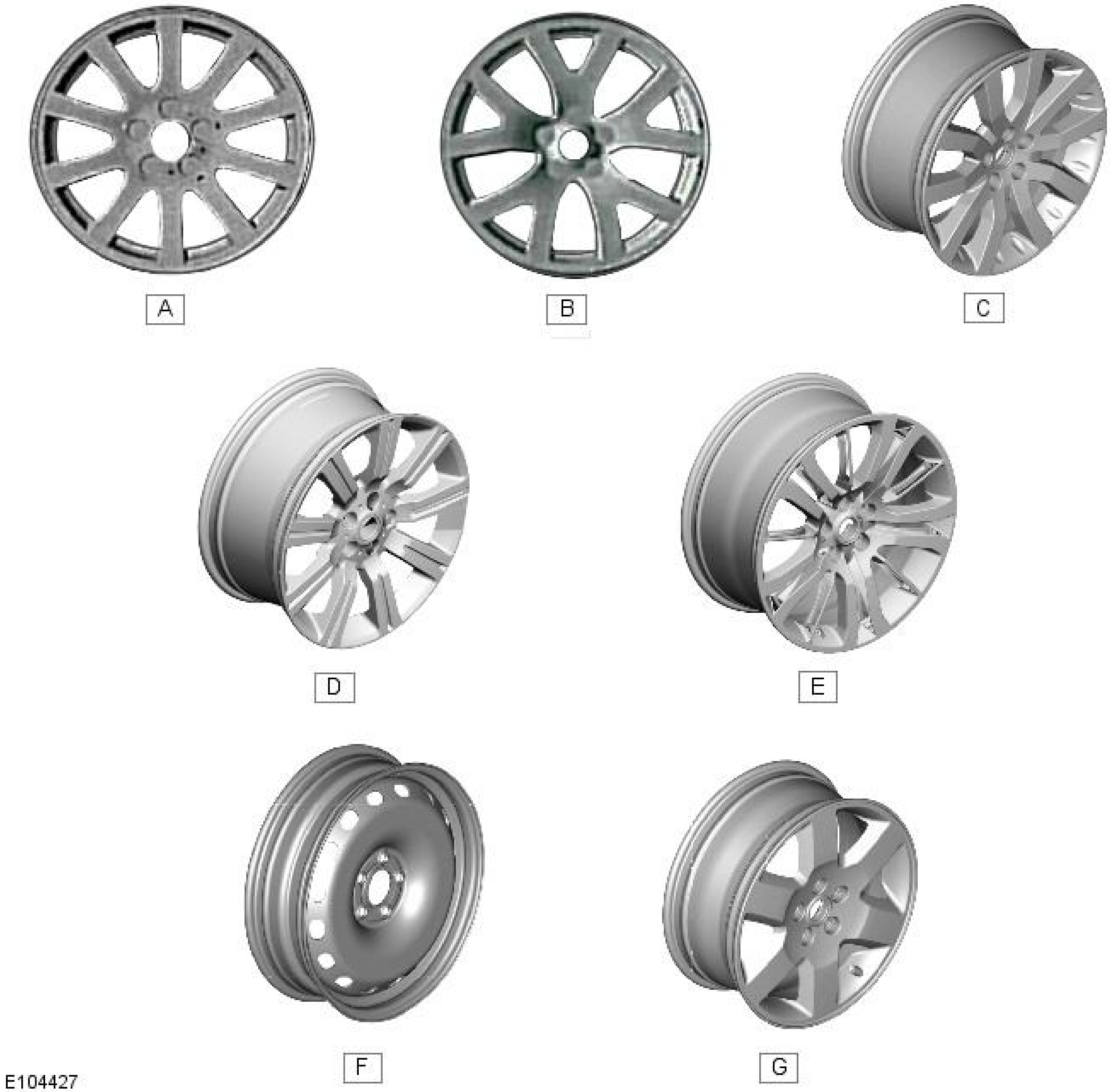
Wheels and Tires - Wheels and Tires

Description and Operation

OVERVIEW

A number of alloy wheel and tire size combinations are available. A Tire Pressure Monitoring System (TPMS) is also available. This system monitors the pressure in each tire and informs the driver if the pressure is outside predetermined thresholds.

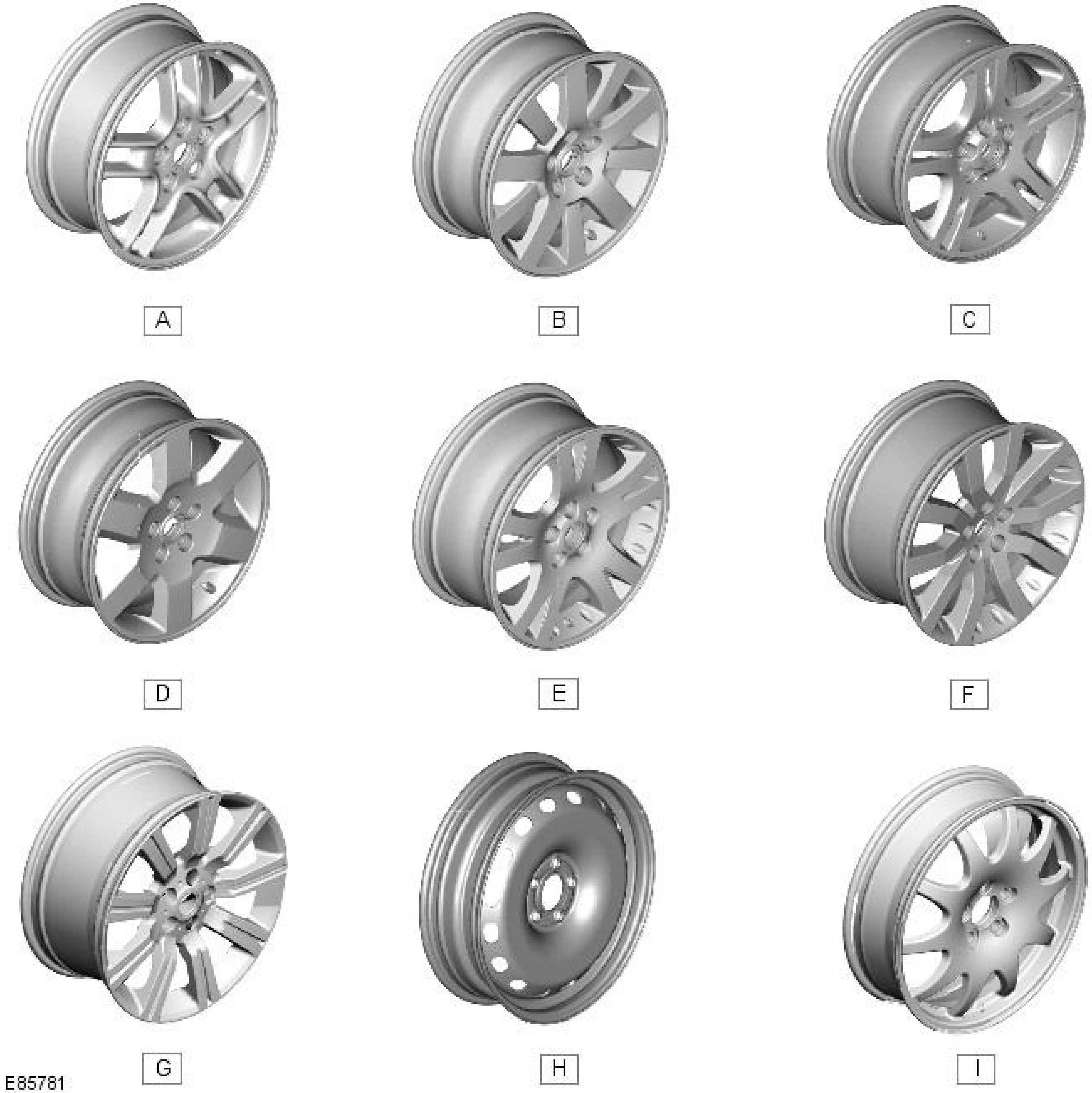
WHEELS (2009 MY onwards)



Item	Part Number	Description
A	-	8JX18 (10 Spoke)
B	-	9JX19 (5x2 Spoke)
C	-	9½JX20 (10 Spoke Supercharge + 10 Spoke Supercharge Chrome Shadow)
D	-	9½JX20 (Stormer)
E	-	9½JX20 (5 Star + 5 Star Diamond Turned)

F	-	5½JX19 (Stiff Space Saver)
G	-	8X19 (6 Spoke Spare)

WHEELS (up to 2009 MY)



Item	Part Number	Description
A	-	7JX17
B	-	8JX18 - Style 2
C	-	8JX18 - Style 3 (up to 2007MY)
D	-	8JX19
E	-	9JX19
F	-	9½JX20
G	-	9.5JX20 Stormer (from 2007)
H	-	5½JX19 - Space saver (up to 2007MY)
I	-	5.5X19 Space Saver Alloy (from 2007)

There are a number of different alloy wheel sizes and styles as shown in the above illustration.

The spare wheel fitted to most vehicles is a steel space saver wheel. The wheel size is 5½J X 19 and uses a T175/80R19 tire. The space saver wheel is a standard fitment for all markets except Gulf states. An 8J X 19 alloy, black painted spare is offered as an optional fitment. The steel space saver and the alloy spare wheel are subject to a maximum 50 mph (80 km/h) speed limit.

TIRES

Tires are available in a number of sizes and tread patterns dependent on the vehicle usage. Tire sizes are as follows:

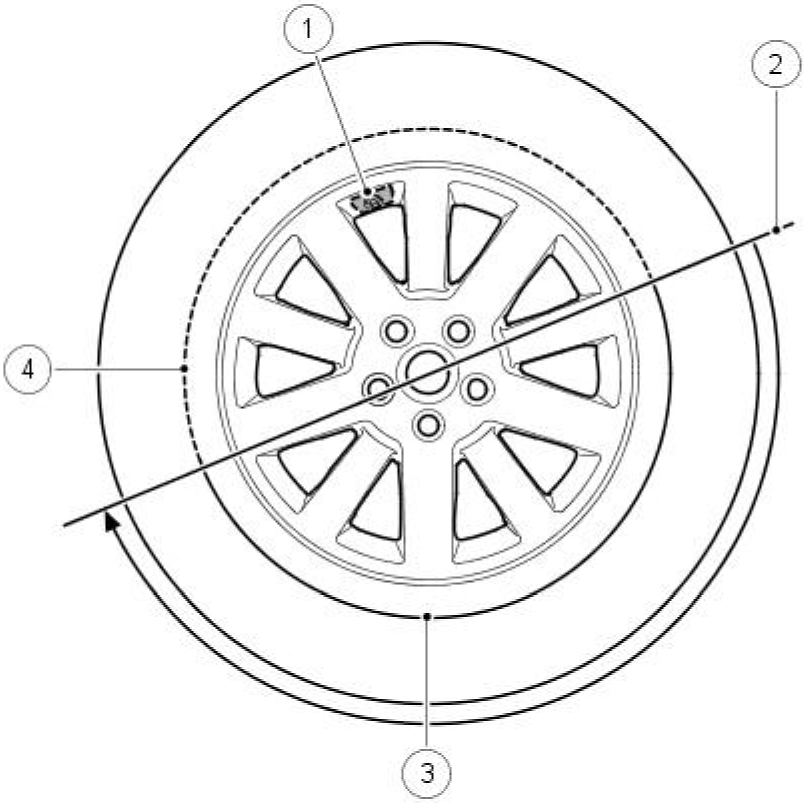
- 235/65R17
- 255/55R18
- 255/50R19
- 275/40R20.

The following tires are available; All Season (AS), All Terrain (AT) and All Terrain - Sport (AT-S).

• NOTE: Tires should be inflated to the recommended pressures (as given in the owners handbook) only when the tires are cold (ambient temperature). If the tires have been subjected to use or exposed to direct sunlight, move the vehicle into a shaded position and allow the tires to cool before checking and/or adjusting the pressures.

Tire Changing

Care must be taken when removing and refitting tires to ensure that the tire pressure sensor is not damaged.



E45549

Item	Part Number	Description
1	-	Tire valve and pressure sensor
2	-	Tire fitting/removal tool initial start position
3	-	High tire and bead tension area
4	-	Low tire and bead tension area

When removing the tire, the bead breaker must not be used within 90 degrees of the tire valve in each direction.

When using the tire removal machine, the fitting arm start position must be positioned as shown in the tire changing illustration. The wheel can then be rotated through 180 degrees in a counterclockwise direction. This will relieve the high tension from the tire bead allowing the remaining 180 degrees of the tire to be manually pulled from the rim.

When refitting the tire, position the fitting arm as shown. Rotate the tire and take care that the bead on the low tension side of the tire does not damage the sensor.

Tread Act - NAS Only

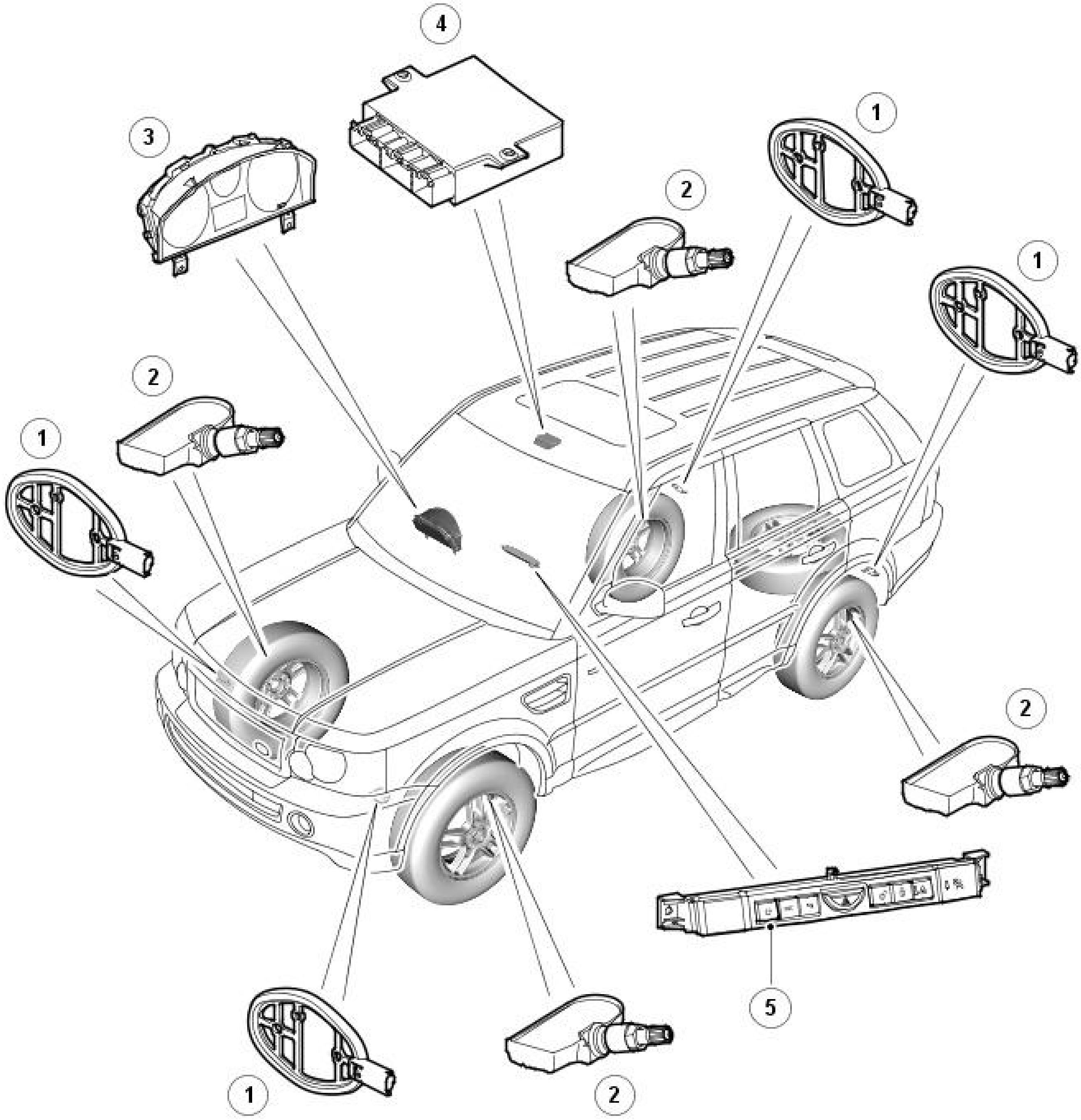
Vehicles supplied to the North American markets must comply with the legislation of the Transport Recall Enhancement, Accountability and Documentation (TREAD) act. Part of the requirement of the TREAD act is for the vehicle to display a label, positioned on the driver's side B-pillar, which defines the recommended tire inflation pressure, load limits and maximum load of passengers and luggage the vehicle can safely carry. This label is specific to each individual vehicle and is installed on the production line.

This label must not be removed from the vehicle. The label information will only define the specification of the vehicle as it came off the production line. It will not include dealer or owner fitted accessory wheels and tires of differing size from the original fitment.

If the label is damaged or removed for body repair, it must be replaced with a new label specific to that vehicle. A new label is requested from Land Rover parts and will be printed specifically for the supplied VIN of the vehicle.

TIRE PRESSURE MONITORING SYSTEM (TPMS)

Tire Pressure Monitoring System - Component Location



E52480

Item	Part Number	Description
1	-	Initiator
2	-	Tire pressure sensor
3	-	Instrument cluster
4	-	TPMS module
5	-	TPMS switch (Not available on NAS vehicles)

The purpose of the Tire Pressure Monitoring System (TPMS) is to assist the driver in maintaining the vehicle's tire pressures at the optimum level in order to:

- improve fuel consumption
- maintain ride and handling characteristics
- reduce the risk of rapid tire deflation – which may be caused by under inflated tires
- comply with legislation in relevant markets.

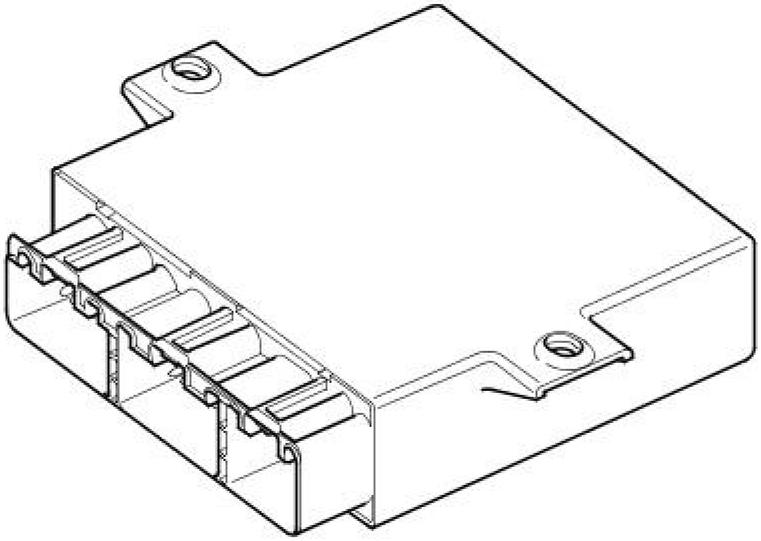
The TPMS measures the pressure in each of the tires on the vehicle (including the spare, if required) and issues warnings to the driver if any of the pressures deviate from defined tolerances.

• NOTE: During a 'blow out' a very rapid reduction in pressure is experienced. The system is not intended to warn the driver of a 'blow out', since it is not possible to give the driver sufficient warning that such an event is occurring, due to its short duration. The design of the TPMS is to assist the driver in keeping the tires at the correct pressure, which will tend to reduce the likelihood of a tire 'blow out' occurring.

A single TPMS hardware configuration is used. TPMS status information is relayed to the driver with a message displayed in the instrument cluster message centre and one warning indicator LED.

The message centre provides the driver with more detailed information and identifies of location of a specific tire on the vehicle.

TPMS Module



E45551

The TPMS module is located above the head liner of the vehicle, mounted in a central position above the windscreen. The module is retained in position with two plastic locknuts. The three connectors of the module point towards the left hand side of the vehicle.

The TPMS module's main function is to detect the following:

- the tire pressure is below the recommended low tolerance value – under inflated tire
- the location of the tire on the vehicle.

The TPMS module also communicates with the vehicle instrument cluster to provide the driver with appropriate warnings that show the importance of the condition detected and indicate the status/failure of TPMS components.

Tire Location

Because of the requirement for different pressure targets and thresholds for the front and rear tires, the TPMS module can identify the location of the tires on the vehicle, and assign a received tire pressure sensor identification to a specific position on the vehicle (i.e. FL (front left), FR (front right), RL (rear left) or RR (rear right)).

Tire location is performed automatically by the module using an auto-location function. This function requires no manual intervention by the driver. The TPMS module can automatically learn the position of tires on the vehicle if the tire pressure sensors or their positions are changed on the vehicle.

The tire learn and location process is ready to commence when the vehicle has been stationary or travelling at less than 12 mph (20 km/h) for 15 minutes. This is known as 'parking mode'. The learn/locate process requires the vehicle to driven at speeds of more than 12 mph (20 km/h) for 15 minutes. If the vehicle speed reduces to below 12 mph (20 km/h), the learn process timer is suspended until the vehicle speed increases to more than 12 mph (20 km/h), after which time the timer is resumed. If the vehicle speed remains below 12 mph (20 km/h) for more than 15 minutes, the timer is set to zero and the process starts again.

The TPMS module can automatically detect, under all operating conditions, the following:

- one or more tire pressure sensors have been replaced
- one or more tire pressure sensor identifications are missing
- one or more ‘alien’ identifications are being received, i.e. the module can reject identifications from tire pressure sensors that do not belong to the vehicle
- the spare tire and one of the tires in use on the vehicle have exchanged position on the vehicle.

If the tire pressure sensors fitted to the running wheels (not the spare) are changed, the module can learn the new sensor identifications automatically. The learn function requires no manual intervention by the driver.

If a new sensor is fitted to the spare tire, it must have its identification code programmed into the TPMS module diagnostically using a Land Rover approved diagnostic system or used on the vehicle as a 'running' wheel and the vehicle driven for 15 minutes at more than 12.5 mph (20 km/h).

Spare Tire Identification

Depending on the vehicle specification, the spare tire may or may not be fitted with a tire pressure sensor.

• NOTE: Tire pressure sensors cannot be fitted to space saver spare wheels.

If the spare tire is fitted with a tire pressure sensor, the TPMS module can detect it, determine that it is the spare tire and monitor its pressure and issue warnings to the driver accordingly. If the TPMS module expects the spare tire to be fitted with a tire pressure sensor and it does not, the module will not show a fault to the driver, however a fault code will be stored in the TPMS module.

If the spare tire is being monitored and the driver replaces a flat ‘running’ tire with the spare tire, the module will not continually warn the driver that the original flat tire (now in the spare position) is flat. This prevents distraction of the driver by constant pressure warnings being issued. The driver is reminded by a message displayed for 20 seconds at each ignition on cycle that the spare tire is flat.

System Operation

Each time the vehicle is driven, the TPMS module transmits a Low Frequency (LF) (125 KHz) signal to each initiator in turn. This is received by the tire pressure sensor which transmits a Radio Frequency (RF) (315 or 433 MHz depending on market) signal to the module. This signal contains coded data which corresponds to sensor identification, air pressure, air temperature and acceleration data.

The system enters 'parking mode' after the vehicle speed has been less than 12.5 mph (20 km/h) for 12 minutes. In parking mode the tire pressure sensors transmit a coded signal to the module once every 13 hours. If the tire pressure decreases by more than 1 lbf/in^2 (0.6 bar) the sensor will transmit more often if pressure is being lost.

The spare tire sensor transmits a signal every 13 hours in the same manner as the road wheels when in parking mode. If the tire pressure decreases by more than 1 lbf/in^2 (0.6 bar) the sensor will transmit more often if pressure is being lost.

As each wheel responds to the LF signal from the TPMS module, it is assigned a position on the vehicle and is monitored for the remainder of that drive cycle in that position.

When the vehicle has been parked for more than 15 minutes and then driven at a speed of more than 12.5 mph (20 km/h), the initiators fire in turn for 6 seconds on vehicles fitted with 433 MHz systems or for 18 seconds on vehicles fitted with 315 MHz systems in the following order:

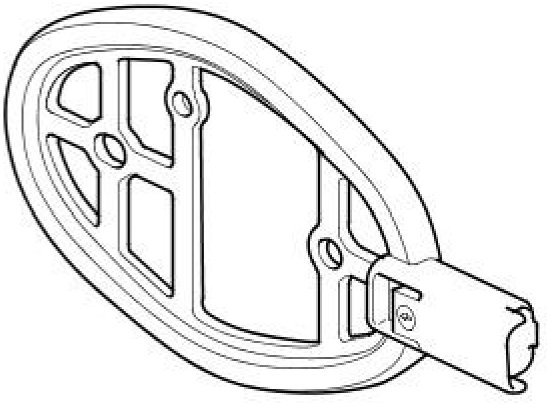
- Front left
- 6 second pause (for the TPMS module to detect a response from the tire pressure sensor)
- Front right
- 6 second pause
- Rear right
- 6 second pause
- Rear left
- 6 second pause.

Each tire pressure sensor responds in turn so the module can establish the sensor positions at the start of the drive cycle. This process is repeated up to three times but less if the sensor positions are already known in the module. The process is known as 'Auto Location' and takes 3 to 4 minutes on vehicles fitted with 433 MHz systems and 7 to 8 minutes on vehicles fitted with 315 MHz systems to complete. During this period the tire sensors transmit at regular intervals, once every 5 seconds on vehicles fitted with 433 MHz systems and once every 15 seconds on vehicles fitted with 315 MHz systems. For the remainder of the drive cycle the tire sensors transmit once every 60 seconds or if a change in tire pressure is sensed until the vehicle stops and the system returns to parking mode.

Once the wheel position is established, the initiators stop firing a signal and do not fire again until the vehicle has been parked for more than 15 minutes. The signal transmissions from each wheel sensor continue at 1 minute intervals whilst the vehicle is being driven. This transmission is to monitor the tire pressure.

At 25% deflation the amber warning indicator in the instrument cluster is illuminated and an appropriate message displayed in the message centre.

Initiator



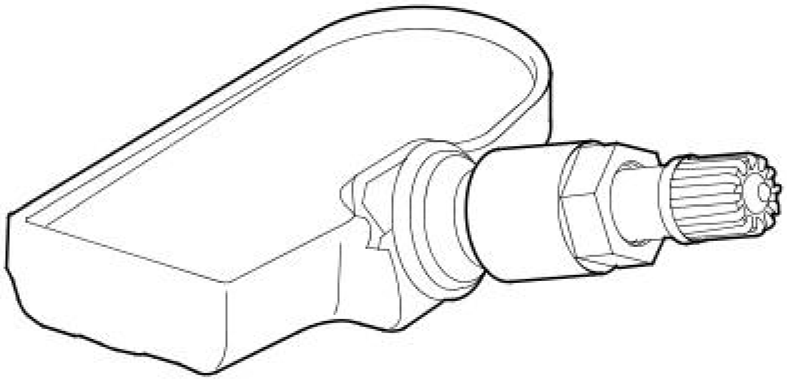
E45552

The initiators are located near the front of the front wheel arches and near the rear of the rear wheel arches and are secured with two scrivets. The TPMS has four initiators. Each initiator has a connector which connects with the body harness.

The initiator is a passive, Low Frequency (LF) transmitter. Each initiator provides an auto-location feature to identify tire positions on the vehicle and transmit that data to the TPMS module.

The TPMS module energises each initiator in turn using LF drivers. The corresponding tire pressure sensor detects the resulting LF transmission and responds by initiating an RF transmission of its data. This data is received by the TPMS module internal RF antenna. The module can then determine which sensor is transmitting and its location on the vehicle.

Tire Pressure Sensor



E45553

The TPMS system uses ‘active’ tire pressure sensors which are mounted on each wheel, inside the tire cavity. The sensor is retained in position by the valve attachment to the wheel structure. The sensors transmit their RF signals at either 315 MHz or 433 MHz dependent on market requirements.

The sensors periodically measure the pressure and temperature of the air inside the tire. Pressure and temperature measurements are transmitted periodically to the RF receiver in the vehicle.

The tire pressure sensors are self-contained units which have no electrical connections into or out of the sensor.

The care points detailed in 'Tire Changing' in this chapter must be followed to avoid damage to the sensor. If the sensor is replaced, the nut, seal and washer must also be replaced and the sensor tightened to the correct torque value as given in the Service Repair manual.

The RF transmission from the sensor contains a unique identification code in its transmission data, so that the TPMS module can identify the tire on the vehicle. If the sensor is replaced on a 'running' wheel, the new sensor identification will be learnt when the vehicle is first driven at a speed of more than 12.5 mph (20 km/h) for 15 minutes. If a new sensor is fitted to the spare wheel, the identification for that sensor must be programmed into the TPMS module using a Land Rover approved diagnostic system or that wheel will not be monitored. The code is provided on a label with the complete wheel and tire assembly when new and is also printed on the casing of each sensor.

The replacement spare wheel may also be programmed to the vehicle by using it as a 'running' wheel for 15 minutes at more than 12.5 mph (20 km/h), then replacing it to the spare wheel position.

In order to conserve battery power, the tire sensor module uses different transmission rates when the wheel is stationary or moving. The wheel speed required to change between the stationary and moving transmission rates is very low to allow for the requirement for slow off-road driving.

TPMS Switch

- NOTE: The TPMS switch is not fitted to NAS vehicles. NAS vehicles do not have the option to select target pressure modes.

The TPMS switch is a non-latching push button switch which is located in the centre console switch pack, adjacent to the DSC switch.

The TPMS switch is used by the driver to set the required target pressures for the vehicle, i.e. ‘light load’ or ‘heavy load’. The switch is used to toggle between the two modes.

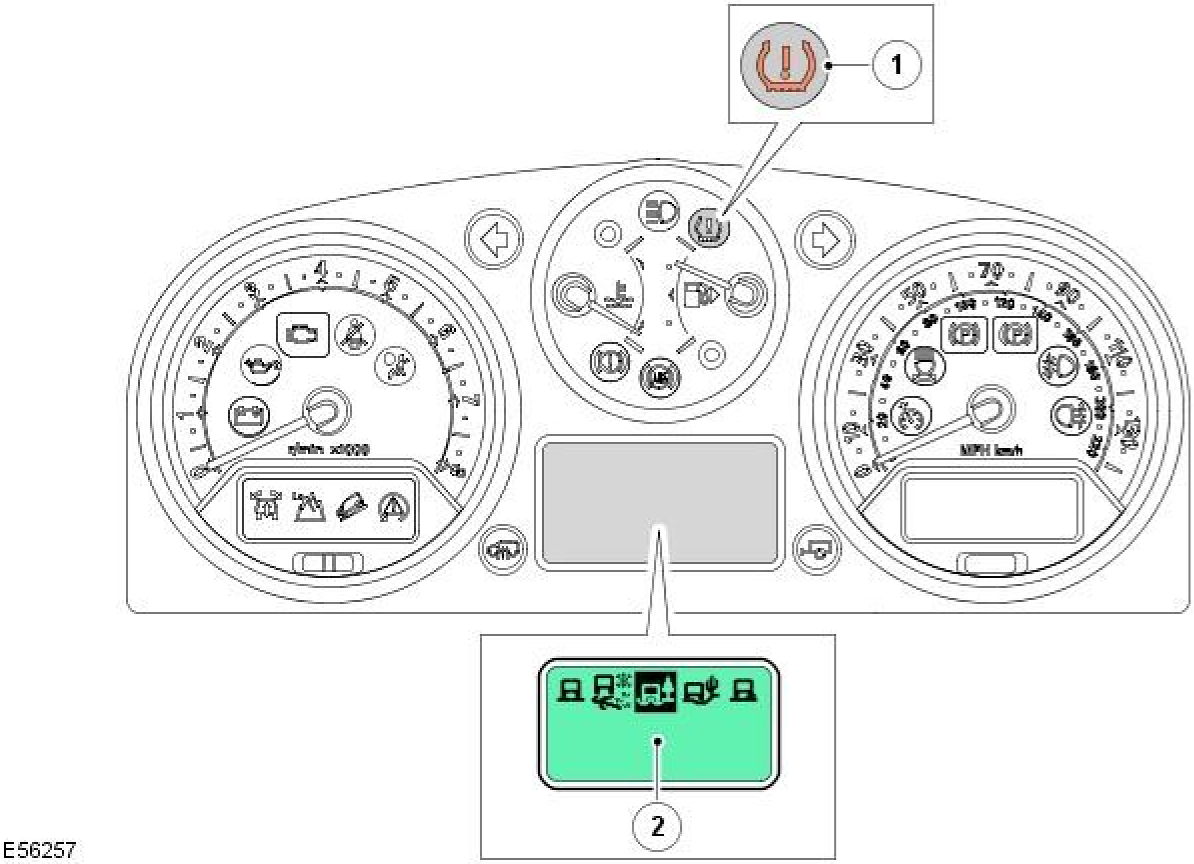
The TPMS switch has a status LED, located in the face of the switch, which informs the driver when the ‘light load’ or ‘heavy load’ pressures are set. When 'light load' mode is set, the LED is illuminated. When 'heavy load' mode is set, the LED is extinguished.

The status LED has two-stage illumination, providing day or night time illumination levels. The illumination level is determined by the TPMS module, based on data received via the vehicle CAN interface.

The switch is used to change between the modes as required. The ignition switch must be in position II. If the TPMS is in the 'light load' mode, pressing and holding the switch for 4 seconds will change the target pressures to 'heavy load' mode. The LED will be extinguished, the message centre in the instrument cluster will flash 'TYRE PRESSURE MONITORING SET FOR HEAVY LOAD' for 3 seconds. This setting will remain until deselected by the driver.

To change from 'heavy load' mode to 'light load' mode, the ignition switch must be in position II and the switch must be pressed and held for 4 seconds. This will change the target pressures from 'heavy load' mode to 'light load' mode. The switch LED will illuminate and the instrument cluster message centre will display 'TYRE PRESSURE MONITORING SET FOR LIGHT LOAD' for 3 seconds. The 'light load' message will also be displayed at every ignition cycle.

Instrument Cluster Indications



Item	Part Number	Description
1	-	Amber warning indicator
2	-	Message centre

The warning indications to the driver are common on all vehicles fitted with TPMS. Warnings are conveyed by an amber LED warning indicator and a text message displayed in the message centre.

The warning indicator and message centre are driven by CAN messages from the TPMS module. The warning indicator is illuminated by the cluster software for 3 seconds when the ignition is switched to position II for a bulb check.

• NOTE: If the vehicle is not fitted with the TPMS, the warning indicator will not illuminate at any time.

When the TPMS module transmits a warning indicator on signal, this may also be accompanied by a chime from the instrument cluster sounder.

The following table shows the warning indicator functionality for given events.

Event	Instrument Cluster Indications
Minor warning threshold reached in any 'running' tire	Amber LED illuminated. 'CHECK ALL TYRE PRESSURES' message displayed.
Any 'running' or 'spare' tire pressure sensor battery low	No indication (Fault code stored on TPMS module)
TPMS Fault	Amber LED illuminated. Amber LED illuminated at next and subsequent ignition on cycle. Sounder activated on initial LED illumination. 'TYRE PRESSURE MONITORING SYSTEM FAULT' message displayed.
One TPMS wheel sensor fault	Amber LED illuminated. Amber LED illuminated at next and subsequent ignition on cycle. Sounder activated on initial LED illumination. 'XX TYRE PRESSURE NOT MONITORED' message displayed.
More than one TPMS wheel sensor fault	Amber LED illuminated. Amber LED illuminated at next and subsequent ignition on cycle. Sounder activated on detection of each additional

Event	Instrument Cluster Indications
	wheel sensor fault event. 'TYRE PRESSURE MONITORING SYSTEM FAULT' message displayed.
TPMS switch pressed for 4 seconds to set 'Light Load' operation when engine is not running and the ignition switch is in position II	TPMS switch status LED illuminated. 'TYRE PRESSURE MONITORING SET FOR LIGHT LOAD' message displayed for 3 seconds.
TPMS switch pressed for 4 seconds to set 'Heavy Load' operation when engine is not running and the ignition switch is in position II	TPMS switch status LED is extinguished. 'TYRE PRESSURE MONITORING SET FOR HEAVY LOAD' message is displayed for 3 seconds.

- NOTE: 'XX' is the tire position on the vehicle, e.g. FL (front left), FR (front right), RL (rear left) or RR (rear right).

Controller Area Network (CAN)

The TPMS module sends and receives a number of digital messages via the medium speed CAN. The received messages are used for the operation of the TPMS. The transmitted messages comprise of TPMS status and requests to the instrument cluster to illuminate warnings indicators and/or display messages in the message centre.

Received Messages

The TPMS module receives the messages shown in the following table.

Message	Transmitted By
Vehicle speed	ABS module
External ambient temperature - corrected	ATC module
Side lamp status	CJB
Ignition switch status	CJB
Odometer value	Instrument cluster
Minute counter	Instrument cluster
Vehicle voltage level	Instrument cluster
Engine crank relay status	ECM
Diagnostic physical request	Land Rover approved diagnostic system
Diagnostic functional request	Land Rover approved diagnostic system
Engine running status	ECM
Master car configuration identification	Instrument cluster
Car configuration parameters	Instrument cluster

Transmitted Messages

The TPMS module transmits the messages shown in the following table.

Message	Received By
TPMS diagnostic response	Land Rover approved diagnostic system
TPMS yellow warning indicator request at 25% tire deflation	Instrument cluster
TPMS audible alert	Instrument cluster
TPMS message display request	Instrument cluster

Diagnostics

The TPMS module has a diagnostic connection via the medium speed CAN to enable system status and faults to be retrieved using a Land Rover approved diagnostic system.

Additionally, an on-board diagnostic routine within the TPMS module constantly monitors the system and alerts the driver to system faults by illuminating the amber warning indicator, emitting a tone from the instrument cluster sounder and/or displaying a message in the instrument cluster message centre.

Fault Detection

If a sensor fails, the amber warning indicator in the instrument cluster will be illuminated. A message 'XX Tyre Pressure Not Monitored' will be displayed in the message centre in addition to the amber warning indicator.

If more than one sensor fails or the TPMS module develops a fault, the amber warning indicator will be illuminated. A message 'Tyre Pressure Monitoring System Fault' will be displayed in the message centre in addition to the amber warning indicator. This fault could also be caused if RF interference near the vehicle affects the system signal reception. When the interference has ceased, the fault will be automatically cancelled and the TPMS will operate normally.

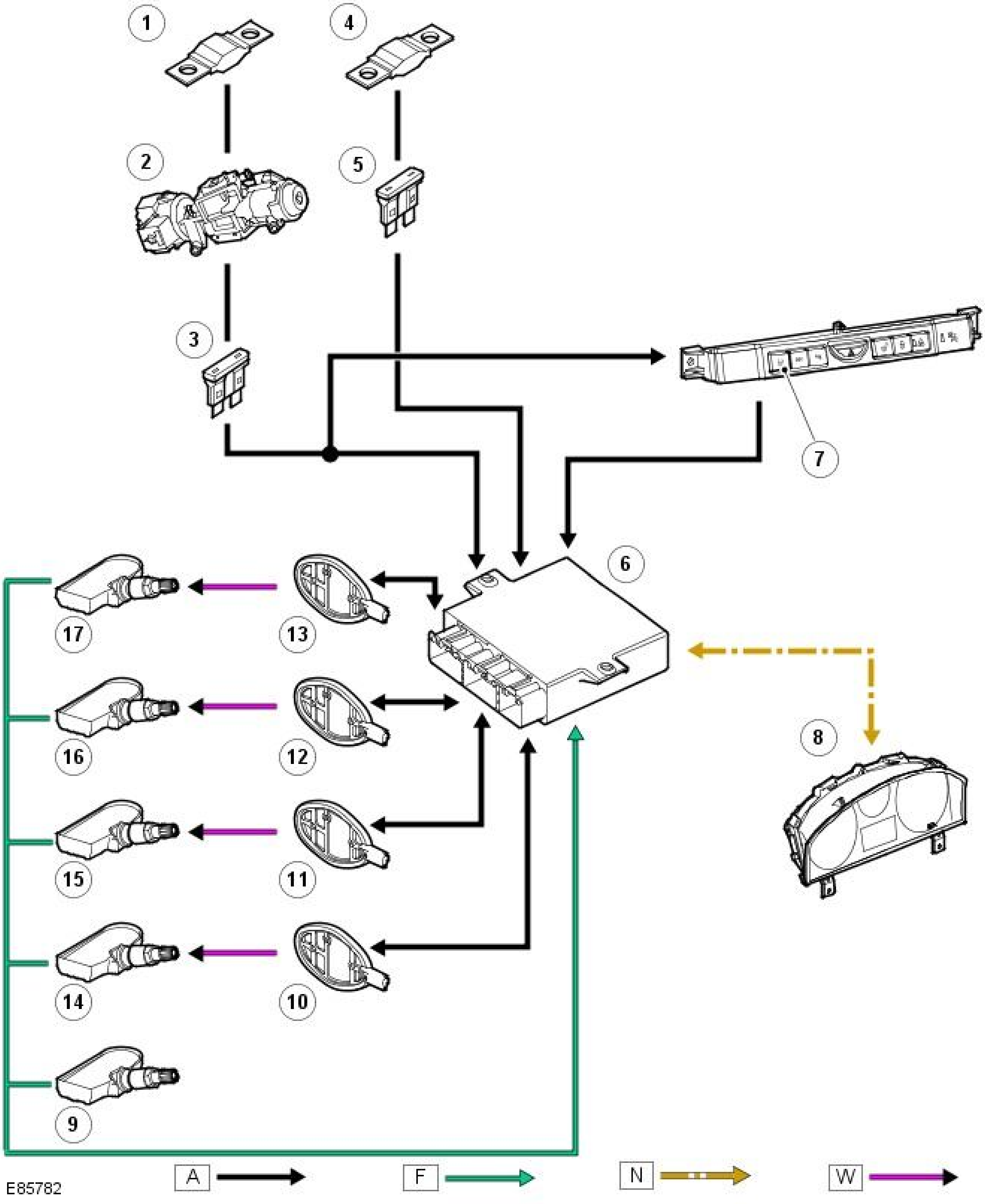
If a tire pressure sensor battery voltage becomes low, the sensor transmits a message to the TPMS module. The module stores the low battery condition as a fault flag in its memory with no other visual warnings displayed. If the battery fails, the sensor will stop transmitting and the TPMS module will transmit a message to display 'FL Tyre Not Being Monitored' for example in the message centre.

The dealer should interrogate the TPMS module using a Land Rover approved diagnostic system for the fault flag to determine the cause of the message. If the battery has failed, the sensor must be replaced and the stored fault flags removed using a Land Rover approved diagnostic system.

The TPMS module will learn the identification of the new sensor when the vehicle is driven. If the replaced sensor is fitted to the spare wheel (if fitted), its identification must be manually programmed into the module using a Land Rover approved diagnostic system or by using it as a 'running' wheel for 15 minutes at more than 12.5 mph (20 km/h), then replacing it to the spare wheel position.

CONTROL DIAGRAM

- NOTE: **A** = Hardwired; **F** = RF Transmission; **N** = Medium Speed CAN Bus; **W** = LF Transmission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Item	Part Number	Description
1	-	Fusible link 17E (50A)
2	-	Ignition switch
3	-	Fuse 36P (5A)
4	-	Fusible link 11E (30A)
5	-	Fuse 32P (10A)

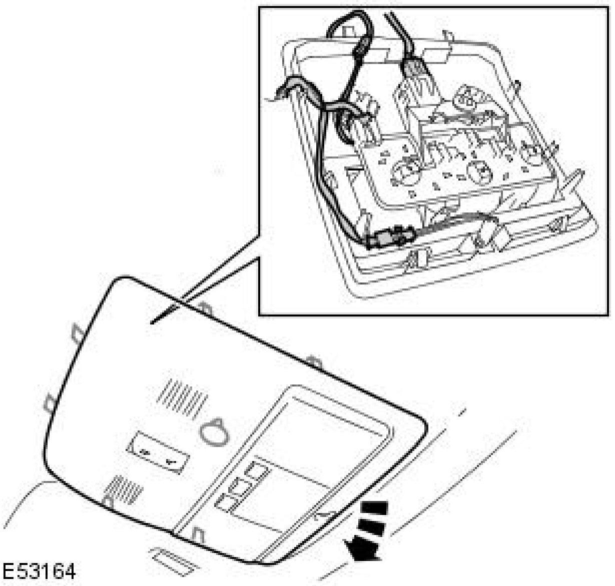
6	-	TPMS module
7	-	TPMS switch and LED
8	-	Instrument cluster
9	-	Tire pressure sensor - spare (if fitted)
10	-	Initiator - Rear right hand
11	-	Initiator - Rear left hand
12	-	Initiator - Front right hand
13	-	Initiator - Front left hand
14	-	Tire pressure sensor - Rear right hand
15	-	Tire pressure sensor - Rear left hand
16	-	Tire pressure sensor - Front right hand
17	-	Tire pressure sensor - Front left hand

Published: 11-May-2011

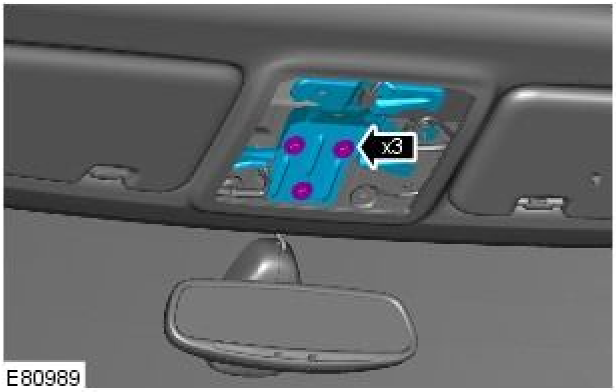
Wheels and Tires - Tire Pressure Monitoring System (TPMS) Module

Removal and Installation

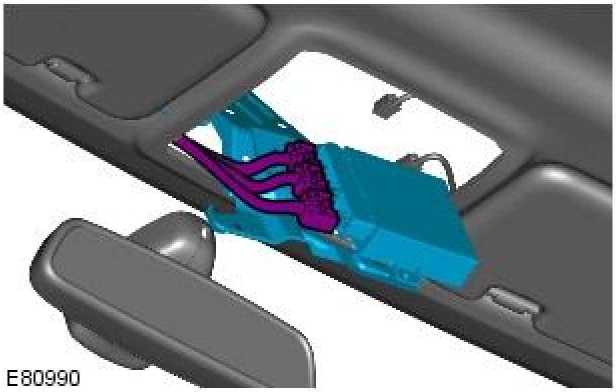
Removal



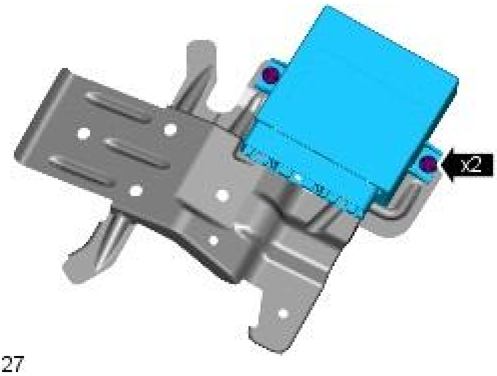
1. Remove the overhead console.



2. Remove the tire pressure monitoring module and bracket assembly.



3. Disconnect the electrical connectors.



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4. NOTE: Do not disassemble further if the component is removed for access only.

Remove the tire pressure monitoring module.

Installation

1. Install the tire pressure monitoring module.

2. Install the tire pressure monitoring module and bracket assembly.

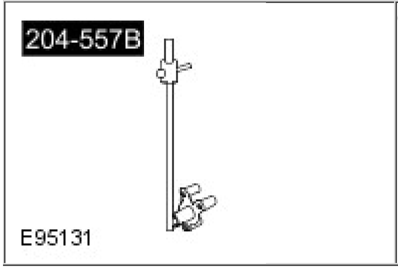
- Install and tighten the bolts to 25 Nm (18 lb.ft).

3. Install the overhead console.

Published: 11-May-2011

Vehicle Dynamic Suspension - Ride Height Adjustments

General Procedures

Special Tool(s)	
	Gauge, Ride height 204-557B

- CAUTIONS:

⚠ Make sure the wheels and tires, tie rod ends, suspension joints and wheel bearings are free from damage, wear and free play.

⚠ Make sure there are no heavy objects in the vehicle.

⚠ The ride height must be measured with the vehicle weight supported by the suspension.

⚠ With the engine running and all vehicle doors closed, make sure the air suspension is functioning and the vehicle height can be raised and lowered using the air suspension switch.

⚠ Drive the vehicle on to a flat, level surface.

⚠ Make sure the steering is in the straight ahead position.

- NOTE: This procedure must be carried out after replacement of the air suspension control module or height sensor link arm, removal or replacement of the front or rear upper arms or the height sensor. The ride height does not need calibration after removal or replacement of the front or rear air springs or shock absorbers.

1. Using the Land Rover approved diagnostic system, carry out the ride height adjustments.

2. ⚠ CAUTION: Make sure the vehicle is not moved once it has been positioned to take measurements.

Position the vehicle on a flat level surface.

3. Connect IDS to the vehicle data link connector.

- Connect the vehicle data link cable into the vehicle communications module.
- Connect the IDS USB Lead into the vehicle communications module.
- Connect the data link cable to the data link connector.
- Connect the IDS USB lead to the IDS USB port.

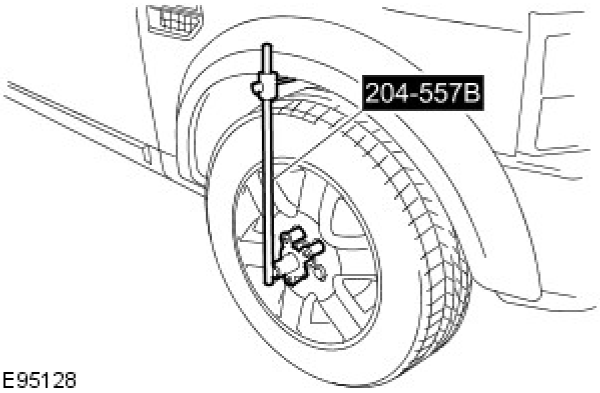
4. ⚠ CAUTION: Make sure the ignition switch is turned off, the park brake is on and the selector lever is in park.

- NOTE: IDS already loaded with the latest issue of software.

Switch IDS on and navigate to the vehicle identification number (VIN) input screen.

5. Enter the VIN and navigate to the vehicle configuration menu.

- Select setup and configuration.
- Select air suspension height calibration and read all warnings and cautions.



6. NOTE: Do not install the special tool over a locking wheel nut.

• NOTE: Make sure the special tool is square to the wheel face with the measuring rod in a vertical position.

• NOTE: Take the measurement from the top edge of the slider on the special tool.

• NOTE: Make sure the fender splash shields are correctly fitted.

Once in the suspension height measurement screen, use the special tool to measure and record the height setting from each wheel center to the wheel arch.

7. ⚠ CAUTION: IDS will now cause the vehicle height to change.

Input the ride height measurements taken from the vehicle into IDS.

8. Using the special tool, repeat the vehicle ride height measurements.

9. After successful calibration of the air suspension switch off IDS and return to its original position.

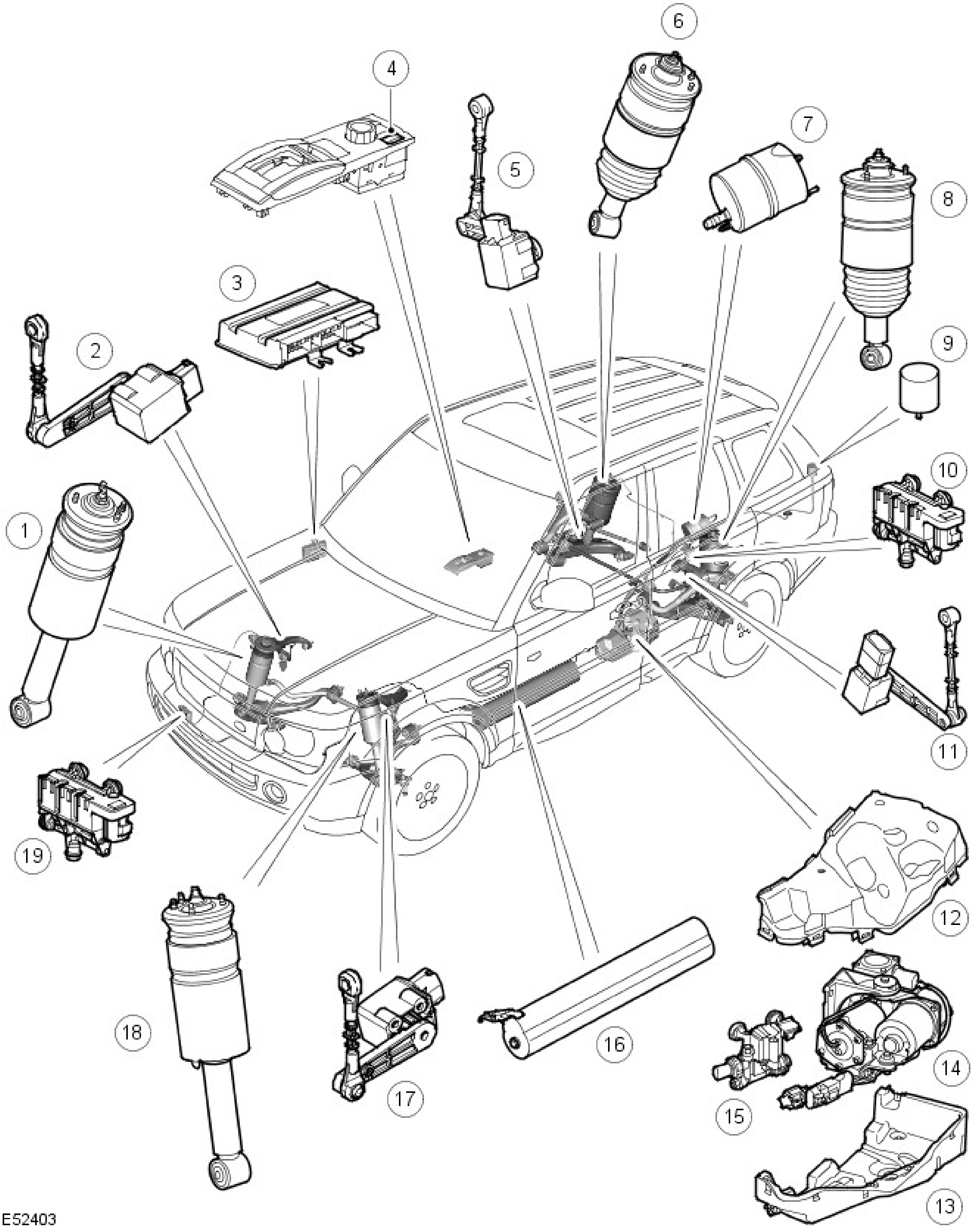
Published: 21-Nov-2011

Vehicle Dynamic Suspension - Vehicle Dynamic Suspension

Description and Operation

Dynamic Suspension - Component Location

- NOTE: Right hand drive vehicle shown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Item	Part Number	Description
1	-	Front RH air spring damper module
2	-	Front RH height sensor
3	-	Air suspension control module
4	-	Air suspension control switch
5	-	Rear RH height sensor
6	-	Rear RH air spring damper module
7	-	Air supply unit silencer
8	-	Rear LH air spring damper module
9	-	Air filter
10	-	Rear valve block
11	-	Rear LH height sensor
12	-	Upper acoustic cover
13	-	Lower acoustic cover
14	-	Air supply unit
15	-	Reservoir valve block
16	-	Air reservoir
17	-	Front LH height sensor
18	-	Front LH air spring damper module
19	-	Front valve block

OVERVIEW

• NOTE: This section covers the air suspension control system.

Front suspension, rear suspension, Dynamic Response and Terrain Response™ are detailed in separate sections. For additional information, refer to:

Front Suspension (204-01 Front Suspension, Description and Operation),
Rear Suspension (204-02 Rear Suspension, Description and Operation),
Active Stabilization System (204-06 Ride and Handling Optimization, Description and Operation),
Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

The dynamic suspension system is a four corner air suspension system which is fitted as standard to all models.

The dynamic suspension system is electronically controlled by an air suspension control module which controls the air supply unit, reacts to inputs from four height sensors and distributes air around the system via valve blocks.

The main air suspension system components are:

- Air suspension control module
- Air supply unit
- Four height sensors
- Three valve block assemblies
- Reservoir
- Air harness
- Four suspension air spring damper modules.

The four corner air suspension system maintains the vehicle height under all operating conditions by controlling the mass of air in the air springs. The air suspension control module uses signals from the four height sensors to maintain the correct suspension height. This is achieved by operating pneumatic control valves to increase or decrease the mass of air in the air spring damper modules.

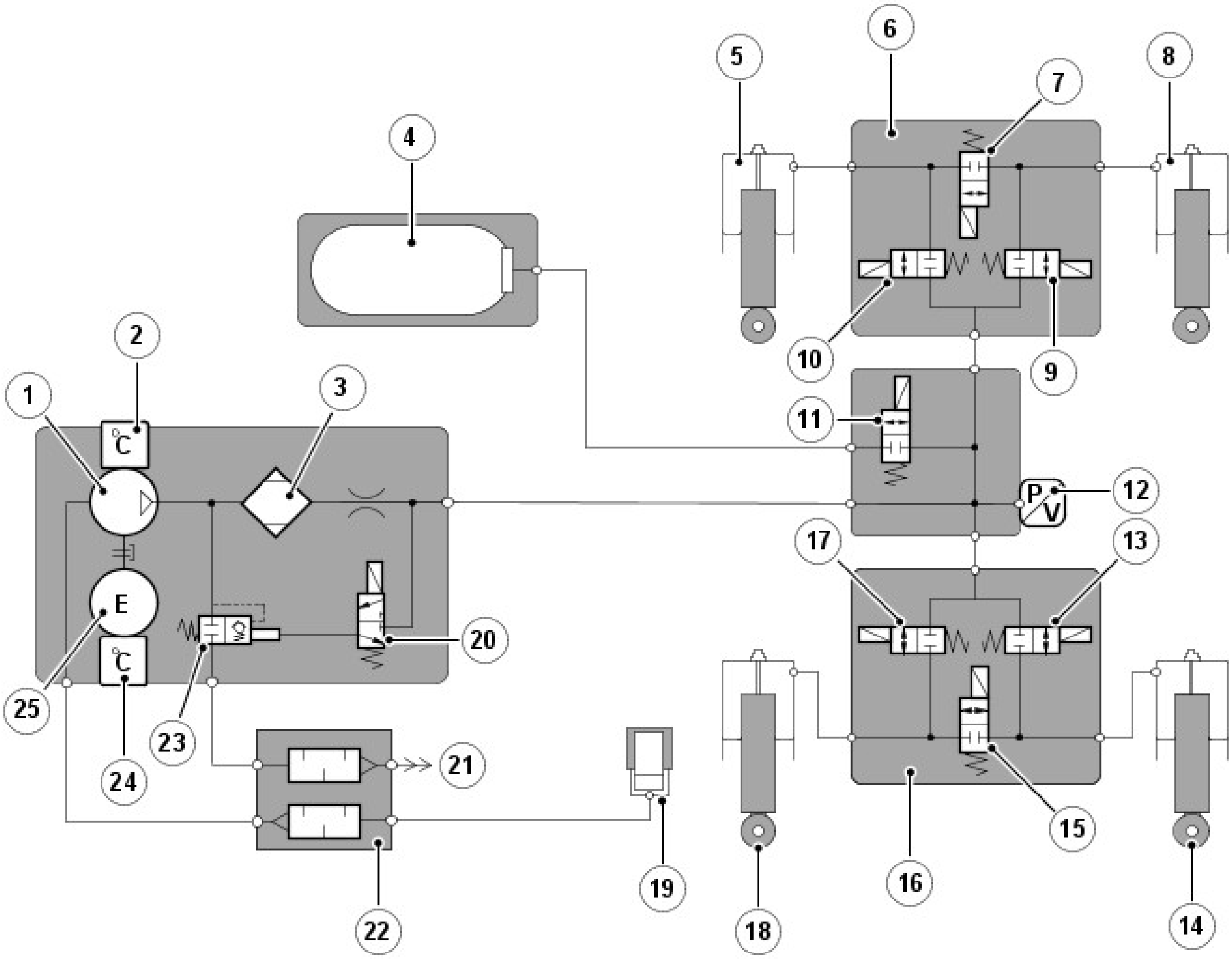
The air suspension system has three driver selectable, pre-determined ride heights. A driver interface indicates the selected ride height and direction of movement. Additional information is also relayed to the driver via the instrument cluster message centre and by audible warnings also transmitted by the instrument cluster.

Height changes can only be made when the engine is running and the driver's and passenger doors are closed.

Access height can be selected with the engine not running, within 40 seconds of moving the ignition switch to the off position provided the driver's door has not been opened in this time.

The air suspension can be controlled manually by the driver using a switch on the centre console to select the required height change.

Schematic Pneumatic Circuit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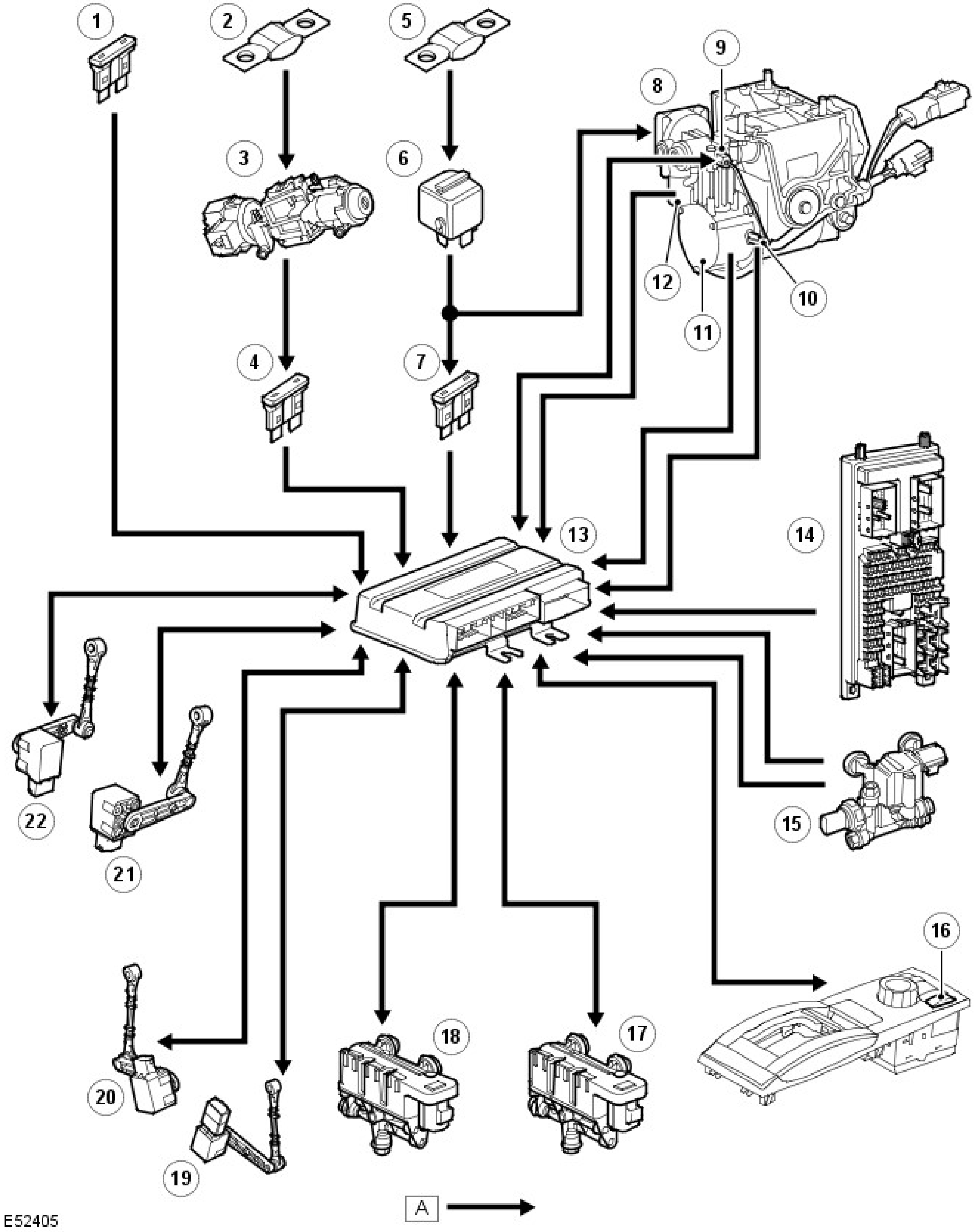
Item	Part Number	Description
1	-	Compressor
2	-	Compressor temperature sensor
3	-	Air dryer
4	-	Reservoir
5	-	Front LH air spring damper module
6	-	Front valve block
7	-	Cross link valve
8	-	Front RH air spring damper module
9	-	Front RH corner valve
10	-	Front LH corner valve
11	-	Reservoir control valve
12	-	Pressure sensor
13	-	Rear RH corner valve
14	-	Rear RH air spring damper module
15	-	Cross link valve
16	-	Rear valve block
17	-	Rear LH corner valve
18	-	Rear LH air spring damper module

19	-	Inlet air filter
20	-	Pilot exhaust valve
21	-	Exhaust
22	-	Air silencer
23	-	Pressure relief and exhaust valve
24	-	Motor temperature sensor
25	-	Electric motor

CONTROL DIAGRAM

- NOTE: **A** = Hardwired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Item	Part Number	Description
1	-	Fuse 26E (20A)
2	-	Fusible link 11E (30A)
3	-	Ignition switch
4	-	Fuse 35P (5A)
5	-	Fusible link 10E (60A)
6	-	Air supply unit relay
7	-	Fuse 3E (5A)

8	-	Air supply unit
9	-	Compressor temperature sensor
10	-	Motor temperature sensor
11	-	Motor and crankcase assembly
12	-	Exhaust valve solenoid
13	-	Air suspension control module
14	-	CJB
15	-	Reservoir control valve
16	-	Air suspension switch
17	-	Front control valve
18	-	Rear control valve
19	-	RH rear height sensor
20	-	LH rear height sensor
21	-	RH front height sensor
22	-	LH front height sensor

OPERATING MODES

The driver can manually select, using the air suspension switch, one of four ride states:

- ON-ROAD - this height is the normal operating height of the vehicle
- OFF-ROAD - this height is higher than the on-road height and provides improved ground clearance, approach, departure and breakover angles
- ACCESS - this height is lower than the on-road height and makes entering and exiting the vehicle easier for the occupants
- CRAWL (Locked at access) - this height allows the vehicle to be driven at the access height at low speeds to provide increased roof clearance in low car parks etc.

HIGH SPEED - A non-selectable, automatic high speed mode is provided which lowers the vehicle height to improve vehicle handling.

• NOTE: Vehicle height changes are prevented if the air suspension control module receives a 'Door Open' signal from the Central Junction Box (CJB).

An additional 'TRANSPORTATION' mode is also available but is only selectable using a Land Rover approved diagnostic system.

An additional function allows the vehicle to be raised or lowered from outside of the vehicle when the vehicle is stationary. For example, this assists with the attachment of a trailer and is achieved using the buttons on the remote handset and the ignition switch in the off position. The remote handset can be programmed to perform a number of additional functions.
For additional information, refer to: Handles, Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

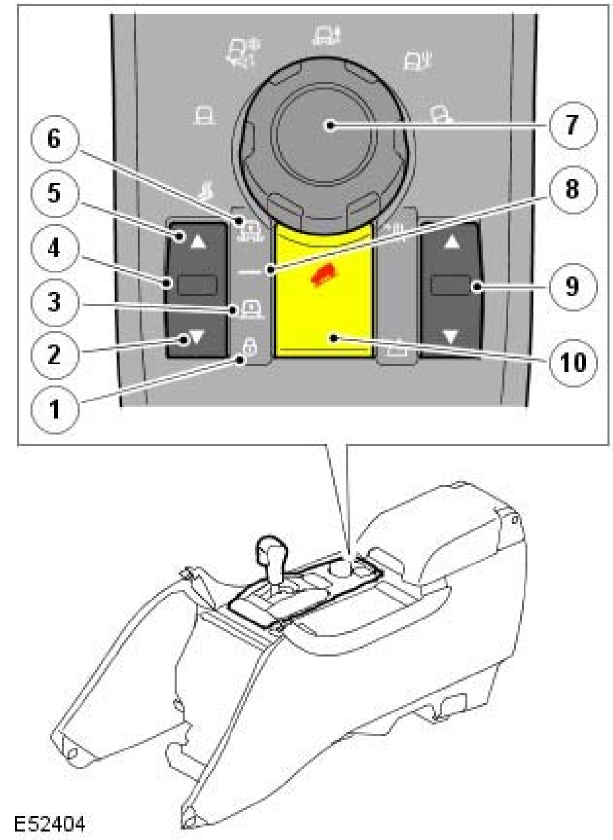
If the air suspension control module senses that the vehicle has grounded and lost traction, the control module can temporarily increase and/or redistribute the volume of air supplied to the affected air spring(s) to maximise the available traction. This is known as extended mode and will be indicated to the driver by the lamps on the air suspension switch flashing and a message in the instrument cluster message centre.

If the air suspension control module senses that the vehicle is prevented from moving upwards or downwards during a height change or levelling correction, the control module will adopt a safe state and further height changes will be suspended.

If a fault is detected by the air suspension control module, the control module will reduce the system functionality dependent on the type and severity of the fault. The control module will also store a fault code which can be retrieved using a Land Rover approved diagnostic system. If a severe fault occurs, the control module will attempt to put the vehicle in a safe condition. A fault is relayed to the driver by the illumination of the air suspension warning indicator, the instrument cluster message centre and an audible warning emitted from the instrument cluster.

If the detected fault is minor and does not affect vehicle safety, the air suspension warning indicator in the instrument cluster will illuminate in an amber color and the fault should be rectified at the earliest opportunity. If a more severe fault is detected, the warning indicator will illuminate in a red color at vehicle speeds above 31 mph (50 km/h) and the vehicle should be driven with care until the fault is rectified. An audible warning is emitted by the instrument cluster sounder when the warning indicator is illuminated. The indicator will change to an amber color and the audible warning will stop when the vehicle speed is reduced.

Air Suspension Switch Mode Lamps



Item	Part Number	Description
1	-	Crawl (locked at access) mode lamp
2	-	Lowering lamp
3	-	Access mode lamp
4	-	Air suspension switch
5	-	Raising lamp
6	-	Off-road mode lamp
7	-	Terrain Response™ rotary control
8	-	On-road (normal height) lamp
9	-	Transfer box range selection switch
10	-	Hill Descent Control (HDC) switch

On-Road Mode

This is the normal ride height for the vehicle.

Off-Road Mode

Off-road mode will only be activated if the vehicle speed is less than 25 mph (40 km/h). The vehicle will be raised 55 mm (2.2 in) higher than the on-road mode to provide additional body clearance and improved approach, departure and breakover angles. If the vehicle speed exceeds 31 mph (50 km/h), the air suspension control module will automatically lower the vehicle to the on-road mode height. At 25 to 28 mph (40 to 45 km/h) a message is displayed in the message centre to warn the driver to slow down or the vehicle will lower.

• NOTE: The suspension can be automatically set to off-road mode when some Terrain Response programs and low range are selected.

Access Mode

Access mode lowers the vehicle body height by 50 mm (2 in) and provides easier entry, exit and loading of the vehicle. Access mode can be pre-selected when the vehicle is moving. The vehicle will partly lower as the vehicle speed decreases, lowering to the full access mode height when the vehicle reaches 5 mph (8 km/h). If the required road speed is not reached within a predetermined time, the air suspension will return the vehicle to the previously selected height.

Access mode can be selected at any vehicle speed. When access mode is selected, the response of the air suspension system will depend on the vehicle speed:

- If the vehicle speed is more than 12.5 mph (20 km/h), the air suspension control module will wait for up to one minute for the vehicle speed to be reduced. The access mode lamp and the lowering lamp will flash while the air suspension control module waits for the vehicle speed to be reduced, the on-road mode lamp will remain illuminated. If the vehicle speed is not reduced sufficiently, the access mode request will be cancelled after 1 minute.

- If the vehicle speed is less than 12.5 mph (20 km/h), the air suspension control module will lower the suspension to a part lowered height and will remain at this height for up to one minute. The on-road mode lamp will extinguish as the air suspension control module lowers the suspension to the part lowered height. The access mode lamp and the lowering lamp will illuminate. When part lowered is reached, the lowering lamp will flash. If the vehicle speed is not reduced to less than 5 mph (8 km/h) in the one minute period, the access mode request will be cancelled.
- If the vehicle speed is less than 5 mph (8 km/h), the suspension will be lowered to access mode immediately. The access mode lamp and the lowering lamp will illuminate. When the access mode height is reached, the lowering lamp will be extinguished.

Access height may be selected up to 40 seconds after the ignition is turned off, provided that the driver's door has not been opened within this time.

The suspension will automatically rise from access mode when the vehicle speed exceeds 6.2 mph (10 km/h). If access mode was selected directly from off-road mode then the system will return to off-road mode when the vehicle speed exceeds 6.2 mph (10 km/h). Otherwise the system will lift the suspension to On-road height.

Selecting Access Mode Directly from Off-Road Mode

When the suspension is in off-road mode height, pressing the air suspension switch once and then a second time before the lowering lamp is extinguished, the control module will lower the suspension to access mode height. The control module will remember to return the suspension to off-road height automatically if the vehicle speed increases above 6.2 mph (10 km/h).

Crawl (Locked at Access) Mode

Crawl mode allows the vehicle to be driven at access height. The vehicle is locked in access height and can be selected at a speed of less than 21.7 mph (35 km/h) and can be driven at low speeds to improve clearance in areas with restricted headroom, i.e. car parks. If the vehicle exceeds 24.8 mph (40 km/h), crawl mode will be cancelled and the vehicle will return to on-road height.

Crawl mode allows the vehicle to be driven at low speeds with the suspension locked at the access mode height. This allows the vehicle to be driven in low car parks etc. with increased roof clearance.

Crawl mode can be selected from normal or access ride heights up to 21.7 mph (35 km/h) with a long press of the switch in the down direction. The access mode lamp and the crawl mode lamp will be illuminated. When the control module is in crawl mode, on-road mode height will be selected automatically if the vehicle speed exceeds 25 mph (40 km/h). At 18.6 to 21.7 mph (30 to 35 km/h) a message is displayed in the message centre to warn the driver to slow down or the vehicle will raise. Crawl mode can also be manually cancelled by moving the switch in the up direction for 1 second. The crawl mode lamp will be extinguished.

High Speed Mode

High speed mode is a non-selectable, automatic mode which lowers the vehicle height by 20mm to improve vehicle handling. This feature is fully automated and is 'invisible' to the driver.

If the vehicle speed exceeds 100 mph (160 km/h) for more than five seconds, the air suspension control module initiates the high speed mode. When the vehicle speed reduces to less than 80 mph (130 km/h) for more than 30 seconds, the vehicle returns to the On-Road height. This function is cancelled if a trailer is connected to the trailer socket.

Automatic Height Change Warnings

When the suspension is in off-road mode, access mode or crawl mode height, the air suspension control module will change the suspension height automatically when the vehicle speed exceeds predetermined thresholds.

When the suspension is at off-road mode or crawl mode height, the control module issues a warning to advise the driver that the vehicle is approaching the speed threshold. The instrument cluster sounder will emit a chime, a message will be displayed in the message centre and the on-road mode lamp and either the raising or lowering lamp will flash.

The off-road mode or crawl mode height speed warning is removed when the vehicle speed is reduced.

SPECIAL MODES

Door Open Functionality

If one or more of the vehicle doors are opened during a height change when the vehicle is stationary, the air suspension control module will restrict further height change. The door open signal is transmitted by the CJB on the high speed CAN bus and received by the air suspension control module. This keeps the vehicle level to the set height when a door opens to allow for changes in loading conditions.

A hardwired door status signal is also transmitted from the CJB to the air suspension control module. This signal provides door status information when the high speed CAN bus is off, i.e.; during periodic re-levelling.

The lamp on the air suspension switch for the target mode height will remain illuminated and the raising or lowering lamp will flash.

If all of the doors are closed within 90 seconds, the height change will resume. If the 90 second period is exceeded and all of the doors are not closed, the height change will be cancelled. The mode lamps showing the previously selected height and the target height will be illuminated. The mode height change can be reselected by operating the switch, however, if the vehicle is driven at speed of more than 5 mph (8 km/h) the control module will continue to raise or lower the vehicle to the target mode height.

Extended Mode

If the vehicle becomes grounded and the traction control becomes operational, the air suspension control module automatically increases the mass of air in the air springs to raise the vehicle clear of the obstruction. Extended mode is activated automatically and cannot be selected manually.

When the air suspension control module has activated the extended mode, the off-road mode lamp will flash if the suspension is above off-road mode height. The off-road mode and on-road mode lamps will flash if the suspension is between off-road mode and on-road mode heights. The on-road mode and access mode lamps will flash if the suspension is between on-road mode and access mode. A message will also be displayed in the message centre.

To exit the extended mode, press the air suspension switch briefly in the up or down position or alternatively drive the vehicle at a speed of more than 2 mph (3 km/h) for 45 seconds.

Additional Lift in Extended Mode

When extended mode has been invoked and the automatic lifting of the vehicle is complete, the driver can request an additional lift of the vehicle. This can be particularly useful when extended mode has been activated on soft surfaces.

The additional lift can be requested once the raising lamp has extinguished. Press and hold the air suspension switch in the up position for 3 seconds whilst simultaneously depressing the brake pedal. A chime from the instrument cluster will sound to confirm that the request has been accepted. The raising symbol will be illuminated while the vehicle is being lifted.

Suspension Prevented From Moving

If the air suspension control module is attempting to change the suspension height and it detects that the suspension is prevented from moving, the control module will stop all suspension movement. This can be caused by jacking the vehicle, attempting to lower the vehicle onto an object or raising the vehicle against an obstruction.

The air suspension switch lamps operate as described for extended mode and the same message is displayed in the message centre. To start the air suspension system operating, press the air suspension switch briefly in the up or down position or drive the vehicle at a speed of more than 12.5 mph (20 km/h).

Periodic Re-levelling

When the vehicle is parked, the air suspension control module 'wakes up' two hours after the ignition was last switched off and then once every six hours. The vehicle height is checked and if the vehicle is not level within a pre-set tolerance, small downwards height adjustments may be made automatically.

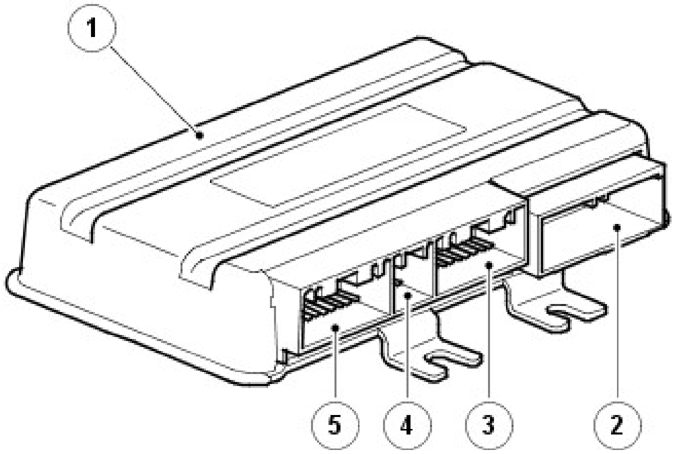
Transportation Mode

Transportation mode is a factory set mode which locks the suspension to enable the vehicle to be safely lashed to a transporter. Transportation mode can only be selected or deselected using a Land Rover approved diagnostic system.

When the ignition switch is switched off, the vehicle will be lowered onto the bump stops. This ensures that the securing straps do not become loose should air leak from the air springs.

When the engine is running, the air supply unit will operate to raise the vehicle height, allowing the vehicle to be loaded. When the ignition switch is subsequently switched off, the vehicle will again lower onto the bump stops. An audible warning will be emitted from the instrument cluster sounder until the vehicle has reached the higher transportation height.

AIR SUSPENSION CONTROL MODULE



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Item	Part Number	Description
1	-	Air suspension control module
2	-	Connector C2321
3	-	Connector C2320
4	-	Connector C2030
5	-	Connector C0867

The air suspension control module is located behind the instrument panel, on the driver's side 'A' pillar. The control module is attached to the 'A' pillar with a single screw and two plastic clips.

The air suspension control module also contains the software for the variable steering.
For additional information, refer to: Power Steering (211-02 Power Steering, Description and Operation).

Calibration

A calibration routine is performed using a Land Rover approved diagnostic system to access the position of each corner of the vehicle and record the settings in the control module memory. Once set, the calibration is not required to be performed unless the air suspension control module is removed or replaced, a height sensor is removed or replaced or a suspension arm to which the sensor is connected is removed or replaced. If a removed height sensor is subsequently refitted, the calibration procedure will have to be performed to ensure the integrity of the system.

If the air supply unit, the reservoir, a valve block, a damper module or the air harness is removed or replaced, the system will not require recalibration.

Inputs and Outputs

The air suspension control module uses four harness connectors for all inputs and outputs.

The air suspension control module uses inputs received on the CAN bus from other vehicle systems. The system uses longitudinal acceleration, lateral acceleration, steering angle and wheel speed data to control the suspension operation in differing driving conditions.

The system will react differently if one or more of these data inputs is missing or incorrect, for example, if the steering angle sensor is missing or incorrect, the air suspension control module assumes a default value of zero which may result in some unnecessary levelling activity.

Steering - Servotronic Valve

The power steering Servotronic 2 system is controlled by software which is incorporated into the air suspension control module. The software responds to steering torque inputs and road speed signals and controls the assistance via a transducer valve located on the steering gear valve. The valve is connected by two wires to the control module on connector C2320. For details refer to the Power Steering section.
For additional information, refer to: Power Steering (211-02 Power Steering, Description and Operation).

Air Supply Unit Relay

The air supply unit relay is located in the Battery Junction Box (BJB) in the engine compartment. The relay is connected directly to the battery via fusible link 10E (60A). The relay coil is connected to and controlled by the air suspension control module. The relay is used by the air suspension control module to control the operation of the compressor.

When air supply unit operation is required, the air suspension control module supplies power and ground for the relay coil which energises, closing the relay contacts. This allows battery voltage via the fusible link to pass through the relay and operate the air supply unit electric motor and the compressor.

The battery voltage is also passed from the relay, via a splice joint in the harness, to the air suspension control module and is used as a signal that the relay is operating.

System Inhibits

A number of conditions exist where a change of ride height is undesirable. To counter this, the air suspension control module is programmed with a number of system inhibits. If any of the conditions detailed below exist, the air suspension control module will suspend height changes and height corrections.

Compressor

The temperature sensors located within the compressor protect the compressor from overheating. If the compressor temperature rises above set limits, the air suspension control module will inhibit the compressor operation. These limits are shown in the following table:

Compressor Head Temperature Sensor

	Lifting	Filling Reservoir
Stop	140°C (302°F)	130°C (284°F)
Start	120°C (266°F)	110°C (248°F)

Compressor Brush Temperature Sensor

	Lifting	Filling Reservoir
Stop	140°C (284°F)	130°C (266°F)
Start	120°C (248°F)	110°C (230°F)

Cornering

If the air suspension control module registers a cornering force greater than 0.2g it will inhibit all height changes and corrections. The system will remain inhibited until the cornering force falls to less than 0.15g. The air suspension control module receives a message from the lateral acceleration sensor (which is an integral part of the ABS yaw rate sensor) on the high speed CAN bus for the cornering force.

Rapid Acceleration

If the air suspension control module registers a rapid acceleration greater than 0.2g it will inhibit all height changes and corrections. The system will remain inhibited until the rapid acceleration falls to less than 0.15g. Acceleration is calculated by the air suspension control module from a vehicle speed signal received via the high speed CAN bus.

Rapid Deceleration

If the air suspension control module registers a rapid deceleration smaller than -0.2g it will inhibit all height changes and corrections. The system will remain inhibited until the rapid deceleration rises above -0.15g. Deceleration is calculated by the air suspension control module from a vehicle speed signal received via the high speed CAN bus.

Vehicle Jack

The air suspension control module will inhibit all height changes and corrections if it detects a corner lowering too slowly for more than 1.2 seconds. This is interpreted as the corner identified as moving too slowly being supported on a jack. In this situation, the corner height will not change when air is released from the air spring because the jack acts as a mechanical prop. The system will remain inhibited until any of the following conditions exist:

- The air suspension switch is moved to the up or down position
- Vehicle speed rises to more than 2 mph (3 km/h) for more than 45 seconds.

Door Open

The air suspension control module will stop all height change requests while any of the doors are open. Vehicle levelling continues with a door open by keeping the vehicle at the height when the door was opened if the vehicle load changes.

Battery Voltage

If the supply voltage measured by the control module is less than 10 volts for more than 0.25 seconds or more than 17.5 volts for more than 0.25 seconds, all valve and compressor operation is suspended. Operation is resumed when the battery voltage is more than 11 volts or less than 16.5 volts. A diagnostic code is stored if the battery voltage is out of range after the engine has been running for more than 10 seconds.

Diagnostics

The air suspension control module can store fault codes which can be retrieved using a Land Rover approved diagnostic system. The diagnostic information is obtained via the diagnostic socket which is located in the lower instrument panel closing panel, on the driver's side, below the steering column.

The diagnostic socket allows the exchange of information between the various control modules on the bus systems and a Land Rover approved diagnostic system or a diagnostic tool. This allows the fast retrieval of diagnostic information and programming of certain functions using a Land Rover approved diagnostic system.

Fault Detection

The air suspension control module performs fault detection and plausibility checks. Fault detection is limited to faults that the control module can directly measure as follows:

- Sensor electrical hardware faults
- Valve electrical hardware faults
- Sensor and actuator supply faults
- Bus failures
- Control module hardware errors.

Plausibility checks are checks on signal behaviour, as follows:

- Average height does not change correctly
    - Height changes too slowly
- Gallery pressure
    - Does not increase fast enough when reservoir filling requested
    - Increases when system is inactive
    - Too low when lifting is requested
    - Increases too rapidly when filling reservoir
    - Does not decrease when gallery is vented
    - Pressure varies too much when inactive.
- Compressor temperature
    - Sensor voltage too large - head and brush sensors (short circuit to battery)
    - Takes too long to be readable after suitable compressor run time - head and brush sensors
    - Does not increase when compressor active - head sensor only
- Sensor activity
    - Signal floating
    - Constant articulation when moving

When a fault is detected, the air suspension control module will attempt to maintain a comfortable ride quality and where possible will retain as much functionality as possible.

The system functionality depends on the severity of the fault.

Faults

- Height sensor faults (hardware faults) and reservoir valve block failure
    - Retain full functionality with no 'refinements', e.g. cross-link valves inoperative, no compensation for uneven surfaces.
- Pressure sensor faults, compressor faults, corner valves stuck shut
    - Vehicle returns to on-road mode height when next requested
    - Levels at 'current' height.
- Reservoir valve stuck open, exhaust valve stuck shut if below on-road mode height, corner valves stuck open if above on-road mode height
    - Vehicle returns to on-road mode height when next requested
    - Does not level at 'current' height.
- Failure of multiple height sensors, cross-articulation when driving, calibration corrupted
    - Vehicle lowers to bump stops.
- ABS module failure, CAN bus failure
    - If the air suspension control module loses communications with the ABS module or the ABS module reports a fault, the air suspension control module immediately returns to the 'default' height, which is below the on-road ride height. Once at the default height, the control module will continue to level the vehicle at this height. It is unlikely that the fault will be in the air suspension control module. When the fault is repaired, the air suspension control module will resume full functionality but the error will remain in the control module memory.

For major faults the control module will not level the vehicle at the 'current' ride height. The control module freezes height changes until it receives a manual or automatic request for height change. The control module will return to standard height if possible and freezes once standard height is achieved.

If the suspension is above the on-road height and the air suspension control module cannot lower the suspension, all height changes will be frozen. The control module will issue a message on the high speed CAN bus which is received by the instrument cluster which displays a maximum advisable speed in the message centre. An immediate 'freeze' of the vehicle height is caused by the following:

- Failure of more than one height sensor - vehicle on bump stops
- Implausible articulation symptoms detected - vehicle on bump stops
- Valve or solenoid failure - corner valve stuck open below on-road mode height or exhaust valve stuck shut above on-road mode height
- Stuck corner or whole vehicle (diagnosed using plausibility of the sensor inputs).

If height change is not possible, e.g. exhaust valve failed closed at off-road height or compressor failed at access height, the control module will not level or change height.

If the air suspension control module has a hardware fault, the control module will disable all air suspension functions. Detectable hardware errors include memory error, control module failure and calibration errors.

Fault Messages

The air suspension has two methods which it can use to inform the driver of a fault in the air suspension system; the air suspension switch LED's and the instrument cluster message centre.

When minor faults occur and the air suspension control module is able to level the vehicle to the 'current' ride height, the air suspension switch LED's will display the current ride height.

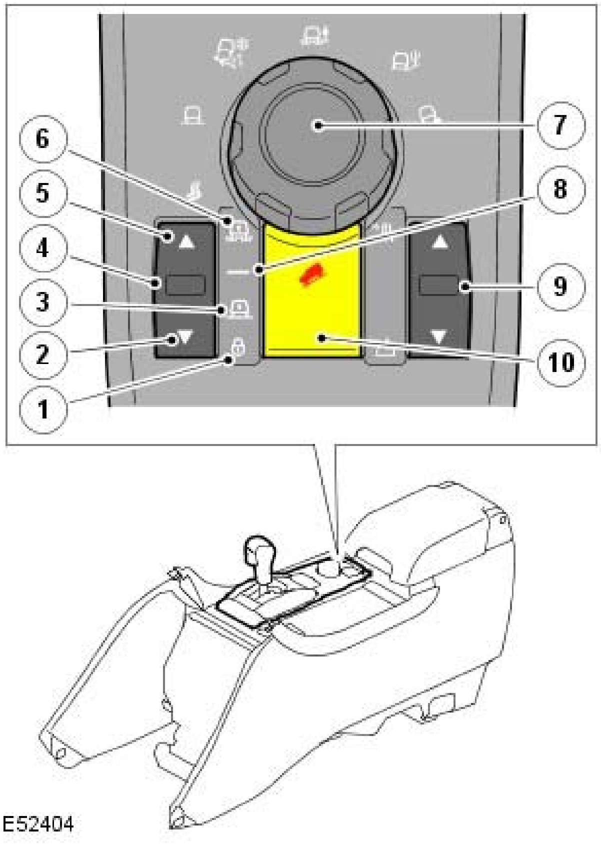
If the air suspension control module suffers a major failure and there is no air suspension control, all the control switch LED's will remain off.

If a fault occurs and the air suspension control module can determine the ride height and the vehicle is above on-road mode height, the driver will be notified via a 'AIR SUSPENSION FAULT MAX SPEED 30 MPH (50 KM/H)' message in the message centre.

If the control module cannot determine the height of the vehicle, or the vehicle is not above on-road mode height, cannot be lowered and the vehicle speed is too high, an air suspension fault message is displayed.

If the vehicle is restricted to on-road mode height an air suspension fault normal height only message is displayed.

AIR SUSPENSION SWITCH



Item	Part Number	Description
1	-	Crawl (locked at access) mode lamp
2	-	Lowering lamp
3	-	Access mode lamp
4	-	Air suspension switch
5	-	Raising lamp
6	-	Off-road mode lamp
7	-	Terrain Response™ rotary control
8	-	On-road (normal height) lamp
9	-	Transfer box range selection switch
10	-	Hill Descent Control (HDC) switch

The air suspension control switch is located in the centre console, behind the automatic transmission selector lever. The switch is a three position, non-latching rocker type switch which allows selection of the following driver selectable modes:

- Off-road mode
- On-road mode
- Access mode
- Crawl (locked at access) mode.

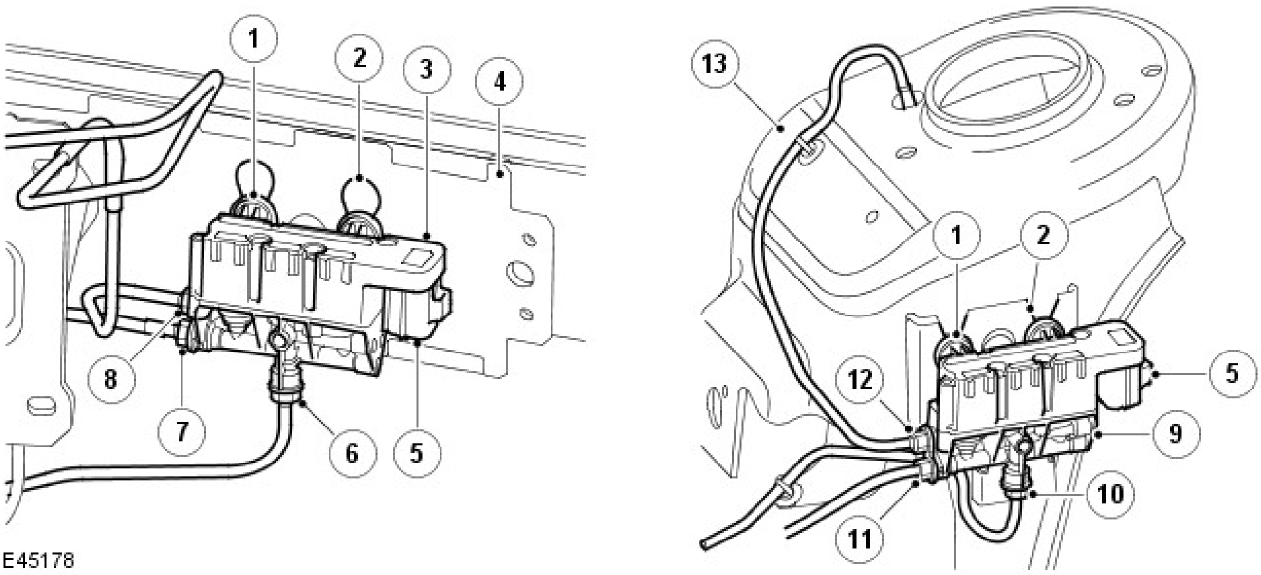
The air suspension rocker switch can be pressed downwards at either end to select the required mode. The switch is non-latching and returns to the central position when released. The switch completes a ground path to the air suspension control module when operated. This ground path is completed on separate wires for the raise and lower switch positions, allowing the control module to determine which selection the driver has made.

The switch has six symbols which illuminate to show the current selected height and the direction of movement. The raise and lower symbols will flash and a warning tone will be emitted from the instrument cluster sounder when a requested height change is not allowed, i.e. vehicle speed too fast.

A flashing symbol indicates that the air suspension system is in a waiting state or that the system will override the driver's selection because the speed threshold is too high.

The driver can also ignore the system's warning signals and allow the height to change automatically. For example, increasing the vehicle speed to more than 25 mph (40 km/h) will cause the control module to automatically change the ride height from off-road mode to on-road mode.

FRONT AND REAR AXLE VALVE BLOCKS



Item	Part Number	Description
1	-	Isolation rubber mounts (3 off)
2	-	Location slots
3	-	Front valve block, valves and solenoid assembly
4	-	Front bumper armature
5	-	Electrical connector
6	-	LH air spring damper module air harness connection
7	-	Air inlet/outlet connection
8	-	RH air spring damper module air harness connection
9	-	Rear valve block, valves and solenoid assembly
10	-	RH air spring damper module air harness connection
11	-	Air inlet/outlet connection
12	-	LH air spring damper module air harness connection
13	-	Rear suspension turret

The front and rear axle valve blocks are similar in their design and construction and control the air supply and distribution to the front or rear pairs of air spring damper modules respectively. The difference between the two valves is the connections from the valve block to the left and right hand air spring damper modules and the valve size. It is important that the correct valve block is fitted to the correct axle. Fitting the incorrect valve block will not stop the air suspension system from functioning but will result in slow raise and lower times and uneven raising and lowering between the front and rear axles.

The front valve block is attached to the right hand end of the front bumper armature assembly. The valve block has three attachment lugs which are fitted with isolation rubber mounts. The rubber mounts locate in slots in the armature. The valve lugs locate in the holes above the slots and are pushed downwards into positive location in the slots.

The rear valve block is located on the forward face of the left hand rear suspension turret. The valve block has three attachment lugs which are fitted with isolation rubber mounts which locate in a bracket with three slotted holes. The bracket is attached to the left hand side of the chassis. The isolation rubber mounts locate in the 'V' shaped slots and are pushed downwards into positive location in the slots.

The front and rear valve blocks each have three air pipe connections which use 'Voss' type air fittings. One connection is an air pressure inlet/outlet from the reservoir valve block. The remaining two connections provide the pressure connections to the left and right hand air springs.

Each valve block contains three solenoid operated valves; two corner valves and one cross-link valve. Each of the valve solenoids is individually controlled by the air suspension control module. The solenoids have a resistance value of 2 Ohms at a temperature of 20°C (68°F).

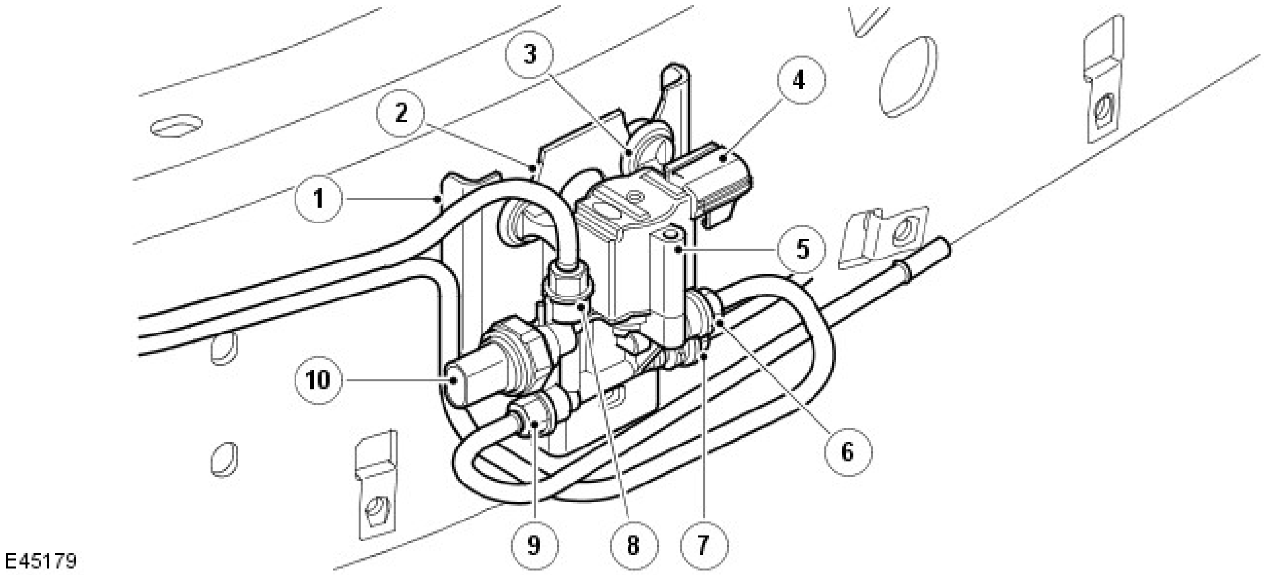
Corner Valves

The corner valves control the flow of air into and out of the individual air springs. When the solenoid is de-energised, the corner valves are held in a closed position by internal springs. When the solenoid is energised, the valve armature moves and allows air to flow into or out of the air spring.

Cross Link Valves

The cross-link valve provides a connection between the two air springs on the same axle. When de-energised, the cross-link valve prevents air passing from one air spring to another. When the solenoid is energised, the valve spool moves and allows air to pass from one air spring to the other. This increases wheel articulation and improves ride comfort at low vehicle speeds.

RESERVOIR VALVE BLOCK



Item	Part Number	Description
1	-	Chassis mounting bracket
2	-	Location slot
3	-	Isolation rubber mounts (3 off)
4	-	Electrical connector
5	-	Reservoir valve block, valves and solenoid assembly
6	-	Reservoir connection
7	-	Rear valve block connection
8	-	Front valve block connection
9	-	Air supply unit connection
10	-	Pressure sensor

The reservoir valve block controls the storage and distribution of air from the reservoir. The reservoir valve block also contains the system pressure sensor.

The reservoir valve block is attached to a bracket on the outside of the left hand chassis rail, between the reservoir and the air supply unit. The valve block is located within the air supply unit acoustic box to protect it from dirt ingress and damage from stones. The valve block has three attachment lugs which are fitted with isolation rubber mounts. The rubber mounts locate in the chassis bracket which has three corresponding 'V' shaped slots. the rubber mounts are pushed downwards into positive location in the slots.

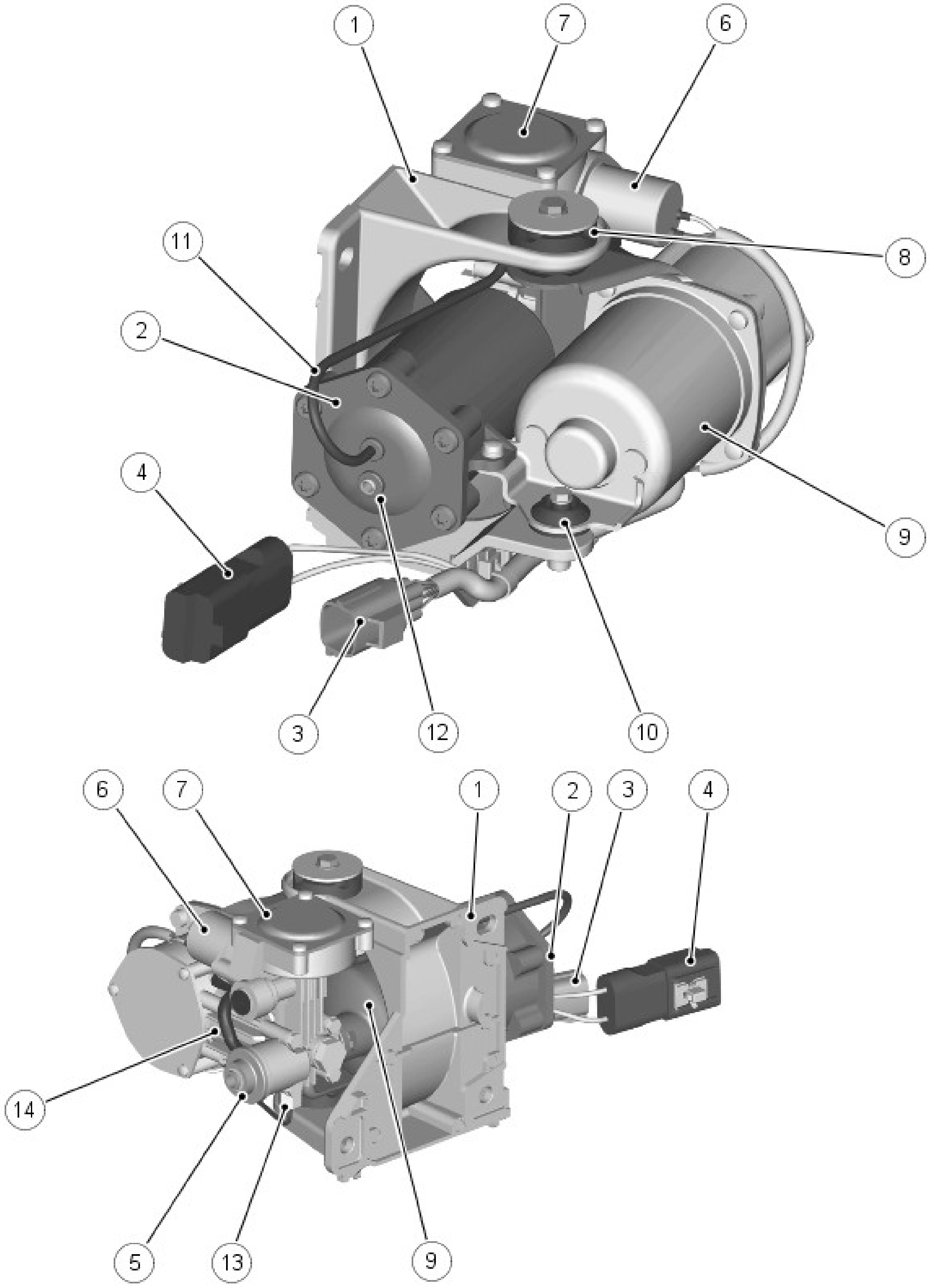
The valve block has four air pipe connections which use 'Voss' type air fittings. The connections provide for air supply from the air supply unit, air supply to and from the reservoir and air supply to and from the front and rear valve blocks. The connections from the air supply unit and the front and rear control valves are all connected via a common gallery within the valve and therefore are all subject to the same air pressures.

The valve block contains a solenoid operated valve which is controlled by the air suspension control module. The solenoid valve controls the pressure supply to and from the reservoir. The solenoid has a resistance value of 2 Ohms at a temperature of 20°C (68°F). When energised, the valve spool moves allowing air to pass to or from the reservoir.

The valve block also contains a pressure sensor which can be used to measure the system air pressure in the air springs and the reservoir. The pressure sensor is connected via a harness connector to the air suspension control module. The control module provides a 5V reference voltage to the pressure sensor and monitors the return signal voltage from the sensor.

Using this sensor, the control module controls the air supply unit operation and therefore limits the nominal system operating pressure to 244 lbf/in^2 (16.8 bar gage).

AIR SUPPLY UNIT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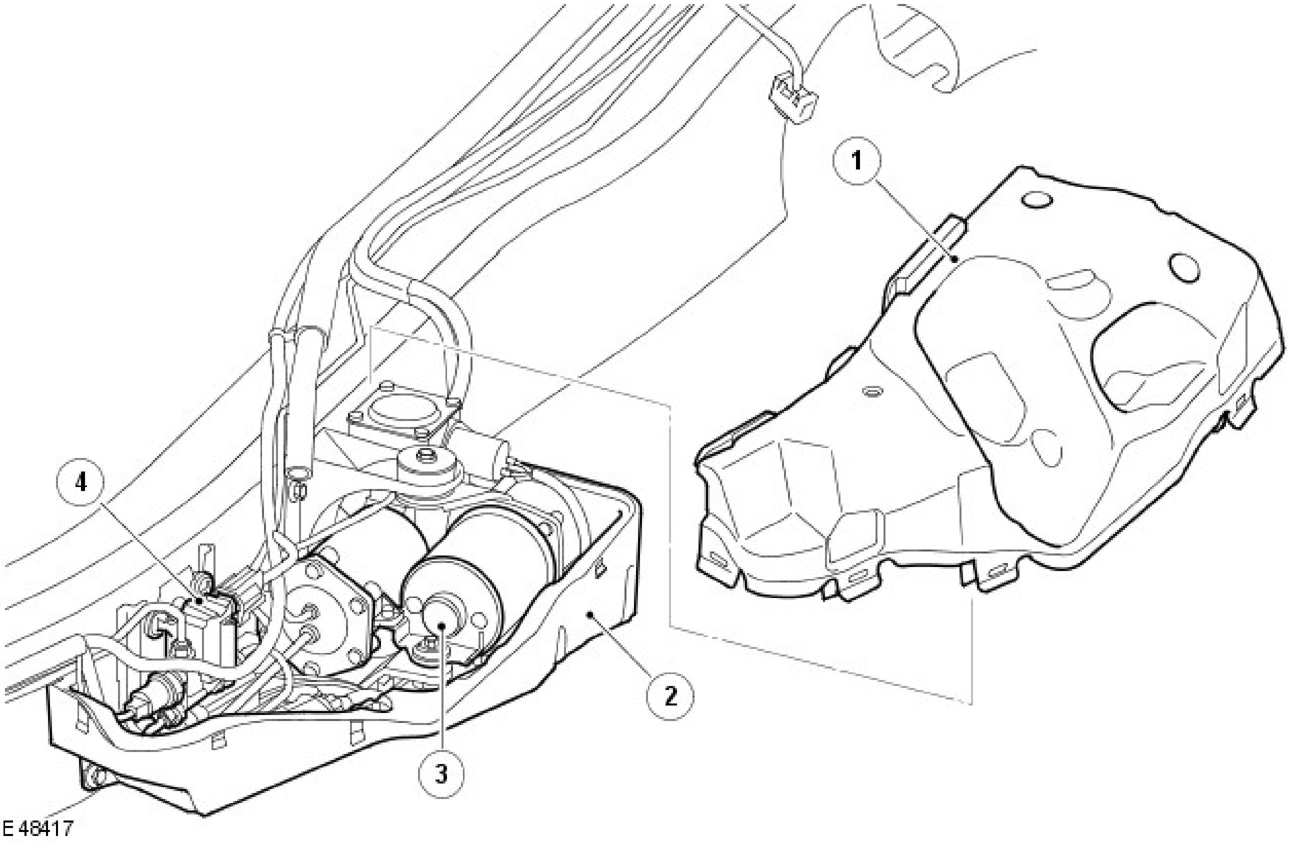
E45180

Item	Part Number	Description
1	-	Mounting bracket
2	-	Air dryer
3	-	Pilot exhaust valve solenoid and temperature sensors harness connector
4	-	Motor harness connector
5	-	Intake port
6	-	Pilot exhaust valve
7	-	Exhaust valve

8	-	Isolation mounting rubber (2 off)
9	-	Electric motor
10	-	Isolation mounting rubber (1 off)
11	-	Pilot air pipe
12	-	High pressure supply to the air suspension system
13	-	Compressor cylinder head temperature sensor
14	-	Compressor

The air supply unit is located on the outside of the left hand chassis rail, forward of the upper control arm. The unit is attached to the chassis rail with three bolts and is protected by an acoustic box.

Acoustic Box



Item	Part Number	Description
1	-	Upper cover
2	-	Lower cover
3	-	Air supply unit
4	-	Reservoir valve block

The acoustic box, which comprises of two parts; upper and lower, surrounds the air supply unit. The acoustic box is a plastic moulding which is lined with an insulating foam which controls the operating noise of the air supply unit. The reservoir valve block is also located in the acoustic box, forward of the air supply unit.

The air supply unit comprises the following major components:

- A piston compressor
- A 12V electric motor
- A solenoid operated pilot valve
- An exhaust valve
- An air dryer unit

The air supply unit supplies dry, compressed air into the air suspension system where it is directed into the air springs or the reservoir by solenoid operated valves. Air can be exhausted from the system when required by the opening of an air spring or reservoir valve in addition to an exhaust valve which is part of the air supply unit.

The compressor operates to pressurize either the reservoir or to inflate one or more of the air springs. Height changes of less than 20 mm are achieved using the compressor alone. Height changes of more than 20 mm are achieved using the reservoir and the compressor. The compressor cannot operate without the engine running, with the following exceptions:

- During remote operation to raise the vehicle to allow for thr attachment of a trailer

- When under control of a Land Rover approved diagnostic system.

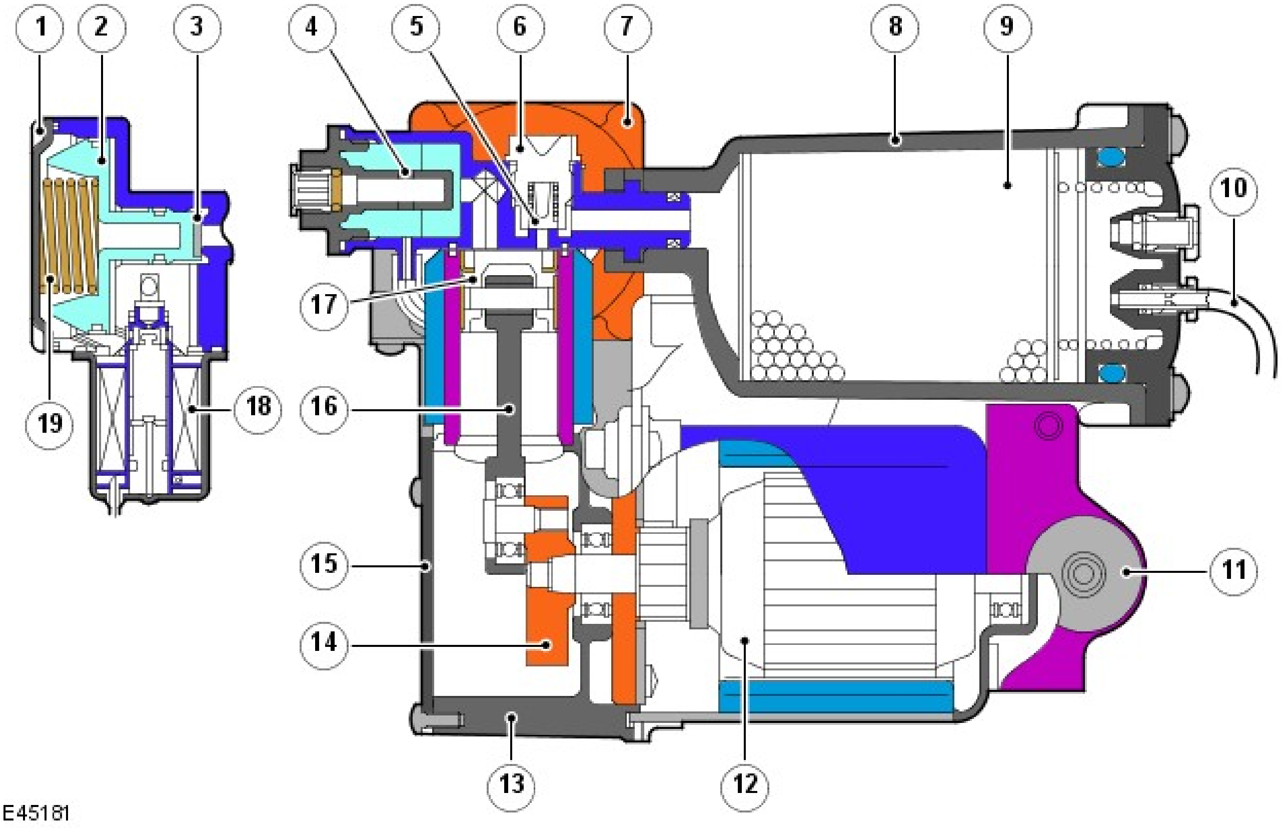
The air supply unit can be serviced in the event of component failure, but is limited to the following components; air dryer, pilot exhaust pipe and the rubber mounts.

The air supply unit is attached to a bracket which is bolted to the chassis. The unit is mounted to the bracket with flexible isolation mounting rubbers which assist with preventing operating noise being transmitted to the chassis.

Removal of the air supply unit does not require the whole air suspension system to be depressurised. The front and rear valve blocks and the reservoir valve block are normally closed when de-energised, preventing air pressure in the air springs and the reservoir escaping when the unit is disconnected.

There are a number of conditions that will inhibit operation of the air supply unit. It is vitally important that these system inhibits are not confused with a system malfunction. A full list of air supply unit inhibits are given in the air suspension control module section in this chapter.

Air Supply Unit - Sectional View



Item	Part Number	Description
1	-	Exhaust valve cap
2	-	Plunger
3	-	Valve seat
4	-	Intake silencer port
5	-	Delivery valve
6	-	Valve guide
7	-	Cylinder head
8	-	Dryer case
9	-	Desiccant
10	-	Pilot exhaust line
11	-	Isolation rubber mount
12	-	Motor assembly
13	-	Crankcase
14	-	Crank
15	-	Crankcase cover
16	-	Connecting rod
17	-	Piston
18	-	Pilot exhaust valve

19	-	Spring - pressure relief

Pilot Exhaust Valve

A solenoid operated pilot exhaust valve is connected to the air delivery gallery, downstream of the air dryer. The pilot valve, when opened, operates the main compressor exhaust valve. This allows the air springs to be deflated when required.

When the solenoid is energised, pilot air moves the exhaust valve plunger, allowing pressurised air from the air springs and/or reservoir to pass via the reservoir control valve to the air supply unit.

The solenoid has a resistance value of 4 Ohms at a temperature of 20°C (68°F).

Exhaust Valve

The exhaust valve has three functions. It operates in conjunction with the pilot exhaust valve to allow air to be exhausted from the air springs and/or the reservoir as described previously.

The valve also protects the system from over-pressure. The valve is connected into the main pressure gallery which is always subject to the system pressure available in either the air springs or the reservoir. The valve is controlled by a spring which restricts the maximum operating pressure to between 319 to 391 lbf/in^2 (22.0 to 27 bar gage).

The minimum pressure in the system is also controlled by the exhaust valve to ensure that, even when deflated, the air springs contain a positive pressure of approximately 14.5 lbf/in^2 (1 bar gage) with respect to atmosphere. This protects the air spring by ensuring it can still 'roll' over the piston without creasing.

Electric Motor

The electric motor is a 12V dc motor with a nominal operating voltage of 13.5V. The motor drives a crank which has an eccentric pin to which the compressor connecting rod is attached.

The motor is fitted with a temperature sensor on the brush PCB assembly. The sensor is connected to the air suspension control module which monitors the temperature and can suspend motor operation if an overheat condition occurs.

Compressor

The compressor comprises a motor driven connecting rod and piston which operate in a cylinder with a cylinder head. The motor rotates the crank moving the piston up and down in the cylinder bore. The air in the cylinder is compressed with the up stroke and is passed via a delivery valve, through the air dryer into the system.

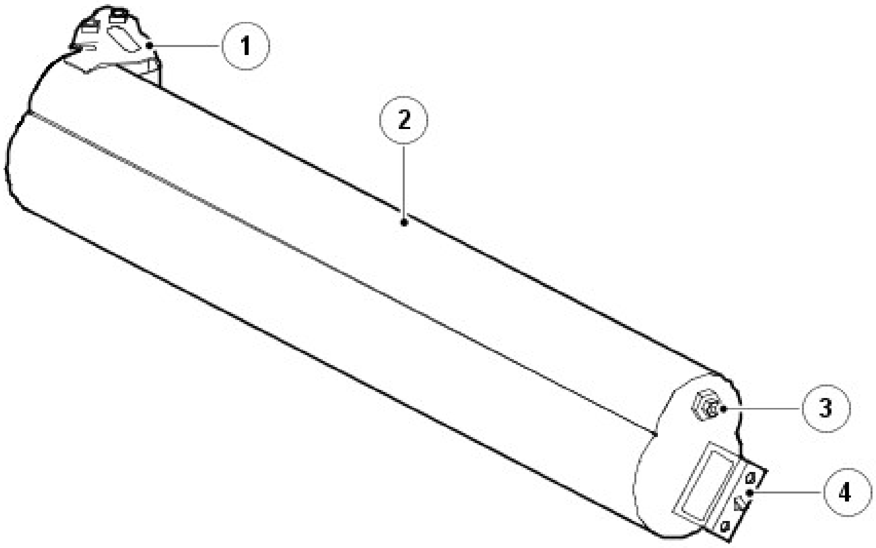
Air Dryer

The air dryer is an integral part of the air supply unit. The air dryer contains a desiccant which absorbs moisture. Pressurised air is passed through the air dryer which removes any moisture in the compressed air before it is passed to the reservoir and/or the system

When the air is exhausted from the system, the returning air is passed through the air dryer, regenerating the air dryer by removing moisture from the desiccant and expelling it to atmosphere via the exhaust.

The air dryer is an essential component in the system ensuring that only dry air is present in the system. If moist air is present in the system, freezing can occur, resulting in poor system operation or component malfunction/failure.

AIR RESERVOIR



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Item	Part Number	Description
1	-	Front bracket
2	-	Reservoir
3	-	Air hose connection to reservoir valve block
4	-	Rear bracket

The reservoir is an air storage vessel which provides fast air suspension lift times by the immediate availability of pressurised air into the system.

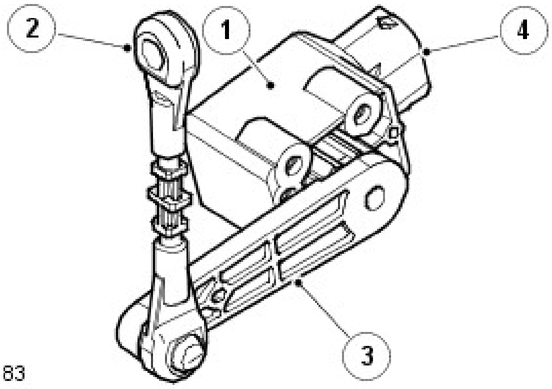
The reservoir is a steel fabrication and is located on the outside of the left hand chassis rail, in front of the air supply unit. The reservoir has a bracket at each end which attach to the body mounting brackets on the chassis.

The rearward end of the reservoir has a 'Voss' air fitting which provides for the connection of the air hose between the reservoir and the reservoir valve block.

The reservoir has a capacity of 550 in^3 (9 liters). The nominal working pressure of the reservoir is 243.6 lbf/in^2 (16.8 bar gage), with a maximum pressure of 507 lbf/in^2 (35 bar gage).

HEIGHT SENSORS

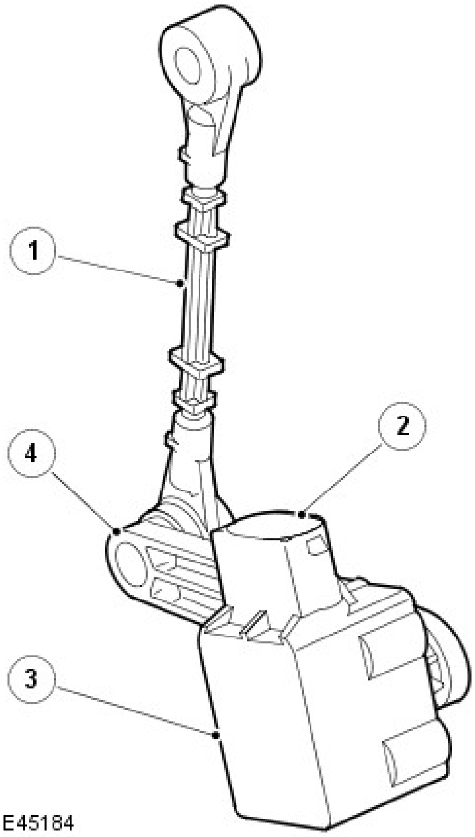
Front Height Sensor



E45183

Item	Part Number	Description
1	-	Sensor body
2	-	Drop link
3	-	Lever arm
4	-	Electrical connector

Rear Height Sensor



Item	Part Number	Description
1	-	Drop link
2	-	Electrical connector
3	-	Sensor body
4	-	Lever arm

A height sensor is fitted in each corner of the vehicle to monitor the ride height of the vehicle. The sensor bodies are attached with screws to brackets on the chassis rails.

Each sensor comprises a sensor body which contains a single track rotary potentiometer, a lever arm and a drop link.

The sensor lever arm has a drop link which provides the connection between the sensor and the suspension control arm. The drop link is a serviceable component and is a push fit to the lever arm and the suspension control arm.

The sensors are connected via their harness connector to the air suspension control module which receives the signal output from each sensor and, using preprogrammed information, converts the signal to a height for each sensor position.

The front left and right hand sensors are common parts. The left and right hand rear sensors are handed. All are color coded for identification as follows:

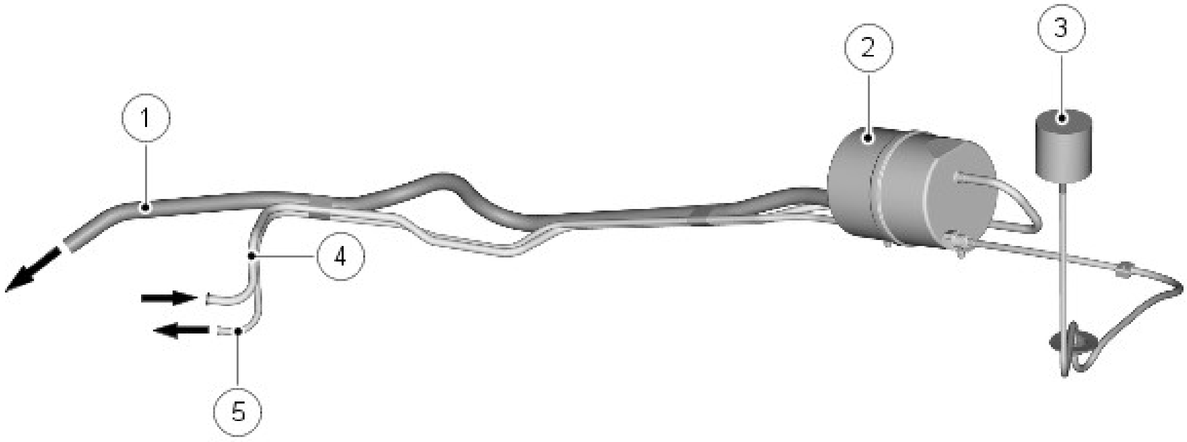
- Left and right hand front - gray lever arm
- Left hand rear - white colored lever arm, black plastic drop link
- Right hand rear - black colored lever arm, black plastic drop link.

Calibration

A calibration routine is performed using a Land Rover approved diagnostic system to read the position of each corner of the vehicle and record the settings in the control module memory. Once set, the calibration is not required to be performed unless the air suspension control module is removed or replaced, a height sensor is removed or replaced or a suspension arm to which the sensor is connected is removed or replaced. If the removed height sensor is subsequently refitted, the calibration procedure will have to be performed to ensure the integrity of the system.

If a replacement drop link is fitted, recalibration is not required providing the sensor body is not removed from its mounting bracket.

AIR SILENCER AND INLET AIR FILTER



E45185

Item	Part Number	Description
1	-	Exhaust (to atmosphere)
2	-	Inlet and exhaust silencer
3	-	Air inlet filter
4	-	Exhaust air from air supply unit
5	-	Air inlet supply to air supply unit

The air silencer is required to limit any noise produced from the air supply unit during inflation or deflation of the air springs.

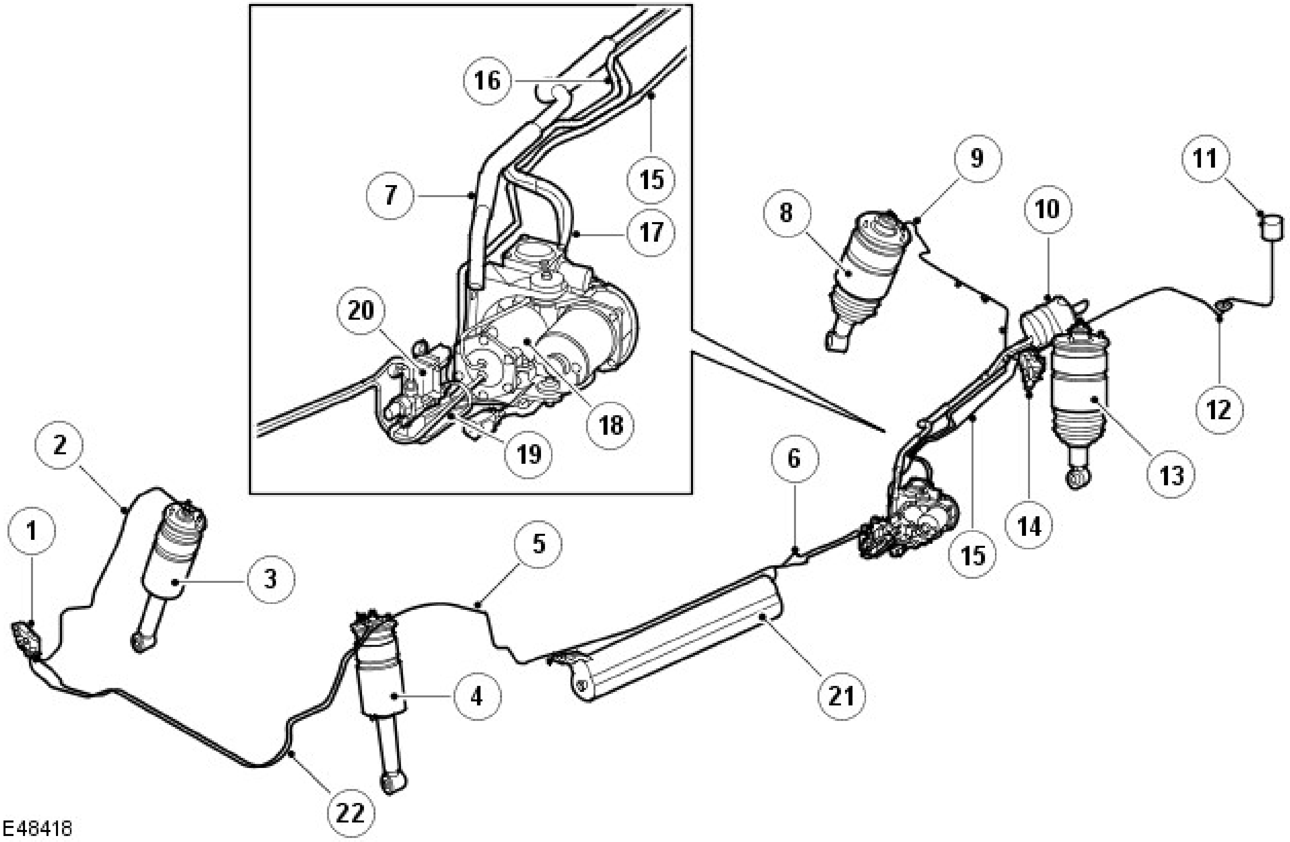
The silencer comprises two plastic moulded cans, which are bonded together. A silencing foam in the large internal chamber forms the exhaust silencer. A pipe connection is moulded onto each end of the silencer and provides for the attachment of the exhaust air to atmosphere pipe and the exhaust air pipe from the air supply unit.

A secondary chamber, located around the outside of the exhaust chamber forms the silencer for the inlet air. Pipe connections are moulded onto each end of the intake silencer and provide for the attachment of the air inlet pipe from the inlet air filter and the air inlet pipe to the air supply unit. The intake air silencer is a hollow chamber with no noise reduction foam filling.

The air intake filter is connected via a pipe to the intake silencer chamber of the air silencer unit. The filter is located in the rear left hand corner of the body, away from possible sources of dirt and moisture.

The filter contains a foam element which removes particulate matter from the inlet air before it reaches the silencer or the air supply unit.

AIR HARNESS



Item	Part Number	Description
1	-	Front axle valve block
2	-	Pipe - Front axle valve block to front RH air spring damper module
3	-	Front RH air spring damper module
4	-	Front LH air spring damper module
5	-	Pipe - Reservoir valve block to front axle valve block
6	-	Pipe - Reservoir valve block to reservoir
7	-	Pipe - Exhaust
8	-	Rear RH air spring damper module
9	-	Pipe - Rear axle valve block to rear RH air spring damper module
10	-	Air silencer assembly
11	-	Air inlet filter
12	-	Pipe - Main inlet
13	-	Rear LH air spring damper module
14	-	Rear axle valve block
15	-	Pipe - Reservoir valve block to rear axle valve block
16	-	Pipe - Compressor inlet
17	-	Pipe - Compressor exhaust
18	-	Air supply unit
19	-	Pipe - Air supply unit to reservoir valve block
20	-	Reservoir valve block
21	-	Reservoir
22	-	Pipe - Front axle valve block to front LH air spring damper module

The air harness comprises ten separate nylon pipes which are connected between the system components with Voss connectors. The pipes have the following diameters:

Pipe	Diameter
High pressure pipes	6 mm
Compressor inlet pipe	8 mm
Inlet filter to silencer	8 mm
Compressor exhaust pipe	10 mm
Silencer exhaust pipe	19 mm

If a pipe becomes damaged, an in-line connector is available for repair purposes. The pipes are secured to the body and the chassis with a number of plastic clips.

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Vehicle Dynamic Suspension - Vehicle Dynamic Suspension

Diagnosis and Testing

Principle of Operation

For information on the operation of the system, refer to relevant section 204-05 - Vehicle Dynamic Suspension of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Confirm which, if any, warning lights and/or messages were displayed on the instrument cluster. For a list of messages, Refer to the relevant section of the workshop manual.
3. **3.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Air leakage ● Air springs ● Reservoir ● Compressor ● Compressor air filter ● Pipework and unions ● Sensor installation ● Valve block(s)	● Battery ● Fuse(s) ● Wiring harness physical damage or water ingress ● Loose or corroded electrical connectors ● Air suspension control switch ● Controller area network (CAN) circuits ● Sensors ● Valve block(s) ● Air suspension control module

4. **4.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. **5.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible message	Possible other warnings	Possible causes	Action
Vehicle on bump stops	● Suspension fault	● Two chimes repeated regularly Red indicator permanently illuminated	● Water ingress to wiring harness or connectors ● Air leak(s) ● Vehicle in transportation mode ● System not calibrated or calibration corrupt ● Implausible articulation symptoms detected ● Failure of multiple height sensors ● Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage. Check the system mode and calibration using the approved diagnostic system. Check for implausible articulation symptoms, i.e. height sensor or linkage fault, deflated air spring, under inflated tire etc. Note implausible articulation symptoms may be caused by an un-calibrated height sensor. Check for height sensor DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle does not sit level	● Suspension fault	● Two chimes repeated regularly Red indicator permanently illuminated	● Water ingress to wiring harness or connectors ● Air leak(s) ● Calibration corrupt ● cross-link valve fault ● Height sensor fault	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage and refer to the guided diagnostic routine on the approved diagnostic system. Check the system calibration using the approved diagnostic system. For front

Symptom	Possible message	Possible other warnings	Possible causes	Action
			- Reservoir valve stuck open - Exhaust valve stuck closed - Corner valves stuck open - Air suspension control module failure	and rear cross link valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for height sensor DTCs and refer to the DTC index. For reservoir and exhaust valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for corner valve DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle sits too low	- Suspension fault - Hill descent control (HDC) fault, system not available - Dynamic stability control (DSC)	- Two chimes, amber indicator permanently illuminated - One chime - DSC amber indicator permanently illuminated - ABS indicator permanently illuminated	- Water ingress to wiring harness or connectors - Air leak(s) - Air suspension compressor temperature sensor fault - Inlet air filter blockage/restriction - Air suspension compressor fault - Exhaust valve stuck/sticking - Air suspension control module lost communication with ABS module - ABS fault. - Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage. For air compressor temperature sensor, inlet air filter, exhaust valve and air compressor tests refer to the guided diagnostic routine on the approved diagnostic system. For Air suspension control module lost communication with ABS module, refer to the lost communication codes statement at the end of this table. Check for ABS DTCs, Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle sits too high	- Suspension fault	- Two chimes, amber indicator permanently illuminated	- Reservoir valve stuck open - Exhaust valve stuck closed - Corner valves stuck open - Air suspension control module failure	For reservoir valve and exhaust valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for corner valve DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
System detects extended mode unnecessarily when lowering	- -	- -	- Crossed gallery and air spring pipes - Incorrect valve block installed to front or rear - Damage or blockage in air harness	Refer to the guided diagnostic routine on the approved diagnostic system.
Vehicle leans/tilts after being left over-night or for some days	- -	- -	- Leaking air spring(s) - Leak from corner valve to gallery - Exhaust valve stuck open	Refer to the guided diagnostic routine on the approved diagnostic system.
After vehicle left over-night or for some days system regularly indicates "Suspension vehicle raising	- Suspension vehicle raising slowly	- -	- Leaking air spring(s) - Leaking reservoir	Refer to the guided diagnostic routine on the approved diagnostic system.

Symptom	Possible message	Possible other warnings	Possible causes	Action
slowly" when first driving off				

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: Intermittent faults may cause DTCs to be logged, however some DTCs may be cleared during an ignition off, ignition on cycle. Carry out a road test (if safe to do so), check the functionality of the system and retrieve any DTCs **before** turning the ignition off.

DTC	Description	Possible causes	Action
B1A8455	Car Configuration Data	● Data does not match that expected for VIN range/Air suspension incorrectly configured	Configure the car configuration file (CCF) using the approved diagnostic system. Clear the DTC and test for normal operation.
C112201	Steering Isolation Valve	● Servotronic steering valve disconnected ● Servotronic steering valve circuit(s) high resistance or short circuit to ground ● Servotronic steering valve fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C11231C	Steering Isolation Valve Supply Circuit	● Servotronic steering valve supply circuit high resistance ● Servotronic steering valve supply circuit short circuit to ground ● Servotronic steering valve supply circuit short circuit to power ● Servotronic steering valve fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C112F72	Air Spring Valve	● Repeated or frequent level activity in the down direction ● Corner valve stuck open ● Corner valve leak to gallery	Refer to the approved diagnostic system for corner valve checks.
C113066	Air Spring Air Supply	● Repeated or frequent level activity in the up direction ● Air spring leak ● Air harness leak ● Exhaust valve stuck open ● Corner valve leak to gallery	Visually inspect the system for air leakage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C11307A	Air Spring Sir Supply	● Unable to lift vehicle ● Detached air pipe ● Loose or burst air pipe ● Excessive air spring leak ● Height sensor stuck ● Height sensor failure ● Blockage in air harness	Visually inspect the system for an excessive air leak. Check the height sensor linkage(s) for damage/restrictions. Visually inspect the air harness for evidence of melting, crushing, kinking or collapsing. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C113192	Air Spring Air Supply	● Unable to pressurize gallery ● Insufficient pressure from compressor ● Detached air pipe	Visually inspect the system for air leakage. Check the reservoir valve block pipes for correct routing and installation.

DTC	Description	Possible causes	Action
		● Loose or burst air pipe ● Reservoir valve block pipes incorrectly installed (unions reversed) ● Pressure sensor fault	
C1A001C	Control Module	● A momentary low voltage event occurred ● Low battery voltage ● One or more control valve supplies intermittent short circuit to ground	Check the battery charge, condition and circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C1A001D	Control Module	● Isolation switch current monitor ● One or more valve supplies short circuit to ground ● Rear valve block disconnected ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0049	Control Module	● Water ingress to valve wiring harness or connector(s) ● Valve supply circuit(s) short circuit to power ● Air suspension control module internal electrical failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0053	Control Module	● This is not a fault, the system has been deflated using the diagnostic routine	Carry out Air suspension deflation exit routine using the approved diagnostic system or the routine listed at the end of this section.
C1A0054	Control Module	● Air suspension control module not calibrated ● Air suspension control module has been set into manufacturing, calibration or tight tolerance mode	If the problem is found during pre-delivery inspection, check that the air suspension control module (RLM) is NOT in manufacturing mode, calibration mode or tight tolerance mode using the approved diagnostic system. Configure the RLM to customer mode if necessary (tight tolerance mode and manufacturing mode can be set/cleared by starting then ending the suspension geometry set process from IDS menu. Refer to the relevant Technical Service Bulletin). Clear the DTC and test for normal operation. Only if the DTC re-occurs, should the system be calibrated using the approved diagnostic system. Clear the DTC and test for normal operation.
C1A0119	LED	● Switch pack LED circuit, short circuit to power ● One or more LEDs short circuit to each other	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C1A031C	Left Front Height Sensor	● Left-hand front height sensor signal voltage out of range ● Water ingress to wiring harness or connectors ● Height sensor linkage disconnected ● Height sensor linkage damaged/bent ● Height sensor disconnected ● Height sensor linkage toggled (now operating in reverse direction) ● Height sensor bracket damaged/bent ● Height sensor incorrectly	Visually inspect the wiring harness and connectors for water ingress. For height sensor linkage, mounting and circuit tests refer to the guided diagnostic routine on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		installed ● Height sensor installed on wrong side of vehicle ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Incorrect height calibration ● Air suspension control module failure	
C1A0326	Left Front Height Sensor	● Left-hand front height sensor signal voltage stuck whilst vehicle is driven ● Water ingress to wiring harness or connectors ● Height sensor linkage disconnected ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0329	Left Front Height Sensor	● Left-hand front height sensor signal invalid ● Water ingress to wiring harness or connectors ● Height sensor linkage damaged/bent ● Height sensor bracket damaged/bent ● Height sensor incorrectly installed ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Incorrect height calibration process	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system.
C1A0392	Left Front Height Sensor	● Left-hand front height sensor height changing slower than expected ● Suspension prevented from moving ● Height sensor incorrectly installed ● Air spring leak ● Air harness leak ● Blocked/damaged air harness ● Blocked/damaged gallery pipe ● Corner valve stuck closed ● Front or rear valve block pipes incorrectly installed (unions reversed) ● Reservoir valve block pipes incorrectly installed (unions reversed) ● Reservoir valve stuck open ● Exhaust valve stuck closed	Check that the vehicle is free of obstructions. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check for an air spring leak. Check the air harness for evidence of melting, crushing, kinking or collapsing. Check the front and rear valve block pipes for correct routing and installation. Check the reservoir valve block pipes for correct routing and installation. Refer to the approved diagnostic system for corner, reservoir and exhaust valve checks. Check the corner valve for leaks.

DTC	Description	Possible causes	Action
		• Corner valve air leak • Pressure sensor fault • Height sensor failure	
C1A041C	Right Front Height Sensor	• Right-hand front height sensor signal voltage out of range • Water ingress to wiring harness or connectors • Height sensor linkage disconnected • Height sensor linkage damaged/bent • Height sensor disconnected • Height sensor linkage toggled (now operating in reverse direction) • Height sensor bracket damaged/bent • Height sensor incorrectly installed • Height sensor installed on wrong side of vehicle • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor failure • Incorrect height calibration • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0426	Right Front Height Sensor	• Right-hand front height sensor signal voltage stuck whilst vehicle is driven • Water ingress to wiring harness or connectors • Height sensor linkage disconnected • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor failure • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0429	Right Front Height Sensor	• Right-hand front height sensor signal invalid: • Water ingress to wiring harness or connectors • Height sensor linkage damaged/bent • Height sensor bracket damaged/bent • Height sensor incorrectly installed • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor failure • Incorrect height calibration process	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system.

DTC	Description	Possible causes	Action
C1A0492	Right Front Height Sensor	• Right-hand front height sensor height changing slower than expected • Suspension prevented from moving • Height sensor incorrectly installed • Air spring leak • Air harness leak • Blocked/damaged air harness • Blocked/damaged gallery pipe • Corner valve stuck closed • Front or rear valve block pipes incorrectly installed (unions reversed) • Reservoir valve block pipes incorrectly installed (unions reversed) • Reservoir valve stuck open • Exhaust valve stuck closed • Corner valve air leak • Pressure sensor fault • Height sensor failure	Check that the vehicle is free of obstructions. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check for an air spring leak. Check the air harness for evidence of melting, crushing, kinking or collapsing. Check the front and rear valve block pipes for correct routing and installation. Check the reservoir valve block pipes for correct routing and installation. Refer to the approved diagnostic system for corner, reservoir and exhaust valve checks. Check the corner valve for leaks.
C1A051C	Left Rear Height Sensor	• Left-hand rear height sensor signal voltage out of range • Water ingress to wiring harness or connectors • Height sensor linkage disconnected • Height sensor linkage damaged/bent • Height sensor disconnected • Height sensor linkage toggled (now operating in reverse direction) • Height sensor bracket damaged/bent • Height sensor incorrectly installed • Height sensor installed on wrong side of vehicle • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor failure • Incorrect height calibration • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0526	Left Rear Height Sensor	• Left-hand rear height sensor signal voltage stuck whilst vehicle is driven • Water ingress to wiring harness or connectors • Height sensor linkage disconnected • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor failure • Air suspension control	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		module failure	
C1A0529	Left Rear Height Sensor	- Left-hand rear height sensor signal invalid - Water ingress to wiring harness or connectors - Height sensor linkage damaged/bent - Height sensor bracket damaged/bent - Height sensor incorrectly installed - Height sensor harness wiring short circuit to ground, short circuit to power or high resistance - Height sensor failure - Incorrect height calibration process	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system.
C1A0592	Left Rear Height Sensor	- Left-hand rear height sensor height changing slower than expected - Suspension prevented from moving - Height sensor incorrectly installed - Air spring leak - Air harness leak - Blocked/damaged air harness - Blocked/damaged gallery pipe - Corner valve stuck closed - Front or rear valve block pipes incorrectly installed (unions reversed) - Reservoir valve block pipes incorrectly installed (unions reversed) - Reservoir valve stuck open - Exhaust valve stuck closed - Corner valve air leak - Pressure sensor fault - Height sensor failure	Check that the vehicle is free of obstructions. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check for an air spring leak. Check the air harness for evidence of melting, crushing, kinking or collapsing. Check the front and rear valve block pipes for correct routing and installation. Check the reservoir valve block pipes for correct routing and installation. Refer to the approved diagnostic system for corner, reservoir and exhaust valve checks. Check the corner valve for leaks.
C1A061C	Right Rear Height Sensor	- Right-hand rear height sensor signal voltage out of range - Water ingress to wiring harness or connectors - Height sensor linkage disconnected - Height sensor linkage damaged/bent - Height sensor disconnected - Height sensor linkage toggled (now operating in reverse direction) - Height sensor bracket damaged/bent - Height sensor incorrectly installed - Height sensor installed on wrong side of vehicle - Height sensor harness wiring short circuit to	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		ground, short circuit to power or high resistance ● Height sensor failure ● Incorrect height calibration ● Air suspension control module failure	
C1A0626	Right Rear Height Sensor	● Right-hand rear height sensor signal voltage stuck whilst vehicle is driven ● Water ingress to wiring harness or connectors ● Height sensor linkage disconnected ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0629	Right Rear Height Sensor	● Right-hand rear height sensor signal invalid ● Water ingress to wiring harness or connectors ● Height sensor linkage damaged/bent ● Height sensor bracket damaged/bent ● Height sensor incorrectly installed ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Incorrect height calibration process	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system.
C1A0692	Right Rear Height Sensor	● Right-hand rear height sensor height changing slower than expected ● Suspension prevented from moving ● Height sensor incorrectly installed ● Air spring leak ● Air harness leak ● Blocked/damaged air harness ● Blocked/damaged gallery pipe ● Corner valve stuck closed ● Front or rear valve block pipes incorrectly installed (unions reversed) ● Reservoir valve block pipes incorrectly installed (unions reversed) ● Reservoir valve stuck open ● Exhaust valve stuck closed ● Corner valve air leak ● Pressure sensor fault ● Height sensor failure	Check that the vehicle is free of obstructions. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check for an air spring leak. Check the air harness for evidence of melting, crushing, kinking or collapsing. Check the front and rear valve block pipes for correct routing and installation. Check the reservoir valve block pipes for correct routing and installation. Refer to the approved diagnostic system for corner, reservoir and exhaust valve checks. Check the corner valve for leaks.

DTC	Description	Possible causes	Action
C1A0762	Cross Articulation	- Cross articulation too large whilst vehicle is driven - Water ingress to wiring harness or connectors - Height sensor linkage damaged/bent - Height sensor linkage loose/disconnected - Height sensor bracket damaged/bent - Height sensor harness wiring short circuit to ground, short circuit to power or high resistance - Height sensor removed and reinstalled without being recalibrated - New height sensor installed without calibration - Incorrect height calibration - Height sensor failure	Follow the process detailed in the relevant special service message (SSM). Check the condition and security of the height sensor bracket(s). Check the height sensor for correct fitment and fixings torque. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system.
C1A081C	Pressure Sensor Supply	- Pressure sensor supply voltage out of range - Pressure sensor harness wiring short circuit to ground, short circuit to power or high resistance - Pressure sensor failure - Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A091C	Pressure Sensor Signal	- Pressure sensor signal voltage out of range - Pressure sensor disconnected - Pressure sensor harness wiring short circuit to ground, short circuit to power or high resistance - Pressure sensor failure - Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A1064	Pressure Fluctuates When System Inactive	- Reservoir and air spring pipes incorrectly installed to front or rear valve block (unions reversed) - Corner valve stuck open - Pressure sensor harness wiring short circuit to ground, short circuit to power or high resistance - Pressure sensor failure - Air suspension control module failure	Check the reservoir and air spring pipes for correct routing and installation. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A1164	Pressure Fluctuates When System Inactive	- Reservoir and air spring pipes incorrectly installed to front or rear valve block (unions reversed) - Corner valve internal leak - Reservoir valve internal leak - Pressure sensor harness wiring short circuit to ground, short circuit to	Check the reservoir and air spring pipes for correct routing and installation. For corner valve, reservoir valve, pressure sensor and circuit tests refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		power or high resistance - Pressure sensor failure	
C1A1364	Pressure Does Not Decrease When Venting Gallery	- Exhaust valve stuck closed - Exhaust valve does not hold minimum retention pressure - Gallery pipe blocked/damaged - Pressure sensor fault - Air suspension exhaust silencer blocked/restricted - Air suspension exhaust pipe blocked/damaged - Reservoir valve block pipes incorrectly installed (unions reversed)	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the Air suspension exhaust pipe and silencer for blockage/restriction. Check the reservoir valve block pipes for correct routing and installation.
C1A1864	Pressure Increase Too Rapid When Filling Reservoir	- Reservoir valve stuck closed - Reservoir pipe blocked/damaged - Reservoir port blocked/restricted - Pressure sensor fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C1A2064	Pressure Increase Too Slow When Filling Reservoir	- Compressor fault - Reservoir pipe air leak - Reservoir air leak - Gallery pipe air leak - Intake filter blocked/restricted - Intake pipe blocked/restricted - Air suspension intake silencer blocked/restricted - Corner valve stuck open - Pressure sensor fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the Air suspension intake pipe and silencer for blockage/restriction.
C1A2464	No Temperature Increase When Compressor Requested	- Air compressor cylinder head temperature sensor disconnected - Air compressor cylinder head temperature sensor detached from cylinder head - Air compressor cylinder head temperature sensor fault - Air compressor fault	Check the security of the compressor cylinder head temperature sensor and electrical connection. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C1A2467	No Temperature Increase When Compressor Requested	- Temperature takes too long to read after suitable compressor runtime - Air compressor cylinder head temperature sensor disconnected - Air compressor cylinder head temperature sensor fault - Air compressor disconnected - Air compressor ground circuit high resistance - Air compressor fault	Check the security of the compressor cylinder head temperature sensor and electrical connection. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
C1A2616	Temperature Sensor Circuit	● Temperature sensor voltage out of range ● Air compressor cylinder head temperature sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A2712	Compressor Circuit	● Compressor voltage present when compressor not requested ● Air compressor harness wiring short circuit to power ● Air compressor relay fault ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A2714	Compressor Circuit	● Compressor voltage present when compressor requested ● Air suspension control module supply (COMP_V) fuse in battery junction box (BJB) failed ● Air supply relay/air compresor supply fusible link in BJB failed/not installed ● Air compressor harness wiring short circuit to ground or high resistance ● Air compressor relay failure ● Air suspension control module failure	Check/renew fuses as necessary. Refer to the electircal guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A2729	Compressor Circuit	● Compressor relay control voltage signal invalid ● Air compressor harness wiring short circuit to power ● Air compressor relay fault ● Air suspension control module failure	DTC C1A2712 will be set first. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A2864	Wrong Number of LEDs Illuminated	● Wrong number of LEDs illuminated on switch pack ● Air suspension control module supply (BATTERY) fuse in battery junction box (BJB) failed ● Switch pack harness wiring short circuit to ground, short circuit to power or high resistance ● LED circuit short circuit to power ● One or more LEDs short circuit to each other ● Switch pack failure ● Air suspension control module failure	Check/renew fuse as necessary. Refer to the electircal guides. Refer to the electrical guides and check the switch pack and LED wiring ciruits. Renew/repir as necessary. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
C1A2992	Switch Activation Too Long	● Ride height change switch activation too long ● Switch pressed for more than 255 seconds ● Switch pack harness wiring short circuit to ground, short circuit to power or high resistance ● Switch pack failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3064	Both Switches Pressed At Same Time	● Raise and lower switches activated at same time ● Air suspension control module supply (BATTERY) fuse in battery junction box (BJB) failed ● Switch pack harness wiring short circuit to ground, short circuit to power or high resistance ● Switch pack failure ● Air suspension control module failure	Check/renew fuse as necessary. Refer to the electircal guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3101	Left Front Corner Valve	● Left-hand front corner valve, general electrical failure ● Front valve block disconnected ● Front valve block harness wiring short circuit to ground or high resistance ● Left-hand front corner valve failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3201	Right Front Corner Valve	● Right-hand front corner valve, general electrical failure ● Front valve block disconnected ● Front valve block harness wiring short circuit to ground or high resistance ● Right-hand front corner valve failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3301	Left Rear Corner Valve	● Left-hand rear corner valve, general electrical failure ● Rear valve block disconnected ● Rear valve block harness wiring short circuit to ground or high resistance ● Left-hand rear corner valve failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
C1A3401	Right Rear Corner Valve	● Right-hand rear corner valve, general electrical failure ● Rear valve block disconnected ● Rear valve block harness wiring short circuit to ground or high resistance ● Right-hand rear corner valve failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3501	Reservoir Valve	● Reservoir valve general electrical failure ● Reservoir valve block disconnected ● Reservoir valve block harness wiring short circuit to ground or high resistance ● Reservoir valve block failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3601	Exhaust Valve	● Exhaust valve, general electrical failure ● Exhaust valve disconnected ● Exhaust valve harness wiring short circuit to ground or high resistance ● Exhaust valve failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3701	Front Cross-Link Valve	● Front cross-link valve general electrical failure ● Front valve block disconnected ● Front valve block harness wiring short circuit to ground or high resistance ● Front cross-link valve failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A3801	Rear Cross-Link Valve	● Rear cross-link valve general electrical failure ● Rear valve block disconnected ● Rear valve block harness wiring short circuit to ground or high resistance ● Rear cross-link valve failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A5501	Ignition Switch Input Circuit	● Ignition switch input circuit; ignition on while wake-up off or ignition off while engine running ● Ignition switch input circuit short circuit to ground, short circuit to power or	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		high resistance	
C1A681C	Left Front Height Sensor Supply	● Left-hand front height sensor supply circuit voltage out of range ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A691C	Right Front Height Sensor Supply	● Right-hand front height sensor supply circuit voltage out of range ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A701C	Left Rear Height Sensor Supply	● Left-hand rear height sensor supply circuit voltage out of range ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A711C	Right Rear Height Sensor Supply	● Right-hand rear height sensor supply circuit voltage out of range ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A721C	Left Front Height Sensor Mechanism	● Left-hand front height sensor signal voltage out of range (mechanical) ● Water ingress to wiring harness or connectors ● Height sensor linkage disconnected ● Height sensor linkage damaged/bent ● Height sensor disconnected ● Height sensor linkage toggled (now operating in reverse direction) ● Height sensor bracket damaged/bent ● Height sensor incorrectly installed ● Incorrect height calibration ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		● Height sensor failure ● Air suspension control module failure	
C1A731C	Left Front Height Sensor Mechanism	● Right-hand front height sensor voltage out of range (mechanical) ● Water ingress to wiring harness or connectors ● Height sensor linkage disconnected ● Height sensor linkage damaged/bent ● Height sensor disconnected ● Height sensor linkage toggled (now operating in reverse direction) ● Height sensor bracket damaged/bent ● Height sensor incorrectly installed ● Incorrect height calibration ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A741C	Left Rear Height Sensor Mechanism	● Left-hand rear height sensor signal voltage out of range (mechanical) ● Water ingress to wiring harness or connectors ● Height sensor linkage disconnected ● Height sensor linkage damaged/bent ● Height sensor disconnected ● Height sensor linkage toggled (now operating in reverse direction) ● Height sensor bracket damaged/bent ● Height sensor incorrectly installed ● Incorrect height calibration ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
C1A751C	Right Rear Height Sensor Mechanism	● Right-hand rear height sensor signal voltage out of range (mechanical) ● Water ingress to wiring harness or connectors ● Height sensor linkage disconnected ● Height sensor linkage damaged/bent ● Height sensor disconnected ● Height sensor linkage	Visually inspect the wiring harness and connectors for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the height sensor bracket condition and security. Check the height sensor for correct installation and torque of fixings. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		toggled (now operating in reverse direction) ● Height sensor bracket damaged/bent ● Height sensor incorrectly installed ● Incorrect height calibration ● Height sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Height sensor failure ● Air suspension control module failure	
C1B1862	Supply Voltage X-Ref Check	● Inconsistent battery voltages received by Air suspension control module ● Air suspension control module supply circuit(s) short circuit to ground ● Air suspension control module supply circuit(s) high resistance ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C1B1903	Door Status Signal	● Door status signal, pulse width modulated failures ● Incorrect software loaded to Air suspension control module ● Central junction box to Air suspension module harness wiring short circuit to ground, short circuit to power or high resistance ● Central junction box fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
C1B211C	Compressor Brush Card Temperature Sensor Circuit	● Compressor brush card temperature sensor circuit, voltage out of range ● Compressor brush card temperature sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Compressor brush card temperature sensor failure ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
U007388	Control Module Communication Bus 'A' Off	● CAN bus connections short circuit to each other	Refer to the Network Communications section of the workshop manual.
U010087	Lost Communication With ECM/PCM "A"	● CAN bus fault ● ECM disconnected ● ECM not configured ● ECM failure	Refer to the Network Communications section of the workshop manual.
U010187	Lost Communication With Transmission Control Module	● CAN bus fault ● Transmission control module (TCM) disconnected ● TCM not configured ● TCM failure	Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Action
U010287	Lost Communication With Transfer Box Control Module	● CAN bus fault ● Transfer box control module disconnected ● Transfer box control module not configured ● Transfer box control module failure	Refer to the Network Communications section of the workshop manual.
U012287	Lost Communication With Vehicle Dynamics Control Module	● CAN bus fault ● ABS module disconnected ● ABS module not configured ● ABS module failure	Refer to the Network Communications section of the workshop manual.
U012687	Lost Communication With Steering Angle Sensor Module	● CAN bus fault ● SASM disconnected ● SASM not configured/calibrated ● SASM failure	Refer to the Network Communications section of the workshop manual.
U012887	Lost Communication With Park Brake Control Module	● CAN bus fault ● Park brake module disconnected ● Park brake module not configured ● Park brake module failure	Refer to the Network Communications section of the workshop manual.
U013387	Lost Communication With Active Roll Control Module	● CAN bus fault ● Vehicle dynamic suspension system module disconnected ● Vehicle dynamic suspension system module not configured ● ABS module failure	Refer to the Network Communications section of the workshop manual.
U013687	Lost Communication With Differential Control Module - Rear	● CAN bus fault ● Electronic rear differential control module disconnected ● Electronic rear differential control module not configured ● Electronic rear differential control module failure	Refer to the Network Communications section of the workshop manual.
U015587	Lost Communication With Instrument Panel Cluster (IPC) Control Module	● CAN bus fault ● Instrument cluster disconnected ● Instrument cluster not configured ● Instrument cluster failure	Refer to the Network Communications section of the workshop manual.
U030055	Internal Control Module Software Incompatibility	● Incorrect software loaded ● CAN wiring to instrument cluster high resistance ● Incorrect instrument cluster CAN configuration	Configure the Air suspension control module and instrument cluster as necessary using the approved diagnostic system.
U040186	Invalid Data Received From ECM/PCM A	● Engine management system fault	Refer to the Network Communications section of the workshop manual.
U041686	Invalid Data Received From Vehicle Dynamics Control Module	● Warnings and Messages: - Warning - Two Chimes - Displayed message - SLOW DOWN OR VEHICLE WILL LOWER ● Subsequent Warning &	Refer to the Network Communications section of the workshop manual. Check for ABS system DTCs and repair as necessary.

DTC	Description	Possible causes	Action
		Message - Warning - One Chime. - Message - SUSPENSION LOWERED - Meaning - Vehicle has lowered to Access height because of failure of another vehicle system ● ABS fault	
U041786	Invalid Data Received From Park Brake Control Module	● Park brake fault	Refer to the Network Communications section of the workshop manual.
U042886	Invalid Data Received From Steering Angle Sensor Module (SASM)	● SASM not configured/calibrated ● SAS fault	Check the security of the electrical connection. Configure/calibrate the SAS using the approved diagnostic system. Refer to the Network Communications section of the workshop manual.
U043486	Invalid Data Received From Active Roll Control Module	● Vehicle dynamic suspension system fault	Refer to the Network Communications section of the workshop manual.
U1A1387	Lost Communication With All Terrain Control Module	● Lost communication with all terrain optimization switch ● CAN bus fault ● Terrain optimization switch disconnected ● Terrain response module not configured ● Terrain response module failure	Refer to the Network Communications section of the workshop manual.
U1A1449	CAN Initialization Failure	● Internal electronic failure	Refer to the Network Communications section of the workshop manual.
U1A3562	VIN Data	● VIN from instrument cluster does not match VIN at time of calibration ● Air suspension control module has been swapped with another vehicle ● Instrument cluster not configured	Configure the instrument cluster using the approved diagnostic system.
U200067	Motor Temperature	● Temperature sensor voltage takes too long to read after suitable compressor runtime ● Compressor brush card temperature sensor harness wiring short circuit to ground, short circuit to power or high resistance ● Compressor brush card temperature sensor failure ● Compressor fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
U200701	Valve(s)	● Valve circuit short circuit to ground ● Water ingress to wiring harness or connectors ● Valve harness wiring short circuit to ground or high resistance	DTC C1A001D will be set first. Visually inspect the wiring harness and connectors between the Air suspension control module and the control valves for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		- Air suspension control module failure	
U200711	Valve(s)	- Valve circuit short circuit to ground when system is inactive - Water ingress to wiring harness or connectors - Valve harness wiring short circuit to ground or high resistance - Air suspension control module failure	Visually inspect the wiring harness and connectors between the Air suspension control module and the control valves for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
U200719	Valve(s)	- Valve circuit current above threshold - Valve supply circuit(s) intermittent short circuit to ground or high resistance - Valve failure - Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
U200767	Valve(s)	- Valve signal incorrect after event - Water ingress to wiring harness or connectors - Valve supply circuit(s) short circuit to ground, short circuit to power or high resistance - Air suspension control module failure	Visually inspect the wiring harness and connectors between the Air suspension control module and the control valves for water ingress. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

Air suspension deflation exit routine

1. **1.** Key on, engine off.
2. **2.** Key off.
3. **3.** Press and release raise switch.
4. **4.** Press and release lower switch.
5. **5.** Key on, engine off.
6. **6.** Key on, engine running.
7. **7.** Press and release raise switch twice.
8. **8.** Press and release lower switch twice.
9. **9.** Press and release raise switch.

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Vehicle Dynamic Suspension - Air Suspension System Depressurize and Pressurize

General Procedures

- WARNINGS:

⚠ A small amount of air pressure will be left in the air suspension system.

⚠ Eye protection must be worn.

⚠ Wear protective gloves.

- CAUTIONS:

⚠ Make sure tailgate, hood and all doors are closed.

⚠ Make sure the vehicle is in a clear working area.

1. ⚠ WARNING: The air suspension system is pressurised up to 16.8 bar (244 lbf/in^2). Make sure no dirt or grease enters the system. Always wear hand, eye and ear safety standard protection when working on the system.

Using T4, depressurize the air suspension.

2. Using T4, pressurize the air suspension.

- Start and run the engine.

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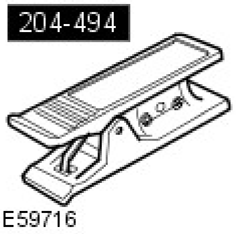
Vehicle Dynamic Suspension - Air Leaks

General Procedures

Special Tool(s)	
	Hose Cutter 204-494 (LRT 60-002)

1. ⚠ CAUTION: Any leak detection spray used must have a corrosion inhibitor, and must not cause damage to paintwork, plastics, metals or plastic lines.

   - NOTE: The recommended leak detection spray is GOTEC LDS, Landrover part number STC 1090.

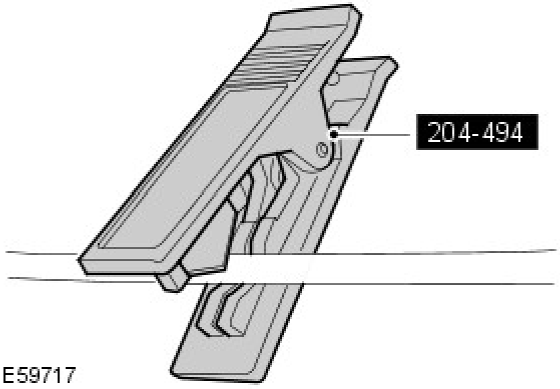
   The recommended leak detection spray should be used to identify any suspected leaks. This procedure should also be used where any of the air suspension components have been disturbed.

2. Clean around the area of the suspected air leak.

3. Using the recommended leak detection spray, spray around all of the air suspension components, working systematically until the source of the air leak has been found.

4. If any of the air suspension components are found to be leaking e.g. air spring, compressor, reservoir or a solenoid valve block, repair is effected by replacement only.

5. Using T4, depressurize the air suspension system.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).



6. CAUTIONS:

   ⚠ Different air lines in the air suspension system have different material properties and wall thicknesses. It is important, in order to prevent subsequent air line failure, that the new air line material and wall thicknesses are identical to those of the air line being removed.

   ⚠ Replacement air line must be cut from a new air line with the equivalent Land Rover part number as the one being replaced. Do not use air line cut from a roll or coil.

   ⚠ Any existing heatsleeves and abrasion sleeves must be replaced as part of the repair.

   ⚠ Air line connectors should be positioned in areas away from heat sources such as the exhaust system, and away from any section of air line with a heat shield installed.

   ⚠ Do not trim air line ends. If the end of the air line is damaged, the air line must be cut and a new section added using a Land Rover approved air line connector, or the air line must be renewed completely.

   - NOTE: Air lines must only be cut using either Hose cutter 204-494 (LRT 60-002), available from SPX LTD or Hose cutter YA1000A, available from Snap-On Tools. Make sure the cut air line end is free from damage or burrs.

- NOTE: Only Land Rover approved air lines have been tested to the correct pressure and temperature specifications.

- NOTE: Only the Land Rover approved air line connector, RYC500210, has been tested to the correct pressure and temperature specifications.

- NOTE: If the markings or tape adjacent to the air line connections are removed when cutting air lines, the cut end of the air line must be clearly marked with a suitable colored tape or paint mark.

If the source of the air leak is found to be an air line connection, renew the Voss connector and, if required, the end of the air line. Using the special tool, cut off the damaged end of the air line and replace with new Land Rover approved air line and air line connectors as required.

7. If the source of the air leak is found to be in a section of air line, either; renew the air line, or, using the special tool, cut out the damaged section of air line and replace with new Land Rover approved air line, and air line connectors, as required.

8. NOTE: If the repair has been unsuccessful repeat the above steps until the air leak is rectified.

Using T4, pressurize the air suspension system.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

Published: 30-Nov-2011

Vehicle Dynamic Suspension - Front Shock Absorber and Air Spring Assembly

Removal and Installation

Removal

- NOTE: Only the air spring being removed needs to be depressurised.
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

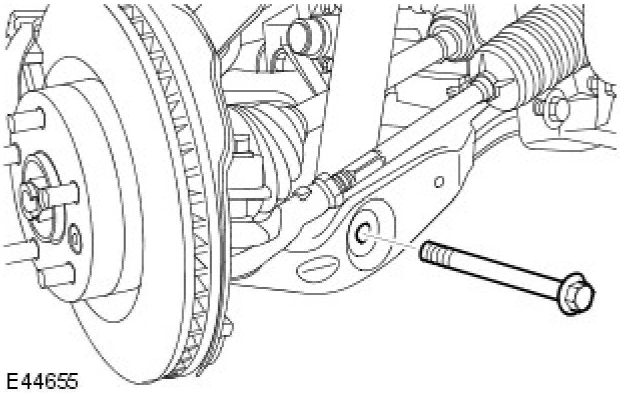
Raise and support the vehicle.

2. Remove the wheel and tire.

3. Using the Land Rover approved diagnostic system, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. Disconnect the shock absorber and air spring assembly from the lower arm.

- Remove the nut and bolt.



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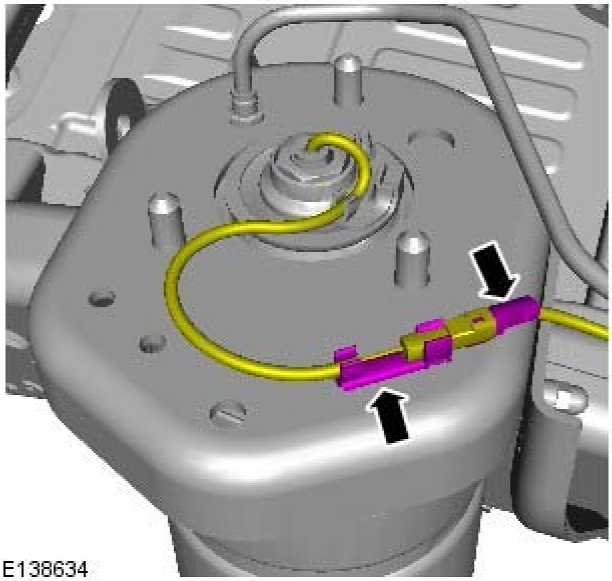
5. Disconnect the active damping wiring.



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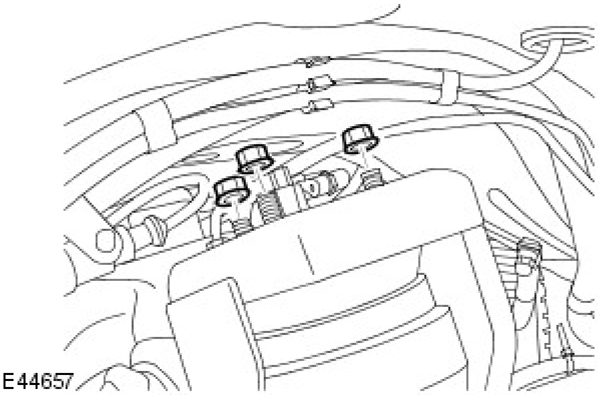
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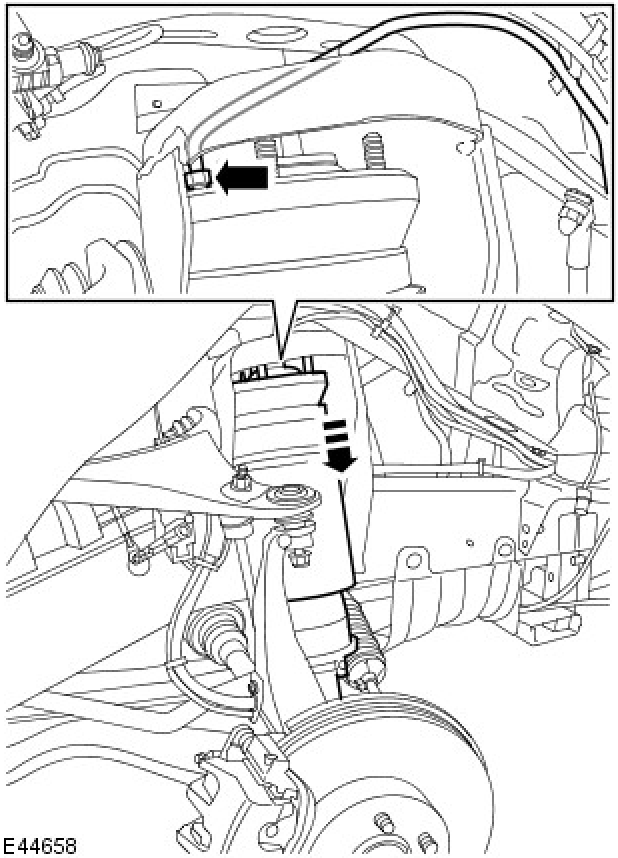
6. Release the shock absorber and air spring assembly.

- Remove the 3 nuts.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7. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Release the shock absorber and air spring assembly and disconnect the air line.

8. Remove the shock absorber and air spring assembly.

9. Remove the Voss connector from the air line.

- Remove and discard the collet and the union.

Installation

1. ⚠ CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

Install a new Voss connector to the air spring.

- Tighten to 3.5 Nm (2.6 lb.ft)

2. NOTE: Remove and discard the blanking caps.

Install the shock absorber and air spring assembly.

- Make sure the shock absorber and air spring assembly top mounting to body mating faces are clean.
- Fit the nuts and tighten to 63 Nm (46 lb.ft).
- Connect the air line into the Voss connector.
- Tug on the air line to make sure it is fully installed into the Voss connecter.

3. Attach the active damping wiring.

4. Connect the shock absorber and air spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

5. Using the Land Rover approved diagnostic system, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

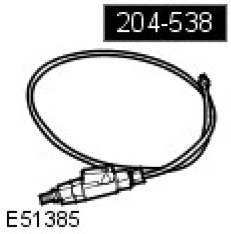
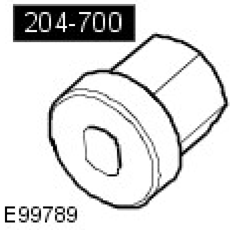
6. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Vehicle Dynamic Suspension - Front Air Shock Absorber

Removal and Installation

<table>
<tr><th colspan="2">Special Tool(s)</th></tr>
<tr><td>
</td><td>Air spring tester
204-538</td></tr>
<tr><td>
</td><td>Remover front air shocker absorber spindle nut
204-700</td></tr>
</table>

Removal

- NOTE: This procedure should also be used to remove the front air spring.

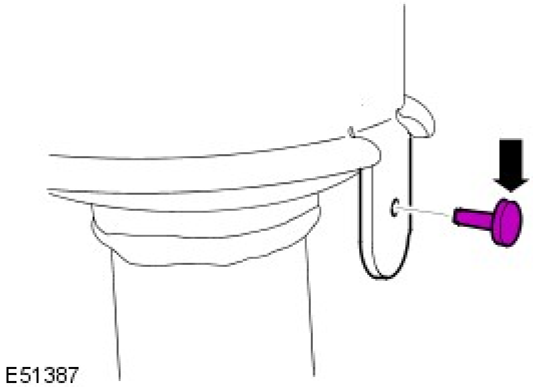
1. Remove the front shock absorber and air spring assembly.
For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

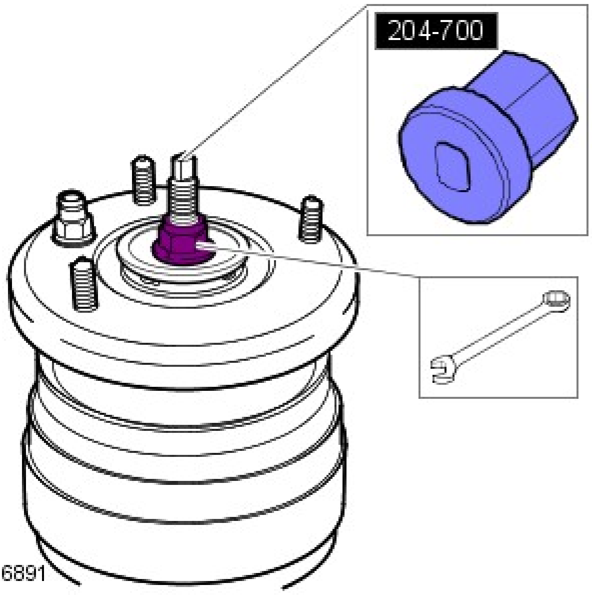
2. NOTE: If no leak is detected, investigate other areas of the air suspension for faults.

Check the assembly for leaks.

- Inflate the module to 4 bar and check for pressure loss using leak detector spray.
- If a leak is suspected, immerse the shock absorber and air spring assembly in a tank of water to locate the source of the leak and mark the area.

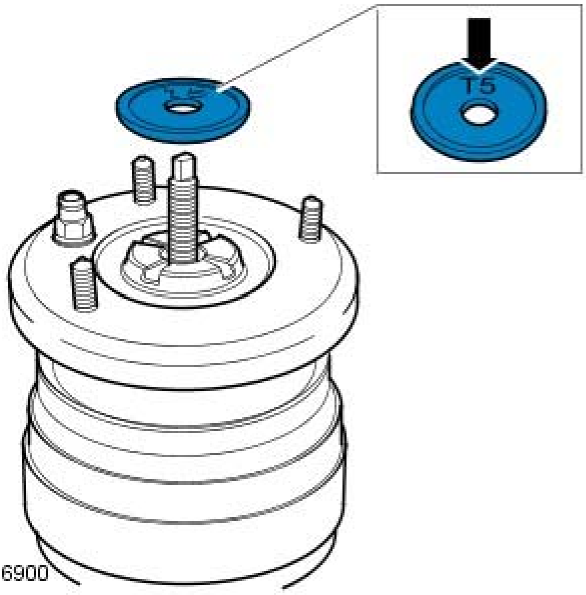
3. Remove the nylon retaining pin.





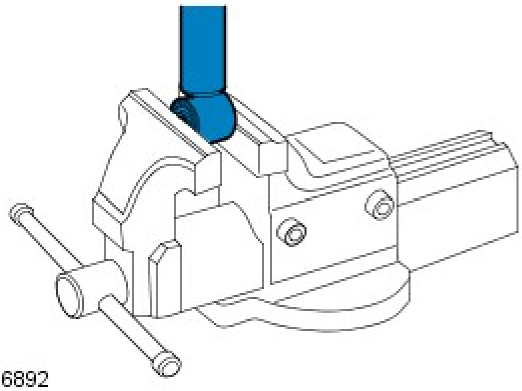
E96891

4. Using the special tool, remove the nut.



E96900

5. Remove the rebound washer.



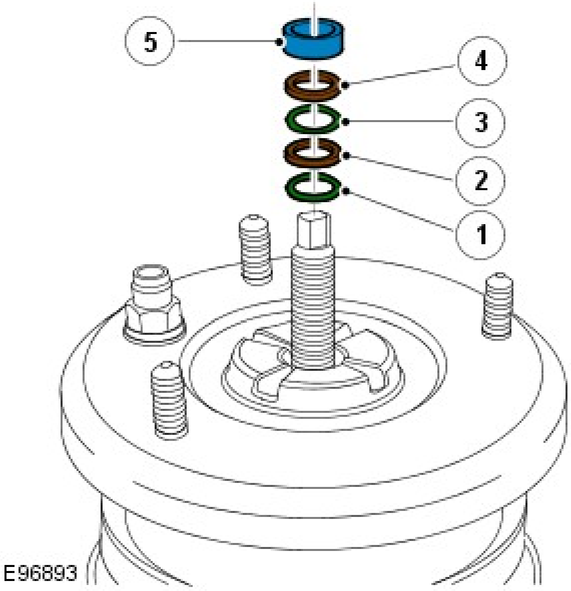
E96892

6. CAUTIONS:

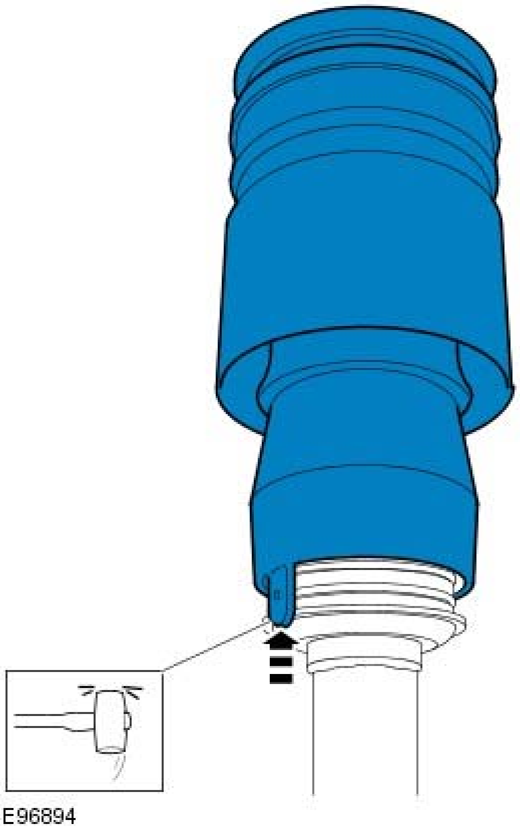
⚠ Make sure protective jaws are installed to the vice. Failure to follow this instruction may result in damage to the component.

⚠ Do not clamp the shock absorber tube. Failure to follow this instruction may result in damage to the component.

Position the front shock absorber and air spring assembly in a vice.

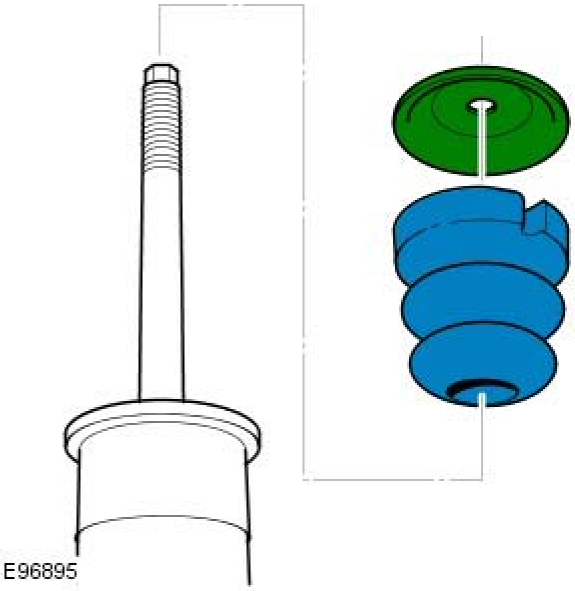

5
4
3
2
1
E96893

7. Remove and discard the 3 spacers and 2 O-ring seals.



8. Remove the air spring.

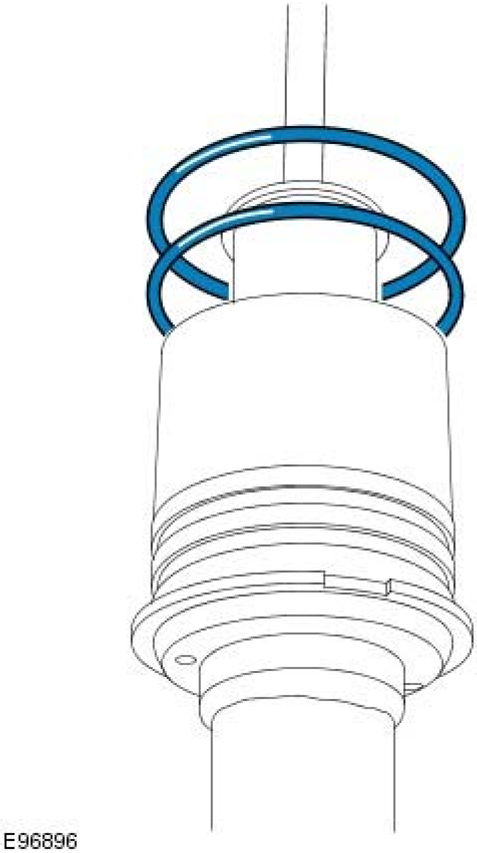
- Using a soft faced mallet, gently tap the sleeve support upwards to release it from the O-ring seals.



E96895

9. NOTE: Note the fitted position.

Remove the bump plate and spring aid.

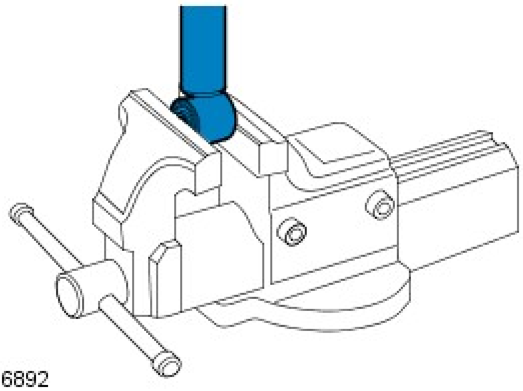


E96896

10. Remove and discard the 2 large black O-ring seals from the lower seal carrier.

11. Remove the front shock absorber and air spring assembly from the vice.

Installation



E96892

1. CAUTIONS:

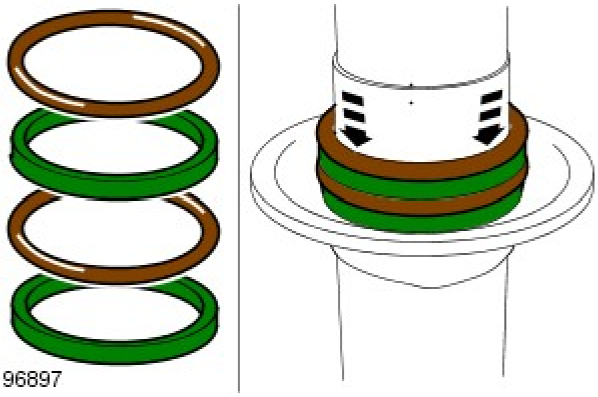
⚠ Make sure protective jaws are installed to the vice. Failure to follow this instruction may result in damage to the component.

⚠ Do not clamp the shock absorber tube. Failure to follow this instruction may result in damage to the component.

Position the front shock absorber and air spring assembly in a vice.

2. ⚠ CAUTION: Use compressed air and lint free non-flocking material.

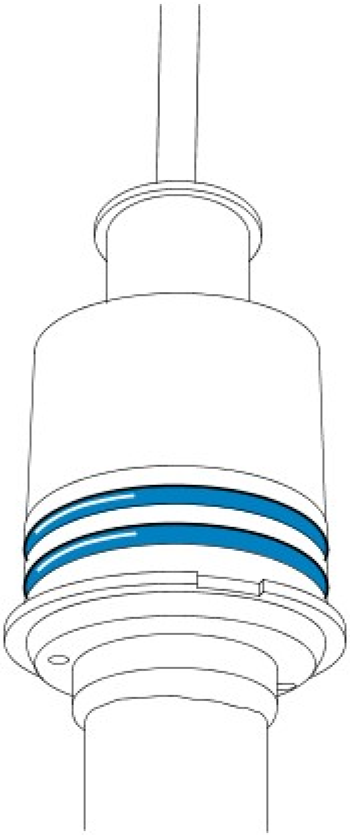
Clean the components.



E96897

3. Lift the seal carrier to expose the O-ring seal stack.

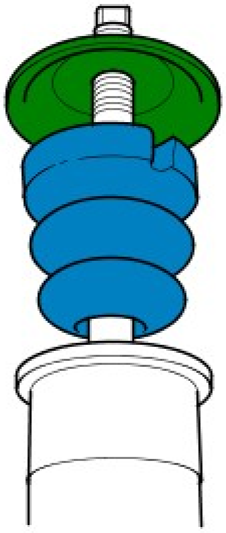
- Make sure that the damper body O-ring seals and spacers are fully seated to the spring seat.


E96898

4. ⚠ CAUTION: Take care not to damage the O-ring seals during installation.

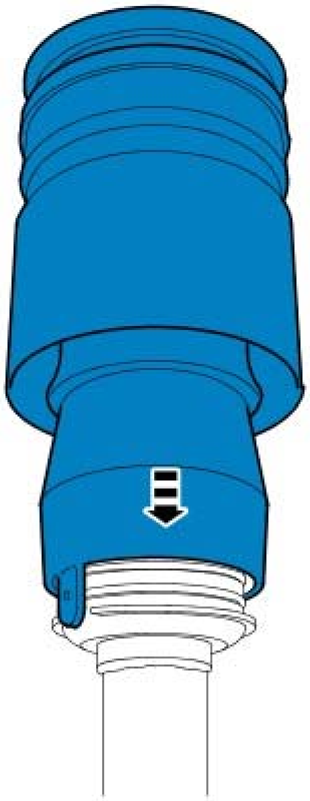
Install new O-ring seals to the seal carrier.

- Apply loctite 8021 (silicon-based oil) to the O-ring seals.


E96899

5. NOTE: Make sure that these components are installed to the noted removal position.

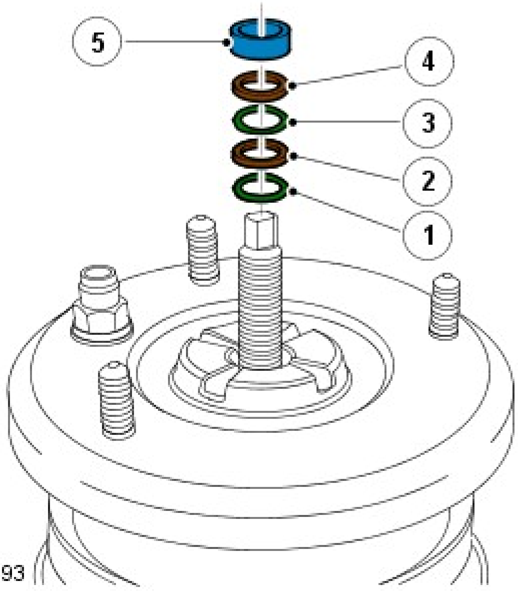
Install the bump plate and spring aid.



E99908

6. Install the air spring.

- Align the sleeve support with the first O-ring seal making sure that the location tag is correctly aligned with the spring seat cut-out.



E96893

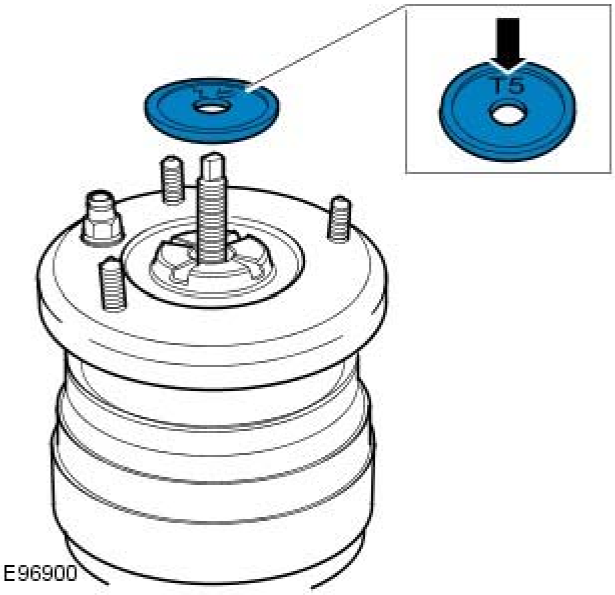
7. CAUTIONS:

⚠ Make sure that the threads of the front air shock absorber are covered with protective tape.

⚠ Take care not to damage the O-ring seals during installation.

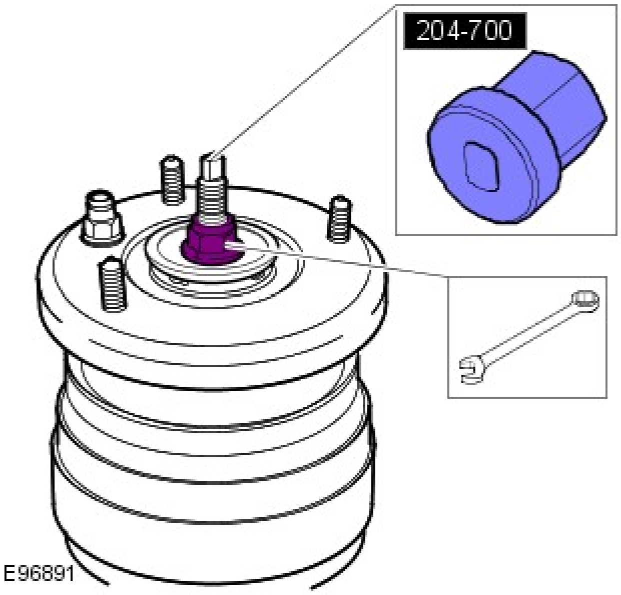
Install the components in the following order:

1. O-ring seal
2. Spacer
3. O-ring seal
4. Spacer
5. Spacer

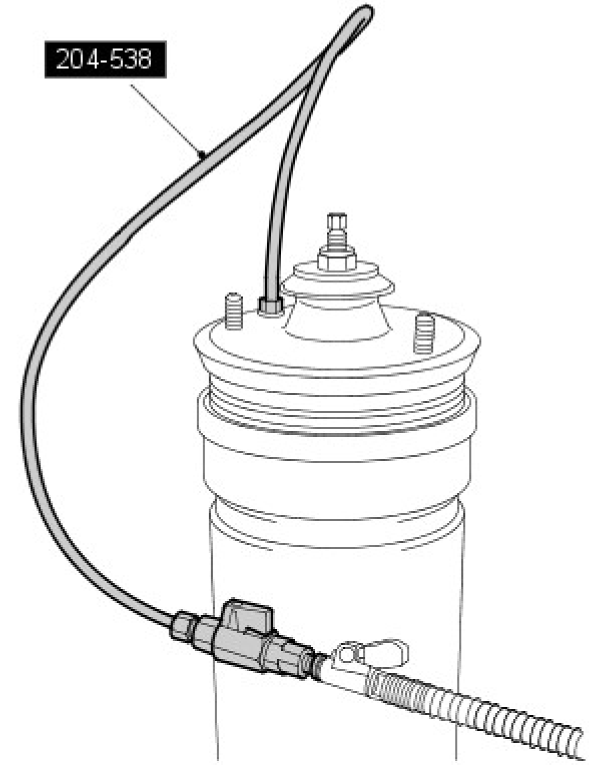

T5
T5
E96900

8. NOTE: The "T5" stamp on the upper face of the rebound washer must be visable after assembly.

Install the rebound washer.


204-700
E96891

9. Install a new nut and using the special tool, and tighten to 98 Nm (72 lb.ft).



E51445

10. CAUTIONS:

⚠ The air supply must be free of any moisture.

⚠ If during disassembly the air sleeve is unrolled, the air sleeve may inflate incorrectly (to one side). If this occurs, release the air pressure, and insert a suitable tool that will not damage the air sleeve or piston (a screw driver handle), into the side opposite the bulge. Inflate and deflate until the air sleeve inflates correctly (the air sleeve will be uniform inside the shroud).

• NOTE: To prevent damage when seating the sleeve support over the large black O-rings, compressed air should be used to inflate the air spring.

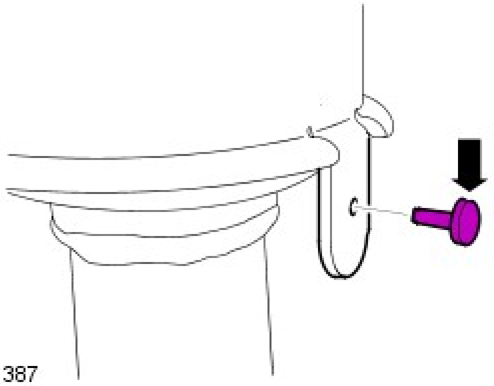
Using the special tool coupled to a tire inflator with a gauge, apply approximately 2 bar of air pressure to the air spring to fully seat the sleeve support over the O-ring seals.

11. Check the assembly for leaks.

- Inflate the module to 4 bar and check for pressure loss using leak detector spray.
- If a leak is suspected, immerse the shock absorber and air spring assembly in a tank of water to locate the source of the leak.

12. Depressurize and remove the special tool from the shock absorber and air spring assembly.

13. Install the nylon retaining pin.



E51387

14. NOTE: Install a new air spring pipe connector.

Install the front shock absorber and air spring assembly.
For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

Vehicle Dynamic Suspension - Suspension Height Sensor

Removal and Installation

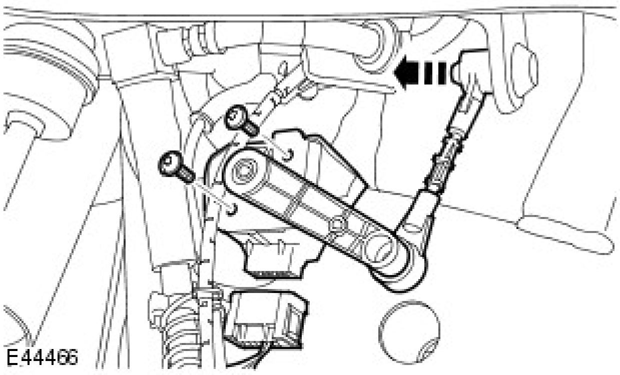
Removal

• NOTE: The rear height sensors are handed. The right hand sensor has a black colored lever and the left hand sensor has a white colored lever. The front height sensors are not handed, and are fitted with grey levers for identification.

• NOTE: This procedure covers removal and installation of both the front and rear suspension height sensors.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. CAUTION: Do not use excessive force to disconnect the height sensor link.

Remove the suspension height sensor.

- Disconnect the height sensor link.
- Disconnect the electrical connector.
- Remove the 2 Torx screws.

Installation

1. CAUTION: Make sure the Torx screw is not over tightened. Failure to follow this instruction will result in damage to the vehicle.

To install, reverse the removal procedure.

- Tighten the screws to 3 Nm (2 lb.ft).

2. Using Land Rover approved diagnostic equipment, calibrate the ride hight.

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Vehicle Dynamic Suspension - Air Suspension Reservoir

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

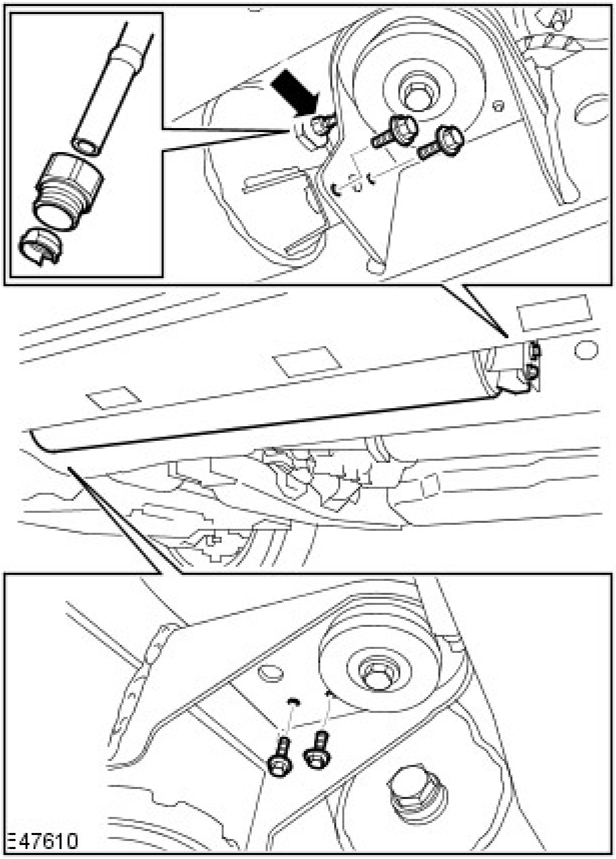
3. CAUTIONS:

⚠ Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

⚠ The air line must only be disconnected by removal of the voss connector. Do not remove the air line retaining boss from the air suspension reservoir. Failure to follow this instruction may result in damage to the vehicle.

⚠ Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

Disconnect the air line from the air suspension reservoir.



4. Remove the air suspension reservoir.

- Remove the 4 bolts.

5. Remove the Voss connector from the air line.

- Remove and discard the collet and the union.

Installation

1. ⚠ CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

Install a new Voss connector to the air reservoir.

- Tighten the new Voss connector to 5 Nm (4 lb.ft).

2. Install the air suspension reservoir.

- Locate the air reservoir to the chassis brackets, fit the bolts and tighten to 23 Nm (17 lb.ft).
- Fully seat the air line into the Voss connector.
- Pull on the air line to make sure it is fully installed into the Voss connecter.

3. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

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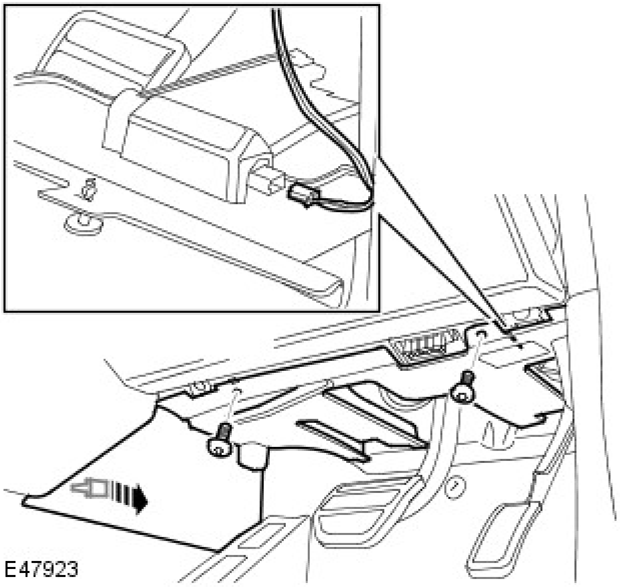
Vehicle Dynamic Suspension - Air Suspension Control Module

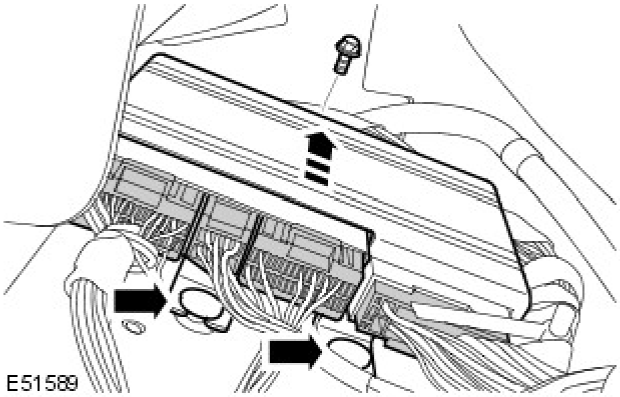
Removal and Installation

Removal

1. Driver side: Remove the cowl side trim panel.
   For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. Remove the closing trim panel.
   - Release the clip.
   - Remove the 2 screws.
   - Disconnect the electrical connector.



3. Remove the air suspension control module.
   - Disconnect the 4 electrical connectors.
   - Remove the bolt.
   - Release from the 2 clips.

Installation

1. Install the air suspension control module.
   - Secure with the clips.
   - Connect the electrical connectors.
   - Tighten the bolt to 9 Nm (7 lb.ft).
2. Install the closing trim panel.
   - Connect the electrical connector.
   - Secure the clip.
   - Tighten the screws.

3. Install the cowl side trim panel.
   For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Initiate a new control module using T4.

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Vehicle Dynamic Suspension - Air Suspension Reservoir Solenoid Valve Block

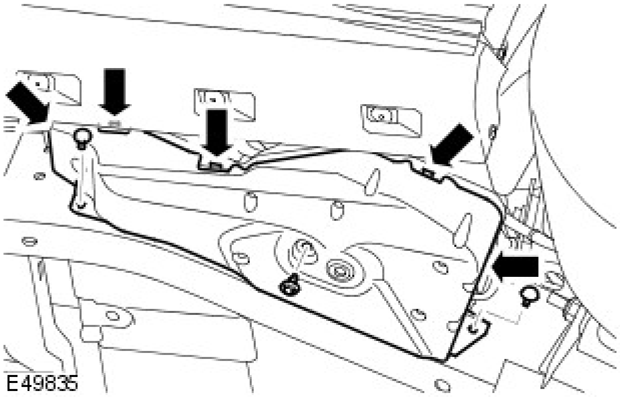
Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

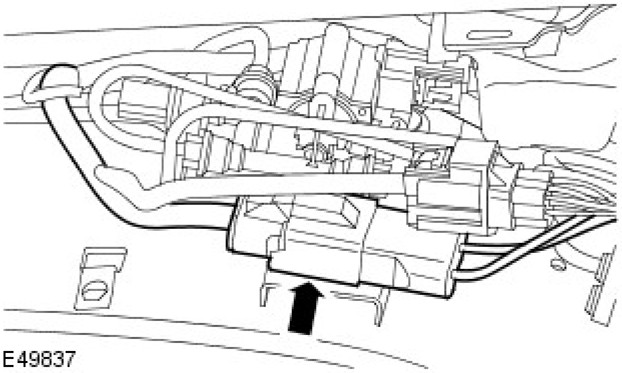
2. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).



E49835

3. Remove the air suspension compressor lower cover.

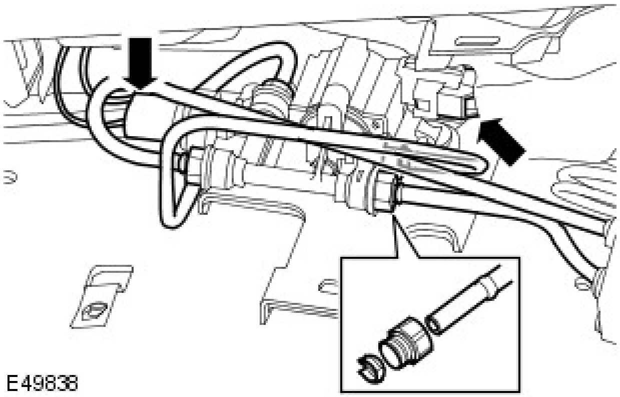
- Remove the 3 bolts.
- Release the 5 clips.



E49837

4. Move the air compressor electrical connector aside.

- Release the 2 clips.



E49838

5. CAUTIONS:

⚠ Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

⚠ Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

• NOTE: Note the air line fitted positions.

Remove the air suspension reservoir solenoid valve block.

- Disconnect the 4 air lines.
- Disconnect the 2 electrical connectors.

- Release the valve block 3 rubber insulators.

6. Remove the Voss connectors.

- Remove and discard the collets and the unions.

Installation

1. ⚠ CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

• NOTE: New air suspension components are supplied with new Voss connectors tightened to the correct torque. Do not install new voss connectors if a new component is being installed.

Install new Voss connectors to the air suspension reservoir solenoid valve block.

- Tighten to 2.5 Nm (1.7 lb.ft).

2. NOTE: Make sure the valve block does not become detached during connection of the air lines.

Install the air suspension reservoir solenoid valve block.

- Secure the 3 valve block rubber insulators.
- Connect the electrical connectors.
- Connect the air lines into the Voss connector.
- Pull on each air line to make sure it is fully installed into the Voss connecter.

3. Secure the air compressor electrical connector.

4. Install the air suspension compressor lower cover.

- Install the bolts and tighten to 10 Nm (7 lb.ft).

5. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

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Vehicle Dynamic Suspension - Air Suspension Compressor

Removal and Installation

Removal

⚠WARNING: Steps 1 and 2 must be carried out within 10 minutes of each other, failure to follow this instruction may result in personnel injury.

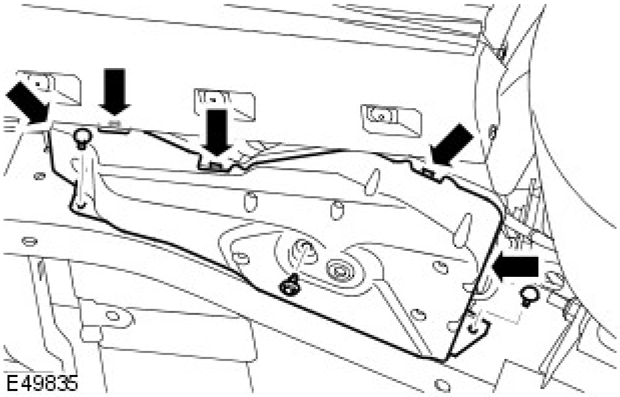
⚠CAUTION: If a new air suspension compressor, air compressor drier or air compressor delivery valve kit is installed due to failure, an air compressor relay must be installed. Failure to follow this instruction may result in damage to the air suspension system components.

1. ⚠CAUTION: Make sure the ignition switch is turned off, the park brake is on and the selector lever is in park position.

Open the front door.

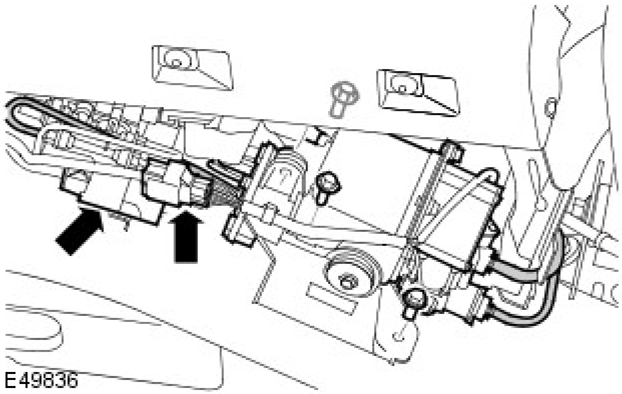
2. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle, make sure at least one of the wheels is off the ground.



3. Remove the air suspension compressor lower cover.

- Remove the bolt.
- Release the 5 clips.



4. ⚠CAUTION: Always plug any open connections to prevent contamination.

• NOTE: Access to the top compressor fixing bolt is very restricted. It is advisable to use a 3/8 inch drive socket with a flexible coupling.

Remove the air suspension compressor.

- Disconnect the 3 air lines.
- Disconnect the 2 electrical connectors.
- Remove the 3 bolts.

Installation

1. CAUTIONS:

⚠ Make sure that the wiring harness and the air suspension pipes are not trapped behind the air suspension compressor bracket.

⚠ Make sure the air suspension compressor upper cover is correctly positioned.

• NOTE: Install the upper retaining bolt, but do not fully tighten, before installing the 2 lower retaining bolts.

Install the air suspension compressor.

- Tighten the bolts to 23 Nm (17 lb.ft).
- Connect the air lines.
- Connect the electrical connectors.

2. CAUTIONS:

⚠ Make sure the air suspension exhaust pipe is correctly located in to the air suspension upper cover.

⚠ Make sure the air suspension compressor upper cover is correctly positioned.

Install the air suspension compressor lower cover.

- Install the bolt and tighten to 9 Nm (7 lb.ft).

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Vehicle Dynamic Suspension - Air Suspension Front Solenoid Valve Block

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

3. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. CAUTIONS:

⚠ Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

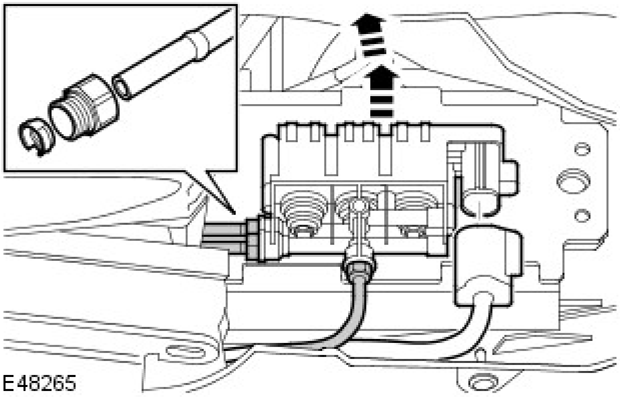
⚠ Visually inspect the air line ends for damage or wear. Replace the air line as necessary.

• NOTE: Note the air line fitted positions.

Disconnect the 3 air lines from the air suspension front solenoid valve block.

5. Remove the air suspension front solenoid valve block.

- Disconnect the electrical connector.
- Release the valve block 3 rubber insulators.



6. Remove the Voss connectors from the air lines.

- Remove and discard the collet and the union.

Installation

1. ⚠ CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

• NOTE: New air suspension components are supplied with new Voss connectors tightened to the correct torque. Do not install new voss connectors if a new component is being installed.

Install new Voss connectors to the air suspension front solenoid valve block.

- Tighten to 2.5 Nm (1.7 lb.ft).

2. NOTE: Make sure the valve block does not become detached during connection of the air lines.

Install the air suspension front solenoid valve block.

- Secure the 3 valve block rubber insulators.
- Connect the air lines into the Voss connector.
- Pull on each air line to make sure it is fully installed into the Voss connecter.
- Connect the electrical connector.

3. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. Install the RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

Published: 01-Dec-2011

Vehicle Dynamic Suspension - Rear Shock Absorber and Air Spring Assembly

Removal and Installation

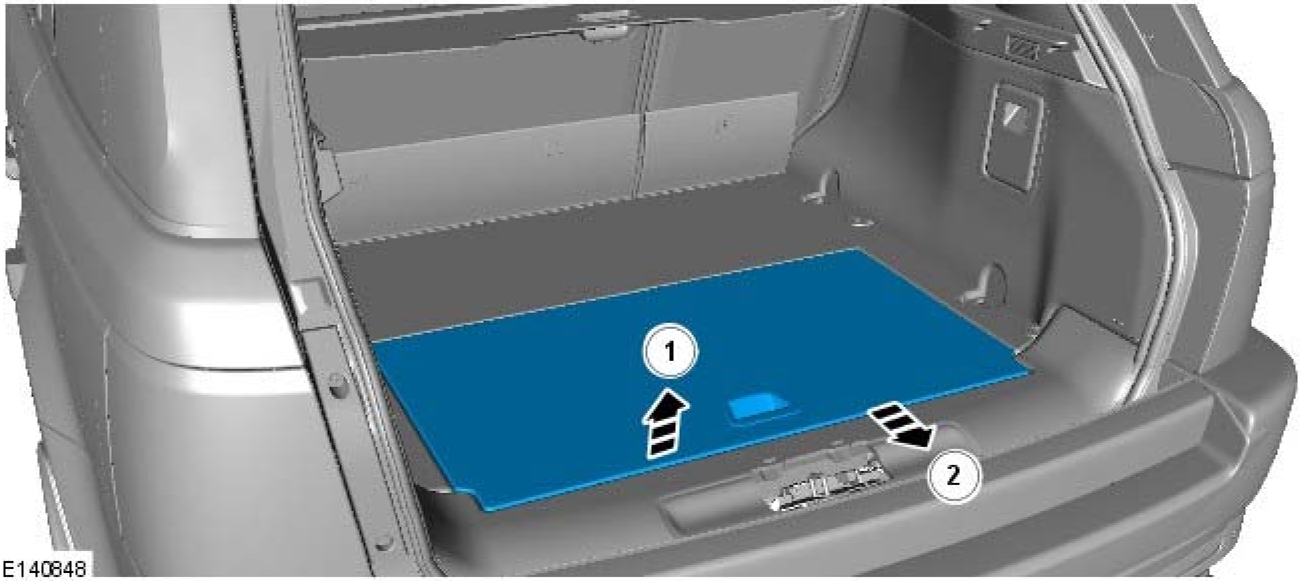
Removal

- NOTE: Only the air spring being removed needs to be depressurised.

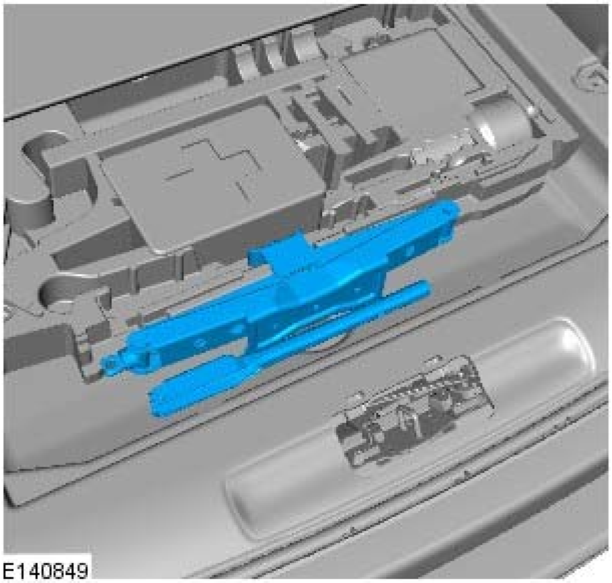
- NOTE: RH illustration shown, LH is similar.

1. Using the Land Rover approved diagnostic system, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

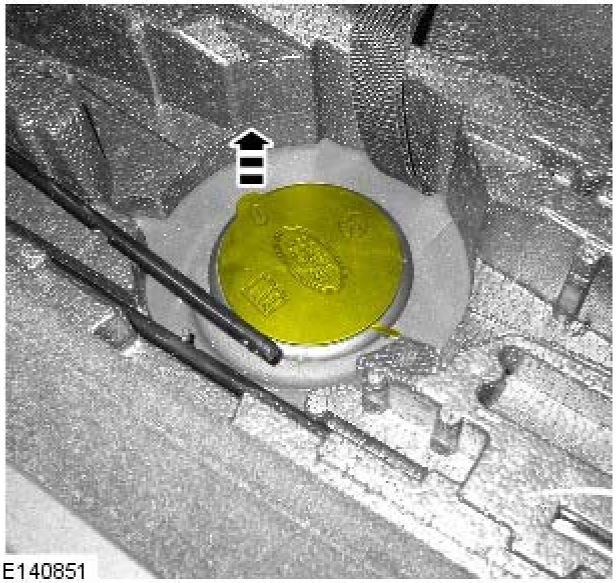
2. Remove the loadspace floor panel.



3. Remove the jack and wheel brace.

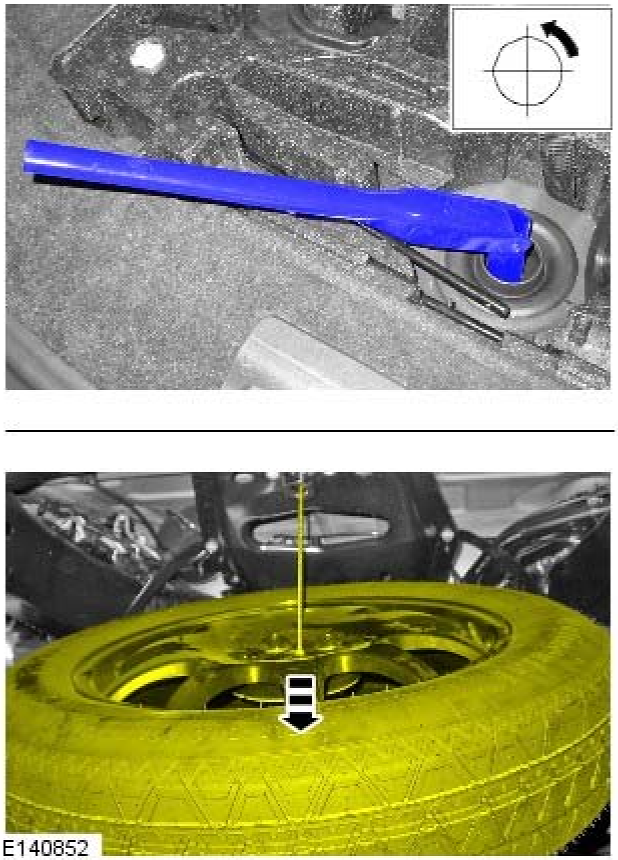


4. Remove the spare wheel/tool compartment cover.



E140851

5. Lower the spare wheel and tire.



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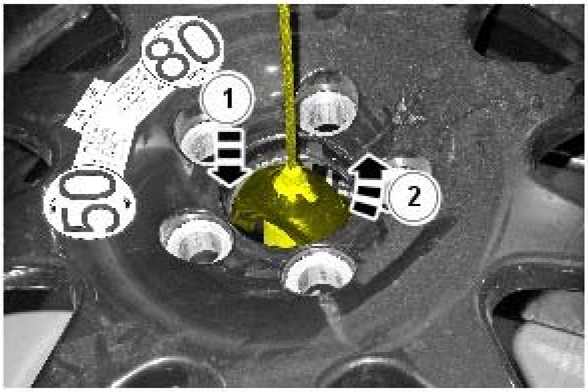


6. Remove the spare wheel.

- Disconnect the spare wheel release strap and position aside.

E140853

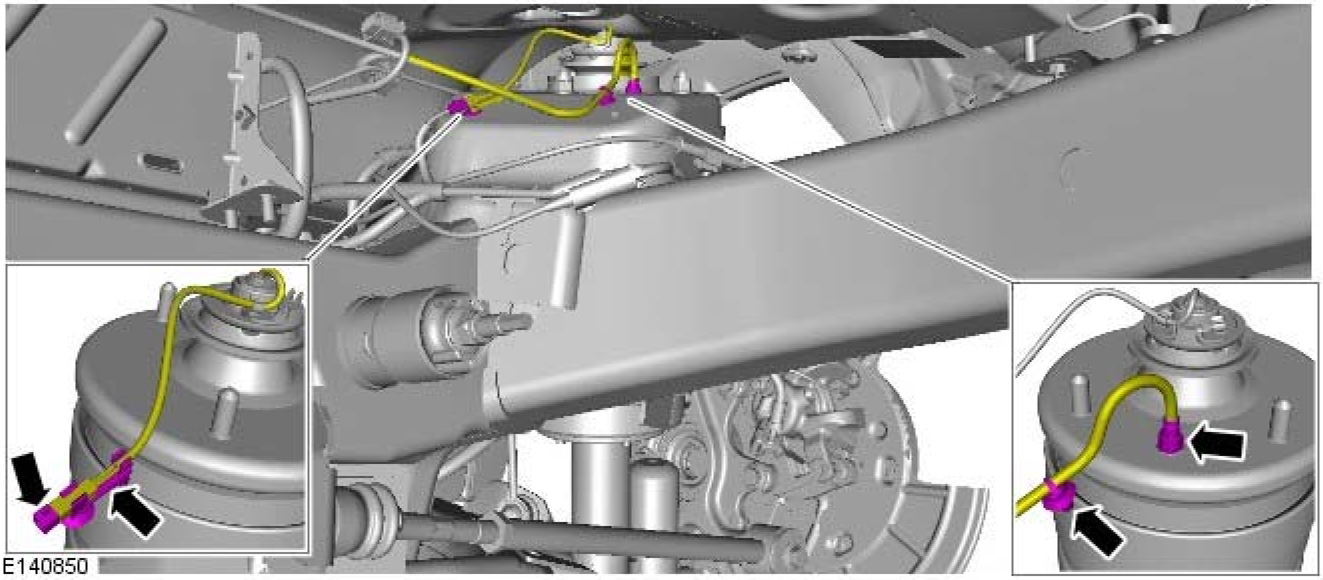
7. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

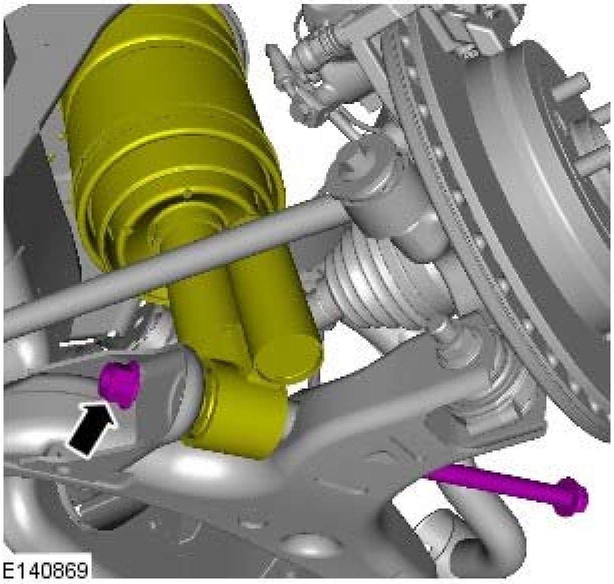
Raise and support the vehicle.

8. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the Voss connector from the air line.

- Remove and discard the collet and the union.
- Disconnect the active damping wiring.

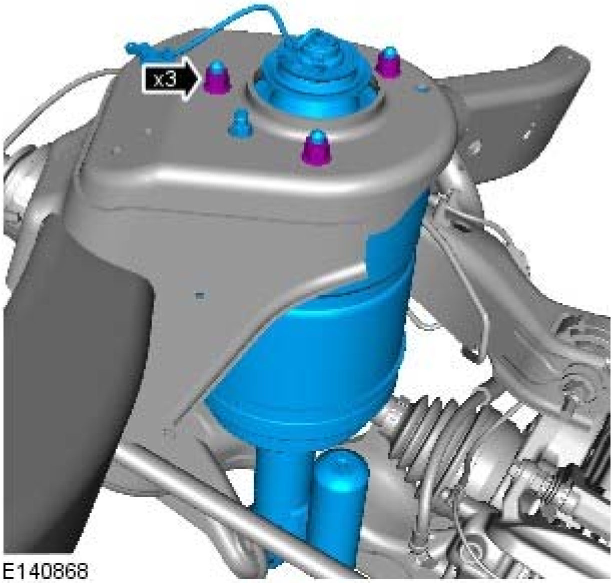




9. Remove the wheel and tire.

10. Disconnect the shock absorber and air spring assembly from the lower arm.

- Remove the nut and bolt.



11. Remove the three shock absorber and air spring retaining nuts.

- Remove the shock absorber and air spring assembly.

Installation

1. Install the shock absorber and air spring assembly.

- Make sure the shock absorber and air spring assembly top mounting to body mating faces are clean.
- Fit the nuts and tighten to 63 Nm (46 lb.ft).
- Connect the air line into the Voss connector.
- Tug on the air line to make sure it is fully installed into the Voss connecter.

2. Connect the shock absorber and air spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

3. ⚠CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

Install a new Voss connector to the air spring.

- Tighten to 3.5 Nm (2.6 lb.ft)
- Attach the active damping wiring.

4. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

5. Lower the vehicle on the lift.

6. Connect the spare wheel release strap to the spare wheel and tire.

7. Install the spare wheel and tire.

- Raise the spare wheel and tire.

8. Install the spare wheel/tool compartment cover.

9. Install the jack and wheel brace.

10. Install the loadspace floor panel.

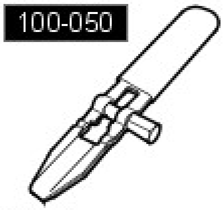
11. Using the Land Rover approved diagnostic system, pressurize

the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

Published: 11-May-2011

Vehicle Dynamic Suspension - Rear Air Shock Absorber

Removal and Installation

Special Tool(s)	
 E51385	Air spring tester 204-538
 E57611	Band-it Thrift tool 100-050 (LRT-99-019)

Removal

- NOTE: This procedure should also be used to remove the rear air spring.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

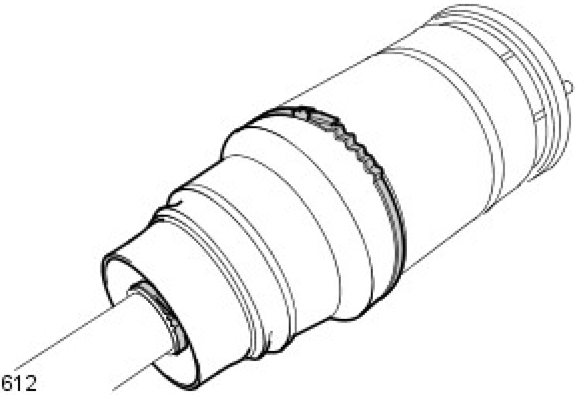
Raise and support the vehicle.

2. Remove the wheel and tire.

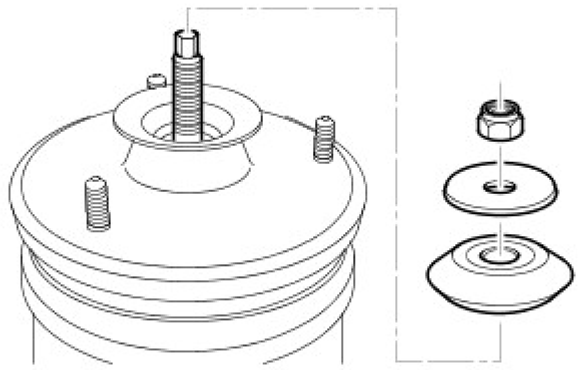
3. Remove the shock absorber and spring assembly.
For additional information, refer to: Rear Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

4. Remove the gaiter.

- Remove and discard the 2 straps.



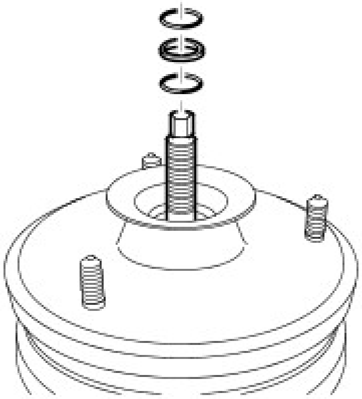
E57612



E51439

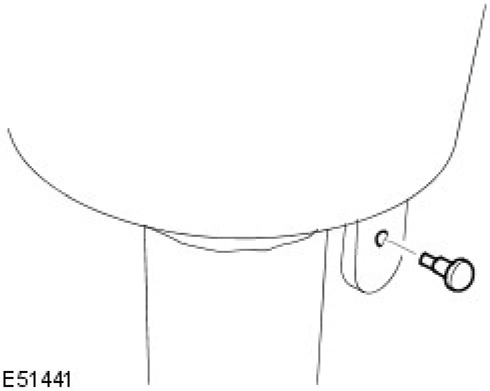
5. Remove the nut, rebound washer and rubber bushing.

- Discard the nut.



E51440

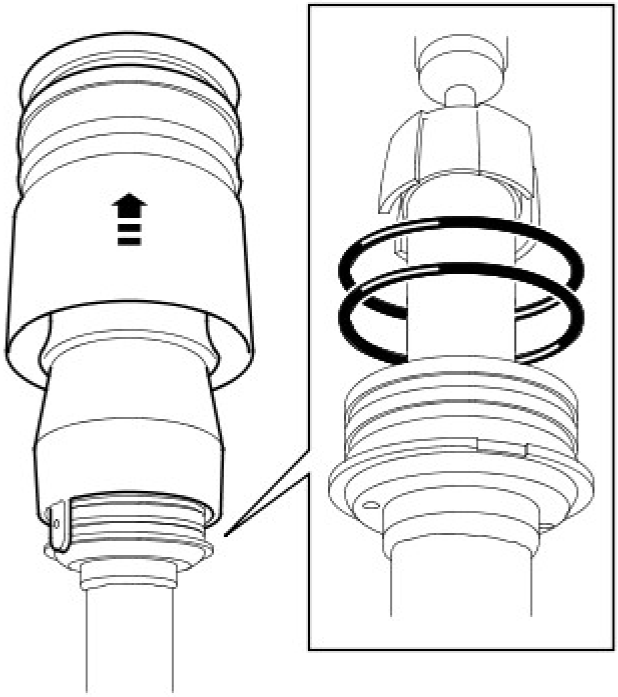
6. Remove and discard the O-ring seals and spacer.



E51441

7. Remove the nylon retaining pin.

8. Remove the rebound plate and spring aid.



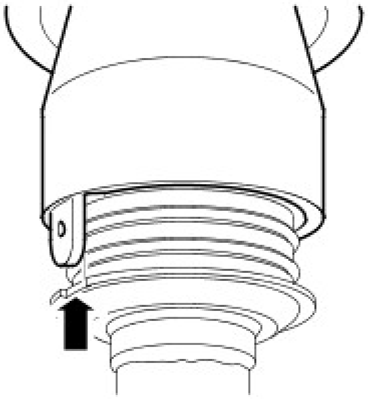
E51442

9. Remove the air spring.
   - Using a soft faced mallet, gently tap the sleeve support upwards to release it from the O-ring seals.
   - Remove and discard the 2 O-ring seals.

10. Remove the shock absorber from the vise.

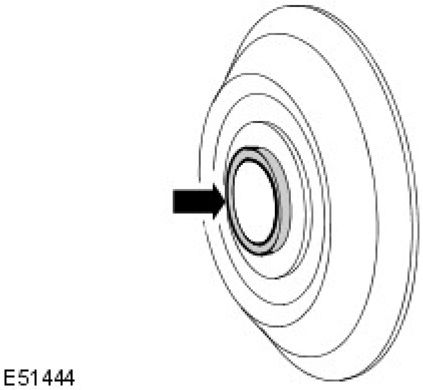
Installation

1. Install the shock absorber in the vise.
2. Clean the components.
3. Lubricate and install new O-rings to the seal carrier.
4. Install the spring aid and rebound plate.
5. Install the air spring.
   - Align the piston with the first O-ring seal, making sure the location tag is correctly aligned.



E51443

6. Install the new O-ring seals and spacer, taking care not to damage the seals.



7. Install the rubber bushing and rebound washer.

- Make sure the formed insert on the bushing is located against the O-ring seal.

8. Install and lightly tighten the nut.

9. CAUTIONS:

⚠ The air supply must be free of any moisture.

⚠ If during disassembly the air sleeve is unrolled, the air sleeve may inflate incorrectly (to one side). If this occurs, release the air pressure, and insert a suitable tool that will not damage the air sleeve or piston (a screw driver handle), into the side opposite the bulge. Inflate and deflate until the air sleeve inflates correctly (the air sleeve will be uniform inside the shroud).

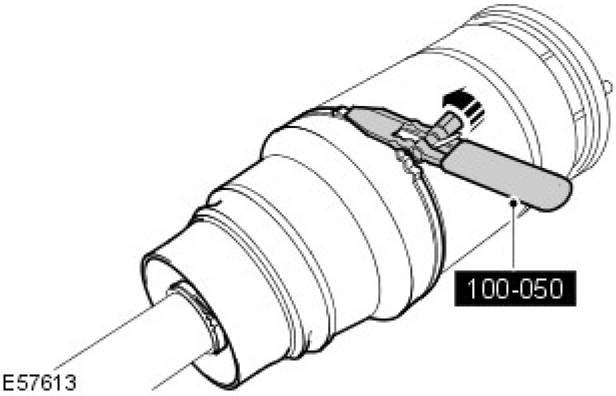
Install the air spring piston over the O-ring seals.

- Using the special tool coupled to a tire inflator with a gauge, apply approximately 2 bar of air pressure to the air spring to fully seat the piston over the O-ring seals.

10. Tighten the top nut to 98 Nm (72 lb.ft).

11. Check the assembly for leaks.

- Inflate the module to 4 bar and check for pressure loss.
- If a leak is suspected, immerse the spring and shock absorber assembly in a tank of water to locate the source of the leak.



12. Install the gaiter.

- Using the special tool, install new straps.

13. Install the shock absorber and spring assembly.
For additional information, refer to: Rear Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

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Vehicle Dynamic Suspension - Air Suspension Rear Solenoid Valve Block

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the LH rear wheel and tire.

3. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. CAUTIONS:

⚠ Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

⚠ Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

• NOTE: Note the air line fitted positions.

Disconnect 3 air lines from the rear valve block.

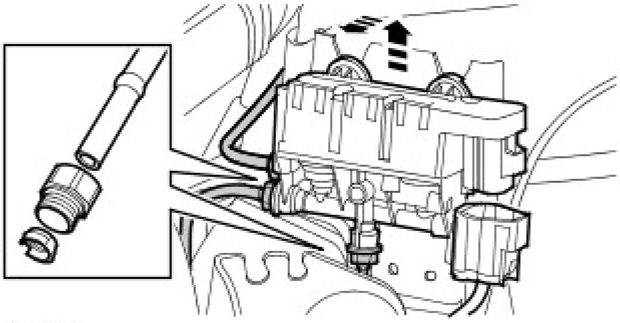
5. Disconnect the electrical connector.

6. Remove the rear valve block.

- Release the valve block 3 rubber insulators.

7. Remove the Voss connectors from the air lines.

- Remove and discard the collets and the unions.



E48266

Installation

1. NOTE: New air suspension components are supplied with new Voss connectors tightened to the correct torque. Do not install new voss connectors if a new component is being installed.

Install new Voss connectors to the rear valve block.

- Tighten to 2.5 Nm (1.7 lb.ft).

2. Install the rear valve block.

- Secure the 3 valve block rubber insulators.
- Connect the electrical connector.

- Connect the air lines into the Voss connector.
- Pull on each air line to make sure it is fully installed into the Voss connecter.

3. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

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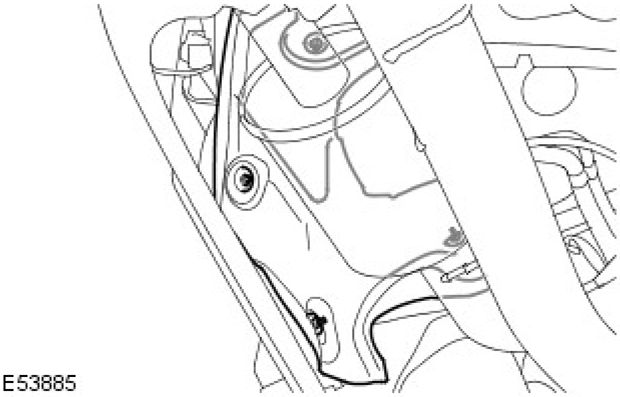
Vehicle Dynamic Suspension - Air Suspension Air Filter

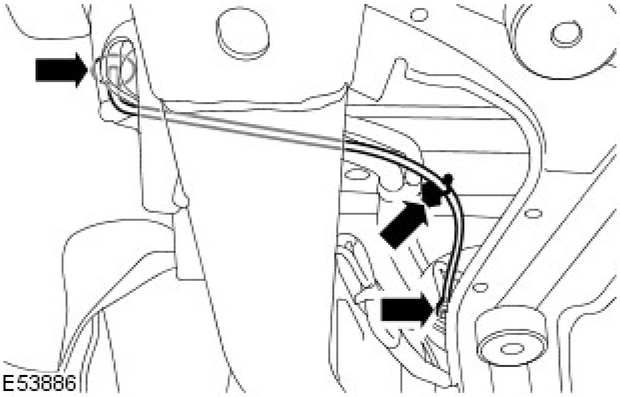
Removal and Installation

Removal

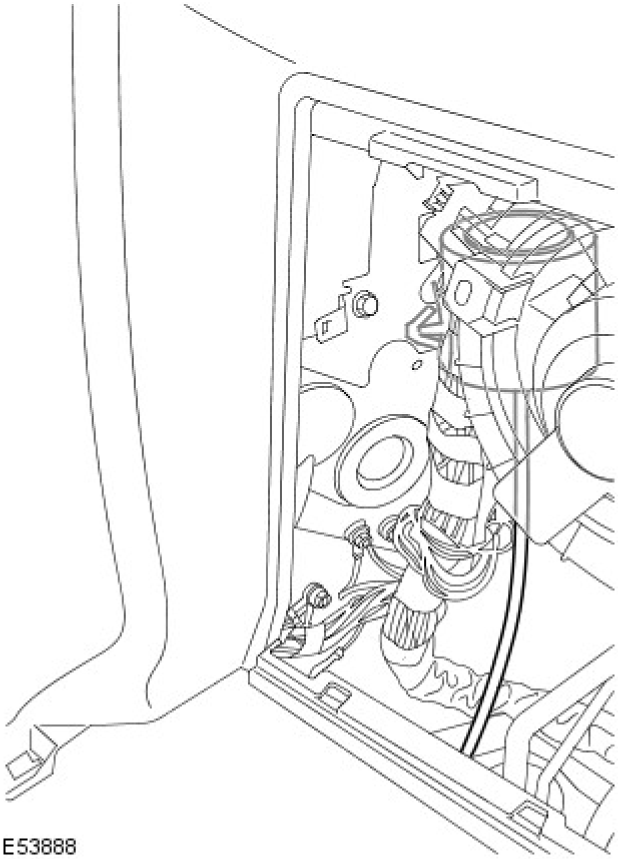
1. Open the liftgate and tailgate.
2. Remove the spare wheel and tire.
3. Remove the 4 nuts securing the LH rear tail pipe heat shield.



4. Reposition the LH rear tail pipe heat shield.
5. Disconnect the air suspension intake filter line.
6. Detach the air suspension intake filter.
   - Release the grommet.
   - Release from the clip.



7. Remove the LH lower rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



8. Remove the air suspension intake filter.

Installation

1. NOTE: Make sure the air suspension air filter retaining clip is fully seated in the vehicle body. An audible click will be heard when the retaining clip is fully seated.

Install the air suspension intake filter.

- Install the grommet.

2. Install the LH rear quarter trim panel.
For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Attach the air suspension intake filter.

4. Connect the air suspension intake filter line.

5. Reposition the LH rear tail pipe heat shield.

- Install the nuts.

6. Install the spare wheel and tire.

7. Close the liftgate and tailgate.

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Vehicle Dynamic Suspension - Air Suspension Muffler

Removal and Installation

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

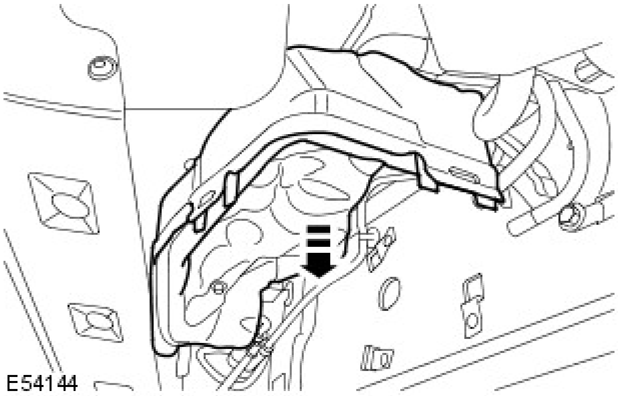
Raise and support the vehicle.

2. Remove the muffler assembly.
For additional information, refer to: Muffler (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

3. Remove the evaporative emissions canister.
For additional information, refer to: Evaporative Emission Canister (303-13B Evaporative Emissions - V8 4.4L Petrol, Removal and Installation).

4. Remove the air suspension compressor.
For additional information, refer to: Air Suspension Compressor (204-05 Vehicle Dynamic Suspension, Removal and Installation).

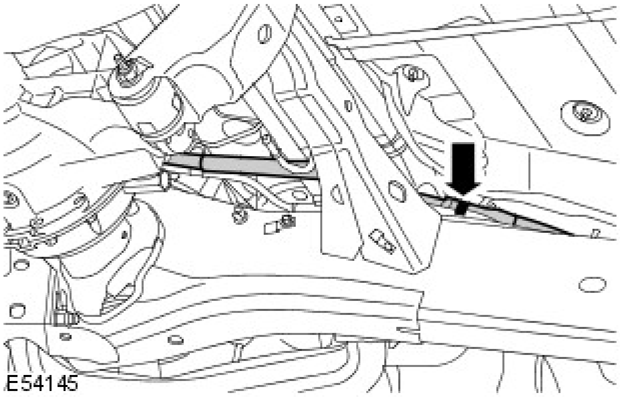
5. Remove the air suspension compressor upper cover.



6. Disconnect the air suspension intake filter pipe.

7. Remove the air suspension muffler.

- Release clip from the air suspension muffler pipe.
- Release the air suspension compressor to air suspension silencer pipes.



Installation

1. Install the air suspension muffler.

- Locate the air suspension muffler pipes.
- Secure the clip.

2. Connect the air suspension intake filter.

3. ⚠CAUTION: Make sure the air suspension compressor upper cover is correctly positioned.

Install the air suspension compressor upper cover.

4. Install the air suspension compressor.
For additional information, refer to: Air Suspension Compressor (204-05 Vehicle Dynamic Suspension, Removal and Installation).

5. Install the evaporative emissions canister.
For additional information, refer to: Evaporative Emission Canister (303-13B Evaporative Emissions - V8 4.4L Petrol, Removal and Installation).

6. Install the muffler assembly.
For additional information, refer to: Muffler (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

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Vehicle Dynamic Suspension - Air Suspension Pressure Sensor

Removal and Installation

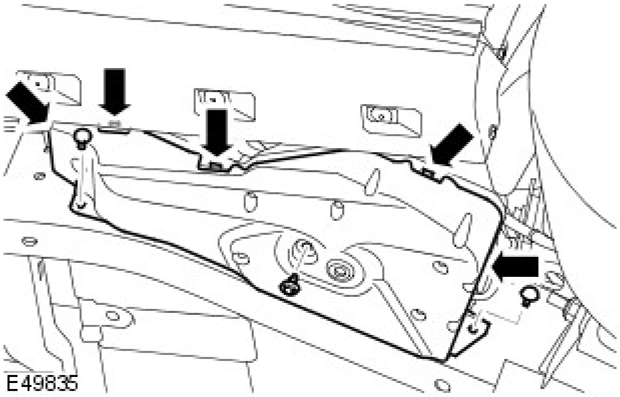
Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the air compressor housing cover.

- Remove the 3 bolts.
- Release the 5 clips.



3. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

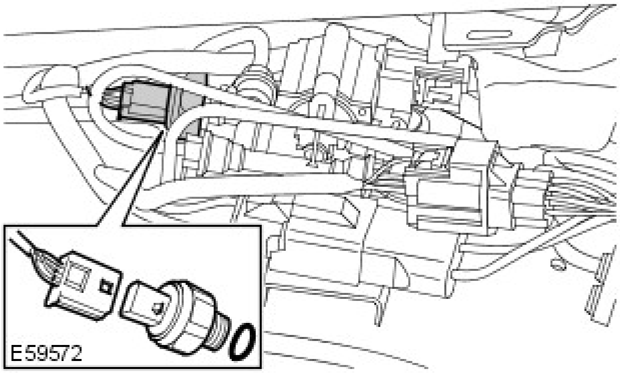
4. NOTE: Make sure the valve block does not become detached during removal of the air pressure sensor.

Disconnect the electrical connector.

5. CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the air pressure sensor.

- Remove and discard the O-ring seal.



Installation

1. NOTE: Make sure the valve block does not become detached during installation of the air pressure sensor.

Install the air pressure sensor.

- Install a new O-ring seal.
- Tighten to 5 Nm (4 lb.ft).

2. Connect the electrical connector.

3. Using T4, pressurize the air suspension.

For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. CAUTIONS:

⚠ Make sure the air suspension compressor upper cover is correctly positioned.

⚠ Make sure the air suspension exhaust pipe is correctly located in to the air suspension upper cover.

Install the air compressor housing cover.

- Install the bolts and tighten to 9 Nm (7 lb.ft).

Ride and Handling Optimization -

General Specifications

Item	Specification
Dynamic Response fluid	Texaco Cold Climate Fluid 33270
Capacity	2.4 Liters (4.2 pints) (2.5 US quarts)
System pressure	Variable between 3-165 bar dependant on lateral acceleration

Torque Specifications

Description	Nm	lb-ft
Dynamic Response actuator bleed screw	15	11
Dynamic Response pump bolts	23	17
Fluid pipe banjo bolt	35	26
Dynamic Response pump drive pulley bolts	22	16
Radiator access panel	10	7
Dynamic Response module	4	3
* Front actuator pipes to valve block nuts	22	16
Valve block bolts	22	16
* Rear actuator pipes to valve block nuts	22	16
Dynamic Response fluid pipe securing bracket nuts/bolts	9	7
Valve block filter access plug	62	46
Body mount bolts	133	98
Upper suspension arm to wheel knuckle nut	70	52
Wheel speed sensor	9	7
Brake caliper to wheel knuckle bolt	275	203
Brake hose bracket bolt	23	17
Fluid lines to actuator bolts	22	16
* Stabilizer bar link nut	175	129
Valve block transducer	25	18
Front stabilizer bar to body clamp bolts	115	85
Rear stabilizer bar to body clamp bolts	62	46
LH stabilizer bar to actuator bolts	120	89

*** New nuts/bolts must be installed**

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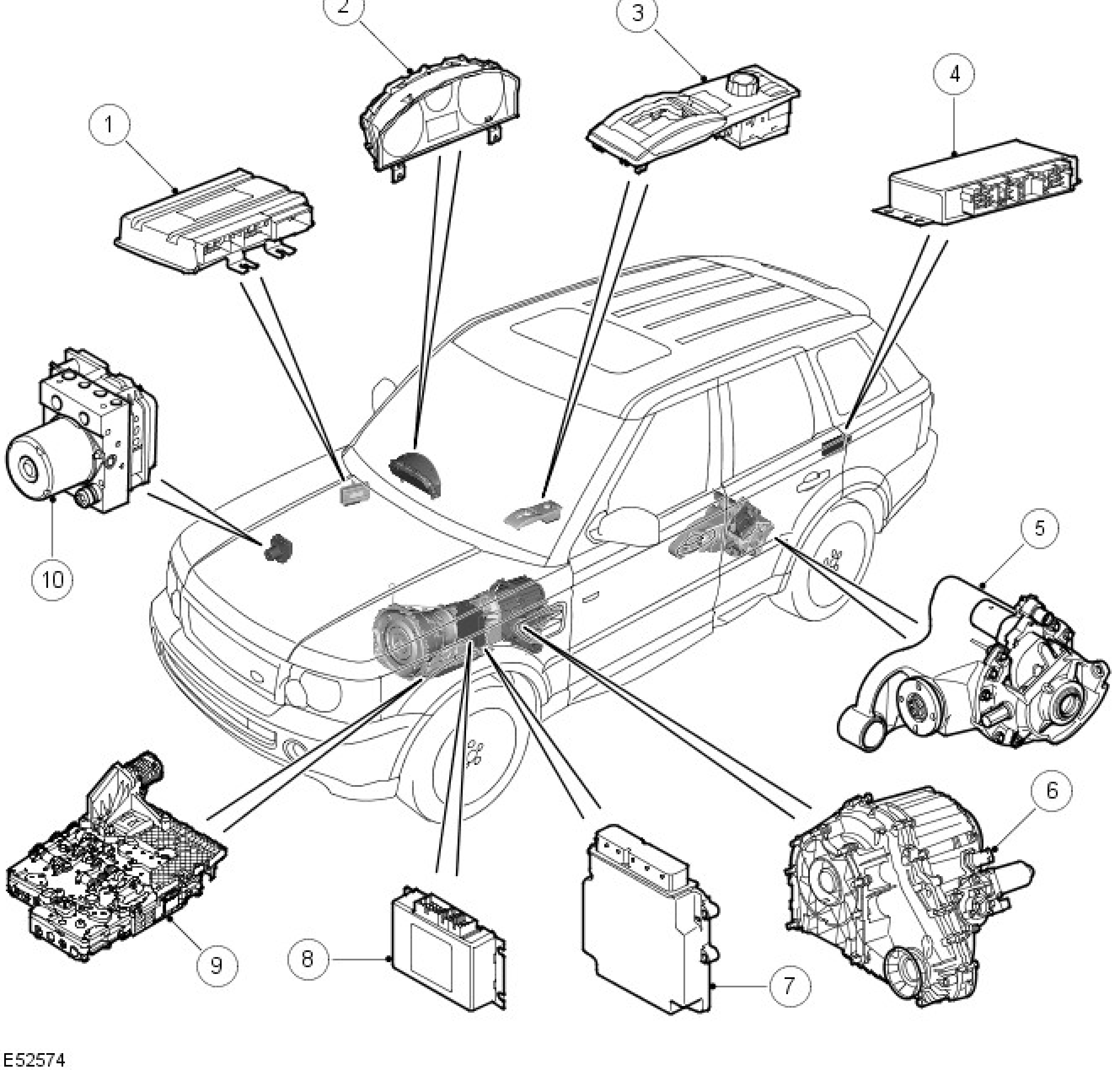
Ride and Handling Optimization - Ride and Handling Optimization

Description and Operation

Terrain Response - Component Location



E52574

Item	Part Number	Description
1	-	Air suspension control module
2	-	Instrument cluster
3	-	Terrain Response rotary control and control module
4	-	Rear differential control module (if fitted)
5	-	Rear differential
6	-	Transfer box (center differential and high/low range)
7	-	Engine control module
8	-	Transfer box control module
9	-	Transmission control module (automatic transmission only)
10	-	ABS module

GENERAL

The Terrain Response™ system allows the driver to select a program which aims to provide the optimum settings for traction and performance for the prevailing terrain conditions. The system cannot be switched off. The 'special programs off' is the default program and covers all general driving conditions. Four specific terrain programs are selectable to cover all terrain surfaces.

The system is controlled by a rotary control located on the center console, rearward of the selector lever (automatic transmission) or gearshift lever (manual transmission). The rotary control allows the selection of one of the following five programs:

- Special programs off
- Grass/Gravel/Snow
- Mud/Ruts
- Sand
- Rock crawl.

The rotary control can be rotated through 360 degrees or more in either direction and selects each program in turn. When Terrain Response is fitted to a vehicle the instrument cluster will display the selected program in the message center.

The Terrain Response system uses a combination of a number of vehicle subsystems to achieve the required vehicle characteristics for the terrain selected. The following subsystems make up the Terrain Response system:

- Engine management system
- Automatic transmission (if fitted)
- Transfer box (center differential)
- Rear differential (electronically controlled)
- Brake system (ABS/DSC/ETC/HDC functions)
- Air suspension.

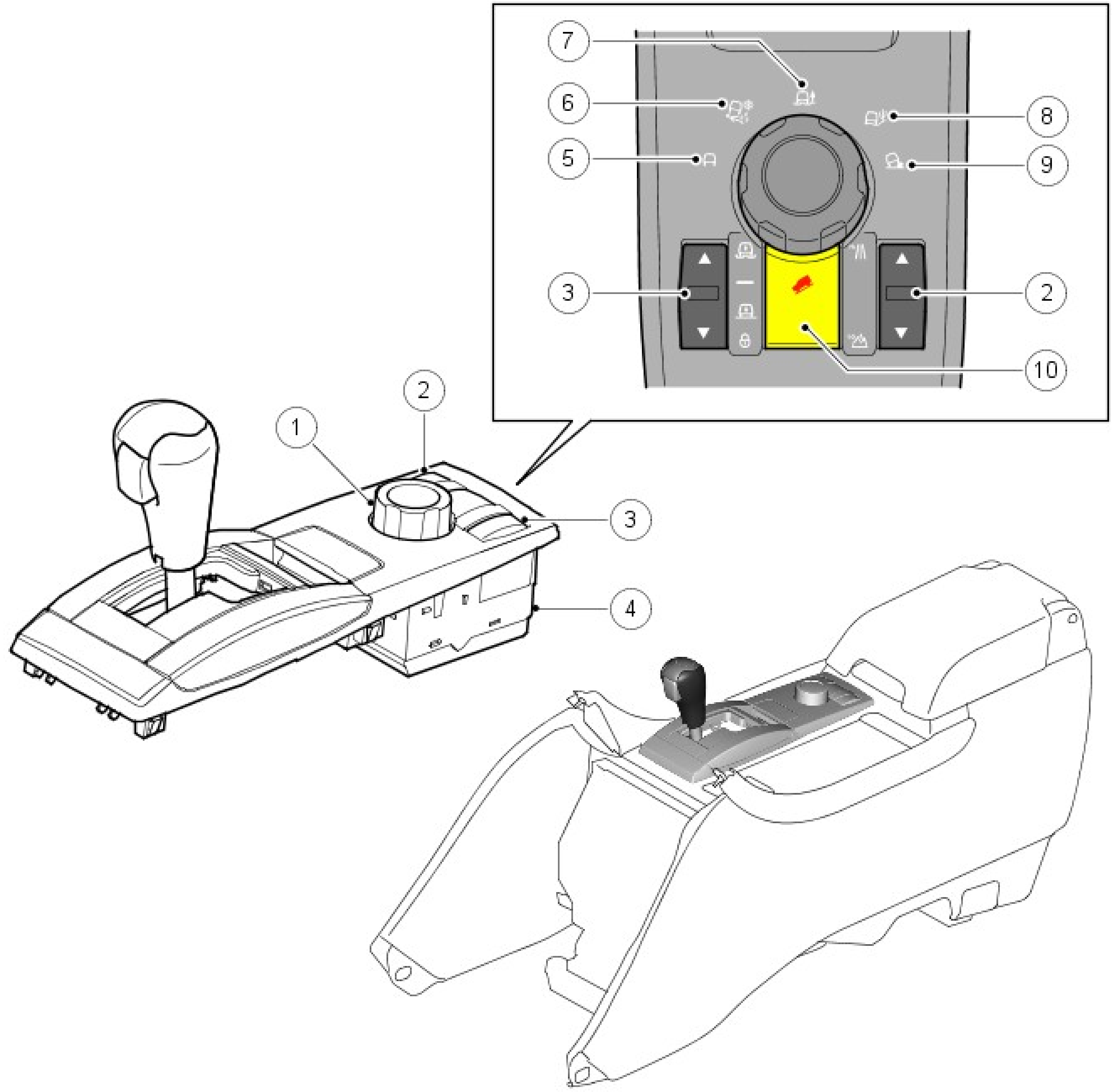
A Terrain Response control module is located below the rotary control. The control module detects the selection made on the rotary control and transmits a signal on the high speed CAN which is received by each of the subsystem control modules.

Each of the affected sub-system control modules contain software which applies the correct operating parameters to their controlled system for the Terrain Response program selection made.

Each sub-system control module also provides a feedback for the selected program so that the Terrain Response control module can check that all systems have changed to the correct operating parameters.

Information is displayed in the instrument cluster message center which informs the driver of improvements which can be made to the vehicle operating parameters to optimise the vehicle for the prevailing conditions. Inexperienced off-road drivers may benefit from the automatic assistance of the Terrain Response system and the driver information. Experienced off-road drivers can select the specific programs for extreme conditions to access control over the vehicle systems (e.g., throttle shift maps or traction settings) which are not accessible on vehicles without Terrain Response.

TERRAIN RESPONSE ROTARY CONTROL AND MODULE



E52575

Item	Part Number	Description
1	-	Terrain Response rotary control
2	-	Transfer box high/low range switch
3	-	Air suspension switch
4	-	Terrain Response control module
5	-	Special programs off
6	-	Grass/gravel/snow program
7	-	Mud/ruts program
8	-	Sand program
9	-	Rock/crawl program
10	-	HDC switch

The Terrain Response rotary control is located in the center console and allows the selection of five operating programs. Each program is denoted by a symbol which represents the terrain encountered. The rotary control can be depressed downwards to lock it in a position flush with the trim surround. A second push of the control releases the lock and the control emerges from the surround allowing it to be rotated.

The rotary control can be rotated to select the required program. The control will only select the last program in its direction of rotation. Further rotation of the control once the last program in either direction has been selected, will have no effect, e.g. once rock crawl has been selected, further rotation in a clockwise direction will have no effect.

The Terrain Response control module is located below the rotary control. The module is connected via a harness connector which also contains the wiring for the HDC switch, the transfer box high/low range switch, the air suspension switch and the switch illumination circuits. The control module and switch uses four of these wires for a 12V battery supply when the ignition switch is in ignition position II, a ground and high speed CAN positive and negative.

TERRAIN RESPONSE OPERATION

The following vehicle subsystem control modules are used for the Terrain Response system:

- Engine management (engine control module)
- Transmission control (transmission control module - automatic transmission only)
- Transfer box control (transfer box control module)
- Rear differential control (rear differential control module - if fitted)
- Air suspension control (air suspension control module)
- Brake system (ABS/DSC/ETC/HDC functions) (ABS module)

Each subsystem operates in different ways in relation to the selected Terrain Response program to achieve the optimum traction, stability and ease of control for the terrain encountered. The system has a safety factor built in which ensures that any program can be safely used on any surface, even when an inappropriate program selection has been made.

Engine Management System (EMS)

The EMS varies the throttle pedal response to control the engine torque output. The EMS can change the throttle maps to change the amount of torque per percentage of pedal travel. The EMS can also change the throttle response to control the allowed torque change relative to the percentage pedal travel.

Each terrain program uses a combination of operating parameters for each subsystem. Changing between terrain programs initiates a different set of operating characteristics which will be noticeable to the driver. The driver will notice differences in engine and throttle response when, for example, the throttle pedal is held in a constant position and the terrain program is changed from grass/gravel/snow to sand, the driver will notice the torque and engine speed increase. If the terrain program is changed from sand to grass/gravel/snow the driver will notice a reduction in torque and engine speed.

• NOTE: The change in torque and engine speed can take approximately 30 seconds and care must be taken not to confuse the Terrain Response system operation with an EMS fault.

Transmission Control

The transmission control module changes the shift maps for the Terrain Response program selected. This changes the shift points providing early or late upshifts and downshifts.

On slippery surfaces the transmission will select 2nd gear in high range or 3rd gear in low range for starting from a standstill to minimise wheel slip. In muddy conditions the transmission will provide maximum torque output from the transmission. In sand the transmission will provide an output which passes maximum engine power from the transmission.

In rock crawl special program (low range) the transmission will select 1st gear for driving off.

Sport mode is only available when the general program is selected and the transfer box is in high range. Sport mode is disabled in low range and all Terrain Response special programs. CommandShift™ is available in any program and also in high or low range.

If the transmission is in 'Sport' mode and a special program is subsequently selected, the transmission will automatically change to manual 'CommandShift™' mode. If a special program is already selected and the transmission selector lever is moved from drive 'D' to the 'Sport' mode position, the transmission will automatically change to 'CommandShift™' mode.

Transfer Box and Rear Differential Control

The transfer box electronically controlled differential and the rear electronically controlled differential (if fitted) are treated as one system. The electronic rear differential is an optional fitment on vehicles fitted with the Terrain Response system. The differential control has two operating strategies; pre-emptive and reactive.

The pre-emptive strategy anticipates and predicts the locking torque value required for each differential to minimise slip and maximise stability. Each Terrain Response program has a different threshold and input criteria for the pre-emptive strategy. The pre-emptive strategy improves vehicle traction and composure by avoiding wheel spin. This is achieved by anticipating the amount of differential lock required for the program selected. For example, a high locking torque would be applied for rock crawl or slippery surfaces.

The reactive strategy varies the amount of locking torque in response to the actual slip level and the dynamic behaviour of the vehicle. Each Terrain Response program has a different threshold and input for the reactive strategy. The reactive strategy improves vehicle traction and composure by eliminating any wheel spin which has occurred after the pre-emptive strategy was applied. The locking response applied is applicable to the terrain program selected, for example, very sensitive on slippery surfaces to provide maximum traction and minimise surface damage.

The locking torque calculations use various signals from other subsystems, for example, engine torque, throttle position, selected gear, steering angle, vehicle speed, lateral acceleration and yaw behaviour.

The Dynamic Stability Control function of the ABS system can override the Terrain Response differential control and reduce any applied locking torque during DSC action.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

Air Suspension Control

The air suspension control module contains a strategy which provides automatic switching between normal and off-road heights. Changes in vehicle height settings will be relayed to the driver via the instrument cluster message center and LED illuminated icons on the switch. The automatic selection and deselection of the vehicle height provides automatic increase and decrease in ground clearance and aims to provide maximum benefit to the selected terrain program.

On a vehicle fitted with a correctly installed, Land Rover approved trailer socket, if an electrical load is sensed on the trailer socket, height changes are prohibited and the message center displays a message advising that a trailer is connected and off-road height is not automatically selected. The driver can raise the suspension manually using the air suspension switch.

• NOTE: The prohibiting of the automatic ride height selection is only operational if a Land Rover approved trailer socket is fitted and an electrical load is sensed on the socket.

ABS Control

The ABS module controls several vehicle functions and adjusts the operating parameters of these functions to optimise the selected Terrain Response program.

Traction control uses different slip/acceleration thresholds to improve traction and vehicle composure. For example, the system sensitivity is increased on slippery surfaces to reduce wheel spin.

If DSC is switched off (with the DSC switch on the instrument panel) when using a Terrain Response special program, if the special program is subsequently changed for a different program DSC is automatically switched back on.

The stability control uses different threshold values for the selected program to automatically reduce DSC intervention, removing the requirement for the driver to disable the DSC system in order to reduce engine intervention which is sometimes induced in extreme off-road conditions. In extreme sand conditions, there may be an additional benefit of disabling the DSC function using the DSC switch on the instrument panel in addition to selecting the sand program.

HDC is automatically switched on or off and target speeds are adjusted in response to the Terrain Response program selected. The responsiveness of the HDC function is also increased where required.

Automatic operation of HDC aims to assist the driver by switching the system on or off when it is of most benefit. Target speeds for HDC operation are also adjusted according the vehicle operating conditions.

Incorrect Program Usage

Selection of an inappropriate program is discouraged in the following ways:

- The active program icon is continually displayed in the instrument cluster message center
- The Terrain Response control module 'locks' out certain functions in some programs, e.g. ,
    - cruise control is only available with the special programs off or grass/gravel/snow program
    - transmission 'Sport' mode is deactivated in all special programs.
- In any special program, except the grass/gravel/snow program, when the ignition has been in the off position, continually for more than six hours, the Terrain Response system defaults to the Special Programs off. When in the grass/gravel/snow program, the Terrain Response system will never default to the Special Programs off. This is to allow for drivers in cold climates where continuous use of the grass/gravel/snow program would be beneficial.
- The rock crawl program is only available with the transfer box in low range.

Selection of an inappropriate program for the terrain conditions will not endanger the driver or cause damage to the vehicle. Continued use of an inappropriate program may reduce the life of some components. The driver may notice reduced vehicle response, with the engine and transmission being less responsive than in the special programs off. Also, in some programs, HDC will remain on, signified by illumination of the HDC indicator in the instrument cluster. The driver may also notice torque 'wind-up' in the center and rear differentials causing a 'braking' effect when the vehicle is manoeuvred in some special programs.

The use of the special programs in the Terrain Response system is monitored by the Terrain Response control module which records the mileage and time the vehicle has operated in a specific program in high and low range. This information can be retrieved using T4 and used by the dealer technician to check customer concerns, e.g. high fuel consumption which may be due to continued use of a certain program.

Driver Information

The instrument cluster contains a message center which displays vehicle information to the driver. The message center contains the Terrain Response program icons which display the currently selected program. If no symbol is displayed, no special program is selected and the system is in special programs off.

Any required changes to the subsystems are also passed to the driver in the form of indicator illumination in the instrument cluster or appropriate messages in the message center, HDC off or air suspension height change for example.

In certain operating conditions, the Terrain Response system also displays advice or warning messages to ensure the driver is using the vehicle to its full potential, e.g.,

- Steering angle is displayed in the message center to avoid driving in deep ruts with steering lock applied
- gear information is displayed to recommend a gear for slippery conditions
- if the system automatically provided off road ride height, but the driver subsequently lowers the vehicle to normal height, then the system may advise that this will cause a risk of grounding.

The messages which can be displayed in the instrument cluster message center are detailed in the Information and Message Center section.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

DIAGNOSTICS

The Terrain Response control module stores information on detected Terrain Response faults and CAN errors which can be interrogated using T4. The Terrain Response sub-systems and the instrument cluster also store fault information relating to CAN errors from the Terrain Response control module.

The control module also stores the miles travelled and time elapsed in high range for the individual programs and in low range for use of all programs which can also be retrieved using T4. This information aids diagnosis of the Terrain Response system and also provides an indication of Terrain Response system abuse by the driver which can lead to premature component failure.

Terrain Response System Fault Diagnosis

Terrain Response relies on the correct functionality of the five sub-systems. If one of the sub-systems develops a fault, the Terrain Response system will not function, even though the fault is not in the Terrain Response system. The Terrain Response control module and rotary control should only be investigated if there are no apparent faults in any of the sub-systems. If a fault in a sub-system is subsequently corrected, the Terrain Response system will function normally after an ignition on and off cycle.

Terrain Response Sub-System Faults

If a fault occurs in a sub-system, the driver is alerted by the illumination of a warning indicator and/or an appropriate message for that sub-system in the instrument cluster message center. There will be no warning of a Terrain Response system fault.

When a sub-system fault is present and the driver attempts to select a different Terrain Response program using the rotary control or at the next ignition on cycle, a message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' will appear in the message center. This implies that the Terrain Response system has a fault, but only because a sub-system fault is preventing its operation. This message will be displayed for 5 seconds per ignition cycle, but is repeated if a further selection is made by the driver using the Terrain Response rotary control or at the next ignition on cycle.

• NOTE: The message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' can also be generated by a fault in the Terrain Response rotary control or control module. See following section for details of rotary control or control module faults.

It is not possible for the Terrain Response control module to cause any fault behaviour (warning indicator illumination or message generation) in any of the five sub-systems. Illumination of a sub-system warning indicator and/or a sub-system related message will never be associated with a Terrain Response control module or Terrain Response system fault.

The sub-system control modules can detect a fault with the CAN signal from the Terrain Response control module. If a fault in the Terrain Response system is detected, the sub-system control modules will operate in the 'special programs off' setting. The sub-system control modules will record a fault code for a failure of the Terrain Response CAN signal. These faults can be retrieved using T4 and will provide useful information to indicate investigation of the Terrain Response control module or the CAN network.

Terrain Response Rotary Control or Control Module Fault

If a fault occurs in the Terrain Response rotary control, all rotary control icon amber LEDs will be turned off (background illumination will remain on) and rotation of the rotary control is ignored. The instrument cluster message center will display a message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' when the fault occurs, if the fault is present and the driver attempts to select a special program (if the control module is able to do this) or at the next ignition on cycle.

If a failure of a rotary control icon amber LED occurs, the Terrain Response system will still function. Any selected special program will default to 'special programs off' at every ignition on cycle, with the exception of the grass/gravel/snow program.

The Terrain Response rotary control and the control module are an integral unit. If a fault occurs in either component, the whole unit will require replacement.

CAN Faults

If a CAN fault exists and prevents Terrain Response system operation, all of the Terrain Response rotary control icon LEDs will be illuminated and rotation of the rotary control is ignored.

If the instrument cluster does not receive a Terrain Response system CAN message from the Terrain Response Control module, the message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' will be displayed when the fault occurs and will be repeated at every ignition on cycle.

User Error

The following incorrect usage of the system may be misinterpreted as a system fault:

- Engine not running - Program changes and driver advisory messages are only available with the engine running
- Rock crawl program selected but transfer box in high range
- Special program change attempted with DSC or ABS active (this includes ABS cycling which is operational when HDC is being used on slippery or loose surfaces).
- Special program change attempted with overheat condition present on center or rear differential.

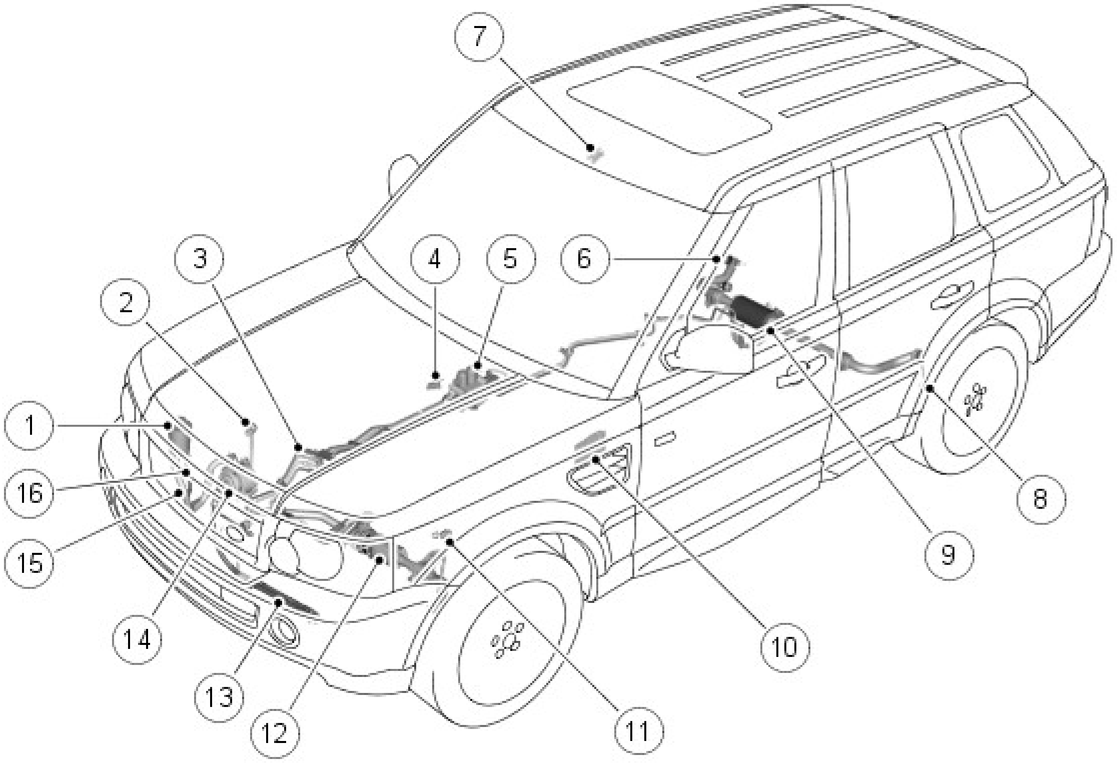
Published: 11-May-2011

Ride and Handling Optimization - Active Stabilization System

Description and Operation

Dynamic Response Component Location

• NOTE: Left Hand (LH) drive TdV6 shown, other models similar



E56396

Item	Part Number	Description
1	-	Reservoir
2	-	Right Hand (RH) front stabilizer link
3	-	Pipe set
4	-	Lower accelerometer
5	-	Valve block
6	-	RH rear stabilizer link
7	-	Upper accelerometer
8	-	LH rear stabilizer link
9	-	Rear actuator and stabilizer bar
10	-	Dynamic response control module
11	-	LH front stabilizer link
12	-	Front actuator and stabilizer bar
13	-	High pressure hose
14	-	Pump
15	-	Return pipe - valve block to reservoir
16	-	Feed pipe - reservoir to pump

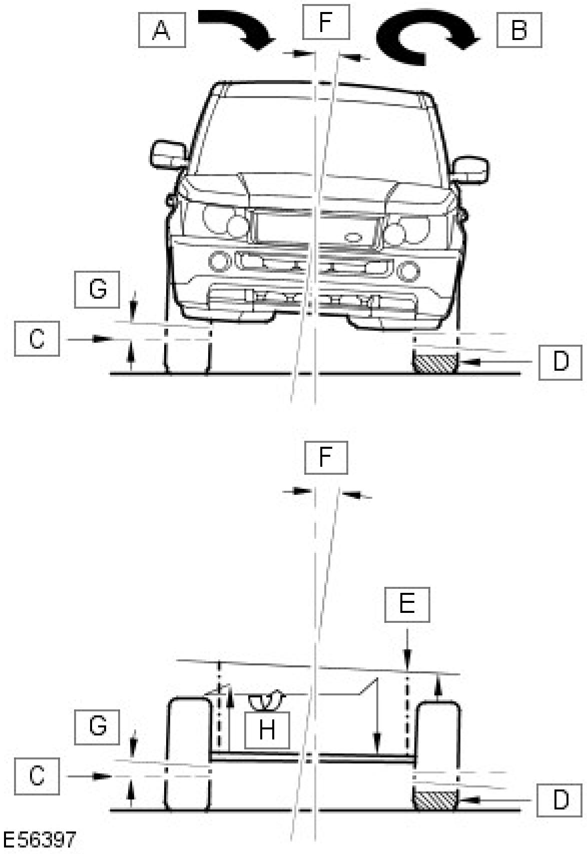
OVERVIEW

The Dynamic Response system provides improved vehicle handling and ride characteristics and is active for both on and off-road driving.

The Dynamic Response system uses two accelerometers to detect vehicle cornering forces and inputs from the steering angle sensor to supply data to a dynamic response control module. The control module then operates solenoid valves in a valve block which apply hydraulic pressure to actuators fitted to the front and rear stabilizer bars. The application of hydraulic pressure to the actuators applies a specified amount of torque to the stabilizer bars to counteract the cornering forces and minimize vehicle body roll.

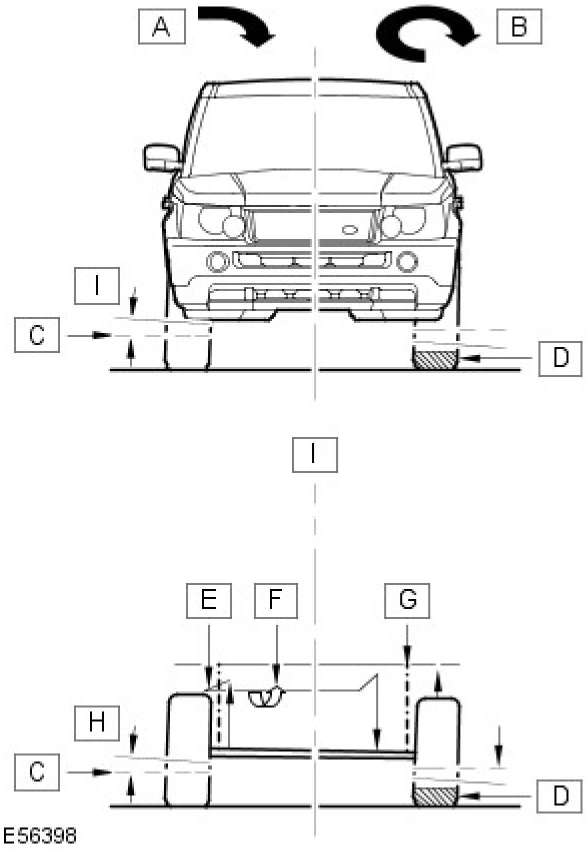
The following illustrations demonstrate the difference in body angle between a conventional 'passive' (non-Dynamic Response) stabilizer bar vehicle and a vehicle fitted with the Dynamic Response system.

Conventional 'Passive' Stabilizer Bar



Item	Part Number	Description
A	-	Direction of travel - Right hand bend
B	-	Body roll
C	-	Drive line roll
D	-	Tire squash
E	-	Dampers
F	-	Body roll angle
G	-	Drive line roll angle
H	-	Direction of stabilizer bar twist

Dynamic Response System



Item	Part Number	Description
A	-	Direction of travel - Right hand bend
B	-	Body roll
C	-	Drive line roll
D	-	Tire squash
E	-	Stabilizer bar
F	-	Direction of stabilizer bar twist
G	-	Dampers
H	-	Drive line roll angle
I	-	Reduced body roll with Dynamic Response system

The Dynamic Response system is electrically and hydraulically operated. Electrical and hydraulic operation is controlled by the Dynamic Response control module which is located on the driver's side 'A' pillar, behind the instrument panel.

The Dynamic Response system comprises front and rear stabilizer bars with integral actuators, two accelerometers, a control module, a hydraulic pump, a valve block and a fluid reservoir.

The Dynamic Response system prevents body roll with cornering forces of up to 0.4 g. From 0.4 g there is a progressive increase in body roll but significantly lower than on a 'passive' system. A 'passive' system will have a progressive increase in body roll angle as soon as cornering forces are applied and will have a greater roll angle than the Dynamic Response system for the same cornering force.

The Dynamic Response system can also detect when the vehicle is driven off-road. If off-road conditions are detected and the vehicle is traveling at 25 mph (40 km/h) or less, the control module will reduce roll compensation. On side slopes of more than 11 degrees the Dynamic Response system will switch to a 'locked bars' condition at slow speed.

Lateral acceleration of the body is sensed by two accelerometers and signals from these are transmitted to the control module. The engine driven hydraulic pump supplies a constant hydraulic flow to the valve block. Two directional control valves are solenoid operated by the control module and supply hydraulic pressure to the applicable side of each actuator to apply a force equal to and opposite to the force applied to the stabilizer bar. In operation the Dynamic Response system maintains the attitude of the vehicle body when cornering.

The Dynamic Response hydraulic system uses a semi-synthetic hydraulic fluid which is the same fluid used in the power steering system. The total capacity of the Dynamic Response system is 2.50 liters (0.66 US gallons).

⚠ CAUTION: The Dynamic Response hydraulic system is extremely sensitive to the ingress of dirt and debris. The smallest amount can cause the system to become unserviceable. It is imperative that the following precautions are followed:

- Dynamic Response components are thoroughly cleaned externally before work commences
- All opened pipe and component ports are capped immediately
- All fluid is stored in clean containers.

In the event of a control module or hydraulic failure the system will 'fail-safe' to a 'locked bars' condition. The 'locked bars' condition will allow the stabilizer bars to operate in a similar manner as conventional 'passive' stabilizer bars. Prolonged cornering forces will allow a progressive increase in roll angle due to hydraulic leakage through the actuators and valve block. Failures of the system are relayed to the driver by illumination of the air suspension/dynamic response warning indicator in the instrument cluster, an audible warning chime and a message displayed in the instrument cluster message centre. Faults are recorded by the control module and can be retrieved using a Land Rover approved diagnostic system.

When the ignition switch is moved to position II, the warning indicator is illuminated for two seconds to check functionality. The warning indicator functionality can also be checked using a Land Rover approved diagnostic system.

A Land Rover approved diagnostic system must also be used to perform a bleeding procedure after repair or maintenance operations have been performed. This is to ensure that the system is completely free from air. Trapped air in the system can significantly reduce system performance.

FLUID RESERVOIR

The fluid reservoir is located in the front right hand side of the engine compartment. The reservoir is attached to the front of air cleaner housing by two slotted rails which positively locate the reservoir.

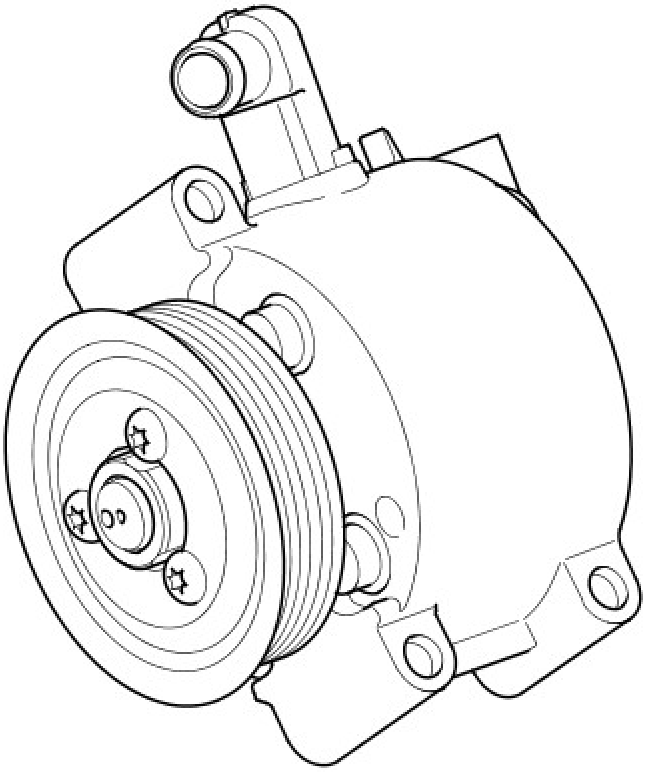
The reservoir is a moulded plastic container with a threaded neck which is fitted with a sealed cap. Two connections on the bottom of the reservoir provide for connection of the feed pipe to the pump and the return pipe from the valve block.

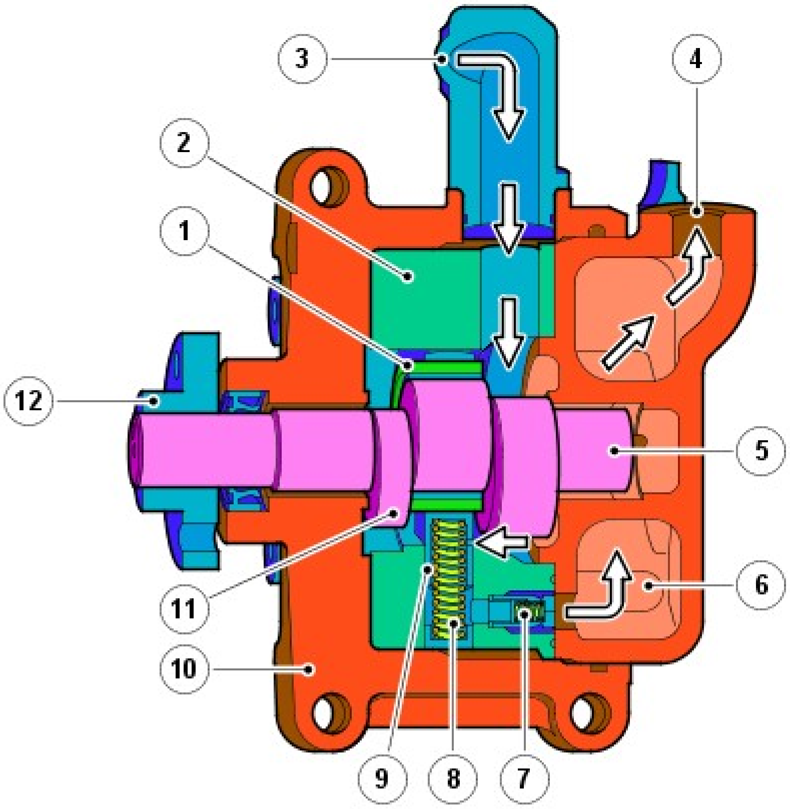
A non-serviceable filter assembly is fitted to the base of the reservoir. The filter is made from a fine nylon mesh which is moulded into the bottom of the reservoir. The filter removes particulate matter from the fluid before it is drawn into the pump.

Upper and lower fluid level marks are moulded onto the reservoir body. The capacity of the reservoir to the upper level mark is 0.4 liter (0.11 US gallon).

DYNAMIC RESPONSE PUMP

The Dynamic Response hydraulic pump is located on the RH side of the engine. The pump is attached to a mounting bracket below the generator on TdV6 and TdV8 engines and above the generator on V8 petrol engines. On both engines the pump is driven by the accessory drive belt from the crankshaft.





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E56399

Item	Part Number	Description
1	-	Cam ring
2	-	Cylinder housing
3	-	Inlet port
4	-	Outlet port
5	-	Shaft

6	-	Silencer volume
7	-	Discharge valve
8	-	Piston spring
9	-	Piston
10	-	Housing
11	-	Counter balance
12	-	Pulley attachment flange

The hydraulic pump is driven at approximately 1.7 times crankshaft speed by the auxiliary drive belt. The pump is a radial piston type which delivers fluid at high pressures.

The radial pump has eight pistons located in bores in a cylinder housing. A balanced central shaft, which is driven by a pulley and the auxiliary drive belt, has a cam which operates the pistons as the shaft rotates.

As the cam lobe reaches each piston, the piston is pushed outward, moving the fluid above the piston. The pressure created by the fluid flow from the bore opens a spring loaded discharge valve. When the valve opens, the now pressurized fluid flows, via the silencer volume area of the cylinder housing, to the outlet port. The silencer volume assists with damping out operating noise from the pump. When the piston reaches its full stroke, the flow reduces and the discharge valve closes under spring pressure.

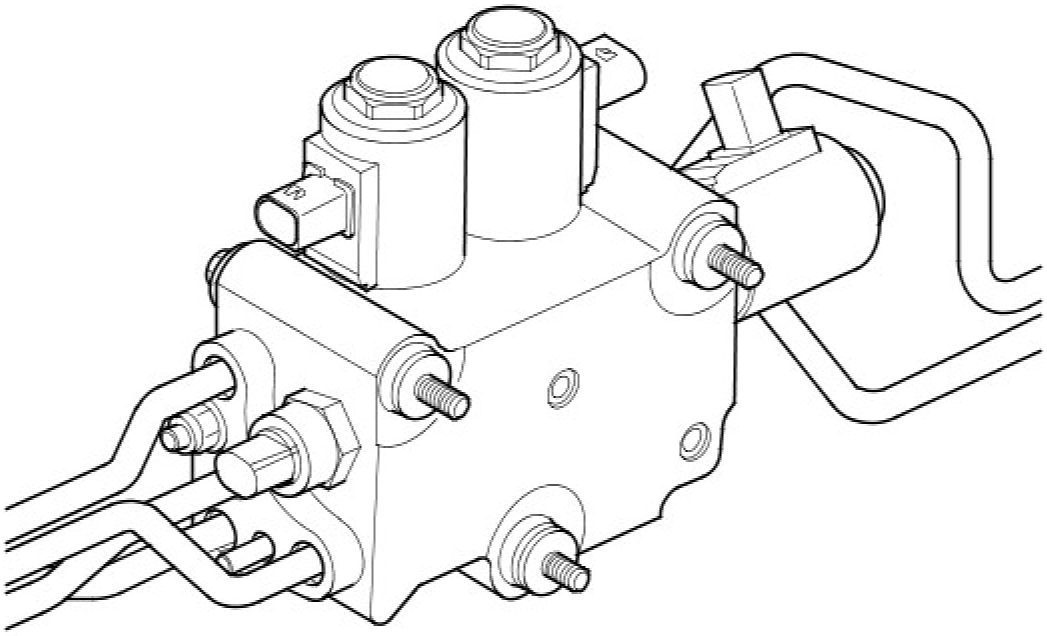
As the cam lobe moves away from the piston, a spring pushes the piston down the bore, creating a vacuum above the piston. As the piston moves down the bore, ports in the piston are exposed and connect with the fluid inlet port. The vacuum draws fluid into the piston filling the piston and the chamber above it. As the piston is again pushed upwards, the ports in the piston are closed off by the bore and the pressurized fluid opens the discharge valve and flows to the outlet port.

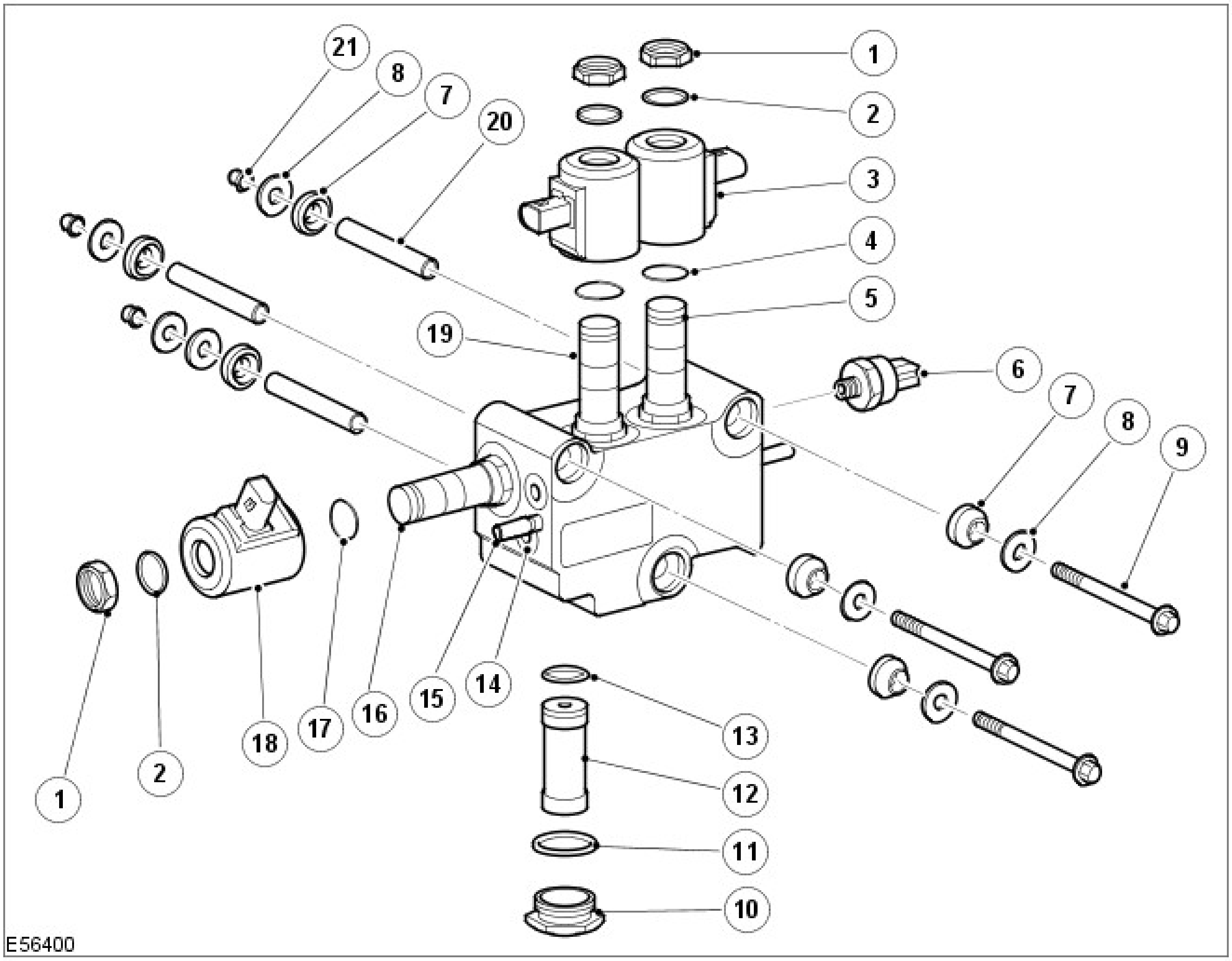
The above sequence is applied to each of the eight pistons for every revolution of the shaft and cam. When the engine is running the sequence occurs rapidly creating a constant flow of fluid. The fluid flow varies with engine speed and the rotational speed of the shaft. The pressure applied to the actuators, created by the flow from the pump, is controlled by the pressure control valve in the valve block.

The pump has a displacement of 6cm^3/rev and an operational pressure of 165 bar (2248 lbf/in^2). The pump output flow ranges from 6.5 l/min (1.7 US Gallons/min) at idle to 10 l/min (2.64 US Gallons/min) at 1000 rev/min and above.

DYNAMIC RESPONSE VALVE BLOCK

The valve block is located below the RH sill of the body and is secured with three bolts and rubber bushes to captive nuts located in the chassis. The rubber bushes isolate the valve block preventing hydraulic noise from transmitting through the body.





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E56400

Item	Part Number	Description
1	-	Nut (3 off)
2	-	O ring (3 off)
3	-	Directional control valve coils (DCV1 and DCV2)
4	-	O ring (3 off)
5	-	DCV1

6	-	Pressure transducer
7	-	Mounting bush (6 off)
8	-	Washer (7 off)
9	-	Bolt (3 off)
10	-	Nut
11	-	O ring
12	-	High pressure filter
13	-	O ring
14	-	Pipe connections
15	-	Stud (3 off)
16	-	Pressure control valve
17	-	O ring
18	-	Pressure control valve coil
19	-	DCV2
20	-	Spacer (3 off)
21	-	Captive nut (3 off) (chassis mounting)

The valve block directs hydraulic pressure to the actuators via solenoid operated directional control valves. A solenoid operated pressure control valve regulates the required pressure to the actuators. The three solenoid valves are controlled by signals received from the dynamic response control module. A pressure transducer monitors the pressure generated by the Pressure Control Valve (PCV). A serviceable high pressure filter is installed into the underside of the valve block and filters the hydraulic fluid before it reaches the control valves. The filter must be changed at the intervals defined on the vehicle service schedule.

The two Directional Control Valves (DCV's) are fitted to ports in the top face of the valve block. The DCV's are screwed into the valve block and are sealed with O rings. Each DCV has a solenoid for electrical operation of the valve. The solenoid is sealed to the DCV with two O rings and secured with a threaded nut. The nut, coil and O rings are serviceable parts. The DCV's are non-serviceable and failure of a DCV requires replacement of the valve block assembly.

The PCV is fitted to a port in the rear facing end of the valve block. The PCV is screwed into the valve block and is sealed with O rings. The PCV has coil for electrical operation which is sealed to the PCV with two O rings and secured with a threaded nut. The nut, coil and O rings are serviceable items. The PCV is non-serviceable and failure of the PCV requires replacement of the valve block assembly.

The pressure transducer is located in the forward facing end of the valve block and is sealed with an O ring. The pressure transducer measures the hydraulic pressure and returns a signal to the Dynamic Response control module.

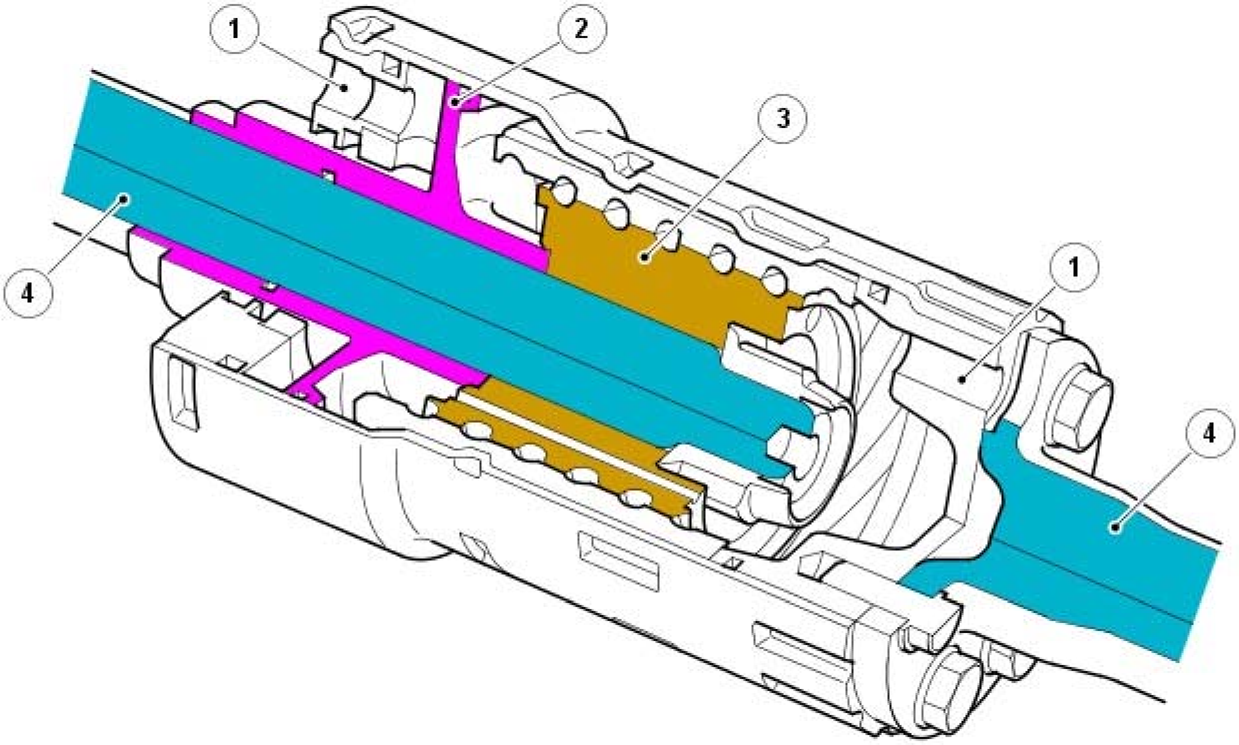
A high pressure filter locates in a port on the lower face of the valve block. The gauze and fibre filter is sealed in the port with O rings and is secured with a threaded cap which is also sealed with an O ring. A threaded hole in the lower face of the filter allows a bolt to be fitted to remove the filter from the port. If a system hydraulic component is replaced, the filter must also be replaced.

Four ports are located on the forward facing end of the valve block and two ports on the opposite end. Each port is fitted with a seal pack which contains two O rings and backing rings. The pipes locate and seal in the seal packs and are secured to the valve block with studs and nuts.

ACTUATORS AND STABILIZER BARS

Two stabilizer bars with integral hydraulic actuators are used for the Dynamic Response system. The actuators apply a hydraulically generated force or rotational torque to the stabilizer bar to oppose lateral forces caused by the vehicle cornering.

Actuator Sectional View

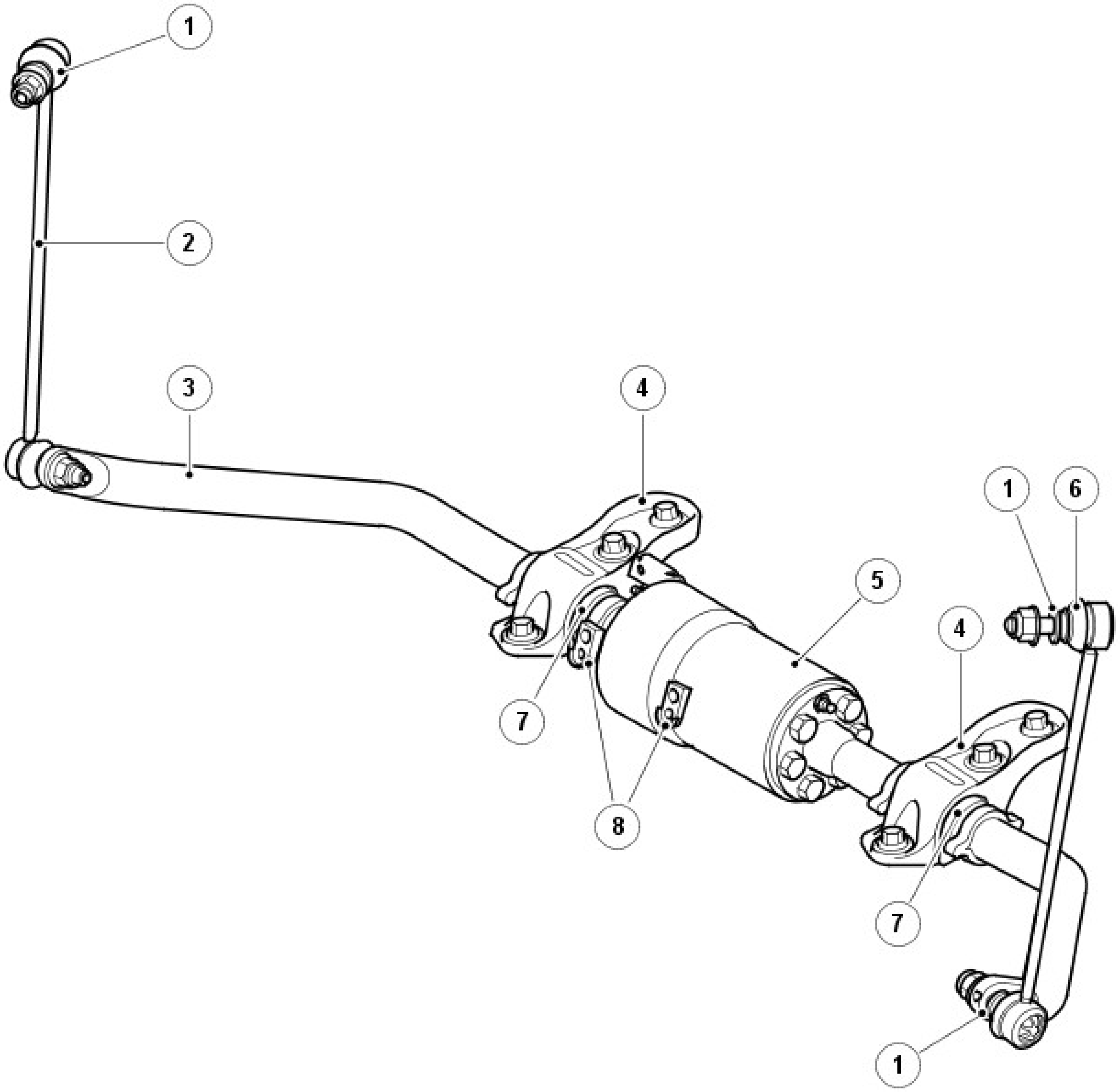


E56408

Item	Part Number	Description
1	-	Air bleed ports
2	-	Piston
3	-	Ball screw
4	-	Stabilizer bar

Each actuator has a piston which is attached to the inner part of a rotor linear ball screw, which is splined to half of the stabilizer bar. The outer part of the ball screw is crimped and welded into a housing which is attached to the other half of the stabilizer bar. As pressure is applied to one side of the piston or the other, the ball screw converts the linear force applied to the piston into a rotational torque between the two halves of the stabilizer bar.

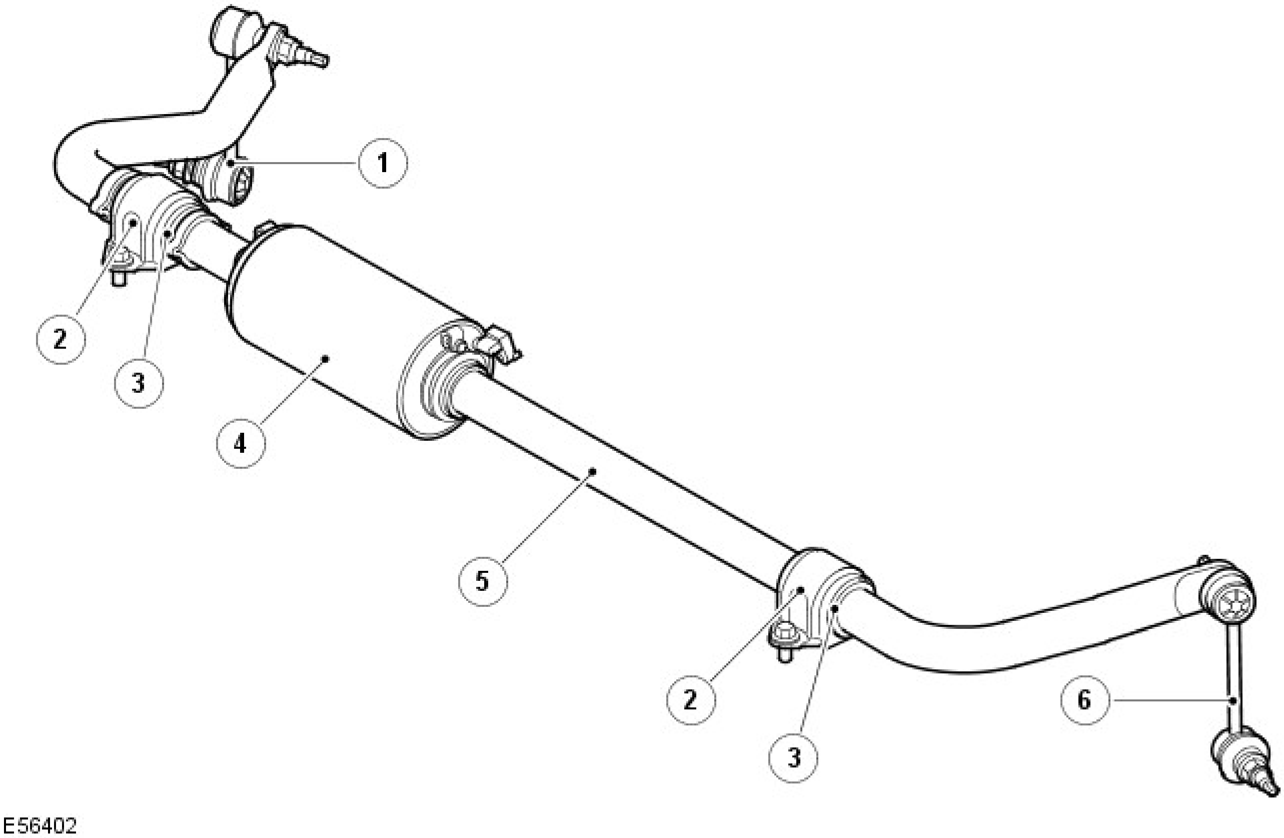
Front Actuator and Stabilizer Bar



E56401

Item	Part Number	Description
1	-	Hardened washer (4 off)
2	-	RH stabilizer link
3	-	Stabilizer bar
4	-	Chassis mounting brackets
5	-	Actuator
6	-	LH stabilizer link
7	-	Stabilizer bar mounting bush
8	-	Pipe fluid connections

Rear Actuator and Stabilizer Bar



Item	Part Number	Description
1	-	RH stabilizer link
2	-	Stabilizer bar bracket
3	-	Stabilizer bar mounting bush
4	-	Actuator
5	-	Stabilizer bar
6	-	LH stabilizer link

- NOTE: TdV8 models are fitted with a different rear actuator to that fitted to TdV6 or petrol V8 models. The TdV8 actuator has a larger internal piston diameter and care must be taken in service to ensure that the correct part is fitted.

- NOTE: On vehicles from 2007MY, the positions of the front actuator ports have been moved and therefore care must be taken to ensure the correct parts are fitted in service.

Two hydraulic connections provide for the attachment of the hydraulic pipes from the valve block. The connections provide hydraulic flow to each side of the actuator piston.

The front and rear actuator assemblies are similar in their construction, with the rear actuator being smaller than the front. Each stabilizer bar is made from 34 mm (1.34 in) diameter spring steel bar.

The actuator assembly and the stabilizer bars are not serviceable items. Only the stabilizer bar attachment bushes, brackets and stabilizer links are serviceable components.

The front stabilizer links are not handed on the front stabilizer bar and are also common to vehicles not fitted with Dynamic Response. The rear stabilizer links are unique to vehicles with Dynamic Response. The Dynamic Response rear links are identified by a gray color plastic bearing moulding. The passive (non-Dynamic Response) links can be identified by a white colored plastic bearing moulding.

The front stabilizer bar and actuator is attached to a chassis strengthening member known as the secondary load path and to the front cross-member. Two serviceable, split rubber bushes are fitted to the stabilizer bar and are located in cast brackets. Each bracket is secured to the secondary load path with two bolts and to the front cross-member with a third bolt.

The rear stabilizer bar and actuator is attached to fabricated brackets which are located on the outside of the chassis side members, forward of the rear wheels.

Two rubber bushes are fitted to each stabilizer bar and are located in clamp brackets. The front and rear bushes and brackets are not interchangeable.

On both the front and rear stabilizer bars, roll correction force is transmitted to the suspension arm via ball jointed stabilizer bar links. The front links are attached to the front suspension upper arm and the rear links are attached to the rear lower arm.

Each front stabilizer link is fitted with a hardened steel washer which is located between the stabilizer bar and the link ball joint and the upper arm and the link ball joint. It is important that these washers are in the correct position and the correct, hardened washers are fitted. Failure to fit the washers or using incorrect washers will result in relaxation of the torque on the self-locking nut and damage will be caused to the stabilizer bar, link and suspension upper arm.

SYSTEM PIPES

Fluid is moved through the Dynamic Response system via a series of six pipes and hoses. The pipes are mounted on brackets at strategic points to provide quiet operation of the system.

The six pipes connecting the pump, reservoir and actuators are one-piece components. If the pipes require replacement during service, the pipes are supplied individually and are removed and replaced in one piece. The front and rear pipes require the body to be lifted slightly to allow access for removal and replacement.

On TdV8 models from 2007MY, the high pressure hose and pipe from the pump to the valve block are available as two separate service parts. The high pressure hose has a quick release connector located in a position below the Air Conditioning (A/C) compressor. This allows the hose to be split into two parts to assist with service repairs. The connector is sealed with an O-ring and a back-up ring which are available as service items. A special tool is required to separate the connector. The tool is inserted into a slot in the connector, which separates the two components. It is not necessary to use the tool as a lever to 'push' the two components apart.

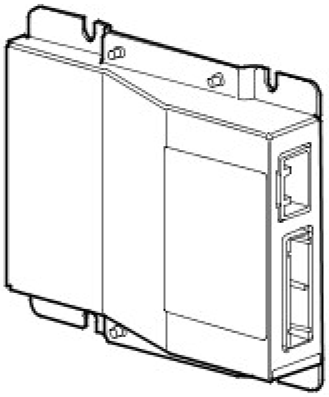
The flexible high pressure hose which supplies pressure from the pump to the high pressure pipe is fitted with attenuators. The attenuators comprise of tuned lengths of PTFE pipe and restrictors within the flexible hose. The attenuators damp pressure pulsations in the hydraulic fluid produced by the pump, reducing noise and strain on components downstream. The attenuator is integral with the high pressure hose and cannot be serviced separately.

⚠CAUTION: Under no circumstances during repairs should clamps be used on the high pressure hose or the front and rear actuator feed pipes to prevent fluid loss. The use of clamps will damage the pipes and hoses leading to premature failure.

DYNAMIC RESPONSE CONTROL MODULE

The Dynamic Response control module is located on the driver's side 'A' pillar, behind the instrument panel. The control module is secured to the vehicle body with two screws. Two connectors are located on the rear face of the control module and allow for the connection of the harness connectors. The two connectors supply power, ground, signal and sensor information to and from the control module for control of the Dynamic Response system.

On vehicles from 2007MY, the Dynamic Response control module contains 2 tunes; One for TdV6 and V8 petrol models and one for TdV8 models. When a replacement control module is fitted, the correct tune is selected from the data contained within the Car Configuration File (CCF) retained in the instrument cluster.



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The Dynamic Response control module receives a power supply from the main relay via fuse 9E in the Battery Junction Box (BJB).

An engine speed signal is transmitted to the control module from the Engine Control Module (ECM) via the high speed Controller Area Network (CAN) bus. The engine speed signal is used by the Dynamic Response control module to detect that the engine is running and hydraulic pressure for the Dynamic Response system is available.

A road speed signal is transmitted to the control module from the ABS module on the high speed CAN. A steering angle signal is transmitted on the high speed CAN bus from the steering angle sensor. The Dynamic Response control module uses the road speed and steering angle signals to calculate lateral acceleration and for on and off-road roll compensation.

When reverse gear is selected and reverse wheel rotation is transmitted on the high speed CAN bus, the Dynamic Response system reverts to a 'locked bars' condition. This condition is maintained until reverse gear is deselected and a forward wheel rotation message is transmitted on the CAN bus.

The Dynamic Response control module receives an ignition on signal on the high speed CAN bus. The ignition signal provides an input into the control module to inform the control module that the ignition switch is in position II. The control module initiates a 250 ms start time which is used to prevent functions operating when the software routines are being initialized.

When the ignition on CAN signal is removed, the control module senses that the ignition has been switched off. The control module remains powered for a 30 second period to allow fault information and adaptive values to be stored in the memory. The values and fault information are read by the control module when the ignition is next switched on. The power supply to the control module is maintained for as long as the main relay remains energized.

The Dynamic Response control module is connected on the high speed CAN bus to the diagnostic socket which allows diagnostic interrogation of the control module. The diagnostic socket allows for the connection of a Land Rover approved diagnostic system to read any stored fault codes in the control module. The control module can also be updated with revised software using a Land Rover approved diagnostic system should a software update be required.

When system faults are detected, the control module issues a message on the CAN bus which is received by the instrument cluster. The instrument cluster then illuminates the air suspension/Dynamic Response warning indicator as follows:

- Minor faults - warning indicator illuminated in an amber color with an applicable message in the message centre
- Major faults - warning indicator illuminated in a flashing red color with an applicable message in the message centre and an audible warning. The message will instruct the driver to stop the vehicle immediately or drive with caution.

Two messages relating to Dynamic Response are displayed in the instrument cluster message centre:

- SUSPENSION FAULT, VEHICLE LEAN, WHEN CORNERING
- SUSPENSION FAULT, STOP SAFELY, STOP ENGINE.

The Dynamic Response control module supplies a control current to the Pressure Control Valve (PCV) in the valve block. The current supplied is determined by a number of input signals from the upper and lower accelerometers, road speed, steering angle etc.. The PCV controls the hydraulic pressure supplied to the actuators proportional to the current supplied by the control module.

Power is supplied to the two solenoid operated Directional Control Valves (DCV) in the valve block by the control module. Together, the two DCV's control the direction of flow of hydraulic fluid to the actuators. When the control module supplies power to the solenoids the valves open allowing hydraulic fluid to flow to the actuators. When power is removed, the DCV's close. DCV1 is left open for left hand corners and DCV2 is opened for right hand corners.

The pressure transducer located in the valve block receives a 5V current from the control module. The transducer measures the hydraulic pressures in the range of 0 to 180 bar (0 to 2610 lbf/in^2) and returns a linear output voltage to the control module dependant on the hydraulic pressure.

The Dynamic Response control module supplies a 5V current to each of the accelerometers. Each accelerometer is capable of measuring lateral acceleration in the range of ± 1.11 g. An analogue input to the control module of between 0.5 and 4.5V relative to the lateral acceleration sensed is returned by each accelerometer. The control module processes the two signals received, together with the steering angle and vehicle speed signals, to produce a 'pure' lateral acceleration signal which is then used as the main control signal for the Dynamic Response system.

Failure Modes

Failures where the vehicle can still be driven safely are indicated by the air suspension/Dynamic Response warning indicator in the instrument cluster illuminating continuously in an amber color. The amber indicator will remain illuminated until the ignition is switched off. For all faults, the warning indicator will only illuminate again if the fault is still present.

Failures which require the driver to stop the vehicle immediately are indicated by the air suspension/Dynamic Response warning indicator flashing in a red color and an audible warning. This will also be accompanied by an applicable message displayed in the message centre.

All faults are recorded by the control module and can be retrieved using a Land Rover approved diagnostic system. The diagnostic system provides a description of the fault, possible causes and corrective action to rectify the fault. The control module can fail to one of two states; 'locked bars' or 'reduced operation'.

The 'locked bars' condition means that pump flow is directed through the valve block and returns to the reservoir. Both DCV's close, trapping the fluid in the actuators. The fluid can flow from one actuator to the other via the valve block. The stabilizer bars will perform similar to a conventional stabilizer bar, resisting roll but still allowing suspension articulation.

The 'reduced operation' condition means that the system can still operate, but one of the input signals is not being received and so the system performance is not optimum.

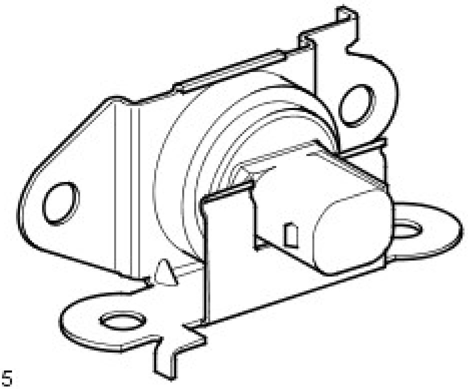
If the steering angle sensor develops a fault or is out of calibration, there is a possibility that the dynamic response control module will record a fault code. A Land Rover approved diagnostic system should be used to check for fault codes and the adaptive data should be cleared by resetting the fault codes in the control module after the steering angle sensor has been

recalibrated.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

ACCELEROMETERS

Two accelerometers are used; an upper and a lower. Both accelerometers are identical in their construction.

The lower accelerometer is secured to the underside of the vehicle floor, on the RH inner sill panel, below the front door. The upper accelerometer is secured to a bracket on the body roof panel, in a central position at the top of the windscreen.



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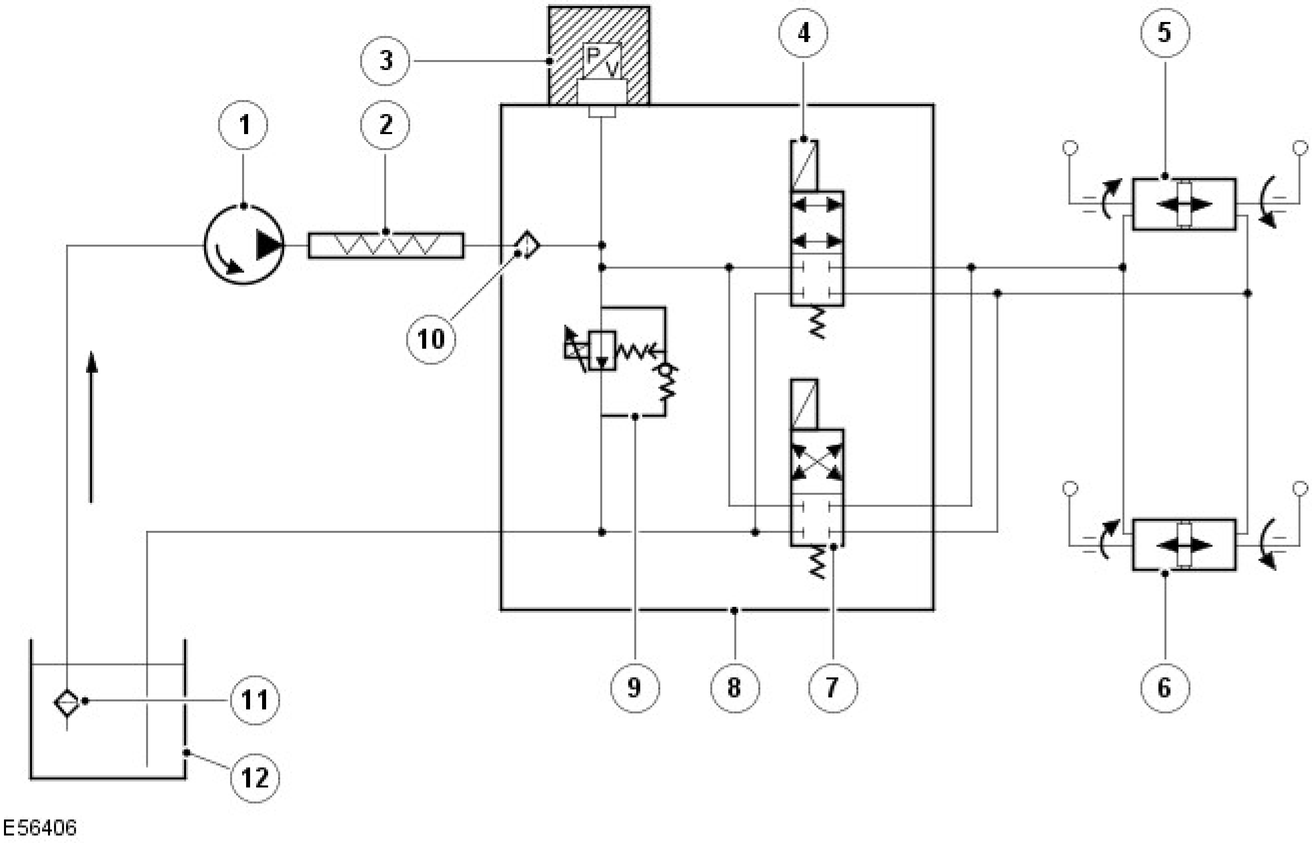
The lower accelerometer is the primary sensor used to measure lateral acceleration of the vehicle for roll control. The upper accelerometer is used by the Dynamic Response control module for roll correction and fault detection in conjunction with the lower accelerometer.

Each accelerometer is a capacitive acceleration sensor and operates on a 5V supply from the dynamic response control module. The upper and lower accelerometers can measure acceleration in the range of ±1.11 g and return an output to the control module of between 0.5 and 4.5V.

Failures of an accelerometer are recorded by the control module and can be retrieved using a Land Rover approved diagnostic system. A special tool is required to remove and replace the accelerometer in the mounting bracket.

HYDRAULIC CIRCUIT DIAGRAM



Item	Part Number	Description
1	-	Hydraulic pump
2	-	Attenuator hose
3	-	Pressure transducer
4	-	Directional control valve 2
5	-	Front actuator assembly
6	-	Rear actuator assembly
7	-	Directional control valve 1
8	-	Valve block
9	-	Pressure Control Valve (PCV)
10	-	High pressure filter
11	-	Filter
12	-	Reservoir

DYNAMIC RESPONSE SYSTEM OPERATION

Vehicle Not Moving

When the engine is running and the vehicle is not moving, both DCV's are closed, locking fluid in each side of the actuator piston. The hydraulic pump draws fluid from the reservoir and passes it at very low pressure to the valve block.

Because both DCV's are closed, after the fluid passes through the high pressure filter, it is directed through the PCV to the reservoir.

The PCV is open fully to allow the full flow to pass to the reservoir. The DCV's will remain closed until the control module detects a requirement to operate.

Vehicle Moving and Turning Left

When the vehicle is turning left, the accelerometers detect the cornering forces applied and transmit signals to the control module. The control module determines that an opposing force must be applied to the stabilizer bars to counter the cornering forces. The control module supplies a current to the solenoid of DCV2. Simultaneously, a current is supplied from the control module to the PCV which operates to restrict the flow of fluid returning to the reservoir.

The restriction causes the hydraulic pressure in the system to rise and the pressure is sensed by the pressure transducer which sends a signal to the control module. The control module determines from the inputs it receives what pressure is required and adjusts the pressure accordingly.

The pressure in the system is applied to the piston of each actuator, applying an opposing force to the stabilizer bar and minimizing the cornering effect on the vehicle and maintaining the vehicle attitude. The fluid displaced from the other side of the piston is returned to the reservoir via the valve block.

As the cornering force is removed when the vehicle straightens up, the control module opens the PCV to reduce the pressure in the system. The fluid bleeds from the actuator back into the system as the cornering force is reduced, removing the force applied to the stabilizer bar. When the vehicle is moving in a straight line DCV2 closes.

Vehicle Moving and Turning Right

When the vehicle is turning right, the accelerometers detect the cornering forces applied and transmit signals to the control module. The control module determines that an opposing force must be applied to the stabilizer bars to counter the cornering forces. The control module supplies a current to the solenoid of DCV1. Simultaneously, a current is supplied from the control module to the PCV which operates to restrict the flow of fluid through the by-pass gallery.

The restriction causes the hydraulic pressure in the system to rise and the pressure is sensed by the pressure transducer which sends a signal corresponding to the pressure to the control module. The control module determines from the inputs it receives what pressure is required and adjusts the pressure control valve accordingly.

The pressure in the system is applied to the piston of each actuator, applying an opposing force to the stabilizer bar and minimizing the cornering effect on the vehicle and maintaining the vehicle attitude. The fluid displaced from the other side of the piston is returned to the reservoir via the valve block.

As the cornering force is removed when the vehicle straightens up, the control module opens the PCV to reduce the pressure in the system. The fluid bleeds from the actuator back into the system as the cornering force is reduced, removing the force applied to the stabilizer bar. When the vehicle is moving in a straight line DCV1 closes.

Vehicle Moving in a Straight Line

The control module is constantly monitoring the signals received and operates the DCV's and PCV to maintain the vehicle attitude when the vehicle is moving.

Off-Road Driving

Off-road detection is achieved by the control module by monitoring the signals from the upper and lower accelerometers for varying degrees of body movement. Off-road driving generates differing signals to the accelerometers which in turn produce differing outputs due to their vertical separation and the location of the roll centre of the vehicle.

The two signals are passed through a filter to remove any offset caused by the vehicle leaning or the terrain. The control module then uses this signal to calculate the percentage of road roughness.

Below 25 mph (40 km/h) the percentage of road roughness calculated is used by the control module to limit the operation of the Dynamic Response system. At speeds above 25 mph (40 km/h) the system disables the percentage road roughness signal and full Dynamic Response system assistance is restored. The system is completely inoperative at speeds below 2 mph (3 km/h).

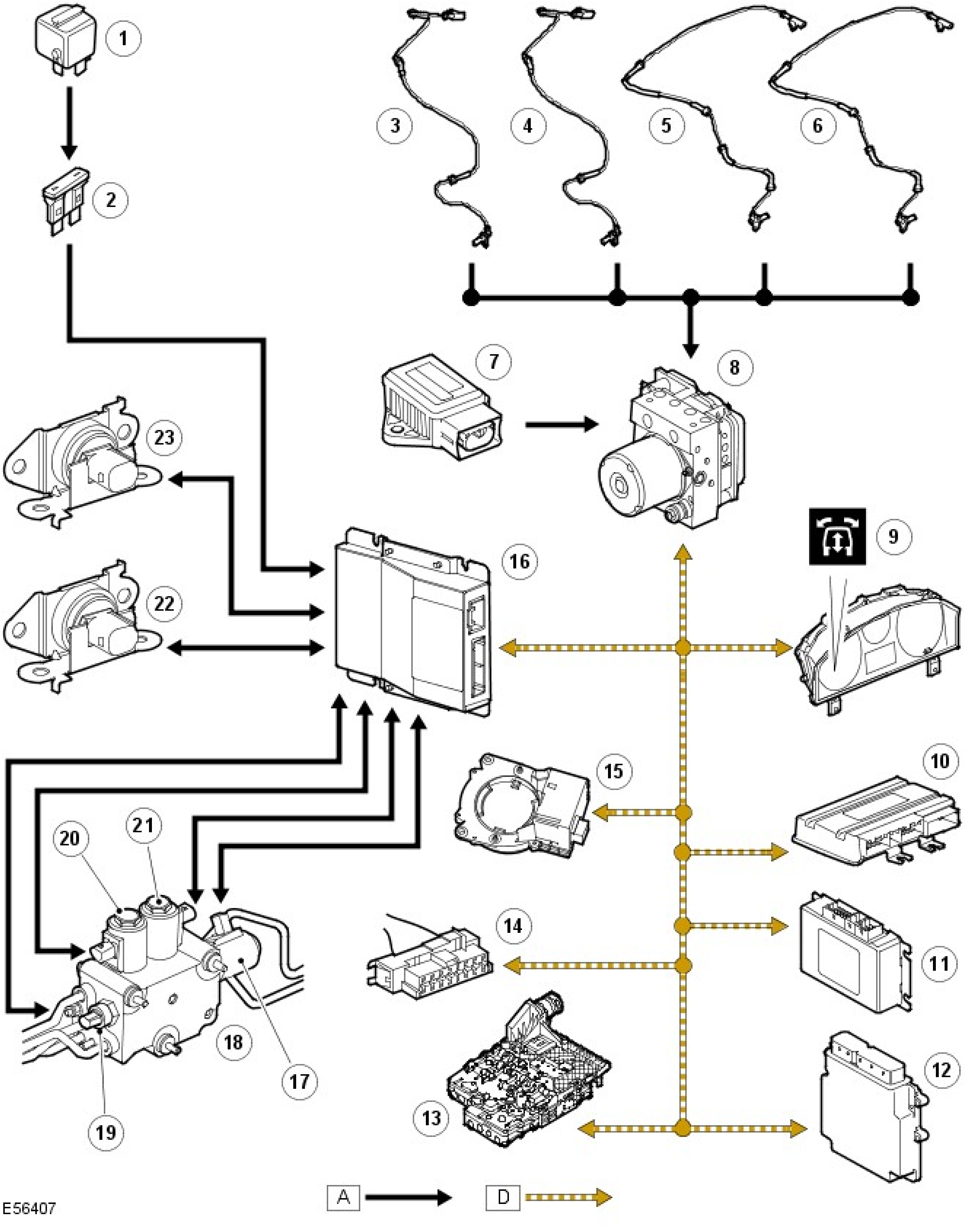
Side Slope Detection

The control module uses side slope detection when the upper and lower accelerometers detect an average acceleration of more than ± 0.2 g or 11 degrees of side slope and a road speed of less than 25 mph (40 km/h).

When side slope is detected, both DCV's close to provide a 'locked bars' condition. This condition increases stability and gives a constant vehicle response. As the road speed increases up to 25 mph (40 km/h), the level of average lateral acceleration must also increase and be maintained for the system to recognize that the vehicle is on a side slope. If the side slope angle is steep and the road speed is low, the control module will detect the side slope in a short time.

CONTROL DIAGRAM

- NOTE: **A** = Hardwired; **D** = High speed CAN bus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Item	Part Number	Description
1	-	Main relay
2	-	Fuse 9E (15A)
3	-	Left front wheel speed sensor
4	-	Right front wheel speed sensor
5	-	Left rear wheel speed sensor

6	-	Right rear wheel speed sensor
7	-	Yaw rate and lateral acceleration sensor
8	-	ABS module
9	-	Instrument cluster
10	-	Air suspension control module
11	-	Transfer box control module
12	-	Engine control module
13	-	Transmission control module
14	-	Diagnostic socket
15	-	Steering angle sensor
16	-	Dynamic Response control module
17	-	Pressure Control Valve (PCV) coil
18	-	Valve block
19	-	Pressure transducer
20	-	DCV 2 coil
21	-	DCV 1 coil
22	-	Lower accelerometer
23	-	Upper accelerometer

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Ride and Handling Optimization - Ride and Handling Optimization

Diagnosis and Testing

Overview

Ride and handling optimization incorporates the terrain response system which links a number of modules around the vehicle to give the best combination of settings in the different systems.

For information on the description and operation of the system, refer to section 204-06 - Ride and Handling Optimization of the workshop manual.

Inspection and Verification

⚠CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Mechanical	Electrical
● Tire condition, pressures, etc ● Driveline components (correct installation, damage, etc) ● Engine components (correct installation, damage, etc) ● Transmission components (correct installation, damage, etc) ● Suspension components (correct installation, damage, etc)	● Fuses ● Harnesses/Connectors ● Terrain response module ● Engine control module (ECM) ● Transmission control module (TCM) ● Transfer case control module ● ABS control module ● Rear differential control module ● Dynamic suspension control module ● Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index. Refer to the relevant section of the workshop manual.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Because the overall function of the system is dependent on sub-systems, it is possible to misinterpret displays in the message center as being terrain response faults when they are actually a result of a fault in one of the sub-systems.

Refer to the table below for help in deciding when to investigate terrain response faults and when the fault is likely to be in a sub-system.

Symptom	Description	Possible causes	Action
Message center display indicating a sub-system fault	The message center indicates to the driver that a fault has occurred and in which sub-system	● Any sub-system fault supported by the message center	For details of the available messages, refer to the relevant section of the workshop manual. Carry out a complete vehicle DTC read and follow the diagnostic routine(s) indicated.
Message center display: **System fault special programs not available**, terrain response switch operation normal	This message will display when a sub-system fault has occurred if the driver attempts to change the special program, and at each ignition on cycle for 5 seconds until the fault is rectified	● Any sub-system fault supported by the message center	For details of the available messages, refer to the relevant section of the workshop manual. Carry out a complete vehicle DTC read and follow the diagnostic routine(s) indicated.
Message center display: **System fault special programs not available**, **ALL** terrain response switch LEDs illuminated	CAN circuit errors	● CAN circuit: short circuit to ground ● CAN circuit: short circuit to power ● CAN circuit: high	Carry out a complete vehicle DTC read and follow the diagnostic routine(s) indicated.

Symptom	Description	Possible causes	Action
		resistance	
Special program changes not available	User error	● Engine not running ● Rock crawl selected with transfer box in high range ● Special program change attempted with ABS or DSC active - This includes ABS cycling as part of HDC ● Special program change attempted with an overheat condition present in the center or rear differential	Refer to the relevant section of the workshop manual. Make sure that the driver is familiar with the correct operation of the system.

DTC index

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

DTC	Description	Possible causes	Action
C1A00-46	Control module - calibration / parameter memory failure	● The terrain response control module has indicated a calibration / parameter memory failure for embedded systems using FLASH memory. This is equivalent to EEPROM in RAM/ROM /EEPROM embedded systems ● Corruption in the non-volatile memory storage system (EEPROM) in the terrain response control module	Rectify this DTC before attempting to rectify others. Record all DTCs logged and clear them. With ignition on select a terrain response special program, turn off the ignition, then turn back on the ignition and verify the selected special program is still active. If the selected terrain response special program is not still active and has returned to the general program, confirm if DTC has returned. Repeat procedure again once more. If DTC is still present install a new terrain response rotary control and control module.
C1A01-96	LED – component internal failure	● Terrain response rotary control and control module - LED short circuit to ground ● Terrain response rotary control and control module - LED open circuit	• NOTE: If the system is in 'failsafe default mode due to another issue no LEDs will illuminate. This fault does not cause the system to go to 'failsafe default'. Refer to the Description and Operation section of workshop manual. Check terrain response system, special program LEDs. One or more of the LEDs is suspected of not illuminating as appropriate. With the engine running move the terrain response rotary control through all five programs and confirm the appropriate special program LED does not illuminate when the terrain response rotary control is in that position. Suspect the terrain response rotary control and control module, check and install a new terrain response rotary control and control module as required, refer to the new module/component installation note at the top of the DTC Index.
C1A02-94	Rotary encoder stuck in intermediate position –	● The terrain response rotary control is held in an intermediate position (between the special	Check that the terrain response control is correctly located into a detent. Using the manufacturer approved diagnostic system, clear the DTC. With the engine running check the system responds to switch rotation and the DTC does not return. Check for foreign

DTC	Description	Possible causes	Action
	unexpected operation	programs) for more than 60 seconds ● Foreign object preventing correct operation of terrain response rotary control ● Mechanical damage to the terrain response rotary control	object preventing correct operation of terrain response rotary control. Check for mechanical damage to the terrain response rotary control. Rectify as required.
U0073-88	Control module communication bus ‘A’ off – bus off	● Bus off. The terrain response control module has detected the data bus is not available ● CAN bus open circuit ● CAN bus short circuit to ground ● CAN bus short circuit to power ● Failure of another control module on the CAN bus	Refer to electrical circuit diagrams, check CAN circuit for open circuit, short to ground, short to power, repair/renew as necessary. Using the manufacturer approved diagnostic system, carry out network integrity test. Check the system is operating correctly and the DTC does not return.
U0100-87	Lost communication with ECM/PCM ‘A’ – missing message	● The terrain response control module has not received one or more expected messages from the engine control module ● High speed CAN circuit communications failure ● Open circuit engine control module, power feed ● Open circuit engine control module, ground supply ● Engine control module disconnected from the high speed CAN communication bus ● Open circuit engine control module high speed CAN low circuit ● Open circuit engine control module high speed CAN high circuit ● Engine control module not configured ● Engine control module failure	Using the manufacturer approved diagnostic system, check the engine control module for DTCs and refer to the relevant DTC index. Using the manufacturer approved diagnostic system, carry out network integrity test. Using the manufacturer approved diagnostic system, re-configure the engine control module. Refer to electrical circuit diagrams, check power feed and ground supplies, to engine control module for open circuit. Check for open circuit engine control module high speed CAN low circuit. Check for open circuit engine control module high speed CAN high circuit, repair as necessary. Suspect the engine control module, check and install a new engine control module as required, refer to the new module/component installation note at the top of the DTC Index. Check the system is operating correctly and the DTC does not return.
U0101-87	Lost communication with transmission control module – missing message	● The terrain response control module has not received one or more expected messages from the transmission control module ● High speed CAN circuit communications failure ● Open circuit transmission control module, power feed ● Open circuit transmission control module, ground supply ● Transmission control module disconnected from the high speed CAN	Using the manufacturer approved diagnostic system, check the transmission control module for DTCs and refer to the relevant DTC index. Using the manufacturer approved diagnostic system, carry out network integrity test. Using the manufacturer approved diagnostic system, re-configure the transmission control module. Refer to electrical circuit diagrams, check power feed and ground supplies, to transmission control module for open circuit. Check for open circuit transmission control module high speed CAN low circuit. Check for open circuit transmission control module high speed CAN high circuit, repair as necessary. Suspect the transmission control module, check and install a new transmission control module as required, refer to the new module/component installation note at the top of the DTC Index. Check the system is operating correctly and the DTC does not return.

DTC	Description	Possible causes	Action
		communication bus - Open circuit transmission control module high speed CAN low circuit - Open circuit transmission control module high speed CAN high circuit - Transmission control module not configured - Transmission control module failure	
U0102-87	Lost communication with transfer case control module - missing message	- The terrain response control module has not received one or more expected messages from the transfer box control module - High speed CAN circuit communications failure - Open circuit transfer box control module, power feed - Open circuit transfer box control module, ground supply - Transfer box control module disconnected from the high speed CAN communication bus - Open circuit transfer box control module high speed CAN low circuit - Open circuit transfer box control module high speed CAN high circuit - Transfer box control module not configured - Transfer box control module failure	Using the manufacturer approved diagnostic system, check the transfer box control module for DTCs and refer to the relevant DTC index. Using the manufacturer approved diagnostic system, carry out network integrity test. Using the manufacturer approved diagnostic system, re-configure the transfer box control module. Refer to electrical circuit diagrams, check power feed and ground supplies, to transfer box control module for open circuit. Check for open circuit transfer box control module high speed CAN low circuit. Check for open circuit transfer box control module high speed CAN high circuit, repair as necessary. Suspect the transfer box control module, check and install a new transfer box control module as required, refer to the new module/component installation note at the top of the DTC Index. Check the system is operating correctly and the DTC does not return.
U0122-87	Lost communication with vehicle dynamics control module - missing message	- The terrain response control module has not received one or more expected messages from the dynamic response control module - High speed CAN circuit communications failure - Open circuit dynamic response control module, power feed - Open circuit dynamic response control module, ground supply - Dynamic response control module disconnected from the high speed CAN communication bus - Open circuit dynamic response control module high speed CAN low circuit - Open circuit dynamic response control module high speed CAN high circuit	Using the manufacturer approved diagnostic system, check the dynamic response control module for DTCs and refer to the relevant DTC index. Using the manufacturer approved diagnostic system, carry out network integrity test. Using the manufacturer approved diagnostic system, re-configure the dynamic response control module. Refer to electrical circuit diagrams, check power feed and ground supplies, to dynamic response control module for open circuit. Check for open circuit dynamic response control module high speed CAN low circuit. Check for open circuit dynamic response control module high speed CAN high circuit, repair as necessary. Suspect the dynamic response control module, check and install a new dynamic response control module as required, refer to the new module/component installation note at the top of the DTC Index. Check the system is operating correctly and the DTC does not return.

DTC	Description	Possible causes	Action
		- Dynamic response control module not configured - Dynamic response control module failure	
U0132-87	Lost communication with suspension control module ‘A’ - missing message	- The terrain response control module has not received one or more expected messages from the air suspension control module - High speed CAN circuit communications failure - Open circuit air suspension control module, power feed - Open circuit air suspension control module, ground supply - Air suspension control module disconnected from the high speed CAN communication bus - Open circuit air suspension control module high speed CAN low circuit - Open circuit air suspension control module high speed CAN high circuit - Air suspension control module not configured - Air suspension control module failure	Using the manufacturer approved diagnostic system, check the air suspension control module for DTCs and refer to the relevant DTC index. Using the manufacturer approved diagnostic system, carry out network integrity test. Using the manufacturer approved diagnostic system, re-configure the air suspension control module. Refer to electrical circuit diagrams, check power feed and ground supplies, to air suspension control module for open circuit. Check for open circuit air suspension control module high speed CAN low circuit. Check for open circuit air suspension control module high speed CAN high circuit, repair as necessary. Suspect the air suspension control module, check and install a new air suspension control module as required, refer to the new module/component installation note at the top of the DTC Index. Check the system is operating correctly and the DTC does not return.
U0155-87	Lost communication with instrument panel cluster (IPC) control module - missing message	- The terrain response control module has not received one or more expected messages from the instrument cluster - High speed CAN circuit communications failure - Open circuit instrument cluster, power feed - Open circuit instrument cluster, ground supply - Instrument cluster disconnected from the high speed CAN communication bus - Open circuit instrument cluster high speed CAN low circuit - Open circuit instrument cluster high speed CAN high circuit - Instrument cluster not configured - Instrument cluster failure	Using the manufacturer approved diagnostic system, check the instrument cluster for DTCs and refer to the relevant DTC index. Using the manufacturer approved diagnostic system, carry out network integrity test. Using the manufacturer approved diagnostic system, re-configure the instrument cluster. Refer to electrical circuit diagrams, check power feed and ground supplies, to instrument cluster for open circuit. Check for open circuit instrument cluster high speed CAN low circuit. Check for open circuit instrument cluster high speed CAN high circuit, repair as necessary. Suspect the instrument cluster, check and install a new instrument cluster as required, refer to the new module/component installation note at the top of the DTC Index. Check the system is operating correctly and the DTC does not return.
U0300-55	Internal control module software incompatibility - not configured	- The terrain response control module has failed to recognise the correct master configuration ID from the CAN data bus master, the instrument	Using the manufacturer approved diagnostic system, check the vehicle configuration file, rectify as necessary. Check correct software version is installed to both terrain response control module and instrument cluster, update as necessary. Check the system is operating correctly and the DTC does not return.

DTC	Description	Possible causes	Action
		cluster - Terrain response control module not correctly configured - Instrument cluster not correctly configured	
U0401-94	Invalid data received from ECM/PCM A - unexpected operation	- The terrain response control module has detected that the engine control module component had operated in a way or at a time that it had not been commanded to operate - The engine management system, engine control module is unable to support normal terrain response functionality, the terrain response system will go into default condition - Engine management system fault - Engine control module failure	Using the manufacturer approved diagnostic system, check the engine control module for DTCs and refer to the relevant DTC index, rectify as required. Check the system is operating correctly and the DTC does not return. Suspect the engine control module, check and install a new engine control module as required, refer to the new module/component installation note at the top of the DTC Index.
U0402-94	Invalid data received from transmission control module - unexpected operation	- The terrain response control module has detected that the transmission control module component had operated in a way or at a time that it had not been commanded to operate - The transmission system, transmission control module is unable to support normal terrain response functionality, the terrain response system will go into default condition - Transmission system fault - Transmission control module failure	Using the manufacturer approved diagnostic system, check the transmission control module for DTCs and refer to the relevant DTC index, rectify as required. Check the system is operating correctly and the DTC does not return. Suspect the transmission control module, check and install a new transmission control module as required, refer to the new module/component installation note at the top of the DTC Index.
U0403-94	Invalid data received from transfer case control module - unexpected operation	- The terrain response control module has detected that the transfer box control module component had operated in a way or at a time that it had not been commanded to operate - The transfer box system, transfer box control module is unable to support normal terrain response functionality, the terrain response system will go into default condition - Transfer box system fault - Transfer box control module failure	Using the manufacturer approved diagnostic system, check the transfer box control module for DTCs and refer to the relevant DTC index, rectify as required. Check the system is operating correctly and the DTC does not return. Suspect the transfer box control module, check and install a new transfer box control module as required, refer to the new module/component installation note at the top of the DTC Index.

Published: 11-May-2011

Ride and Handling Optimization - Active Stabilization System

Diagnosis and Testing

Overview

Active stabilization is also known as dynamic response, active roll control or active cornering enhancement, and refers to the control of the front and rear stabilizer (or anti-roll) bars.

For information on the description and operation of the system:
REFER to: Active Stabilization System (204-06 Ride and Handling Optimization, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Mechanical	Electrical
● Fluid level/condition, pipes, reservoir, etc ● Pump and pulley ● Drive belt condition ● Hoses ● Valve block ● Accelerometers (correct fitment, etc) ● Tire condition, pressures, etc ● Suspension components (correct fitment, damage, etc)	● Fuses (battery junction box) ● Engine control module (ECM) relay ● Harnesses/Connectors ● Upper accelerometer ● Lower accelerometer ● Steering wheel rotation sensor ● Dynamic response control module ● Air suspension control module ● ABS control module ● Instrument cluster module ● Transmission control module (TCM) ● Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
   - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible cause	Action
Poor on-center response	● System bleed required ● Stabilizer bar bushes ● Residual pressure ● Steering angle sensor offset ● Control module adaptive data	Carry out the manual bleed procedure. REFER to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures). Check the stabilizer bar bushes. REFER to: Front Stabilizer Bar - V8 S/C 4.2L Petrol (204-06 Ride and Handling Optimization, Removal and Installation) / Rear Stabilizer Bar (204-06 Ride and Handling Optimization, Removal and Installation). Check for residual pressure in the system. Check and calibrate the steering angle sensor, clear the adaptive data after calibration. REFER to: Steering Angle Sensor (211-02 Power Steering, Removal and Installation).
Asymmetrical response	● Steering angle sensor offset ● Accelerometer calibration ● System bleed required	Check and calibrate the steering angle sensor, clear the adaptive data after calibration. REFER to: Steering Angle Sensor (211-02 Power Steering, Removal and Installation). Calibrate the accelerometers using the approved diagnostic system. Carry out the manual bleed procedure. REFER to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).

Symptom	Possible cause	Action
Excessive roll	- System bleed required - Stabilizer bar bushes - Stabilizer bar drop-links	Carry out the manual bleed procedure. REFER to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures). Check the stabilizer bar bushes and drop links. REFER to: Front Stabilizer Bar - V8 S/C 4.2L Petrol (204-06 Ride and Handling Optimization, Removal and Installation) / Rear Stabilizer Bar (204-06 Ride and Handling Optimization, Removal and Installation).
Powered roll-rock	- Harness faults - Valve block fault - Control module adaptive data - Accelerometer fault	Check for DTCs indicating any of the possible causes are present.
Oversteer or understeer	- Stabilizer bar drop-links - System actuators	Check the stabilizer bar drop links and the system actuators. REFER to: Front Stabilizer Bar - V8 S/C 4.2L Petrol (204-06 Ride and Handling Optimization, Removal and Installation) / Rear Stabilizer Bar (204-06 Ride and Handling Optimization, Removal and Installation).

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1A8700	Battery disconnection/control module reset	- Loss of power to the dynamic response control module while the vehicle is in motion	Check the harness and connectors, check the EMS relay, check the ground connections.
C111122	Control lateral acceleration	- Internal control module calculation fault	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
C111127	Control lateral acceleration	- Intermittent lower lateral accelerometer signal - Lower lateral accelerometer fault - Internal control module calculation fault	Check for associated codes giving more information. Carry out the accelerometer tests using the approved diagnostic system.
C111200	Roll angle	- Internal control module calculation fault	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
C111229	Roll angle	- Internal control module calculation fault	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
C111300	Off-Road determination	- Internal control module calculation fault	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
C111400	Roll axis torque	- Internal control module calculation fault	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
C111629	Torque/Pressure	- Internal control module calculation fault	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
C111729	Direction control valve(s)	- Internal control module calculation fault	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
C111771	Direction control valve(s)	- Sticking direction control valves	Install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation).
C111795	Direction control valve(s)	- Incorrect connection of the pressure control and direction control valves - Damaged direction control valve - High resistance	Check the valve connections and rectify as necessary. Check the direction control valves. Check the harnesses and connectors.

DTC	Description	Possible causes	Action
		harness/connectors	
C111909	Hydraulic pressure	● Low fluid ● Leak in high pressure primary circuit ● Leaking reservoir ● Leak in secondary circuit ● Direction control valves stuck open ● Pressure control valve fault ● Pressure transducer fault ● Blocked filter ● Actuator fault	Check and top up the fluid. Rectify leaks as necessary. For sticking/faulty valves, install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation). For a pressure transducer fault, install a new pressure transducer. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation). Install a new filter as necessary. REFER to: Valve Block Filter (204-06 Ride and Handling Optimization, Removal and Installation). Check the system actuators.
C111962	Hydraulic pressure	● Low fluid ● Leak in high pressure primary circuit ● Leaking reservoir ● Leak in secondary circuit ● Direction control valves stuck open ● Pressure control valve fault ● Pressure transducer fault ● Blocked filter ● Actuator fault ● Broken drop link ● Broken stabilizer bar ● Air in system	Check and top up the fluid. Rectify leaks as necessary. For sticking/faulty valves, install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation). For a pressure transducer fault, install a new pressure transducer. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation). Install a new filter as necessary. REFER to: Valve Block Filter (204-06 Ride and Handling Optimization, Removal and Installation). Check the system actuators. Install new drop links or stabilizer bars as necessary. REFER to: Front Stabilizer Bar - V8 S/C 4.2L Petrol (204-06 Ride and Handling Optimization, Removal and Installation) / Rear Stabilizer Bar (204-06 Ride and Handling Optimization, Removal and Installation). Carry out the manual bleed procedure. REFER to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).
C11197B	Hydraulic pressure	● Low fluid ● Leak in high pressure primary circuit ● Leaking reservoir ● Leak in secondary circuit ● Blocked filter ● Low pump flow ● Blocked or kinked suction hose	Check and top up the fluid. Rectify leaks as necessary. Install a new filter as necessary. REFER to: Valve Block Filter (204-06 Ride and Handling Optimization, Removal and Installation). Check and replace the pump as necessary. REFER to: Fluid Pump - V8 4.4L Petrol/V8 S/C 4.2L Petrol (204-06 Ride and Handling Optimization, Removal and Installation). Check the suction hose, rectify as necessary.
C111991	Hydraulic pressure	● Pressure control valve fault ● Contaminated fluid ● Kinked or blocked return pipe ● Pressure transducer fault	For sticking/faulty valves, install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation). Clean the system, replace the fluid. Check and replace the return pipe as necessary. For a pressure transducer fault, install a new pressure transducer. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation).
C1A0001	Dynamic response control module	● Harness fault ● Damaged isolation switch	Check the control module harness. Refer to the electrical guides.
C1A0004	Dynamic response control module	● Internal control module fault	Refer to the warranty policy and procedures manual if a module is suspect.
C1A0043	Dynamic response control module	● Internal control module fault	Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
C1A0045	Dynamic response control module	- Internal control module fault	Refer to the warranty policy and procedures manual if a module is suspect.
C1A0047	Dynamic response control module	- Internal control module fault	Refer to the warranty policy and procedures manual if a module is suspect.
C1A0052	Dynamic response control module	- New control module	Configure the new module using the approved diagnostic system
C1A0054	Dynamic response control module	- New control module	Configure the new module using the approved diagnostic system
C1A0916	Pressure transducer signal	- Pressure transducer signal circuit: short circuit to ground - Pressure transducer fault	Check the pressure transducer circuit, rectify as necessary. Install a new pressure transducer as necessary. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation).
C1A0917	Pressure transducer signal	- Pressure transducer signal circuit: short circuit to power - Pressure transducer fault	Check the pressure transducer circuit, rectify as necessary. Install a new pressure transducer as necessary. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation).
C1A091C	Pressure transducer signal	- Pressure control valve circuit: short circuit to power - Pressure control valve fault - Pressure transducer fault	For sticking/faulty valves, install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation). Install a new pressure transducer as necessary. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation).
C1A0926	Pressure transducer signal	- Low fluid - Pressure transducer fault - Blocked filter	Check and top up the fluid. Install a new filter as necessary. REFER to: Valve Block Filter (204-06 Ride and Handling Optimization, Removal and Installation). Install a new pressure transducer as necessary. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation).
C1A9762	Lateral accelerometer circuit	- Damaged accelerometers - Bent brackets	Check the accelerometers and brackets. Rectify as necessary.
C1B0312	Directional control valve 1	- Directional control valve 1 circuit: short circuit/very low resistance - Directional control valve 1 circuit: short circuit to power	Check the directional control valve circuit. For sticking/faulty valves, install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation).
C1B0314	Directional control valve 1	- Directional control valve 1 circuit: short circuit to ground	Check the directional control valve circuit. Refer to the electrical guides.
C1B0318	Directional control valve 1	- Directional control valve 1 circuit: high resistance	Check the directional control valve circuit. Refer to the electrical guides.
C1B0319	Directional control valve 1	- Directional control valve 1 circuit: very low resistance - Directional control valve 1 circuit: short circuit to power	Check the directional control valve circuit. Refer to the electrical guides.
C1B031D	Directional control valve 1	- Directional control valve 1 circuit: high resistance	Check the directional control valve circuit. Refer to the electrical guides.
C1B0400	Hit current directional control valve 1	- Directional control valve 1 circuit: high resistance	Check the directional control valve circuit. Refer to the electrical guides.
C1B0500	Hold current directional control valve 1	- Directional control valve 1 circuit: high resistance - Air in system	Check the directional control valve circuit. Carry out the manual bleed procedure. REFER to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).

DTC	Description	Possible causes	Action
C1B0600	Off current directional control valve 1	- Directional control valve 1 circuit: short circuit to other circuits	Check the directional control valve circuit with the control module connector disconnected. Refer to the electrical guides.
C1B0712	Directional control valve 2	- Directional control valve 2 circuit: short circuit/very low resistance - Directional control valve 2 circuit: short circuit to power	Check the directional control valve circuit. For sticking/faulty valves, install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation).
C1B0714	Directional control valve 2	- Directional control valve 2 circuit: short circuit to ground	Check the directional control valve circuit. Refer to the electrical guides.
C1B0718	Directional control valve 2	- Directional control valve 2 circuit: high resistance	Check the directional control valve circuit. Refer to the electrical guides.
C1B0719	Directional control valve 2	- Directional control valve 2 circuit: very low resistance - Directional control valve 2 circuit: short circuit to power	Check the directional control valve circuit. Refer to the electrical guides.
C1B071D	Directional control valve 2	- Directional control valve 2 circuit: high resistance	Check the directional control valve circuit. Refer to the electrical guides.
C1B0800	Hit current directional control valve 2	- Directional control valve 2 circuit: high resistance	Check the directional control valve circuit. Refer to the electrical guides.
C1B0900	Hold current directional control valve 2	- Directional control valve 2 circuit: high resistance - Air in system	Check the directional control valve circuit. Carry out the manual bleed procedure. REFER to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).
C1B1000	Off current directional control valve 2	- Directional control valve 2 circuit: short circuit to other circuits	Check the directional control valve circuit with the control module connector disconnected. Refer to the electrical guides.
C1B1112	Pressure control valve (PCV)	- PCV circuit: very low resistance - PCV circuit: short circuit to power	Check the PCV circuit. Refer to the electrical guides.
C1B1114	Pressure control valve (PCV)	- PCV circuit: short circuit to ground	Check the PCV circuit. Refer to the electrical guides.
C1B1118	Pressure control valve (PCV)	- PCV circuit: high resistance	Check the PCV circuit. Refer to the electrical guides.
C1B1119	Pressure control valve (PCV)	- PCV circuit: very low resistance - PCV circuit: short circuit to power	Check the PCV circuit. Refer to the electrical guides.
C1B111D	Pressure control valve (PCV)	- PCV circuit: high resistance	Check the PCV circuit. Refer to the electrical guides.
C1B1162	Pressure control valve (PCV)	- Low/Contaminated fluid - PCV fault - Low flow/low pressure pump - Pressure transducer fault - Air in system	Check fluid level and condition. For sticking/faulty valves, install a new valve block. REFER to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation). Check the pump operation and hoses, rectify as necessary. Install a new pressure transducer as necessary. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation). Carry out the manual bleed procedure. REFER to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).
C1B1164	Pressure control valve (PCV)	- PCV circuit: high resistance	Check the PCV circuit. Refer to the electrical guides.

DTC	Description	Possible causes	Action
C1B1212	Lower lateral accelerometer circuit	- Lower lateral accelerometer signal circuit: short circuit to other circuit or power	Check the lower lateral accelerometer circuit. Refer to the electrical guides.
C1B1214	Lower lateral accelerometer circuit	- Lower lateral accelerometer signal circuit: short circuit to other circuit or ground - Lower lateral accelerometer fault	Check the lower lateral accelerometer circuit. Carry out the accelerometer tests using the approved diagnostic system. Install a new lower lateral accelerometer as necessary. REFER to: Lower Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1222	Lower lateral accelerometer circuit	- Lower lateral accelerometer loose - Lower lateral accelerometer signal circuit: short circuit to other circuit or ground - Lower lateral accelerometer fault	Check the lower lateral accelerometer fitment, rectify as necessary. Check the lower lateral accelerometer circuit. Carry out the accelerometer tests using the approved diagnostic system. Install a new lower lateral accelerometer as necessary. REFER to: Lower Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1226	Lower lateral accelerometer circuit	- Lower lateral accelerometer signal circuit: short circuit to other circuit - Lower lateral accelerometer fault	Check the lower lateral accelerometer circuit. Carry out the accelerometer tests using the approved diagnostic system. Install a new lower lateral accelerometer as necessary. REFER to: Lower Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1228	Lower lateral accelerometer circuit	- Lower lateral accelerometer mounting damaged - Lower lateral accelerometer loose - Lower lateral accelerometer fault	Check the lower lateral accelerometer fitment, rectify as necessary. Carry out the accelerometer tests using the approved diagnostic system. Install a new lower lateral accelerometer as necessary. REFER to: Lower Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1276	Lower lateral accelerometer circuit	- Lower lateral accelerometer mounting damaged - Lower lateral accelerometer fault	Check the lower lateral accelerometer fitment, rectify as necessary. Carry out the accelerometer tests using the approved diagnostic system. Install a new lower lateral accelerometer as necessary. REFER to: Lower Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1312	Upper lateral accelerometer circuit	- Upper lateral accelerometer signal circuit: short circuit to other circuit or power - Upper lateral accelerometer fault	Check the upper accelerometer circuit. Carry out the accelerometer tests using the approved diagnostic system. Install a new upper lateral accelerometer as necessary. REFER to: Upper Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1314	Upper lateral accelerometer circuit	- Upper lateral accelerometer signal circuit: short circuit to other circuit or ground - Upper lateral accelerometer fault	Check the upper accelerometer circuit. Carry out the accelerometer tests using the approved diagnostic system. Install a new upper lateral accelerometer as necessary. REFER to: Upper Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1322	Upper lateral accelerometer circuit	- Upper lateral accelerometer loose - Upper lateral accelerometer signal circuit: short circuit to other circuit - Upper lateral accelerometer fault	Check the upper lateral accelerometer fitment, rectify as necessary. Check the upper accelerometer circuit. Carry out the accelerometer tests using the approved diagnostic system. Install a new upper lateral accelerometer as necessary. REFER to: Upper Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1326	Upper lateral accelerometer circuit	- Upper lateral accelerometer signal circuit: short circuit to other circuit - Upper lateral accelerometer fault	Check the upper accelerometer circuit. Carry out the accelerometer tests using the approved diagnostic system. Install a new upper lateral accelerometer as necessary. REFER to: Upper Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1328	Upper lateral accelerometer circuit	- Upper lateral accelerometer mounting damaged - Upper lateral accelerometer loose	Check the upper lateral accelerometer fitment, rectify as necessary. Carry out the accelerometer tests using the approved diagnostic system. Install a new upper lateral accelerometer as necessary.

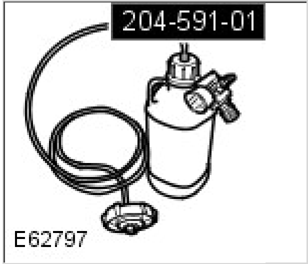
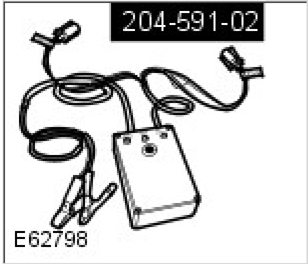
DTC	Description	Possible causes	Action
		● Upper lateral accelerometer fault	REFER to: Upper Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B1376	Upper lateral accelerometer circuit	● Upper lateral accelerometer mounting damaged ● Upper lateral accelerometer fault	Check the upper lateral accelerometer fitment, rectify as necessary. Carry out the accelerometer tests using the approved diagnostic system. Install a new upper lateral accelerometer as necessary. REFER to: Upper Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B141C	Sensor supply 1	● Lower lateral accelerometer or pressure transducer supply circuit: short circuit to other circuit or ground ● Lower lateral accelerometer fault ● Pressure transducer fault	Check the lower accelerometer and pressure transducer circuits. Carry out the accelerometer tests using the approved diagnostic system. Install a new lower lateral accelerometer as necessary. REFER to: Lower Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation). Install a new pressure transducer as necessary. REFER to: Valve Block Transducer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B151C	Sensor supply 2	● Upper lateral accelerometer supply circuit: short circuit to other circuit or ground ● Upper lateral accelerometer fault	Check the upper lateral accelerometer circuits. Carry out the accelerometer tests using the approved diagnostic system. Install a new upper lateral accelerometer as necessary. REFER to: Upper Accelerometer (204-06 Ride and Handling Optimization, Removal and Installation).
C1B181C	Control module supply voltage cross-reference check	● Control module supply circuit: high resistance ● Charging system fault	Check the control module power and ground circuits. Check for charging system DTCs, rectify as necessary. REFER to: Charging System (414-00 Battery and Charging System - General Information, Diagnosis and Testing).
P14529	Calculated torque error	● Internal control module calculation failure	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
U007388	Control module communication bus off	● CAN circuit fault ● CAN module fault ● Dynamic response module fault	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U010087	Lost communication with the engine control module (ECM)	● ECM CAN message not received in the specified time	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U010187	Lost communication with the transmission control module (TCM)	● TCM CAN message not received in the specified time	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U010287	Lost communication with the transfer case control module (TCCM)	● TCCM CAN message not received in the specified time	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U012287	Lost communication with the anti-lock brake (ABS) module	● ABS module CAN message not received in the specified time	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U012687	Lost communication with the steering wheel rotation sensor	● Steering wheel rotation sensor CAN message not received in the specified time	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U013287	Lost communication with the air suspension control module	● Air suspension control module CAN message not received in the specified time	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U015587	Lost communication with the instrument cluster module	● Instrument cluster module CAN message not received in the specified time	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
U030055	Module configuration does not match the vehicle configuration	● Dynamic response module incorrectly configured	Configure the module using the approved diagnostic system.

DTC	Description	Possible causes	Action
U040181	Invalid data received from the ECM	- ECM fault	Check for CAN or module DTCs. Check the power and ground circuits to the ECM, rectify as necessary.
U040281	Invalid data received from the TCM	- TCM fault	Check for CAN or module DTCs. Check the power and ground circuits to the TCM, rectify as necessary.
U040381	Invalid data received from the TCCM	- TCCM fault	Check for CAN or module DTCs. Check the power and ground circuits to the TCCM, rectify as necessary.
U041681	Invalid data received from the ABS module	- ABS module fault	Check for CAN or module DTCs. Check the power and ground circuits to the ABS module, rectify as necessary.
U042181	Invalid data received from the air suspension control module	- Air suspension control module fault	Check for CAN or module DTCs. Check the power and ground circuits to the air suspension control module, rectify as necessary.
U042881	Invalid data received from the steering wheel rotation sensor	- Steering wheel rotation sensor fault	Check for CAN or module DTCs. Check the power and ground circuits to the steering wheel rotation sensor, rectify as necessary.
U042885	Invalid data received from the steering wheel rotation sensor	- Steering wheel rotation sensor out of calibration - Steering wheel rotation sensor fault	Calibrate the steering wheel rotation sensor using the approved diagnostic system. Check for CAN or module DTCs. Check the power and ground circuits to the steering wheel rotation sensor, rectify as necessary.
U042886	Invalid data received from the steering wheel rotation sensor	- Steering wheel rotation sensor out of calibration - Wheels out of alignment - Steering wheel rotation sensor fault	Calibrate the steering wheel rotation sensor using the approved diagnostic system. Check the wheel alignment, adjust as necessary. REFER to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures). Check for CAN or module DTCs. Check the power and ground circuits to the steering wheel rotation sensor, rectify as necessary.
U1A0400	Vehicle speed CAN signal	- ABS module fault	Check for CAN or module DTCs. Check the power and ground circuits to the ABS module, rectify as necessary.
U1A1086	Ignition status CAN signal	- Lost communications	Check for associated codes giving more information. Refer to the warranty policy and procedures manual if a module is suspect.
U1A1449	CAN initialization failure	- Dynamic response module internal fault	Refer to the warranty policy and procedures manual if a module is suspect.
U200798	Valve(s)	- Restricted filter - Restricted high pressure or return line pipework - Damaged pump - Contaminated fluid - Continuous use at high lateral acceleration	Check the filter and pipework. Check the pump, rectify as necessary. Check the fluid condition, replace and clean as necessary. Investigate the driving profile.

Published: 11-May-2011

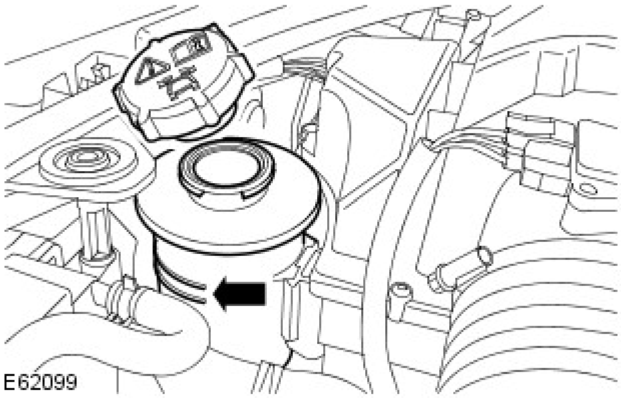
Ride and Handling Optimization - Active Stabilization System Bleeding

General Procedures

Special Tool(s)	
	Dynamic Response Bleed Bottle 204-591-01
	Dynamic Response Control Box 204-591-02

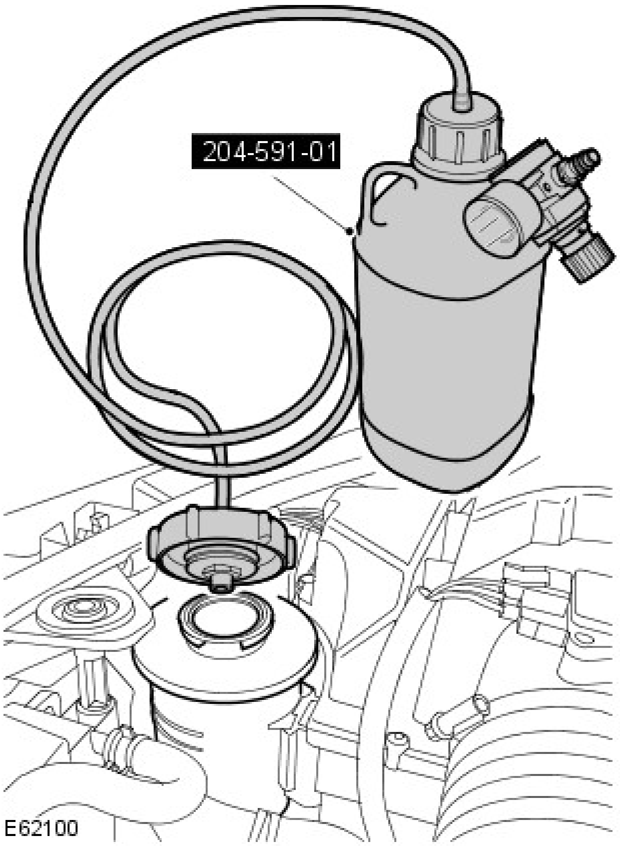
⚠CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

• NOTE: This procedure should be carried out if the following components have been removed or replaced: front or rear stabilizer bar, front or rear valve block to actuator bar pipe assemblies, or the valve block. It is possible to bleed only the front or rear of the system if only a stabilizer bar or pipe assembly has been removed. If the valve block has been removed, the complete system must be bled.



1. Check and top-up the dynamic response system fluid reservoir.

- Top-up the fluid level to the mid-way mark on the reservoir.



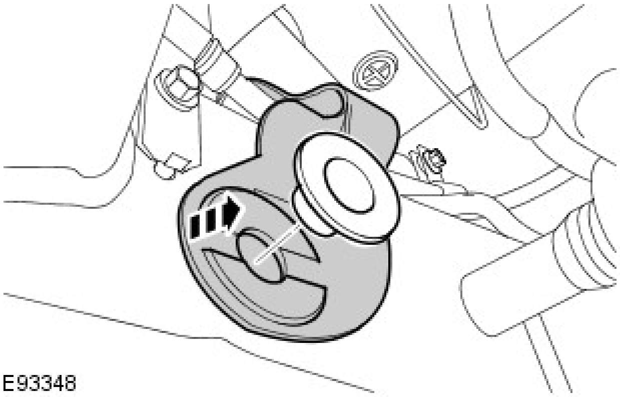
2. Install the special tool to the dynamic response reservoir.
   - Completely fill the reservoir with fluid.
   - Make sure the pressure regulator on the special tool is turned OFF.
   - Fill the special tool bottle approximately three-quarters full with fluid.
   - Connect the special tool to a suitable workshop air supply.

3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

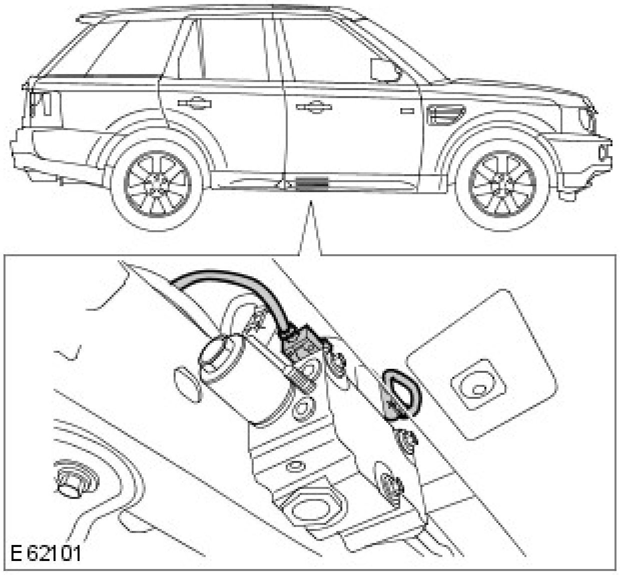
   Raise and support the vehicle.

4. Remove the RH rear wheel and tire.

5. RH side rear: To improve access to RH rear actuator bleed screw, remove bracket from body frame securing fuel breather pipes.

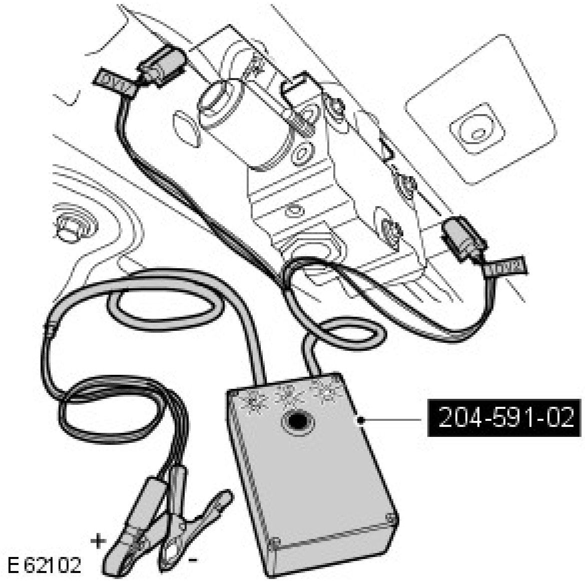


6. Disconnect the two direction control valve electrical connectors.



7. Connect the special tool electrical connectors to the valve block.

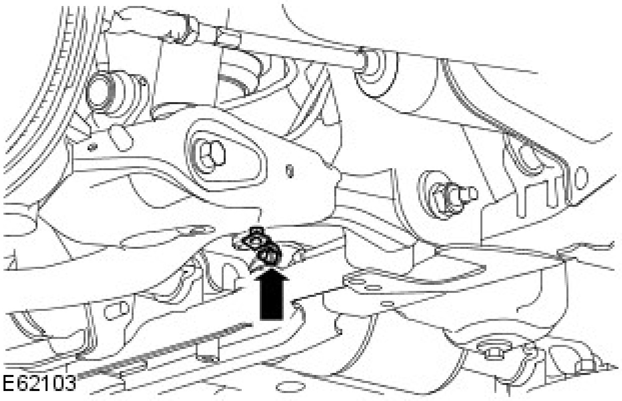
- Connect the special tool power supply leads to the vehicle battery.



8. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

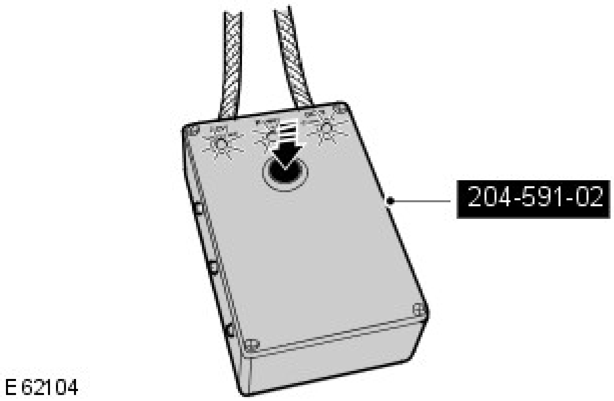
9. Connect the hose from special tool kit to the front stabilizer bar bleed screws.

- Remove the bleed screw covers.



10. Loosen the front actuator RH bleed screw by one-half of a turn.

11. Using the special tool, open both actuator control valves.

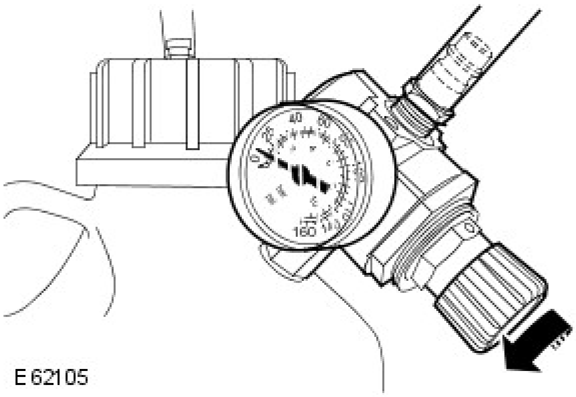


12. ⚠CAUTION: The Dynamic Response bleed tool fluid reservoir must remain full with new, clean fluid, at all times during bleeding.

• NOTE: It may be necessary to operate the switch several times to help pulse the air out of the actuator.

Bleed the dynamic response system until a flow of clean, air-free fluid, is being pumped into the bleed jar.

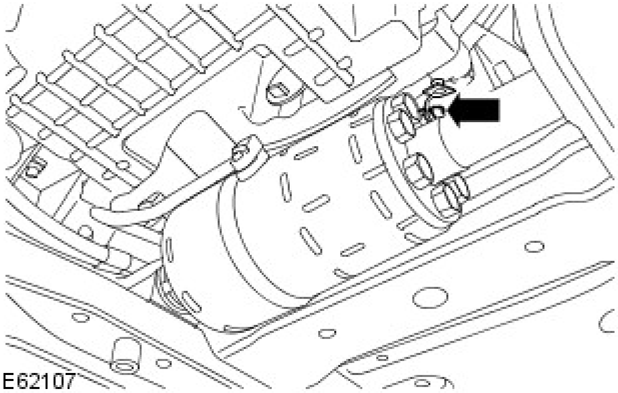
- Using the special tool pressure regulator, carefully increase the air pressure to approx. 5 - 10 PSI / 0.3 - 0.7 kPa, until air/fluid is being expelled from bleed screw.

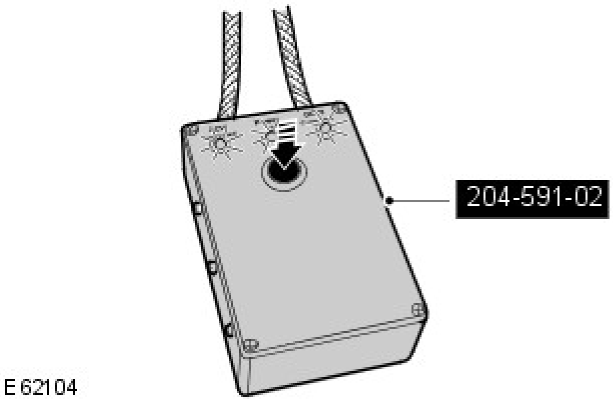


13. When a steady flow of clean air free fluid is running from the bleed point, tighten the bleed screw to 15 Nm (11 lb.ft).

- Release the switch on the special tool to switch off the actuator control valves.

14. Loosen the front actuator LH bleed screw by one-half of a turn.





15. Using the special tool, open both actuator control valves.

16. NOTE: It may be necessary to operate the switch several times to help pulse the air out of the actuator.

Bleed the dynamic response system until a flow of clean, air-free fluid, is being pumped into the bleed jar.

17. When a steady flow of clean air free fluid is running from the bleed point, tighten the bleed screw to 15 Nm (11 lb.ft).

- Release the switch on the special tool to switch off the actuator control valves.

18. Repeat the front stabilizer bar bleed procedure, from steps 9 to 17, a further two times, to make sure all air is removed from the actuator.

19. Disconnect the special tool hose from the front stabilizer bar bleed screws.

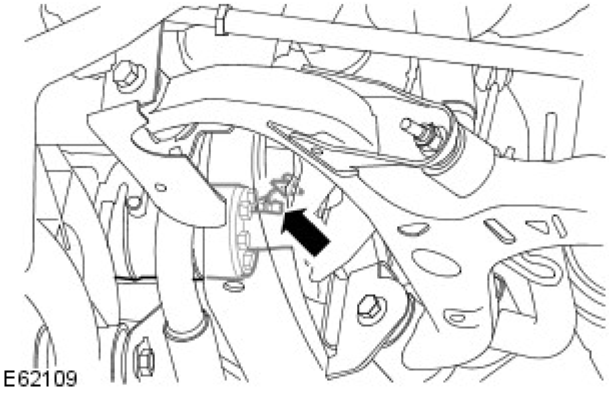
- Install the bleed screw covers.
- Discard the fluid from the bleed jar.

20. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

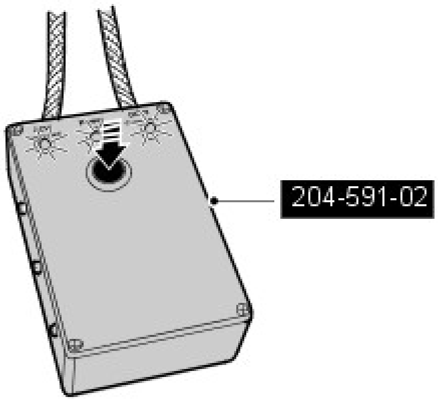
21. Check and top-up the special tool fluid reservoir.

22. Connect the hose from the special tool kit to the rear stabilizer bar bleed screws.

- Remove the bleed screw covers.

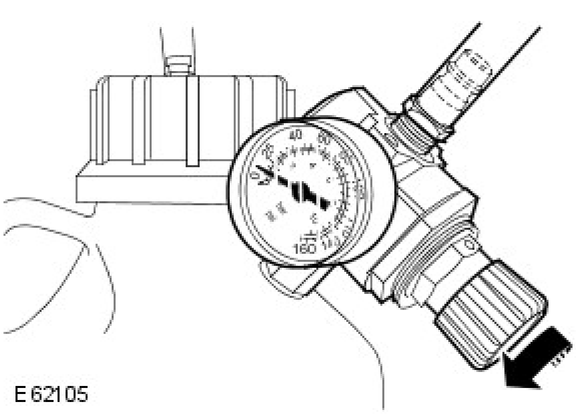


23. Loosen the rear actuator RH bleed screw by one-half of a turn.



E62104

24. Using the special tool, open both actuator control valves.

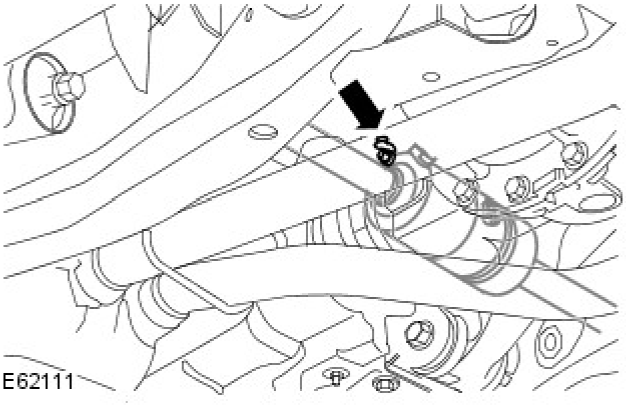


E62105

25. CAUTION: The Dynamic Response bleed tool fluid reservoir must remain full with new, clean fluid, at all times during bleeding.

• NOTE: It may be necessary to operate the switch several times to help pulse the air out of the actuator.

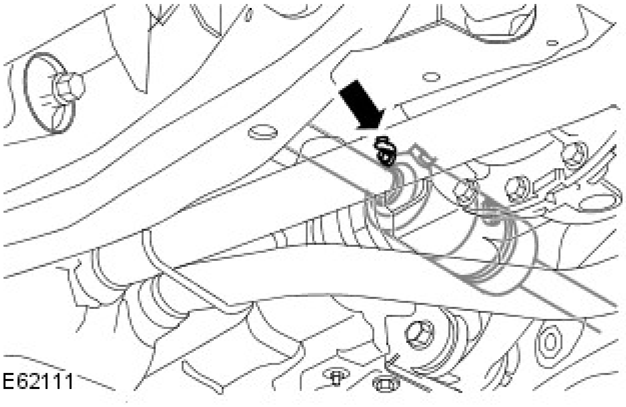
Bleed the dynamic response system until a flow of clean, air-free fluid, is being pumped into the bleed jar.



E62111

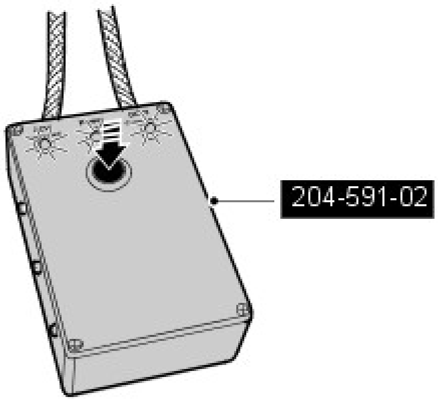
26. When a steady flow of clean air free fluid is running from the bleed point, tighten the bleed screw to 15 Nm (11 lb.ft).

- Release the switch on the special tool to switch off the actuator control valves.



E62111

27. Loosen the rear actuator LH bleed screw by one-half of a turn.



28. Using the special tool, open both actuator control valves.

29. NOTE: It may be necessary to operate the switch several times to help pulse the air out of the actuator.

Bleed the dynamic response system until a flow of clean, air-free fluid, is being pumped into the bleed jar.

30. When a steady flow of clean air free fluid is running from the bleed point, tighten the bleed screw to 15 Nm (11 lb.ft).

- Release the switch on the special tool to switch off the actuator control valves.

31. Repeat the rear stabilizer bar bleed procedure, from steps 22 to 30, a further two times, to make sure all air is removed from the actautor.

32. Disconnect the special tool hose from the rear stabilizer bar bleed screws.

- Discard the fluid from the bleed jar.
- Install the bleed screw covers.

33. Disconnect the special tool from the valve block.

- Connect the valve block electrical connectors.

34. ⚠ WARNING: The special tool is still pressurised when the source air pressure is removed. Release air pressure within special tool slowly before removing.

Remove the special tool from the dynamic response system reservoir.

- Remove the special tool.
- Top-up the fluid level to the mid-way mark on the reservoir.

35. Install bracket securing fuel breather pipes.

36. Using IDS, check operation of the dynamic response system.

37. If necessary, repeat the above procedure.

38. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Ride and Handling Optimization - Ride and Handling Optimization Switch

Removal and Installation

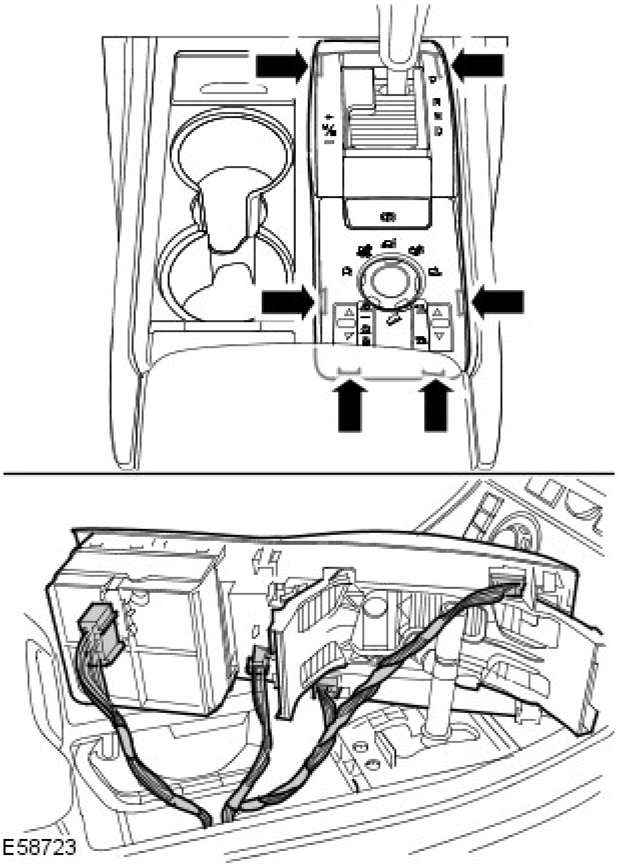
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the selector lever knob.
For additional information, refer to: Selector Lever Knob (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

3. Remove the ride and handling optimization switch.

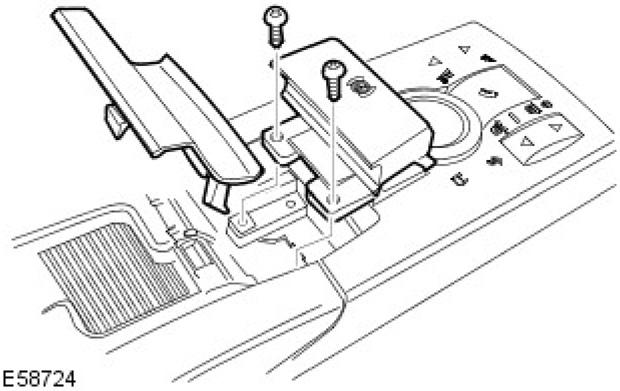
- Release the 6 clips.
- Disconnect the 4 electrical connectors.



4. NOTE: Do not disassemble further if the component is removed for access only.

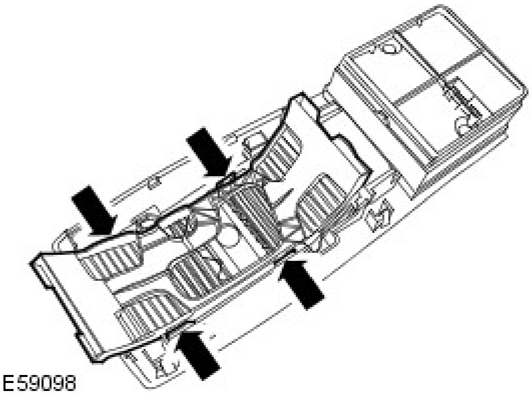
Remove the screw cover.

- Release the clip.



5. Remove the parking brake switch.

- Remove the 2 screws.



6. Remove the selector lever panel.

- Release the 4 clips.

Installation

1. Install the selector lever panel.

- Secure the clips.

2. Install the parking brake switch.

- Tighten the screws.

3. Install the screw cover.

4. Install the ride and handling optimization switch.

- Connect the electrical connectors.
- Secure the clips.

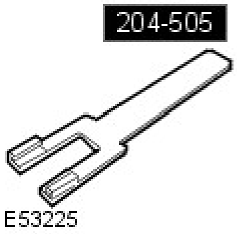
5. Install the selector lever knob.
For additional information, refer to: Selector Lever Knob (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

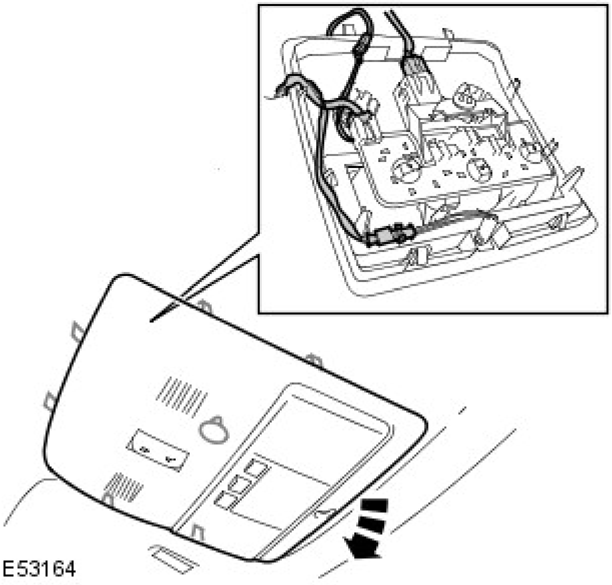
Ride and Handling Optimization - Upper Accelerometer

Removal and Installation

Special Tool(s)	
	Accelerometer remover/replacer 204-505 (LRT-60-014A)

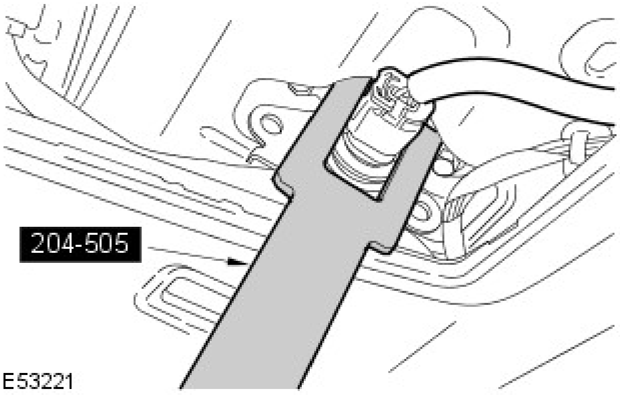
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the front overhead console.
   - Carefully release the 9 clips.
   - Disconnect the 2 electrical connectors.



3. ⚠ CAUTION: The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

   Remove the upper accelerometer.
   - Using the special tool, release the accelerometer.
   - Release and disconnect the electrical connector.



Installation

1. Using the special tool, install the upper accelerometer.
   - Connect and secure the electrical connector.

2. Install the front overhead console.

- Connect and secure the electrical connectors.
- Carefully secure the clips.

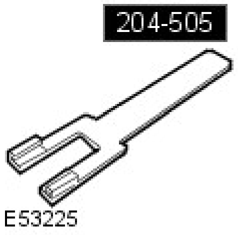
3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Using T4, calibrate the dynamic response system.

Published: 11-May-2011

Ride and Handling Optimization - Lower Accelerometer

Removal and Installation

Special Tool(s)	
 E53225	Accelerometer remover/replacer 204-505 (LRT-60-014A)

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

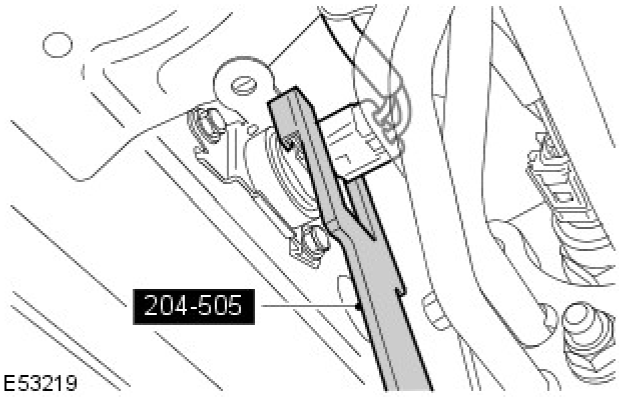
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. ⚠ CAUTION: The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

Remove the lower accelerometer.

- Using the special tool , release the accelerometer.
- Release and disconnect the electrical connector.



E53219

Installation

1. Using the special tool, install the lower accelerometer.

- Connect and secure the electrical connector.

2. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Using T4, calibrate the dynamic response system.

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Ride and Handling Optimization - Fluid PumpTDV8 3.6L Diesel

Removal and Installation

Removal

⚠ CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

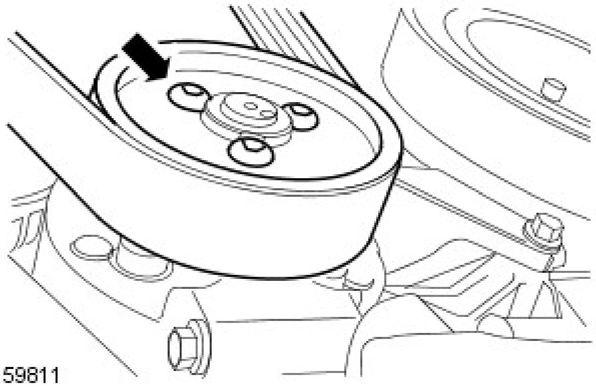
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the cooling fan.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

4. Loosen the fluid pump drive pulley bolts.

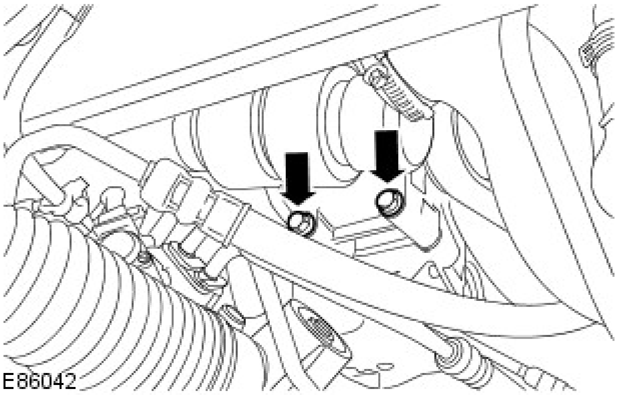
- Loosen the 3 bolts.



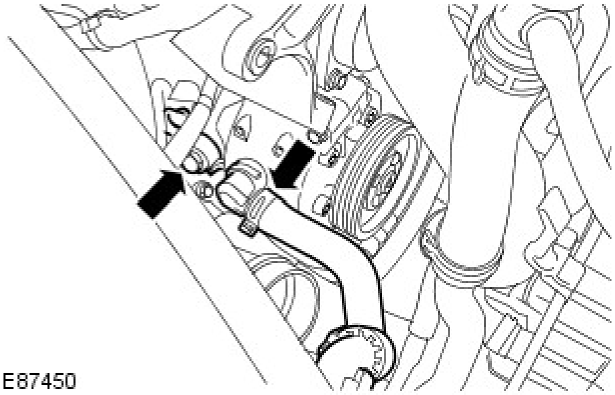
E59811

5. Remove the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and Installation).

6. Remove the 2 fluid pump lower bolts.



E86042

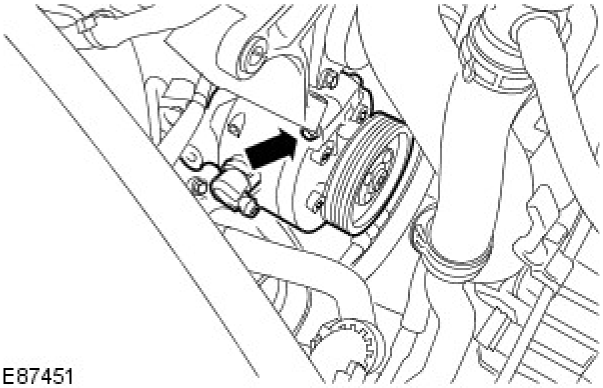

E87450

7. ⚠CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid pump hoses.

- Clamp the fluid pump to reservoir hose.
- Release the hose clip.
- Remove the banjo bolt.
- Disconnect the hoses.
- Discard the O-ring seals.


E87451

8. Remove the fluid pump.

- Remove the remaining fluid pump bolt.

9. Remove the fluid pump drive pulley.

- Remove the 3 bolts.

Installation

1. Install the fluid pump drive pulley.

- Install the bolts, but do not tighten fully at this stage.

2. Install the fluid pump.

- Tighten the bolts to 23 Nm (17 lb.ft).

3. ⚠CAUTION: Make sure both O-ring seals are correctly installed on the high-pressure union.

Connect the hoses.

- Clean the component mating faces.
- Lubricate and install new O-rings to the high-pressure union.
- Tighten the union to 35 Nm (26 lb.ft).
- Install the hose clip.
- Remove the hose clamp.

4. Install the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and Installation).

5. Tighten the fluid pump drive pulley bolts to 22 Nm (16 lb.ft).

6. Install the cooling fan.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

8. Fill the fluid reservoir.

9. Make sure there is fluid circulation through the reservoir.

- Start the engine and allow to idle.

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Ride and Handling Optimization - Fluid PumpTDV6 2.7L Diesel

Removal and Installation

Removal

⚠CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

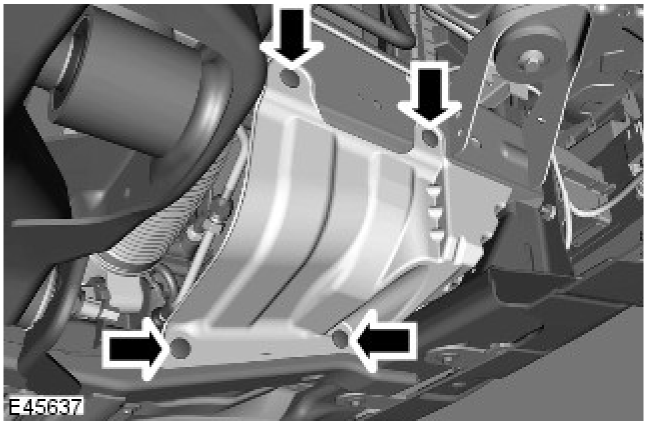
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00, Specifications).

2. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the front RH splash shield.

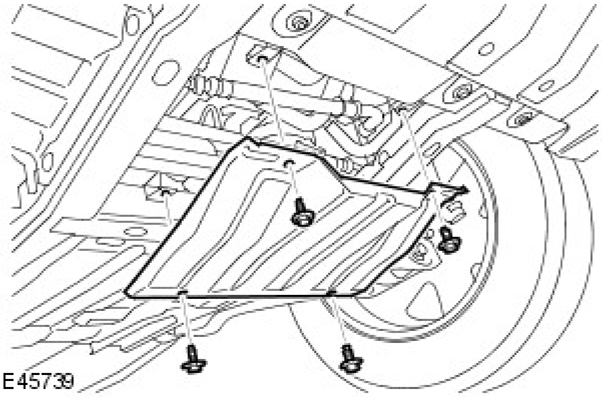
- Remove the 4 clips.



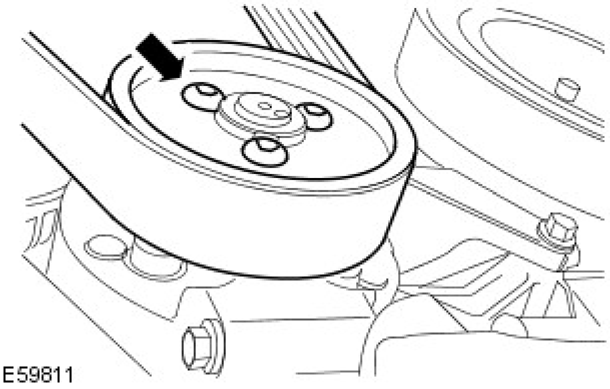
4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02, Removal and Installation).

5. Remove the radiator access panel.

- Remove the 4 bolts.



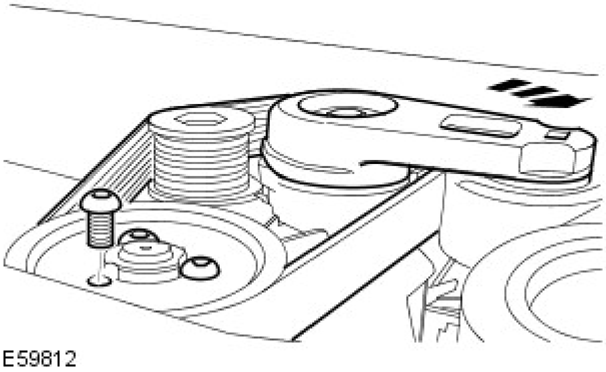
6. Remove the front RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02, Removal and Installation).



7. NOTE: Loosen the bolts prior to removing the accessory drive belt.

Loosen the fluid pump drive pulley retaining bolts.

- Loosen the 3 Torx bolts.

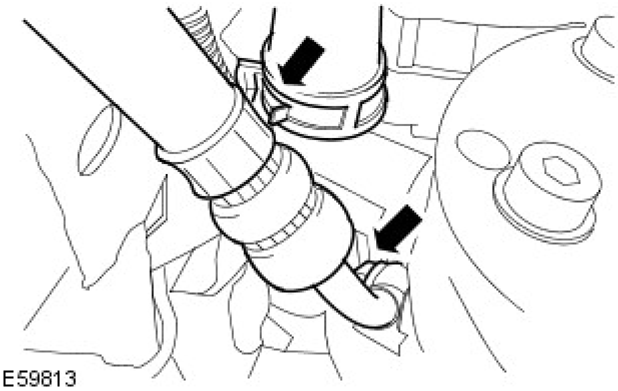


8. Release the tension from the belt.

- Remove the accessory drive belt.

9. Remove the fluid pump drive pulley.

- Remove the 3 bolts.



10. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

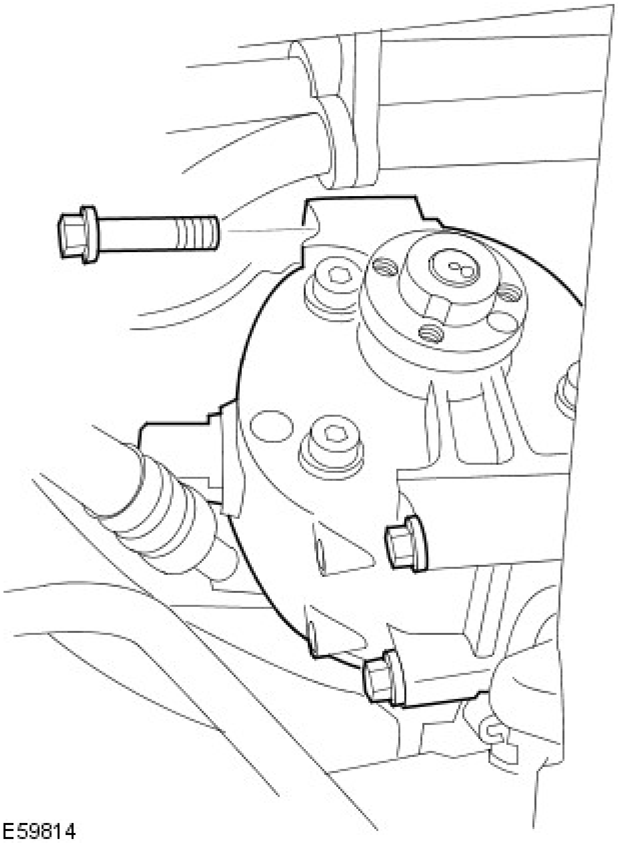
• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid pump hoses.

- Clamp the fluid pump to reservoir hose.
- Release the hose clip.
- Disconnect the hoses.
- Discard the O-ring seals.

11. Remove the fluid pump.

- Remove the 3 bolts.



E59814

Installation

1. Install the fluid pump.

- Clean the locating dowels.
- Install and tighten the bolts to 22 Nm (16 lb.ft).
- Prime the pump with clean fluid.

2. CAUTION: Make sure both O-ring seals are correctly installed on the high pressure union.

Connect the hoses.

- Clean the component mating faces.
- Lubricate and install new O-rings to the high-pressure union.
- Tighten the union to 35 Nm (26 lb.ft).
- Install the hose clip.
- Remove the hose clamp.

3. Install the fluid pump drive pulley.

- Install the Torx bolts, but do not tighten fully at this stage.

4. Install the belt.

5. Tighten the fluid pump drive pulley retaining bolts to 22 Nm (16 lb.ft).

6. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02,

Removal and Installation).

7. Install the radiator access panel.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

8. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02, Removal and Installation).

9. Install the front RH splash shield.

10. Refill the fluid reservoir.

11. Connect the battery ground lead, tighten the nut to 5 Nm (4 lb.ft).
For additional information, refer to: Specifications (414-00, Specifications).

12. Make sure there is fluid circulation through the reservoir.

- Start the engine and allow to idle.

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Ride and Handling Optimization - Dynamic Response Module

Removal and Installation

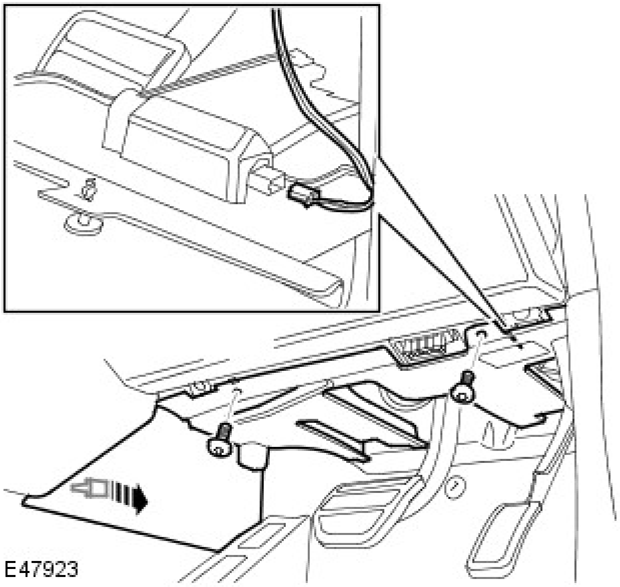
Removal

- NOTE: The dynamic response module is always located on the driver's side of the vehicle.

1. Remove the cowl side trim panel.
For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Remove the closing trim panel.

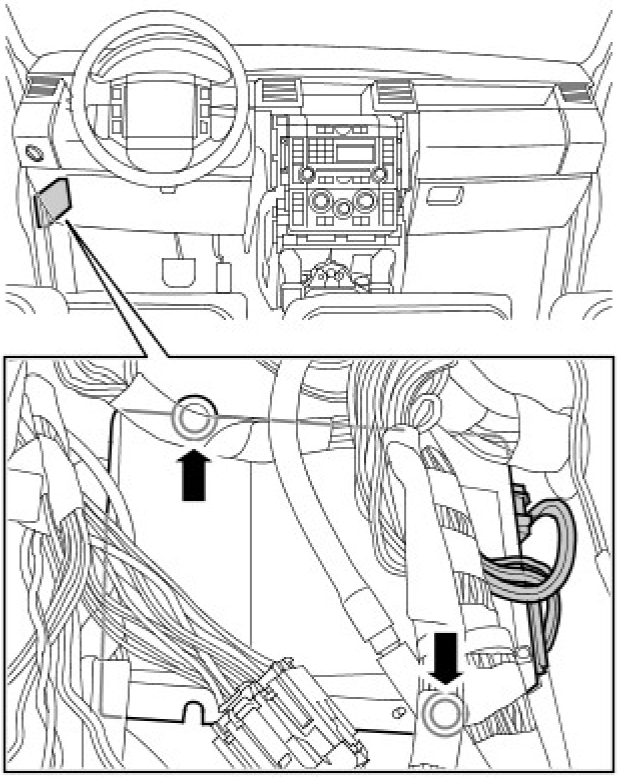
- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



E47923

3. Remove the dynamic response module.

- Remove the 2 bolts.
- Disconnect the 2 electrical connectors.



E53030

Installation

1. Install the dynamic response module.
    - Connect the electrical connectors.
    - Tighten the 2 bolts to 4 Nm (3 lb.ft).
2. Install the closing trim panel.
    - Connect the electrical connector.
    - Secure the clip.
    - Tighten the screws.
3. Install the cowl side trim panel.
   For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Initiate a new control module using T4.

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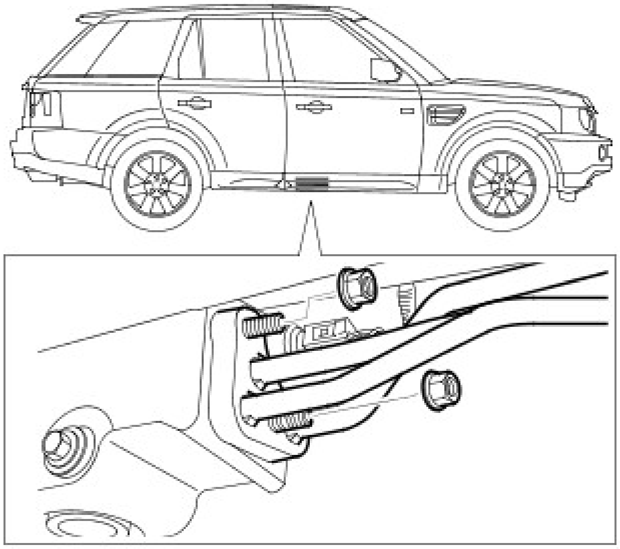
Ride and Handling Optimization - Valve Block

Removal and Installation

Removal

CAUTION: Dynamic Response system components are manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the Dynamic Response system.

• NOTE: The valve block seals do not require replacement unless there is evidence of a fluid leak. A new valve block is supplied with new seals installed.



E57817

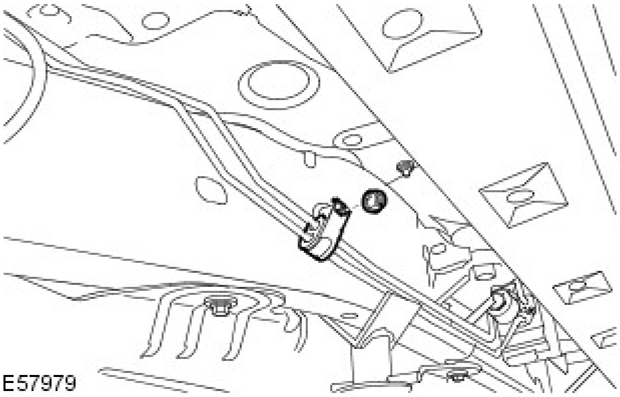
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. NOTE: Some fluid spillage is inevitable during this operation.

   Release the front actuator pipes from the valve block.

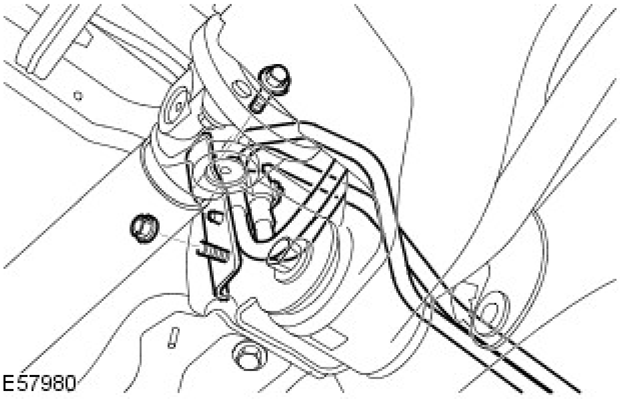
   - Position a container to collect the fluid spillage.
   - Remove and discard the 2 nuts.



E57979

3. Release the valve block to rear stabilizer bar actuator pipe assembly mounting.

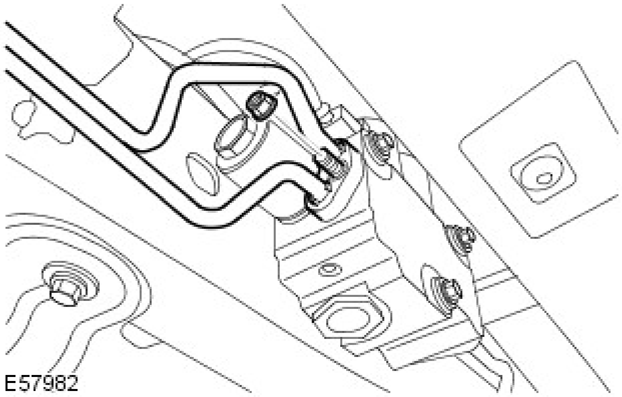
   - Remove the nut.



E57980

4. Release the valve block to rear stabilizer bar actuator pipe assembly mounting.

- Remove the bolt.
- Remove the nut.
- Remove the bracket.



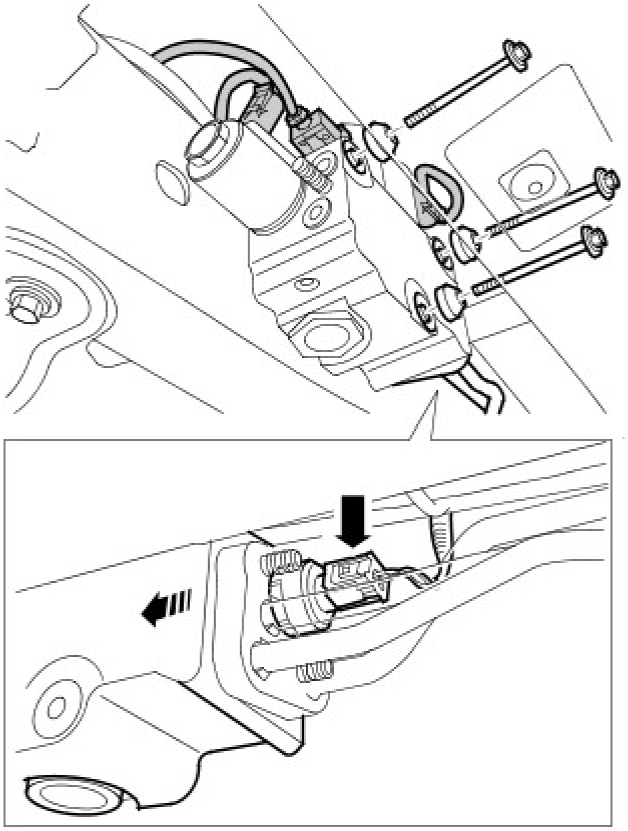
E57982

5. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the rear actuator pipes from the valve block.

- Position a container to collect the fluid spillage.
- Remove and discard the nut.



E57983

6. CAUTIONS:

⚠ Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not clamped or kinked. Failure to follow this instruction will result in damage to the vehicle.

• NOTE: Some fluid spillage is inevitable during this operation.

• NOTE: Note the fitted position of the washers.

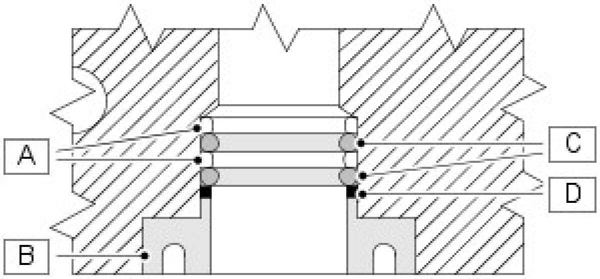
Remove the valve block.

- Disconnect the 4 electrical connectors.
- Remove the 3 bolts.
- Collect the 4 washers.
- Disconnect the front actuator pipes from the valve block.

Installation

1. Check the valve block O-rings seals and plastic spacer washers are correctly installed.

- A: Backing rings (white)
- B: Outer clamping ring
- C: O-ring seals
- D: Outer backing ring (Black)

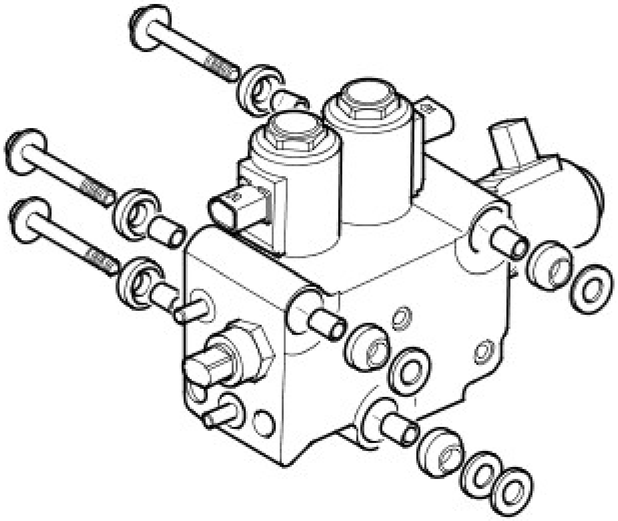


E58627

2. NOTE: Make sure there are two washers installed between the integrated body frame and the valve block lower retaining bolt.

Install the valve block.

- Remove the blanking caps from the ports.
- Connect the front actuator pipes to the valve block.
- Install 3 new nuts and tighten to 23 Nm (17 lb.ft).
- Discard the 3 valve block retaining bolts, fit new ones and tighten to 20 Nm (15 lb.ft).
- Connect the electrical connectors.



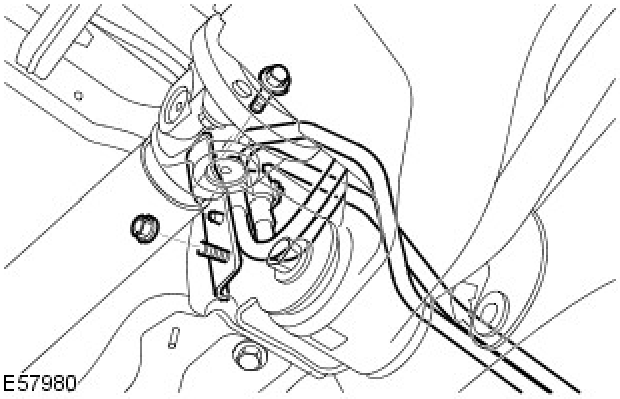
E58615

3. Connect the rear actuator pipes to the valve block.

- Remove the blanking caps from the ports.
- Install a new nut and tighten to 22 Nm (16 lb.ft).
- Remove the container.

4. Secure the valve block to rear stabilizer bar actuator pipe assembly mounting.

- Install the bracket.
- Install the nut and bolt and tighten to 9 Nm (7 lb.ft).



E57980

5. Secure the valve block to rear stabilizer bar actuator pipe assembly mountings.

- Tighten the nut to 9 Nm (7 lb.ft)

6. Using T4, bleed the Dynamic Response system.

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Ride and Handling Optimization - Valve Block Filter

Removal and Installation

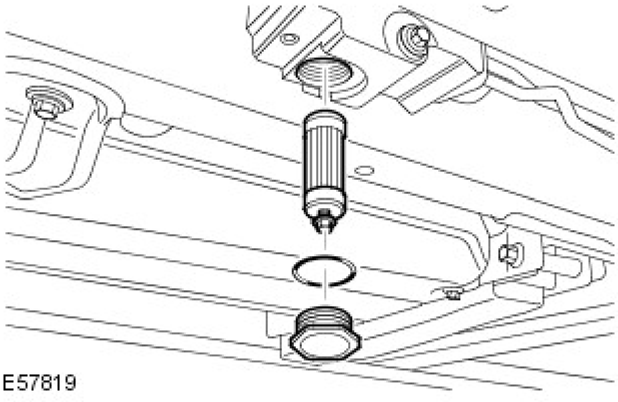
Removal

CAUTION: Dynamic Response system components are manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the Dynamic Response system.

• NOTE: This procedure does not require the Dynamic Response system to be bled.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.


E57819

2. CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove and discard the valve block filter.

- Position container to collect fluid loss.
- Remove the access plug.
- Remove and discard the access plug O-ring seal.
- Using a suitable M6 bolt, release the filter from the valve block.

Installation

1. Install the new valve block filter.

- Clean the component mating faces.
- Install a new access plug O-ring seal.
- Tighten the access plug to 62 Nm (46 lb.ft).
- Remove the container.

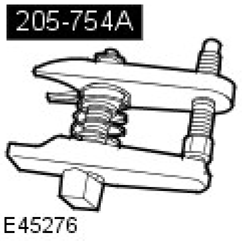
2. Start the engine and allow to idle.

3. Check and top-up the Dynamic Response system fluid reservoir.

Published: 11-May-2011

Ride and Handling Optimization - Valve Block to Front Stabilizer Bar Actuator Pipe AssemblyTDV8 3.6L Diesel

Removal and Installation

Special Tool(s)	
	Ball joint separator 205-754(LRT-54-027)

Removal

⚠ CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

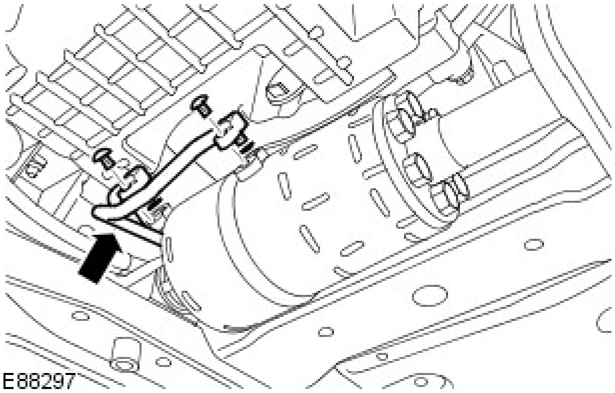
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



5. CAUTIONS:

⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

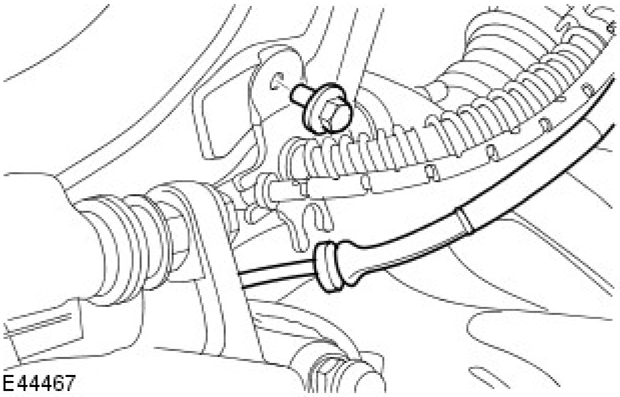
- NOTE: Some fluid spillage is inevitable during this operation.

Disconnect and reposition the fluid lines.

- Position container to collect fluid loss.
- Remove the fluid line bracket bolt.
- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.
- Remove and discard the plastic spacer washers.

6. Remove the front wheels and tires.

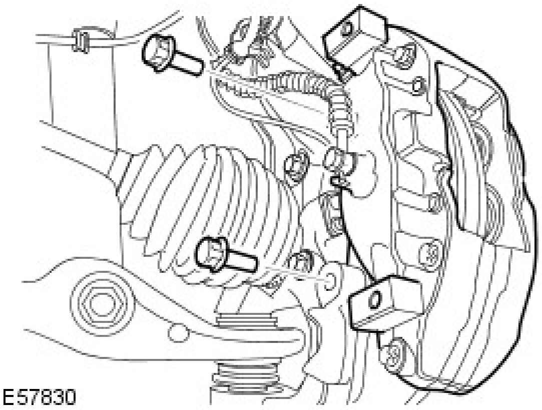
7. RH front: Remove the shock absorber and air spring assembly.
For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).



E44467

8. Release the brake hose bracket from the wheel knuckle.

- Remove the bolt.

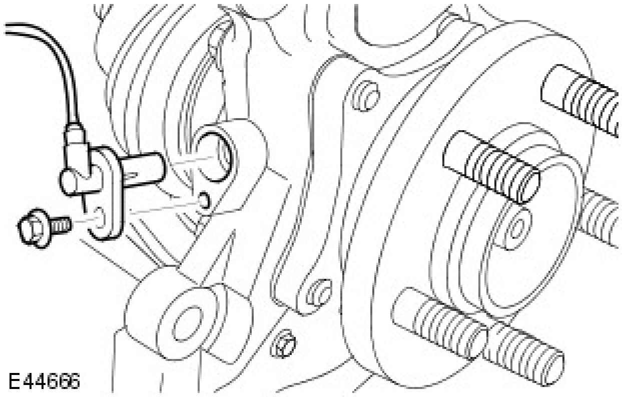


E57830

9. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper from the wheel knuckle.

- Remove the 2 bolts.
- Tie the brake caliper aside.



E44666

10. NOTE: The brake disc is shown removed for clarity.

Release the wheel speed sensor from the wheel knuckle.

- Remove the bolt.

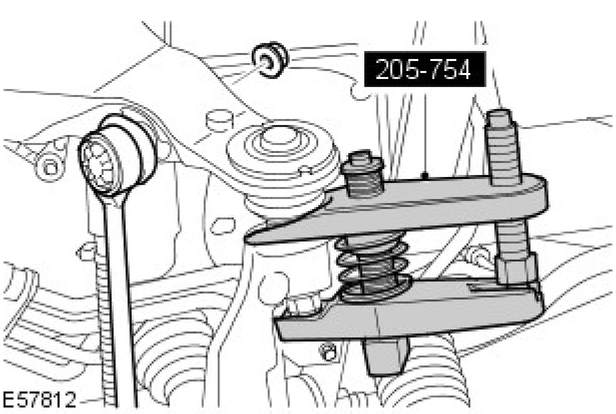
11. CAUTIONS:

⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

Release the stabilizer bar link.

- Remove and discard the nut.

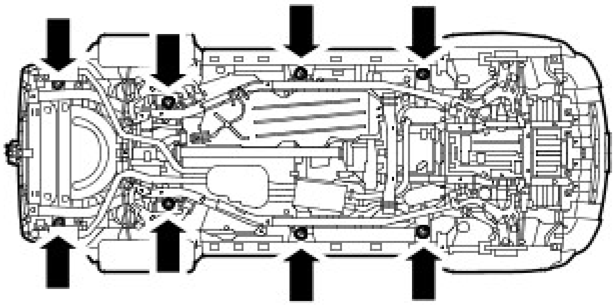


12. ⚠ CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

Using the special tool, release the upper arm ball joint.

- Remove and discard the nut.

13. Remove the 8 body mount bolts.

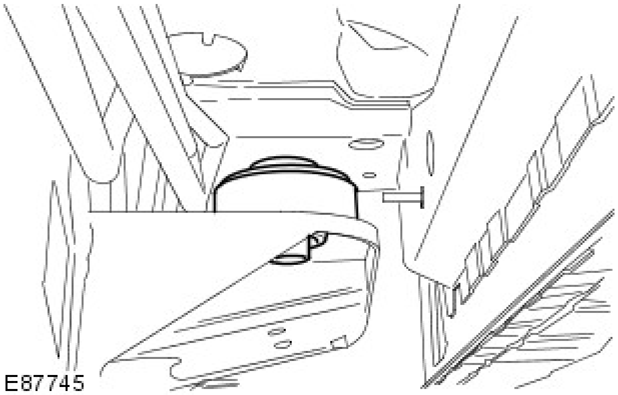


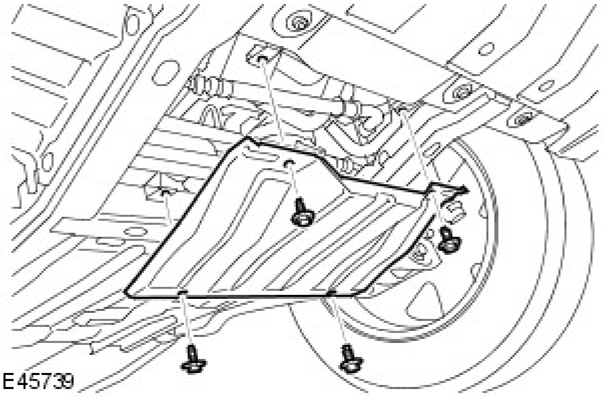
14. ⚠ CAUTION: Only raise the body sufficiently to remove the body mount.

Carefully raise the body.

- Using suitable stands, raise the body to release the body mounts.

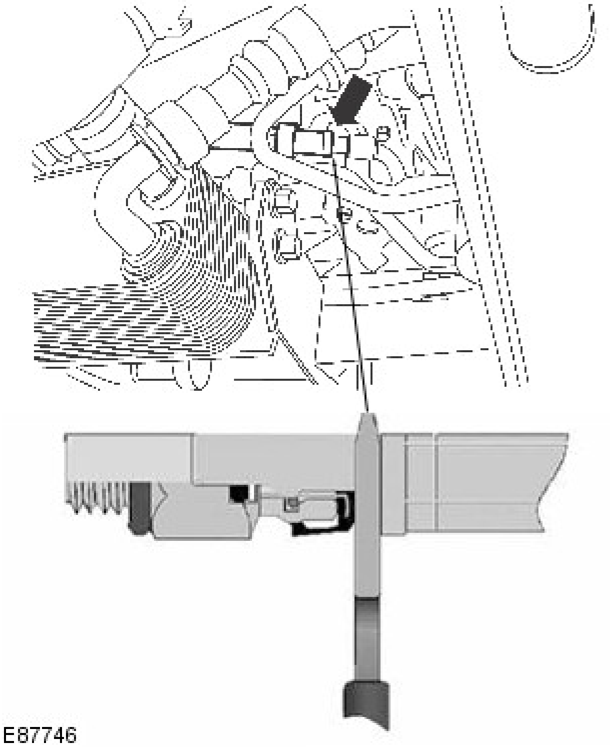
15. Remove the body mount.





16. Remove the radiator splash shield.

- Remove the 4 bolts.



17. ⚠ WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.

• CAUTIONS:

⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

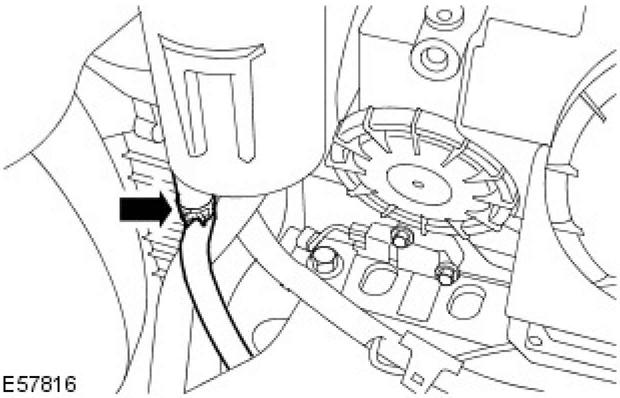
⚠ Make sure the release sleeve is pushed back no further than 3 mm (0.12 inches). Failure to follow this instruction may result in damage to the vehicle.

⚠ Do not lever the connection apart. Failure to follow this instruction may result in damage to the vehicle.

Using a suitable tool, disconnect the high-pressure line.

1. Insert the suitable tool behind the release sleeve.
2. Disconnect the high-pressure line.

18. Remove the air cleaner.
For additional information, refer to: Air Cleaner (303-12D Intake Air Distribution and Filtering - TDV8 3.6L Diesel, Removal and Installation).

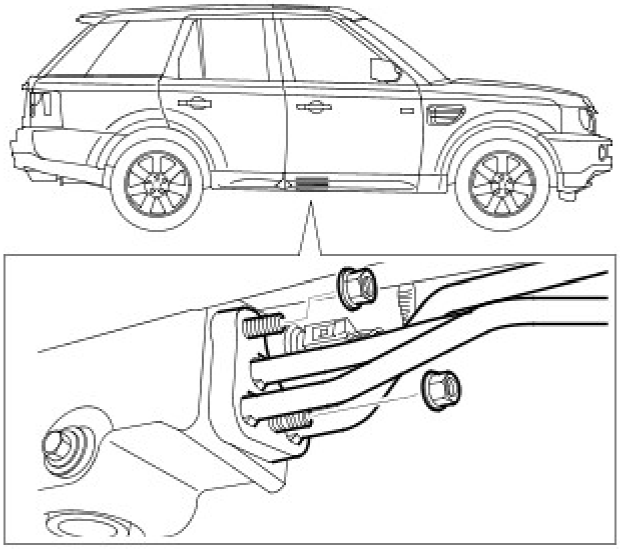


19. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid return line from the reservoir.

- Position a container to collect the fluid spillage.
- Reposition the fluid line into the wheel arch area.



E57817

20. CAUTIONS:

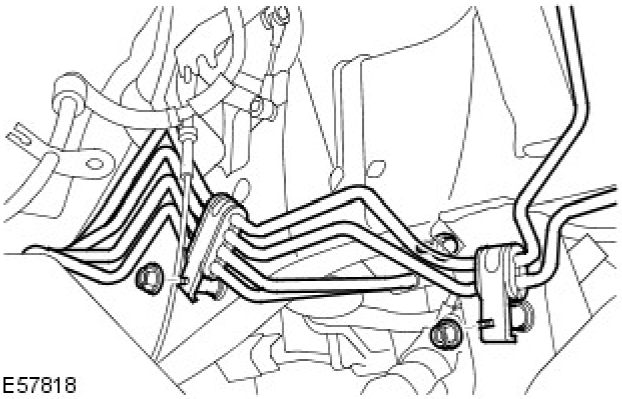
⚠ Always plug any open connections to prevent contamination.

⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the front actuator pipes from the valve block.

- Position a container to collect the fluid spillage.
- Remove and discard the 2 nuts.
- Install blanking caps to the exposed ports.



E57818

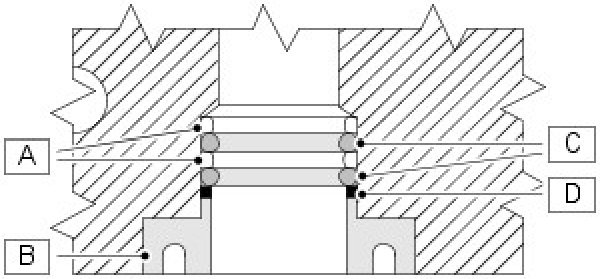
21. Release the valve block to front stabilizer bar actuator pipe assembly mountings.

- Remove the 2 nuts and 1 bolt.

22. Remove the valve block to front stabilizer bar actuator pipe assembly.

Installation

1. Check the valve block O-rings and plastic spacer washers are correctly installed.



E58627

- A: Backing rings (white)
- B: Outer clamping ring
- C: O-ring seals
- D: Outer backing ring (Black)

2. Install the valve block to front stabilizer bar actuator pipe assembly.

- Clean the components.

3. Connect the front actuator pipes to the valve block.

- Remove the blanking caps from the ports.
- Install 2 new nuts and tighten to 22 Nm (16 lb.ft).
- Remove the container.

4. Attach the valve block to front stabilizer bar actuator pipe assembly mountings.

- Tighten the 2 nuts and 1 bolt to 9 Nm (7 lb.ft).

5. Connect the fluid line to the reservoir.

- Reposition the fluid line from the wheel arch area.
- Install the clip.
- Remove the container.

6. Install the air cleaner.
For additional information, refer to: Air Cleaner (303-12D Intake Air Distribution and Filtering - TDV8 3.6L Diesel, Removal and Installation).

7. NOTE: Pull on the 2 halves of the high-pressure line connector to make sure the latch has fully engaged.

Connect the high-pressure line.

- Remove the blanking caps from the ports.
- Remove the container.

8. Install the radiator splash shield.

- Tighten the M6 bolts to 10 Nm (7 lb.ft).
- Tighten the M10 bolts to 62 Nm (46 lb.ft).

9. Install the body mount.

10. Lower the body.

- Remove the stands.

11. Install the body mount bolts.

- Tighten the bolts to 133 Nm (98 lb.ft).

12. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

13. Install the wheel speed sensor.

- Tighten the bolt to 9 Nm (7 lb.ft).
- Connect the electrical connector.
- Secure the wiring harness in the clips.

14. Secure the brake caliper to the wheel knuckle.

- Tighten the bolts to 275 Nm (203 lb.ft).

15. Secure the brake hose bracket to the wheel knuckle.

- Tighten the bolt to 23 Nm (17 lb.ft).

16. Install the shock absorber and air spring assembly.
For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

17. CAUTIONS:

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

⚠ Care must be taken to avoid damage to the plastic spacer washers and O-ring seals during installation of the fluid lines to the actuator.

• NOTE: Some fluid spillage is inevitable during this operation.

Connect the fluid lines to the actuator.

- Clean the component mating faces.
- Remove the blanking caps from the ports.
- Install new plastic spacer washers and O-ring seals.
- Tighten the 2 bolts to 22 Nm (16 lb.ft).
- Tighten the fluid line bracket bolt to 4 Nm (3 lb.ft).

18. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

19. Using the approved Land Rover diagnostic system, bleed the active stabilization system.
For additional information, refer to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).

20. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

21. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Secure the stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

22. Install the front wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

23. Install the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

Published: 11-May-2011

Ride and Handling Optimization - Valve Block to Rear Stabilizer Bar Actuator Pipe Assembly

Removal and Installation

Removal

⚠CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the Dynamic Response system.

- NOTE: The valve block seals do not require replacement unless there is evidence of a fluid leak.

1. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

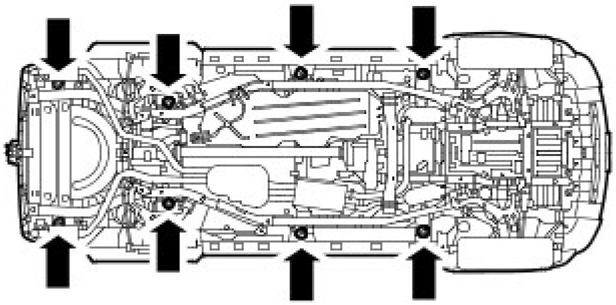
2. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

3. Remove the spare wheel and tire.

4. Remove the rear wheels and tires.

5. Remove the body mount retaining bolts.

- Remove the 8 bolts.



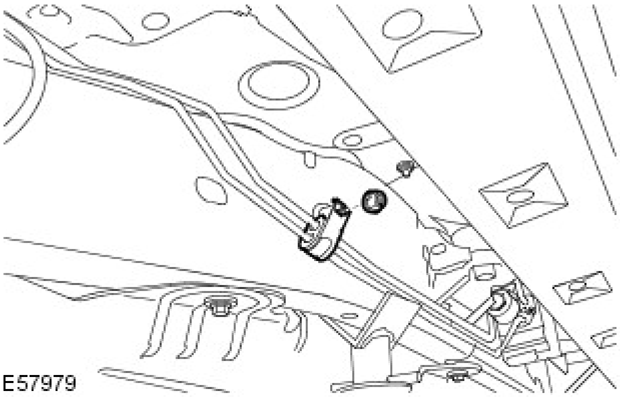
E52217

6. ⚠CAUTION: Only raise the body sufficiently to remove the valve block to rear stabilizer bar actuator pipe.

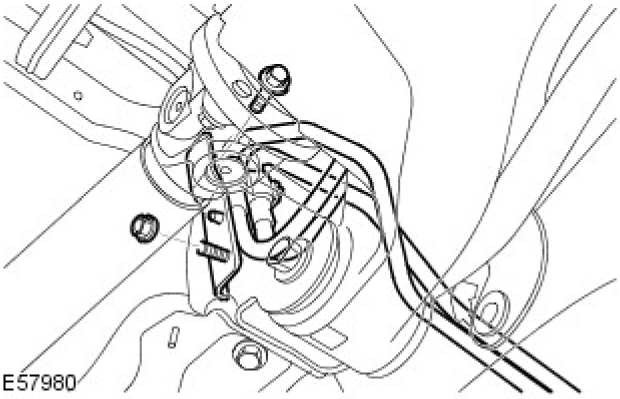
Using suitable stands, raise the body.

7. Release the valve block to rear stabilizer bar actuator pipe assembly mounting.

- Remove the nut.

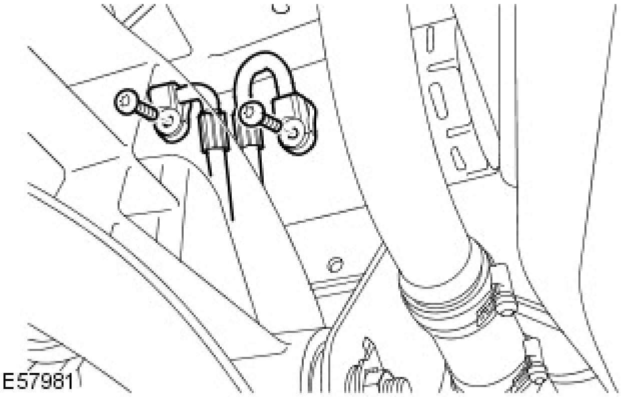


E57979



8. Release the valve block to rear stabilizer bar actuator pipe assembly mounting.

- Remove the nut.
- Remove the bolt.
- Remove the bracket.



9. CAUTIONS:

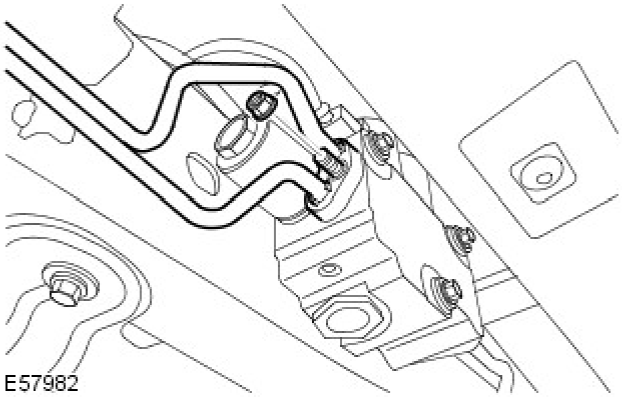
⚠ Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid lines from the actuator.

- Position container to collect fluid loss.
- Remove the 2 bolts.
- Remove and discard the O-ring seals.
- Remove and discard the plastic spacer washers.
- Install blanking caps to the exposed ports.



10. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

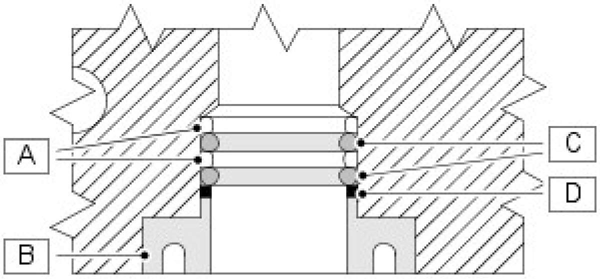
• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the rear actuator pipes from the valve block.

- Position a container to collect the fluid spillage.
- Remove and discard the nut.

11. Remove the valve block to rear stabilizer bar actuator pipe assembly.

Installation



E58627

1. Check the valve block O-rings and plastic spacer washers are correctly installed.

- A: Backing rings (white)
- B: Outer clamping ring
- C: O-ring seals
- D: Outer backing ring (Black)

2. ⚠ CAUTION: Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

Install the valve block to rear stabilizer bar actuator pipe assembly.

3. NOTE: Some fluid spillage is inevitable during this operation.

Connect the rear actuator pipes to the valve block.

- Remove the blanking caps from the ports.
- Install a new nut and tighten to 22 Nm (16 lb.ft).
- Remove the container.

4. CAUTIONS:

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

⚠ Care must be taken to avoid damage to the plastic spacer washers and O-ring seals during installation of the fluid lines to the actuator.

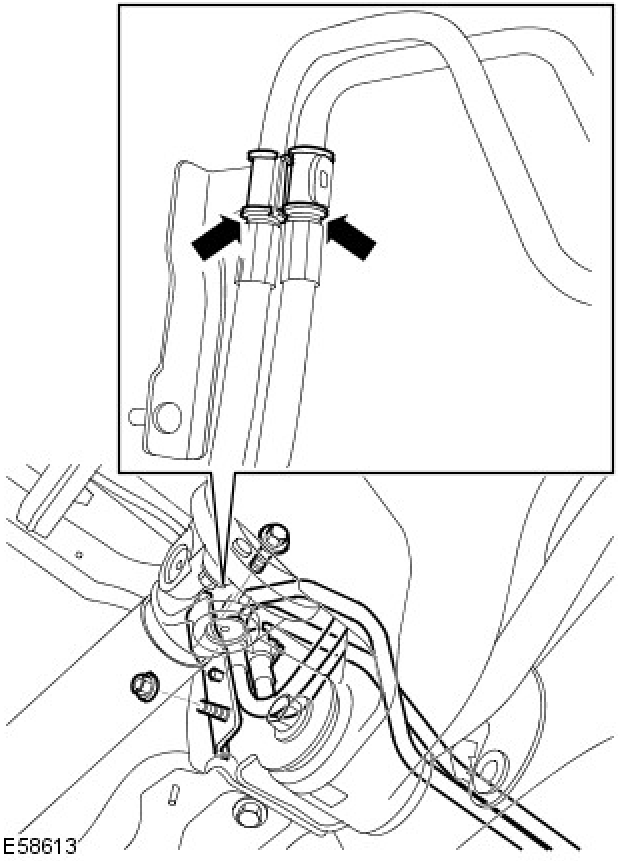
• NOTE: Some fluid spillage is inevitable during this operation.

Connect the fluid lines to the actuator.

- Clean the component mating faces.
- Remove the blanking caps from the ports.
- Install new plastic spacer washers and O-ring seals.
- Tighten the 2 bolts to 22 Nm (16 lb.ft).

5. Secure the valve block to rear stabilizer bar actuator pipe assembly mounting.

- Install the bracket.
- Install the nut and bolt and tighten to 9 Nm (7 lb.ft).



6. Secure the valve block to rear stabilizer bar actuator pipe assembly mounting.

- Tighten the nut to 9 Nm (7 lb.ft)

7. Bleed the rear of the Dynamic Response system using T4.
For additional information, refer to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).

8. Lower the body.

- Remove the stands.

9. Install the body mount retaining bolts.

- Tighten the 8 retaining bolts to 133 Nm (98 lb.ft).

10. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Install the spare wheel and tire.

12. Install the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

Published: 11-May-2011

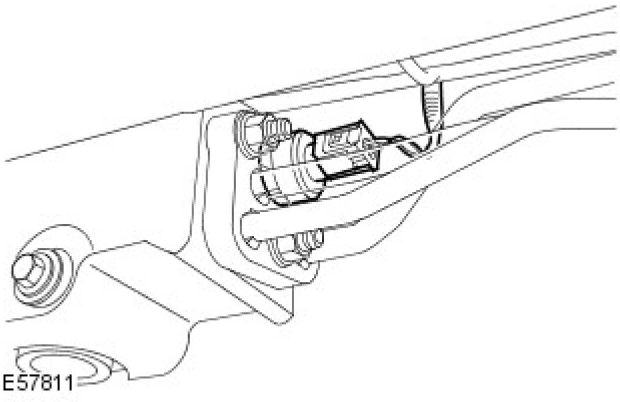
Ride and Handling Optimization - Valve Block Transducer

Removal and Installation

Removal

CAUTION: Dynamic Response system components are manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the Dynamic Response system.

• NOTE: This procedure does not require the Dynamic Response system to be bled.



1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the valve block transducer.

- Disconnect the electrical connector.
- Position container to collect fluid loss.

Installation

1. Install the valve block transducer.

- Clean the component mating faces.
- Tighten to 25 Nm (18 lb.ft).
- Remove the container.

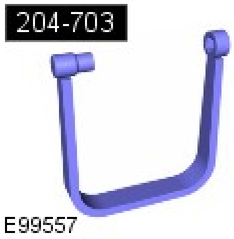
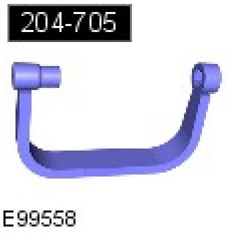
2. Start the engine and allow to idle.

3. Check and top-up the Dynamic Response system fluid reservoir.

Published: 11-May-2011

Ride and Handling Optimization - Front Stabilizer Bar BushingTDV8 3.6L Diesel

Removal and Installation

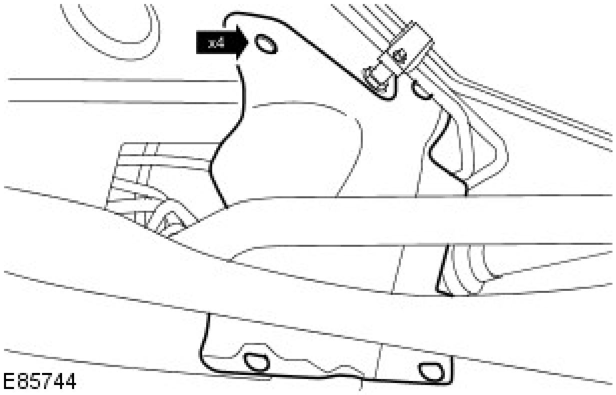
Special Tool(s)	
	Front Stabilizer Bar Bushing Tightening Tool 204-703
	Front Stabilizer Bar Bushing Tightening Tool 204-705

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

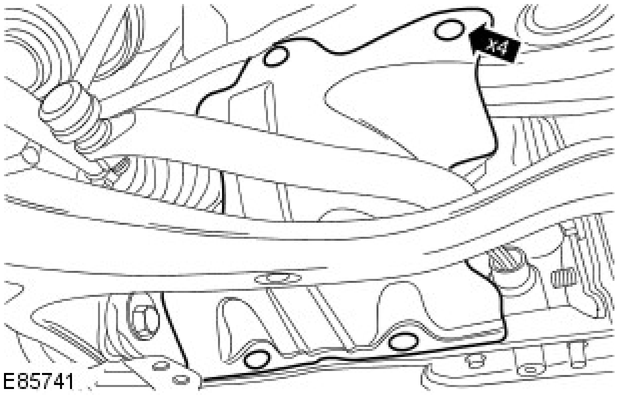
Raise and support the vehicle.

2. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



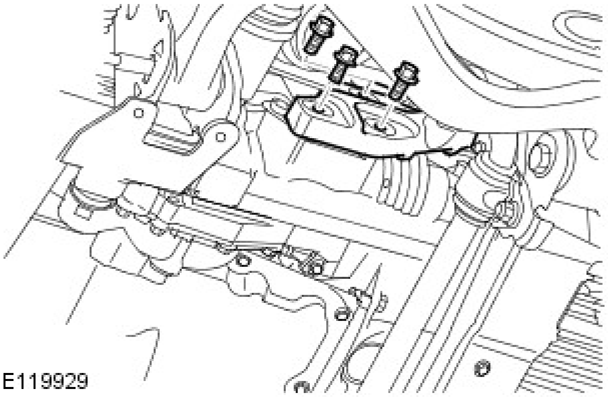
3. Remove the RH splash shield.

- Remove the 4 clips.



4. Remove the LH splash shield.

- Remove the 4 clips.

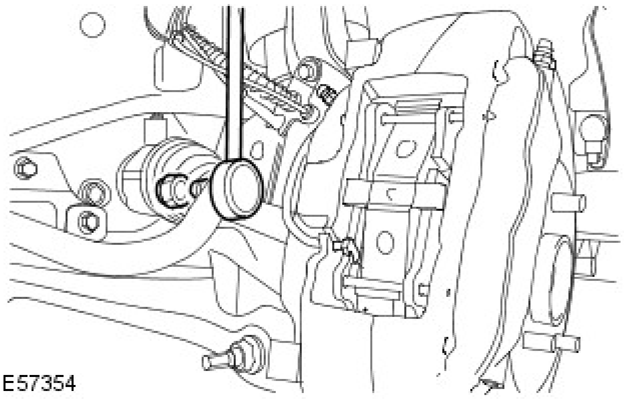


E119929

5. NOTE: Crossmember shown removed for clarity.

Using a suitable jack, support the differential.

- Remove and discard the three differential mounting bolts.
- Raise and reposition the front differential case.



E57354

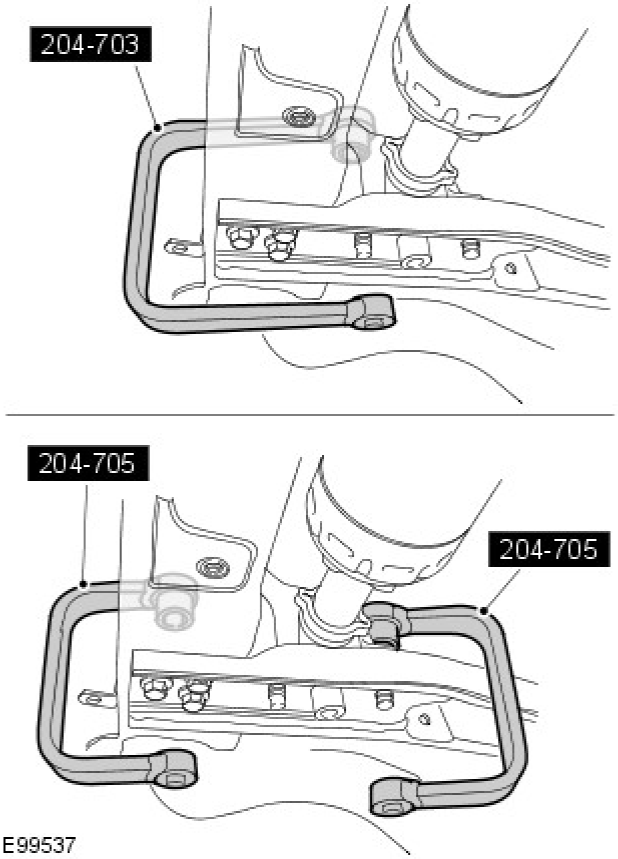
6. CAUTIONS:

⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

Disconnect both the stabilizer bar links from the stabilizer bar.

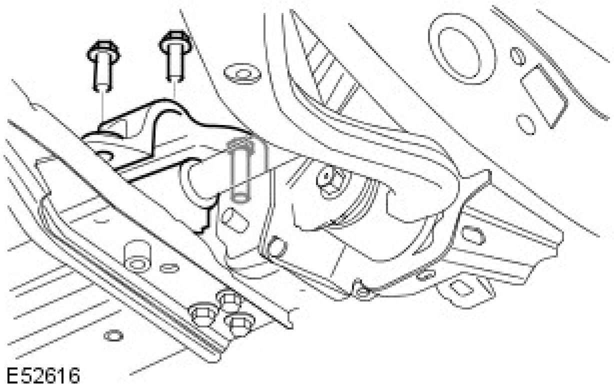
- Remove and discard the 2 nuts.



E99537

7. NOTE: Right-hand shown, left-hand similar.

Position the special tools.

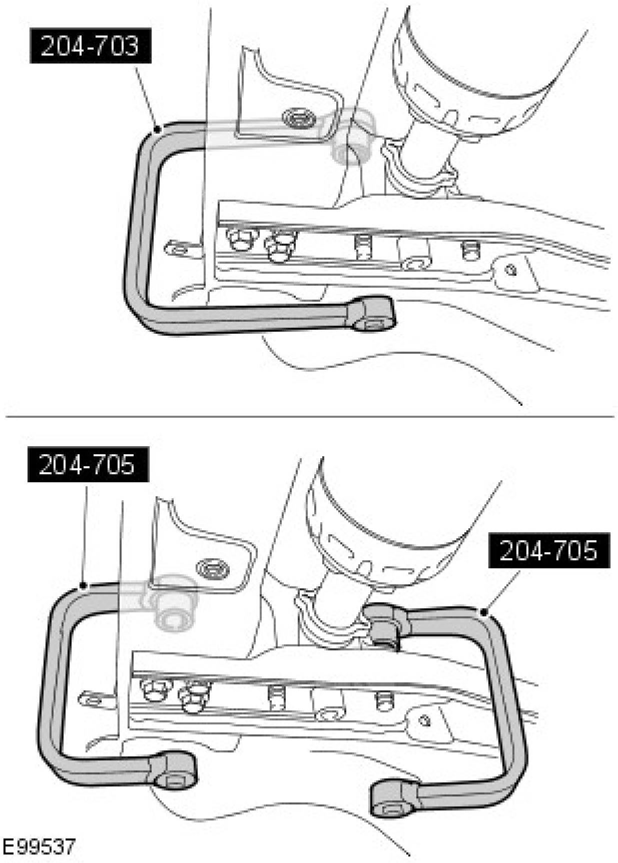


8. NOTE: Left-hand shown, right-hand similar.

Remove the stabilizer bar bushings.

- Using the special tools, remove and discard the 6 bolts.
- Remove the stabilizer bar clamps.

Installation



1. Install the stabilizer bar bushings.

- Clean the components.
- Install the stabilizer bar clamps.
- Using the special tools, tighten the bolts to 115 Nm (85 lb.ft).

2. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Connect both stabilizer bar links to the stabilizer bar.

- Install new nuts and tighten to 175 Nm (129 lb.ft).

3. Align and secure the front differential case.

- Tighten the new axle carrier bracket bolts to 80 Nm (59 lb.ft), then a further 60 degrees.

4. Install the LH splash shield.

- Install the clips.

5. Install the RH splash shield.

- Install the clips.

6. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

Published: 11-May-2011

Ride and Handling Optimization - Rear Stabilizer Bar Bushing

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

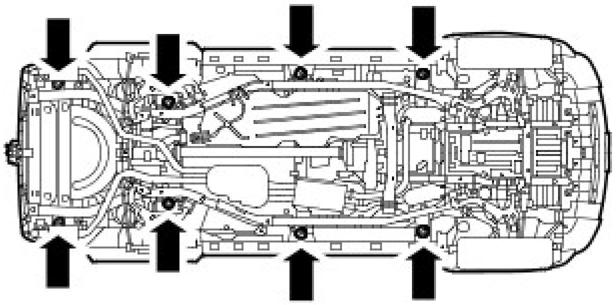
3. Remove the spare wheel and tire.

4. Raise the vehicle.

5. Remove the rear wheels and tires.

6. Remove the body mount retaining bolts.

- Remove the 8 bolts.



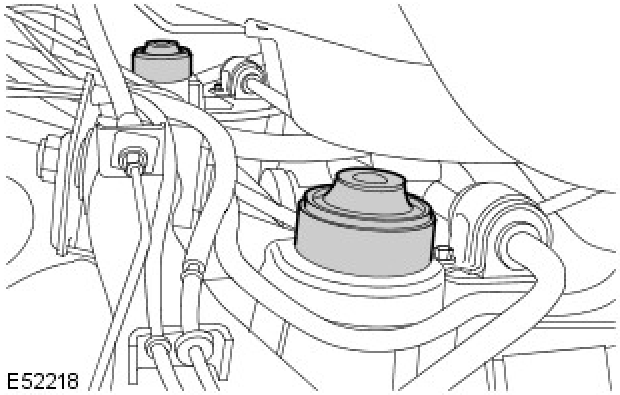
E52217

7. ⚠ CAUTION: Only raise the body sufficiently to remove the body mounts.

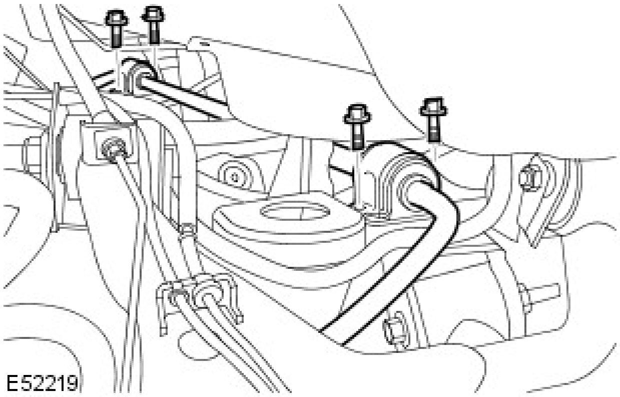
Raise the body.

- Using suitable stands, raise the body to release the body mounts.

8. Remove the 2 rear body mounts.



E52218



9. Remove the stabilizer bar bushings.

- Remove and discard the 4 bolts.
- Remove the 2 clamps.

Installation

1. Install the stabilizer bar bushings.

2. Install the stabilizer bar clamps.

- Tighten the 4 retaining bolts to 62 Nm (46 lb.ft).

3. Install the body mounts.

4. Lower the body.

- Remove the stands.

5. Install the body mount retaining bolts.

- Tighten the 8 retaining bolts to 133 Nm (98 lb.ft).

6. Install the wheels and tires.

7. Lower the vehicle.

8. Install the spare wheel and tire.

9. Install the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

Published: 29-Sep-2011

Ride and Handling Optimization - Front Stabilizer BarTDV8 3.6L Diesel

Removal and Installation

Special Tool(s)	
 E99557	Front Stabilizer Bar Bushing Tightening Tool 204-703
 E99558	Front Stabilizer Bar Bushing Tightening Tool 204-705

Removal

- CAUTIONS:

⚠ Do not remove or loosen the 6 bolts on the stabilizer bar. Failure to follow this instruction may result in damage to or failure of the stabilizer bar.

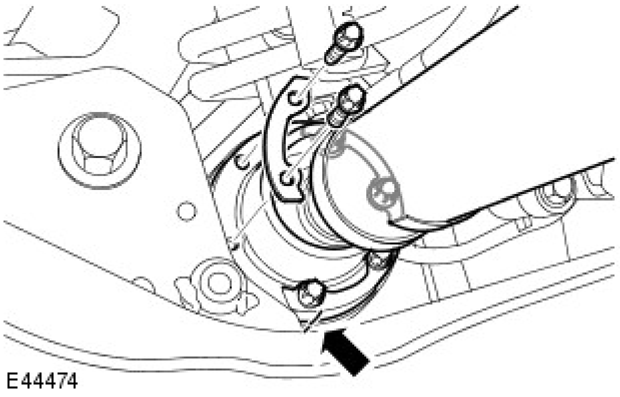
⚠ Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the front wheels and tires.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



E44474

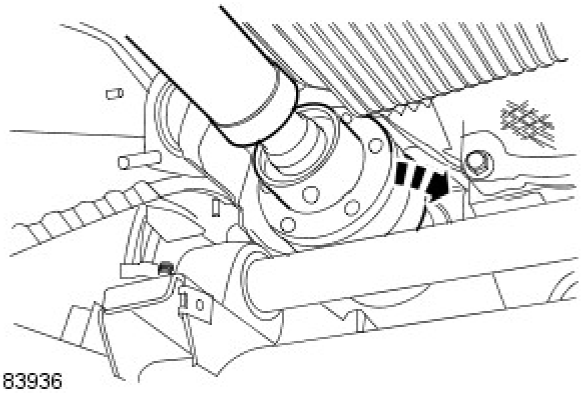
4. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

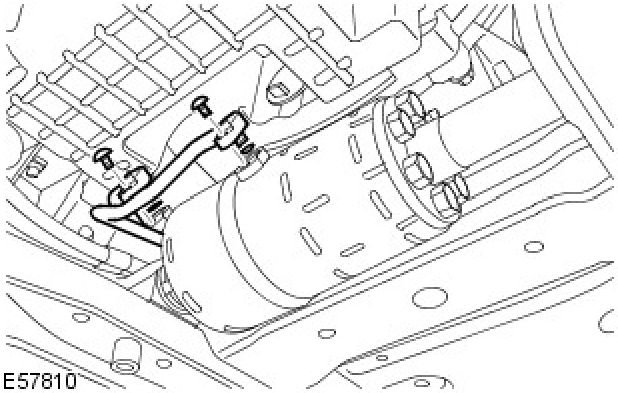
- Remove the 6 Torx bolts and washers.
- Discard the bolts.



E83936

5. Support the driveshaft.

- Compress the joints to disengage the drive flanges.
- Using suitable securing strap, reposition and support the driveshaft.



E57810

6. CAUTIONS:

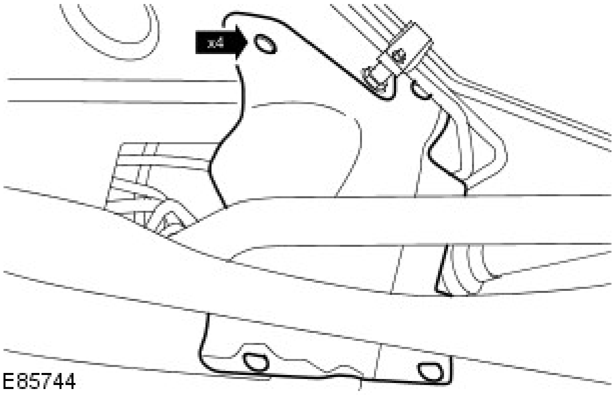
⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect and reposition the fluid lines.

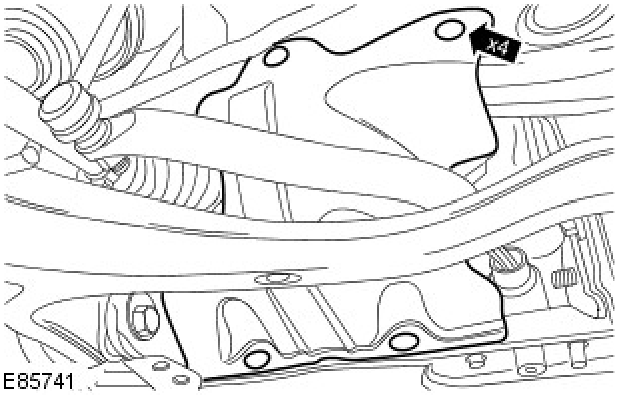
- Position container to collect fluid loss.
- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.
- Remove and discard the plastic spacer washers.



E85744

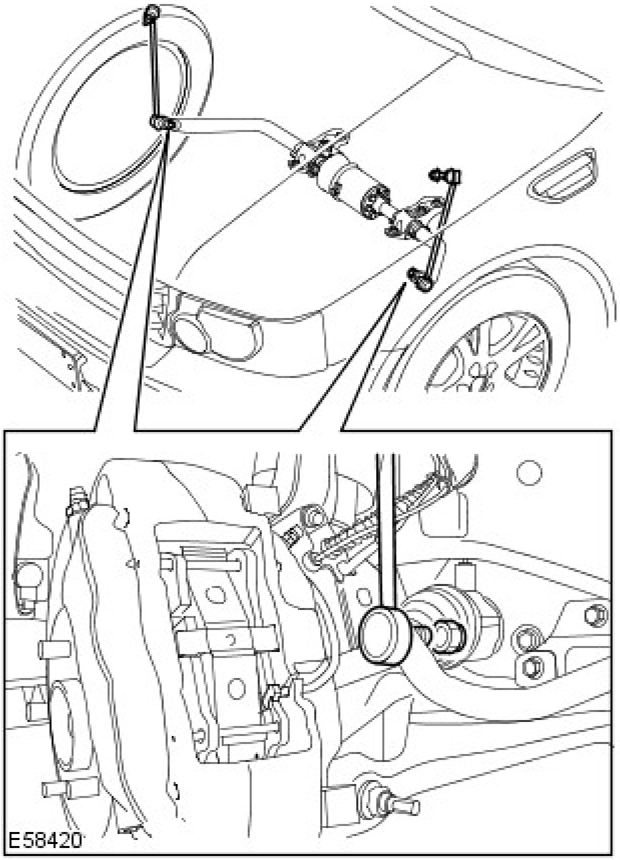
7. Remove the RH splash shield.

- Remove the 4 clips.



8. Remove the LH splash shield.

- Remove the 4 clips.



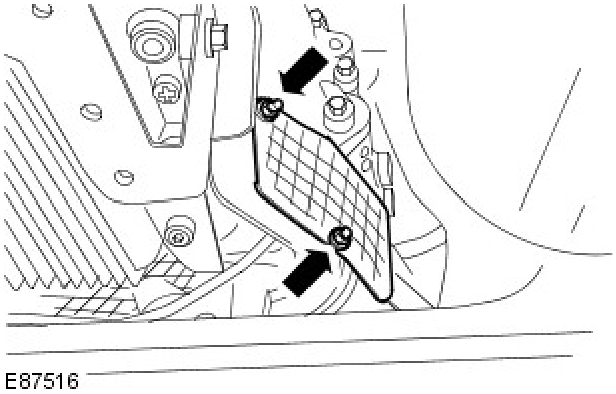
9. CAUTIONS:

⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

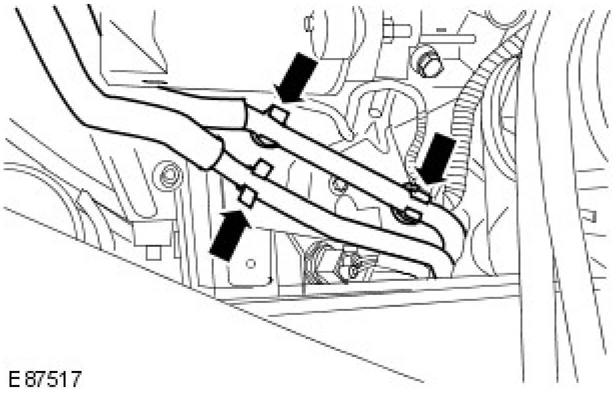
Disconnect both the stabilizer bar links from the stabilizer bar.

- Remove and discard the 2 nuts.

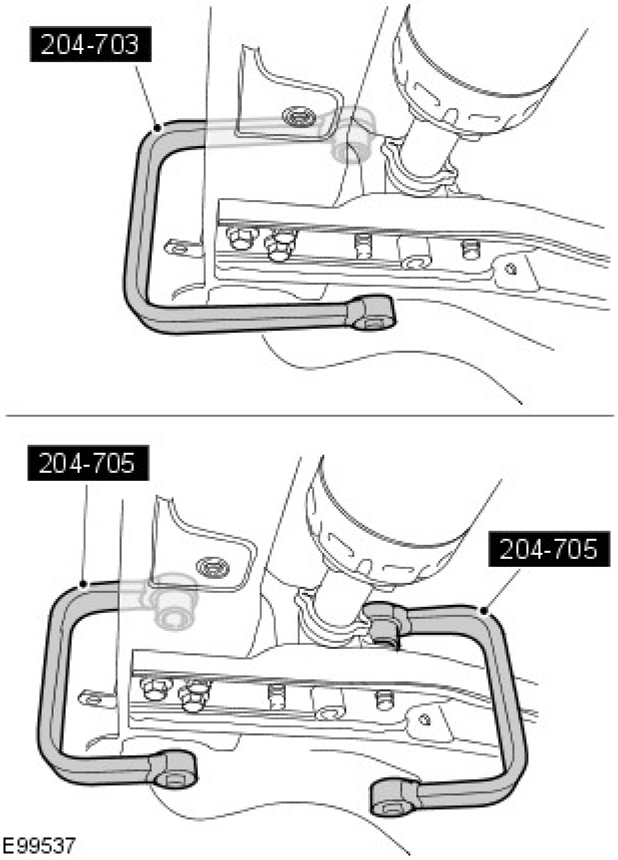


10. Remove the fuel pipe heat shield.

- Remove the 2 nuts.

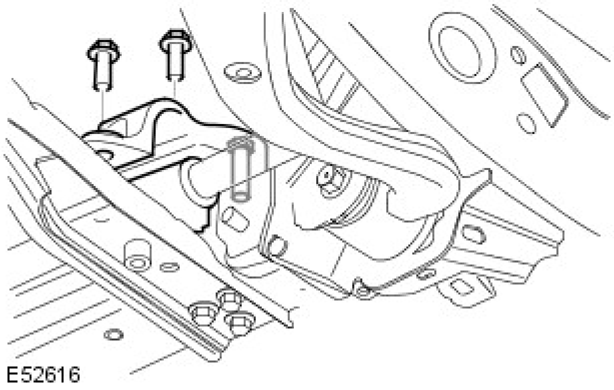


11. Release the fuel pipes from the 3 clips.


204-703
204-705
204-705
E99537

12. NOTE: Right-hand shown, left-hand similar.

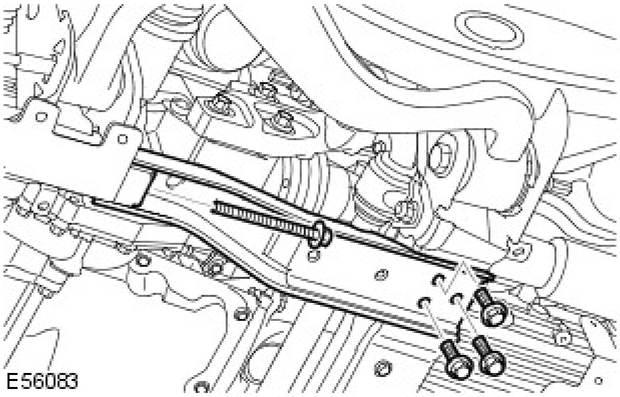
Position the special tools.



13. NOTE: Left-hand shown, right-hand similar.

Remove the stabilizer bar clamps.

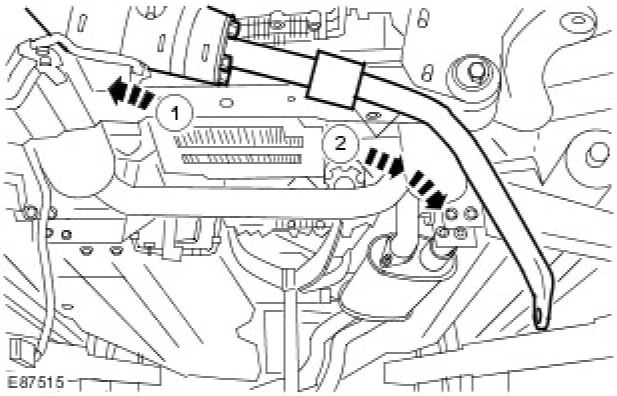
- Using the special tools, remove and discard the 6 bolts.
- Remove the stabilizer bar clamps.



14. Remove the front axle crossmember.

- Remove the 4 bolts.

15. Remove the stabilizer bar and actuator assembly.

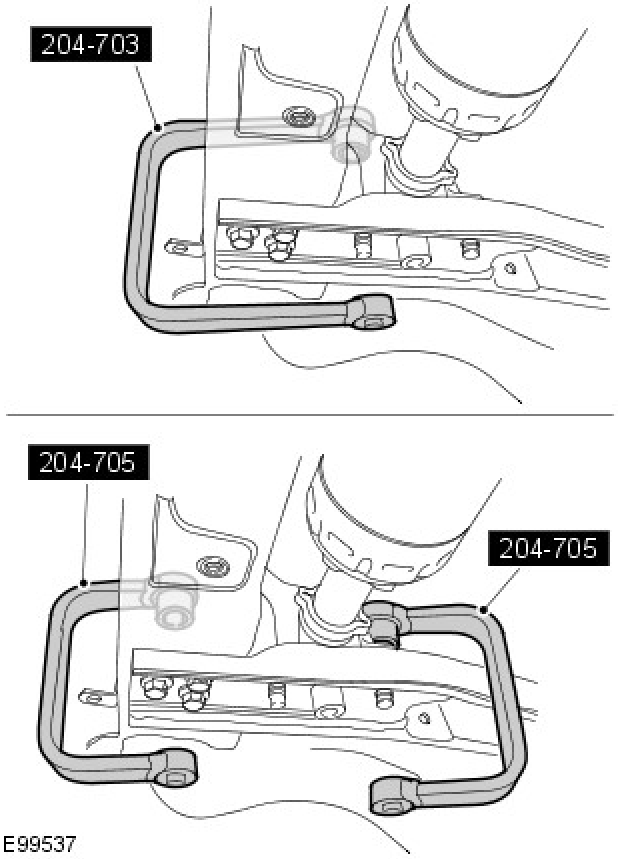


Installation

1. Install the stabilizer bar and actuator assembly.

2. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).



E99537

3. Install the stabilizer bar clamps.

- Clean the components.
- Install the stabilizer bar clamps.
- Using the special tools, tighten the bolts to 115 Nm (85 lb.ft).

4. Secure the fuel pipes in the clips.

5. Install the fuel pipe heat shield.

- Tighten the nuts to 8 Nm (6 lb.ft).

6. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Connect the LH stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

7. Install the LH splash shield.

- Install the clips.

8. CAUTIONS:

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

⚠ Care must be taken to avoid damage to the plastic spacer washers and O-ring seals during installation of the fluid lines to the actuator.

• NOTE: Some fluid spillage is inevitable during this operation.

Connect the fluid lines to the actuator.

- Clean the component mating faces.
- Remove the blanking caps from the ports.
- Install new plastic spacer washers and O-ring seals.
- Tighten the 2 bolts to 22 Nm (16 lb.ft).

9. Using the approved Land Rover diagnostic system, bleed the active stabilization system. For additional information, refer to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).

10. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Connect the RH stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

11. Install the RH splash shield.

- Install the clips.

12. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Secure the driveshaft to the front axle drive flange.

- Remove and discard the tie strap.
- Clean the components.
- Compress the joints to engage the drive flanges.
- Install new retaining bolts.
- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

13. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

14. Install the front wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 29-Sep-2011

Ride and Handling Optimization - Rear Stabilizer Bar

Removal and Installation

Removal

- CAUTIONS:

⚠ Do not remove or loosen the 6 bolts on the stabilizer bar. Failure to follow this instruction may result in damage to or failure of the stabilizer bar.

⚠ It is possible to install the stabilizer bar incorrectly. Note the position of the stabilizer bar before removal.

⚠ Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the Dynamic Response system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

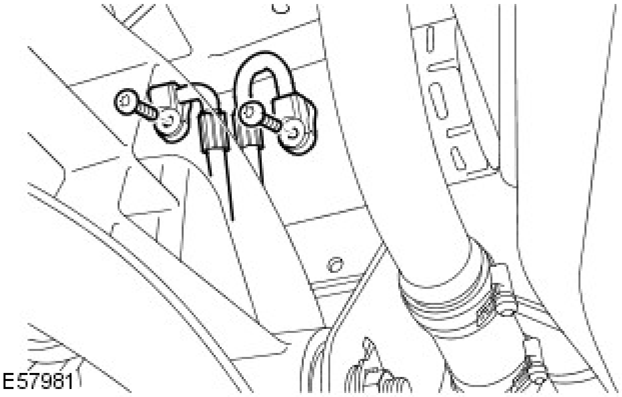
Raise and support the vehicle.

2. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

3. Remove the spare wheel and tire.

4. Raise the vehicle.

5. Remove the rear wheels and tires.



6. CAUTIONS:

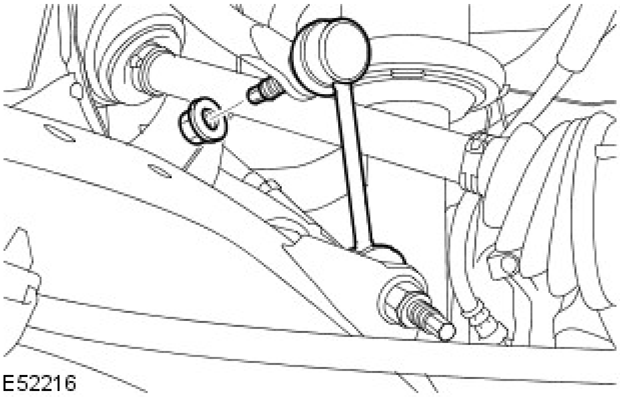
⚠ Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

- NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid lines from the actuator.

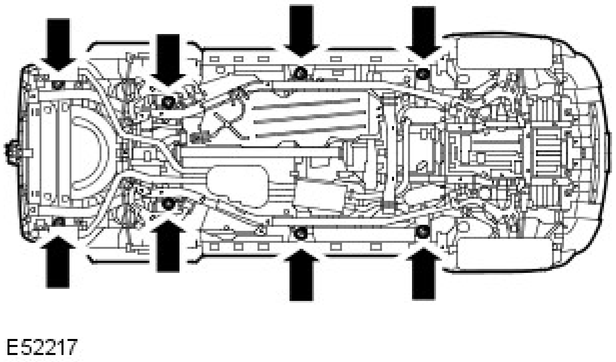
- Position container to collect fluid loss.
- Remove the 2 bolts.
- Remove and discard the plastic spacer washers.
- Remove and discard the O-ring seals.
- Install blanking caps to the exposed ports.



7. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Release both stabilizer bar links.

- Remove the 2 nuts.



8. Remove the body mount retaining bolts.

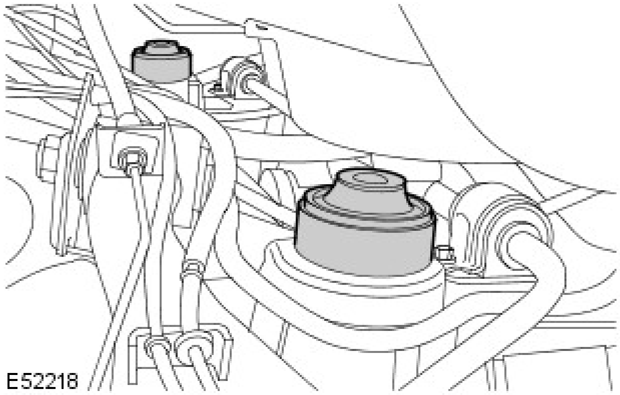
- Remove the 8 bolts.

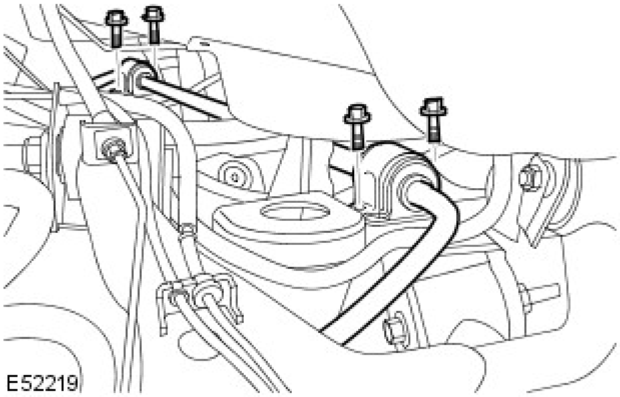
9. ⚠ CAUTION: Only raise the body sufficiently to remove the body mount.

Raise the body.

- Using suitable stands, raise the body to release the body mounts.

10. Remove the 2 rear body mounts.





11. Remove the stabilizer bar and actuator assembly bushings.

- Remove and discard the 4 bolts.
- Remove the 2 clamps.

12. NOTE: Note the fitted position.

With assistance, remove the stabilizer bar and actuator assembly.

Installation

1. ⚠CAUTION: Make sure the stabilizer bar is correctly installed.

With assistance, install the stabilizer bar and actuator assembly.

2. Install the stabilizer bar and actuator assembly bushings.

3. Install the stabilizer bar clamps.

- Tighten the 4 retaining bolts to 62 Nm (46 lb.ft).

4. ⚠CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Connect the RH stabilizer bar link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

5. CAUTIONS:

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

⚠ Care must be taken to avoid damage to the plastic spacer washers and O-ring seals during installation of the fluid lines to the actuator

• NOTE: Some fluid spillage is inevitable during this operation.

Connect the fluid lines to the actuator.

- Clean the component mating faces.
- Remove the blanking caps from the ports.
- Install new plastic spacer washers and O-ring seals.
- Tighten the 2 bolts to 22 Nm (16 lb.ft).

6. Bleed the rear of the Dynamic Response system using T4.

7. ⚠CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Connect the LH stabilizer bar link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

8. Install the body mounts.

9. Lower the body.

- Remove the stands.

10. Install the body mount retaining bolts.

- Tighten the 8 retaining bolts to 133 Nm (98 lb.ft).

11. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

12. Lower the vehicle.

13. Install the spare wheel and tire.

14. Install the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

Published: 11-May-2011

Ride and Handling Optimization - Fluid PumpV8 4.4L Petrol/V8 S/C 4.2L Petrol

Removal and Installation

Removal

CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

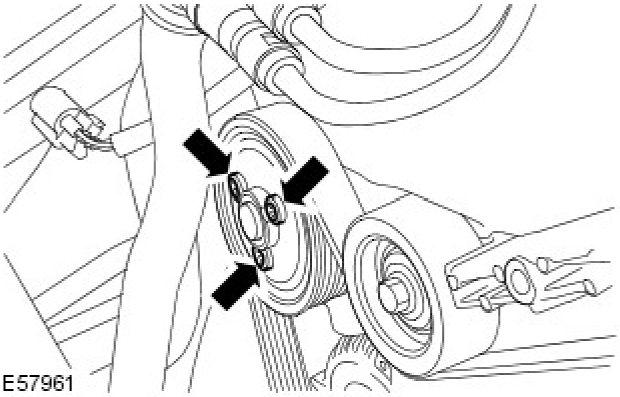
Raise and support the vehicle.

3. Remove the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

4. Remove the viscous fan assembly.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

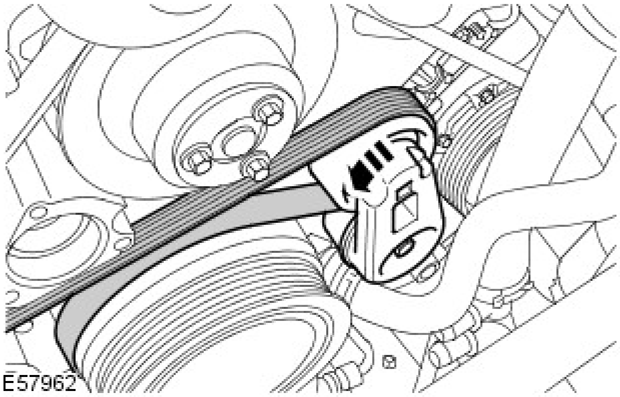
5. Remove the front RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

6. NOTE: Loosen the bolts prior to removing the accessory drive belt.



Loosen the fluid pump drive pulley retaining bolts.

- Loosen the 3 Torx bolts.

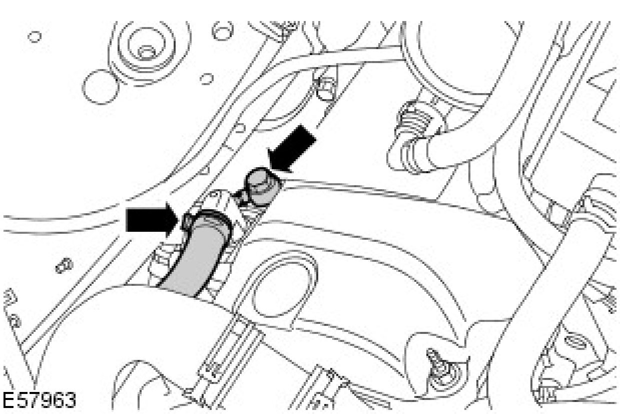


7. Release the tension from the belt.

- Remove the accessory drive belt.

8. Remove the fluid pump drive pulley.

- Remove the 3 bolts.

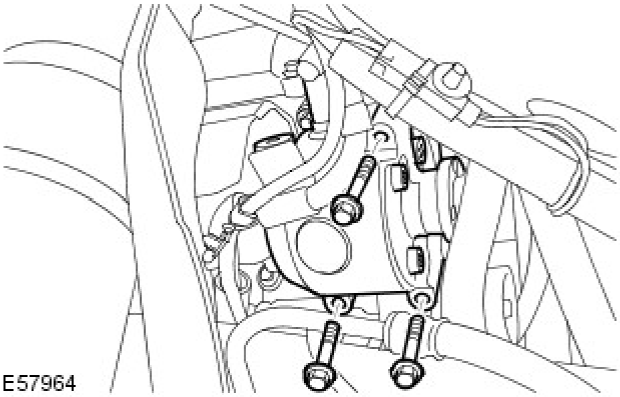


9. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid pump hoses.

- Clamp the fluid pump to reservoir hose.
- Release the hose clip.
- Disconnect the hoses.
- Discard the O-ring seals.



10. Remove the fluid pump.

- Remove the 3 bolts.

Installation

1. Install the fluid pump.

- Clean the locating dowels.
- Install and tighten the bolts to 22 Nm (16 lb.ft).
- Prime the pump with clean fluid.

2. ⚠ CAUTION: Make sure both O-ring seals are correctly installed on the high pressure union.

Connect the hoses.

- Clean the component mating faces.
- Lubricate and install new O-rings to the high-pressure union.
- Tighten the union to 35 Nm (26 lb.ft).
- Install the hose clip.
- Remove the hose clamp.

3. Install the fluid pump drive pulley.

- Install the Torx bolts, but do not tighten fully at this stage.

4. Install the belt.

5. Tighten the fluid pump drive pulley retaining bolts to 22 Nm (16 lb.ft).

6. Install the viscous fan assembly.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

7. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

8. Install the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

9. Refill the fluid reservoir.

10. Connect the battery ground lead, tighten the nut to 5 Nm (4 lb.ft).
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

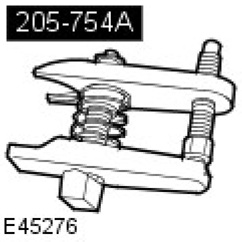
11. Make sure there is fluid circulation through the reservoir.

- Start the engine and allow to idle.

Published: 11-May-2011

Ride and Handling Optimization - Valve Block to Front Stabilizer Bar Actuator Pipe AssemblyV8 S/C 4.2L Petrol

Removal and Installation

Special Tool(s)	
	Ball joint separator 205-754 (LRT-54-027)

Removal

⚠CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the Dynamic Response system.

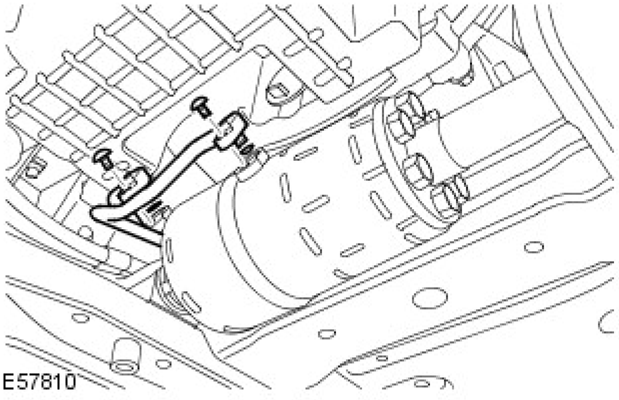
1. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

3. Remove the spare wheel and tire.

4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



5. CAUTIONS:

⚠ Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

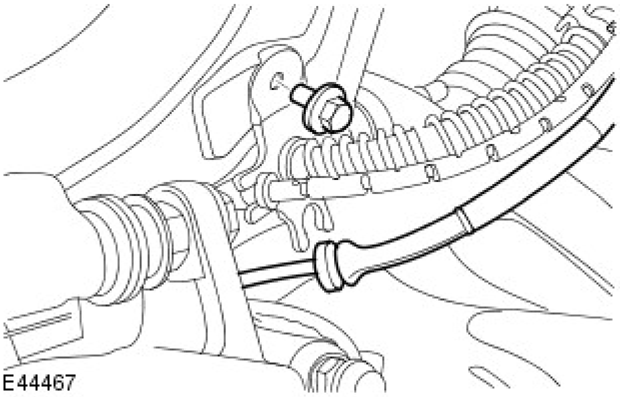
- NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid lines from the actuator.

- Position container to collect fluid loss.
- Remove the 2 bolts.
- Remove and discard the O-ring seals.
- Remove and discard the plastic spacer washers.
- Install blanking caps to the exposed ports.

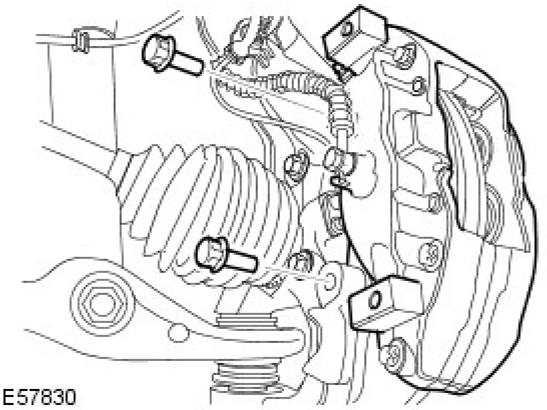
6. Remove the front wheels and tires.

7. RH front: Remove the shock absorber and air spring assembly.
For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).


E44467

8. Release the brake hose bracket from the wheel knuckle.

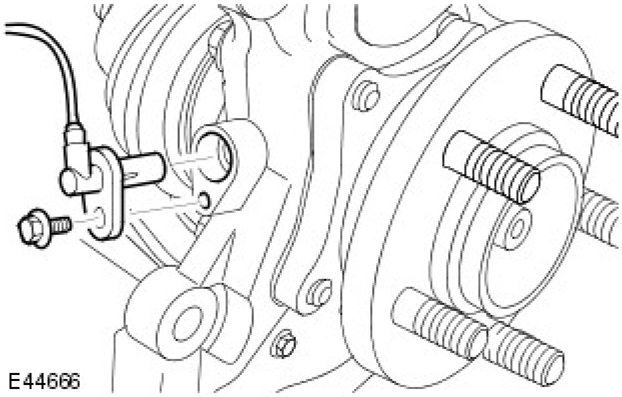
- Remove the retaining bolt.


E57830

9. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper from the wheel knuckle.

- Remove the 2 retaining bolts.
- Tie the brake caliper aside.


E44666

10. NOTE: The brake disc is shown removed for clarity.

Release the wheel speed sensor from the wheel knuckle.

- Remove the bolt.

11. CAUTIONS:

⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

Remove the stabilizer bar link nut.

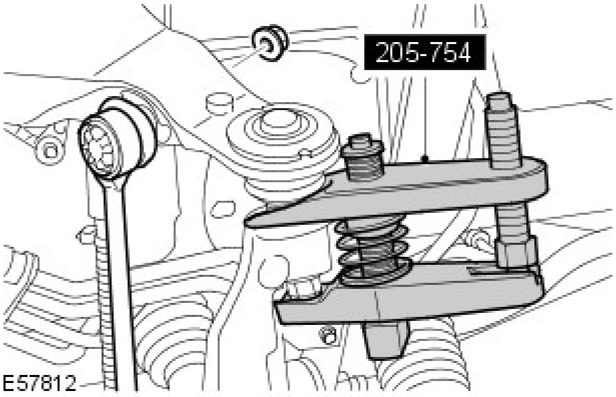
- Discard the nut.

12. ⚠ CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

Loosen the upper arm retaining nut.

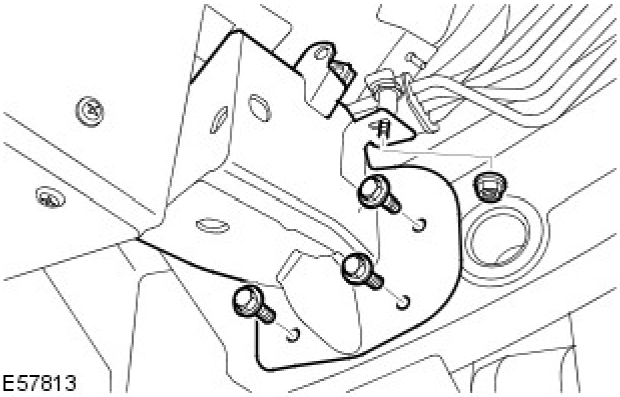
13. Using the special tool, release the upper arm ball joint.

- Remove and discard the retaining nut.



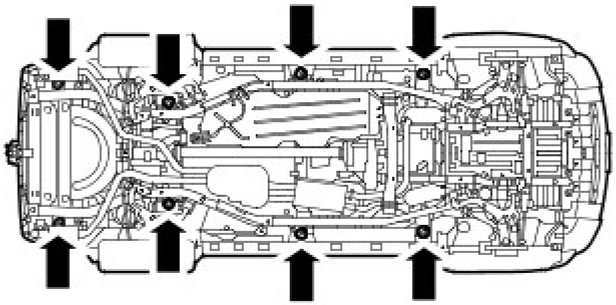
14. Remove the integrated body frame bracket.

- Remove the 3 bolts and 1 nut.



15. Remove the body mount retaining bolts.

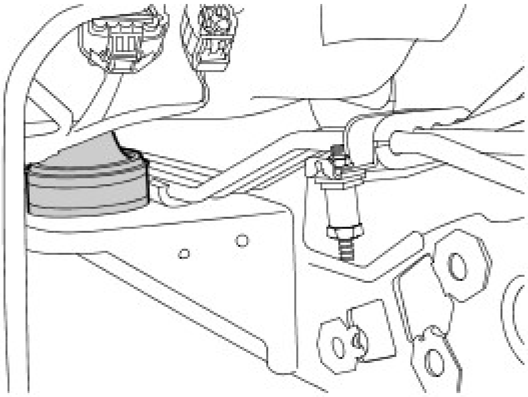
- Remove the 8 bolts.



16. ⚠CAUTION: Only raise the body sufficiently to remove the body mount.

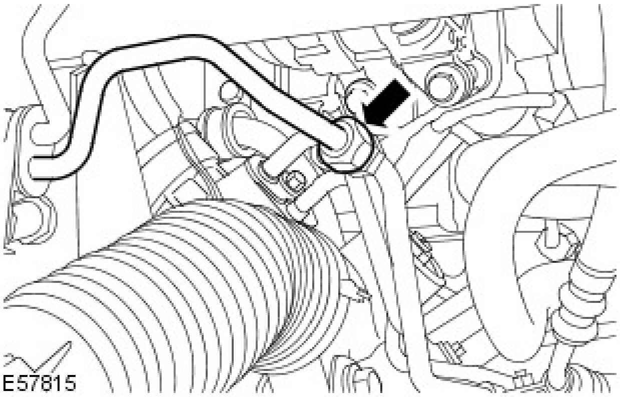
Raise the body.

- Using suitable stands, raise the body to release the body mounts.



E57814

17. Remove the body mount.



E57815

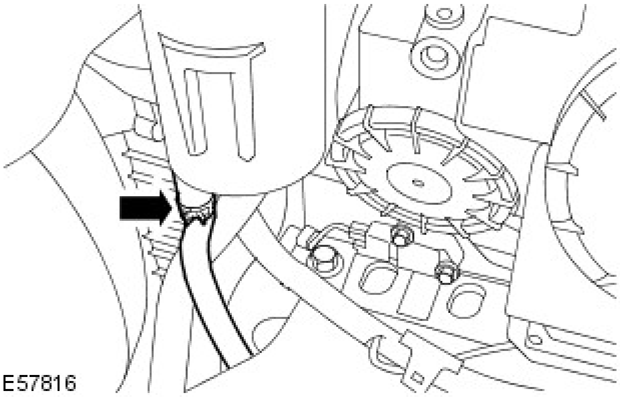
18. ⚠CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the high pressure line.

- Position a container to collect the fluid spillage.
- Install blanking caps to the exposed ports.

19. Remove the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).



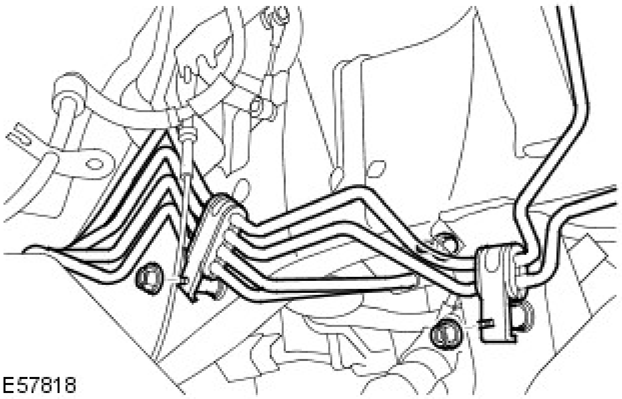
E57816

20. ⚠CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

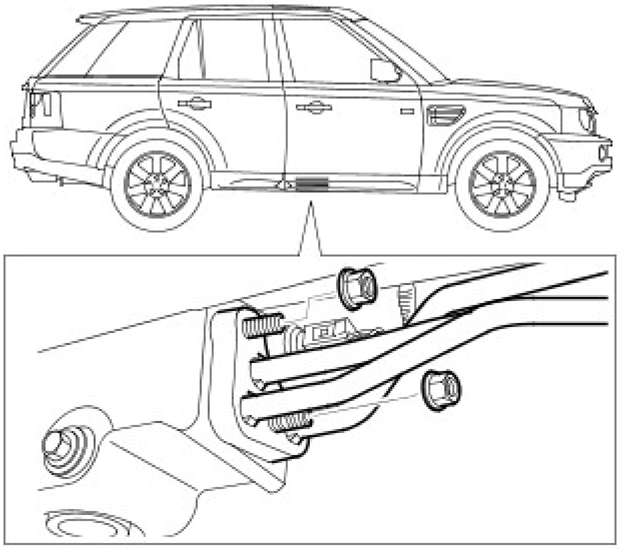
Disconnect the fluid return line from the reservoir.

- Position a container to collect the fluid spillage.
- Reposition the fluid line into the wheel arch area.


E57818

21. Release the valve block to front stabilizer bar actuator pipe assembly mountings.

- Remove the 2 nuts and 1 bolt.


E57817

22. CAUTIONS:

⚠ Always plug any open connections to prevent contamination.

⚠ Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the front actuator pipes from the valve block.

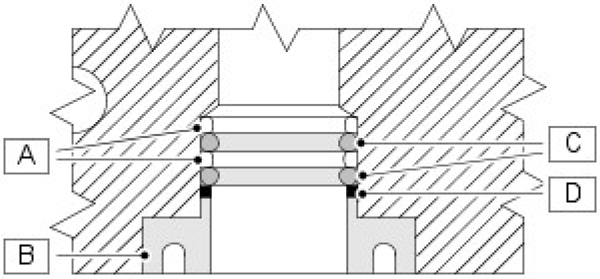
- Position a container to collect the fluid spillage.
- Remove and discard the 2 nuts.
- Install blanking caps to the exposed ports.

23. Remove the valve block to front stabilizer bar actuator pipe assembly.

Installation

1. Check the valve block O-rings and plastic spacer washers are correctly installed.

- A: Backing rings (white)
- B: Outer clamping ring
- C: O-ring seals
- D: Outer backing ring (Black)



E58627

2. Install the valve block to front stabilizer bar actuator pipe assembly.

- Clean the components.

3. Connect the front actuator pipes to the valve block.

- Remove the blanking caps from the ports.
- Install 2 new nuts and tighten to 22 Nm (16 lb.ft).
- Remove the container.

4. Attach the valve block to front stabilizer bar actuator pipe assembly mountings.

- Tighten the 2 nuts and 1 bolt to 9 Nm (7 lb.ft).

5. Connect the fluid line to the reservoir.

- Reposition the fluid line from the wheel arch area.
- Install the clip.
- Remove the container.

6. Install the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

7. Connect the high pressure line.

- Remove the blanking caps from the ports.
- Tighten the union to 21 Nm (15 lb.ft).
- Remove the container.

8. Install the body mount.

9. Lower the body.

- Remove the stands.

10. Install the body mount retaining bolts.

- Tighten the 8 retaining bolts to 133 Nm (98 lb.ft).

11. Install the integrated body frame bracket.

- Install the 3 bolts and tighten to 40 Nm (30 lb.ft).
- Tighten the nut to 9 Nm (7 lb.ft)

12. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

13. Install the wheel speed sensor.

- Tighten the bolt to 9 Nm (7 lb.ft).
- Connect the electrical connector.
- Secure the wiring harness in the clips.

14. Secure the brake caliper to the wheel knuckle.

- Tighten the bolts to 275 Nm (203 lb.ft).

15. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 23 Nm (17 lb.ft).

16. Install the shock absorber and air spring assembly.

For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

17. CAUTIONS:

Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

Care must be taken to avoid damage to the plastic spacer washers and O-ring seals during installation of the fluid lines to the actautor.

• NOTE: Some fluid spillage is inevitable during this operation.

Connect the fluid lines to the actuator.

- Clean the component mating faces.
- Remove the blanking caps from the ports.
- Install new plastic spacer washers and O-ring seals.
- Tighten the 2 bolts to 22 Nm (16 lb.ft).

18. Bleed the front of the Dynamic Response system using T4.

19. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

20. CAUTIONS:

Make sure the hardened steel washer is installed between the stabilizer bar link and the upper arm. Failure to follow this instruction may result in damage to the vehicle.

Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Secure the stabilizer bar link.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

21. Install the front wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

22. Install the spare wheel and tire.

23. Install the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

Published: 11-May-2011

Ride and Handling Optimization - Front Stabilizer Bar BushingV8 S/C 4.2L Petrol/TDV6 2.7L Diesel

Removal and Installation

Special Tool(s)	
204-703 E99557	Front Stabilizer Bar Bushing Tightening Tool 204-703
204-705 E99558	Front Stabilizer Bar Bushing Tightening Tool 204-705

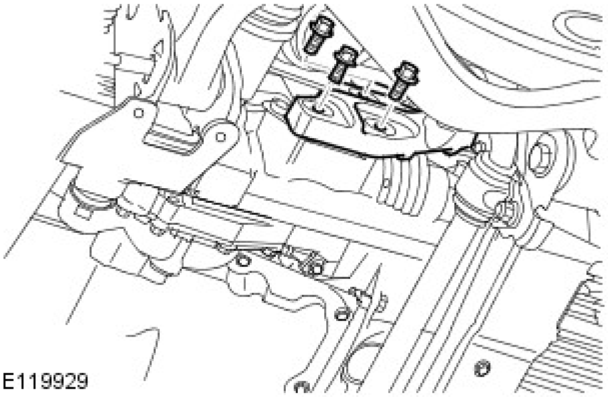
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

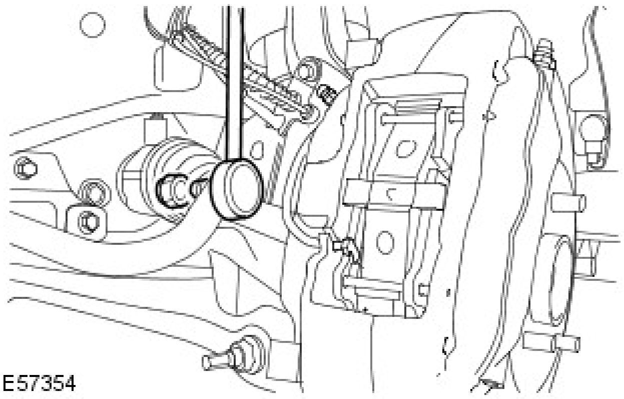
2. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

3. NOTE: Crossmember shown removed for clarity.



Using a suitable jack, support the differential.

- Remove and discard the three differential mounting bolts.
- Raise and reposition the front differential case.



E57354

4. CAUTIONS:

⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

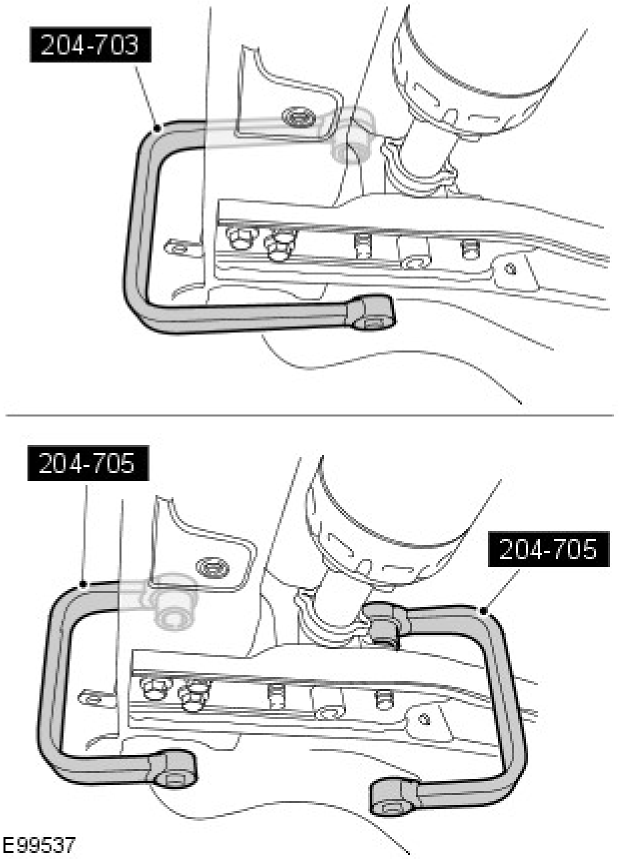
• NOTE: Left-hand shown, right-hand similar.

Disconnect both the stabilizer bar links from the stabilizer bar.

- Remove and discard the 2 nuts.

5. NOTE: Right-hand shown, left-hand similar.

Position the special tools.

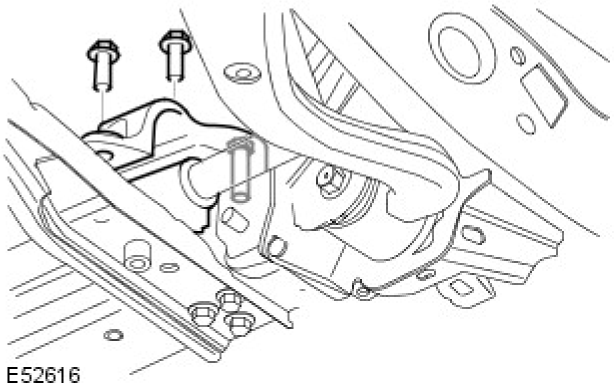


E99537

6. NOTE: Left-hand shown, right-hand similar.

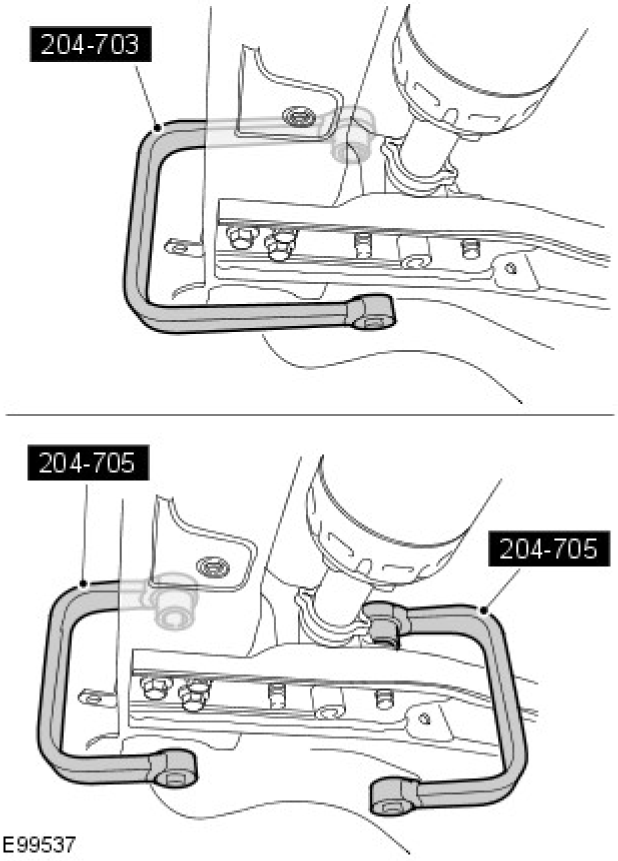
Remove the stabilizer bar bushings.

- Using the special tools, remove and discard the 6 bolts.
- Remove the stabilizer bar clamps.



E52616

Installation



1. Install the stabilizer bar bushings.

- Clean the components.
- Install the stabilizer bar clamps.
- Using the special tools, tighten the bolts to 115 Nm (85 lb.ft).

2. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Connect both stabilizer bar links to the stabilizer bar.

- Install new nuts and tighten to 175 Nm (129 lb.ft).

3. Align and secure the front differential case.

- Tighten the new axle carrier bracket bolts to 80 Nm (59 lb.ft), then a further 60 degrees.

4. Install the engine undershield.

For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

Published: 29-Sep-2011

Ride and Handling Optimization - Front Stabilizer BarV8 S/C 4.2L Petrol

Removal and Installation

Special Tool(s)	
	Front Stabilizer Bar Bushing Tightening Tool 204-703
	Front Stabilizer Bar Bushing Tightening Tool 204-705

Removal

• CAUTIONS:

⚠ Do not remove or loosen the 6 bolts on the stabilizer bar. Failure to follow this instruction may result in damage to or failure of the stabilizer bar.

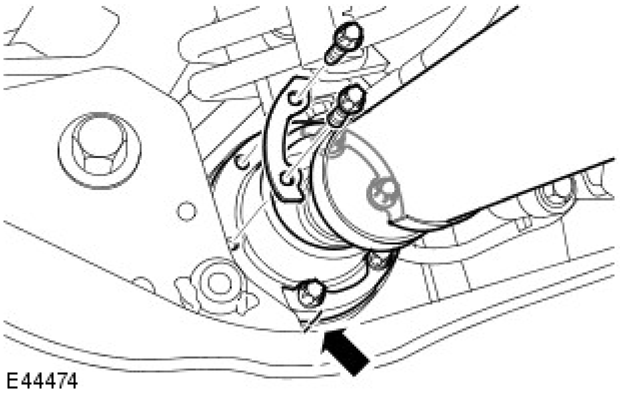
⚠ Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the front wheels and tires.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



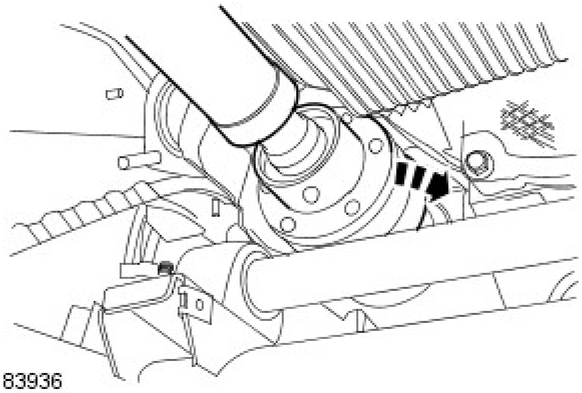
4. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

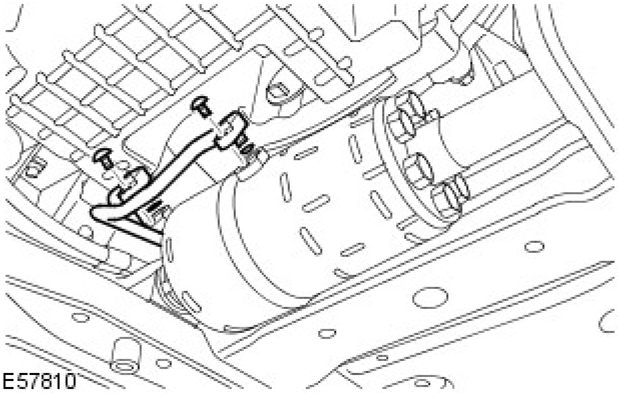
- Remove the 6 Torx bolts and washers.
- Discard the bolts.



E83936

5. Support the driveshaft.

- Compress the joints to disengage the drive flanges.
- Using suitable securing strap, reposition and support the driveshaft.



E57810

6. CAUTIONS:

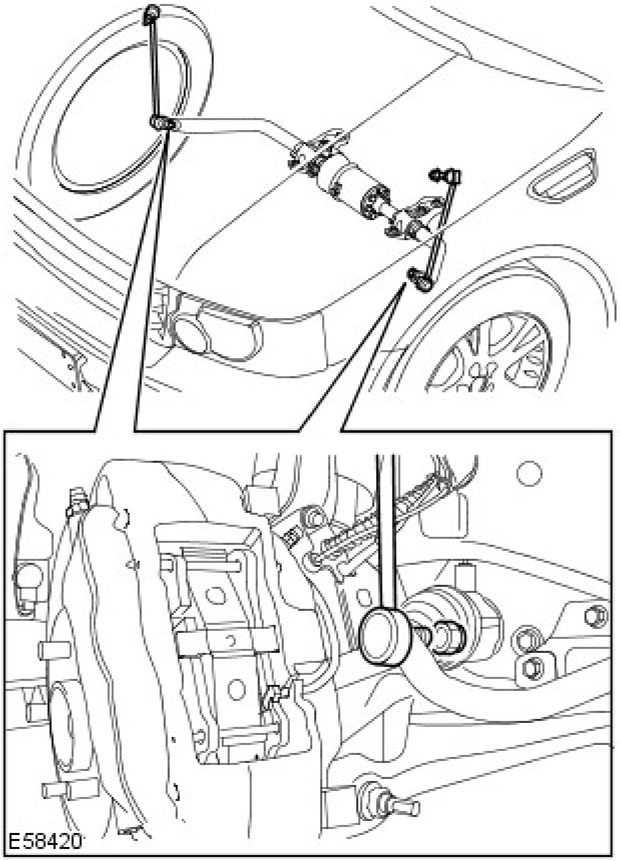
⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the fluid lines from the actuator.

- Position container to collect fluid loss.
- Remove the 2 bolts.
- Remove and discard the O-ring seals.
- Remove and discard the plastic spacer washers.



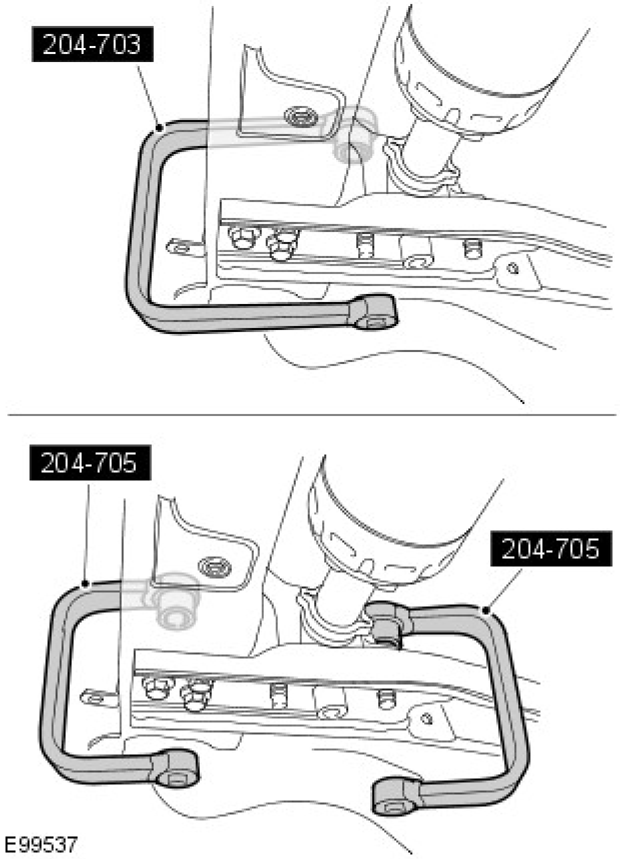
7. CAUTIONS:

⚠ Note the position of the hardened steel washer. The hardened steel washer must be installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst removing the nut.

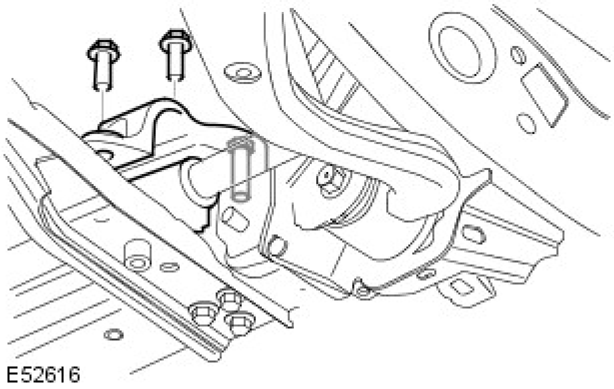
Release both of the stabilizer bar links from the stabilizer bar.

- Remove and discard the 2 nuts.



8. NOTE: Right-hand shown, left-hand similar.

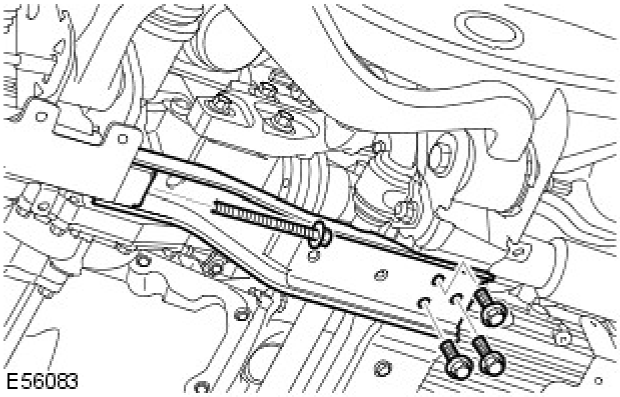
Position the special tools.



9. NOTE: Left-hand shown, right-hand similar.

Remove the stabilizer bar bushings.

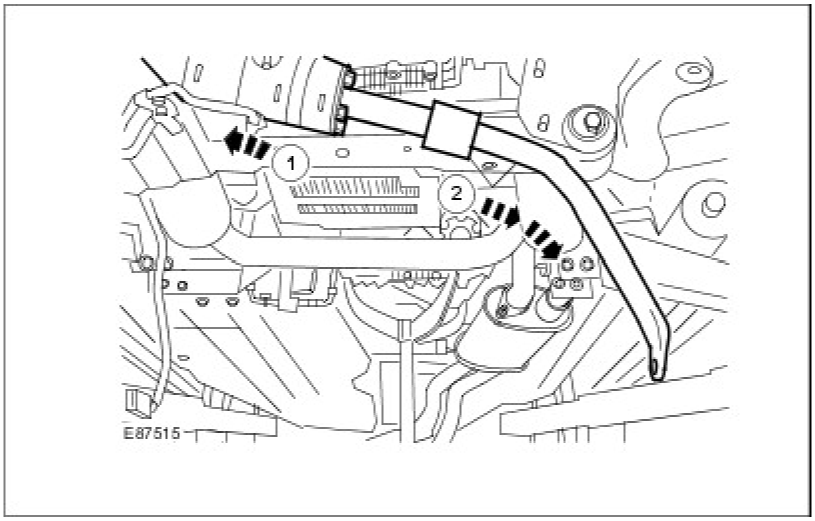
- Using the special tools, remove and discard the 6 bolts.
- Remove the stabilizer bar clamps.



10. Remove the front axle crossmember.

- Remove the 4 bolts.

11. Remove the stabilizer bar and actuator assembly.



Installation

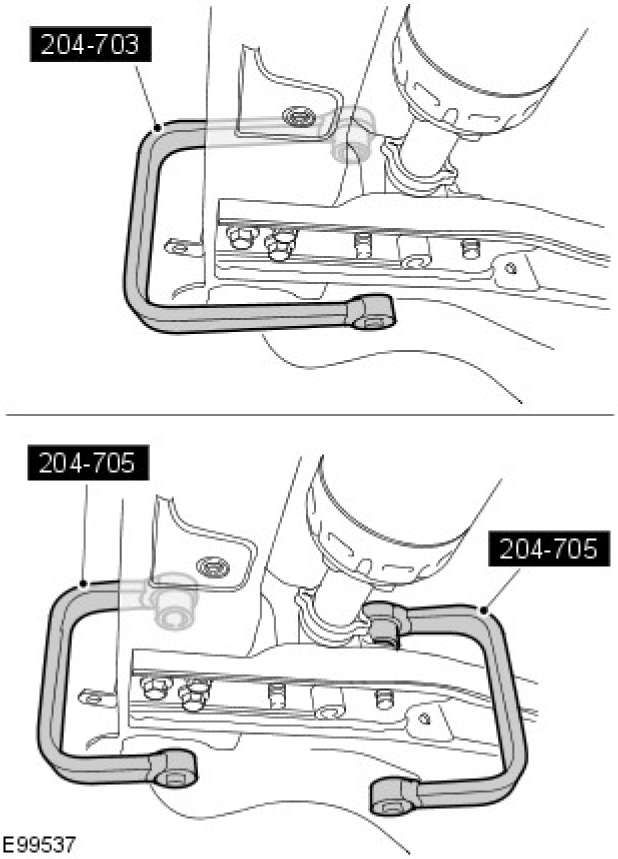
1. Install the stabilizer bar and actuator assembly.

2. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

3. Install the stabilizer bar clamps.

- Clean the components.
- Install the stabilizer bar clamps.
- Using the special tools, tighten the bolts to 115 Nm (85 lb.ft).



4. CAUTIONS:

⚠ Make sure the hardened steel washer is installed between the stabilizer bar link and the stabilizer bar. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a Torx socket to prevent the ball joint rotating whilst installing the nut.

Secure both stabilizer bar links to the stabilizer bar.

- Install a new nut and tighten to 175 Nm (129 lb.ft).

5. CAUTIONS:

⚠ Make sure the actuator fluid lines are not damaged or kinked during removal or installation.

⚠ Care must be taken to avoid damage to the plastic spacer washers and O-ring seals during installation of the fluid lines to the actuator.

• NOTE: Remove and discard the blanking caps.

Connect the fluid lines to the actuator.

- Clean the component mating faces.
- Install new plastic spacer washers and O-ring seals.
- Tighten the 2 bolts to 22 Nm (16 lb.ft).

6. Using the approved Land Rover diagnostic system, bleed the active stabilization system.

7. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Secure the driveshaft to the front axle drive flange.

- Remove and discard the tie strap.
- Clean the components.
- Compress the joints to engage the drive flanges.
- Install new retaining bolts.
- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

8. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

9. Install the front wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Ride and Handling Optimization - Pressure Control Valve

Removal and Installation

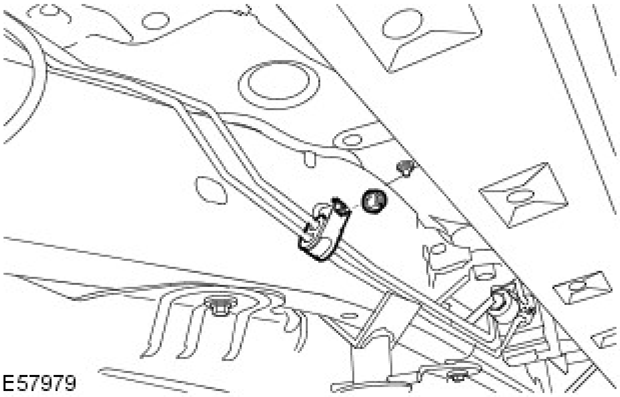
Removal

⚠CAUTION: Dynamic Response system components are manufactured to very precise tolerances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the dynamic response system.

- NOTE: This procedure does not require the Dynamic Response system to be bled.

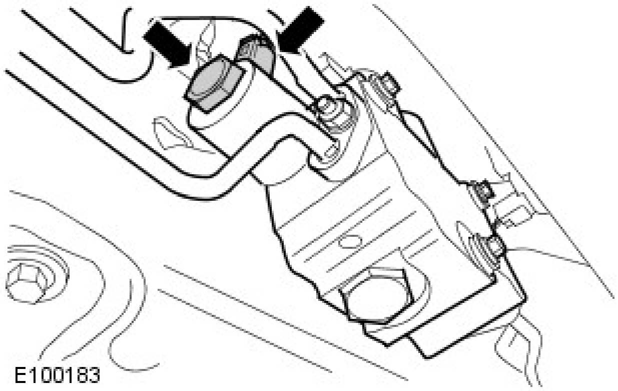
1. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



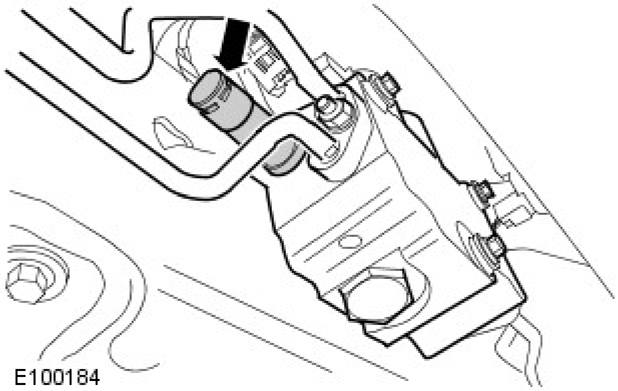
2. Release the valve block to rear stabilizer bar actuator pipe assembly mounting.

- Remove the nut.
- Remove the bracket.



3. Remove the solenoid.

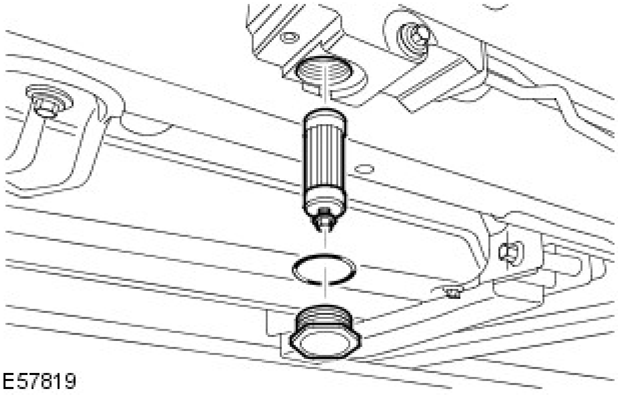
- Remove the electrical connector.
- Remove the solenoid nut.
- Remove and discard the O-ring seal.



4. ⚠CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the PCV valve.

- Clamp the fluid pump supply and return hoses to minimise fluid loss.
- Position container to collect fluid loss.
- Remove the PCV valve.



5. CAUTIONS:

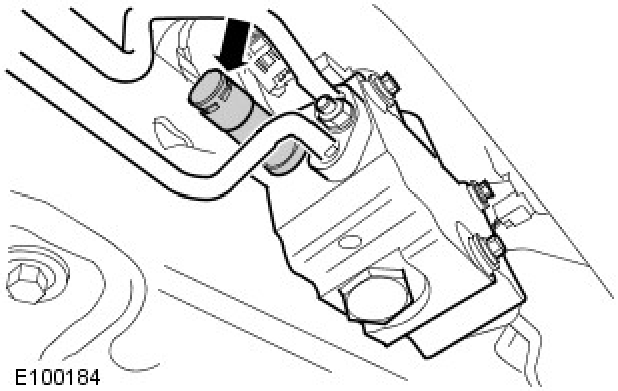
⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Make sure the actuator fluid lines are not clamped or kinked. Failure to follow this instruction will result in damage to the vehicle.

Remove and discard the valve block filter.

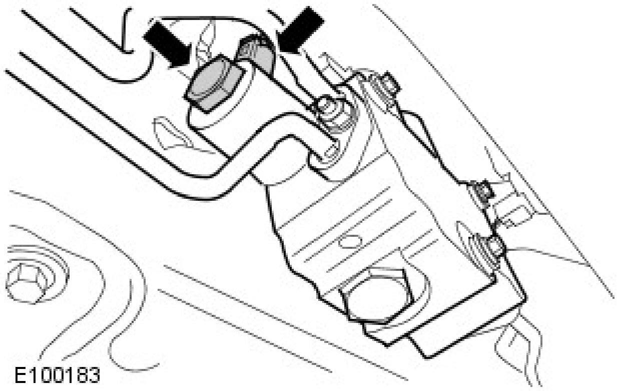
- Remove the access plug.
- Remove and discard the access plug O-ring seal.
- Using a suitable M6 bolt, release the filter from the valve block.

Installation



1. Install the PCV valve.

- Clean the component mating faces.
- Install the PCV valve.
- Torque: 35 Nm (26 lb.ft).



2. Install the solenoid.

- Install the O-ring seal.
- Tighten to 12 Nm.
- Install the electrical connector.

3. Install the new valve block filter.

- Clean the component mating faces.
- Install a new access plug O-ring seal.
- Tighten the access plug to 62 Nm (46 lb.ft).
- Remove the container.
- Remove the hose clamps.

4. Secure the valve block to rear stabilizer bar actuator pipe assembly mountings.

- Tighten the nut to 9 Nm (7 lb.ft)

5. Check and top-up the dynamic response system fluid reservoir.

6. Start the engine and allow to idle.

7. Check and top-up the dynamic response system fluid reservoir.

- Make sure there is fluid circulation through the reservoir.

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Ride and Handling Optimization - Direction Control Valve Solenoid

Removal and Installation

Removal

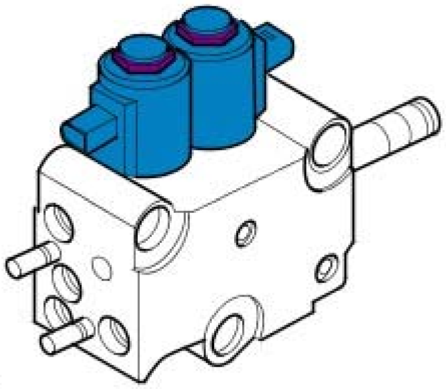
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the valve block.
   For additional information, refer to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation).

3. Remove the solenoid.

   - Remove the solenoid nut.
   - Remove and discard the O-ring seal.

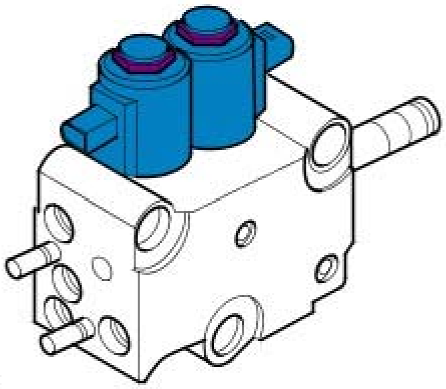


E135109

Installation

1. Install the solenoid.

   - Install the O-ring seal.
   - Tighten to 12 Nm.



E135109

2. Install the valve block.
   For additional information, refer to: Valve Block (204-06 Ride and Handling Optimization, Removal and Installation).

3. Bleed the dynamic response system.
   For additional information, refer to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).

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Driveline System - General Information - Driveline System

Diagnosis and Testing

Overview

The driveline system is a fairly straightforward design requiring no specialized techniques for diagnosis.

This section will not deal with the electronic differential which is covered in:
REFER to: Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Diagnosis and Testing).

For information on the description and operation of the system: REFER to:

Driveshaft (205-01 Driveshaft, Description and Operation),
Universal Joints (205-01 Driveshaft, Description and Operation),
Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Description and Operation),
Front Drive Axle and Differential (205-03 Front Drive Axle/Differential, Description and Operation),
Front Drive Halfshafts (205-04 Front Drive Halfshafts, Description and Operation),
Halfshaft Joint (205-04 Front Drive Halfshafts, Description and Operation),
Rear Drive Halfshafts (205-05 Rear Drive Halfshafts, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
    - ○ If a road test is necessary make sure the vehicle is safe to do so.
2. **2.** Visually inspect for obvious mechanical faults.

Visual inspection

Mechanical
● Wheel rim and tire damage or runout ● Check all the driveshafts and halfshafts for damage including dents, cracks and excessive runout ● Check all the CV joint gaiters for splits, damage and security ● Check all the driveshafts and halfshafts for correct alignment ● Check the driveshaft mounting bolts security ● Check all the driveshaft and halfshaft joints for excessive movement ● Check the rear driveshaft centre support bearing for security, damage and excessive wear ● Check the front and rear differential mounting bolts and bushes for wear, damage and security ● Check the front and rear differentials for oil leaks

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step

Symptom chart

Symptom	Possible causes	Action
Vibration through the vehicle body at a specified speed	● Road wheel imbalance ● Driveshaft imbalance	Road test the vehicle. If the vibration is only at a specified speed, balance the road wheels. Test for normal operation. Disconnect the rear driveshaft. Check CV and universal joints for smooth and full movement. Disconnect the front driveshaft. Check CV joints for smooth and full movement. If any joints are faulty, replace the driveshaft. Test for normal operation.
Vibration through the vehicle body at all speeds	● Misalignment of the rear driveshaft ● Bent or misaligned stub axle	Road test the vehicle. Check the rear driveshaft for correct alignment through the centre support bearing. Rectify as necessary. Test for normal operation. Check for a damaged or bent stub axle. Rectify as necessary.
Rumbling noise from the rear of the vehicle varying at different vehicle speed and load	● Rear differential bearings worn ● Rear wheel bearings worn ● Rear driveshaft centre support bearing worn	Using a suitable listening device (e.g. stethoscope) listen to the rear differential pinion bearings and output bearings, the rear wheel bearings and the rear driveshaft centre bearing. Rectify as necessary. Test for normal operation.

Symptom	Possible causes	Action
Rumbling noise from the front of the vehicle varying at different vehicle speed and load	● Front differential bearings worn ● Front wheel bearings worn	Using a suitable listening device (e.g. stethoscope) listen to the front differential pinion bearings and output bearings and the front wheel bearings. Rectify as necessary. Test for normal operation.
Whining noise from the rear of the vehicle during acceleration and overrun conditions	● Rear differential gears worn or damaged	Check and top up the rear differential oil level if necessary. Using a suitable listening device (e.g. stethoscope) listen to the rear differential. Replace the rear differential unit if there is excessive gear noise. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential, Removal and Installation).
Whining noise from the front of the vehicle during acceleration and overrun conditions	● Front differential gears worn or damaged	Check and top up the front differential oil level if necessary. Using a suitable listening device (e.g. stethoscope) listen to the front differential. Replace the front differential unit if there is excessive gear noise. REFER to: (205-03 Front Drive Axle/Differential) Axle Assembly - V8 S/C 4.2L Petrol (Removal and Installation), Axle Assembly - 4.4L (Removal and Installation), Axle Assembly - TDV6 2.7L Diesel (Removal and Installation).
Knocking, clicking or clunking noise from rear of vehicle during acceleration and overrun conditions	● Rear driveshaft joint fixings insecure ● Rear driveshaft joints worn or damaged ● Rear halfshaft joints or splined shaft worn or damaged ● Rear differential internal components worn or damaged	Disconnect the rear driveshaft. Check joint mounting bolt holes for elongation. Check the joints. Disconnect the rear halfshafts. Check the shaft splines for wear or damage. Check the CV joints. Rectify as necessary. With the rear driveshaft and halfshafts disconnected, check the rear differential for tight spots or excessive play. Rectify as necessary.
Knocking, clicking or clunking noise from front of vehicle during acceleration and overrun conditions	● Front driveshaft CV joints worn or damaged ● Front halfshaft joints or splined shaft worn or damaged ● Front differential internal components worn or damaged	Disconnect the front driveshaft. Check joint mounting bolt holes for elongation. Check the joints. Disconnect the front halfshafts. Check the shaft splines for wear or damage. Check the CV joints. Rectify as necessary. With the front driveshaft and halfshafts disconnected check the front differential for tight spots or excessive play. Rectify as necessary.

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Driveshaft -

Front Drive (Propeller) Shaft

Item	Specification
Type	One piece, variable length steel tube.
Constant velocity joints	Plunging type, fitted at front and rear.

Rear Drive (Propeller) Shaft

Item	Specification
Type	Two piece, variable length steel tube with isolated centre bearing and swaged front section to provide controlled collapse of the shaft during a crash.
Constant velocity joints	Plunging constant velocity joints are positioned at the front and centre of the shaft with a fixed, Hookes type universal joint at the rear.

Torque Specifications

Description	Nm	lb-ft
*** Front driveshaft to front axle drive flange Torx bolts:**		
Stage 1	45	33
Stage 2	Further 90°	Further 90°
*** Front driveshaft to transfer case drive flange Torx bolts:**		
Stage 1	45	33
Stage 2	Further 90°	Further 90°
* Rear driveshaft to rear axle drive flange Torx bolts	150	110
Rear driveshaft to transfer case drive flange Torx bolts	73	54
Rear driveshaft center bearing bolts	30	22
Fuel tank heat shield bolts	5	4
Fuel tank heat shield nuts	3	2

*** New 'Patched' Torx bolts must be installed**

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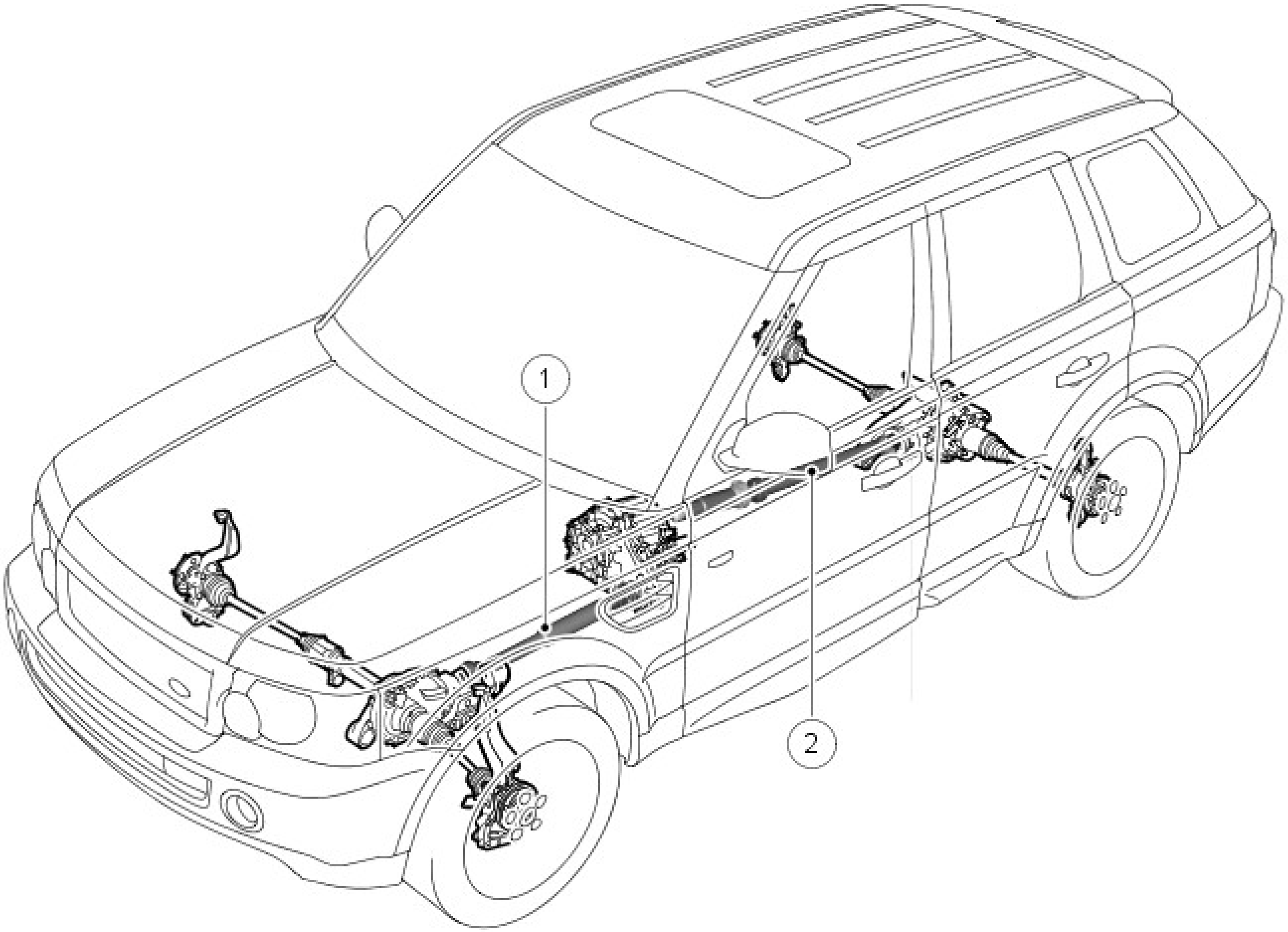
Driveshaft - Driveshaft

Description and Operation

Drive shaft Component Location



E56469

Item	Part Number	Description
1	-	Front drive shaft
2	-	Rear drive shaft

GENERAL

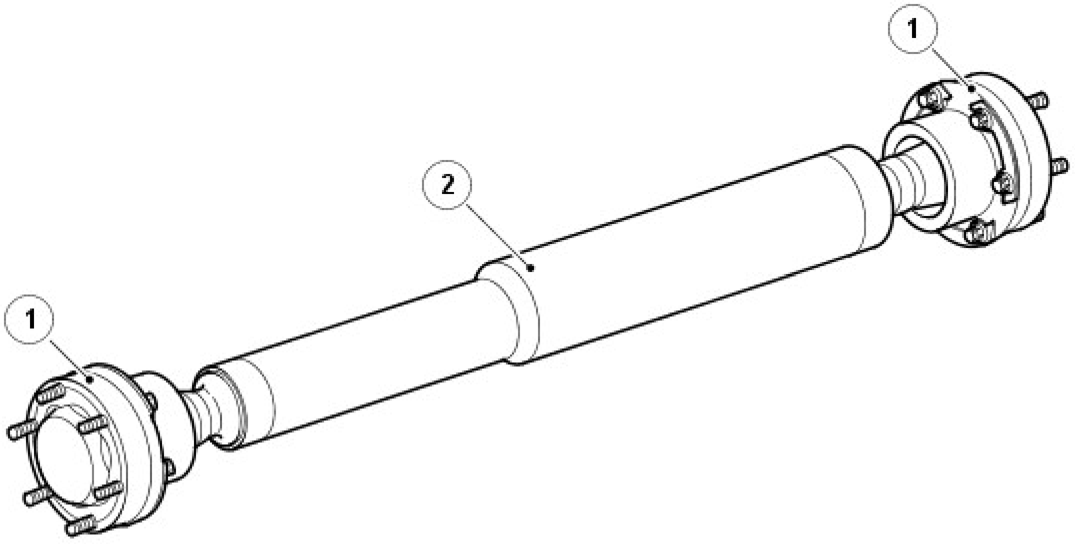
Drive shafts are used to transmit drive from the transfer box to the front and rear differentials.

The front drive shaft is a one-piece unit, connected to the transfer box and front differential unit via Constant Velocity (CV) joints.

The rear drive shaft is a two-piece unit, supported on a central bearing due to its increased length. The rear drive shaft is connected to the transfer box via a CV joint and the rear differential with a universal joint. These joints allow for angular deviations of the drive shaft due to acceleration and braking.

The front and rear drive shafts are not serviceable items and a failure will require the replacement of the complete drive shaft assembly.

FRONT DRIVE SHAFT



E46305

Item	Part Number	Description
1	-	CV joint
2	-	Front drive shaft

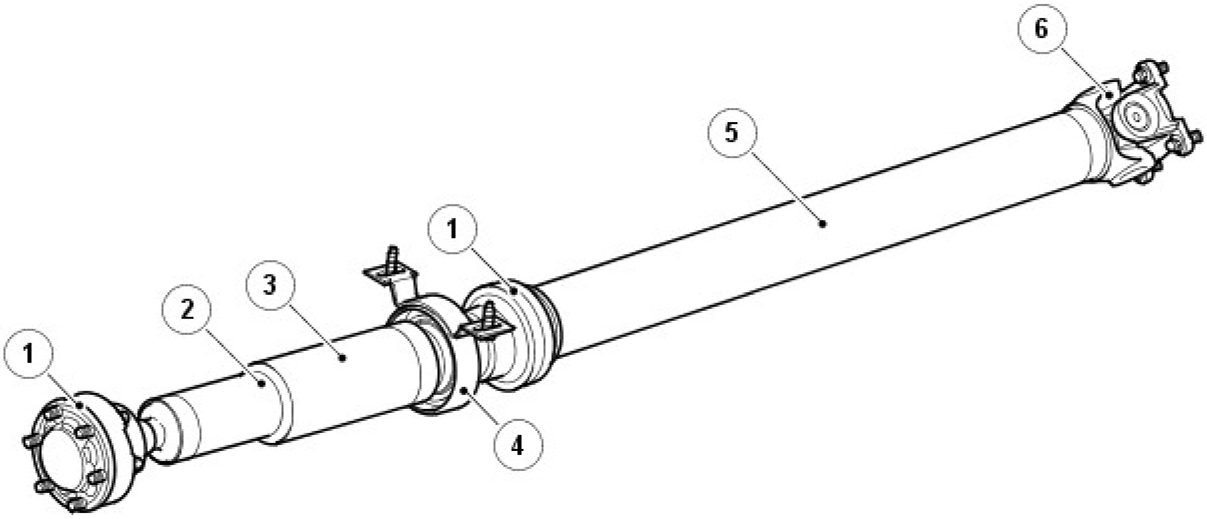
The front drive shaft is constructed from 1.7 mm wall tubular steel. A CV joint is attached to each end of the drive shaft (see 'Halfshaft Joint' section for more information on CV joints).

Each CV joint has six holes, which allow for attachment to the input flange of the front differential and the front output flange of the transfer box. The CV joints are secured to the front differential and transfer box with six Torx head adhesive retained bolts.

Three compression link washers are fitted under each pair of bolts. The washers are required to prevent compression of the CV joints attachment flange.

A shroud is pressed over the CV joint. The shroud seals to the joint body using an internal gasket and to the front output flange of the transfer box using an end cap and internal gasket. This prevents the ingress of dirt and moisture. The CV joints allow for movement of the drive shaft caused by small movements in the transmission and transfer box mountings.

REAR DRIVE SHAFT ASSEMBLY



E46306

Item	Part Number	Description
1	-	CV joints
2	-	Collapsible crash section
3	-	Front shaft assembly
4	-	Support bearing
5	-	Rear shaft assembly
6	-	Universal joint

The rear drive shaft assembly comprises front and rear shaft assemblies and a centrally mounted shaft bearing.

Front Shaft Assembly

The front shaft assembly incorporates a crash feature within the tube, which controls the collapse of the drive shaft during a crash.

The front shaft assembly comprises a CV joint at each end (see 'Halfshaft Joint' section for more information on CV joints).

The front CV joint (transfer box end) has six radial holes, which provide for the attachment to the transfer box rear output flange. The joint is secured to the output flange with six torx bolts, which screw into threaded holes in the flange. Three compression link washers are fitted under each pair of bolts. The rear splined shaft mates with splines in the rear shaft CV joint hub and is pressed in and fixed with Locktite. A machined surface on the shaft accepts the shaft bearing, which is a press fit.

Rear Shaft Assembly

The rear shaft assembly comprises a Hookes type universal joint at the rear (rear differential end).

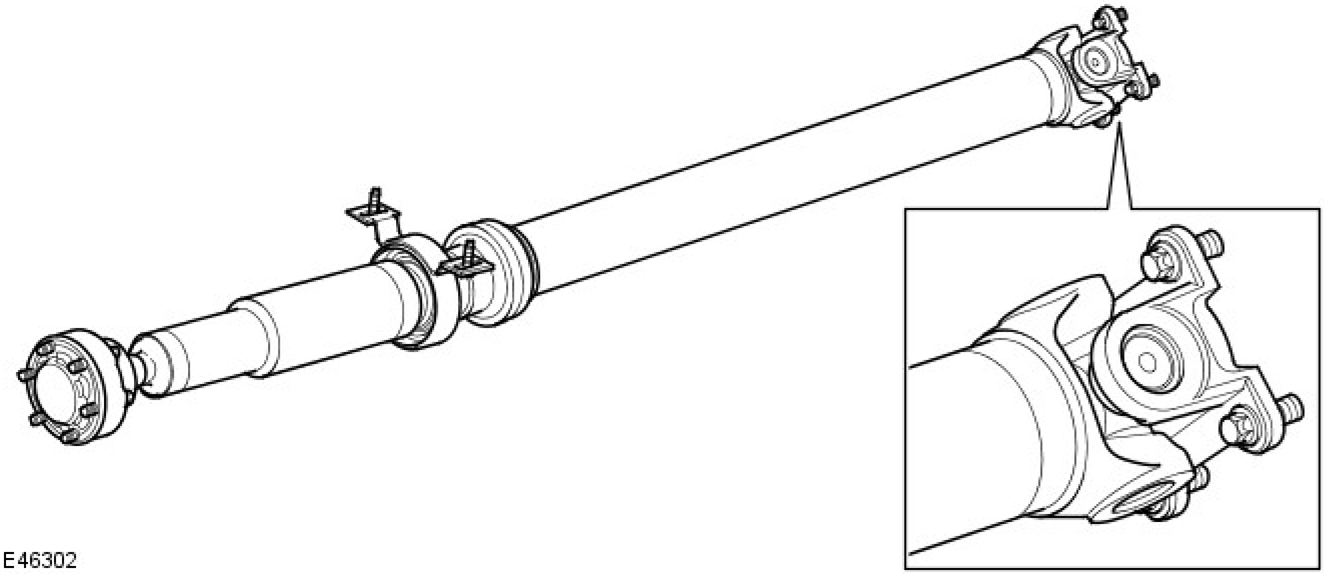
The universal joint is welded to the rear shaft tube and is secured to the input shaft of the rear differential with four flanged nuts. The opposite end of the rear shaft tube is welded directly to the CV joint body.

Shaft Bearing Assembly

The shaft bearing assembly comprises a pressed steel housing, a rubber diaphragm and a ball bearing. The diaphragm is bonded into the housing. An internal metal ring, bonded to the bush, allows for the bearing to be press fitted into it. The rubber bush allows for small deviations in alignment and also absorbs vibrational forces. The shaft bearing assembly is located by screws, which pass through plain holes in the bearing assembly and locate into nuts welded on the inside face of the chassis cross-member.

Driveshaft - Universal Joints

Description and Operation



A Hookes type universal joint is used to connect the rear drive shaft assembly to the rear differential, allowing for angular deviations of the drive shafts due to acceleration and braking.

The joint is bolted to the input shaft of the rear differential with four flanged adhesive screws and is lubricated during manufacture and sealed for life.

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Driveshaft - Driveshaft

Diagnosis and Testing

For additional information,
REFER to: Driveline System (205-00 Driveline System - General Information, Diagnosis and Testing).

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Driveshaft - Front DriveshaftV8 S/C 4.2L Petrol

Removal and Installation

Removal

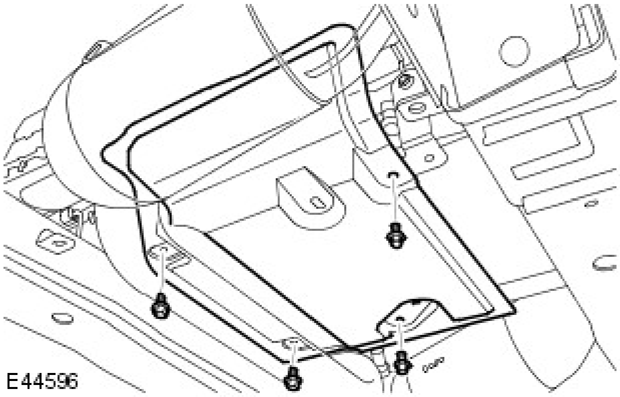
⚠ CAUTION: It is possible to fit the driveshaft incorrectly. Note the orientation before removal.

• NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

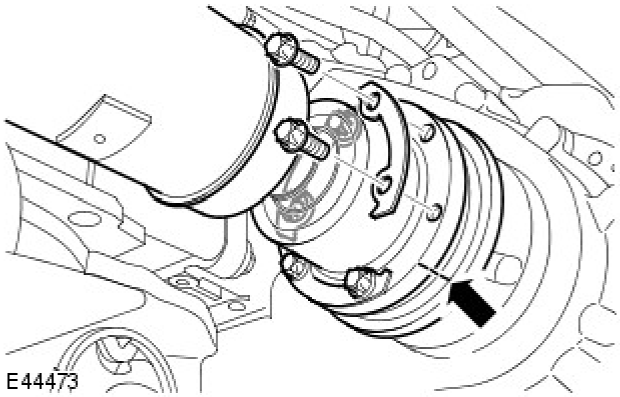
Raise and support the vehicle.

2. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).



3. Remove the transmission heat shield.

- Remove the 4 bolts.



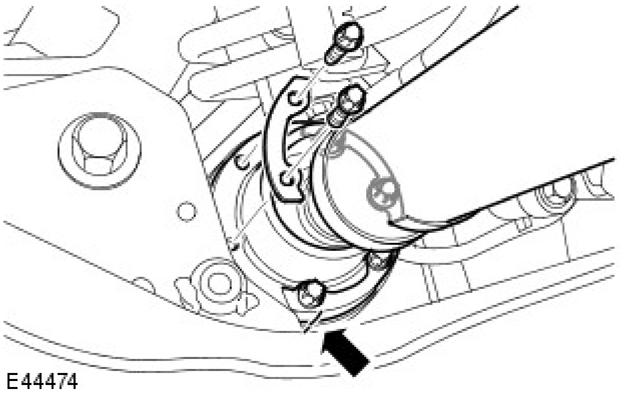
4. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the transfer case drive flange.

- Remove the 6 bolts and washers, discard the bolts.



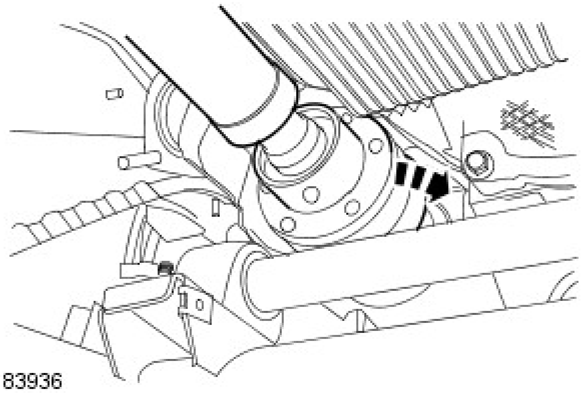
5. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

- Remove the 6 bolts and washers, discard the bolts.



6. Remove the front driveshaft.

- Compress the joints to disengage the drive flanges.

Installation

1. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Install the driveshaft.

- Clean the components.
- Compress the joints to engage the drive flanges.

2. Secure the driveshaft to the front axle drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

3. Secure the driveshaft to the transfer case drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

4. Install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

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Driveshaft - Front DriveshaftV8 4.4L Petrol

Removal and Installation

Removal

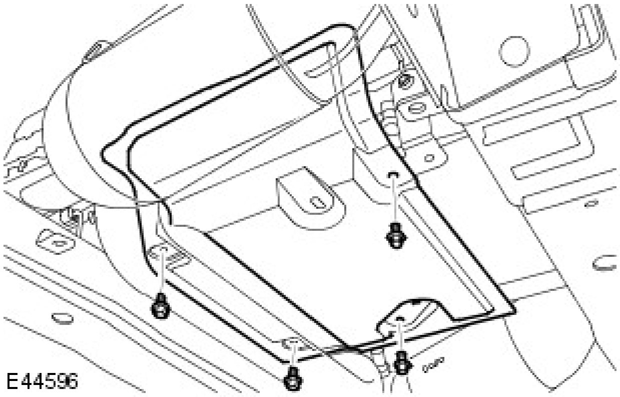
⚠ CAUTION: It is possible to fit the driveshaft incorrectly. Note the orientation before removal.

• NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

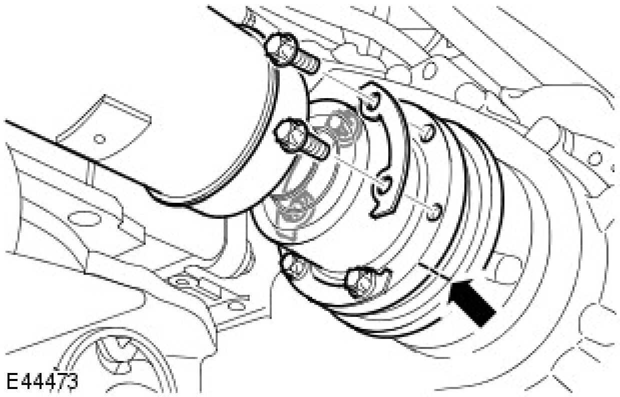
Raise and support the vehicle.

2. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).



3. Remove the transmission heat shield.

- Remove the 4 bolts.



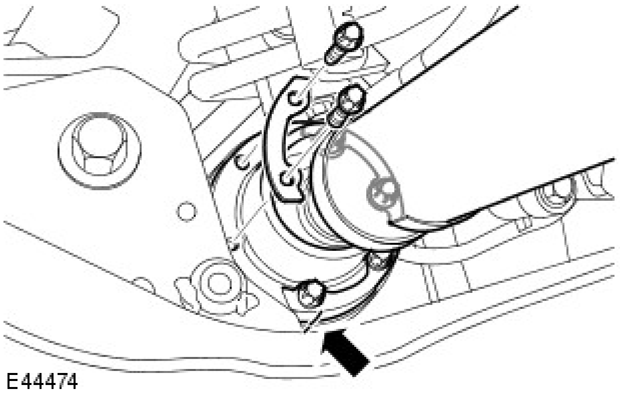
4. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the transfer case drive flange.

- Remove the 6 bolts and washers, discard the bolts.



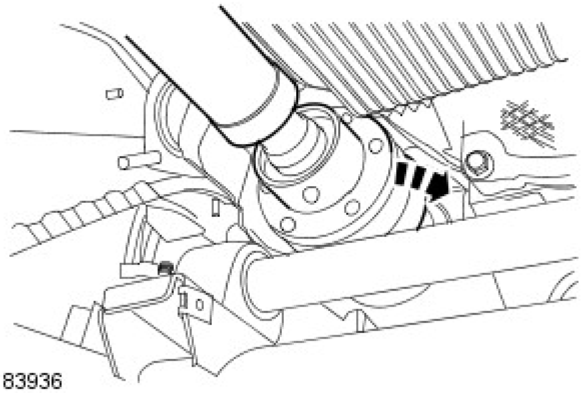
5. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

- Remove the 6 bolts and washers, discard the bolts.



6. Remove the front driveshaft.

- Compress the joints to disengage the drive flanges.

Installation

1. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Install the driveshaft.

- Clean the components.
- Compress the joints to engage the drive flanges.

2. Secure the driveshaft to the front axle drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

3. Secure the driveshaft to the transfer case drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

4. Install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

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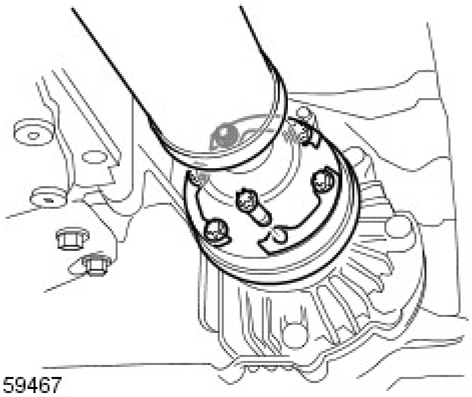
Driveshaft - Front DriveshaftTDV8 3.6L Diesel

Removal and Installation

Removal

1. Raise and support the vehicle.

2. Remove the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).


E59467

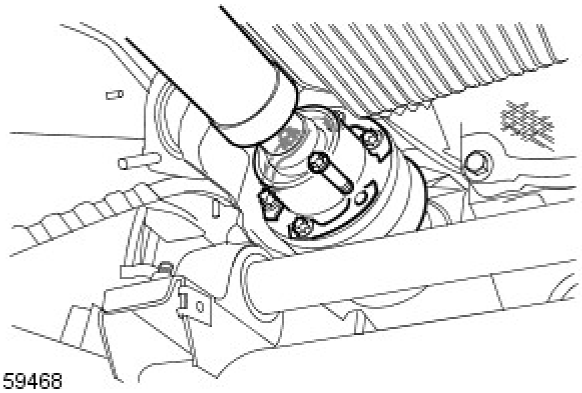
3. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the transfer case drive flange.

- Remove and discard the 6 bolts.
- Remove the 3 washers.


E59468

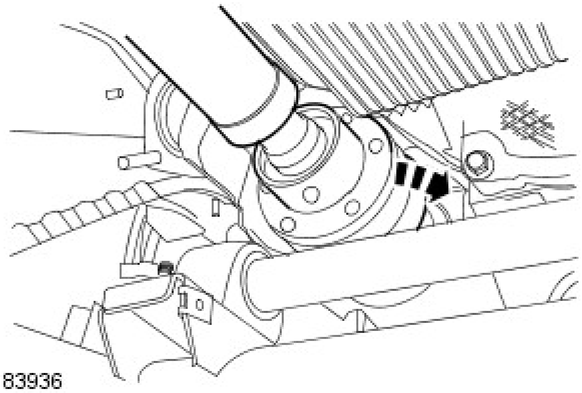
4. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

- Remove and discard the 6 bolts.
- Remove the 3 washers.


E83936

5. Remove the front driveshaft.

- Compress the joints to disengage the drive flanges.

Installation

1. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Install the front driveshaft.

- Clean the component mating faces.
- Compress the joints to engage the drive flanges.

2. ⚠ CAUTION: Make sure that new bolts are installed.

Secure the driveshaft to the front axle drive flange.

- Install the washers.
- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

3. Secure the driveshaft to the transfer case drive flange.

- Install the washers.
- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

4. Install the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

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Driveshaft - Rear Driveshaft

Removal and Installation

Removal

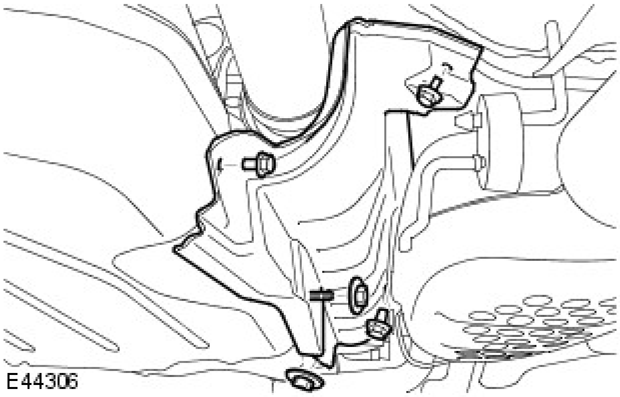
• NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.



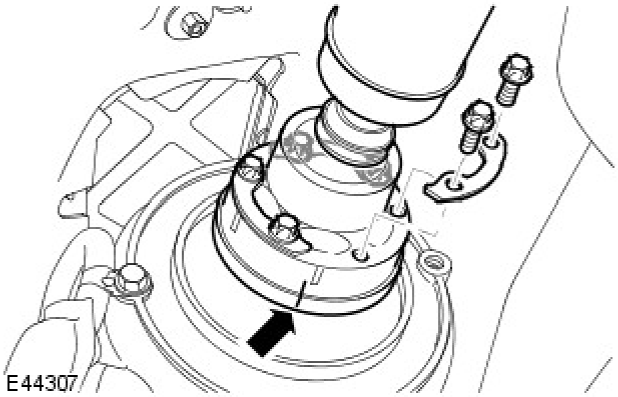
3. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the transfer case drive flange.

- Remove the 6 Torx bolts and washers.



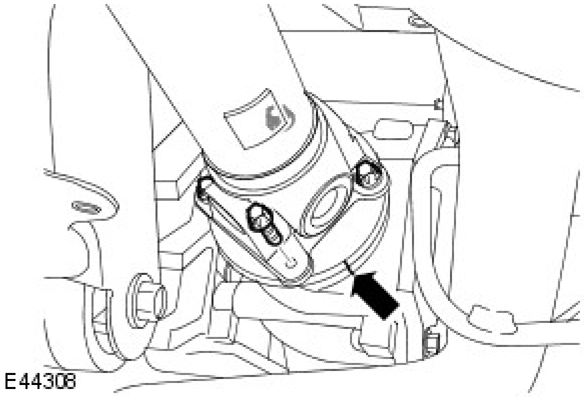
4. CAUTIONS:

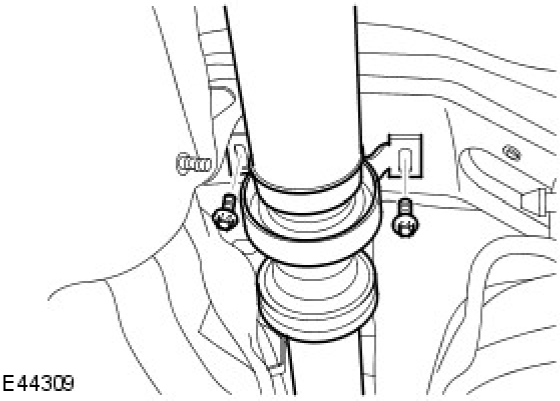
⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the rear axle drive flange.

- Remove and discard the 4 Torx bolts.





5. With assistance, remove the driveshaft.

- Remove the 2 driveshaft center bearing mount bolts.

Installation

1. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Attach the driveshaft to the rear axle drive flange.

- Clean the component mating faces.
- Attach the driveshaft to the rear axle drive flange.
- Tighten the new Torx bolts to 150 Nm (110 lb.ft).

2. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Attach the driveshaft to the transfer case drive flange.

- Clean the component mating faces.
- Tighten the Torx bolts to 73 Nm (54 lb.ft).

3. CAUTIONS:

⚠ Align the driveshaft center bearing mount by moving the floating front section of the shaft backward or forwards until the bolt holes in the mount align with the holes in the chassis.

⚠ Make sure the center bearing mount is not under tension.

Install the driveshaft center bearing mount bolts.

- Align the center bearing mount.
- Tighten the driveshaft center bearing retaining bolts to 30 Nm (22 lb.ft).

4. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

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Driveshaft - Front DriveshaftTDV6 2.7L Diesel

Removal and Installation

Removal

⚠ CAUTION: It is possible to fit the driveshaft incorrectly. Note the orientation before removal.

• NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durabilty of the joint.

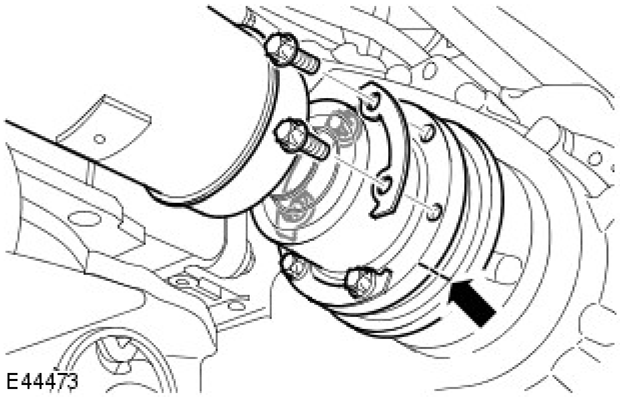
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

4. Remove the crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).



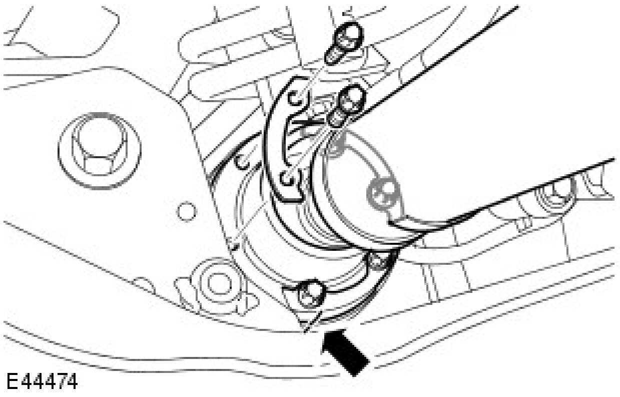
5. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the transfer case drive flange.

- Remove the 6 Torx bolts and washers, discard the bolts.



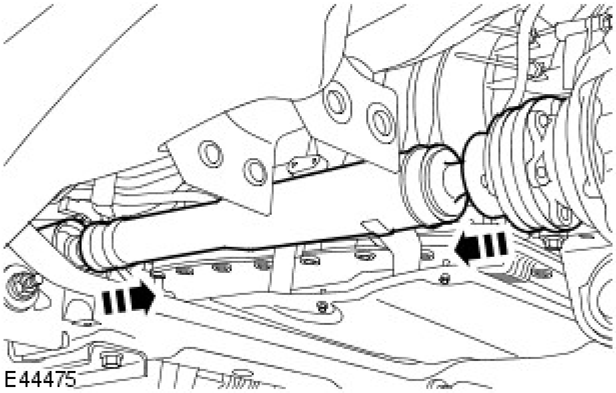
6. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

- Remove the 6 Torx bolts and washers, discard the bolts.



7. Remove the front driveshaft.

- Compress the joints to disengage the drive flanges.
- Remove the washer from the transfer case drive flange.

Installation

1. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durabilty of the joint.

Install the driveshaft.

- Clean the components.
- Install the washer.
- Compress the joints to engage the drive flanges.

2. Attach the driveshaft to the front axle drive flange.

- Tighten the new Torx bolts to 45 Nm (33 lb.ft), then a further 90 degrees.

3. Attach the driveshaft to the transfer case drive flange.

- Tighten the new Torx bolts to 45 Nm (33 lb.ft), then a further 90 degrees.

4. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

5. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Rear Drive Axle / Differential -

Sealers

Item	Land Rover Part No.
Input shaft flange nut	STC 50553
Input shaft splines	STC 50554
Differential (ETM) unit locking motor	STC 50550

Lubricants

Item	Specification
*** Recommended lubricant:**	
'Open' unit	Castrol SAF-XO - 75W/90
Electronic torque managed (ETM) unit	Castrol SAF Carbon Mod Plus

*** Do not use any lubricant other than that specified**

Capacities

Unit	Capacity
'Open' differential	1.1 litres (2.3 US pints) (1.16 US quarts)
Electronic torque managed (ETM) differential	1.5 litres (3.17 US pints) (1.6 US quarts)

Rear 'Open' Differential

Item	Specification
Reduction ratio:	
V6 Diesel engine - Automatic transmission	3.54:1
V8 Diesel engine - Automatic transmission	3.54:1
V8 SC Petrol engine - Automatic transmission	3.54:1
V8 N/A Petrol engine - Automatic transmission	3.54:1

Rear Electronic Torque Managed (ETM) Differential

Item	Specification
Electronic torque managed (ETM) range	Up to 2500 Nm (98.5 lbf/ft)
Electronic torque managed (ETM) motor	Operates the ball/ramp mechanism and wet clutch. Motor incorporates a temperature sensor and is controlled by an ECU
Differential type	4 pin
Reduction ratio:	
V6 Diesel engine	3.54:1
V8 Diesel engine	3.54:1
V8 Supercharged Petrol engine	3.54:1
V8 N/A Petrol engine	3.54:1

Torque Specifications

Description	Nm	lb-ft
Oil drain plug	54	40
Oil filler plug	34	25
Oil temperature sensor	22	16
++ Differential locking motor	10	7
Differential front mounting bolt	275	203
Differential rear mounting bolts	175	129
* Driveshaft to rear axle drive flange Torx bolts	150	110
Lower arm to wheel knuckle	275	203
Toe link bolt	175	129
Stabilizer bar link nuts	115	85
**+ Halfshaft retaining nut	350	258
Fuel tank heat shield nuts	3	2
Fuel tank heat shield bolts	5	4
Road wheel nuts	140	103

*** New ''Patchlok' Torx bolts must be installed**

**** New nut must be installed**

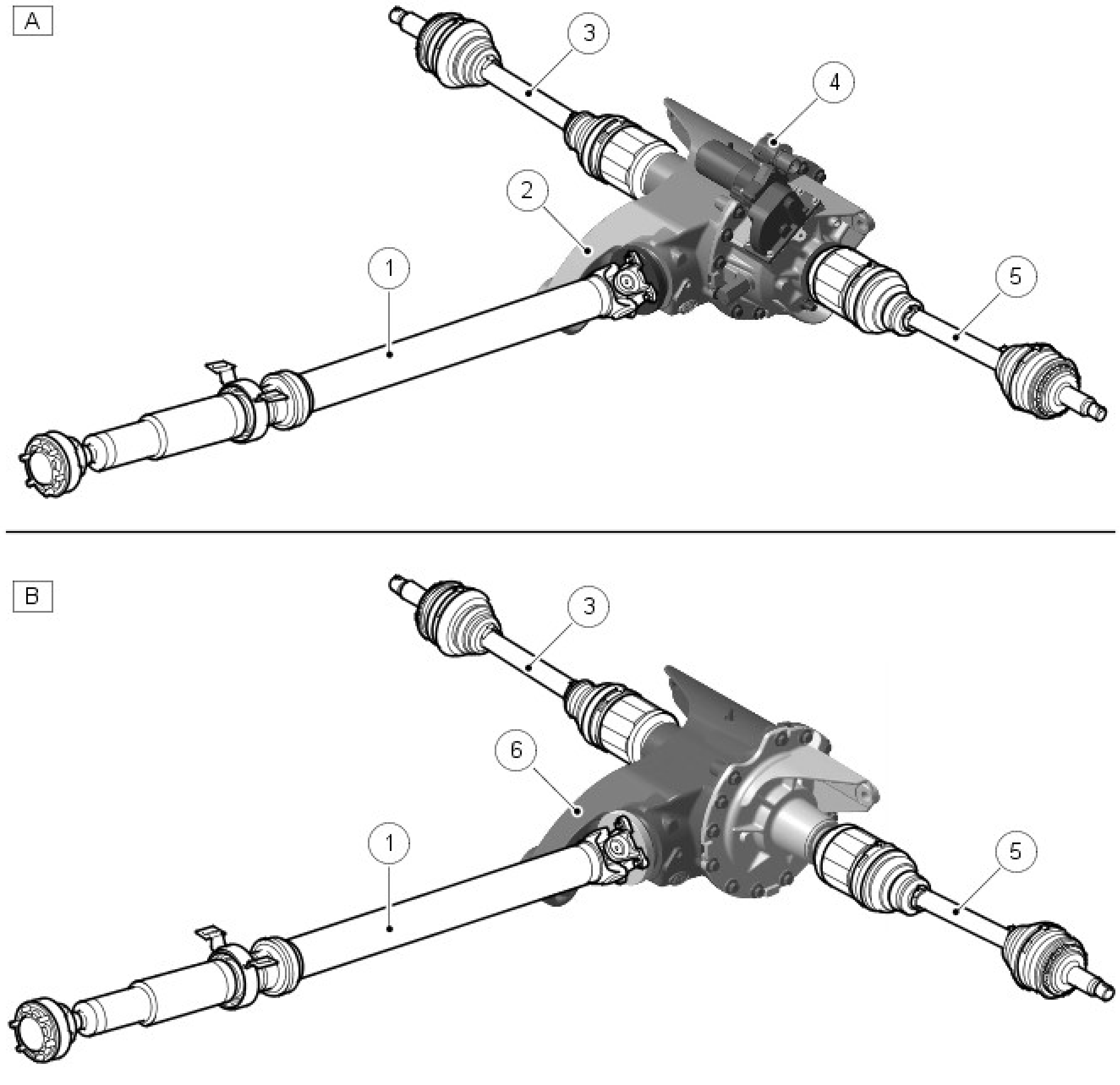
+ Stake nut on completion of tightening operation

++ Apply sealant, Part No. STC 50550 to flange of locking motor

Rear Drive Axle/Differential - Rear Drive Axle and Differential

Description and Operation

GENERAL



E51166

Item	Part Number	Description
A	-	Electronic rear differential
B	-	Open rear differential
1	-	Rear driveshaft
2	-	Electronic rear differential
3	-	RH rear drive halfshaft
4	-	Actuator (locking) motor assembly
5	-	LH rear drive halfshaft
6	-	Rear differential

The open rear differential converts the 'angle of drive' through 90° and distributes drive, via the rear drive halfshafts, to the rear wheels.

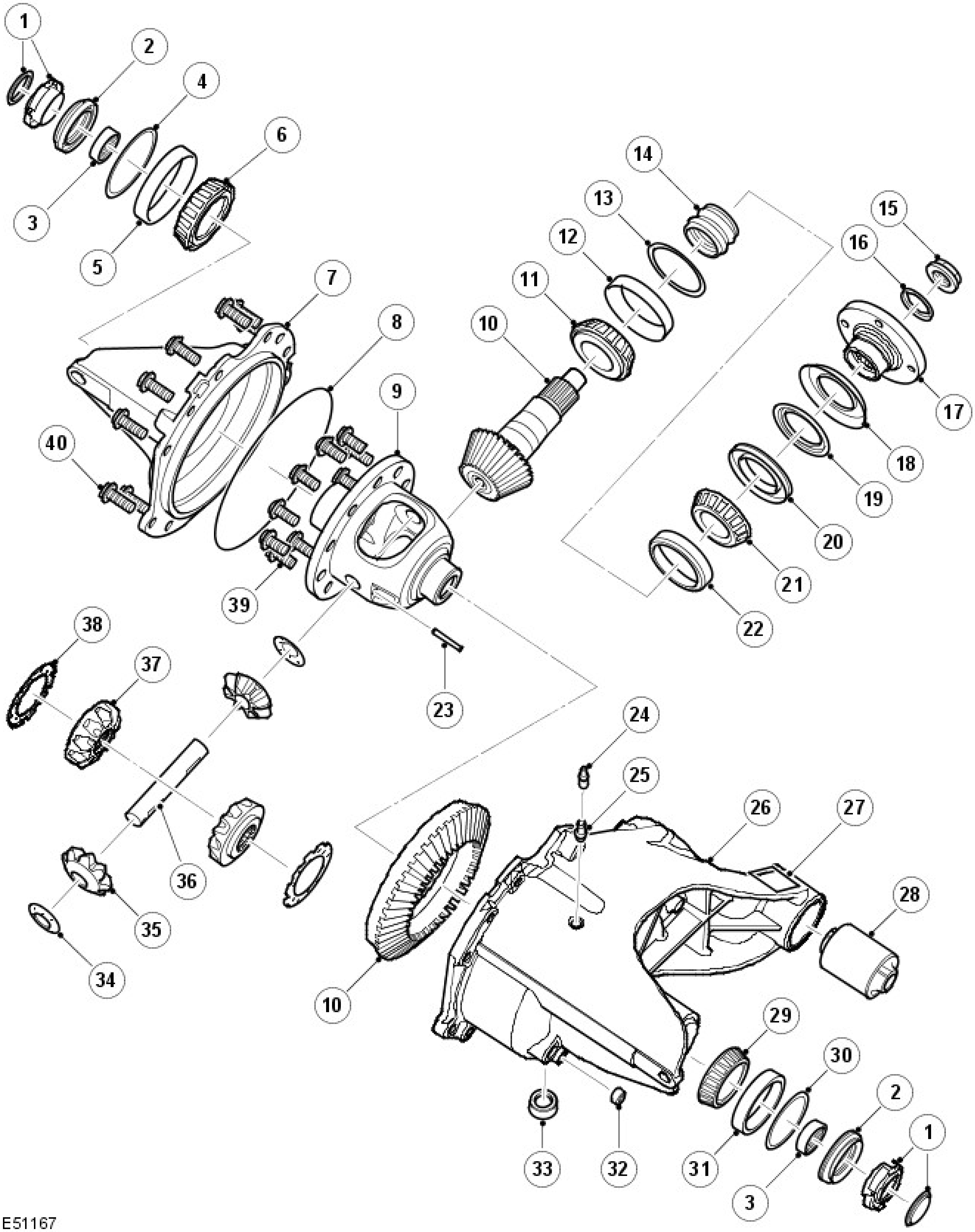
The open rear differential for the V8 petrol variants utilise the same output ratio, which differs to that used on the TdV6.

The open rear differential is located centrally in the rear of the chassis.

The units are mounted to the chassis via rubber bushes and bolts; two mounting points at the rear of the unit and one at the front.

OPEN REAR DIFFERENTIAL ASSEMBLY

Open Rear Differential - Exploded View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E51167

Item	Part Number	Description
1	-	Cap
2	-	Seal
3	-	Bearing assembly, without race
4	-	Bearing pre-load spacer
5	-	Bearing

6	-	Roller bearing cup
7	-	Cover
8	-	Seal
9	-	Differential carrier
10	-	Gear and pinion assembly
11	-	Bearing
12	-	Roller bearing cup
13	-	Shim
14	-	Collapsible spacer
15	-	Pinion nut
16	-	Retainer
17	-	Flange
18	-	Outer deflector
19	-	Inner deflector
20	-	Oil seal
21	-	Bearing
22	-	Roller bearing cup
23	-	Roll pin
24	-	Breather cap
25	-	Breather
26	-	Case
27	-	Data location
28	-	Mounting bush
29	-	Bearing
30	-	Bearing pre-load spacer
31	-	Roller bearing cup
32	-	Plug
33	-	Drain plug
34	-	Thrust washer
35	-	Planet gears
36	-	Crosspin shaft
37	-	Sunwheel
38	-	Thrust washer
39	-	Bolt, 10 of
40	-	Bolt, 12 of

The cast iron casing comprises two parts; a cover and a carrier. The carrier provides locations for all the internal components. The carrier is sealed to the cover via an O-ring seal and secured with twelve bolts. The cover and carrier have cast fins, which assist mobility. A breather tube is fitted to the top of the carrier. This allows a plastic tube to be fitted and routed to a high point under the vehicle body, preventing the ingress of water when the vehicle is wading.

The carrier contains an oil drain plug. The differential unit contains approximately 1.16 litres of oil from a dry fill. If oil is being replaced, a smaller quantity of oil will be required due to residual oil retained in the pinion housing.

The differential is a conventional design using a hypoid gear layout, similar to the front differential. The open rear differential is available in two ratios. V8 petrol engine vehicles use a differential with a final drive ratio of 3.73:1 and TdV6 engine vehicles use a final drive ratio of 3.54. Changing the number of teeth between the crown wheel drive gear and pinion gear changes the ratio.

The differential comprises a pinion shaft and hypoid pinion gear and a crown wheel drive gear with an integral cage, which houses two planet gears. Two sun wheels are also located in the cage and pass the rotational drive to the drive shafts.

The pinion shaft is mounted on two opposed taper roller bearings, with a collapsible spacer located between them. The spacer is used to hold the bearings in alignment and also collapses under the pressure applied to the pinion-flanged nut. This allows the flanged nut to be tightened to a predetermined torque, which collapses the spacer, setting the correct bearing preload.

The pinion shaft has an externally splined outer end, which accepts and locates the input flange, which is retained by the pinion nut and retainer. The input flange has four threaded holes and mates with the rear drive shaft. Four bolts secure the rear drive shaft to the input flange. An oil seal is pressed into the pinion housing and seals the input flange to the pinion housing. The pinion shaft has a hypoid gear at its inner end, which mates with the crown wheel drive gear.

The crown wheel drive gear is located on the differential case and secured with ten bolts. The differential case is mounted on taper roller bearings located in machined bores on each side of the pinion housing. Shims are retained in the casing behind the bearing cups, the shim thickness is selected to apply the correct bearing preload and hypoid backlash.

The differential carrier has a through hole, which provides location for the shaft. The shaft is supported by a sun gear and a needle roller bearing. The shaft is fitted with a snap ring at one end, which locates in a machined groove in the sun gear, locking the shaft in position.

The sun gears are located in pockets in the carrier cage and mesh with the planet gears. Spacers are fitted between the sun wheels and the carrier and set the correct mesh contact between the planet gears and the sun wheels. Each sun wheel has a machined bore with internal splines and machined groove near the splined end. The groove provides positive location for a snap ring fitted to the end of each output flange.

Each output shaft has a spline, which locates in each sun wheel. A snap ring fitted to the splined shaft locates in the groove of the sun wheel bore and positively locates the output shaft. Oil seals are pressed into each side of the pinion housing and seals the output shaft.

Differential Operation

The operating principles of the front and rear differentials are the same. Rotational input from the drive shaft is passed via the input flange to the pinion shaft and pinion gear. The angles of the pinion gear to the crown wheel drive gear moves the rotational direction through 90°.

The transferred rotational motion is now passed to the crown wheel drive gear, which in turn rotates the differential casing. The shaft, which is secured to the casing, also rotates at the same speed as the casing. The planet gears, which are mounted on the shaft, also rotate with the casing. In turn, the planet gears transfer their rotational motion to the left and right hand sun wheels, rotating the drive halfshafts.

When the vehicle is moving in a forward direction, the torque applied through the differential to each sun wheel is equal. In this condition both drive halfshafts rotate at the same speed. The planet gears do not rotate and effectively lock the sun wheels to the differential casing.

If the vehicle is turning, the outer wheel will be forced to rotate faster than the inner wheel by having a greater distance to travel. The differential senses the torque difference between the sun wheels. The planet gears rotate on their axes to allow the outer wheel to rotate faster than the inner one.

SERVICE

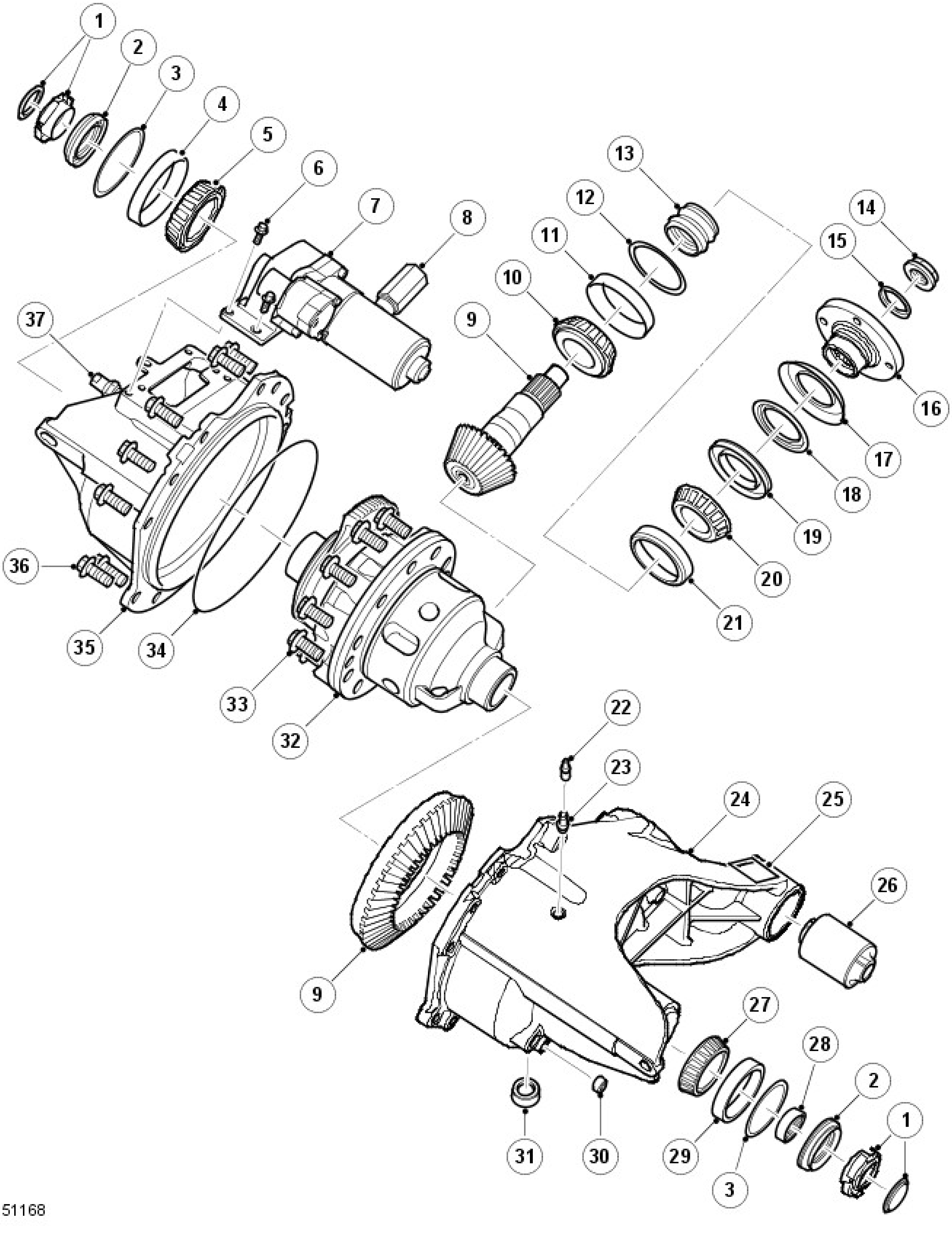
The oil used in the open rear differential is Castrol SAF-XO. The oil contains unique additives, which enhance the differentials operation. No other oil must be used in the open rear differential.

Open Rear Differential Serviceable Components

- Needle roller bearing assemblies
- Halfshaft seals
- Chassis bush/fixings
- Lubricant.

ELECTRONIC REAR DIFFERENTIAL ASSEMBLY

Electronic Rear Differential - Exploded View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E51168

Item	Part Number	Description
1	-	Cap
2	-	O ring
3	-	Bearing pre-load spacer
4	-	Bearing
5	-	Bearing cup

6	-	Bolt, 4 of
7	-	Housing and motor assembly
8	-	Damper
9	-	Gear and pinion assembly
10	-	Bearing
11	-	Bearing cup
12	-	Shim
13	-	Collapsible spacer
14	-	Pinion nut
15	-	Retainer
16	-	Flange
17	-	Deflector, outer
18	-	Deflector, inner
19	-	Seal
20	-	Bearing
21	-	Bearing cup
22	-	Breather cap
23	-	Breather
24	-	Case
25	-	Data location
26	-	Mounting bush
27	-	Bearing
28	-	Bearing assembly without race
29	-	Bearing cup
30	-	Filler plug
31	-	Drain plug
32	-	Electronic differential assembly
33	-	Bolt, 10 of
34	-	O ring
35	-	Cover
36	-	Bolt, 12 of
37	-	Temperature sensor

The electronic rear differential has the same functionality as the open rear differential but incorporates a locking feature.

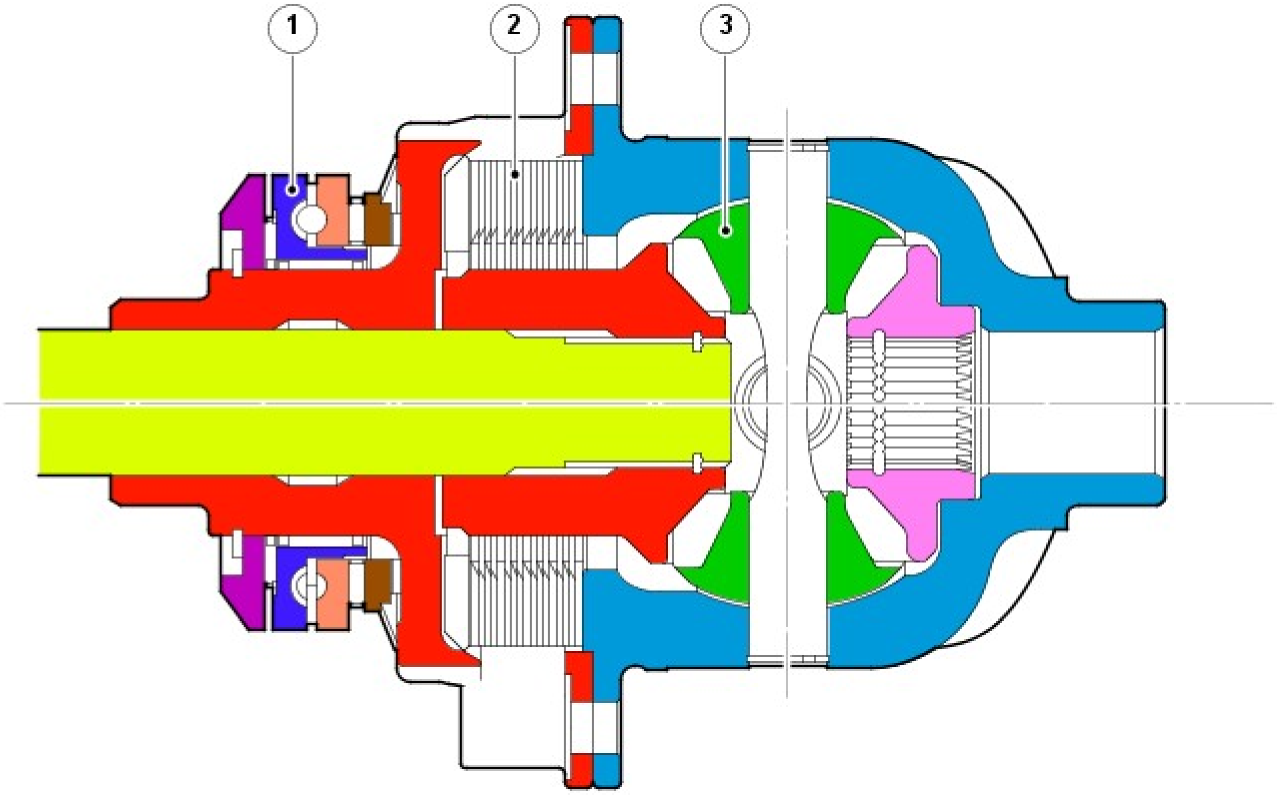
An electronically controlled multi-plate clutch provides a rear differential lock and torque biasing function to give improved traction performance and vehicle dynamic stability.

A strategy, to electronically control the rear differential multi-plate clutch assembly, has been developed to provide:

- a pre-loading function, increasing locking torque with increased driving torque
- a slip controller to increase locking torque under off-road conditions and decrease locking torque for optimum comfort, e.g. parking.

The unit receives a torque input from the transfer box output shaft, which is passed through the unit to two outputs for the rear drive halfshafts.

The unit detects wheel slip via various vehicle system inputs to the electronic rear differential control module and locks the differential accordingly.

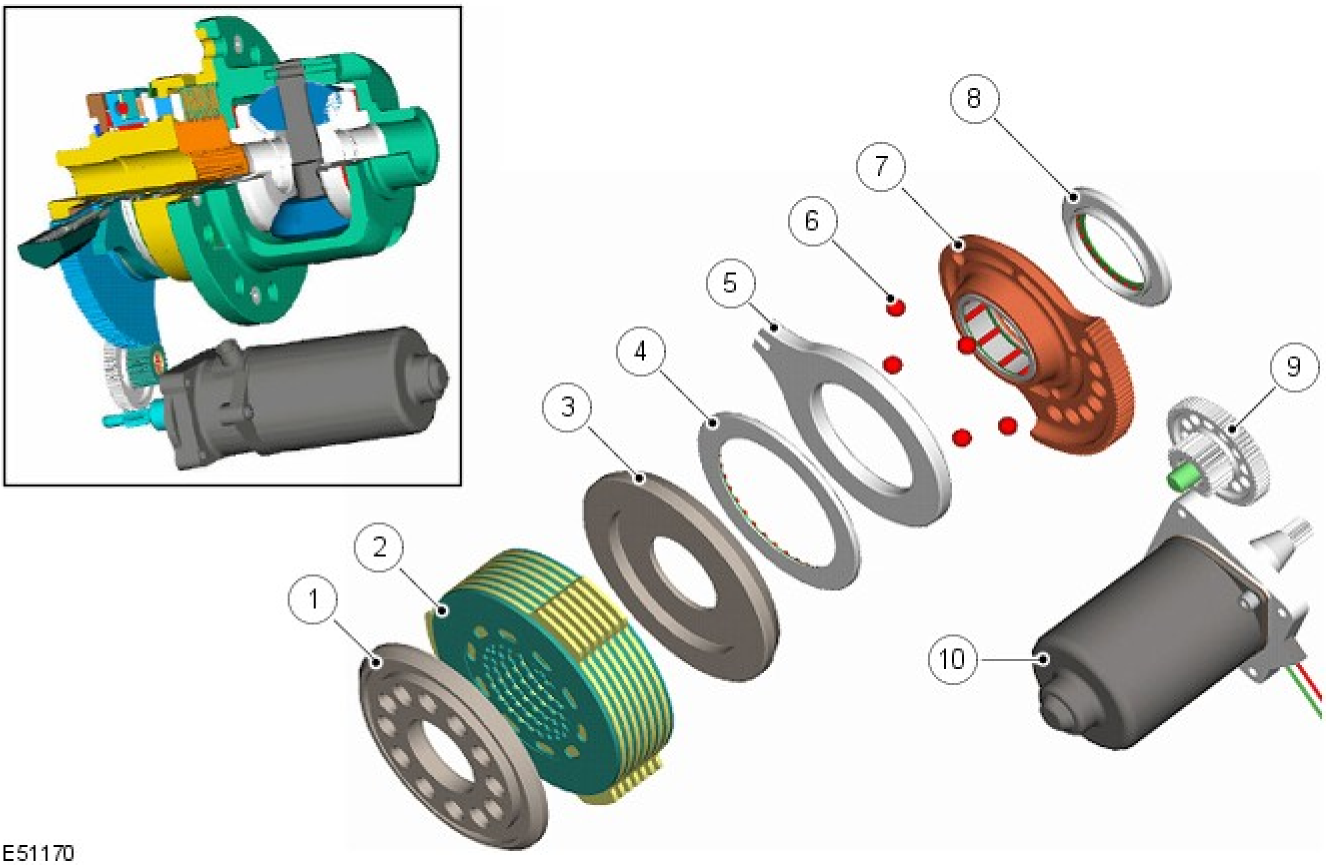


E51169

Item	Part Number	Description
1	-	Actuator
2	-	Clutch pack
3	-	Differential

The electronic rear differential locking and biasing feature is actuated via a DC motor, which is controlled by the electronic rear differential control module, via a Pulse Width Modulation (PWM) signal.

Multi-plate Clutch Assembly



E51170

Item	Part Number	Description
1	-	Pressure disc
2	-	Clutch plate assembly
3	-	Pressure disc
4	-	Thrust race
5	-	Output actuator
6	-	Actuator balls
7	-	Input actuator
8	-	Bearing pre-load spacer
9	-	Reduction gearset
10	-	Actuator motor

The multi-plate clutch assembly for both centre (transfer box) and electronic rear differentials act in a similar way. The aim of the multi-plate clutch assembly is to prevent excessive differential slip and therefore maximise the traction performance of the vehicle. This is fundamentally different from the 'braked' traction control, which can only counteract differential slip when it occurs.

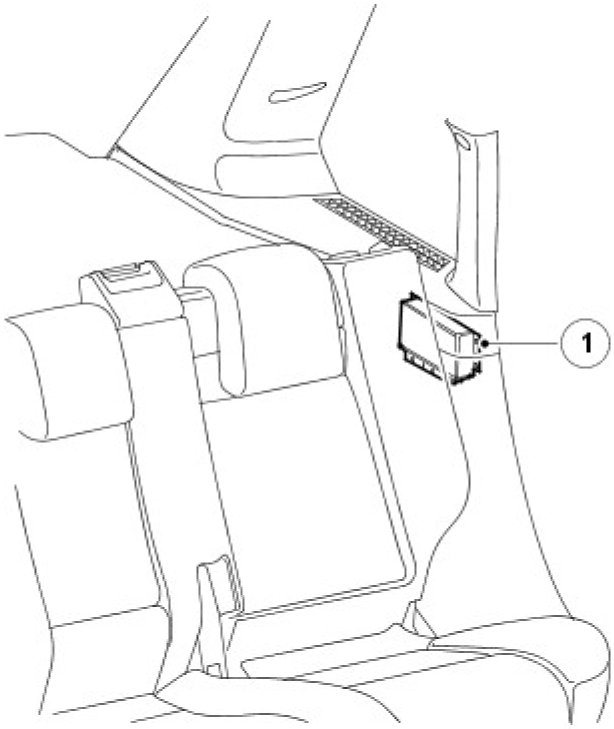
A certain amount of differential slip is required to allow the vehicle to turn corners and to remain stable under control of the Anti-lock Braking System (ABS). The transfer box control module monitors the driver's demands through primary vehicle controls and automatically sets the slip torque at the rear differential via the electronic rear differential control module. The system is completely automatic and does not require any special driver input.

The multi-plate clutch assembly actively controls the torque flow through the rear differential and optimises the torque distribution in the driveline. The clutch assembly biases the torque from the differential to the wheels with the higher grip and prevents the wheels with the lower grip from spinning.

By turning the input actuator disc, via the motor shaft, the output actuator is rotated. This movement acts on 5 balls in a ramp mechanism between the input and output actuators and gives a defined axial movement. The movement forces the pressure disc to induce friction between the sun gear and differential case via the clutch plates supported by the sun gear and the plates supported by the clutch basket on the differential case. This frictional force inhibits the differential rotation; the differential case and left hand differential side gear are locked together.

Electronic Rear Differential Control Module

The electronic rear differential control module controls the multi-plate clutch actuation. The control module is mounted on a bracket located on the LH C-pillar, behind the trim.



E56476

Item	Part Number	Description
1	-	Electronic rear differential control module

The control module is connected on the Controller Area Network (CAN) bus and controls the differential operation using CAN messages from other control modules on the network.

The control module uses three connectors for all inputs and outputs. It receives a permanent power supply via a 40A fusible link located in the Battery Junction Box (BJB), and an ignition supply via fuse 24 located in the Central Junction Box (CJB).

The control module memorises the position of the electronic rear differential motor when the ignition is switched off.

The control module controls the closed loop position sensing system within the motor and regulates the power supply to the motor.

If the control module is replaced, T4 must be connected to the vehicle and the electronic rear differential control module self-calibration procedure must be performed. This procedure must also be performed if the motor or differential assembly is replaced.

If a fault occurs with the electronic rear differential, the control module or one of the required input signals, i.e. road speed signal, the control module records an error code and a warning lamp, in the instrument cluster, illuminates permanently.

Electronic Rear Differential Control Module Pin Out Details

Connector C2162

Pin No.	Description	Input/output
1	Not used	-
2	CAN bus low	Input/output
3	CAN bus high	Input/output
4	Not used	-
5	CAN bus high	Input/output
6	CAN bus low	Input/output

Connector C2163

Pin No.	Description	Input/output
1	Not used	-
2	Not used	-
3	Ground	-

Pin No.	Description	Input/output
4	Ignition feed	Input
5	Not used	-
6	Ground	-
7	Battery feed	Input
8	Battery feed	Input

Connector C2164

Pin No.	Description	Input/output
1	+ve for actuator Hall sensor	Input
2	Not used	-
3	Actuator motor	Output
4	Hall sensor - Signal A	Input
5	Not used	-
6	Not used	-
7	Hall sensor - Signal B	Input
8	Differential oil temperature sensor	Input
9	Not used	-
10	Ground - Hall sensor	-
11	Differential oil temperature sensor	Output
12	Actuator motor	Input
13	Motor temperature sensor	Output
14	Not used	-
15	Not used	-
16	Motor temperature sensor	Input
17	Motor brake solenoid	Output
18	Motor brake solenoid	Input

CAN Bus Messages

The CAN bus is a high speed broadcast network connected between various vehicle control modules. It allows the fast exchange of data between control modules every few microseconds. The bus comprises two wires, which are twisted together to minimise electromagnetic interference (noise) produced by the CAN messages.
For additional information, refer to: Communications Network (418-00 Module Communications Network, Description and Operation).

The electronic rear differential control module is connected on the CAN bus, via the transfer box control module, and controls differential operation using CAN messages from other control units on the network. Wheel speed, steering angle, automatic transmission speed, temperature information, car configuration, axle ratios and mode inputs, are some of the main signals received by the control module.

The control module also sends messages via the CAN bus to tell other control modules on the network, the status of the electronic rear differential. The clutch torque and default mode status are some of the main signals sent out by the control module.

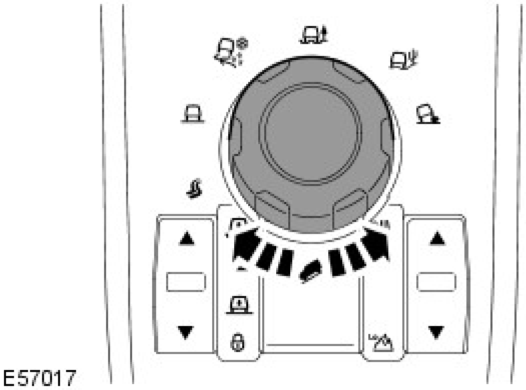
The following table shows the messages that can be displayed in the message centre of a high-line instrument cluster relating to the electronic rear differential:

Message	Description	Chime
'TRANSMISSION OVERHEAT' 'SLOW DOWN'	Rear differential temperature has reached or is approaching the overheat threshold.	None
'TRANSMISSION FAULT' 'TRACTION REDUCED'	Transfer box control module has stopped transmitting CAN bus messages. Defaults to open centre differential. Message also displayed when fault occurs with electronic rear differential.	None
'TRANSMISSION FAULT' 'STOP SAFELY'	Fault has occurred with electronic rear differential. Stop vehicle at earliest opportunity.	Single

On vehicles fitted with the low line instrument cluster, in place of the message centre there will be a status lamp, which has the following logic:

- Amber - Over temperature
- Red - Failure, stop vehicle

TERRAIN RESPONSE



The Terrain Response system allows the driver to select a program, which will provide the optimum settings for traction and performance for the prevailing terrain conditions.

The system is controlled by a rotary control located on the centre console.

The system uses a combination of vehicle subsystems to achieve the required vehicle characteristics for the terrain selected. The following subsystems form the Terrain Response system:

- Engine management system
- Automatic transmission
- Transfer box
- Brake system
- Air suspension.

Each subsystem control module provides a feedback for the selected program so that the Terrain Response control module can check that all systems are controlling the system correctly. The exception to this is the electronic rear differential control module, which does not provide feedback to the Terrain Response system as it is a slave to the transfer box control module.
For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

SERVICE

The oil used in the electronic rear differential is Castrol SAF-Carbon Mod Plus. The oil contains unique additives and friction modifiers, which enhance the differentials operation. No other oil must be used in the electronic rear differential.

Electronic Rear Differential Serviceable Components

- Halfshaft seals
- Needle roller bearing assembly
- Chassis bush/fixings
- Actuator motor
- Temperature sensor
- Control module and bracket
- Lubricant.

DIAGNOSTICS

The electronic rear differential control module can store fault codes, which can be retrieved using T4 or a diagnostic tool using ISO-14229 protocol.

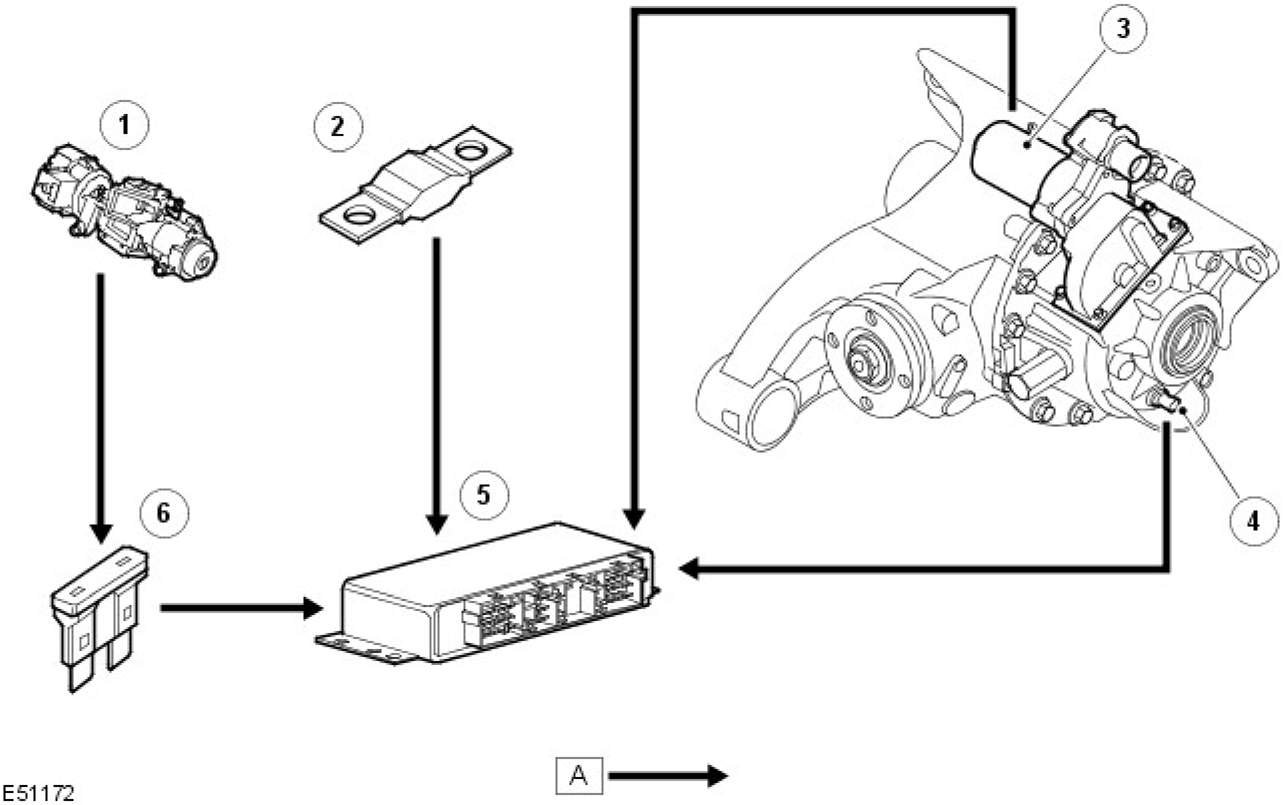
The information is communicated via a diagnostic socket.

The diagnostic socket allows the exchange of information between the various control modules on the bus systems and T4 or another suitable diagnostic tool. The information is communicated to the socket via the CAN bus. This allows the retrieval of diagnostic information and programming of certain functions using T4 or another suitable diagnostic tool.

The electronic rear differential control module uses Diagnostic Trouble Codes (DTC), which relate to electronic rear differential electrical faults.

ELECTRONIC REAR DIFFERENTIAL CONTROL DIAGRAM

• NOTE: A = Hardwired



Item	Part Number	Description
1	-	Ignition switch
2	-	Fusible link (battery)
3	-	Actuator motor
4	-	Oil temperature sensor
5	-	Electronic rear differential control module
6	-	Fuse (ignition)

Published: 11-May-2011

Rear Drive Axle/Differential - Rear Drive Axle and Differential

Diagnosis and Testing

Principle of Operation

For additional information, refer to section 205-02 - Rear Drive Axle/Differential of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Confirm which, if any, warning lights and/or messages were displayed on the instrument cluster. For a list of messages, refer to the relevant section of the workshop manual.
3. **3.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Differential oil leakage ● Sensor installation	● power ● Fuse(s) ● Wiring harness physical damage or water ingress ● Loose or corroded electrical connectors ● Controller area network (CAN) circuits ● Sensors ● Rear differential control module

4. **4.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. **5.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible message	Possible other warnings	Possible causes	Action
Running at reduced capability with fault present	● Rear differential fault	● Driveline overheat warning lamp illuminated ● Rear differential/driveline fault warning lamp illuminated	● Water ingress to wiring harness or connectors ● Reduced differential capability ● Differential increased tolerances ● Internal fault ● Rear differential control module fault (Rear differential control module)	Visually inspect the wiring harness and connectors for water ingress. Refer to the warranty policy and procedures manual if a module is suspect.
Rear differential overheat	● Rear differential Overheat Slow Down	● Driveline overheat warning lamp illuminated	● Oil level incorrect ● Oil level incorrect specification ● Sensor fault ● Internal fault	Check for correct oil quantity and specifications. Refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: Intermittent faults may cause DTCs to be logged, however some DTCs may be cleared during an ignition off, ignition on cycle. Carry out a road test (if safe to do so), check the functionality of the system and retrieve any DTCs **before** turning the ignition off.

DTC	Description	Possible causes	Action
P0562-00	System Voltage Low - no sub type information	● Rear differential control module voltage supply below 9V	Check the power charge condition, refer to the electrical guides and check the differential actuator sensor circuit, repair as necessary
P0563-00	System Voltage High - no sub type information	● Rear differential control module voltage supply below 16V	Check the charging circuit and power condition
P0604-00	Internal Control Module Random Access Memory (RAM) Error - no sub type information	● Rear differential control module internal error	Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect
P0605-00	Internal Control Module Read Only Memory (ROM) Error - no sub type information	● Rear differential control module internal error	Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect
P0606-00	Control Module Processor - no sub type information	● Watchdog reset	This is a control module internal check DTC and is not necessarily a fault. If no other DTCs are logged and no customer complaint exists, clear/ignore this DTC
P0607-00	Control Module Performance - no sub type information	● Rear differential control module internal error	Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect
P0652-00	Sensor Reference Voltage 'B' Circuit Low - no sub type information	● Actuator internal position sensor supply voltage below 57V	Refer to the electrical guides and check the differential actuator sensor position circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P0653-00	Sensor Reference Voltage 'B' Circuit High - no sub type information	● Actuator internal position sensor supply voltage below 83V	Refer to the electrical guides and check the differential actuator sensor position circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P0666-00	PCM/ECM/TCM Internal Temperature Sensor 'A' Circuit - no sub type information	● Rear differential control module internal temperature sensor value above 105°C	This is a control module internal check DTC and is not necessarily a fault. If no other DTCs are logged and no customer complaint exists, clear this DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect
P0712-00	Transmission Fluid Temperature Sensor 'A' Circuit Low - no sub type information	● Differential actuator internal temperature sensor open circuit or short circuit to ground	Refer to the electrical guides and check the differential actuator sensor circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P0713-00	Transmission Fluid Temperature Sensor 'A' Circuit High - no sub type information	● Differential actuator internal temperature sensor open circuit or short circuit to power	Refer to the electrical guides and check the differential actuator sensor circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P0806-00	Clutch Position Sensor Circuit Range/Performance - no sub type information	● Mismatch of actual and expected/calculated actuator position - Internal differential actuator error	Calibrate the clutch and range change mechanism using the approved diagnostic system or by the procedure listed in the description and operation. Refer to the relevant section of the workshop manual. Clear the DTC and retest. If the problem persists, renew the differential actuator
P0807-00	Clutch Position Sensor Circuit Low - no sub type information	● Differential actuator internal position sensor supply, ground, signal 1 or 2 open circuit or sensor supply, signal 1 or 2 short circuit to ground	Refer to the electrical guides and check the differential actuator circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P0808-00	Clutch Position Sensor Circuit High - no sub type information	● Differential actuator internal position sensor signal 1 or 2 short circuit to power	Refer to the electrical guides and check the differential actuator circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P080A-00	Clutch Position Not Learned - no sub type information	● Rear differential control module (RDCM) not calibrated ● Differential clutch stuck or out of tolerance	Using the approved diagnostic equipment, calibrate the rear differential control module. Clear the DTC and retest. If the problem persists, renew the rear differential assembly. Refer to the warranty policy and procedures manual if a differential is suspect

DTC	Description	Possible causes	Action
P0810-92	Clutch Position Control Error - performance or incorrect operation	- This DTC is for information only	If DTC P186D-00 is also logged in the rear differential control module, refer to repair actions as necessary. **If DTC P186D-00 is not logged no repair action is necessary.**
P0894-00	Transmission Component Slipping - no sub type information	- Differential actuator internal magnetic brake is slipping	Renew the differential actuator
P0900-00	Clutch Actuator Circuit/Open - no sub type information	- Differential actuator supply open circuit	Refer to the electrical guides and check the differential actuator circuit, repair as necessary
P0901-00	Clutch Actuator Circuit Range/Performance - no sub type information	- Differential actuator supply short circuit	Refer to the electrical guides and check the differential actuator circuit, repair as necessary
P0902-00	Clutch Actuator Circuit Low - no sub type information	- Differential actuator supply circuit short to ground.	Refer to the electrical guides and check the differential actuator circuit, repair as necessary
P0903-00	Clutch Actuator Circuit High - no sub type information	- Differential actuator supply circuit short to power	Refer to the electrical guides and check the differential actuator circuit, repair as necessary
P1603-00	EEPROM Malfunction - no sub type information	- Rear differential control module internal error	Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect
P1783-00	Transmission Over-Temperature Condition - no sub type information	- Rear Differential oil sump temperature sensor value above 150°C	Confirm the customer complaint and vehicle usage at the time of DTC event. Check the operation of the rear differential. Check the rear differential oil quantity and specification. Refer to the relevant section of the workshop manual. Clear the DTC and retest. If the problem persists, renew the rear differential assembly. Refer to the warranty policy and procedures manual if a differential is suspect
P186A-00	Differential Lock-Up Actuator Brake Control Circuit/Open - no sub type information	- Open circuit of actuator internal magnetic brake supply leads	Refer to the electrical guides and check the differential actuator circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P186B-00	Differential Lock-Up Actuator Brake Control Circuit Low - no sub type information	- Short circuit to ground of both differential actuator internal magnetic brake pins	Refer to the electrical guides and check the differential actuator circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P186C-00	Differential Lock-Up Actuator Brake Control Circuit High - no sub type information	- Short circuit to power of both differential actuator internal magnetic brake pins	Refer to the electrical guides and check the differential actuator circuit, repair as necessary. If no circuit problems exist, renew the differential actuator
P186D-00	Clutch Actuator Stuck - no sub type information	- Actuator fault	Using the approved diagnostic equipment, calibrate the rear differential control module/clutch actuator. Clear the DTC and retest. If the problem persists, renew the actuator
P2742-00	Transmission Fluid Temperature Sensor 'B' Circuit Low - no sub type information	- Rear differential oil sump temperature sensor short circuit to ground	Refer to the electrical guides and check the differential oil temperature sensor circuit, repair as necessary
P2743-00	Transmission Fluid Temperature Sensor 'B' Circuit High - no sub type information	- Rear differential oil sump temperature sensor open circuit or short circuit to power	Refer to the electrical guides and check the differential oil temperature sensor circuit, repair as necessary
P2785-00	Clutch Actuator Temperature Too High - no sub type information	- Actuator internal temperature sensor value above 150°C - Extensive prolonged off-road use - Insufficient oil quantity - Incorrect oil specification - Internal differential problem	Confirm the customer complaint and vehicle usage at the time of DTC event. Check the operation of the rear differential. Check the rear differential oil quantity and specification. Refer to the relevant section of the workshop manual. Clear the DTC and retest. If the problem persists, renew the rear differential assembly. Refer to the warranty policy and procedures manual if a differential is suspect

DTC	Description	Possible causes	Action
P2787-00	Clutch Temperature Too High - no sub type information	● Rear differential clutch pack temperature (calculated) above 200°C	Confirm the customer complaint and vehicle usage at the time of DTC event. Check the operation of the rear differential. Check the rear differential oil quantity and specification. Refer to the relevant section of the workshop manual. Clear the DTC and retest. If the problem persists, renew the rear differential assembly. Refer to the warranty policy and procedures manual if a differential is suspect
U0001-88	High Speed CAN Communication Bus - bus off	● High speed CAN communication Bus (CAN Bus Off)	Refer to the Network Communications section of the workshop manual
U0102-87	Lost Communication With Transfer Case Control Module - missing message	● Lost communication with TCCM	Refer to the bus off statement within workshop manual section 418-00. Refer to the Network Communications section of the workshop manual
U0122-87	Lost Communication With Vehicle Dynamics Control Module - missing message	● Lost communication with VDM	Refer to the bus off statement within workshop manual section 418-00. Refer to the Network Communications section of the workshop manual
U0300-55	Internal Control Module Software Incompatibility - not configured	● Rear differential control module not configured	Configure the module using the approved diagnostic system
U1A14-49	CAN Initialization Failure - internal electronic failure	● Rear differential control module supervision software failure ● Internal control module failure	Configure the module using the approved diagnostic system. Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect

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Rear Drive Axle/Differential - Differential Draining and Filling

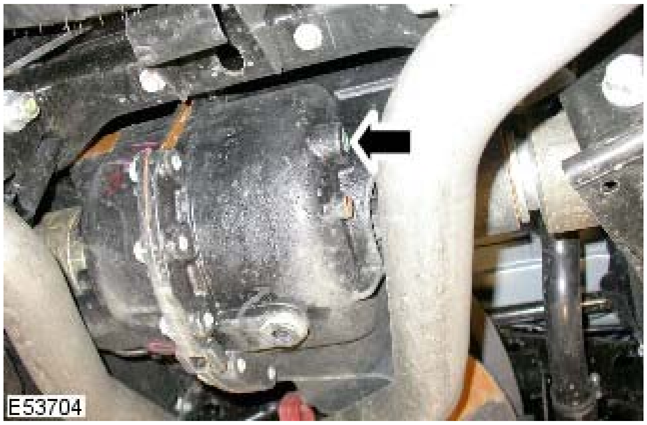
General Procedures

⚠ CAUTION: Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, and not to act as a level indicator.

• NOTE: The only way to check the fluid level in the differential is to drain all the fluid out and refill with the correct quantity, shown in the specification section.
For additional information, refer to: Specifications (205-02 Rear Drive Axle/Differential, Specifications).

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

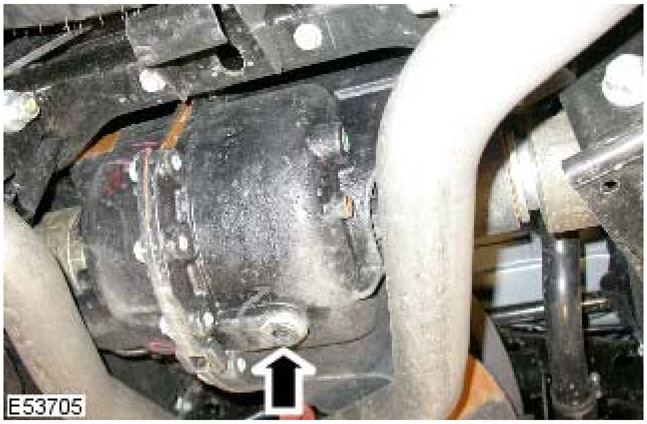
Raise and support the vehicle.



2. ⚠ CAUTION: Do not undo or remove the large protruding hexagon on the differential casing.

Remove the differential case lubricant filler plug.

- Clean the area around the lubricant filler plug.
- Position container to collect fluid loss.



3. Drain the differential lubricant.

- Clean the area around the drain plug.
- Remove the fluid drain plug.

4. ⚠ CAUTION: There has been 2 different types of fixings used for the drain plug. Note the type and make sure the correct torque is applied, see below.

Install the lubricant drain plug.

- Clean the drain plug.
- Up to differential serial number 254325: Tighten the hexagonal drive drain plug to 54 Nm (40 lb.ft).
- From differential serial number 254326: Tighten the 3/8'' square drive drain plug to 28 Nm (21 lb.ft).

5. CAUTIONS:

⚠ There have been 2 different types of fixings used for the drain plug. Note the type and differential serial number, and make sure the correct torque is applied, see below.

⚠ Make sure the correct specification and quantity of oil is used.

Fill the differential with the correct amount of lubricant.
For additional information, refer to: Specifications (205-02 Rear Drive Axle/Differential, Specifications).

6. Install the differential filler plug.

- Clean the filler plug.
- Tighten the filler plug to 34 Nm (25 lb.ft).

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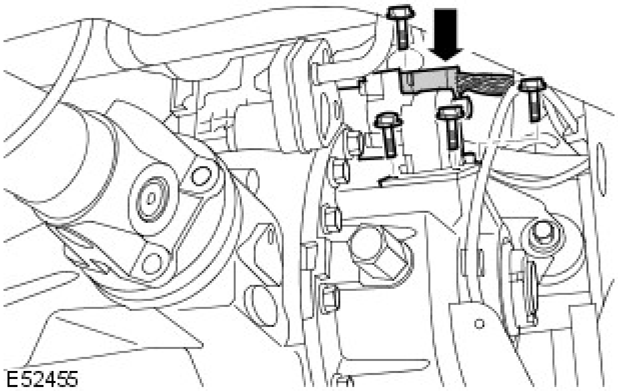
Rear Drive Axle/Differential - Differential Locking Motor

In-vehicle Repair

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

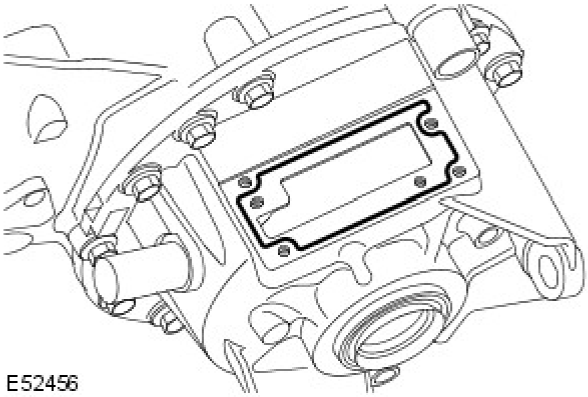


2. Remove the differential locking motor.

- Disconnect the electrical connector.
- Remove the 4 bolts.

Installation

1. Clean the component mating faces.



2. Apply continuous bead of sealant to the motor mating face on the differential.

3. Install the differential locking motor.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Connect the electrical connector.

4. Lower the vehicle.

5. Calibrate the differential locking motor using the diagnostic tool.

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Rear Drive Axle/Differential - Rear Axle Oil Temperature Sensor

In-vehicle Repair

Removal

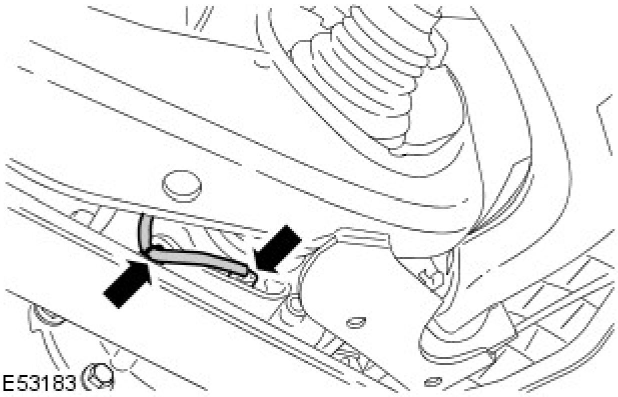
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Drain the differential lubricant.
For additional information, refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

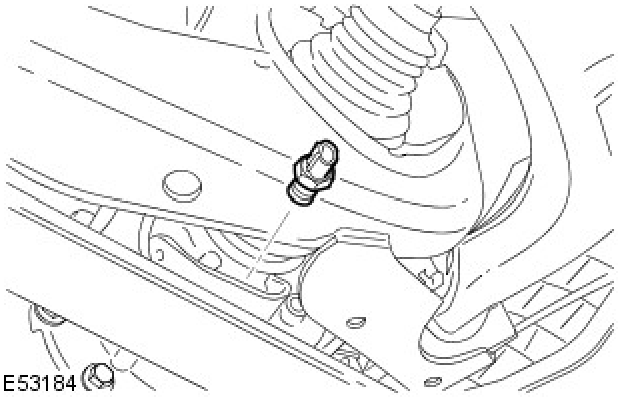
3. Disconnect the electrical connector.

- Release the wiring harness retaining clip.



4. Remove the oil temperature sensor.

- Remove and discard the O-ring seal.



Installation

1. Clean the component mating faces.

2. Install the oil temperature sensor.

- Tighten to 22 Nm (16 lb.ft).

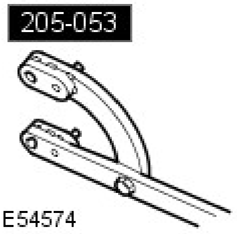
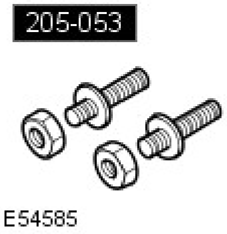
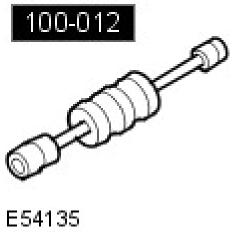
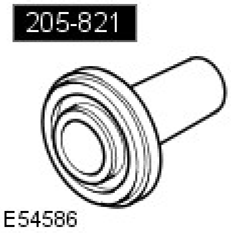
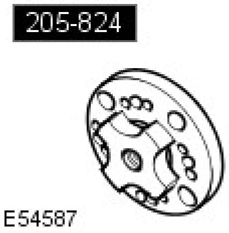
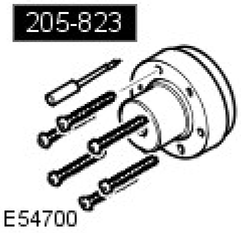
3. Connect the electrical connector.

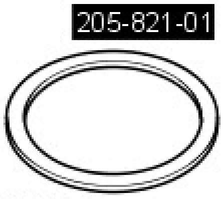
- Secure the wiring harness clip.

4. Fill the differential with the correct amount of lubricant.
For additional information, refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

Rear Drive Axle/Differential - Drive Pinion Seal

In-vehicle Repair

Special Tool(s)	
 205-053 E54574	Flange holding tool 205-053
 205-053 E54585	Adapter for 205-053
 100-012 E54135	Impulse extractor 100-012(LRT-99-004)
 205-821 E54586	Installer drive pinion oil seal 205-821
 205-824 E54587	Remover drive flange 205-824
 205-823 E54700	Remover drive pinion seal 205-823

 E112195	Seal installer, adaptor 205-821-01

Removal

• CAUTIONS:

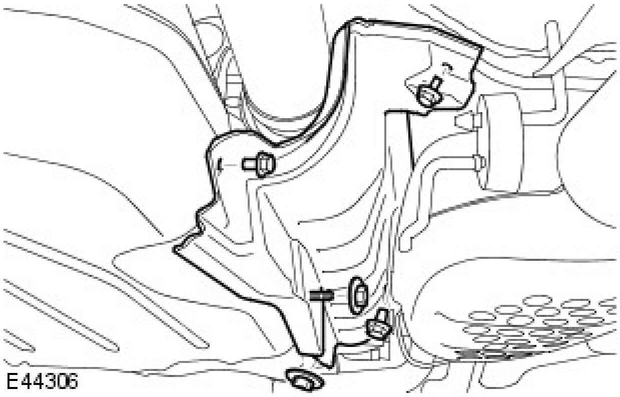
⚠ The input flange must not be change for one from another unit.

⚠ The drive pinion seal must only be renewed for 1 repair.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

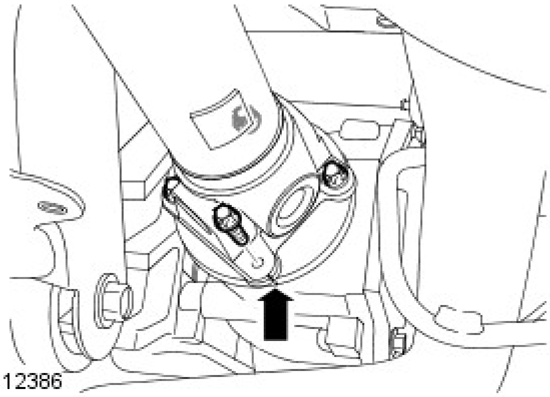
2. Drain the differential lubricant.
For additional information, refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).



E44306

3. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.

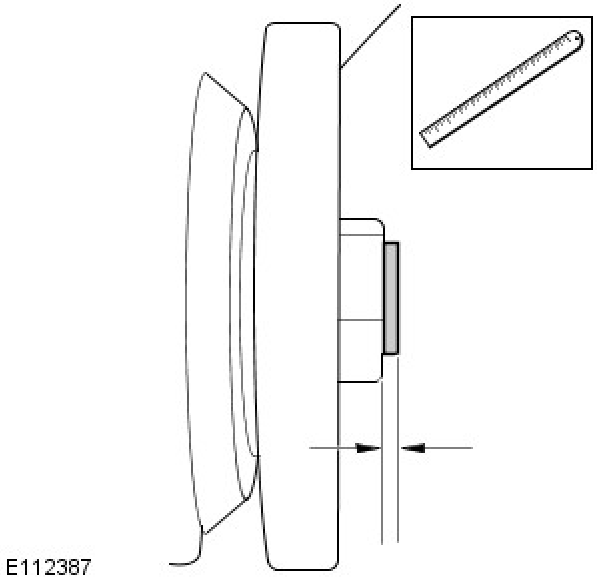


E112386

4. ⚠ CAUTION: Mark the position of the driveshaft flange in relation to the drive pinion flange.

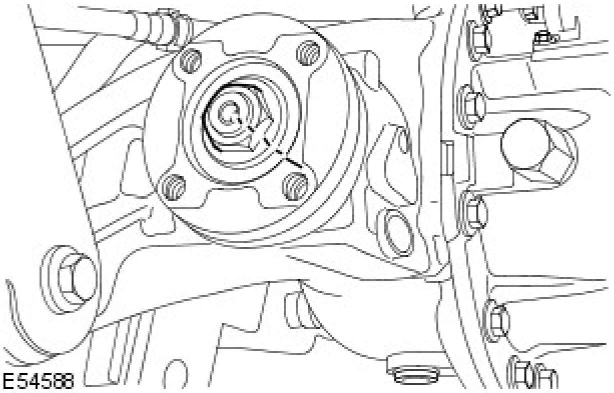
Release the driveshaft from the rear axle drive pinion flange.

- Remove and discard the 4 Torx bolts.



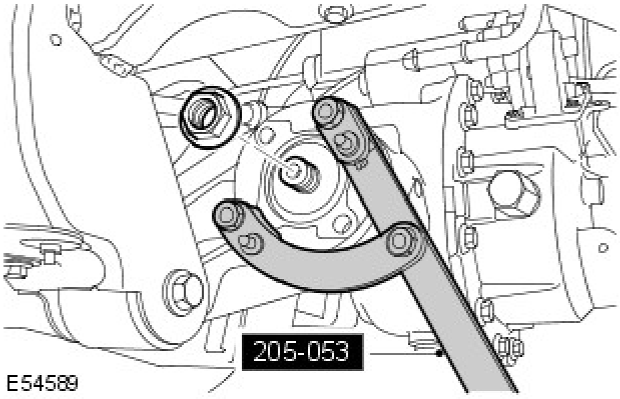
5. Measure the depth of the pinion nut on the pinion shaft.

- Note measurement for installation.



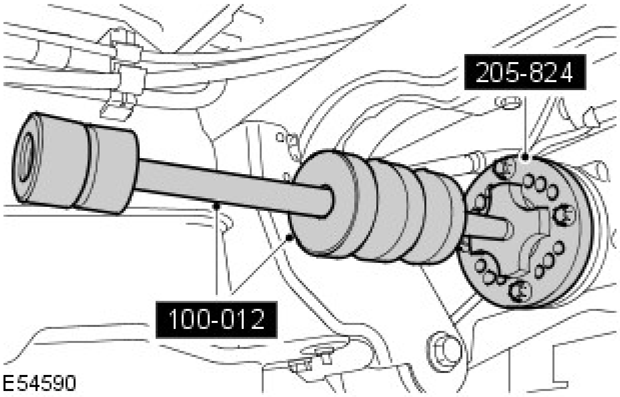
6. ⚠ CAUTION: This step must be carried out to make sure that the drive pinion nut is correctly tightend on assembly.

Accurately scribe a line to mark the drive pinion shaft to the drive pinion nut and pinion flange.



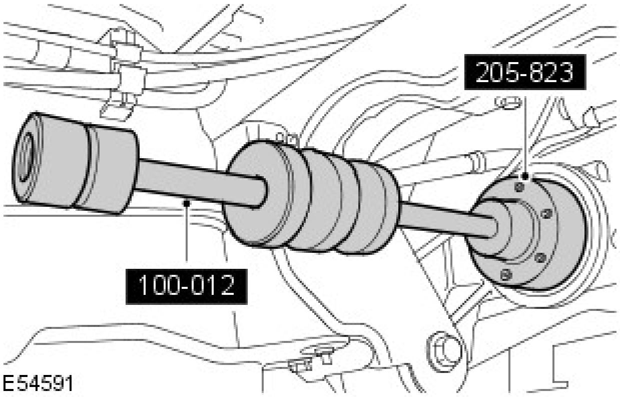
7. Remove the drive pinion flange retaining nut.

- Using the special tool, counter hold the drive pinion flange.
- Note number of turns for installation.


205-824
100-012
E54590

8. Using the special tool, remove the drive pinion flange.

- Check flange seal journal for any damage.


205-823
100-012
E54591

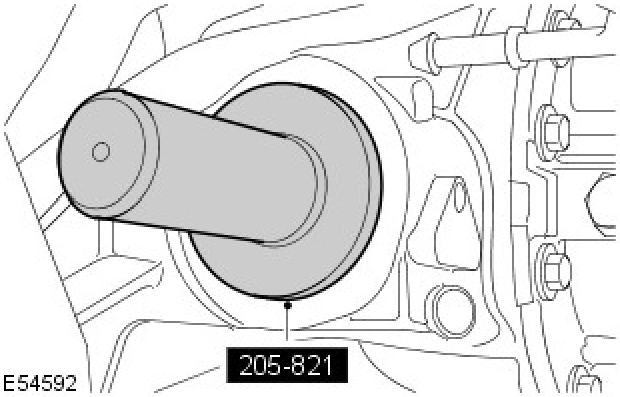
9. Using the special tool, remove the drive pinion seal.

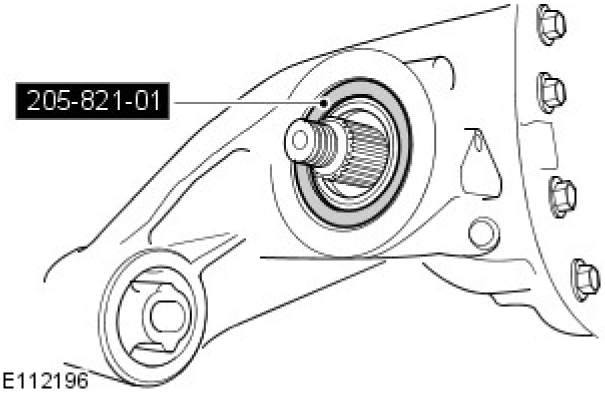
Installation

1. Clean the drive pinion flange.

2. Clean the drive pinion seal mating faces.

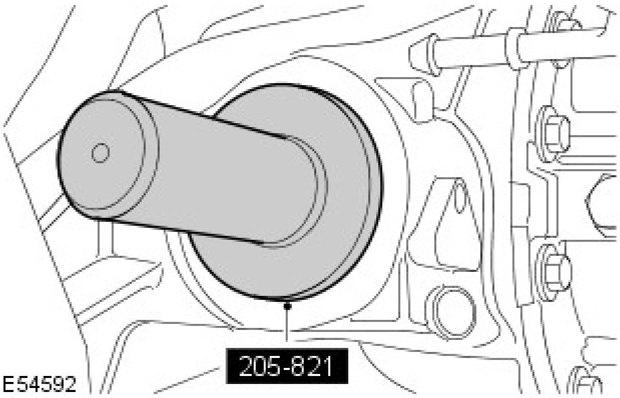
3. Using the special tool, install the new drive pinion seal.


205-821
E54592



4. Remove the special tool.

- Install special tool 205-821-01 to the seal face.



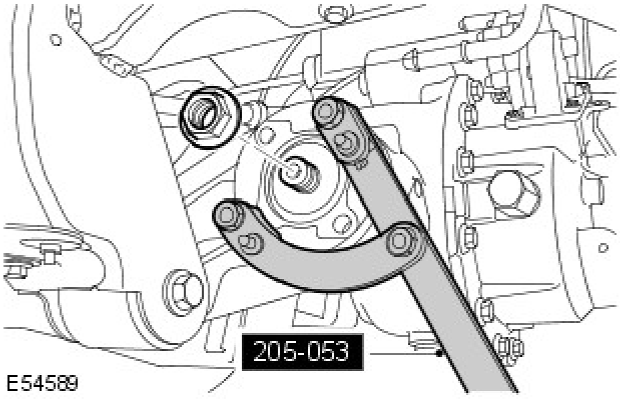
5. ⚠ CAUTION: Make sure adaptor is removed or damage to the vehicle may occur.

Using the special tool, install the new drive pinion seal.

- Remove the special tools.

6. ⚠ CAUTION: Make sure the drive pinion flange scribed marks are aligned.

Install the drive pinion flange.



7. CAUTIONS:

⚠ Make sure the mark on the drive pinion nut is never tightened short of the scribed mark on the drive pinion shaft.

⚠ Make sure the drive pinion flange has no end float and is free to rotate.

⚠ Make sure the scribed mark on the drive pinion nut is no more than a maximum of 5 degrees past the scribed mark on the drive pinion shaft.

Install the drive pinion flange retaining nut.

- Using the special tool, counter hold the drive pinion flange.
- Install nut to previously noted number of turns.
- Measure the depth of the pinion nut on the pinion shaft.

8. Attach the driveshaft to the rear axle drive flange.

- Clean the component mating faces.
- Attach the driveshaft to the rear axle drive flange.
- Tighten the new Torx bolts to 150 Nm (110 lb.ft).

9. Install the fuel tank heat shield.

- Tighten the bolts and nuts to 10 Nm (7 lb.ft).

10. ⚠ CAUTION: Make sure the correct specification and quanity of oil is used.

Fill the differential with the correct amount of lubricant.
For additional information, refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

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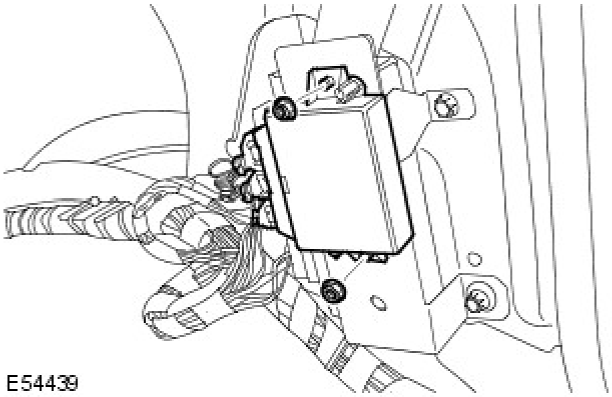
Rear Drive Axle / Differential - Differential Locking Module

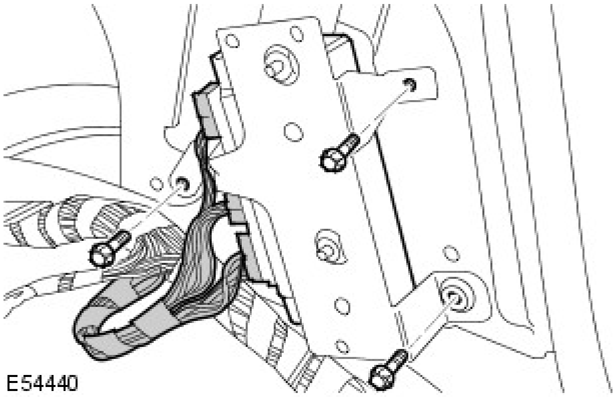
In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Release the parking aid module.
   - Remove the 2 nuts.



4. Remove the differential locking module.
   - Disconnect the 3 electrical connectors.
   - Remove the 3 bolts.



Installation

1. Install the differential locking module.
   - Install the bolts and tighten to 10 Nm (7 lb.ft).
   - Connect and secure the electrical connectors.
2. Install the parking aid module.
   - Tighten the nuts to 10 Nm (7 lb.ft).
3. Install the rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

5. Use T4 to calibrate a new differential locking module.

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Rear Drive Axle/Differential - Axle Assembly

Removal and Installation

Removal

⚠ CAUTION: Do not undo or remove the large protruding hexagon on the differential casing.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

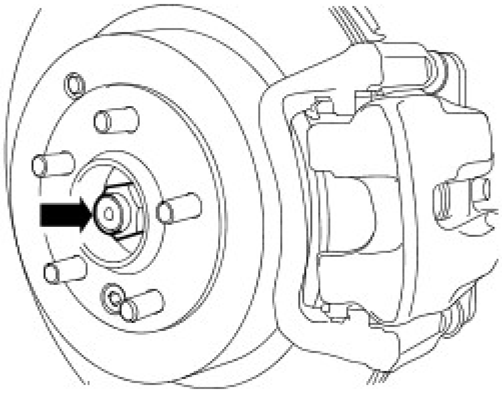
Raise and support the vehicle.

2. Remove the rear wheels and tires.

3. Remove the exhaust system.
For additional information, refer to: Muffler (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

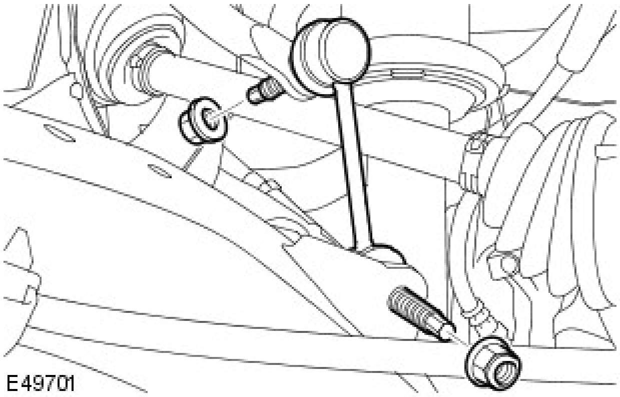
4. Drain the differential fluid.
For additional information, refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

5. Remove the RH halfshaft.
For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).



6. Remove the LH halfshaft retaining nut.

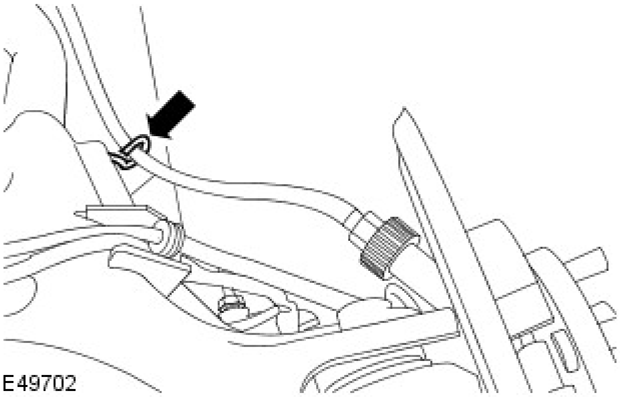
- Discard the nut.



7. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

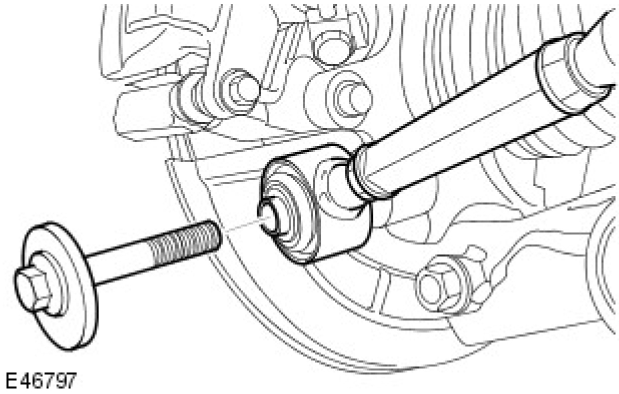
Remove the LH stabilizer bar link and discard the nuts.

8. Release the LH parking brake cable from the lower arm.



9. Disconnect the LH toe link.

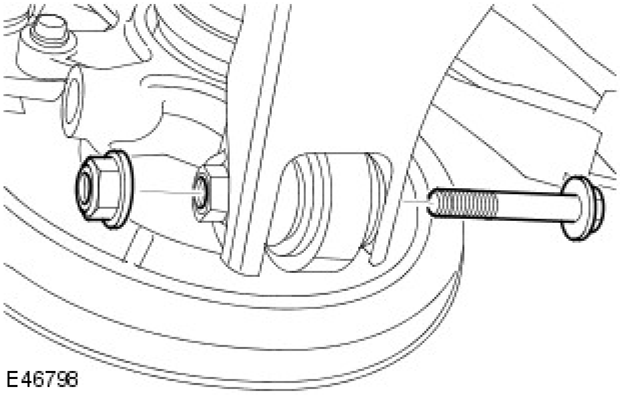
- Remove the bolt.



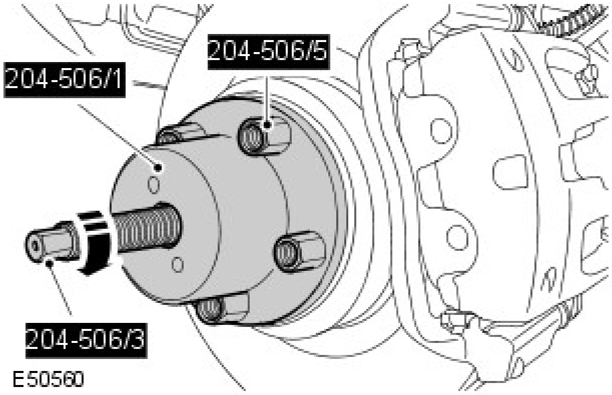
10. ⚠CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Release the LH knuckle from the lower arm.

- Remove the bolt.



11. Using the special tools, release the LH halfshaft from the wheel hub.

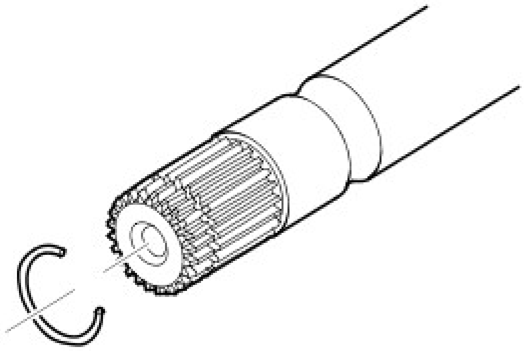

204-506/1
204-506/5
204-506/3
E50560

12. Position a container to collect the oil spillage.

13. Release the LH halfshaft from the differential housing.

14. With assistance, remove the LH halfshaft.

- Remove and discard the snap ring.



E45752

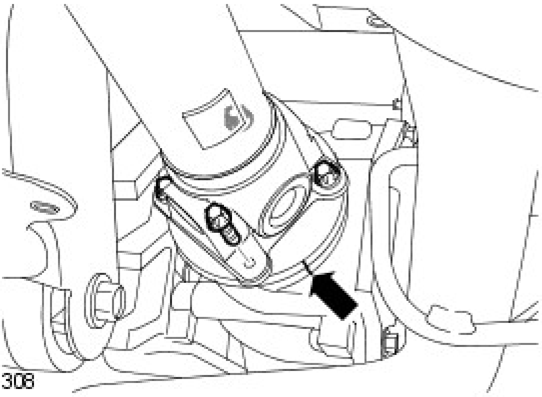
15. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the rear axle drive flange.

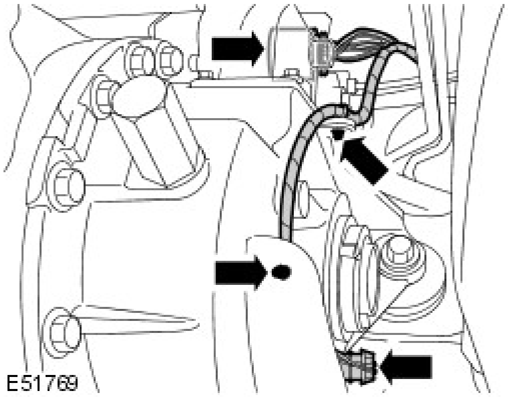
- Remove and discard the 4 Torx bolts.
- Tie aside.



E44308

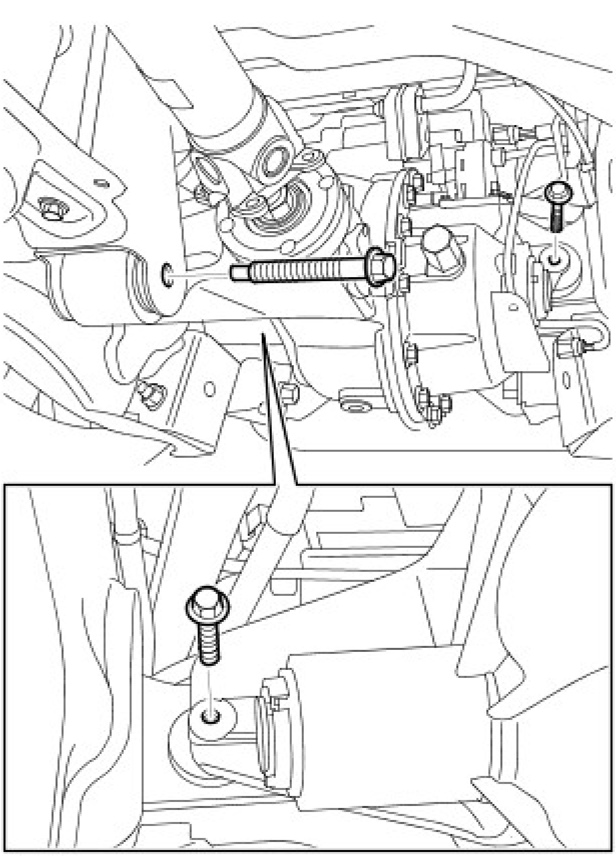
16. Vehicles with differential locking motor: Disconnect the 2 electrical connectors.

- Release the 2 wiring harness clips.



E51769

17. Using a transmission jack, support the differential.



E51590

18. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the rear differential.

- Remove the 3 bolts.
- Disconnect the breather line.

Installation

1. Install the rear differential.

- Connect the breather line.
- Tighten the front mounting bolt to 275 Nm (203 lb.ft).
- Tighten the rear mounting bolts to 175 Nm (129 lb.ft).

2. Vehicles with differential locking motor: Connect the electrical connectors.

- Secure the wiring harness clips.

3. Attach the driveshaft to the rear axle drive flange.

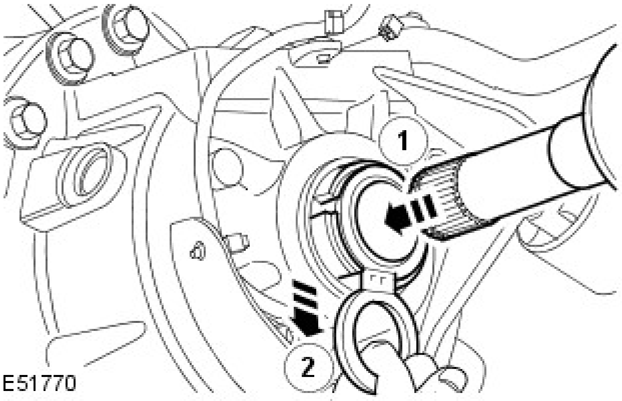
- Clean the component mating faces.
- Tighten the new Torx bolts to 150 Nm (110 lb.ft).

4. Install the exhaust system.
For additional information, refer to: Muffler (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

5. Clean the components.

6. With assistance, install the LH halfshaft.

- Install the snap ring.
- Open the halfshaft oil seal protector.
- Make sure the snap ring is fully engaged and retains the halfshaft.

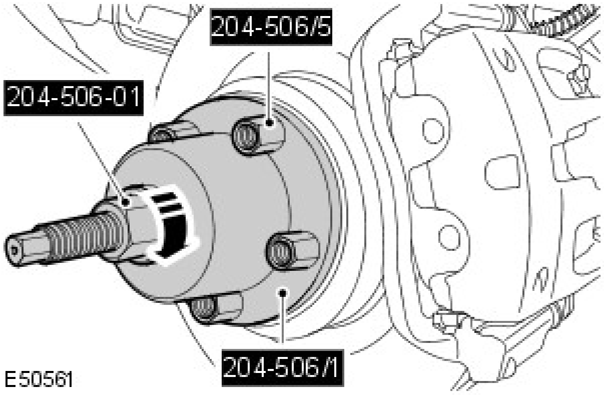


7. NOTE: The oil seal protector is designed to break into two pieces.

- NOTE: RH illustration shown, LH is similar.

Remove and discard the halfshaft oil seal protector.

- Use pull ring to break seal protector as shown.



8. Using the special tools, install the LH halfshaft in the wheel hub.

9. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Connect the LH lower arm to the wheel knuckle.

- Tighten to 275 Nm (203 lb.ft).

10. Install a new halfshaft retaining nut and lightly tighten.

11. Connect the LH toe link.

- Tighten the bolt to 175 Nm (129 lb.ft).

12. Secure the LH parking brake cable to the lower arm.

13. Install the LH stabilizer bar link.

- Tighten the new nuts to 115 Nm (85 lb.ft).

14. Tighten the LH halfshaft retaining nut to 350 Nm (258 lb.ft).

- Stake the nut to the halfshaft.

15. Install the RH halfshaft.
For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

16. Fill the differential with fluid.
For additional information, refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

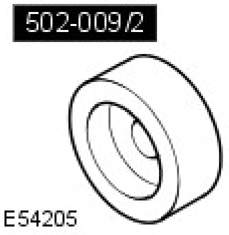
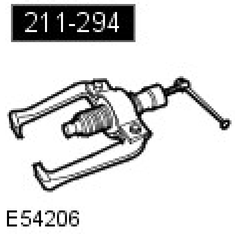
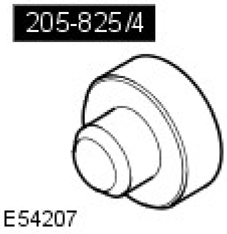
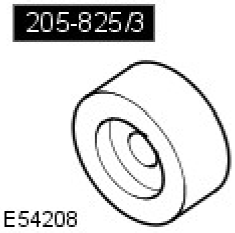
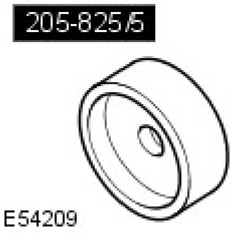
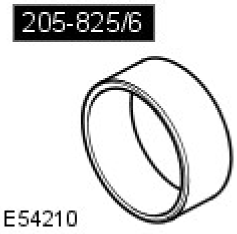
17. Install the wheels and tires.

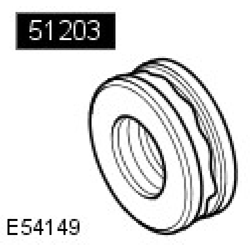
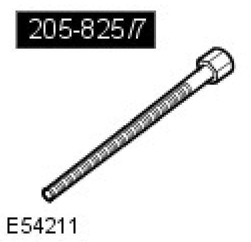
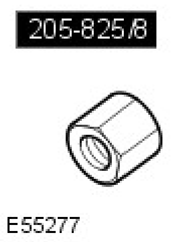
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Rear Drive Axle/Differential - Axle Housing Bushing

Removal and Installation

Special Tool(s)	
 502-009/2 E54205	Remover rear differential rear bush 502-009/2
 211-294 E54206	Hydraulic two legged puller 211-294
 205-825/4 E54207	Adaptor/button 205-825/4
 205-825/3 E54208	Installer rear differential front bush 205-825/3
 205-825/5 E54209	Receiver cup rear differential front bush 205-825/5
 205-825/6 E54210	Bearing Housing 205-825/6

	Bearing Set for 16mm Bolt 51203
	Remover/Installer long 16mm bolt 205-825/7
	Nut for long 16mm bolt 205-825/8

Removal

- NOTE: Take note of the fitted position of the bush.

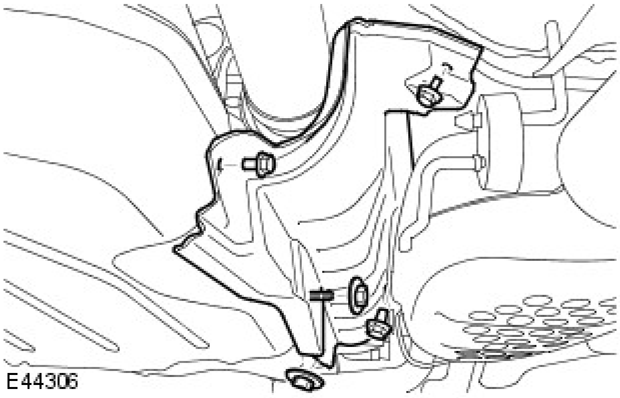
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

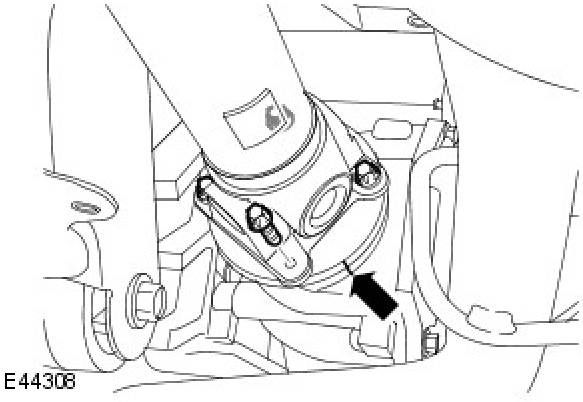
Raise and support the vehicle.

2. Remove the muffler assembly.
For additional information, refer to: Muffler (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

3. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.





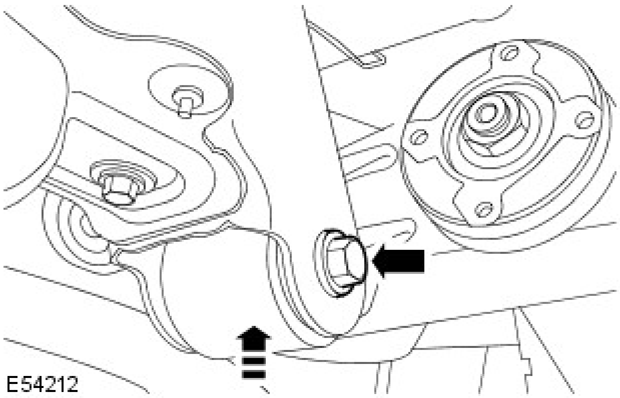
4. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the rear axle drive flange.

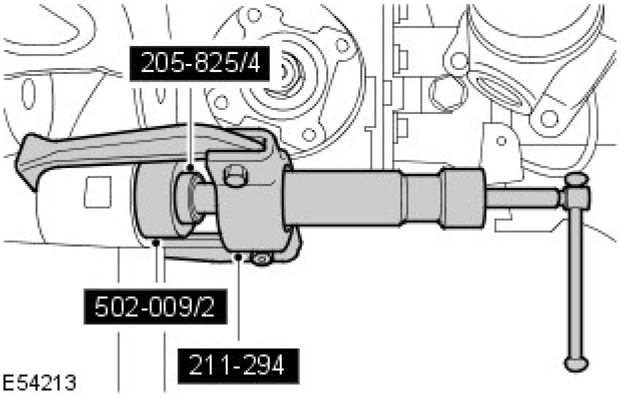
- Remove and discard the 4 Torx bolts.



5. ⚠CAUTION: Make sure the weight of the axle is always supported.

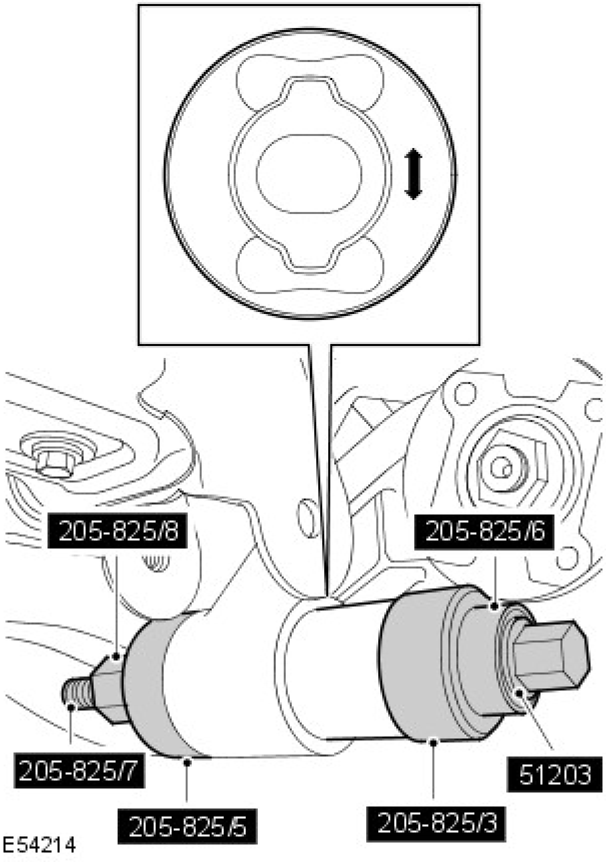
Using a suitable jack, lower the front of the axle.

- Remove the axle front retaining bolt.



6. Using the special tools, remove the axle housing bushing.

Installation



1. Using the special tools, install the axle housing bushing.

2. ⚠CAUTION: Make sure the weight of the axle is always supported.

Using a suitable jack, raise the front of the differential.

- Install the axle front retaining bolt.
- Tighten to 275 Nm (203 lb.ft).

3. Attach the driveshaft to the rear axle drive flange.

- Clean the component mating faces.
- Attach the driveshaft to the rear axle drive flange.
- Tighten the new Torx bolts to 150 Nm (110 lb.ft).

4. Install the fuel tank heat shield.

- Tighten the bolts and nuts to 10 Nm (7 lb.ft).

5. Install the muffler assembly.
For additional information, refer to: Muffler (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

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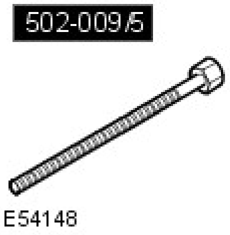
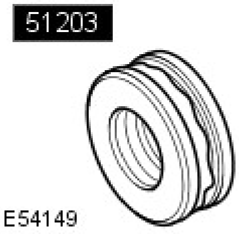
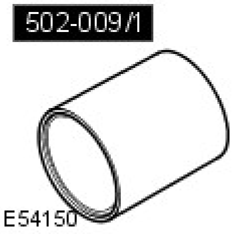
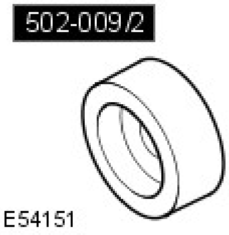
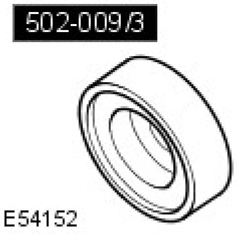
Rear Drive Axle/Differential - Rear Axle Housing Support Insulator

Removal and Installation

Special Tool(s)	
	Remover/Installer long 14mm bolt 502-009/5
	Bearing set for 14mm and 16mm bolt, 51203
	Receiver cup rear differential rear bush 502-009/1
	Remover rear differential rear bush 502-009/2
	Installer rear differential rear bush 502-009/3

Removal

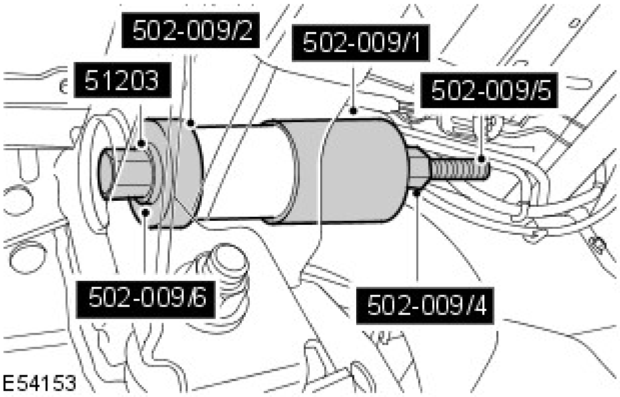
- NOTE: Take note of the fitted position of the bush.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheels and tires.

3. Remove the rear differential.
For additional information, refer to: Axle Assembly (205-02 Rear Drive Axle/Differential, Removal and Installation).


502-009/2
502-009/1
51203
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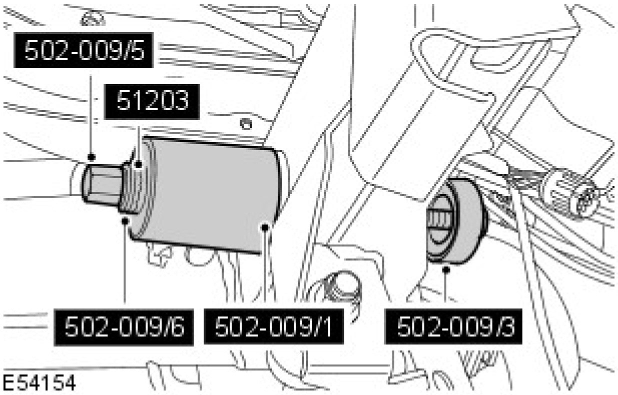
502-009/6
502-009/4
E54153

4. NOTE: Take note of the fitted position of the bush.

   Using the special tools, remove the rear axle housing support insulator.

Installation


502-009/5
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502-009/6
502-009/1
502-009/3
E54154

1. Using the special tools, install the rear axle housing support insulator.

2. Install the rear differential.
   For additional information, refer to: Axle Assembly (205-02 Rear Drive Axle/Differential, Removal and Installation).

3. Install the wheels and tires.

   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Drive Axle / Differential -

Sealers

Item	Land Rover Part No.
Input shaft flange nut	STC 50553
Input shaft splines	STC 50554

Lubricants

Item	Specification
* Recommended lubricant	Castrol SAF-XO - 75W/90

*** Do not use any lubricant other than that specified**

Capacities

Item	Capacity
Front differential	0.61 litres (1.07 pints) (0.64 US quarts)

Front Differential

Item	Specification
Reduction ratio:	
V6 Diesel engine	3.54:1
V8 Diesel engine	3.54:1
V8 Supercharged petrol engine	3.54:1
V8 N/A Petrol engine	3.54:1

Torque Specifications

Description	Nm	lb-ft
Oil drain plug	30	22
Oil filler plug	34	25
Differential case mounting bolts:		
Front differential - front mounting bolt	105	77
* Front differential - rear mounting bracket to front differential casing - Stage 1	80	59
Stage 2	Further 60°	Further 60°
Front axle crossmember bolts	115	85
**** Driveshaft to front axle drive flange Torx bolts**		
Stage 1	45	33
Stage 2	Further 90°	Further 90°
Road wheel nuts	140	103

*** New bolts must be installed**

**** New 'Patchlok' Torx bolts must be installed**

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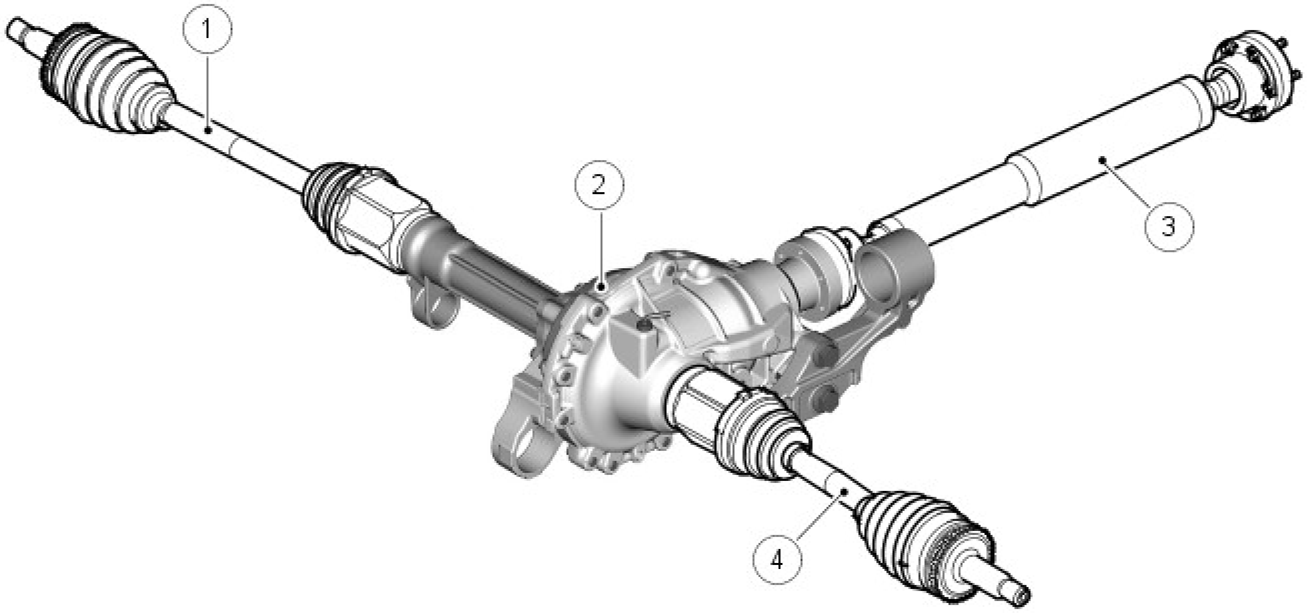
Front Drive Axle/Differential - Front Drive Axle and Differential

Description and Operation

GENERAL



E50981

Item	Part Number	Description
1	-	RH front drive halfshaft
2	-	Front differential assembly
3	-	Front driveshaft
4	-	LH front drive halfshaft

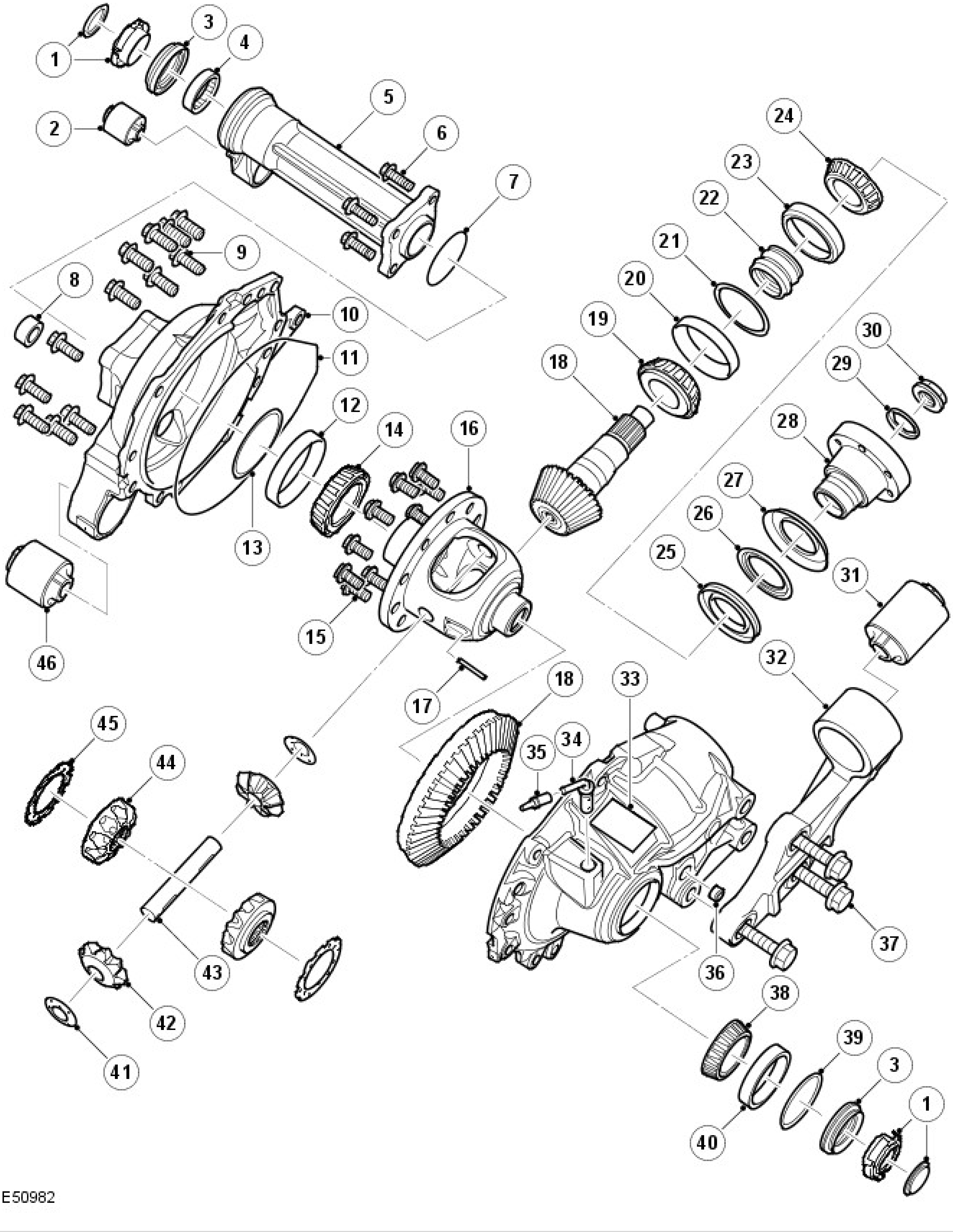
The front differential converts the 'angle of drive' through 90° and distributes drive, via the front drive halfshafts, to the front wheels.

The front differential for the V8 petrol variants utilise the same output ratio, which differs to that used on the TdV6.

The front differential is mounted on the LH side of the chassis.

FRONT DIFFERENTIAL ASSEMBLY

Front Differential - Exploded View



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E50982

Item	Part Number	Description
1	-	Protection cap
2	-	Mounting bush assembly
3	-	Seal
4	-	Bearing assembly
5	-	Front tube

6	-	Bolt, 4 of
7	-	O-ring
8	-	Drain plug
9	-	Bolt, 14 of
10	-	Cover assembly
11	-	Cover seal
12	-	Roller bearing cup
13	-	Bearing preload spacer
14	-	Taper roller bearing
15	-	Bolt, 10 of
16	-	Differential case
17	-	Roll pin
18	-	Gear and pinion assembly
19	-	Taper roller bearing
20	-	Roller bearing cup
21	-	Shim
22	-	Collapsible spacer
23	-	Roller bearing cup
24	-	Taper roller bearing
25	-	Oil seal
26	-	Inner deflector
27	-	Outer deflector
28	-	Flange
29	-	Pinion nut retainer
30	-	Pinion nut
31	-	Mounting bush assembly
32	-	Axle mounting bracket
33	-	Data label
34	-	Breather tube
35	-	Cap
36	-	Fill plug
37	-	Bolt, 3 of
38	-	Taper roller bearing
39	-	Bearing preload spacer
40	-	Roller bearing cup
41	-	Thrust washer
42	-	Planet gear
43	-	Shaft
44	-	Sunwheel
45	-	Thrust washer
46	-	Mounting bush assembly

The casing comprises two halves with machined mating faces. When assembled, the cast iron casing halves are sealed with a thin film of Loctite 5999 sealant and secured together with fourteen bolts. A breather tube is fitted to the casings. This allows a plastic tube to be fitted and routed to a high point in the engine compartment, preventing the ingress of water when the vehicle is wading.

The RH casing is fitted with a drain plug. The front differential unit contains approximately 0.7 litre of oil for a dry fill.

The differential is a conventional design using a hypoid gear layout. This employs a hypoid bevel pinion gear and crown wheel, with the pinion offset above the centre line of the crown wheel. This design allows for a larger pinion gear to be used, which has the advantages of increased gear strength and reduced operating noise.

The front differential is available in two ratios. V8 petrol engine vehicles use a front differential with a final drive ratio of 3.73:1 and TdV6 diesel engine vehicles use a final drive ratio of 3.54:1. Changing the number of teeth between the crown-wheel drive gear and pinion gear changes the ratio.

The differential comprises a pinion shaft and hypoid bevel gear, a crown wheel drive gear with an integral cage, which houses two planet gears. Two sunwheels are also located in the cage and pass the rotational drive to the drive shaft shafts.

The pinion shaft is mounted on two opposed taper roller bearings with a collapsable spacer located between them. The spacer is used to hold the bearings in alignment and also collapses under the pressure applied to the pinion nut. This allows the nut to be tightened to a predetermined torque, which collapses the spacer, setting the correct bearing preload.

The pinion shaft has an externally splined outer end which accepts and locates the input flange, which is retained by the pinion nut. The opposite end of the output flange has an internal spline which provides positive location for the front propeller shaft. The flange has an external O-ring seal, which seals against the front propeller shaft shroud preventing the ingress of dirt and moisture into the splines. An oil seal is pressed into the LH casing and seals the input flange to the differential unit. The pinion shaft has a hypoid bevel gear at its inner end which mates with the crown wheel drive gear.

The crown wheel drive gear is located on the carrier and secured with ten bolts. The carrier is mounted on taper roller bearings located in each casing half. The bearings are press fitted into the casing and a spacer is located on the outside face to set backlash and apply preload to the bearing.

The carrier is fitted with a shaft onto which the two planet gears are mounted. The shaft is secured in the carrier with a roll pin. The sunwheels are located in pockets within the carrier and mesh with the planet gears. Thrust washers are located between the carrier and the sunwheels and hold the sunwheels in mesh with the planet gears. Each sunwheel has a machined, splined, bore to accept the drive shaft. A groove is machined in the bore to locate the snap ring fitted to the drive shaft, providing positive drive shaft location.

Differential Operation

The operating principles of the front and rear differentials are the same. Rotational input from the drive shaft is passed via the input flange to the pinion shaft and pinion gear. The angles of the pinion gear to the crown wheel drive gear moves the rotational direction through 90°.

The transferred rotational motion is now passed to the crown wheel drive gear, which in turn rotates the carrier. The shaft, which is secured to the carrier, also rotates at the same speed as the carrier. The planet gears, which are mounted on the shaft, also rotate with the carrier. In turn, the planet gears transfer their rotational motion to the left and right hand sunwheels, rotating the drive shafts.

When the vehicle is moving in a forward direction, the torque applied through the differential to each sunwheel is equal. In this condition both drive shafts rotate at the same speed. The planet gears do not rotate and effectively lock the sunwheels to the carrier.

If the vehicle is turning, the outer wheel will be forced to rotate faster than the inner wheel by having a greater distance to travel. The differential senses the torque difference between the sunwheels. The planet gears rotate on their axes to allow the outer wheel to rotate faster than the inner one.

SERVICE

The oil used in the front differential is Castrol SAF-XO. The oil contains unique additives, which enhance the differentials operation. No other oil must be used in the front differential.

Front Differential Serviceable Components

- Halfshaft seals
- Needle roller bearing assemblies
- Chassis bush/fixings
- Lubricant.

Front Drive Axle/Differential - Front Drive Axle

Diagnosis and Testing

For additional information,
REFER to: Driveline System (205-00 Driveline System - General Information, Diagnosis and Testing).

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Front Drive Axle / Differential - Differential Draining and Filling

General Procedures

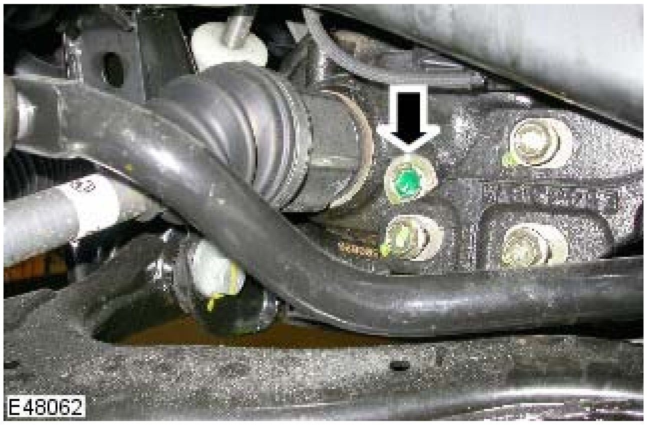
⚠ CAUTION: Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, not to act as a level indicator.

• NOTE: The only way to check the fluid level in the differential is to drain all the fluid out and refill with the correct quantity, shown in the specification section.
For additional information, refer to: Specifications (205-03 Front Drive Axle/Differential, Specifications).

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

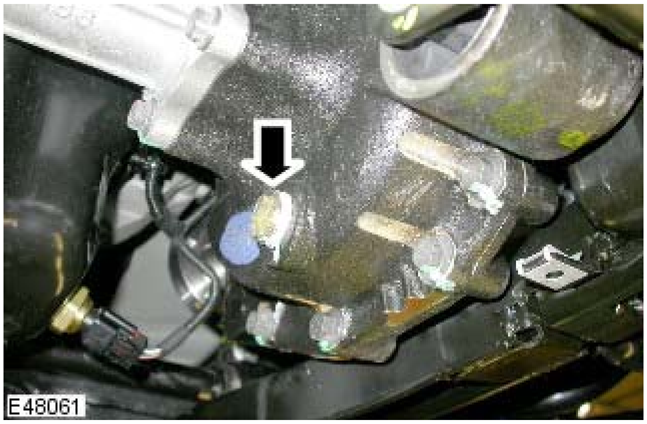
Raise and support the vehicle.

2. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



3. Remove the differential case lubricant filler plug.

- Clean the area around the lubricant filler plug.
- Position container to collect fluid loss.



4. Drain the differential lubricant.

- Clean the area around the drain plug.
- Remove the fluid drain plug.

5. ⚠ CAUTION: There have been 2 different types of fixings used for the drain plug. Note the type and differential serial number, and make sure the correct torque is applied, see below.

Install the lubricant drain plug.

- Clean the drain plug.
- Up to differential serial number 254845: Tighten the hexagonal drive drain plug to 54 Nm (40 lb.ft).
- From differential serial number 254846: Tighten the 3/8'' square drive drain plug to 28 Nm (21 lb.ft).

6. ⚠ CAUTION: Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, not to act as a level indicator.

Fill the differential with the correct amount of lubricant.
For additional information, refer to: Specifications (205-03 Front Drive Axle/Differential, Specifications).

7. Install the differential filler plug.

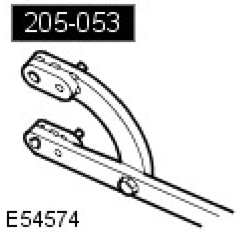
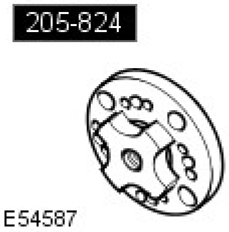
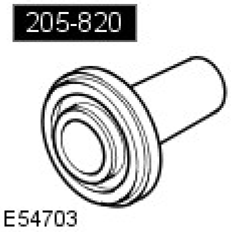
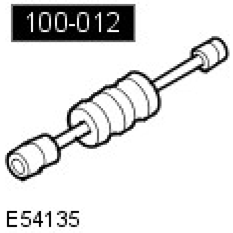
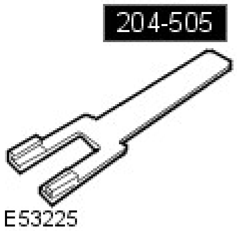
- Tighten the filler plug to 34 Nm (25 lb.ft).

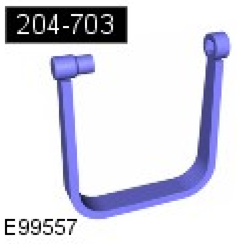
8. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

Published: 11-May-2011

Front Drive Axle/Differential - Drive Pinion Seal

In-vehicle Repair

Special Tool(s)	
 205-053 E54574	Flange holding tool 205-053
 205-824 E54587	Remover drive flange 205-824
 205-820 E54703	Installer - drive pinion oil seal 205-820
 100-012 E54135	Impulse extractor 100-012(LRT-99-004)
 204-505 E53225	Accelerometer remover/replacer 204-505(LRT-60-014A)
204-705 E99558	Front Stabilizer Bar Bushing Tightening Tool 204-705

	Front Stabilizer Bar Bushing Tightening Tool 204-703

Removal

CAUTION: The drive pinion seal must only be renewed once.

All vehicles

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Drain the differential lubricant.
   For additional information, refer to: Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

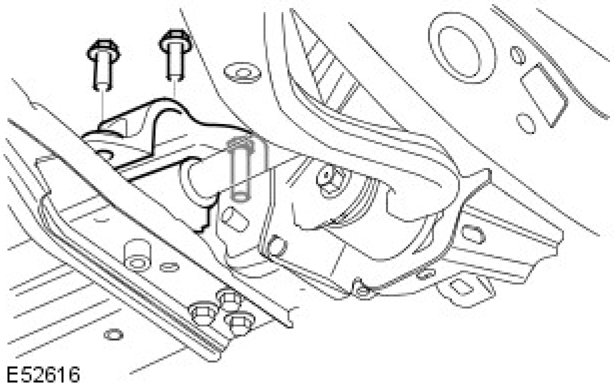
3. Remove the front driveshaft. For additional information, refer to: (205-01 Driveshaft)

   Front Driveshaft - V8 S/C 4.2L Petrol (Removal and Installation),
   Front Driveshaft - V8 4.4L Petrol (Removal and Installation),
   Front Driveshaft - TDV6 2.7L Diesel (Removal and Installation),
   Front Driveshaft - TDV8 3.6L Diesel (Removal and Installation).

Vehicles with Active Stabilization

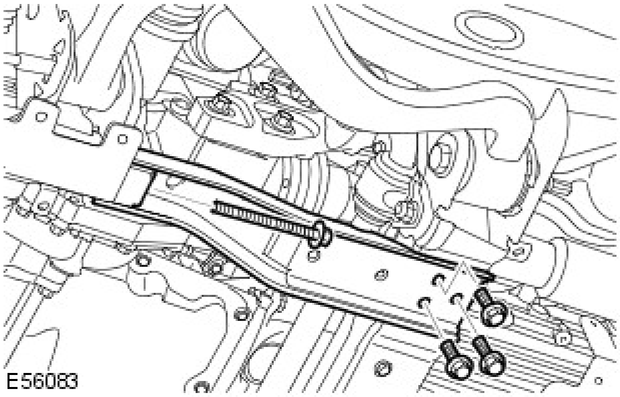
4. Remove the LH stabilizer bar bracket.

   - Remove the 3 bolts.

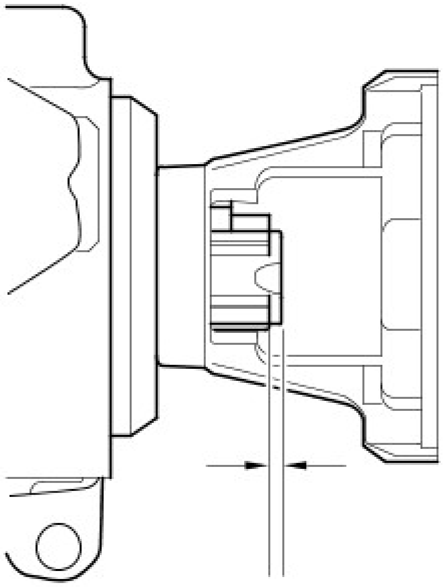


5. Remove the front axle crossmember.

   - Remove the 4 bolts.



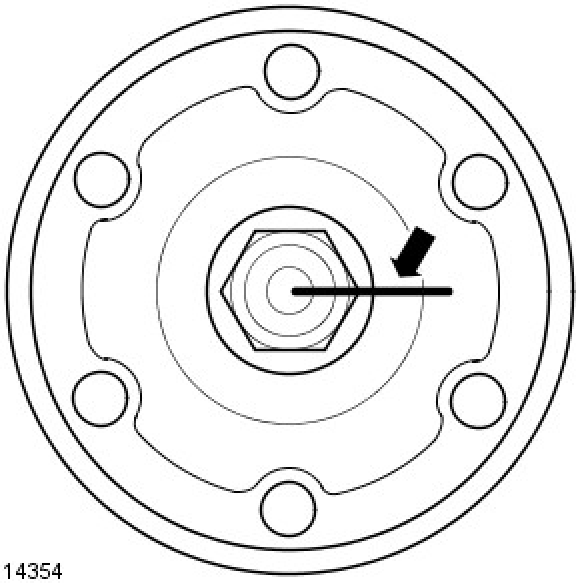
All vehicles



E114355

6. Measure the depth of the pinion nut on the pinion shaft.

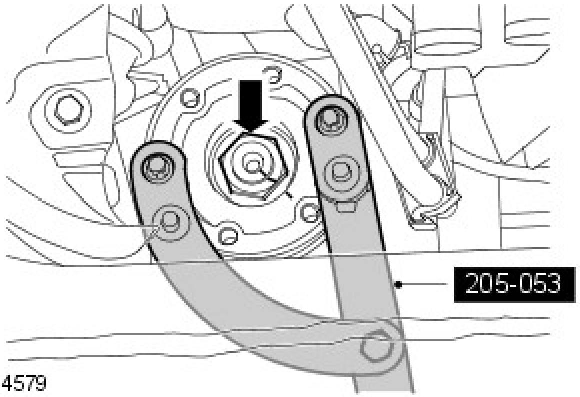
- Note measurement for installation.



E114354

7. ⚠ CAUTION: This step must be carried out to make sure that the drive pinion nut is correctly tightend on assembly.

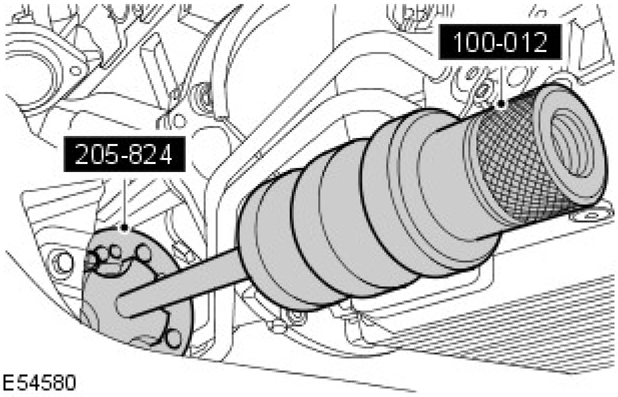
Accurately scribe a line to mark the drive pinion shaft to the drive pinion nut and pinion flange.



E54579

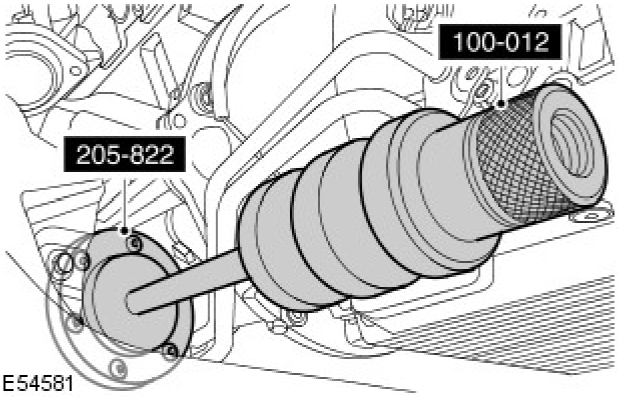
8. Remove the drive pinion flange retaining nut.

- Using the special tool, counter hold the drive pinion flange.
- Note number of turns for installation.


100-012
205-824
E54580

9. ⚠CAUTION: Make sure only a bolt is used with the special tool, to draw the drive pinion flange off the drive pinion shaft.

Using the special tool, remove the drive pinion flange.


100-012
205-822
E54581

10. Using the special tool, remove the drive pinion seal.

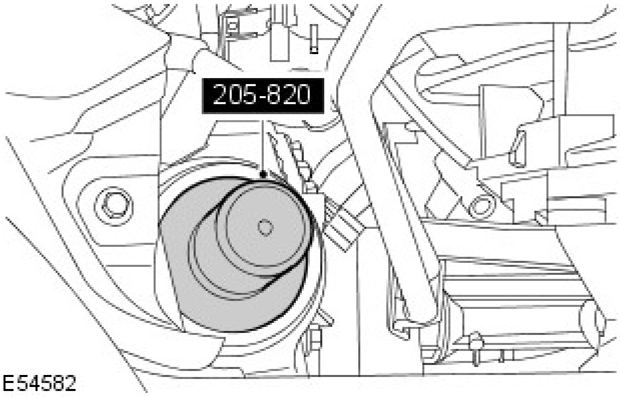
Installation

All vehicles

1. Clean the drive pinion flange.

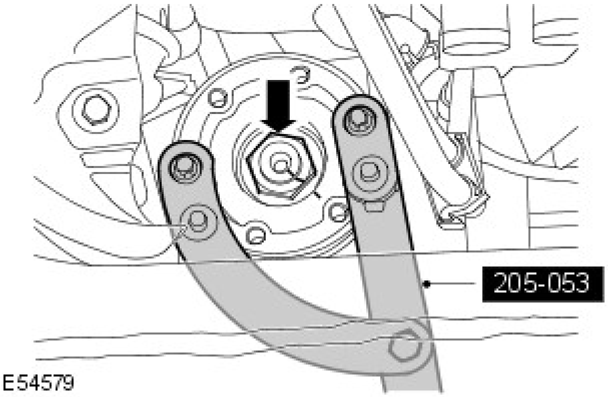
2. Clean the drive pinion seal mating faces.

3. Using the special tool, install the new drive pinion seal.


205-820
E54582

4. ⚠CAUTION: Make sure the drive pinion flange scribed marks are aligned.

Install the drive pinion flange.



5. CAUTIONS:

Make sure the mark on the drive pinion nut is never tightened short of the scribed mark on the drive pinion shaft.

Make sure the drive pinion flange has no end float and is free to rotate.

Make sure the scribed mark on the drive pinion nut is no more than a maximum of 5 degrees past the scribed mark on the drive pinion shaft.

Install the drive pinion flange retaining nut.

- Using the special tool, counter hold the drive pinion flange.
- Install nut to previously noted number of turns.
- Measure the depth of the pinion nut on the pinion shaft.

Vehicles with Active Stabilization

6. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

7. Install the stabilizer bar bushing.

- Install the clamp.
- Install the bolts.
- Tighten the bolts to 115 Nm (85 lb.ft).

All vehicles

8. Install the front driveshaft. For additional information, refer to: (205-01 Driveshaft)

Front Driveshaft - V8 S/C 4.2L Petrol (Removal and Installation),
Front Driveshaft - V8 4.4L Petrol (Removal and Installation),
Front Driveshaft - TDV6 2.7L Diesel (Removal and Installation),
Front Driveshaft - TDV8 3.6L Diesel (Removal and Installation).

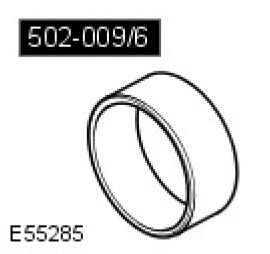
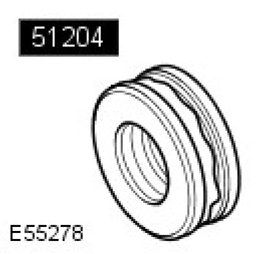
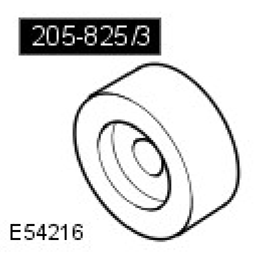
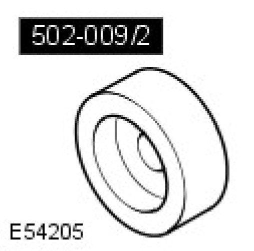
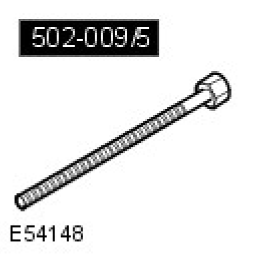
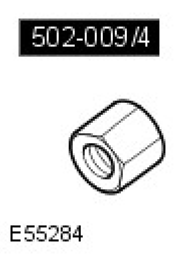
9. CAUTION: Make sure the correct specification and quanity of oil is used.

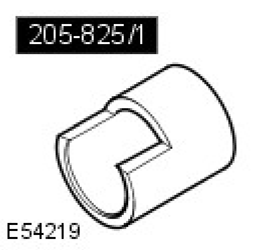
Fill the differential with the correct amount of lubricant.
For additional information, refer to: Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

Published: 11-May-2011

Front Drive Axle/Differential - Front Axle Housing Support Insulator

In-vehicle Repair

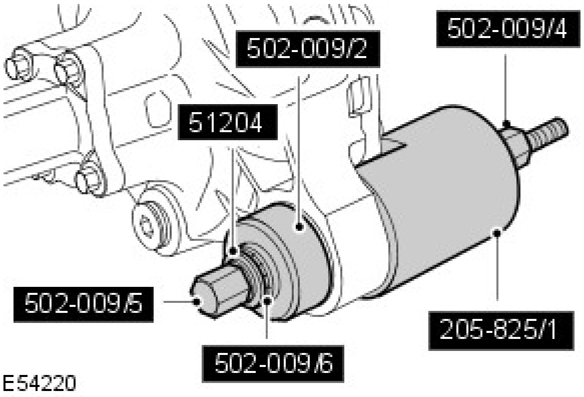
Special Tool(s)	
 502-009/6 E55285	Bearing Housing 502-009/6
 51204 E55278	Bearing set for 14mm bolt 51204
 205-825/3 E54216	Installer rear axle front bush 205-825/3
 502-009/2 E54205	Remover rear differential rear bush 502-009/2
 502-009/5 E54148	Remover/Installer long 14mm bolt 502-009/5
 502-009/4 E55284	Nut for long 14mm bolt 502-009/4

 205-825/1 E54219	Receiver cup front axle front bush 205-825/1

Removal

CAUTION: Make sure the bush is correctly aligned.

- NOTE: Take note of the fitted position of the bush.


502-009/2
502-009/4
51204
502-009/5
502-009/6
205-825/1
E54220

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

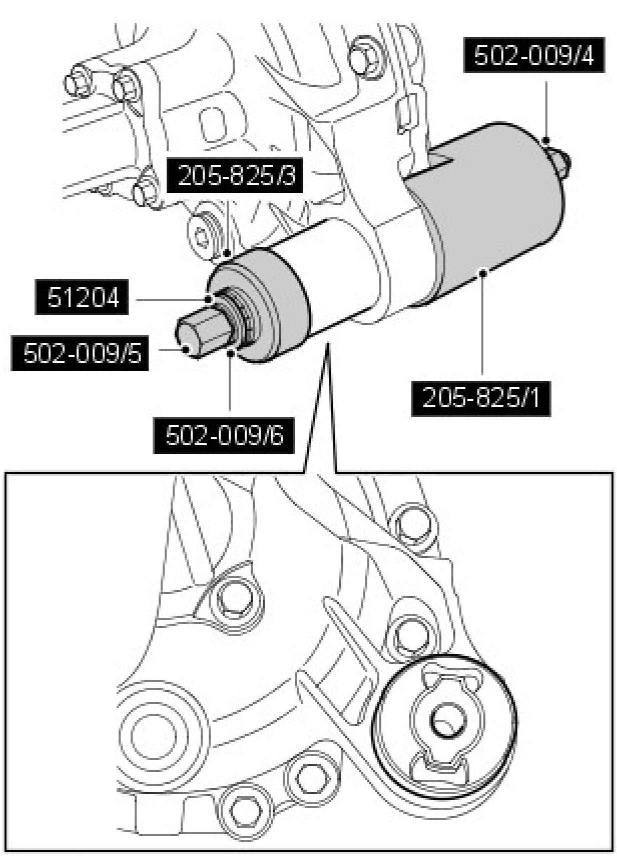
2. Remove the front wheels and tires.

3. Remove the front differential.
For additional information, refer to: Axle Assembly - V8 S/C 4.2L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).

4. NOTE: Take note of the fitted position of the bush.

Using the special tools, remove the front axle housing support insulator.

Installation


502-009/4
205-825/3
51204
502-009/5
502-009/6
205-825/1
E54221

1. ⚠ CAUTION: Make sure the bush is correctly aligned.

   Using the special tools, install the front axle housing support insulator.

2. Install the front differential.
   For additional information, refer to: Axle Assembly - V8 S/C 4.2L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).

3. Install the front wheels and tires.

   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

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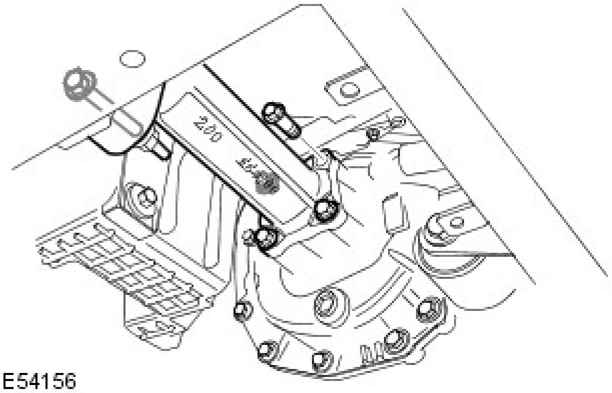
Front Drive Axle/Differential - Axle Tube

In-vehicle Repair

Removal

1. Remove the RH halfshaft.
   For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).



E54156

2. Remove the axle tube.
   - Remove the bolt from the bushing.
   - Remove the 4 bolts.
   - Rotate and remove the axle tube.
   - Early models: Remove and discard the O-ring seal.
   - Later models: Remove the sealant.

Installation

1. Install the axle tube.
   - Clean the component mating faces.
   - Early models: Install a new O-ring seal.
   - Later models: Apply sealant to the mating face.
     For additional information, refer to: Specifications (205-03 Front Drive Axle/Differential, Specifications).
   - Tighten the 4 axle tube bolts to 50 Nm (37 lb.ft).
   - Tighten the axle tube bushing bolt to 63 Nm (46 lb.ft).

2. Install the RH halfshaft.
   For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

Published: 11-May-2011

Front Drive Axle/Differential - Axle AssemblyV8 S/C 4.2L Petrol

Removal and Installation

Special Tool(s)	
204-705 E99558	Front Stabilizer Bar Bushing Tightening Tool 204-705
204-703 E99557	Front Stabilizer Bar Bushing Tightening Tool 204-703

Removal

All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

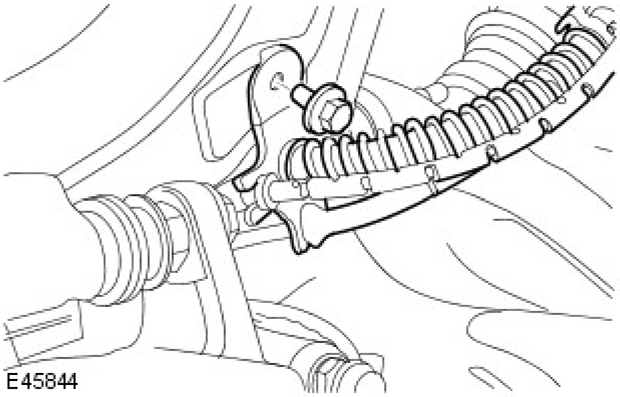
2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

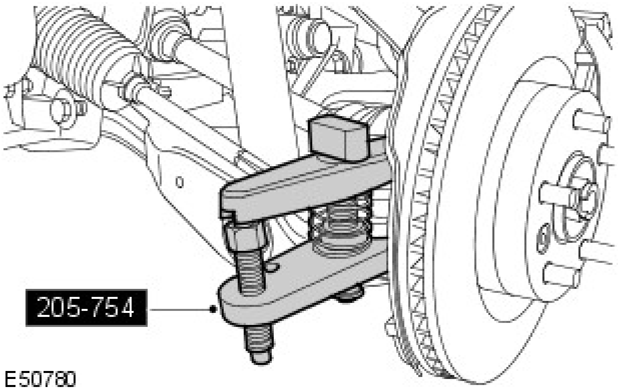
3. Remove the front wheels and tires.

4. Remove the axle tube.
   For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

5. Release the LH brake hose bracket from the wheel knuckle.

   - Remove the bolt.

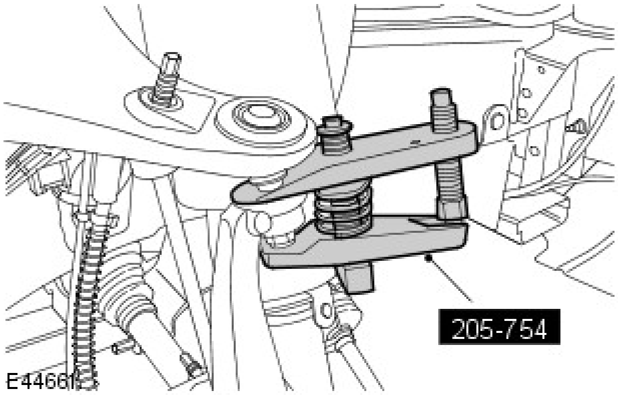




6. CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the LH tie-rod end ball joint from the wheel knuckle.

- Remove and discard the nut.



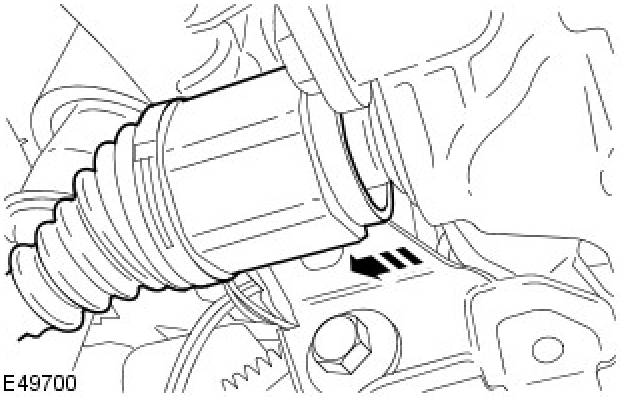
7. CAUTIONS:

Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

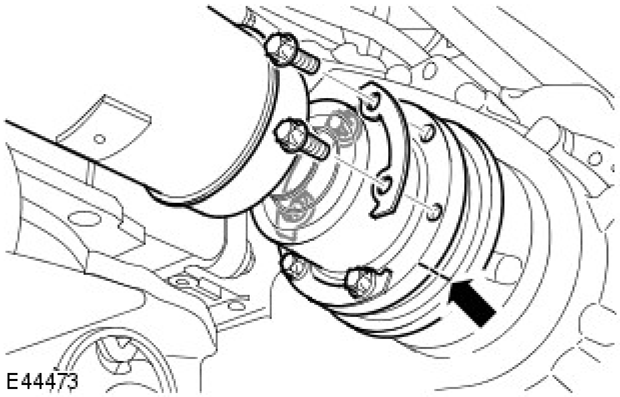
Using the special tool, release the LH upper arm ball joint.

- Remove and discard the nut.



8. Release the LH halfshaft from the axle assembly.

- Remove and discard the snap ring.
- Using a suitable tie strap, support the LH halfshaft.



9. CAUTIONS:

Mark the position of the driveshaft flange in relation to the drive pinion flange.

To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

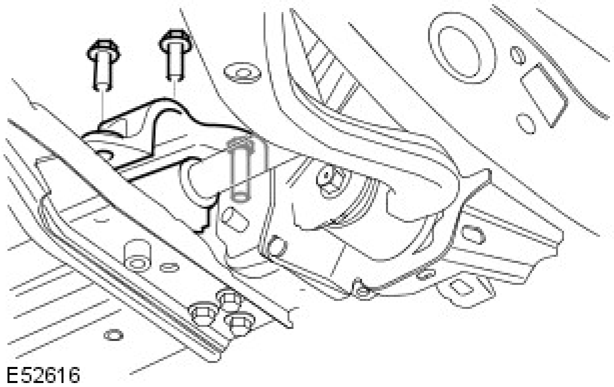
Release the driveshaft from the front axle drive flange.

- Remove the 6 Torx bolts and washers, discard the bolts.
- Using a suitable tie strap, secure the driveshaft end plate.

Vehicles with Active Stabilization

10. Remove the stabilizer bar bushing.

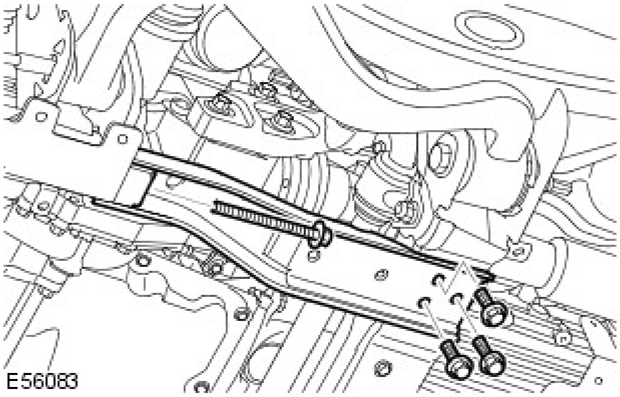
- Remove the 3 bolts.
- Remove the clamp.
- Remove the stabilizer bar bushing.

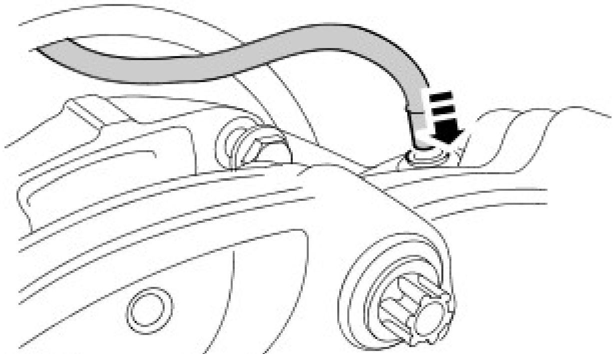


All vehicles

11. Remove the front axle crossmember.

- Remove the 4 bolts.





12. ⚠ CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the breather line.

- Release the clip.

Vehicles built up to VIN 935921

13. NOTE: If a new axle is being installed, a new breather line must also be installed.

Remove and discard the breather line.

- Release from the 3 clips.

14. Remove the engine oil cooler.
For additional information, refer to: Oil Cooler (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

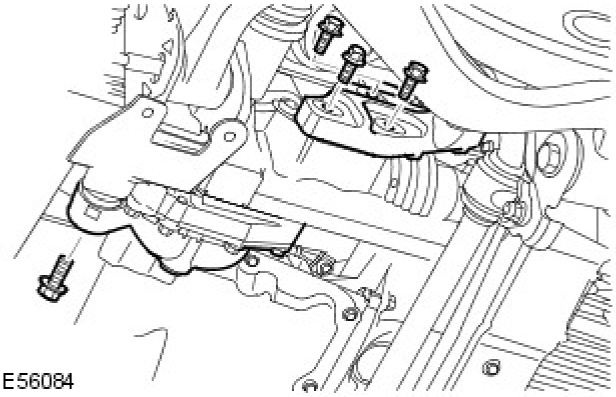
15. Remove the oil cooler support bracket.

- Remove the 3 bolts.

All vehicles

16. Using a transmission jack, support the front axle assembly.

17. With assistance, remove the front axle assembly.



- Remove and discard the 3 axle assembly rear mounting bolts.
- Remove the front axle assembly front mounting bolt.

Installation

Vehicles built up to VIN 935921

1. NOTE: If a new axle is being installed, a new breather line must also be installed.

Install a new breather tube.

- Secure in the clips.

All vehicles

2. Install the front differential case.

- With assistance, raise and manoeuvre the front differential case.
- Connect the breather line.

3. Install the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

4. Connect the breather line.

5. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

Vehicles with Active Stabilization

6. Install the stabilizer bar bushing.

- Install the clamp.
- Install the bolts.
- Tighten the bolts to 115 Nm (85 lb.ft).

All vehicles

7. Install the oil cooler support bracket.

- Install the 3 bolts.

8. Install the oil cooler.
For additional information, refer to: Oil Cooler (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

9. NOTE: Make sure that new bolts are installed.

Secure the driveshaft to the front axle drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.
- Remove and discard the tie strap.

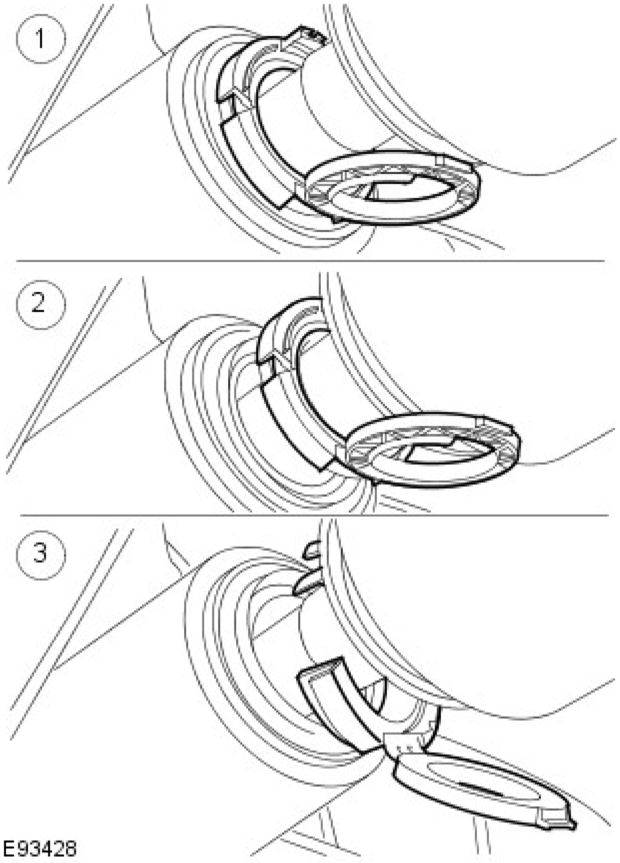
10. Install a new snap ring to the LH halfshaft.

- Remove and discard the tie strap.

11. NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.

Secure the LH halfshaft in the axle assembly.

1. Open the halfshaft seal protector and install the halfshaft.
2. Release the halfshaft seal protector from the halfshaft seal.
3. Remove the halfshaft seal protector.
4. Fully install the halfshaft.



12. WARNING: Make sure that a new nut is installed.

Secure the LH upper arm to the wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

13. WARNING: Make sure that a new nut is installed.

Secure the LH tie-rod end ball joint to the wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

14. Secure the LH brake hose bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

15. Fill the differential with the correct amount of lubricant.

16. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

17. Connect the battery ground cable.

Published: 11-May-2011

Front Drive Axle/Differential - Axle AssemblyV8 4.4L Petrol

Removal and Installation

Special Tool(s)	
	Front Stabilizer Bar Bushing Tightening Tool 204-703
	Front Stabilizer Bar Bushing Tightening Tool 204-705

Removal

All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

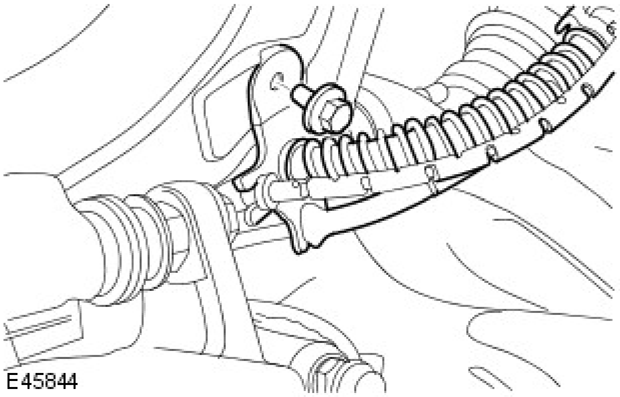
2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

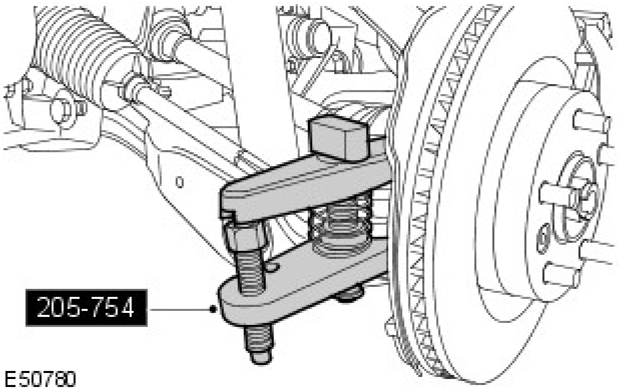
3. Remove the front wheels and tires.

4. Remove the axle tube.
   For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

5. Release the LH brake hose bracket from the wheel knuckle.

   - Remove the bolt.

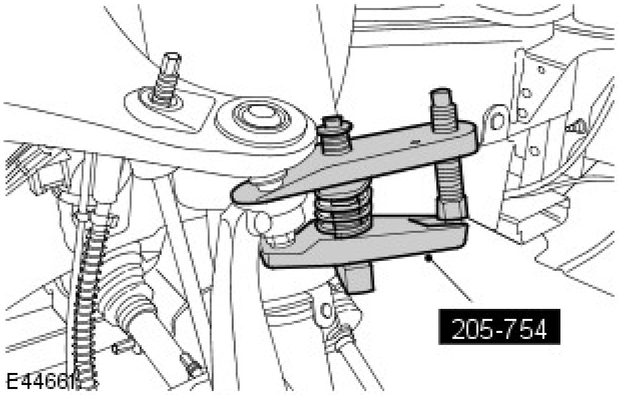




6. CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the LH tie-rod end ball joint from the wheel knuckle.

- Remove and discard the nut.



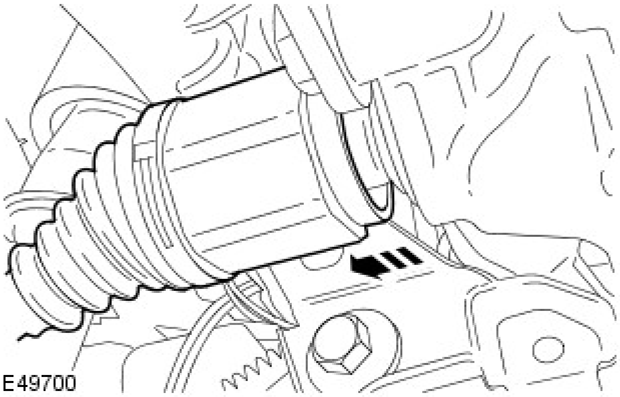
7. CAUTIONS:

Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

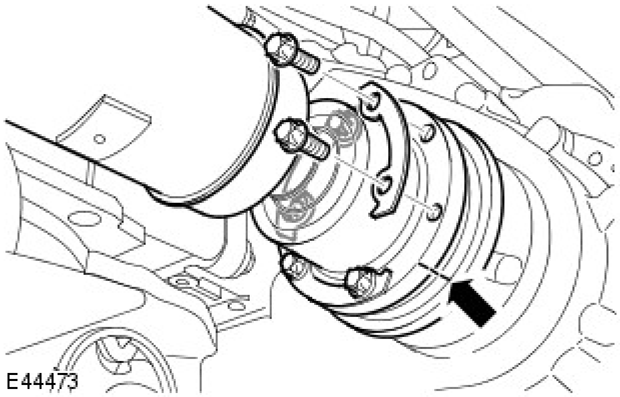
Using the special tool, release the LH upper arm ball joint.

- Remove and discard the nut.



8. Release the LH halfshaft from the axle assembly.

- Remove and discard the snap ring.
- Using a suitable tie strap, support the LH halfshaft.



9. CAUTIONS:

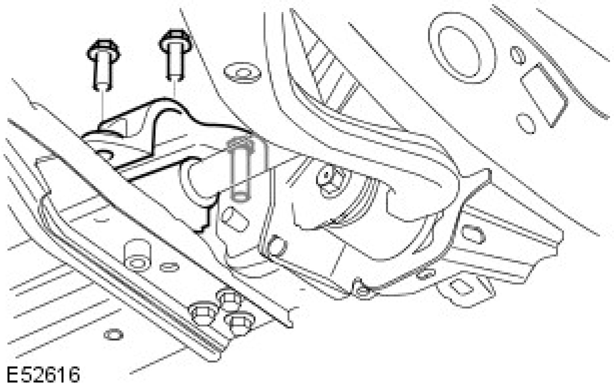
Mark the position of the driveshaft flange in relation to the drive pinion flange.

To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

- Remove the 6 Torx bolts and washers, discard the bolts.
- Using a suitable tie strap, secure the driveshaft end plate.

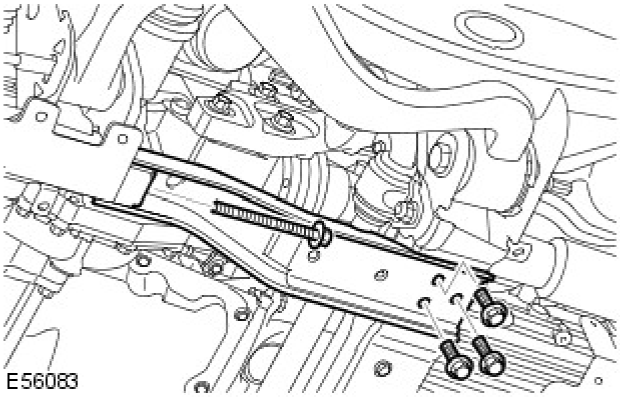
Vehicles with Active Stabilization



10. Remove the stabilizer bar bushing.

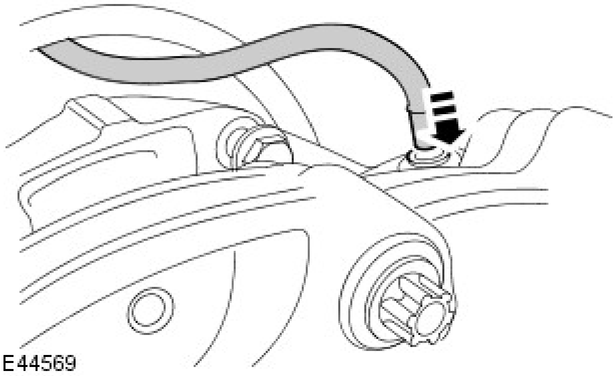
- Remove the 3 bolts.
- Remove the clamp.
- Remove the stabilizer bar bushing.

All vehicles



11. Remove the front axle crossmember.

- Remove the 4 bolts.



12. ⚠ CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the breather line.

- Release the clip.

Vehicles built up to VIN 935921

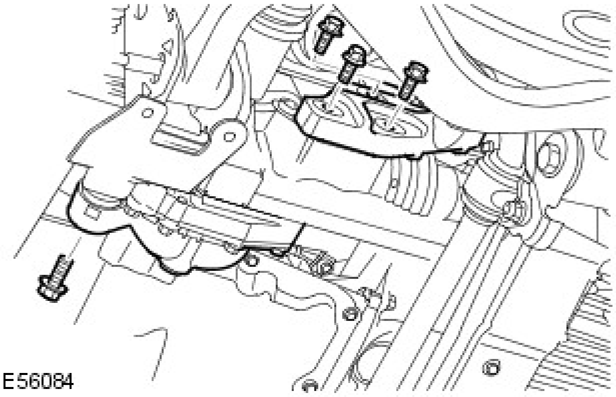
13. NOTE: If a new axle is being installed, a new breather line must also be installed.

Remove and discard the breather line.

- Release from the 3 clips.

All vehicles

14. Using a transmission jack, support the front axle assembly.



15. With assistance, remove the front axle assembly.

- Remove and discard the 3 axle assembly rear mounting bolts.
- Remove the front axle assembly front mounting bolt.

Installation

Vehicles built up to VIN 935921

1. NOTE: If a new axle is being installed, a new breather line must also be installed.

Install a new breather tube.

- Secure in the clips.

All vehicles

2. Install the front differential case.

- With assistance, raise and manoeuvre the front differential case.
- Connect the breather line.

3. With assistance, install the front axle assembly.

4. Connect the breather line.

5. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

Vehicles with Active Stabilization

6. Install the stabilizer bar bushing.

- Install the clamp.
- Install the bolts.
- Tighten the bolts to 115 Nm (85 lb.ft).

All vehicles

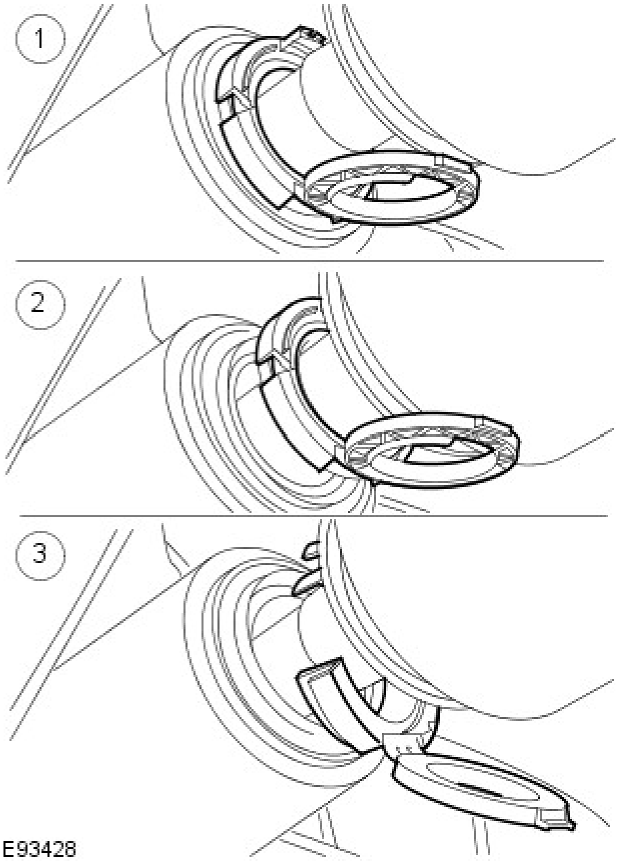
7. NOTE: Make sure that new bolts are installed.

Secure the driveshaft to the front axle drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.
- Remove and discard the tie strap.

8. Install a new snap ring to the LH halfshaft.

- Remove and discard the tie strap.



E93428

9. NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.

Secure the LH halfshaft in the axle assembly.

1. Open the halfshaft seal protector and install the halfshaft.
2. Release the halfshaft seal protector from the halfshaft seal.
3. Remove the halfshaft seal protector.
4. Fully install the halfshaft.

10. ⚠ WARNING: Make sure that a new nut is installed.

Secure the LH upper arm to the wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

11. ⚠ WARNING: Make sure that a new nut is installed.

Secure the LH tie-rod end ball joint to the wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

12. Secure the LH brake hose bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

13. Install the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

14. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

15. Connect the battery ground cable.

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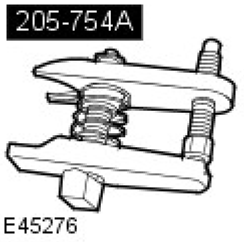
Front Drive Axle/Differential - Axle AssemblyTDV8 3.6L Diesel

Removal and Installation

Special Tool(s)	
	Ball joint separator 205-754(LRT-54-027)

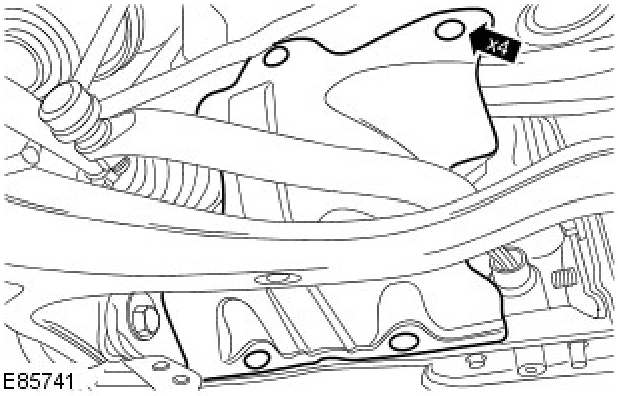
Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

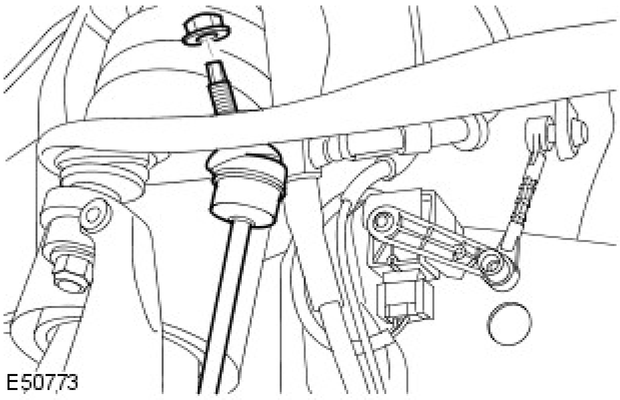
2. Remove the front wheels and tires.

3. Remove the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).



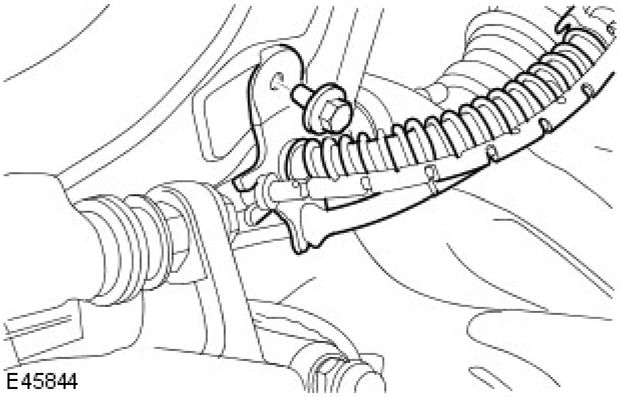
4. Remove the LH splash shield.

- Remove the 4 clips.



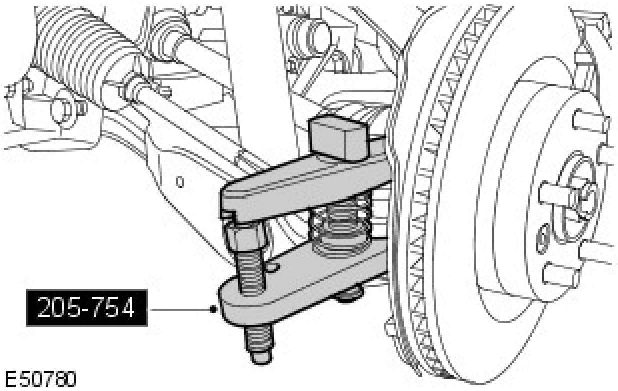
5. Release the LH stabilizer bar link.

- Remove and discard the nut.



6. Release the LH brake hose bracket from the wheel knuckle.

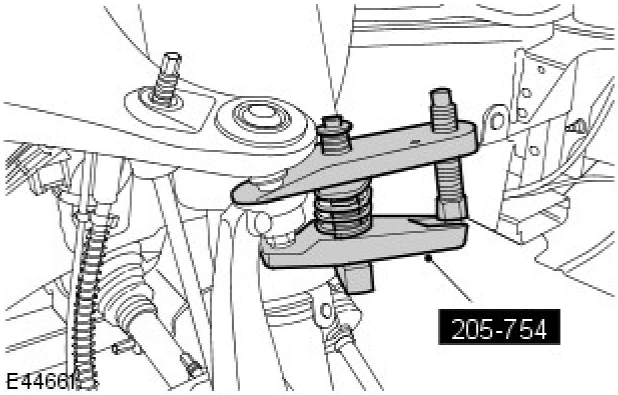
- Remove the bolt.



7. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the LH tie-rod end ball joint from the wheel knuckle.

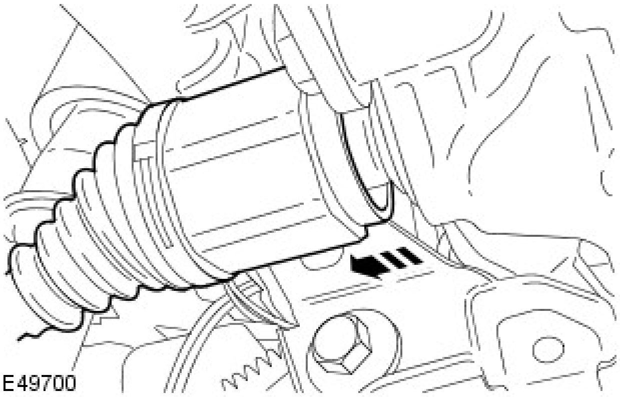
- Remove and discard the nut.



8. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the LH upper arm ball joint.

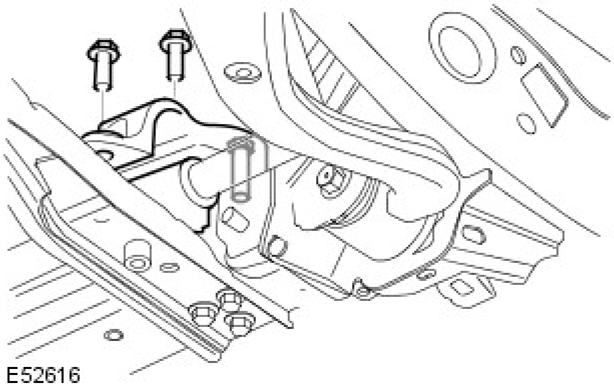
- Remove and discard the nut.



9. Release the LH halfshaft from the axle assembly.

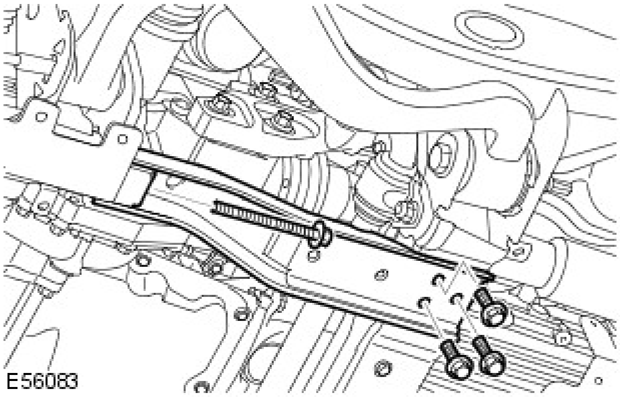
- Remove and discard the snap ring.

10. Remove the front driveshaft.
For additional information, refer to: Front Driveshaft - TDV8 3.6L Diesel (205-01 Driveshaft, Removal and Installation).



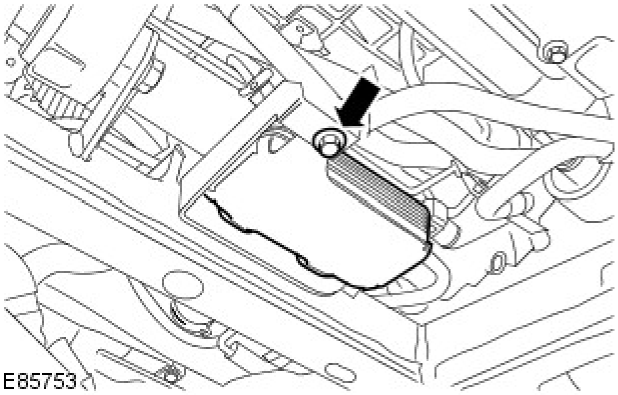
11. Remove the LH stabilizer bar bracket.

- Remove the 3 bolts.



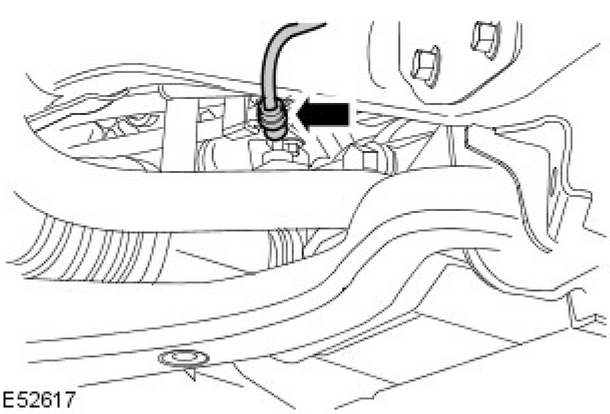
12. Remove the front axle crossmember.

- Remove the 4 bolts.



13. Release the fuel cooler.

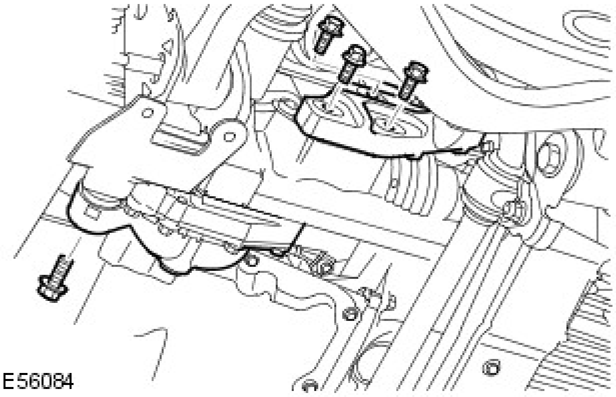
- Remove the bolt.



14. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the breather line.

15. Using a transmission jack, support the front axle assembly.



16. With assistance, remove the front axle assembly.

- Remove and discard the 3 bolts from the front axle assembly.
- Remove the front axle assembly front mounting bolt.

Installation

1. With assistance, install the front axle assembly.

2. With assistance, align and secure the front axle assembly.

- Tighten the front axle assembly front mounting bolt to 105 Nm (77 lb.ft).
- Tighten the 3 new bolts in the front axle assembly to 80 Nm (59 lb.ft), then a further 60 degrees.

3. NOTE: Remove and discard the blanking caps.

Connect the breather line.

4. Secure the fuel cooler.

- Tighten the bolt to 23 Nm (17 lb.ft).

5. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

6. Install the LH stabilizer bar bracket.

- Tighten the bolts to 115 Nm (85 lb.ft).

7. Install the front driveshaft.
For additional information, refer to: Front Driveshaft - TDV8 3.6L Diesel (205-01 Driveshaft, Removal and Installation).

8. NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.

Secure the LH halfshaft in the axle assembly.

- Install a new snap ring.
- Lubricate the seal and the bearing running surfaces with clean axle oil.
- Open the halfshaft oil seal protector.
- Make sure the snap ring is fully engaged and retains the halfshaft.

9. Secure the LH upper arm to the wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

10. Secure the LH tie-rod end ball joint to the wheel knuckle.

- Install a new nut and tighten to 76 Nm (56 lb.ft).

11. Secure the LH brake hose bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

12. Secure the LH stabilizer bar link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

13. Install the LH splash shield.

- Install the clips.

14. Install the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

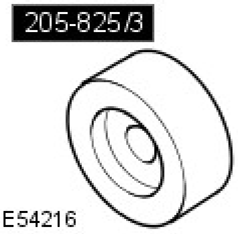
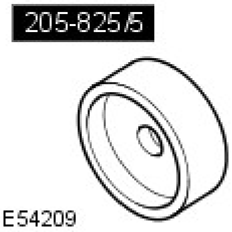
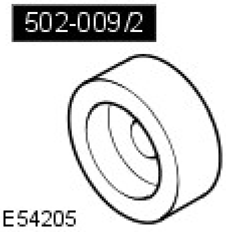
15. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Drive Axle/Differential - Axle Carrier Bushing

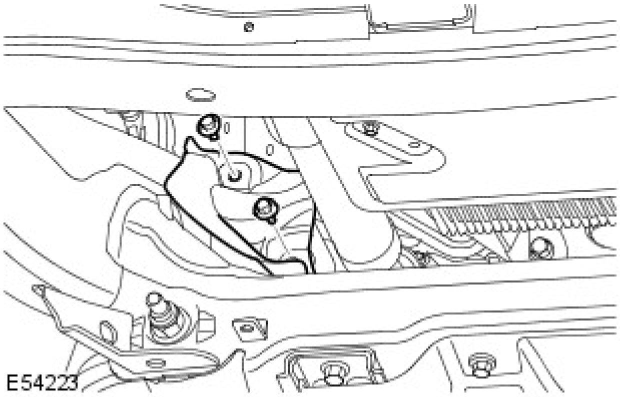
Removal and Installation

Special Tool(s)	
	Installer rear axle front bush 205-825/3
	Receiver cup rear differential front bush 205-825/5
	Remover rear differential rear bush 502-009/2

Removal

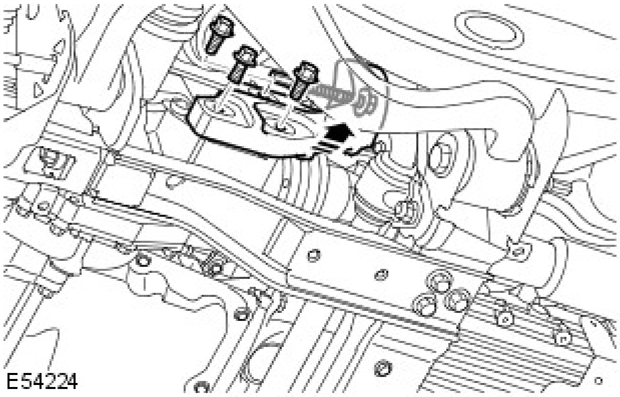
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.
2. Disconnect the battery ground cable.
3. Remove the exhaust system.
   For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).
4. Remove the stabilizer bar mounting.
   - Remove the 3 bolts.
   - Remove the clamp.
   - Remove the stabilizer bar bushing.
5. Disconnect the stabilizer bar link from the stabilizer bar (LH side).
   - Remove and discard the nut.



6. Remove the axle carrier bushing heat shield.

- Remove the two retaining bolts.

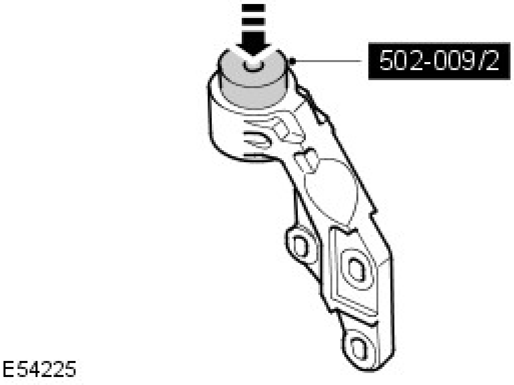


7. Using a transmission jack support the front differential case.

8. ⚠ CAUTION: The bolts must only be used once.

Remove the axle carrier.

- Remove and discard the three bolts retaining the axle carrier to the axle.
- Remove the axle carrier bushing bolt.



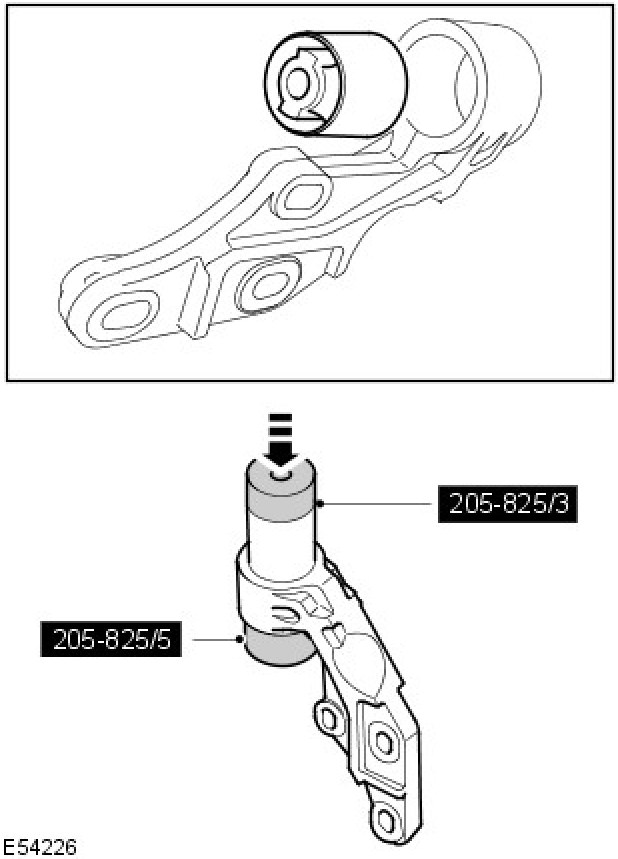
9. NOTE: Take note of the fitted position of the bush.

Using the special tools, remove the axle carrier bushing.

Installation

1. ⚠ CAUTION: Make sure the bush is correctly aligned.

Using the special tools, install the axle carrier bushing.



E54226

2. Install the axle carrier.

- Tighten the M14 bolt to 105 Nm (77 lb.ft).
- Tighten the new axle carrier bracket bolts to 80 Nm (59 lb.ft), then a further 60 degrees.

3. Install the axle carrier bushing heat shield.

4. Install the stabilizer bar mounting.

- Install the stabilizer bar bushing.
- Install the clamp.
- Install the bolts.

5. Install the stabilizer bar link.

- Tighten the nut to 115 Nm (85 lb.ft).

6. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

7. Connect the battery ground cable.

Published: 11-May-2011

Front Drive Axle/Differential - Axle Tube Bushing

Removal and Installation

Special Tool(s)	
 E60582	Remover/installer - Front axle extension support bush 308-625/1
 E60583	Remover/installer - Front axle extension support bush 308-625/2
 E60584	Remover/installer - Front axle extension support bush 308-625/3

Removal

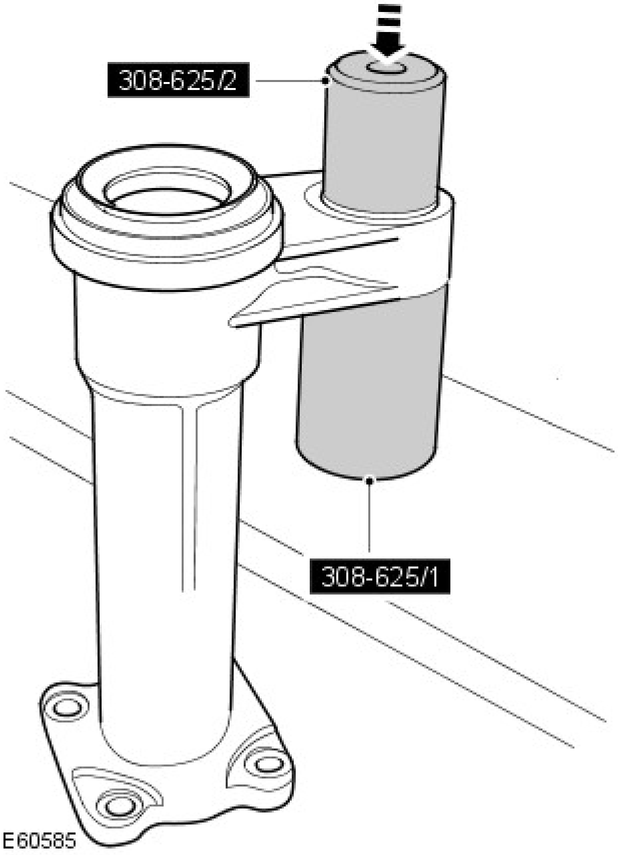
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

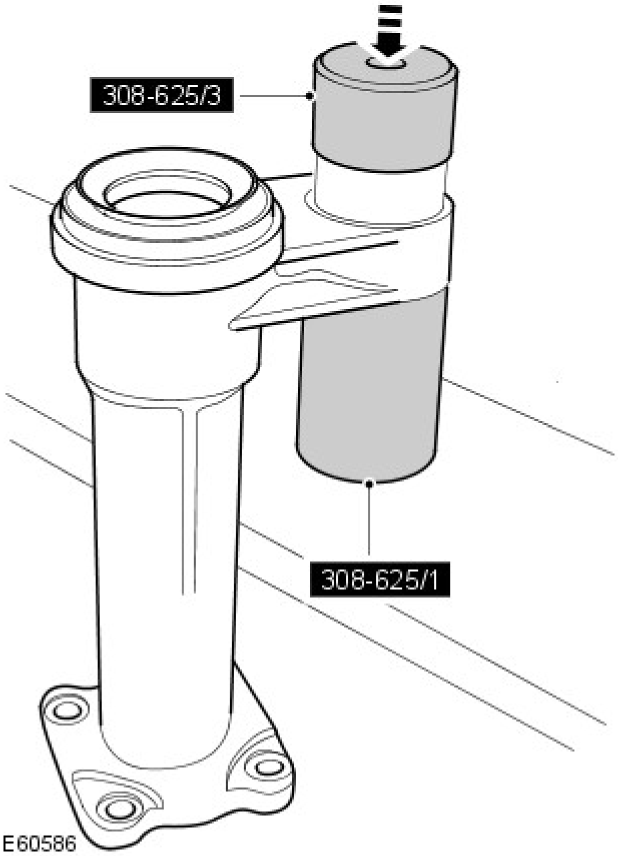
3. Remove the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

4. NOTE: Note the fitted position.

Using the special tools, remove the bushing.


308-625/2
308-625/1
E60585

Installation



1. NOTE: Note the fitted position.

Using the special tools, install the bushing.

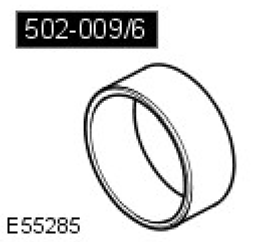
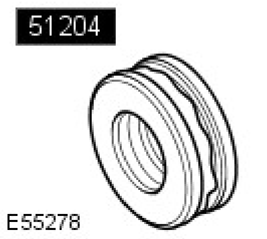
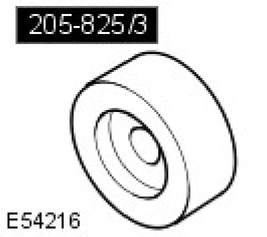
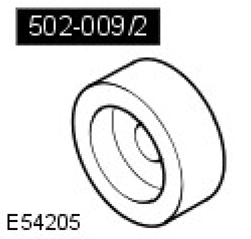
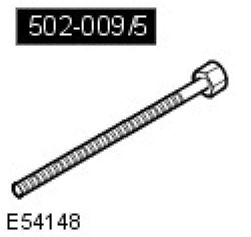
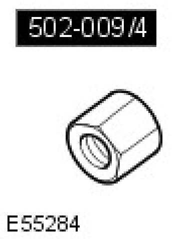
2. Install the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

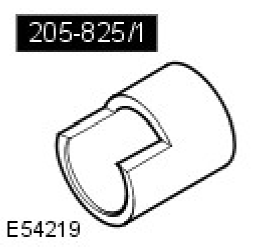
3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Front Drive Axle / Differential - Axle Cover Bushing

Removal and Installation

Special Tool(s)	
 502-009/6 E55285	Bearing Housing 502-009/6
 51204 E55278	Bearing set for 14mm bolt 51204
 205-825/3 E54216	Installer rear axle front bush 205-825/3
 502-009/2 E54205	Remover rear differential rear bush 502-009/2
 502-009/5 E54148	Remover/Installer long 14mm bolt 502-009/5
 502-009/4 E55284	Nut for long 14mm bolt 502-009/4

 205-825/1 E54219	Receiver cup front axle front bush 205-825/1

Removal

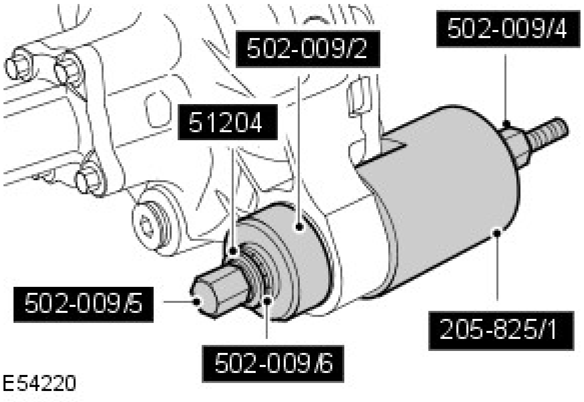
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the front wheels and tires.

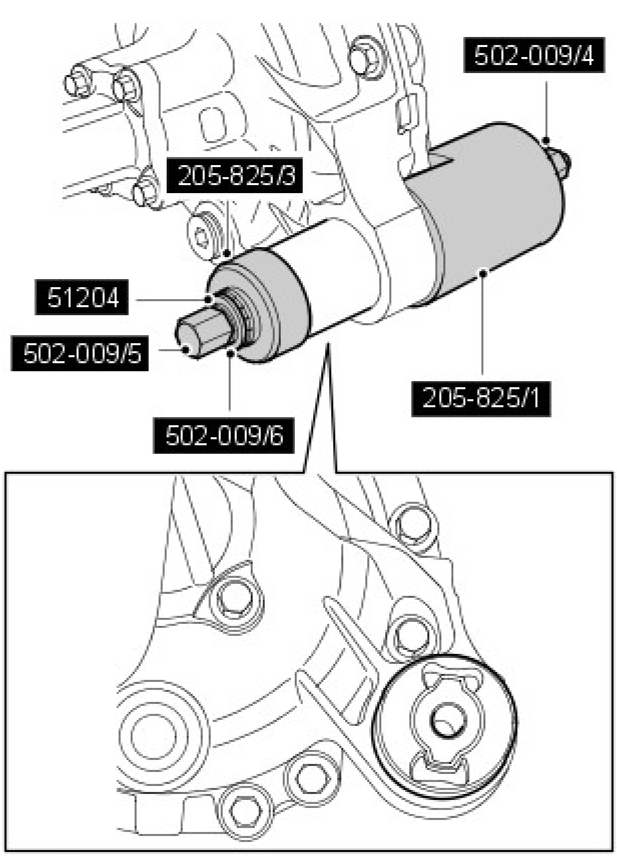
3. Remove the front differential.
For additional information, refer to: Axle Assembly - V8 S/C 4.2L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).

4. NOTE: Take note of the fitted position of the bush.


502-009/2
502-009/4
51204
502-009/5
502-009/6
205-825/1
E54220

Using the special tools, remove the front axle housing support insulator.

Installation


502-009/4
205-825/3
51204
502-009/5
502-009/6
205-825/1
E54221

1. ⚠ CAUTION: Make sure the bush is correctly aligned.

   Using the special tools, install the front axle housing support insulator.

2. Install the front differential.
   For additional information, refer to: Axle Assembly - V8 S/C 4.2L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).

3. Install the front wheels and tires.

   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Drive Axle/Differential - Axle AssemblyTDV6 2.7L Diesel

Removal and Installation

Removal

All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

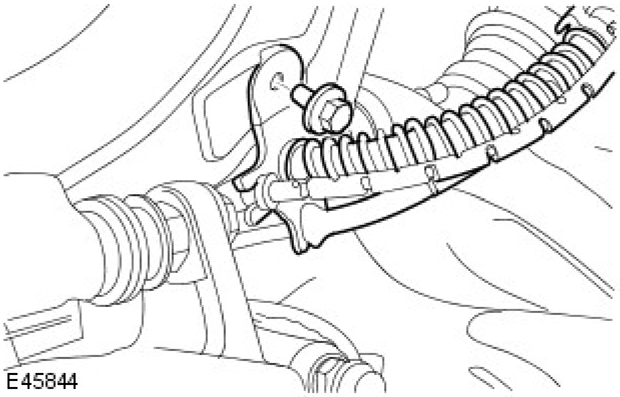
2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the front wheels and tires.

4. Remove the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

5. Release the LH brake hose bracket from the wheel knuckle.

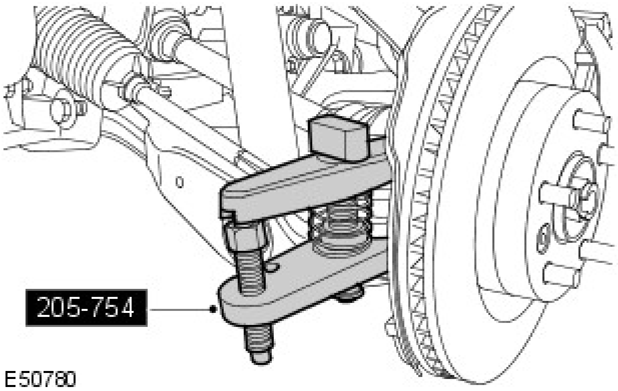
- Remove the bolt.

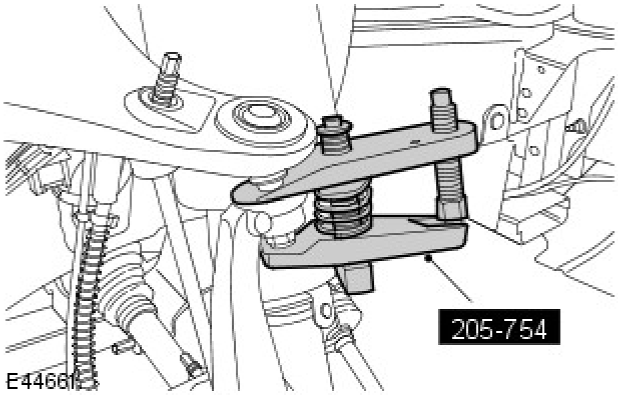


6. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the LH tie-rod end ball joint from the wheel knuckle.

- Remove and discard the nut.





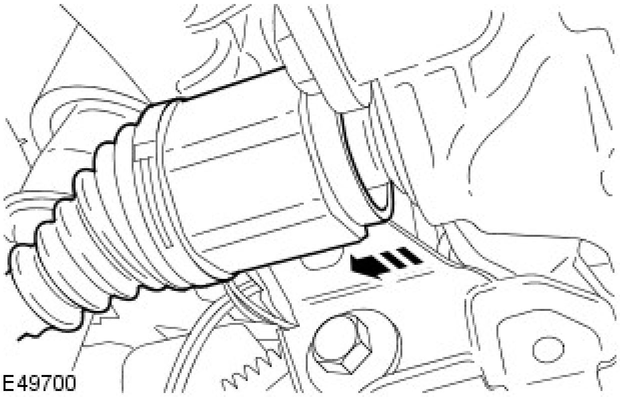
7. CAUTIONS:

⚠ Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

⚠ The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

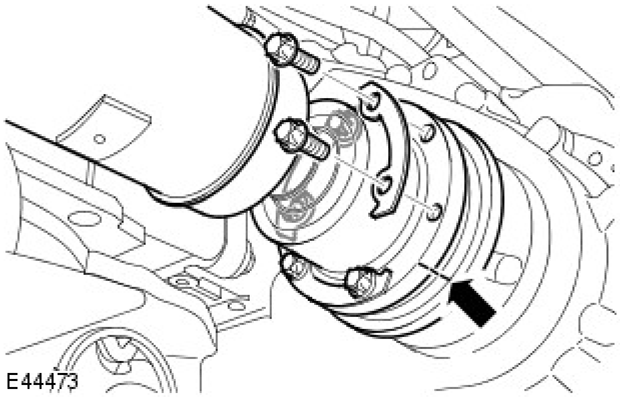
Using the special tool, release the LH upper arm ball joint.

- Remove and discard the nut.



8. Release the LH halfshaft from the axle assembly.

- Remove and discard the snap ring.
- Using a suitable tie strap, support the LH halfshaft.



9. CAUTIONS:

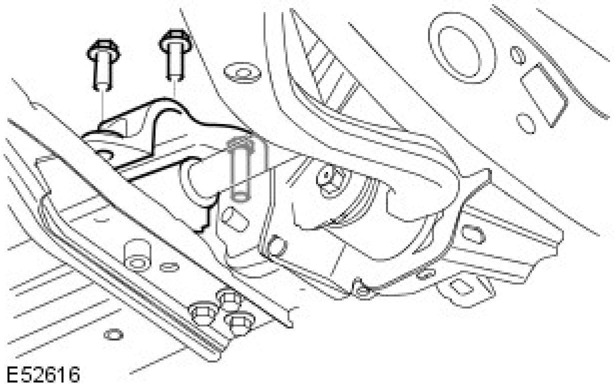
⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft from the front axle drive flange.

- Remove the 6 Torx bolts and washers, discard the bolts.
- Using a suitable tie strap, secure the driveshaft end plate.

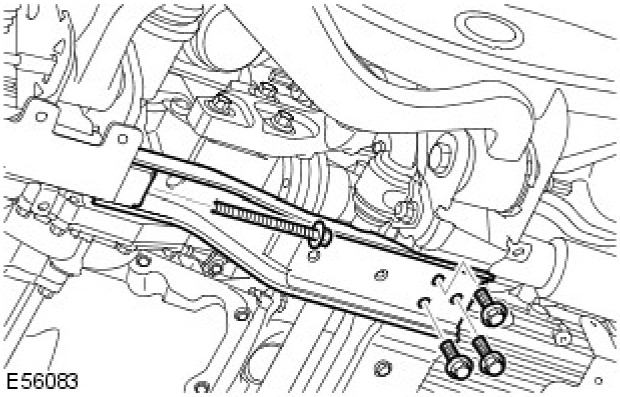
Vehicles with Active Stabilization



10. Remove the stabilizer bar bushing.

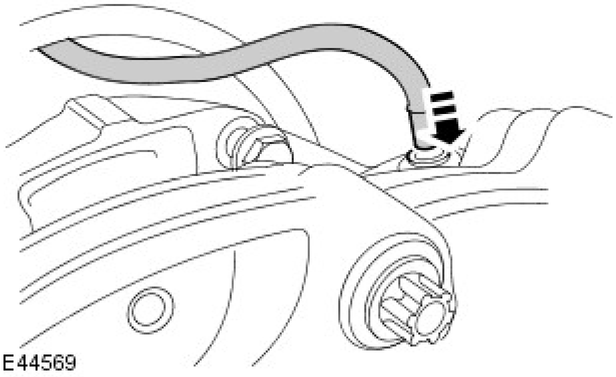
- Remove the 3 bolts.
- Remove the clamp.
- Remove the stabilizer bar bushing.

All vehicles



11. Remove the front axle crossmember.

- Remove the 4 bolts.



12. ⚠ CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the breather line.

- Release the clip.

Vehicles built up to VIN 935921

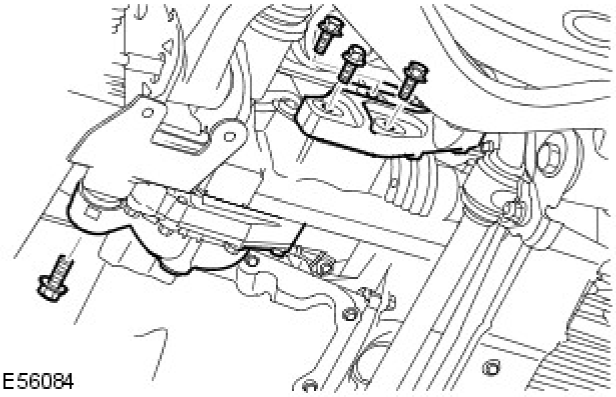
13. NOTE: If a new axle is being installed, a new breather line must also be installed.

Remove and discard the breather line.

- Release from the 3 clips.

All vehicles

14. Using a transmission jack, support the front axle assembly.



15. With assistance, remove the front axle assembly.

- Remove and discard the 3 axle assembly rear mounting bolts.
- Remove the front axle assembly front mounting bolt.

Installation

All vehicles

1. Install the front differential case.

- With assistance, raise and manoeuvre the front differential case.
- Connect the breather line.

2. With assistance, install the front axle assembly.

Vehicles built up to VIN 935921

3. NOTE: If a new axle is being installed, a new breather line must also be installed.

Install a new breather tube.

- Secure in the clips.

All vehicles

4. Connect the breather line.

5. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

Vehicles with Active Stabilization

6. Install the stabilizer bar bushing.

- Install the clamp.
- Install the bolts.
- Tighten the bolts to 115 Nm (85 lb.ft).

All vehicles

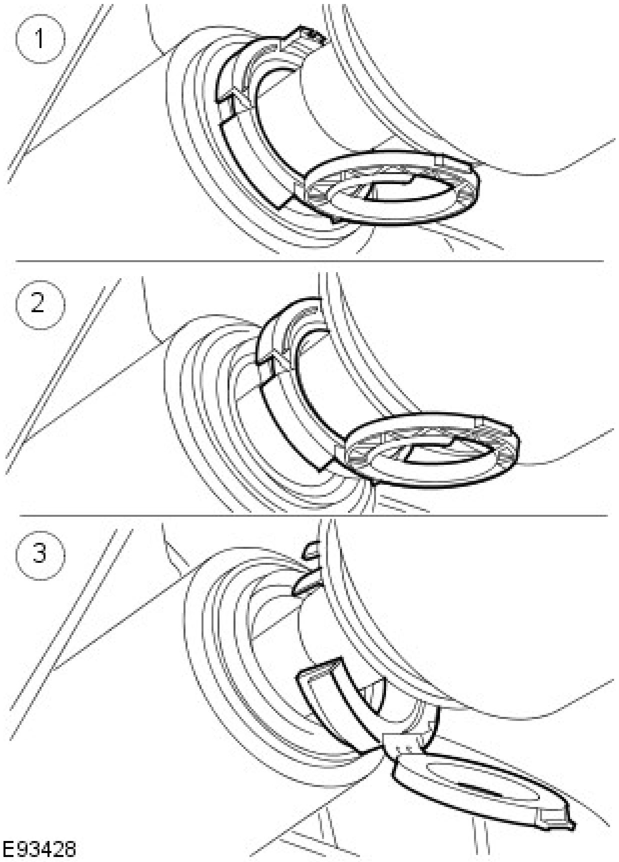
7. NOTE: Make sure that new bolts are installed.

Secure the driveshaft to the front axle drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.
- Remove and discard the tie strap.

8. Install a new snap ring to the LH halfshaft.

- Remove and discard the tie strap.



9. NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.

Secure the LH halfshaft in the axle assembly.

1. Open the halfshaft seal protector and install the halfshaft.
2. Release the halfshaft seal protector from the halfshaft seal.
3. Remove the halfshaft seal protector.
4. Fully install the halfshaft.

10. ⚠ WARNING: Make sure that a new nut is installed.

Secure the LH upper arm to the wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

11. ⚠ WARNING: Make sure that a new nut is installed.

Secure the LH tie-rod end ball joint to the wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

12. Secure the LH brake hose bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

13. Install the axle tube.
For additional information, refer to: Axle Tube (205-03 Front Drive Axle/Differential, In-vehicle Repair).

14. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

15. Connect the battery ground cable.

Published: 11-May-2011

Front Drive Halfshafts -

General Specification

Item	Specification
Type	Fully floating, fixed length, solid shafts incorporating constant velocity joints at each end of shaft

Recommended Lubricant

Item	Specification
Outboard joint	Use grease supplied with replacement boot kit (Optimol MS139G)
Inboard joint	Use grease supplied with replacement boot kit (1 Luber C MS132G)

Torque Specifications

Description	Nm	lb-ft
* Stabilizer bar link nuts	115	85
* Stabilizer bar link nuts - vehicles with Dynamic Response	175	129
* Upper arm to wheel knuckle nut	70	52
* Tie rod end ball joint nut	76	56
Brake hose retaining bracket to wheel knuckle bolt	25	18
*+ Halfshaft retaining nut	230	169
Road wheel nuts	140	103

*** New nut must be installed**

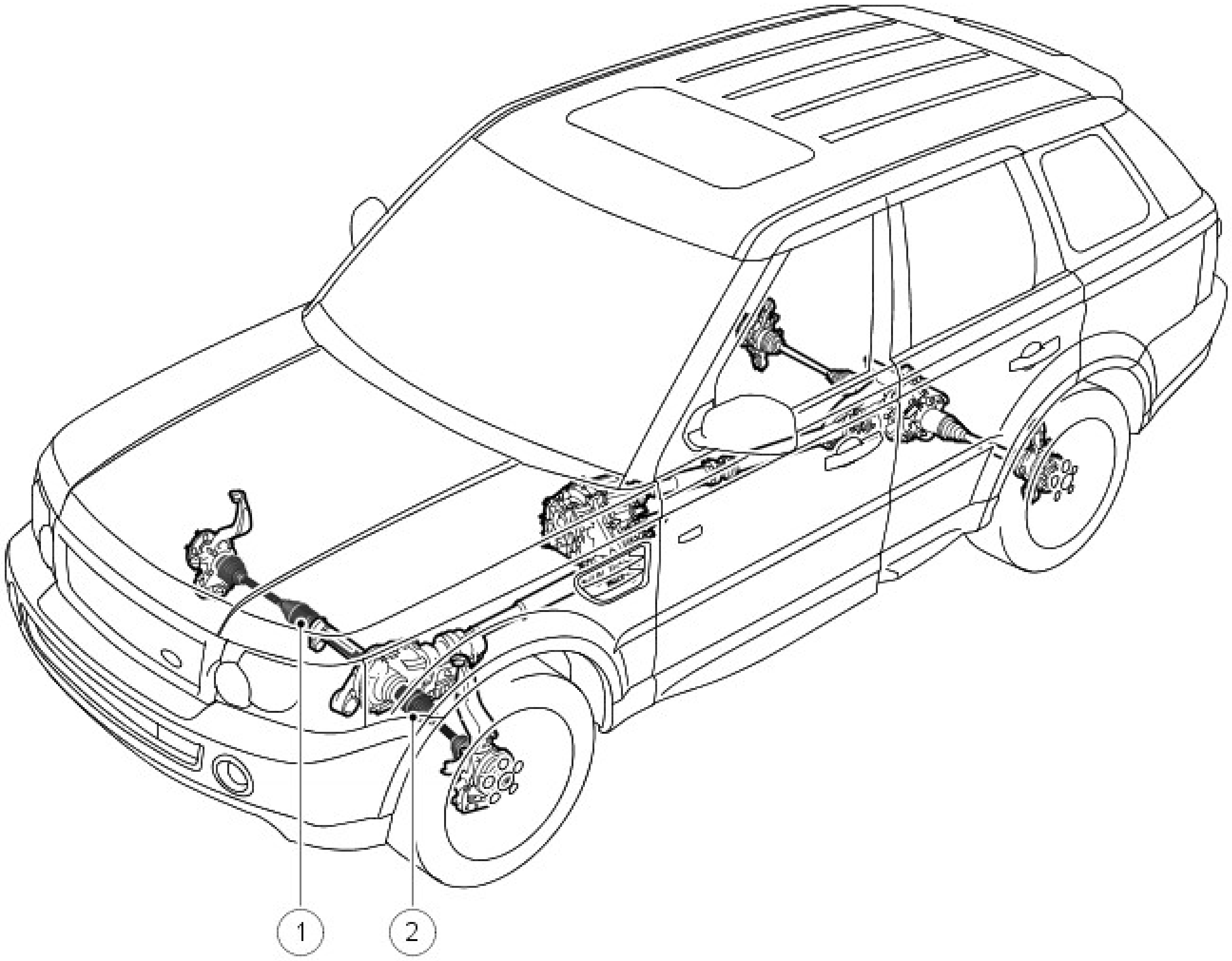
+ Stake nut on completion

Published: 11-May-2011

Front Drive Halfshafts - Front Drive Halfshafts

Description and Operation

Front Drive Halfshaft Component Location



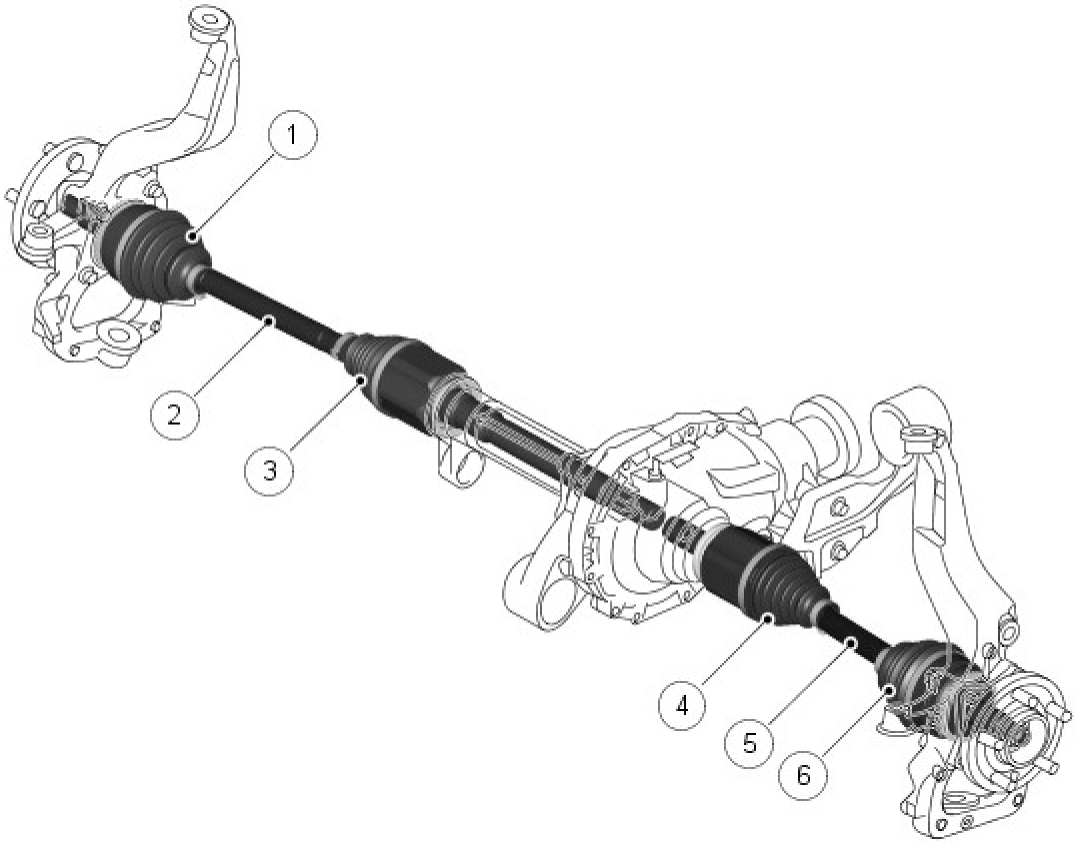
E56495

Item	Part Number	Description
1	-	RH front drive halfshaft
2	-	LH front drive halfshaft

GENERAL

The front drive shafts are handed components with the RH drive shaft being longer than the LH drive shaft. Both shafts are of similar construction with Constant Velocity (CV) joints at each end to allow for steering and suspension movement.

FRONT DRIVE HALFSHAFT ASSEMBLY



Item	Part Number	Description
1	-	RH outer CV joint
2	-	RH front drive halfshaft
3	-	RH inner CV joint
4	-	LH inner CV joint
5	-	LH front drive halfshaft
6	-	LH outer CV joint

The front drive shafts are similar in their construction. The only difference is the lengths of each shaft, the RH drive shaft is a longer shaft with an extended stem.

The outer CV joints have a target wheel on the outer diameter. This is used by the ABS wheel speed sensor for vehicle and wheel speed calculations.

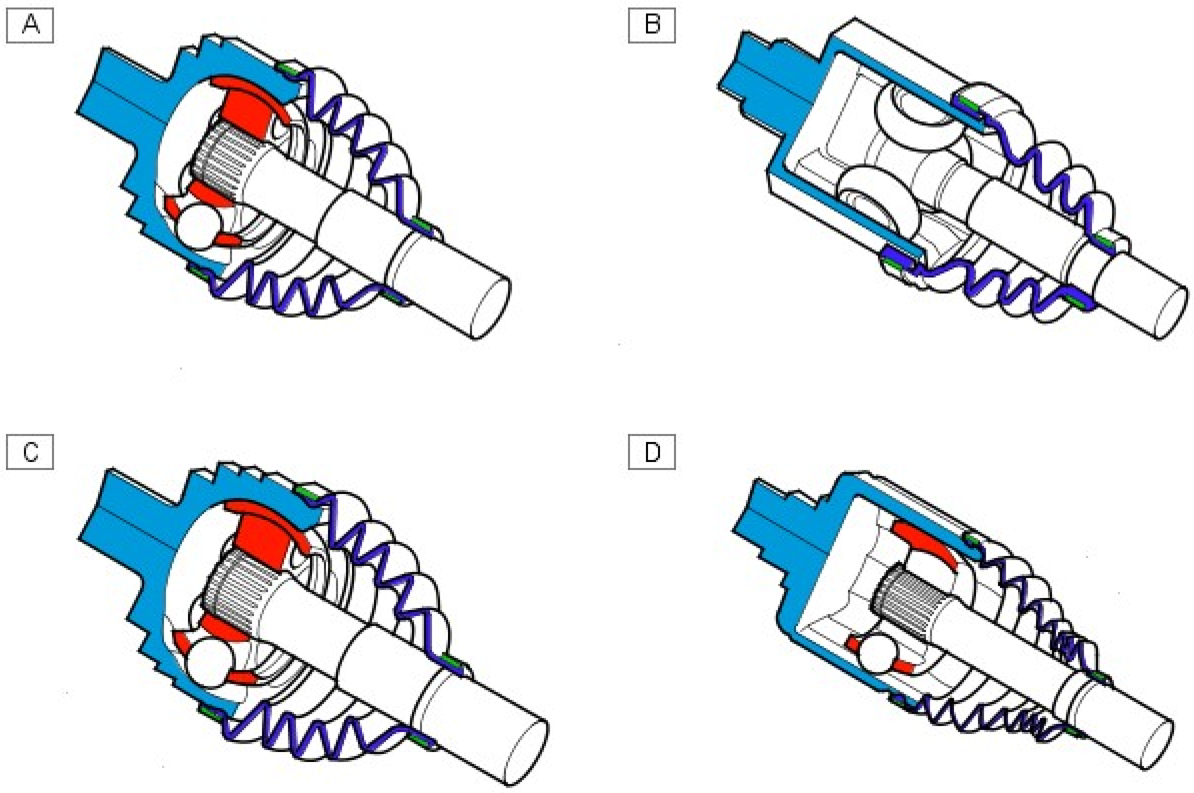
Each drive shaft comprises two CV joints (inner and outer), boots, an outer tube and a solid barshaft, which is retained in the front differential by a circlip (see 'Halfshaft Joint' section for more information on CV joints).

Published: 11-May-2011

Front Drive Halfshafts - Halfshaft Joint

Description and Operation

Front Drive Halfshaft – Sectional Views



E50637

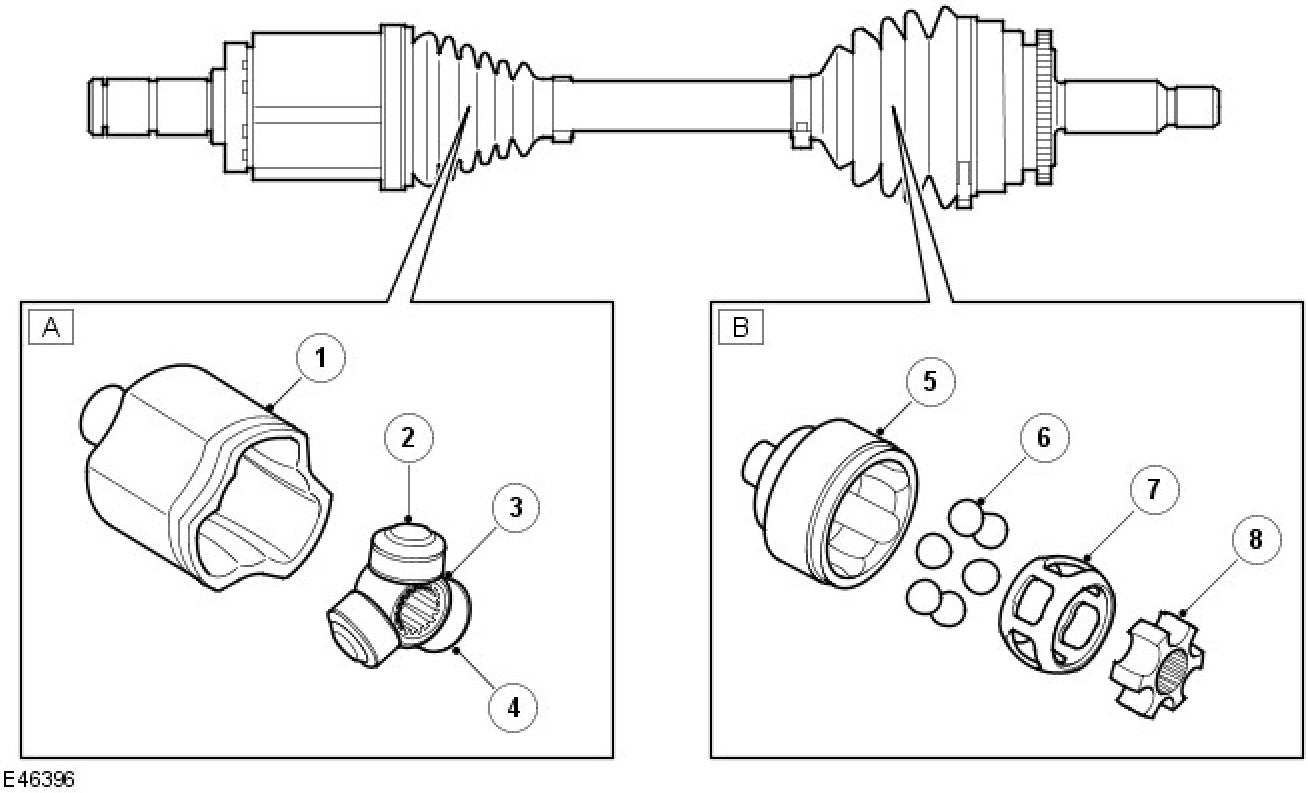
Item	Part Number	Description
A	-	Front outboard halfshaft joint
B	-	Front inboard halfshaft joint
C	-	Rear outboard halfshaft joint
D	-	Rear inboard halfshaft joint

The outboard and rear inboard CV joints are of the Birfield design. This design uses longitudinal, elliptical grooves, which retain six steel balls. A cage further retains the balls. Constant velocity is achieved by the position of the steel balls. If a centre line is drawn through the balls and the driven hub or differential shaft, the two centre lines always bisect each other at the angle of drive. This condition allows the rotational speed of the driven shaft to be passed to the driven hub or differential shaft with no loss of rotational speed regardless of the shaft angle. The CV joints are packed with grease, which is retained in the joint by a synthetic rubber gaiter. The gaiter is retained at each end by a metal clamp, which provides a watertight seal to prevent the ingress of dirt and moisture. The CV joints are retained on their respective shaft or tube by an internal snap ring. The snap rings are located in a groove on each shaft or tube end and locate in a mating groove in the CV joint.

⚠CAUTION: The inner hub is not retained in the joint body on this type of joint. The joint is held together in its unfitted state only by the boot. Pulling on the barshaft can therefore pull the hub out of the joint body. For this reason care must be taken when handling and fitting the front driveshafts.

The shaft is a sliding fit inside the outer tube, which allows for the small length changes, which occur with articulation of the suspension. The shaft is located in a ball cage, which is retained inside the outer tube. The ball cage ensures that the shaft is held rigidly in the outer tube whilst allowing it to freely move in and out of the tube as necessary. A sealing plug is pressed into the outer tube and retains grease around the balls in the cage.

The inner CV joints are similar in design and operation to the outer joints except that the inner joints use rollers rather than balls to transmit the drive.



Item	Part Number	Description
A	-	Inner CV joint
B	-	Outer CV joint
1	-	Tulip outer race
2	-	Trunions (3 of)
3	-	Spider
4	-	Rollers (3 of)
5	-	Outer race
6	-	Steel balls (6 of)
7	-	Cage
8	-	Inner race

The front inboard joint is a 'tripode joint', having three 'feet' or 'podes'. The torque is transmitted from the outer race to the connecting shaft by means of rollers running on needle rollers around the trunions of the tripode spider. The roller tracks of the outer race enable the tripode assembly to move angularly and axially within the joint.

The inner CV joint shaft is splined and mates with splines in the front differential. There is no internal retaining mechanism for this type of joint so care must be taken during service as the shaft and CV joint can separate.

Front Drive Halfshafts - Front Drive Halfshafts

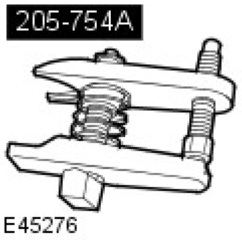
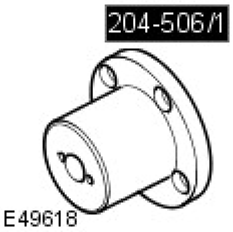
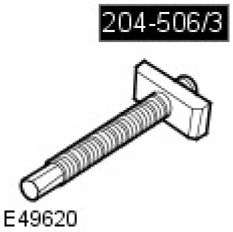
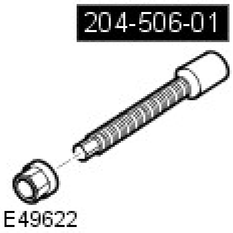
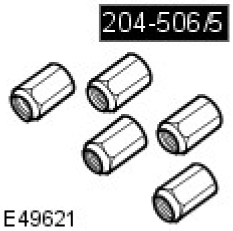
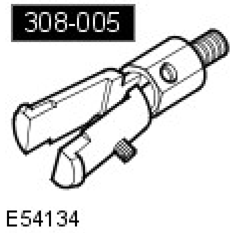
Diagnosis and Testing

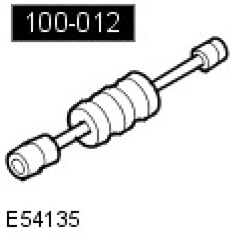
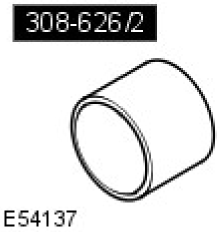
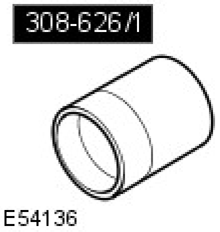
For additional information,
REFER to: Driveline System (205-00 Driveline System - General Information, Diagnosis and Testing).

Published: 29-Sep-2011

Front Drive Halfshafts - Front Halfshaft LH

Removal and Installation

Special Tool(s)	
 205-754A E45276	Ball joint separator 205-754(LRT-54-027)
 204-506/1 E49618	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
 204-506/3 E49620	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
 204-506-01 E49622	Halfshaft installer adapter 204-506-01(LRT-60-030/4)
 204-506/5 E49621	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
 308-005 E54134	Axle oil seal remover 308-005(LRT-37-004/2)

	Impulse extractor 100-012(LRT-99-004)
	Installer/Guide halfshaft oil seal 308-626/2
	Installer halfshaft oil seal 308-626/1

Removal

- CAUTIONS:

⚠ Do not store or install halfshafts with joints at maximum articulation or damage may occur to the joint.

⚠ Do not allow halfshafts to hang unsupported at one end or joint damage will occur.

⚠ Angularly Adjusted Roller (AAR) joints, used at the inboard end of some halfshafts have no internal retaining mechanism and can separate.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

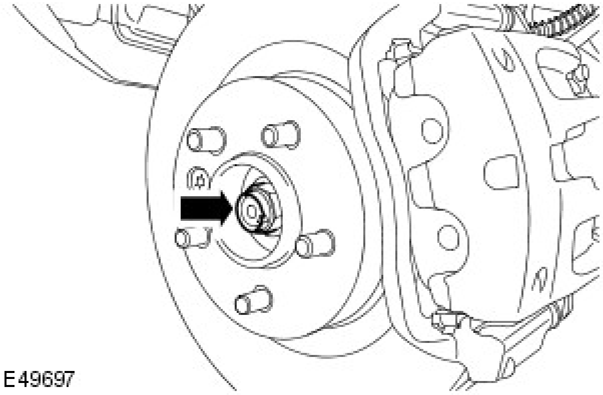
Raise and support the vehicle.

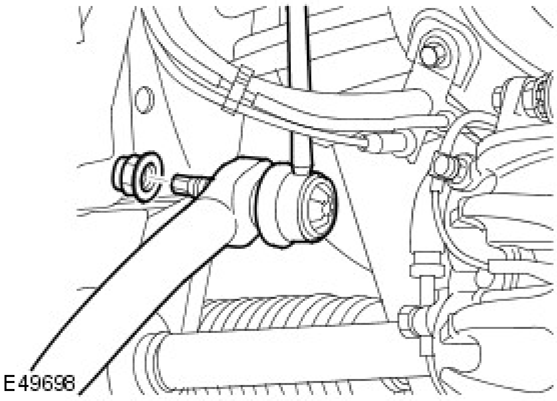
2. Drain the differential lubricant.
For additional information, refer to: Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

3. Remove the wheel and tire.

4. Remove the halfshaft retaining nut.

- Discard the nut.

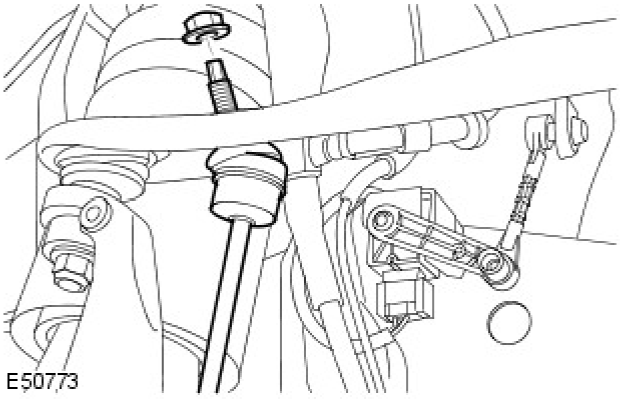




5. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Disconnect the RH stabilizer bar link.

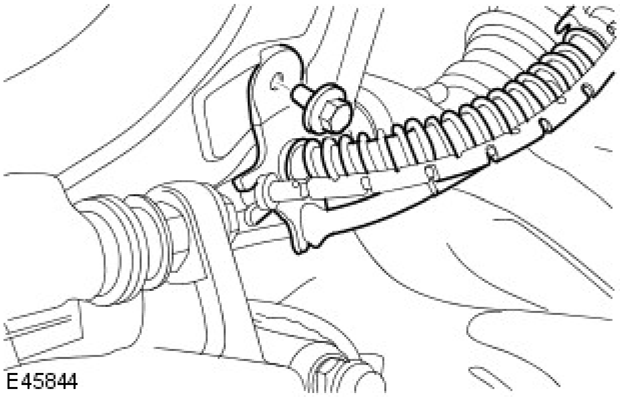
- Remove and discard the nut.



6. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

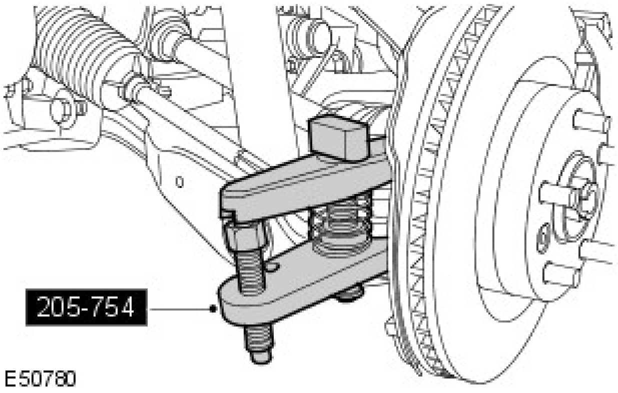
Remove the stabilizer bar link nut.

- Remove and discard the nut.



7. Release the brake hose bracket from the wheel knuckle.

- Remove the bolt.



8. Loosen the tie-rod end ball joint retaining nut.

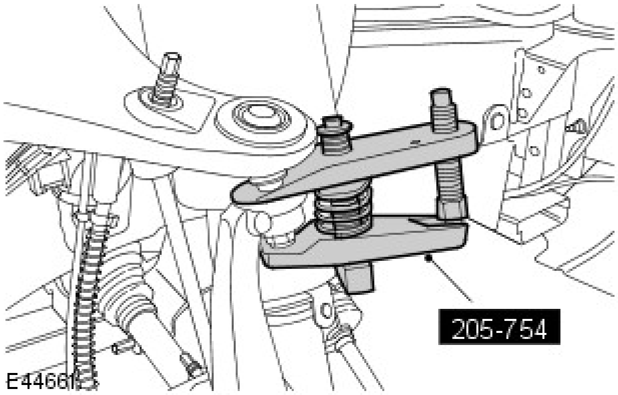
9. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the tie-rod end ball joint from the wheel knuckle.

- Discard the nut.

10. ⚠ CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

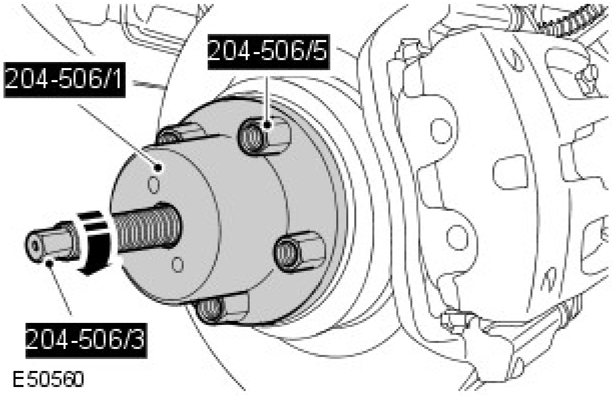
Loosen the upper arm retaining nut.



11. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the upper arm ball joint.

- Remove and discard the retaining nut.



12. CAUTIONS:

⚠ The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

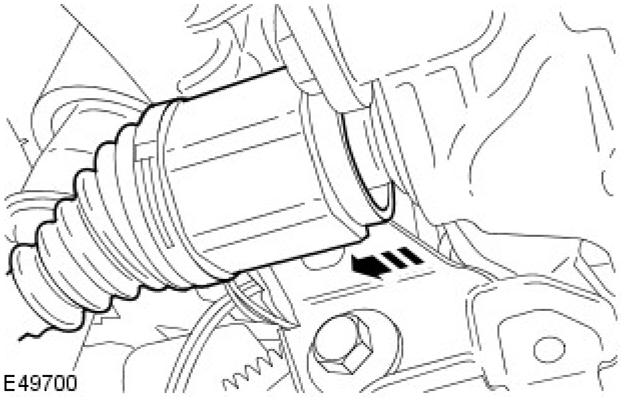
⚠ Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

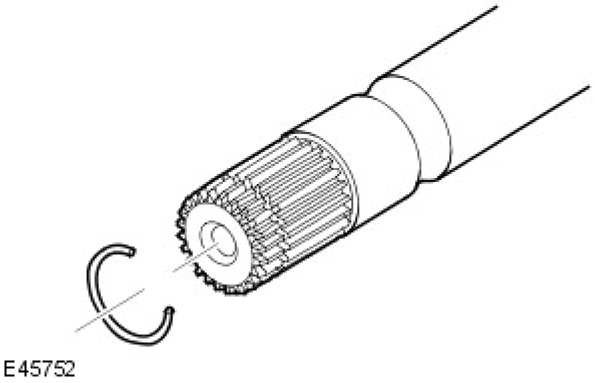
⚠ Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Using the special tools, release the halfshaft from the wheel hub.

13. Release the halfshaft from the wheel knuckle.

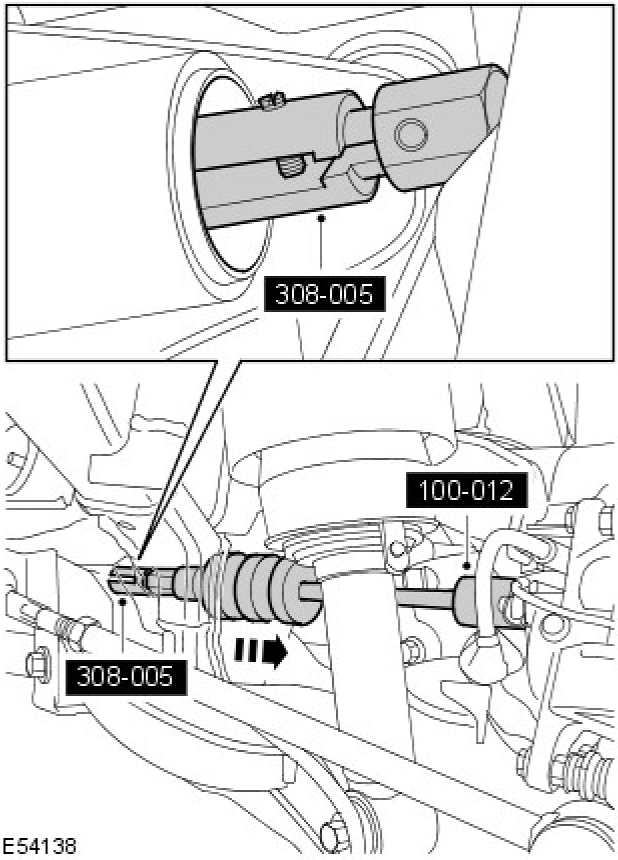
14. Release the halfshaft from the differential housing.





15. Remove the halfshaft.

- Raise the stabilizer bar to allow removal of the halfshaft.
- Remove and discard the snap ring.


308-005
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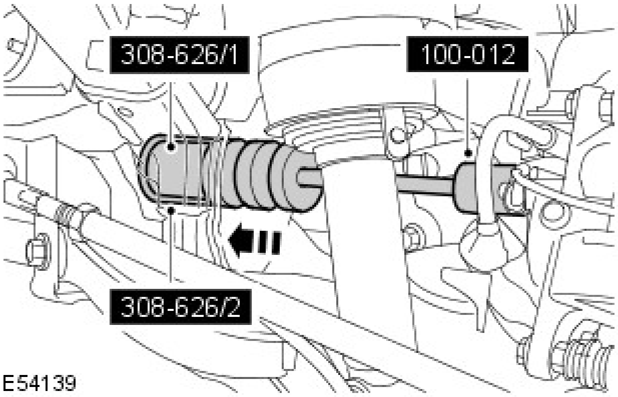
16. Using the special tools, remove and discard the halfshaft oil seal.

Installation

1. Clean the components.



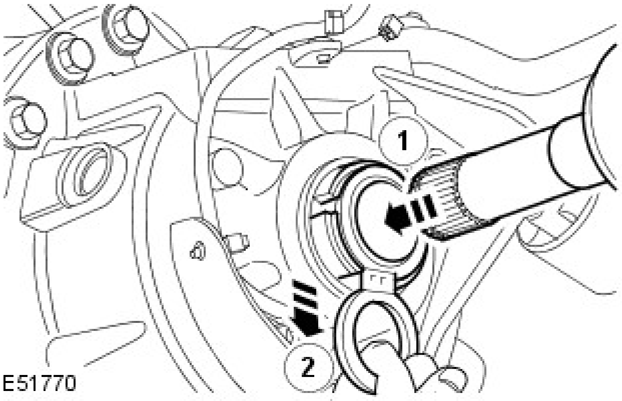
2. Using the special tools, install a new halfshaft oil seal.

- The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

3. NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.

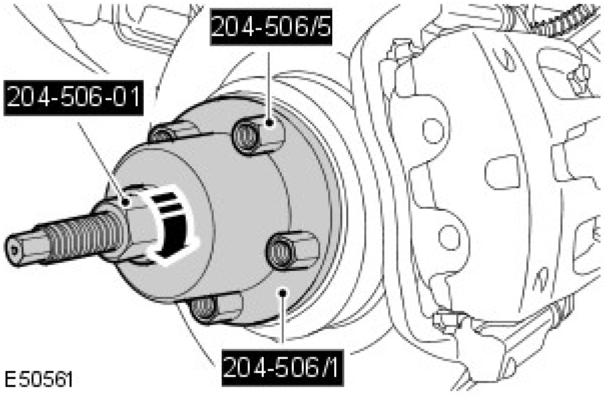
Install the halfshaft.

- Install the snap ring.
- Lubricate the seal and the bearing running surfaces with clean axle oil.
- Make sure the snap ring is fully engaged and retains the halfshaft.
- Open the halfshaft oil seal protector.



4. NOTE: The oil seal protector is designed to break into two pieces.

Remove and discard the halfshaft oil seal protector.



5. ⚠ CAUTION: The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

Using the special tools, install the halfshaft in the wheel hub.

6. Connect the upper arm and wheel knuckle.

7. Secure the stabilizer bar link.

8. Connect the tie-rod end ball joint.

- Install a new nut and tighten to 70 Nm (52 lb.ft).
- Install a new nut and tighten to 115 Nm (85 lb.ft).

- Install a new nut and tighten to 76 Nm (56 lb.ft).

9. ⚠ CAUTION: Install the halfshaft nut finger tight.

Install a new halfshaft retaining nut and lightly tighten.

10. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

11. Secure the RH stabilizer link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

12. ⚠ CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Tighten the new halfshaft retaining nut to 230 Nm (170 lb.ft).

- Stake the nut to the halfshaft.

13. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

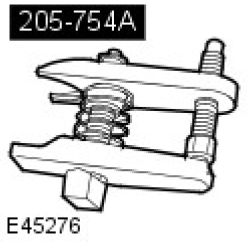
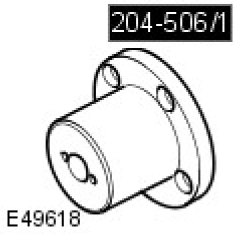
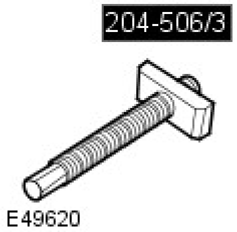
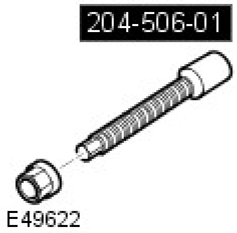
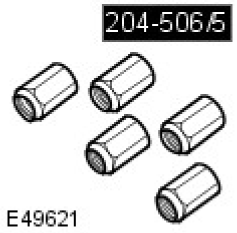
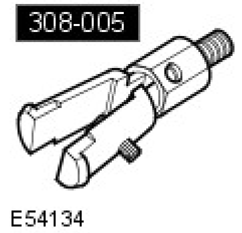
14. ⚠ CAUTION: Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, and not to act as a level indicator.

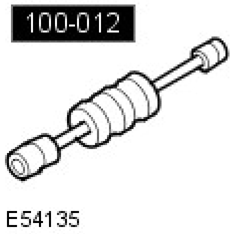
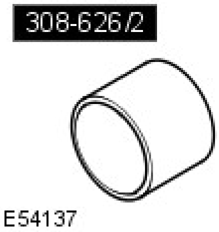
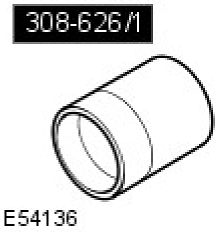
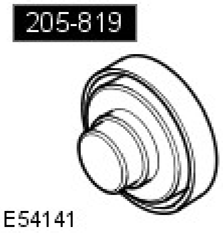
Fill the differential with the correct amount of lubricant.
For additional information, refer to: Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

Published: 29-Sep-2011

Front Drive Halfshafts - Front Halfshaft RH

Removal and Installation

Special Tool(s)	
 205-754A E45276	Ball joint separator 205-754(LRT-54-027)
 204-506/1 E49618	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
 204-506/3 E49620	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
 204-506-01 E49622	Halfshaft installer adapter 204-506-01(LRT-60-030/4)
 204-506/5 E49621	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
 308-005 E54134	Axle oil seal remover 308-005(LRT-37-004/2)

	Impulse extractor 100-012(LRT-99-004)
	Installer/Guide halfshaft oil seal 308-626/2
	Installer halfshaft oil seal 308-626/1
	Halfshaft bearing installer 205-819

Removal

- CAUTIONS:

⚠ Angularly Adjusted Roller (AAR) joints, used at the inboard end of some halfshafts have no internal retaining mechanism and can separate.

⚠ Do not allow halfshafts to hang unsupported at one end or joint damage will occur.

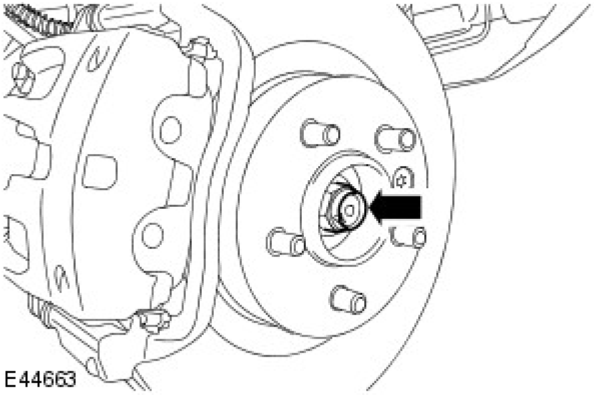
⚠ Do not store or install halfshafts with joints at maximum articulation or damage may occur to the joint.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

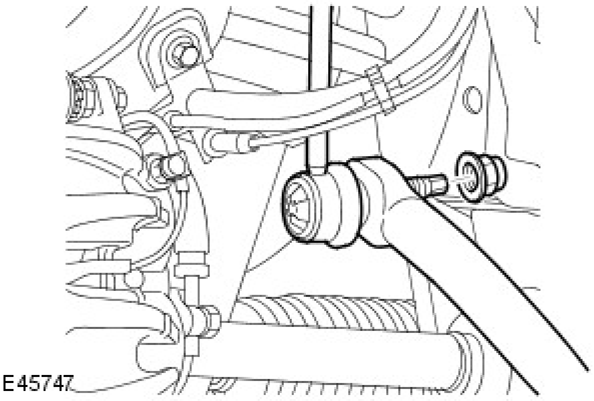
2. Drain the differential lubricant.
For additional information, refer to: Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

3. Remove the wheels and tires.


E44663

4. Remove the halfshaft retaining nut.

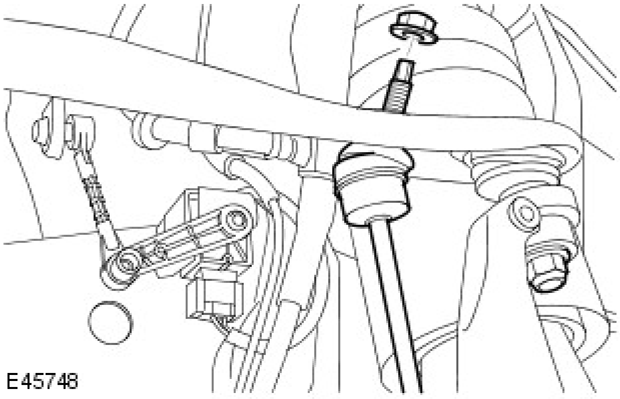
- Discard the nut.


E45747

5. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

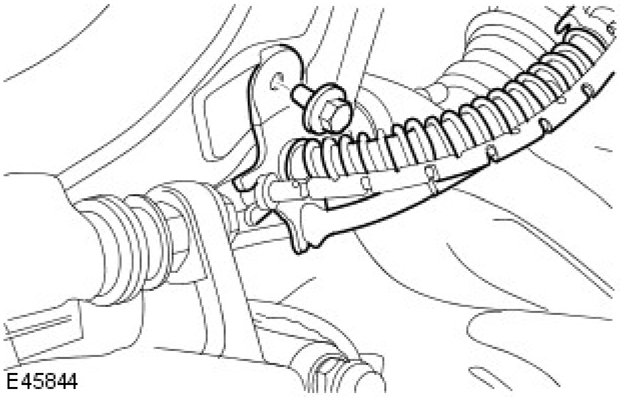
Disconnect the LH stabilizer bar link.

- Remove and discard the nut.


E45748

6. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

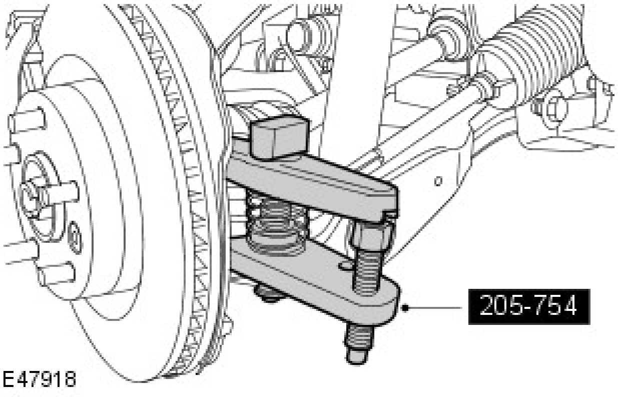
Remove the stabilizer bar link nut.


E45844

7. Release the brake hose bracket from the wheel knuckle.

- Remove the bolt.

8. Loosen the tie-rod end ball joint retaining nut.



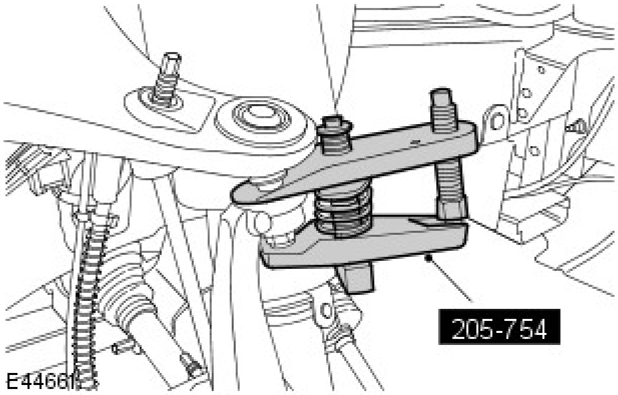
9. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the tie-rod end ball joint from the wheel knuckle.

- Discard the nut.

10. ⚠ CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

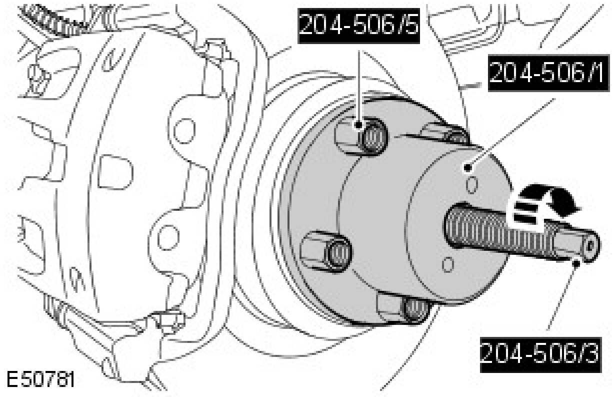
Loosen the upper arm retaining nut.



11. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Using the special tool, release the upper arm ball joint.

- Remove and discard the retaining nut.



12. CAUTIONS:

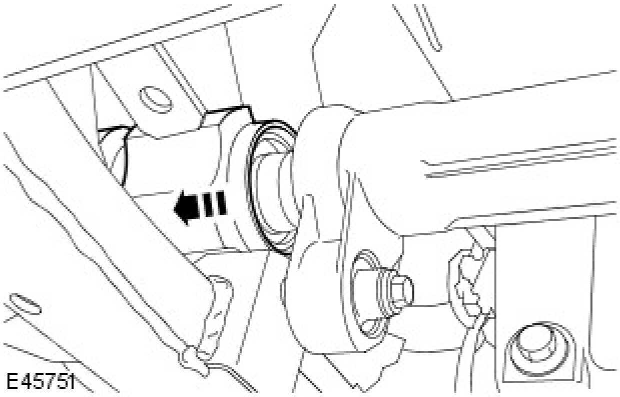
⚠ The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

⚠ Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

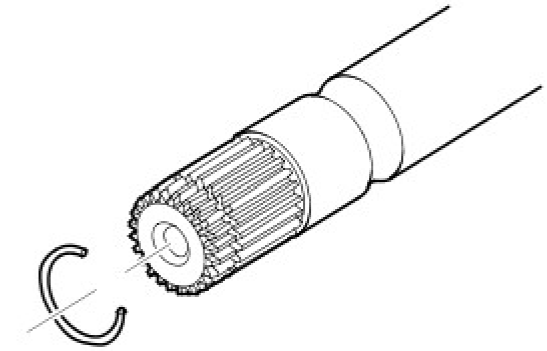
Using the special tools, release the halfshaft from the wheel hub.

13. Release the halfshaft from the wheel knuckle.

14. Position a container to collect the oil spillage.



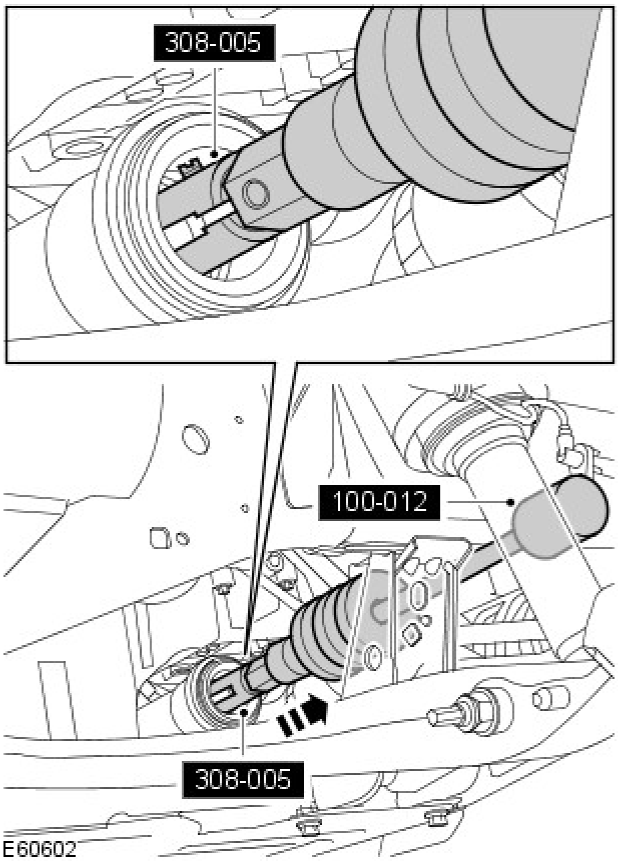
15. Release the halfshaft from the differential housing.



16. ⚠ CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.

Remove the halfshaft.

- Raise the stabilizer bar to allow removal of the halfshaft.
- Remove and discard the snap ring.

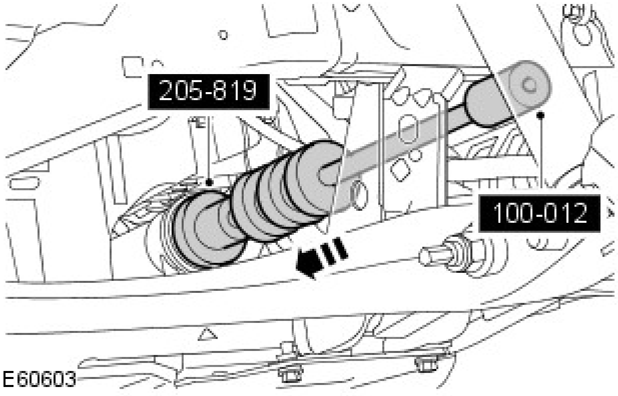

308-005
100-012
308-005
E60602

17. Using the special tools, remove and discard the halfshaft oil seal.

Installation

1. Clean the components.

2. Using the special tools, install a new halfshaft oil seal.



- The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

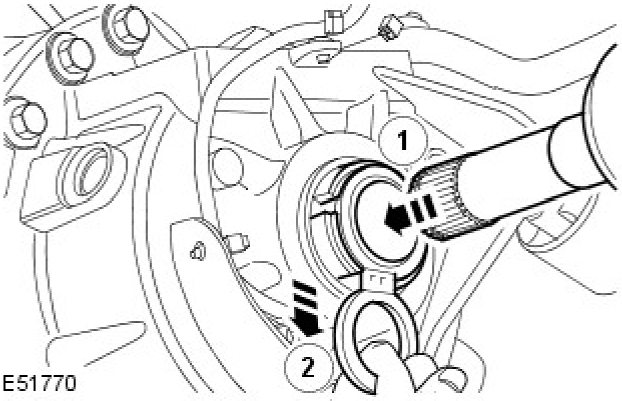
3. NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.

Install the halfshaft.

- Install the snap ring.
- Lubricate the seal and the bearing running surfaces with clean axle oil.
- Make sure the snap ring is fully engaged and retains the halfshaft.
- Open the halfshaft oil seal protector.

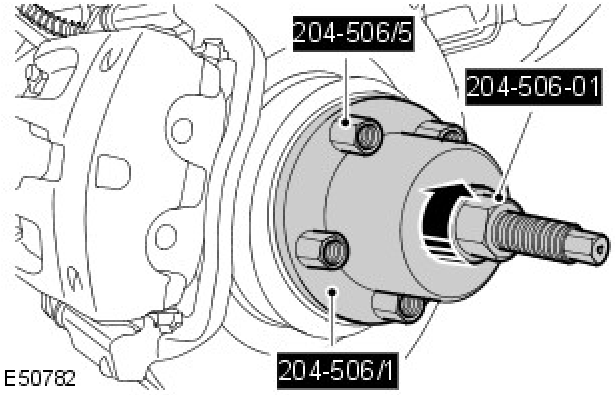
4. NOTE: The oil seal protector is designed to break into two pieces.

Remove and discard the halfshaft oil seal protector.



5. ⚠ CAUTION: The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

Using the special tools, install the halfshaft in the wheel hub.



6. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

7. Secure the stabilizer bar link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

8. Connect the tie-rod end ball joint.

- Install a new nut and tighten to 76 Nm (56 lb.ft).

9. ⚠ CAUTION: Install the halfshaft nut finger tight.

Install a new halfshaft retaining nut and lightly tighten.

10. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

11. Secure the LH stabilizer link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

12. ⚠ CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Tighten the new halfshaft retaining nut to 230 Nm (170 lb.ft).

- Stake the nut to the halfshaft.

13. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

14. ⚠ CAUTION: Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, and not to act as a level indicator.

Fill the differential with the correct amount of lubricant.
For additional information, refer to: Differential Draining and Filling (205-03 Front Drive Axle/Differential, General Procedures).

Published: 14-Jun-2011

Front Drive Halfshafts - Outer Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

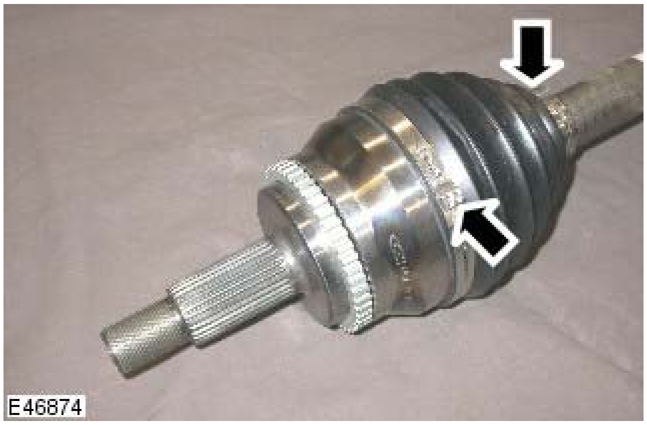
Raise and support the vehicle.

2. Remove the wheel and tire.

3. Remove the halfshaft.
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

4. Clamp the halfshaft in a vise.

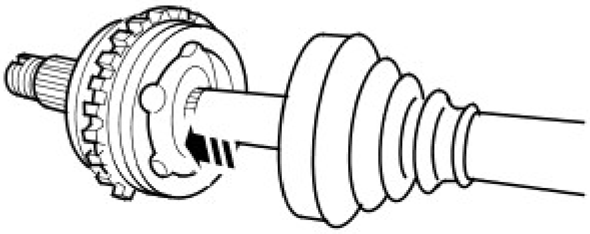
5. Remove and discard the CV joint boot retaining clamps.



6. Slide the CV joint boot along the halfshaft to gain access to the joint.

7. Using a drift against the inner part of the CV joint, remove the CV joint from the halfshaft.

- Remove and discard the snap ring.



E46875

8. Remove the outer CV joint boot.

Installation

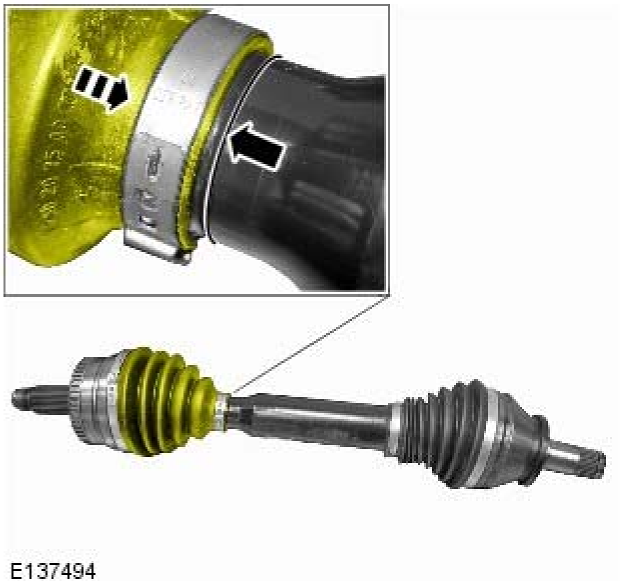
1. Clean the components.

2. Install the CV joint boot.

3. Install the outer CV joint.

4. Pack the CV joint with the grease supplied.

- Install the snap ring.
- Position the CV joint on the halfshaft, press the snap ring into it's groove and push the CV joint fully on to the halfshaft.
- Pull on the CV joint to ensure the snap ring has fully engaged.



5. CAUTIONS:

⚠ Make sure the CV boot is not pushed too far onto the drive shaft and the recess is exposed, failure to follow this instruction may result in damage to the component.

⚠ After the clamps have been secured do not adjust them, failure to follow this instruction may result in damage to the component.

Install the CV joint boot to the CV joint.

- Using a suitable tool, secure the CV joint boot with the new clamps.

6. Install the halfshaft.
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

7. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 14-Jun-2011

Front Drive Halfshafts - Outer Constant Velocity (CV) Joint

Removal and Installation

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

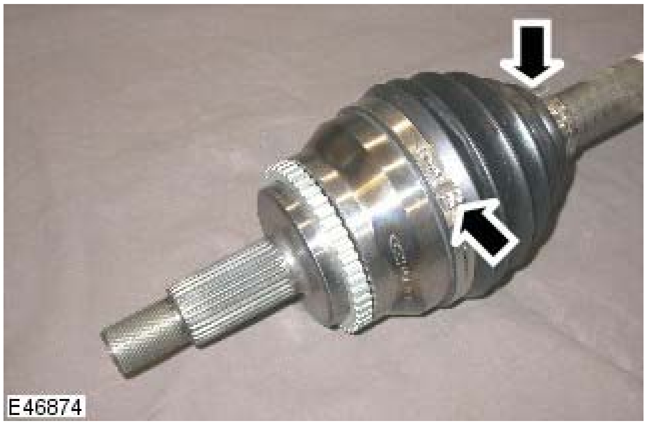
Raise and support the vehicle.

2. Remove the wheel and tire.

3. Remove the halfshaft.
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

4. Clamp the halfshaft in a vise.

5. Remove and discard the CV joint boot retaining clamps.

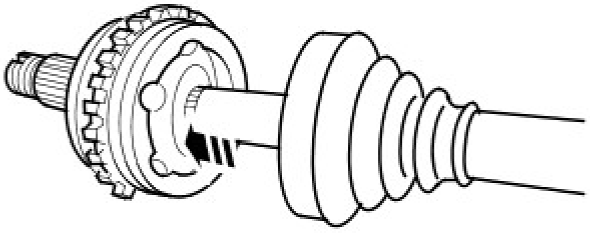


E46874

6. Slide the CV joint boot along the halfshaft to gain access to the joint.

7. Using a drift against the inner part of the CV joint, remove the CV joint from the halfshaft.

- Remove and discard the snap ring.



E46875

8. Remove the outer CV joint boot.

Installation

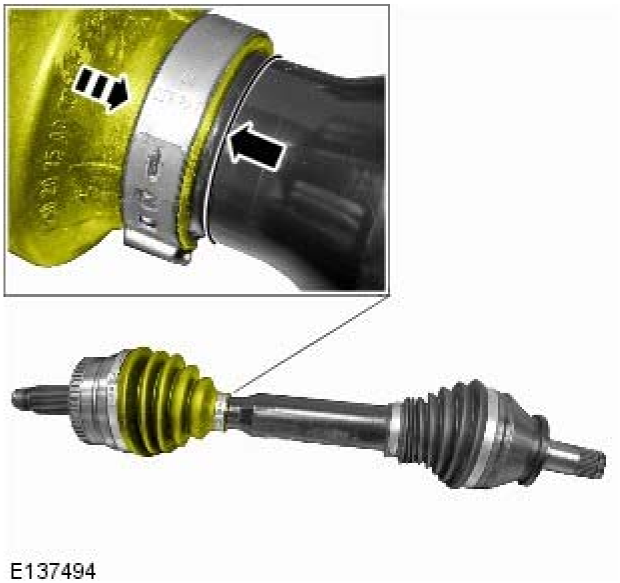
1. Clean the components.

2. Install the CV joint boot.

3. Install the outer CV joint.

4. Pack the CV joint with the grease supplied.

- Install the snap ring.
- Position the CV joint on the halfshaft, press the snap ring into it's groove and push the CV joint fully on to the halfshaft.
- Pull on the CV joint to ensure the snap ring has fully engaged.



5. CAUTIONS:

⚠ Make sure the CV boot is not pushed too far onto the drive shaft and the recess is exposed, failure to follow this instruction may result in damage to the component.

⚠ After the clamps have been secured do not adjust them, failure to follow this instruction may result in damage to the component.

Install the CV joint boot to the CV joint.

- Using a suitable tool, secure the CV joint boot with the new clamps.

6. Install the halfshaft.
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

7. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Drive Halfshafts - Inner Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

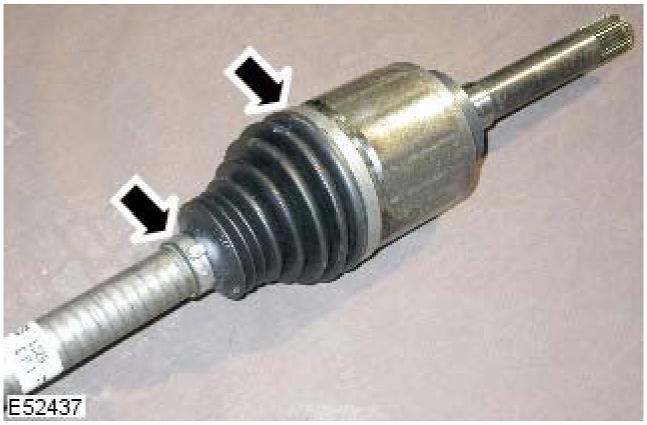
Raise and support the vehicle.

2. Remove the wheel and tire.

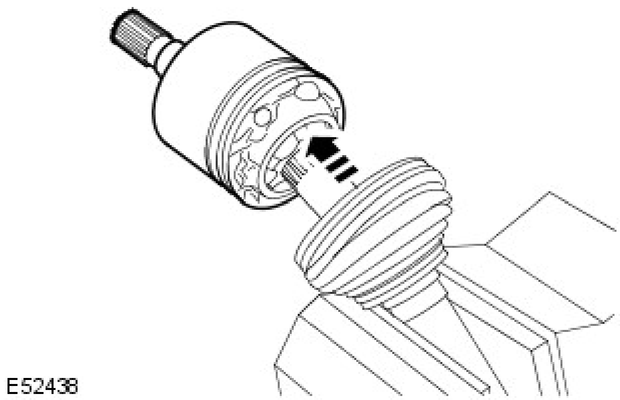
3. Remove the halfshaft.
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

4. Clamp the halfshaft in a vise.

5. Remove and discard the CV joint boot retaining clamps.

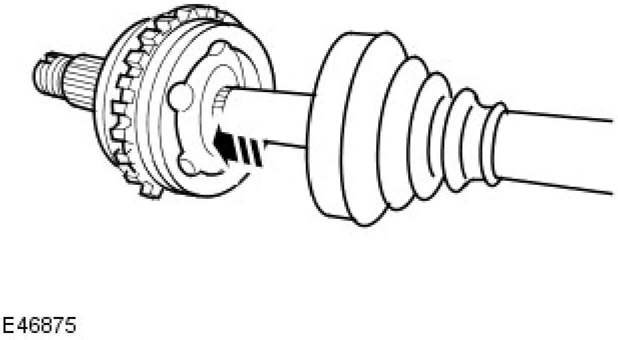


6. Slide the CV joint boot along the halfshaft to gain access to the joint.



7. Using a drift against the inner part of the CV joint, remove the CV joint from the halfshaft.

- Remove and discard the snap ring.



8. Remove the inner joint boot.

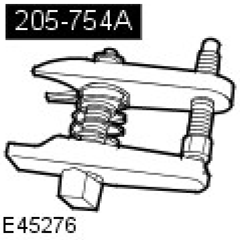
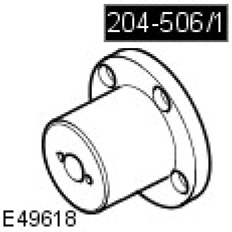
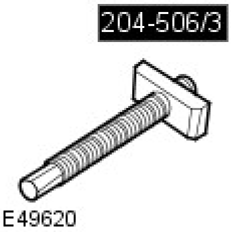
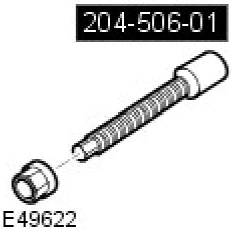
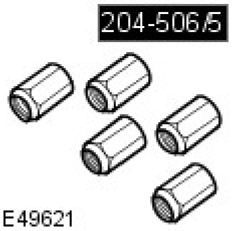
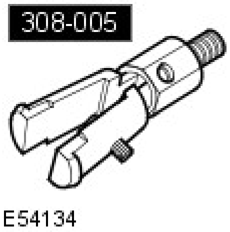
Installation

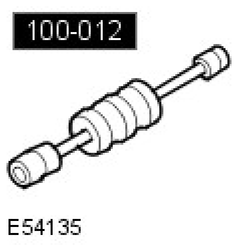
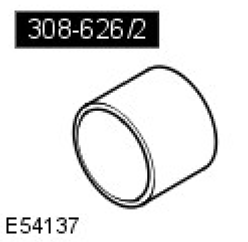
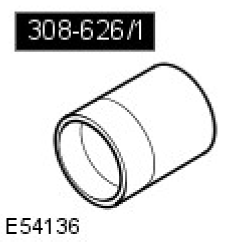
1. Clean the components.
2. Install the inner joint boot.
3. Install the inner joint.
    - Install a new snap ring.
    - Position the CV joint on the halfshaft, press the snap ring into it's groove and push the CV joint fully on to the halfshaft.
    - Pull on the CV joint to ensure the snap ring has fully engaged.
4. Pack the joint with the grease supplied.
5. Install the CV joint boot to the CV joint.
    - Secure with the new clamps.
6. Install the halfshaft.
   For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).
7. Install the wheel and tire.
    - Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Drive Halfshafts - Halfshaft Seal LH

Removal and Installation

Special Tool(s)	
 205-754A E45276	Ball joint separator (LRT-54-027) 205-754
 204-506/1 E49618	Halfshaft remover/replacer (LRT-60-030/1) 204-506/1
 204-506/3 E49620	Halfshaft remover/replacer (LRT-60-030/3) 204-506/3
 204-506-01 E49622	Halfshaft installer adapter 204-506-01
 204-506/5 E49621	Retainers - halfshaft remover/replacer (LRT-60-030/5) 204-506/5
 308-005 E54134	Axle oil seal remover (LRT-37-004/2) 308-005

 	Impulse extractor (LRT-99-004) 100-012
 	Installer/Guide halfshaft oil seal 308-626/2
 	Installer halfshaft oil seal 308-626/1

Removal

- CAUTIONS:

⚠ Do not store or install halfshafts with joints at maximum articulation or damage may occur to the joint

⚠ Do not allow halfshafts to hang unsupported at one end or joint damage will occur.

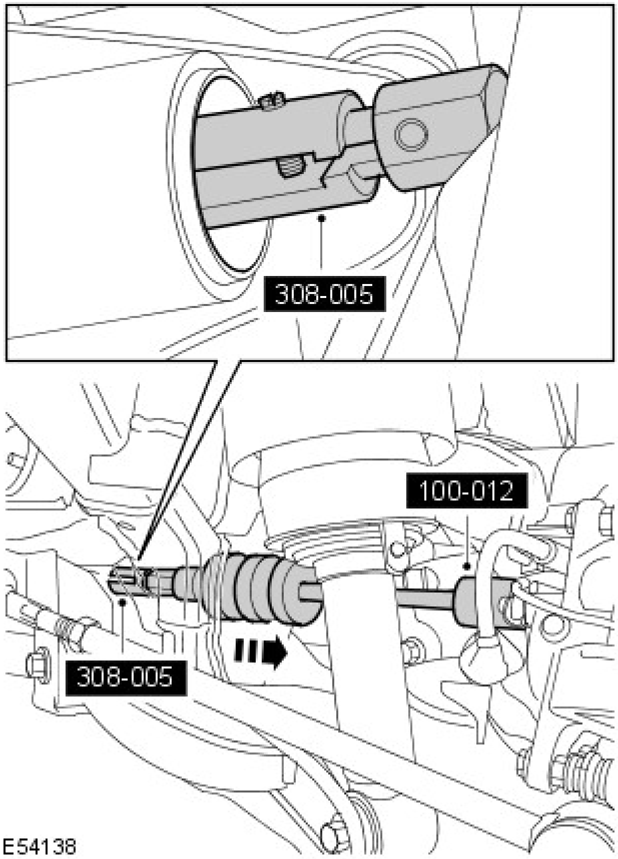
⚠ Angularly Adjusted Roller (AAR) joints, used at the inboard end of some halfshafts have no internal retaining mechanism and can separate.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the LH halfshaft.
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

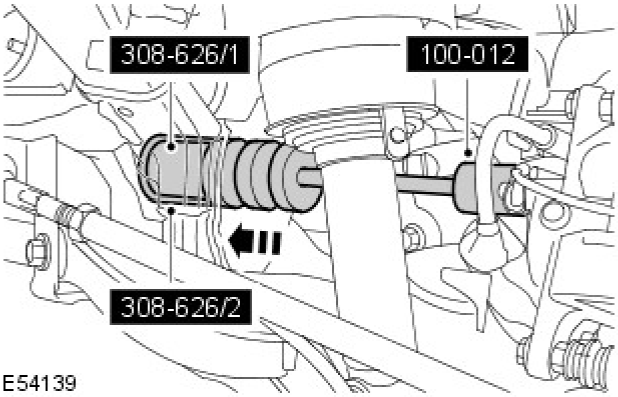
3. Using the special tools, remove and discard the halfshaft oil seal.


308-005
100-012
308-005
E54138

Installation

1. Using the special tools, install a new halfshaft oil seal.

- The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

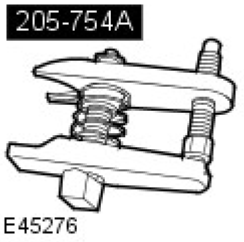
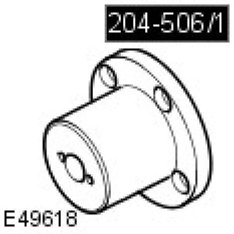
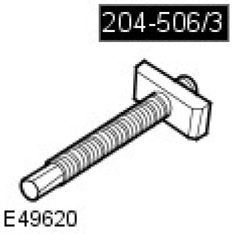
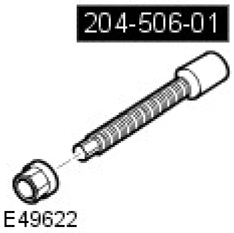
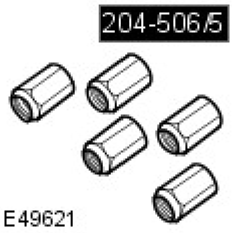
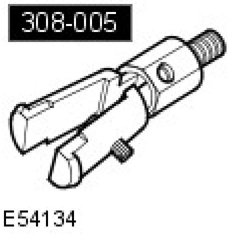

308-626/1
100-012
308-626/2
E54139

2. Install the LH halfshaft.
For additional information, refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

Published: 11-May-2011

Front Drive Halfshafts - Halfshaft Seal RH

Removal and Installation

Special Tool(s)	
 205-754A E45276	Ball joint separator (LRT-54-027) 205-754
 204-506/1 E49618	Halfshaft remover/replacer (LRT-60-030/1) 204-506/1
 204-506/3 E49620	Halfshaft remover/replacer (LRT-60-030/3) 204-506/3
 204-506-01 E49622	Halfshaft installer adapter 204-506-01
 204-506/5 E49621	Retainers - halfshaft remover/replacer (LRT-60-030/5) 204-506/5
 308-005 E54134	Axle oil seal remover (LRT-37-004/2) 308-005

100-012 E54135	Impulse extractor (LRT-99-004) 100-012
308-626/2 E54137	Installer/Guide halfshaft oil seal 308-626/2
308-626/1 E54136	Installer halfshaft oil seal 308-626/1

Removal

- CAUTIONS:

⚠ Angularly Adjusted Roller (AAR) joints, used at the inboard end of some halfshafts have no internal retaining mechanism and can separate.

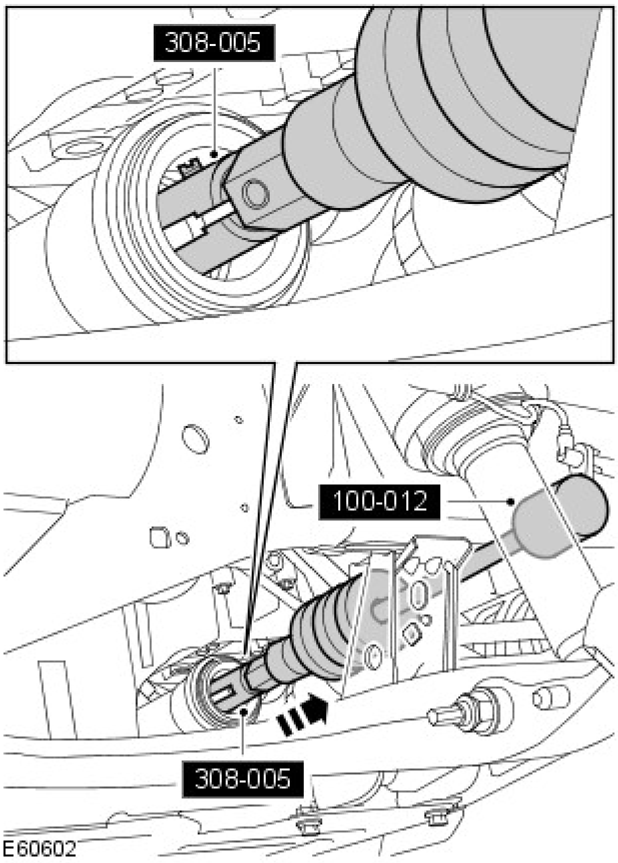
⚠ Do not allow halfshafts to hang unsupported at one end or joint damage will occur.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

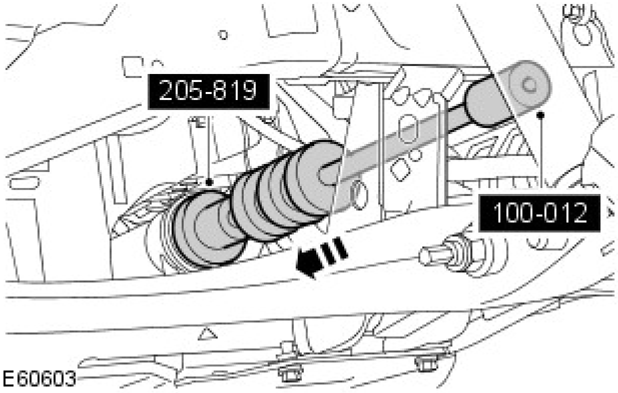
2. Remove the RH halfshaft.
For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

3. Using the special tools, remove and discard the halfshaft oil seal.


308-005
100-012
308-005
E60602

Installation

1. Using the special tools, install a new halfshaft oil seal.


205-819
100-012
E60603

2. Install the RH halfshaft.
For additional information, refer to: Front Halfshaft RH (205-04 Front Drive Halfshafts, Removal and Installation).

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Rear Drive Halfshafts -

Recommended Lubricant

Item	Specification
Outboard joint	Use grease supplied with replacement boot kit (Optimol MS139G)
Inboard joint	Use grease supplied with replacement boot kit (Thermax MS141G)

General Specification

Item	Specification
Type	Fully floating, solid shafts incorporating plunging constant velocity joint at inboard end and fixed constant velocity joint at outboard end of shaft

Torque Specifications

Description	Nm	lb-ft
* Lower arm to wheel knuckle nut	275	203
Toe link bolt	175	129
*+ Halfshaft nut	350	258
Road wheel nuts	140	103

*** New nut must be fitted**

+ Stake nut on completion

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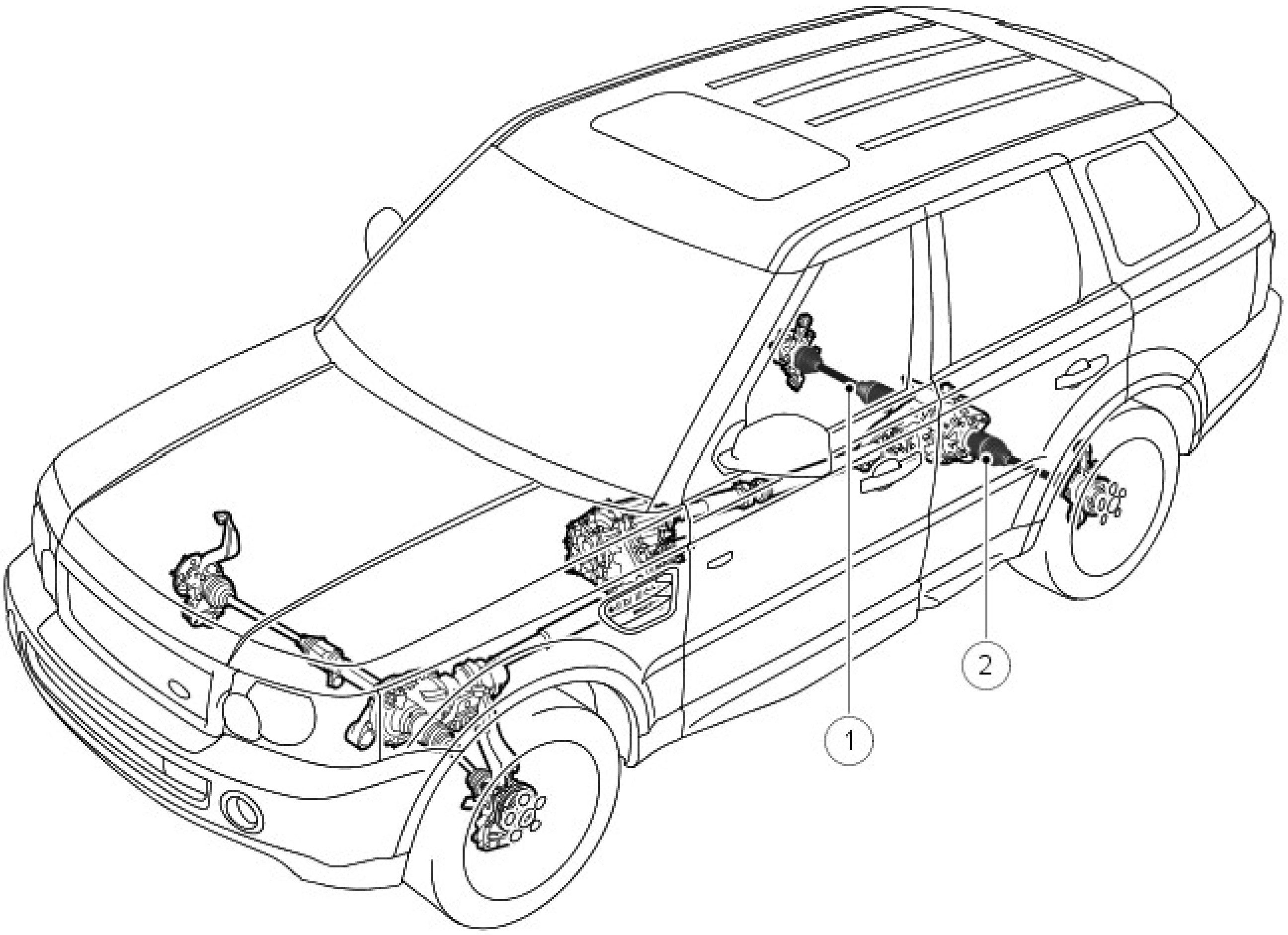
Rear Drive Halfshafts - Rear Drive Halfshafts

Description and Operation

Rear Drive Halfshaft Component Locations



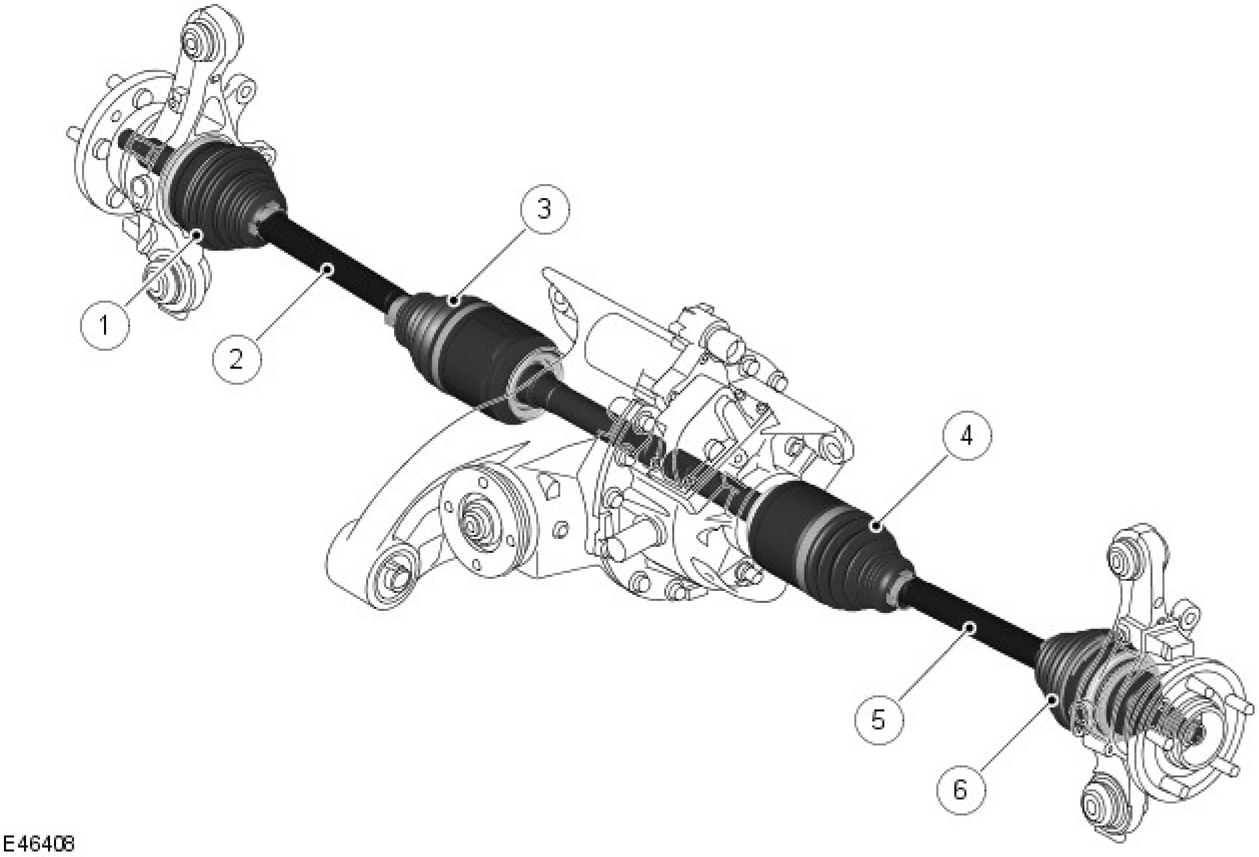
E56496

Item	Part Number	Description
1	-	RH rear drive halfshaft
2	-	LH rear drive halfshaft

GENERAL

The rear drive halfshafts are identical in their construction with a Constant Velocity (CV) joint at each end to allow for suspension movement.

REAR DRIVE SHAFT ASSEMBLY



Item	Part Number	Description
1	-	RH outer CV joint
2	-	RH rear drive halfshaft
3	-	RH inner CV joint
4	-	LH inner CV joint
5	-	LH rear drive halfshaft
6	-	LH outer CV joint

Each outer CV joint has a target wheel on the outer diameter. The ABS wheel speed sensor for vehicle and wheel speed calculations uses this target.

Each rear drive halfshaft comprises two CV joints (inner and outer), boots and a solid barshaft, which is retained in the rear differential by a circlip.

The CV joints used on the rear drive halfshafts share the same design and operating principles as the front drive halfshafts CV joints (see 'Halfshaft Joint' section for more information on CV joints). Peening over the lip of the joint body retains the rear drive halfshaft inner joint hubs.

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Rear Drive Halfshafts - Rear Drive Halfshafts

Diagnosis and Testing

For additional information,
REFER to: Driveline System (205-00 Driveline System - General Information, Diagnosis and Testing).

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Rear Drive Halfshafts - Outer Constant Velocity (CV) Joint Boot

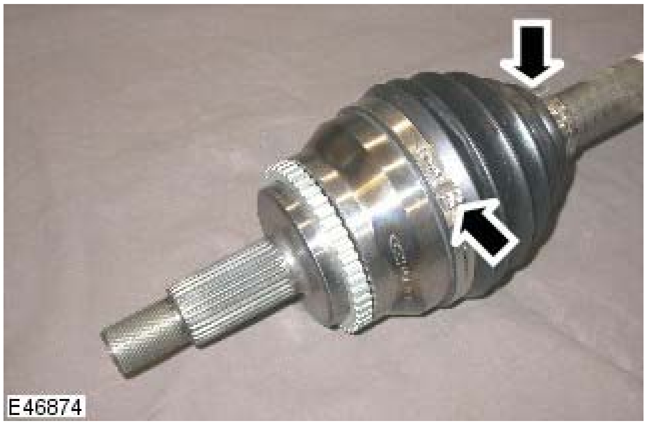
Removal and Installation

Removal

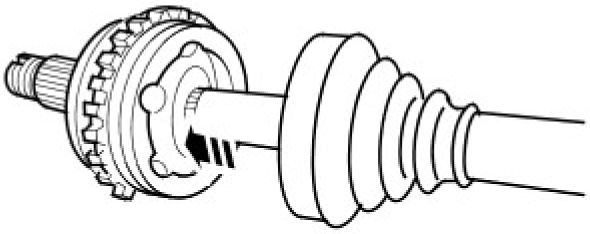
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the wheel and tire.
3. Remove the halfshaft.
   For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).
4. Clamp the halfshaft in a vise.
5. Remove and discard the CV joint boot retaining clamps.



6. Slide the CV joint boot along the halfshaft to gain access to the joint.
7. Using a drift against the inner part of the CV joint, remove the CV joint from the halfshaft.
   - Remove and discard the snap ring.


E46875

8. Remove the outer CV joint boot.

Installation

1. Clean the components.
2. Install the CV joint boot.
3. Install the outer CV joint.
   - Install the snap ring.
   - Position the CV joint on the halfshaft, press the snap ring into it's groove and push the CV joint fully on to the halfshaft.
   - Pull on the CV joint to ensure the snap ring has fully engaged.
4. Pack the CV joint with the grease supplied.
5. Install the CV joint boot to the CV joint.
   - Secure with the new clamps.
6. Install the halfshaft.

For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

7. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

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Rear Drive Halfshafts - Inner Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

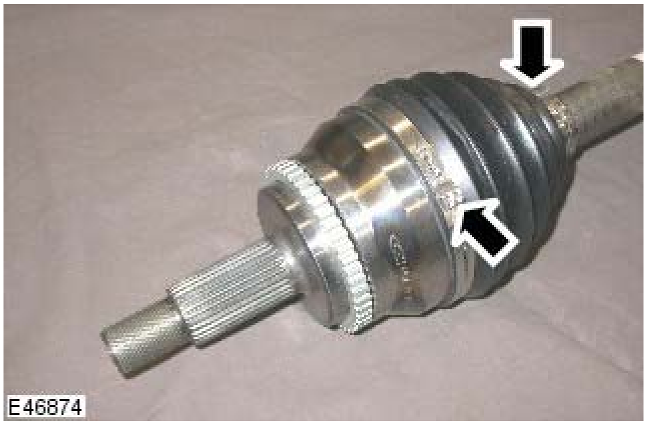
   Raise and support the vehicle.

2. Remove the wheel and tire.

3. Remove the halfshaft.
   For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

4. Clamp the halfshaft in a vise.

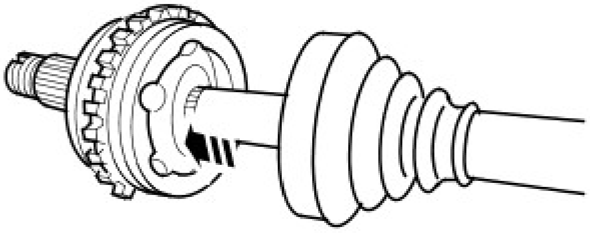
5. Remove and discard the CV joint boot retaining clamps.



6. Slide the CV joint boot along the halfshaft to gain access to the joint.

7. Using a drift against the inner part of the CV joint, remove the CV joint from the halfshaft.

   - Remove and discard the snap ring.



E46875

8. Remove the inner CV joint boot.

Installation

1. Clean the components.

2. Install the inner CV joint boot.

3. Install the inner joint.

   - Install a new snap ring.
   - Position the CV joint on the halfshaft, press the snap ring into it's groove and push the CV joint fully on to the halfshaft.
   - Pull on the CV joint to ensure the snap ring has fully engaged.

4. Pack the joint with the grease supplied.

5. Install the boot to the joint.

   - Secure with the new clamps.

6. Install the halfshaft.

For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

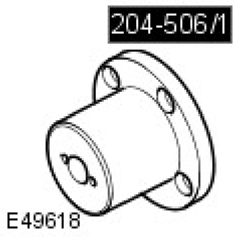
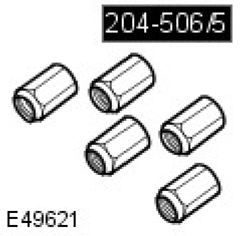
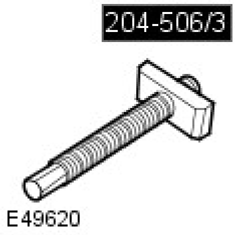
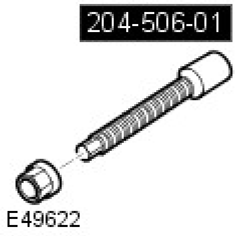
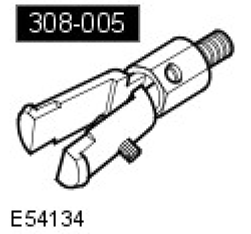
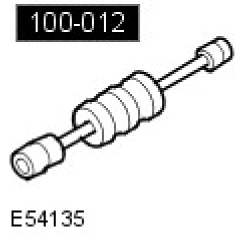
7. Install the wheel and tire.

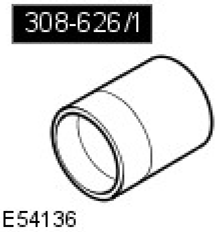
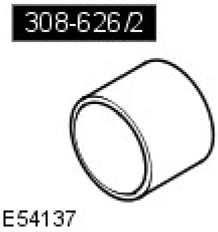
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 18-May-2011

Rear Drive Halfshafts - Rear Halfshaft

Removal and Installation

Special Tool(s)	
 204-506/1 E49618	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
 204-506/5 E49621	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
 204-506/3 E49620	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
 204-506-01 E49622	Halfshaft installer adapter 204-506-01(LRT-60-030/4)
 308-005 E54134	Axle oil seal remover 308-005(LRT-37-004/2)
 100-012 E54135	Impulse extractor 100-012(LRT-99-004)

	Installer halfshaft oil seal 308-626/1
	Installer/Guide halfshaft oil seal 308-626/2

Removal

- CAUTIONS:

⚠ Do not allow halfshafts to hang unsupported at one end or joint damage will occur.

⚠ Do not store or install halfshafts with joints at maximum articulation or damage may occur to the joint.

⚠ Angularly Adjusted Roller (AAR) joints, used at the inboard end of some halfshafts have no internal retaining mechanism and can separate.

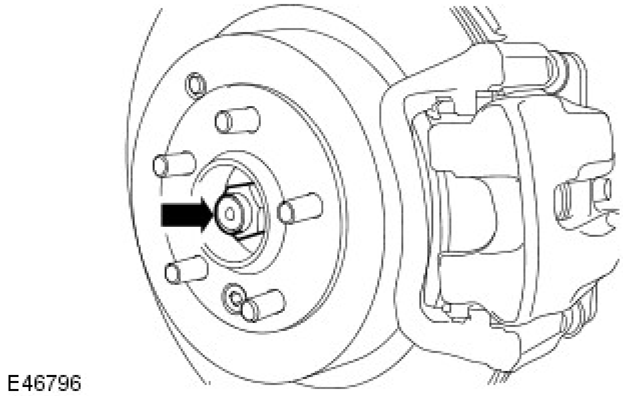
⚠ Do not undo or remove the large protruding hexagon on the differential casing.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Drain the differential lubricant.
For additional information, refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

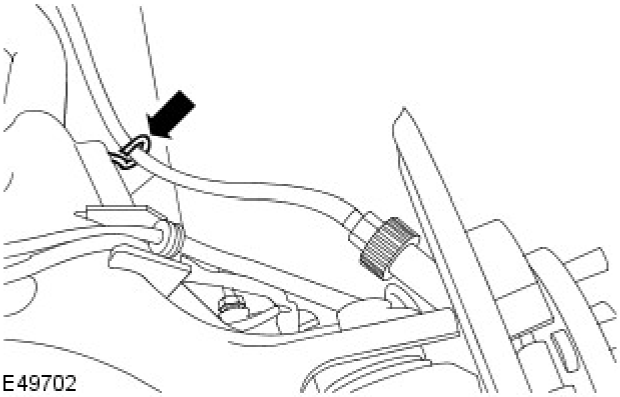
3. Remove the wheel and tire.



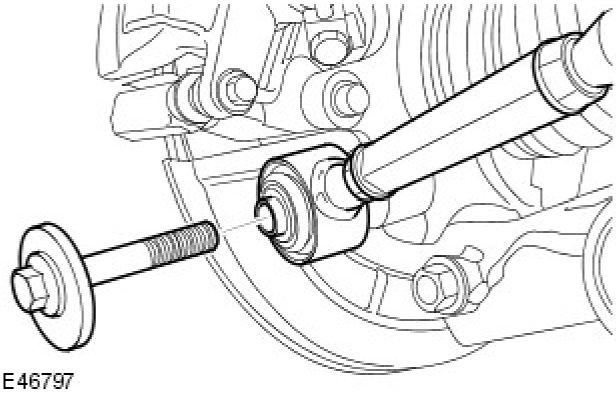
4. Loosen the halfshaft retaining nut.

- Discard the nut.

5. Remove the stabilizer bar link.
For additional information, refer to: Rear Stabilizer Bar Link (204-02 Rear Suspension, Removal and Installation).

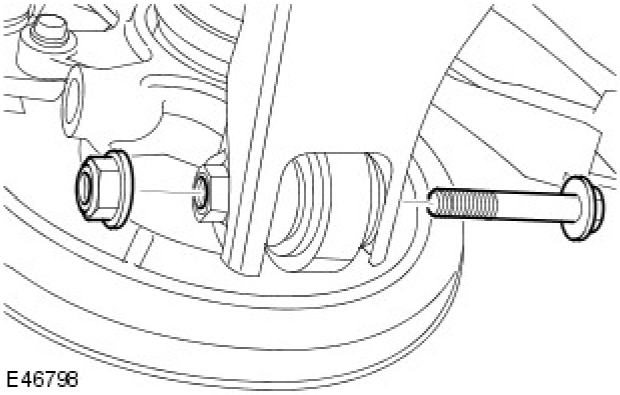


6. Release the parking brake cable from the lower arm.



7. Disconnect the toe link.

- Remove the bolt.

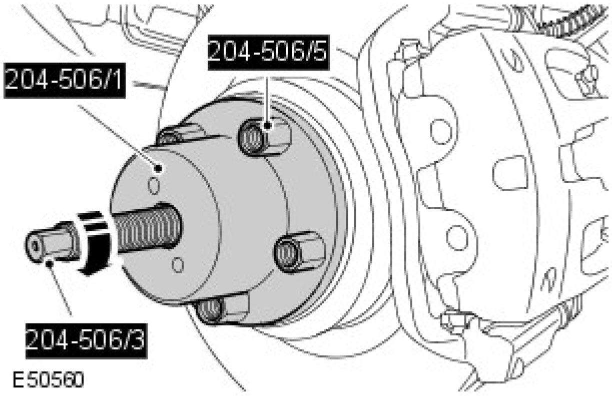


8. Remove and discard the halfshaft retaining nut.

9. ⚠ CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

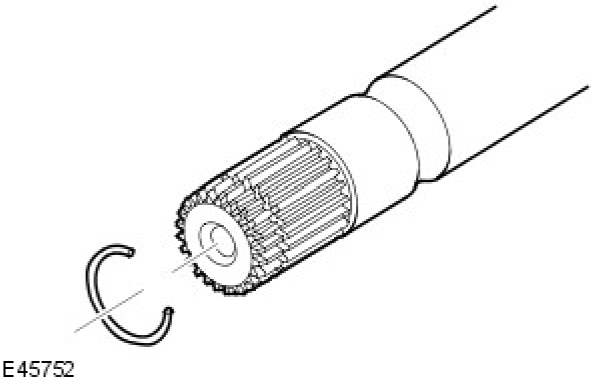
Release the knuckle from the lower arm.

- Remove the bolt.



10. ⚠ CAUTION: Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Using the special tools, release the halfshaft from the wheel hub.

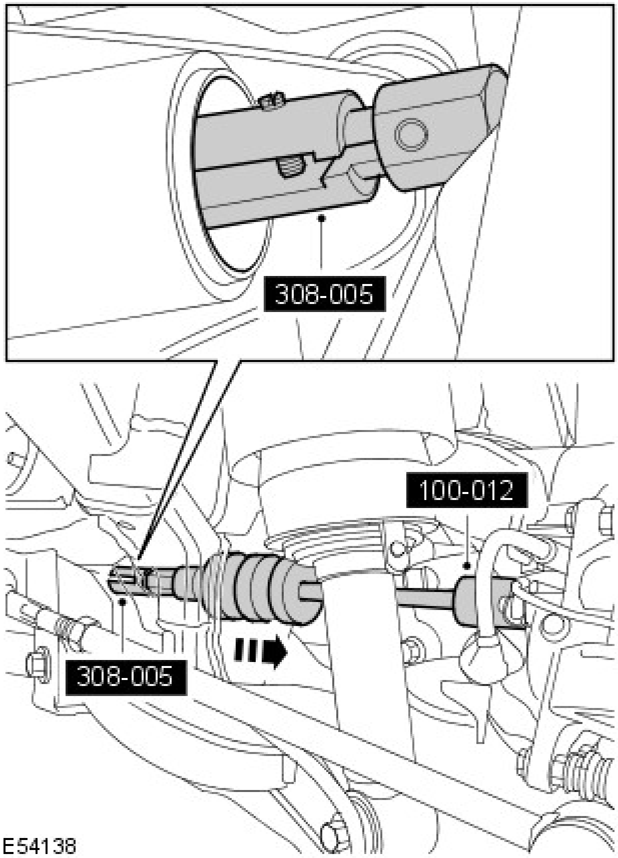


11. Position a container to collect the oil spillage.

12. Release the halfshaft from the differential housing.

13. With assistance, remove the halfshaft.

- Remove and discard the snap ring.


308-005
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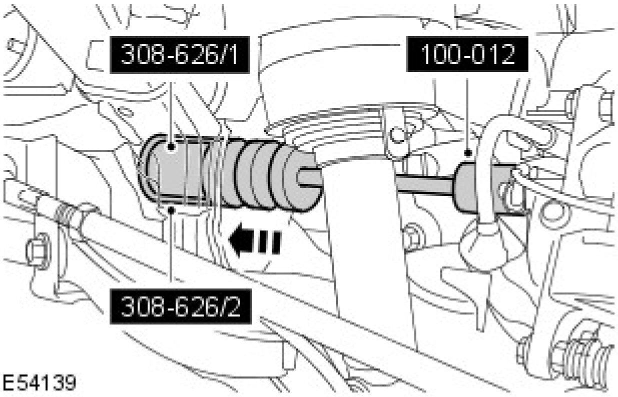
14. Using the special tools, remove and discard the halfshaft oil seal.

Installation

1. Clean the components.

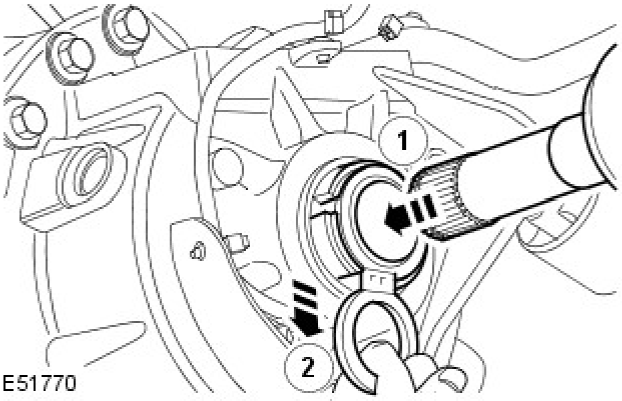


2. Using the special tools, install a new halfshaft oil seal.

- The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

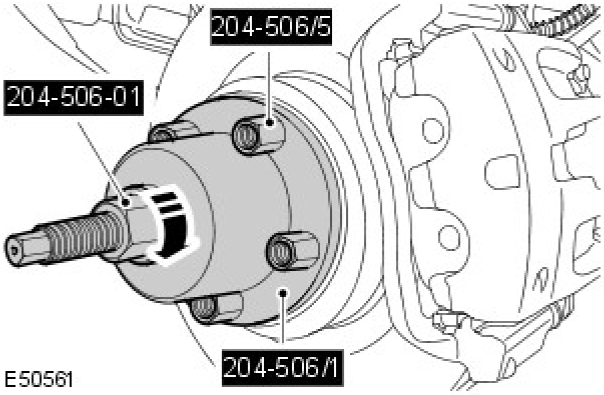
3. With assistance, install the halfshaft.

- Install the snap ring.
- Open the halfshaft oil seal protector.
- Make sure the snap ring is fully engaged and retains the halfshaft.



4. NOTE: The oil seal protector is designed to break into two pieces.

Remove and discard the halfshaft oil seal protector.



5. Using the special tools, install the halfshaft in the wheel hub.

6. CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

7. CAUTION: Install the halfshaft nut finger tight.

Install a new halfshaft retaining nut and lightly tighten.

Connect the lower arm to the wheel knuckle.

8. Connect the toe link.

- Tighten to 275 Nm (203 lb.ft).
- Tighten the bolt to 175 Nm (129 lb.ft).
- Tighten the new nut to 275 Nm (203 lb.ft).

9. Secure the parking brake cable to the lower arm.

10. Install the stabilizer bar link.
For additional information, refer to: Rear Stabilizer Bar Link
(204-02 Rear Suspension, Removal and Installation).

11. ⚠ CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Tighten the new halfshaft retaining nut to 350 Nm (258 lb.ft).

- Stake the nut to the halfshaft.

12. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

13. ⚠ CAUTION: Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, and not to act as a level indicator.

Fill the differential with the correct amount of lubricant.
For additional information, refer to: Differential Draining and Filling
(205-02 Rear Drive Axle/Differential, General Procedures).

Published: 11-May-2011

Brake System - General Information -

Brake Hydraulic Fluid

Item	Specification
* Recommended hydraulic fluid	SHELL DONAX YB DOT4 ESL FLUID

⚠ CAUTION: * If the above fluid is not available, use a low viscosity DOT 4 brake fluid meeting ISO 4925 Class 6 and Land Rover LRES22BF03 requirements.

General Specification

Item	Specification
Footbrake type:	
Vehicles without Brembo Brakes	Hydraulic, servo assisted, self-adjusting with front/rear split hydraulic system, twin piston sliding calipers to the front and single piston sliding calipers to the rear
Vehicles with Brembo Brakes	Hydraulic, servo assisted, self-adjusting with front/rear split hydraulic system, opposed four piston calipers to the front and single piston sliding calipers to the rear
Parking brake type	Twin shoe (leading/trailing) operating on rear wheels and controlled from electric park brake actuator via twin cables

Sealant

Application	Land Rover Part Number
Brake vacuum pump - 2.7 Litre engine	8510302

Published: 11-May-2011

Brake System - General Information - Brake System

Diagnosis and Testing

Principle of Operation

The brake system is a fairly straightforward design requiring no specialized techniques for diagnosis.

For information on the description and operation of the system, refer to the relevant section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
    - If a road test is necessary make sure the vehicle is safe to do so.
2. **2.** Visually inspect for obvious mechanical faults.

Visual inspection

Mechanical
• Brake pad(s) condition and installation • Brake caliper(s) condition and installation • Brake disc(s) condition and installation • Parking brake disc(s)/parking brake drum(s) condition and installation • Parking brake shoes condition and installation • Parking brake cable(s) condition and installation • Brake booster condition and installation • Brake booster vacuum hose condition and installation • Brake master cylinder condition and installation • Hydraulic control unit (HCU) • Brake fluid leaks • Brake warning indicator

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart.
    - For a list of diagnostic trouble codes (DTCs) referring to the anti-lock brake system, refer to section 206-09 - Traction Control in the workshop manual.
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Brake noise	• Debris • Brake pads • Brake disc(s)	Refer to the relevant section of the workshop manual.
Brake vibration	• Suspension components • Brake disc(s)	Refer to the relevant section of the workshop manual.
Excessive brake pedal travel/brake pedal spongy	• Brake pads • Air in the brake system • Brake master cylinder • Brake fluid leak (see visual inspection)	Worn pads may make the pedal travel excessive, new pads may make the pedal spongy. Check after bedding in the pads. Check the pedal travel. If the pedal "pumps-up", suspect air in the system. Check for a cause for air ingress, rectify as necessary. If the pedal sinks to the floor when held under pressure when there are no external leaks, suspect a master cylinder fault. Refer to the relevant section of the workshop manual.
Excessive brake pedal effort/brake pedal hard	• Brake pipe(s) • Brake caliper slide(s) • Brake caliper piston(s) • Brake vacuum	Check for damaged brake pipes. Check the brake calipers. Check the brake vacuum pipe for air leaks, rectify as necessary. Check the brake vacuum pump operation. Refer to the relevant section of the workshop manual. Check the brake booster.

Symptom	Possible causes	Action
	pipe ● Brake vacuum pump ● Brake booster	
Low foot brake efficiency/brakes pulling/sticking/binding	● Brake pipe(s) ● Pads ● Brake caliper piston(s) ● Brake caliper slide(s) ● Brake disc(s)	Check the vehicle for damaged brake pipes. Inspect the brake pads. Check the brake calipers. Check the brake discs. Refer to the relevant section of the workshop manual.
Parking brake will not engage or release	● Parking brake cables ● Parking brake shoes ● Parking brake adjusters ● Rear brake disc(s)/parking brake drum(s) ● Parking brake actuator malfunction	Check the parking brake cable(s) for operation/condition. Check that the cable end connector(s) are correctly installed to the operating lever(s). Inspect the parking brake shoes for wear. Check the parking brake shoes for correct adjustment. Check the rear brake disc(s)/parking brake drum(s). Check the parking brake actuator for damage and/or excessive noise in normal operation. Refer to the relevant section of the workshop manual.
Low parking brake efficiency/parking brake sticking/binding		
Brake warning indicator staying illuminated	● Brake reservoir fluid level ● Brake pads ● Brake pad wear sensor leads ● Brake fluid level sensor	Check the brake fluid level, top up if required. Inspect the brake pads. Check the brake pad sensor circuit. Refer to the electrical guides. Check the function of the brake fluid level sensor. Refer to the relevant section of the workshop manual.

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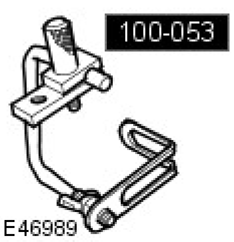
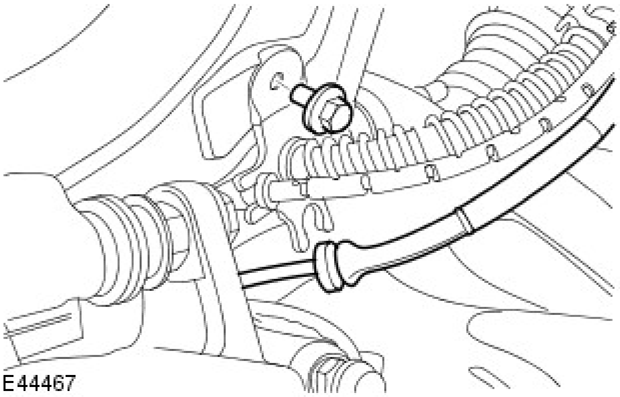
Brake System - General Information - Front Brake Disc Runout CheckVehicles With: Standard Brakes

General Procedures

Special Tool(s)	
	Dial indicator gauge holding fixture 100-053 (LRT-99-503)

⚠CAUTION: Brake discs must be renewed in pairs, unless one disc requires changing before 1000 miles (1500 kilometers) from new.

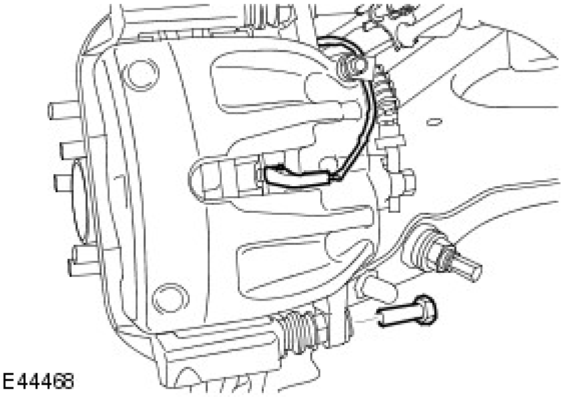


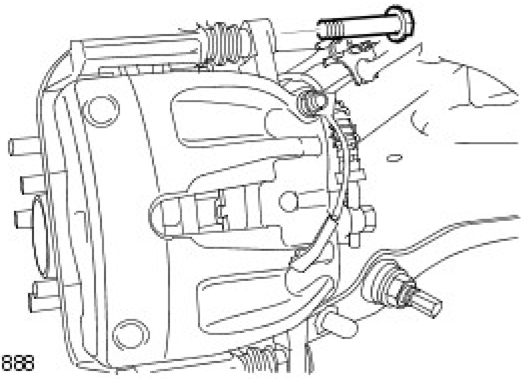
1. Release the brake hose bracket from the wheel knuckle.
   - Remove the bolt.

2. ⚠CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

   LH side only: Disconnect the brake pad wear indicator sensor.

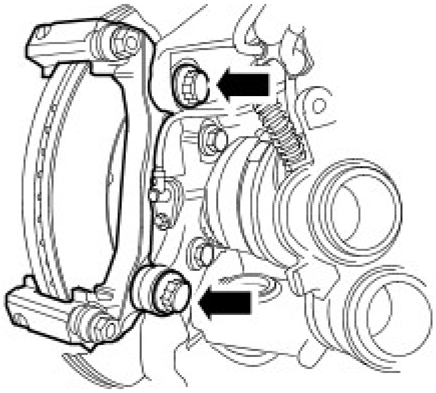
3. Remove the brake caliper lower bolt.





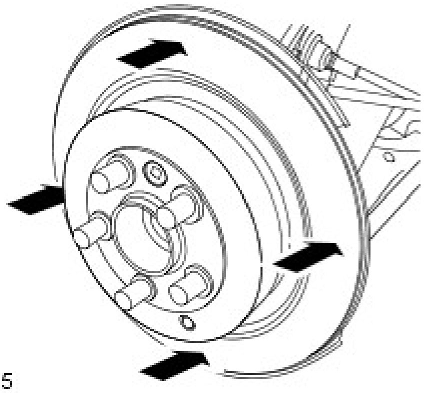
4. Remove the brake caliper upper bolt.

5. Tie the brake caliper housing aside.



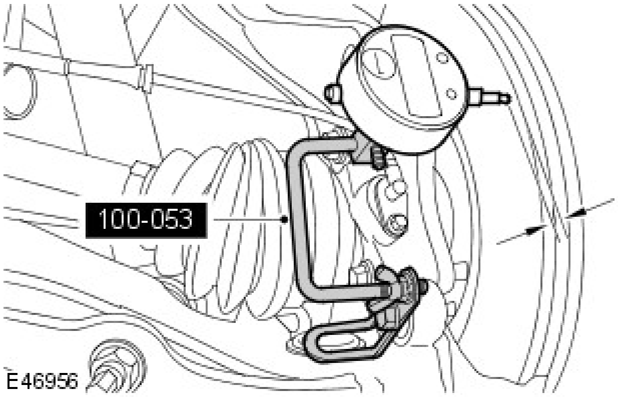
6. Remove the brake caliper anchor plate.

- Remove the 2 bolts.



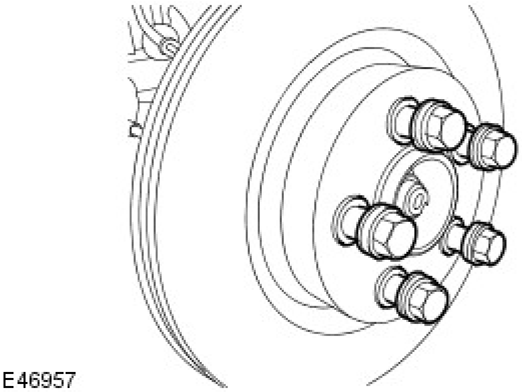
7. Measure the brake disc thickness at four points around the brake disc.

- Renew the brake disc if the thickness is less than the service limit, or if the maximum thickness variation is exceeded. Brake disc thickness, NEW = 30 mm, Service limit = 27 mm.



8. Using the special tool, install a dial indicator gauge to the brake caliper lower mounting.

- Position the dial indicator gauge plunger 5 mm in from the outer edge of the brake disc.



9. Install the wheel nuts.

- Install spacer washers under the wheel nuts.
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

10. Rotate the brake disc one revolution to measure the brake disc run-out.

- Brake disc run-out must not exceed 0.05 mm.

11. If the brake disc run-out is outside the limit. Remove the brake disc.

12. Make sure the brake disc and hub mating surfaces are clean.

13. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

14. Install the wheel nuts.

- Install spacer washers under the wheel nuts.
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

15. Rotate the brake disc one revolution to measure the brake disc run-out.

- Brake disc run-out must not exceed 0.05 mm.

16. If the brake disc run-out is still outside the limit, install a new brake disc and/or hub.

17. Remove the dial indicator gauge and the special tool.

18. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the caliper housing and anchor plate using brake cleaning fluid.

19. Install the anchor plate.

- Tighten the bolts to 275 Nm (203 lb.ft).

20. Install the brake caliper housing and fit the top bolt.

- Tighten the bolt to 32 Nm (24 lb.ft).

21. Install the brake pads.

- Install the two clips.

22. Rotate the brake caliper downwards.

- Tighten the bolt to 32 Nm (24 lb.ft).

23. Connect the brake pad wear indicator sensor.

24. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

25. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

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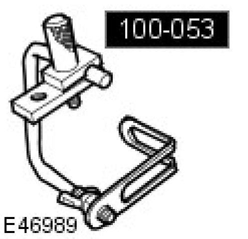
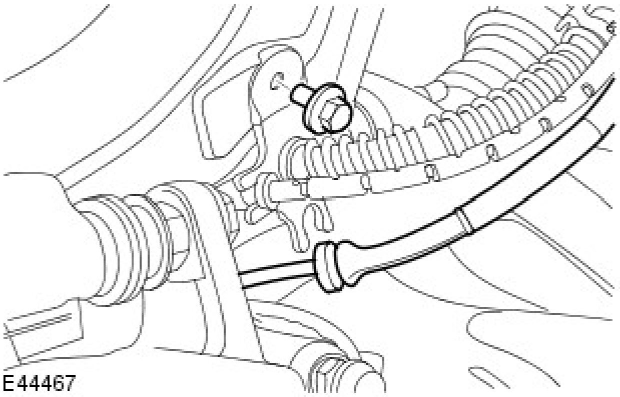
Brake System - General Information - Front Brake Disc Runout CheckVehicles With: High Performance Brakes

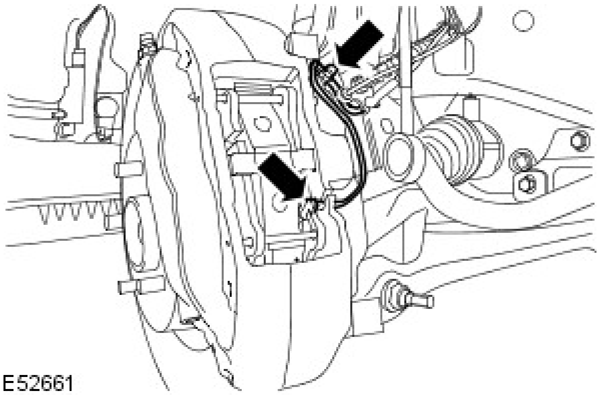
General Procedures

Special Tool(s)	
	Dial indicator gauge holding fixture 100-053 (LRT-99-503)



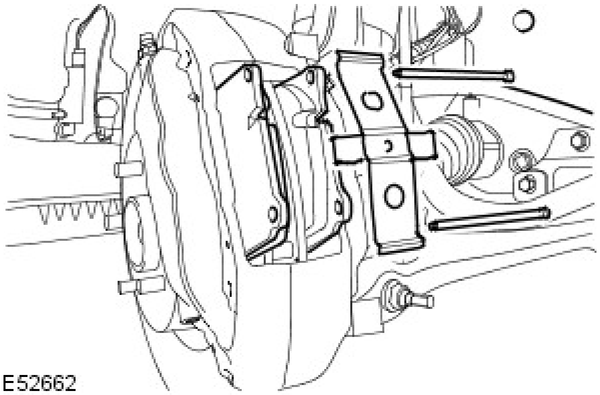
1. Release the brake hose bracket from the wheel knuckle.

- Remove the bolt.



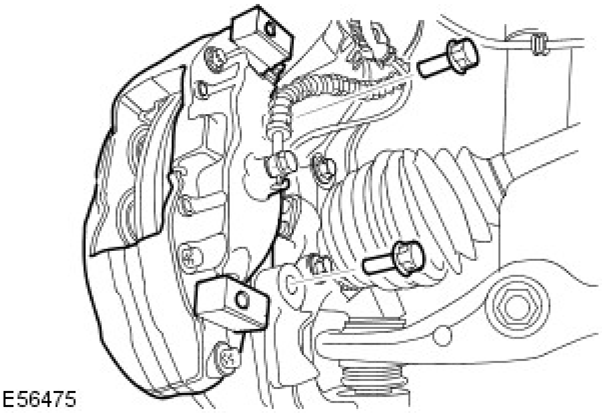
2. LH side only: Disconnect the brake pad wear indicator sensor.

- Release the lead from the clips.



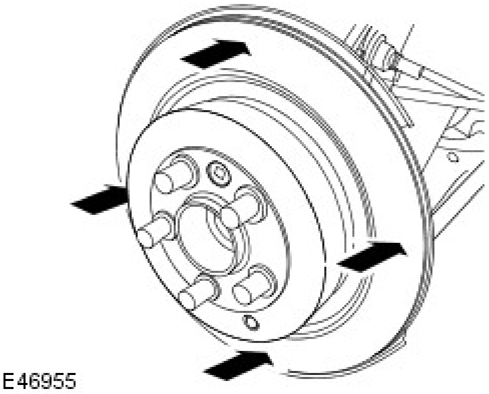
3. Remove the brake pads.

- Remove the 2 retaining pins.
- Remove the anti-rattle spring.
- Withdraw the brake pads.


E56475

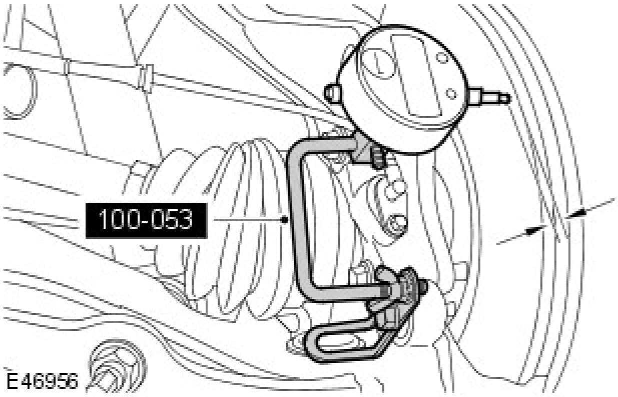
4. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper and tie aside.


E46955

5. Measure the brake disc thickness at 4 points around the brake disc.

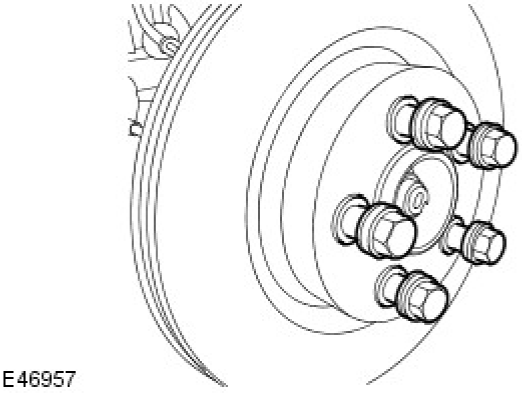
- Renew the brake disc if the thickness is less than the service limit, or if the maximum thickness variation is exceeded. Brake disc thickness, NEW = 30 mm, Service limit = 27 mm.



E46956

6. Using the special tool, install a dial indicator gauge to the brake caliper lower mounting.

- Position the dial indicator gauge plunger 5 mm in from the outer edge of the brake disc.


E46957

7. Install the wheel nuts.

- Install spacer washers under the wheel nuts.
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

8. Rotate the brake disc one revolution to measure the brake disc run-out.

- Brake disc run-out must not exceed 0.05 mm.

9. If the brake disc run-out is outside the limit. Remove the brake disc.

10. Make sure the brake disc and hub mating surfaces are clean.

11. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

12. Install the wheel nuts.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).
- Install spacer washers under the wheel nuts.

13. Rotate the brake disc one revolution to measure the brake disc run-out.

- Brake disc run-out must not exceed 0.05 mm.

14. If the brake disc run-out is still outside the limit, install a new brake disc and/or hub.

15. Remove the dial indicator gauge and the special tool.

16. Secure the brake caliper to the wheel knuckle.

- Tighten the bolts to 275 Nm (203 lb.ft).

17. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 23 Nm (17 lb.ft).

18. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the components.

19. Inspect the caliper piston seals for damage.

20. Position a bleed jar containing a small quantity of approved brake fluid. Connect the bleed tube to the bleed screw and loosen the screw.

21. Press the pistons into the caliper housing.

- Tighten the bleed screw to 19 Nm (14 lb.ft).

22. Repeat the above process for the other 2 pistons.

23. Disconnect the bleed tube and remove the jar.

24. Install the brake pads.

- Position the anti-rattle spring.
- Install the pins, making sure the pin collets are fully engaged in the caliper.

25. LH side only: Connect the brake pad wear indicator sensor.

- Secure the lead in the clips.

26. Install the wheels and tires.

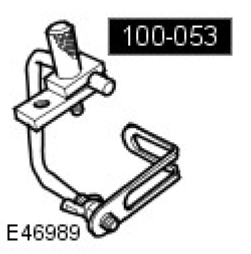
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

27. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

Published: 11-May-2011

Brake System - General Information - Rear Brake Disc Runout Check

General Procedures

Special Tool(s)	
	Dial indicator gauge holding fixture 100-053 (LRT-99-503)

• NOTE: If the parking brake shoes or the brake discs have been removed for access to other components then DO NOT carry out the bedding in procedure.

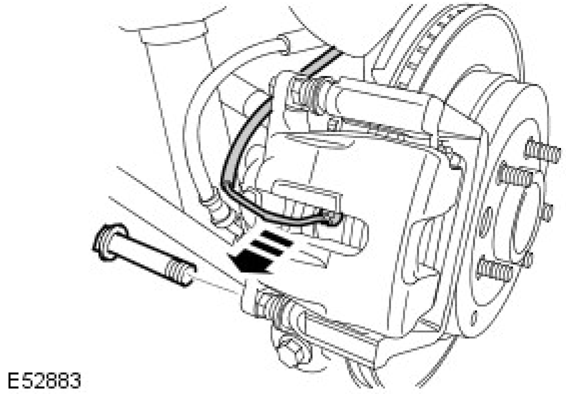
1. CAUTION: Do not turn the ignition on when the parking brake service mode has been set, this will result in the parking brake being released from the service mode.

Enter the parking brake into the service mode.

- Turn the ignition key to position II.
- Apply, and hold, the footbrake.
- Apply, and hold, the parking brake switch to the RELEASE position.
- Turn the ignition key to position '0' and remove the key.
- Release the footbrake.
- Release the parking brake switch.

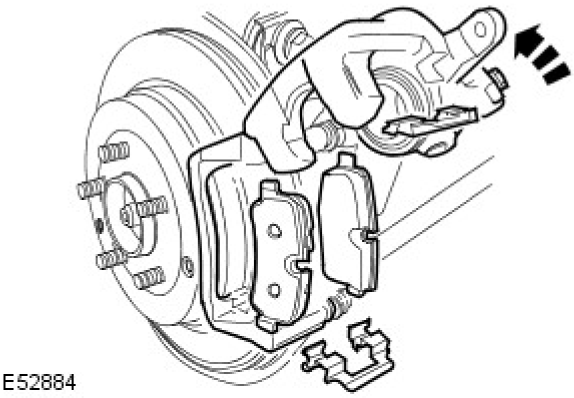
2. CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

RH side only: Disconnect the brake pad wear indicator sensor.



E52883

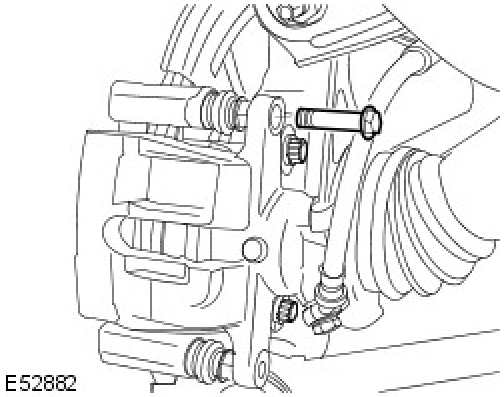
3. Remove the brake caliper lower bolt.



E52884

4. Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the two clips.



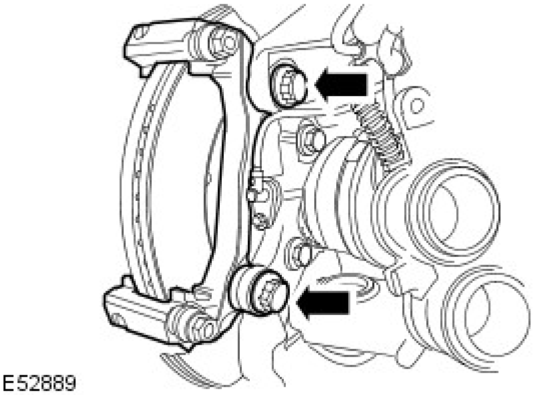
E52882

5. Remove the brake caliper upper bolt.

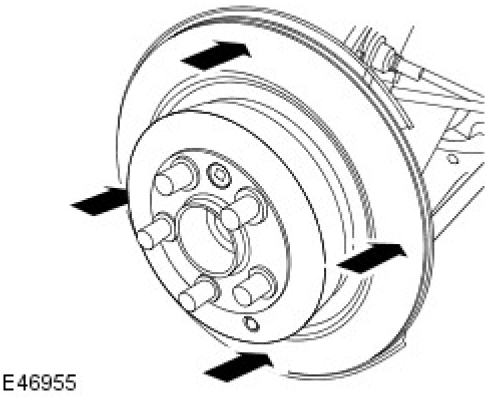
6. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

Tie the brake caliper housing aside.

7. Remove the brake caliper anchor plate.

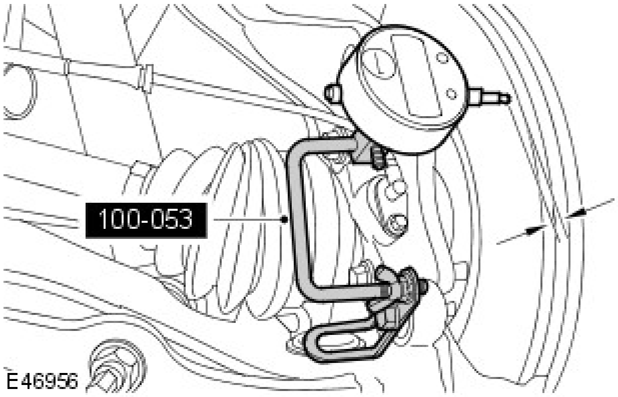


E52889



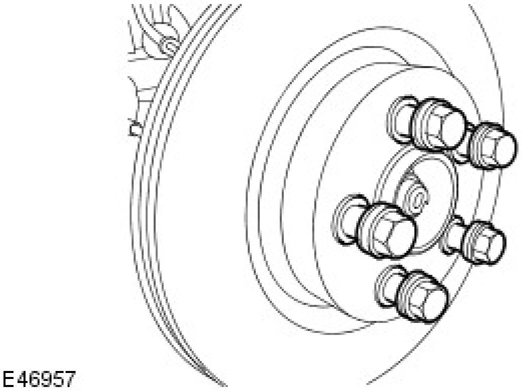
8. Measure the brake disc thickness at four points around the brake disc.

- Renew the brake disc if the thickness is less than the service limit, or if the maximum thickness variation is exceeded. Brake disc thickness, NEW = 20 mm, Service limit = 17 mm.



9. Using the special tool, install a dial indicator gauge to the brake caliper lower mounting.

- Position the dial indicator gauge plunger 5 mm in from the outer edge of the brake disc.



10. Install the wheel nuts.

- Install spacer washers under the wheel nuts.
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Rotate the brake disc one revolution to measure the brake disc run-out.

- Brake disc run-out must not exceed 0.09 mm.

12. If the brake disc run-out is outside the limit. Remove the brake disc.

13. Make sure the brake disc and hub mating surfaces are clean.

14. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

15. Install the wheel nuts.

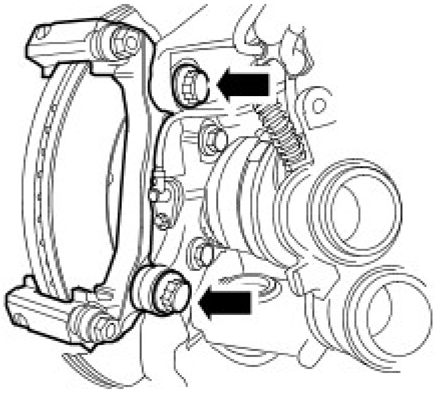
- Install spacer washers under the wheel nuts.
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

16. Rotate the brake disc one revolution to measure the brake disc run-out.

- Brake disc run-out must not exceed 0.09 mm.

17. If the brake disc run-out is still outside the limit, install a new brake disc and/or hub.

18. Remove the dial indicator gauge and the special tool.



E52889

19. Install the anchor plate.

- Tighten the bolts to 115 Nm (85 lb.ft).

20. Install the brake caliper housing and fit the top bolt.

- Tighten the bolt to 32 Nm (24 lb.ft).

21. Install the brake pads.

- Install the 2 clips.
- Install the two clips.

22. Rotate the brake caliper downwards.

- Tighten the bolt to 32 Nm (24 lb.ft).

23. Connect the brake pad wear indicator sensor.

24. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

Brake System - General Information - Brake System BleedingVehicles With: Standard Brakes

General Procedures

WARNING: If any components upstream of the Hydraulic Control Unit (HCU), including the HCU itself are replaced, the brake system must be bled using the procedure on T4. This will ensure that all air is expelled from the new component(s).

• NOTE: Bleeding of the brake system can be carried out using the procedures given on T4, or by using the procedure below. The following procedure covers bleeding the brake system if components downstream of the HCU have been replaced.

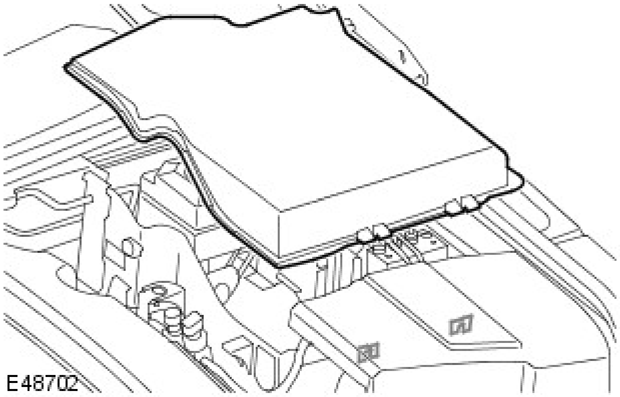
• NOTE: Where only the primary or secondary brake circuits have been disturbed in isolation, it should only be necessary to bleed that circuit. Partial bleeding of the hydraulic system is only permissible if a brake tube or hose has been disconnected with only minimal loss of fluid.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Check that all the brake line connections are tight and that there are no signs of leaks. If any leak of brake fluid is observed, investigate and rectify the cause of the leak before bleeding the brakes.

3. Pump the brake pedal until the brake vacuum assistance is exhausted.


E48702

4. Remove the plenum chamber panel.

- Release the 2 clips.

5. WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

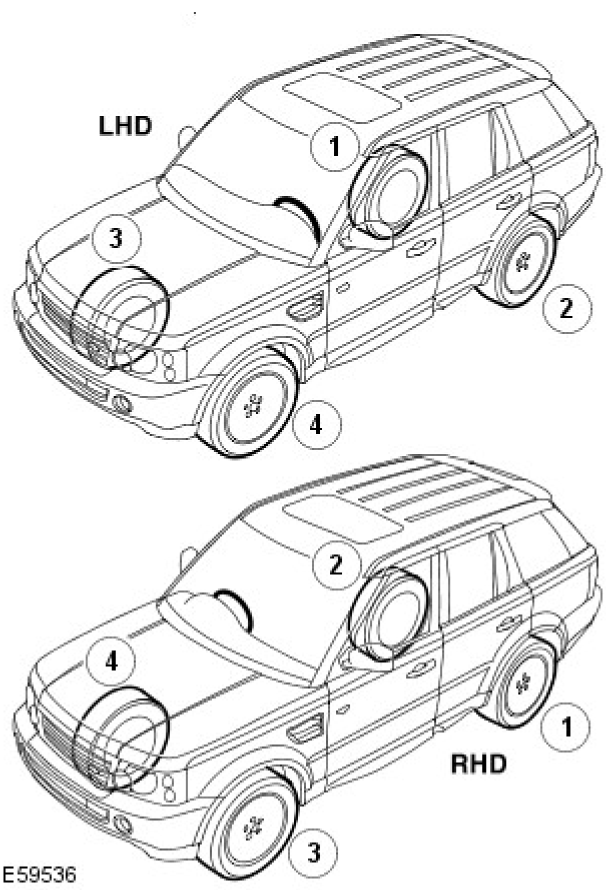
CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

Remove the brake fluid reservoir cap.

- Disconnect the brake fluid reservoir electrical connector.

6. Fill the brake fluid reservoir to the MAX mark.

7. Install the bleed tube to the brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.



8. ⚠ WARNING: Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Starting at the brake caliper furthest away from the brake master cylinder, loosen the bleed screw by one-half to three-quarters of a turn.

9. ⚠ CAUTION: The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

With the aid of an assistant, depress the brake pedal steadily through its full stroke and allow to return to the rest position. Repeat the procedure until a flow of clean, air-free fluid is being pumped into the bleed jar.

10. When a flow of clean, air-free fluid is being pumped into the bleed jar, depress and hold the brake pedal.

11. ⚠ CAUTION: Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw to 10 Nm (7 lb.ft).

12. Fill the brake fluid reservoir to the MAX mark.

13. Repeat the brake bleeding procedure for each brake caliper, following the above sequence.

14. Fill the brake fluid reservoir to the MAX mark.

15. Apply the brakes and check for leaks.

16. Install the brake fluid reservoir cap.

- Connect the brake fluid reservoir electrical connector.

17. Install the plenum chamber panel.

- Secure the clips.

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Brake System - General Information - Brake System BleedingVehicles With: High Performance Brakes

General Procedures

WARNING: If any components upstream of the Hydraulic Control Unit (HCU), including the HCU itself are replaced, the brake system must be bled using the procedure on T4. This will ensure that all air is expelled from the new component(s).

• NOTE: Bleeding of the brake system can be carried out using the procedures given on T4, or by using the procedure below. The following procedure covers bleeding the brake system if components downstream of the HCU have been replaced.

• NOTE: Where only the primary or secondary brake circuits have been disturbed in isolation, it should only be necessary to bleed that circuit. Partial bleeding of the hydraulic system is only permissible if a brake tube or hose has been disconnected with only minimal loss of fluid.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

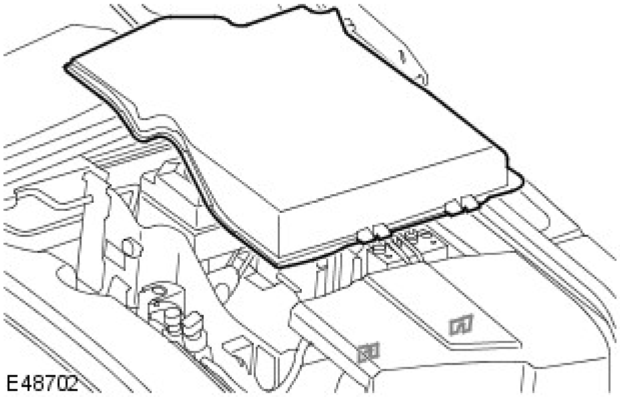
Raise and support the vehicle.

2. Check that all the brake line connections are tight and that there are no signs of leaks. If any leak of brake fluid is observed, investigate and rectify the cause of the leak before bleeding the brakes.

3. Pump the brake pedal until the brake vacuum assistance is exhausted.

4. Remove the plenum chamber panel.

- Release the 2 clips.



5. WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

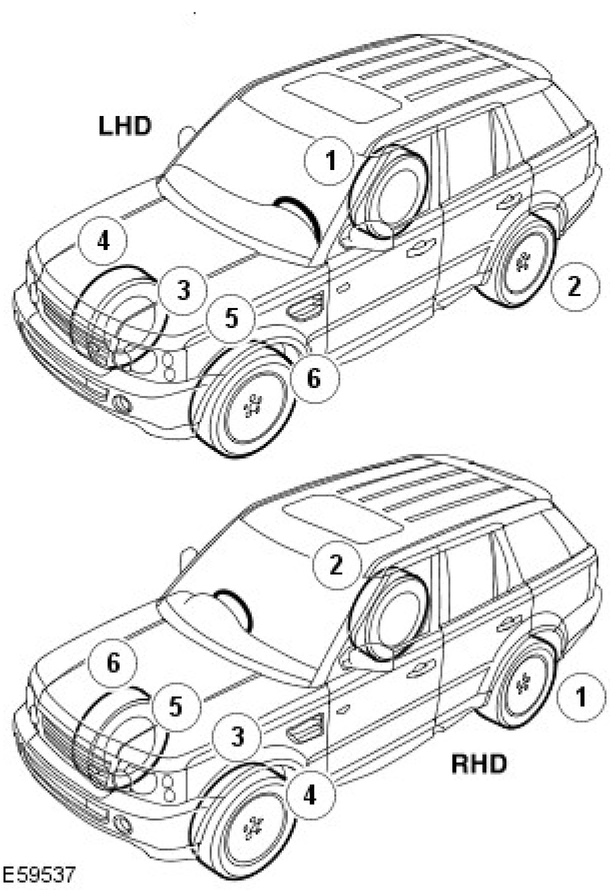
CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

Remove the brake fluid reservoir cap.

- Disconnect the brake fluid reservoir electrical connector.

6. Fill the brake fluid reservoir to the MAX mark.

7. Install the bleed tube to the brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.



8. WARNING: Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Starting at the brake caliper furthest away from the brake master cylinder, loosen the bleed screw by one-half to three-quarters of a turn.

9. CAUTION: The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

With the aid of an assistant, depress the brake pedal steadily through its full stroke and allow to return to the rest position. Repeat the procedure until a flow of clean, air-free fluid is being pumped into the bleed jar.

10. When a flow of clean, air-free fluid is being pumped into the bleed jar, depress and hold the brake pedal.

11. CAUTION: Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw to 10 Nm (7 lb.ft).

12. Fill the brake fluid reservoir to the MAX mark.

13. Repeat the brake bleeding procedure for the remaining rear brake caliper.

- Tighten the bleed screw to 10 Nm (7 lb.ft).

14. WARNING: Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Repeat the brake bleeding procedure for each front brake caliper, following the above sequence.

- If access is restricted to the front caliper outer bleed screws, rotate the road wheels to gain access.
- Tighten the front brake caliper bleed screws to 19 Nm (14 lb.ft).

15. Fill the brake fluid reservoir to the MAX mark.

16. Apply the brakes and check for leaks.

17. Install the brake fluid reservoir cap.

- Connect the brake fluid reservoir electrical connector.

18. Install the plenum chamber panel.

- Secure the clips.

Published: 11-May-2011

Brake System - General Information - Brake System Pressure BleedingVehicles With: Standard Brakes

General Procedures

⚠WARNING: If any components upstream of the Hydraulic Control Unit (HCU), including the HCU itself are replaced, the brake system must be bled using the procedure on T4, to ensure that all the air is expelled from the new component(s).

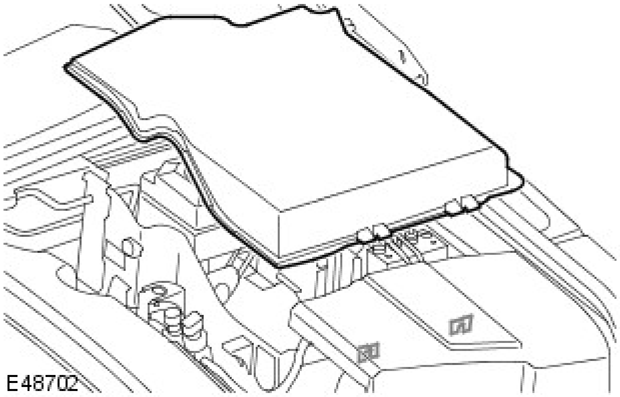
- NOTE: The following procedure covers bleeding the complete system. Where only the primary or secondary brake circuits have been disturbed in isolation, it should only be necessary to bleed that circuit. Partial bleeding of the hydraulic system is only permissible if a brake tube or hose has been disconnected with only minimal loss of fluid.

1. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Check that all the brake line connections are tight and that there are no signs of leaks.
For additional information, refer to: Specifications (206-00, Specifications).

3. Release the 3 clips and remove the cover.



4. ⚠WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

⚠CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

Fill the brake fluid reservoir to the MAX mark.

5. Install the bleed tube to the brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.

6. Starting at the brake caliper furthest away from the brake master cylinder, loosen the bleed screw by one-half turn.

7. ⚠CAUTION: The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

Depress the brake pedal steadily through its full stroke and allow to return to the rest position. Repeat the procedure until a flow of clean, air-free fluid is being pumped into the bleed jar.

8. ⚠CAUTION: Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw to 10 Nm (7 lb.ft).

9. Fill the brake fluid reservoir to the MAX mark.

10. ⚠ WARNING: Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Repeat the brake bleeding procedure for each brake caliper.

11. Using T4, bleed the braking system.

12. Apply the brakes and check for leaks.

13. Install the cover.

Front Disc Brake -

Item	**Specification**
Disc type	Ventilated
Disc diameter:	
V6 Diesel engine vehicles without Brembo brakes	320 mm (12.6 in)
V8 Petrol engine vehicles without Brembo brakes	340 mm (13.5 in)
Vehicles with Brembo brakes	360 mm (14.1 in)
Disc thickness:	
New	30.0 mm (1.18 in)
Service limit	27.0 mm (1.063 in)
Maximum disc run-out - disc installed	0.05 mm (0.002 in)
Vehicles without Brembo brakes:	
Caliper type	Sliding pin, twin piston
Piston diameter	48.0 mm (1.9 in)
Pad minimum thickness	3.0 mm (0.12 in)
Vehicles with Brembo brakes:	
Caliper type	Fixed, opposing four piston
Piston diameter	46 mm (1.8 in)
Pad minimum thickness	3.0 mm (0.12 in)
Brake pad wear warning lead:	
Location	Front left hand brake pad
Activates at	75% of pad life utilised

Torque Specifications Vehicles without Brembo Brakes

Description	Nm	lb-ft
Brake caliper bleed screw	14	10
Brake caliper to anchor plate bolts	35	26
Brake disc Torx screw	35	26
Brake caliper anchor plate to wheel knuckle bolts	275	202
Brake hose union	32	24
Brake hose retaining bracket to wheel knuckle bolt	22	16
Road wheel nuts	140	103

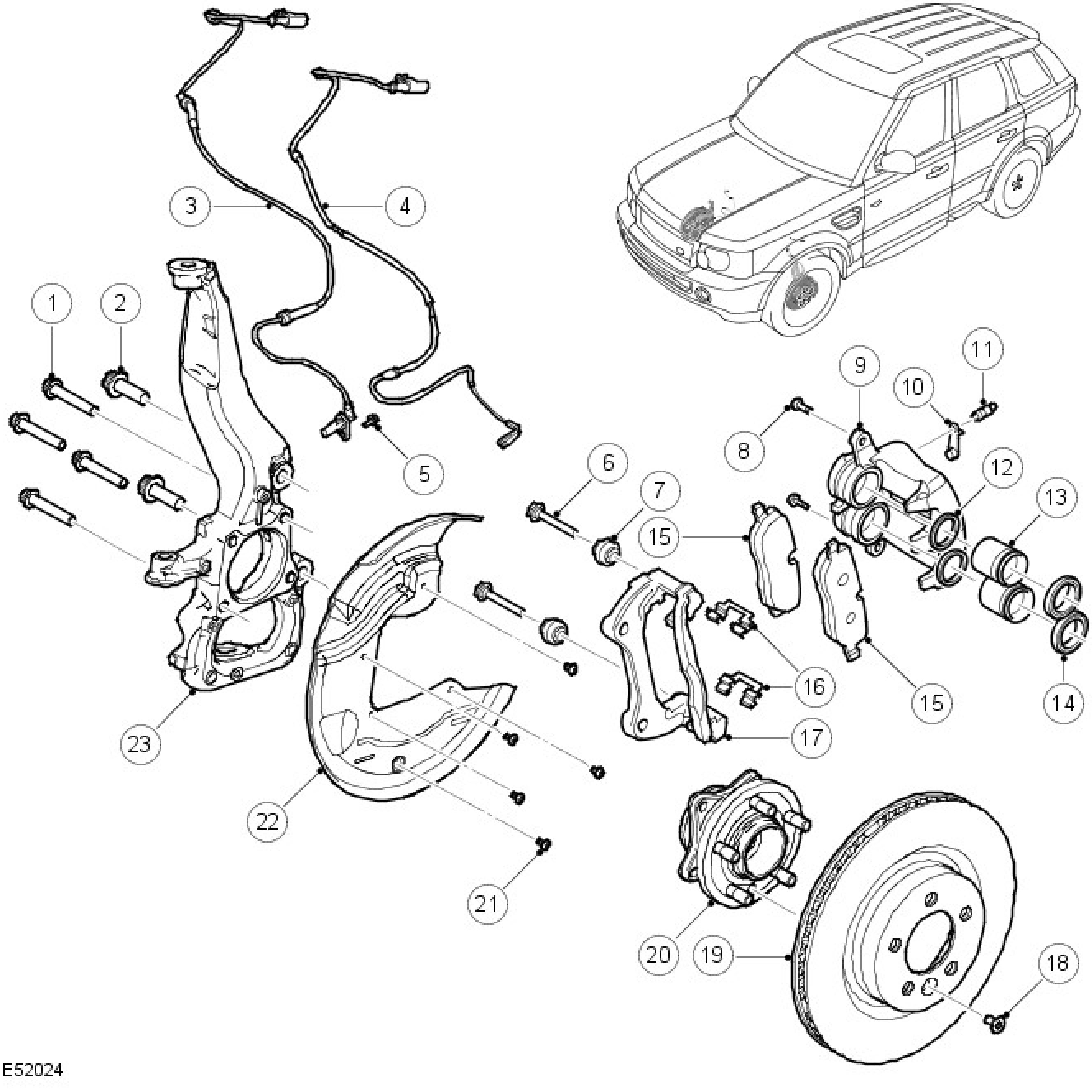
Torque Specifications Vehicles with Brembo Brakes

Description	Nm	lb-ft
Brake caliper bleed screw	19	14
Brake disc Torx screw	35	26
Brake caliper to wheel knuckle bolts	275	202
Brake hose union	32	24
Brake hose retaining bracket to wheel knuckle bolt	22	16
Road wheel nuts	140	103

Front Disc Brake - Front Disc Brake

Description and Operation

COMPONENT LOCATIONS - 4.4L and 2.7L DIESEL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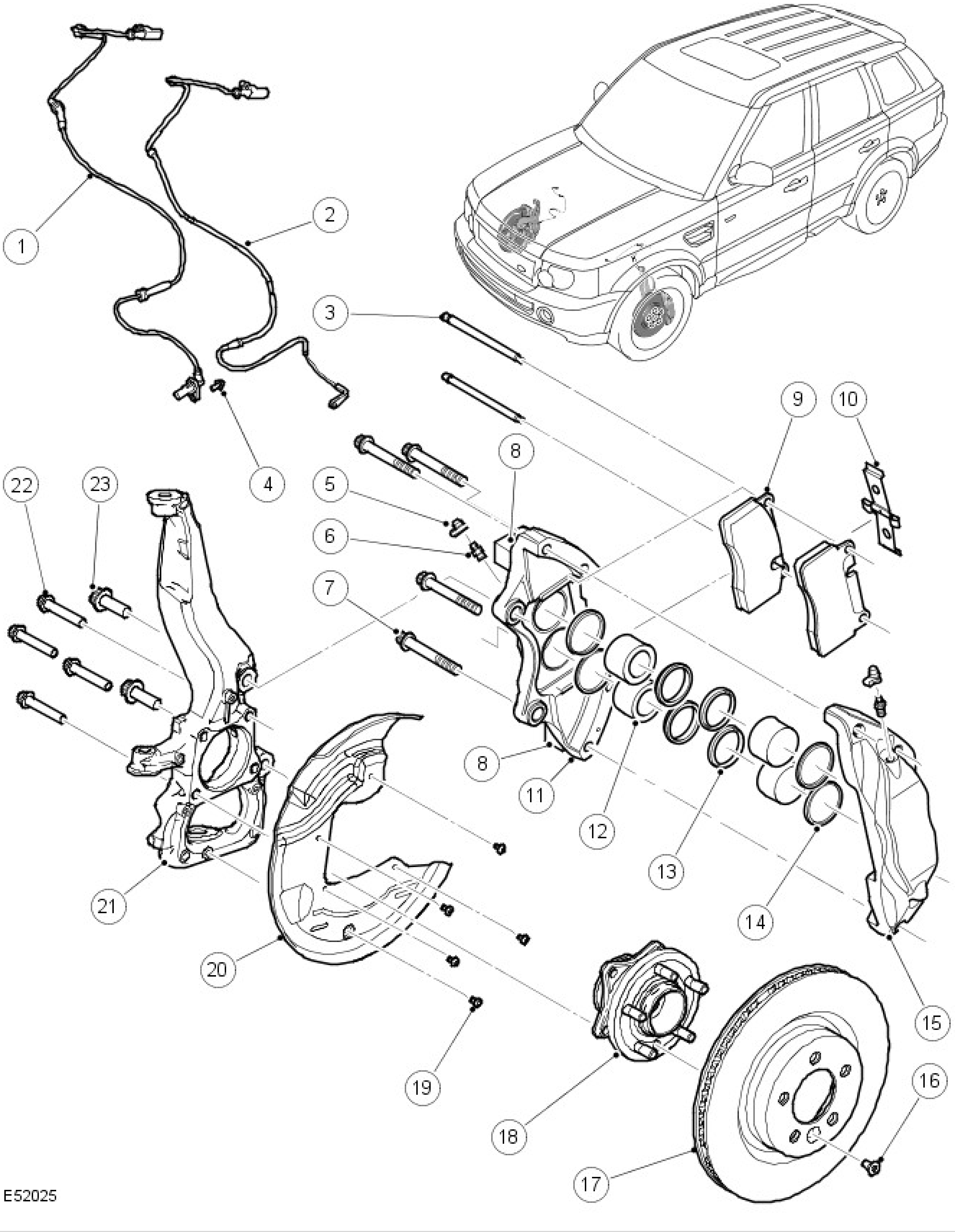
Item	Part Number	Description
1	-	Hub bearing assembly bolt (x 4)
2	-	Caliper bolt (x 2)
3	-	Wheel speed sensor
4	-	Brake pad wear sensor lead
5	-	Wheel speed sensor bolt
6	-	Guide pin (x 2)
7	-	Guide pin dust cover (x 2)
8	-	Guide pin bolt (x 2)
9	-	Caliper body
10	-	Bleed screw dust cap

11	-	Bleed screw
12	-	Piston seal (x 2)
13	-	Piston (x 2)
14	-	Piston dust cover (x 2)
15	-	Brake pad
16	-	Brake pad retainers
17	-	Caliper carrier
18	-	Brake disc retaining bolt
19	-	Brake disc
20	-	Hub bearing assembly
21	-	Dust shield screw (x 5)
22	-	Dust shield
23	-	Front knuckle

COMPONENT LOCATIONS - 4.2L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Item	Part Number	Description
1	-	Wheel speed sensor
2	-	Brake pad wear sensor lead
3	-	Guide pin (x 2)
4	-	Wheel speed sensor bolt
5	-	Bleed screw dust cap (x 2)

6	-	Bleed screw (x 2)
7	-	Caliper clamping bolt (x 4)
8	-	Damper weight
9	-	Brake pad
10	-	Brake pad retainer
11	-	Caliper body half, inboard
12	-	Piston (x 4)
13	-	Piston dust cover (x 4)
14	-	Piston seal (x 4)
15	-	Caliper body half, outboard
16	-	Brake disc retaining bolt
17	-	Brake disc
18	-	Hub bearing assembly
19	-	Dust shield screw (x 5)
20	-	Dust shield
21	-	Front knuckle
22	-	Hub bearing assembly bolt (x 4)
23	-	Caliper retaining bolt (x 2)

GENERAL

The front brakes on all models feature ventilated brake discs, with different diameter brake discs for each model. The 4.4L and 2.7L diesel models feature twin piston sliding calipers. Although similar in appearance, the sliding calipers on 4.4L and 2.7L diesel are not interchangeable. On 4.2L models, 4 piston, opposed piston Brembo calipers are installed. The dust shields are common on 4.4L and 2.7L diesel models, and unique on 4.2L models.

Two steel damper weights are installed on the inboard side of the Brembo calipers to reduce noise, vibration and harshness (NVH).

On all models the brake caliper is attached to the rear of the front knuckle. The brake pads are made from an asbestos free material. The inboard brake pad of the left front brake incorporates a wear sensor.

With the sliding calipers, when hydraulic pressure is supplied to the caliper, the pistons extend and force the inner pad against the brake disc. The caliper body reacts and slides on the guide pins to bring the outer pad into contact with the brake disc.

With the Brembo calipers, when hydraulic pressure is supplied to the caliper, the two pairs of opposed pistons extend in the caliper. The two pistons in each side of the caliper force their related brake pads against the brake disc.

The front brake pad wear sensor is connected in series with the rear brake pad wear sensor, between the instrument cluster and ground. When a brake pad incorporating a brake pad wear sensor is approximately 75% worn, the brake pad wear sensor goes open circuit. When the instrument cluster detects the open circuit, it illuminates the amber light emitting diode (LED) in the brake warning indicator, displays an appropriate warning in the message center and sounds a warning chime.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

At the beginning of each ignition cycle, the instrument cluster performs a bulb check on the brake warning indicator: the indicator is illuminated amber for 1.5 seconds, red for 1.5 seconds, then goes off.

Published: 11-May-2011

Front Disc Brake - Front Disc Brake

Diagnosis and Testing

Overview

The front disc brake system is a fairly straightforward design requiring no specialized techniques for diagnosis.

For information on the description and operation of the system:
REFER to: Front Disc Brake (206-03 Front Disc Brake, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
    - ○ If a road test is necessary make sure the vehicle is safe to do so.
2. **2.** Visually inspect for obvious mechanical faults.

Visual inspection

Mechanical
- Brake caliper(s) condition and fitment - Brake pad(s) condition and fitment - Brake disc(s) condition and fitment - Fluid leaks

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the symptom chart.

Symptom Chart

Symptom	Possible causes	Action
Brake noise	- Debris - Brake pads - Brake discs	Inspect for debris, remove as necessary. Check for excessive brake pad wear. Check for brake disc damage. REFER to: Brake Pads - Vehicles Without: Brembo Brakes (206-03 Front Disc Brake, Removal and Installation) / Brake Pads - Vehicles With: Brembo Brakes (206-03 Front Disc Brake, Removal and Installation).
Brake vibration	- Suspension components - Brake discs	Check for worn or damaged suspension components. REFER to: Front Suspension (204-01 Front Suspension, Diagnosis and Testing). Check for brake disc distortion or runout. REFER to: Front Brake Disc Runout Check - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures) / Front Brake Disc Runout Check - Vehicles With: High Performance Brakes (206-00 Brake System - General Information, General Procedures).

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Front Disc Brake - Brake DiscVehicles Without: Brembo Brakes

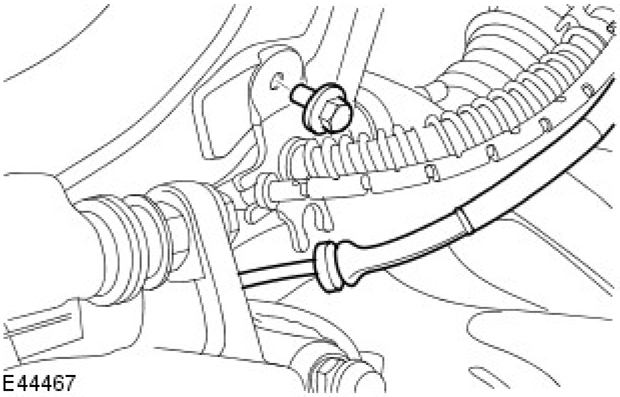
Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

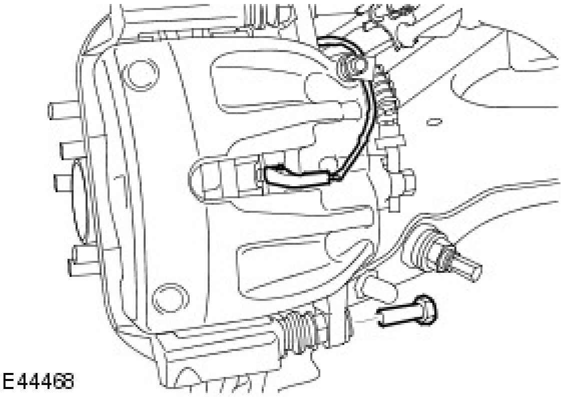
2. Remove the wheel and tire.
3. Release the brake hose bracket from the wheel knuckle.
   - Remove the bolt.



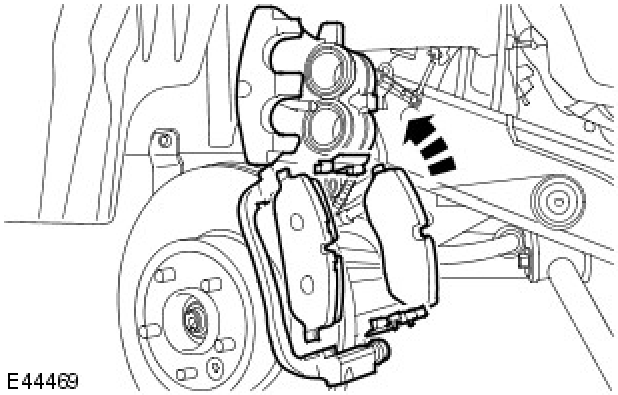
4. ⚠ CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

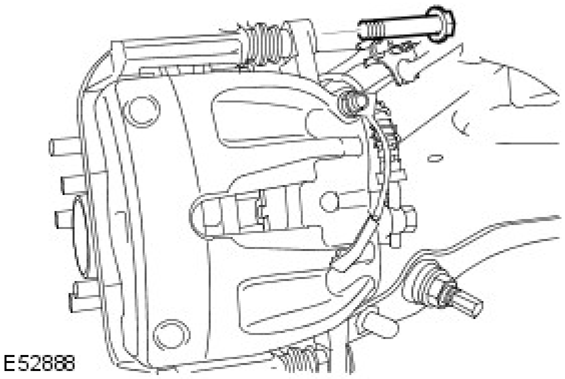
   LH side only: Disconnect the brake pad wear indicator sensor.

5. Remove the brake caliper lower bolt.



6. Remove the brake pads.
   - Rotate the brake caliper upwards.
   - Remove the two clips.





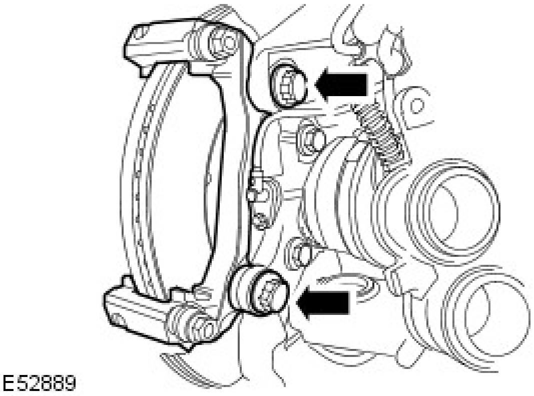
7. Remove the brake caliper upper bolt.

8. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

Tie the brake caliper housing aside.

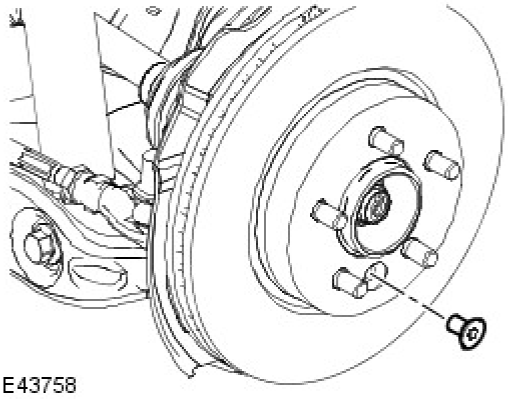
9. Remove the brake caliper anchor plate.

- Remove the 2 bolts.



10. Remove the brake disc.

- Remove the Torx screw.



Installation

1. Make sure the brake disc and hub mating surfaces are clean.

2. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

3. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the caliper housing and anchor plate using brake cleaning fluid.

4. Install the anchor plate.

- Tighten the bolts to 275 Nm (203 lb.ft).

5. Install the brake caliper housing and fit the top bolt.

- Tighten the bolt to 35 Nm (26 lb.ft).

6. Install the brake pads.

- Install the two clips.

7. Rotate the brake caliper downwards.

- Tighten the bolt to 35 Nm (26 lb.ft).

8. Connect the brake pad wear indicator sensor.

9. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

10. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

Published: 11-May-2011

Front Disc Brake - Brake DiscVehicles With: Brembo Brakes

Removal and Installation

Removal

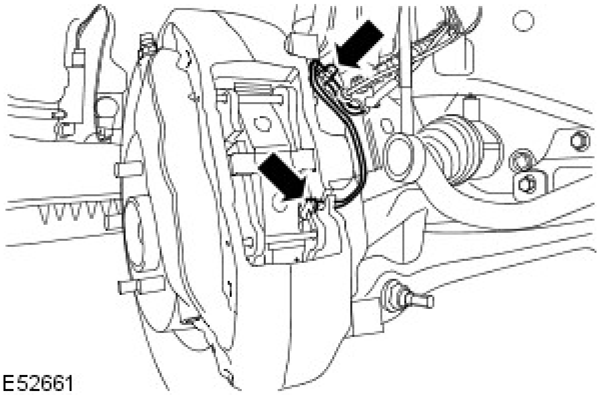
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

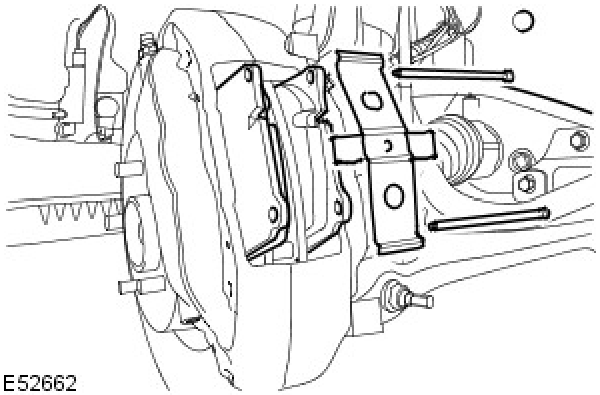
3. LH side only: Disconnect the brake pad wear indicator sensor.

- Release the lead from the clips.



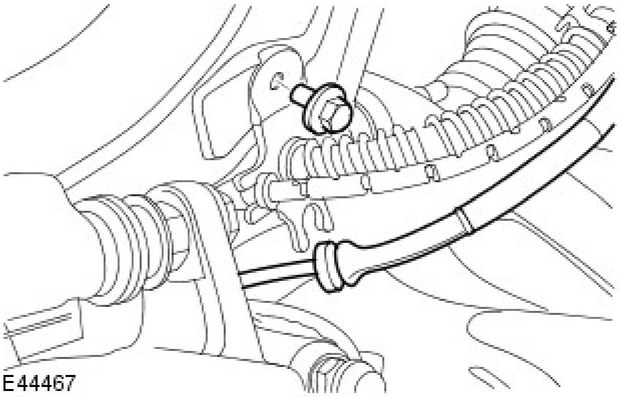
4. Remove the brake pads.

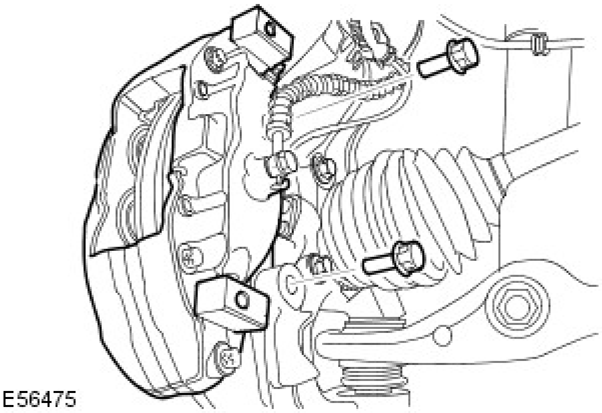
- Remove the 2 retaining pins.
- Remove the anti-rattle spring.
- Withdraw the brake pads.



5. Release the brake hose bracket from the wheel knuckle.

- Remove the retaining bolt.

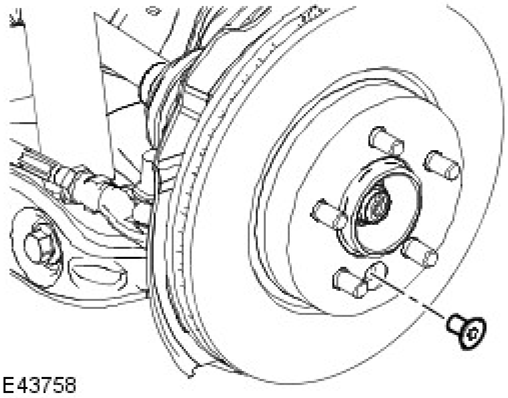




6. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper from the wheel knuckle.

- Remove the 2 retaining bolts.
- Tie the brake caliper aside.



7. Remove the brake disc.

- Remove the Torx screw.

Installation

1. Make sure the brake disc and hub mating surfaces are clean.

2. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

3. Secure the brake caliper to the wheel knuckle.

- Tighten the bolts to 275 Nm (203 lb.ft).

4. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 23 Nm (17 lb.ft).

5. ⚠WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the components.

6. Inspect the caliper piston seals for damage.

7. Position a bleed jar containing a small quantity of approved brake fluid. Connect the bleed tube to the bleed screw and loosen the screw.

8. Press the pistons into the caliper housing.

- Tighten the bleed screw to 19 Nm (14 lb.ft).

9. Repeat the above process for the other 2 pistons.

10. Disconnect the bleed tube and remove the jar.

11. Install the brake pads.

- Position the anti-rattle spring.
- Install the pins, making sure the pin collets are fully engaged in the caliper.

12. LH side only: Connect the brake pad wear indicator sensor.

- Secure the lead in the clips.

13. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

14. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

Published: 09-Jun-2011

Front Disc Brake - Brake PadsVehicles Without: Brembo Brakes

Removal and Installation

Removal

- WARNINGS:

⚠ Brake pads must be renewed in axle sets only, otherwise braking efficiency may be impaired.

⚠ If the brake pad wear warning light has been activated, the pad wear sensor must be replaced.

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

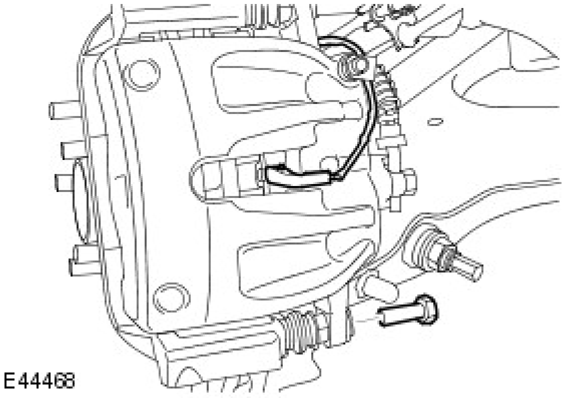
Raise and support the vehicle.

2. Remove the wheel and tires.

3. ⚠ CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

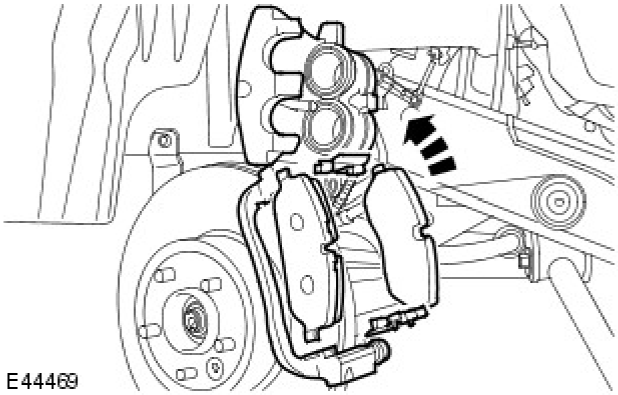
LH side only: Disconnect the brake pad wear indicator sensor.

4. Remove the brake caliper lower bolt.



5. Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the 2 clips.



6. Repeat the above 2 steps for the other side.

Installation

1. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the caliper housing and anchor plate using brake cleaning fluid.

2. Inspect the caliper piston and slide pin seals for damage.

3. CAUTIONS:

⚠ The brake caliper should move freely on both slide pins.

⚠ If necessary, renew the components.

Check the slide pins for correct operation.

4. ⚠ CAUTION: Check the brake fluid reservoir level before pushing the piston back, failure to follow this instruction may result in damage to the vehicle.

• NOTE: As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

Press the pistons into the caliper housing.

5. NOTE: Make sure the brake pads are installed in the correct orientation.

Install the brake pads.

- Install the 2 clips.
- Apply a suitable amount of the supplied grease to the mating faces of the brake pads and brake calipers.

6. Rotate the brake caliper downwards.

- Tighten the bolt to 35 Nm (26 lb.ft).

7. Repeat the above procedure for the other side.

8. LH side front: Connect the brake pad wear indicator wiring harness electrical connection.

9. Install the wheel and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

10. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top up with brake fluid if necessary.

Published: 11-May-2011

Front Disc Brake - Brake PadsVehicles With: Brembo Brakes

Removal and Installation

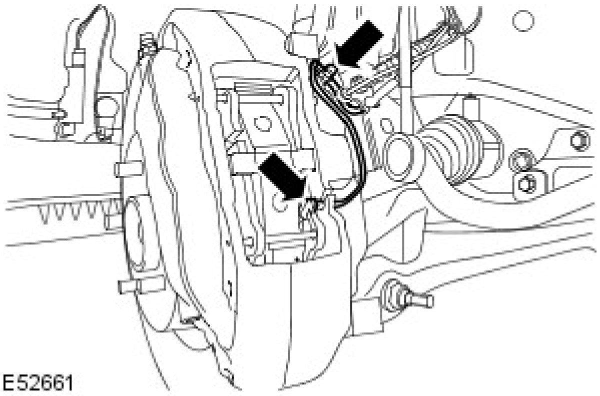
Removal

WARNING: Brake pads must be renewed in axle sets only. Failure to follow this instruction may result in braking efficiency being impaired.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheels and tires.



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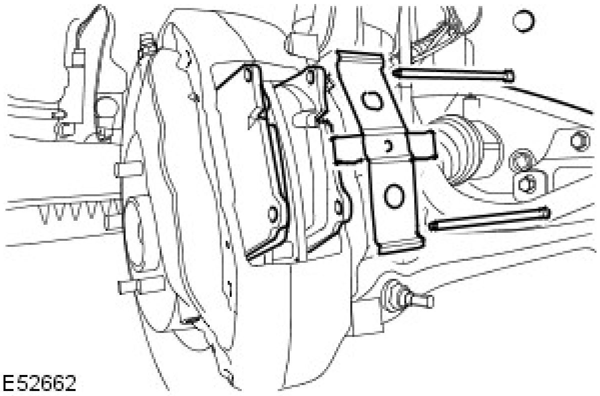
3. LH side only: Disconnect the brake pad wear indicator sensor.

- Release the lead from the clips.



E52662

4. Remove the brake pads.

- Remove the 2 retaining pins.
- Remove the anti-rattle spring.
- Withdraw the brake pads.

5. Repeat the above procedure for the other side.

Installation

1. WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the components.

2. Inspect the caliper piston seals for damage.

3. Position a bleed jar containing a small quantity of approved brake fluid. Connect the bleed tube to the bleed screw and loosen the screw.

4. Press the pistons into the caliper housing.

- Tighten the bleed screw to 19 Nm (14 lb.ft).

5. Repeat the above process for the other 2 pistons.

6. Disconnect the bleed tube and remove the jar.

7. Install the brake pads.

- Position the anti-rattle spring.
- Install the pins, making sure the pin collets are fully engaged in the caliper.

8. LH side only: Connect the brake pad wear indicator sensor.

- Secure the lead in the clips.

9. Repeat the above procedure for the other side.

10. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

Published: 11-May-2011

Front Disc Brake - Brake CaliperVehicles Without: Brembo Brakes

Removal and Installation

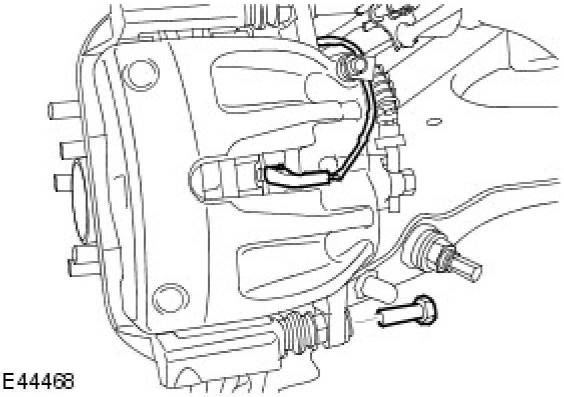
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. Remove the brake caliper lower bolt.

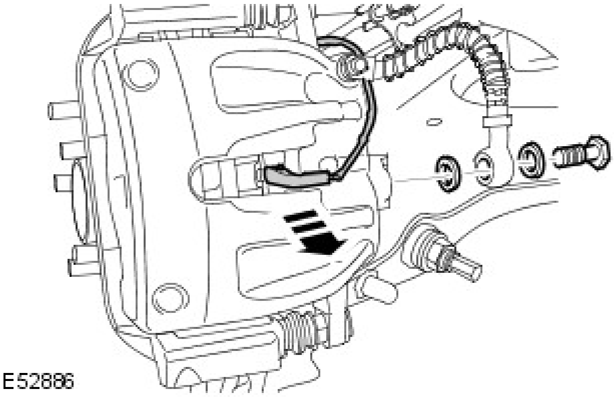


E44468

4. LH side only: Disconnect the brake pad wear indicator sensor.

5. Disconnect the brake hose from the brake caliper.

- Remove the union.
- Remove and discard the two sealing washers.
- Install blanking caps to the exposed ports.



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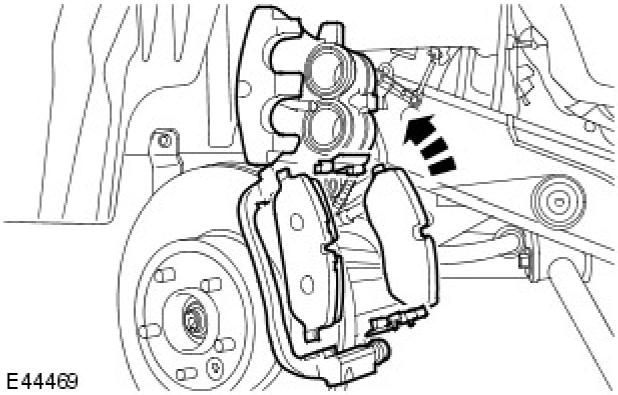
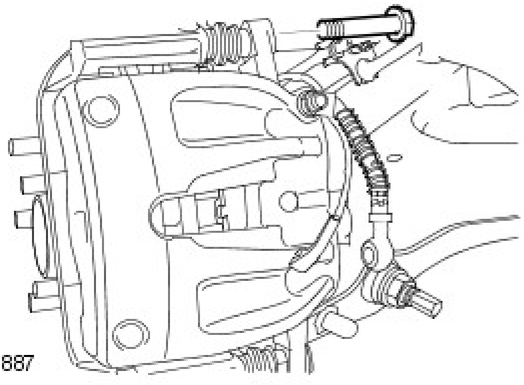
6. Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the two clips.



E44469

7. Remove the brake caliper upper bolt.



E52887

8. Remove the brake caliper housing.

Installation

1. WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the caliper housing and anchor plate using brake cleaning fluid.

2. Install the brake caliper.

3. Install the brake caliper upper bolt.

- Tighten the bolt to 35 Nm (26 lb.ft).

4. Install the brake pads.

- Install the two clips.

5. Rotate the brake caliper downwards.

- Tighten the bolt to 35 Nm (26 lb.ft).

6. Connect the brake hose to the brake caliper.

- Remove the blanking caps from the ports.
- Install new sealing washers.
- Tighten the brake hose union to 32 Nm (24 lb.ft).

7. Connect the brake pad wear indicator sensor.

8. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Bleed the brake system.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

Published: 11-May-2011

Front Disc Brake - Brake CaliperVehicles With: Brembo Brakes

Removal and Installation

Removal

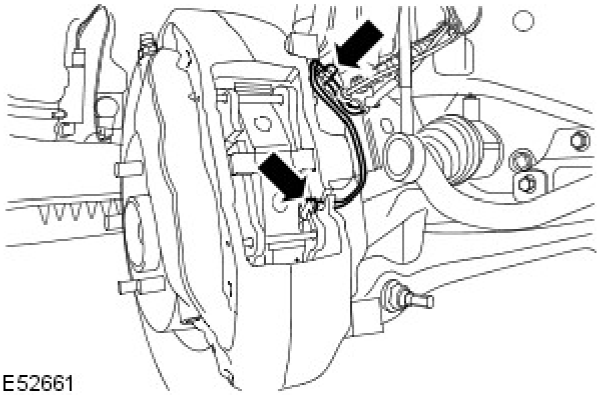
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

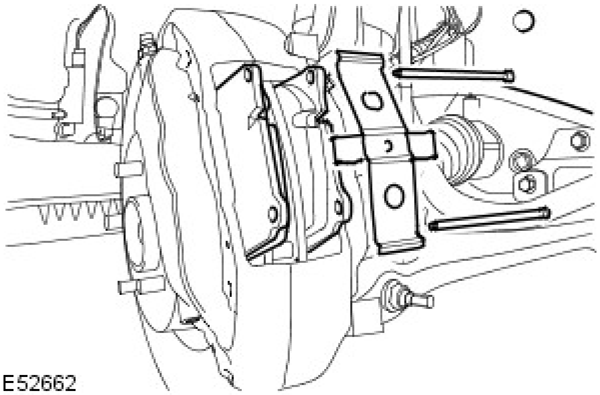
3. LH side only: Disconnect the brake pad wear indicator sensor.

- Release the lead from the clips.



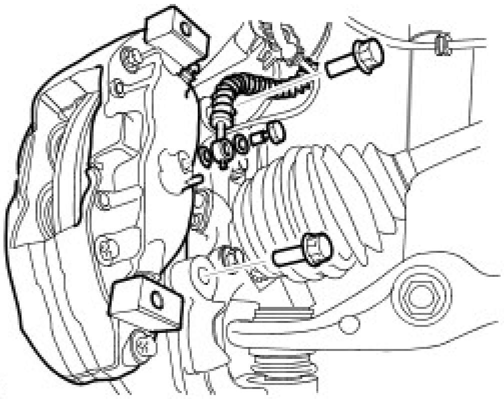
4. Remove the brake pads.

- Remove the 2 retaining pins.
- Remove the anti-rattle spring.
- Withdraw the brake pads.



5. Disconnect the brake hose from the brake caliper.

- Remove the union.
- Remove and discard the 2 sealing washers.



6. Remove the brake caliper.

- Remove and discard the 2 bolts.

Installation

1. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the components.

2. Inspect the caliper piston seals for damage.

3. Install the brake caliper.

- Tighten the bolts to 275 Nm (203 lb.ft).

4. Connect the brake hose to the brake caliper.

- Install new sealing washers.
- Tighten the brake hose union to 32 Nm (24 lb.ft).

5. Position a bleed jar containing a small quantity of approved brake fluid. Connect the bleed tube to the bleed screw and loosen the screw.

6. Press the pistons into the caliper housing.

- Tighten the bleed screw to 19 Nm (14 lb.ft).

7. Repeat the above process for the other 2 pistons.

8. Disconnect the bleed tube and remove the jar.

9. Install the brake pads.

- Position the anti-rattle spring.
- Install the pins, making sure the pin collets are fully engaged in the caliper.

10. LH side only: Connect the brake pad wear indicator sensor.

- Secure the lead in the clips.

11. Bleed the brake system.

12. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

13. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

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Rear Disc Brake -

Item	**Specification**
Disc type	Ventilated
Disc diameter:	
V6 Diesel engine	325 mm (12.7 in)
V8 Petrol engine	350 mm (13.5 in)
Disc thickness - All engines:	
New	20.0 mm (0.78 in)
Service limit	17.0 mm (0.67 in)
Maximum disc run-out - disc installed	0.09 mm (0.003 in)
Caliper type	Sliding pin, single piston
Piston diameter	45.0 mm (1.7 in)
Pad minimum thickness	3.0 mm (0.12 in)
Brake pad wear warning lead:	
Location	Rear right hand brake pad
Activates at	75% of pad life utilised

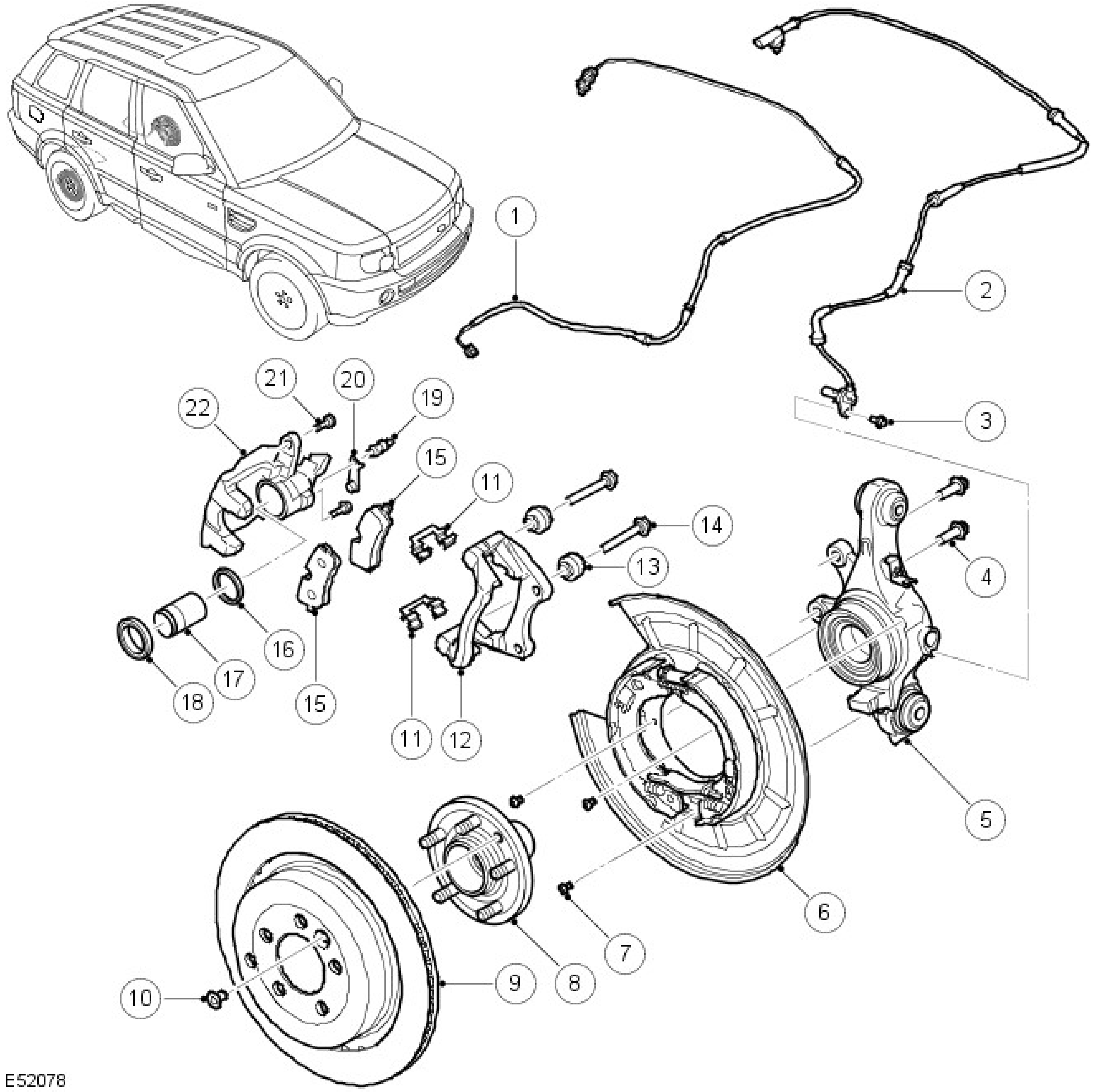
Torque Specifications

Description	Nm	lb-ft
Brake caliper bleed screw	14	10
Brake caliper to anchor plate bolts	35	26
Brake hose union	32	24
Brake disc Torx screw	35	26
Brake caliper anchor plate to wheel knuckle bolts	115	85
Road wheel nuts	140	103

Rear Disc Brake - Rear Disc Brake

Description and Operation

COMPONENT LOCATIONS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Item	Part Number	Description
1	-	Brake pad wear sensor lead
2	-	Wheel speed sensor
3	-	Wheel speed sensor bolt
4	-	Caliper bolt (x 2)
5	-	Rear knuckle
6	-	Backplate assembly and dust shield
7	-	Dust shield screw (x 3)
8	-	Drive flange assembly
9	-	Brake disc
10	-	Brake disc retaining bolt

11	-	Brake pad retainers
12	-	Caliper carrier
13	-	Guide pin dust cover (x 2)
14	-	Guide pin (x 2)
15	-	Brake pad
16	-	Piston seal
17	-	Piston
18	-	Piston dust cover
19	-	Bleed screw
20	-	Bleed screw dust cap
21	-	Guide pin bolt (x 2)
22	-	Caliper body

GENERAL

The rear brakes each consist of a single piston brake caliper, a ventilated brake disc and a dust shield (integrated as part of the parking brake). The 4.2L and 4.4L models feature a different caliper and a larger diameter brake disc than 2.7L diesel models. The dust shield and parking brake are common on all models.

The brake caliper is attached to the rear of the rear knuckle. The brake pads are made from an asbestos free material. The inboard brake pad of the right rear brake incorporates a wear sensor.

When hydraulic pressure is supplied to the caliper, the piston extends and forces the inner pad against the disc. The caliper body reacts and slides on the guide pins to bring the outer pad into contact with the disc.

The rear brake pad wear sensor is connected in series with the front brake pad wear sensor, between the instrument cluster and ground. When a brake pad incorporating a brake pad wear sensor is approximately 75% worn, the brake pad wear sensor goes open circuit. When the instrument cluster detects the open circuit, it illuminates the amber light emitting diode (LED) in the brake warning indicator, displays an appropriate warning in the message center and sounds a warning chime.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

At the beginning of each ignition cycle, the instrument cluster performs a bulb check on the brake warning indicator: the indicator is illuminated amber for 1.5 seconds, then red for 1.5 seconds.

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Rear Disc Brake - Rear Disc Brake

Diagnosis and Testing

Overview

The rear disc brake system is a fairly straightforward design requiring no specialized techniques for diagnosis.

For information on the description and operation of the system:
REFER to: Rear Disc Brake (206-04 Rear Disc Brake, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
    - ○ If a road test is necessary make sure the vehicle is safe to do so.
2. **2.** Visually inspect for obvious mechanical faults.

Visual inspection

Mechanical
● Brake caliper(s) condition and fitment ● Brake pad(s) condition and fitment ● Brake disc(s) condition and fitment ● Fluid leaks

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the symptom chart.

Symptom Chart

Symptom	Possible causes	Action
Brake noise	● Debris ● Brake pads ● Brake discs	Inspect for debris, remove as necessary. Check for excessive brake pad wear. Check for brake disc damage. REFER to: Brake Pads (206-04 Rear Disc Brake, Removal and Installation).
Brake vibration	● Suspension components ● Brake discs	Check for worn or damaged suspension components. REFER to: Rear Suspension (204-02 Rear Suspension, Diagnosis and Testing). Check for brake disc distortion or runout. REFER to: Rear Brake Disc Runout Check (206-00 Brake System - General Information, General Procedures).

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Rear Disc Brake - Brake Disc

Removal and Installation

Removal

• NOTE: If the parking brake shoes or the brake discs have been removed for access to other components then DO NOT carry out the bedding in procedure.

1. CAUTION: Do not turn the ignition on when the parking brake service mode has been set, this will result in the parking brake being released from the service mode.

Enter the parking brake into the service mode.

- Turn the ignition key to position II.
- Apply, and hold, the footbrake.
- Apply, and hold, the parking brake switch to the RELEASE position.
- Turn the ignition key to position '0' and remove the key.
- Release the footbrake.
- Release the parking brake switch.

2. Isolate the parking brake electrical circuit.

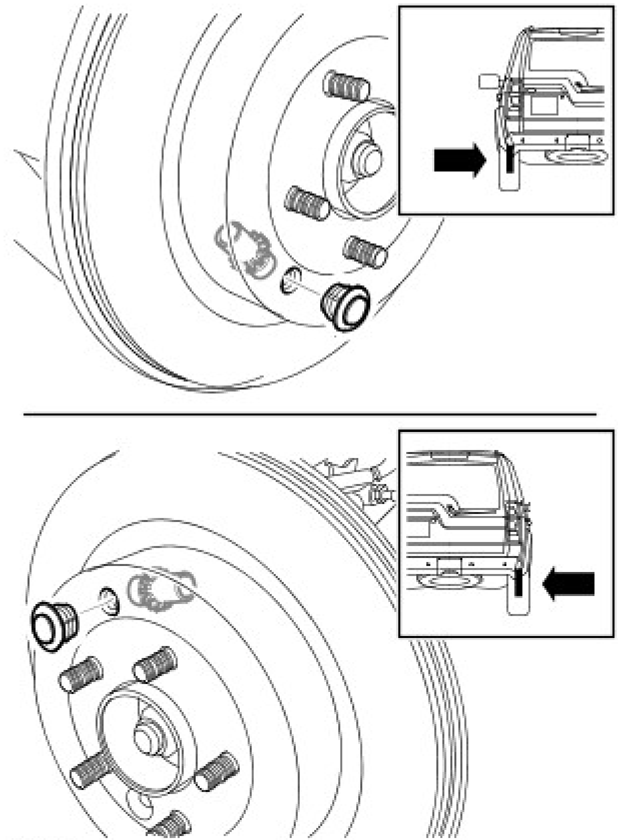
- Remove fuse number 8 from the BJB.

3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the wheel and tire.

5. Remove the brake caliper anchor plate.
For additional information, refer to: Brake Caliper Anchor Plate (206-04 Rear Disc Brake, Removal and Installation).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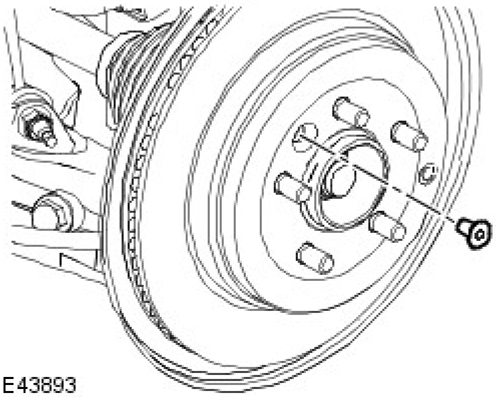
6. Release the parking brake shoe adjustment.

- Remove the plug from the access hole in the brake disc.
- Using a suitable tool, rotate the brake shoe adjuster to release the adjustment.
- Install the access plug.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7. Remove the brake disc.

- Remove the Torx screw.

Installation

1. Make sure the brake disc and hub mating surfaces are clean.

2. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

3. Install the brake caliper anchor plate.
For additional information, refer to: Brake Caliper Anchor Plate (206-04 Rear Disc Brake, Removal and Installation).

4. Adjust the parking brake.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

5. Install fuse number 8 into the BJB.

6. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

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Rear Disc Brake - Brake Pads

Removal and Installation

Removal

- WARNINGS:

⚠ Brake pads must be renewed in axle sets only, otherwise braking efficiency may be impaired.

⚠ If the brake pad wear warning light has been activated, the pad wear sensor must be replaced.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

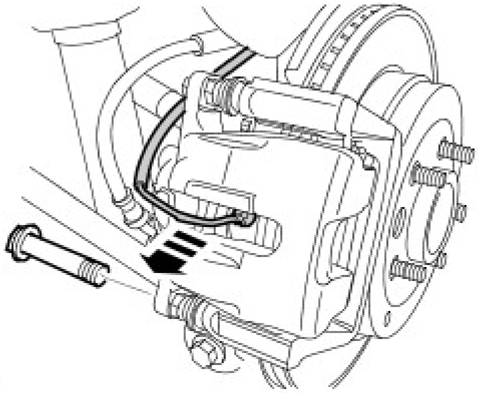
Raise and support the vehicle.

2. Remove the wheel and tire.

3. ⚠ CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

RH side only: Disconnect the brake pad wear indicator sensor.

4. Remove the brake caliper lower bolt.



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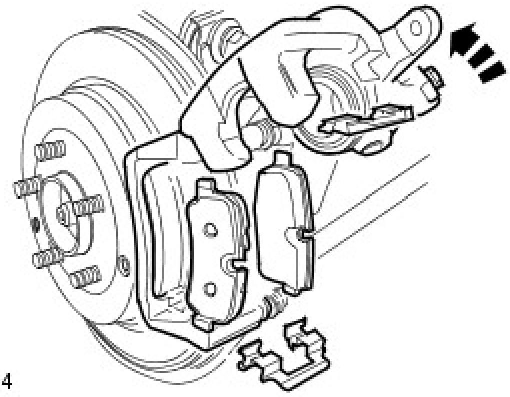
5. Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the 2 clips.



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Installation

1. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the brake caliper housing and anchor plate using brake cleaning fluid.

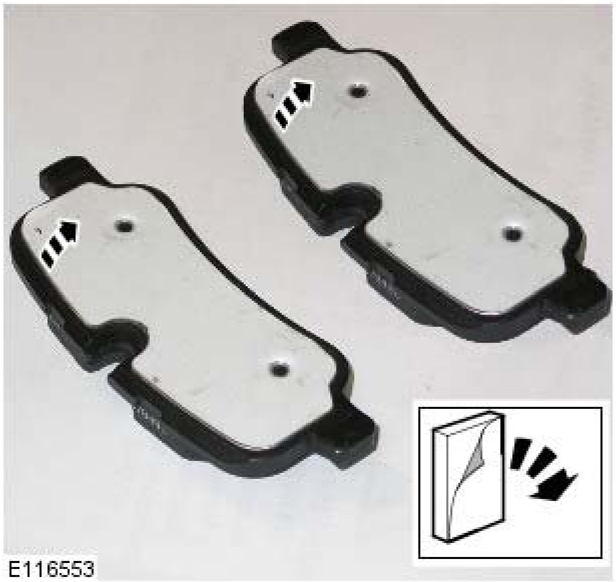
2. Inspect the caliper piston and slide pin seals for damage.

3. Position a bleed jar containing a small quantity of approved brake fluid. Connect the bleed tube to the bleed screw and loosen the screw.

4. Press the piston into the caliper housing.

- Tighten the bleed screw to 14 Nm (10 lb.ft).

5. Disconnect the bleed tube and remove the jar.



6. ⚠ CAUTION: If equipped, the adhesive strips covering the outer brake pads must be removed before installation. Failure to follow this instruction may result in damage to the vehicle.

If equipped, remove the adhesive strips from the 2 outer brake pads.

7. Install the brake pads.

- Install the 2 clips.

8. Rotate the brake caliper downwards.

- Tighten the bolt to 32 Nm (24 lb.ft).

9. Connect the brake pad wear indicator sensor.

10. Repeat the above procedure for the other side.

11. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

12. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

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Rear Disc Brake - Brake Caliper

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

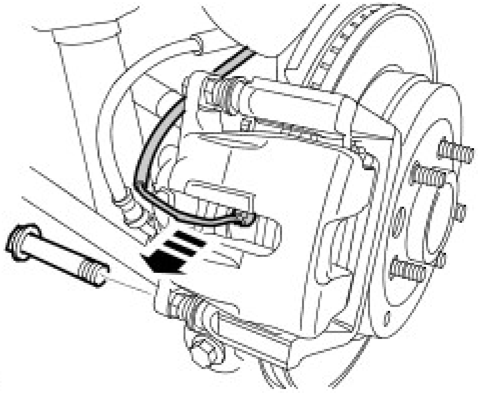
Raise and support the vehicle.

2. Remove the wheel and tire.

3. ⚠ CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

RH side only: Disconnect the brake pad wear indicator sensor.

4. Remove the brake caliper lower bolt.



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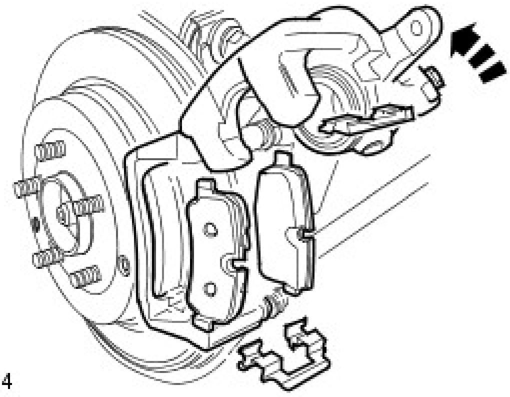
5. Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the 2 clips.



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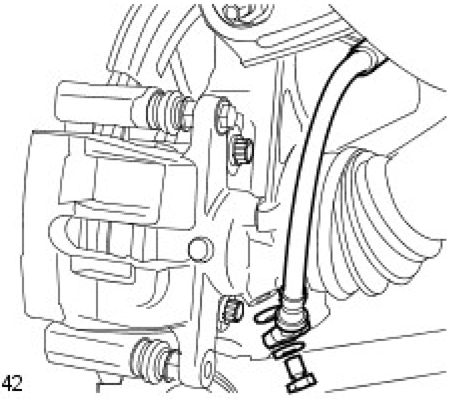
6. Disconnect the brake hose from the brake caliper.

- Remove the union.
- Remove and discard the two sealing washers.
- Install blanking caps to the exposed ports.



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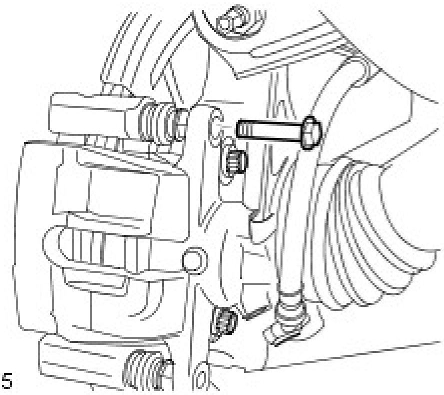
7. Remove the brake caliper upper bolt.



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8. Remove the brake caliper housing.

Installation

1. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the caliper housing and anchor plate using brake cleaning fluid.

2. Install the brake caliper.

3. Install the brake caliper upper bolt.

- Tighten the bolt to 35 Nm (26 lb.ft).

4. Connect the brake hose to the brake caliper.

- Remove the blanking caps from the ports.
- Install new sealing washers.
- Tighten the brake hose union to 28 Nm (21 lb.ft).

5. Install the brake pads.

- Install the two clips.

6. Rotate the brake caliper downwards.

- Tighten the bolt to 35 Nm (26 lb.ft).

7. Connect the brake pad wear indicator sensor.

8. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Bleed the brake system.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

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Rear Disc Brake - Brake Caliper Anchor Plate

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

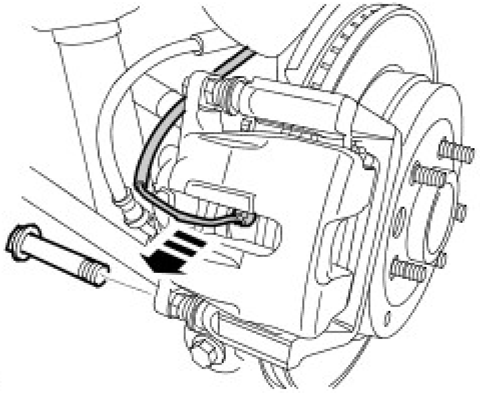
Raise and support the vehicle.

2. Remove the wheel and tire.

3. ⚠ CAUTION: The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

RH side only: Disconnect the brake pad wear indicator sensor.

4. Remove the brake caliper lower bolt.



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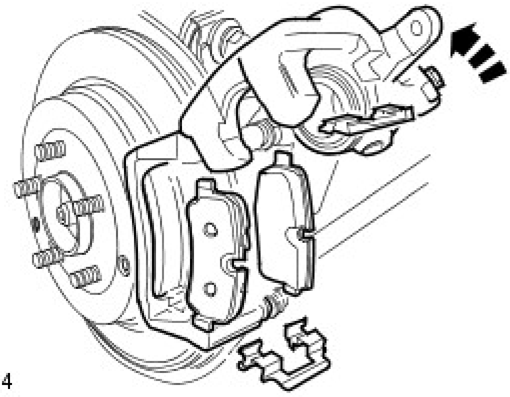
5. Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the two clips.



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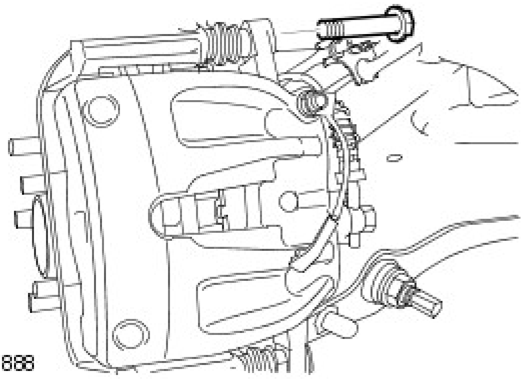
6. Remove the brake caliper upper bolt.



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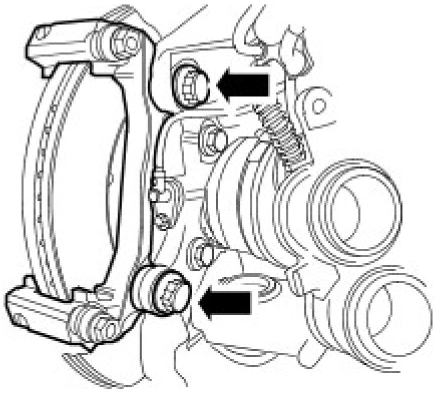
7. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

Tie the brake caliper housing aside.

8. Remove the brake caliper anchor plate.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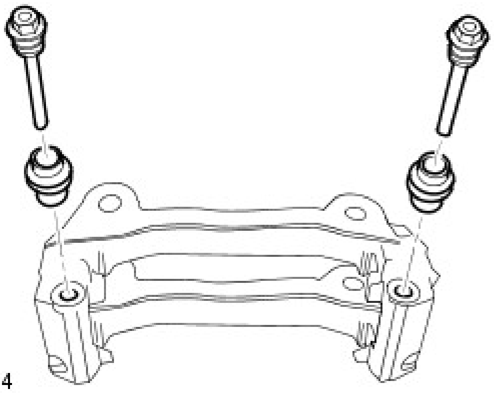
9. Remove the guide pins and seals.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Installation

1. ⚠WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the caliper housing and anchor plate using brake cleaning fluid.

2. Clean and lubricate the guide pins.

3. Install the guide pins.

4. Install the anchor plate.

- Tighten the bolts to 115 Nm (85 lb.ft).

5. Install the brake caliper housing and fit the top bolt.

- Tighten the bolt to 35 Nm (26 lb.ft).

6. Install the brake pads.

- Install the 2 clips.

7. Rotate the brake caliper downwards.

- Tighten the bolt to 35 Nm (26 lb.ft).

8. Connect the brake pad wear indicator sensor.

9. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

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Parking Brake and Actuation -

General Specification

Item	Specification
Make	Continental Teves
Model/type	N5528001
Operation	Twin cable operation to park brake with emergency cable release located in passenger compartment
Minimum brake lining material thickness	2.0 mm (0.078 in)

Torque Specifications

Description	Nm	lb-ft
Wedge adjuster Allen screw	7	5
Rear brake disc Torx screw	35	26
Brake caliper anchor plate to wheel knuckle bolts	115	85
Brake caliper to anchor plate bolts	35	26
Parking brake actuator and cable assembly nuts	5	4
Parking brake actuator mounting bracket bolts	22	16
Fuel tank heat shield nuts	3	2
Fuel tank heat shield bolts	6	4
* LH/RH parking brake cable bolts	22	16
Parking brake cable coupling	8	6
Road wheel nuts	140	103

*** New nuts/bolts must be installed**

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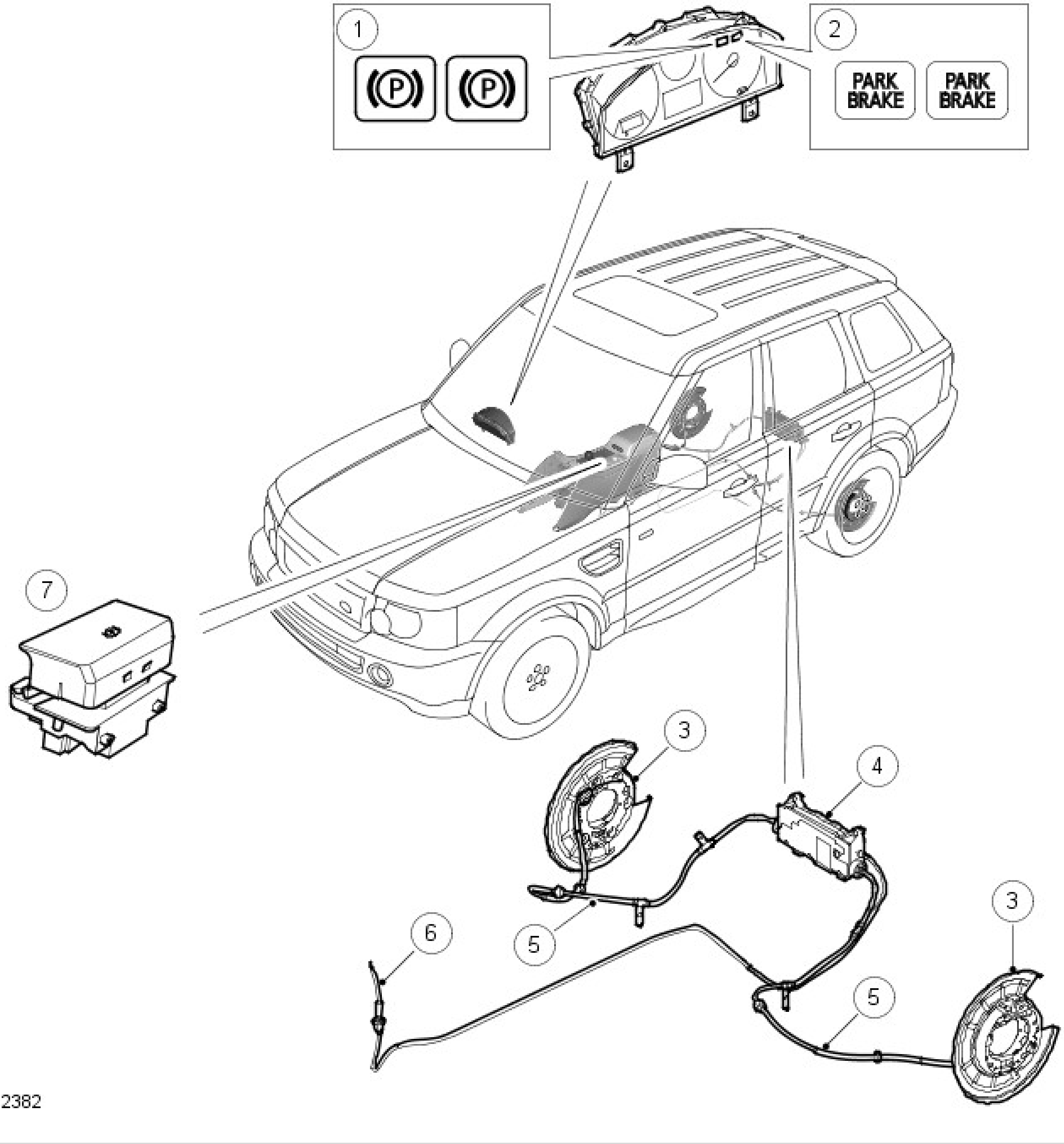
Parking Brake and Actuation - Parking Brake

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	Parking brake indicators (all except NAS (north America specification))
2	-	Parking brake indicators (NAS only)
3	-	Drum brake
4	-	Parking brake module
5	-	Parking brake cable
6	-	Emergency release cable
7	-	Parking brake switch

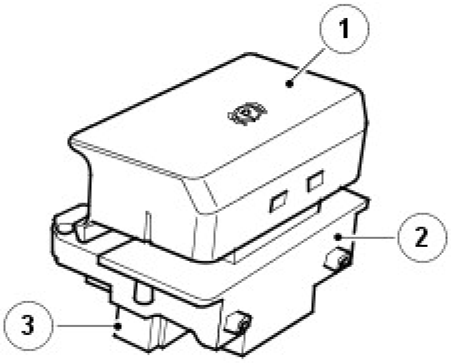
GENERAL

The parking brake is an electrically actuated system that operates drum brakes integrated into the rear brake discs. The parking brake system consists of:

- A parking brake switch.
- Left and right drum brakes.
- Left and right brake cables.
- An emergency release cable.
- Two parking brake indicators.
- A parking brake module.

The parking brake is operated by the parking brake module, which adjusts the tension of the brake cables to apply and release the drum brakes. Operation of the parking brake module is initiated by the parking brake switch.

PARKING BRAKE SWITCH



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Item	Part Number	Description
1	-	Operating handle
2	-	Switch body
3	-	Electrical connector

The parking brake switch is used by the driver to apply and release the parking brake, and is installed in the center console adjacent to the gear lever.

Slots on the sides of the parking brake switch engage with the top panel of the center console, and a screw secures the parking brake switch in position. An electrical connector on the back of the switch provides the interface with the vehicle wiring. A brake symbol on the switch illuminates when the exterior lamps are selected on.

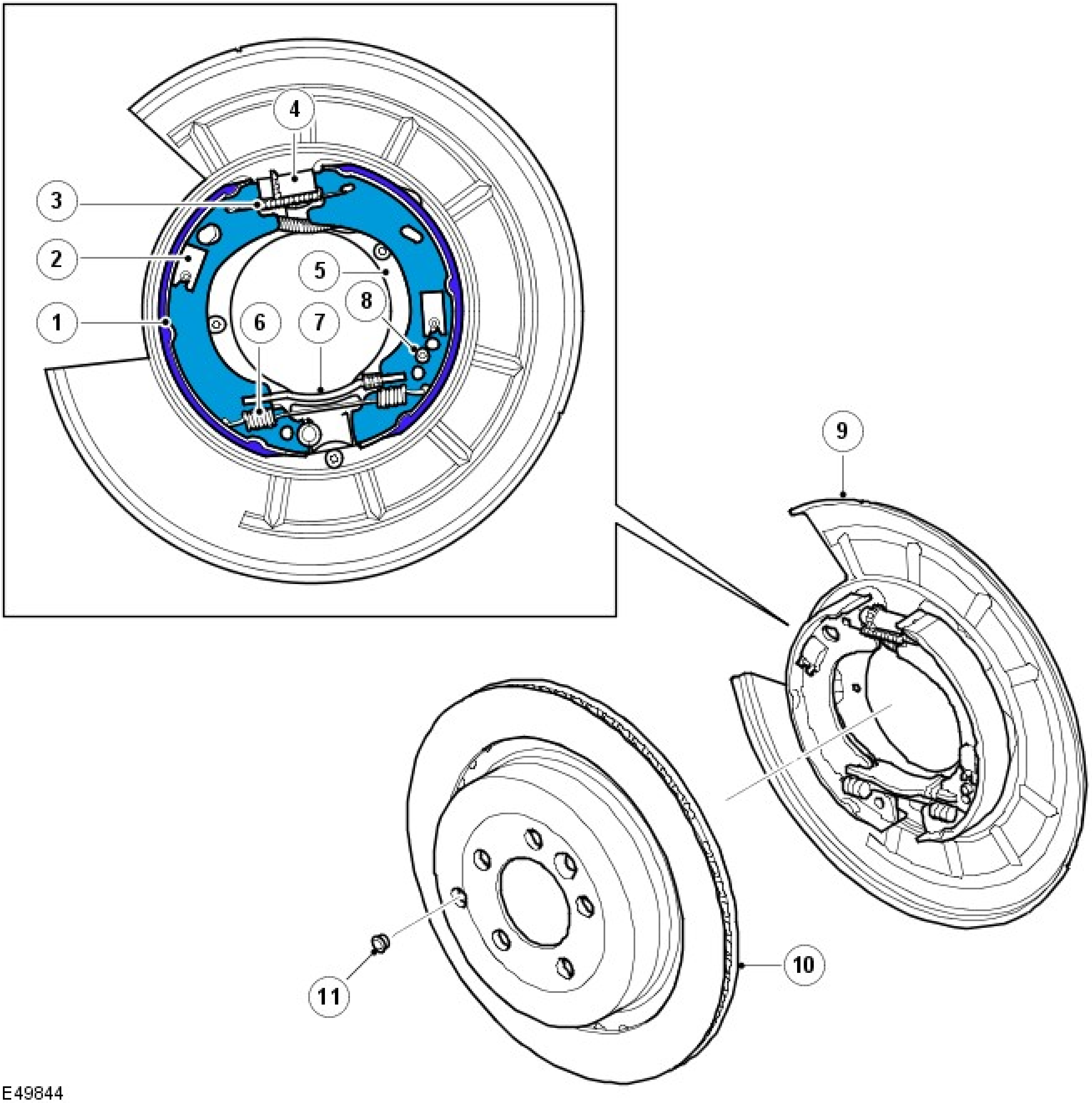
There are three states for the parking brake switch:

- Apply request, when the handle of the parking brake switch is pulled up.
- Release request, when the handle of the parking brake switch is pushed down.
- Idle, when the handle of the parking brake switch is in the central or rest position.

Microswitches, incorporated into the parking brake switch, are activated by the handle of the parking brake switch. To determine the operating state of the parking brake switch, the parking brake module scans the circuits containing the microswitches.

DRUM BRAKES

• NOTE: right-hand (RH) brake shown, left-hand (LH) brake similar



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Item	Part Number	Description
1	-	Brake shoe
2	-	Shoe locating pin and clip
3	-	Adjuster spring
4	-	Toothed wheel adjuster
5	-	Backplate
6	-	Return spring
7	-	Cross strut
8	-	Wedge adjuster screw
9	-	Dust shield
10	-	Rear brake disc
11	-	Adjuster access plug

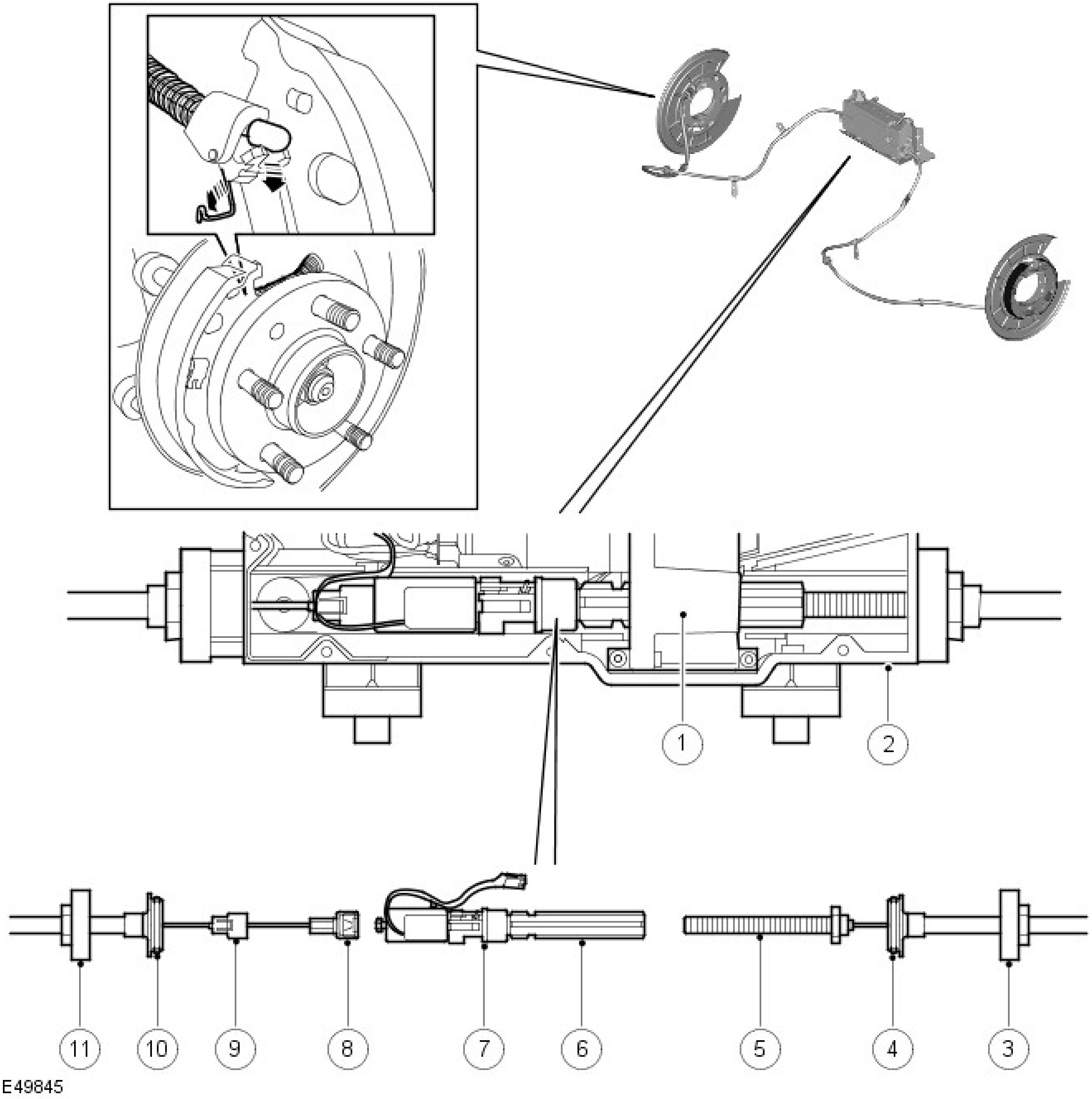
⚠ WARNING: Prior to removing a brake disc from a vehicle, power should be disconnected from the parking brake module. Operation of the parking brake switch while a brake disc is removed can cause the actuating mechanism in the parking brake module to seize. In addition, the parking brake may not switch off until 20 minutes after key-off; automatic re-apply cannot be eliminated until this period has expired.

Each drum brake consists of a pair of brake shoes installed on a backplate attached to the rear hub carrier. The brake shoes operate on the drum integrated into the rear brake disc. The orientation of the brake shoes differ by 180° between the LH and RH brakes.

When the parking brake module tensions the brake cables, the movement is transmitted to an operating lever on one of the brake shoes. The operating lever pivots against a cross strut, which forces the brake shoes apart and into contact with the drum in the rear brake disc. Brake shoe to drum clearance is set with two manual adjusters, which are accessed through a hole in the brake disc. One of the adjusters is a conventional toothed wheel adjuster. The second adjuster is a wedge adjuster operated by an Allen screw.

After replacement of the brake shoes or brake discs, a bedding in procedure must be performed to ensure the drum brakes operate satisfactorily.
For additional information, refer to: Parking Brake Shoes Bedding-In (206-05 Parking Brake and Actuation, General Procedures).

BRAKE CABLES



Item	Part Number	Description
1	-	Gearbox
2	-	Parking brake module housing

3	-	Cable nut
4	-	Sealing collar
5	-	Threaded connector
6	-	Spline shaft
7	-	Force sensor
8	-	Shoe
9	-	Locking cover
10	-	Sealing collar
11	-	Cable nut

WARNING: Prior to disconnecting a brake cable, power should be disconnected from the parking brake module. Operation of the parking brake switch while a brake cable is disconnected can cause the actuating mechanism in the parking brake module to seize. In addition, the parking brake may not switch off until 20 minutes after key-off; automatic re-apply cannot be eliminated until this period has expired.

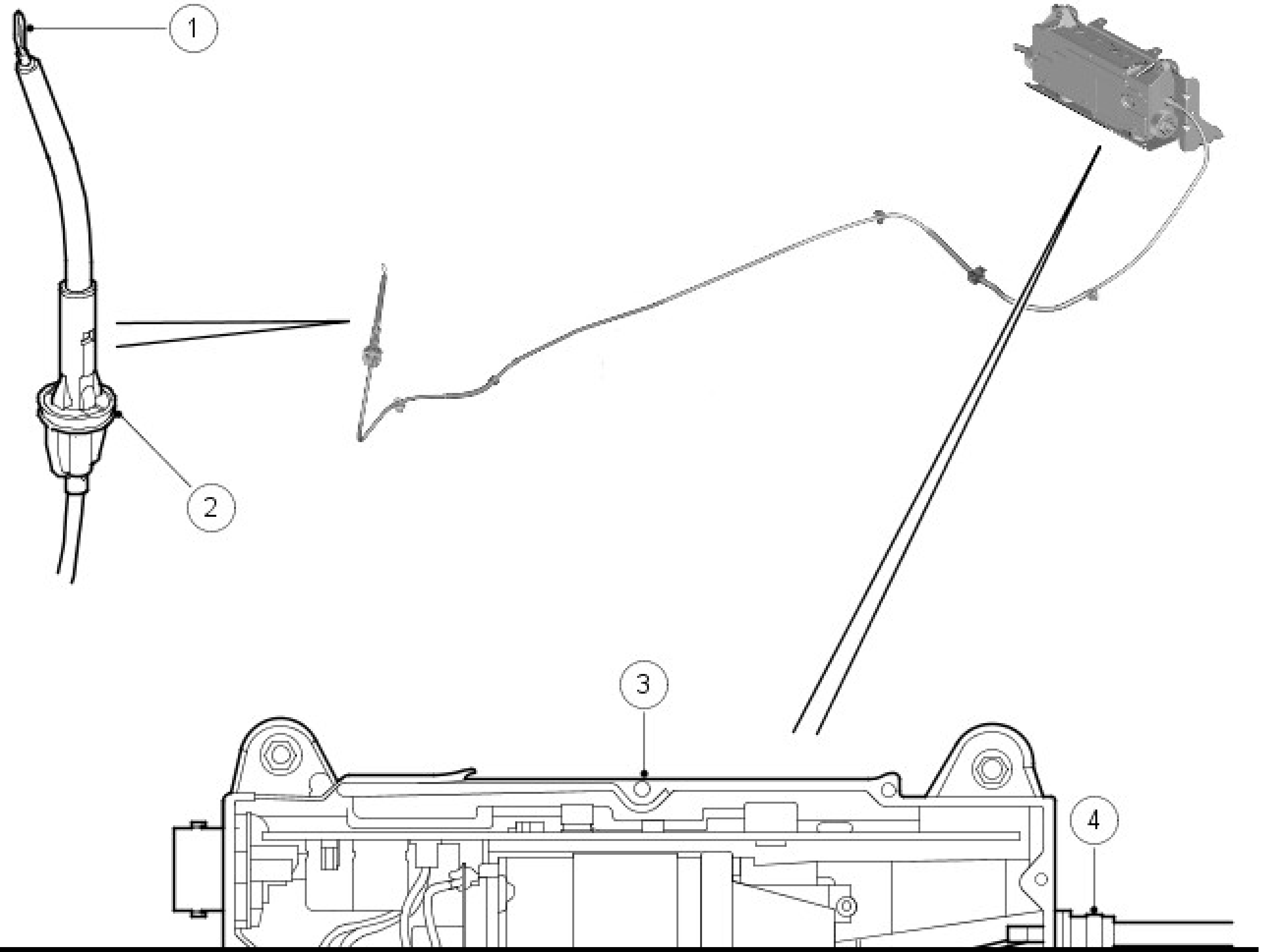
The brake cables consist of Bowden cables installed between the parking brake module and the drum brakes. Nuts, on the ends of the outer cables, secure the brake cables to the parking brake module and the backplate of the related drum brake. In each drum brake, the inner cable is located in the guide spring and connected to the brake shoe operating lever by a nipple on the end of the cable. In the parking brake module, the two inner cables are joined together via the force sensor and the spline shaft.

The inner cable of the RH brake cable is connected to a nipple on the force sensor by a 'shoe' on the end of the cable; a locking cover keeps the shoe engaged with the nipple.

The inner cable of the LH brake cable is connected to the spline shaft by a threaded connector (LH thread); a squared flange at the end of the threaded connector locates in the housing of the parking brake module, to prevent the threaded connector from turning with the spline shaft.

When the spline shaft turns, the threaded connector of the LH brake cable is screwed into or out of the spline shaft, which changes the effective length of the inner cables and operates the drum brakes. The ability of the spline shaft to move axially in the gearbox equalizes the load applied by the inner cables to the two drum brakes.

EMERGENCY RELEASE CABLE



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Item	Part Number	Description
1	-	Pull ring
2	-	Quick release fitting
3	-	Parking brake module
4	-	Sealing collar
5	-	Spring
6	-	Inner cable
7	-	Nipple
8	-	Pulley wheel

The emergency release cable allows the parking brake to be mechanically released if:

- The parking brake cannot be electrically released because of a system fault.
- The battery is disconnected or battery voltage decreases below 7.5 volts while the parking brake is applied, so that the parking brake cannot be electrically released.

The parking brake is mechanically released by disconnecting the force sensor from the spline shaft in the parking brake module. During normal operation, the force sensor and the spline shaft are locked together by a lever operated pawl on the end of the spline shaft, which engages with a spigot on the force sensor.

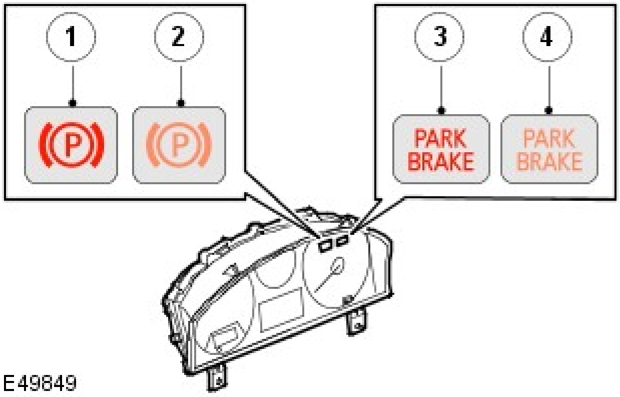
The emergency release cable is a Bowden cable installed between the parking brake module and the center console. The emergency release cable is held in clips along the underside of the vehicle and enters the passenger compartment below the center console through an aperture in the transmission tunnel. A quick release fitting seals the emergency release cable in the aperture. At the parking brake module, a sealing collar on the outer cable is a push fit in the housing of the parking brake module.

In the center console, a pull ring is installed on the end of the inner cable. The pull ring is designed to fit the hook on the end of the jack handle which, in combination with a screwdriver shaft, can be used to pull on the cable. The pull ring can be accessed by removing a circular panel in the bottom of the center console cupholders, on left-hand drive (LHD) vehicles, or by removing the parking brake switch on right-hand drive (RHD) vehicles.

The pull required to release the latch is approximately 200 N (45 lbf). When the pull ring of the emergency release cable is released, the spring in the parking brake module retracts the inner cable and the nipple moves away from the pawl operating lever.

After the emergency release cable has been used to release the parking brake, the next time an apply selection is made with the parking brake switch, the parking brake module automatically runs through a latching procedure to reconnect the spline shaft with the force sensor. The parking brake module turns the spline shaft so that it moves towards the force sensor. The pawl of the spline shaft then re-engages with the spigot of the force sensor. A second apply selection with the parking brake switch is required to apply the parking brake.

PARKING BRAKE INDICATORS



Item	Part Number	Description
1	-	Red warning indicator (all except NAS)
2	-	Amber warning indicator (all except NAS)
3	-	Red warning indicator (NAS only)
4	-	Amber warning indicator (NAS only)

The parking brake has two warning indicators, one amber and one red, located in the speedometer of the instrument cluster.

Amber Parking Brake Warning Indicator

The amber parking brake warning indicator is continuously illuminated if there is a parking brake system fault. Operation of the indicator is controlled by a high speed controller area network (CAN) bus signal from the parking brake module to the instrument cluster.

Red Parking Brake Warning Indicator

When the parking brake is applied, the red parking brake warning indicator is continuously illuminated while the ignition is on and for 3 minutes after the ignition is switched off. If the system is unable to comply with an apply or release request, due to a system fault, the indicator flashes.

When the ignition is on and the indicator is not flashing, operation is controlled by a high speed CAN bus signal from the parking brake module to the instrument cluster. When the ignition is off or when the indicator is flashing, operation is controlled by a hardwired signal from the parking brake module to the instrument cluster.

Messages Center

When there is a fault condition, illumination of the warning indicators is accompanied by a text message displayed in the message center.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

PARKING BRAKE MODULE

The parking brake module monitors external and internal inputs and adjusts the tension of the brake cables to operate the drum brakes and provide the required parking brake function.

The parking brake module is installed on a support bracket attached to the front of the spare wheel carrier. Two rubber mounts, installed on lugs on the underside of the parking brake module, locate in holes in the support bracket. The top corners of the parking brake module are secured to the support bracket with rubber mounts and flanged nuts.

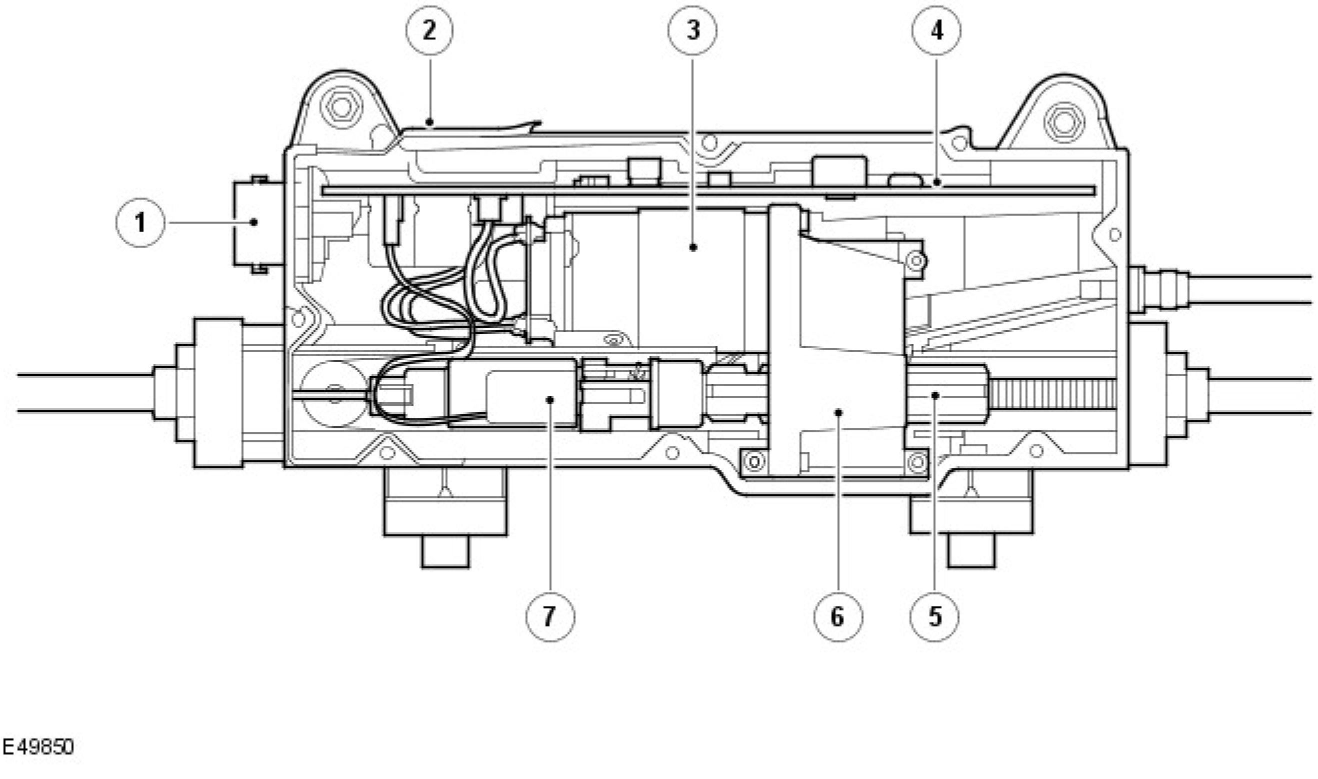
The main components of the parking brake module are:

- A PCB (printed circuit board) incorporating the ASIC (application specific integrated circuit) for control of the parking brake.
- An electric motor.
- A gearbox.
- A spline shaft.
- A force sensor.

The spline shaft and the force sensor are connected together by a latch on the end of the spline shaft. The spline shaft rotates on the latch and moves axially in the gearbox. The latch and the force sensor slide in a channel in the body of the parking brake module.

To apply or release the drum brakes, the parking brake module runs the electric motor, which drives the gearbox. The gearbox turns the spline shaft to increase or decrease the tension in the brake cables. The parking brake module monitors the load exerted by the brake cables using the input from the force sensor.

Interior of Parking Brake Module



Item	Part Number	Description
1	-	Electrical connector
2	-	Housing
3	-	Electric motor
4	-	PCB
5	-	Spline shaft
6	-	Gearbox
7	-	Force sensor

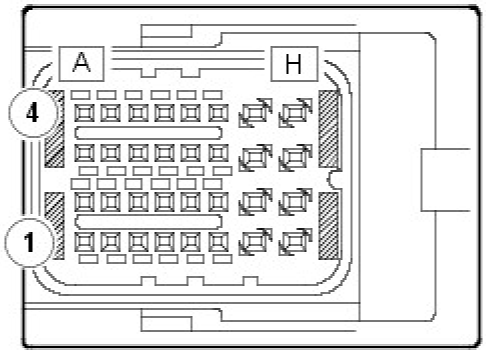
Inputs and Outputs

A 32 pin electrical connector on the RH side of the parking brake module provides the interface between the PCB and the vehicle wiring.

The parking brake module is powered by two permanent battery power feeds from the battery junction box (BJB). Two further connections with the central junction box (CJB) provide battery voltage signals when the key is in the ignition switch (key in) and when the ignition switch is in position II (ignition). Other hardwired inputs include those from the parking brake switch.

In addition to the hardwired connections, the parking brake module is connected to the high speed CAN bus to enable communication with other vehicle systems.

Parking Brake Module Harness Connector C2178



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Parking Brake Module Harness Connector C2178 Pin Details

Pin No.	Description	Input/Output
A1	Not used	-
A2	High speed CAN bus low out	Input/Output
A3	High speed CAN bus high in	Input/Output
A4	High speed CAN bus low in	Input/Output
B1	Not used	-
B2	High speed CAN bus high out	Input/Output
B3	Parking brake switch SW1	Input
B4	Parking brake switch SW4	Input
C1 and C2	Not used	-
C3	Parking brake switch SW2	Input
C4	Parking brake switch SW5	Output
D1 to F1	Not used	-
F2	Key in ignition switch	Input
F3	Ignition power supply	Input
F4	Red parking brake indicator	Output
G1	Not used	-
G2	Ground	Output
G3	Not used	-
G4	Battery power supply	Input
H1	Not used	-
H2	Ground	Output
H3	Not used	-
H4	Battery power supply	Input

PARKING BRAKE OPERATION

The parking brake can be applied at any time provided sufficient battery power is available. For the parking brake to be released, various pre-conditions are required. The parking brake has manual and automatic actuating modes, to cater for different operating circumstances, as detailed in the following table:

Actuating Modes

Mode	Pre-Conditions	Driver Action
Static apply	Vehicle speed less than 2.5 km/h (1.6 mph).	Pull up parking brake switch.
Static release	1. Vehicle speed less than 2.5 km/h (1.6 mph). 2. Engine running. **OR** Ignition switch in position II and brake pedal or accelerator pedal pressed.	Press down parking brake switch.
Dynamic apply	Vehicle speed more than 2.5 km/h (1.6 mph).	Pull up parking brake switch as required.

Mode	Pre-Conditions	Driver Action
Dynamic release	Vehicle speed more than 2.5 km/h (1.6 mph).	Release (to neutral position) or press down parking brake switch.
DAR (drive away release)	1. Ignition switch in position II. 2. Transmission in gear 1, 2 or R (with high range selected) or 1, 2, 3 or R (with low range selected). 3. Accelerator pedal pressed more than 5%.	None. Parking brake released automatically on drive away.

Operating Voltages

Actuation of the parking brake (apply or release) is only started if the power supply to the parking brake module is within 9 to 18 volts. At any voltage in this range, the parking brake module is able to tighten the brake cables to the maximum, to fully apply the parking brake, although at voltages between 9 and 10.5 volts the actuation time may exceed 1.0 second.

During a parking brake actuation:

- If the power supply to the parking brake module decreases to less than 8.3 volts, the parking brake module continues the actuation, but stores a related fault code. If the ignition is on, the parking brake module also signals the instrument cluster to illuminate the amber parking brake warning indicator and flash the red parking brake warning indicator. On the instrument cluster, a message advising there is a parking brake fault is shown in the message center. The warning indications are discontinued if the power supply voltage increases to 8.3 volts or more.
- If the power supply voltage decreases to less than 7.5 volts, the parking brake module discontinues the actuation. Actuation is automatically resumed if the power supply voltage subsequently increases to 7.5 volts or more and the parking brake switch request is still valid.
- If the power supply voltage decreases below 6.5 volts, the parking brake function is disabled for the remainder of the ignition cycle.
- If the power supply voltage increases to more than 18.0 volts, the parking brake module immediately disables the parking brake function and stores a related fault code. If the ignition is on, the parking brake module also signals the instrument cluster to illuminate the amber parking brake warning indicator and flash the red parking brake warning indicator. On the instrument cluster, a message advising that the parking brake has a fault and is not functioning is shown in the message center. The parking brake function remains disabled until the power supply voltage is within 9 to 18 volts again. When the power supply voltage is within 9 to 18 volts again, the warning indications are cancelled and actuation is automatically resumed if the parking brake module is in a dynamic mode of operation with a valid parking brake switch request.

• NOTE: The instrument cluster shuts down below 8 volts, so warning indications and messages are not displayed below 8 volts. CAN transmission stops if battery voltage drops below 7.0 volts and re-starts when voltage goes above 7.5 volts.

Sleep Mode

To reduce quiescent drain on the vehicle battery, the parking brake module incorporates a sleep mode. The parking brake module enters the sleep mode, provided the ignition is off and there are no signals from the wheel speed sensors, when one of the following occurs:

- 20 minutes elapse after the last actuation of the parking brake.
- If no actuation occurred, 20 minutes elapse after the ignition is switched off.

The parking brake module wakes up from the sleep mode when one of the following occurs:

- An apply or release request is made with the parking brake switch.
- The ignition is turned on.

The parking brake module wakes up within 500 ms. The high speed CAN bus is activated within 200 ms maximum.

When the parking brake module is woken with a release request from the parking brake switch, the parking brake module ignores the request but illuminates the red brake warning indicator. The parking brake module extinguishes the red brake warning indicator and goes back to sleep immediately the switch is released to the neutral position.

When the parking brake module is woken with an apply request from the parking brake switch, if the parking brake is already applied the parking brake module ignores the request but illuminates the red brake warning indicator. The parking brake module extinguishes the red brake warning indicator and goes back to sleep immediately the switch is released to the neutral position. If the parking brake is in the released condition when the apply request is made, the parking brake module illuminates the red brake warning indicator and applies the parking brake. The parking brake module extinguishes the red brake warning indicator and goes back to sleep 3 minutes after the apply activation, or immediately after the switch is released to the neutral position, whichever occurs last.

Dynamic Apply

In the dynamic apply mode, if the vehicle speed is more than 10 km/h (6.25 mph) when the parking brake switch is selected to apply, the parking brake module requests the anti-lock brake system (ABS) module to activate the disc brakes on all four wheels. When the vehicle comes to a standstill, the parking brake module statically applies the parking brake. Once the static load is achieved, the hydraulic pressure is removed. If the parking brake switch is released to the neutral position, or pressed down to the release position, during dynamic apply, braking is cancelled.

The ABS module monitors the deceleration rate using the wheel speed sensor signals, and adjusts the hydraulic pressure to the disc brakes as required to achieve the required rate. All of the anti-lock control - traction control system brake functions remain enabled in the dynamic apply mode.

The parking brake module incorporates two fallback functions for the dynamic apply mode:

- Fallback 1 is invoked if vehicle speed is between 2.5 km/h (1.25 mph) and V_{max} when the parking brake switch is selected to apply and the ABS module is unable to fulfil a hydraulic request. When fallback 1 is invoked, the parking brake module decelerates the vehicle using only the parking brake. The parking brake module monitors the deceleration rate using the wheel speed information from the ABS module, and adjusts the tension of the brake cables to achieve the required rate. During deceleration the parking brake module also uses the wheel speed inputs from the ABS module to operate an anti-lock function for the rear wheels. When vehicle speed decreases to 2.5 km/h (1.25 mph) the parking brake module changes to the static apply mode.
- Fallback 2 is invoked if there is a loss of communication between the parking brake module and the ABS module or the CAN bus has failed. When fallback 2 is invoked, the parking brake module decelerates the vehicle using only the parking brake. The parking brake module tightens the brake cables under the control of the driver, no anti-lock function is available.

While dynamic apply is active, including fallback 1 and fallback 2, the parking brake module also outputs high speed CAN bus signals to:

- The ABS module, to apply the stoplamps.
- The instrument cluster, to sound an intermittent warning buzzer, at 0.5 second on, 1.0 second off.
- The instrument cluster, to illuminate the red parking brake warning indicator. The indicator is permanently illuminated except in fallback 2, when it flashes.

DAR Pre-arming

The DAR pre-arming function operates when the transfer box is in high range to reduce the parking brake release time during DAR and to provide a smooth take-off. DAR pre-arming is invoked when:

- The ignition switch is in position II.
- The transmission is in gear 1, 2 or R.
- The vehicle is stationary.
- No failsafe tighten actuation has occurred.

Automatic Load Adjustment

While the ignition is on, the parking brake module constantly monitors the input from the force sensor. If the tension of the brake cables goes outside the limits for a given operating mode, the parking brake module automatically restores the tension within limits.

Failsafe Tighten. If, during DAR pre-arming, the vehicle moves, then the maximum cable force is reinstated for the remainder of that ignition cycle.

Automatic Apply. While the parking brake is applied, if the tension of the brake cables decreases by a prescribed amount from the initial setting, the parking brake module automatically restores the tension to the initial setting.

Automatic Release. While the parking brake is released, if the tension of the brake cables increase to a prescribed amount, the parking brake module automatically reduces the tension to zero.

Parking Brake Switch Monitoring

The parking brake module monitors for the following types of fault in the parking brake switch system:

- Short circuits between a pull-down transistor in the parking brake module and battery voltage.
- Broken wires and microswitches.
- Plausibility.

If a fault is detected, the parking brake module stores a related fault code.

The parking brake switch has a degree of in-built redundancy. If a single microswitch fault is detected the parking brake module can still determine the operating state of the parking brake switch. Short circuits or multiple failures cause the parking brake module to disable the parking brake switch for the remainder of the ignition cycle. The parking brake module also disables the parking brake switch if a plausibility fault occurs. However, since plausibility faults are usually caused by incomplete operation of the parking brake switch, the parking brake switch is re-enabled if the parking brake module subsequently establishes a plausible operating state.

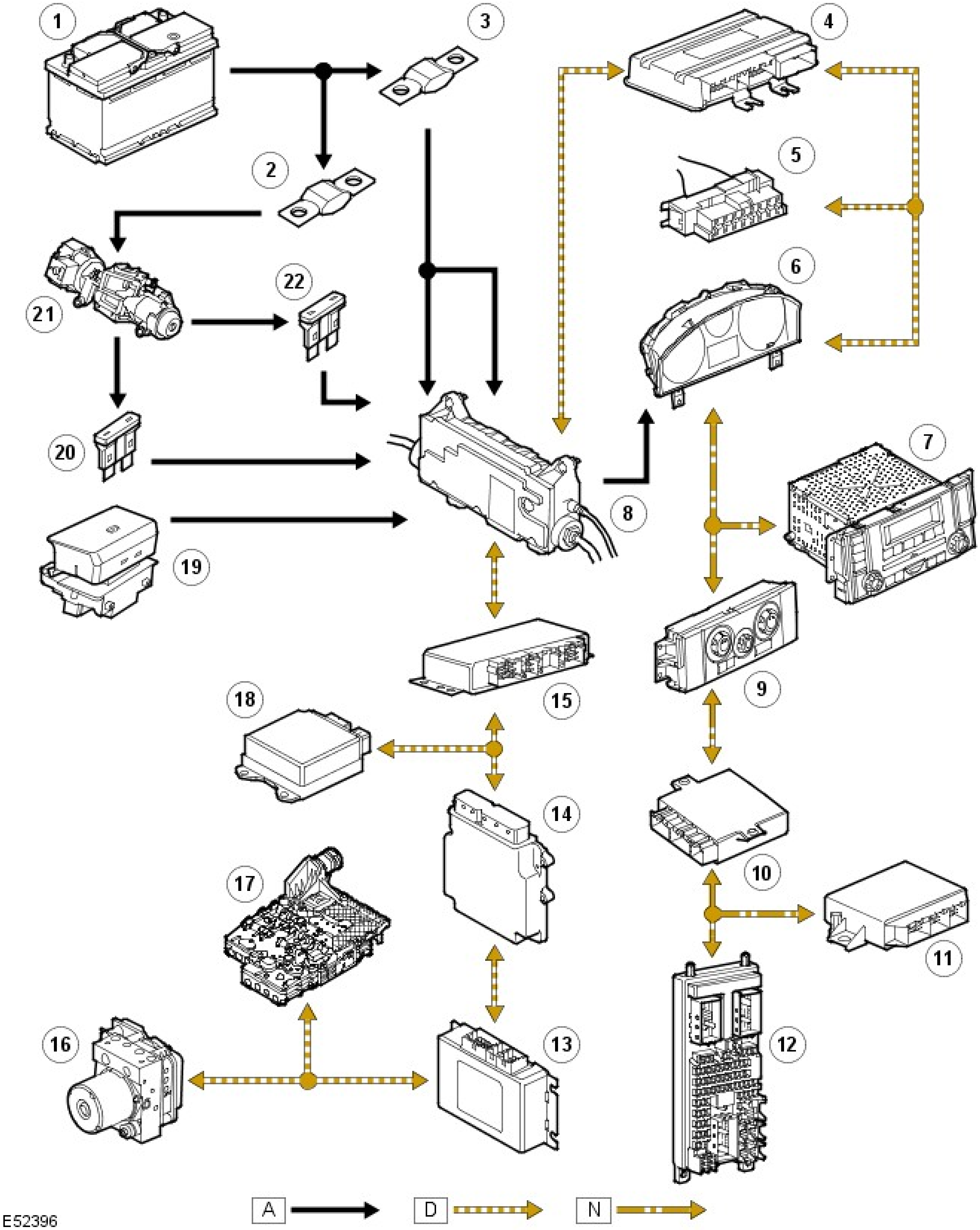
If a single microswitch fault is detected, the parking brake module signals the instrument cluster to illuminate the amber parking brake warning indicator. The parking brake module also signals the instrument cluster to display a message advising there is a parking brake fault. During an apply actuation, the parking brake module also signals the instrument cluster to flash the red parking brake warning indicator.

For all other fault types, the parking brake module signals the instrument cluster to illuminate the amber parking brake warning indicator and to display a message advising the parking brake has a fault and is not functioning. If it makes an apply actuation, the parking brake module signals the instrument cluster to flash the red parking brake warning indicator for the remainder of the ignition cycle.

On the next ignition cycle, the warning indicators and the messages are only activated if the fault is still present, although the fault code is retained by the parking brake module until cleared by T4.

PARKING BRAKE CONTROL DIAGRAM

- NOTE: A = Hardwired connection; D = High speed CAN bus; N = Medium speed CAN bus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Item	Part Number	Description
1	-	Battery
2	-	Fusible link 11E, BJB
3	-	Fusible link 8E, BJB
4	-	Air suspension control module
5	-	Diagnostic socket

6	-	Instrument cluster
7	-	Integrated head unit
8	-	Parking brake module
9	-	automatic temperature control (ATC) module
10	-	TPM (tire pressure monitoring) module
11	-	Parking aid module
12	-	CJB
13	-	Transfer box control module
14	-	engine control module (ECM)
15	-	Rear differential control module
16	-	ABS module
17	-	transmission control module (TCM)
18	-	Restraints control module
19	-	Parking brake switch
20	-	Fuse 41P, CJB (ignition)
21	-	Ignition switch
22	-	Fuse 40P, CJB (key-in)

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Parking Brake and Actuation - Parking Brake

Diagnosis and Testing

Overview

Please note this is a sealed unit and no attempt must be made to open the actuator as it will invalidate the warranty claim.

For information on the operation of the system, refer to the relevant section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Parking brake cable(s) condition and installation ● Parking brake shoes condition and installation ● Parking brake drums (integrated into rear brake discs) ● Parking brake actuator module condition and installation	● Parking brake indicators ● Fuses - Fuse box - engine compartment - fuse 11E - Fuse box - engine compartment - fuse 8E - Fuse box - passenger compartment - fuse 40P - Fuse box - passenger compartment - fuse 41P ● Wiring harness/electrical connectors - Check for bent/corroded pins ● Controller area network (CAN) circuits ● Parking brake switch ● Parking brake actuator module

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
   - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Parking brake will not engage or release	● Parking brake cables fouled, trapped or damaged ● Parking brake cables incorrectly routed or fixed ● Parking brake shoes, linings worn/contaminated ● Parking brake drums (integrated into rear brake discs) ● Parking brake shoes incorrectly adjusted following replacement ● Parking brake actuator module malfunction	Check the parking brake cables for fouling, trapping or damage. Check the cables for correct routing. Check that the cable end fitting connector(s) are correctly installed to the operating lever(s). Inspect the parking brake shoes and drums for condition/wear/contamination. Check the parking brake shoes for correct adjustment. REFER to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures). Check the operation of the parking brake actuator module, check for damage and/or excessive noise during operation. Check for parking brake actuator module DTCs.
Low parking brake efficiency/parking brake sticking/binding		

DTC Index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: Intermittent faults may cause DTCs to be logged, however some DTCs may be cleared during an ignition off, ignition on cycle. Carry out a road test (if safe to do so), check the functionality of the system and retrieve any DTCs **before** turning the ignition off.

Brake Bedding Mode

Bedding mode is a special mode available in the parking brake module (PBM) that disables the stability assist system (ABS) and allows the parking brake to provide the braking force rather than the conventional braking system whilst the vehicle is moving at a velocity of >3kph. This mode is entered via a series of brake pedal presses and switch applications, full details on this procedure is available in the relevant section of the workshop manual. If brake bedding mode is entered accidentally by the driver the RED warning lamp will flash in the Instrument Pack, the module will return to normal operational mode when the ignition has been cycled. This DTC (C110468) is intended to highlight the fact that although the RED lamp was illuminated there was no fault present in the control module.

• NOTE: Where reference is made to a drive cycle test, refer to the descriptions at the end of the table.

DTC	Description	Possible causes	Action
C110468	Brake Bedding Mode	- Event information - Brake bedding mode has been entered	This is not a fault. This is where the parking brake bedding-in mode has been activated. For information on how the bedding-in mode is activated and deactivated, REFER to: Parking Brake Shoes Bedding-In (206-05 Parking Brake and Actuation, General Procedures).
C1A0000	Control Module	- Parking brake actuator module fault	Clear DTCs, complete drive cycle 1 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect.
C1A0016	Control Module	- Battery voltage below 8.3V at parking brake actuator module - Charging system under charging - Parking brake actuator module supply circuit short circuit to ground - Parking brake actuator module supply circuit open circuit - Parking brake actuator module ground circuit short circuit to power - Parking brake actuator module ground circuit open circuit	Check the charging system, charging voltage and battery condition. Check the parking brake actuator power and ground circuits. Refer to the electrical guides. Clear DTCs, complete drive cycle 3 to test for normal operation, refer to the relevant drive cycle shown below this table.
C1A0017	Control Module	- Vehicle started using a booster pack - Battery voltage at parking brake actuator module has been greater than 17V - Charging system over charging - Parking brake actuator module supply circuit short circuit to power	Check the charging system and charging voltage. Check the parking brake actuator power circuits. Refer to the electrical guides. Clear DTCs, complete drive cycle 3 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect.
C1A004B	Control module	• NOTE: This is not a fault. - Parking brake actuator module temperature protection invoked, typically due to over-use where there have been more than 15 apply and release cycles continuously	If the red parking brake warning indicator flashes the fault is the result of short term protection (message displayed). Allow the parking brake to cool for 60 seconds and retest for functionality. If the parking brake does not apply, check for other DTCs. Rectify as necessary. Clear DTCs, complete drive cycle 3 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect.
C1A4001	Longitudinal Acceleration Sensor	• NOTE: The longitudinal acceleration sensor is part of the parking brake actuator module - Longitudinal acceleration sensor	Clear DTCs and check if the fault reoccurs when the vehicle is stationary. Refer to the warranty policy and procedures manual if a module is suspect. Clear DTCs, complete drive cycle 1 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		fault	
C1A4002	Longitudinal Acceleration Sensor	• NOTE: The longitudinal acceleration sensor is part of the parking brake actuator module - Longitudinal acceleration sensor plausibility failure	Clear DTCs and check if the fault reoccurs when the vehicle is stationary. Calibrate the longitudinal acceleration sensor. To calibrate the sensor make sure the vehicle is on a level surface and run the calibration routine from the configuration menu of the approved diagnostic system. If calibration was not successful check that the parking brake actuator module is correctly installed. Refer to the warranty policy and procedures manual if a module is suspect. Clear DTCs, complete drive cycle 2 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect.
C1A4054	Longitudinal Acceleration Sensor	• NOTE: The longitudinal acceleration sensor is part of the parking brake actuator module - Longitudinal acceleration sensor not calibrated	Clear DTCs and calibrate the longitudinal acceleration sensor. To calibrate the sensor make sure the vehicle is on a level surface and run the calibration routine from the configuration menu of the approved diagnostic system. Retest for functionality. Clear DTCs, complete drive cycle 1 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect.
C1A4101	Clutch Pedal Sensor	- Clutch pedal sensor electrical error	Refer to the electrical guides and check the electrical circuit between the PBM and clutch position sensor, repair/renew as necessary.
C1A4102	Clutch Pedal Sensor	- Clutch pedal sensor circuit error	Refer to the electrical guides and check the electrical circuit between the PBM and clutch position sensor, repair/renew as necessary.
C1A4300	Motor Supply	• NOTE: The electric motor is part of the parking brake actuator module - Brake cables loose/broken/damaged - Brake shoes worn/damaged - Electric motor jammed	Check that the brake cables are connected correctly and are not loose/damaged. If the cables need to be re-connected use the approved diagnostic system to drive the cables to the "mount" position so that maximum cable length is available. Check the parking brake shoes adjustment and condition, REFER to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures) / Brake Disc (206-04 Rear Disc Brake, Removal and Installation) / Parking Brake Shoes (206-05 Parking Brake and Actuation, Removal and Installation). If the parking brake actuator module is stuck, re-cycle the ignition. If the parking brake actuator module cannot be operated from the switch then use the approved diagnostic system to drive the parking brake actuator module using the 'unjam' application in the set-up and configuration menu. Retest for functionality. Refer to the warranty policy and procedures manual if a module is suspect. Clear DTCs, complete drive cycle 1 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect.
C1A4301	Motor Supply	• NOTE: The electric motor is part of the parking brake actuator module - Internal motor circuit fault	Clear DTCs, complete drive cycle 3 to test for normal operation, refer to the relevant drive cycle shown below this table. Refer to the warranty policy and procedures manual if a module is suspect. Refer to the warranty policy and procedures manual if a module is suspect.
C1A4662	Mismatch Between Motor Drive Current and Resultant Force	- Parking brake cables fouled, trapped or damaged - Parking brake shoes, linings worn - Parking brake shoes incorrectly adjusted following replacement - Parking brake actuator module circuit short circuit to ground, short circuit to power, high resistance - Parking brake actuator module fault	Check the parking brake cables for fouling, trapping or damage. Check the parking brake shoes for correct adjustment, REFER to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures). Inspect the parking brake shoes for excessive wear. REFER to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation) / Parking Brake Shoes (206-05 Parking Brake and Actuation, Removal and Installation). Check the parking brake actuator module circuits. Refer to the electrical guides. Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect.

Drive Cycle 1 Description

- Ignition On
- Make sure that no parking brake activation (diagnostic command or switch input) is attempted for a minimum of 3 seconds
- Retest for functionality

Drive Cycle 2 Description

- Ignition On
- Drive vehicle at a constant speed of 20KPH (13MPH) or slightly above in 2nd gear
- At a constant speed of 20KPH (13MPH) or slightly above apply the parking brake via the parking brake switch
- Press the brake pedal

Drive Cycle 3 Description

- Ignition On
- Make sure that the vehicle is stationary and that the parking brake is released
- Pull the parking brake switch to the apply position and hold in this position until the parking brake motor has stopped (this may take up to 5 seconds)
- Release the parking brake switch to the idle position, leave in the idle position for 2 seconds
- Push the parking brake switch to the release position (while pressing the brake pedal) and keep in this position until the parking brake motor has stopped (this may take up to 5 seconds)
- Release the parking brake switch to the idle position

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake Shoe and Lining Adjustment

General Procedures

• NOTE: This procedure must be carried out if, new parking brake shoes are fitted, new rear brake discs are fitted or if the vehicle has been mud wading (not water) for more than 50 miles.

1. Check the parking brake for correct operation.

2. CAUTIONS:

When the vehicle is in the mounting position a red flashing light may appear on the instrument cluster. This indicates that the parking brake actuator is in the mounting position. It does not indicate a vehicle fault.

The warning lamp on the instrument cluster will flash whilst the parking brake is being driven into the mounting position.

Using the Land Rover approved diagnostic system, drive the parking brake to the mounting position.

3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

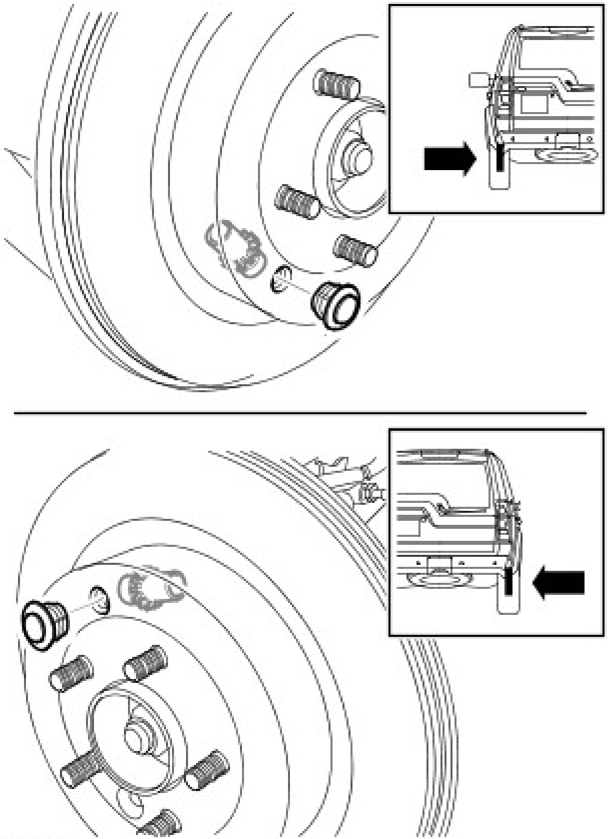
Raise and support the vehicle.

4. Remove the wheels and tires.

5. NOTE: Align the access hole with the indicators located on the back plate.

Locate the parking brake shoe adjuster.

- Remove the access plug.
- Rotate the brake disc.



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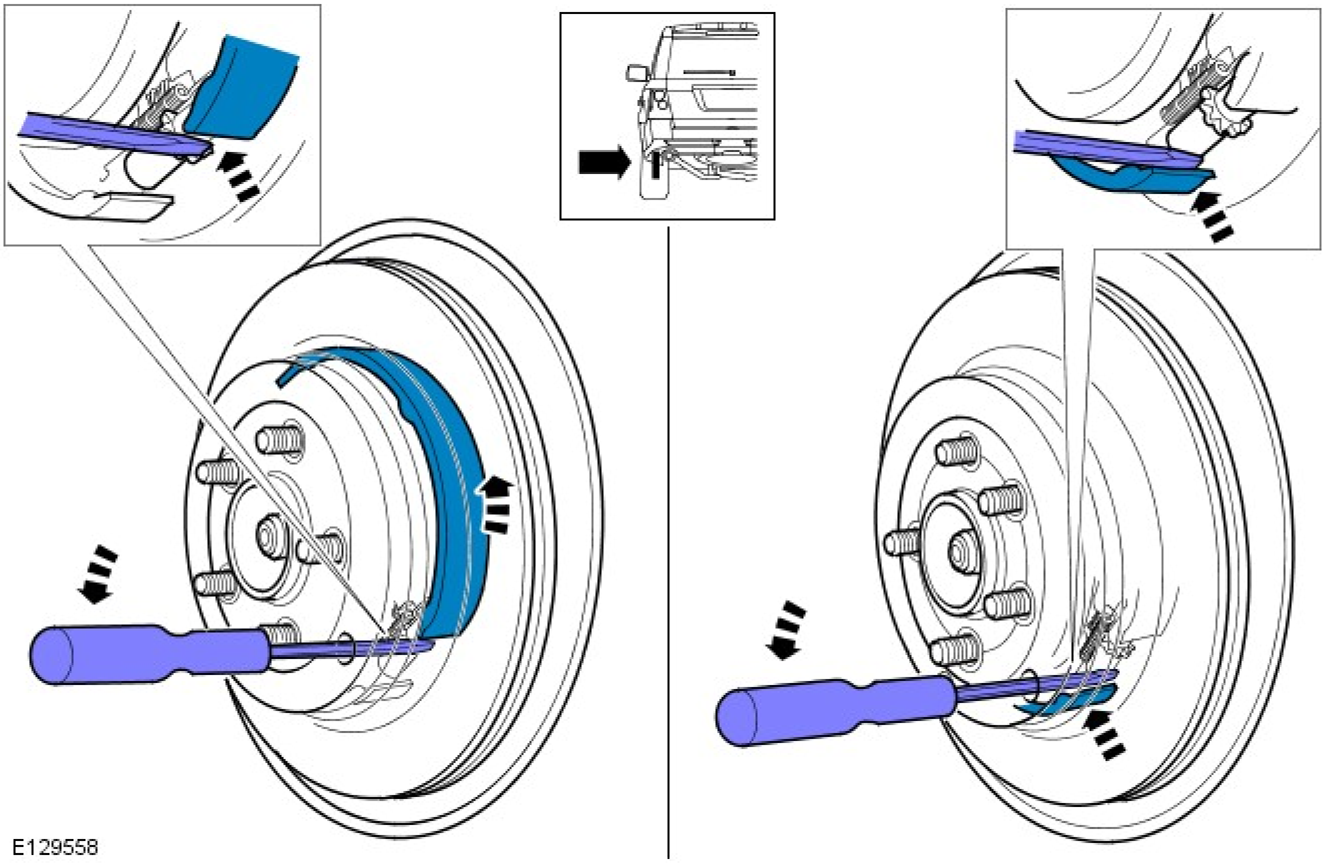
6. CAUTION: Failure to follow this step may cause damage to the parking brake system. Failure to displace the parking brake shoes, as shown, will result in incorrect clearance when carrying out the adjustment step.

- NOTE: The movement of the parking brake shoe will be small and may not be felt when levering.
- NOTE: LH shown.

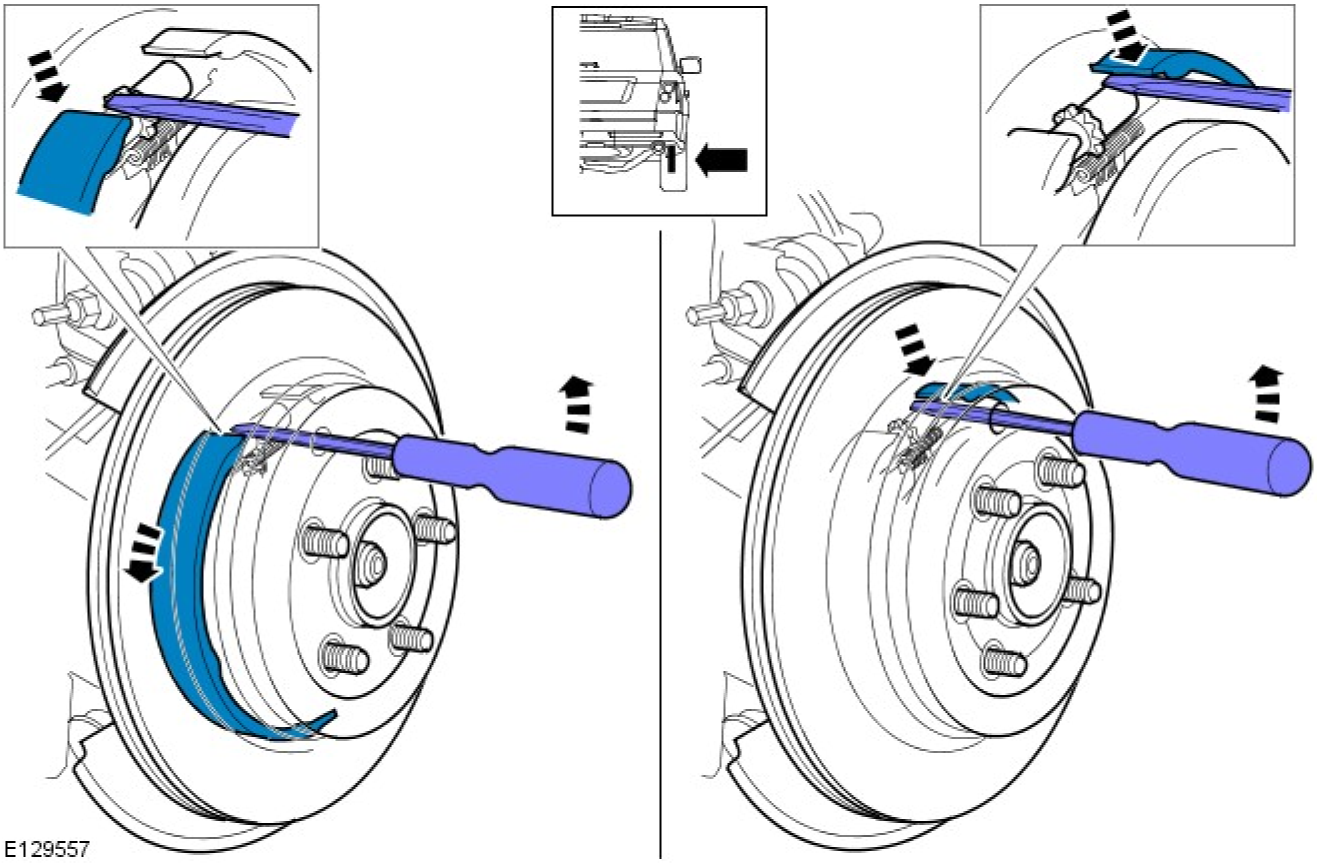
Using a flat blade screwdriver, lever the brake shoes as indicated.



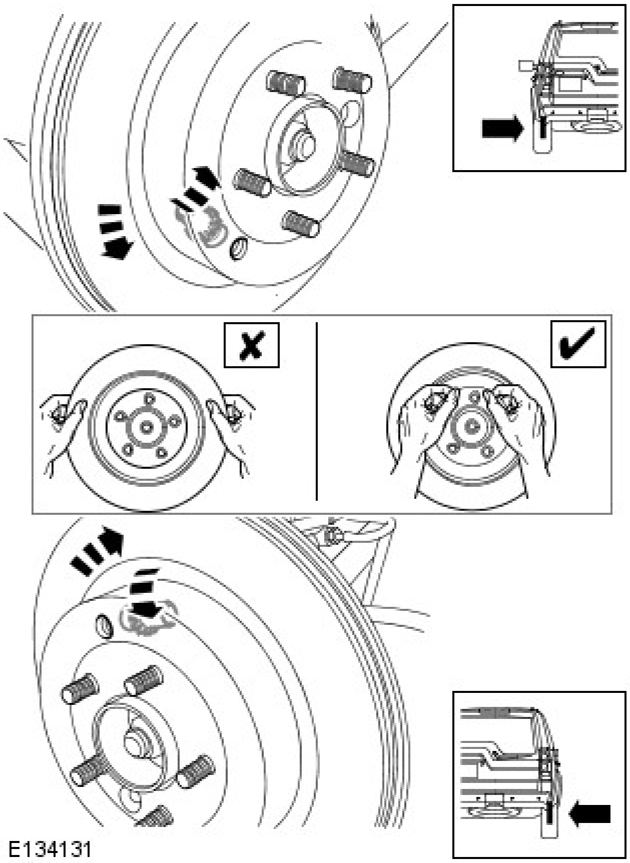
7. ⚠ CAUTION: Failure to follow this step may cause damage to the parking brake system. Failure to displace the parking brake shoes, as shown, will result in incorrect clearance when carrying out the adjustment step.

- NOTE: The movement of the parking brake shoe will be small and may not be felt when levering.
- NOTE: RH Shown.

Using a flat blade screwdriver, lever the brake shoes as indicated.



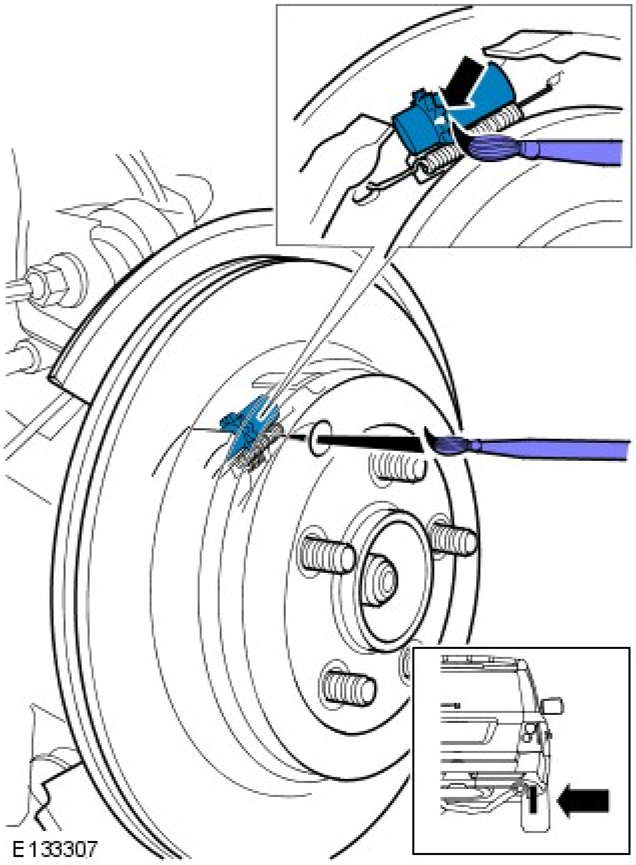
E129557



E134131

8. CAUTION: Do dot apply excessive force on the brake shoe adjuster. Failure to follow this instruction may result in damage to the parking brake system

Using a flat bladed screwdriver rotate the brake shoe adjuster to extend it until the brake disc is locked hand tight.

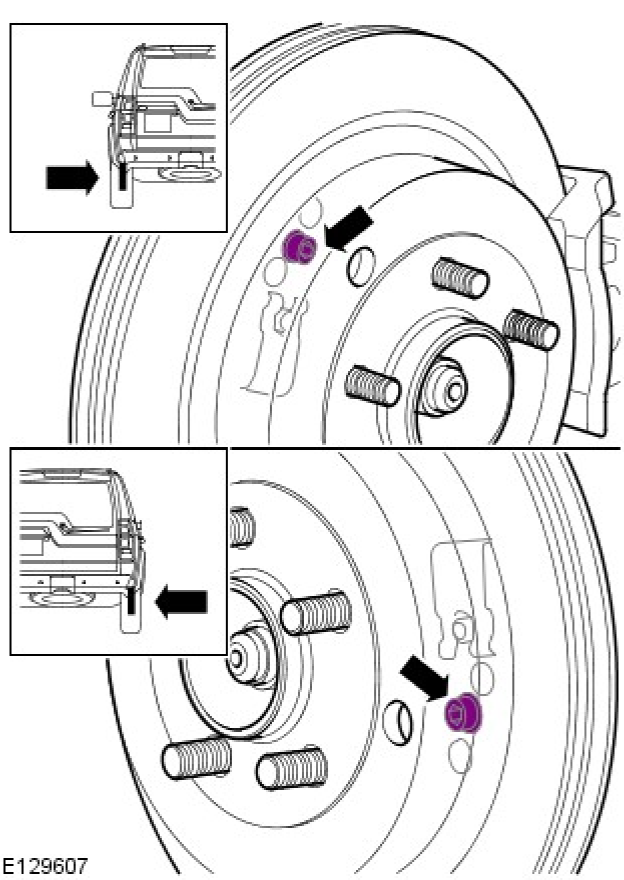


9. ⚠CAUTION: The following steps sets the running clearance for the parking brake shoes, failure to adhere to the paint marking process may cause damage to the park brake system when the adjustment steps are carried out.

Using suitable marker, mark the position of the brake shoe adjuster.

10. ⚠CAUTION: The parking brake adjuster must be rotated back EXACTLY one full revolution. Failure to follow this instruction may result in damage to the parking brake system.

Rotate the adjuster back one revolution until paint mark is visible.



E129607

11. ⚠ CAUTION: The wedge adjuster must be correctly seated to make sure the parking brake cable is correctly adjusted. Failure to follow this instruction may result in damage to the parking brake system.

Loosen the wedge adjuster Allen screw half a turn.

- Tap the brake disc lightly with a soft faced mallet, around the parking brake shoe location within the brake disc.
- Tighten the wedge adjuster Allen screw to 6 Nm (5 lb.ft).
- Install the access plug.

12. Repeat the above procedure for the other side.

13. Take the vehicle out of the mounting position by operating the parking brake twice.

14. ⚠ CAUTION: If the parking brake shoes or the brake discs have been removed for access to other components then DO NOT carry out this procedure.

Carry out the parking brake shoe bedding-in procedure.
For additional information, refer to: Parking Brake Shoes Bedding-In (206-05 Parking Brake and Actuation, General Procedures).

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Parking Brake and Actuation - Parking Brake Shoes Bedding-In

General Procedures

- NOTE: This procedure must be carried out if, new parking brake shoes are fitted, new rear brake discs are fitted or if the vehicle has been mud wading (not water) for more than 50 miles.

1. Carry out the parking brake shoe bedding-in procedure.

2. NOTE: The electronic parking brake 'Service Bedding-in Procedure mode' will be active for the remainder of the igntion cycle, or until the vehicle speed exceeds 31 mph (50 kph). If the procedure needs to be re-entered, the entry actions must be repeated.

To enter 'Service Bedding-in Procedure' mode.

- Start and run the engine.
- Apply the footbrake 3 times within 10 seconds and hold applied after the 3rd application.
- Apply the electronic parking brake switch 4 times, followed by 3 release applications within 10 seconds.

3. Once the Service Bedding-in procedure mode has been entered, the electronic parking brake linings can be bedded-in by conducting 10 repeated stops from 30 - 35 kph (19 - 22 mph), followed by a 500 metre (547 yard) interval between each stop to allow the brakes to cool, using the electronic parking brake control switch.

- The electronic parking brake brake force will be increased up to the dynamic maximum so long as the switch is held in the applied position.
- If the switch is released to either the NEUTRAL or OFF positions, the electronic parking brake will be released.
- The electronic parking brake MUST be allowed to cool between applications, either by driving at 19 mph (30 kph) for 500 metres (547 yards) or remaining stationary for 1 minute between each application.

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake Cable LH

Removal and Installation

Removal

CAUTION: To avoid accidental operation of the parking brake, and possible damage to the parking brake actuator, remove Fusible link 8, located in the engine compartment fuse box before commencing work.

• NOTE: If the parking brake system has completed less than 50,000 cycles it is permissible to replace the parking brake cables. If over 50,000 cycles have been completed, then the cables can only replaced as part of the parking brake actuator and cable assembly. The parking brake cycle count can be checked using using the Land Rover approved diagnostic system, (ON/OFF = 1 cycle). If a cable breaks or becomes detached whilst the vehicle is being driven, a 'parking brake actuator unjaming procedure' may be required using the Land Rover approved diagnostic system.

1. Using the Land Rover approved diagnostic system, drive the parking brake to the 'mounting position'.

2. Isolate the parking brake electrical circuit.

- Remove fuse number 8 from the BJB.

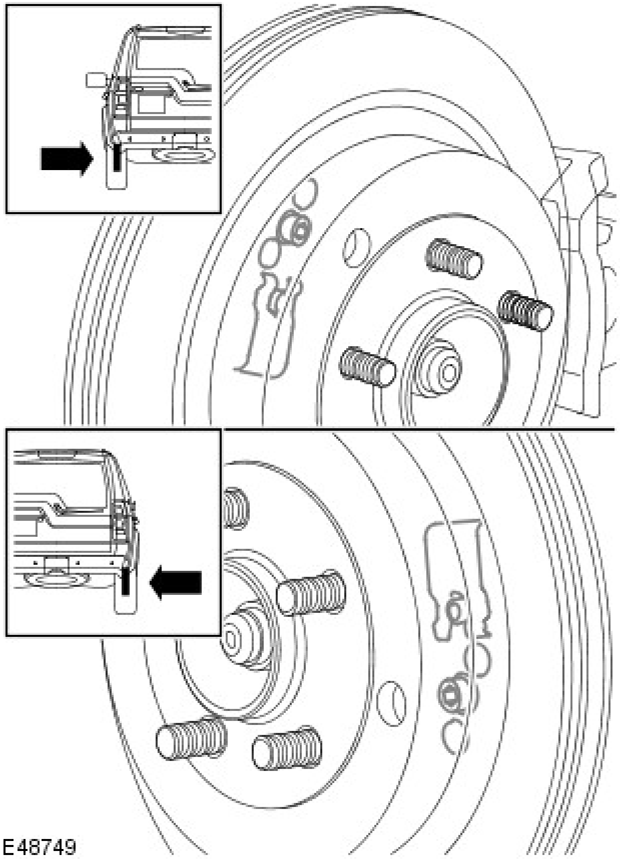
3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

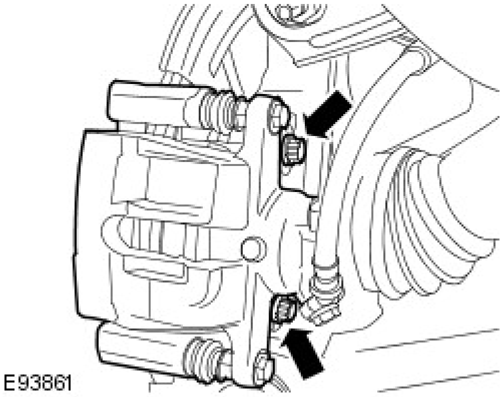
Raise and support the vehicle.

4. Remove both rear wheels and tires.

5. Release the parking brake shoe adjustment.

- Loosen the screw.

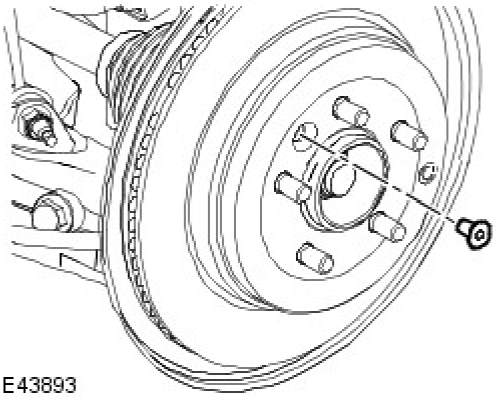



E93861

6. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

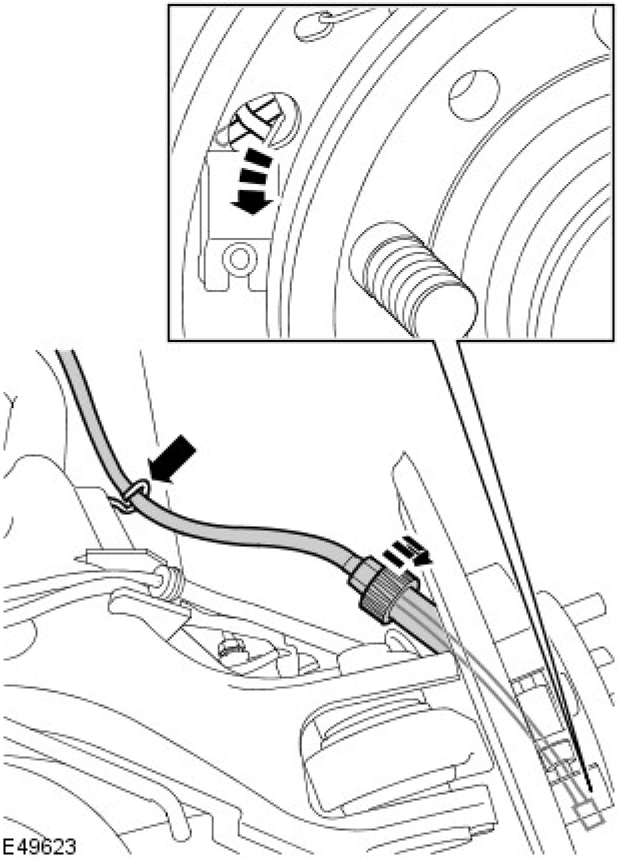
Reposition the LH rear brake caliper.

- Remove the 2 bolts.
- Using a suitable tie strap, support the brake caliper.


E43893

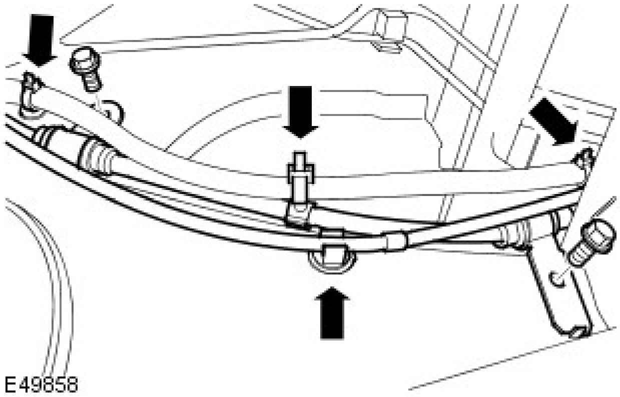
7. Remove the LH rear brake disc.

- Remove the screw.


E49623

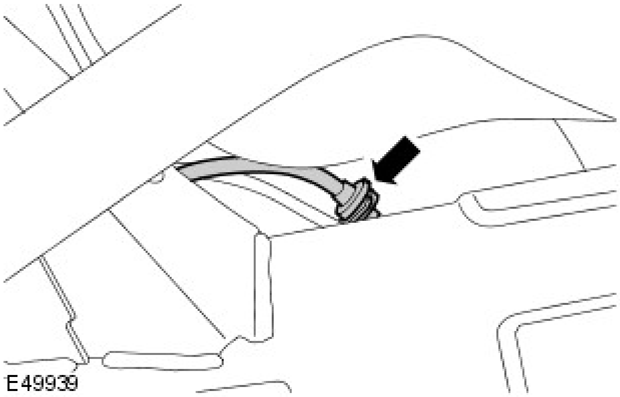
8. Disconnect parking brake cable from the wheel hub.

- Fully loosen the nut.
- Release the cable from the lower arm.
- Disconnect the inner cable from the brake shoe.

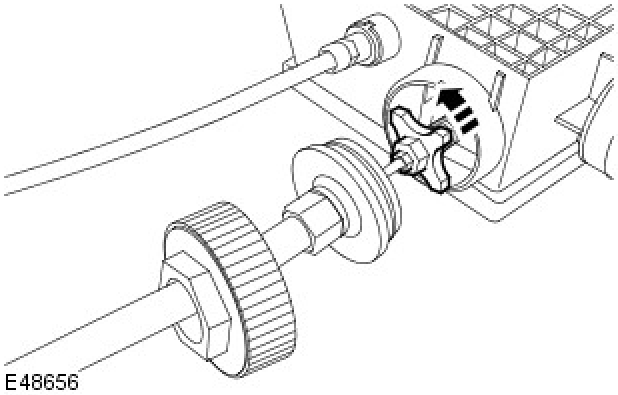


9. Release the LH parking brake cable.

- Remove the 2 bolts.
- Release the 3 wiring harness clips.
- Release the cable from the clip on the chassis.



10. Release the LH parking brake cable.



11. Remove the LH parking brake cable.

- Release the retaining nut.
- Release and remove the cable.

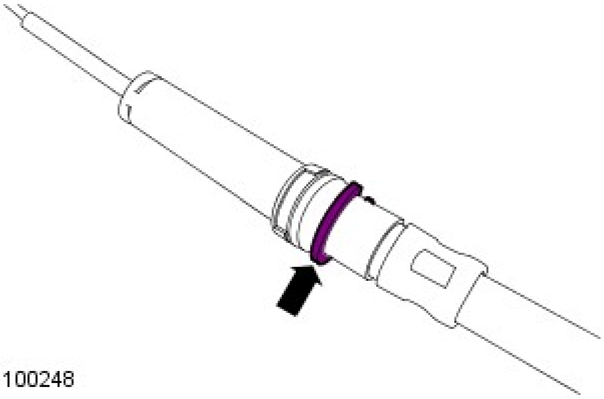
Installation

1. Install the LH parking brake cable.

- LH cable: Screw the cable in 5 complete turns.
- Tighten the retaining nut.

2. Locate and secure the LH parking brake cable.

- Tighten the bolts to 22 Nm (16 lb.ft).
- Secure the wiring harness.
- Secure the cable grommet to the integrated body frame bracket.



E100248

3. NOTE: Make sure that the brake cable circlip is positioned as shown.

Connect the parking brake cable to the wheel hub.

- Connect the cable to the brake shoe lever.
- Locate the cable to the backplate.
- Tighten the nut to 8 Nm (6 lb.ft).

4. ⚠ CAUTION: Make sure that the component is clean, free of foreign material and lubricant.

Install the LH rear brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

5. Secure the LH rear brake caliper.

- Remove and discard the tie strap.
- Tighten the bolts to 115 Nm (85 lb.ft).

6. NOTE: The adjustment procedure must be carried out in full.

Adjust the parking brake shoes.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

7. Install the rear wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

8. Install fuse number 8 into the BJB.

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Parking Brake and Actuation - Parking Brake Cable RH

Removal and Installation

Removal

⚠CAUTION: To avoid accidental operation of the parking brake, and possible damage to the parking brake actuator, remove Fusible link 8, located in the engine compartment fuse box before commencing work.

• NOTE: If the parking brake system has completed less than 50,000 cycles it is permissible to replace the parking brake cables. If over 50,000 cycles have been completed, then the cables can only replaced as part of the parking brake actuator and cable assembly. The parking brake cycle count can be checked using using the Land Rover approved diagnostic system, (ON/OFF = 1 cycle). If a cable breaks or becomes detached whilst the vehicle is being driven, a 'parking brake actuator unjaming procedure' may be required using the Land Rover approved diagnostic system.

1. Using the Land Rover approved diagnostic system, drive the parking brake to the 'mounting position'.

2. Isolate the parking brake electrical circuit.

- Remove fuse number 8 from the BJB.

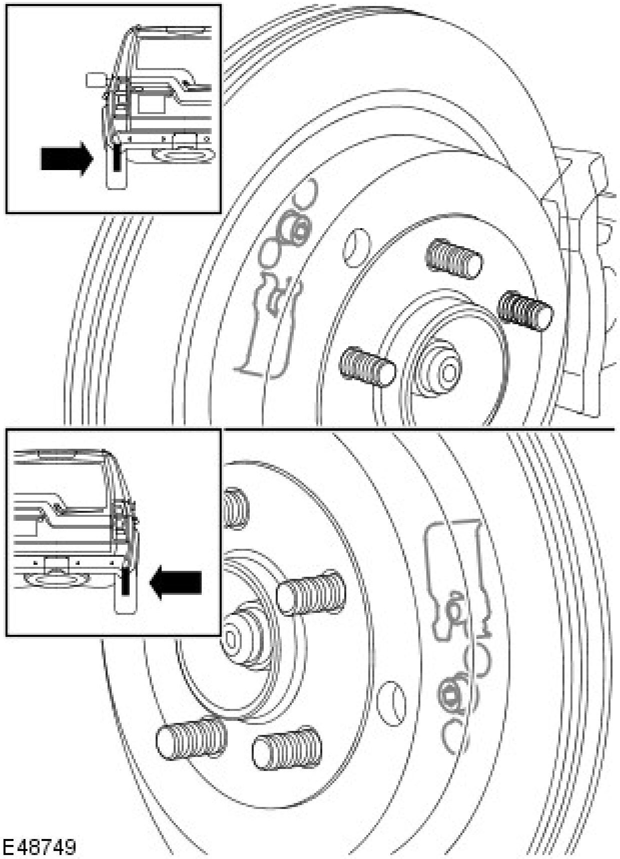
3. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

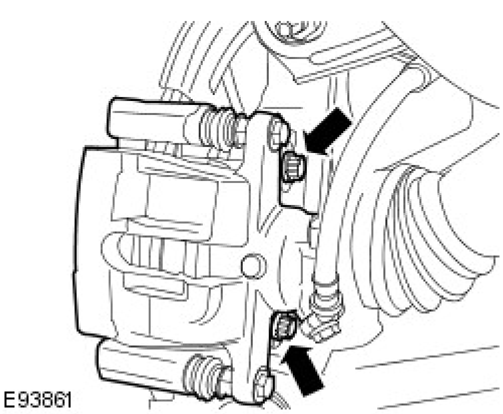
Raise and support the vehicle.

4. Remove the wheels and tires.

5. Release the parking brake shoe adjustment.

- Loosen the screw.

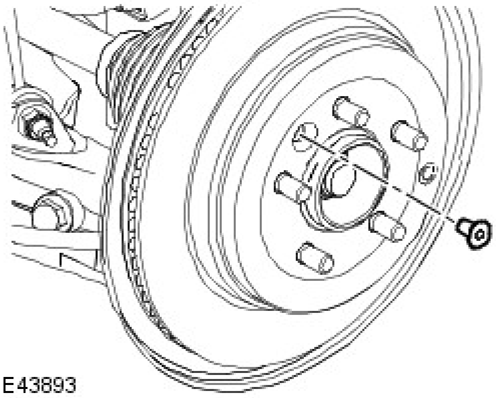




6. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

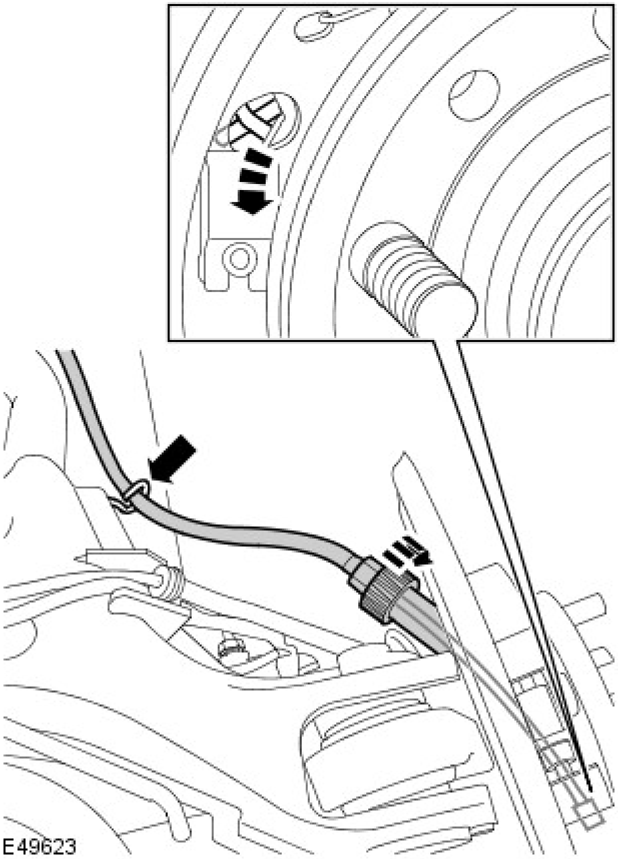
Reposition the RH rear brake caliper.

- Remove the 2 bolts.
- Using a suitable tie strap, support the brake caliper.



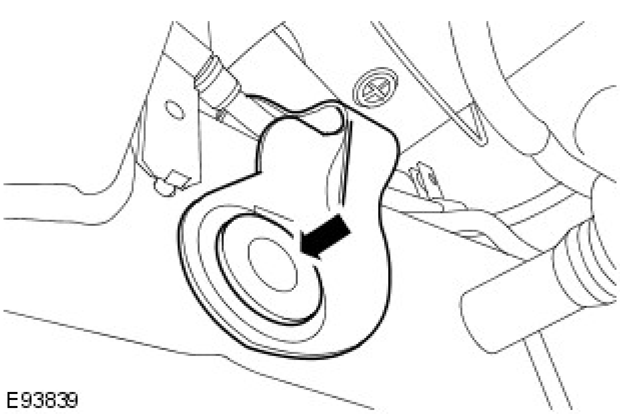
7. Remove the RH rear brake disc.

- Remove the screw.



8. Disconnect parking brake cable from the wheel hub.

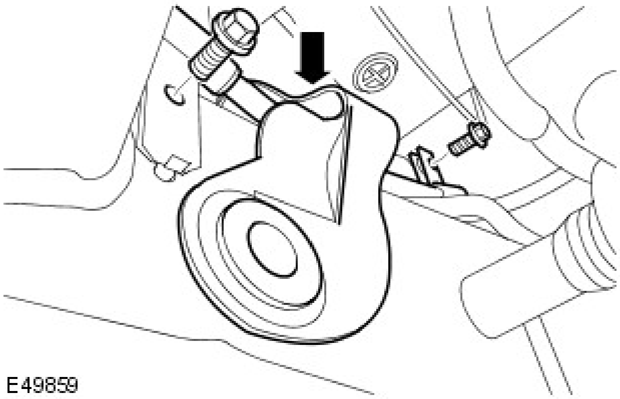
- Fully loosen the nut.
- Release the cable from the lower arm.
- Disconnect the inner cable from the brake shoe.



9. ⚠ CAUTION: The fuel tank breather line bracket can be easily damaged when releasing it from the chassis.

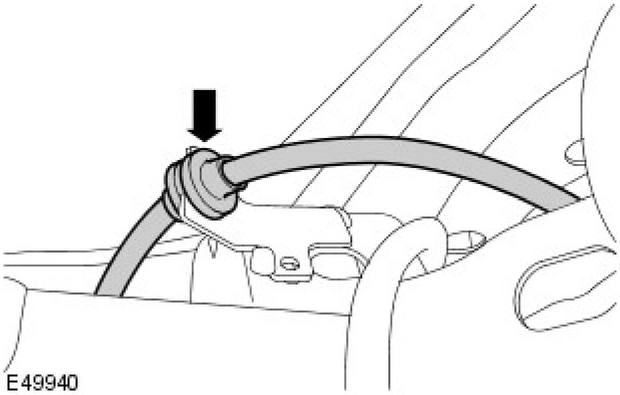
Release the fuel tank breather line bracket.

- Remove the plastic insert.

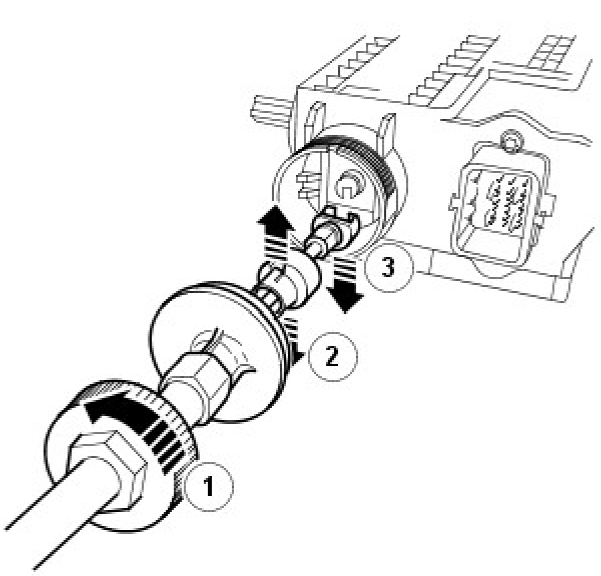


10. Release the RH parking brake cable.

- Remove the 2 bolts.
- Release the parking brake cable from the 2 pipe clips.
- Release the cable from the clip on the chassis.



11. Release the RH parking brake cable.



E61820

12. CAUTION: Make sure that no dirt or moisture enters the actuator during cable replacement.

Remove the RH parking brake cable.

- Release the retaining nut.
- Release the cable retaining clip.
- Release and remove the cable.

Installation

1. Install the RH parking brake cable.

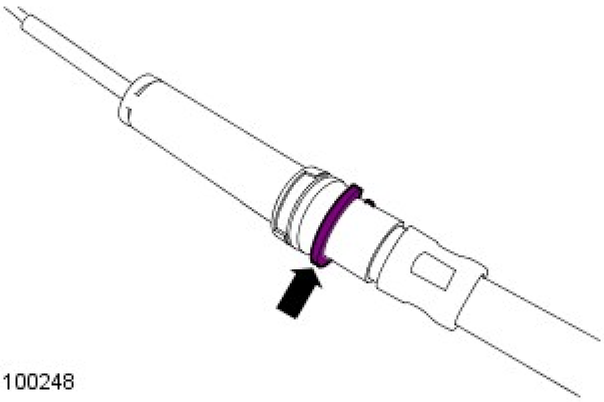
- Install the cable.
- Install the cable retaining clip.
- Tighten the retaining nut.

2. Secure the fuel tank breather line bracket.

- Install the plastic insert.

3. Locate and secure the RH parking brake cable.

- Tighten the bolts to 22 Nm (16 lb.ft).
- Secure the parking brake cable to the 2 pipe clips.
- Secure the cable grommet to the integrated body frame bracket.



E100248

4. NOTE: Make sure that the brake cable circlip is positioned as shown.

Connect the parking brake cable to the wheel hub.

- Connect the cable to the brake shoe lever.
- Locate the cable to the backplate.
- Tighten the nut to 8 Nm (6 lb.ft).

5. CAUTION: Make sure that the component is clean, free of foreign material and lubricant.

Install the RH rear brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

6. Secure the RH rear brake caliper.

- Remove and discard the tie strap.
- Tighten the bolts to 115 Nm (85 lb.ft).

7. NOTE: The adjustment procedure must be carried out in full.

Adjust the parking brake shoes.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

8. Install the rear wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Install fuse number 8 into the BJB.

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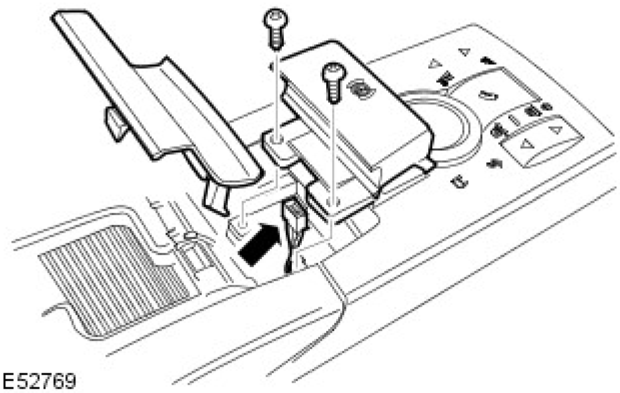
Parking Brake and Actuation - Parking Brake Switch

Removal and Installation

Removal



1. Remove the parking brake switch.
   - Remove the screw cover.
   - Remove the 2 screws.
   - Disconnect the electrical connector.

Installation

1. To install, reverse the removal procedure.

Parking Brake and Actuation - Parking Brake ActuatorV8 4.4L Petrol/V8 S/C 4.2L Petrol

Removal and Installation

Removal

1. Using the Land Rover approved diagnostic system, drive the parking brake to the 'mounting position'.

2. Isolate the parking brake electrical circuit.

- Remove fuse number 8 from the BJB.

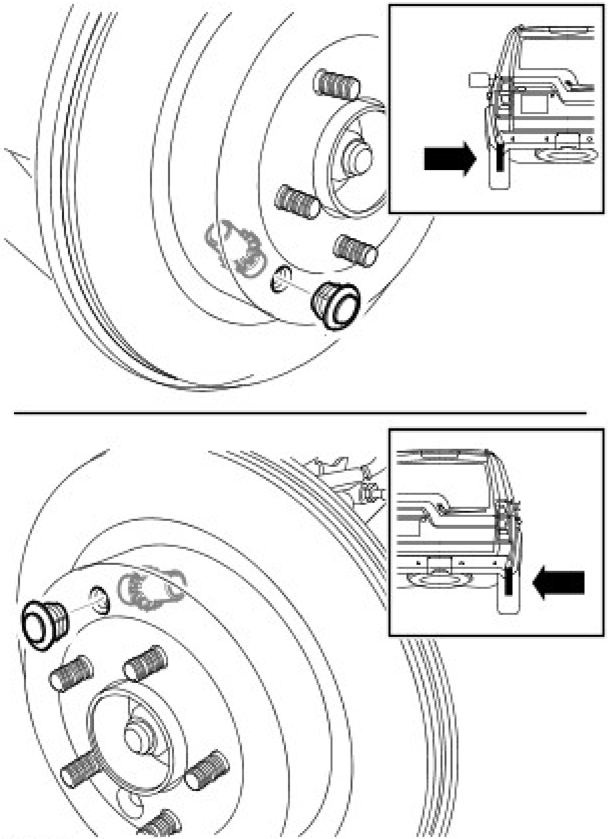
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

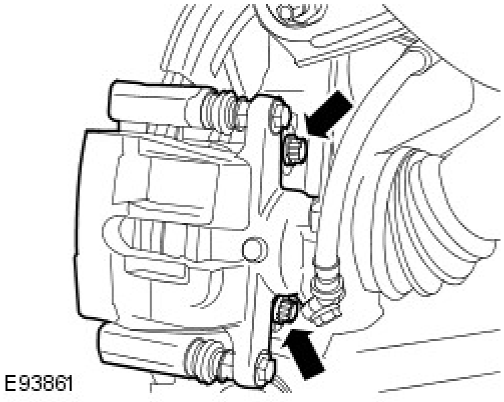
Raise and support the vehicle.

4. Remove the rear wheels and tires.

5. Release the parking brake shoe adjustment.

- Remove the plug from the access hole in the brake disc.
- Using a suitable tool, rotate the brake shoe adjuster to release the adjustment.

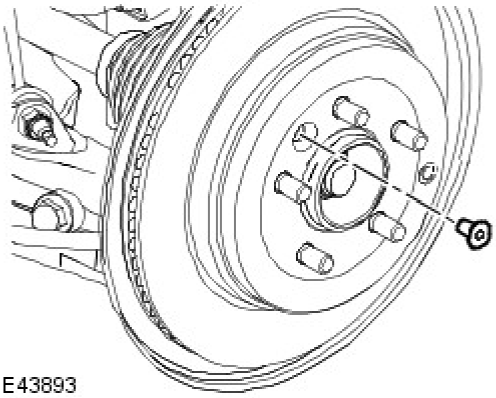




6. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

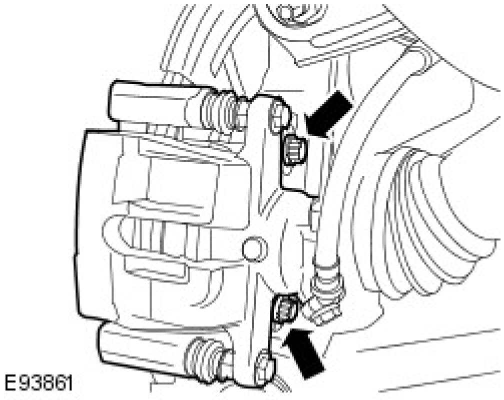
Reposition the RH rear brake caliper.

- Remove the 2 bolts.
- Using a suitable tie strap, support the brake caliper.



7. Remove the RH rear brake disc.

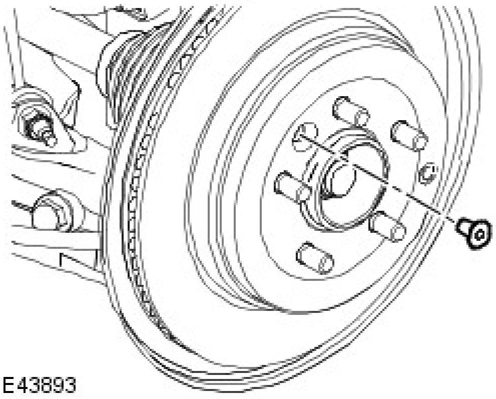
- Remove the screw.



8. ⚠CAUTION: Do not allow the brake caliper to hang on the brake hose.

Reposition the LH rear brake caliper.

- Remove the 2 bolts.
- Using a suitable tie strap, support the brake caliper.

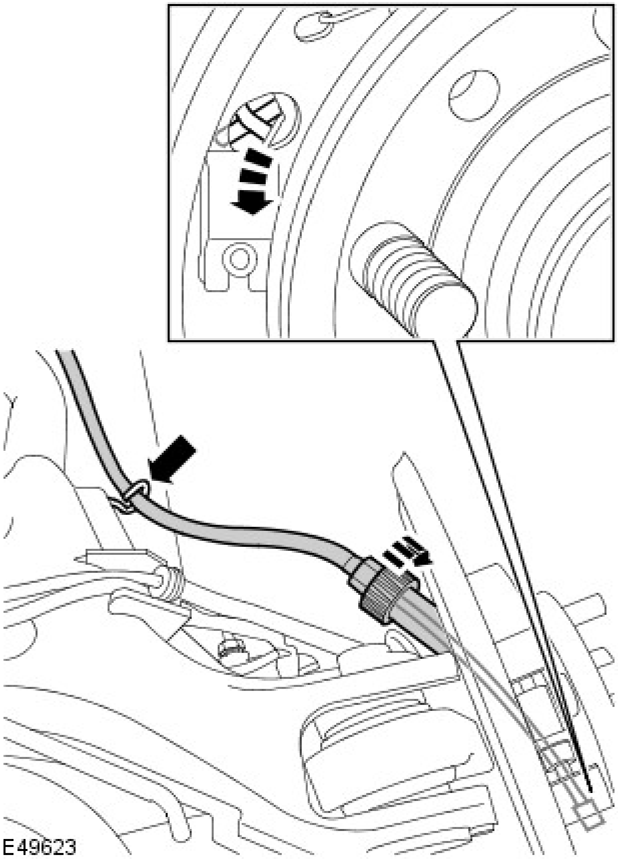


9. Remove the LH rear brake disc.

- Remove the screw.

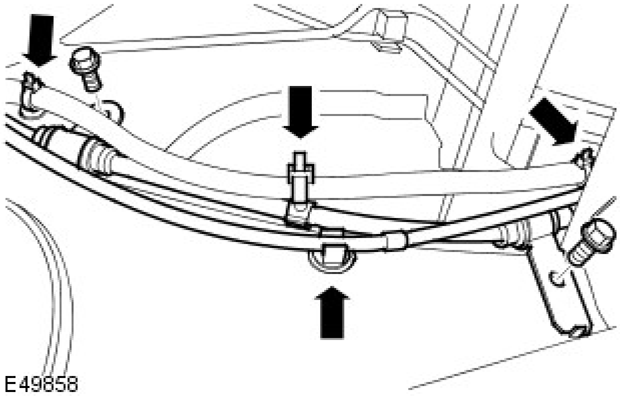
10. Disconnect both parking brake cables from the wheel hubs.

- Fully loosen the nut.
- Release the cable from the lower arm.
- Disconnect the inner cable from the brake shoe.

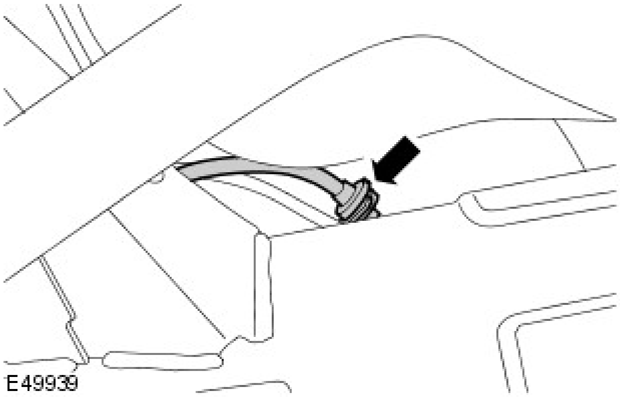


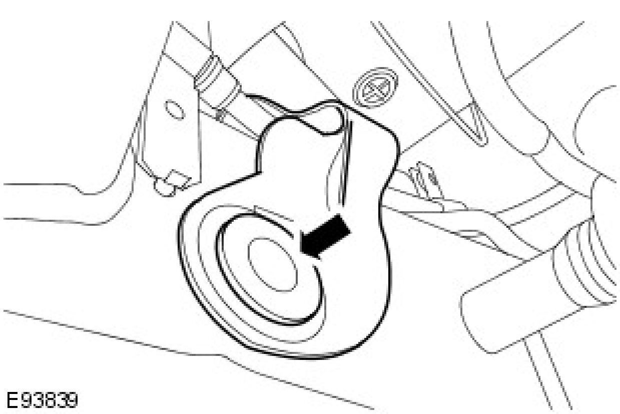
11. Release the LH parking brake cable.

- Remove the 2 bolts.
- Release the 3 wiring harness clips.
- Release the cable from the clip on the chassis.



12. Release the LH parking brake cable.

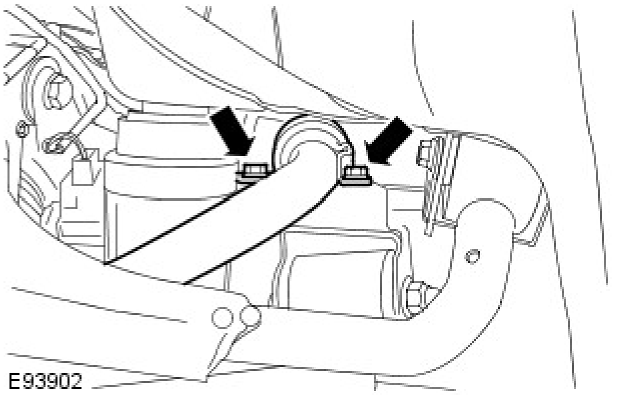




13. ⚠ CAUTION: The fuel tank breather line bracket can be easily damaged when releasing it from the chassis.

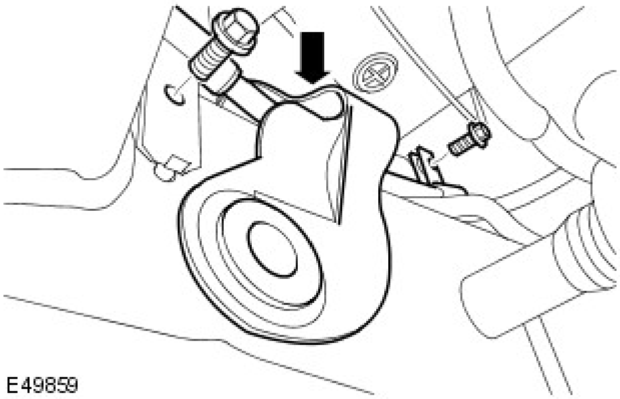
Release the fuel tank breather line bracket.

- Remove the plastic insert.



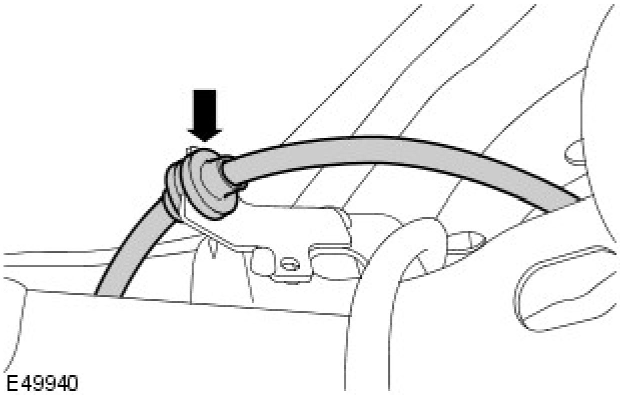
14. Raise the RH side of the rear stabilizer bar.

- Loosen the 2 bolts.

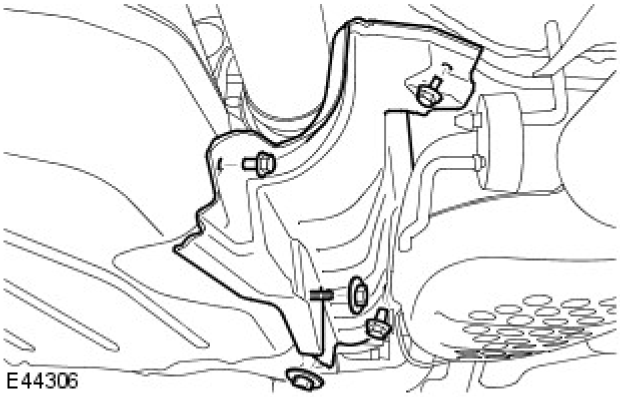


15. Release the RH parking brake cable.

- Remove the 2 bolts.
- Release the parking brake cable from the 2 pipe clips.
- Release the cable from the clip on the chassis.

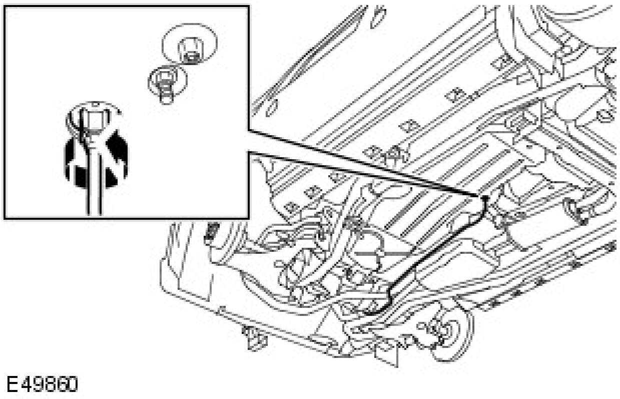


16. Release the RH parking brake cable.



17. Remove the fuel tank heat shield.

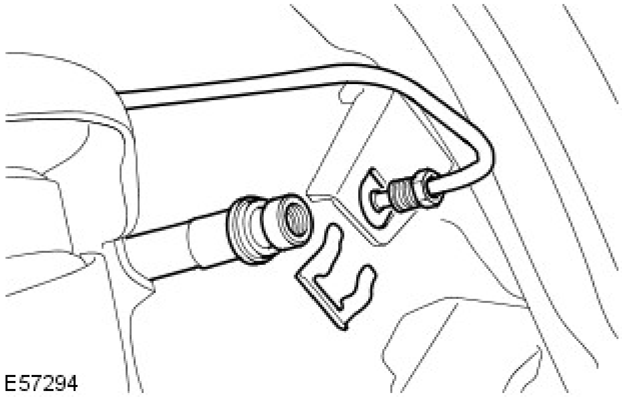
- Remove the 3 bolts and 2 nuts.



18. ⚠ CAUTION: Inspect the parking brake emergency release cable to body seal and replace if damaged.

• NOTE: Note the fitted position of the parking brake emergency release cable to body seal.

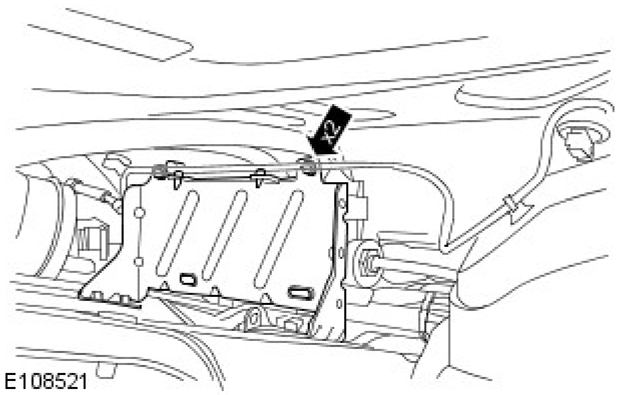
Release the parking brake emergency release cable.



19. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

RH side rear: Disconnect the brake line.

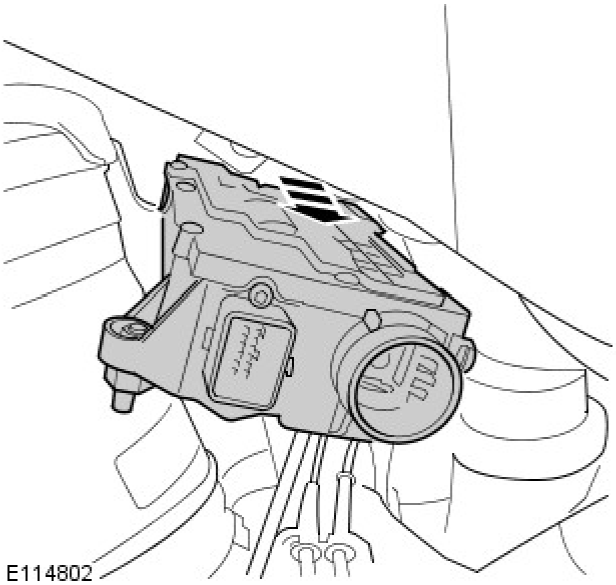
- Position an absorbent cloth to collect fluid spillage.
- Disconnect the line union.
- Remove the clip.



20. NOTE: Note the routing of the parking brake emergency release cable.

Displace the parking brake actuator and cable assembly.

- Disconnect the electrical connector.
- Remove the 2 nuts.



21. NOTE: Brake cable shown removed for clarity.

Remove the parking brake actuator and cable assembly.

- Withdraw from the RH rear wheel arch aperture.

Installation

1. NOTE: Note the routing of the parking brake emergency release cable.

Install the parking brake actuator and cable assembly.

- Install the 2 nuts.
- Connect the electrical connector.

2. NOTE: Remove and discard the blanking caps.

RH side rear: Connect the brake line.

- Clean the component mating faces.
- Secure the clip.
- Tighten the brake line union to 16 Nm (12 lb.ft).

3. ⚠ CAUTION: Make sure the parking brake emergency release cable to body seal is installed correctly.

Locate and secure the parking brake emergency release cable.

4. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

5. Secure the fuel tank breather line bracket.

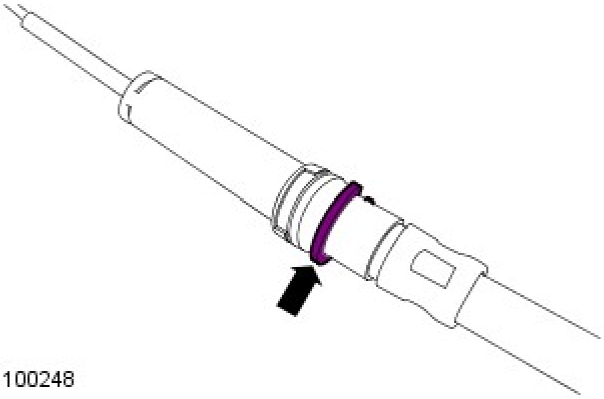
- Install the plastic insert.

6. Locate and secure the RH parking brake cable.

- Tighten the bolts to 22 Nm (16 lb.ft).
- Secure the parking brake cable to the 2 pipe clips.
- Secure the cable grommet to the integrated body frame bracket.

7. Locate and secure the LH parking brake cable.

- Tighten the bolts to 22 Nm (16 lb.ft).
- Secure the wiring harness.
- Secure the cable grommet to the integrated body frame bracket.


E100248

8. NOTE: Make sure that the brake cable circlip is positioned as shown.

Connect the parking brake cables to the wheel hubs.

- Connect the cable to the brake shoe lever.
- Locate the cable to the backplate.
- Tighten the nut to 8 Nm (6 lb.ft).

9. ⚠ CAUTION: Make sure that the component is clean, free of foreign material and lubricant.

Install the LH rear brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

10. Secure the LH rear brake caliper.

- Remove and discard the tie strap.
- Tighten the bolts to 115 Nm (85 lb.ft).

11. ⚠ CAUTION: Make sure that the component is clean, free of foreign material and lubricant.

Install the RH rear brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

12. Secure the RH rear brake caliper.

- Remove and discard the tie strap.
- Tighten the bolts to 115 Nm (85 lb.ft).

13. Adjust the parking brake shoes.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

14. Bleed the brake system.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

15. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

16. Install fuse number 8 into the BJB.

17. Using the Land Rover approved diagnostic system, calibrate the parking brake actuator on an even surface.

18. Apply and release hand brake to confirm operation.

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake Shoes

Removal and Installation

Removal

• NOTE: If the parking brake shoes or the brake discs have been removed for access to other components then DO NOT carry out the bedding in procedure.

1. Using the Land Rover approved diagnostic system, drive the parking brake to the mounting position.

2. Isolate the parking brake electrical circuit.

- Remove fuse number 8 from the BJB.

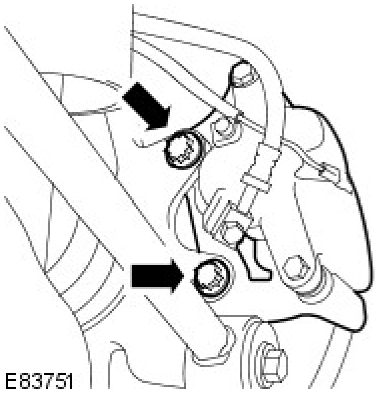
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the wheels and tires.

5. Release the brake caliper.

- Remove the brake caliper anchor bolts.

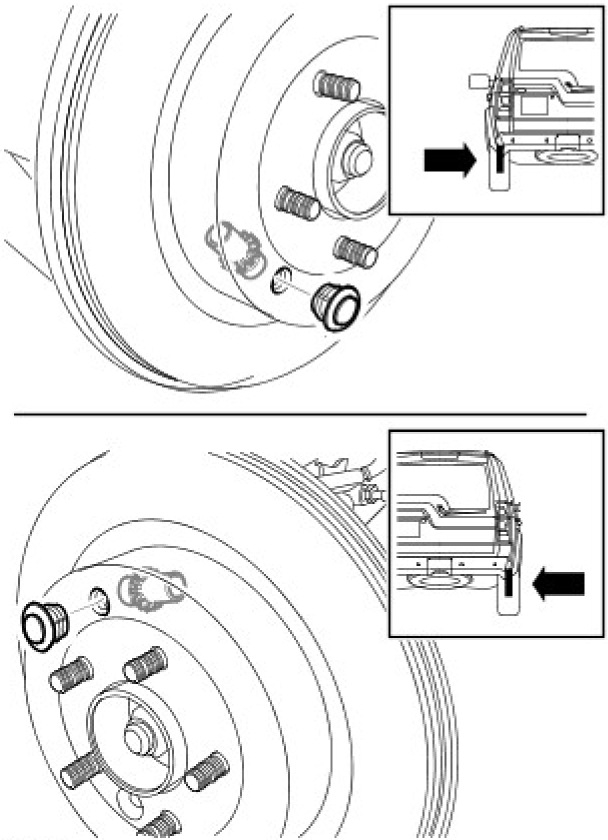


6. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

Tie the brake caliper aside.

7. Release the park brake shoe adjustment.

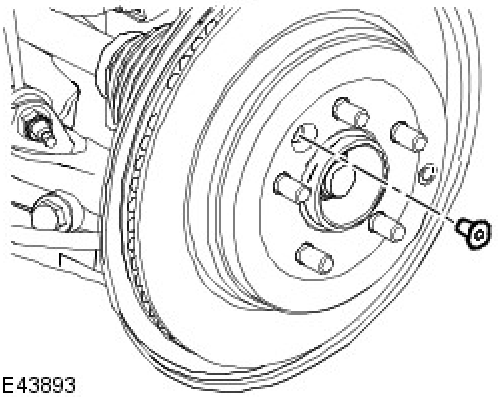
- Remove the plug from the access hole in the brake disc.
- Using a suitable tool, rotate the brake shoe adjuster to release the adjustment.



E48748

8. Remove the brake disc.

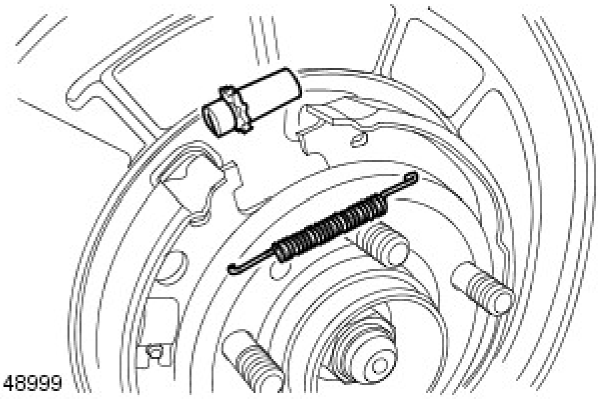
- Remove the Torx screw.



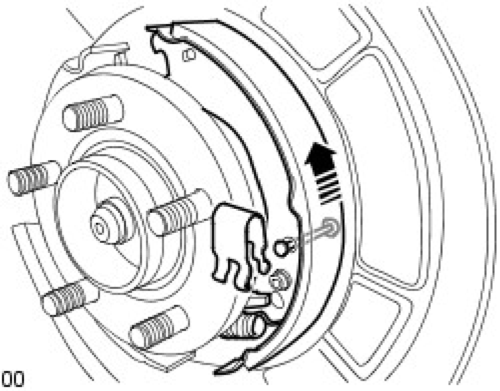
E43893

9. Remove the adjuster and return spring.

- Release the the parking brake shoe adjuster to the minimum adjustment.



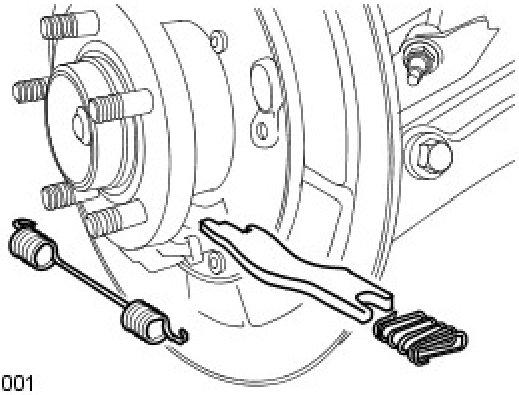
E48999



E49000

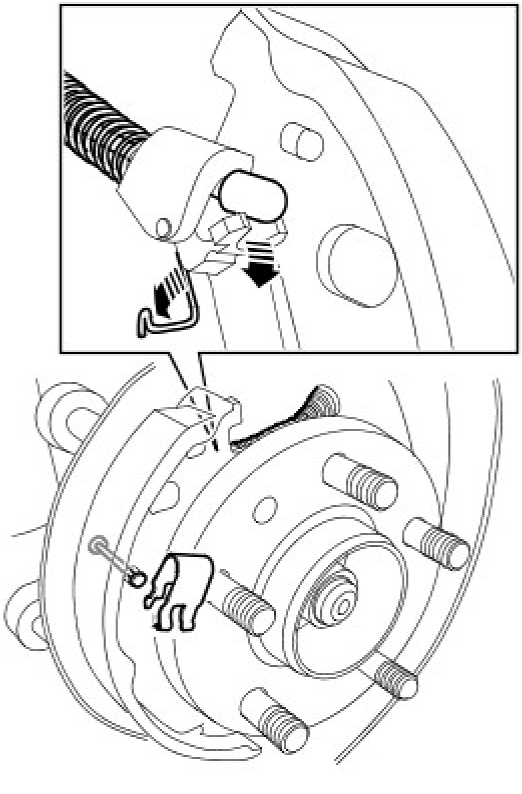
10. Remove the primary brake shoe.

- Remove the hold-down spring and retaining pin.
- Pivot the shoe to release it from the spreader plate and return spring.



E49001

11. Remove the spreader plate and spring.
12. Remove the return spring.



E49002

13. Remove the secondary brake shoe.

- Remove the hold-down spring and retaining pin.
- Disconnect the parking brake cable retaining spring from the brake shoe lever.
- Release the parking brake cable.

14. Repeat the above procedure for the other side.

Installation

1. ⚠ WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the backing plate and apply grease to the brake shoe contacts.

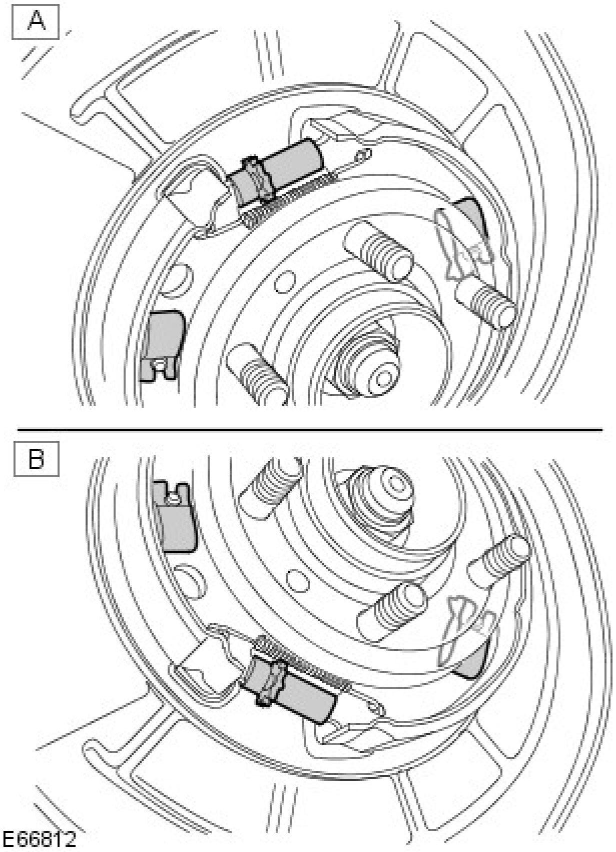
2. Clean the adjuster and set it to its minimum extension.

3. CAUTIONS:

⚠ Make sure the brake shoe spring is not over stretched.

⚠ Make sure the closed end of the retaining clip is installed facing the brake shoe adjuster. Failure to follow this instruction may result in damage to the vehicle.

⚠ Illustration 'A' is the LH side and 'B' is the RH side.

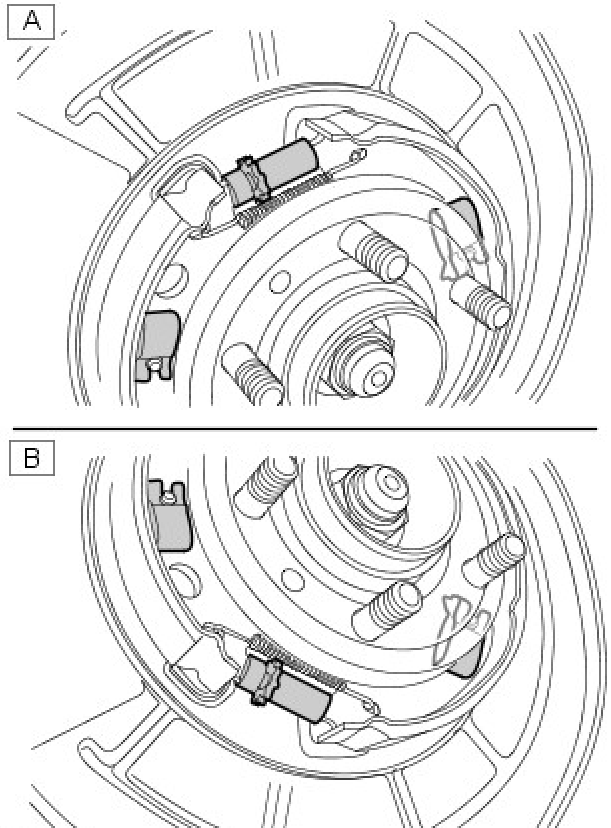


Install the secondary brake shoe.

- Connect the parking brake cable.
- Connect the parking brake cable retaining spring to the brake shoe lever, making sure the spring is not twisted.
- Install the hold-down spring and retaining pin.

4. Install the spreader plate and the spring.

- Using a tie strap, tie back the spreader plate spring.



E66812

5. WARNING: Make sure the return spring and the adjuster spring are correctly installed to the primary shoe.

• CAUTIONS:

Make sure the brake shoe spring is not over stretched.

Make sure the closed end of the retaining clip is installed facing the brake shoe adjuster. Failure to follow this instruction may result in damage to the vehicle.

Illustration 'A' is the LH side and 'B' is the RH side.

Install the primary brake shoe.

- Install the return spring.
- Connect the primary brake shoe to the return spring.
- Locate the primary brake shoe to the spreader plate.
- Install the hold-down spring and retaining pin.

6. CAUTION: Make sure the brake shoe spring is not over stretched.

Install the brake shoe adjuster and the retaining spring.

7. Remove and discard the spreader plate spring tie strap.

8. Make sure the brake disc and hub mating surfaces are clean.

9. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

10. Install the brake caliper.

- Tighten the bolts to 115 Nm (85 lb.ft).

11. Repeat the above procedure for the other side.

12. Adjust the parking brake.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

13. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

14. Install fuse number 8 into the BJB.

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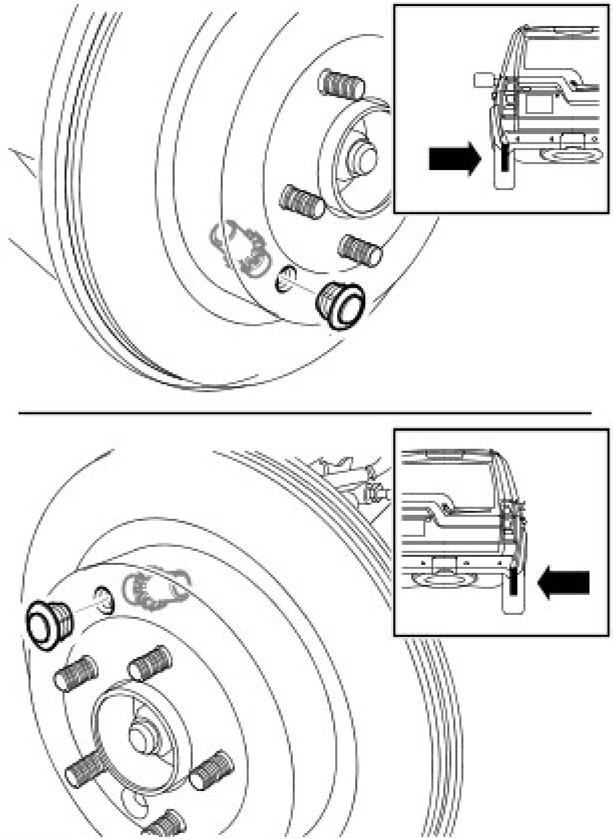
Parking Brake and Actuation - Parking Brake ActuatorTDV8 3.6L Diesel/TDV6 2.7L Diesel

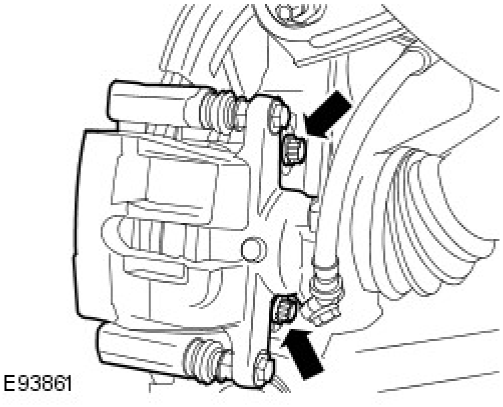
Removal and Installation

Removal

1. Using the Land Rover approved diagnostic system, drive the parking brake to the 'mounting position'.
2. Isolate the parking brake electrical circuit.
   - Remove fuse number 8 from the BJB.
3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.
4. Remove the rear wheels and tires.
5. Release the parking brake shoe adjustment.
   - Remove the plug from the access hole in the brake disc.
   - Using a suitable tool, rotate the brake shoe adjuster to release the adjustment.

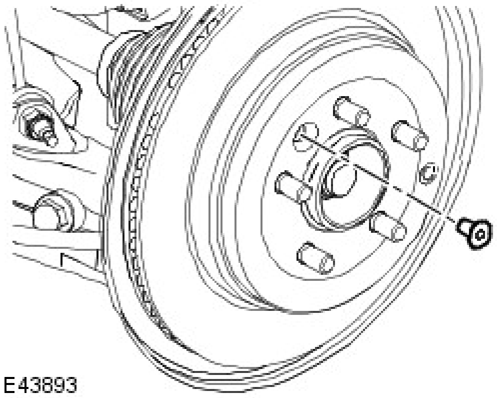




6. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

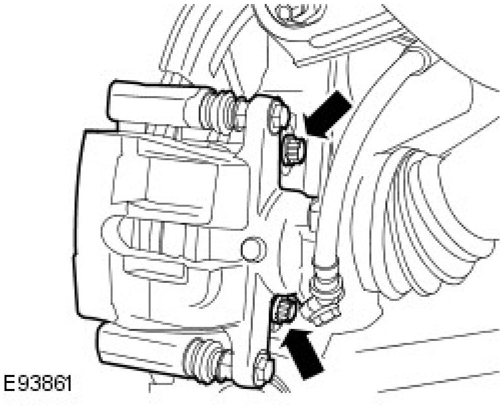
Reposition the RH rear brake caliper.

- Remove the 2 bolts.
- Using a suitable tie strap, support the brake caliper.



7. Remove the RH rear brake disc.

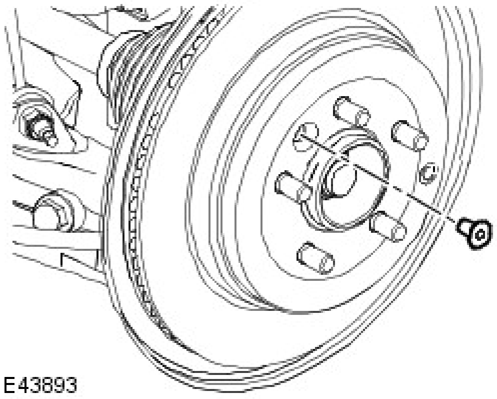
- Remove the screw.



8. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

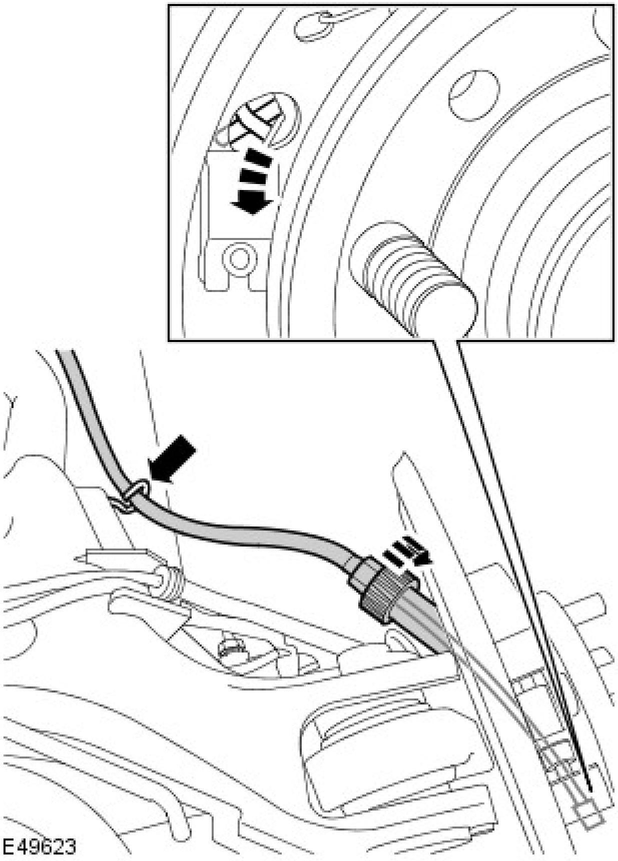
Reposition the LH rear brake caliper.

- Remove the 2 bolts.
- Using a suitable tie strap, support the brake caliper.



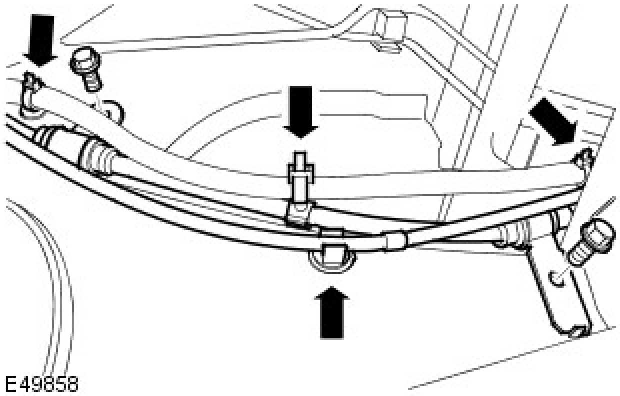
9. Remove the LH rear brake disc.

- Remove the screw.



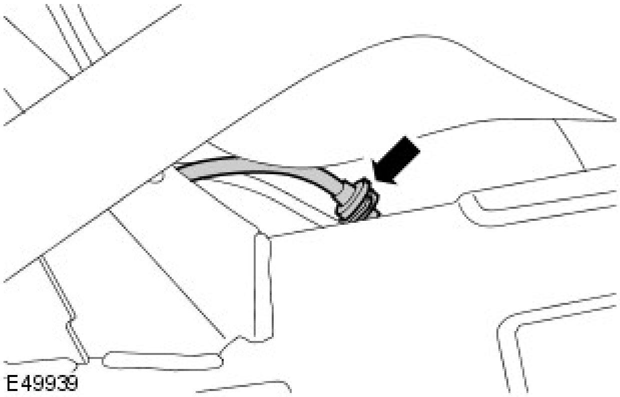
10. Disconnect both parking brake cables from the wheel hubs.

- Fully loosen the nut.
- Release the cable from the lower arm.
- Disconnect the inner cable from the brake shoe.



11. Release the LH parking brake cable.

- Remove the 2 bolts.
- Release the 3 wiring harness clips.
- Release the cable from the clip on the chassis.

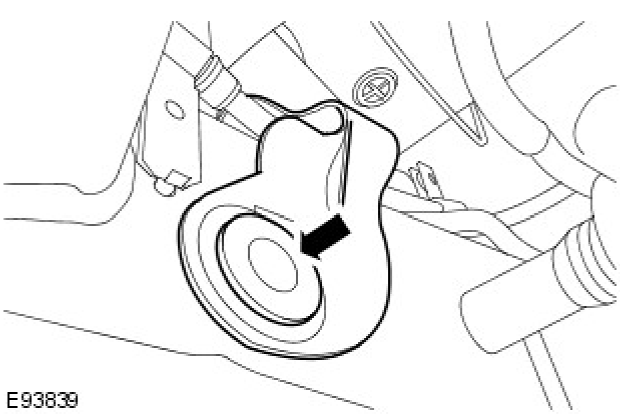


12. Release the LH parking brake cable.

13. ⚠ CAUTION: The fuel tank breather line bracket can be easily damaged when releasing it from the chassis.

Release the fuel tank breather line bracket.

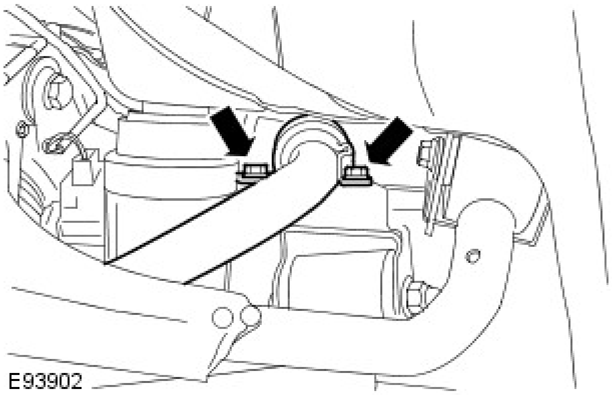
- Remove the plastic insert.



E93839

14. Raise the RH side of the rear stabilizer bar.

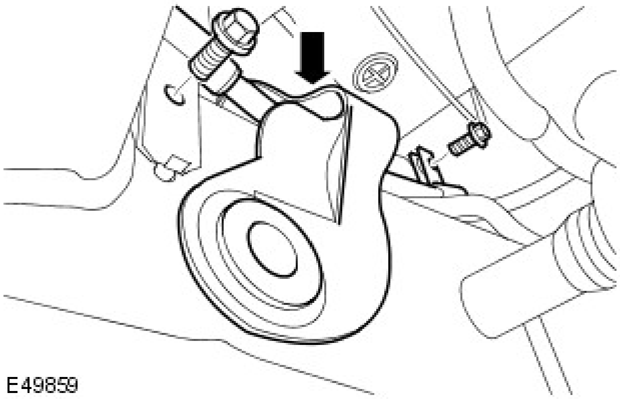
- Loosen the 2 bolts.



E93902

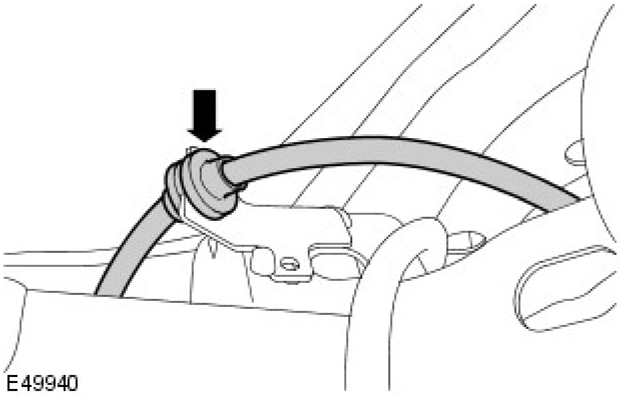
15. Release the RH parking brake cable.

- Remove the 2 bolts.
- Release the parking brake cable from the 2 pipe clips.
- Release the cable from the clip on the chassis.

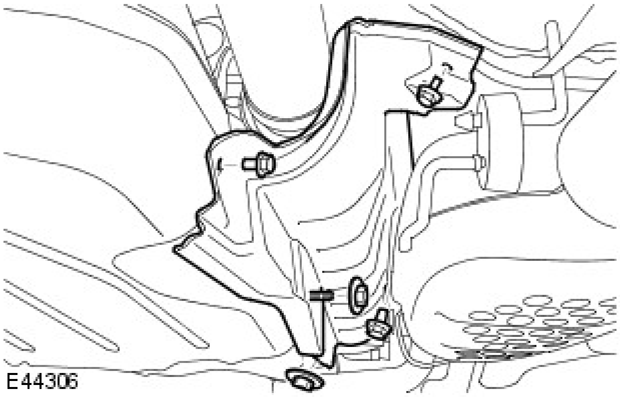


E49859

16. Release the RH parking brake cable.



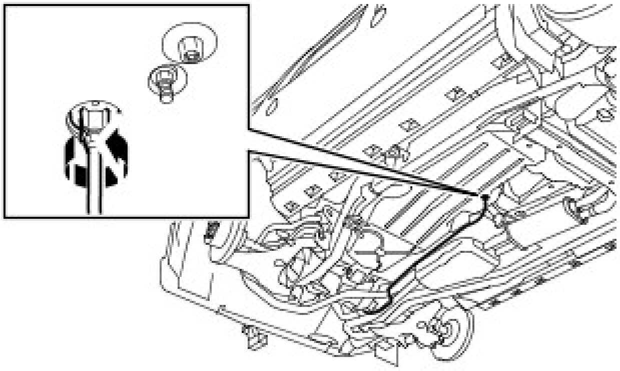
E49940



E44306

17. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.

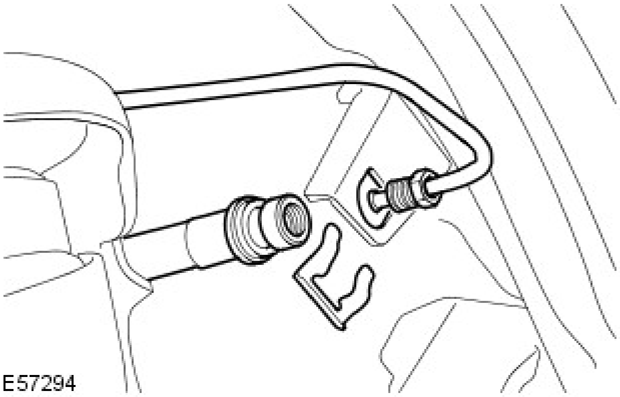


E49860

18. CAUTION: Inspect the parking brake emergency release cable to body seal and replace if damaged.

• NOTE: Note the fitted position of the parking brake emergency release cable to body seal.

Release the parking brake emergency release cable.

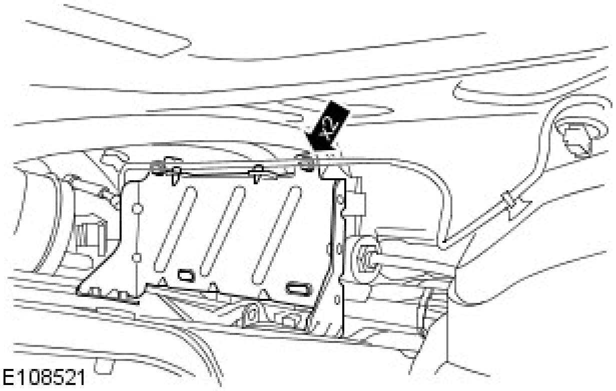


E57294

19. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

RH side rear: Disconnect the brake line.

- Position an absorbent cloth to collect fluid spillage.
- Disconnect the line union.
- Remove the clip.



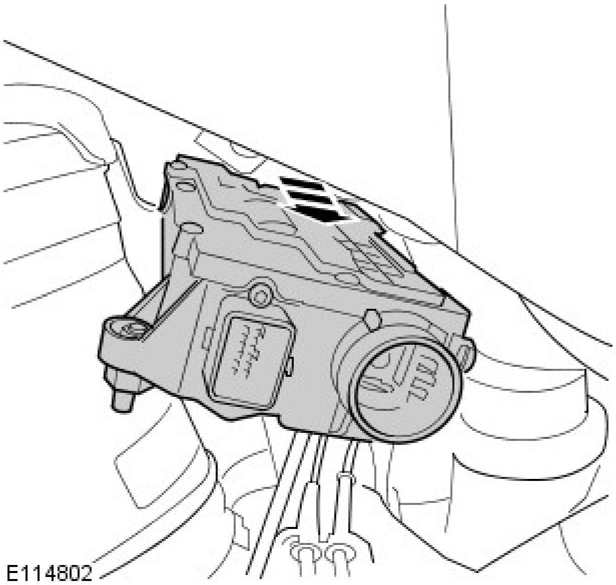
E108521

20. NOTE: Note the routing of the parking brake emergency release cable.

Displace the parking brake actuator and cable assembly.

- Disconnect the electrical connector.
- Remove the 2 nuts.

21. NOTE: Brake cable shown removed for clarity.



Remove the parking brake actuator and cable assembly.

- Withdraw from the RH rear wheel arch aperture.

Installation

1. NOTE: Note the routing of the parking brake emergency release cable.

Install the parking brake actuator and cable assembly.

- Install the 2 nuts.
- Connect the electrical connector.

2. NOTE: Remove and discard the blanking caps.

RH side rear: Connect the brake line.

- Clean the component mating faces.
- Secure the clip.
- Tighten the brake line union to 16 Nm (12 lb.ft).

3. ⚠ CAUTION: Make sure the parking brake emergency release cable to body seal is installed correctly.

Locate and secure the parking brake emergency release cable.

4. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

5. Secure the fuel tank breather line bracket.

- Install the plastic insert.

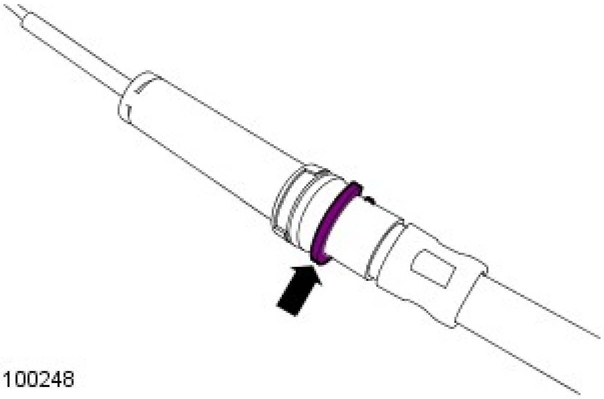
6. Locate and secure the RH parking brake cable.

- Tighten the bolts to 22 Nm (16 lb.ft).
- Secure the parking brake cable to the 2 pipe clips.
- Secure the cable grommet to the integrated body frame bracket.

7. Locate and secure the LH parking brake cable.

- Tighten the bolts to 22 Nm (16 lb.ft).
- Secure the wiring harness.
- Secure the cable grommet to the integrated body frame bracket.

8. NOTE: Make sure that the brake cable circlip is positioned as shown.



E100248

Connect the parking brake cables to the wheel hubs.

- Connect the cable to the brake shoe lever.
- Locate the cable to the backplate.
- Tighten the nut to 8 Nm (6 lb.ft).

9. ⚠ CAUTION: Make sure that the component is clean, free of foreign material and lubricant.

Install the LH rear brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

10. Secure the LH rear brake caliper.

- Remove and discard the tie strap.
- Tighten the bolts to 115 Nm (85 lb.ft).

11. ⚠ CAUTION: Make sure that the component is clean, free of foreign material and lubricant.

Install the RH rear brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

12. Secure the RH rear brake caliper.

- Remove and discard the tie strap.
- Tighten the bolts to 115 Nm (85 lb.ft).

13. Adjust the parking brake shoes.
For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

14. Bleed the brake system.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

15. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

16. Install fuse number 8 into the BJB.

17. Using the Land Rover approved diagnostic system, calibrate the parking brake actuator on an even surface.

18. Apply and release hand brake to confirm operation.

Published: 11-May-2011

Hydraulic Brake Actuation -

General Specifications

Item	Specification
Master cylinder bore diameter:	
Primary	27 mm (1.1 in)
Secondary	20.6 mm (0.8 in)
Stroke	36 mm (1.4 in)

Torque Specifications

Description	Nm	lb-ft
Brake pedal nut and bolt	45	33
Brake pedal bracket Torx bolts	10	7
Brake booster to brake pedal bracket nuts	25	18
Brake master cylinder nuts	26	19
Brake pipe unions	18	13

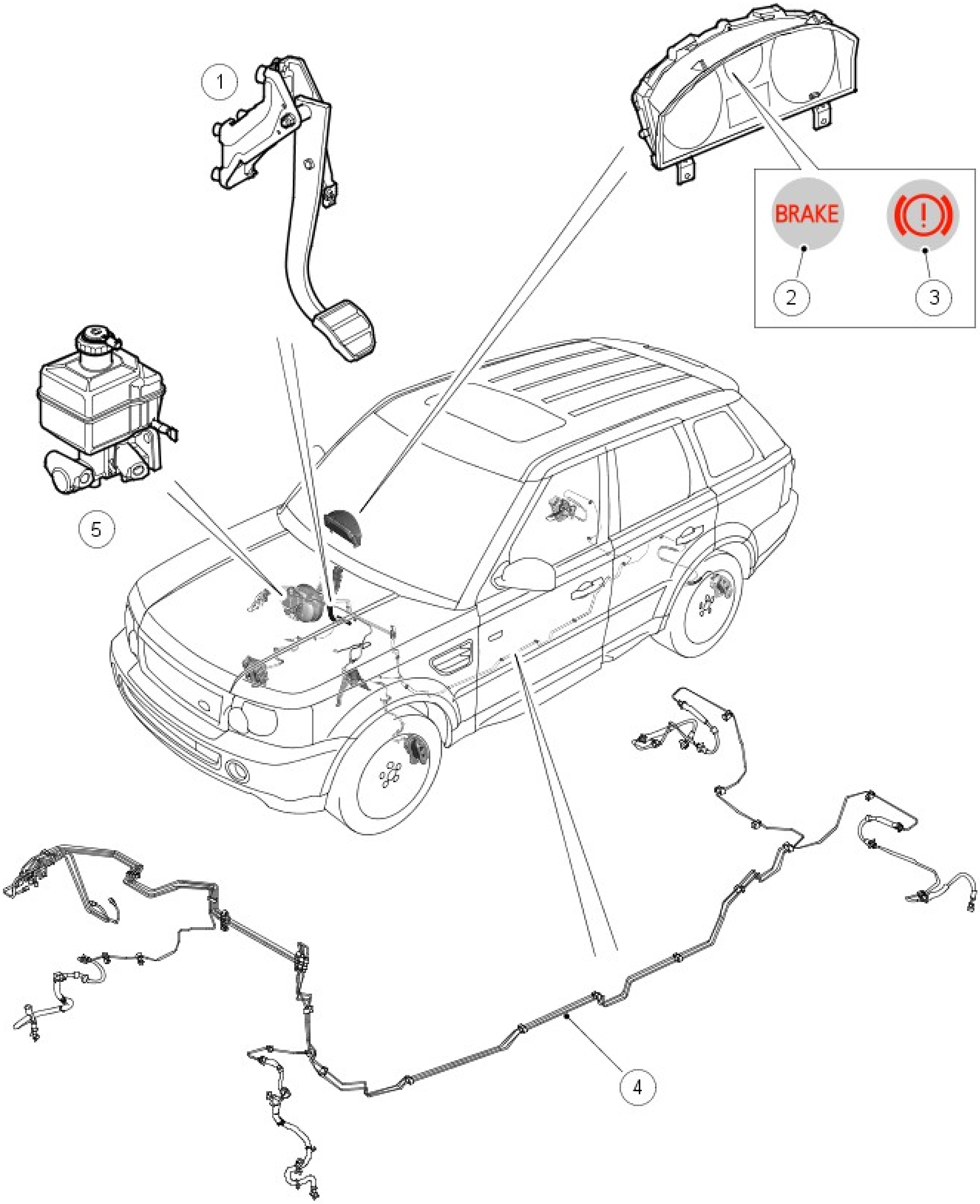
Published: 11-May-2011

Hydraulic Brake Actuation - Hydraulic Brake Actuation

Description and Operation

COMPONENT LOCATIONS

- NOTE: right-hand drive (RHD) shown, left-hand drive (LHD) similar



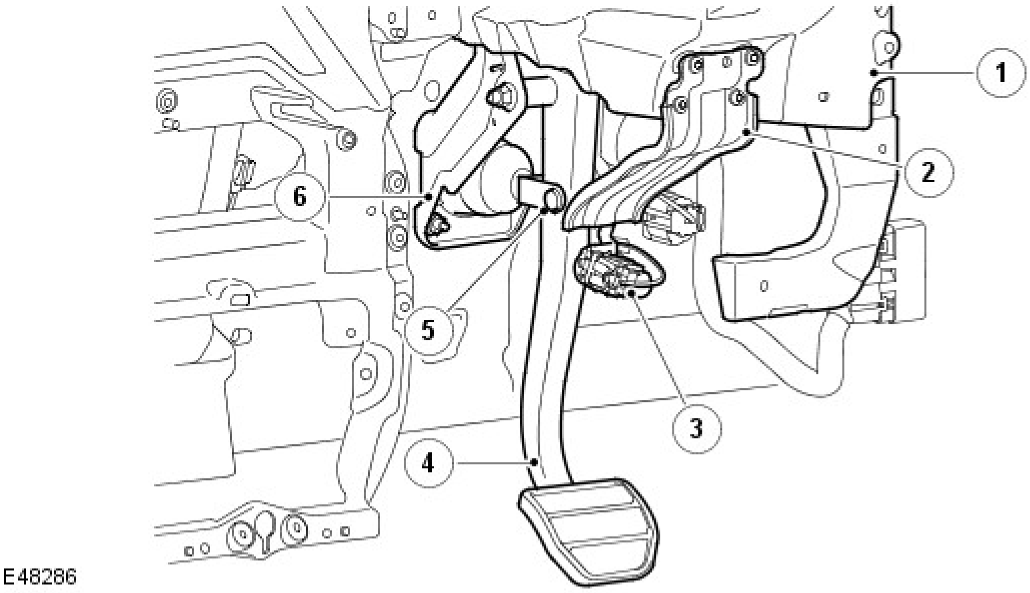
E52213

Item	Part Number	Description
1	-	Brake pedal
2	-	Brake warning indicator NAS (north American specification)
3	-	Brake warning indicator (all except NAS)
4	-	Brake pipes and hoses
5	-	Brake master cylinder and reservoir

GENERAL

Hydraulic brake actuation consists of the brake pedal, the brake master cylinder and the hydraulic pipes and hoses.

BRAKE PEDAL



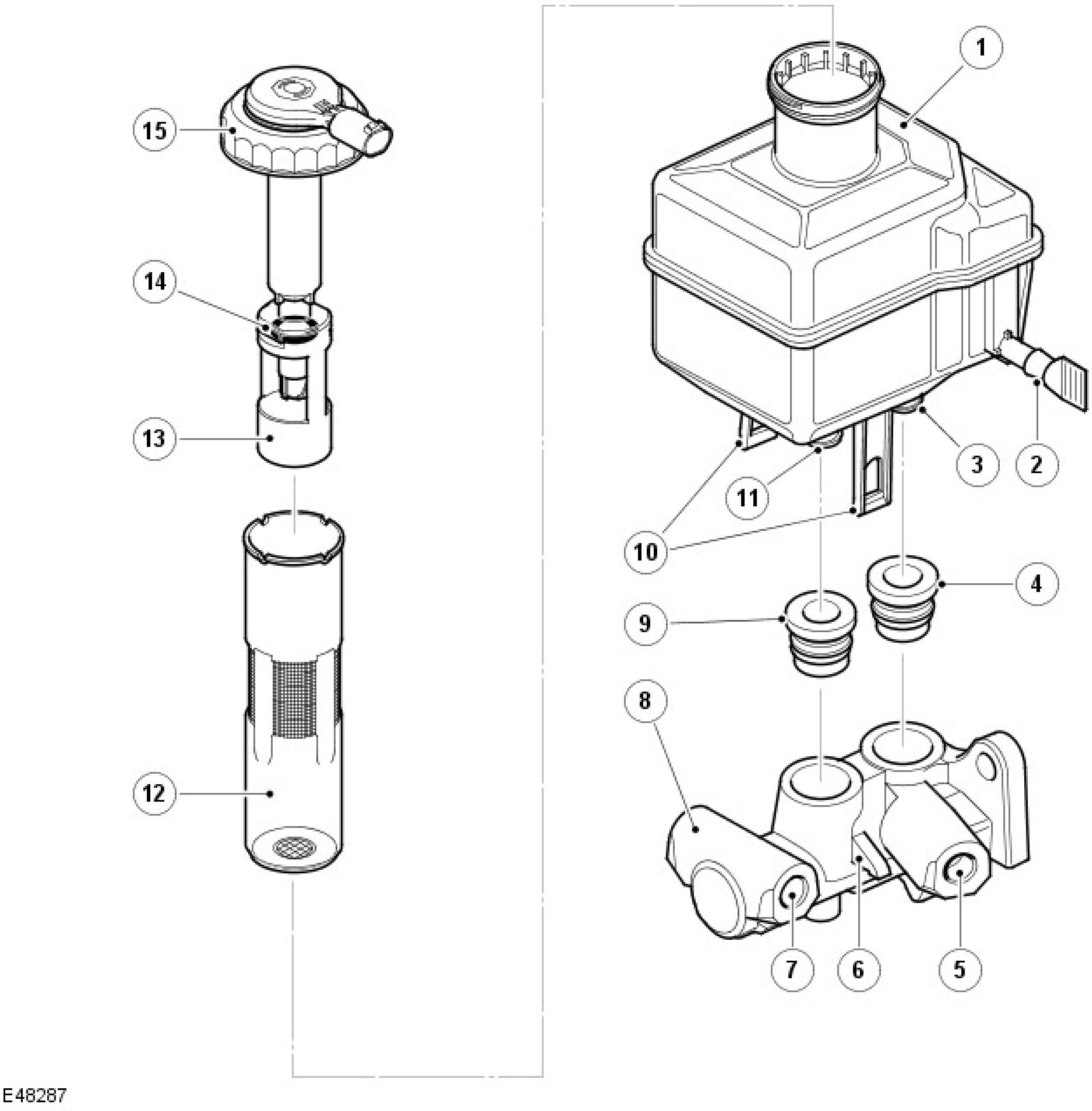
Item	Part Number	Description
1	-	In-vehicle cross beam
2	-	Brake pedal buffer
3	-	Stoplamp switch
4	-	Brake pedal
5	-	Clevis pin and clip
6	-	Brake pedal bracket

The brake pedal is mounted in a bracket attached to the rear side of the engine bulkhead. A clevis pin and clip connect the brake pedal to the push rod of the brake booster. A brake pedal buffer is installed on the in-vehicle cross beam to restrain rearward movement of the brake pedal in an accident.

The stoplamp switch is mounted in the brake pedal bracket and operated by the brake pedal.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

BRAKE MASTER CYLINDER AND RESERVOIR

- NOTE: RHD version shown, LHD version similar



Item	Part Number	Description
1	-	Reservoir
2	-	Clutch outlet spigot and sealing cap (reference, not used)
3	-	Primary outlet spigot
4	-	Reservoir to master cylinder seal, primary inlet
5	-	Primary outlet port
6	-	Reservoir securing lug
7	-	Secondary outlet port
8	-	Cylinder housing
9	-	Reservoir to master cylinder seal, secondary inlet
10	-	Reservoir securing straps
11	-	Secondary outlet spigot
12	-	Filter
13	-	Float
14	-	Magnet
15	-	Reservoir cap and level switch

The brake master cylinder and reservoir is attached to the front of the brake booster, on the driver side of the engine compartment.

Master Cylinder

The brake master cylinder consists of a cylinder housing containing two pistons in tandem. The rear piston produces pressure for the primary circuit and the front piston produces pressure for the secondary circuit. The pistons incorporate center valves with a high flow rate to ensure there is always sufficient fluid available at the hydraulic control unit for stability control operations.

When the brake pedal is pressed, the front push rod in the brake booster pushes the primary piston along the bore of the cylinder housing. This produces pressure in the primary pressure chamber which, in conjunction with the primary spring, overcomes the secondary spring and simultaneously moves the secondary piston along the bore. The initial movement of the pistons, away from the piston stops, closes the primary and secondary center valves. Further movement of the pistons then pressurizes the fluid in the primary and secondary pressure chambers, and thus the brake circuits. The fluid in the chambers behind the pistons is unaffected by the movement of the pistons and can flow unrestricted through the feed holes between the chambers and the reservoir.

When the brake pedal is released, the primary and secondary springs push the pistons back down the bore of the cylinder housing. As the pistons contact the piston stops, the primary and secondary center valves open, which allows fluid to circulate unrestricted between the two hydraulic circuits and the reservoir, through the center valves, the chambers behind the pistons and the cylinder housing inlets.

Should a failure occur in one of the brake circuits, the remaining brake circuit will still operate effectively, although brake pedal travel and vehicle braking distances will increase.

Reservoir

The reservoir is installed on top of the master cylinder to provide a supply of brake fluid for the primary and secondary circuits of the brake system.

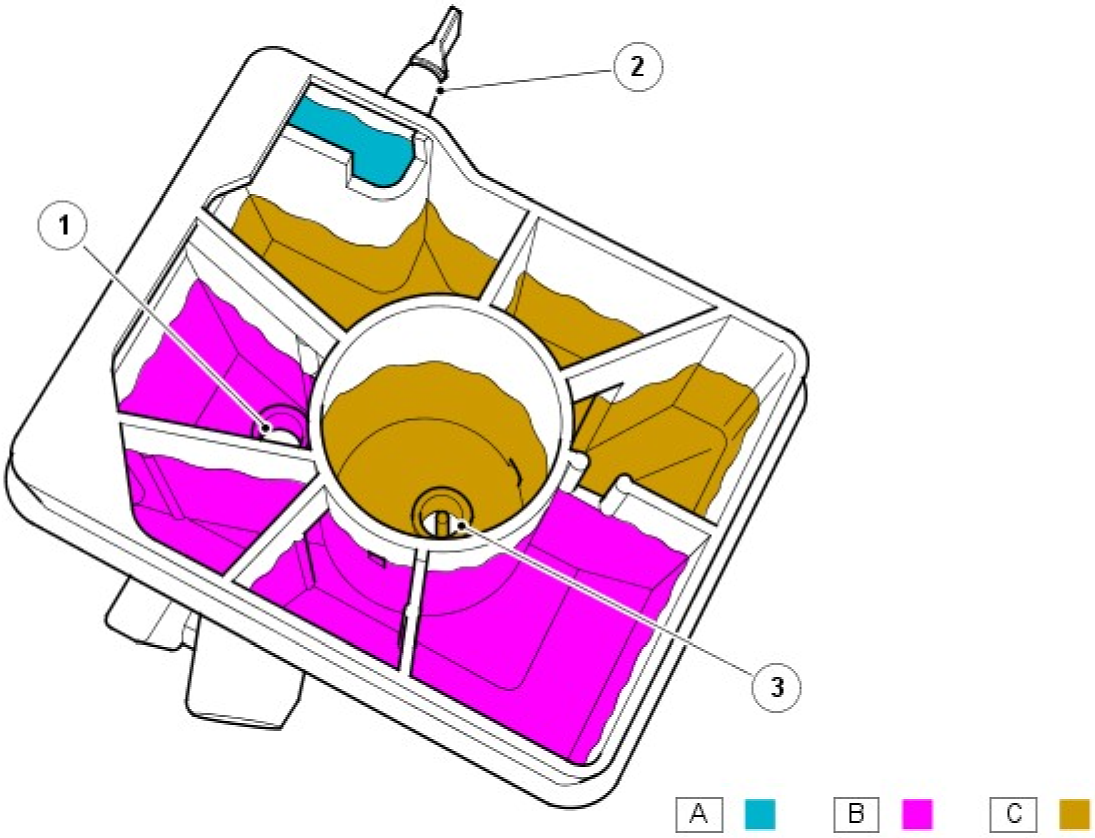
Two straps, integrated onto the sides of the reservoir, engage with lugs on the master cylinder to secure the reservoir in position. Two outlet spigots on the underside of the reservoir locate in seals installed in the inlet ports of the master cylinder. An outlet port is incorporated into the left side of the reservoir for use on vehicles with a clutch.

The reservoir is internally divided to isolate the circuits from each other at low fluid levels, and so prevent a leak in one circuit from disabling the other circuit(s). The dividing walls support a central well and divide the area around the well into a further eight separate compartments. The well forms an extension of the filler neck and contains the filter and the fluid level switch.

The well and the surrounding compartments are interconnected by slots in the dividing walls. The slots are positioned such that when the reservoir is full, fluid can move between the well and all of the surrounding compartments, but at low fluid levels the interior forms separate reservoirs for each circuit. The following figure shows the separate reservoirs for each circuit and the amount retained in each reservoir if there is a leak from one of the other circuits.

Reservoir Interior

- NOTE: A = Clutch reservoir (reference, not used); B = Primary circuit reservoir; C = Secondary circuit reservoir



E54600

Item	Part Number	Description
1	-	Primary outlet
2	-	Clutch outlet (reference, not used)
3	-	Secondary outlet

The filler neck of the reservoir is sealed with a cap incorporating the level switch. The level switch is operated by a magnet, which is installed in the float on the bottom of the switch. The switch reacts to the influence of the magnetic field surrounding the magnet.

When the reservoir is full, the float rests against the bottom of the switch and holds the level switch open. When the fluid level decreases, the float moves down and the switch closes to connect a ground to the instrument cluster. When the ground is made, the instrument cluster illuminates the red light emitting diode (LED) in the brake warning indicator. The instrument cluster also display an appropriate warning in the message center.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

At the beginning of each ignition cycle, the instrument cluster performs a bulb check on the brake warning indicator; the indicator is illuminated amber for 1.5 seconds, then red for 1.5 seconds.

The instrument cluster broadcasts the status of the brake fluid level, on the high speed controller area network (CAN) bus, to the anti-lock brake system (ABS) module.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

BRAKE PIPES AND HOSES

The brake pipes and hoses connect the master cylinder to the wheel brakes via the hydraulic control unit. The pipes are arranged to provide a front and rear split braking system. The brakes on the front axle are operated by the primary system; the brakes on the rear axle are operated by the secondary system.

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Hydraulic Brake Actuation - Hydraulic Brake Actuation

Diagnosis and Testing

For additional information.
REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).

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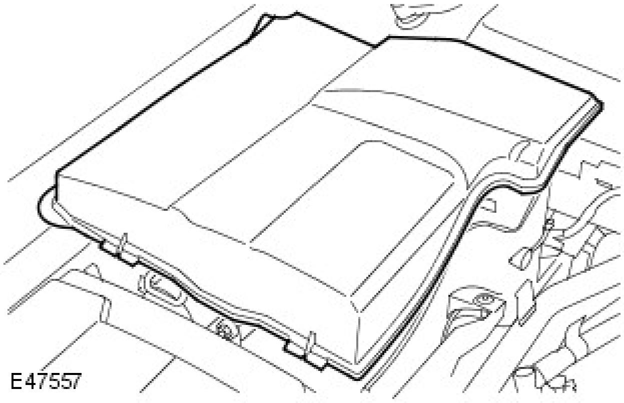
Hydraulic Brake Actuation - Brake Fluid Reservoir

Removal and Installation

Removal

⚠ CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.



1. Remove the cover.

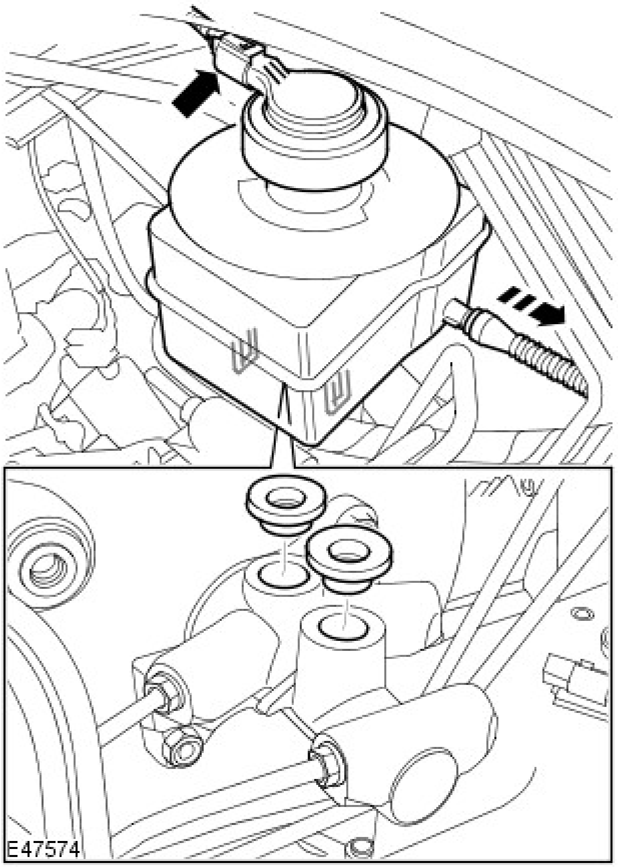
2. Position an absorbent cloth to collect fluid spillage.

3. Disconnect the low brake fluid warning indicator switch electrical connector.

4. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the brake fluid reservoir.

- Release the 2 clips.
- Remove and discard 2 brake fluid reservoir seals.



Installation

1. Clean the components.

2. Install the brake fluid reservoir.

- Install new brake fluid reservoir seals.

3. Connect the low brake fluid warning indicator switch electrical connector.

4. Bleed the brake system using T4.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures) /
Brake System Bleeding - Vehicles With: High Performance Brakes (206-00 Brake System - General Information, General Procedures).

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Hydraulic Brake Actuation - Brake Master Cylinder

Removal and Installation

Removal

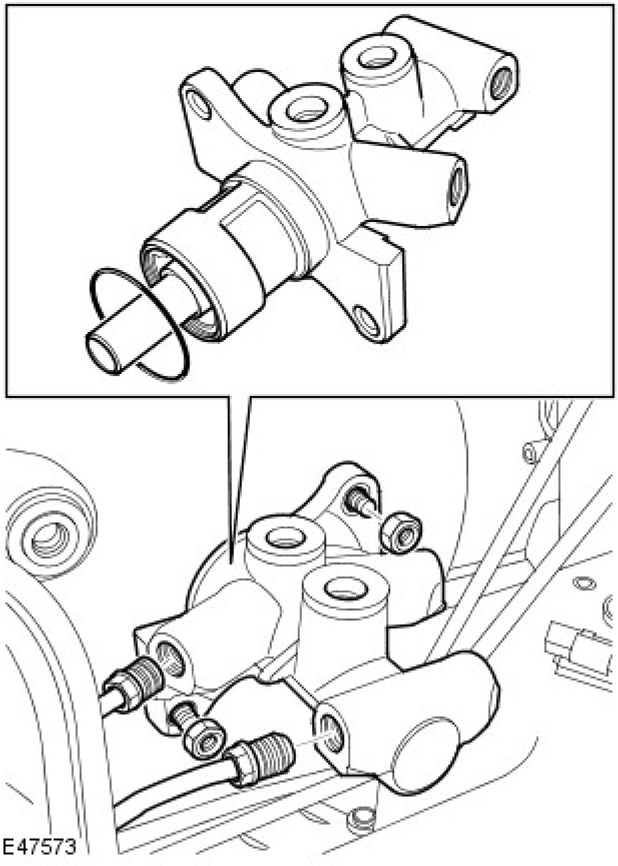
1. Remove the brake fluid reservoir.
For additional information, refer to: Brake Fluid Reservoir (206-06 Hydraulic Brake Actuation, Removal and Installation).

2. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the brake master cylinder brake tubes.

3. Remove the brake master cylinder.

- Remove the 2 nuts.
- Remove and discard the O-ring seal.



Installation

1. Install the brake master cylinder.

- Install a new O-ring seal.
- Tighten the nuts to 26 Nm (19 lb.ft).

2. Connect the brake tubes.

- Tighten the brake tube unions to 18 Nm (13 lb.ft).

3. Install the brake fluid reservoir.
For additional information, refer to: Brake Fluid Reservoir (206-06 Hydraulic Brake Actuation, Removal and Installation).

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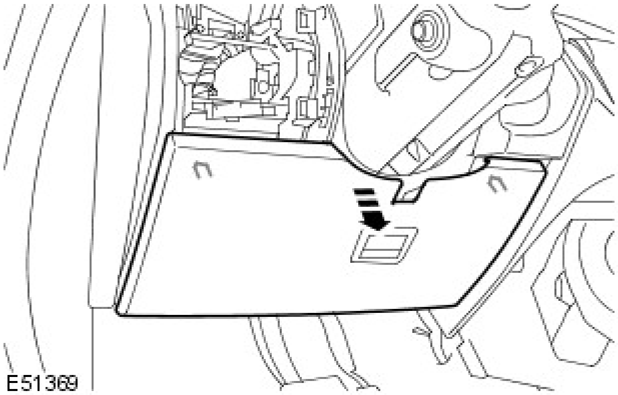
Hydraulic Brake Actuation - Brake Pedal

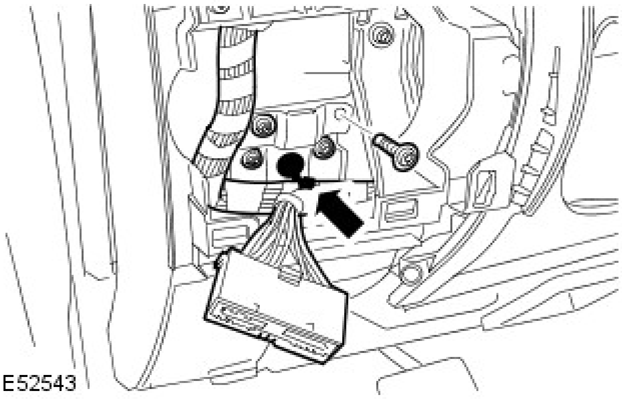
Removal and Installation

Removal

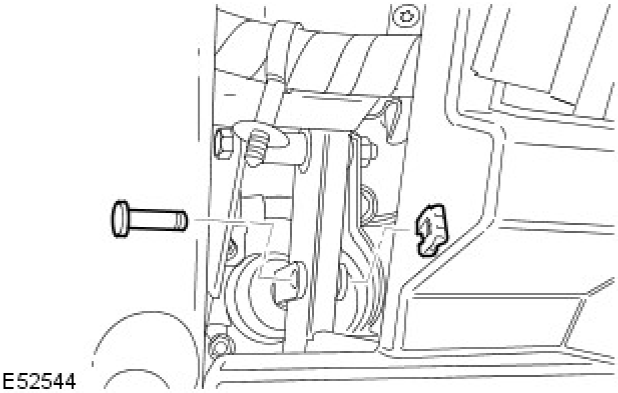
1. Remove the headlamp switch.
   For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).
2. Remove the stoplamp switch.
   For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).
3. Remove the instrument panel access panel.
   - Release the 2 clips.

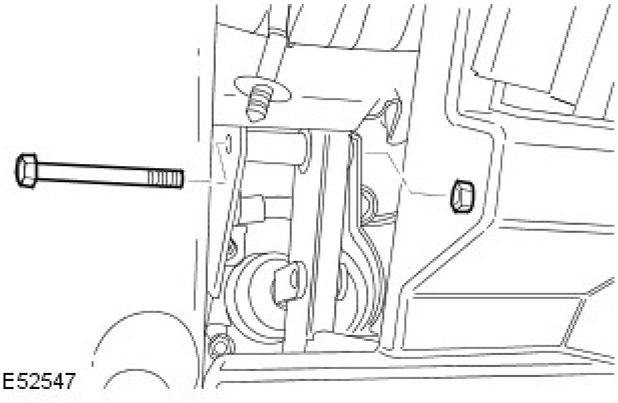


4. Remove the brake pedal bracket.
   - Release the wiring harness clip.
   - Remove the 4 Torx bolts.



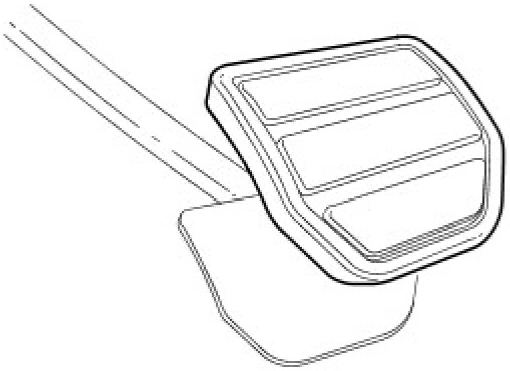
5. Remove the brake pedal clevis pin.
   - Remove the clip.




E52547

6. Remove the brake pedal.

- Remove the nut and bolt.


E52548

7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the brake pedal pad.

Installation

1. Install the brake pedal pad.

2. Install the brake pedal.

- Clean the component mating faces.
- Tighten the nut and bolt to 45 Nm (33 lb.ft).

3. Install the brake pedal clevis pin.

- Install the clip.

4. Install the brake pedal bracket.

- Tighten the Torx bolts to 10 Nm (7 lb.ft).
- Secure the wiring harness.

5. Install the instrument panel access panel.

- Secure with the clips.

6. Install the stoplamp switch.
For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

7. Install the headlamp switch.
For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).

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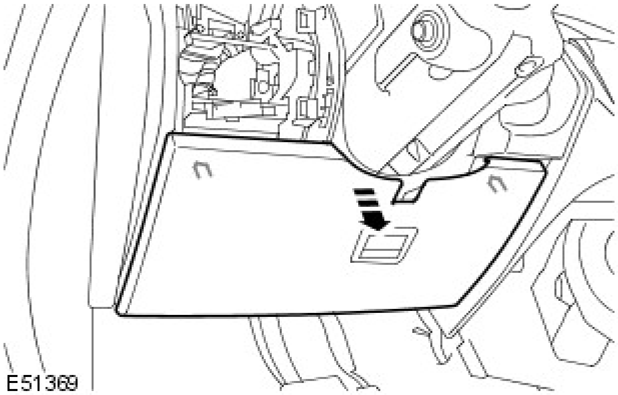
Hydraulic Brake Actuation - Brake Pedal and Bracket

Removal and Installation

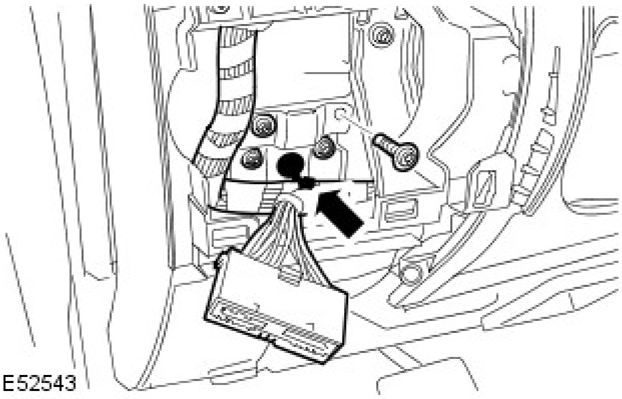
Removal

1. Remove the headlamp switch.
   For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).
2. Remove the stoplamp switch.
   For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).
3. Remove the instrument panel access panel.
   - Release the 2 clips.



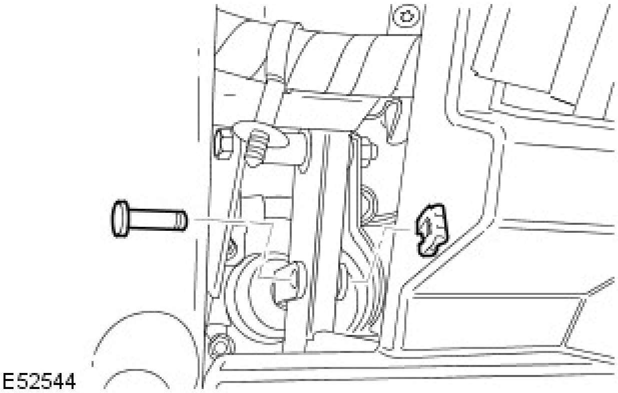
E51369

4. Remove the brake pedal bracket.
   - Release the wiring harness clip.
   - Remove the 4 Torx bolts.



E52543

5. Remove the brake pedal clevis pin.
   - Remove the clip.



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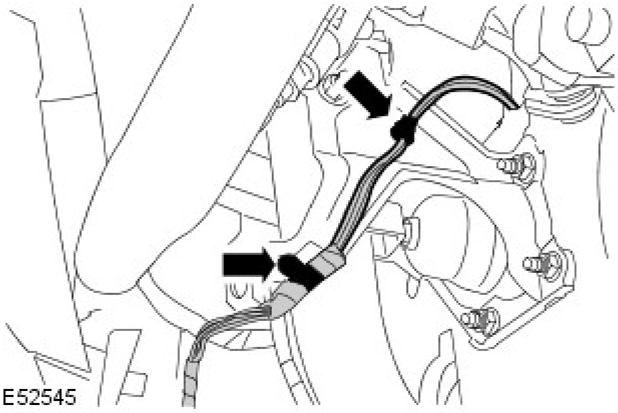
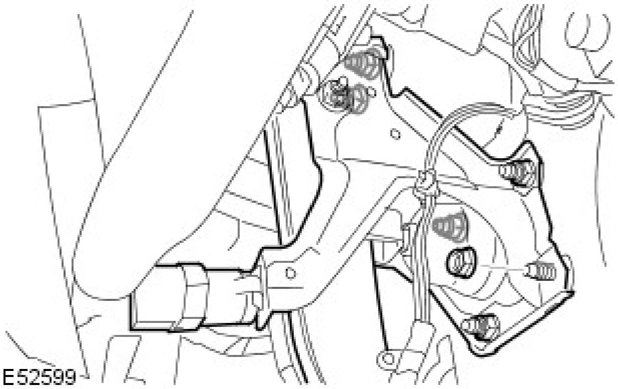


6. Release the stoplamp wiring harness.

- Release the 2 clips.



7. Remove the brake pedal assembly.

- Remove the 6 nuts.
- Position the brake booster forward to aid the removal of the brake pedal assembly.

Installation

1. Install the brake pedal assembly.

- Position the brake booster to the brake pedal bracket.
- Tighten the nuts to 25 Nm (18 lb.ft).

2. Secure the wiring harness.

- Secure the clips.

3. Install the brake pedal clevis pin.

- Install the clip.

4. Install the brake pedal bracket.

- Tighten the Torx bolt to 10 Nm (7 lb.ft).
- Secure the wiring harness.

5. Install the instrument panel access panel.

- Secure with the clips.

6. Install the stoplamp switch.
For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

7. Install the headlamp switch.
For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).

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Power Brake Actuation -

General Specifications

Item	Specification
Brake booster type	Twin chamber 228 and 254 mm (9.0 and 10.0 in)
Boost ratio - vehicles without Brembo brakes	7:1
Boost ratio - vehicles with Brembo brakes	8:1

Torque Specifications

Description	Nm	lb-ft
Brake booster nuts	23	17
Brake master cylinder nuts	26	19
M12 brake pipe unions	16	12
M14 brake pipe unions	18	13
Brake pedal buffer bolts	10	7
Brake vacuum pump nuts - 4.2 and 4.4 liter engines	5	4
Brake vacuum pump bolts - 2.7 liter engine	23	17
Brake vacuum pump stud - 2.7 liter engine	13	10
Brake vacuum pump nut - 2.7 liter engine	13	10
Brake vacuum pump bolts - 3.6 liter engine	23	17
Brake vacuum pump stud - 3.6 liter engine	10	7
Brake vacuum pump nut - 3.6 liter engine	23	17

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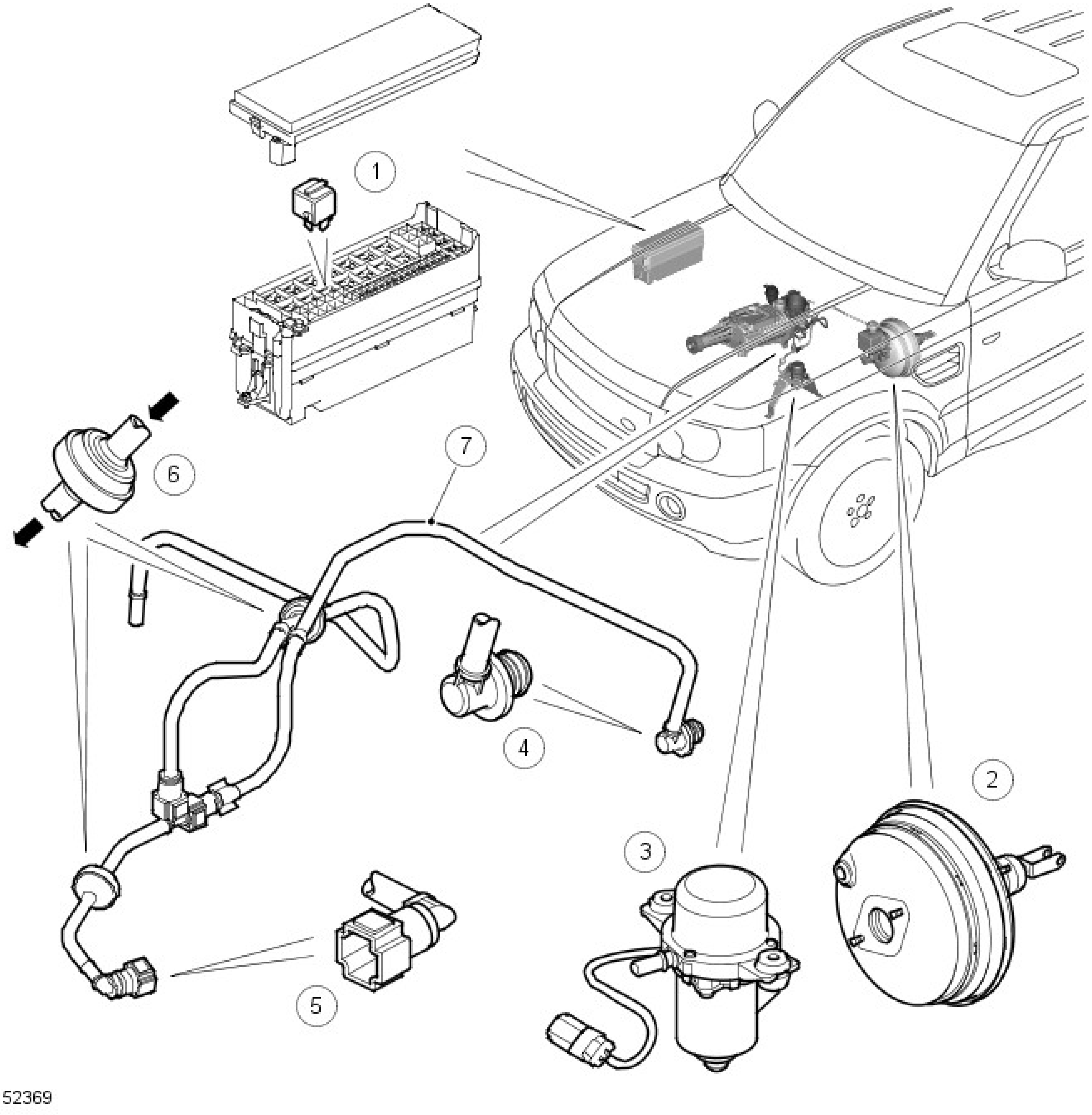
Power Brake Actuation - Brake Booster

Description and Operation

COMPONENT LOCATIONS - 4.2L

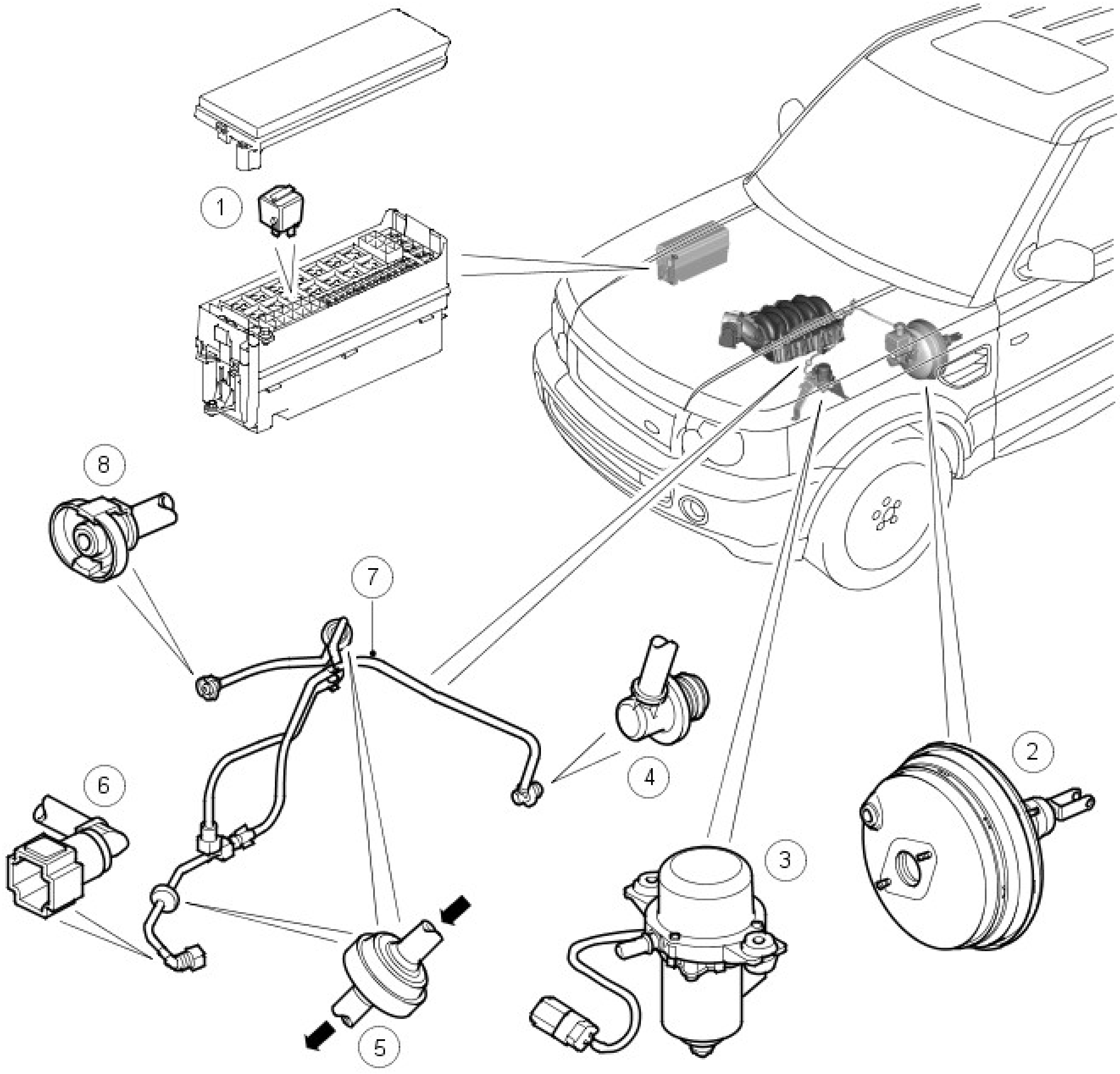
- NOTE: left-hand drive (LHD) shown, right-hand drive (RHD) similar



Item	Part Number	Description
1	-	Vacuum pump relay
2	-	Brake booster
3	-	Vacuum pump
4	-	Vacuum pipe connection to brake booster
5	-	Vacuum pipe connection to vacuum pump
5	-	Check valve
7	-	Vacuum pipes

COMPONENT LOCATIONS - 4.4L

- NOTE: LHD shown, RHD similar

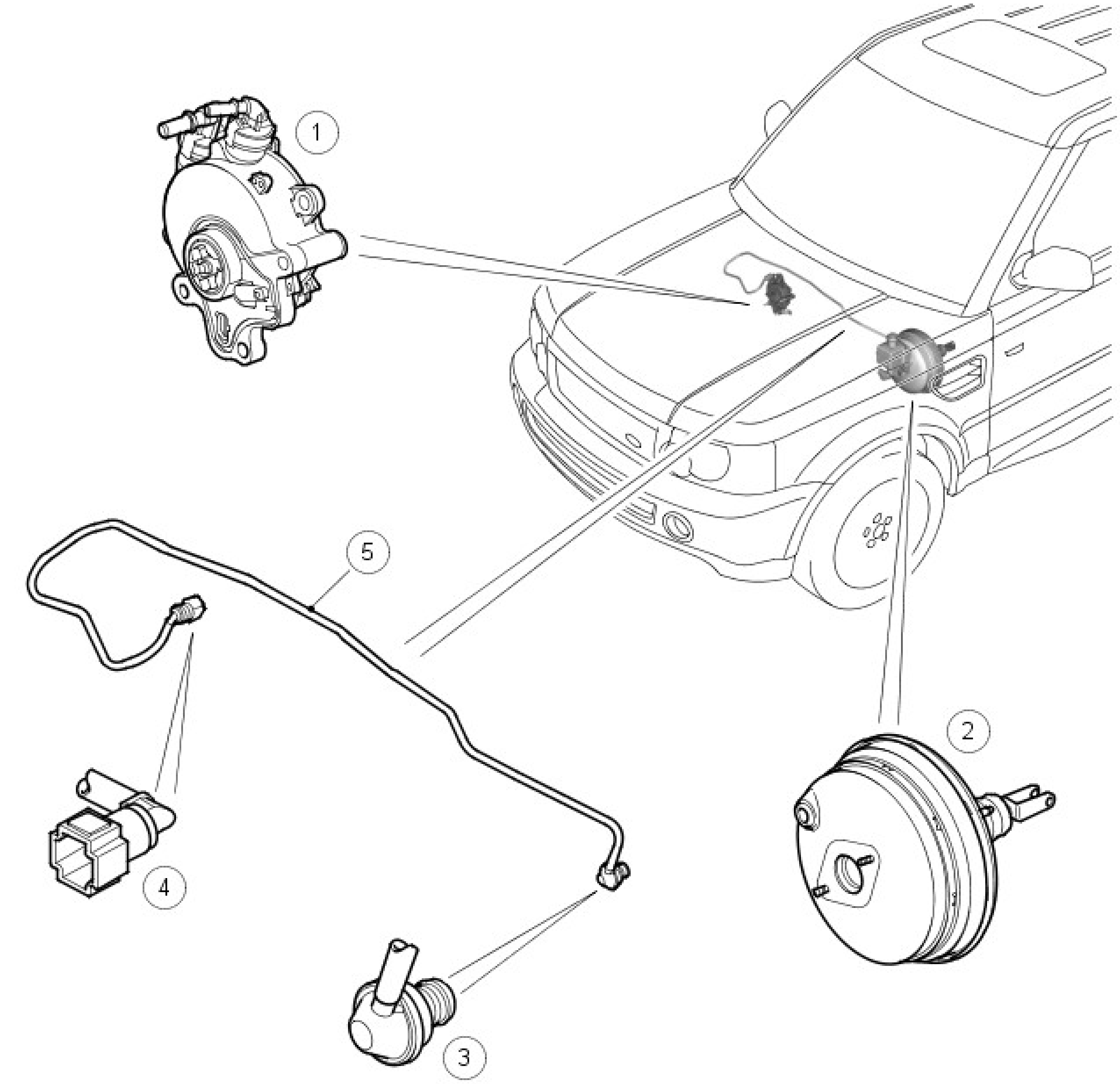


E52370

Item	Part Number	Description
1	-	Vacuum pump relay
2	-	Brake booster
3	-	Vacuum pump
4	-	Vacuum pipe connection to brake booster
5	-	Check valve
6	-	Vacuum pipe connection to vacuum pump
7	-	Vacuum pipes
8	-	Vacuum pipe connection to inlet manifold

COMPONENT LOCATIONS - 2.7L DIESEL

- NOTE: LHD shown



E52371

Item	Part Number	Description
1	-	Vacuum pump
2	-	Brake booster
3	-	Vacuum pipe connection to brake booster (includes check valve)
4	-	Vacuum pipe connection to vacuum pump
5	-	Vacuum pipes

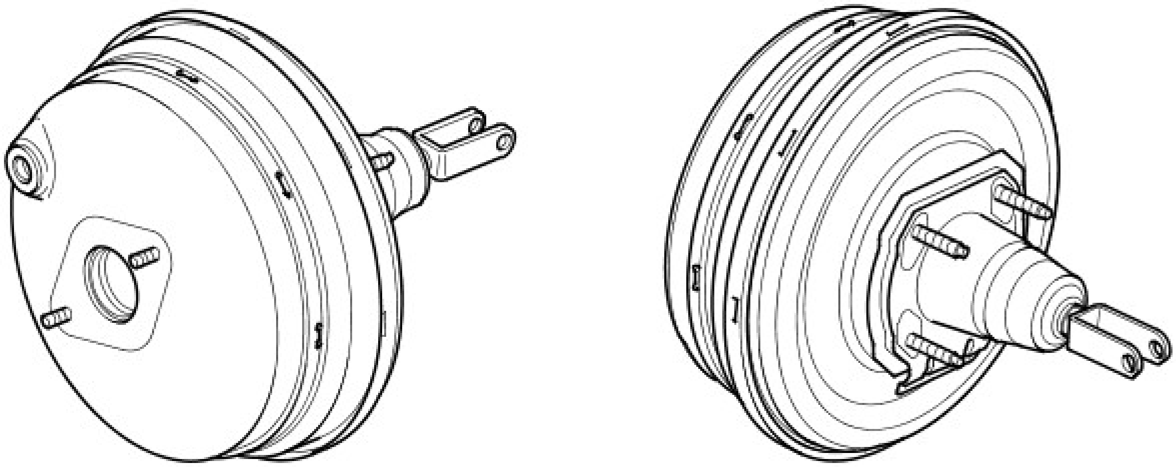
GENERAL

Power assistance for the brakes is provided by a vacuum operated brake booster. On petrol models, the vacuum is produced by the intake manifold and an electric vacuum pump. On diesel models, the vacuum is produced by an engine driven vacuum pump.

VACUUM PIPES

Plastic vacuum pipes connect the brake booster to the vacuum source. Check valves are incorporated into the vacuum pipes. On petrol models there are two in-line check valves, to maintain the vacuum in the brake booster when the throttle is open and the vacuum pump is not running, and prevent fuel vapor entering the brake booster. On diesel models there is a single check valve integrated into the vacuum pipe connection with the brake booster, to maintain the vacuum in the brake booster when the vacuum pump is operating at less than the optimum.

BRAKE BOOSTER

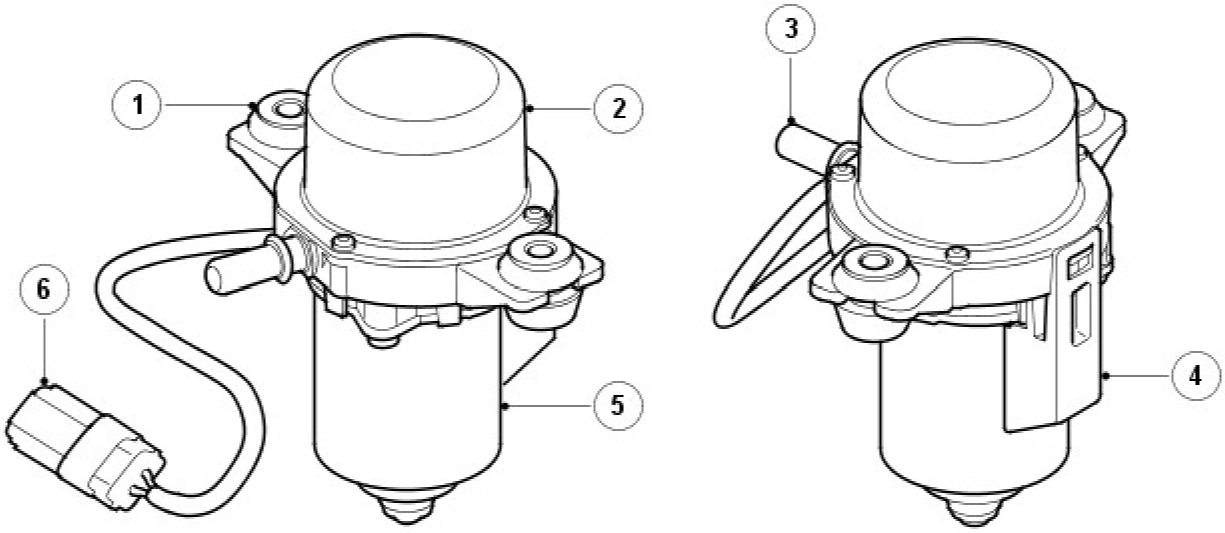


E49905

The brake booster is installed in the driver side of the engine compartment, on the engine bulkhead.

The brake booster is a dual diaphragm unit with a boost ratio of 7.0 : 1 on 4.4L and 2.7L Diesel models and 8.0 : 1 on 4.2L models. The input push rod is connected to the brake pedal. The output push rod locates in the primary piston of the brake master cylinder. A vacuum pipe, connected to the front face of the housing, connects the brake booster to the intake manifold and electric vacuum pump (petrol models) or the engine driven vacuum pump (diesel models).

VACUUM PUMP (4.2L AND 4.4L)



E49906

Item	Part Number	Description
1	-	Anti-vibration mount
2	-	Pump cover
3	-	Vacuum pump inlet
4	-	Rubber shroud for exhaust port
5	-	Motor cover
6	-	Electrical connector

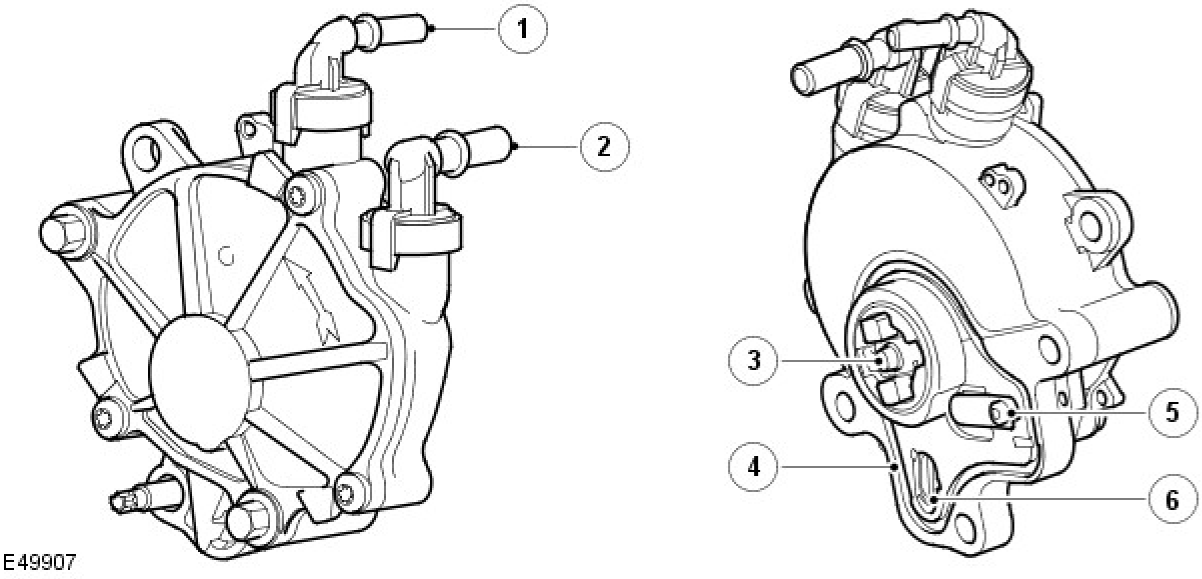
On petrol models the electric vacuum pump supplements the main vacuum supply from the engine manifold.

The vacuum pump is installed on a mounting bracket in the front left corner of the engine compartment. Two anti-vibration mounts on the vacuum pump are located on studs on the mounting bracket and secured with nuts.

The vacuum pump consists of a radial vane pump driven by an electric motor. The rotor and vanes of the pump are made from a self-lubricating carbon based material. A stub pipe is installed in the inlet of the pump to provide a connection point for the vacuum pipe from the brake booster. A second stub pipe, which is covered by a rubber shroud, is installed in the outlet from the pump.

Operation of the vacuum pump is controlled by the engine control module (ECM), which uses the brake vacuum pump relay in the battery junction box (BJB) to switch power to the vacuum pump. The ECM controls the time for which the vacuum pump is switched on and has in-built safeguards to protect the pump from overuse, e.g. continuous running is not allowed so a minimum delay time is specified between applications.

VACUUM PUMP (2.7L DIESEL)



Item	Part Number	Description
1	-	Vacuum connection (not used)
2	-	Vacuum connection for brake booster
3	-	Drive dog
4	-	Seal
5	-	Oil inlet port
6	-	Oil return/air vent

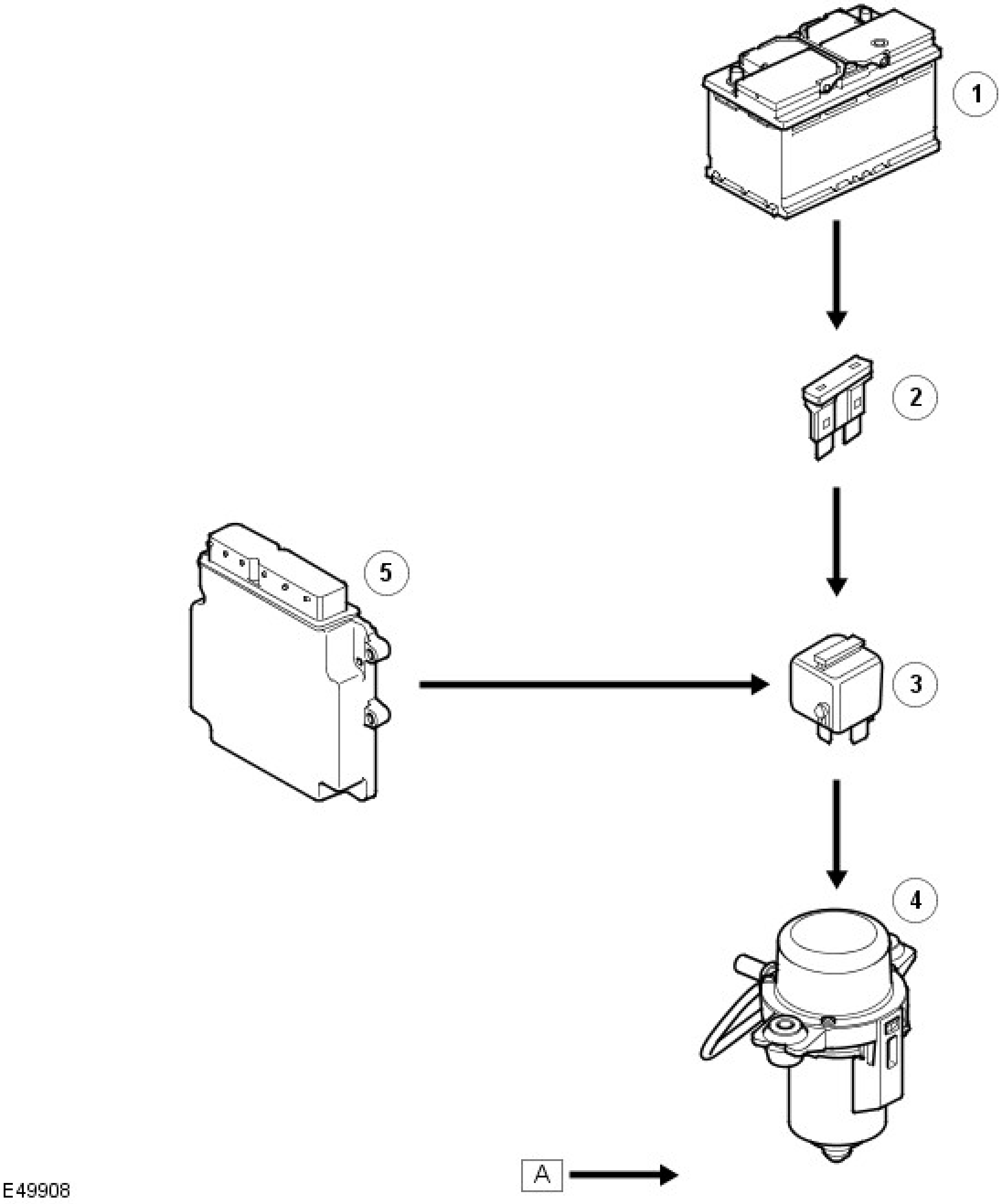
A vacuum pump is installed on diesel models as the air inlet system does not produce sufficient vacuum for satisfactory operation of the brake booster.

The vacuum pump is a radial vane pump which is attached to the rear of the right-hand (RH) cylinder head and driven at half engine speed by the exhaust camshaft. The vacuum pipe from the brake booster connects to an elbow on the rim of the vacuum pump.

The vacuum pump is lubricated and cooled by engine oil supplied to a port in the front face of the vacuum pump from a gallery in the cylinder head. The oil return is through a vent in the front face of the pump into a drain cavity in the cylinder head. Air extracted from the brake booster is vented into the drain cavity with the returning engine oil.

VACUUM PUMP CONTROL DIAGRAM (4.2L AND 4.4L)

- NOTE: A = Hardwired connection


1
2
3
4
5
A
E49908

Item	Part Number	Description
1	-	Battery
2	-	Fuse 24E, BJB
3	-	Vacuum pump relay
4	-	Vacuum pump
5	-	ECM

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Power Brake Actuation - Power Brake System

Diagnosis and Testing

For additional information.
REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).

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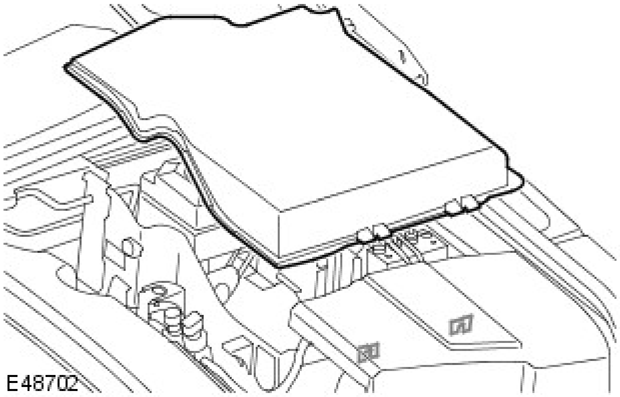
Power Brake Actuation - Brake Booster

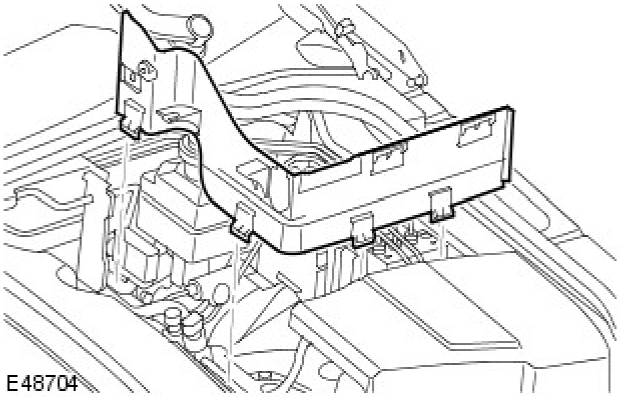
Removal and Installation

Removal

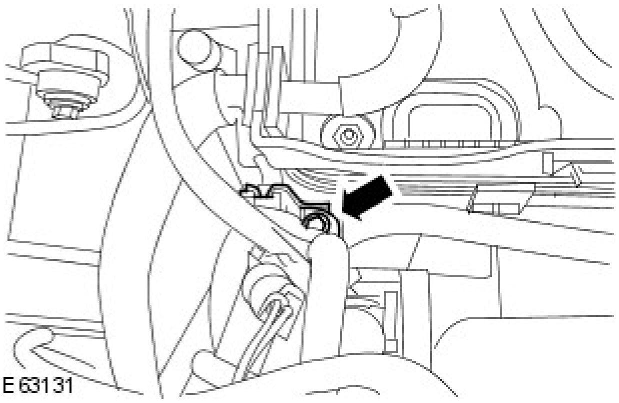
1. Pump the brake pedal until the brake vacuum assistance is exhausted.



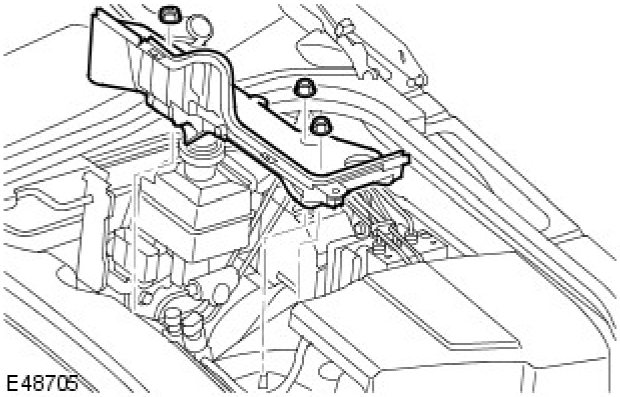
2. Remove the auxiliary battery cover.
   - Release the 2 clips.



3. If installed, remove the auxiliary battery.
4. Remove the auxiliary battery compartment side wall.
   - Release the four clips.

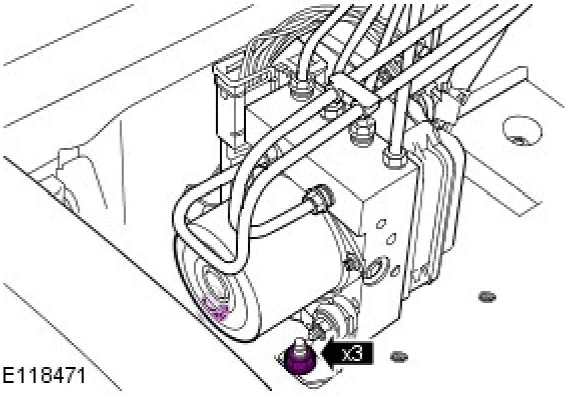


5. Release the Air Conditioning (A/C) pipes.
   - Remove the retaining screw.



6. Remove the auxiliary battery tray.

- Remove the 3 bolts.



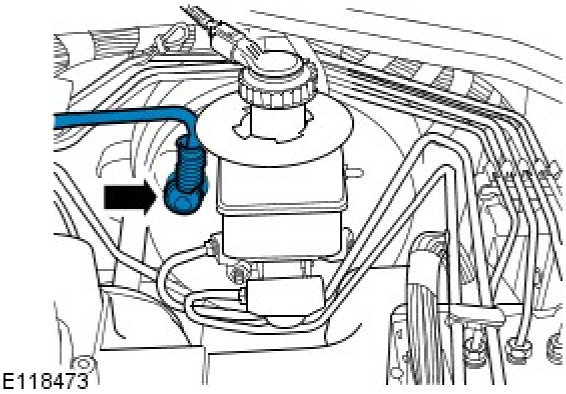
7. Release the Anti-lock Brake System (ABS) module.

- Remove the 3 nuts.
- Release the brake tubes from the clip.

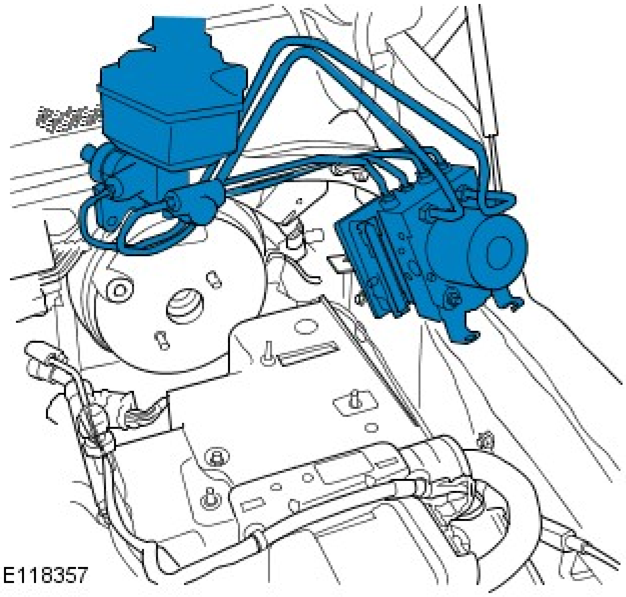
8. Disconnect the low brake fluid warning indicator switch electrical connector.

9. ⚠ CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

Position an absorbent cloth to collect fluid spillage.



10. Disconnect the brake booster vacuum hose from the brake booster.


E118357

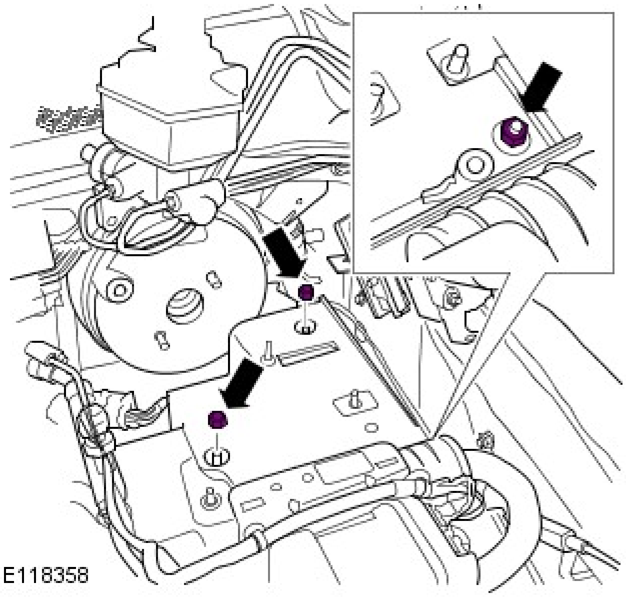
11. CAUTIONS:

⚠ Make sure that excessive force is not used. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure the wings and trim panels are covered and protected, failure to follow this instruction may result in damage to the vehicle.

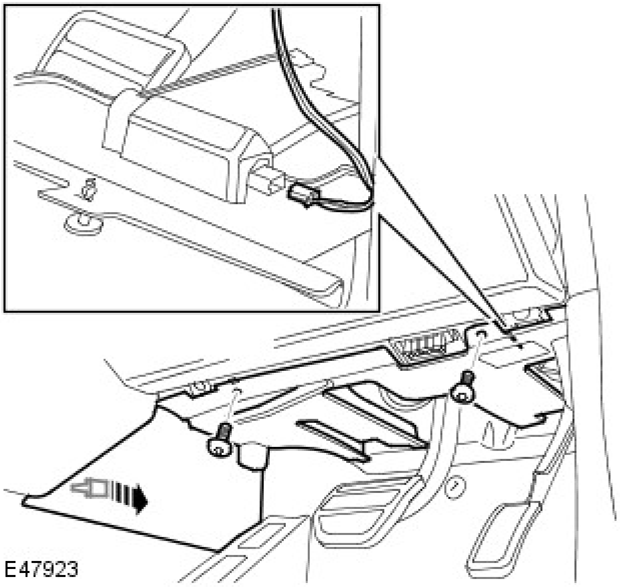
Displace the master cylinder.

- Remove the 2 nuts.


E118358

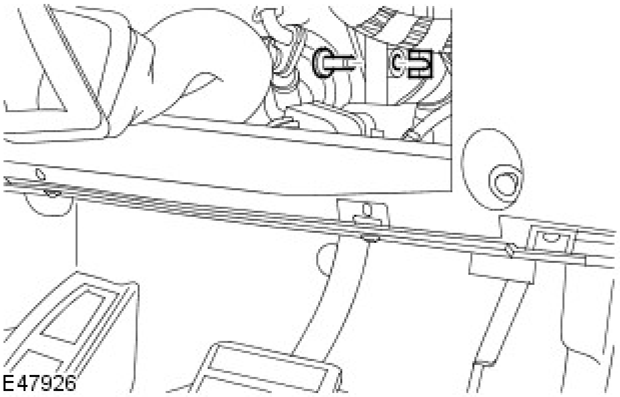
12. Remove the outer plenum base.

- Remove the 3 nuts.



13. Remove the driver side closing trim panel.

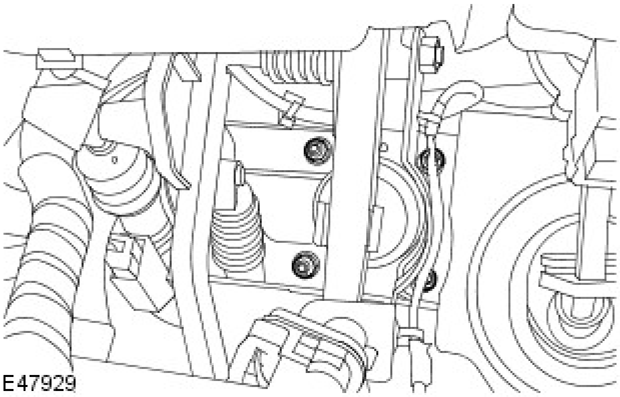
- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



14. NOTE: The cover is shown removed for clarity.

Remove the brake booster push rod clevis pin.

- Remove the retaining clip.



15. Remove the brake booster.

- Remove the 4 nuts.

Installation

1. Install the brake booster.

- Tighten the nuts to 23 Nm (17 lb.ft).

2. Install the brake booster push rod clevis pin.

- Install the retaining clip.

3. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

4. Connect the brake booster vacuum hose.

5. Install the outer plenum base.

- Carefully lift the anti-lock brake system modulator for access.
- Install the 3 nuts.

6. ⚠ CAUTION: Make sure the master cylinder is correctly aligned. Failure to make sure the master cylinder is correctly aligned to the brake booster actuation rod may cause component damage or poor brake performance.

Install the brake master cylinder.

- Tighten the nuts to 26 Nm (19 lb.ft).

7. Secure the anti-lock brake system modulator.

- Install the 3 nuts.
- Secure the brake tubes to the clip.

8. Connect the low brake fluid warning indicator switch electrical connector.

9. Install the auxiliary battery tray.

- Install the 3 bolts.

10. Install the auxiliary battery compartment side wall.

- Secure with the four retaining clips.

11. Secure the A/C pipes.

- Install the retaining screw.

12. If installed, install the auxiliary battery.

13. Start engine and check the brake booster operation.

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Power Brake Actuation - Brake Vacuum PumpTDV8 3.6L Diesel

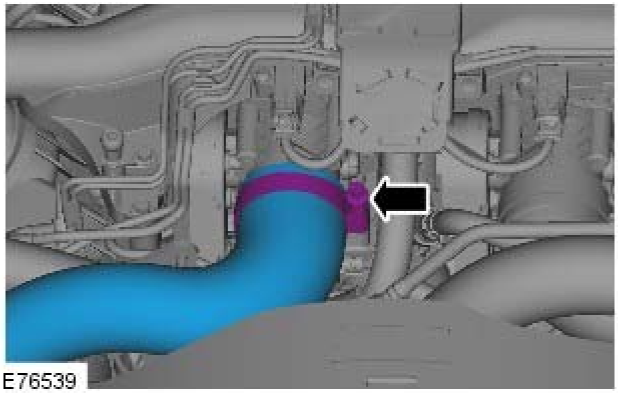
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

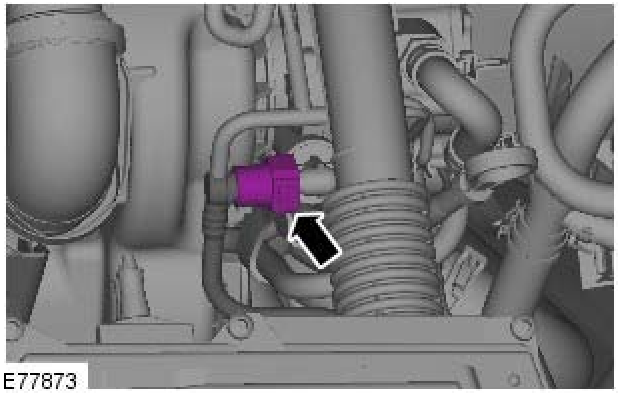
2. Remove the air cleaner assembly.

3. Remove the charge air cooler RH outlet hose.

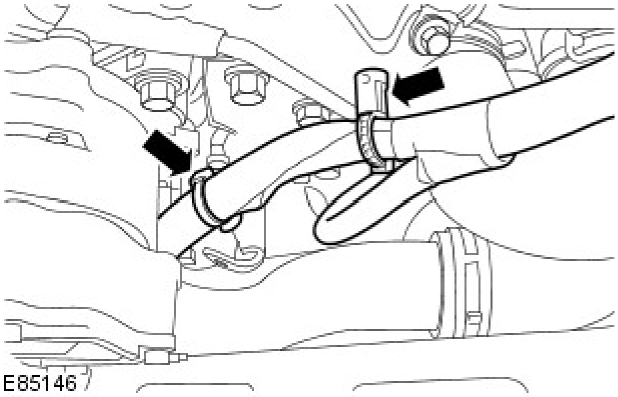


- Release the 2 clips.

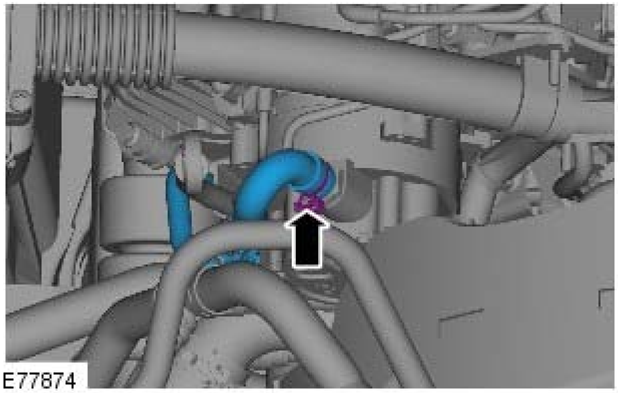
4. Disconnect the brake booster vacuum line from the brake vacuum pump.



5. Release the engine wiring harness.

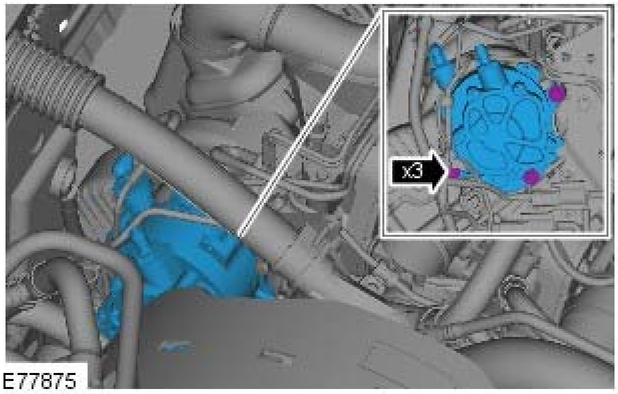


- Release the 2 clips.



6. Disconnect the engine oil pick-up hose.

- Release the clip.



7. Remove the brake vacuum pump.

- Remove the nut.
- Remove the stud.
- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

Install the brake vacuum pump.

- Install a new gasket.
- Tighten the stud to 10 Nm (7 lb.ft).
- Tighten the nut to 23 Nm (17 lb.ft).
- Tighten the bolts to 23 Nm (17 lb.ft).

2. Connect the engine oil pick-up hose.

- Secure with the clip.

3. Secure the engine wiring harness.

- Secure the clips.

4. Connect the brake booster vacuum line to the brake vacuum pump.

5. Install the charge air cooler RH outlet hose.

- Secure with the clips.

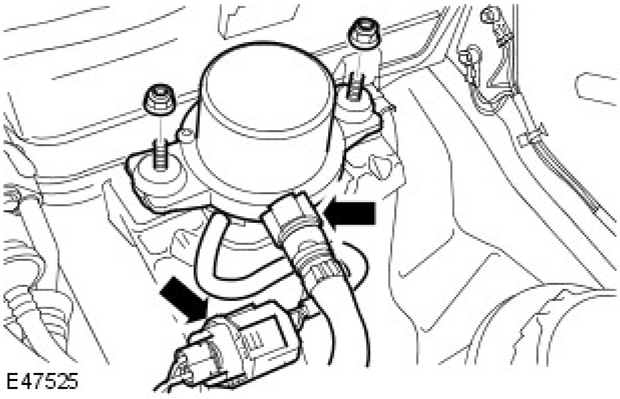
6. Install the air cleaner assembly.

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Power Brake Actuation - Brake Vacuum PumpV8 4.4L Petrol/V8 S/C 4.2L Petrol

Removal and Installation

Removal

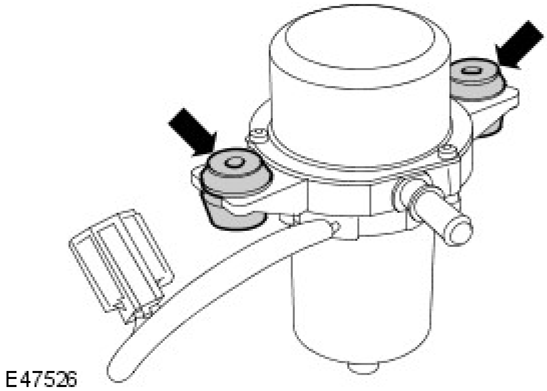


E47525

1. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the brake vacuum pump.

- Release and disconnect the electrical connector.
- Disconnect the vacuum line.
- Remove the 2 nuts.



E47526

2. NOTE: Do not disassemble further if the component is removed for access only.

Remove the 2 rubber insulators.

Installation

1. To install, reverse the removal procedure.

- Tighten the nuts to 5 Nm (4 lb.ft).

Published: 11-May-2011

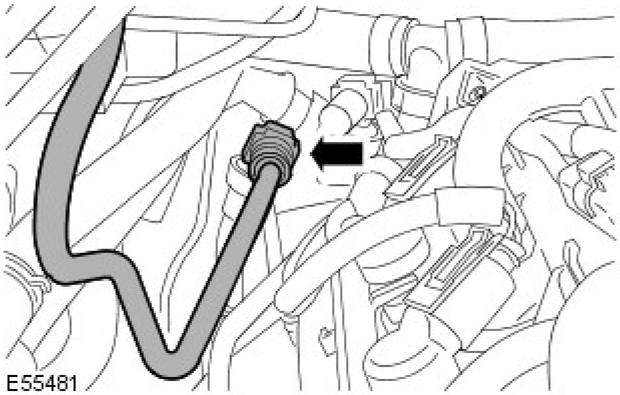
Power Brake Actuation - Brake Vacuum PumpTDV6 2.7L Diesel

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).


E55481

3. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the brake booster vacuum line from the brake vacuum pump.

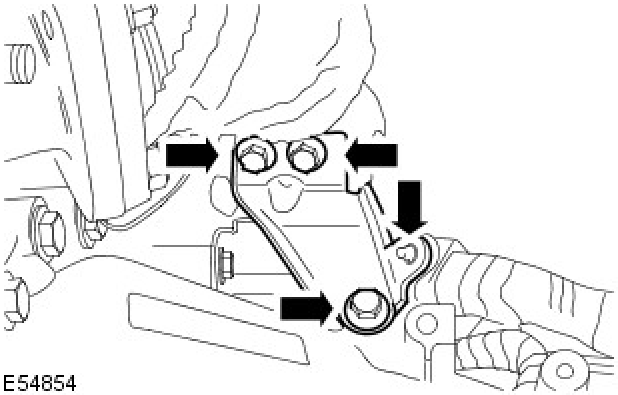
4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

5. Remove the exhaust system. For additional information, refer to: (309-00C Exhaust System - TDV6 2.7L Diesel)

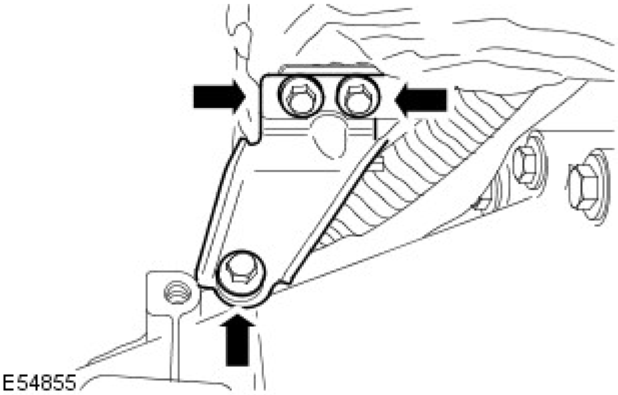
Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (Removal and Installation),
Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (Removal and Installation).

6. Lower the rear of the transmission for access.


E54854

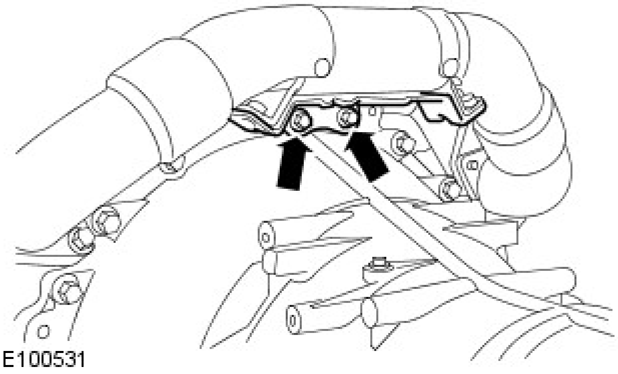
7. Remove the exhaust cross-over pipe LH support bracket.

- Release the wiring harness.
- Remove the 3 bolts.



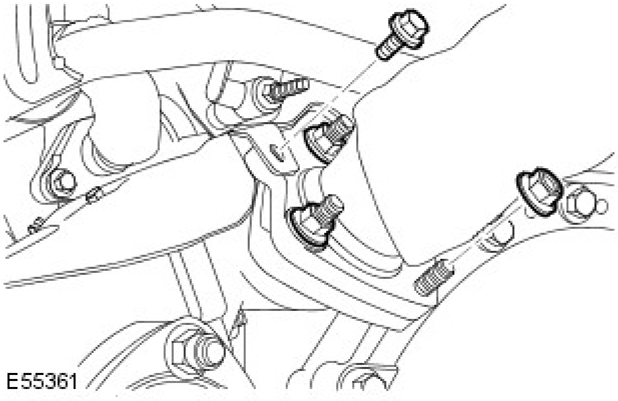
8. Remove the exhaust cross-over pipe RH support bracket.

- Remove the 3 bolts.



9. Remove the exhaust cross-over pipe center support bracket.

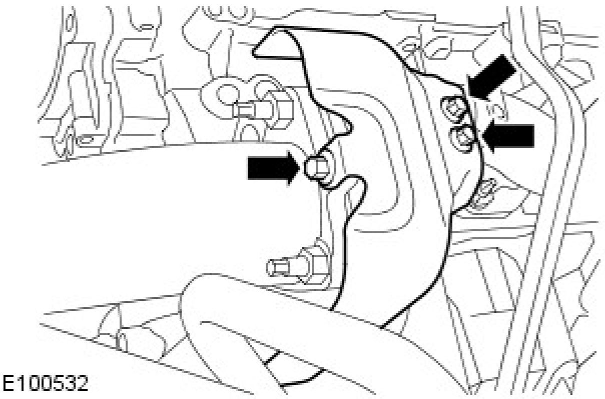
- Remove the 2 bolts.



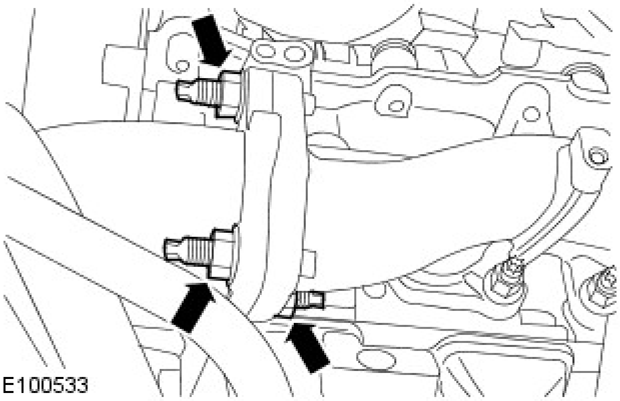
10. ⚠ CAUTION: Take care when handling the cross-over pipe as damage to the insulating material may occur.

Release the exhaust cross-over pipe from the turbocharger.

- Remove the turbocharger heat shield bolt.
- Remove and discard the 3 nuts.

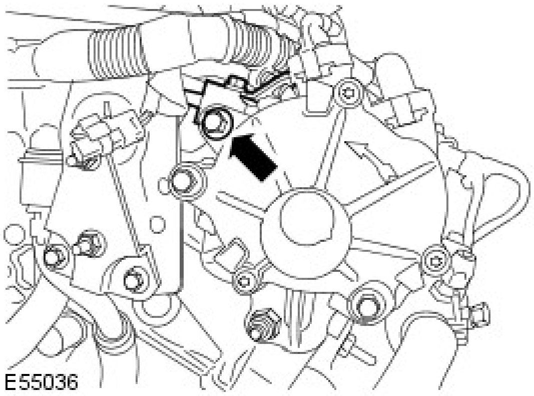


11. Remove the RH exhaust manifold heat shield.



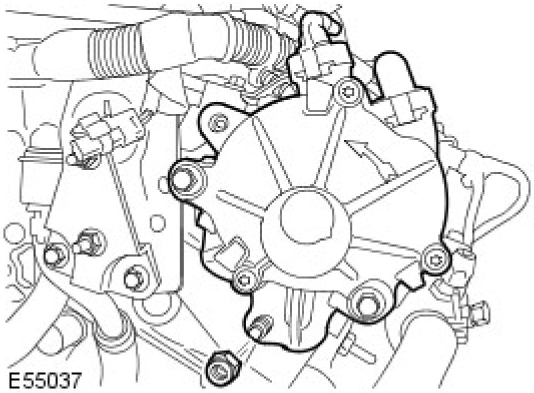
12. Remove the exhaust cross-over pipe.

- Remove and discard the 3 nuts.
- Remove and discard the 2 gaskets.

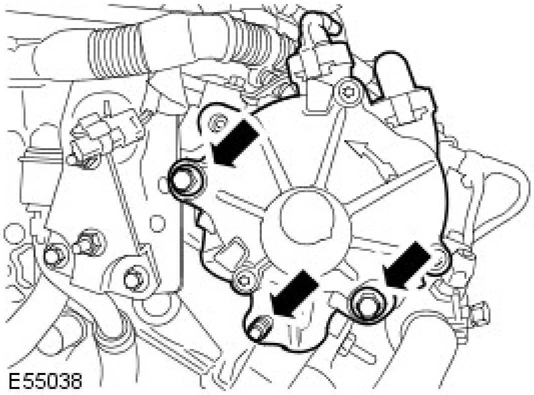


13. Release the high-pressure fuel supply line.

- Remove the bolt.



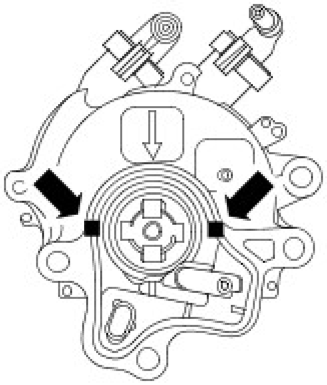
14. Remove the brake vacuum pump nut.



15. Remove the brake vacuum pump.

- Remove the stud.
- Remove the 2 bolts.

Installation


E56076

1. ⚠ CAUTION: Extreme care is required during assembly so that the sealant is not smeared. If the sealant is smeared, the mating faces must be cleaned and new sealant must be applied.

   Apply sealant to the two places shown.

   - Make sure the vacuum pump seal is clean and dry.
   - Make sure that the dogs on the vacuum pump are aligned with the camshaft.
   - Apply a 2mm square of Loctite 518 sealant in the 2 places shown.
   - Install the brake vacuum pump immediately after applying the sealant.
   - The brake vacuum pump should be fitted directly to the engine without smearing the sealant.

2. Install the brake vacuum pump.
   - Install the 2 bolts.
   - Tighten the bolts to 23 Nm (17 lb.ft).

3. Install the brake vacuum pump stud.
   - Tighten to 13 Nm (10 lb.ft).

4. Install the brake vacuum pump nut.
   - Tighten to 13 Nm (10 lb.ft).

5. Secure the high-pressure fuel supply line.
   - Tighten the bolt to 10 Nm (7 lb.ft).

6. Install 3 new exhaust manifold studs.
   - Tighten the 3 studs to 13 Nm (10 lb. ft).

7. Install 3 new turbocharger studs.
   - Tighten the 3 studs to 13 Nm (10 lb. ft).

8. ⚠ CAUTION: Take care when handling the cross-over pipe as damage to the insulating material may occur.

   Install the exhaust cross-over pipe.

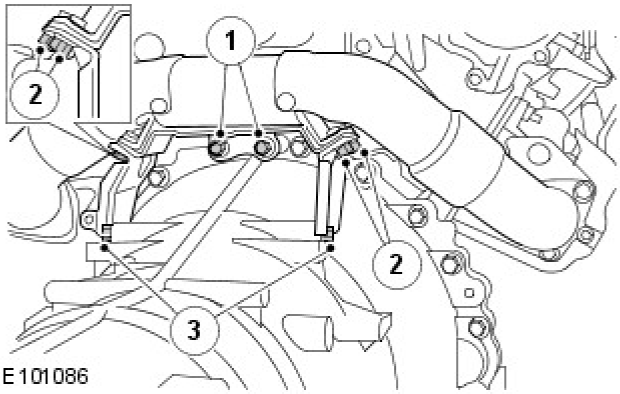
   - Clean the component mating faces.
   - Install 2 new gaskets.
   - Install 6 new nuts
   - Tighten the 6 nuts to 24 Nm (18 lb. ft).

9. Install the exhaust cross-over pipe center support bracket.
   - Loosely install the 2 bolts.

10. Install the exhaust cross-over pipe RH support bracket.
    - Loosely install the 3 bolts.

11. Install the exhaust cross-over pipe LH support bracket.

- Loosely install the 3 bolts.



12. Tighten the exhaust cross-over pipe mounting bracket bolts in the following sequence.

- Tighten the 2 bolts marked 1 to 10 Nm (7 lb.ft).
- Undo the 2 bolts by 90 degrees.
- Tighten the 2 bolts marked 3 to 10 Nm (7 lb.ft).
- Undo the 2 bolts by 90 degrees.
- Tighten the 4 bolts marked 2 to 25 Nm (18 lb.ft).
- Tighten the 2 bolts marked 1 to 25 Nm (18 lb.ft).
- Tighten the 2 bolts marked 3 to 25 Nm (18 lb.ft).
- Attach the wiring harness.

13. Install the RH exhaust manifold heat shield.

- Tighten the 3 bolts to 10 Nm (7 lb.ft).

14. Install the turbocharger heat shield.

- Tighten the bolt to 10 Nm (7 lb.ft).

15. Install the exhaust system. For additional information, refer to: (309-00C Exhaust System - TDV6 2.7L Diesel)

Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (Removal and Installation),
Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (Removal and Installation).

16. CAUTION: Always plug any open connections to prevent contamination.

Connect the brake booster vacuum line to the brake vacuum pump.

17. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

18. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Anti-Lock Control - Traction Control -

General Specification

Item	Specification
System make/type	Bosch 8.0 Anti-lock braking system with Electronic Brake Distribution (EBD), Corner Brake Control (CBC), Electronic Traction Control (ETC), Hill Descent Control (HDC), Anti-roll Mitigation (ARM), Emergency Brake Assist (EBA), and Dynamic Stability Control (DSC)
Wheel speed sensors:	
Make/type	Bosch DF11i
Location	Front and rear knuckles with the active directional sensor acting on the driveshaft pole wheel
Yaw rate sensor make/type	Bosch DRS MM1.OR

Torque Specifications

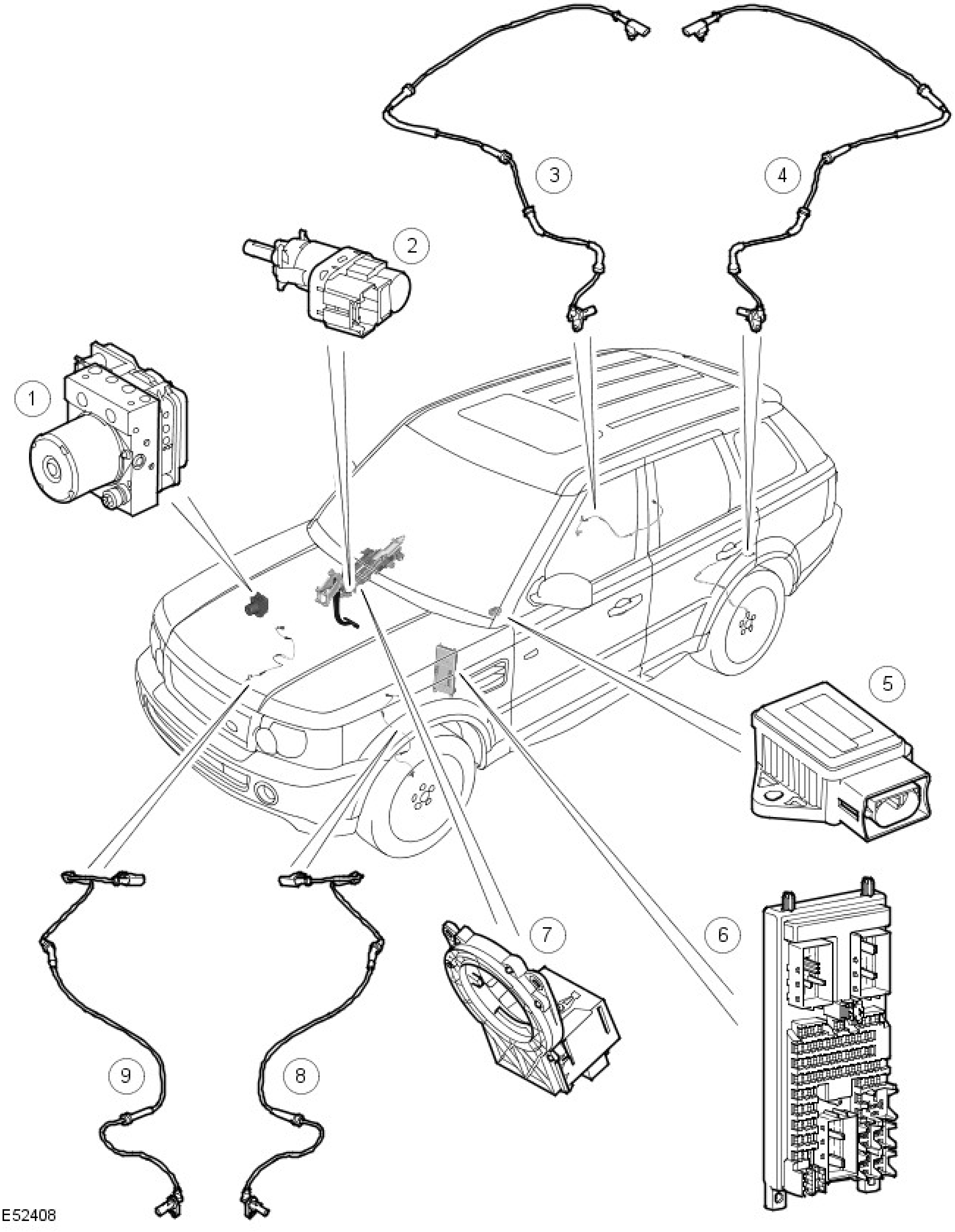
Description	Nm	lb-ft
Front road wheel speed sensor bolt	9	7
Front brake caliper anchor plate to wheel knuckle bolts	275	203
Brembo front brake caliper to wheel knuckle bolts	275	203
Front brake hose retaining bracket to wheel knuckle bolt	22	16
Rear road wheel speed sensor to wheel knuckle bolt	9	7
ABS module to mounting bracket nuts	8	6
ABS module mounting bracket to body nuts	23	17
M10 Brake tube union nuts	15	11
M12 Brake tube union nuts	15	11
M14 Brake tube union nut	17	13
Yaw rate sensor bolts	7	5
Road wheel nuts	140	103

Published: 11-May-2011

Anti-Lock Control - Traction Control - Anti-Lock Control - Traction Control

Description and Operation

COMPONENT LOCATIONS - SHEET 1 OF 2



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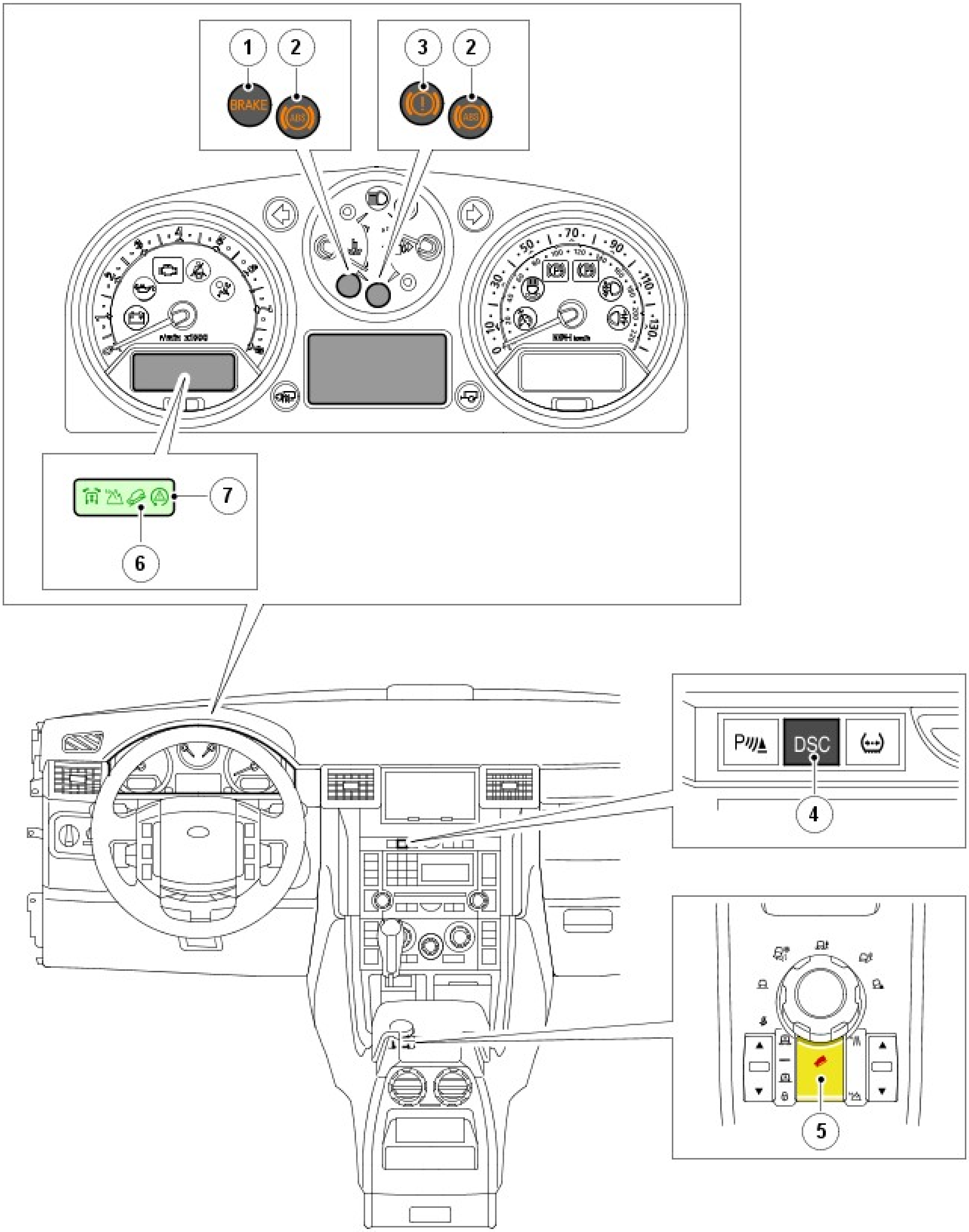
E52408

Item	Part Number	Description
1	-	hydraulic control unit (HCU) with attached anti-lock brake system (ABS) module
2	-	Stoplamp switch
3	-	Right rear wheel speed sensor
4	-	Left rear wheel speed sensor
5	-	Yaw rate and lateral acceleration sensor
6	-	HDC (hill descent control) relay (non-serviceable, integrated into central junction box (CJB))
7	-	Steering angle sensor
8	-	Left front wheel speed sensor
9	-	Right front wheel speed sensor

COMPONENT LOCATIONS - SHEET 2 OF 2


1
2
BRAKE
ABS
3
2
ABS
7
6
P
DSC
4
5

E52409

Item	Part Number	Description
1	-	Brake warning indicator (NAS (north American specification) only)
2	-	ABS warning indicator
3	-	Brake warning indicator (all except NAS)
4	-	DSC (dynamic stability control) switch
5	-	HDC switch

6	-	HDC information indicator
7	-	DSC warning indicator

GENERAL

The anti-lock control - traction control system is based on the 4 channel Bosch 8.0 system and provides the following brake functions:

- ARM (active roll mitigation).
- ABS.
- CBC (corner brake control).
- DSC.
- electronic brake force distribution (EBD).
- ETC (electronic traction control).
- emergency brake assist (EBA).
- EDC (engine drag-torque control).
- HDC.

The system consists of the following components:

- A DSC switch.
- An HDC switch.
- An HDC relay.
- A stoplamp switch.
- Four wheel speed sensors.
- A yaw rate and lateral acceleration sensor.
- A steering angle sensor.
- Four warning indicators.
- A HCU with attached ABS module.

DSC SWITCH

The DSC switch allows the DSC function to be selected off. Although Land Rover recommend that DSC is selected on for all normal driving conditions, it may be beneficial to de-select DSC, to maximize traction, under the following conditions:

- If the vehicle needs to be rocked out of a hollow or a soft surface.
- Driving on loose surfaces or with snow chains.
- Driving in deep sand, snow or mud.
- On tracks with deep longitudinal ruts.

The DSC switch is a non-latching switch installed in the center switch pack on the instrument panel. Pressing the DSC switch connects an ignition power feed to the ABS module. With the first press of the DSC switch, the ABS module disables the DSC functions. When the DSC switch is pressed again, the ABS module re-enables the DSC functions. The DSC switch must be pressed for a minimum of 0.3 second for the ABS module to react. The DSC function is re-enabled at the beginning of each ignition cycle.

The status of the DSC switch selection is shown by the DSC warning indicator. The DSC warning indicator is off while DSC is selected on, and continuously illuminated while DSC is selected off.

A DSC switch request to disable DSC is ignored if the air suspension system has failed, or is in off-road height at speeds above 60 km/h (37.5 mph).

To guard against incorrect operation or a broken switch, if the input from the DSC switch is held high for more than one minute, a failure is stored in the ABS module.

Even if DSC is deselected, driving maneuvers with extreme yaw or lateral acceleration may trigger DSC activity to assist vehicle stability.

HDC SWITCH

The HDC switch controls the selection of the HDC function.

The HDC switch is a non-latching switch installed on the center console, to the rear of the gear shift lever. Pressing and releasing the HDC switch momentarily connects an ignition power feed to the ABS module. With the first press and release of the HDC switch, the ABS module enables operation of the HDC function. When the HDC switch is pressed and released again, the ABS module disables operation of the HDC function.

To guard against incorrect operation or a broken switch, if the switch is pressed for more than 10 seconds no change of state occurs. If the input from the HDC switch is held high for more than one minute, a failure is stored in the ABS module.

HDC RELAY

The HDC relay is used to illuminate the stoplamps when the brakes are activated:

- During HDC operation.
- During dynamic application of the parking brake.
  For additional information, refer to: Parking Brake (206-05 Parking Brake and Actuation, Description and Operation).
- By the adaptive speed control system. For additional information, refer to:
  Speed Control (310-03B Speed Control - V8 4.4L Petrol, Description and Operation),
  Speed Control (310-03C Speed Control - TDV6 2.7L Diesel, Description and Operation).

The HDC relay is a non-serviceable, solid state relay on the circuit board of the CJB. Operation of the HDC relay is controlled by the ABS module switching the coil to ground.

To operate the stoplamps during HDC or adaptive speed control operation, the ABS module monitors brake system hydraulic pressure and energizes the HDC relay during active braking. A pressure threshold and time filter prevent the stoplamps from flickering when HDC is braking. During dynamic application of the parking brake, the ABS module energizes the HDC relay when it receives a stoplamp request message from the parking brake module on the high speed controller area network (CAN) bus.

STOPLAMP SWITCH

The stoplamp switch is mounted in the brake pedal bracket and operated by the brake pedal. The stoplamp switch is a two pole switch: The BS (brake switch) pole supplies a brake pedal status signal to the ABS module; the BLS (brake lamp switch) pole operates the stoplamps and also supplies a brake pedal status signal to the ABS module and to the engine control module (ECM).

While the brake pedal is released:

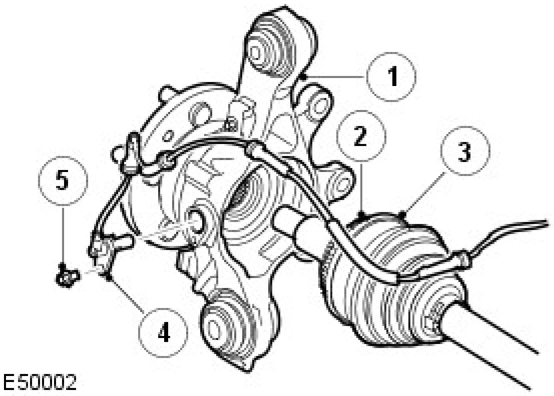
- The BS contacts are closed, and connect an ignition power feed from the CJB to the ABS module.
- The BLS contacts are open.

When the brake pedal is pressed:

- The BS contacts open.
- The BLS contacts close, and connect an ignition power feed from the CJB to the three stoplamps, the ABS module and the ECM.

The ABS module monitors the status inputs from the stoplamp switch and broadcasts the brake pedal status and an associated quality factor on the high speed CAN bus.

WHEEL SPEED SENSORS



Item	Part Number	Description
1	-	Knuckle assembly
2	-	Sensor ring
3	-	Halfshaft
4	-	Wheel speed sensor
5	-	Screw

An active wheel speed sensor is installed in each wheel hub to provide the ABS module with a rotational speed signal from each road wheel. The head of each wheel speed sensor is positioned close to a 48 tooth sensor ring on the outer diameter of the constant velocity joint of the halfshaft. A flying lead connects each sensor to the vehicle wiring.

The wheel speed sensors each have a power supply connection and a signal connection with the ABS module. When the ignition switch is in position II, the ABS module supplies power to the wheel speed sensors and monitors the return signals. Any rotation of the halfshafts induces current fluctuations in the return signals which are converted into individual wheel speeds and the overall vehicle speed by the ABS module.

The ABS module outputs the individual wheel speeds and the vehicle speed on the high speed CAN bus for use by other systems. The quality of the vehicle speed signal is also broadcast on the high speed CAN bus. If all wheel speed signals are available to calculate vehicle speed from, the quality of the vehicle speed signal is set to 'data calculated within specified accuracy'. If one or more wheel speed sensors is faulty, the quality of the vehicle speed signal is set to 'accuracy outside specification'.

The ABS module monitors the wheel speed sensor circuits for faults. If a fault is detected the ABS module stores a related fault code and illuminates the appropriate warning indicators, depending on the system functions affected (DSC/ETC, ABS, EBA/EBD, HDC). Also a warning chime sounds and a related message is shown in the message center.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

Since the wheel speed sensors are active devices, a return signal is available when the road wheels are not turning, which enables the ABS module to check the sensors while the vehicle is stationary. In addition, the direction of travel of each wheel can be sensed. This information is broadcast on the high sped CAN bus for use by other systems.

YAW RATE AND LATERAL ACCELERATION SENSOR

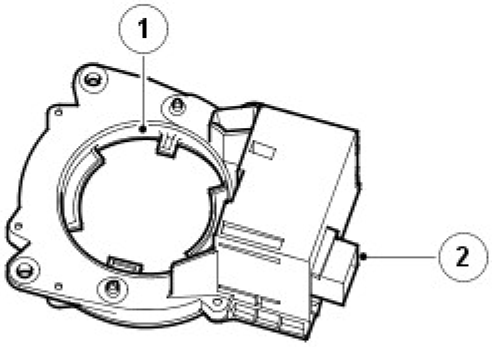
The yaw rate and lateral acceleration sensor provides the ABS module with inputs of yaw rate and lateral acceleration.

The yaw rate and lateral acceleration sensor is installed under the center console and secured to the transmission tunnel with two bolts.

When the ignition switch is in position II, the yaw rate and lateral acceleration sensor receives an ignition power feed from the CJB. The sensor is self diagnosed by the ABS module and can be interrogated using T4. The ABS module broadcasts the yaw rate and lateral acceleration values, on the high speed CAN bus, for use by other systems.

The ABS module monitors the yaw rate and lateral acceleration sensor for faults. If a fault is detected the ABS module stores a related fault code and illuminates the DSC warning indicator. Also, a warning chime sounds and a message advising of an HDC fault is shown in the message center.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

STEERING ANGLE SENSOR



E50003

Item	Part Number	Description
1	-	Gear wheel
2	-	Electrical connector

The steering angle sensor measures the steering wheel angle and the rate of change of the steering wheel angle (known as the steering wheel angle speed). These measurements are output on the high speed CAN bus, together with a quality factor signal, for use by other systems. The ABS module uses the steering angle sensor signals for CBC and DSC operation.

The steering angle sensor is fixed to the pivot bracket of the steering column by three screws. A gear wheel in the steering angle sensor engages with a plastic drive collar fixed onto the lower shaft of the column. Inside the steering angle sensor, the gear wheel meshes with a gear train containing magnets. An eight pin electrical connector provides the interface between the vehicle wiring and integrated circuits in the steering angle sensor.

The steering angle sensor uses the MR (magneto resistive) effect, which evaluates the direction of magnetic fields, to measure the angular position of the lower shaft, and thus the steering wheel angle. When the steering wheel turns, the steering column lower shaft rotates the gear wheel in the steering angle sensor, which drives the gear train and rotates the magnets on the gears. The direction of the magnetic fields is constantly monitored by the steering angle sensor and converted into a steering wheel angle and steering wheel angle speed.

The steering angle sensor performs a plausibility check of the steering wheel angle each time the following conditions co-exist:

- The vehicle is traveling in a straight line.
- The vehicle speed is between 20 and 25 km/h (12.5 and 15.6 mph).

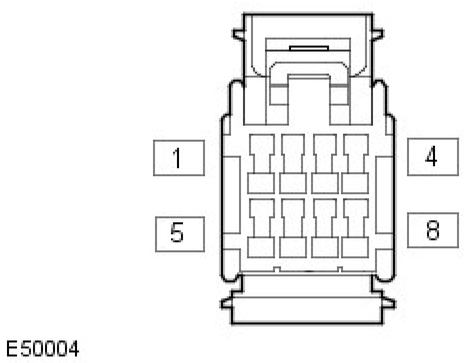
- The transfer box is in high range.
- The brake pedal is not pressed.
- There is no ABS, DSC or ETC activity.

The steering angle sensor uses inputs of wheel speed, yaw rate and lateral acceleration to determine when the vehicle is traveling in a straight line. When all of the conditions co-exist, the steering angle sensor checks the steering angle, which should be 0 ± 15°. If the steering angle is outside the limits on two successive checks, the steering angle sensor changes the quality factor signal to 'outside specification' for the remainder of the ignition cycle and stores a fault code. At the beginning of each ignition cycle the quality factor signal is reset to 'within specified accuracy'.

The status of the steering angle sensor can be determined using T4.

If the steering angle sensor is replaced, the new sensor must be calibrated using T4. The steering angle sensor must also be re-calibrated any time it is disturbed from the steering column, or if the upper and lower steering columns are separated.

Steering Angle Sensor Harness Connector C0862



Steering Angle Sensor Harness Connector C0862 Pin Details

Pin No.	Description	Input/Output
1 to 4	Not used	-
5	Ignition power supply	Input
6	High speed CAN bus high	Input/Output
7	High speed CAN bus low	Input/Output
8	Ground	-

WARNING INDICATORS

The following anti-lock control - traction control indicators are installed in the instrument cluster:

ABS Warning Indicator

The ABS warning indicator is an amber colored indicator located between the coolant temperature gage and the fuel level gage.

The ABS warning indicator is continuously illuminated if there is a fault that affects ABS performance or causes the ABS function to be disabled.

Operation of the ABS warning indicator is controlled by a high speed CAN bus message from the ABS module to the instrument cluster.

When the ignition switch is first turned to position II, the ABS warning indicator illuminates for approximately 3 seconds as a bulb check. During the bulb check, if a fault is stored in the memory of the ABS module, the ABS warning indicator goes off for 0.5 second, 0.5 second after the start of the bulb check. If a fault during the previous ignition cycle caused the ABS warning indicator to be illuminated, the ABS warning indicator may remain illuminated after the next bulb check, even if the fault has been rectified and cleared from the ABS module; the ABS warning indicator remains illuminated until vehicle speed reaches 15-20 km/h (9.5-12.5 mph) while additional checks of the related inputs are performed.

Brake Warning Indicator

The brake warning indicator is a dual colored indicator, located in the coolant temperature gage, that illuminates amber for EBA faults and red for EBD faults. The brake warning indicator is also used to give warnings of:

- Low brake fluid level (illuminates red).
  For additional information, refer to: Hydraulic Brake Actuation (206-06 Hydraulic Brake Actuation, Description and Operation).
- Brake pad wear (illuminates amber).

For additional information, refer to: Rear Disc Brake (206-04 Rear Disc Brake, Description and Operation).

Operation of the brake warning indicator is controlled by a high speed CAN bus message from the ABS module to the instrument cluster.

When the ignition switch is first turned to position II, the brake warning indicator illuminates amber for approximately 1.5 seconds then red for approximately 1.5 seconds, as a bulb check.

DSC Warning Indicator

The DSC warning indicator is an amber colored warning indicator located in the tachometer.

Each time the DSC or the ETC function is active, the DSC warning indicator flashes at 2 Hz. If DSC has been selected off, or there is a fault that disables the DSC or the ETC function, the DSC warning indicator is continuously illuminated. If DSC has been selected off the instrument cluster also displays a message advising that DSC is switched off.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

Operation of the DSC warning indicator is controlled by a high speed CAN bus message from the ABS module to the instrument cluster.

When the ignition switch is first turned to position II, the DSC warning indicator illuminates for approximately 3 seconds as a bulb check. If a fault during the previous ignition cycle caused the DSC warning indicator to be illuminated, the DSC warning indicator may remain illuminated after the next bulb check, even if the fault has been rectified and cleared from the ABS module; the DSC warning indicator may remain illuminated during vehicle operation while additional checks of the related inputs are performed.

HDC Information Indicator

The HDC information indicator is a green colored indicator located in the tachometer.

The HDC information indicator is continuously illuminated while the HDC function is selected on and the vehicle is within the parameters for HDC operation; when the vehicle is outside the parameters for HDC operation, the HDC information indicator is flashed at 2 Hz.

Operation of the HDC information indicator is controlled by a high speed CAN bus message from the ABS module to the instrument cluster.

HCU

The HCU is a 4 channel unit that modulates the supply of hydraulic pressure to the brakes under the control of the ABS module.

The HCU is attached by three mounting bushes to a bracket in the plenum box on the driver side of the engine compartment. Hydraulic pipes connect the HCU to the master cylinder and the brakes.
For additional information, refer to: Hydraulic Brake Actuation (206-06 Hydraulic Brake Actuation, Description and Operation).

The primary and secondary outlets of the master cylinder are connected to primary and secondary circuits within the HCU. The primary circuit in the HCU has separate outlet ports to the front brakes. The secondary circuit in the HCU has separate outlet ports to the rear brakes. Each of the circuits in the HCU contain the following components to control the supply of hydraulic pressure to the brakes:

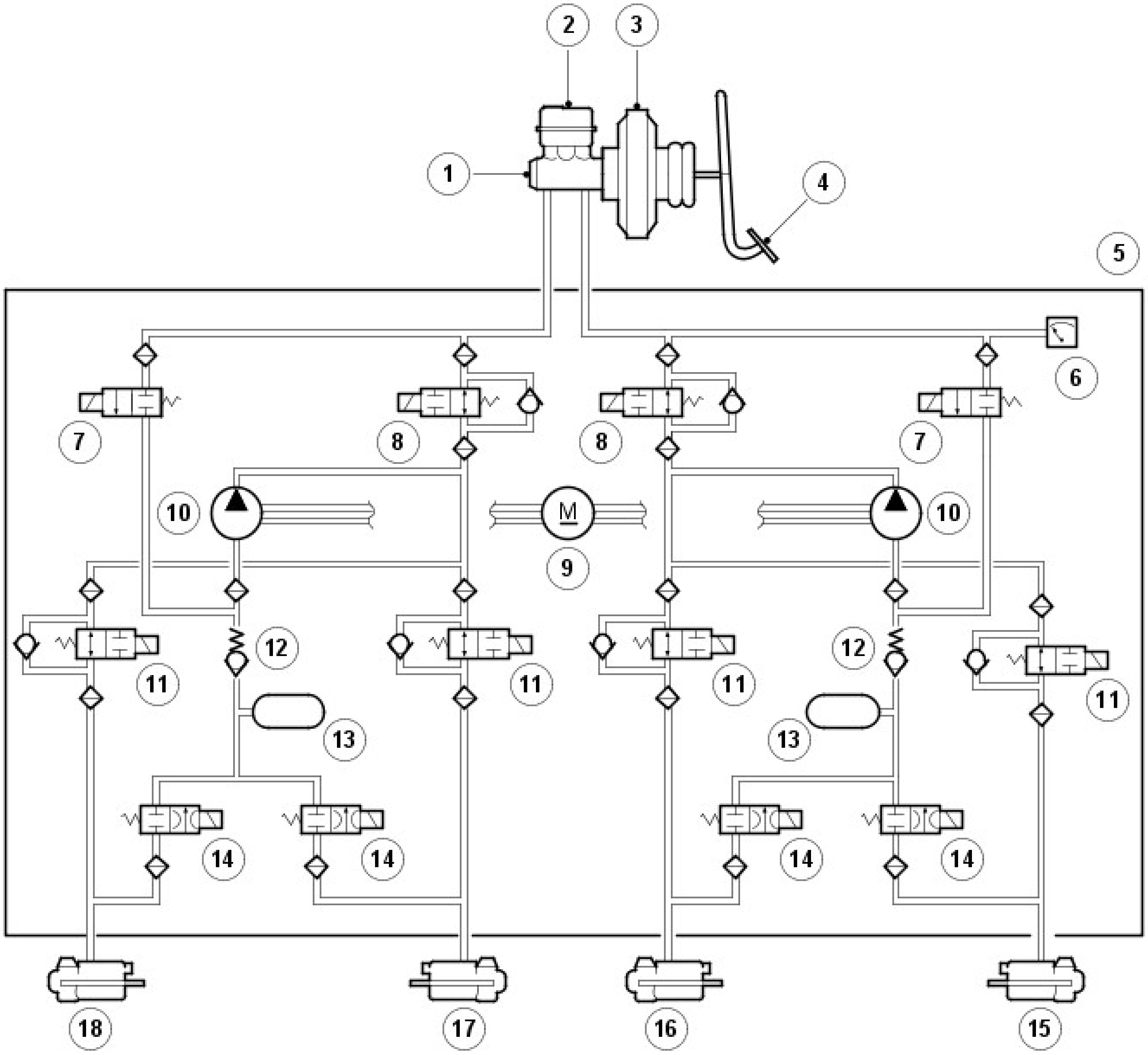
- A normally open, solenoid operated, pilot valve, to enable active braking.
- A normally closed, solenoid operated, priming valve, to connect the brake fluid reservoir to the return pump during active braking.
- A return pump, to generate hydraulic pressure for active braking and return brake fluid to the reservoir.
- Normally open, solenoid operated, inlet valves and normally closed, solenoid operated, outlet valves, to modulate the hydraulic pressure in the individual brakes.
- An accumulator and a relief valve, to allow the fast release of pressure from the brakes.
- Filters, to protect the components from contamination.

The primary circuit also incorporates a pressure sensor to provide the ABS module with a hydraulic pressure signal.

Contact pins on the HCU mate with contacts on the ABS module to provide the electrical connections from the ABS module to the return pump motor and the pressure sensor. The solenoids that operate the valves are installed in the ABS module.

Replacement HCU are supplied pre-filled. After installation on the vehicle, T4 must be used to operate the solenoid valves and the return pump to ensure correct bleeding of the HCU and brake circuits.

Schematic of HCU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E50005

Item	Part Number	Description
1	-	Master cylinder
2	-	Reservoir
3	-	Brake booster
4	-	Brake pedal
5	-	HCU
6	-	Pressure sensor
7	-	Priming valve
8	-	Pilot valve
9	-	Return pump motor
10	-	Return pump
11	-	Inlet valve
12	-	Relief valve
13	-	Accumulator
14	-	Outlet valve
15	-	Left front brake
16	-	Right front brake

17	-	Right rear brake
18	-	Left rear brake

The HCU has three operating modes: Normal braking/EBD mode, ABS braking and active braking.

Normal Braking/EBD Mode

Initially, all of the solenoid operated valves are de-energized. Operating the brake pedal produces a corresponding increase or decrease of pressure in the brakes, through the open pilot valves and inlet valves. If the ABS module determines that EBD is necessary, it energizes the inlet valves for the brakes of the trailing axle, to isolate the brakes from any further increase in hydraulic pressure.

ABS Braking Mode

If the ABS module determines that ABS braking is necessary, it energizes the inlet and outlet valves of the related brake and starts the return pump. The inlet valve closes to isolate the brake from pressurized fluid; the outlet valve opens to release pressure from the brake into the accumulator and the return pump circuit; the reduced pressure allows the wheel to accelerate. The ABS module then operates the inlet and outlet valves to modulate the pressure in the brake to apply the maximum braking effort without locking the wheel. Control of the valves for each wheel takes place individually.

Active Braking Mode

The active braking mode is used to generate and control hydraulic pressure to the brakes for functions other than ABS braking, e.g. DSC, EBA, ETC, HDC, dynamic application of the parking brake and adaptive speed control.

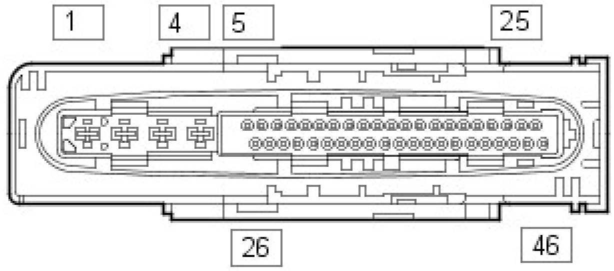
For active braking, the ABS module energizes the pilot valves and priming valves, starts the return pump and energizes all of the inlet valves. Brake fluid, drawn from the reservoir through the master cylinder and priming valve, is pressurized by the return pump and supplied to the inlet valves. The ABS module then operates the inlet valves and outlet valves, as required, to modulate the pressure in the individual brakes. Some noise may be generated during active braking.

ABS MODULE

The ABS module controls the brake functions using the HCU to modulate hydraulic pressure to the individual wheel brakes.

The ABS module is attached to the HCU, in the plenum box on the driver side of the engine compartment. A 46 pin connector provides the electrical interface between the ABS module and the vehicle wiring.

ABS Module Harness Connector C0506



E50006

ABS Module Harness Connector C0506 Pin Details

Pin No.	Description	Input/Output
1	Ground	Output
2	Battery power supply	Input
3	Battery power supply	Input
4	Ground	Output
5	Front left wheel speed sensor signal	Input
6	Rear left wheel speed sensor power supply	Output
7	Rear right wheel speed sensor power supply	Output
8	Rear right wheel speed sensor signal	Input
9	Front right wheel speed sensor power supply	Output
10	Front right wheel speed sensor signal	Input
11 to 13	Not used	-
14	High speed CAN bus low	Input/Output
15	Yaw rate and lateral acceleration sensor ground	Input

Pin No.	Description	Input/Output
16	Yaw rate signal	Input
17	Not used	-
18	Yaw rate and lateral acceleration sensor reference	Input
19	Not used	-
20	Lateral acceleration signal	Input
21	Not used	-
22	HDC relay	Output
23 to 25	Not used	-
26	Front left wheel speed sensor power supply	Output
27	Rear left wheel speed sensor signal	Input
28	Ignition power supply	Input
29	Not used	-
30	Stoplamp switch BLS contacts	Input
31	DSC switch	Input
32	Not used	-
33	Road speed signal	Output
34	Not used	-
35	High speed CAN bus high	Input/Output
36	HDC switch	Input
37	Yaw rate and lateral acceleration sensor test	Output
38 to 40	Not used	-
41	Stoplamp switch BS contacts	Input
42 to 46	Not used	-

SYSTEM OPERATION

ARM

The ARM function uses the brakes and the engine to attempt to restore stability if the vehicle is forced into such a harsh manoeuver that it risks tipping over.

The ABS module monitors driver inputs and vehicle behavior using various powertrain signals and the inputs from the wheel speed sensors, the steering angle sensor and the yaw rate and lateral acceleration sensor. These are compared with modeled behavior and, if vehicle behavior reaches a given risk level, the ABS module cuts the engine power, or brakes one or more wheels, just enough to help the vehicle regain its poise and help the driver remain in control.

While the ignition is on, ARM is permanently enabled, even when DSC has been selected off.

ABS

ABS controls the speed of all road wheels to ensure optimum wheel slip when braking at the adhesion limit. This prevents the wheels from locking, which helps to retain effective steering control of the vehicle.

On the front axle, the brake pressure is modulated separately for each wheel. On the rear axle, brake pressure is modulated by select low. Select low applies the same pressure to both rear brakes, with the pressure level being determined by the wheel on the lower friction surface. This maintains rear stability on split friction surfaces.

CBC

CBC influences the brake pressures, below the DSC and ABS thresholds, to counteract the yawing moment produced when braking in a corner. CBC produces a correction torque by limiting the brake pressure on one side of the vehicle.

DSC

DSC uses the brakes and powertrain torque control to help maintain the lateral stability of the vehicle. While the ignition is on the DSC function is permanently enabled unless selected off by the DSC switch. Even if DSC is deselected, driving maneuvers with extreme yaw or lateral acceleration may trigger DSC activity to assist vehicle stability.

DSC enhances driving safety in abrupt maneuvers and in understeer or oversteer situations which may occur in a bend. The ABS module monitors the yaw rate and lateral acceleration of the vehicle, and the steering input, then selectively applies individual brakes and signals for powertrain torque adjustments to reduce understeer or oversteer.

In general: in an understeering situation, the inner wheels are braked to counteract the yaw movement towards the outer edge of the bend; in an oversteering situation, the outer wheels are braked to prevent the rear end of the vehicle from pushing towards the outer edge of the bend.

The ABS module monitors the tracking stability of the vehicle using inputs from the wheel speed sensors, the steering angle sensor and the yaw rate and lateral acceleration sensor. The tracking stability is compared with stored target data and, whenever the tracking stability deviates from the target data, the ABS module intervenes by applying the appropriate brakes. When the DSC function is active, the ABS module also signals the transmission control module (TCM) to prevent gear shifts. If necessary, the ABS module also signals:

- The ECM, to reduce engine torque.
- The transfer box control module, to adjust the locking torque of the center differential.
- The rear differential control module, to adjust the locking torque of the rear differential.

The DSC function overrides the differential locking torque requests from the terrain response system.

EBD

EBD limits the brake pressure applied to the rear wheels. When the brakes are applied, the weight of the vehicle transfers forwards, which reduces the ability of the rear wheels to transfer braking effort to the road surface. This can cause the rear wheels to slip and make the vehicle unstable.

EBD uses the anti-lock braking hardware to automatically optimize the pressure of the rear brakes, below the point where anti-lock braking would be invoked. Only the rear axle is under EBD control.

ETC

ETC attempts to optimize forward traction by reducing engine torque or braking a spinning wheel until it regains grip.

ETC is activated if an individual wheel speed is above that of the vehicle reference speed (positive slip) and the brake pedal is not pressed. The spinning wheel is braked, allowing the excess torque to be transmitted to the non spinning wheels through the drive line. If necessary, the ABS module also sends a high speed CAN bus message to the ECM to request a reduction in engine torque. Torque reduction requests are for either a slow or fast response: a slow response requests a reduction of throttle angle (4.2L and 4.4L only); a fast response requests an ignition cut-off (4.2L and 4.4L) or a fuel cut-off (2.7L Diesel).

When the DSC function is selected off with the DSC switch, the engine torque reduction feature is disabled.

When the ETC function is active the ABS module also signals the TCM to prevent gear shifts.

EBA

EBA assists the driver, in emergency braking situations, by automatically maximizing the braking effort. There are two situations when the ABS module will invoke EBA: when the brake pedal is pressed very suddenly and when the brake pedal is pressed hard enough to bring the front brakes into ABS operation.

When the brake pedal is pressed very suddenly, the ABS module increases the hydraulic pressure to all of the brakes until they reach the threshold for ABS operation, thus applying the maximum braking effort for the available traction. The ABS module monitors for the sudden application of the brakes using the inputs from the stoplamp switch and from the pressure sensor in the HCU. With the brake pedal pressed, if the rate of increase of hydraulic pressure exceeds the predetermined limit, the ABS module invokes emergency braking.

When the brake pedal is pressed hard enough to bring the front brakes into ABS operation, the ABS module increases the hydraulic pressure to the rear brakes up to the ABS threshold.

EBA operation continues until the driver releases the brake pedal enough for the hydraulic pressure in the HCU to drop below a threshold value stored in the ABS module.

EDC

EDC prevents wheel slip caused by any of the following:

- A sudden decrease in engine torque when the accelerator is suddenly released.
- A downshift using the CommandShift™.

When the ABS module detects the onset of wheel slip without the brakes being applied, it signals the ECM, on the high speed CAN bus, to request a momentary increase in engine torque.

HDC

HDC uses brake intervention to control vehicle speed and acceleration during low speed descents in off-road and low grip on-road conditions. Generally, equal pressure is applied to all four brakes, but pressure to individual brakes can be modified by the ABS and DSC functions to retain stability. Selection of the HDC function is controlled by the HDC switch on the center console. HDC operates in both high and low ranges, at vehicle speeds up to 50 km/h (31.3 mph).

HDC may be used in D, R and CommandShift 1 in high range, and in D, R and all CommandShift gears in low range. When in D, the transmission control module will automatically select the most appropriate gear. The vehicle should not be driven with HDC active and the transmission in N.

HDC can be selected at speeds up to 80 km/h (50 mph), but will only be enabled at speeds below 50 km/h (31.3 mph). When HDC is selected:

- At speeds up to 50 km/h (31.3 mph), the HDC information indicator is permanently illuminated if a valid gear is selected.
- At speeds from >50 to 80 km/h (>31.3 to 50 mph) the HDC information indicator flashes and a message advising that the speed is too high is displayed in the message center.
  For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).
  If the HDC switch is pressed while vehicle speed is more than 80 km/h (50 mph), the HDC information indicator will not illuminate and HDC will not be selected.
- If the speed reaches 80 km/h (50 mph) or more, a warning chime sounds, the HDC function is switched off, the information indicator goes off and a message advising that HDC has been switched off is displayed in the message center.

When HDC is enabled, the ABS module calculates a target speed and compares this with the actual vehicle speed. The ABS module then operates the HCU, in the active braking mode, as required to achieve and maintain the target speed. During active braking for HDC, the ABS module also energizes the HDC relay to operate the stoplamps. Applying the foot brakes during active braking may result in a pulse through the brake pedal, which is normal.

The target speed varies, between minimum and maximum values for each gear and transmission range, depending on driver inputs through the foot pedals. If the foot pedals are not operated, the ABS module adopts a default target speed.

Low Range Target Speeds

Limit	Speed, km/h (mph)	
		Gear
	1, R	D, 2 to 6
Default	3.5 (2.19)	6 (3.75)
Minimum	3.5 (2.19)	3.5 (2.19)
Maximum	20 (12.5)	20 (12.5)

High Range Target Speeds

Limit	Speed, km/h (mph)	
		Gear
	1, R	D
Default	6 (3.75)	10 (6.25)
Minimum	6 (3.75)	6 (3.75)
Maximum	20 (12.5)	20 (12.5)

The target speed is varied between the minimum and maximum values using the accelerator pedal.

The target speed can also be varied by pressing the speed control '+' and '-' buttons (where fitted). For additional information, refer to:

Speed Control (310-03A Speed Control - V8 S/C 4.2L Petrol, Description and Operation),
Speed Control (310-03B Speed Control - V8 4.4L Petrol, Description and Operation),
Speed Control (310-03C Speed Control - TDV6 2.7L Diesel, Description and Operation).

During changes of target speed, the ABS module limits deceleration and acceleration to -0.5 m/s^2 (-1.65 ft/s^2) and +0.5 m/s^2 (+1.65 ft/s^2) respectively.

To provide a safe transition from active braking to brakes off, the ABS module invokes a fade out strategy, which gradually discontinues the braking effort, if it detects any of the following during active braking:

- HDC selected off with the HDC switch.
- Failure of a component used by HDC, but not critical to fade out function.
- Accelerator pedal pressed when transmission is in neutral.
- Brake overheat.

If fade out is invoked because of deselection or component failure, the HDC function is cancelled by the ABS module. If fade out is invoked because the accelerator pedal is pressed with the transmission in neutral, or because of brake overheat, the HDC function remains in standby and resumes operation when the accelerator pedal is released or the brakes have cooled.

The fade out strategy increases the target speed, at a constant acceleration rate of 0.5 m/s^2 (1.65 ft/s^2), until the maximum target speed is reached or until no active braking is required for 0.5 s. If the accelerator pedal is positioned within the range that influences target speed, the acceleration rate is increased to 1.0 m/s^2 (3.3 ft/s^2).

When fade out is invoked because of component failure, a warning chime sounds, the HDC information indicator is extinguished and a message advising there is a fault is displayed in the message center.

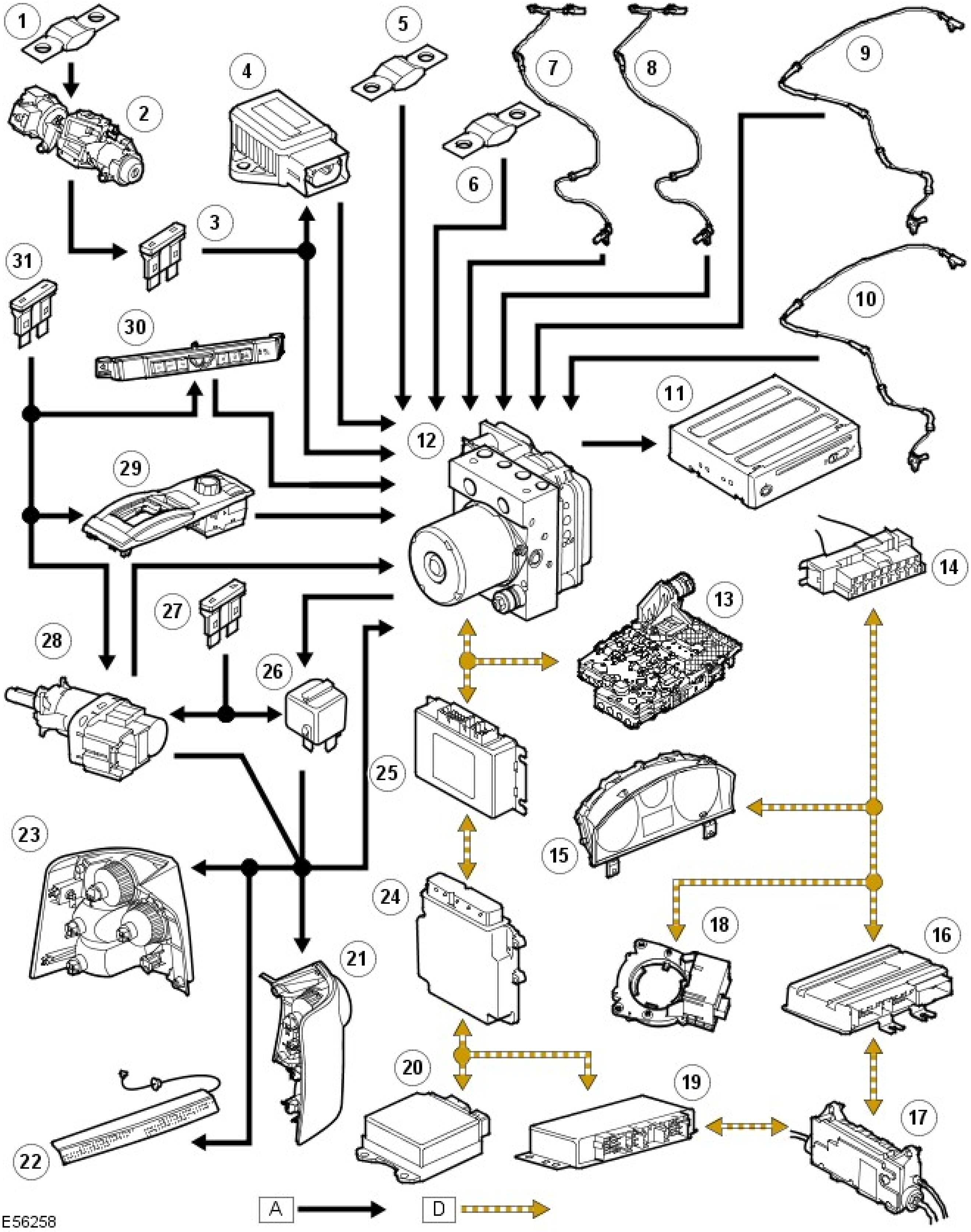
When fade out is invoked because of brake overheat, a message advising that HDC is temporarily unavailable is displayed. At the end of fade out, the HDC information indicator flashes. The message is displayed, while HDC remains selected, until the brakes have cooled.

To monitor for brake overheat, the ABS module monitors the amount of braking activity and, from this, estimates the temperature of each brake. If the estimated temperature of any brake exceeds a preset limit, the ABS module invokes the fade out strategy. After the fade out cycle, the HDC function is re-enabled when the ABS module estimates that all of the brake temperatures are at less than 64% of the temperature limit.

If there is a fault that affects the HDC function, or if the HDC function is temporarily unavailable because of brake overheat, an appropriate message is displayed in the message center.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

ANTI-LOCK CONTROL DIAGRAM

- NOTE: A = Hardwired connection; D = High speed CAN bus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Item	Part Number	Description
1	-	Fusible link 11E, battery junction box (BJB)
2	-	Ignition switch
3	-	Fuse 37P, CJB
4	-	Yaw rate and lateral acceleration sensor
5	-	Fusible link 9E, BJB

6	-	Fusible link 23E, BJB
7	-	Front wheel speed sensor
8	-	Front wheel speed sensor
9	-	Rear wheel speed sensor
10	-	Rear wheel speed sensor
11	-	Navigation computer
12	-	ABS module
13	-	TCM
14	-	Diagnostic socket
15	-	Instrument cluster
16	-	Air suspension control module
17	-	Parking brake module
18	-	Steering angle sensor
19	-	Rear differential control module
20	-	restraints control module (RCM)
21	-	Left stoplamp
22	-	Center stoplamp
23	-	Right stoplamp
24	-	ECM
25	-	Transfer box control module
26	-	HDC relay (non-serviceable, integrated into CJB)
27	-	Fuse 15P, CJB
28	-	Stoplamp switch
29	-	HDC switch
30	-	DSC switch
31	-	Fuse 66P, CJB

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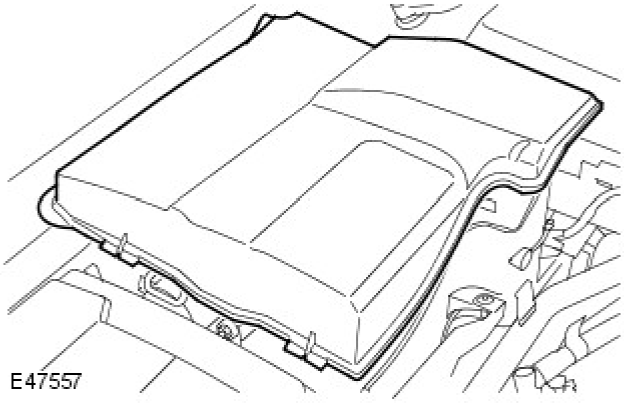
Anti-Lock Control - Traction Control - Anti-Lock Brake System (ABS) Module

Removal and Installation

Removal

⚠ CAUTION: Make sure the ignition switch is in position 0.

1. Remove the cover.



2. Disconnect the electrical connector.

3. CAUTIONS:

⚠ Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

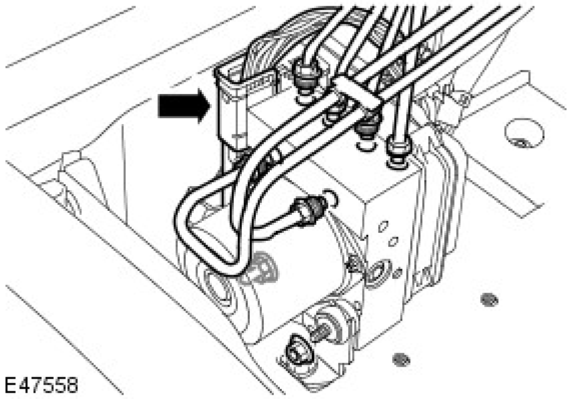
⚠ Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the 6 brake tubes.

- Position an absorbent cloth to collect fluid spillage.

4. Remove the ABS module from the mounting bracket.

- Loosen, but do not remove, the 2 nuts securing the ABS module to the bracket.



Installation

1. NOTE: Make sure the ABS module locating grommet is correctly seated in the bracket before installing the ABS module.

• NOTE: Make sure the ABS module locating pin is correcly located in the grommet, and the 2 front isolators are fully seated in the bracket slots.

Install the ABS module.

- Tighten the 2 ABS module retaining nuts to 8 Nm (6 lb.ft).
- Remove the blanking caps from the ports.
- Tighten the two M10 and three M12 brake tube unions to 15 Nm (11 lb.ft).
- Tighten the M14 brake tube union to 17 Nm (13 lb.ft).
- Connect the electrical connector.
- Remove the ABS module from the mounting bracket.

2. Using T4, bleed the braking system.
For additional information, refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures) / Brake System Bleeding - Vehicles With: High Performance Brakes (206-00 Brake System - General Information, General Procedures).

3. Install the cover.

4. If a new ABS module has been installed, interrogate the ABS system using T4.

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Anti-Lock Control - Traction Control - Front Wheel Speed Sensor

Removal and Installation

Removal

All vehicles

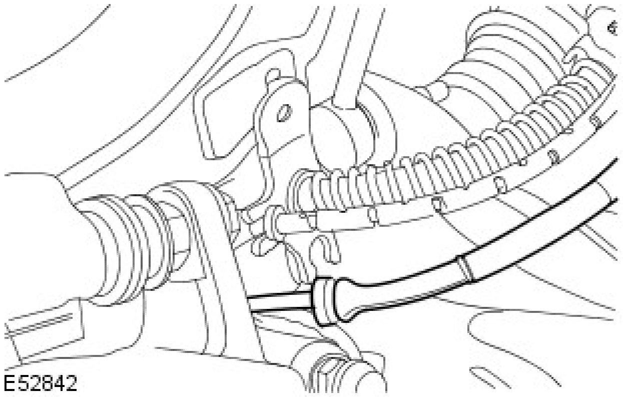
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the front wheel and tire.

3. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

4. Release the wheel speed sensor lead from the brake hose retaining bracket.

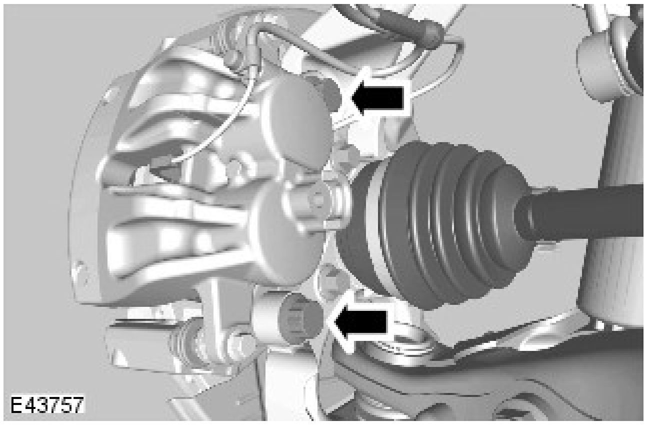


Vehicles with standard brakes

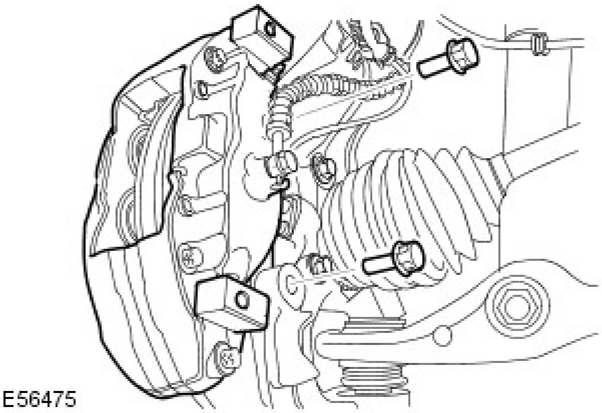
5. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper anchor plate from the wheel knuckle and tie the caliper aside.

- Remove the 2 retaining bolts.



Vehicles with high performance brakes



6. ⚠ CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper from the wheel knuckle.

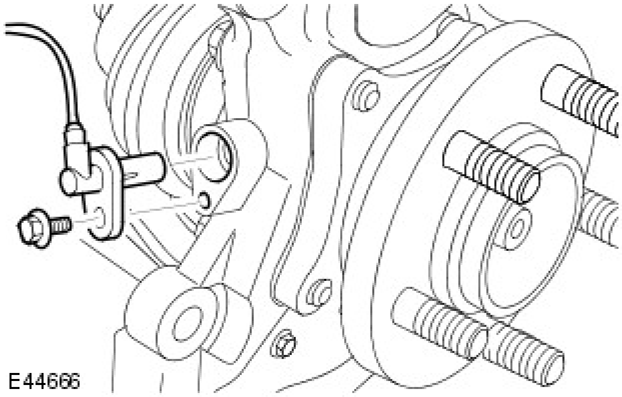
- Remove the 2 retaining bolts.
- Tie the brake caliper aside.

All vehicles

7. NOTE: The brake disc is shown removed for clarity.

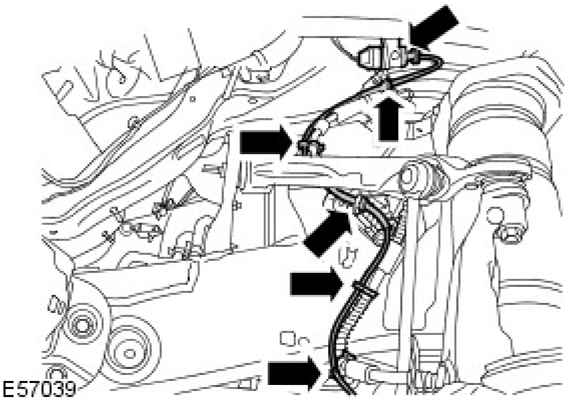
Release the wheel speed sensor from the wheel knuckle.

- Remove the bolt.



8. Remove the wheel speed sensor.

- Disconnect the electrical connector.
- Release the wiring harness from the clips.



Installation

All vehicles

1. Make sure the wheel speed sensor location in the wheel knuckle is free of dirt.

2. NOTE: Make sure the electrical connector retaining clip is attached to the body wiring harness.

Install the wheel speed sensor.

- Tighten the bolt to 9 Nm (7 lb.ft).
- Connect the electrical connector.

- Secure the wiring harness in the clips.

Vehicles with standard brakes

3. Secure the brake caliper and anchor plate to the wheel knuckle.

- Tighten the bolts to 275 Nm (203 lb.ft).

Vehicles with high performance brakes

4. Secure the brake caliper to the wheel knuckle.

- Tighten the bolts to 275 Nm (203 lb.ft).

All vehicles

5. Secure the wheel speed sensor lead to the brake hose retaining bracket.

6. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

7. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Anti-Lock Control - Traction Control - Rear Wheel Speed Sensor

Removal and Installation

Removal

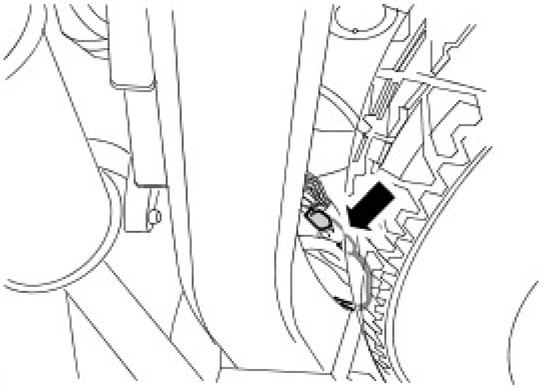
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the wheel and tire.

3. Disconnect the anti-lock brake system (ABS) sensor electrical connector.

   - Release the wiring harness retaining clip.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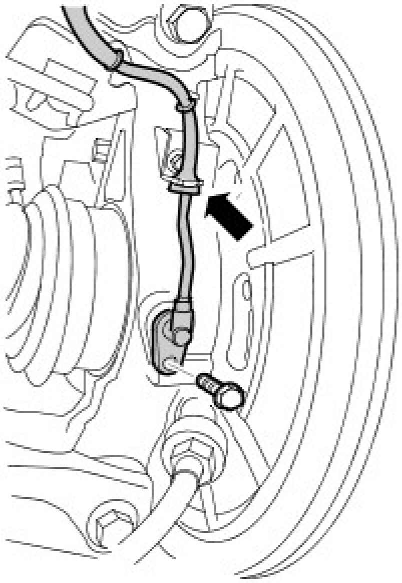
4. Release the wheel speed sensor from the wheel knuckle.

   - Release the wiring harness.
   - Remove the retaining bolt.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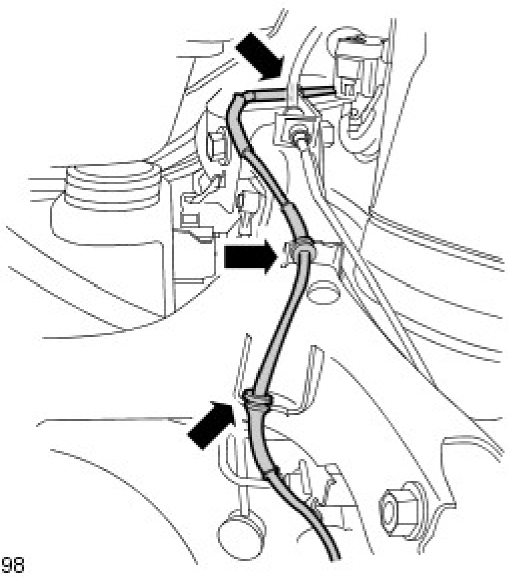

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5. Remove the wheel speed sensor.

- Release the wiring harness from the 4 clips.

Installation

1. Make sure the wheel speed sensor location in the wheel knuckle is free of dirt.

2. Install the wheel speed sensor.

- Attach the wiring harness to the 4 clips.

3. Secure the wheel speed sensor to the wheel knuckle.

- Tighten the bolt to 9 Nm (7 lb.ft).
- Attach the wiring harness to the clip.

4. NOTE: Make sure the electrical connector retaining clip is attached to the body wiring harness.

Connect the ABS sensor electrical connector.

- Attach the wiring harness.

5. If a new wheel speed sensor has been installed, interrogate the ABS system using T4.

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Anti-Lock Control - Traction Control - Anti-Lock Control - Traction Control

Diagnosis and Testing

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
● Tire size, condition and installation ● Wheel speed sensor condition and installation ● Steering Angle Sensor (SAS) condition and installation ● Yaw rate sensor and accelerometer condition and installation ● Hydraulic control unit (with attached ABS module) condition and installation	● Fuses ● Harnesses and connectors ● Warning lamp operation ● Wheel speed sensors ● Central junction box ● HDC switch ● DSC switch ● Combined stop lamp switch / brake switch ● Yaw rate sensor and accelerometer ● Steering Angle Sensor (SAS) ● Anti-lock Braking (ABS) module ● Controller Area Network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible Causes	Action
C1105-67	Brake lamp control signal incorrect after event - signal incorrect after event	• NOTE: The stoplamp-switch contains the brake-lamp -switch (BLS) and the brake-switch (BS) these are located within the same housing ● The BLS circuit and the BS circuit have failed the plausibility test ● Switch internal fault ● Circuit fault	• NOTE: Check for correct operation of the stop-lamps ● Refer to the electrical circuit diagrams and check the ABS module circuit to the hill decent relay for fault
C1109-24	Vehicle dynamics control switch - signal stuck high	● Switch internal fault ● Circuit short to power	• NOTE: This DTC may be logged if the switch state is active for over 1 minute ● Check for correct switch operation. Refer to the electrical circuit diagrams and check the ABS module circuit to the centre facia switch pack / DSC switch for circuit short to power

DTC	Description	Possible Causes	Action
C1A00-16	Control module - circuit voltage below threshold	- Low voltage detected - Circuit short to ground, open circuit or high resistance	• NOTE: DTC may be stored due to a vehicle charging or starting fault - Using the manufacturer approved diagnostic system check other modules for related DTCs. Check for correct vehicle battery / charging system operation. Refer to the electrical circuit diagrams and check the ABS module power **(UZ)** and ground circuit for fault
C1A00-17	Control module - circuit voltage above threshold	- Voltage detected above preset maximum	• NOTE: DTC may be stored due to battery charger use or vehicle charging fault - Using the manufacturer approved diagnostic system check other modules for related DTCs. Check for correct vehicle battery and charging system operation
C1A00-1C	Control module - circuit voltage out of range	- Momentary low voltage detected	• NOTE: DTC may be stored due to a vehicle charging or starting fault - Using the manufacturer approved diagnostic system check other modules for related DTCs. Check for correct vehicle charging system operation. Refer to the electrical circuit diagrams and check the ABS module power **(UZ)** and ground circuit for fault
C1A00-45	Control module - program memory failure	- Module internal fault	- Using the manufacturer approved diagnostic system. Clear the DTC and retest if the DTC returns suspect the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A00-46	Control module - calibration / parameter memory failure	- Incorrect car configuration file (CCF) data received from IPC or CCF incorrectly configured - Module installed to unrecognized vehicle configuration - Module calibration/parameter memory failure (internal error)	Configure the module using the approved diagnostic system. Clear the DTC and check if the DTC resets after ignition reset following >10 seconds ignition on. If the possible causes listed have been checked and the DTC persists, suspect the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A00-49	Control module - internal electronic failure	- Module internal fault	- Using the manufacturer approved diagnostic system, clear the DTC and retest. If the DTC returns, suspect the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A00-4A	Control module - incorrect component installed	- The stored vehicle variant code in the control module (EEPROM) does not match the variant code received via the CAN bus	- Using the manufacturer approved diagnostic system, confirm that the stored vehicle variant code and the transmitted variant code match. Configure as required
C1A00-4B	Control module - over temperature	- The control module has excided a preset maximum temperature - Module internal fault	• NOTE: Investigate the cause of the control module temperature event - Using the manufacturer approved diagnostic system, clear the DTC and retest. If DTC returns suspect an internal fault with the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index

DTC	Description	Possible Causes	Action
C1A00-68	Control module - event information	- Control module event information	Using the manufacturer approved diagnostic system, check for DTCs relating to a defective steering angle sensor, wheel speed sensor or yaw rate sensor. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A00-88	Control module - bus off	- CAN bus circuit fault	- Using the manufacturer approved diagnostic system, carry out the CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN bus circuit to the ABS module for circuit short to power, short to ground, open circuit or high resistance
C1A76-01	Valve relay circuit - general electrical failure	- Module internal fault	- Using the manufacturer approved diagnostic system, clear the DTC and retest. If DTC returns suspect an internal fault with the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A76-04	Valve relay circuit - system internal failures	- Module internal fault	- Using the manufacturer approved diagnostic system, clear the DTC and retest. If DTC returns suspect an internal fault with the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A77-16	Valve relay circuit - circuit voltage below threshold	- Low voltage detected - Circuit fault	• NOTE: DTC may be stored due to a vehicle charging or starting fault - Using the manufacturer approved diagnostic system, check other modules for related DTCs. Check for correct vehicle charging system operation. Refer to the electrical circuit diagrams and check the ABS module **(UBVR)** power and ground circuits for fault
C1A78-04	Front left inlet valve - system internal failures	- Module internal fault	- Using the manufacturer approved diagnostic system, clear the DTC and retest. If the DTC returns suspect the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A79-04	Front left outlet valve - system internal failures	- Module internal fault	- Using the manufacturer approved diagnostic system, clear the DTC and retest. If the DTC returns suspect the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A80-04	Front right inlet valve - system internal failures	- Module internal fault	- Using the manufacturer approved diagnostic system, clear the DTC and retest. If the DTC returns suspect the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index
C1A81-04	Front right outlet valve - system internal failures	- Module internal fault	- Using the manufacturer approved diagnostic system, clear the DTC and retest. If the DTC returns suspect the ABS module. Replace as required. Refer to the new module / component installation note at the top of the DTC index

Pinpoint Tests

PINPOINT TEST A : STOPLAMP-SWITCH PLAUSIBILITY FAULT (DTC C1A96-24)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS

A1: CUSTOMER INDUCED DTC

• NOTE: These tests are to be carried out if DTC C1A96-24 has been stored. This DTC indicates plausibility – The stoplamp-switch signal is high (Footbrake pedal pressed condition) while the vehicle is not braking.

• NOTE: Plausibility detail – A DTC will be stored if the stoplamp-switch signal is high for more than 60 seconds while the accelerator pedal is pressed and the vehicle speed is greater than 7 mph/10.8 km/h and the ABS Module is not actively controlling pressure.

1. Confirm that the fault is not being provoked by a customer driving habit (Resting a foot on the brake pedal while accelerating / cruising).

Is the fault being provoked by a customer driving habit?

Yes

Advise the customer that the cause of the DTC being stored maybe due to his/her foot resting on the brake pedal whilst the vehicle is in motion. Clear the stored DTC, operate the footbrake and check for correct stoplamp operation.

No

GO to A2.

A2: STOPLAMP-SWITCH ADJUSTMENT CHECK

• NOTE: Removal and correct installation of the stoplamp-switch will reset the adjustment. Ensure the footbrake pedal is fully raised against its upstop, (pedal rest position) when installing the stoplamp-switch.

1. Check that the stoplamp-switch is securely installed and correctly adjusted. REFER to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

Is the stoplamp-switch securely installed and correctly adjusted?

Yes

GO to A3.

No

Adjust the stoplamp-switch using the approved process. Clear the stored DTC, operate the Footbrake and check for correct stoplamp operation.

A3: STOPLAMP CIRCUIT SHORT TO POWER

• NOTE: If a circuit short to power is present the stoplamps may be illuminated (Footbrake Pedal released).

1. Using the manufacturer approved diagnostic system, monitor the Data Logger Signal, PID-2B00 (brake input switch status - brake pedal switch / brake lamp switch), set the Ignition-state to the on position and with the footbrake released PID-2B00 (brake input switch status) should show **Inactive (BLS = 0)**.

Does PID-2B00 (brake input switch status) show Inactive (BLS =0)?

Yes

GO to A4.

No

Refer to electrical circuit diagrams to locate the fault. Repair the circuit as required using the approved process. Clear the stored DTC, operate the Footbrake and check for correct stoplamp operation.

A4: SHORT CIRCUIT TO ANOTHER POWER CIRCUIT

• NOTE: A short circuit to another circuit will cause the DTC to log in the ABS Module.

1. Using the manufacturer approved diagnostic system, monitor the Data-logger signal, PID-2B00 (brake input switch status - brake pedal switch / brake lamp switch), set the Ignition-state to the on position and with the footbrake released PID-2B00 (brake input switch status) should show **Inactive (BLS = 0)**.
2. Operate any electrical circuits that could supply a voltage to the stoplamp-switch circuit.

Does PID-2B00 (brake input switch status) show **Inactive (BLS =0)**?

Yes

Suspect an intermittent fault. Carry out visual and mechanical check of splice joints, all connectors and cables, check for corrosion, bent or damaged contact faces of pins, terminals and for security of connectors. Where possible flex cables while using the manufacturer approved diagnostic system to monitor the Data-logger signal, PID-2B00 (brake input switch status - brake pedal switch / brake lamp switch). This test should be carried out with the ignition on and the footbrake pedal in the released position. **BLS** should remain **Inactive (BLS=0)**.

No

Refer to electrical circuit diagrams to locate the fault. Repair the circuit as required using the approved process. Clear the stored DTC, operate the footbrake and check for correct stoplamp operation.

Pinpoint Tests

PINPOINT TEST B : SIGNAL COMPARE PLAUSIBILITY (DTC C1A96-62)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS

B1: STOPLAMP-SWITCH CIRCUIT

• NOTE: These tests are to be carried out if DTC C1A96-62 signal compare - plausibility, has been stored. This DTC indicates that the brake lamp switch and brake switch have shared the same state (both switches in the open circuit condition at the same time).

• NOTE: The stoplamp switch contains the brake-lamp switch **(BLS)** and the brake-switch **(BS)** these are located within the same housing.

- NOTE: Signal compare - plausibility: Brake lamp switch and brake switch must not be open circuit at the same time.

- NOTE: The datalogger-signals represent the position of the stoplamp switch. Both the brake lamp switch **(BLS)** and the brake switch **(BS)** are shown as **active** with the **footbrake pressed** and **inactive** with the **footbrake released.** This does **not** directly reflect the state of the stoplamp switch internal switch contacts as shown in the circuit diagrams.

1. Using the manufacturer approved diagnostic system, monitor the data-logger signal, PID-2B00 (brake input switch status - brake pedal switch / brake lamp switch) and PID-2B00 (brake input switch status - brake pedal switch /brake switch) inputs while the footbrake pedal is slowly pressed & released.
2. BLS = Brake Pedal Switch (brake lamp switch), BS = Brake Pedal Switch (brake switch). The correct inputs should be, pedal released **BLS = Inactive (BLS = 0)**, **BS = Inactive (BS = 0)**. Brief transition (as the pedal is pressed **BLS = Active (BLS = 1)**, **BS = Inactive (BS = 0)**. Pedal pressed **BLS = Active (BLS = 1)**, **BS = Active (BS = 1)**. If either input remains inactive during the test procedure a fault is evident.

Did the inputs show correctly?

Yes

Suspect an intermittent fault. Carry out visual and mechanical check of splice joints, all connectors and cables, check for corrosion, bent or damaged contact faces of pins, terminals and for security of connectors. Where possible flex cables while using the manufacturer approved diagnostic system, monitor the data-logger signal, PID-2B00 (brake input switch status - brake pedal switch / brake lamp switch) and PID-2B00 (brake input switch status - brake pedal switch /brake switch). This test should be carried out with the stoplamp-switch in both the pressed and released position independently. Refer to electrical circuit diagrams to locate the intermittent open circuit. Repair the circuit as required using the approved process. Clear the stored DTC, operate the footbrake and check for correct stoplamp operation.

No

GO to B2.

B2: STOPLAMP-SWITCH CIRCUIT 2

1. If **BLS = Inactive (0) BS = Active (1)** occurred with the footbrake released the fault is with the **(BS) = Brake Pedal Switch (brake switch) circuit**. If **BLS = Inactive (0) BS = Active (1)** occurred with the footbrake pressed the fault is with the (BLS) = **Brake-pedal switch (brake lamp switch) circuit**.

Did BLS (brake lamp switch) = Inactive (0) BS (brake switch) = Active (1) occur with the footbrake released?

Yes

Suspect a stoplamp-switch (brake switch) circuit fault. Refer to electrical circuit diagrams and replace blown fuse or locate the open circuit. Repair the circuit as required using the approved process. Clear the stored DTC, operate the footbrake and check for correct stoplamp operation.

No

Suspect a stoplamp-switch (brake lamp switch) circuit fault. Refer to electrical circuit diagrams and replace blown fuse or locate the open circuit. Repair the circuit as required using the approved process. Clear the stored DTC, operate the footbrake and check for correct stoplamp operation.

PINPOINT TEST C : PLAUSIBILITY – STOPLAMP-SWITCH (BLS) VERSES BRAKE PRESSURE (PS) (DTC C1A96-64)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS

C1: IDS MONITOR

- NOTE: These tests are to be carried out if DTC C1A96-64 plausibility – Stoplamp-switch (BLS) verses brake fluid hydraulic pressure (PS) has been stored.

- NOTE: This DTC indicates plausibility – the stoplamp-switch must be seen to operate before brake fluid hydraulic pressure (PS) exceeds a pressure threshold of 10 Bar.

- NOTE: The stoplamp-switch status is monitored by the ABS module (**BLS** terminal 30).

- NOTE: The ABS module contains an internal pressure sensor and monitors the brake fluid hydraulic pressure (PS).

1. Using the manufacturer approved diagnostic system, check for ABS module pressure sensor DTCs C1A99-01 or C1A99-49. If either of these DTCs has been stored carry out the specified action prior to investigating DTC C1A96-64.
2. Using the manufacturer approved diagnostic system, monitor the data-logger signal PID-2B00 (brake input switch status - brake pedal switch / brake lamp switch) and PID-2B0D (brake fluid hydraulic pressure) . When the brake pedal is pressed, the (brake-pedal switch / brake lamp switch) status should change from **Inactive (BLS = 0)** to **Active (BLS = 1)** before the brake fluid hydraulic pressure reaches 1000KPa (10 Bar).

Does the (brake pedal switch / brake lamp switch) change from **Inactive (BLS = 0)** to **Active (BLS = 1)** before the brake fluid hydraulic pressure reaches **1000KPa (10 Bar)**?

Yes

Suspect an intermittent brake-lamp switch circuit fault. Refer to electrical circuit diagrams, carry out visual and mechanical check of the of splice joints, connectors and cables of the stoplamp-switch circuit, check for corrosion, bent or damaged contact faces of pins, terminals and for security of connectors. Where possible flex cables to attempt to induce the intermittent open circuit. Repair the circuit as required using the approved process. Clear the stored DTC, operate the Footbrake and check for correct stoplamp operation.

No

GO to C2.

C2: STOPLAMP-SWITCH ADJUSTMENT CHECK	
• NOTE: Removal and correct installation of the stoplamp-switch will reset the adjustment. Ensure the footbrake pedal is fully raised against its upstop, (pedal rest position) when installing the stoplamp switch.	
	1 Check that the stoplamp-switch is securely installed and correctly adjusted. REFER to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).
	Is the fault still present with the stoplamp-switch securely installed and correctly adjusted? **Yes** Suspect a brake-lamp switch circuit fault. Refer to electrical circuit diagrams, carry out visual and mechanical check of the splice joints, connectors and cables of the stoplamp-switch circuit, check for corrosion, bent or damaged contact faces of pins, terminals and for security of connectors. Repair the circuit as required using the approved process. Clear the stored DTC, operate the Footbrake and check for correct stoplamp operation. **No** Adjust the stoplamp-switch using the approved process. Clear the stored DTC, operate the footbrake and check for correct stoplamp operation.

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Anti-Lock Control - Stability Assist -

General Specification

Item	Specification
Yaw Rate Sensor	Bosch DRS MM1.OR

Torque Specifications

Description	Nm	lb-ft
Yaw rate sensor bolts	10	7

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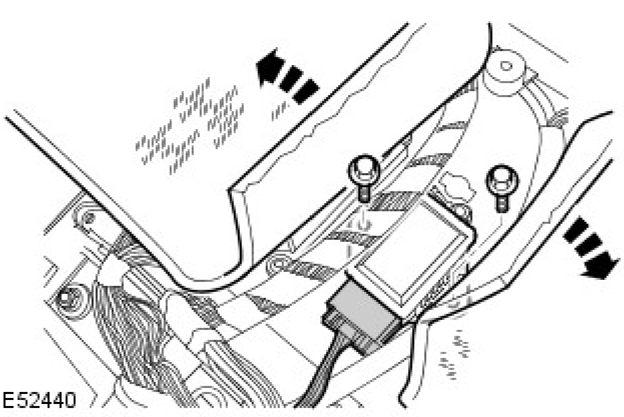
Anti-Lock Control - Stability Assist - Yaw Rate Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the floor console.
   For additional information, refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).



E52440

3. ⚠ CAUTION: Make sure the wiring harness is protected when cutting the carpet.

   Remove the yaw rate sensor.

   - Cut the carpet for access.
   - Position the wiring harness aside.
   - Disconnect the electrical connector.
   - Remove the 2 bolts.

Installation

1. Install the yaw rate sensor.
   - Tighten the bolts to 10 Nm (7 lb.ft).
   - Connect the electrical connector.
   - Attach the wiring harness.
   - Attach the carpet.
2. Install the floor console.
   For additional information, refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).
3. If a new yaw rate sensor has been installed, interrogate the ABS system using T4.

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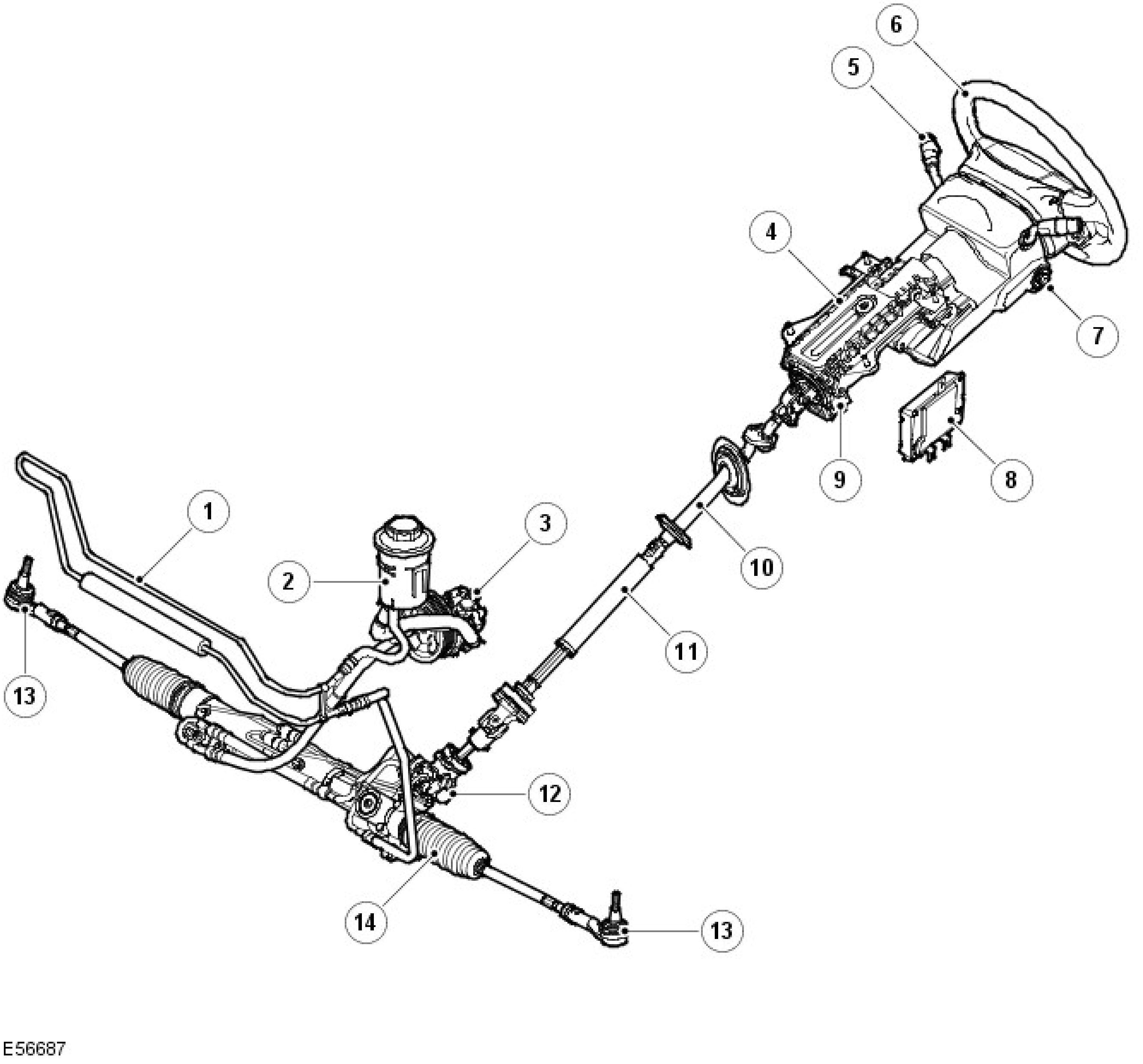
Steering System - General Information - Steering System

Description and Operation

Steering System Component Layout

- NOTE: 2.7L TdV6 Left Hand Drive shown



Item	Part Number	Description
1	-	Fluid cooler
2	-	Reservoir
3	-	Power steering pump
4	-	Upper steering column assembly
5	-	Steering column multifunction switches
6	-	Steering wheel
7	-	Column electric adjustment switch
8	-	Air suspension control module
9	-	Steering angle sensor

10	-	Lower collapsable shaft
11	-	Intermediate shaft
12	-	Servotronic valve
13	-	Track rod end
14	-	Steering gear

GENERAL

The steering system on all models comprises the following components:

- Steering gear with Servotronic valve
- Servotronic software integrated into air suspension control module
- Power steering pump
- Reservoir
- Lower collapsable shaft
- Intermediate shaft
- Upper column assembly with electrical adjustment
- Steering column multifunction switches
- Steering column adjustment switch
- Steering wheel.

The steering system uses a ZF rack and pinion steering gear with a conventional end take-off and a pinion power assisted unit with the addition of ZF Servotronic 2 assistance. The steering gear is handed depending on vehicle drive hand but is common to all three engine variants.

Servotronic 2 adds electronic control and speed sensitive steering to the steering gear. The Servotronic 2 feature provides easy and comfortable steering operation when parking, improved 'road feel' at increased road speeds and adds an integrated, positive center feel feature which optimises steering wheel torque during high speed driving. The Servotronic 2 system is controlled by software which is incorporated into the air suspension control module. The software responds to steering torque inputs and road speed signals and controls the assistance via a transducer valve located on the steering gear valve.

The steering column features fully electrical adjustment for tilt and reach. On vehicles fitted with memory seats, the steering wheel position control is incorporated into the memory module.

Each steering system uses an engine mounted power steering pump which is driven by an auxiliary belt. The location and attachment of the pump differs between engine variants. A power steering fluid reservoir is mounted near to each pump and provides fluid supply to the pump via a suction hose.

The steering system incorporates a fluid cooler in the hydraulic pipe layout. The cooler is routed near to the front of the vehicle to benefit from the increased airflow when the vehicle is moving. The power steering fluid is cooled as it returns from the gear to the reservoir via the cooler by air flowing over the cooler.

The upper column components are common to all models and drive hands. A collapsable lower shaft is located on the gear pinion shaft by two flats. An intermediate shaft is located between the lower collapsable shaft and the upper column assembly.

The column assembly, which is attached to the vehicle cross-car beam, provides the location for the steering column reach and rake adjustment switch, the steering column multifunction switches, the steering wheel, the steering column lock and the ignition switch. The column assembly comprises a number of components which are designed to allow the column to collapse in a controlled manner in the event of a frontal impact (reducing occupant loads). The lower collapsible shaft is designed to telescope, and the intermediate shaft to de-couple, to prevent excessive frontal impact loads/displacements being transmitted to the steering column.

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Steering System - General Information - Steering System

Diagnosis and Testing

Overview

The steering is a variable power assist system, the degree of assistance being controlled by the dynamic suspension control module.

For information on the description and operation of the system, refer to section 211-00 - Steering System of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
   - If a road test is necessary make sure the vehicle is safe to do so.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Check the tires for correct pressure, size and tread pattern ● Check for wheel rim and tire damage ● Check road wheel security ● Check the power steering fluid level and the hydraulic circuit for oil leaks ● Check the power steering pump drive belt condition and tension ● Check the power steering pump for security, wear, damage and excessive noise ● Check the steering gear assembly for damage, wear and security ● Check the hydraulic pipes and cooler lines for damage and correct routing ● Check the steering joints for damage, excessive play, wear and security ● Check the steering column and joints for damage, excessive play, wear and security	● Check the electrical connections to the servotronic transducer valve (power steering control valve actuator) ● Steering angle sensor (SAS) and circuits ● Controller area networks (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. • NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

   4. Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the Symptom Chart or DTC Index.
   - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
   - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible Causes	Action
Steering wanders	● Excessive free play in the steering system ● Steering geometry incorrectly aligned	Check for excessive movement or play in the steering system with the engine running. Check for play at several different steering positions. Carry out steering geometry and alignment checks. Refer to the relevant section of the workshop manual
Steering pulls to the left or right	● Steering geometry incorrectly aligned	Carry out steering geometry and alignment checks using a four wheel alignment system. Refer to section 204-00 - Suspension System - General Information of the workshop manual. Ensure that the tire direction of rotation is correct for the position on the vehicle (where directional tires are installed)

Symptom	Possible Causes	Action
Steering feels notchy when turning from lock to lock.	Steering or suspension swivel joints seized Steering tie rod end joints or track rod inner joints seized Steering column or universal joints seized Steering gear internal components misaligned, worn or damaged	Disconnect the steering gear from the suspension. Check for freedom of movement in the suspension. Disconnect the steering column from the steering gear. Check the steering column and universal joints for freedom of movement. Check the steering gear for freedom of movement. Rectify as necessary
Steering feels tight and does not self-center		
Power steering hydraulics noisy operation	Power steering fluid level low or contaminated Incorrect specification of power steering fluid Power steering fluid aerated power steering hoses twisted or restricted.	Check and top-up the power steering fluid level if required, using the correct specification of fluid. Refer to section 204-00 - Suspension System - General Information of the workshop manual. Check for contaminated fluid. Check for air ingress into the system. Check the power steering hoses for twisting or restrictions. Rectify as necessary
Power steering pump noisy	Power steering fluid level low or contaminated Pump internal components worn or damaged	Check and top-up the power steering fluid level if required. Refer to the relevant section of the workshop manual. Check for contaminated fluid. Check for excessive pump noise. Rectify as necessary
Power steering gear noisy	Power steering fluid level low or contaminated Steering gear internal components worn or damaged	Check and top-up the power steering fluid level if required. Refer to the relevant section of the workshop manual. Check for contaminated fluid. Check for excessive steering gear noise. Rectify as necessary
Steering column noisy	Steering column fouling or universal joints dry	Check the steering column and universal joints. Rectify as necessary
Power steering feels heavier than normal through its operating range	Lack of power assistance Servotronic transducer valve or circuit fault	Check the power steering pump pressure. Check the steering column has no damage and rotates freely. Refer to the Network Communications section of the workshop manual. Check for DTCs indicating a steering transducer fault
Power steering feels too light at speed		
Power steering feels too heavy at standstill and low speed		

DTC Index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: Intermittent faults may cause DTCs to be logged, however some DTCs may be cleared during an ignition off, ignition on cycle. Carry out a road test (if safe to do so), check the functionality of the system and retrieve any DTCs **before** turning the ignition off.

DTC	Description	Possible Causes	Action
B1C3173	Steering Column Motor Relay	Software error (electric column not installed) Steering column motor relay fault (stuck on)	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column motor circuit for short or open circuit and check/renew the memory control module as necessary

DTC	Description	Possible Causes	Action
B1C3193	Steering Column Motor Relay	- Software error (electric column not installed) - Memory control module internal relay fault (inoperative)	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, check/renew the control module as necessary
B1C3213	Steering Column Tilt Solenoid	- Software error (electric column not installed) - Steering column motor tilt solenoid open load	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt solenoid circuit for short or open circuit and check/renew the tilt solenoid as necessary
B1C3296	Steering Column Tilt Solenoid	- Software error (electric column not installed) - Steering column motor tilt solenoid thermal overload	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt solenoid circuit for short or open circuit. Check for other relevant DTCs and repair as necessary. Allow the solenoid to cool, clear the DTC and check the solenoid/tilt function operation. If the DTC persists renew the tilt solenoid as necessary
B1C333A	Steering Column Tilt Feedback Signal	- Software error (electric column not installed) - Steering column tilt motor moved beyond expected range - Sensor circuit open or short circuit - Motor position sensor fault	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt solenoid feedback circuit for short or open circuit. Check the solenoid/tilt function operation and range of movement. Renew the tilt solenoid as necessary
B1C3413	Steering Column Telescopic Solenoid	- Software error (electric column not installed) - Steering column motor telescopic solenoid open load	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column telescopic solenoid circuit for short or open circuit and check/renew the tilt solenoid as necessary
B1C3496	Steering Column Telescopic Solenoid	- Software error (electric column not installed) - Steering column motor telescopic solenoid thermal overload	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column telescopic solenoid circuit for short or open circuit. Check for other relevant DTCs and repair as necessary. Allow the solenoid to cool, clear the DTC and check the solenoid/telescopic function operation. If the DTC persists renew the telescopic solenoid as necessary
B1C353A	Steering Column Telescopic Feedback Signal	- Software error (electric column not installed) - Steering column telescopic motor moved beyond expected range - Sensor circuit open or short circuit - Motor position sensor fault	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column telescopic solenoid feedback circuit for short or open circuit. Check the solenoid/telescopic function operation and range of movement. Renew the telescopic solenoid as necessary
B1C363A	Steering Column Tilt/Telescope Switch	- Software error (electric column not installed) - Steering column tilt/telescopic switch voltage beyond expected range - Sensor circuit open or short circuit - Switch fault	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt/telescopic switch circuit for short or open circuit. Check the tilt/telescopic switch operation and renew the switch as necessary
C005104	Steering Wheel Position Sensor	- System internal failure - Harness/connector issue	Check the steering angle sensor, connector and circuits. Refer to the electrical guides

DTC	Description	Possible Causes	Action
C005162	Steering Wheel Position Sensor	● Signal compare failure ● Harness/connector issue	Check the steering angle sensor, connector and circuits. Refer to the electrical guides
C005164	Steering Wheel Position Sensor	● Signal plausibility failure ● Harness/connector issue	Check the steering angle sensor, connector and circuits. Refer to the electrical guides
C112201	Steering Isolation Valve	● Servotronic steering valve circuit high resistance ● Servotronic steering valve circuit short circuit to ground ● Servotronic steering valve fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system
C11231C	Steering Isolation Valve Supply Circuit	● Servotronic steering valve supply circuit high resistance ● Servotronic steering valve supply circuit short circuit to ground ● Servotronic steering valve supply circuit short circuit to power ● Servotronic steering valve fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system
C1B1862	Supply Voltage X-Ref Check	● Inconsistent battery voltages received by air suspension control module ● Air suspension control module supply circuit short circuit to ground ● Air suspension control module supply circuit high resistance ● Air suspension control module failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect
U007388	Control Module Communication Bus 'A' Off	● CAN bus off	Refer to the Network Communications section of the workshop manual
U012287	Lost Communication With Vehicle Dynamics Control Module	● CAN module status signals not received from the VDM in the specified time	Check for ABS DTCs. Refer to the Network Communications section of the workshop manual
U012687	Lost Communication With Steering Angle Sensor Module	● CAN bus fault ● Steering angle sensor module disconnected ● Steering angle sensor module not configured ● Steering angle sensor module failure ● Harness/connector issue	Check the control module installation/configuration. Refer to the Network Communications section in the workshop manual
U030055	Internal Control Module Software Incompatibility	● Software incompatibility with ATCM ● Not configured	Configure the modules using the approved diagnostic system. Refer to the Network Communications section of the workshop manual

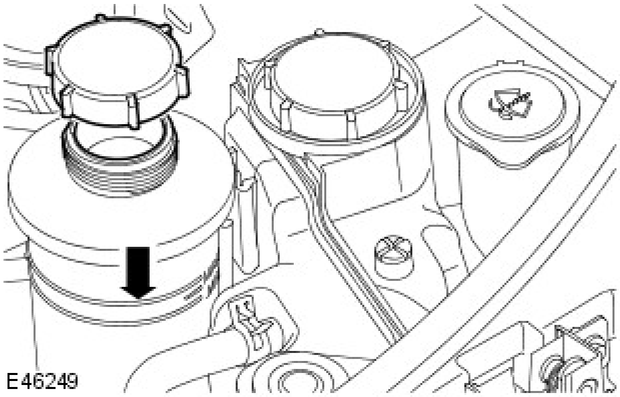
DTC	Description	Possible Causes	Action
U041686	Invalid Data Received From Vehicle Dynamics Control Module	● ABS fault	Check for dynamic suspension/ABS DTCs. Refer to the relevant section of the workshop manual
U1A1449	CAN Initialization Failure	● Internal electronic fault	Configure the steering angle sensor module using the approved diagnostic system. Refer to the Network Communications section of the workshop manual
U300262	Vehicle Identification Number	● Signal compare failure	Program the module using the approved diagnostic system

Published: 11-May-2011

Steering System - General Information - Power Steering System Filling and Bleeding

General Procedures

1. Check the power steering fluid level.



2. ⚠ CAUTION: Fluid must always be present in the reservoir during bleeding.

Remove the filler cap and fill to the MAX level mark.

- Install the reservoir filler cap.

3. Start the engine and allow to run for 10 seconds, stop the engine.

- Check the power steering fluid, if aerated, wait until fluid is free from bubbles then top-up reservoir to UPPER level mark with recommended fluid.

4. ⚠ CAUTION: Do not hold steering on full lock for longer than 10 seconds.

Start the engine and turn steering fully lock to lock, stop the engine.

- Check and top-up power steering fluid level.

5. Start and run the engine for 2 minutes, turn the steering fully lock to lock.

- Check and top-up power steering fluid level.

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Steering System - General Information - Power Steering System Flushing

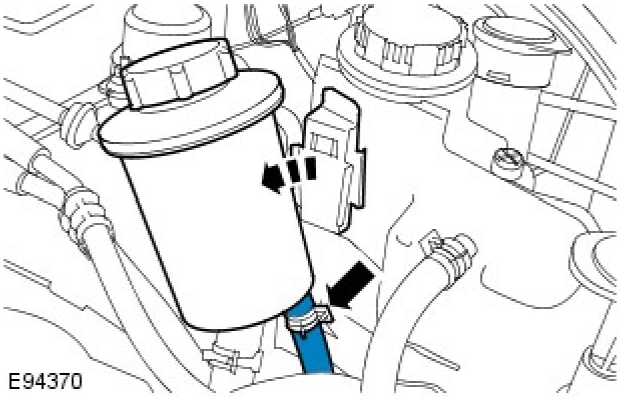
General Procedures

• NOTE: If heavy steering or contamination within the power steering system is found, it is necessary to carry out the system flush procedure as detailed below. If any components have been replaced in the power steering system the procedure below must be carried out in full.

• NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Remove the power steering fluid reservoir cap.

2. Using a suitable syringe, remove the power steering fluid from the power steering fluid reservoir.

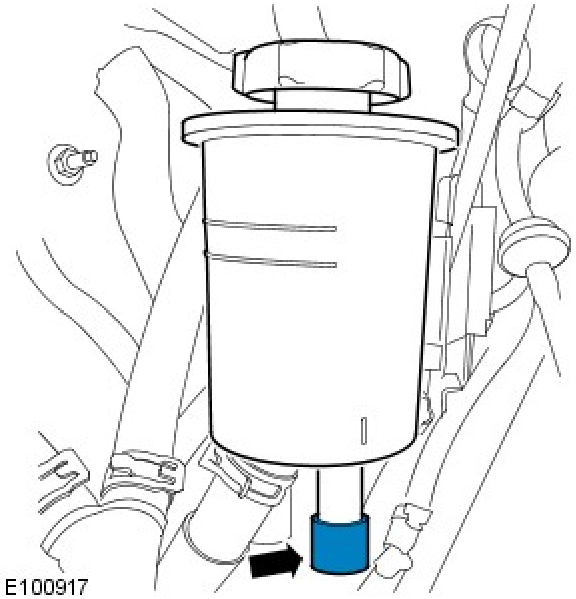


3. ⚠ CAUTION: Be prepared to collect escaping fluids.

• NOTE: Note the orientation of the clip.

Detach the power steering fluid reservoir.

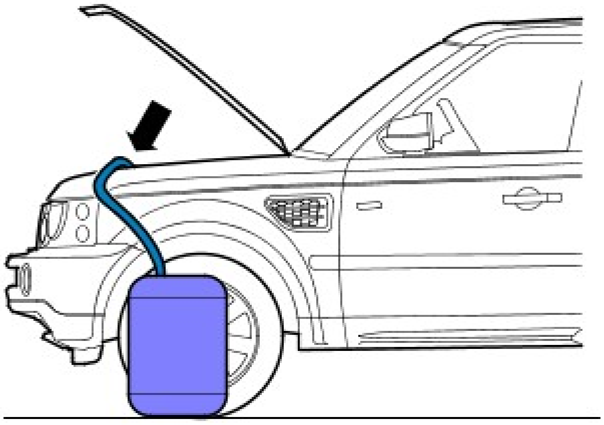
- Detach but do not remove the power steering fluid reservoir.
- Release the power steering fluid return hose from the power steering fluid reservoir.
- If a quick release coupling is fitted to the power steering return hose, release the power steering fluid return hose from the coupling by removing the clip.



4. ⚠ CAUTION: Be prepared to collect escaping fluids.

• NOTE: Make sure that all openings are sealed. Use new blanking caps.

Using a suitable blanking cap, cap the power steering reservoir return pipe.



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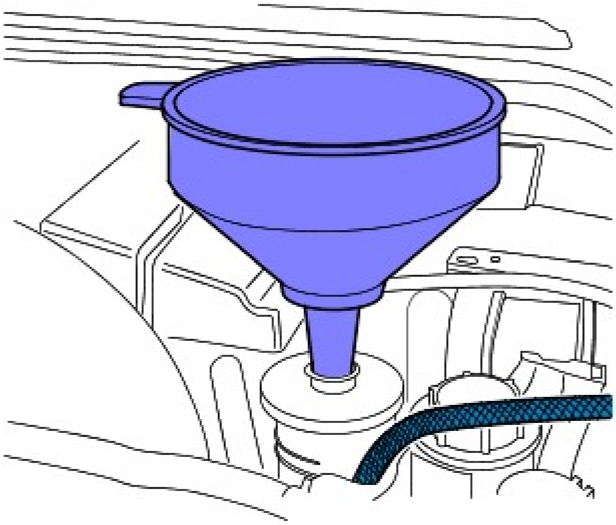
5. ⚠ CAUTION: Be prepared to collect escaping fluids.

- NOTE: Make sure the extended pipe is not kinked or twisted and is correctly secured with hose clips.

Attach a suitable pipe to the power steering return hose to allow the fluid to drain.



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6. NOTE: The suitable funnel should have the a capacity of 4 litres and O-ring seal

- NOTE: The suitable funnel must be tightly sealed to the power steering fluid reservoir to avoid fluid leakage.

Install a suitable funnel onto the power steering fluid reservoir.

7. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

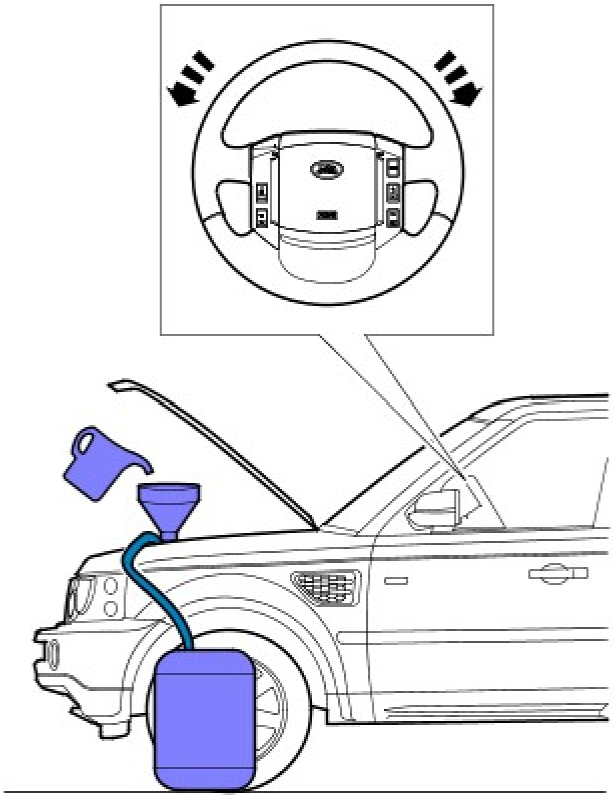
Raise and support the vehicle with the wheels just clear of the ground.

8. CAUTIONS:

⚠ Steps 8 and 9 must be carried out within 2 - 3 seconds of each other. Failure to follow this instruction may result in damage to the power steering system.

⚠ Be prepared to collect escaping fluids.

Using the suitable funnel, top up the power steering system with the specified fluid. Make sure the fluid level is maintained at two thirds full in the funnel.



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9. CAUTIONS:

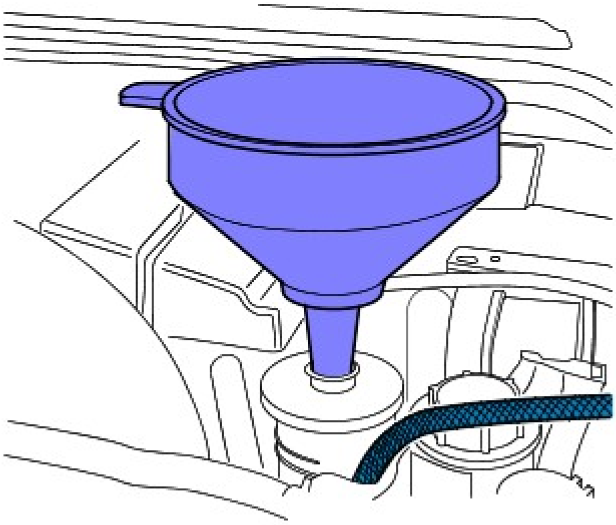
⚠ Be prepared to collect escaping fluids.

⚠ Do not allow the power steering fluid level in the power steering fluid reservoir to fall below the minimum power steering fluid level. Failure to follow this instruction may result in damage to the power steering system.

⚠ Make sure the engine is switched off as soon as the full 4 litres of power steering fluid has entered the power steering fluid reservoir.

Flush the power steering system.

- Start the engine
- With assistance turn the steering slowly lock to lock 3 times at approximately 1 revolution every 5 seconds.
- Continue to flush the power steering system until 4 litres of power steering fluid has been added to the power steering reservoir. This should take approximately 30 seconds.



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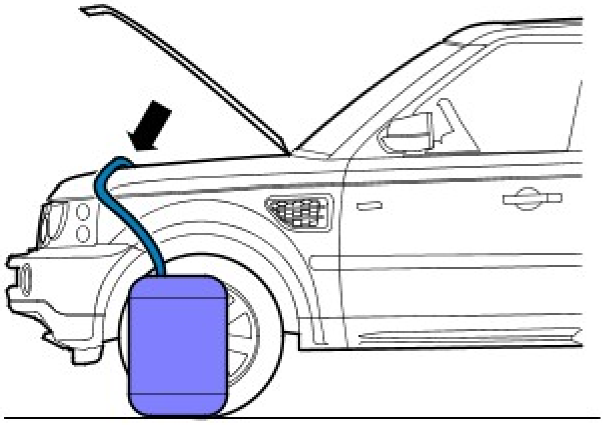
10. ⚠ CAUTION: Be prepared to collect escaping fluids.

Remove the suitable funnel.

11. ⚠ CAUTION: Be prepared to collect escaping fluids.

Remove the suitable pipe to the power steering return hose.



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12. ⚠ CAUTION: Be prepared to collect escaping fluids.

- NOTE: Note the orientation of the clip.

If a quick release coupling is fitted to the power steering return hose, connect the power steering fluid return hose to the coupling by installing the clip.

13. Install a new power steering fluid reservoir.
For additional information, refer to: Power Steering Fluid Reservoir (211-02, Removal and Installation).

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Power Steering -

Recommended Fluid

Item	Specification
Fluid	Texaco Cold Climate Fluid 33270

General Specification

Item	Specification
Type	Power assisted rack and pinion, speed proportional with belt driven pump, remote hydraulic fluid reservoir and fluid cooler
Steering wheel diameter	395 mm (15.55 in)
Number of turns - lock to lock	3.1
System ratio	Variable - 19.5:1 on center
Pump relief valve operating pressure	
Petrol vehicles	114 ± 4 bar (11400 ± 400 kPa) (1653 ± 58 lb/in²)
Diesel vehicles	115 ± 4 bar (11500 ± 400 kPa) (1668 ± 58 lb/in²)
Fluid flow rate - constant	
For all petrol vehicles and V6 diesel	8.8 ± 0.5 liter/min (15.4 ± 0.8 pints/min) (9.2 ± 0.5 US quarts/min)
V8 diesel vehicles	9.5 ± 0.5 liter/min (16.7 ± 0.8 pints/min) (10 ± 0.5 US quarts/min)
Steering rack travel	158 mm (6.22 in)
Piston diameter	50 mm (1.93 in)
Rack bar diameter	30 mm (1.18 in)

Description	Nm	lb-ft
High-pressure line to pump bolt	25	18
Steering gear mounting bolts	175	129
High-pressure line to steering gear support bracket bolt	10	7
Power steering return line support bracket.	10	7
* High-pressure line and return line to steering gear bolt	22	16
Power steering Pump bolts	23	17
* Lower steering column universal joint to steering gear bolt	24	18

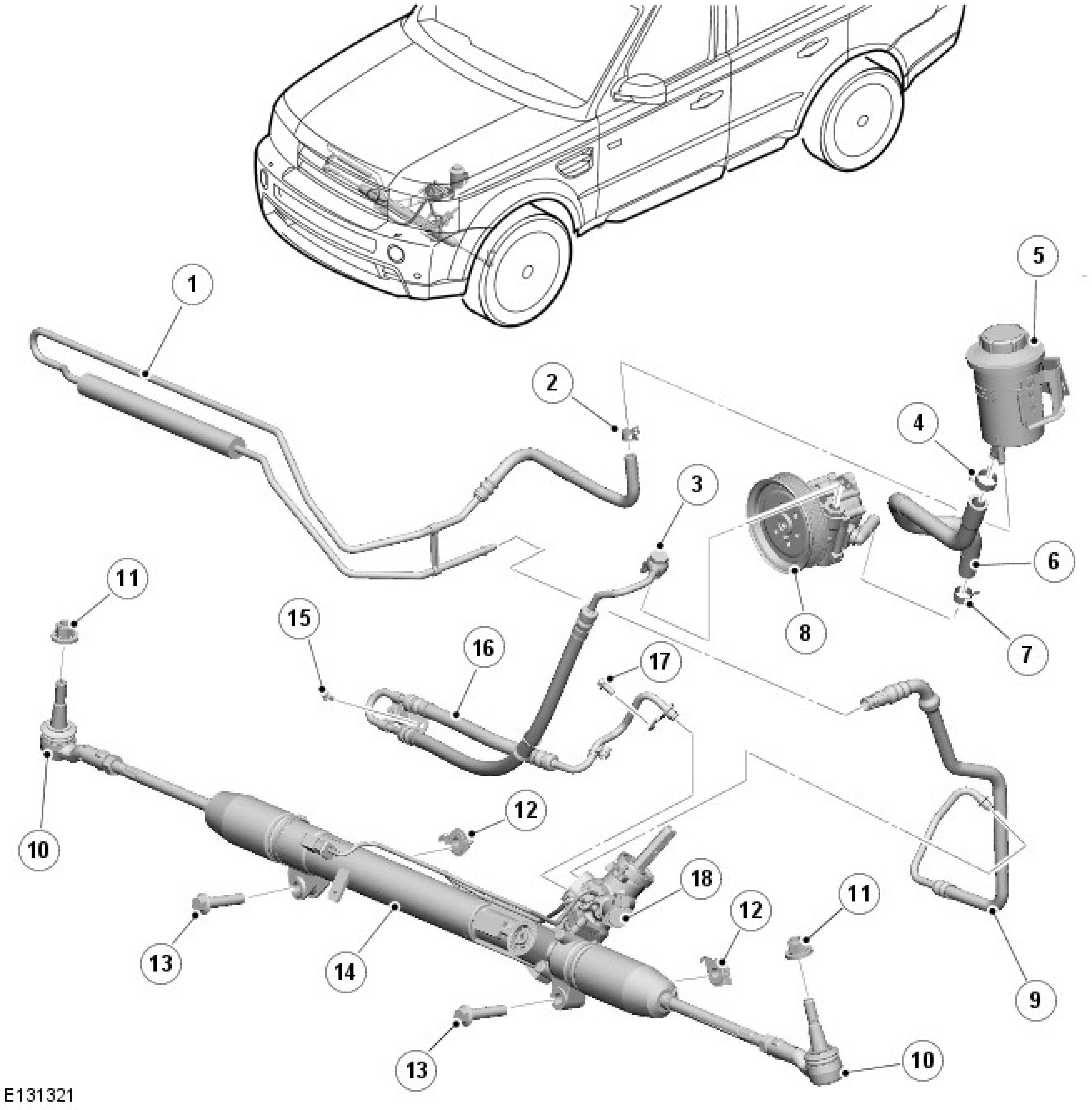
*** New bolt/nuts must be installed**

Power Steering - Power Steering

Description and Operation

COMPONENT LOCATION

- NOTE: Petrol version shown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Item	Part Number	Description
1	-	Fluid cooler and hose assembly - Fluid return (petrol models only)
2	-	Spring clip
3	-	Banjo bolt
4	-	Spring clip
5	-	Reservoir
6	-	Suction hose - Reservoir to pump
7	-	Spring clip
8	-	Power steering pump
9	-	Hose assembly - Steering gear to cooler - Fluid return

10	-	Tie rod end (2 off)
11	-	Locknut (2 off)
12	-	Caged nut (2 off)
13	-	Bolt (2 off)
14	-	Steering gear
15	-	Screw
16	-	Hose - pump to steering gear - Fluid pressure
17	-	Screw
18	-	Servotronic valve

OVERVIEW

The steering system comprises a ZF manufactured rack and pinion Servotronic 2 steering gear, a power steering pump, a reservoir, a fluid cooler and fluid hoses. The steering gear is an end take-off rack and pinion power assisted unit with the addition of road speed proportional ZF Servotronic 2 assistance.

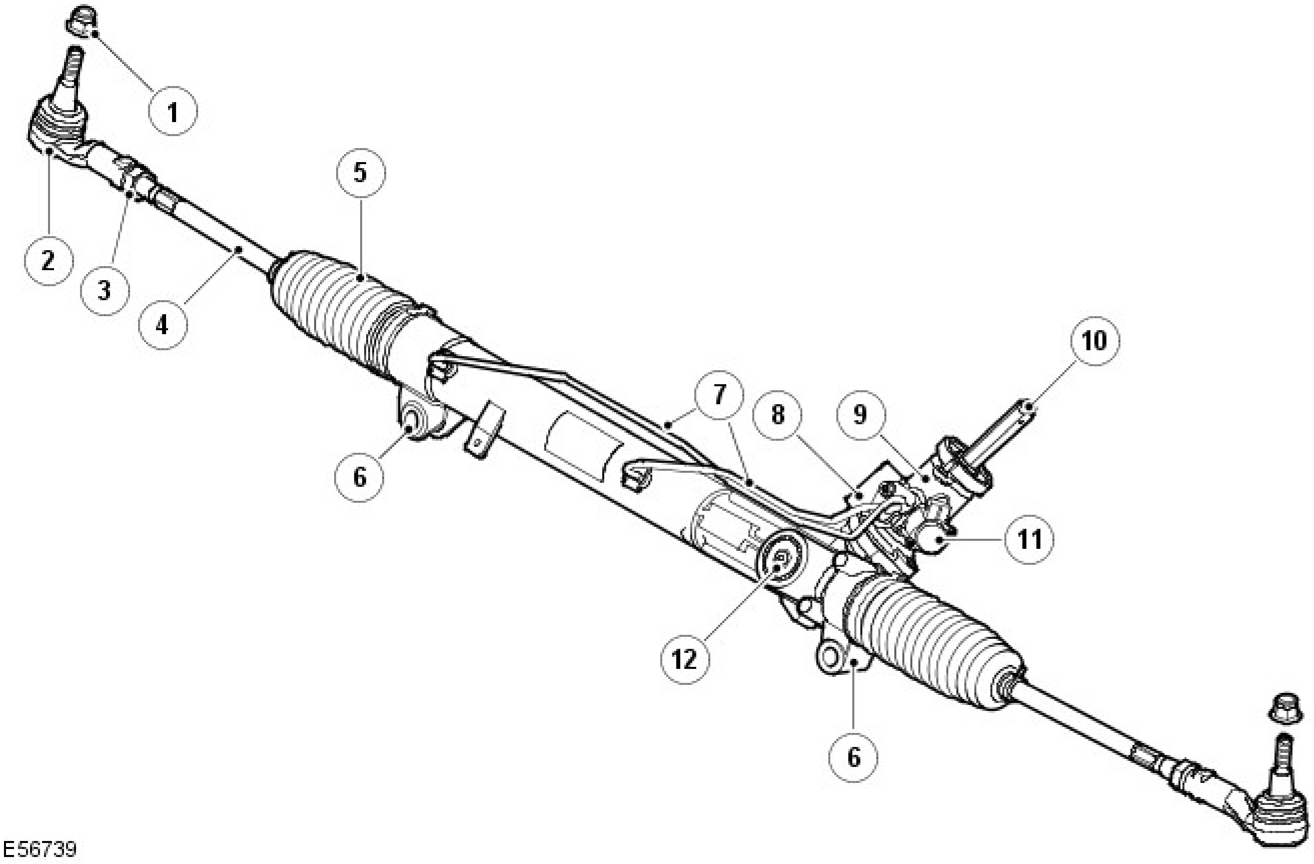
Servotronic 2 adds electronic control and speed sensitive steering to the steering gear. The Servotronic 2 feature provides easy and comfortable steering operation when parking, improved 'road feel' at increased road speeds and adds an integrated, positive centre feel feature which optimises steering wheel torque during high speed driving.

The Servotronic 2 system is controlled by software which is incorporated into the air suspension control module. The software responds to steering torque inputs and road speed signals and controls the assistance via a transducer valve located on the steering gear valve.

The steering gear has a variable ratio rack. This provides conventional response when the steering is in the centre, straight ahead position, but provides more direct and faster steer as the turning angle increases. The variable ratio provides precise and rapid steering response at high speeds and optimizes the steering of the vehicle when manoeuvring into parking spaces, turning in tight areas and when cornering in extreme conditions.

The steering gear rack has a travel of 158 mm (6.22 in). Lock to lock requires 3.167 revolutions of the steering wheel which gives a ratio of 45 mm (1.77 in)/revolution at the centre position and 52.6 mm (2.07 in)/revolution at end of lock.

STEERING GEAR



Item	Part Number	Description
1	-	Locknut

2	-	Tie-rod end
3	-	Locknut
4	-	Tie rod
5	-	steering gear boot
6	-	Steering gear casing attachment lugs
7	-	Pressure/return pipes
8	-	Pressure/return connection from/to pump
9	-	Valve unit housing
10	-	Input shaft
11	-	Servotronic valve
12	-	Pinion housing

The steering gear is located at the front of the engine, below the accessory belt drive. The gear is attached to two brackets on the chassis and is secured to the brackets with flanged bolts and caged nuts. The cage prevents the nuts from turning when the bolts are loosened or tightened. The cage nuts can only be used once and must be replaced when the gear is removed. For service, M12 Nylock nuts are available as a replacement for the cage nuts.

The steering gear comprises an aluminum, cast, valve housing which contains the hydraulic valve unit and Servotronic valve. The mechanical steering rack and the hydraulic power unit are located in a tubular steel cylinder which is attached to the cast valve housing.

The steering gear uses a rack with an integrated piston which is guided on plain bearings within the cylinder and the valve housing. The pinion, which is attached to the valve unit, runs in bearings and meshes with the rack teeth. The rack is pressed against the pinion by a spring loaded yoke which ensures that the teeth mesh with the minimum of play. The pinion is connected to the valve unit via a torsion bar. The rotary motion of the steering wheel is converted into linear movement of the rack by the pinion and is initiated by the valve unit. This movement is transferred into movement of the road wheels by adjustable tie-rods.

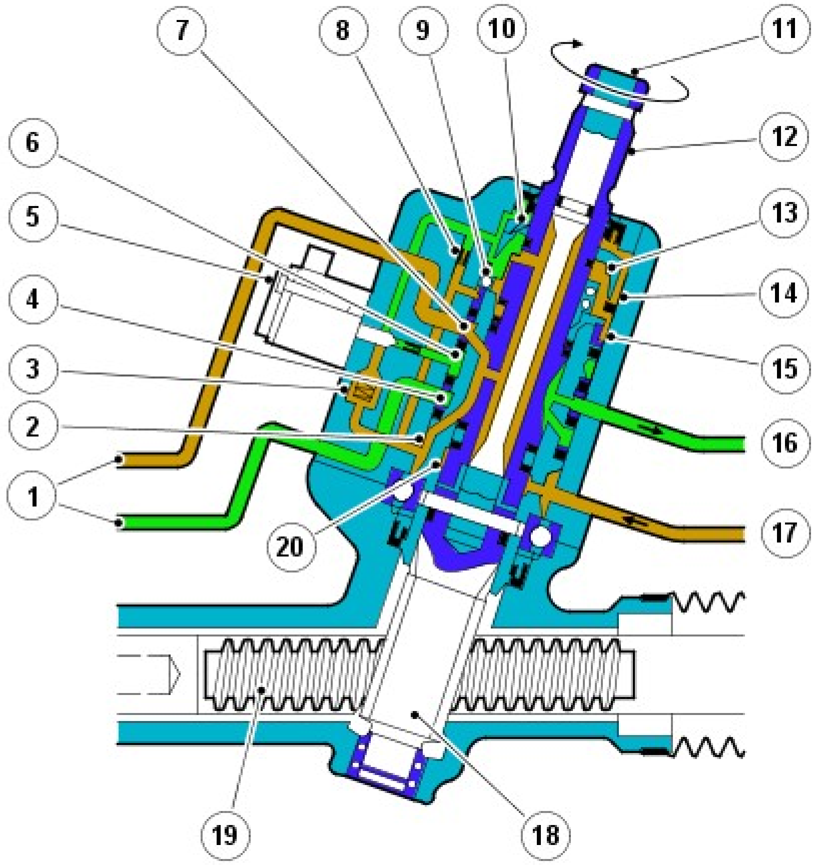
The rack teeth angles vary from 20 degrees in the centre position to 40 degrees at the end sections of the rack. It is this variation in teeth angles which provides the variable ratio.

The 50 mm (1.97 in) diameter piston of the hydraulic power unit is located at one end of the cylinder. Each side of the piston is connected to fluid pressure or fluid return via external metal pipes which are connected to the valve unit.

Each end of the gear has a threaded hole which provides for the fitment of the tie-rod. The external ends of the gear are sealed with steering gear boots which prevent the ingress of dirt and moisture. The tie-rod has a long threaded area which allows for the fitment of the tie-rod end. The thread allows for the adjustment of the steering toe. When the correct toe is achieved, a locknut is tightened against the tie-rod end preventing inadvertent movement.

The gear has a central hole machined along part of its length. The hole allows the air in the boots to be balanced when the steering is turned. The boots are serviceable items and are retained on the gear housing and the tie-rod with zip ties.

Valve Unit



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Item	Part Number	Description
1	-	Pressure/return to/from steering gear
2	-	Return fluid chamber
3	-	Cut-off valve
4	-	Radial groove
5	-	Servotronic transducer valve
6	-	Fluid feed radial groove
7	-	Radial groove
8	-	Orifice
9	-	Balls
10	-	Compression spring
11	-	Torsion bar
12	-	Valve rotor
13	-	Reaction piston
14	-	Reaction chamber
15	-	Centering piece
16	-	Pressure supply from pump
17	-	Return to reservoir
18	-	Pinion
19	-	Steering gear rack
20	-	Valve sleeve

The valve unit is an integral part of the steering gear. The principle function of the valve unit is to provide maximum power assistance (i.e. when parking) with minimum effort required to turn the steering wheel.

The pinion housing of the valve is an integral part of the main steering gear casting. The pinion housing has four machined ports which provide connections for pressure feed from the power steering pump, return fluid to the reservoir and pressure feeds to each side of the cylinder piston.

The valve unit comprises an outer sleeve, an input shaft, a torsion bar and a pinion shaft. The valve unit is co-axial with the pinion shaft which is connected to the steering column via the input shaft. The valve unit components are located in the steering gear pinion housing which is sealed with a cap.

The outer sleeve is located in the main bore of the pinion housing. Three annular grooves are machined on its outer diameter. PTFE rings are located between the grooves and seal against the bore of the pinion housing. Holes are drilled radially in each annular groove through the wall of the sleeve. The bore of the outer sleeve is machined to accept the input shaft. Six equally spaced slots are machined in the bore of the sleeve. The ends of the slots are closed and do not continue to the end of the outer sleeve. The radial holes in the outer sleeve are drilled into each slot.

The input shaft has two machined flats at its outer end which allow for the attachment of the steering column intermediate shaft yoke. The flats ensure that the intermediate shaft is fitted in the correct position to maintain the optimum phase angle. The inner end of the input shaft forms a dog-tooth which mates with a slot in the pinion shaft. The fit of the dog-tooth in the slot allows a small amount of relative rotation between the input shaft and the pinion shaft before the dog-tooth contacts the wall of the slot. This ensures that, if the power assistance fails, the steering can be operated manually without over stressing the torsion bar. The central portion of the input shaft has equally spaced longitudinal slots machined in its circumference. The slots are arranged alternately around the input shaft.

The torsion bar is fitted inside the input shaft and is an interference fit in the pinion shaft. The torsion bar is connected to the input shaft by a drive pin. The central diameter of the torsion bar is machined to a smaller diameter in its central section. The smaller diameter allows the torsion bar to twist in response to torque applied from the steering wheel in relation to the grip of the tyres on the road surface.

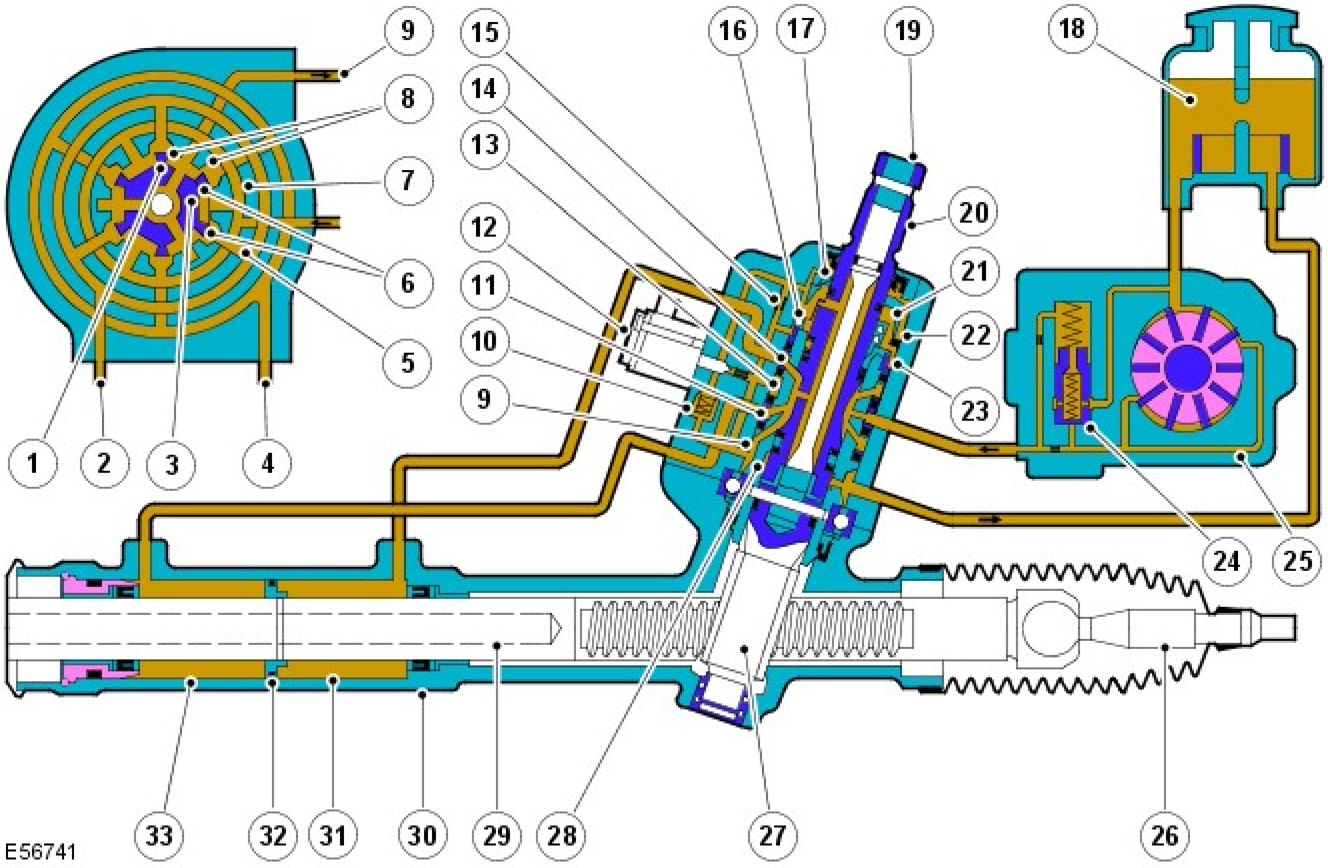
The pinion shaft has machined upper teeth on its central diameter which mate with teeth on the steering gear rack. A slot, machined in the upper end of the pinion shaft mates with the dog-tooth on the input shaft. The pinion shaft locates in the pinion housing and rotates on ball and roller bearings.

Power Steering Hydraulic Operation

The following hydraulic circuits show power steering operation and fluid flow for the steering in a straight ahead, neutral position and when turning right. The circuit diagram for turning left is similar to that shown for turning right.

Power Steering in Neutral Position

- NOTE: Circuit shows steering rotary valve in neutral position with the vehicle not moving.



Item	Part Number	Description
1	-	Return fluid control groove
2	-	Radial groove
3	-	Feed fluid control groove
4	-	Radial groove
5	-	Axial groove
6	-	Feed fluid control edge

7	-	Feed fluid radial groove
8	-	Return fluid control edge
9	-	Return fluid chamber
10	-	Cut-off valve
11	-	Radial groove
12	-	Servotronic transducer valve
13	-	Feed fluid radial groove
14	-	Radial groove
15	-	Orifice
16	-	Balls
17	-	Compression spring
18	-	Torsion bar
19	-	Power steering fluid reservoir
20	-	Valve rotor
21	-	Reaction piston
22	-	Reaction chamber
23	-	Centering piece
24	-	Pressure relief/flow limiting valve
25	-	Power steering pump
26	-	Inner track rod
27	-	Pinion
28	-	Valve sleeve
29	-	Steering gear
30	-	Steering gear housing
31	-	Power assist cylinder - right
32	-	Piston
33	-	Power assist cylinder - left

When the engine is started, the power steering pump draws fluid from the reservoir down the low pressure suction line. The fluid passes through the pump and is delivered, via a hose, to the steering rack valve unit.

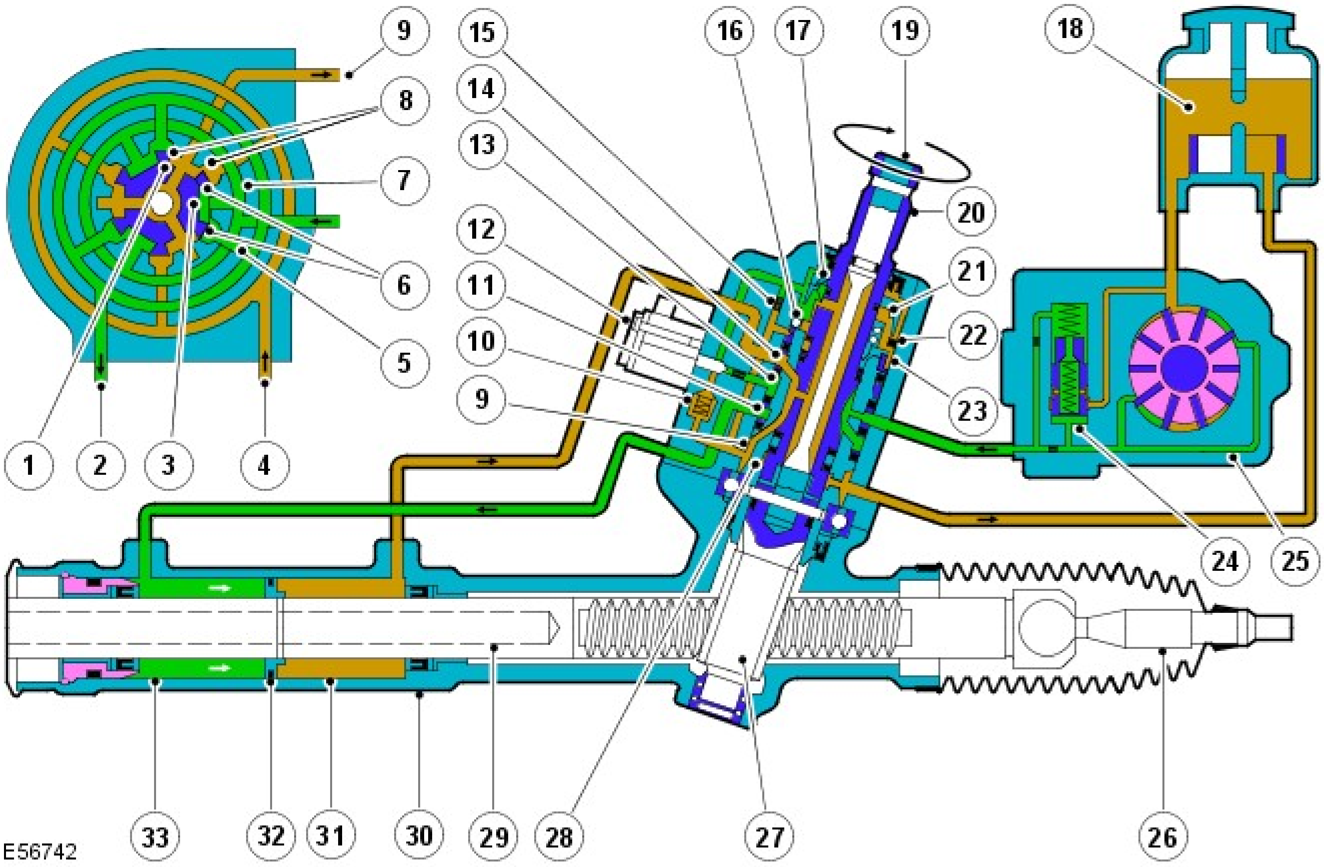
The pressurized fluid flows through a connecting bore in the valve and, via the feed fluid radial groove and the transverse bores in the valve sleeve, passes to the feed fluid control groove of the valve rotor.

In the neutral (straight ahead) position, the fluid passes over the open feed fluid control edges to all valve sleeve axial grooves. The fluid then passes through the open return fluid control edges and the return fluid control grooves of the valve rotor. The fluid then passes via connecting bores to the return fluid chamber and to the reservoir via an external hose.

Simultaneously, the radial grooves of the valve body and their associated pipes provide a connection between the left and right power assist cylinders.

Power Steering in Right Turn Position

- NOTE: Circuit shows steering rotary valve in right turn position, at high vehicle speed and with rapid steering corrections. The Servotronic transducer valve is fully open and the maximum hydraulic reaction is limited by the cut-off valve.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Item	Part Number	Description
1	-	Return fluid control groove
2	-	Radial groove
3	-	Feed fluid control groove
4	-	Radial groove
5	-	Axial groove
6	-	Feed fluid control edge
7	-	Feed fluid radial groove
8	-	Return fluid control edge
9	-	Return fluid chamber
10	-	Cut-off valve
11	-	Radial groove
12	-	Servotronic transducer valve
13	-	Feed fluid radial groove
14	-	Radial groove
15	-	Orifice
16	-	Balls
17	-	Compression spring
18	-	Power steering fluid reservoir
19	-	Torsion bar
20	-	Valve rotor
21	-	Reaction piston
22	-	Reaction chamber
23	-	Centering piece
24	-	Pressure relief/flow limiting valve
25	-	Power steering pump
26	-	Inner track rod
27	-	Pinion
28	-	Valve sleeve
29	-	Steering gear
30	-	Steering gear housing
31	-	Power assist cylinder - right

32	-	Piston
33	-	Power assist cylinder - left

When the steering wheel is turned to the right, the steering rack and piston moves to the right in the piston bore. The valve rotor is rotated to the right (clockwise) which directs pressurized fluid over the further opened feed fluid control edges and associated axial grooves, the radial groove and via an external pipe to the left power assist cylinder chamber. The pressure applied to the piston from the left power assist cylinder chamber provides the hydraulic assistance.

An adaptable pressure build-up is achieved by the partially or fully closed feed fluid control edges restricting or preventing a connection between the fluid pressure inlet and the other axial grooves connected to the radial groove.

Simultaneously, the fluid pressure outlet to the pressurized axial grooves are restricted or partially restricted by the closing return fluid control edges. The fluid displaced by the piston from the right power assist cylinder chamber, flows through an external pipe to the radial grooves. From there the fluid passes to the associated axial grooves and on to the return fluid control grooves, via the further opened return fluid control edges.

The return flow of fluid to the reservoir passes via interconnecting bores which lead to the return fluid chamber. When the steering wheel is turned to the left the operating sequence is as above but the pressure is applied to the opposite side of the piston.

SERVOTRONIC VALVE

The Servotronic transducer valve is located in a port on the side of the steering gear valve housing. The valve is sealed in the housing with an O-ring seal and is secured with two long screws into threaded holes in the housing. The Servotronic valve is a transducer controlled valve which responds to control signals supplied from the body control module.

The Servotronic valve determines the hydraulic reaction at the steering gear rotary valve and controls the input torque required to turn the steering wheel. The Servotronic system allows the steering to be turned with minimum effort when the vehicle is stationary or manoeuvred at slow speed. The hydraulic reaction changes proportional to the vehicle speed, with the required steering effort increasing as the vehicle moves faster. At high speeds, the Servotronic system provides the driver with a good feedback through the steering providing precise steering and improved stability.

The body control module contains a microprocessor which receives road speed signals from the ABS module and calculates the correct controlling signal for the Servotronic valve. The Servotronic software within the control module has a diagnostic capability which allows T4 to check the tune of the steering and retrieve fault codes relating to the Servotronic valve. Two fault codes are stored relating to the valve for positive connection short to ground or battery and negative connection short to ground or battery.

The Servotronic software within the body control module contains a number of steering maps which are selected via the car configuration file depending on the vehicle model, tire fitment and fitment of Dynamic Response.

If a failure of the Servotronic valve or software occurs, the system will suspend Servotronic assistance and only a default level of power assistance will be available. Fault codes relating to the fault are stored in the body control module. No warning lamps are illuminated and the driver may be aware of the steering being 'heavier' than usual.

Servotronic Operation

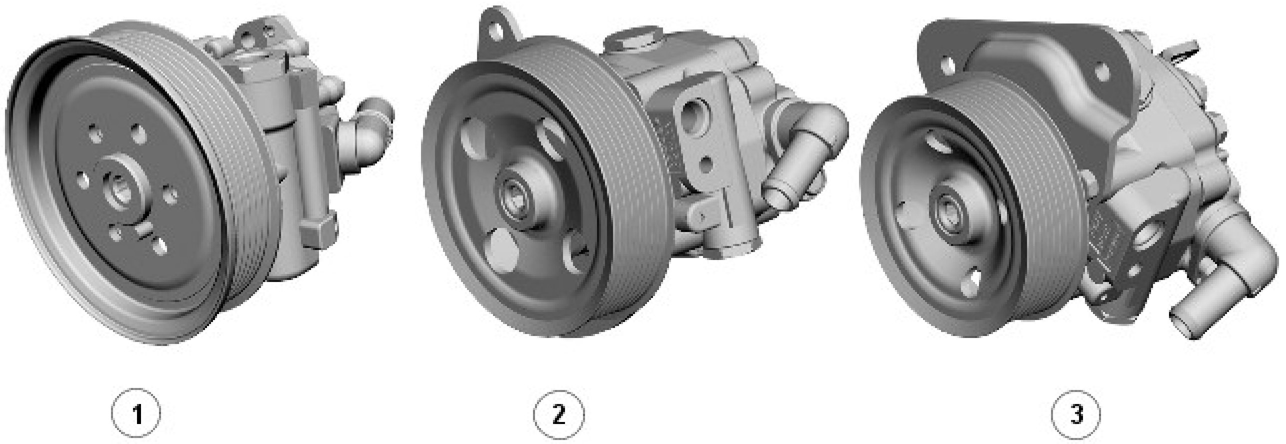
When the vehicle is manoeuvred into and out of a parking space (or other similar manoeuvre), the Servotronic function of the body control module uses road speed data from the ABS module to determine the vehicle speed, which in this case will be slow or stationary. The control module microprocessor analyses the signals and outputs an appropriate control current to the Servotronic transducer valve. The Servotronic valve closes and prevents fluid flowing from the feed fluid radial groove to the reaction chamber. An orifice also ensures that there is return pressure in the reaction chamber. This condition eliminates any 'reaction' ensuring that the steering is very light to operate, reducing the effort required to turn the steering wheel.

As the vehicle is driven and the road speed increases, the body control module microprocessor analyses the road speed signals from the ABS module and reduces the amount of control current supplied to the Servotronic valve. The Servotronic valve reacts to the control current and opens the valve by an amount appropriate to the road speed. This allows a controlled fluid supply from the feed fluid radial groove to the reaction chamber. The orifice prevents the loss of large amounts of fluid to the return fluid chamber. The higher fluid pressure acting on the reaction piston causes compression of the balls which are located between the reaction piston and the centering piece which in turn is securely connected to the valve sleeve. When driving in a straight line, this has a positive effect on the exact centralising of the steering valve. When the steering valve is actuated, the balls, with a higher load on them, provide additional torsional resistance to rotation of the valve rotor. This mode of Servotronic assistance requires an established higher steering wheel torque until the hydraulic assistance required in the left or right power assist cylinder is determined.

At high driving speeds, i.e. on a motorway, the Servotronic valve is fully open due to a very low or non-existent control current supplied from the body control module. This enables maximum pressure supply from the feed fluid radial groove to the reaction piston.

When the steering wheel is turned, the reaction pressure increases appropriate to the existing operating pressure and pressurizes the piston in the reaction chamber. As soon as the reaction pressure reaches its upper limit, the fluid is discharged to the return fluid chamber via the cut-off valve and prevents further increases in reaction pressure. This maintains the input torque applied through the steering wheel and provides the driver with an improved 'road feel' allowing precise steering and directional stability.

POWER STEERING PUMP



E131322

Item	Part Number	Description
1	-	5.0L V8
2	-	3.0L TdV6
3	-	3.6L TdV8 (from 2007MY)

The power steering pumps used are basically the same pump with different connection fitments, therefore they are not interchangeable.

Power Steering Pump - Petrol Engines

The pump is a fixed displacement, vane type pump which supplies hydraulic pressure to the steering gear valve unit. The pump is driven by a Poly Vee belt from the crankshaft pulley. A self-adjusting tensioner is fitted to maintain the correct tension on the belt.

The pump has an internal flow control valve which also incorporates a pressure relief valve. The pressure relief valve limits the maximum pressure supplied to the steering gear to 115 bar (1667 lbf in^2) ± 4 bar (58 lbf in^2). The flow control valve limits the maximum flow to 8.8 l/min (1.93 gal/min) ± 0.5 l/min (0.1 gal/min) regardless of engine speed. The pump has a displacement of 11 cc/rev (0.67 in^3/rev).

A shaft runs longitudinally through the pump. One end of the shaft is bolted on the drive pulley, the opposite end of the shaft is closed by a cover. The shaft runs in bearings located in the body and oil seals at each end of the shaft prevent leakage of hydraulic fluid.

The pump contains ten vanes which rotate within a cam ring and are driven by the shaft. As the vanes rotate, the cam ring causes the space between the vanes to increase. This causes a depression between the vanes and fluid is drawn from the reservoir via the suction hose into the space between the vanes.

As the shaft rotates, the inlet port is closed to the vanes which have drawn in fluid, trapping the fluid between the vanes. The cam ring causes the space between the vanes to reduce and consequentially compresses and pressurizes the hydraulic fluid trapped between them.

Further rotation of the shaft moves the vanes to the outlet port. As the vanes pass the port plate the pressurized fluid passes from the pump outlet port into the pressure hose to the steering gear.

The pressurized fluid is subject to control by the flow control and pressure relief valve. The flow control valve maintains a constant flow of fluid supplied to the steering gear irrespective of engine speed variations. The pressure relief valve activates only to limit the maximum system pressure on the output side of the pump. A metering orifice is included in the discharge port of the pump. If the pressure in the orifice reaches a predetermined level, a spring loaded ball in the centre of the flow control valve is lifted from its seat and allows pressurized fluid to recirculate within the pump.

The pressure relief valve will operate if the discharge from the pump is restricted, i.e.; steering held on full lock. If the output from the pump is blocked, all output is recirculated through the pump. In this condition, as no fresh fluid is drawn into the pump from the reservoir, the fluid temperature inside the pump will increase rapidly. Consequentially, periods of operation of the steering gear on full lock should be kept to a minimum to prevent overheating of the pump and the fluid within it.

Power Steering Pump - Diesel Engines

The pump is a variable displacement, vane type pump which supplies the required hydraulic pressure to the steering gear valve unit. The pump is located at the front of the engine and is driven by a Poly Vee belt which is directly driven from the crankshaft. A self-adjusting tensioner is fitted to maintain the correct tension on the belt.

The pump has an internal pressure relief valve and a flow control valve. The pressure relief valve limits the maximum pressure supplied to the steering gear to 115 bar (1667 lbf in^2) ± 4 bar (58 lbf in^2). The flow control valve limits the maximum flow as follows:

- TdV6 - 8.8 l/min (1.93 gal/min) ± 0.5 l/min (0.1 gal/min) at 10 bar (145 lbf in^2)
- TdV8 - 9.5 l/min (2.09 gal/min) ± 0.5 l/min (0.1 gal/min) at 10 bar (145 lbf in^2).

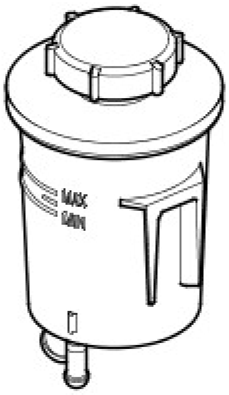
Both pumps have a displacement of 9.6 cc/rev (0.58 in^3/rev).

The output from the pump increases proportionally with the load applied to the steering valve unit. Inside the pump, a cartridge set consisting of 11 vanes and a rotor is mounted on the input shaft and is surrounded by the variable displacement cam.

The variable displacement pump maintains a constant fluid output by varying the internal displacement of the pump, unlike a conventional fixed displacement pump which has to use a flow control valve to recirculate the excess flow within the pump. At low engine speeds, the internal displacement of the variable displacement pump is at its maximum to generate the controlled fluid output.

As the pump speed increases with engine speed, the increased flow inside the pump generates a back pressure within the pump. This back pressure causes the cam ring to move and reduce the internal displacement of the pump to maintain the constant fluid flow from the pump. As the internal displacement of the pump decreases, the power and torque required to drive the pump reduces, which leads to improved fuel economy.

RESERVOIR



E46941

The fluid reservoir is located on a bracket in the left hand side of the engine compartment, behind the radiator. The reservoir comprises a body, cap and filter. The purpose of the reservoir is to contain a surplus of the hydraulic fluid in the system to allow for expansion and contraction of the fluid due to temperature variations. The fluid level ensures that the supply connection on the bottom of the reservoir is covered with fluid at all operating vehicle attitudes. Any air which is present in the system is exhausted from the system in the reservoir.

The body is a plastic moulding with two ports at the bottom which provide for the connection of the suction supply and return hoses. Moulded markings on the side of the reservoir denote the upper and lower fluid levels. A non-serviceable, 100 micron nylon mesh filter is fitted in the body. The filter removes particulate matter from the fluid before it is drawn into the pump supply connection.

The cap is rotated counterclockwise for one quarter turn to release from the body. The cap is fitted with an O-ring to prevent fluid leakage. The cap incorporates a breather hole to allow for changes in fluid level during operation and prevent vacuum or pressurization of the reservoir.

HIGH PRESSURE HOSE

The high pressure hose connecting the pump to the steering gear valve unit contains two attenuators. Each attenuator has a restrictor which is secured inside the hose. The restrictors damp pressure pulses from the pump, consequently reducing noise and strain on downstream components. The attenuators are an integral part of the hose and cannot be serviced separately.

FLUID COOLER

- NOTE: Diesel engine vehicles are not fitted with a fluid cooler.

The fluid cooler is located in the return line from the steering gear to the reservoir. The cooler comprises a flexible hose and a solid pipe which connect between the reservoir and the return pipe from the steering gear. The cooler is an integral part of the pipe and cannot be replaced as a separate component.

The cooler is a fabricated aluminum tube, through which the power steering fluid passes. The outer diameter of the cooler tube has aluminum loops attached to it which dissipate heat. Cool air entering the front of the vehicle passes over the cooler and flows through the loops. The loops act as heat exchangers, conducting heat from the fluid as it passes through the tube.

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Power Steering - Power Steering

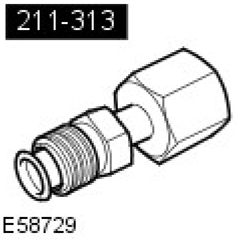
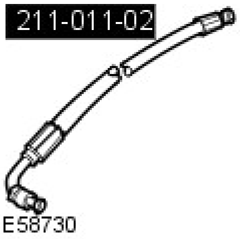
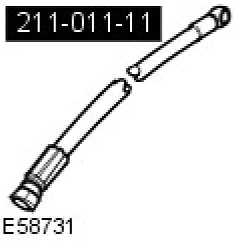
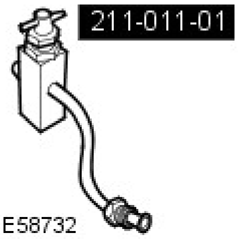
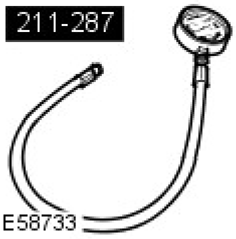
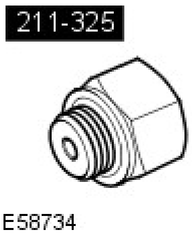
Diagnosis and Testing

For additional information.
REFER to: Steering System (211-00 Steering System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Power Steering - Power Steering Pressure TestV8 4.4L Petrol/V8 S/C 4.2L Petrol

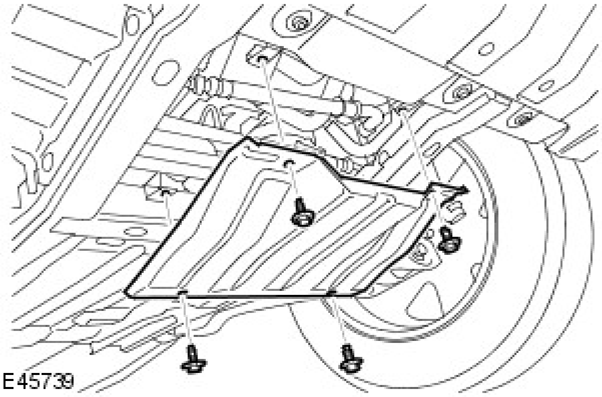
General Procedures

Special Tool(s)	
 211-313 E58729	Adapter, power steering test 211-313 (LRT-57-035A)
 211-011-02 E58730	Hose, power steering test 211-011-02 (LRT-57-002)
 211-011-11 E58731	Hose, power steering test 211-011-11
 211-011-01 E58732	Valve block, power steering test 211-011-01 (LRT-57-001)
 211-287 E58733	Hose and gauge, power steering test 211-287 (LRT-57-005)
 211-325 E58734	Adapter, power steering test 211-325 (LRT-57-042)

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

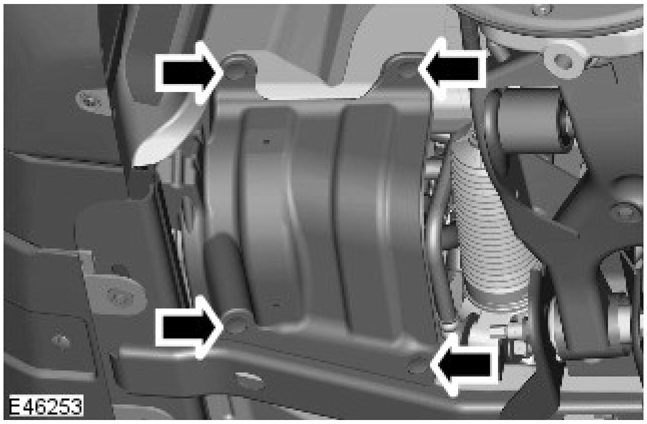
Raise and support the vehicle.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



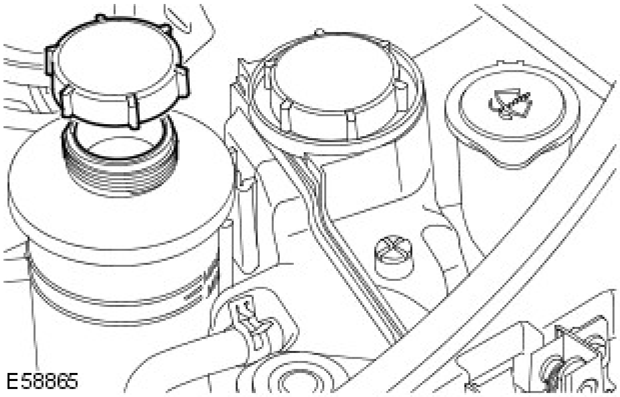
3. Remove the radiator access panel.

- Remove the 4 bolts.



4. Remove the front LH splash shield.

- Remove the 4 clips.



5. Siphon the fluid from the power steering reservoir.

- Remove the filler cap.
- Install the filler cap.

6. Position an absorbent cloth to collect fluid spillage.

7. ⚠CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

• NOTE: Care must be taken to avoid contamination of the drive belt.

Disconnect the power steering high-pressure pipe union.

- Remove the bolt.

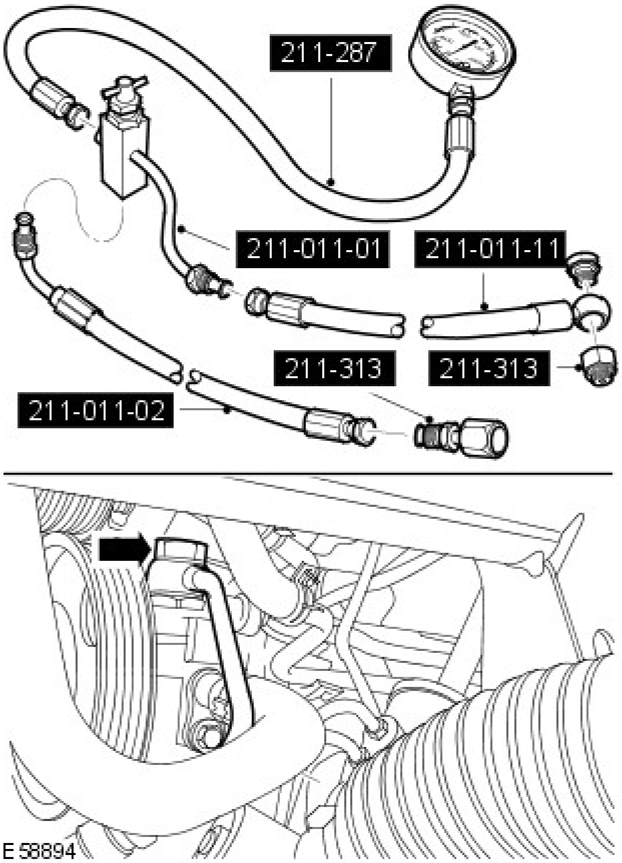
- Remove and discard the 2 sealing washers.
- Position a container to collect the fluid.

8. Install the special tools to the power steering high-pressure port.

- Install the O-ring seal.
- Tie the pressure gauge aside under the hood.

9. Install the special tool to the high-pressure union.

- Install the O-ring seals.
- Connect the special tool line, to the special tool valve block assembly.



10. Refill the power steering reservoir.

- Remove the filler cap.

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

12. NOTE: Ensure the steering components and test equipment are free from leaks.

• NOTE: Maintain the maximum fluid level during the test.

• NOTE: Make sure the steering is in the straight ahead position.

• NOTE: Under no circumstances must the low pressure spigot be removed from the steering pump.

With the test valve open start the engine.

- Start the engine and turn steering fully lock to lock, stop the engine.
- Top up the power steering fluid reservoir.
- Install the reservoir filler cap.

13. For correct power steering pressures, refer to the steering specification section.
For additional information, refer to: Specifications (211-02 Power Steering, Specifications).

14. With the engine at idle, slowly turn the steering wheel and hold on full lock.

- Record the pressure reading.

15. Repeat the above procedure for the other side.

- Record the pressure reading.

16. With the engine at idle, release the steering wheel. The pressure should be, at or below, the pressure specified.

17. Pressure outside this tolerance, indicates a fault.

18. To determine if the fault is in the steering pump or the steering rack, close the test valve for a maximum of 5 seconds.

19. If the pressures recorded fall outside the given values, replace the power steering pump.

20. If the maximum pump pressure is correct, then suspect the power steering rack.

21. On completion of the test stop the engine, disconnect the battery ground cable and siphon the steering fluid from the reservoir.

- Remove the filler cap.
- Install the filler cap.

22. Disassemble the test equipment.

23. Connect the high-pressure line to the power steering pump.

- Clean the component mating faces.
- Install the new O-ring seals.
- Tighten the bolt to 25 Nm (18 lb.ft).

24. Install the front LH splash shield.

- Secure with the clips.

25. Install the radiator access panel.

- Tighten the M6 bolts to 10 Nm (7 lb.ft).
- Tighten the M10 bolts to 45 Nm (33 lb.ft).

26. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

27. Refill and bleed the power steering.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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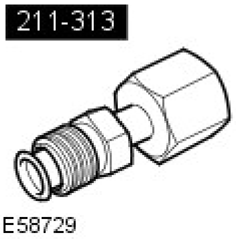
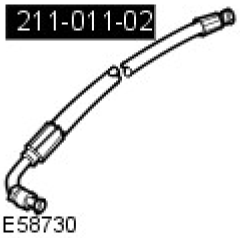
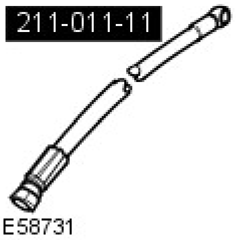
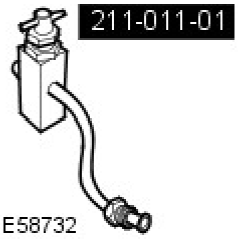
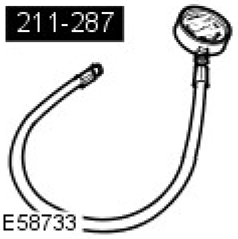
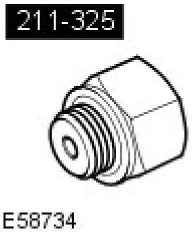
Power Steering - Power Steering Pressure TestTDV6 2.7L Diesel

General Procedures

Special Tool(s)	
 211-313 E58729	Adapter, power steering pressure test 211-313 (LRT-57-035A)
 211-011-02 E58730	Hose, power steering pressure test 211-011-02 (LRT-57-002)
 211-011-11 E58731	Hose, power steering pressure test 211-011-11
 211-011-01 E58732	Valve block, power steering pressure test 211-011-01 (LRT-57-001)
 211-287 E58733	Hose and gauge, power steering pressure test 211-287 (LRT-57-005)
 211-325 E58734	Adapter, power steering pressure test 211-325 (LRT-57-042)

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L

Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Siphon the fluid from the power steering reservoir.

- Remove the filler cap.
- Install the filler cap.

4. Position an absorbent cloth to collect fluid spillage.

5. ⚠CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

• NOTE: Care must be taken to avoid contamination of the drive belt.

Disconnect the power steering high-pressure pipe union.

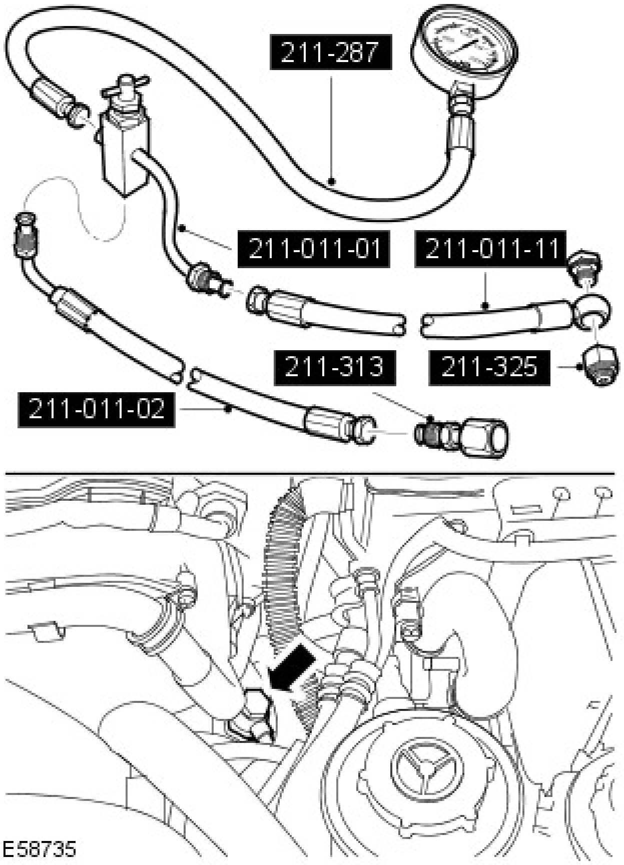
- Remove the bolt.
- Remove and discard the 2 sealing washers.
- Position a container to collect the fluid.

6. Install the special tools to the power steering high-pressure port.

- Install the O-ring seal.
- Tie the pressure gauge aside under the hood.

7. Install the special tool to the high-pressure union.

- Install the O-ring seals.
- Connect the special tool line, to the special tool valve block assembly.



8. Refill the power steering reservoir.

- Remove the filler cap.

9. Connect the battery ground cable.

10. NOTE: Ensure the steering components and test equipment are free from leaks.

• NOTE: Maintain the maximum fluid level during the test.

• NOTE: Make sure the steering is in the straight ahead position.

• NOTE: Under no circumstances must the low pressure spigot be removed from the steering pump.

With the test valve open start the engine.

- Start the engine and turn steering fully lock to lock, stop the engine.
- Top-up the power steering fluid reservoir.
- Install the reservoir filler cap.

11. For correct power steering pressures, refer to the steering specification section.
For additional information, refer to: Specifications (211-02 Power Steering, Specifications).

12. With the engine at idle, slowly turn the steering wheel and hold on full lock.

- Record the pressure reading.

13. Repeat the above procedure for the other side.

- Record the pressure reading.

14. With the engine at idle, release the steering wheel. The pressure should be, at or below, the pressure specified.

1. Pressure outside this tolerance, indicates a fault.

15. To determine if the fault is in the steering pump or the steering rack, close the test valve for a maximum of 5 seconds.

16. If the pressures recorded fall outside the given values, replace the power steering pump.

17. If the maximum pump pressure is correct, then suspect the power steering rack.

18. On completion of the test stop the engine, disconnect the battery ground cable and siphon the steering fluid from the reservoir.

- Remove the filler cap.
- Install the filler cap.

19. Disassemble the test equipment.

20. Connect the high-pressure line to the power steering pump.

- Clean the component mating faces.
- Install the new O-ring seals.
- Tighten the bolt to 25 Nm (18 lb.ft).

21. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

22. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

23. Refill and bleed the power steering.

For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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Power Steering - Steering GearV8 S/C 4.2L Petrol

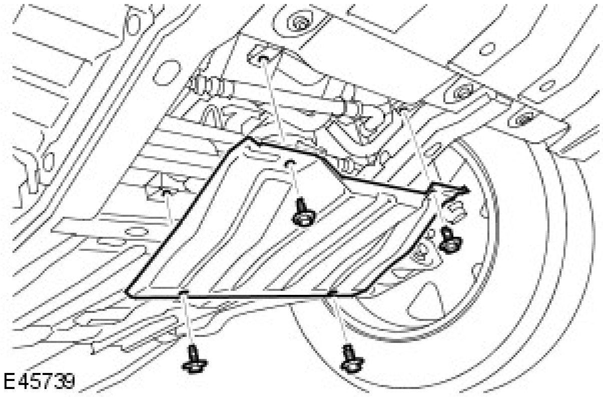
Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

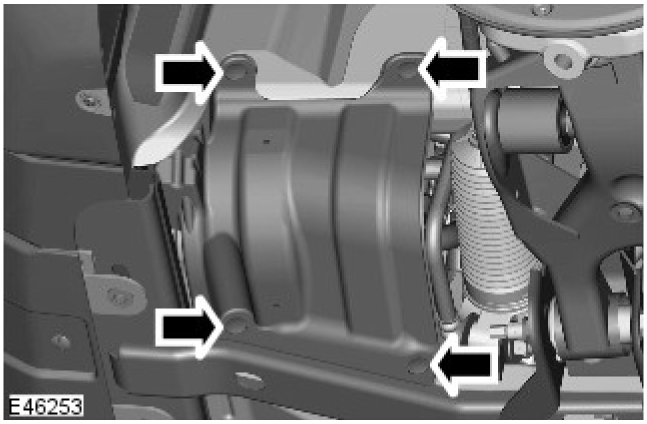
Raise and support the vehicle.

2. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



3. Remove the radiator access panel.

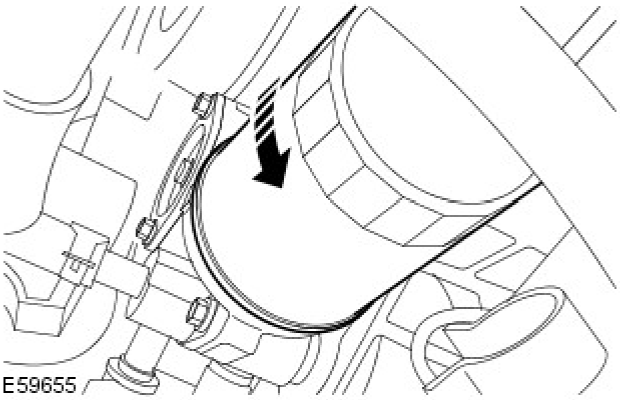
- Remove the 4 bolts.



4. NOTE: Left-hand shown, right-hand similar.

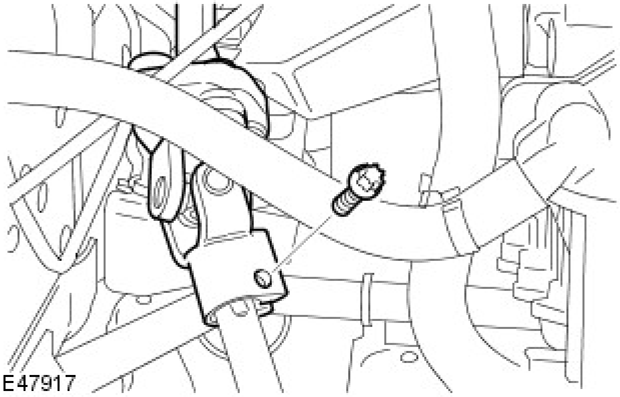
Remove the front RH and LH splash shields.

- Remove the 8 clips.



5. Remove the oil filter.

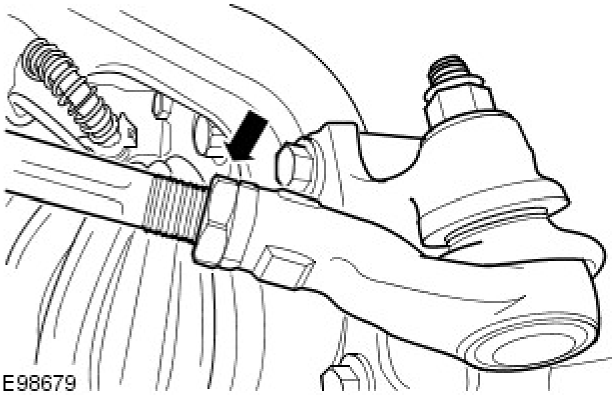
- Position a container to collect the fluid.



6. NOTE: Make sure the steering is in the straight ahead position.

Release the universal joint from the steering gear.

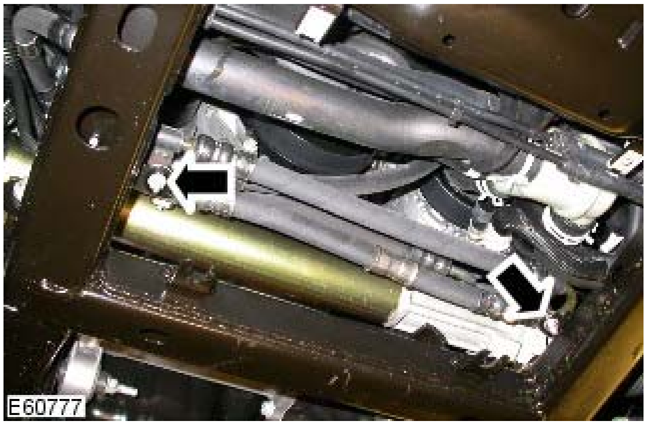
- Remove and discard the bolt.



7. NOTE: LH illustration shown, RH is similar.

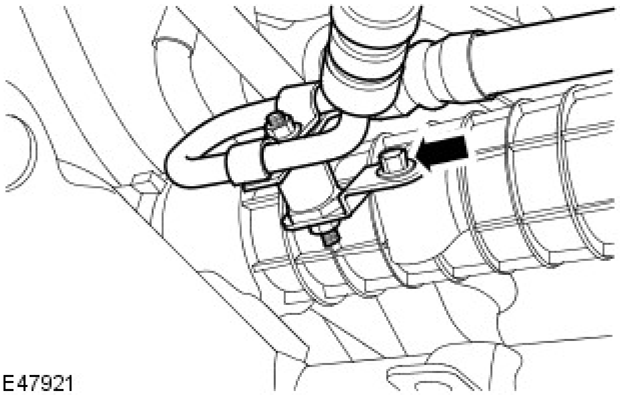
Release both tie-rod end ball joints.

- Loosen the locknut.
- Release both track rods from tie rod ends, note the number of turns for installation.



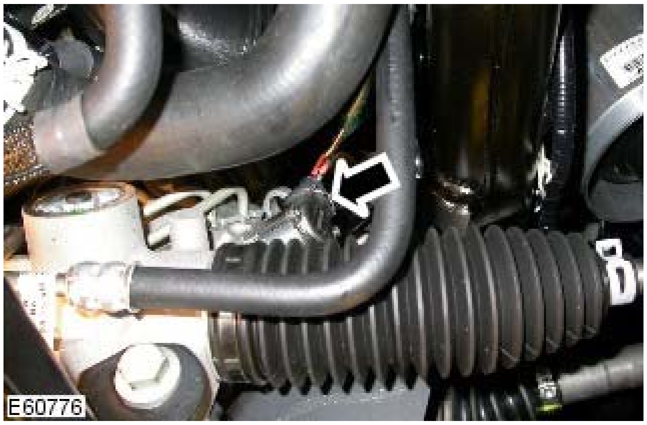
8. Release the dynamic response line supports.

- Remove the 2 nuts.
- Remove the 2 supports.

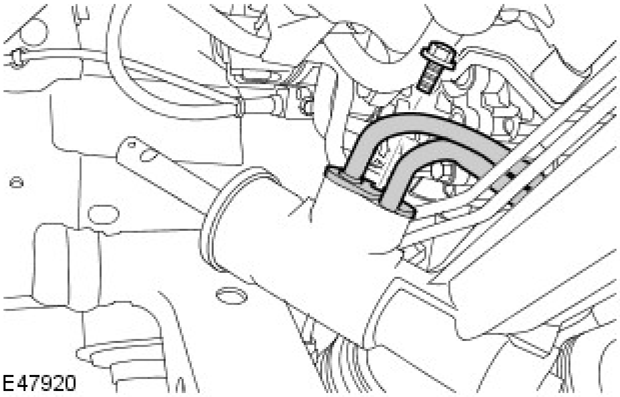


9. Release the power steering line support bracket.

- Remove the nut.


E60776

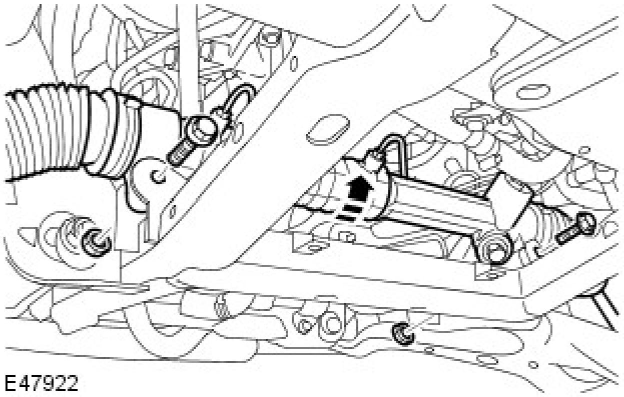
10. Disconnect the steering gear electrical connector.


E47920

11. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the pressure lines from the power steering gear.

- Remove and discard the bolt.
- Allow the fluid to drain into a container.
- Remove and discard the O-ring seal.


E47922

12. Remove the steering gear.

- Remove the 2 bolts and discard the cage nuts.
- Support the engine.
- With assistance, carefully rotate and release the steering gear.

Installation

1. Clean the component mating faces.

2. Install the steering gear.

- Tighten the bolts to 175 Nm (129 lb.ft).

3. Connect the electrical connector.

4. Connect the steering gear pressure lines.

- Clean the component mating faces.
- Install new O-ring seals.
- Tighten the bolt to 22 Nm (16 lb.ft).

5. Install the power steering line support bracket.

- Install the bolt and tighten to 10 Nm (7 lb.ft).

6. Install the dynamic response line supports.

- Tighten the supports to 10 Nm (7 lb.ft).
- Tighten the nuts to 10 Nm (7 lb.ft).

7. Connect the tie-rod end ball joints.

- Attach both tie rods to previously noted positions.
- Tighten the tie-rod locking nut.

8. Connect the universal joint to the steering gear.

- Install new patchlock bolt and tighten to 30 Nm (22 lb.ft).

9. Install the engine oil filter.

- Lubricate the oil filter seal with clean engine oil and tighten to 18 Nm (13 lb.ft).
- Tighten the bolts to 10 Nm (7 lb.ft).

10. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

11. Check and top-up the engine oil.

12. Adjust the front wheel alignment.

13. Install the radiator access panel.

- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).

14. Install the splash shields.

- Install the clips.

15. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

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Power Steering - Steering GearV8 4.4L Petrol

Removal and Installation

Removal

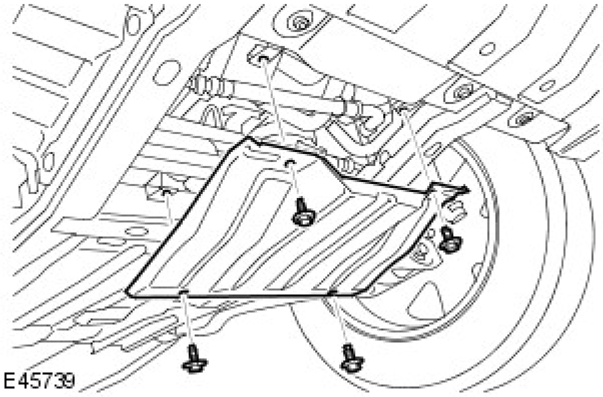
All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

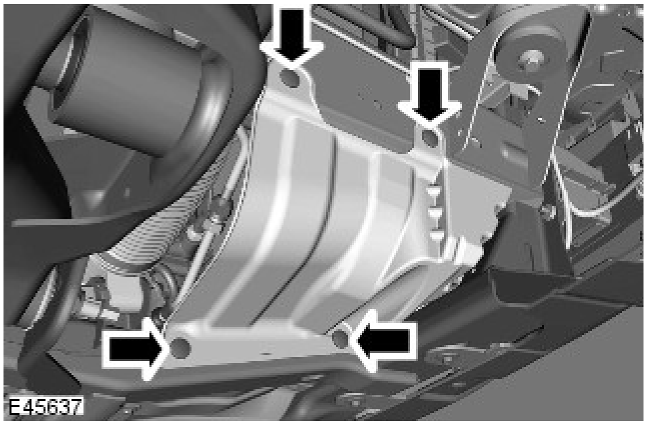
2. Remove the radiator access panel.

- Remove the 4 bolts.



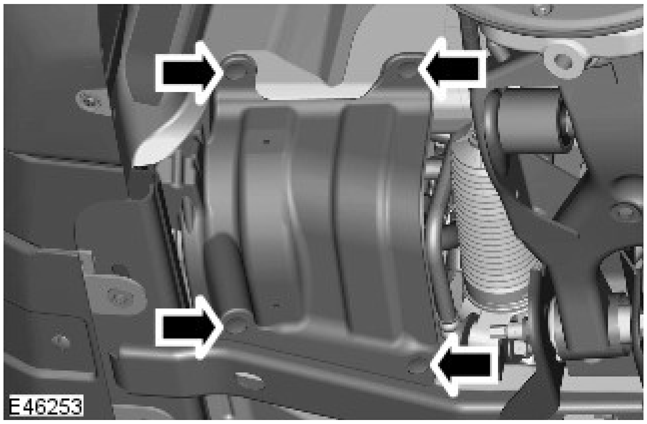
3. Remove the front RH splash shield.

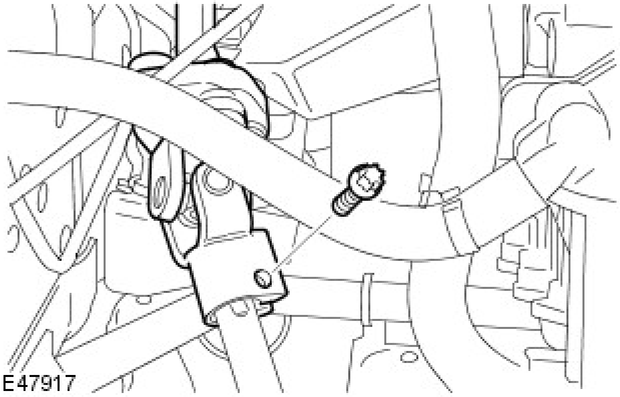
- Remove the 4 clips.



4. Remove the front LH splash shield.

- Remove the 4 clips.





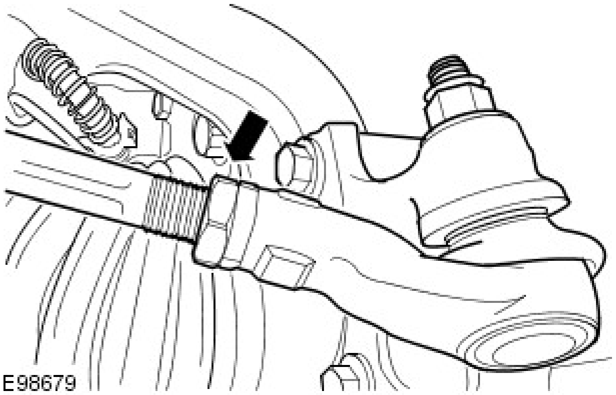
E47917

5. ⚠ CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

• NOTE: Make sure the steering is in the straight ahead position.

Release the universal joint from the steering gear.

- Remove and discard the bolt.

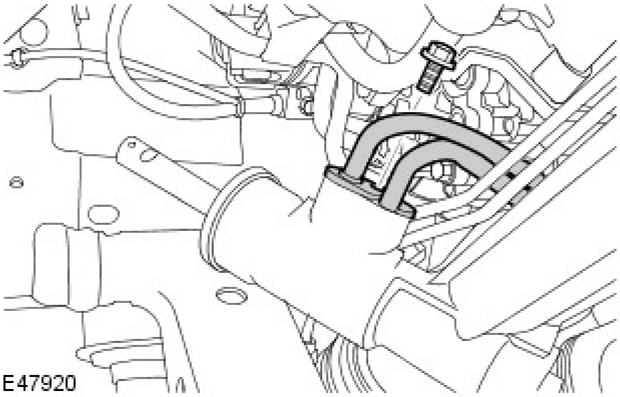


E98679

6. NOTE: LH illustration shown, RH is similar.

Release both tie-rod end ball joints.

- Loosen the locknut.
- Release both track rods from tie rod ends, note the number of turns for installation.

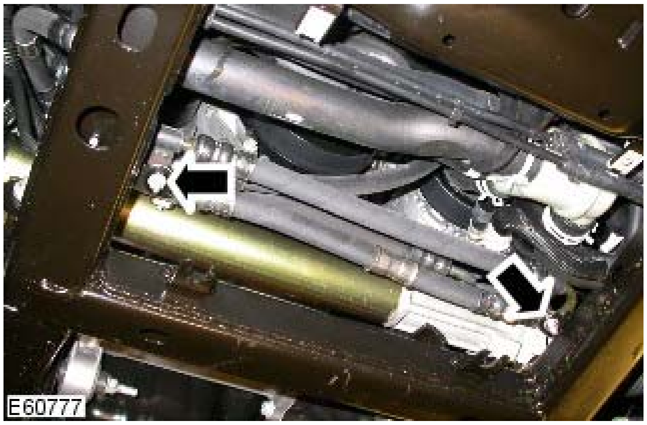


E47920

7. Disconnect the pressure lines from the power steering gear.

- Remove the bolt.
- Position an absorbent cloth to collect fluid spillage.
- Remove and discard the O-ring seals.

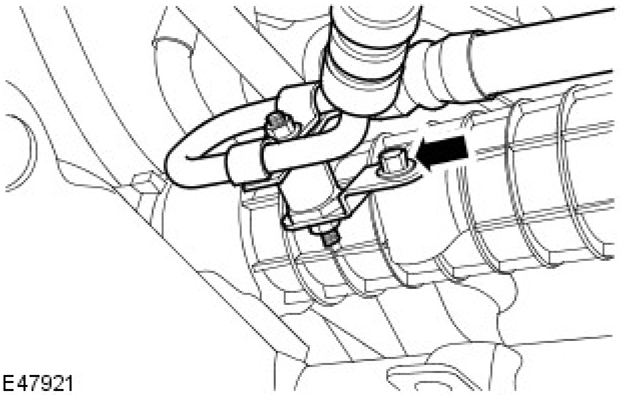
Vehicles with dynamic suspension



8. Release the dynamic response line supports.

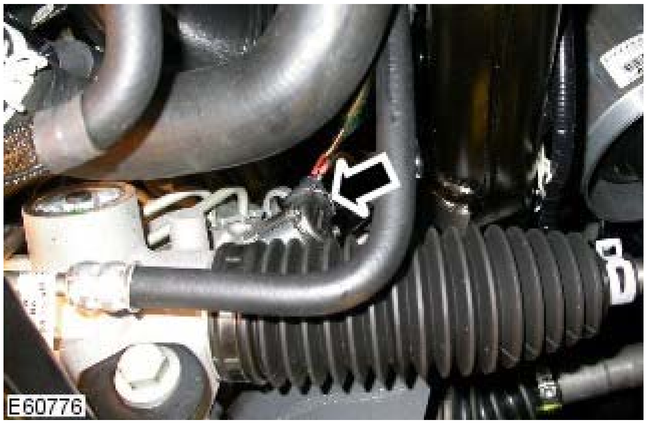
- Remove the 2 nuts.
- Remove the 2 supports.

All vehicles

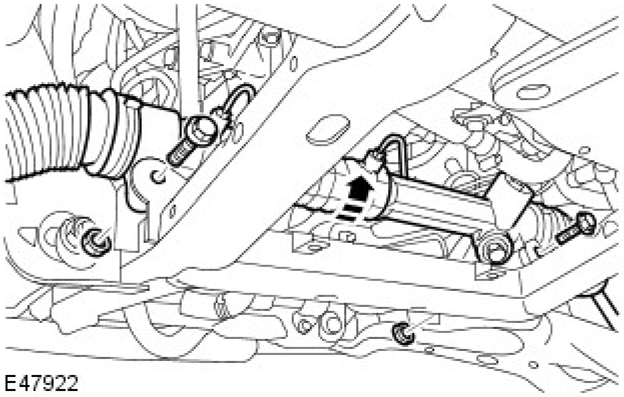


9. Remove the steering gear high-pressure line.

- Remove the bolt.



10. Disconnect the steering gear electrical connector.



E47922

11. Remove the steering gear.

- Remove the 2 bolts and discard the cage nuts.
- Release the steering gear.

Installation

All vehicles

1. Clean the component mating faces.

2. Install the steering gear.

- Tighten the bolts to 175 Nm (129 lb.ft).

3. Connect the electrical connector.

4. NOTE: Do not install the support bracket bolt until the steering gear connections are tightened.

Install the steering gear high pressure line.

5. NOTE: Lubricate the seals with clean power steering fluid.

Connect the steering gear pressure lines.

- Clean the component mating faces.
- Install new O-ring seals.
- Tighten the bolt to 22 Nm (16 lb.ft).

6. Install the power steering line support bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).

Vehicles with dynamic suspension

7. Install the dynamic response line supports.

- Tighten the supports to 10 Nm (7 lb.ft).
- Tighten the nuts to 10 Nm (7 lb.ft).

All vehicles

8. Connect the tie-rod end ball joints.

- Attach both tie rods to previously noted positions.
- Tighten the tie-rod locking nut.

9. Connect the universal joint to the steering gear.

- Install a new patchlock bolt and tighten to 25 Nm (18 lb.ft).

10. Install the radiator access panel.

- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).

11. Install the front LH splash shield.

12. Install the front RH splash shield.

13. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

14. Adjust the front wheel alignment.

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Power Steering - Steering GearTDV6 2.7L Diesel

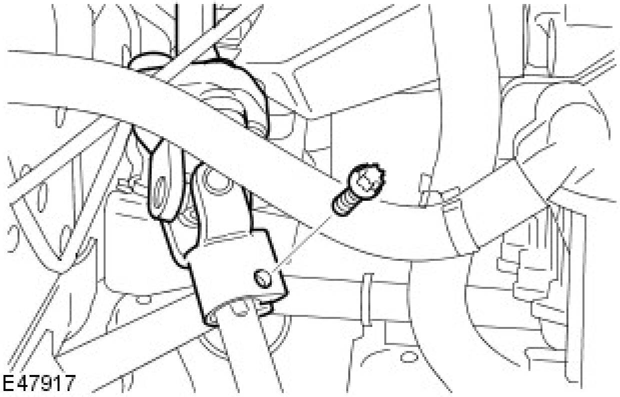
Removal and Installation

Removal

All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

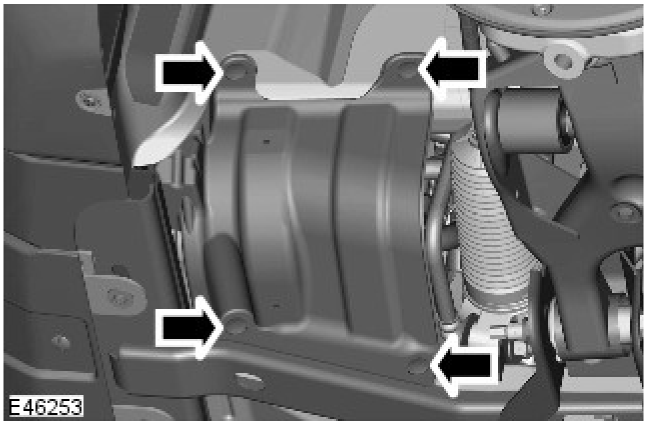
Raise and support the vehicle.



2. NOTE: Make sure the steering is in the straight ahead position.

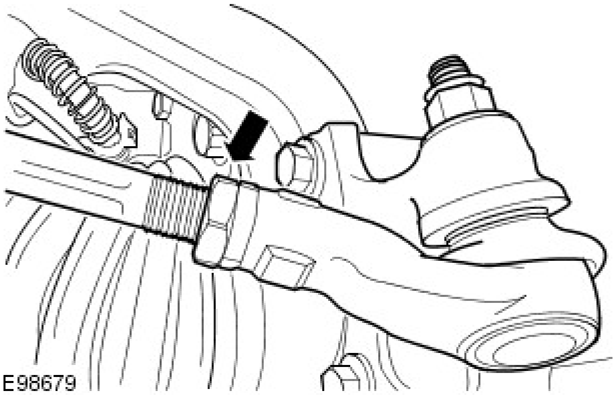
Release the universal joint from the steering gear.

- Remove and discard the bolt.



3. Remove the front RH and LH splash shields.

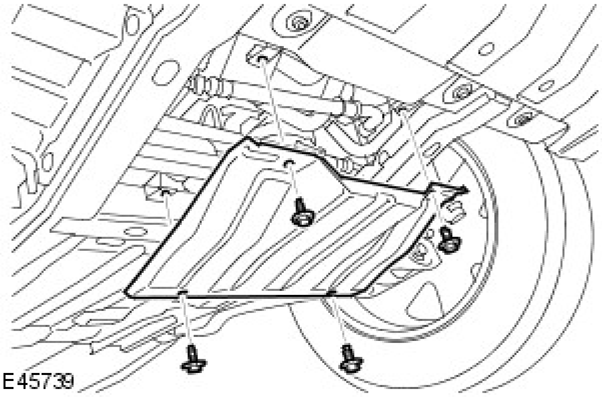
- Remove the 8 clips.



4. NOTE: LH illustration shown, RH is similar.

Release both tie-rod end ball joints.

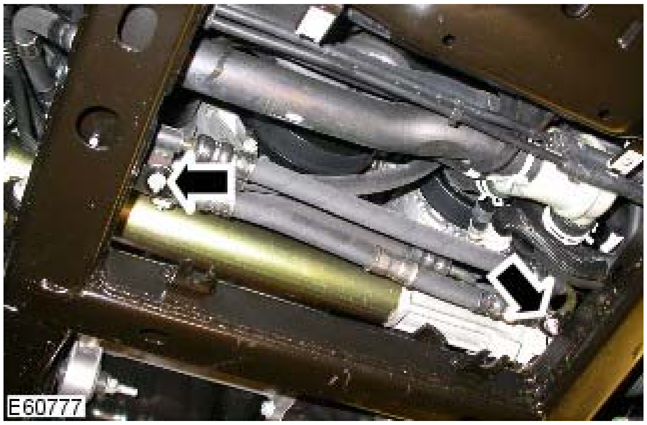
- Loosen the locknut.
- Release both track rods from tie rod ends, note the number of turns for installation.



5. Remove the radiator access panel.

- Remove the 4 bolts.

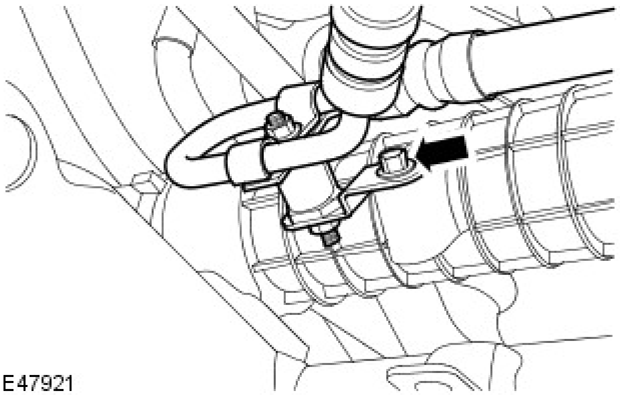
Vehicles with dynamic suspension



6. Release the dynamic response line supports.

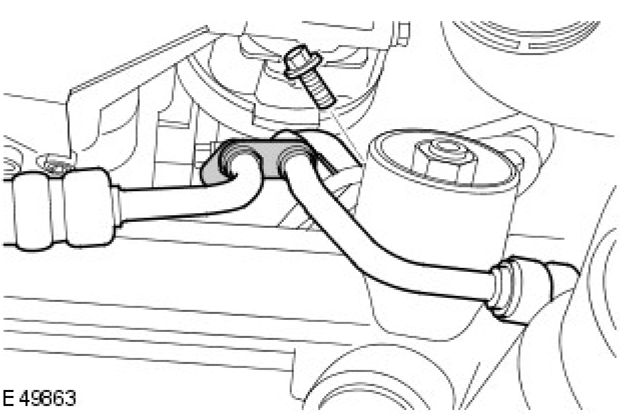
- Remove the 2 nuts.
- Remove the 2 supports.

All vehicles



7. Release the power steering line support mount.

- Remove the bolt.

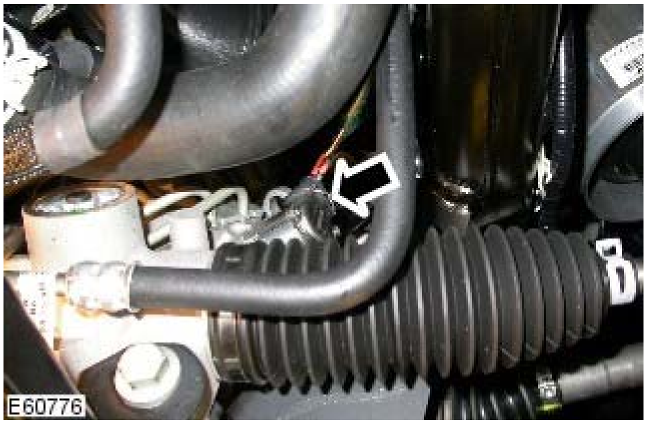


8. ⚠CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

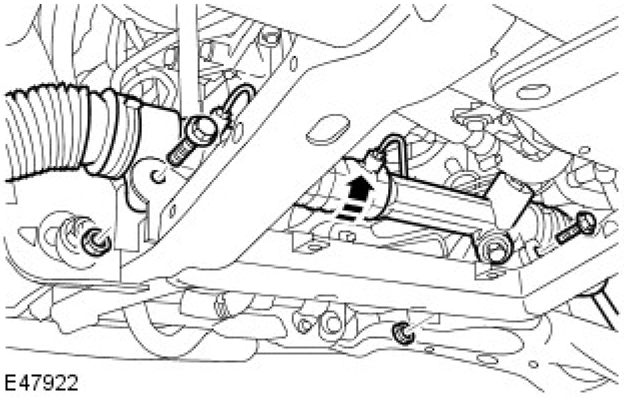
• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the power steering fluid lines.

- Position a container to collect spillage.
- Remove the clip.
- Remove and discard the bolt.
- Discard the O-ring seals.



9. Disconnect the steering gear electrical connector.



10. Remove the steering gear.

- Remove the 2 bolts and discard the nuts.

Installation

All vehicles

1. Clean the component mating faces.

2. Install the steering gear.

- Tighten the bolts to 175 Nm (129 lb.ft).

3. Connect the electrical connector.

4. Install the power steering fluid lines.

- Clean the component mating faces.
- Install new O-ring seals.
- Install the clip.

- Tighten the bolt to 22 Nm (16 lb.ft).

5. Secure the power steering line support mount.

- Install the bolt and tighten to 10 Nm (7 lb.ft).

6. Connect the universal joint to the steering gear.

- Install new patchlock bolt and tighten to 30 Nm (22 lb.ft).

Vehicles with dynamic suspension

7. Install the dynamic response line supports.

- Tighten the supports to 10 Nm (7 lb.ft).
- Tighten the nuts to 10 Nm (7 lb.ft).

All vehicles

8. Install the radiator access panel.

- Tighten the bolts to 10 Nm (7 lb.ft).

All vehicles

9. Connect the tie-rod end ball joints.

- Attach both tie rods to previously noted positions.
- Tighten the tie-rod locking nut.

10. Install the splash shields.

- Install the clips.

11. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

12. Adjust the front wheel alignment.

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Power Steering - Power Steering Fluid ReservoirV8 4.4L Petrol / V8 S/C 4.2L Petrol

Removal and Installation

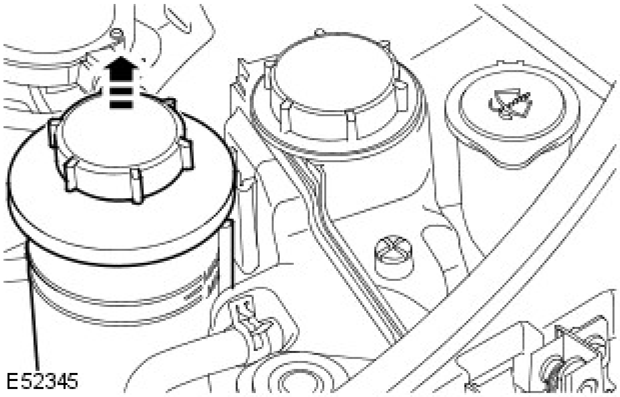
Removal

• NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Siphon the fluid from the power steering reservoir.

3. Release the power steering fluid reservoir from the bracket.

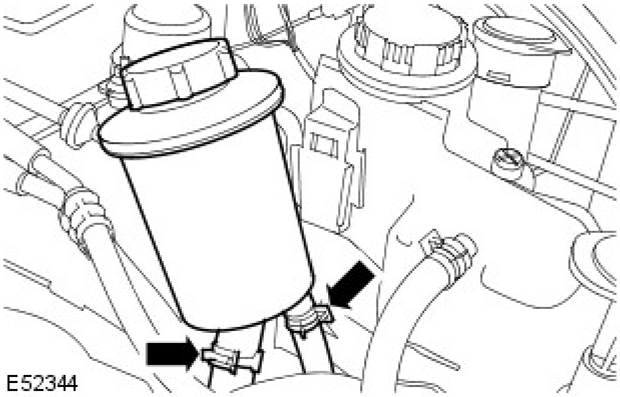


4. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the power steering fluid reservoir.

- Position an absorbent cloth to collect fluid spillage.
- Release the hose clips and disconnect the hoses.



Installation

1. To install, reverse the removal procedure.

2. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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Power Steering - Power Steering Fluid ReservoirTDV8 3.6L Diesel

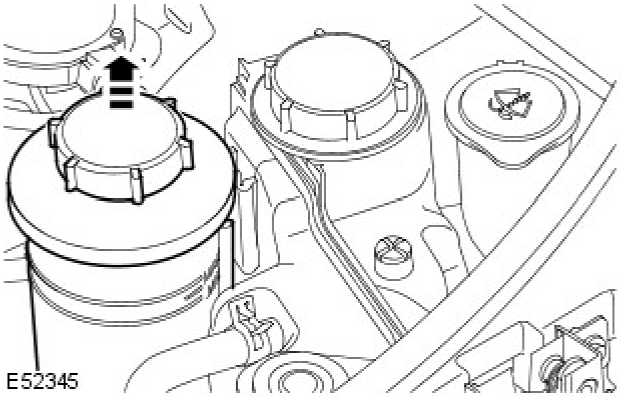
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Siphon the fluid from the power steering reservoir.

3. Release the power steering fluid reservoir from the coolant expansion tank.

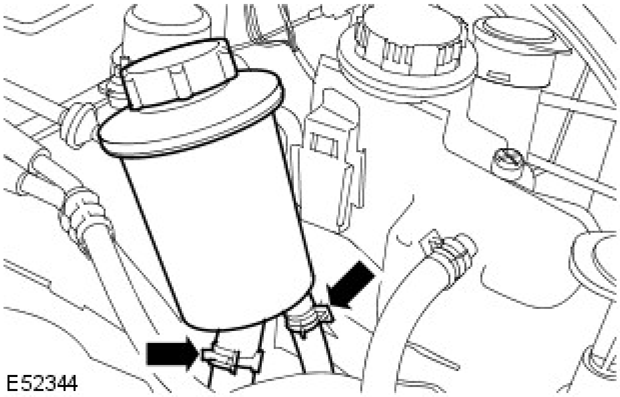


4. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the power steering fluid reservoir.

- Position an absorbent cloth to collect fluid spillage.
- Release the hose clips and disconnect the hoses.



Installation

1. NOTE: Remove and discard the blanking caps.

To install, reverse the removal procedure.

2. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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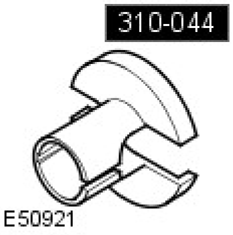
Power Steering - Power Steering Fluid CoolerV8 S/C 4.2L Petrol

Removal and Installation

Special Tool(s)	
	Spring lock decoupler 310-044

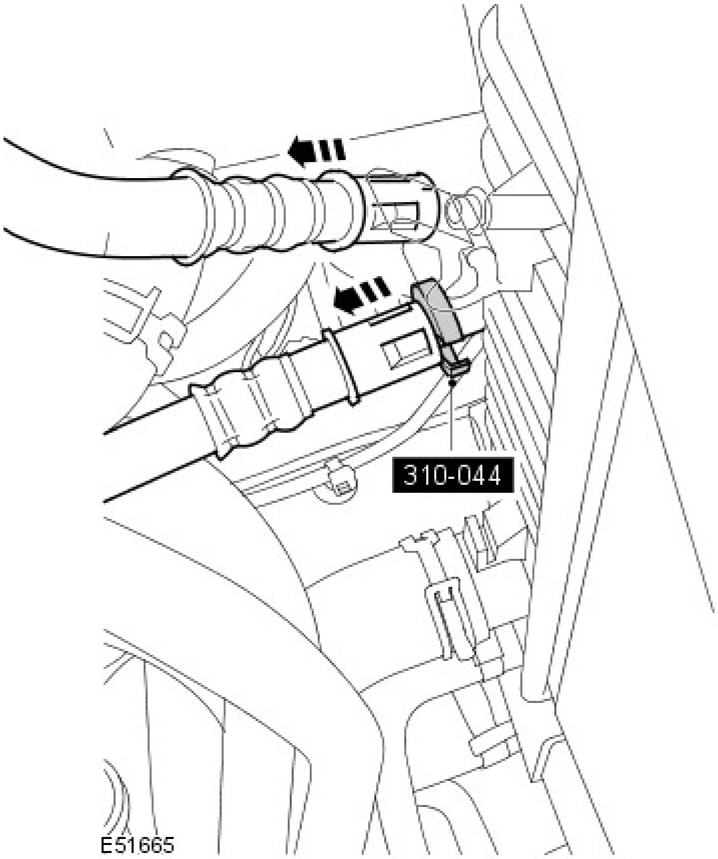
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the front radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

3. Siphon the fluid from the power steering reservoir.

4. Remove the coolant expansion tank.
For additional information, refer to: Coolant Expansion Tank (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).



5. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

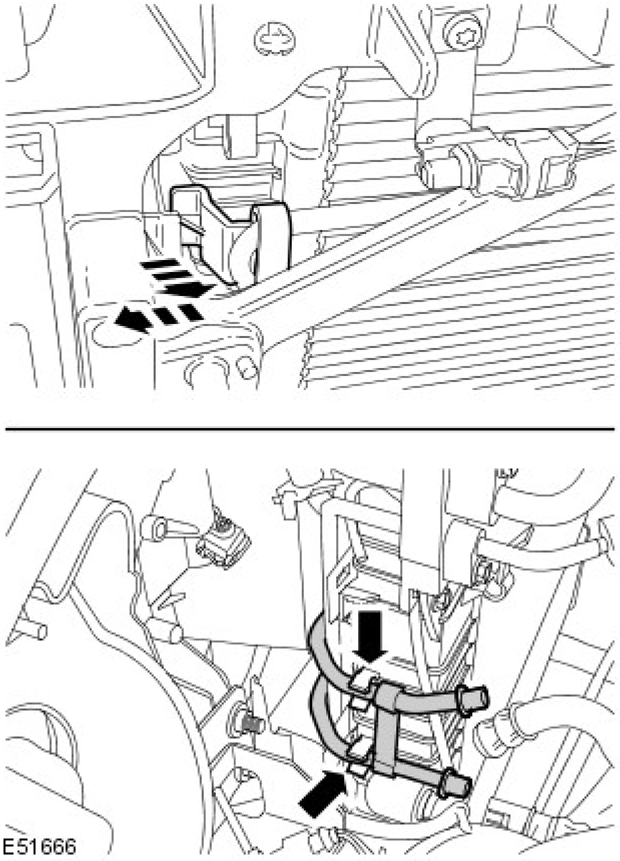
• NOTE: Some fluid spillage is inevitable during this operation.

Using the special tool, disconnect the cooler line.

- Position an absorbent cloth to collect fluid spillage.

6. Remove the power steering fluid cooler.

- Release the 3 clips.



Installation

1. Install the power steering fluid cooler.

- Install the clips.

2. Install the power steering fluid lines.

- Clean the component mating faces.

3. Install the coolant expansion tank.
For additional information, refer to: Coolant Expansion Tank (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

4. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

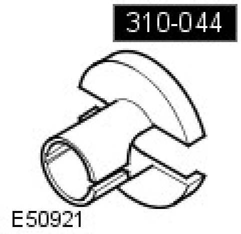
5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

6. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

Published: 11-May-2011

Power Steering - Power Steering Fluid CoolerV8 4.4L Petrol

Removal and Installation

Special Tool(s)	
	Spring lock decoupler 310-044

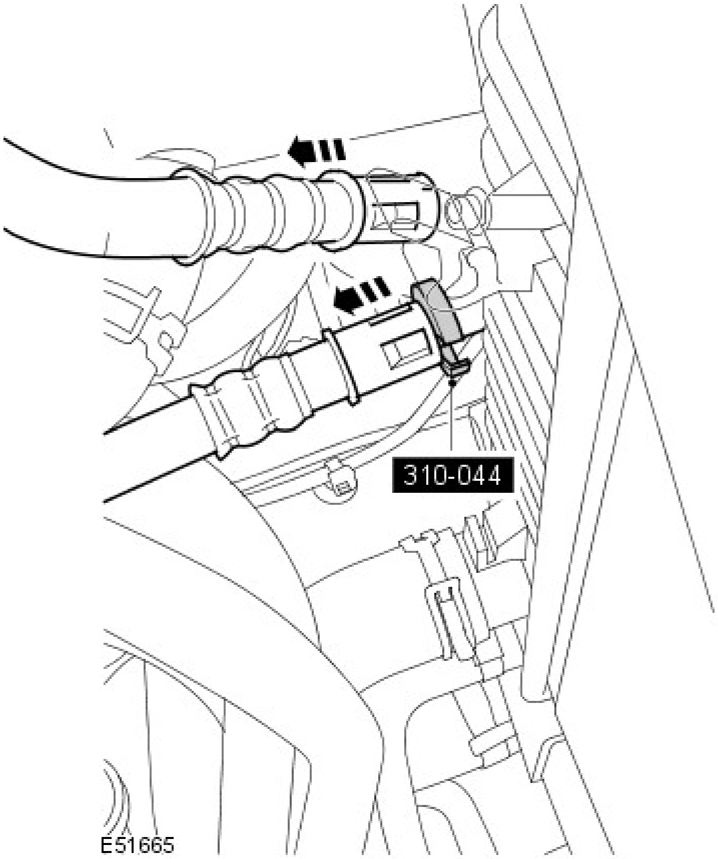
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the front radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

3. Siphon the fluid from the power steering reservoir.

4. Remove the coolant expansion tank.
For additional information, refer to: Coolant Expansion Tank (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

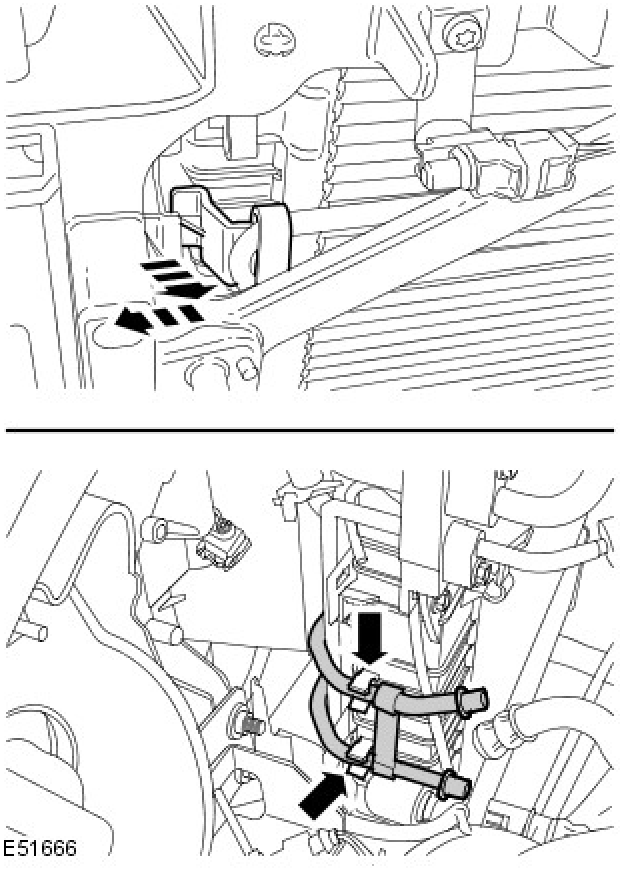


5. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Using the special tool, disconnect the cooler line.

- Position an absorbent cloth to collect fluid spillage.



6. Remove the power steering fluid cooler.

- Release the 3 clips.

Installation

1. Install the power steering fluid cooler.

- Install the clips.

2. Install the power steering fluid lines.

- Clean the component mating faces.

3. Install the coolant expansion tank.
For additional information, refer to: Coolant Expansion Tank (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

4. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

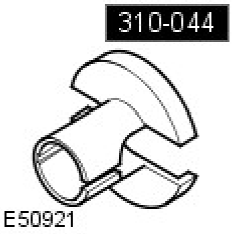
5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

6. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

Published: 11-May-2011

Power Steering - Power Steering Fluid CoolerTDV6 2.7L Diesel

Removal and Installation

Special Tool(s)	
 310-044 E50921	Spring lock decoupler 310-044

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

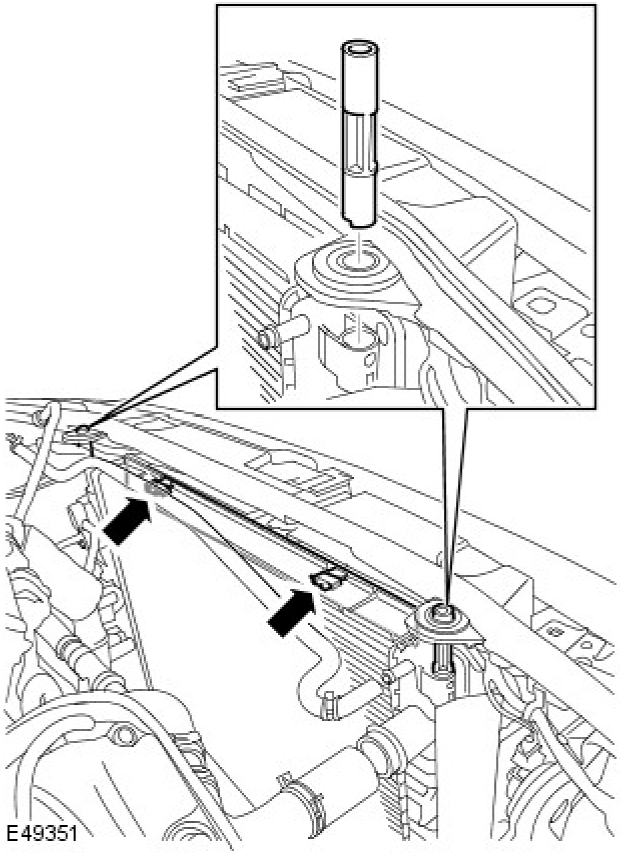
2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the cooling fan lower shroud.
   For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the radiator grille.
   For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

5. Remove the radiator securing pegs.

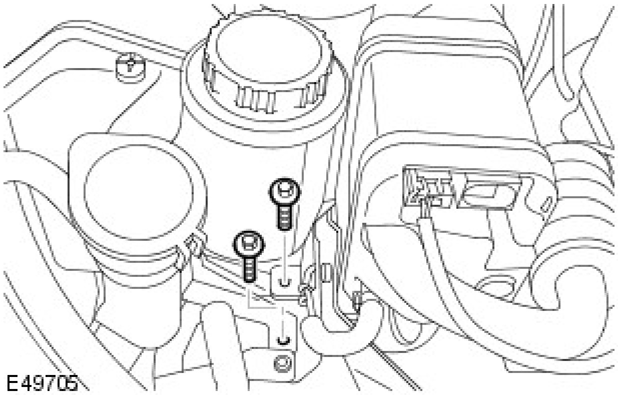
6. Remove the radiator upper deflector.



- Release the 2 clips.

7. Release the coolant expansion tank.

- Remove the 2 bolts.



E49705

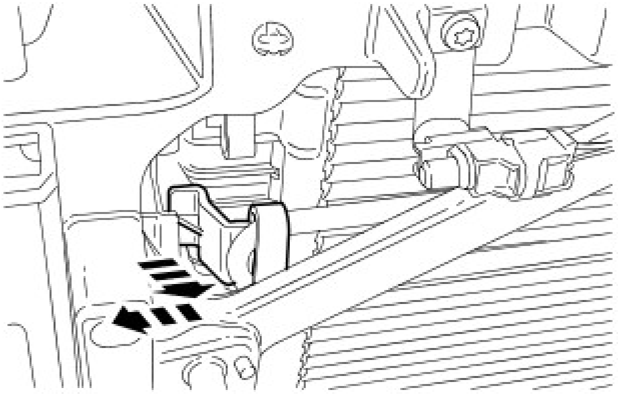
8. Tie the engine air intake duct towards the engine.

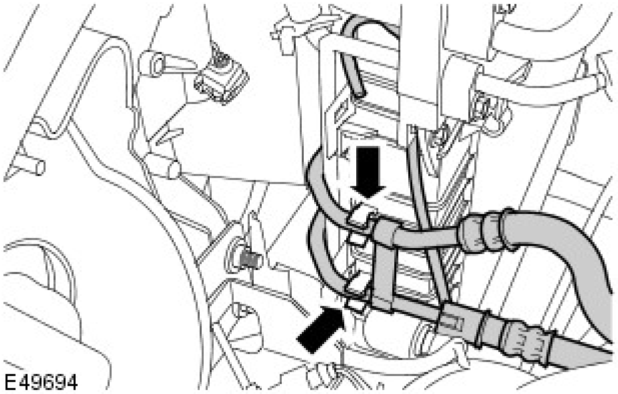
9. Tie the fuel fired booster heater coolant lines towards the engine.

10. NOTE: Note the position of the differential breather line.

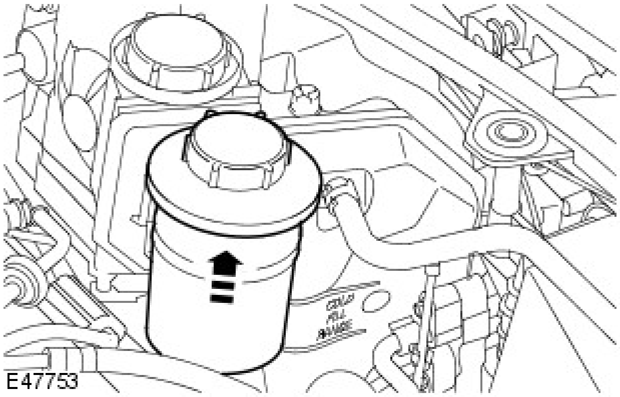
Release the power steering fluid cooler.

- Release it from 3 clips.



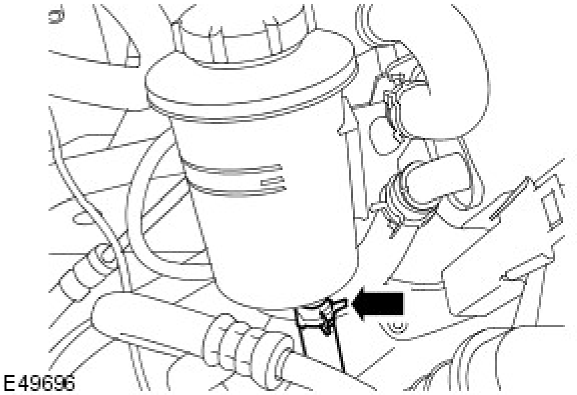


E49694



E47753

11. Release the power steering fluid reservoir.



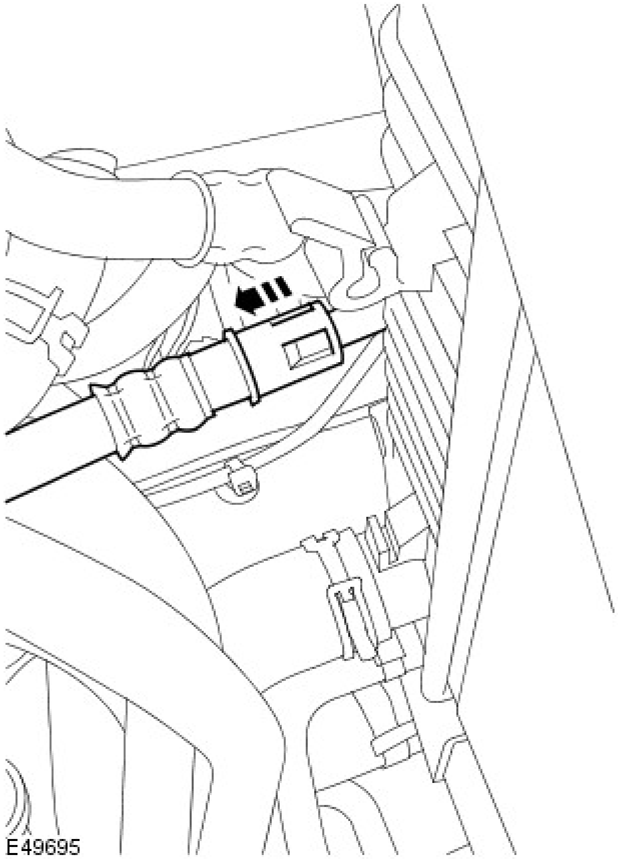
E49696

12. CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the power steering cooler line from the fluid reservoir.

- Release the clip.
- Allow the fluid to drain into a container.



E49695

13. CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the power steering fluid cooler.

- Using the special tool, release the clip.

Installation

1. Install the power steering fluid cooler.
   - Clean the component mating faces.
   - Secure the clip.
2. Connect the power steering cooler line to the fluid reservoir.
   - Clean the component mating faces.
   - Secure with the clip.
3. Install the power steering fluid reservoir.
4. Position the front differential breather line.
5. Secure the power steering fluid cooler line.
   - Secure in the 3 clips.
6. Secure the coolant expansion tank.
   - Tighten the 2 bolts to 10 Nm (7 lb.ft).
7. Install the radiator upper deflector.
8. Install the radiator securing pegs.
9. Connect the A/C condenser refrigerant lines.
   - Clean the component mating faces.
   - Install new O-ring seals.
   - Tighten the bolts to 25 Nm (18 lb.ft).
10. Install the radiator grille.
    For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).
11. Install the cooling fan lower shroud.
    For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).
12. Connect the battery ground cable.
    For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
13. Fill and bleed the power steering system.
    For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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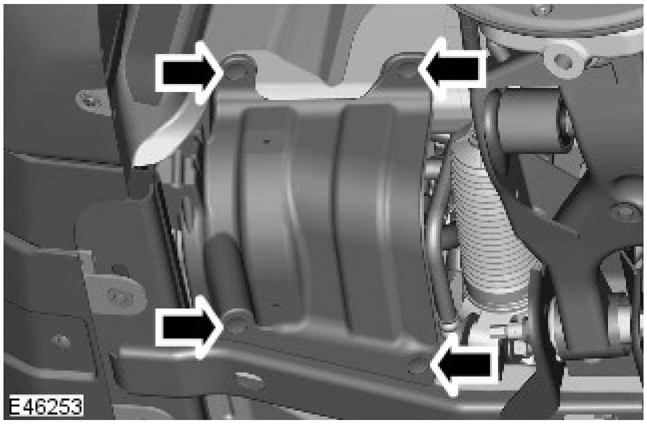
Power Steering - Power Steering PumpV8 S/C 4.2L Petrol

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).



3. Remove the splash shield.

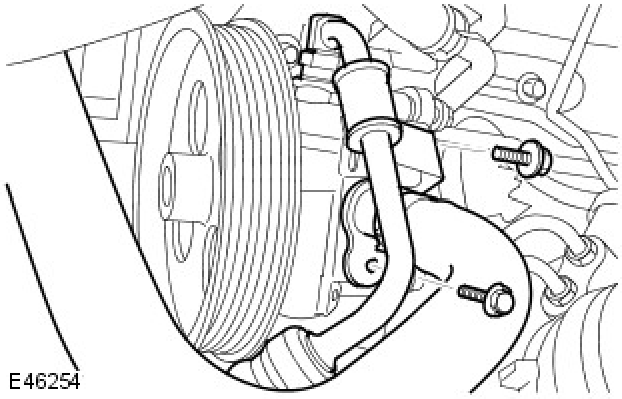
- Remove the 4 clips from the splash shield.

4. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the low pressure line.

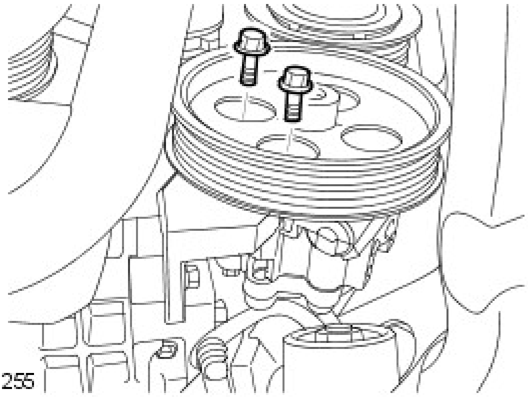
- Remove the power steering line bolt.
- Allow the fluid to drain into a container.
- Remove and discard the O-ring seal.

5. Disconnect the high pressure line.



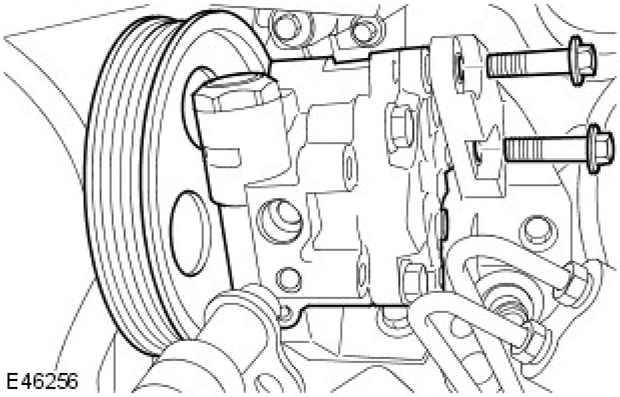
6. Release the power steering line support bracket.

- Remove the bolt.



7. Remove the power steering pump front retaining bolts.

- Remove the 2 bolts.



8. Remove the power steering pump rear retaining bolts.

- Remove the 2 bolts.

9. Remove the power steering pump.

Installation

1. Position the power steering pump and install the front retaining bolts.

- Tighten the bolts to 25 Nm (18 lb.ft).

2. Install the power steering pump rear retaining bolts.

- Tighten the bolts to 25 Nm (18 lb.ft).

3. Connect the high-pressure power steering line to the power steering pump.

- Install a new O-ring seal.
- Tighten the union to 25 Nm (18 lb.ft).

4. Connect the low pressure line to the power steering pump.

5. Install the power steering line support bracket.

6. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

7. Connect the battery ground cable.

8. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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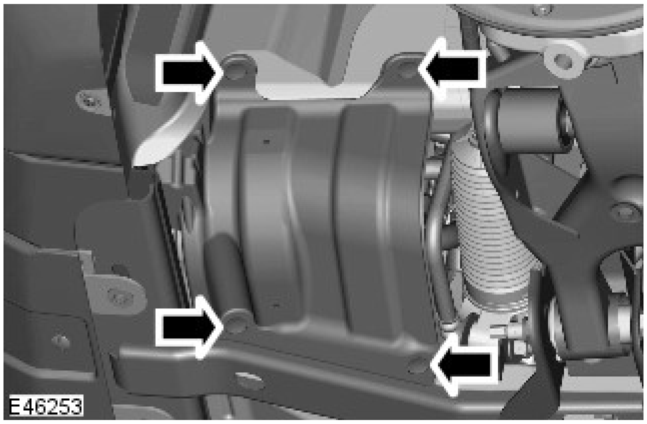
Power Steering - Power Steering PumpV8 4.4L Petrol

Removal and Installation

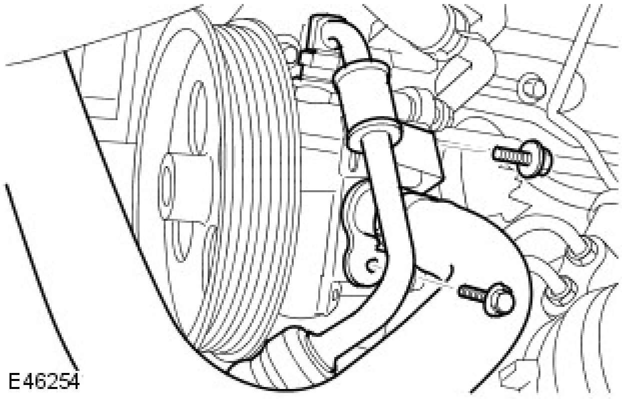
Removal

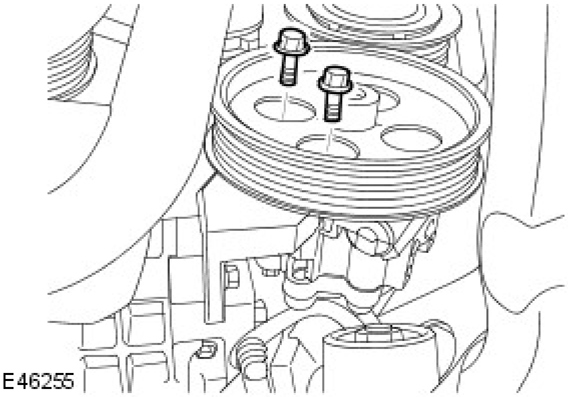
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).
3. Remove the splash shield.
   - Remove the 4 clips.



4. ⚠ CAUTION: Always plug any open connections to prevent contamination.

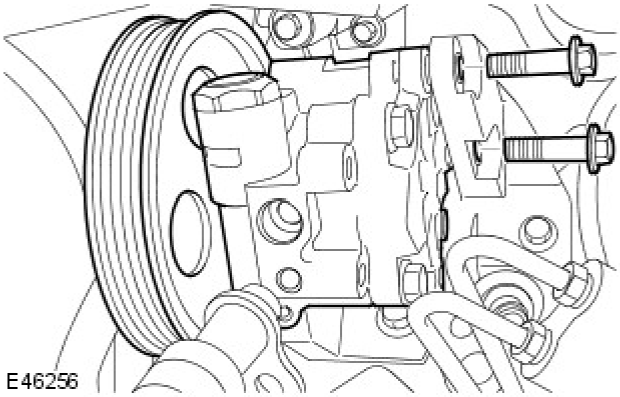
   Disconnect the low pressure line.
   - Remove the power steering line bolt.
   - Allow the fluid to drain into a container.
   - Remove and discard the O-ring seal.
5. Disconnect the high pressure line at the steering pump union.
   - Remove and discard the O-ring seal.
6. Release the power steering line support bracket.
   - Remove the bolt.





7. Remove the power steering pump front retaining bolts.

- Remove the 2 bolts.



8. Remove the power steering pump rear retaining bolts.

- Remove the 2 bolts.

9. Remove the power steering pump.

Installation

1. Position the power steering pump and install the front retaining bolts.

- Tighten the bolts to 25 Nm (18 lb.ft).

2. Install the power steering pump rear retaining bolts.

- Tighten the bolts to 25 Nm (18 lb.ft).

3. Connect the high pressure power steering line to the power steering pump.

- Install a new O-ring seal.
- Tighten the union to 25 Nm (18 lb.ft).

4. Connect the low pressure line to the power steering pump.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolt to 25 Nm (18 lb.ft).

5. Install the power steering line support bracket.

6. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

7. Install the splash shield.

8. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

9. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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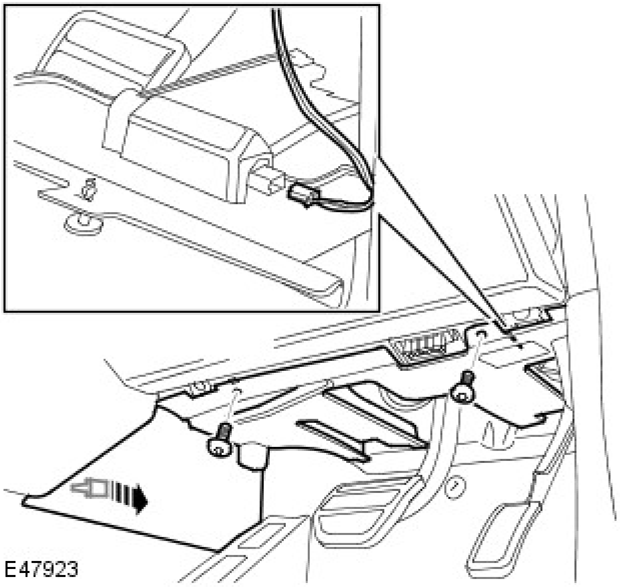
Power Steering - Steering Angle Sensor

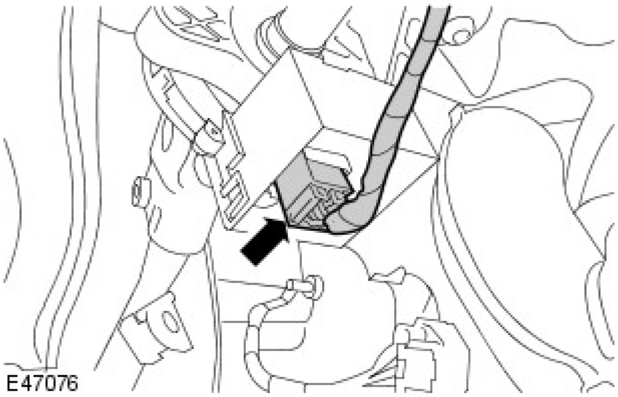
Removal and Installation

Removal

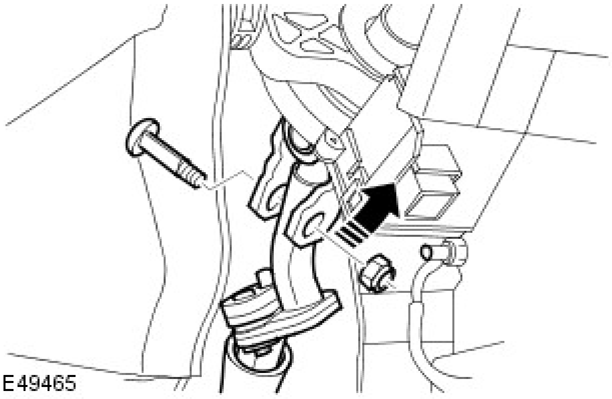
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the driver side closing trim panel.
   - Release the clip.
   - Remove the 2 screws.
   - Disconnect the electrical connector.

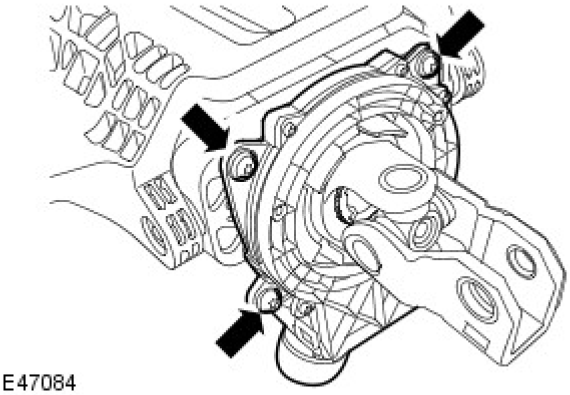


3. Disconnect the steering angle sensor electrical connector.



4. Disconnect the steering column intermediate shaft from the steering column.
   - Note the fitted position.
   - Remove the special bolt and discard the nut.





5. Remove the steering angle sensor.
   - Remove the 3 Torx screws.

Installation

1. Install the steering angle sensor.
   - Tighten the Torx screws to 3 Nm (2 lb.ft).
2. Connect the steering column intermediate shaft.
   - Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).
3. Connect the steering angle sensor electrical connector.
4. Install the closing trim panel.
   - Connect the electrical connector.
   - Secure the clip.
   - Tighten the screws.
5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
6. Initiate a new steering angle sensor using T4.

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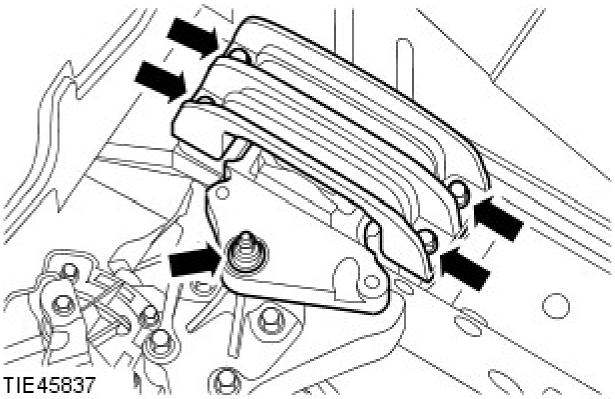
Power Steering - Power Steering Pump to Steering Gear Pressure Line

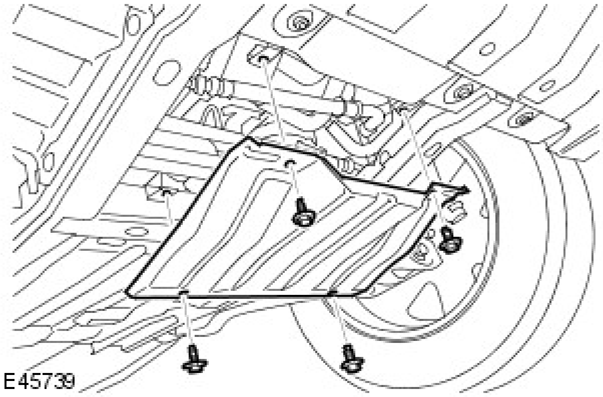
Removal and Installation

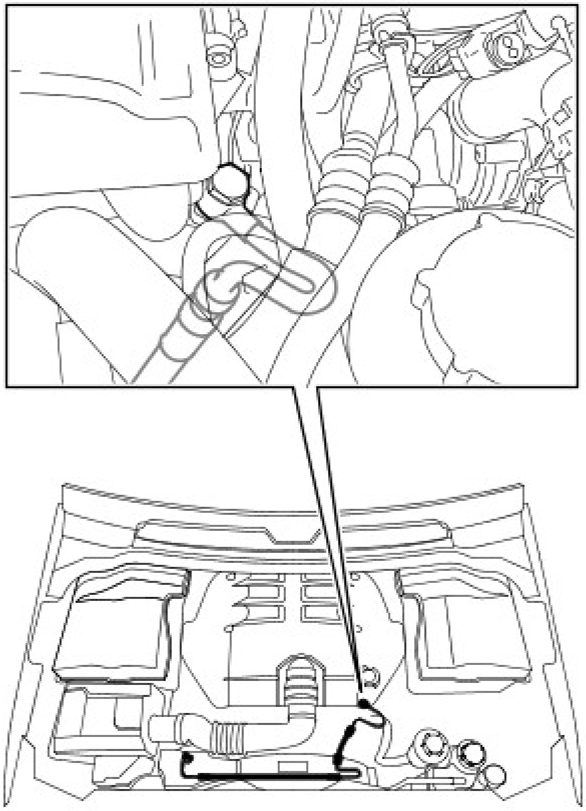
Removal

1. Raise and support the vehicle.
2. Remove the front RH splash shield.
   - Remove the 4 clips.



3. Remove the front LH fender splash shield.
   For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).
4. Remove the radiator access panel.
   - Remove the 4 bolts.



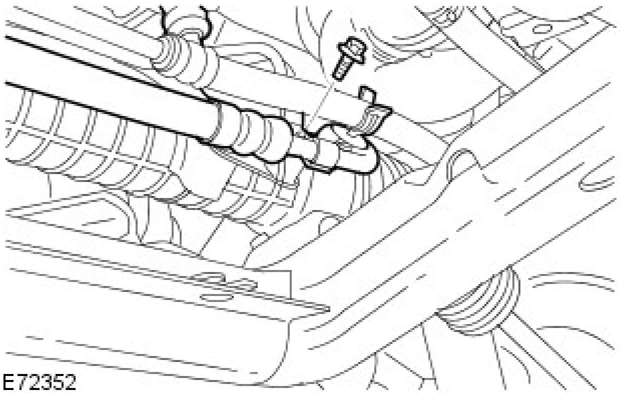


E72350

5. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the high pressure line from the power steering pump.

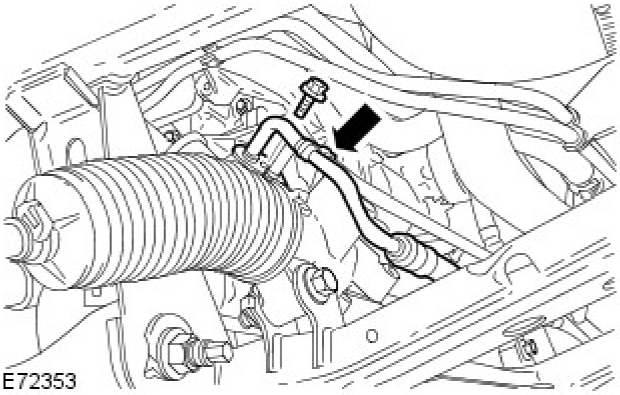
- Loosen and release the power steering pump line.
- Allow the fluid to drain into a container.
- Remove and discard the 2 sealing washers.



E72352

6. Release the power steering line support bracket.

- Remove the nut.
- Release the hose.



E72353

7. Disconnect the high pressure line from the power steering gear.

- Remove the bolt.
- Release the power steering gear line.
- Remove and discard the O-ring seal.

8. Remove the steering gear high-pressure line.

Installation

1. Install the steering gear high-pressure line.
2. Connect the high-pressure line to the power steering gear.
    - Install the O-ring seal.
    - Attach the power steering gear high-pressure line.
    - Tighten the bolt to 25 Nm (18 lb.ft).
3. Install the power steering line support bracket.
    - Tighten the nut to 10 Nm (7 lb.ft).
    - Secure the hose with the clip.
4. ⚠ CAUTION: Always plug any open connections to prevent contamination.

    Connect the high-pressure line to the power steering pump.
    - Install new sealing washers.
    - Connect the power steering pump high-pressure line.
5. Install the radiator access panel.
    - Tighten the bolts to 10 Nm (7 lb.ft).
6. Install the front LH fender splash shield.
    For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).
7. Install the front RH splash shield.
    - Secure with the clips.
8. Fill and bleed the power steering system.
    For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

Power Steering - Power Steering PumpTDV8 3.6L Diesel

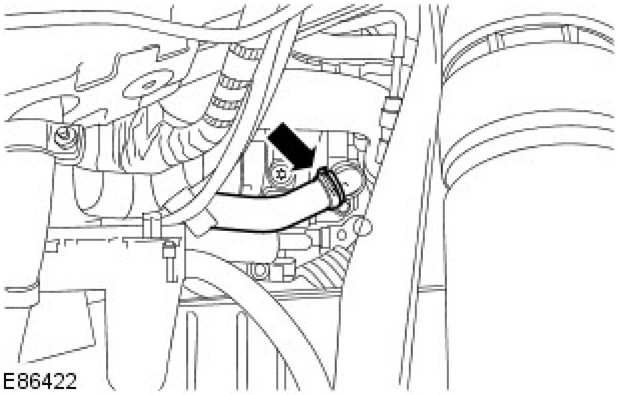
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

3. Remove the LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



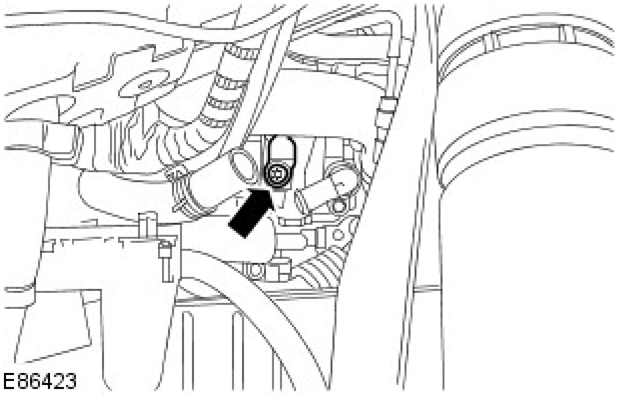
4. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Make sure that the area around the component is clean and free of foreign material.

Disconnect the power steering pump supply hose.

- Release the clip.
- Position a container to collect the fluid.



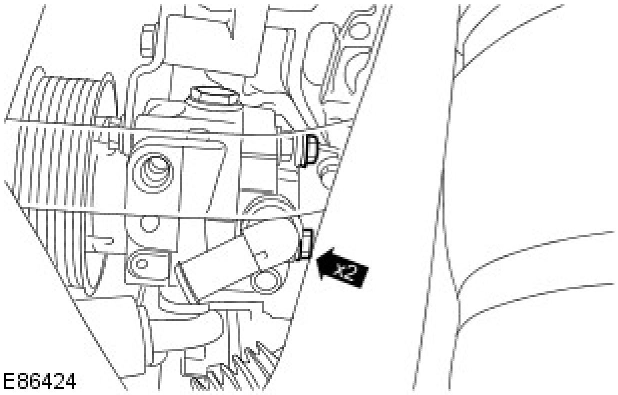
5. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Make sure that the area around the component is clean and free of foreign material.

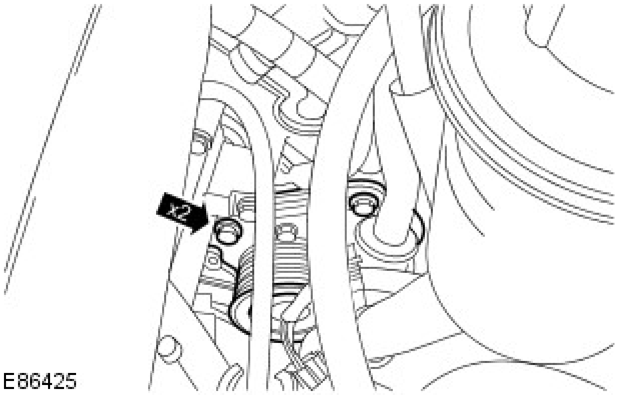
Disconnect the power steering pump high-pressure line.

- Remove the bolt.
- Remove and discard the O-ring seal.



6. Remove the 2 power steering pump rear bolts.

7. Remove the cooling fan belt lower idler pulley.
For additional information, refer to: Cooling Fan Belt Idler Pulley (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).



8. Remove the power steering pump and mounting bracket.

- Remove the remaining 2 bolts.

Installation

1. Install the power steering pump and mounting bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).

2. Install the cooling fan belt lower idler pulley.
For additional information, refer to: Cooling Fan Belt Idler Pulley (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

3. Tighten the power steering pump rear bolts to 23 Nm (17 lb.ft).

4. NOTE: Remove and discard the blanking caps.

Connect the power steering pump high-pressure line.

- Install a new O-ring seal.
- Tighten the bolt to 25 Nm (18 lb.ft).

5. NOTE: Remove and discard the blanking caps.

Connect the power steering pump supply hose.

- Secure with the clip.

6. Install the LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

8. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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Power Steering - Steering GearTDV8 3.6L Diesel, RHD AWD

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

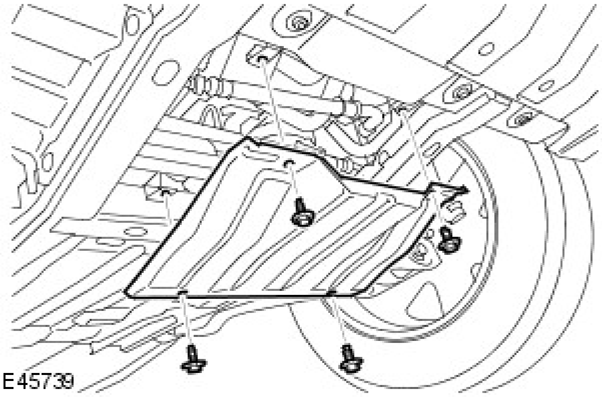
2. ⚠ CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

Center the steering wheel.

- Remove the ignition key.

3. Remove the radiator splash shield.

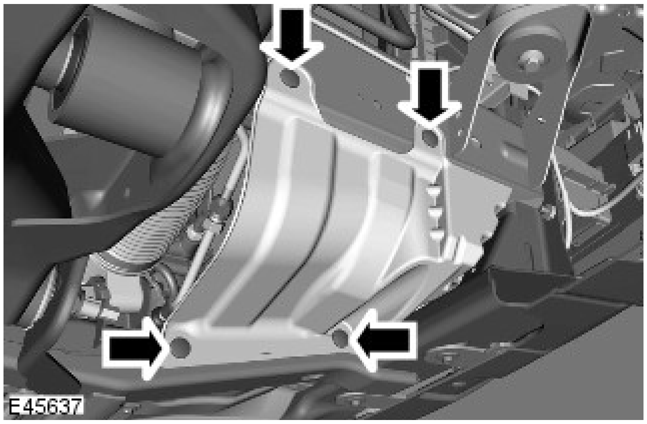
- Remove the 4 bolts.

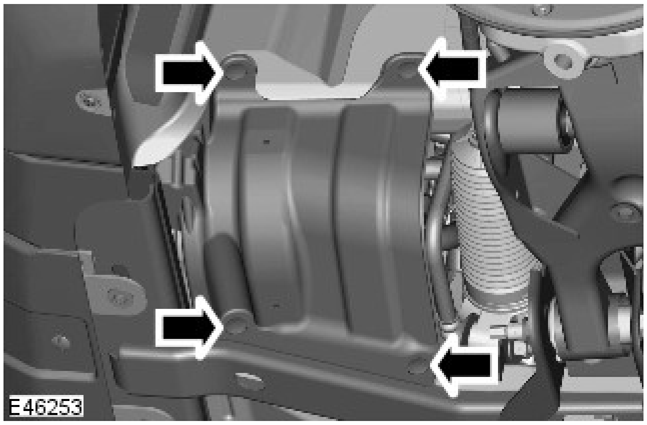


4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Remove the front RH splash shield.

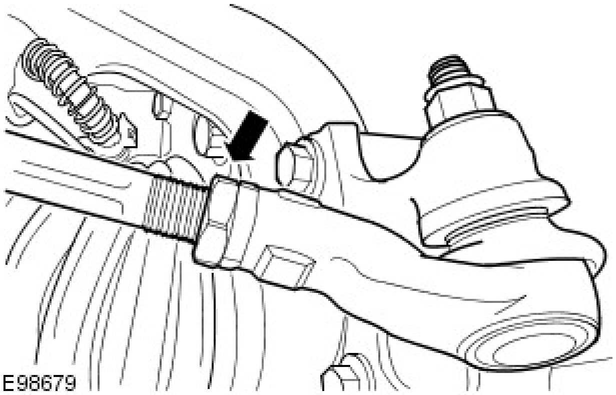
- Remove the 4 clips.





6. Remove the front LH splash shield.

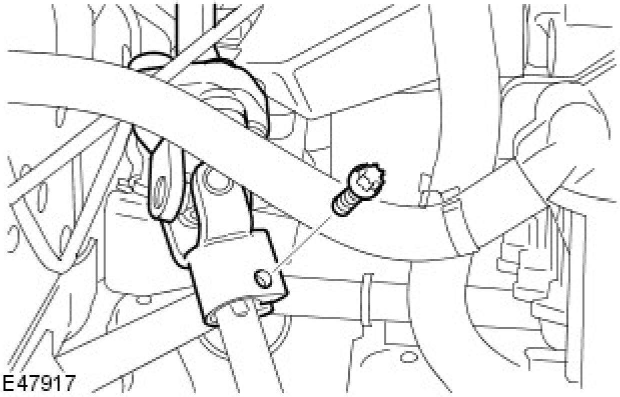
- Remove the 4 clips.



7. NOTE: LH illustration shown, RH is similar.

Release both tie-rod end ball joints.

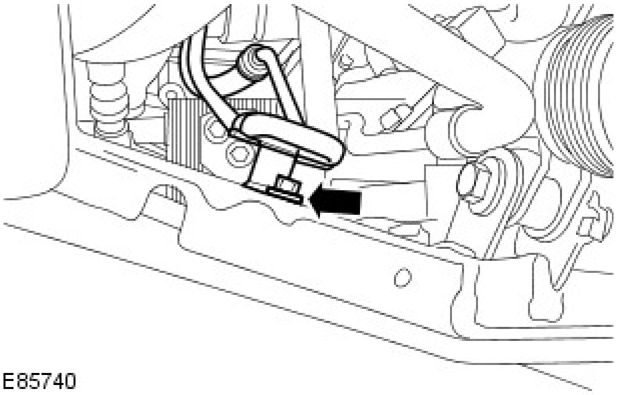
- Loosen the locknut.
- Release both track rods from tie rod ends, note the number of turns for installation.



8. NOTE: Note the fitted position.

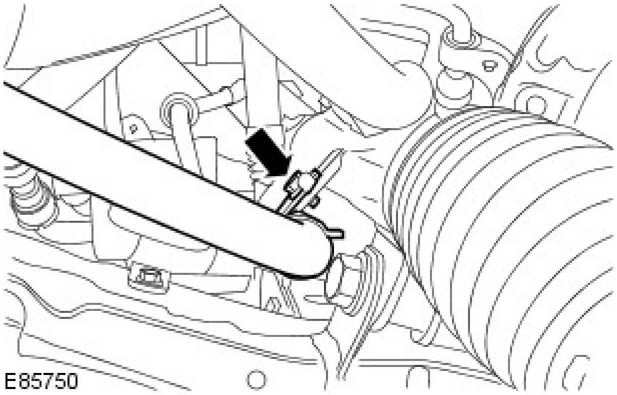
Disconnect the lower steering column from the steering gear.

- Remove and discard the bolt.



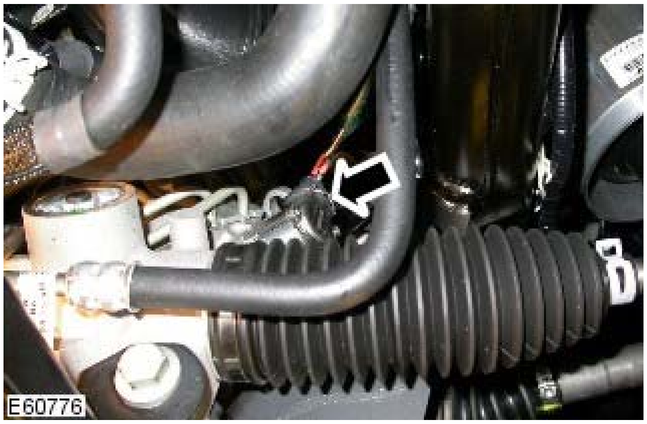
9. Release the power steering return line support bracket.

- Remove the bolt.

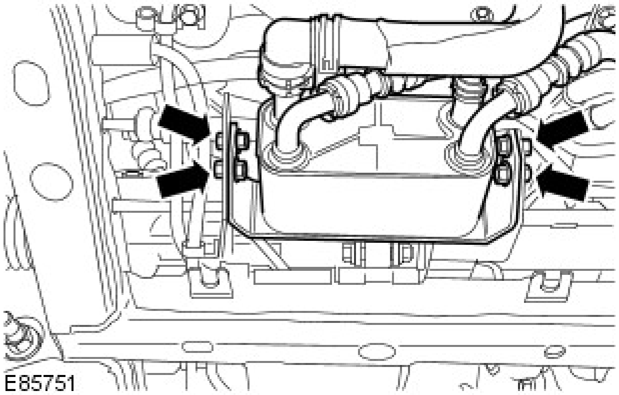


10. Release the steering gear high-pressure line.

- Remove the bolt.

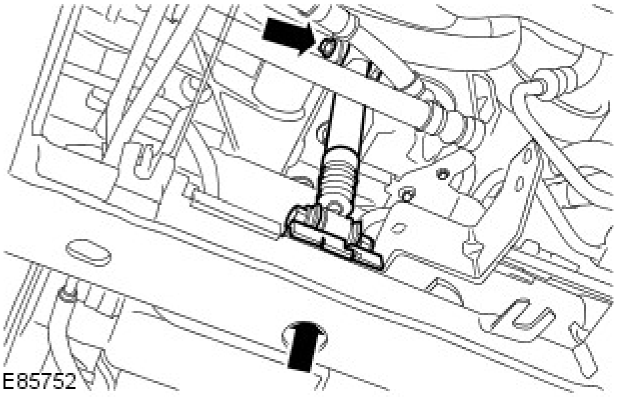


11. Disconnect the steering gear control valve actuator electrical connector.



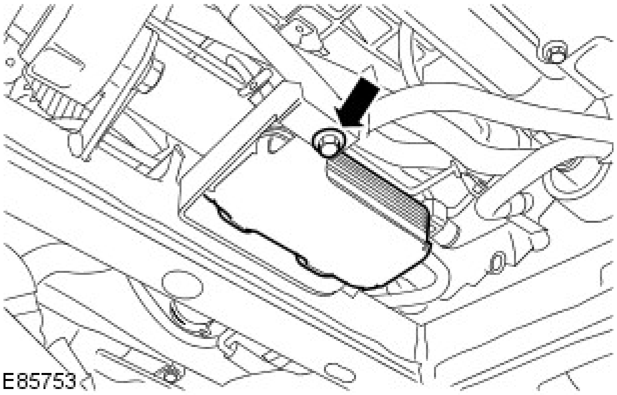
12. Release the transmission fluid cooler.

- Remove the 4 bolts.



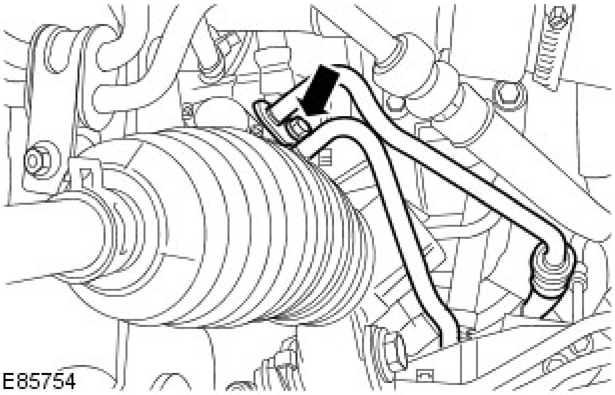
13. Remove the engine stabilizer and engine stabilizer bracket.

- Remove the bolt.
- Remove and discard the nut.



14. Release the fuel cooler.

- Remove the bolt.



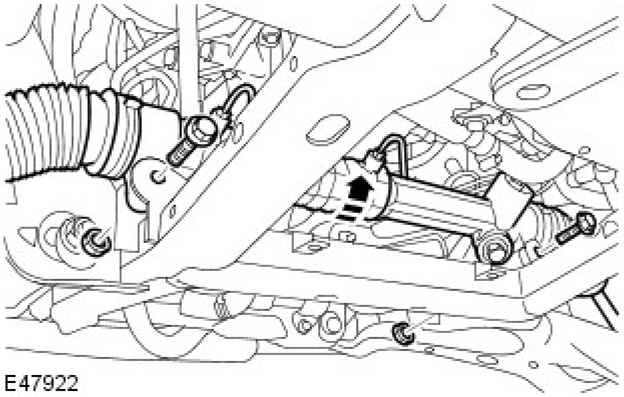
15. CAUTIONS:

⚠ Make sure that the area around the component is clean and free of foreign material.

⚠ Make sure that all openings are sealed. Use new blanking caps.

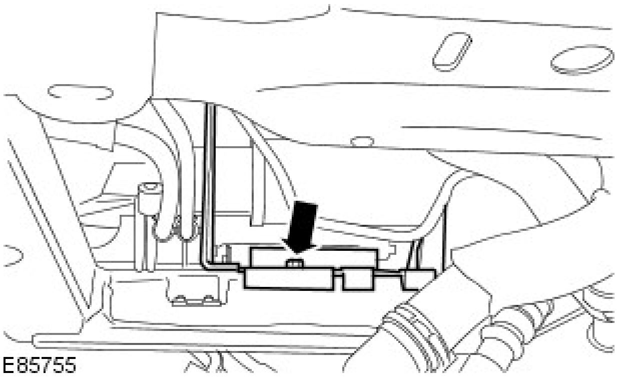
Disconnect the power steering high pressure line and return line from the steering gear.

- Remove and discard the bolt.
- Remove and discard the 2 O-ring seals.



16. Release the steering gear.

- Remove the 2 bolts.



17. Remove the transmission fluid cooler and fuel cooler support bracket.

- Remove the bolt.
- Release the coolant line.

18. Remove the steering gear.

Installation

1. Install the steering gear.

2. Install the transmission fluid cooler and fuel cooler support bracket.

- Secure the coolant line.
- Tighten the bolt to 23 Nm (17 lb.ft).

3. Secure the steering gear.

- Tighten the bolts to 175 Nm (129 lb.ft).

4. NOTE: Remove and discard the blanking caps.

- NOTE: Lubricate the seals with clean power steering fluid.

Connect the power steering high pressure line and return line to the steering gear.

- Install new O-ring seals.
- Tighten the new bolt to 22 Nm (16 lb.ft).

5. Secure the fuel cooler.

- Tighten the bolt to 23 Nm (17 lb.ft).

6. Install the engine stabilizer and engine stabilizer bracket.

- Tighten the nut.
- Tighten the bolt.

7. Secure the transmission fluid cooler.

- Tighten the nuts and bolts to 25 Nm (18 lb.ft).

8. Connect the steering gear control valve actuator electrical connector.

9. Secure the steering gear high pressure line.

- Tighten the bolt to 10 Nm (7 lb.ft).

10. Secure the power steering return line support bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).

11. Connect the lower steering column shaft to the steering gear.

- Tighten the new bolt to 24 Nm (18 lb.ft).

12. Connect the tie-rod end ball joints.

- Attach both tie rods to previously noted positions.
- Tighten the tie-rod locking nut.

13. Install the front LH splash shield.

- Install the clips.

14. Install the front RH splash shield.

- Install the clips.

15. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

16. Install the radiator splash shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

17. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

18. Adjust the front wheel alignment.

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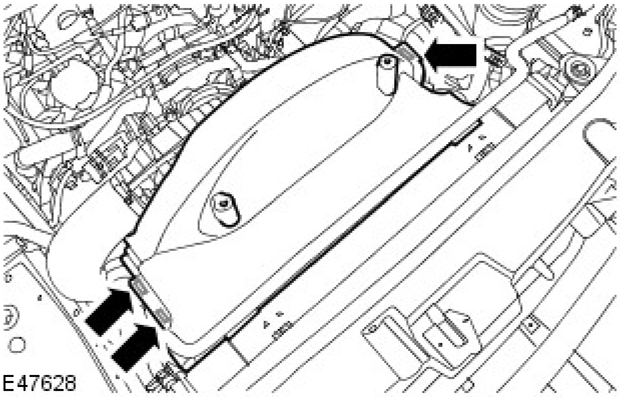
Power Steering - Power Steering Fluid ReservoirTDV6 2.7L Diesel

Removal and Installation

Removal

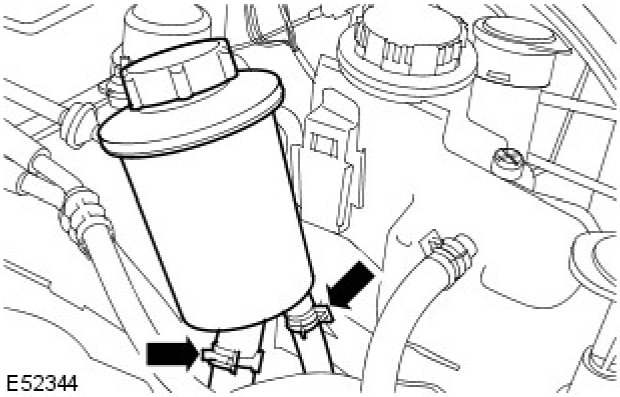
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12C Intake Air Distribution and Filtering - TDV6 2.7L Diesel, Removal and Installation).



3. Remove the cooling fan shroud.

- Release the coolant hose.
- Release the 3 clips.



4. ⚠CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the power steering reservoir.

- Position a container to collect spillage.
- Release the 2 clips.
- Disconnect the 2 hoses.

Installation

1. Install the power steering fluid reservoir.

- Clean the component mating faces.
- Connect the hoses.
- Secure with the 2 clips.

2. Install the cooling fan shroud.

- Secure the coolant hose.

3. Install the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12C Intake Air Distribution and Filtering - TDV6 2.7L Diesel, Removal and Installation).

4. Fill and bleed the power steering system.

For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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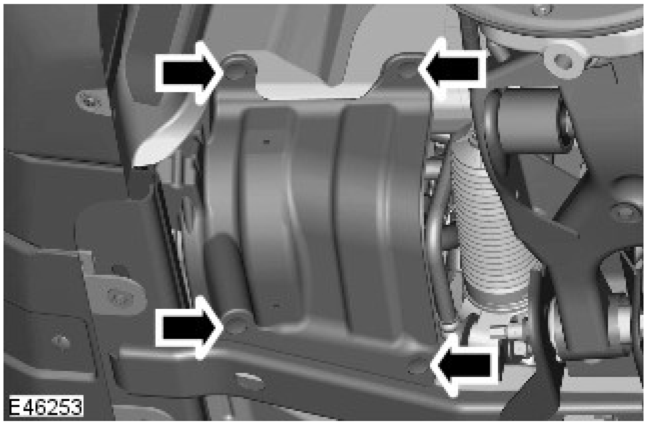
Power Steering - Power Steering Pump to Steering Gear Pressure LineTDV8 3.6L Diesel

Removal and Installation

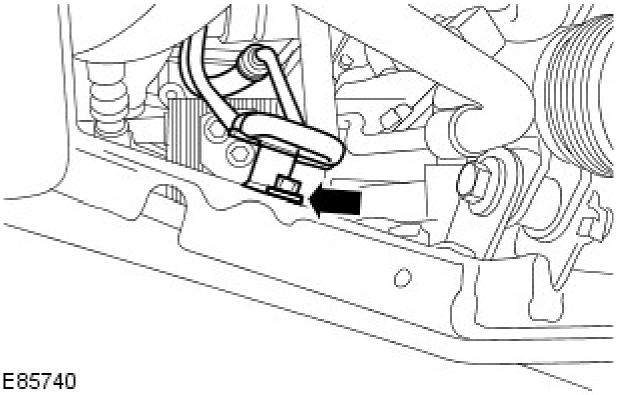
Removal

1. Raise and support the vehicle.



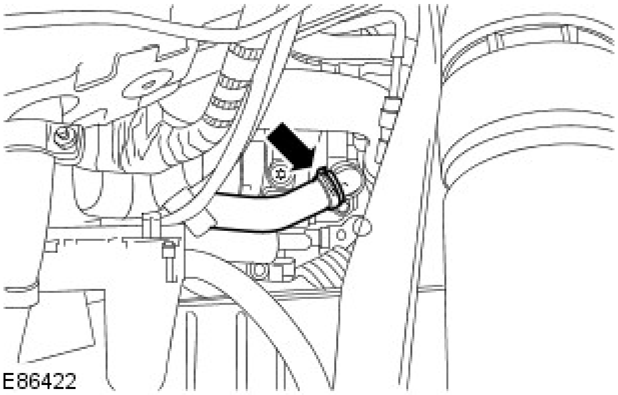
2. Remove the front LH splash shield.

- Remove the 4 clips.



3. Release the steering gear high-pressure line.

- Remove the bolt.



4. Remove the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

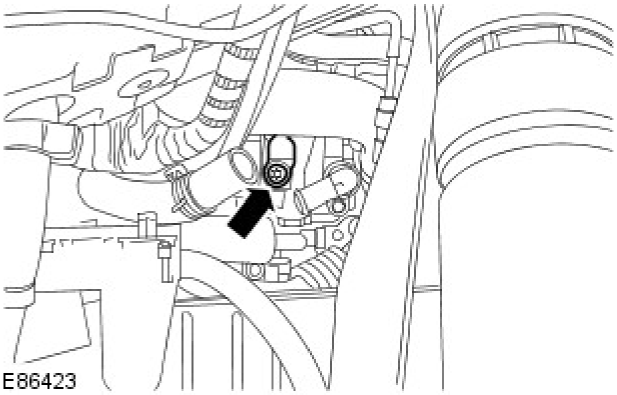
5. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Make sure that the area around the component is clean and free of foreign material.

Disconnect the power steering pump supply hose.

- Release the clip.
- Position a container to collect the fluid.



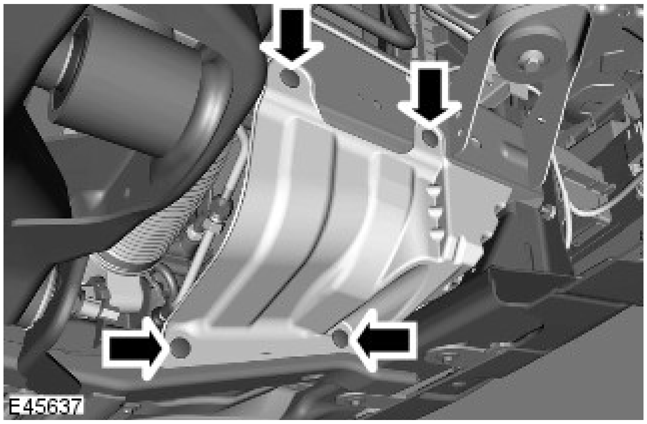
6. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Make sure that the area around the component is clean and free of foreign material.

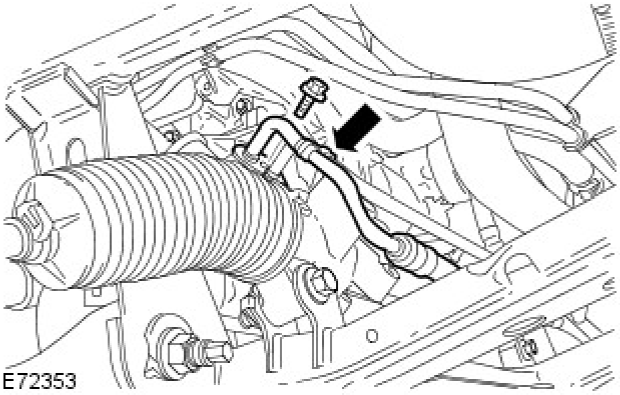
Disconnect the power steering pump high-pressure line.

- Remove the bolt.
- Remove and discard the O-ring seal.



7. Remove the front RH splash shield.

- Remove the 4 clips.



8. CAUTIONS:

⚠ Make sure that the area around the component is clean and free of foreign material.

⚠ Make sure that all openings are sealed. Use new blanking caps.

Disconnect the high-pressure line from the power steering gear.

- Remove and discard the bolt.
- Remove and discard the O-ring seal.

9. Remove the steering gear high-pressure line.

Installation

1. Install the steering gear high-pressure line.

2. NOTE: Remove and discard the blanking caps.

Connect the high-pressure line to the power steering gear.

- Install a new O-ring seal.
- Tighten the new bolt to 22 Nm (16 lb.ft).

3. Install the front RH splash shield.

- Secure with the clips.

4. NOTE: Remove and discard the blanking caps.

Connect the high-pressure line to the power steering pump.

- Install a new O-ring seal.
- Tighten the bolt to 25 Nm (18 lb.ft).

5. NOTE: Remove and discard the blanking caps.

Connect the power steering pump supply hose.

- Secure with the clip.

6. Install the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

7. Secure the steering gear high-pressure line.

- Tighten the bolt to 10 Nm (7 lb.ft).

8. Install the front LH splash shield.

- Secure with the clips.

9. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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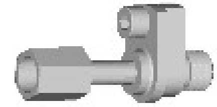
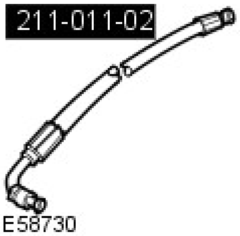
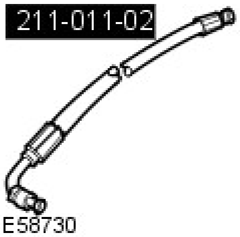
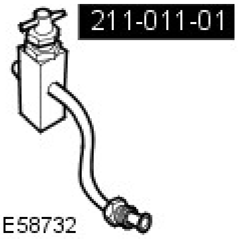
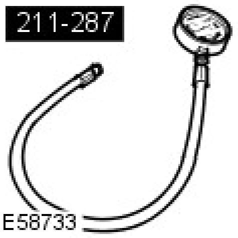
Power Steering - Power Steering Pressure TestTDV8 3.6L Diesel

General Procedures

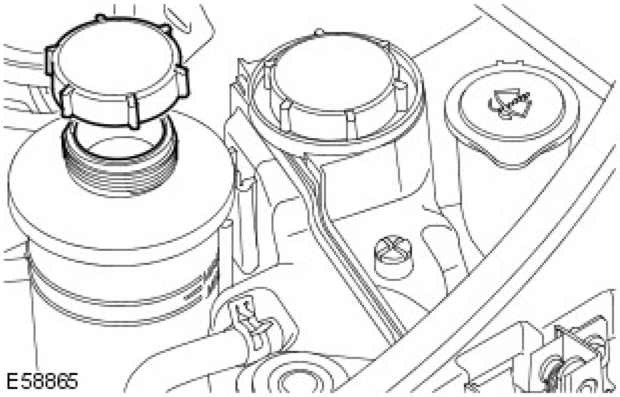
Special Tool(s)	
 E87857	Adaptor, power steering pressure test 211-011-12
 E58730	Hose - power steering pressure test 211-011-02(LRT-57-002)
 E58730	Hose - power steering pressure test 211-011-02(LRT-57-002)
 E58732	Valve block power steering test 211-011-01(LRT-57-001)
 E58733	Hose and gauge - power steering pressure test 211-287(LRT-57-005)

⚠ CAUTION: If power steering fluid comes into contact with the paintwork, the affected area must be immediately washed down with cold water.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

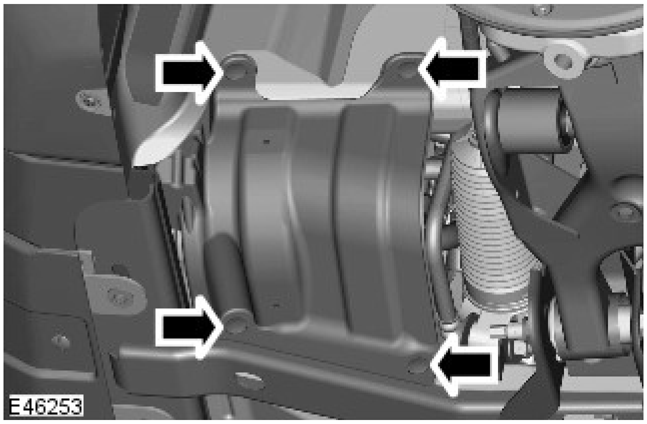
   Raise and support the vehicle.

2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



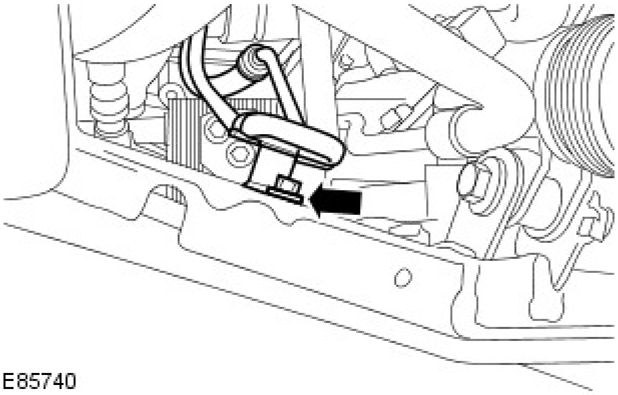
3. Siphon the fluid from the power steering reservoir.

- Remove the filler cap.



4. Remove the front LH splash shield.

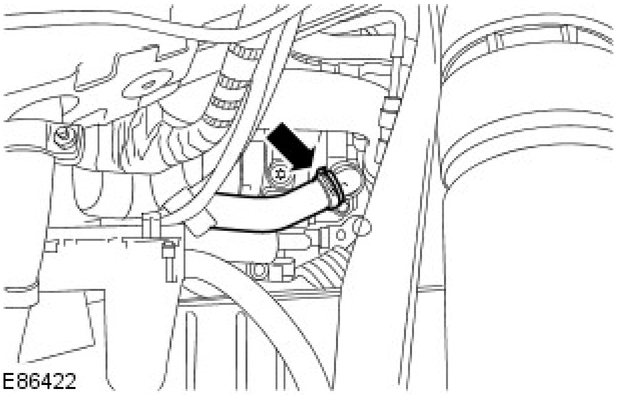
- Remove the 4 clips.



5. Release the steering gear high-pressure line.

- Remove the bolt.

6. Remove the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



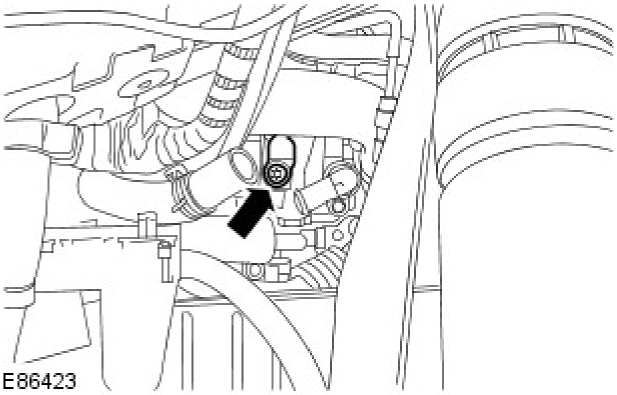
7. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Make sure that the area around the component is clean and free of foreign material.

Disconnect the power steering pump supply hose.

- Release the clip.
- Position a container to collect the fluid.



8. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

Disconnect the power steering pump high-pressure line.

- Remove the bolt.

9. Install the special tools.

- Tie the pressure gauge aside.

10. NOTE: Remove and discard the blanking caps.

Connect the power steering pump supply hose.

- Secure with the clip.

11. Fill the power steering reservoir.

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

13. NOTE: Make sure the steering components and test equipment are free from leaks.

• NOTE: Maintain the maximum fluid level during the test.

• NOTE: Make sure the steering is in the straight ahead position.

• NOTE: Under no circumstances must the low pressure spigot be removed from the steering pump.

With the test valve open start the engine.

- Start the engine and turn steering fully lock to lock, stop the engine.
- Top-up the power steering fluid reservoir.
- Install the reservoir filler cap.

14. For correct power steering pressures, refer to the steering specification section.
For additional information, refer to: Specifications (211-02 Power Steering, Specifications).

15. ⚠ CAUTION: Do not hold steering at full lock for longer than 10 seconds.

With the engine at idle, slowly turn the steering wheel and hold on full lock.

- Record the pressure reading.

16. Repeat the above procedure for the other side.

- Record the pressure reading.

17. With the engine at idle, release the steering wheel. The pressure should be, at or below, the pressure specified.

18. Pressure outside this tolerance, indicates a fault.

19. ⚠ CAUTION: Pump damage will occur if test valve is closed for longer periods.

To determine if the fault is in the steering pump or the steering rack, close the test valve for a maximum of 5 seconds.

20. If the pressures recorded fall outside the given values, replace the power steering pump.

21. If the maximum pump pressure is correct, check the hoses for correct routing and condition, if correct suspect the steering gear.

22. On completion of the test stop the engine, disconnect the battery ground cable and siphon the steering fluid from the reservoir.

23. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Make sure that the area around the component is clean and free of foreign material.

Disconnect the power steering pump supply hose.

- Release the clip.

24. Disassemble the test equipment.

25. Connect the power steering pump high-pressure line.

- Tighten the bolt to 25 Nm (18 lb.ft).
- Install a new O-ring seal.

26. NOTE: Remove and discard the blanking caps.

Connect the power steering pump supply hose.

- Secure with the clip.
- Remove the container.

27. Secure the steering gear high-pressure line.

- Tighten the bolt to 10 Nm (7 lb.ft).

28. Install the front LH splash shield.

- Install the clips.

29. Install the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

30. Connect the battery ground cable.

31. Fill and bleed the power steering system.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

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Power Steering - Power Steering PumpTDV6 2.7L Diesel

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Remove the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

4. Recover the air conditioning (A/C) refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

5. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

6. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

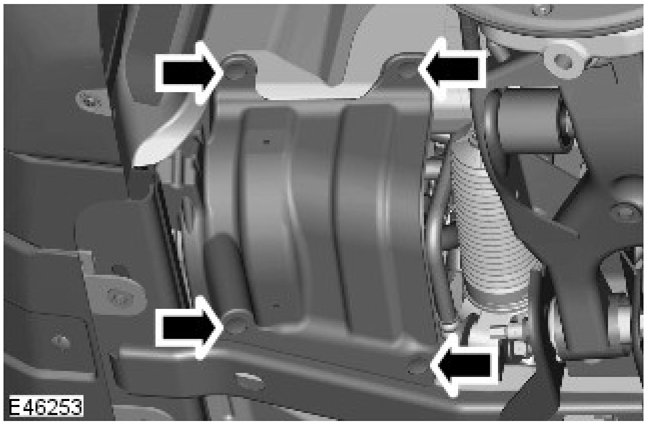
7. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

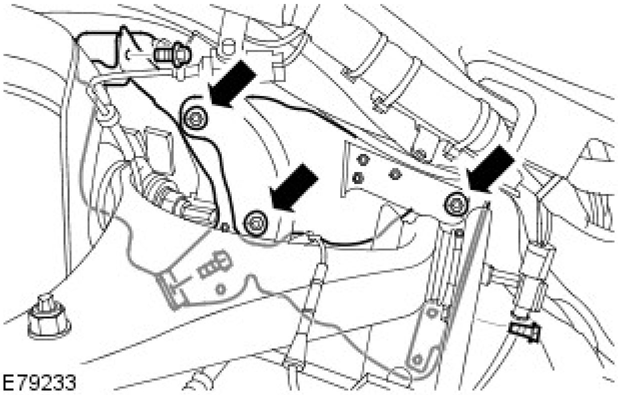
8. Remove the LH front wheel and tire.

9. Remove the fender splash shield lower trim panel.

- Remove the 4 clips.

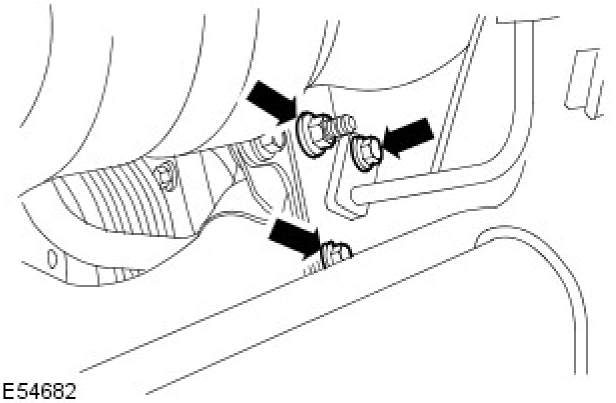


10. Remove the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02, Removal and Installation).



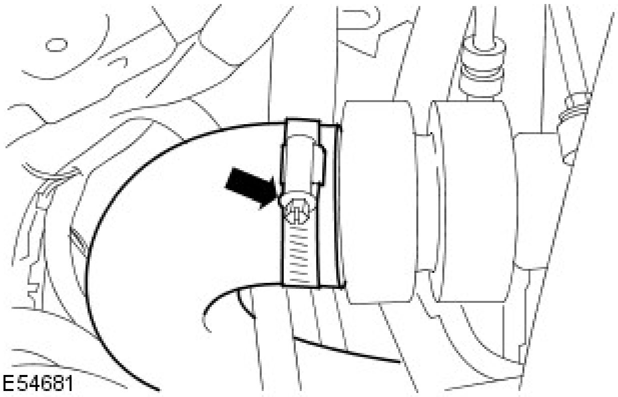
11. Remove the upper arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.



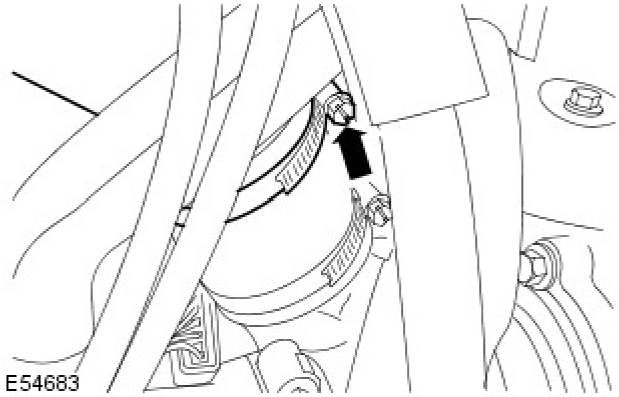
12. Release the charge air cooler inlet pipe.

- Remove the two retaining bolts.
- Remove the retaining nut.



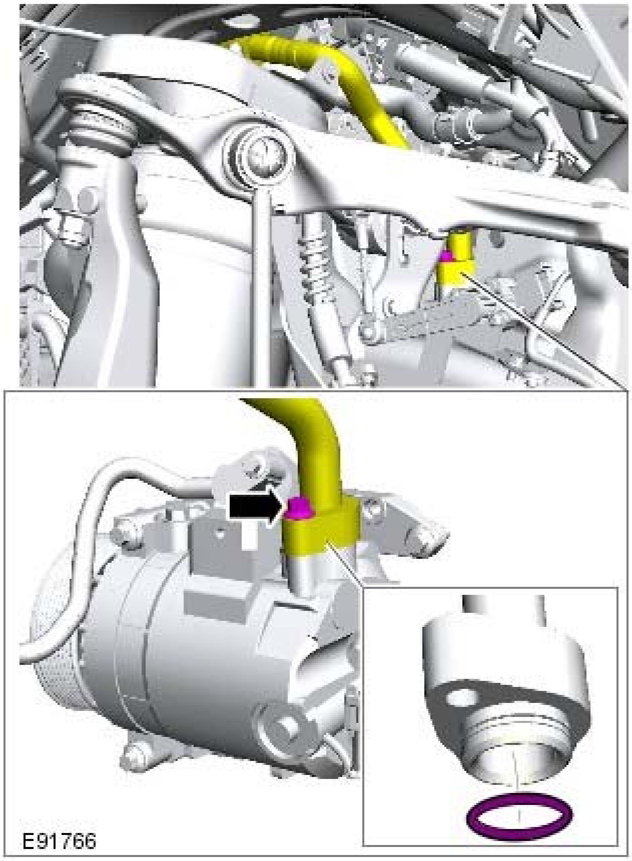
13. Disconnect the charge air cooler inlet hose.

- Loosen the clip.



14. Disconnect the charge air cooler inlet hose.

- Loosen the clip.



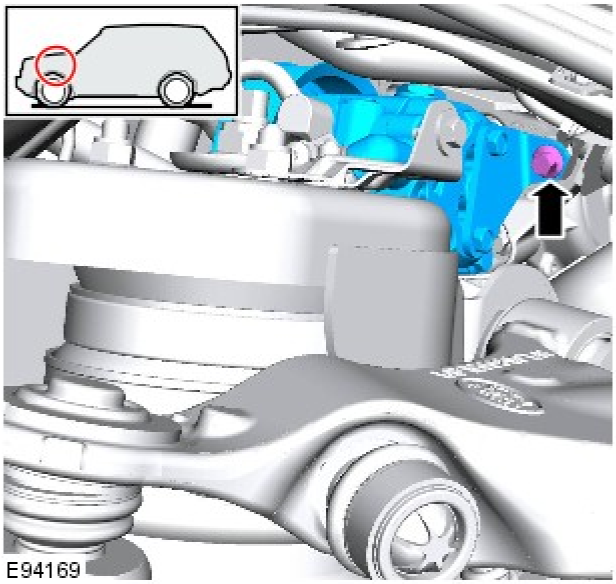
15. CAUTIONS:

⚠ Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

⚠ Care must be taken to avoid damage to the mating surfaces.

Release the A/C low pressure pipe from the compressor.

- Remove and discard the O-ring seal.
- Using a suitable tie strap, secure the A/C low-pressure pipe aside.

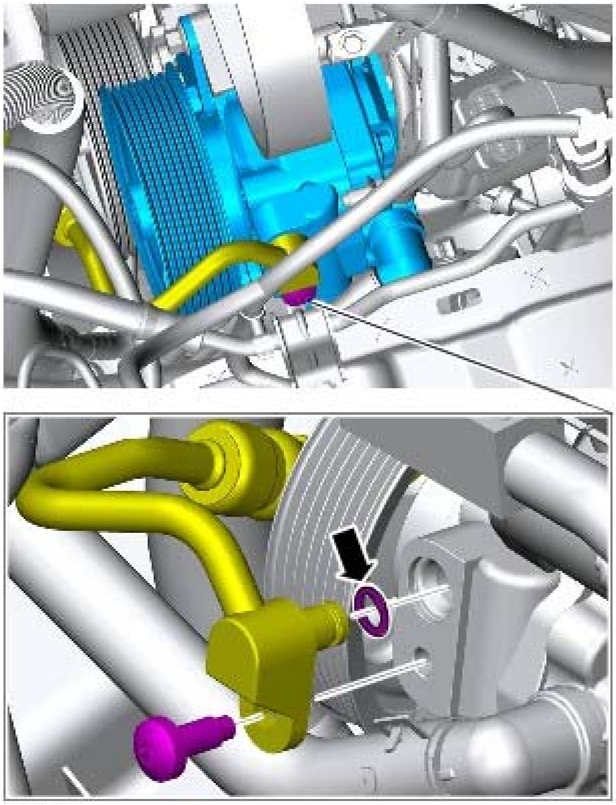


16. Remove the power steering pump rear fixing bracket retaining bolt.

- Reposition the charge air cooler inlet pipe to gain access to the power steering pump retaining bolt.

17. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Lower the vehicle.

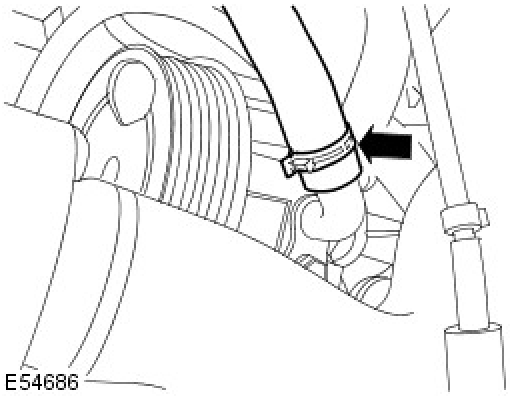


E94170

18. ⚠CAUTION: If power steering fluid comes into contact with the paintwork, the affected area must be immediately washed down with cold water.

Disconnect the high pressure line from the power steering gear.

- Remove and discard the O-ring seal.
- Install blanking caps to the exposed ports.
- Allow the fluid to drain into a container.

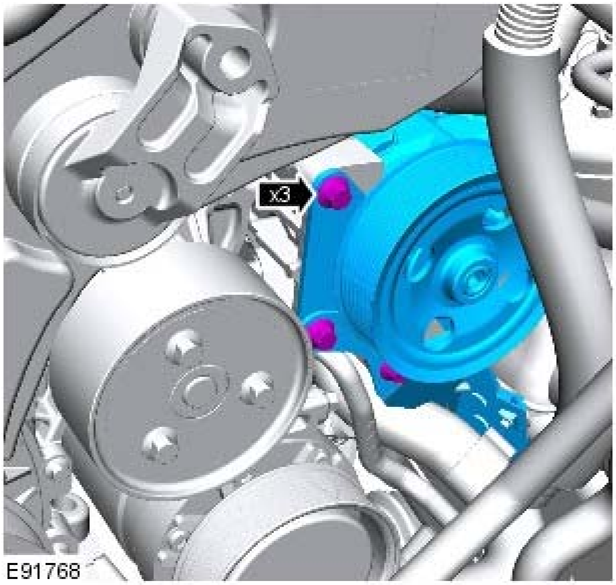


E54686

19. ⚠CAUTION: If power steering fluid comes into contact with the paintwork, the affected area must be immediately washed down with cold water.

Disconnect the power steering pump supply hose.

- Clamp the power steering pump supply hose to minimise fluid loss.
- Install blanking caps to the exposed ports.



20. Remove the power steering pump.

- Remove the 3 power steering pump front retaining bolts.

Installation

1. Install the power steering pump and bracket.

- Install the 3 power steering pump front bolts and lightly tighten, then back off each bolt a 1/4 turn.

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise the vehicle.

3. Install the power steering pump rear fixing bracket retaining bolt.

- Reposition the charge air cooler inlet pipe to gain access to the power steering pump retaining bolt.
- Tighten the bolt to 25 Nm (18 lb.ft).

4. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Lower the vehicle.

5. Tighten power steering pump front retaining bolts to 24 Nm (18 lb.ft).

6. Connect the power steering supply hose.

- Remove the blanking caps from the ports.
- Remove the hose clamp.

7. NOTE: Lubricate the seals with clean power steering fluid.

Connect the power steering high-pressure pipe union.

- Remove the blanking caps from the ports.
- Install a new O-ring seal.
- Tighten the Torx bolt to 25 Nm (18 lb.ft).
- Remove the container.

8. CAUTION: Lubricate the new seals with clean refrigerant oil.

Install the A/C low pressure pipe to the compressor.

- Remove the blanking caps from the ports.
- Install a new O-ring seal.
- Tighten the bolt to 9 Nm (7 lb.ft).

9. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise the vehicle.

10. Connect the charge air cooler inlet hose.

- Tighten the clips.

11. Secure the charge air cooler inlet pipe.

- Install the two retaining bolts.
- Install the retaining nut.
- Tighten to 10 Nm (7 lb.ft).

12. Install the upper arm and brake line heat shields.

- Install the 3 bolts.
- Install the 3 nuts.

13. Install the fender splash shield lower trim panel.

- Install the 4 clips.

14. Install the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02, Removal and Installation).

15. Install the wheel and tire.

16. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Lower the vehicle.

17. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

18. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

19. Recharge the A/C system
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

20. Install the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

21. Check and top-up power steering fluid level.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00 Steering System - General Information, General Procedures).

22. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L

Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

23. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Power Steering - Power Steering Control Valve Actuator

Removal and Installation

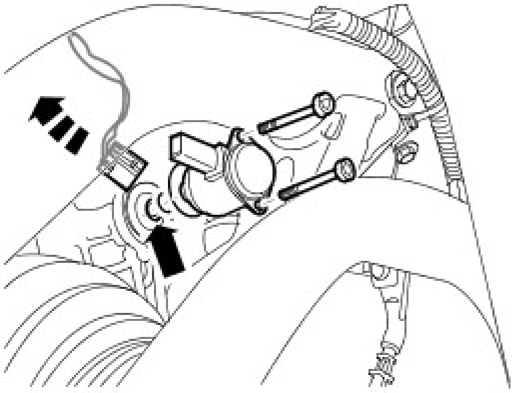
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00, Specifications).

2. ⚠ WARNING: Make sure to support the vehicle with axle stands.

Raise the vehicle on the lift.

3. Remove the front wheel and tire.



E71406

4. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Note the fitted position.

• NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove the power steering control valve actuator.

- Disconnect the electrical connector.
- Position a container to collect the fluid spillage.
- Remove and discard the 2 Torx screws.
- Remove and discard the 2 O-ring seals.
- Remove and discard the filter.

Installation

1. ⚠ CAUTION: Make sure the working surfaces are thoroughly clean to avoid contamination of the sensitive hydraulic components.

Clean the component mating faces.

2. Install a new filter to the steering gear.

3. Install new seals to the actuator.

4. NOTE: Align to the position noted on removal.

Install the actuator.

- Tighten the new Torx screws, evenly and progressively, to 3 Nm (2.2 lb.ft).
- Connect the electrical connector.

5. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00, Specifications).

7. Refill and bleed the power steering.
For additional information, refer to: Power Steering System Filling and Bleeding (211-00, General Procedures).

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Steering Linkage -

Torque Specifications

Description	Nm	lb-ft
* Tie-rod end nut - Vehicles fitted with an M12 nut	76	56
* Tie-rod end nut - Vehicles fitted with an M14 nut	150	111
Tie-rod locking nut	55	40
Road wheel nuts	140	103

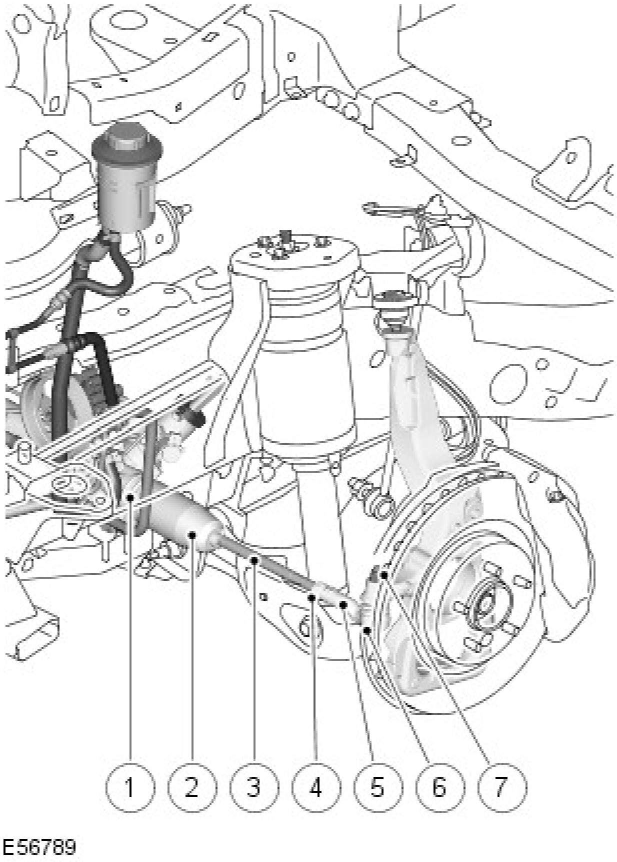
*** New nut must be installed**

Published: 11-May-2011

Steering Linkage - Steering Linkage

Description and Operation

Steering Linkage Component Location



Item	Part Number	Description
1	-	Steering gear
2	-	Steering gear gaitor
3	-	Tie rod
4	-	Locknut
5	-	Tie rod end
6	-	Ball joint
7	-	Self-locking nut

GENERAL

The steering linkage comprises the tie rod which provides the connection between the steering gear and the front wheel knuckle.

Each end of the steering gear has a threaded hole which provides for the fitment of the tie rods. The external ends of the tie rods are sealed with steering gear gaitors to prevent the ingress of dirt and moisture into the steering gear.

The outer ends of the tie rods are threaded to allow the fitment of the tie rod ends. The tie rod ends are screwed onto the tie rods and locked with locknuts to prevent inadvertent movement. The thread on the tie rod allows the position of the tie rod end to be adjusted in order to set the correct toe angle for each front wheel.

The tie rod end comprises a forged housing with a threaded bore for attachment to the tie rod. The tie rod end incorporates a non-serviceable tapered ball joint which locates in a tapered hole in the front wheel knuckle and is secured with a self-locking nut. The ball joint has an internal hexagonal drive which enables the joint to be held stationary when the self-locking nut is tightened.

Published: 11-May-2011

Steering Linkage - Steering Linkage

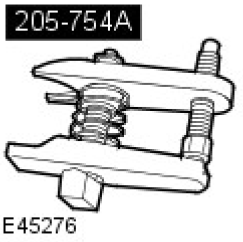
Diagnosis and Testing

For additional information.
REFER to: Steering System (211-00 Steering System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Steering Linkage - Tie Rod End

Removal and Installation

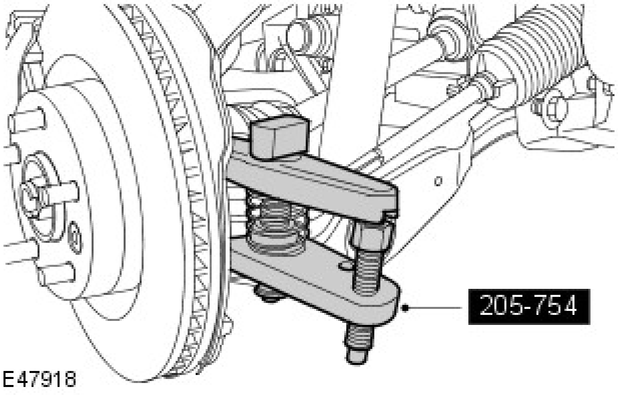
Special Tool(s)	
	Ball joint separator 205-754 (LRT-54-027)

Removal

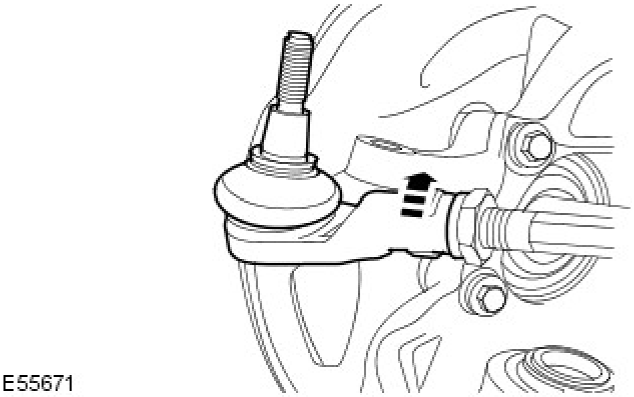
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the front wheel.
3. Loosen the tie rod end ball joint retaining nut.
4. Loosen the tie rod end lock nut.
5. Using the special tool, release the tie-rod end ball joint from the wheel knuckle.
   - Remove and discard the tie rod end retaining nut.



6. Remove the tie-rod end, note the number of turns for installation.



Installation

1. Install the tie rod end, note the number of turns until adjacent to the locknut.
2. CAUTION: To prevent damage to the tie rods, use an

additional wrench when loosening or tightening the components.

Connect the tie rod end ball joint.

- Clean the component mating faces.
- For vehicles fitted with an M12 nut, install a new nut and tighten to 76 Nm (56 lb.ft).
- For vehicles fitted with an M14 nut, install a new nut and tighten to 150 Nm (111 lb.ft).

3. Tighten the tie rod locking nut.

- Clean the component mating faces.
- Tighten the nut to 55 Nm (40 lb.ft).

4. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

5. Lower the vehicle.

6. Using only four wheel alignment equipment approved by Land Rover, check and adjust the wheel alignment.

Published: 11-May-2011

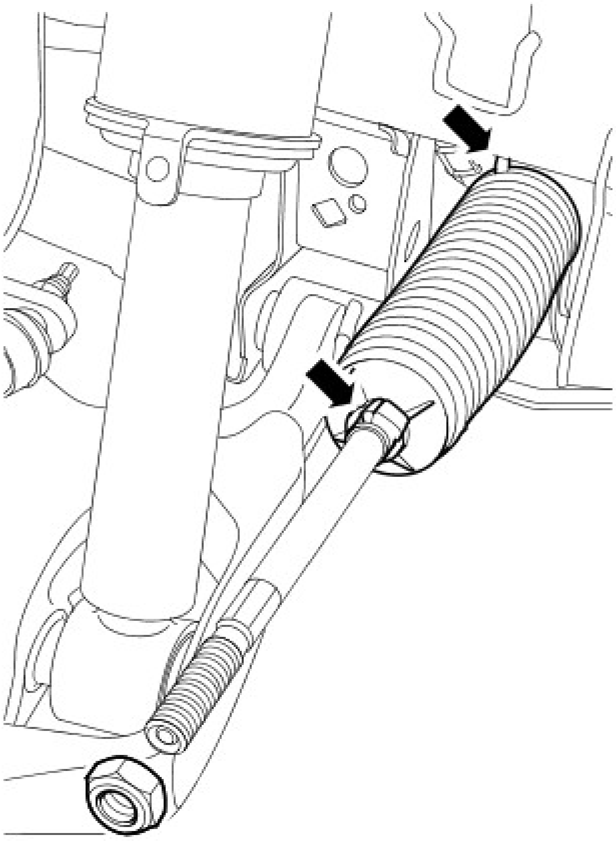
Steering Linkage - Steering Gear Boot

Removal and Installation

Removal

1. Remove the tie-rod end.
   For additional information, refer to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).
2. NOTE: Note the fitted position.

   Remove the locknut.
3. Remove the steering gear boot.
   - Release the 2 clips.



E55694

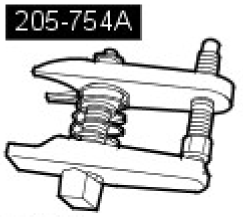
Installation

1. Install the steering gear boot.
   - Clean the component mating faces.
   - Secure with the clips.
2. Install the locknut.
3. Install the tie-rod end.
   For additional information, refer to: Tie Rod End (211-03 Steering Linkage, Removal and Installation).

Published: 11-May-2011

Steering Linkage - Tie Rod

Removal and Installation

Special Tool(s)	
 E45276	Ball joint separator 205-754(LRT-54-027)

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

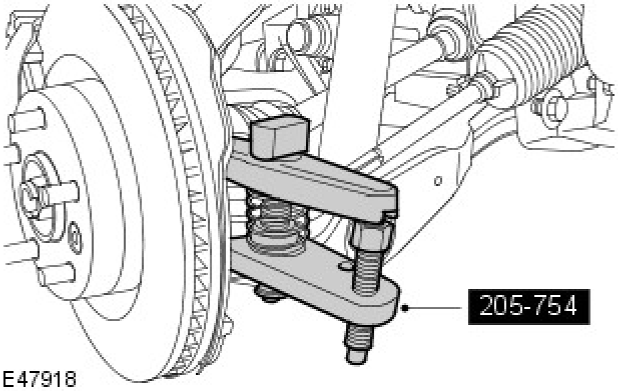
2. Remove the front wheel.

3. Loosen the outer tie-rod end ball joint retaining nut.

4. Loosen the outer tie-rod end lock nut.

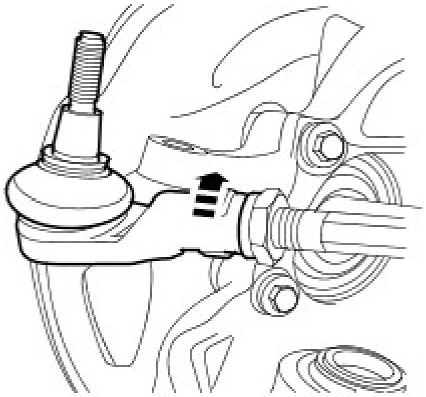
5. Using the special tool, release the tie-rod end ball joint from the wheel knuckle.

- Remove and discard the tie rod end retaining nut.



E47918

6. Remove the outer tie-rod end, note the number of turns for installation.



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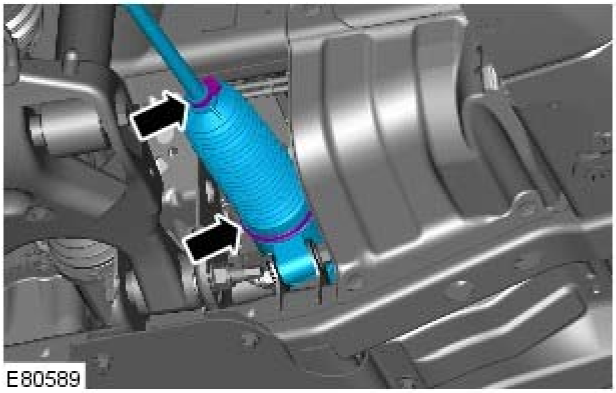
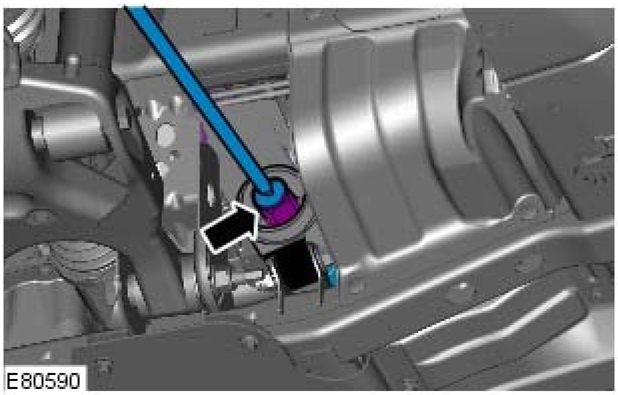
7. Remove the outer tie-rod end lock nut.



8. Remove the steering gear boot.

- Release the 2 clips.



9. Remove the inner tie-rod end.

- Loosen the nut.

Installation

1. Install the inner tie-rod end.

- Tighten the nut to 100 Nm (74 lb.ft).

2. Install the steering gear boot.

- Secure with the clips.

3. Install the outer tie-rod end lock nut.

4. Install the tie rod end, note the number of turns until adjacent to the locknut.

5. ⚠ CAUTION: To prevent damage to the tie rods, use an additional wrench when loosening or tightening the components.

Connect the tie-rod end ball joint.

- Clean the component mating faces.
- For vehicles fitted with an M12 nut, install a new nut and tighten to 76 Nm (56 lb.ft).
- For vehicles fitted with an M14 nut, install a new nut and tighten to 150 Nm (111 lb.ft).

6. Tighten the tie-rod locking nut.

- Clean the component mating faces.
- Tighten the nut to 55 Nm (40 lb.ft).

7. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

8. Lower the vehicle.

9. Using only four wheel alignment equipment approved by Land Rover, check and adjust the wheel alignment.

Published: 11-May-2011

Steering Column -

General Specification

Item	Specification
Type	Two piece, articulated with flexible coupling to steering rack; fitted with energy absorption system and having a 120 mm (4.7 in) ride down capability with a 4.5 kN (0.45 ton force) maximum decoupling load on the intermediate shaft and a 77 mm (3.0 in) collapse stroke on the lower shaft.
Upper column adjustment:	
Reach	40 mm (1.57 in)
Rake	6°

Torque Specifications

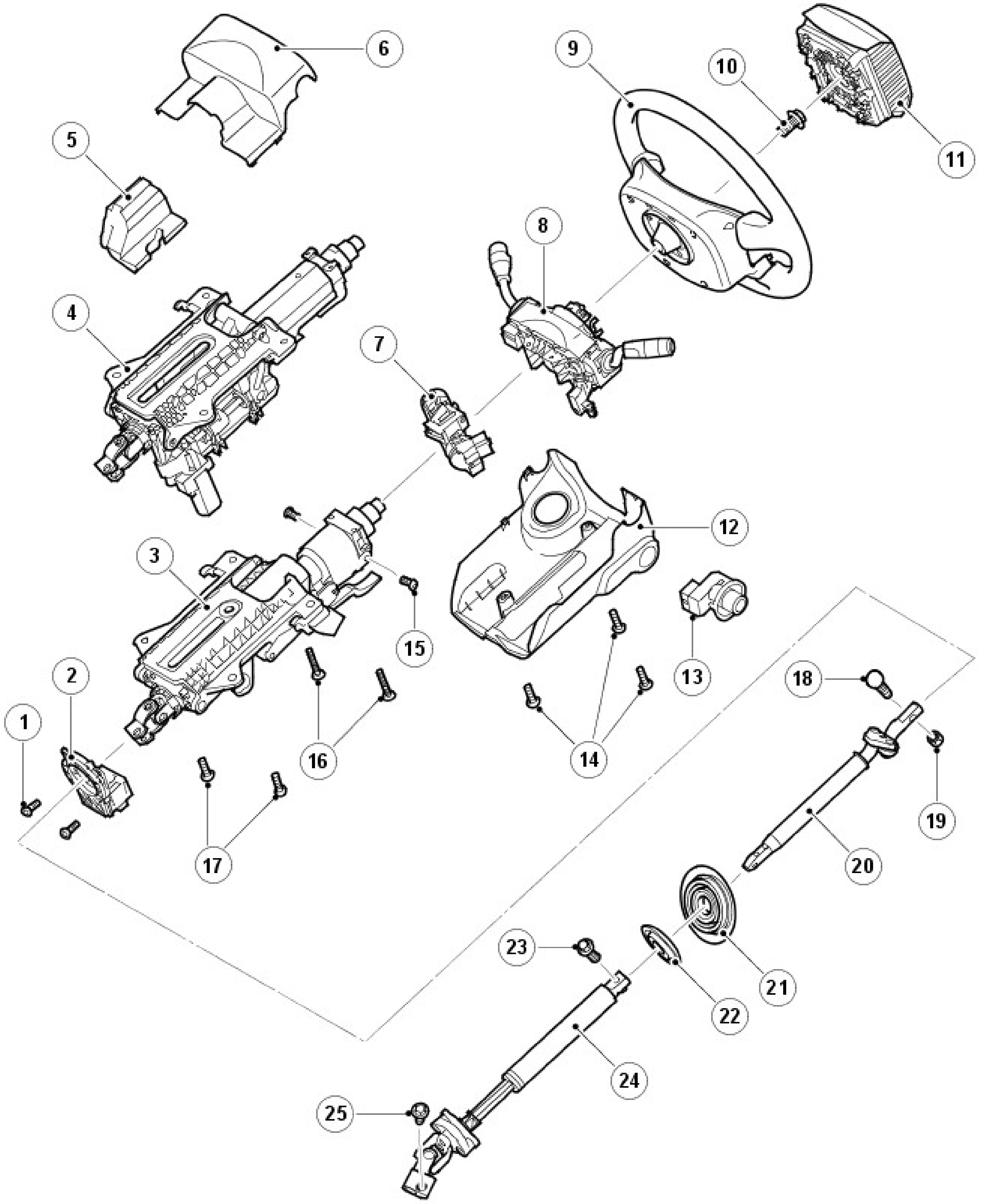
Description	Nm	lb-ft
Steering angle sensor Torx screws	3	2
* Steering column intermediate shaft to lower shaft bolts	30	22
* Steering column intermediate shaft to steering column nut	22	16
Steering column switch assembly Torx bolts	3	2
Steering wheel bolt	63	46

*** New bolts/nut must be installed**

Steering Column - Steering Column

Description and Operation

STEERING COLUMN COMPONENT LOCATION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Item	Part Number	Description

1	-	Screw (3 off)
2	-	Steering angle sensor
3	-	Upper steering column assembly - Manual
4	-	Upper steering column assembly - Electric
5	-	Cowl insert
6	-	Upper cowl
7	-	Column lock assembly
8	-	Multifunction column switch
9	-	Steering wheel
10	-	Bolt
11	-	Driver airbag
12	-	Lower cowl
13	-	Column adjustment switch (Electric column only)
14	-	Screw, self-tapping (3 off)
15	-	Column lock shear bolt (2 off)
16	-	Bolt, thread forming (2 off)
17	-	Bolt , thread forming (2 off)
18	-	Cam bolt
19	-	Self-locking nut
20	-	Intermediate shaft
21	-	Column seal - bulkhead
22	-	Cover seal - secondary bulkhead
23	-	Screw
24	-	Lower collapsible shaft
25	-	Bolt - Torx - Lower collapsible shaft yoke

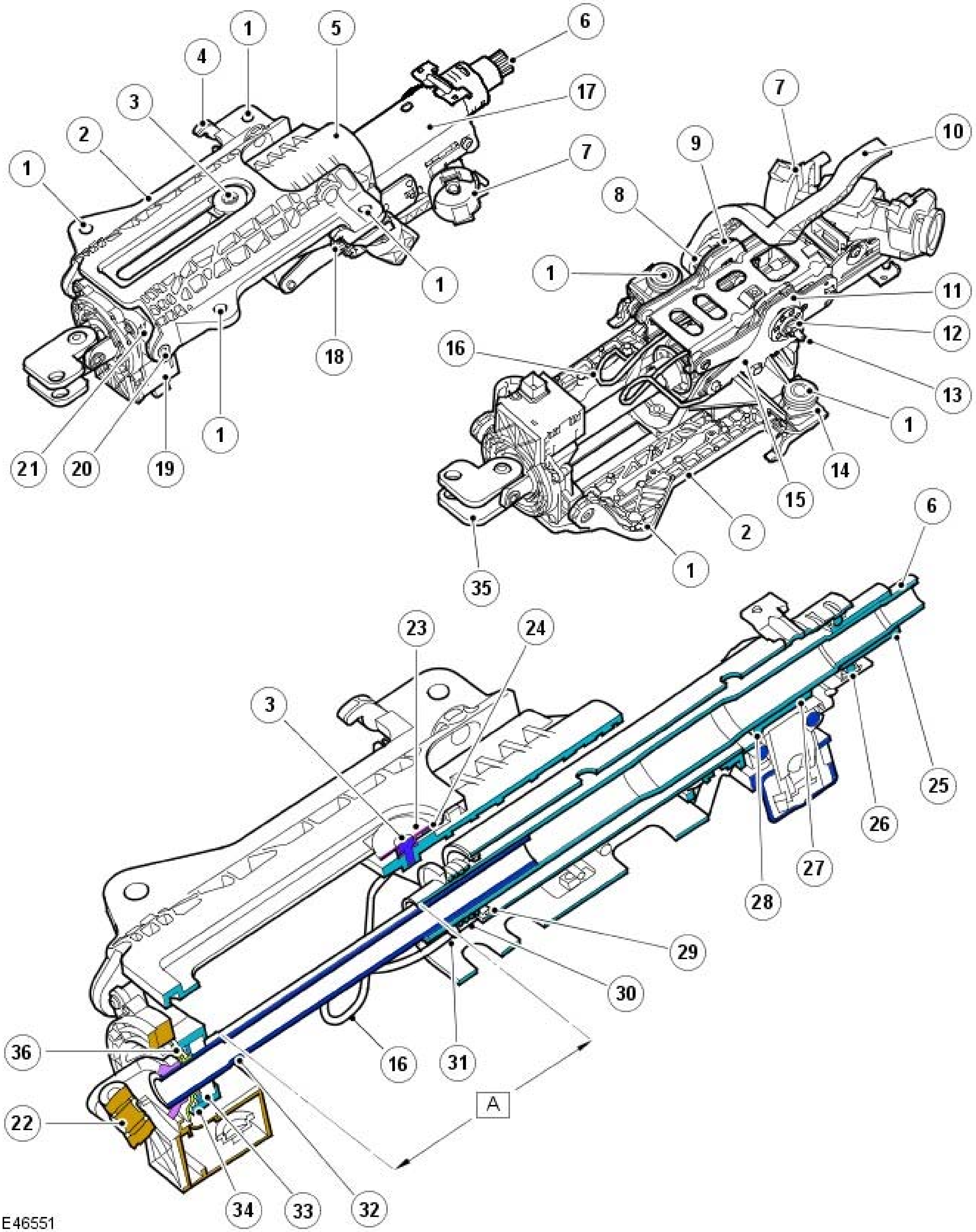
OVERVIEW

The steering column comprises the upper column assembly, the intermediate shaft and the lower collapsible shaft. The three components are positively connected together to pass driver rotary input from the steering wheel to a linear output of the steering rack.

The upper steering column assembly is adjustable for steering wheel reach and rake and provides the location for the ignition switch, the ignition lock barrel, the steering lock mechanism and the steering angle sensor. Column adjustment is obtained either manually or electrically, dependant on column variant fitted.

MANUAL UPPER COLUMN ASSEMBLY

Manual Steering Column Component Layout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E46551

Item	Part Number	Description
A	-	Crash Stroke 120.00 mm (4.72 in)
1	-	Attachment holes

2	-	Roof bracket
3	-	Screw
4	-	Locating hook
5	-	'U' bracket
6	-	Steering wheel splines
7	-	Lock assembly
8	-	Cam plate
9	-	Clamp plate assembly
10	-	Adjustment lever
11	-	Brake pad
12	-	Lever nut
13	-	Lever bolt
14	-	Shearing capsule (2 off)
15	-	Clamp plate assembly
16	-	Adjustment balance spring (2 off)
17	-	Main body
18	-	Strap (2 off)
19	-	Steering angle sensor
20	-	Pivot pin
21	-	Pivot housing
22	-	Spider
23	-	Bush
24	-	Pressure washer (2 off)
25	-	Upper shaft
26	-	Upper bearing
27	-	Tolerance ring
28	-	Lock collar
29	-	Middle bearing
30	-	Spring
31	-	Spring washer
32	-	Lower shaft
33	-	Retaining ring
34	-	Universal joint seal
35	-	Swing yoke
36	-	Driving collar

The steering column is attached to the in-vehicle crossbeam and secured with four, 8 mm thread forming, pan head Torx drive screws. The two forward attachment screws are fixed through the column mounting bracket, the two rearward mounting screws also pass through the shearing capsules. In the event of a high energy frontal impact, the shearing capsules remain fixed to the crossbeam, but the 'U' bracket (with the main body) disengages from the capsules, allowing the column to shorten axially (collapse), with the coiled straps absorbing energy to reduce occupant loading.

⚠ WARNING: Take care when handling the column not to trap fingers if releasing the adjustment lever at any point during the removal procedure when the column is not in the vehicle. The balance springs will cause the column to rapidly move to its upmost position.

The column comprises a cast magnesium roof bracket which is attached to the in-vehicle crossbeam. Attached to the roof bracket are a pivot housing, a 'U' bracket, upper and lower shafts and a main body. The roof bracket has two hooks which locate in slots in the in-vehicle crossbeam. The hooks assist in supporting the weight of the column during removal or installation.

The pivot housing is attached to the forward end of the roof bracket with two pivot pins. The pivot housing allows for adjustment of the column rake and contains a bearing which supports the column lower shaft.

The 'U' bracket is attached to the roof bracket by a screw, bush and plastic washer assembly (third fixing) located in a slot in the top of the roof bracket. When the column is assembled into the vehicle, the shearing capsules, which are attached to the 'U' bracket, are clamped up against the roof bracket by the fixing screws, preventing movement of the 'U' bracket. The bolts also pass through rectangular section steel straps, which at one end, have coils that locate around a plastic bush (positioned on the shearing capsule). The straps are used to control the rate of column collapse, in the event of a high energy frontal impact.

The main body is positioned in the 'U' bracket via the lever bolt. The bolt is captive within the vertical slots in the 'U' bracket and the horizontal slots in the main body. The bolt also passes through the clamp plate assemblies (one on either side of the 'U' bracket). The body houses the middle and upper bearings through which the upper shaft is located. Two offset holes in the main body provide for the attachment of the column lock assembly.

The upper and lower shafts are located through the length of the column assembly. The upper shaft is supported in two bearings in the main body and the lower shaft is located in the upper shaft and supported in a bearing in the pivot housing. The lower shaft has a tubular section with external splines. These mate with the internal splines in the upper shaft. The purpose of the splines is to transmit rotational movement of the upper shaft to the lower shaft, but allowing the two components to telescope into each other in the event of a collision. The length of the splined sections allow for 120 mm (4.72 in) of linear movement. The lower shaft is fitted with a universal joint spider to which a swivel yoke is attached. The swivel yoke attaches to the intermediate shaft of the steering column on the interior side of the bulkhead using a special cam bolt and self-locking nut.

A steering angle sensor is attached to the pivot housing of the column and its centre gear is rotated by a drive collar which is attached to the lower shaft and rotates with movement of the steering wheel. The sensor transmits steering angle data on the high speed CAN bus which is used by various systems on the vehicle. The steering angle sensor is designed to become detached from the column in the event of a frontal impact. Care must be taken when handling the column assembly to prevent accidental damage to the sensor.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

The upper shaft is fitted with a locking collar which engages with the lock bolt of the column lock assembly. The locking collar is retained by a tolerance ring on the shaft. The tolerance ring allows a specified amount of force to be applied to the shaft before it slips, preventing damage to the column lock if excessive torque is applied to the steering wheel. The tolerance ring is designed to slip on the upper shaft when an applied torque exceeds its fitted slip load of 200Nm minimum. Following rotation, the torque to rotate the lock collar should exceed 100Nm.

The steering column is adjustable for reach and rake. The column can be adjusted for 40 mm (1.57 in) of reach adjustment and 6º of rake adjustment. The adjustment mechanism comprises an adjustment lever, a cam plate, a lever bolt and nut, two brake pads and two clamp plate assemblies.

A plastic adjustment lever is located on the underside of the column assembly and is attached to a cam plate. When the lever is pulled downwards, the cam plate rotates and releases tension in the lever bolt. The lever bolt also passes through two sets of clamp plate assemblies. When the lever is moved upwards, the cam plate rotates applying tension to the lever bolt, which applies pressure to the brake pads which in turn apply pressure to the clamp plate assemblies (which lock the column in the desired position). The lever bolt is retained by a self-locking lever nut, which abuts a thrust bearing.

⚠WARNING: Under no circumstances should the lever nut torque be reduced, as this will reduce the clamping efficiency of the adjustment mechanism possibly affecting the stability of the column during a frontal impact.

The pivot housing is attached to the roof bracket with two pivot pins. When the rake adjustment is operated, the pivot housing rotates around the pivot pins to allow for the up and down adjustment, but maintains a positive location to the roof bracket. An adjustment spring is fitted between the 'U' bracket and the main body, to counteract the weight of the main body, upper shaft, steering wheel and airbag, preventing the steering wheel from dropping rapidly when the adjustment lever is released.

In the event of a high energy frontal impact, the upper column assembly is designed to axially collapse reducing impact injury to the driver. A number of components interact together to ensure that the collapse of the column is in a controlled manner. The following components control the column collapse:

- Pressure washer and bush (third fixing)
- Shearing capsules
- Straps
- Upper and lower shaft (splined) connection.

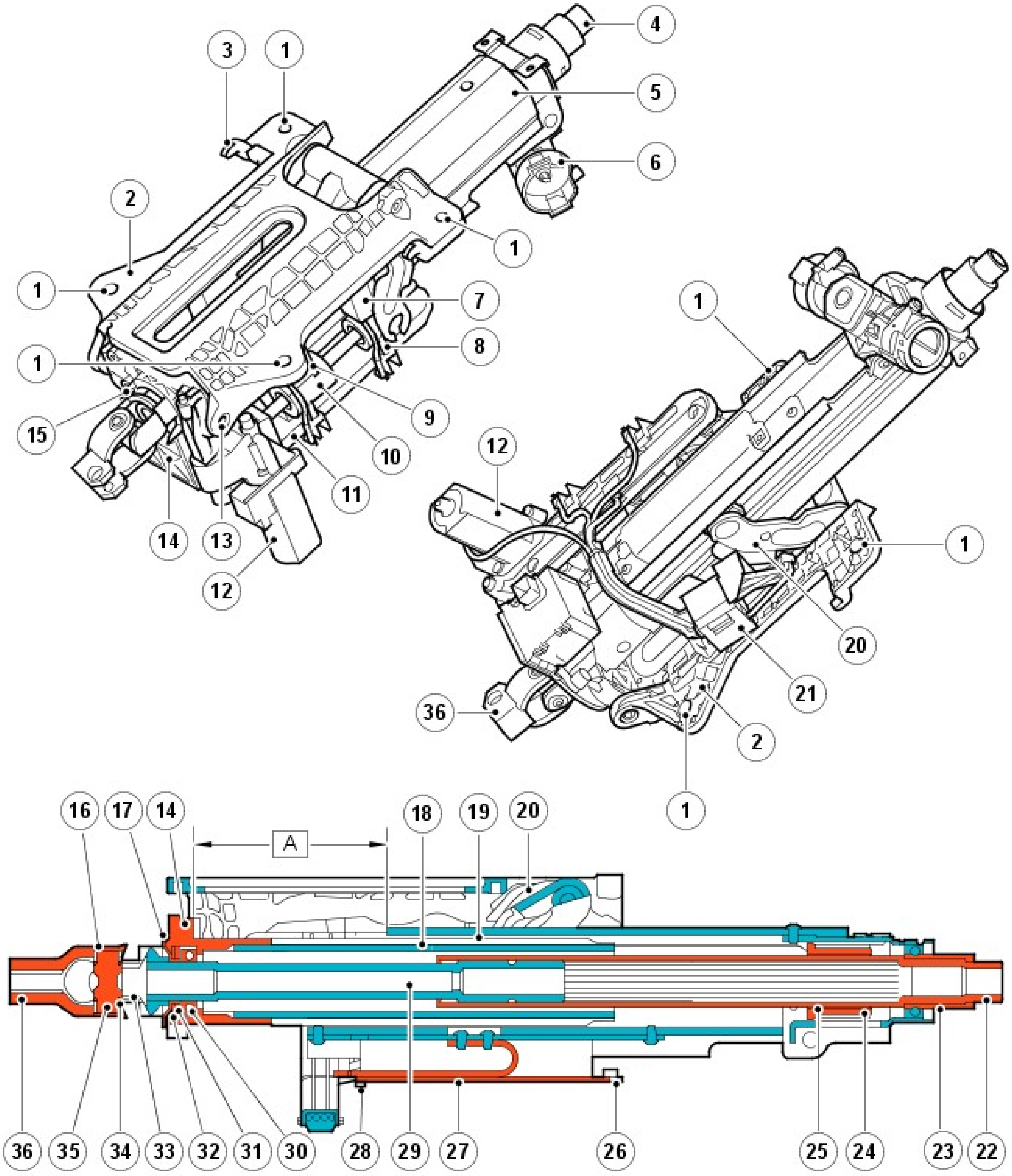
The shearing capsules have a central hole through which the rearward attachment bolts pass through into the roof bracket. The capsules are located in the 'U' bracket by tapered slots, which have small cut-outs in the inside faces. The shearing capsules have a number of small holes which align with the cut-outs in the 'U' bracket. When the capsules are installed, plastic is injected into the holes and cut-outs. This plastic retention of the capsules provides the initial controlled break-out force for the column in the event of a collision. After 10 mm of displacement, the 'U' bracket is no longer located by the shearing capsules. When handling the column, care should be taken that the shearing capsules are not impacted or dislodged.

The tension in the 'Third Fixing' screw, applies a clamp load to the roof bracket (via the bush and compression washers). In the event of a collision, this clamp load (supplementary to the shearing capsules) must be overcome before the column can collapse. When this load has been exceeded (and the fixing has been displaced 20 mm (0.79 in)) it slides easily within the roof bracket slot, providing directional control to the column, as it collapses. Under no circumstances should the screw torque be adjusted.

The straps are rectangular section steel, which at one end, have coils that locate around a plastic bush (positioned on the shearing capsule). The other end is formed into a hook which locates within a slot in the 'U' bracket. When a collision has occurred, and the 'U' bracket has been displaced from the shearing capsules by 8 mm (0.3 in), the straps begin to un-roll due to the displacement of the 'U' bracket. The straps provide the main element for energy absorption as the column collapses. The cross section of the straps change after approximately 40 mm (1.6 in) of extension, changing the amount of energy that they absorb.

ELECTRIC UPPER COLUMN ASSEMBLY

Electric Steering Column Component Layout



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E86421

Item	Part Number	Description
A	-	Crash Stroke 90.00 mm (3.54 in)
1	-	Attachment hole
2	-	Roof bracket
3	-	Locating hook
4	-	Steering wheel splines
5	-	Outer profile

6	-	Lock assembly
7	-	Rake solenoid
8	-	Rake clutch
9	-	Reach solenoid
10	-	Reach clutch
11	-	Potentiometer
12	-	Electric motor
13	-	Pivot pin
14	-	Pivot housing
15	-	Steering angle sensor
16	-	Needle bearing
17	-	Driving collar
18	-	Inner profile
19	-	Crash rail
20	-	Rake lever
21	-	Electrical connector
22	-	Upper shaft
23	-	Upper bearing
24	-	Lock collar
25	-	Tolerance ring
26	-	Clip - cowl attachment
27	-	Flat strap
28	-	shear pin
29	-	Lower shaft
30	-	Lower bearing
31	-	Washer
32	-	Retaining ring
33	-	Yoke
34	-	Universal joint seal
35	-	Spider
36	-	Swing yoke

The electric steering column is a standard fit on certain models and an optional fit on other models.

The steering column is attached to the in-vehicle crossbeam and secured with four, 8mm, thread forming, pan head Torx drive screws. In the event of a high energy frontal impact, a strap and shear pin on the underside of the column provides a controlled collapse of the outer housing on the inner housing, allowing the column to shorten axially (collapse), absorbing energy to reduce occupant loading.

The column comprises a cast magnesium roof bracket which is attached to the in-vehicle crossbeam. Attached to the roof bracket is a pivot housing, a outer housing and upper and lower shafts. The roof bracket has two hooks which locate in slots in the in-vehicle crossbeam. The hooks assist in supporting the weight of the column during removal or installation.

The rake lever locates the aluminum outer profile, into which is fixed the steel column lock adaptor (with upper bearing). The inner profile is located within the outer profile, by 2 linear bearing assemblies, which allow a telescopic action for the reach adjustment.

The assembly of the upper and lower shafts is located within the column by the bearings in the column lock adaptor and the pivot housing. Both shafts are tubular. The lower shaft has external splines (which are over molded with nylon), and these mate with the internal splines in the upper shaft. The purpose of the splines is to transmit rotational movement of the upper shaft to the lower shaft, yet allow telescopic movement during column axial collapse. The lower shaft is fitted with a universal joint spider to which a swivel yoke is attached. The swivel yoke attaches to the intermediate shaft of the steering column on the interior side of the bulkhead using a special cam bolt and self-locking nut.

A steering angle sensor is attached to the pivot housing of the column and its centre gear is rotated by a drive collar which is attached to the lower shaft and rotates with movement of the steering wheel. The sensor transmits steering angle data on the high speed CAN bus which is used by various systems on the vehicle. The steering angle sensor is designed to become detached from the column in the event of a frontal impact. Care must be taken when handling the column assembly to prevent accidental damage to the sensor.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

The upper shaft is fitted with a locking collar which engages with the lock bolt of the column lock assembly. The locking collar is retained by a tolerance ring on the shaft. The tolerance ring allows a specified amount of force to be applied to the shaft before it slips, preventing damage to the column lock due to excessive torque being applied to the steering wheel when the lock is engaged. The tolerance ring is designed to slip on the upper shaft when an applied torque exceeds its fitted slip load of 200Nm minimum. Following rotation, the torque to rotate the lock collar should exceed 100Nm.

The steering column is adjustable electrically for reach and rake. The column can be adjusted for 40.00 mm (1.57 in) of reach adjustment and 6 degrees of rake adjustment. The adjustment mechanism comprises an electric adjustment motor, a lead screw, a rake solenoid, a reach solenoid, a rake clutch and a reach clutch.

The column adjustment is controlled by the driver using a joystick switch located on the left hand side of the column cowl. The joystick can be moved forward and backward to adjust the column reach in and out and moved up and down to adjust the rake. The single electric motor is used for both adjustment ranges. The switch selection s the applicable solenoid, engaging the applicable clutch on the lead screw.

When selected by the Auto function on the joystick adjustment switch, the steering column will adjust to the uppermost tilt position when the key is removed from the column lock barrel, and re-adjust to the previous set position, when the key is re-inserted.

For the reach adjustment, the lead screw drives the outer housing in or out as required. For the rake adjustment, the lead screw drives a rake lever which moves the column up or down as applicable.

The pivot housing is attached to the roof bracket with two pivot pins. When the rake adjustment is operated, the pivot housing rotates around the pivot pins to allow for the up and down adjustment, but maintains a positive location to the roof bracket.

The electric column is linked to and controlled by the memory control module. The memory control module provides storage of three separate memory positions which are stored against three individual vehicle keys.
For additional information, refer to: Seats (501-10 Seating, Description and Operation).
The electric column also has an easy egress feature which lifts the column to its maximum rake to allow easier access to the vehicle.

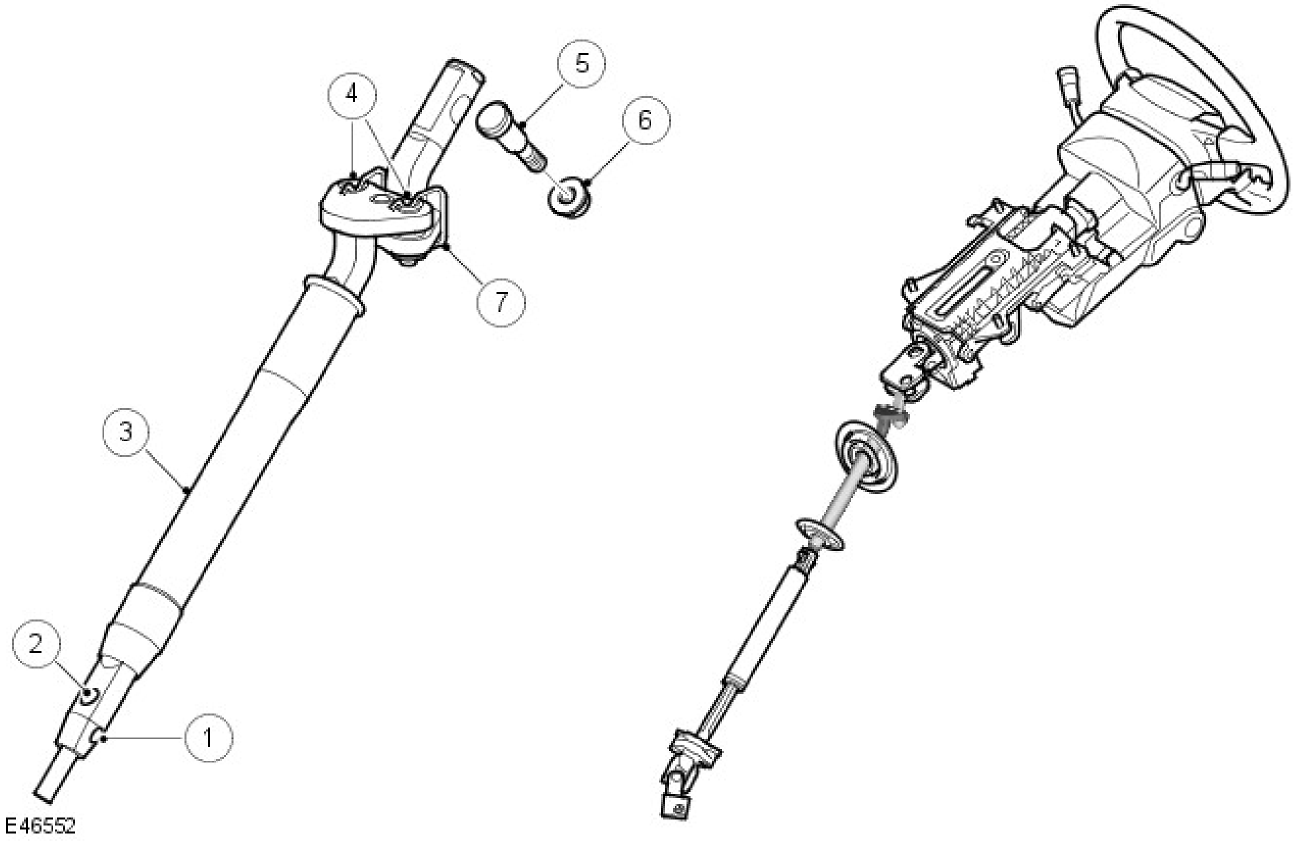
In the event of a high energy frontal impact, the upper column assembly is designed to collapse reducing impact injury to the driver. A number of components interact together to ensure that the collapse of the column is in a controlled manner. The following components control the column collapse:

- Shear pin
- Strap
- Upper and lower shaft (splined) connection.

The strap is rectangular section steel, which is secured by two Allen screws to the outer housing and by a shear pin to the strap guide. The strap provides the main element for energy absorption as the column collapses. To initiate axial movement of the column, the shear pin has to be severed, friction between several column interfaces has to be overcome, and an axial load applied sufficient to initiate strap guide deformation. Once the column is telescoping, deformation of the strap guide, and sliding friction between column interfaces, absorbs the energy of the occupant in a controlled manner, as the column collapses.

WARNING: Do not attempt to dismantle the steering column. The crash safety of the unit will be compromised.

INTERMEDIATE SHAFT



Item	Part Number	Description
1	-	Alignment slot
2	-	Attachment hole
3	-	Seal sleeve
4	-	Load limiter pins
5	-	Cam bolt
6	-	Self-locking nut
7	-	Retention spring

CAUTION: Care should be taken when handling the intermediate shaft, to ensure that it is not subject to impacts or that the retention spring is not displaced.

The non-handed, intermediate shaft is attached at its upper end to the swivel yoke on the lower shaft of the steering column assembly. The intermediate shaft comprises two main parts; the upper and lower axis which are joined together with a shear joint.

The upper axis has a cut-out in the shaft which allows for the fitment of the cam bolt. Only when the shaft is located correctly in the swivel yoke, can the cam bolt be inserted. A self-locking nut is fitted to the cam bolt. The torque applied as the nut is tightened, rotates the bolt, forcing the cam against the shaft, positioning it correctly in the swivel yoke prior to the joint being clamped.

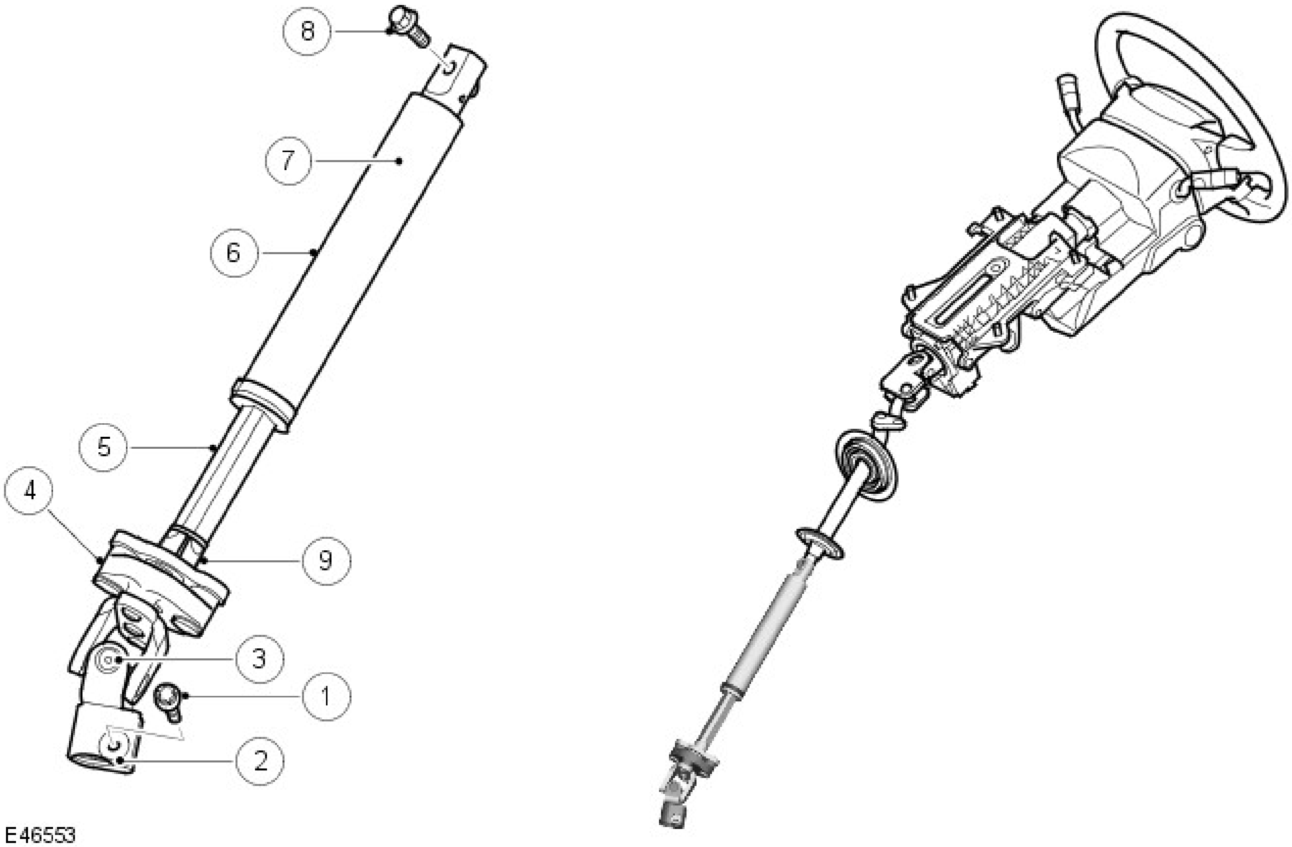
- NOTE: If the self-locking nut is removed for any reason, it is recommended that a new, correct nut is fitted to maintain the optimum torque on the cam bolt.

The lower axis is fitted with a plastic molded seal sleeve which provides a suitable surface for the location of the plastic bearings within the two bulkhead seals. The bottom of the lower axis is machined to a double 'D' shape which tapers at the end. One side of the taper has a slot which is used to align the intermediate shaft and the lower collapsible shaft to ensure that the correct orientation of the steering wheel to steering gear is maintained. A hole is drilled through the double 'D' shape and provides for attachment of the intermediate shaft to the lower collapsible shaft.

The upper and lower axis, are joined together via a load limiter. The load limiter is designed to disconnect the upper and lower axis in the event of a high energy frontal impact preventing an excessive load being applied to the steering column (causing intrusion into the passenger compartment or an unstable airbag deployment).

The load limiter comprises two plates which are part of the upper and lower axis. The plates have a central 'guide' pin, and two retention pins, which pass through bushes in the plates, onto which a rubber and steel washer are staked in position. The size of the staking controls the load at which the lower axis separates from the upper axis. A wire 'retention' spring is also fitted to the load limiter.

LOWER COLLAPSABLE SHAFT



E46553

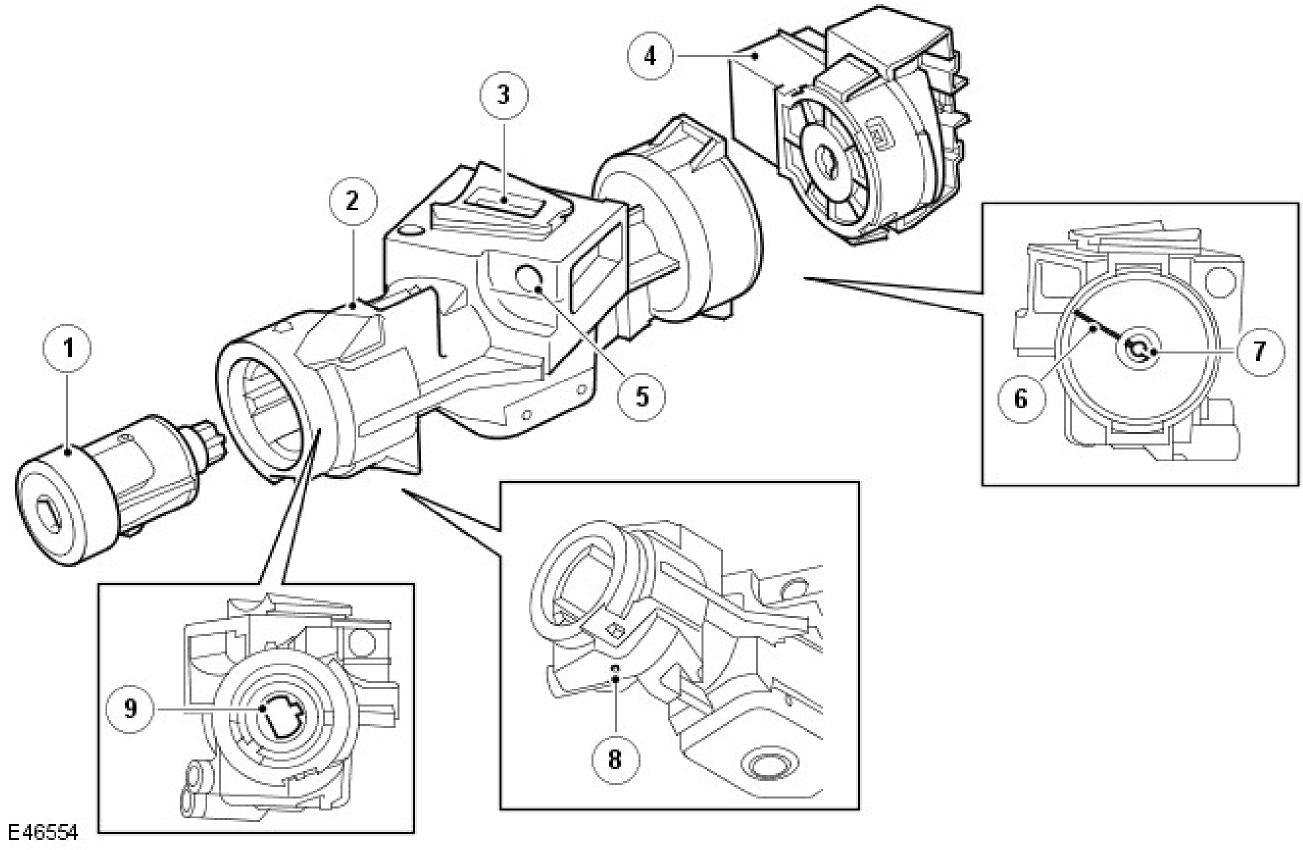
Item	Part Number	Description
1	-	Torx bolt
2	-	'U' yoke
3	-	Universal joint
4	-	Flexible coupling
5	-	Male shaft
6	-	Female shaft
7	-	Heat shield
8	-	Bolt
9	-	Plastic spacer

The lower collapsible shaft is a handed component and the correct component must be fitted to ensure that the steering phase angle is maintained. The shaft is attached at its upper end to the intermediate shaft and at its lower end to the valve unit pinion on the steering gear. These attachment joints can only be fitted in one orientation to ensure the correct alignment of the steering wheel to the steering gear. The shaft comprises two female and male shafts which are a telescopic fit on each other. The male shaft can slide up to 77 mm (3.03 in) within the female shaft in the event of a frontal impact, to minimize the effect of frontal intrusion. The sliding fit also allows for dynamic displacement between the chassis and the body during severe off-road driving. A plastic spacer is fitted to the male shaft which is only used as an assembly aid during vehicle production and serves no function once the shaft is assembled to the vehicle.

The female shaft is a triangular section tube which is formed to a double 'D' hole at its upper end which mates with the intermediate shaft. An indentation pressed in the wall of the tube ensures the correct alignment between the intermediate shaft and the lower collapsible shaft. A captive nut, clinched to one side of a hole in the double 'D' section, allows for the fitment of a patchlock bolt to secure the intermediate shaft. Clamped around the end of the female shaft is a dust seal which prevents the ingress of dirt and moisture into the sliding joint, and a heat sleeve is also fitted to reflect radiant heat from the exhaust.

The male shaft is a triangular section tube which is staked at its lower end into a flange. A cage and curved 'spring plates' are fitted to its upper end, which slide in the female shaft. A pin is fitted into the side of the female tube, to secure the male tube in the bore. The lower end of the male shaft is fitted with a flexible coupling to absorb vibration and steering 'kick back', transmitted from the steering gear. A 'stabilizing pin' is fitted through the coupling to prevent coupling articulation (acting as a universal joint), while still allowing rotational flexing and plunge movement. The coupling is a rubber molding within which are nylon fibres wound around the attachment holes to transmit torque applied to the steering. The coupling is attached to a drive flange (which is part of the male shaft), and to the 'U' yoke which in turn is connected to the pinion yoke, by the universal joint assembly.

STEERING COLUMN LOCK



Item	Part Number	Description

1	-	Ignition barrel
2	-	Column lock assembly
3	-	Lock bolt
4	-	Ignition switch
5	-	Attachment hole
6	-	Alignment mark
7	-	Switch drive
8	-	Barrel release hole
9	-	Barrel drive

The column lock comprises a cast housing which contains the locking components. The unit is assembled and sealed with a cover which is secured with roll pins into blind holes. The column lock is not a serviceable part and must be replaced as a complete component. The lock has a locking bolt which moves up and down on a cam. The cam is part of a shaft which runs through the lock and is operated by rotation of the ignition key in the ignition barrel.

The column lock is attached to the column with two shear bolts. When the column lock is fitted to the column, the bolts are tightened to a specified torque which shears off the heads of the bolts, preventing easy removal of the column lock.

⚠CAUTION: Before removing the ignition switch and/or key barrel, ensure the lock is in key position I. Ensure that the shaft is not rotated from this position when the ignition switch has been removed from the column lock. If the shaft is rotated beyond key position 0, a plunger and spring can become unseated from the lock bolt, causing incorrect operation of the column lock. . If the plunger is not correctly located in the lock bolt, the lock is not serviceable and must be discarded.

The ignition barrel is fitted to the right hand end of the column lock. The lock is pushed into the bore and locks in position. Removal and fitment of the barrel is achieved by inserting the ignition key into the key barrel and turning to position I. To remove from the column lock, a suitable probe must be inserted through the release hole to depress the locking plunger on the key barrel. The key barrel can then be pulled from the lock using the key.

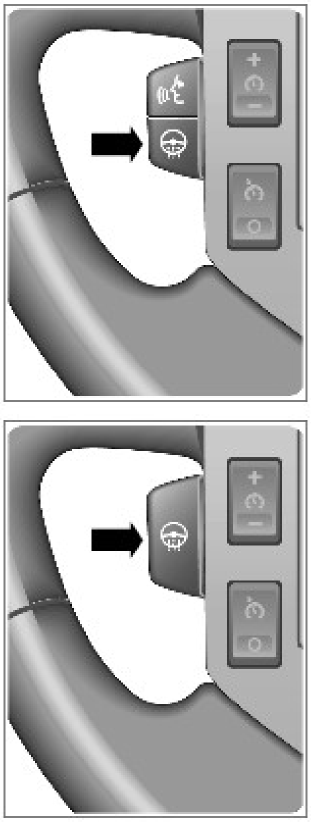
The ignition switch is fitted to the left hand end of the column lock. The ignition switch is pushed into the bore and two plastic clips locate in slots in the lock to retain the switch. Removal of the ignition switch is achieved by ensuring that the key is in the ignition barrel and turned to position I, depressing the two plastic clips and pulling the switch from the lock. Before replacing the ignition barrel, ensure that the switch is in position I (a new switch is supplied in position 0), and ensure that the drive tangs on the lock shaft are aligned with the alignment mark on the lock casting. Push the switch into the lock and ensure that it is fully engaged on the drive tangs and the plastic clips are fully located in the slots.

Steering Wheel Heating

Overview

The heated steering wheel is controlled by the driver using the switch on the steering wheel. The switch is either a dual function switch, or a separate switch depending on the feature level fitted.

Heated steering wheel switches



E103222

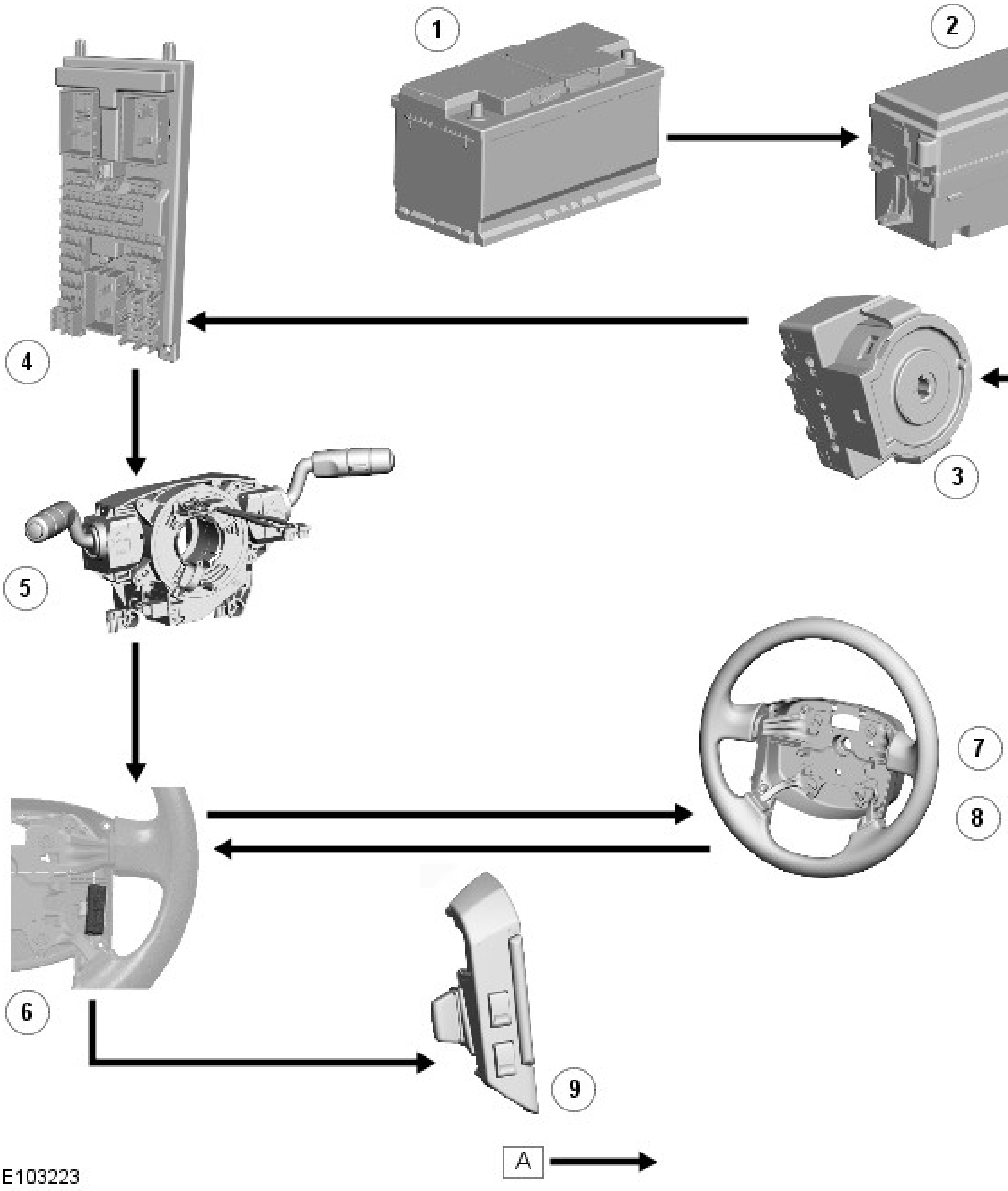
The heated steering wheel icon, in the switch, will illuminate as follows:

- If the steering wheel heating is on, the icon will show amber.
- If the steering wheel heating and headlamps are off, the icon will not illuminate.
- If the steering wheel heating is off and headlamps are on, the icon will show green.

System Operation

Heated steering wheel, control diagram

- NOTE: A = hardwired



Item	Part Number	Description
1	-	Battery
2	-	Battery junction box (fuse)
3	-	Ignition switch
4	-	Central junction box (fuse)
5	-	Clockspring
6	-	Steering wheel heater module
7	-	Steering wheel heater element
8	-	Steering wheel heat sensor
9	-	Steering wheel heater switches

A non-serviceable heater element is incorporated in the steering wheel which provides a uniform distribution of heat throughout the rim of the steering wheel. A heat sensor also located in the rim of the steering wheel is monitored by the steering wheel heater module located under the steering wheel's right-hand switch pack.

The heater element is activated when the driver operates the switch on the steering wheel. The switch provides an input to the steering wheel heater module, which responds by supplying an output signal to the heater element. The heater module, via signals from the heat sensor, controls the operation of the heater element to maintain a steering wheel surface temperature of approximately 30°C (86°F).

Published: 11-May-2011

Steering Column - Steering Column

Diagnosis and Testing

For additional information. REFER to:

Steering System (211-00 Steering System - General Information, Diagnosis and Testing),
Seats (501-10 Seating, Diagnosis and Testing).

Published: 11-May-2011

Steering Column - Steering Column

Removal and Installation

Removal

WARNING: Take care if releasing the adjustment lever when the column has been removed from the vehicle. The spring is under a high tension, and if released, could cause personal injury. Make sure fingers are clear from any areas, likely to be trapped.

CAUTION: Air tools MUST NOT be used on steering column bolts.

All vehicles

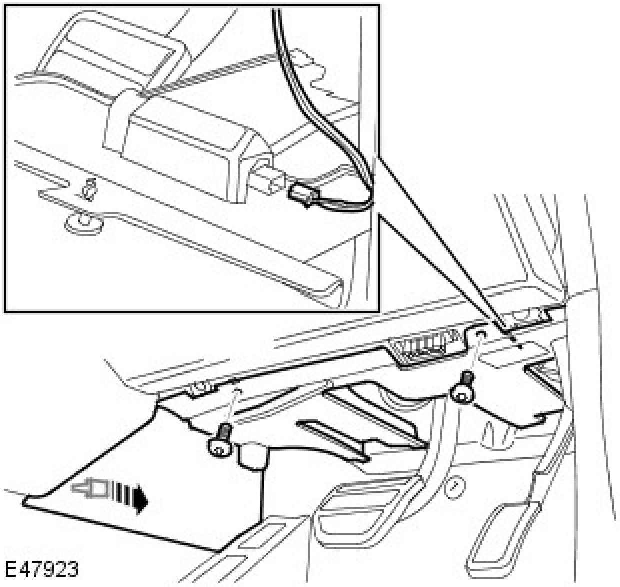
1. Fully extend the steering column for access.

2. Remove the steering wheel.
For additional information, refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).

3. Remove the headlamp switch trim panel.
For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).

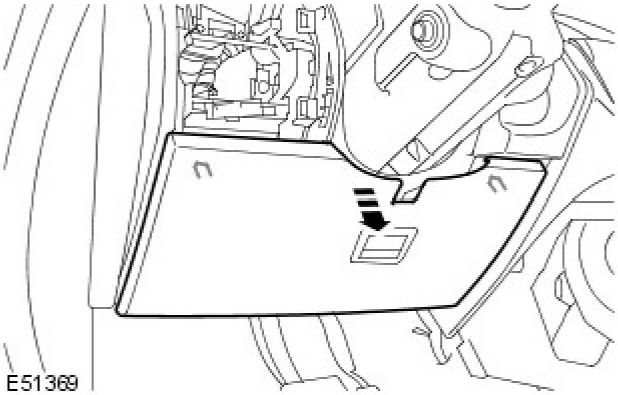
4. Remove the driver side closing trim panel.

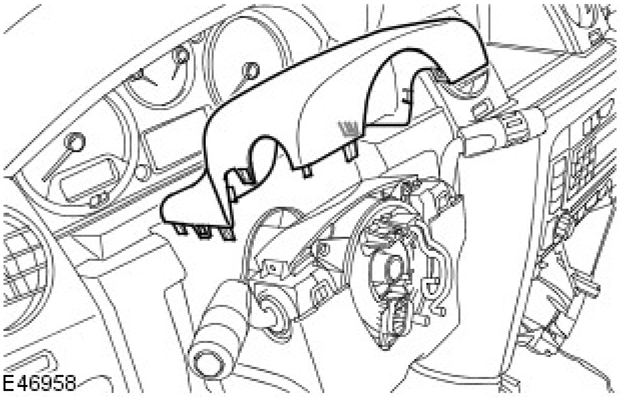
- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



5. Remove the instrument panel access panel.

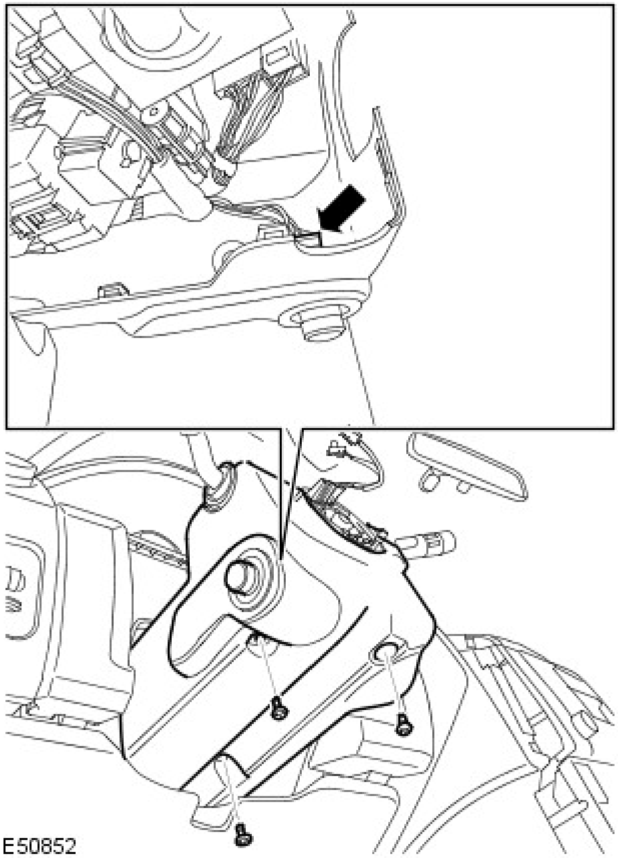
- Release the 2 clips.





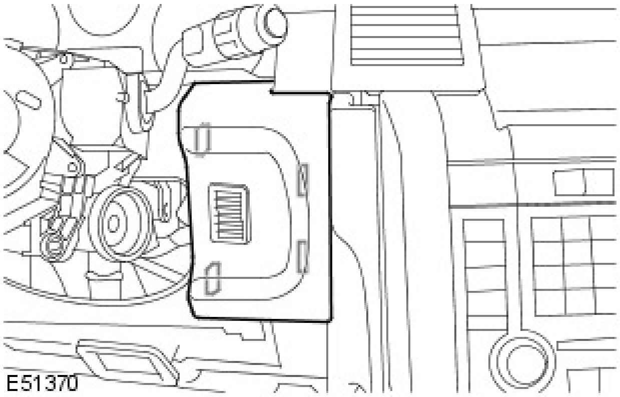
6. Remove the steering column upper shroud.

- Release the 6 clips.



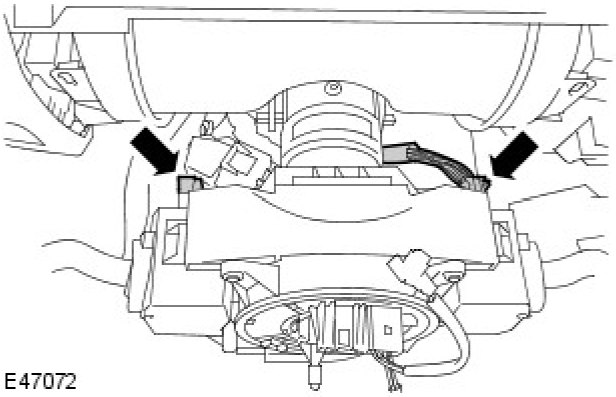
7. Remove the steering column lower shroud.

- Remove the 3 Torx screws.
- Disconnect the electrical connector.

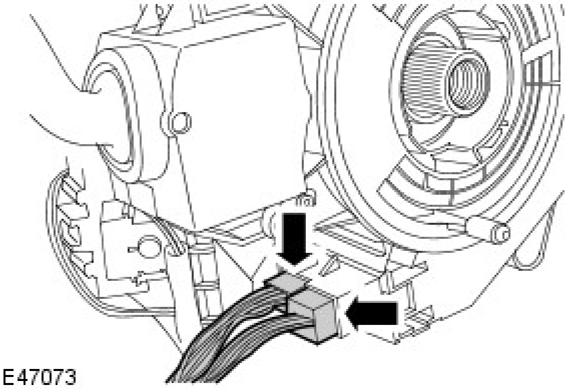


8. Remove the steering column side trim panel.

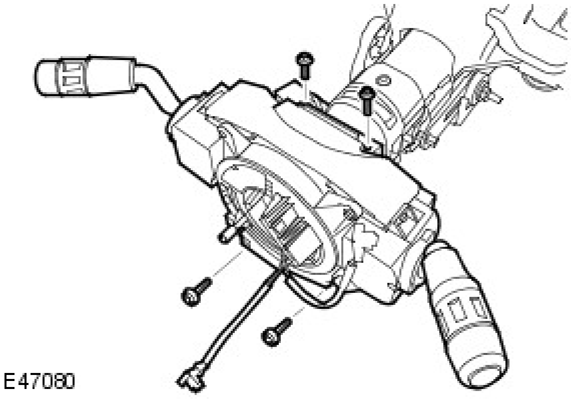
- Release the 4 clips.



9. Disconnect the 2 electrical connectors from the steering column multifunction switches.

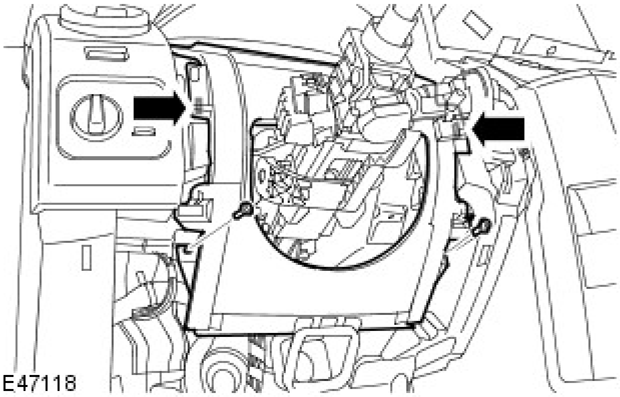


10. Disconnect the 2 electrical connectors from the clockspring.



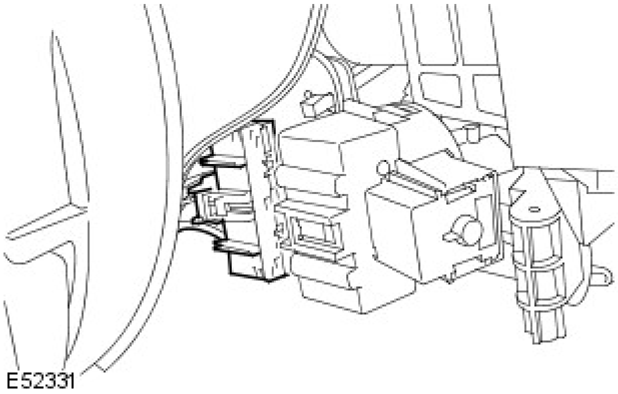
11. Remove the steering column switch assembly.

- Remove the 4 Torx bolts.

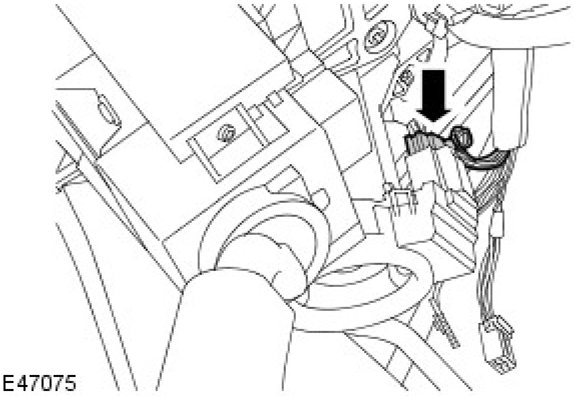


12. Remove the steering column gaiter panel.

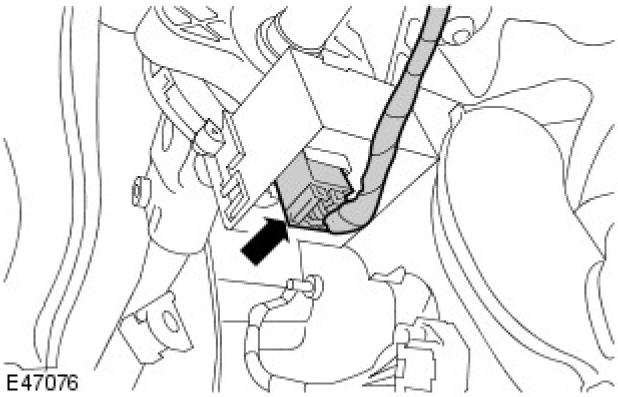
- Remove the 2 Torx screws.
- Release the 2 clips.



13. Disconnect the ignition switch electrical connector.

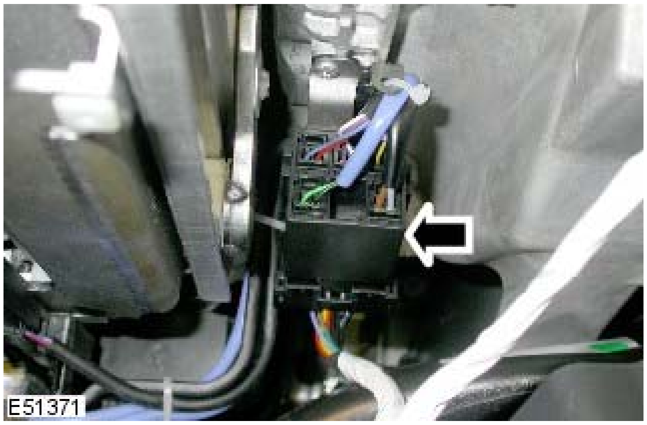


14. Disconnect the passive coil electrical connector.



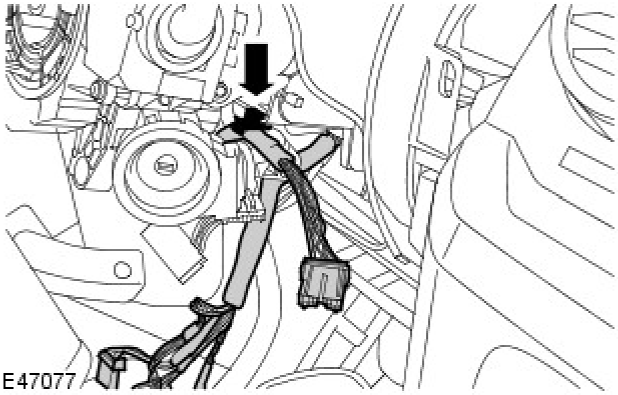
15. Disconnect the steering angle sensor electrical connector.

Vehicles with electric steering column



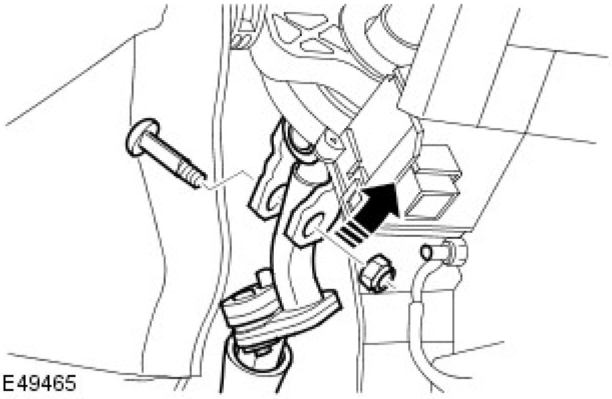
16. Disconnect the steering column adjustment motor electrical connector.

All vehicles



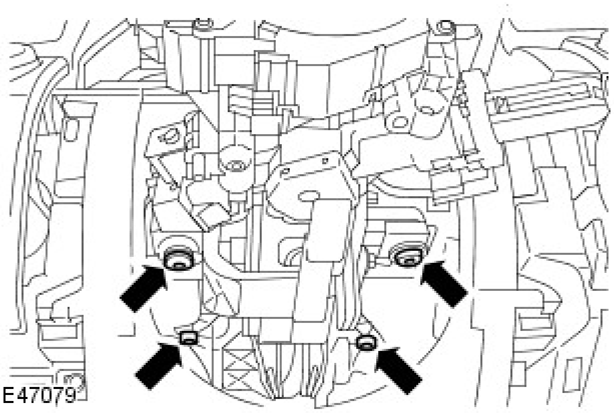
17. Position the steering column wiring harness aside.

- Release the clip.



18. Disconnect the steering column intermediate shaft from the steering column.

- Note the fitted position.
- Remove the special bolt and discard the nut.

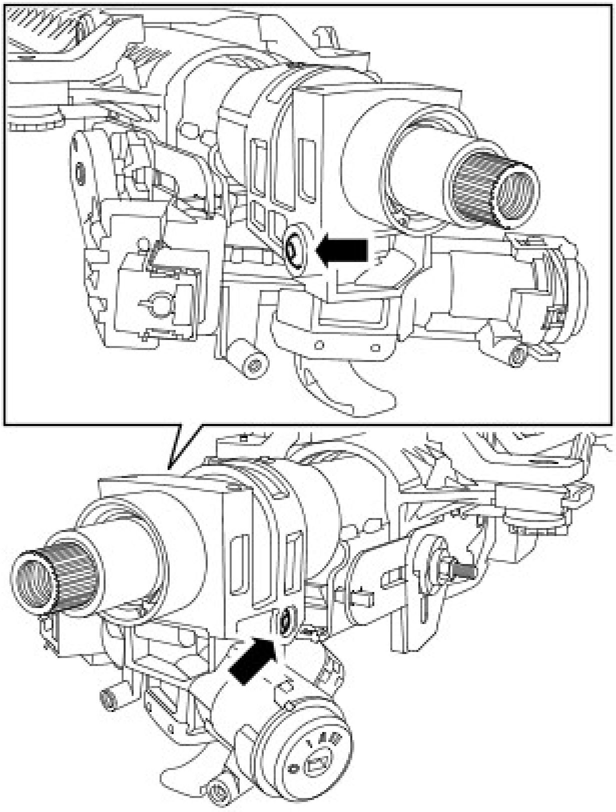

E47079

19. ⚠ WARNING: Take care if releasing the adjustment lever when the column has been removed from the vehicle. The spring is under a high tension, and if released, could cause personal injury. Make sure fingers are clear from any areas, likely to be trapped.

⚠ CAUTION: If the steering angle sensor is damaged upon removal of the steering column, the sensor MUST be replaced.

With assistance, remove the steering column.

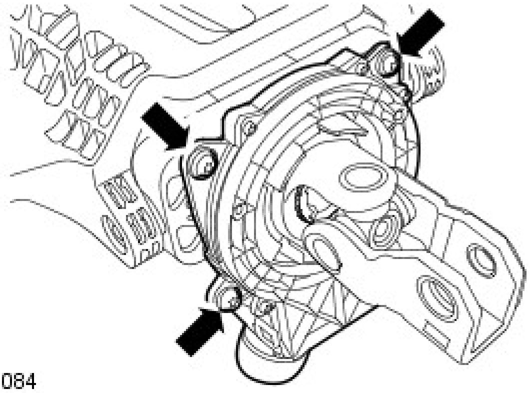
- Remove the 4 Torx bolts.


E47082

20. NOTE: Do not disassemble further if the component is removed for access only.

Remove the ignition switch assembly.

- Remove and discard the 2 shear bolts.


E47084

21. Remove the steering angle sensor.

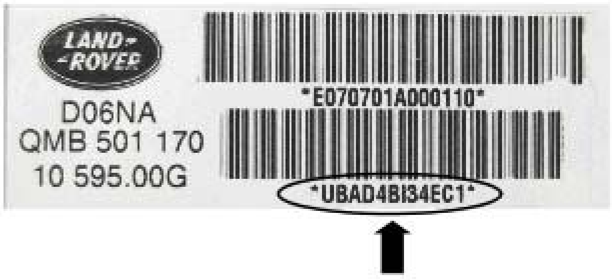
- Remove the 3 Torx screws.

Installation

Vehicles with electric steering column

1. ⚠ CAUTION: The potentiometer adjustment values are unique for each steering column. Failure to enter the correct code during calibration may result in damage to the vehicle.

Note the potentiometer hexadecimal code on the new steering column label for future reference.



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10 595.00G
E070701A000110
UBAD4BI34EC1

E102064

All vehicles

2. Install the steering angle sensor.

- Tighten the Torx screws to 3 Nm (2.2 lb.ft).

3. Install the ignition switch assembly.

- Tighten the shear bolts until the heads shear off.

4. CAUTIONS:

⚠ Make sure the bolt holes are clean and free of swarf.

⚠ The steering column bolts must by tighted by hand a minimum of 3 revolutions.

⚠ Air tools MUST NOT be used on steering column bolts.

With assistance, install the steering column.

- Tighten the bolts in sequence to 25 Nm (18 lb.ft).

5. Connect the steering column intermediate shaft.

- Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).

6. Secure the wiring harness to the steering column.

Vehicles with electric steering column

7. Connect the steering column adjustment motor electrical connector.

All vehicles

8. Connect the steering angle sensor electrical connector.

9. Connect the passive coil electrical connector.

10. Connect the ignition switch electrical connector.

11. Install the steering column gaiter panel.

- Secure with the clips.
- Tighten the Torx screws.

12. Install the steering column switch assembly.

- Tighten the Torx bolts to 3 Nm (2 lb.ft).

13. Connect the clockspring and multifunction switch electrical connectors.

14. Install the steering column side trim panel.

- Secure with the clips.

15. Install the steering column shrouds.

16. Install the instrument panel access panel.

- Secure with the clips.

17. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

18. Install the steering wheel.
For additional information, refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).

19. Install the headlamp switch trim panel.
For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).

20. Calibrate the steering angle sensor using the Land Rover approved diagnostic tool.

Vehicles with electric steering column

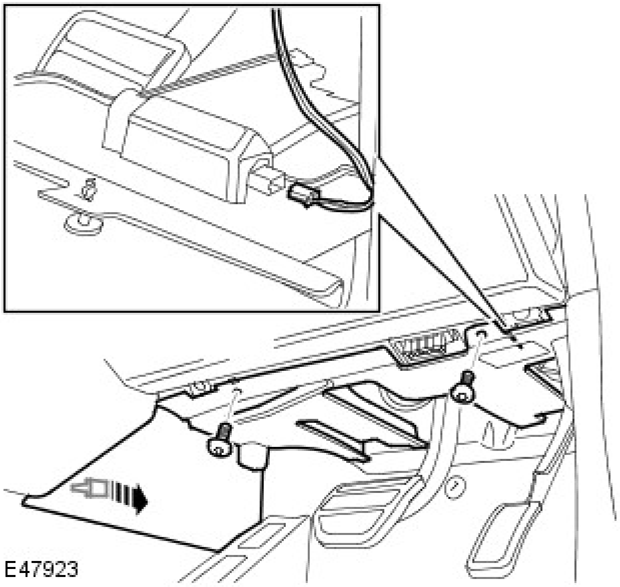
21. If a new electric steering column is fitted re-calibrate the steering column potentiometer using the Land Rover approved diagnostic system.

Steering Column - Steering Column Shaft

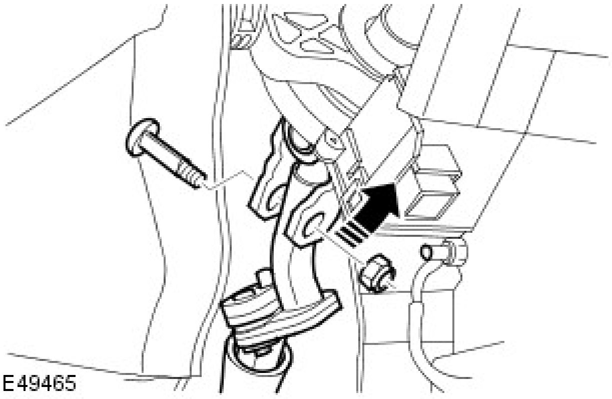
Removal and Installation

Removal

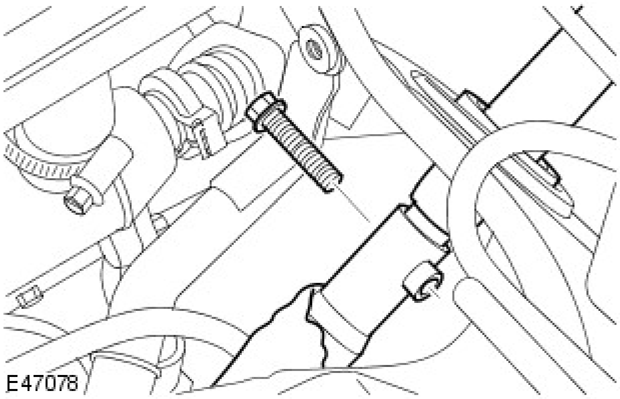
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



2. Remove the driver side closing trim panel.
   - Release the clip.
   - Remove the 2 screws.
   - Disconnect the electrical connector.



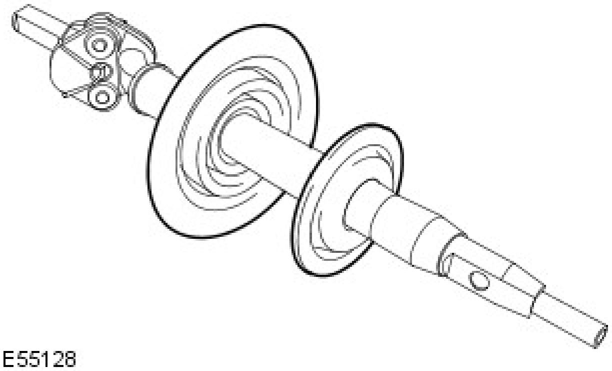
3. Disconnect the steering column intermediate shaft from the steering column.
   - Note the fitted position.
   - Remove the special bolt and discard the nut.



4. Disconnect the steering column intermediate shaft from the lower shaft.
   - Note the fitted position.
   - Remove and discard the bolt.

5. Remove the steering column intermediate shaft.

- Release the 2 grommets.



E55128

6. NOTE: Do not disassemble further if the component is removed for access only.

• NOTE: Note the fitted position.

Remove the 2 intermediate shaft grommets.

Installation

1. Install the steering column intermediate shaft.

- Install the grommets.

2. Connect the steering column intermediate shaft to the lower shaft.

- Tighten the new bolt to 25 Nm (18 lb.ft).

3. Connect the steering column intermediate shaft to the steering column.

- Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).

4. Install the driver side closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Steering Column - Steering Column Lower Shaft

Removal and Installation

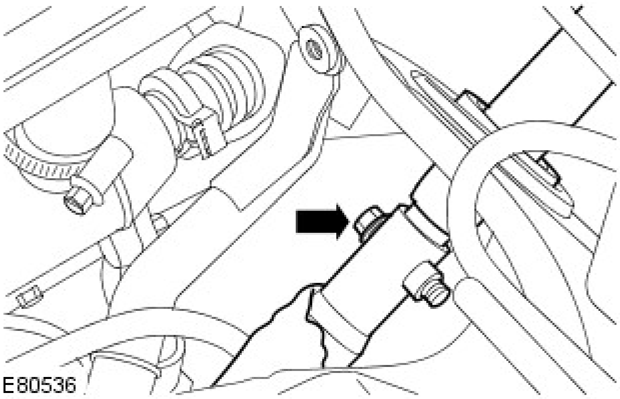
Removal

⚠CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Turn the steering wheel to the straight ahead position.


E80536

3. CAUTIONS:

⚠ Make sure the steering wheel is in the straight ahead position.

⚠ Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

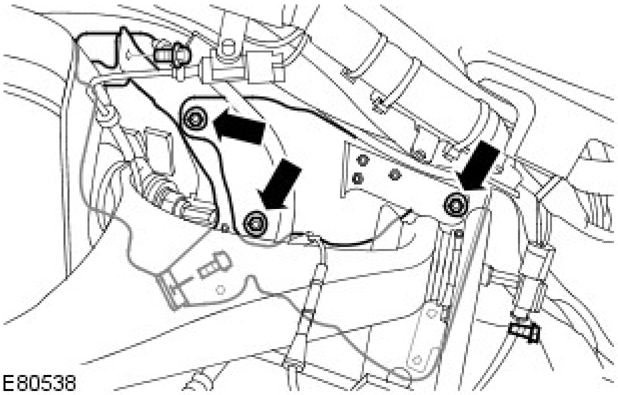
- NOTE: Note the fitted position.

Remove and discard the steering column lower shaft upper bolt.

4. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

Vehicles with 3.6L diesel engine


E80538

5. ⚠CAUTION: Make sure that the brake hose and the wiring harnesses are not damaged during the removal and installation of the heat shields.

- NOTE: Note the fitted position.

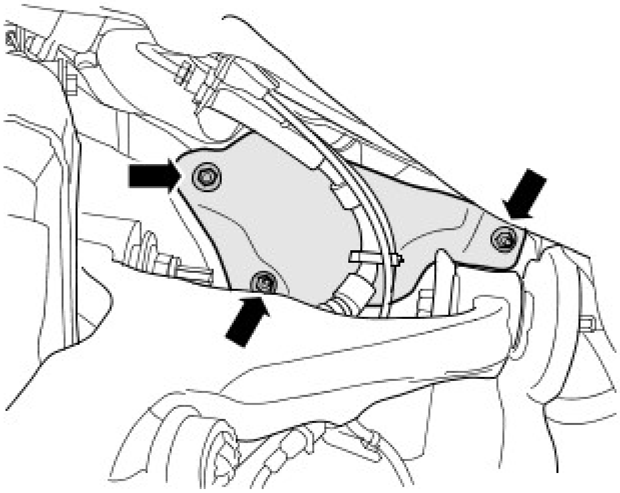
Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 2 bolts.

All other engine types

6. Remove the brake line heat shield for access.

- Remove the 3 nuts.



E102486

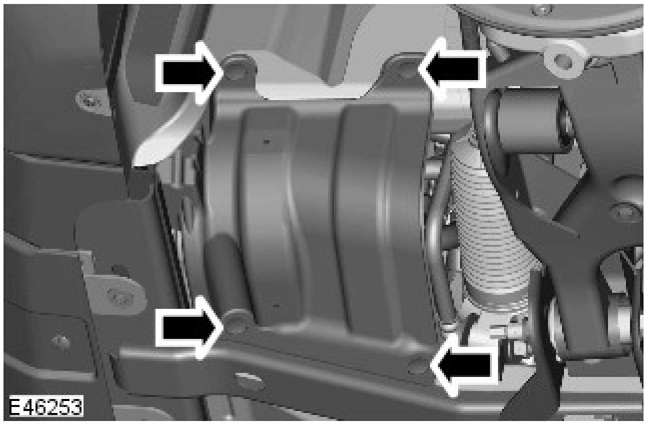
All vehicles

7. ⚠CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

Disconnect the steering column lower shaft from the intermediate shaft.

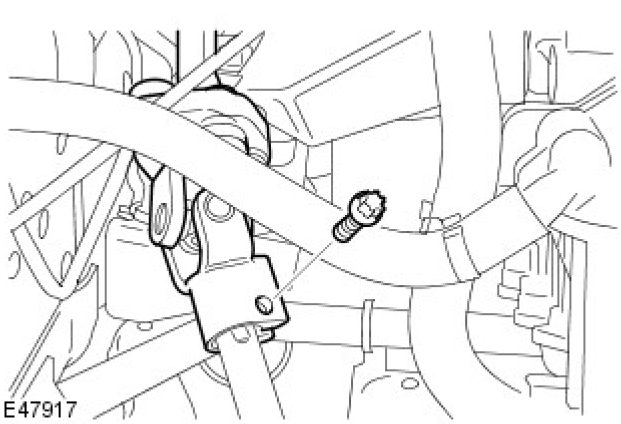
8. Remove the fender splash shield lower trim.

- Remove the 4 clips.



9. ⚠CAUTION: Make sure that the steering is correctly positioned using the road wheels. Do not turn the steering wheel. Failure to follow this instruction my result in damage to the vehicle.

Turn the steering until access can be gained to the steering column lower shaft bolt.



10. ⚠ CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

Remove and discard the steering column lower shaft bolt.

Vehicles with 3.6L diesel engine

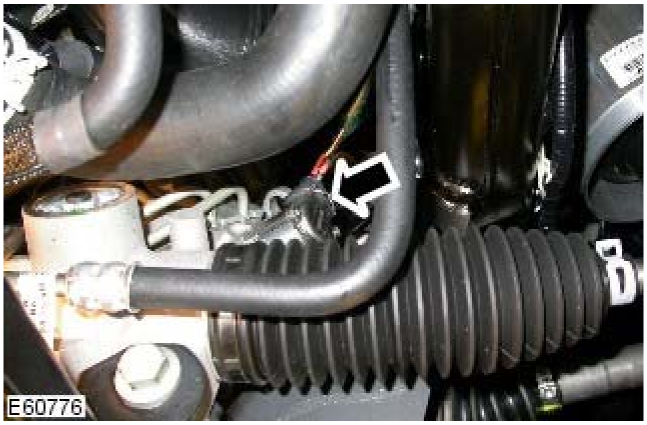
11. Lower the vehicle.

12. NOTE: The steering column lower shaft is removed from the vehicle through the inner wing.

Remove the steering column lower shaft.

- Disconnect the steering column lower shaft from the steering gear.

All other engine types



13. Disconnect the steering gear electrical connector.

14. Remove the steering column lower shaft.

- Disconnect the steering column lower shaft from the steering gear.

Installation

All vehicles

1. Clean the component mating faces.

2. ⚠ CAUTION: Make sure that the road wheels are in the straight ahead position.

With assistance, install the steering column lower shaft.

- Connect the steering column lower shaft to the steering gear.
- Connect the steering column intermediate shaft to the lower shaft.

3. Lower the vehicle on the lift.

4. ⚠ CAUTION: Make sure that a new bolt is installed.

Install the steering column lower shaft upper bolt.

- Install a new bolt and tighten to 30 Nm (22 lb.ft).

5. Raise the vehicle on the lift.

6. CAUTIONS:

⚠ Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

⚠ Make sure that the steering is correctly positioned using the road wheels. Do not turn the steering wheel. Failure to follow this instruction my result in damage to the vehicle.

Turn the steering until access can be gained to the steering column lower shaft bolt.

7. ⚠ CAUTION: Make sure that a new bolt is installed.

Install the steering column lower shaft to steering gear bolt.

- Install a new bolt and tighten to 30 Nm (22 lb.ft).

All other engine types

8. Connect the steering gear electrical connector.

All vehicles

9. Install the fender splash shield lower trim.

- Install the 4 clips.

Vehicles with 3.6L diesel engine

10. ⚠ CAUTION: Make sure that the brake hose and the wiring harnesses are not damaged during the removal and installation of the heat shields.

Install the upper arm and brake line heat shields.

- Install the 3 nuts.
- Install the 2 bolts.

All other engine types

11. Install the brake line heat shield.

- Install the 3 nuts.

12. Lower the vehicle on the lift.

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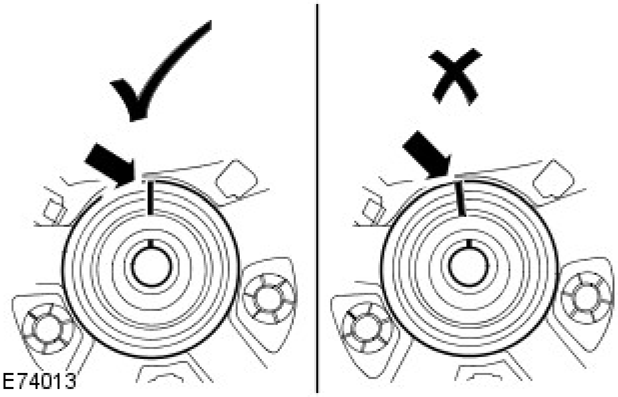
Steering Column - Steering Wheel

Removal and Installation

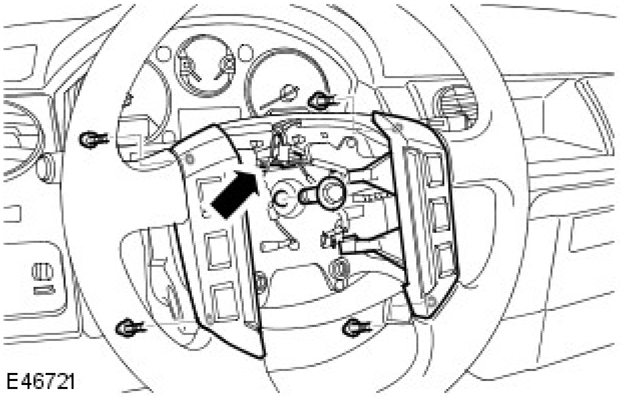
Removal

1. Remove the driver air bag module.
For additional information, refer to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).



2. ⚠ CAUTION: If the steering wheel timing marks were not aligned prior to the steering wheel being removed, they must be aligned on assembly and the steering angle sensor must be calibrated using the approved Land Rover diagnostic equipment and a four wheel alignment check must also be carried out. Failure to follow this instruction may result in damage to the vehicle.

Check that the steering wheel is correctly aligned prior to the steering wheel being removed.

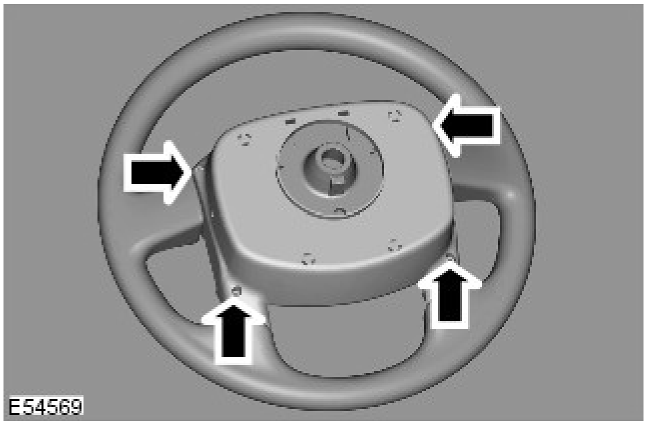


3. ⚠ CAUTION: Make sure the wheels are in the straight-ahead position. Failure to follow this instruction may result in damage to the components.

• NOTE: Note the steering wheel to column alignment marks.

Remove the steering wheel.

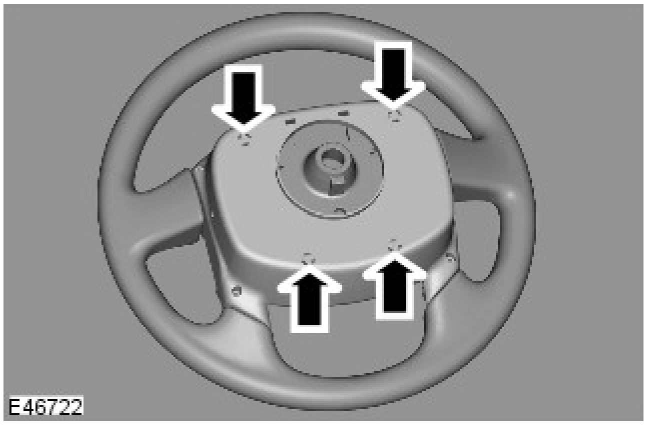
- Restrain the steering wheel and remove the bolt.
- Disconnect the steering wheel switch electrical connector.



4. NOTE: Do not disassemble further if the component is removed for access only.

Remove the steering wheel switch.

- Remove the 2 Torx screws.
- Disconnect the electrical connector.
- Repeat the above procedure for the other side.



5. Remove the steering wheel cover.

- Release the 4 clips.

6. Remove the wiring harness.

Installation

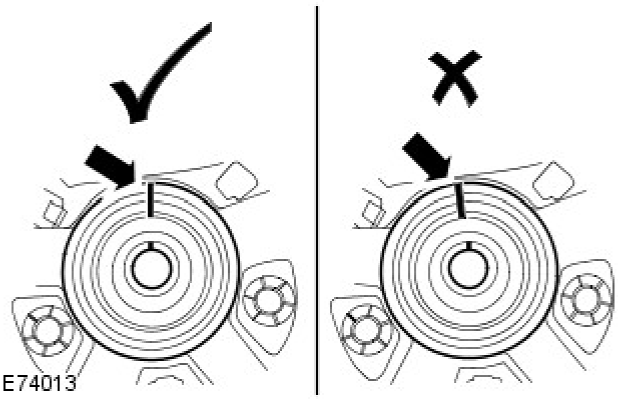
1. Attach the wiring harness.

2. Install the steering wheel cover.

- Secure with the clips.

3. Install the steering wheel switch.

- Connect the electrical connector.
- Tighten the Torx screws.
- Repeat the above procedure for the other side.



4. ⚠ CAUTION: If the steering wheel timing marks were not aligned prior to the steering wheel being removed, they must be aligned on assembly and the steering angle sensor must be calibrated using the approved Land Rover diagnostic equipment and a four wheel alignment check must also be carried out. Failure to follow this instruction may result in damage to the vehicle.

Correctly align the steering wheel to the steering column.

5. ⚠ CAUTION: Correct clockspring alignment can be found by viewing a yellow marker through the window situated on the clockspring face. If the marker is not visible, carefully turn the clockspring. If the turning force increases before the marker is visible, reverse the direction to avoid component damage.

Carefully install the steering wheel, engage the clockspring and align to the column.

- Tighten the bolt to 63 Nm (46 lb.ft).

6. Install the driver air bag module.
For additional information, refer to: Driver Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation).

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Steering Column Switches -

Torque Specifications

Description	Nm	lb-ft
Steering column switch Torx screws	3	2

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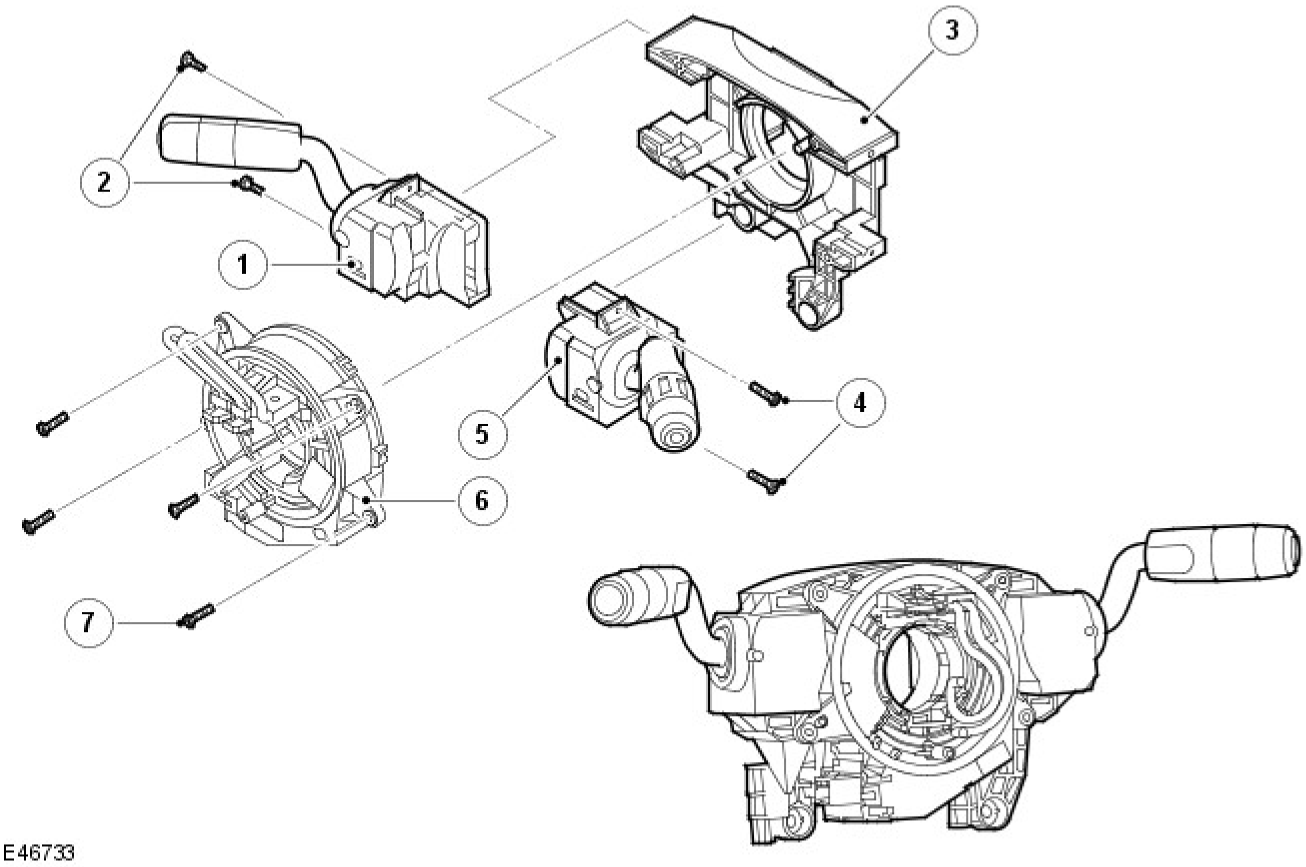
Steering Column Switches - Steering Column Switches

Description and Operation

The steering column switches comprise the steering column multifunction switch and the ignition switch. Both switches are located on the steering column assembly.

STEERING COLUMN MULTIFUNCTION SWITCH

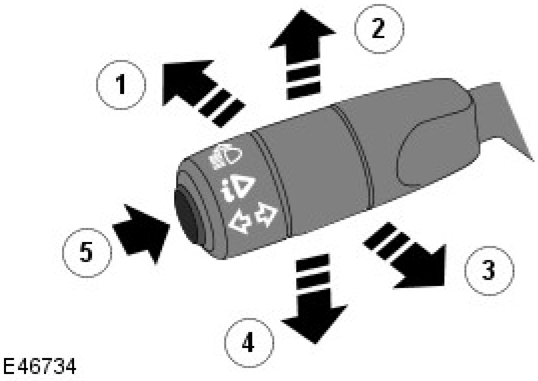


Item	Part Number	Description
1	-	Turn signal indicator switch assembly
2	-	Screw (2 off)
3	-	Case
4	-	Screw (2 off)
5	-	Windshield wiper switch assembly
6	-	Clockspring
7	-	Screw (4 off)

The steering column multifunction switch comprises a case which houses a turn signal indicator switch assembly, a windshield wiper switch assembly and a clockspring. The multifunction switch is located behind the steering wheel and is secured with two screws at the top to the steering column assembly and two screws at the bottom to the column lock housing.

The clockspring is located in the front of the case and retained with four screws. The clockspring engages in slots in the steering wheel boss and turns with the rotation of the steering wheel. The clockspring incorporates a tang which cancels the turn signal indicators when the steering wheel is rotated.
For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).

Turn Signal Indicator Switch Assembly



Item	Part Number	Description
1	-	High beam
2	-	Right hand indicator
3	-	Headlamp flash
4	-	Left hand indicator
5	-	Computer function button

The turn signal indicator switch assembly is located in the left hand side of the case and is retained in the case with two screws. The switch is connected to the main harness via a connector on the back of the switch. The switch controls the following functions:

- Left / right turn signal operation
- High / low beam operation
- Headlamp flash
- Computer function selection (if fitted).

Turn Signal Indicators

The turn signal indicators are operated by pushing the switch up for right hand indicators and down for left hand indicators. The switch has a detent position which locks the switch in the selected position until it is moved to the central off position. The switch also has a 'lane change' function which allows the switch to be operated without moving through the detent for use when changing lane on motorways or when overtaking. When released from the 'lane change' position, the switch is automatically returned to the central off position. The left and right hand turn signal indicator switch positions are connected on separate wires to the Central Junction Box (CJB) and the switch. When a switch position selection is made, a circuit is completed from the CJB to ground, via the selected switch position. The CJB detects the completed circuit and operates the selected turn signal indicator until the switch is moved to the central off position. The turn signal indicators can be cancelled either manually by the driver or automatically when the steering wheel is rotated to the straight ahead position.

High/Low Beam and Headlamp Flash

High beam is operated by pushing the switch forwards. The switch is latched in this position and the high beam is active until the switch is manually pulled rearwards. The headlamp flash function is operated by pulling the switch rearwards. The switch contacts complete a circuit and the headlamps are activated for as long as the switch is operated. The switch is non-latching in this position and the headlamp flash is switched off when the switch is released and it returns to its off position. The high beam and headlamp flash positions are connected on separate wires to the CJB and ground. When a switch selection is made, a circuit is completed from the CJB to ground via the switch contacts.

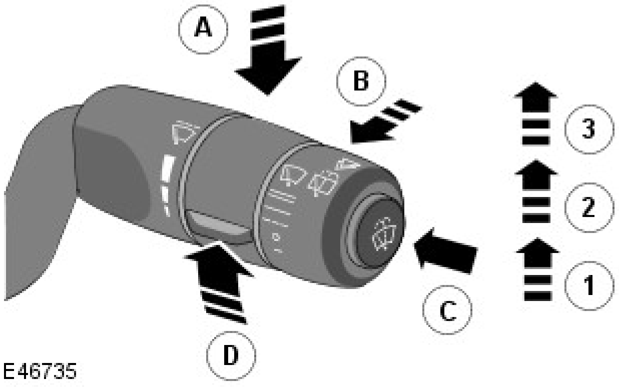
Computer Function Button

The computer function button is located on the end of the switch stalk. The button is a momentary switch and allows the driver to select the following information in the instrument cluster message center:

- Trip distance
- Distance on fuel remaining in the fuel tank
- Fuel tank remaining quantity
- Average fuel consumption
- Vehicle life fuel consumption
- Average speed
- Instantaneous fuel consumption.

The button is connected to the instrument cluster and ground. When the button is pressed the circuit is completed and the instrument cluster displays the next trip computer information. Repeated presses of the button selects each display in the message center in turn.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Windshield Wiper Switch Assembly



Item	Part Number	Description
1	-	Intermittent position
2	-	Slow speed
3	-	Fast speed
A	-	Flick wipe
B	-	Rear wash/wipe
C	-	Wash wipe
D	-	Intermittent delay (6 positions)

The windshield wiper switch assembly is located on the right hand side of the case and is retained in the case with two screws. The switch is connected to the main harness via a connector at the back of the switch. The switch controls the following functions:

- Windshield wiper intermittent, slow and fast speed
- Windshield wiper flick wipe
- Windshield wash/wipe
- Rear wash/wipe
- Intermittent delay selection.

For additional information, refer to: Wipers and Washers (501-16 Wipers and Washers, Description and Operation).

Windshield Wiper Switch Operation

The windshield wiper functions are operated by moving the switch up or down. Flick wipe is selected by pushing the switch down. The switch is non-latching in this position and wiper operation is stopped when the switch is released and it returns to the off position. The flick wipe switch contact is connected on a single wire to the CJB and ground. This is the same connection to the CJB as the fast speed wipe. When the switch is operated the circuit is completed between the CJB and ground. The CJB detects the completed circuit and operates the wipers for as long as the switch contact is made.

Intermittent is selected by pushing the wiper switch up, to the detent position, the wipers operate at the delay period selected on the rotary switch on the wiper stalk. The wipers remain in the intermittent mode until the wiper switch is moved to the off or slow/fast speed positions. The intermittent switch contact is connected between the CJB and ground. When the switch is moved to the intermittent position the circuit is completed. The CJB detects the completed circuit and operates the wipers in the intermittent delay selected for as long as the switch contact is made.

The intermittent delay period is selected using a rotary control on the wiper switch stalk. The rotary control allows the driver to select six delay periods to suit the prevailing weather conditions. The rotary control is connected on three wires to the CJB and a single wire to ground. The six positions each use a different combination of the three wires. The CJB detects, via the three wires, which selection has been made and operates the wipers with the appropriate delay.

Slow speed operation is selected by pushing the wiper switch up, to the second detent position. The wipers operate at slow speed until the wiper switch is moved to the off, intermittent or fast speed positions. The slow speed switch contact is connected between the CJB and ground. When the switch is moved to the slow speed position the circuit is completed. The CJB detects the completed circuit and operates the wipers at slow speed for as long as the switch contact is made.

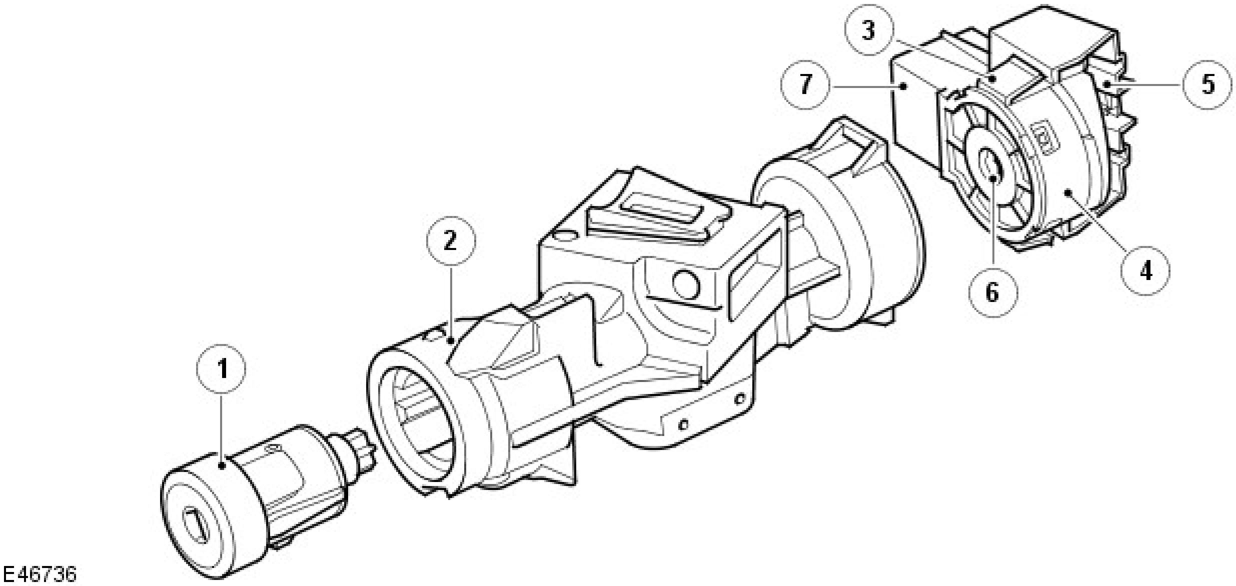
Fast speed operation is selected by pushing the wiper switch up, to the third detent position. The wipers operate at fast speed until the wiper switch is moved to the off, intermittent or slow speed positions. The fast speed switch contact is connected between the CJB and ground. When the switch is moved to the fast speed position the circuit is completed. The CJB detects the completed circuit and operates the wipers at fast speed for as long as the switch contact is made.

Rear Wash/Wipe Switch Operation

The rear wash/wipe functions are operated by moving the switch rearwards. Rear wipe is selected by moving the wiper switch rearwards to the first detent position. The rear wiper switch is connected between the CJB and ground. When the switch is moved to the rear wiper position the circuit is completed. The CJB detects the completed circuit and operates the rear wiper for as long as the switch contact is made.

The rear washer is selected by moving the wiper switch rearwards to the second, non-latching position. When the switch is moved to this position a circuit is completed between the CJB and ground. The CJB detects the completed circuit and operates the rear washer for as long as the switch contact is made.

IGNITION SWITCH



Item	Part Number	Description
1	-	Key barrel
2	-	Column lock
3	-	Locking tab
4	-	Ignition switch
5	-	Harness connector
6	-	Drive shaft location
7	-	Key interlock solenoid

The ignition switch is located in the left hand end of the steering column lock assembly. The switch is held in the column lock casting with two locking tabs which engage in slots in the column lock casting.

The switch has a slot which provides for the location of the drive shaft which passes through the column lock. This shaft is rotated by the driver when the ignition key is turned in the key barrel. This rotation turns a drum inside the ignition switch which moves two electrical contacts to select the required ignition position. A spring loaded ball locates in a seat for each of the three ignition switch positions, allowing the driver to feel when the required position is reached.

On vehicles with automatic transmission. a solenoid is located on the side of the ignition switch. The solenoid, which is controlled on a single wire from the transfer box control module, prevents the key from being removed from the key barrel if the transmission selector lever is not in the PARK (P) position. The transfer box receives the transmission position status via a message transmitted from the transmission control module on the CAN bus.

The solenoid, when energised, moves a pin which prevents the ignition switch returning fully to the '0' off position. This prevents the key being removed until the transmission is in the PARK position.

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Steering Column Switches - Steering Column Switches

Diagnosis and Testing

For additional information. REFER to:

Steering System (211-00 Steering System - General Information, Diagnosis and Testing),
Turn Signal and Hazard Lamps (417-01 Exterior Lighting, Diagnosis and Testing),
Turn Signal, Cornering and Hazard Lamps (417-01 Exterior Lighting, Diagnosis and Testing),
Wipers and Washers (501-16 Wipers and Washers, Diagnosis and Testing).

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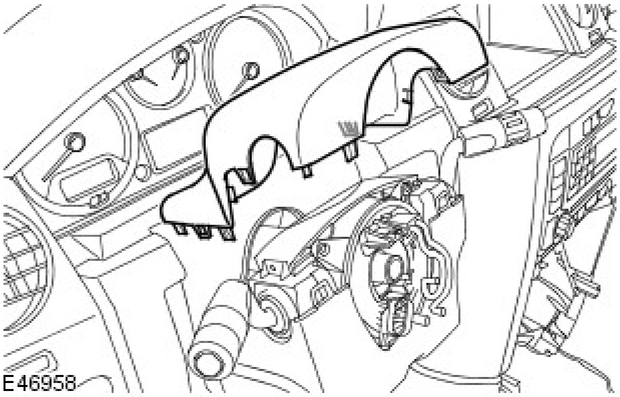
Steering Column Switches - Steering Column Lock and Ignition Switch Housing

Removal and Installation

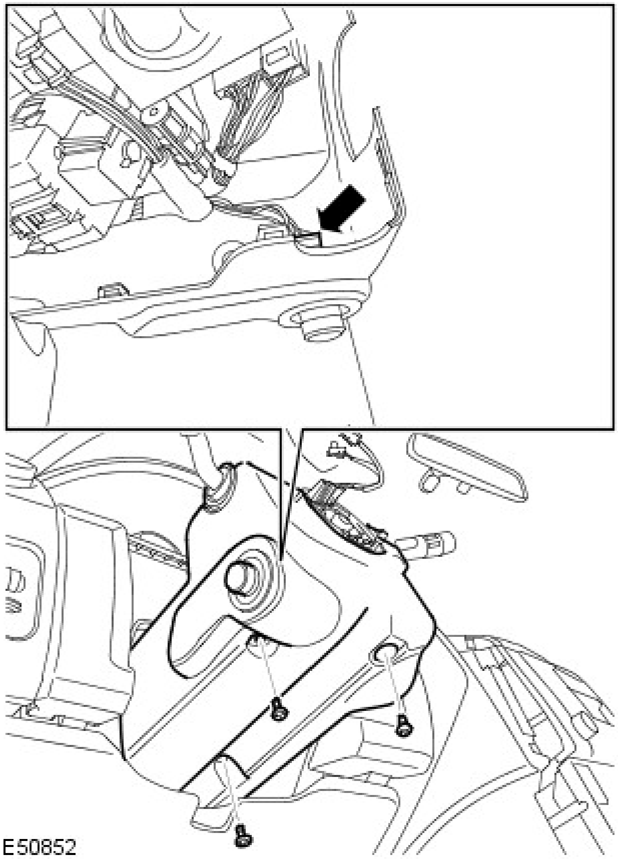
Removal

⚠CAUTION: If the ignition lock cylinder and switch are both removed from the ignition switch assembly, the assembly shaft MUST NOT be rotated. Failure to comply will cause the incorrect operation of the lock, and the assembly must be replaced.

1. Fully extend the steering column for access.
2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
3. Remove the steering wheel.
   For additional information, refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).

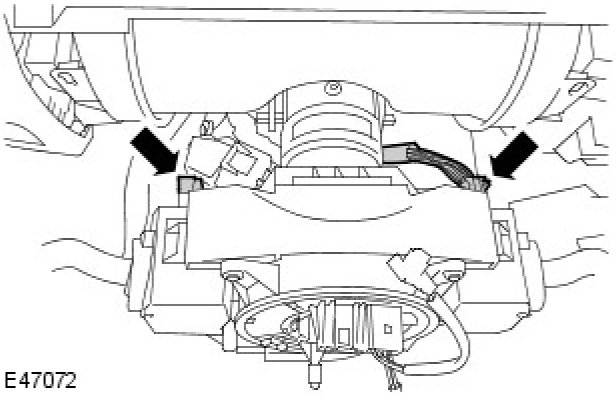


4. Remove the steering column upper shroud.
   - Release the 6 clips.

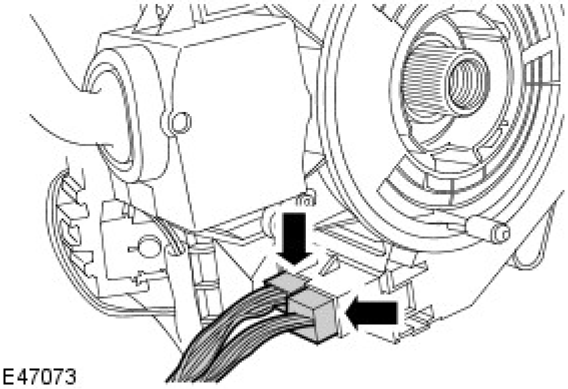


5. Remove the steering column lower shroud.

- Remove the 3 Torx screws.
- Disconnect the electrical connector.



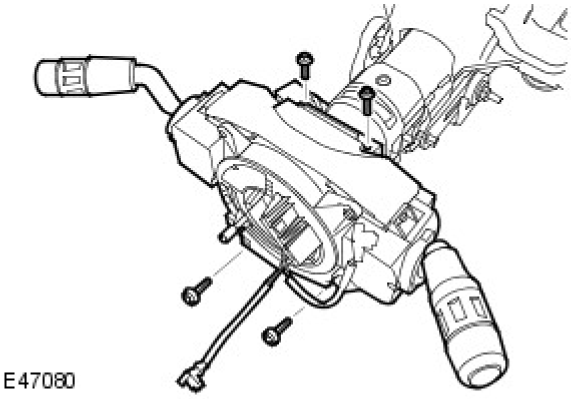
6. Disconnect the 2 electrical connectors from the steering column multifunction switches.



7. Disconnect the 2 electrical connectors from the clockspring.

8. Remove the steering column switch assembly.

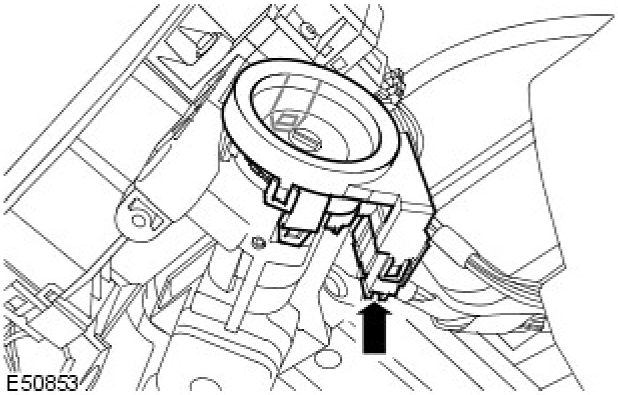
- Remove the 4 Torx bolts.



E47080

9. Remove the passive coil.

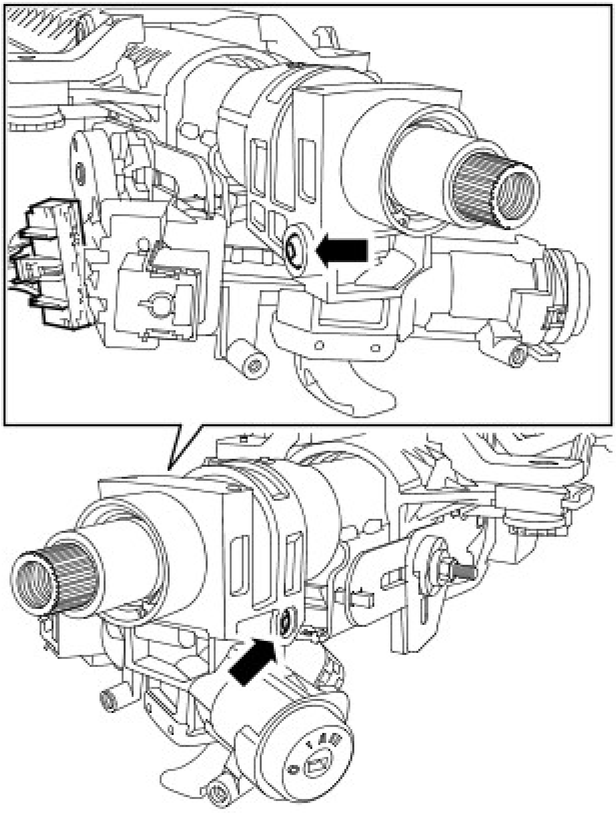
- Disconnect the electrical connector.
- Release the 2 clips.



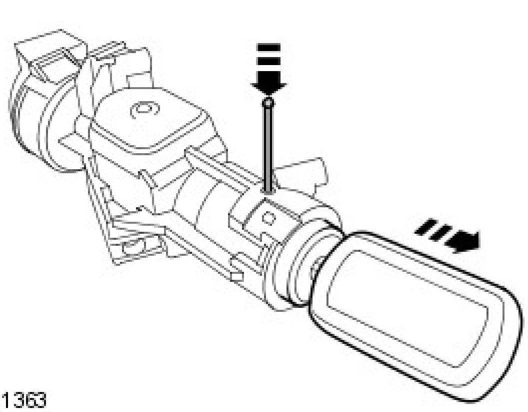
E50853

10. Remove the ignition switch assembly.

- Remove and discard the 2 shear bolts.
- Disconnect the electrical connector.



E50482



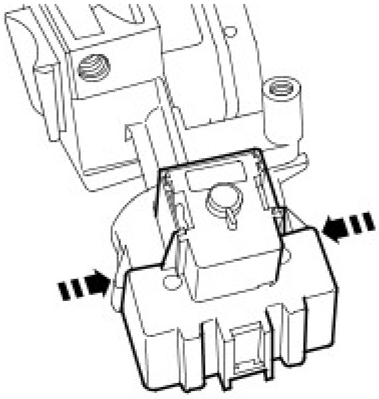
E51363

11. ⚠ CAUTION: If the ignition lock cylinder and switch are both removed from the ignition switch assembly, the assembly shaft MUST NOT be rotated. Failure to comply will cause the incorrect operation of the lock, and the assembly must be replaced.

• NOTE: Do not disassemble further if the component is removed for access only.

Remove the ignition lock cylinder.

- Turn the ignition key to position 1.
- Insert a pin, not exceeding 2 mm diameter, through the access hole in the ignition lock cylinder housing to depress the plunger, and release the ignition lock cylinder.



E51364

12. Remove the ignition switch.

- Depress the 2 clips.

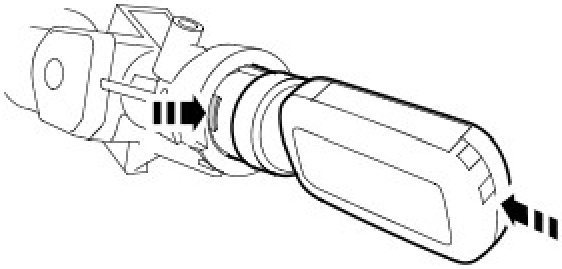
Installation

1. Install the ignition switch.

- Secure with the clips.

2. Install the ignition lock cylinder.

- Turn the ignition key to position 1.
- Locate into guides and depress the plunger.



E51372

3. Install the passive coil.

- Secure the clips.
- Connect the electrical connector.

4. Install the ignition switch assembly.

- Tighten the shear bolts until the heads shear off.
- Connect the electrical connector.

5. Install the steering column switch assembly.

- Tighten the Torx bolts to 3 Nm (2 lb.ft).

6. Connect the clockspring and multifunction switch electrical connectors.

7. Install the steering column shrouds.

- Connect the electrical connector.
- Tighten the Torx screws.
- Secure the clips.

8. Install the steering wheel.
For additional information, refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).

9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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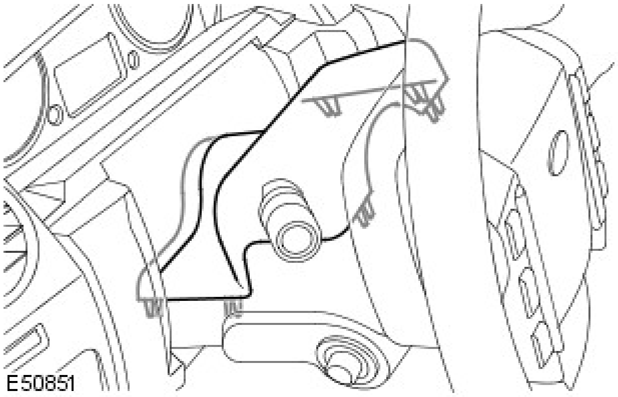
Steering Column Switches - Ignition Switch

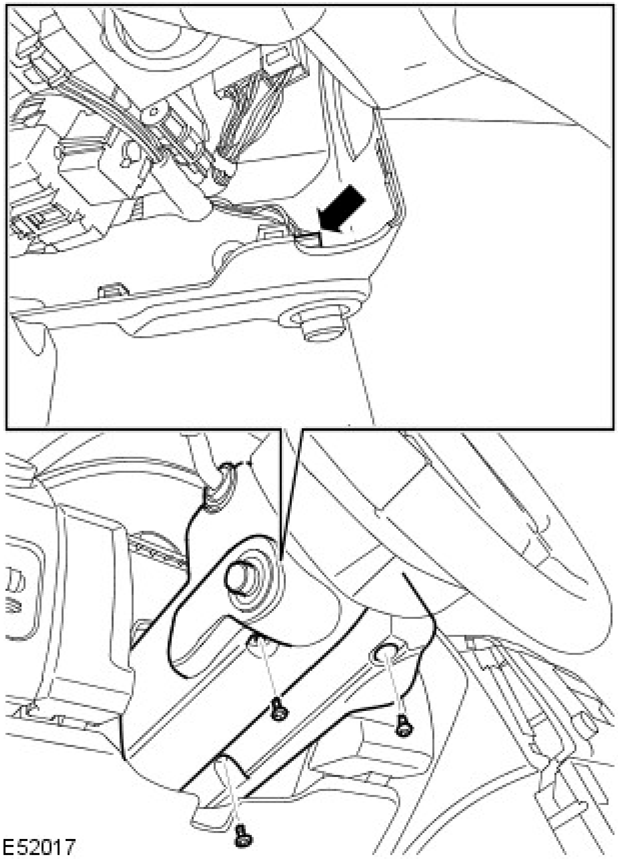
Removal and Installation

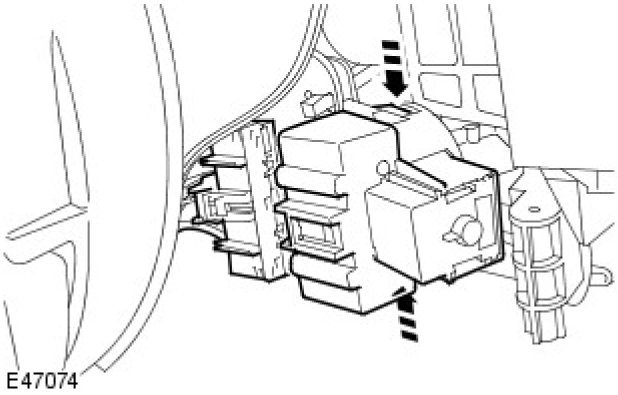
Removal

1. Fully extend the steering column for access.
2. Remove the steering column upper shroud.
   - Release the 6 clips.



3. Remove the steering column lower shroud.
   - Remove the 3 Torx screws.
   - Disconnect the electrical connector.





4. ⚠ CAUTION: The ignition key must be removed prior to the removal of the ignition switch.

Remove the ignition switch.

- Disconnect the electrical connector.
- Depress the 2 clips.

Installation

1. Install the ignition switch.

- Secure with the clips.
- Connect the electrical connector.

2. Install the steering column shrouds.

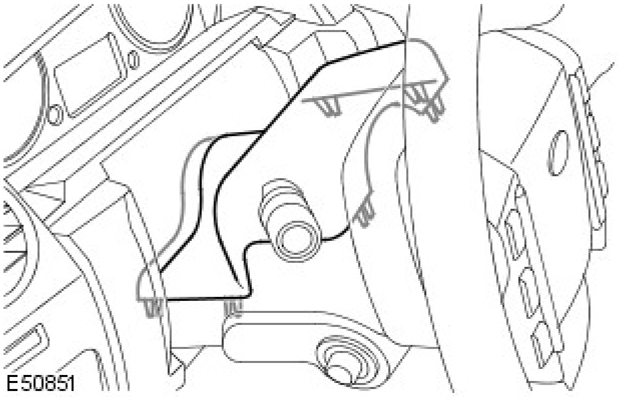
- Connect the electrical connector.
- Tighten the Torx screws.
- Secure the clips.

Steering Column Switches - Steering Column Multifunction Switch RH

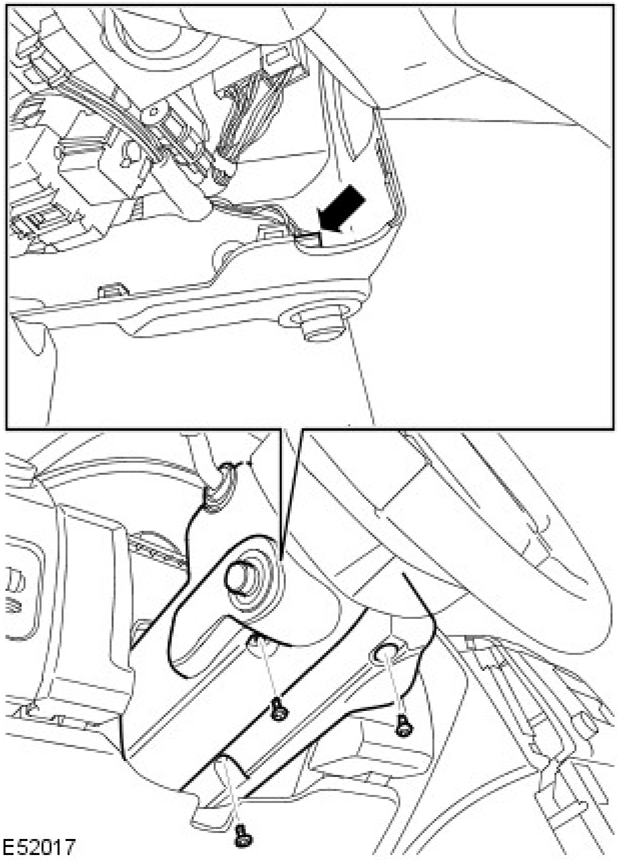
Removal and Installation

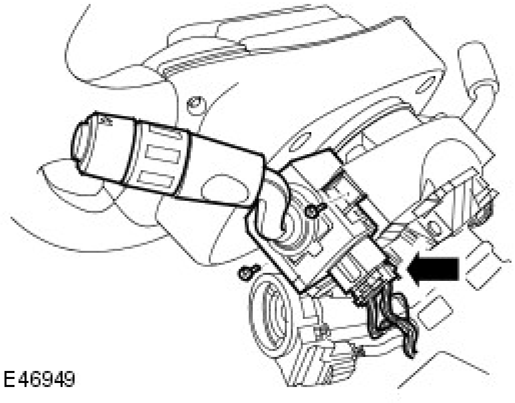
Removal

1. Fully extend the steering column for access.
2. Remove the steering column upper shroud.
    - Release the 6 clips.



3. Remove the steering column lower shroud.
    - Remove the 3 Torx screws.
    - Disconnect the electrical connector.




E46949

4. Remove the steering column multifunction switch.
   - Disconnect the electrical connector.
   - Remove the 2 screws.

Installation

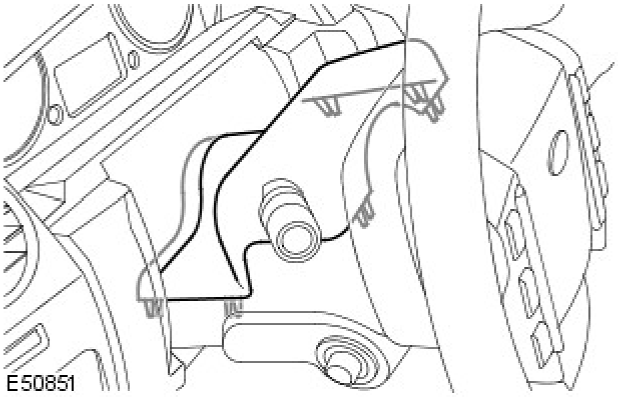
1. To install, reverse the removal procedure.

Steering Column Switches - Steering Column Multifunction Switch LH

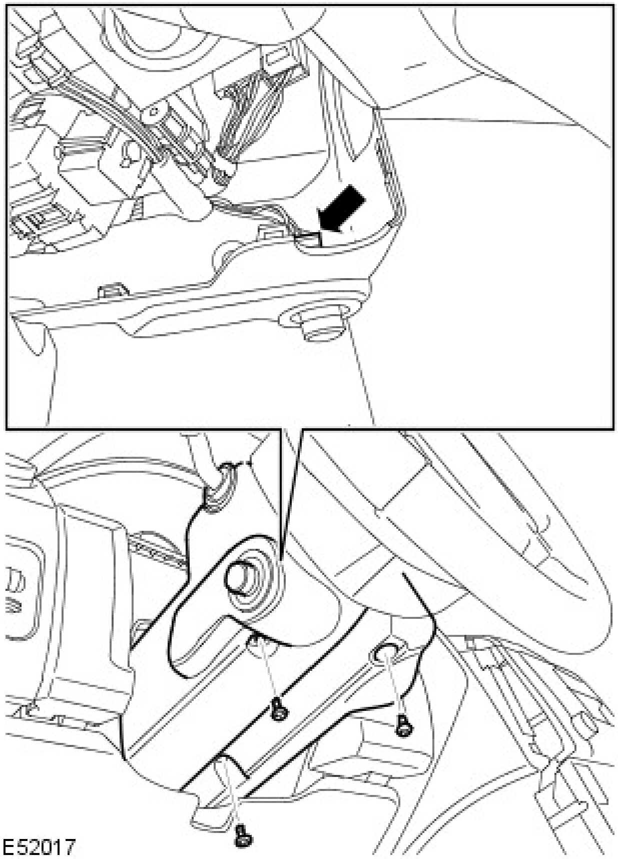
Removal and Installation

Removal

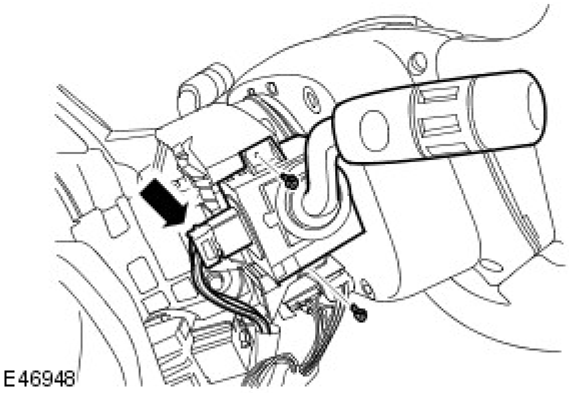
1. Fully extend the steering column for access.



2. Remove the steering column upper shroud.
   - Release the 6 clips.



3. Remove the steering column lower shroud.
   - Remove the 3 Torx screws.
   - Disconnect the electrical connector.



4. Remove the steering column multifunction switch.

- Disconnect the electrical connector.
- Remove the 2 screws.

Installation

1. To install, reverse the removal procedure.

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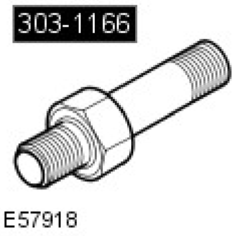
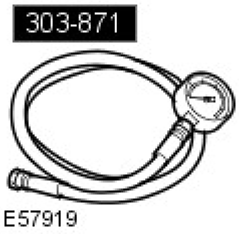
Engine System - General Information - EngineV8 S/C 4.2L Petrol

Diagnosis and Testing

Special Tool(s)	
	Oil pressure testing adaptor, 303-1166
	Oil pressure testing gauge, 303-871

Principles of Operation

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.
3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step

Engine oil pressure check - 4.2l

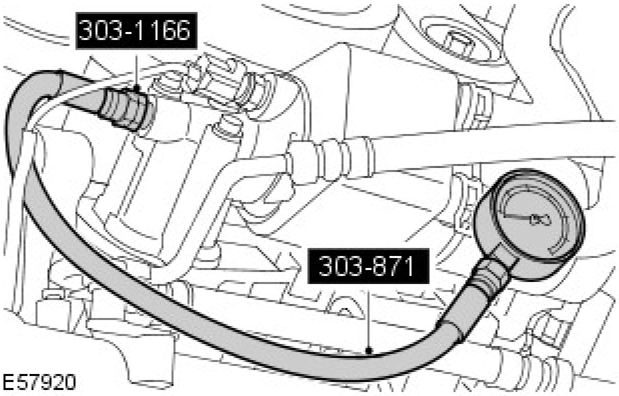
• NOTE: Prior to checking the engine oil pressure, a road test of 6 miles (10 kilometers), must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle.

1. **1.** Disconnect the battery ground cable. Refer to section 414-00 - Charging System - General Information of the workshop manual.
2. • WARNINGS:

   ⚠ The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

   ⚠ Wear protective gloves.

   2. Remove the engine oil pressure sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).
3. **3.** Install the special tool.
4. **4.** Install the special tool gauge and tighten the union.



5. **5.** Check and top-up the engine oil if required.
6. **6.** Connect the battery ground cable.
   REFER to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
7. **7.** Start and run the engine.
8. **8.** Note the oil pressure readings with the engine running at idle and 3500 RPM.
   REFER to: Specifications (303-01A Engine - V8 S/C 4.2L Petrol, Specifications).
9. **9.** Turn off the engine.
10. **10.** Disconnect the battery ground cable.
11. **11.** Remove the special tools.
    1. Clean the components.
12. **12.** Install the oil pressure sensor.
    REFER to: Engine Oil Pressure (EOP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).
13. **13.** Check and top-up the engine oil if required.
14. **14.** Connect the battery ground cable.

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Engine System - General Information - EngineV8 4.4L Petrol

Diagnosis and Testing

Overview

As diagnosis of the different areas of the engine is covered in other sections and by general procedures, this section is limited to a compression and an oil pressure test.

For specific areas of the engine, refer to the general procedures in this section and the relevant section of the manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Symptom chart

Mechanical
• Engine oil level • Coolant level • Transmission fluid level • Fuel level • Coolant leaks • Oil leaks • Fuel leaks • Visibly damaged or worn parts • Loose or missing nuts or bolts • Fuel contamination/grade/quality • Sensor fitment/condition • Viscous fan and solenoid

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before carrying out the following procedures.
    - Make sure that all DTCs are cleared following rectification.

Compression test

WARNING: Make sure the parking brake is applied and the gear selector is in neutral (or park for vehicles with automatic transmission) before beginning this procedure. Failure to follow this instruction may result in personal injury.

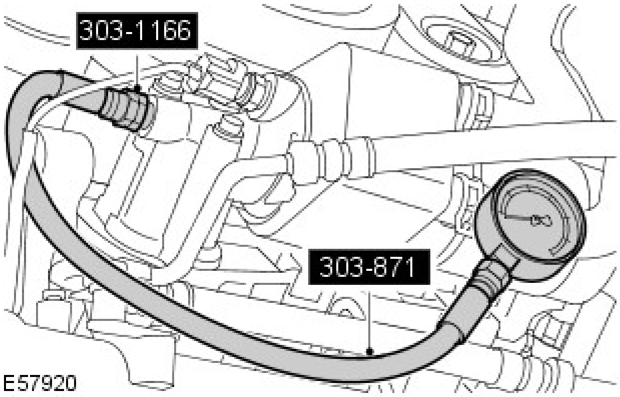
1. **1.** Remove the fuel pump relay.
2. **2.** Start the engine and allow to idle.
    - The engine will run for a few seconds then stall
3. **3.** Remove the spark plugs.
   REFER to: Spark Plugs (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).
4. **4.** Install a compression tester.
5. **5.** Hold the accelerator pedal to the floor and crank the engine a minimum of five and a maximum of ten engine revolutions and record the reading.
6. **6.** Repeat the test on each cylinder, cranking the engine approximately the same number of compression strokes.
    - A reliable indicator of a problem is one cylinder reading lower than the others, rather than a minimum figure for all cylinders
7. **7.** Install the components in reverse order, observing the specified tightening torques.
8. **8.** Check and clear any DTCs.

Oil Pressure check

WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding. Failure to follow this instruction may result in personal injury.

• NOTE: Before checking the oil pressure, carry out a 6 mile (10 kilometer) road test. Do not attempt to achieve normal operating temperature by allowing the engine to idle.

1. **1.** Remove the engine oil pressure sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).
2. **2.** Install the special tool to the oil filter housing.
3. **3.** Install the special tool gauge and tighten the union.



4. **4.** Check and top-up the engine oil, if required.
5. **5.** Start and run the engine.
6. **6.** Note the oil pressure readings with the engine at idle and at 3,500 rpm.
   REFER to: Specifications (303-01B Engine - V8 4.4L Petrol, Specifications).
7. **7.** Turn off the engine.
8. **8.** Remove the special tools.
9. **9.** Install the oil pressure sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).
10. **10.** Check and top-up the engine oil, if required.

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Engine System - General Information - EngineTDV6 2.7L Diesel

Diagnosis and Testing

Overview

As diagnosis of the different areas of the engine is covered in other sections and by general procedures, this section is limited to an oil pressure test.

For specific areas of the engine, refer to the general procedures in this section and the relevant section of the manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Symptom chart

Mechanical
● Engine oil level ● Coolant level ● Transmission fluid level ● Fuel level ● Coolant leaks ● Oil leaks ● Fuel leaks ● Visibly damaged or worn parts ● Loose or missing nuts or bolts ● Fuel contamination/grade/quality ● Sensor fitment/condition ● Viscous fan and solenoid

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before carrying out the following procedure.
    - ○ Make sure that all DTCs are cleared following rectification.

Oil Pressure check

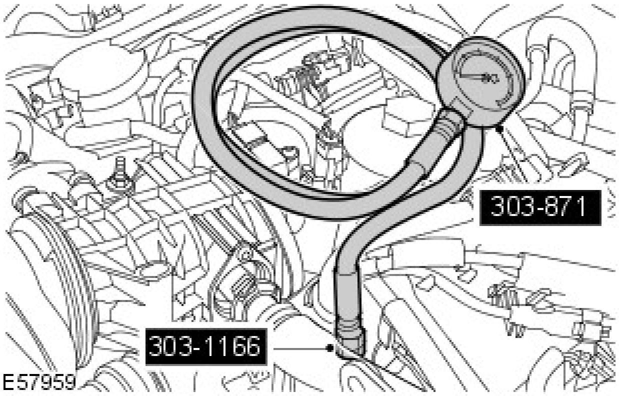
• NOTE: Prior to checking the engine oil pressure, a road test of 6 miles (10 kilometers), must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle.

1. • WARNINGS:

   ⚠ The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

   ⚠ Wear protective gloves.

   1. Remove the oil pressure sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Removal and Installation).
2. **2.** Install the special tool to the oil filter housing.
3. **3.** Install the special tool gauge and tighten the union.



4. **4.** Check and top-up the engine oil, if required.
5. **5.** Start and run the engine.
6. **6.** Note the oil pressure readings with the engine running at idle and 3500 RPM.
   REFER to: Specifications (303-01C Engine - TDV6 2.7L Diesel, Specifications).
7. **7.** Turn off the engine.
8. **8.** Remove the special tools.
9. **9.** Install the oil pressure sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Removal and Installation).
10. **10.** Check and top-up the engine oil, if required.

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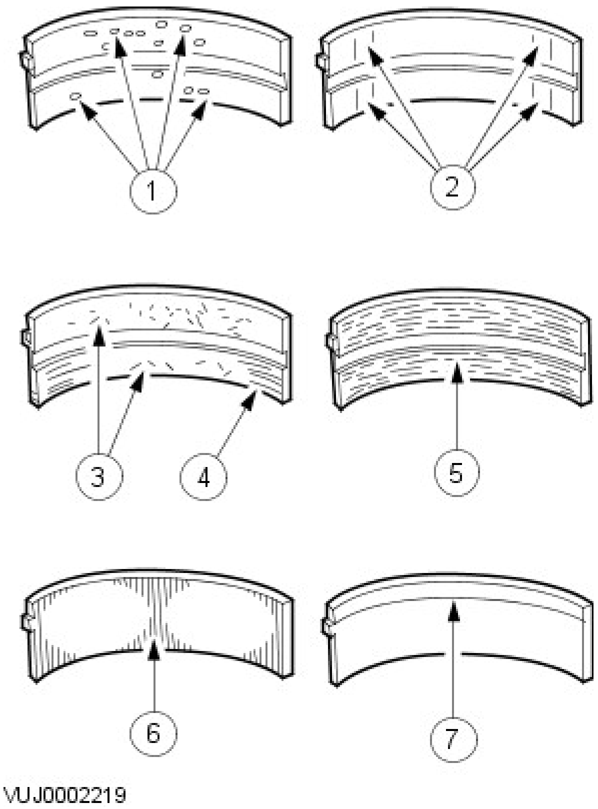
Engine System - General Information - Bearing Inspection

General Procedures



1. Inspect bearings for the following defects.

1. Cratering - fatigue failure
2. Spot polishing - incorrect seating.
3. Imbedded dirt engine oil.
4. Scratching - dirty engine oil.
5. Base exposed - poor lubrication.
6. Both edges worn - journal damaged.
7. One edge worn - journal tapered or bearing not seated.

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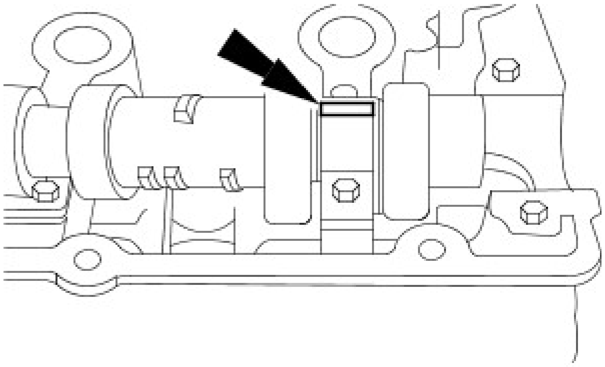
Engine System - General Information - Camshaft Bearing Journal Clearance

General Procedures



VUJ0001696

1. NOTE: Make sure that the following stages are followed exactly. The tappets or followers must be removed to carry out this measurement.

• NOTE: Make sure that the camshaft is to specification.

• NOTE: The bearing caps and journals should be free from engine oil and dirt.

Position on a length of plastigage on the bearing cap.

- Insert the camshaft, without lubrication, into the cylinder head.
- Position a plastigage strip, which should be equal to the width of the bearing cap, on the bearing journal.

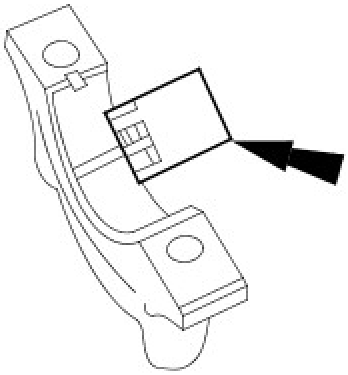
2. Install the camshaft bearing caps.

- Follow the relevant tightening sequence.

3. NOTE: Do not strike the bearing caps.

Remove the camshaft bearing caps.

- Follow the relevant loosening sequence.



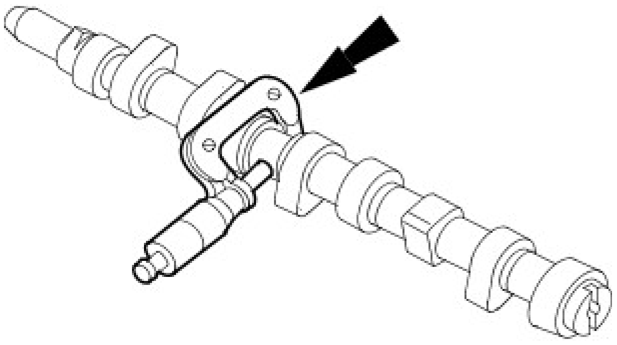
VUJ0001697

4. Using the special tool, read off the measurement.

- Compare the width of plastigage with the plastigage scale.
- The value that is read off is the bearing clearance.
- If the values are not to specification install a new camshaft.

Engine System - General Information - Camshaft Bearing Journal Diameter

General Procedures



VUJ0001695

1. Determine the diameter of the camshaft journals.
    - Using a micrometer measure the diameter at 90 degrees intervals to determine if the journals are out-of-round.
    - Measure at two different points on the journal to determine if there is any tapering.
    - If the measurements are out of the specified range, install a new camshaft.

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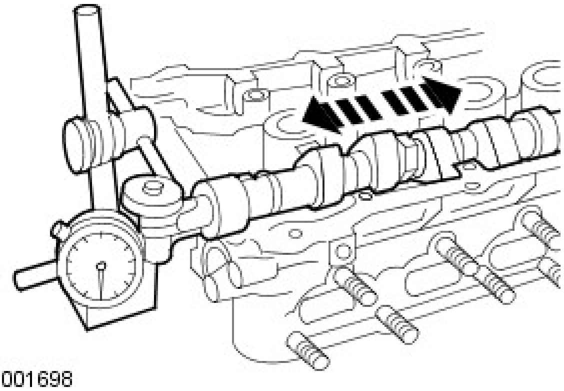
Engine System - General Information - Camshaft End Play

General Procedures



VUJ0001698

1. NOTE: Make sure that the camshaft is to specification.

   Using the special tool, measure the end play.

   - Slide the camshaft in both directions. Read and note the maximum and minimum values on the dial indicator gauge.
     1. End play = maximum value minus minimum value.
   - If the measurement is out of specification, install new components.

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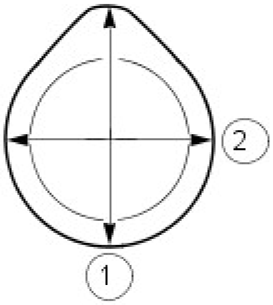
Engine System - General Information - Camshaft Lobe Lift

General Procedures

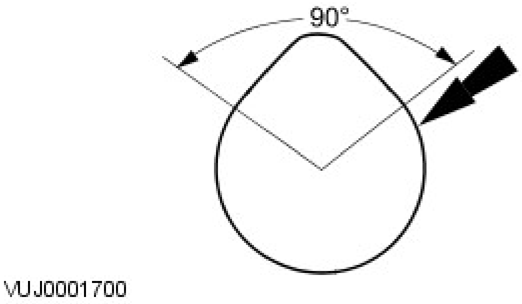


VUJ0001699

1. Measure the diameter (1) and diameter (2) with a vernier caliper. The difference in measurements is the lobe lift.

Engine System - General Information - Camshaft Surface Inspection

General Procedures



1. Inspect camshaft lobes for pitting or damage in the active area. Minor pitting is acceptable outside the active area.

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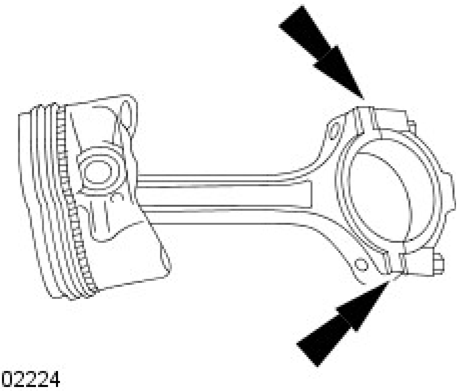
Engine System - General Information - Connecting Rod Cleaning

General Procedures



VUJ0002224

1. ⚠CAUTION: Do not use a caustic cleaning solution or damage to connecting rods may occur.

Mark and separate the parts and clean with solvent. Clean the oil passages.

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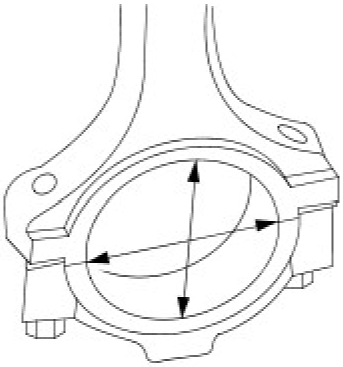
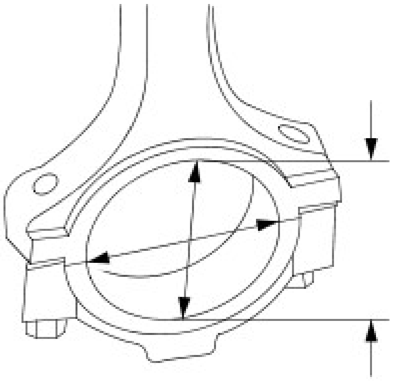
Engine System - General Information - Connecting Rod Large End Bore

General Procedures



VUJ0002223

1. Measure the bearing bore in two directions. The difference is the connecting rod bore out-of-round. Verify the out-of-round is within specification.

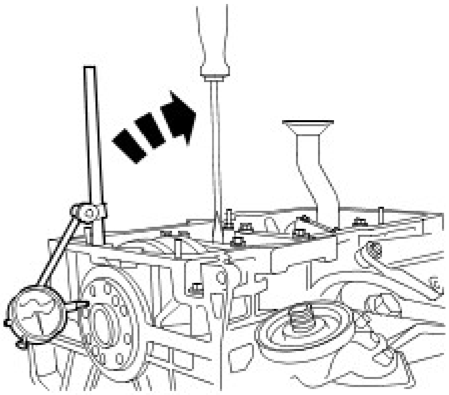


VUJ0002222

2. Measure the bearing bore diameter in two directions. Verify the bearing bore is within specification.

Engine System - General Information - Crankshaft End Play

General Procedures



VUJ0002235

1. Using the Dial Indicator Gauge with Brackets, measure the end play.
   - Measure the end play by lifting the crankshaft using a lever.
   - If the value is out of the specification, install new thrust half rings to take up the end float and repeat the measurement.

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Engine System - General Information - Crankshaft Main Bearing Journal Clearance

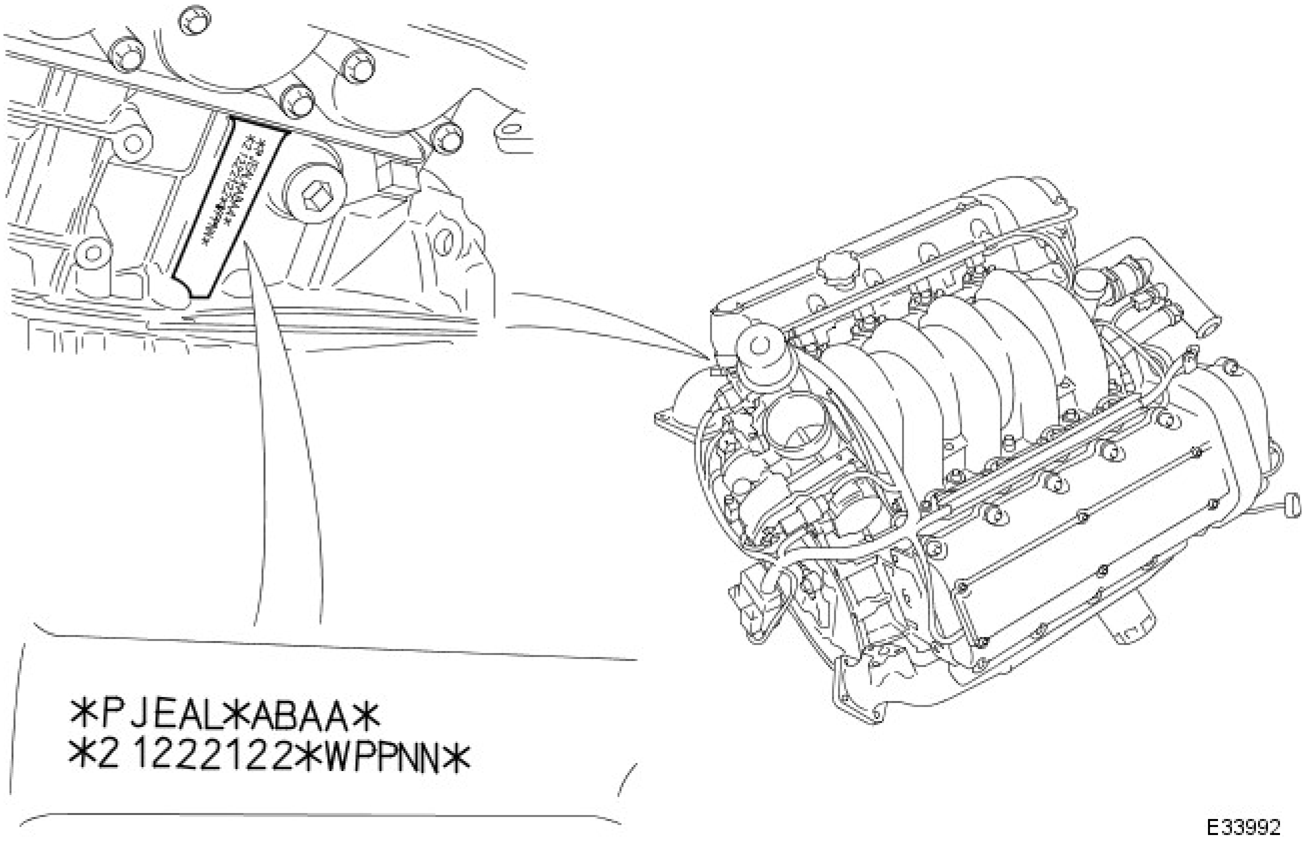
General Procedures

CAUTION: **THESES PROCEDURES SHOULD NOT BE CARRIED OUT DURING THE MANUFACTURERS WARRANTY PERIOD.**

1. NOTE: **Example - *PJEAL* - Crankshaft Main Journal Diameter.**

Read the grade letters from LEFT to RIGHT = FRONT to REAR of engine eg. for this example engine, the crank journal at the front of the engine is grade P, and at the rear is grade L.

- The selection of main bearing shells is described in the following chart.



2. NOTE: **Example - *ABAA* - Crankshaft (Big End Bearing) Crankpin Diameter**

• NOTE: **For vehicles built up to 2002 MY.**

• NOTE: **If the crankshaft main bearing carrier retaining bolts have been marked with a center punch dot, they must be discarded and new bolts installed.**

Read the grade letters from LEFT to RIGHT = FRONT to REAR of engine eg. for this example engine, the crankpin at the front of the engine is grade A and at the rear is also grade A.

- Grade A = 56,000 to 55,994 mm (Bearing Shell Color Code - Blue).
- Grade B = 55,994 to 55,988 mm (Bearing Shell Color Code - Green).

- Grade C = 55,988 to 55,982 mm (Bearing Shell Color Code - Yellow).

3. NOTE: **Example - *ABAA* - Crankshaft (Big End Bearing) Crankpin Diameter**

• NOTE: **For vehicles built from 2002 MY.**

• NOTE: **If the crankshaft main bearing carrier retaining bolts have been marked with a center punch dot, they must be discarded and new bolts installed.**

Read the grade letters from LEFT to RIGHT = FRONT to REAR of engine eg. for this example engine, the crankpin at the front of the engine is grade A and at the rear is also grade A.

- Grade A = 53,000 to 52,994 mm (Bearing Shell Color Code - Blue).
- Grade B = 52,994 to 52,988 mm (Bearing Shell Color Code - Green).
- Grade C = 52,988 to 52,982 mm (Bearing Shell Color Code - Yellow).

4. NOTE: **Example - *21222122* - Cylinder Bore and Piston**

The cylinder bore grades read from LEFT to RIGHT as follows:

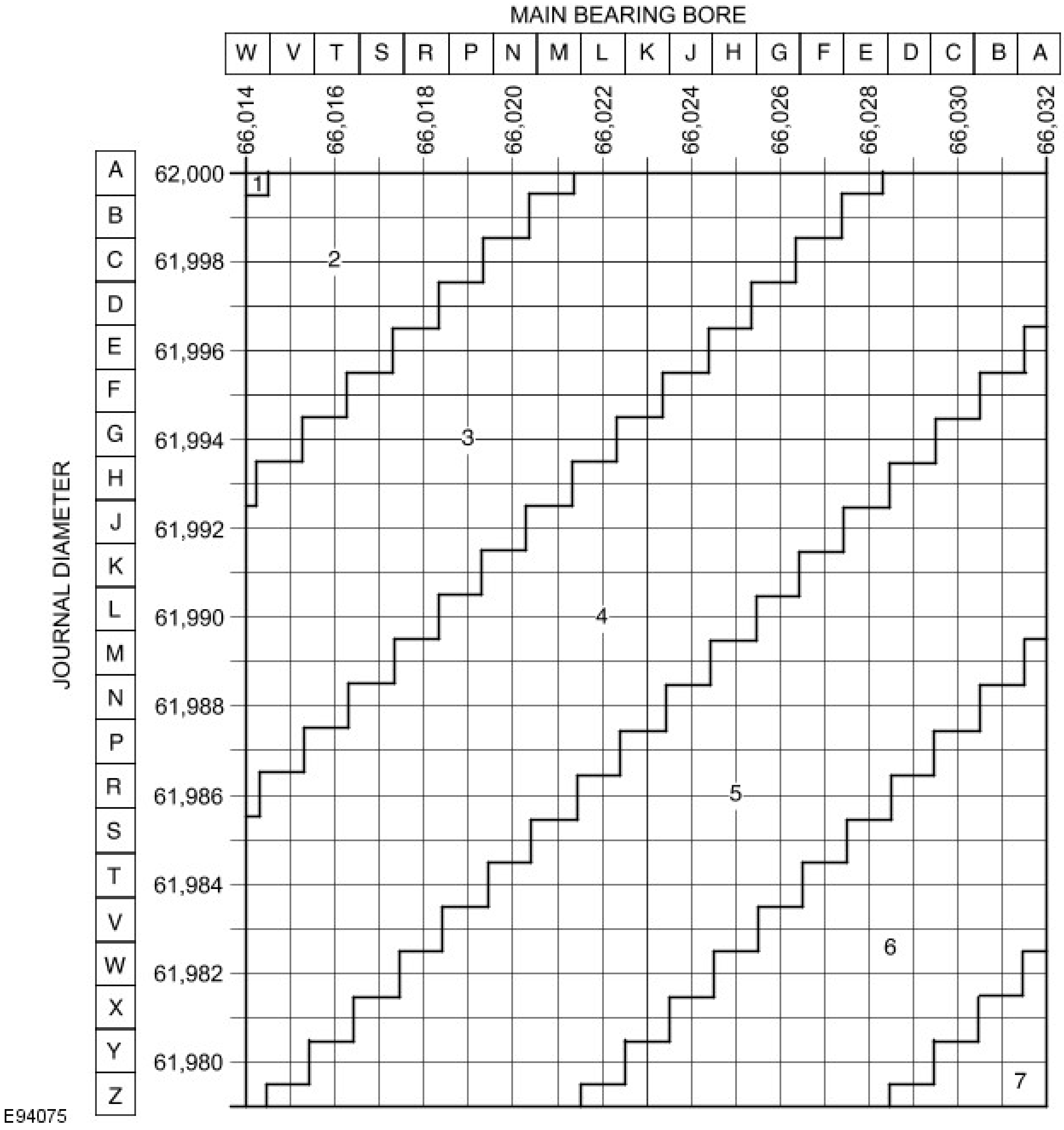
- Bank 2 - Cylinder 1, Bank 2 - Cylinder 2, Bank 2 - Cylinder 3, Bank 2 - Cylinder 4, Bank 1 - Cylinder 4,
- Bank 1 - Cylinder 3, Bank 1 - Cylinder 2, Bank 1 - Cylinder 1.
- **(Note, in earlier publications Bank 1 was described as A-Bank and Bank 2 as B-Bank)**
- Grade 1 Bore = 85,990 to 86,000 mm.
- Grade 2 Bore = 86,000 to 86,010 mm.
- Grade 3 Bore = 86,010 to 86,020 mm.

5. NOTE: **Example - *WPPNN* - Crankshaft Main Bearing Bore in Cylinder Block**

Read the grade letters from LEFT to RIGHT = FRONT to REAR of engine eg. for this example engine, the crank journal bore at the front of the engine is grade W, and at the rear is grade N.

- The selection of main bearing shells is described in the following **JOURNAL DIAMETER AND MAIN BEARING BORE CHART**.

6. JOURNAL DIAMETER AND MAIN BEARING BORE CHART



7. NOTE: **THIS PROCEDURE SHOULD ONLY BE CARRIED OUT WHEN REPLACIING MAIN BEARING SHELLS.**

- NOTE: Refer to the **JOURNAL DIAMETER AND MAIN BEARING BORE CHART** in step 6 for tolerance and bearing information.

The number in each diagonal band represents a PAIR of color coded main bearing shells which must be used with a specific journal, depending on the combination of journal diameter and crankshaft bore diameter. The color codes for each band are as follows:

1. **Blue / Green and Blue / Green**
2. **Blue / Green and Blue**
3. **Blue and Blue**
4. **Blue and Green**
5. **Green and Green**

6. **Green and Yellow**

7. **Yellow and Yellow**

- Consider crankshaft journal 5 (from the example grade markings on the cylinder block) - the cylinder block bore is Grade N and the crankshaft journal diameter is Grade L. From the chart, it will be seen that the point of intersection is in Band 4 which equates to one Blue shell and one Green shell.
- When the appropriate pair of color codes have been selected for a journal, either color may be installed to the cylinder block or to the bedplate, but, the shell which is to be installed to the cylinder block must have an oil groove and the shell which is to be installed to the bedplate must be plain.

8. NOTE: **THIS PROCEDURE SHOULD ONLY BE CARRIED OUT WHEN A REPLACMENT CRANKSHAFT OR CYLINDER BLOCK HAS BEEN FITTED.**

• NOTE: Refer to the **JOURNAL DIAMETER AND MAIN BEARING BORE CHART** in step 6 for tolerance and bearing information.

The thickness grade of all main bearing shells are to be selected to give a total running clearance of not less than 0.022 mm or greater than 0.040 mm.

- Each bearing bore in the block/bedplate assembly should be measured at two mutually perpendicular diameters 45° to the vertical in the middle of the bearing.
- The minimum diameter of the two is to be used.
- Each crankshaft main bearing journal should be measured dynamically at a point in line with the middle of each bearing.
- When the appropriate pair of color codes have been selected for a journal, either color may be installed to the cylinder block or to the bedplate, but, the shell which is to be installed to the cylinder block must have an oil groove and the shell which is to be installed to the bedplate must be plain.

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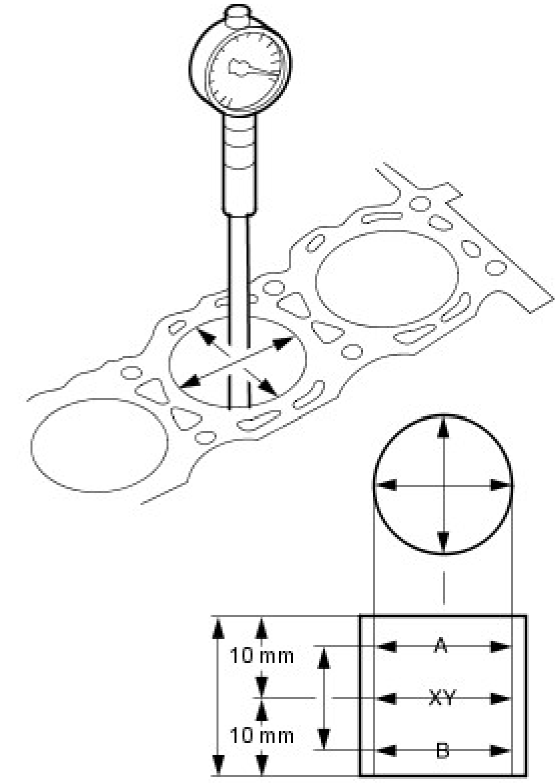
Engine System - General Information - Cylinder Bore Out-of-Round

General Procedures



VUJ0002234

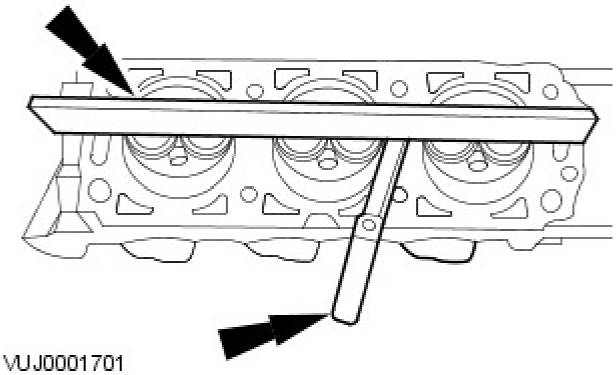
1. NOTE: The main bearing caps or lower crankcase must be in place and tightened to the specified torque; however, the bearing shells should not be installed.

Measure the cylinder bore with an internal micrometer.

- Carry out the measurements in different directions and at different heights to determine if there is any out-of-roundness or tapering.
- If the measurement is out of the specified range, hone out the cylinder block or install a new block.

Engine System - General Information - Cylinder Head Distortion

General Procedures



VUJ0001701

1. Measure the cylinder block/cylinder head distortion.
   - Using the special tool, measure the mating face distortion.
   - If the value is not to specification rework the mating face.

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Engine System - General Information - Exhaust Manifold Cleaning and Inspection

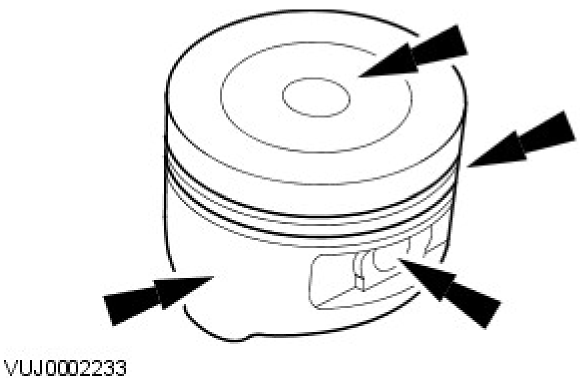
General Procedures

1. Inspect the cylinder head joining flanges of the exhaust manifold for evidence of exhaust gas leaks.

2. Inspect the exhaust manifold for cracks, damaged gasket surfaces, or other damage that would make it unfit for further use.

Engine System - General Information - Piston Inspection

General Procedures



1. ⚠ CAUTION: Do not use any aggressive cleaning fluid or a wire brush to clean the piston.

Carry out a visual inspection.

- Clean the piston skirt, pin bush, ring grooves and crown and check for wear or cracks.
- If there are signs of wear on the piston skirt, check whether the connecting rod is twisted or bent.

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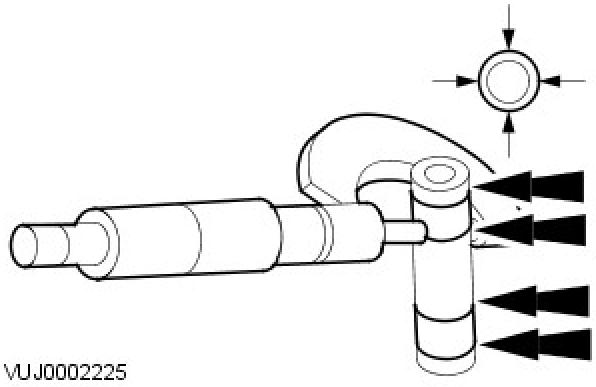
Engine System - General Information - Piston Pin Diameter

General Procedures



1. NOTE: The piston and piston pin are a matched pair. Do not mix up the components.

Measure the piston pin diameter.

- Measure the diameter in two directions.
- If the values are not to specification, install a new piston and a new piston pin.

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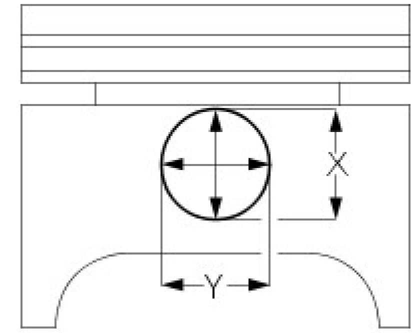
Engine System - General Information - Piston Pin to Bore Diameter

General Procedures



VUJ0002232

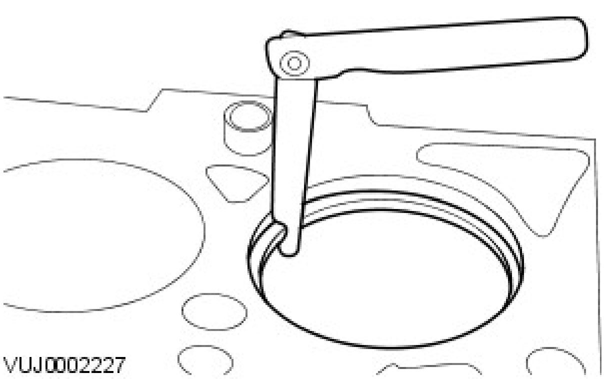
1. NOTE: The piston and piston pin form a matched pair. Do not mix up the components.

Measure the diameter of the piston pin bore.

- Measure the diameter in two directions.
- If the values are not to specification, install both a new piston and a new piston pin.

Engine System - General Information - Piston Ring End Gap

General Procedures



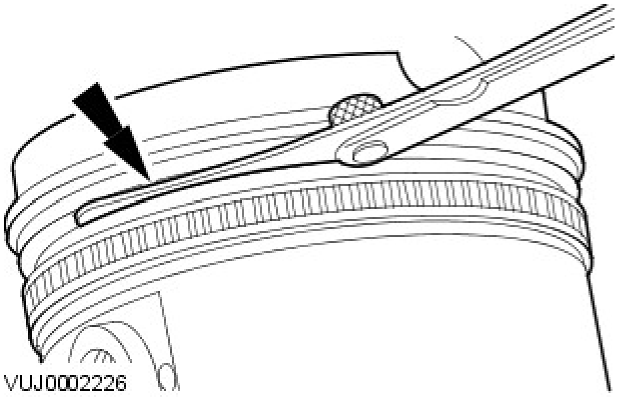
1. ⚠ CAUTION: Do not mix up the piston rings. Install the piston rings in the same position and location.

   Using the Feeler Gauge, measure the piston ring gap.

   - The values given in the specification refer to a gauge ring used during production.

Engine System - General Information - Piston Ring-to-Groove Clearance

General Procedures

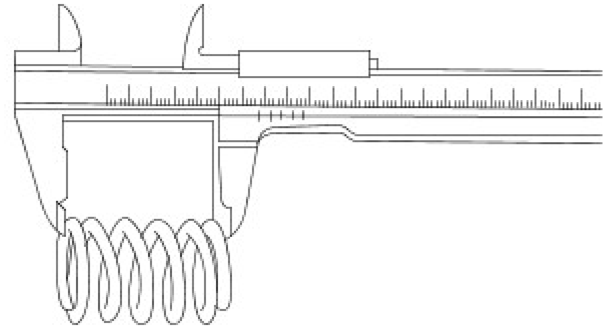


1. NOTE: The piston ring must protrude from the piston groove. To determine the piston ring clearance, insert the Feeler Gauge right to the back of the groove, behind the wear ridge.

Using the Feeler Gauge, measure the piston ring clearance.

Engine System - General Information - Valve Spring Free Length

General Procedures



VUJ0002221

1. Using a vernier gauge, measure the free length of each valve spring. Verify the length is within specification.

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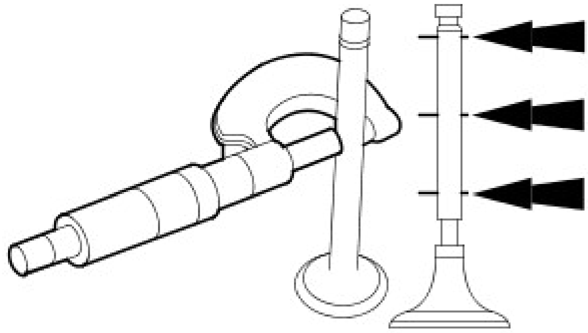
Engine System - General Information - Valve Stem Diameter

General Procedures



VUJ0002220

1. Using a micrometer measure the diameter of the valve stems.
   - If the measurements are not to specification, install a new valve.

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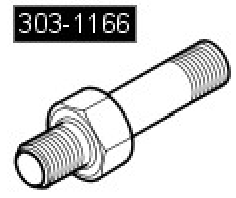
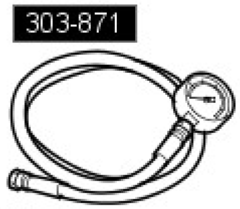
Engine System - General Information - EngineTDV8 3.6L Diesel

Diagnosis and Testing

Special Tool(s)	
 E57918	Oil Pressure Testing Adaptor 303-1166
 E57919	Oil Pressure Testing Gauge 303-871

Overview

As diagnosis of the different areas of the engine is covered in other sections and by general procedures, this section is limited to an oil pressure test.

For specific areas of the engine, refer to the general procedures in this section and the relevant section of the manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Symptom chart

Mechanical
● Engine oil level ● Coolant level ● Transmission fluid level ● Fuel level ● Coolant leaks ● Oil leaks ● Fuel leaks ● Visibly damaged or worn parts ● Loose or missing nuts or bolts ● Fuel contamination/grade/quality ● Sensor fitment/condition ● Viscous fan and solenoid

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before carrying out the following procedure.
    - Make sure that all DTCs are cleared following rectification.

Oil Pressure check

- WARNINGS:

⚠ The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

⚠ Wear protective gloves.

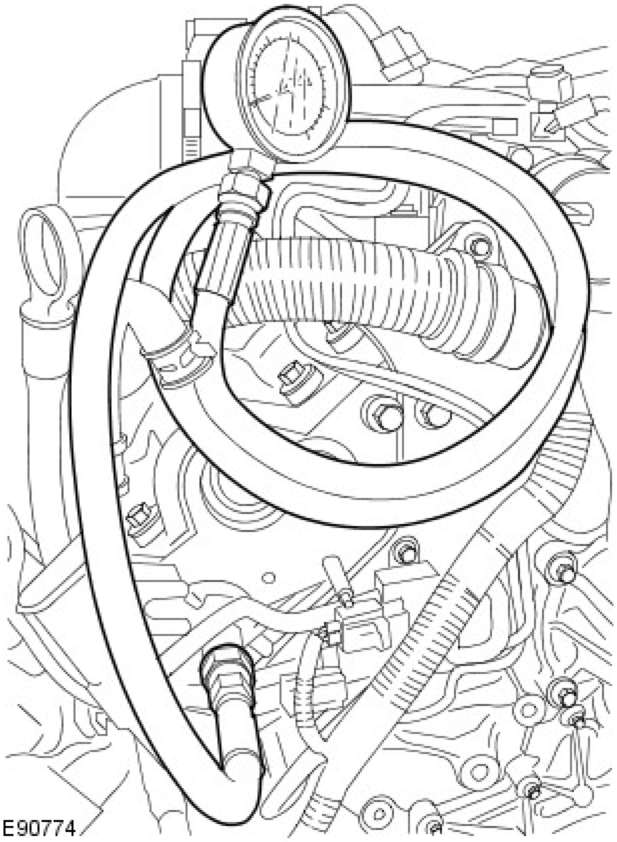
⚠ Eye protection must be worn.

• NOTE: Prior to checking the engine oil pressure, a road test of 6 miles (10 kilometers), must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle.

1. **1.** Disconnect the battery ground cable.
   REFER to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. **2.** Remove the engine oil pressure (EOP) sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

3. **3.** Install the special tools.



4. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

   4. Install the brake vacuum pump.
   REFER to: Brake Vacuum Pump - TDV8 3.6L Diesel (206-07 Power Brake Actuation, Removal and Installation).

5. **5.** Check and top-up the engine oil, if required.

6. **6.** Start and run the engine.

7. **7.** Note the oil pressure readings with the engine running at idle and 3500 RPM.
   REFER to: Specifications (303-01D Engine - TDV8 3.6L Diesel, Specifications).

8. **8.** Turn off the engine.

9. **9.** Remove the brake vacuum pump.
   REFER to: Brake Vacuum Pump - TDV8 3.6L Diesel (206-07 Power Brake Actuation, Removal and Installation).

10. **10.** Remove the special tools.

11. **11.** Install the oil pressure sensor.
    REFER to: Engine Oil Pressure (EOP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

12. **12.** Check and top-up the engine oil, if required.

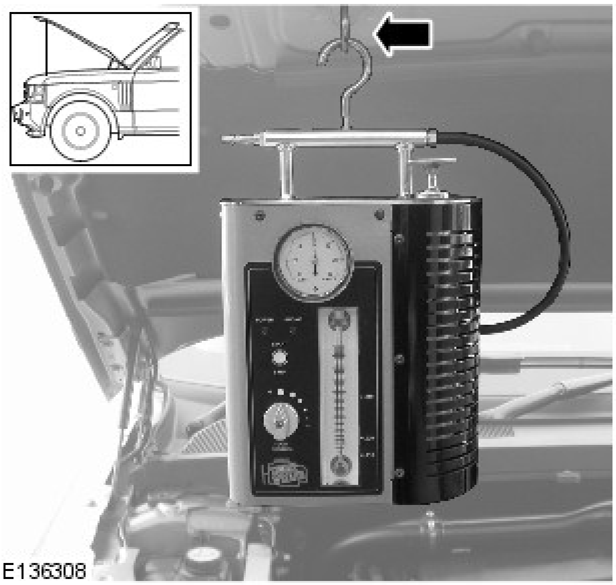
Published: 02-Jun-2011

Engine System - General Information - Leakage Test Using Smoke Test Equipment

General Procedures

⚠CAUTION: The compressed air line supply pressure must be between 3.5 and 12 bar (50 and 175 psi) for the smoke test equipment to function correctly. Do not exceed this pressure. Failure to follow this instruction may result in damage to the smoke test equipment.

- NOTE: The vehicle battery must be in good condition and fully charged before carrying out this procedure.
- NOTE: On vehicles with 3.0L TDV6, it will be necessary to insert smoke at both air cleaner outlet pipes independently if the right hand turbocharger and associated hoses are to be tested.
- NOTE: In some cases it may be necessary to remove undertrays, trim or engine covers to obtain access to all potential leak locations.
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.
- NOTE: For further information regarding operation of the test equipment refer to the manufacturers operators manual supplied with the kit.



1. ⚠WARNING: Use an additional support to prevent the hood from falling if the smoke test equipment is secured to the hood. Failure to follow this instruction may result in personal injury.

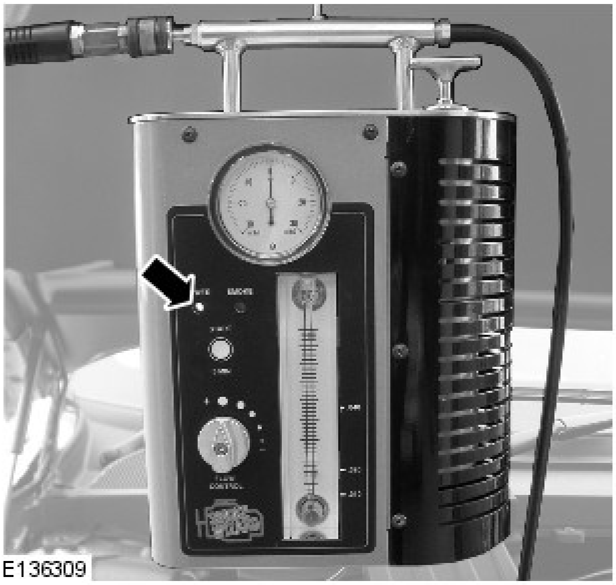
Install the smoke test equipment to a suitable location under the hood.

2. Connect a suitable compressed air line to the smoke test equipment.

3. Connect the smoke test equipment positive power cable to the battery positive terminal.

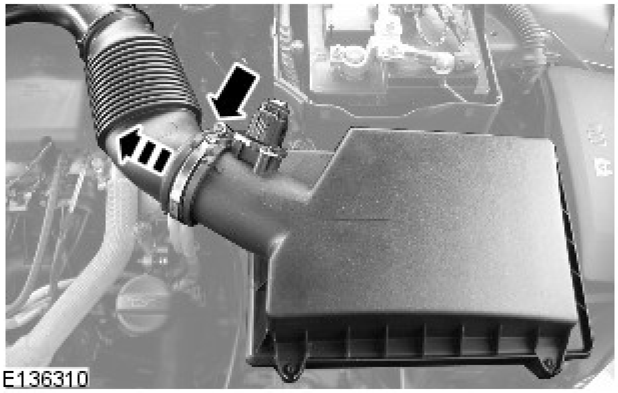
4. ⚠WARNING: Do not connect the smoke test equipment negative cable to the battery negative terminal.

Connect the smoke test equipment negative cable to a suitable body ground point.


E136309

5. NOTE: A flashing green light indicates low battery voltage. In this case, place the battery on charge and make sure that the battery is fully charged before using the smoke test equipment.

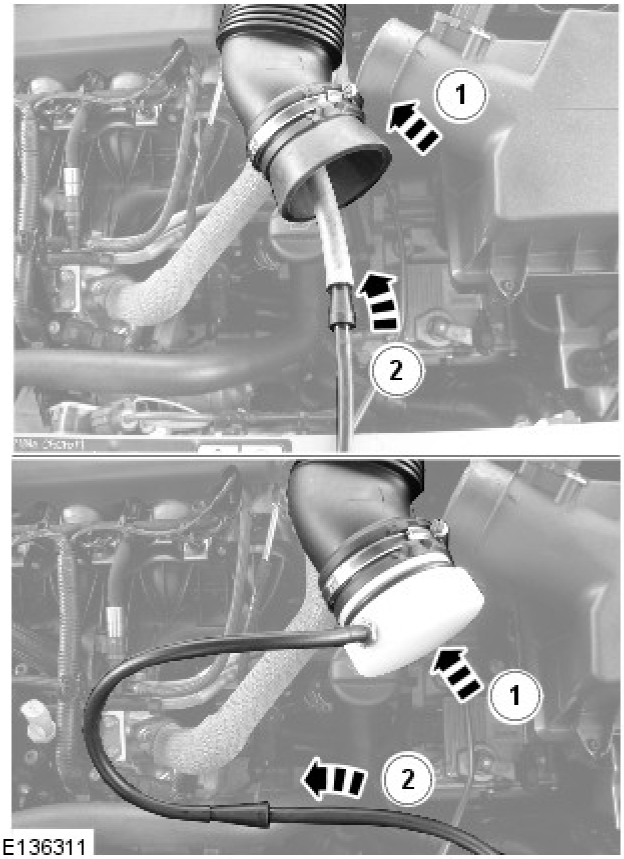
Observe the power indicator lamp on the smoke test equipment. Make sure that a continuous green light is displayed.


E136310

6. NOTE: In some cases it may be necessary to remove the air cleaner(s) to allow access to the air cleaner outlet pipes.

- NOTE: In some cases it will be necessary to cap one of the air cleaner outlet pipes. Use the blanking caps supplied in the kit to cap the open orifice.

Disconnect the air cleaner outlet pipe(s).

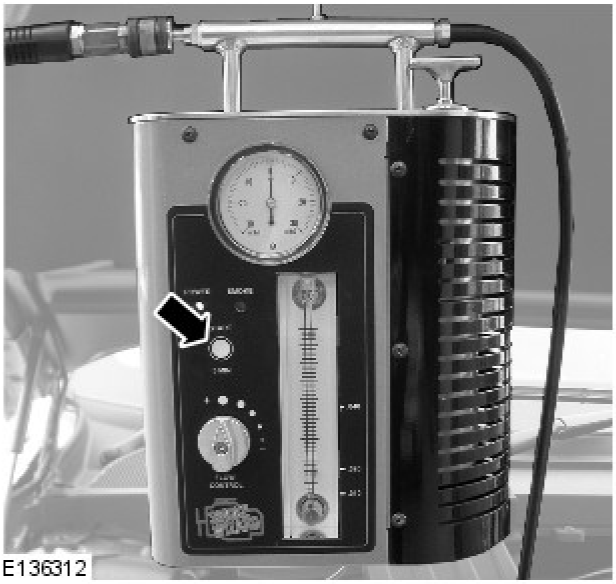


E136311

7. NOTE: Make sure the smoke test equipment adapter is a good fit to the air cleaner outlet pipe. This must be an air tight seal.

Connect the smoke test equipment supply hose to the air cleaner outlet pipe.

1. Install the appropriate adapter to the air cleaner outlet pipe.
2. Connect the smoke test equipment supply hose to the adapter link hose.



E136312

8. NOTE: The flow control valve must be in the fully open position.

- NOTE: Smoke is produced for 5 minutes. The smoke test equipment will automatically switch off after this period of time.

Switch the smoke test equipment on.

9. Remove the oil filler cap, and observe until a constant flow of smoke is visible leaving the oil filler orifice. Install the oil filler cap.

10. NOTE: The longer smoke is allowed to exit from a leak, the more fluorescent dye will be deposited at a leak location.

Using the torch supplied in the kit set to white light, look for escaping smoke. Alternatively, use the ultraviolet light to look for fluorescent dye deposits at the source of a leak.

Engine - V8 S/C 4.2L Petrol -

Sealers

Item	Land Rover Part No.
Valve cover gasket	8510303
Sump pan	8510303
Oil strainer pick-up pipe bolts	STC 50553
Cylinder block core plugs	STC 50554
Timing cover seal aperture	8510303
Cylinder block coolant outlet elbow stub pipe	STC 50554
Bedplate to cylinder block	8510303

Lubricant - UK, Europe and ROW - Not NAS/Japan

Item	Specification
* Recommended lubricant	5W/30 Preferred: WSS–M2C913–B Alternative: ACEA A3/B3

*** WSS is a Ford prefix to the oil specification**

Lubricant - NAS/Japan

Item	Specification
* Recommended lubricant	5W/30 – ILSAC GF4 and API SM

*** WSS is a Ford prefix to the oil specification**

Capacity

Item	Capacity
Dry fill including filter and cooler	9.4 litres (16.5 pints) (9.9 US quarts)
Oil and filter change	7.7 litres (13.6 pints) (8.1 US quarts)
Amount of oil required to bring the level from the lower to the upper holes on the dipstick	1.5 litres (2.6 pints) (1.5 US quarts)

General Specification

Item	Specification
Type	4.2 litre, 90 degree 'V', supercharged, petrol engine, twin overhead camshafts per cylinder head, 4 valves per cylinder
Cylinder arrangement	For additional information, refer to: Engine (303-01A Engine - V8 S/C 4.2L Petrol, Description and Operation).
Cylinder numbering	For additional information, refer to: Engine (303-01A Engine - V8 S/C 4.2L Petrol, Description and Operation).
Bore - nominal	86.0 mm (3.386 in)
Stroke	90.3 mm (3.555 in)
Capacity	4196 cm^3 (256.0 in^3)
Firing order (pre 2006)	1 - 5 - 4 - 2 - 6 - 3 - 7 - 8
Firing order (2006 onwards)	1 - 2 - 7 - 3 - 4 - 5 - 6 - 8
Compression ratio	9.1:1
Direction of rotation	Anti-clockwise viewed from rear of engine
Maximum power:	
UK/Europe and ROW - Not NAS/Japan	287 kW (385 bhp) @ 5750 rev/min
NAS/Japan	390 bhp (291 kW) @ 5750 rev/min
Maximum torque:	
UK/Europe and ROW - Not NAS/Japan	550 Nm (406 lb-ft) @ 3500 rev/min
NAS/Japan	410 lb-ft (555 Nm) @ 3500 rev/min
Dimensions:	
Length	720 mm (28.3 in)
Width	720 mm (28.3 in)
Height	785 mm (30.9 in)
*** Engine oil pressure:**	
At Idle	1.0 bar (100 kPa) (15.0 lb/in^2)
At 3500 rev/min	3.0 bar (300 kPa) (44.0 lb/in^2)
**** Valve clearances:**	
Inlet	0.18 to 0.22 mm (0.007 to 0.008 in)
Exhaust	0.23 to 0.27 mm (0.009 to 0.010 in)
Cylinder Head	
Maximum permitted warp	0.125 mm (0.005 in)

*** Note: prior to checking the engine oil pressure, a road test of 6 miles (10 kilometres) must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle**

**** Note: there are 50 different thicknesses of graded tappet available ranging from 2.950 to 3.685 mm (0.116 to 0.145 in) rising in increments of 0.015 mm (0.0005 in)**

Torque Specifications

Description	Nm	lb-ft
Exhaust manifold heat shield bolt	25	18
* Exhaust manifold to cylinder head bolts	20	15
Battery clamp bolt	10	7
***+ Cylinder head bolts:**		
Stage 1 - Tighten bolts 1 to 10	20	15
Stage 2 - Tighten bolts 1 to 10	35	26
Stage 3 - Tighten bolts 1 to 10	Further 90°	Further 90°
Stage 4 - Tighten bolts 1 to 10	Further 90°	Further 90°
Stage 5 - Tighten the M8 bolts 11 and 12	25	18
CMP sensor Torx screw	7	5
++ Oil filter	18	13
Oil drain plug	25	18
Oil cooler bolts	10	7
Primary timing chain tensioner guide bolts	12	9
Primary timing chain tensioner bolts	12	9
Secondary timing chain tensioner bolts	12	9
* Camshaft bearing cap bolts	10	7
**** Intake camshaft sprocket retaining bolt**		
Stage 1	20	15
Stage 2	Further 90°	Further 90°
**** Exhaust camshaft sprocket retaining bolt**		
Stage 1	20	15
Stage 2	Further 90°	Further 90°
Engine front mount bolts:		
Stage 1	45	33
Stage 2	Further 60°	Further 60°
Engine to front mount nut	90	66
Engine ground cable bolt	25	18
Starter motor bolts	45	33
+++ Starter motor cable nut	10	7
*+ Steering column lower universal joint bolt	25	18
*+ Crankshaft pulley bolt	380	280
PCV valve bolt	6	4
Valve cover bolts	12	9
Oil level indicator tube nut	6	4
* Sump pan bolts	20	15
Transmission retaining bolts	45	33
Transmission cooler pipes retaining clamp bolt	25	18
A/C compressor mounting bracket bolts	25	18
Power steering pump bolts	25	18
Differential extension bolts	45	33
Oil pump to cylinder block bolts	10	7
**+ Oil strainer pick-up pipe bolts - M5	6	4
Oil strainer pick-up pipe bolts - M6	10	7
Coolant pump pulley bolts	10	7
Accessory drive belt idler pulley bolt	25	18
* Engine front cover bolts	12	9
Generator mounting bracket bolts	48	35
Accessory drive belt tensioner bolt	40	30
Viscous fan drive pulley bolts	25	18
Viscous fan drive belt tensioner bolt	40	30
Radiator access panel bolts	10	7
Engine oil pressure sensor	12	9
Upper suspension arm and brake line heat shield nuts and bolts	10	7
Flexplate to torque converter bolts:		

Description	Nm	lb-ft
Stage 1	15	11
Stage 2	110	81
Hood bolts	25	18
Auxiliary oil cooler thermostat bolts	10	7
Engine oil temperature sensor	20	15
Oil filter housing	20	15
Oil cooler hose adaptors	10	7
Fuel pressure sensor	6	4
Fuel temperature sensor	7	5
Dynamic Response pump mounting bolts	25	18

*** Bolts must be tightened in sequence**

**** New nuts/bolts must be installed**

****+ Apply sealant to threads**

***+ New Patchlok bolts must be installed**

+ Lightly oil bolt threads

++ Apply engine oil to seal

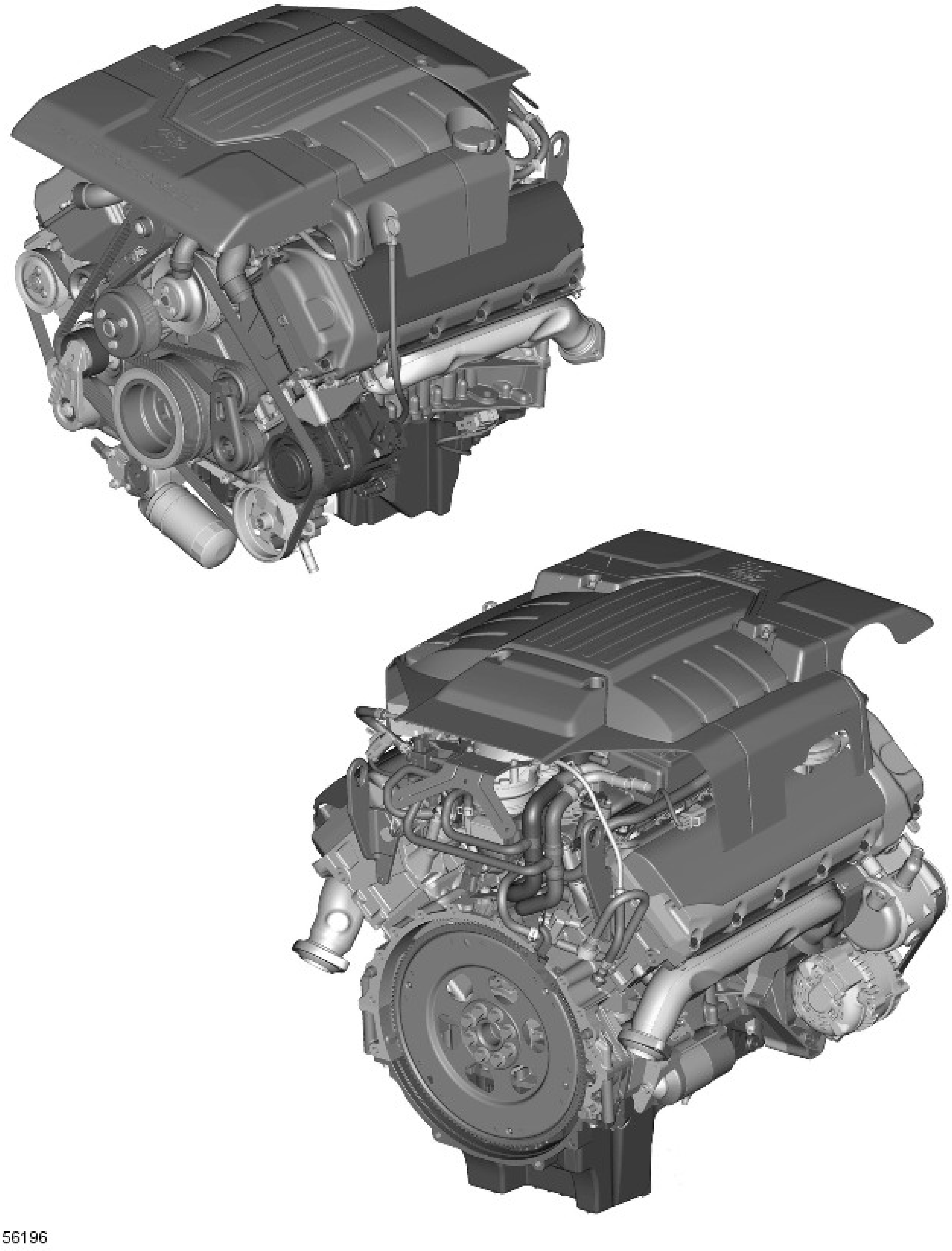
+++ Damage to internal connections will result if this torque is exceeded

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Engine

Description and Operation

External View



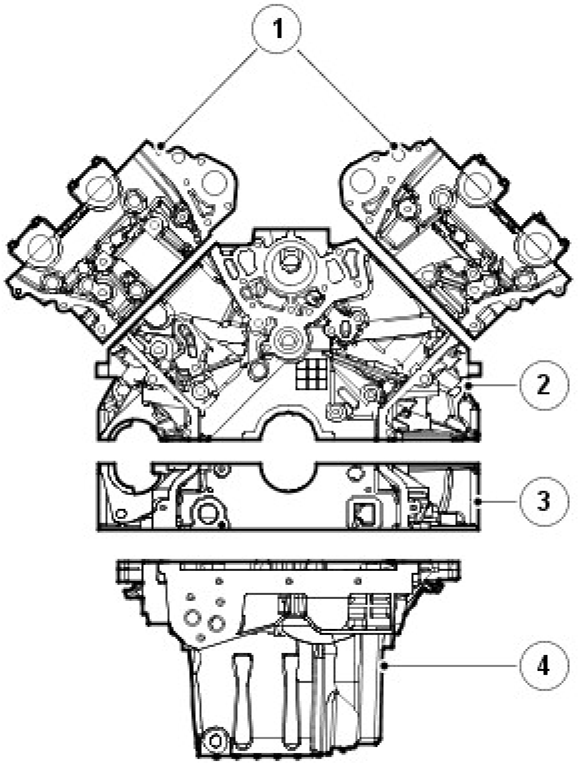
E56196

GENERAL

The V8 supercharged petrol engine is a 4.2 liter, 8 cylinder, 90 degrees 'Enclosed' V unit, with 4 valves per cylinder, operated by two overhead camshafts per cylinder head. The engine emissions comply with ECD3 (European Commission Directive) and US Federal Tier2 Bin 8 legislative requirements and employs catalytic converters, electronic engine management control and positive crankcase ventilation to limit the emission of pollutants. The cooling system is a low volume, high velocity system. The Engine Control Module (ECM) controls the fuel injection system, the ignition system and the electric throttle.

The cylinder block is of aluminum alloy construction with cast iron liners. A cast aluminum bedplate is bolted to the bottom of the block to improve lower structure rigidity. The cylinder heads are cast aluminum with thermo-plastic camshaft covers. The single-piece oil sump is also cast aluminum. The fabricated stainless steel twin skin exhaust manifolds are unique for each cylinder bank. A molded plastic acoustic cover is fitted over the upper engine to reduce engine-generated noise.

Engine Structure



E43424

Item	Part Number	Description
1	-	Cylinder heads
2	-	Cylinder block
3	-	Bedplate
4	-	Structural sump

TECHNICAL FEATURES

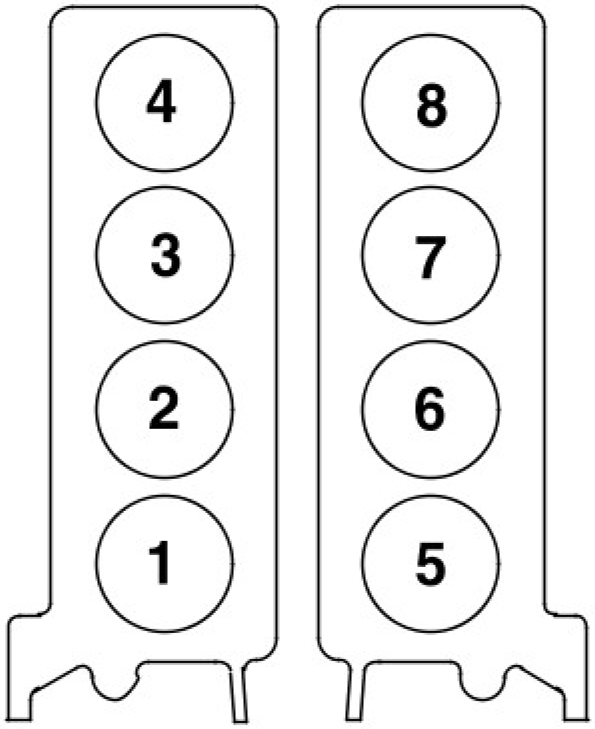
The technical features include:

- An eight-cylinder 90-degree 'Enclosed V' configuration liquid cooled aluminum cylinder block with cast iron liners
- Pistons are of open-ended skirt design, with two compression rings and a three-piece oil control ring
- Two aluminum cylinder heads, each incorporating two camshafts manufactured in chilled cast iron
- Four valves per cylinder
- Graded valve lifters (shimless)
- Belt driven supercharger
- Top fed, 12-hole fuel injectors
- Engine front cover manufactured from aluminum, accommodating the crankshaft front oil seal
- Primary and secondary chain drive for the camshafts
- An aluminum bedplate
- A cast iron crankshaft

- Fracture-split connecting rods in sintered-forged steel
- A twin multi-vee belt, driving the front-end accessories
- Fabricated stainless steel twin skin exhaust manifolds
- An advanced engine management system incorporating electronic throttle control
- Meets with the fault handling requirements, as detailed in the European On-Board Diagnostic (EOBD) III, US Federal OBD and California OBDII legislation.

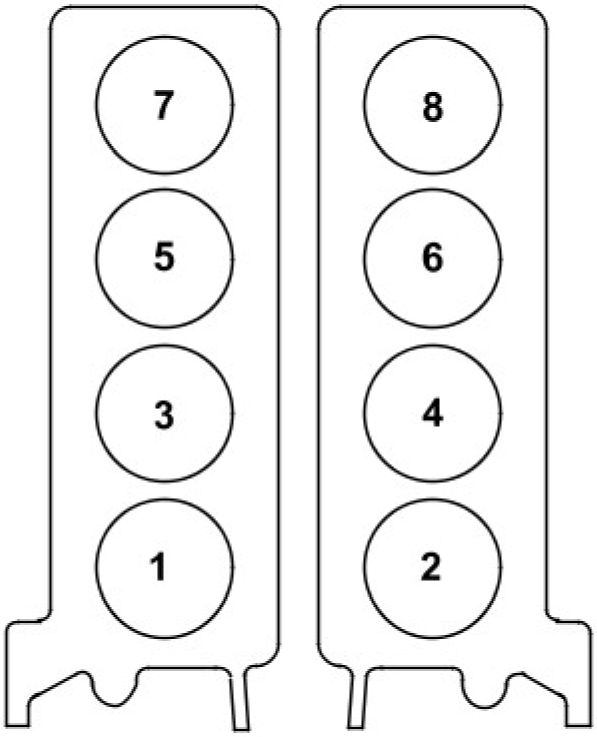
Cylinder Numbering Convention

Pre 2006



E133968

2006 onwards

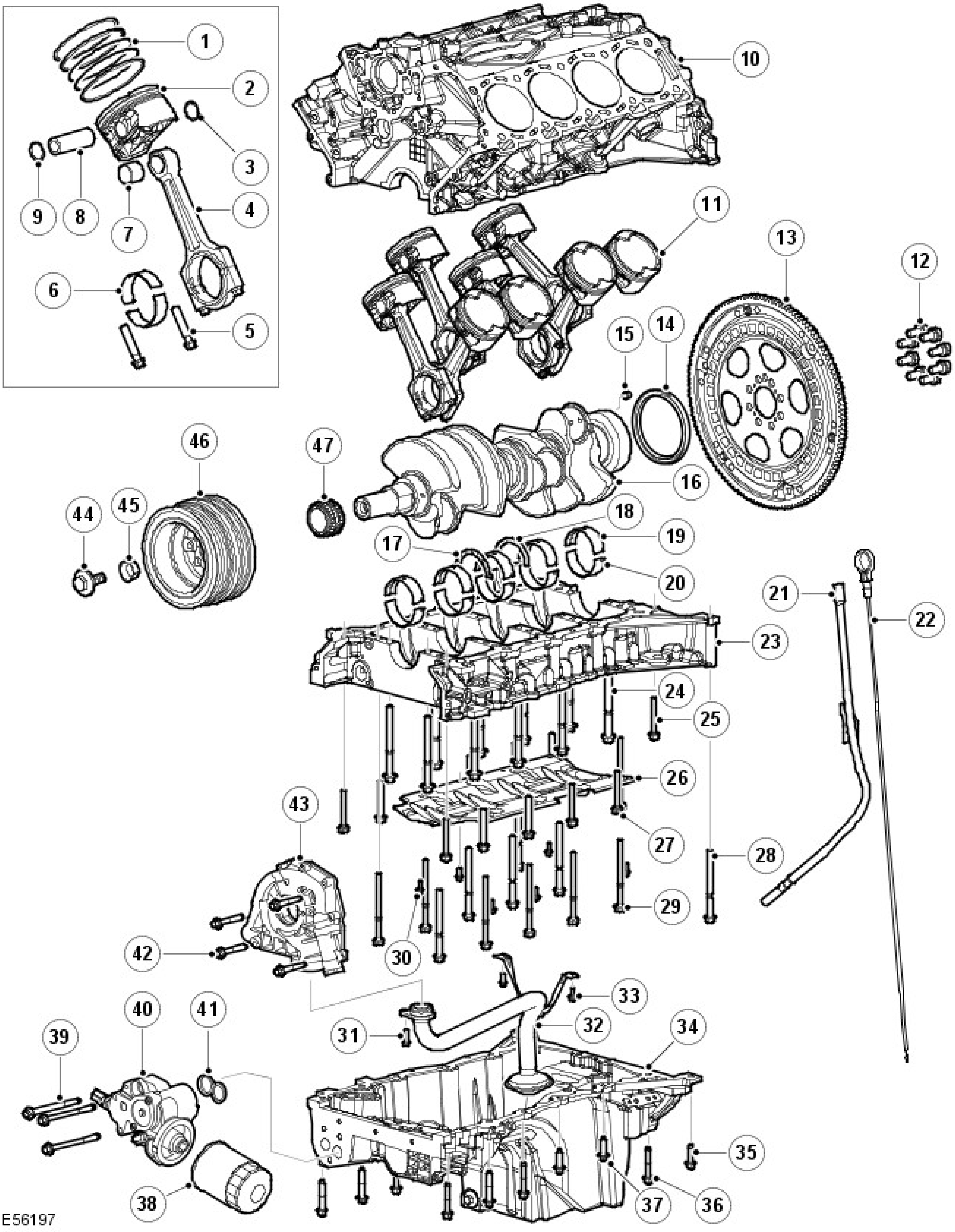


E133972

ENGINE DATA

DESCRIPTION	TYPE
Configuration	90 degree V8
Maximum power	283 kW at 5750 rpm
Maximum torque	550 Nm at 3500 rpm
Displacement	4196 liters
Stroke/bore	90.3/86 mm
Compression ratio	9.1 : 1
Firing order (pre 2006)	1 5 4 2 6 3 7 8
Firing order (2006 onwards)	1 2 7 3 4 5 6 8
Engine weight	220 kg (approx.)
Oil volume	7.5 liters (wet)

CYLINDER BLOCK COMPONENTS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E56197

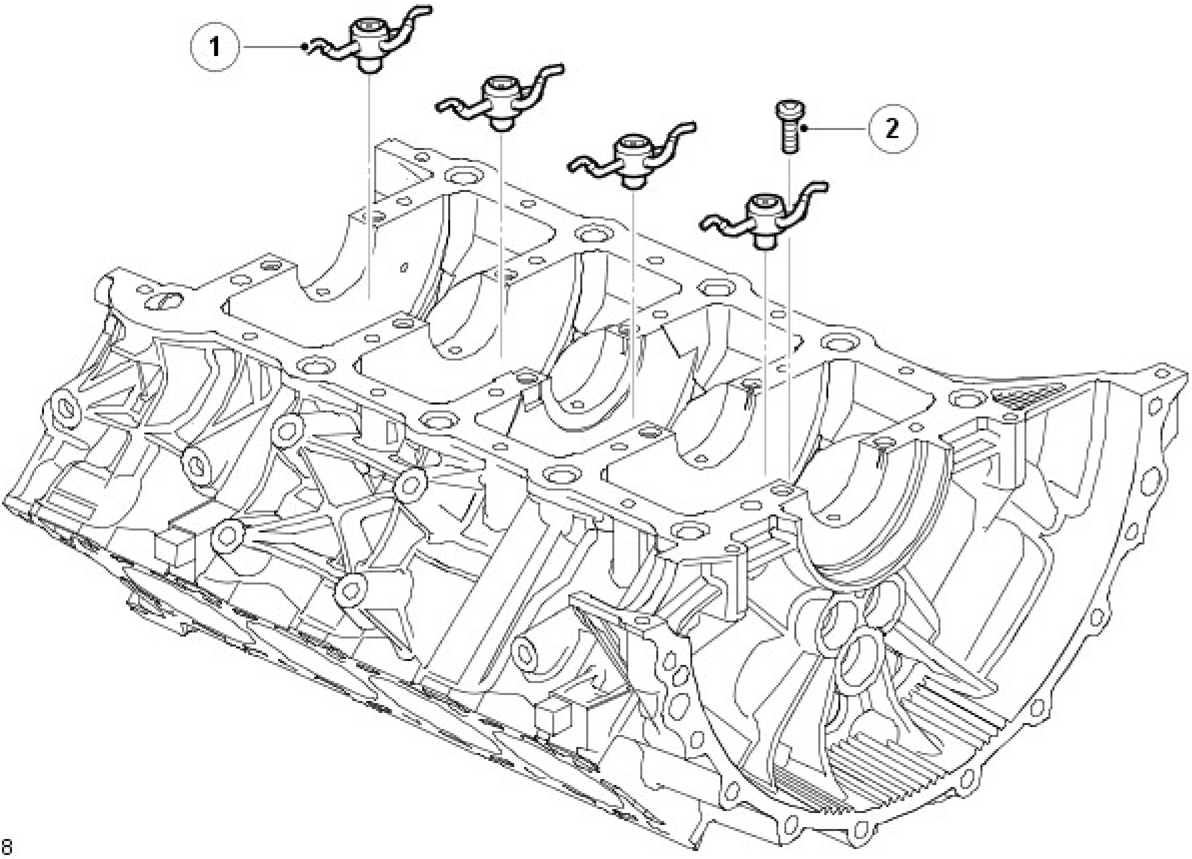
Item	Part Number	Description
1	-	Piston rings
2	-	Piston
3	-	Circlip
4	-	Connecting rod
5	-	Bolts

6	-	Connecting rod bearing shells
7	-	Bearing
8	-	Gudgeon pin
9	-	Circlip
10	-	Cylinder block
11	-	Pistons
12	-	Bolts
13	-	Flywheel
14	-	Seal
15	-	Dowel
16	-	Crankshaft
17	-	Thrust washer
18	-	Thrust washer
19	-	Bearing shells - upper
20	-	Bearing shells - lower
21	-	Oil level gage tube
22	-	Oil level gage
23	-	Bedplate
24	-	Bolts
25	-	Bolts
26	-	Windage tray
27	-	Bolts
28	-	Bolts
29	-	Bolts
30	-	Bolt
31	-	Bolt
32	-	Oil pick-up pipe
33	-	Bolts
34	-	Sump
35	-	Bolts
36	-	Bolts
37	-	Bolts
38	-	Oil filter
39	-	Bolts
40	-	Oil filter head assembly
41	-	Seals
42	-	Bolts
43	-	Oil pump
44	-	Crankshaft bolt
45	-	Taper collet
46	-	Crankshaft pulley
47	-	Crankshaft sprocket

Cylinder Block

The cylinder block is an 'Enclosed V' design, which provides an inherently rigid structure with good vibration levels. A low volume coolant jacket improves warm-up times and piston noise levels; the longitudinal flow design of the jacket, with a single cylinder head coolant transfer port in each bank, improves rigidity and head gasket sealing. The right hand cylinder bank is designated as 'A' bank, and the left hand as 'B' bank.

Piston Cooling Jets



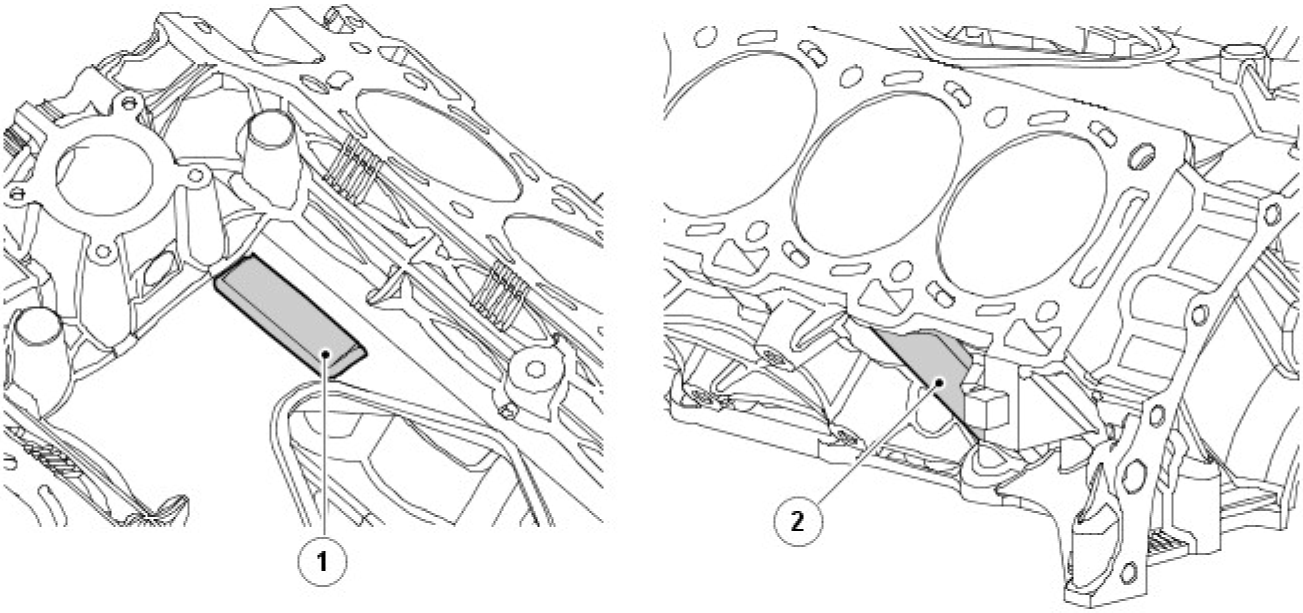
E56198

Item	Part Number	Description
1	-	Piston cooling jets
2	-	Bolt

Jets located in the cylinder block provide piston and gudgeon pin lubrication and cooling. These jets spray oil on the underside of the piston.

Lubrication oil is distributed through the cylinder block, via the main oil gallery and channels bored in the block, to all critical moving parts. These channels divert oil to the main and big-end bearings via holes machined into the crankshaft.

Engine Data Locations

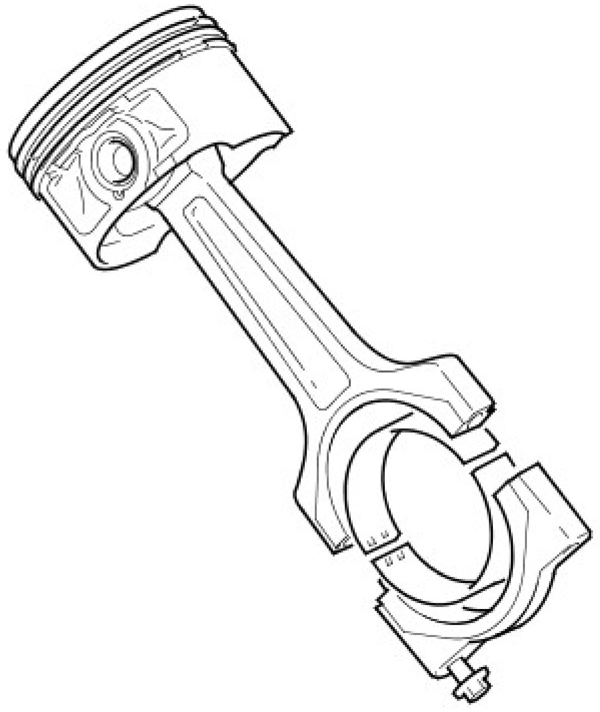


E43426

Item	Part Number	Description
1	-	Engine part number
2	-	Engine data (main bearing diameters, cylinder bore diameters, etc), emissions code and engine number

Engine data is marked at three locations, two on the cylinder block (shown) and one on the engine front cover, which consists a label displaying the engine number. Component diameters are represented by alphabetical and numerical codes; keys to the codes are in the Service Repair Procedures (SRP) Manual.

Connecting Rods and Pistons

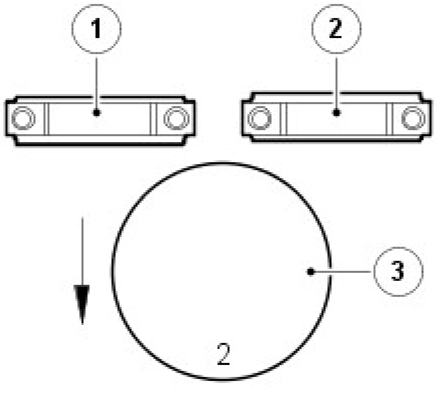


E43427

The connecting rods are manufactured from sinter-forged steel and have fracture-split bearing caps. The bearing caps are produced by fracturing the opposing sides of the connecting rod at the bearing horizontal center line. As well as being easier to manufacture, when reassembled the fractured surfaces interlock to form a strong seamless joint. The cylinder position is marked on adjoining sides of the joint to identify matching connecting rods and bearing caps. The connecting rod bearings are aluminum/tin split plain bearings.

The pistons are of the open-ended skirt design with a dished crown. They are also manufactured from a higher strength aluminum alloy and incorporate a thicker top land to resist the increased thermal and mechanical loads produced by supercharging. Three piston rings, two compression and one solid oil control ring, are installed on each piston. Each piston is installed on a gudgeon pin located in an bronze bushing in the connecting rod.

Connecting Rod and Piston Installation



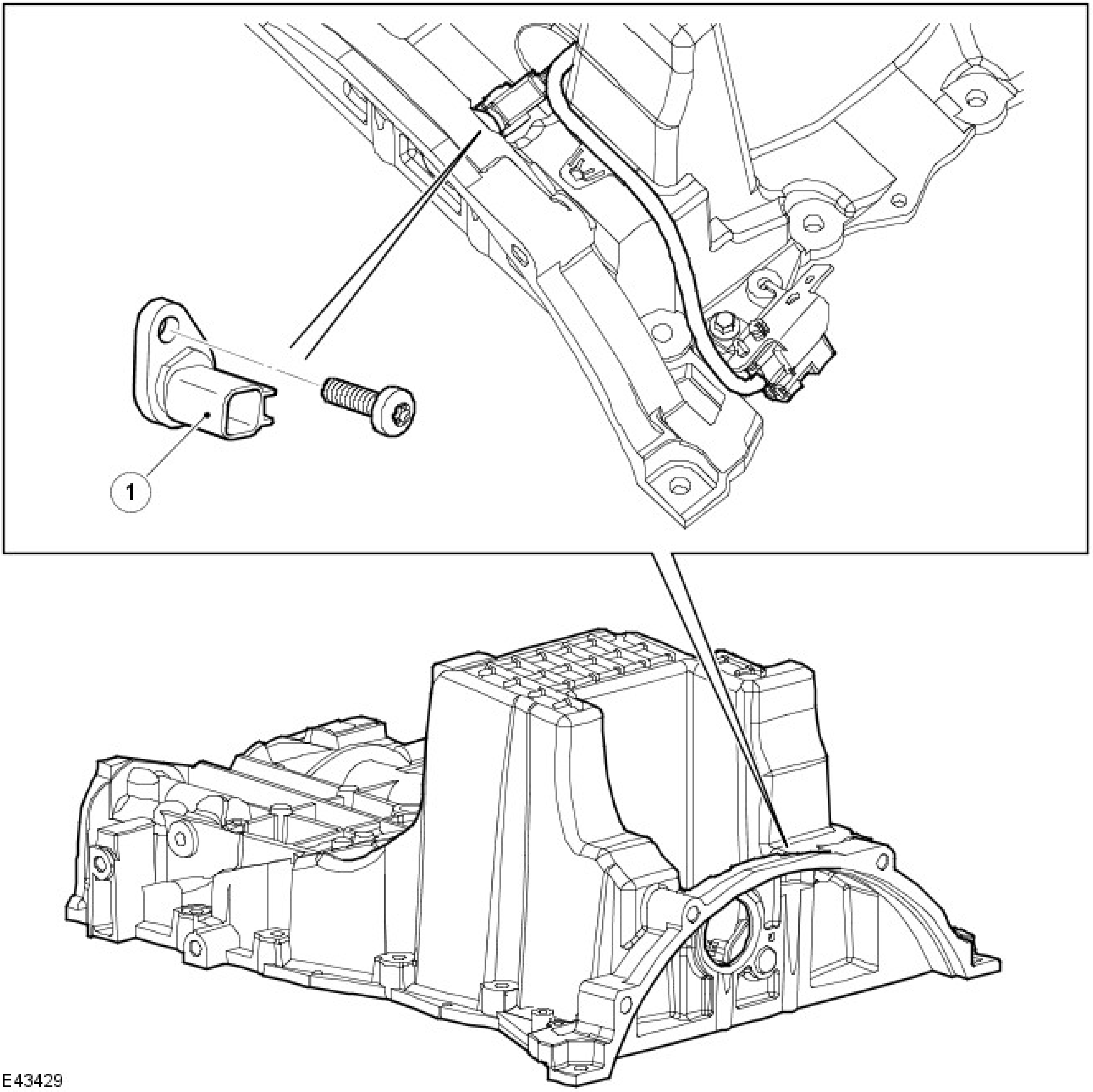
E43428

Item	Part Number	Description
1	-	Bank A (RHS)
2	-	Bank B (LHS)
3	-	Piston

The piston grade number is stamped on the crown of the piston and must coincide with that for each cylinder bore. The piston must be assembled in the correct orientation for the designated cylinder bore:

- Bank 'A' - piston grade number and the thick flange of the connecting rod must face the front of the engine
- Bank 'B' - piston grade number and the thin flange of the connecting rod must face the front of the engine

Crankshaft Position Sensor

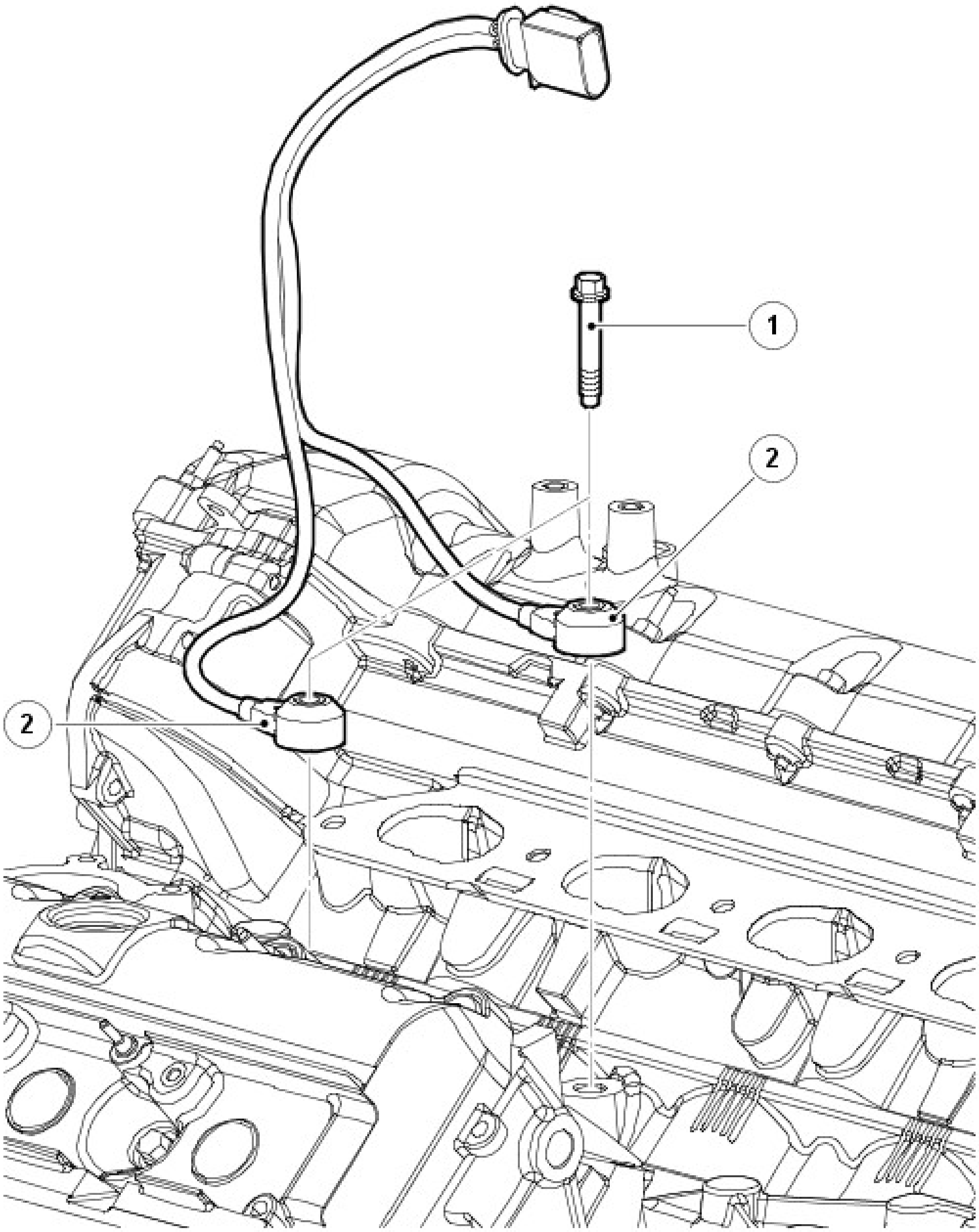


Item	Part Number	Description
1	-	Crankshaft position sensor (CKP)

The CKP sensor is installed at the rear of the sump. It is a variable reluctance sensor that provides an input of engine crankshaft speed and position.

For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

Knock Sensors



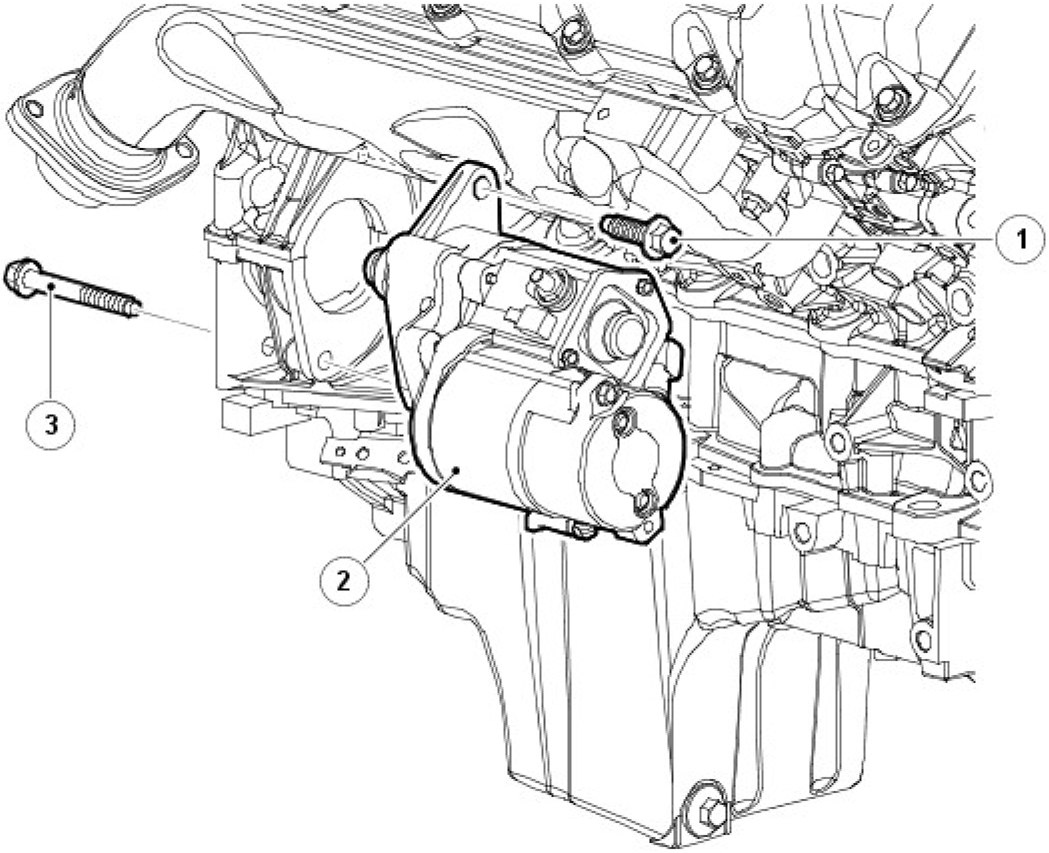
E43430

Item	Part Number	Description
1	-	Bolt
2	-	Knock sensor

The knock sensors are installed in the cylinder block on the inboard side of each cylinder bank. They are piezo-electric sensors that provide inputs to detect and locate detonation during combustion.

For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

Starter

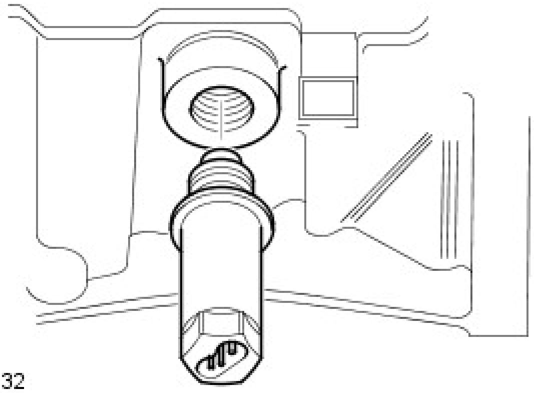


E43431

Item	Part Number	Description
1	-	Bolt
2	-	Starter motor
3	-	Bolt

The engine starter motor is installed at the rear right side of the engine, at the cylinder block to bedplate split line.
For additional information, refer to: Starting System (303-06B Starting System - V8 4.4L Petrol, Description and Operation).

Coolant Drain Plug / Heater

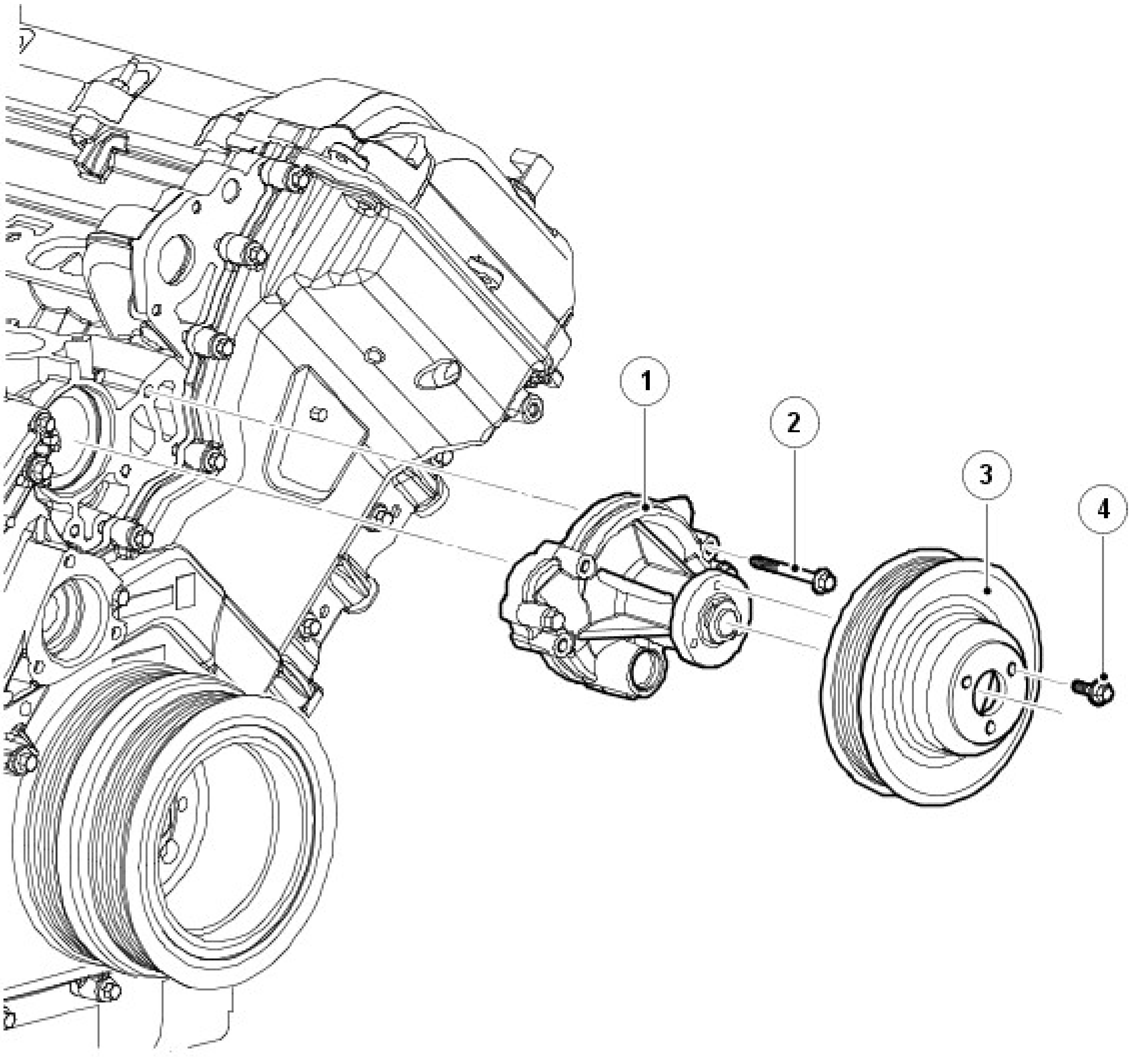


E43432

A coolant drain plug is installed on the rear left side of the cylinder block. On vehicles with the cold climate package, the cylinder block heater replaces the drain plug.

On vehicles destined for Canada, the coolant heater is installed during engine manufacture, but for Scandinavian vehicles the heater is supplied in kit form to be installed at the dealership.

Coolant Pump

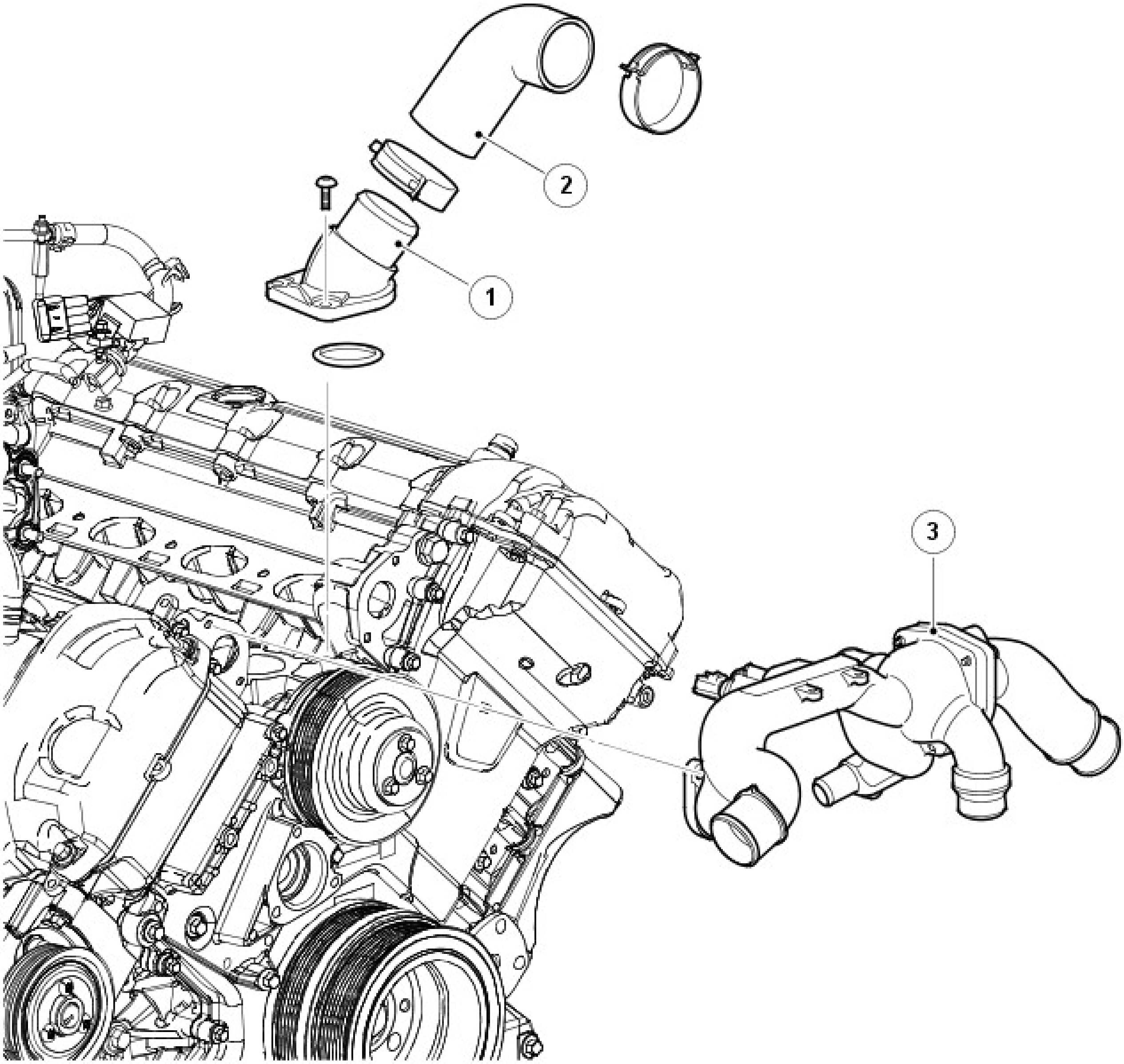


E43433

Item	Part Number	Description
1	-	Coolant pump
2	-	Bolt
3	-	Pulley
4	-	Bolt

The coolant pump is installed between the two cylinder banks, on the front face of the cylinder block.

Coolant Inlet and Outlet Assembly

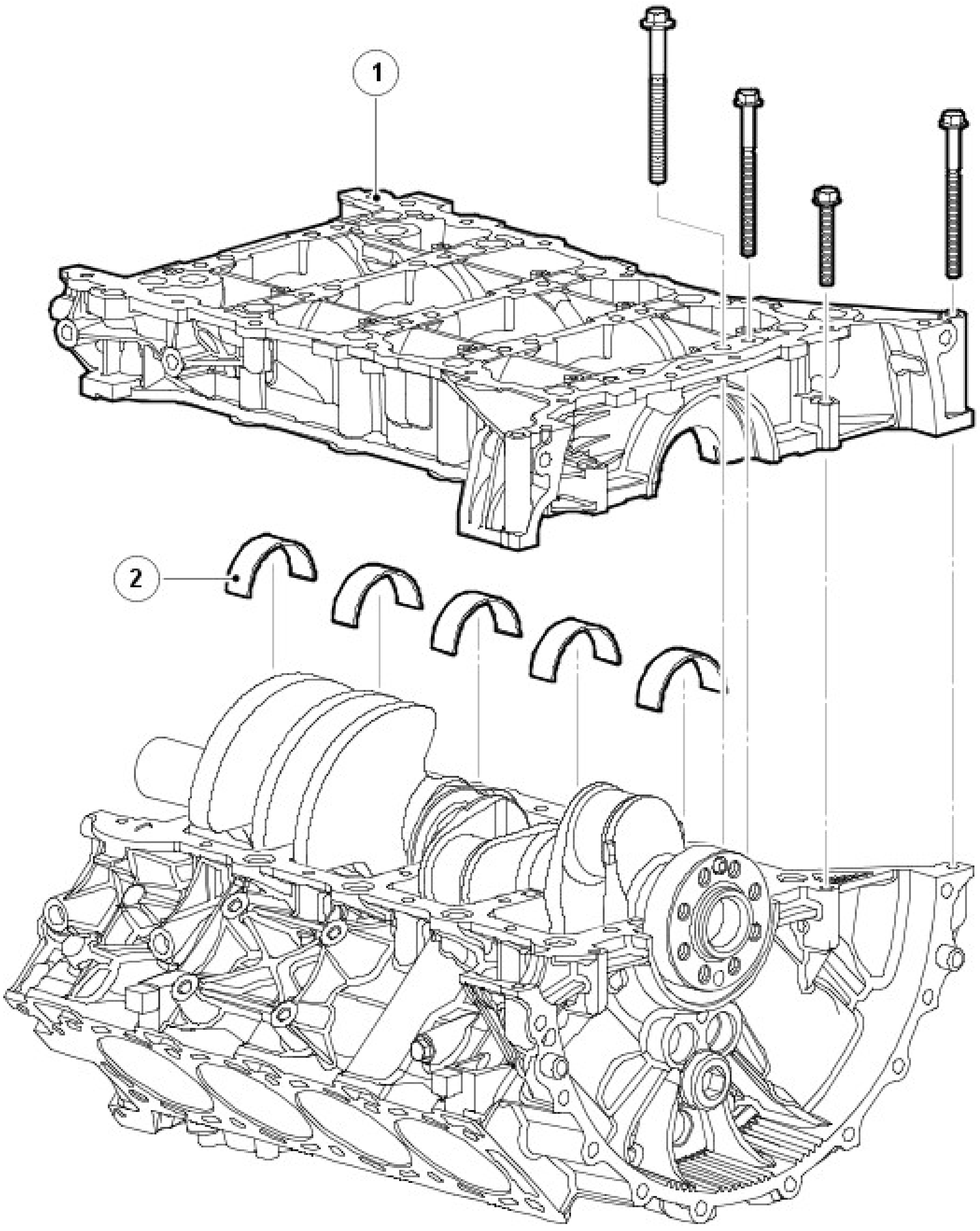


E56199

Item	Part Number	Description
1	-	Coolant outlet elbow
2	-	Coolant hose
3	-	Thermostat housing

To accommodate the installation of the supercharger, the thermostat housing and coolant outlet duct are combined into an aluminum alloy coolant outlet assembly, which is installed between the two cylinder banks, immediately above the coolant pump. A hose connects the coolant outlet assembly to a coolant inlet housing attached to the coolant pump intake on the cylinder block. The thermostat controls the flow of coolant through the radiator.

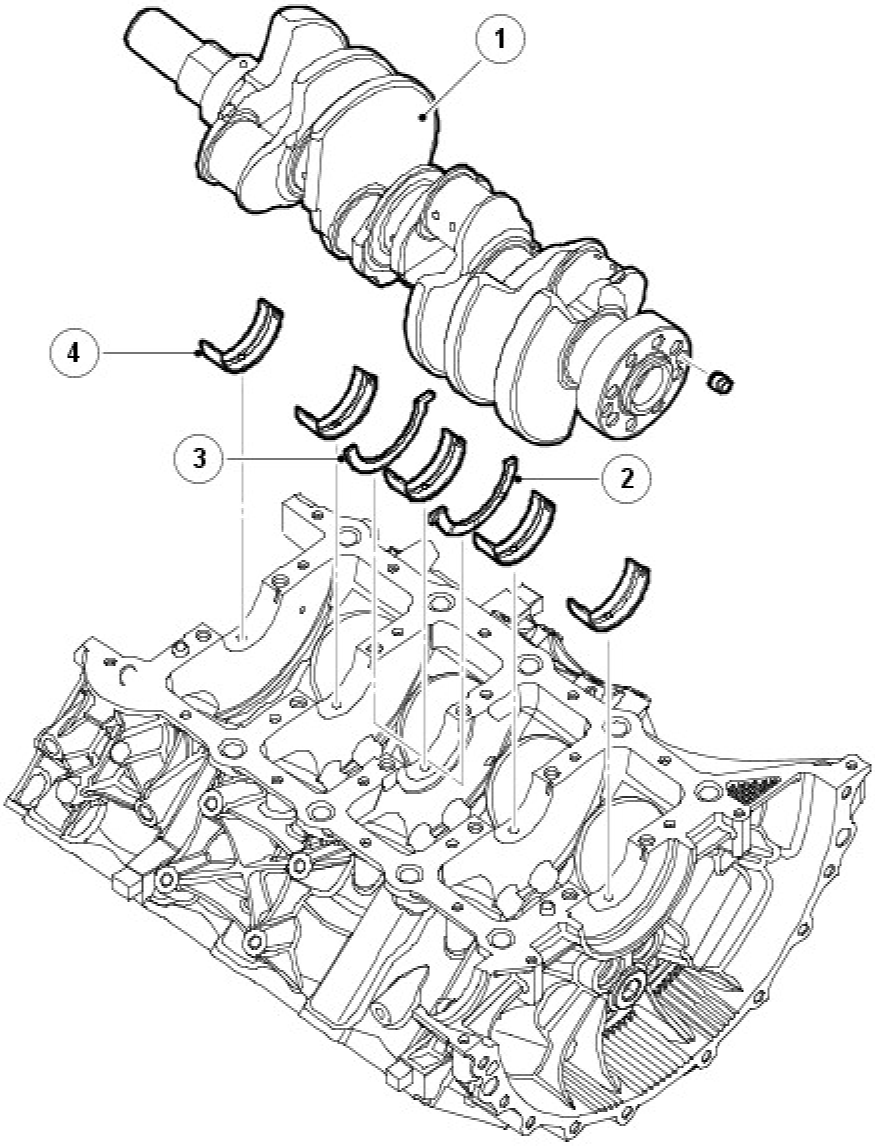
CRANKSHAFT AND SUMP COMPONENTS



E43435

Item	Part Number	Description
1	-	Bedplate
2	-	Main bearings - lower

Crankshaft and Main Bearings



E43436

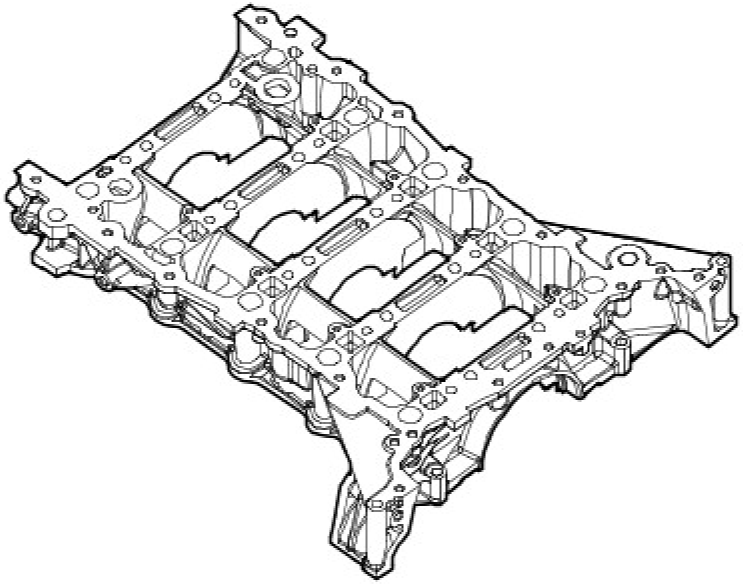
Item	Part Number	Description
1	-	Crankshaft
2	-	Thrust washer
3	-	Thrust washer
4	-	Main bearings - upper

Six counter-balance weights ensure good vibration levels from the four throw, five bearing crankshaft. Manufactured in cast iron, the crankshaft also has undercut and rolled fillets for improved strength.

The crankshaft rear oil seal is a press fit in the bedplate to cylinder block interface.

The main bearings are aluminum/tin split plain bearings. An oil groove in the upper half of each bearing transfers the oil into the crankshaft for lubrication of the connecting rod bearings. An aluminum/tin thrust washer is installed each side of the top half of the center main bearing.

Bedplate



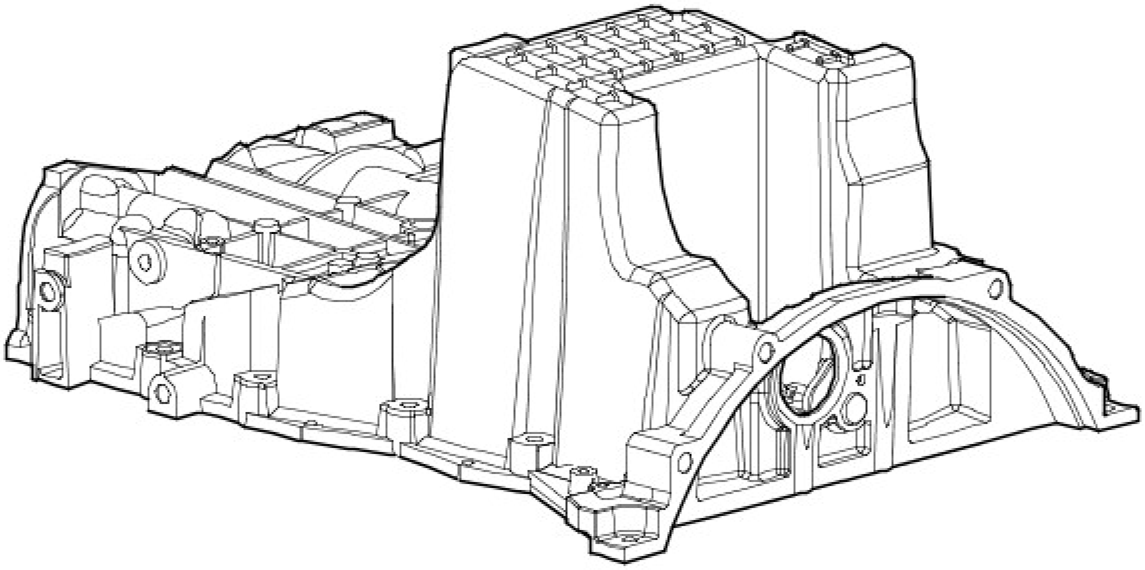
E43437

The bedplate is a structural casting bolted to the bottom of the cylinder block to retain the crankshaft. The use of a bedplate further improves rigidity. Iron inserts, cast into the main bearing supports of the bedplate, minimize main bearing clearance changes due to heat expansion.

Two hollow dowels align the bedplate with the cylinder block.

Beads of sealant seal the joint between the bedplate and the cylinder block.

Sump

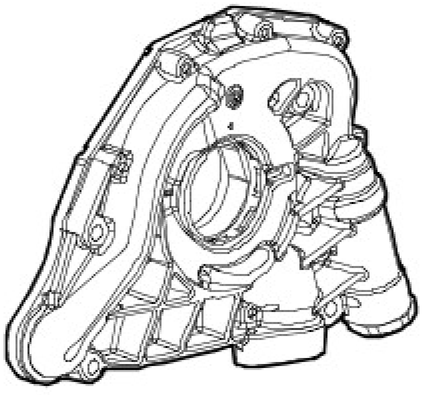


E43438

The aluminum alloy structural sump is bolted to the bedplate. A windage tray attached to the underside of the bedplate isolates the oil pan from the disturbed air produced by the rotation of the crankshaft, to prevent oil aeration and improve oil drainage. A rubber plug at the rear of the structural sump seals the port that provides access to the torque converter securing bolts. The engine oil drain plug is located at the front right corner of the oil pan.

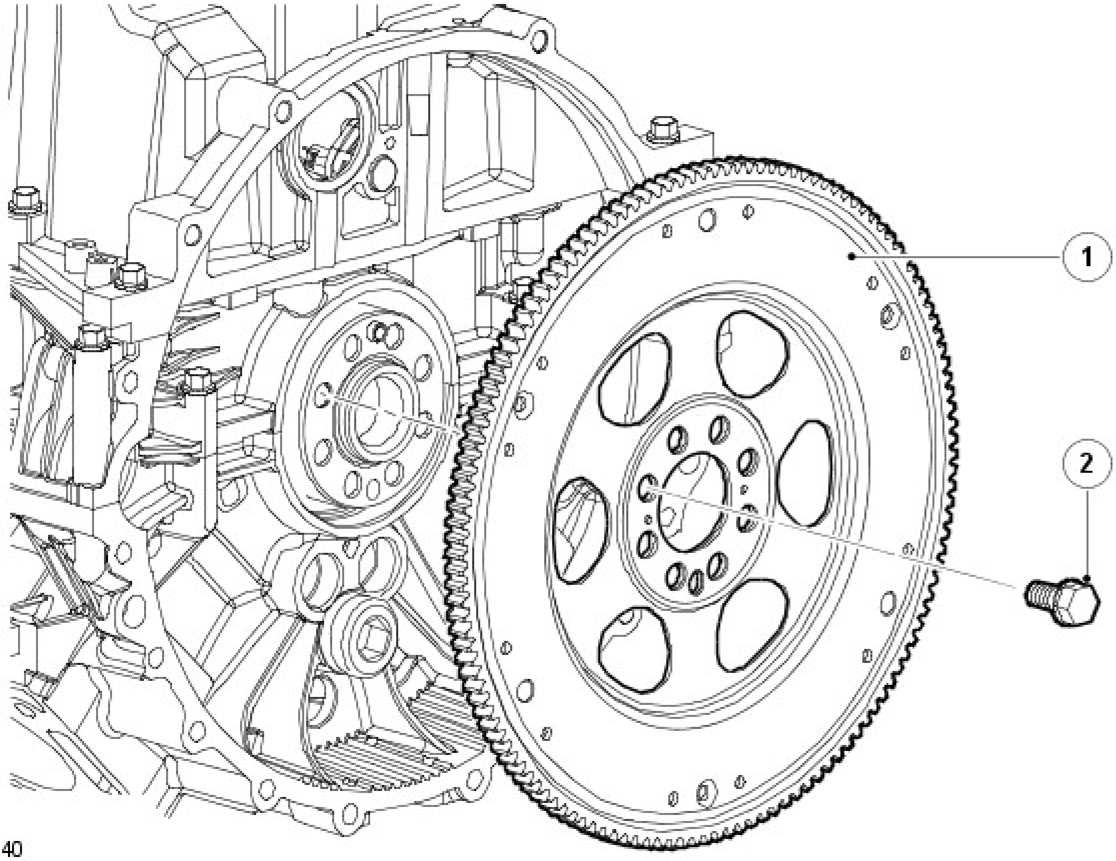
A bead of sealant seals the joint between the structural sump and the bedplate.

Oil Pump


E43439

The oil pump is installed on the crankshaft at the front of the engine. The pump outlet port aligns with oil passages in the bedplate.

Starter Drive Plate

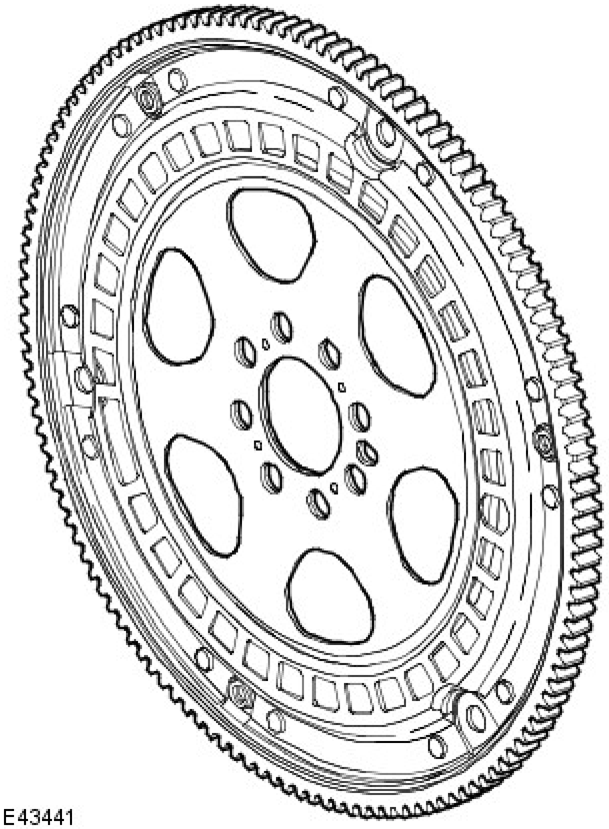


E43440

Item	Part Number	Description
1	-	Starter drive plate
2	-	Bolt

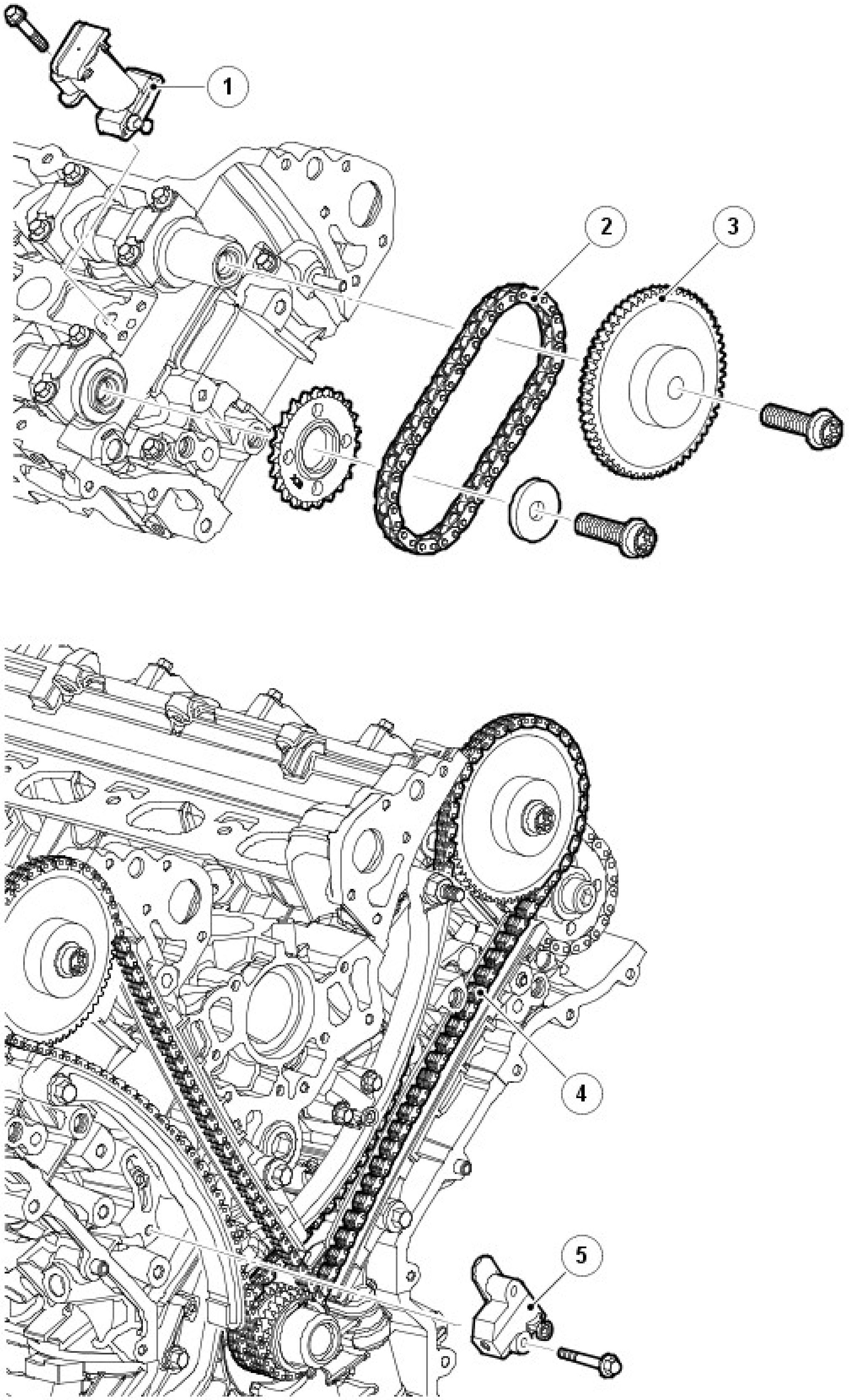
The starter drive plate is attached to the rear of the crankshaft. A timing disc, for the engine speed sensor, is spot welded to the front face of the drive plate.

Timing Disc



E43441

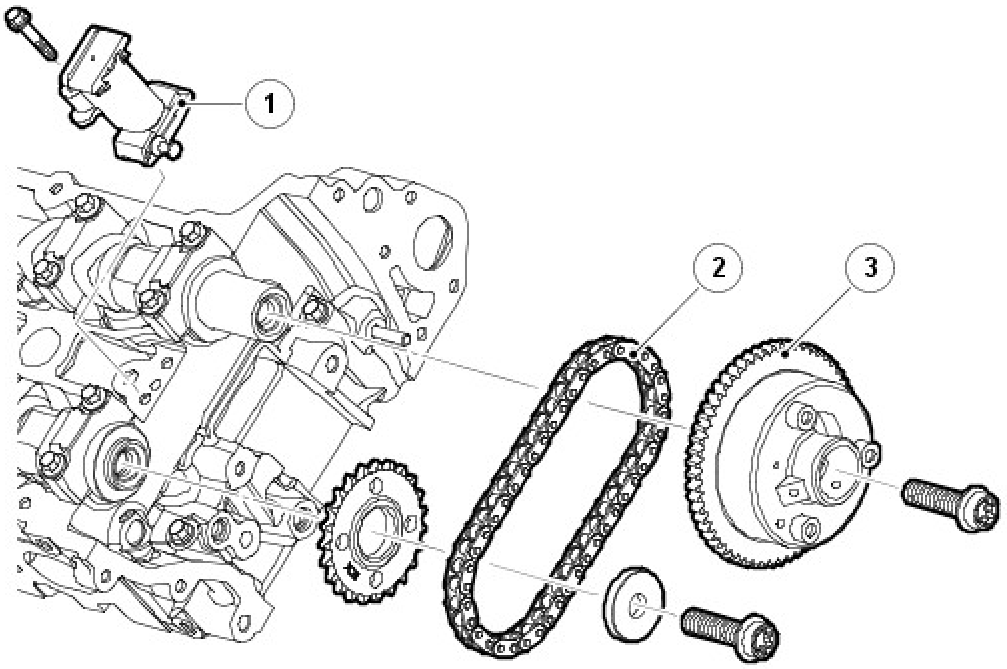
CAMSHAFT TIMING COMPONENTS

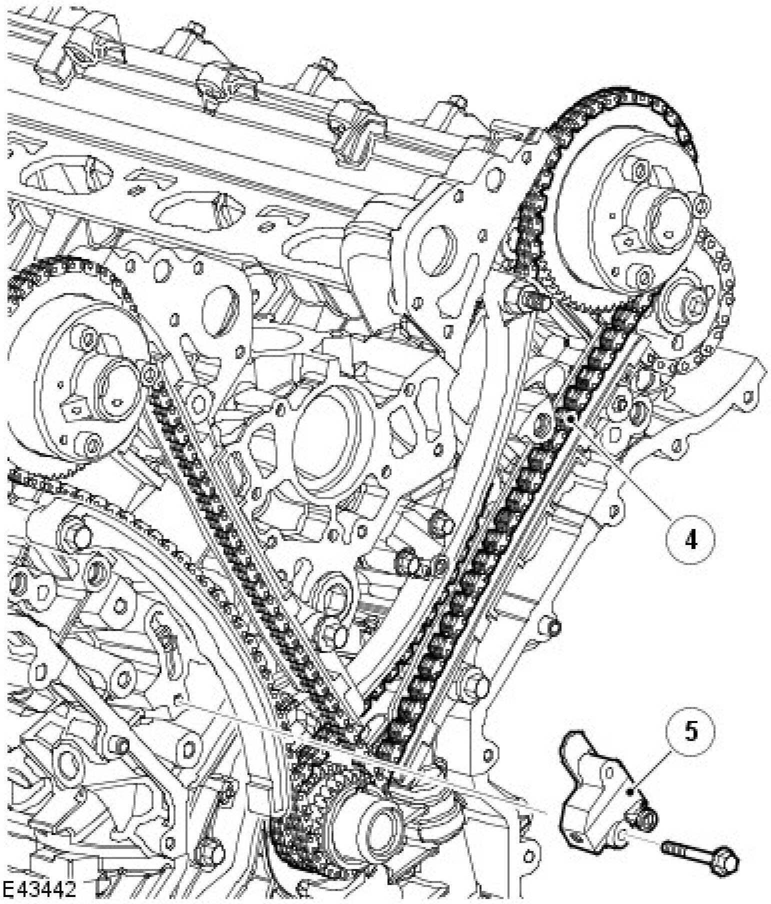


E56200

Item	Part Number	Description
1	-	Secondary chain tensioner
2	-	Secondary chain
3	-	Inlet camshaft sprocket
4	-	Primary chain
5	-	Primary chain tensioner

- NOTE: Vehicles fitted with Variable valve timing.





Item	Part Number	Description
1	-	Secondary chain tensioner
2	-	Secondary chain
3	-	Variable valve timing unit

4	-	Primary chain
5	-	Primary chain tensioner

Timing Gear

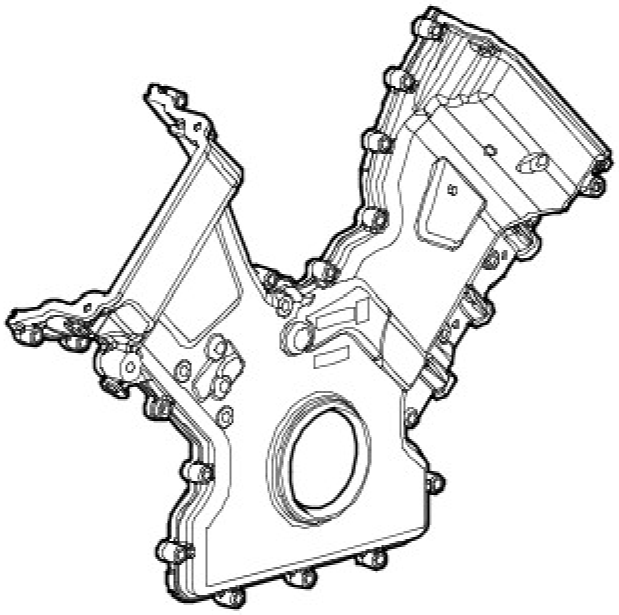
Multiple link primary and single row secondary chains drive the camshafts of each cylinder bank. The primary chains transmit drive from two sprockets on the crankshaft to each intake camshaft sprocket. The secondary chains transmit drive from the intake camshaft sprockets to the exhaust camshafts.

A key locates the two drive sprockets on the crankshaft. The crankshaft's torsional vibration damper retains the sprockets in position. The intake and exhaust camshaft sprockets are non-interference, non-keyed fit on their respective camshafts; the drive being transmitted by the face-to-face friction load produced by the sprocket-securing bolt.

Each chain has a hydraulic tensioner operated by engine oil. The primary chains are lubricated via oil squirt tubes located at the front of the engine block, near the crankshaft drive sprockets. A jet of oil from the end of each secondary chain tensioner lubricates the secondary chains. The primary chain tensioners act on pivoting flexible tensioner blades. The secondary chain tensioners act directly on the chains. Guide rails are installed on the drive side of the primary chains.

In ceratin markets some engines are equipped with VVT timing gear.
For additional information, refer to: Engine (303-01B Engine - V8 4.4L Petrol, Description and Operation).

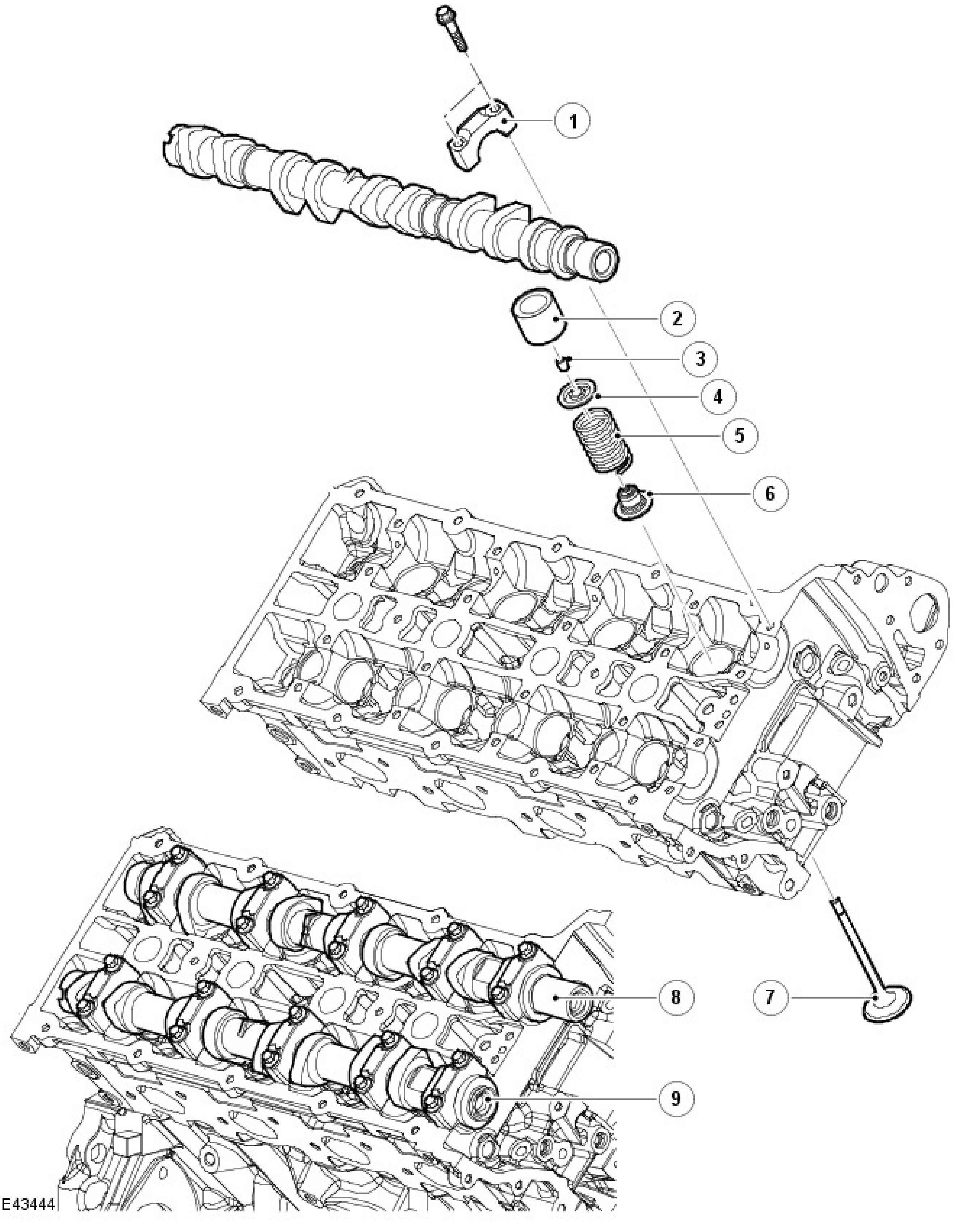
Timing Cover



E43443

The aluminum alloy timing cover accommodates the crankshaft front oil seal (a PTFE lip seal). Silicon rubber in-groove gaskets seal the joint between the timing cover and the front face of the engine.

CYLINDER HEAD COMPONENTS


1
2
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E43444

Item	Part Number	Description
1	-	Camshaft bearing cap
2	-	Tappet (shimless)
3	-	Collet
4	-	Valve spring cap
5	-	Valve spring

6	-	Valve stem oil seal
7	-	Valve
8	-	Inlet camshaft
9	-	Exhaust camshaft

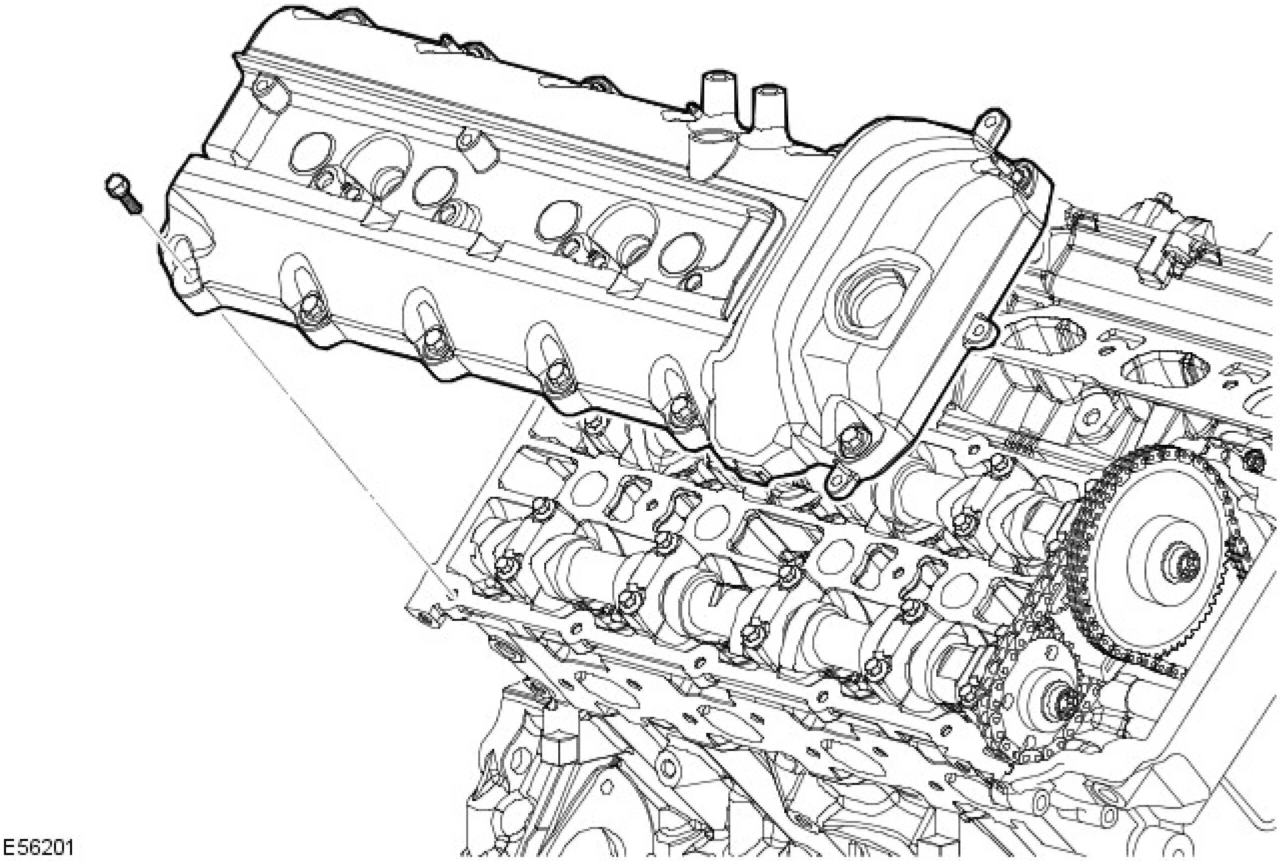
Cylinder Heads

The cylinder heads are unique to each cylinder bank. Deep-seated bolts, to reduce distortion, secure the cylinder heads to the cylinder block. Two hollow dowels align each cylinder head with the cylinder block.

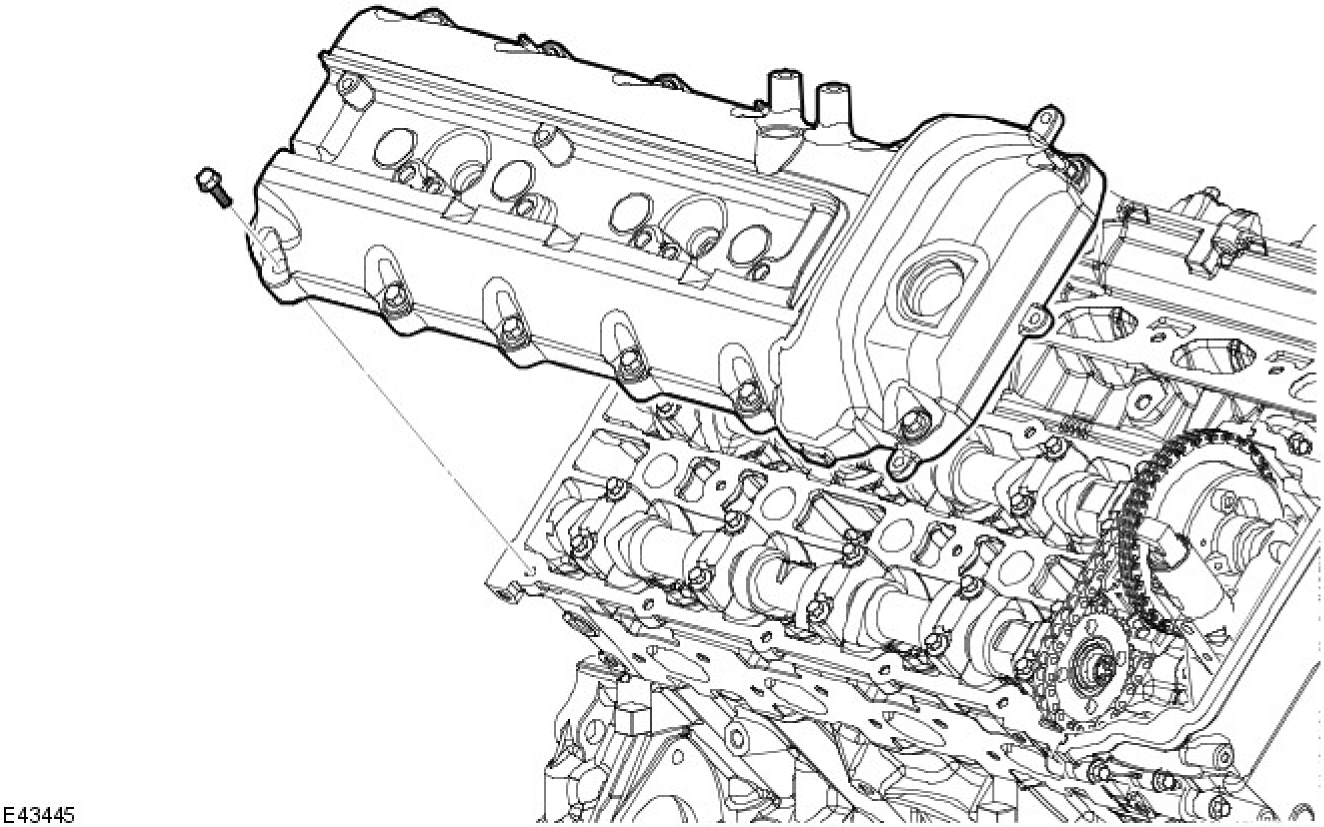
The 14 mm spark plugs, one per cylinder, locate in recesses down the center line of each cylinder head.

The engine-lifting eyes are bolted to the cylinder heads; two on the rear (one per head) and one at the front.

Camshaft Covers



- NOTE: Vehicles fitted with Variable Valve Timing (VVT).



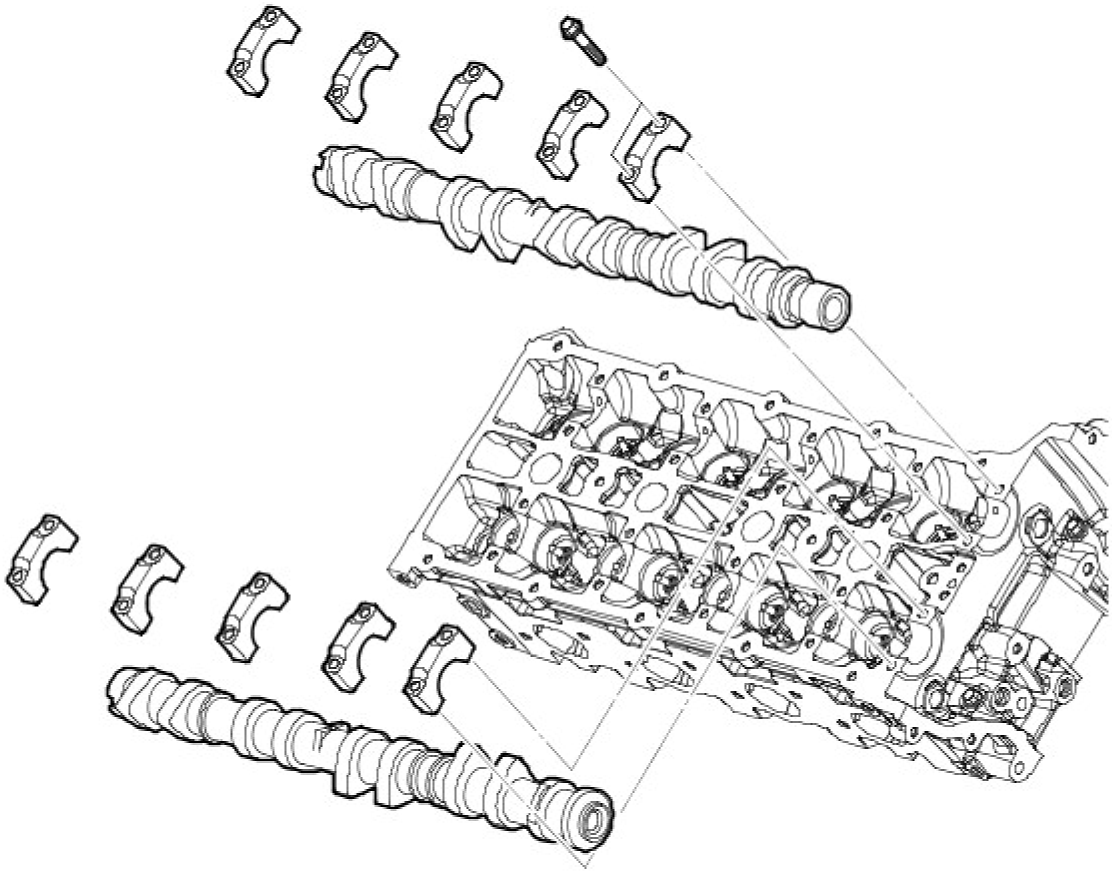
The camshaft covers are manufactured from thermo-plastic. The A bank camshaft cover incorporates an outlet for the part load engine breather and the Pressure Control Valve (PCV). The B bank camshaft cover incorporates an outlet for the full load engine breather and the engine oil filler cap. Identical oil separators are incorporated below the breather outlet in each cover.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

Silicon rubber in-groove gaskets seal the joints between the camshaft covers and the cylinder heads. Together with spacers and seals on the camshaft cover fasteners, they also isolate the covers from direct contact with the cylinder heads, to reduce noise.

Cylinder Head Gasket

The multi-layered steel cylinder head gasket has cylinder specific water flow cross-sections for uniform coolant flow.

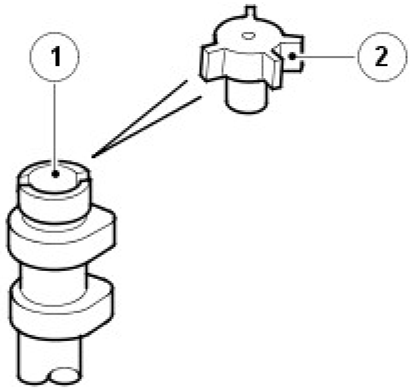
Camshafts



E43446

The camshafts are manufactured in chilled cast iron. Five aluminum alloy caps retain each camshaft. Location numbers, 0 to 4 for the intake camshaft and 5 to 9 for the exhaust camshaft, are marked on the outer faces of the caps.

Sensor Ring

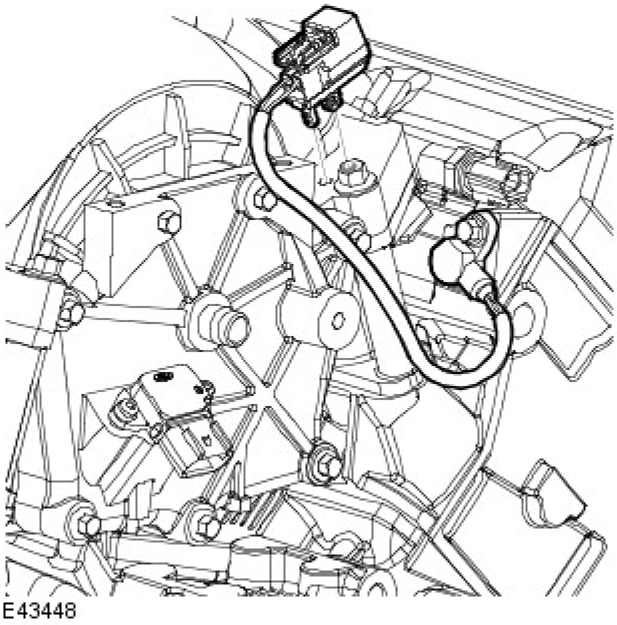


E43447

Item	Part Number	Description
1	-	Inlet camshaft
2	-	Sensor ring

Timing rings for each camshaft position sensor are located at the rear of both intake camshafts. A flat, machined near the front of each camshaft, enables the camshafts to be locked during the valve timing procedure.

Camshaft Position Sensor



The camshaft position sensors are installed in each cylinder head at the rear of the intake camshaft. It is a variable reluctance sensor that provides an input to the ECM regarding the position of the camshaft.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

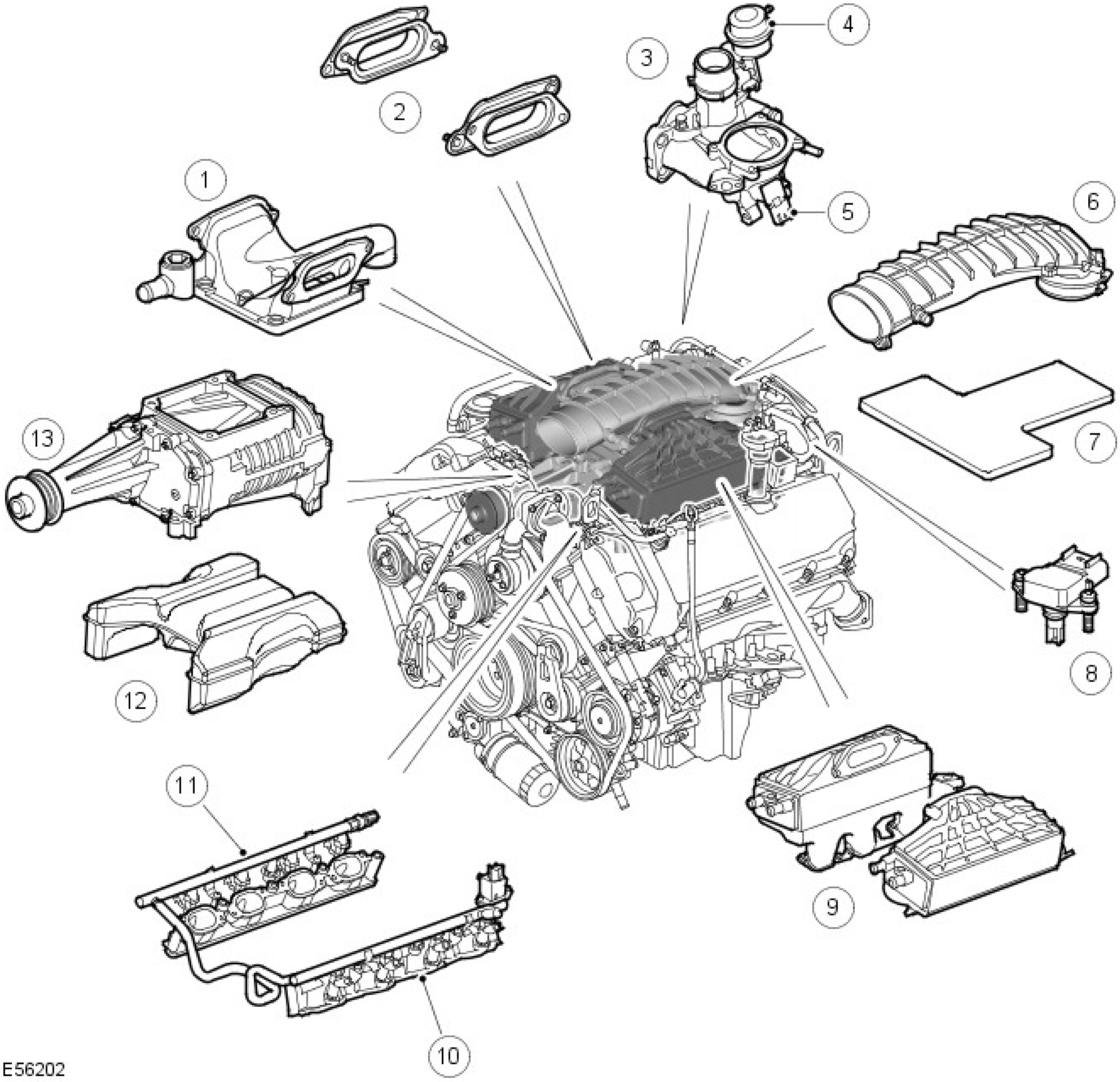
Inlet and Exhaust Valves

Each cylinder head incorporates dual overhead camshafts operating four valves per cylinder via solid shimless valve lifters.

The lightweight valve gear provides good fuel economy and noise levels. Valve head diameters are 31mm (1.220 in) for the exhaust and 35mm (1.378 in) for the intake. All valves have 5mm (0.197 in) diameter stems supported in sintered metal seats and guide inserts. Collets, valve collars and spring seats locate single valve springs on both intake and exhaust valves. Valve stem seals are integrated into the spring seats.

⚠CAUTION: Due to slight variations in length, the valves are **not** interchangeable between marques (Land Rover, Jaguar and Aston Martin).

SUPERCHARGER



Item	Part Number	Description
1	-	Outlet duct
2	-	Gaskets
3	-	Intake elbow assembly
4	-	Bypass valve and actuator
5	-	Manifold Absolute Pressure (MAP) sensor
6	-	Throttle body intake
7	-	Noise isolator
8	-	Temperature and Absolute Pressure (TMAP) sensor
9	-	Intercoolers
10	-	Intercooler adaptor
11	-	Fuel rail
12	-	Noise isolator
13	-	Supercharger

The supercharger is a compressor used to pump an air into the cylinders. This increases the concentration of oxygen and fuel in the charge to create a more powerful combustion inside the cylinder. This increases cylinder pressure upon ignition and creates more power.

As the supercharger compresses the air its temperature increases. This raise in air temperature reduces the potential for power gains. By installing intercoolers the air is cooled to overcome this.

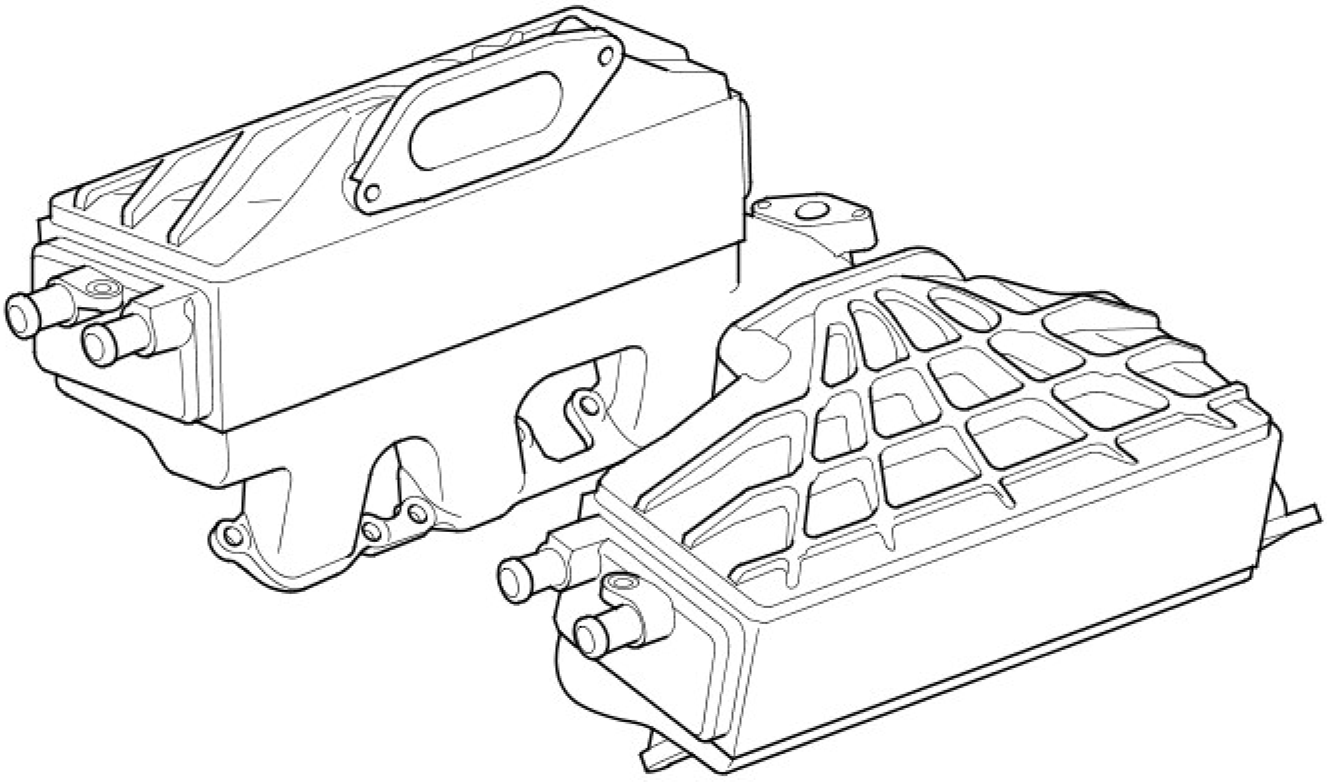
The supercharger is an Eaton M112 unit attached to the three mounting bosses between the 'V' of the cylinder block. Positive alignment with the drive belt is provided by a doweled mounting bracket. An eight-ribbed belt drives the supercharger, via the crankshaft, at 2.1 engine speed. The maximum pressure increase is approximately 0.8 bar.

On the 4.2L V8 supercharged engine the intake manifold is replaced by:

- A supercharger.
- Two intercoolers.
- An outlet duct.
- A bypass valve.
- A bypass valve actuator.
- Two intercooler adapters.
- Fuel rails.

The supercharger has a sealed-for-life internal lubrication system.

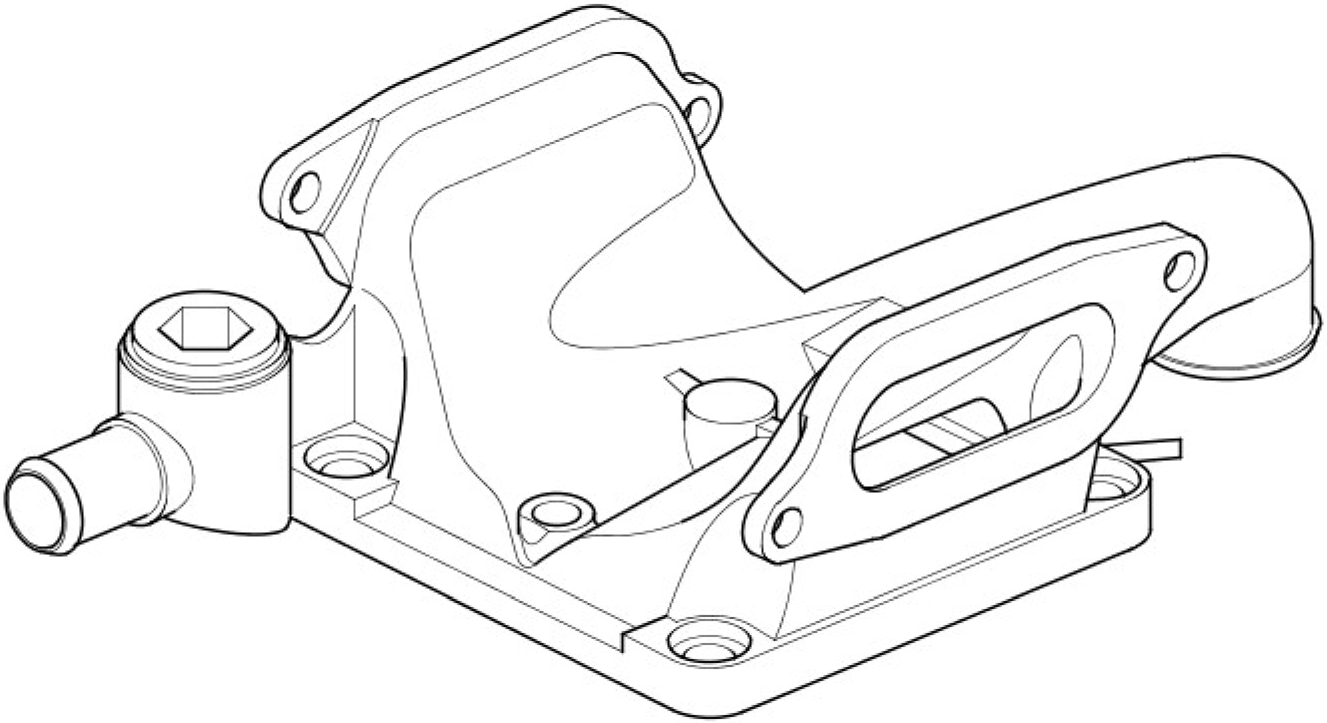
Intercooler



E56203

Each of the two intercoolers is a fin and tube air-to-liquid heat exchanger. Two rubber ducts, secured by clamp plates, provide the interfaces between the outlet duct and the intercoolers. After passing through the heat exchanger core, the air flows into individual outlets to the cylinders. At the rear of the B bank intercooler there is a mounting boss for an air intake temperature sensor.

Outlet Duct



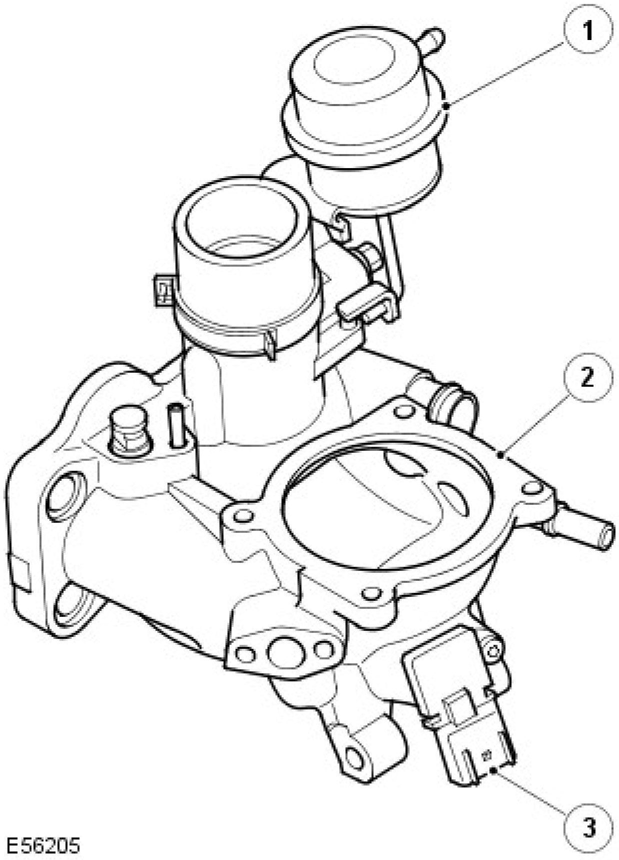
E56204

The outlet duct directs air from the supercharger into the two intercoolers. A filler point for the intercooler coolant system is integrated into the front and right side of the outlet duct. **This connection is not used on Land Rover vehicles.** A vacuum take-off for the fuel pressure regulator/cruise control system is located on the right side of the outlet duct. Isolating bolts, to reduce noise, secure the outlet duct to the supercharger and a rubber gasket seals the supercharger to the outlet duct interface.

Bypass Valve

The bypass valve attaches to an opening in the induction elbow and controls a bypass flow from the intercoolers back to the inlet side of the supercharger. At closed or partially open throttle settings (i.e. idle and most cruise conditions), the bypass valve is fully open to provide maximum bypass and optimum fuel economy. As the throttle opens, the bypass valve progressively closes to reduce the bypass flow and increase the pressure of air supplied to the engine for optimum power output.

Bypass Valve and Actuator

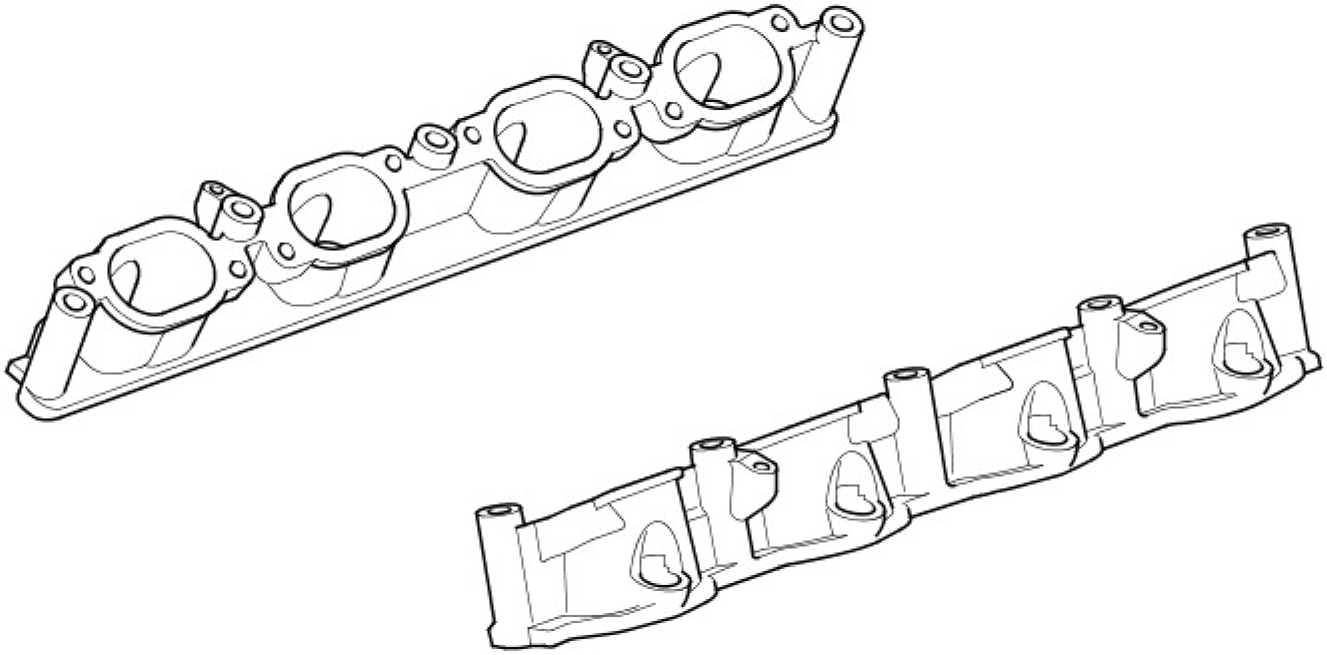


Item	Part Number	Description
1	-	Bypass valve actuator
2	-	Induction elbow
3	-	MAP sensor

Bypass Valve Actuator

The bypass valve actuator is a diaphragm-operated actuator attached to the valve spindle of the bypass valve. A vacuum pipe connects the actuator to the induction elbow.

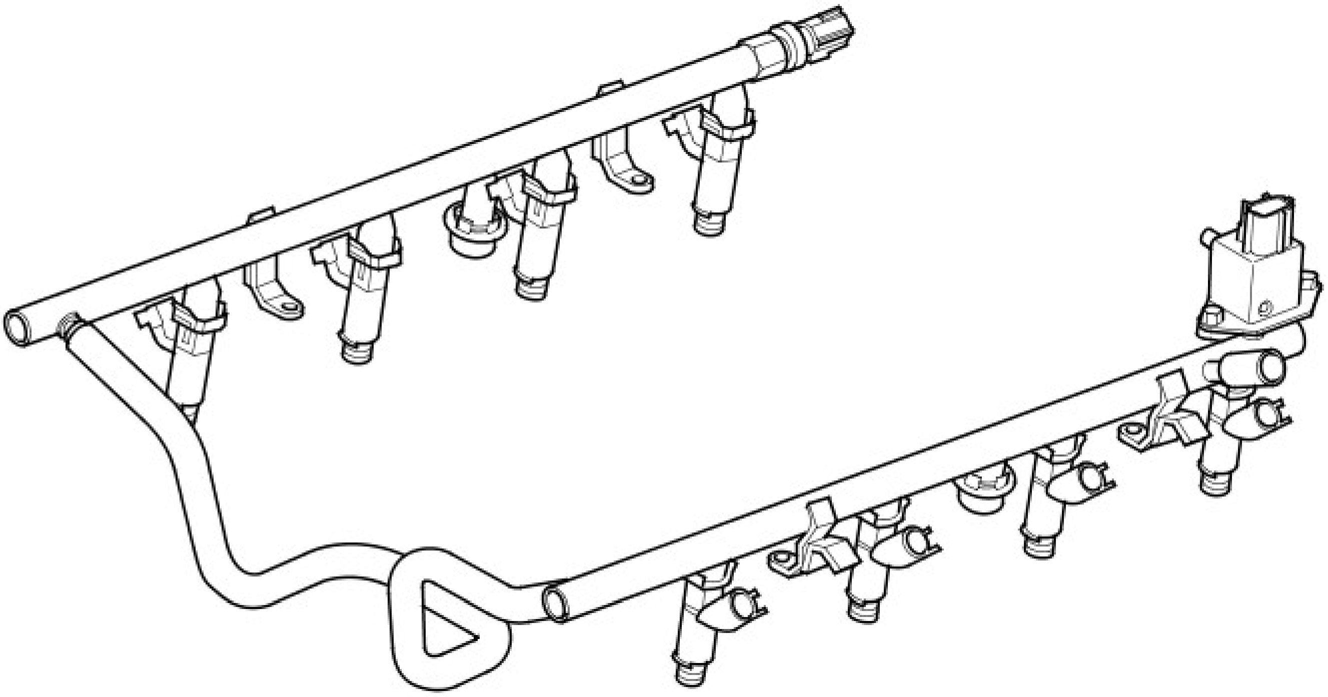
Intercooler Adapters



E56206

The intercooler adapters provide an interface between the intercoolers and the cylinder heads, and also locate the fuel rails and injectors. One-piece gaskets seal the joints between the intercoolers and the intercooler adapters, and between the intercooler adapters and the cylinder heads.

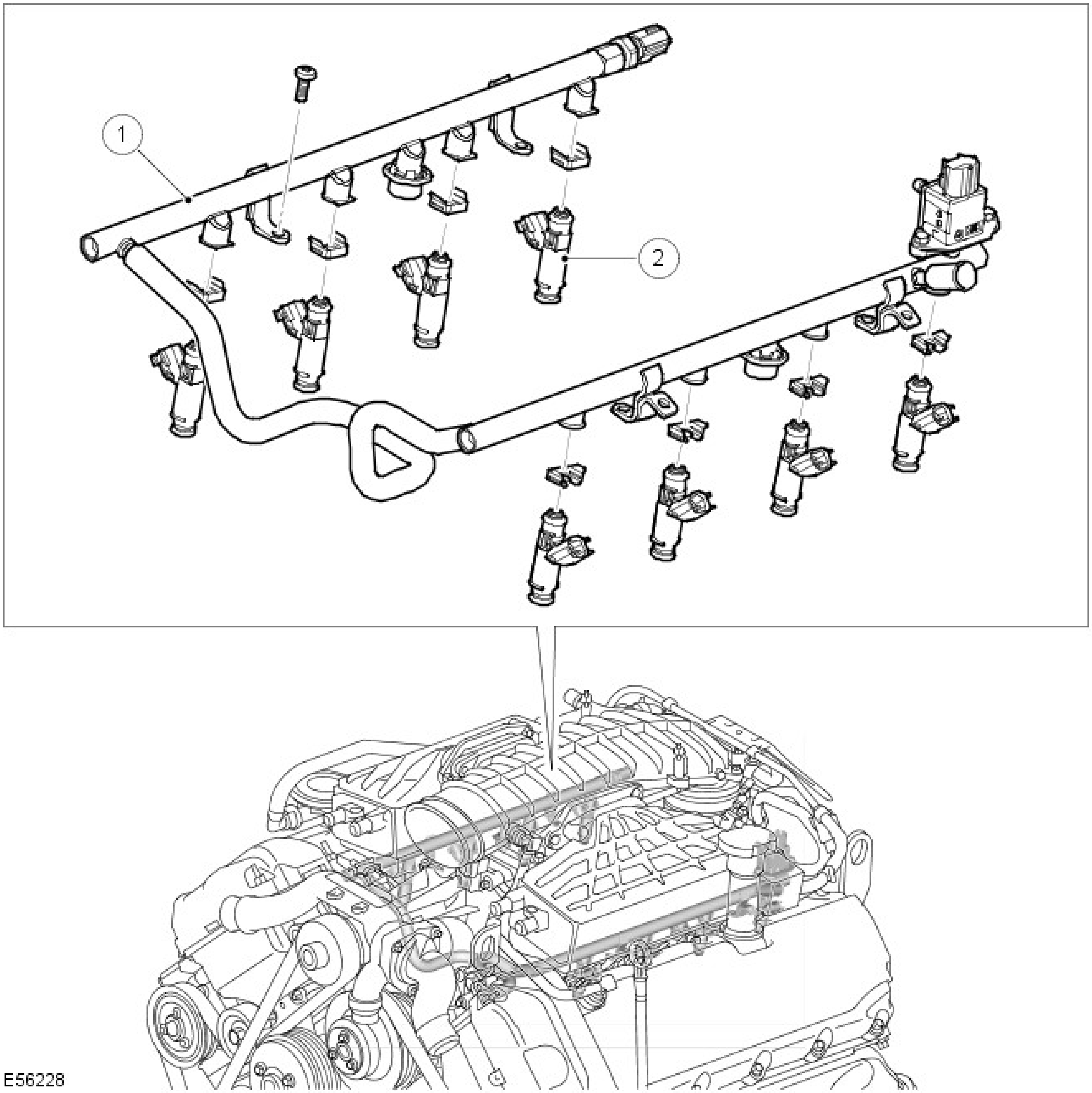
Fuel Rails



E56207

The fuel rails are installed on the intercooler adapters. A fuel crossover pipe connects the fuel rails together at the front of the engine.

Fuel Injectors

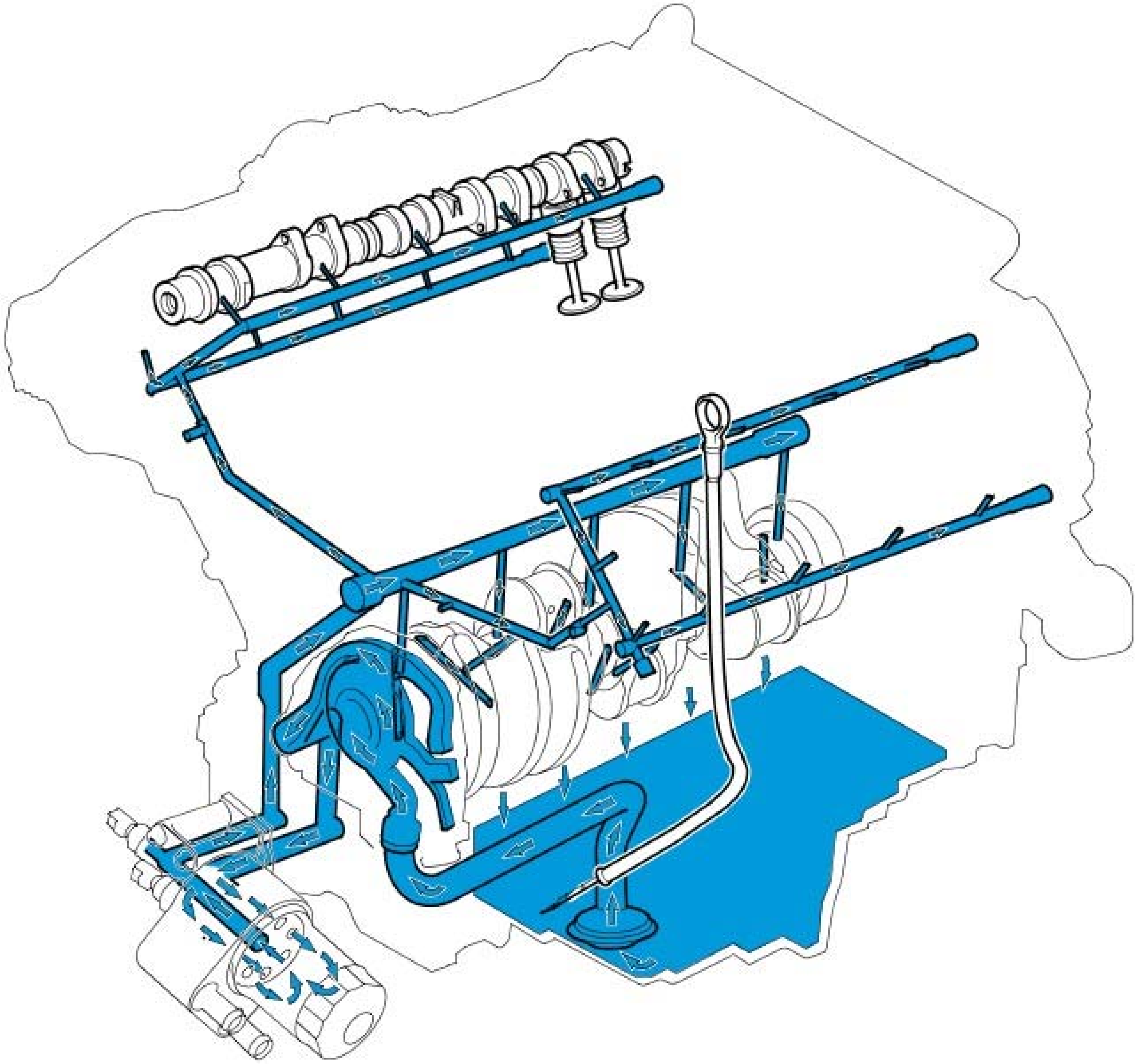


Item	Part Number	Description
1	-	Fuel rail
2	-	Injectors

Eight, top fed, 12-hole, fuel injectors are installed in the fuel rails and are held in position by spring clips. Two O-rings are installed between the injector mounts of the fuel rails and the related recesses in the intercooler adapters. The injectors are electromagnetic solenoid valves controlled by the ECM. The fuel jets from the injectors are directed onto the back of the intake valves.

For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

LUBRICATION SYSTEM



E43454

General

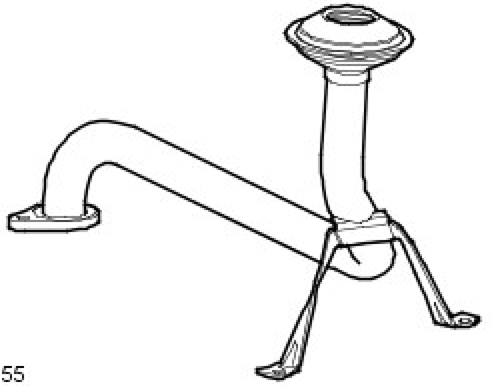
Oil is drawn from the reservoir in the oil pan and pressurized by the oil pump. The output from the oil pump is then filtered, cooled and distributed through internal oil passages.

All moving parts are lubricated by pressure or splash oil. Pressurized oil is also provided for the timing gear chain tensioners and the piston cooling jets.

The oil returns to the oil pan under gravity. Large drain holes through the cylinder heads and cylinder block ensure the quick return of the oil, reducing the volume of oil required and enabling an accurate check of the contents soon after the engine stops.

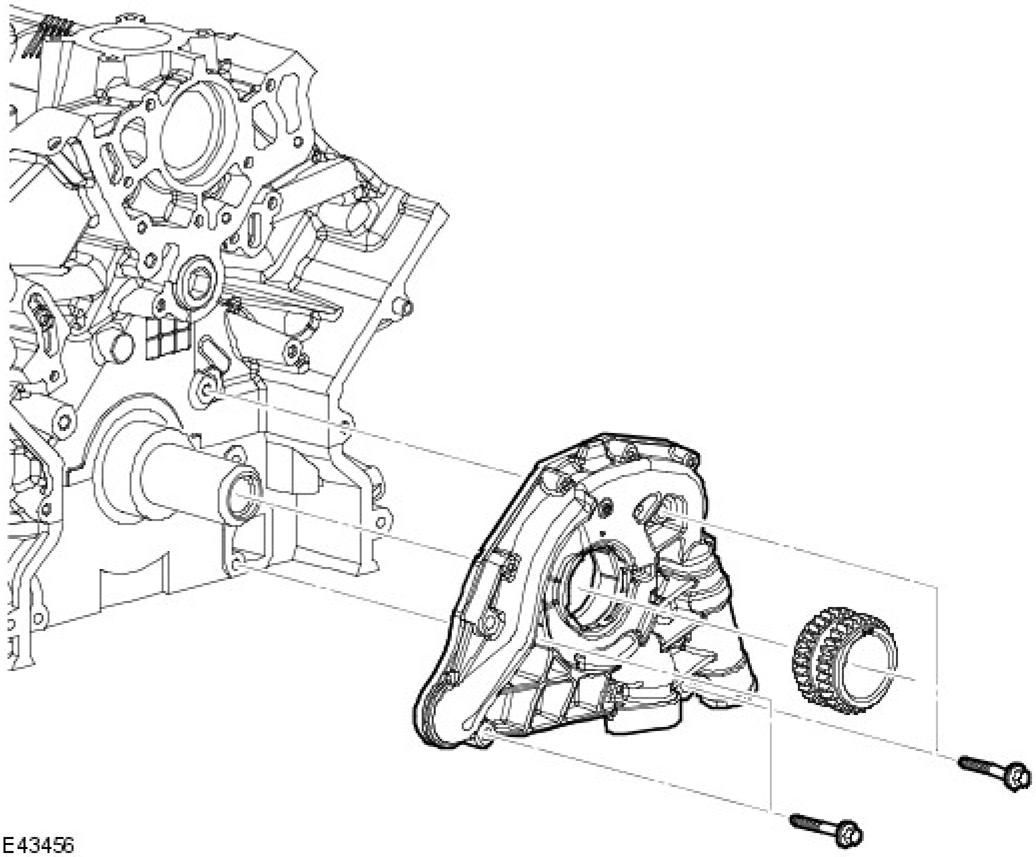
System replenishment is through the oil filler cap on the 'B' bank camshaft cover.

Oil Pick-up



The fabricated steel oil pick-up is immersed in the oil reservoir to provide a supply to the oil pump during all normal vehicle attitudes. A mesh screen in the inlet prevents debris from entering the oil system.

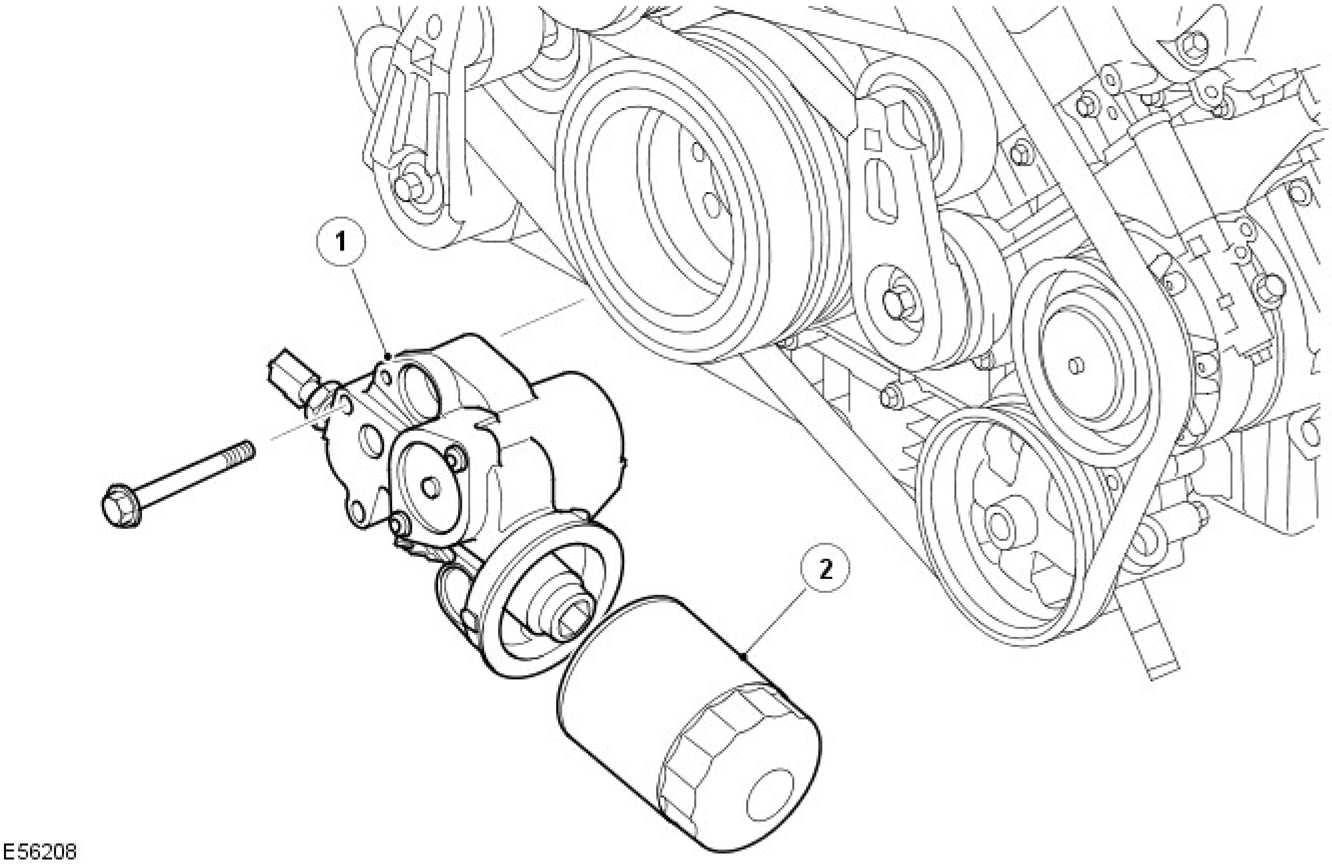
Oil Pump



The oil pump is installed on the crankshaft at the front of the engine. The pump outlet port aligns with oil passages in the bedplate.

The pumping element is an eccentric rotor, which is directly driven by flats on the crankshaft. An integral pressure relief valve regulates pump outlet pressure at 4.5 bar (65.25 psi).

Oil Filter Assembly

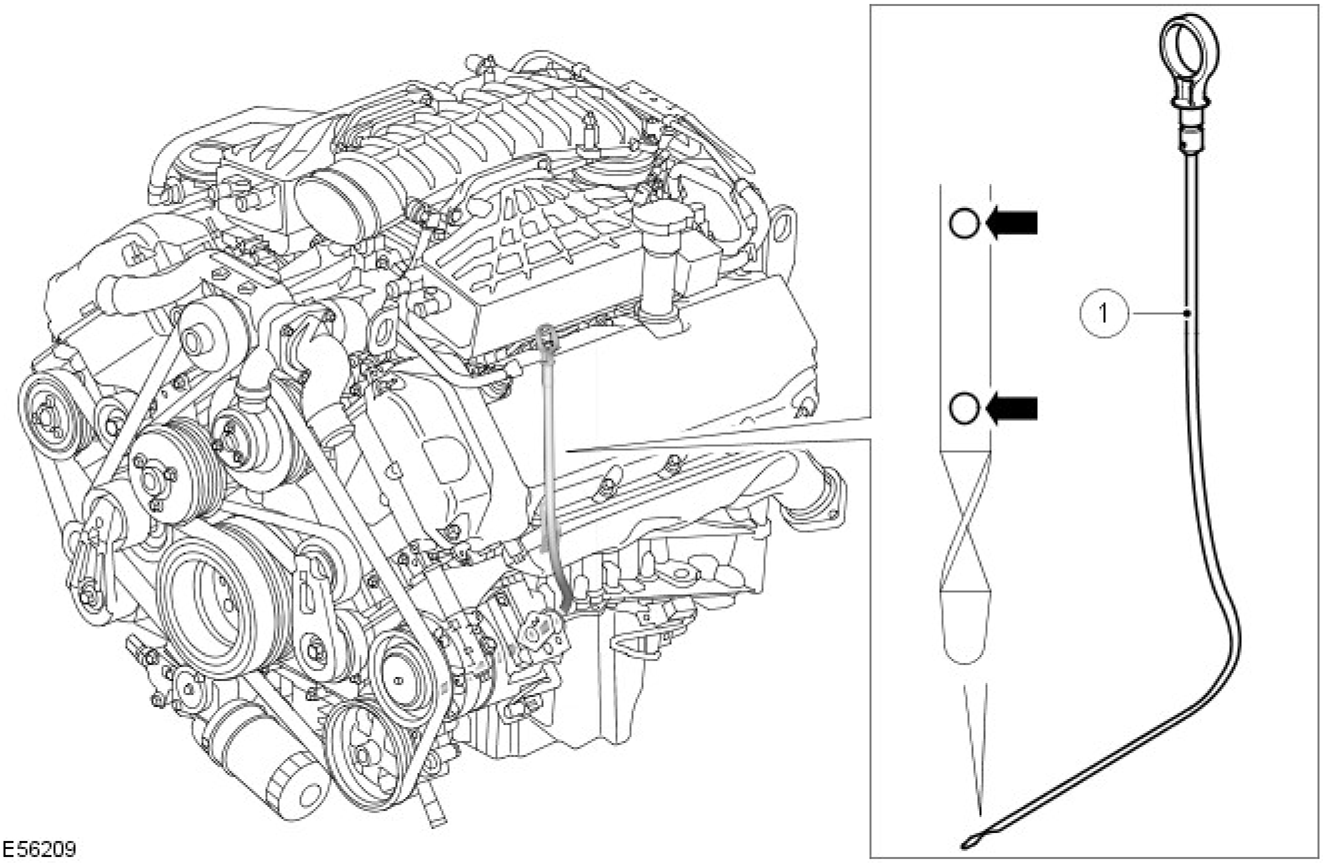


Item	Part Number	Description
1	-	Oil bypass tube
2	-	Oil filter head assembly
3	-	Oil filter

The oil filter is a replaceable cartridge installed on an adapter. An internal bypass facility permits full flow bypass if the filter is blocked.

The oil pressure switch connects a ground input to the instrument cluster when oil pressure is present. The switch operates at a pressure of 0.15 to 0.41 bar (2.2 to 5.9 psi).

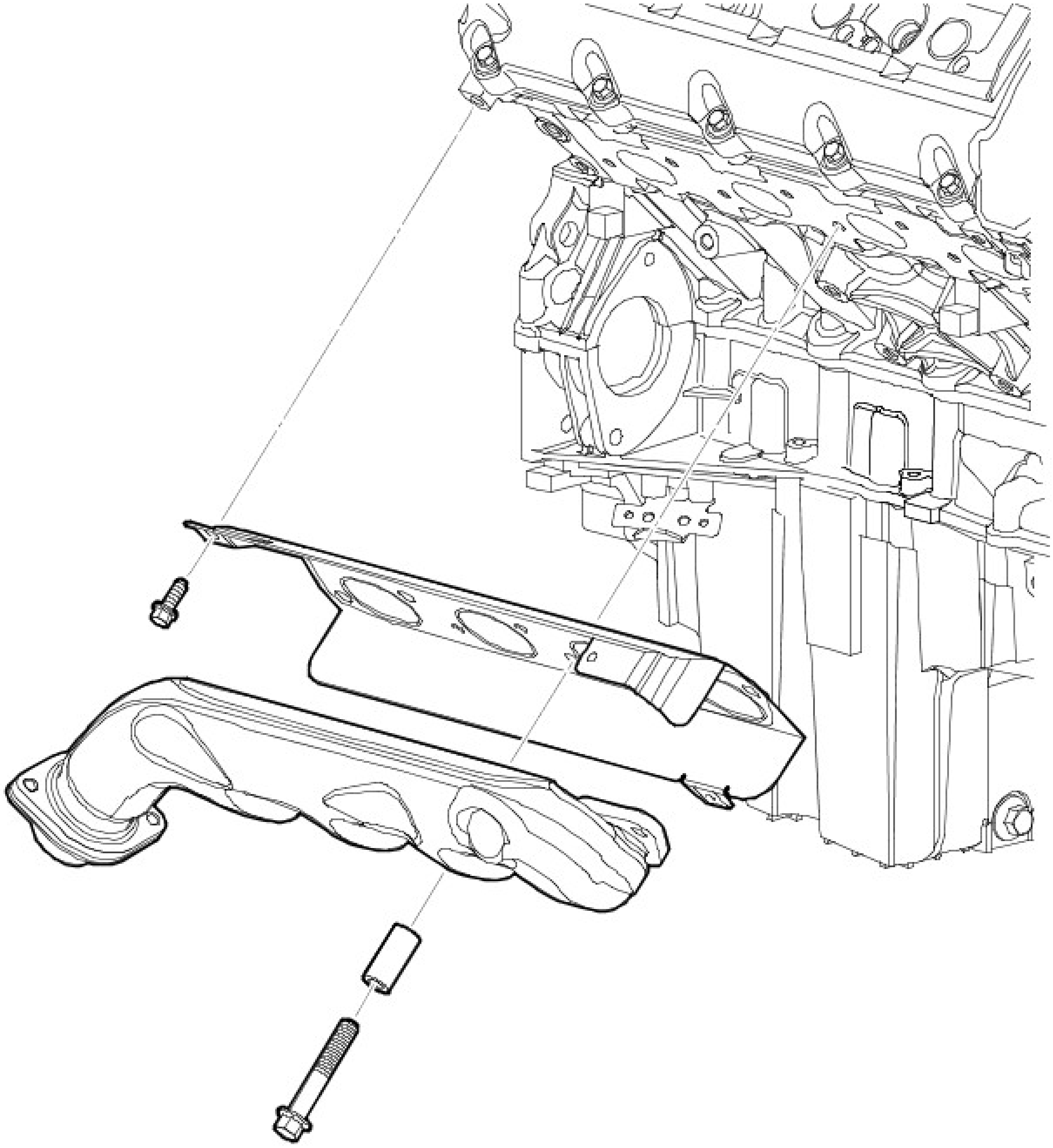
Oil Level Gage



Item	Part Number	Description
1	-	Oil level gage

The oil level gage locates along the left side of the oil pan, supported in a tube installed in the sump. Two holes in the end of the gage indicate the minimum and maximum oil levels. There is a difference of approximately 1.5 liters (1.58 US quart) between the two levels.

EXHAUST MANIFOLD



E43459

The fabricated stainless steel twin skin exhaust manifolds are unique for each cylinder bank.

Spacers on the securing bolts allow the manifolds to expand and retract with changes of temperature while maintaining the clamping loads.

Heat shields are integrated into the exhaust manifold gaskets.

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Engine

Diagnosis and Testing

For additional information:
REFER to: Engine - 4.2L (303-00 Engine System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Valve Clearance Check

General Procedures

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the cooling fan.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

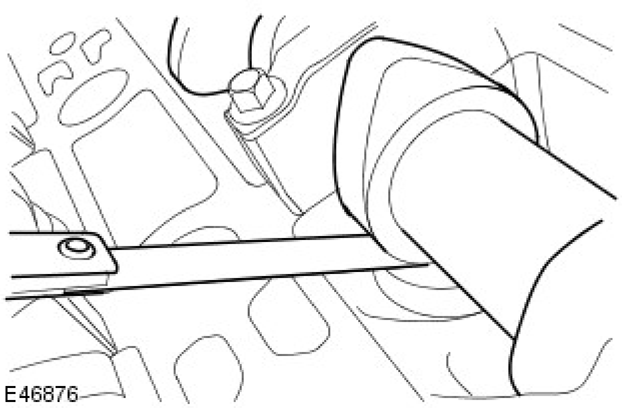
3. Remove the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

4. Remove the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

5. ⚠ CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Rotate the engine clockwise to position the camshaft lobe away from the valve tappet

6. Using the feeler gauge set, measure the clearance between the camshaft and the valve tappet.



7. Repeat the above procedure for the remaining 31 tappets.

8. Adjust the clearance as necessary.

9. For cylinder head data, refer to specifications.
For additional information, refer to: Specifications (303-01A Engine - V8 S/C 4.2L Petrol, Specifications).

10. Install the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

11. Install the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

12. Install the cooling fan.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Engine - V8 S/C 4.2L Petrol - Valve Clearance Adjustment

General Procedures

- NOTE: The valve clearance adjustment procedure is part of the the camshafts removal and installation procedure.

1. Remove the camshafts.
   For additional information, refer to: Camshafts RH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).
2. Install the camshafts.
   For additional information, refer to: Camshafts RH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

Engine - V8 S/C 4.2L Petrol - Engine Oil Draining and Filling

General Procedures

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

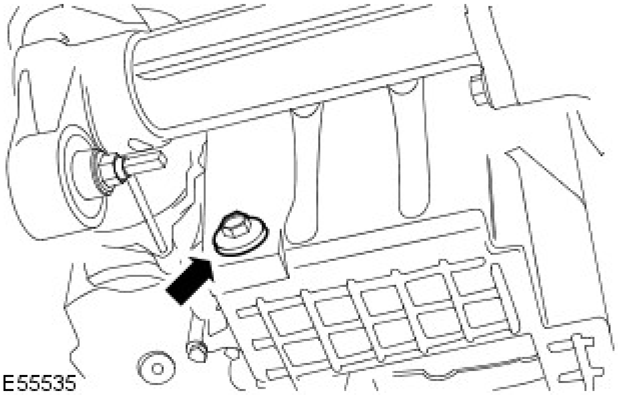
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

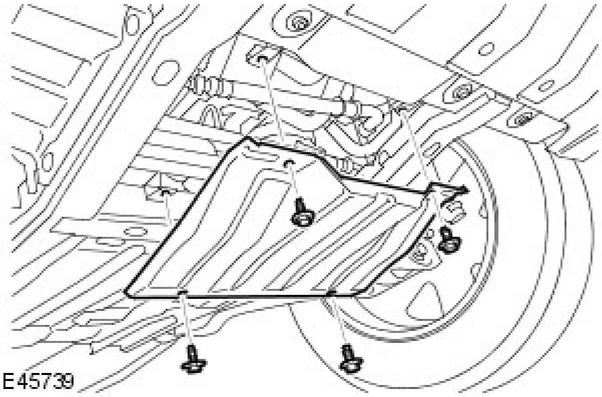
4. Remove the oil pan drain plug.

- Position a container to collect the fluid.
- Discard the oil drain plug seal.



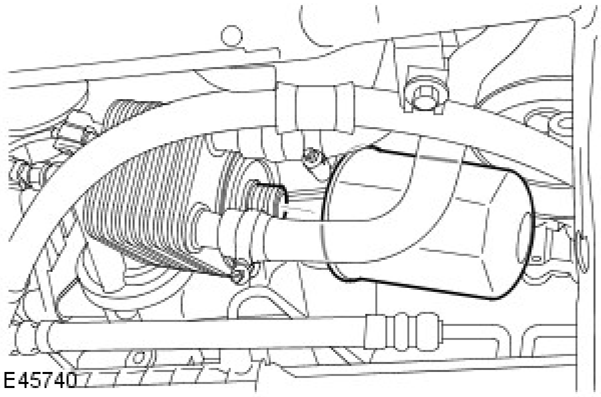
5. Remove the radiator access panel.

- Remove the 4 bolts.



6. Remove the oil filter.

- Position a container to collect the fluid.
- Discard the oil filter.



7. Install the engine oil filter.

- Lubricate the oil filter seal with clean engine oil and tighten to 18 Nm (13 lb.ft).
- Install a new seal.
- Tighten the drain plug to 25 Nm (18 lb.ft).

8. Tighten the drain plug to 25 Nm (18 lb.ft).

- Install a new seal.

9. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

10. Fill the engine with oil.

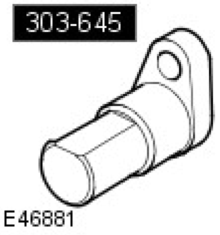
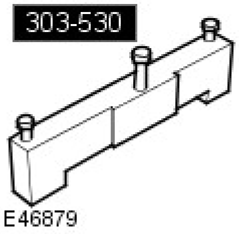
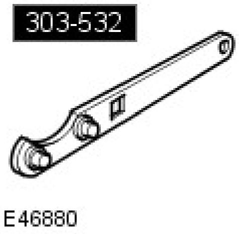
11. Check and top-up the engine oil.

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Camshafts RH

In-vehicle Repair

Special Tool(s)	
	Timing Setting tool 303-645
	Camshaft setting/locking tool 303-530
	Timing chain tensioning tool 303-532

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

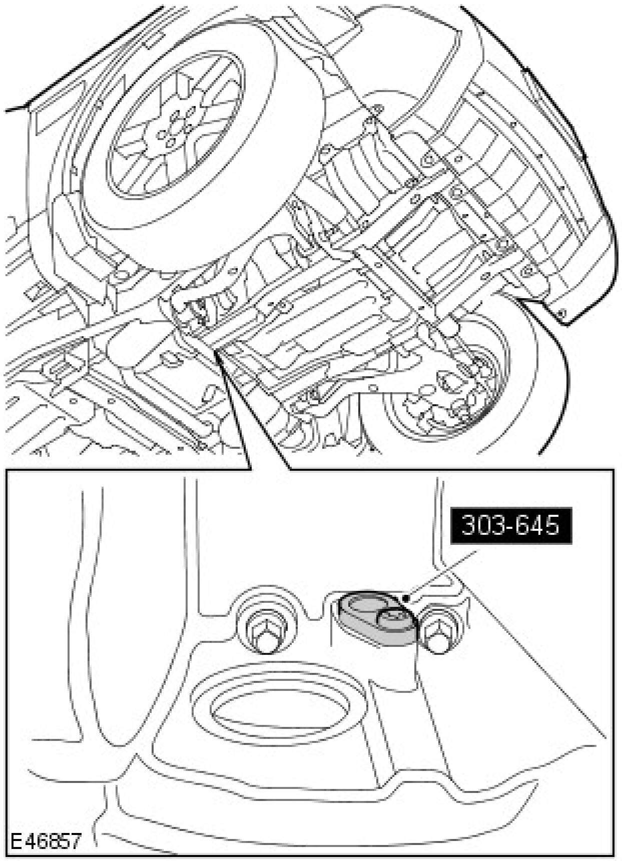
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

5. Remove the crankshaft position (CKP) sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).

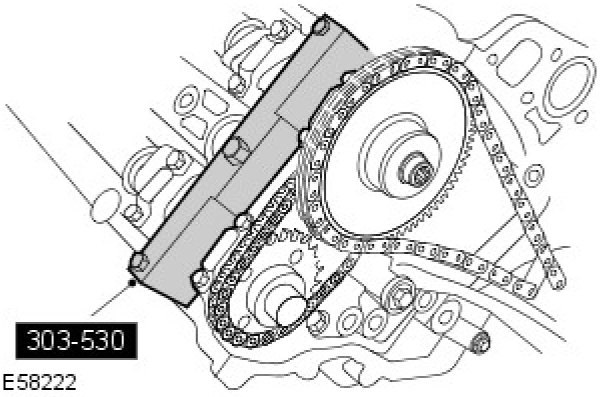
6. Rotate the crankshaft until the flats on the camshafts are parallel with the cylinder head joint faces.


303-645
E46857

7. NOTE: The engine is now in the SAFE position.

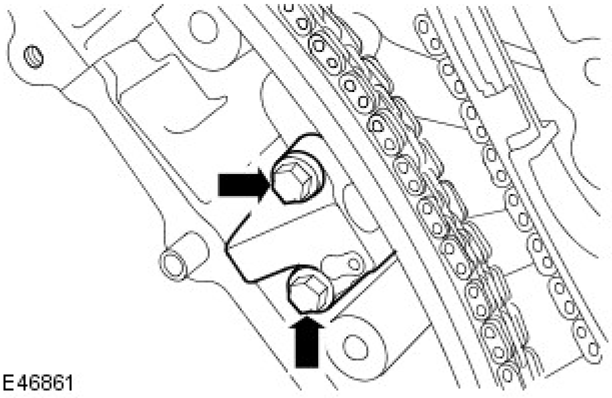
Lock the crankshaft.

- Install the special tool.
- Install the screw.


303-530
E58222

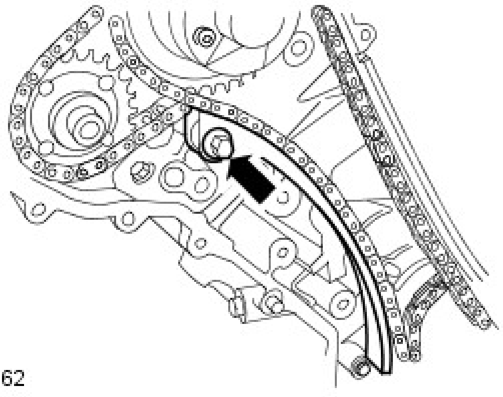
8. Install the special tool to the RH cylinder head.

- Install the 3 bolts.



9. Remove the primary timing chain tensioner.

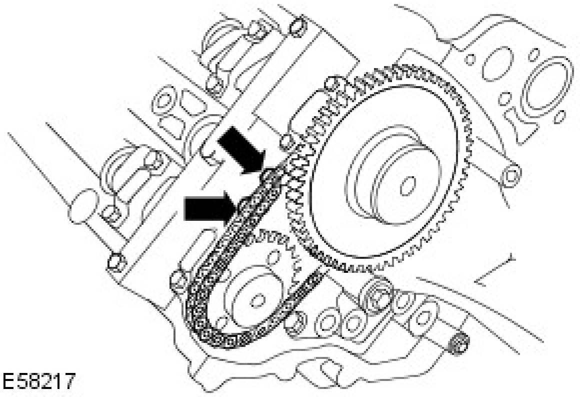
- Remove the 2 bolts.



10. Remove the primary timing chain tensioner guide.

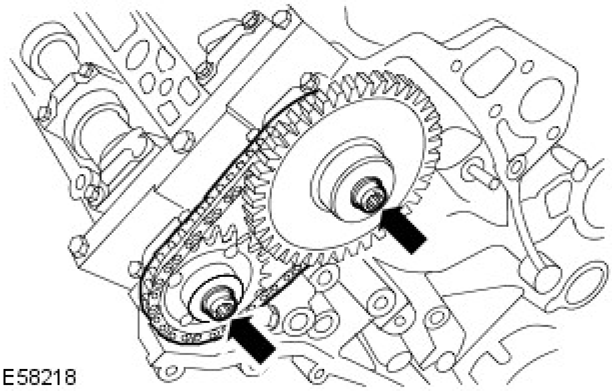
- Remove the bolt.

11. Remove the primary timing chain.



12. Remove the secondary timing chain tensioner and the secondary timing chain.

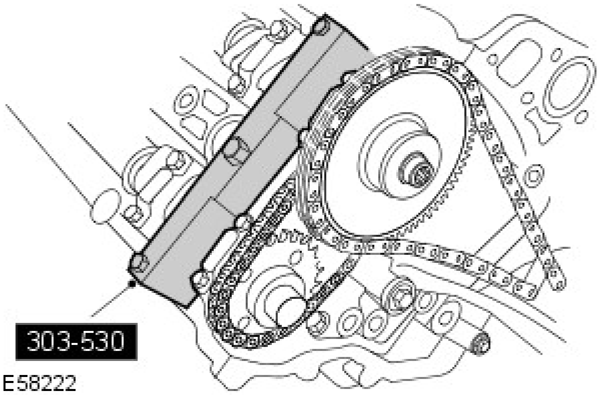
- Remove the 2 retaining bolts.



13. ⚠ CAUTION: Discard the bolts.

Remove the camshaft sprockets.

- Remove the 2 bolts.



14. Remove the special tool from the RH cylinder head.

- Remove the 3 bolts.

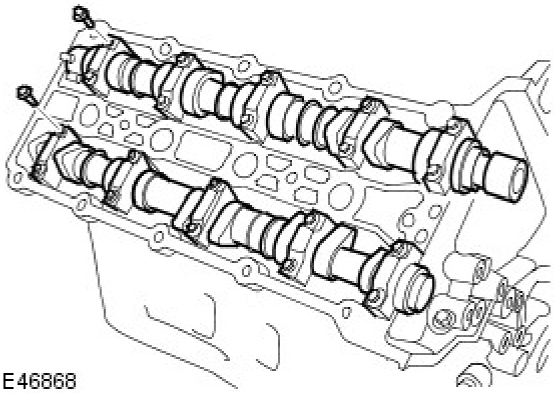
15. CAUTION: Evenly and progressively, release the camshaft bearing caps.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshaft bearing caps.

- Remove the 20 bolts.

16. Remove the camshafts.



E46868

Installation

1. Replace the valve shims, with the smallest shim available.

- Apply a light coat of clean engine oil to the replacement valve shims.

2. Install the camshafts.

- Clean the component mating faces.
- Lubricate the journals and camshaft lobes.

3. Install the camshaft bearing caps.

- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm (7 lb.ft).

4. CAUTION: Make sure that new bolts are installed.

Install the sprocket retaining Torx bolts to the camshafts.

5. CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Measure and record the tappet clearances.

- Rotate the camshafts using the Torx bolts.

6. NOTE: Remove the camshaft bearing caps evenly and in stages.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshafts.

- Remove the 20 bolts.

7. Remove the valve tappets, replace with selected tappets.

8. Install the camshafts.

- Lubricate the journals and camshaft lobes.
- Clean the component mating faces.

9. Install the camshaft bearing caps.

- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm (7 lb.ft).

10. ⚠ CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Check valve tappet clearances are correct.

- Rotate the camshafts using the Torx bolts.
- Remove the camshaft Torx bolts after the check is complete.

11. NOTE: Apply clean engine oil to the camshaft and bearing surfaces, as follows: upper surface in the cylinder head, upper face of each bearing surface on each bearing cap, on the cam lobes ONLY and not on the base circle area.

Install the camshafts.

- Clean the component mating faces.

12. Install the camshaft bearing caps.

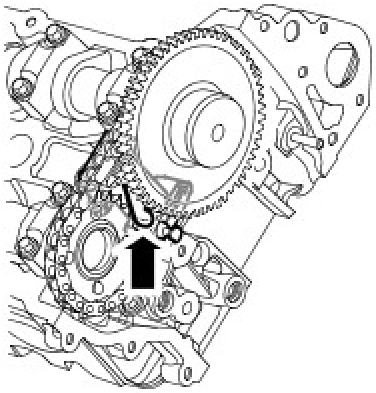
- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm (7 lb.ft).

13. Install the special tool to the RH cylinder head.

- Install the 3 bolts.

14. Retain the LH secondary timing chain tensioner piston.

- Install a metal rod.



E58227

15. Install the secondary timing chain tensioner and chain to the camshaft sprockets.

16. NOTE: Lightly tighten the camshaft sprocket Torx bolts, the sprockets MUST be free to move.

Install the secondary timing chain and sprockets to the camshafts.

- Install the sprocket retaining Torx bolts to the camshafts.

17. NOTE: Lightly tighten the camshaft sprocket Torx bolts, the sprockets MUST be free to move.

Install the secondary timing chain tensioner retaining bolts.

- Tighten the bolts to 12 Nm (9 lb.ft).

18. Tension the secondary timing chain.

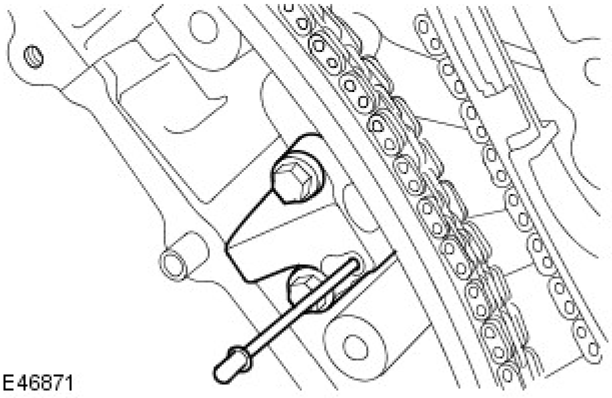
- Remove the retaining rod.

19. Install the primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

20. Install the primary tensioner guide.

- Tighten the bolts to 12 Nm (9 lb.ft).

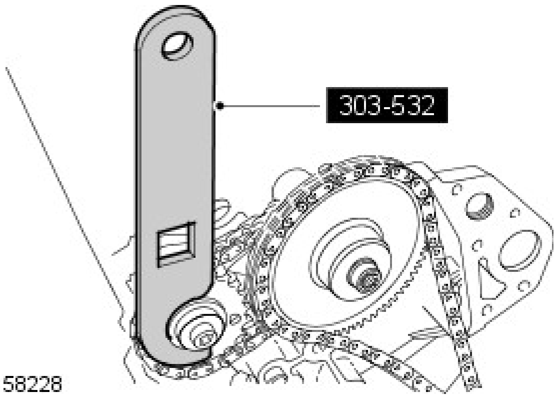


E46871

21. CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the primary chain tensioner.

- Using a metal rod, retain the tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Release the retaining rod.



E58228

22. CAUTIONS:

Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

Install the special tool to the exhaust camshaft sprocket.

- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.
- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

23. Remove the special tool from the RH cylinder head.

24. Remove the crankshaft locking tool.

- Remove the screw.

25. Install the CKP sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).

26. Install the engine front cover.
For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

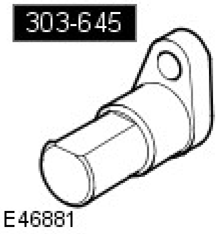
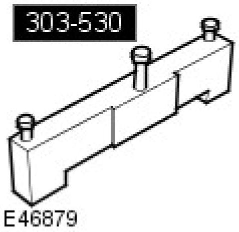
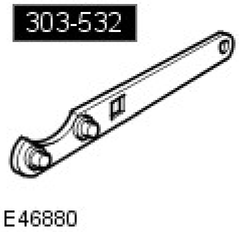
27. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery,

Mounting and Cables, Removal and Installation).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Camshafts LH

In-vehicle Repair

Special Tool(s)	
	Timing Setting tool 303-645
	Camshaft setting/locking tool 303-530
	Timing chain tensioning tool 303-532

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

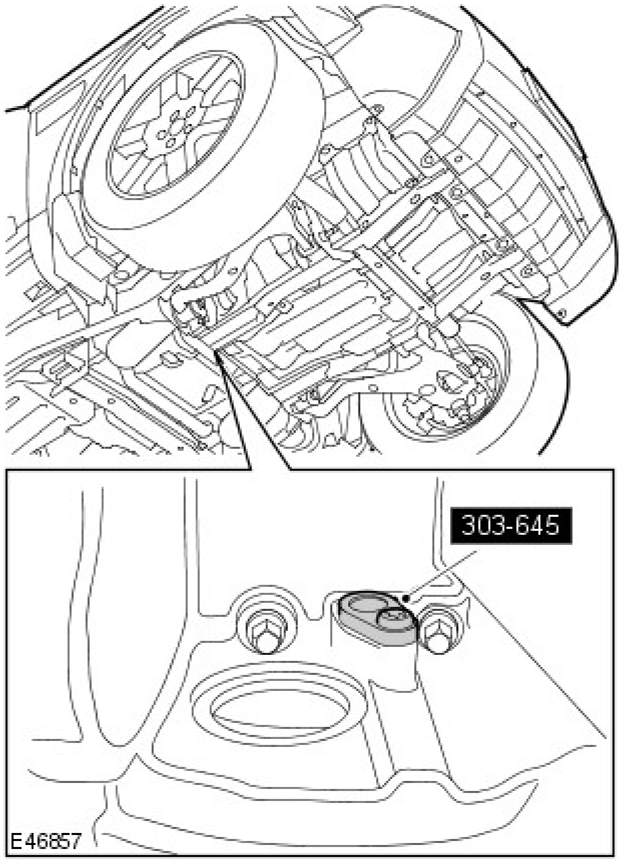
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

5. Remove the crankshaft position (CKP) sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).

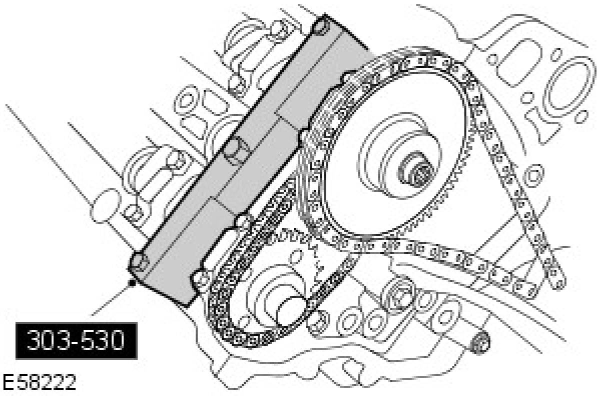
6. Rotate the crankshaft until the flats on the camshafts are parallel with the cylinder head joint faces.


303-645
E46857

7. NOTE: The engine is now in the SAFE position.

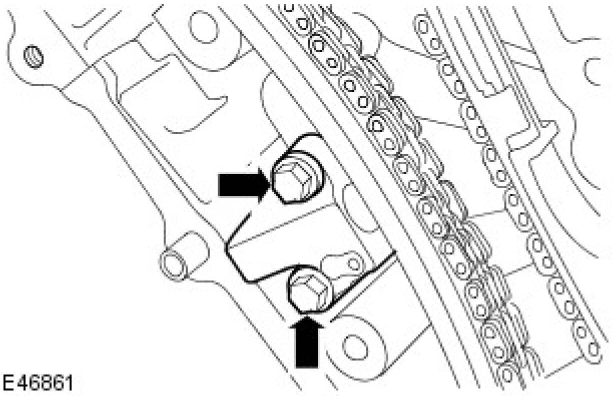
Rotate the crankshaft for access.

- Install the special tool.
- Install the screw.


303-530
E58222

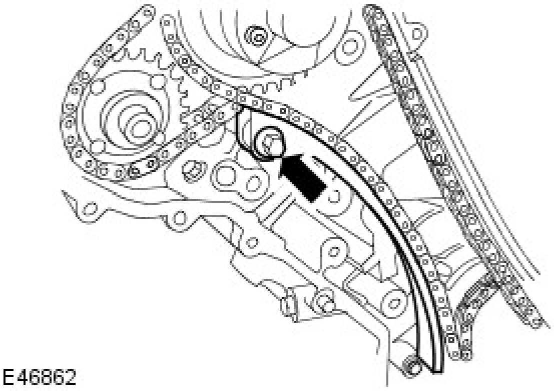
8. Install the special tool to the RH cylinder head.

- Install the 3 bolts.



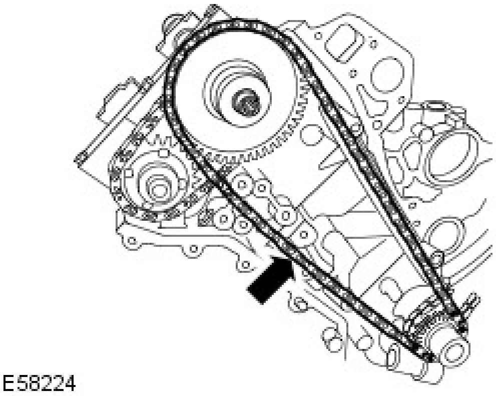
9. Remove the RH primary timing chain tensioner assembly.

- Remove the 2 bolts.

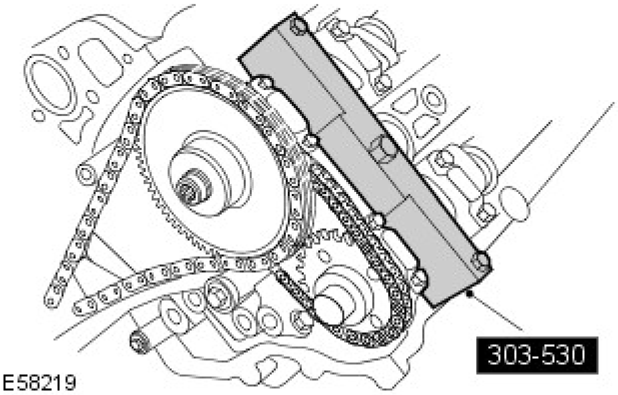


10. Remove the RH primary timing chain tensioner guide.

- Remove the bolt.

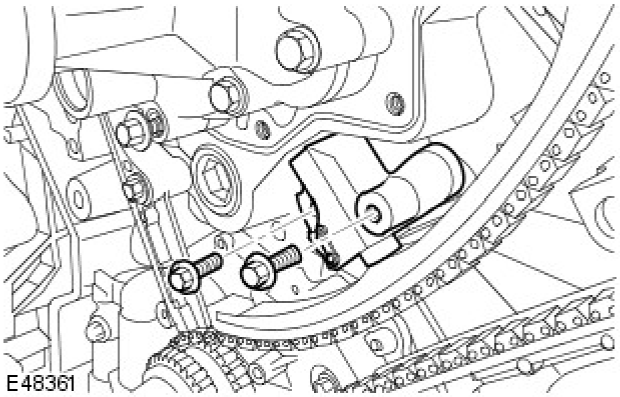


11. Remove the RH primary timing chain.


E58219
303-530

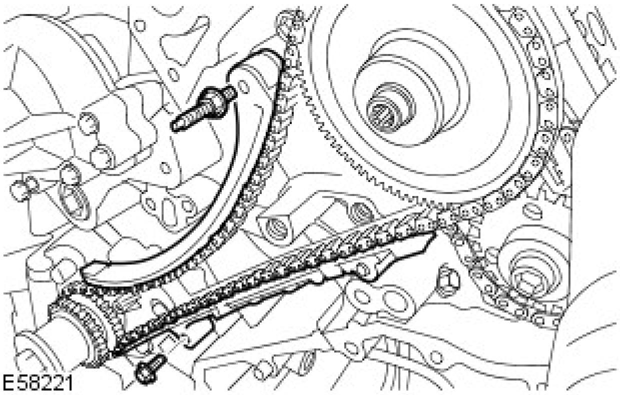
12. Install the special tool to the LH cylinder head.

- Install the 3 bolts.



13. Remove the LH primary timing chain tensioner.

- Remove the 2 bolts.

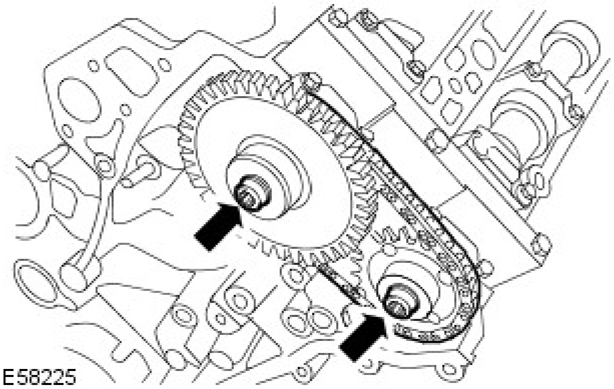


E58221

14. Remove the LH upper and lower primary timing chain tensioner guides.

- Remove the stud.
- Remove the bolt.

15. Remove the LH primary timing chain.

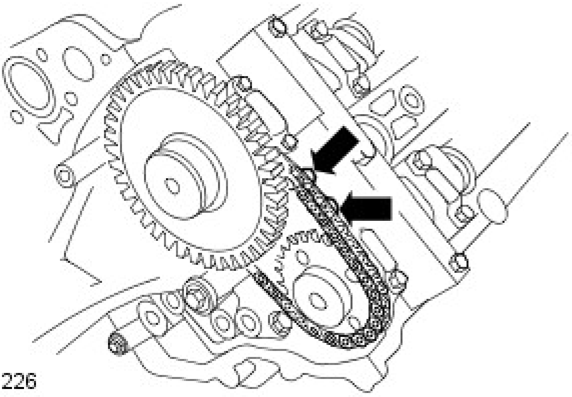


E58225

16. ⚠ CAUTION: Discard the bolts.

Remove the camshaft sprockets.

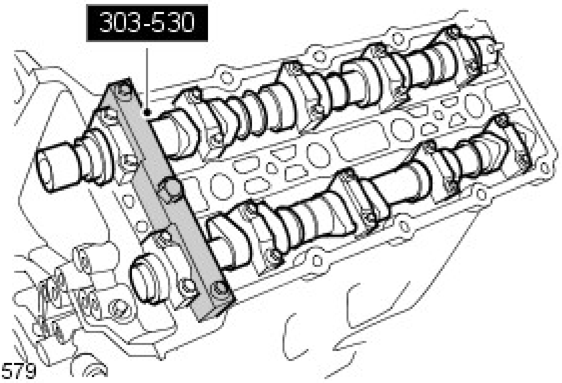
- Remove the 2 bolts.



E58226

17. Remove the secondary timing chain tensioner and the secondary timing chain.

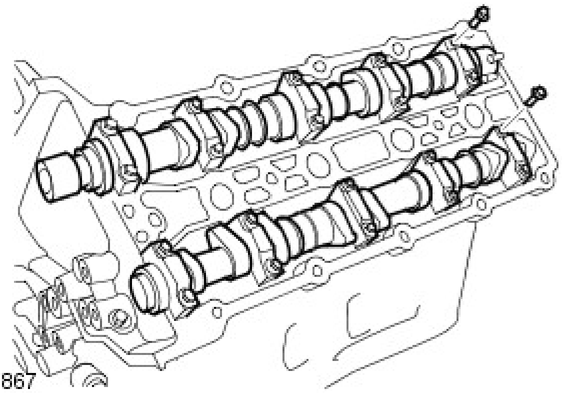
- Remove the 2 bolts.



E48579

18. Remove the special tool from the LH cylinder head.

- Remove the 3 bolts.



E46867

19. ⚠CAUTION: Evenly and progressively, release the camshaft bearing caps.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshaft bearing caps.

- Remove the 20 bolts.

20. Remove the camshafts.

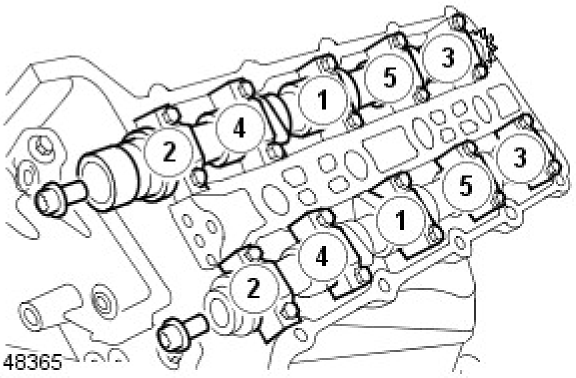
Installation

1. Replace the valve shims, with the smallest shim available.

- Apply a light coat of clean engine oil to the replacement valve shims.

2. Install the camshafts.

- Clean the component mating faces.
- Lubricate the journals and camshaft lobes.



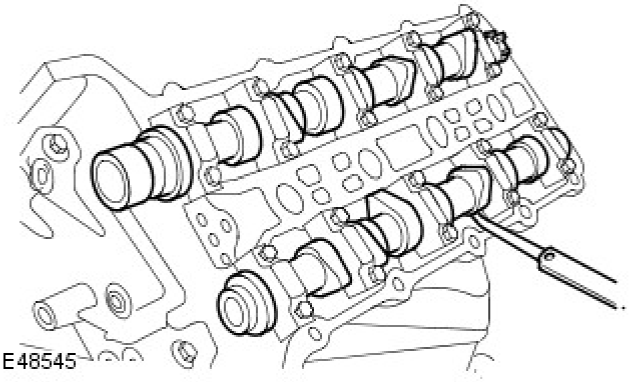
E48365

3. Install the camshaft bearing caps.

- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm (7 lb.ft).

4. ⚠CAUTION: Make sure that new bolts are installed.

Install the sprocket retaining Torx bolts to the camshafts.



5. CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Measure and record the tappet clearances.

- Rotate the camshafts using the Torx bolts.

6. NOTE: Remove the camshaft bearing caps evenly and in stages.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshafts.

- Remove the 20 bolts.

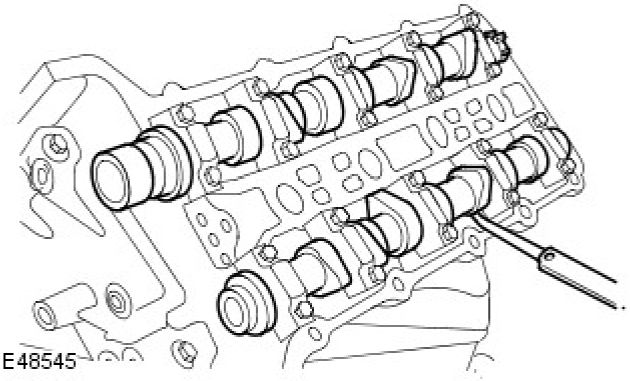
7. Remove the valve tappets, replace with selected tappets.

8. Install the camshafts.

- Lubricate the journals and camshaft lobes.
- Clean the component mating faces.

9. Install the camshaft bearing caps.

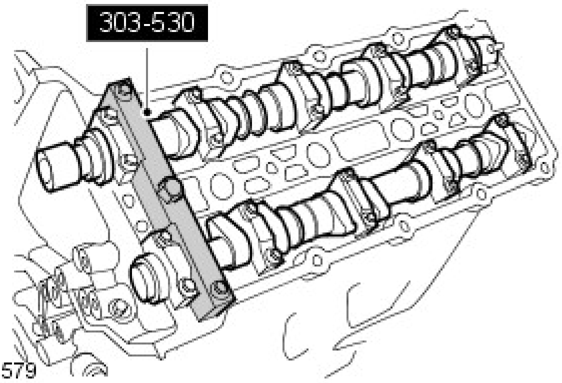
- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm (7 lb.ft).



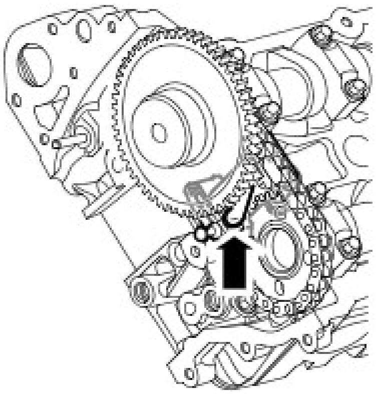
10. CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Check valve tappet clearances are correct.

- Rotate the camshafts using the Torx bolts.
- Remove the camshaft Torx bolts after the check is complete.



11. Install the special tool to the LH cylinder head.



12. Depress the LH secondary timing chain tensioner piston.

- Using 1 mm diameter metal rod, retain the chain tensioner piston.

13. Install the LH secondary timing chain tensioner and chain to the camshaft sprockets.

14. Install the LH secondary timing chain tensioner retaining bolts.

- Tighten the bolts to 12 Nm (9 lb.ft).

15. NOTE: Lightly tighten the camshaft sprocket Torx bolts, the sprockets MUST be free to move.

Install the LH secondary timing chain and sprockets to the camshafts.

- Install the sprocket retaining Torx bolts to the camshafts.

16. Tension the secondary timing chain.

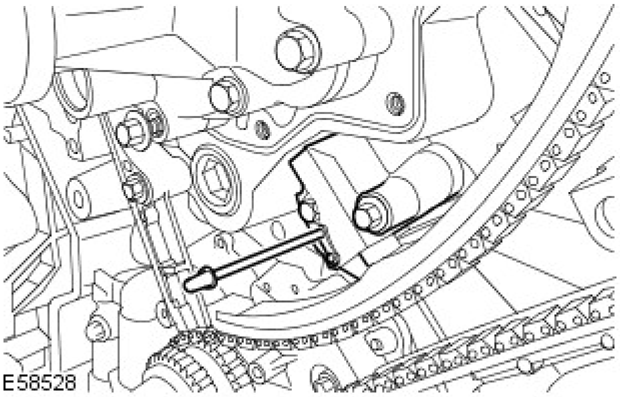
- Remove the retaining rod.

17. Install the LH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

18. Install the LH primary chain tensioner guide.

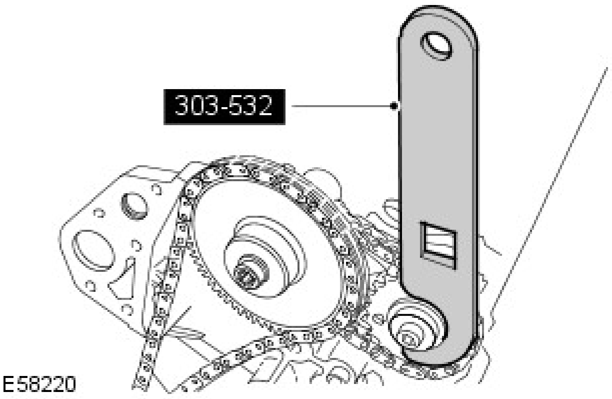
- Tighten the stud to 12 Nm (9 lb.ft).



19. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the LH primary timing chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.



20. CAUTIONS:

⚠ Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

⚠ The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

Install the special tool to the exhaust camshaft sprocket.

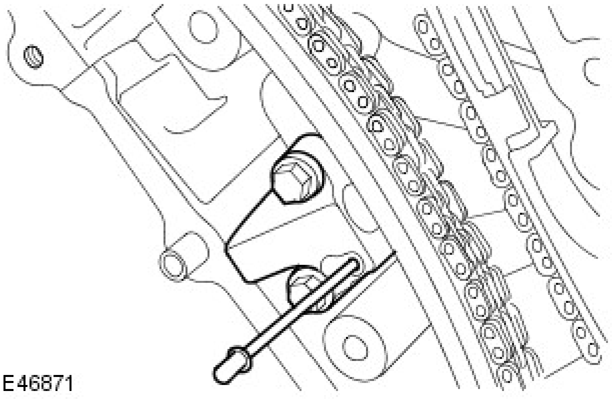
- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.
- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

21. Install the RH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

22. Install the RH primary timing chain tensioner guide.

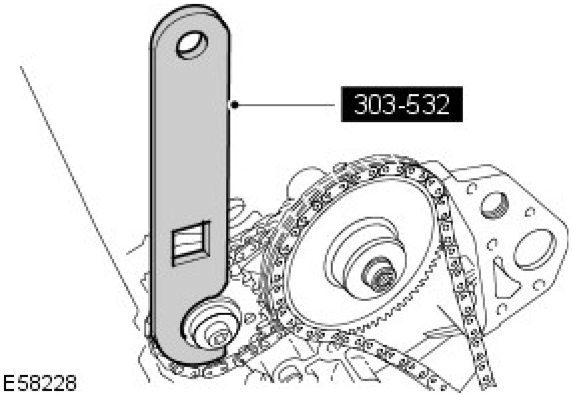
- Tighten the bolts to 12 Nm (9 lb.ft).



23. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the RH primary timing chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.



24. CAUTIONS:

⚠ The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

⚠ Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

Install the special tool to the exhaust camshaft sprocket.

- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.
- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

25. Remove the special tool from the LH cylinder head.

26. Remove the special tool from the RH cylinder head.

27. Remove the crankshaft locking tool.

- Remove the screw.

28. Install the CKP sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).

29. Install the engine front cover.
For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

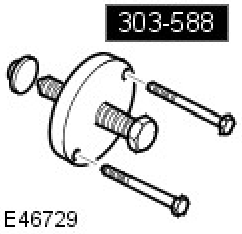
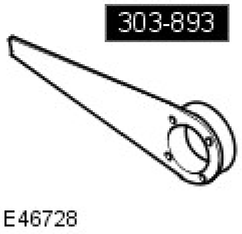
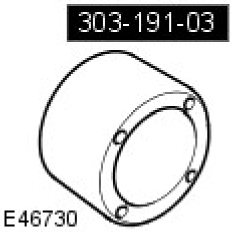
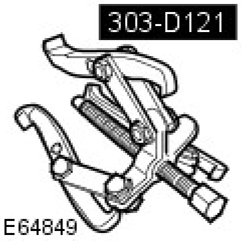
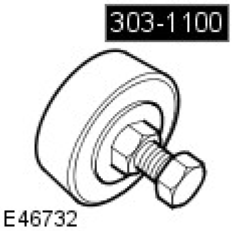
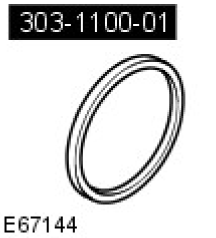
30. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

31. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Crankshaft Pulley

In-vehicle Repair

Special Tool(s)	
 303-588 E46729	Remover, crankshaft pulley 303-588
 303-893 E46728	Holding Tool Crankshaft Pulley 303-893(LRT-12-080)
 303-191-03 E46730	Adapter 303-191-03
 303-D121 E64849	Remover, crankshaft seal 303-D121
 303-1100 E46732	Installer, crankshaft seal 303-1100
 303-1100-01 E67144	Adapter - Crankshaft seal installer 303-1100-01

Removal

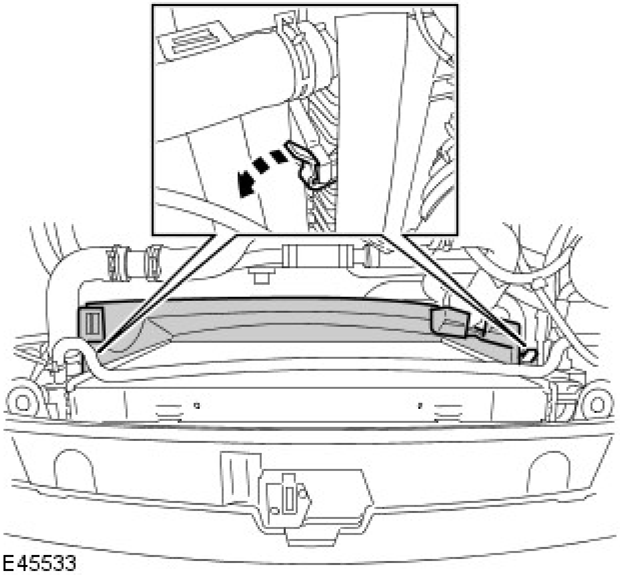
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

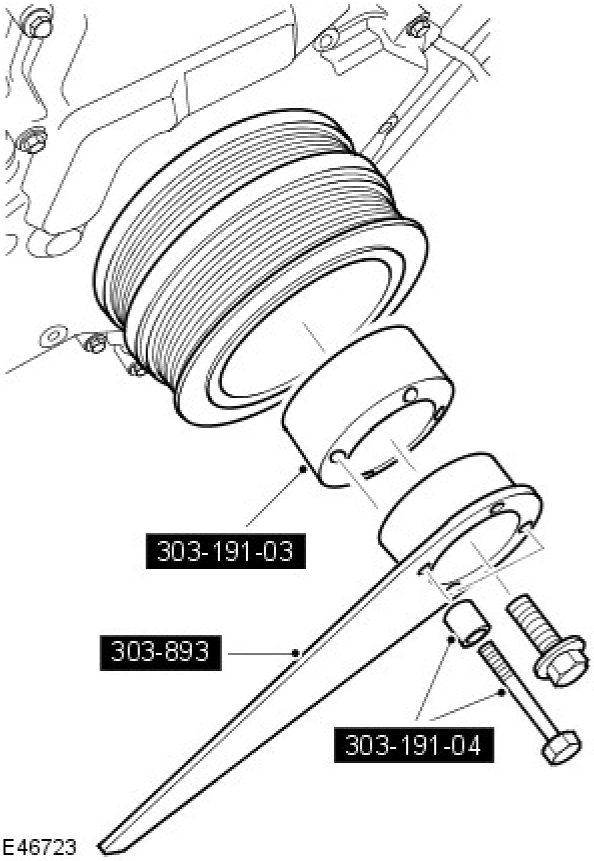
3. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

4. Remove the cooling fan lower shroud.



- Release the 2 clips.

5. ⚠ CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.



Using the special tools, retain the crankshaft pulley.

6. NOTE: The crankshaft pulley retaining bolt will be very tight.

Remove the crankshaft pulley retaining bolt.

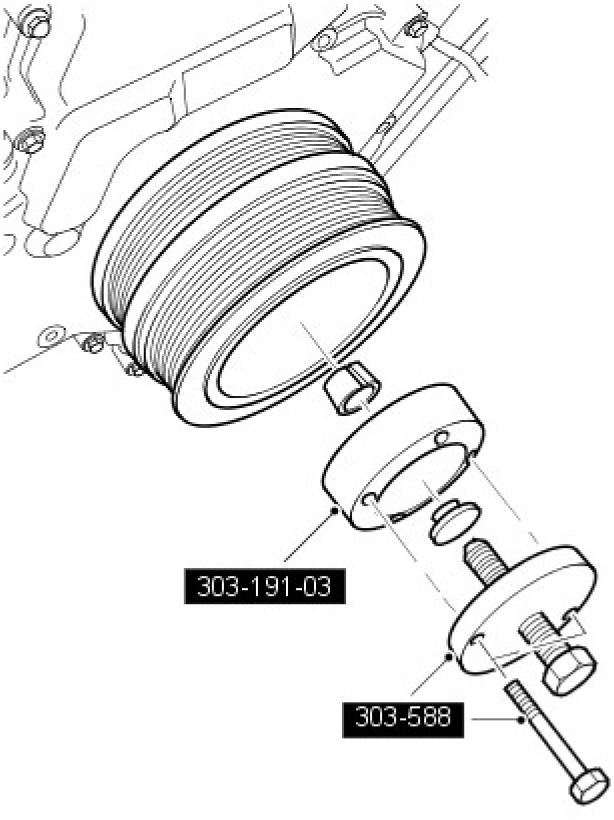
- Discard the bolt.

7. Remove the special tools.

8. NOTE: The crankshaft pulley will be very tight.

Using the special tools, remove the crankshaft pulley.

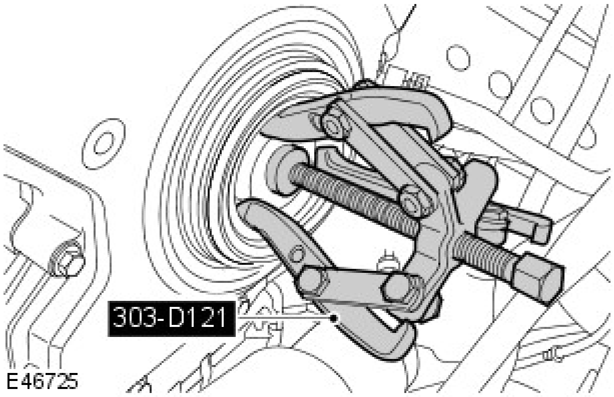
- Collect the locking ring.



E46724

9. Remove the special tools.

10. Using the special tool, remove the crankshaft front seal.

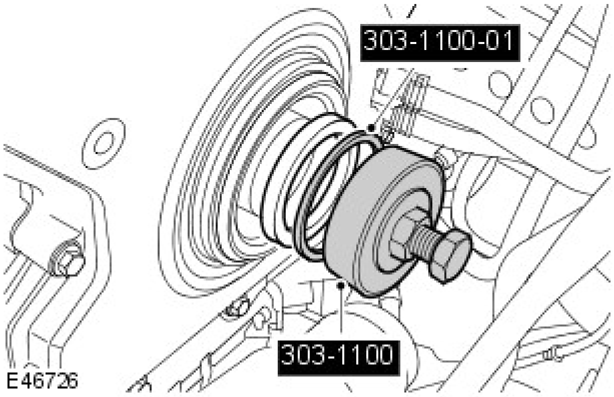


E46725

11. Check the crankshaft damper pulley and locking ring for damage.

Installation

1. Clean all the crankshaft pulley mating faces.



2. Using the special tools, install the crankshaft front seal.

- Lubricate the new crankshaft front seal with clean engine oil.

3. Install the crankshaft pulley.

- Lubricate the new crankshaft front seal with clean engine oil.

4. Remove the special tools.

5. Install the crankshaft pulley locking ring.

6. ⚠ CAUTION: The screw thread in the crankshaft pulley must be cleaned out before installing a new crankshaft pulley bolt.

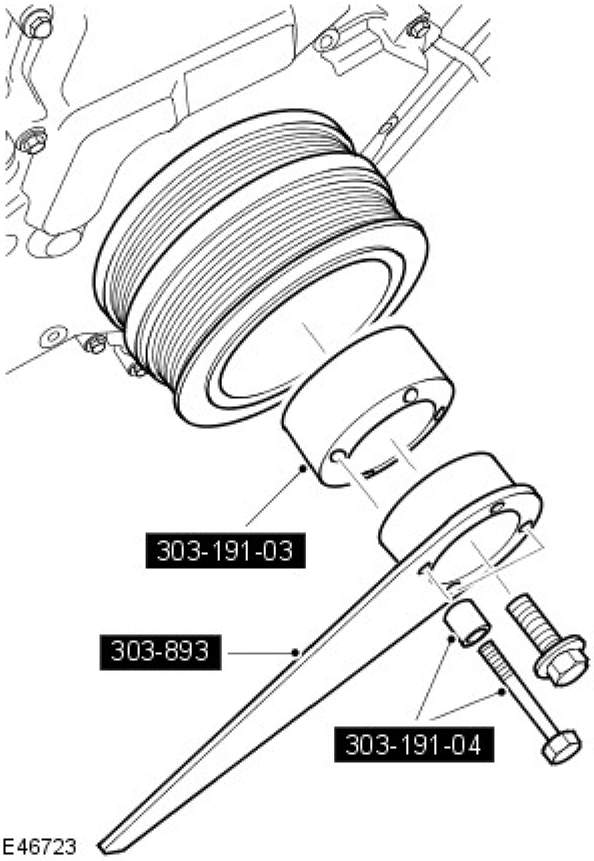
Install a new crankshaft pulley bolt.

- A new crankshaft pulley bolt must be installed.
- Install, but do not tighten, the new crankshaft pulley bolt.

7. ⚠ CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.

Using the special tools, retain the crankshaft pulley.

- Tighten the crankshaft pulley bolt to 380 Nm (280 lb.ft).
- Remove the special tools.



8. Remove the special tools.

9. Install the cooling fan lower shroud.

- Secure the clips.

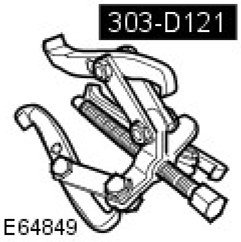
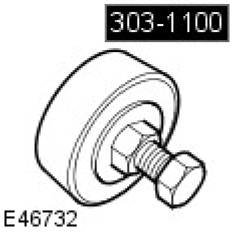
10. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Crankshaft Front Seal

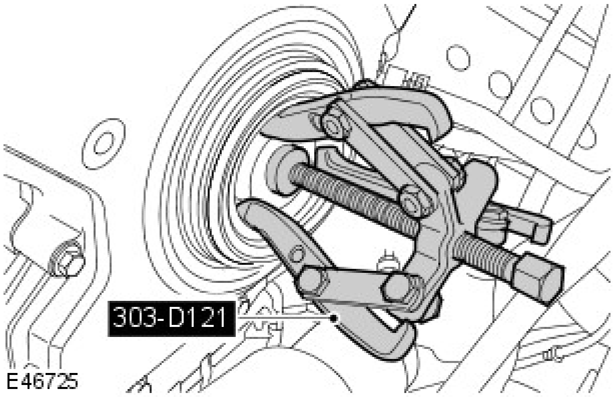
In-vehicle Repair

Special Tool(s)	
	Remover, crankshaft seal 303-D121
	Installer, crankshaft seal 303-1100
303-1100-01 E67144	Adapter - Crankshaft seal installer 303-1100-01

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

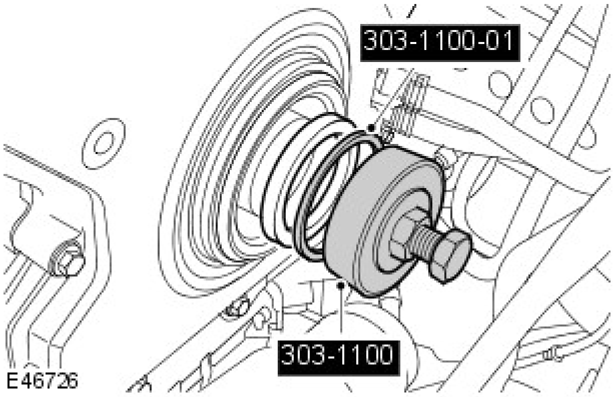
2. Remove the crankshaft pulley.
   For additional information, refer to: Crankshaft Pulley (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).



3. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

   Using the special tool, remove the crankshaft front seal.

Installation



1. Using the special tools, install the crankshaft front seal.
   - Clean the component mating faces.

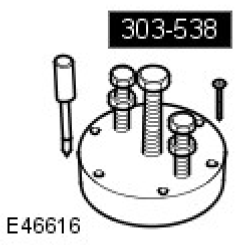
2. Install the crankshaft pulley.
   For additional information, refer to: Crankshaft Pulley (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Crankshaft Rear Seal

In-vehicle Repair

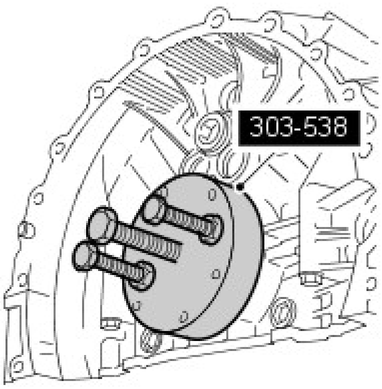
Special Tool(s)	
 E46616	Crankshaft rear oil seal remover/installer 303-538

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

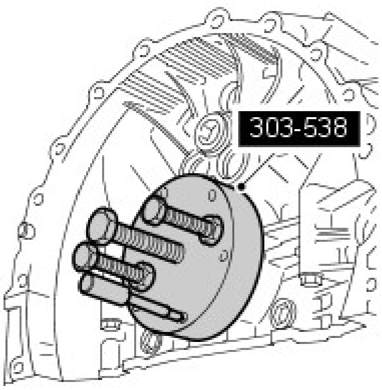
   Raise and support the vehicle.

2. Remove the torque converter flexplate.
   For additional information, refer to: Flexplate (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).



E46613

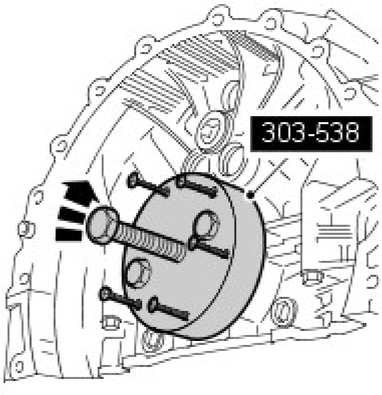
3. Install the special tools.
   - Install the 2 bolts.
   - Tighten the 2 nuts to retain the special tool.



E46614

4. Using the special tool, pierce the seal to create holes for the 6 self-tapping screws.

E46615



5. Using the special tools, remove and discard the crankshaft rear oil seal.

- Install the 6 self-tapping screws.
- Adjust the 2 nuts.
- Tighten the center bolt.

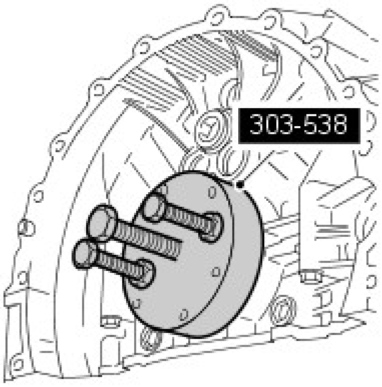
Installation

1. ⚠ CAUTION: Do not lubricate the components.

Partially install the crankshaft rear oil seal.

- Make sure the components are clean and dry.
- Carefully remove the transit sleeve, leaving the seal on the crankshaft.

E46613



2. ⚠ CAUTION: Make sure the seal is installed parallel

Using the special tool, install the crankshaft rear oil seal.

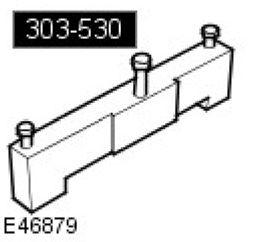
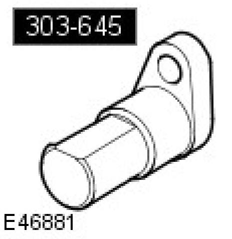
- Tighten the special tool nuts evenly and progressively to fully install the seal.

3. Install the torque converter flexplate.
For additional information, refer to: Flexplate (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Timing Drive Components

In-vehicle Repair

Special Tool(s)	
	Camshaft setting/locking tool 303-530
	Crankshaft setting tool 303-645

Removal

- NOTE: This procedure covers the removal and installation of both primary chains, tensioners, guides and the crankshaft sprocket.

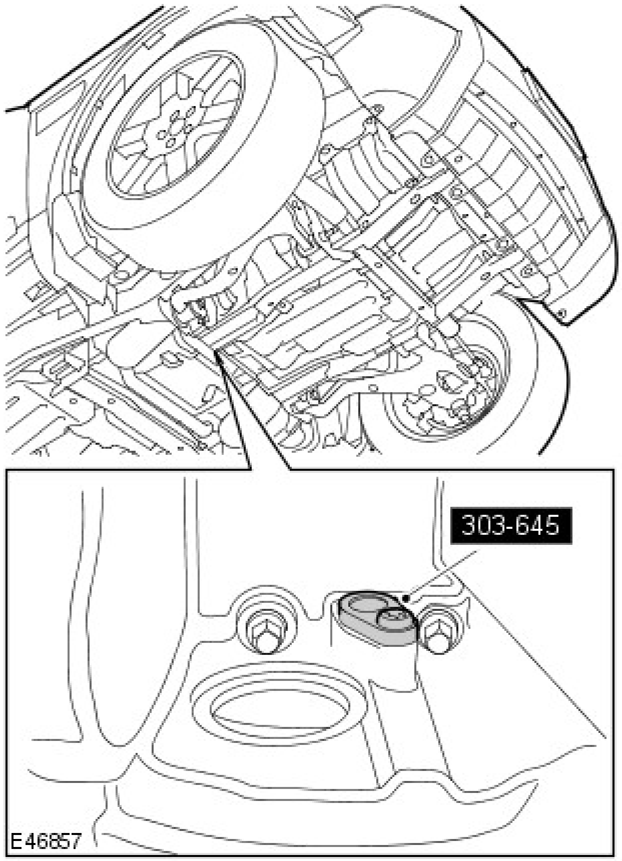
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

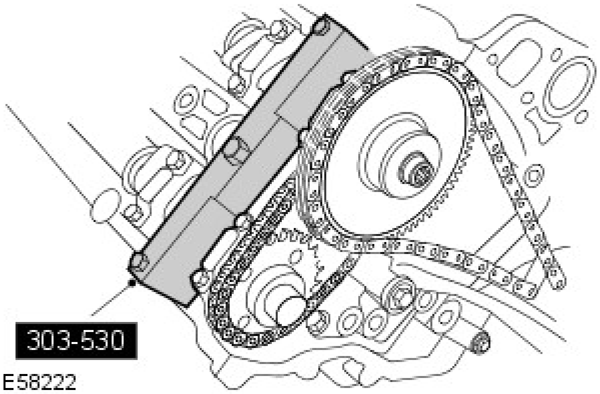
3. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

4. Remove the crankshaft position (CKP) sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).


303-645
E46857

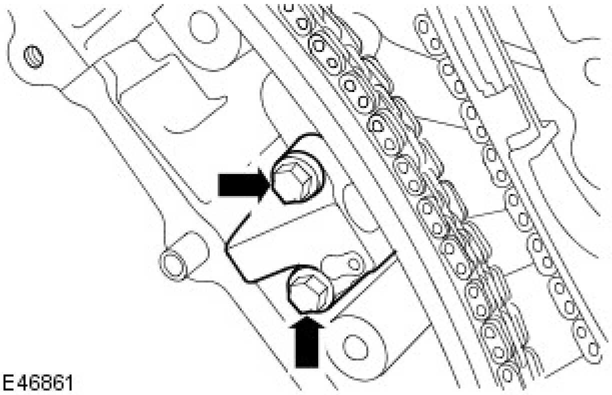
5. Install the crankshaft setting tool.

- Install the screw.


303-530
E58222

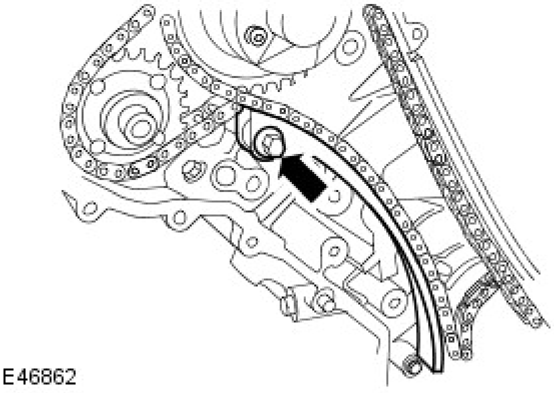
6. Install the special tool to the RH cylinder head.

- Install the 3 bolts.



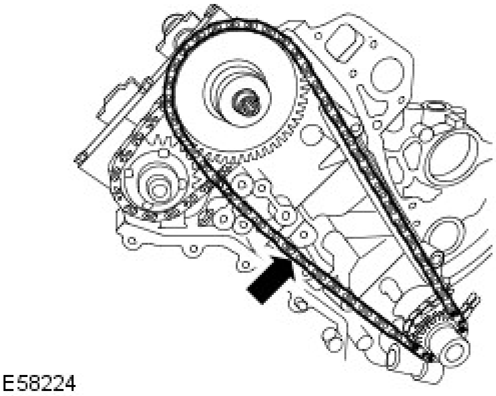
7. Remove the RH primary timing chain tensioner assembly.

- Remove the 2 bolts.

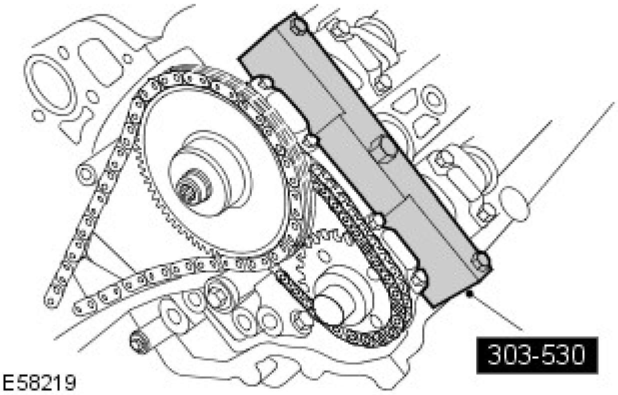

E46862

8. Remove the RH primary timing chain tensioner guide.

- Remove the bolt.


E58224

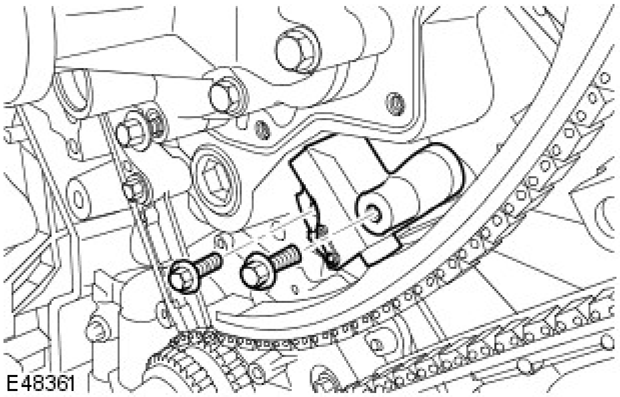
9. Remove the RH primary timing chain.



E58219

10. Install the special tool to the LH cylinder head.

- Install the 3 bolts.


E48361

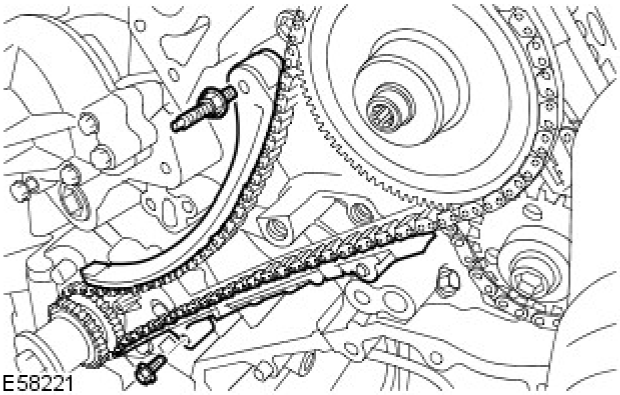
11. Remove the LH primary timing chain tensioner.

- Remove the 2 bolts.

12. Remove the LH upper and lower primary timing chain tensioner guides.

- Remove the 2 bolts.

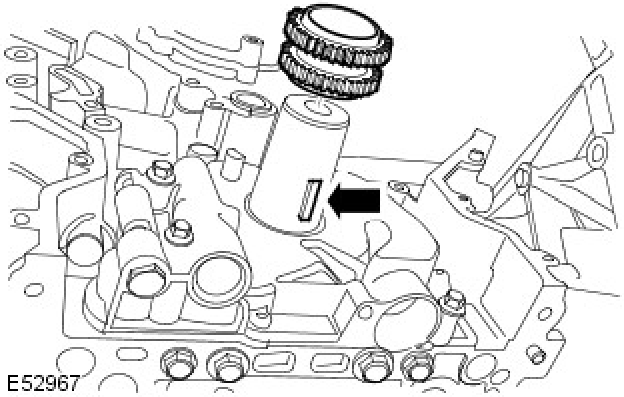
13. Remove the LH primary timing chain.


E58221

14. NOTE: Note the orientation of the crankshaft sprocket.

Remove the crankshaft sprocket.

- Remove the crankshaft sprocket key.


E52967

Installation

1. Install the crankshaft sprocket.

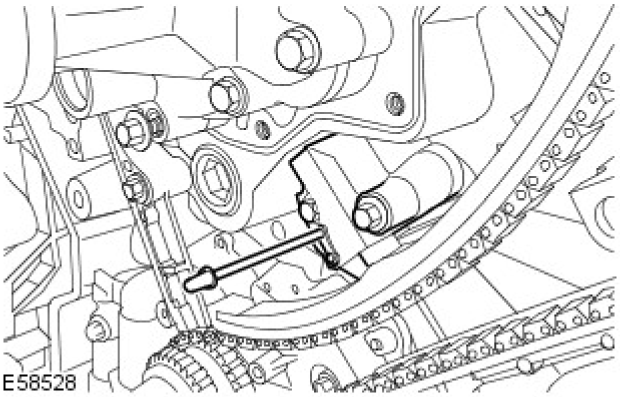
- Install the crankshaft sprocket key.

2. Install the LH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

3. Install the LH primary timing chain tensioner guides.

- Tighten the bolts to 12 Nm (9 lb.ft).



4. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the LH primary timing chain tensioner.

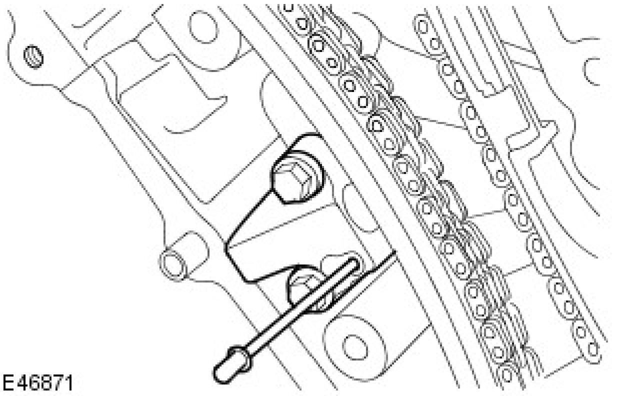
- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.

5. Install the RH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

6. Install the RH primary timing chain tensioner guide.

- Tighten the bolts to 12 Nm (9 lb.ft).



7. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the RH primary timing chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.

8. Remove the special tool from the RH cylinder head.

9. Remove the special tool from the LH cylinder head.

10. Install the engine front cover.
For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

11. Remove the crankshaft setting tool.

- Remove the screw.

12. Install the CKP sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Removal and Installation).

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 15-Jul-2011

Engine - V8 S/C 4.2L Petrol - Cylinder Head LH

In-vehicle Repair

Removal

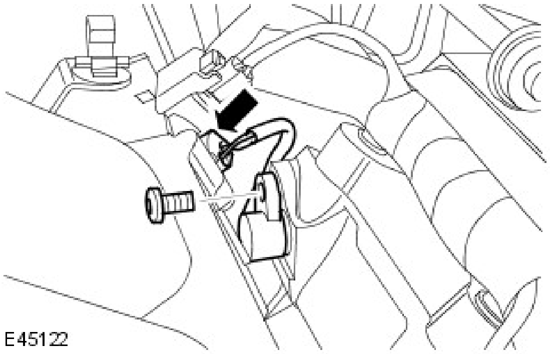
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the fuel rail.
For additional information, refer to: Fuel Rail (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

3. Remove the LH bank camshafts.
For additional information, refer to: Camshafts LH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

4. Remove the camshaft position (CMP) sensor.

- Remove the Torx screw.
- Disconnect the electrical connector.



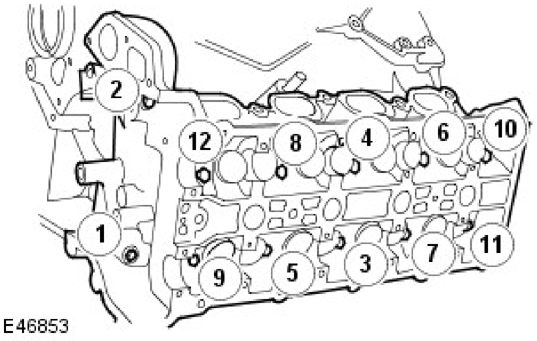
5. CAUTIONS:

⚠ The bolts can only be used twice, mark the bolts with a center punch. If two punch marks are visible, discard the bolts.

⚠ Vehicles fitted with Polydrive cylinder head bolts, the cylinder head bolts must be removed using a 10 mm Polydrive socket or a 10 mm Allen key. Failure to follow this instruction may result in damage to the component.

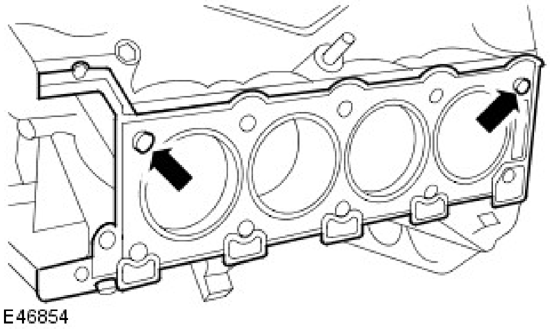
• NOTE: Remove the bolts in the indicated sequence.

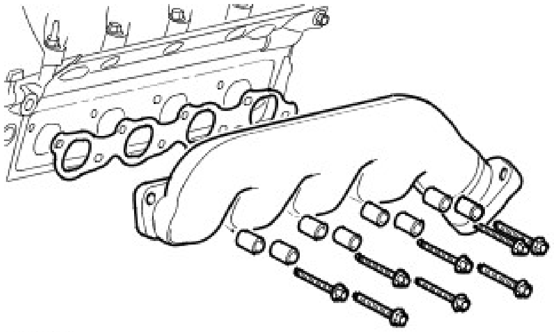
Remove the 12 cylinder head bolts.



6. With assistance remove the cylinder head.

7. Remove and discard the cylinder head gasket.





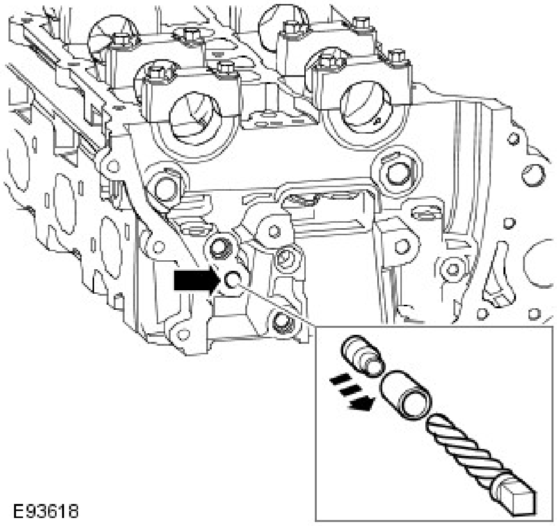
E48399

8. NOTE: Do not disassemble further if the component is removed for access only.

Remove the exhaust manifold.

- Remove the 8 bolts.
- Discard the gasket and the bolts.

Installation



E93618

1. CAUTIONS:

⚠ If a new cylinder head is to be installed to a vehicle with variable valve timing (VVT), the cylinder head must have the oil gallery blind rivet removed before installation.

⚠ Make sure that all debris and foreign material is removed from the cylinder head and cylinder head oil gallery.

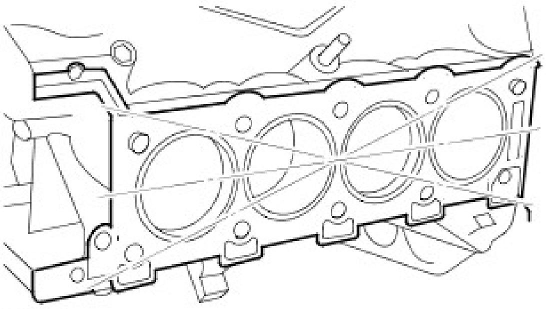
• NOTE: The centre bore of the blind rivet is 6 mm (0.24 inch) diameter.

Vehicles fitted with VVT: remove the blind rivet from the VVT oil gallery.

- Identify the VVT oil supply gallery and the 8 mm (0.31 inch) blind rivet.
- Using a suitable 3 mm (0.12 inch) punch release the centre of the blind rivet until it is released from the outer part of the blind rivet.
- Using a suitable extraction tool, remove the remaining part of the blind rivet.

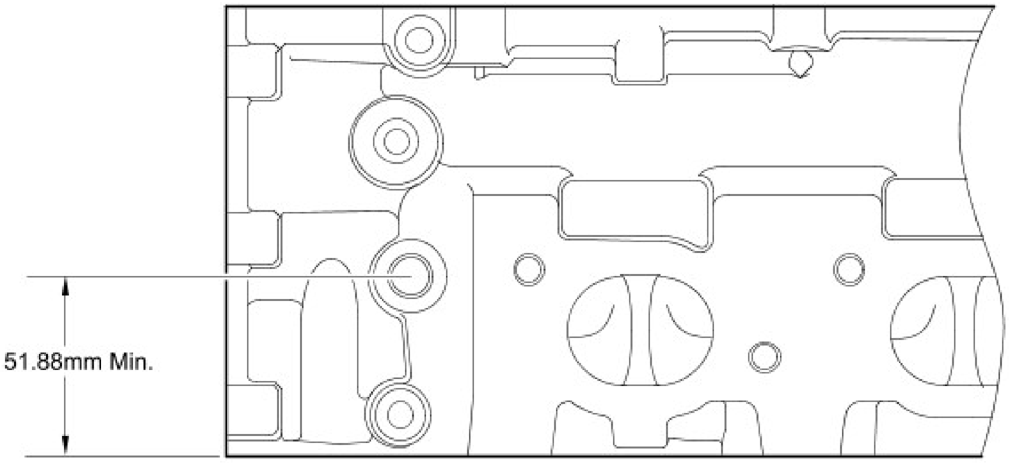
2. Clean the component mating faces.

3. Check cylinder head face for distortion, across the center and from corner to corner.
For additional information, refer to: Specifications (303-01A Engine - V8 S/C 4.2L Petrol, Specifications).



E46855

4. For cylinder head face distortion data, refer to specifications.
For additional information, refer to: Specifications (303-01A Engine - V8 S/C 4.2L Petrol, Specifications).



E100333

5. NOTE: For cylinder head with distortion above the maximum allowance, the cylinder head material must be measured.

Measure the cylinder head material.

- Check measurement from the centre of the exhaust dowel to the cylinder head face as shown.
- If the measurement is less than 51.88 mm the cylinder head requires replacement.

6. Install the exhaust manifold.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 20 Nm (15 lb.ft).

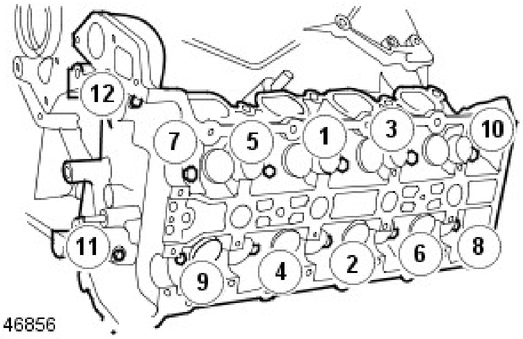
7. ⚠CAUTION: The head gasket must be installed over the cylinder block dowels.

Install a new cylinder head gasket.

- Clean the cylinder head locating dowels.

8. With assistance install the cylinder head.

9. NOTE: Note: Tighten the bolts 1 to 12 in the sequence shown.



E46856

Install the cylinder head bolts.

- Lubricate the new cylinder head bolt threads with clean engine oil.
- Tighten the bolts to 20 Nm (15 lb.ft).
- Tighten the bolts to 35 Nm (26 lb.ft).
- Tighten the bolts 1 to 10, a further 90 degrees.
- Tighten the bolts 1 to 10, a further 90 degrees.
- Tighten the M8 bolts 11 and 12, to 25 Nm (18 lb.ft).

10. Install the CMP sensor.

- Tighten the Torx screw to 7 Nm (5 lb.ft).
- Connect the electrical connector.

11. Install the LH bank camshafts.
For additional information, refer to: Camshafts LH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

12. Install the fuel rail.
For additional information, refer to: Fuel Rail (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

13. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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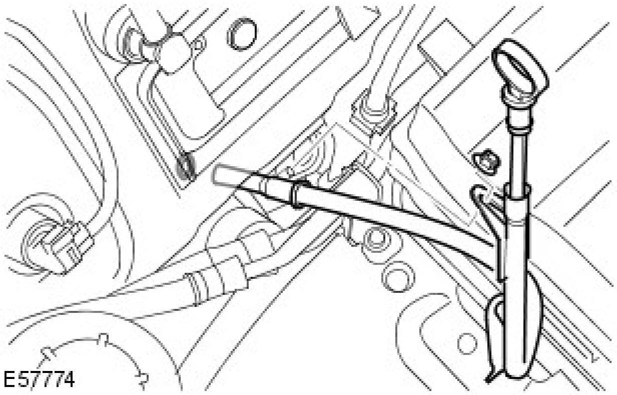
Engine - V8 S/C 4.2L Petrol - Valve Cover LH

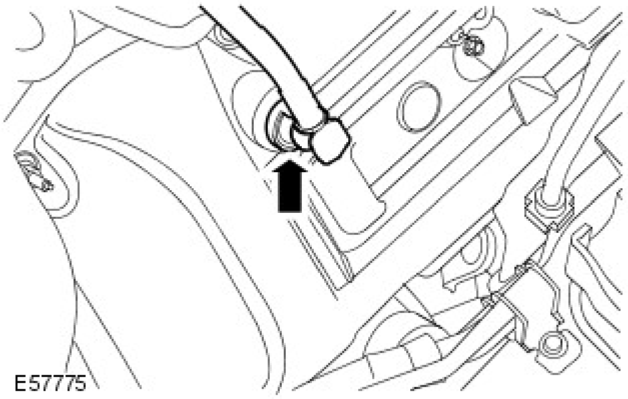
In-vehicle Repair

Removal

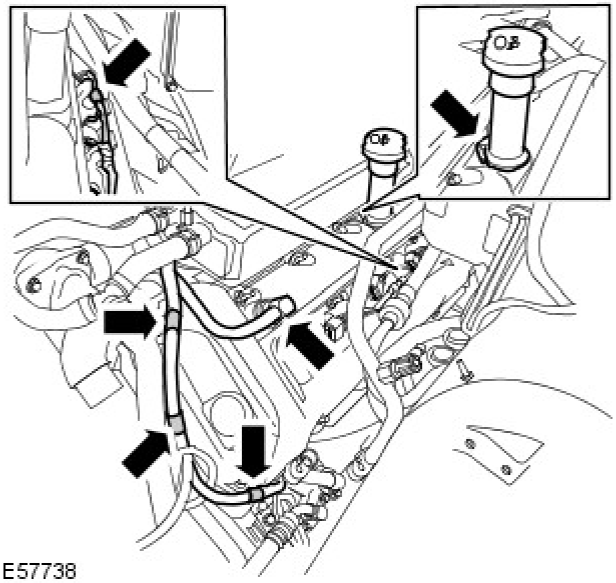
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the ignition coil-on-plug.
   For additional information, refer to: Ignition Coil-On-Plug (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and Installation).
3. Remove the remaining ignition coil-on-plugs.
4. Remove the oil level indicator and tube.
   - Remove the dipstick.
   - Remove the nut.
   - Discard the O-ring seal.



5. Disconnect the valve cover breather hose.



6. Release the engine wiring harness.
   - Release from the 4 clips.

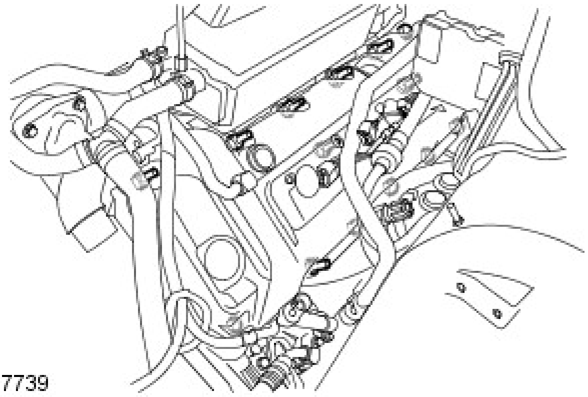


E57738

7. NOTE: Rotate the oil filler pipe counter-clockwise to remove.

Remove the oil filler pipe.

- Release the clip.

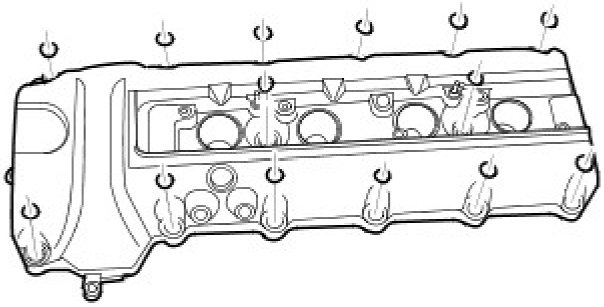


E57739

8. NOTE: Note the fitted position of the retaining bolts prior to removal.

Remove the valve cover assembly.

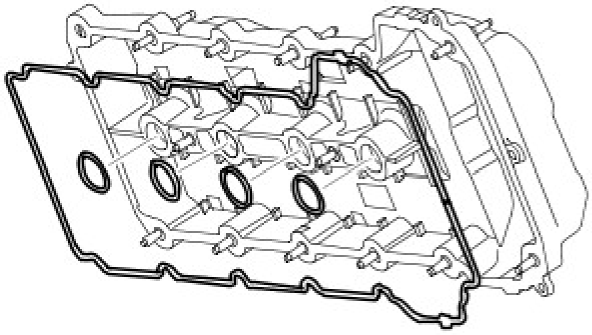
- Remove the 14 valve cover retaining bolts.



E46676

9. Remove and discard the valve cover retaining bolt O-ring seals.

10. Remove and discard the valve cover gaskets.



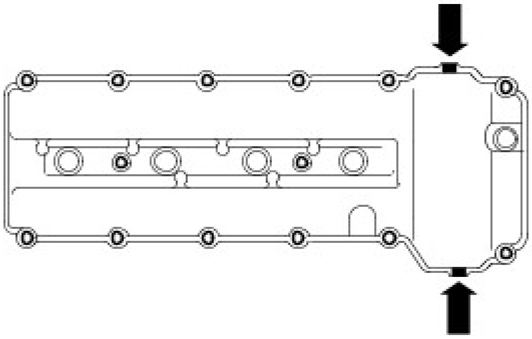
E46652

Installation

1. Install new valve cover plug aperture gaskets.

2. Install a new valve cover gasket.

3. NOTE: Apply two beads of silcone gasket sealant as shown on the illustration. The application of the sealant must be 3mm diameter 12mm long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

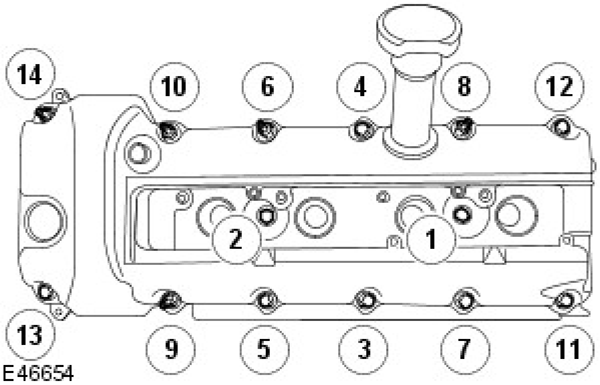


E49922

Install the valve cover.

- Clean the component mating faces.

4. Install the valve cover retaining bolts.



E46654

- Install new O-ring seals.
- Install valve cover retaining bolts to their position previously noted.
- Complete the tightening sequence as illustrated.
- Tighten the bolts to 12 Nm (9 lb.ft).

5. Install the oil filler pipe.

- Install a new O-ring seal.

6. Attach the engine wiring harness.

7. With assistance, install the oil level indicator and tube.

- Clean the component mating faces.
- Install a new O-ring seal.
- Lubricate the seal with clean engine oil.

- Tighten the nut to 6 Nm (4 lb.ft).

8. Install the ignition coil-on-plug.
For additional information, refer to: Ignition Coil-On-Plug (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and Installation).

9. Install the remaining ignition coil-on-plugs.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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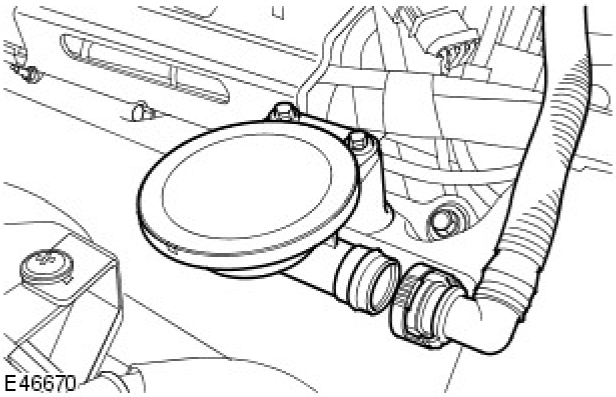
Engine - V8 S/C 4.2L Petrol - Valve Cover RH

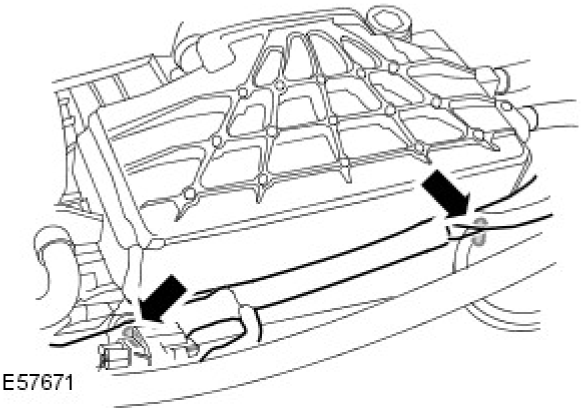
In-vehicle Repair

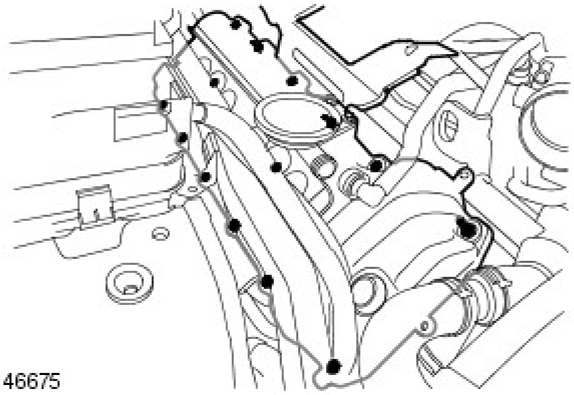
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the air cleaner assembly.
   For additional information, refer to: Air Cleaner Element (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).
3. Remove the air intake resonator.
   For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).
4. Remove the ignition coil-on-plug.
   For additional information, refer to: Ignition Coil-On-Plug (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and Installation).
5. Remove the remaining ignition coil-on-plugs.
6. Disconnect the positive crankcase ventilation (PCV) line.



7. Release the engine wiring harness from the retaining bracket.

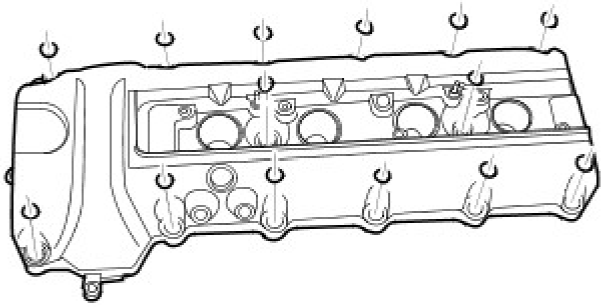



E46675

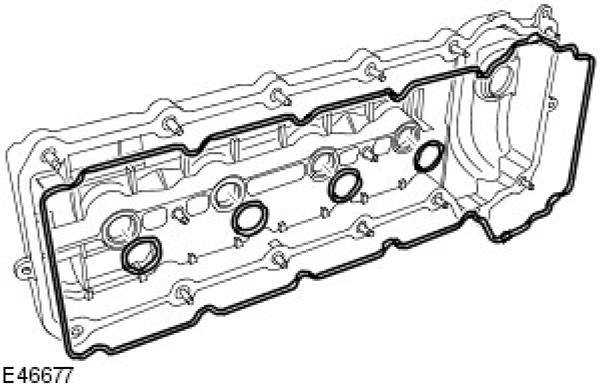
8. NOTE: Note the fitted position of the retaining bolts prior to removal.

Remove the valve cover assembly.

- Remove the 14 valve cover retaining bolts.
- Remove the engine cover bracket.

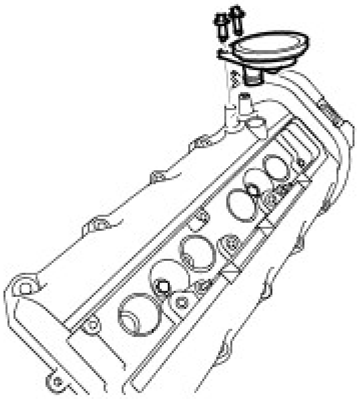

E46676

9. Remove and discard the valve cover retaining bolt O-ring seals.


E46677

10. Remove and discard the valve cover gasket.

11. Remove the valve cover plug aperture seals.


E46678

12. NOTE: Do not disassemble further if the component is removed for access only.

Remove the PCV valve.

- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.

Installation

1. NOTE: Lubricate new seals with clean engine oil.

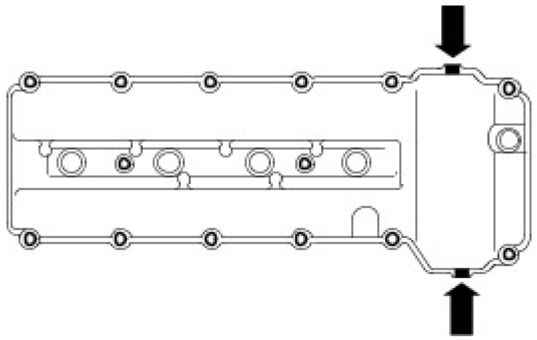
   Install the PCV valve.

   - Clean the component mating faces.
   - Install new O-ring seals.
   - Tighten the bolts to 6 Nm (4 lb.ft).

2. Install new valve cover plug aperture seals
3. Install a new valve cover gasket.
4. Install new valve cover retaining bolt O-ring seals
5. NOTE: Apply two beads of silcone gasket sealant as shown on the illustration. The application of the sealant must be 3mm diameter 12mm long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

   Install the valve cover.

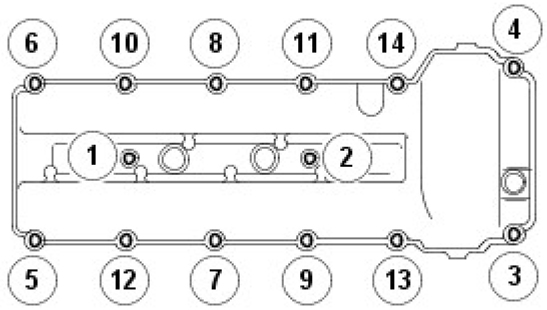
   - Clean the component mating faces.



E49922

6. Install the valve cover retaining bolts.

   - Install valve cover retaining bolts to their position previously noted.
   - Tighten the bolts to 12 Nm (9 lb.ft).
   - Complete the tightening sequence as illustrated.



E46679

7. Attach the engine wiring harness to the retaining bracket.
8. Connect the PCV line.

   - Clean the component mating faces.

9. Install the air intake resonator.
   For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).
10. Install the air cleaner assembly.
    For additional information, refer to: Air Cleaner Element (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).
11. Install the ignition coil-on-plugs.
    For additional information, refer to: Ignition Coil-On-Plug (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and

Installation).

12. Install the remaining ignition coil-on-plugs.

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 S/C 4.2L Petrol - Engine Mount LHLHD AWD

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the front wheel.

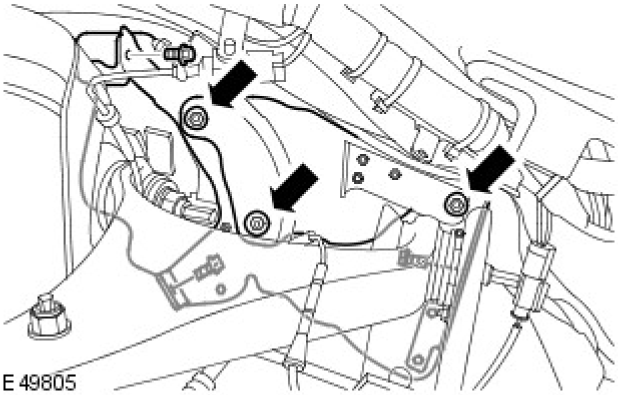
4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

6. NOTE: The heatshield consists of 3 parts.

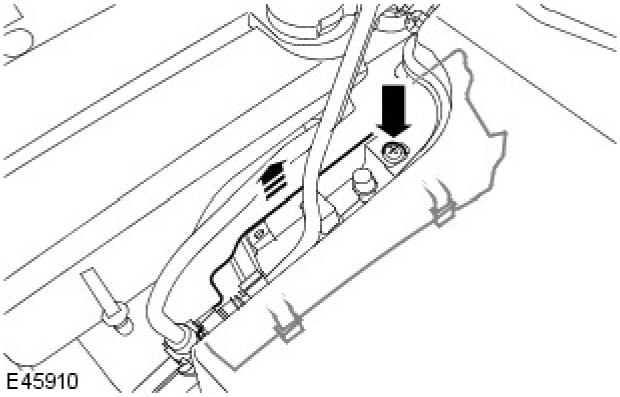
Remove the upper suspension arm and brake line heat shields for access.

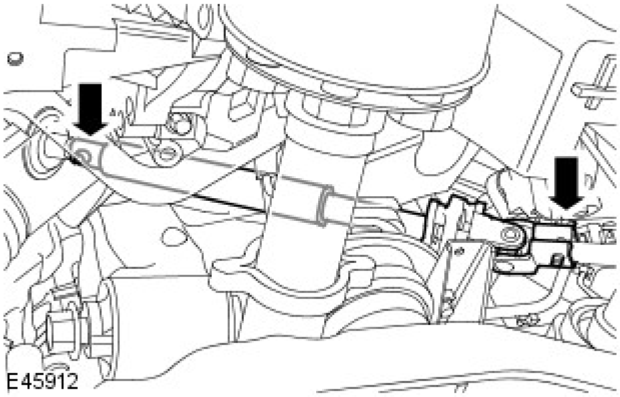
- Remove the 3 nuts.
- Remove the 3 bolts.



7. Remove the engine compartment LH upper heat shield.

- Remove the screw.





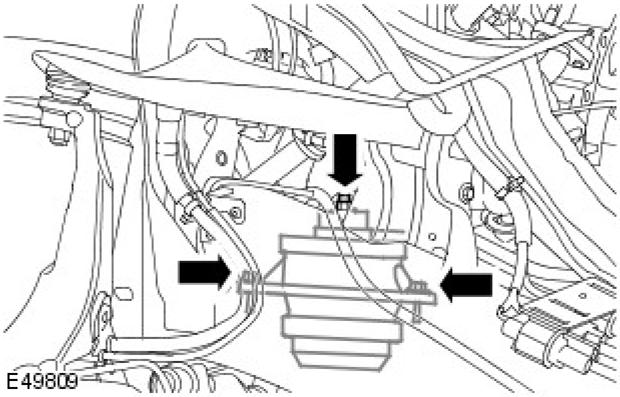
8. Remove the steering column lower universal joint assembly for access.

- Remove and discard the bolts.

9. Support the engine.

10. Raise the engine.

- Remove the nut.



11. Remove the engine front mount.

- With assistance remove the 2 bolts.

Installation

1. Install the engine front mount.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft), then a further 60 degrees.

2. Lower the engine onto the mount.

- Tighten the nut to 90 Nm (66 lb.ft).

3. Remove the engine support.

4. Install the steering column lower universal joint assembly.

- Install new patchlock bolts and tighten to 25 Nm (18 lb.ft).

5. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

6. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

7. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

8. Install the engine compartment upper LH heat shield.

- Install the screw.

9. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 S/C 4.2L Petrol - Engine Mount LHRHD AWD

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

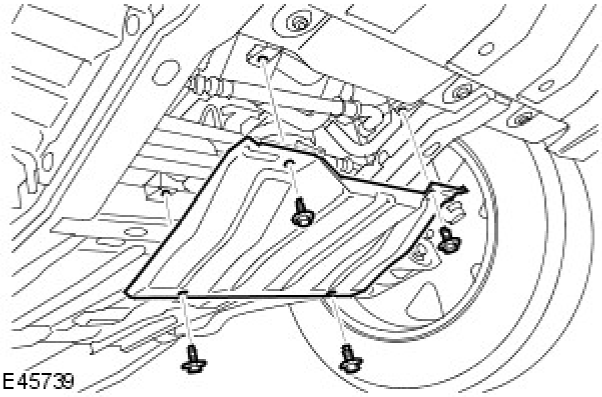
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

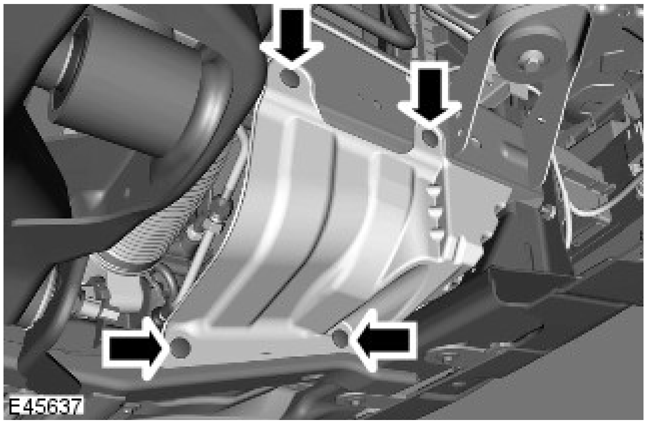
3. Remove the front wheel.

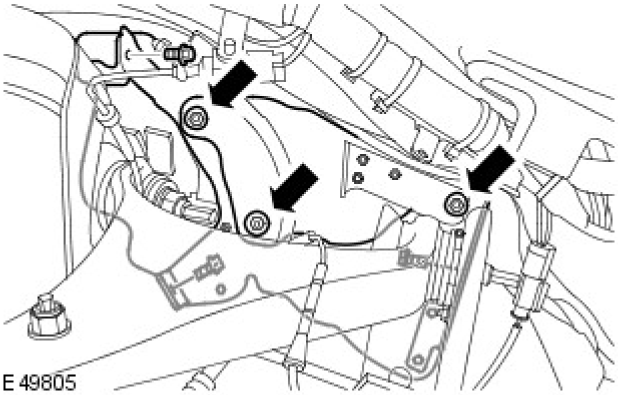
4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Remove the radiator access panel.



6. Remove the front LH splash shield.

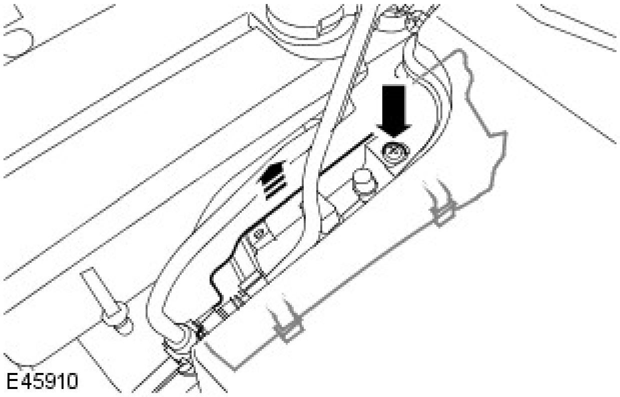




7. NOTE: The heatshield consists of 3 parts.

Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.



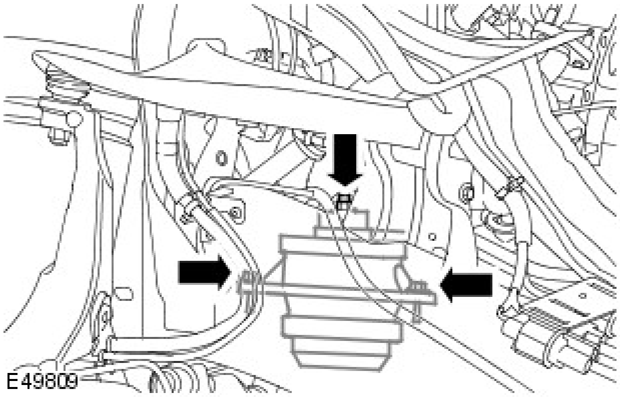
8. Remove the engine compartment LH upper heat shield.

- Remove the screw.

9. Support the engine.

10. Raise the engine.

- Remove the nut.



11. Remove the engine front mount.

- With assistance remove the 2 bolts.

Installation

1. Install the engine front mount.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft), then a further 60 degrees.

2. Lower the engine onto the mount.

- Tighten the nut to 90 Nm (66 lb.ft).

3. Remove the engine support.

4. Install the engine undershield.

For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Install the radiator access panel.

6. Install the front LH splash shield.

7. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

8. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Install the engine compartment upper LH heat shield.

- Install the screw.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 S/C 4.2L Petrol - Engine Mount RH

In-vehicle Repair

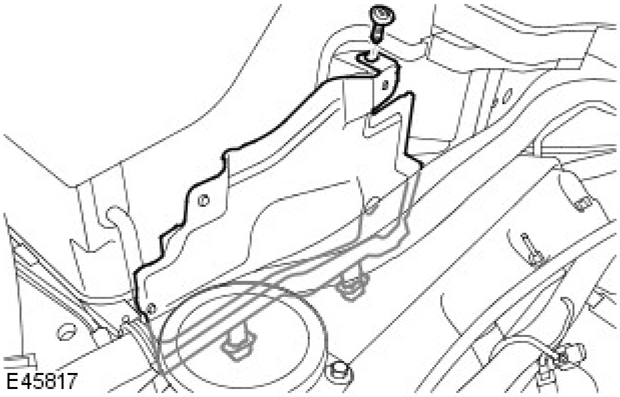
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the starter motor.
For additional information, refer to: Starter Motor (303-06A Starting System - V8 S/C 4.2L Petrol, Removal and Installation).



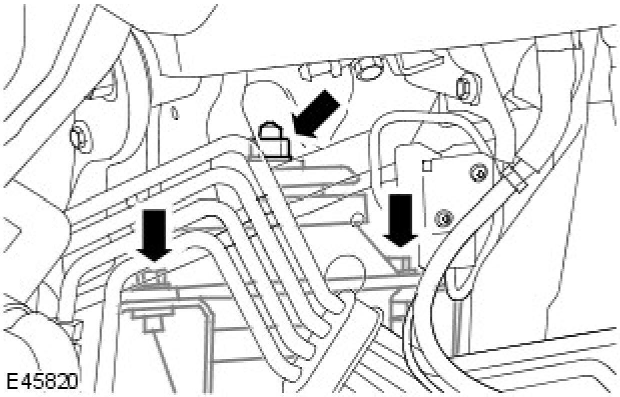
4. Remove the engine compartment RH upper heat shield.

- Remove the screw.
- Release the 2 clips.

5. Support the engine.

6. Release the engine mount bracket.

- Remove the nut.
- Using a transmission jack, raise the engine clear of the engine mount.



7. Remove the engine mount RH.

- Remove the 2 bolts.

Installation

1. Install the engine mount RH.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft), then a further 60

degrees.

2. Lower the engine onto the mount.

- Tighten the nut to 90 Nm (66 lb.ft).

3. Remove the engine support.

4. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

5. Install the engine compartment upper RH heat shield.

- Install the screw.

6. Install the starter motor.
For additional information, refer to: Starter Motor (303-06A Starting System - V8 S/C 4.2L Petrol, Removal and Installation).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 S/C 4.2L Petrol - Flexplate

In-vehicle Repair

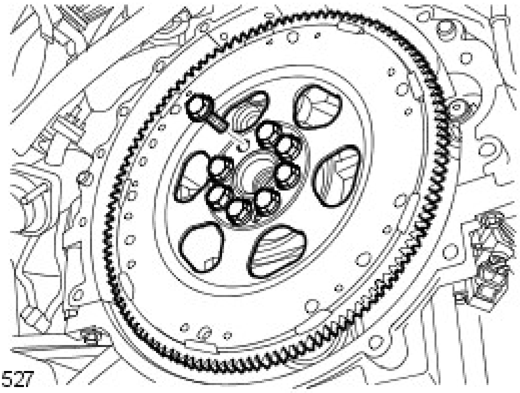
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transmission.
For additional information, refer to: Transmission (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, Removal and Installation).



E46527

4. ⚠ CAUTION: The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.

• NOTE: Prevent the flexplate from rotating.

Remove the torque converter flexplate.

- Remove the 8 bolts.

Installation

1. NOTE: Prevent the flexplate from rotating.

Install the torque converter flexplate.

- Clean the component mating faces.
- Tighten the bolts evenly and progressively in 2 stages.
- Tighten the bolts to 15 Nm (11 lb ft).
- Tighten the bolts to 110 Nm (81 lb.ft).

2. Install the transmission.
For additional information, refer to: Transmission (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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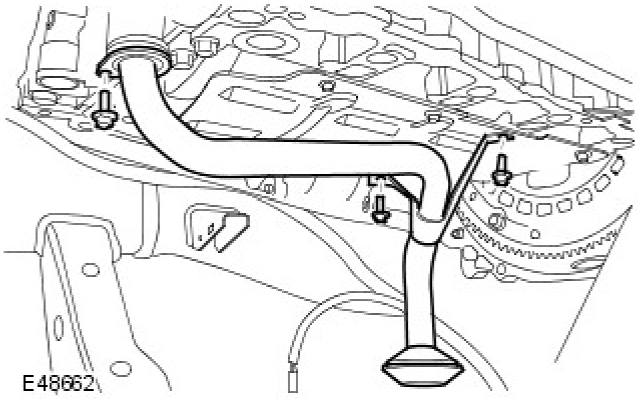
Engine - V8 S/C 4.2L Petrol - Oil Pump

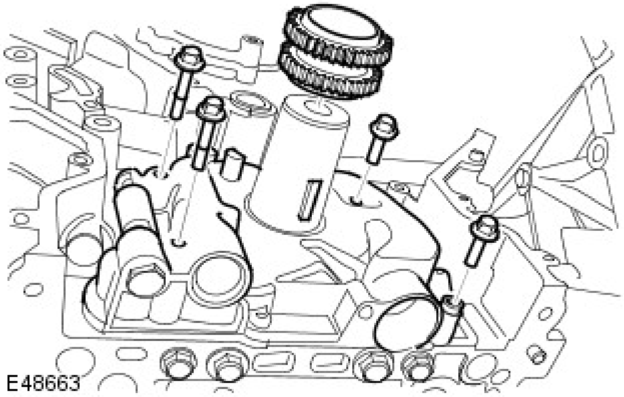
In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the timing drive components.
   For additional information, refer to: Timing Drive Components (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).
3. Remove the oil pan.
   For additional information, refer to: Oil Pan (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).



4. Remove the oil strainer pick-up assembly.
   - Remove the 3 bolts.
   - Remove and discard the O-ring seal.



5. Remove the oil pump assembly.
   - Remove the 4 bolts.
   - Remove and discard the gasket.
   - Clean the component mating faces.

Installation

1. Install the oil pump assembly.
   - Install the new gasket.
   - Tighten the bolts to 10 Nm (7 lb.ft).
2. Install the oil strainer pick-up assembly.
   - Install the O-ring seal.
   - Tighten the bolt to 10 Nm (7 lb.ft).
   - Apply sealant to the M5 bolts.
   - Tighten the bolts to 6 Nm (4 lb.ft).

3. Install the oil pan.
For additional information, refer to: Oil Pan (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

4. Install the timing drive components.
For additional information, refer to: Timing Drive Components (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 S/C 4.2L Petrol - Oil Pan

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Drain the engine oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01B Engine - V8 4.4L Petrol, General Procedures).

4. Remove the oil cooler assembly.
For additional information, refer to: Oil Cooler (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

5. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

6. Remove the front differential.
For additional information, refer to: Axle Assembly - V8 S/C 4.2L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).

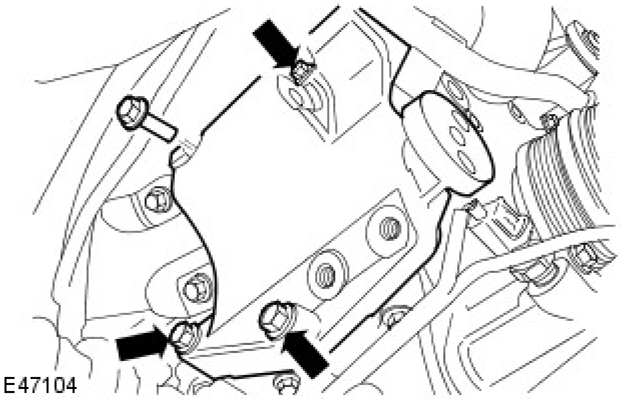
7. Remove the stabilizer control arm.
For additional information, refer to: Front Stabilizer Bar - V8 S/C 4.2L Petrol (204-06 Ride and Handling Optimization, Removal and Installation).

8. Remove the steering gear.
For additional information, refer to: Steering Gear - V8 S/C 4.2L Petrol (211-02 Power Steering, Removal and Installation).

9. Remove the generator.
For additional information, refer to: Generator (414-02A Generator and Regulator - V8 S/C 4.2L Petrol, Removal and Installation).

10. Remove the generator mounting bracket.

- Remove the 4 bolts.

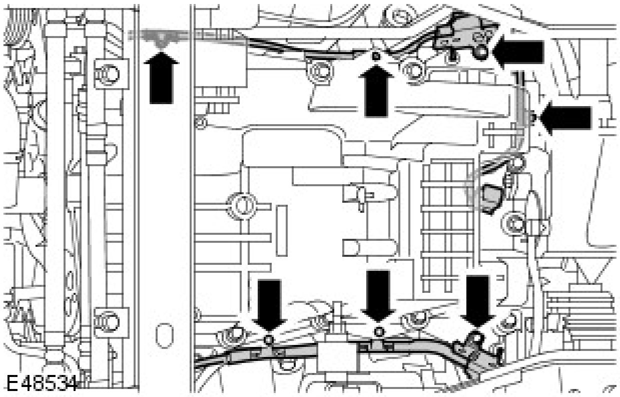


11. Disconnect the heated oxygen sensor (HO2S) electrical connectors.

- Release the 8 wiring harness securing clips.

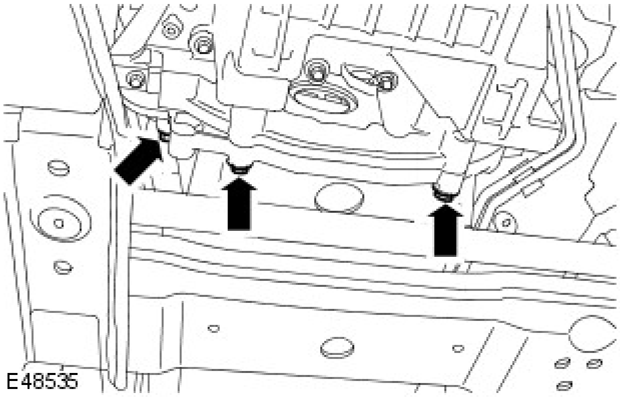
12. Release the HO2S mounting bracket.

- Remove the 2 bolts.



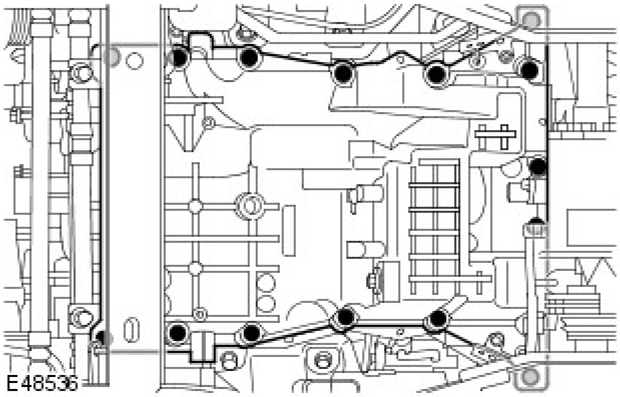
13. Release the HO2S wiring harness from the oil pan.

- Release the 3 clips.



14. Remove the transmission retaining bolts.

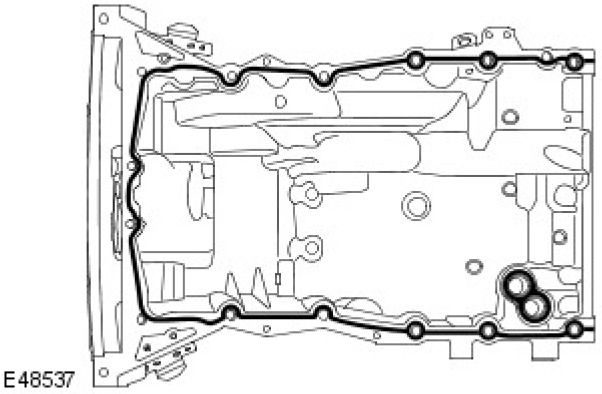
- Remove the 3 bolts.



15. Remove the oil pan.

- Remove the 16 bolts.

Installation



1. Install the oil pan.
   - Clean the component mating faces.
   - Apply a bead of sealant, 3 mm diameter by 130 cm long, to the areas indicated.
   - Tighten the bolts to 20 Nm (15 lb.ft).

2. Install the transmission retaining bolts.
   - Tighten the bolts to 45 Nm (33 lb.ft).

3. Install the HO2S mounting bracket.
   - Tighten the 2 bolts to 10 Nm (7 lb.ft).

4. Connect the HO2S electrical connectors.
   - Install the wiring harness clips.

5. Install the HO2S wring harness.
   - Secure the clips.

6. Install the generator mounting bracket.
   - Clean the component mating faces.

7. Install the generator.
   For additional information, refer to: Generator (414-02A Generator and Regulator - V8 S/C 4.2L Petrol, Removal and Installation).

8. Install the steering gear.
   For additional information, refer to: Steering Gear - V8 S/C 4.2L Petrol (211-02 Power Steering, Removal and Installation).

9. Install the stabilizer control arm.
   For additional information, refer to: Front Stabilizer Bar - V8 S/C 4.2L Petrol (204-06 Ride and Handling Optimization, Removal and Installation).

10. Install the front differential.
    For additional information, refer to: Axle Assembly - V8 S/C 4.2L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).

11. Install the oil cooler assembly.
    For additional information, refer to: Oil Cooler (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

12. Install the engine front cover.
    For additional information, refer to: Engine Front Cover (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

13. Fill the engine with oil.
    For additional information, refer to: Engine Oil Draining and Filling (303-01B Engine - V8 4.4L Petrol, General Procedures).

14. Connect the battery ground cable.
    For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Engine - V8 S/C 4.2L Petrol - Oil Cooler

In-vehicle Repair

Removal

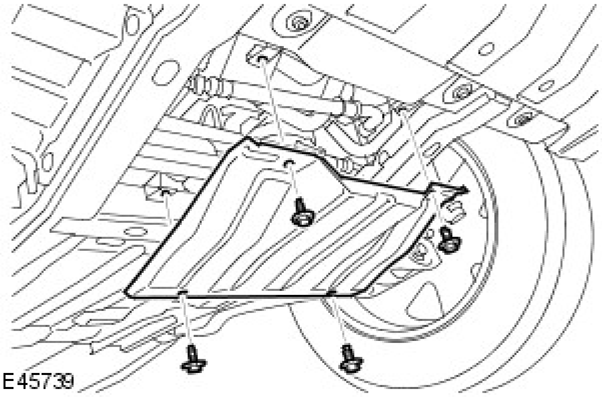
• NOTE: The special tool to disconnect the oil cooler hoses is attached to the top outlet pipe on the auxilliary oil cooler. Always replace the special tool after use .

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

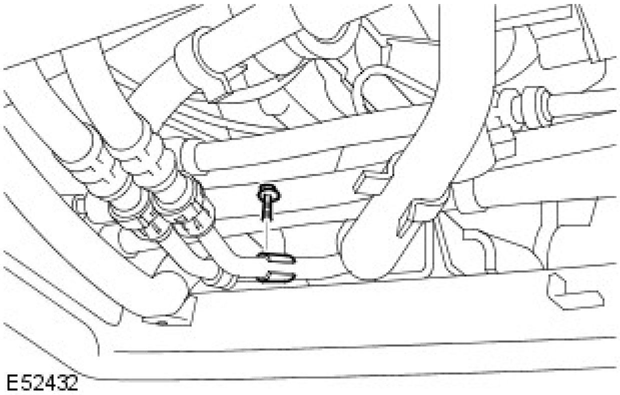
3. Remove the radiator access panel.



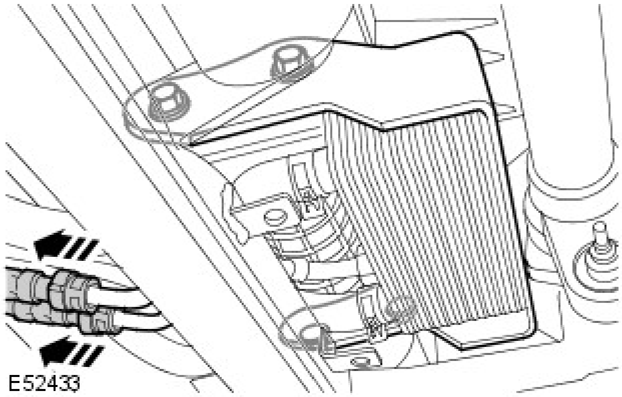
- Remove the 4 bolts.

4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Remove the oil cooler pipe support bracket.



- Remove the bolt.

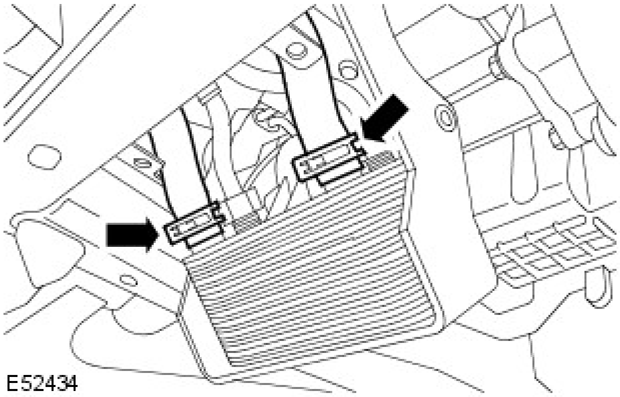


6. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

Release the oil cooler.

- Using the special tool, disconnect the oil cooler hoses.
- Remove the 4 bolts.



7. Disconnect the coolant hoses.

- Position a container to collect the fluid spillage.
- Clamp the relevant hoses, to minimise the coolant loss.
- Release the 2 clips.

Installation

1. Connect the coolant hoses.

- Clean the component mating faces.
- Secure the clips.
- Remove the hose clamps.

2. Install the oil cooler.

- Clean the component mating faces.
- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).
- Connect the hoses.

3. Install the oil cooler pipe support bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).

4. Install the radiator access panel.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

6. Check and top-up the engine oil.

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

8. Check and top-up the coolant.

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Engine - V8 S/C 4.2L Petrol - Engine Front Cover

In-vehicle Repair

Removal

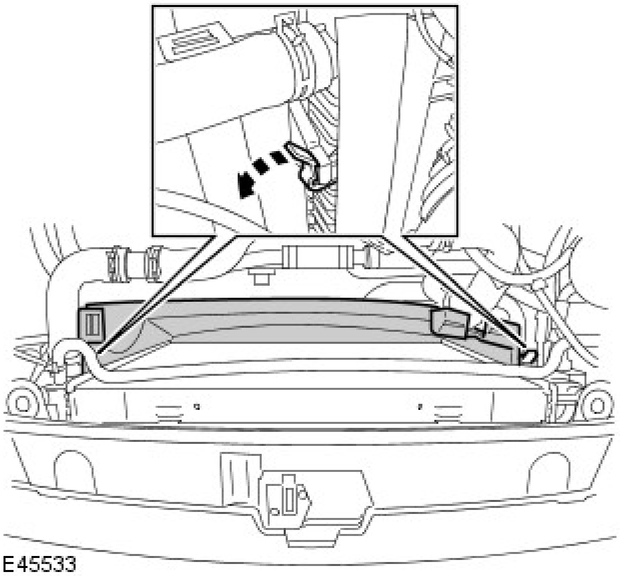
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the cooling fan lower shroud.

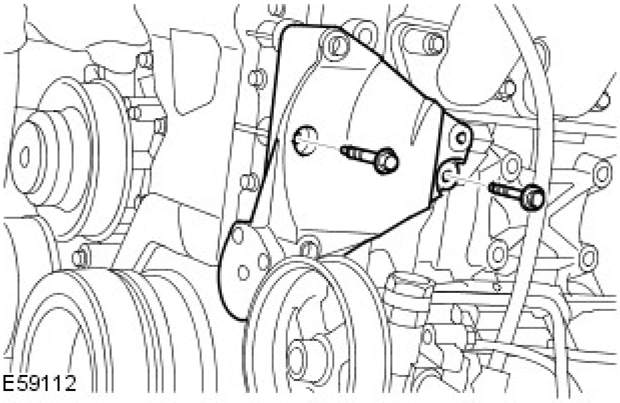
- Release the 2 clips.

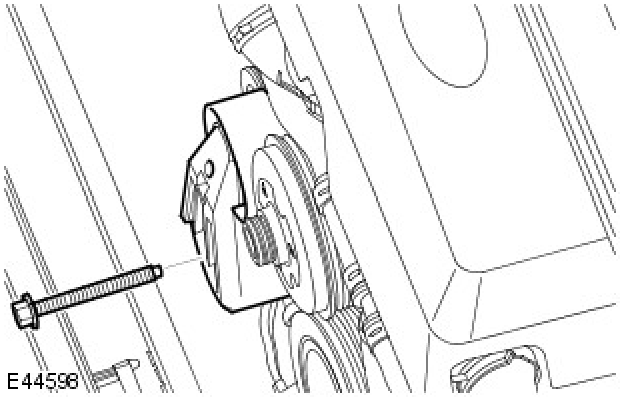


4. Remove the air conditioning (A/C) compressor.
For additional information, refer to: Air Conditioning (A/C) Compressor (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Removal and Installation).

5. Remove the A/C compressor mounting bracket.

- Remove the 2 bolts.





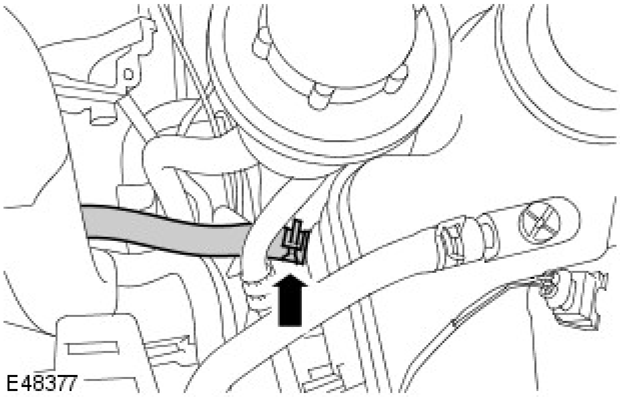
6. Remove the cooling fan drive belt tensioner.

- Remove the bolt.

7. Remove the coolant manifold.
For additional information, refer to: Coolant Manifold (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

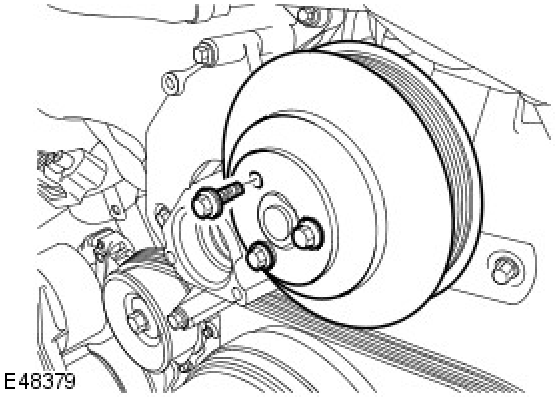
8. Disconnect the coolant expansion tank hose.

- Release the clip.



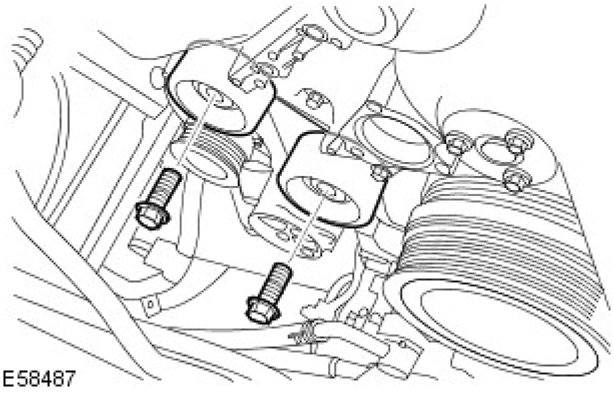
9. Remove the coolant pump pulley.

- Remove the 3 bolts.



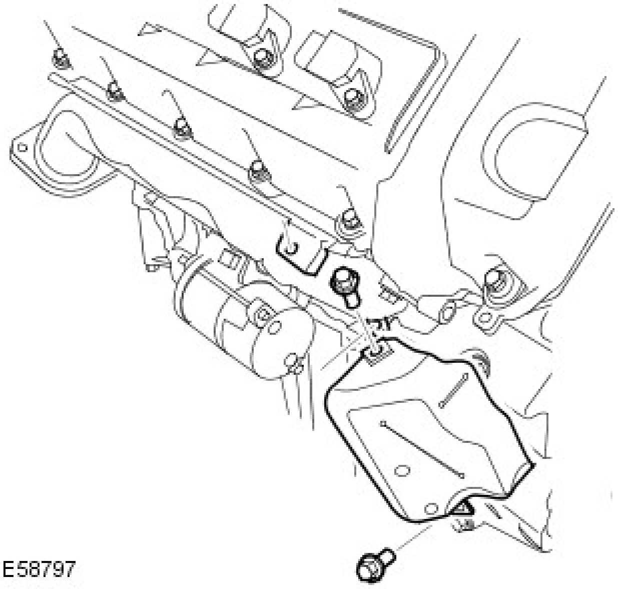
10. Remove the accessory drive belt idler pulley.

- Remove the bolt.
- Repeat the above procedure for the remaining idler pulley.



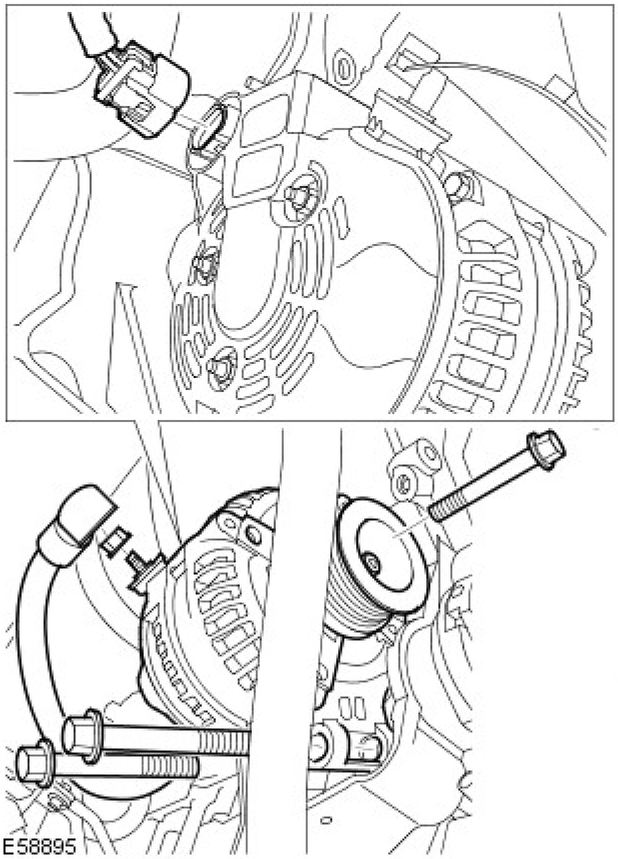
11. Remove the exhaust manifold heat shield.

- Remove the 2 screws.



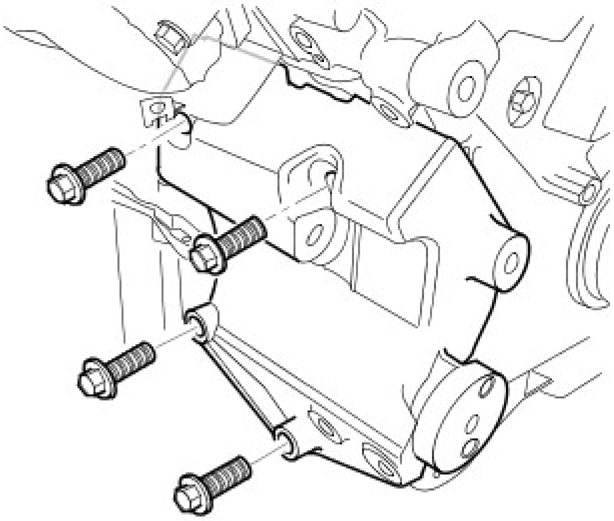
12. Disconnect the battery positive cable.

- Release the cover.
- Remove the nut.


E58895

13. Remove the generator.

- Remove the 3 bolts.
- Disconnect the electrical connector.


E58798

14. Remove the generator mounting bracket.

- Remove the 4 bolts.

15. Remove the crankshaft front oil seal.
For additional information, refer to: Crankshaft Front Seal (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

16. Remove the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

17. Remove the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

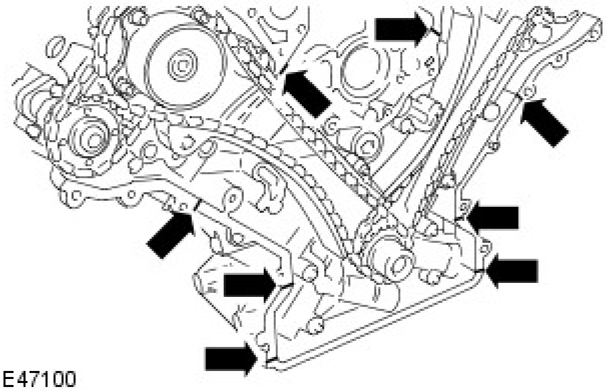
18. Remove the engine front cover.

- Release the engine wiring harness clips.
- Remove the 24 bolts.
- Remove and discard the gasket.

Installation

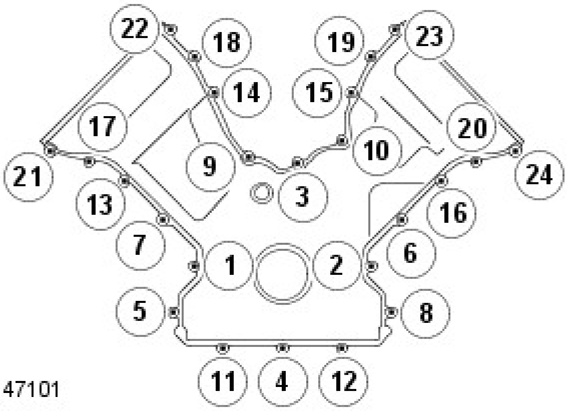
1. Install the engine front cover.

- Clean the component mating faces.
- Apply a bead of sealant 3 mm diameter, by 12 mm long, to the 8 places indicated.



E47100

2. Evenly and progressively tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).



E47101

3. Install the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

4. Install the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

5. Install the crankshaft front oil seal.
For additional information, refer to: Crankshaft Front Seal (303-01A Engine - V8 S/C 4.2L Petrol, In-vehicle Repair).

6. Install the generator mounting bracket.

- Tighten the bolts to 45 Nm (33 lb.ft).

7. Install the generator.

- Tighten the 3 bolts to 48 Nm (35 lb.ft).
- Connect the electrical connector.

8. Connect the battery positive cable.

- Tighten the nut to 10 Nm (7 lb.ft).

- Secure the cover.

9. Install the exhaust manifold heat shield.

- Tighten the screws.

10. Install the A/C mounting bracket.

- Tighten the bolts to 25 Nm (18 lb.ft).

11. Install the A/C compressor.
For additional information, refer to: Air Conditioning (A/C) Compressor (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Removal and Installation).

12. Install the accessory drive belt idler pulleys.

- Tighten the bolts to 25 Nm (18 lb.ft).

13. Install the coolant pump pulley.

- Tighten the bolts to 10 Nm (7 lb.ft).

14. Install the coolant manifold.
For additional information, refer to: Coolant Manifold (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

15. Install the coolant expansion tank hose.

- Connect the clip.

16. Install the cooling fan drive belt tensioner.

- Tighten the pulley bolt to 25 Nm (18 lb.ft).
- Tighten the tensioner bolt to 40 Nm (30 lb.ft).

17. Install the cooling fan shroud.

18. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

19. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

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Engine - V8 S/C 4.2L Petrol - Exhaust Manifold LH

In-vehicle Repair

Removal

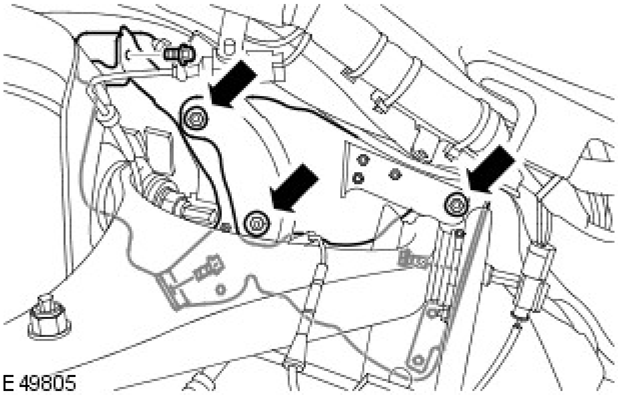
All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

3. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

4. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



5. NOTE: The heatshield consists of 3 parts.

Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.

Left-hand drive vehicles

6. Check the road wheels are in the straight ahead position, then remove the steering column universal joint upper clamp bolt.

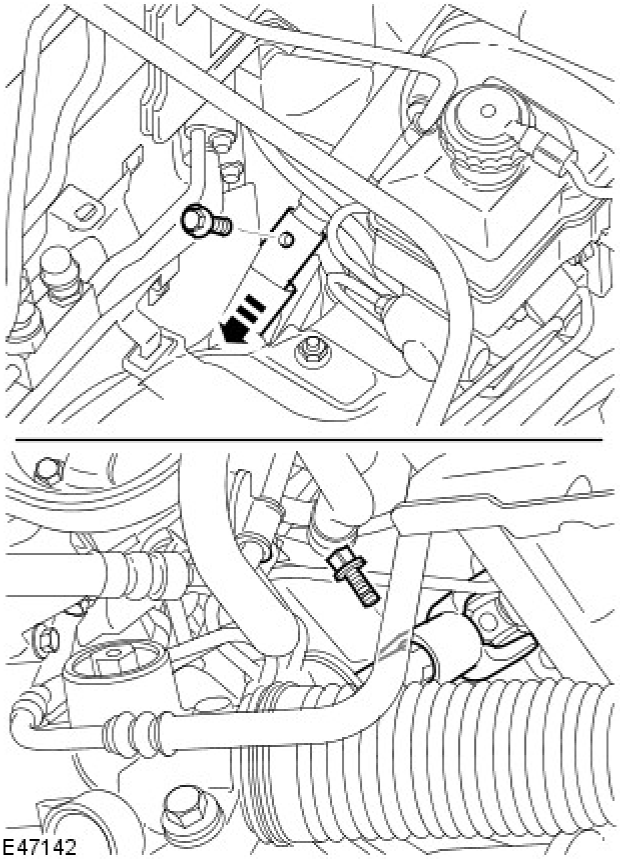
- Discard the retaining bolt.

7. Release the upper steering column shaft.

8. Remove the steering gear universal joint clamp bolt.

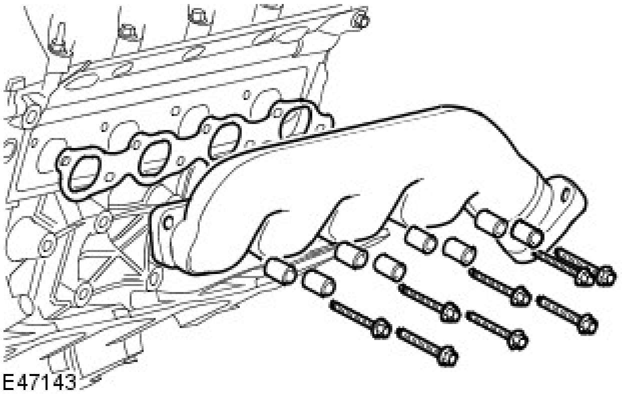
- Discard the retaining bolt.

9. Release and remove the shaft and joint assembly.


E47142

10. Remove the exhaust manifold.

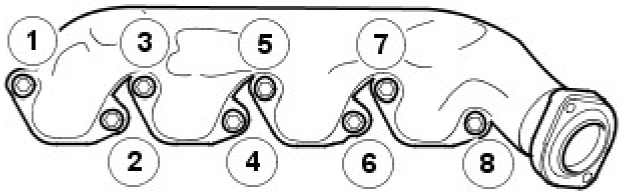
- Remove the 8 bolts.
- Collect the spacers and discard the bolts.
- Remove the gasket/heat shield retaining bolt.
- Discard the gasket.


E47143

Installation

All vehicles

1. Clean the component mating faces.



E47144

2. Install the exhaust manifold.

- Install a new gasket.
- Install, and lightly tighten the bolts.
- Evenly and progressively, tighten the bolts in the sequence shown to 20 Nm (15 lb.ft).

Left-hand drive vehicles

3. Install the steering column lower universal joint assembly.

- Clean the component mating faces.
- Install new patchlock bolts and tighten to 25 Nm (18 lb.ft).

4. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.

5. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

6. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 S/C 4.2L Petrol - Exhaust Manifold RH

In-vehicle Repair

Removal

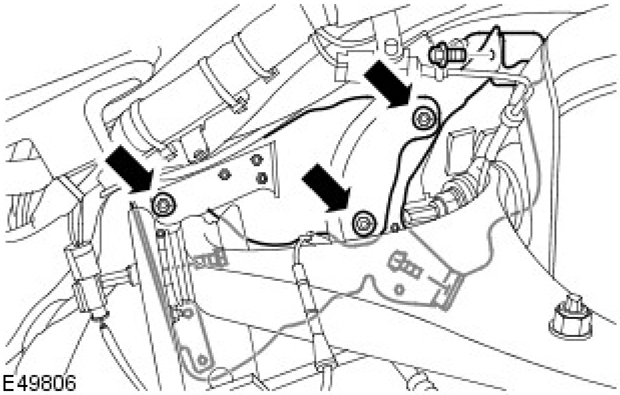
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

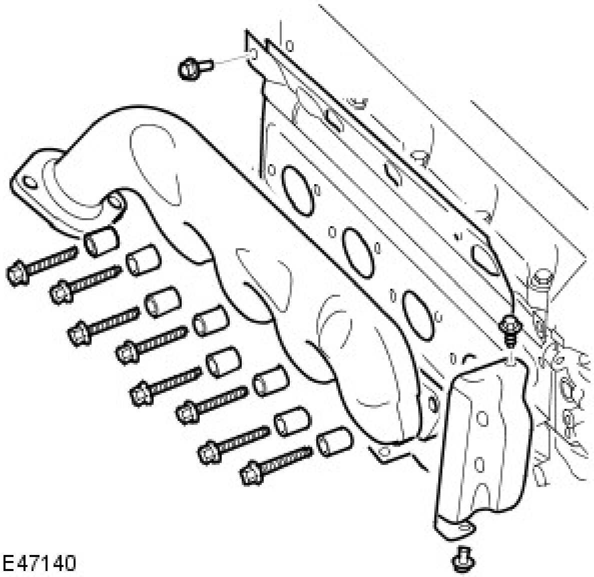
4. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



5. NOTE: The heatshield consists of 3 parts.

Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.

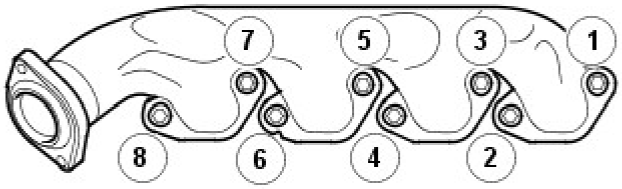


6. Remove the exhaust manifold.

- Remove 2 bolts and the heat shield.
- Remove the gasket/heat shield retaining bolt.
- Remove the 8 bolts.
- Collect the spacers and discard the bolts.
- Discard the gasket/heat shield.

Installation

1. Clean the component mating faces.



E47141

2. Install the exhaust manifold.

- Install the gasket/heat shield.
- Install, and lightly tighten the bolts.
- Evenly and progressively, tighten the bolts in the sequence shown to 20 Nm (15 lb.ft).
- Tighten the M6 bolt to 10 Nm (7 lb.ft).
- Install the exhaust heat shield.
- Install the bolts.

3. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.

4. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

5. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 S/C 4.2L Petrol - Auxiliary Oil Cooler

In-vehicle Repair

Removal

• NOTE: The special tool required to release the hoses is attached to the top outlet pipe on the cooler. Always install the special tool to the outlet pipe after use.

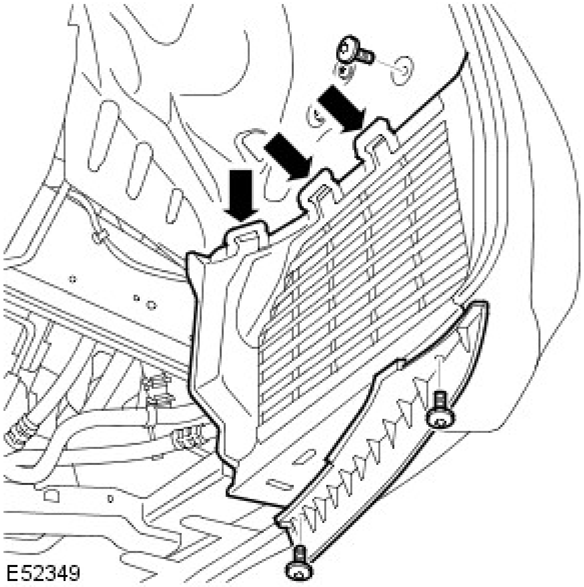
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

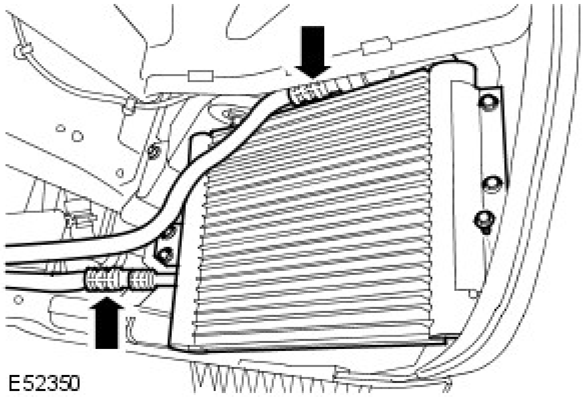
3. Remove fender splash shield grille.

- Remove the 3 screws.
- Release the 3 clips and remove the cover.



4. Remove the oil cooler.

- Remove the 5 bolts.
- Position a container to collect the oil spillage.
- Disconnect the 2 hoses.



Installation

1. Install the oil cooler.

- Clean the component mating faces.
- Connect the hoses.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the fender splash shield grille.

- Clean the component mating faces.
- Secure in the 3 clips.
- Install the screws.

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Check and top-up the engine oil.

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Auxiliary Oil Cooler Thermostat

In-vehicle Repair

Removal

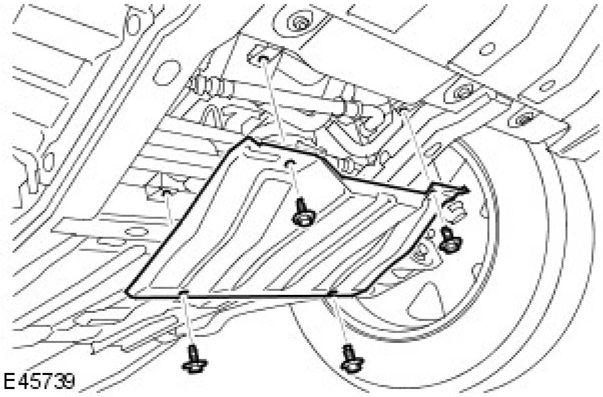
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the radiator access panel.

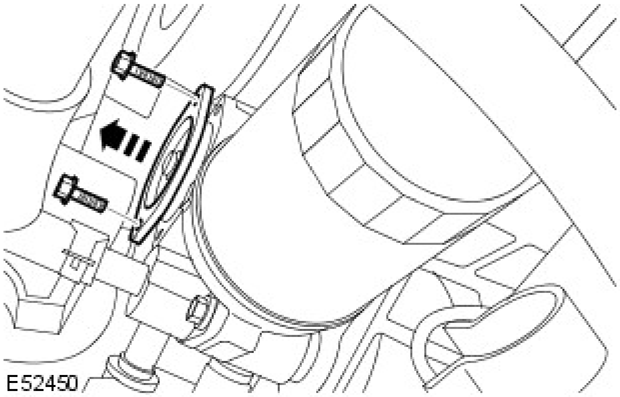
- Remove the 4 bolts.



4. NOTE: Some fluid spillage is inevitable during this operation.

Remove the thermostat.

- Position an absorbent cloth to collect fluid spillage.
- Remove the 2 bolts.
- Remove and discard the O-ring seal.



Installation

1. Install the thermostat.

- Clean the component mating faces.
- Install a new O-ring seal.
- Install the bolts and tighten to 10 Nm (7 lb.ft).

2. Install the radiator access panel.

- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Oil Filter Housing

In-vehicle Repair

Removal

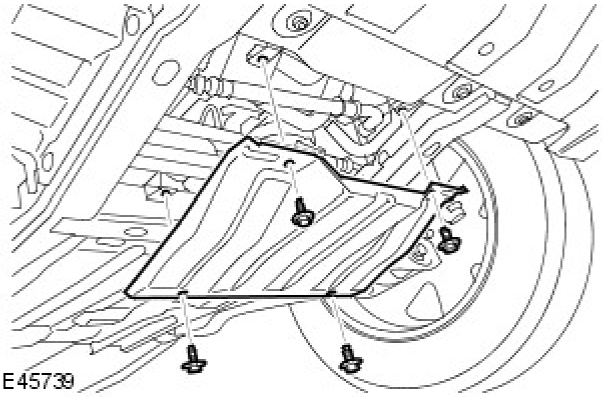
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

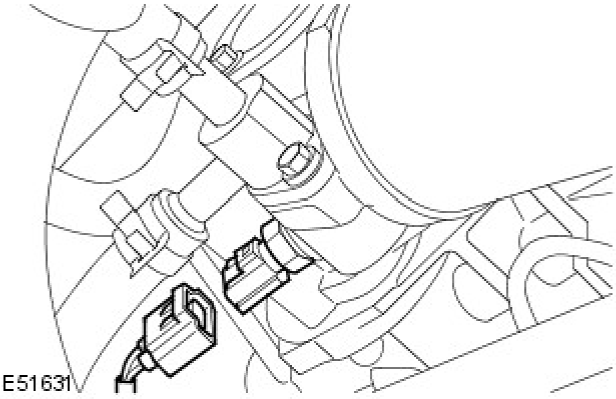
Raise and support the vehicle.

3. Remove the radiator access panel.

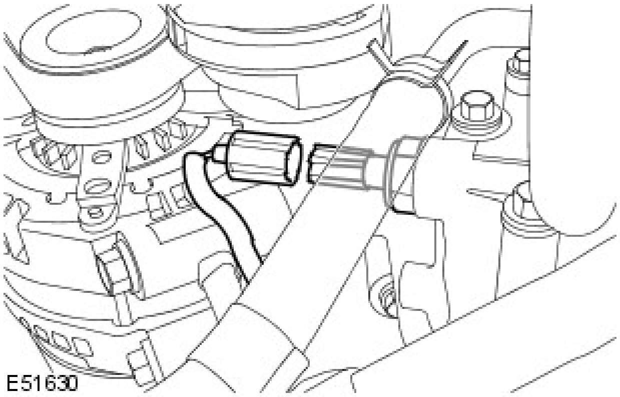
- Remove the 4 bolts.

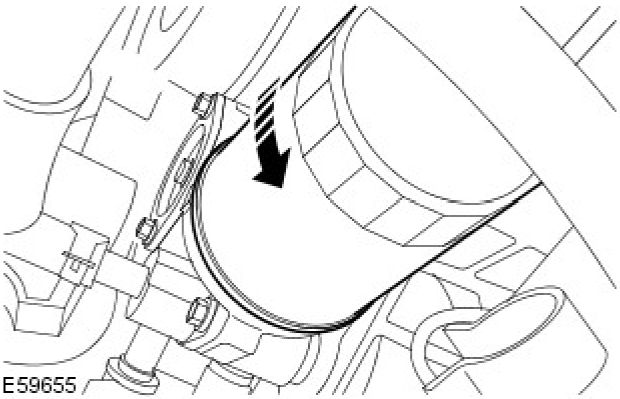


4. Disconnect the engine oil temperature sensor electrical connector.



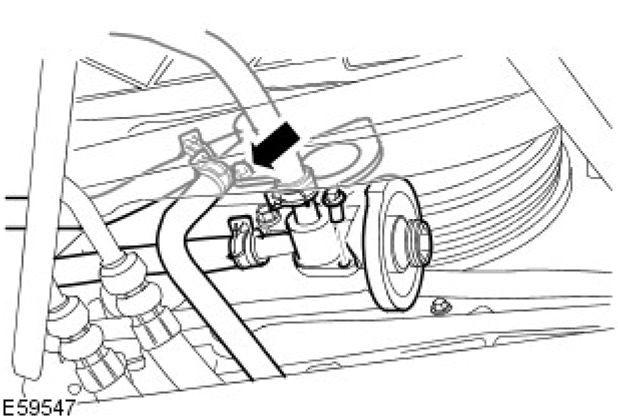
5. Disconnect the engine oil pressure (EOP) sensor electrical connector.





6. Remove the engine oil filter.

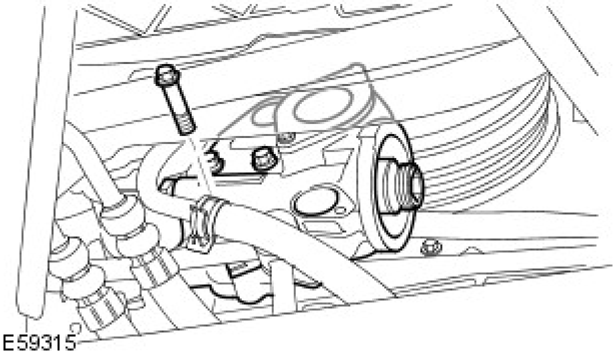
- Position a container to collect the fluid spillage.



7. ⚠CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the oil cooler hose adapter.

- Remove the bolt.
- Remove and discard the O-ring seal.
- Repeat the above procedure for the remaining adapter.

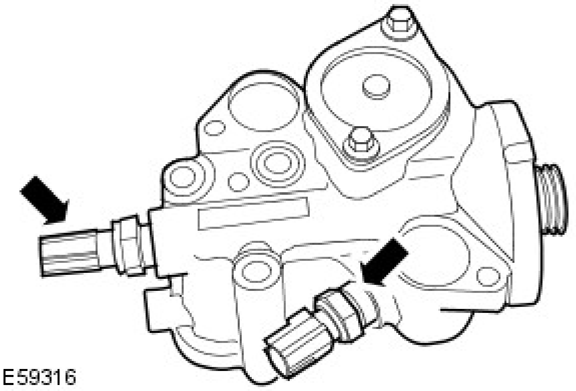


8. Remove the oil filter housing.

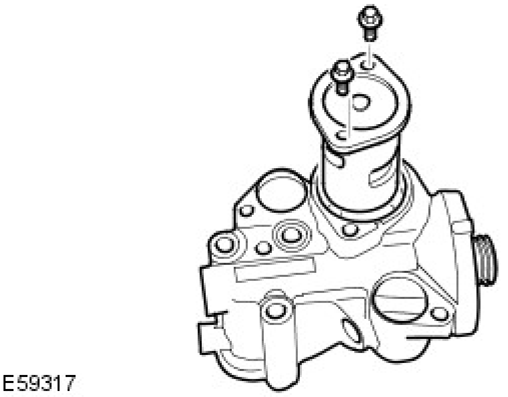
- Remove the 3 bolts.
- Remove and discard the O-ring seal.

9. NOTE: Do not disassemble further if the component is removed for access only.

Remove the engine oil temperature sensor.



10. Remove the EOP sensor.



11. Remove the auxiliary oil cooler thermostat.

- Remove the 2 bolts.
- Remove and discard the O-ring seal.

Installation

1. Install the auxiliary oil cooler thermostat.

- Clean the component mating faces.
- Install a new O-ring seal.
- Install the bolts and tighten to 10 Nm (7 lb.ft).

2. Install the EOP sensor.

- Tighten the EOP sensor to 13 Nm (10 lb.ft).

3. Install the engine oil temperature sensor.

- Tighten the engine oil temperature sensor to 20 Nm (15 lb.ft).

4. Install the oil filter housing.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolts to 20 Nm (15 lb.ft).

5. Connect the oil cooler hose adapters.

- Clean the component mating faces.
- Install new O-ring seals.
- Tighten the bolts to 10 Nm (7 lb.ft).

6. Install the engine oil filter.

- Lubricate the seal with clean engine oil.

7. Connect the EOP sensor electrical connector.

8. Connect the engine oil temperature sensor electrical connector.

9. Install the radiator splash shield.

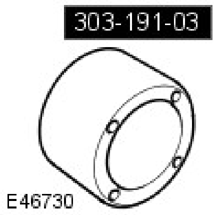
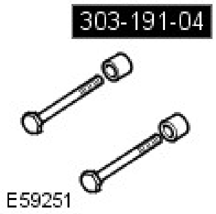
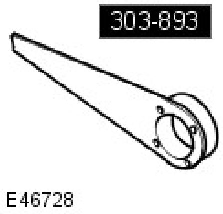
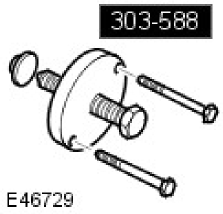
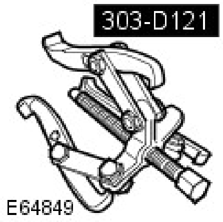
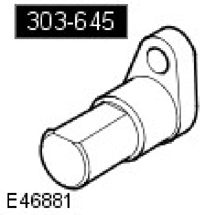
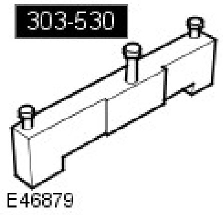
10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

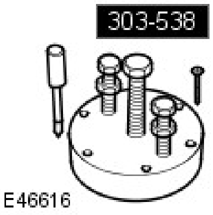
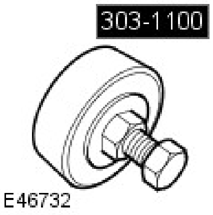
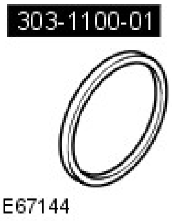
11. Check and top-up the engine oil.

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Crankshaft Main Bearing Carrier

Removal and Installation

Special Tool(s)	
 303-191-03 E46730	Adapter 303-191-03
 303-191-04 E59251	Bolts and spacers 303-191-04
 303-893 E46728	Holding Tool Crankshaft Pulley 303-893(LRT-12-080)
 303-588 E46729	Remover, crankshaft pulley 303-588
 303-D121 E64849	Remover, crankshaft seal 303-D121
 303-645 E46881	Timing Setting tool 303-645
 303-530 E46879	Camshaft setting/locking tool 303-530

	Crankshaft rear oil seal remover/installer 303-538
	Installer, crankshaft seal 303-1100
	Adapter - Crankshaft seal installer 303-1100-01

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

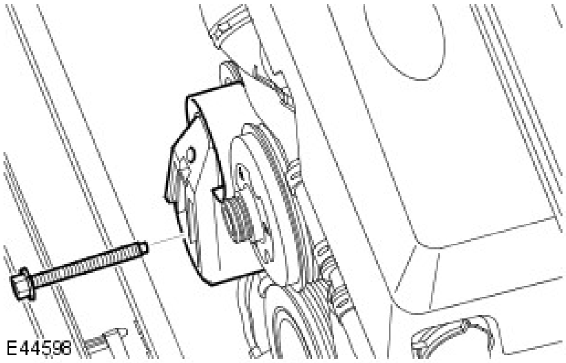
Raise and support the vehicle.

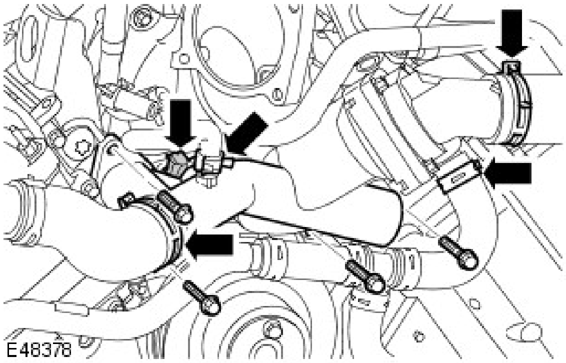
3. Remove the engine.
For additional information, refer to: Engine (303-01A Engine - V8 S/C 4.2L Petrol, Installation).

4. Mount the engine to an engine stand.

5. Remove the cooling fan drive belt tensioner.

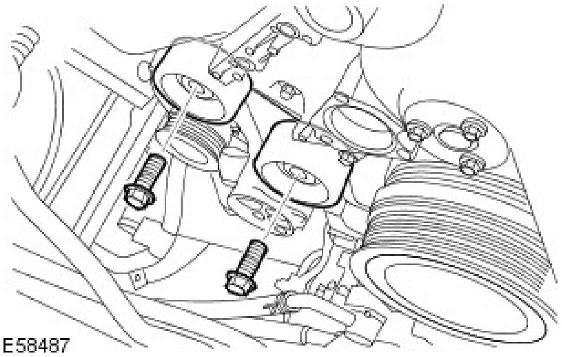
- Remove the bolt.





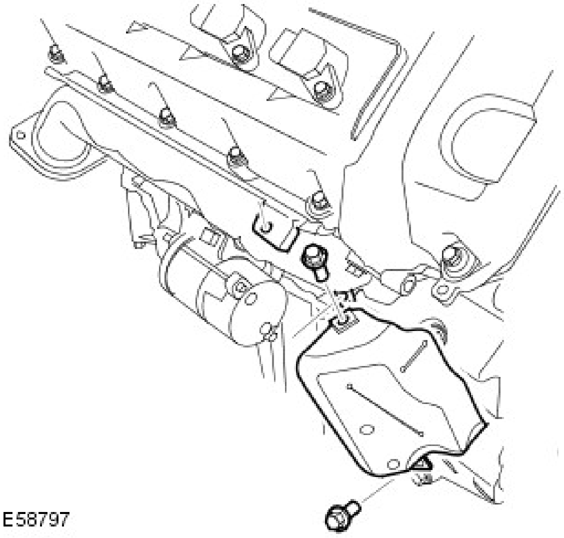
6. Remove the coolant manifold.

- Release the clips and disconnect the 4 coolant hoses.
- Remove the 4 bolts.
- Disconnect the engine coolant temperature (ECT) sensor electrical connector.



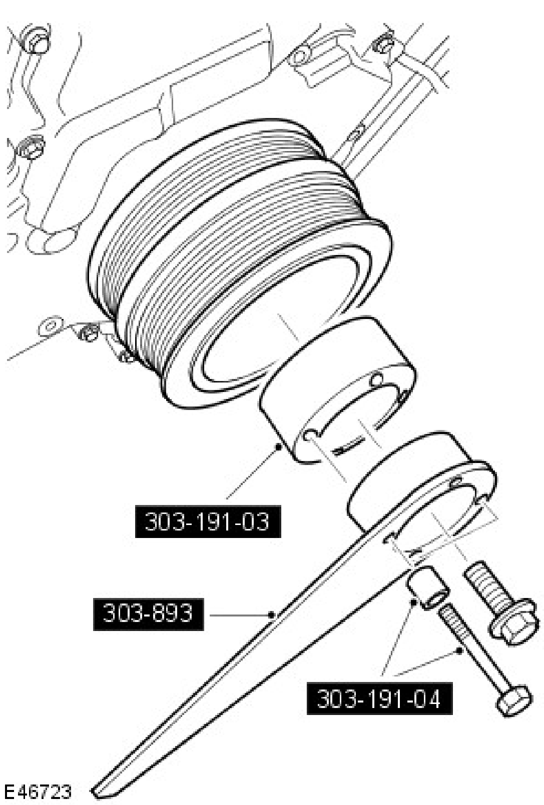
7. Remove the coolant pump and accessory drive belt idler pulleys.

- Remove the bolts.



8. Remove the exhaust manifold heat shield.

- Remove the 2 bolts.


303-191-03
303-893
303-191-04
E46723

9. ⚠ CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.

Using the special tools, retain the crankshaft pulley.

10. NOTE: The crankshaft pulley retaining bolt will be very tight.

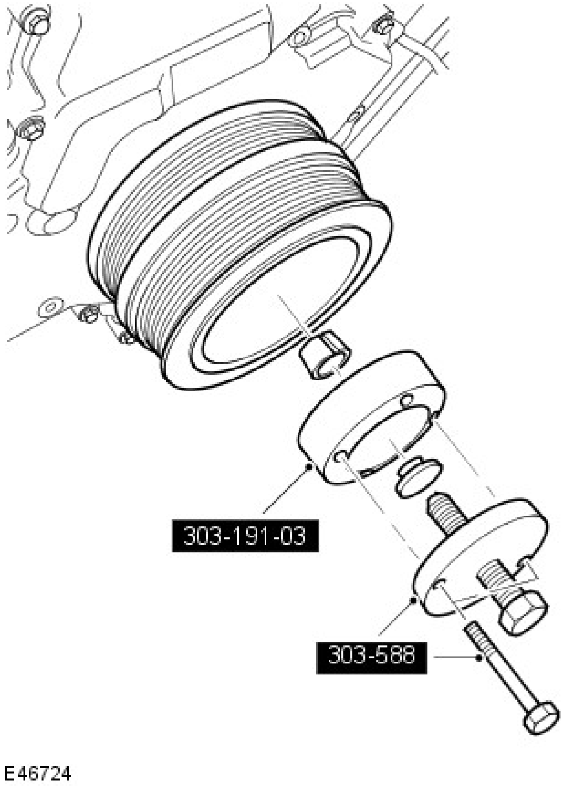
Using the special tools, remove the crankshaft pulley bolt.

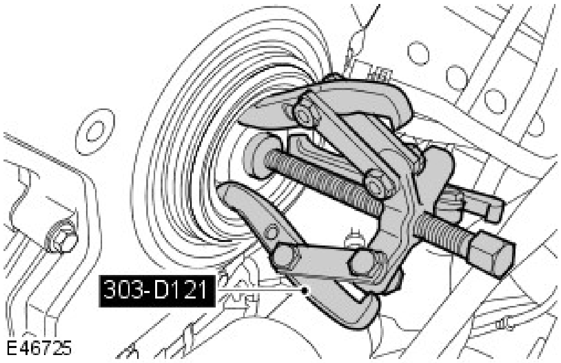
- Discard the bolt.
- Remove the special tools.

11. NOTE: The crankshaft pulley will be very tight.

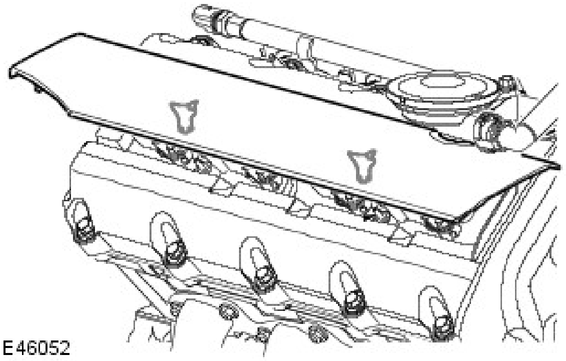
Using the special tools, remove the crankshaft pulley.

- Collect the locking ring.
- Remove the special tools.


303-191-03
303-588
E46724

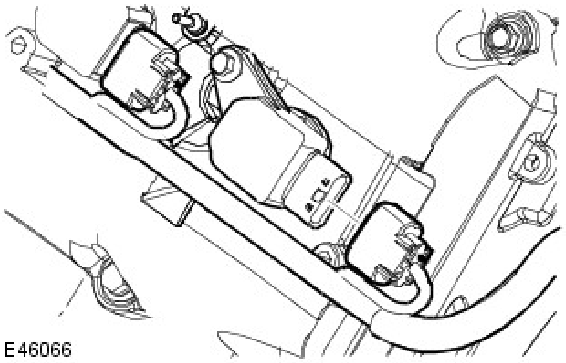

303-D121
E46725

12. Using the special tool, remove and discard the crankshaft front seal.

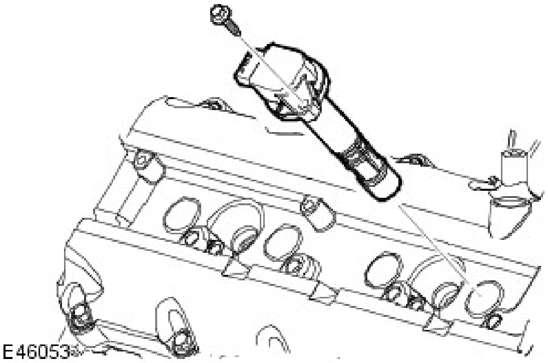


13. Remove the RH ignition coil-on-plug cover.

- Release from the 2 clips.



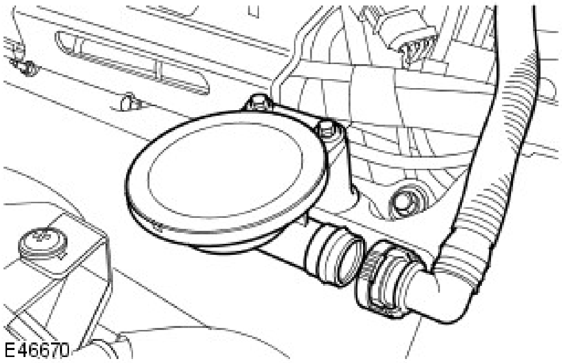
14. Disconnect the RH ignition coil-on-plug electrical connector.



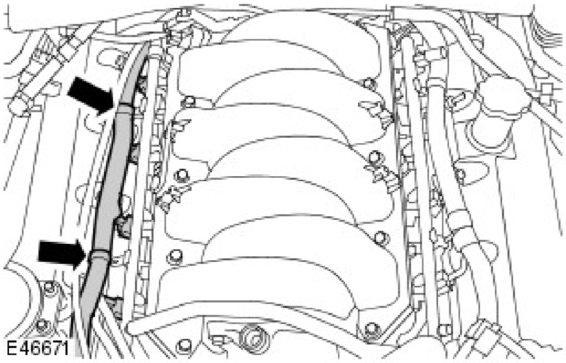
15. Remove the RH ignition coil-on-plug.

- Remove the bolt.
- Remove and discard the seal.

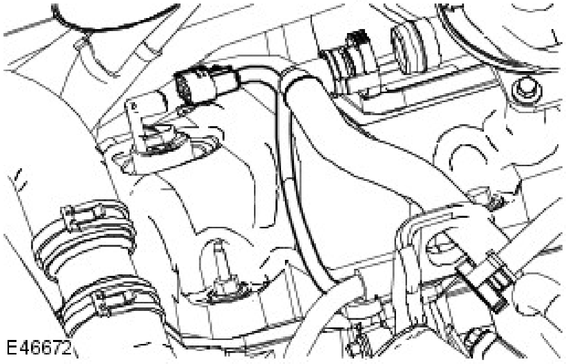
16. Remove the remaining RH ignition coil-on-plugs.



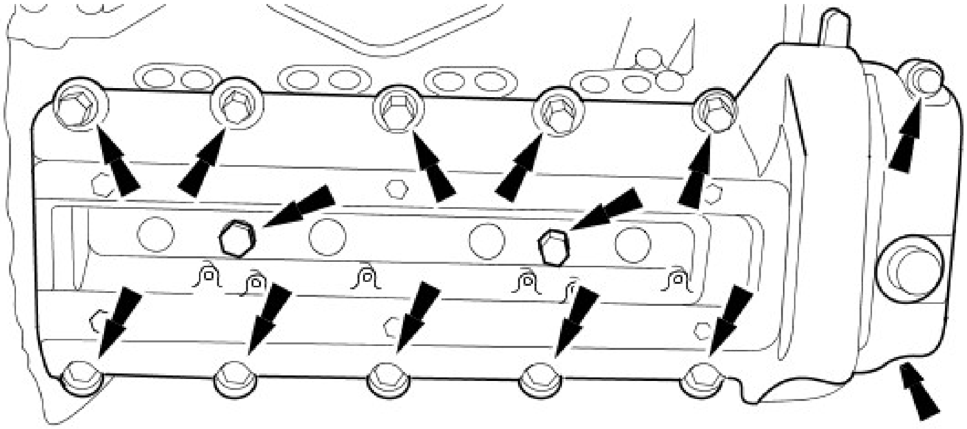
17. Disconnect the positive crankcase ventilation (PCV) line.



18. Release the engine wiring harness from the retaining bracket.



19. Disconnect the RH variable camshaft timing (VCT) oil solenoid electrical connector.

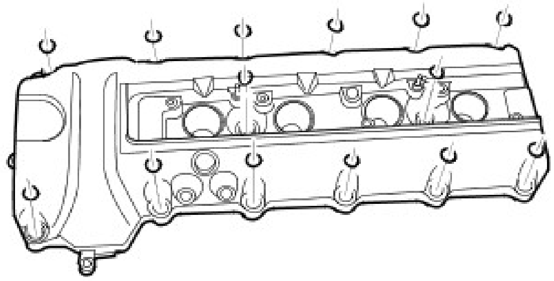


20. NOTE: Note the fitted position of the retaining bolts prior to removal.

Remove the RH valve cover.

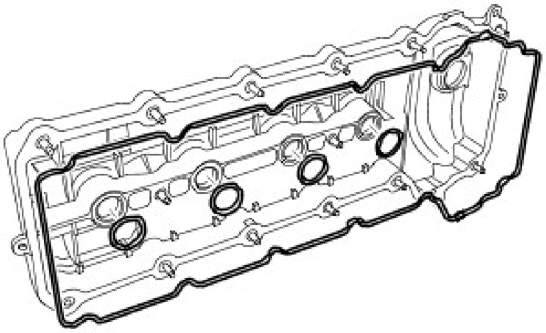
- Remove the 14 valve cover retaining bolts.
- Remove the engine cover bracket.

21. Remove and discard the RH valve cover bolt O-ring seals.


E46676

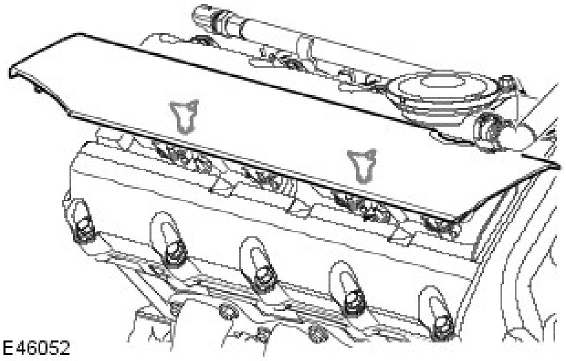
22. Remove and discard the RH valve cover gaskets.

- Remove and discard the seals.

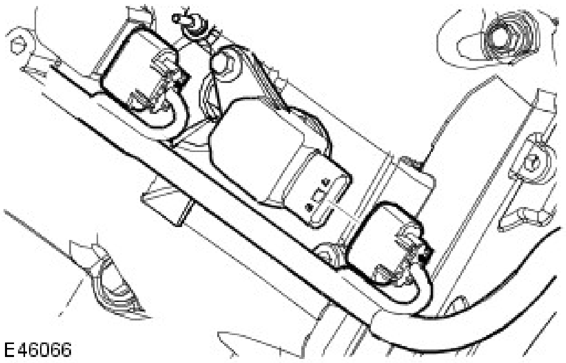

E46677

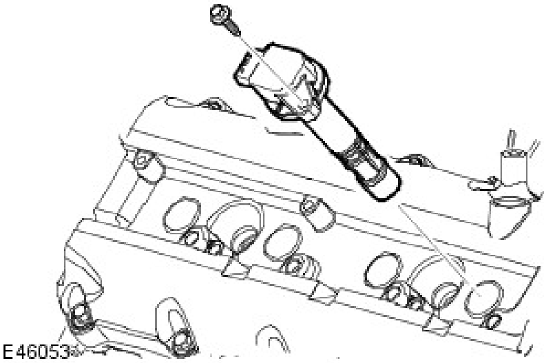
23. Remove the LH ignition coil-on-plug cover.

- Release from the 2 clips.


E46052

24. Disconnect the LH ignition coil-on-plug electrical connector.


E46066



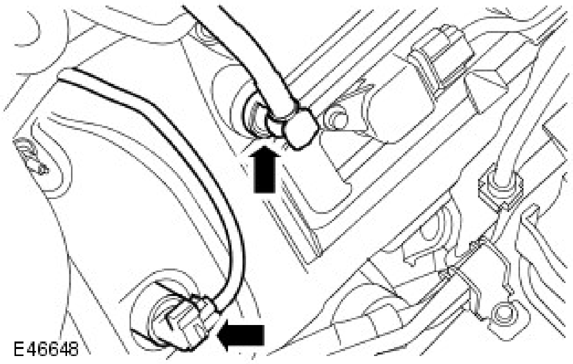
25. Remove the LH ignition coil-on-plug.

- Remove the bolt.
- Remove and discard the seal.

26. Remove the remaining LH ignition coil-on-plugs.

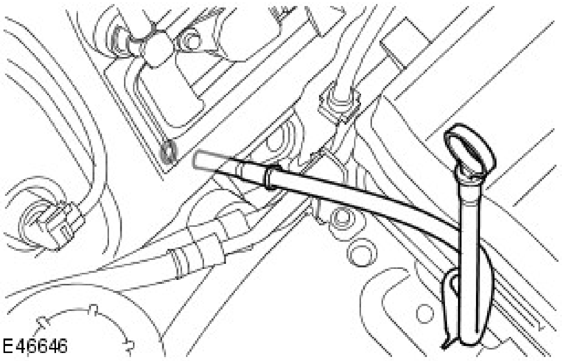
27. Disconnect the LH variable camshaft timing (VCT) oil solenoid electrical connector.

28. Disconnect the valve cover breather hose.

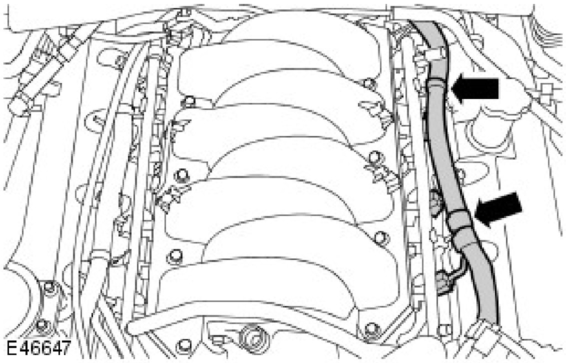


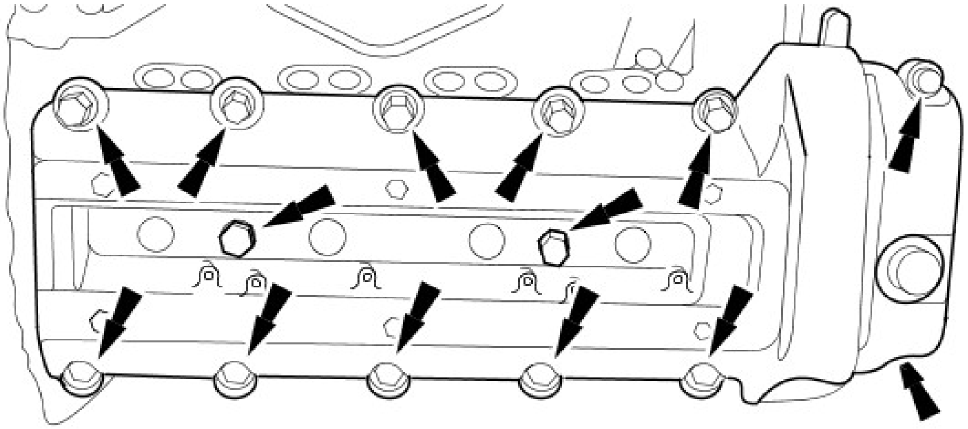
29. Remove the oil level indicator and tube.

- Remove the oil level indicator.
- Remove the nut.
- Remove the tube.
- Remove and discard the O-ring seal.



30. Release the engine wiring harness from the retaining bracket.



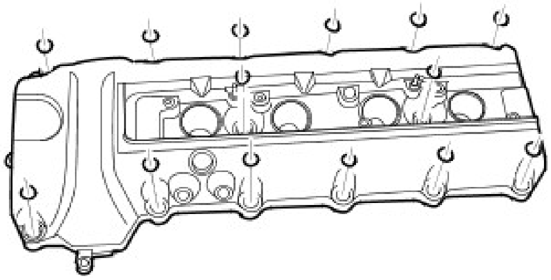


E30696

31. NOTE: Note the fitted position of the retaining bolts prior to removal.

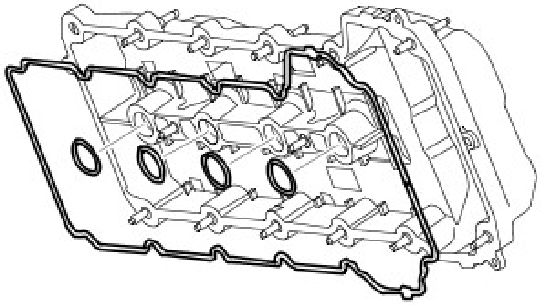
Remove the LH valve cover.

- Remove the 14 valve cover retaining bolts.



E46676

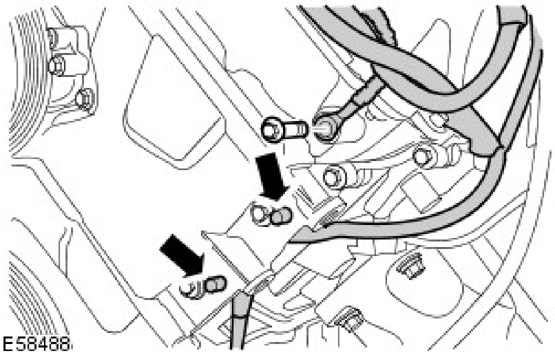
32. Remove and discard the LH valve cover bolt O-ring seals.



E46652

33. Remove and discard the LH valve cover gaskets.

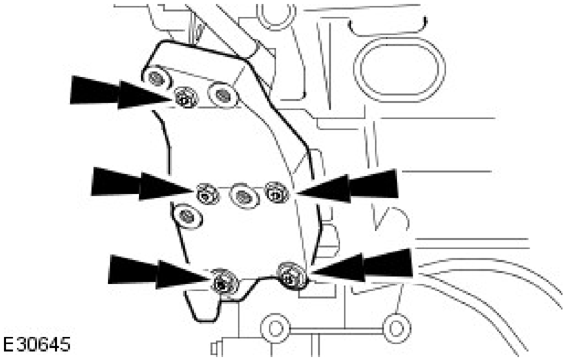
- Remove and discard the seals.



E58488

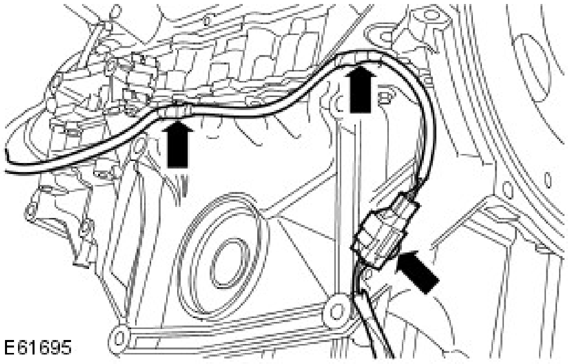
34. Release the engine wiring harness.

- Release the 2 clips.
- Remove the bolt.



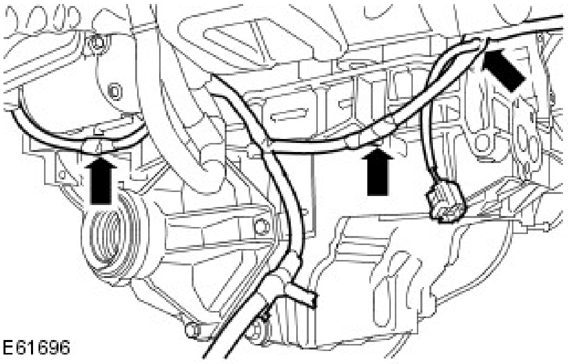
35. Remove the power steering pump mounting bracket.

- Remove the 5 bolts.



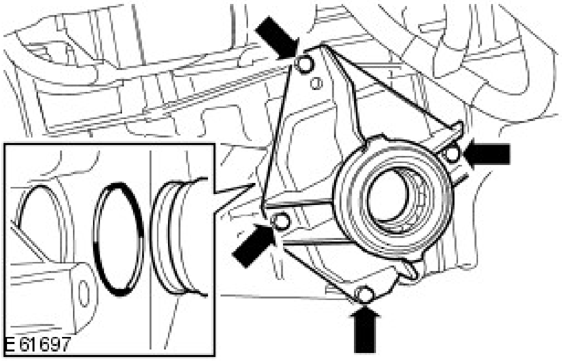
36. Release the wiring harness from the LH side of the engine.

- Release the 3 clips.



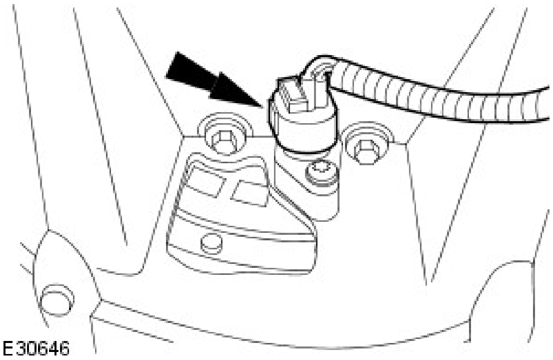
37. Release the wiring harness from the RH side of the engine.

- Release the 3 clips.

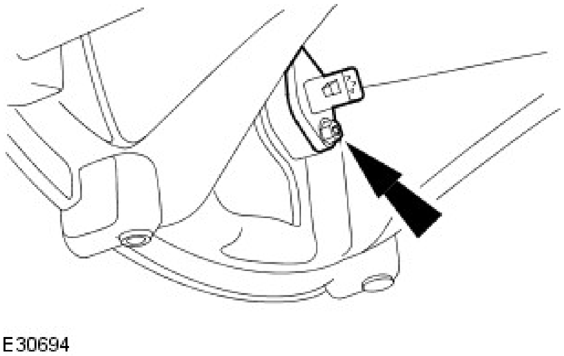


38. Remove the halfshaft support bearing housing.

- Remove the 4 bolts.
- Remove and discard the O-ring seal.

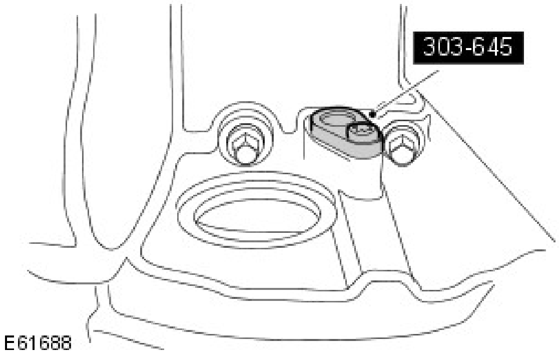


39. Disconnect the crankshaft position (CKP) sensor electrical connector.



40. Remove the CKP sensor.

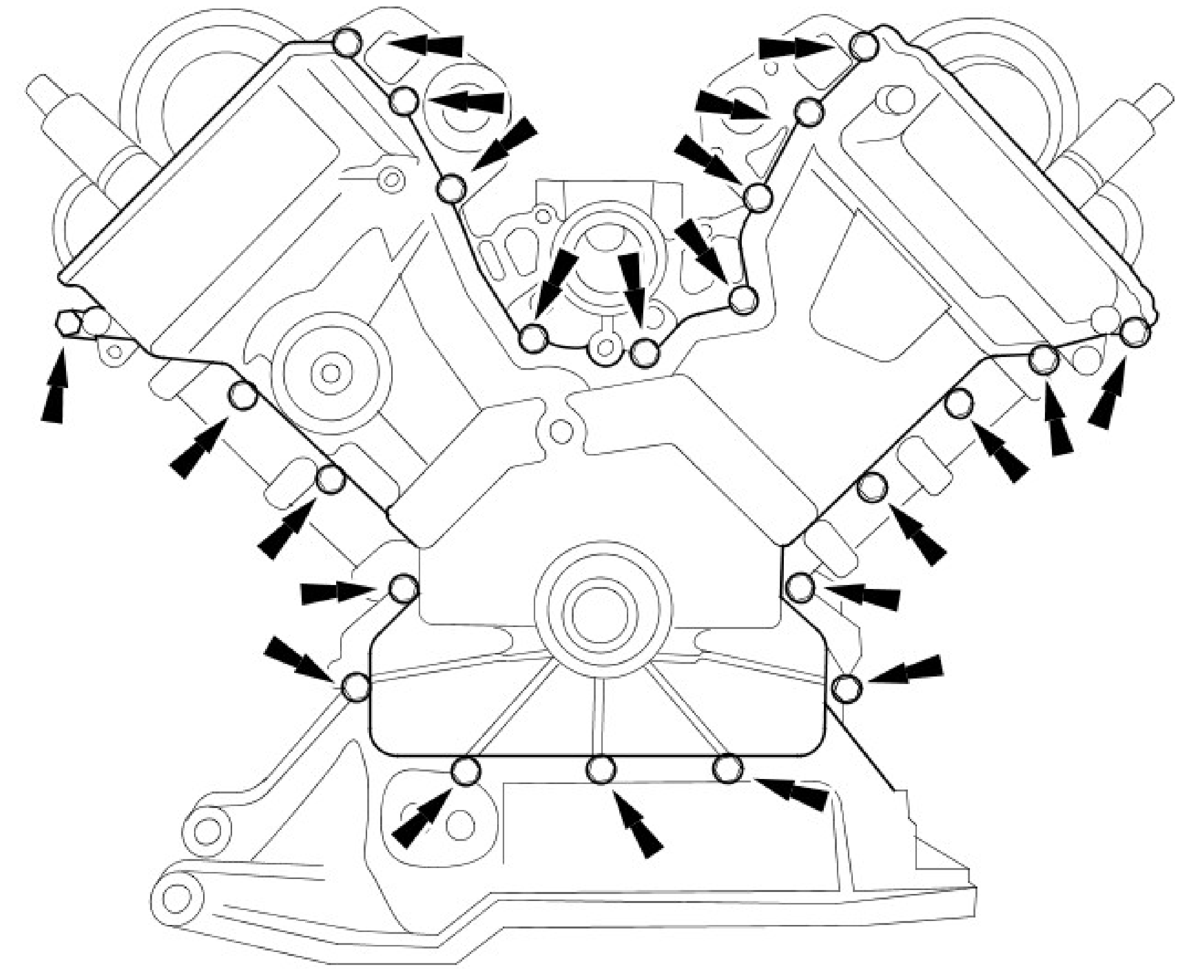
- Remove the bolt.


303-645
E61688

41. NOTE: Install the special tool to the crankshaft sensor aperture.

Lock the crankshaft.

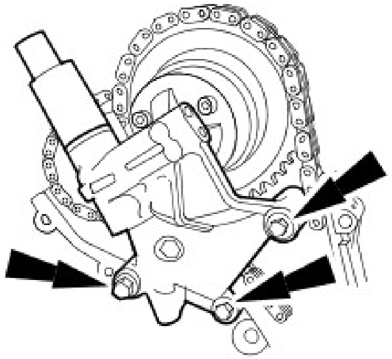
- Install the special tool.
- Install the bolt.



VUJ0002398

42. Remove the engine front cover.

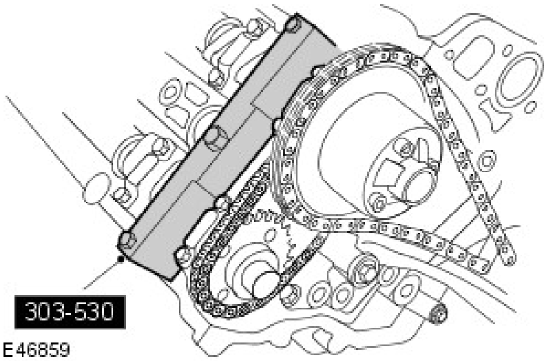
- Remove the 24 bolts.
- Remove and discard the gasket.
- Remove and discard the 3 O-ring seals.



E30699

43. Remove the RH VCT housing.

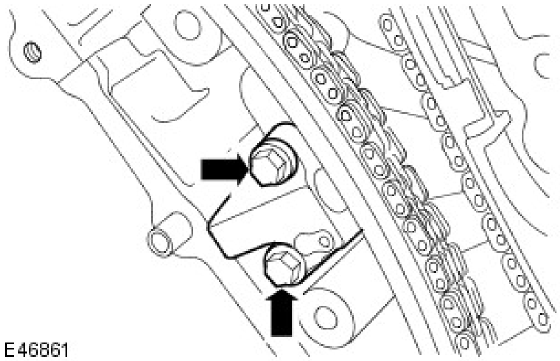
- Remove the 3 bolts.
- Remove and discard the O-ring seals.



E46859

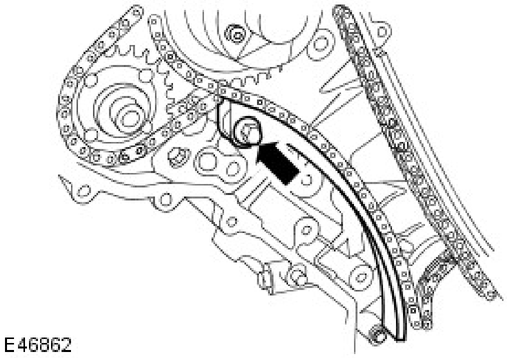
44. Install the special tool to the RH cylinder head.

- Install the 3 bolts.



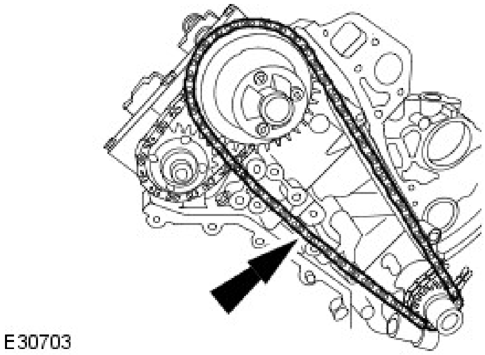
45. Remove the RH primary timing chain tensioner assembly.

- Remove the 2 bolts.

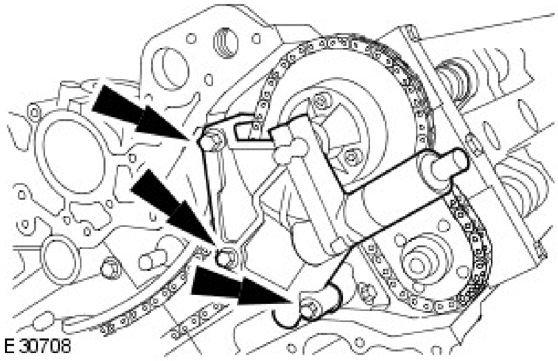


46. Remove the RH primary timing chain tensioner guide.

- Remove the bolt.

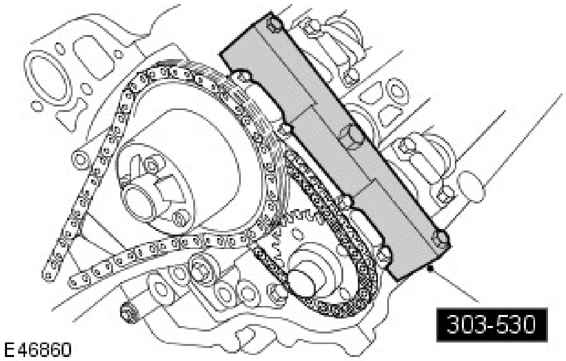


47. Remove the RH primary timing chain.



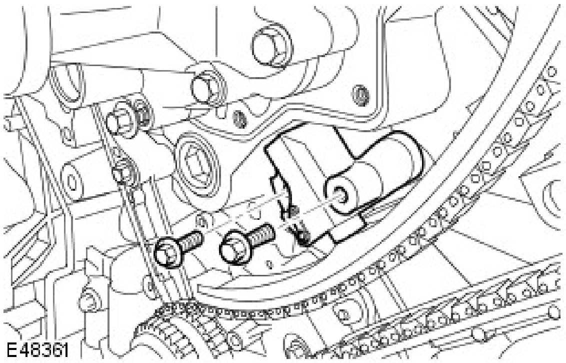
48. Remove the LH VCT housing.

- Remove the 3 bolts.
- Remove and discard the O-ring seals.


303-530
E46860

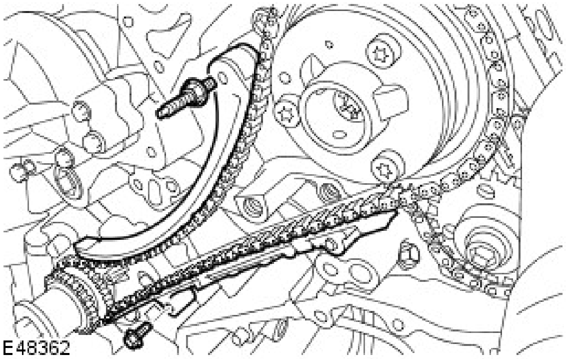
49. Install the special tool to the LH cylinder head.

- Install the 3 bolts.



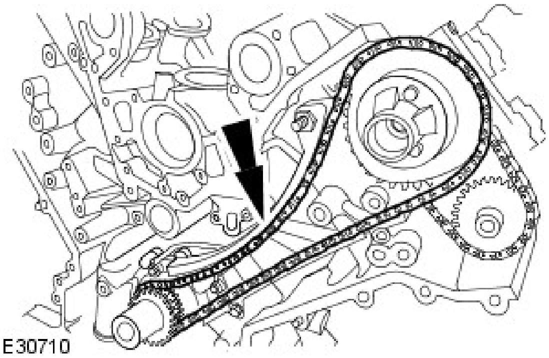
50. Remove the LH primary timing chain tensioner.

- Remove the 2 bolts.

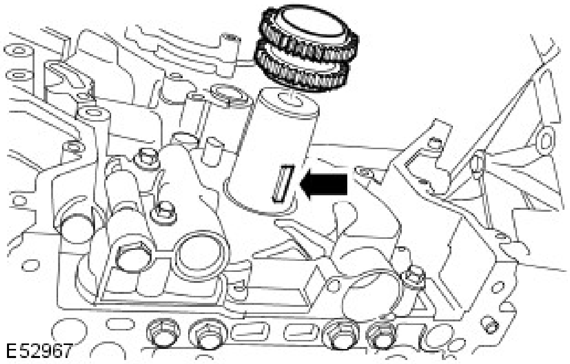


51. Remove the LH upper and lower primary timing chain tensioner guides.

- Remove the 2 bolts.



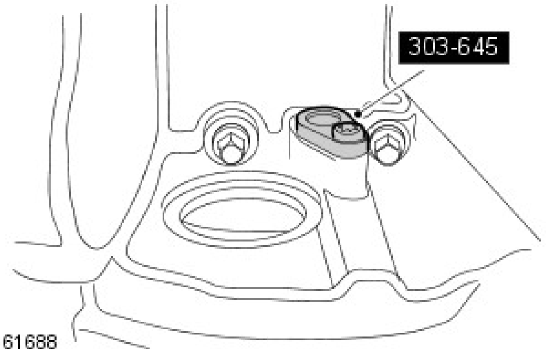
52. Remove the LH primary timing chain.



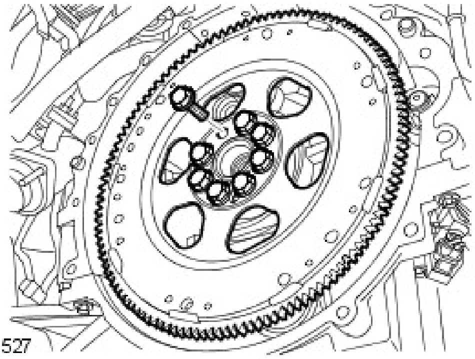
53. NOTE: Note the orientation of the crankshaft sprocket.

Remove the crankshaft sprocket.

- Remove the crankshaft sprocket key.



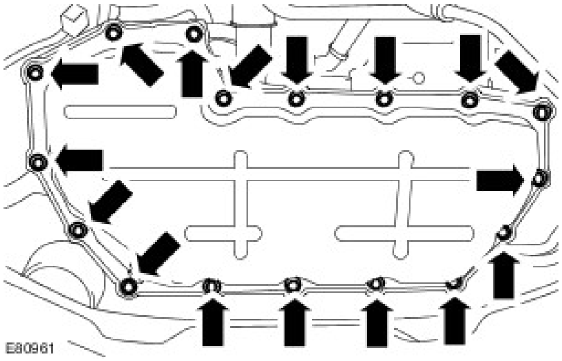
54. Remove the special tool.



55. CAUTION: The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.

Remove the torque converter flexplate.

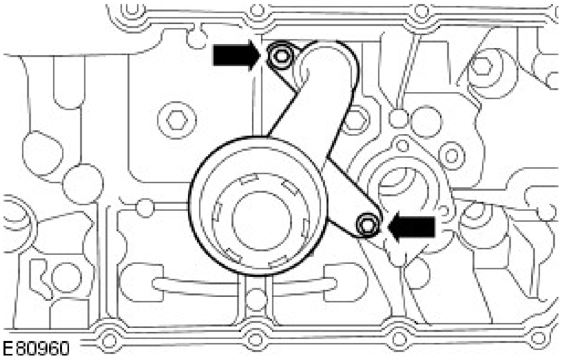
- Remove the 8 bolts.



56. CAUTION: Note the position of the bolts, prior to removal.

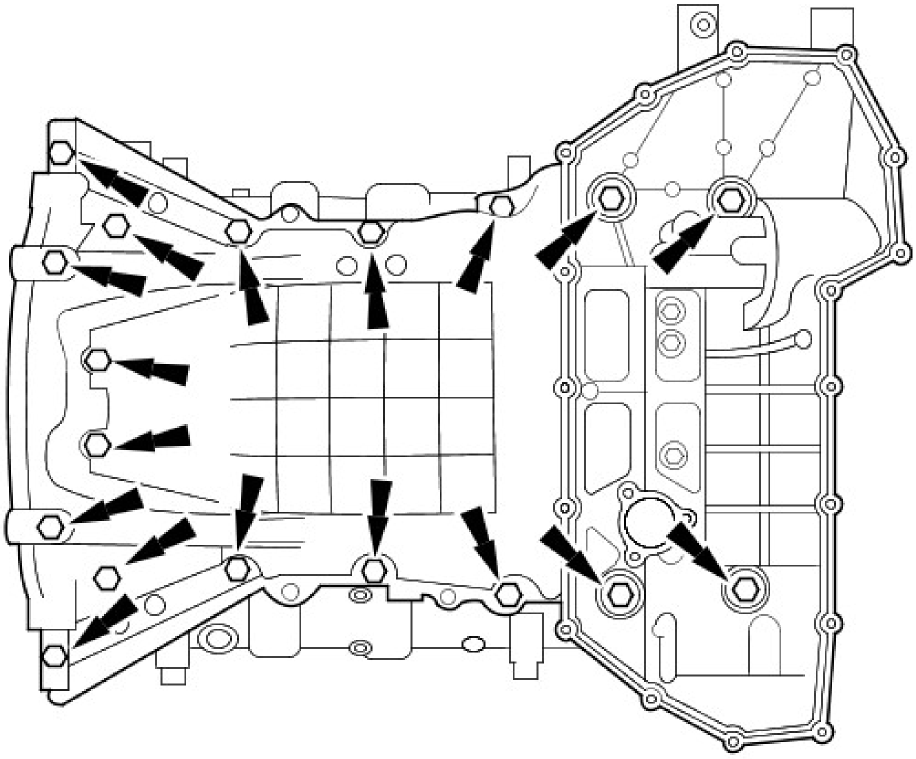
Remove the oil pan.

- Remove the 17 bolts.
- Remove and discard the gasket.



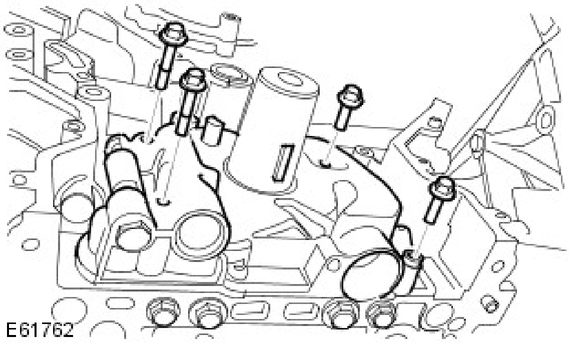
57. Remove the oil strainer pick-up assembly.

- Remove the 2 bolts.
- Remove and discard the O-ring seal.



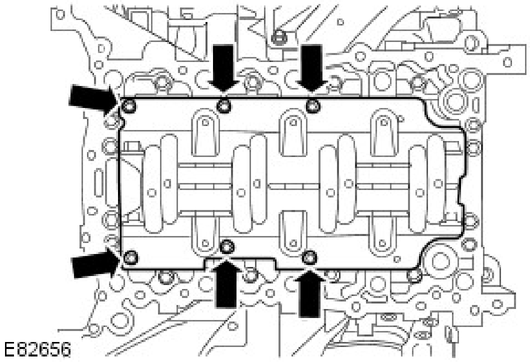
58. Remove the oil pan extension.

- Remove the 18 bolts.



59. Remove the oil pump assembly.

- Remove the 4 bolts.
- Remove and discard the gasket.
- Clean the component mating faces.



60. Remove the baffle plate.

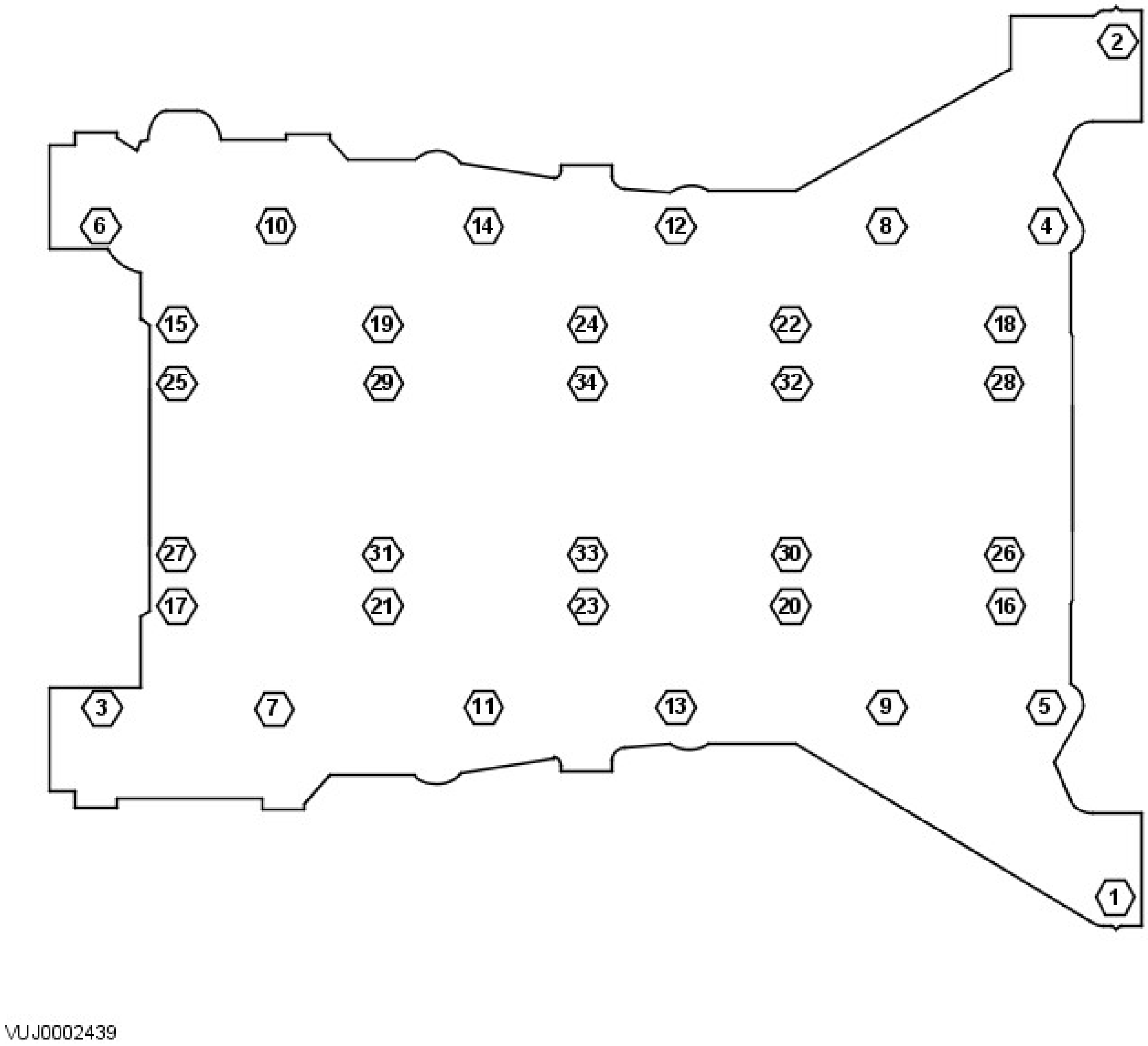
- Remove the 6 bolts.

61. ⚠ CAUTION: To make sure damage does not occur to the crankshaft and piston components, the engine must be inverted on the engine stand. Failure to follow this instruction may result in damage to the engine.

- NOTE: If the crankshaft main bearing carrier retaining bolts have been marked with a center punch dot, they must be discarded and new bolts installed.

Remove the crankshaft main bearing carrier.

- Remove the crankshaft main bearing carrier retaining bolts in the indicated sequence.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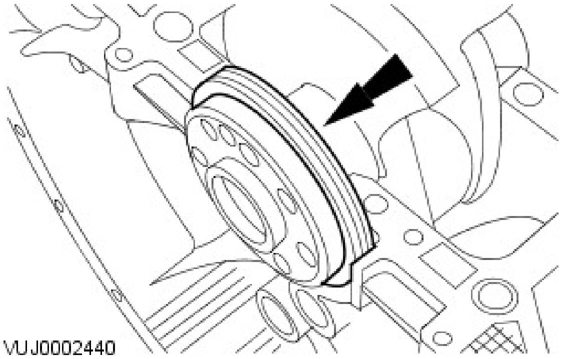

VUJ0002440

62. Discard the crankshaft rear main oil seal.

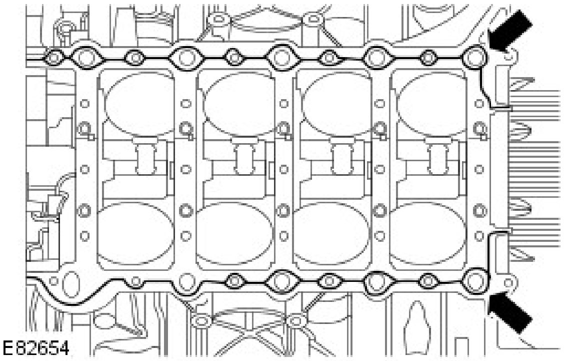
Installation

1. CAUTIONS:

⚠ Use only a plastic scraper when removing the sealing material.

⚠ If any new bolts are to be installed to retain the crankshaft main bearing carrier, pre-stress the retaining bolts by installing the crankshaft main bearing carrier without any sealant and tightening the new retaining bolts to the specified torque. Remove the crankshaft main bearing carrier once the bolts have been pre-stressed. Failure to follow this instruction may result in damage to the vehicle.

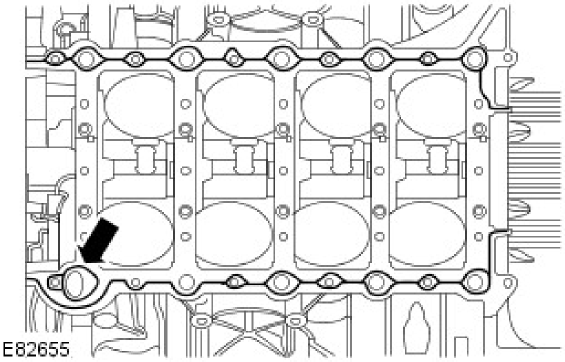
Clean all the mating faces and reusable parts thoroughly and check for damage.


E82654

2. NOTE: Install the crankshaft main bearing carrier and tighten bolts to specification within twenty minutes of applying the sealant.

Apply a 2 mm (0.08in) bead of sealant to the cylinder block in the area shown.

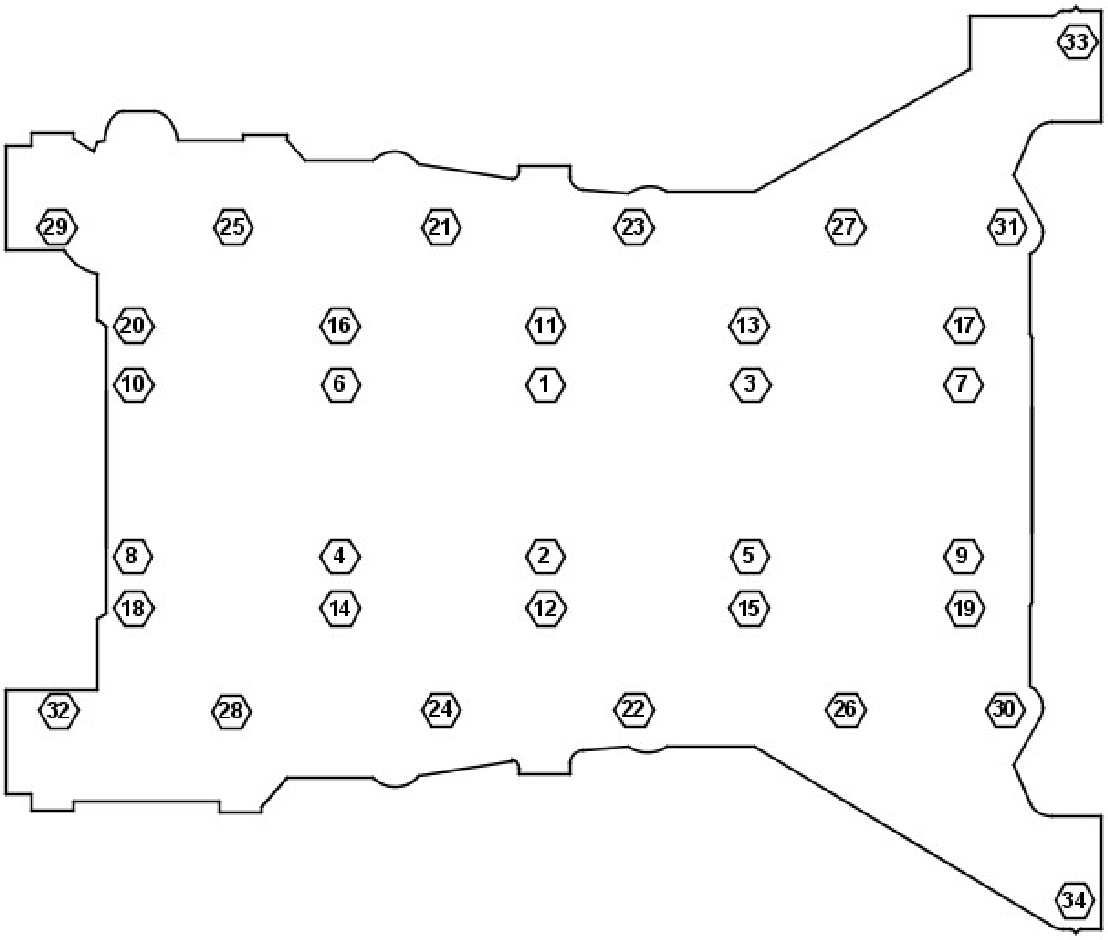
- Use WSS-M4G323-A4-RTV sealant.


E82655

3. NOTE: Install the crankshaft main bearing carrier and tighten bolts to specification within twenty minutes of applying the sealant.

Apply a 1 mm (0.039in) bead of sealant to the cylinder block in the area shown.

- Use WSS-M4G323-A4-RTV sealant.



VUJ0002450

4. ⚠ CAUTION: Make sure all dowels are fully seated into the crankshaft main bearing carrier prior to tightening the bolts.

- NOTE: Do not lubricate the crankshaft main bearing carrier retaining bolts.

- NOTE: Do not rotate the crankshaft until all the retaining bolts are tightened to specification.

- NOTE: The retaining bolts must be tightened within twenty minutes of applying the sealant.

- NOTE: Tighten the retaining bolts in the sequence shown.

Install the crankshaft main bearing carrier to the cylinder block.

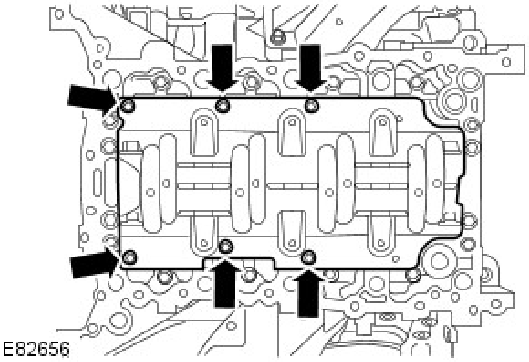
1. Stage 1: Bolts 21 to 32, tighten to 15 Nm (11 lb.ft).
2. Stage 2: Bolts 33 to 34, tighten to 15 Nm (11 lb.ft).
3. Stage 3: Bolts 1 to 10, tighten to 25 Nm (18 lb.ft).
4. Stage 4: Bolts 11 to 20, tighten to 15 Nm (11 lb.ft).
5. Stage 5: Bolts 1 to 10, tighten to 35 Nm (26 lb.ft), then a

further 135 degrees.

6. Stage 6: Bolts 11 to 20, tighten to 20 Nm (15 lb.ft), then a further 150 degrees.
7. Stage 7: Bolts 21 to 32, tighten to 20 Nm (15 lb.ft), then a further 90 degrees.
8. Stage 8: Bolts 33 to 34, tighten to 20 Nm (15 lb.ft), then a further 150 degrees.
9. Stage 9: Center punch each of the bolt heads to indicate it has been reused.

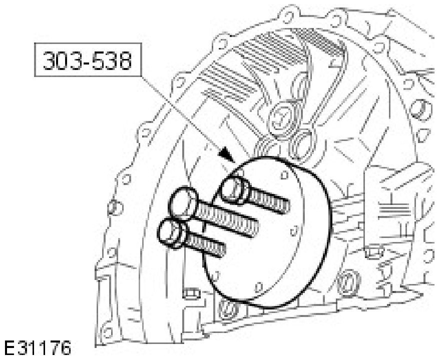
5. Rotate the crankshaft to check correct operation.

6. Remove excess sealant which may squeeze out at the front cover sealing surfaces.



7. Install the baffle plate.

- Tighten the 6 bolts to 6 Nm (4 lb.ft).

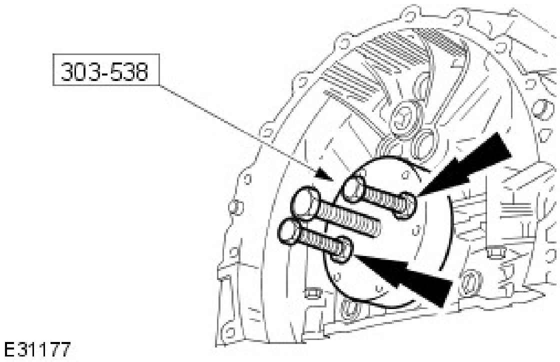


8. NOTE: Carefully remove the transit sleeve, leaving the seal in place.

• NOTE: Make sure that the transit sleeve is correctly positioned and install the new seal over the crankshaft. Do not use any lubricant on the seal, the transit sleeve or the crankshaft.

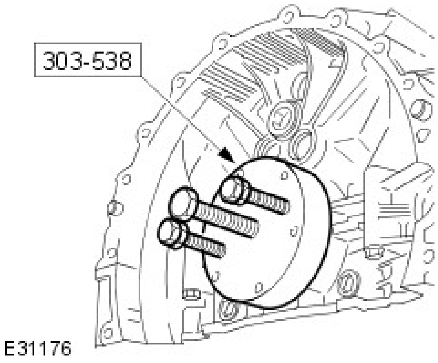
Using the special tool, position the crankshaft rear oil seal.

- Install the special tool to the crankshaft.



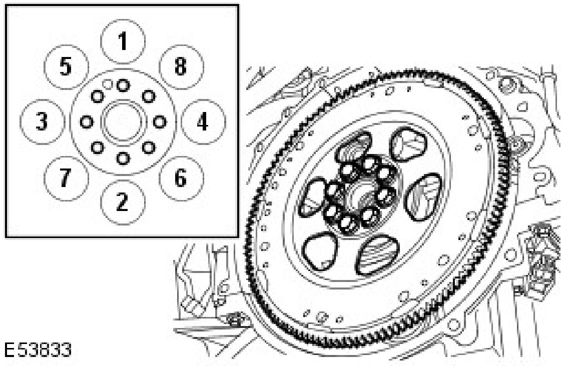
9. ⚠CAUTION: Alternate the nut tightening to correctly seat the crankshaft rear oil seal.

Using the special tool, install the rear crankshaft oil seal.



10. ⚠CAUTION: Make sure that the crankshaft rear oil seal is correctly located.

Remove the special tool.

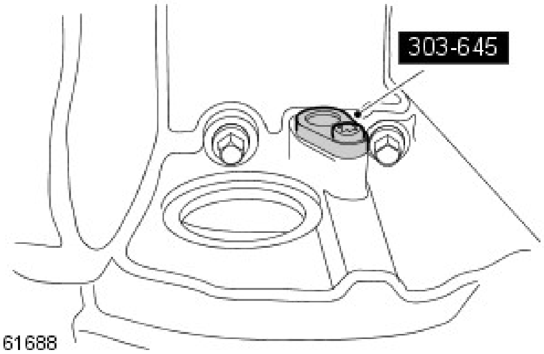


11. NOTE: Prevent the flexplate from rotating.

Install the torque converter flexplate.

- Clean the component mating faces.
- Tighten the bolts evenly in 2 stages to the sequence shown.
- Tighten the bolts to 15 Nm (11 lb ft).
- Tighten the bolts to 110 Nm (81 lb.ft).

12. Install the special tool.



E61688

13. NOTE: Install a new gasket.

Install the oil pump assembly.

- Clean the component mating faces.
- Install the gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

14. NOTE: Install a new O-ring seal.

Install the oil strainer pick-up assembly.

- Install the O-ring seal.
- Tighten the M6 bolt to 10 Nm (7 lb.ft).
- Apply sealant to the M5 bolts.
- Tighten the M5 bolts to 6 Nm (4 lb.ft).

15. Install the crankshaft sprocket.

- Clean the component mating faces.
- Install the crankshaft sprocket key.

16. Install the LH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

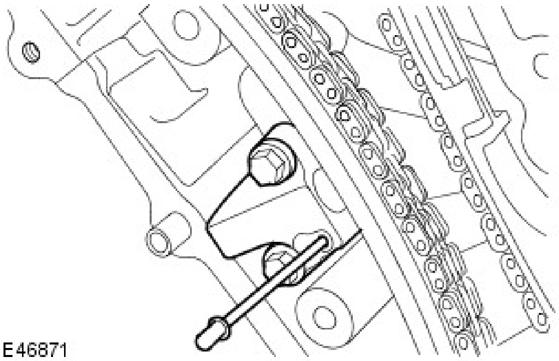
17. Install the LH primary timing chain tensioner guides.

- Tighten the bolts to 12 Nm (9 lb.ft).

18. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the LH primary timing chain tensioner.

- Using a 3 mm (0.118 in) diameter rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.



E46871

19. ⚠ CAUTION: Make sure that new bolts are installed.

• NOTE: Install new O-ring seals.

Install the LH VCT control solenoid housing.

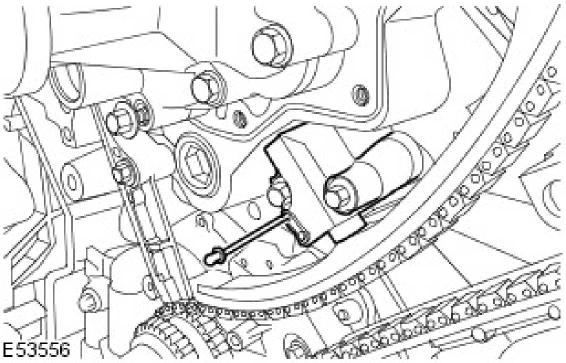
- Install the O-ring seals.
- Tighten the bolts to 22 Nm (16 lb.ft).
- Tighten the nut to 10 Nm (7 lb.ft).

20. Install the RH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

21. Install the RH primary timing chain tensioner guide.

- Tighten the bolts to 12 Nm (9 lb.ft).



22. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the RH primary timing chain tensioner.

- Using a 3 mm (0.118 in) diameter rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.

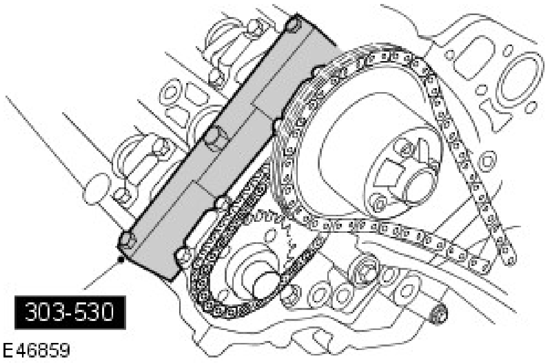
23. ⚠ CAUTION: Make sure that new bolts are installed.

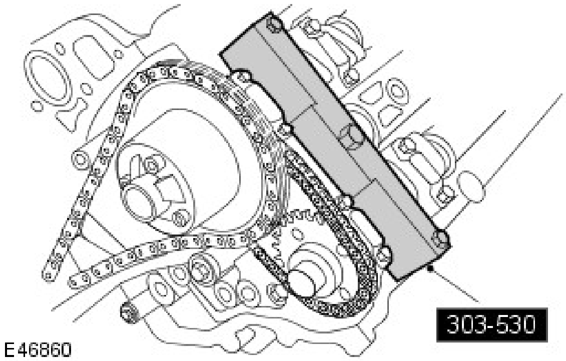
• NOTE: Install new O-ring seals.

Install the RH VCT control solenoid housing.

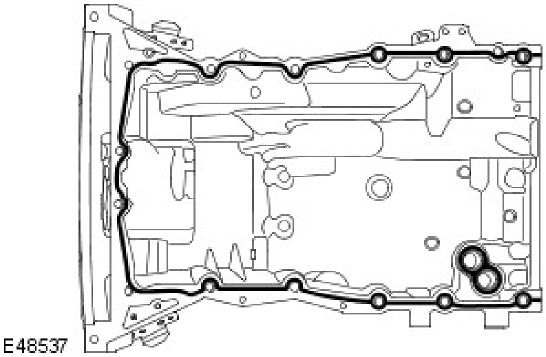
- Install the O-ring seals.
- Tighten the bolts to 22 Nm (16 lb.ft).
- Tighten the nut to 10 Nm (7 lb.ft).

24. Remove the special tool from the RH cylinder head.



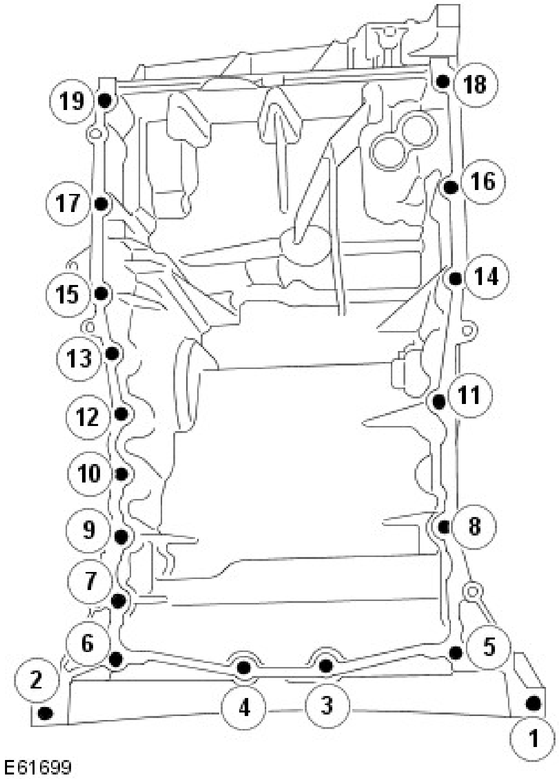

303-530
E46860

25. Remove the special tool from the LH cylinder head.



26. Install the oil pan extension.

- Clean the component mating faces.
- Apply a 3 mm (0.118 in) diameter bead of sealant, to the area indicated.
- Install the bolts, but do not tighten fully at this stage.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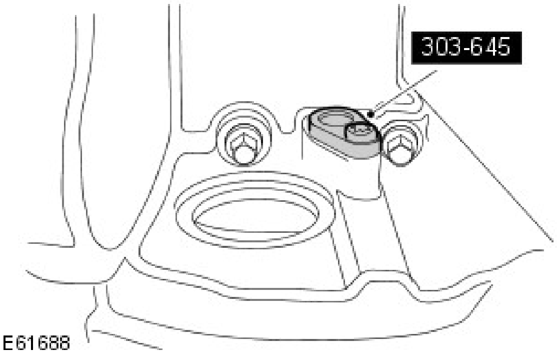
E61699

27. Tighten the oil pan bolts in the sequence shown to 20 Nm (15 lb.ft).



28. Remove the special tool.

- Remove the bolt.

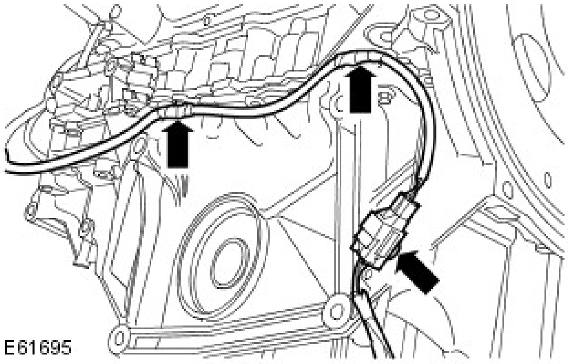
29. Install the CKP sensor.

- Tighten the bolt to 8 Nm (6 lb.ft)

30. NOTE: Install a new O-ring seal.

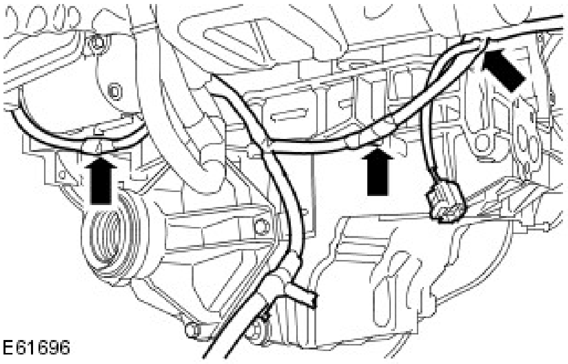
Install the halfshaft support bearing housing.

- Install the O-ring seal.
- Lubricate the O-ring seal with a suitable lubricant.
- Tighten the bolts evenly to 25 Nm (18 lb.ft).



31. Attach the wiring harness to the LH side of the engine

- Secure the clips.

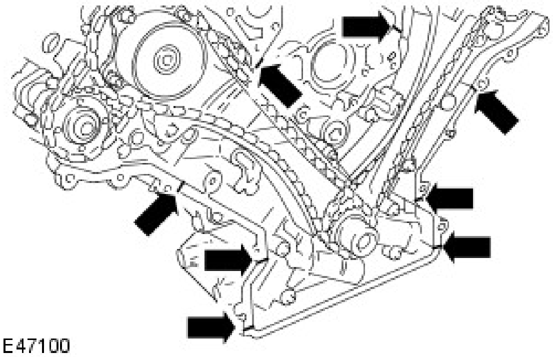


32. Attach the wiring harness to the RH side of the engine.

- Secure the clips.

33. Install the power steering pump mounting bracket.

- Tighten the bolts to 25 Nm (18 lb.ft).



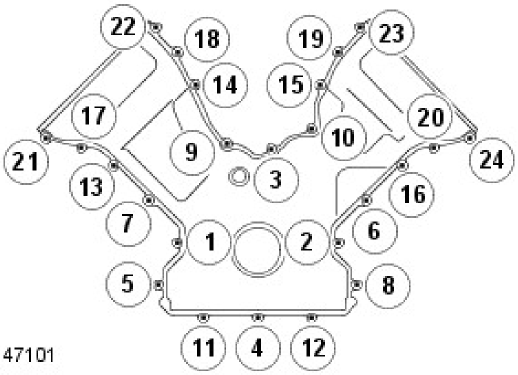
E47100

34. NOTE: Install a new gasket.

• NOTE: Install a new O-ring seal.

Install the engine front cover.

- Clean the component mating faces.
- Apply a 3 mm (0.118 in) diameter bead of sealant 12mm (0.47 in) long, to the 8 places indicated.
- Install the gasket.
- Install the O-ring seal.



E47101

35. Evenly and progressively tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).

36. Attach the engine wiring harness.

- Secure the clips.
- Tighten the bolt to 10 Nm (7 lb.ft).

37. NOTE: Install new seals.

Install the LH valve cover plug aperture seals.

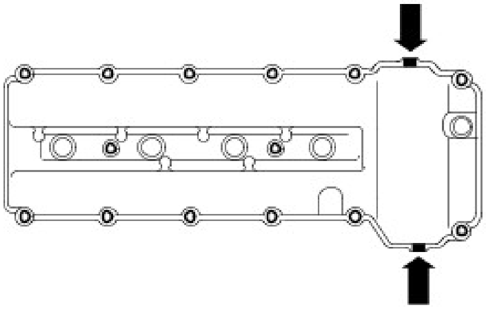
38. Install new LH valve cover bolt O-ring seals.

39. NOTE: Install a new gasket.

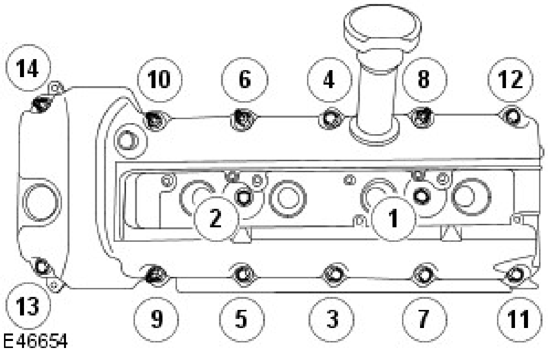
• NOTE: Apply two beads of silicone gasket sealant as shown on the illustration. The application of the sealant must be 3 mm (0.118 in) diameter 12 mm (0.47 in) long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

Install the LH valve cover.

- Clean the component mating faces.
- Install the valve cover gasket.



E49922



40. Install the LH valve cover bolts.

- Install the LH valve cover bolts to the positions previously noted.
- Tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).

41. Connect the LH VCT oil solenoid electrical connector.

42. Attach the engine wiring harness to the retaining bracket.

43. NOTE: Install a new O-ring seal.

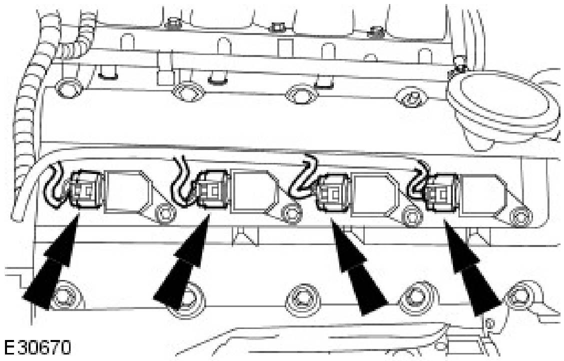
With assistance, install the oil level indicator and tube.

- Clean the component mating faces.
- Install the O-ring seal.
- Lubricate the O-ring seal with clean engine oil.
- Tighten the nut to 6 Nm (4 lb.ft).

44. NOTE: Install new O-ring seals.

Install the 4 LH ignition coil-on-plugs.

- Install the O-ring seals.
- Install the 4 ignition coil-on-plugs.
- Tighten the bolts to 6 Nm (4 lb.ft).



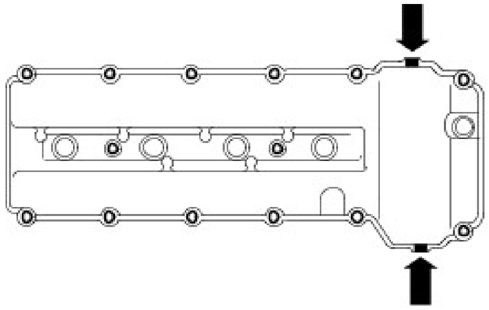
45. Connect the 4 electrical connectors.

46. Install the LH ignition coil-on-plug cover.

47. NOTE: Install new seals.

Install new RH valve cover plug aperture seals.

48. Install new RH valve cover bolt O-ring seals.



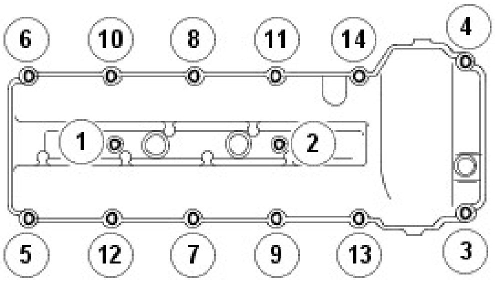
E49922

49. NOTE: Install a new gasket.

• NOTE: Apply two beads of silicone gasket sealant as shown on the illustration. The application of the sealant must be 3 mm (0.118 in) diameter 12 mm (0.47 in) long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

Install the RH valve cover.

- Clean the component mating faces.
- Install the gasket.



E46679

50. Install the RH valve cover bolts.

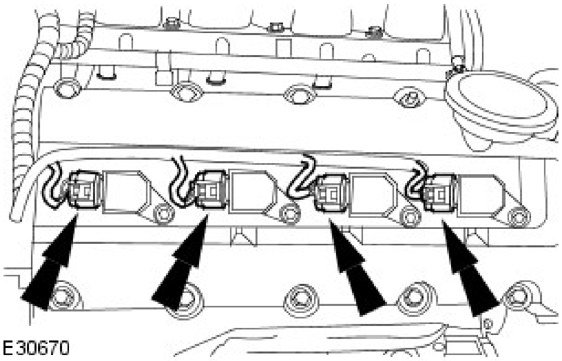
- Install the RH valve cover bolts to the positons previously noted.
- Tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).

51. NOTE: Install new O-ring seals.

Install the 4 RH ignition coil-on-plugs.

- Install the O-ring seals.
- Install the 4 ignition coil-on-plugs.
- Tighten the bolts to 6 Nm (4 lb.ft).

52. Connect the 4 electrical connectors.



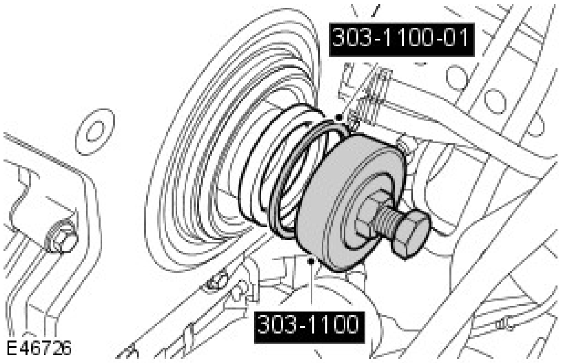
E30670

53. Connect the RH VCT oil solenoid electrical connector.

54. Attach the engine wiring harness to the retaining bracket.

55. Connect the PCV line to the RH valve cover.

56. Clean the crankshaft pulley mating faces.



57. Using the special tool, install the crankshaft front seal.

- Lubricate the seal with clean engine oil.
- Use the discarded crankshaft bolt with the special tool.
- Remove the special tools.

58. Install the crankshaft pulley.

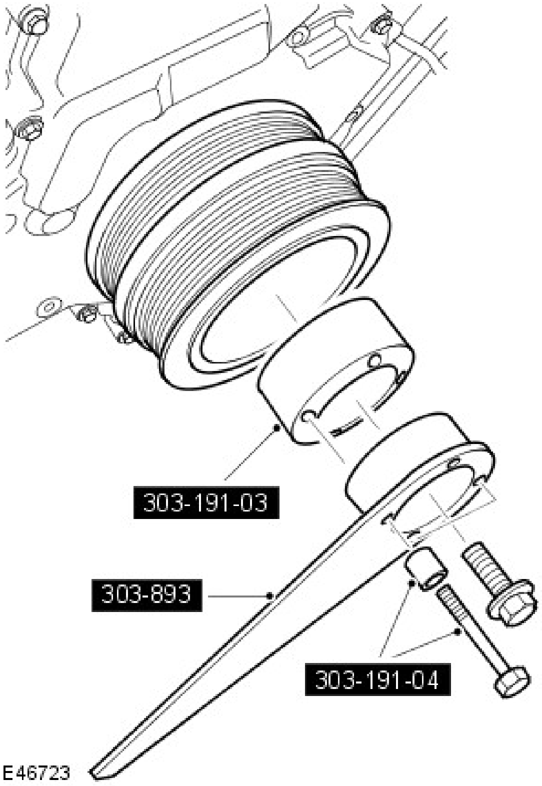
- Lubricate the seal with clean engine oil.

59. Install the crankshaft pulley locking ring.

60. ⚠ CAUTION: The screw thread in the crankshaft pulley must be cleaned out before installing a new crankshaft pulley bolt.

Install, but do not tighten, the new crankshaft pulley bolt.

61. ⚠ CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.



Using the special tools, tighten the crankshaft pulley bolt.

- Tighten the crankshaft pulley bolt to 380 Nm (280 lb.ft).
- Remove the special tools.

62. Install the exhaust manifold heat shield.

- Tighten the 2 bolts.

63. Install the accessory drive belt idler pulleys.

- Tighten the bolts to 25 Nm (18 lb.ft).

64. Install the coolant pump pulley.

- Tighten the bolts to 10 Nm (7 lb.ft).

65. NOTE: Install new O-ring seals.

Install the coolant manifold.

- Clean the components.
- Install the O-ring seals.
- Connect the 4 coolant hoses and install the clips.
- Attach the wiring harness bracket.
- Tighten the 2 bolts to 10 Nm (7 ib.ft).

66. Connect the ECT sensor electrical connector.

67. Install the cooling fan drive belt tensioner.

- Tighten the bolt to 40 Nm (30 lb.ft).

68. Remove the engine from the engine stand.

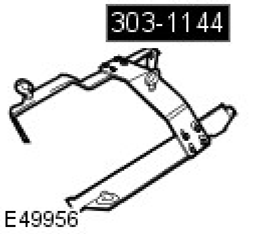
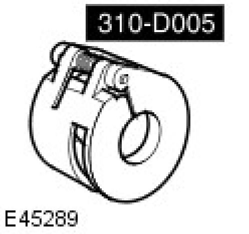
69. Install the engine.
For additional information, refer to: Engine (303-01A Engine - V8 S/C 4.2L Petrol, Installation).

70. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Engine

Removal

Special Tool(s)	
	Engine lifting cradle 303-1144
	Fuel spring lock decoupling tool 310-D005

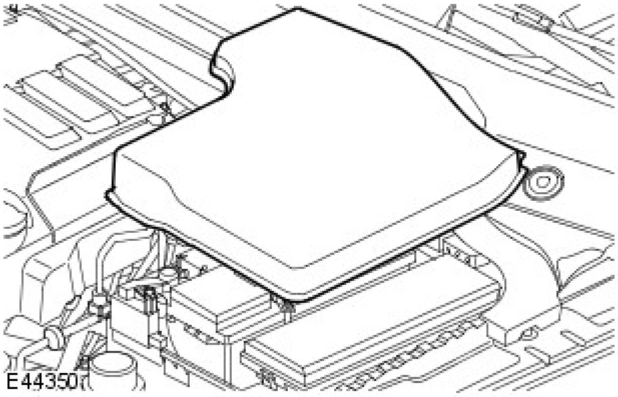
Removal

1. Secure the hood in the service position.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

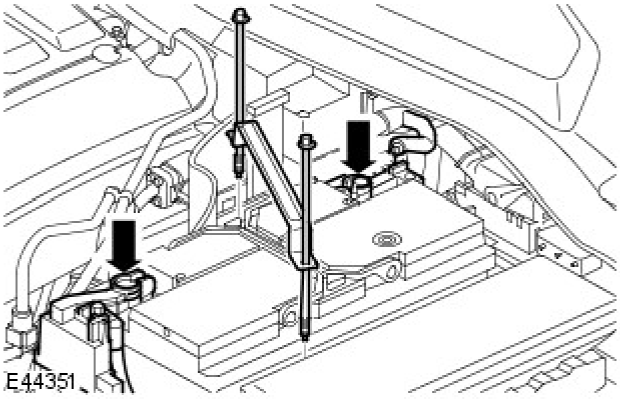
3. Remove the battery cover.

- Release the 2 mounting clips.



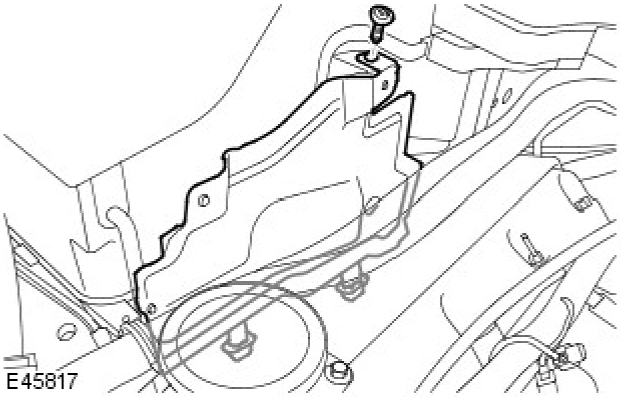
4. Disconnect the battery positive cable.

5. Remove 2 bolts securing the battery clamp and remove the clamp.



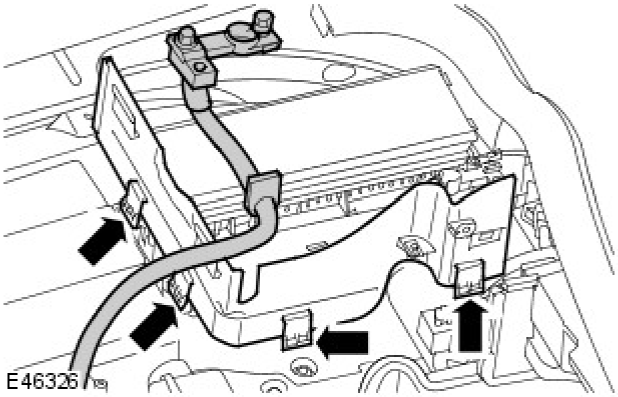
6. Remove the battery.

7. Remove the engine compartment upper heat shield.



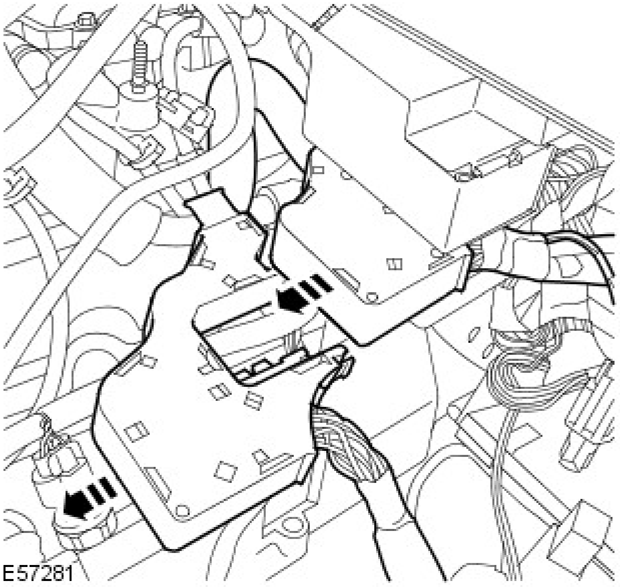
- Remove the 2 screws.
- Release the 2 mounting clips.

8. Remove the battery compartment side wall.

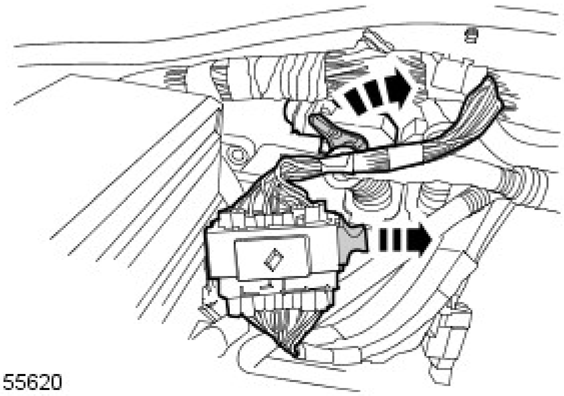


- Release the battery positive cable and grommet.
- Release the 4 clips.

9. Release the cassette.



- Release the 2 clips.



10. Disconnect the engine wiring harness.

- Release and disconnect the 2 electrical connectors.

11. Remove the RH air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

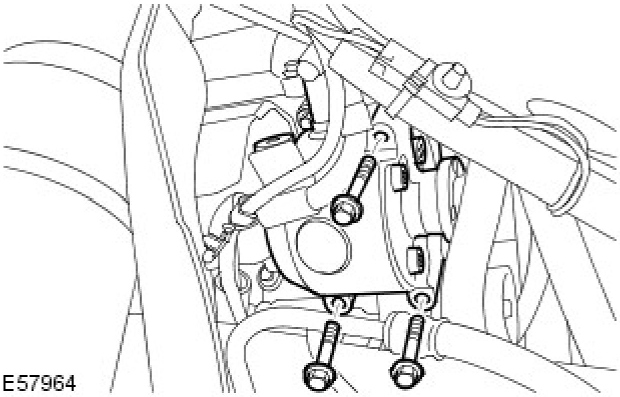
12. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

13. Remove the fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

14. Release the dynamic response pump and tie aside.

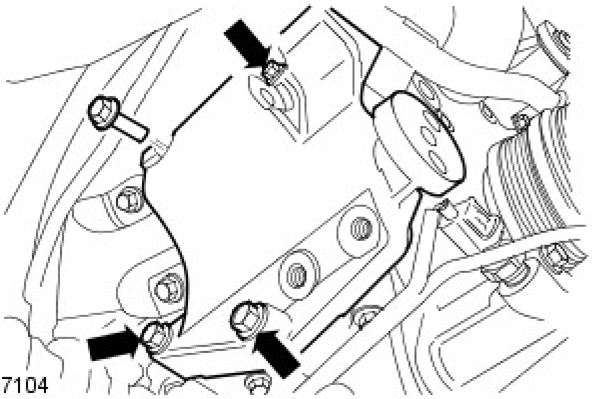
- Remove the 3 bolts.



15. Remove the generator.
For additional information, refer to: Generator (414-02A Generator and Regulator - V8 S/C 4.2L Petrol, Removal and Installation).

16. Remove the dynamic response and generator mounting brackets.

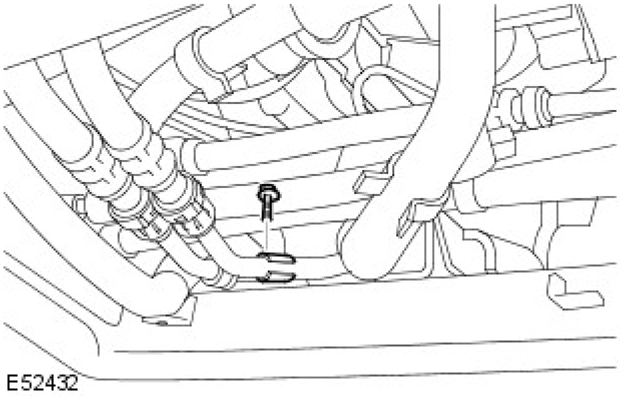
- Remove the 8 bolts.



17. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

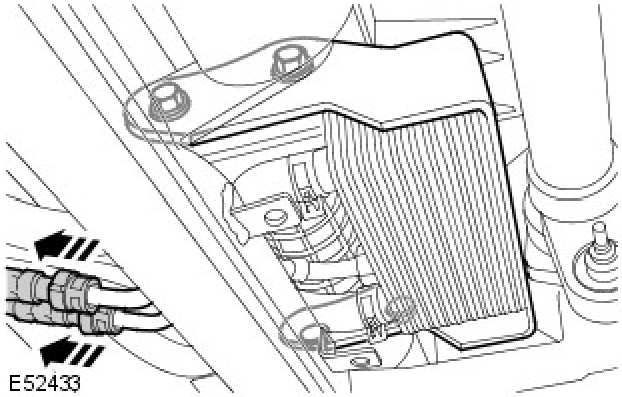
18. Drain the engine oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01A Engine - V8 S/C 4.2L Petrol, General Procedures).

19. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).



20. Remove the oil cooler pipe support bracket.

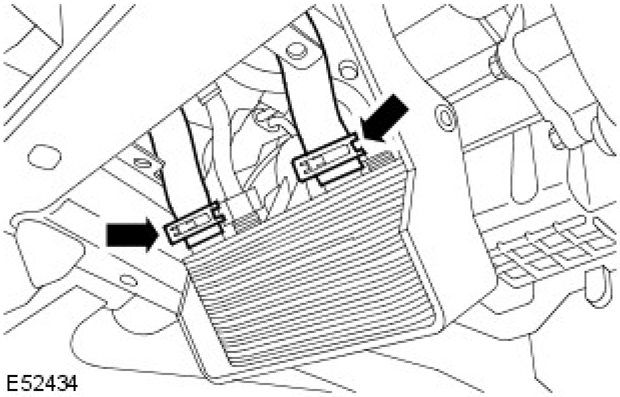
- Remove the bolt.



21. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

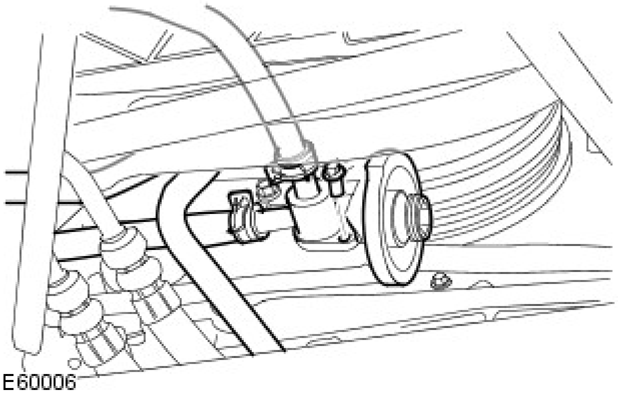
Release the oil cooler.

- Disconnect the oil cooler hoses.
- Remove the 4 bolts.



22. Disconnect the engine oil cooler coolant hoses.

- Position a container to collect the fluid spillage.
- Clamp the relevant hoses, to minimise the coolant loss.
- Release the 2 clips.



23. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Release and tie aside the oil filter housing.

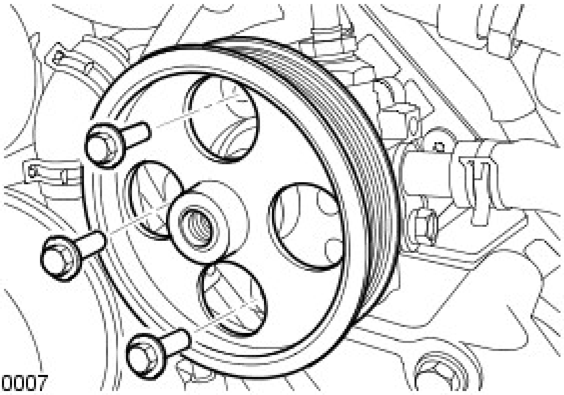
- Remove the oil union bolt for access.
- Remove the 3 bolts.

24. Remove the LH charge air cooler.
For additional information, refer to: Charge Air Cooler (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

25. Remove the RH charge air cooler.

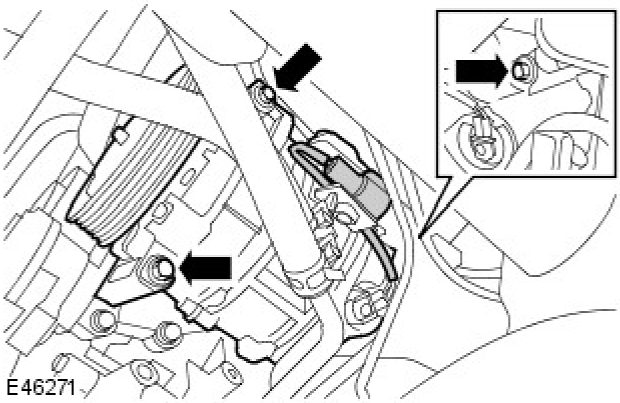
26. Release the power steering pump and tie aside

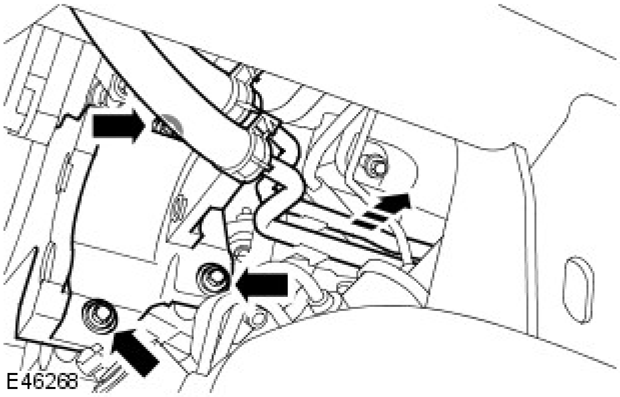
- Remove the 3 bolts.



27. Release the A/C compressor and tie aside.

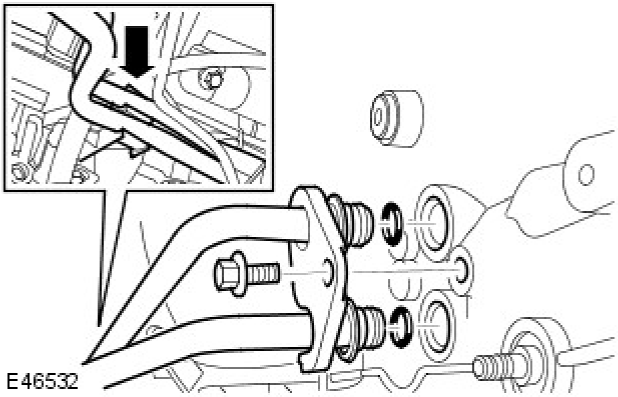
- Remove the 3 bolts.
- Disconnect the electrical connector.





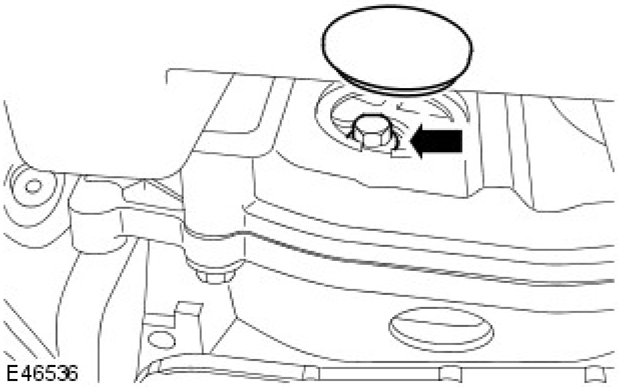
28. Remove the A/C compressor mounting bracket.

- Remove the 3 bolts.



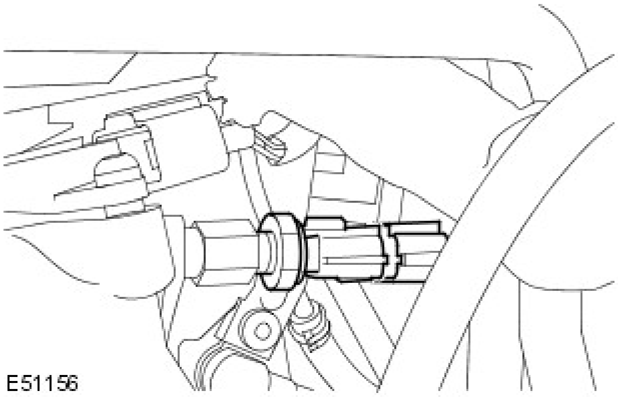
29. Release the transmission cooler pipes.

- Position a container to collect the fluid.
- Remove the bolt.
- Release the 2 clips.
- Move the transmission pipes aside.



30. Release the flexplate.

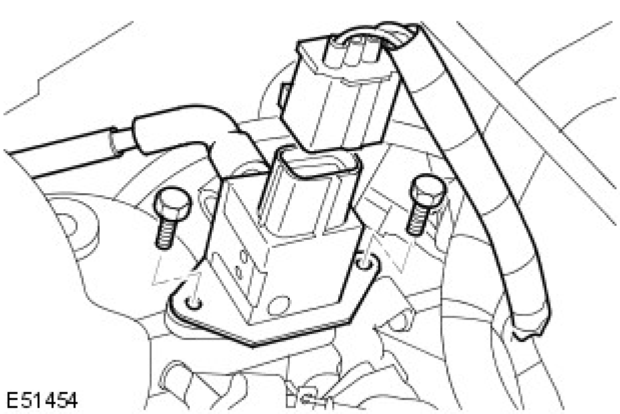
- Remove the grommet.
- Rotate the crankshaft to access the retaining bolts.
- Remove the 3 bolts.



31. WARNING: The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Remove the fuel temperature sensor.

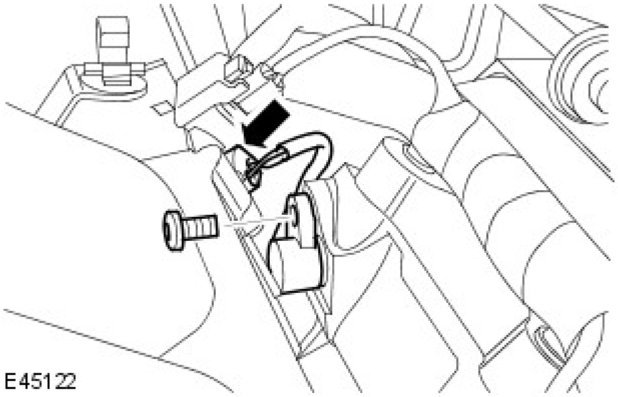
- Disconnect the electrical connector.
- Position an absorbent cloth to collect fluid spillage.



32. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

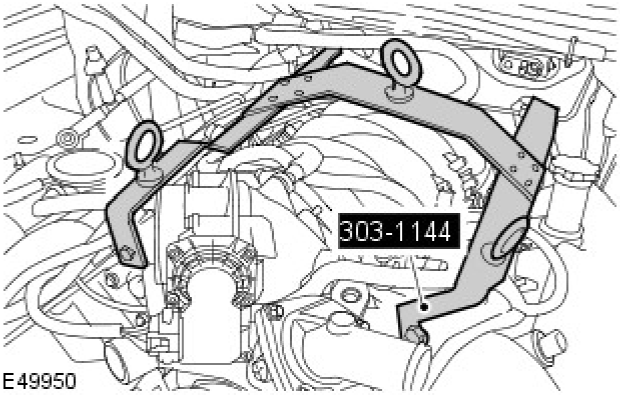
Remove the fuel rail pressure sensor.

- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.



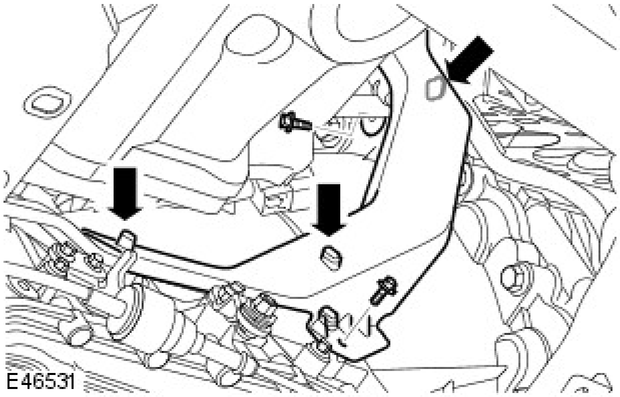
33. Remove both camshaft position (CMP) sensors and brackets for access.

- Remove the Torx screw.
- Release the harness brackets.



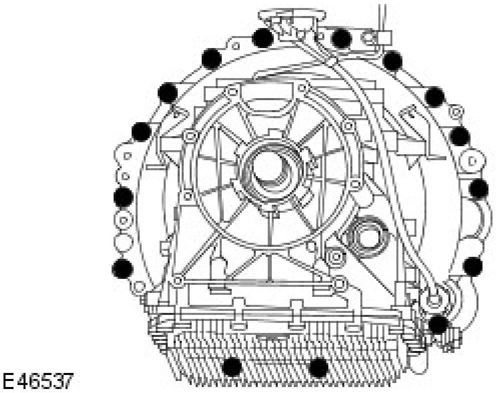
34. NOTE: Naturally aspirated illustrated, mounting points are identical on the supercharged engine.

Install the engine lifting cradle.



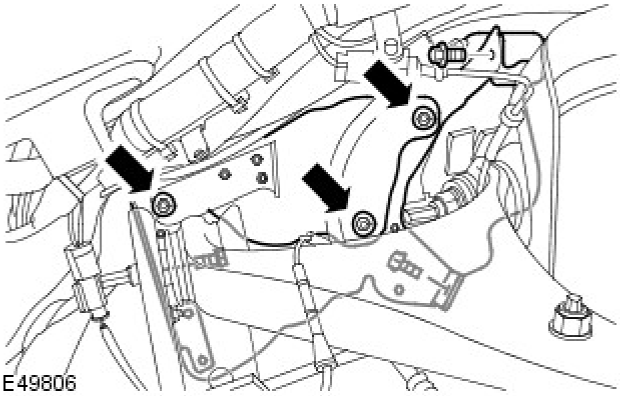
35. Release the heat shield for access to the transmission bolts.

- Remove the 2 bolts.
- Move the shield aside.

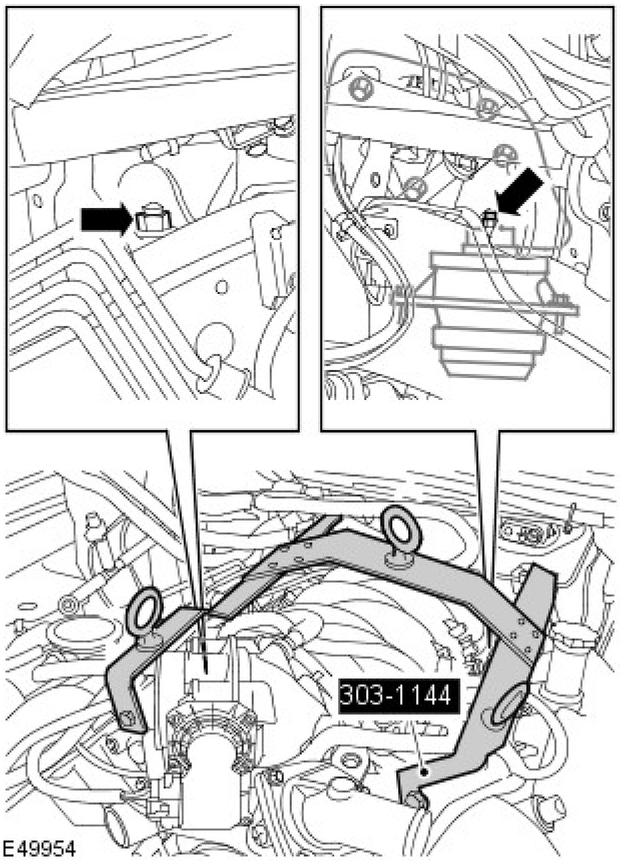


36. Remove the transmission bolts.

- Support the transmission.
- Remove the 16 bolts.



37. Remove the upper suspension arm and brake line heat shields for access.

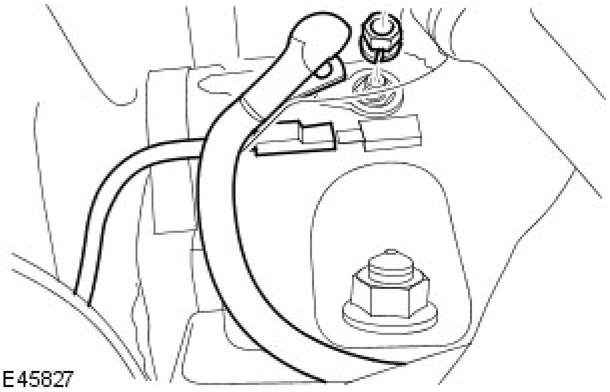

303-1144
E49954

38. NOTE: Naturally aspirated graphic shown.

Remove the 2 engine mount nuts.

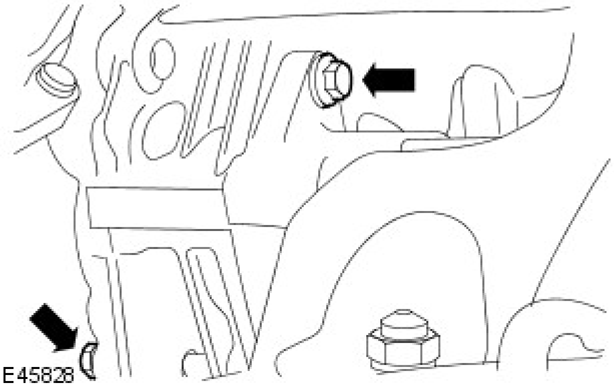
39. Release the engine from mounts and the transmission.

- Install the lifting chains.
- Raise the RH side of the engine by approximately 40 mm.



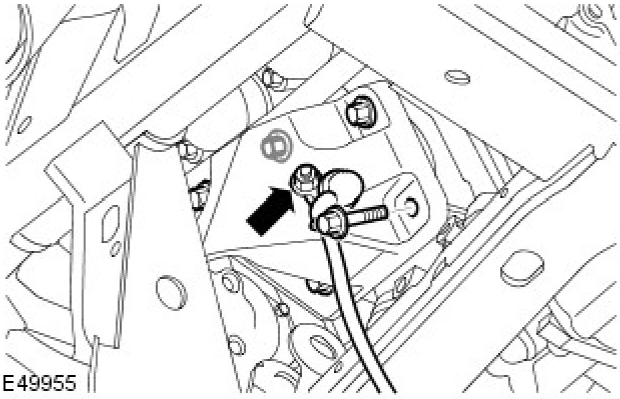
40. Disconnect the starter motor electrical connections.

- Remove the nut.



41. Remove the starter motor.

- Remove the starter motor retaining bolts.



42. CAUTIONS:

⚠ Make sure the torque converter remains connected to the transmission.

⚠ Care must be taken to avoid damaging the steering rack and differential.

Remove the engine front mount bracket.

- Remove 4 bolts securing the engine mount bracket to the cylinder block.
- Disconnect the engine ground cable from the RH mounting bracket.
- Carefully and progressively raise and remove the engine.

43. CAUTIONS:

⚠ Make sure the torque converter remains connected to the transmission.

⚠ Care must be taken to avoid damaging the steering rack and differential.

Carefully and progressively raise and remove the engine.

44. Disconnect the lifting chains.

- Remove the engine lifting cradle.

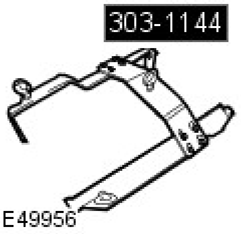
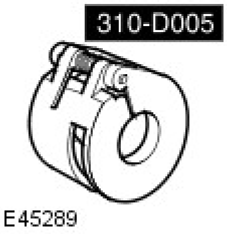
45. Position the engine.

- Install the lifting chains.
- Raise the engine.
- Clean the component mating faces.
- Clean the locating dowels.

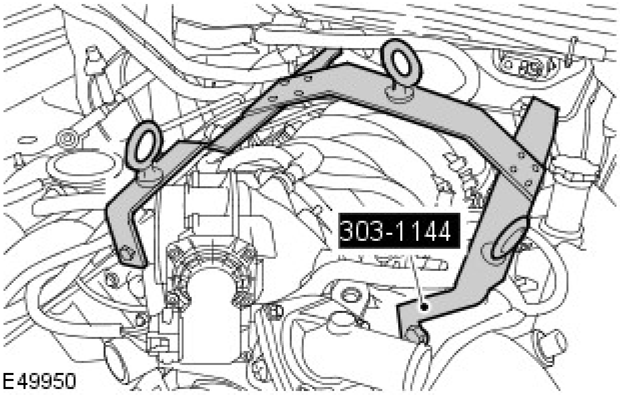
Published: 11-May-2011

Engine - V8 S/C 4.2L Petrol - Engine

Installation

Special Tool(s)	
 303-1144 E49956	Engine lifting cradle 303-1144
 310-D005 E45289	Fuel spring lock decoupling tool 310-D005

Installation

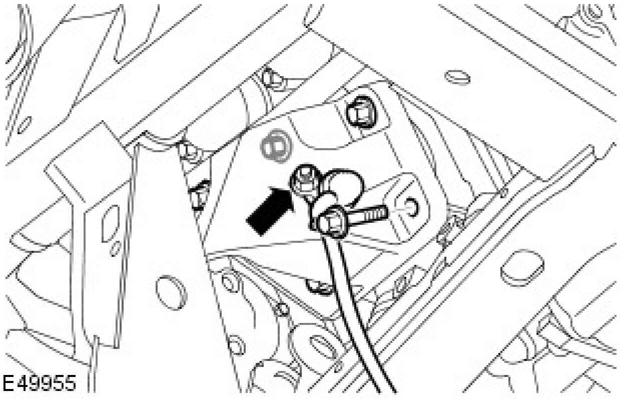

303-1144
E49950

1. Install the engine lifting cradle.

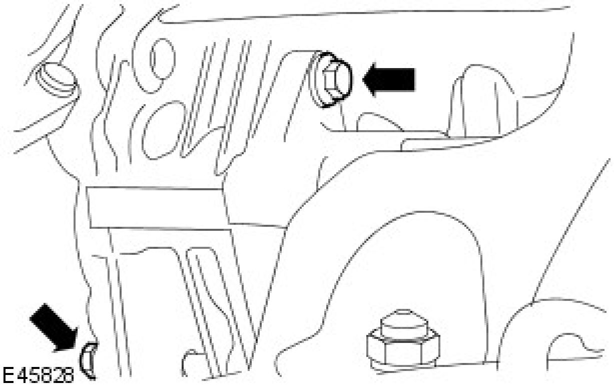
- Connect the lifting chains.

2. Carefully lower the engine until approximately 35mm above engine mounts.

3. Install the engine front mount bracket.

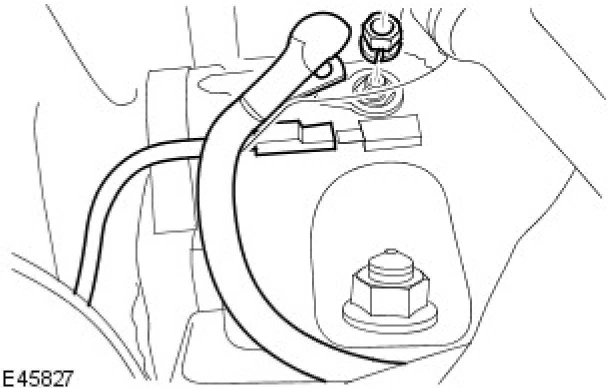


- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).
- Connect the engine ground cable and tighten the bolt to 25 Nm (18 lb.ft).



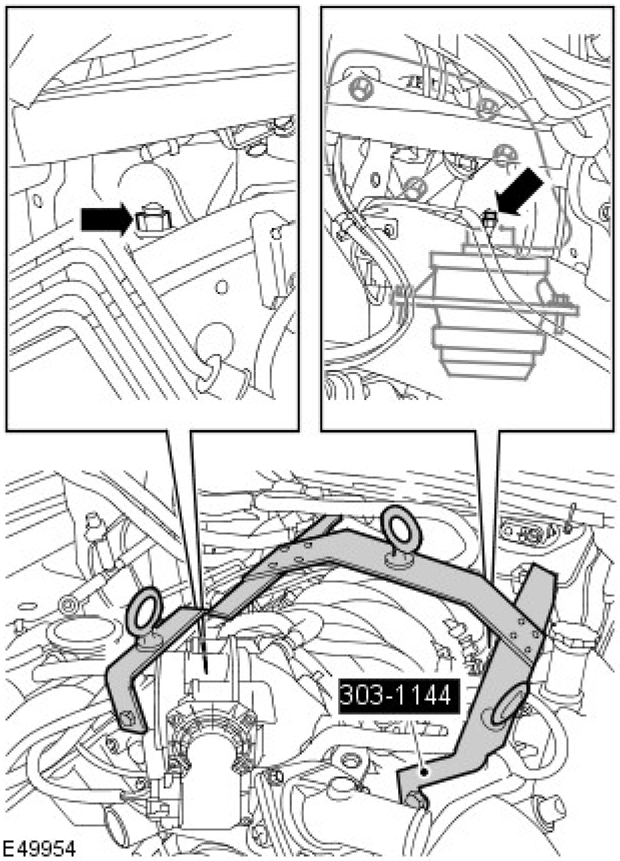
4. Install the starter motor.

- Tighten the bolts to 45 Nm (33 lb.ft).



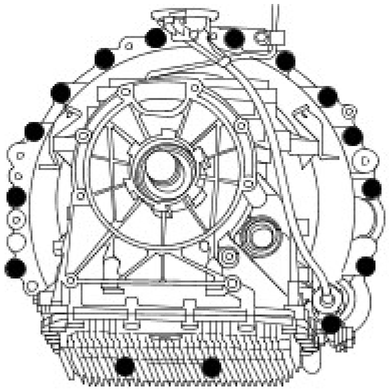
5. Connect the starter motor electrical connectors.

- Connect and secure the electrical connectors.
- Tighten the starter motor nut to 10 Nm (7 lb.ft).



6. With assistance align the engine to the transmission and engine mounts.

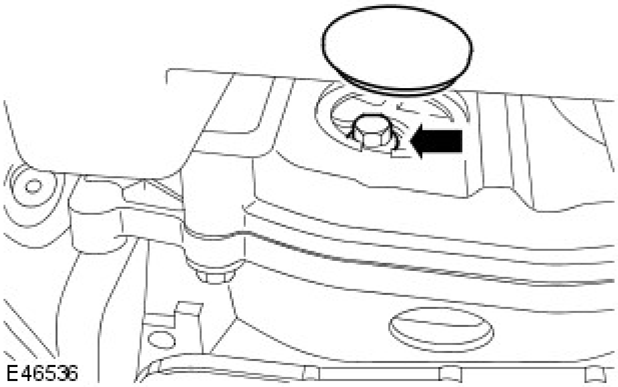
- Tighten the engine mount nuts to 90 Nm (66 lb.ft).



E46537

7. Install the transmission retaining bolts.

- Tighten the bolts to 45 Nm (33 lb.ft).



E46536

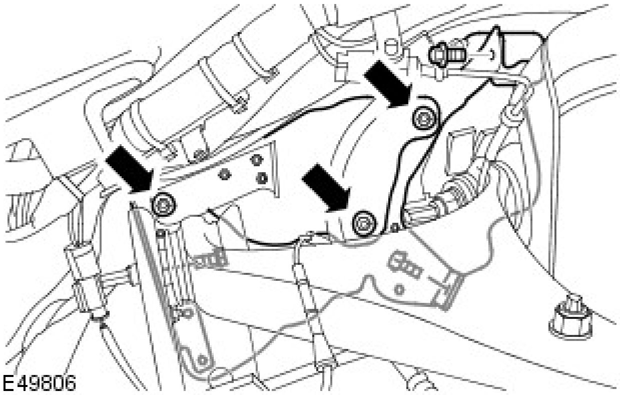
8. Attach the flexplate to the torque converter.

- Rotate the crankshaft to access the retaining bolts.
- Tighten the bolts evenly and progressively in 2 stages.
- Tighten the bolts to 15 Nm (11 lb ft).
- Tighten the bolts to 110 Nm (81 lb.ft).
- Install the grommet.

9. Remove the engine lifting cradle.

10. Install the upper suspension arm and brake line heat shields.

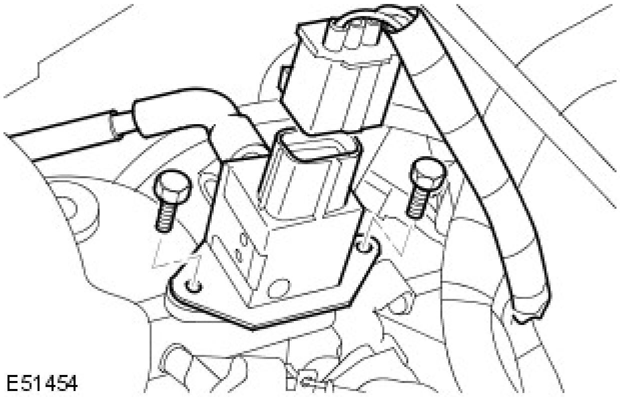
- Tighten to 8 Nm (6 lb.ft)



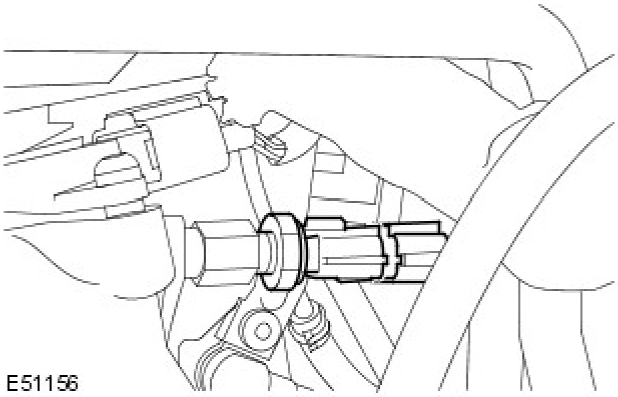
E49806

11. Install the fuel pressure sensor.

- Install the new O-ring seals.
- Tighten the bolts to 6 Nm (4 lb.ft).

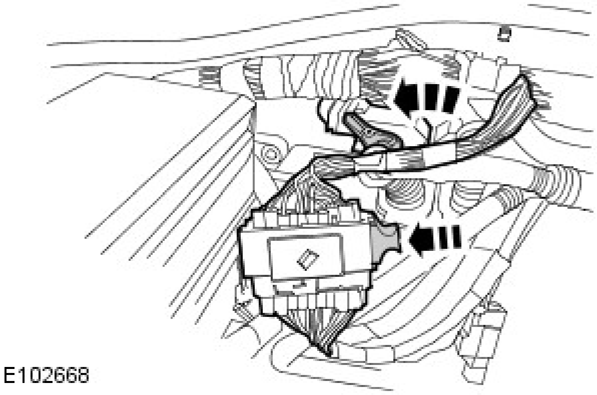


E51454



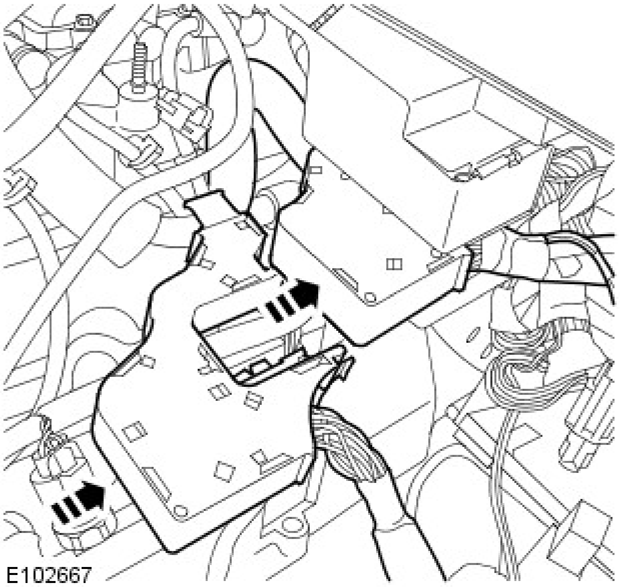
12. Install the fuel temperature sensor.

- Apply sealant to the sensor thread.
- Tighten the sensor to 7 Nm (5 lb.ft).

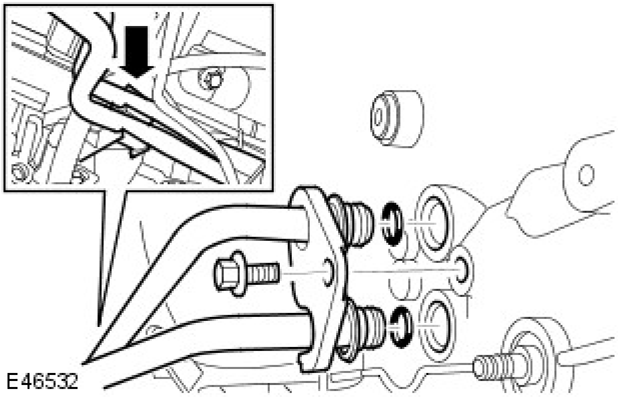


13. Connect the engine wiring harness.

- Connect the electrical connectors.

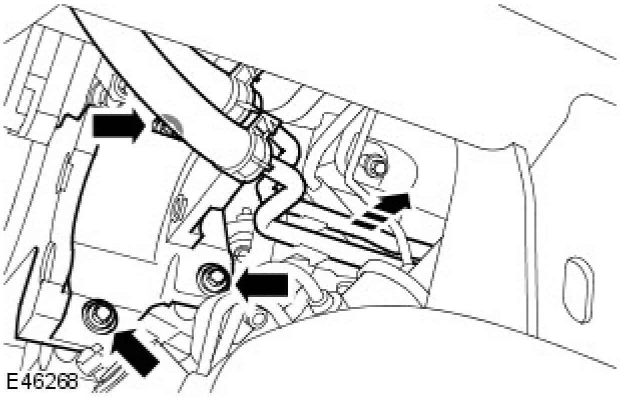


14. Install the cassette.



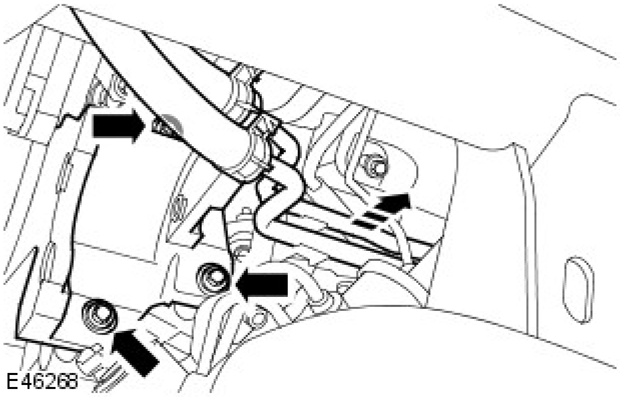
15. Install the transmission cooler pipes.

- Clean the component mating faces.
- Install new O-ring seals.
- Install the clamp.
- Tighten the bolt to 25 Nm (18 lb.ft).



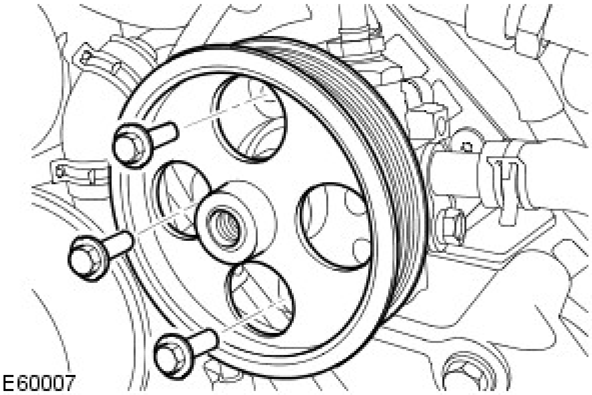
16. Install the A/C compressor mounting bracket.

- Install the 3 bolts.



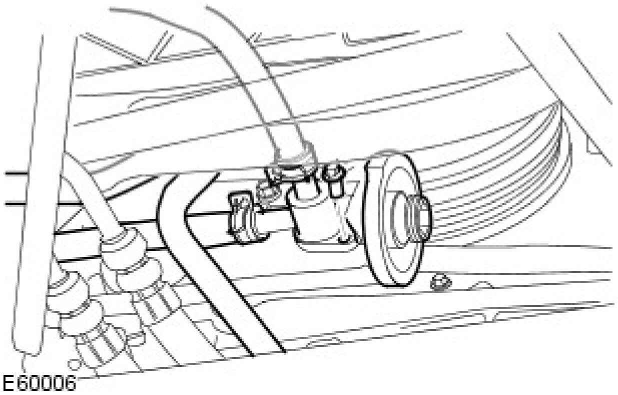
17. Install the A/C compressor assembly.

- Install the A/C mounting bracket.
- Tighten the bolts to 25 Nm (18 lb.ft).
- Connect and secure the electrical connector.



18. Install the power steering pump.

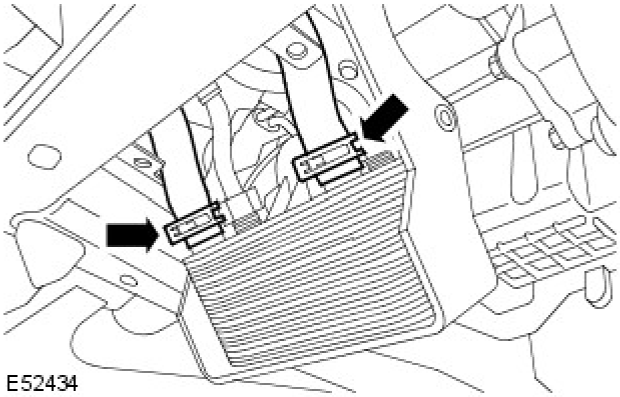
- Tighten the bolts to 25 Nm (18 lb.ft).



E60006

19. Install the oil filter housing.

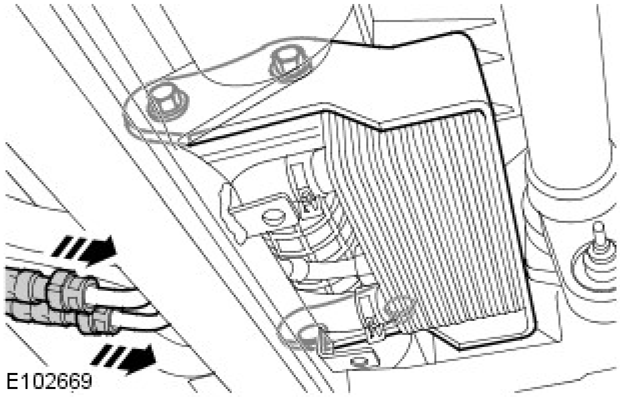
- Clean the component mating faces.
- Tighten the M8 bolts to 25 Nm (18 lb.ft).
- Tighten the M6 bolt to 10 Nm (7 lb.ft).



E52434

20. Connect the coolant supply hose to the new transmission cooler.

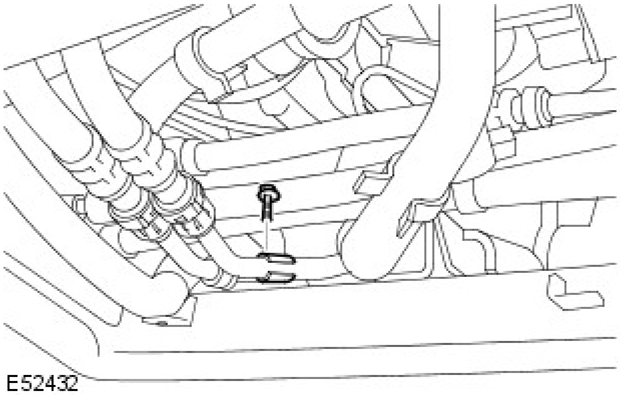
- Clean the component mating faces.
- Secure the clips.



E102669

21. Install the oil cooler.

- Clean the component mating faces.
- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).
- Connect the hoses.

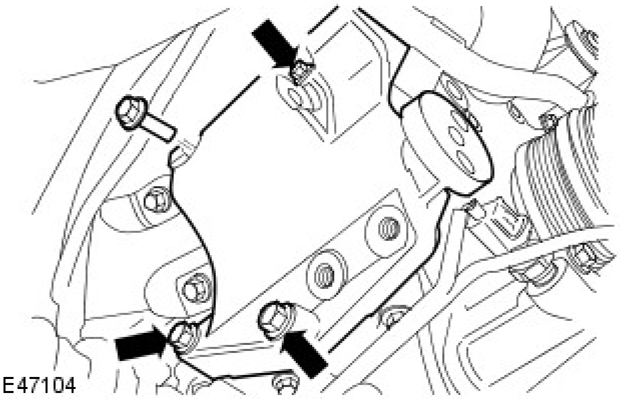


E52432

22. Install the oil cooler pipe support bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).

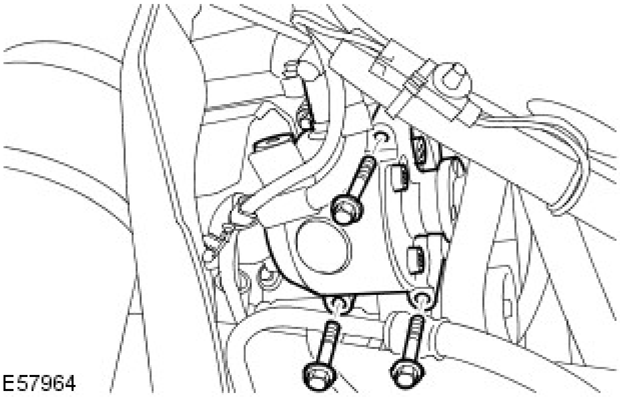
23. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).


E47104

24. Install the generator and dynamic response pump mounting brackets.

- Tighten the M10 bolts to 40 Nm (30 lb.ft).
- Tighten the M8 bolts to 25 Nm (18 lb.ft).

25. Install the generator.
For additional information, refer to: Generator (414-02A Generator and Regulator - V8 S/C 4.2L Petrol, Removal and Installation).


E57964

26. Install the dynamic response pump.

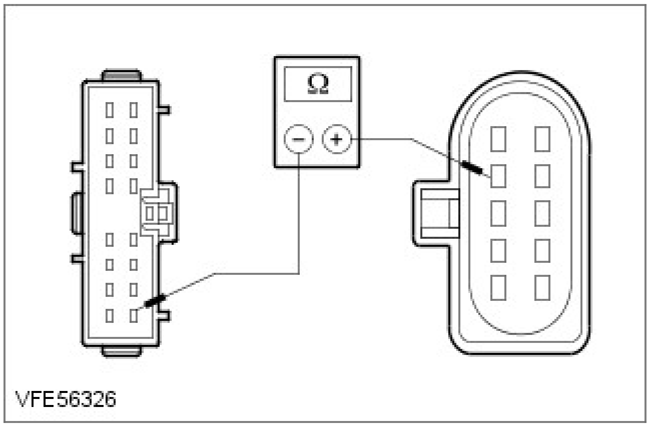
- Tighten the bolts to 25 Nm (18 lb.ft).

27. Install the LH charge air cooler.
For additional information, refer to: Charge Air Cooler (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

28. Install the RH charge air cooler.

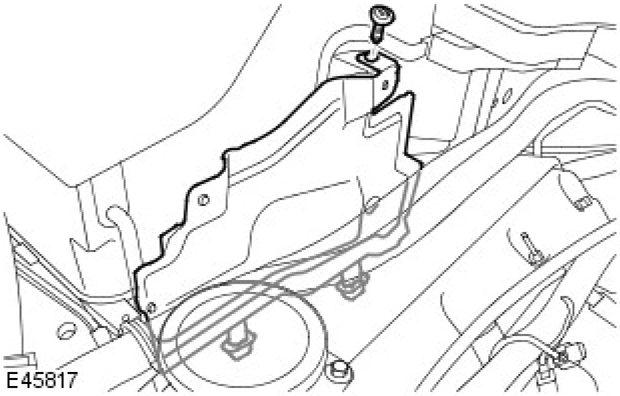
29. Install the fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

30. Install the RH air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).



31. Install the auxiliary battery compartment side wall.

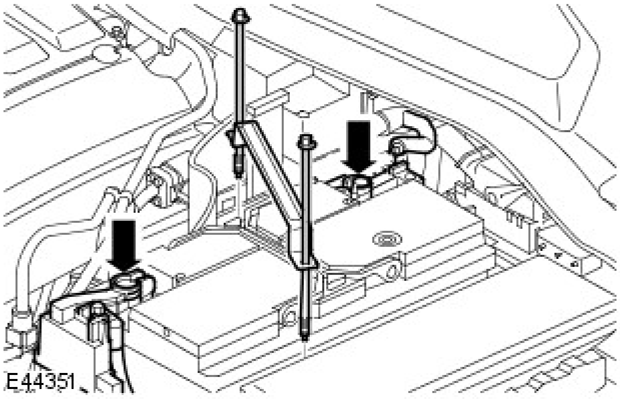
- Install the battery positive cable and grommet.
- Secure the 4 clips.



32. Install the engine compartment upper heat shield.

- Install the 2 screws.
- Secure in the 2 clips.

33. Install the battery.



34. Install the battery clamp.

- Install the 2 bolts.

35. Install the battery positive cable.

36. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

37. Install the battery cover.

- Release the 2 mounting clips.
- Secure with the 2 clips.

38. Fill the engine with oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01A Engine - V8 S/C 4.2L Petrol, General Procedures).

39. Fill the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

40. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

41. Return the hood from the service position.

- Release the 2 clips.
- Connect the struts and secure with the clips.

42. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Published: 13-Sep-2011

Engine - V8 4.4L Petrol -

Sealers

Item	Land Rover Part No.
Valve cover gasket	8510303
Sump pan	8510303
Oil strainer pick-up pipe bolts	STC 50553
Cylinder block core plugs	STC 50554
Timing cover seal apertures	8510303
Cylinder block coolant outlet elbow stub pipe	STC 50554
Bedplate to cylinder block	8510303

Lubricant - UK, Europe and ROW - Not NAS/Japan

Item	Specification
* Recommended Lubricant	5W/30 Preferred: WSS–M2C913–B Alternative: ACEA A3/B3

*** WSS is a Ford prefix to the oil specification**

Lubricant NAS/Japan

Item	Specification
* Recommended Lubricant	5W/30 – ILSAC GF4 and API SM

*** WSS is a Ford prefix to the oil specification**

Capacity

Item	Capacity
Dry fill including filter	8 litres (14 pints) (8.5 US quarts)
Oil and filter change	7.7 litres (13.6 pints) (8.1 US quarts)
Amount of oil required to bring the level from the lower to the upper holes on the dipstick	1.5 litres (2.6 pints) (1.5 US quarts)

General Specification

Item	Specification
Type	4.4 litre 90° 'V', petrol engine, twin overhead camshafts per cylinder head, 4 valves per cylinder
Bore - nominal	88.0 mm (3.465 in)
Stroke	90.3 mm (3.55 in)
Capacity	4396 cm³ (268.3 in³)
Firing order	Refer to Description and Operation section
Compression ratio	10.5:1
Direction of rotation	Anti-clockwise - viewed from rear of engine
Maximum power:	
UK/Europe and ROW - Not NAS/Japan	220 kW (295 bhp) @ 5500 rev/min
NAS/Japan	300 bhp (224 kW) @ 5500 rev/min
Maximum torque:	
UK/Europe and ROW - Not NAS/Japan	425 Nm (313 lb-ft) @ 4000 rev/min
NAS/Japan	315 lb-ft (427 Nm) @ 4000 rev/min
Dimensions:	
Length	720 mm (28.3 in)
Width	720 mm (28.3 in)
Height	785 mm (30.9 in)
*** Engine oil pressure:**	
At idle	1.0 bars (100 kPa) (15.0 lb/in²)
At 3500 rev/min	3.0 bars (300 kPa) (44.0 lb/in²)
**** Valve clearances:**	
Inlet	0.18 to 0.22 mm (0.007 to 0.008 in)
Exhaust	0.23 to 0.27 mm (0.009 to 0.010 in)
Cylinder Head	
Maximum permitted warp	0.125 mm (0.005 in)

*** Note: prior to checking the engine oil pressure, a road test of 6 miles (10 kilometres) must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle**

**** Note: that there are 50 different thicknesses of graded tappet available ranging from 2.950 to 3.685 mm (0.116 to 0.145 in) rising in increments of 0.015 mm (0.0005 in)**

Torque Specifications

Description	Nm	lb-ft
Exhaust manifold heat shield bolt	25	18
* Exhaust manifold to cylinder head bolts	20	15
Battery clamp nut	10	7
***+ Cylinder head bolts:**		
Stage 1 - Tighten bolts 1 to 10	20	15
Stage 2 - Tighten bolts 1 to 10	35	26
Stage 3 - Tighten bolts 1 to 10	Further 90°	Further 90°
Stage 4 - Tighten bolts 1 to 10	Further 90°	Further 90°
Stage 5 - Tighten the M8 bolts 11 and 12	25	18
EGR pipe to exhaust manifold flange nuts	25	18
CMP sensor Torx screw	7	5
Oil filter adapter	60	44
++ Oil filter	18	13
Oil drain plug	25	18
Oil cooler bolts	10	7
Oil cooler Allen bolt	60	44
Primary timing chain tensioner guide bolts	12	9
Primary timing chain tensioner bolts	12	9
Secondary timing chain tensioner bolts	12	9
Primary timing chain tensioner guide stud	12	9
** VCT oil control unit bolts	22	16
LH VCT oil control unit nut	10	7
* Camshaft bearing cap bolts	10	7
**** Intake camshaft sprocket retaining bolt**		
Stage 1	20	15
Stage 2	Further 90°	Further 90°
**** Exhaust camshaft sprocket retaining bolt**		
Stage 1	20	15
Stage 2	Further 90°	Further 90°
Engine front mount bolts:		
Stage 1	45	33
Stage 2	Further 60°	Further 60°
Engine to front mount nut	90	66
Engine ground cable bolt	25	18
Starter motor bolts	45	33
+++ Starter motor cable nut	10	7
*+ Steering column lower universal joint bolts	25	18
Brake hose to upper arm bolt	23	17
** Upper arm/wheel knuckle nut	70	52
Stabilizer bar link nuts	175	129
*+ Crankshaft pulley bolt	380	280
PCV valve bolts	6	4
* RH valve cover bolts	12	9
* LH valve cover bolts	12	9
Oil level indicator tube nut	6	4
* Sump pan bolts	20	15
Transmission retaining bolts	45	33
Transmission cooler pipes clamp bolt	25	18
A/C compressor bolts	25	18
Power steering pump bolts	25	18
Differential extension bolts	45	33
HO2S mounting bracket bolts	10	7
Oil pump to cylinder block bolts	10	7
**+ Oil strainer pick-up pipe bolts - M5	6	4
Oil strainer pick-up pipe bolt - M6	10	7
Coolant pump pulley bolts	10	7
Coolant crossover tube bolts	6	4
Accessory drive belt idler pulley bolt	25	18
Accessory drive belt tensioner bolt	40	30
Viscous fan drive belt tensioner pulley bolt	25	18

Description	Nm	lb-ft
Viscous fan drive belt tensioner bolt	40	30
Radiator access panel bolts	10	7
Engine oil pressure sensor	12	9
Exhaust manifold EGR pipe to flange nuts and bolts	25	18
EGR valve to EGR pipe bolts	25	18
Upper suspension arm and brake line heat shield nuts and bolts	10	7
Battery positive cable to battery junction box (BJB) bolt	10	7
Flexplate to torque converter bolts:		
Stage 1	15	11
Stage 2	110	81
Hood bolts	25	18
Road wheel nuts	140	103
Engine oil temperature sensor	20	15
Engine front cover bolts	12	9
Generator mounting bracket bolts	45	33
Generator mounting bolts	48	35

*** Bolts must be tightened in sequence**

**** New nuts/bolts must be installed**

****+ Apply sealant to threads**

***+ New Patchlok bolt(s) must be installed**

+ Lightly oil bolt threads

++ Apply engine oil to seal

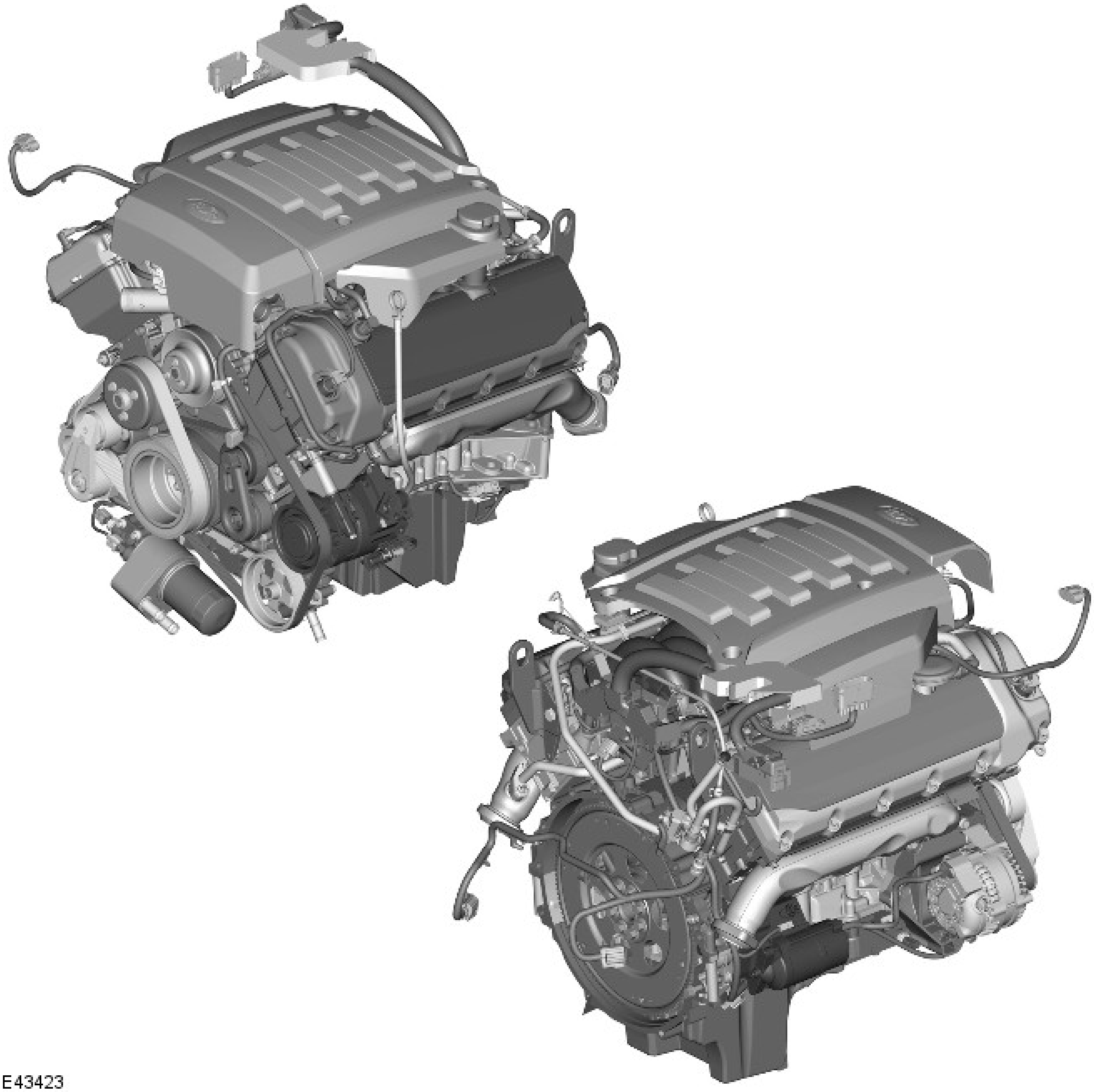
+++ Damage to internal connections will result if this torque is exceeded

Published: 11-May-2011

Engine - V8 4.4L Petrol - Engine

Description and Operation

External View



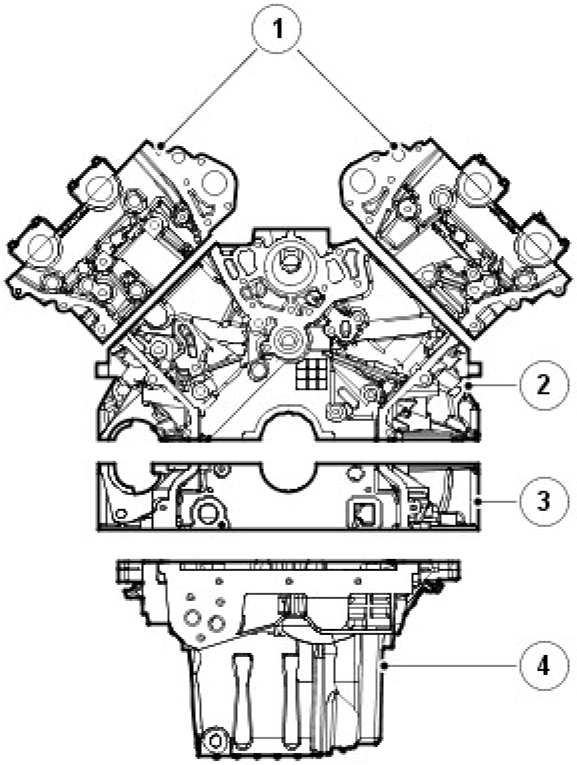
E43423

GENERAL

The V8 petrol engine is a 4.4 litre, 8 cylinder, 90 degrees 'Enclosed' V unit, with 4 valves per cylinder, operated by two overhead camshafts. The engine emissions comply with ECD3 (European Commission Directive) and US Federal Tier2 Bin 8 legislative requirements and employs catalytic converters, electronic engine management control, positive crankcase ventilation and exhaust gas re-circulation to limit the emission of pollutants. The cooling system is a low volume, high velocity system. The Engine Control Module (ECM) controls the fuel injection system, the ignition system and the Exhaust Gas Recirculation (EGR).

The cylinder block is of aluminium alloy construction with cast iron liners and a cast aluminium bedplate bolted to the bottom of the block to improve lower structure rigidity. The cylinder heads are cast aluminium with thermo-plastic camshaft covers. The single-piece oil sump is also cast aluminium. The fabricated stainless steel twin skin exhaust manifolds are unique for each cylinder bank and a moulded plastic acoustic cover is fitted over the upper engine to reduce engine-generated noise.

Engine Structure



E43424

Item	Part Number	Description
1	-	Cylinder heads
2	-	Cylinder block
3	-	Bed plate
4	-	Structural sump

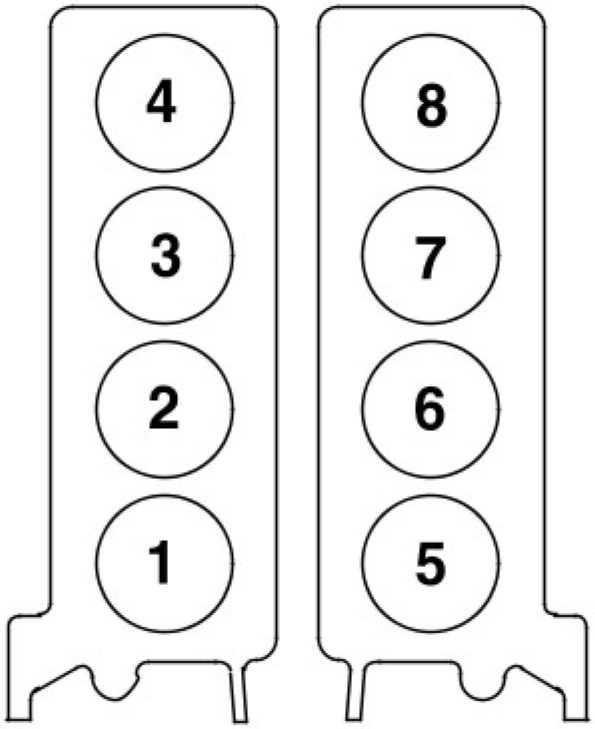
TECHNICAL FEATURES

The technical features include:

- An eight cylinder 90 degree 'Enclosed V' configuration liquid cooled aluminium cylinder block with cast iron liners
- Pistons are of open-ended skirt design, with two compression rings and a three piece oil control ring
- Two aluminium cylinder heads, each incorporating two camshafts manufactured in chilled cast iron
- Four valves per cylinder
- Graded valve lifters (shimless)
- Variable Valve Timing (VVT) (inlet only)
- Top fed, 8-jet fuel injectors
- Engine front cover manufactured from aluminium which accommodates the crankshaft front oil seal
- Primary and secondary chains drive the camshafts
- An aluminium bed plate
- A cast iron crankshaft
- Fracture-split connecting rods in sintered-forged steel
- A twin multi-vee belt, which drives the front end accessories
- Fabricated stainless steel twin skin exhaust manifolds
- Electronic Exhaust Gas Recirculation (EGR) valve
- An advanced engine management system incorporating electronic throttle control
- Meets with the fault handling requirements, as detailed in the European On-Board Diagnostic (EOBD) III, US Federal OBD and California OBDII legislation.

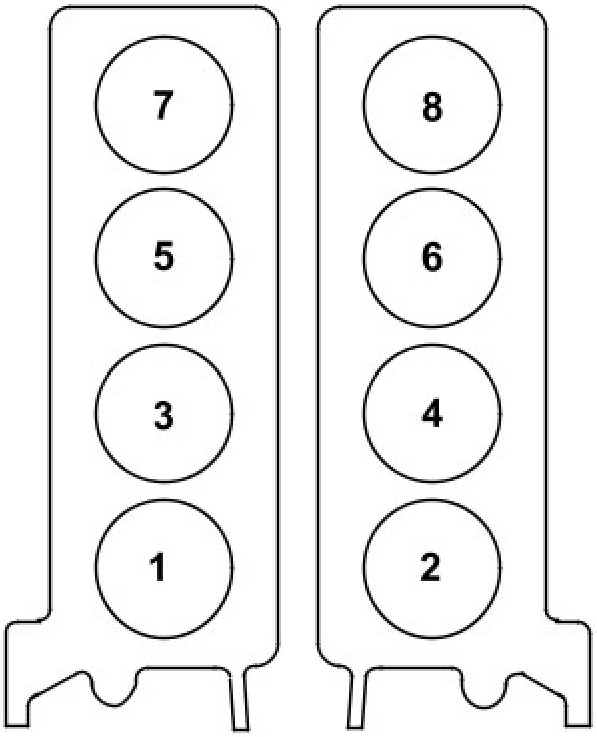
Cylinder Numbering Convention

Pre 2006



E133968

2006 onwards

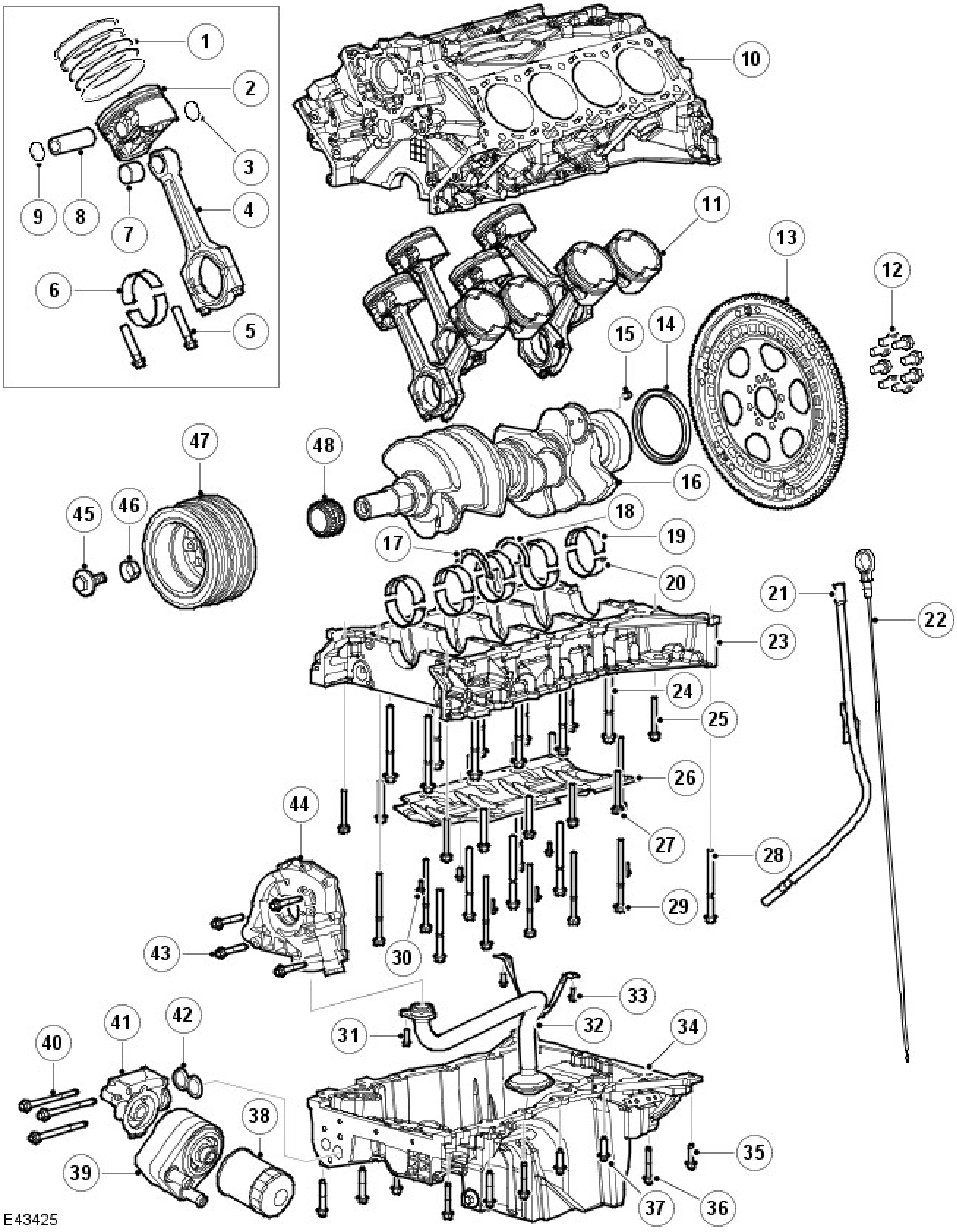


E133972

ENGINE DATA

DESCRIPTION	TYPE
Configuration	90 degree V8
Maximum power	220 kW at 6000 rpm
Maximum torque	425 Nm at 4000 rpm
Displacement	4.396 litres
Stroke/bore	90.3/88.0 mm
Compression ratio	10.50 : 1
Firing order (pre 2006)	1 5 4 2 6 3 7 8
Firing order (2006 onwards)	1 2 7 3 4 5 6 8
Engine weight (wet)	208 kg (approx.)
Oil volume	7.5 litres (wet fill)

CYLINDER BLOCK COMPONENTS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E43425

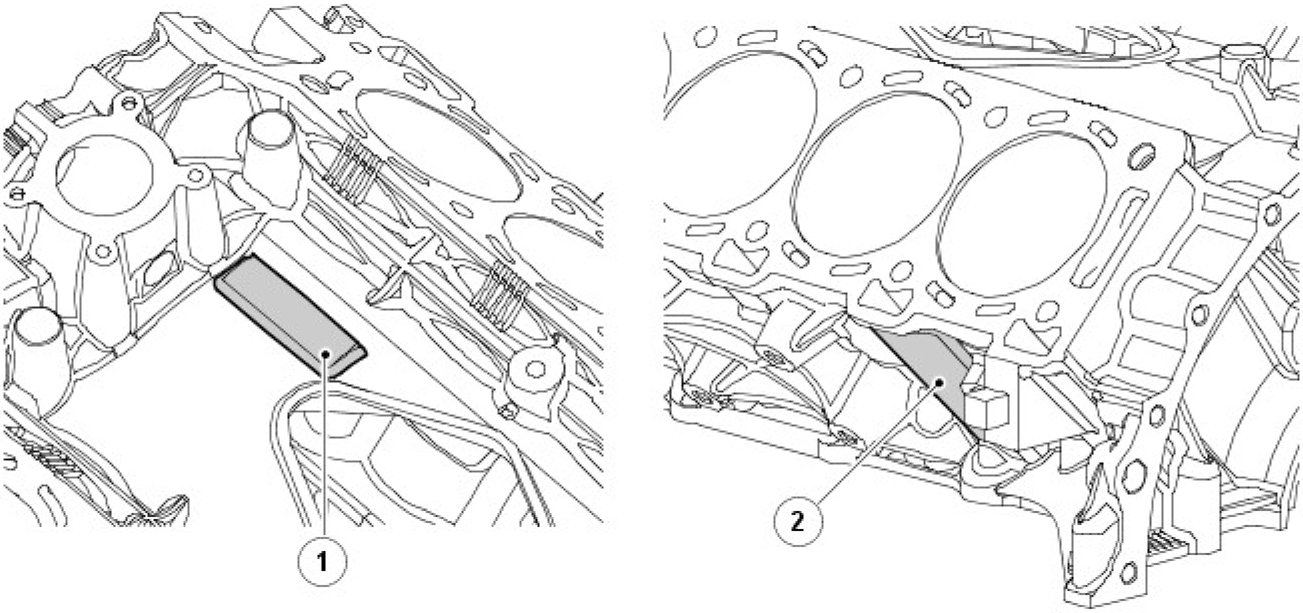
Item	Part Number	Description
1	-	Piston rings
2	-	Piston
3	-	Circlip
4	-	Connecting rod
5	-	Bolts

6	-	Connecting rod bearing shells
7	-	Bearing
8	-	Gudgeon pin
9	-	Circlip
10	-	Cylinder block
11	-	Pistons
12	-	Bolts
13	-	Flywheel
14	-	Seal
15	-	Dowel
16	-	Crankshaft
17	-	Thrust washer
18	-	Thrust washer
19	-	Bearing shells - upper
20	-	Bearing shells - lower
21	-	Oil level gauge tube
22	-	Oil level gauge
23	-	Bedplate
24	-	Bolts
25	-	Bolts
26	-	Windage tray
27	-	Bolts
28	-	Bolts
29	-	Bolts
30	-	Bolt
31	-	Bolt
32	-	Oil pick-up pipe
33	-	Bolts
34	-	Sump
35	-	Bolts
36	-	Bolts
37	-	Bolts
38	-	Oil filter
39	-	Oil cooler assembly
40	-	Bolts
41	-	Oil filter head assembly
42	-	Seals
43	-	Bolts
44	-	Oil pump
45	-	Crankshaft bolt
46	-	Taper collet
47	-	Crankshaft pulley
48	-	Crankshaft sprocket

Cylinder Block

The cylinder block is an 'Enclosed V' design, which provides an inherently rigid structure with good vibration levels. A low volume coolant jacket improves warm-up times and piston noise levels; the longitudinal flow design of the jacket, with a single cylinder head coolant transfer port in each bank, improves rigidity and head gasket sealing. The right hand cylinder bank is designated as bank 'A' , and the left hand as bank 'B'.

Engine Data Locations

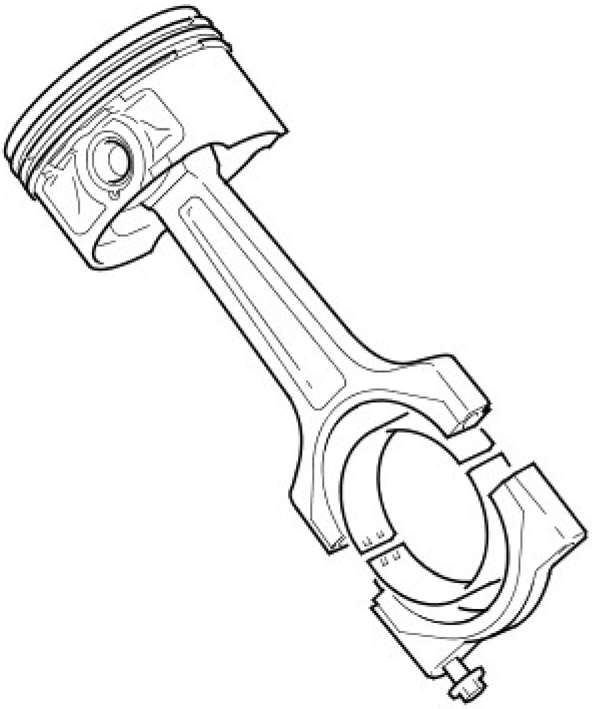


E43426

Item	Part Number	Description
1	-	Engine part number
2	-	Engine data (main bearing diameters, cylinder bore diameters, etc), emissions code and engine number

Engine data is marked at three locations, two on the cylinder block (shown) and one on the engine front cover, which consists a label displaying the engine number. Component diameters are represented by alphabetical and numerical codes; keys to the codes are in the Service Repair Procedures (SRP) Manual.

Connecting Rods and Pistons

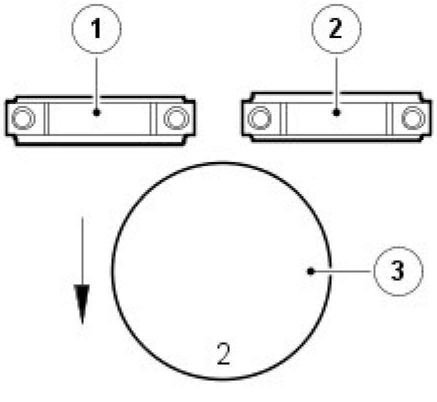


E43427

The connecting rods are manufactured from sinter-forged steel and have fracture-split bearing caps. The bearing caps are produced by fracturing the opposing sides of the connecting rod at the bearing horizontal centre line. As well as being easier to manufacture, when reassembled the fractured surfaces interlock to form a strong seamless joint. The cylinder position is marked on adjoining sides of the joint to identify matching connecting rods and bearing caps. The connecting rod bearings are aluminium/tin split plain bearings.

The pistons are of the open-ended skirt design. Three piston rings, two compression and one oil control, are installed on each piston. Each piston is installed on a gudgeon pin located in a aluminium/tin bushing in the connecting rod.

Connecting Rod and Piston Installation



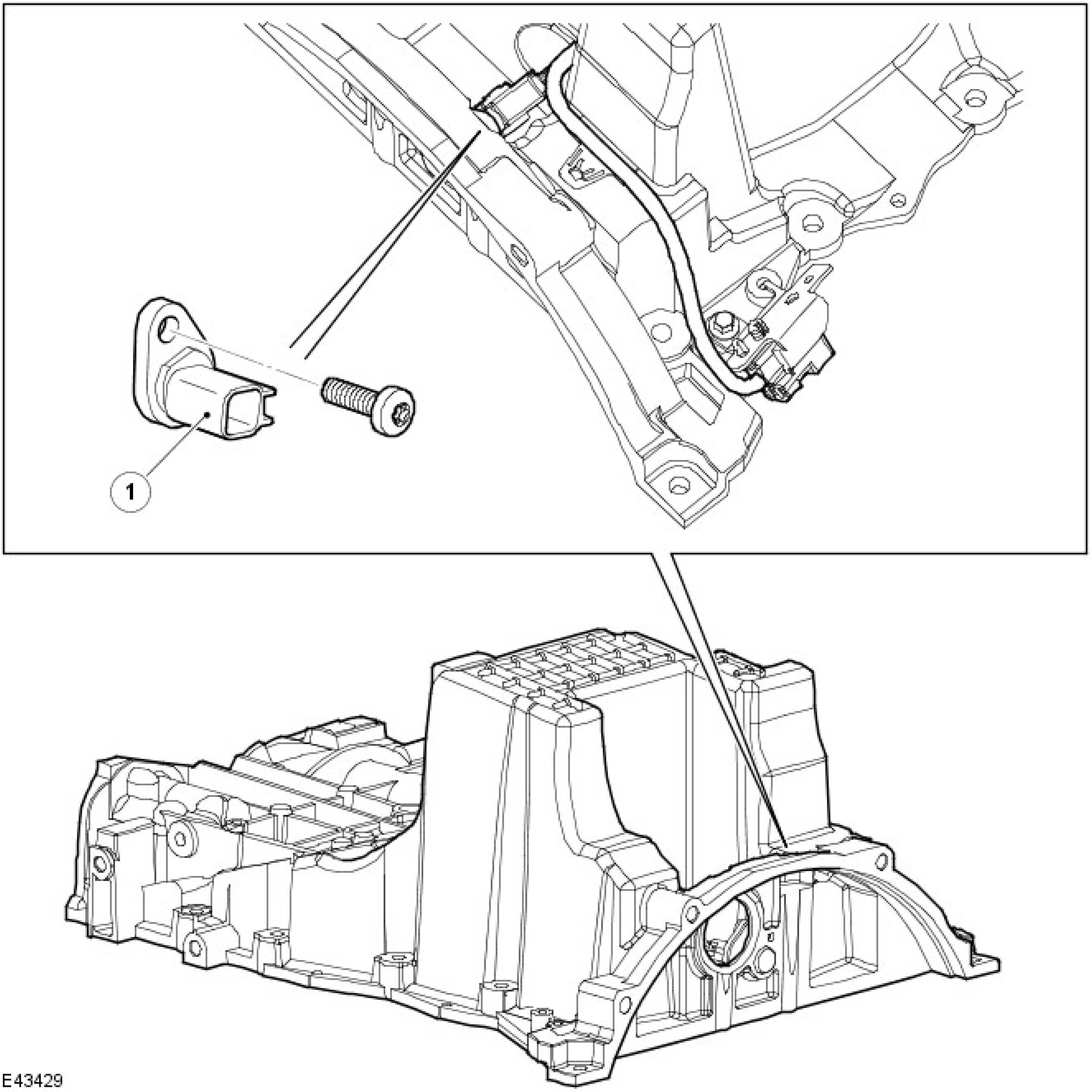
E43428

Item	Part Number	Description
1	-	Bank 'A' (RHS)
2	-	Bank 'B' (LHS)
3	-	Piston

The piston grade number is stamped on the crown of the piston and must coincide with that for each cylinder bore. The piston must be assembled in the correct orientation for the designated cylinder bore:

- Bank 'A' - piston grade number and the thick flange of the connecting rod must face the front of the engine
- Bank 'B' - piston grade number and the thin flange of the connecting rod must face the front of the engine

Crankshaft Position Sensor

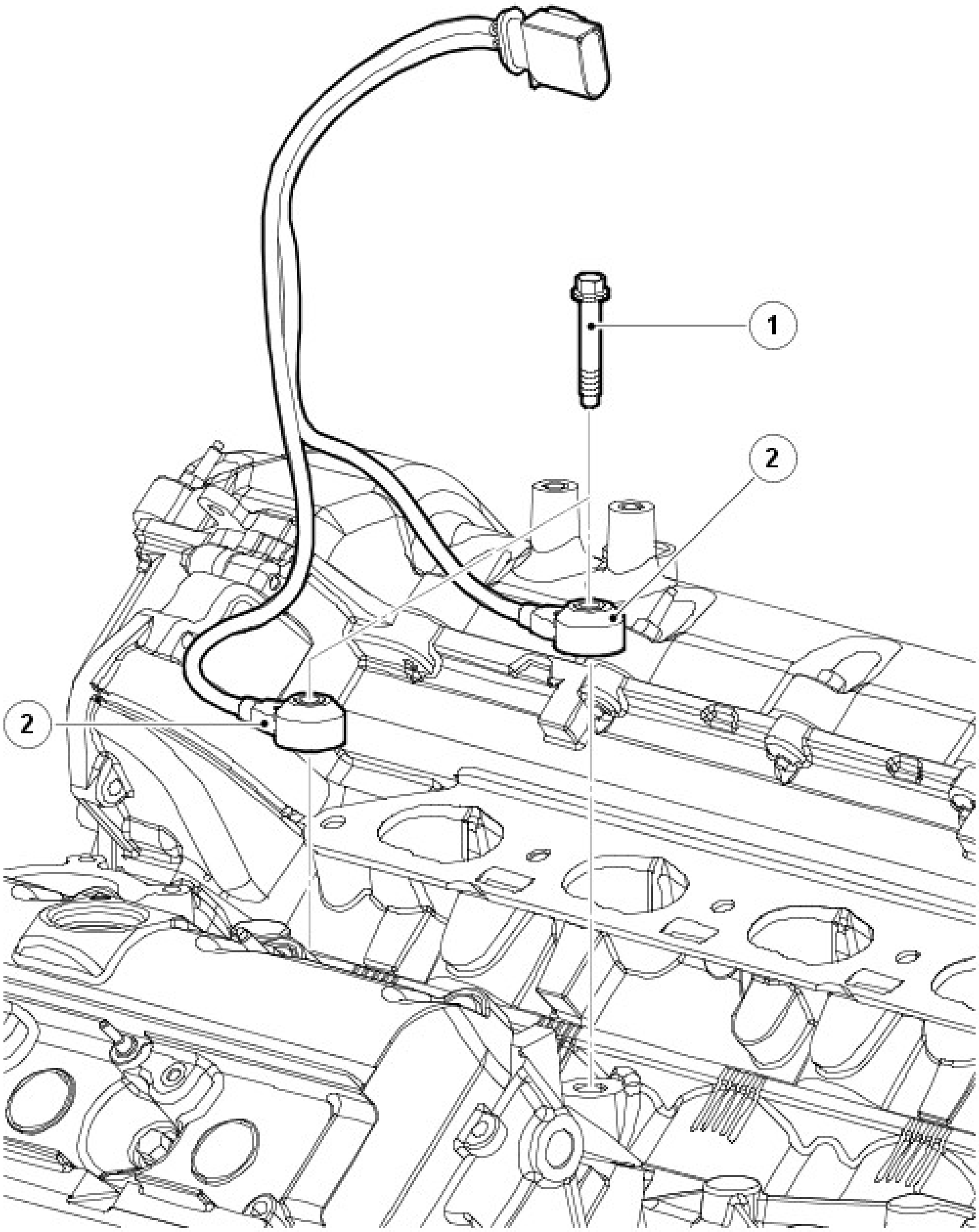


Item	Part Number	Description
1	-	Crankshaft position sensor (CKP)

The CKP sensor is installed at the rear of the sump. It is a variable reluctance sensor that provides an input of engine crankshaft speed and position.

For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

Knock Sensors



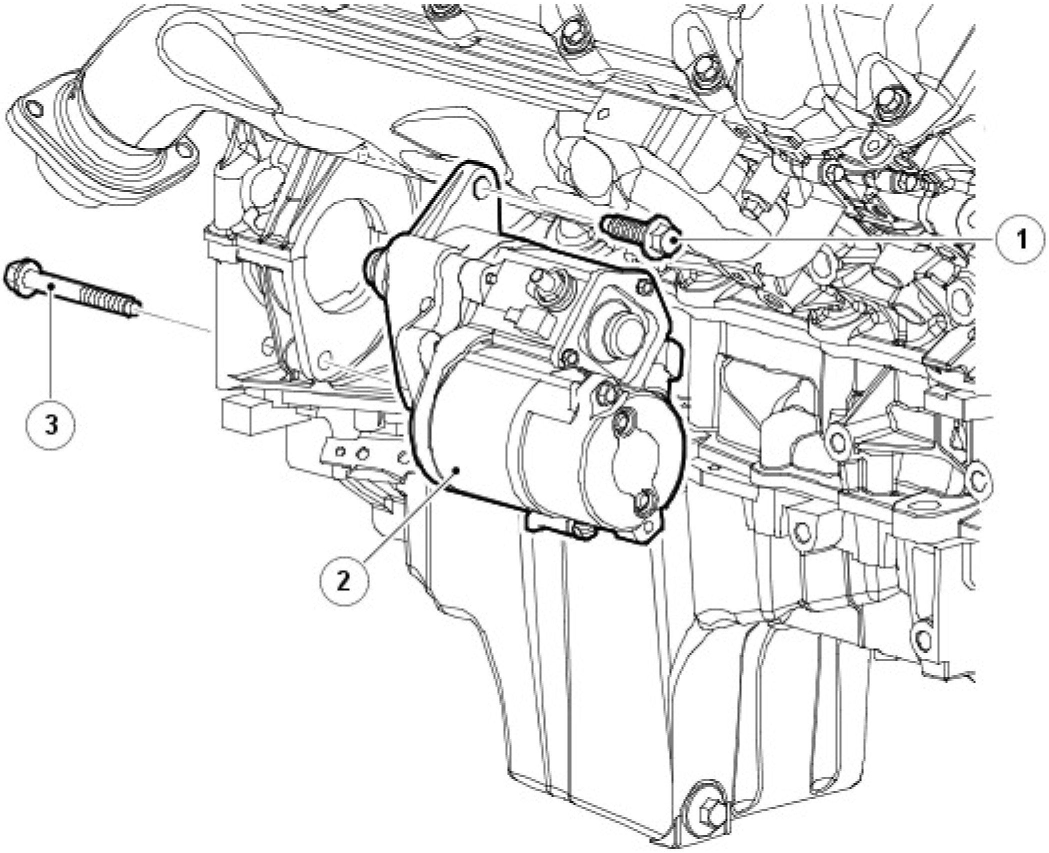
E43430

Item	Part Number	Description
1	-	Bolt
2	-	Knock sensor

The knock sensors are installed in the cylinder block on the inboard side of each cylinder bank. They are piezo-electric sensors that provide inputs to detect and locate detonation during combustion.

For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

Starter

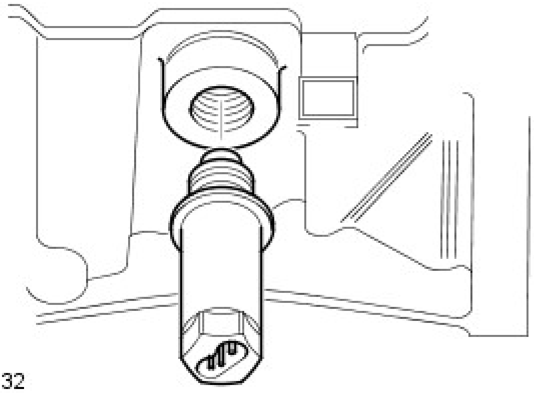


E43431

Item	Part Number	Description
1	-	Bolt
2	-	Starter motor
3	-	Bolt

The engine starter motor is installed at the rear right side of the engine, on the cylinder block to bedplate split line.
For additional information, refer to: Starting System (303-06B Starting System - V8 4.4L Petrol, Description and Operation).

Coolant Drain Plug / Heater

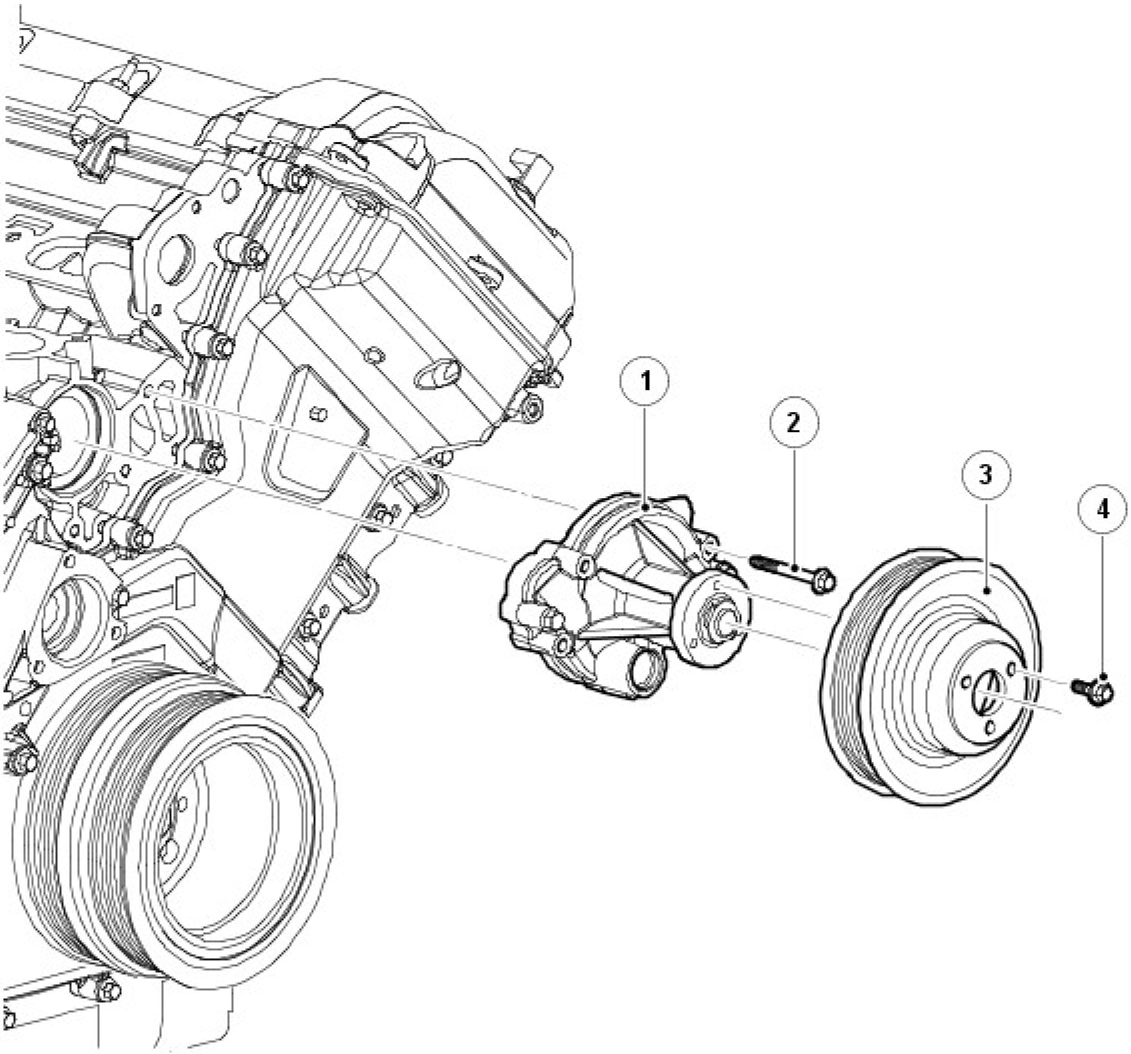


E43432

A coolant drain plug is installed on the rear left side of the cylinder block. On vehicles with the cold climate package, the cylinder block heater replaces the drain plug.

On vehicles destined for Canada, the coolant heater is installed during engine manufacture, but for Scandinavian vehicles the heater is supplied in kit form to be installed at the dealership.

Coolant Pump

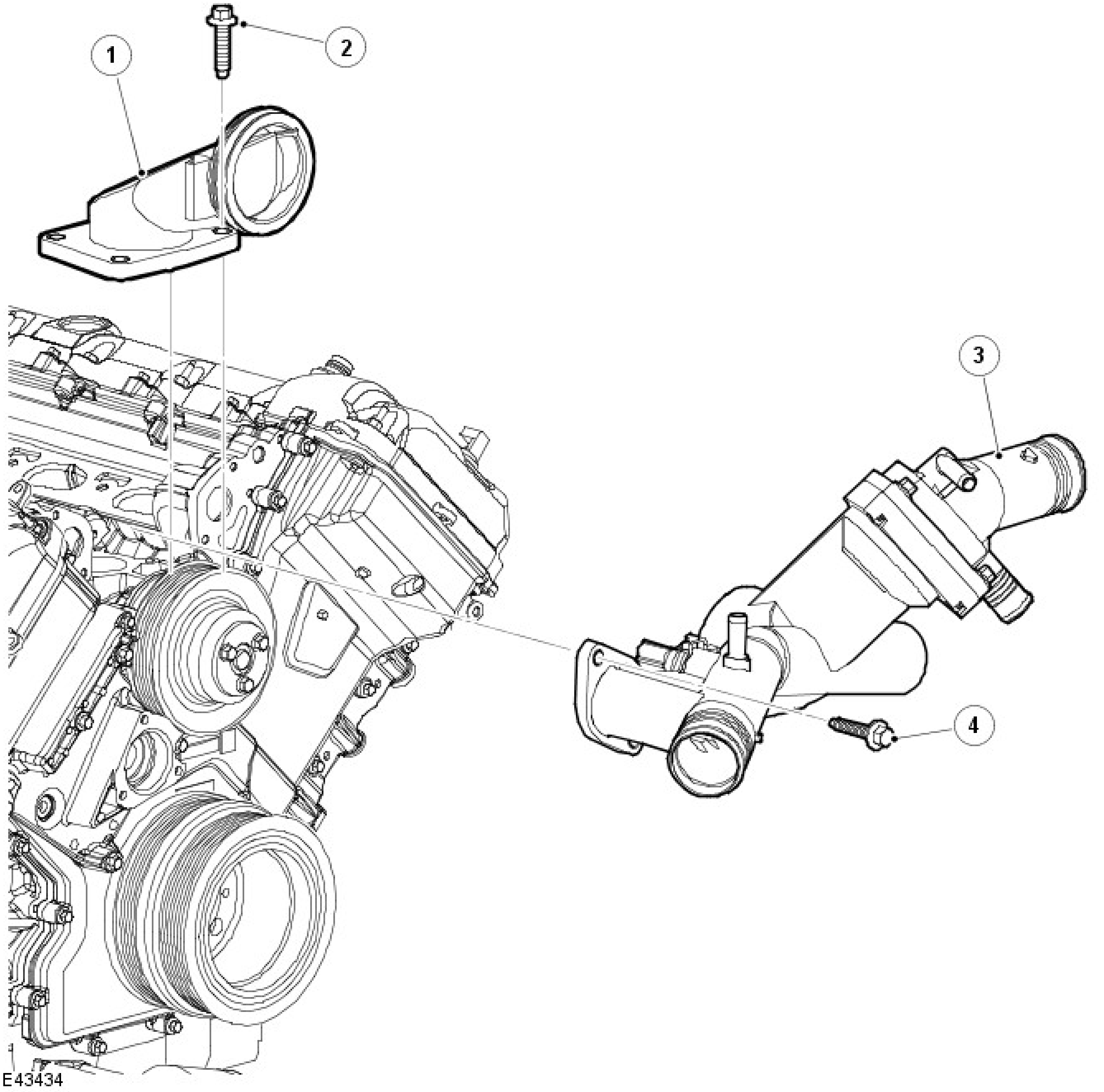


E43433

Item	Part Number	Description
1	-	Coolant pump
2	-	Bolt
3	-	Pulley
4	-	Bolt

The coolant pump is installed between the two cylinder banks, on the front face of the cylinder block.

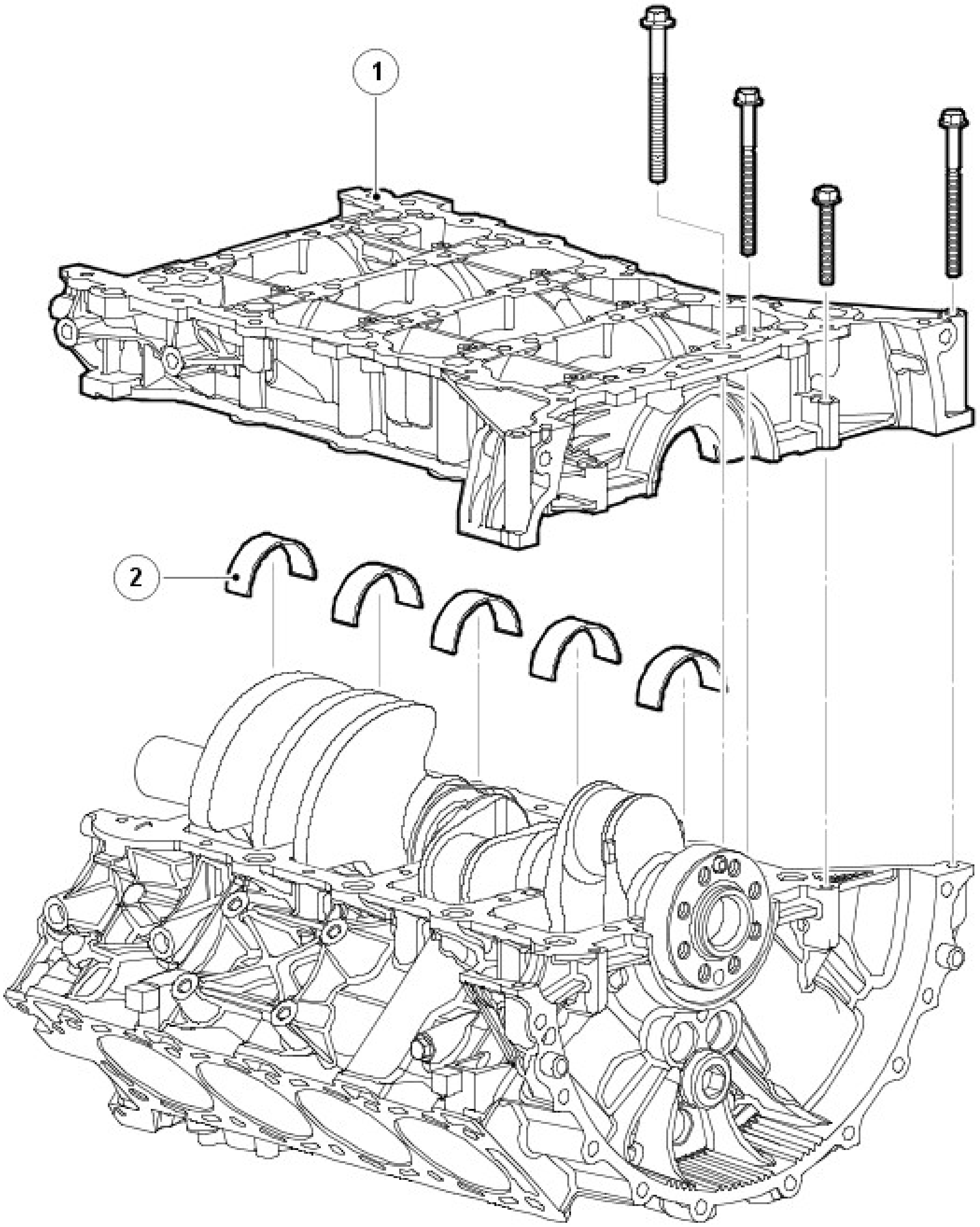
Thermostat Housing



Item	Part Number	Description
1	-	Coolant outlet elbow
2	-	Bolt
3	-	Thermostat housing
4	-	Bolt

The composite thermostat housing is installed between the two cylinder banks, immediately above the coolant pump. The thermostat controls the flow of coolant through the radiator.

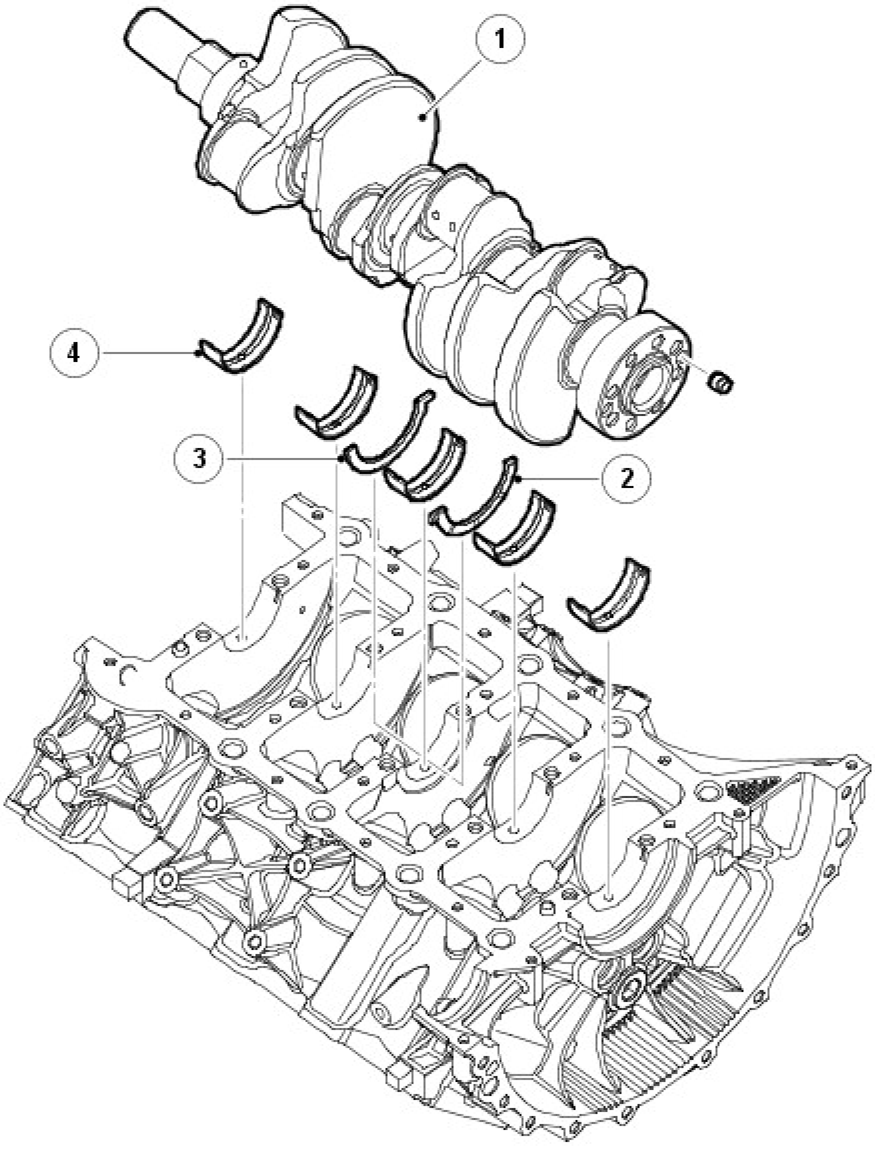
CRANKSHAFT AND SUMP COMPONENTS



E43435

Item	Part Number	Description
1	-	Bedplate
2	-	Main bearings - lower

Crankshaft and Main Bearings



E43436

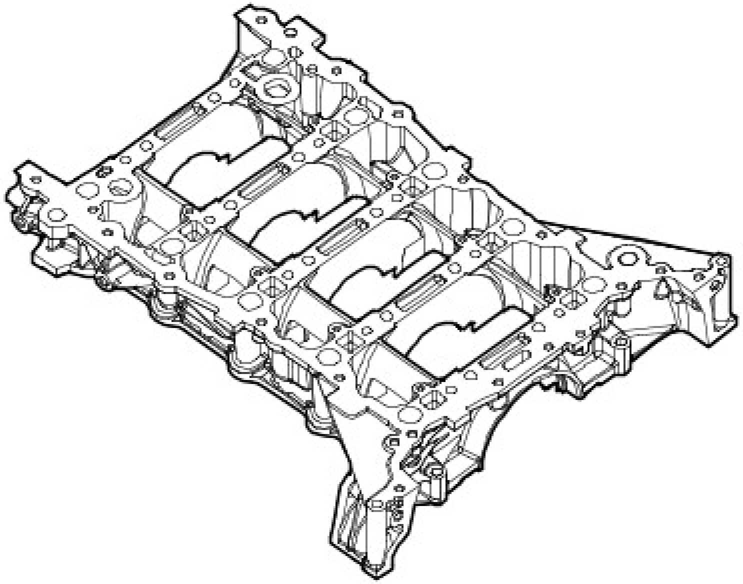
Item	Part Number	Description
1	-	Crankshaft
2	-	Thrust washer
3	-	Thrust washer
4	-	Main bearings - upper

Six counter-balance weights ensure good vibration levels from the four throw, five bearing crankshaft. Manufactured in cast iron, the crankshaft also has undercut and rolled fillets for improved strength.

The crankshaft rear oil seal is a press fit in the bedplate to cylinder block interface.

The main bearings are aluminium/tin split plain bearings. An oil groove in the upper half of each bearing transfers the oil into the crankshaft for lubrication of the connecting rod bearings. An aluminium/tin thrust washer is installed each side of the top half of the centre main bearing.

Bedplate



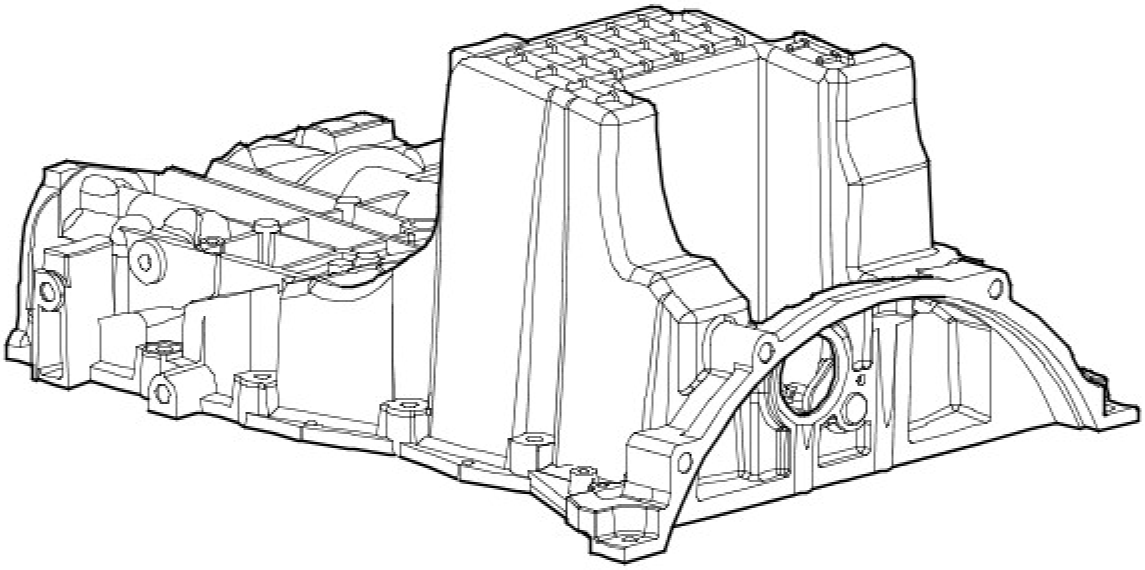
E43437

The bedplate is a structural casting bolted to the bottom of the cylinder block to retain the crankshaft. The use of a bedplate further improves rigidity. Iron inserts, cast into the main bearing supports of the bedplate, minimise main bearing clearance changes due to heat expansion.

Two hollow dowels align the bedplate with the cylinder block.

Beads of sealant seal the joint between the bedplate and the cylinder block.

Sump

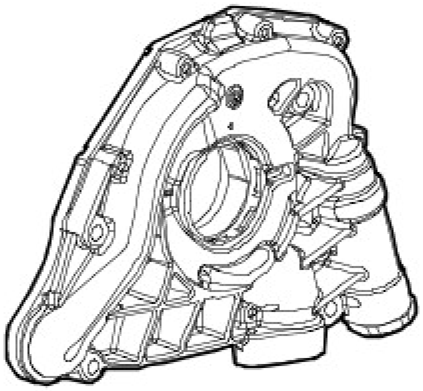


E43438

The aluminium alloy structural sump is bolted to the bedplate. A windage tray attached to the underside of the bedplate isolates the oil pan from the disturbed air produced by the rotation of the crankshaft, to prevent oil aeration and improve oil drainage. A rubber plug at the rear of the structural sump seals the port that provides access to the torque converter securing bolts. The engine oil drain plug is located at the front right corner of the oil pan.

A bead of sealant seals the joint between the structural sump and the bedplate.

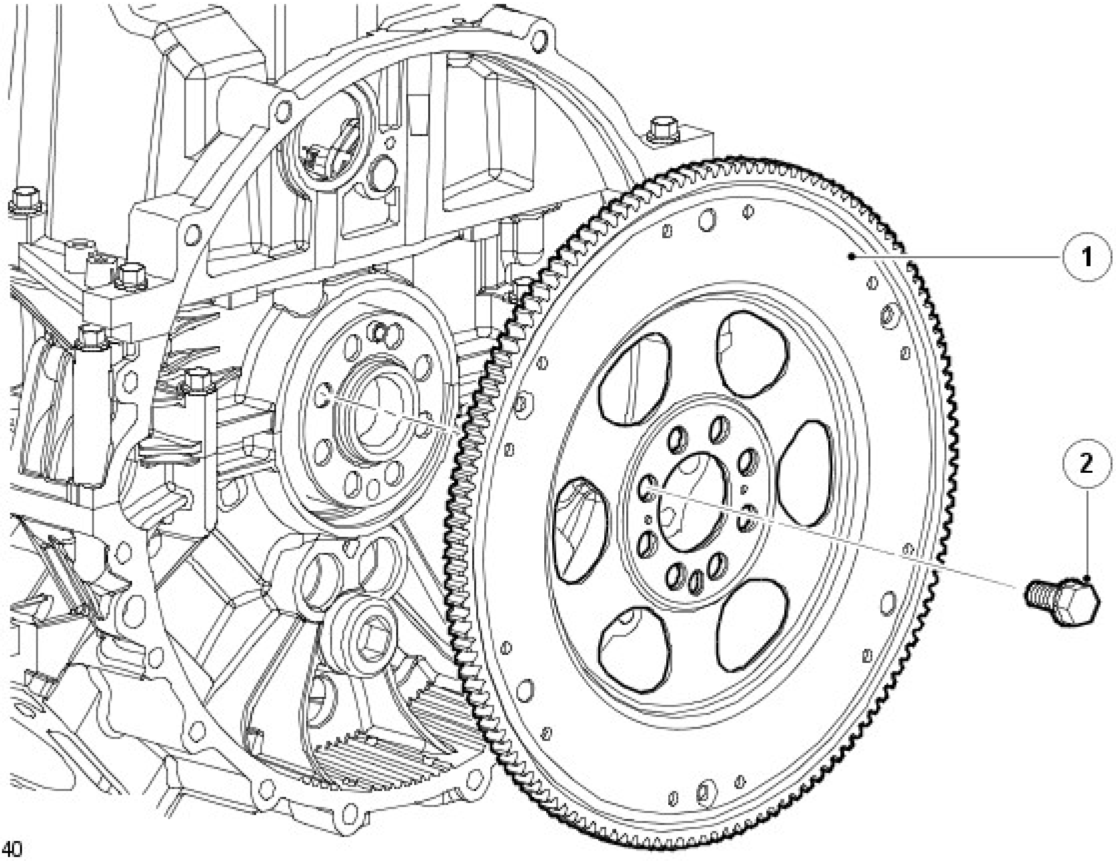
Oil Pump



E43439

The oil pump is installed on the crankshaft at the front of the engine. The pump outlet port aligns with oil passages in the bedplate.

Starter Drive Plate

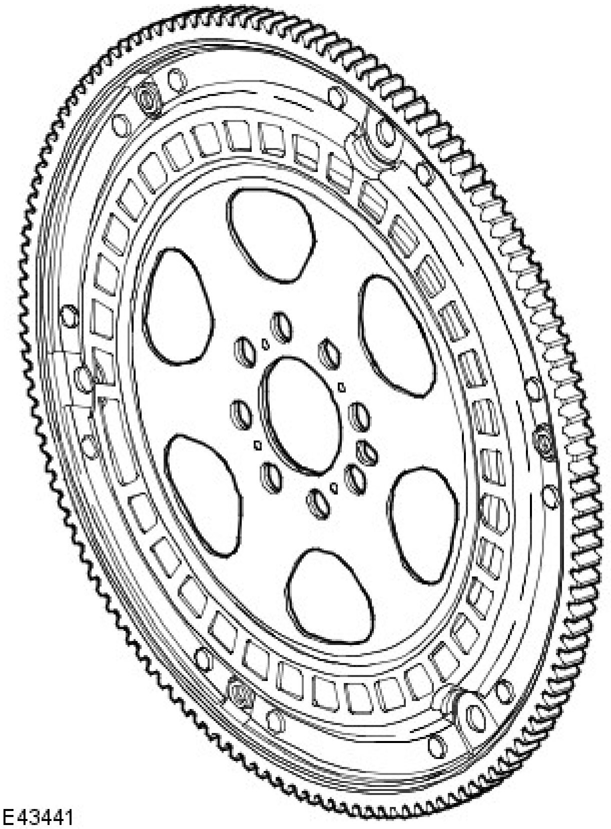


E43440

Item	Part Number	Description
1	-	Starter drive plate
2	-	Bolt

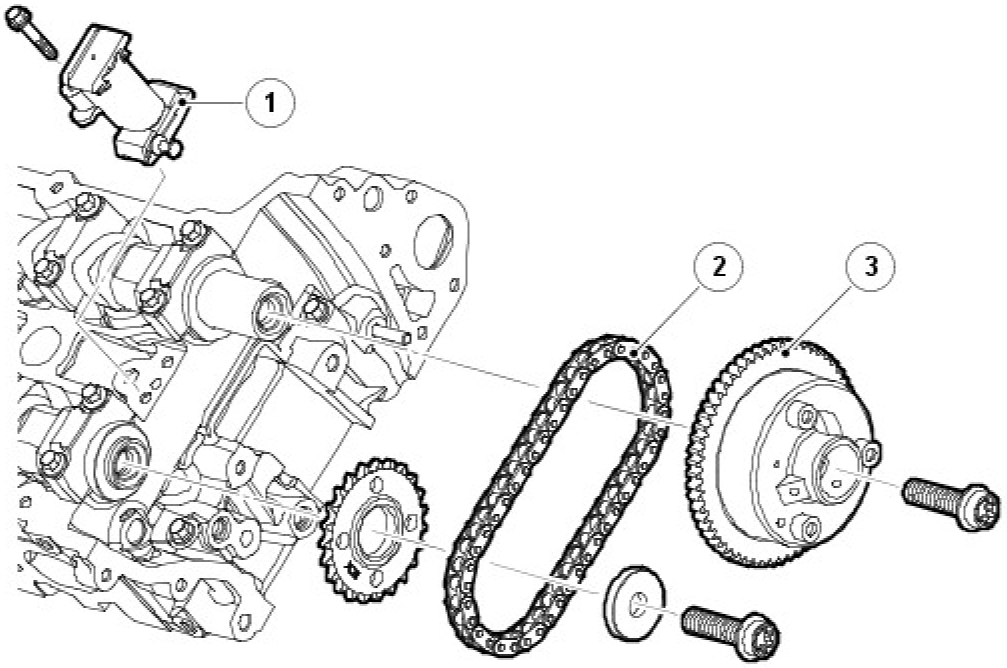
The starter drive plate is attached to the rear of the crankshaft. A timing disc, for the engine speed sensor, is spot welded to the front face of the drive plate.

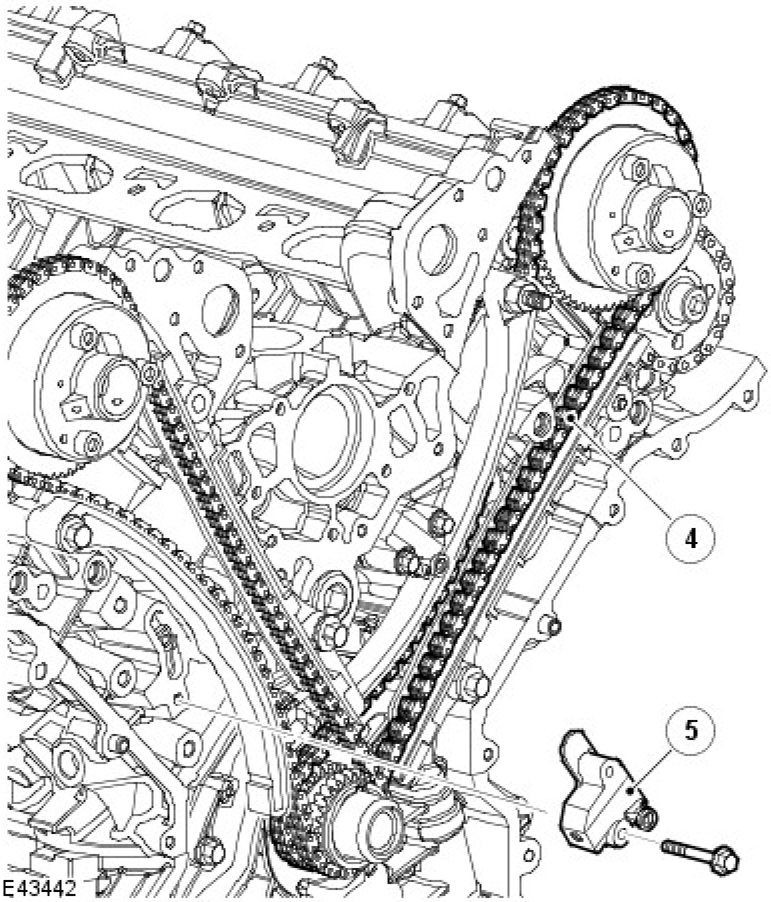
Timing Disc



E43441

CAMSHAFT TIMING COMPONENTS





Item	Part Number	Description
1	-	Secondary chain tensioner
2	-	Secondary chain
3	-	Variable valve timing unit
4	-	Primary chain
5	-	Primary chain tensioner

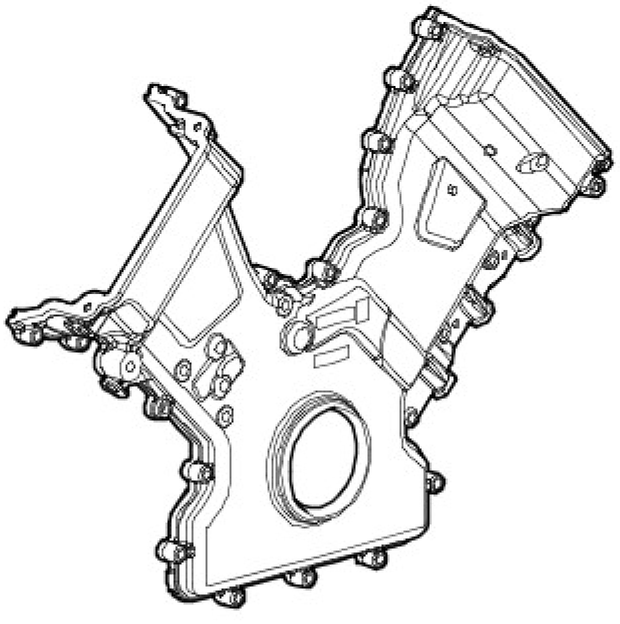
Timing Gear

Multiple link primary and single row secondary chains drive the camshafts of each cylinder bank. The primary chains transmit the drive from two sprockets on the crankshaft to variable valve timing units on the intake camshafts. The secondary chains transmit the drive from the variable valve-timing units to sprockets on the exhaust camshafts.

A key locates the two drive sprockets on the crankshaft. The crankshaft's torsional vibration damper retains the sprockets in position. The variable valve timing units and the exhaust camshaft sprockets are non-interference, non-keyed fits on their respective camshafts; the drive being transmitted by the face to face friction load produced by the valve timing unit/sprocket securing bolt.

Each chain has a hydraulic tensioner operated by engine oil. The primary chains are lubricated via oil squirt tubes located at the front of the engine block, near the crankshaft drive sprockets. A jet of oil from the end of each secondary chain tensioner lubricates the secondary chains. The primary chain tensioners act on pivoting flexible tensioner blades. The secondary chain tensioners act directly on the chains. Guide rails are installed on the drive side of the primary chains.

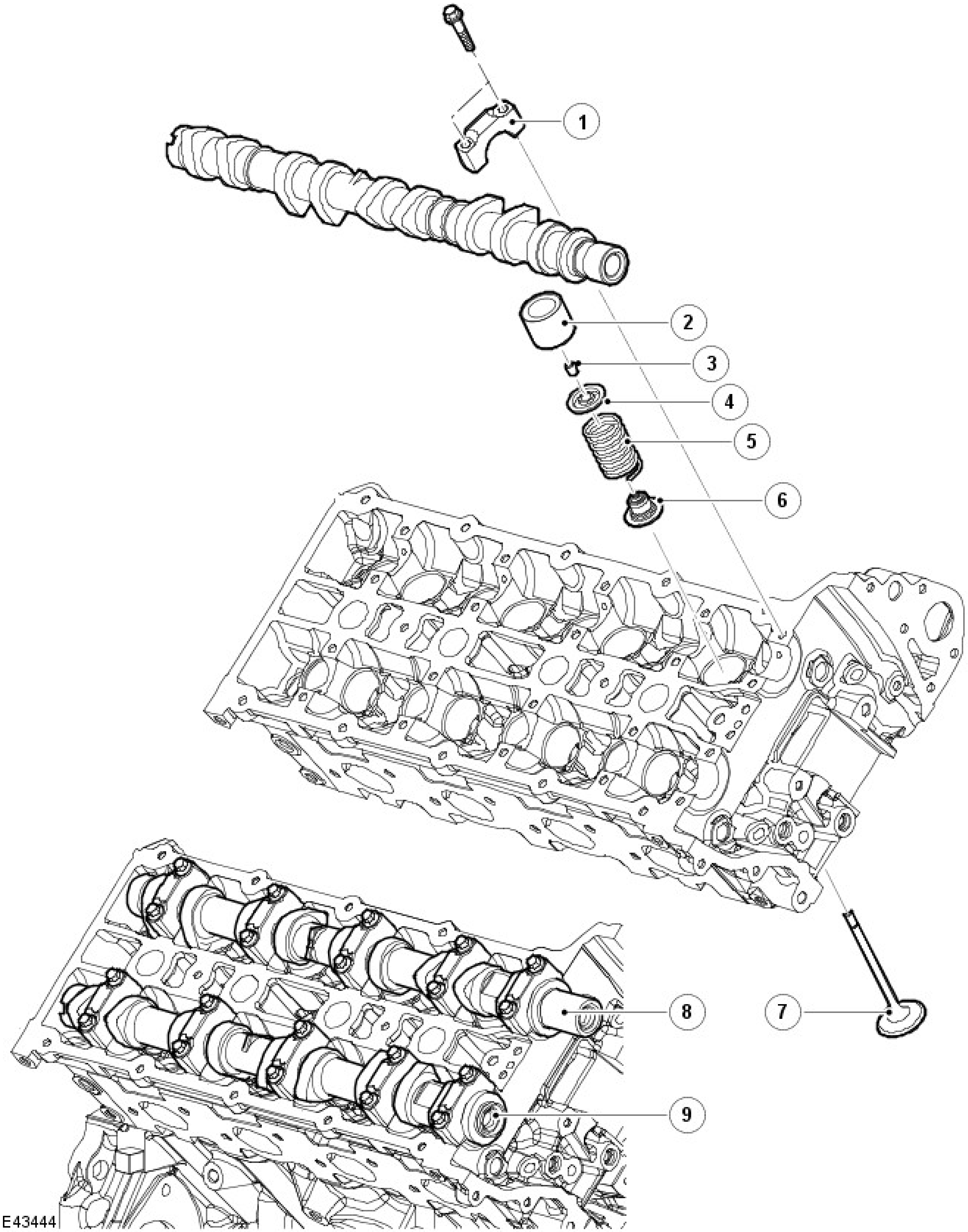
Timing Cover



E43443

The aluminium alloy timing cover accommodates the crankshaft front oil seal (a PTFE lip seal). Silicon rubber in-groove gaskets seal the joint between the timing cover and the front face of the engine.

CYLINDER HEAD COMPONENTS


1
2
3
4
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E43444

Item	Part Number	Description
1	-	Camshaft bearing cap
2	-	Tappet (shimless)
3	-	Collet
4	-	Valve spring cap
5	-	Valve spring

6	-	Valve stem oil seal
7	-	Valve
8	-	Inlet camshaft
9	-	Exhaust camshaft

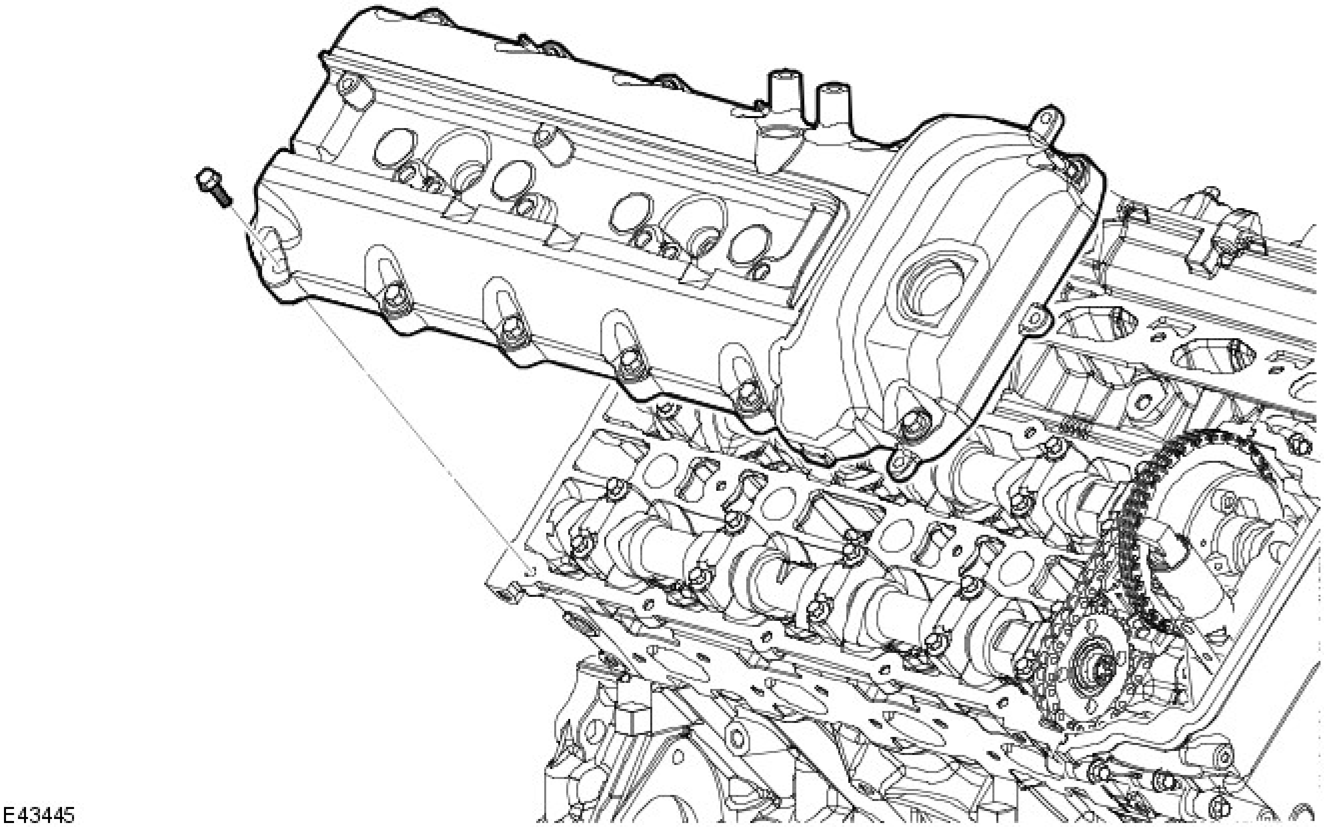
Cylinder Heads

The cylinder heads are unique to each cylinder bank. Deep-seated bolts, to reduce distortion, secure the cylinder heads to the cylinder block. Two hollow dowels align each cylinder head with the cylinder block.

The 14 mm spark plugs, one per cylinder, locate in recesses down the centre line of each cylinder head.

The engine-lifting eyes are bolted to the cylinder heads; two on the rear (one per head) and one at the front.

Camshaft Covers



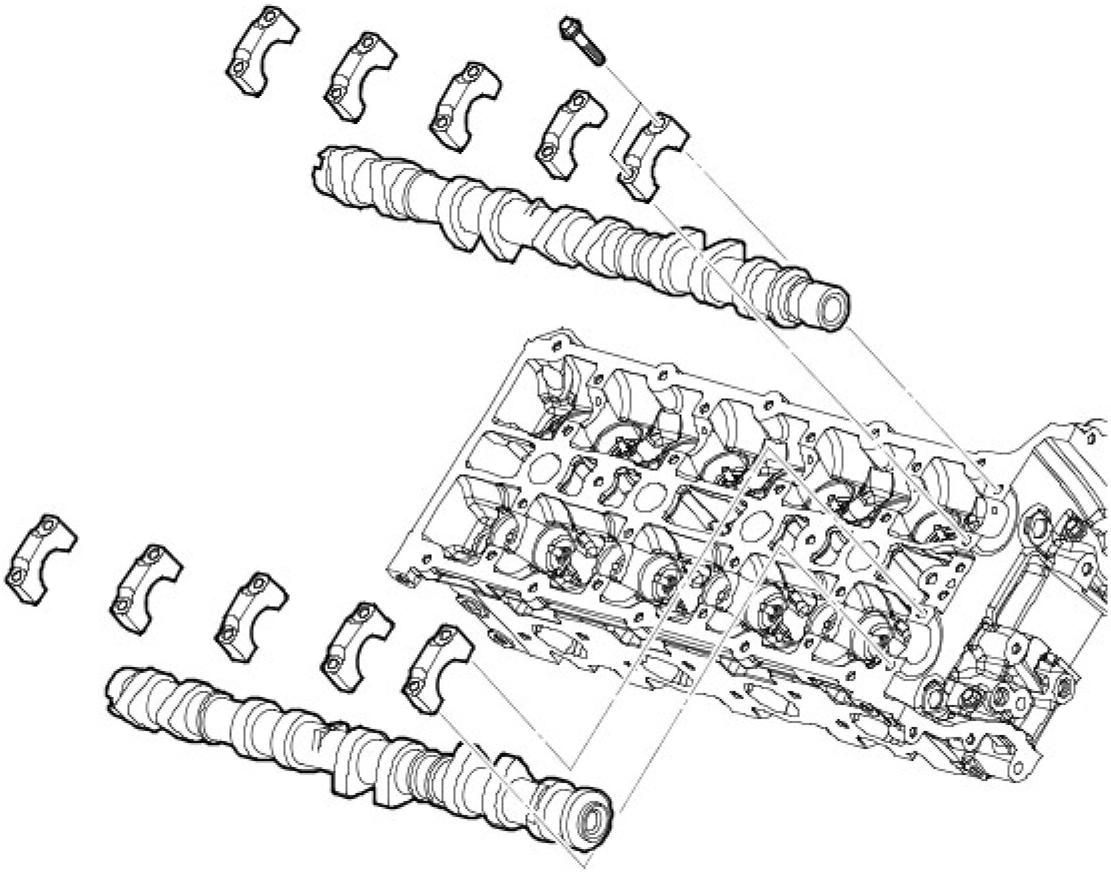
The camshaft covers are manufactured from thermo-plastic. The bank 'A' camshaft cover incorporates an outlet for the part load engine breather. The bank 'B' camshaft cover incorporates an outlet for the full load engine breather and the engine oil filler cap. Identical oil separators are incorporated below the breather outlet in each cover.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

Silicon rubber in-groove gaskets seal the joints between the camshaft covers and the cylinder heads. Together with spacers and seals on the camshaft cover fasteners, they also isolate the covers from direct contact with the cylinder heads, to reduce noise.

Cylinder Head Gasket

The multi-layered steel cylinder head gasket has cylinder specific water flow cross-sections for uniform coolant flow.

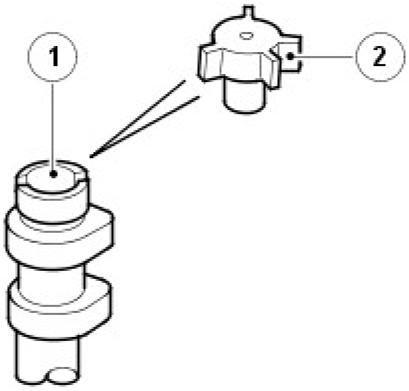
Camshafts



E43446

The camshafts are manufactured in chilled cast iron. Five aluminium alloy caps retain each camshaft. Location numbers, 0 to 4 for the intake camshaft and 5 to 9 for the exhaust camshaft, are marked on the outer faces of the caps.

Sensor Ring

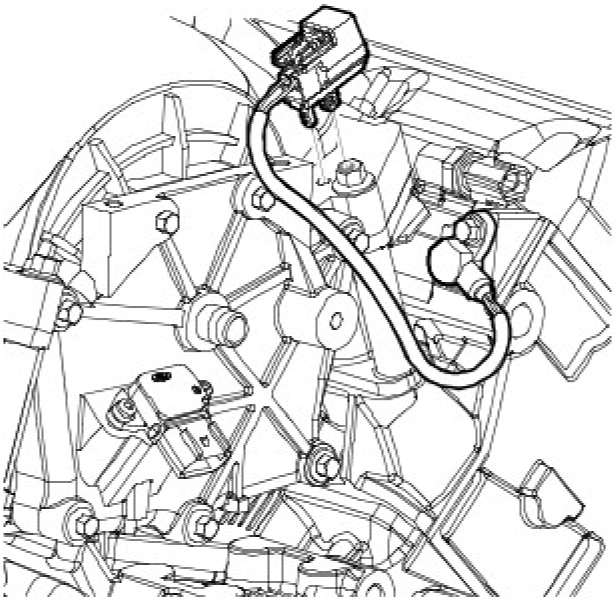


E43447

Item	Part Number	Description
1	-	Inlet camshaft
2	-	Sensor ring

Timing rings for each camshaft position sensor are located at the rear of both intake camshafts. A flat, machined near the front of each camshaft, enables the camshafts to be locked during the valve timing procedure.

Camshaft Position Sensor



E43448

The camshaft position sensors are installed in each cylinder head at the rear of the intake camshaft. It is a variable reluctance sensor that provides an input to the ECM regarding the position of the camshaft.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

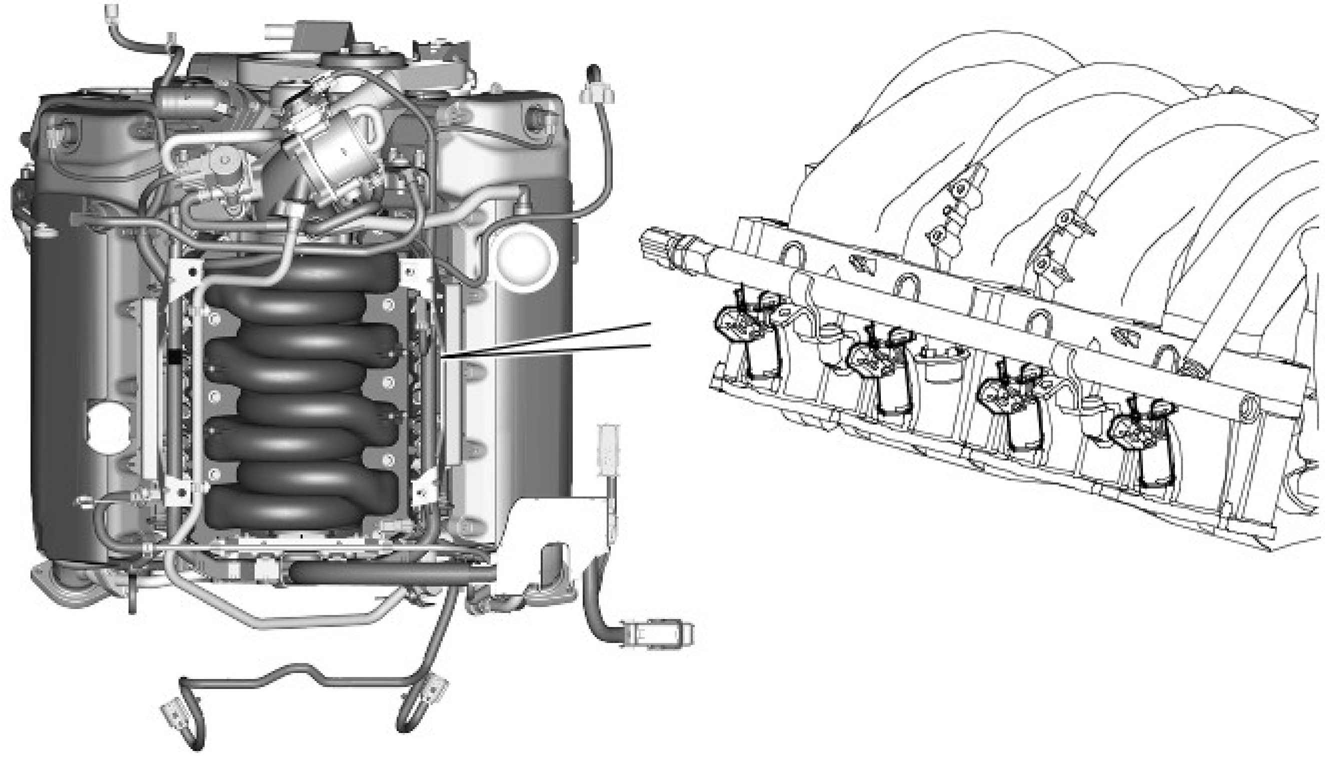
Inlet and Exhaust Valves

Each cylinder head incorporates dual overhead camshafts operating four valves per cylinder via solid shimless aluminium alloy valve lifters.

The lightweight valve gear provides good economy and noise levels. Valve head diameters are 31mm (1.220 in) for the exhaust and 35mm (1.378 in) for the intake. All valves have 5mm (0.197 in) diameter stems supported in sintered metal seats and guide inserts. Collets, valve collars and spring seats locate single valve springs on both intake and exhaust valves. Valve stem seals are integrated into the spring seats.

⚠CAUTION: Due to slight variations in length, the valves are **not** interchangeable between marques (Land Rover, Jaguar and Aston Martin).

Fuel Injectors



Eight, top fed, eight hole, fuel injectors are installed in the fuel rails. The injectors are electromagnetic solenoid valves controlled by the ECM. Two O-rings seal each injector to manifold interface. The fuel jets from the injectors are directed onto the back of the intake valves.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

VARIABLE VALVE TIMING (VVT)

The continuously VVT unit turns the intake camshaft in relation to the primary chain to advance and retard the timing.

The system improves low and high-speed engine performance, engine idle quality and exhaust emission.

The VVT system changes the phasing of the intake valves, relative to the fixed timing of the exhaust valves, to alter:

- the mass of air flow into the engine's cylinders,
- and the engine's torque response and emissions.

The VVT unit uses a vane device to control the camshaft angle (refer to VVT operation). The system operates over a range of 48° and is advanced or retarded to the optimum angle within this range.

The ECM controls the VVT, using engine speed and load, engine oil temperature and throttle position signals to calculate the appropriate camshaft position.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

The continuous VVT system provides the following advantages:

- Reduces engine emissions and fuel consumption by further optimising the camshaft timing, this improves the engine's internal exhaust gas re-circulation (EGR) effect over a wider operating range
- Improves full-load torque characteristics as the camshaft timing is optimised at all engine speeds for superior volumetric efficiency
- Improves fuel economy by optimising torque over the engine's speed range.

Variable Valve Timing Operation

The VVT unit is a hydraulic actuator mounted on the end of the intake camshaft, which advances or retards the intake camshaft timing and thereby alters the camshaft to crankshaft phasing. The oil control solenoid, controlled by the ECM, routes oil pressure to either the advance or retard chambers located either side of the three vanes interspersed within the machined housing of the unit.

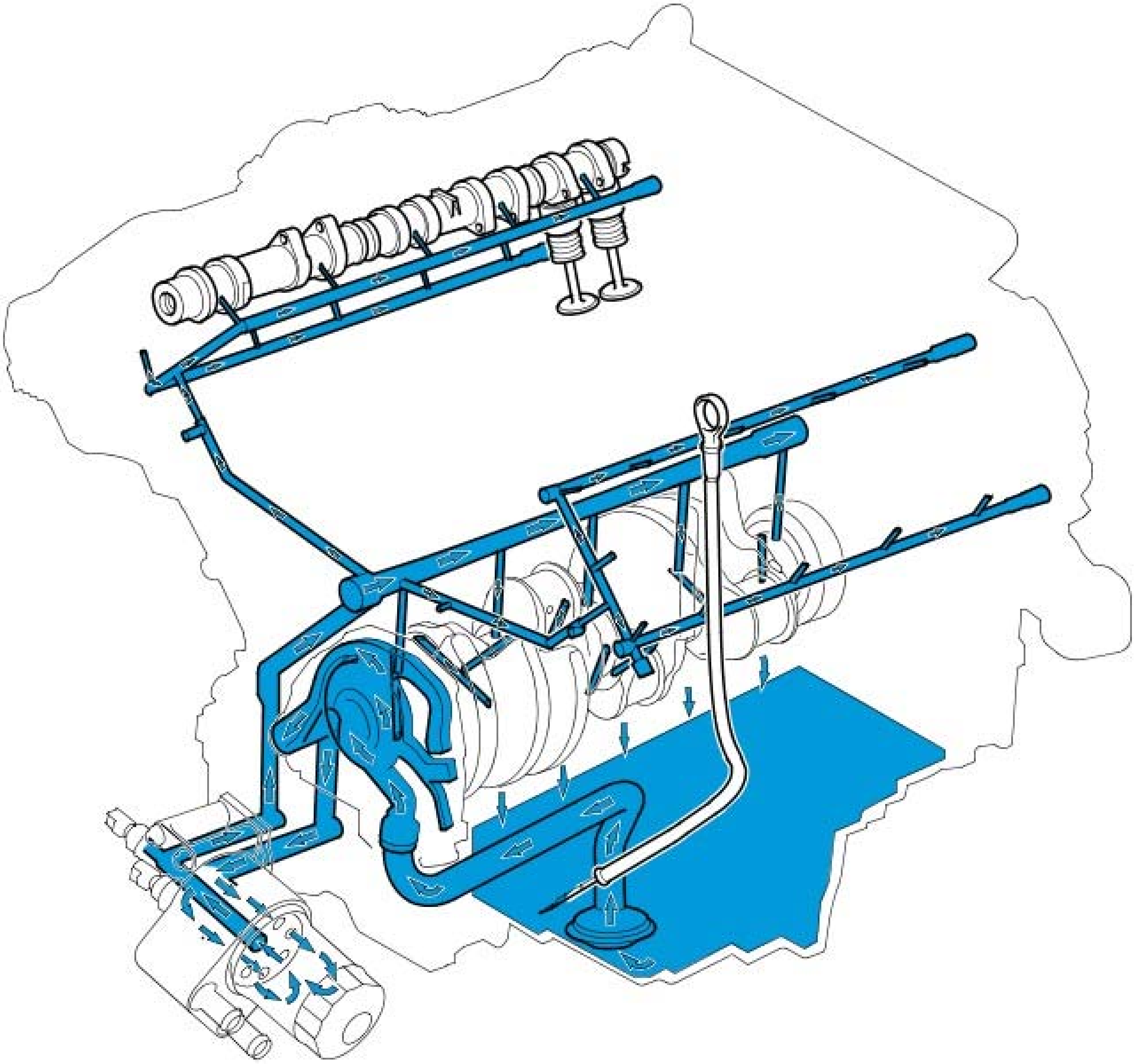
The VVT unit is driven by the primary chain and rotates relative to the exhaust camshaft sprocket. When the ECM requests the camshaft timing to advance, the oil control solenoid is energized moving the shuttle valve to the relevant position to allow engine oil pressure, via a filter, into the VVT unit's advance chambers. When the camshaft timing is requested to retard, the shuttle valve moves position to allow oil pressure to exit the advance chambers, while simultaneously routing the oil pressure into the retard chambers.

When directed by the ECM, the VVT unit will be set to the optimum position between full advance and retard for a particular engine speed and load. This is achieved when the ECM sends the energising signal to the oil control solenoid until the target position is met. At this point, the energizing signal is reduced to hold the solenoid position, and as a result the position of the shuttle valve. This function is under closed-loop control, where the ECM will alter the energizing signal, when required, to maintain the desired position.

Engine oil properties and temperature can affect the ability of the VVT mechanism to follow demand changes to the cam phase angle. At very low oil-temperatures, movement of the VVT mechanism is sluggish due to increased viscosity, and at high oil-temperatures the reduced viscosity may impair operation if the oil pressure is too low. To maintain satisfactory VVT performance, an increased capacity oil pump is installed, plus an engine oil temperature sensor to enable monitoring by the ECM. The VVT system is normally under closed-loop control except in extreme temperature conditions, such as cold starts below 0°C. At extremely high oil-temperatures, the ECM may limit the amount of VVT advance to prevent the engine from stalling when returning to idle speed.

The VVT does not operate when engine oil-pressure is below 1.25 bar, as there is insufficient pressure to release the VVT unit's internal stopper pin. This usually occurs when the engine is shutting-down and the VVT has returned to the retarded position. The stopper pin locks the camshaft to the VVT unit to ensure camshaft stability during the next engine start-up.

LUBRICATION SYSTEM



E43454

General

Oil is drawn from the reservoir in the oil pan and pressurised by the oil pump. The output from the oil pump is then filtered, cooled and distributed through internal oil passages.

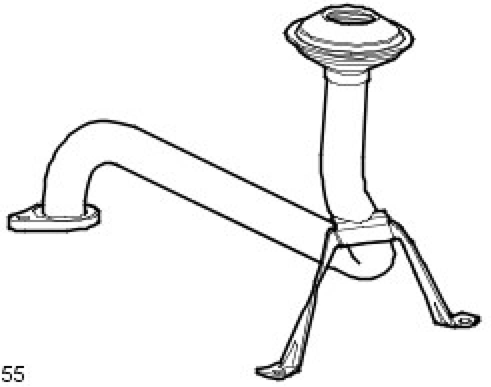
All moving parts are lubricated by pressure or splash oil. Pressurised oil is also provided for operation of the variable valve timing units and the timing gear chain tensioners.

The oil returns to the oil pan under gravity. Large drain holes through the cylinder heads and cylinder block ensure the quick return of the oil, reducing the volume of oil required and enabling an accurate check of the contents soon after the engine stops.

System replenishment is through the oil filler cap on the bank 'B' camshaft cover.

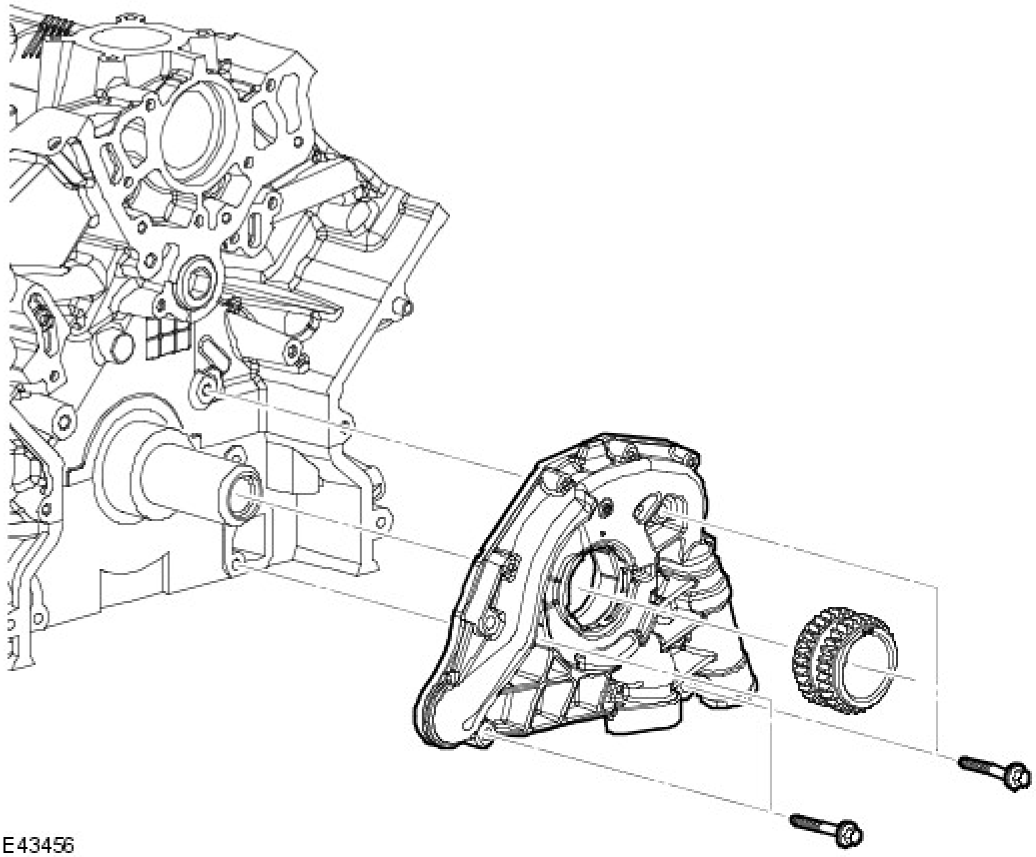
With the exception of the pump, all oil system components are installed on the structural sump.

Oil Pick-up



The fabricated steel oil pick-up is immersed in the oil reservoir to provide a supply to the oil pump during all normal vehicle attitudes. A mesh screen in the inlet prevents debris from entering the oil system.

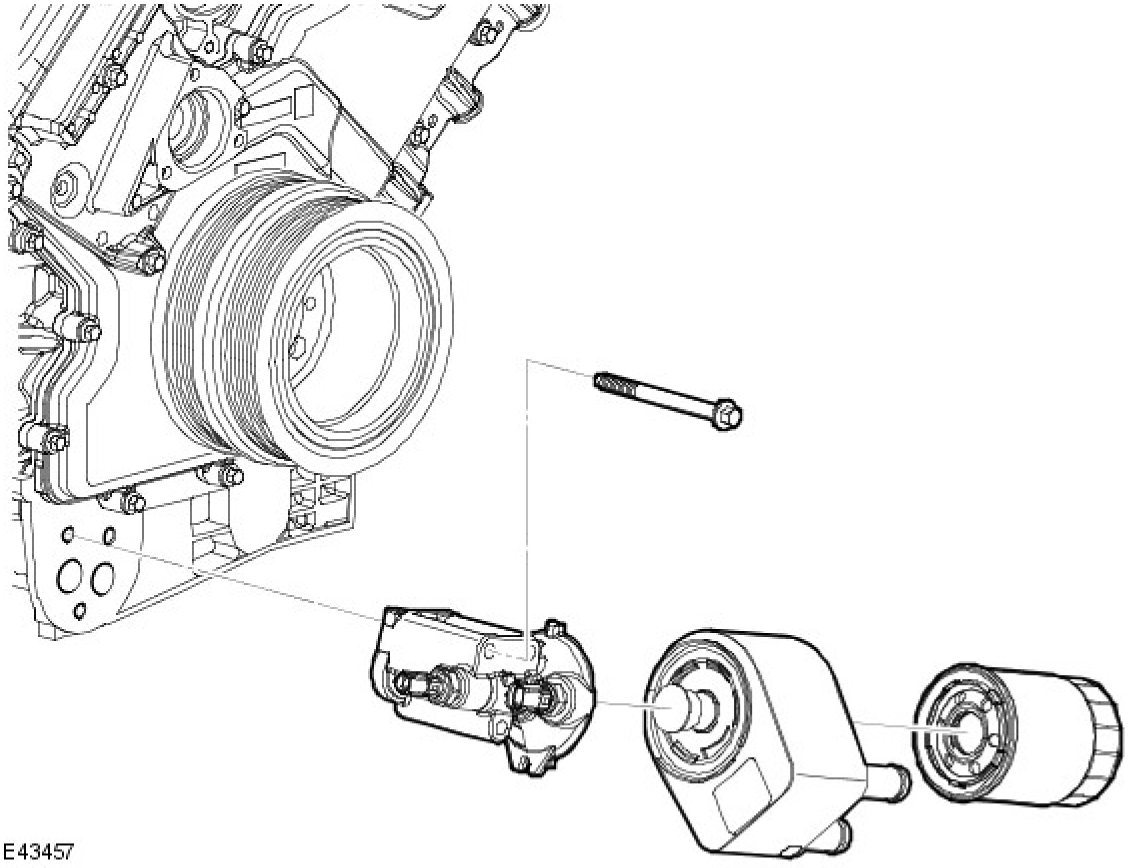
Oil Pump



The oil pump is installed on the crankshaft at the front of the engine. The pump outlet port aligns with oil passages in the bedplate.

The pumping element is an eccentric rotor, which is directly driven by flats on the crankshaft. An integral pressure relief valve regulates pump outlet pressure at 4.5 bar (65.25 psi).

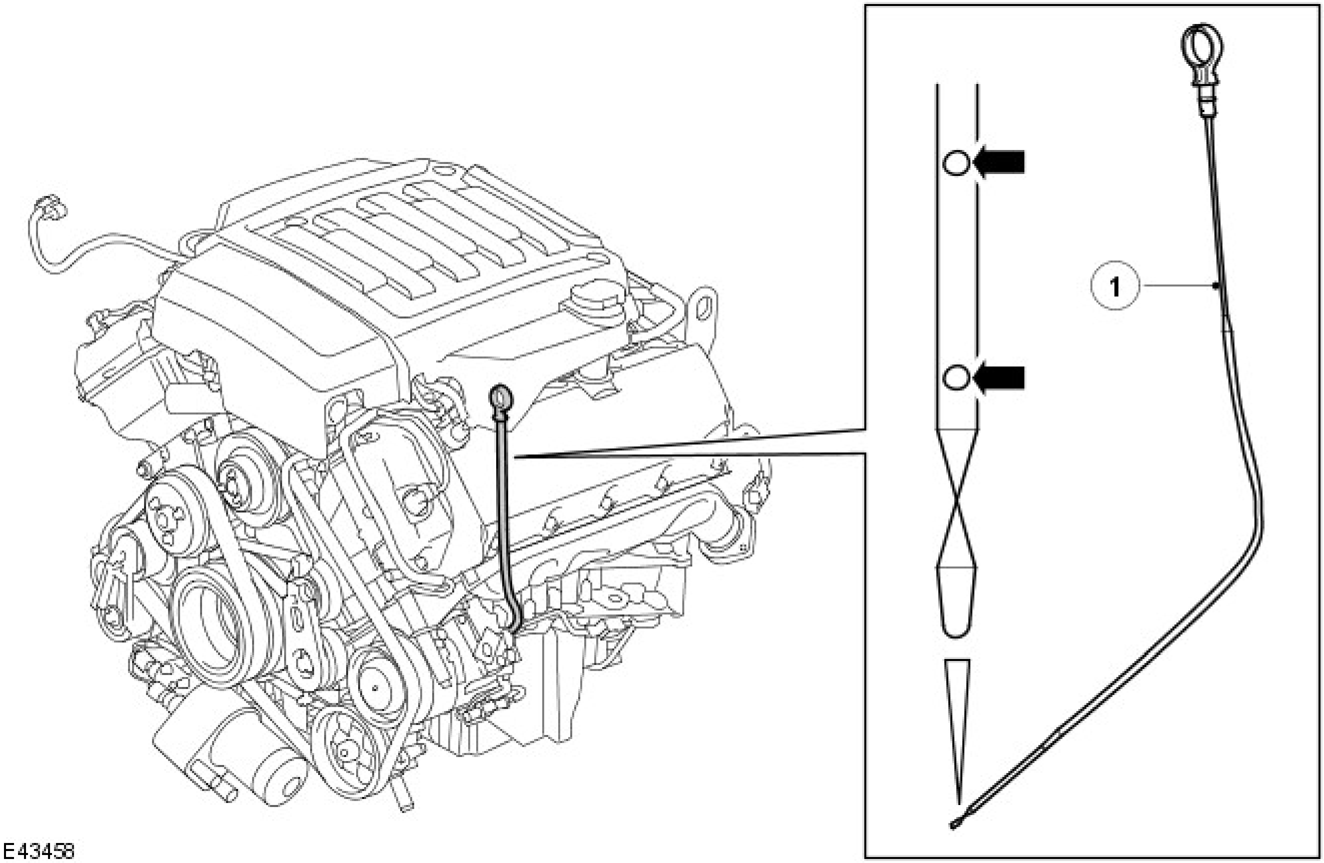
Oil Filter and Oil Pressure Switch



The oil filter is a replaceable cartridge installed on an adapter. An internal bypass facility permits full flow bypass if the filter is blocked.

The oil pressure switch connects a ground input to the instrument cluster when oil pressure is present. The switch operates at a pressure of 0.15 to 0.41 bar (2.2 to 5.9 psi).

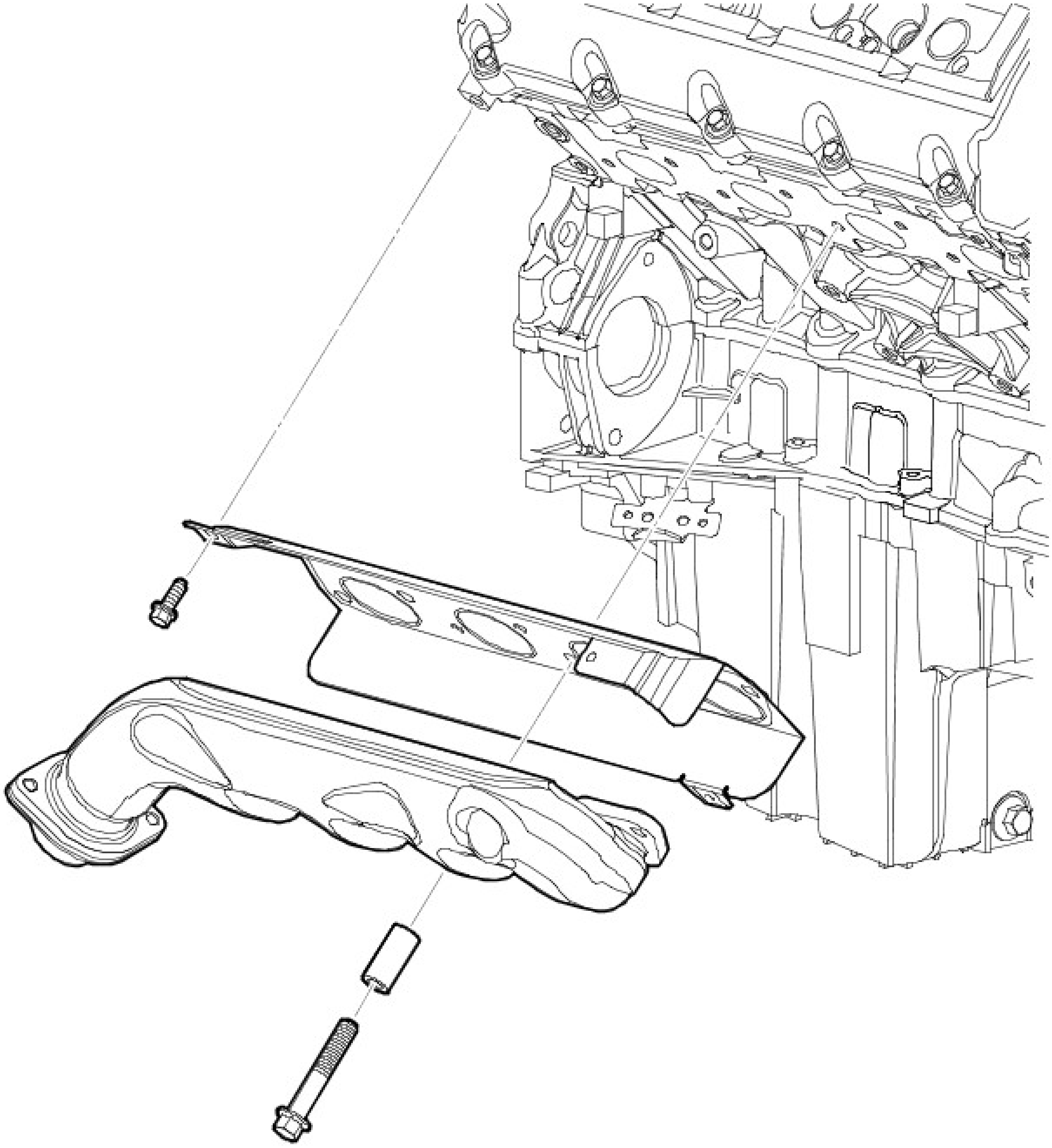
Oil Level Gauge



Item	Part Number	Description
1	-	Oil level gauge

The oil level gauge locates along the left side of the oil pan, supported in a tube installed in the sump. Two holes in the end of the gauge indicate the minimum and maximum oil levels. There is a difference of approximately 1.5 litres (1.58 US quart) between the two levels.

EXHAUST MANIFOLD



E43459

The fabricated stainless steel twin skin exhaust manifolds are unique for each cylinder bank. The bank 'B' manifold has a connection for the EGR transfer pipe.

Spacers on the securing bolts allow the manifolds to expand and retract with changes of temperature while maintaining the clamping loads.

Heat shields are integrated into the exhaust manifold gaskets.

Published: 11-May-2011

Engine - V8 4.4L Petrol - Engine

Diagnosis and Testing

For additional information:
REFER to: Engine - V8 4.4L Petrol (303-00 Engine System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Engine - V8 4.4L Petrol - Valve Clearance Check

General Procedures

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the cooling fan.
For additional information, refer to: Cooling Fan (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

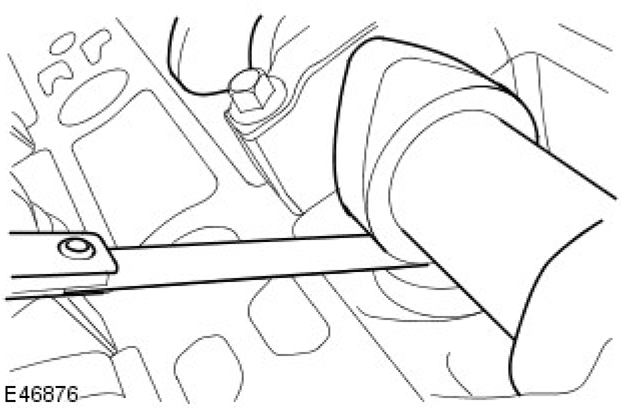
3. Remove the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

4. Remove the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

5. ⚠ CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Rotate the engine clockwise to position the camshaft lobe away from the valve tappet

6. Using the feeler gauge set, measure the clearance between the camshaft and the valve tappet.



7. Repeat the above procedure for the remaining 31 tappets.

8. Adjust the clearance as necessary.

9. For cylinder head data, refer to specifications.
For additional information, refer to: Specifications (303-01B Engine - V8 4.4L Petrol, Specifications).

10. Install the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

11. Install the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

12. Install the cooling fan.
For additional information, refer to: Cooling Fan (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Engine - V8 4.4L Petrol - Valve Clearance Adjustment

General Procedures

- NOTE: The valve clearances adjustment procedure is part of the the camshafts removal and installation procedure.

1. Remove the camshafts.
For additional information, refer to: Camshafts RH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

2. Install the camshafts.
For additional information, refer to: Camshafts RH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

Published: 11-May-2011

Engine - V8 4.4L Petrol - Engine Oil Draining and Filling

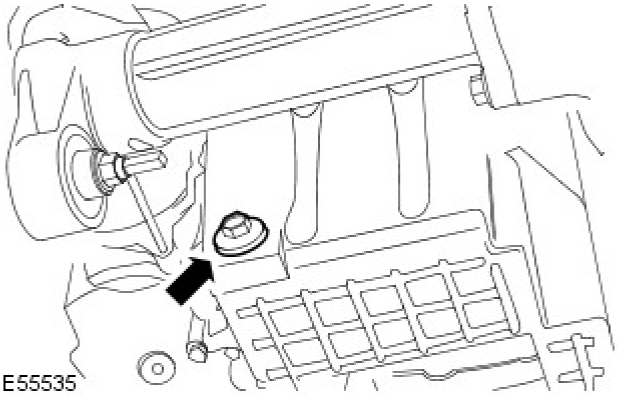
General Procedures

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

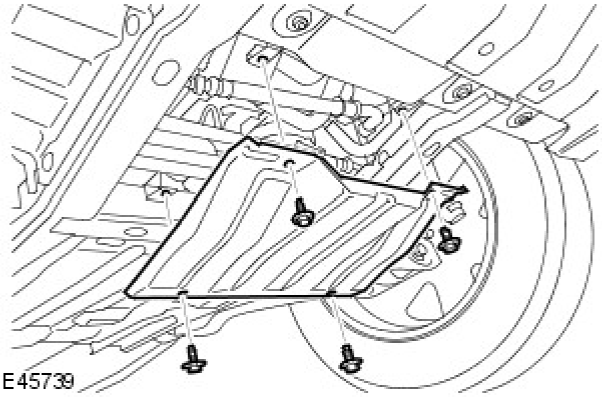
Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



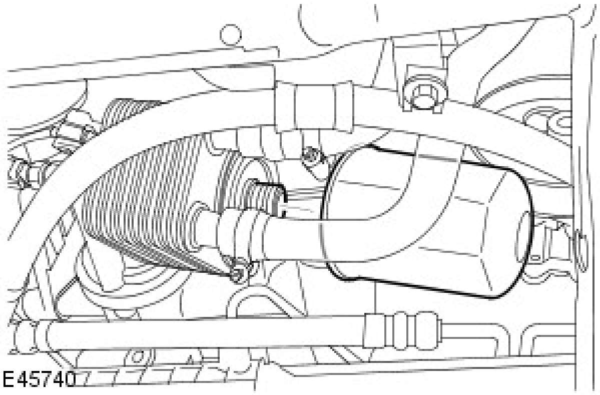
4. Remove the oil pan drain plug.

- Position a container to collect the fluid.
- Discard the oil drain plug seal.



5. Remove the radiator access panel.

- Remove the 4 bolts.



6. Remove the oil filter.

- Position a container to collect the fluid.
- Discard the oil filter.

7. Install the engine oil filter.

- Lubricate the oil filter seal with clean engine oil and tighten to 18 Nm (13 lb.ft).
- Install a new seal.
- Tighten the drain plug to 25 Nm (18 lb.ft).

8. Tighten the drain plug to 25 Nm (18 lb.ft).

- Install a new seal.

9. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

10. Fill the engine with oil.

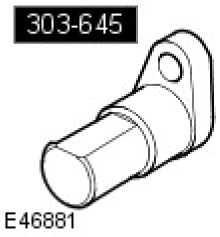
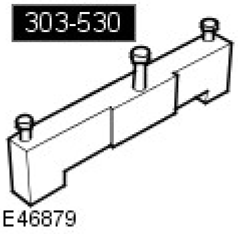
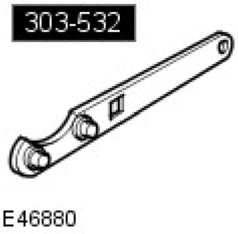
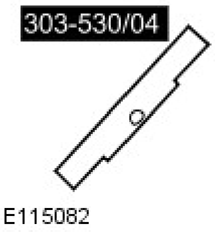
11. Check and top-up the engine oil.

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 4.4L Petrol - Camshafts RH

In-vehicle Repair

Special Tool(s)	
	Timing Setting tool 303-645
	Camshaft setting/locking tool 303-530
	Timing chain tensioning tool 303-532
	Timing shim tool 303-530/04

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

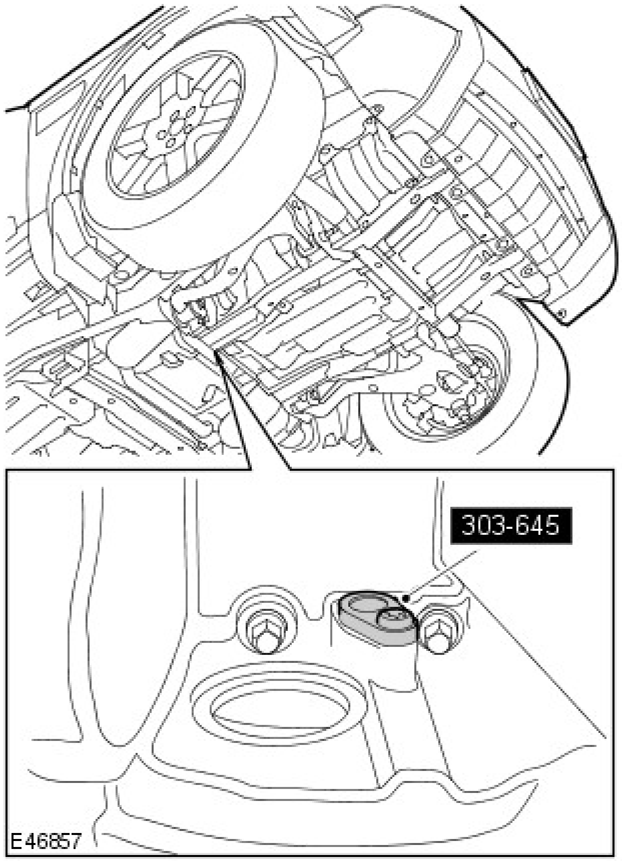
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

5. Remove the crankshaft position (CKP) sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).

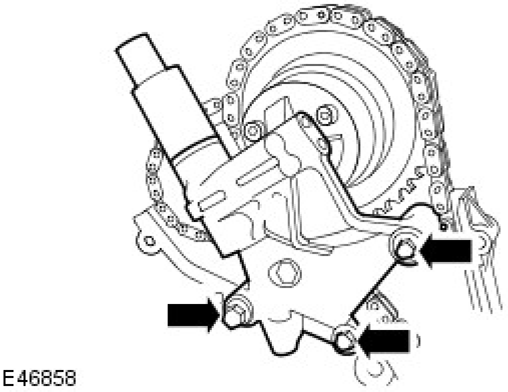
6. Rotate the crankshaft until the flats on the camshafts are parallel with the cylinder head joint faces.



7. NOTE: The engine is now in the SAFE position.

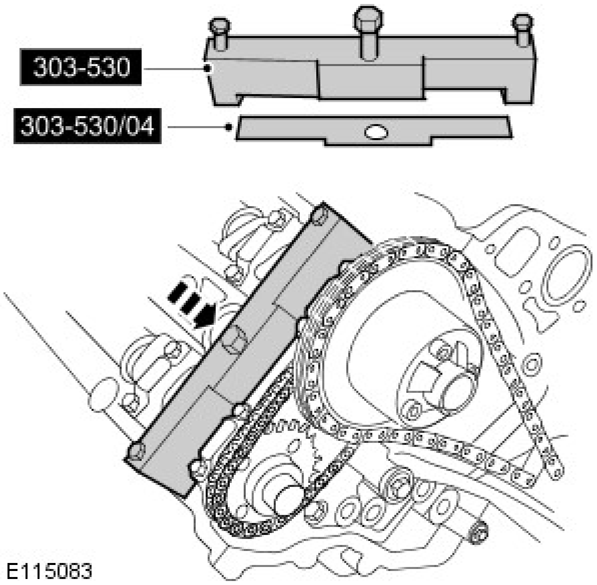
Lock the crankshaft.

- Install the special tool.
- Install the screw.



8. Remove the RH variable camshaft timing (VCT) control unit.

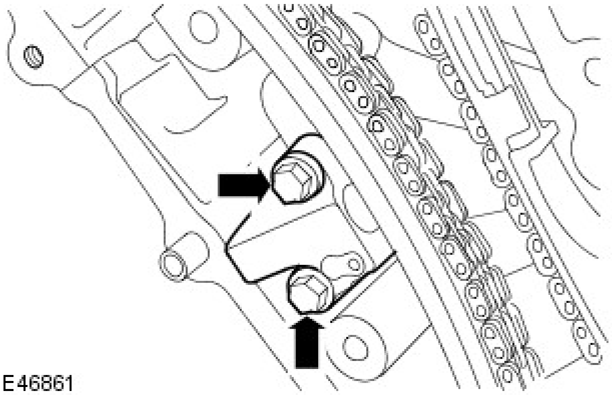
- Remove the 3 bolts.
- Remove and discard the O-ring seals.



E115083

9. Install the special tools to the RH cylinder head.

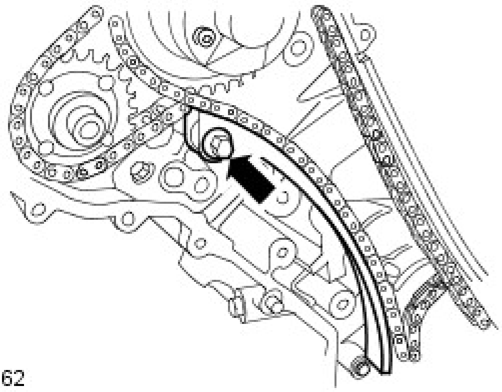
- Install the 3 bolts.



E46861

10. Remove the primary timing chain tensioner.

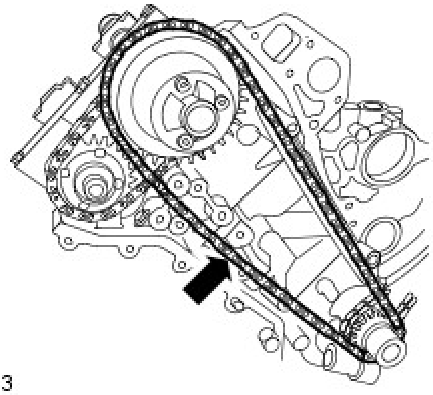
- Remove the 2 bolts.



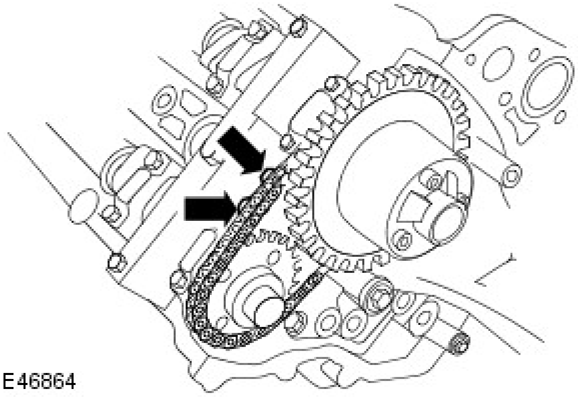
E46862

11. Remove the primary timing chain tensioner guide.

- Remove the bolt.

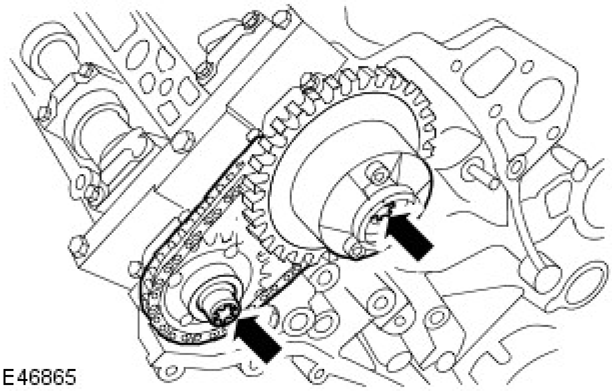

E46863

12. Remove the primary timing chain.


E46864

13. Remove the secondary timing chain tensioner and the secondary timing chain.

- Remove the 2 retaining bolts.


E46865

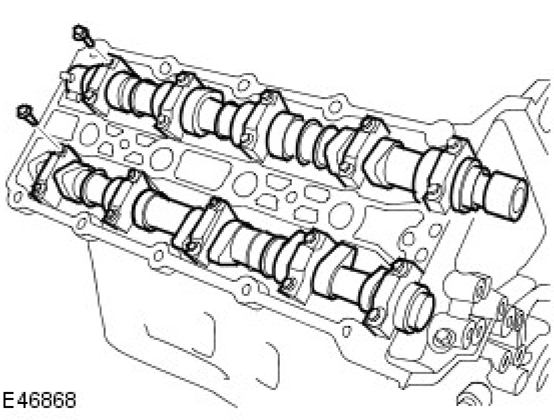
14. ⚠ CAUTION: Discard the bolts.

Remove the camshaft sprockets.

- Remove the 2 bolts.

15. Remove the special tools from the RH cylinder head.

- Remove the 3 bolts.



E46868

16. ⚠ CAUTION: Evenly and progressively, release the camshaft bearing caps.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshaft bearing caps.

- Remove the 20 bolts.

17. Remove the camshafts.

Installation

1. Check and adjust the valve tappet clearances.

2. Replace the valve shims, with the smallest shim available.

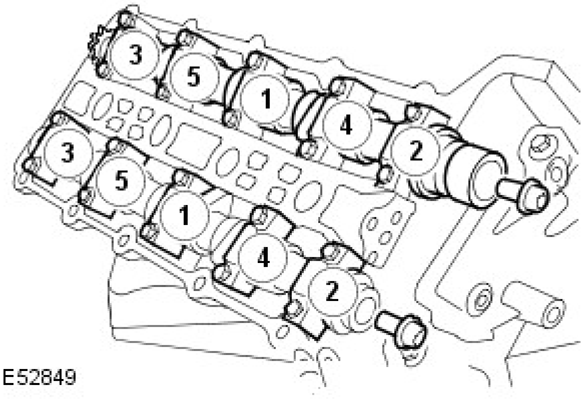
- Apply a light coat of clean engine oil to the replacement valve shims.

3. Install the camshafts.

- Clean the component mating faces.
- Lubricate the journals and camshaft lobes.

4. Install the camshaft bearing caps.

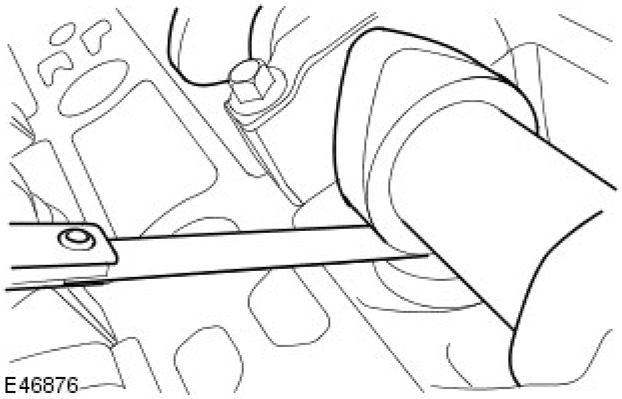
- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm.



E52849

5. ⚠ CAUTION: Make sure that new bolts are installed.

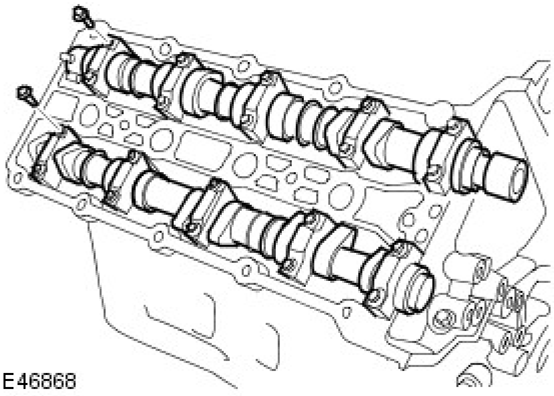
Install the sprocket retaining Torx bolts to the camshafts.


E46876

6. CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Measure and record the tappet clearances.

- Rotate the camshafts using the Torx bolts.


E46868

7. CAUTION: Evenly and progressively, release the camshaft bearing caps.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshaft bearing caps.

- Remove the 20 bolts.

8. Remove the camshafts.

9. Remove the valve tappets, replace with selected tappets.

10. Install the camshafts.

- Lubricate the journals and camshaft lobes.
- Clean the component mating faces.

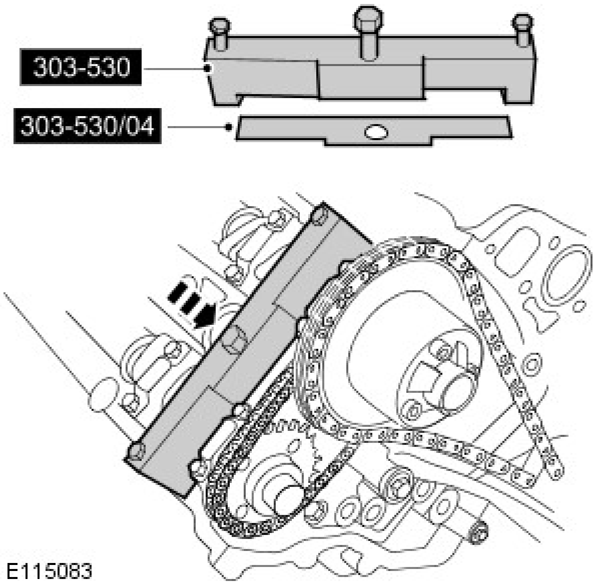
11. Install the camshaft bearing caps.

- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm.

12. CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

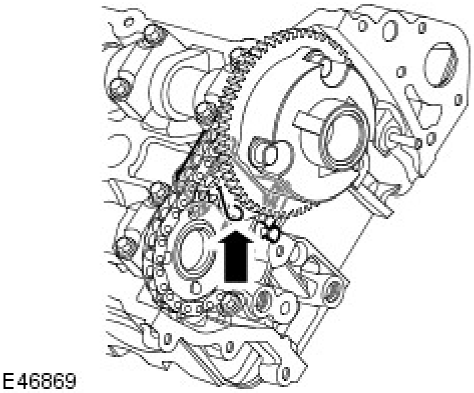
Check valve tappet clearances are correct.

- Rotate the camshafts using the Torx bolts.
- Remove the camshaft Torx bolts after the check is complete.



13. Install the special tools to the RH cylinder head.

- Install the 3 bolts.



14. Retain the RH secondary timing chain tensioner piston.

- Using 1 mm diameter metal rod, retain the chain tensioner piston.

15. Install the secondary timing chain tensioner and chain to the camshaft sprockets.

16. NOTE: Lightly tighten the camshaft sprocket Torx bolts, the sprockets MUST be free to move.

Install the secondary timing chain and sprockets to the camshafts.

- Install the sprocket retaining Torx bolts to the camshafts.

17. Install the secondary timing chain tensioner retaining bolts.

- Tighten the bolts to 12 Nm.

18. Tension the secondary timing chain.

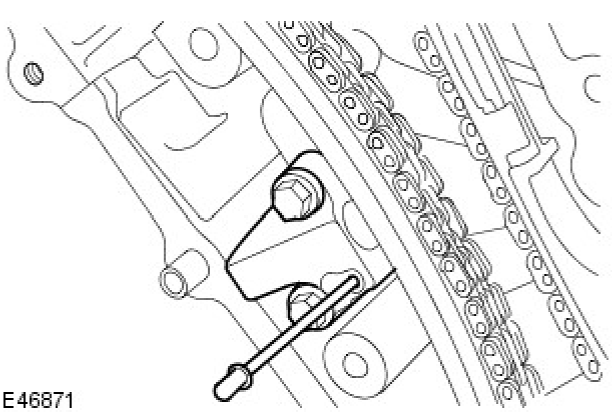
- Remove the retaining rod.

19. Install the primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

20. Install the primary tensioner guide.

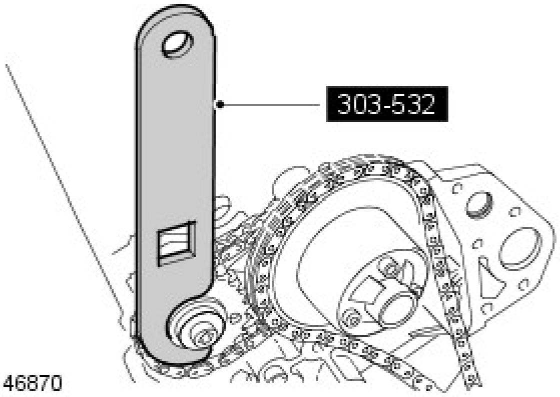
- Tighten the bolts to 12 Nm.


E46871

21. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the primary chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm.
- Remove the retaining rod.



E46870

22. CAUTIONS:

⚠ The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

⚠ Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

Install the special tool to the exhaust camshaft sprocket.

- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.
- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

23. Remove the special tools from the RH cylinder head.

24. Install the RH VCT oil control unit.

- Install the new O-ring seals.
- Tighten the new bolts to 22 Nm.

25. Remove the crankshaft locking tool.

- Remove the screw.

26. Install the CKP sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).

27. NOTE: Before installing the valve covers, check the valve clearances.

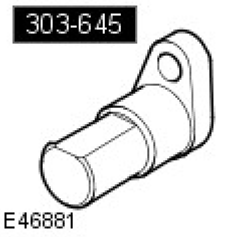
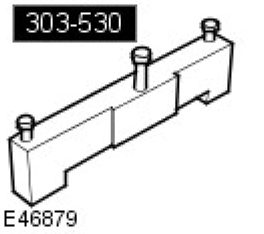
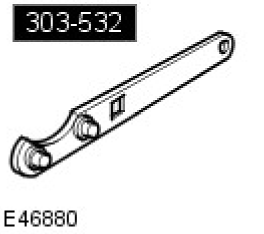
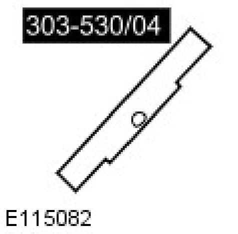
Install the engine front cover.
For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

28. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

Published: 11-May-2011

Engine - V8 4.4L Petrol - Camshafts LH

In-vehicle Repair

Special Tool(s)	
	Timing Setting tool 303-645
	Camshaft setting/locking tool 303-530
	Timing chain tensioning tool 303-532
	Timing shim tool 303-530/04

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

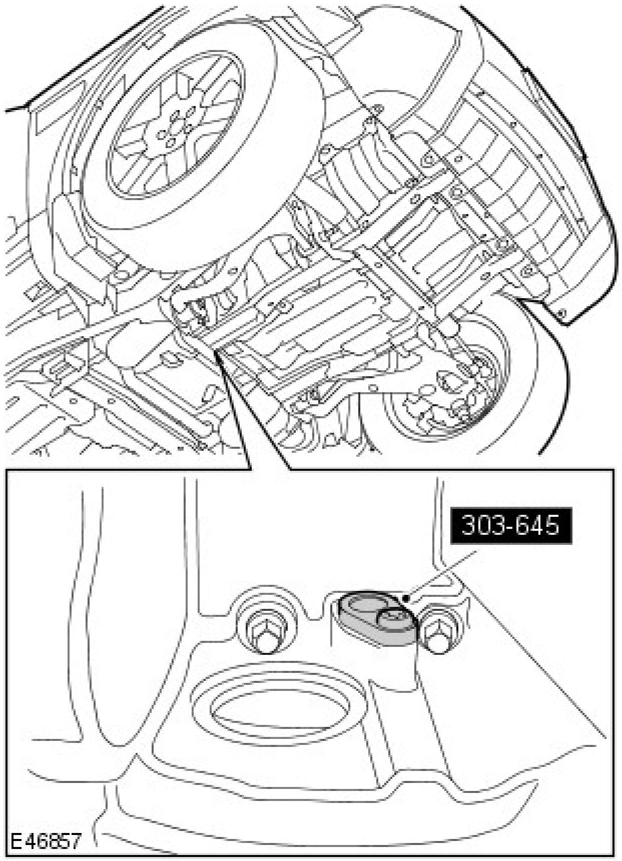
3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

5. Remove the crankshaft position (CKP) sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).

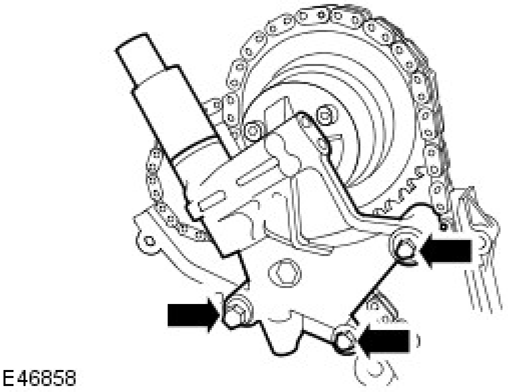
6. Rotate the crankshaft until the flats on the camshafts are parallel with the cylinder head joint faces.



7. NOTE: The engine is now in the SAFE position.

Lock the crankshaft.

- Install the special tool.
- Install the screw.

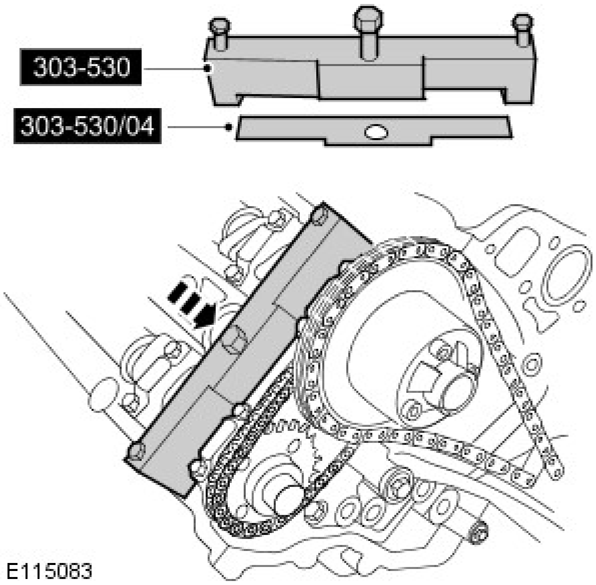


8. Remove the RH variable camshaft timing (VCT) control unit.

- Remove the 3 bolts.
- Remove and discard the O-ring seals.

9. Install the special tools to the RH cylinder head.

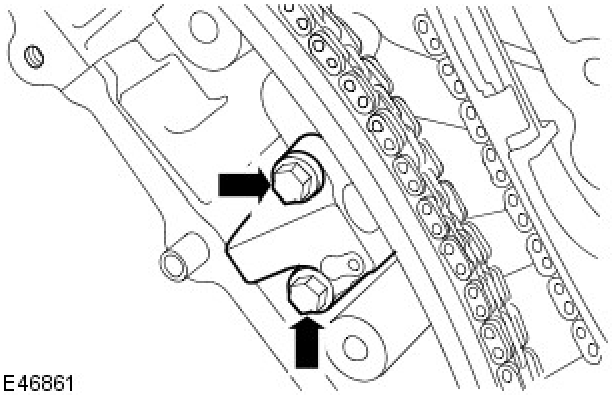
- Install the 3 bolts.



E115083

10. Remove the RH primary timing chain tensioner assembly.

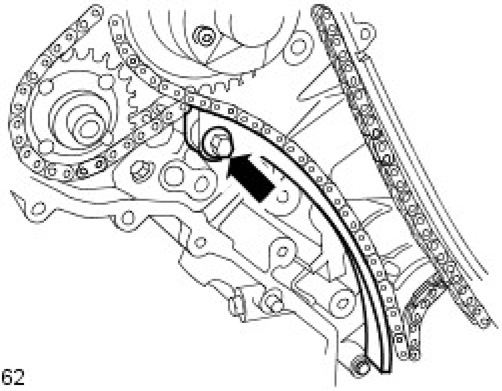
- Remove the 2 bolts.



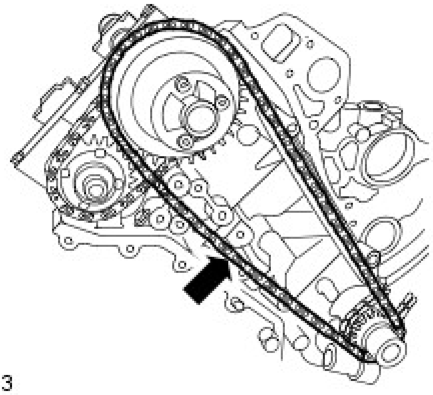
E46861

11. Remove the RH primary timing chain tensioner guide.

- Remove the bolt.



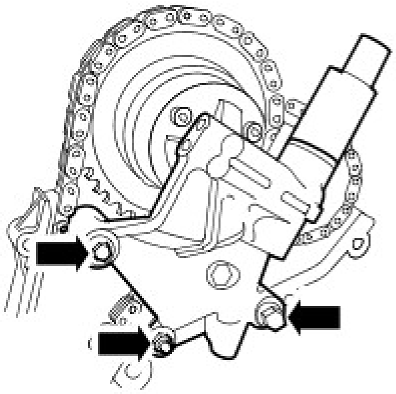
E46862


E46863

12. Remove the RH primary timing chain.

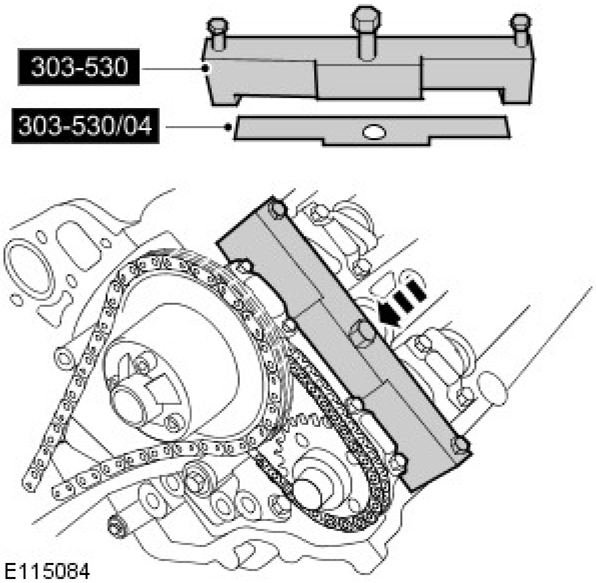
13. Remove the special tools from the RH cylinder head.

- Remove the 3 bolts.


E48360

14. Remove the LH variable camshaft timing (VCT) control unit.

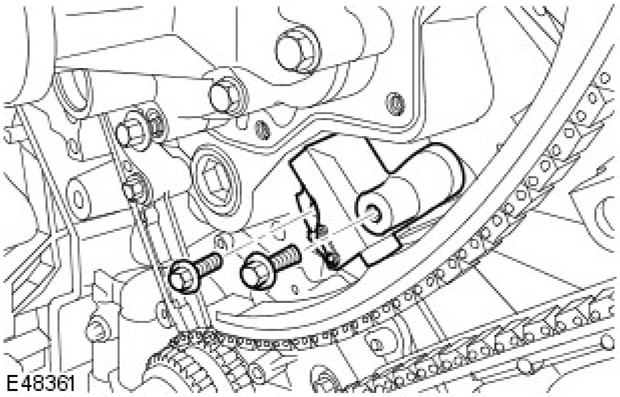
- Remove the 2 bolts.
- Remove the nut.
- Remove and discard the O-ring seals.



E115084

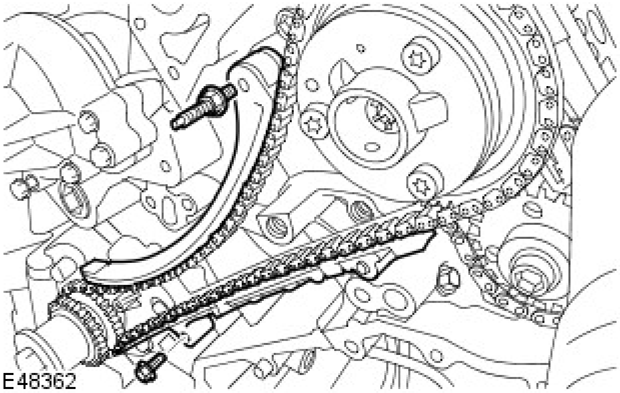
15. Install the special tools to the LH cylinder head.

- Install the 3 bolts.



16. Remove the LH primary timing chain tensioner.

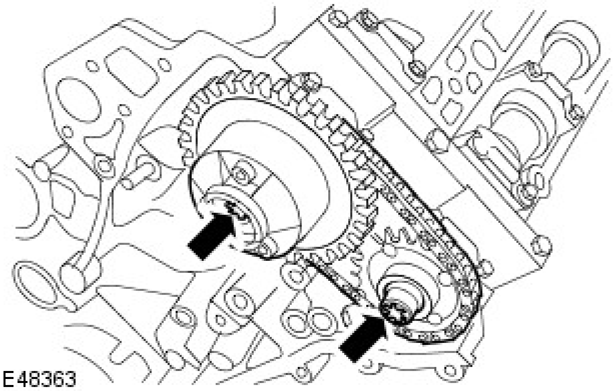
- Remove the 2 bolts.



17. Remove the LH upper and lower primary timing chain tensioner guides.

- Remove the stud.
- Remove the bolt.

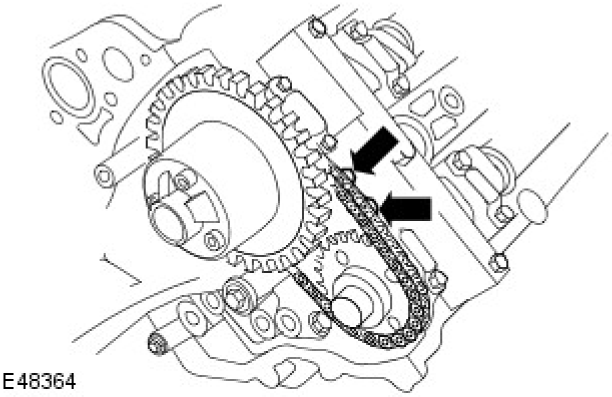
18. Remove the LH primary timing chain.



19. ⚠ CAUTION: Discard the bolts.

Remove the camshaft sprockets.

- Remove the 2 bolts.

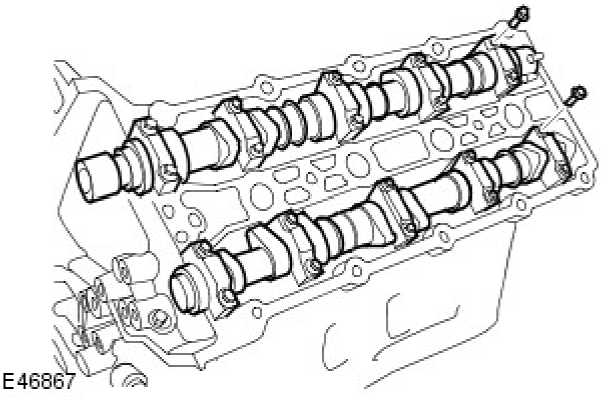


20. Remove the secondary timing chain tensioner and the secondary timing chain.

- Remove the 2 bolts.

21. Remove the special tools from the LH cylinder head.

- Remove the 3 bolts.



22. ⚠ CAUTION: Evenly and progressively, release the camshaft bearing caps.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshaft bearing caps.

- Remove the 20 bolts.

23. Remove the camshafts.

Installation

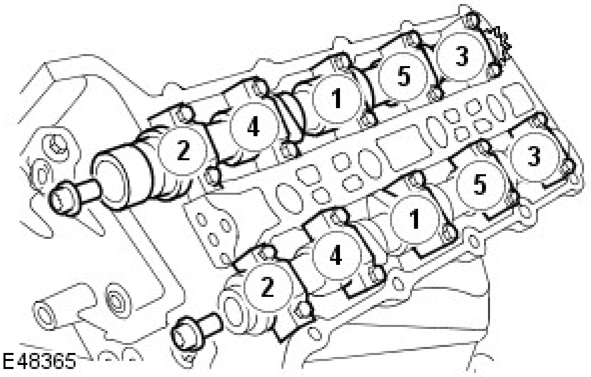
1. Check and adjust the valve tappet clearances.

2. Replace the valve shims, with the smallest shim available.

- Apply a light coat of clean engine oil to the replacement valve shims.

3. Install the camshafts.

- Clean the component mating faces.
- Lubricate the journals and camshaft lobes.

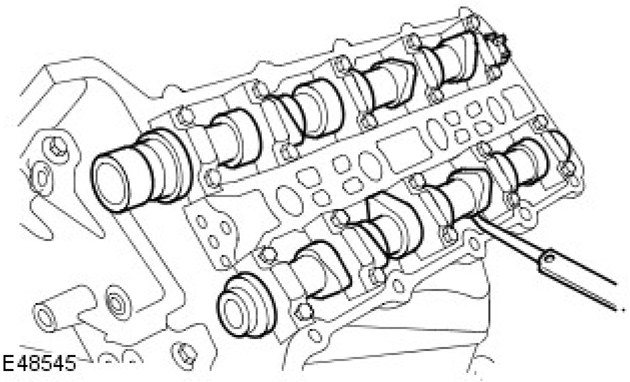


4. Install the camshaft bearing caps.

- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm.

5. ⚠ CAUTION: Make sure that new bolts are installed.

Install the sprocket retaining Torx bolts to the camshafts.



6. ⚠ CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Measure and record the tappet clearances.

- Rotate the camshafts using the Torx bolts.

7. NOTE: Remove the camshaft bearing caps evenly and in stages.

• NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

Remove the camshafts.

- Remove the 20 bolts.

8. Remove the valve tappets, replace with selected tappets.

9. Install the camshafts.

- Lubricate the journals and camshaft lobes.
- Clean the component mating faces.

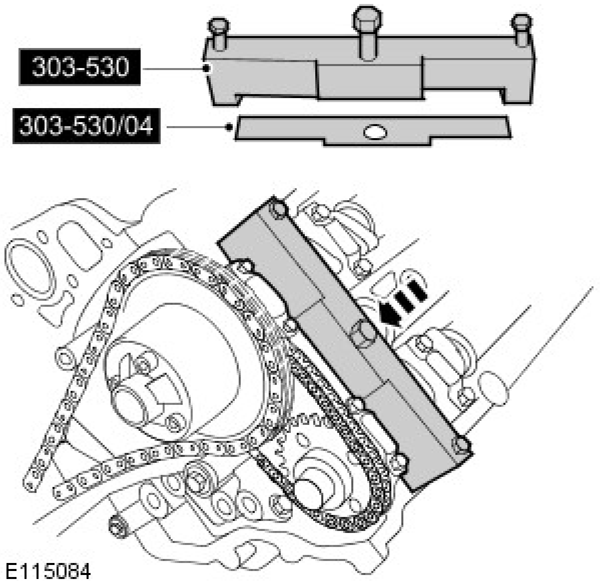
10. Install the camshaft bearing caps.

- Evenly and progressively tighten the bolts in the sequence shown to 10 Nm.

11. ⚠ CAUTION: Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.

Check valve tappet clearances are correct.

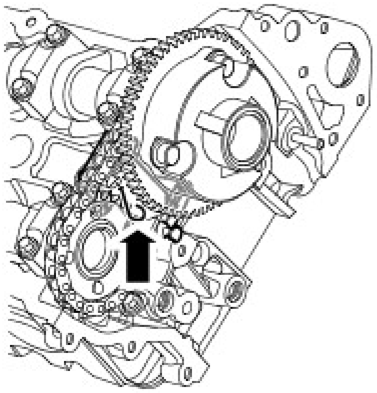
- Rotate the camshafts using the Torx bolts.
- Remove the camshaft Torx bolts after the check is complete.



E115084

12. Install the special tools to the LH cylinder head.

- Install the 3 bolts.



E46869

13. NOTE: RH illustration shown, LH is similar.

Depress the LH secondary timing chain tensioner piston.

- Using 1 mm diameter metal rod, retain the chain tensioner piston.

14. Install the LH secondary timing chain tensioner and chain to the camshaft sprockets.

15. Install the LH secondary timing chain tensioner retaining bolts.

- Tighten the bolts to 12 Nm.

16. NOTE: Lightly tighten the camshaft sprocket Torx bolts, the sprockets MUST be free to move.

Install the LH secondary timing chain and sprockets to the camshafts.

- Install the sprocket retaining Torx bolts to the camshafts.

17. Tension the secondary timing chain.

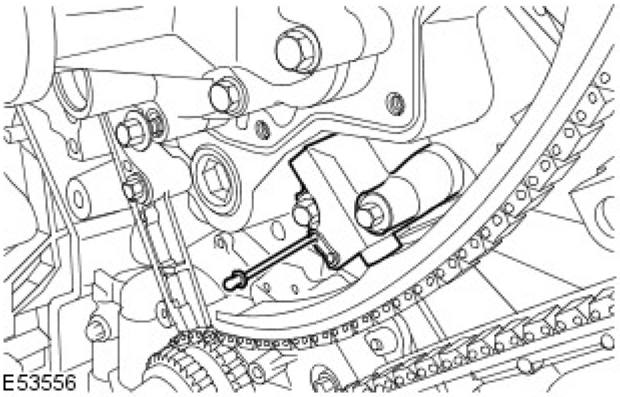
- Remove the retaining rod.

18. Install the LH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

19. Install the LH primary chain tensioner guide.

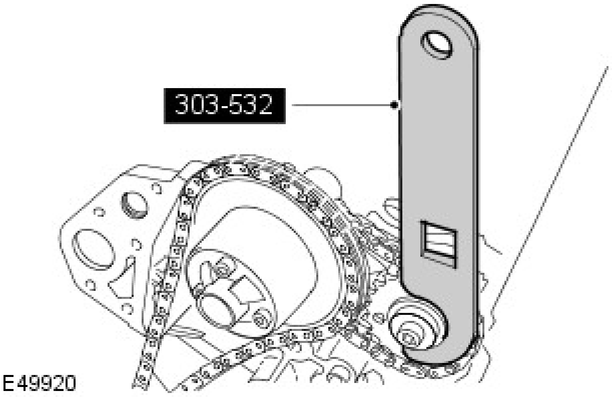
- Tighten the stud to 12 Nm.



20. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the LH primary timing chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm.
- Remove the retaining rod.



21. CAUTIONS:

⚠ Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

⚠ The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

⚠ Make sure that new bolts are installed.

Install the special tool to the exhaust camshaft sprocket.

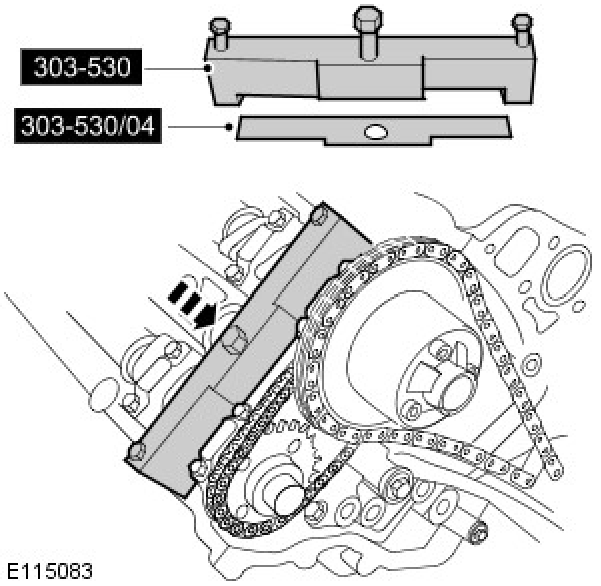
- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.
- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

22. Install the LH VCT oil control unit.

- Install the new O-ring seals.
- Tighten the new bolts to 22 Nm.
- Tighten the nut to 10 Nm.

23. Remove the special tools from the LH cylinder head.

- Remove the 3 bolts.



24. Install the special tools to the RH cylinder head.

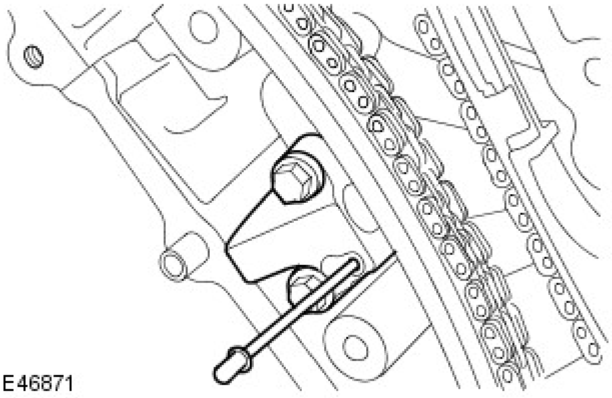
- Install the 3 bolts.

25. Install the RH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

26. Install the RH primary timing chain tensioner guide.

- Tighten the bolts to 12 Nm.



27. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the RH primary timing chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm.
- Remove the retaining rod.

28. CAUTIONS:

⚠ Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

⚠ The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

⚠ Make sure that new bolts are installed.

Install the special tool to the exhaust camshaft sprocket.

- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.

- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

29. Install the RH VCT oil control unit.

- Install the new O-ring seals.
- Tighten the new bolts to 22 Nm.

30. Remove the special tools from the RH cylinder head.

- Remove the 3 bolts.

31. Remove the crankshaft locking tool.

- Remove the screw.

32. Install the CKP sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).

33. NOTE: Before installing the valve covers, check the valve clearances.

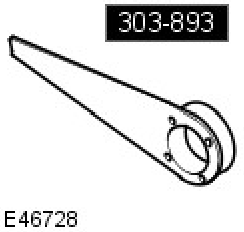
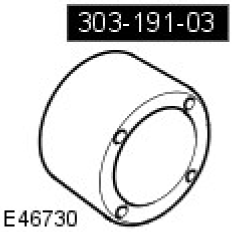
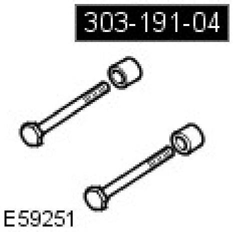
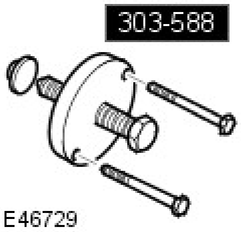
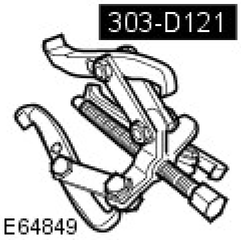
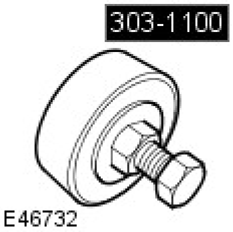
Install the engine front cover.
For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

34. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

Published: 11-May-2011

Engine - V8 4.4L Petrol - Crankshaft Pulley

In-vehicle Repair

Special Tool(s)	
 303-893 E46728	Holding Tool Crankshaft Pulley 303-893(LRT-12-080)
 303-191-03 E46730	Adapter 303-191-03
 303-191-04 E59251	Bolts and spacers 303-191-04
 303-588 E46729	Remover, crankshaft pulley 303-588
 303-D121 E64849	Remover, crankshaft seal 303-D121
 303-1100 E46732	Installer, crankshaft seal 303-1100

303-1100-01 E67144	Adapter - Crankshaft seal installer 303-1100-01

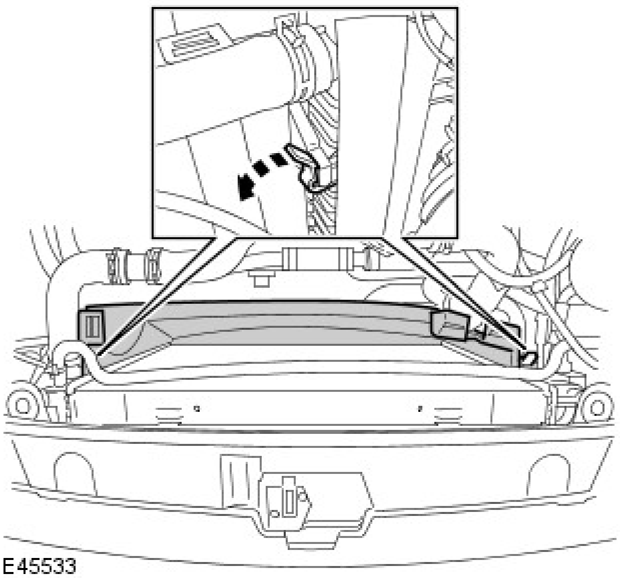
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

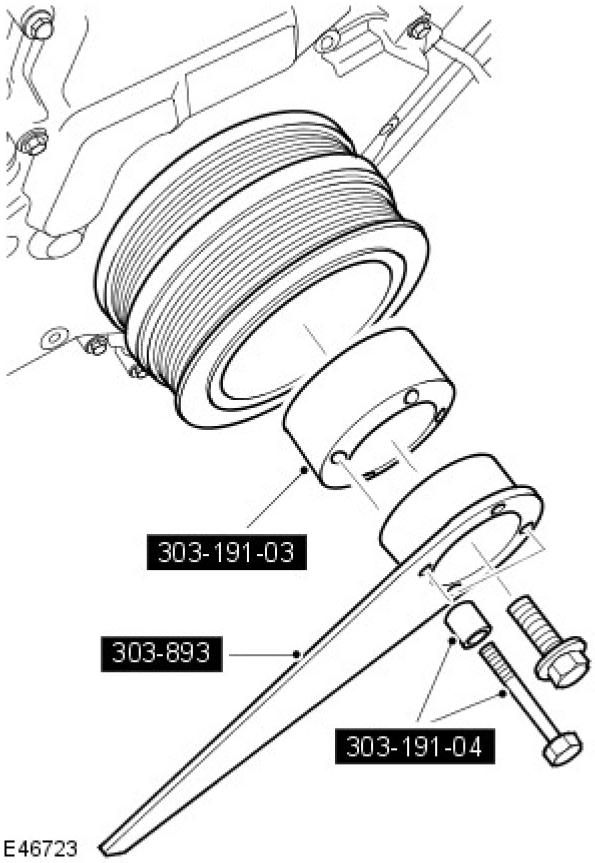
3. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).



E45533

4. Remove the cooling fan shroud.

- Release 2 clips from the cooling fan lower shroud.
- Release and remove the cooling fan lower shroud from the cooling pack.



5. Using the special tools, retain the crankshaft pulley.

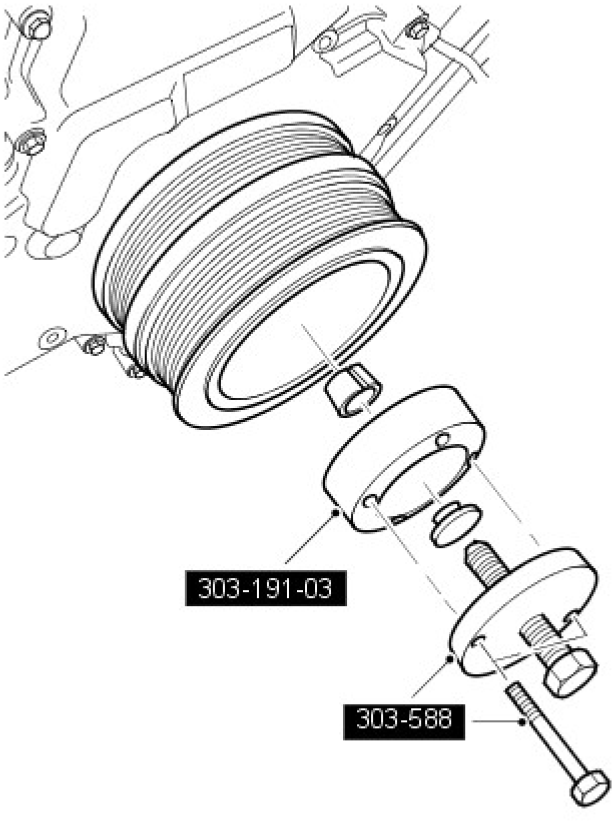
6. ⚠CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.

• NOTE: The crankshaft pulley retaining bolt will be very tight.

Remove the crankshaft pulley retaining bolt.

- Discard the bolt.

7. Remove the special tools.



E46724

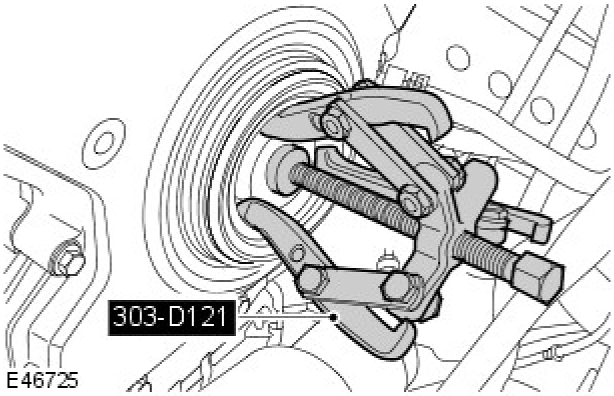
8. Using the special tools, remove the crankshaft pulley.

- Collect the locking ring.

9. Remove the special tools from the crankshaft pulley.

10. Using the special tool, remove the crankshaft front seal.

- Remove the outer section of the seal.
- Repeat the process to remove the inner section of seal.

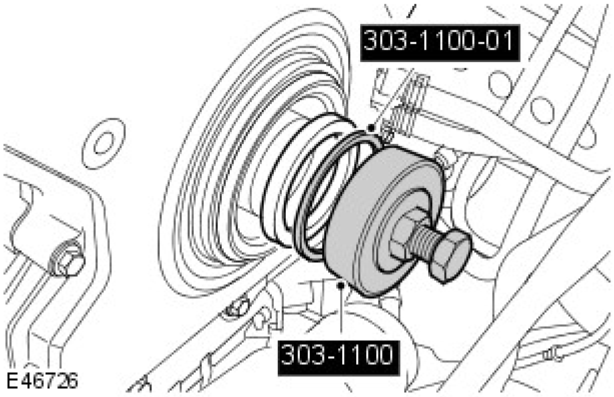


E46725

11. Check the crankshaft damper pulley and locking ring for damage.

Installation

1. Clean all the crankshaft pulley mating faces.



2. Using the special tools, install the crankshaft front seal.

- Lubricate the seal with clean engine oil.
- Use the discarded crankshaft bolt with the service tool.

3. Install the crankshaft pulley.

- Lubricate the seal with clean engine oil.

4. Install the crankshaft pulley locking ring.

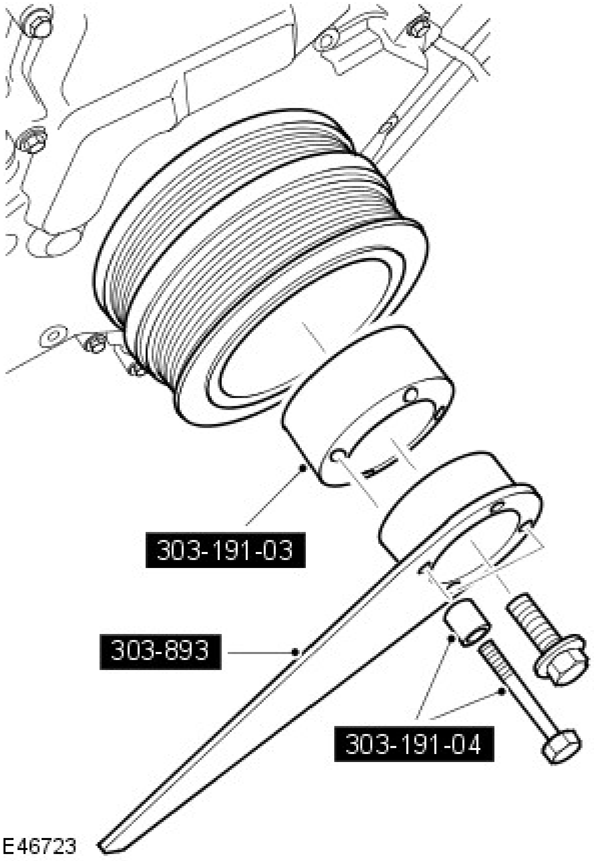
5. CAUTION: The screw thread in the crankshaft pulley must be cleaned out before installing a new crankshaft pulley bolt.

Install, but do not tighten, the new crankshaft pulley bolt.

6. CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.

Using the special tools, retain the crankshaft pulley.

- Tighten the crankshaft pulley bolt to 380 Nm (280 lb.ft).



7. Remove the special tools.

8. Install the cooling fan lower shroud.

9. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

10. Connect the battery ground cable.
    For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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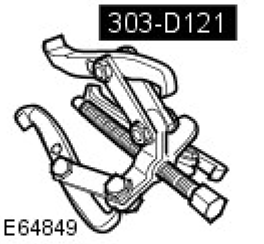
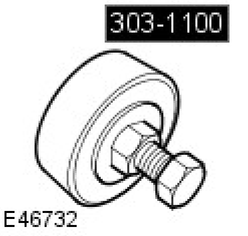
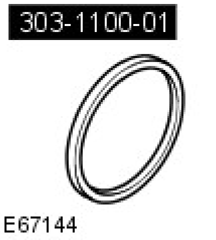
Engine - V8 4.4L Petrol - Crankshaft Front Seal

In-vehicle Repair

Special Tool(s)	
	Remover, crankshaft seal 303-D121
	Installer, crankshaft seal 303-1100
	Adapter - Crankshaft seal installer 303-1100-01

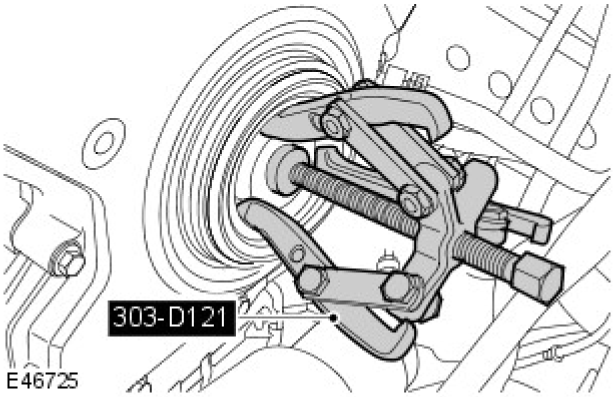
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

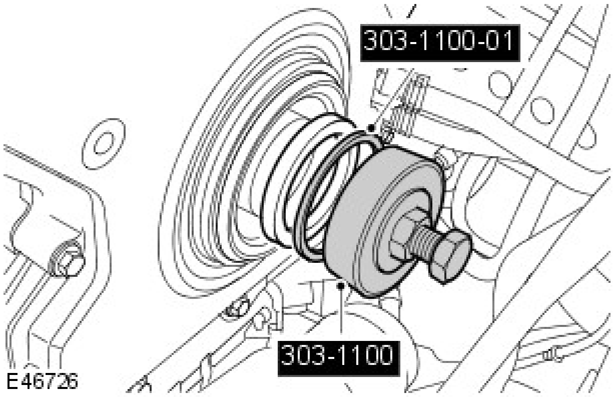
2. Remove the crankshaft pulley.
For additional information, refer to: Crankshaft Pulley (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

3. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Using the special tool, remove the crankshaft front seal.



Installation


303-1100-01
303-1100
E46726

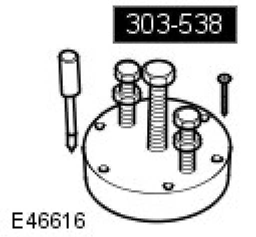
1. Using the special tools, install the crankshaft front seal.
   - Clean the component mating faces.

2. Install the crankshaft pulley.
   For additional information, refer to: Crankshaft Pulley (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

Published: 11-May-2011

Engine - V8 4.4L Petrol - Crankshaft Rear Seal

In-vehicle Repair

Special Tool(s)	
 E46616	Crankshaft rear oil seal remover/installer 303-538

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

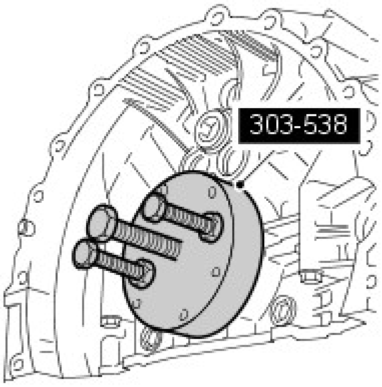
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the torque converter flexplate.
For additional information, refer to: Flexplate (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

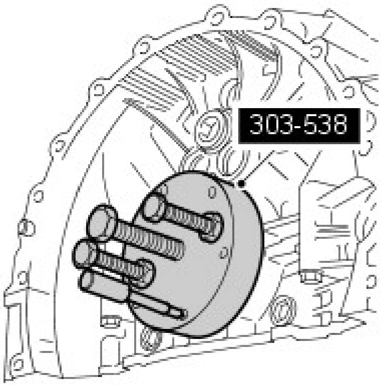
4. Install the special tools.

- Install the 2 bolts.
- Tighten the 2 nuts to retain the special tool.

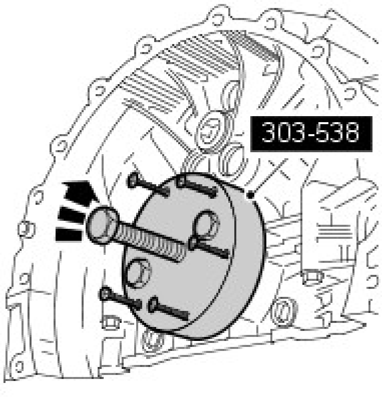


E46613

5. Using the special tool, pierce the seal to create holes for the 6 self-tapping screws.



E46614



6. Using the special tools, remove and discard the crankshaft rear oil seal.

- Install the 6 self-tapping screws.
- Adjust the 2 nuts.
- Tighten the center bolt.

Installation

1. ⚠ CAUTION: Do not lubricate the components.

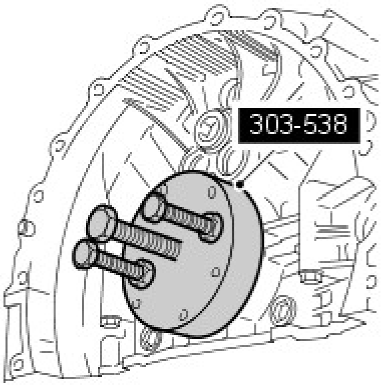
Partially install the crankshaft rear oil seal.

- Make sure the components are clean and dry.
- Carefully remove the transit sleeve, leaving the seal on the crankshaft.

2. ⚠ CAUTION: Make sure the seal is installed parallel

Using the special tool, install the crankshaft rear oil seal.

- Tighten the special tool nuts evenly and progressively to fully install the seal.



3. Install the torque converter flexplate.
For additional information, refer to: Flexplate (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

Published: 15-Jul-2011

Engine - V8 4.4L Petrol - Cylinder Head LH

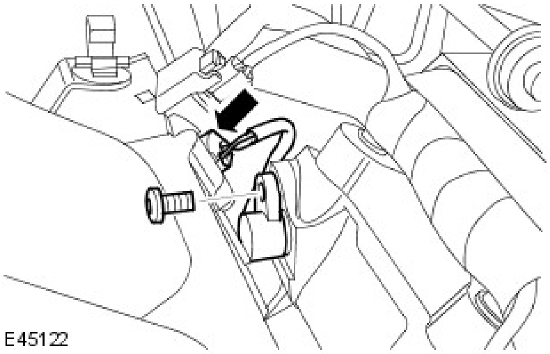
In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the intake manifold.
For additional information, refer to: Intake Manifold Assembly (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

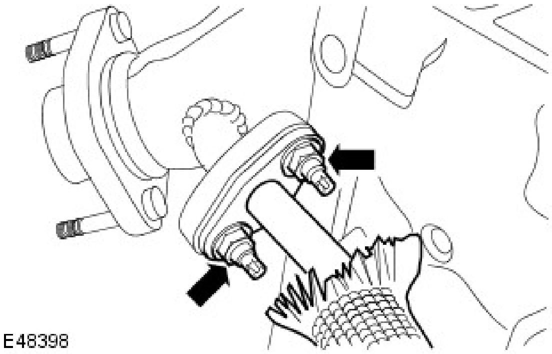
3. Remove the LH bank camshafts.
For additional information, refer to: Camshafts LH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).



E45122

4. Remove the camshaft position (CMP) sensor.

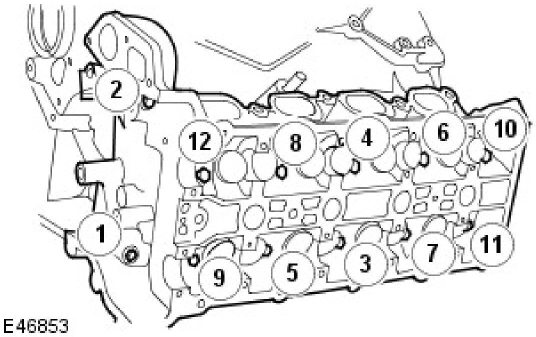
- Remove the Torx screw.
- Disconnect the electrical connector.



E48398

5. Disconnect the exhaust manifold EGR pipe flange.

- Remove the 2 nuts.



E46853

6. CAUTIONS:

⚠ The bolts can only be used twice, mark the bolts with a center punch. If two punch marks are visible, discard the bolts.

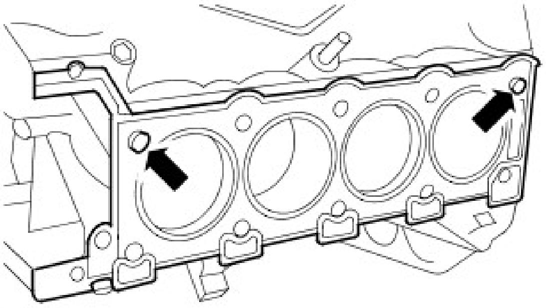
⚠ Vehicles fitted with Polydrive cylinder head bolts, the cylinder head bolts must be removed using a 10 mm Polydrive socket or a 10 mm Allen key. Failure to follow this instruction may result in damage to the component.

• NOTE: Remove the bolts in the indicated sequence.

Remove the 12 cylinder head bolts.

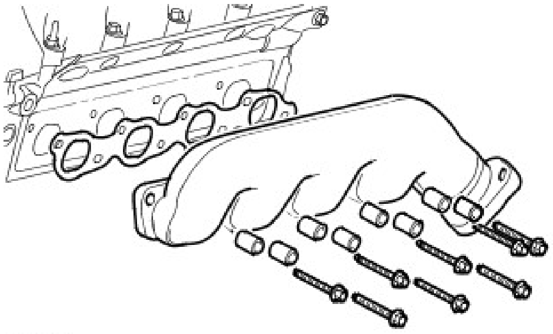
7. Remove the LH cylinder head assembly.

- With assistance remove the cylinder head.


E46854

8. Remove and discard the cylinder head gasket.

- Clean the cylinder head locating dowels.

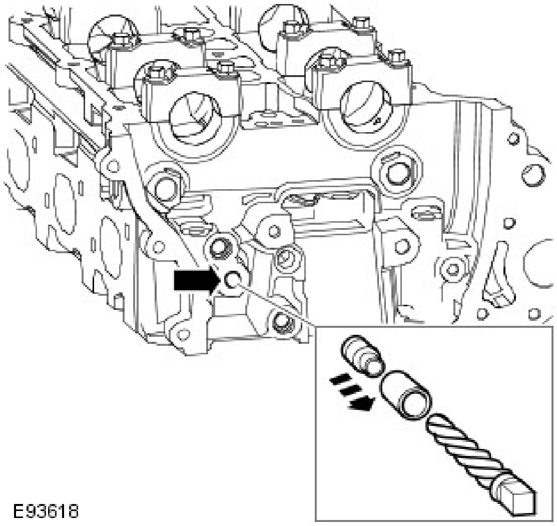

E48399

9. NOTE: Do not disassemble further if the component is removed for access only.

Remove the exhaust manifold.

- Remove the 8 bolts.
- Discard the gasket and the bolts.

Installation


E93618

1. CAUTIONS:

⚠ If a new cylinder head is to be installed to a vehicle with variable valve timing (VVT), the cylinder head must have the oil gallery blind rivet removed before installation.

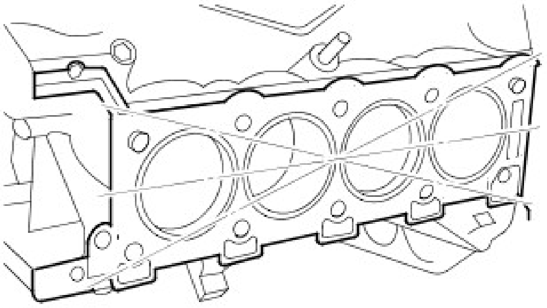
⚠ Make sure that all debris and foreign material is removed from the cylinder head and cylinder head oil gallery.

• NOTE: The centre bore of the blind rivet is 6 mm (0.24 inch) diameter.

Vehicles fitted with VVT: remove the blind rivet from the VVT oil gallery.

- Identify the VVT oil supply gallery and the 8 mm (0.31 inch) blind rivet.
- Using a suitable 3 mm (0.12 inch) punch release the centre of the blind rivet until it is released from the outer part of the blind rivet.
- Using a suitable extraction tool, remove the remaining part of the blind rivet.

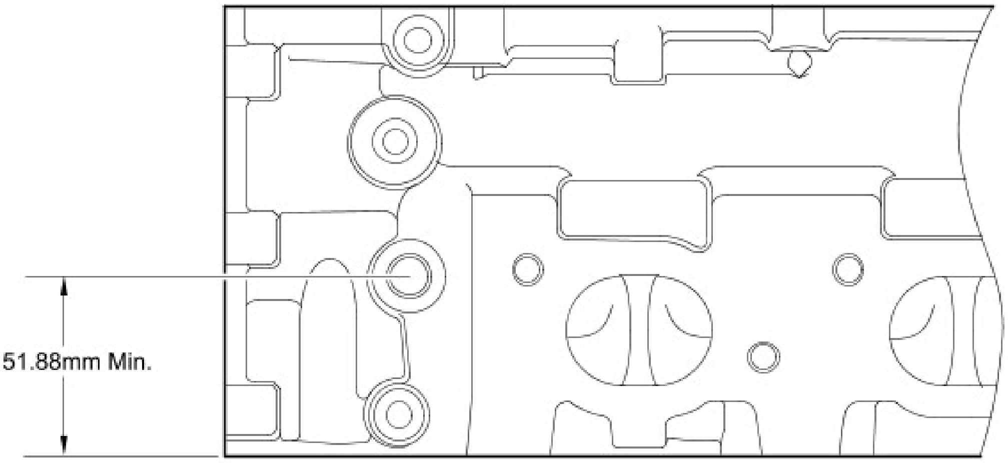
2. Clean the component mating faces.



E46855

3. Check cylinder head face for distortion, across the center and from corner to corner.

4. For cylinder head face distortion data, refer to specifications.
For additional information, refer to: Specifications (303-01B Engine - V8 4.4L Petrol, Specifications).

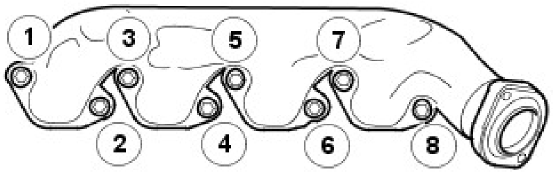


E100333

5. NOTE: For cylinder head with distortion above the maximum allowance, the cylinder head material must be measured.

Measure the cylinder head material.

- Check measurement from the centre of the exhaust dowel to the cylinder head face as shown.
- If the measurement is less than 51.88 mm the cylinder head requires replacement.



E47144

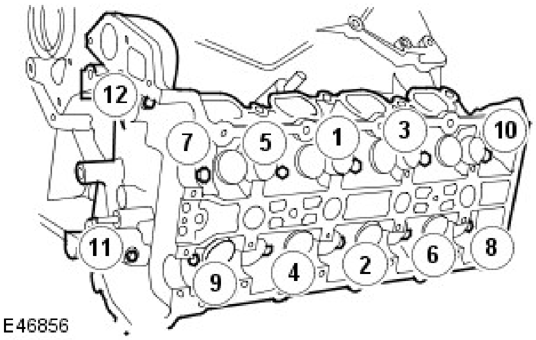
6. Install the exhaust manifold.

- Clean the component mating faces.
- Install the gasket/heat shield.
- Tighten the heat shield bolt to 25 Nm (18 lb.ft).
- Evenly and progressively, tighten the bolts in the sequence shown to 20 Nm (15 lb.ft).

7. CAUTION: The head gasket must be installed over the cylinder block dowels.

Install a new cylinder head gasket.

8. With assistance install the cylinder head.



9. NOTE: Tighten the bolts 1 to 10 in the sequence shown.

Install the cylinder head bolts.

- Lubricate the new cylinder head bolt threads with clean engine oil.
- Tighten the bolts to 20 Nm (15 lb.ft).
- Tighten the bolts to 35 Nm (26 lb.ft).
- Tighten the bolts 1 to 10, a further 90 degrees.
- Tighten the bolts 1 to 10, a further 90 degrees.
- Tighten the M8 bolts 11 and 12, to 25 Nm (18 lb.ft).

10. Connect the EGR pipe and exhaust manifold flanges.

- Tighten the nuts to 25 Nm (18 lb.ft).

11. Install the CMP sensor.

- Tighten the Torx screw to 7 Nm (5 lb.ft).
- Connect the electrical connector.

12. Install the LH bank camshafts.
For additional information, refer to: Camshafts LH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

13. Install the intake manifold.
For additional information, refer to: Intake Manifold Assembly (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

14. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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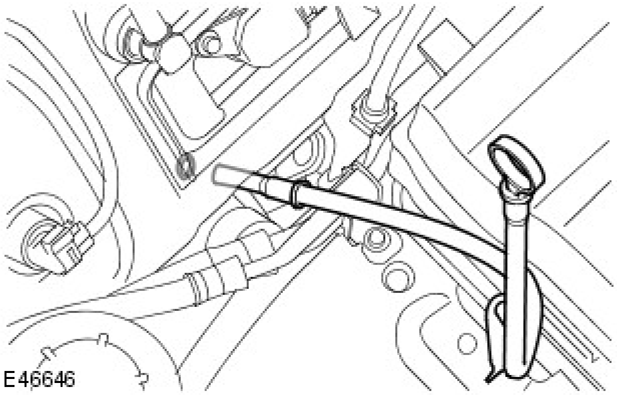
Engine - V8 4.4L Petrol - Valve Cover LH

In-vehicle Repair

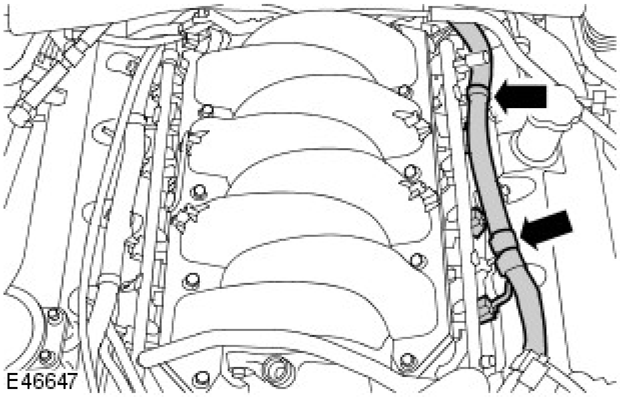
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the ignition coil-on-plug.
   For additional information, refer to: Ignition Coil-On-Plug (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).
3. Remove the remaining ignition coil-on-plugs.
4. Remove the oil level indicator and tube.

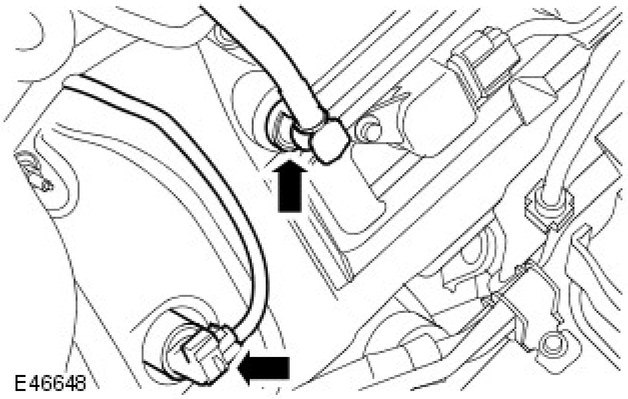


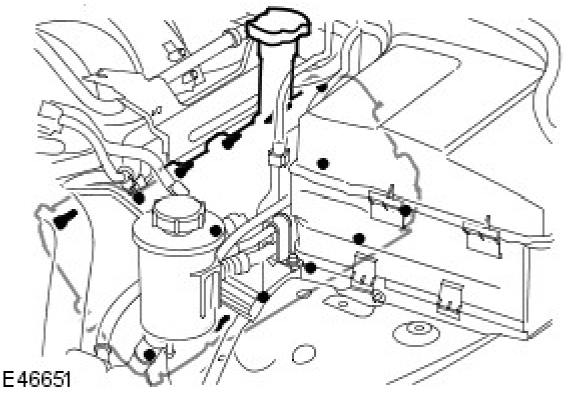
- Remove the dipstick.
- Remove the nut.
- Discard the O-ring seal.

5. Release the engine wiring harness from the retaining bracket.



6. Disconnect the variable camshaft timing (VCT) oil solenoid electrical connector.
7. Disconnect the valve cover breather hose.

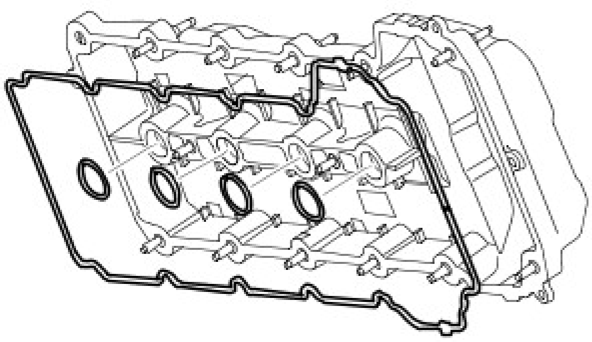



E46651

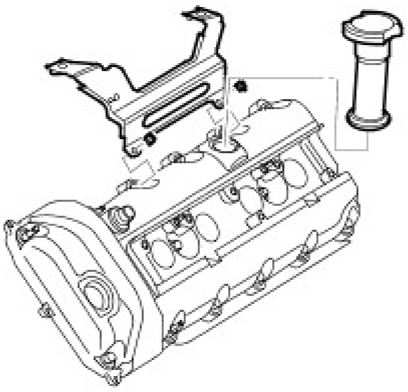
8. NOTE: Note the fitted position of the retaining bolts prior to removal.

Remove the valve cover assembly.

- Remove the 14 valve cover retaining bolts.


E46652

9. Remove and discard the valve cover gaskets.


E46669

10. NOTE: Do not disassemble further if the component is removed for access only.

Remove the oil filler tube.

- Remove and discard the O-ring seal.

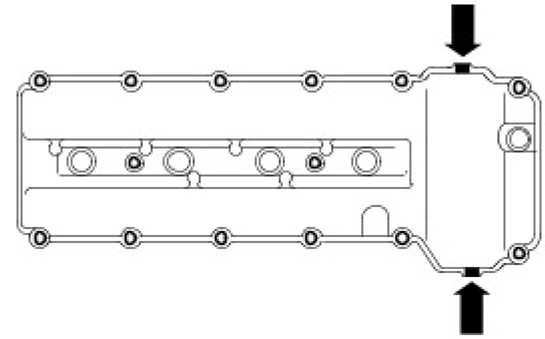
Installation

1. Install the oil filler tube.

- Install a new O-ring seal.

2. Install new valve cover plug aperture seals

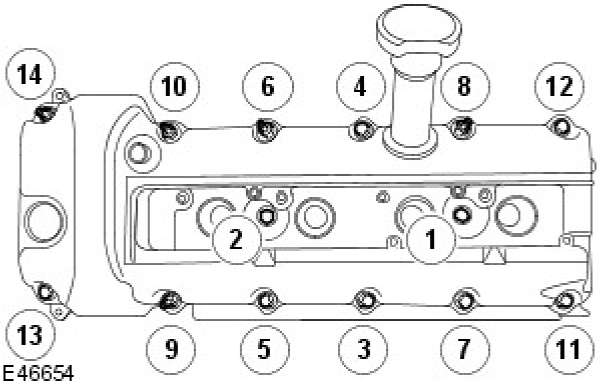
3. Install a new valve cover gasket.


E49922

4. NOTE: Apply two beads of silcone gasket sealant as shown on the illustration. The application of the sealant must be 3mm diameter 12mm long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

Install the valve cover.

- Clean the component mating faces.



E46654

5. Install the valve cover retaining bolts.

- Install valve cover retaining bolts to their position previously noted.
- Complete the tightening sequence as illustrated.
- Tighten the bolts to 12 Nm (9 lb.ft).

6. Connect the VCT oil solenoid electrical connector.

7. Attach the engine wiring harness to the retaining bracket.

8. With assistance, install the oil level indicator and tube.

- Clean the component mating faces.
- Install a new O-ring seal.
- Lubricate the seal with clean engine oil.
- Tighten the nut to 6 Nm (4 lb.ft).

9. Install the ignition coil-on-plug.
For additional information, refer to: Ignition Coil-On-Plug (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).

10. Install the remaining ignition coil-on-plugs.

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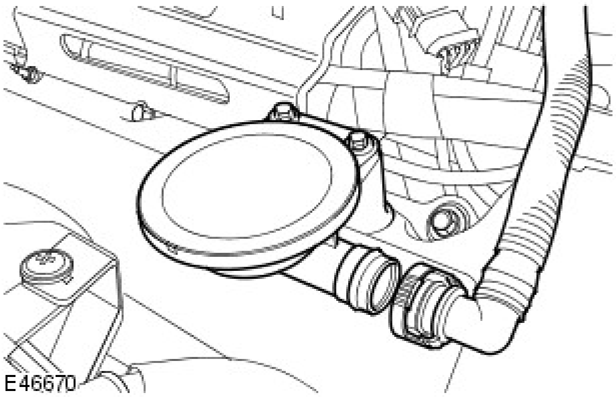
Engine - V8 4.4L Petrol - Valve Cover RH

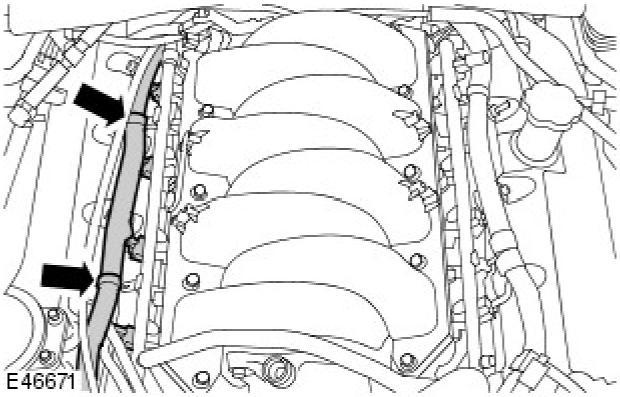
In-vehicle Repair

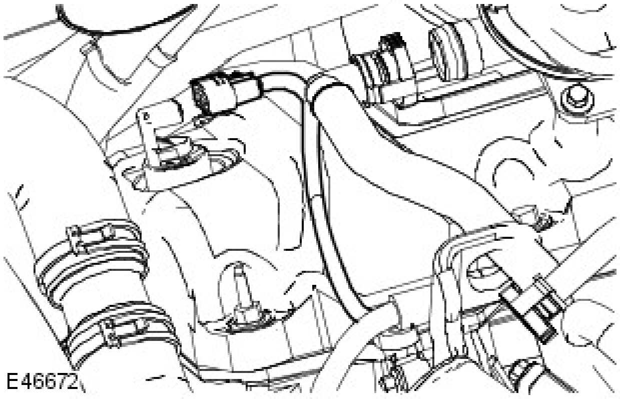
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the air intake resonator.
   For additional information, refer to: Resonator (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).
3. Remove the air cleaner assembly.
   For additional information, refer to: Air Cleaner (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).
4. Remove the ignition coil-on-plug.
   For additional information, refer to: Ignition Coil-On-Plug (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).
5. Remove the remaining ignition coil-on-plugs.
6. Disconnect the positive crankcase ventilation (PCV) line.

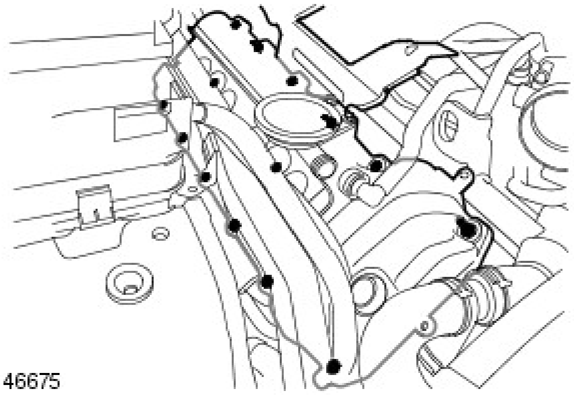


7. Release the engine wiring harness from the retaining bracket.




E46672

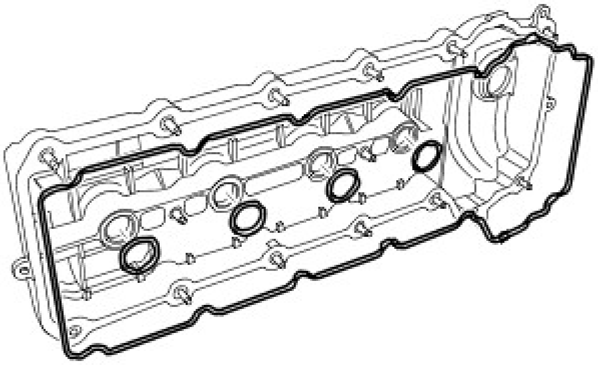
8. Disconnect the variable camshaft timing (VCT) oil solenoid electrical connector.


E46675

9. NOTE: Note the fitted position of the retaining bolts prior to removal.

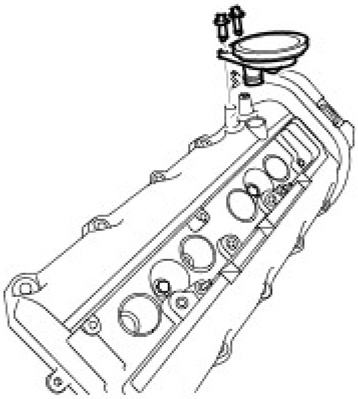
Remove the valve cover assembly.

- Remove the 14 valve cover retaining bolts.
- Remove the engine cover bracket.


E46677

10. Remove and discard the valve cover gasket.

11. Remove the valve cover plug aperture seals.


E46678

12. NOTE: Do not disassemble further if the component is removed for access only.

Remove the PCV valve.

- Remove the 2 bolts.
- Remove and discard the O-ring seal.

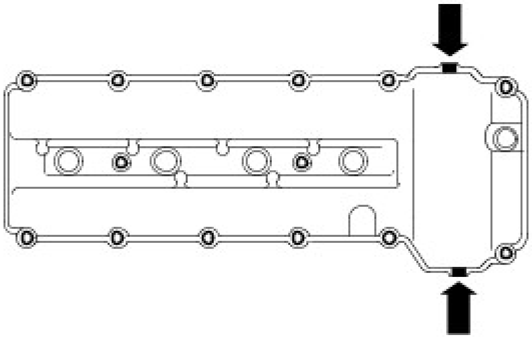
Installation

1. Install the PCV valve.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolts to 6 Nm (4 lb.ft).

2. Install new valve cover plug aperture seals

3. Install a new valve cover gasket.

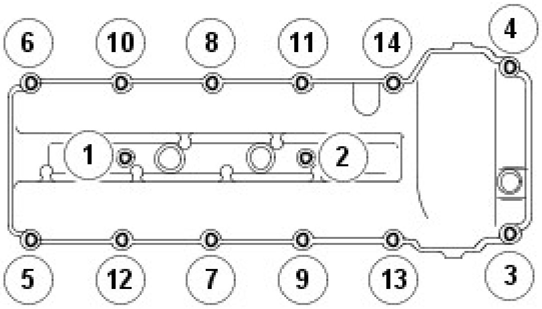


E49922

4. NOTE: Apply two beads of silcone gasket sealant as shown on the illustration. The application of the sealant must be 3mm diameter 12mm long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

Install the valve cover.

- Clean the component mating faces.



E46679

5. Install the valve cover retaining bolts.

- Install valve cover retaining bolts to their position previously noted.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Complete the tightening sequence as illustrated.

6. Connect the VCT oil solenoid electrical connector.

7. Install the ignition coil-on-plugs.
For additional information, refer to: Ignition Coil-On-Plug (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).

8. Install the remaining ignition coil-on-plugs.

9. Attach the engine wiring harness to the retaining bracket.

10. Connect the PCV line.

11. Install the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).

12. Install the air intake resonator.
For additional information, refer to: Resonator (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).

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Engine - V8 4.4L Petrol - Engine Mount LHLHD AWD

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

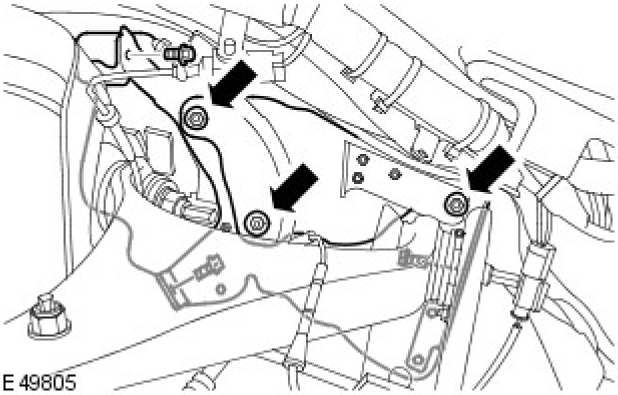
Raise and support the vehicle.

3. Remove the front wheel.

4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

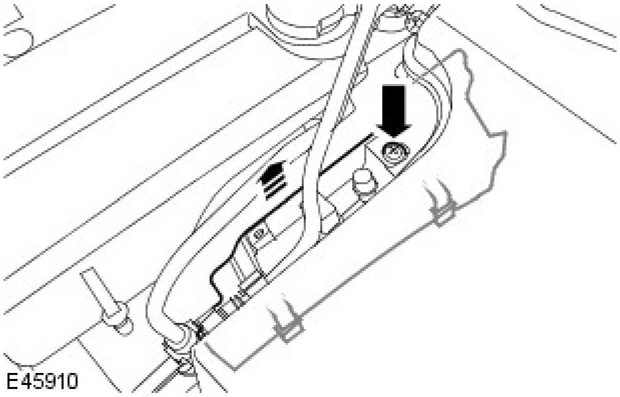
5. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

6. NOTE: The heatshield consists of 3 parts.



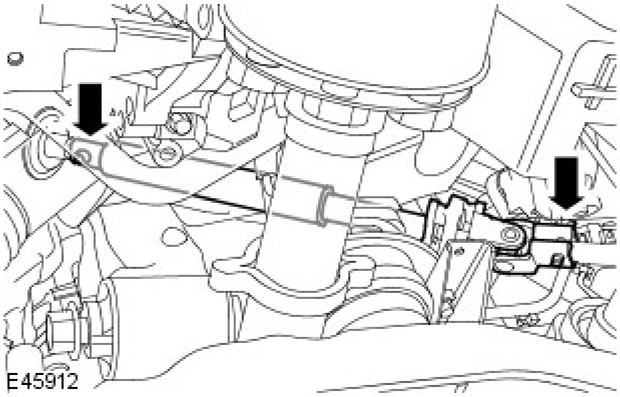
Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.



7. Remove the engine compartment LH upper heat shield.

- Remove the screw.



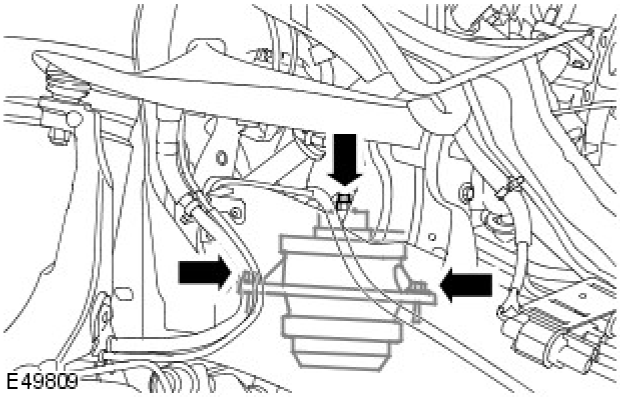
8. Remove the steering column lower universal joint assembly for access.

- Remove and discard the bolts.

9. Support the engine.

10. Raise the engine.

- Remove the nut.



11. Remove the engine front mount.

- With assistance remove the 2 bolts.

Installation

1. Install the engine front mount.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft), then a further 60 degrees.

2. Lower the engine onto the mount.

- Tighten the nut to 90 Nm (66 lb.ft).

3. Remove the engine support.

4. Install the steering column lower universal joint assembly.

- Install new patchlock bolts and tighten to 25 Nm (18 lb.ft).

5. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

6. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

7. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

8. Install the engine compartment upper LH heat shield.

- Install the screw.

9. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Engine Mount LHRHD AWD

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

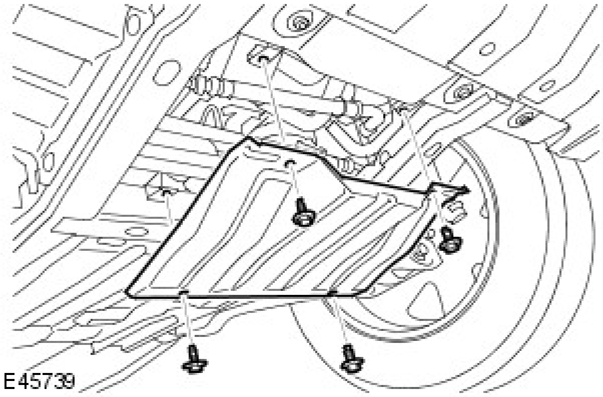
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

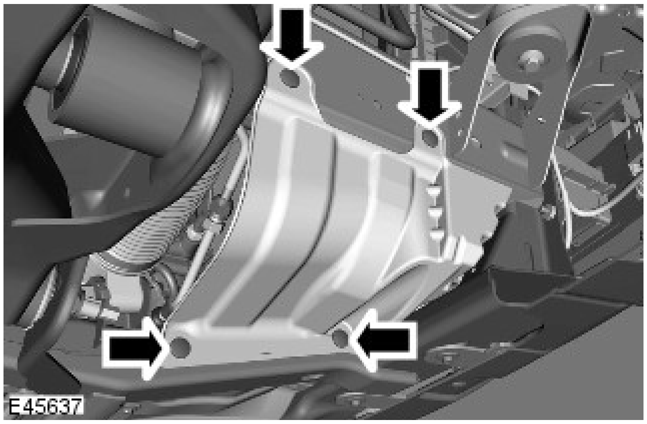
3. Remove the front wheel.

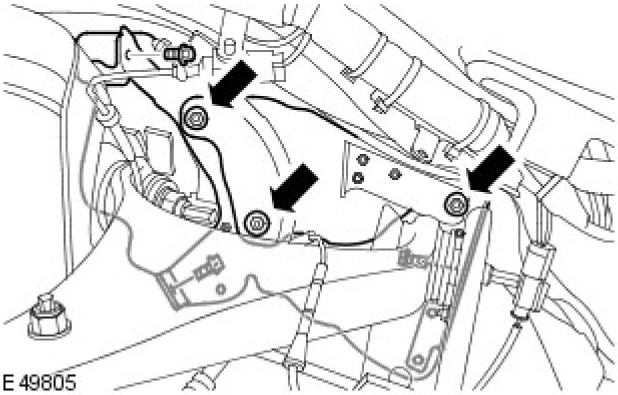
4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Remove the radiator access panel.



6. Remove the front LH splash shield.

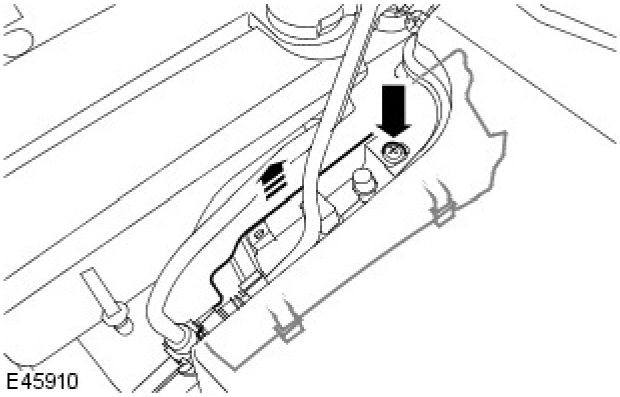




7. NOTE: The heatshield consists of 3 parts.

Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.



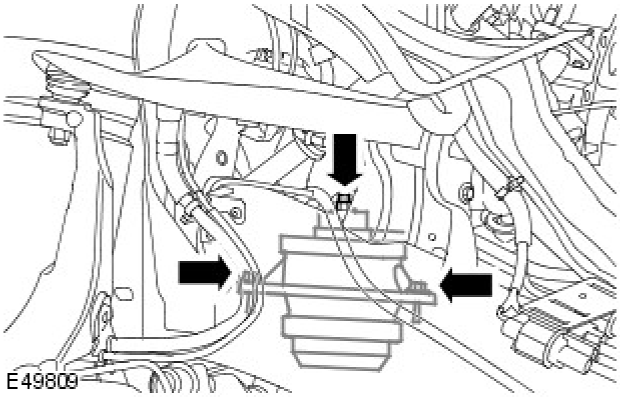
8. Remove the engine compartment LH upper heat shield.

- Remove the screw.

9. Support the engine.

10. Raise the engine.

- Remove the nut.



11. Remove the engine front mount.

- With assistance remove the 2 bolts.

Installation

1. Install the engine front mount.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft), then a further 60 degrees.

2. Lower the engine onto the mount.

- Tighten the nut to 90 Nm (66 lb.ft).

3. Remove the engine support.

4. Install the engine undershield.

For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Install the radiator access panel.

6. Install the front LH splash shield.

7. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

8. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Install the engine compartment upper LH heat shield.

- Install the screw.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Engine Mount RH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

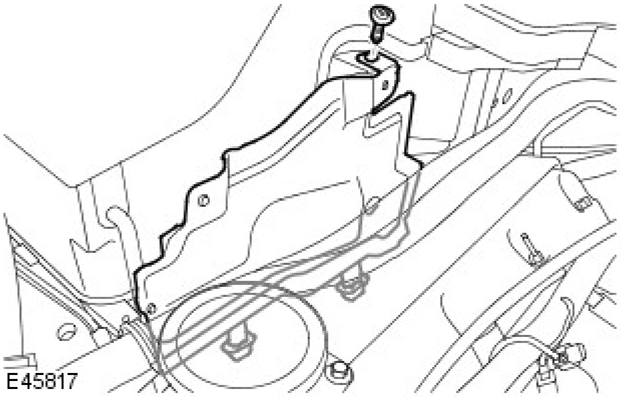
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the starter motor.
For additional information, refer to: Starter Motor (303-06B Starting System - V8 4.4L Petrol, Removal and Installation).

4. Remove the engine compartment RH upper heat shield.

- Remove the screw.
- Release the 2 clips.



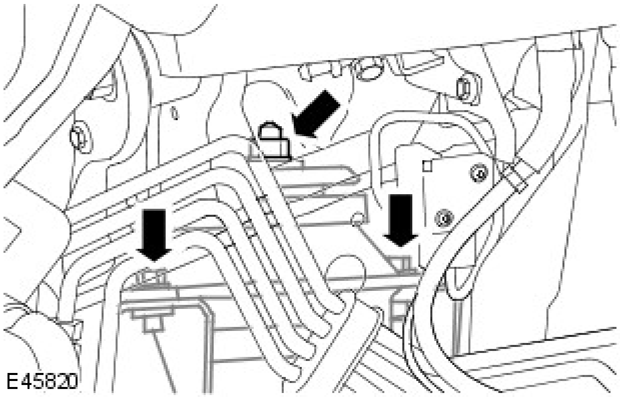
5. Support the engine.

6. Release the engine mount bracket.

- Remove the nut.
- Using a transmission jack, raise the engine clear of the engine mount.

7. Remove the engine mount RH.

- Remove the 2 bolts.



Installation

1. Install the engine mount RH.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft), then a further 60

degrees.

2. Lower the engine onto the mount.

- Tighten the nut to 90 Nm (66 lb.ft).

3. Remove the engine support.

4. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

5. Install the engine compartment upper RH heat shield.

- Install the screw.

6. Install the starter motor.
For additional information, refer to: Starter Motor (303-06B Starting System - V8 4.4L Petrol, Removal and Installation).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Flexplate

In-vehicle Repair

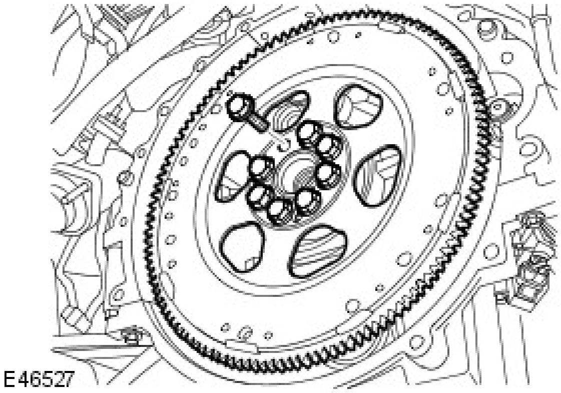
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transmission.
For additional information, refer to: Transmission (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, Removal and Installation).



4. ⚠ CAUTION: The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.

• NOTE: Prevent the flexplate from rotating.

Remove the torque converter flexplate.

- Remove the 8 bolts.

Installation

1. NOTE: Prevent the flexplate from rotating.

Install the torque converter flexplate.

- Clean the component mating faces.
- Tighten the bolts evenly and progressively in 2 stages.
- Tighten the bolts to 15 Nm (11 lb ft).
- Tighten the bolts to 110 Nm (81 lb.ft).

2. Install the transmission.
For additional information, refer to: Transmission (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Oil Pump

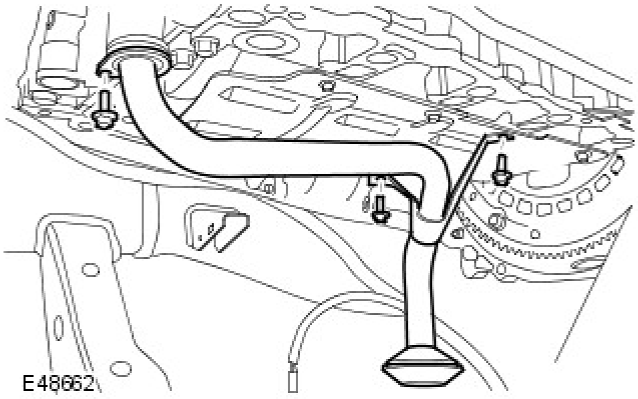
In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

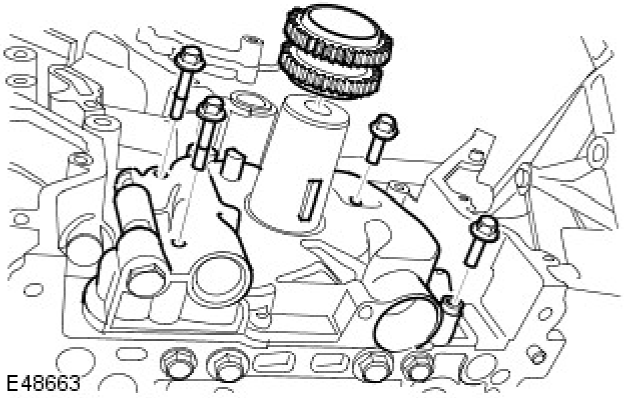
2. Remove the timing drive components.
For additional information, refer to: Timing Drive Components (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

3. Remove the oil pan.
For additional information, refer to: Oil Pan (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).



4. Remove the oil strainer pick-up assembly.

- Remove the 3 bolts.
- Remove and discard the O-ring seal.



5. Remove the oil pump assembly.

- Remove the 4 bolts.
- Remove and discard the gasket.
- Clean the component mating faces.

Installation

1. Install the oil pump assembly.

- Install the new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the oil strainer pick-up assembly.

- Install the O-ring seal.
- Tighten the bolt to 10 Nm (7 lb.ft).
- Apply sealant to the M5 bolts.
- Tighten the bolts to 6 Nm (4 lb.ft).

3. Install the oil pan.
   For additional information, refer to: Oil Pan (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).
4. Install the timing drive components.
   For additional information, refer to: Timing Drive Components (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).
5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Oil Filter Housing

In-vehicle Repair

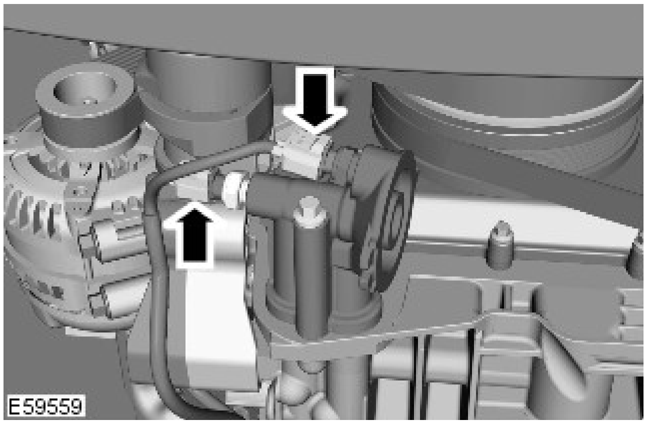
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the oil cooler assembly.
For additional information, refer to: Oil Cooler (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

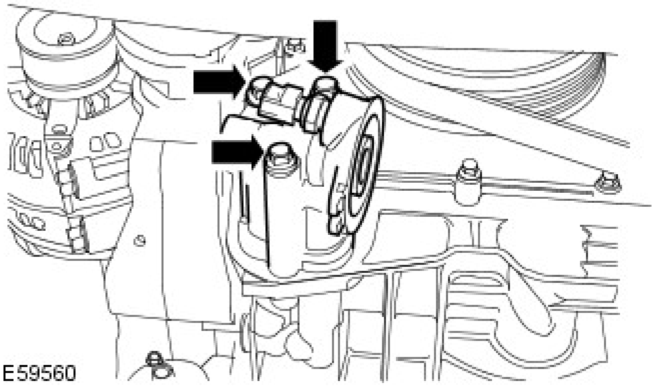
3. Disconnect the engine oil temperature sensor electrical connector.

4. Disconnect the engine oil pressure (EOP) sensor electrical connector.



5. Remove the oil filter housing.

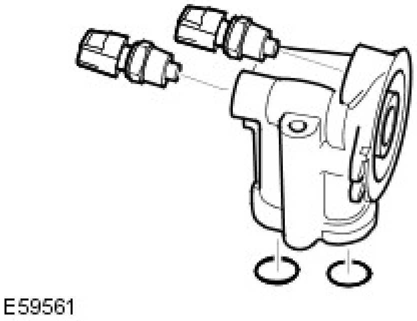
- Remove the 3 bolts.
- Remove and discard the O-ring seal.



6. NOTE: Do not disassemble further if the component is removed for access only.

Remove the engine oil temperature sensor.

7. Remove the EOP sensor.


E59561

Installation

1. Install the EOP sensor.

- Tighten the EOP sensor to 13 Nm (10 lb.ft).

2. Install the engine oil temperature sensor.

- Tighten the engine oil temperature sensor to 20 Nm (15 lb.ft).

3. Install the oil filter housing.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolts to 20 Nm (15 lb.ft).

4. Connect the EOP sensor electrical connector.

5. Connect the engine oil temperature sensor electrical connector.

6. Install the oil cooler assembly.
For additional information, refer to: Oil Cooler (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Oil Pan

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Drain the engine oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01B Engine - V8 4.4L Petrol, General Procedures).

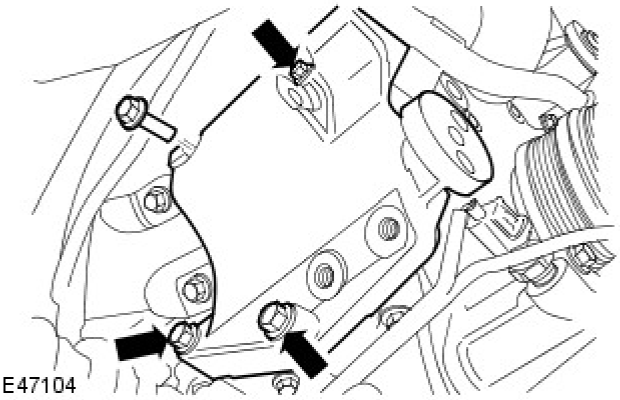
4. Remove the oil cooler assembly.
For additional information, refer to: Oil Cooler (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

5. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

6. Remove the front differential.
For additional information, refer to: Axle Assembly - V8 4.4L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).

7. Remove the steering gear.
For additional information, refer to: Steering Gear - V8 4.4L Petrol (211-02 Power Steering, Removal and Installation).

8. Remove the generator.
For additional information, refer to: Generator (414-02B Generator and Regulator - V8 4.4L Petrol, Removal and Installation).



9. Remove the generator mounting bracket.

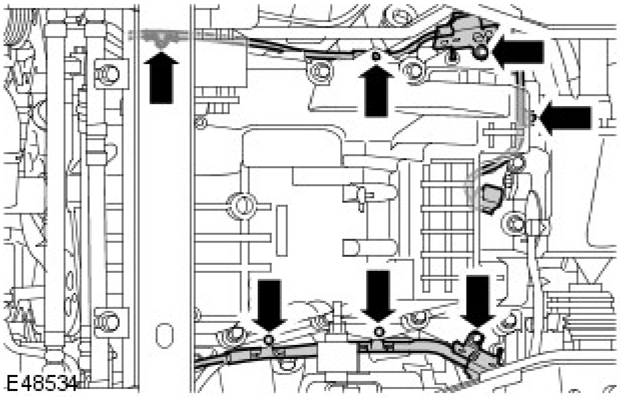
- Remove the 4 bolts.

10. Disconnect the heated oxygen sensor (HO2S) electrical connectors.

- Release the 8 wiring harness securing clips.

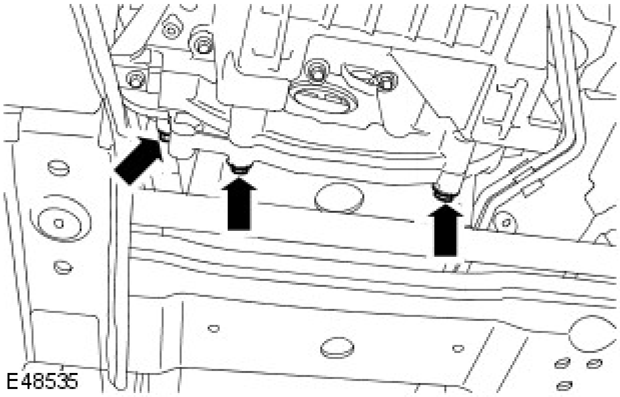
11. Release the HO2S mounting bracket.

- Remove the 2 bolts.



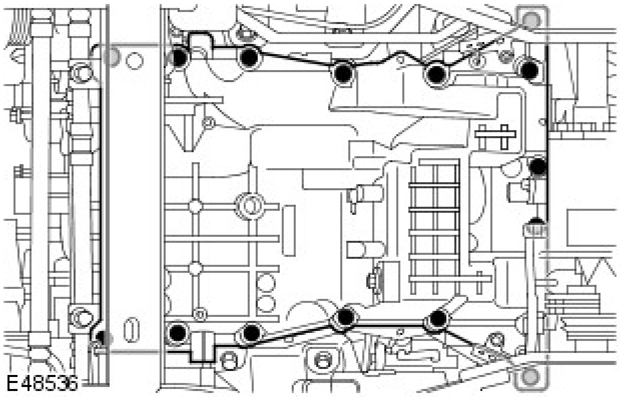
12. Release the HO2S wiring harness from the oil pan.

- Release the 3 clips.



13. Remove the transmission retaining bolts.

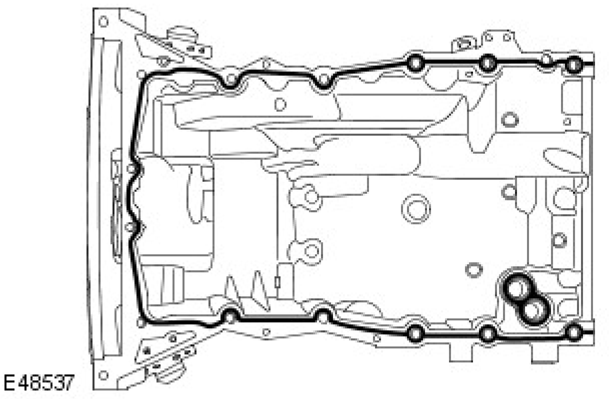
- Remove the 3 bolts.



14. Remove the oil pan.

- Remove the 16 bolts.

Installation



1. Install the oil pan.
   - Clean the component mating faces.
   - Apply a bead of sealant, 3 mm diameter by 130 cm long, to the areas indicated. See specifications for sealant information.
   - Tighten the bolts to 20 Nm (15 lb.ft).
2. Install the transmission retaining bolts.
   - Tighten the bolts to 45 Nm (33 lb.ft).
3. Install the HO2S mounting bracket.
   - Tighten the 2 bolts to 10 Nm (7 lb.ft).
4. Connect the HO2S electrical connectors.
   - Install the wiring harness clips.
5. Install the HO2S wring harness.
   - Secure the clips.
6. Install the generator mounting bracket.
   - Clean the component mating faces.
7. Install the generator.
   For additional information, refer to: Generator (414-02B Generator and Regulator - V8 4.4L Petrol, Removal and Installation).
8. Install the steering gear.
   For additional information, refer to: Steering Gear - V8 4.4L Petrol (211-02 Power Steering, Removal and Installation).
9. Install the front differential.
   For additional information, refer to: Axle Assembly - V8 4.4L Petrol (205-03 Front Drive Axle/Differential, Removal and Installation).
10. Install the oil cooler assembly.
    For additional information, refer to: Oil Cooler (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).
11. Install the engine front cover.
    For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).
12. Fill the engine with oil.
    For additional information, refer to: Engine Oil Draining and Filling (303-01B Engine - V8 4.4L Petrol, General Procedures).
13. Connect the battery ground cable.
    For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Oil Cooler

In-vehicle Repair

Removal

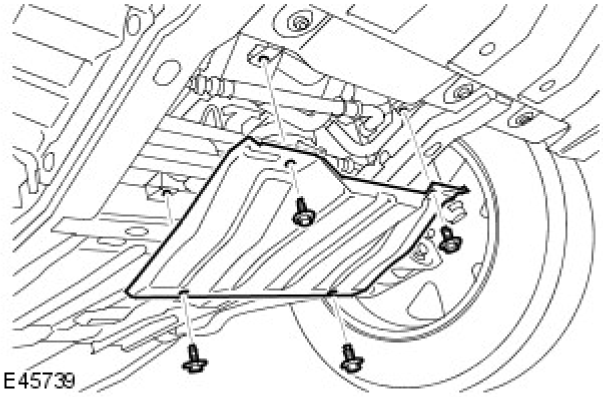
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

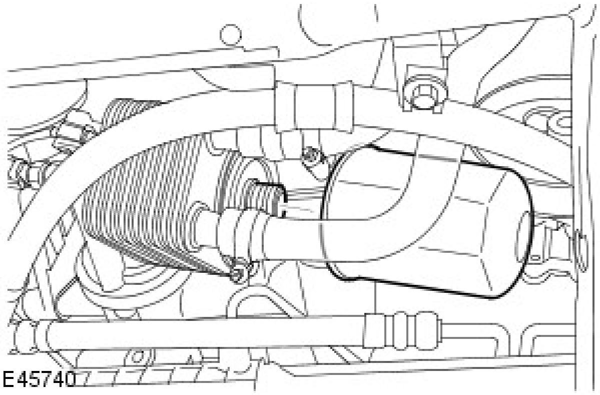
3. Remove the radiator access panel.

- Remove the 4 bolts.



4. Remove the oil filter.

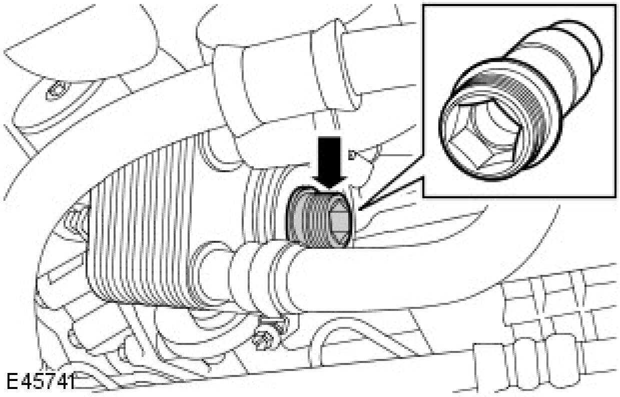
- Position a container to collect the fluid.

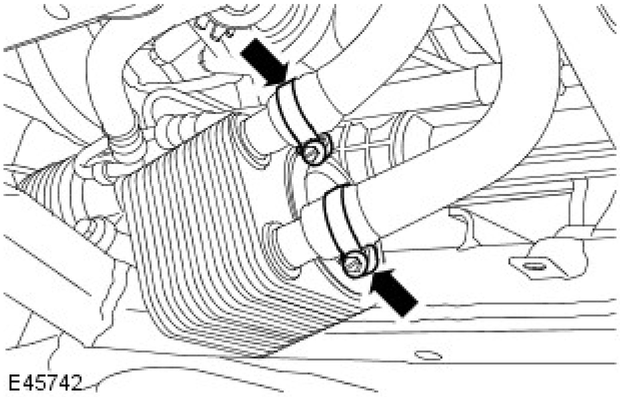


5. NOTE: Note the fitted position of the oil cooler assembly.

Remove the oil filter adapter.

- Release the cooler from the oil filter head.





6. Clamp, then disconnect the coolant hoses from the oil cooler.

7. Remove the oil cooler.

Installation

1. NOTE: Fill the cooler with coolant to eliminate the air, prior to connecting the coolant hoses.

To install, reverse the removal procedure.

- Tighten the adapter to 60 Nm (44 lb.ft)
- Lubricate the oil filter seal with clean engine oil and tighten to 18 Nm (13 lb.ft).
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Check and top up the engine oil.

3. Top up and bleed the coolant.

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Engine - V8 4.4L Petrol - Engine Front Cover

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

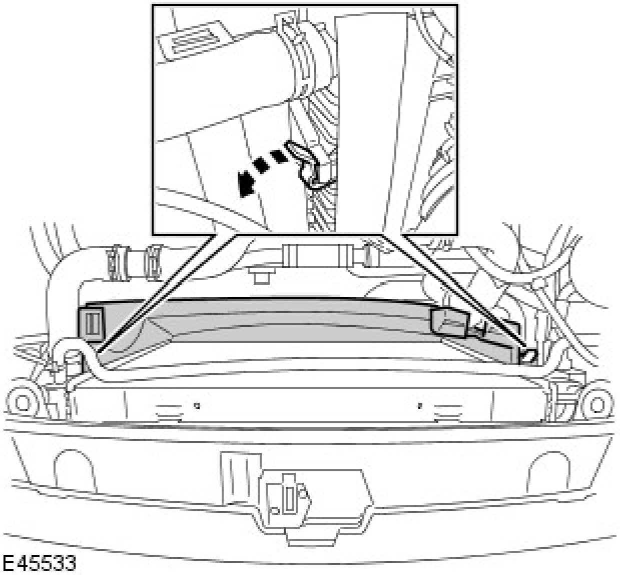
3. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

4. Remove the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

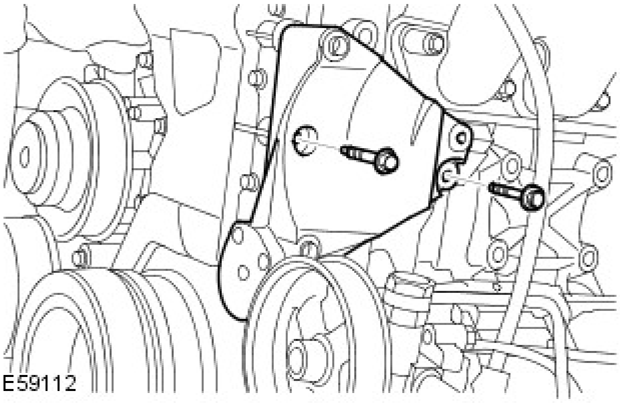
5. Remove the crankshaft front oil seal.
For additional information, refer to: Crankshaft Front Seal (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

6. Remove the cooling fan lower shroud.

- Release 2 clips from the cooling fan lower shroud.
- Release and remove the cooling fan lower shroud from the cooling pack.

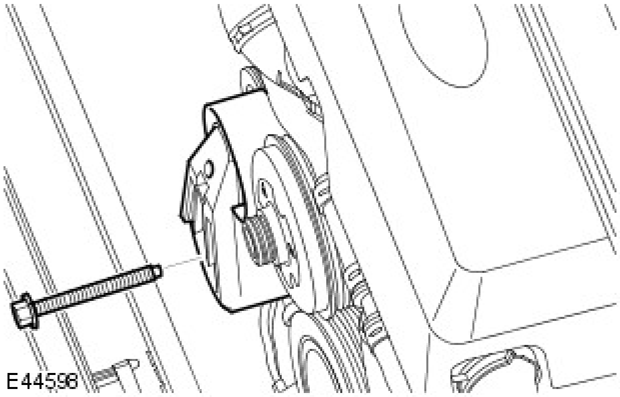


7. Remove the air conditioning (A/C) compressor.
For additional information, refer to: Air Conditioning (A/C) Compressor (412-03B Air Conditioning - V8 4.4L Petrol, Removal and Installation).



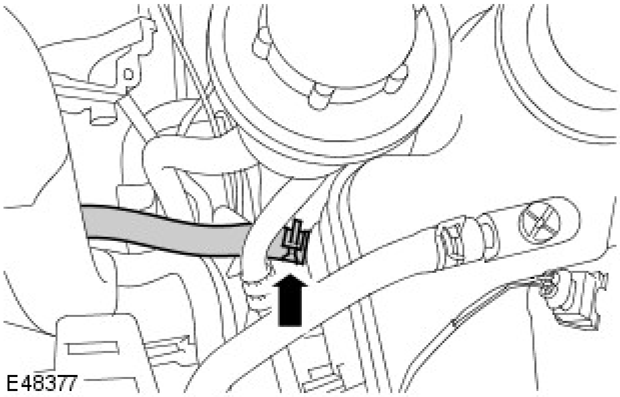
8. Remove the A/C compressor mounting bracket.

- Remove the 2 bolts.



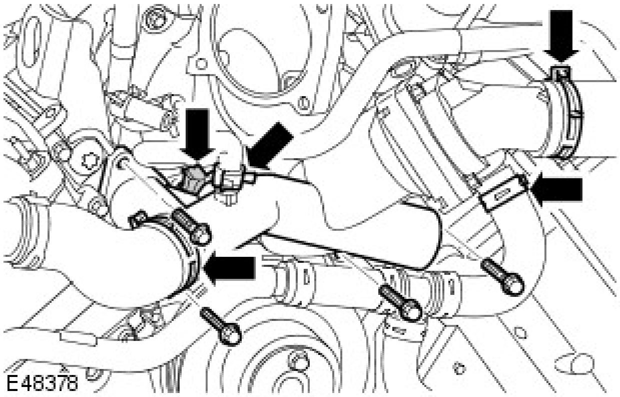
9. Remove the cooling fan drive belt tensioner.

- Remove the bolt.



10. Disconnect the coolant expansion tank hose.

- Release the clip.



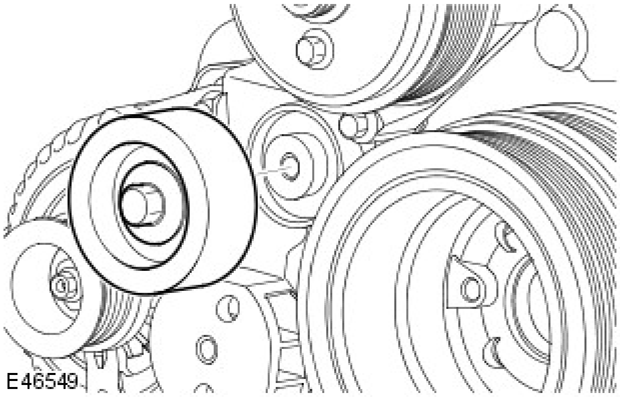
11. Remove the coolant manifold.

- Release the clips and disconnect the 4 coolant hoses.
- Remove the 4 bolts.
- Disconnect the electrical connector.
- Position the coolant hoses aside for access.

12. Release the engine wiring harness clips.

13. Remove the accessory drive belt idler pulley.

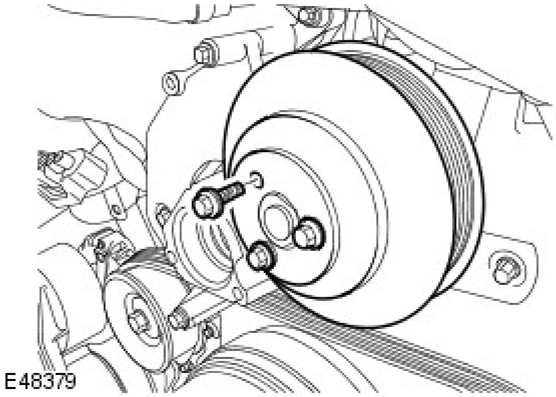
- Remove the bolt.



E46549

14. Remove the coolant pump pulley.

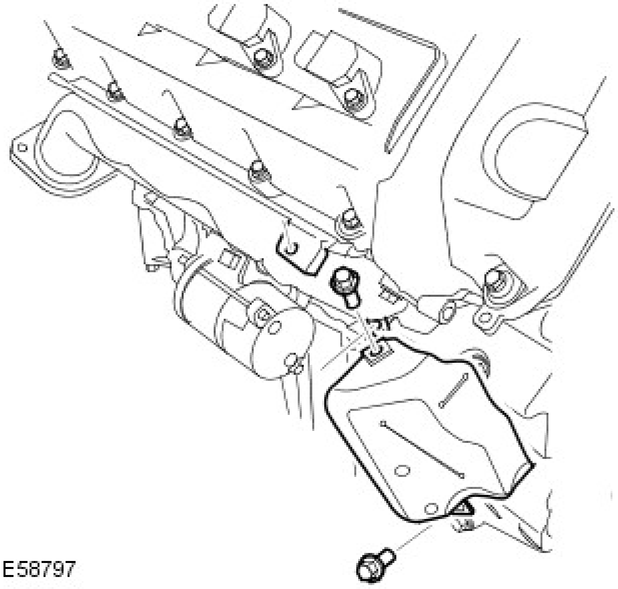
- Remove the 3 bolts.



E48379

15. Remove the RH exhaust manifold heat shield.

- Remove the 2 screws.



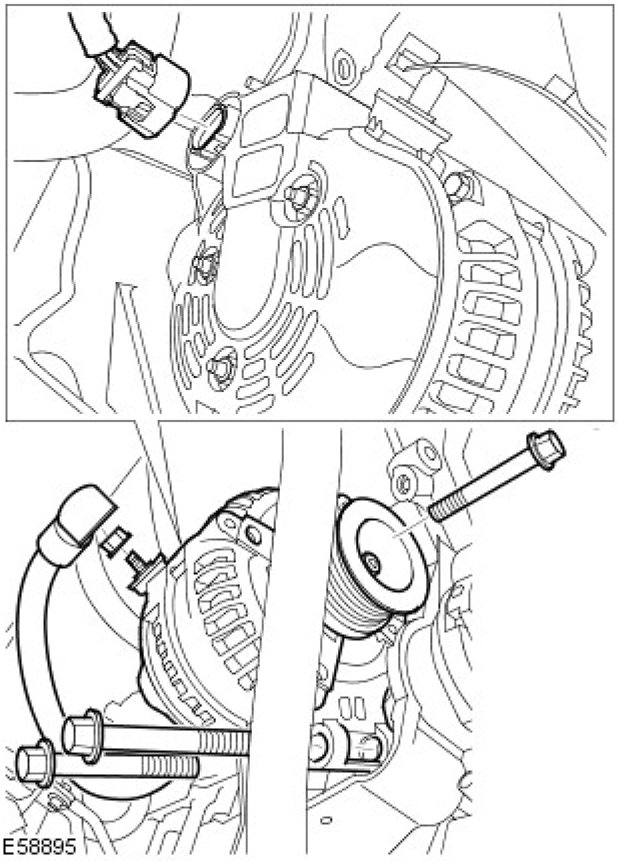
E58797

16. Disconnect the battery positive cable.

- Release the cover.
- Remove the nut.
- Disconnect the electrical connector.

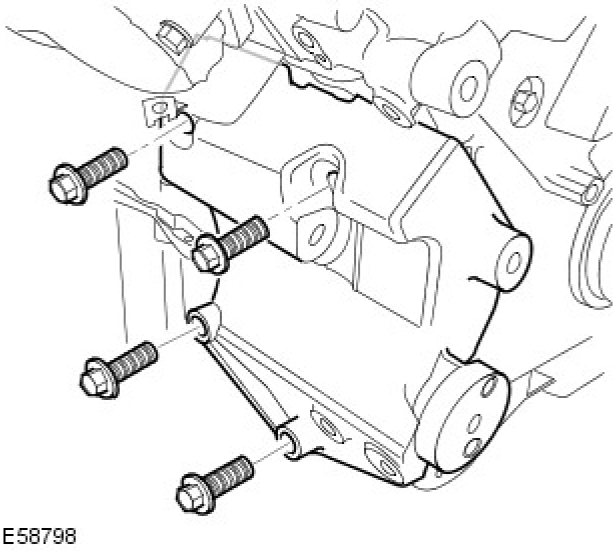
17. Remove the generator.

- Remove the 3 bolts.



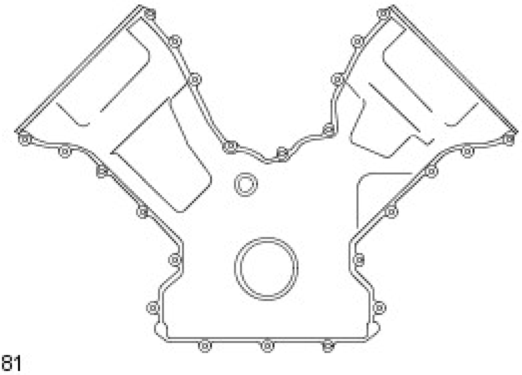
18. Remove the generator mounting bracket.

- Remove the 4 bolts.



19. Remove the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

20. Remove the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

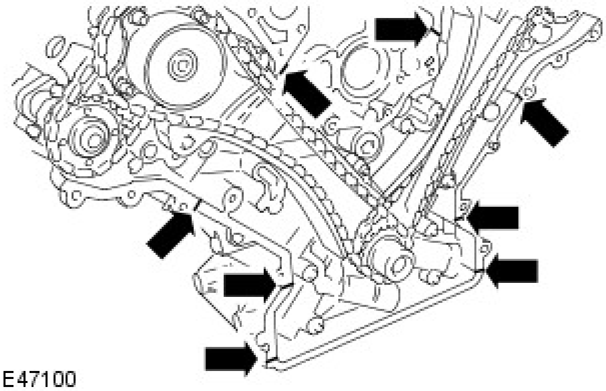


E48381

21. Remove the engine front cover.

- Release the engine wiring harness clips.
- Remove the 24 bolts.
- Remove and discard the gasket.

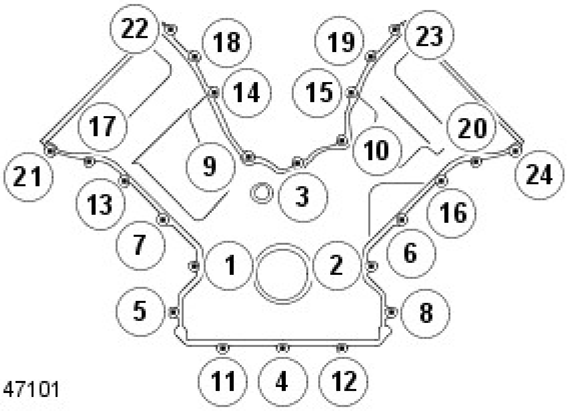
Installation



E47100

1. Install the engine front cover.

- Clean the component mating faces.
- Apply a bead of sealant 3 mm diameter, by 12 mm long, to the 8 places indicated.



E47101

2. Evenly and progressively tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).

3. Install the crankshaft front oil seal.
For additional information, refer to: Crankshaft Front Seal (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

4. Install the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

5. Install the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

6. Install the generator mounting bracket.

- Clean the locating dowels.
- Clean the component mating faces.

- Tighten the bolts to 45 Nm (33 lb.ft).

7. Install the generator.

- Clean the component mating faces.
- Tighten the bolts to 48 Nm (35 lb.ft).

8. Connect the battery positive cable.

- Tighten the nut to 10 Nm (7 lb.ft).
- Secure the cover.

9. Install the RH exhaust manifold heat shield.

- Tighten the screws.

10. Install the coolant manifold.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Install the coolant hoses.
- Secure with the clips.

11. Install the coolant expansion tank hose.

- Connect the clip.

12. Install the coolant pump pulley.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Install the accessory drive belt idler pulley.

- Tighten the bolt to 25 Nm (18 lb.ft).

14. NOTE: Care must be taken when installing the plug top coil ground connections. The engine will fail to start on either or both banks if the ground is poor.

Secure the engine wiring harness clips.

15. Install the cooling fan drive belt tensioner.

- Tighten the pulley bolt to 25 Nm (18 lb.ft).
- Tighten the tensioner bolt to 40 Nm (30 lb.ft).

16. Install the A/C mounting bracket.

17. Install the A/C compressor.
For additional information, refer to: Air Conditioning (A/C) Compressor (412-03B Air Conditioning - V8 4.4L Petrol, Removal and Installation).

18. Install the cooling fan shroud.

19. Install the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

20. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

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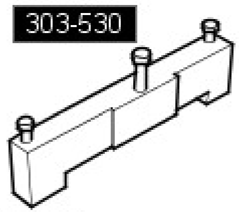
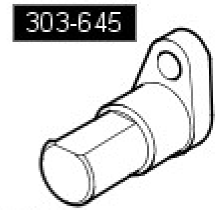
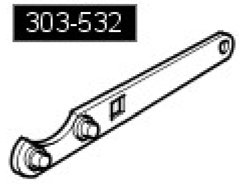
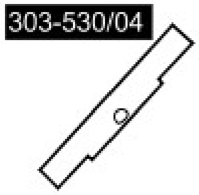
Engine - V8 4.4L Petrol - Timing Drive Components

In-vehicle Repair

Special Tool(s)	
 E46879	Camshaft setting/locking tool 303-530
 E46881	Timing Setting tool 303-645
 E46880	Timing chain tensioning tool 303-532
 E115082	Timing shim tool 303-530/04

Removal

• NOTE: This procedure covers the removal and installation of the following components: timing chains, chain guides, tensioners and sprockets.

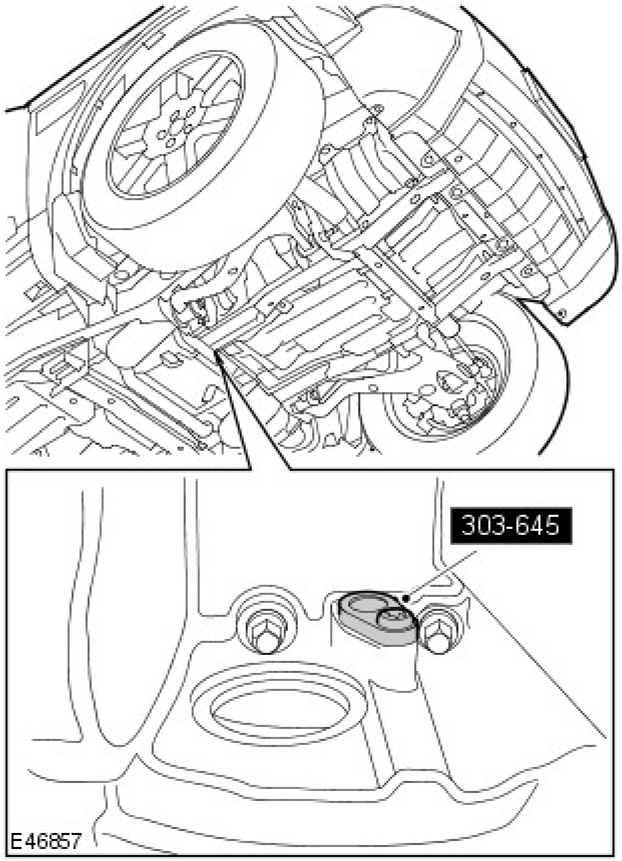
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

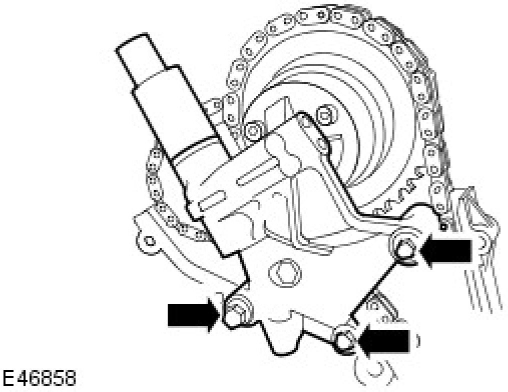
3. Remove the engine front cover.
For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

4. Remove the crankshaft position (CKP) sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).


303-645
E46857

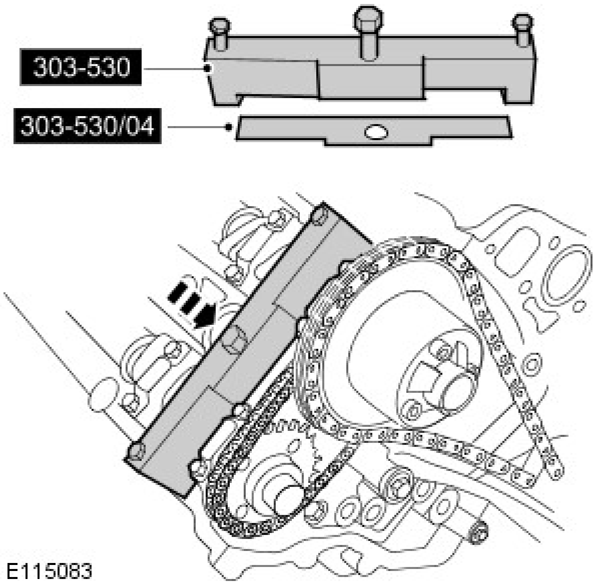
5. Lock the crankshaft.

- Install the special tool.
- Install the screw.

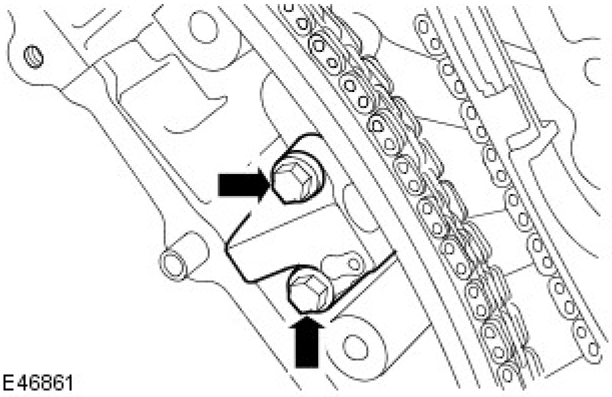


6. Remove the RH variable camshaft timing (VCT) control solenoid housing.

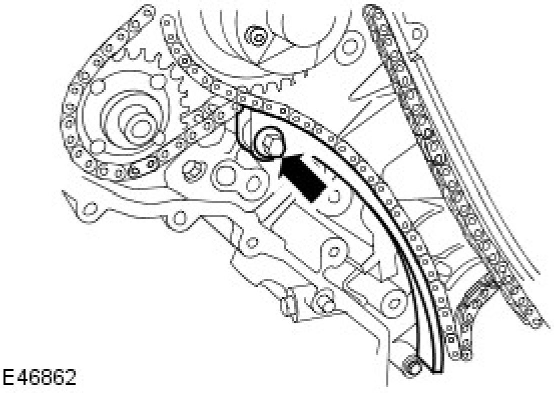
- Remove the 3 bolts.
- Remove and discard the O-ring seals.


303-530
303-530/04
E115083

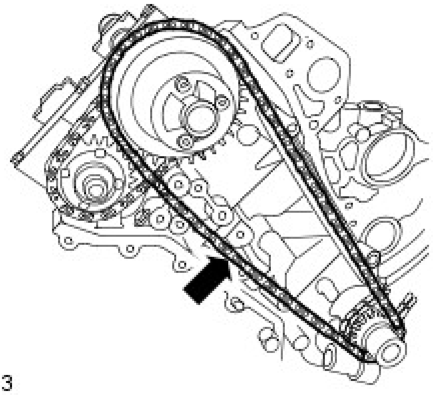
7. Install the special tools to the RH cylinder head.
    - Install the 3 bolts.



8. Remove the RH primary timing chain tensioner assembly.
    - Remove the 2 bolts.

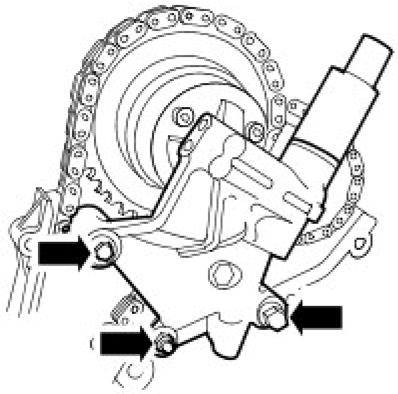


9. Remove the RH primary timing chain tensioner guide.
    - Remove the bolt.

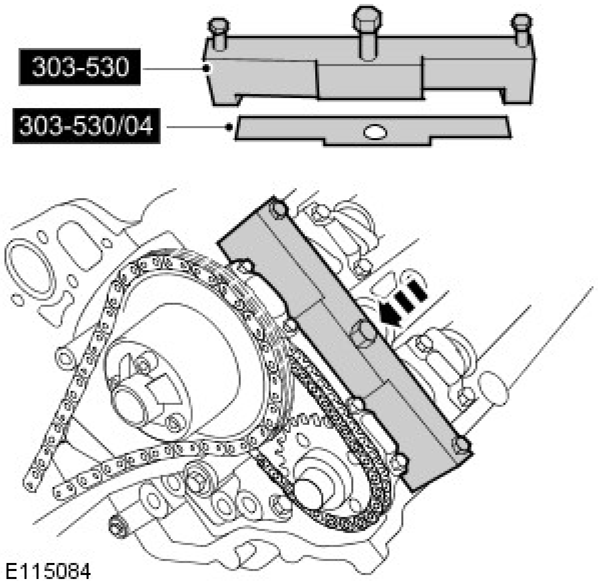

E46863

10. Remove the RH primary timing chain.
    - Remove the bolt retaining the chain guide.

11. Remove the special tools from the RH cylinder head.
    - Remove the 3 bolts.

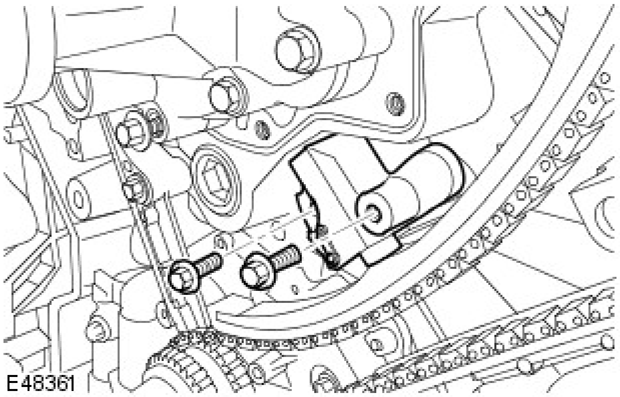

E48360

12. Remove the LH variable camshaft timing (VCT) control solenoid housing.
    - Remove the 2 bolts.
    - Remove the nut.
    - Remove and discard the O-ring seals.



E115084

13. Install the special tools to the LH cylinder head.
    - Install the 3 bolts.

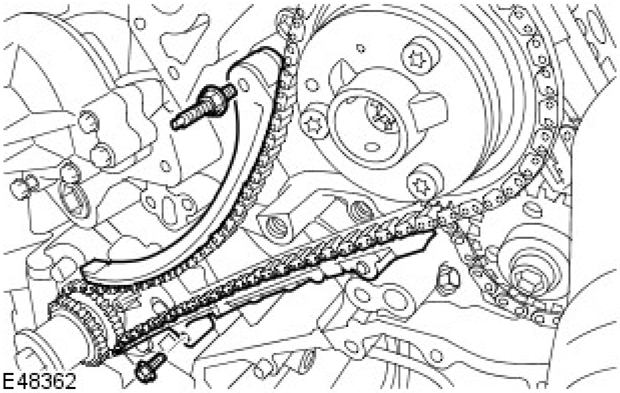

E48361

14. Remove the LH primary timing chain tensioner.

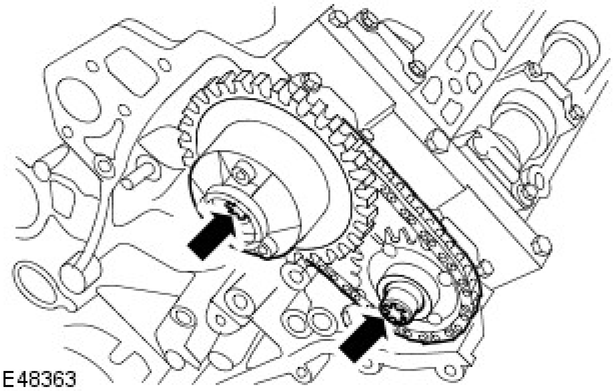
- Remove the 2 bolts.

15. Remove the LH upper and lower primary timing chain tensioner guides.

- Remove the 2 bolts.

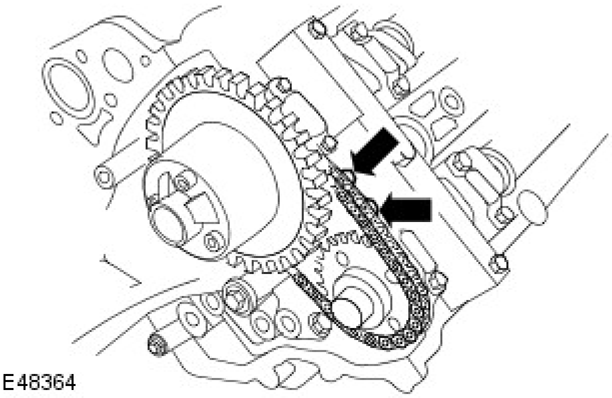

E48362

16. Remove the LH primary timing chain.


E48363

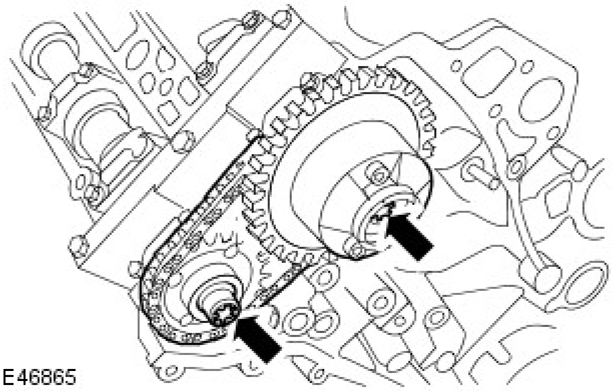
17. Remove the LH camshaft sprocket assembly.

- Remove the 2 Torx bolts.


E48364

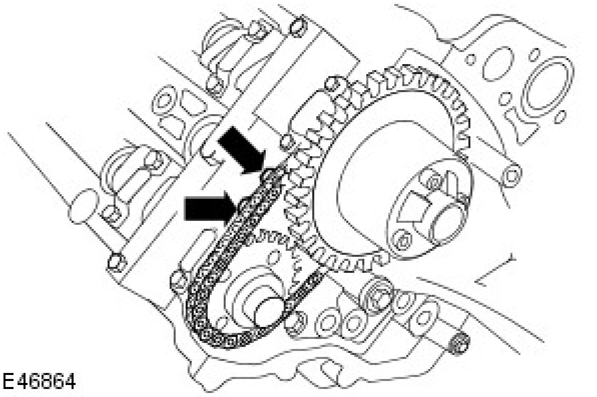
18. Remove the LH secondary timing chain tensioner and the secondary timing chain.

- Remove the 2 bolts.


E46865

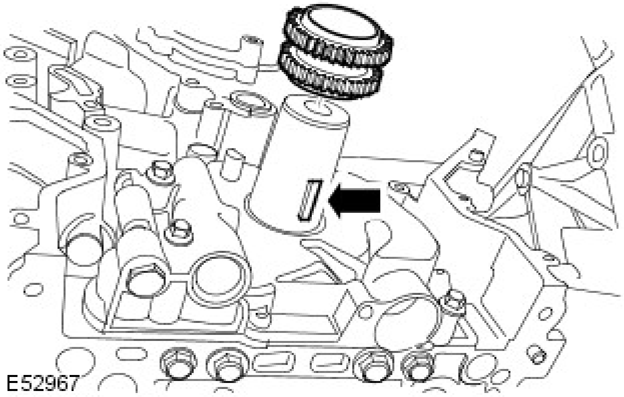
19. Remove the RH camshaft sprocket assembly.

- Remove the 2 Torx bolts.


E46864

20. Remove the RH secondary timing chain tensioner and the secondary timing chain.

- Remove the 2 retaining bolts.


E52967

21. NOTE: Note the orientation of the crankshaft sprocket.

Remove the crankshaft sprocket.

- Remove the crankshaft sprocket key.

Installation

1. Install the crankshaft sprocket key.

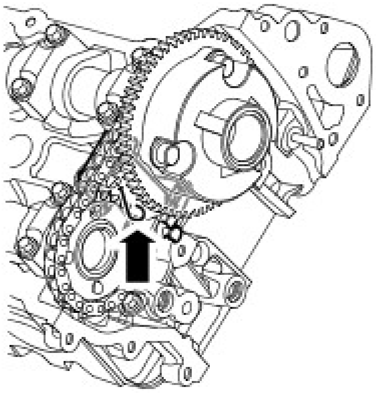
- Clean the component mating faces.

2. Install the crankshaft sprocket.

3. Depress the LH secondary timing chain tensioner piston.

- Using 1 mm diameter metal rod, retain the chain tensioner piston.

4. NOTE: RH illustration shown, LH is similar.



E46869

Install the LH secondary timing chain tensioner and chain to the camshaft sprockets.

5. Install the LH secondary timing chain tensioner retaining bolts.

- Tighten the bolts to 12 Nm.

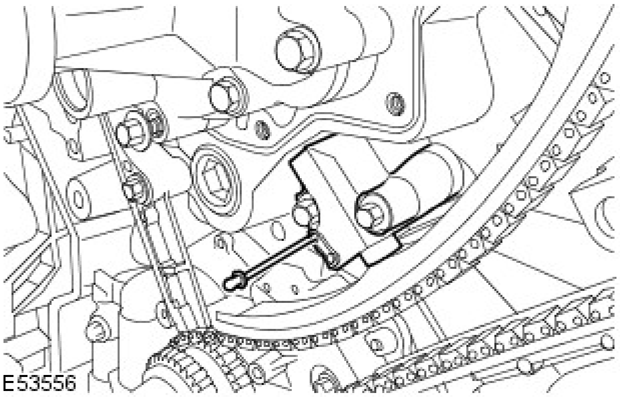
6. Install the LH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

7. Install the LH primary timing chain tensioner guides.

- Tighten the bolts to 12 Nm.

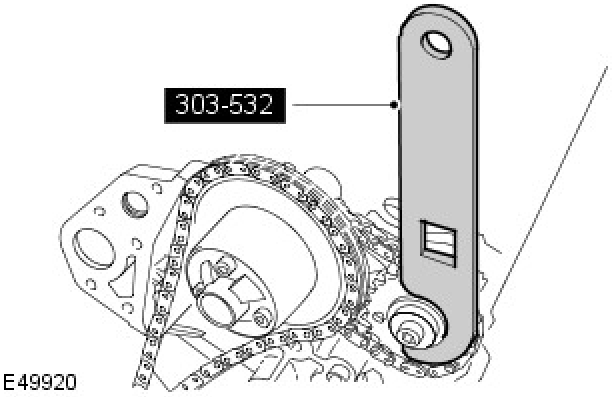
8. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.



E53556

Install the LH primary timing chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm.
- Remove the retaining rod.



9. CAUTIONS:

⚠ Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

⚠ The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

⚠ Make sure that new bolts are installed.

Install the special tool to the LH exhaust camshaft sprocket.

- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.
- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

10. Install the LH VCT control solenoid housing.

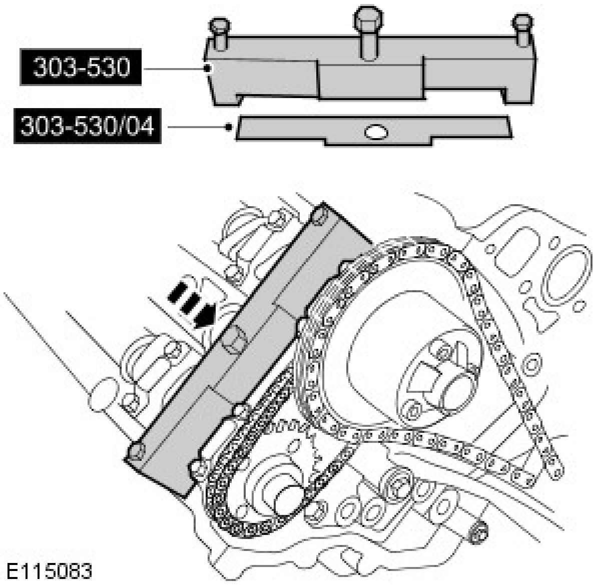
- Install the new O-ring seals.
- Tighten the new bolts to 22 Nm.
- Tighten the nut to 10 Nm.

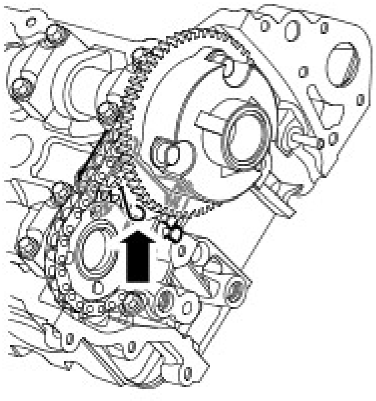
11. Remove the special tools from the LH cylinder head.

- Remove the 3 bolts.

12. Install the special tools to the RH cylinder head.

- Install the 3 bolts.




E46869

13. Retain the RH secondary timing chain tensioner piston.

- Using 1 mm diameter metal rod, retain the chain tensioner piston.

14. Install the RH secondary timing chain tensioner and the secondary timing chain to the camshaft sprockets.

15. NOTE: Lightly tighten the camshaft sprocket Torx bolts, the sprockets MUST be free to move.

Install the RH secondary timing chain and sprockets to the camshafts.

- Install the sprocket retaining Torx bolts to the camshafts.

16. Install the RH secondary timing chain tensioner retaining bolts.

- Tighten the bolts to 12 Nm.

17. Tension the secondary timing chain.

- Remove the retaining rod.

18. Install the RH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

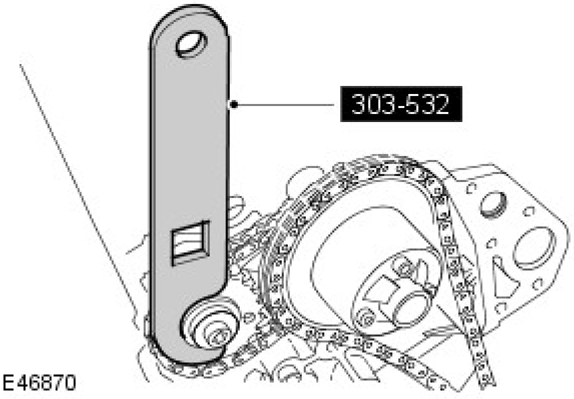
19. Install the RH primary timing chain tensioner guide.

- Tighten the bolts to 12 Nm.

20. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the RH primary timing chain tensioner.

- Using 3 mm diameter metal rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm.
- Remove the retaining rod.



21. CAUTIONS:

⚠ The intake camshaft sprocket retaining bolt MUST be tightened before the exhaust camshaft sprocket retaining bolt. Engine damage will occur if this procedure is not followed.

⚠ Using the special tool, apply force to the tool in a counter-clockwise direction, to tension the primary timing chain on its drive side.

⚠ Make sure that new bolts are installed.

Install the special tool to the RH exhaust camshaft sprocket.

- Tighten the intake camshaft sprocket retaining bolt to 20 Nm + 90 deg.
- Tighten the exhaust camshaft sprocket retaining bolt to 20 Nm + 90 deg.

22. Install the RH VCT control solenoid housing.

- Install the new O-ring seals.
- Tighten the new bolts to 22 Nm.

23. Remove the special tool from the RH cylinder head.

24. Install the engine front cover.
For additional information, refer to: Engine Front Cover (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

25. Remove the crankshaft locking tool.

- Remove the screw.

26. Install the CKP sensor.
For additional information, refer to: Crankshaft Position (CKP) Sensor (303-14B Electronic Engine Controls - V8 4.4L Petrol, Removal and Installation).

27. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - V8 4.4L Petrol - Exhaust Manifold LH

In-vehicle Repair

Removal

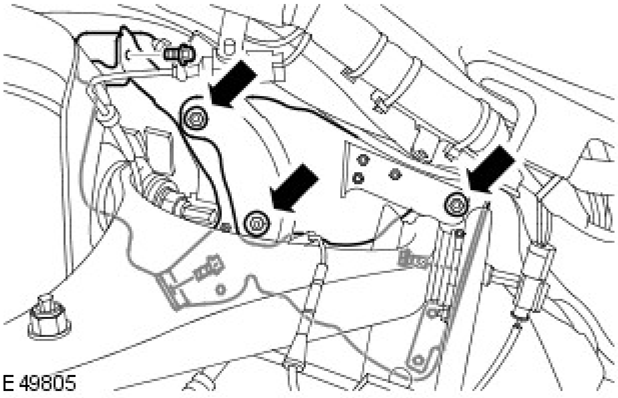
All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

3. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

4. NOTE: The heatshield consists of 3 parts.



Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.

Left-hand drive vehicles

5. Check the road wheels are in the straight ahead position, then remove the steering column universal joint upper clamp bolt.

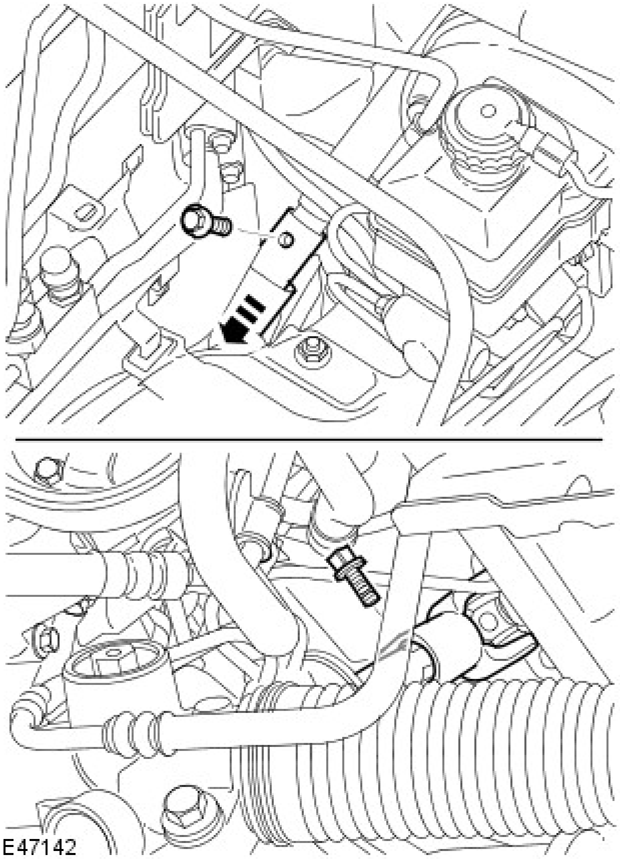
- Discard the retaining bolt.

6. Release the upper steering column shaft.

7. Remove the steering rack universal joint clamp bolt.

- Discard the retaining bolt.

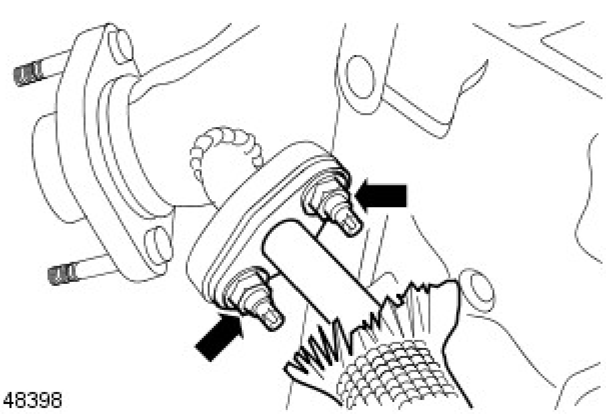
8. Release and remove the shaft and joint assembly.



E47142

All vehicles

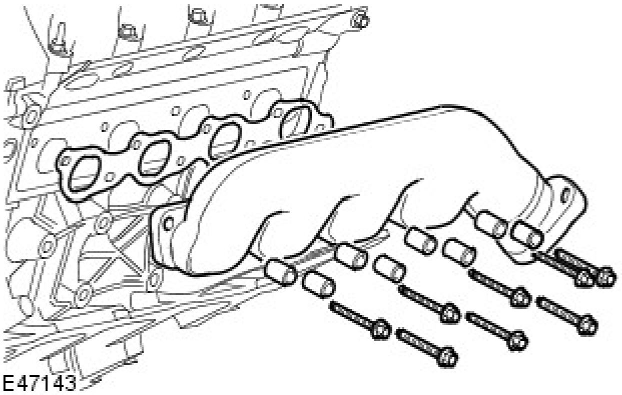
9. CAUTION: Failure to follow this procedure can lead to the EGR pipe stress cracking.



E48398

Disconnect the exhaust manifold EGR pipe flange.

- Remove the 2 nuts.
- Discard the gasket.
- Loosen, but do not remove 2 bolts, securing the EGR pipe to the EGR valve.


E47143

10. Remove the exhaust manifold.

- Remove the 8 bolts.
- Collect the spacers and discard the bolts.
- Remove the gasket/heat shield retaining bolt.
- Discard the gasket/heat shield.

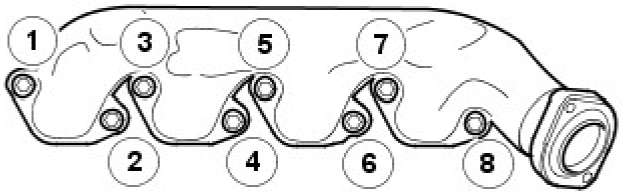
Installation

All vehicles

1. Clean the component mating faces.

2. Install the exhaust manifold.

- Install the gasket/heat shield.
- Tighten the heat shield bolt to 25 Nm (18 lb.ft).
- Install, and lightly tighten the bolts.
- Evenly and progressively, tighten the bolts in the sequence shown to 20 Nm (15 lb.ft).



E47144

3. Connect the EGR pipe and exhaust manifold flanges.

- Install a new gasket.
- Tighten the nuts to 25 Nm (18 lb.ft).
- Tighten the bolts to 25 Nm (18 lb.ft).

Left-hand drive vehicles

4. Install the steering column lower universal joint assembly.

- Clean the component mating faces.
- Install new patchlock bolts and tighten to 25 Nm (18 lb.ft).

All vehicles

5. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.

6. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

7. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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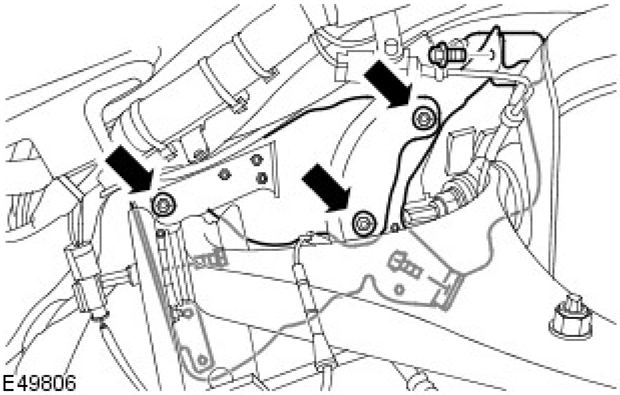
Engine - V8 4.4L Petrol - Exhaust Manifold RH

In-vehicle Repair

Removal

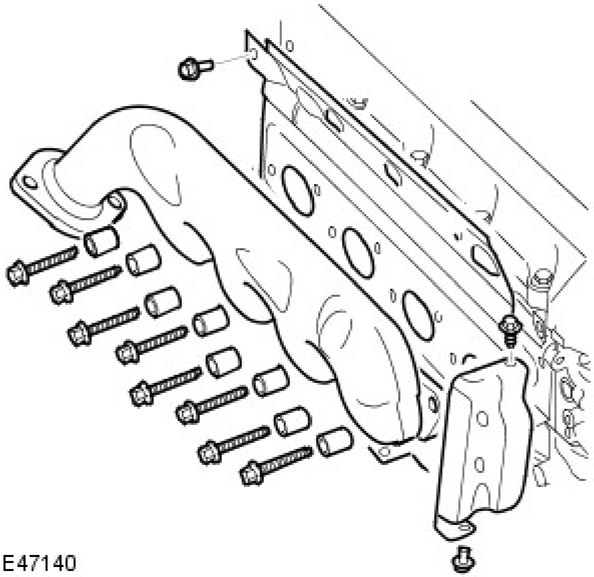
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the exhaust system.
   For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).
3. Remove the fender splash shield.
   For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



4. NOTE: The heatshield consists of 3 parts.

   Remove the upper suspension arm and brake line heat shields for access.

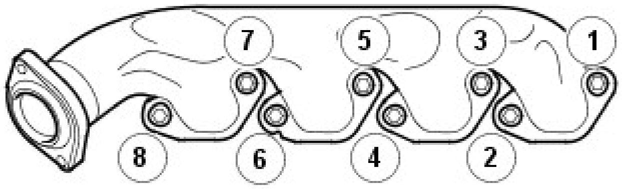
   - Remove the 3 nuts.
   - Remove the 3 bolts.



5. Remove the exhaust manifold.
   - Remove the 8 bolts.
   - Collect the spacers and discard the bolts.
   - Remove the gasket/heat shield retaining bolt.
   - Discard the gasket/heat shield.

Installation

1. Clean the component mating faces.



E47141

2. Install the exhaust manifold.

- Install the gasket/heat shield.
- Tighten the heat shield bolt to 25 Nm (18 lb.ft).
- Evenly and progressively, tighten the bolts in the sequence shown to 20 Nm (15 lb.ft).

3. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.

4. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

5. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Engine - V8 4.4L Petrol - Variable Camshaft Timing (VCT) Unit

In-vehicle Repair

Removal

- NOTE: The removal and installation of the RH VCT unit is similar to the LH and is covered within the timing drive component procedure.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the timing drive components.
   For additional information, refer to: Timing Drive Components (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).

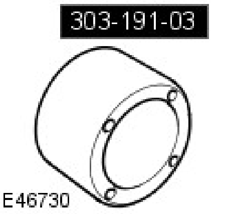
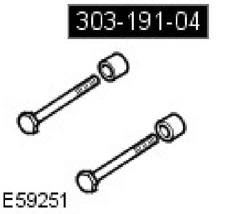
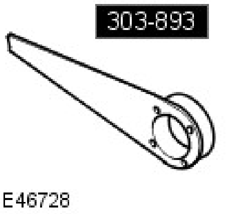
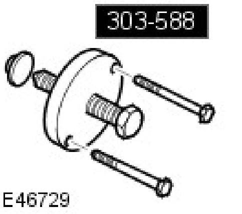
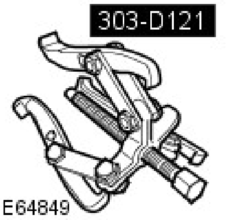
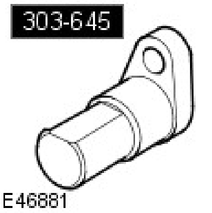
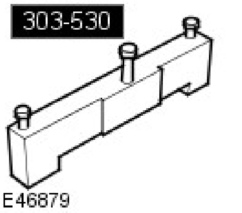
Installation

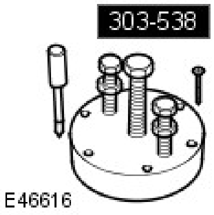
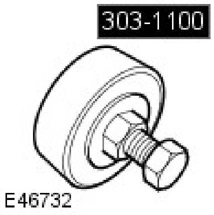
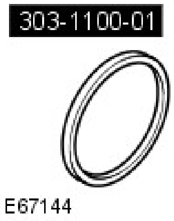
1. Install the timing drive components.
   For additional information, refer to: Timing Drive Components (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).
2. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - V8 4.4L Petrol - Crankshaft Main Bearing Carrier

Removal and Installation

Special Tool(s)	
 303-191-03 E46730	Adapter 303-191-03
 303-191-04 E59251	Bolts and spacers 303-191-04
 303-893 E46728	Holding Tool Crankshaft Pulley 303-893(LRT-12-080)
 303-588 E46729	Remover, crankshaft pulley 303-588
 303-D121 E64849	Remover, crankshaft seal 303-D121
 303-645 E46881	Timing Setting tool 303-645
 303-530 E46879	Camshaft setting/locking tool 303-530

	Crankshaft rear oil seal remover/installer 303-538
	Installer, crankshaft seal 303-1100
	Adapter - Crankshaft seal installer 303-1100-01

Removal

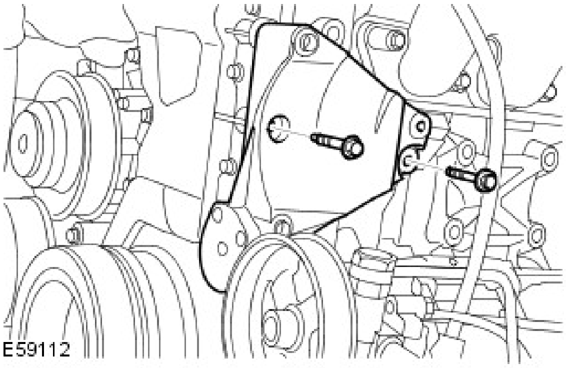
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

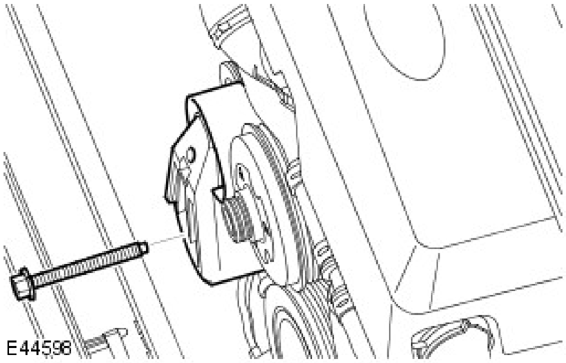
3. Remove the engine.
For additional information, refer to: Engine (303-01B Engine - V8 4.4L Petrol, Installation).

4. Mount the engine to an engine stand.



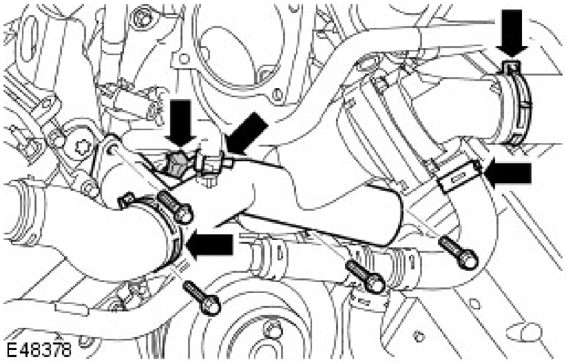
5. Remove the air conditioning compressor (A/C) support bracket.

- Remove the 2 bolts.



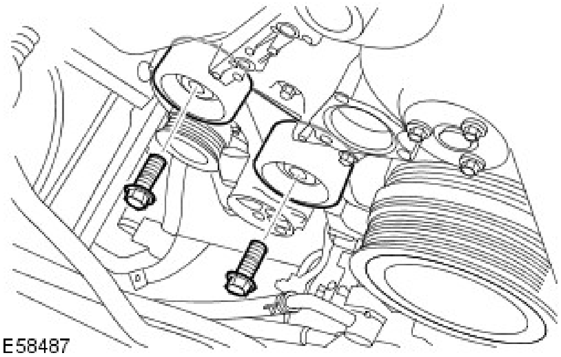
6. Remove the cooling fan drive belt tensioner.

   - Remove the bolt.



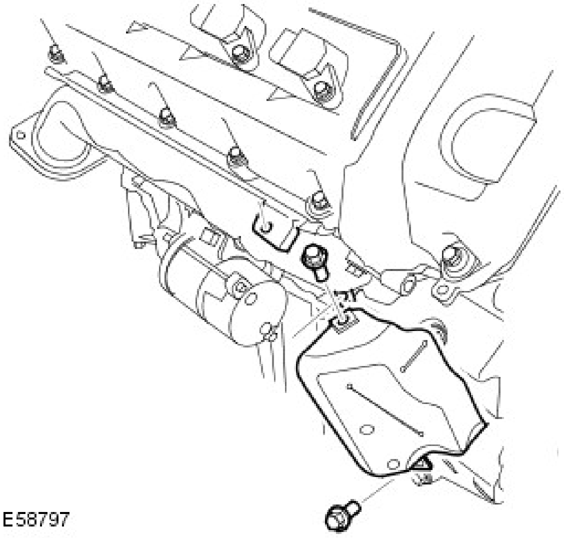
7. Remove the coolant manifold.

   - Release the clips and disconnect the 4 coolant hoses.
   - Remove the 4 bolts.
   - Disconnect the engine coolant temperature (ECT) sensor electrical connector.



8. Remove the coolant pump and accessory drive belt idler pulleys.

   - Remove the bolts.



9. Remove the exhaust manifold heat shield.

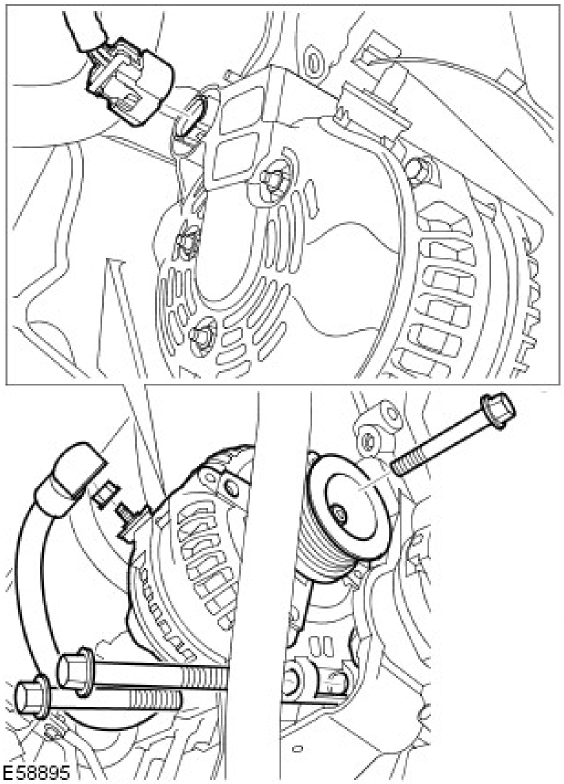
   - Remove the 2 bolts.

10. Disconnect the battery positive cable.

- Remove the battery positive cable cover.
- Remove the nut.

11. Remove the generator.

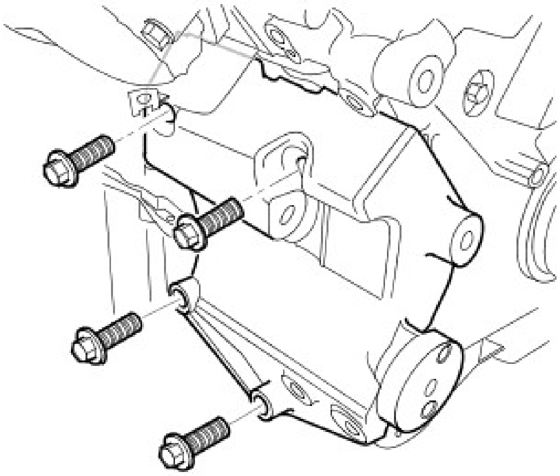
- Disconnect the electrical connector.
- Remove the 3 bolts.



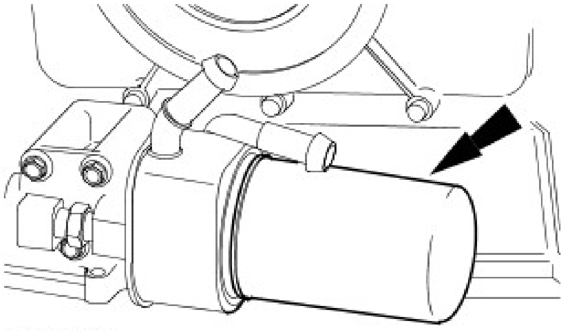
E58895

12. Remove the generator mounting bracket.

- Remove the 4 bolts.



E58798



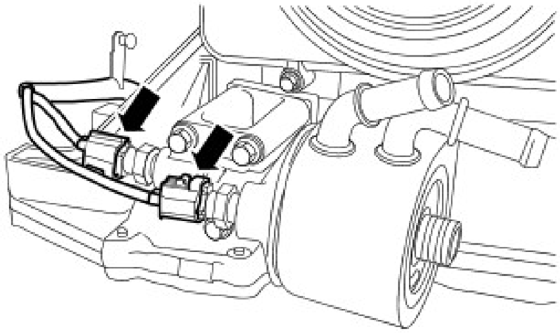
VUJ0001576

13. NOTE: Some oil spillage is inevitable during this operation.

• NOTE: Clean the components general area prior to dismantling.

Remove the oil filter.

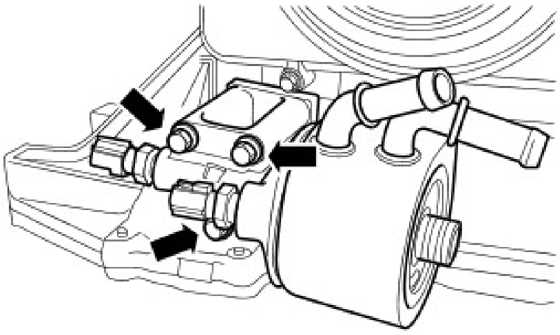
- Disconnect the engine oil temperature sensor electrical connector.



E82652

14. Disconnect the engine oil pressure (EOP) sensor electrical connector.

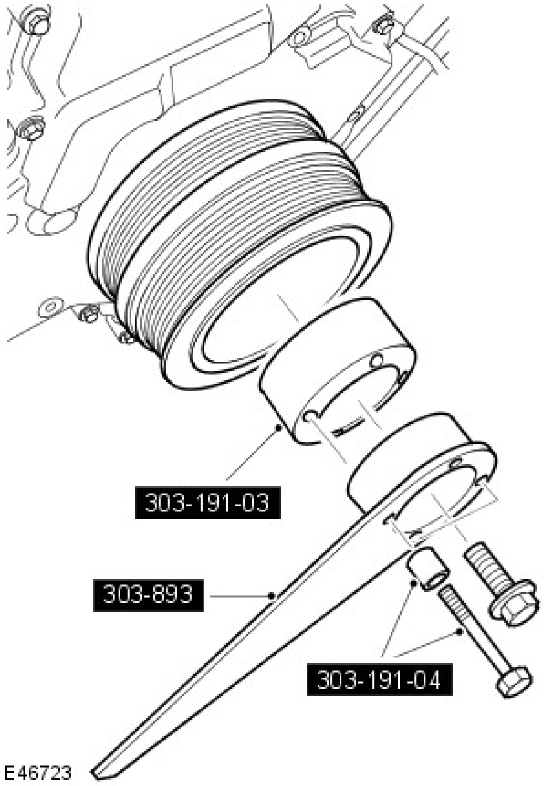
15. Disconnect the engine oil temperature sensor electrical connector.



E82653

16. Remove the oil filter housing.

- Remove the 3 bolts.
- Remove and discard the O-ring seal.


303-191-03
303-893
303-191-04
E46723

17. ⚠ CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.

Using the special tools, retain the crankshaft pulley.

18. NOTE: The crankshaft pulley retaining bolt will be very tight.

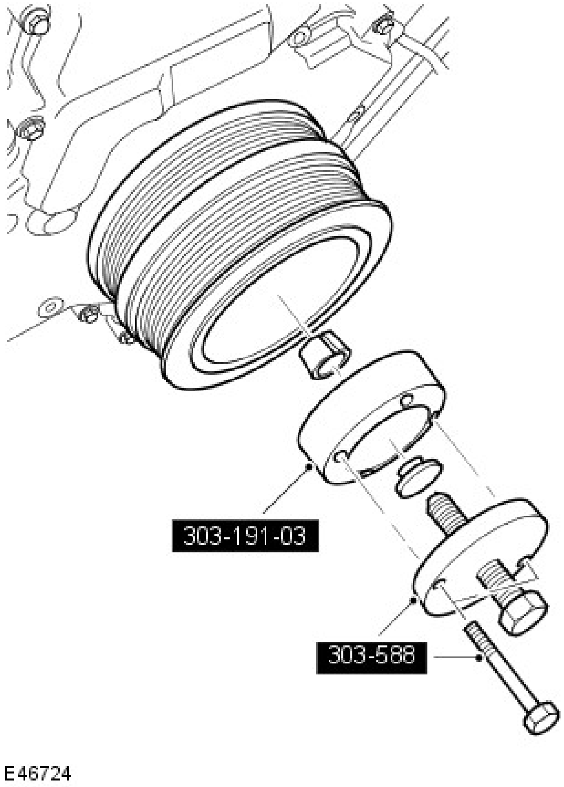
Using the special tools, remove the crankshaft pulley bolt.

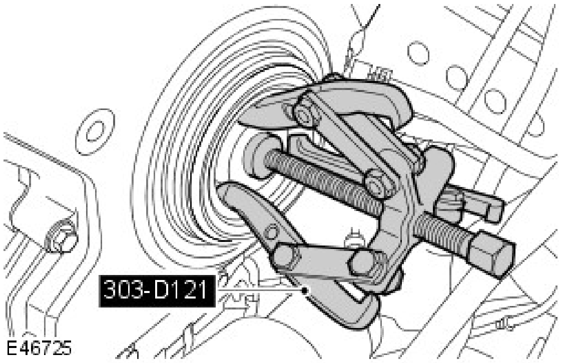
- Discard the bolt.
- Remove the special tools.

19. NOTE: The crankshaft pulley will be very tight.

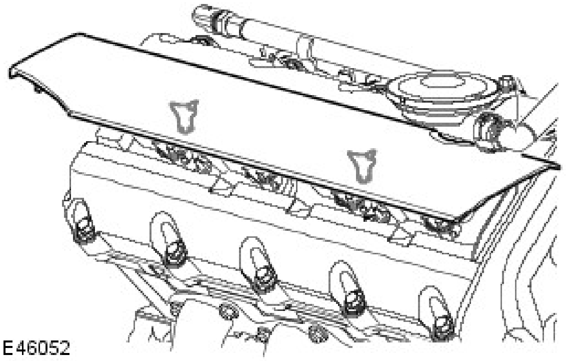
Using the special tools, remove the crankshaft pulley.

- Collect the locking ring.
- Remove the special tools.


303-191-03
303-588
E46724

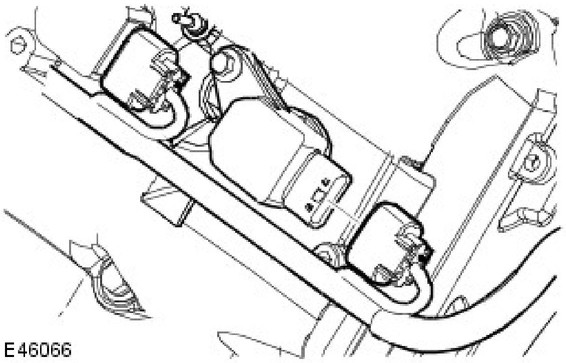

303-D121
E46725

20. Using the special tool, remove and discard the crankshaft front seal.

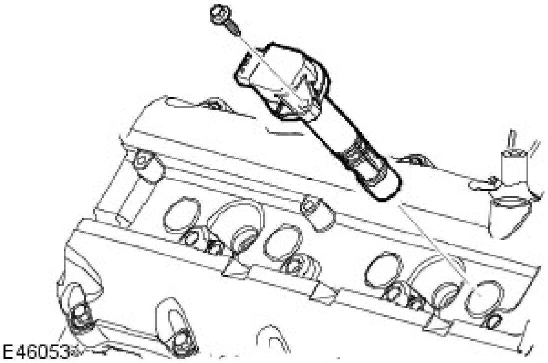


21. Remove the RH ignition coil-on-plug cover.

- Release from the 2 clips.



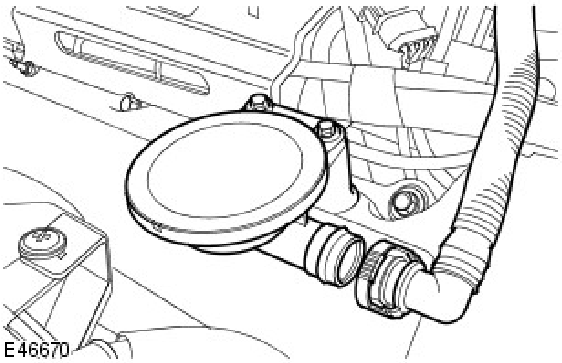
22. Disconnect the RH ignition coil-on-plug electrical connector.



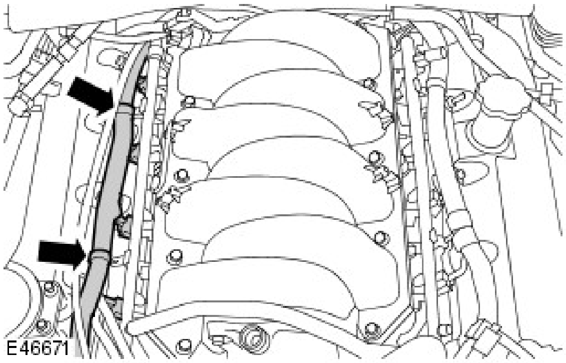
23. Remove the RH ignition coil-on-plug.

- Remove the bolt.
- Remove and discard the seal.

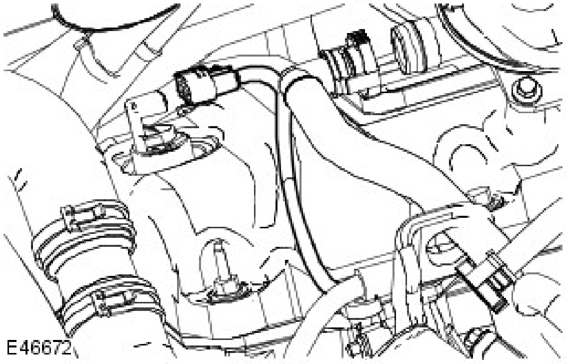
24. Remove the remaining RH ignition coil-on-plugs.



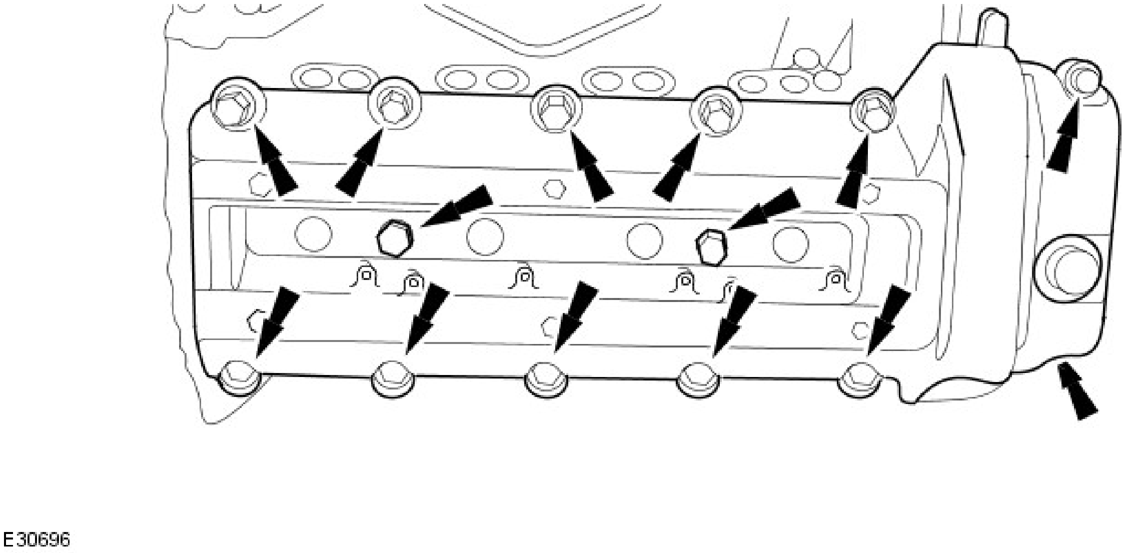
25. Disconnect the positive crankcase ventilation (PCV) line.



26. Release the engine wiring harness from the retaining bracket.



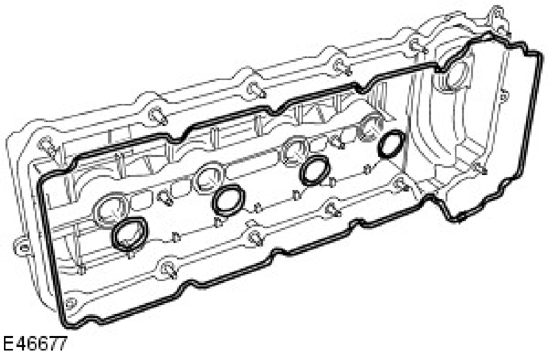
27. Disconnect the RH variable camshaft timing (VCT) oil solenoid electrical connector.



28. NOTE: Note the fitted position of the retaining bolts prior to removal.

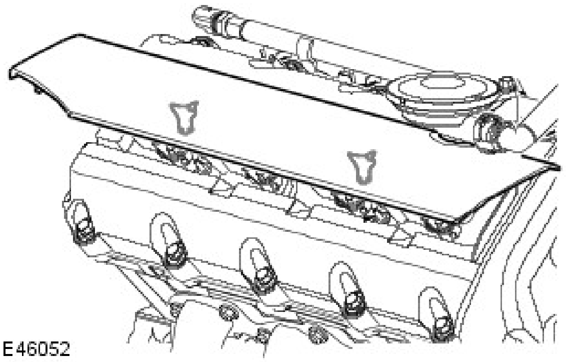
Remove the RH valve cover.

- Remove the 14 valve cover retaining bolts.
- Remove the engine cover bracket.



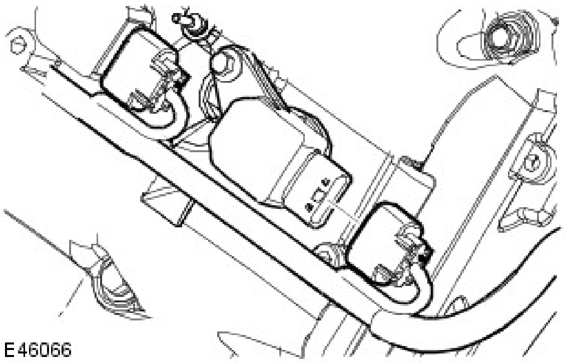
29. Remove and discard the RH valve cover gaskets.

- Remove and discard the seals.

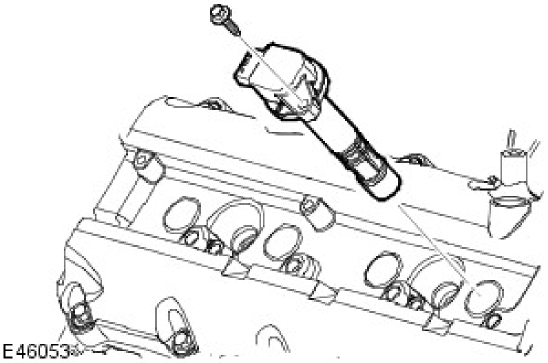


30. Remove the LH ignition coil-on-plug cover.

- Release from the 2 clips.



31. Disconnect the LH ignition coil-on-plug electrical connector.



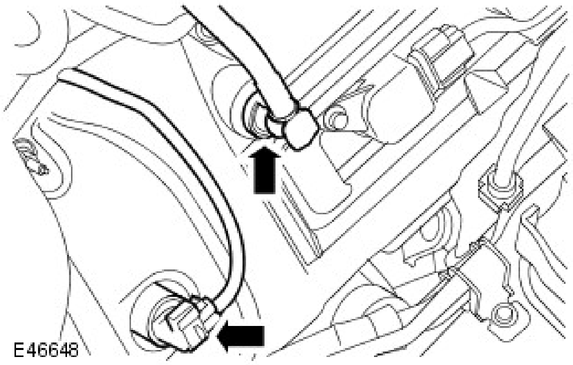
32. Remove the LH ignition coil-on-plug.

- Remove the bolt.
- Remove and discard the seal.

33. Remove the remaining LH ignition coil-on-plugs.

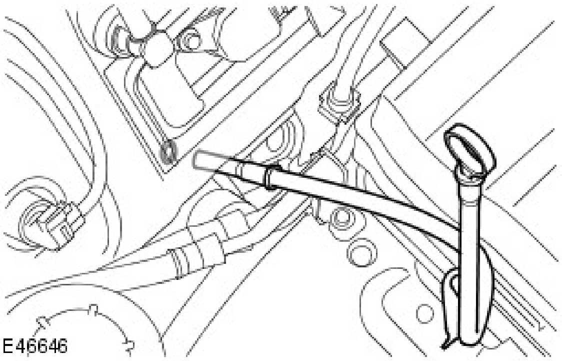
34. Disconnect the LH variable camshaft timing (VCT) oil solenoid electrical connector.

35. Disconnect the valve cover breather hose.

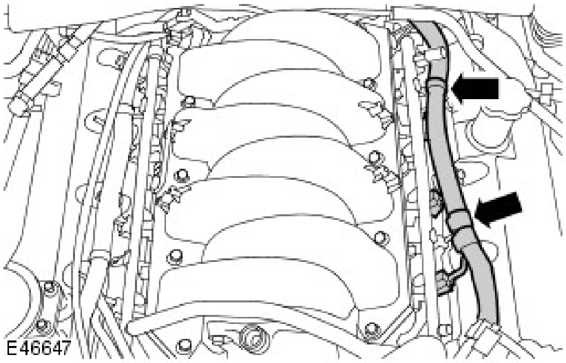


36. Remove the oil level indicator and tube.

- Remove the oil level indicator.
- Remove the nut.
- Remove the tube.
- Remove and discard the O-ring seal.



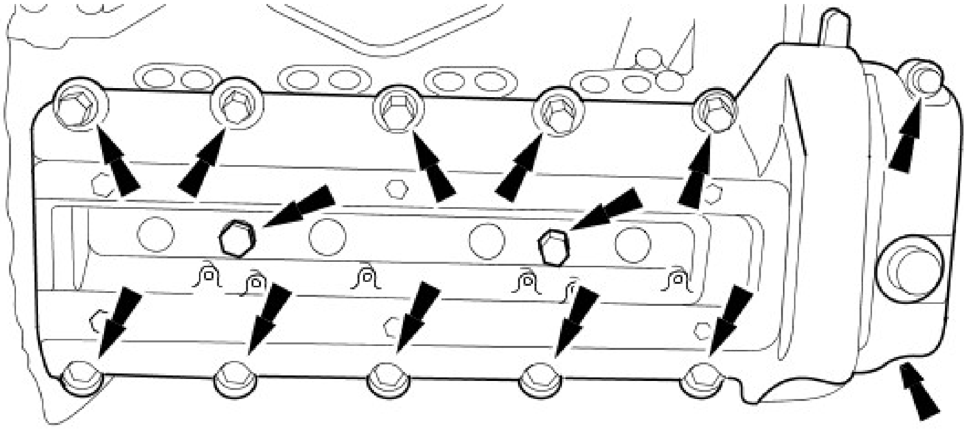
37. Release the engine wiring harness from the retaining bracket.



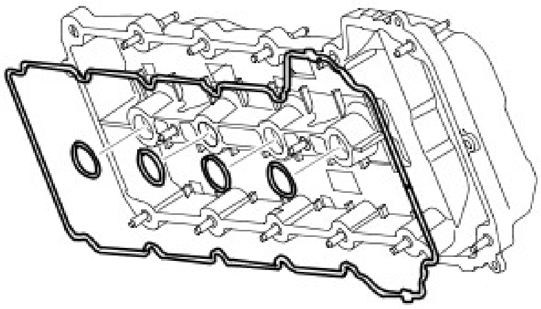
38. NOTE: Note the fitted position of the retaining bolts prior to removal.

Remove the LH valve cover.

- Remove the 14 valve cover retaining bolts.



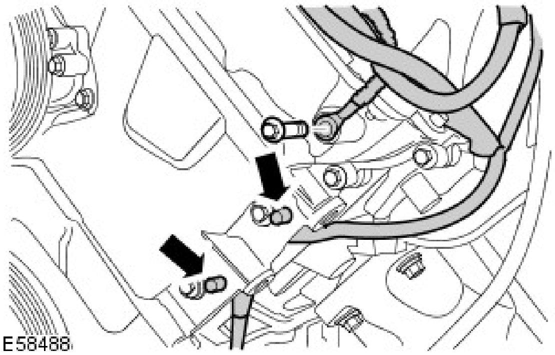
E30696



E46652

39. Remove and discard the LH valve cover gaskets.

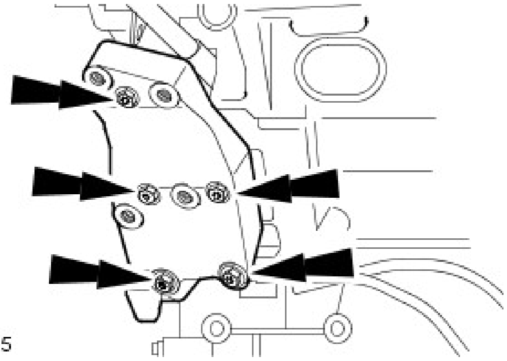
- Remove and discard the seals.



E58488

40. Release the engine wiring harness.

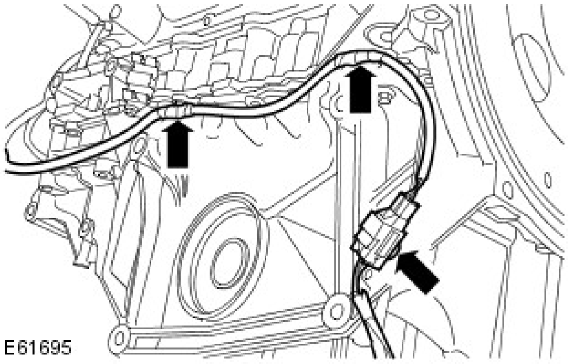
- Release the 2 clips.
- Remove the bolt.



E30645

41. Remove the power steering pump mounting bracket.

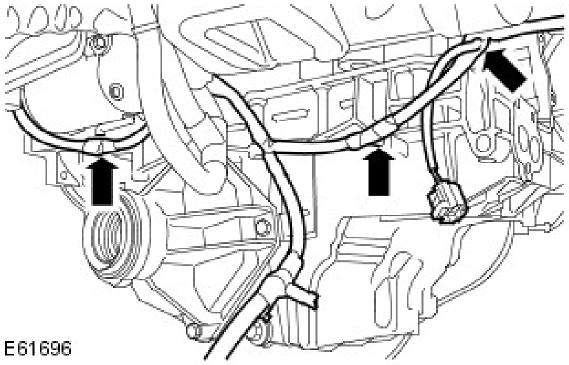
- Remove the 5 bolts.



E61695

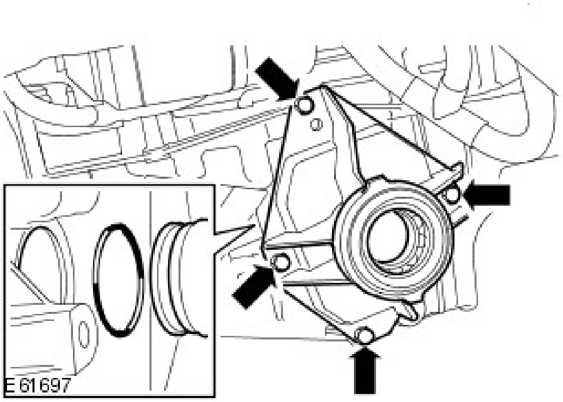
42. Release the wiring harness from the LH side of the engine.

- Release the 3 clips.


E61696

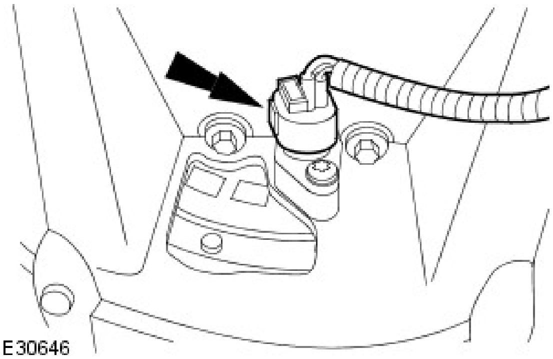
43. Release the wiring harness from the RH side of the engine.

- Release the 3 clips.

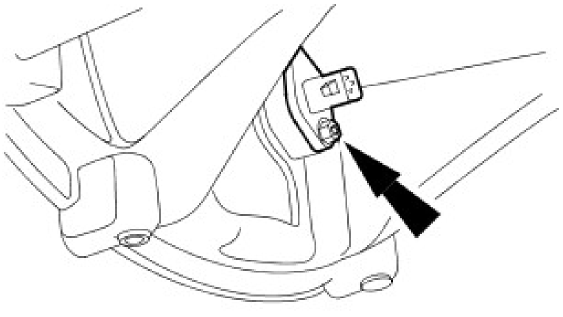

E61697

44. Remove the halfshaft support bearing housing.

- Remove the 4 bolts.
- Remove and discard the O-ring seal.

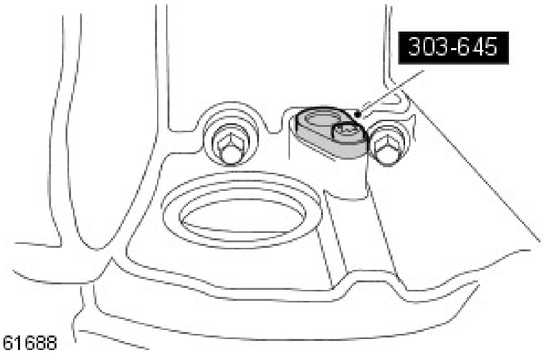

E30646

45. Disconnect the crankshaft position (CKP) sensor electrical connector.


E30694

46. Remove the CKP sensor.

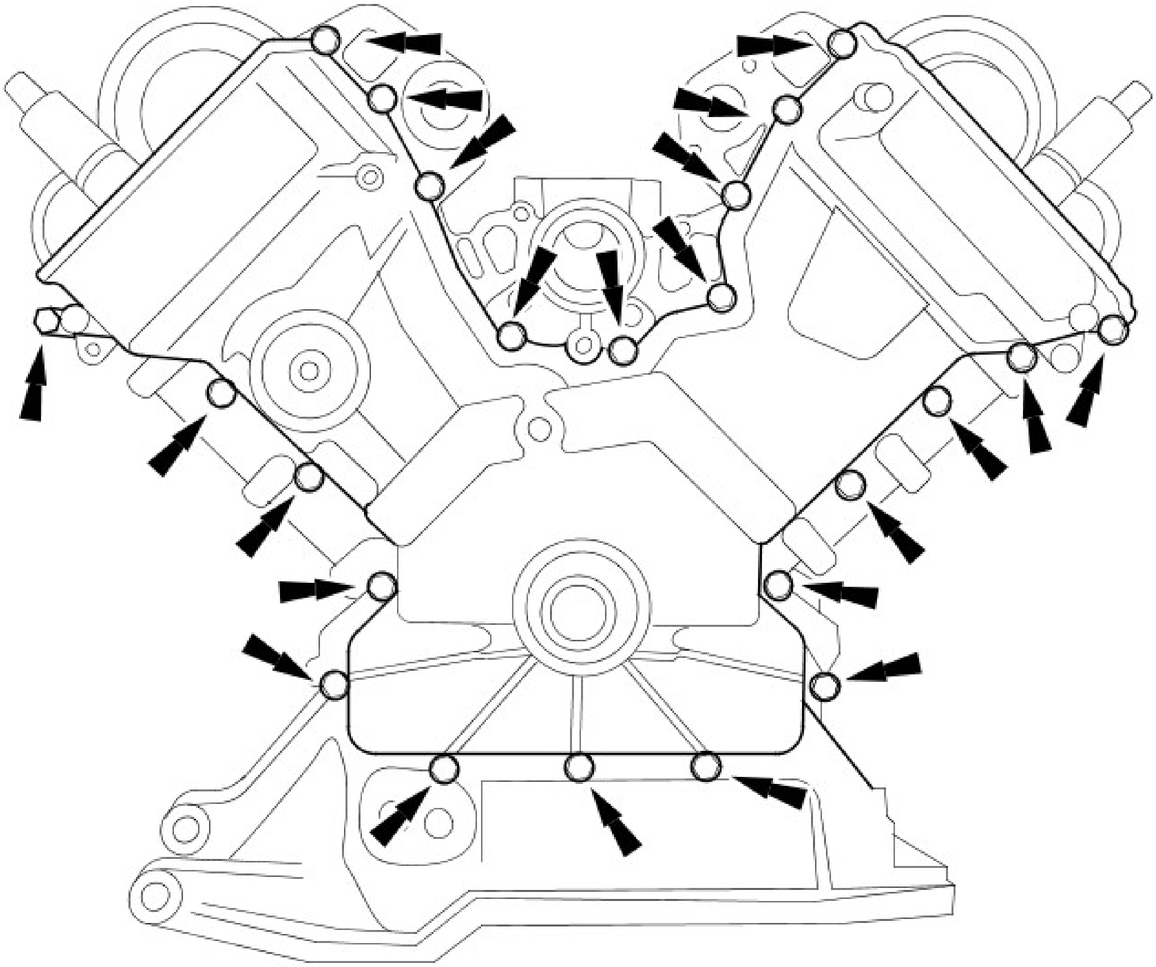
- Remove the bolt.



47. NOTE: Install the special tool to the crankshaft sensor aperture.

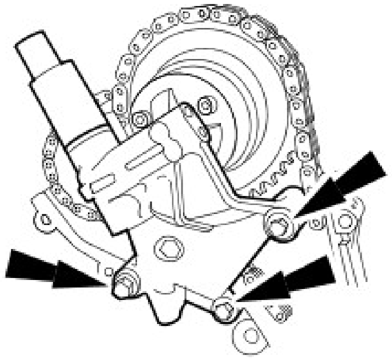
Lock the crankshaft.

- Install the special tool.
- Install the bolt.



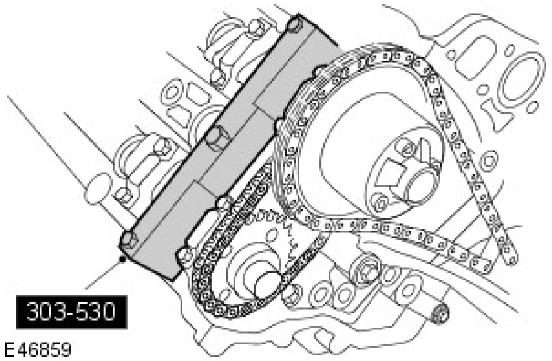
48. Remove the engine front cover.

- Remove the 24 bolts.
- Remove and discard the gasket.
- Remove and discard the 3 O-ring seals.



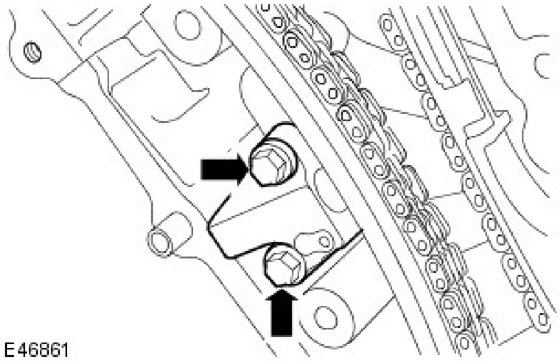
49. Remove the RH VCT housing.

- Remove the 3 bolts.
- Remove and discard the O-ring seals.


303-530
E46859

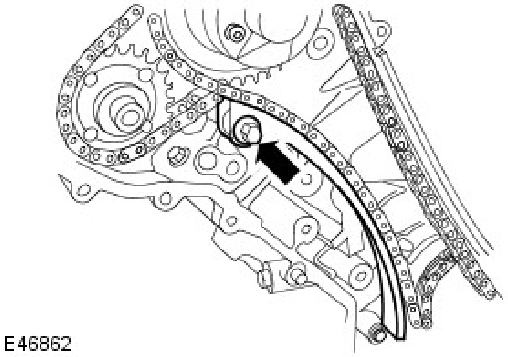
50. Install the special tool to the RH cylinder head.

- Install the 3 bolts.



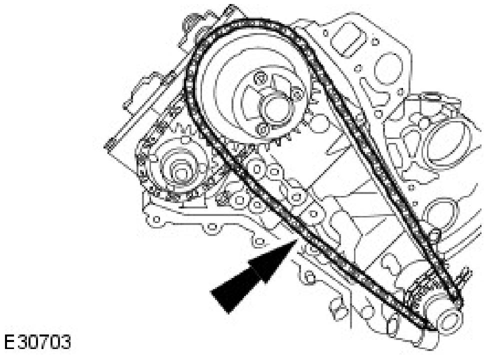
51. Remove the RH primary timing chain tensioner assembly.

- Remove the 2 bolts.

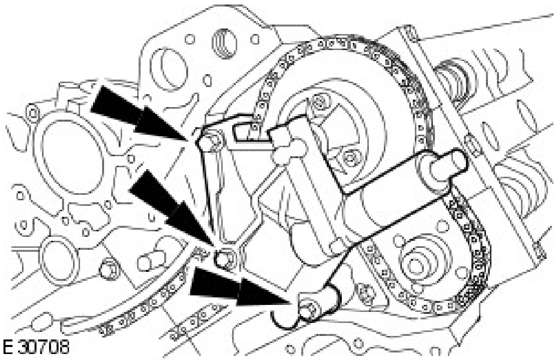


52. Remove the RH primary timing chain tensioner guide.

- Remove the bolt.

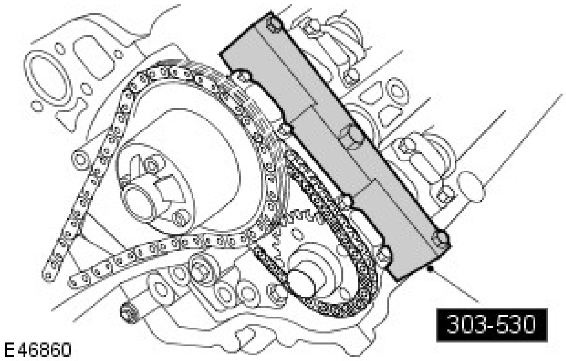


53. Remove the RH primary timing chain.



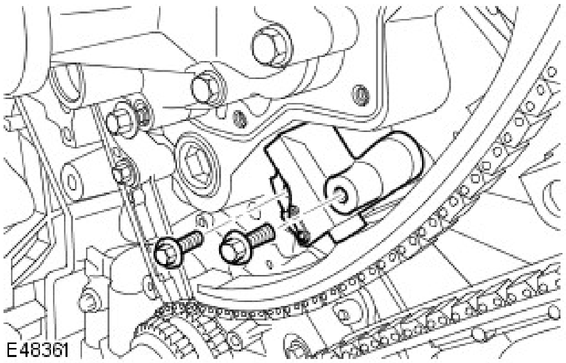
54. Remove the LH VCT housing.

- Remove the 3 bolts.
- Remove and discard the O-ring seals.


303-530
E46860

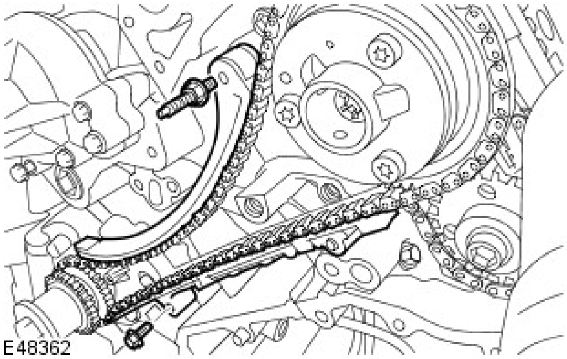
55. Install the special tool to the LH cylinder head.

- Install the 3 bolts.



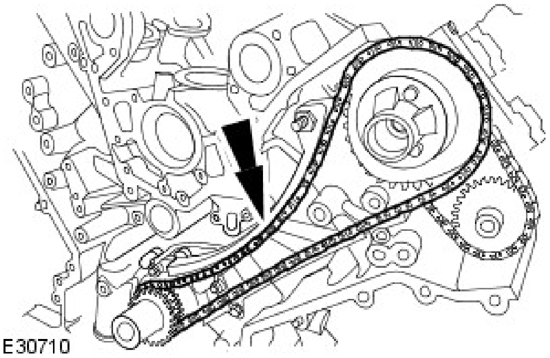
56. Remove the LH primary timing chain tensioner.

- Remove the 2 bolts.

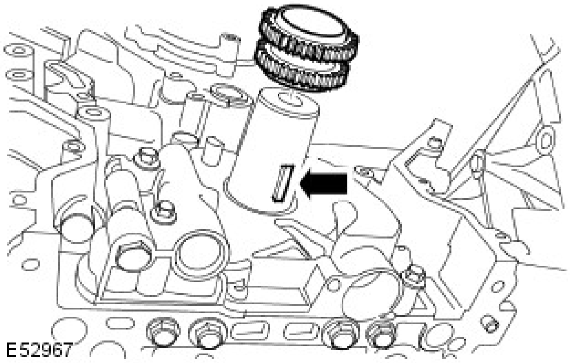


57. Remove the LH upper and lower primary timing chain tensioner guides.

- Remove the 2 bolts.



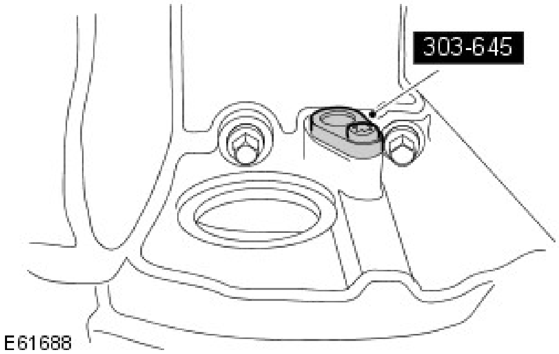
58. Remove the LH primary timing chain.



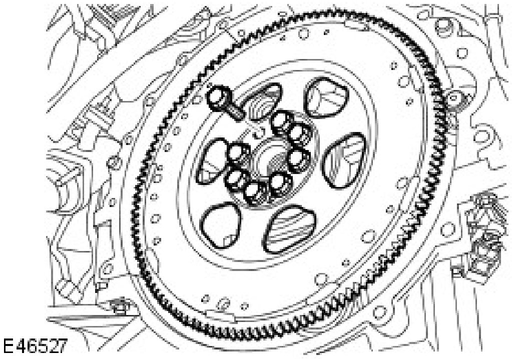
59. NOTE: Note the orientation of the crankshaft sprocket.

Remove the crankshaft sprocket.

- Remove the crankshaft sprocket key.



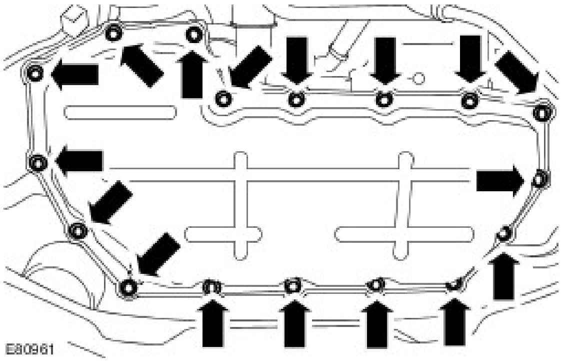
60. Remove the special tool.



61. CAUTION: The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.

Remove the torque converter flexplate.

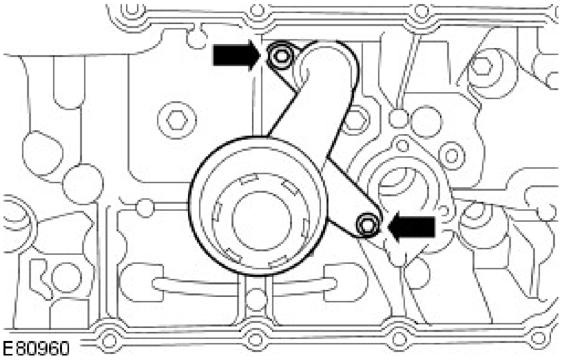
- Remove the 8 bolts.



62. CAUTION: Note the position of the bolts, prior to removal.

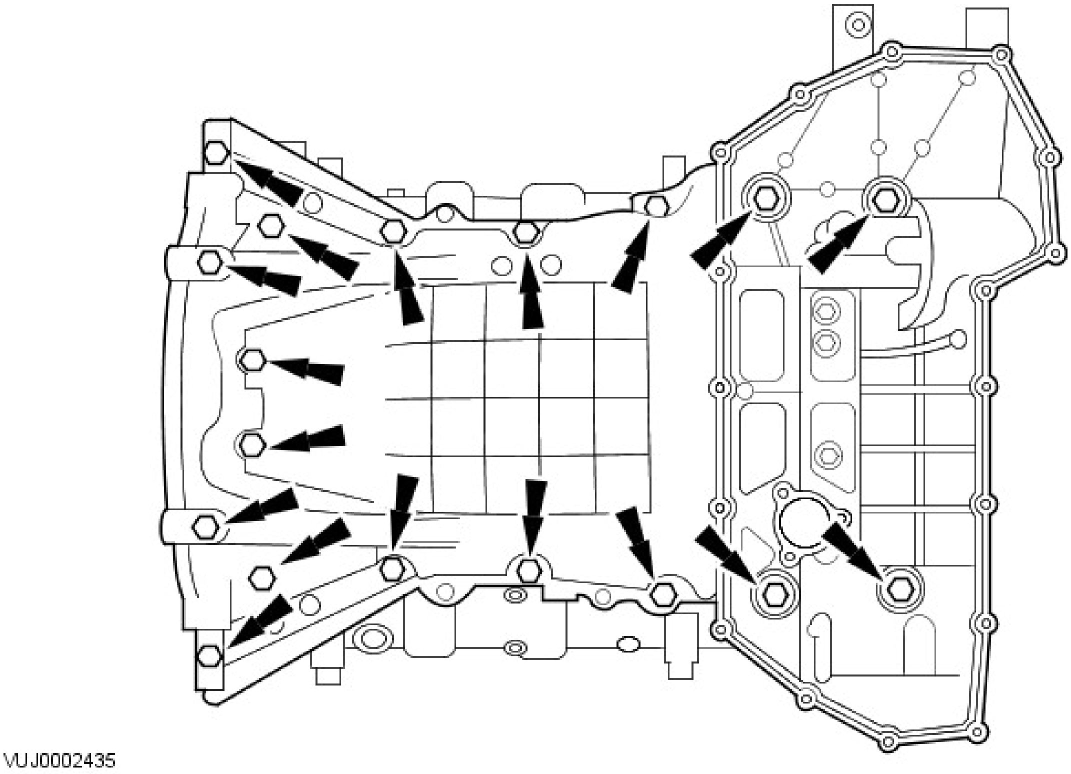
Remove the oil pan.

- Remove the 17 bolts.
- Remove and discard the gasket.



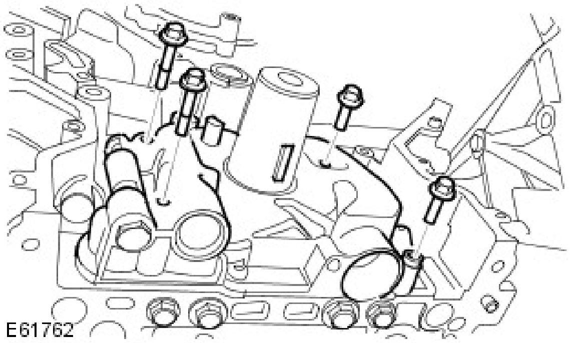
63. Remove the oil strainer pick-up assembly.

- Remove the 2 bolts.
- Remove and discard the O-ring seal.



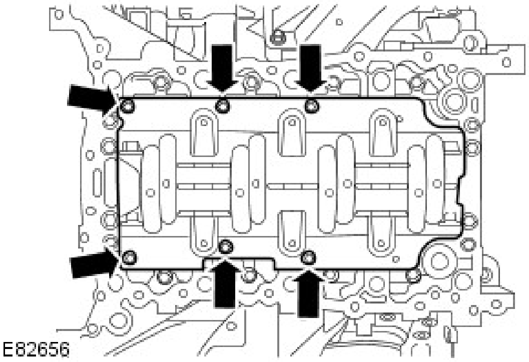
64. Remove the oil pan extension.

- Remove the 18 bolts.



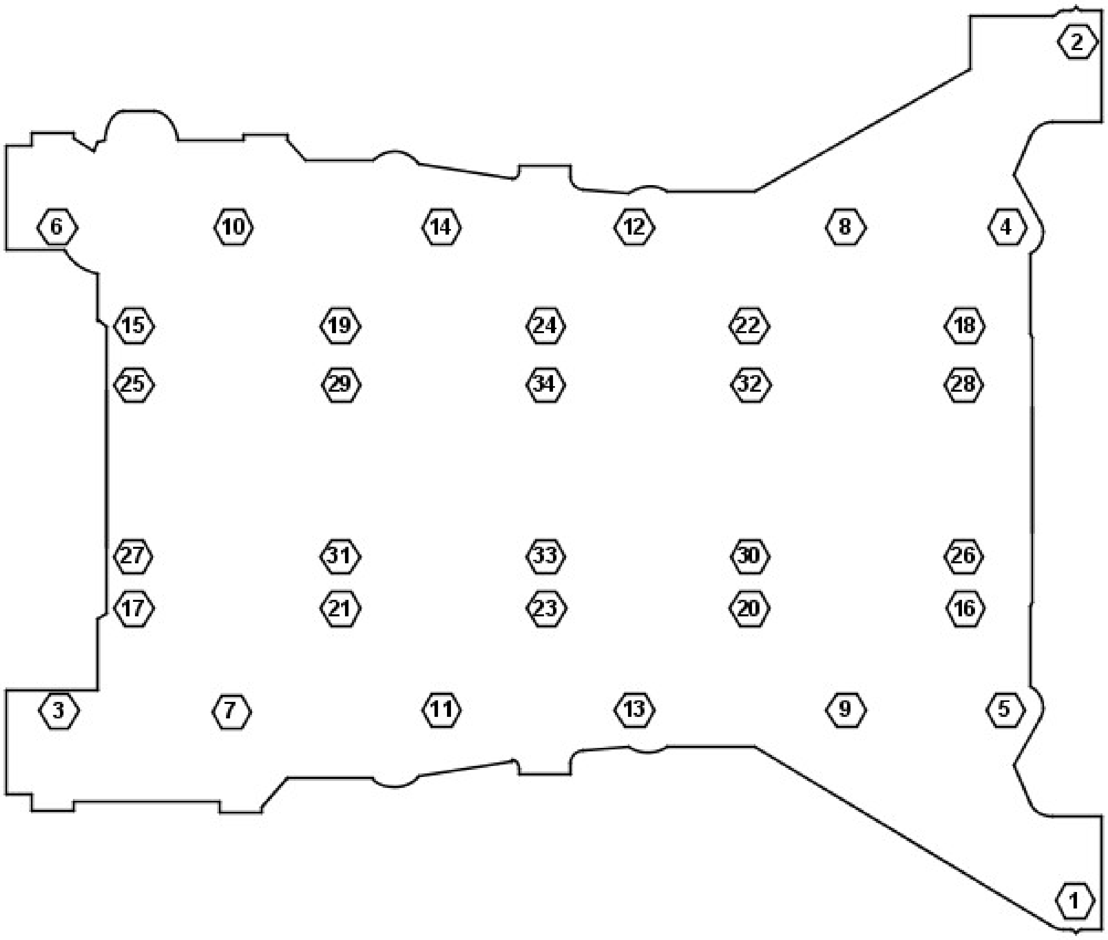
65. Remove the oil pump assembly.

- Remove the 4 bolts.
- Remove and discard the gasket.
- Clean the component mating faces.



66. Remove the baffle plate.

- Remove the 6 bolts.



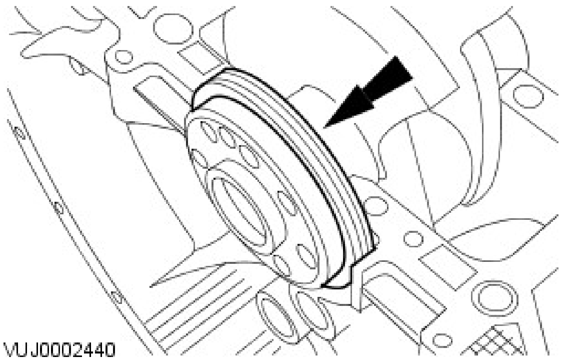
VUJ0002439

67. CAUTION: To make sure damage does not occur to the crankshaft and piston components, the engine must be inverted on the engine stand. Failure to follow this instruction may result in damage to the engine.

• NOTE: If the crankshaft main bearing carrier retaining bolts have been marked with a center punch dot, they must be discarded and new bolts installed.

Remove the crankshaft main bearing carrier.

- Remove the crankshaft main bearing carrier retaining bolts in the indicated sequence.



VUJ0002440

68. Discard the crankshaft rear main oil seal.

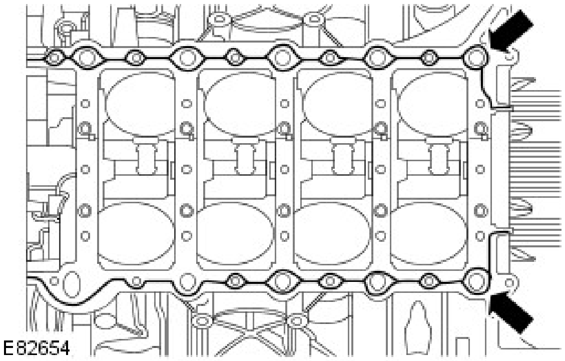
Installation

1. CAUTIONS:

Use only a plastic scraper when removing the sealing material.

If any new bolts are to be installed to retain the crankshaft main bearing carrier, pre-stress the retaining bolts by installing the crankshaft main bearing carrier without any sealant and tightening the new retaining bolts to the specified torque. Remove the crankshaft main bearing carrier once the bolts have been pre-stressed. Failure to follow this instruction may result in damage to the vehicle.

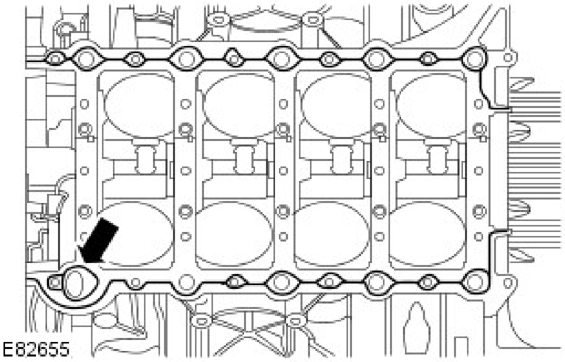
Clean all the mating faces and reusable parts thoroughly and check for damage.



2. NOTE: Install the crankshaft main bearing carrier and tighten bolts to specification within twenty minutes of applying the sealant.

Apply a 2 mm (0.08in) bead of sealant to the cylinder block in the area shown.

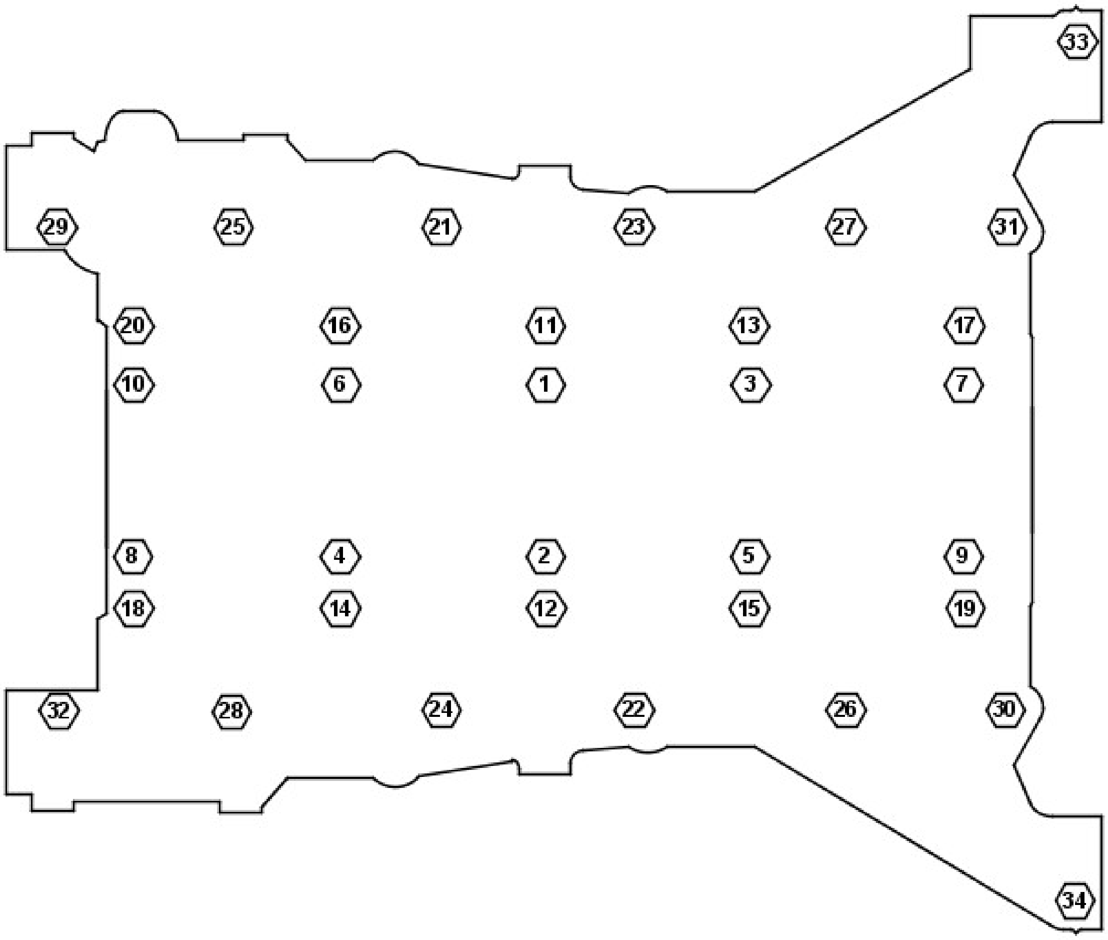
- Use WSS-M4G323-A4-RTV sealant.



3. NOTE: Install the crankshaft main bearing carrier and tighten bolts to specification within twenty minutes of applying the sealant.

Apply a 1 mm (0.039in) bead of sealant to the cylinder block in the area shown.

- Use WSS-M4G323-A4-RTV sealant.



VUJ0002450

4. ⚠ CAUTION: Make sure all dowels are fully seated into the crankshaft main bearing carrier prior to tightening the bolts.

- NOTE: Do not lubricate the crankshaft main bearing carrier retaining bolts.
- NOTE: Do not rotate the crankshaft until all the retaining bolts are tightened to specification.
- NOTE: The retaining bolts must be tightened within twenty minutes of applying the sealant.
- NOTE: Tighten the retaining bolts in the sequence shown.

Install the crankshaft main bearing carrier to the cylinder block.

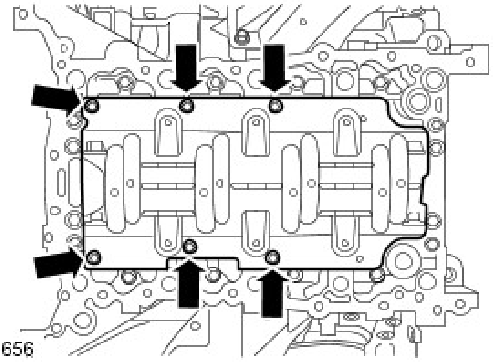
1. Stage 1: Bolts 21 to 32, tighten to 15 Nm (11 lb.ft).
2. Stage 2: Bolts 33 to 34, tighten to 15 Nm (11 lb.ft).
3. Stage 3: Bolts 1 to 10, tighten to 25 Nm (18 lb.ft).
4. Stage 4: Bolts 11 to 20, tighten to 15 Nm (11 lb.ft).
5. Stage 5: Bolts 1 to 10, tighten to 35 Nm (26 lb.ft), then a

further 135 degrees.

6. Stage 6: Bolts 11 to 20, tighten to 20 Nm (15 lb.ft), then a further 150 degrees.
7. Stage 7: Bolts 21 to 32, tighten to 20 Nm (15 lb.ft), then a further 90 degrees.
8. Stage 8: Bolts 33 to 34, tighten to 20 Nm (15 lb.ft), then a further 150 degrees.
9. Stage 9: Center punch each of the bolt heads to indicate it has been reused.

5. Rotate the crankshaft to check correct operation.

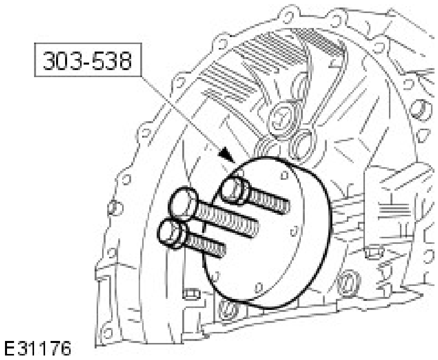
6. Remove excess sealant which may squeeze out at the front cover sealing surfaces.



E82656

7. Install the baffle plate.

- Tighten the 6 bolts to 6 Nm (4 lb.ft).

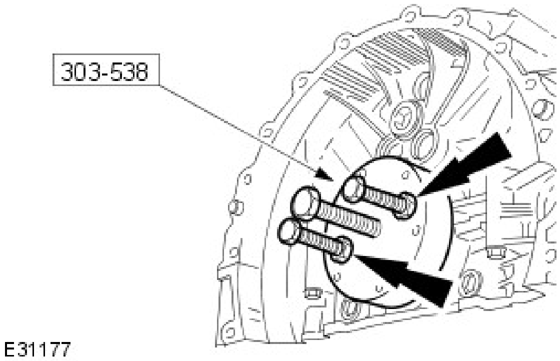


8. NOTE: Carefully remove the transit sleeve, leaving the seal in place.

• NOTE: Make sure that the transit sleeve is correctly positioned and install the new seal over the crankshaft. Do not use any lubricant on the seal, the transit sleeve or the crankshaft.

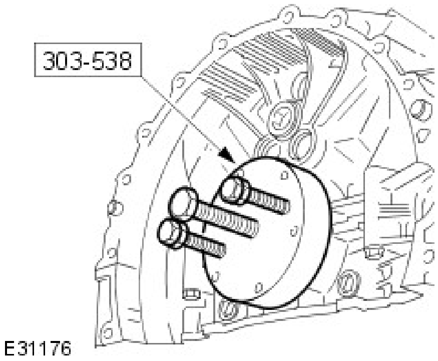
Using the special tool, position the crankshaft rear oil seal.

- Install the special tool to the crankshaft.



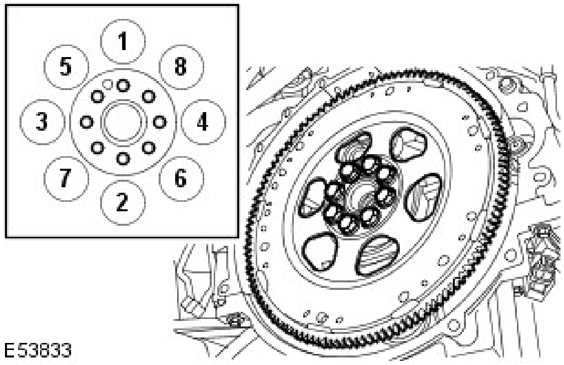
9. ⚠ CAUTION: Alternate the nut tightening to correctly seat the crankshaft rear oil seal.

Using the special tool, install the rear crankshaft oil seal.



10. ⚠ CAUTION: Make sure that the crankshaft rear oil seal is correctly located.

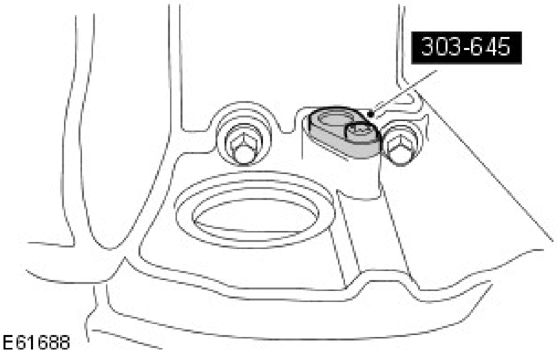
Remove the special tool.



11. NOTE: Prevent the flexplate from rotating.

Install the torque converter flexplate.

- Clean the component mating faces.
- Tighten the bolts evenly in 2 stages to the sequence shown.
- Tighten the bolts to 15 Nm (11 lb ft).
- Tighten the bolts to 110 Nm (81 lb.ft).



12. Install the special tool.

13. NOTE: Install a new gasket.

Install the oil pump assembly.

- Clean the component mating faces.
- Install the gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

14. NOTE: Install a new O-ring seal.

Install the oil strainer pick-up assembly.

- Install the O-ring seal.
- Tighten the M6 bolt to 10 Nm (7 lb.ft).
- Apply sealant to the M5 bolts.
- Tighten the M5 bolts to 6 Nm (4 lb.ft).

15. Install the crankshaft sprocket.

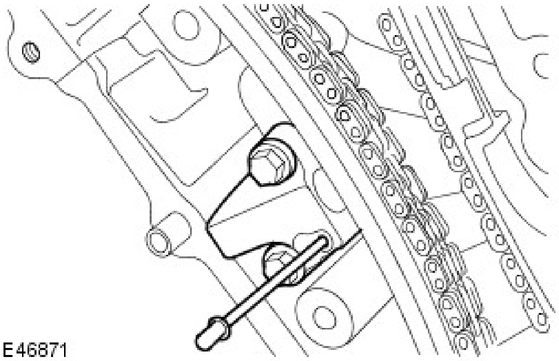
- Clean the component mating faces.
- Install the crankshaft sprocket key.

16. Install the LH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

17. Install the LH primary timing chain tensioner guides.

- Tighten the bolts to 12 Nm (9 lb.ft).



18. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the LH primary timing chain tensioner.

- Using a 3 mm (0.118 in) diameter rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.

19. ⚠ CAUTION: Make sure that new bolts are installed.

• NOTE: Install new O-ring seals.

Install the LH VCT control solenoid housing.

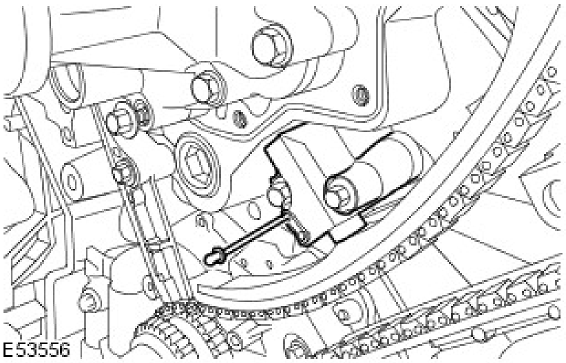
- Install the O-ring seals.
- Tighten the bolts to 22 Nm (16 lb.ft).
- Tighten the nut to 10 Nm (7 lb.ft).

20. Install the RH primary timing chain.

- Make sure the timing chain slack is on the tensioner side of the timing chain.

21. Install the RH primary timing chain tensioner guide.

- Tighten the bolts to 12 Nm (9 lb.ft).



22. ⚠ CAUTION: During timing chain tensioner compression, do not release the ratchet stem until the timing chain tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

Install the RH primary timing chain tensioner.

- Using a 3 mm (0.118 in) diameter rod, retain the chain tensioner piston.
- Tighten the bolts to 12 Nm (9 lb.ft).
- Remove the retaining rod.

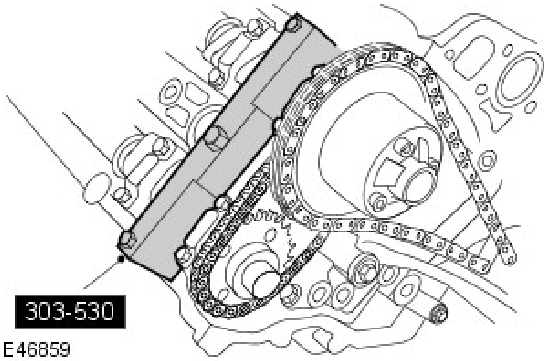
23. ⚠ CAUTION: Make sure that new bolts are installed.

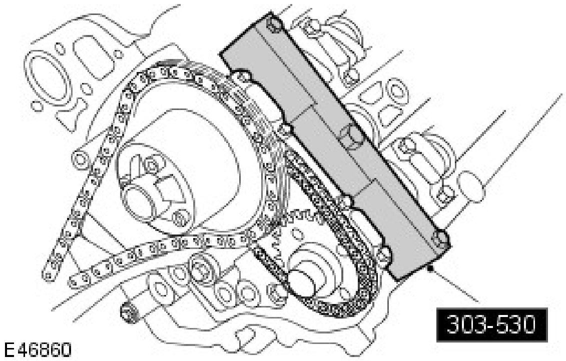
• NOTE: Install new O-ring seals.

Install the RH VCT control solenoid housing.

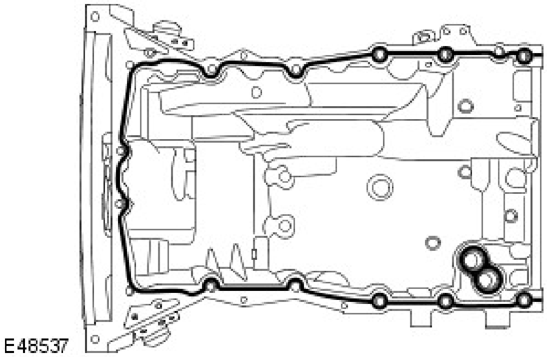
- Install the O-ring seals.
- Tighten the bolts to 22 Nm (16 lb.ft).
- Tighten the nut to 10 Nm (7 lb.ft).

24. Remove the special tool from the RH cylinder head.



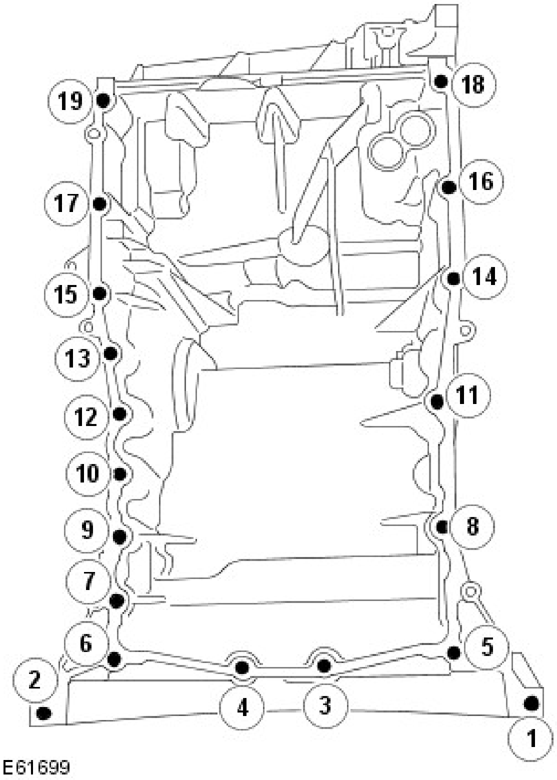

303-530
E46860

25. Remove the special tool from the LH cylinder head.



26. Install the oil pan extension.

- Clean the component mating faces.
- Apply a 3 mm (0.118 in) diameter bead of sealant, to the area indicated.
- Install the bolts, but do not tighten fully at this stage.


19
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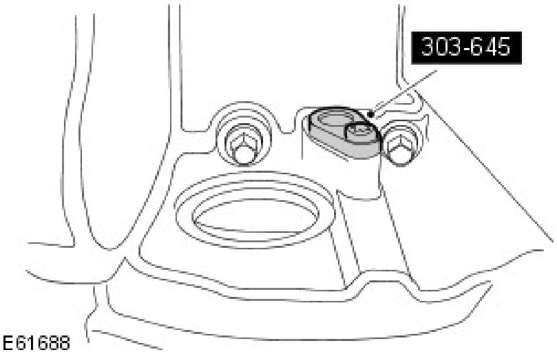
E61699

27. Tighten the oil pan bolts in the sequence shown to 20 Nm (15 lb.ft).



28. Remove the special tool.

- Remove the bolt.

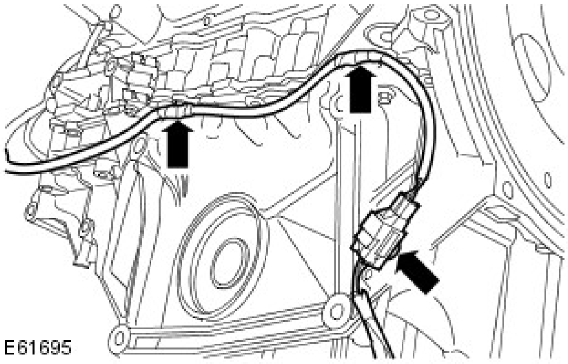
29. Install the CKP sensor.

- Tighten the bolt to 8 Nm (6 lb.ft)

30. NOTE: Install a new O-ring seal.

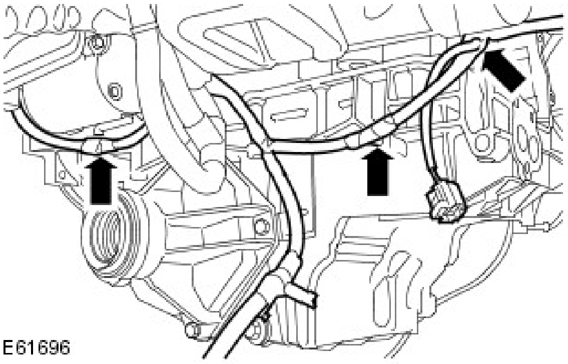
Install the halfshaft support bearing housing.

- Install the O-ring seal.
- Lubricate the O-ring seal with a suitable lubricant.
- Tighten the bolts evenly to 25 Nm (18 lb.ft).



31. Attach the wiring harness to the LH side of the engine

- Secure the clips.

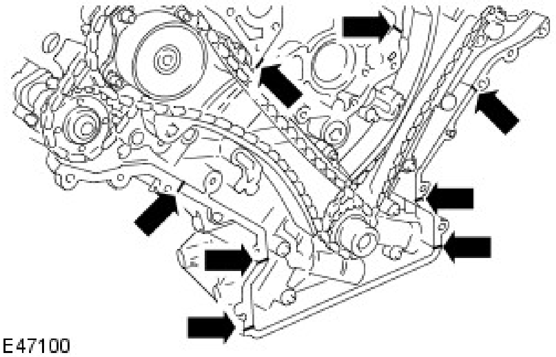


32. Attach the wiring harness to the RH side of the engine.

- Secure the clips.

33. Install the power steering pump mounting bracket.

- Tighten the bolts to 25 Nm (18 lb.ft).



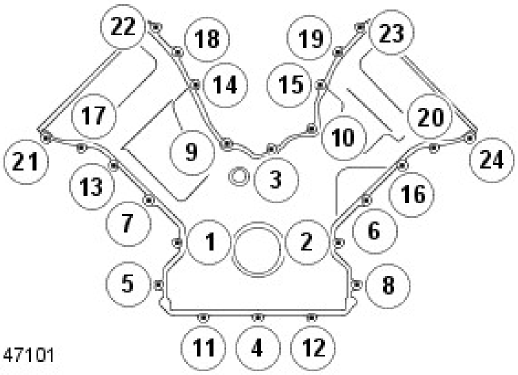
E47100

34. NOTE: Install a new gasket.

• NOTE: Install a new O-ring seal.

Install the engine front cover.

- Clean the component mating faces.
- Apply a 3 mm (0.118 in) diameter bead of sealant 12mm (0.47 in) long, to the 8 places indicated.
- Install the gasket.
- Install the O-ring seal.



E47101

35. Evenly and progressively tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).

36. Attach the engine wiring harness.

- Secure the clips.
- Tighten the bolt to 10 Nm (7 lb.ft).

37. NOTE: Install new seals.

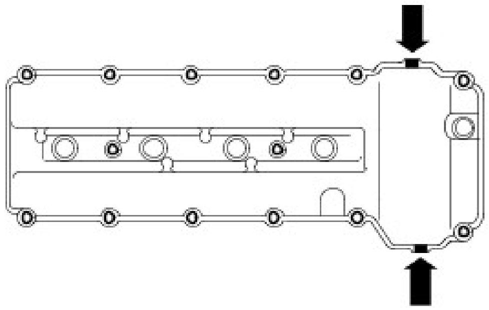
Install the LH valve cover plug aperture seals.

38. NOTE: Install a new gasket.

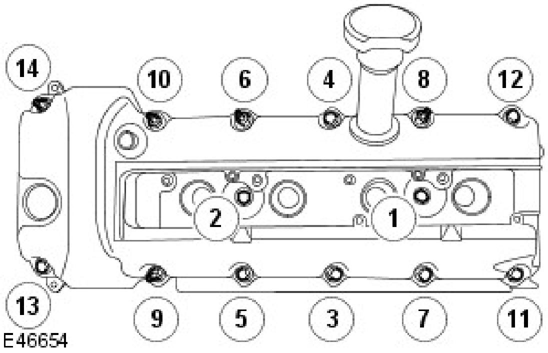
• NOTE: Apply two beads of silicone gasket sealant as shown on the illustration. The application of the sealant must be 3 mm (0.118 in) diameter 12 mm (0.47 in) long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

Install the LH valve cover.

- Clean the component mating faces.
- Install the valve cover gasket.



E49922



39. Install the LH valve cover bolts.

- Install the LH valve cover bolts to the positions previously noted.
- Tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).

40. Connect the LH VCT oil solenoid electrical connector.

41. Attach the engine wiring harness to the retaining bracket.

42. NOTE: Install a new O-ring seal.

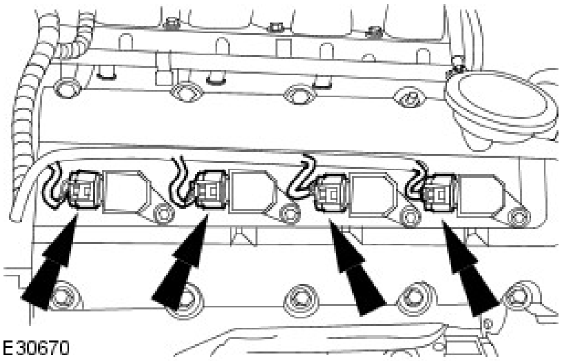
With assistance, install the oil level indicator and tube.

- Clean the component mating faces.
- Install the O-ring seal.
- Lubricate the O-ring seal with clean engine oil.
- Tighten the nut to 6 Nm (4 lb.ft).

43. NOTE: Install new O-ring seals.

Install the 4 LH ignition coil-on-plugs.

- Install the O-ring seals.
- Install the 4 ignition coil-on-plugs.
- Tighten the bolts to 6 Nm (4 lb.ft).

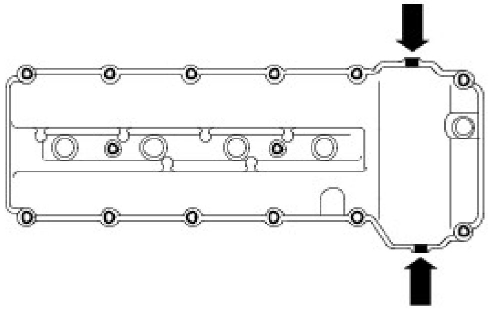


44. Connect the 4 electrical connectors.

45. Install the LH ignition coil-on-plug cover.

46. NOTE: Install new seals.

Install new RH valve cover plug aperture seals.



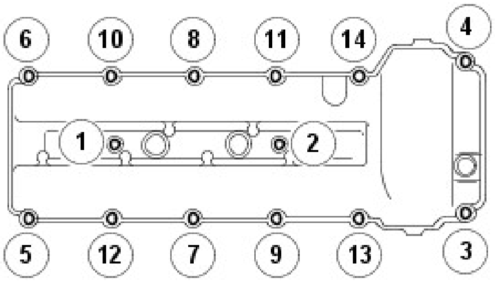
E49922

47. NOTE: Install a new gasket.

• NOTE: Apply two beads of silicone gasket sealant as shown on the illustration. The application of the sealant must be 3 mm (0.118 in) diameter 12 mm (0.47 in) long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

Install the RH valve cover.

- Clean the component mating faces.
- Install the gasket.



E46679

48. Install the RH valve cover bolts.

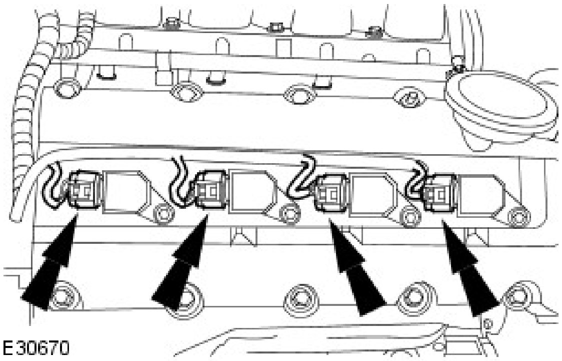
- Install the RH valve cover bolts to the positons previously noted.
- Tighten the bolts in the sequence shown to 12 Nm (9 lb.ft).

49. NOTE: Install new O-ring seals.

Install the 4 RH ignition coil-on-plugs.

- Install the O-ring seals.
- Install the 4 ignition coil-on-plugs.
- Tighten the bolts to 6 Nm (4 lb.ft).

50. Connect the 4 electrical connectors.



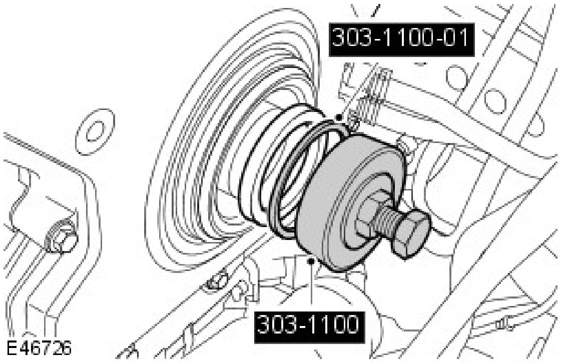
E30670

51. Connect the RH VCT oil solenoid electrical connector.

52. Attach the engine wiring harness to the retaining bracket.

53. Connect the PCV line to the RH valve cover.

54. Clean the crankshaft pulley mating faces.



55. Using the special tool, install the crankshaft front seal.

- Lubricate the seal with clean engine oil.
- Use the discarded crankshaft bolt with the special tool.
- Remove the special tools.

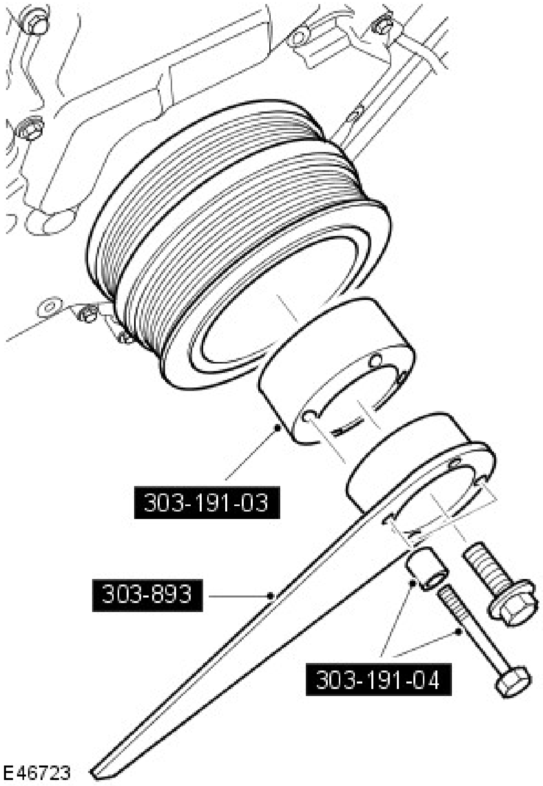
56. Install the crankshaft pulley.

- Lubricate the seal with clean engine oil.

57. Install the crankshaft pulley locking ring.

58. ⚠CAUTION: The screw thread in the crankshaft pulley must be cleaned out before installing a new crankshaft pulley bolt.

Install, but do not tighten, the new crankshaft pulley bolt.



59. ⚠CAUTION: Under no circumstances should the crankshaft setting peg, 303-645, be used in the following operations, to restrain the crankshaft.

Using the special tools, tighten the crankshaft pulley bolt.

- Tighten the crankshaft pulley bolt to 380 Nm (280 lb.ft).
- Remove the special tools.

60. Install the oil filter housing.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolts to 20 Nm (15 lb.ft).

61. Install the engine oil filter.

- Lubricate the oil filter seal with clean engine oil and tighten to 18 Nm (13 lb.ft).

62. Connect the EOP sensor electrical connector.

63. Connect the engine oil temperature sensor electrical connector.

64. Install the generator mounting bracket.

- Tighten the 4 bolts to 45 Nm (33 lb.ft).

65. Install the generator.

- Tighten the 3 bolts to 48 Nm (35 lb.ft).
- Connect the electrical connector.

66. Connect the battery positive cable.

- Tighten the nut to 10 Nm (7 lb.ft).
- Install the battery positive cable cover.

67. Install the exhaust manifold heat shield.

- Tighten the 2 bolts.

68. Install the accessory drive belt idler pulleys.

- Tighten the bolts to 25 Nm (18 lb.ft).

69. Install the coolant pump pulley.

- Tighten the bolts to 10 Nm (7 lb.ft).

70. NOTE: Install new O-ring seals.

Install the coolant manifold.

- Clean the components.
- Install the O-ring seals.
- Connect the 4 coolant hoses and install the clips.
- Attach the wiring harness bracket.
- Tighten the 2 bolts to 10 Nm (7 lb.ft).

71. Connect the ECT sensor electrical connector.

72. Install the cooling fan drive belt tensioner.

- Tighten the bolt to 40 Nm (30 lb.ft).

73. Install the A/C compressor mounting bracket.

- Tighten the bolts to 25 Nm (18 lb.ft).

74. Remove the engine from the engine stand.

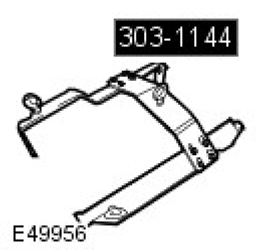
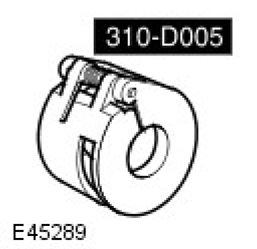
75. Install the engine.
For additional information, refer to: Engine (303-01B Engine - V8 4.4L Petrol, Installation).

76. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

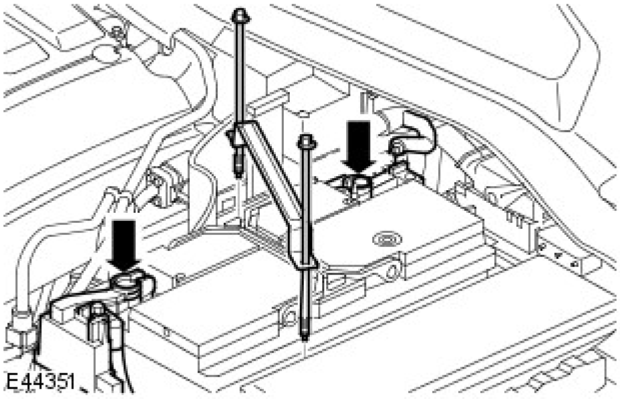
Engine - V8 4.4L Petrol - Engine

Removal

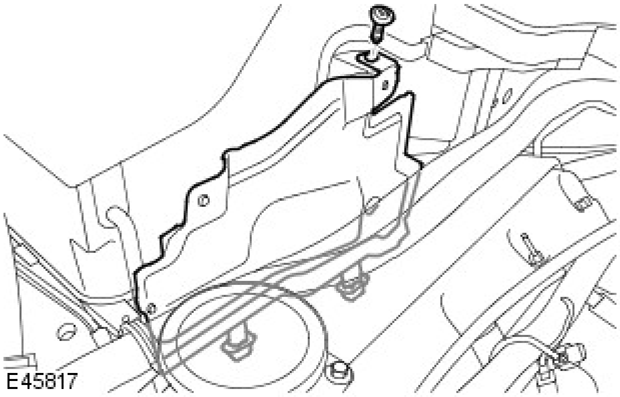
Special Tool(s)	
	Engine lifting cradle 303-1144
	Fuel spring lock decoupling tool 310-D005

Removal

1. Secure the hood in the service position.
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the battery cover.
   - Release the 2 mounting clips.
4. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
5. Disconnect the battery positive cable.
6. Remove 2 bolts securing the battery clamp and remove the clamp.

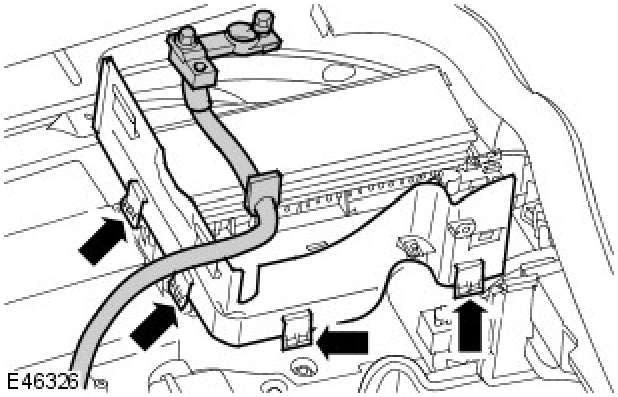


7. Remove the battery.



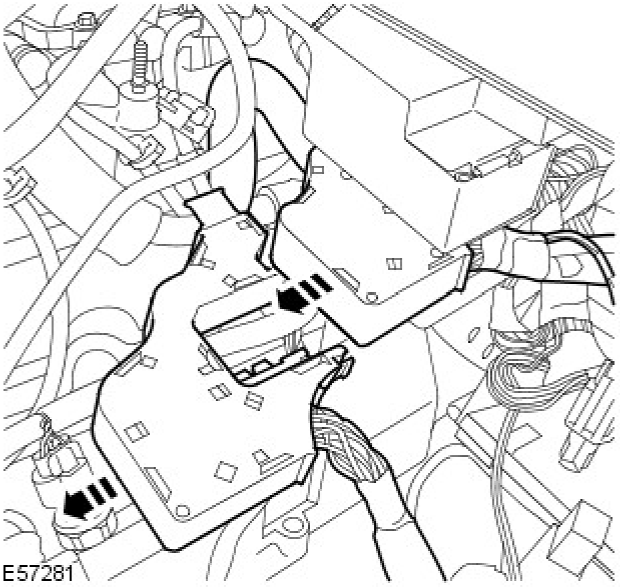
8. Remove the engine compartment upper heat shield.

- Remove the 2 screws.
- Release the 2 mounting clips.



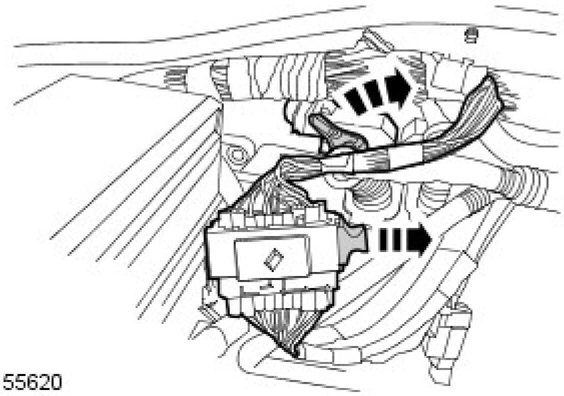
9. Remove the battery compartment side wall.

- Release the battery positive cable and grommet.
- Release the 4 clips.



10. Release the cassette.

- Release the 2 clips.



E55620

11. Disconnect the engine wiring harness.

- Release and disconnect the 2 electrical connectors.

12. Remove the RH air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).

13. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

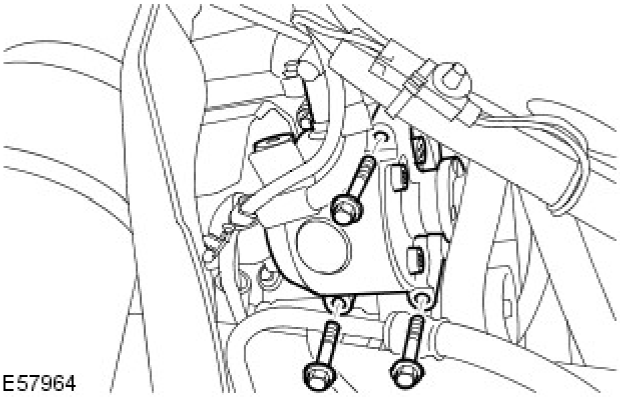
Raise and support the vehicle.

14. Remove the fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

15. Remove the generator.
For additional information, refer to: Generator (414-02B Generator and Regulator - V8 4.4L Petrol, Removal and Installation).

16. Release the dynamic response pump and tie aside.

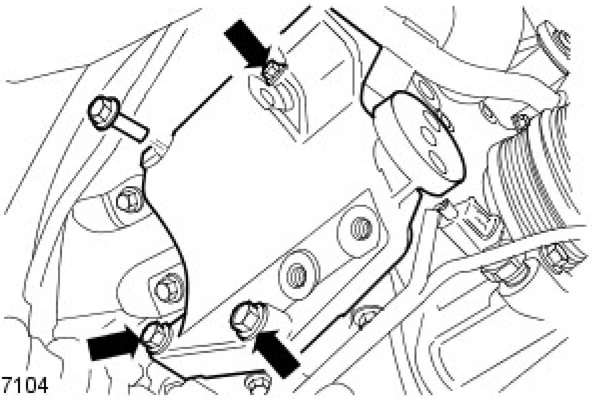
- Remove the 3 bolts.



E57964

17. Remove the dynamic response and generator mounting brackets.

- Remove the 8 bolts.

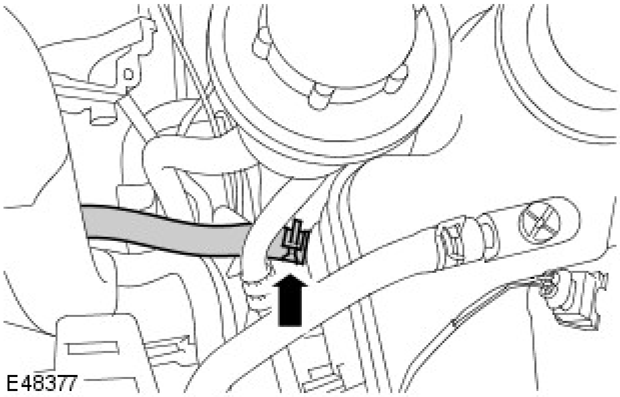


E47104

18. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

19. Drain the engine oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01A Engine - V8 S/C 4.2L Petrol, General Procedures).

20. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

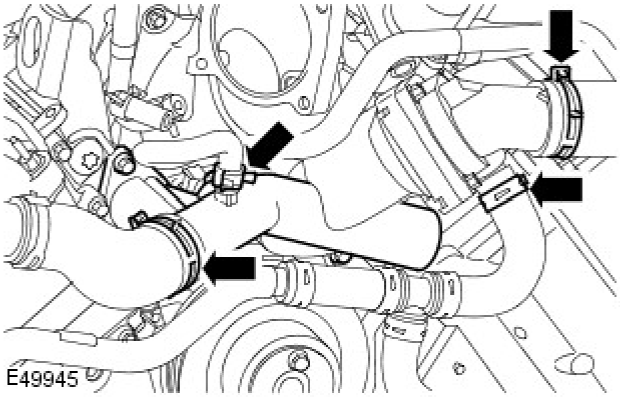


21. Disconnect the coolant expansion tank lower hose.

- Release the clip.

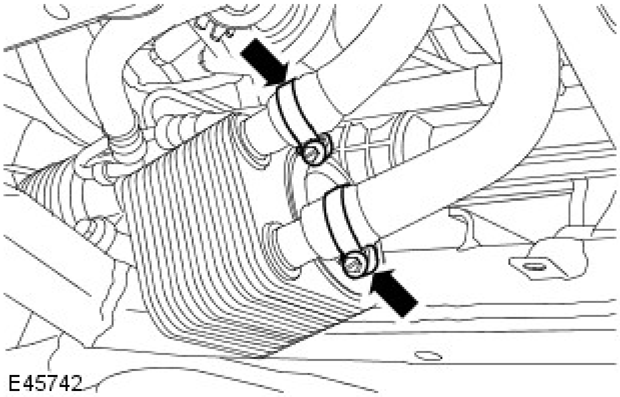
22. Disconnect the thermostat housing coolant hoses.

- Release the 2 clips.



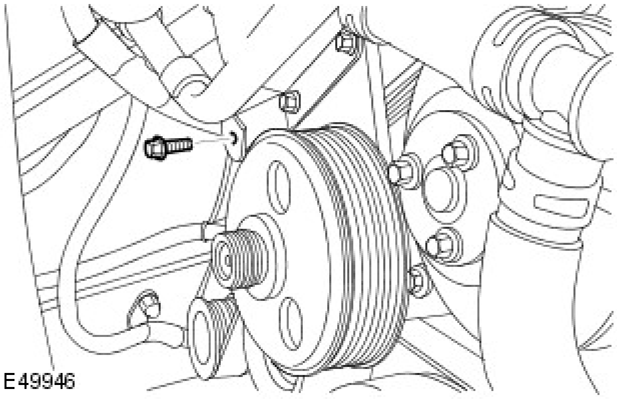
23. Disconnect the upper coolant hose assembly.

- Release the 2 clips.



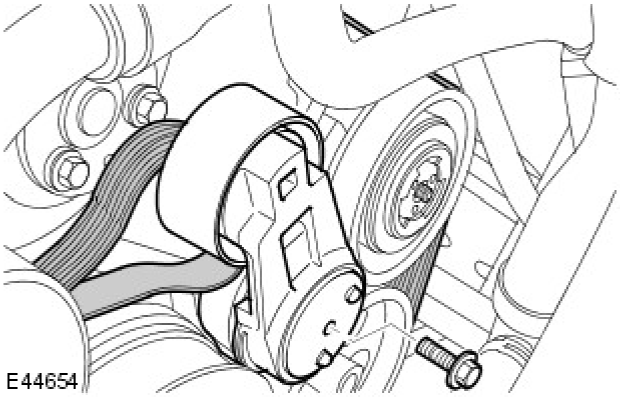
24. Disconnect the engine oil cooler coolant hoses.

- Release the 2 clips.
- Remove the hose assembly.



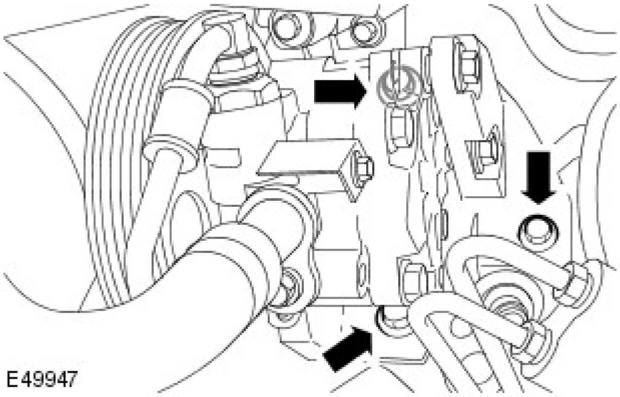
25. Tie the hose assembly aside for access.

- Remove the bolt.



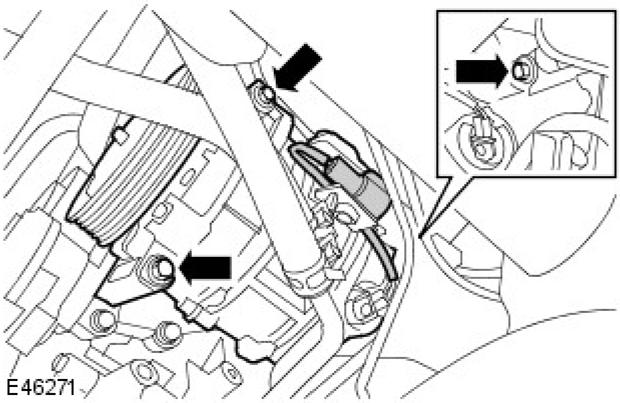
26. Remove the accessory drive belt tensioner.

- Remove the bolt.



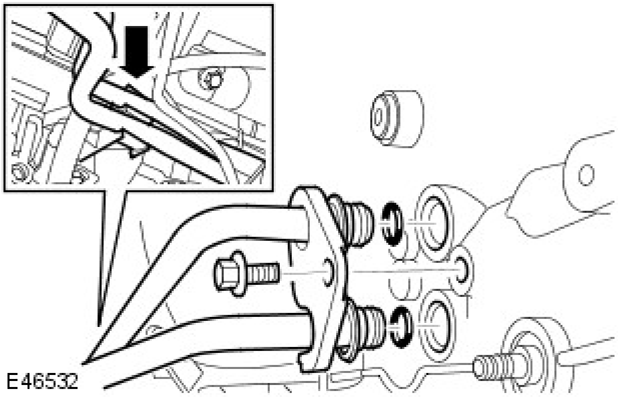
27. Release the power steering pump and tie aside

- Remove the 3 bolts.



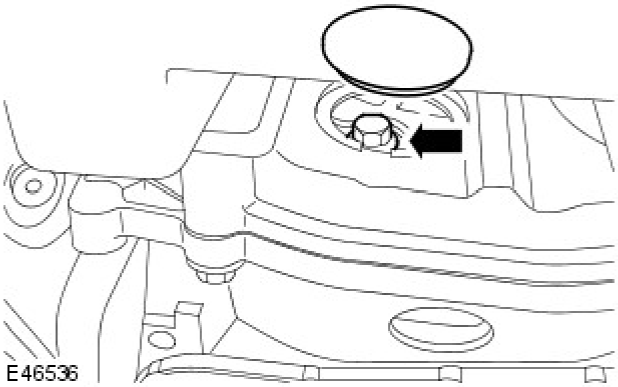
28. Release the A/C compressor and tie aside.

- Remove the 3 bolts.



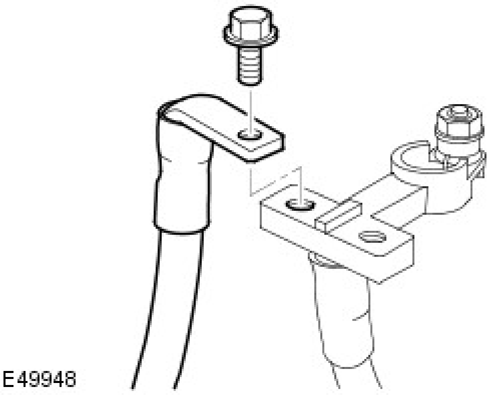
29. Release the transmission cooler pipes.

- Position a container to collect the fluid.
- Remove the bolt.
- Release the 2 clips.
- Move the transmission pipes aside.



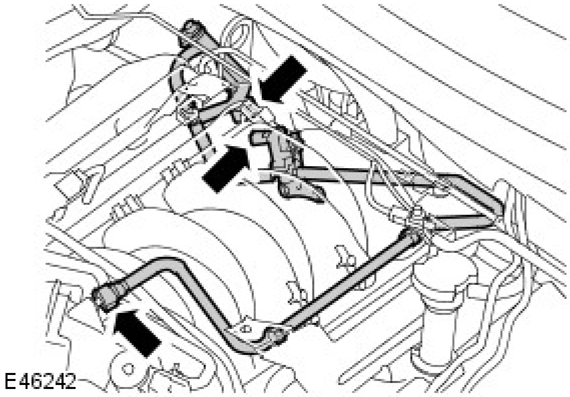
30. Release the flexplate.

- Remove the grommet.
- Rotate the crankshaft to access the retaining bolts.
- Remove the 3 bolts.



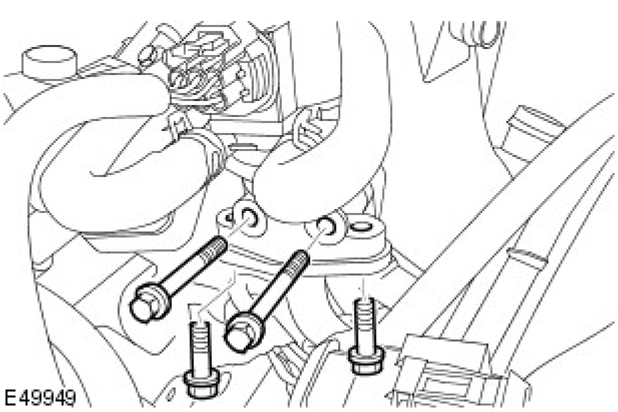
31. Disconnect the battery positive cable from the BJB.

- Remove the bolt.
- Position the positive cable aside.



32. Disconnect the evaporative emission hose from the intake manifold assembly.

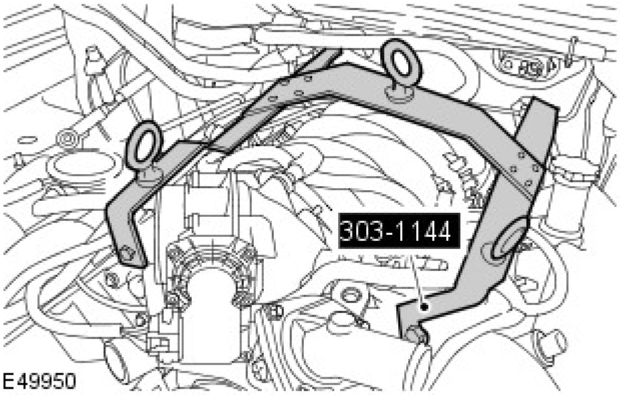
- Position the hose aside for access.



33. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Position the EGR valve aside.

- Remove the 4 bolts.
- Remove and discard the gasket.



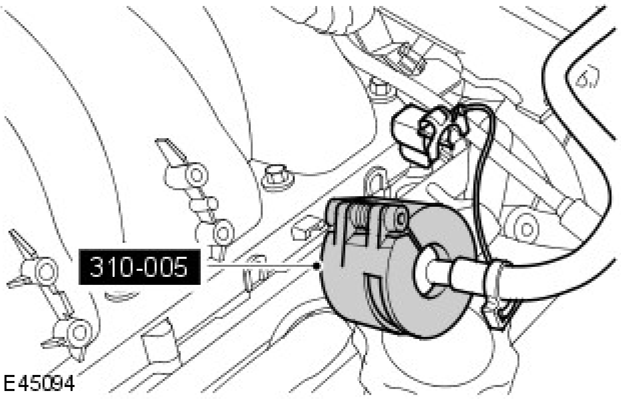
34. Install the special tool.

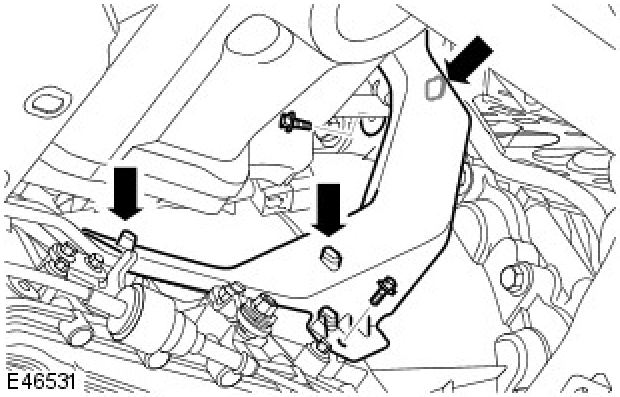
35. Depressurize the fuel rail.

- Position an absorbent cloth to collect fluid spillage.

36. Using the special tool, disconnect the fuel line.

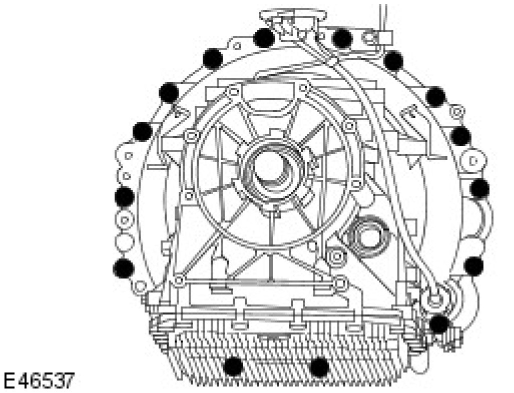
- Position the supply line aside.





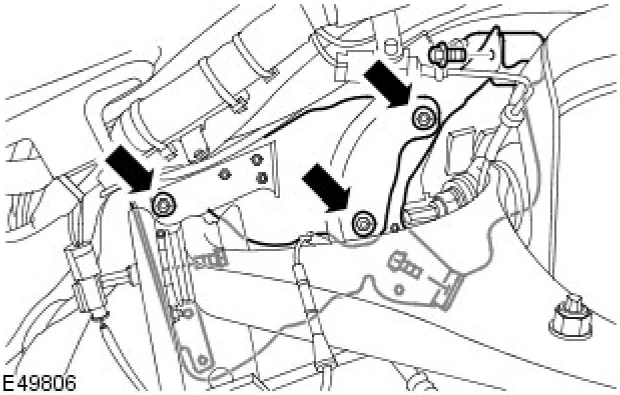
37. Release the heat shield for access to the transmission bolts.

- Remove the 2 bolts.
- Move the shield aside.



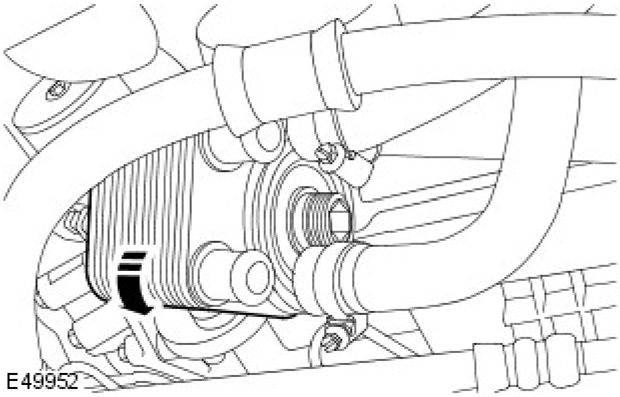
38. Remove the transmission bolts.

- Support the transmission.
- Remove the 16 bolts.

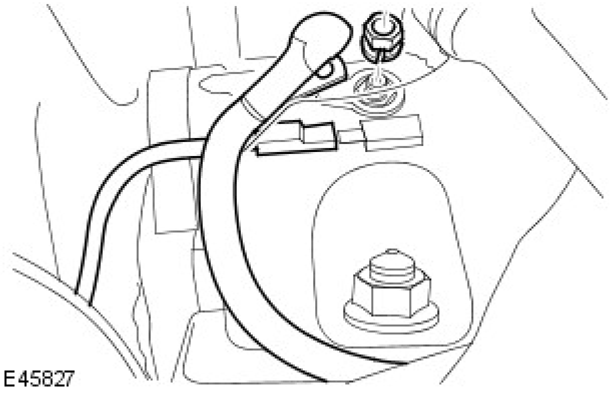


39. Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 bolts.
- Remove the 3 nuts.

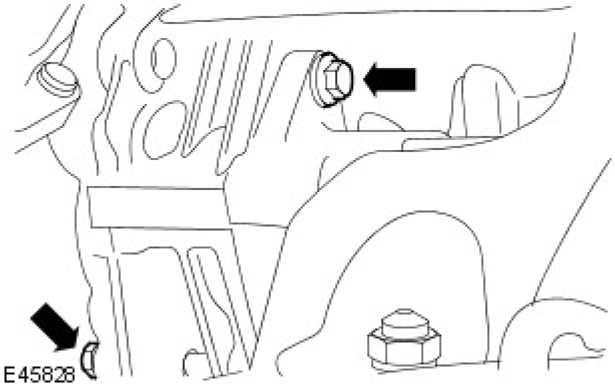


40. Loosen the Allen bolt and rotate the engine oil cooler aside for access.


E45827

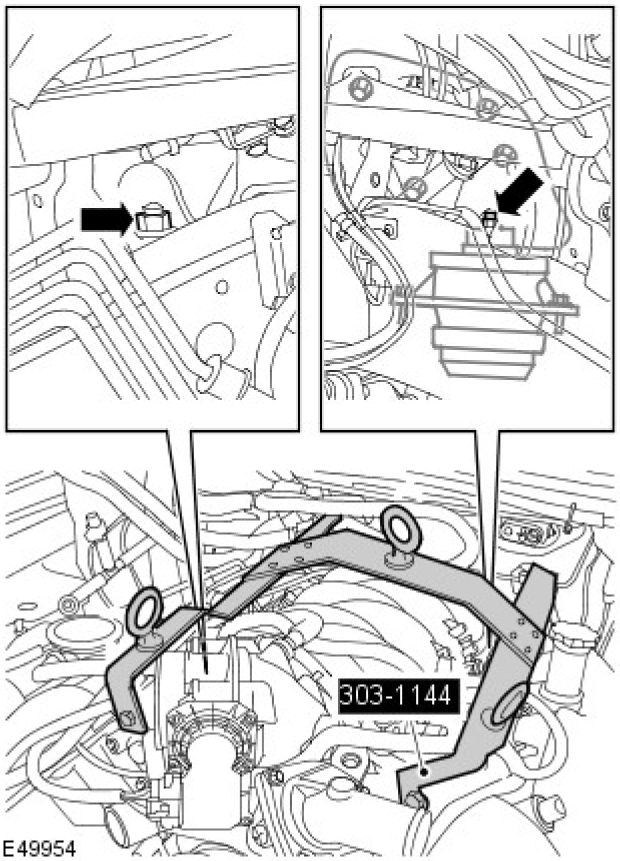
41. Disconnect the starter motor electrical connections.

- Remove the nut.


E45828

42. Remove the starter motor.

- Remove the 2 bolts.

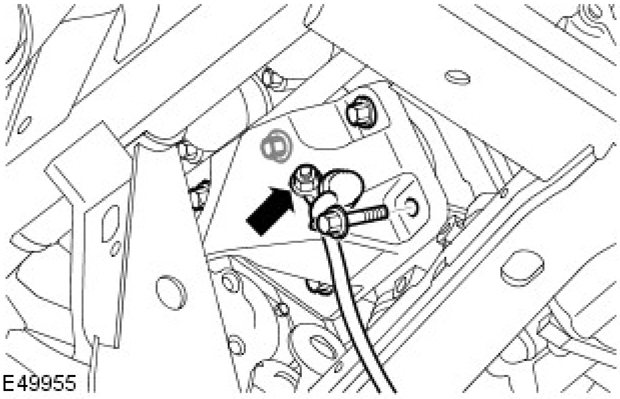


E49954

43. Remove the 2 engine mount nuts.

44. Release the engine from mounts and the transmission.

- Install the lifting chains.
- Raise the RH side of the engine by approximately 35 mm.



45. Remove the engine RH mount bracket.

- Remove 4 bolts securing the engine mount bracket to the cylinder block.
- Disconnect the engine ground cable from the RH mounting bracket.

46. CAUTIONS:

⚠ Make sure the torque converter remains connected to the transmission.

⚠ Care must be taken to avoid damaging the steering rack and differential.

Carefully and progressively raise and remove the engine.

47. Disconnect the lifting chains.

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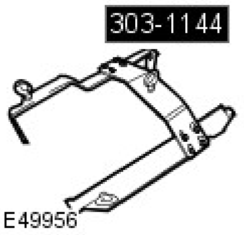
Engine - V8 4.4L Petrol - Engine

Installation

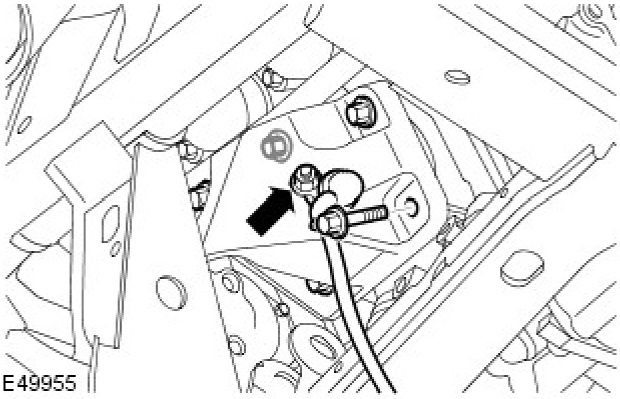
Special Tool(s)	
 E49956	Engine lifting cradle 303-1144

Installation

1. Install the engine lifting cradle.

- Connect the lifting chains.

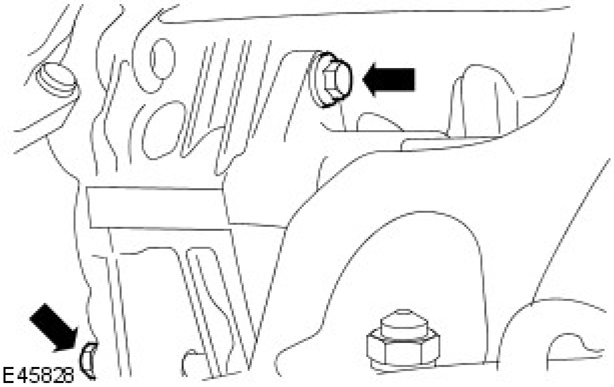
2. Carefully lower the engine until approximately 35mm above engine mounts.



E49955

3. Install the engine front mount bracket.

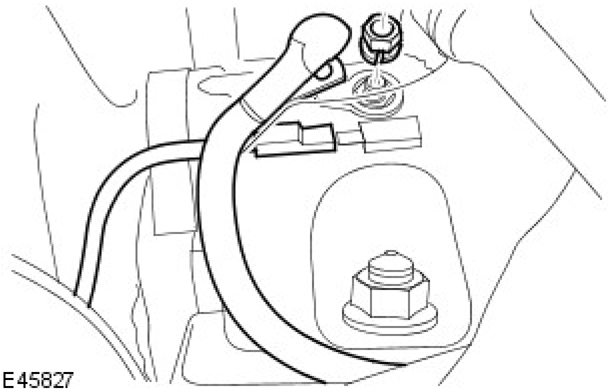
- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).
- Connect the engine ground cable and tighten the bolt to 25 Nm (18 lb.ft).



E45828

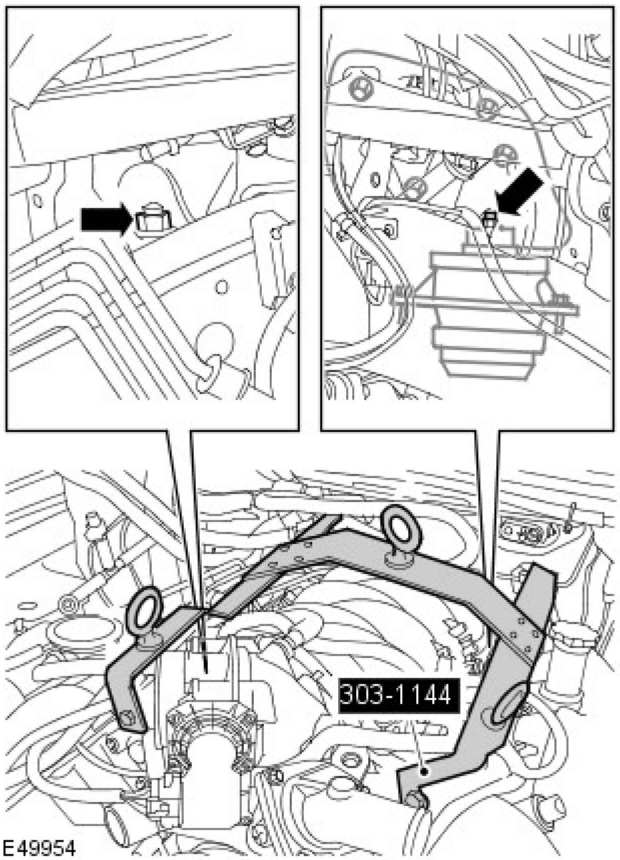
4. Install the starter motor.

- Tighten the bolts to 45 Nm (33 lb.ft).



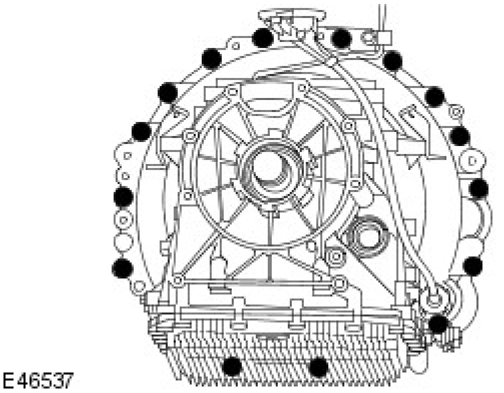
5. Connect the starter motor electrical connectors.

- Connect and secure the electrical connectors.
- Tighten the starter motor nut to 10 Nm (7 lb.ft).



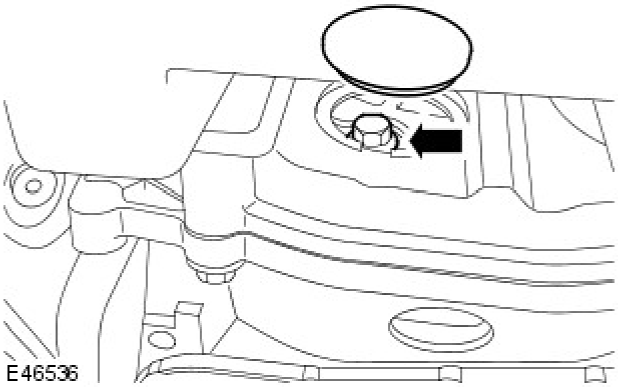
6. With assistance align the engine to the transmission and engine mounts.

- Tighten the engine mount nuts to 90 Nm (66 lb.ft).



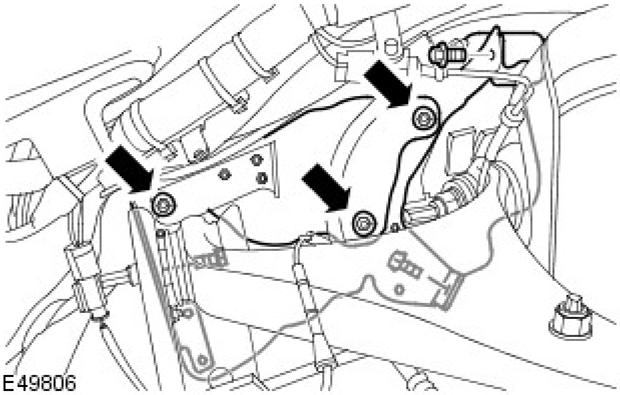
7. Install the transmission retaining bolts.

- Tighten the bolts to 45 Nm (33 lb.ft).



8. Attach the flexplate to the torque converter.

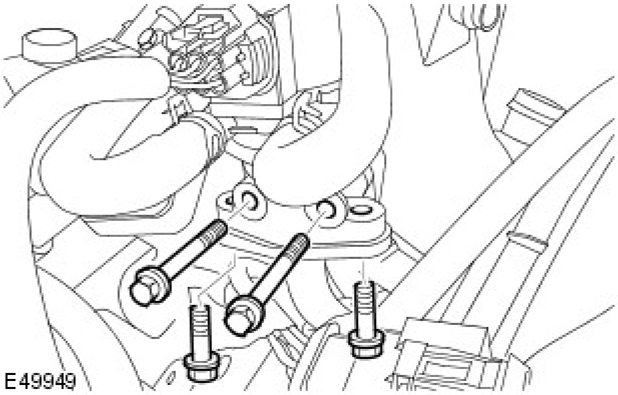
- Rotate the crankshaft to access the retaining bolts.
- Tighten the bolts evenly and progressively in 2 stages.
- Tighten the bolts to 15 Nm (11 lb ft).
- Tighten the bolts to 110 Nm (81 lb.ft).
- Install the grommet.



9. Install the transmission heat shield.

10. Install the upper suspension arm and brake line heat shields.

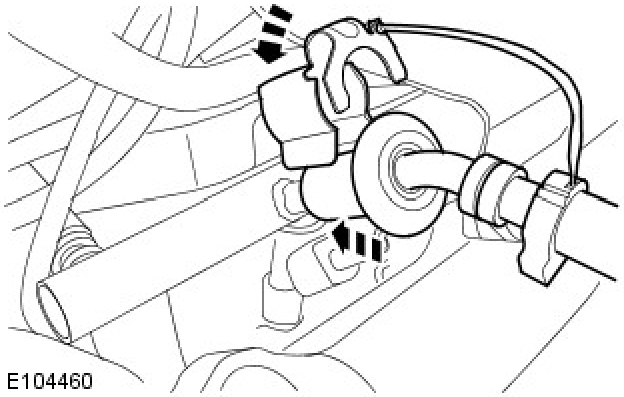
- Install the bolts and tighten to 10 Nm (7 lb.ft).
- Tighten the nuts to 10 Nm (7 lb.ft).



11. Remove the engine lifting cradle.

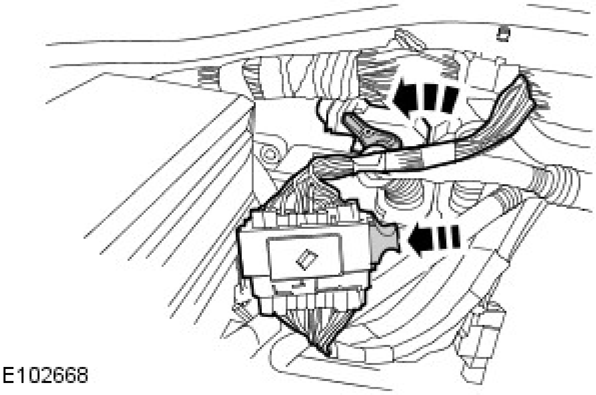
12. Position the EGR valve to the EGR pipe, fit the bolts and tighten to 25 Nm (18 lb.ft).

- Install and align new gasket.



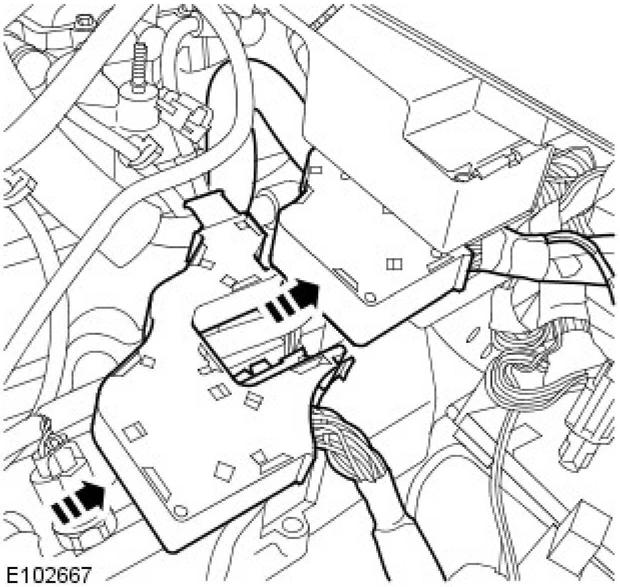
13. Connect the fuel line to the fuel rail.

- Clean the component mating faces.
- Secure with the clips.

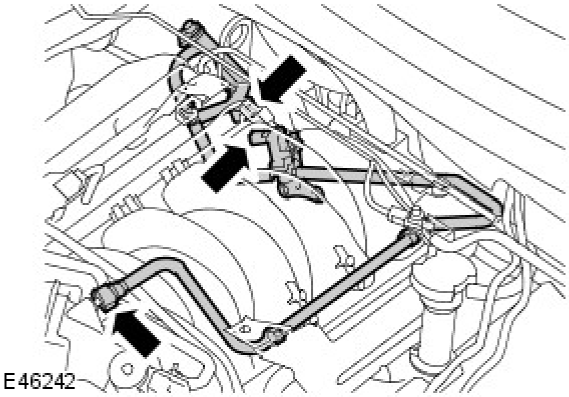


14. Connect the engine wiring harness.

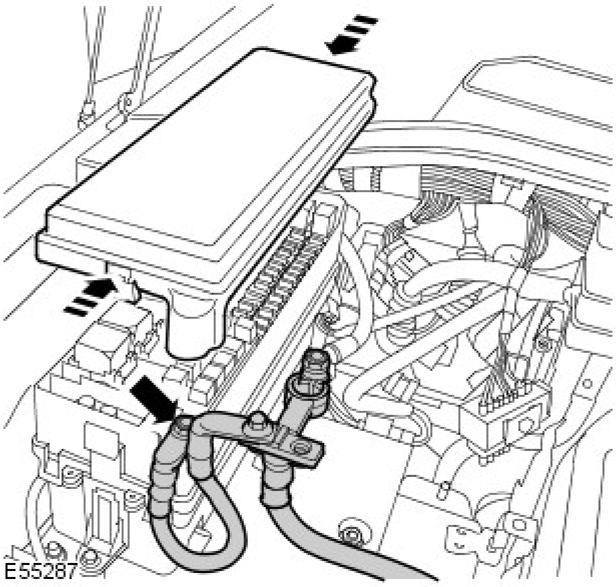
- Connect the electrical connectors.



15. Install the cassette.

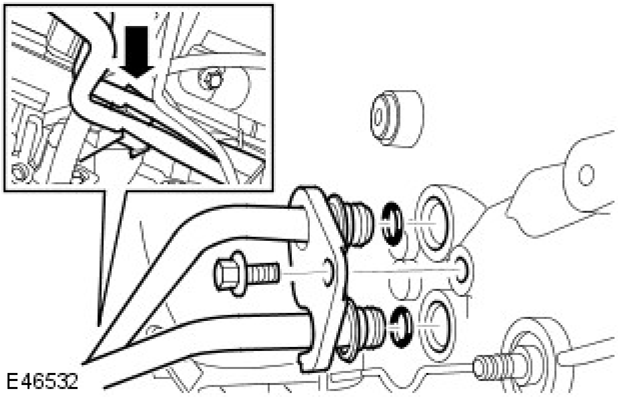


16. Connect the evaporative emission hose to the intake manifold.



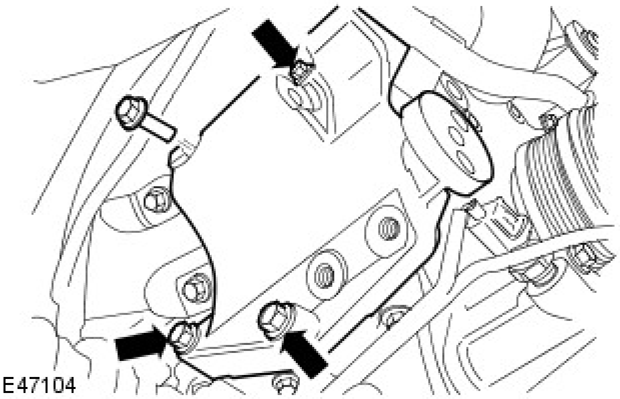
17. Connect the battery positive cable to the BJB.

- Tighten the bolt to 10 Nm (7 lb.ft).



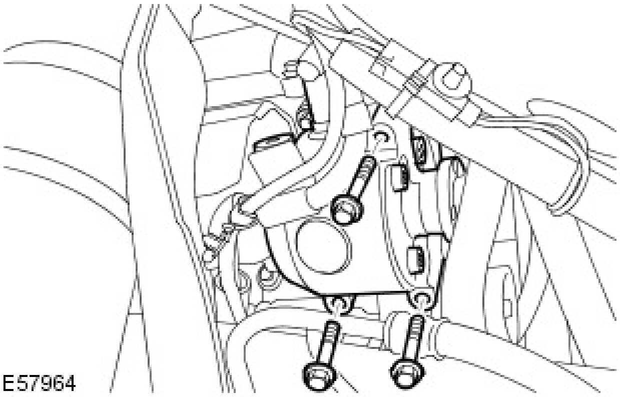
18. Install the transmission cooler pipes.

- Clean the component mating faces.
- Install new O-ring seals.
- Install the clamp.
- Tighten the bolt to 25 Nm (18 lb.ft).



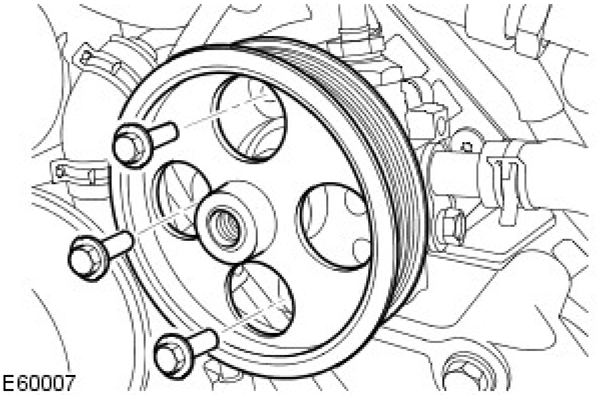
19. Install the generator and dynamic response pump mounting brackets.

- Install the 4 bolts.
- Tighten to 45 Nm (33 lb.ft).



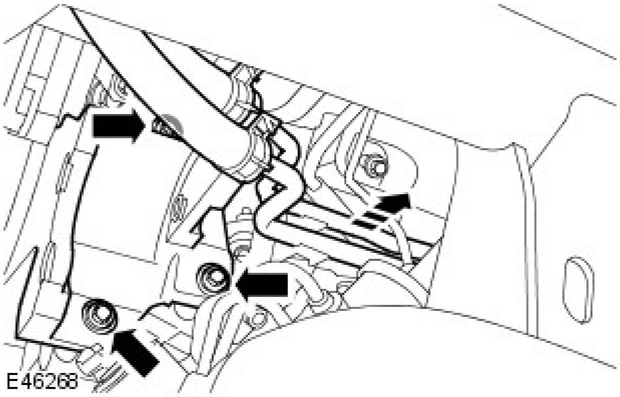
20. Install the dynamic response pump.

- Install the 3 bolts.
- Tighten the bolts to 22 Nm (16 lb.ft).



21. Install the power steering pump.

- Tighten the bolts to 25 Nm (18 lb.ft).



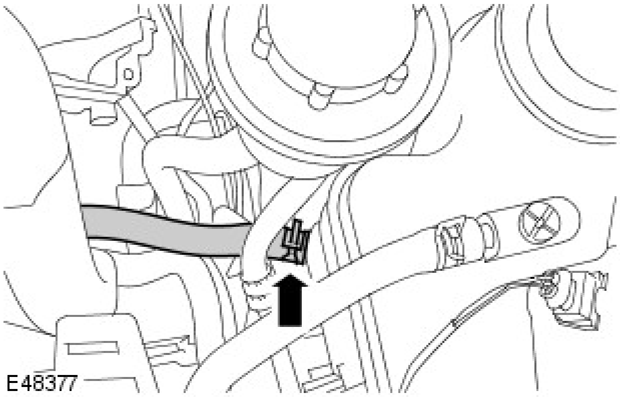
22. Install the A/C compressor assembly.

- Install the A/C mounting bracket.
- Tighten the bolts to 25 Nm (18 lb.ft).
- Connect and secure the electrical connector.

23. Install the generator.
For additional information, refer to: Generator (414-02B Generator and Regulator - V8 4.4L Petrol, Removal and Installation).

24. Connect the coolant expansion tank lower hose.

- Secure the clip.

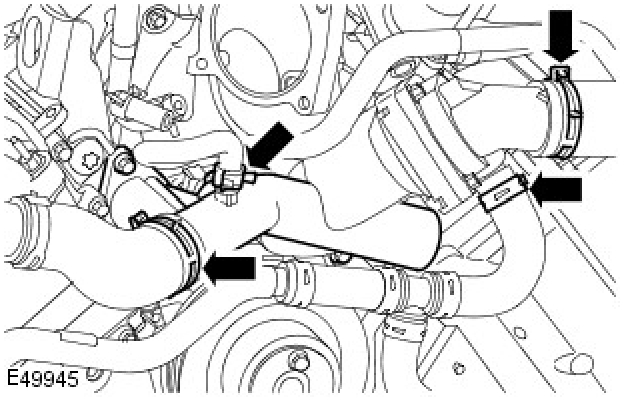


25. Connect the thermostat housing coolant hoses.

- Secure the 2 clips.

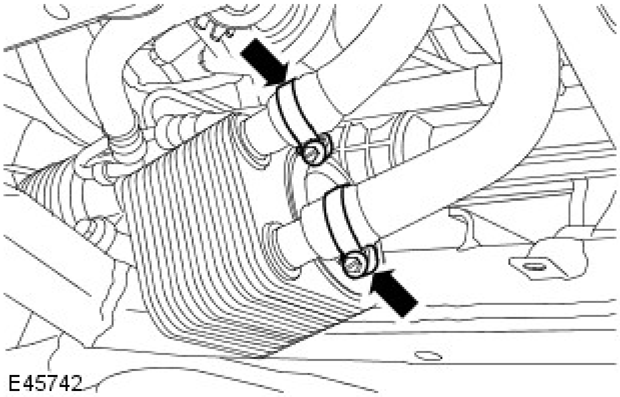
26. Connect the upper coolant hose assembly.

- Secure the 2 clips.



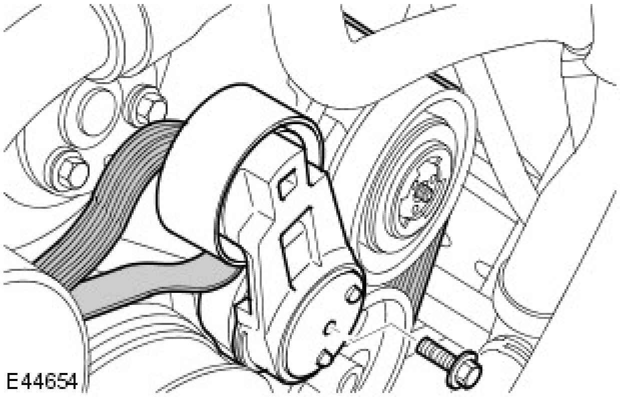
27. Connect the engine oil cooler coolant hoses.

- Install the hose assembly.
- Secure the 2 clips.



28. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

29. Install the fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

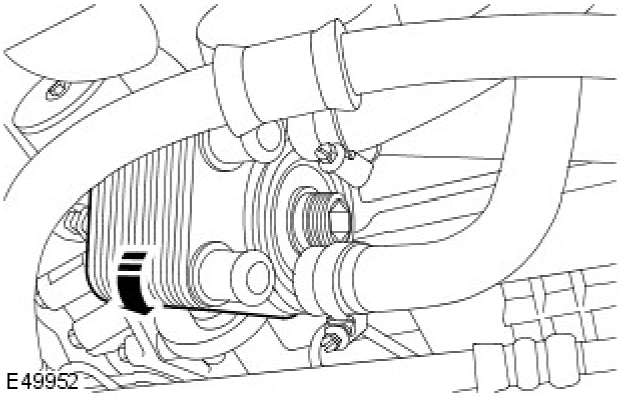


30. Install the accessory drive belt tensioner.

- Tighten the bolt to 45 Nm (33 lb.ft).

31. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

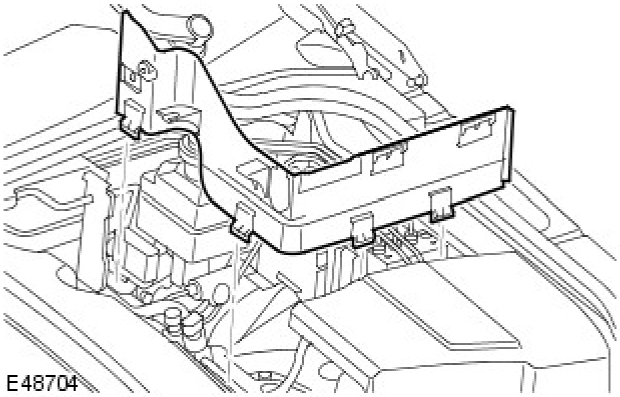
32. Install the RH air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).



33. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

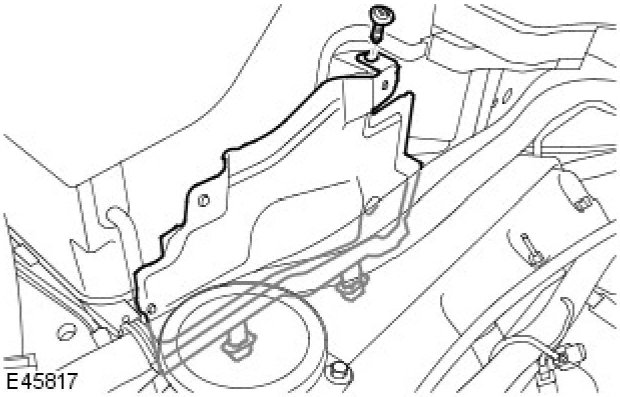
Align the engine oil cooler to the fitted position.

- Tighten the Allen bolt to 60 Nm (44 lb.ft).



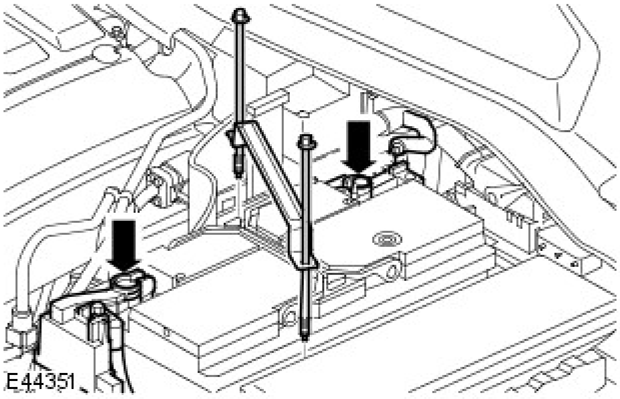
34. Install the auxiliary battery compartment side wall.

- Install the battery positive cable and grommet.
- Secure the 4 clips.



35. Install the engine compartment upper heat shield.

- Install the 2 screws.
- Secure in the 2 clips.



36. Install the battery.

37. Install the battery clamp.

- Install the 2 bolts.

38. Install the battery positive cable.

39. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

40. Install the battery cover.

- Release the 2 mounting clips.
- Secure with the 2 clips.

41. Fill the engine with oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01A Engine - V8 S/C 4.2L Petrol, General Procedures).

42. Fill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

43. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

44. Install the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

45. Return the hood from the service position.

- Release the 2 clips.
- Connect the struts and secure with the clips.

46. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

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Engine - TDV6 2.7L Diesel -

Sealers

Description	Land Rover Part No.
Camshaft caps	8510302
‘T’ joints - ladder frame to engine block	STC 50550
Coolant plug - threaded	STC 50552
Oil pump upper middle retaining bolt	STC 50552

Lubricants

Description	Specification
Engine oil, SAE 5W-30	Use 5W/30 oil to specification WSS-M2C-913B meeting ACEA B1/B3

Note: WSS is a Ford prefix to the oil specification

Capacities

Engine Oil Capacity	Specification
Dry fill including filter for factory fitted engine	6.55 litres (11·5 pints) (6.9 US quarts)
Dry fill including filter for all new engines fitted in service	7.05 litres (12.4 pints) (7.4 US quarts)
Oil and filter change	5·54 litres (9·6 pints) (5.8 US quarts)
Amount of oil required to bring level from 'MIN' to 'MAX' mark on oil level indicator	1·5 litres (2·6 pints) (1.6 US quarts)

Dimensions

Item	Specification
Length	523 mm (20·59 in)
Width	717 mm (28·25 in)
Height	771 mm (30·35 in)

General Specifications

Item	Specification
Type	2.7 litre, 60 degree 'V', common rail direct injection, turbocharged and intercooled diesel, twin overhead camshafts, 4 valves per cylinder
Cylinder arrangement	V6, numbers 1 and 4 cylinders at front of engine when engine is viewed from rear
Cylinder numbering	Number 1 cylinder - right hand bank; Number 4 cylinder - left hand bank
Bore - nominal	81·0 mm (3·188 in)
Stroke	88·0 mm (3·464 in)
Capacity	2720 cm^3 (165·9 in^3)
Firing order	1 - 4 - 2 - 5 - 3 - 6
Compression ratio	17.3:1
Direction of rotation	Anti-clockwise viewed from rear of engine
Maximum power	147 kW (200 PS) (197 bhp) @ 4000 rev/min
Maximum torque	440 Nm (324 lb-ft) @ 1900 rev/min
Engine oil pressure:	
At idle	0.7 bar (70 kPa) (10 lb/in^2)
At 3500 rev/min	1.9 bar (190kPa) (27.5 lb/ft^2)
Maximum permissible cylinder head warp	
Total flame face	0.1 mm
150 mm x 150 mm square on flame face	0.05 mm
25 mm x 25 mm square on flame face	0.025 mm

Torque Specifications

Description	Nm	lb-ft
Accessory drive belt idler retaining bolt	47	35
Accessory drive belt tensioner M8 retaining bolts	47	35
Accessory drive belt tensioner M10 retaining bolts	25	18
Air conditioning (A/C) compressor retaining bolts	23	17
A/C compressor mounting bracket retaining bolts	23	17
A/C compressor low pressure pipe fixing	9	7
A/C manifold retaining bolt	20	15
Battery positive cable mounting bolts	10	7
*** Camshaft inner bearing cap retaining bolts**		
Stage 1: tighten bolts 1 to 14	1	1
Stage 2: tighten bolts 1 to 14	5	4

Description	Nm	lb-ft
Stage 3: tighten bolts 1 to 14	10	7
*** Camshaft outer bearing cap retaining bolts**		
Stage 1: tighten bolts 1 to 4	1	1
Stage 2: tighten bolts 1 to 4	5	4
Stage 3: tighten bolts 1 to 4	10	7
Camshaft position sensor retaining bolt	10	7
+¹ Camshaft hub retaining bolts		
Stage 1	80	59
Stage 2	Further 90°	Further 90°
Camshaft pulley retaining bolts	23	17
Camshaft timing belt cover securing bolts	10	7
+² Crankshaft pulley retaining bolt		
Stage 1	100	74
Stage 2	Further 90°	Further 90°
Crankshaft damper bolts	14	10
Crankshaft position sensor retaining bolt	5	4
Crankshaft rear seal retainer plate	10	7
Coolant outlet elbow	10	7
***+² Cylinder head retaining bolts**		
Stage 1	20	15
Stage 2	40	30
Stage 3	80	59
Stage 4	Further 180°	Further 180°
Differential front mounting bracket heat shield	10	7
EGR valve inlet tube	10	7
EGR valve mounting bolts	10	7
EGR valve support bracket fixing	10	7
Engine breather tube securing bolt	10	7
Engine mount retaining nuts to cross member	62	46
Engine mount bracket to engine mount retaining bolts	62	46
Engine mount bracket to engine block retaining bolts	115	85
Exhaust cross over pipe retaining nuts	24	18
Exhaust manifold heat shield retaining bolts	10	7
Exhaust manifold retaining nuts	23	17
Exhaust manifold retaining studs	13	10
***+ Flexplate retaining bolts**		
Stage 1	50	37
Stage 2	Further 45°	Further 45°
Stage 3	Further 45°	Further 45°
Fuel injection pump	23	17
Fuel injection pump pulley retaining nut	50	37
Fuel injection supply manifold	23	17
Fuel injection supply manifold securing bracket	23	17
Fuel injection supply line unions		
Stage 1 - High pressure fuel supply line union at the fuel injection diverter rail	15	11
Stage 2 - High pressure fuel supply line union at the fuel injection supply manifold	15	11
Stage 3 - High pressure fuel supply line union at the fuel injection diverter rail	30	22
Stage 4 - High pressure fuel supply line union at the fuel injection supply manifold	30	22
Fuel injection high pressure supply line mounting bolt	10	7
Fuel injector retaining bolts	10	7
Fuel filter mounting bolts	10	7
Generator retaining bolts	23	17
Generator mount bracket retaining bolts	23	17
Glow plugs	11	8
Intake air shut off throttle elbow support bracket bolts	10	7
Knock sensor retaining bolts	20	15
Oil cooler to cylinder block retaining bolts	10	7
Oil level indicator tube upper retaining bolt	10	7
Oil pan retaining bolts	10	7
Oil pump screen and pick-up tube	10	7
Oil pump to engine block retaining bolts	10	7

Description	Nm	lb-ft
Oil pan drain plug	23	17
Oil separator retaining bolts	10	7
Oil temperature sensor	10	7
Oil filter	25	18
Piston cooling jet retaining bolt	10	7
Power steering bracket retaining bolts	23	17
Power steering pump retaining bolts	23	17
Power steering high pressure pipe fixing	25	18
Primary timing chain tensioner retaining bolts	10	7
Secondary timing chain tensioner bolts	10	7
Starter motor retaining bolts	45	33
Timing belt tensioner retaining bolt	24	18
Timing belt idler pulley retaining bolt	45	33
Transmission fluid cooler pipe securing bracket	10	7
Transmission retaining bolts	45	33
Turbo heat shield	10	7
Turbo support bracket	22	16
Coolant pump retaining bolts	10	7
Coolant pump pulley retaining bolts	23	17
Coolant pump outlet pipe retaining bolts	10	7
Valve cover retaining bolts	10	7
Vacuum pump retaining bolts	23	17
Vacuum pump retaining nuts	13	10

*** Bolts must be tightened in sequence**

+ New bolts must be installed

¹ Lightly oil bolt threads

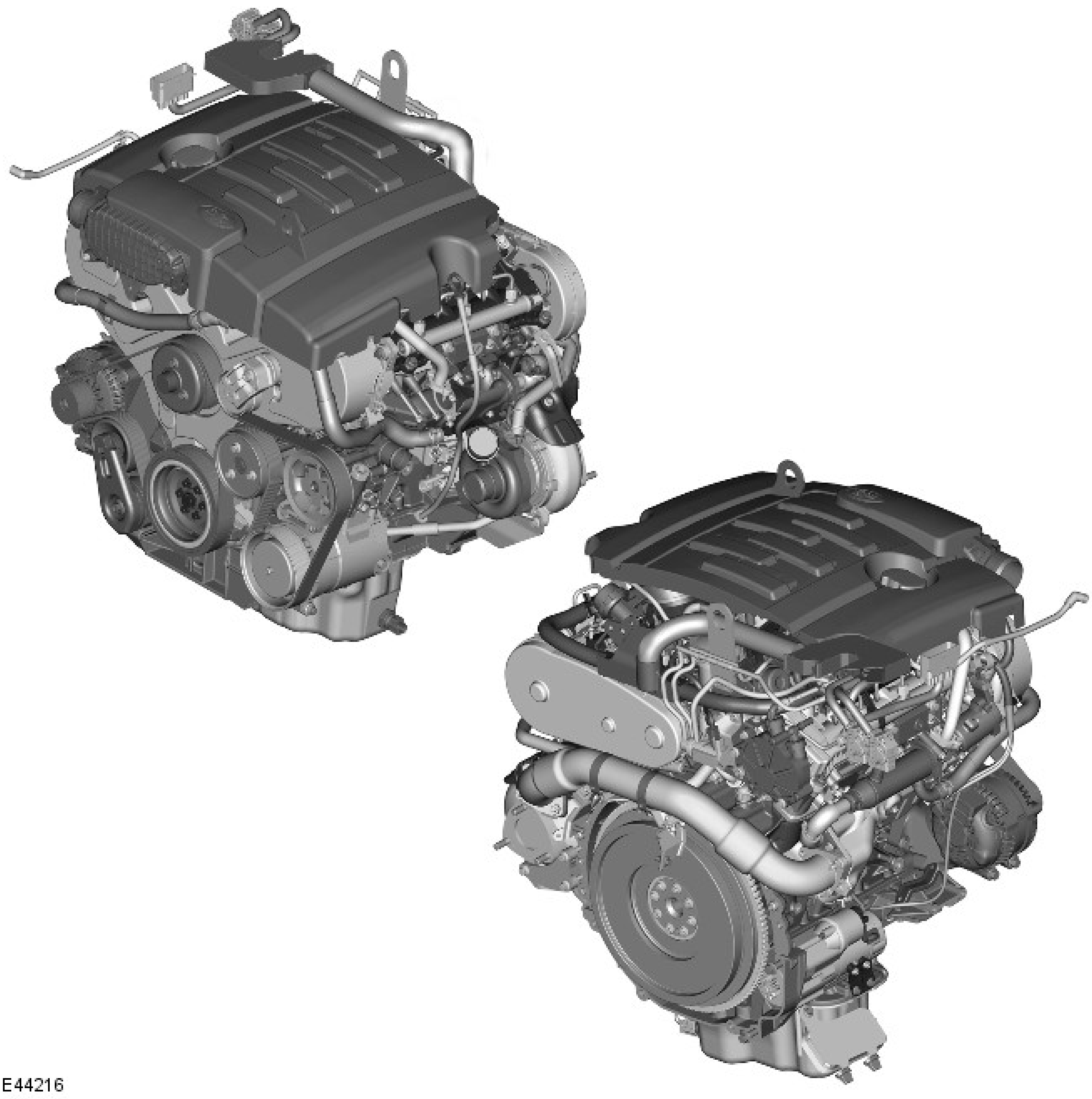
² Do not apply lubricant to bolt threads

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Engine

Description and Operation

External View



GENERAL

The TdV6 engine is a 2.7 liter, direct injection, six-cylinder diesel engine having two banks of three cylinders, arranged at 60 degrees to each other. There are 4 valves per cylinder, which are operated by two overhead camshafts per cylinder bank. The engine emissions comply with ECD3 (European Commission Directive) legislative requirements and employs two catalytic converters, electronic engine management control, positive crankcase ventilation and exhaust gas recirculation to limit the emission of pollutants. The unit is water cooled and turbo-charged. The fuel injection system features common rail technology.

The cylinder block is manufactured in Compacted Graphite Iron (CGI) and is coupled with a separate aluminium ladder frame to provide a lightweight, compact and very stiff bottom end of the engine. The cylinder heads are cast aluminium with a moulded plastic camshaft cover. The single-piece oil sump is formed from stamped steel. The cast iron exhaust manifolds are unique for each cylinder bank and a moulded plastic acoustic cover is fitted over the upper engine to reduce engine-generated noise.

TECHNICAL FEATURES

The technical features include:

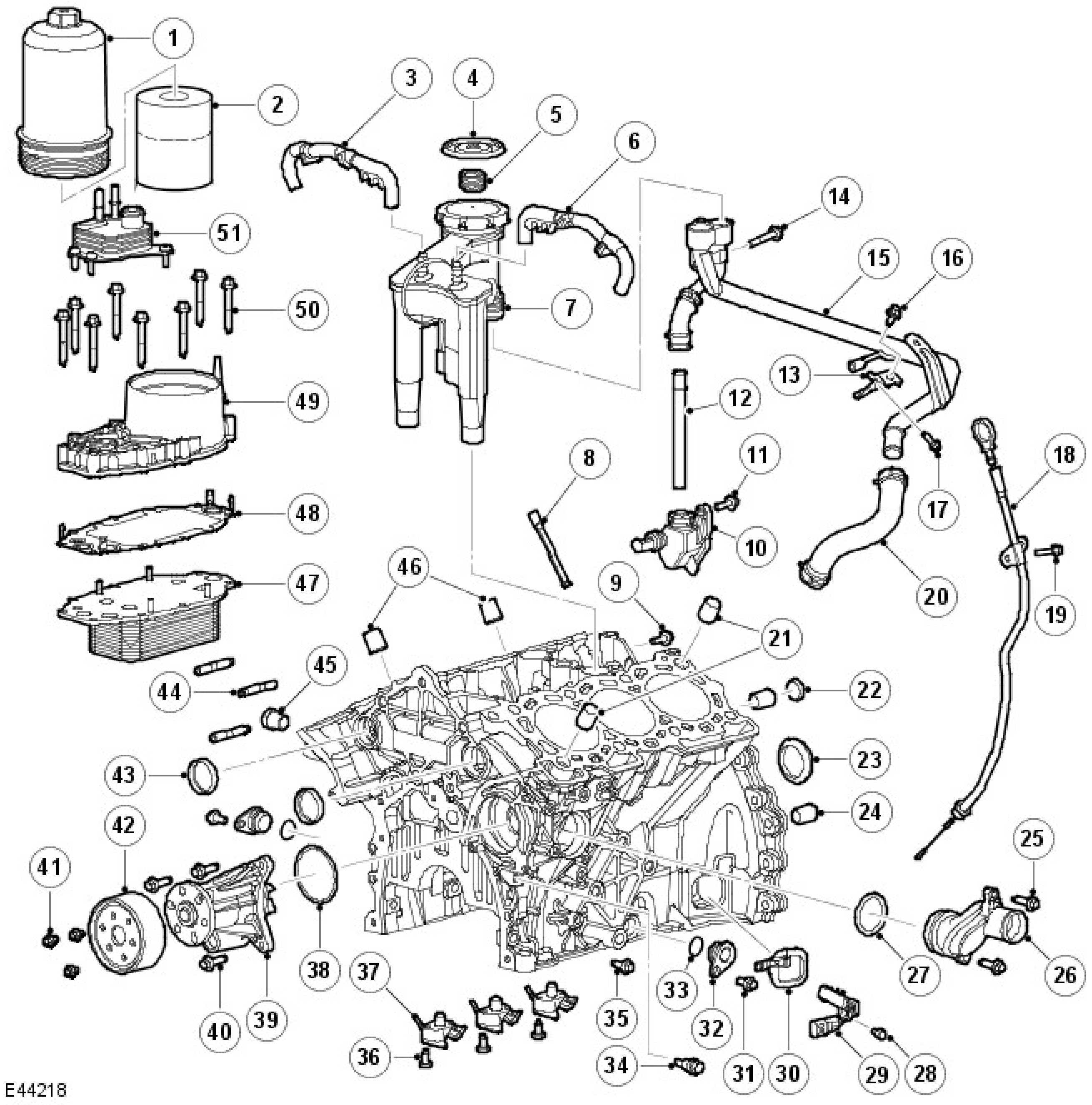
- 60 degree 'vee' 6 cylinder engine with a CGI cylinder block
- Plastic cylinder head cover
- Two light, high strength, aluminium cylinder heads
- 4-valve technology with centrally arranged fuel injectors
- Steel roller rockers with hydraulic lash adjusters
- Twin plenum intake system integrated with the camshaft cover
- Variable Geometry Turbocharger
- Common rail direct fuel injection system
- High pressure fuel pump
- Gallery cooled pistons with a central crown bowl
- Two electronically controlled Exhaust Gas Recirculation (EGR) valves
- Two EGR coolers
- Exhaust re-treatment by means of a diesel specific oxidation catalytic converter and primary catalytic converter
- Cooling fan with electro-viscous clutch drive.

ENGINE DATA

The technical data is detailed below:

DESCRIPTION	TYPE
Configuration	60 degree V6
Maximum power	147 kW at 4000 rpm
Maximum torque	440 Nm at 1900 rpm
Displacement	2720cc
Stroke/bore	81mm/88mm
Compression ratio	17.3:1
Firing order	1 4 2 5 3 6
Oil capacity	6.55 litres (initial fill) 5.45 litres (service fill, includes oil filter)
Engine weight (with oil)	235kg (Automatic) 260kg (Manual, inc. clutch plate and cover)

CYLINDER BLOCK COMPONENTS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E44218

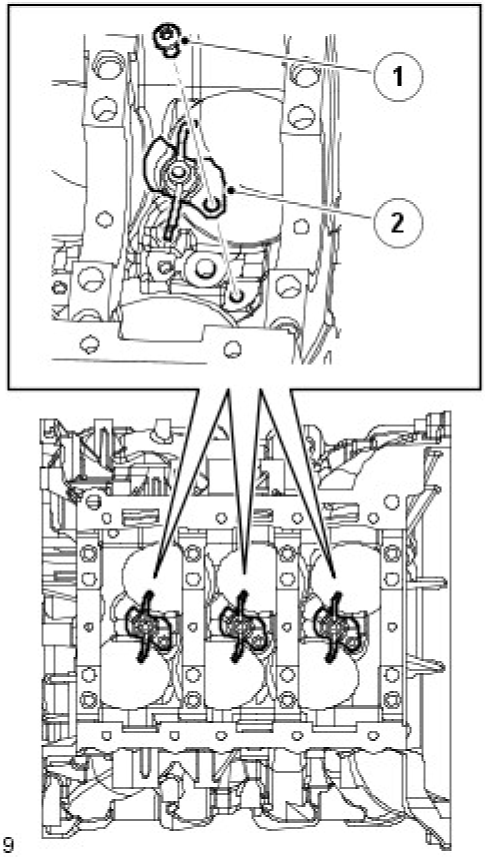
Item	Part Number	Description
1	-	Oil filter cap
2	-	Oil filter element
3	-	Scavenge pipe
4	-	Diaphragm
5	-	Spring
6	-	Scavenge pipe
7	-	Crankcase ventilation oil separator assembly
8	-	Turbocharger feed filter
9	-	Bolt
10	-	Crankcase ventilation drain reservoir assembly
11	-	Bolt
12	-	Crankcase ventilation oil return tube
13	-	Bracket
14	-	Bolt
15	-	Crankcase ventilation oil return assembly
16	-	Bolt

17	-	Bolt
18	-	Oil level gauge
19	-	Bolt
20	-	Crankcase ventilation return hose
21	-	Cylinder head locating dowels
22	-	Core plug
23	-	Seal
24	-	Transmission locating dowel
25	-	Bolt, 2 of
26	-	Water inlet connector assembly
27	-	O ring
28	-	Bolt
29	-	Crankshaft position (CKP) sensor
30	-	Cylinder block aperture cover
31	-	Bolt
32	-	Blanking plug
33	-	O ring
34	-	Crankshaft timing plug
35	-	Bolt
36	-	Bolt, 3 of
37	-	Piston cooling jets
38	-	O ring
39	-	Water pump
40	-	Bolt, 3 of
41	-	Bolt, 3 of
42	-	Water pump pulley
43	-	Core plug
44	-	Stud bolts, 3 of
45	-	Coolant drain plug
46	-	Cylinder head locating dowels
47	-	Lower oil filter and cooler assembly
48	-	Seal
49	-	Upper oil filter and cooler assembly
50	-	Bolt, 8 of
51	-	Fuel cooler

Cylinder Block

The cylinders and crankcase are contained in the cylinder block, which is of single cast CGI construction with a hollow beam structure. With this type of construction less material is required than for a conventional cast iron block, therefore, reducing engine weight and length.

Piston Cooling Jets



E44219

Item	Part Number	Description
1	-	Bolt
2	-	Piston cooling jet

Jets located in the cylinder block provide piston and gudgeon pin lubrication and cooling. These jets spray oil on to the inside of the piston, the oil then flows through two internal wave shaped channels to help cool each piston crown.

Lubrication oil is distributed through the cylinder block, via the main oil gallery and channels bored in the block, to all critical moving parts. These channels divert oil to the main and big-end bearings via holes machined into the crankshaft.

A tapping at the rear RH side of the cylinder block, below the RH cylinder head, connects a pipe to the turbocharger by means of a banjo connection. Oil is supplied, under pressure via this tapping, from the oil pump to provide lubrication for the turbocharger bearings.

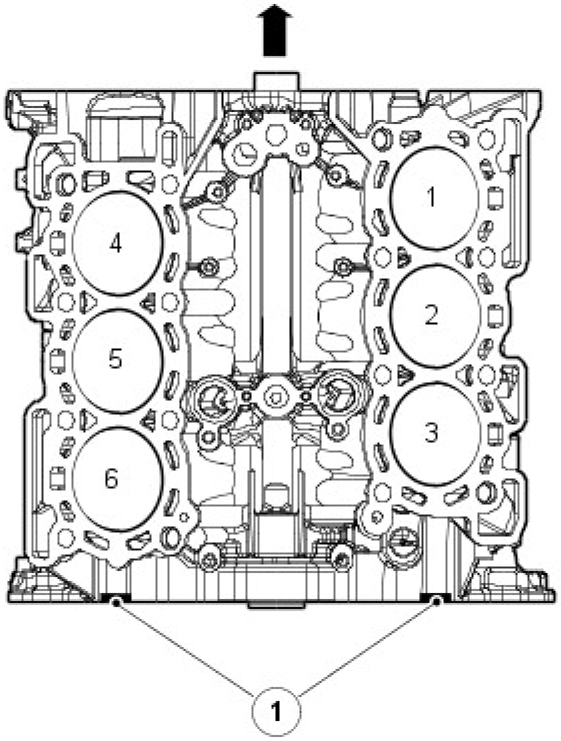
Cylinder cooling is achieved by coolant circulating through chambers in the cylinder block casting.

Two hollow metal dowels are used to locate the cylinder heads to the cylinder block, one on each side at the rear of the unit.

A port is included at the rear LH side of the ladder frame, below the turbocharger, to connect the turbocharger oil return pipe to the sump.

A plug sealing the lubrication cross-drilling gallery is located at the front RH side of the cylinder block. Plugs for the main lubrication gallery are included at the front and rear of the cylinder block.

Engine Data Locations

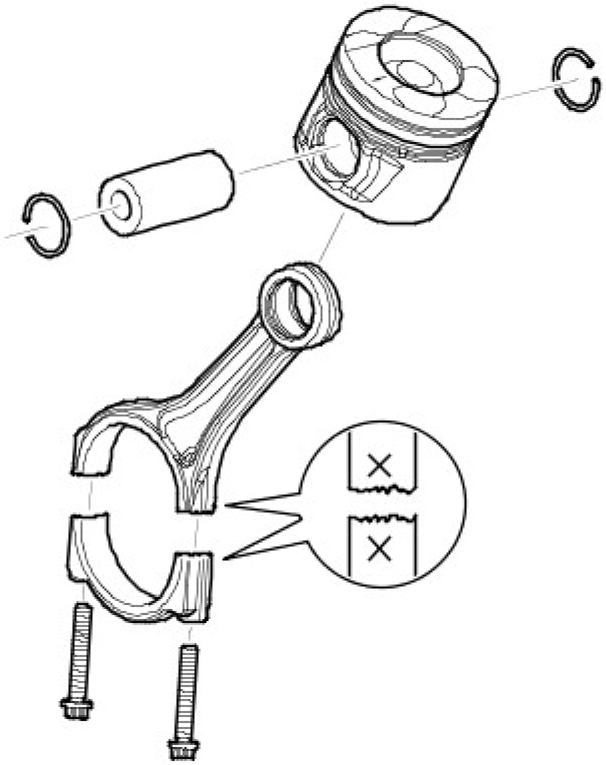


E44217

Item	Part Number	Description
1	-	Engine data locations

Engine data is marked at two locations at the back of the cylinder block. Component diameters are represented by alphabetical and numerical codes; keys to the codes are in the Service Repair Procedures (SRP) Manual.

Connecting Rods and Pistons

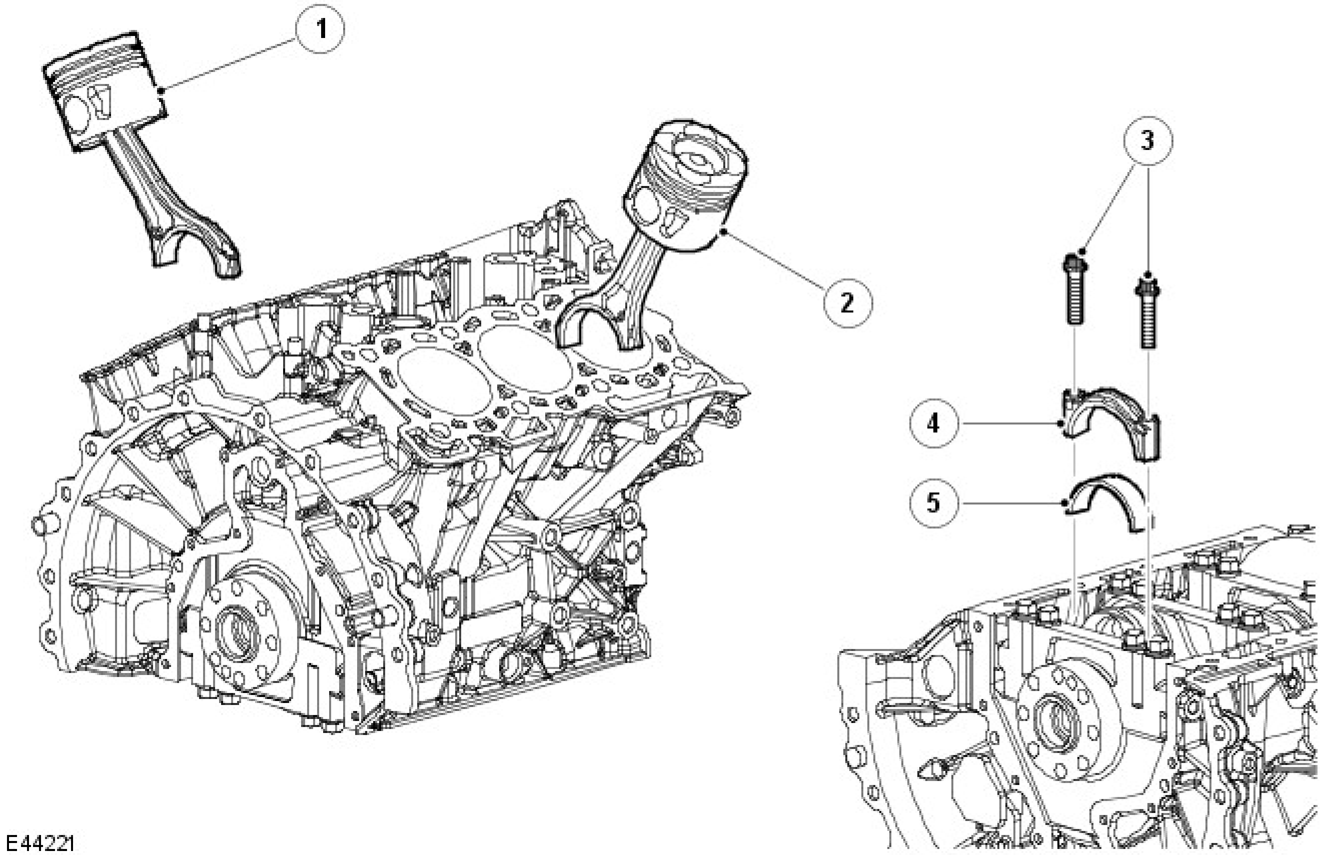


E44220

The connecting rods are manufactured from sinter-forged steel and have fracture-split bearing caps. The bearing caps are produced by fracturing the opposing sides of the connecting rod at the bearing horizontal centre-line. As well as being easier to manufacture, when reassembled the fractured surfaces interlock to form a strong seamless joint. The cylinder position is etched on adjoining sides of the joint to identify matching connecting rods and bearing caps. The selective connecting rod bearings are aluminium/tin split plain bearings. The connecting rod bearing is 'sputter coated', which is a manufacturing process that layers the bearing material to produce a higher load capacity for improved durability.

- NOTE: The connecting rods are not selective.

Connecting Rod Installation



Item	Part Number	Description
1	-	Piston and connecting rod assembly, cylinders 4-6
2	-	Piston and connecting rod assembly, cylinders 1-3
3	-	Bolts
4	-	Connecting rod bearing cap
5	-	Connecting rod lower bearing

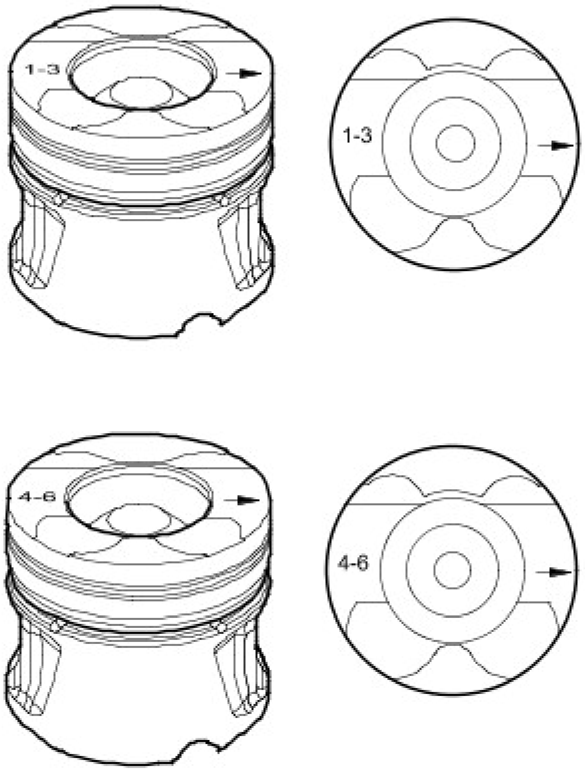
When installing a connecting rod, ensure the back of the connecting rod faces the centre of the 'vee'.

The pistons are made from aluminium alloy and are fitted with three rings. The piston crown incorporates a pronounced bowl; this forms the combustion chamber, which promotes swirl and turbulence necessary for good combustion and improved emissions. In addition, the piston skirt has a molybdenum-coated surface, which counteracts scoring of the cylinder bore and piston.

The piston also incorporates a double wave gallery within the piston crown to enhance piston cooling. The pistons are supplied oil by means of spray jets located in the cylinder block oil gallery. These jets ensure optimum piston cooling to counteract the high temperatures generated by the combustion process.

Each piston is installed on a wrist pin located in a aluminium/tin bushing in the connecting rod.

Piston Installation



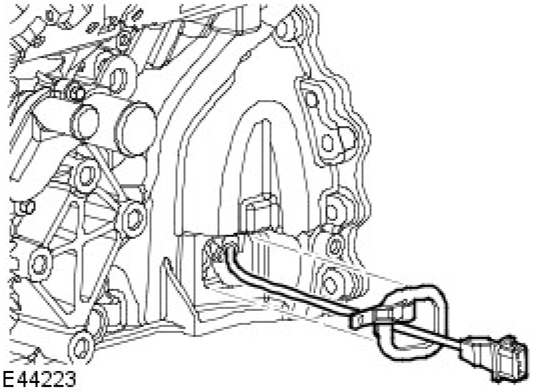
E44222

When installing pistons ensure the arrows on the piston crowns all point to the front of the engine and the pistons are located in the correct cylinder banks, i.e. cylinders 1, 2, 3 or cylinders 4, 5, 6.

- NOTE: All pistons are common single grade/single part number for all engines.

The piston top ring is a taper type and is fitted with the taper to the top of the piston. All rings marked 'top' are assembled with 'top' uppermost. All rings must be spaced evenly around the piston before installing. The circumference gap of the double bevelled oil control ring must be opposite the spiral control joint.

Crankshaft Position Sensor



E44223

The Crankshaft Position (CKP) sensor is located at the rear of the crankshaft, behind the flywheel in the LH side of the rear oil seal retainer. The sensor provides an input of engine crankshaft speed and position. The sensor works on the principle of the Hall effect and scans a trigger wheel (magnetic disc) on the crankshaft. An air gap of 0.4 to 1.5mm, between the trigger wheel and the CKP sensor, is achieved by the positional mounting of the sensor.
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

Starter Motor

The engine starter motor is installed at the rear RH side of the ladder frame, at the cylinder block to ladder frame split line.

For additional information, refer to: Starting System (303-06C Starting System - TDV6 2.7L Diesel, Description and Operation).

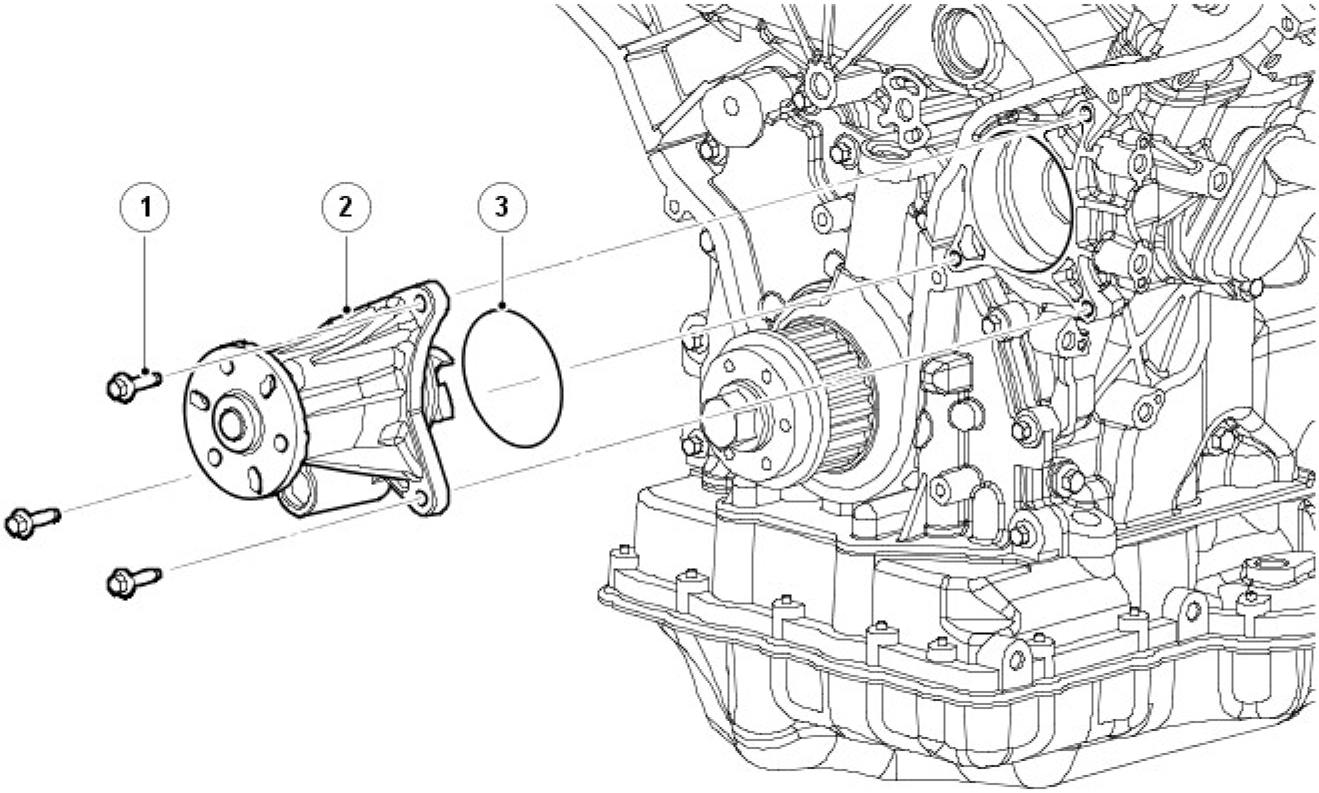
Coolant Drain Plug

Two coolant drain plugs are installed in the cylinder block, one is fitted in the rear RH side, and the other is fitted in the middle of the cylinder block on the LH side.

Cylinder Block Heater

On vehicles destined for cold climates, a cylinder block heater replaces a core plug in the middle of the cylinder block on the LH side.

Coolant Pump

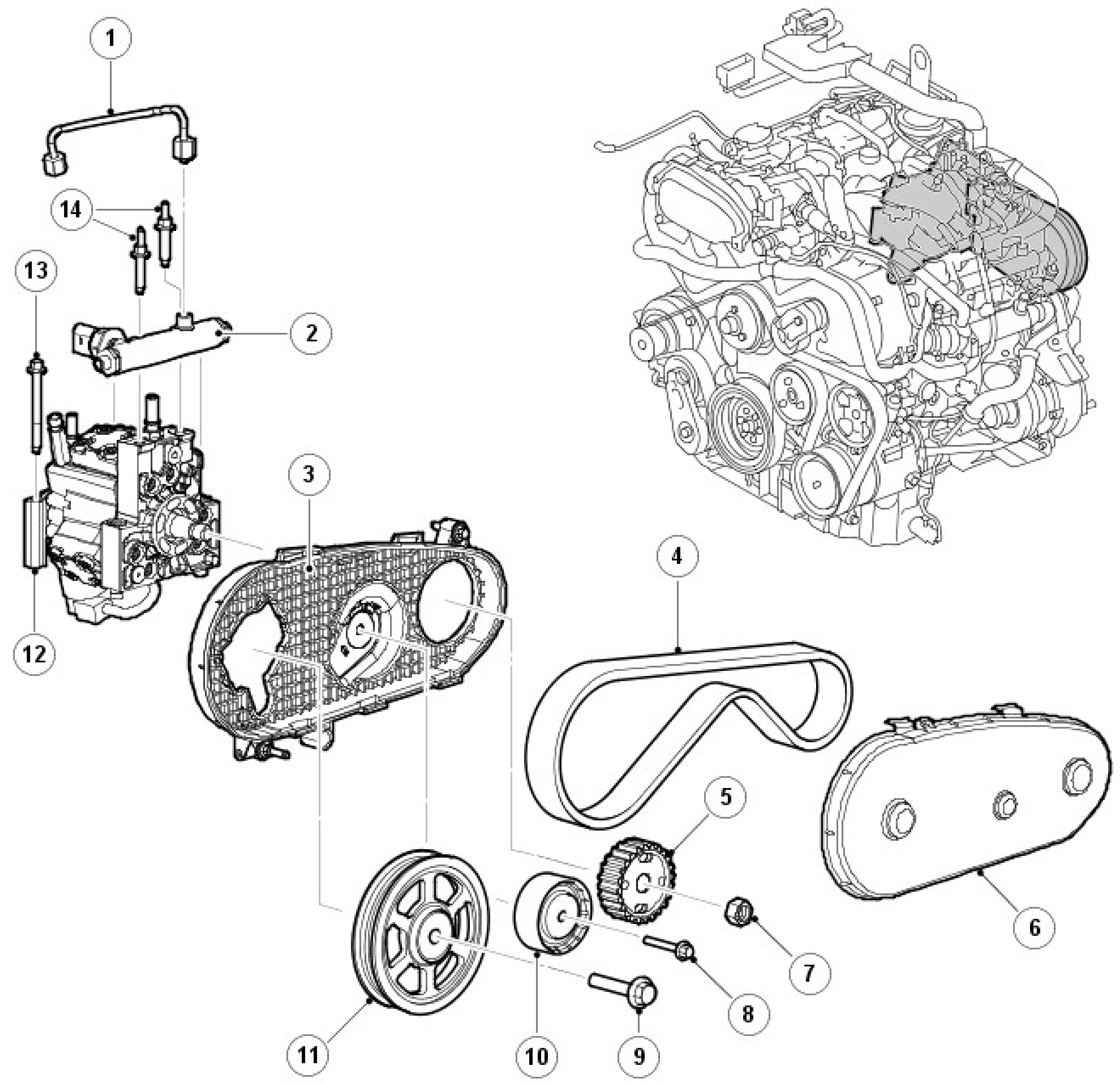


E44224

Item	Part Number	Description
1	-	Bolts
2	-	Water pump
3	-	'O' ring seal

The coolant pump is installed on the LH side of the cylinder block front face and is secured and sealed via three bolts and an 'O' ring. The coolant pump is driven by a poly-vee belt via the crankshaft.

High-Pressure Fuel Pump



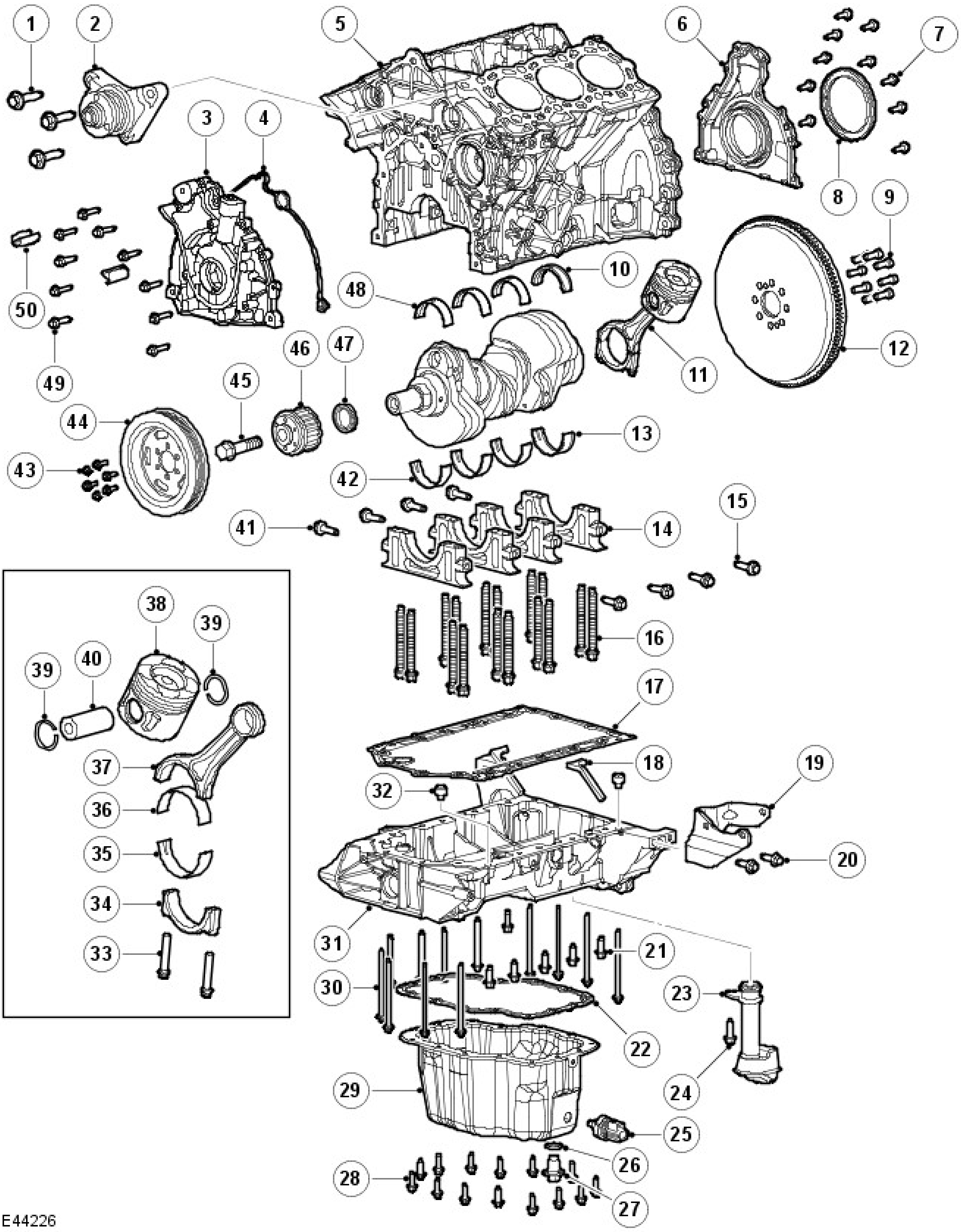
E44225

Item	Part Number	Description
1	-	Fuel pipe
2	-	Diverter rail assembly
3	-	Rear cover
4	-	Belt
5	-	Fuel pump pulley
6	-	Front cover
7	-	Nut
8	-	Bolt
9	-	Bolt
10	-	Tensioner
11	-	LH exhaust camshaft pulley
12	-	High pressure fuel pump
13	-	Bolt
14	-	Stud bolts

The high-pressure fuel pump supplies the common rail with fuel and is fixed to the rear of the cylinder block in the centre of the 'vee'. The pump is a 3 radial piston type controlled by the Engine Management System (EMS) and belt driven from the exhaust camshaft of the LH cylinder head. For additional information, refer to:

Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation),
Fuel Charging and Controls (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Description and Operation).

CRANKSHAFT AND SUMP COMPONENTS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E44226

Item	Part Number	Description

1	-	Bolts, 3 of
2	-	Fan driver bracket
3	-	Oil pump
4	-	Seal
5	-	Cylinder block
6	-	Rear oil seal retainer
7	-	Bolts, 10 of
8	-	Crankshaft position sensor trigger wheel
9	-	Bolts, 8 of
10	-	Main thrust bearing, upper
11	-	Piston and connecting rod assembly
12	-	Flywheel
13	-	Lower main thrust bearing
14	-	Main bearing caps, 4 of
15	-	Cross bolts, 4 of
16	-	Main bearing cap bolts, 16 of
17	-	Gasket
18	-	Seal
19	-	Bracket
20	-	Bolts, 2 of
21	-	Bolts, 6 of
22	-	Gasket
23	-	Oil pick-up
24	-	Bolt
25	-	Oil temperature sensor
26	-	Seal
27	-	Drain plug
28	-	Bolts, 14 of
29	-	Oil pan assembly
30	-	Bolts, 12 of
31	-	Ladder frame
32	-	Dowel
33	-	Bolts, 2 of
34	-	Connecting rod cap
35	-	Connecting rod cap bearing
36	-	Connecting rod bearing
37	-	Connecting rod
38	-	Piston
39	-	Piston pin retainer
40	-	Piston pin
41	-	Cross bolts, 4 of
42	-	Lower main bearings
43	-	Bolts, 5 of
44	-	Crankshaft damper pulley
45	-	Bolt
46	-	Crankshaft drive pulley
47	-	Crankshaft front oil seal
48	-	Upper main bearings
49	-	Bolts, 10 of
50	-	Seal

Crankshaft

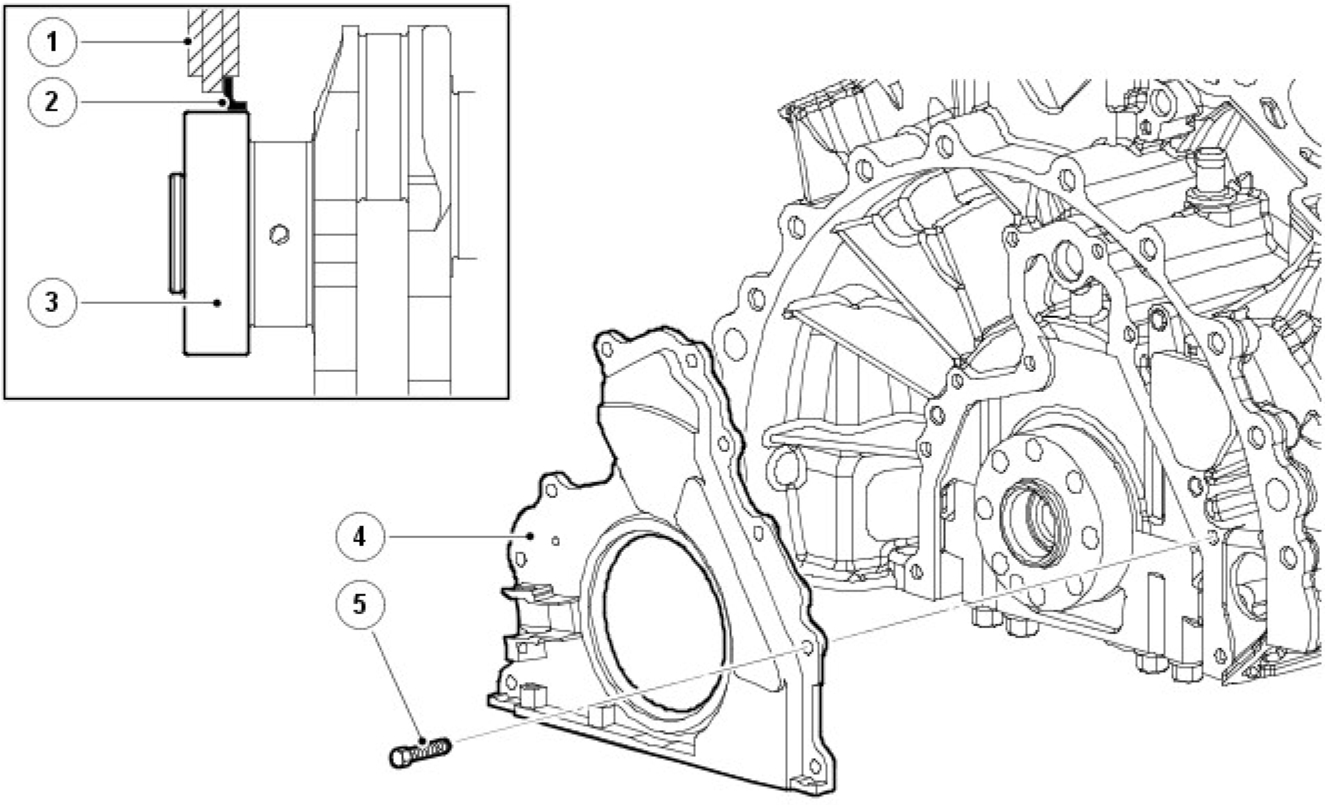
The crankshaft is forged steel and fillet rolled with induction hardened journals, which run in four bearings with clamped two layer bearing shells.

The main bearing caps are double and cross-bolted, this adds to the strength and rigidity of the engine block.

The crankshaft drive pulley is not keyed onto the crankshaft; it is secured to the crankshaft by a single bolt.

- NOTE: Under no circumstances must the crankshaft pulley be tightened or loosened with the timing belt fitted.

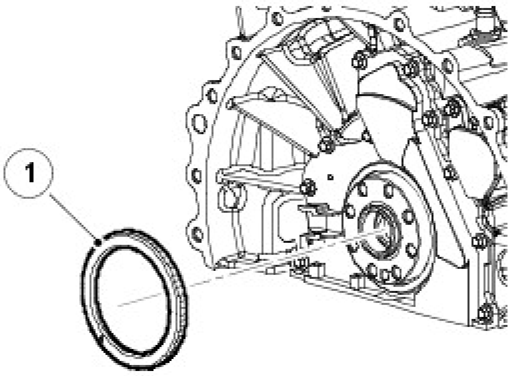
- NOTE: Do not attempt to remove the crankshaft drive pulley unless you have the correct special crankshaft-locking tool.



E44227

Item	Part Number	Description
1	-	Housing
2	-	Seal
3	-	Crankshaft
4	-	Rear oil seal retainer
5	-	Bolt, 10 of

The crankshaft rear oil seal is a press fit in the rear oil seal retainer. The rear oil seal retainer also houses the CKP sensor.



E44228

Item	Part Number	Description
1	-	CKP sensor trigger wheel

The trigger wheel is located on the rear of the crankshaft. It is pressed onto the crankshaft using a special tool, which also precisely aligns the trigger wheel for crankshaft position and timing. The trigger wheel consists of 60 magnets, minus 2 for ECM crankshaft position reference and synchronisation. The magnets cannot be seen on the trigger-wheel; therefore, it can only be positioned using the special tool.

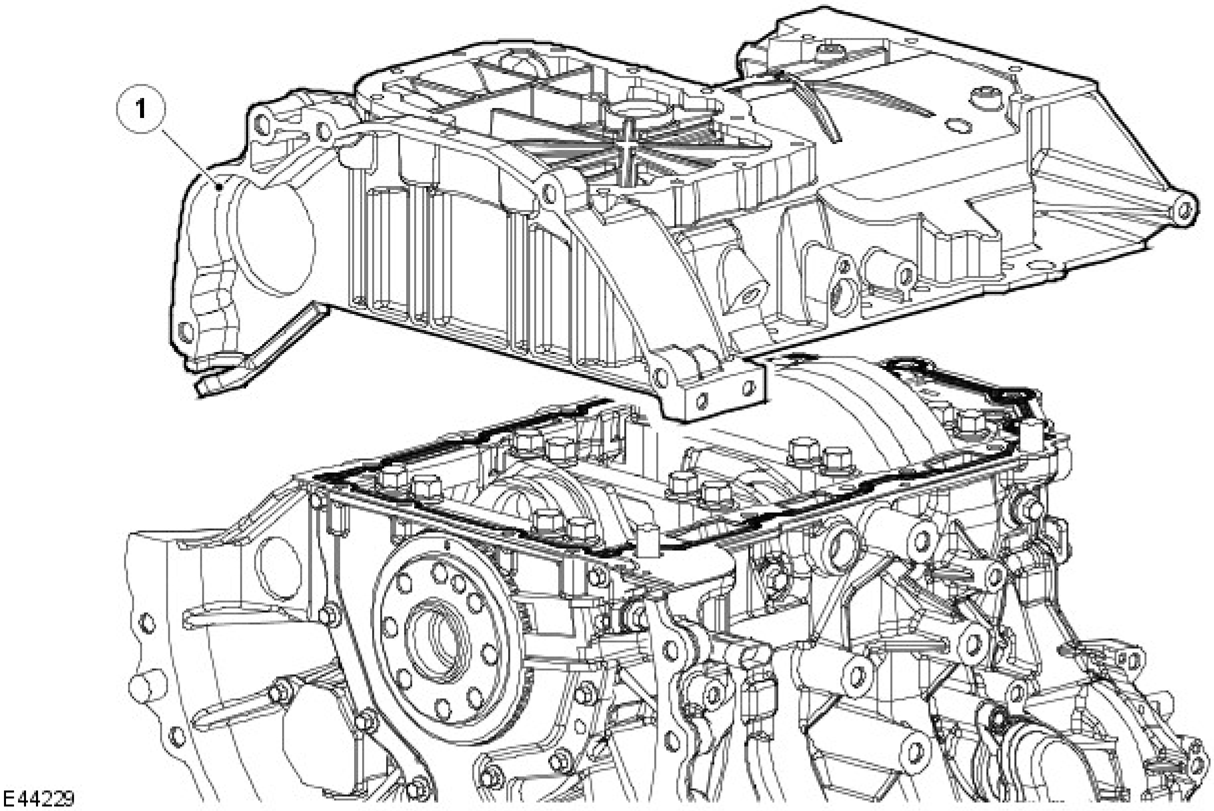
The CKP sensor air gap is 0.4mm to 0.5mm with no adjustment available. The sensor bolts into the rear oil seal retainer and the tolerance on the retainer and sensor give an air gap within the specified range.

- NOTE: If the trigger wheel is removed for any reason, a new trigger wheel must be fitted. Do not reuse the old trigger wheel.

Main Bearings

The main bearings are aluminium/tin split plain selective bearings. An oil groove in the top half of each bearing transfers oil into the crankshaft for lubrication of the connecting rod bearings. The upper and lower shells of bearing number four contain integral thrust washers, which limits the end float of the crankshaft.

Ladder Frame



Item	Part Number	Description
1	-	Ladder frame

The ladder frame is fitted to the lower cylinder block to stiffen the base structure of the engine thus helping to reduce Noise, Vibration and Harshness (NVH). The frame is made of high-pressure die cast aluminium and also incorporates an oil baffle plate to reduce oil foaming and splash.

The ladder frame is secured to the cylinder block with 2 dowels, 2 locator pins for the gasket and 18 retaining bolts; three different lengths of bolts are used:

- M6 x 20, 6 of
- M8 x 75, 4 of
- M6 x 105, 8 of

Iron inserts, cast into the main bearing supports of the ladder frame, minimise main bearing clearance changes due to heat expansion.

A gasket seals the joint between the ladder frame and the cylinder block.

A port for the oil level gage tube is included in the casting on the LH side of the ladder frame.

An oil pick-up pipe with integral strainer locates in the front of the ladder frame to provide oil to the crankshaft driven oil pump.

Sump

The sump consists of a pressed steel oil pan bolted to the aluminium alloy ladder frame with 14 M6 x 16 bolts. The engine oil drain plug and the oil temperature sensor are located at the rear left corner of the sump.

A reusable gasket seals the joint between the oil pan and the ladder frame; a bead of sealant seals the joint between the sump and the ladder frame.

Oil Temperature Sensor

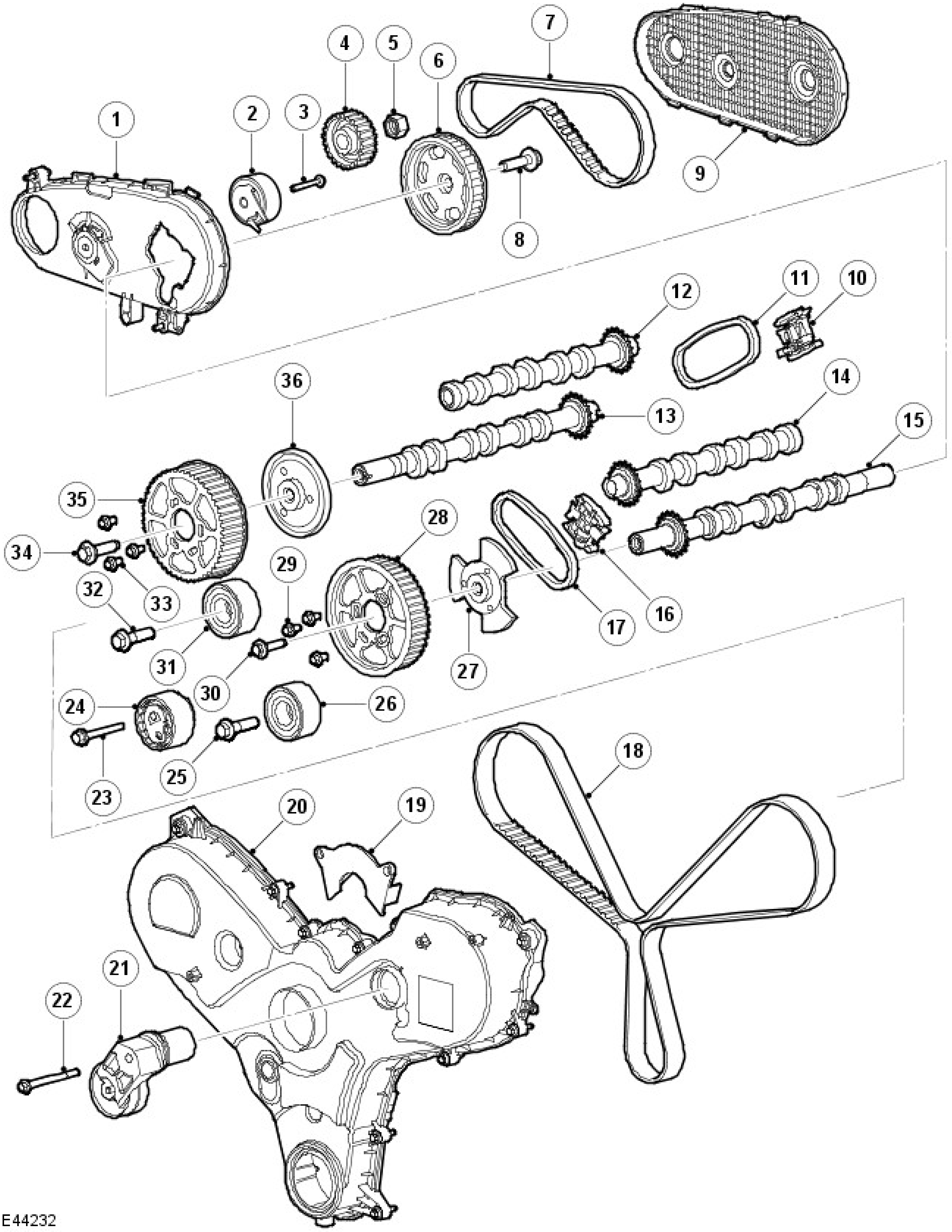
The engine oil temperature sensor is located at the rear left corner of the sump. The sensor provides the ECM and the instrument cluster with the engine oil temperature status.

The sensor circuit consists of an internal voltage divider circuit which, incorporates a Negative Temperature Coefficient (NTC) thermistor. As the engine oil temperature rises the resistance through the sensor decreases and visa versa. The output from the sensor is the change in voltage, as the thermistor allows more current to pass to ground relative to the temperature of the oil. For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

Rear Oil Seal Retainer

The crankshaft rear oil seal retainer is attached to the rear of the cylinder block by ten bolts and is sealed with a rubber seal. The retainer also houses the crankshaft position sensor.

CAMSHAFT TIMING COMPONENTS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E44232

Item	Part Number	Description
1	-	Rear Engine Accessory Drive (READ) rear cover
2	-	READ tensioner
3	-	Bolt
4	-	Fuel pump pulley
5	-	Nut

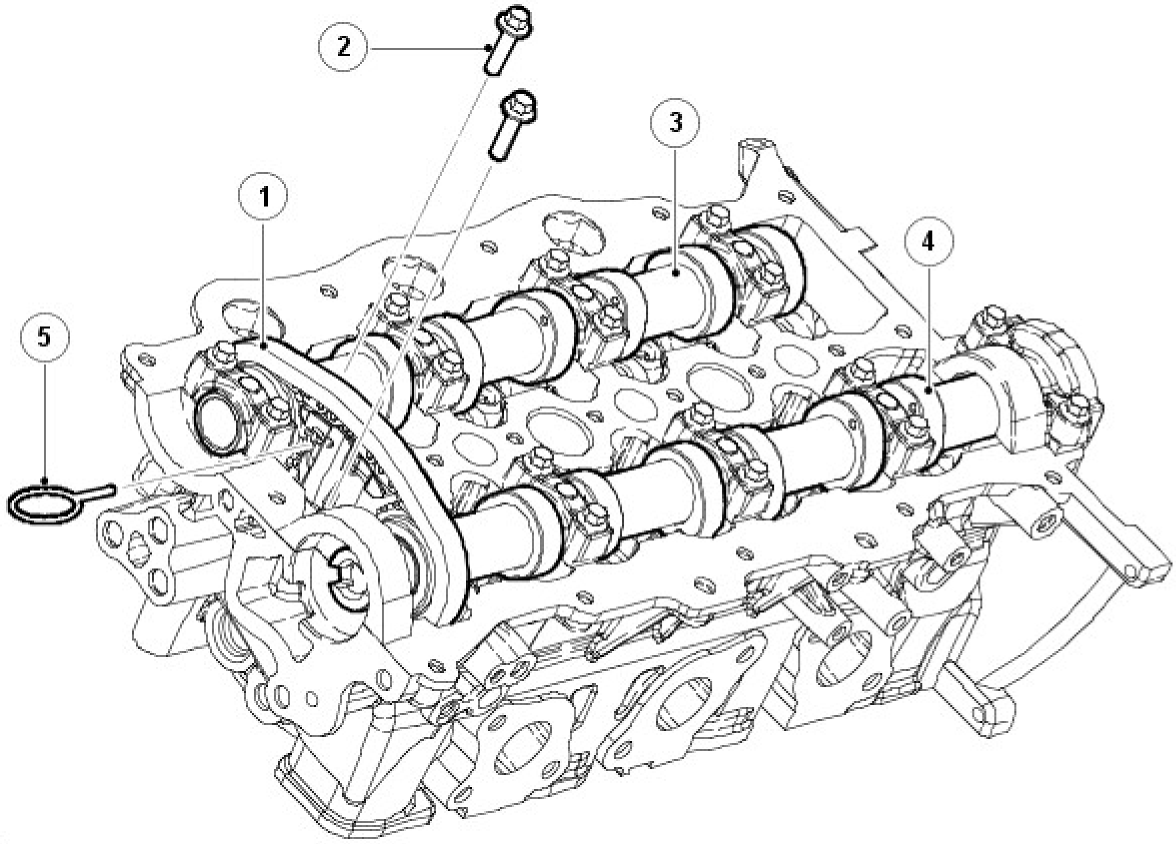
6	-	READ camshaft pulley
7	-	READ belt
8	-	Bolt
9	-	READ front cover
10	-	RH chain tensioner
11	-	RH timing chain
12	-	RH inlet camshaft
13	-	RH exhaust camshaft
14	-	LH inlet camshaft
15	-	LH exhaust camshaft
16	-	LH chain tensioner
17	-	LH timing chain
18	-	Timing belt
19	-	Front cover bridge
20	-	Primary drive cover
21	-	Idler
22	-	Bolt
23	-	Bolt
24	-	Tensioner
25	-	Bolt
26	-	Idler
27	-	Camshaft hub
28	-	LH camshaft timing pulley
29	-	Bolt, 3 of
30	-	Bolt, 1 of
31	-	Idler
32	-	Bolt, 1 of
33	-	Bolt, 3 of
34	-	Bolt, 1 of
35	-	RH camshaft timing pulley
36	-	Camshaft hub

Primary Drive

Primary drive is provided by a single toothed belt from the crankshaft to the exhaust camshaft gears of each cylinder bank via two idler pulleys and a tensioner.

Timing belt adjustment is carried out by an eccentric type tensioner mounted on the RH front face of the cylinder block.

Secondary Drive



E44233

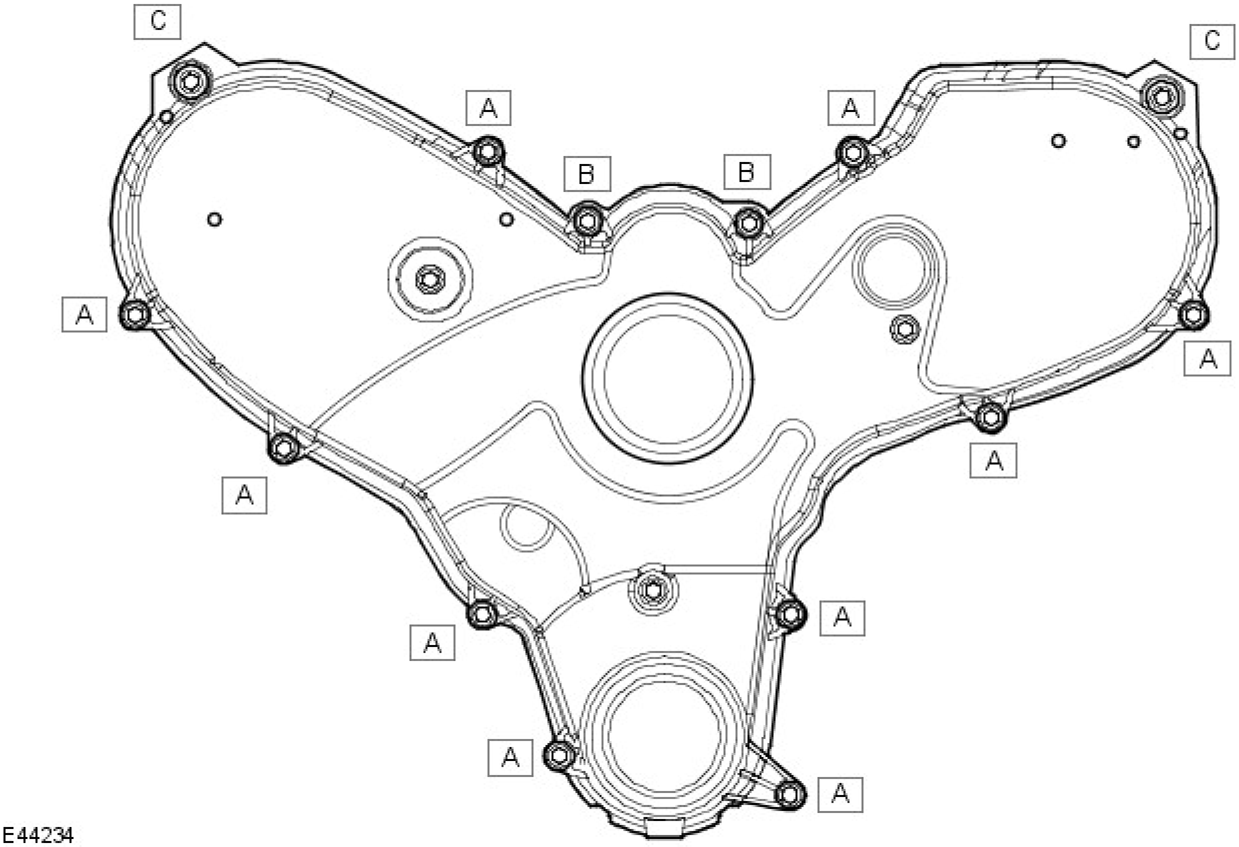
Item	Part Number	Description
1	-	Timing chain
2	-	Bolts
3	-	Inlet camshaft
4	-	Exhaust camshaft
5	-	Tensioner firing pin

Secondary drive is provided by two short crossover chains, which transfer drive from the exhaust camshaft gears to the inlet camshaft gears. The crossover drives are located at the rear of the RH cylinder bank and the front of the LH cylinder bank. This allows for a much shorter and simpler run for the main camshaft drive belt at the front of the engine.

Each crossover chain is tensioned via an automatic chain tensioner, which acts directly on the chains via a guide rail. The tensioners are located between the exhaust and inlet camshafts at the front or rear of the cylinder head, depending on the cylinder bank.

The tensioner firing pin holds the automatic chain tensioner in a compressed state to aid installation.

Timing Cover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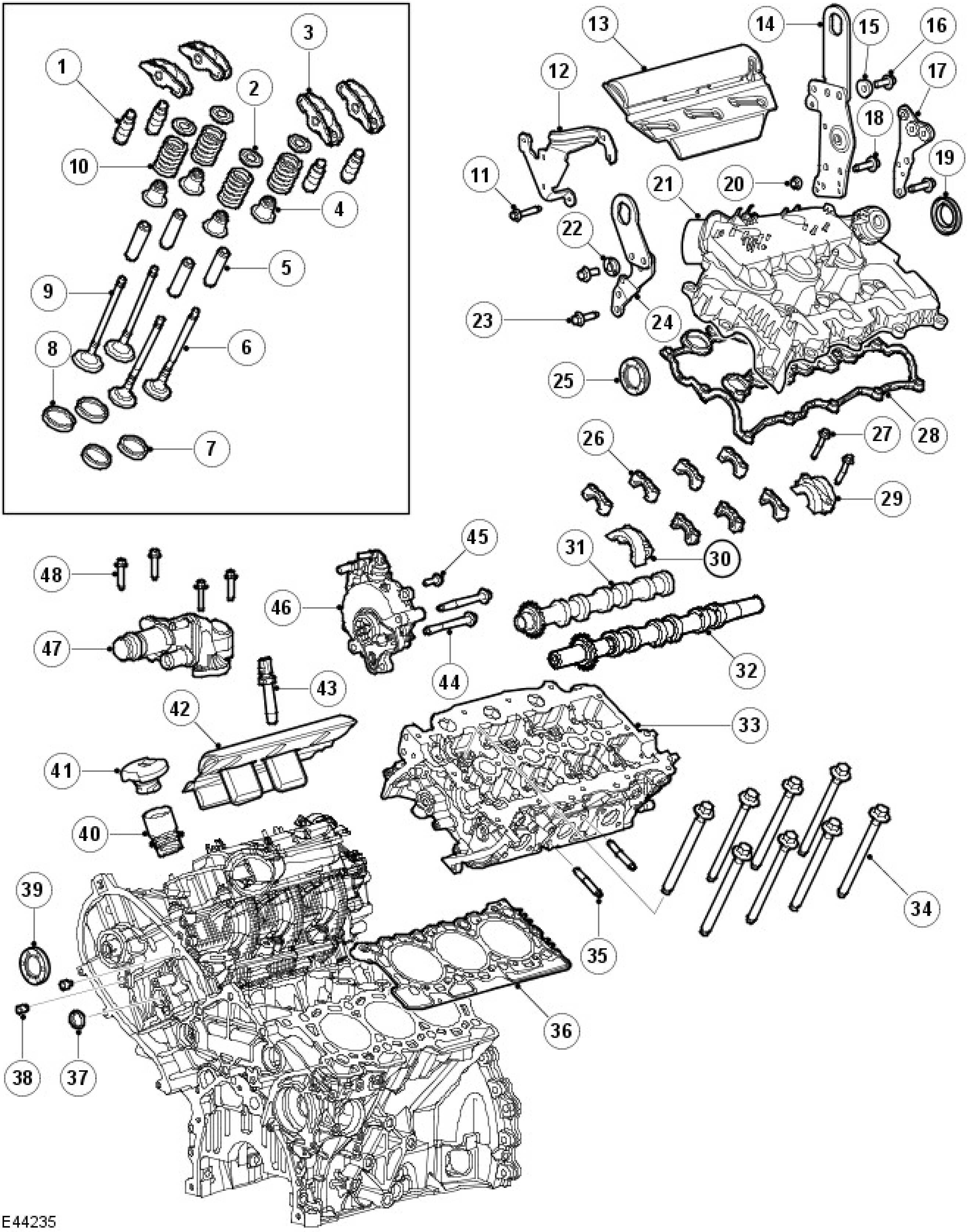
Item	Part Number	Description
A	-	Bolt (M6 x 32), 13 of
B	-	Bolt (M6 x 36), 2 of
C	-	Bolt (M6 x 30), 2 of

The plastic timing cover is bolted to the front of the cylinder block and cylinder heads with sixteen bolts and sealed with a rubber seal.

CYLINDER HEAD COMPONENTS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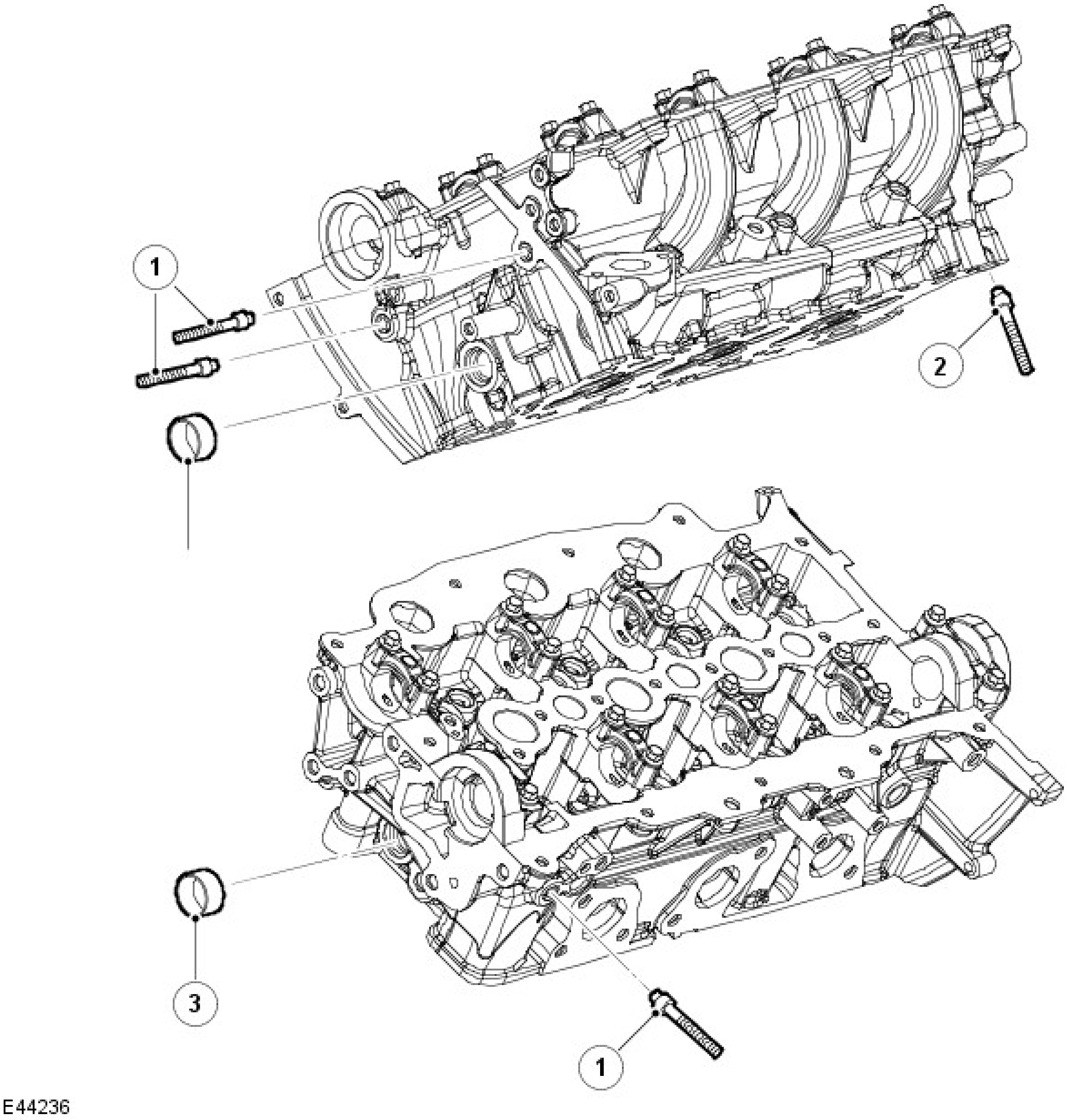
E44235

Item	Part Number	Description
1	-	Hydraulic lash adjusters
2	-	Valve spring retainers
3	-	Roller rockers
4	-	Valve stem seals
5	-	Valve guides

6	-	Exhaust valves
7	-	Intake valve seats
8	-	Exhaust valve seats
9	-	Intake valves
10	-	Valve springs
11	-	Bolt
12	-	Bracket
13	-	Cover
14	-	Lifting eye
15	-	Washer
16	-	Bolt
17	-	Bracket
18	-	Bolt
19	-	Seal
20	-	Cap
21	-	Inlet manifold cover assembly
22	-	Washer
23	-	Bolt
24	-	Lifting eye
25	-	Seal
26	-	Camshaft bearing caps
27	-	Bolts
28	-	Gasket
29	-	Camshaft bearing cap and seal housing
30	-	Camshaft bearing cap and seal housing
31	-	Inlet camshaft
32	-	Exhaust camshaft
33	-	LH cylinder head
34	-	Cylinder head bolts
35	-	Exhaust manifold studs
36	-	LH cylinder head gasket
37	-	Core plug
38	-	Plug
39	-	Seal
40	-	Oil filler tube
41	-	Oil filler cap
42	-	Cover
43	-	Injectors
44	-	Bolts
45	-	Bolt
46	-	Vacuum pump
47	-	Water outlet assembly
48	-	Bolts

Cylinder Heads



Item	Part Number	Description
1	-	Studs
2	-	Bolts
3	-	Blanking plugs

The aluminium gravity die cast cylinder heads are unique to each cylinder bank. Eight deep-seated bolts help reduce distortion and secure each cylinder head to the cylinder block. The cylinder head bolts are located beneath the camshafts, four under the inlet camshaft and four under the exhaust camshaft. Two hollow dowels align each cylinder head with the cylinder block.

- NOTE: The cylinder head bolts are not accessible with the camshafts fitted.

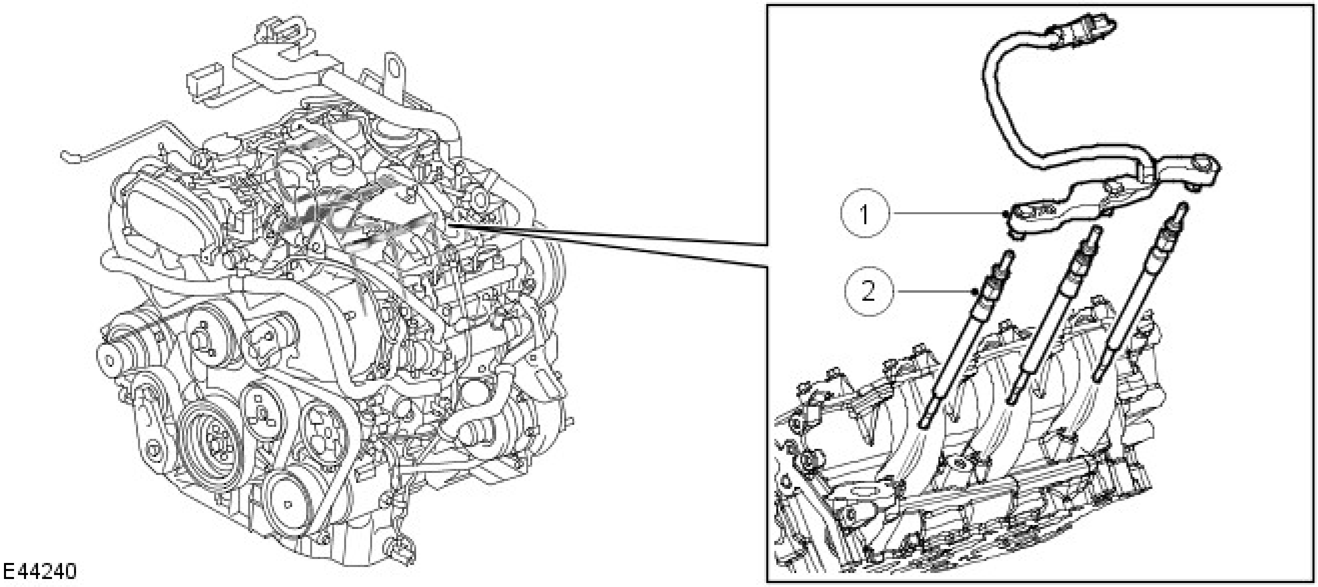
- NOTE: The cylinder head cannot be reworked.

The cylinder head has four ports machined at each cylinder location, two exhaust ports and two inlet ports. One of the inlet ports is helical and functions as a swirl port, the other is arranged laterally as a tangential port and functions as a charge port.

The six fuel injection nozzles are centrally mounted; one above each cylinder and each is fixed to the cylinder head by means of a clamp and two M6 x 35 bolts. For additional information, refer to:

Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation), Fuel Charging and Controls (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Description and Operation).

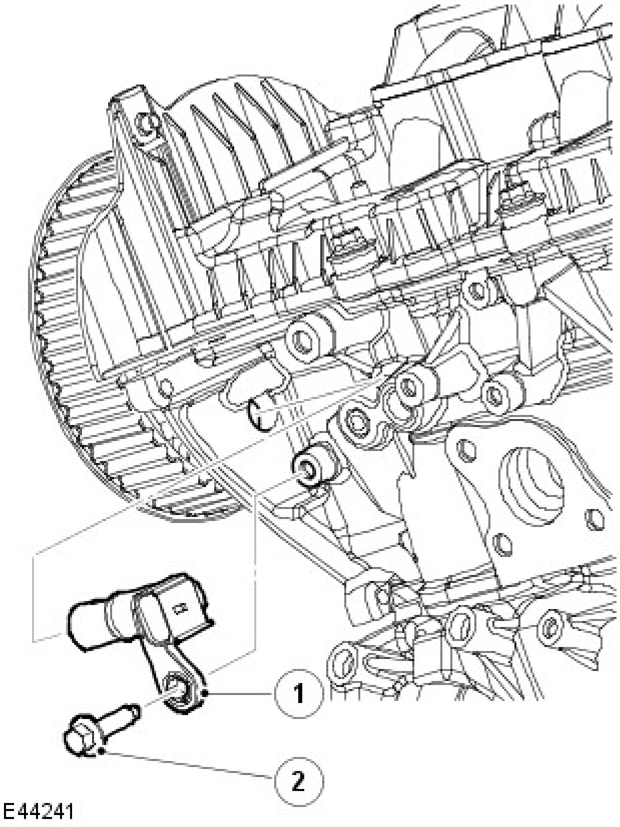
Glowplugs



Item	Part Number	Description
1	-	Harness connector
2	-	Glow plugs

The glow plugs are arranged centrally on the inlet side of the cylinder head, between the two inlet ports of each cylinder. For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

Camshaft Position Sensor

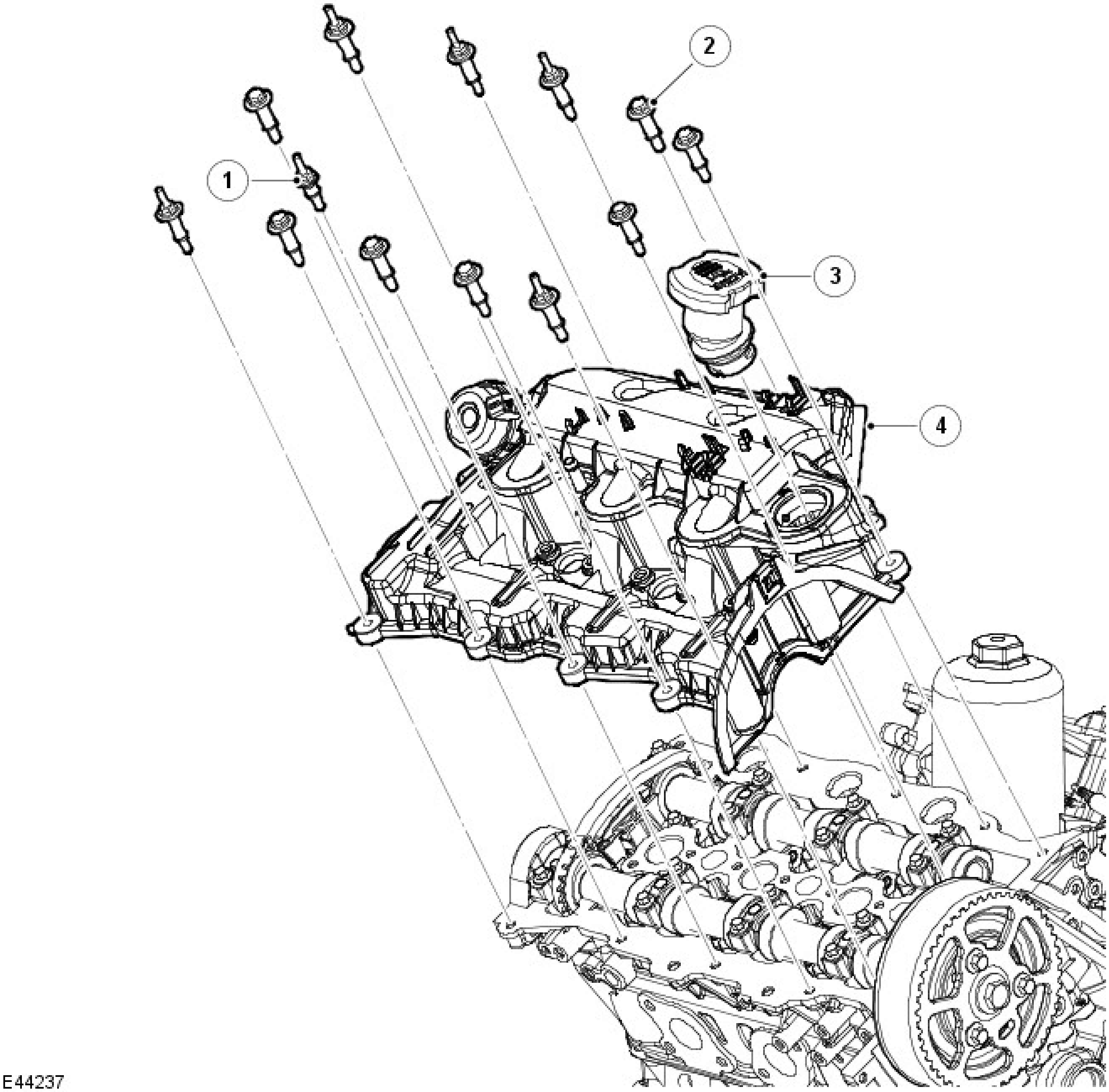


Item	Part Number	Description
1	-	Camshaft Position (CMP) sensor
2	-	Bolt

The CMP sensor locates through a hole in a flange on the front LH side of the LH cylinder head. The exhaust camshaft gear of the LH cylinder head incorporates a trigger wheel, which is used in conjunction with the sensor to measure engine position.
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

The engine lifting eyes are bolted to the cylinder head, one at the front and two at the rear, one per cylinder head.

Camshaft Covers



Item	Part Number	Description
1	-	Stud bolt M6 x 40, 6 of
2	-	Bolt M6 x 40, 7 of
3	-	Oil filler aperture
4	-	RH camshaft cover assembly

The camshaft covers are manufactured from vinyl ester composite. The RH bank camshaft cover incorporates an outlet for the full load engine breather and the engine oil filler cap. The LH bank camshaft cover incorporates an outlet for the part load engine

breather.
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

Silicon rubber in-groove gaskets seal the joints between the camshaft covers and the cylinder heads. Together with spacers and seals on the camshaft cover fasteners, they also isolate the covers from direct contact with the cylinder heads, to reduce noise.

Cylinder Head Gasket

The cylinder head gasket is a three-layer, laminated steel type and is available in five different thickness. The choice of gasket thickness is dependent on the maximum piston protrusion. Gasket thickness is identified by serrations cut into the front end of the gasket.

Gasket Selection Table

Piston Protrusion (mm)	Gasket Thickness (mm)	Identification
0.541 - 0.590	1.12	1
0.591 - 0.640	1.17	2
0.641 - 0.690	1.22	3
0.691 - 0.740	1.27	4
0.741 - 0.790	1.32	5

To calculate the correct cylinder head gasket thickness, each piston must be measured at two points, with an average of the two measurements taken to determine the piston protrusion. The highest of the three measurements will determine the gasket required for that particular cylinder head.

• NOTE: The difference between the maximum and minimum protrusion measurement in any one bank should not be greater than 0.1mm. It is permissible to have a different grade of gaskets between the LH and RH banks.

Camshafts

The camshafts are of a hollow steel tube construction, with pressed on sintered lobes. Each camshaft is retained by aluminium alloy caps, five for the exhaust camshafts and four for the inlet camshafts. Location letters, A to I for the intake camshaft and R to Z for the exhaust camshaft, are marked on the outer faces of the caps for each cylinder head.

The LH cylinder bank exhaust camshaft is machined to accept a rear camshaft gear. The rear camshaft gear provides drive for High Pressure (HP) fuel pump, located centrally at the rear of the 'vee', via a short-toothed belt and tensioner pulley.

The RH cylinder head exhaust camshaft is machined at the rear end to provide a drive connection for the vacuum pump.

• NOTE: The camshaft drive sprockets also form the thrust faces for the camshaft endfloat. In production the endfloat is 0.065mm to 0.185mm. In service, if the endfloat is out of specification, the camshaft(s) or cylinder head(s) may have to be replaced.

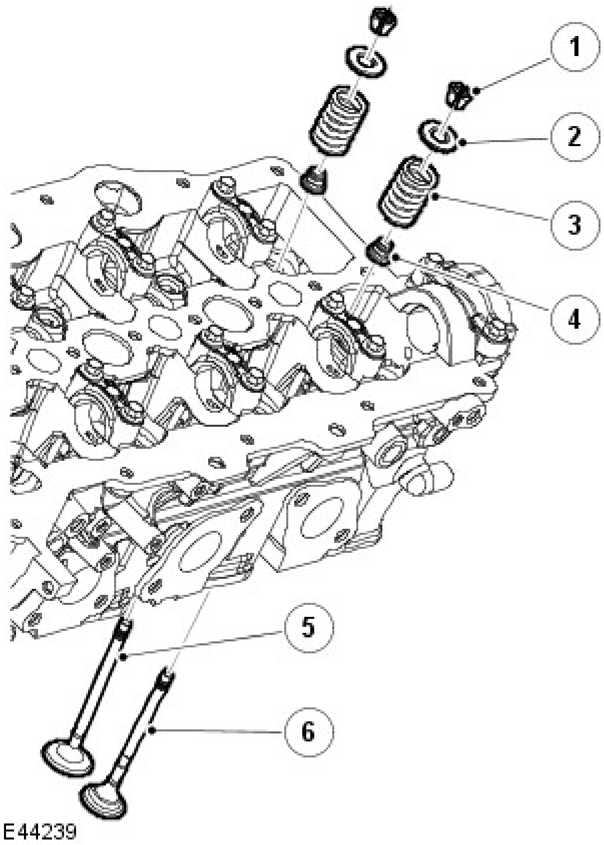
Camshaft Timing

Valve	Position
Inlet valve opens	8.5° BTDC
Inlet valve closes	35.5° ABDC
Exhaust valve opens	64° BBDC
Exhaust valve closes	12° ATDC

Key:

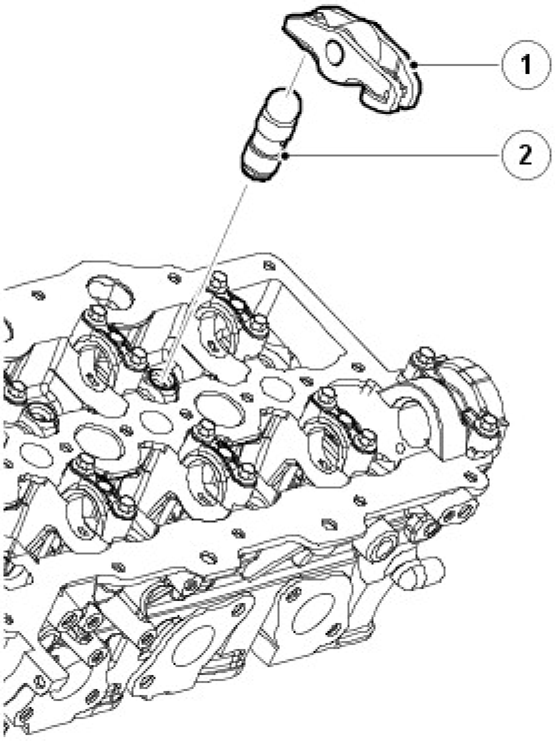
- BTDC = Before Top Dead Center
- ABDC = After Bottom Dead Center
- BBDC = Before Bottom Dead Center
- ATDC = After Top Dead Center.

Inlet and Exhaust Valves



Item	Part Number	Description
1	-	Valve spring collets
2	-	Valve spring retainer
3	-	Valve spring
4	-	Valve stem seal
5	-	Inlet valve
6	-	Exhaust valve

Each cylinder head incorporates two overhead camshafts operating four valves per cylinder via steel roller rockers with hydraulic lash adjusters.

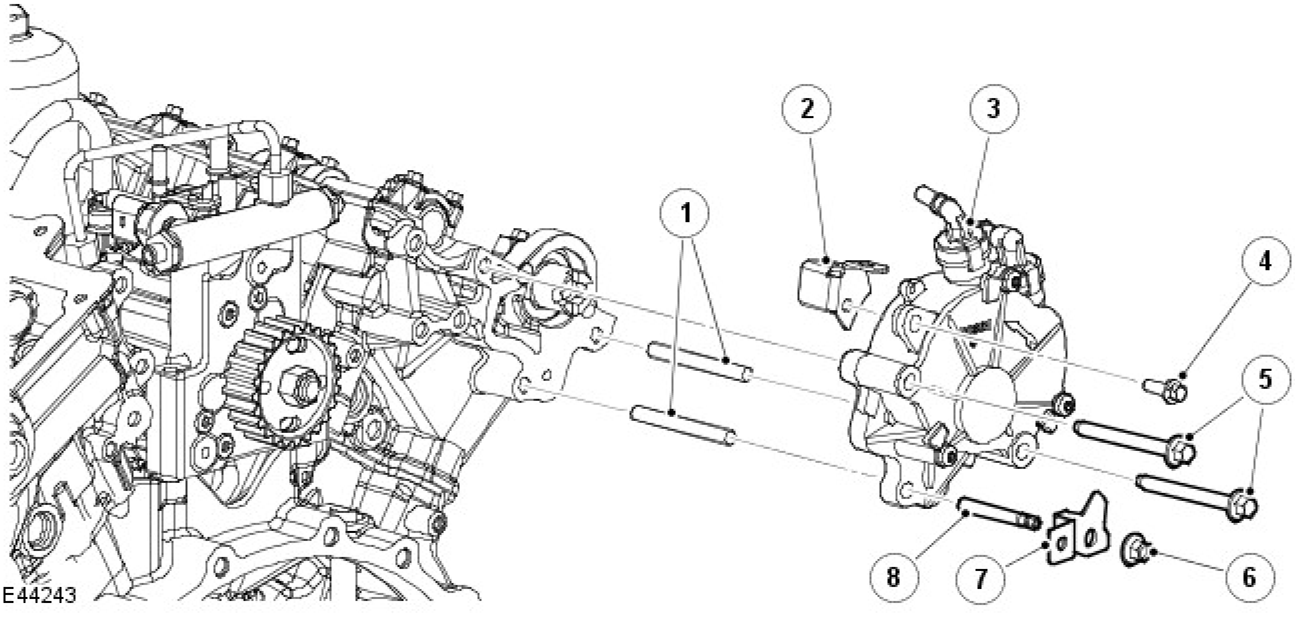


E44238

Item	Part Number	Description
1	-	Roller rocker
2	-	Hydraulic lash adjuster

The lightweight valve gear provides good economy and noise levels. Valve head diameters are 31mm (1.220 in) for the exhaust and 35mm (1.378 in) for the intake. All valves have 5mm (0.197 in) diameter stems supported in sintered metal seats and guide inserts. Collets, valve collars and spring seats locate single valve springs on both intake and exhaust valves. Valve stem seals are integrated into the spring seats.

Vacuum Pump



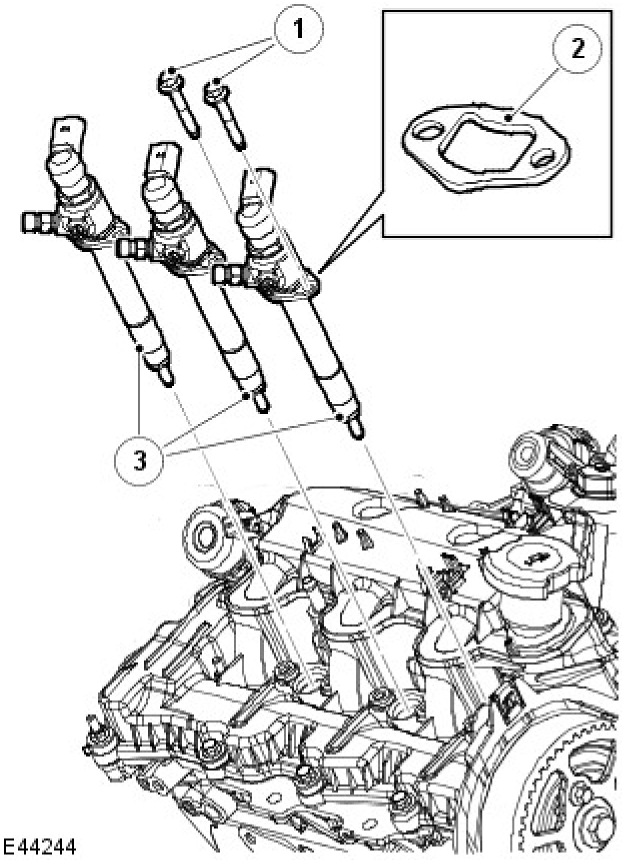
E44243

Item	Part Number	Description
1	-	Location dowels

2	-	Bracket
3	-	Vacuum pump
4	-	Bolt
5	-	Bolts
6	-	Nut
7	-	Bracket (transmission breather hose)
8	-	Stud

The vacuum pump is located at the rear of the RH side cylinder head and is driven from the exhaust camshaft.

Fuel Injectors



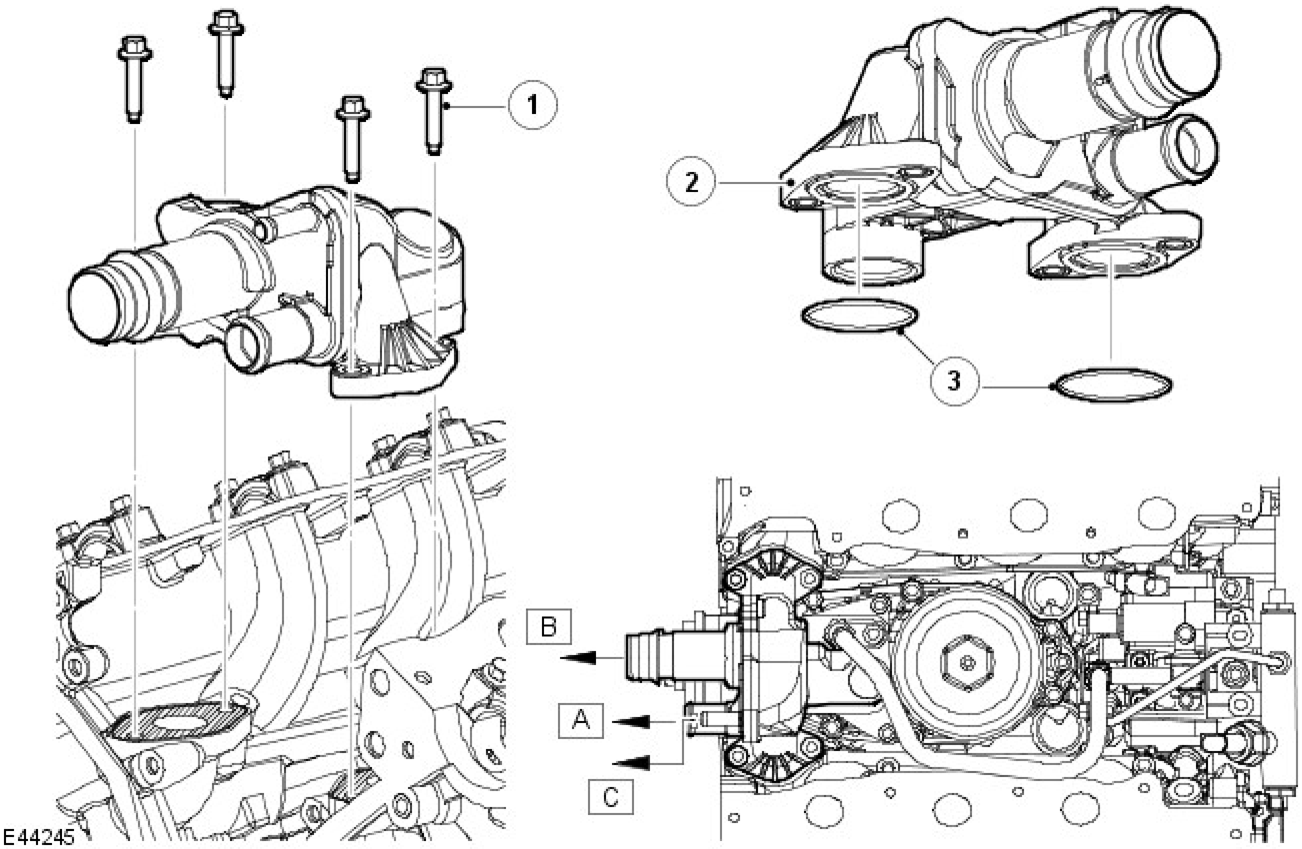
Item	Part Number	Description
1	-	Bolt, 2 per injector
2	-	Clamp
3	-	Injectors

The fuel injectors inject the quantity of fuel required for all the engine operating conditions into the combustion chambers. The quantity of fuel injected during each working cycle is composed of a noise-reducing pilot injection phase and a main injection phase.

The six, side fed, piezo electrically controlled fuel injectors are installed in the fuel rails. The start of fuel injection and the quantity of fuel injected is controlled directly by the ECM. Two O-rings seal each injector to the manifold interface. For additional information, refer to:

Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation),
Fuel Charging and Controls (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Description and Operation).

Water Outlet Assembly



Item	Part Number	Description
1	-	Bolt, 4 of
2	-	Water outlet assembly
3	-	Seals
A	-	Water outlet housing assembly, EGR outlet
B	-	Water outlet housing assembly, radiator outlet
C	-	Water outlet housing assembly, bleed valve

The water outlet assembly connects the cooling channels of the cylinder block to the cooling channels of the LH and RH cylinder heads and provides the coolant outlet for the EGR and coolant return.

LUBRICATION SYSTEM

General

Oil is drawn from the reservoir in the oil pan and pressurised by the oil pump. The output from the oil pump is then filtered and distributed through internal oil passageways.

All moving parts are lubricated by pressure or splash oil. Pressurised oil is also provided for operation of the hydraulic adjusters and the timing gear chain tensioners.

The engine is lubricated by a force-feed oil circulation system with a full flow oil filter. The oil cooler forms a unit with the oil filter and fuel cooler, which is mounted centrally in the middle of the cylinder block between the two banks of cylinders. The engine oil is cooled using the engine cooling system. This eliminates the need for an additional engine oil cooler remotely mounted.

The fuel cooler, which forms part of the oil filter body, is also cooled by engine coolant. In addition there is a further fuel cooler in the return line to the fuel tank.

Oil returns to the oil pan under gravity. Large drain holes through the cylinder heads and cylinder block ensure the quick return of the oil, reducing the volume of oil required and enabling an accurate check of the contents soon after the engine stops.

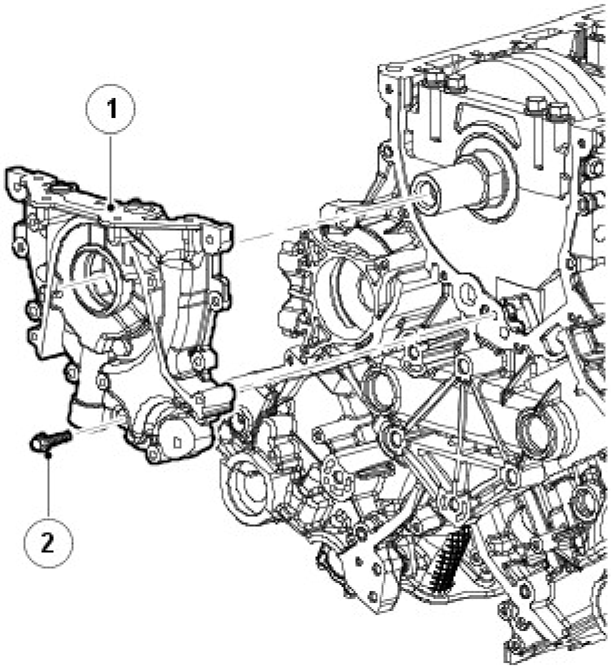
System replenishment is through the oil filler cap on the RH camshaft cover.

With the exception of the pump and level gauge, all oil system components are installed on the sump.

Oil Pick-up

The moulded composite oil pick-up is immersed in the oil reservoir to provide a supply to the oil pump during all normal vehicle attitudes. The castellated inlet allows the supply to be maintained even if the sump pan is deformed (e.g. by 'grounding'). A mesh screen in the inlet prevents debris from entering the oil system.

Oil Pump



E44230

Item	Part Number	Description
1	-	Oil pump
2	-	Bolt

The oil pump is a gear type pump and is bolted and dowelled to the front of the engine block. It is sealed by means of a rubber gasket, which is recessed into the oil pump housing. The pump inlet and outlet ports align with oil passages in the ladder frame.

The pumping element is an eccentric rotor, which is directly driven by flats on the crankshaft. An integral pressure relief valve regulates pump outlet pressure at 4.5 Bar (65.25 Psi).

The front crankshaft oil seal is housed in the oil pump casing and is fitted such that its front face is 1mm underflush with the machined front face of the oil pump.

• NOTE: The seal is not to be pushed all the way into the bore as this will block the seal drains.

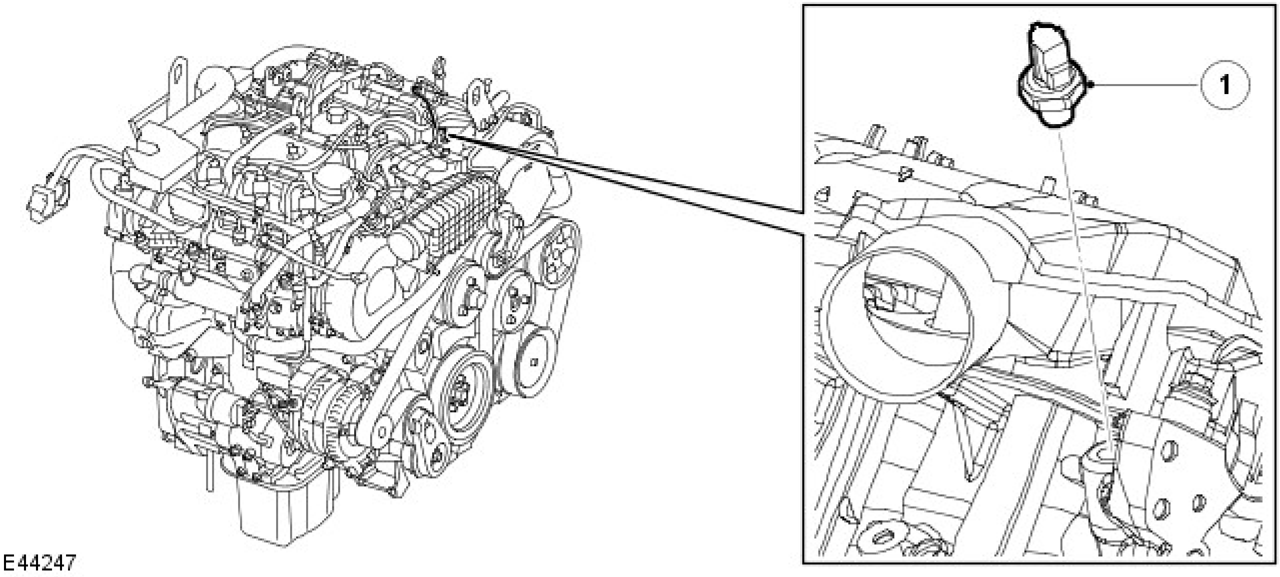
Oil Filter

The oil filter is a replaceable cartridge installed on an adapter in the centre of the 'vee'. An internal bypass facility permits full flow bypass if the filter is blocked.

• NOTE: In service care must be taken when removing the oil filter to minimise oil drips and spillage into the engine 'vee' and cam covers:

- Do not use air/power tools
- Unscrew oil filter cap 4-5 turns
- Leave for a minimum of 1 minute to allow to drain
- Remove cap, ensuring minimal oil spillage
- Replace oil filter element into the cap (can only be fitted in one direction)
- Replace cap and torque to specification.

Oil Pressure Switch



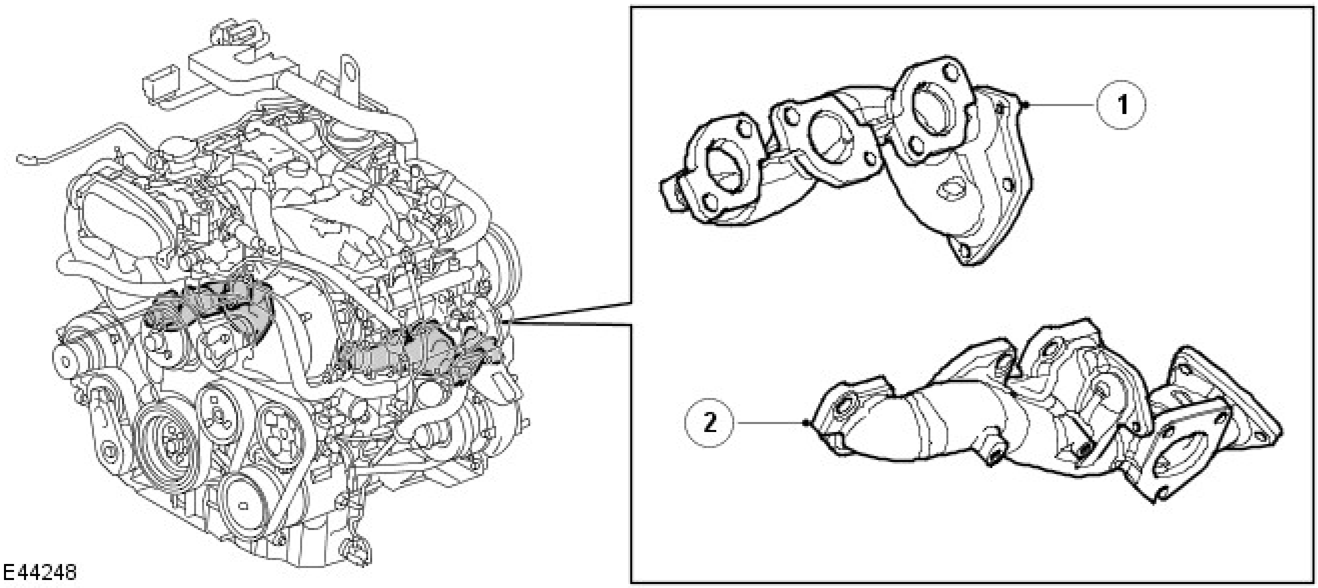
Item	Part Number	Description
1	-	Oil pressure switch

The oil pressure switch, located in the 'vee' at the front of the LH cylinder head, connects a ground input to the instrument cluster when oil pressure is present. The switch operates at a pressure of 0.15 to 0.41 Bar (2.2 to 5.9 Psi).

Oil Level Gage

The oil level gage locates midway along the LH side of the oil pan, supported in a tube installed in the ladder frame. Two holes in the end of the gage indicate the minimum and maximum oil levels. There is a difference of approximately 1 litre (1 US quart) between the two levels.

EXHAUST MANIFOLD



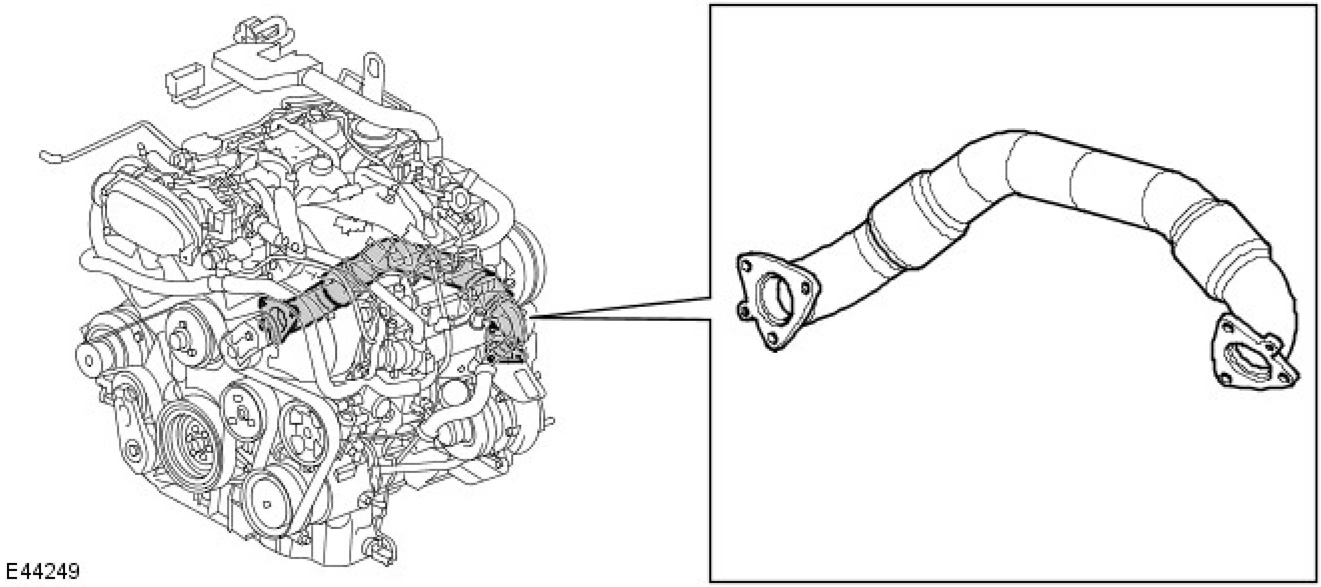
Item	Part Number	Description
1	-	LH exhaust manifold
2	-	RH exhaust manifold

The exhaust manifolds are cast from steel alloy and are unique for each cylinder bank. They are sealed to the cylinder head by means of a steel gasket. Sacrificial plastic sleeves are used to align the manifolds. These sleeves must be changed when refitting the manifolds. Spacers on the securing bolts allow the manifolds to expand and retract with changes of temperature while maintaining the clamping loads.

Each manifold has a connection for the EGR transfer pipe.

The engine is fitted with a Variable Geometry Turbocharger (VGT), which is fixed to the exhaust manifold by a three-hole flange with a steel gasket.

Crossover Pipe



E44249

A crossover pipe carries the exhaust gasses from the RH exhaust manifold to the turbocharger on the LH exhaust manifold. The crossover pipe is located at the rear of the engine and is routed across the top of the transmissions bell housing.

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Engine

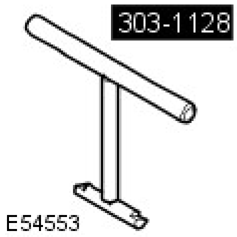
Diagnosis and Testing

For additional information,
REFER to: Engine - TDV8 3.6L Diesel (303-00 Engine System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Engine Oil Draining and Filling

General Procedures

Special Tool(s)	
	Oil filter element remover 303-1128

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

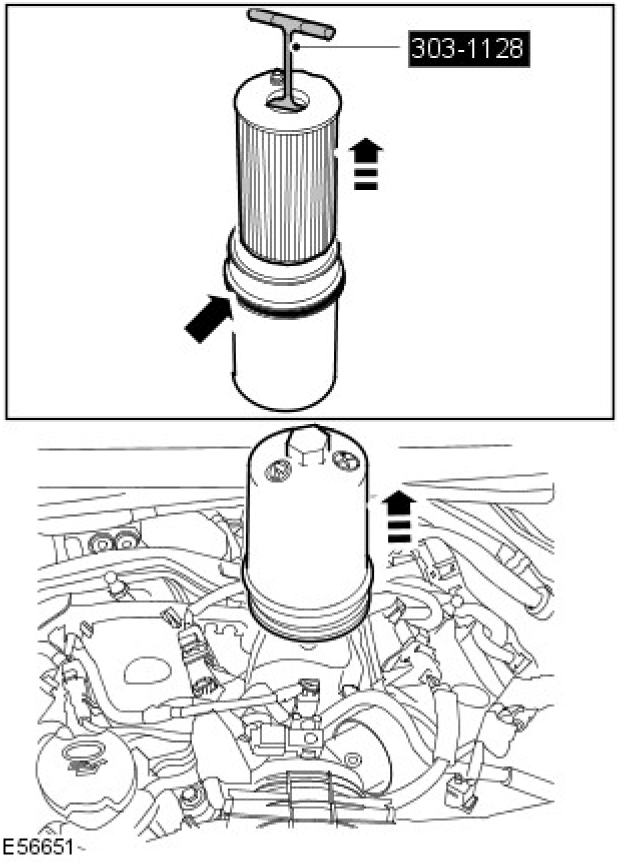
   Raise and support the vehicle.

3. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

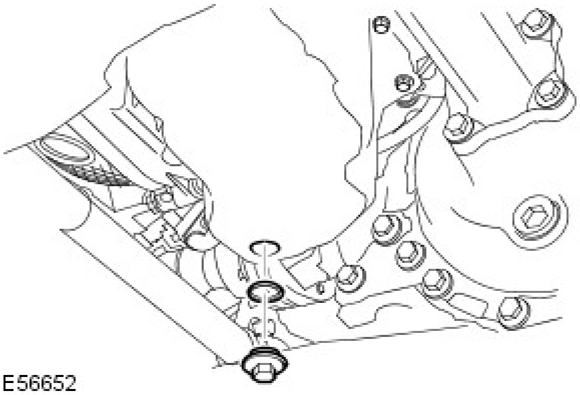
4. ⚠ CAUTION: When removing the oil filter assembly, make sure the fuel temperature sensor is not damaged.

   Using the special tool, remove the oil filter element.

   - Loosen the element cover 4 complete turns to allow engine oil to drain from the filter cover.
   - Remove element cover.
   - Remove and discard the O-ring seal.



5. Remove the engine undershield.
   For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



E56652

6. Remove the lubricant drain plug.

- Position a container to collect the fluid.
- Discard the oil pan drain plug seal.

7. Install the lubricant drain plug.

- Clean the component mating faces.
- Install a new sealing washer.
- Tighten the drain plug to 25 Nm (18 lb.ft).

8. Install the oil filter element.

- Clean the components.
- Make sure the oil filter element spigot aligns with the hole in the filter housing.
- Install a new O-ring seal.
- Tighten the element cover to 25 Nm (18 lb.ft).

9. Fill the engine with oil.

10. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

11. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

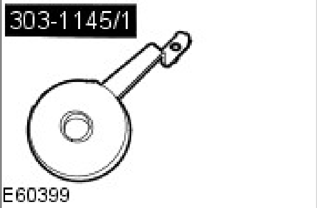
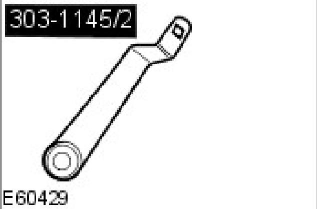
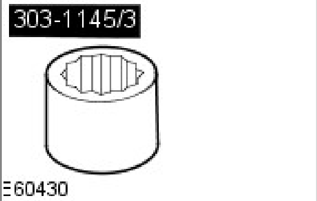
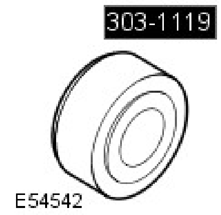
12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

13. Check and top-up the engine oil.

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Camshafts LH

In-vehicle Repair

Special Tool(s)	
	Camshaft pulley holding tool 303-1145/1
	Camshaft pulley bolt remover 303-1145/2
	Camshaft pulley bolt socket 303-1145/3
	Installer - Camshaft Oil Seal 303-1119

Materials

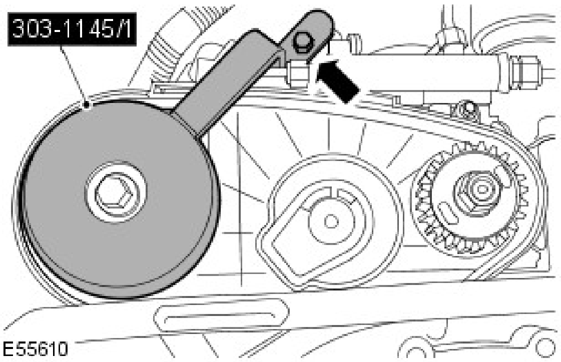
Name	Specification
Loctite 242	ESK-M4G247-A1

Removal

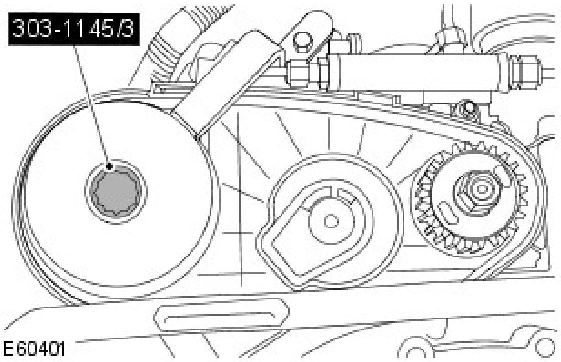
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the camshaft front seal.
   For additional information, refer to: Camshaft Front Seal (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).
3. Remove the LH valve cover.
   For additional information, refer to: Valve Cover LH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).
4. Remove the fuel injection pump belt.
   For additional information, refer to: Fuel Injection Pump Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

5. Install the special tool to the camshaft rear pulley.

- Rotate the crankshaft to align the special tool to the engine lifting bracket.
- Install the special tool retaining bolt.

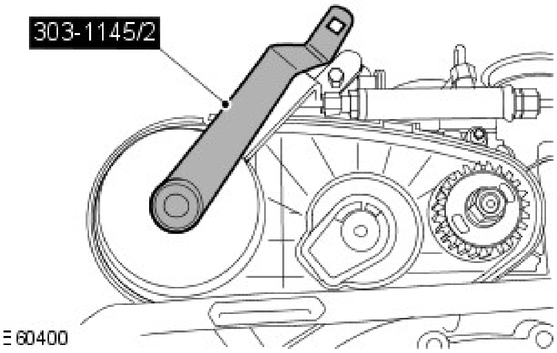

303-1145/1
E55610

6. Install the special tool to the camshaft rear pulley retaining bolt.


303-1145/3
E60401

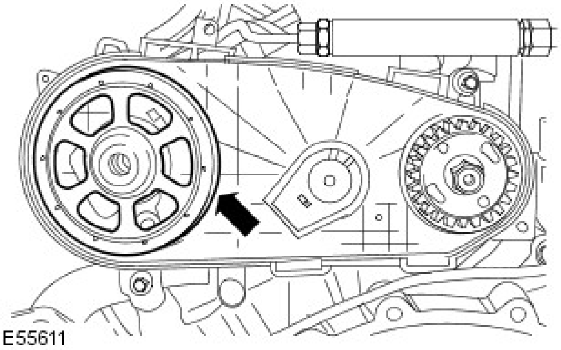
7. Using the special tools, remove and discard the camshaft rear pulley retaining bolt.

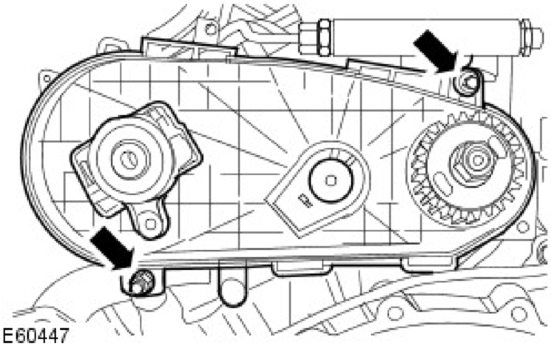
- Rotate the crankshaft clockwise to retain the camshaft rear pulley.


303-1145/2
E60400

8. Remove the special tools.

9. Remove the camshaft rear pulley.

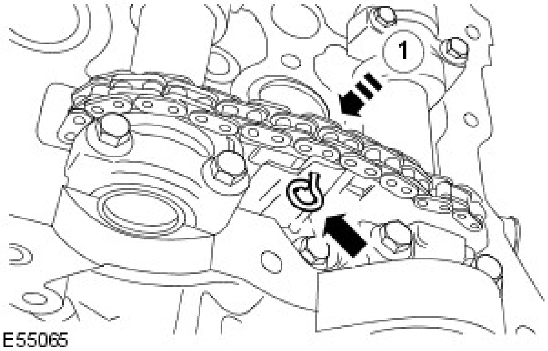




E60447

10. Remove the fuel injection pump belt rear cover.

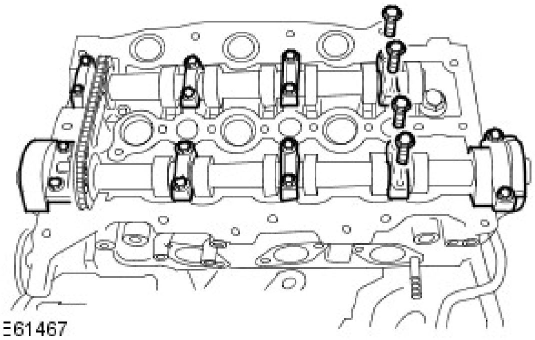
- Remove the fuel injection pump belt rear cover retaining bolt.



E55065

11. Retain the secondary timing chain tensioner piston.

- Reposition the secondary timing chain tensioner.
- Install a 1.5 mm (0.060 in.) diameter pin into the secondary timing chain tensioner piston.

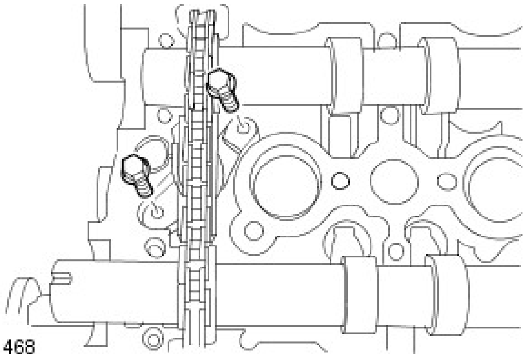


E61467

12. ⚠CAUTION: Evenly and progressively, release the camshaft bearing caps.

Remove the camshaft bearing caps.

- Remove the 18 retaining bolts.

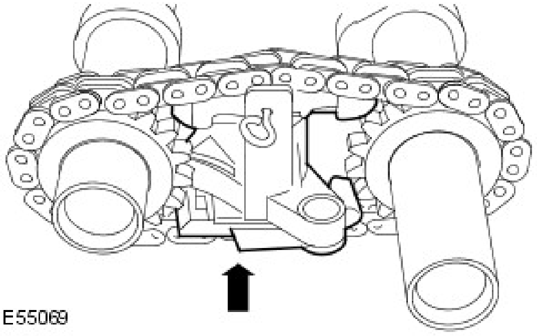


E61468

13. Remove the camshafts and secondary timing chain tensioner assembly.

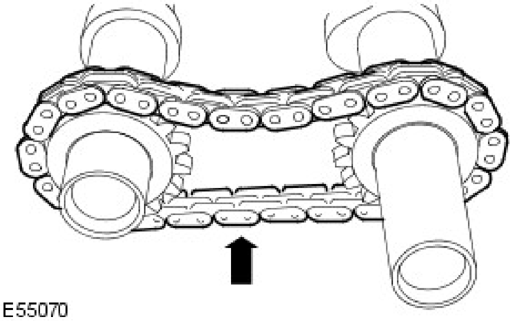
- Remove the two retaining bolts.
- Release the LH secondary timing chain tensioner.

14. Remove the secondary timing chain tensioner.


E55069

15. Remove the LH camshafts.

- Release the secondary timing chain from the LH camshafts.
- Remove and discard the LH camshaft rear seal.


E55070

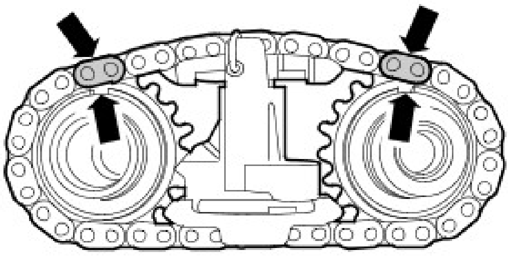
Installation

1. Install the secondary timing chain onto the camshafts.

2. ⚠CAUTION: Do not release the secondary timing chain tensioner locking pin until all of the camshaft bearing caps have been installed.

Install the secondary timing chain tensioner.

- Align the marks on the camshafts with the marks on the secondary timing chain.

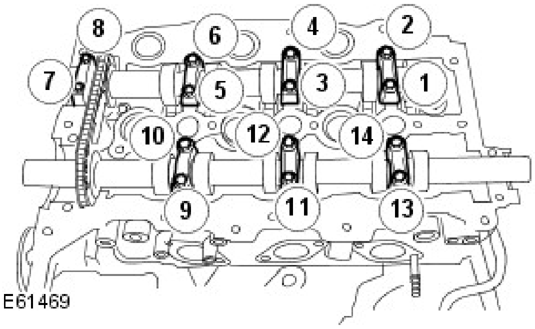

E55062

3. Install the camshafts and secondary timing chain tensioner assembly.

- Lubricate the journals and camshaft lobes.

4. Attach the LH secondary timing chain tensioner.

- Tighten the two retaining bolts to 10 Nm (7 lb.ft).


8
6
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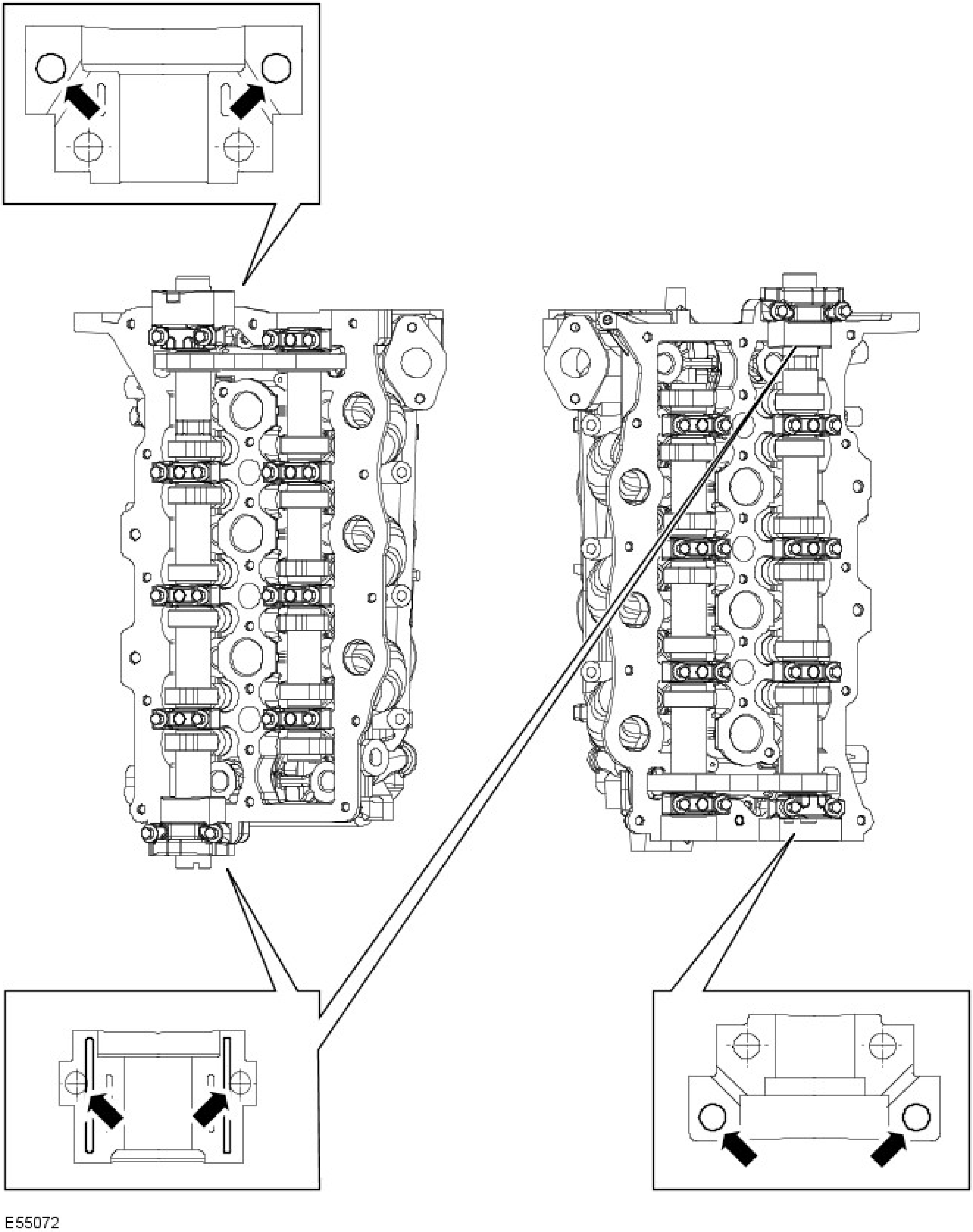
13
E61469

5. Install the camshaft bearing caps.

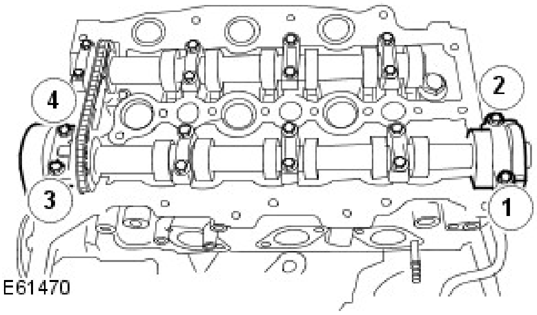
- Do not install the two exhaust camshaft end bearing caps at this stage.
- Tighten the bolts evenly in three stages in the sequence shown.
- Stage one: Tighten to 1 Nm (1 lb.ft).
- Stage two: Tighten to 5 Nm (4 lb.ft).
- Stage three: Tighten to 10 Nm (7 lb.ft).



6. Apply sealant to the two exhaust camshaft end bearing caps at the positions shown.
For additional information, refer to: Specifications (303-01C Engine - TDV6 2.7L Diesel, Specifications).

7. Install the exhaust camshaft end bearing caps.

- Tighten the bolts evenly in three stages in the sequence shown.
- Stage one: Tighten to 1 Nm (1 lb.ft).
- Stage two: Tighten to 5 Nm (4 lb.ft).
- Stage three: Tighten to 10 Nm (7 lb.ft).



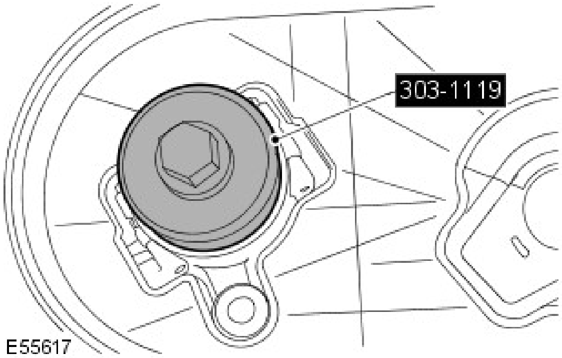
8. Release the secondary timing chain tensioner piston.

- Remove the locking pin.

9. Install the fuel injection pump belt rear cover.

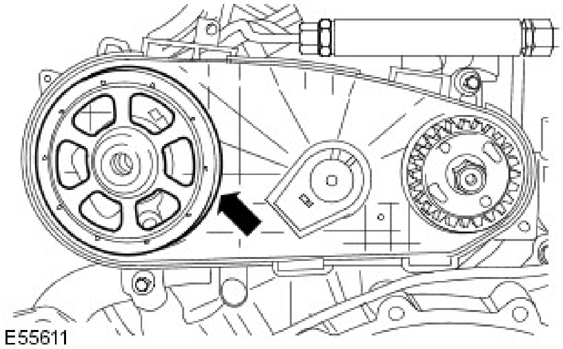
- Install the fuel injection pump belt rear cover retaining bolt.

10. Using the special tool, install the new camshaft rear seal.



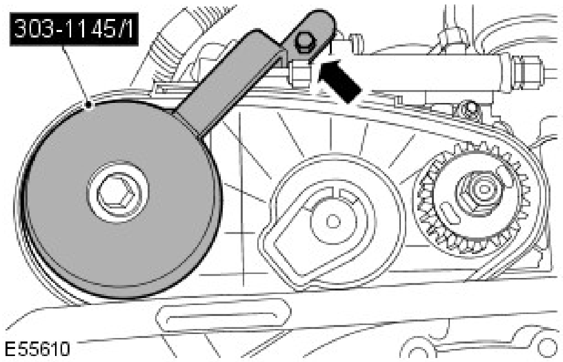
11. Install the camshaft rear pulley.

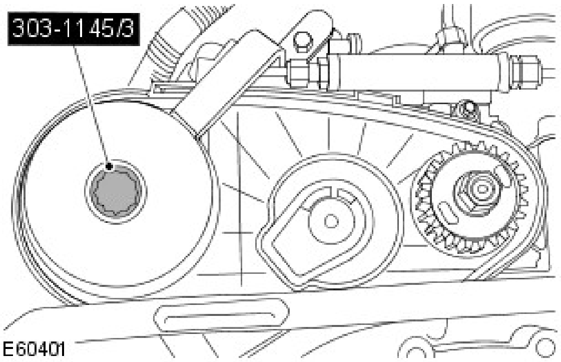
- Apply loctite 242 to the new camshaft pulley bolt.
- Install a new camshaft pulley retaining bolt.



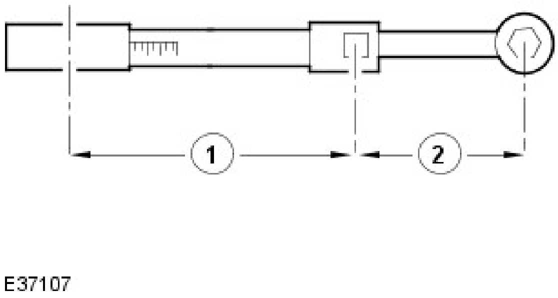
12. Install the special tool to the camshaft rear pulley.

- Install the special tool retaining bolt.





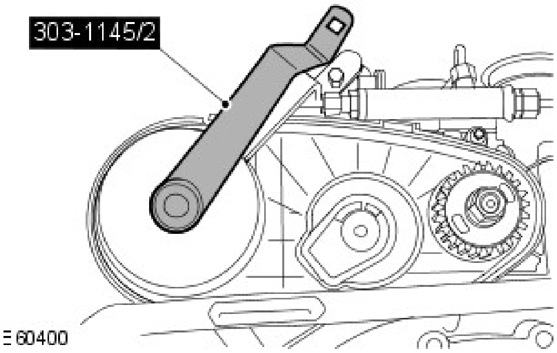
13. Install the special tool to the camshaft rear pulley retaining bolt.



14. ⚠ CAUTION: Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.

Calculate the setting for the torque wrench.

- Stage 1: Multiply the required torque by the effective length of the torque wrench (1).
- Stage 2: Add the effective length of the special tool (2) to the effective length of the torque wrench.
- Stage 3: Divide the total of stage 1 by the total of stage 2.
- Stage 4: Set the torque wrench to the figure arrived at in stage 3.



15. ⚠ CAUTION: Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.

Using the special tools, tighten the camshaft rear pulley retaining bolt to 40 Nm (30 lb.ft).

16. ⚠ CAUTION: Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.

Using the special tools, tighten the camshaft rear pulley bolt a further 75 Nm (56 lb.ft).

- Rotate the crankshaft counter-clockwise to retain the camshaft rear pulley.

17. Remove the special tools.

18. Install the fuel injection pump belt.
For additional information, refer to: Fuel Injection Pump Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

19. Install the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

20. Install the camshaft front seal.
For additional information, refer to: Camshaft Front Seal (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

21. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

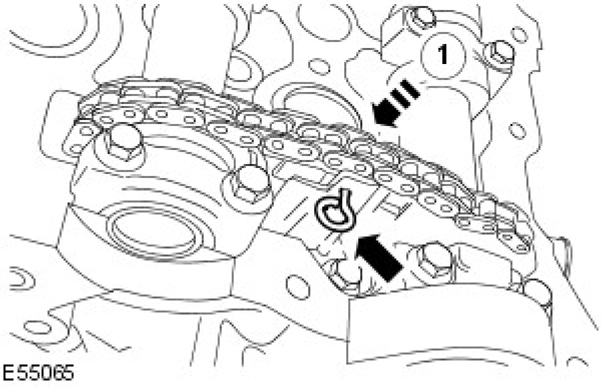
Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Camshaft RH

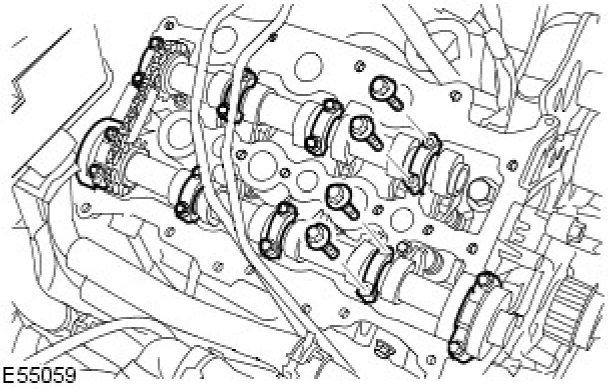
In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the camshaft front seal.
   For additional information, refer to: Camshaft Front Seal (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).
3. Remove the brake vacuum pump.
   For additional information, refer to: Brake Vacuum Pump - TDV6 2.7L Diesel (206-07 Power Brake Actuation, Removal and Installation).
4. Remove the RH valve cover.
   For additional information, refer to: Valve Cover RH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).
5. Retain the secondary timing chain tensioner piston.



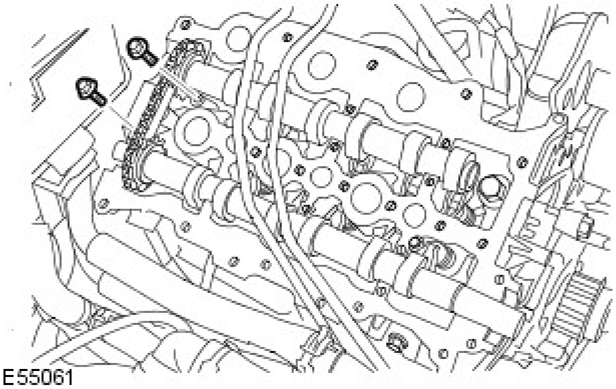
- Reposition the secondary timing chain tensioner.
- Install a 1.5 mm (0.060 in.) diameter pin into the secondary timing chain tensioner piston.



6. ⚠ CAUTION: Evenly and progressively, release the camshaft bearing caps.

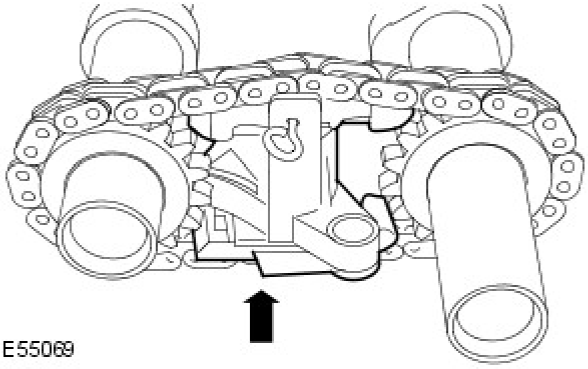
   Remove the camshaft bearing caps.

   - Remove the 18 retaining bolts.

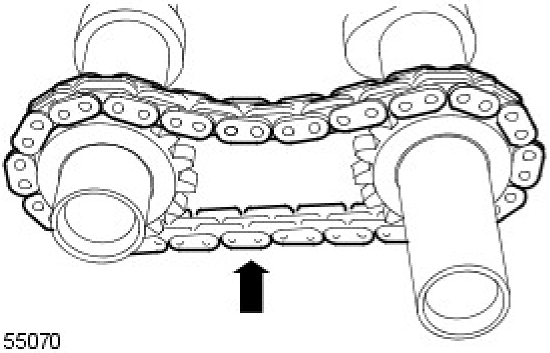

E55061

7. Remove the camshafts and secondary timing chain tensioner assembly.

- Remove the two retaining bolts.
- Release the RH secondary timing chain tensioner.


E55069

8. Remove the secondary timing chain tensioner.

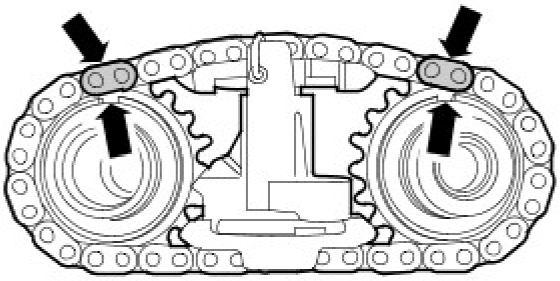

E55070

9. Remove the RH camshafts.

- Release the secondary timing chain from the RH camshafts.

Installation

1. Install the secondary timing chain onto the camshafts.



E55062

2. ⚠ CAUTION: Do not release the secondary timing chain tensioner locking pin until all of the camshaft bearing caps have been installed.

Install the secondary timing chain tensioner.

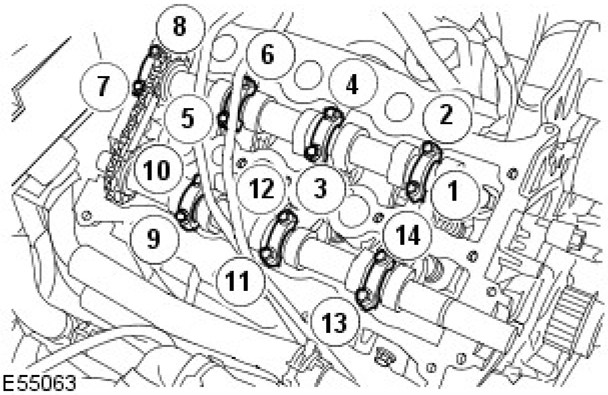
- Align the marks on the camshafts with the marks on the secondary timing chain.

3. Install the camshafts and secondary timing chain tensioner assembly.

- Lubricate the journals and camshaft lobes.

4. Attach the RH secondary timing chain tensioner.

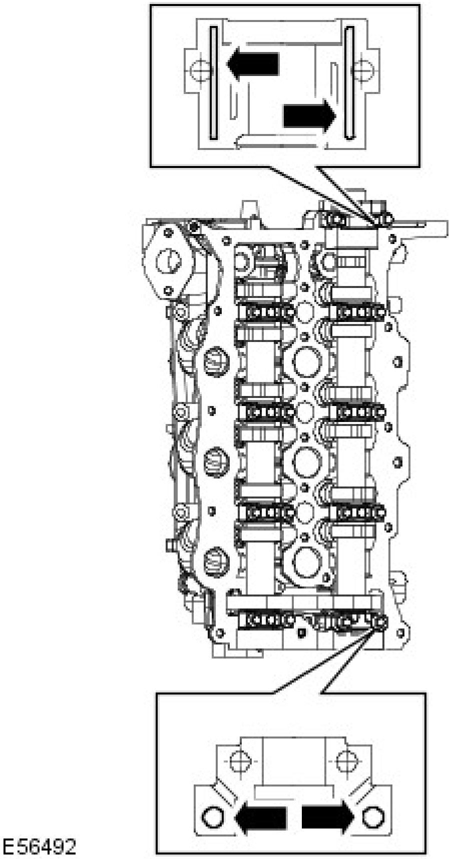
- Tighten the two retaining bolts to 10 Nm (7 lb.ft).



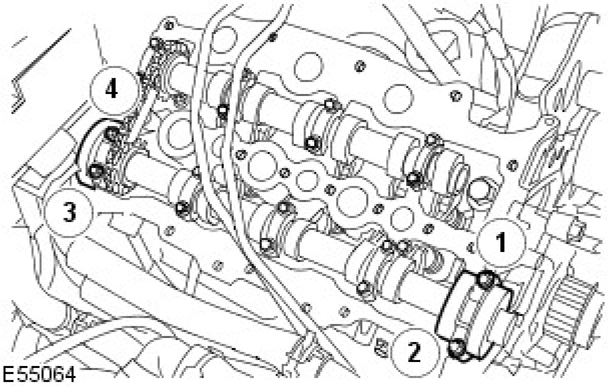
E55063

5. Install the camshaft bearing caps.

- Do not install the two exhaust camshaft end bearing caps at this stage.
- Tighten the bolts evenly in three stages in the sequence shown.
- Stage one: Tighten to 1 Nm (1 lb.ft).
- Stage two: Tighten to 5 Nm (4 lb.ft).
- Stage three: Tighten to 10 Nm (7 lb.ft).



6. Apply sealant to the two exhaust camshaft end bearing caps at the positions shown.
For additional information, refer to: Specifications (303-01C Engine - TDV6 2.7L Diesel, Specifications).



7. Install the camshaft bearing caps.

- Tighten the bolts evenly in three stages in the sequence shown.
- Stage one: Tighten to 1 Nm (1 lb.ft).
- Stage two: Tighten to 5 Nm (4 lb.ft).
- Stage three: Tighten to 10 Nm (7 lb.ft).

8. Release the secondary timing chain tensioner piston.

- Remove the locking pin.

9. Install the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

10. Install the brake vacuum pump.
For additional information, refer to: Brake Vacuum Pump - TDV6 2.7L Diesel (206-07 Power Brake Actuation, Removal and Installation).

11. Install the camshaft front seal.
For additional information, refer to: Camshaft Front Seal (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

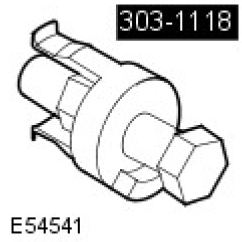
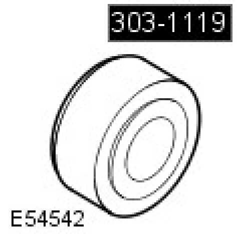
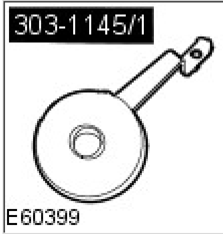
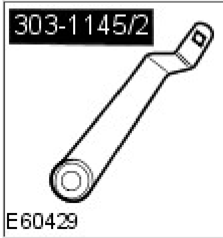
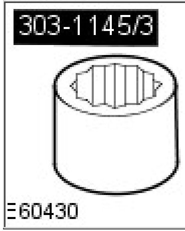
12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery

and Charging System - General Information, Specifications).

Published: 13-Jul-2011

Engine - TDV6 2.7L Diesel - Camshaft Rear Seal

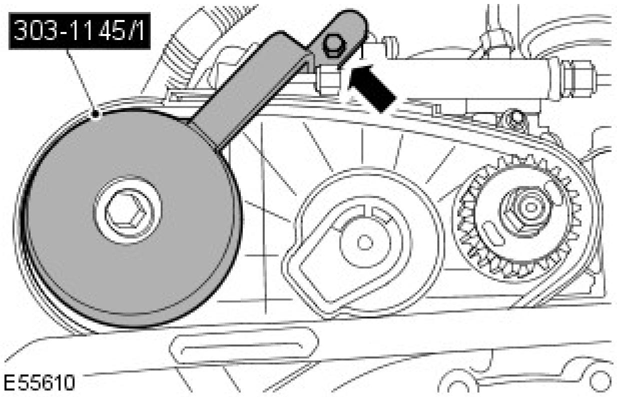
In-vehicle Repair

Special Tool(s)	
 303-1118 E54541	Camshaft Seal Remover 303-1118
 303-1119 E54542	Camshaft Seal Installer 303-1119
 303-1145/1 E60399	Camshaft pulley holding tool 303-1145/1
 303-1145/2 E60429	Camshaft pulley bolt remover 303-1145/2
 303-1145/3 E60430	Camshaft pulley bolt socket 303-1145/3

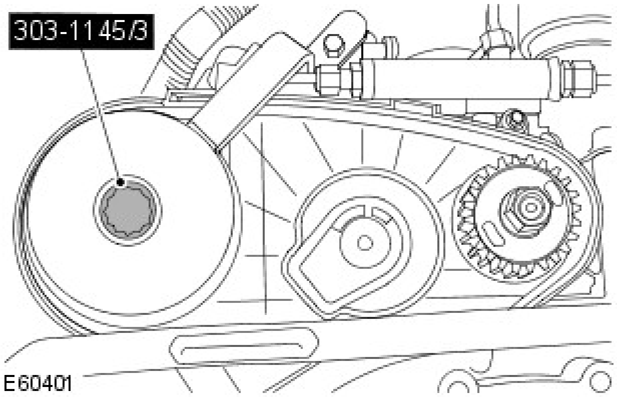
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

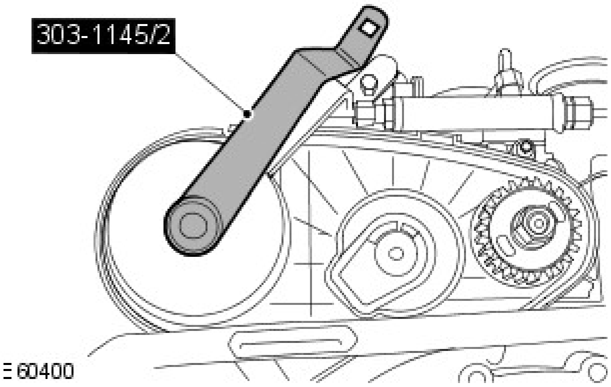
2. Remove the fuel injection pump belt.
For additional information, refer to: Fuel Injection Pump Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).


303-1145/1
E55610

3. Install the special tool to the camshaft rear pulley.
   - Rotate the crankshaft to align the special tool to the engine lifting bracket.
   - Install the special tool retaining bolt.

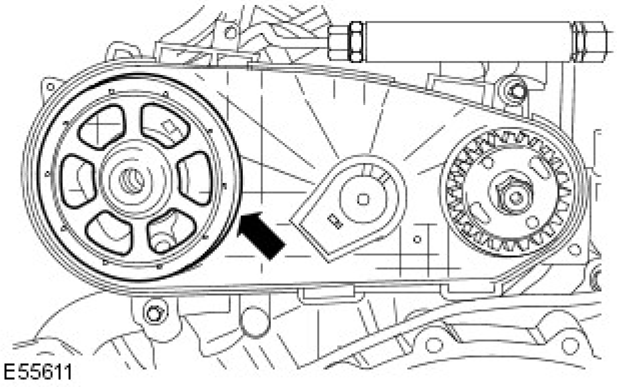

303-1145/3
E60401

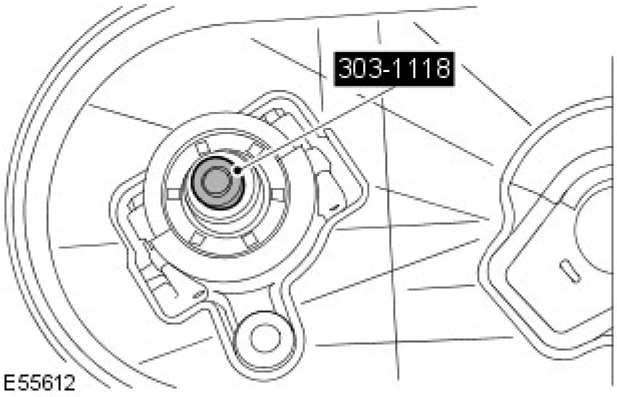
4. Install the special tool to the camshaft rear pulley retaining bolt.


303-1145/2
E60400

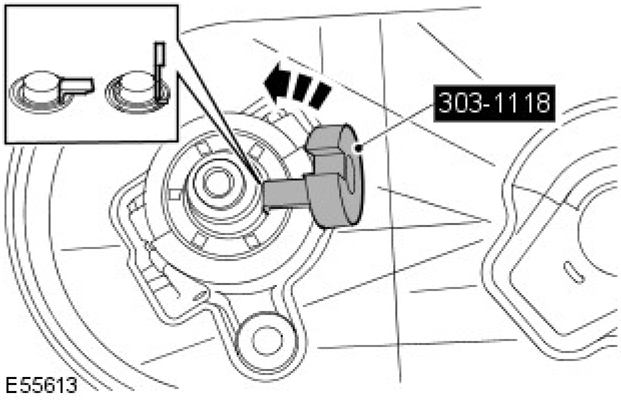
5. Using the special tools, remove and discard the camshaft rear pulley retaining bolt.
   - Rotate the crankshaft clockwise to retain the camshaft rear pulley.

6. Remove the special tools.
7. Remove the camshaft rear pulley.



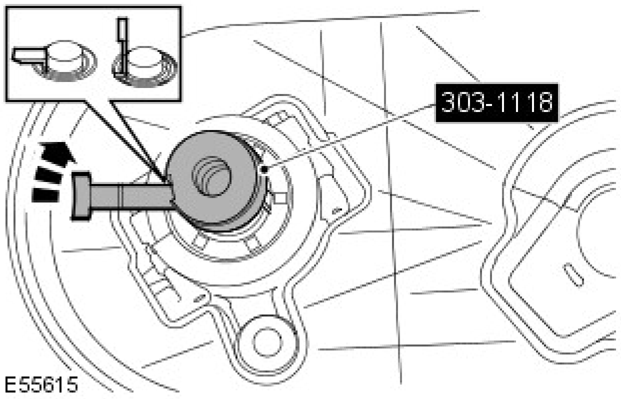

303-1118
E55612

8. Install the special tool to the camshaft.


303-1118
E55613

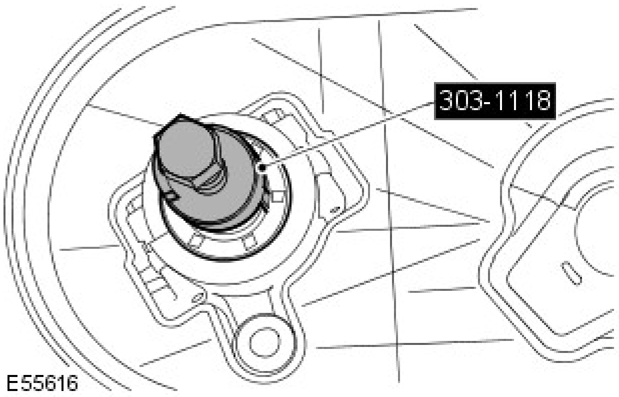
9. ⚠CAUTION: Make sure the special tool is correctly seated behind the camshaft seal. Failure to follow this instruction may result in damage to the special tool.

Install the special tool into the camshaft rear seal.


303-1118
E55615

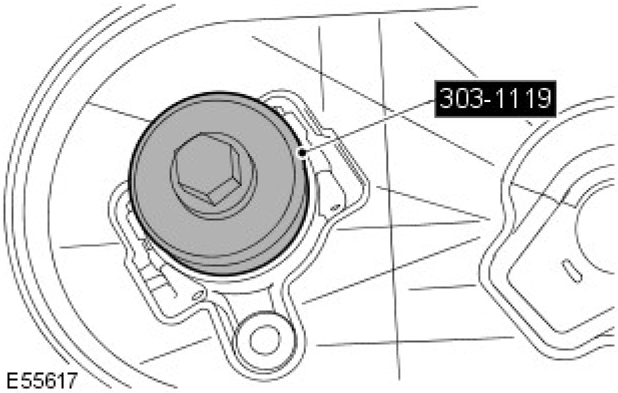
10. ⚠CAUTION: Make sure the special tool is correctly seated behind the camshaft seal. Failure to follow this instruction may result in damage to the special tool.

Install the special tool into the camshaft rear seal.

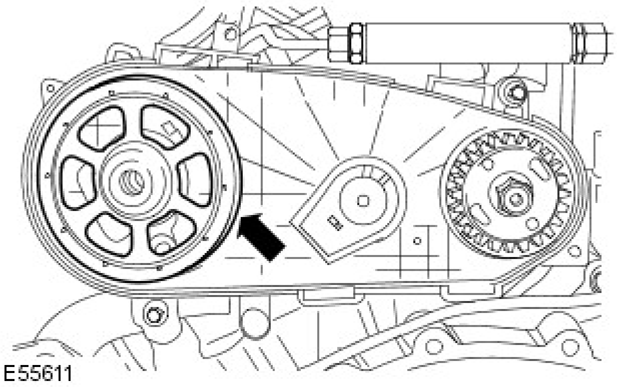

303-1118
E55616

11. Using the special tool, remove and discard the camshaft rear seal.

Installation

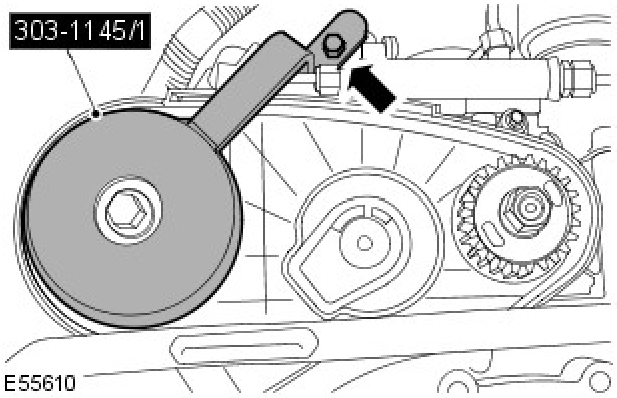

303-1119
E55617

1. Using the special tool, install the new camshaft rear seal.



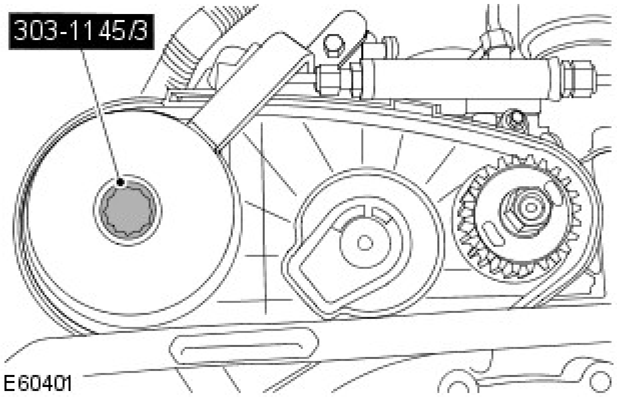
2. Install the camshaft rear pulley.

- Install a new camshaft pulley retaining bolt.

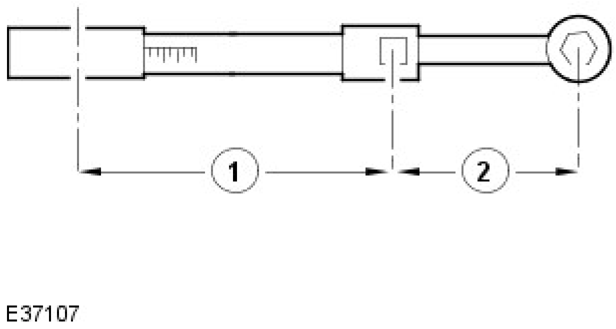

303-1145/1
E55610

3. Install the special tool to the camshaft rear pulley.

- Install the special tool retaining bolt.


303-1145/3
E60401

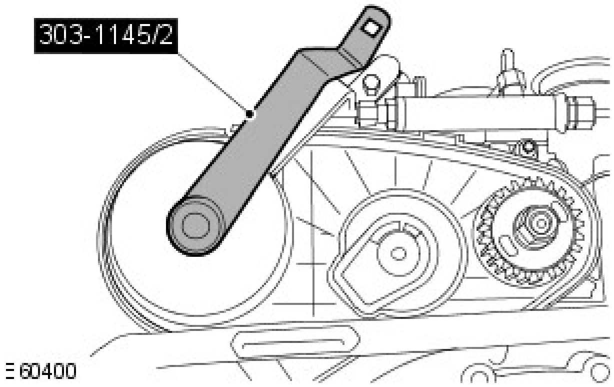
4. Install the special tool to the camshaft rear pulley retaining bolt.



5. CAUTION: Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.

Calculate the setting for the torque wrench.

- Stage 1: Multiply the required torque by the effective length of the torque wrench (1).
- Stage 2: Add the effective length of the special tool (2) to the effective length of the torque wrench.
- Stage 3: Divide the total of stage 1 by the total of stage 2.
- Stage 4: Set the torque wrench to the figure arrived at in stage 3.



6. CAUTION: Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.

Using the special tools, tighten the camshaft rear pulley retaining bolt to 40 Nm (30 lb.ft).

7. CAUTION: Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.

- Rotate the crankshaft counter-clockwise to retain the camshaft rear pulley.
- Stage one: Tighten to 80 Nm (59 lb.ft).
- Stage two: Tighten a further 80 degrees.

8. Remove the special tools.

9. CAUTION: Install a new fuel injection pump belt. Failure to follow this instruction may result in damage to the vehicle.

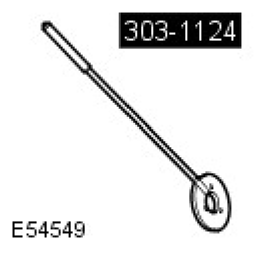
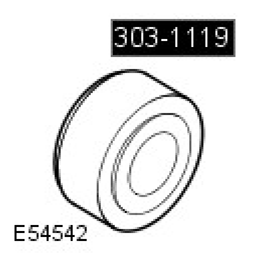
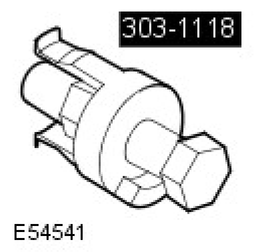
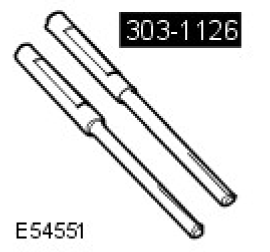
Install the fuel injection pump belt.
For additional information, refer to: Fuel Injection Pump Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 13-Jul-2011

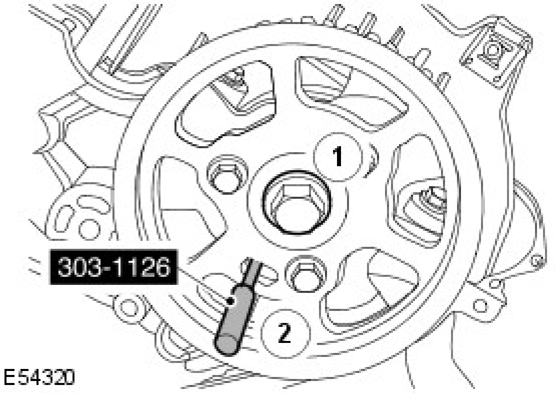
Engine - TDV6 2.7L Diesel - Camshaft Front Seal

In-vehicle Repair

Special Tool(s)	
	Holder - Camshaft Pulleys Front 303-1124
	Installer - Camshaft Oil Seal 303-1119
	Remover - Camshaft Oil Seal 303-1118
	Timing Pin - Camshaft Pulleys 303-1126

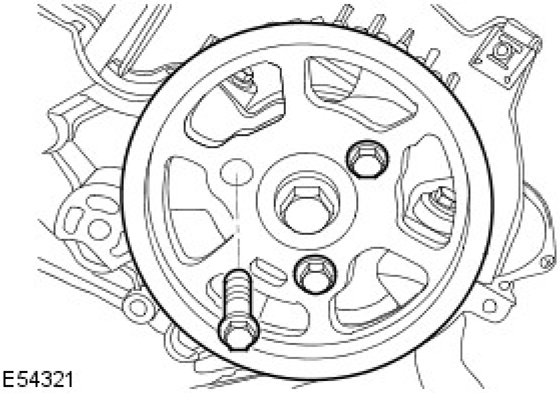
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Remove and discard the timing belt.
   For additional information, refer to: Timing Belt (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).


1
2
303-1126
E54320

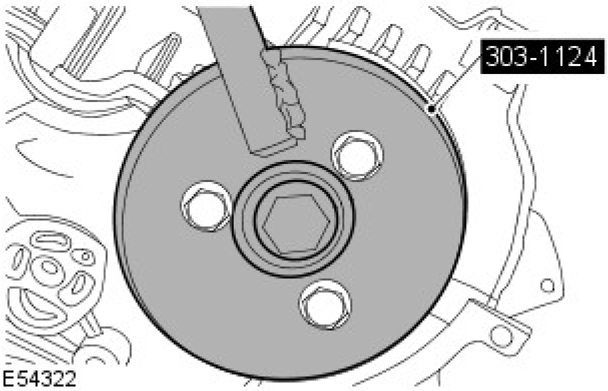
4. Remove the special tool.

- Stage one: Retain the camshaft pulley.
- Stage two: Remove the special tool.



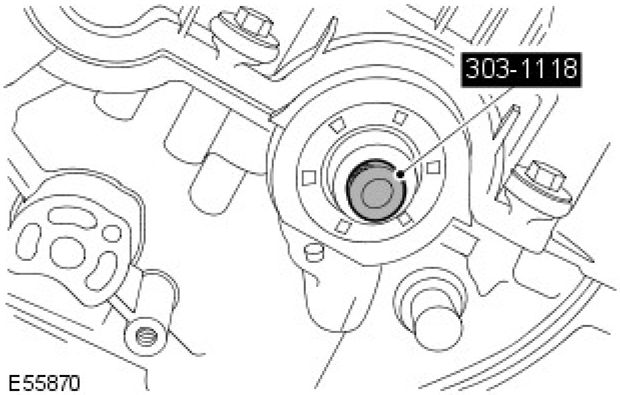
5. Remove the camshaft pulley.

- Remove the three retaining bolts.

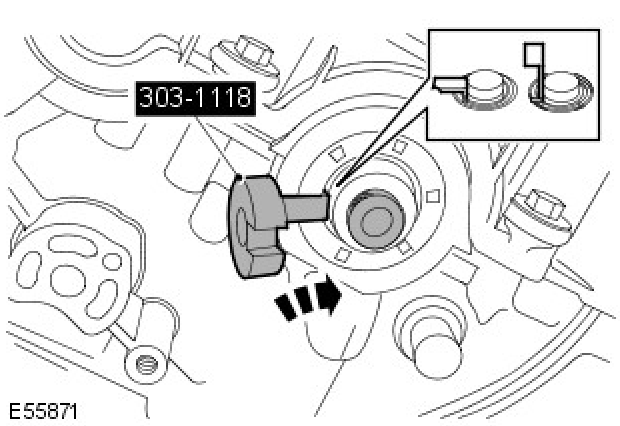

303-1124
E54322

6. Using the special tool, remove the camshaft pulley hub.

- Remove and discard the retaining bolt.

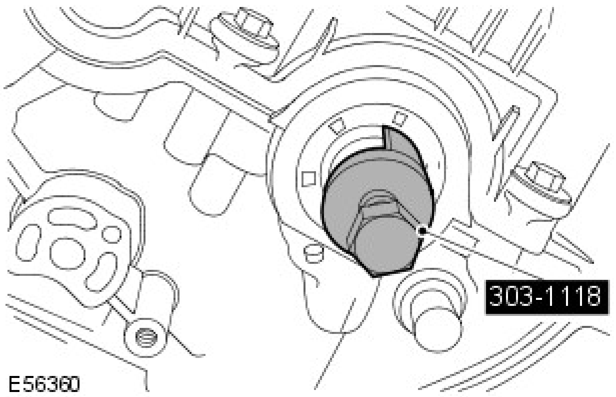

303-1118
E55870

7. Install the special tool to the camshaft.

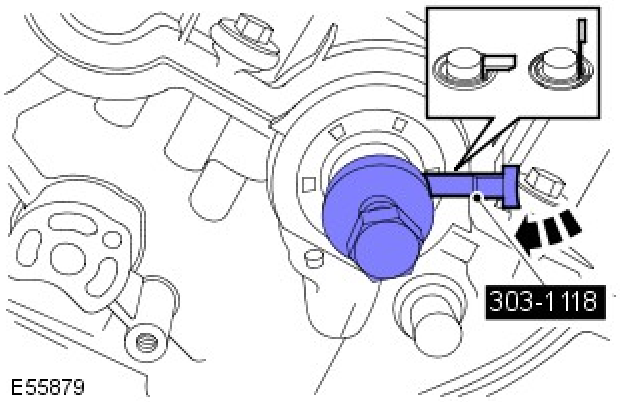

303-1118
E55871

8. ⚠CAUTION: Make sure the special tool is correctly seated behind the camshaft seal. Failure to follow this instruction may result in damage to the special tool.

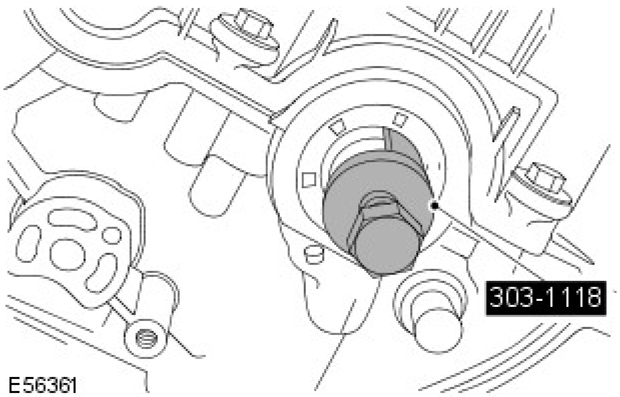
Install the special tool into the camshaft front seal.


303-1118
E56360

9. Install the special tool extracting bolt.

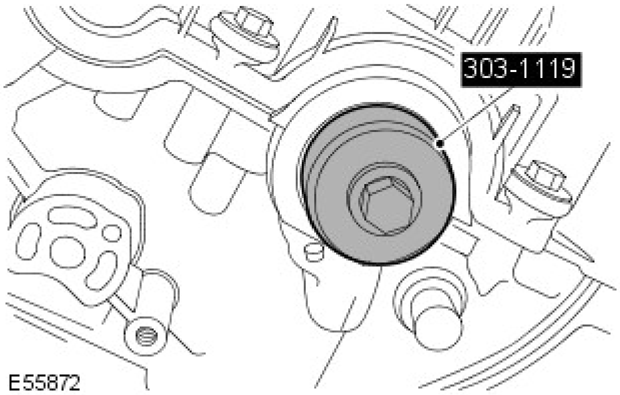

303-1118
E55879

10. Install the special tool into the camshaft front seal.


303-1118
E56361

11. Using the special tool, remove the camshaft front seal.

Installation



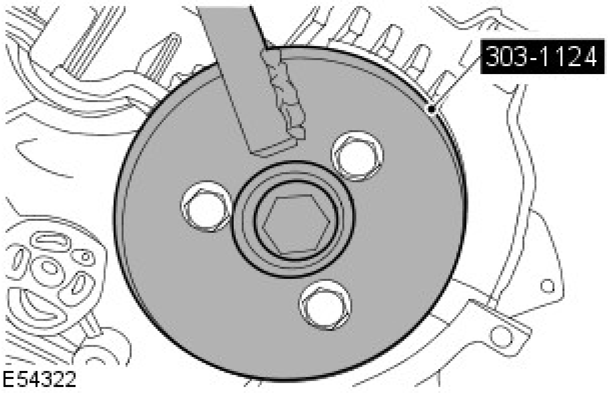
1. CAUTIONS:

⚠ Make sure the seal is installed correctly.

⚠ Do not use any lubricant on the camshaft front seal or the camshaft. Failure to follow this instruction may result in damage to the vehicle.

Using the special tool, install the camshaft front seal.

- Clean the component mating faces.
- Use the discarded camshaft pulley hub retaining bolt with the special tool.



2. Using the special tool, install the camshaft pulley hub.

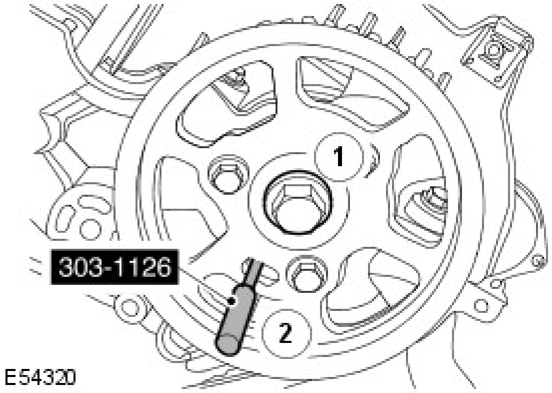
- Install a new retaining bolt.
- Tighten the retaining bolt in two stages:
- Stage one: Tighten to 80 Nm (59 lb.ft).
- Stage two: Tighten a further 80 degrees.

3. Install the camshaft pulley.

- Install the bolts, but do not tighten fully at this stage.

4. Install the special tool.

- Stage one: Retain the camshaft pulley.
- Stage two: Install the special tool.



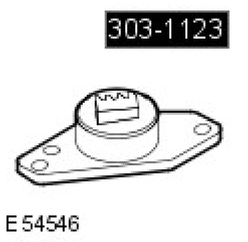
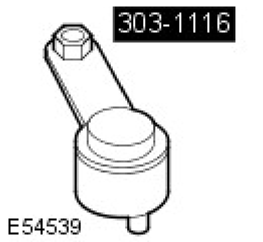
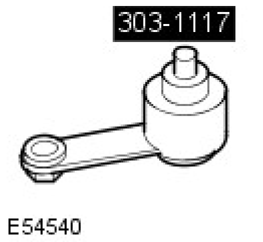
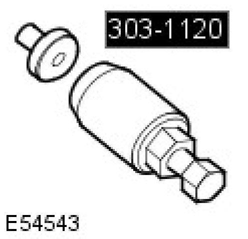
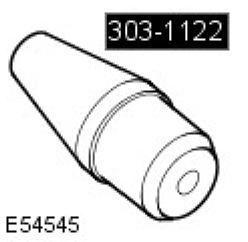
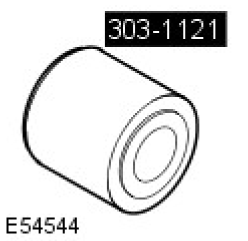
5. Install the new timing belt.
For additional information, refer to: Timing Belt (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Crankshaft Front Seal

In-vehicle Repair

Special Tool(s)	
 303-1123 E54546	Locking Tool - Flywheel 303-1123
 303-1116 E54539	Timing Pin - Manual Transmission 303-1116
 303-1117 E54540	Timing Pin - Automatic Transmission 303-1117
 303-1120 E54543	Crankshaft Front Seal Remover 303-1120
 303-1122 E54545	Crankshaft Front Seal Sleeve 303-1122
 303-1121 E54544	Crankshaft Front Seal Installer 303-1121

Removal

All vehicles

1. Disconnect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

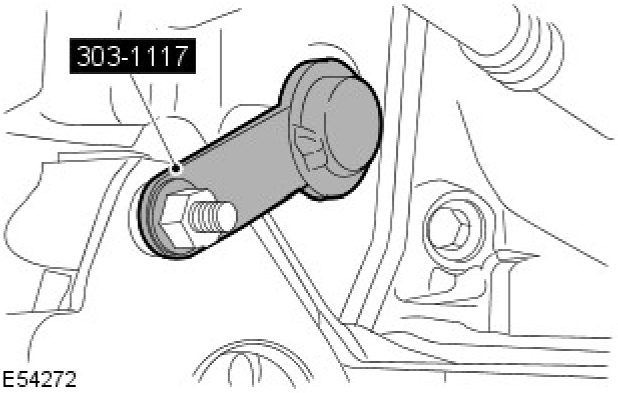
2. Remove and discard the timing belt.
For additional information, refer to: Timing Belt (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

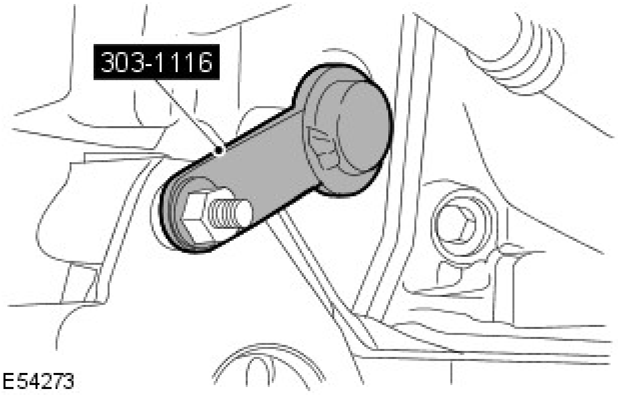
Vehicles with automatic transmission

4. Remove the special tool.



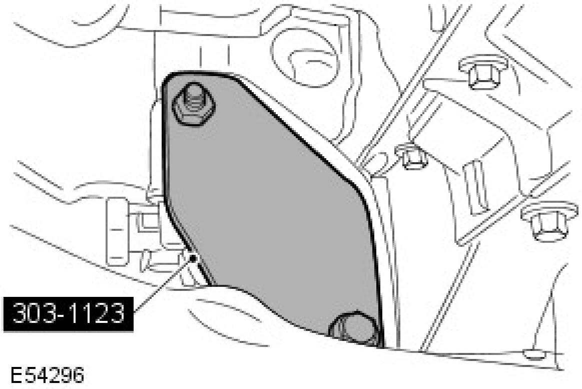
Vehicles with manual transmission

5. Remove the special tool.



All vehicles

6. Install the special tool.

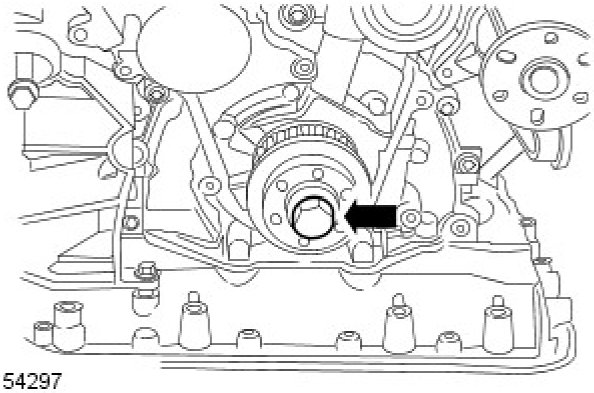


7. Loosen the crankshaft pulley retaining bolt.

8. Using a suitable tool, release the crankshaft pulley.

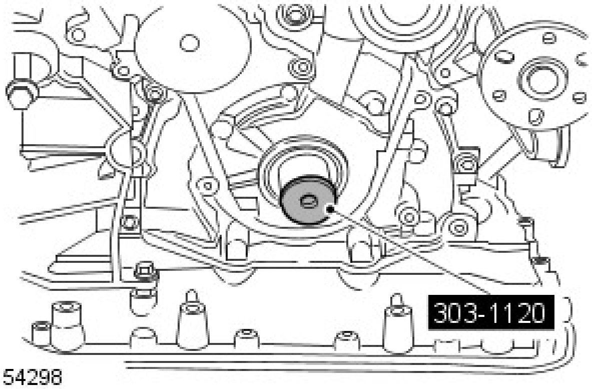
9. Remove the crankshaft pulley.

- Remove the crankshaft pulley retaining bolt.
- Discard the bolt.



E54297

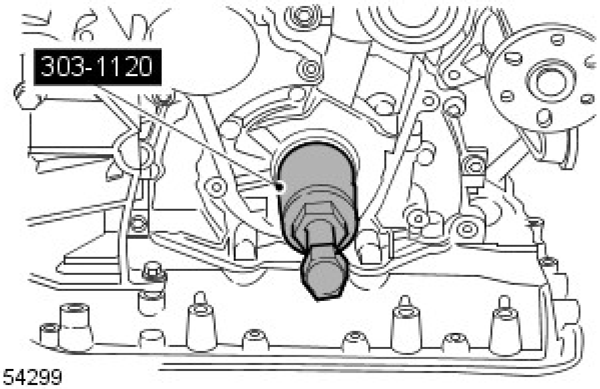
10. Install the special tool to the crankshaft.



E54298

11. Using the special tool, remove the crankshaft front seal.

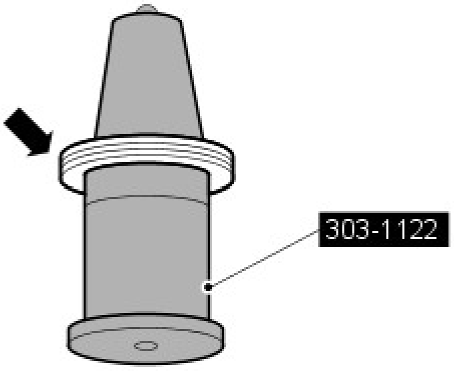
- Remove the special tool.
- Remove and discard the seal from the special tool.



E54299

Installation

All vehicles



E54300

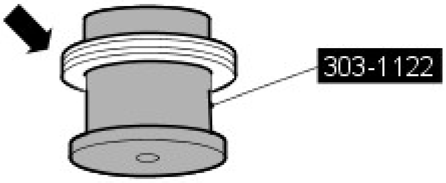
1. ⚠CAUTION: Do not use any lubricant on the crankshaft front seal, special tools or the crankshaft. Failure to follow this instruction may result in damage to the vehicle.

- NOTE: Make sure all component mating faces are clean.

Install a new crankshaft front seal to the special tool.

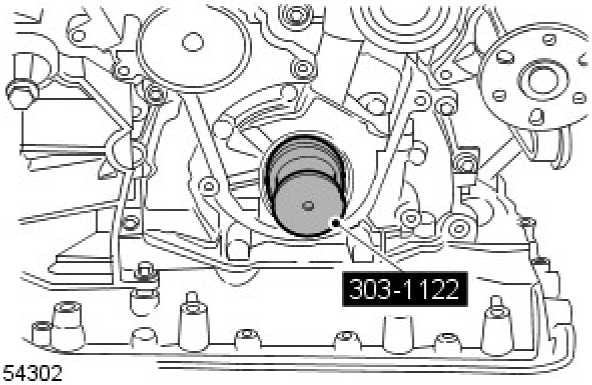
2. Reposition the crankshaft front seal along the special tool.

- Remove the sleeve from the special tool.



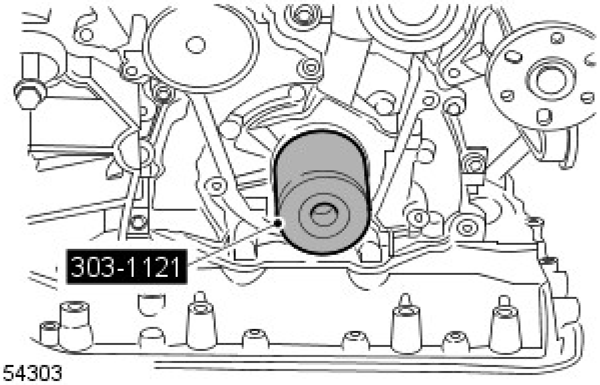
E54301

3. Install the special tool to the crankshaft.

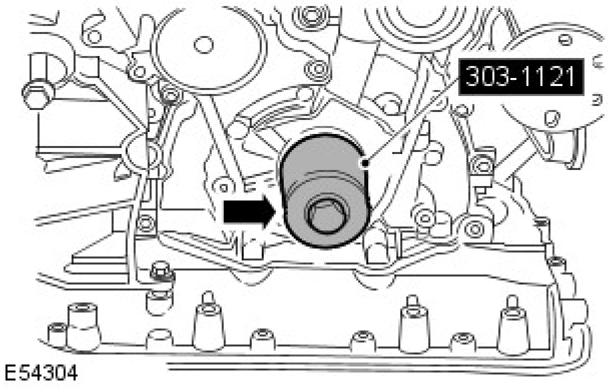


E54302

4. Install the special tool to the crankshaft.



E54303



5. ⚠ CAUTION: Make sure the seal is installed correctly.

Using the special tool, install the crankshaft front seal.

- Use the discarded crankshaft bolt with the service tool.

6. ⚠ CAUTION: Make sure the seal is installed correctly.

Remove the special tool.

- Remove and discard the crankshaft pulley retaining bolt.

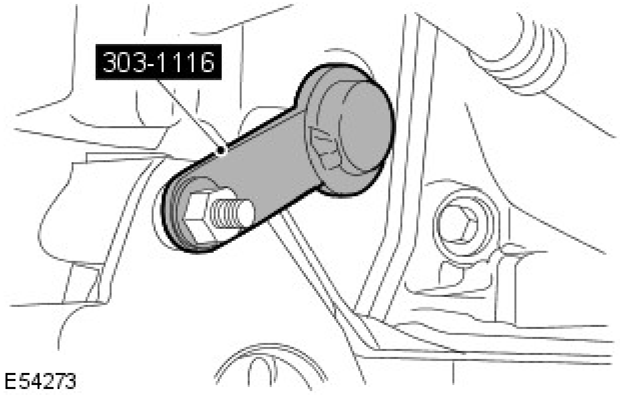
7. Install the crankshaft pulley.

- Install a new crankshaft pulley retaining bolt.
- Tighten the retaining bolt in two stages:
- Stage one: Tighten to 100 Nm (74 lb.ft).
- Stage two: Tighten a further 90 degrees.

8. Remove the special tool.

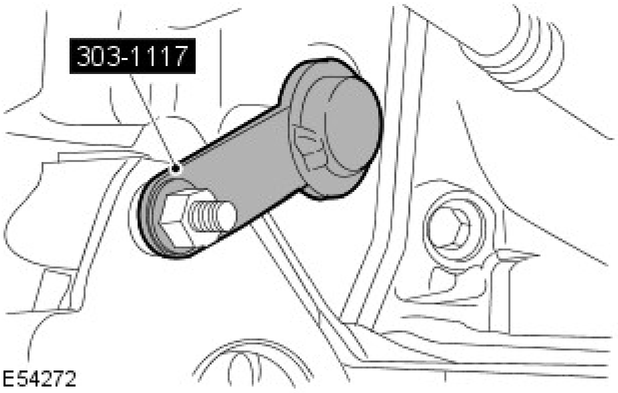
Vehicles with manual transmission

9. Install the special tool.



Vehicles with automatic transmission

10. Install the special tool.



All vehicles

11. Install the new timing belt.
For additional information, refer to: Timing Belt (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

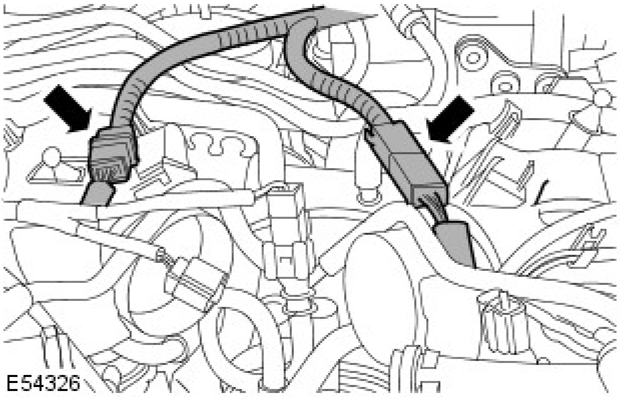
Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Cylinder Head LH

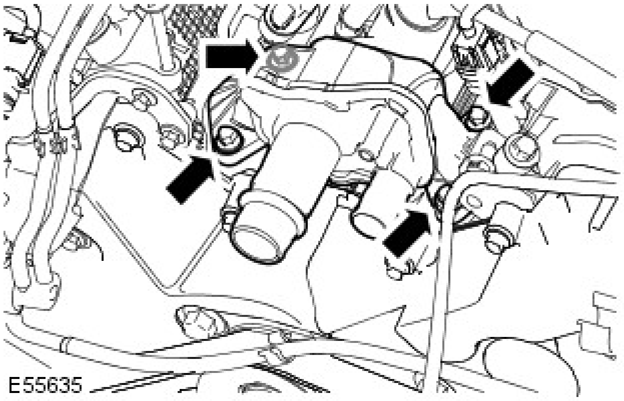
In-vehicle Repair

Removal

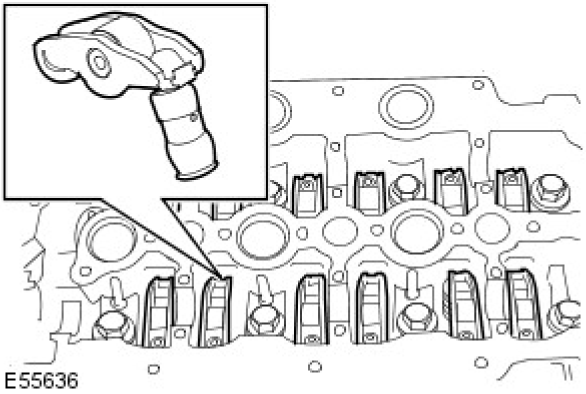
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the LH bank camshafts.
3. Remove the LH exhaust manifold.
   For additional information, refer to: Exhaust Manifold LH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).
4. Disconnect the LH glow plug wiring harness electrical connector.

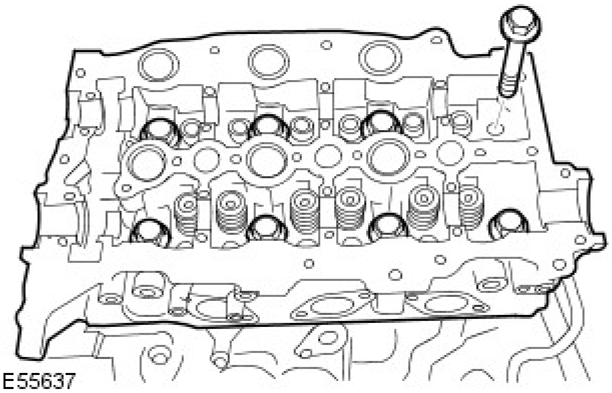


5. Remove the cylinder head coolant outlet connector.



6. Remove the hydraulic adjuster and rocker assemblies.





E55637

7. CAUTIONS:

Only use a plastic scraper to clean off the old gasket.

The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

Remove the LH cylinder head assembly.

- Remove and discard the eight cylinder head bolts.
- Remove and discard the cylinder head gasket.

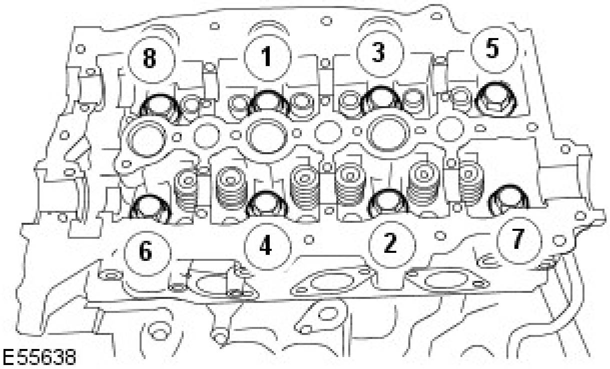
Installation

1. Clean the component mating faces.

2. Check cylinder head face for distortion, across the center and from corner to corner.

3. NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

Install a new cylinder head gasket.



E55638

4. CAUTION: Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

• NOTE: Install a new cylinder head gasket.

• NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

• NOTE: Make sure the cylinder head is installed in its original position.

• NOTE: Tighten the retaining bolts in the indicated sequence in four stages.

Install the LH cylinder head assembly and install new cylinder head retaining bolts.

- Stage one: Tighten to 20 Nm (15 lb.ft).
- Stage two: Tighten to 40 Nm (30 lb.ft).
- Stage three: Tighten to 80 Nm (59 lb.ft).
- Stage four: Tighten a further 180 degrees.

5. Install the hydraulic adjuster and rocker assemblies.

6. Connect the LH glow plug wiring harness electrical connector.

7. NOTE: Install new O-ring seals.

Install the cylinder head coolant outlet connector.

- Install the four retaining bolts and tighten to 10 Nm (7 lb.ft).

8. Install the LH exhaust manifold.
For additional information, refer to: Exhaust Manifold LH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

9. Install the LH bank camshafts.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery

and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Cylinder Head RH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the RH exhaust manifold.
For additional information, refer to: Exhaust Manifold RH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

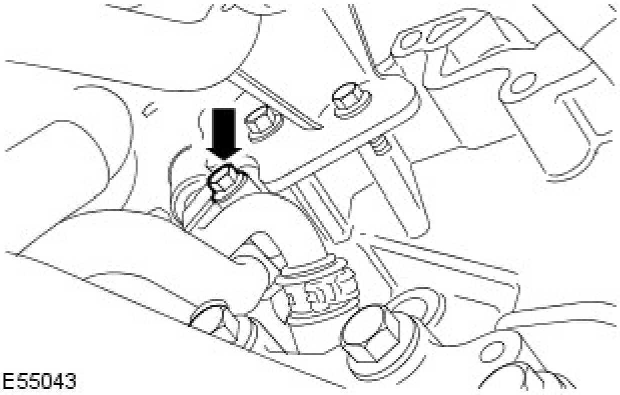
3. Remove the RH camshafts.

4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

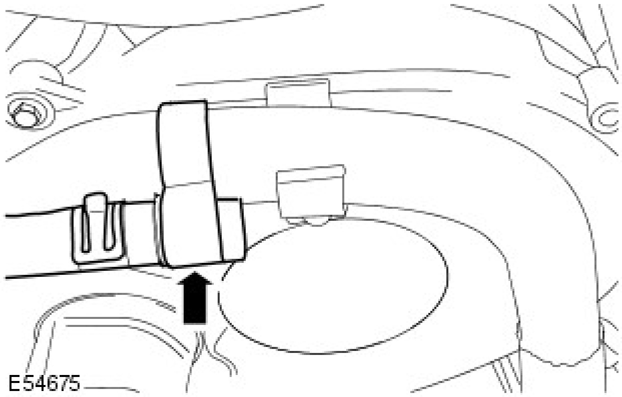
5. Release the engine breather tube.

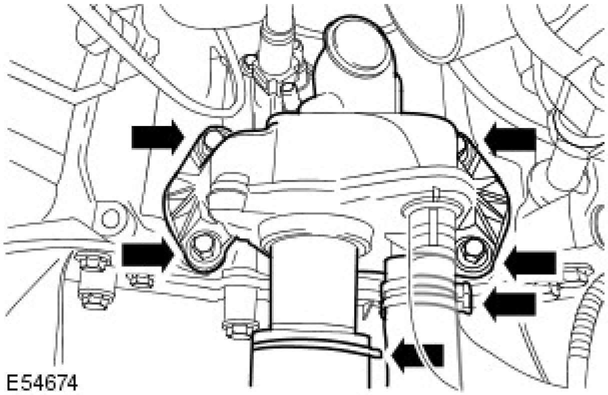
- Remove the retaining bolt.



6. Release the coolant bleed hose.

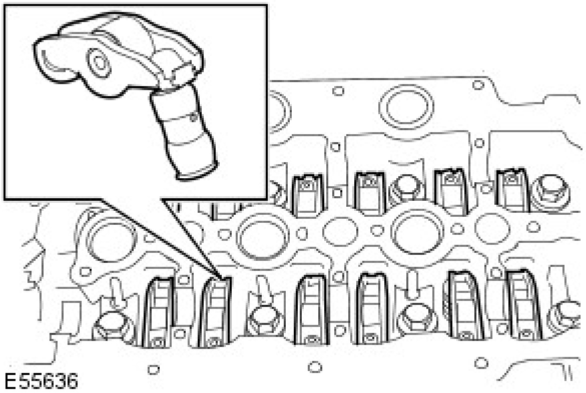
- Release the retaining clip.



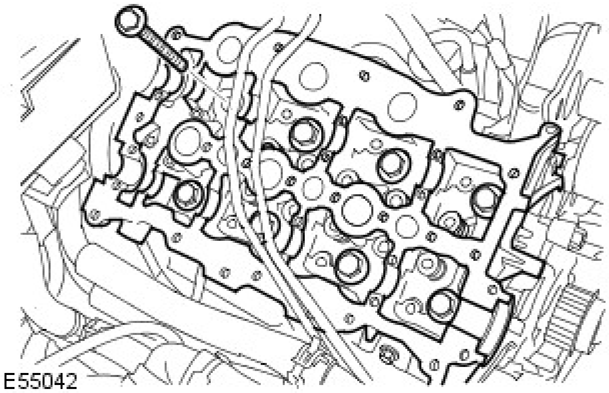


7. Remove the cylinder head coolant elbow.

- Release the two retaining clips and disconnect the hoses.
- Remove the four retaining bolts.
- Remove and discard the O-ring seals.



8. Remove the hydraulic adjuster and rocker assemblies.



9. CAUTIONS:

⚠ The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

⚠ Only use a plastic scraper to clean off the old gasket.

Remove the RH cylinder head assembly.

- Remove and discard the eight cylinder head bolts.
- Remove and discard the cylinder head gasket.

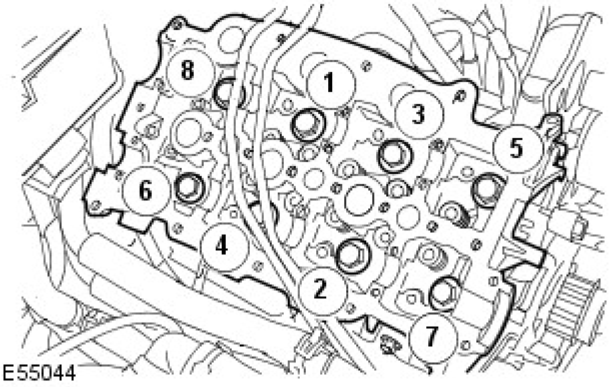
Installation

1. Clean the component mating faces.

2. Check cylinder head face for distortion, across the center and from corner to corner.
For additional information, refer to: Specifications (303-01C Engine - TDV6 2.7L Diesel, Specifications).

3. ⚠ CAUTION: The head gasket must be installed over the cylinder block dowels.

Install a new cylinder head gasket.



4. NOTE: Tighten the retaining bolts in the indicated sequence in four stages.

Install the RH cylinder head assembly

- Install new cylinder head retaining bolts.
- Tighten the bolts evenly in four stages to the sequence shown.
- Stage one: Tighten to 20 Nm (15 lb.ft).
- Stage two: Tighten to 40 Nm (30 lb.ft).
- Stage three: Tighten to 80 Nm (59 lb.ft).
- Stage four: Tighten a further 180 degrees.

5. Install the hydraulic adjuster and rocker assemblies.

6. Install the cylinder head coolant outlet elbow.

- Install new O-ring seals.
- Install the four retaining bolts and tighten to 10 Nm (7 lb.ft).
- Connect the hoses and secure with the clips.

7. Secure the coolant bleed hose.

8. Secure the engine breather tube.

- Tighten the bolt to 10 Nm (7 lb.ft).

9. Install the RH camshafts.

10. Install the RH exhaust manifold.
For additional information, refer to: Exhaust Manifold RH (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Valve Cover LH

In-vehicle Repair

Removal

• WARNINGS:

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

• CAUTIONS:

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

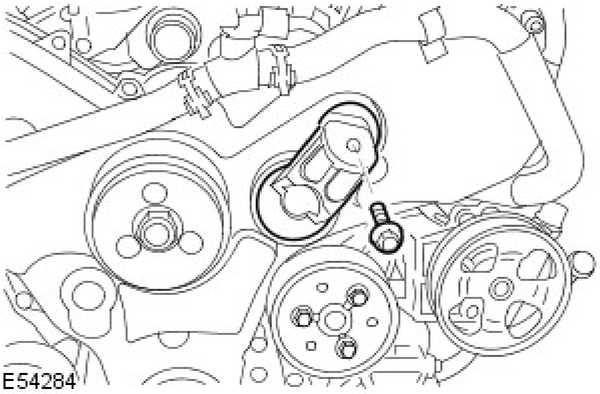
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the intake air shutoff throttle.
For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

3. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

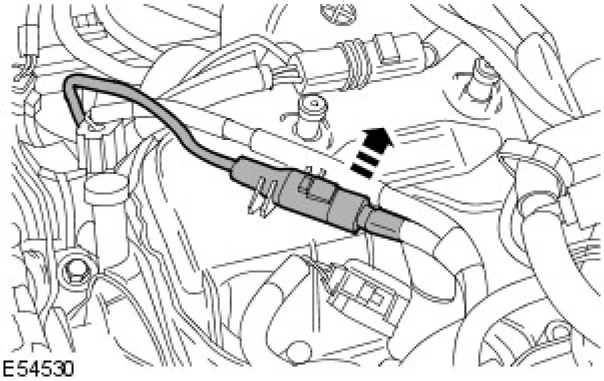
4. Remove the accessory drive belt idler pulley.

- Remove the retaining bolt.

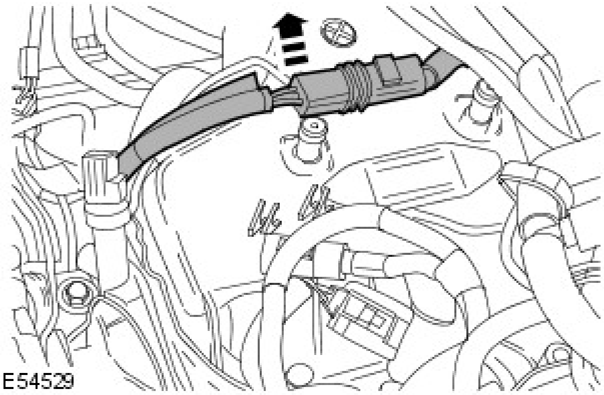


5. Release the knock sensor (KS) harness from the valve cover.

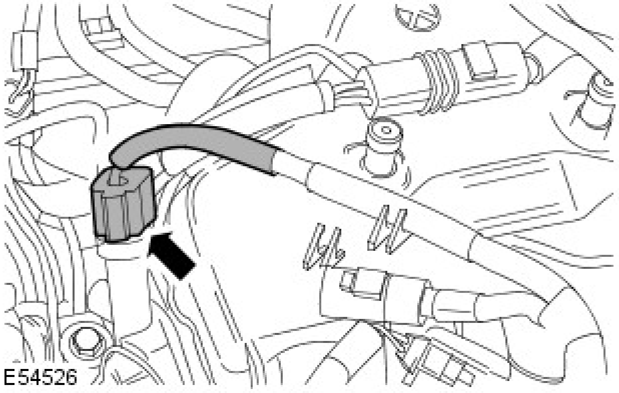
6. Disconnect the KS electrical connector.



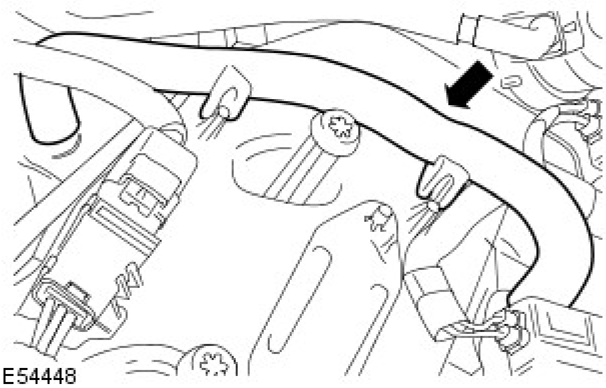
7. Release the glow plug harness from the valve cover.



8. Disconnect the engine oil pressure (EOP) sensor electrical connector.



9. Disconnect the valve cover breather hose.


E54448

10. Remove the fuel injector.

For additional information, refer to: Fuel Injector (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

11. Remove the 2 remaining fuel injectors.

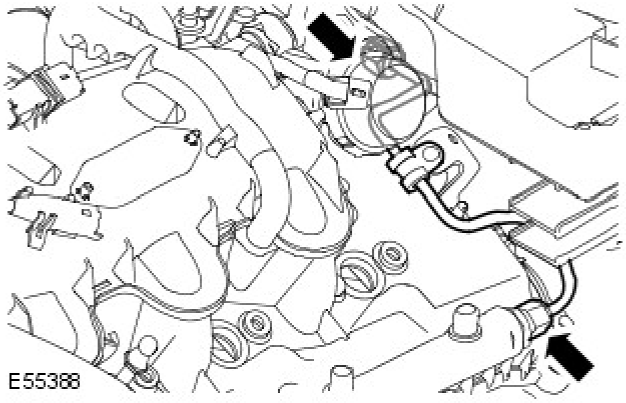
12. Release the high-pressure fuel supply line.

- Remove the retaining bolt.

13. ⚠CAUTION: Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

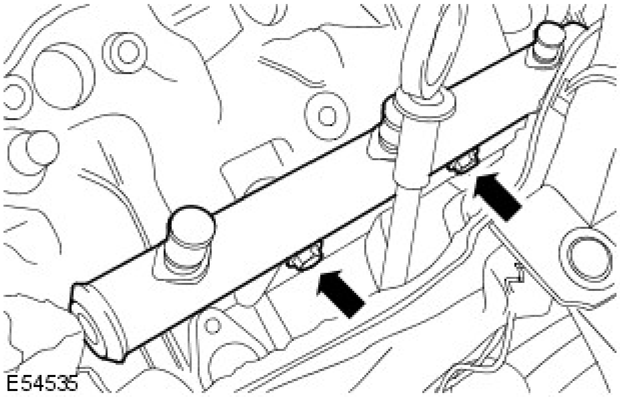
Remove and discard the high-pressure fuel supply line.

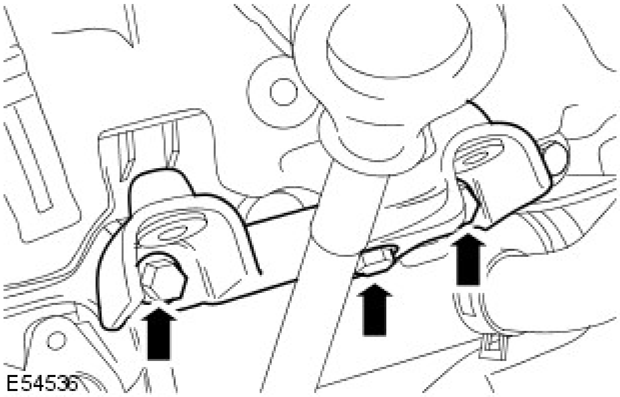
- Install blanking caps to the exposed ports.


E55388

14. Remove the fuel injection supply manifold.

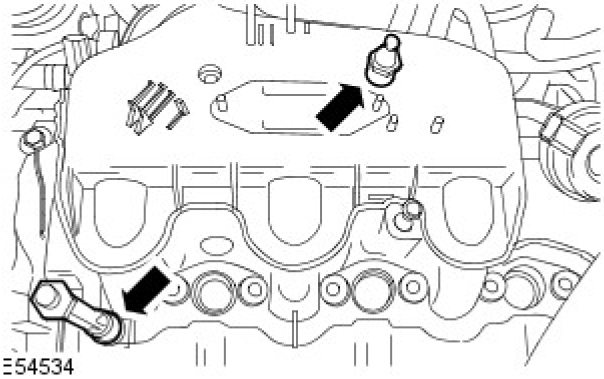
- Remove the two retaining bolts.


E54535

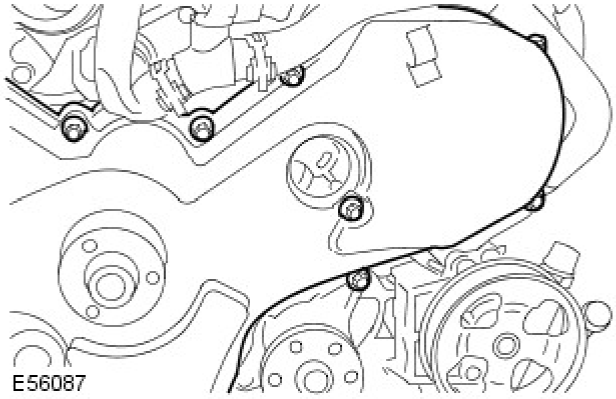


15. Remove the fuel injection supply manifold securing bracket.

- Release the dipstick tube.
- Remove the three retaining bolts.

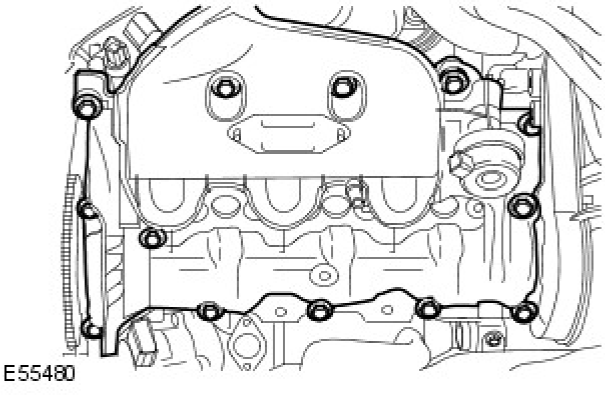


16. Remove the engine cover locating studs.



17. Release the timing belt cover.

- Reposition the timing cover to access the two front valve cover retaining bolts.
- Fully loosen the seven timing belt cover retaining bolts shown.

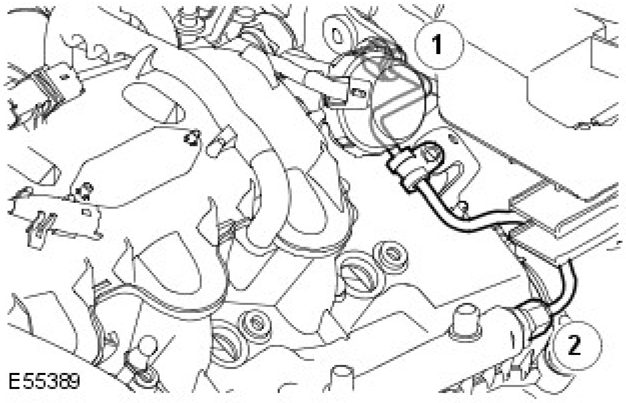


18. Remove the LH valve cover.

- Loosen the 13 valve cover retaining bolts.

Installation

1. Install the LH valve cover.
    - Tighten the 13 retaining bolts to 10 Nm (7 lb.ft).
2. Attach the timing belt cover.
    - Tighten the seven retaining bolts to 10 Nm (7 lb.ft).
3. Install the engine cover locating studs.
4. Install the fuel injection supply manifold securing bracket.
    - Install the two retaining bolts.
    - Tighten the bolts to 23 Nm (17 lb.ft).
    - Secure the dipstick tube.
5. Install the fuel injection supply manifold.
    - Install the two bolts, but do not fully tighten at this stage.



6. Install a new high-pressure fuel supply line.
    - Remove the blanking caps from the ports.
    - Install the new high-pressure fuel supply line, but do not tighten unions at this stage.
    - Tighten the fuel injection supply manifold retaining bolts to 23 Nm (17 lb.ft).
    - Tighten the fuel injection supply line unions in the sequence shown in four stages:
    - Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 15 Nm (11 lb.ft).
    - Stage 2: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 15 Nm (11 lb.ft).
    - Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 30 Nm (22 lb.ft).
    - Stage 4: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 30 Nm (22 lb.ft).
7. Secure the high-pressure fuel supply line.
    - Tighten the retaining bolt to 10 Nm (7 lb.ft).
8. Install the fuel injector.
   For additional information, refer to: Fuel Injector (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).
9. Install the 2 remaining fuel injectors.
10. Connect the valve cover breather hose.
11. Connect the EOP sensor electrical connector.
12. Connect the KS electrical connector.
13. Attach the glow plug harness and KS harness to the valve cover.
14. Install the accessory drive belt idler pulley.
    - Install the retaining bolt and tighten to 47 Nm (35 lb.ft).
15. Install the accessory drive belt.
    For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

16. Install the intake air shutoff throttle.
For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 2.7L Diesel - Valve Cover RH

In-vehicle Repair

Removal

- WARNINGS:

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

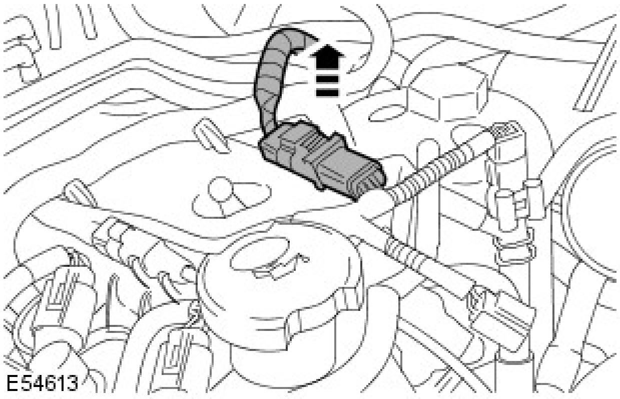
⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

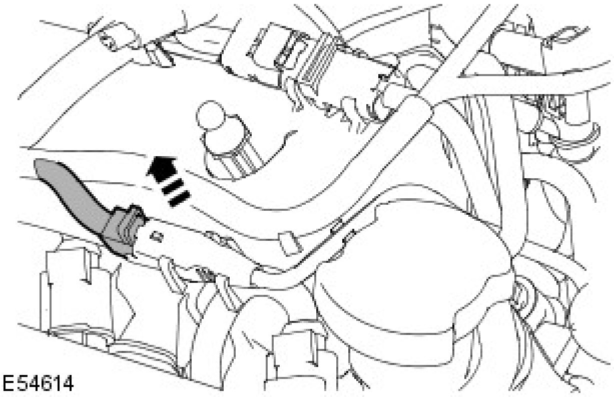
⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

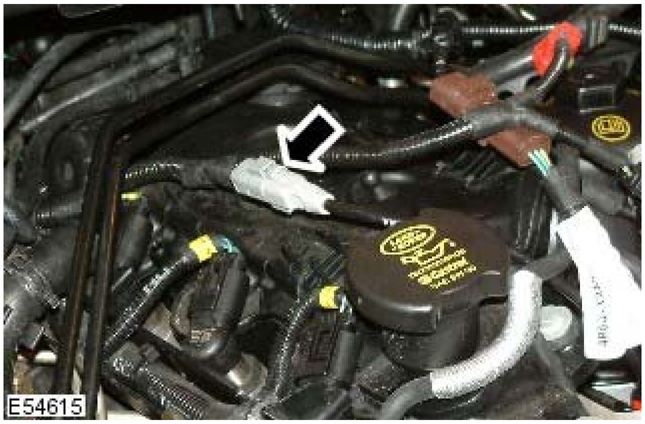
2. Remove the intake air shutoff throttle.
For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

3. Release the glow plug harness from the valve cover.

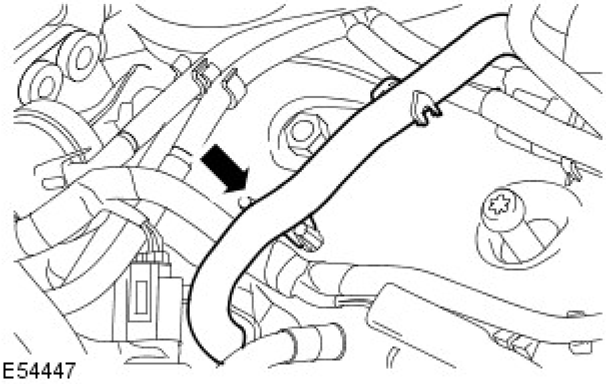




4. Release the knock sensor (KS) harness from the valve cover.



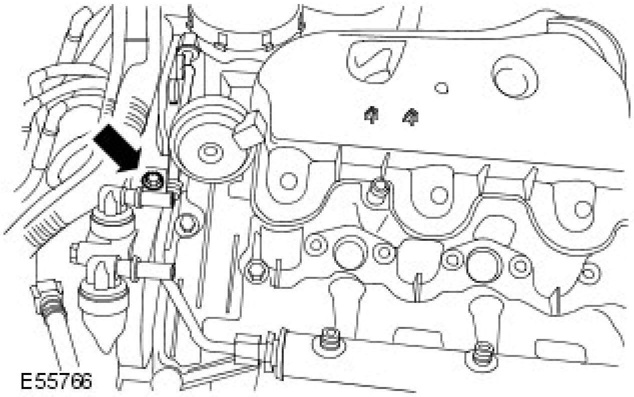
5. Disconnect the KS electrical connector.



6. Disconnect the valve cover breather hose.

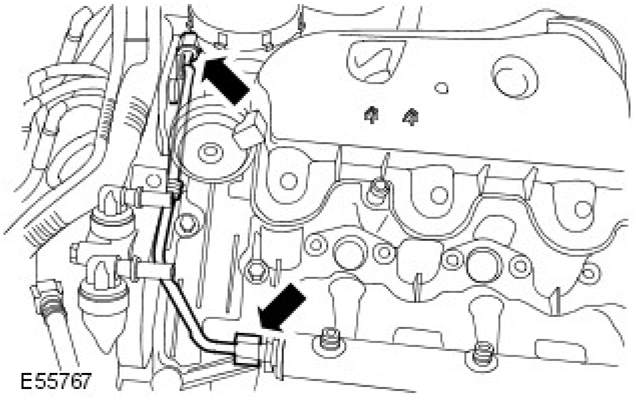
7. Remove the fuel injector.
For additional information, refer to: Fuel Injector (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

8. Remove the remaining fuel injectors.



9. Release the high-pressure fuel supply line.

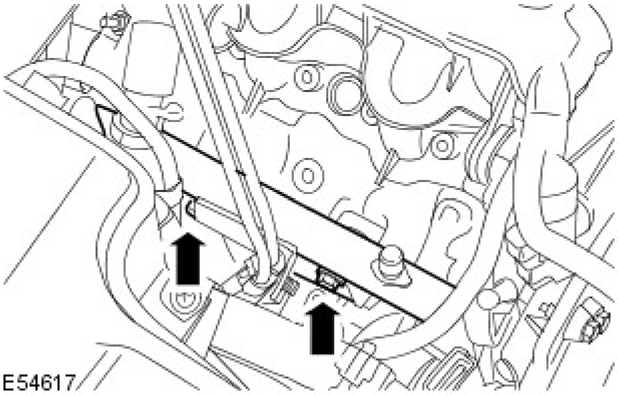
- Remove the retaining bolt.



10. ⚠ CAUTION: Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

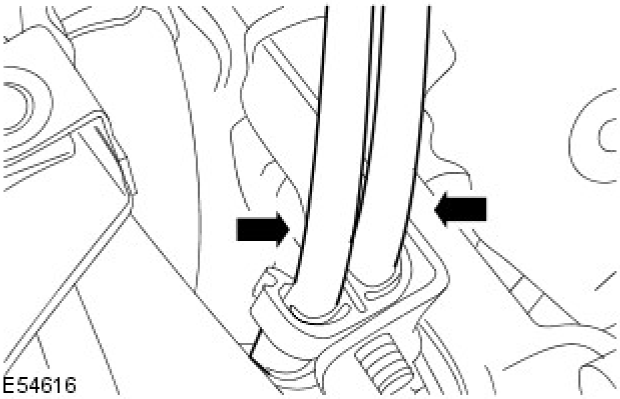
Remove and discard the high-pressure fuel supply line.

- Install blanking caps to the exposed ports.

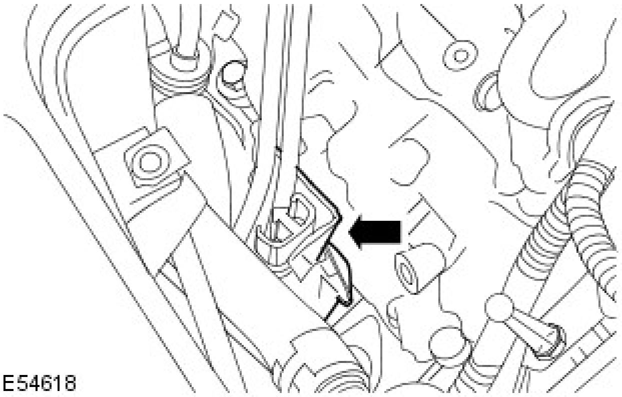


11. Remove the fuel injection supply manifold.

- Remove the two retaining bolts.

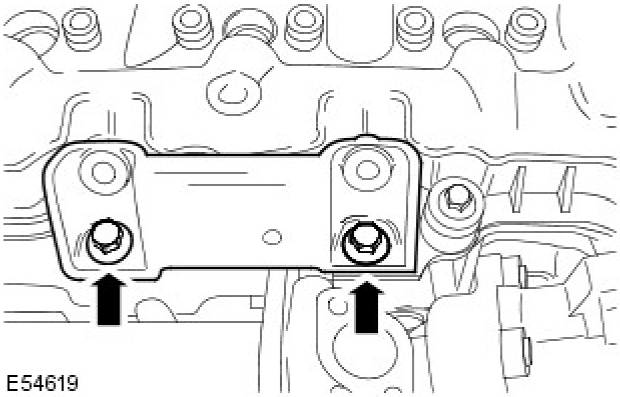


12. Detach the fuel lines.



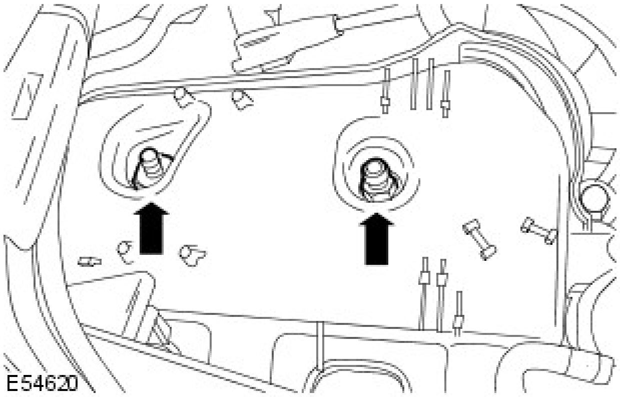
13. Remove the fuel line securing bracket.

- Remove the retaining bolt.

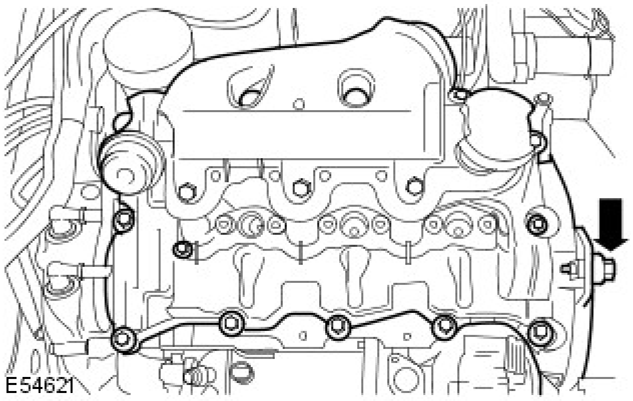


14. Remove the fuel injection supply manifold securing bracket.

- Remove the two retaining bolts.



15. Remove the engine cover locating studs.



16. Remove the RH valve cover.

- Fully loosen the 14 valve cover retaining bolts.

Installation

1. Install the RH valve cover.

- Tighten the 14 retaining bolts to 10 Nm (7 lb.ft).

2. Install the engine cover locating studs.

3. Install the fuel injection supply manifold securing bracket.

- Install the two retaining bolts.
- Tighten the bolts to 23 Nm (17 lb.ft).

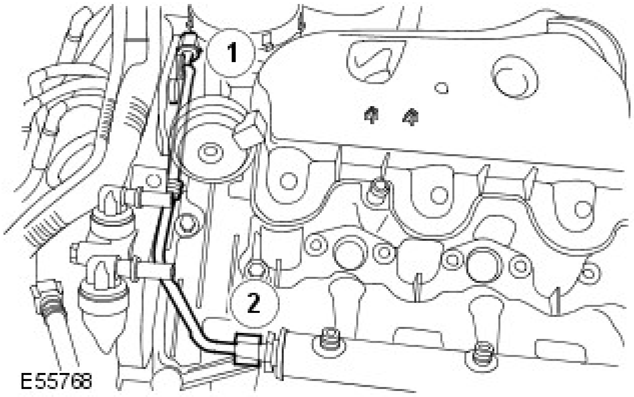
4. Install the fuel line retaining bracket.

- Tighten to 10 Nm (7 lb.ft).

5. Attach the fuel lines to the retaining bracket.

6. Install the fuel injection supply manifold.

- Install the two bolts, but do not fully tighten at this stage.



7. Install a new high-pressure fuel supply line.

- Remove the blanking caps from the ports.
- Loosely install the new high-pressure fuel supply line.
- Tighten the fuel injection supply manifold retaining bolts to 23 Nm (17 lb.ft).
- Tighten the fuel injection supply line unions in the sequence shown in four stages:
- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 30 Nm (22 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 30 Nm (22 lb.ft).

8. Secure the high-pressure fuel supply line.

- Tighten the bolt to 10 Nm (7 lb.ft).

9. Install the fuel injector.
For additional information, refer to: Fuel Injector (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

10. Install the remaining fuel injectors.

11. Connect the valve cover breather hose.

12. Connect the KS electrical connector.

13. Attach the glow plug harness and KS harness to the valve cover.

14. Install the intake air shutoff throttle.
For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

15. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 2.7L Diesel - Engine Mount LH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the turbocharger.
For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Removal and Installation).

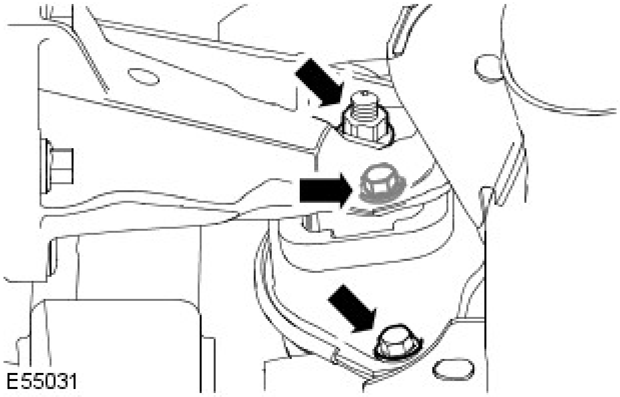
4. ⚠ CAUTION: Protect the engine during this operation.

Support the engine.

- Raise the engine clear of its LH mount.

5. Remove the engine mount.

- Remove the retaining nut.
- Raise the engine clear of its LH mount.
- Remove and discard the two retaining bolts.



Installation

1. Install the engine mount.

- Clean the component mating faces.
- Install new retaining bolts.
- Tighten the bolts to 45 Nm (33 lb.ft), then a further 60 degrees.

2. ⚠ CAUTION: Protect the engine during this operation.

Lower the engine onto the mount.

3. Install the engine mount retaining nut.

- Tighten the nut to 90 Nm (66 lb.ft).

4. Install the turbocharger.
For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Removal and Installation).

5. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 2.7L Diesel - Engine Mount RH

In-vehicle Repair

Removal

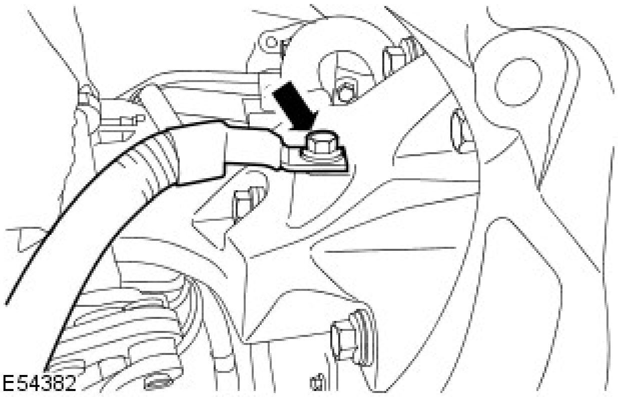
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

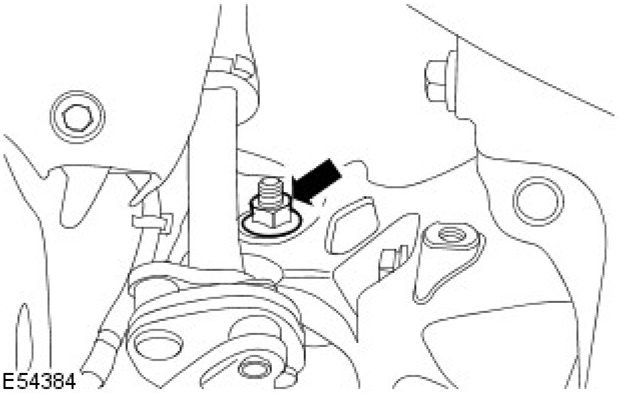
3. Remove the generator.
For additional information, refer to: Generator (414-02, Removal and Installation).

4. Disconnect the ground cable.



- Remove the ground cable retaining bolt.

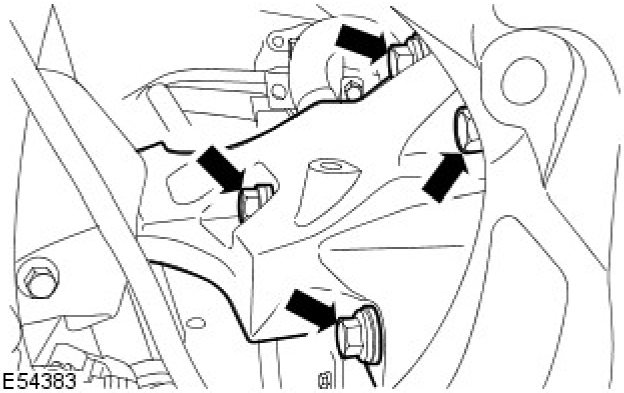
5. Remove the engine mount bracket.



- Remove the nut.

6. ⚠ CAUTION: Protect the engine during this operation.

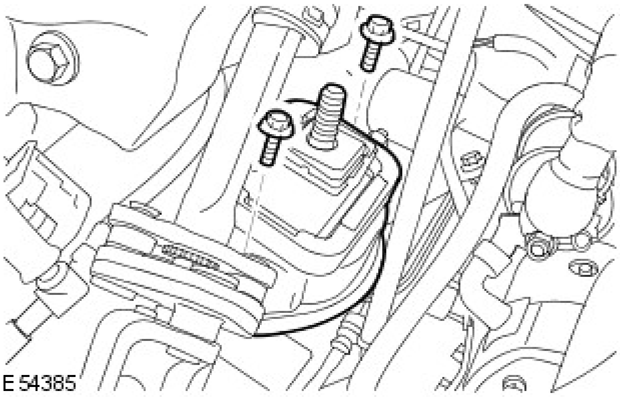
Detach the engine mounting bracket.



- Support the engine.
- Remove the four retaining bolts.

7. Remove the engine mount.

   - Remove and discard the two retaining bolts.



E54385

Installation

1. Install the engine mount.
   - Clean the component mating faces.
   - Install new retaining bolts.
   - Tighten the two new bolts to 45 Nm (33 lb.ft), then a further 60 degrees.
2. Install the engine mount bracket.
   - Clean the component mating faces.
   - Tighten the four retaining bolts to 80 Nm (59 lb.ft).
3. Attach the engine mounting bracket.
   - Lower the engine onto its mount.
   - Tighten the nut to 90 Nm (66 lb.ft).
4. Connect the ground cable.
   - Install the retaining bolt.
5. Install the generator.
   For additional information, refer to: Generator (414-02, Removal and Installation).
6. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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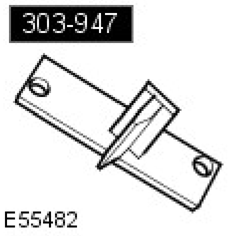
Engine - TDV6 2.7L Diesel - Flexplate

In-vehicle Repair

Special Tool(s)	
	Flex plate locking tool (LRT-12-145) 303-947

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

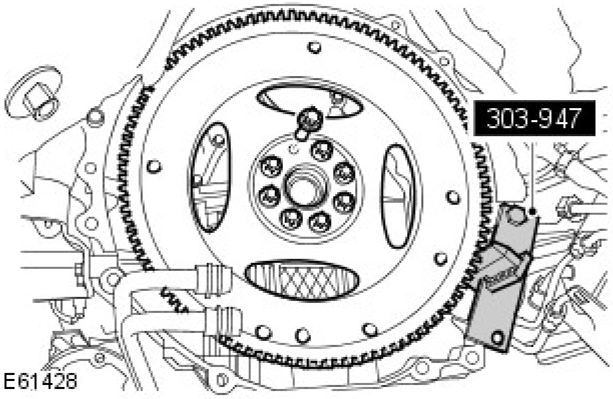
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

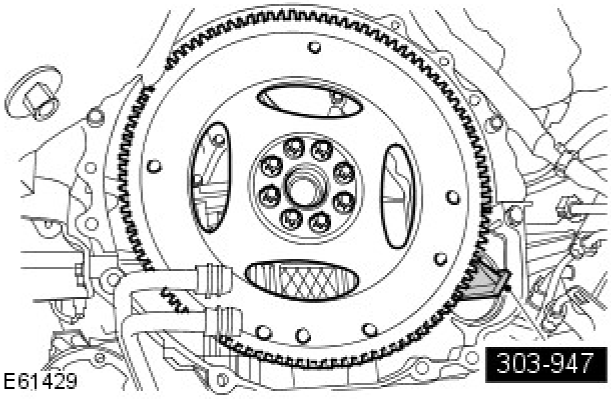
3. Remove the transmission.
For additional information, refer to: Transmission (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the torque converter flexplate.

- Using the special tool, lock the flexplate.
- Remove the 8 Torx bolts.



Installation



1. ⚠ CAUTION: Tighten the bolts in a diagonal sequence.

Install the torque converter flexplate.

- Clean the component mating faces.
- Using the special tool, lock the flexplate.
- Tighten the Torx bolts progressively in 3 stages.
- Tighten the Torx bolts to 50 Nm (37 lb.ft).
- Tighten the Torx bolts by 45 degrees.
- Tighten the Torx bolts by a further 45 degrees.

2. Install the transmission.

For additional information, refer to: Transmission (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 2.7L Diesel - Oil Pump

In-vehicle Repair

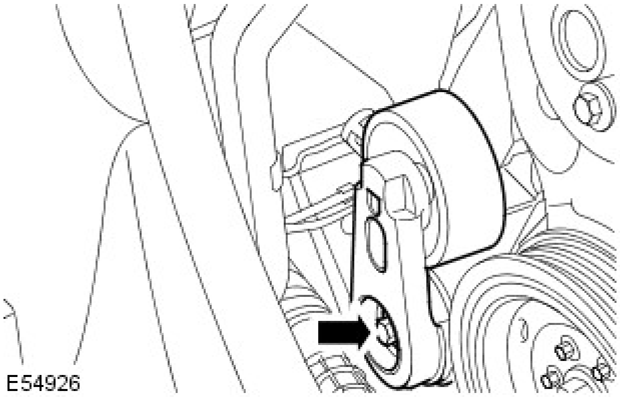
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the generator.
For additional information, refer to: Generator (414-02, Removal and Installation).

3. Remove the accessory drive belt tensioner.

- Remove the LH retaining bolt.

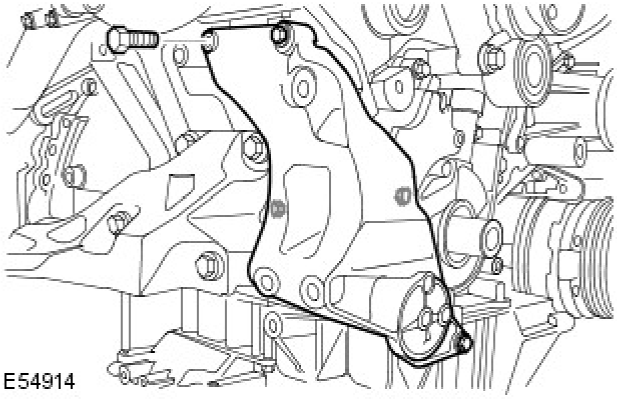


4. Remove the oil pan extension.

5. Remove the crankshaft front oil seal.
For additional information, refer to: Crankshaft Front Seal (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

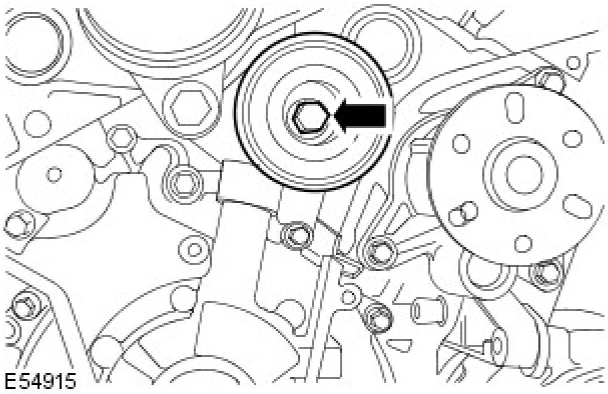
6. Remove the generator mounting bracket.

- Remove the five retaining bolts.



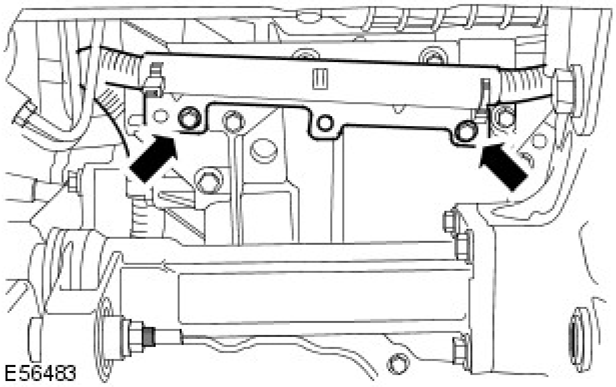
7. Remove the timing belt idler pulley.

- Remove the LH retaining bolt.



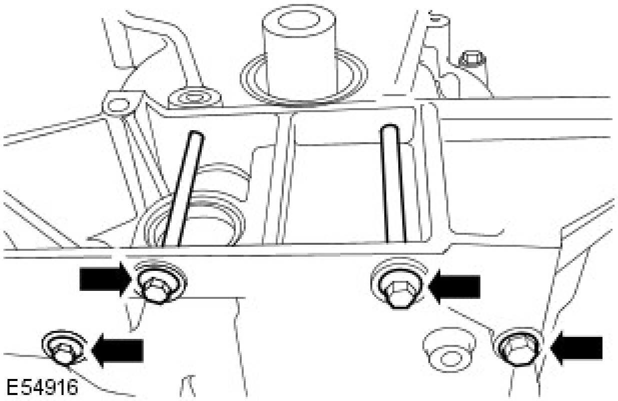
8. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.


E56483

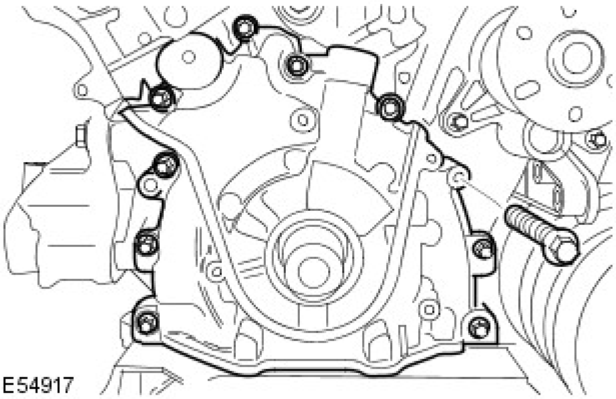
9. Release the battery positive cable.

- Remove the two retaining bolts.


E54916

10. Remove the oil pump lower retaining bolts.

- Remove the four retaining bolts.


E54917

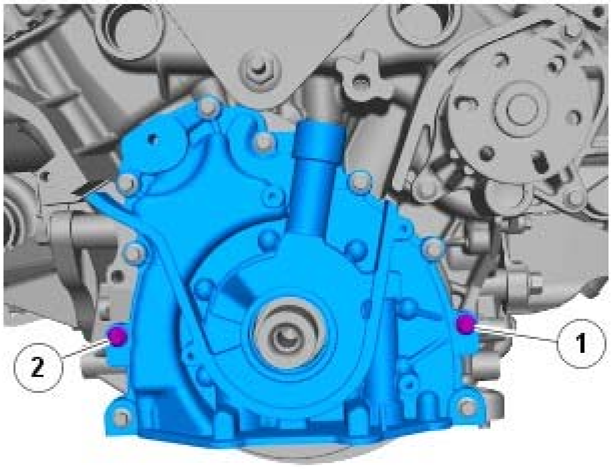
11. Remove the oil pump.

- Remove the ten retaining bolts.
- Remove the timing belt cover sealing strips.
- Remove and discard the gasket.

Installation

1. Prime the oil pump.

- Fill the orifice shown with 20 ml of engine oil.
- Rotate the oil pump drive 2 complete turns.



E123911

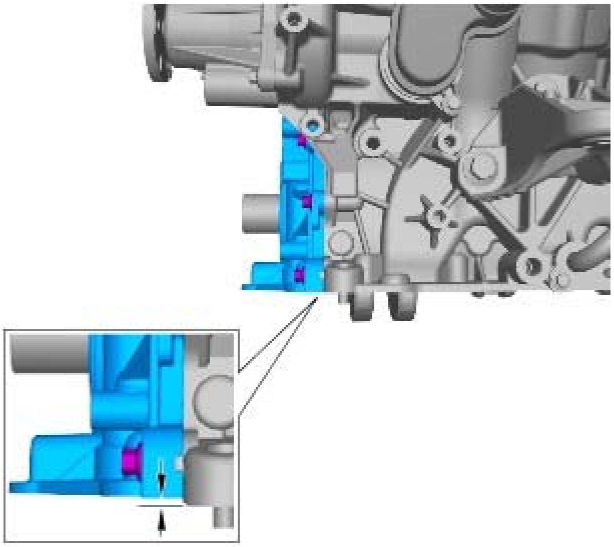
2. CAUTIONS:

⚠ Make sure that the mating faces are clean and free of foreign material.

⚠ Make sure the gasket is installed correctly.

Install the oil pump.

- Clean the component mating faces.
- Install a new gasket.
- Lightly tighten the bolts in the position shown.



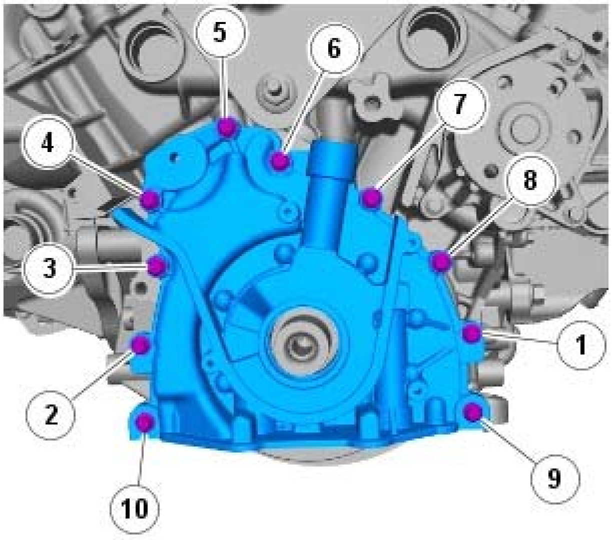
E123913

3. ⚠ CAUTION: Make sure the base of the oil pump is aligned within 0.2 mm of the base of the engine block. Failure to follow this instruction may result in damage to the vehicle.

• NOTE: Vehicles fitted with oil pumps without dowels.

Check the oil pump to engine block alignment.

4. Secure the oil pump.



E123912

- Tighten the bolts in the sequence shown to 10 Nm .

5. Install the oil pump lower retaining bolts.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

6. Install the battery positive cable.

- Tighten the two retaining bolts to 10 Nm (7 lb.ft).

7. Install the timing belt idler pulley.

- Tighten the bolt to 45 Nm (33 lb.ft).

8. Install the crankshaft front oil seal.
For additional information, refer to: Crankshaft Front Seal (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

9. Install the oil pan extension.

10. Install the generator mounting bracket.

- Tighten the bolts to 22 Nm (16 lb.ft).

11. Install the accessory drive belt tensioner.

- Tighten the bolt to 45 Nm (33 lb.ft).

12. Install the generator.
For additional information, refer to: Generator (414-02, Removal and Installation).

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 2.7L Diesel - Oil Pressure Switch

In-vehicle Repair

1. Refer to Engine Oil Pressure (EOP) Sensor.
   For additional information, refer to: Engine Oil Pressure (EOP) Sensor (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Removal and Installation).

Engine - TDV6 2.7L Diesel - Oil Cooler

In-vehicle Repair

Removal

- WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

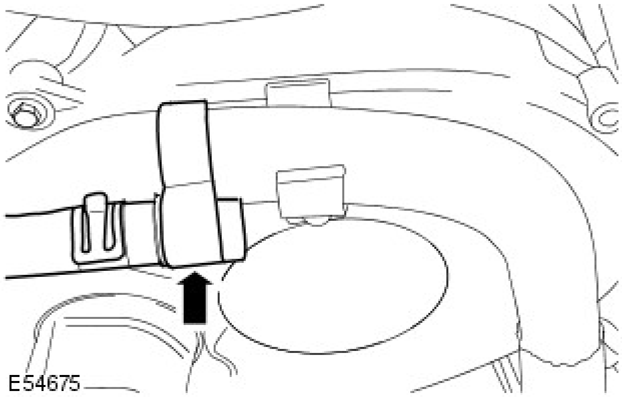
- CAUTIONS:

⚠ Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

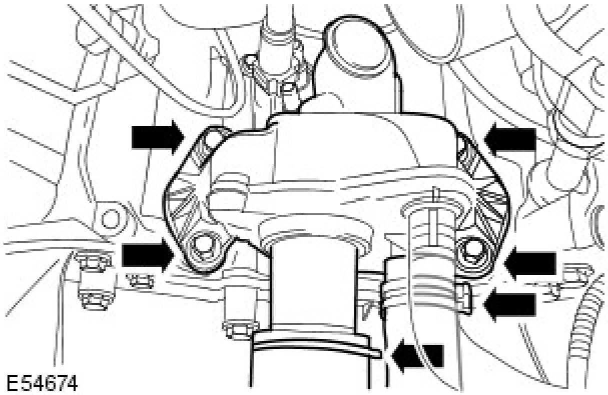
⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Drain the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).
3. Remove the crankcase vent oil separator.
   For additional information, refer to: Crankcase Vent Oil Separator (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).



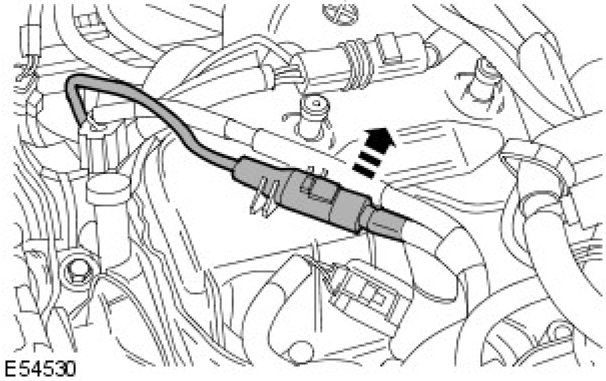
4. Release the coolant bleed hose from the LH exhaust gas recirculation (EGR) coolant inlet hose.

- Release the retaining clip.



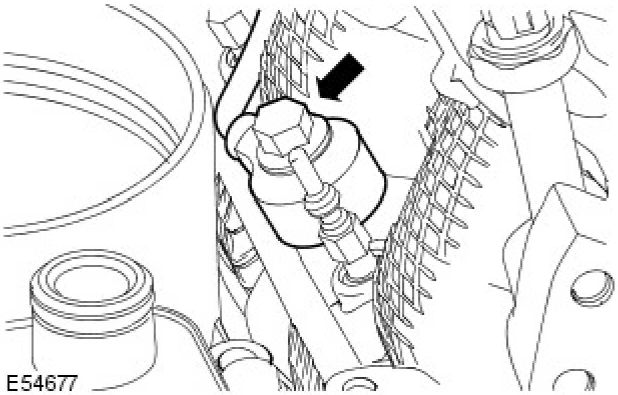
5. Remove the cylinder head coolant elbow.

- Release the two retaining clips and disconnect the hoses.
- Remove the four retaining bolts.
- Remove and discard the O-ring seals.



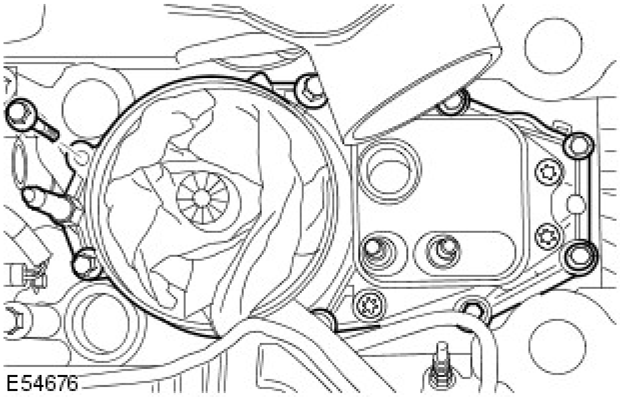
6. Disconnect the knock sensors (KS) electrical connector.

- Release the KS harness from the valve cover.



7. Remove the LH KS.

- Remove the retaining bolt.



8. NOTE: Some fluid spillage is inevitable during this operation.

Remove the oil cooler.

- Remove the eight retaining bolts.
- Remove and discard the gasket.
- Remove and discard the O-ring seal.

Installation

1. ⚠ CAUTION: Make sure the gasket is installed correctly.

• NOTE: Make sure all component mating faces are clean.

Install the oil cooler.

- Install a new gasket.
- Install a new O-ring seal.
- Install the eight retaining bolts and tighten to 10 Nm (7 lb.ft).

2. Install the LH KS.

- Install the retaining bolt and tighten to 20 Nm (15 lb.ft).
- Connect the knock sensor electrical connector.
- Attach the KS harness to the valve cover.

3. Install the cylinder head coolant outlet elbow.

- Install new O-ring seals.
- Install the four retaining bolts and tighten to 10 Nm (7 lb.ft).
- Connect the hoses and secure with the clips.

4. Secure the coolant bleed hose to the EGR coolant inlet hose.

5. Install the crankcase vent oil separator.
For additional information, refer to: Crankcase Vent Oil Separator (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

7. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

8. Check and top-up the engine oil.

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Timing Belt Cover

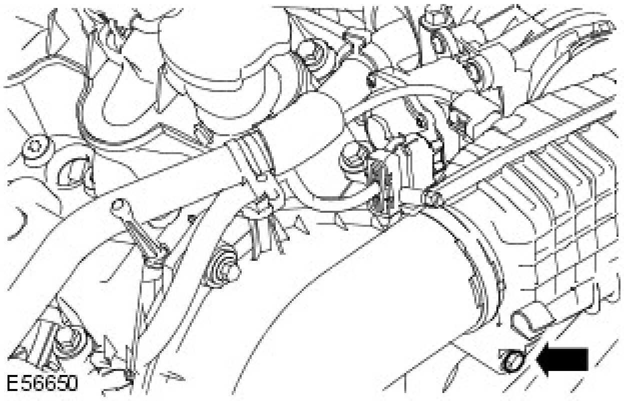
In-vehicle Repair

Removal

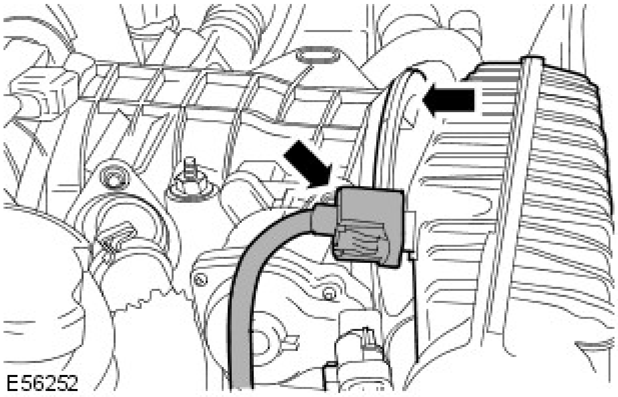
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

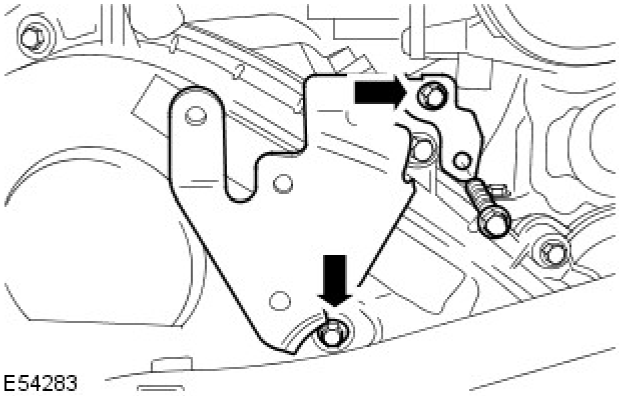
3. Release the intake air shutoff throttle elbow.
   - Remove the retaining bolt.



4. Release the intake air shutoff throttle elbow.
   - Release the retaining clip.
   - Disconnect the electrical connector.



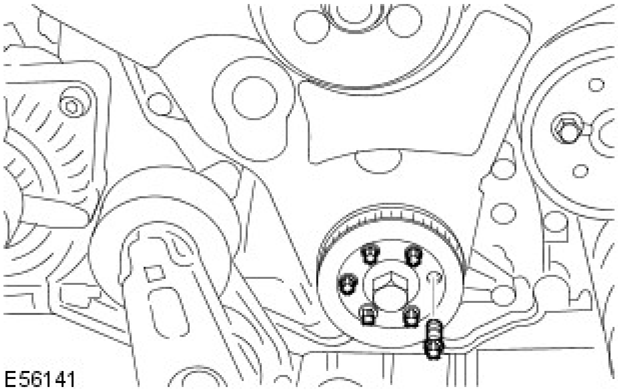
5. Remove the intake air shutoff throttle elbow support bracket.
   - Remove the three retaining bolts.



6. Remove the fan cowl.
   For additional information, refer to: Cooling Fan Shroud (303-03C

Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

7. Remove the crankshaft damper.



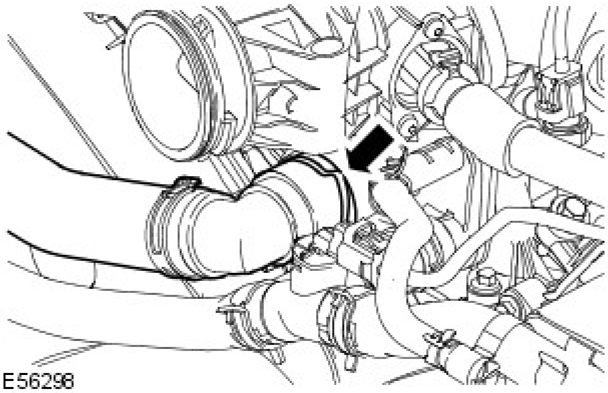
- Remove the six retaining bolts.

8. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

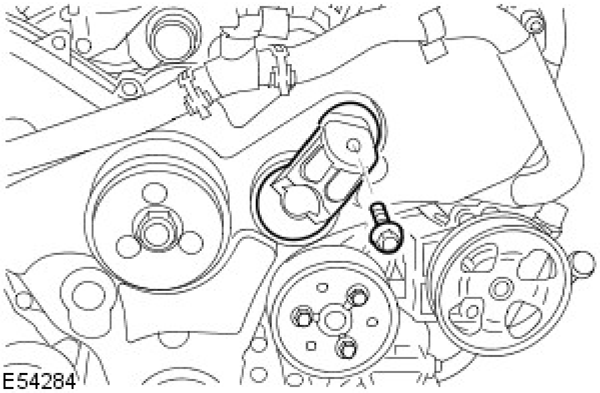
9. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

10. Disconnect the coolant hose from the cylinder head coolant outlet elbow.

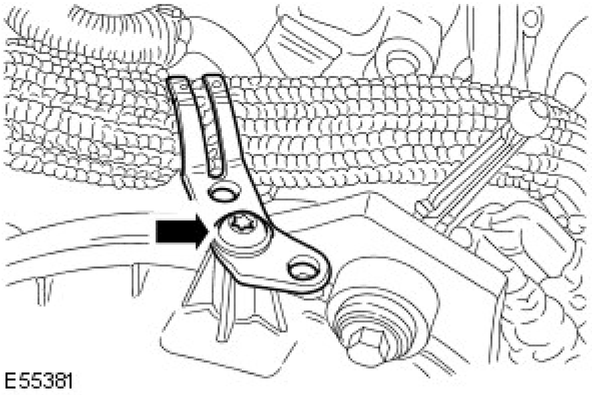


- Release the coolant hose retaining clip.
- Reposition the coolant top hose.

11. Remove the accessory drive belt idler.



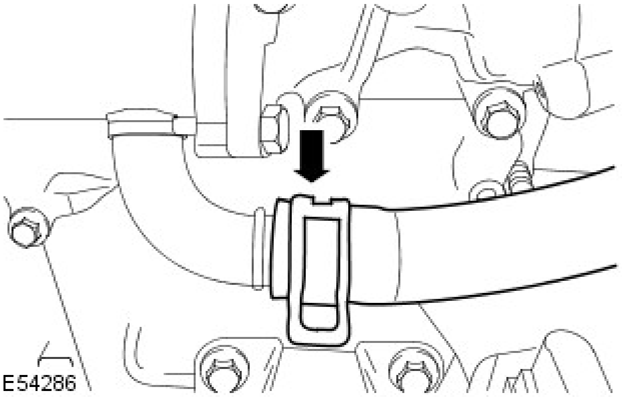
- Remove the retaining bolt.



12. NOTE: Right-hand shown, left-hand similar.

Release the exhaust gas recirculation (EGR) valve outlet tube clamps from the timing cover.

- Remove the retaining bolt.



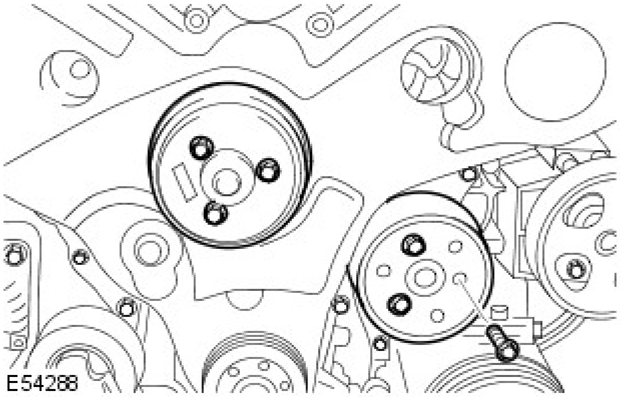
13. Disconnect the right-hand EGR coolant inlet hose from the EGR cooler.

- Release the coolant hose retaining clip.

14. Position the EGR coolant hose aside for access.

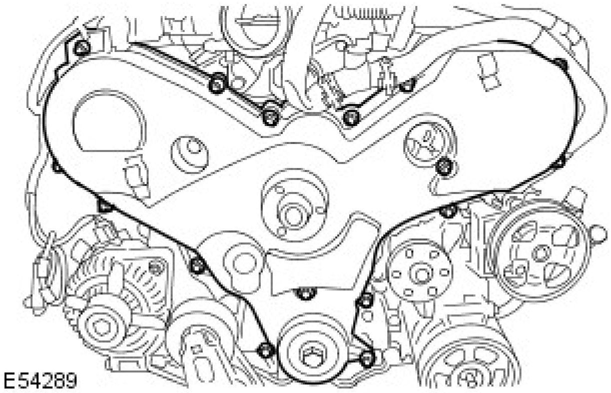
15. Remove the coolant pump and accessory drive belt idler pulleys.

- Remove the six retaining bolts.



16. Remove the timing belt cover.

- Fully loosen the 16 timing belt cover retaining bolts.
- Release the 2 wiring harness clips.



Installation

1. Install the timing belt cover.

- Attach the 2 wiring harness clips.
- Tighten the 16 timing belt cover retaining bolts to 10 Nm (7 lb.ft).

2. Install the coolant pump and accessory drive belt idler pulleys.

- Tighten the six retaining bolts to 23 Nm (17 lb.ft).

3. Connect the right-hand EGR coolant inlet hose to the EGR cooler.

- Install the coolant hose retaining clip.

4. Secure the EGR valve outlet tube clamps to the timing cover.

- Install the two retaining bolts.

5. Connect the coolant hose to the cylinder head coolant outlet elbow.

- Install the retaining clip.

6. Install the accessory drive belt idler.

- Install the retaining bolt and tighten to 47 Nm (35 lb.ft).

7. Install the crankshaft damper.

- Tighten the six retaining bolts to 23 Nm (17 lb.ft).

8. Install the fan cowl.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

9. Install the intake air shutoff throttle elbow support bracket.

- Install the three retaining bolts and tighten to 10 Nm (7 lb.ft).

10. Secure the intake air shutoff throttle elbow.

- Install the retaining clip.
- Install the retaining bolt.
- Connect the electrical connector.

11. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

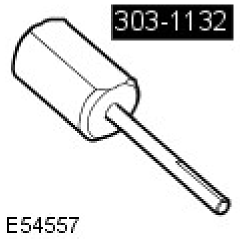
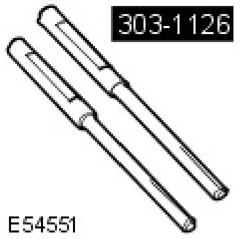
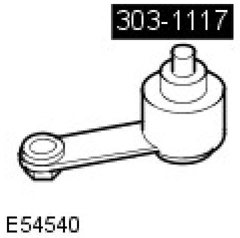
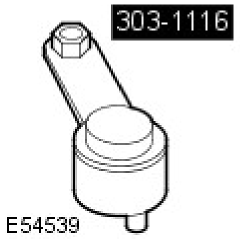
12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

13. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Timing Belt

In-vehicle Repair

Special Tool(s)	
	Check Pin - Camshaft Pulleys 303-1132
	Timing Pin - Camshaft Pulleys 303-1126
	Timing Pin - Automatic Transmission 303-1117
	Timing Pin - Manual Transmission 303-1116

Removal

All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the timing belt cover.
For additional information, refer to: Timing Belt Cover (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

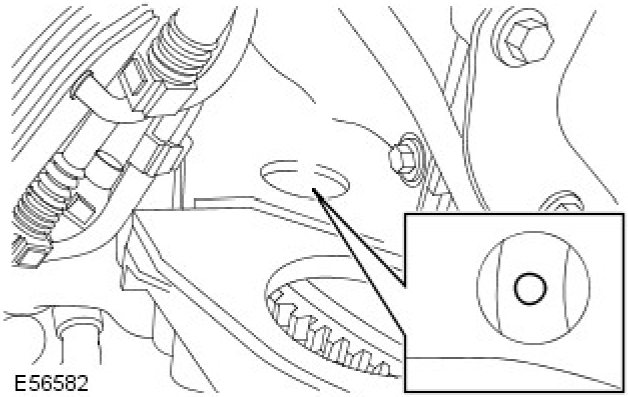
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the starter motor.
For additional information, refer to: Starter Motor (303-06C Starting System - TDV6 2.7L Diesel, Removal and Installation).

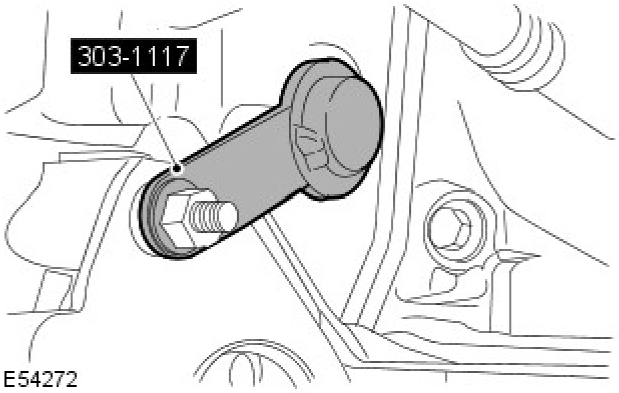
5. Remove the crankshaft timing alignment grommet from the engine block.

6. Rotate the crankshaft clockwise to align the crankshaft alignment hole in the flywheel or flexplate with the block aperture.



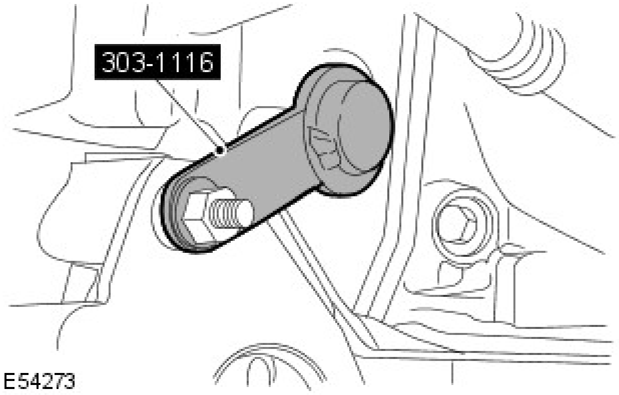
7. Check the camshaft pulley alignment holes are correctly aligned. If the alignment holes are not aligned, rotate the crankshaft one full turn clockwise.

Vehicles with automatic transmission



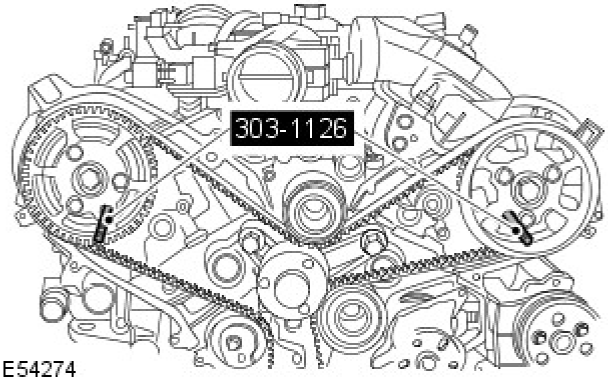
8. Using the special tool, lock the flexplate.
   - Install a starter motor bolt to retain the special tool.

Vehicles with manual transmission



9. Using the special tool, lock the flywheel.
   - Install a starter motor bolt to retain the special tool.

10. Install the special tools to the exhaust camshaft pulleys.

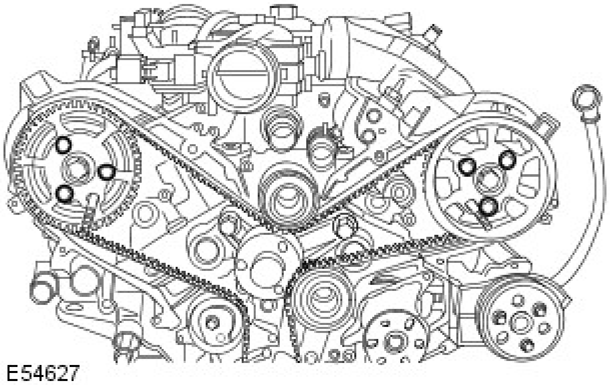


E54274

11. ⚠ CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

Loosen the six exhaust camshaft pulley damper retaining bolts.

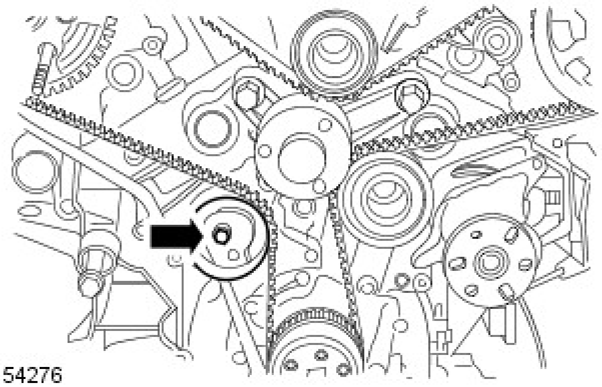
- Using a suitable tool, counterhold the camshaft pulley center retaining bolts.



E54627

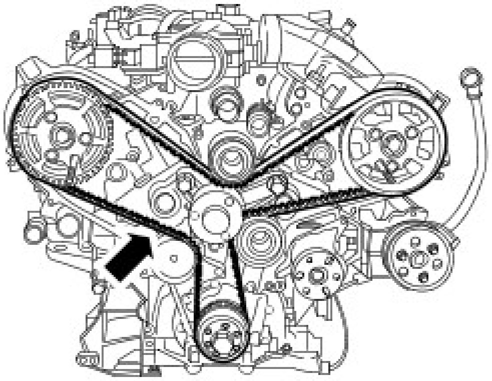
12. Remove and discard the timing belt tensioner.

- Remove and discard the bolt.



E54276

13. Remove and discard the timing belt.

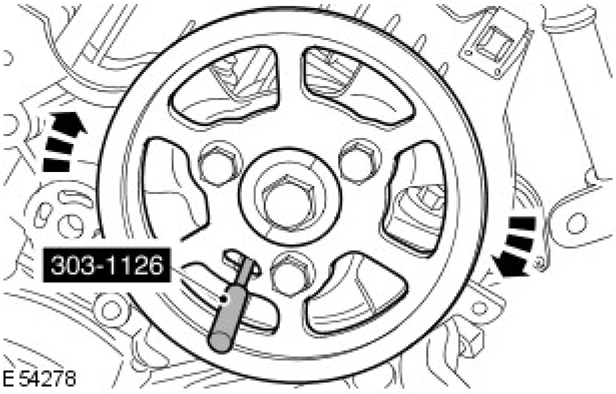


E54277

Installation

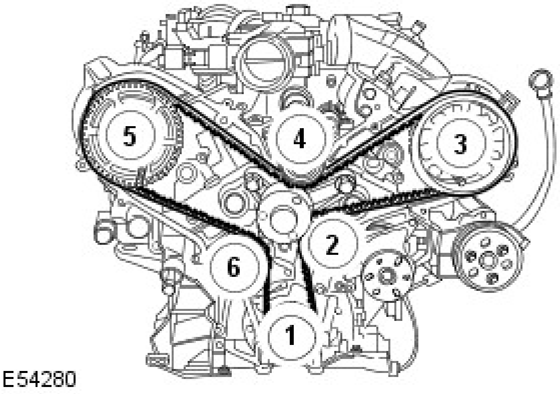
All vehicles

1. Rotate both camshaft pulleys clockwise.



2. Install a new timing belt tensioner.

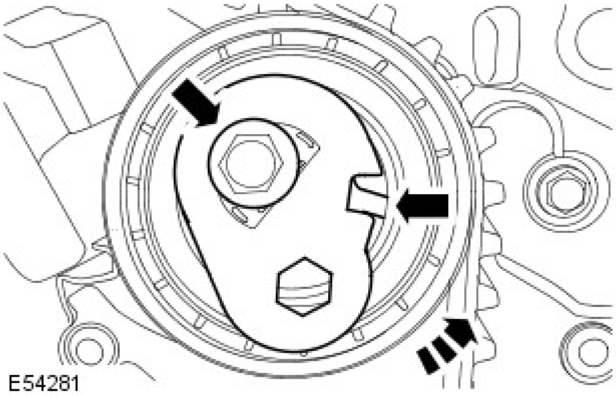
- Install a new bolt, but do not fully tighten at this stage.



3. ⚠ CAUTION: Make sure the camshaft pulleys remain in the clockwise position.

Install the new timing belt.

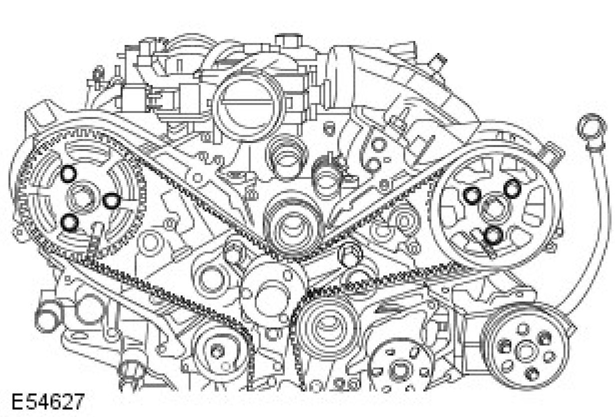
- Starting at the crankshaft pulley, install the timing belt in a counter-clockwise direction, in the sequence shown.
- Stage one: Attach the timing belt to the crankshaft pulley.
- Stage two: Attach the timing belt to the idler pulley.
- Stage three: Attach the timing belt to the left-hand camshaft pulley.
- Stage four: Attach the timing belt to the idler pulley.
- Stage five: Attach the timing belt to the RH camshaft pulley.
- Stage six: Attach the timing belt to the timing belt tensioner.



4. ⚠ CAUTION: Make sure the timing belt tensioner window is aligned with the groove.

Tension the timing belt.

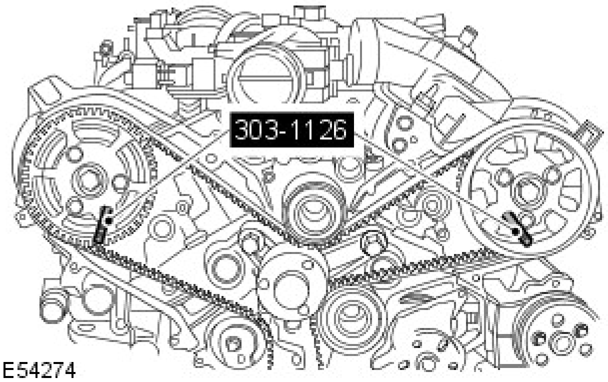
- Rotate the tensioner assembly counterclockwise.
- Tighten to 24 Nm (18 lb.ft).



5. ⚠CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

Using a suitable tool, counterhold the camshaft pulley center retaining bolts.

- Tighten the six exhaust camshaft pulley damper retaining bolts.
- Tighten the bolts to 23 Nm (17 lb.ft).



6. Remove the special tools from the camshaft pulleys.

Vehicles with manual transmission

7. Remove the special tool from the flywheel.

Vehicles with automatic transmission

8. Remove the special tool from the flexplate.

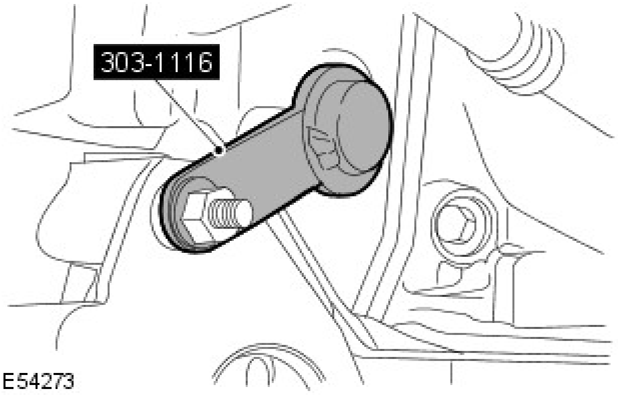
All vehicles

9. Rotate the engine two complete turns clockwise.

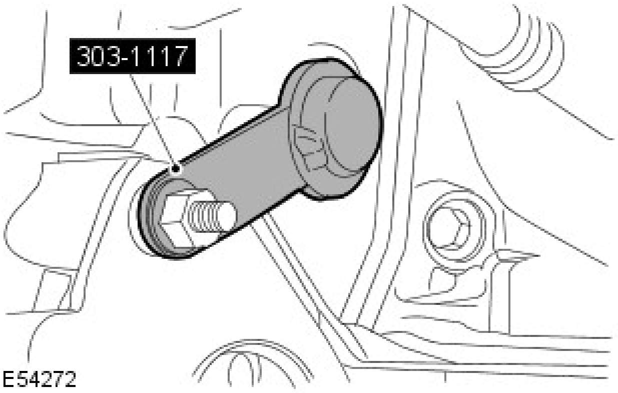
Vehicles with manual transmission

10. Using the special tool, lock the flywheel.

- Install a starter motor bolt to retain the special tool.

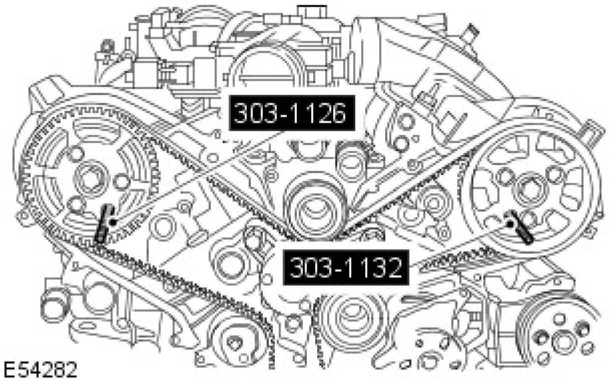


Vehicles with automatic transmission



11. Using the special tool, lock the flexplate.

- Install a starter motor bolt to retain the special tool.



12. Install the special tools to the exhaust camshaft pulleys.

- If the special tool does not fit correctly, repeat the timing belt installation procedure.
- Remove the special tools from the camshaft pulleys.

Vehicles with manual transmission

13. Remove the special tool from the flywheel.

- Install the grommet.

Vehicles with automatic transmission

14. Remove the special tool from the flexplate.

- Install the grommet.

All vehicles

15. Install the starter motor.
For additional information, refer to: Starter Motor (303-06C Starting System - TDV6 2.7L Diesel, Removal and Installation).

16. Install the timing belt cover.
For additional information, refer to: Timing Belt Cover (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

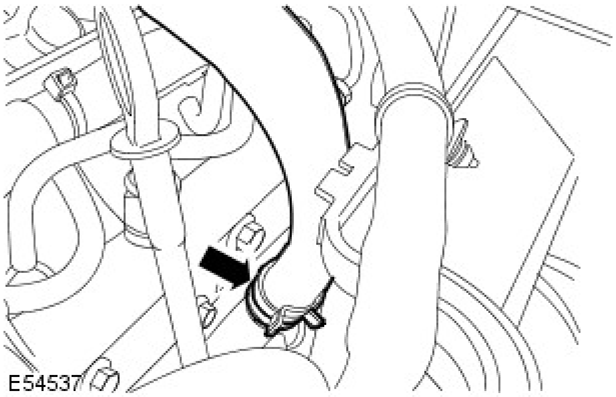
Published: 11-May-2011

Engine - TDV6 2.7L Diesel - Exhaust Manifold LH

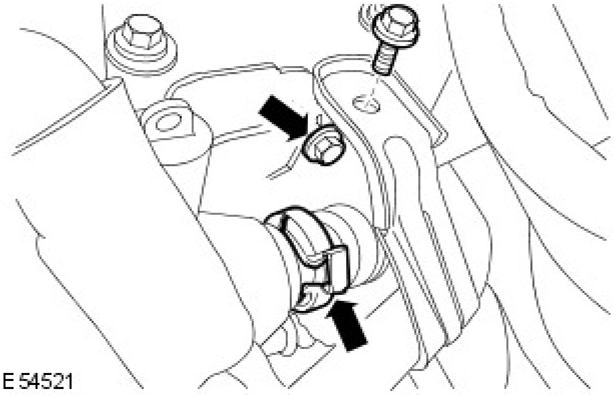
In-vehicle Repair

Removal

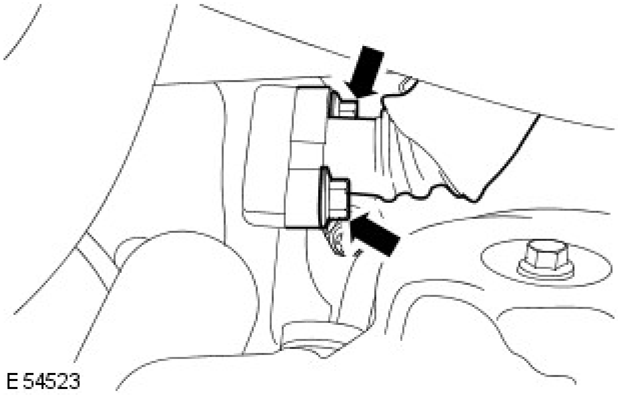
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the turbocharger.
   For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Removal and Installation).
3. Drain the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).
4. Remove the battery tray.
   For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).
5. Remove the LH EGR valve outlet tube.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).



6. Disconnect the coolant outlet hose from the LH EGR valve.
   - Release the clip.

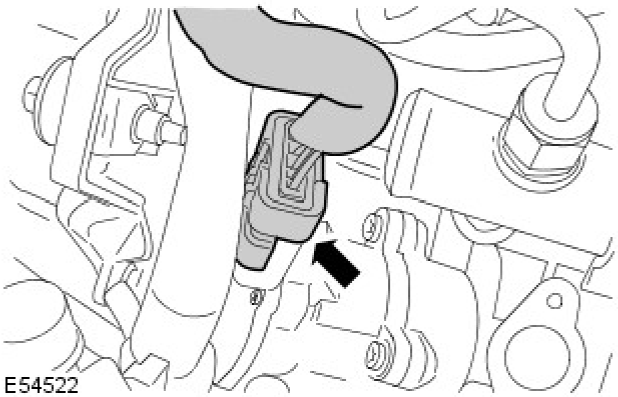


7. Release the LH EGR valve inlet tube.
   - Remove the two support bracket retaining bolts.
   - Remove the support bracket.
   - Remove and discard the retaining clip.

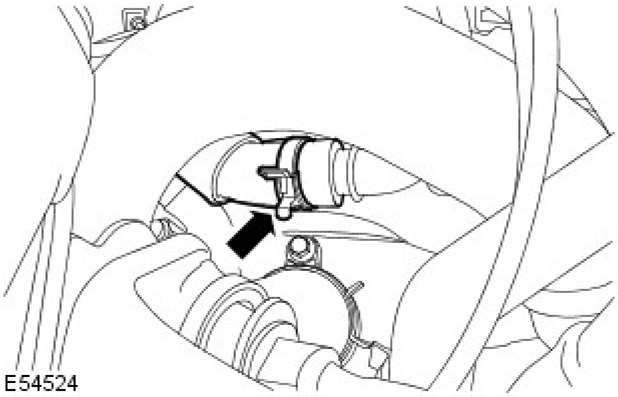


8. Remove the LH EGR valve inlet tube.

- Remove the two retaining bolts.
- Remove and discard the gasket.

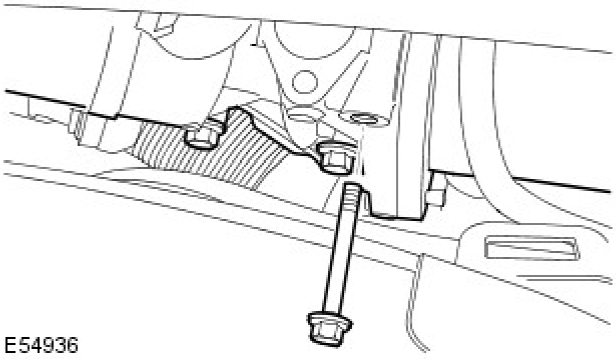


9. Disconnect the LH EGR valve electrical connector.



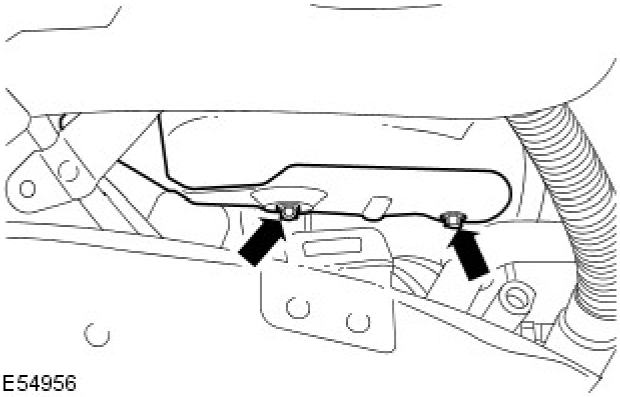
10. Disconnect the coolant inlet hose from the LH EGR valve.

- Release the clip.



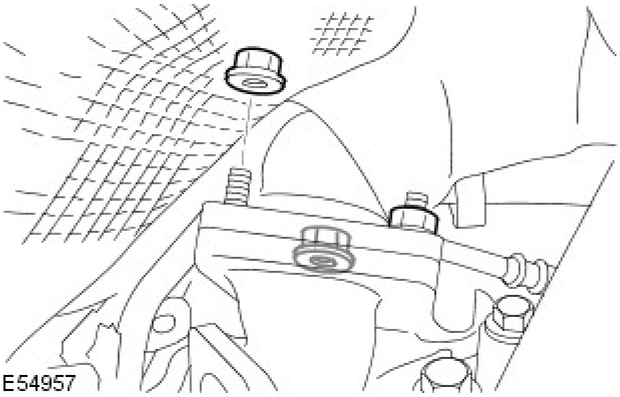
11. Remove the LH EGR valve.

- Remove the three retaining bolts.

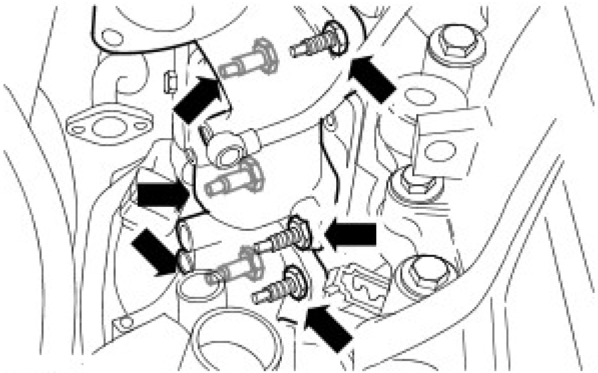

E54956

12. Remove the LH exhaust manifold heat shield.

- Remove the two retaining bolts.

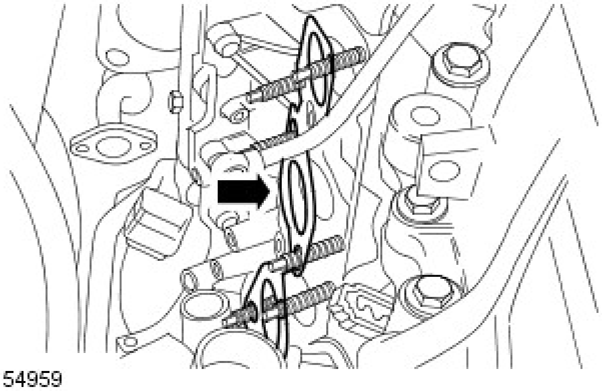

E54957

13. Remove the three exhaust cross-over pipe retaining nuts.


E54958

14. Remove the LH exhaust manifold.

- Remove the six retaining nuts.


E54959

15. Remove and discard the LH exhaust manifold gasket.

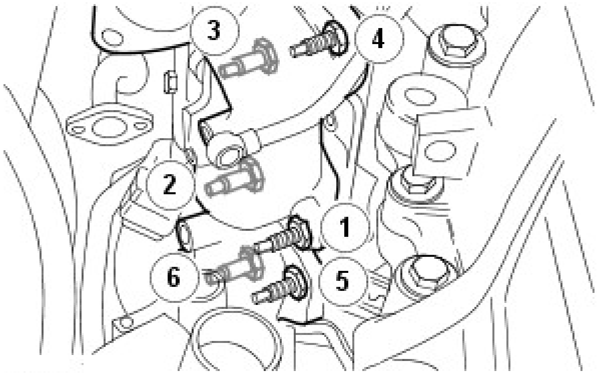
- Remove and discard the studs.

Installation

1. Tighten the LH exhaust manifold retaining studs to 13 Nm (10 lb.ft).

   - Install a new gasket.

2. NOTE: Tighten the retaining nuts in the sequence shown.



E56247

   Install the LH exhaust manifold.

   - Tighten the nuts to 24 Nm (18 lb.ft).

3. Install the three exhaust cross-over pipe retaining nuts.

   - Tighten the nuts to 24 Nm (18 lb.ft).

4. Install the LH exhaust manifold heat shield.

   - Install the two retaining bolts and tighten to 10 Nm (7 lb.ft).

5. Install the LH EGR valve.

   - Install the three EGR valve retaining bolts, but do not fully tighten at this stage.

6. NOTE: Do not fully close the retaining clip at this stage.

   Install the LH EGR valve inlet tube.

   - Install a new retaining clip.
   - Install a new gasket.
   - Loosely install the two EGR valve inlet tube retaining bolts.

7. Fully close the retaining clip.
8. Tighten the two EGR valve inlet tube retaining bolts to 10 Nm (7 lb.ft).
9. Tighten the three EGR valve retaining bolts to 10 Nm (7 lb.ft).
10. Install the support bracket.

    - Tighten the two retaining bolts to 10 Nm (7 lb.ft).

11. Connect the coolant inlet hose to the LH EGR valve.
12. Connect the LH EGR valve electrical connector.
13. Connect the coolant outlet hose to the LH EGR valve.
14. Install the LH EGR valve outlet tube.
    For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).
15. Install the battery tray.
    For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).
16. Install the turbocharger.

For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Removal and Installation).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

18. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

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Engine - TDV6 2.7L Diesel - Exhaust Manifold RH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

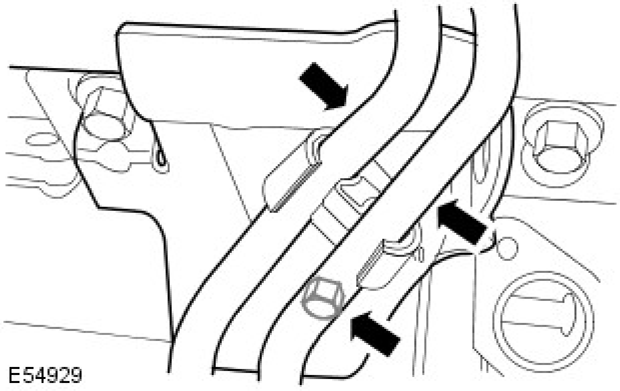
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

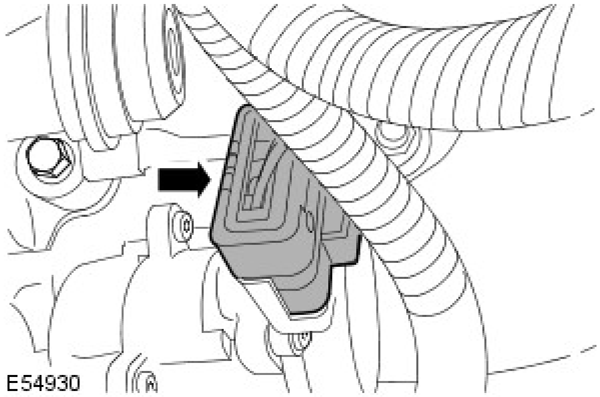
4. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

5. Remove the RH exhaust gas recirculation (EGR) valve outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

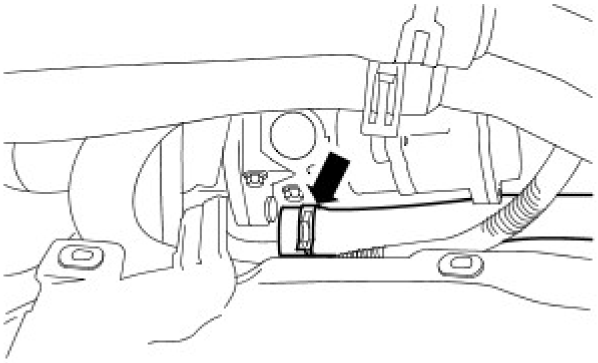


6. Remove the fuel line bracket.

- Release the fuel lines.
- Remove the bolt.



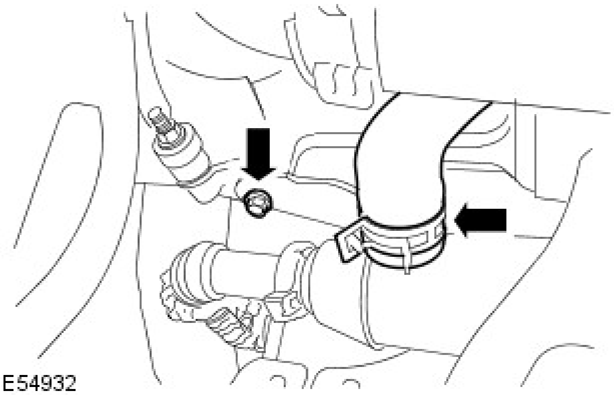
7. Disconnect the EGR valve electrical connector.



E54931

8. Disconnect the coolant inlet hose from the EGR valve.

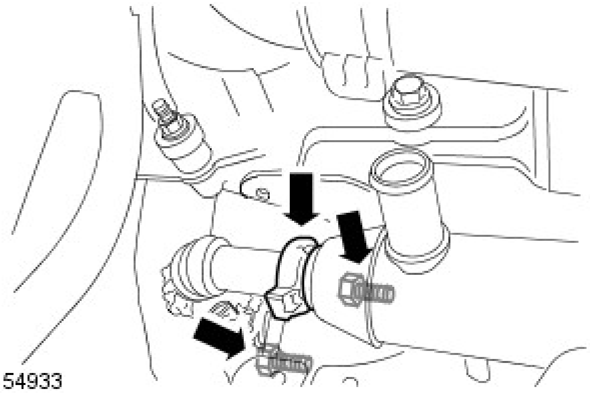
- Release the clip.



E54932

9. Disconnect the coolant outlet hose from the EGR valve.

- Remove the bolt.
- Release the clip.



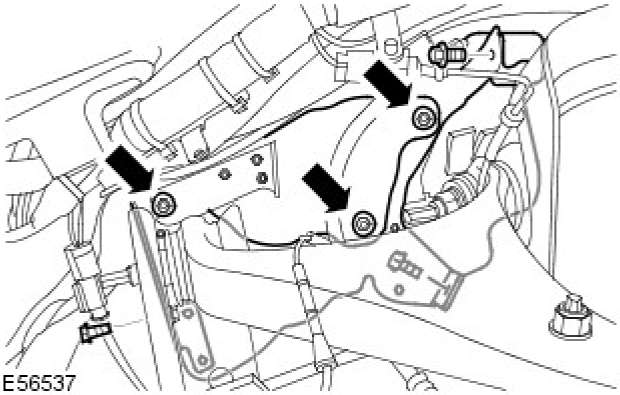
E54933

10. Remove the EGR valve inlet tube.

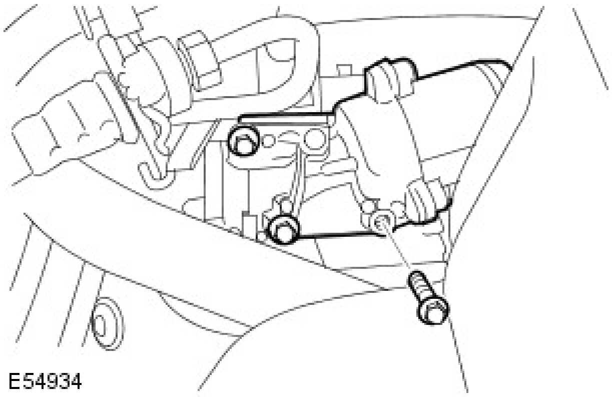
- Release the clip.
- Remove the 2 bolts.
- Remove and discard the gasket.
- Remove and discard the clip.

11. Remove the RH front wheel and tire.

12. Remove the upper suspension arm and brake line heat shields for access.

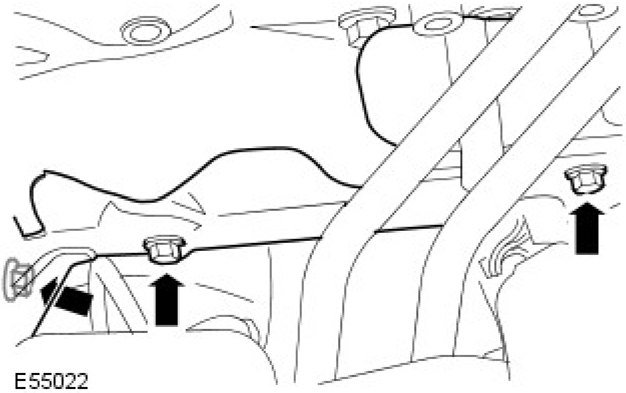


E56537



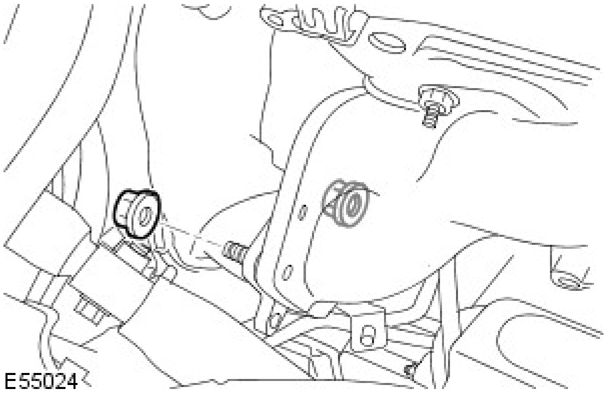
13. Remove the RH EGR valve and cooler assembly.

- Remove the 3 bolts.

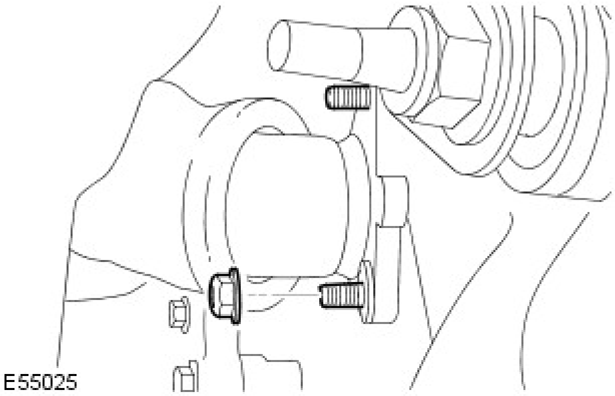


14. Remove the RH exhaust manifold heat shield.

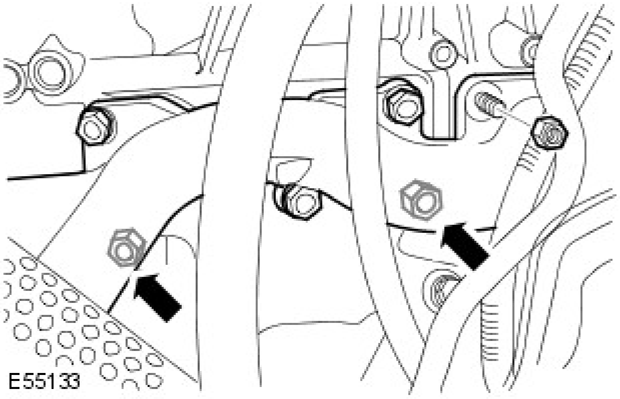
- Remove the 3 bolts.



15. Remove the 2 exhaust cross-over pipe nuts.



16. Remove the remaining exhaust cross-over pipe nut.



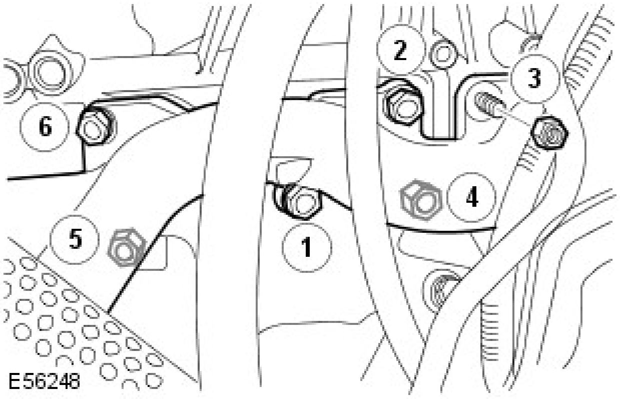
17. Remove the RH exhaust manifold.

- Remove the 6 nuts.
- Remove and discard the gasket.
- Remove and discard the studs.

Installation

1. Tighten the exhaust manifold studs to 13 Nm (10 lb.ft).

- Install a new gasket.



2. NOTE: Tighten the retaining nuts in the sequence shown.

Install the RH exhaust manifold.

- Tighten the nuts to 24 Nm (18 lb.ft).

3. Tighten the exhaust cross-over pipe nut to 24 Nm (18 lb.ft).

4. Tighten the 2 exhaust cross-over pipe nuts to 24 Nm (18 lb.ft).

5. Install the RH exhaust manifold heat shield.

- Install the bolts and tighten to 10 Nm (7 lb.ft).

6. Install the RH EGR valve and cooler assembly.

- Install the EGR valve bolts, but do not fully tighten at this stage.

7. NOTE: Do not fully close the retaining clip at this stage.

Install the EGR valve inlet tube.

- Install a new gasket.
- Install a new clip.
- Loosely install the 2 EGR valve inlet tube bolts.

8. Fully close the clip.

9. Tighten the two EGR valve inlet tube bolts to 10 Nm (7 lb.ft).

10. Tighten the three EGR valve bolts to 10 Nm (7 lb.ft).

11. Install the upper suspension arm and brake line heat shields.

12. Install the wheel and tire.

13. Tighten the EGR valve bolt to 10 Nm (7 lb.ft).

14. Connect the coolant outlet hose to the EGR valve.

15. Connect the coolant inlet hose to the EGR valve.

16. Connect the EGR valve electrical connector.

17. Install the fuel line bracket.

- Install the fuel line retaining bracket bolt and tighten to 10 Nm (7 lb.ft).
- Secure the fuel lines.

18. Install the RH EGR valve outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

19. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

20. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

21. Fill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

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Engine - TDV6 2.7L Diesel - Oil Pan

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

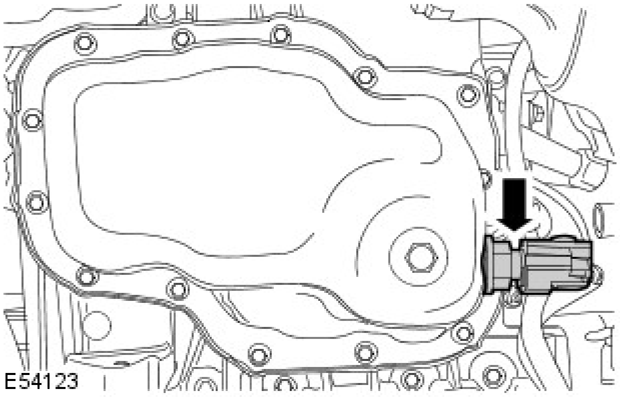
2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Drain the engine oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures).

5. Remove the oil temperature sensor.

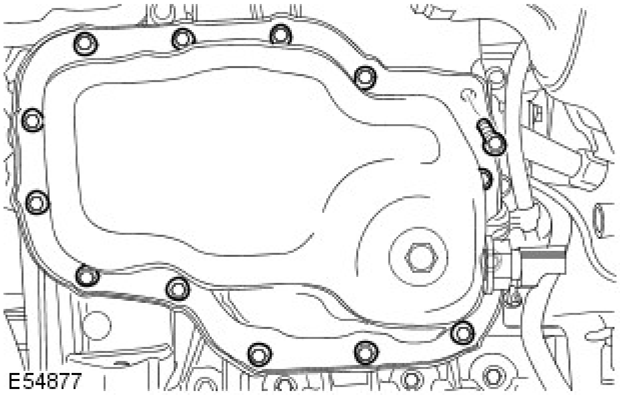


- Disconnect the engine oil temperature sensor electrical connector.
- Remove and discard the O-ring seal.

6. Disconnect the engine wiring harness.

- Release the engine wiring harness from the retaining bracket.

7. Remove the oil pan.



- Remove the 14 oil pan bolts.
- Remove and discard the gasket.

Installation

1. Install the oil pan.

- Clean the component mating faces.
- Install a new gasket.

- Evenly and progressively tighten the bolts to 10 Nm (7 lb.ft).

2. Connect the engine wiring harness.

- Attach the engine wiring harness to the retaining bracket.

3. Install the oil temperature sensor.

- Install a new O-ring seal.
- Tighten the sensor to 10 Nm (7 lb.ft).
- Connect the electrical connector.

4. Fill the engine with oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures).

5. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 2.7L Diesel - Oil Pump Screen and Pickup Tube

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

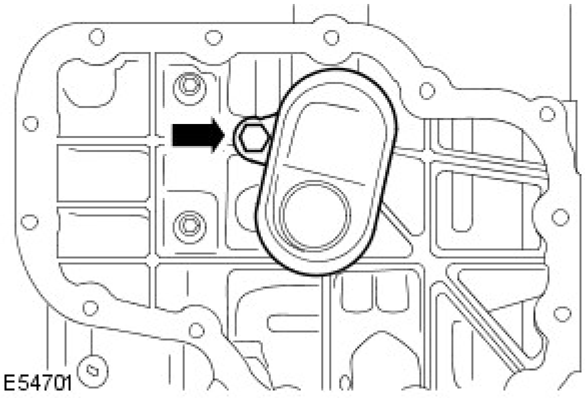
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the oil pan.
For additional information, refer to: Oil Pan (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

4. Remove the oil pump screen and pickup tube.

- Remove the bolt.
- Remove and discard both O-ring seals.
- Clean the seal contact area.



Installation

1. NOTE: Lubricate new seals with clean engine oil.

Install the oil pump screen and pickup tube.

- Clean the components.
- Install new O-ring seals.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. Install the oil pan.
For additional information, refer to: Oil Pan (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 2.7L Diesel - Oil Filter Housing

In-vehicle Repair

1. Refer to oil cooler.
   For additional information, refer to: Oil Cooler (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

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Engine - TDV6 2.7L Diesel - Crankshaft Rear Seal with Retainer Plate

In-vehicle Repair

Removal

- NOTE: The crankshaft rear seal and retainer plate are supplied as an assembly and cannot be serviced separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

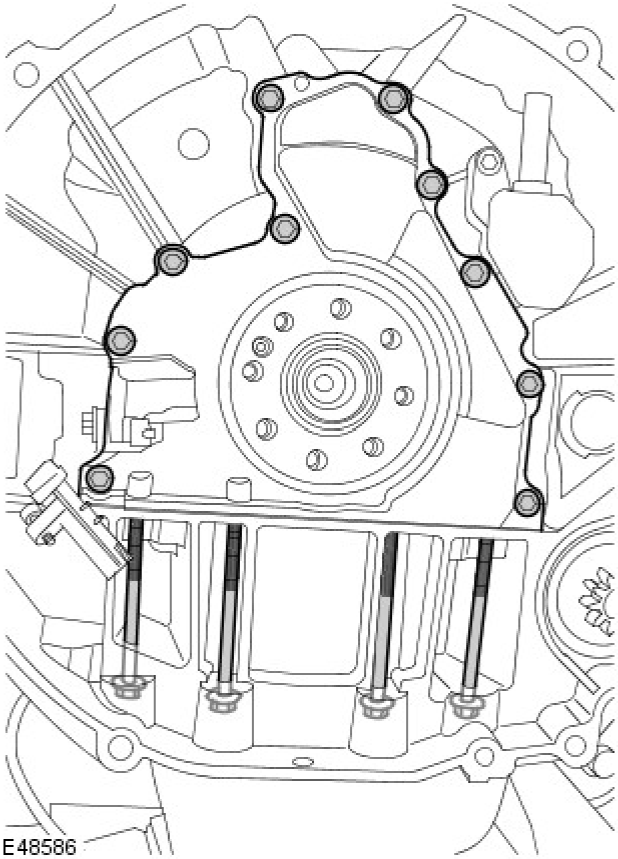
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

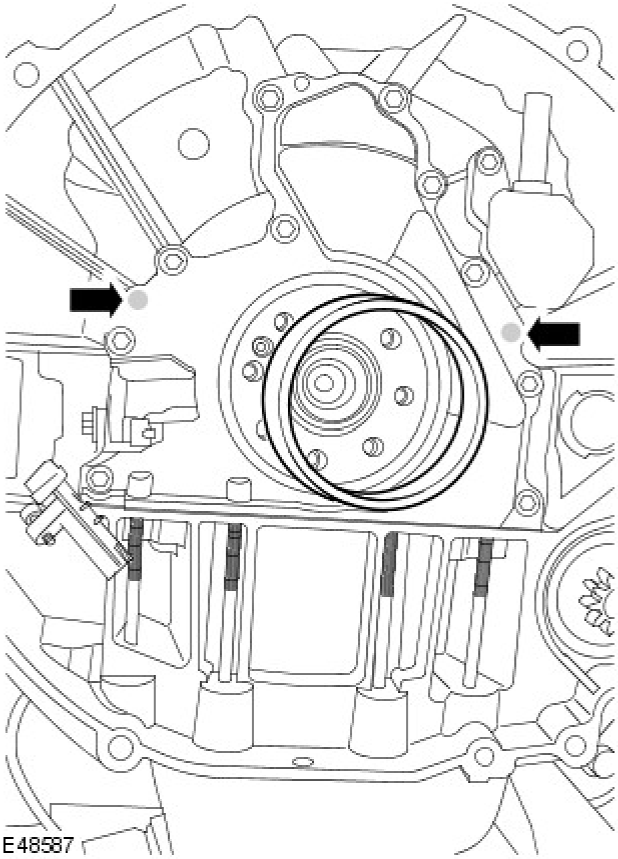
3. Remove the CKP sensor ring.
For additional information, refer to: Crankshaft Position (CKP) Sensor Ring (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the crankshaft seal retainer plate.

- Remove the 14 bolts.



Installation



1. CAUTIONS:

⚠ Oil seals must be fitted dry.

⚠ Tighten the bolts securing the seal retainer to the cylinder block first.

Install the crankshaft seal retainer plate.

- Clean the component mating faces.
- Install the seal retainer with its protection sleeve onto the crankshaft.
- Locate the seal retainer onto the sump flange.
- Engage the seal retainer dowels with the cylinder block and lightly tighten 2 bolts on opposite sides of the retainer.
- Remove the seal protection sleeve.
- Install the 8 remaining bolts and tighten all bolts evenly to 10 Nm (7 lb.ft).

2. Install the CKP sensor ring to the crankshaft.
For additional information, refer to: Crankshaft Position (CKP) Sensor Ring (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Check and top-up the engine oil.

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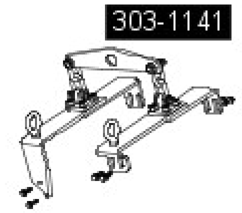
Engine - TDV6 2.7L Diesel - Engine

Removal

Special Tool(s)	
 E56716	Engine lifting cradle 303-1141

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

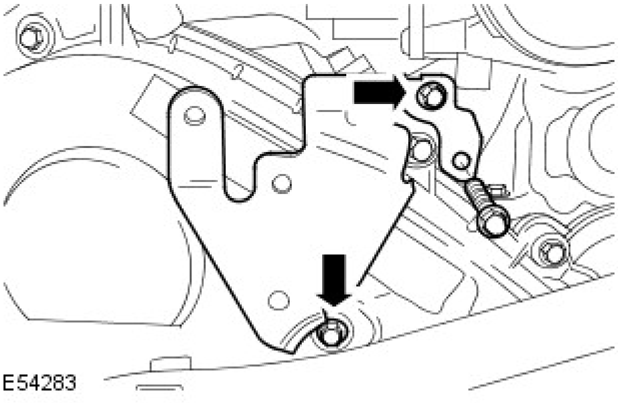
Raise and support the vehicle.

3. Remove the wheels and tires.

4. Remove the body.
For additional information, refer to: Body - TDV6 2.7L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

5. Remove the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

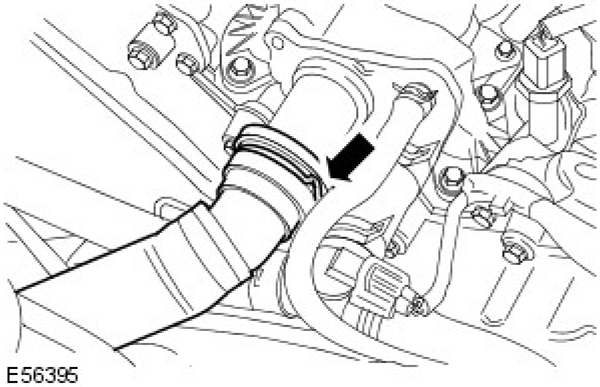
6. Remove the intake air shutoff throttle.
For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).



E54283

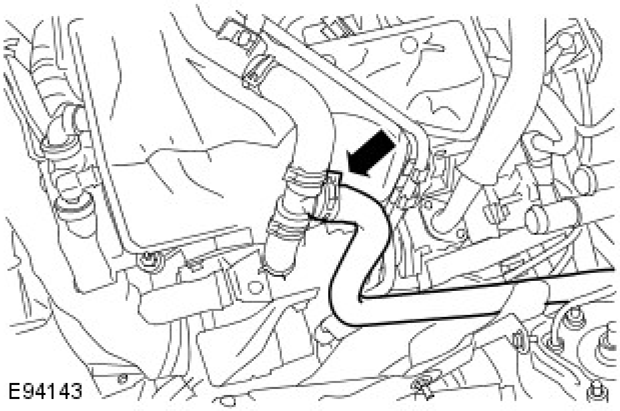
7. Remove the intake air shutoff throttle elbow support bracket.

- Remove the 3 bolts.


E56395

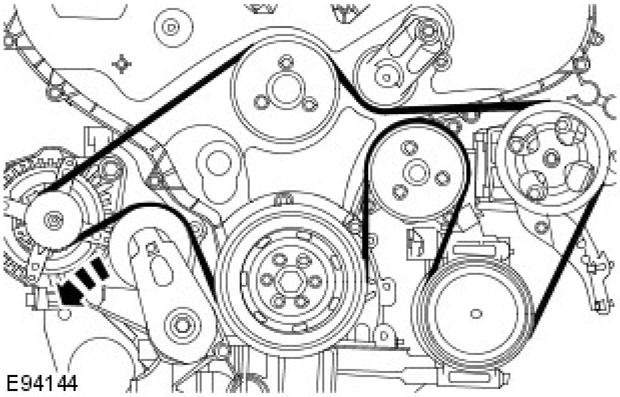
8. Disconnect the upper coolant hose from the coolant distribution manifold.

- Remove the clip.


E94143

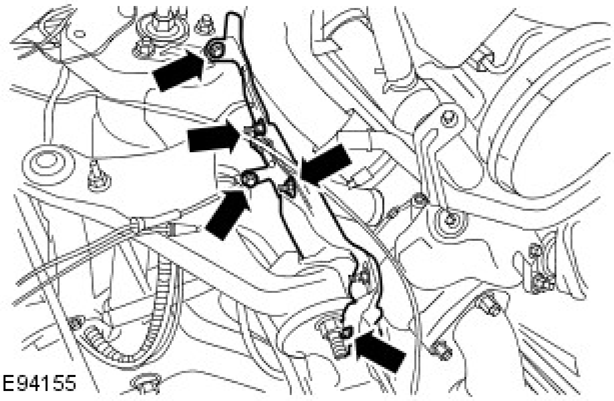
9. Disconnect the RH exhaust gas recirculation (EGR) coolant hose.

- Release the clip.


E94144

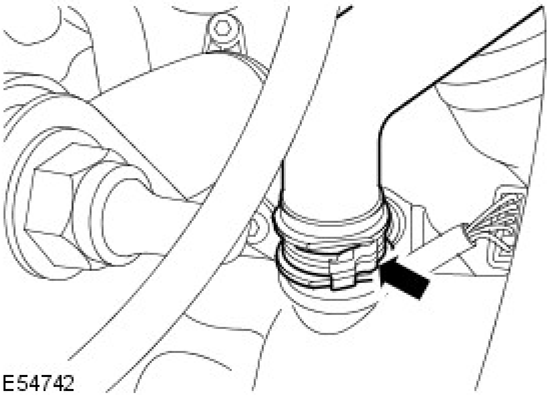
10. Remove the accessory drive belt.

- Rotate the accessory drive belt tensioner counter-clockwise.


E94155

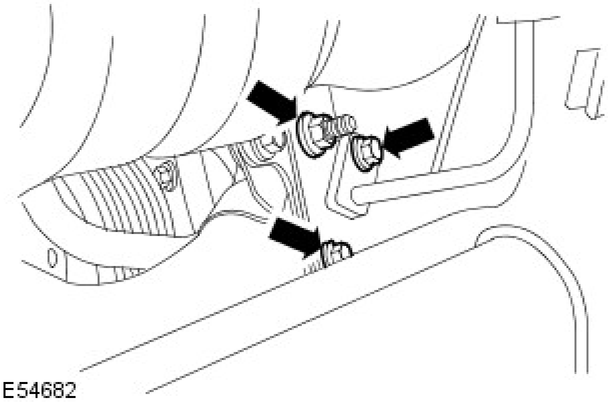
11. Remove the 2 LH upper suspension arm and brake line heat shields.

- Remove the 2 nuts.
- Remove the 3 bolts.


E54742

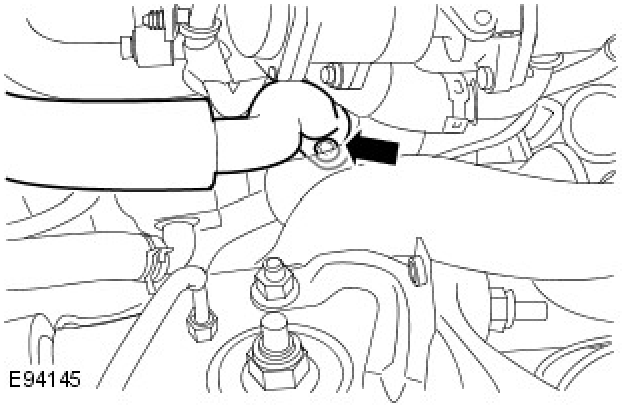
12. Disconnect the breather hose.

- Release the clip.


E54682

13. Release the charge air cooler inlet pipe.

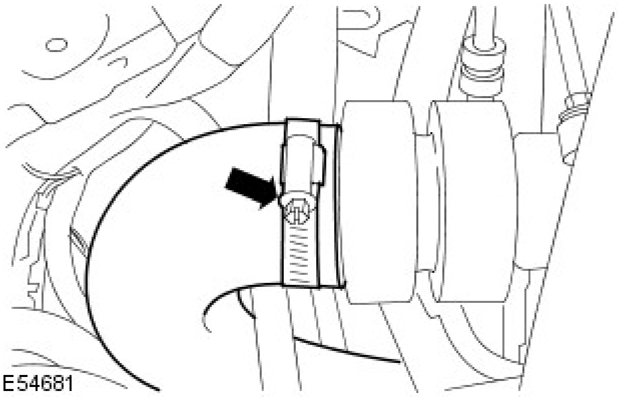
- Remove the 2 nuts.
- Remove the bolt.


E94145

14. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the air conditioning (A/C) compressor low-pressure line.

- Remove the bolt.
- Remove and discard the O-ring seal.

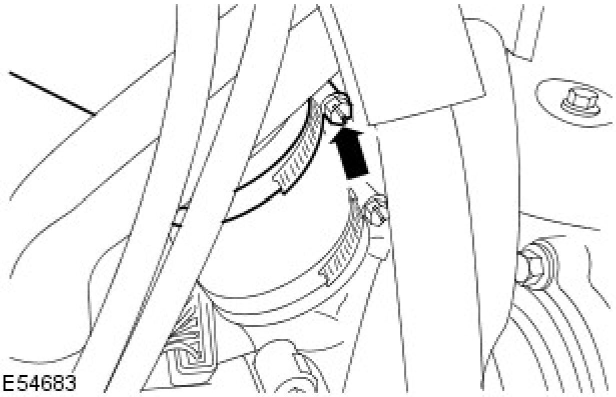

E54681

15. Disconnect the charge air cooler inlet hose.

- Loosen the clip.

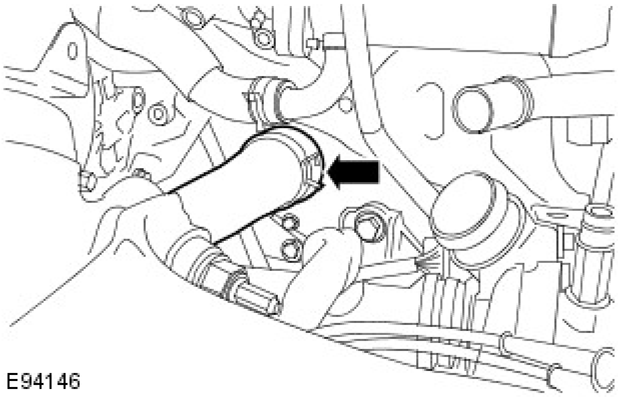
16. Disconnect the charge air cooler inlet hose.

- Loosen the clip.

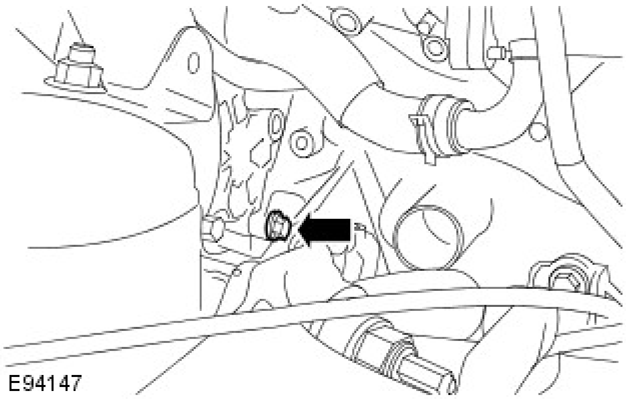


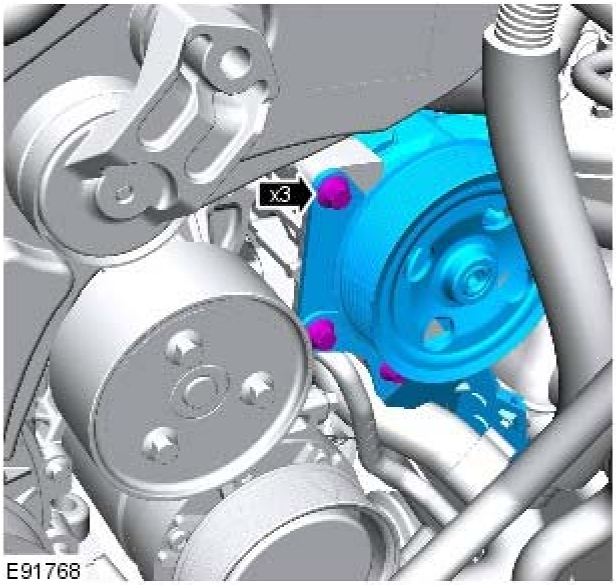
17. Disconnect the coolant lower hose.

- Release the clip.



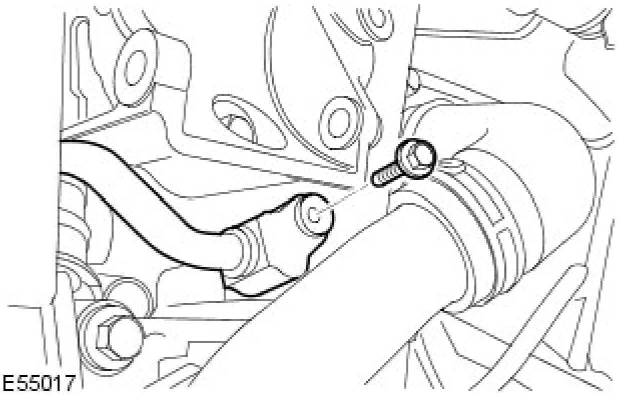
18. Remove the power steering pump rear bolt.





19. Reposition the power steering pump.

- Remove the 3 bolts.



20. Remove the charge air cooler inlet pipe.

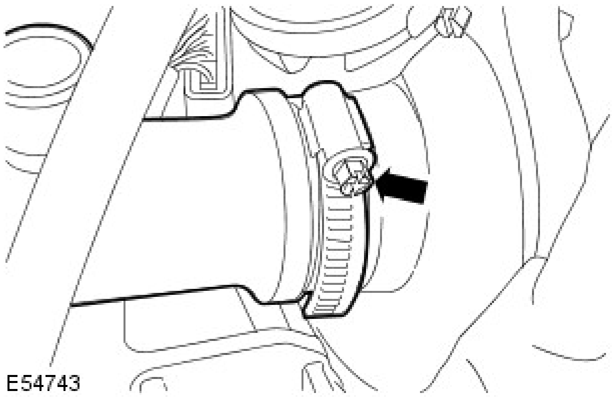
21. CAUTIONS:

⚠ Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

⚠ Care must be taken to avoid damage to the mating surfaces.

Disconnect the A/C compressor high-pressure pipe.

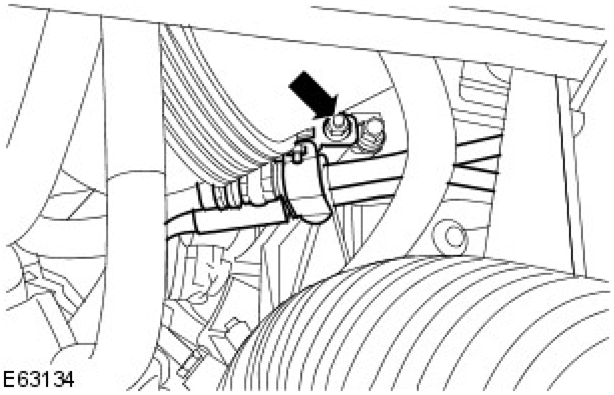
- Remove the bolt.
- Remove and discard the O-ring seal.



22. Reposition the lower coolant hose.

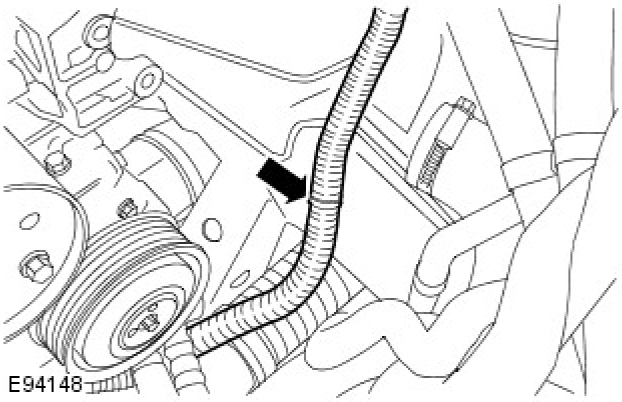
23. Remove the turbocharger intake tube.

- Loosen the clip.



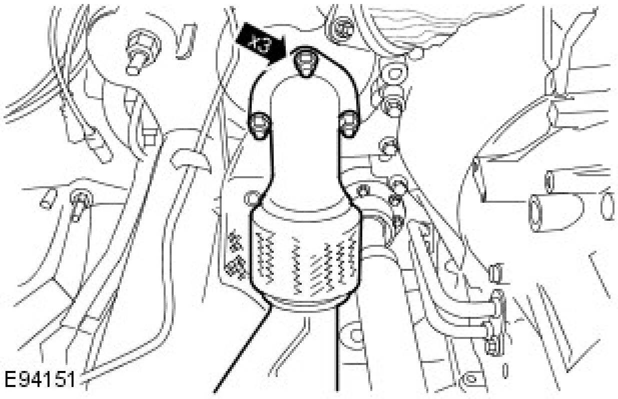
24. Release the transmission fluid lines.

- Remove the nut.



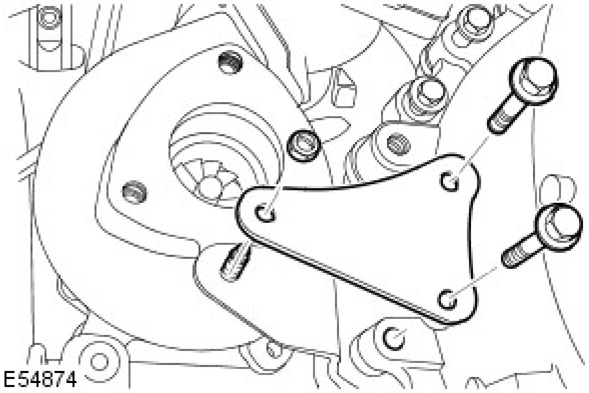
25. Release the battery positive cable.

- Release the clip.



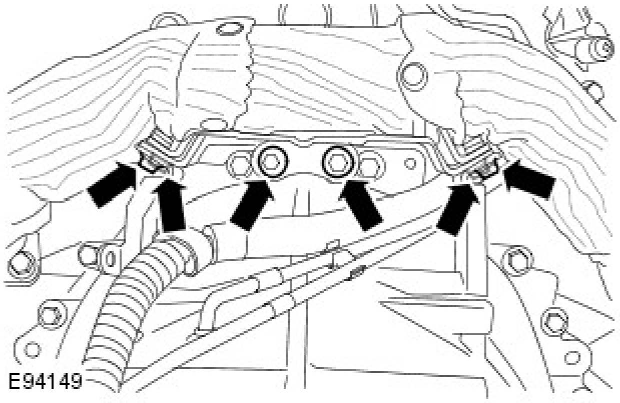
26. Release the exhaust from the turbocharger.

- Remove and discard the 3 nuts.
- Remove and discard the gasket.



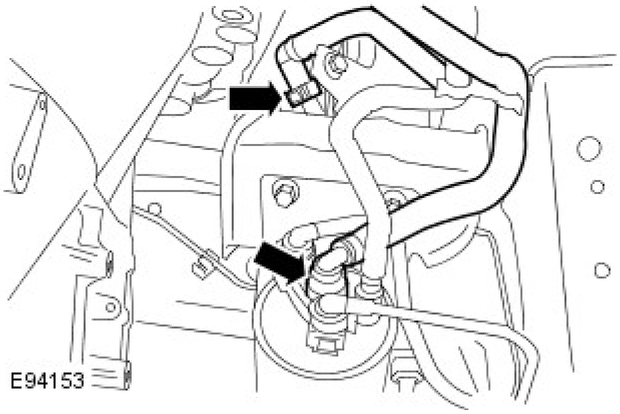
27. Remove the turbocharger support bracket.

- Remove the 2 bolts.
- Remove the nut.



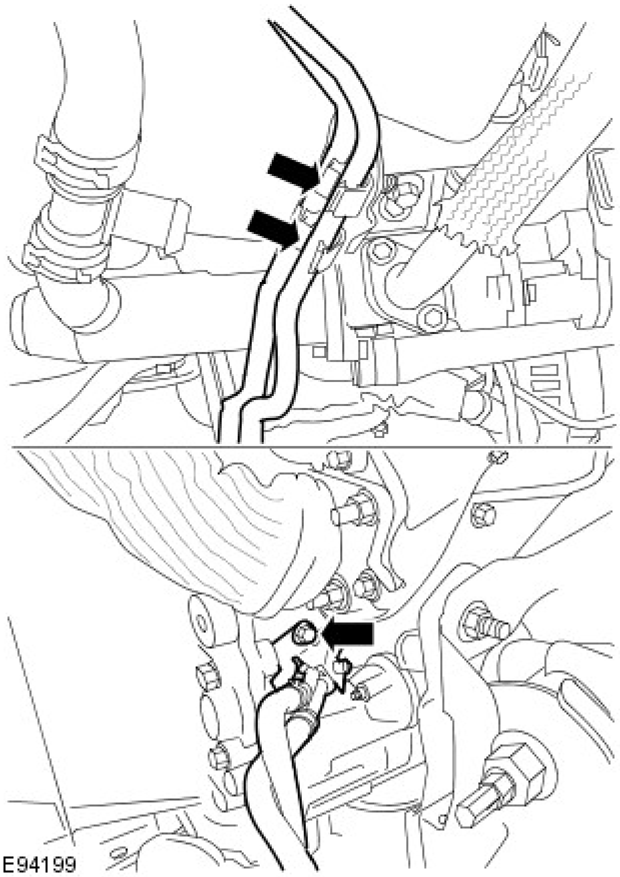
28. Release the exhaust cross-over pipe bracket.

- Remove the 6 bolts.



29. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 fuel lines.

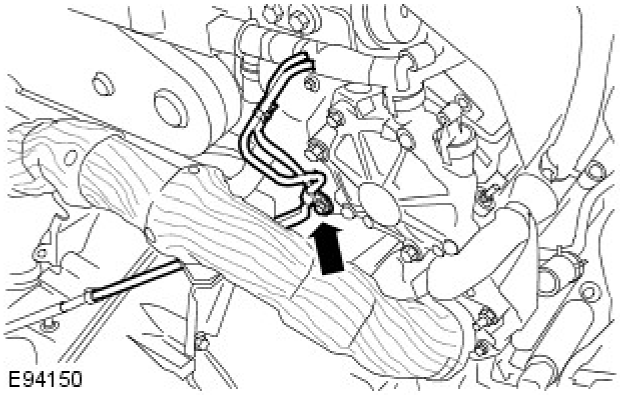


30. Release the 2 fuel lines.

- Remove the bolt.
- Release from the 2 clips.

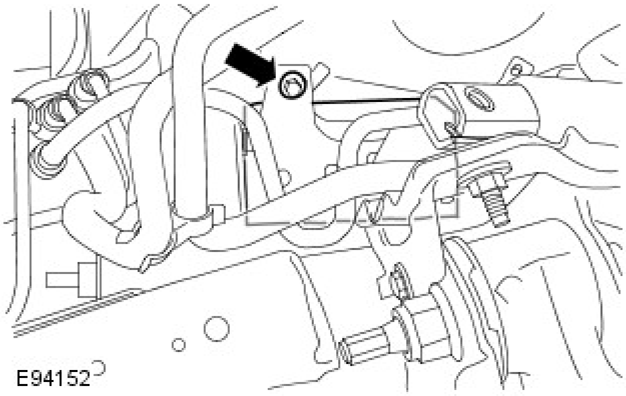
31. Release the transmission breather lines.

- Remove the bolt.



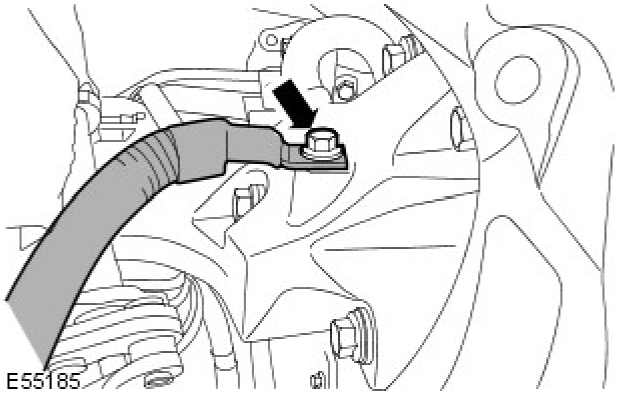
32. Release and reposition the fuel cooler.

- Remove the bolt.



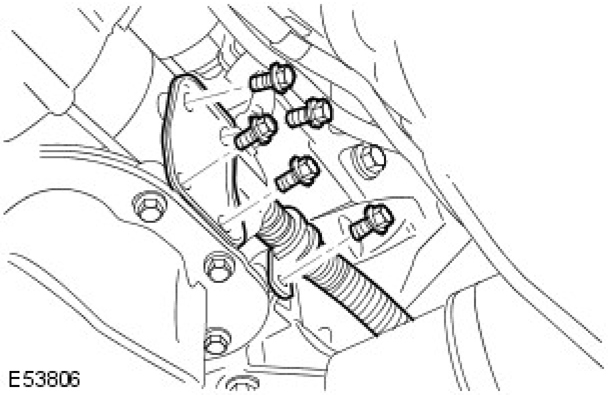
33. Release the engine ground cable.

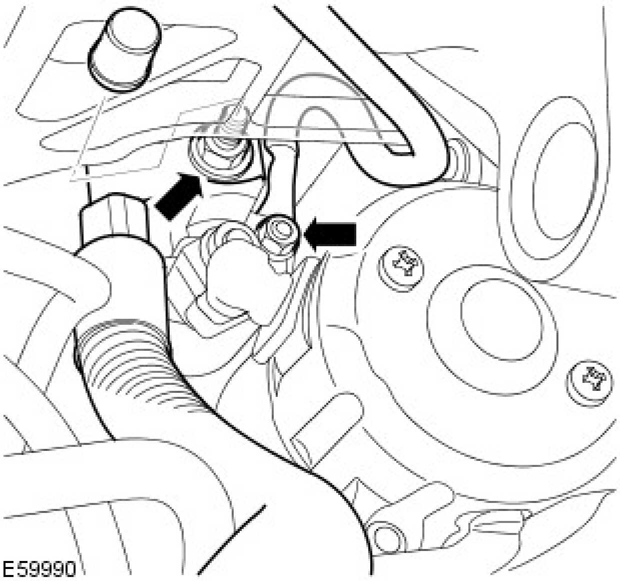
- Remove the bolt.



34. Remove the starter motor support bracket.

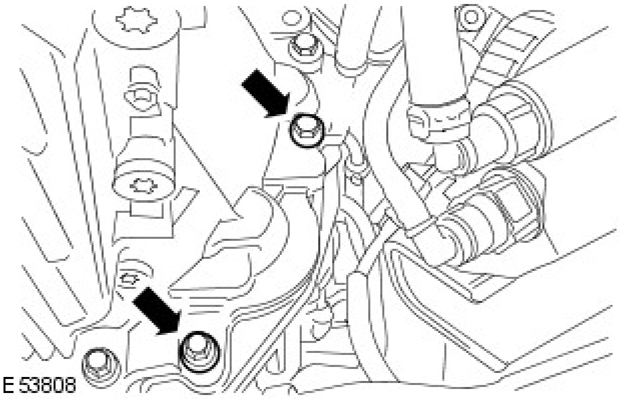
- Remove the 4 bolts.





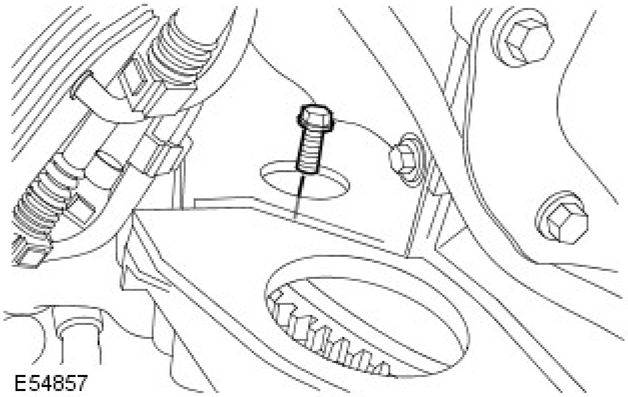
35. Disconnect the 2 starter motor wiring harness connectors from the starter motor solenoid.

- Remove the rubber insulator.
- Remove the 2 nuts.



36. Remove the starter motor.

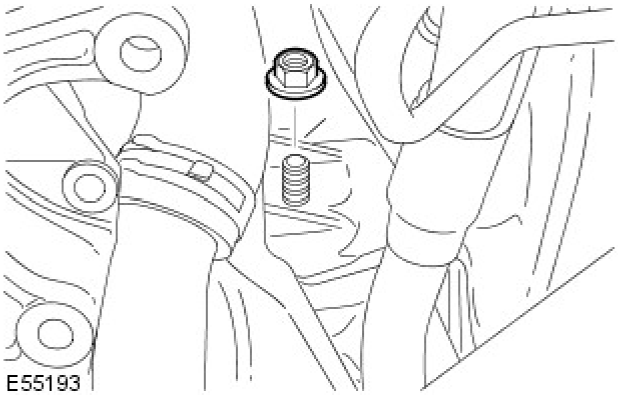
- Remove the 2 bolts.



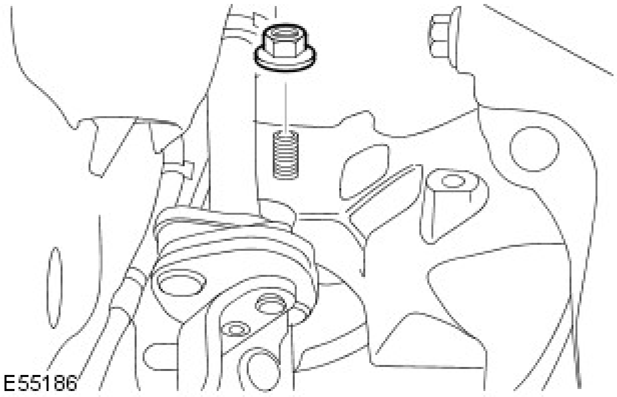
37. Release the flexplate.

- Remove the access plug.
- Remove and discard the 4 bolts.

38. Remove the LH engine mount nut.

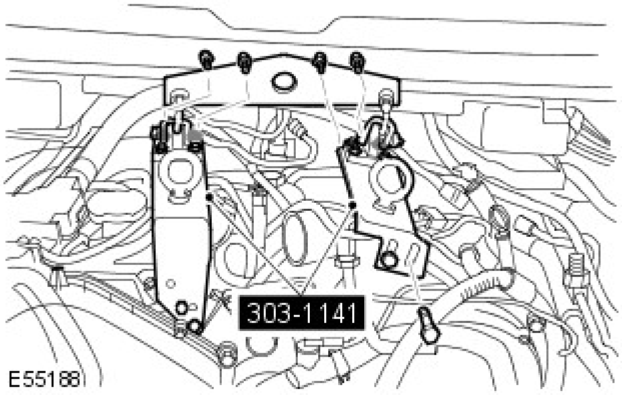


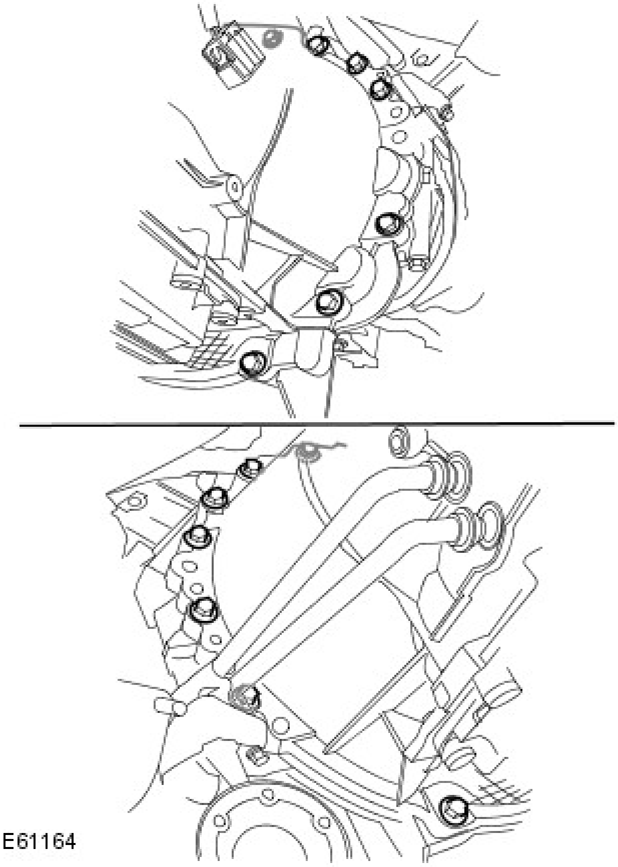
39. Remove the RH engine mount nut.



40. Install the special tool.

- Install and tighten the bolts.


303-1141
E55188



41. Release the transmission from the engine.

- Remove the 14 bolts.

42. NOTE: Note the routing of the battery positive cable.

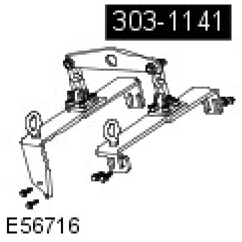
• NOTE: Note the routing of the transmission wiring harness.

With assistance, carefully remove the engine.

- Using a suitable hydraulic jack, support the transmission.
- Carefully guide the transmission wiring harness out as the engine is being removed.
- Carefully guide the battery positive cable out as the engine is being removed.

Engine - TDV6 2.7L Diesel - Engine

Installation

Special Tool(s)	
	Engine lifting Cradle 303-1141

Installation

1. CAUTIONS:

⚠ Apply grease of the correct specification to the torque converter spigot.

⚠ Make sure the torque converter is fully located into the oil pump drive.

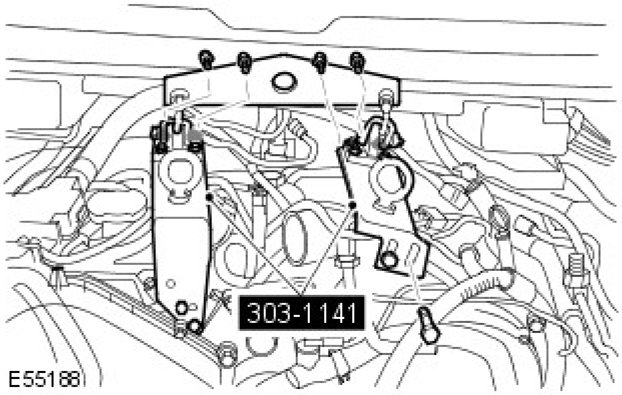
With assistance, carefully install the engine.

- Clean the component mating faces.

2. ⚠ CAUTION: Make sure the torque converter remains connected to the transmission.

Secure the engine to the transmission.

- Tighten the bolts to 45 Nm (33 lb.ft).
- Remove the jack supporting the transmission.



3. Remove the special tool.

- Remove the bolts.

4. Secure both the LH and the RH engine mounts.

- Lower the engine onto its mounts.
- Tighten the nuts to 90 Nm (66 lb.ft).

5. NOTE: Make sure that new bolts are installed.

Secure the flexplate to the torque converter.

- Tighten the bolts to 45 Nm (33 lb.ft).

- Install the access plug.

6. Install the starter motor.

- Tighten the bolts to 48 Nm (35 lb.ft).

7. Connect the 2 starter motor wiring harness connectors to the starter motor solenoid.

- Tighten the solenoid terminal integral connector nut to 8 Nm (6 lb.ft).
- Tighten the battery positive cable nut to 11 Nm (8 lb.ft).
- Install the rubber insulator.

8. Install the starter motor support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

9. Secure the engine ground cable.

- Tighten the bolt to 22 Nm (16 lb.ft).

10. Secure the fuel cooler.

- Tighten the bolt to 10 Nm (7 lb.ft).

11. NOTE: Remove and discard the blanking caps.

Connect the low-pressure fuel lines.

12. Secure the fuel lines.

- Tighten the bolt to 22 Nm (16 lb.ft).
- Secure in the clips.

13. Secure the transmission breather lines.

- Tighten the bolt to 7 Nm (5 lb.ft).

14. Install the turbocharger support bracket.

- Tighten the bolts to 48 Nm (22 lb.ft).
- Tighten the nut to 22 Nm (16 lb.ft).

15. ⚠ WARNING: Make sure that new nuts are installed.

• NOTE: Make sure that all the component mating faces are clean.

Secure the exhaust to the turbocharger.

- Install a new gasket.
- Tighten the nuts to 48 Nm (35 lb.ft).

16. Install the exhaust manifold crossover pipe center support bracket.

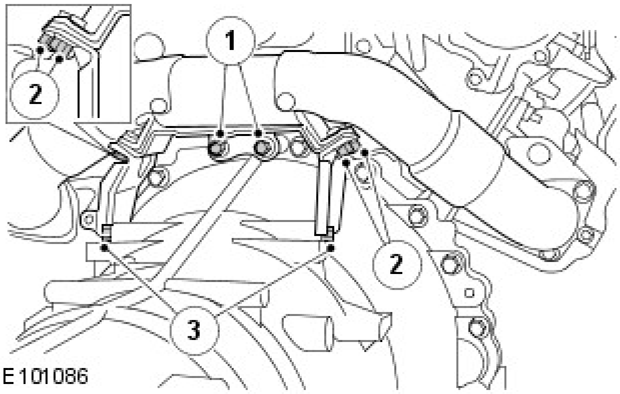
- Loosely install the 2 bolts.

17. Install the exhaust manifold crossover pipe RH support bracket.

- Loosely install the 3 bolts.

18. Install the exhaust manifold crossover pipe LH support bracket.

- Loosely install the 3 bolts.



19. Tighten the exhaust manifold crossover pipe mounting bracket bolts in the following sequence.

- Tighten the 2 bolts marked 1 to 10 Nm (7 lb.ft).
- Loosen the 2 bolts by 90 degrees.
- Tighten the 2 bolts marked 3 to 10 Nm (7lb.ft).
- Loosen the 2 bolts by 90 degrees.
- Tighten the 4 bolts maked 2 to 25 Nm (18 lb. ft).
- Tighten the 2 bolts maked 1 to 25 Nm (18 lb. ft).
- Tighten the 2 bolts maked 3 to 25 Nm (18 lb. ft).
- Attach the wiring harness.

20. Secure the battery positive cable.

- Secure with the clip.

21. Secure the transmission fluid lines.

- Tighten the nut to 10 Nm (7 lb.ft).

22. Install the turbocharger intake tube.

- Tighten the clip.

23. Reposition the lower coolant hose.

24. NOTE: Remove and discard the blanking caps.

Connect the A/C compressor high-pressure line.

- Install a new O-ring seal.
- Tighten the bolt to 9 Nm (7 lb.ft).

25. Install the charge air cooler inlet pipe.

26. Position the power steering pump to the power steering pump bracket.

- Loosely install the rear bolt.

27. Secure the power steering pump.

- Tighten the 3 front bolts to 22 Nm (16 lb.ft).
- Loosen the 3 front bolts by a quarter of a turn.
- Tighten the rear bolt to 22 Nm (16 lb.ft).
- Tighten the 3 front bolts to 22 Nm (16 lb.ft).

28. Connect the coolant lower hose.

- Secure with the clip.

29. Connect the charge air cooler inlet hoses.

- Tighten the clips.

30. NOTE: Remove and discard the blanking caps.

Connect the A/C compressor low-pressure pipe.

- Install a new O-ring seal.
- Tighten the bolt to 9 Nm (7 lb.ft).

31. Secure the charge air cooler inlet pipe.

- Tighten the bolt to 10 Nm (7 Lb.ft).
- Tighten the nuts to 10 Nm (7 lb.ft).

32. Connect the breather hose.

- Secure with the clip.

33. Install the 2 LH upper suspension arm and brake line heat shields.

- Tighten the bolts to 10 Nm (7 Lb.ft).
- Tighten the nuts to 10 Nm (7 lb.ft).

34. Install the accessory drive belt.

- Rotate the accessory drive belt tensioner counter-clockwise.

35. Connect the RH EGR coolant hose.

- Secure with the clip.

36. Connect the upper coolant hose to the coolant distribution manifold.

- Install the clip.

37. Install the intake air shutoff throttle elbow support bracket.

- Tighten the bolts to 10 Nm (7 Lb.ft).

38. Install the intake air shut off valve.
For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

39. Install the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

40. Install the body.
For additional information, refer to: Body - TDV6 2.7L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

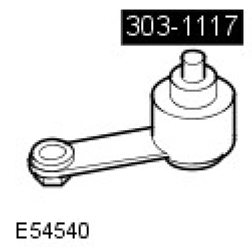
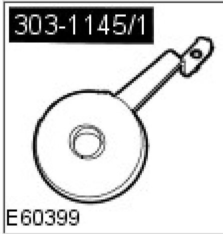
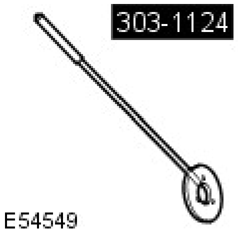
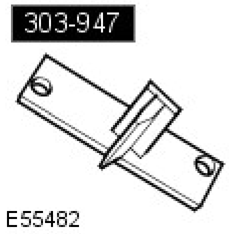
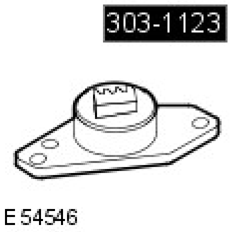
41. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

42. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Engine - TDV6 2.7L Diesel - Engine

Disassembly

Special Tool(s)	
	Timing Pin - Automatic Transmission 303-1117
	Camshaft pulley holding tool 303-1145/1
	Holder - Camshaft Pulleys Front 303-1124
	Flex plate locking tool 303-947
	Locking Tool - Flywheel 303-1123

Disassembly

All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-02A Generator and Regulator - V8 S/C 4.2L Petrol, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Drain the engine oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures).

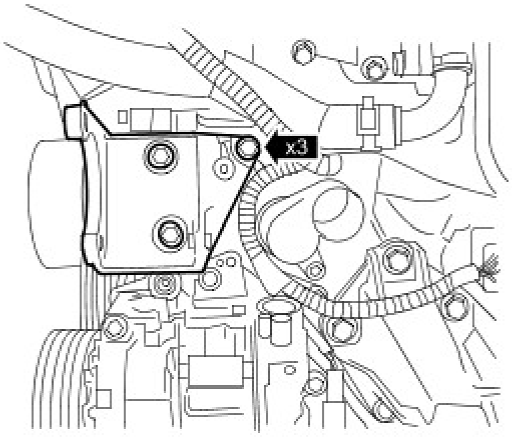
4. Remove the engine.

For additional information, refer to: Engine (303-01C Engine - TDV6 2.7L Diesel, Removal).

5. Install the engine to a suitable engine stand.

6. Remove the power steering pump bracket.

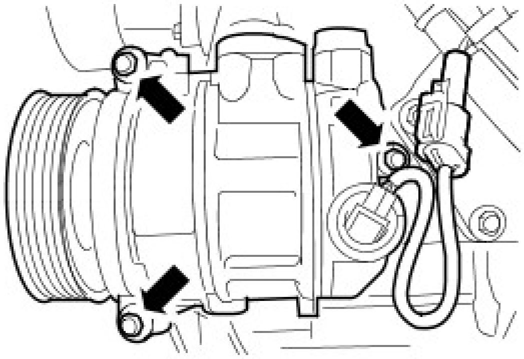
- Remove the 3 bolts.



E96773

7. Remove the air conditioning (A/C) compressor.

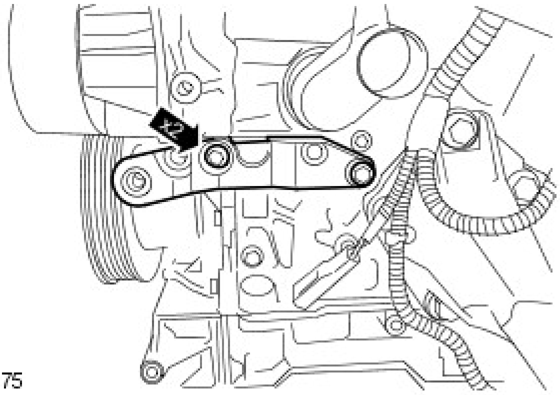
- Disconnect the electrical connector.
- Remove the 3 bolts.



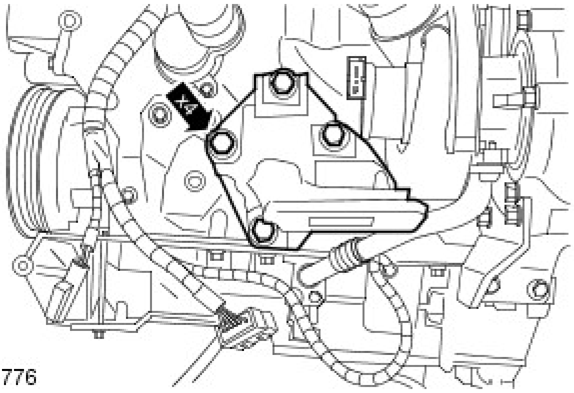
E96774

8. Remove the A/C compressor bracket.

- Remove the 2 bolts.



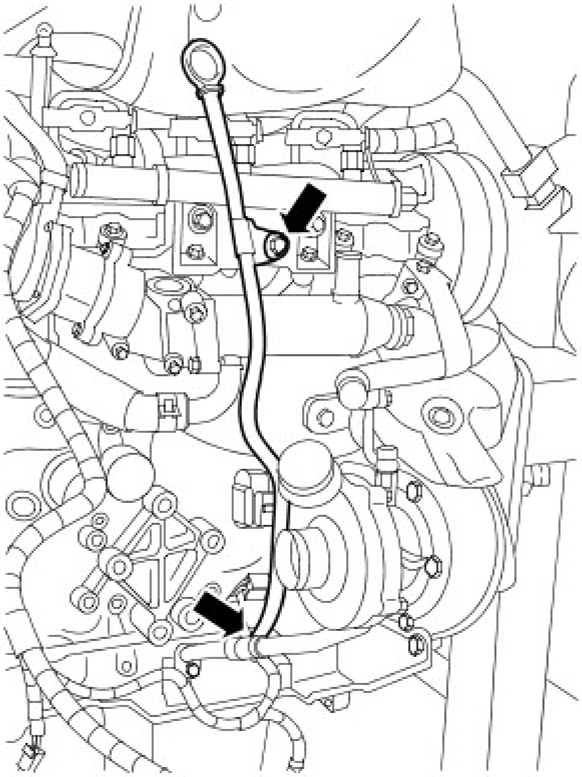
E96775



E96776

9. Remove the LH engine mount bracket.

- Remove the 4 bolts.

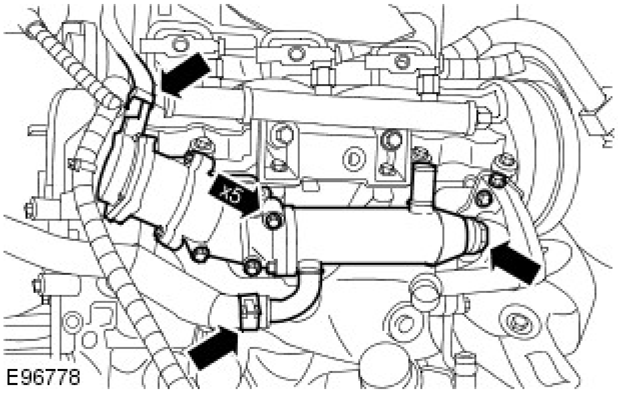


E96777

10. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator and tube.

- Release the wiring harness clip.
- Remove the bolt.
- Remove and discard the O-ring seal.



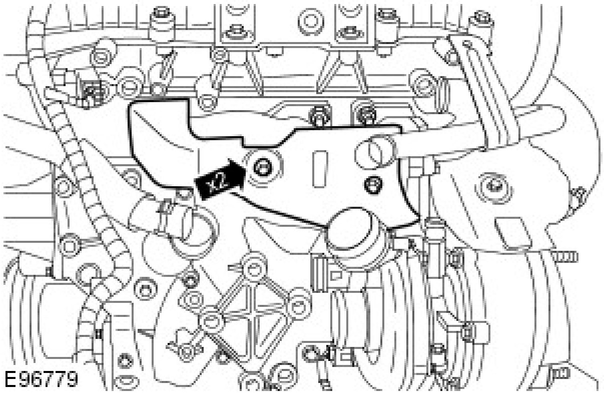
E96778

11. Remove the LH exhaust gas recirculation (EGR) valve and cooler assembly.

- Disconnect the electrical connector.
- Remove and discard the clip.
- Release the clip and disconnect the coolant hose.
- Remove the 5 bolts.
- Collect the bracket.

12. Remove the LH exhaust manifold heat shield.

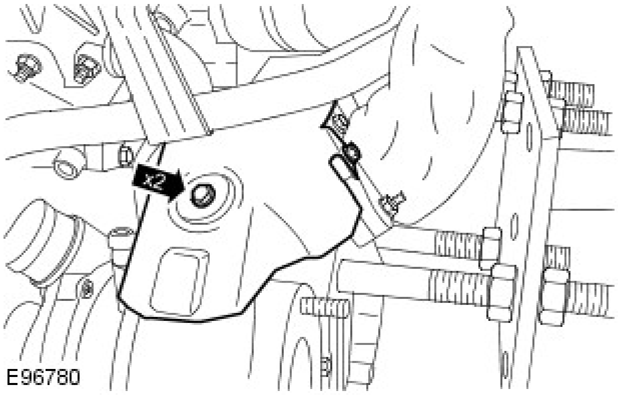
- Remove the 2 bolts.



E96779

13. Remove the turbocharger heat shield.

- Remove the 2 bolts.

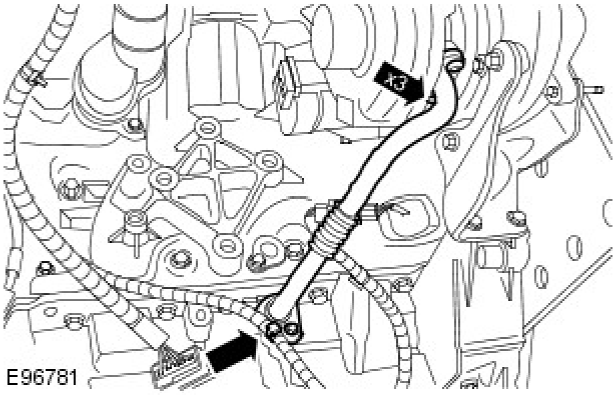


E96780

14. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the turbocharger oil return tube.

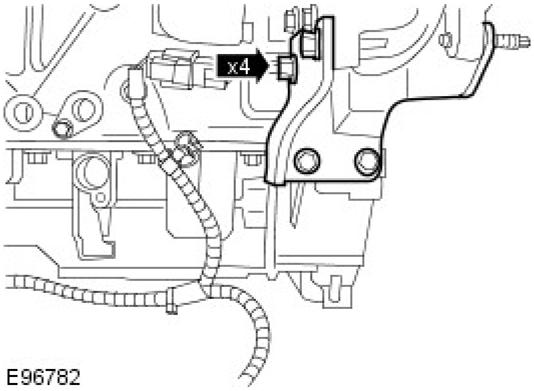
- Release the wiring harness clip.
- Remove the 3 bolts.
- Remove and discard the gasket.
- Remove and discard the O-ring seal.



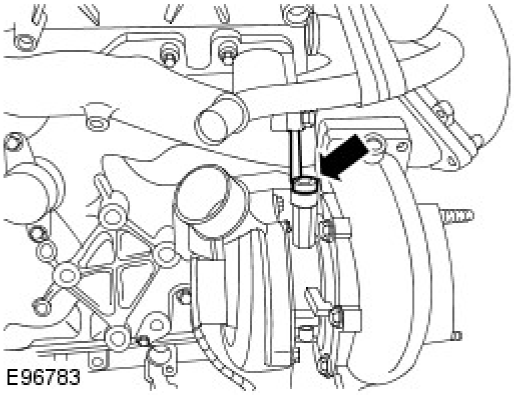
E96781

15. Release the turbocharger support bracket.

- Remove the 4 bolts.



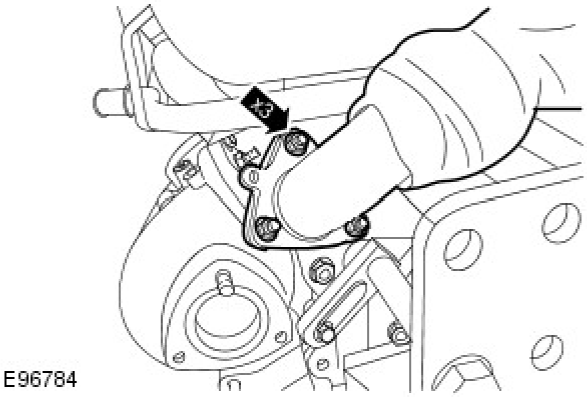
E96782



16. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

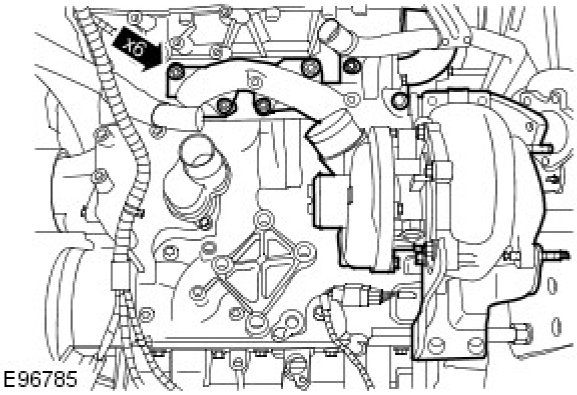
Disconnect the turbocharger oil supply tube.

- Remove the banjo bolt.
- Remove and discard the 2 sealing washers.



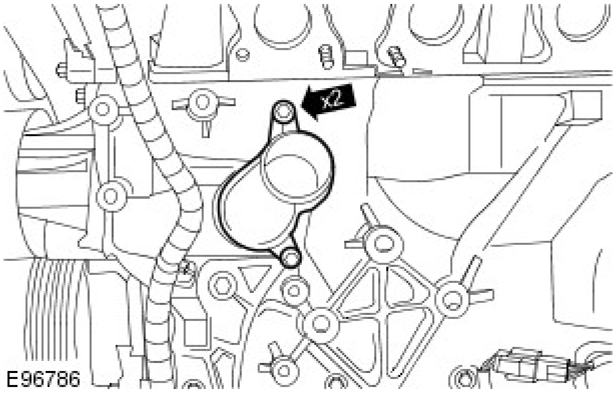
17. Release the exhaust cross-over pipe from the LH exhaust manifold.

- Remove and discard the 3 nuts.
- Remove and discard the gasket.



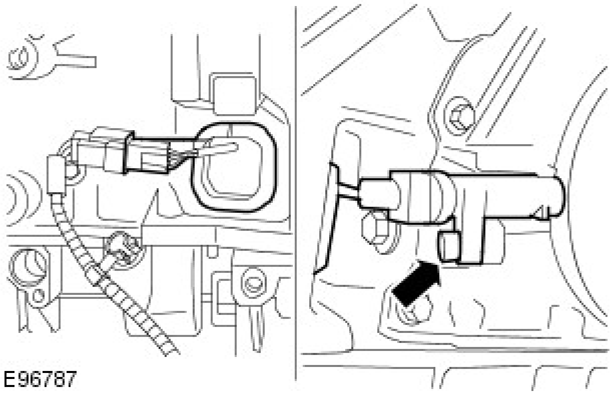
18. Remove the LH exhaust manifold and turbocharger assembly.

- Remove and discard the 6 nuts.
- Remove and discard the gasket.



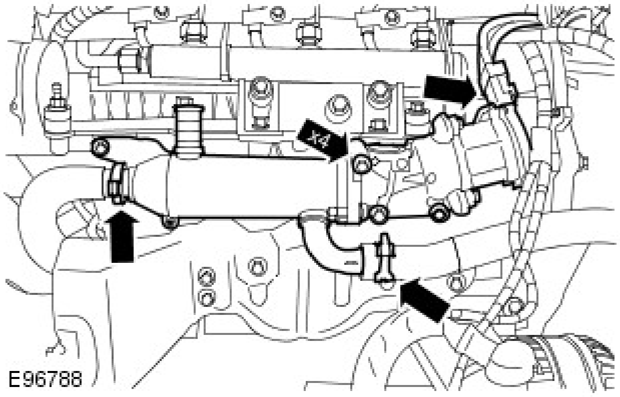
19. Remove the cylinder block coolant inlet pipe.

- Remove the 2 bolts.
- Remove and discard the O-ring seal.


E96787

20. Remove the crankshaft position (CKP) sensor.

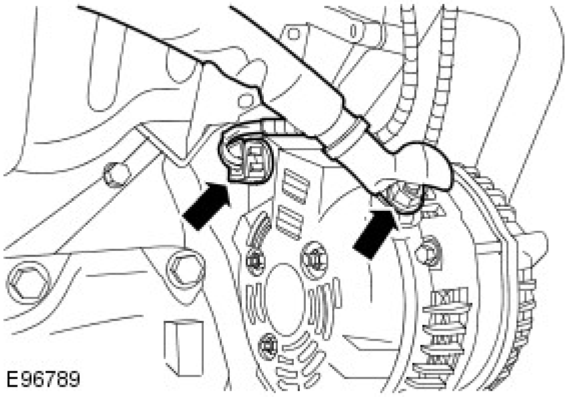
- Disconnect the electrical connector.
- Reposition the access cover.
- Remove the bolt.



E96788

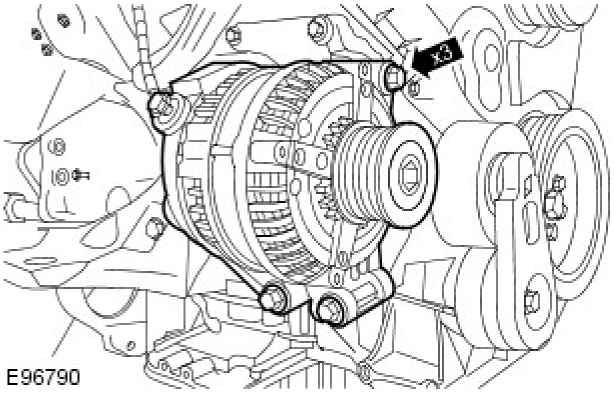
21. Remove the RH EGR valve and cooler assembly.

- Disconnect the electrical connector.
- Remove and discard the clip.
- Release the clip and disconnect the coolant hose.
- Remove the 4 bolts.


E96789

22. Disconnect the generator electrical connectors.

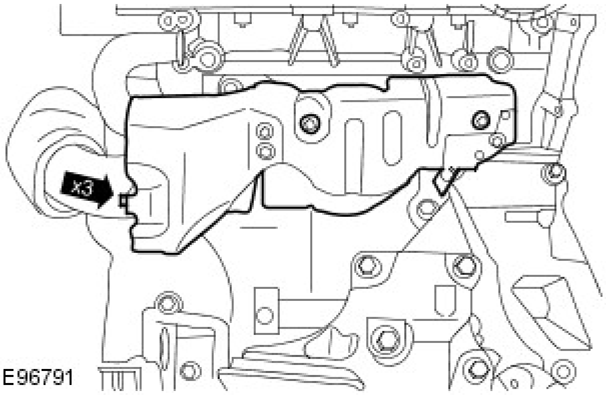
- Reposition the rubber insulator.
- Remove the nut.



E96790

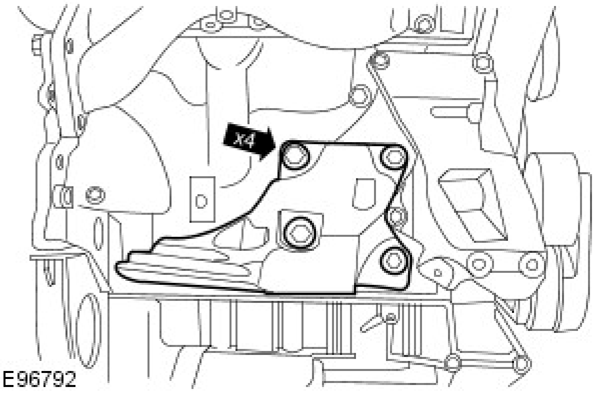
23. Remove the generator.

- Remove the 3 bolts.



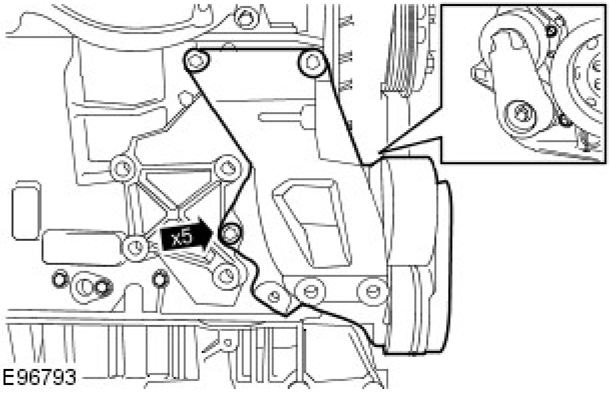
24. Remove the RH exhaust manifold heat shield.

- Remove the 3 bolts.



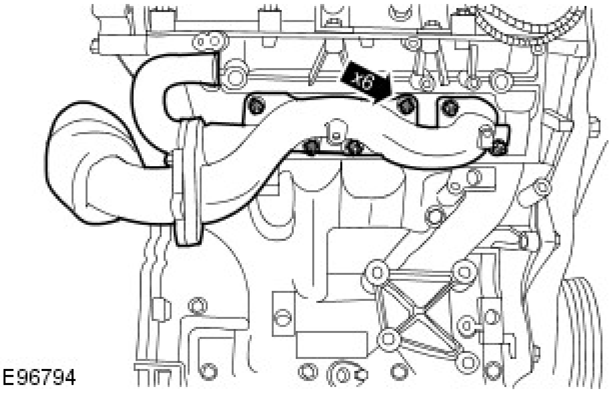
25. Remove the RH engine mount bracket.

- Remove the 4 bolts.



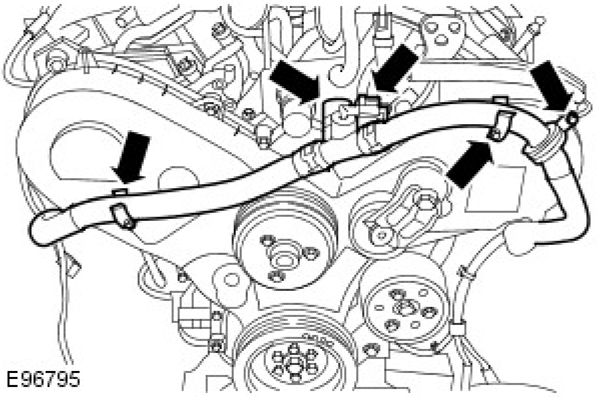
26. Remove the generator bracket.

- Remove the 5 bolts.



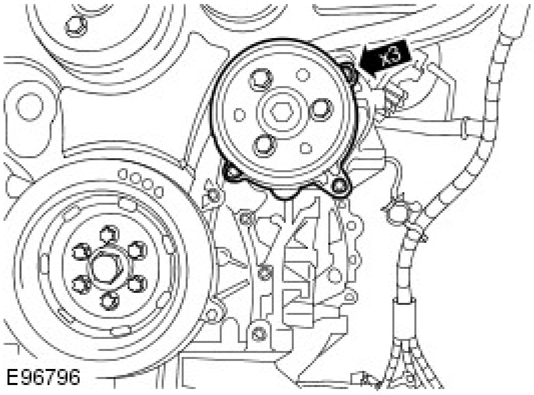
27. Remove the RH exhaust manifold and exhaust cross-over pipe assembly.

- Remove and discard the 6 nuts.
- Remove and discard the gasket.



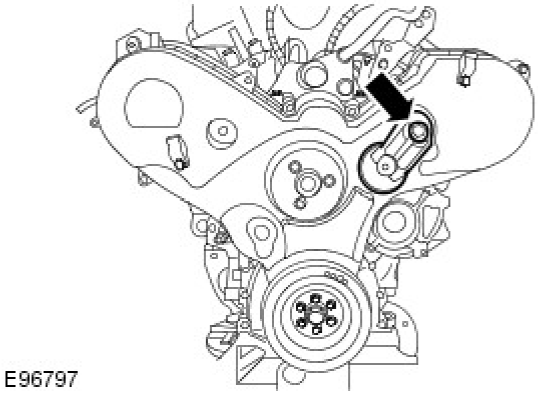
28. Remove the EGR valve coolant pipe.

- Remove the bolt.
- Disconnect the electrical connector.
- Release from the 2 clips.
- Release the clip.



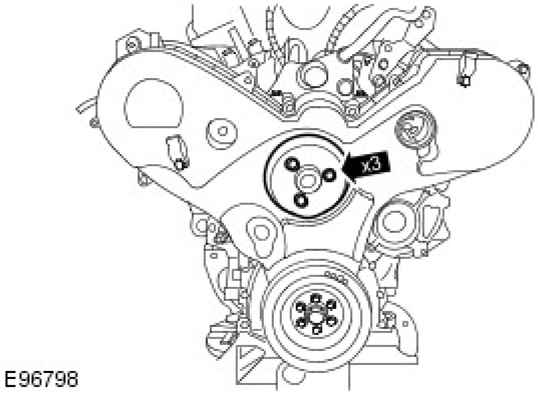
29. Remove the coolant pump.

- Remove the 3 bolts.
- Remove and discard the O-ring seal.



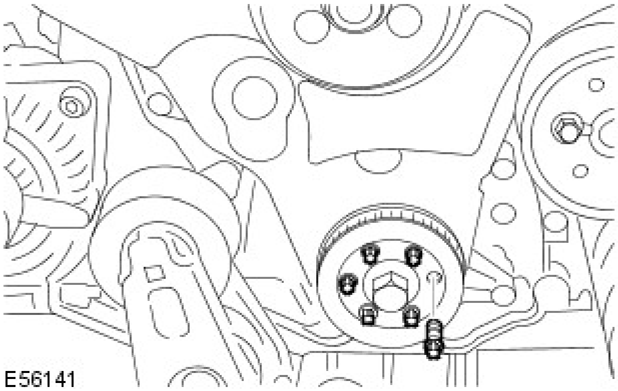
30. Remove the accessory drive belt idler pulley.

- Remove the bolt.



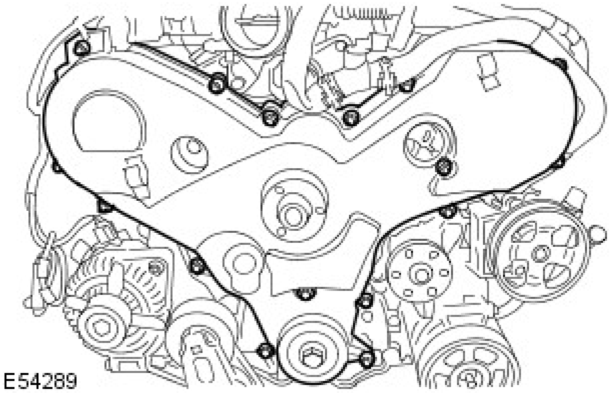
31. Remove the cooling fan pulley.

- Remove the 3 bolts.


E56141

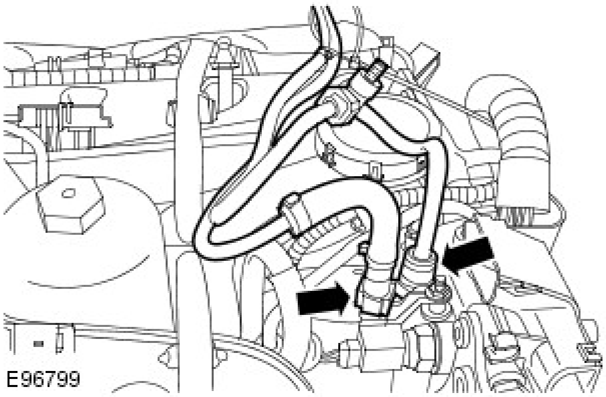
32. Remove the crankshaft pulley.

- Remove the 6 bolts.


E54289

33. Remove the timing belt cover.

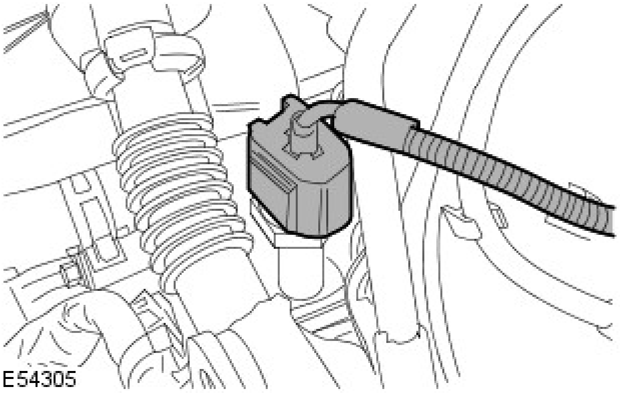
- Fully loosen the 16 bolts.


E96799

34. NOTE: Note the fitted position.

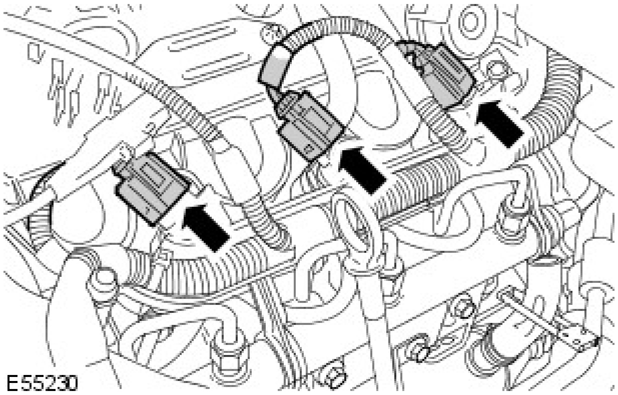
Remove the 2 low pressure fuel pipes.

- Disconnect the 2 quick release connectors.


E54305

35. Disconnect the engine oil pressure (EOP) sensor electrical connector.

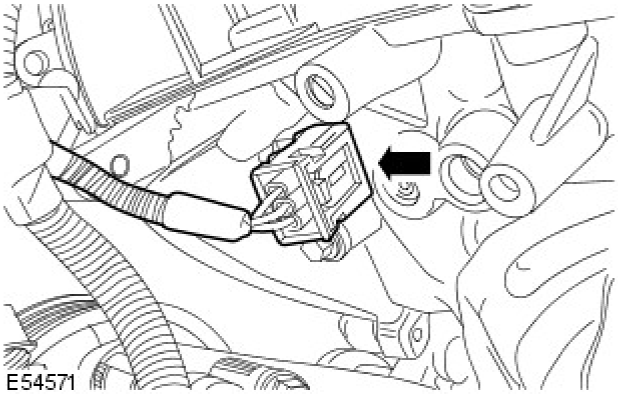
- Release the wiring harness clip.



36. NOTE: LH shown, RH is similar

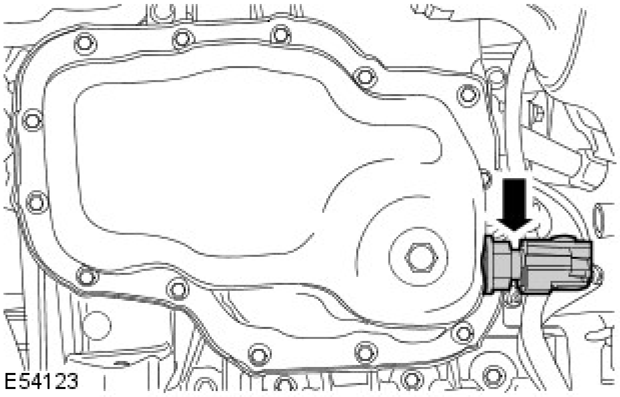
Disconnect the 6 fuel injector electrical connectors.

- Release the 4 wiring harness clips.



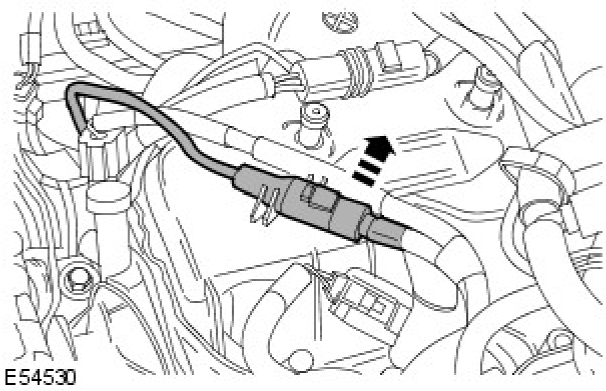
37. Disconnect the camshaft position (CMP) sensor electrical connector.

- Release the wiring harness clip.



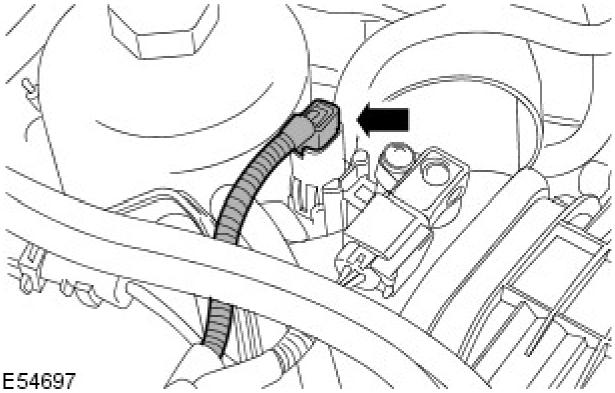
38. Disconnect the engine oil temperature sensor electrical connector.

- Release the wiring harness clip.

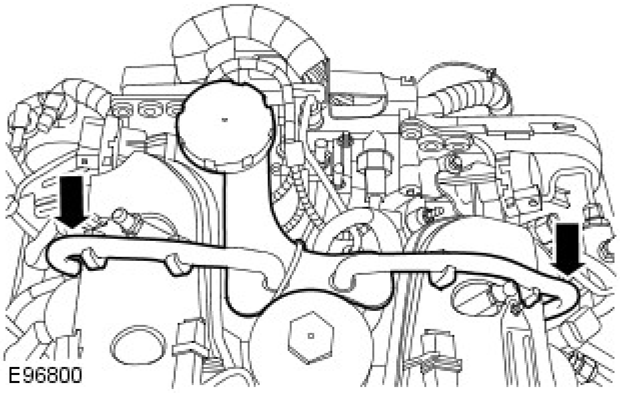


39. NOTE: LH shown, RH similar.

Disconnect the 2 knock sensor (KS) electrical connectors.

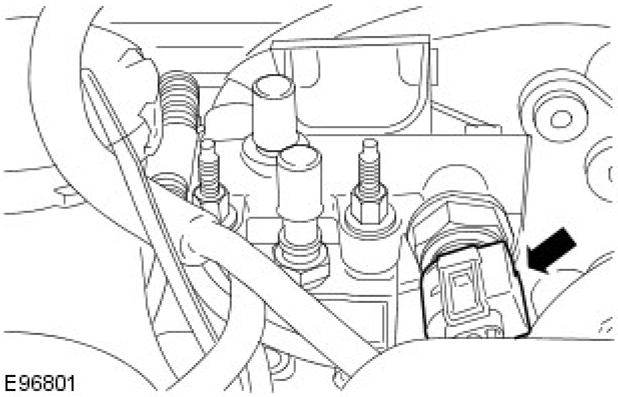


40. Disconnect the fuel temperature sensor electrical connector.

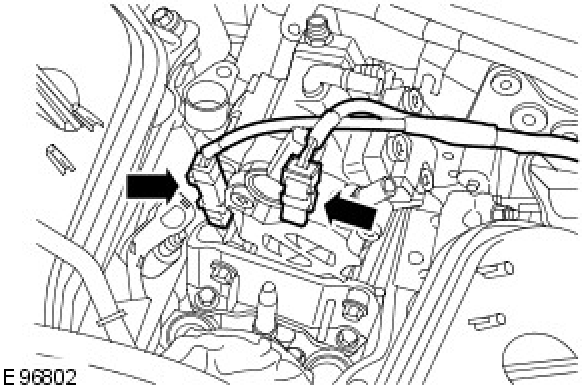


41. Remove the crankcase vent oil separator.

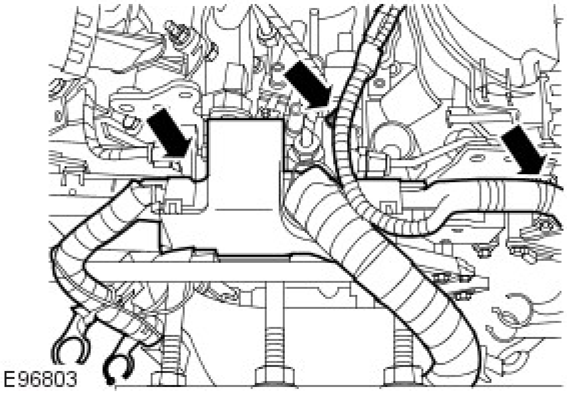
- Disconnect and release the 2 breather hoses.



42. Disconnect the fuel rail pressure (FRP) sensor electrical connector.



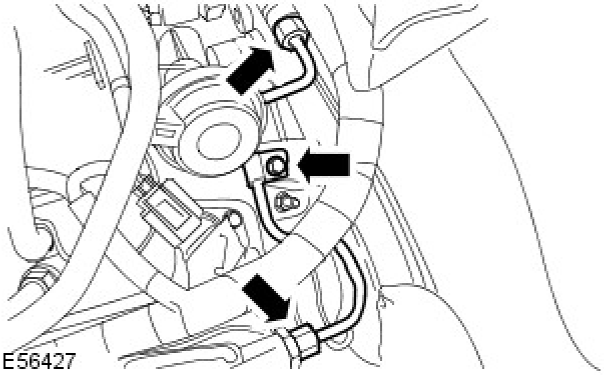
43. Disconnect the 2 fuel injection pump electrical connectors.



44. Remove the engine wiring harness.

- Remove the nut.
- Release the 2 clips.

Vehicles built up to 12/2006

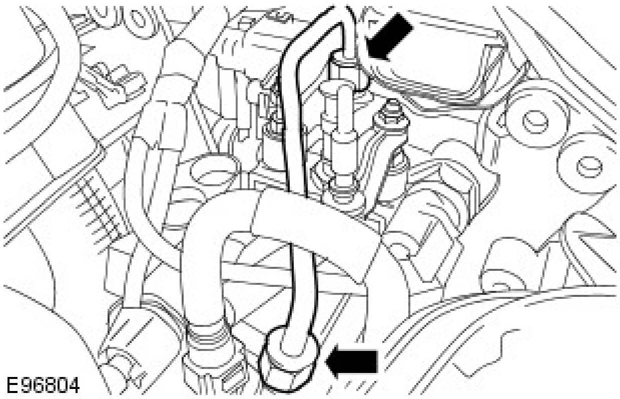


45. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

• NOTE: RH shown, LH is similar

Remove and discard the 2 high-pressure fuel rail supply lines.

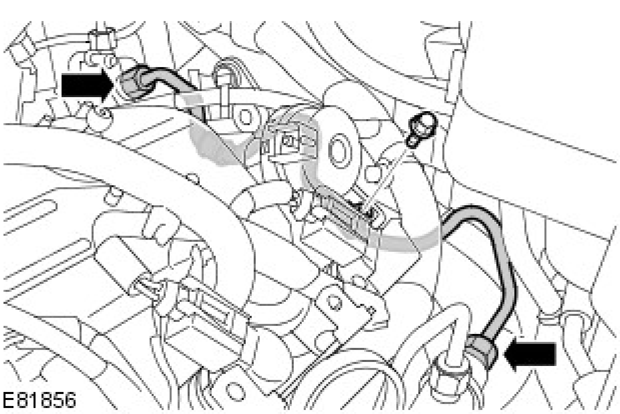
- Release the 2 clips.



46. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the high-pressure fuel diverter rail supply line.

Vehicles built 01/2007 onwards



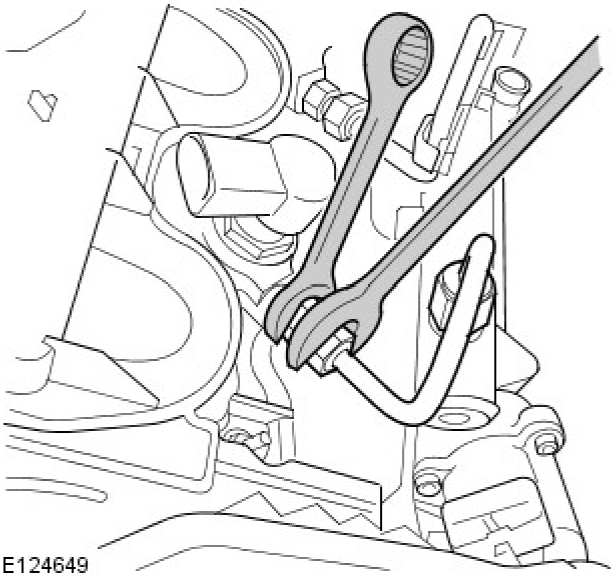
47. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

• NOTE: LH shown, RH is similar

Remove and discard the 2 high-pressure fuel rail supply lines.

- Release the clip.

All vehicles



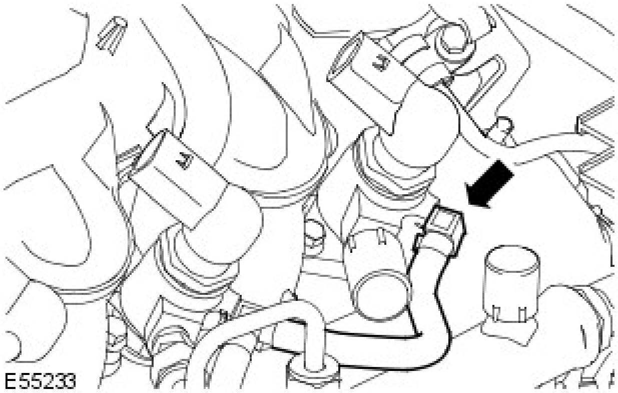
48. CAUTIONS:

⚠ Make sure the high-pressure fuel supply line remains in contact with both the fuel injector and the fuel injection supply manifold until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

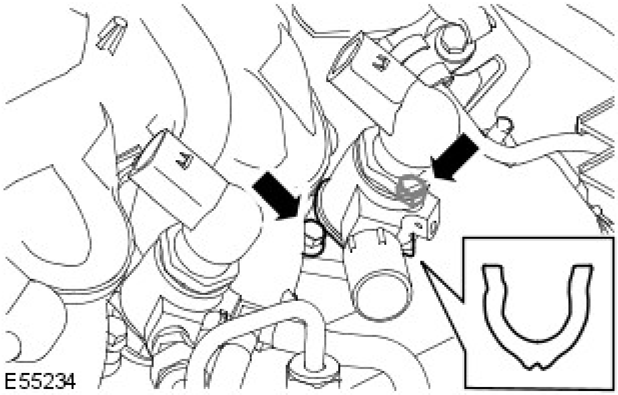
⚠ Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the 6 high-pressure fuel supply lines.

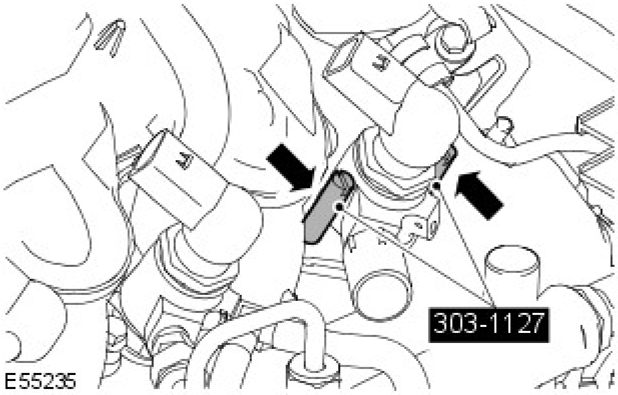


49. Disconnect the fuel return line from the fuel injectors.

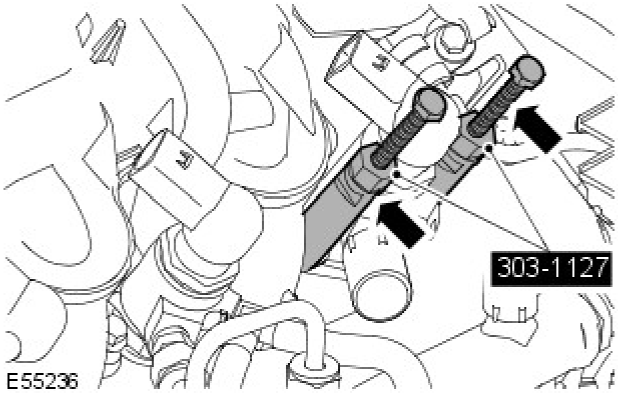
- Remove and discard the 6 clips.



50. Remove the two fuel injector bolts.

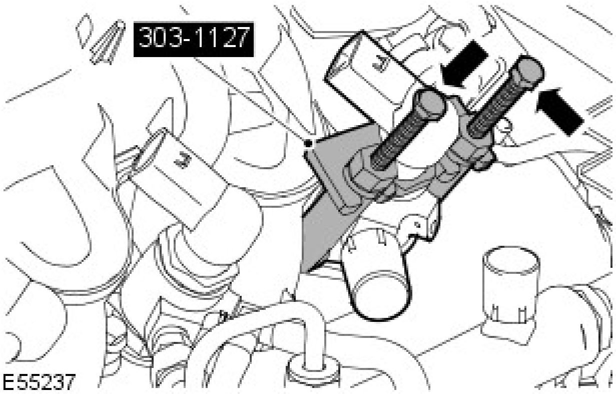

303-1127
E55235

51. Install the special tool studs.


303-1127
E55236

52. ⚠ CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

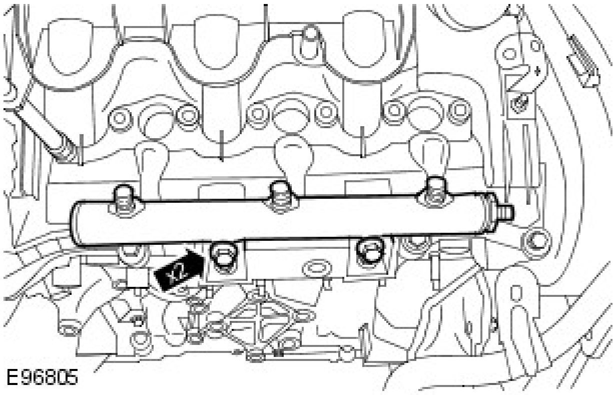
Install the special tool remover legs to the studs.


303-1127
E55237

53. Remove the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.
- Remove and discard the fuel injector clamp.
- Remove and discard the sealing washer.

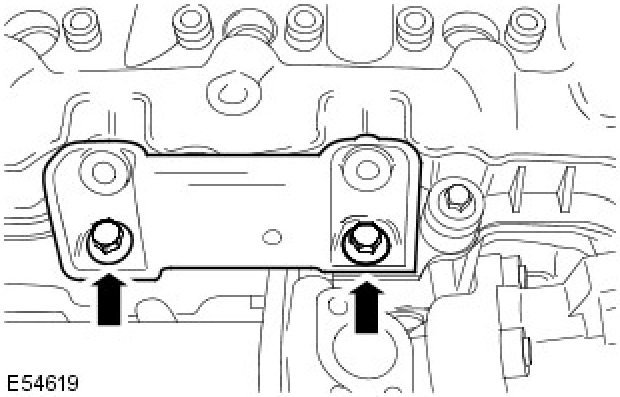
54. Remove the remaining fuel injectors.



55. NOTE: LH shown, RH is similar.

Remove the 2 fuel rails.

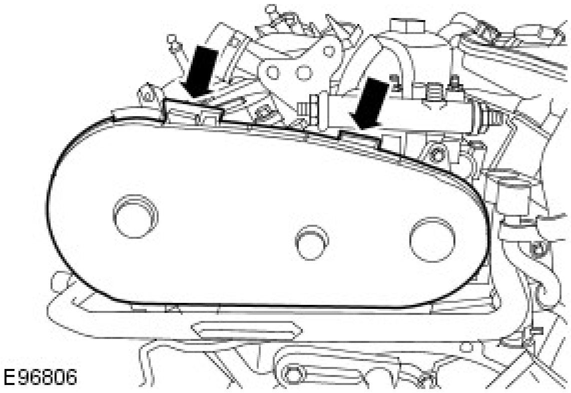
- Remove the 4 bolts.



56. NOTE: RH shown, LH is similar

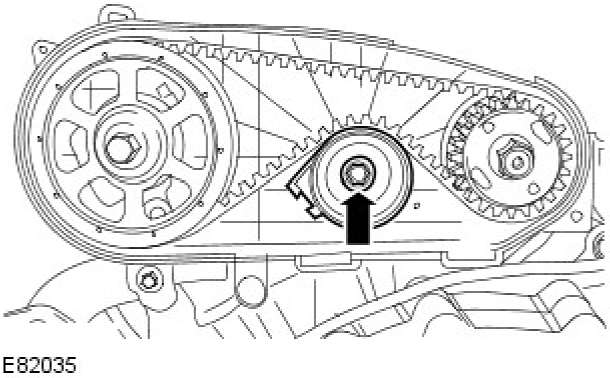
Remove the 2 fuel rail brackets.

- Remove the 4 bolts.



57. Remove the fuel injection pump belt cover.

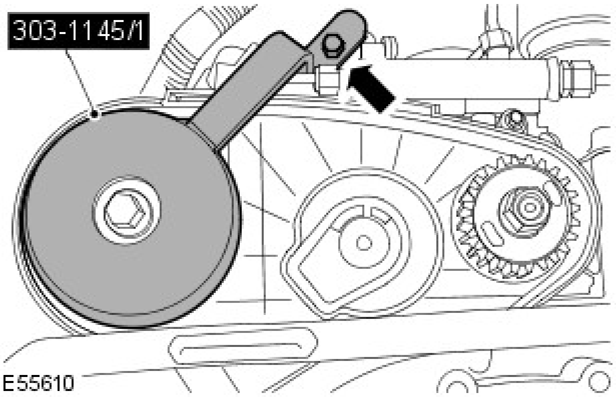
- Release the 2 clips.



58. Remove and discard the fuel injection pump belt tensioner.

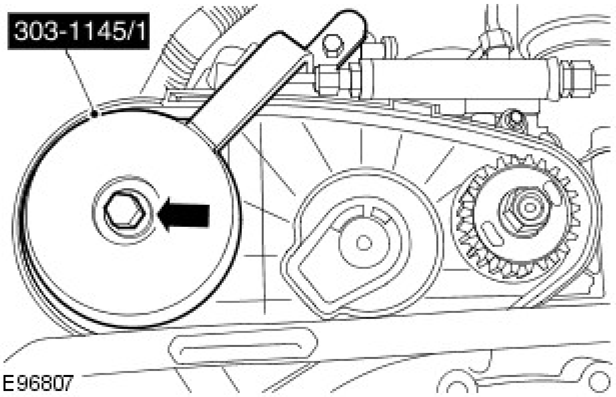
- Remove the bolt.

59. Remove and discard the fuel injection pump belt.


303-1145/1
E55610

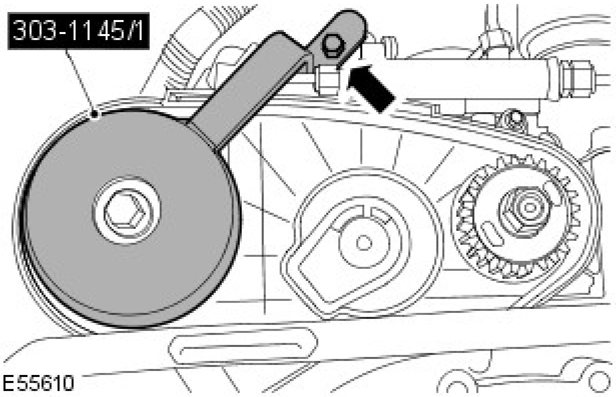
60. Install the special tool to the camshaft rear pulley.

- Rotate the crankshaft to align the special tool to the engine lifting bracket.
- Install and tighten the bolt.


303-1145/1
E96807

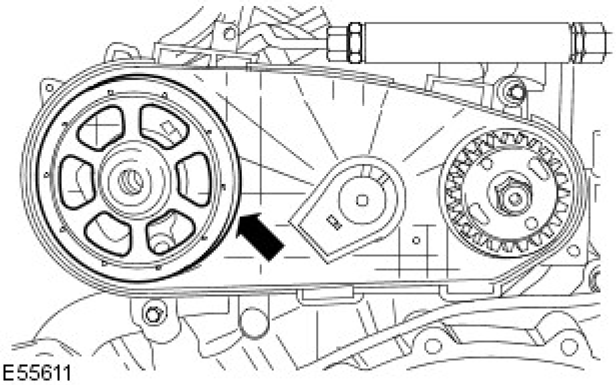
61. NOTE: Discard the bolt.

Using the special tool, remove the camshaft rear pulley bolt.

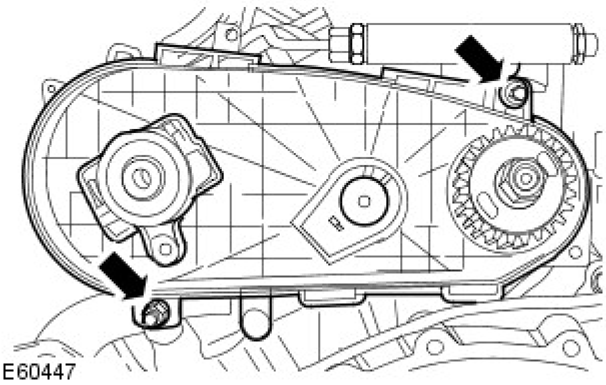

303-1145/1
E55610

62. Remove the special tool.

- Remove the bolt.

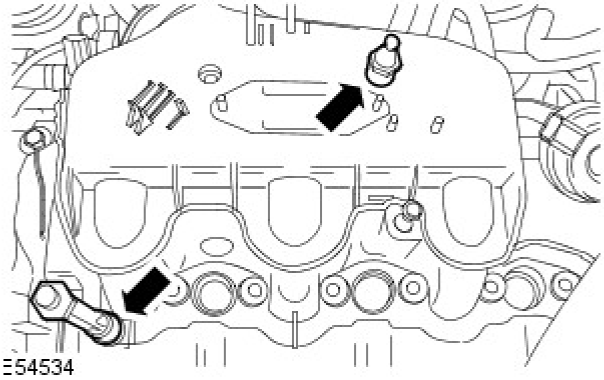


63. Remove the camshaft rear pulley.

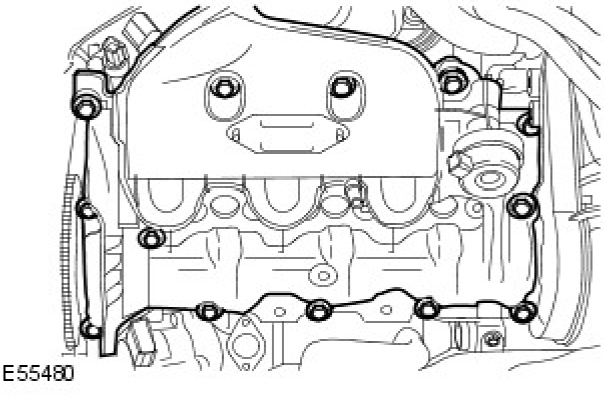


64. Remove the fuel injection pump belt rear cover.

- Fully loosen the 2 bolts.

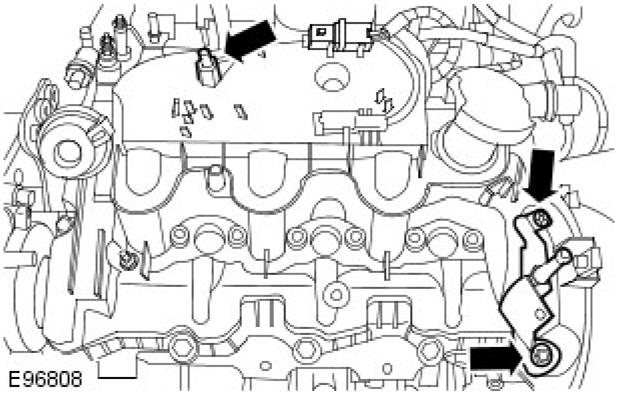


65. Remove the LH engine cover locating studs.



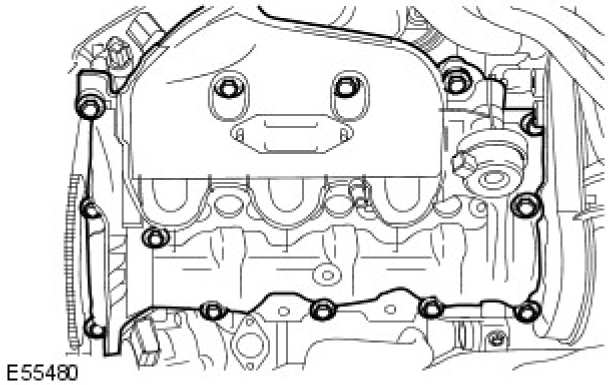
66. Remove the LH valve cover.

- Release the KS electrical connector from the valve cover.
- Fully loosen the 13 bolts.
- Remove the fuel line support bracket.
- Remove and discard the gasket.



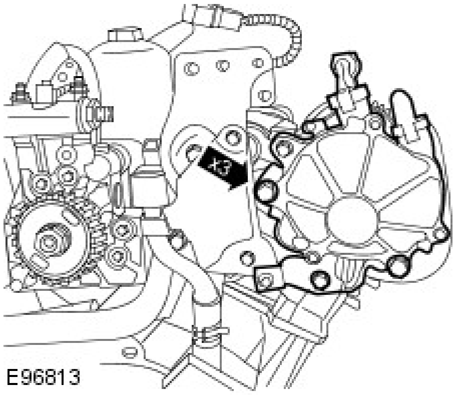
67. Remove the RH engine cover locating studs.

- Remove the nut.
- Remove the bolt.
- Remove the bracket.



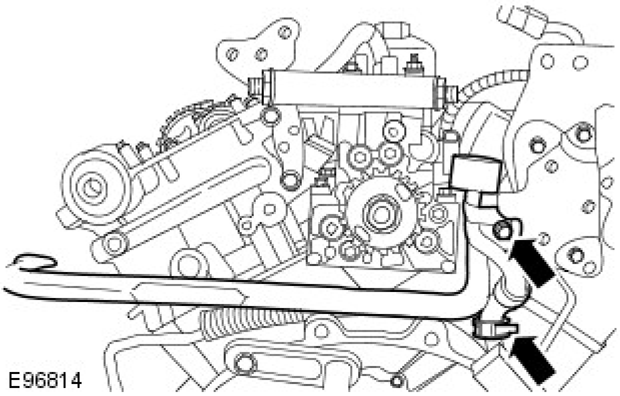
68. Remove the RH valve cover.

- Release the glow plug electrical connector from the valve cover.
- Release the KS electrical connector from the valve cover.
- Fully loosen the 13 bolts.
- Remove and discard the gasket.



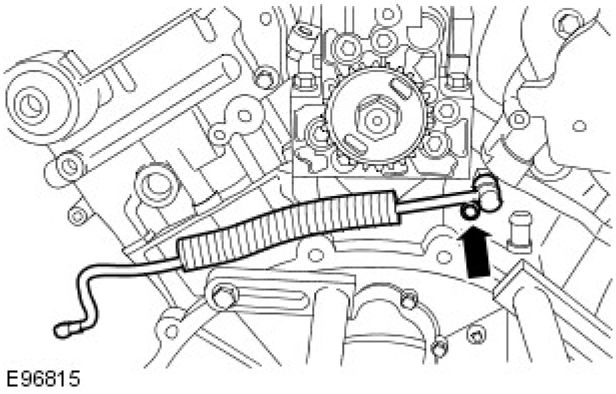
69. Remove the brake vacuum pump.

- Remove the 3 bolts.
- Remove the bracket.
- Remove and discard the gasket.



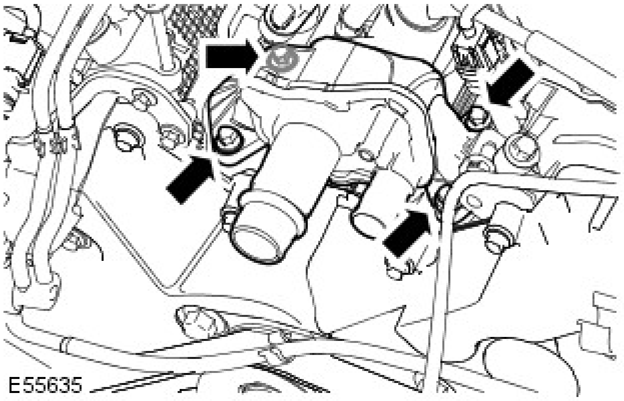
70. Remove the breather line.

- Remove the bolt.
- Release the clip.



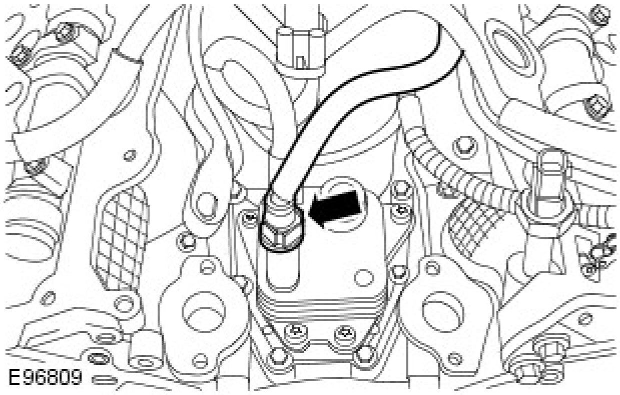
71. Remove the turbocharger oil supply line.

- Remove the bolt.
- Remove and discard the 2 O-ring seals.



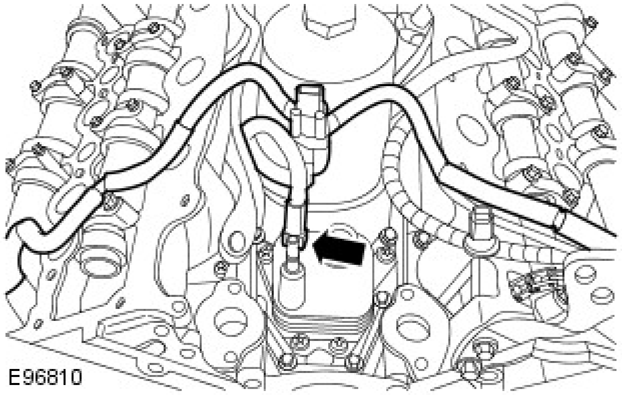
72. Remove the cylinder head coolant outlet assembly.

- Remove the 4 bolts.
- Remove and discard the O-ring seal.



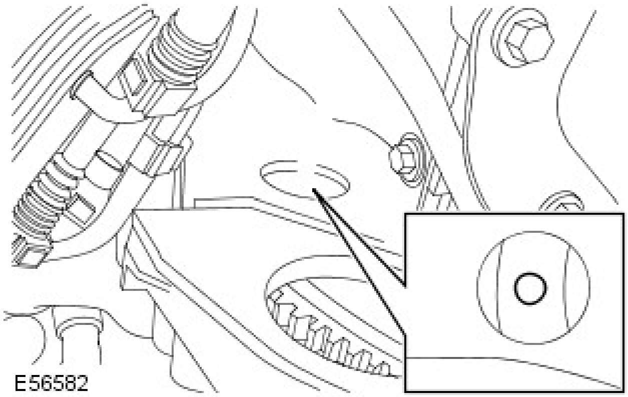
73. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the fuel pipe from the fuel cooler.



74. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the fuel injector return line.

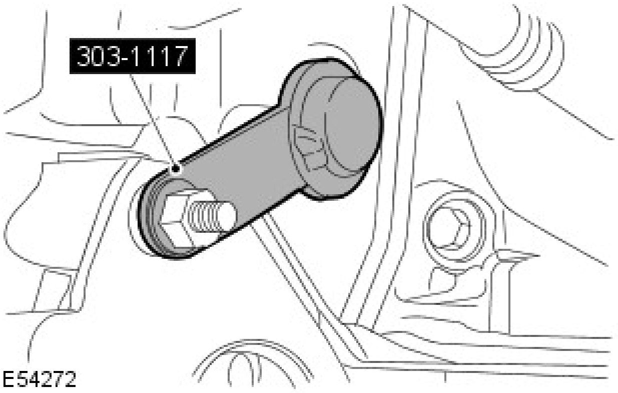


75. Rotate the crankshaft clockwise to align the crankshaft alignment hole in the flywheel or flexplate with the cylinder block aperture.

76. Check the camshaft pulley alignment holes are correctly aligned. If the alignment holes are not aligned, rotate the crankshaft one full turn clockwise.

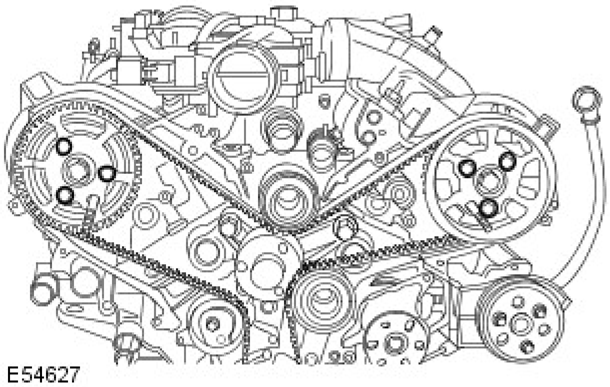
77. Using the special tool, lock the flexplate.

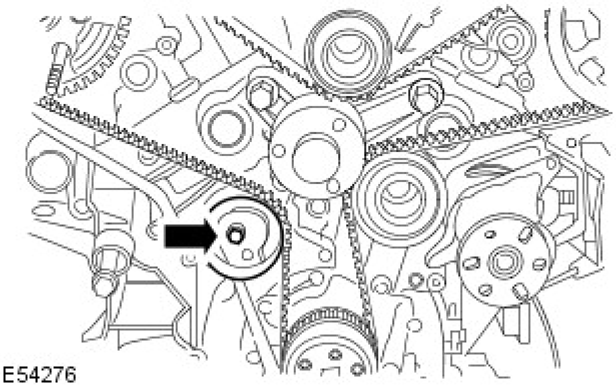
- Install a starter motor bolt to retain the special tool.



78. ⚠CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

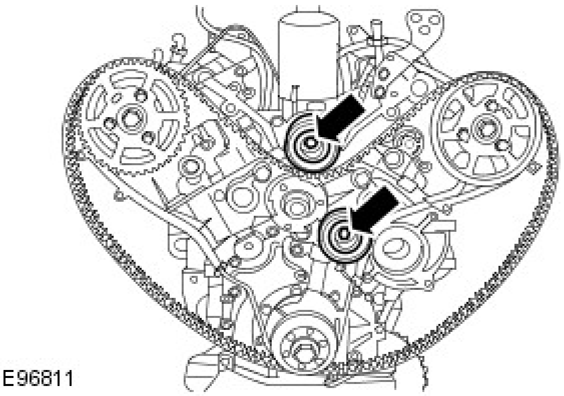
Loosen the 6 exhaust camshaft pulley bolts.





79. Remove and discard the timing belt tensioner.

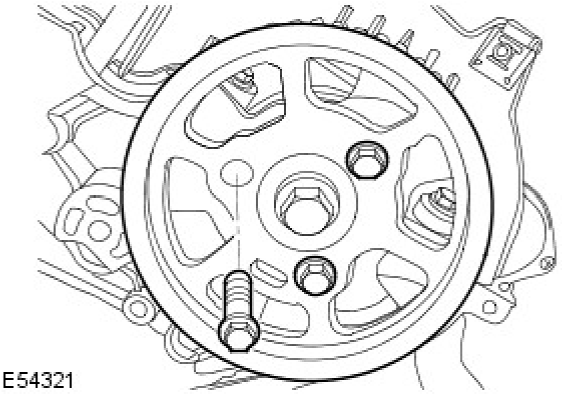
- Remove the bolt.



80. Remove the 2 timing belt idler pulley's.

- Remove the 2 bolts.
- Collect the plastic shield from behind the upper idler pulley.

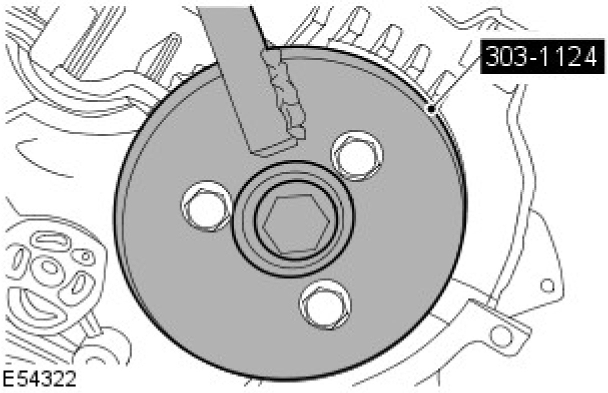
81. Remove and discard the timing belt.



82. NOTE: LH shown, RH is similar.

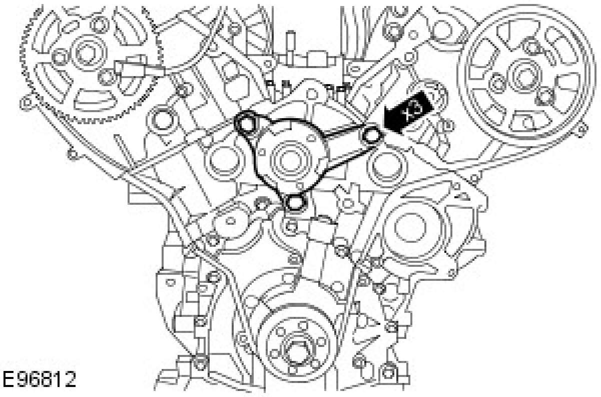
Remove the 2 camshaft pulleys.

- Remove the 6 bolts.



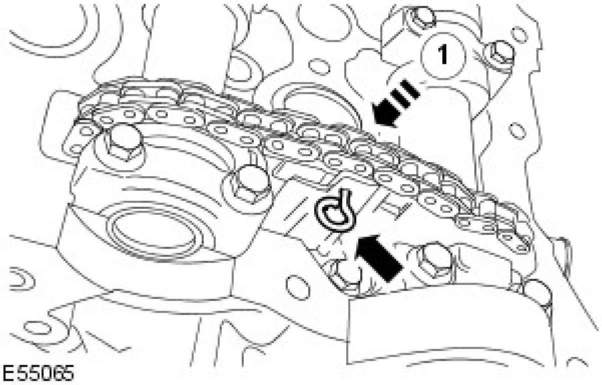
83. Using the special tool, remove the 2 camshaft pulley hubs.

- Remove and discard the 2 bolts.


E96812

84. Remove the cooling fan drive hub bearing.

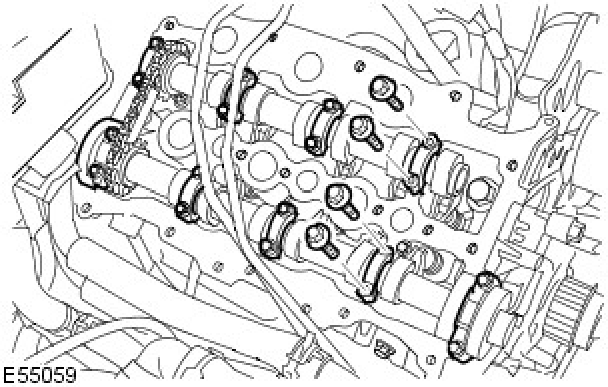
- Remove the 3 bolts.



E55065

85. Retain the RH secondary timing chain tensioner piston.

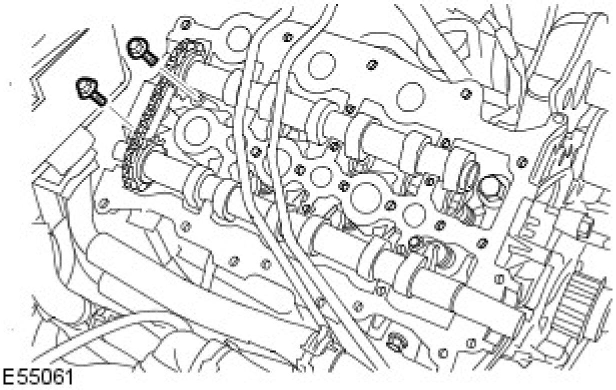
- Reposition the secondary timing chain tensioner.
- Install a 1.5 mm (0.060 in.) diameter pin into the secondary timing chain tensioner piston.


E55059

86. ⚠ CAUTION: Evenly and progressively, release the camshaft bearing caps.

Remove the RH bank camshaft bearing caps.

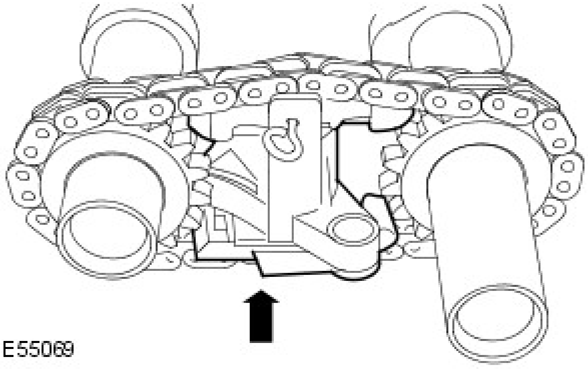
- Remove the 18 bolts.


E55061

87. Remove the RH bank camshafts and secondary timing chain tensioner assembly.

- Remove the 2 bolts.
- Release the RH secondary timing chain tensioner.

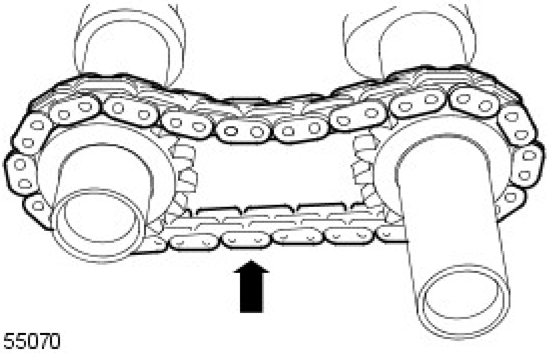
88. Remove the RH bank secondary timing chain tensioner.



E55069

89. Remove the RH bank camshafts.

- Release the secondary timing chain from the RH camshafts.
- Remove and discard the seal.



E55070

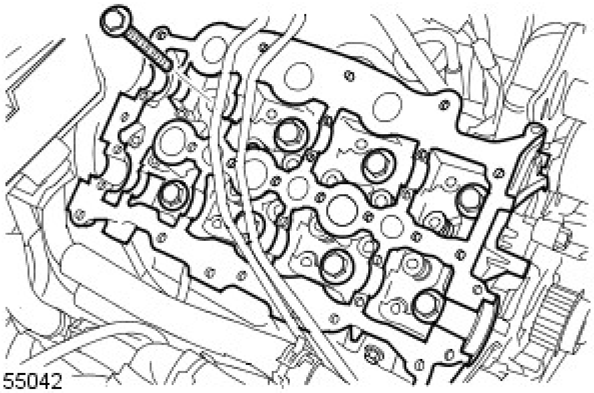
90. CAUTIONS:

⚠ The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

⚠ Only use a plastic scraper to clean off the old gasket.

Remove the RH cylinder head assembly.

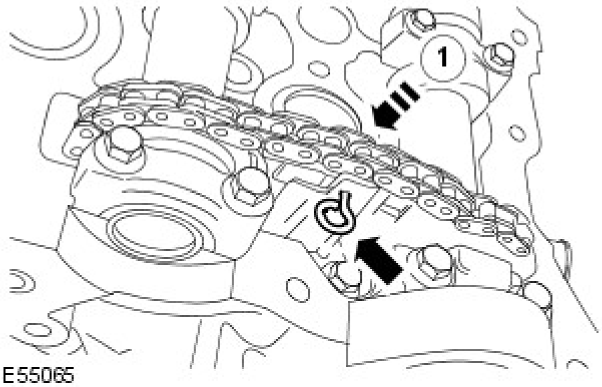
- Remove and discard the 8 bolts.
- Remove and discard the gasket.



E55042

91. Retain the LH secondary timing chain tensioner piston.

- Reposition the secondary timing chain tensioner.
- Install a 1.5 mm (0.060 in.) diameter pin into the secondary timing chain tensioner piston.

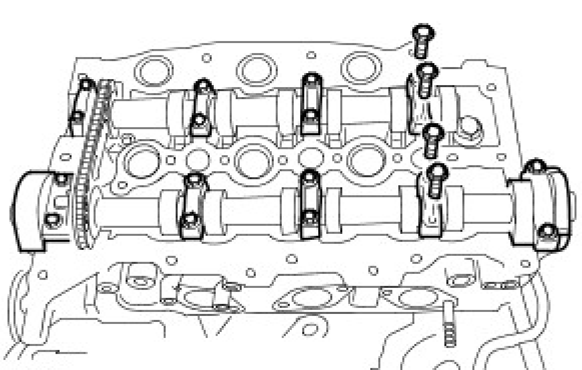


E55065

92. CAUTION: Evenly and progressively, release the camshaft bearing caps.

Remove the LH bank camshaft bearing caps.

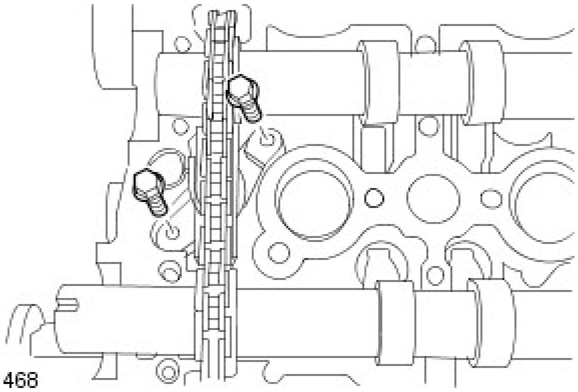
- Remove the 18 bolts.



E61467

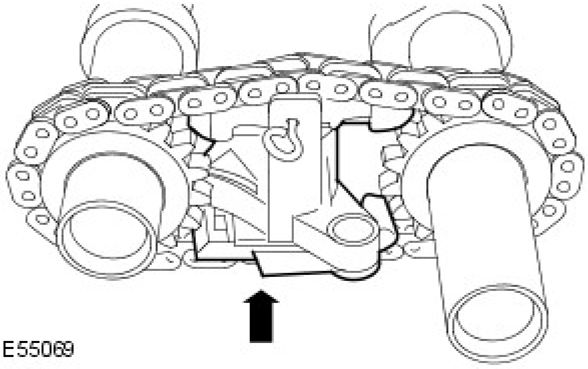
93. Remove the LH bank camshafts and secondary timing chain tensioner assembly.

- Release the LH secondary timing chain tensioner.
- Remove the 2 bolts.



E61468

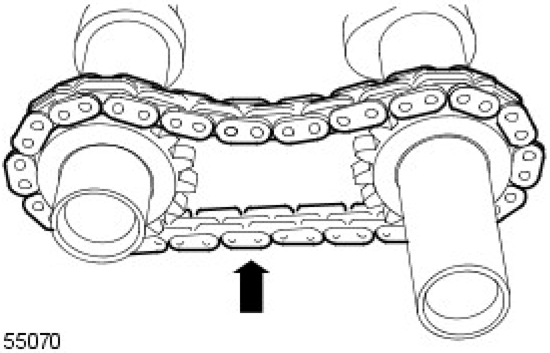
94. Remove the LH bank secondary timing chain tensioner.



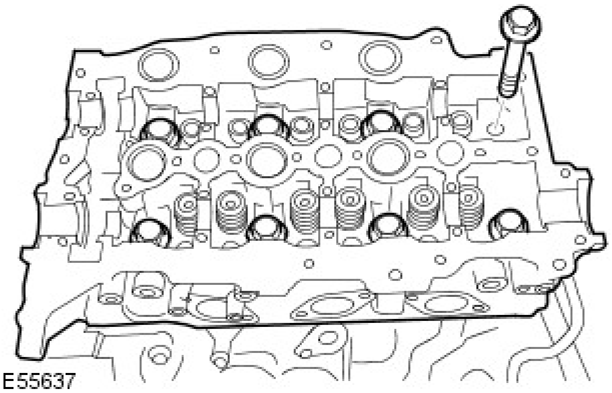
E55069

95. Remove the LH bank camshafts.

- Release the secondary timing chain from the LH camshafts.
- Remove and discard the 2 seals.



E55070



E55637

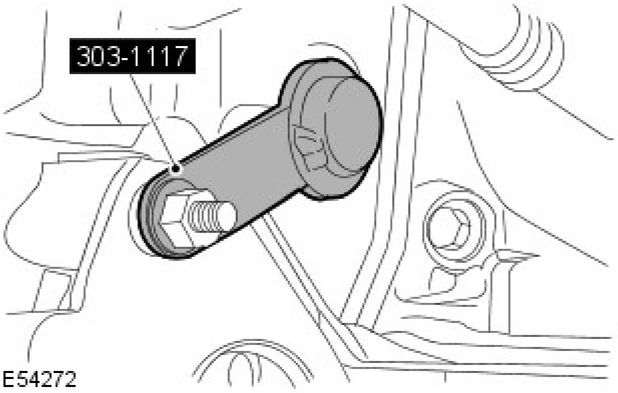
96. CAUTIONS:

⚠ The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

⚠ Only use a plastic scraper to clean off the old gasket.

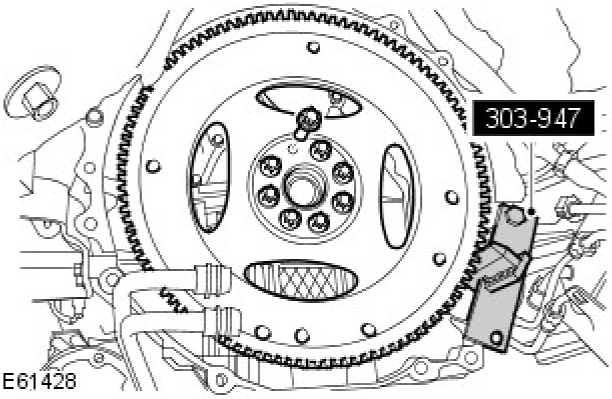
Remove the LH cylinder head assembly.

- Remove and discard the 8 bolts.
- Remove and discard the gasket.



E54272

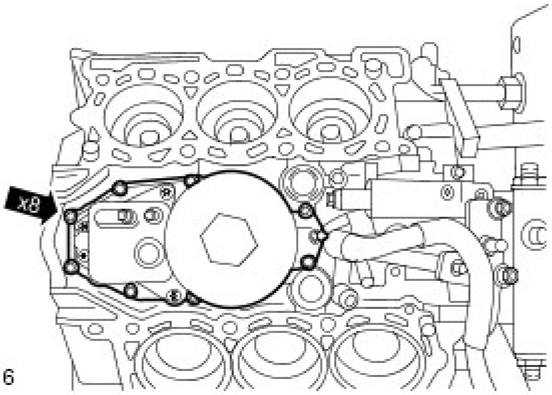
97. Remove the special tool from the flexplate.



E61428

98. Remove the flexplate.

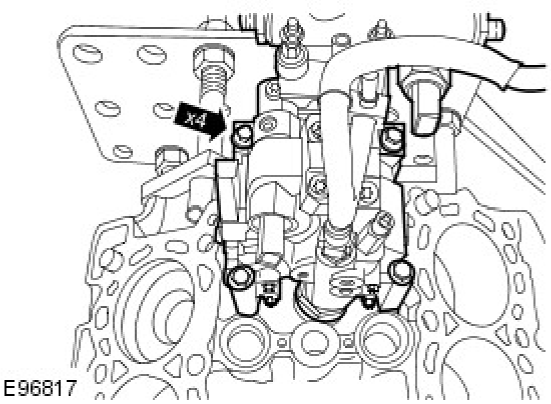
- Using the special tool, lock the flexplate.
- Remove the 8 bolts.



E96816

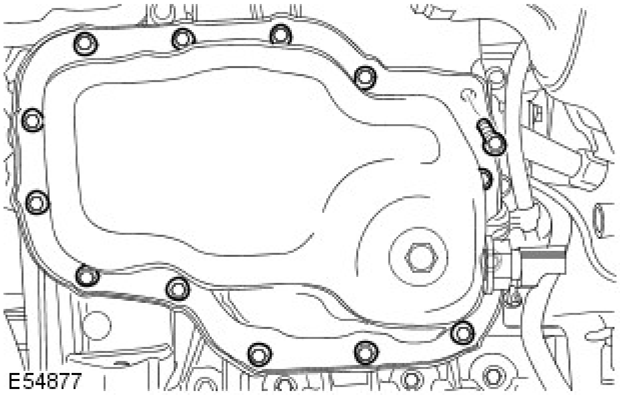
99. Remove the oil cooler assembly.

- Remove the 8 bolts.
- Remove and discard the gasket.



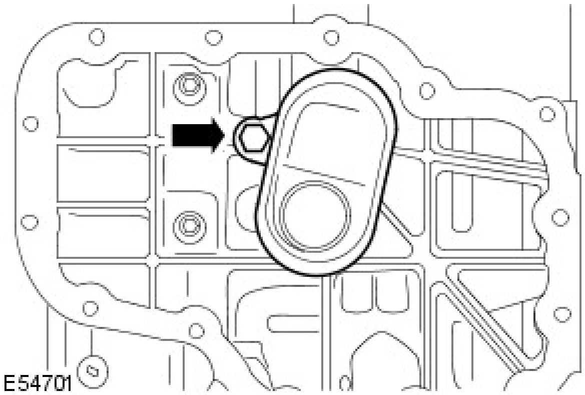
100. Remove the fuel injection pump.

- Remove the 4 bolts.



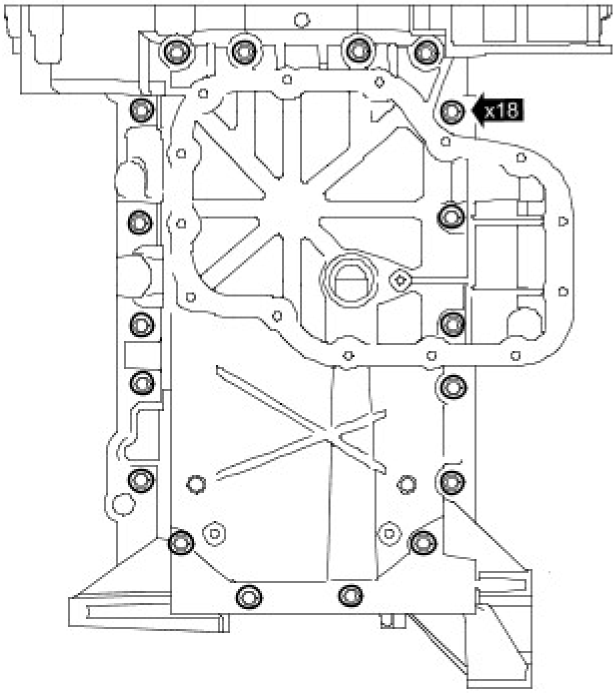
101. Remove the oil pan.

- Remove the 14 bolts.
- Remove and discard the gasket.



102. Remove the oil pump screen and pickup tube.

- Remove the bolt.
- Remove and discard the 2 O-ring seals.



E93945

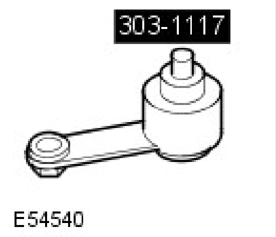
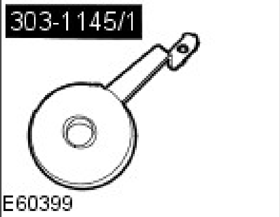
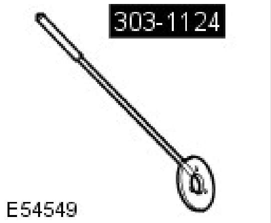
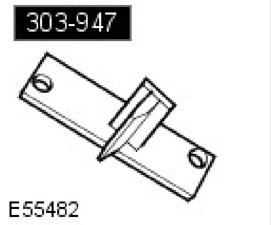
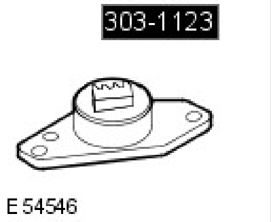
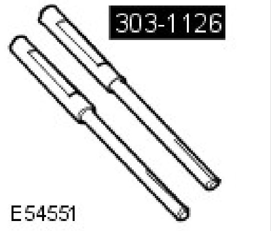
103. Remove the oil pan extension.

- Remove the 18 bolts.
- Remove and discard the gasket.

Published: 11-May-2011

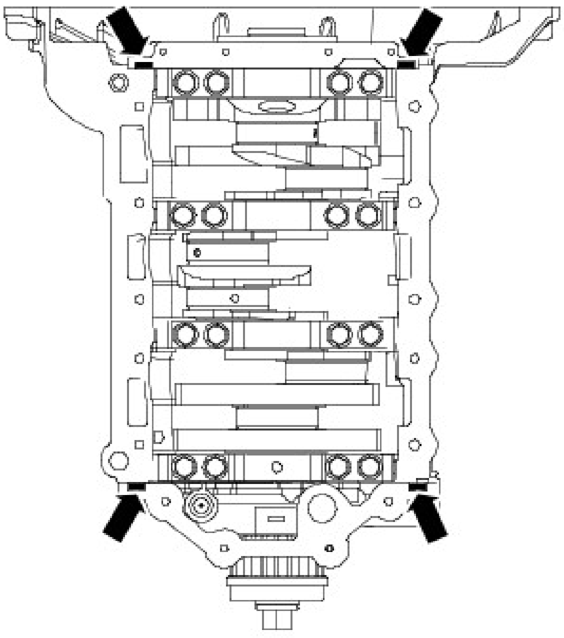
Engine - TDV6 2.7L Diesel - Engine

Assembly

Special Tool(s)	
 303-1117 E54540	Timing Pin - Automatic Transmission 303-1117
 303-1145/1 E60399	Camshaft pulley holding tool 303-1145/1
 303-1124 E54549	Holder - Camshaft Pulleys Front 303-1124
 303-947 E55482	Flex plate locking tool 303-947
 303-1123 E 54546	Locking Tool - Flywheel 303-1123
 303-1126 E54551	Timing Pin - Camshaft Pulleys 303-1126

Assembly

All vehicles



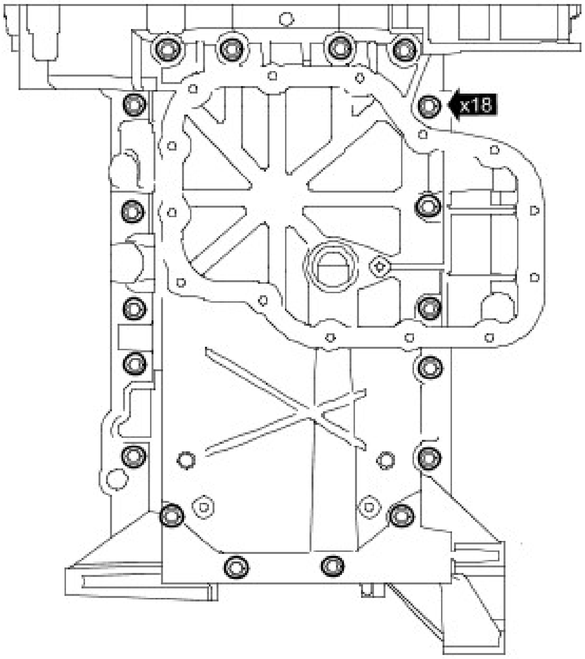
E93678

1. NOTE: Clean the component mating faces.

• NOTE: It is important that the oil pan extension is bolted to the crankshaft main bearing carrier within twenty minutes of applying the sealant.

Apply an 8 mm bead of sealant to the cylinder block in the areas shown.

- Use WSS-M4G323-A4-RTV sealant.

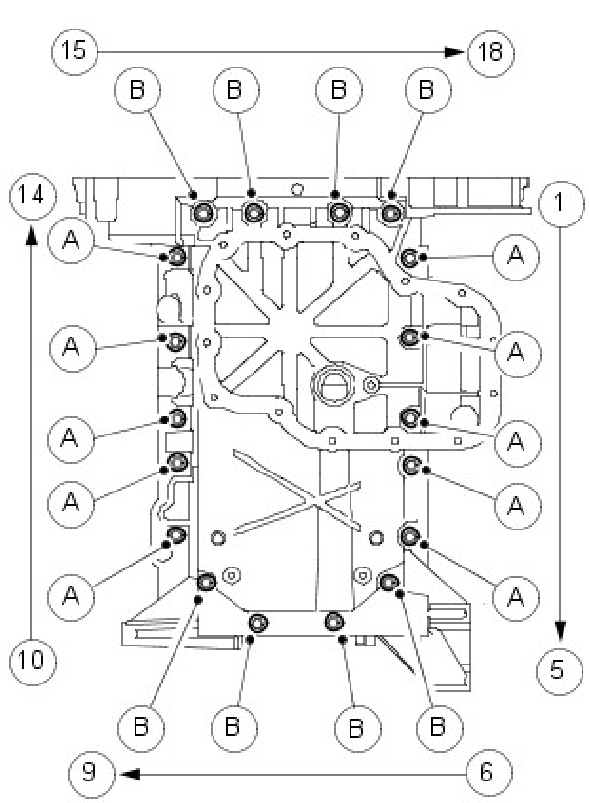


E93945

2. NOTE: Clean the component mating faces.

Install the oil pan extension.

- Install a new gasket.
- Loosely install the bolts.

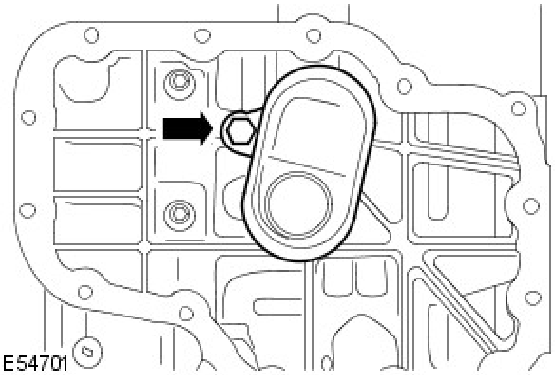


E93962

3. ⚠ CAUTION: Tighten the bolts in the indicated sequence in 2 stages.

Secure the oil pan extension.

1. Tighten bolts A to 10 Nm (7 lb.ft). Tighten bolts B to 4 Nm (2 lb.ft).
2. Tighten bolts A to 24 Nm (18 lb.ft). Tighten bolts B to 10 Nm (7 lb.ft).



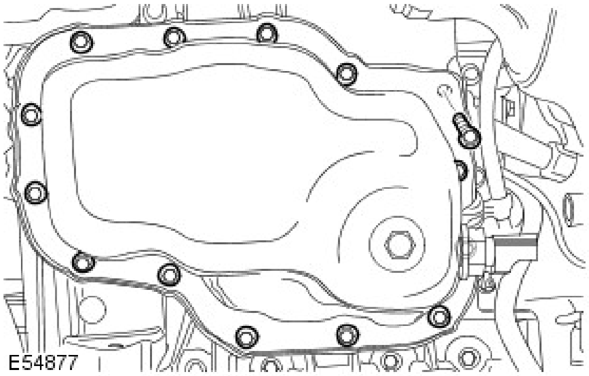
E54701

4. NOTE: Lubricate the new seals with clean engine oil.

• NOTE: Clean the components.

Install the oil pump screen and pickup tube.

- Clean the components.
- Install new O-ring seals.
- Tighten the bolt to 10 Nm (7 lb.ft).

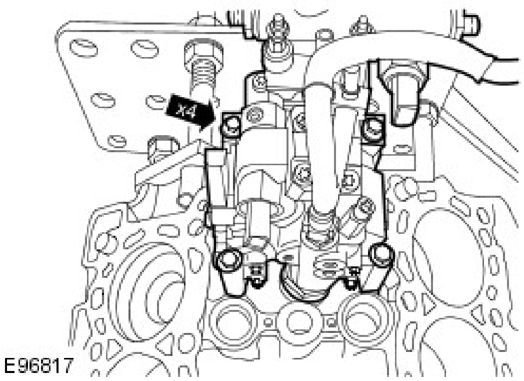


E54877

5. NOTE: Clean the component mating faces.

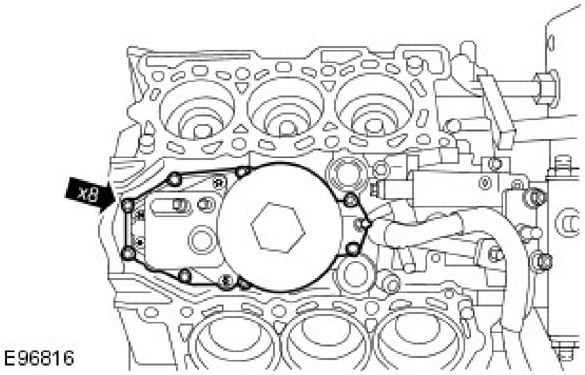
Install the oil pan.

- Install a new gasket.
- Evenly and progressively tighten the bolts to 10 Nm (7 lb.ft).



6. Install the fuel injection pump.

- Tighten the bolts to 23 Nm (17 lb.ft).

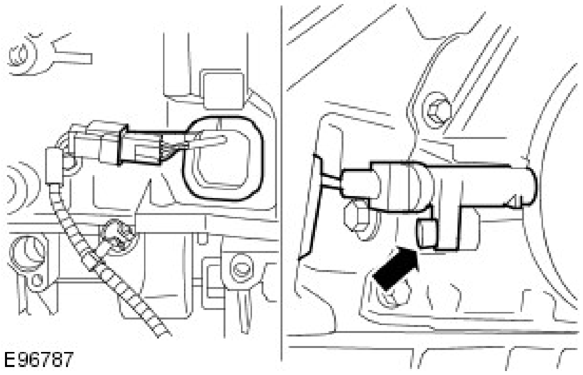


7. ⚠ CAUTION: Make sure the gasket is installed correctly.

• NOTE: Clean the component mating faces.

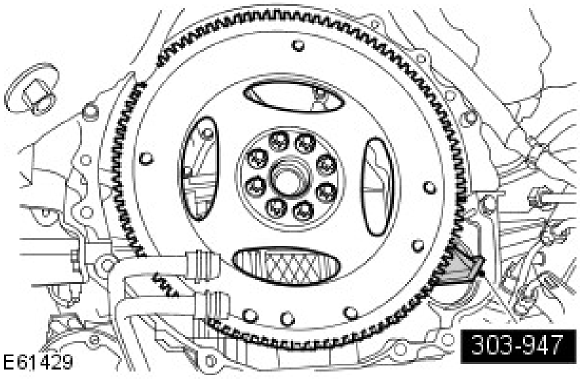
Install the oil cooler assembly.

- Install a new gasket.
- Install a new O-ring seal.
- Tighten the bolts to 10 Nm (7 lb.ft).



8. Install the crankshaft position (CKP) sensor.

- Tighten the bolt to 5 Nm (4 lb.ft).
- Connect the electrical connector.
- Reposition the access cover.



9. CAUTIONS:

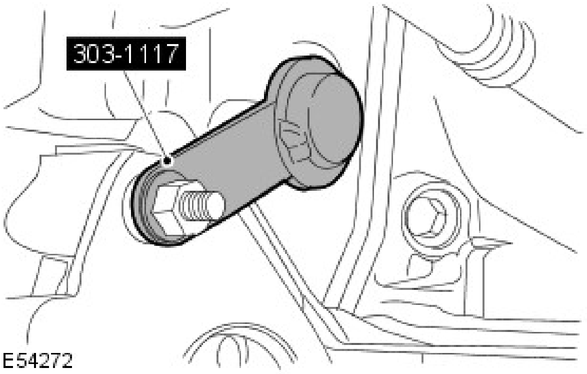
⚠ Tighten the bolts in a diagonal sequence.

⚠ Tighten the bolts in the stages shown.

• NOTE: Clean the component mating faces.

Install the flexplate.

- Using the special tool, lock the flexplate.
- Stage 1: Tighten the bolts to 50 Nm (37 lb.ft).
- Stage 2:Tighten the bolts 45 degrees.
- Stage 3:Tighten the bolts a further 45 degrees.
- Remove the special tool.



10. Using the special tool, lock the flexplate.

- Rotate the crankshaft clockwise to align the crankshaft alignment hole in the flywheel or flexplate with the cylinder block aperture.
- Install a starter motor bolt to retain the special tool.

11. Check the LH cylinder head face for distortion, across the center and from corner to corner.

12. NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

• NOTE: Clean the component mating faces.

Install a new LH cylinder head gasket.

13. CAUTIONS:

⚠ Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

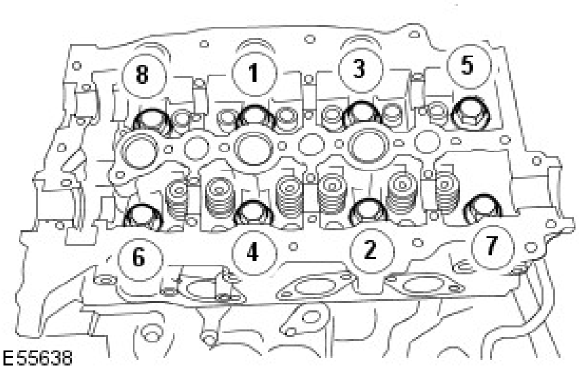
⚠ Make sure that new bolts are installed.

• NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

• NOTE: Make sure the cylinder head is installed in its original position.

• NOTE: Tighten the bolts in the indicated sequence in 4 stages.

• NOTE: Clean the component mating face.



Install the LH cylinder head assembly.

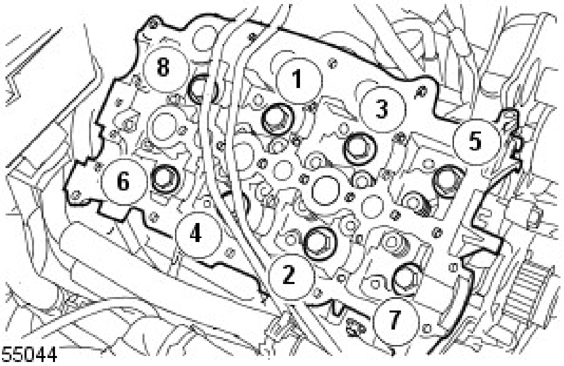
- Stage 1: Tighten the bolts to 20 Nm (15 lb.ft).
- Stage 2: Tighten the bolts to 40 Nm (30 lb.ft).
- Stage 3: Tighten the bolts to 80 Nm (59 lb.ft).
- Stage 4: Tighten the bolts a further 180 degrees.

14. Check the RH cylinder head face for distortion, across the center and from corner to corner.

15. NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

• NOTE: Clean the component mating faces.

Install a new RH cylinder head gasket.



E55044

16. CAUTIONS:

⚠ Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

⚠ Make sure that new bolts are installed.

• NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

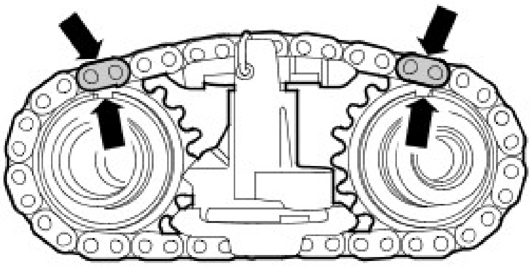
• NOTE: Make sure the cylinder head is installed in its original position.

• NOTE: Tighten the bolts in the indicated sequence in four stages.

Install the RH cylinder head assembly.

- Stage 1: Tighten to 20 Nm (15 lb.ft).
- Stage 2: Tighten to 40 Nm (30 lb.ft).
- Stage 3: Tighten to 80 Nm (59 lb.ft).
- Stage 4: Tighten a further 180 degrees.

17. Install the secondary timing chain to the RH bank camshafts.



E55062

18. ⚠ CAUTION: Do not release the secondary timing chain tensioner locking pin until all of the camshaft bearing caps have been installed.

Install the RH bank secondary timing chain tensioner.

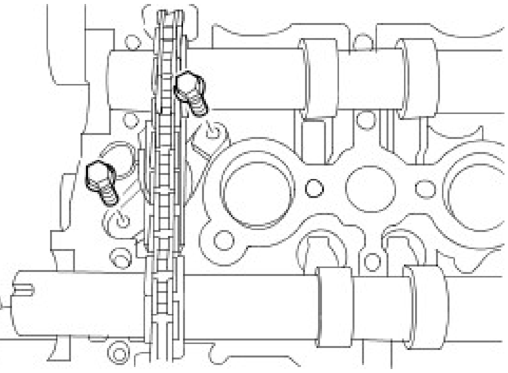
- Align the marks on the camshafts with the marks on the secondary timing chain.

19. NOTE: Clean the components.

• NOTE: Install a new seal.

Install the RH bank camshafts and secondary timing chain tensioner assembly.

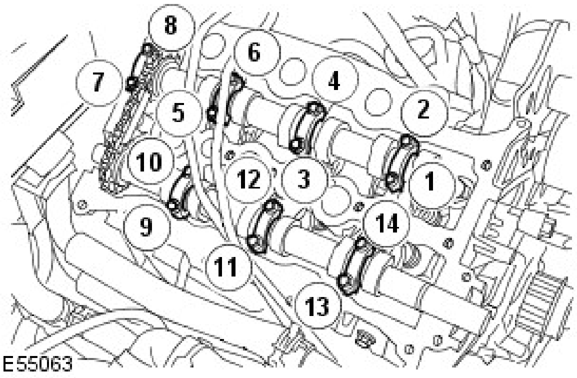
- Lubricate the journals and camshaft lobes.



E61468

20. Secure the RH bank secondary timing chain tensioner.

- Tighten the bolts to 10 Nm (7 lb.ft).


8
7
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1
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14
11
13
E55063

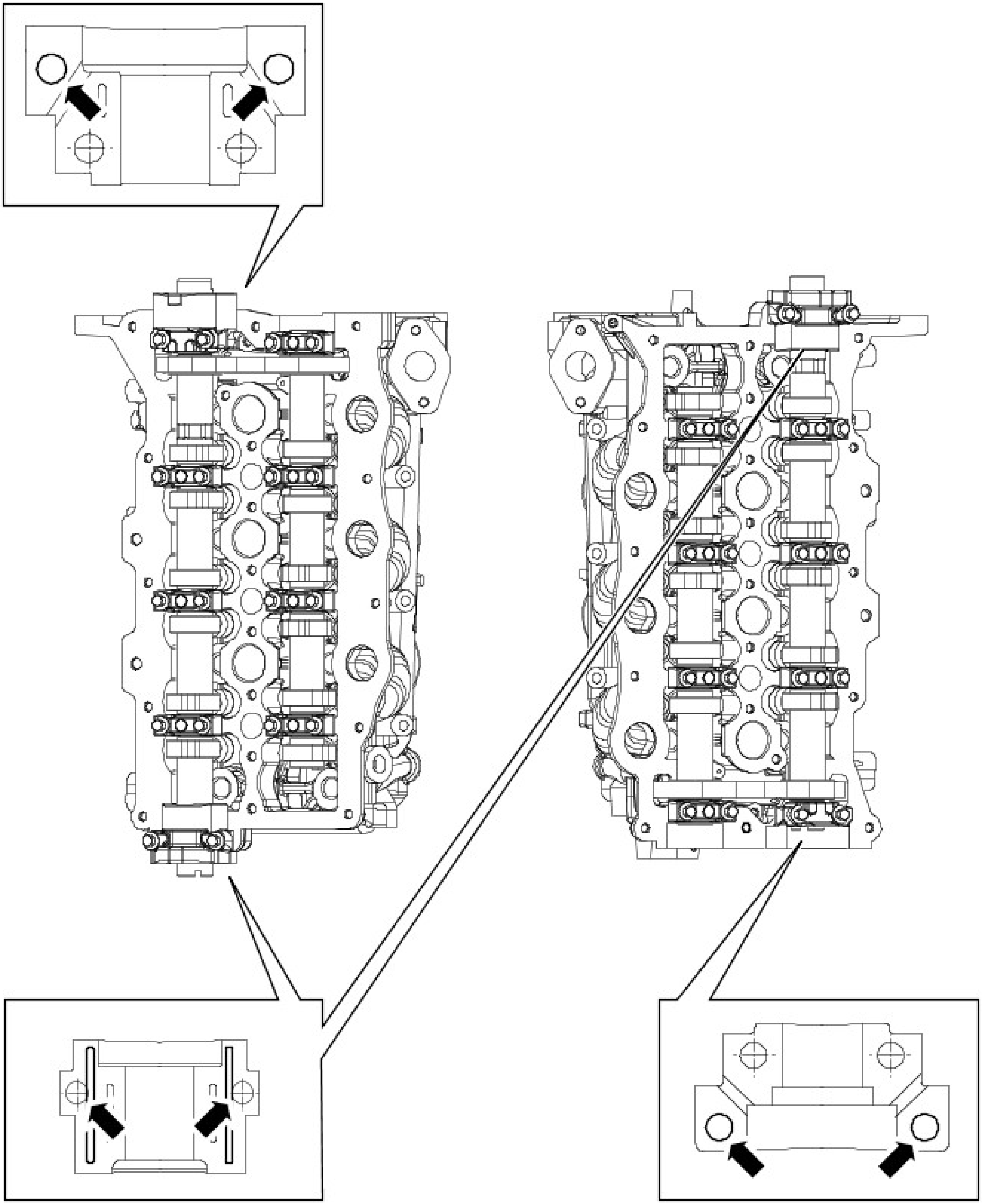
21. ⚠ CAUTION: Tighten the bolts evenly in 3 stages in the sequence shown.

• NOTE: Do not install the two exhaust camshaft end bearing caps at this stage.

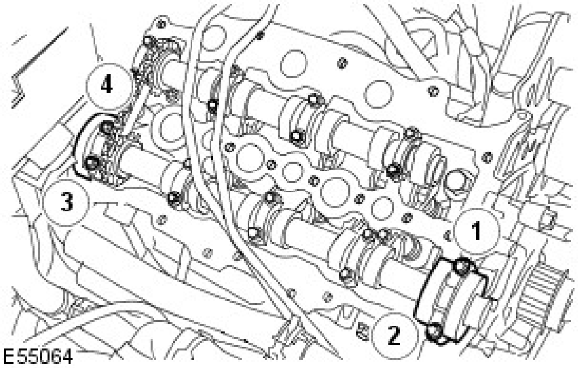
Install the RH bank camshaft bearing caps.

- Stage 1: Tighten to 1 Nm (1 lb.ft).
- Stage 2: Tighten to 5 Nm (4 lb.ft).
- Stage 3: Tighten to 10 Nm (7 lb.ft).

22. Apply sealant to the RH exhaust camshaft end bearing cap at the positions shown.



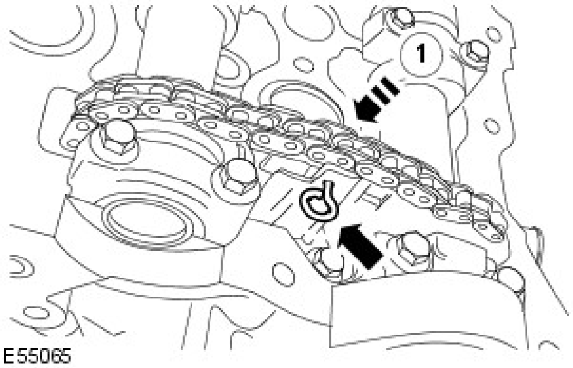
E55072



23. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Install the RH bank exhaust camshaft end bearing caps.

- Stage 1: Tighten to 1 Nm (1 lb.ft).
- Stage 2: Tighten to 5 Nm (4 lb.ft).
- Stage 3: Tighten to 10 Nm (7 lb.ft).



24. Release the RH bank secondary timing chain tensioner piston.

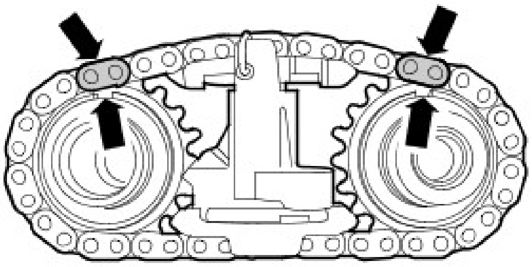
- Remove the locking pin.

25. Install the secondary timing chain to the LH bank camshafts.

26. ⚠ CAUTION: Do not release the secondary timing chain tensioner locking pin until all of the camshaft bearing caps have been installed.

Install the LH bank secondary timing chain tensioner.

- Align the marks on the camshafts with the marks on the secondary timing chain.

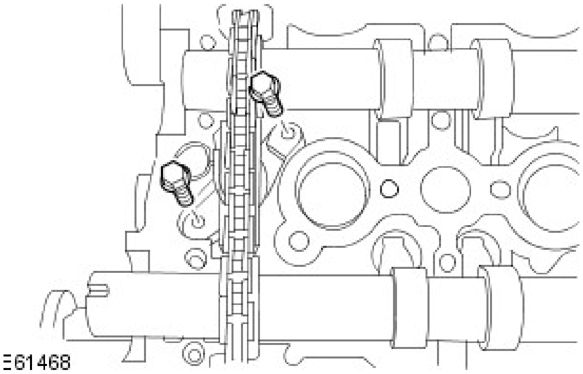


27. NOTE: Clean the components.

• NOTE: Install new seals.

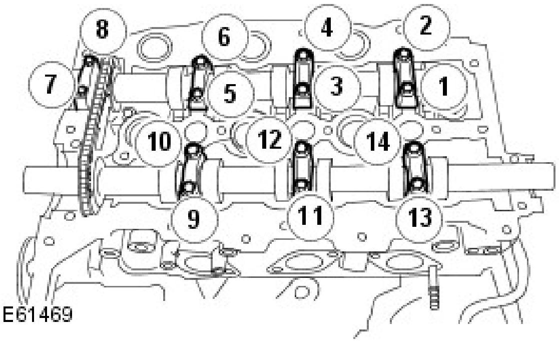
Install the LH bank camshafts and secondary timing chain tensioner assembly.

- Lubricate the journals and camshaft lobes.



28. Secure the LH bank secondary timing chain tensioner.

- Tighten the bolts to 10 Nm (7 lb.ft).



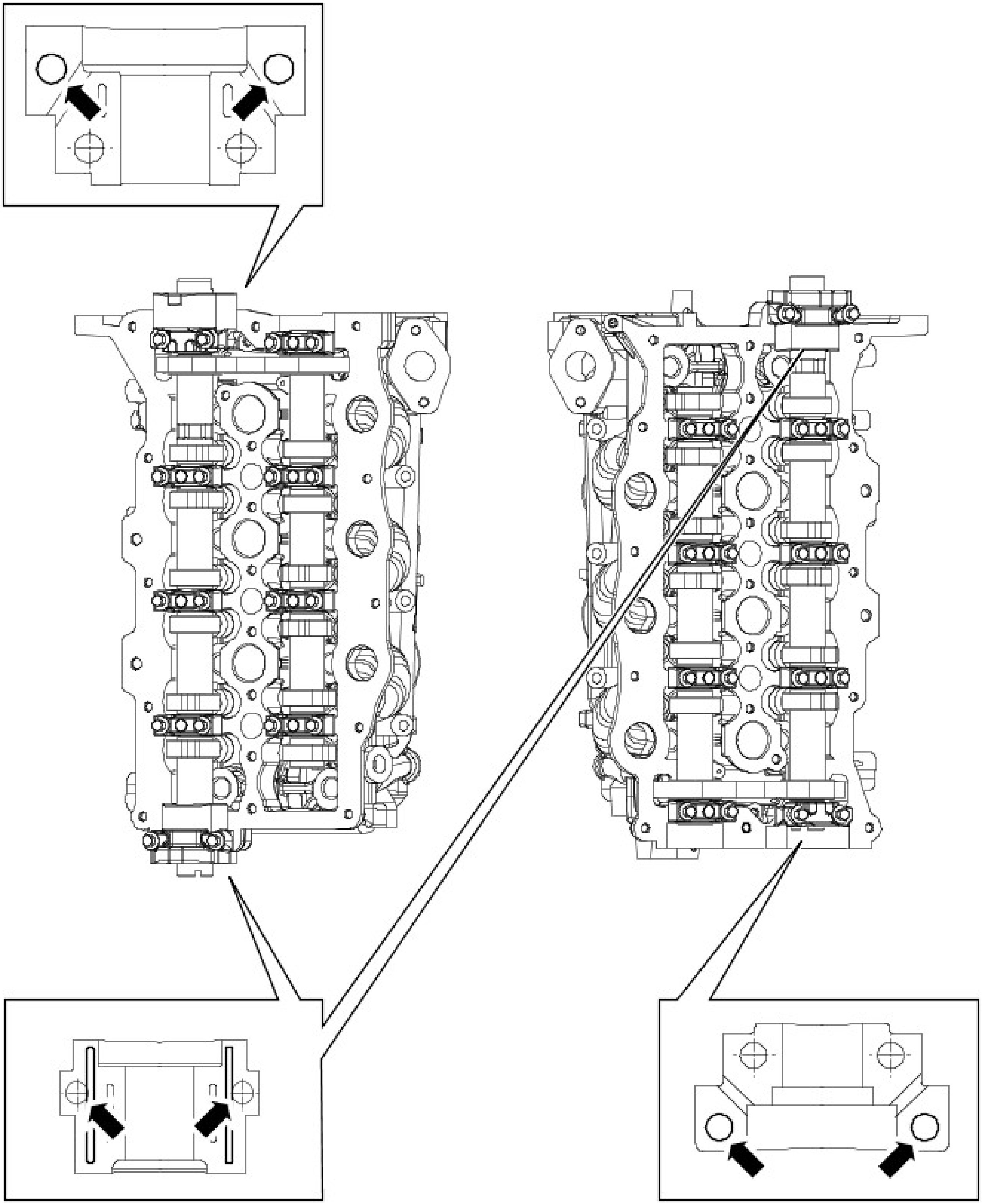
29. CAUTION: Tighten the bolts evenly in 3 stages in the sequence shown.

• NOTE: Do not install the two exhaust camshaft end bearing caps at this stage.

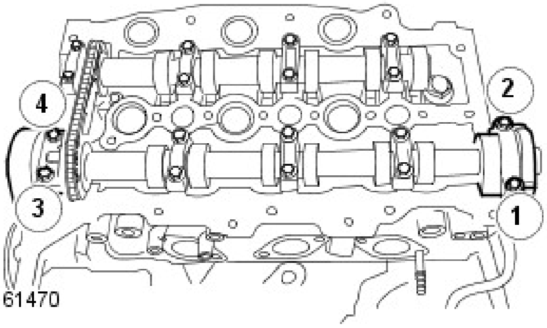
Install the LH bank camshaft bearing caps.

- Stage 1: Tighten to 1 Nm (1 lb.ft).
- Stage 2: Tighten to 5 Nm (4 lb.ft).
- Stage 3: Tighten to 10 Nm (7 lb.ft).

30. Apply sealant to the 2 LH exhaust camshaft end bearing caps at the positions shown.



E55072

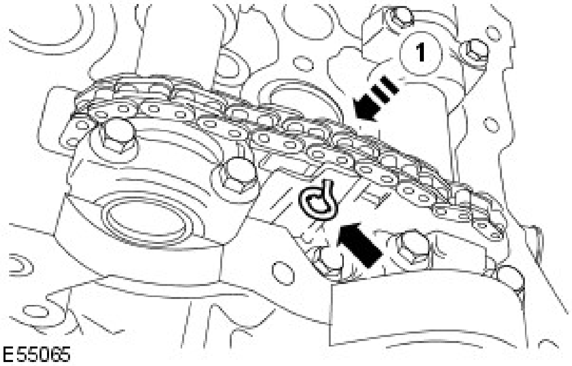


E61470

31. CAUTION: Tighten the bolts in the sequence shown.

Install the LH bank exhaust camshaft end bearing caps.

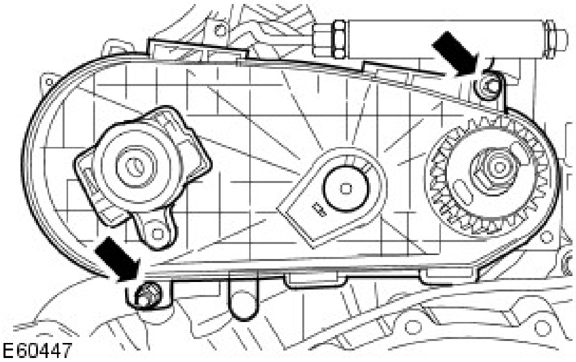
- Stage 1: Tighten the bolt to 1 Nm (1 lb.ft).
- Stage 2: Tighten the bolt to 5 Nm (4 lb.ft).
- Stage 3: Tighten the bolt to 10 Nm (7 lb.ft).



E55065

32. Release the LH bank secondary timing chain tensioner piston.

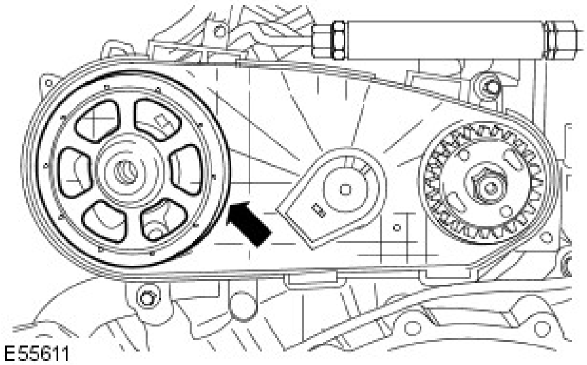
- Remove the locking pin.



E60447

33. Install the fuel injection pump belt rear cover.

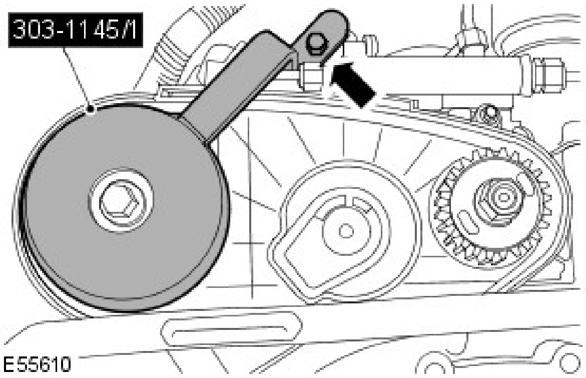
- Tighten the bolts to 10 Nm (7 lb.ft).



E55611

34. Install the camshaft rear pulley.

- Install a new camshaft pulley bolt.



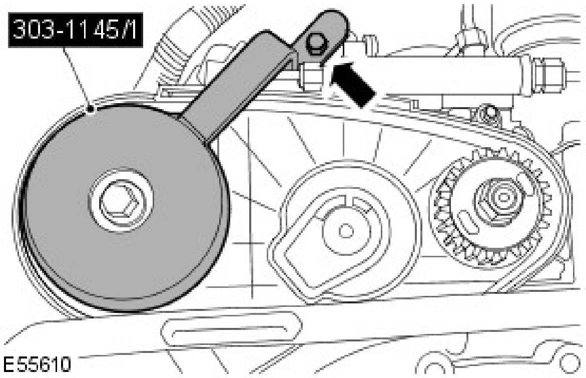
35. Install the special tool to the camshaft rear pulley.

- Install and tighten the bolt.

36. ⚠ CAUTION: Tighten the bolts in the stages shown.

Secure the camshaft rear pulley.

- Stage 1: Tighten the bolt to 40 Nm (30 lb.ft).
- Stage 2: Tighten the bolt to 75 Nm (56 lb.ft).



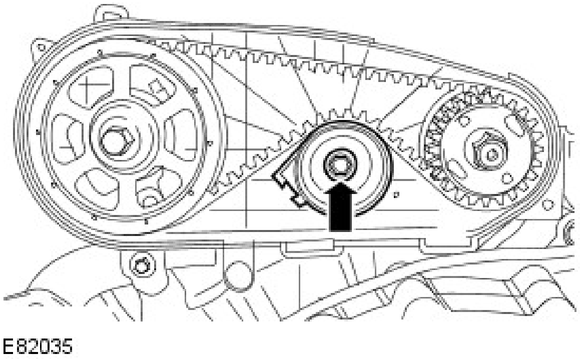
37. Remove the special tools.

- Remove the bolt.

38. ⚠ CAUTION: Do not install the new fuel injection pump belt to the pulleys with the fuel pump belt tensioner installed. Failure to follow this instruction may result in damage to the fuel pump belt.

• NOTE: The fuel injection pump rotates in a counter-clockwise direction when viewed from the rear of the engine.

Install the new fuel injection pump belt.



39. CAUTIONS:

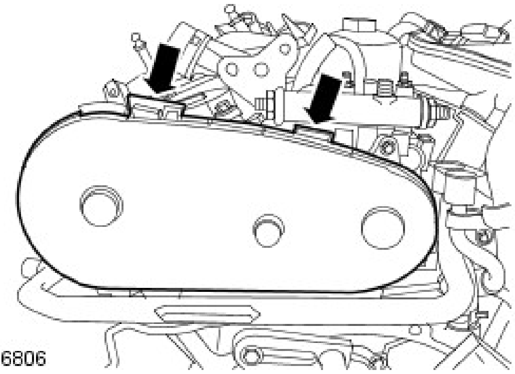
⚠ Make sure that the fuel injection pump belt tensioner locking pin is not removed until the fuel injection pump belt tensioner is fully installed.

⚠ Make sure that the fuel injection pump belt tensioner tang is correctly located to the fuel injection pump belt rear cover. Failure to follow this instruction may result in damage to the engine.

Install a new fuel injection pump belt tensioner.

- Locate the tang on the new fuel injection pump belt tensioner into the fuel injection pump rear cover.
- Tighten the bolt to 25 Nm (18 lb.ft).
- Remove and discard the fuel injection pump belt tensioner locking pin.

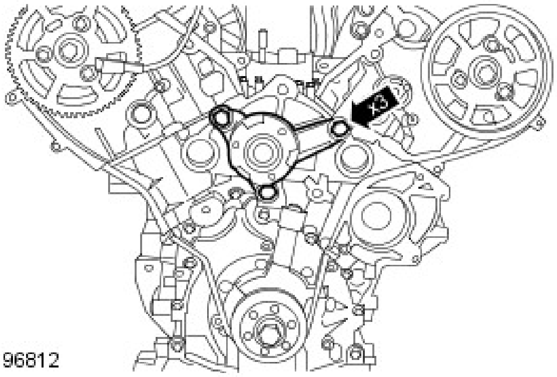
40. Install the fuel injection pump belt cover.



E96806

41. Install the cooling fan drive hub bearing.

- Tighten the bolts to 90 Nm (66 lb.ft).



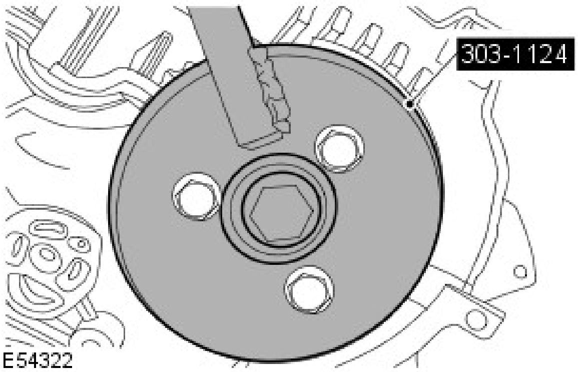
E96812

42. ⚠ CAUTION: Make sure that new bolts are installed.

• NOTE: LH is shown, RH is similar.

Using the special tool, install the 2 camshaft pulley hubs.

- Stage 1: Tighten to 80 Nm (59 lb.ft).
- Stage 2: Tighten a further 90 degrees.



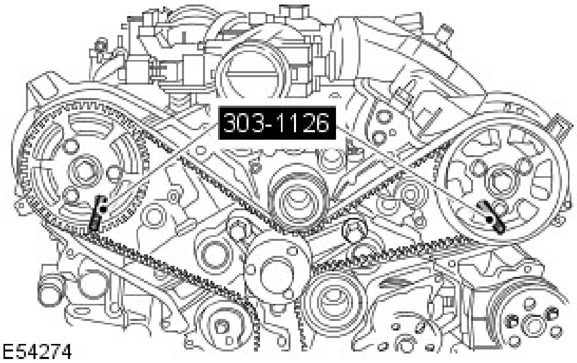
E54322

43. Install the 2 exhaust camshaft pulleys.

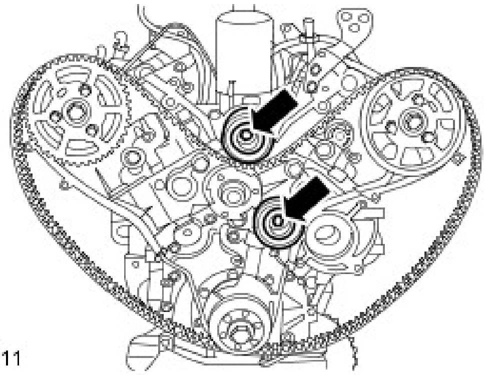
- Install the bolts, but do not tighten fully at this stage.

44. Install the special tools.

- Rotate the camshafts.



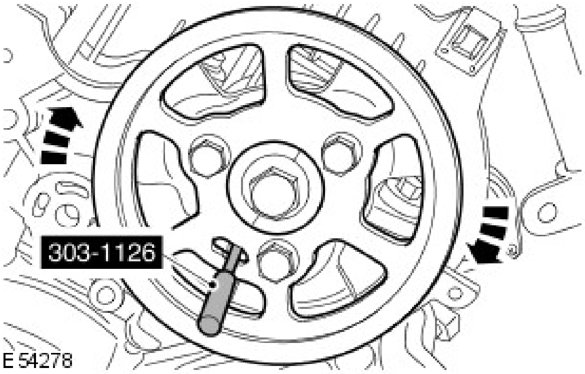
E54274



E96811

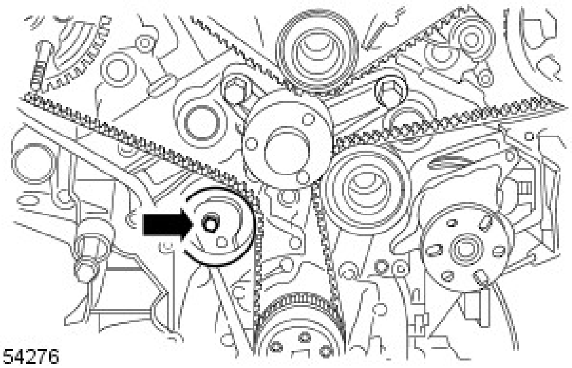
45. Install the 2 timing belt idler pulleys.

- Install the plastic shield behind the upper idler pulley.
- Tighten the bolts to 45 Nm (33 lb.ft).



E54278

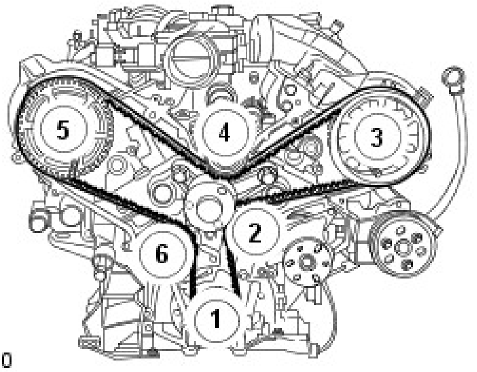
46. Rotate both camshaft pulleys clockwise.



E54276

47. Install a new timing belt tensioner.

- Install a new bolt, but do not fully tighten at this stage.

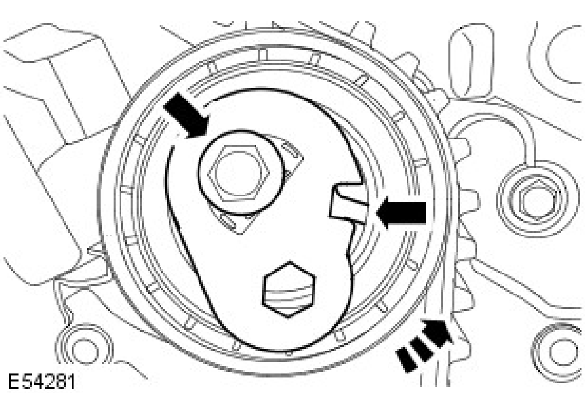


E54280

48. ⚠ CAUTION: Make sure the camshaft pulleys remain in the clockwise position.

Install the new timing belt.

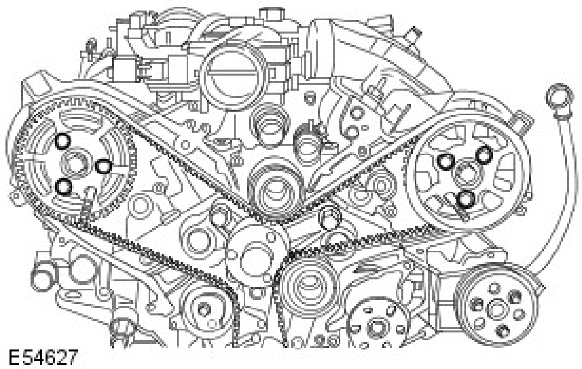
- Starting at the crankshaft pulley, install the timing belt in a counter-clockwise direction, in the sequence shown.
- Stage 1: Attach the timing belt to the crankshaft pulley.
- Stage 2: Attach the timing belt to the idler pulley.
- Stage 3: Attach the timing belt to the left-hand camshaft pulley.
- Stage 4: Attach the timing belt to the idler pulley.
- Stage 5: Attach the timing belt to the RH camshaft pulley.
- Stage 6: Attach the timing belt to the timing belt tensioner.


E54281

49. CAUTION: Make sure the timing belt tensioner window is aligned with the groove.

Tension the timing belt.

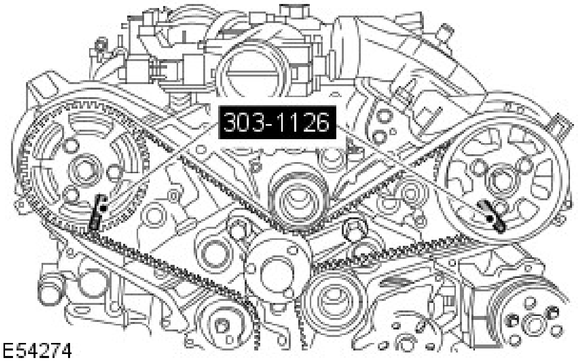
- Rotate the tensioner assembly counter-clockwise.
- Tighten the bolt to 24 Nm (18 lb.ft).


E54627

50. CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

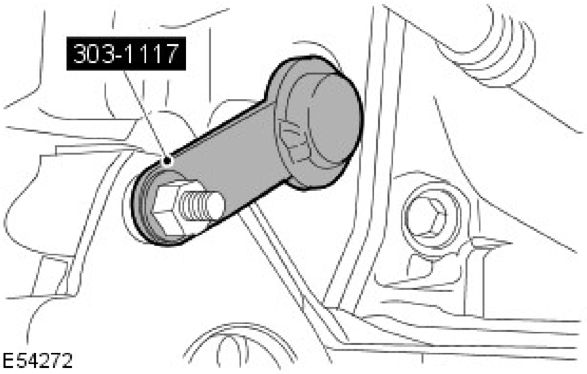
Secure the camshaft pulleys.

- Using a suitable tool, hold the camshaft pulley center bolts.
- Tighten the bolts to 23 Nm (17 lb.ft).



E54274

51. Remove the special tools.

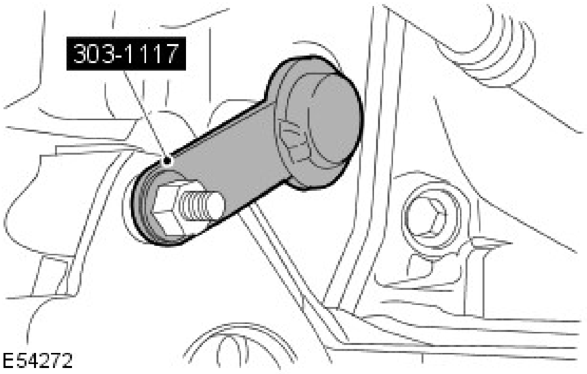


E54272

52. Remove the special tool.

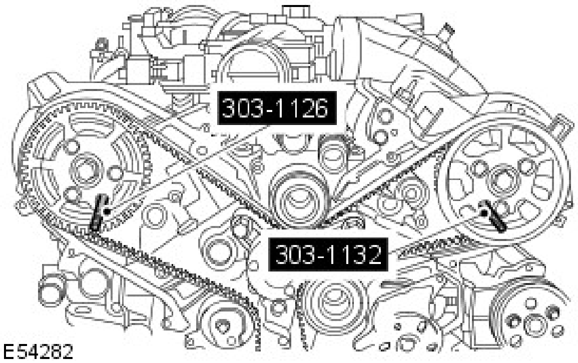
- Remove the bolt.

53. Rotate the engine two complete turns clockwise.


303-1117
E54272

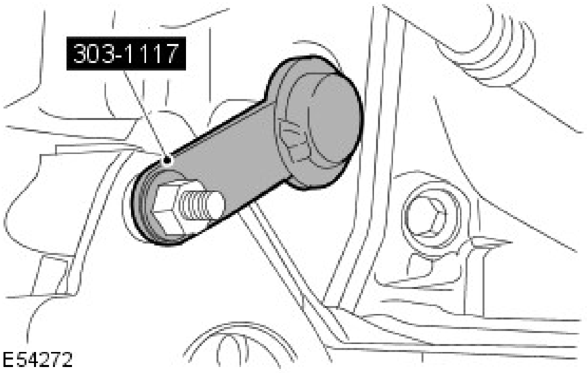
54. Using the special tool, lock the flexplate.

- Install a starter motor bolt to retain the special tool.


303-1126
303-1132
E54282

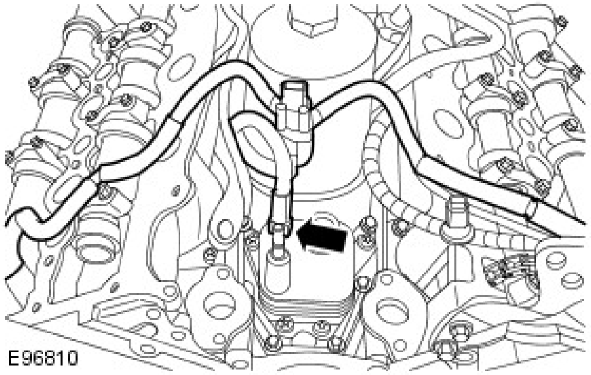
55. Install the special tools to the exhaust camshaft pulleys.

- If the special tool does not fit correctly, repeat the timing belt installation procedure.
- Remove the special tools from the camshaft pulleys.


303-1117
E54272

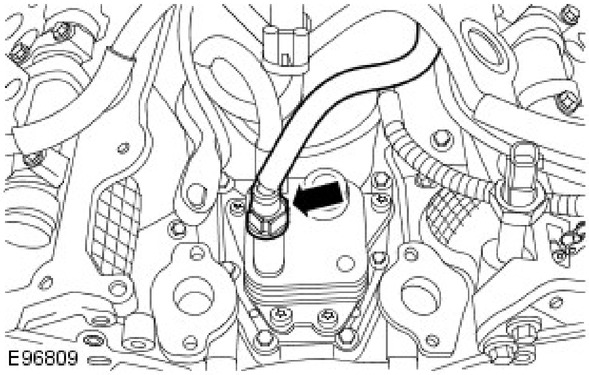
56. Remove the special tool.

- Remove the bolt.



57. NOTE: Remove and discard the blanking caps.

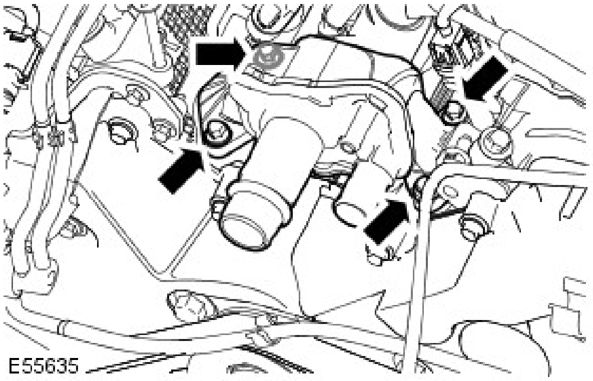
Install a new fuel injector return line.



E96809

58. NOTE: Remove and discard the blanking caps.

Connect the fuel pipe to the fuel cooler.



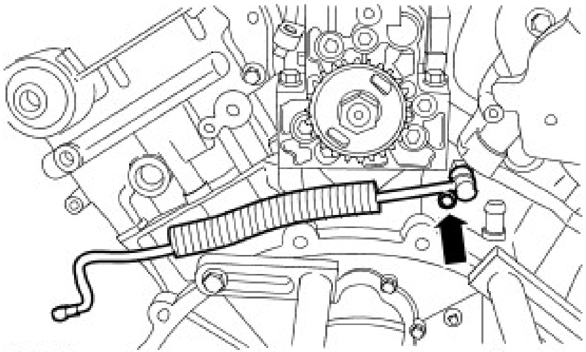
E55635

59. NOTE: Install new O-ring seals.

• NOTE: Make sure that all the component mating faces are clean.

Install the cylinder head coolant outlet assembly.

- Tighten the bolts to 10 Nm (7 lb.ft).

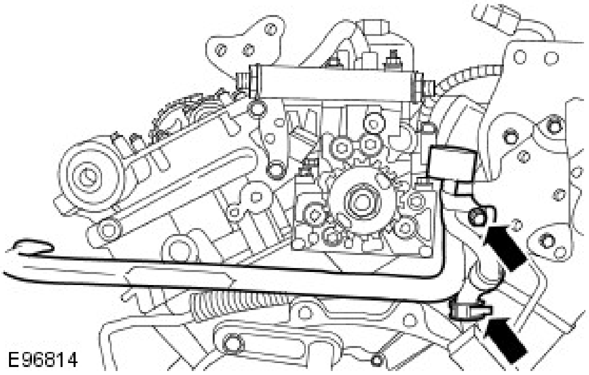


E96815

60. NOTE: Install new O-ring seals.

Install the turbocharger oil supply line.

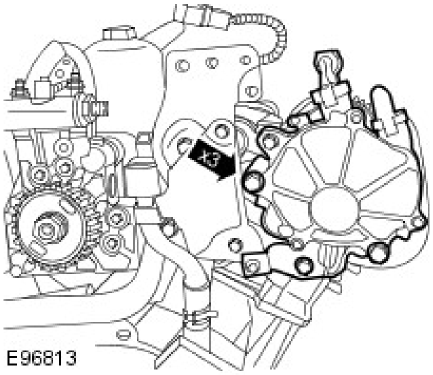
- Tighten the bolts to 10 Nm (7 lb.ft).



E96814

61. Install the breather line.

- Secure the clip.
- Tighten the bolt to 10 Nm (7 lb.ft).

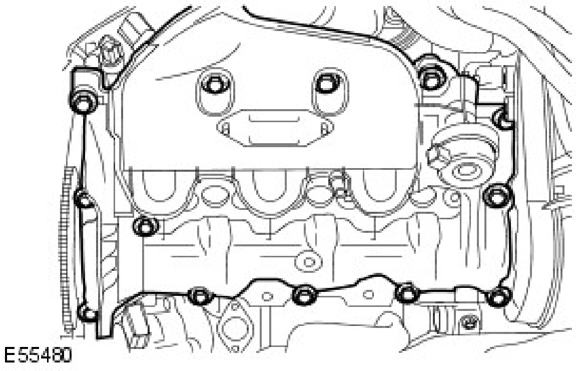


62. NOTE: Clean the component mating faces.

• NOTE: Install a new gasket.

Install the brake vacuum pump.

- Install the bracket.
- Tighten the bolts to 23 Nm (17 lb.ft).

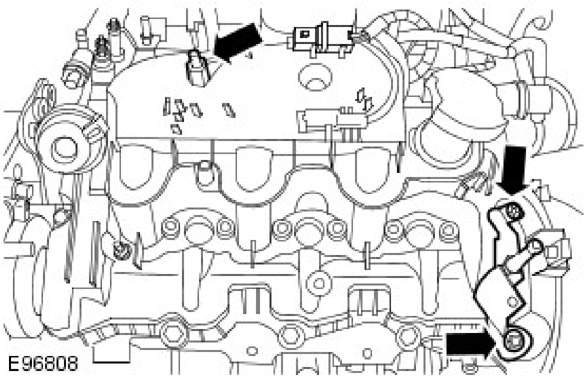


63. NOTE: Clean the component mating faces.

• NOTE: Install a new gasket.

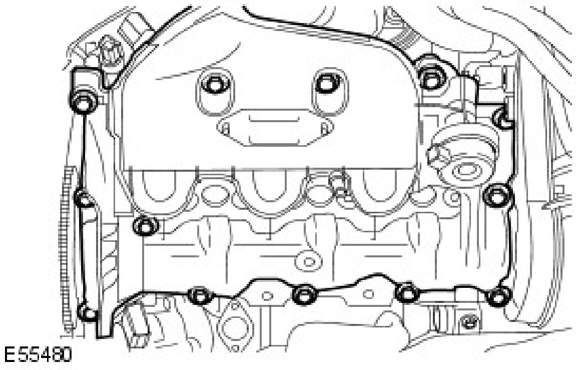
Install the RH valve cover.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the glow plug electrical connector in the valve cover.
- Secure the knock sensor (KS) electrical connector in the valve cover.



64. Install the RH engine cover locating studs.

- Install the bracket.
- Tighten the nut to 10 Nm (7 lb.ft).
- Tighten the bolt to 10 Nm (7 lb.ft).

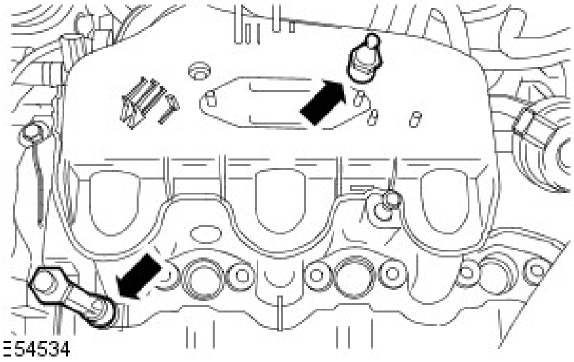


65. NOTE: Clean the component mating faces.

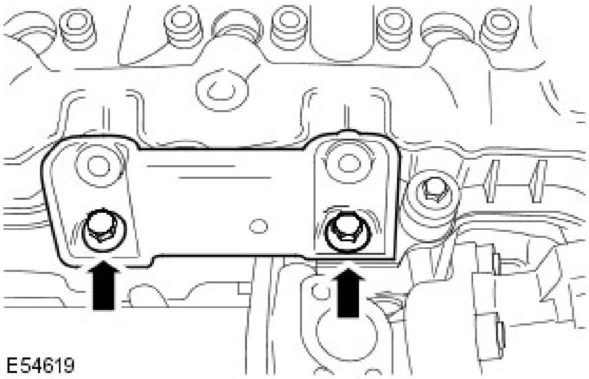
• NOTE: Install anew gasket.

Install the LH valve cover.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the KS electrical connector in the valve cover.

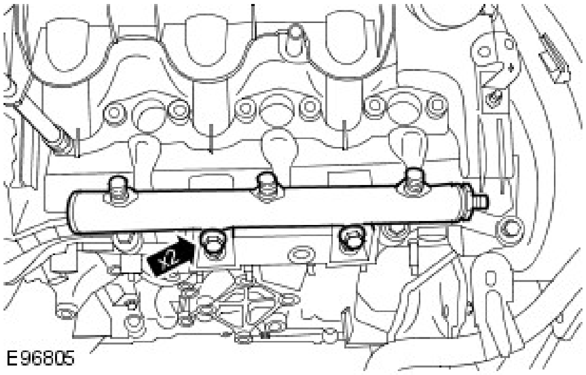


66. Install the LH engine cover locating studs.



67. Install the fuel rail brackets.

- Tighten the bolts to 23 Nm (17 lb.ft).



68. Install the fuel rails.

- Install the bolts, but do not tighten fully at this stage.

Vehicles built up to 12/2006

69. NOTE: Remove and discard the blanking caps.

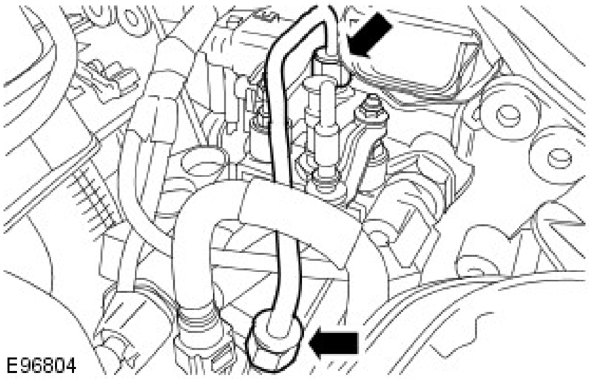
Install the new RH fuel rail high-pressure supply line.

- Tighten the fuel injection supply manifold retaining bolts to 23 Nm (17 lb.ft).
- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 30 Nm (22 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel rail to 30 Nm (22 lb.ft).
- Secure the clip.

70. NOTE: Remove and discard the blanking caps.

Install the new LH fuel rail high-pressure supply line.

- Tighten the fuel injection supply manifold retaining bolts to 23 Nm (17 lb.ft).
- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 30 Nm (22 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel rail to 15 Nm (11 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel rail to 30 Nm (22 lb.ft).
- Secure the clip.



71. NOTE: Remove and discard the blanking caps.

Install the new fuel diverter rail high-pressure supply line.

- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection pump to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection pump to 30 Nm (22 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 30 Nm (22 lb.ft).

Vehicles built 01/2007 onwards

72. NOTE: Remove and discard the blanking caps.

Install the new RH fuel rail high-pressure supply line.

- Tighten the fuel injection supply manifold retaining bolts to 23 Nm (17 lb.ft).
- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection pump to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection pump to 30 Nm (22 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel rail to 30 Nm (22 lb.ft).
- Secure the clip.

73. NOTE: Remove and discard the blanking caps.

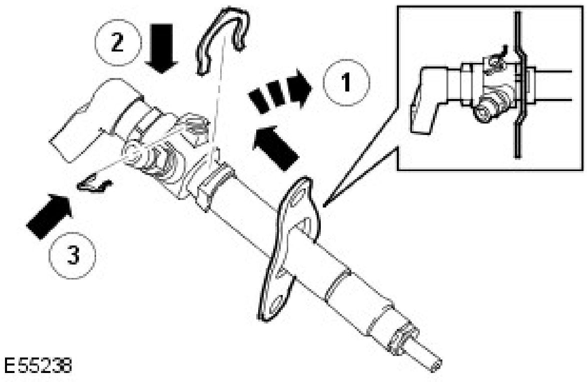
Install the new LH fuel rail high-pressure supply line.

- Tighten the fuel injection supply manifold retaining bolts to 23 Nm (17 lb.ft).
- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection pump to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the

fuel injection pump to 30 Nm (22 lb.ft).

- Stage 4: Tighten the high-pressure fuel supply line union at the fuel rail to 30 Nm (22 lb.ft).
- Secure the clip.

All vehicles



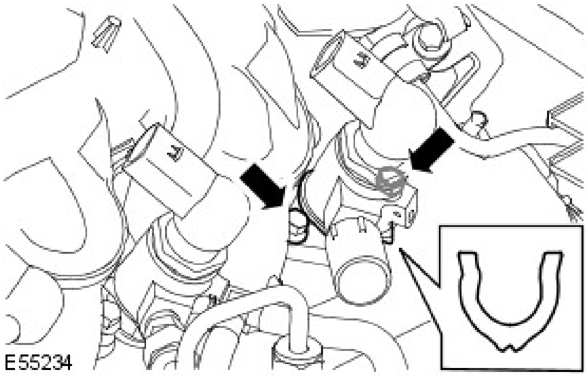
74. CAUTIONS:

⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

⚠ Do not use tools to install the new fuel return line retaining clip. Failure to follow this instruction will result in damage to the retaining clip.

Install a new fuel injector clamp.

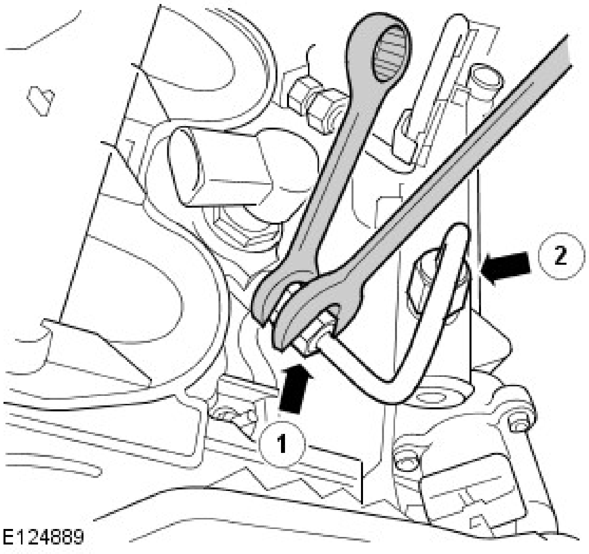
- 1. Install the fuel injector retaining clamp spacer.
- 2. Install a new fuel return line retaining clip.
- 3. Install a new sealing washer.



75. Install the fuel injector.

- Tighten the bolts to 10 Nm (7 lb.ft).

76. Install the remaining fuel injectors.



77. CAUTIONS:

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Maintain pressure on the high-pressure fuel supply line to keep the olives in contact with the fuel injectors and the fuel rail cones while installing unions.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fluid injector nozzle.

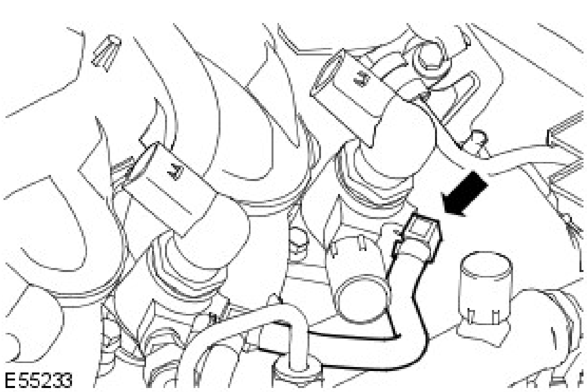
• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel injector supply lines.

- Stage 1: Tighten the high-pressure fuel supply line union at the injector to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the

injector to 30 Nm (22 lb.ft).

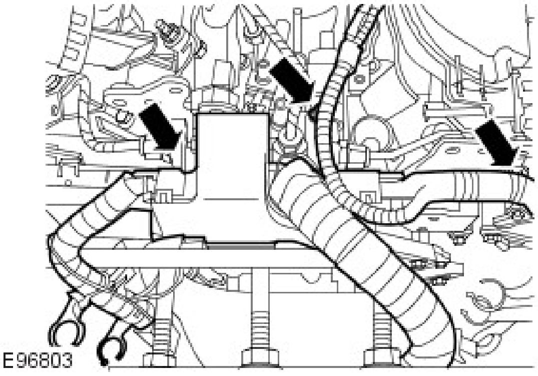
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel rail to 30 Nm (22 lb.ft).



78. ⚠CAUTION: Make sure the fuel return line retaining clip is correctly installed to the fuel injector before installing the return line.

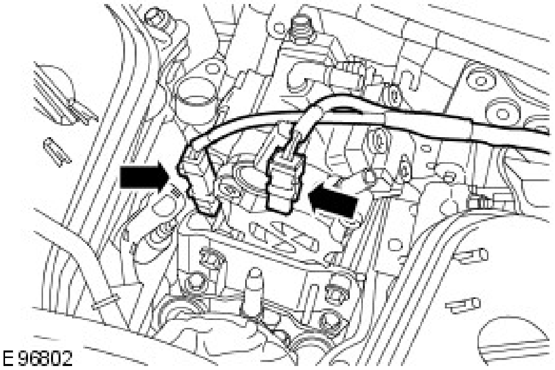
Connect the fuel return line to the fuel injectors.

- Apply a light coating of petroleum jelly to the fuel return line O-ring seals.

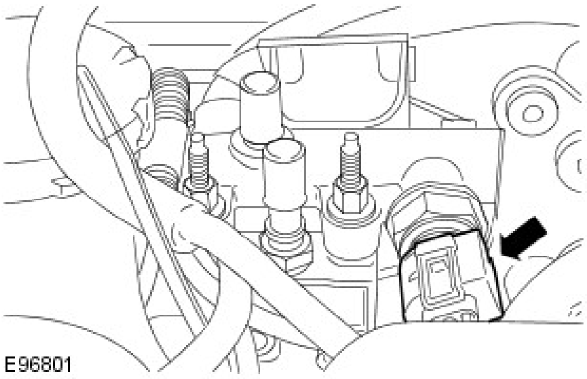


79. Install the engine wiring harness.

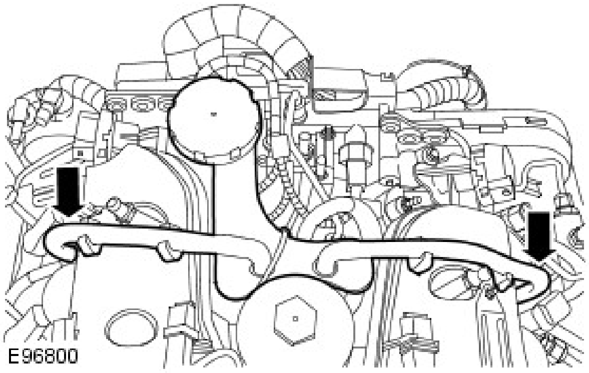
- Tighten the nut to 10 Nm (7 lb.ft).
- Secure the clips.



80. Connect the fuel injection pump electrical connectors.

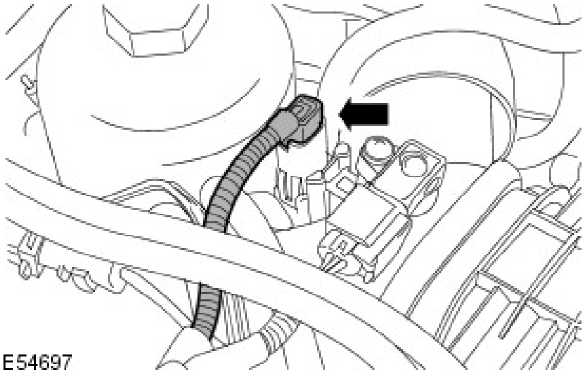


81. Connect the fuel rail pressure (FRP) sensor electrical connector.

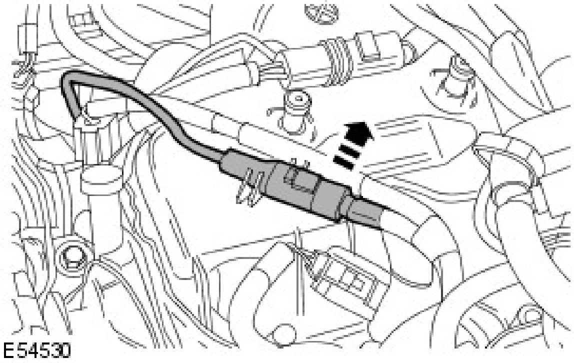


82. Install the crankcase vent oil separator.

- Connect and secure the 2 breather hoses.

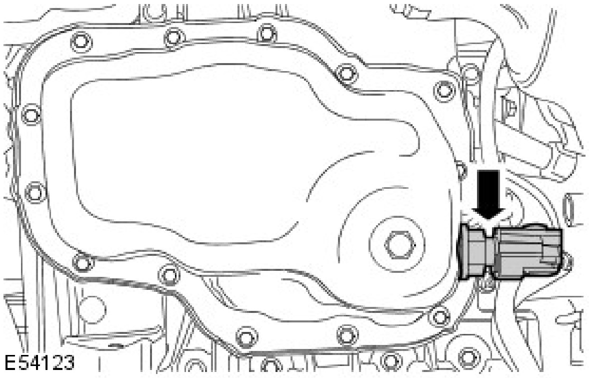


83. Connect the fuel temperature sensor electrical connector.



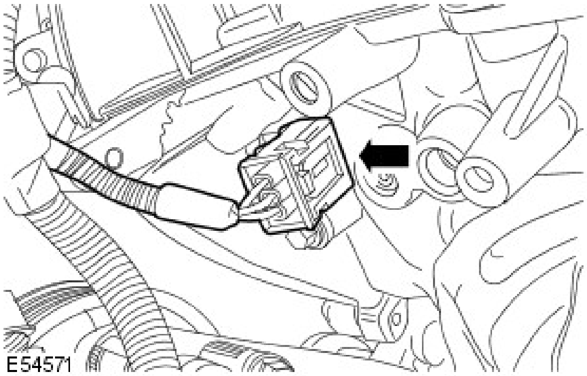
84. NOTE: LH shown, RH is similar.

Connect the 2 KS electrical connectors.



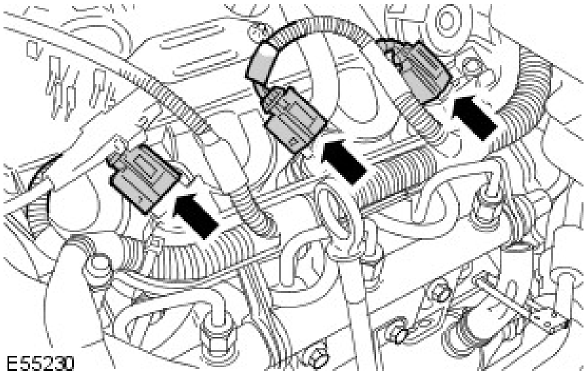
85. Connect the engine oil temperature sensor electrical connector.

- Secure the wiring harness clip.



86. Connect the camshaft position (CMP) sensor electrical connector.

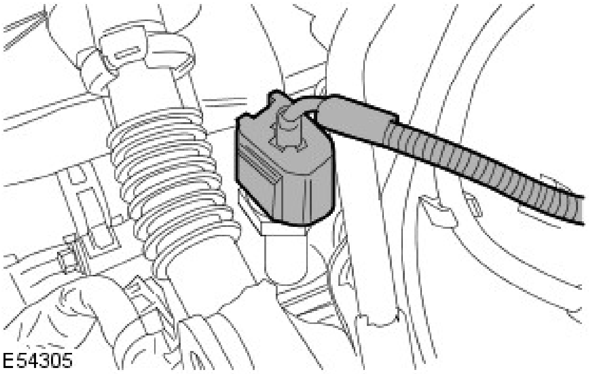
- Secure the wiring harness clip.



87. NOTE: RH shown, LH is similar

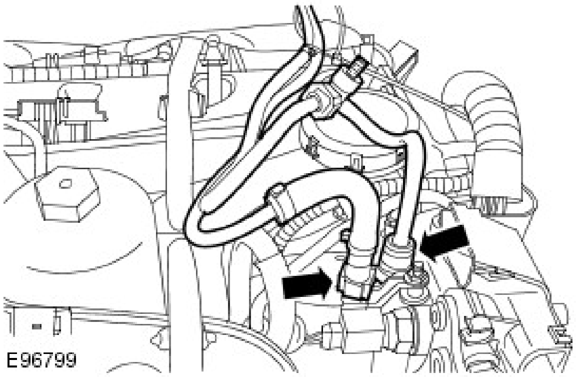
Connect the 6 fuel injector electrical connectors.

- Secure the 4 wiring harness clips.

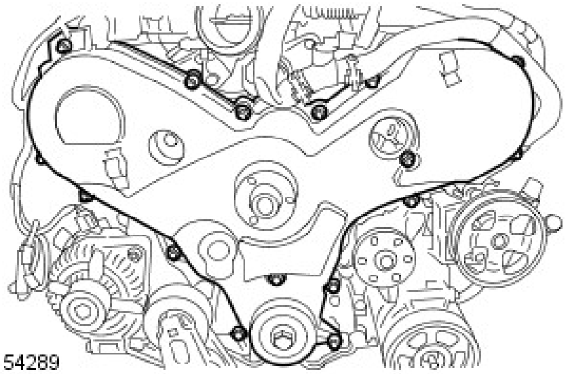


88. Connect the engine oil pressure (EOP) sensor electrical connector.

- Secure the wiring harness clip.



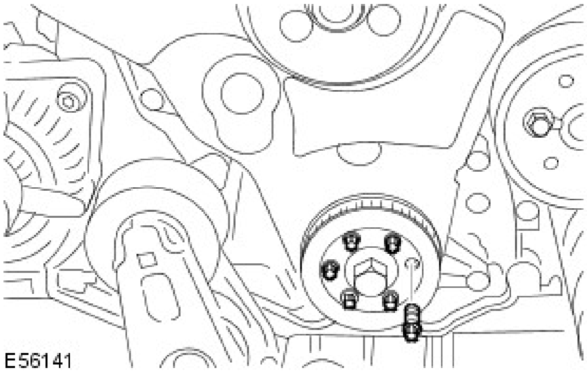
89. Install the 2 low pressure fuel pipes.



E54289

90. Install the timing belt cover.

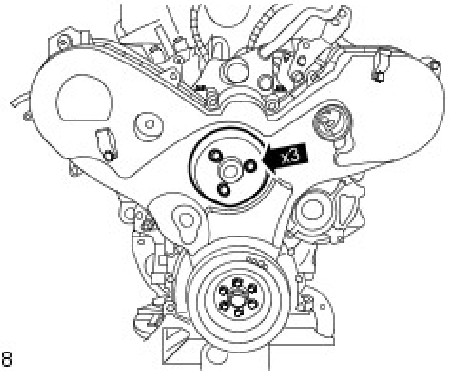
- Tighten the bolts to 10 Nm (7 lb.ft).



E56141

91. Install the crankshaft pulley.

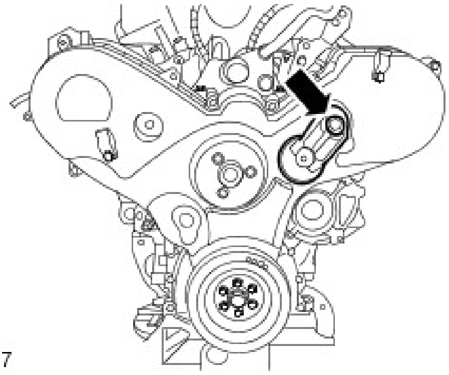
- Tighten the bolts to 14 Nm (10 lb.ft).



E96798

92. Install the cooling fan pulley.

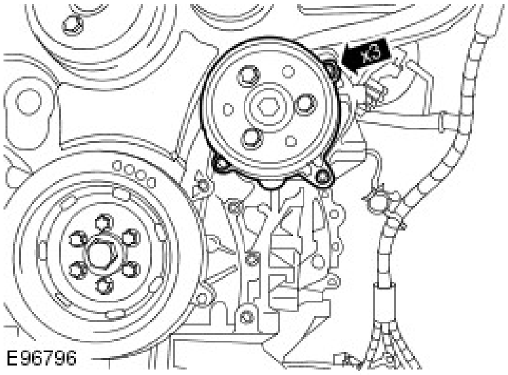
- Tighten the bolts to 23 Nm (17 lb.ft).



E96797

93. Install the accessory drive belt idler.

- Tighten the bolt to 47 Nm (35 lb.ft).

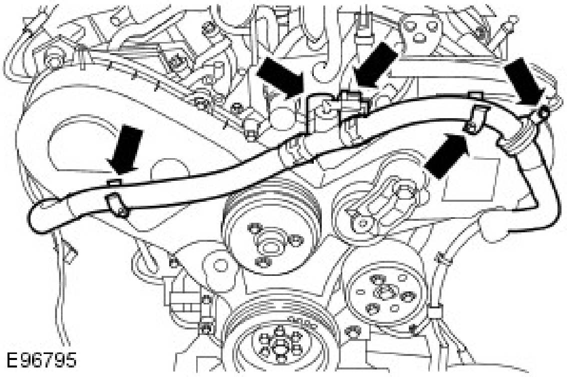


94. NOTE: Clean the component mating faces.

• NOTE: Install a new O-ring seal.

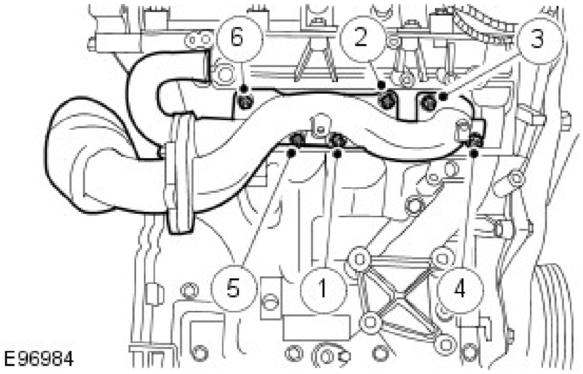
Install the coolant pump.

- Tighten the bolts to 10 Nm (7 lb.ft).



95. Install the exhaust gas recirculation (EGR) valve coolant pipe.

- Install the bolt.
- Connect the electrical connector.
- Secure in the 2 clips.
- Secure the clip.



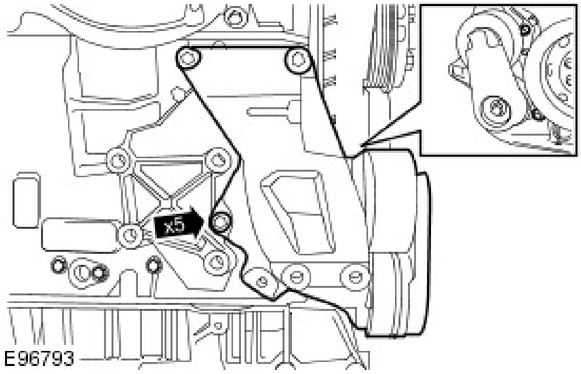
96. ⚠ CAUTION: Make sure that new nuts are installed.

• NOTE: Tighten the nuts in the sequence shown.

• NOTE: Install a new gasket.

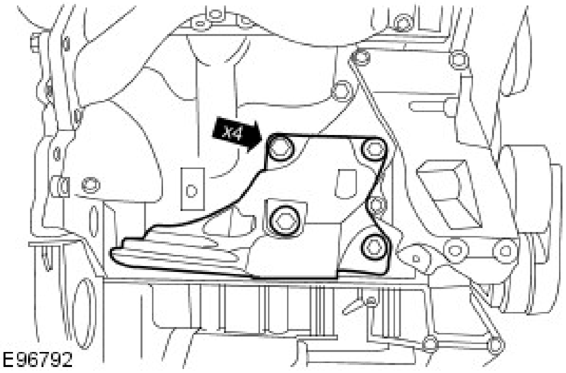
Install the RH exhaust manifold and exhaust cross-over pipe assembly.

- Tighten the nuts to 24 Nm (18 lb.ft).



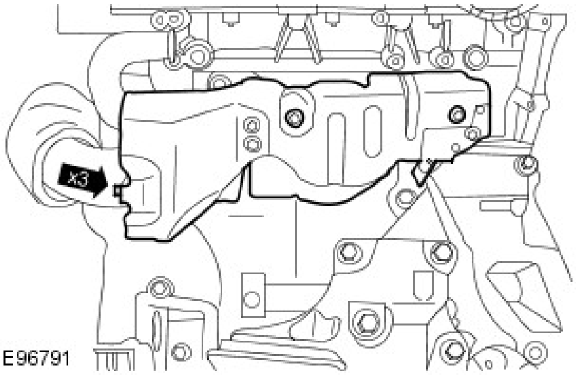
97. Install the generator bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).



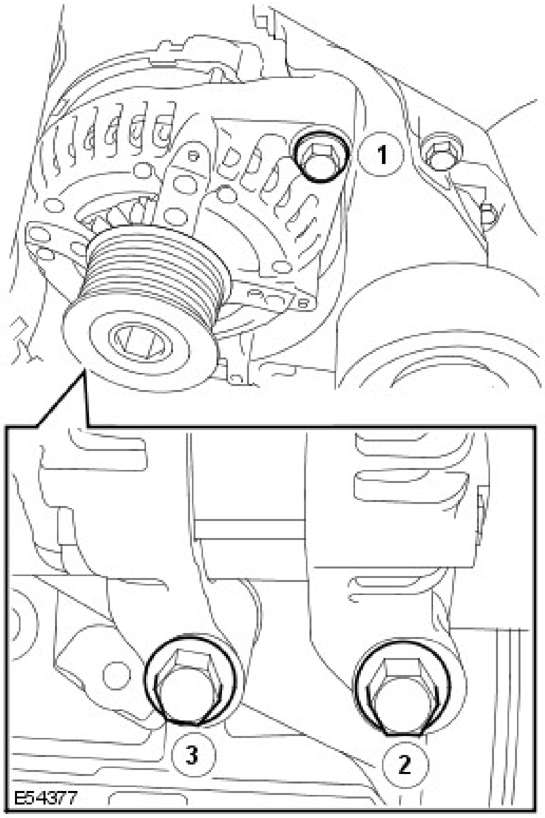
98. Install the RH engine mount bracket.

- Tighten the bolts to 110 Nm (81 lb.ft).



99. Install the RH exhaust manifold heat shield.

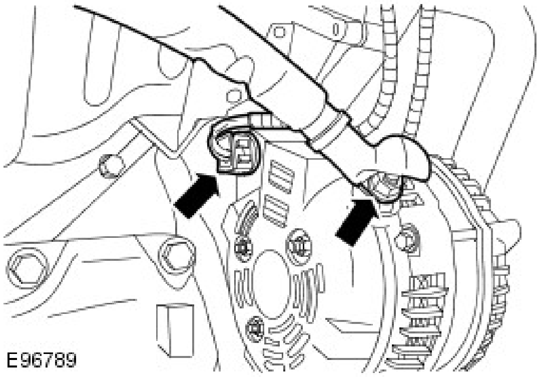
- Tighten the bolts to 10 Nm (7 lb.ft).



100. ⚠ CAUTION: Tighten the bolts in the sequence shown.

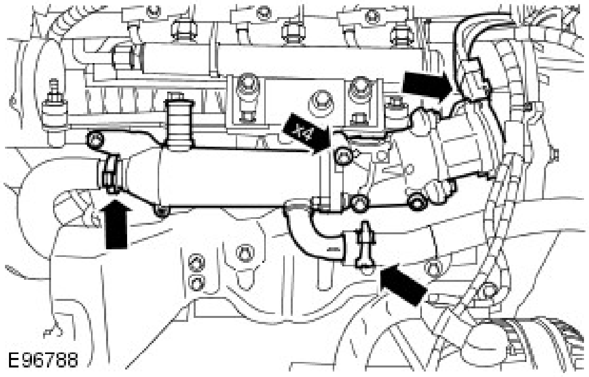
Install the generator.

- Tighten the bolts to 47 Nm (35 lb.ft).


E96789

101. Connect the generator electrical connectors.

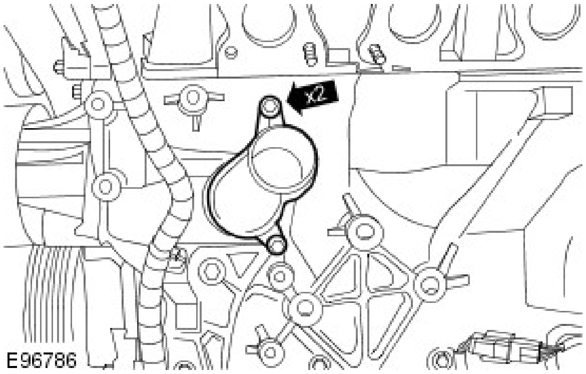
- Tighten the nut to 12 Nm (9 lb.ft).
- Reposition the rubber insulator.



E96788

102. Install the RH EGR valve and cooler assembly.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Connect the coolant hose and secure with the clip.
- Connect the electrical connector.
- Install and secure the new clip.

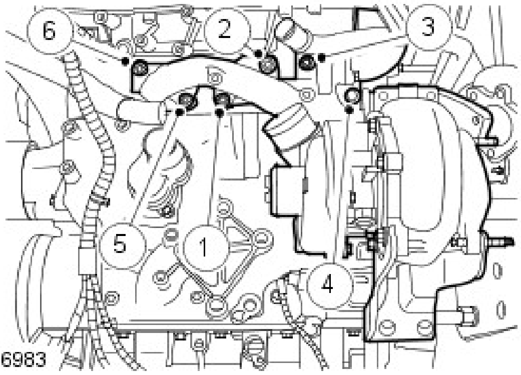


E96786

103. NOTE: Install a new O-ring seal.

Install the cylinder block coolant inlet pipe.

- Tighten the bolts to 10 Nm (7 lb.ft).



E96983

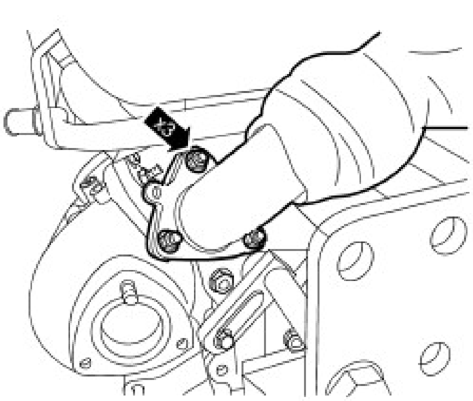
104. CAUTION: Make sure that new nuts are installed.

• NOTE: Tighten the nuts in the sequence shown.

• NOTE: Install a new gasket.

Install the LH exhaust manifold and turbocharger assembly.

- Tighten the nuts to 24 Nm (18 lb.ft).



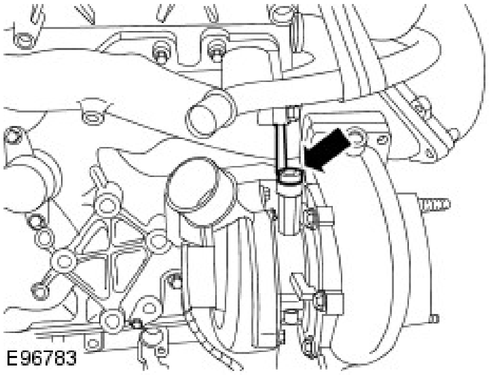
E96784

105. ⚠ CAUTION: Make sure that new nuts are installed.

- NOTE: Install a new gasket.

Secure the exhaust cross-over pipe to the LH exhaust manifold.

- Tighten the nuts to 24 Nm (18 lb.ft).



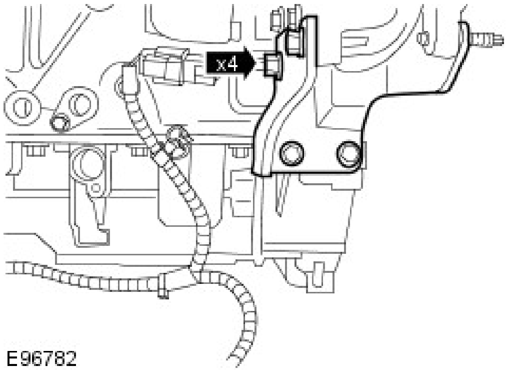
E96783

106. NOTE: Remove and discard the blanking caps.

- NOTE: Install new sealing washers.

Connect the turbocharger oil supply tube.

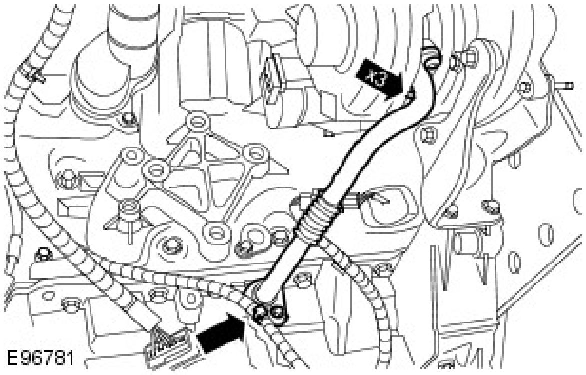
- Tighten the banjo bolt to 30 Nm (22 lb.ft).



E96782

107. Secure the turbocharger support bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).



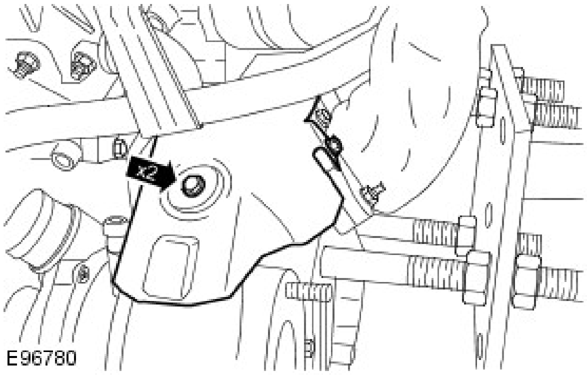
E96781

108. NOTE: Remove and discard the blanking caps.

- NOTE: Install a new O-ring seal.
- NOTE: Install a new gasket.

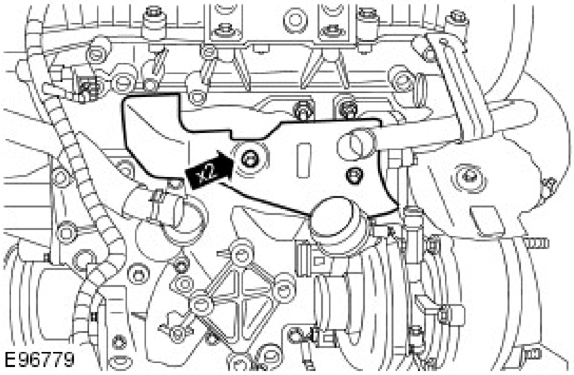
Install the turbocharger oil return tube.

- Tighten the bolts to 10 Nm (7 lb.ft).



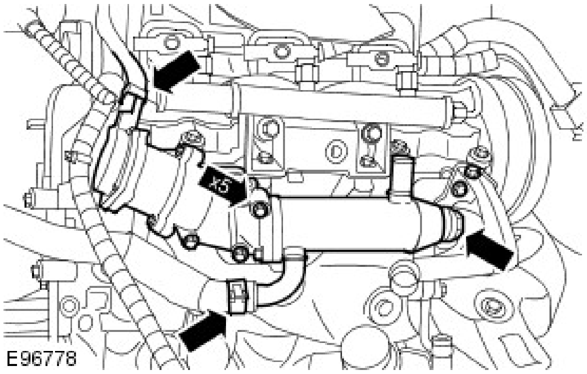
109. Install the turbocharger heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).



110. Install the LH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).



111. NOTE: Install a new clip.

Install the LH EGR valve and cooler assembly.

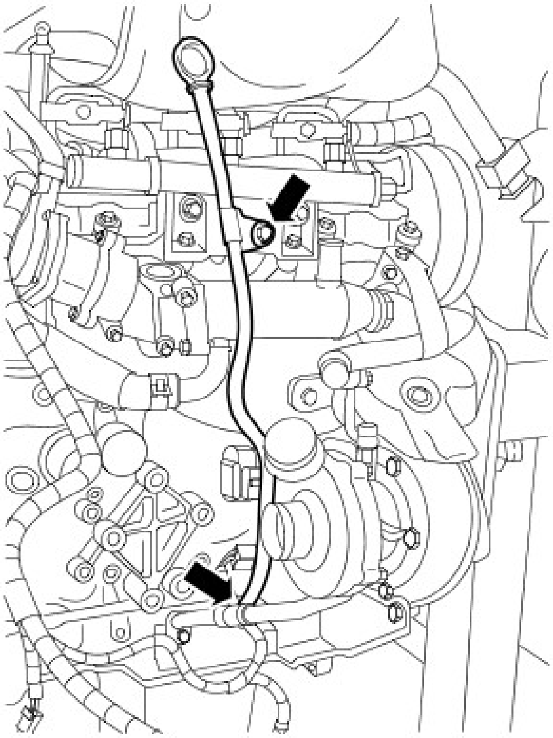
- Install the support bracket.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Connect the coolant hose and secure with the clip.
- Connect the electrical connector.
- Install and secure the clip.

112. NOTE: Remove and discard the blanking caps.

• NOTE: Install a new O-ring seal.

Install the oil level indicator and tube.

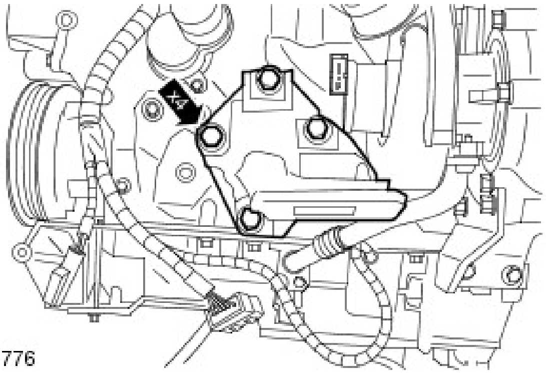
- Tighten the bolt to 10 Nm (7 Lb.ft).
- Secure the wiring harness clip.



E96777

113. Install the LH engine mount bracket.

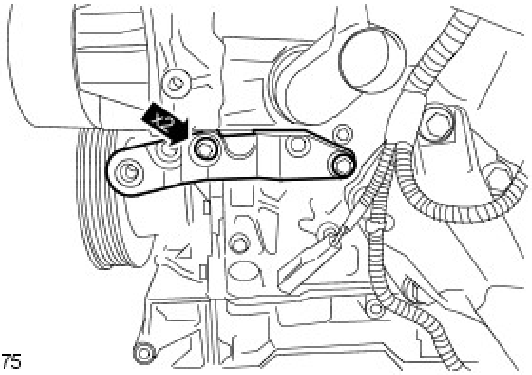
- Tighten the bolts to 110 Nm (81 lb.ft).



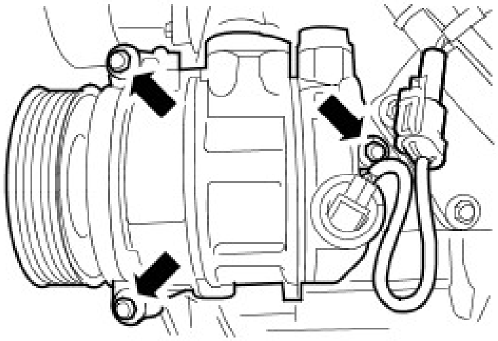
E96776

114. Install the air conditioning (A/C) compressor bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).



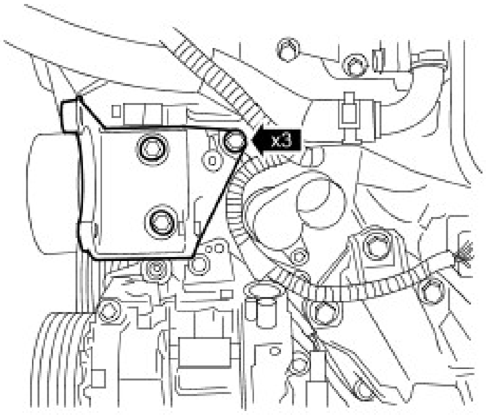
E96775



E96774

115. Install the A/C compressor.

- Tighten the bolts to 23 Nm (17 lb.ft).
- Connect the electrical connector.



E96773

116. Install the power steering pump bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).

117. Remove the engine from the engine stand.

118. Install the engine.
For additional information, refer to: Engine (303-01C Engine - TDV6 2.7L Diesel, Installation).

119. Fill the engine with the recommended oil to the correct level.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures).

Published: 13-Sep-2011

Engine - TDV8 3.6L Diesel -

Lubricants

Description	Specification
Engine oil, SAE 5W-30 (EUR)	5W/30 – WSS–M2C934–B
Engine oil, SAE 5W-30 (ROW)	5W/30 – WSS–M2C913–B or C

Sealers

Description	Specification
Camshaft caps	ESK-M4G269-A
‘T’ joints - ladder frame to engine block	WSE-M4G323-A4
Core plugs	WSK-M2G349A

Capacities

Engine Oil Capacity	Specification
Dry fill including filter	9.9 liters (17.4 pints) (10.4 US quarts)
Oil and filter change	9·5 liters (16.7 pints) (10.0 US quarts)
Amount of oil required to bring level from 'MIN' to 'MAX' mark on oil level indicator	2.7 liters (4.75 pints) (2.85 US quarts)

General Specifications

Item	Specification
Type	3.6L, 60 degree 'V', common rail direct injection, twin turbocharged and intercooled diesel, twin overhead camshafts, 4 valves per cylinder
Cylinder arrangement	V8, numbers 1 and 5 cylinders at front of engine when engine is viewed from the rear of the cylinder block
Cylinder numbering	• NOTE: Viewed from the rear of the cylinder block ● RH bank: Front cylinder number 1 through to cylinder number 4 ● LH bank: Front cylinder number 5 through to cylinder number 8
Bore - nominal	81.009 mm (3.1893 inches)
Stroke	88.0 mm (3.465 inches)
Capacity	3628 cc (221.4 cu.in)
Firing order	1 - 5 - 4 - 2 - 6 - 3 - 7 - 8
Compression ratio	17.3:1
Direction of rotation	Anti-clockwise viewed from rear of engine
Maximum power	200 kW (272 PS) (268 bhp) @ 4000 rev/min
Maximum torque	640 Nm (472 lb-ft) @ 2000 rev/min
Engine oil pressure (measured at the oil pressure sensor and with oil temperature at 65°c)	● At idle: 0.8 bar (80 kPa) (11.6 lb/in^2) – min 0.5 bar (50 kPa) (7.251 lb/in^2) ● At 3500 rev/min: 2.4 bar (240 kPa) (34.8 lb/ft^2) – min 2.0 bar (200 kPa) (29 lb/in^2)

Torque Specifications

Description	Nm	lb-ft
Cooling fan drive belt idler pulley bolt (65mm)	48	35
Cooling fan drive belt idler pulley bolt (80mm)	80	59
Cooling fan drive belt tensioner bolts	25	18
Accessory drive belt tensioner bolts	25	18
Air conditioning (A/C) compressor bolts	25	18
A/C compressor mounting bracket bolts	48	35
A/C compressor low-pressure refrigerant line bolt	23	17
A/C compressor high-pressure refrigerant line bolt	23	17
Battery positive cable nut	22	16
Camshaft position sensor bolt	10	7
*** Camshaft bearing cap bolts**		
Stage 1	1	1
Stage 2	5	4
Stage 3	10	7
Vacuum pump cap bolts	10	7
***+ LH camshaft sprocket and gear bolts**		
Stage 1: Tighten the exhaust camshaft gear bolt	80	59
Stage 2: Tighten the exhaust camshaft gear bolt	Further 80°	
Stage 3: Tighten the intake camshaft sprocket and gear bolt	80	59

Description	Nm	lb-ft
Stage 4: Tighten the intake camshaft sprocket and gear bolt	Further 80°	
***+ RH camshaft sprocket and gear bolts**	-	-
Stage 1: Tighten the exhaust camshaft gear bolt	80	59
Stage 2: Tighten the exhaust camshaft gear bolt	Further 80°	
Stage 3: Tighten the intake camshaft sprocket and gear bolt	80	59
Stage 4: Tighten the intake camshaft sprocket and gear bolt	Further 80°	
Coolant pump bolts	23	17
Coolant pump pulley bolts	25	18
***+² Crankshaft pulley bolt**		
Stage 1	140	103
Stage 2	Further 90°	
Crankshaft position sensor bolt	5	4
Crankshaft rear seal plate bolts	10	7
Cylinder block coolant elbow bolts	10	7
***+² Cylinder head bolts**		
Stage 1: Tighten the M13 bolts	20	15
Stage 2: Tighten the M13 bolts	40	30
Stage 3: Tighten the M13 bolts	80	59
Stage 4: Tighten the M13 bolts	Further 180°	
Stage 5: Tighten the M8 bolts	20	15
EGR valve inlet tube bolts	10	7
EGR valve and cooler assembly bolts	10	7
Engine breather line bolts	23	17
Engine mount bracket bolts	115	85
Engine mount bolts	56	41
Engine mount nut	100	74
Exhaust manifold heat shield bolts	10	7
*Exhaust manifold nuts	24	18
Exhaust manifold studs	13	10
+² Flexplate bolts	95	70
Front driveshaft joint shield bolts	3	2
Front driveshaft joint shield nut	10	7
Fuel injection pump bolts	23	17
Fuel injector bolts	10	7
Fuel rail bolts	23	17
*** Fuel injection supply line unions**		
Stage 1: High-pressure fuel supply line unions	15	11
Stage 2: High-pressure fuel supply line unions	30	22
Generator bolts	47	35
Generator battery positive cable nut	15	11
Generator mounting bracket M10 bolts	47	35
Generator mounting bracket M12 bolts	80	59
Glow plugs	10	7
Knock sensor bolts	20	15
*** Oil pan bolts**		
M6 bolts	10	7
M8 bolts	23	17
*** Oil pump bolts**		
Stage 1: Tighten the bolts	4	3
Stage 2: Tighten the bolts	10	7
Oil level indicator upper tube bolt	10	7
Oil level indicator lower tube bolt	7	5
Oil pan drain plugs	23	17
Oil baffle plate bolts	23	17
Oil pressure sensor	14	10
Oil filter cover	35	26
Power steering pump bolts	23	17
Starter motor bolts	45	33
Timing chain tensioner bolts	10	7
Transmission fluid line bracket bolt	10	7
Transmission bolts	45	33

Description	Nm	lb-ft
Turbocharger heat shield bolts	10	7
* Turbocharger support bracket bolts	24	18
* Valve cover bolts	10	7
Vacuum pump bolts	23	17
Vacuum pump nut	23	17
Vacuum pump stud	10	7

*** Bolts must be tightened in sequence**

+ New bolts must be installed

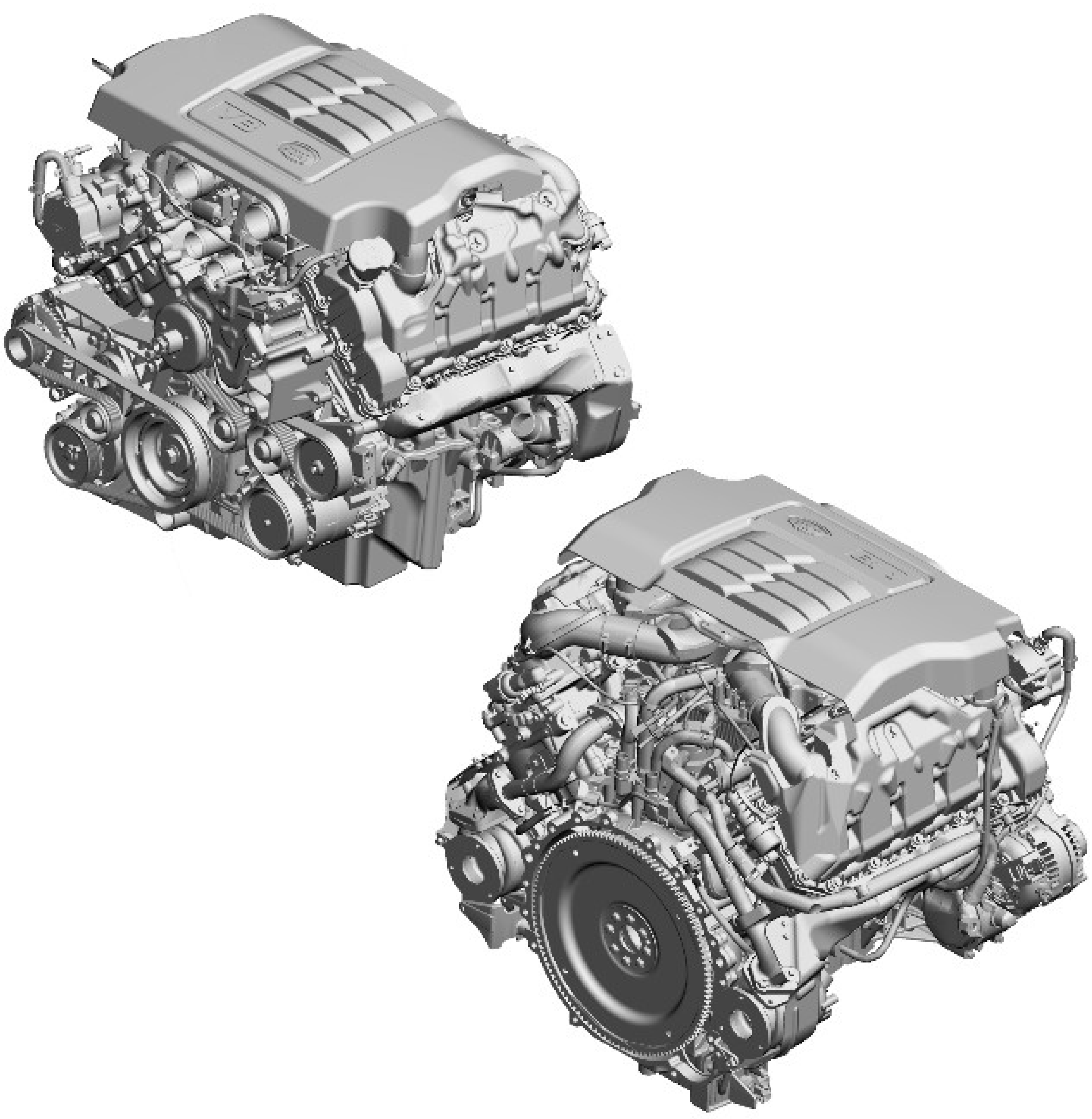
¹ Lightly oil bolt threads

² Do not apply lubricant to bolt threads

Engine - TDV8 3.6L Diesel - Engine

Description and Operation

EXTERNAL VIEW

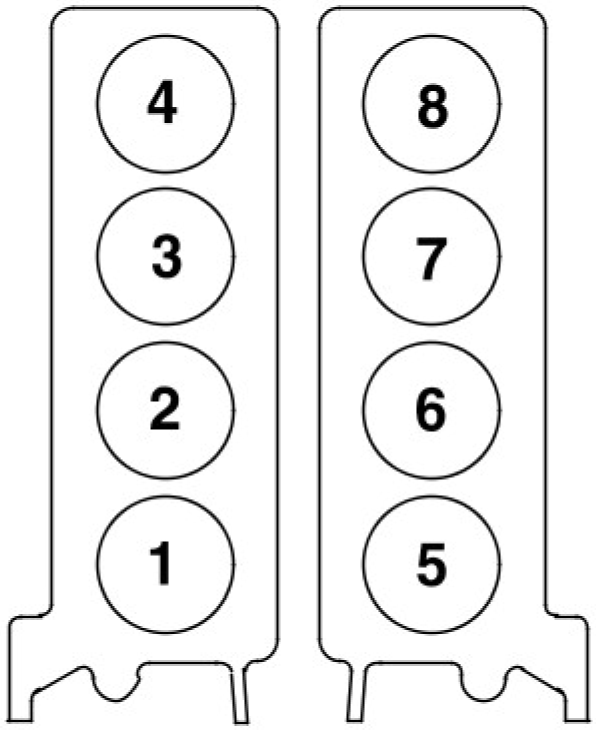


E86595

OVERVIEW

The TdV8 engine is a 3.6 liter, direct injection, 8-cylinder diesel engine having 2 banks of 4 cylinders, arranged at 90 degrees to each other. There are 4 valves per cylinder, which are operated by 2 overhead camshafts per cylinder.

The cylinder are numbered as shown below, with cylinders 1 and 5 at the front to the engine:



E133968

The engine emissions comply with ECD4 (European Commission Directive) legislative requirements and employs 2 catalytic converters systems, electronic engine management control, positive crankcase ventilation and exhaust gas recirculation to limit the emission of pollutants. The unit is water cooled and turbo-charged. The fuel injection system features common rail technology.

The cylinder block is manufactured in Compacted Graphite Iron (CGI) and is coupled with a separate cast aluminium oil pan to provide a lightweight, compact and very stiff bottom end. The cylinder heads are cast aluminium with a moulded plastic camshaft cover. The cast iron exhaust manifolds are unique for each cylinder and a moulded plastic acoustic cover is fitted over the upper engine to reduce engine-generated noise.

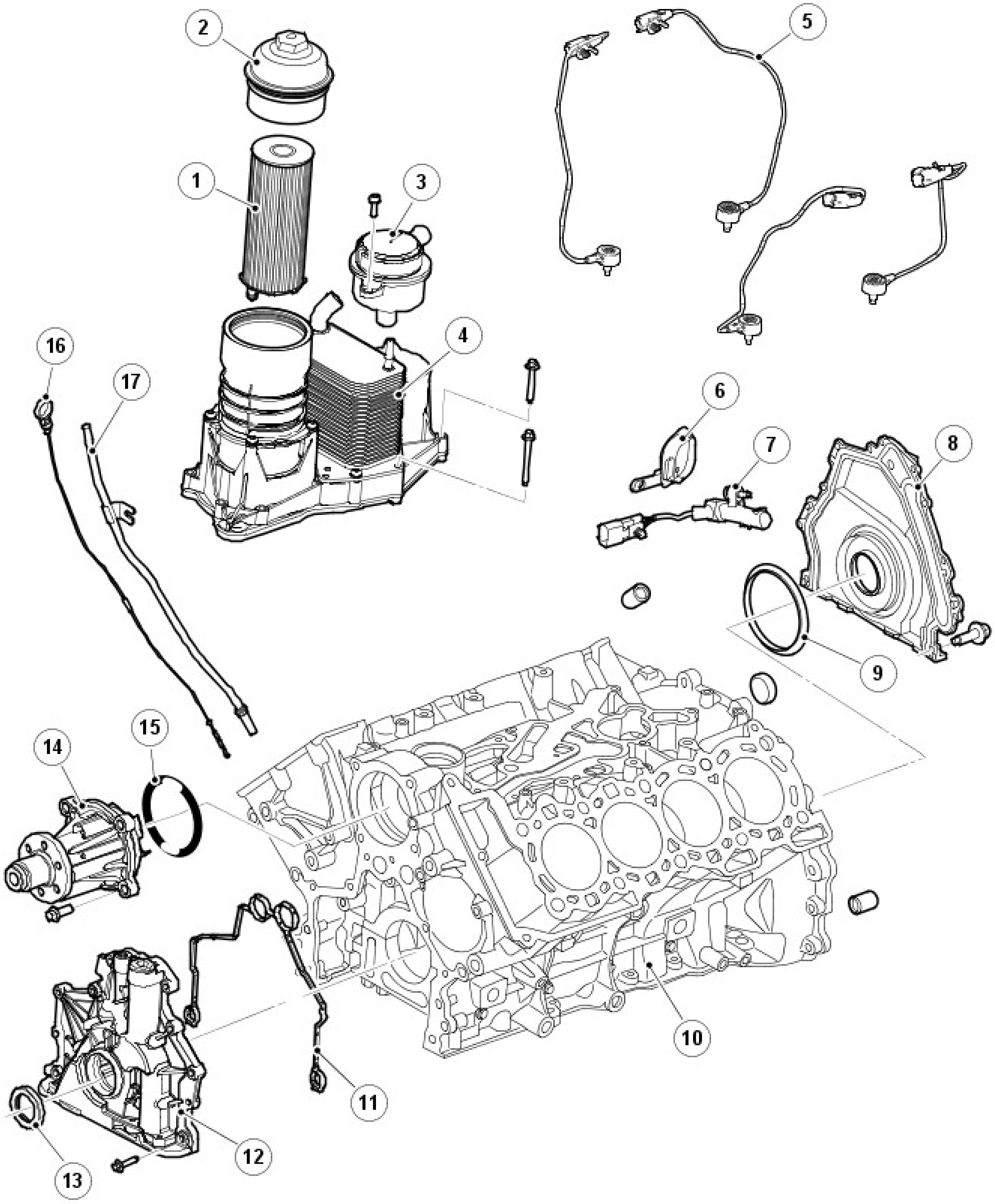
Technical Features

- 90 degree 'vee' 8 cylinder engine with a CGI cylinder block
- Plastic cylinder head cover
- Two light, high strength, aluminium cylinder heads
- Four-valve technology with centrally arranged fuel injectors
- Steel roller rockers with hydraulic lash adjusters
- Twin plenum intake system integrated with the camshaft cover
- Twin electronically controlled Variable Geometry Turbochargers (VGT)
- Common rail direct fuel injection system
- High pressure fuel pump
- Gallery cooled pistons with a central crown bowl
- Two electronically controlled Exhaust Gas Recirculation (EGR) valves
- Two EGR coolers
- Exhaust re-treatment by means of a diesel specific oxidation catalytic converter and primary catalytic converter
- Cooling fan with electro-viscous clutch drive

DESCRIPTION	TYPE
Configuration	90 degree V8
Maximum power	200 kW at 4000 rpm
Maximum torque	640 Nm at 2000 rpm
Displacement	3628cc
Stroke/bore	81.0mm/88.0mm
Compression ratio	17.3:1
Firing order	1 5 4 2 6 3 7 8

DESCRIPTION	TYPE
Oil capacity (fill and filter)	9 liters

CYLINDER BLOCK COMPONENTS


2
5
1
3
4
16
17
6
7
8
9
15
14
10
11
12
13

E79875

Item	Part Number	Description

1	-	Oil filter element
2	-	Oil filter cap
3	-	Crankcase ventilation oil separator assembly
4	-	Oil and fuel cooler assembly
5	-	Knock sensor (4 of, 2 per bank)
6	-	Cylinder block aperture cover
7	-	Crankshaft Position (CKP) sensor
8	-	Crankshaft rear oil seal retainer
9	-	Crankshaft rear oil seal
10	-	Cylinder block
11	-	Seal
12	-	Oil pump
13	-	Crankshaft front oil seal
14	-	Coolant pump
15	-	Gasket
16	-	Oil level gauge
17	-	Oil level gauge tube

Cylinder Block

The cylinders and crankcase are contained in the closed-deck cylinder block, which is of single cast CGI construction with a hollow beam structure and features fully cross-bolted main bearing journals. With this type of construction less material is required than for a conventional cast iron block, therefore, reducing engine weight and length.

Lubrication oil is distributed through the cylinder block, via the main oil gallery and channels bored in the block, to all critical moving parts. These channels divert oil to the main and big-end bearings via holes machined into the crankshaft.

A single connection at the Right Hand (RH) rear of the oil filter and oil/fuel cooler assembly connects a pipe to each of the turbochargers via a T-piece connector. Oil is supplied, under pressure via this connection, from the oil pump to provide lubrication for the turbochargers bearings.

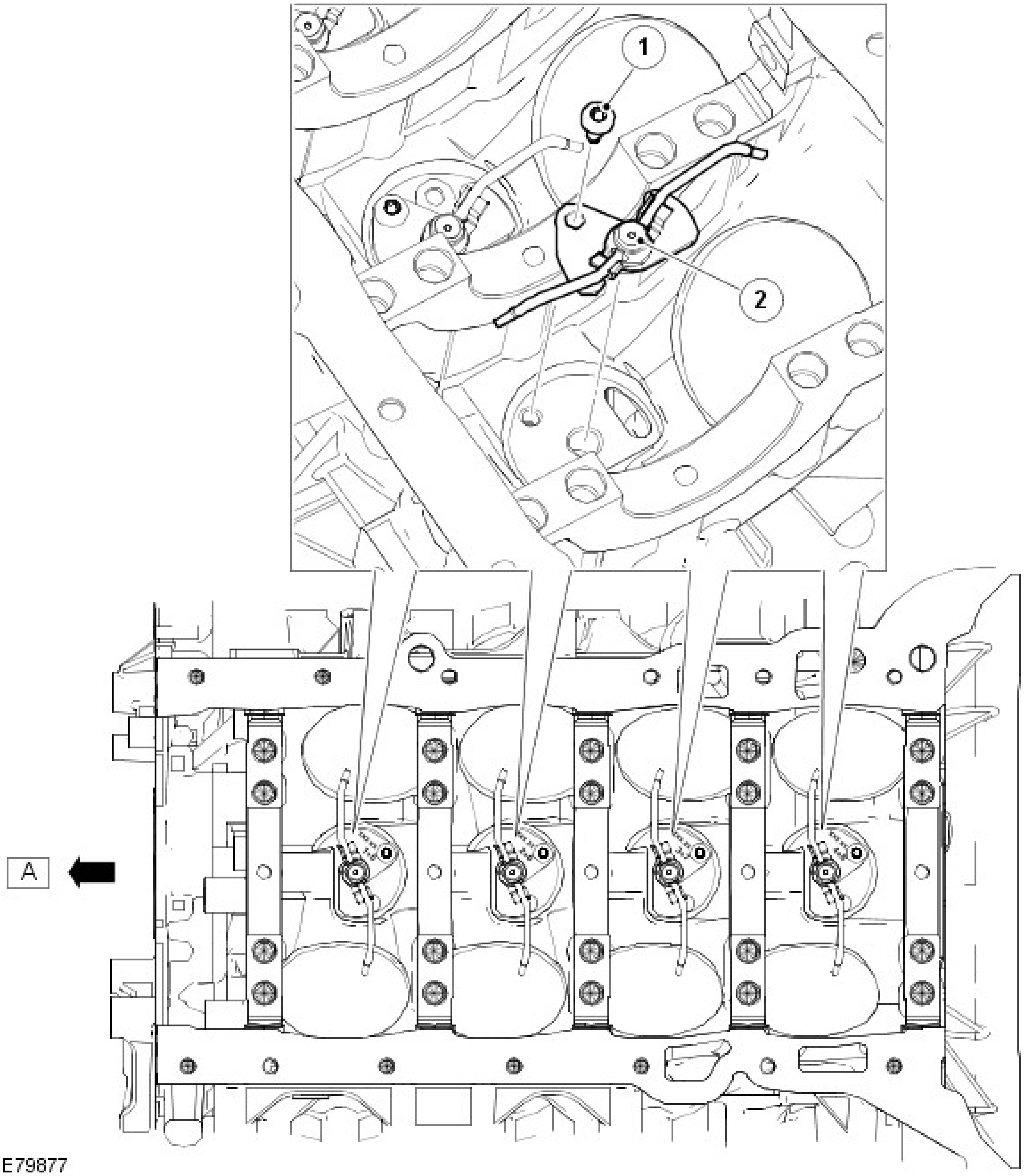
Cylinder cooling is achieved by coolant circulating through chambers in the cylinder block casting.

Two hollow metal dowels are used to locate the cylinder heads to the cylinder block, one on each side at the rear of the unit.

A port is included at the rear RH and Left Hand (LH) side of the oil pan, below the turbochargers, to connect the turbochargers oil return pipes to a dedicated oil pan within the main oil pan (see 'Turbocharger Oil Return' section for more information).

A plug sealing the lubrication cross-drilling gallery is located at the front RH side of the cylinder block. Plugs for the main lubrication gallery are included at the front and rear of the cylinder block.

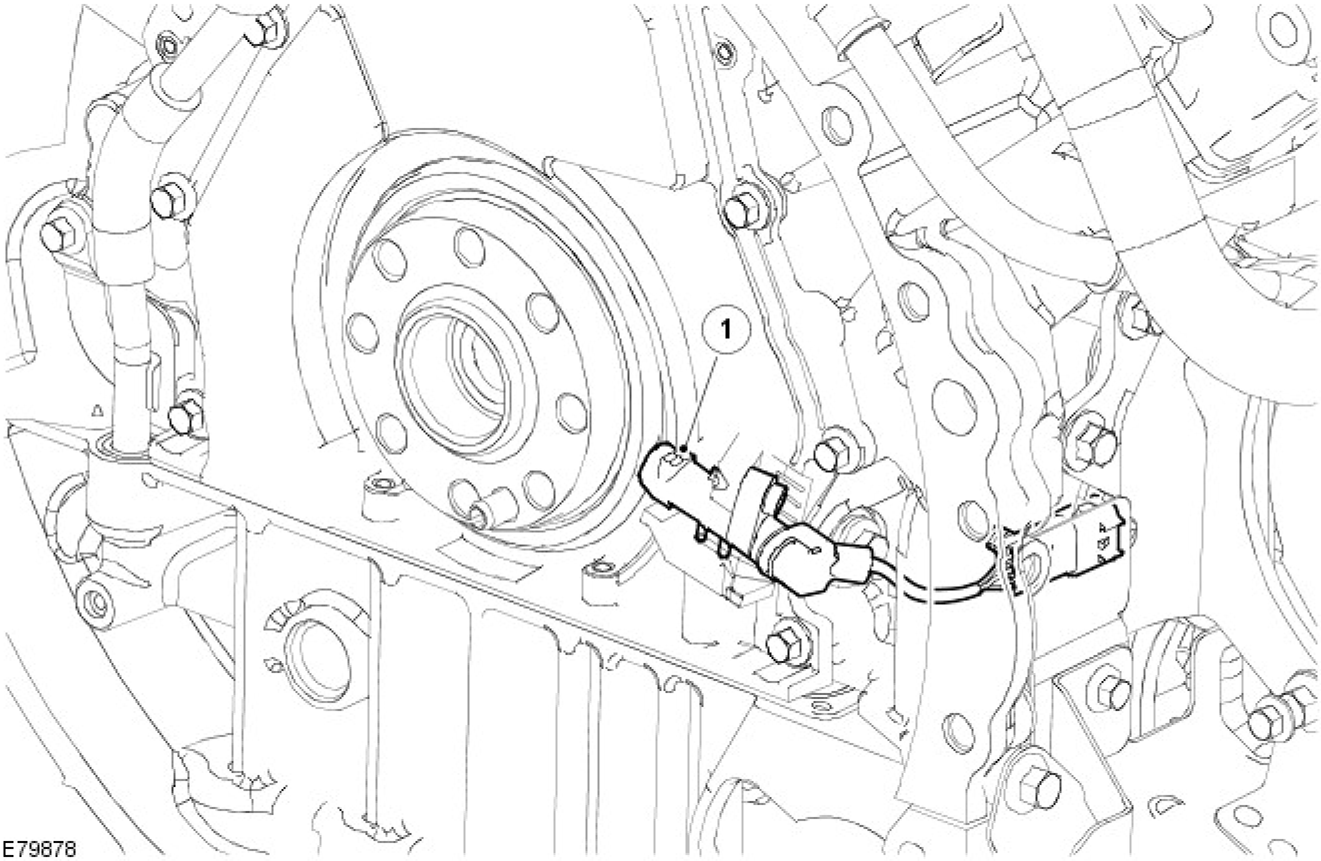
Piston Cooling Jets



Item	Part Number	Description
A	-	Front of engine
1	-	Bolt
2	-	Piston cooling jet

Jets located in the cylinder block provide piston and gudgeon pin lubrication and cooling. These jets spray oil on to the inside of the piston. The oil then flows through 2 internal wave shaped channels to help cool each piston crown.

Crankshaft Position (CKP) Sensor

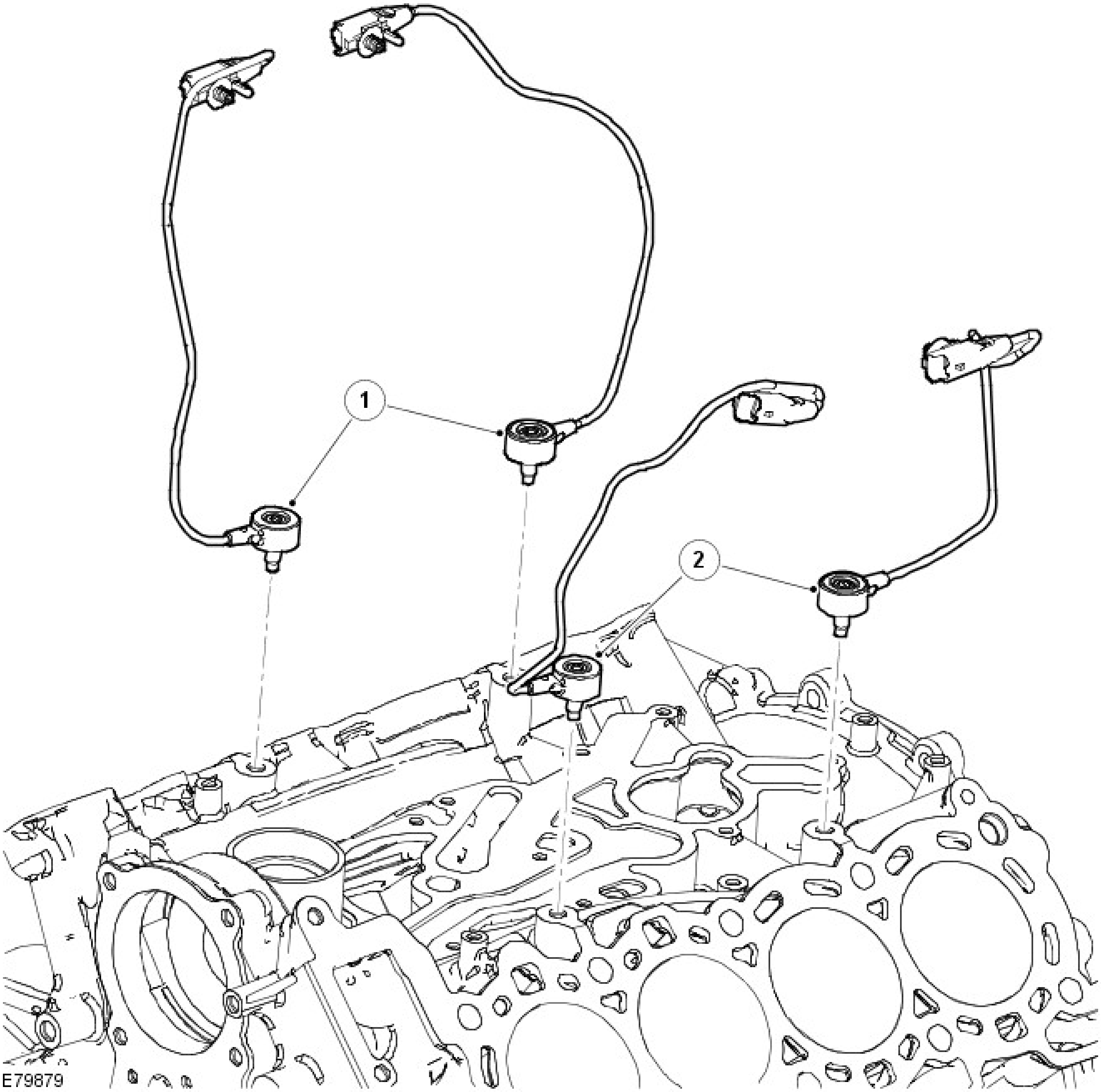


Item	Part Number	Description
1	-	Crankshaft Position (CKP) sensor

The Crankshaft Position (CKP) sensor is located at the rear of the crankshaft, behind the flywheel in the LH side of the rear oil seal retainer. The sensor provides an input of engine crankshaft speed and position. The sensor works on the Hall effect principle and scans a trigger wheel (magnetic disc) on the crankshaft. An air gap of 0.4 to 1.5mm, between the trigger wheel and the CKP sensor, is achieved by the positional mounting of the sensor.

For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

Knock Sensors



Item	Part Number	Description
1	-	RH knock sensors
2	-	LH knock sensors

Four knock sensors are located on the cylinder block between the 'vee' of each cylinder. The knock sensors produce a voltage signal in proportion to the amount of mechanical vibration generated at each ignition point. Each sensor monitors 2 cylinders in the related cylinder bank.

The signals are supplied to the Engine Control Module (ECM), which compares them with mapped signals stored in it's memory. From this, the ECM can determine when detonation occurs on individual cylinders.
For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

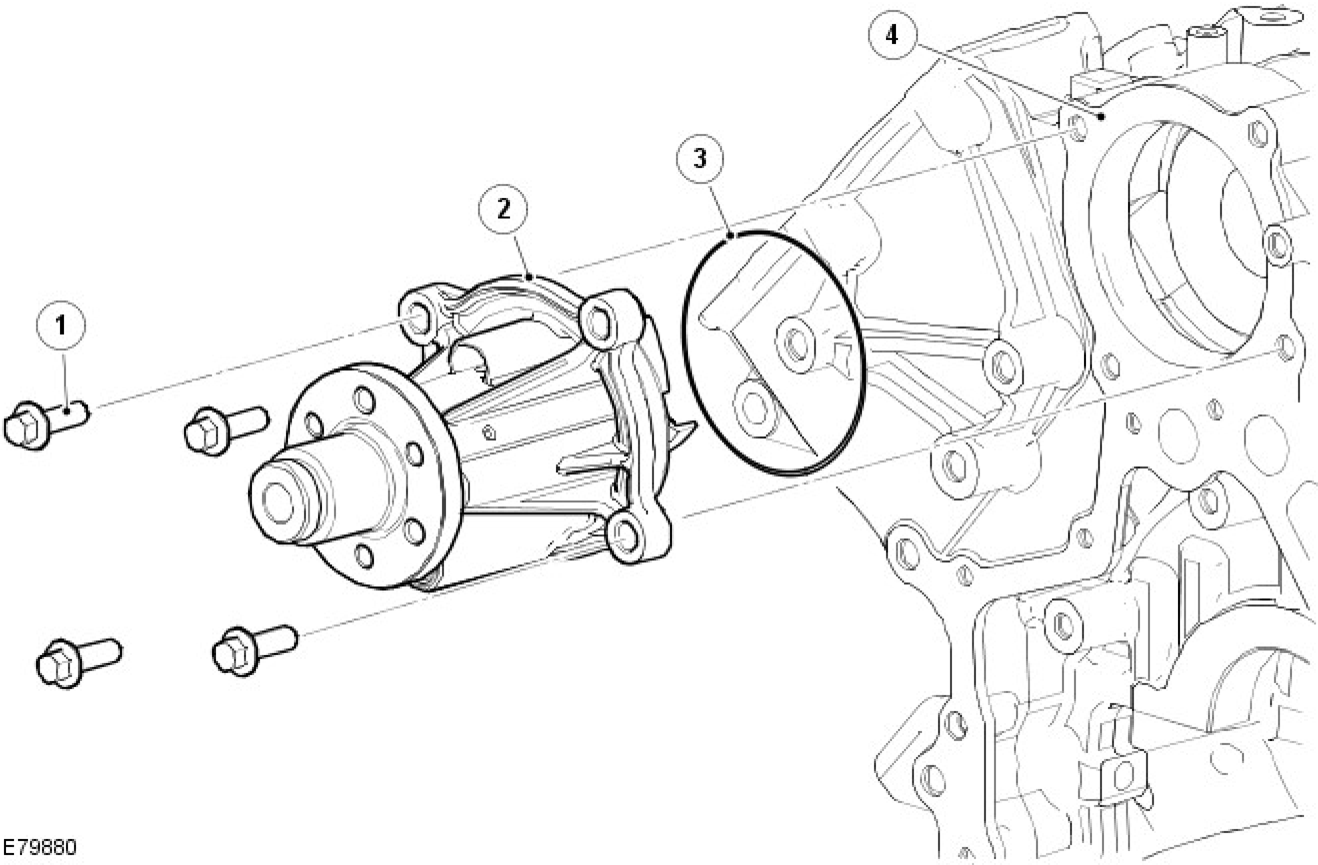
Starter Motor

The engine starter motor is installed at the rear RH side of the oil pan, at the cylinder block to oil pan split line.
For additional information, refer to: Starting System (303-06D Starting System - TDV8 3.6L Diesel, Description and Operation).

Coolant Drain Plug

Two coolant drain plugs are installed in the cylinder block, 1 is fitted in the rear RH side, and the other is fitted in the middle of the cylinder block on the LH side.

Coolant Pump



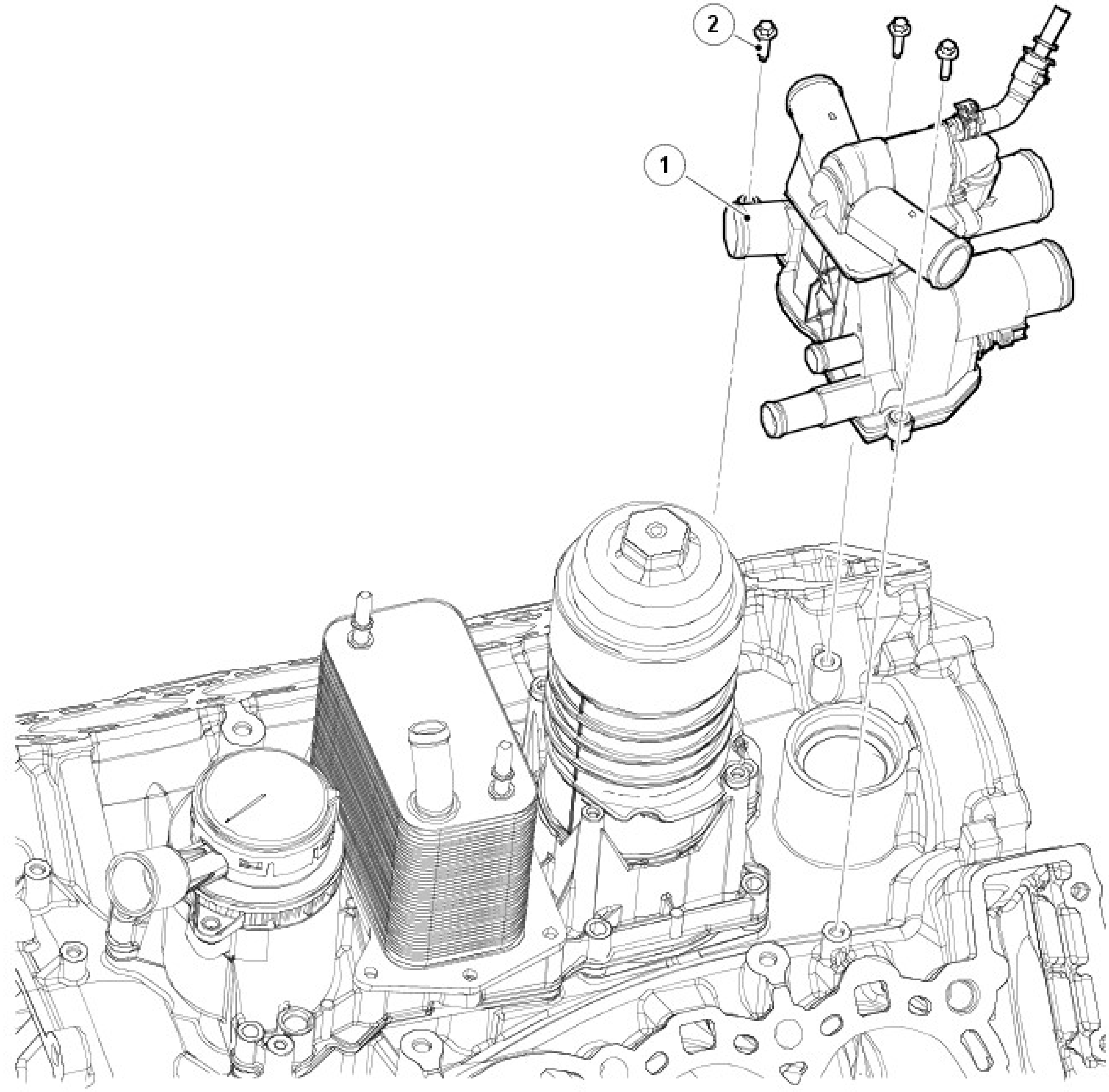
Item	Part Number	Description
1	-	Bolt (4 off)
2	-	Coolant pump
3	-	'O' ring seal
4	-	Cylinder block

The coolant pump is installed on center of the cylinder block front face and is secured and sealed using 4 bolts and an 'O' ring. A poly-vee belt drives the coolant pump via the crankshaft.

Oil Filter and Oil/Fuel Cooler Assembly

The oil filter and oil/fuel cooler assembly is located on the top of the cylinder block in the centre of the 'vee'. The oil filter is a replaceable cartridge installed on an adapter. For more information refer to the lubrication section.

Thermostat Assembly



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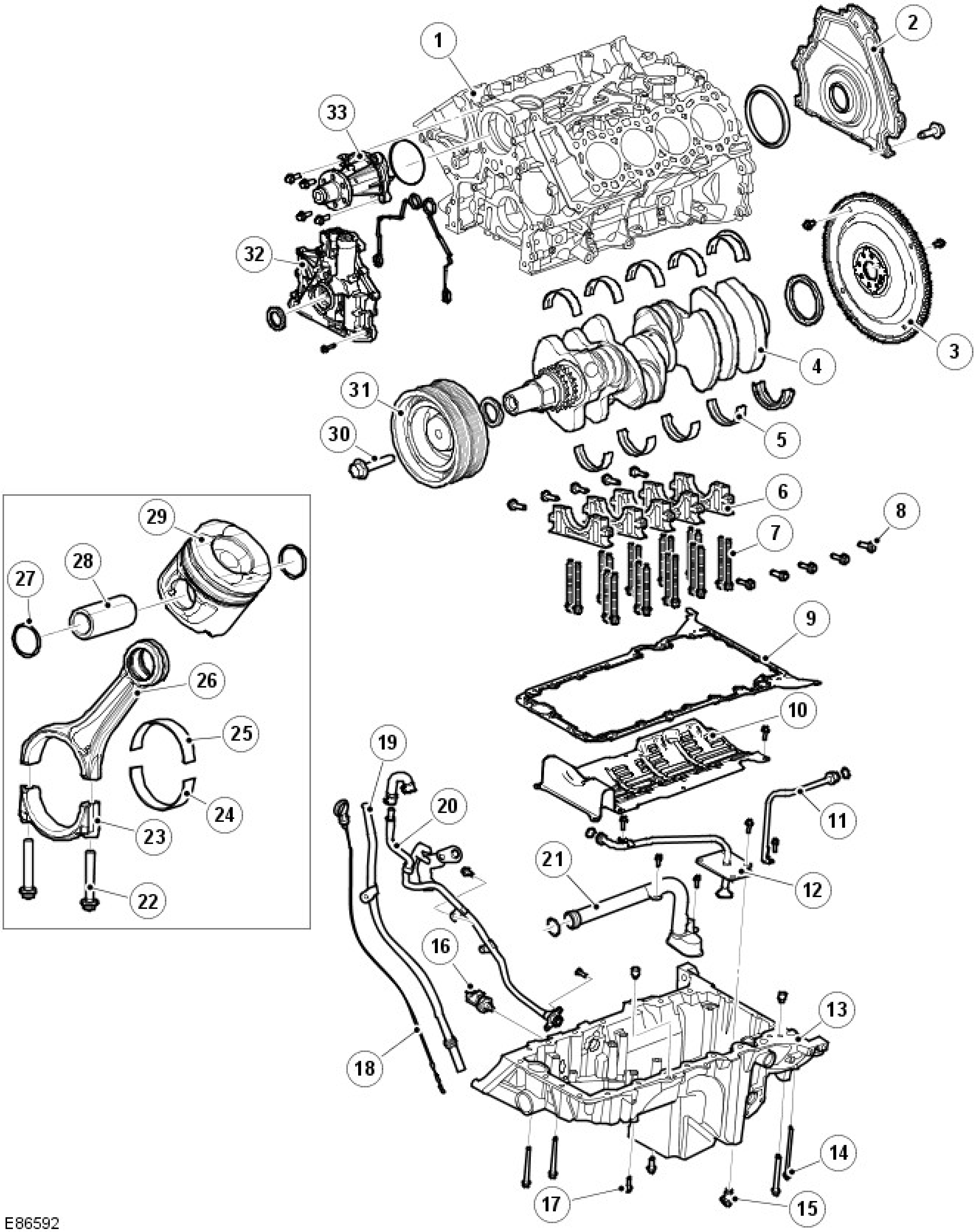
Item	Part Number	Description
1	-	Thermostat assembly
2	-	Bolt (3 off)

The thermostat assembly connects the cooling channels of the cylinder block to the cooling channels of the LH and RH cylinder heads and provides the coolant outlet for the EGR and coolant return.

For additional information, refer to: Engine Cooling (303-03E Engine Cooling - TDV8 3.6L Diesel, Description and Operation).

CRANKSHAFT AND OIL PAN COMPONENTS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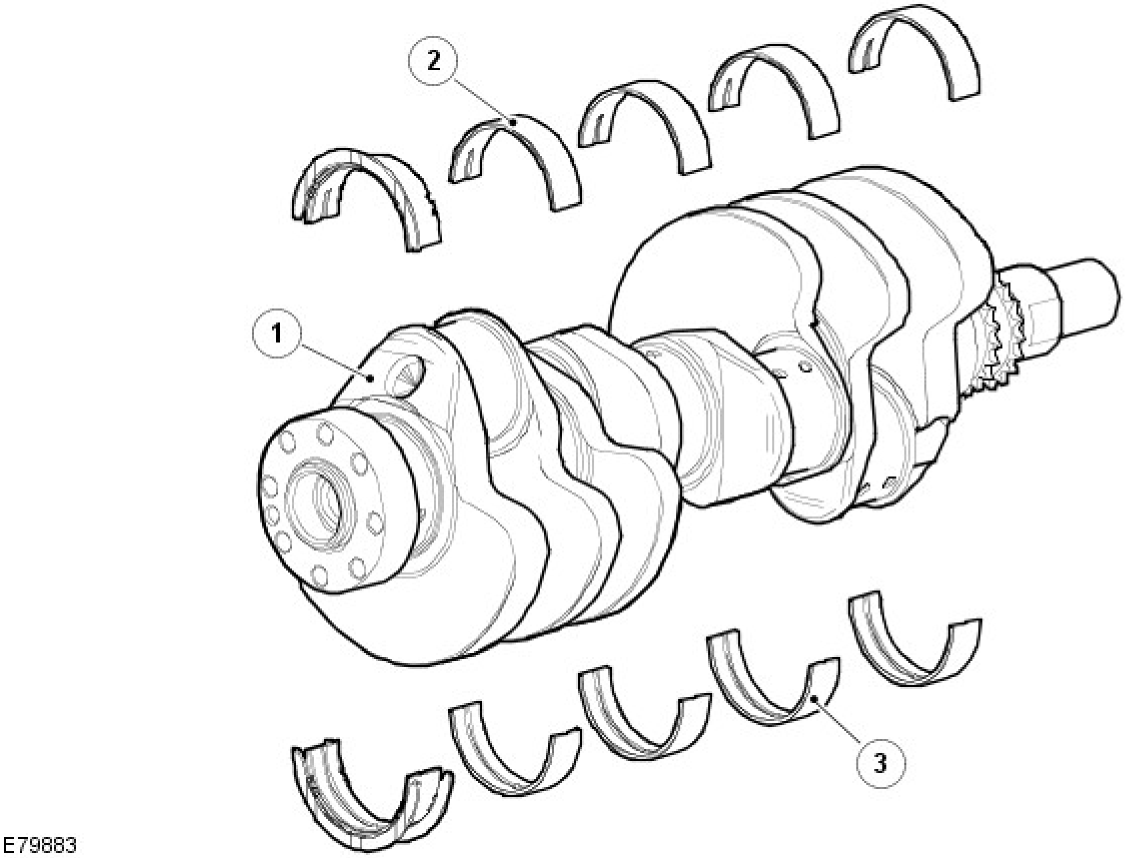
Item	Part Number	Description
1	-	Cylinder block
2	-	Crank rear oil seal retainer
3	-	Flywheel
4	-	Crankshaft
5	-	Main bearings (10 off, 5 upper and 5 lower. Number 5 bearings include thrust washers)

6	-	Main bearing caps (5 off)
7	-	Main bearing cap bolts (20 off)
8	-	Cross bolts (10 off)
9	-	Gasket
10	-	Oil baffle plate
11	-	Crankcase ventilation oil return
12	-	Oil scavenge pipe
13	-	Oil pan
14	-	Bolt (7 off)
15	-	Drain plug
16	-	Oil temperature sensor
17	-	Bolt (14 off)
18	-	Oil level gauge
19	-	Oil level gauge tube
20	-	Crankcase ventilation tube
21	-	Oil pick-up and strainer
22	-	Bolt (16 off, 2 per piston)
23	-	Connecting rod cap
24	-	Connecting rod cap bearing
25	-	Connecting rod bearing
26	-	Connecting rod
27	-	Piston pin retainer (16 off, 2 per piston)
28	-	Piston pin
29	-	Piston
30	-	Bolt
31	-	Crankshaft damper pulley
32	-	Oil pump
33	-	Coolant pump

Crankshaft and Main Bearings



Item	Part Number	Description
1	-	Crankshaft
2	-	Main bearing shell - lower (5 off)

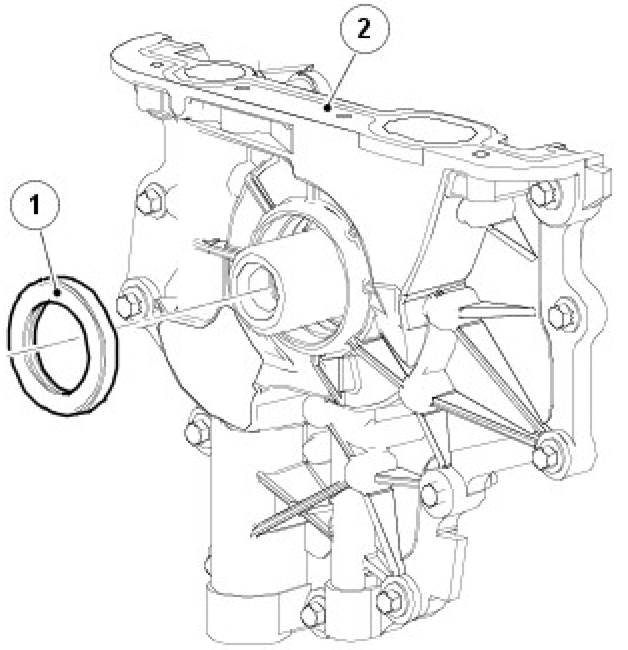
3	-	Main bearing shell - upper (5 off)

The crankshaft is forged steel and undercut rolled with induction hardened journals, which run in 5 main bearings.

The main bearing caps are double and cross-bolted, this adds to the strength and rigidity of the engine block.

The crankshaft drive pulley is not keyed onto the crankshaft; it is secured to the crankshaft by a single bolt.

The main bearings are aluminium/tin split plain selective bearings. An oil groove in the top half of each bearing transfers oil into the crankshaft for lubrication of the connecting rod bearings. The upper and lower shells of bearing number 5 contain integral thrust washers, which limits the crankshaft end float.



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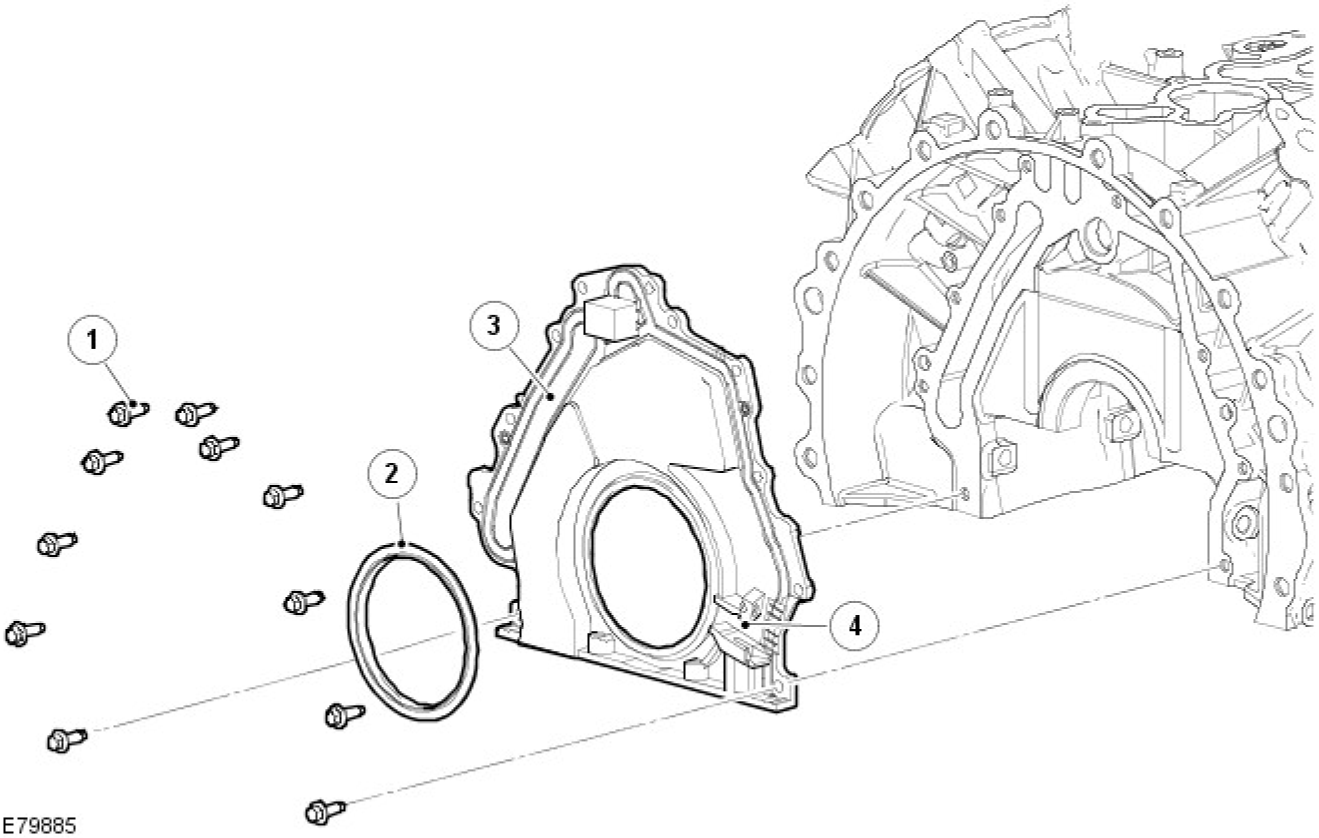
Item	Part Number	Description
1	-	Crankshaft front oil seal
2	-	Oil pump

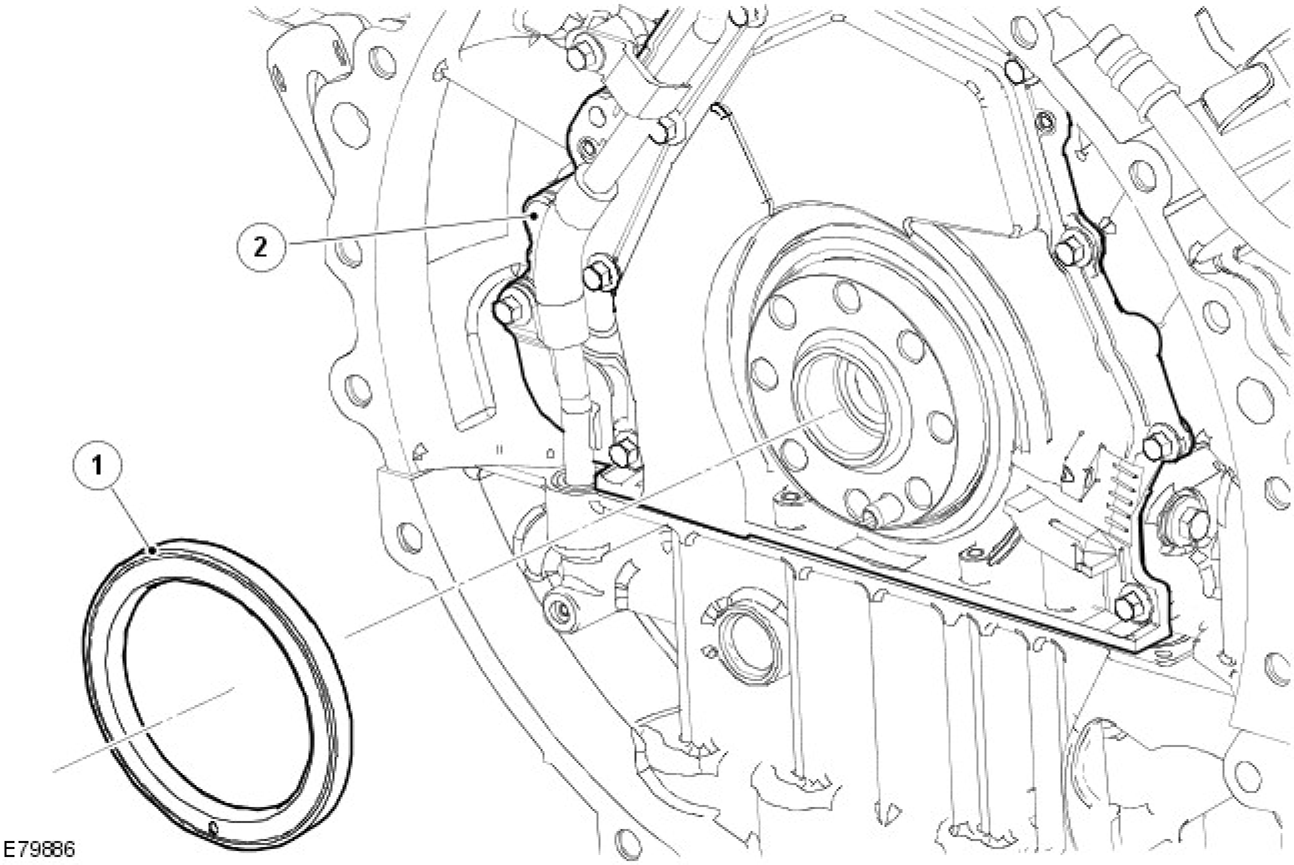
The crankshaft front oil seal is a press fit into the oil pump housing and requires a special tool for fitment.

• NOTE: The seal must be inserted such that it's front face is 1mm underflush with the machined front face of the oil pump. It must not be pushed all the way into the bore as this will block the seal drains.



Item	Part Number	Description
1	-	Bolt (11 off)
2	-	Crankshaft rear oil seal
3	-	Rear oil seal retainer
4	-	CKP retainer

The crankshaft rear oil seal is a press fit in the rear oil seal retainer. The rear oil seal retainer also houses the CKP sensor.



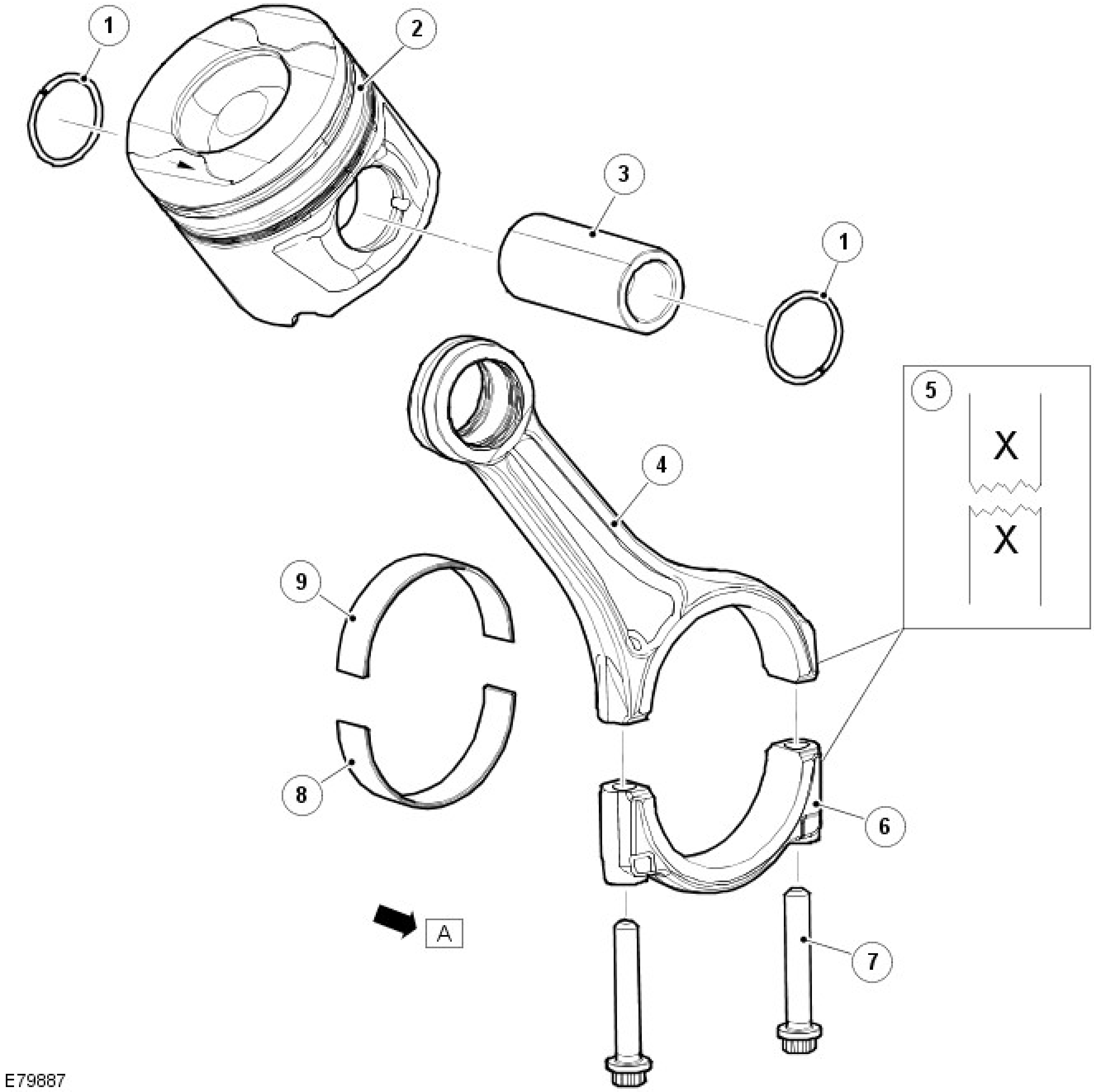
Item	Part Number	Description
1	-	CKP sensor trigger wheel
2	-	Rear oil seal retainer

The trigger wheel is located on the rear of the crankshaft. It is pressed onto the crankshaft using a special tool, which also precisely aligns the trigger wheel for crankshaft position and timing. The trigger wheel consists of 60 magnets, minus 2 for ECM crankshaft position reference and synchronisation. The magnets cannot be seen on the trigger-wheel; therefore, it can only be positioned using the special tool.
For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

- NOTE: If the trigger wheel is removed for any reason, a new trigger wheel must be fitted. Do not reuse the old trigger wheel.

The CKP sensor air gap is not adjustable. The sensor bolts into the rear oil seal retainer and the tolerance on the retainer and sensor give an air gap within the specified range.

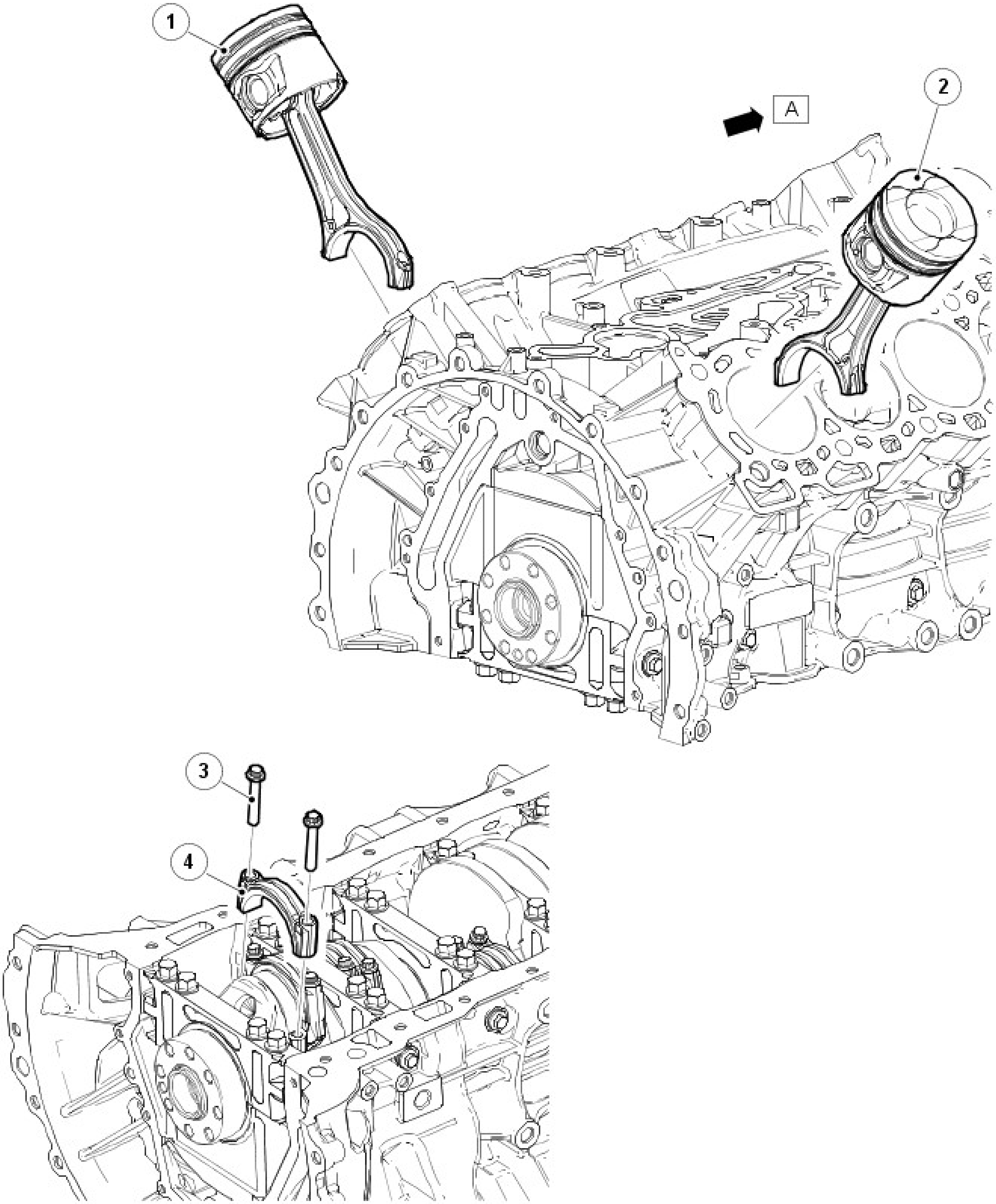
Connecting Rods and Pistons



Item	Part Number	Description
A	-	Front of engine
1	-	Piston pin retainers
2	-	Piston
3	-	Piston pin
4	-	Connecting rod
5	-	Identification marks
6	-	Connecting rod bearing cap
7	-	Bolt (2 off)
8	-	Connecting rod bearing (lower)
9	-	Connecting rod bearing (upper)

The connecting rods are manufactured from sinter-forged steel and have fracture-split bearing caps. Fracturing the opposing sides of the connecting rod at the bearing horizontal centerline produces the bearing caps. As well as being easier to manufacture, when reassembled the fractured surfaces interlock to form a strong seamless joint. The cylinder position is etched on adjoining sides of the joint to identify matching connecting rods and bearing caps. The selective connecting rod bearings are aluminium/tin split plain bearings. The connecting rod bearing is 'Bismuth coated' (Bismuth exhibits the greatest opposition to being magnetised and has one of the lowest thermal conductivity of all metals).

- NOTE: The connecting rods are not selective.



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Item	Part Number	Description
A	-	Front of engine
1	-	Piston and connecting rod assembly, cylinders 5-8
2	-	Piston and connecting rod assembly, cylinders 1-4

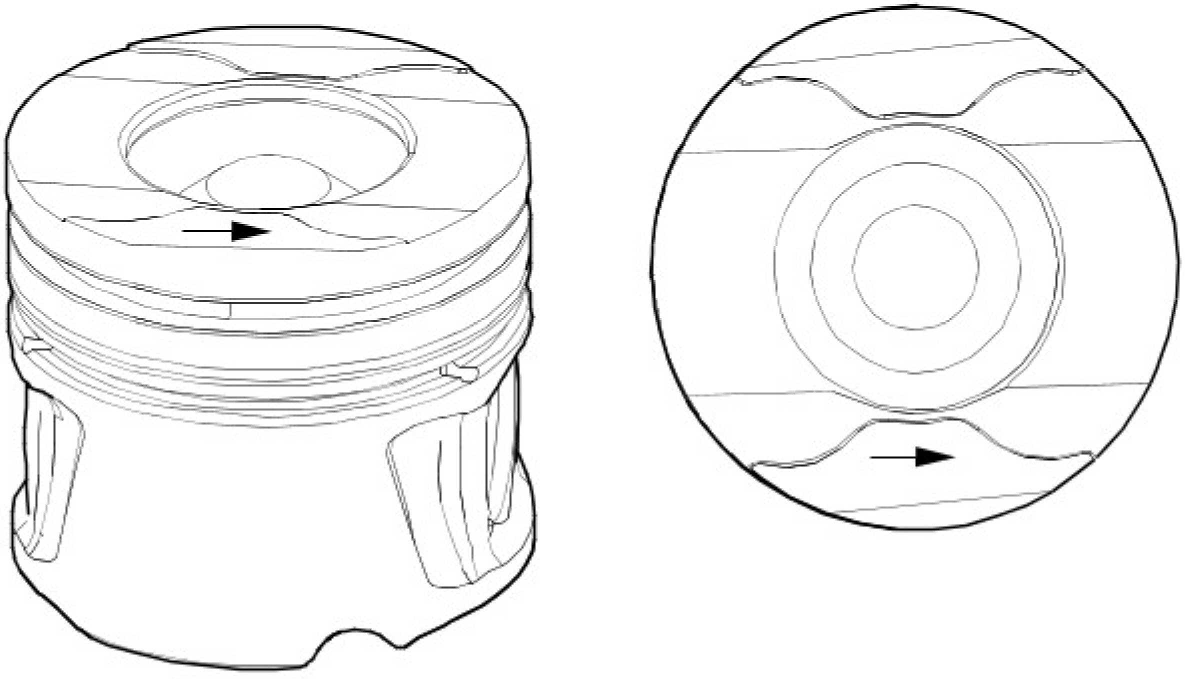
3	-	Bolt (16 off)
4	-	Connecting rod bearing cap

When installing a connecting rod, ensure the back of the connecting rod faces the center of the 'vee'.

The pistons are made from aluminium alloy and are fitted with 2 compression rings and an oil control ring. The piston crown incorporates a pronounced bowl; this forms the combustion chamber, which promotes swirl and turbulence necessary for good combustion and improved emissions. In addition, the piston skirt has a molybdenum-coated surface, which counteracts scoring of the cylinder bore and piston.

The piston also incorporates a double wave gallery within the piston crown to enhance piston cooling. The pistons are supplied oil by means of spray jets located in the cylinder block oil gallery. These jets ensure optimum piston cooling to counteract the high temperatures generated by the combustion process.

Each piston is installed on a wrist pin located in an aluminium/tin bushing in the connecting rod.



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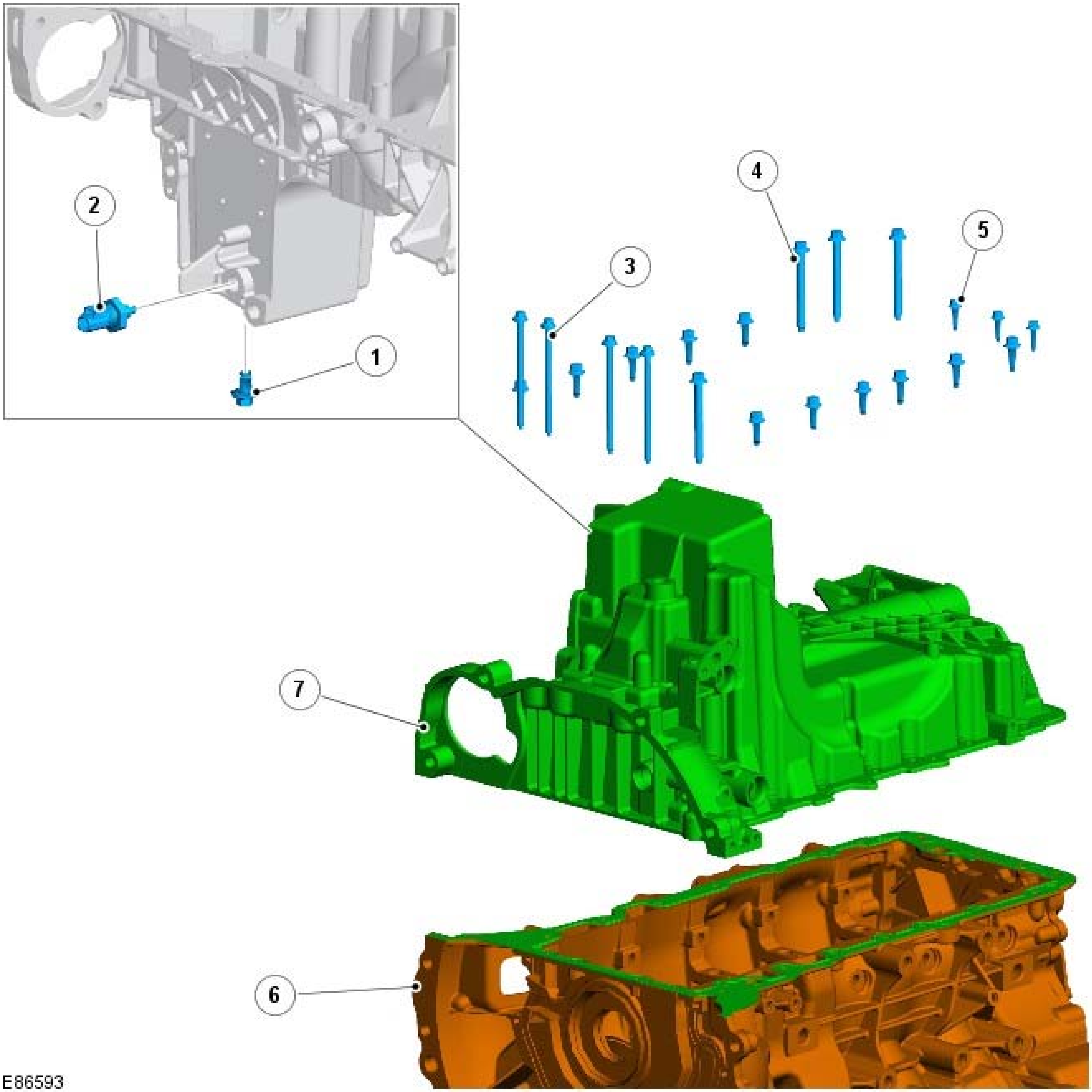
When installing pistons ensure the arrows on the piston crowns all point to the front of the engine.

- NOTE: All pistons are common single grade/single part number.

The piston top ring is a taper type and is fitted with the taper to the top of the piston. All rings marked 'top' are assembled with 'top' uppermost. All rings must be spaced evenly around the piston before installing. The circumference gap of the double bevelled oil control ring must be opposite the spiral control joint.

Oil Pan



Item	Part Number	Description
1	-	Engine oil drain plug
2	-	Oil temperature sensor
3	-	Bolt (4 off)
4	-	Bolt (3 off)
5	-	Bolt (15 off)
6	-	Cylinder block
7	-	Oil pan

The cast aluminium oil pan is heavily ribbed for strength and stiffness and supports the front differential. The engine oil drain plug and oil temperature sensor are located on the underside of the oil pan, towards the rear. An oil baffle plate is incorporated in the oil pan to reduce oil foaming and slosh.

A gasket seals the joint between the oil pan and the cylinder block.

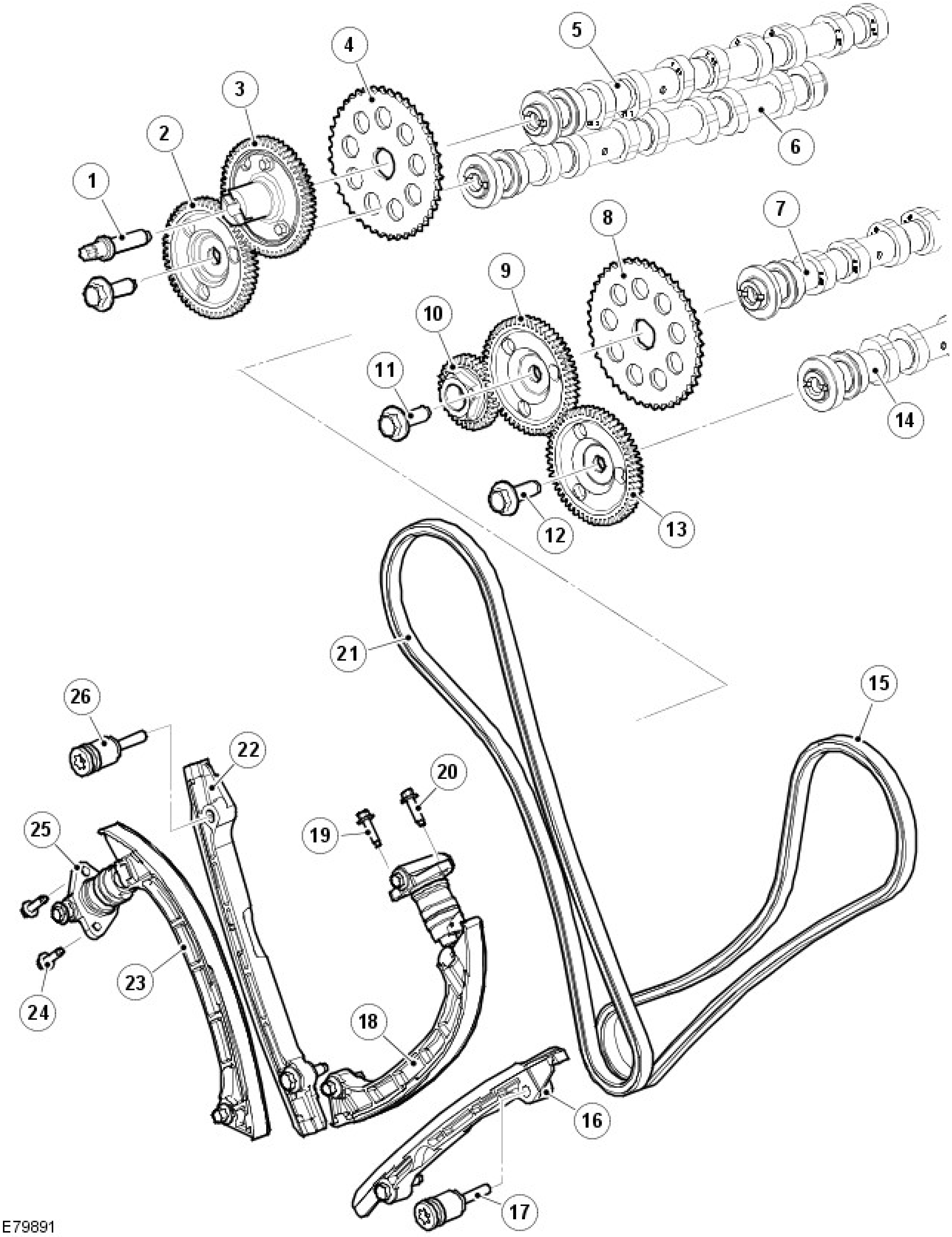
Oil Temperature Sensor

The engine oil temperature sensor, located in the oil pan, provides the ECM and the instrument cluster with the engine oil temperature status.

The sensor circuit consists of an internal voltage divider circuit, which incorporates a Negative Temperature Coefficient (NTC) thermistor. The output from the sensor is the change in voltage, as the thermistor allows more current to pass to ground relative to the temperature of the oil.

For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

CAMSHAFT TIMING COMPONENTS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Item	Part Number	Description
1	-	Bolt
2	-	RH exhaust camshaft gear
3	-	Vacuum pump drive gear
4	-	RH inlet camshaft timing chain gear
5	-	RH inlet camshaft

6	-	RH exhaust camshaft
7	-	LH inlet camshaft
8	-	LH inlet camshaft timing chain gear
9	-	LH exhaust camshaft gear
10	-	High-pressure fuel pump gear
11	-	Bolt
12	-	Bolt
13	-	LH inlet camshaft gear
14	-	LH exhaust camshaft
15	-	LH bank timing chain
16	-	Chain guide
17	-	Guide pin
18	-	Chain guide
19	-	Bolt (2 of)
20	-	LH timing chain tensioner
21	-	RH bank timing chain
22	-	Chain guide
23	-	Chain guide
24	-	Bolt (2 of)
25	-	RH timing chain tensioner
26	-	Guide pin

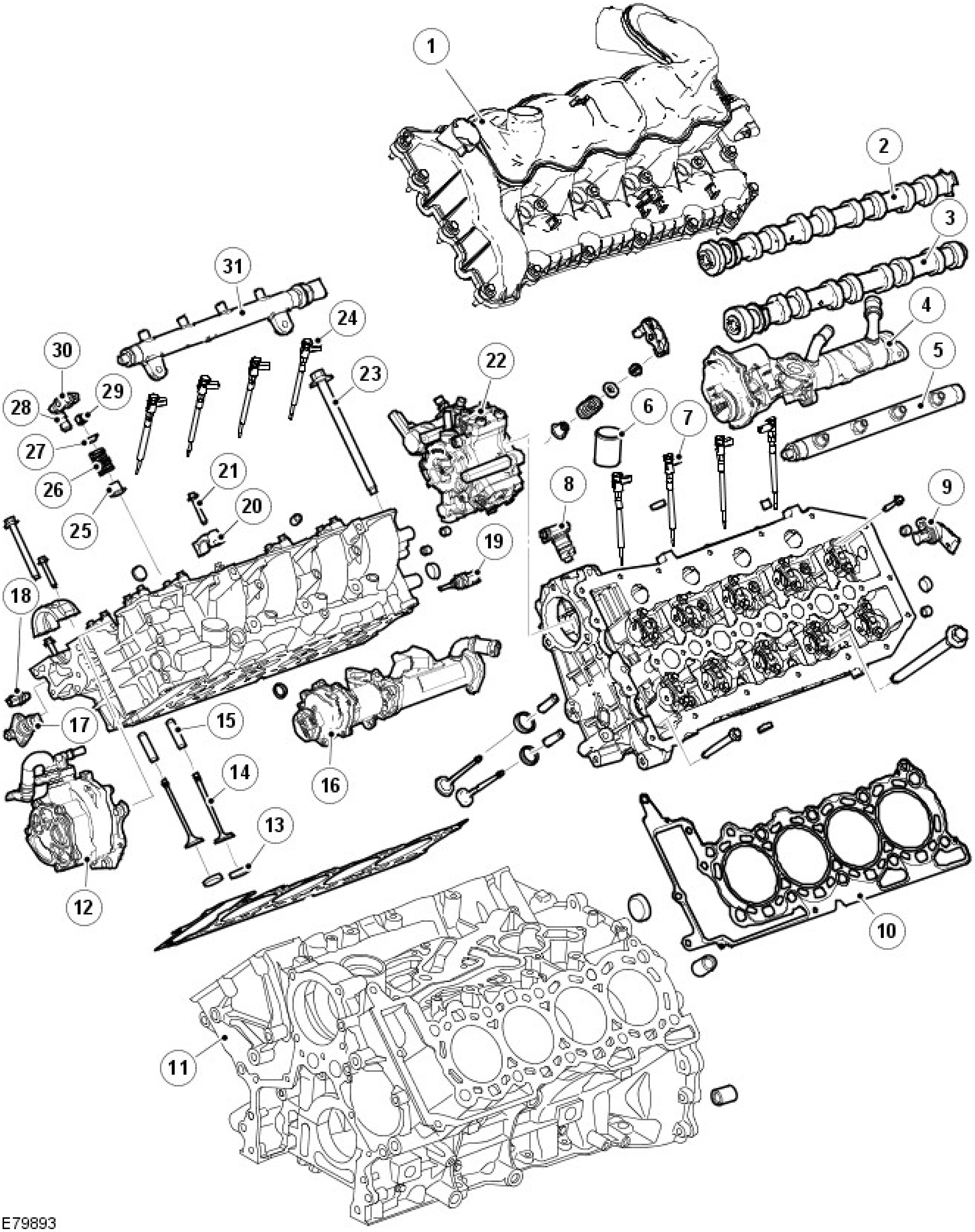
Drive is provided by 2 simplex bush timing chains, driven from the crankshaft to the inlet camshaft gears of each cylinder head.

Each exhaust camshaft is driven by a gearwheel arrangement from the intake camshaft.

Each timing chain is contained between 1 fixed and 1 hydraulically adjustable chain guide. The adjustable guides are of aluminium die casting construction with clip-fastened plastic slide linings. The fixed guides are moulded plastic. The adjustable guides are attached to the front of the cylinder block using pivot bolts, which allows it to pivot about its axis. A single tensioner provides hydraulic tension for the chains, 1 located in each cylinder head (for more information, see cylinder head section). The lateral movement in the adjustable guides causes the timing chain to tension and consequently, compensation for chain flutter and timing chain wear is automatically controlled.

The timing chains are oil splash lubricated, via the oil pump and chain tensioner. Oil spray is directed to the chain from several oil supply ports in the front of the cylinder block and cylinder head.

CYLINDER HEAD COMPONENTS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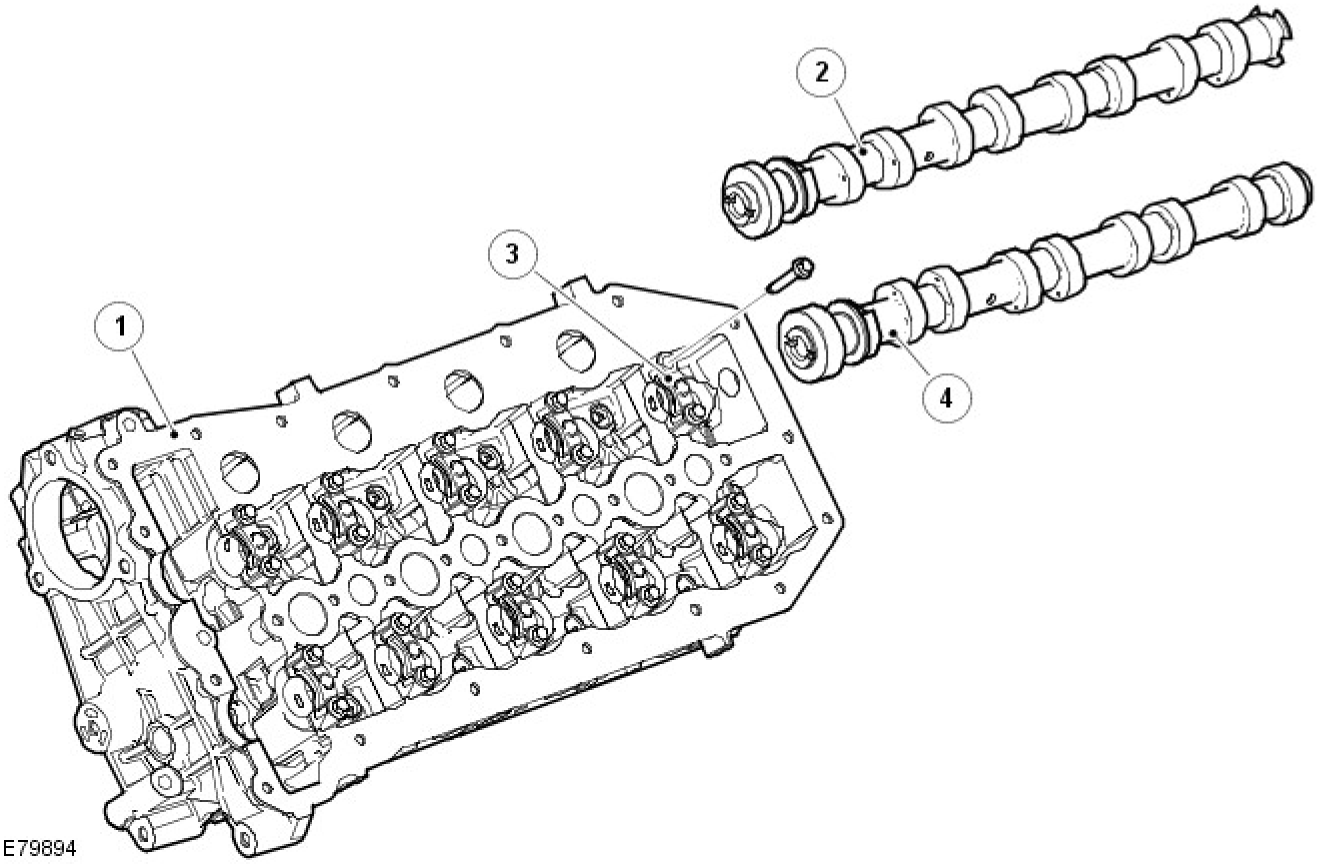
Item	Part Number	Description
1	-	Intake manifold assembly (2 off)
2	-	Inlet camshaft (2 off, 1 per cylinder head)
3	-	Exhaust camshaft (2 off, 1 per cylinder head)
4	-	LH Exhaust Gas Recirculation (EGR) cooler assembly
5	-	LH high-pressure fuel rail

6	-	Coolant tube
7	-	Glow plug (8 off, 4 per cylinder head)
8	-	LH timing chain tensioner
9	-	Camshaft Position (CMP) sensor
10	-	Cylinder head gasket (2 off, 1 per cylinder head)
11	-	Cylinder block
12	-	Vacuum pump
13	-	Valve seat (32 off, 16 per cylinder head)
14	-	Valve (32 off, 8 inlet and 8 exhaust per cylinder head)
15	-	Valve guide (32 off, 16 per cylinder head)
16	-	RH EGR cooler assembly
17	-	RH timing chain tensioner
18	-	Oil pressure sensor
19	-	Engine Coolant Temperature (ECT) sensor
20	-	Camshaft bearing cap (20 off, 10 per cylinder head)
21	-	Bolt (40 off, 20 per cylinder head)
22	-	High-pressure fuel pump
23	-	Bolt (20 off, 10 per cylinder head)
24	-	Glow plugs (8 off, 4 per cylinder head)
25	-	Valve stem oil seal (32 off, 16 per cylinder head)
26	-	Valve spring (32 off, 16 per cylinder head)
27	-	Valve spring cap (32 off, 16 per cylinder head)
28	-	Hydraulic lash adjuster (32 off, 16 per cylinder head)
29	-	Valve spring retainer (32 off, 16 per cylinder head)
30	-	Roller finger lever (32 off, 16 per cylinder head)
31	-	RH high-pressure fuel rail

Cylinder Heads



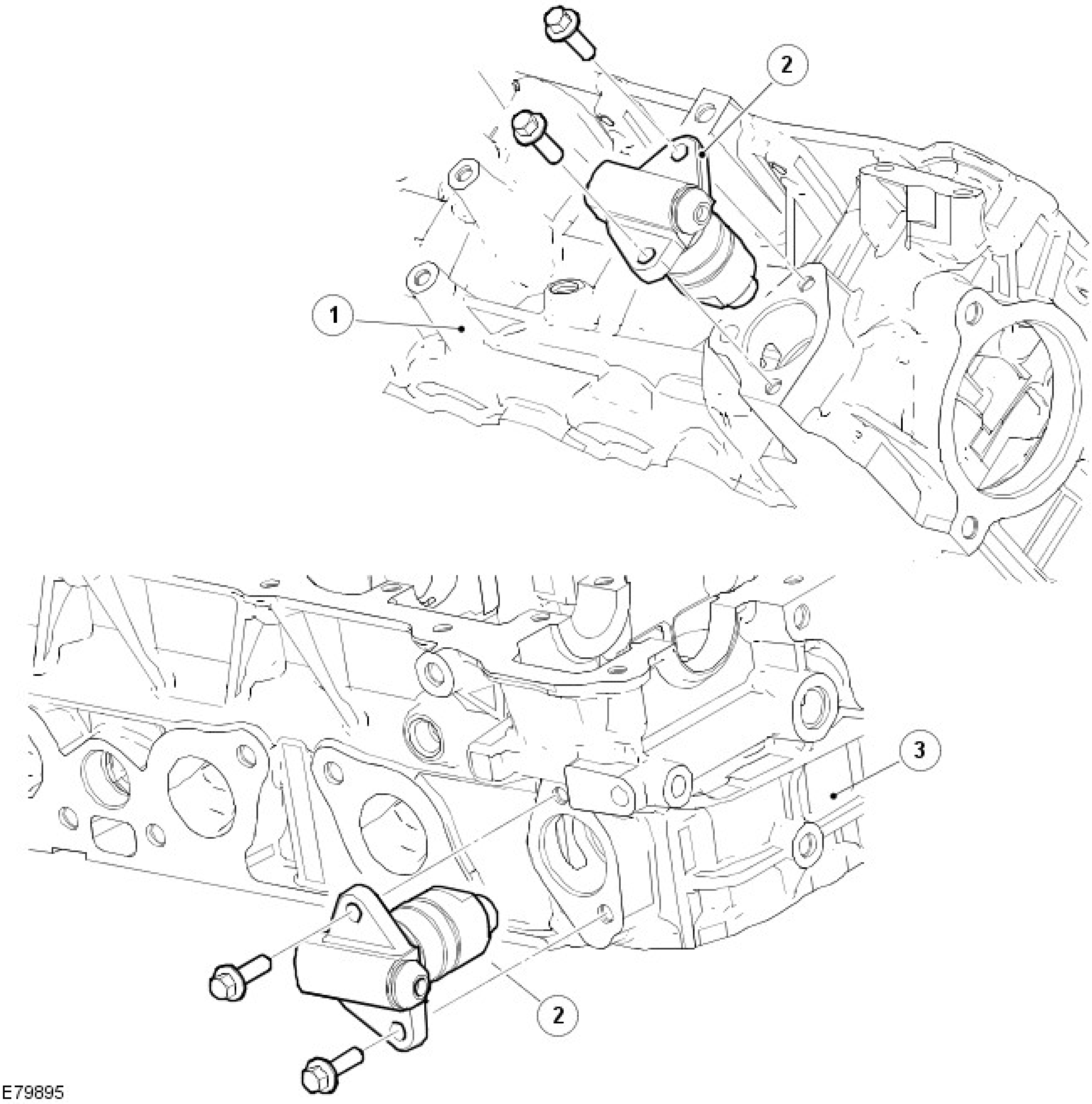
Item	Part Number	Description
1	-	Cylinder head (LH shown, RH similar)
2	-	Intake camshaft
3	-	Camshaft bearing cap (5 off per camshaft)
4	-	Exhaust camshaft

The aluminium gravity die-cast cylinder heads are unique to each cylinder. Ten deep-seated bolts help reduce distortion and secure each cylinder head to the cylinder block. The cylinder head bolts are located beneath the camshafts, 5 under the inlet camshaft and 5 under the exhaust camshaft. Two hollow dowels align each cylinder head with the cylinder block.

- NOTE: The cylinder head bolts are not accessible with the camshafts fitted.

- NOTE: The cylinder head cannot be reworked.

Each cylinder head has 4 ports machined at each cylinder location, 2 exhaust ports and 2 inlet ports. One of the inlet ports is helical and functions as a swirl port, the other is arranged laterally as a tangential port and functions as a charge port.



Item	Part Number	Description
1	-	LH cylinder head
2	-	Hydraulic chain tensioner (2 off)
3	-	RH cylinder head

Each cylinder head houses an automatic chain tensioner, which contains a hydraulically operated plunger that operates on the adjustable guides at the slack side of each of the timing chains. Pressurised oil for the adjuster is supplied through the back of the unit from an oil supply port in each cylinder head.

Camshafts

There is 1 exhaust camshaft and 1 intake camshaft per cylinder head. Each of the overhead camshafts are located in 5 bearings and maintained in position by 5 aluminium alloy bearing caps. Each of the bearing caps are fixed to the cylinder head by 2 bolts. Location letters and numbers are etched on the caps for each cylinder head, A to L for the LH head and 0 to 9 for the RH head. The camshafts are of a hollow steel tube construction, with pressed on steel lobes. The camshafts are driven from the crankshaft via simplex chains and a sprocket arrangement.

- NOTE: Both the LH and RH inlet camshafts utilize LH threads to locate the timing gears.

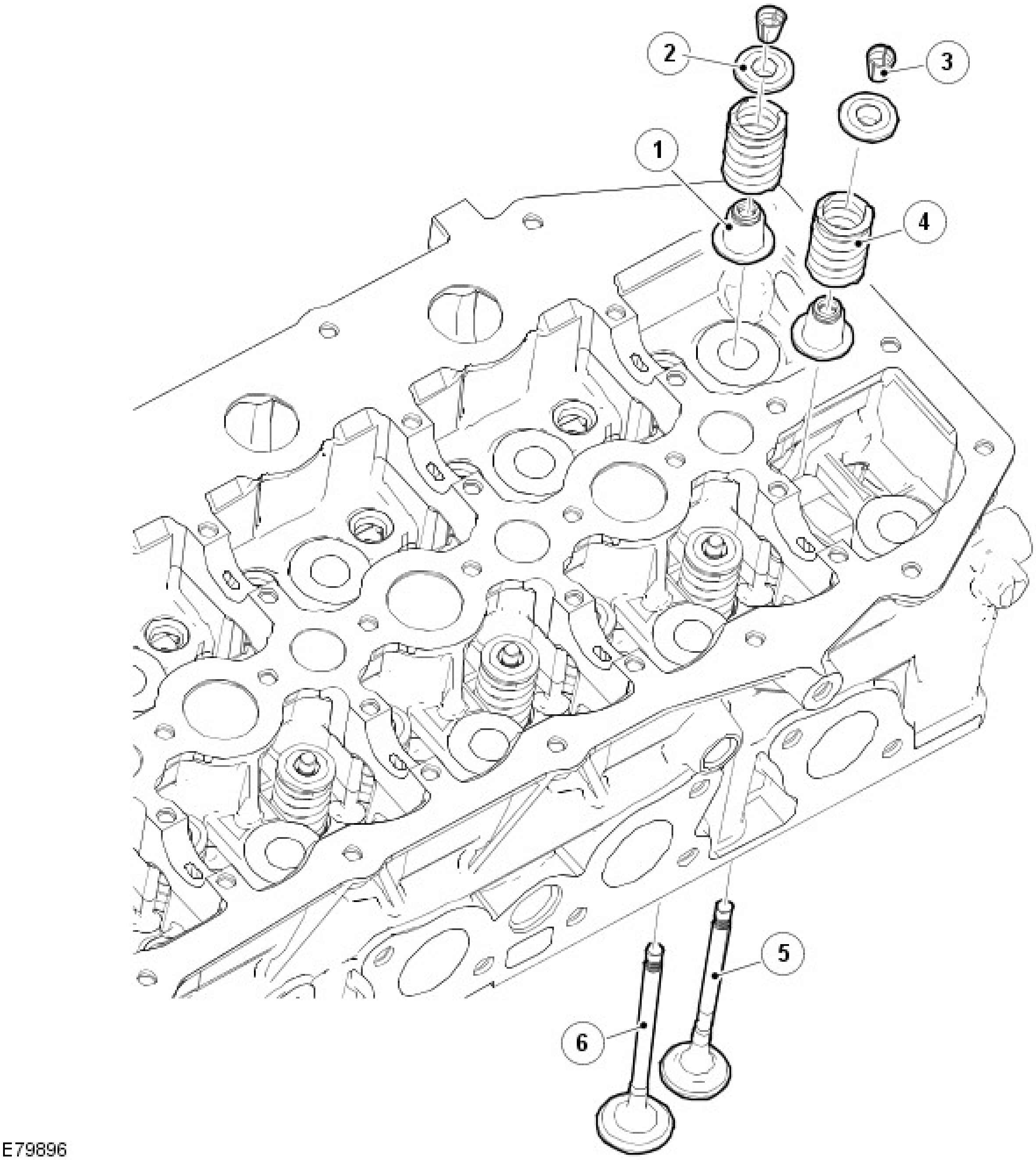
Each camshaft has 8 machined lobes for operating the inlet and exhaust valves through hydraulic lash adjusters and roller-type finger levers. The front of the RH cylinder head inlet camshaft provides a drive connection for the vacuum pump, via a drive gear. The front of the LH cylinder head inlet camshaft provides a drive connection for the high-pressure fuel pump, also via a drive gear.

The following table lists some unique features for each camshaft to avoid placement of camshafts in the wrong position:

Camshaft Identification Table

Camshaft	Identification
Intake - RH	LH thread for camshaft gear attachment Longest camshaft
Exhaust - RH	RH thread for camshaft gear attachment. Cannot accommodate both sprocket and gear
Intake - LH	LH thread for camshaft gear attachment Trigger wheel for CMP sensor Camshaft diameter will not allow it to be fitted in the RH head
Exhaust - LH	RH thread for camshaft gear attachment Cannot accomodate both sprocket and gear

Inlet and Exhaust Valves



Item	Part Number	Description
1	-	Valve spring stem seal (32 off per head)
2	-	Valve spring retainer (32 off per head)
3	-	Valve spring collet (32 off per head)
4	-	Valve spring (32 off per head)
5	-	Exhaust valve (16 off per head)
6	-	Inlet valve (16 off per head)

Two 27.5 mm inlet valves and 2 25.0 mm exhaust valves serve each cylinder. Each valve is of a ground, solid one-piece head construction and the stems are made from a Nimonic alloy material.

The valve springs are made from spring steel and are of the parallel single-coil type. The bottom end of each spring rests on the flange of a spring retainer, which has an integral valve stem seal. The top end of the spring is held in place by a spring retainer, which is held in position at the top end of the valve stem by split taper collets. The taper collets have grooves on the internal bore that locate to grooves ground into the upper stems of the valves.

The powder metal valve seats and guides are an interference fit in the cylinder head.

Valve Timing

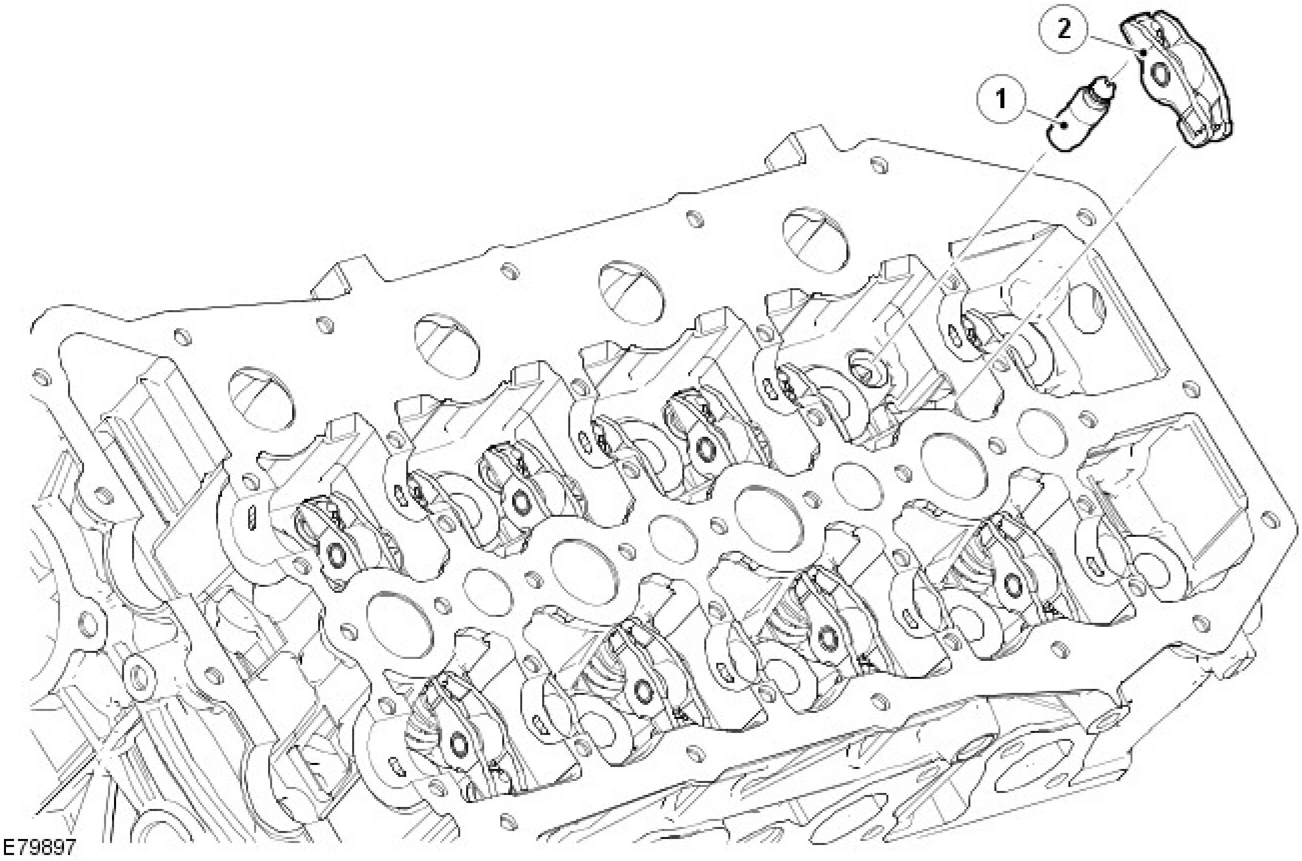
Valve	Position

Valve	Position
Inlet valve opens	8.5 degrees BTDC
Inlet valve closes	35.5 degrees ABDC
Exhaust valve opens	64 degrees BBDC
Exhaust valve closes	12 degrees ATDC

Key

- BTDC = Before Top Dead Center
- ABDC = After Bottom Dead Center
- BBDC = Before Bottom Dead Center
- ATDC = After Top Dead Center

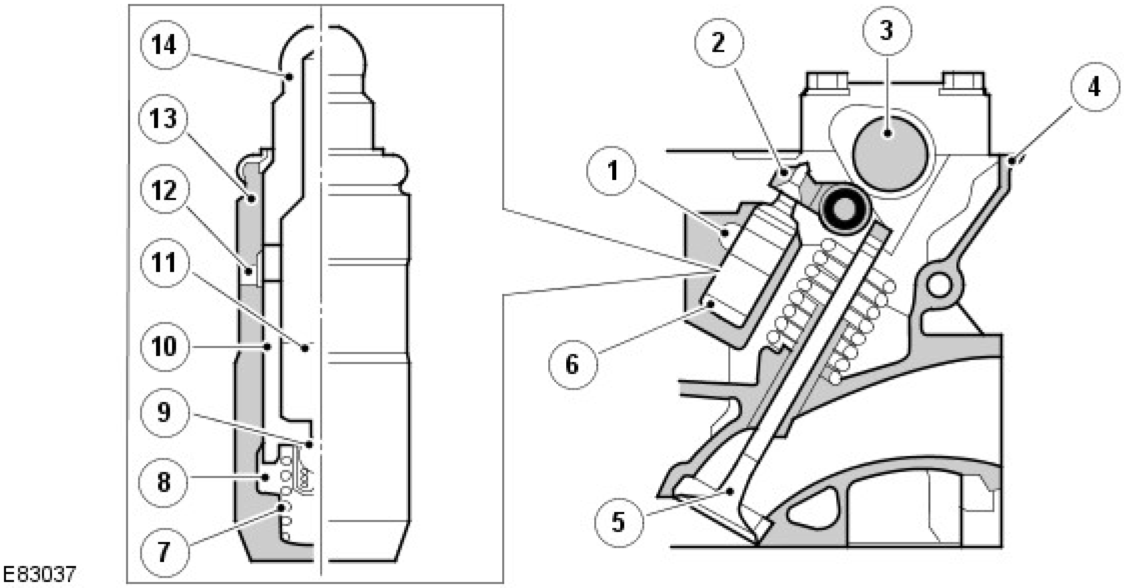
Hydraulic Lash Adjusters and Roller Finger Rockers



Item	Part Number	Description
1	-	Hydraulic lash adjuster
2	-	Roller finger rocker

The valves are operated through roller-type finger rockers and hydraulic lash adjusters, actuated by the camshaft lobes. When the camshaft lobe presses down on the top of a finger rocker, roller mechanism, the respective valve is forced down, opening the effected inlet or exhaust port. The use of this type of actuation method helps reduce friction in the valve timing mechanism.

Typical Hydraulic Lash Adjuster

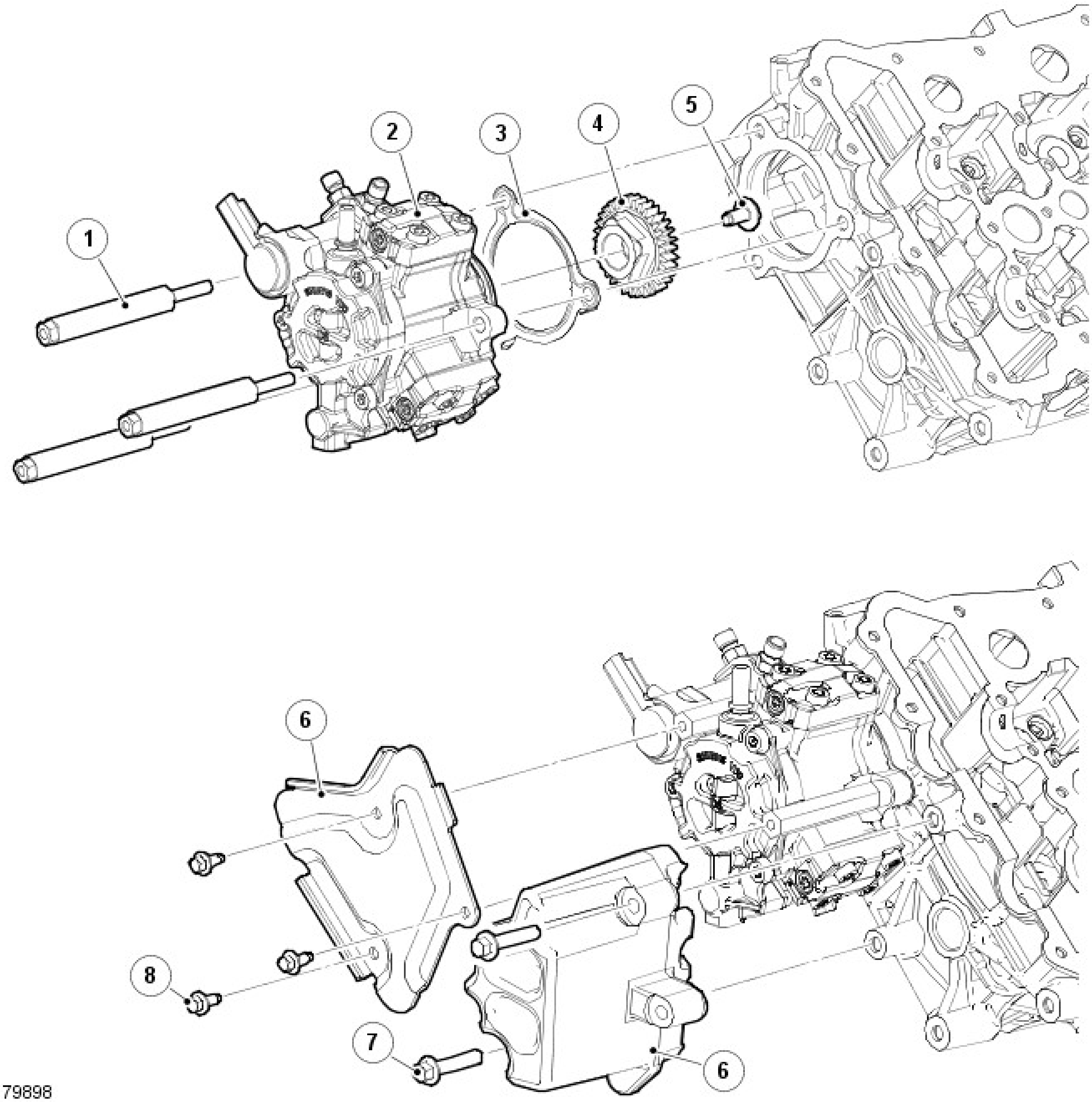


Item	Part Number	Description
1	-	Oil passage
2	-	Roller finger rocker
3	-	Camshaft
4	-	Cylinder head
5	-	Valve
6	-	Hydraulic lash adjuster
7	-	Plunger spring
8	-	High-pressure chamber
9	-	Check ball
10	-	Plunger
11	-	Reservoir chamber
12	-	Oil hole
13	-	Hydraulic lash adjuster body
14	-	Plunger cap

The body of the hydraulic lash adjuster contains a plunger and 2 chambers for oil feed and pressurised oil. The pressurised oil is supplied to the adjusters via the main oil galleries in the cylinder head and through a hole in the side of the adjuster body. The oil passes into a feed chamber in the adjuster and then through to a separate pressure chamber via a 1-way ball valve.

Oil flow from the pressure chamber is determined by the amount of clearance between the adjuster outer body and the centre plunger. Oil escapes up the side of the plunger every time the adjuster is operated, the downward pressure on the plunger forcing a corresponding amount of oil in the adjuster body to be displaced. When the downward pressure from the camshaft and finger rocker is removed (i.e. after the trailing flank of the camshaft lobe has passed), oil pressure forces the adjuster's plunger up again. This pressure is not sufficient to effect the valve operation, but eliminates the clearance between the finger rocker and top of the valve stem.

High-Pressure Fuel Pump



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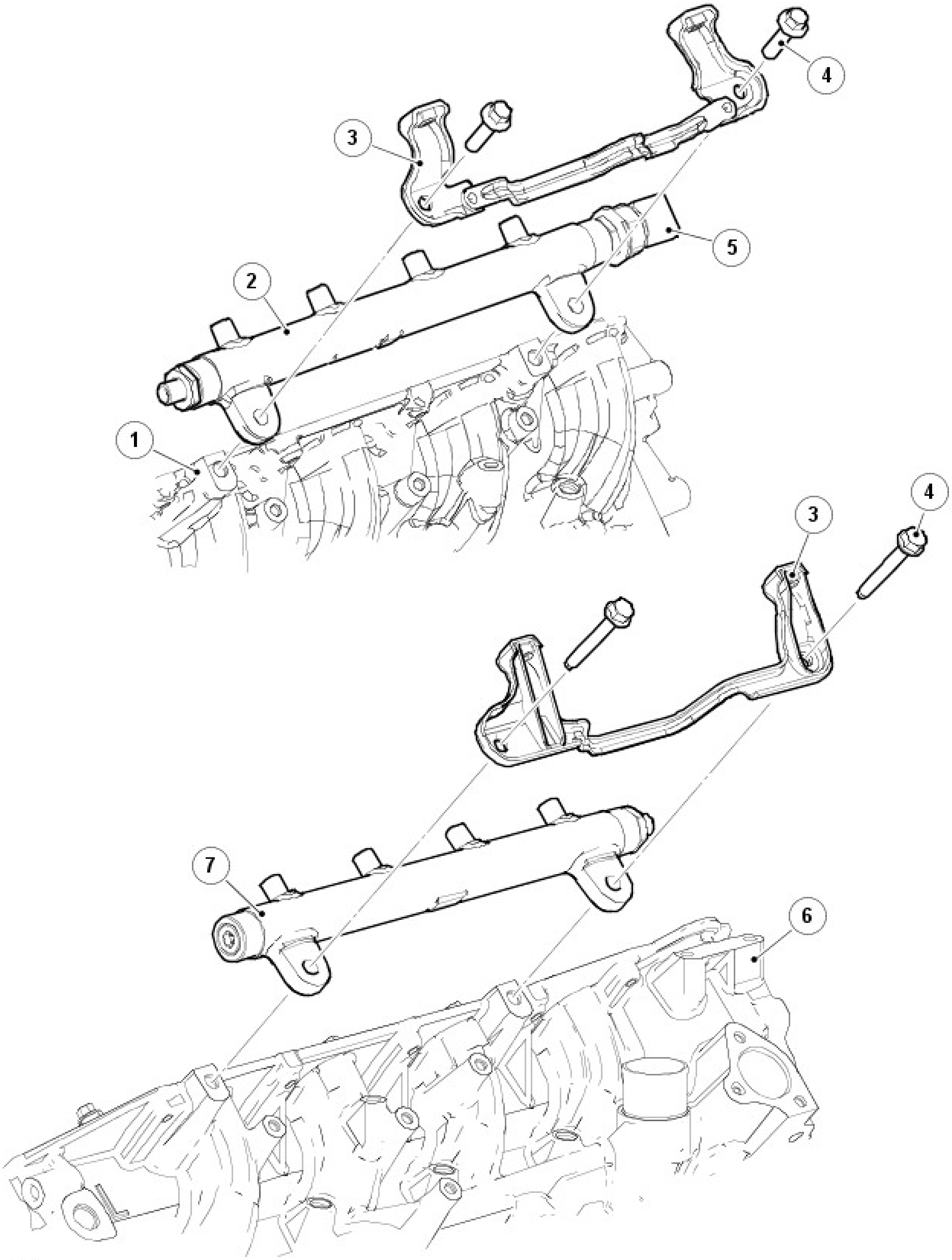
Item	Part Number	Description
1	-	Bolt (3 off)
2	-	High-pressure fuel pump
3	-	Gasket
4	-	Fuel pump drive
5	-	Washer
6	-	Fuel pump bracket shield
7	-	Bolt (3 off)
8	-	Bolt (3 off)

The high-pressure fuel pump supplies the common rail with fuel and is fixed to the front of the LH cylinder head. The pump is a 3-radial piston type and is driven by the intake camshaft of the LH cylinder head via the fuel pump drive gear. The Engine Management System (EMS) controls pump pressure (depending on engine speed and load) up to a maximum of 1700 bar.For additional information, refer to:

Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation),
Fuel Charging and Controls (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Description and Operation).

High-Pressure Fuel Rails



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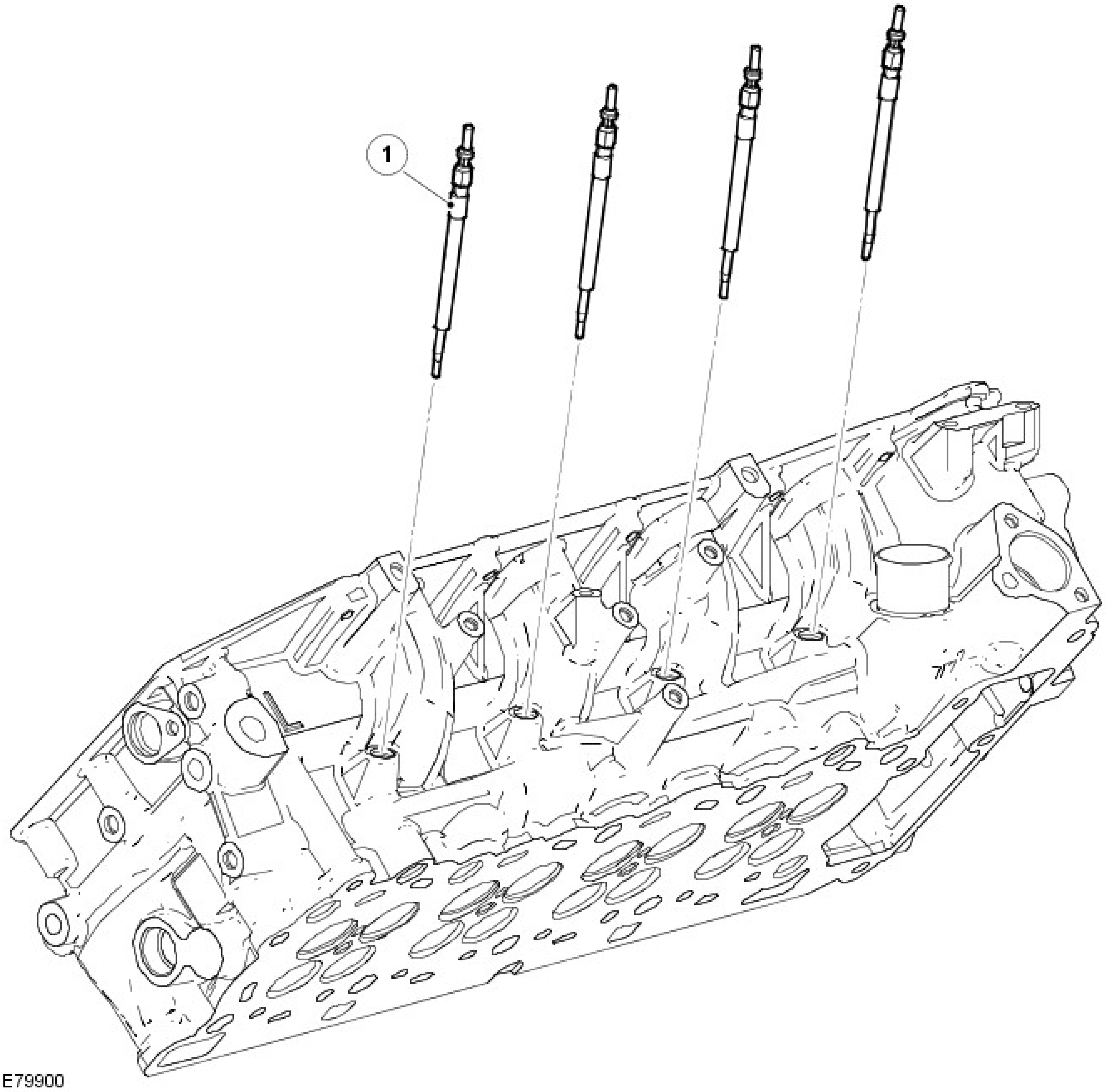
Item	Part Number	Description
1	-	RH cylinder head
2	-	RH high-pressure fuel rail
3	-	Intake manifold support bracket
4	-	Bolt (4 off, 2 per cylinder head)
5	-	Fuel pressure sensor

6	-	LH cylinder head
7	-	LH high-pressure fuel rail

The fuel rails are manufactured from forged steel. They store the fuel at high pressure and prevent pressure fluctuations in the high-pressure system. A fuel rail pressure sensor is fitted into a threaded bore in the rear end of the RH rail. The sensor is connected to the ECM via the engine harness, which supplies a 5V power supply, ground and signal connections. The sensor is a diaphragm type sensor, which changes shape as the fuel pressure increases or decreases. The ECM compares this signal to values stored in its memory to calculate the actual fuel pressure present in the rail.For additional information, refer to:

> Fuel Charging and Controls (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Description and Operation),
> Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

Glow Plugs



Item	Part Number	Description
1	-	Glow plug (4 off per cylinder head)

The glow plugs are arranged centrally on the inlet side of the cylinder head, between the 2 inlet ports of each cylinder.

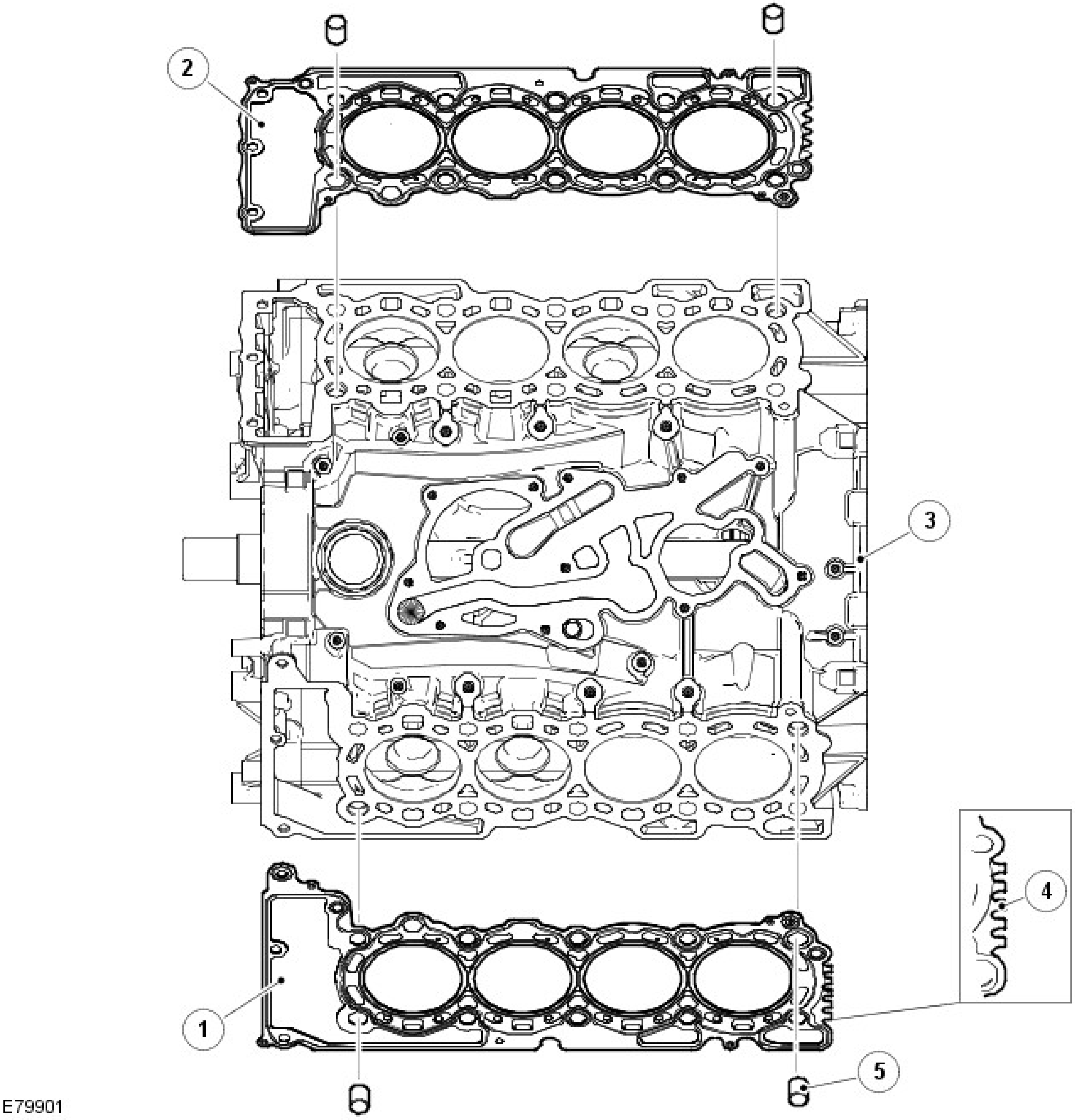
The purpose of the glow plugs is:

- Assist cold engine start

- Reduce exhaust emissions at low engine load/speed

The main part of the glow plug is a tubular heating element that protrudes into the combustion chamber of the engine. The heating element contains a spiral filament that is encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil and connected in series is a control coil. The control coil regulates the heater coil to ensure it does not overheat and cause a possible failure.
For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

Cylinder Head Gaskets



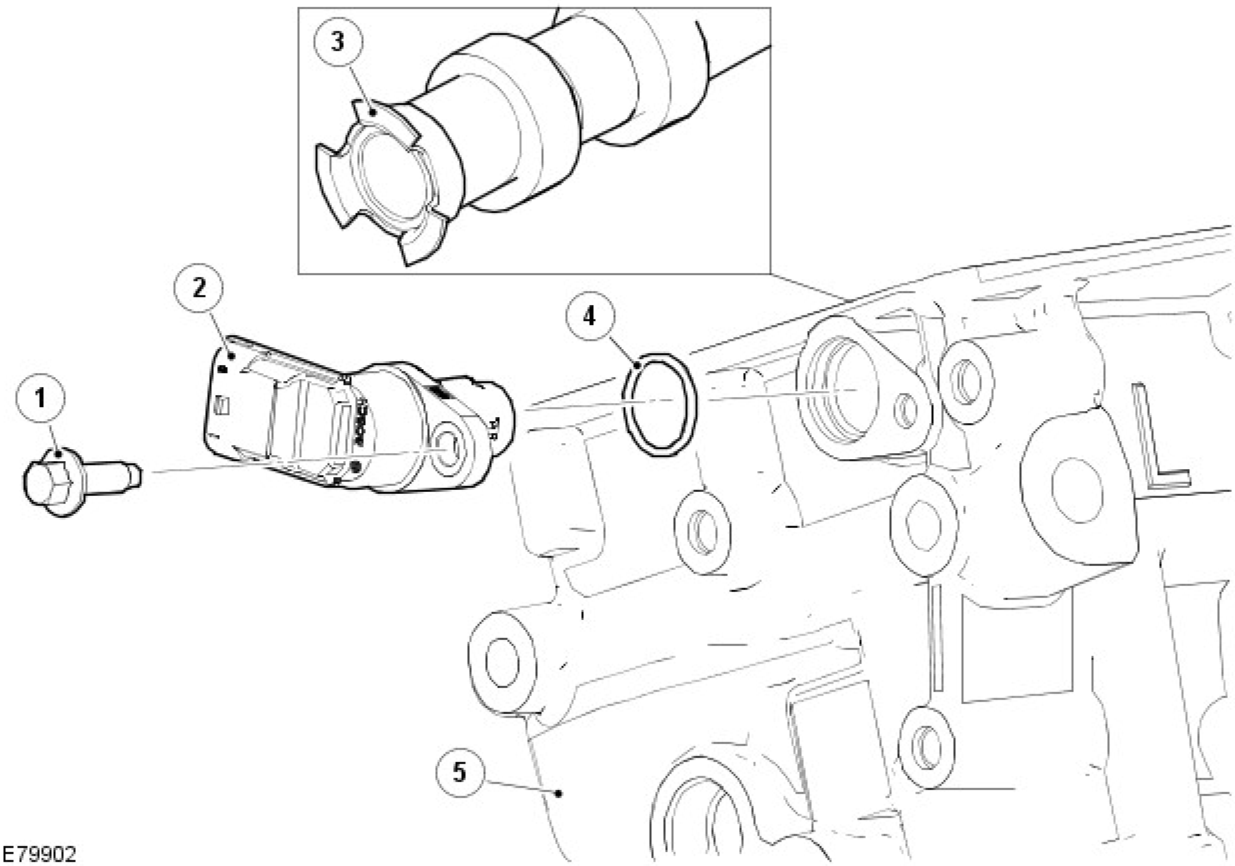
Item	Part Number	Description
1	-	LH cylinder head gasket
2	-	RH cylinder head gasket
3	-	Cylinder block
4	-	Identification teeth
5	-	Cylinder head locating dowel (2 off per cylinder head)

The cylinder head gasket is a multi-layer, laminated steel type and is available in 5 different thicknesses. The choice of gasket thickness is dependent on the maximum piston protrusion. Gasket thickness is identified by teeth cut into the rear end of the gasket.

To calculate the correct cylinder head gasket thickness, each piston must be measured at 2 points, with an average of the 2 measurements taken to determine the piston protrusion. The highest of the 4 measurements will determine the gasket required for that particular cylinder head.

• NOTE: The difference between the maximum and minimum protrusion measurement in any one bank should not be greater than 0.1mm. It is permissible to have a different grade of gaskets between the LH and RH banks.

Camshaft Position (CMP) Sensor

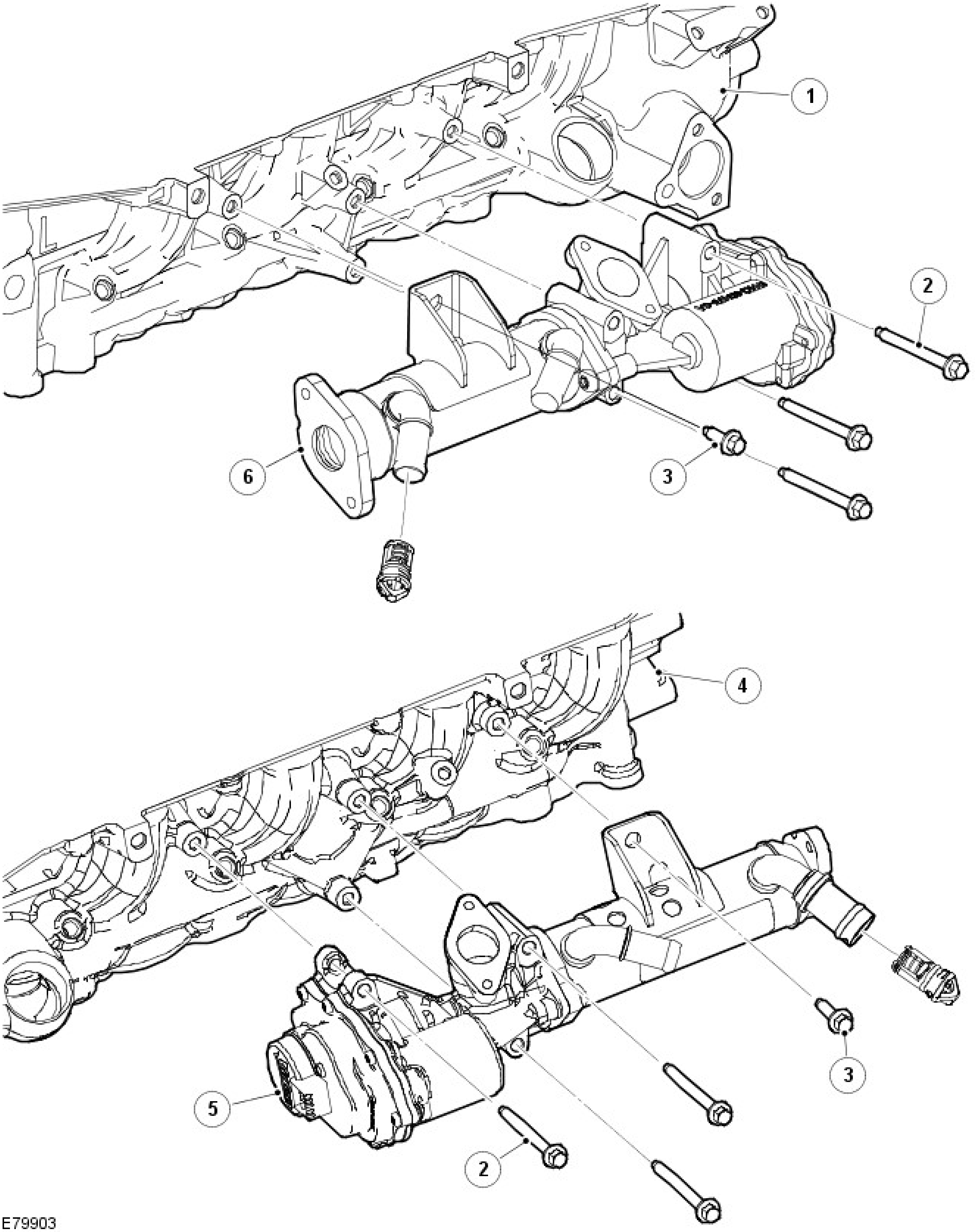


E79902

Item	Part Number	Description
1	-	Bolt (1 off)
2	-	CMP sensor
3	-	LH cylinder head camshaft
4	-	O-ring seal
5	-	Cylinder head

The CMP sensor locates through a hole in a flange on the rear RH side of the LH cylinder head. The rear of the inlet camshaft incorporates a trigger wheel, which is used in conjunction with the sensor to measure engine position.
For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

Exhaust Gas Recirculation (EGR) Valve Assembly



E79903

Item	Part Number	Description
1	-	LH cylinder head
2	-	Bolt (6 off, 3 per assembly)
3	-	Bolt (2 off, 1 per assembly)
4	-	RH EGR cooling and valve assembly
5	-	RH cylinder head

6	-	LH EGR cooling and valve assembly

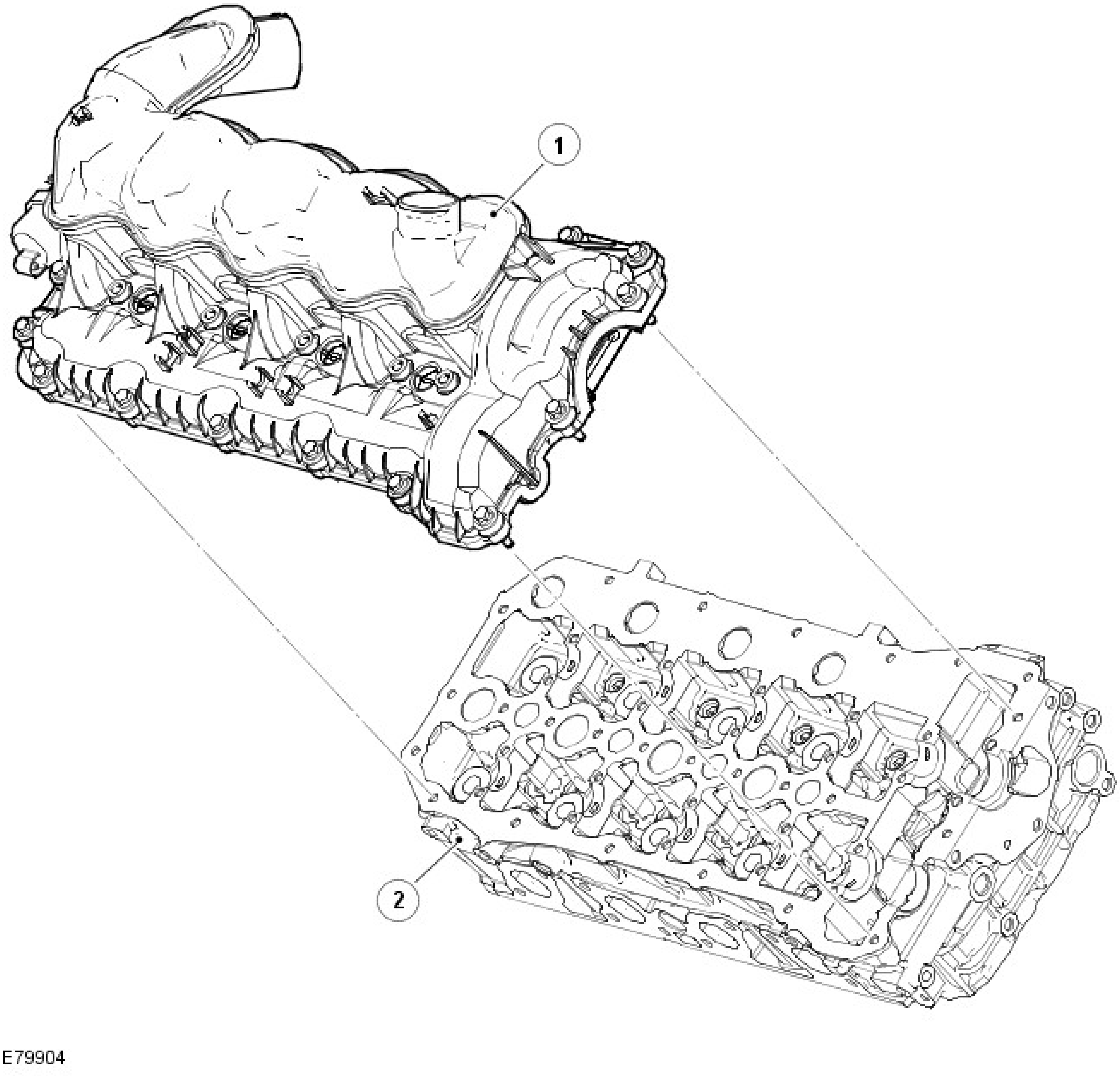
The combined EGR modulator and cooler assemblies are located inboard of each cylinder head, between the vee. The cooler side of the EGR valve assembly is connected to the vehicle cooling system via hoses. The exhaust side is connected directly into the exhaust manifolds on each side. The exhaust gas passes through the cooler and is expelled via the actuator and a metal pipe into the throttle housing. The EGR modulator is a Direct Current (DC) motor, which is operated via a reduction gear drive and is controlled by the ECM. The ECM uses the EGR modulator to control the amount of exhaust gas being recirculated in order to reduce exhaust emissions and combustion noise. The EGR is enabled when the engine is at normal operating temperature and under cruising conditions.
For additional information, refer to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Description and Operation).

Oil Pressure Switch

The oil pressure switch is located in the front of the RH cylinder head. For more information, refer to the 'Lubrication System' section.

Inlet Manifold/Camshaft Cover

- NOTE: RH cylinder head and camshaft cover shown, LH similar.



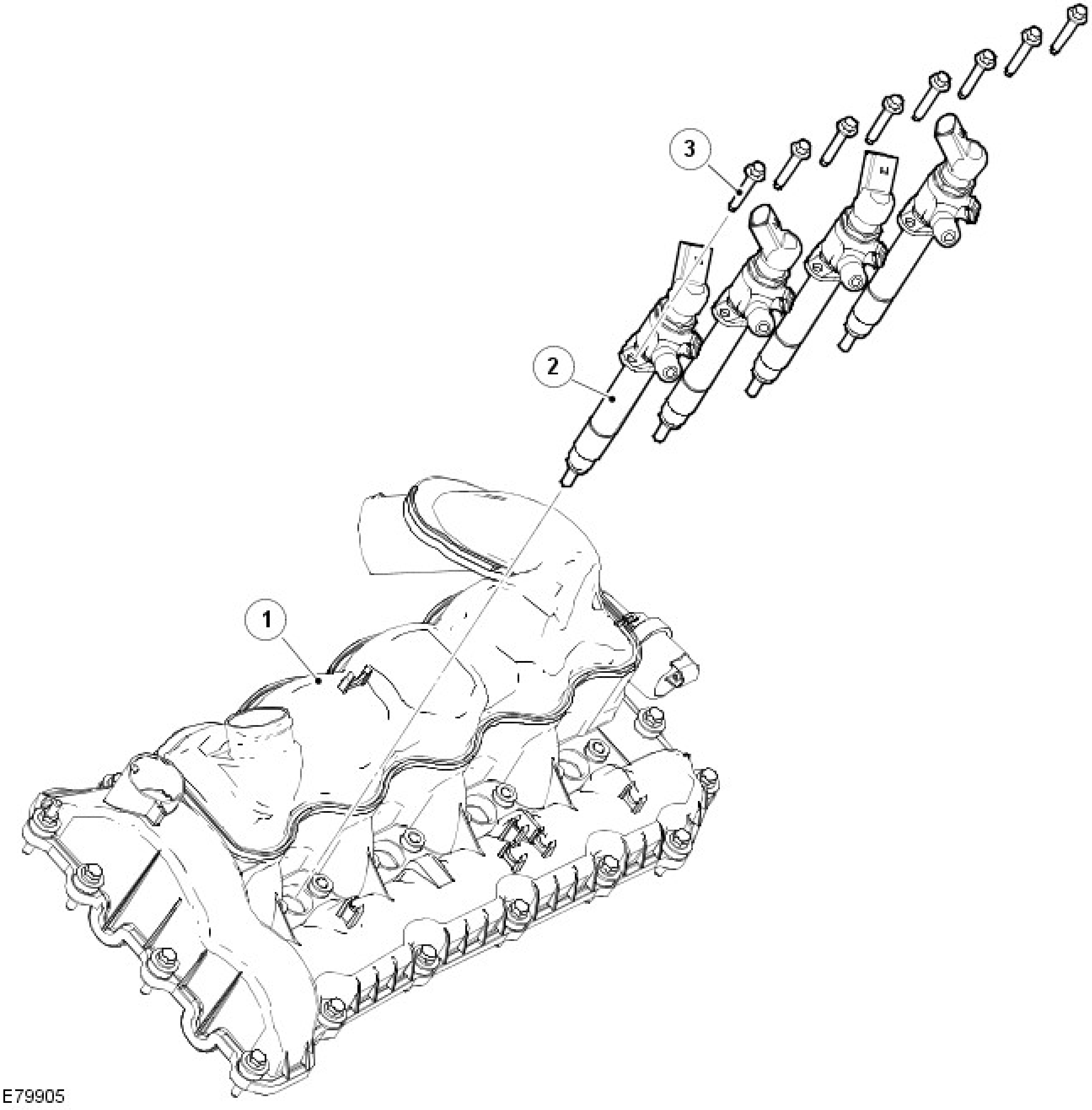
Item	Part Number	Description
1	-	Inlet manifold/camshaft cover
2	-	Cylinder head

The inlet manifolds are integrated with the moulded camshaft covers and work in conjunction with the intake tracts within the cylinder heads to provide variable intake swirl through port deactivation.
For additional information, refer to: Intake Air Distribution and Filtering (303-12D Intake Air Distribution and Filtering - TDV8 3.6L Diesel, Description and Operation).

The covers are manufactured from 2 layers of 2 mm sound-deadened steel that are bonded together by a visco-elastic damping material. This provides a fully formable, acoustically dead panel. The covers are rubber mounted and include additional foam absorbtion.

The LH cover incorporates the oil filler cap assembly.

- NOTE: LH cylinder head and camshaft cover shown, LH similar.



Item	Part Number	Description
1	-	Inlet manifold/camshaft cover
2	-	Injectors (8 off, 4 per cylinder head)

3	-	Bolt (16 off, 8 per cylinder head)

The 8, side fed, piezo electrically controlled fuel injectors are mounted in the inlet manifold/camshaft cover, which locates them centrally in each cylinder head. An O-ring seals each injector to the manifold interface.

The start of fuel injection and the quantity of fuel injected is controlled directly by the ECM.
For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

LUBRICATION SYSTEM

The lubrication system is a wet oil pan, pressure fed type. It lubricates the engine sliding surfaces, dissipates heat, absorbs fuel combustion residue and seals off the gap between the cylinder and piston.

Oil is drawn from the reservoir in the oil pan and pressurised by the crankshaft driven oil pump. The output from the oil pump is then filtered and distributed through internal oil passageways.

All moving parts are lubricated by pressure or splash oil. Pressurised oil is also provided for operation of the hydraulic adjusters and the timing gear chain tensioners.

The engine is lubricated by a force-fed oil circulation system with a full flow oil filter. The oil cooler forms a unit with the oil filter and fuel cooler, which is mounted centrally in the middle of the cylinder block between the 2 banks of cylinders. The engine oil is cooled using the engine cooling system. This eliminates the need for an additional engine oil cooler.

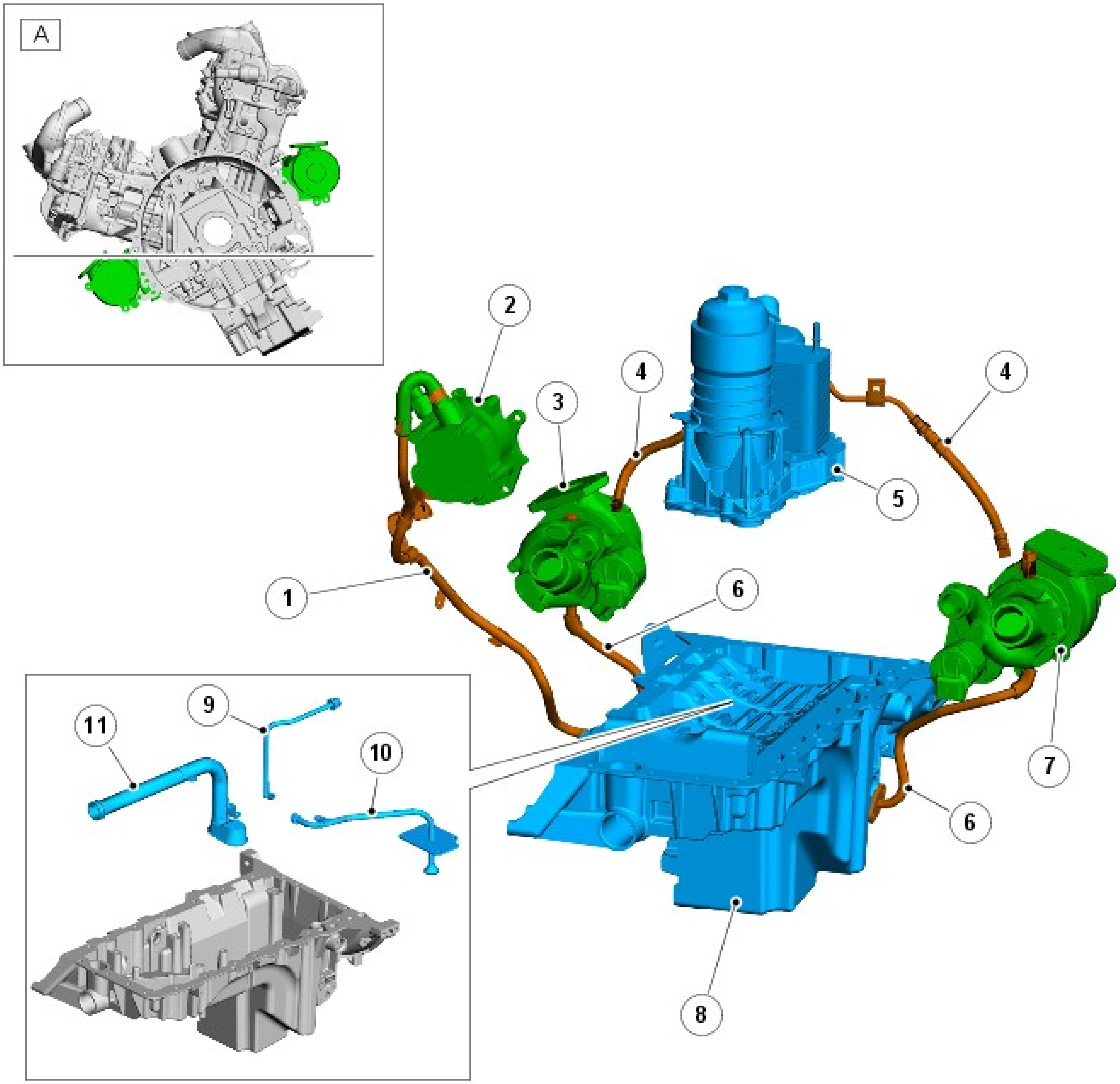
The fuel cooler, which forms part of the oil filter body, is also cooled by engine coolant. In addition there is a further fuel cooler in the return line to the fuel tank.

Oil returns to the oil pan under gravity. Large drain holes through the cylinder heads and cylinder block ensure the quick return of the oil, reducing the volume of oil required and enabling an accurate check of the contents soon after the engine stops.

System replenishment is through the oil filler cap on the LH inlet manifold/camshaft cover.

Turbocharger Oil Return

Due to the wide range of inclines the vehicle operates across, the geometry of the oil pan has been configured to guarantee oil pick-up across all operating angles. Land Rover have developed an oil-scavenge system to guarantee excellent oil flow through the turbochargers on severe side-slopes. Whilst the 60-degree cylinder bank angle of a V6 engine allows the turbochargers to be packaged relatively higher in the vehicle, to obtain the best configuration for the V8 engine, the turbochargers must be sited much lower. At extreme angles, there is a risk they may be below the oil level on the oil pan, restricting oil return flow. To overcome this, the engine uses a rotor pump located on the front of the vacuum pump, to help draw oil back from the turbochargers to guarantee good flow across the full range of operating angles.



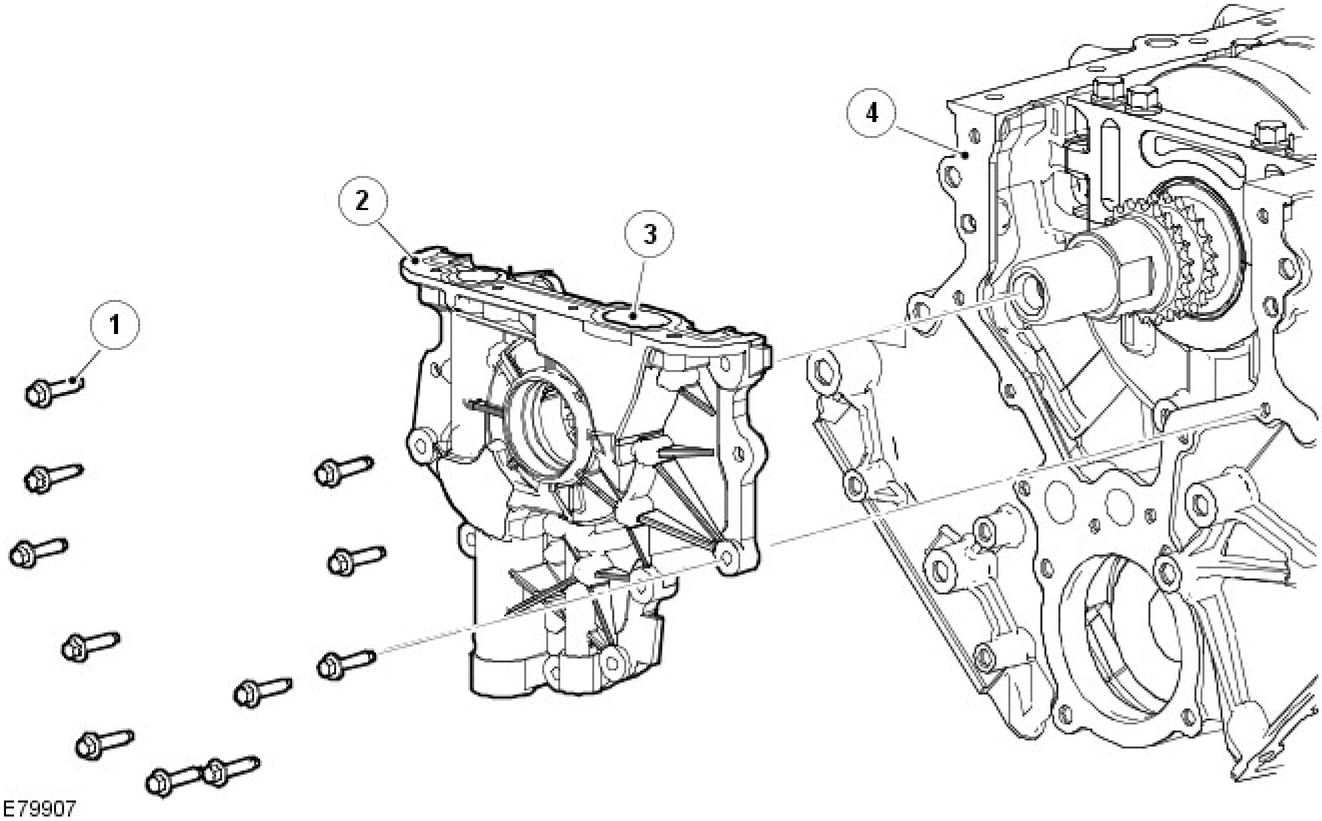
E86594

Item	Part Number	Description
A	-	Potential oil level
1	-	Oil scavenge pipe
2	-	Vacuum pump
3	-	RH turbocharger
4	-	Turbocharger oil feed pipe
5	-	Oil filter/cooler assembly
6	-	Turbocharger oil return pipe
7	-	LH turbocharger
8	-	Oil pan
9	-	Crankcase ventilation oil return pipe
10	-	Oil scavenge pipe
11	-	Oil pick-up pipe

Oil Pick-up

The moulded composite oil pick-up is immersed in the oil reservoir to provide a supply to the oil pump during all normal vehicle attitudes. A mesh screen in the inlet prevents debris from entering the oil system.

Oil Pump



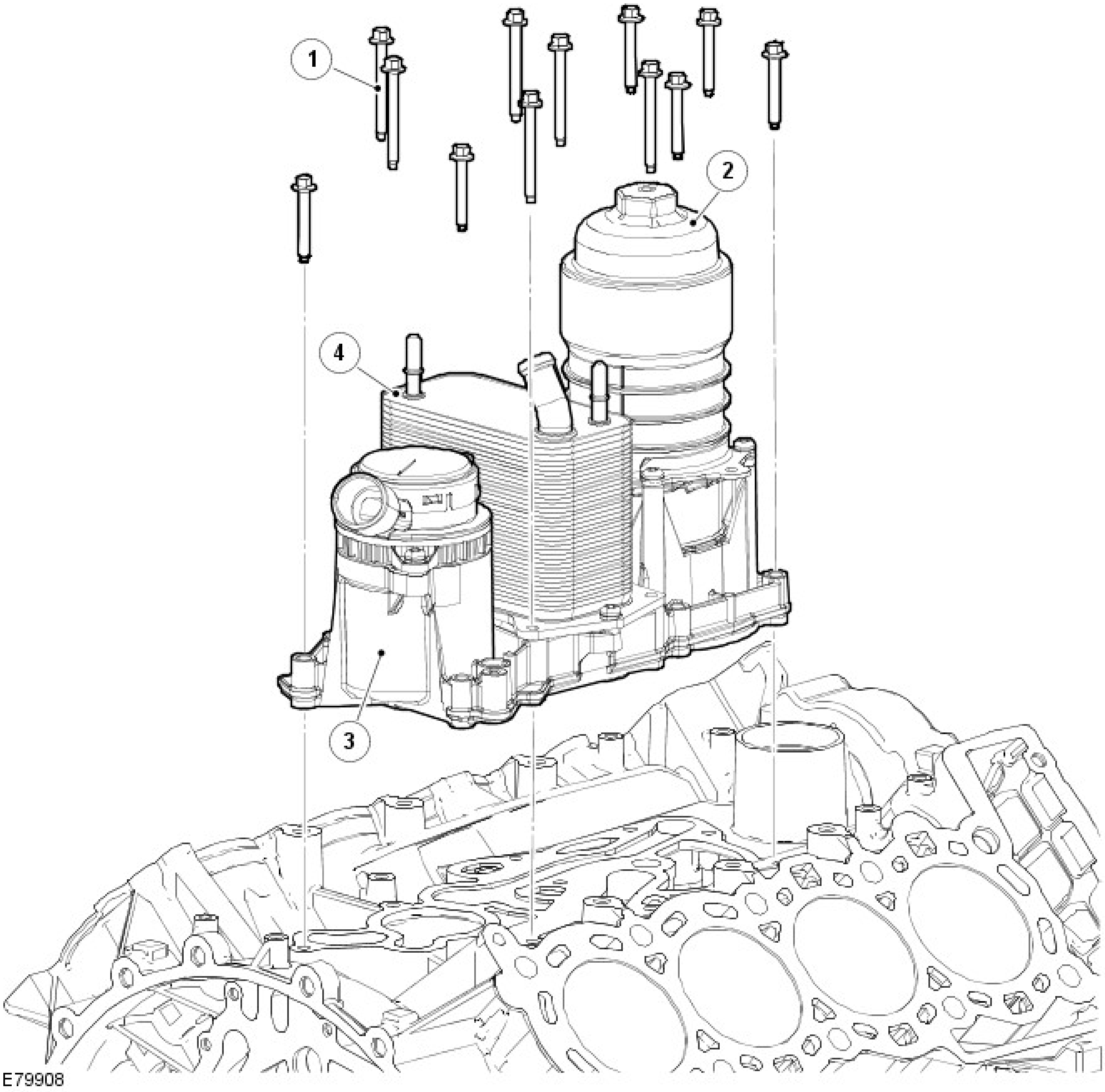
Item	Part Number	Description
1	-	Bolt (11 off)
2	-	Oil pump housing
3	-	Oil inlet
4	-	Cylinder block

The oil pump is a gear type pump and is bolted and dowelled to the front of the engine block. It is sealed by means of a rubber gasket, which is recessed into the oil pump housing. The pump inlet and outlet ports align with oil passages in the ladder frame.

The pumping element is an eccentric rotor, which is directly driven by flats on the crankshaft. An integral pressure relief valve regulates pump outlet pressure at 4.5 bar (65.25 Psi).

The front crankshaft oil seal is housed in the oil pump casing.

Oil Filter and Oil/Fuel Cooler Assembly



Item	Part Number	Description
1	-	Bolt (12 off)
2	-	Oil filter and cooler assembly
3	-	Crankcase ventilation system
4	-	Fuel cooler

The oil filter is a replaceable cartridge installed on an adapter in the center of the 'vee'. An internal bypass facility permits full flow bypass if the filter is blocked.
For additional information, refer to: Fuel Tank and Lines (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Description and Operation).

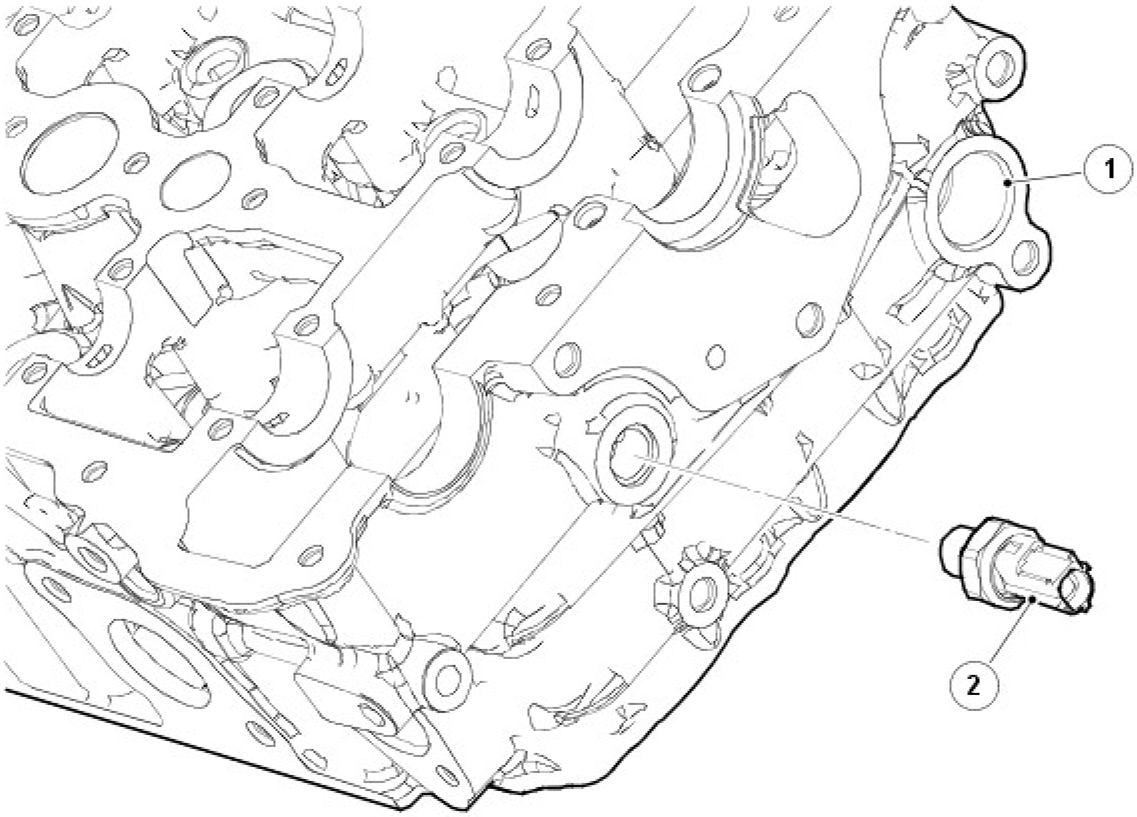
- NOTE: In service care must be taken when removing the oil filter to minimise oil drips and spillage into the engine 'vee' and cam covers.

The crankcase ventilation system ensures that all gasses emitted from the crankcase during engine running are separated from any oil particles.
For additional information, refer to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Description and Operation).

Two fuel coolers are fitted to the vehicle. One is located in the 'vee' of the engine block, and has a coolant system connection to aid heat transfer. The second cooler is a body mounted cooler located in the fuel return line on the LH side of the engine compartment and is a fuel to air cooler.

The body mounted fuel cooler uses engine coolant, direct from the lower part of the radiator, to cool fuel returning to the tank from the High Pressure (HP) injection pump.
For additional information, refer to: Fuel Tank and Lines (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Description and Operation).

Oil Pressure Switch



E79909

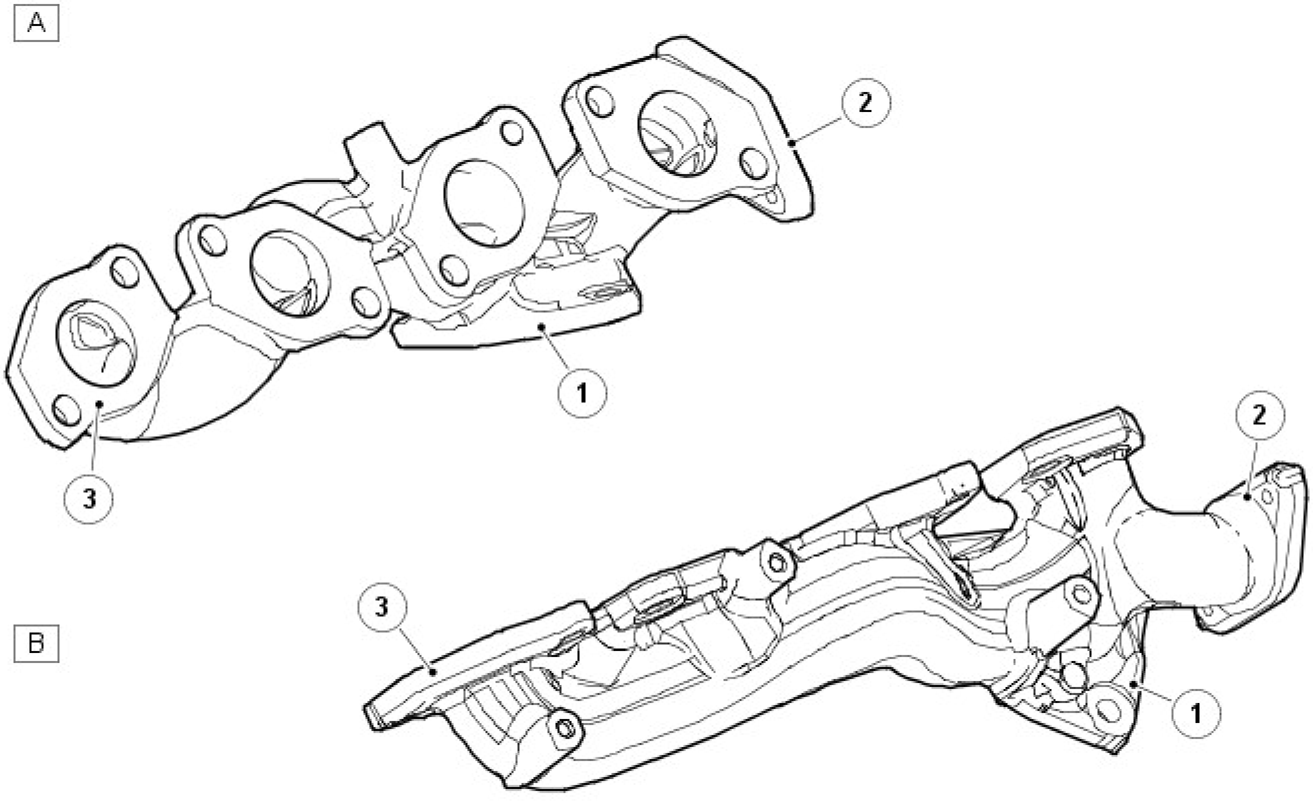
Item	Part Number	Description
1	-	RH cylinder head
2	-	Oil pressure switch

The oil pressure switch, located in the front of the RH cylinder head, connects a ground input to the instrument cluster when oil pressure is present. The switch operates at a pressure of 0.15 to 0.41 bar (2.2 to 5.9 Psi).

Oil Level Gage

The oil level gage is located towards the front RH side of the oil pan. Two holes in the end of the gage indicate the minimum and maximum oil levels. There is a difference of approximately 1 liter (1 US quart) between the 2 levels.

EXHAUST MANIFOLD



E79910

Item	Part Number	Description
A	-	LH exhaust manifold
B	-	RH exhaust maniflod
1	-	Connection for turbocharger
2	-	Connection for exhaust system
3	-	Connection for EGR cooling inlet

The cast iron exhaust manifolds are unique for each cylinder bank. They are sealed to the cylinder head by means of a steel gasket. Sacrificial plastic sleeves are used to align the manifolds. These sleeves must be changed when refitting the manifolds. Spacers on the securing bolts allow the manifolds to expand and retract with changes of temperature while maintaining the clamping loads.

Each manifold has a connection for the EGR cooling inlet pipe.

The engine is fitted with 2 electronically controlled Variable Geometry Turbochargers (VGT), which are fixed to the exhaust manifold by a 3-hole flange with a steel gasket.

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine

Diagnosis and Testing

Overview

As diagnosis of the different areas of the engine is covered in other sections and by general procedures, this section is limited to an oil pressure test and the active engine mount system.

For specific areas of the engine, refer to the general procedures in this section and the relevant section of the manual.

Inspection and Verification (general)

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
● Engine oil level ● Coolant level ● Transmission fluid level ● Fuel level ● Coolant leaks ● Oil leaks ● Fuel leaks ● Visibly damaged or worn parts ● Loose or missing nuts or bolts ● Fuel contamination/grade/quality ● Sensor fitment/condition ● Viscous fan and solenoid ● Active engine mounts, correct fitment/damage ● Routing of pipework etc to avoid vibrations ● Contact anywhere between the driveline and chassis	● Fuses - Fuse 3E, engine compartment box ● Wiring harness ● Electrical connector(s) ● Injectors ● Glow plugs ● Active engine mounts ● 5 volt sensor supply ● Sensor(s) ● Viscous fan solenoid ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Make sure that all DTCs are cleared following rectification.

Inspection and Verification (active engine mounts)

1. **1.** Verify the customer concern.
   - If the customer concern is of a vibration at **other** than idle speed, then the fault is **not** with the active engine mounts.
2. **2.** Use the approved diagnostic system or a scan tool to retrieve any fault codes, as other causes of vibration or misfire should be eliminated before condemning an active engine mount.
3. **3.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
● Active engine mounts, correct fitment/damage ● Routing of pipework etc to avoid vibrations ● Contact anywhere between the driveline and chassis	● Fuse 3E, engine compartment box ● Harnesses/connectors ● Active engine mounts ● Engine control module (ECM)

4. **4.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding.
5. **5.** If any non-engine-mount DTCs were present in the steps above, make sure their causes are rectified before beginning any work on the active engine mounts.
   - Make sure that all DTCs are cleared following rectification.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of engine control module (ECM) DTCs.
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible cause	Action
P0A1413	Engine mount control circuit A open	● Engine mount control circuit: high resistance ● Engine mount fault	Check the engine mounts and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P0A1511	Engine mount control circuit A low	● Engine mount control circuit: short circuit to ground ● Engine mount fault	Check the engine mounts and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P0A1612	Engine mount control circuit A high	● Engine mount control circuit: short circuit to power ● Engine mount fault	Check the engine mounts and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P0AB613	Engine mount control circuit B open	● Engine mount control circuit: high resistance ● Engine mount fault	Check the engine mounts and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P0AB711	Engine mount control circuit B low	● Engine mount control circuit: short circuit to ground ● Engine mount fault	Check the engine mounts and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P0AB812	Engine mount control circuit B high	● Engine mount control circuit: short circuit to power ● Engine mount fault	Check the engine mounts and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.

Oil Pressure check

• NOTE: Prior to checking the engine oil pressure, a road test of 6 miles (10 kilometers), must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle.

1. • WARNINGS:

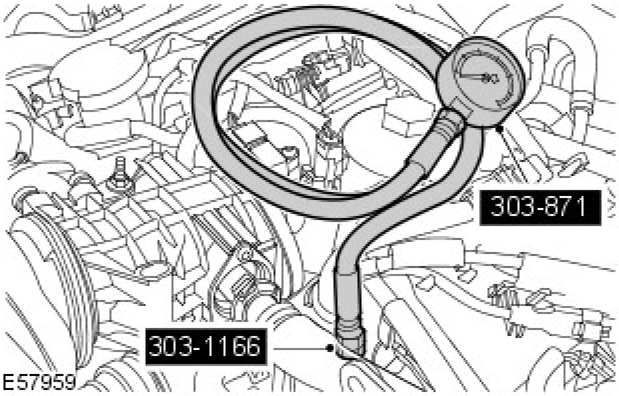
   ⚠ The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding. Failure to follow this instruction may result in personal injury.

   ⚠ Wear protective gloves.

   1. Remove the oil pressure sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

2. **2.** Install the special tool to the oil filter housing.

3. **3.** Install the special tool gauge and tighten the union.



4. **4.** Check and top-up the engine oil, if required.
5. **5.** Start and run the engine.
6. **6.** Note the oil pressure readings with the engine running at idle and at 3,500 rpm.
   REFER to: Specifications (303-01D Engine - TDV8 3.6L Diesel, Specifications).
7. **7.** Turn off the engine.
8. **8.** Remove the special tools.
9. **9.** Install the oil pressure sensor.
   REFER to: Engine Oil Pressure (EOP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
10. **10.** Check and top-up the engine oil, if required.

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine Oil Draining and Filling

General Procedures

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

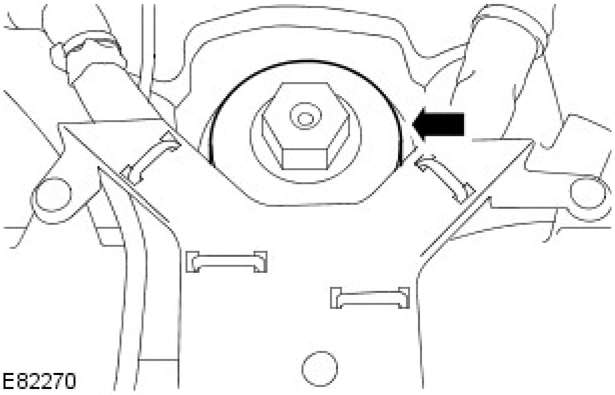
Raise and support the vehicle.

3. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

4. Loosen the oil filter cover 3 turns and allow the engine oil to drain.

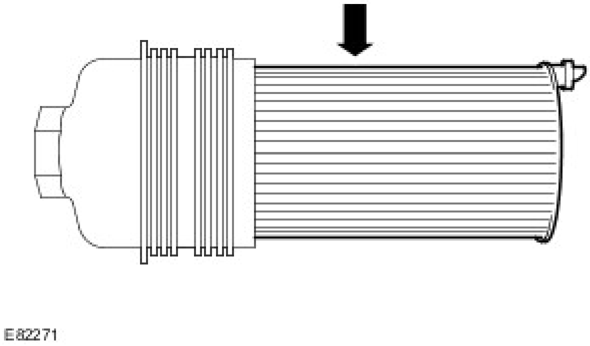
5. NOTE: Position cloth to collect fluid spillage.

Remove the oil filter cover and oil filter element.

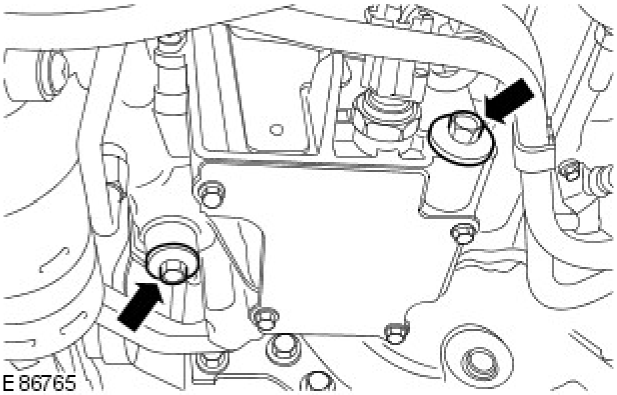


6. Remove and discard the oil filter element.

- Remove and discard the oil filter cover O-ring seal.



7. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



8. Drain the engine oil.

- Position a container to collect the engine oil.
- Remove and discard the 2 drain plugs.
- Allow the engine oil to drain.

9. Install the new drain plugs.

- Clean the component mating faces.
- Tighten the drain plugs to 23 Nm (17 lb.ft).
- Remove the container.

10. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

11. Install a new oil filter cover O-ring seal.

- Clean the components.
- Lubricate the O-ring seal with clean engine oil.

12. Install a new oil filter element to the oil filter cover.

- Lubricate the oil filter element O-ring seal with clean engine oil.

13. Install the oil filter cover and oil filter element.

- Tighten the oil filter cover to 35 Nm (26 lb.ft).

14. Fill the engine with the recommended oil to the correct level.

15. Install the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

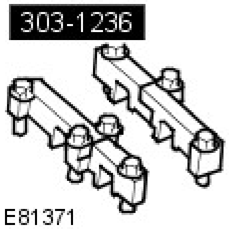
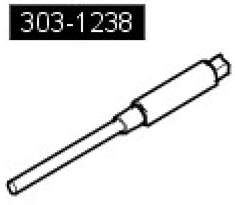
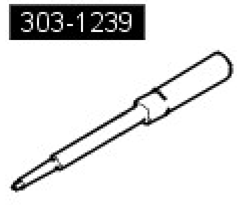
16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

17. Check and top-up the engine oil.

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Camshaft LH

In-vehicle Repair

Special Tool(s)	
 E81371	Camshaft holding tool 303-1236
 E81373	Crankshaft timing pin 303-1238
 E81374	Camshaft rotation pin 303-1239

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

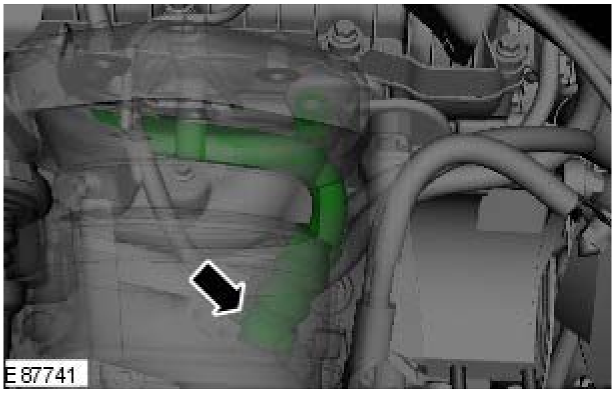
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

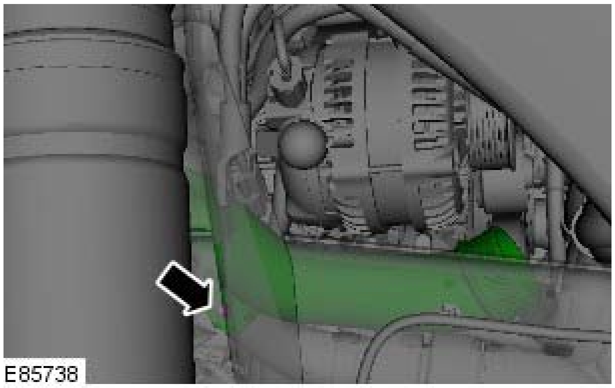
4. Remove the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

5. Remove the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and Installation).



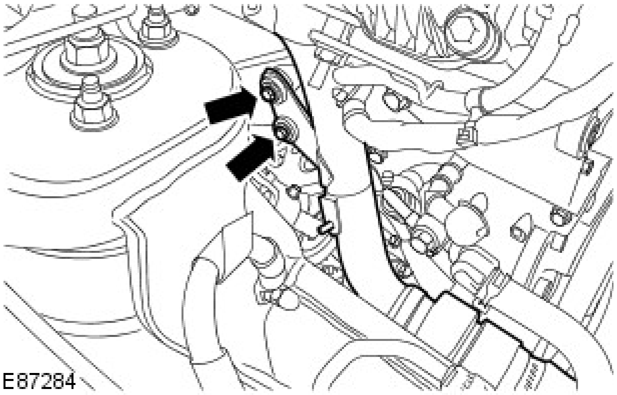
6. Disconnect the breather line.

- Release the clip.



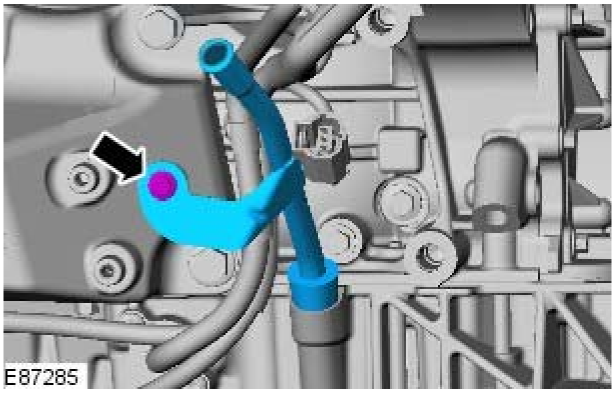
7. Remove the RH turbocharger intake tube.

- Remove the nut.



8. Release the RH turbocharger outlet pipe.

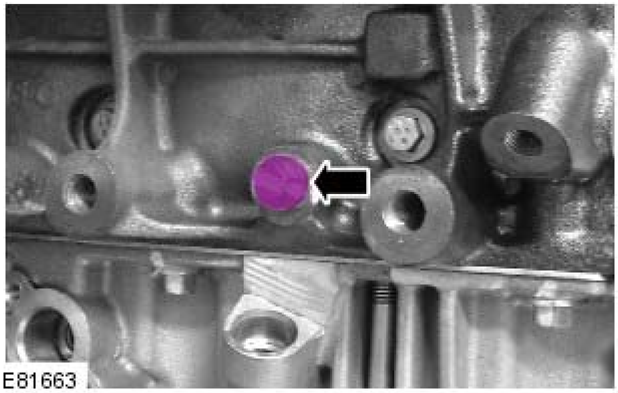
- Remove the 2 bolts.



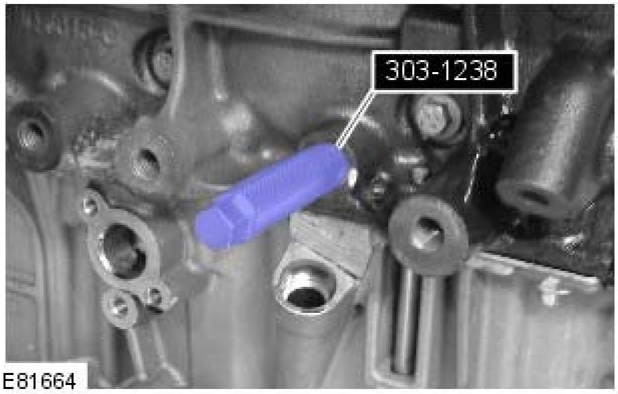
9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator lower tube.

- Remove the bolt.
- Remove and discard the O-ring seal.



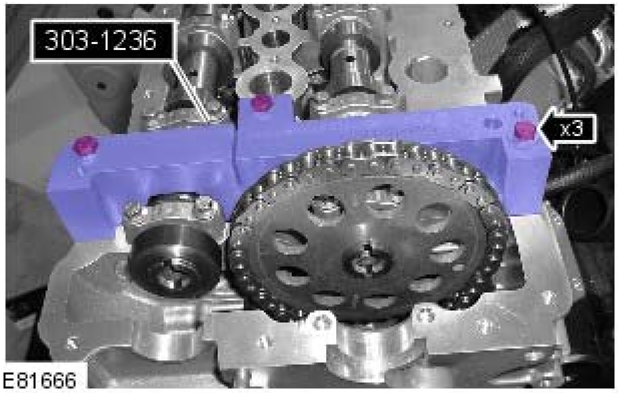
10. Remove the crankshaft timing pin plug.


303-1238
E81664

11. CAUTION: Crankshaft timing tool pistons number 2,4,7&8 are roughly at TDC as pin may lock on web instead of machined face.

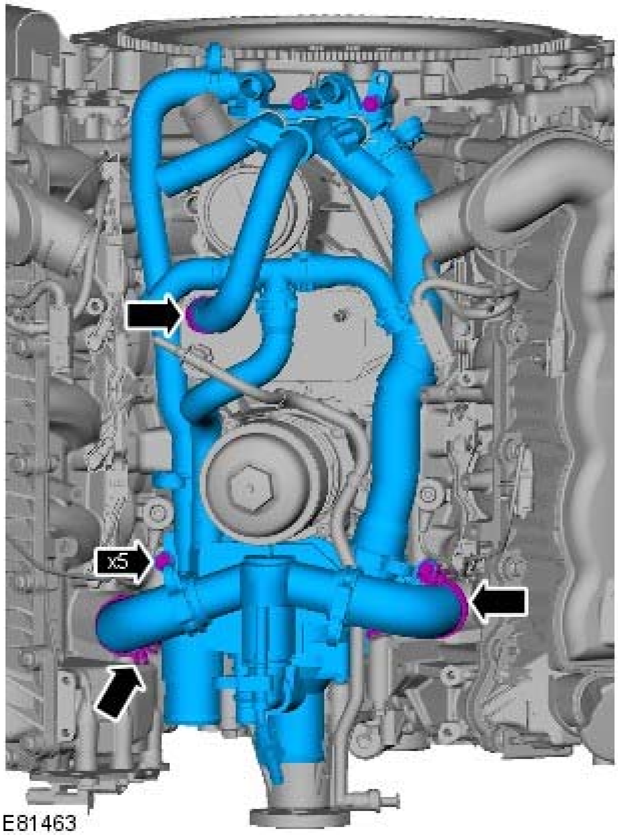
Install the special tool.

- Rotate the crankshaft on to the crankshaft timing pin.


303-1236
x3
E81666

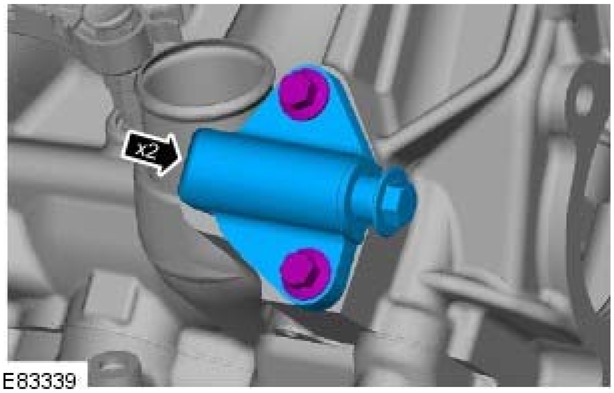
12. Install the special tools to both the LH bank and RH bank camshafts.

- Tighten the bolts to 10 Nm (7 lb.ft).



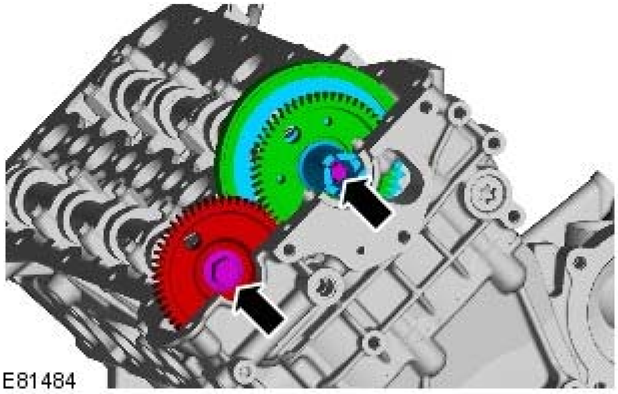
13. Release the coolant distribution manifold.

- Remove the 5 bolts.
- Release the 3 clips.
- Remove and discard the O-ring seal.



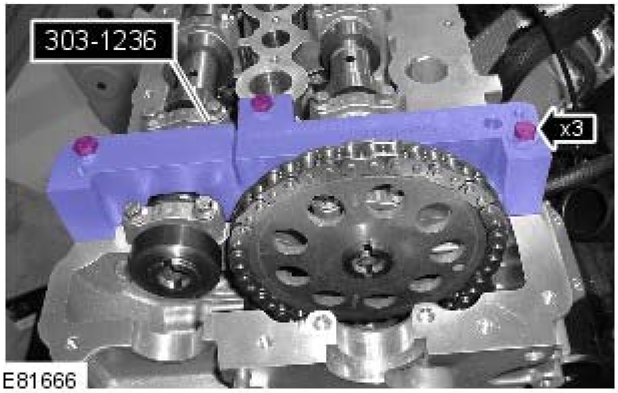
14. Remove and discard the LH hydraulic timing chain tensioner.

- Remove the 2 bolts.

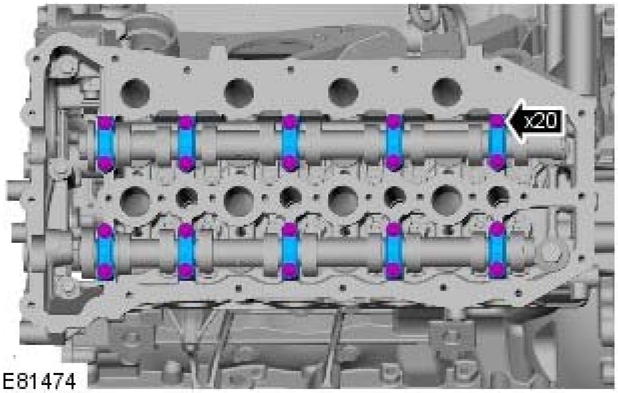


15. Remove the LH timing chain sprocket and gears.

- Remove and discard the 2 bolts.

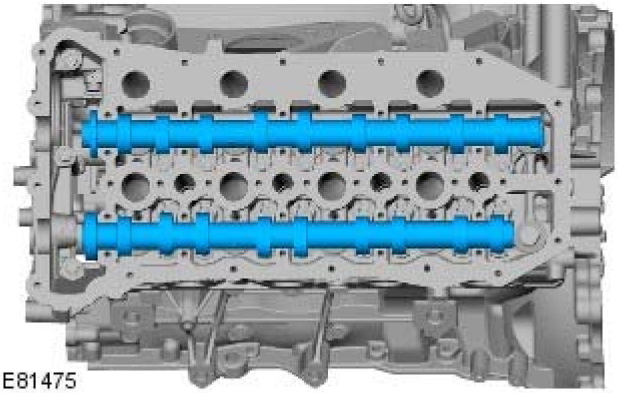


16. Remove the special tools from the LH bank camshafts.



17. Remove the LH bank camshaft bearing caps.

- Remove the 20 bolts.



18. Remove the LH bank camshafts.

Installation

1. NOTE: Make sure that all the component mating faces are clean.

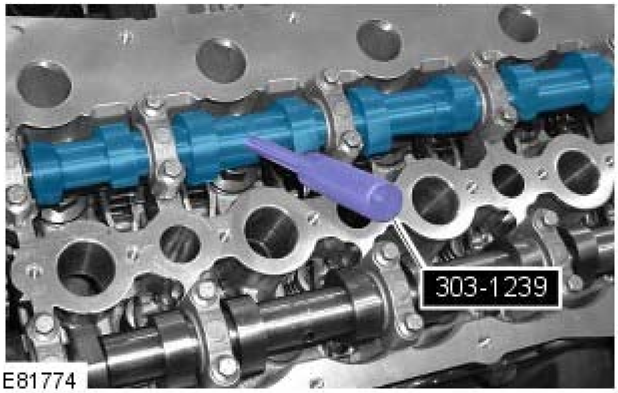
Install the LH bank camshafts.

- Lubricate the camshaft journals and camshaft lobes.

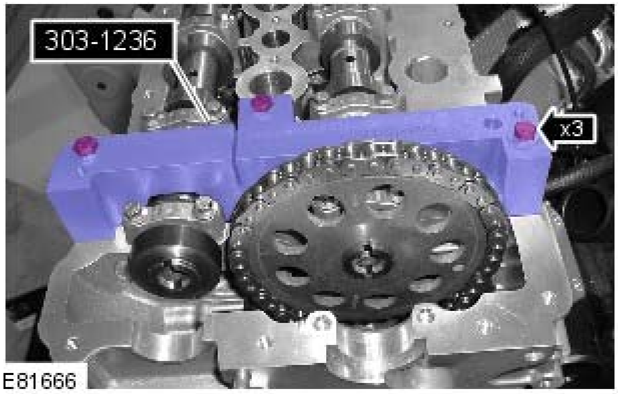
2. ⚠ CAUTION: Tighten the bolts evenly in the stages shown.

Install the LH bank camshaft bearing caps.

- Stage 1: Tighten the bolts to 1 Nm (0.7 lb.ft).
- Stage 2: Tighten the bolts to 5 Nm (3.7 lb.ft).
- Stage 3: Tighten the bolts to 10 Nm (7 lb.ft).



3. Using the special tool, rotate the camshafts and hold in the 12 o'clock position.



4. Install the special tools to the LH bank camshafts.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. ⚠ CAUTION: Do not tighten the camshaft sprocket bolts at this stage.

Install the LH timing chain sprocket and gears.

- Loosely install the new bolts.

6. NOTE: Lubricate the O-ring seals with clean engine oil.

Install a new LH hydraulic timing chain tensioner.

- Tighten the bolts to 10 Nm (7 lb.ft).

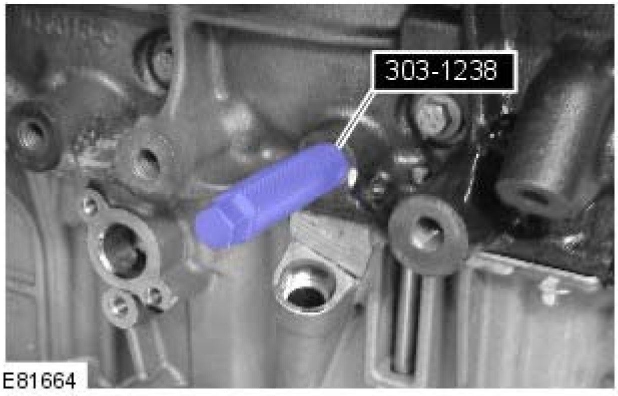
7. Release the LH hydraulic timing chain tensioner.

- Tighten the bolt to 10 Nm (7 lb.ft).

8. Tighten the LH camshaft sprocket and gears.

- Stage 1: Tighten the exhaust camshaft gear bolt to 80 Nm (59 lb.ft).
- Stage 2: Tighten the exhaust camshaft gear bolt a further 80 degrees.
- Stage 3: Tighten the intake camshaft sprocket and gear bolt to 80 Nm (59 lb.ft).
- Stage 4: Tighten the intake camshaft sprocket and gear bolt a further 80 degrees.

9. Remove the special tool.



10. Install the crankshaft timing pin plug.

11. NOTE: Remove and discard the blanking caps.

Install the oil level indicator lower tube.

- Install a new O-ring seal.
- Tighten the bolt to 10 Nm (7 lb.ft).

12. Secure the RH turbocharger outlet pipe.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Install the RH turbocharger intake tube.

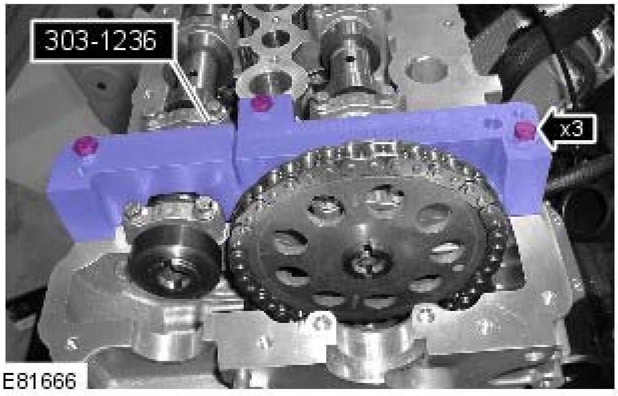
- Tighten the nut to 10 Nm (7 lb.ft).

14. Connect the breather line.

- Secure the clip.

15. Install the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and Installation).

16. Remove the special tools from the LH and RH bank camshafts.



17. NOTE: Lubricate the O-ring seal with clean coolant.

Secure the coolant distribution manifold.

- Install a new O-ring seal.
- Tighten the bolts to 10 Nm (7 lb.ft).

18. Install the RH valve cover.

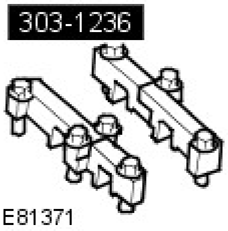
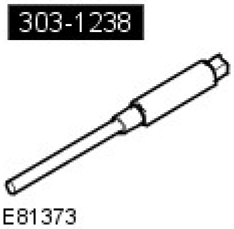
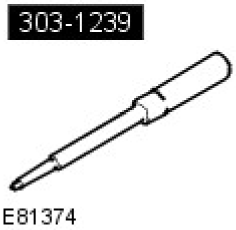
For additional information, refer to: Valve Cover RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

19. Install the LH valve cover.
   For additional information, refer to: Valve Cover LH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).
20. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Camshaft RH

In-vehicle Repair

Special Tool(s)	
	Camshaft holding tool 303-1236
	Crankshaft timing pin 303-1238
	Camshaft rotation pin 303-1239

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

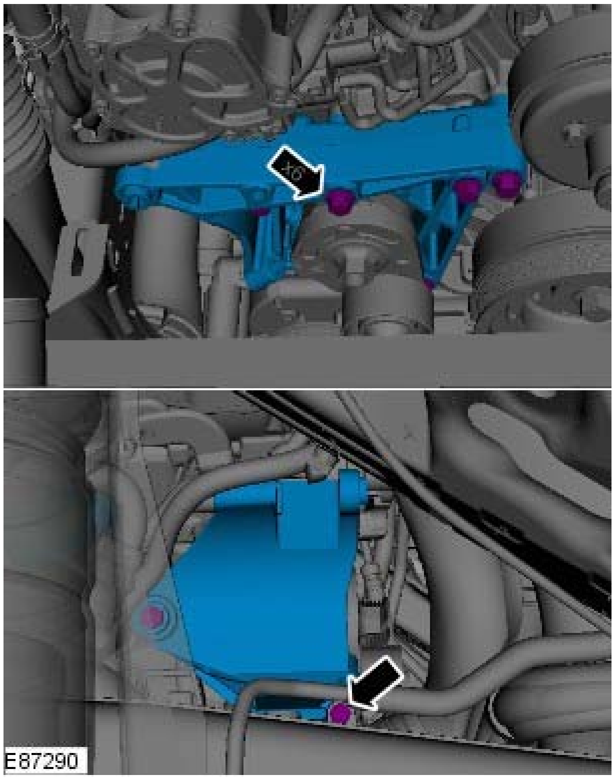
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

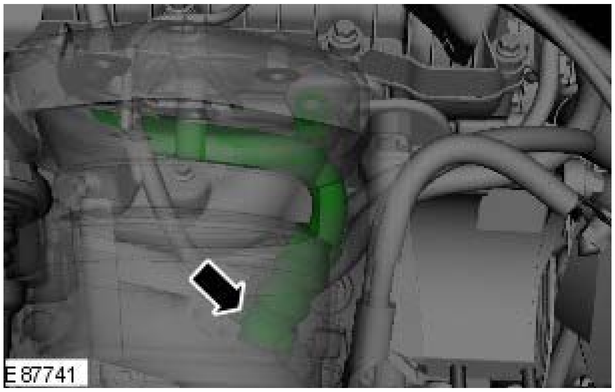
4. Remove the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

5. Remove the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and Installation).



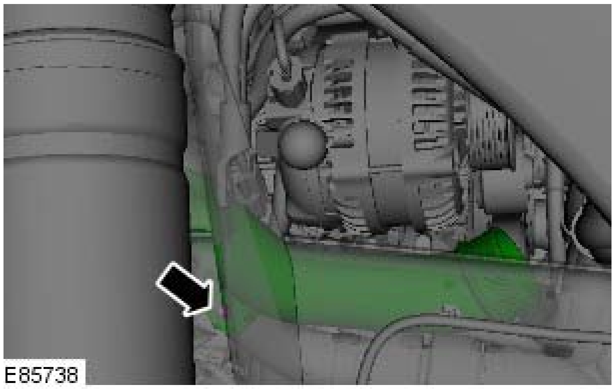
E87290

6. Remove the generator mounting bracket.
    - Remove the fluid pump upper bolt.
    - Remove the 6 bolts.



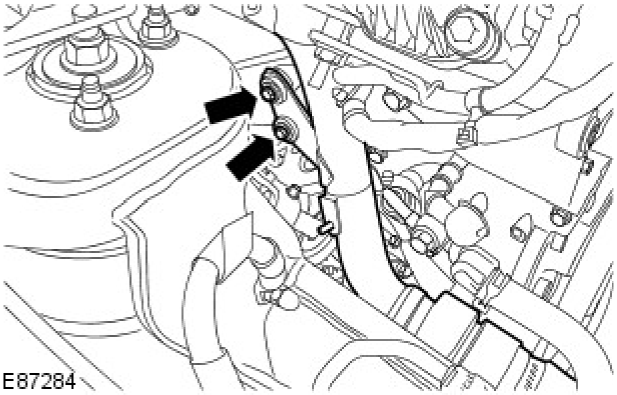
E87741

7. Disconnect the breather line.
    - Release the clip.



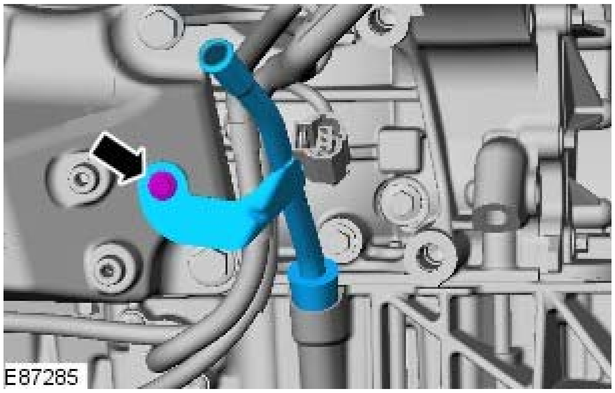
E85738

8. Remove the RH turbocharger intake tube.
    - Remove the nut.



9. Release the RH turbocharger outlet pipe.

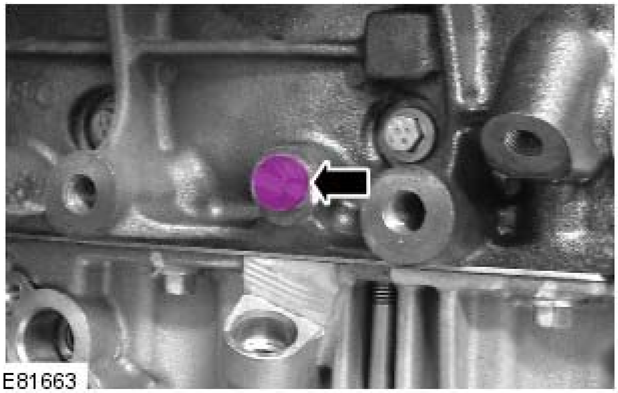
- Remove the 2 bolts.



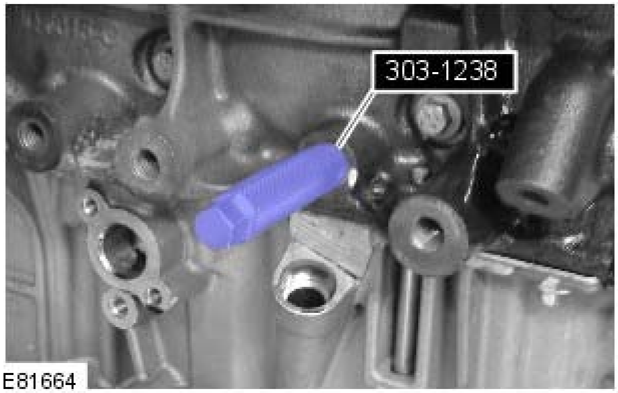
10. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator lower tube.

- Remove the bolt.
- Remove and discard the O-ring seal.



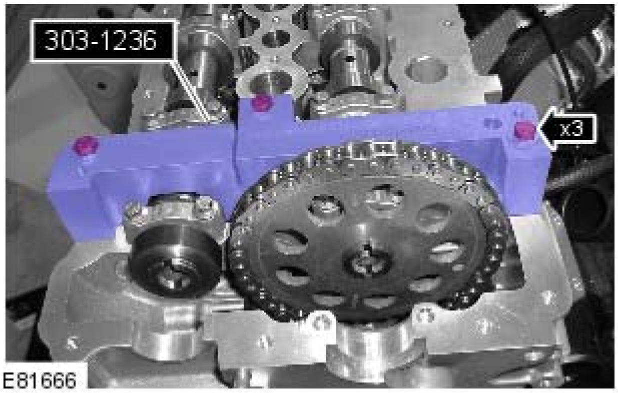
11. Remove the crankshaft timing pin plug.



12. ⚠CAUTION: Crankshaft timing tool pistons number 2,4,7&8 are roughly at TDC as pin may lock on web instead of machined face.

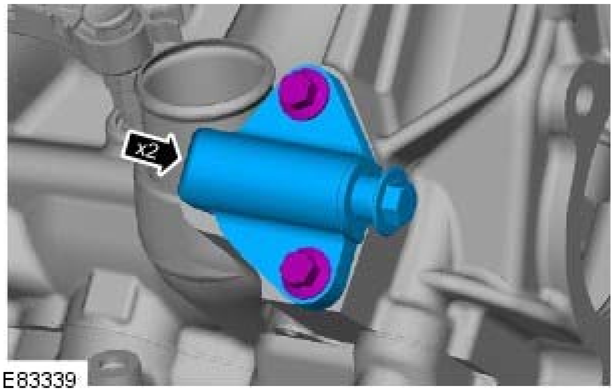
Install the special tool.

- Rotate the crankshaft on to the crankshaft timing pin.


303-1236
x3
E81666

13. Install the special tools to both the LH bank and RH bank camshafts.

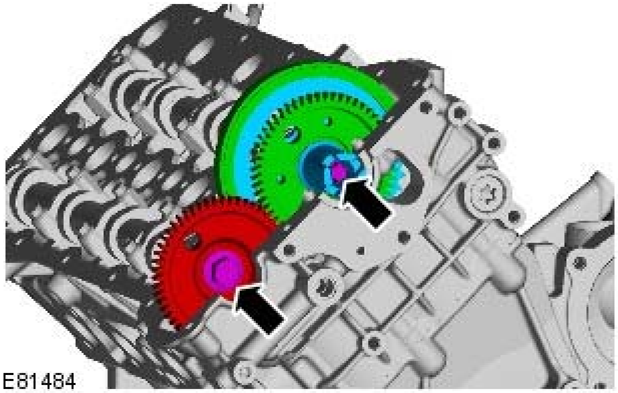
- Tighten the bolts to 10 Nm (7 lb.ft).



14. NOTE: LH illustration shown, RH is similar.

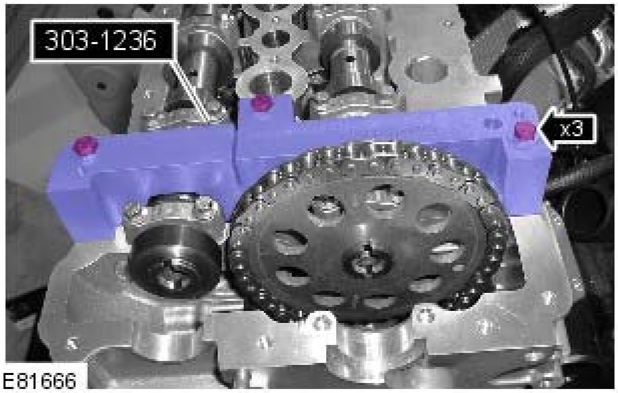
Remove and discard the RH hydraulic timing chain tensioner.

- Remove the 2 bolts.

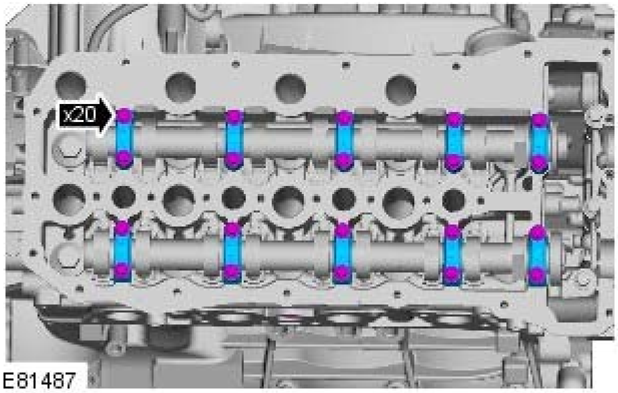


15. Remove the RH timing chain sprocket and gears.

- Remove and discard the 2 bolts.
- Remove the vacuum pump drive gear.

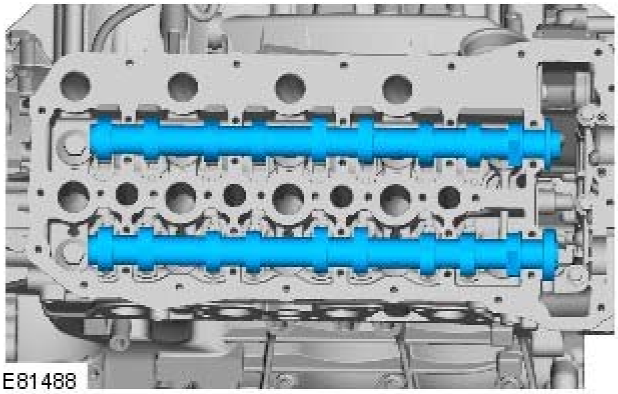

303-1236
x3
E81666

16. Remove the special tools from the RH bank camshafts.



17. Remove the RH bank camshaft bearing caps.

- Remove the 20 bolts.



18. Remove the RH bank camshafts.

Installation

1. NOTE: Make sure that all the component mating faces are clean.

Install the RH bank camshafts.

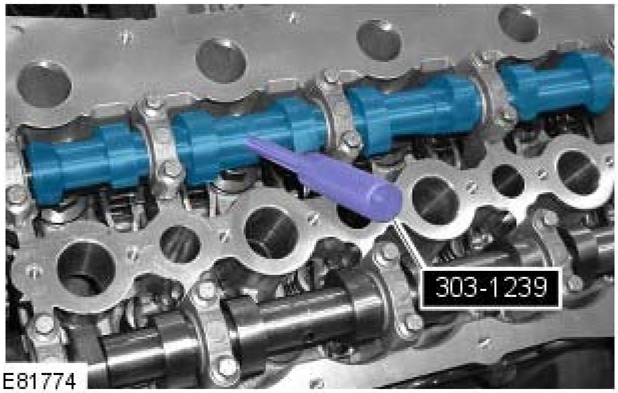
- Lubricate the camshaft journals and camshaft lobes.

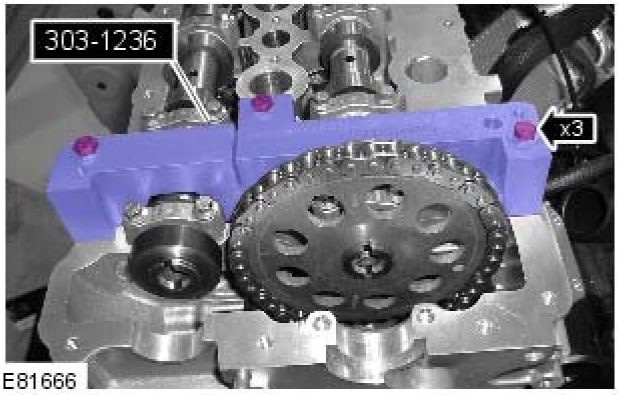
2. ⚠ CAUTION: Tighten the bolts evenly in the stages shown.

Install the RH bank camshaft bearing caps.

- Stage 1: Tighten the bolts to 1 Nm (1 lb.ft).
- Stage 2: Tighten the bolts to 5 Nm (4 lb.ft).
- Stage 3: Tighten the bolts to 10 Nm (7 lb.ft).

3. Using the special tool, rotate the camshafts and hold in the 12 o'clock position.





4. Install the special tools to the RH bank camshafts.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. ⚠ CAUTION: Do not tighten the camshaft sprocket bolts at this stage.

Install the RH timing chain sprocket and gears.

- Install the brake vacuum pump drive gear.
- Loosely install the new bolts.

6. NOTE: Lubricate the O-ring seals with clean engine oil.

Install a new RH hydraulic timing chain tensioner.

- Tighten the bolts to 10 Nm (7 lb.ft).

7. Release the RH hydraulic timing chain tensioner.

- Tighten the bolt to 10 Nm (7 lb.ft).

8. Tighten the RH camshaft sprocket and gears.

- Stage 1: Tighten the exhaust camshaft gear bolt to 80 Nm (59 lb.ft).
- Stage 2: Tighten the exhaust camshaft gear bolt a further 80 degrees.
- Stage 3: Tighten the intake camshaft sprocket and gear bolt to 80 Nm (59 lb.ft).
- Stage 4: Tighten the intake camshaft sprocket and gear bolt a further 80 degrees.

9. Remove the special tool.

10. Install the crankshaft timing pin plug.

11. NOTE: Remove and discard the blanking caps.

Install the oil level indicator lower tube.

- Install a new O-ring seal.
- Tighten the bolt to 10 Nm (7 lb.ft).

12. Secure the RH turbocharger outlet pipe.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Install the RH turbocharger intake tube.

- Tighten the nut to 10 Nm (7 lb.ft).

14. Connect the breather line.

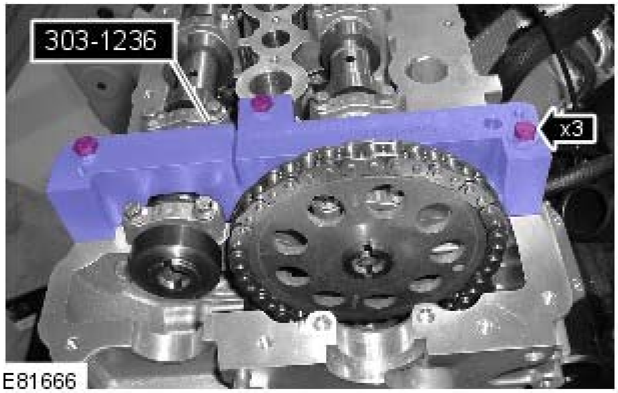
- Secure the clip.

15. Install the generator mounting bracket.

- Tighten the M10 bolts to 45 Nm (33 lb.ft).
- Tighten the M12 bolt to 80 Nm (59 lb.ft).
- Tighten the fluid pump upper bolt to 25 Nm (18 lb.ft).

16. Install the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and Installation).

17. Remove the special tools from the LH and RH bank camshafts.



18. Install the RH valve cover.
For additional information, refer to: Valve Cover RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

19. Install the LH valve cover.
For additional information, refer to: Valve Cover LH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

20. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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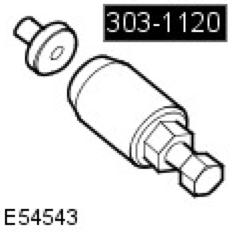
Engine - TDV8 3.6L Diesel - Crankshaft Front Seal

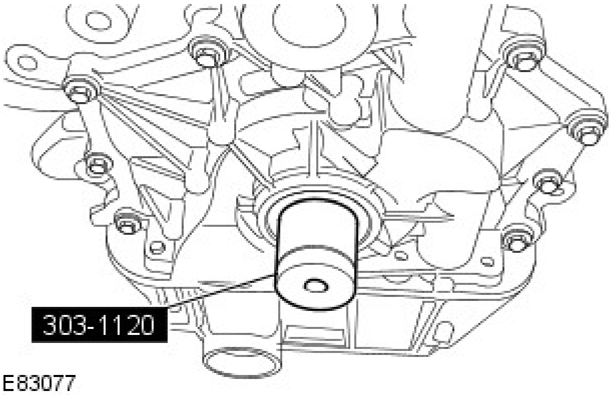
In-vehicle Repair

Special Tool(s)	
	Crankshaft Front Seal Remover 303-1120

Removal

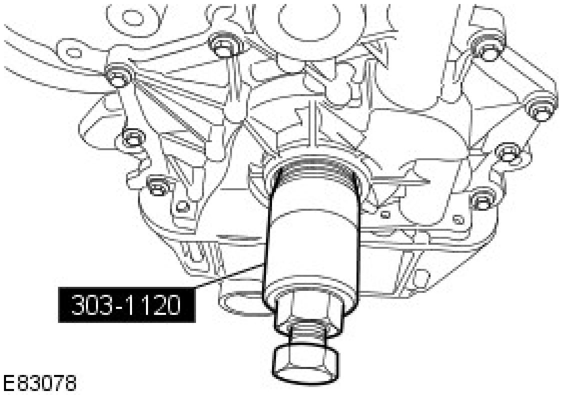
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the crankshaft pulley.
   For additional information, refer to: Crankshaft Pulley (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).



E83077

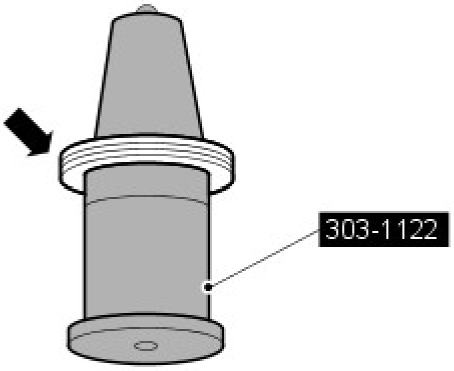
3. Install the special tool to the crankshaft.



E83078

4. Using the special tool, remove the crankshaft front seal.
   - Remove the special tool.
   - Remove and discard the crankshaft front seal from the special tool.

Installation



E54300

1. NOTE: Make sure that the transit sleeve is correctly in place and install the new seal over the crankshaft. Do not use any lubricant on the seal, the transit sleeve or the crankshaft.

- NOTE: Make sure that all the component mating faces are clean.

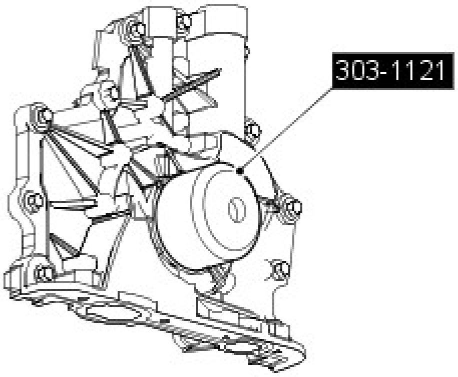
Install a new crankshaft front seal to the special tool.

2. Remove the sleeve from the special tool.

- Reposition the crankshaft front seal along the special tool.

3. Using the special tool, install a new crankshaft front seal.

- Use the discarded crankshaft bolt with the service tool.



E83079

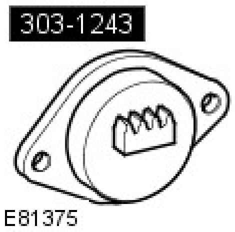
4. Install the crankshaft pulley.
For additional information, refer to: Crankshaft Pulley (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

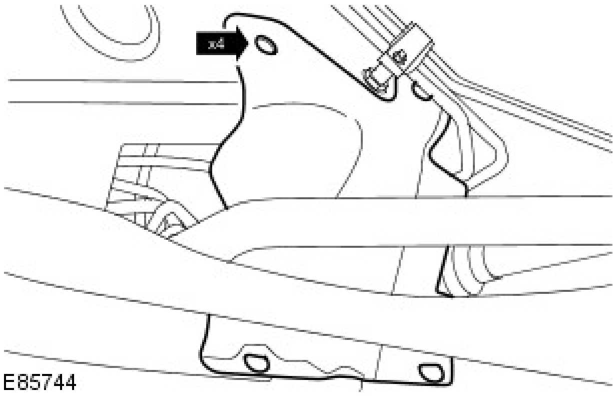
Engine - TDV8 3.6L Diesel - Crankshaft Pulley

In-vehicle Repair

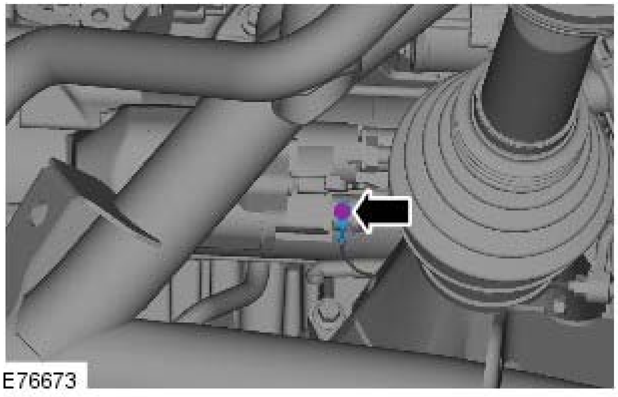
Special Tool(s)	
	Flexplate locking tool 303-1243

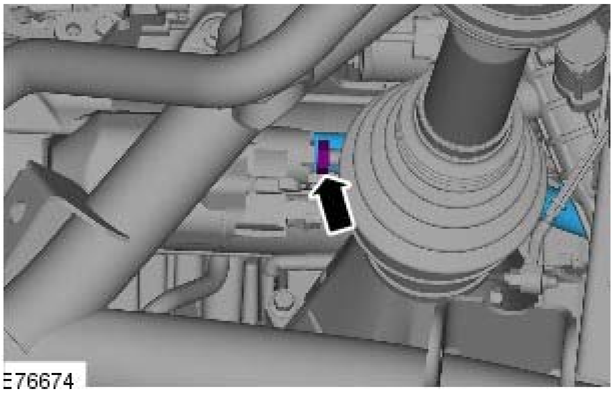
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Remove the cooling fan belt.
   For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).
4. Remove the RH splash shield.
   - Remove the 4 clips.



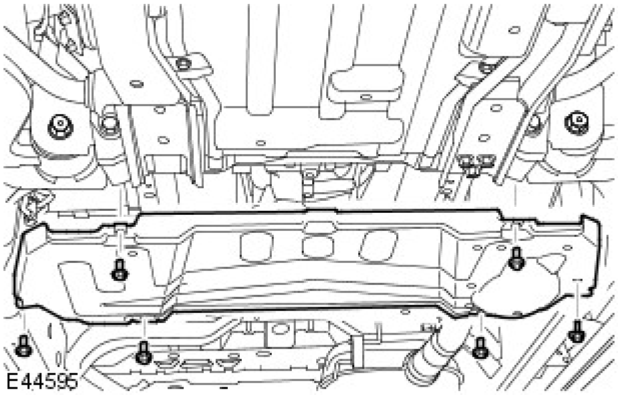
5. Disconnect the switch lead from the starter motor solenoid.
   - Remove the bolt.





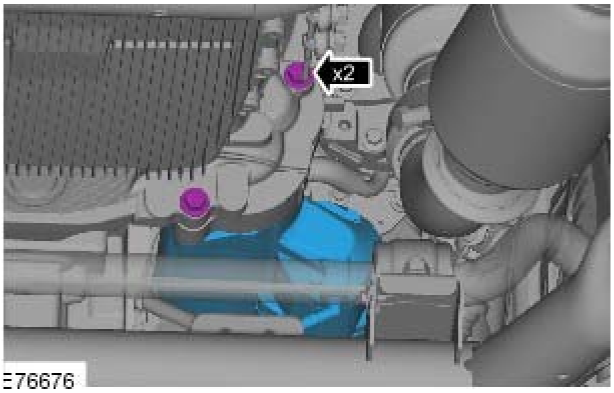
6. Disconnect the 2 battery positive cables from the starter motor solenoid.

- Remove the nut.



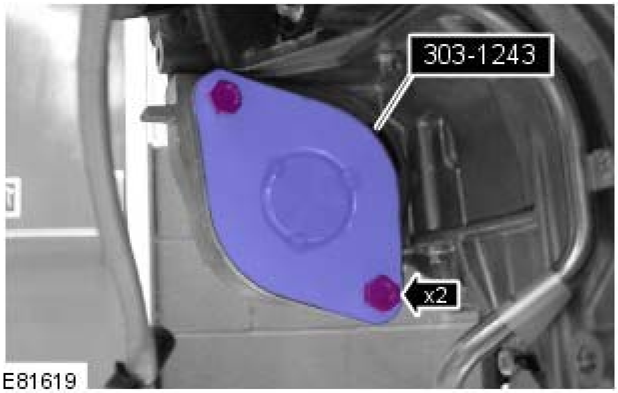
7. Remove the transmission undershield.

- Remove the 6 bolts.

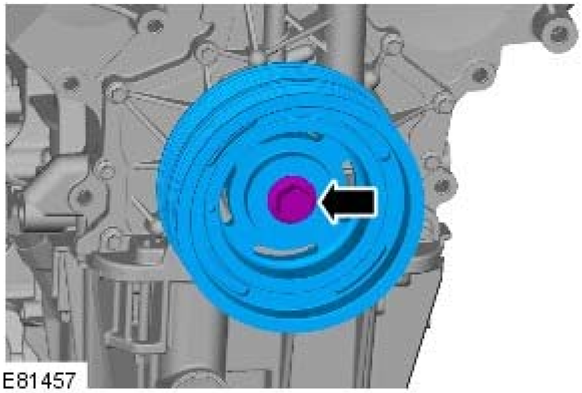


8. Reposition the starter motor.

- Remove the 2 bolts.


303-1243
x2
E81619

9. Install the special tool.



E81457

10. NOTE: The crankshaft pulley bolt will be very tight.

Remove the crankshaft pulley.

- Remove and discard the bolt.

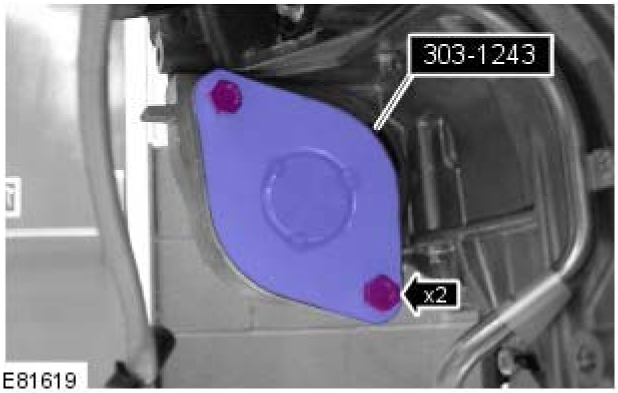
Installation

1. CAUTION: Make sure that the washer is installed between the nose of the crankshaft and the crankshaft pulley.

Install the crankshaft pulley.

- Clean the component mating faces.
- A new crankshaft pulley bolt must be installed.
- Stage 1: Tighten the bolt to 140 Nm (103 lb.ft).
- Stage 2: Tighten the bolt a further 90 degrees.

2. Remove the special tool.



E81619

3. Secure the starter motor.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

4. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Connect the battery positive cable.

- Tighten the nut to 22 Nm (16 lb.ft).

6. Connect the switch lead to the starter motor solenoid.

- Tighten the nut to 4 Nm (3 lb.ft).

7. Install the RH splash shield.

- Install the clips.

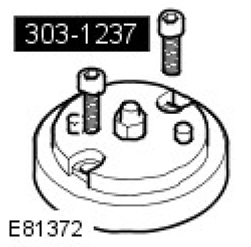
8. Install the cooling fan belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Crankshaft Rear Seal

In-vehicle Repair

Special Tool(s)	
	Installer - Crankshaft Position (CKP) Sensor Ring 303-1237

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

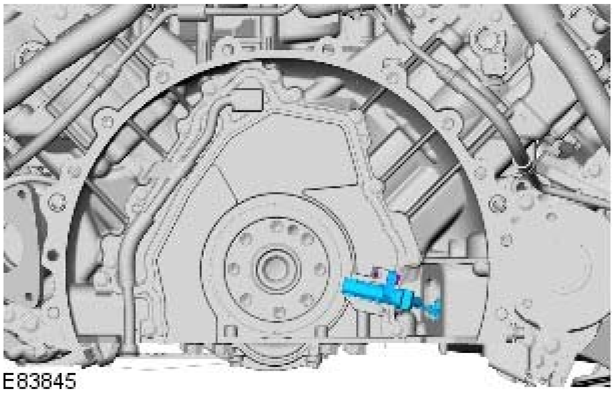
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the oil pan.
For additional information, refer to: Oil Pan (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

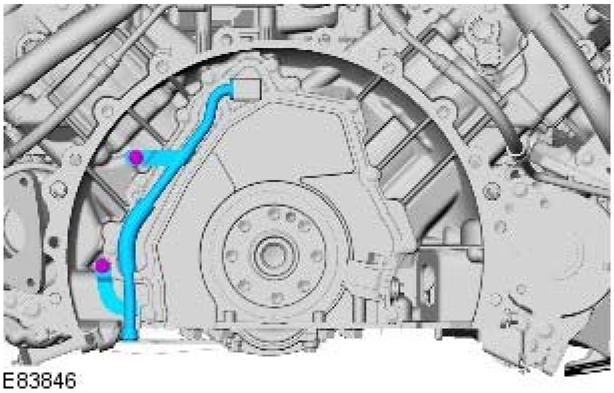
4. Remove the crankshaft position (CKP) sensor.

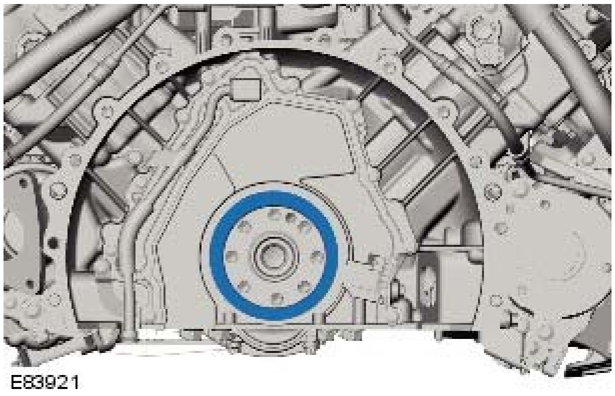
- Remove the bolt.



5. Remove the engine oil return line.

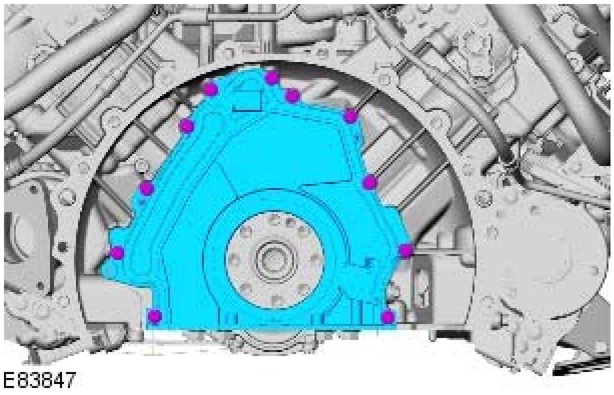
- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.





6. ⚠CAUTION: Care must be taken to avoid damage to the crankshaft.

Remove and discard the CKP sensor ring.



7. Remove and discard the rear crankshaft oil seal.

- Remove the 11 bolts.

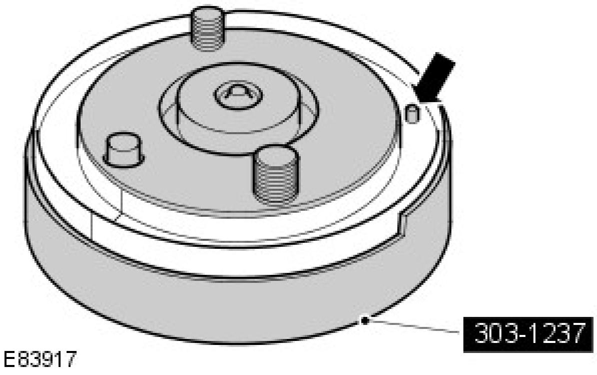
Installation

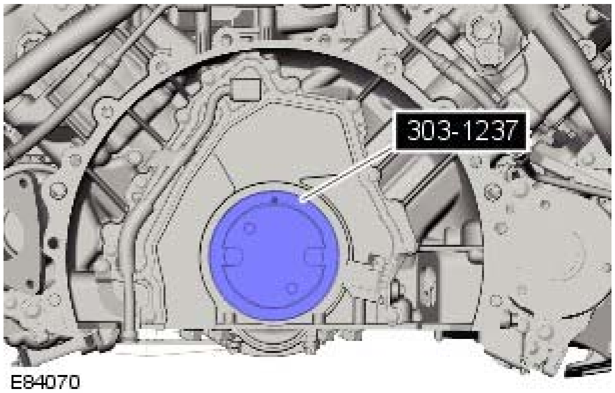
1. Install a new rear crankshaft oil seal.

- Clean the component mating faces.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install a new CKP sensor ring to the special tool.

- Wind the special tool nut back to the end of the thread.
- Engage the CKP sensor ring to the locating pin.





3. Install the CKP sensor ring to the crankshaft.

- Clean the component mating faces.
- Align the dowel and install the special tool to the crankshaft.
- Tighten the 2 bolts.
- Tighten the special tool nut, to install the CKP sensor ring to the crankshaft.
- Remove the special tool.

4. NOTE: Lubricate the O-ring seals with clean engine oil.

Install the engine oil return line.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Install the CKP sensor.

- Tighten the bolt to 5 Nm (4 lb.ft).

6. Install the oil pan.
For additional information, refer to: Oil Pan (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Cylinder Head LH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

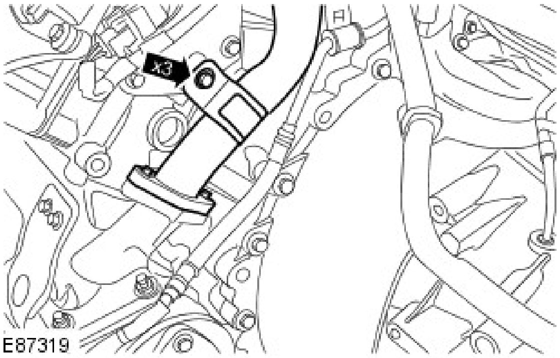
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

4. Remove the LH camshafts.
For additional information, refer to: Camshaft LH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

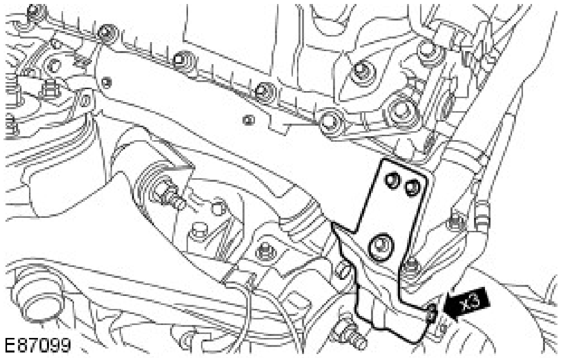
5. Remove the LH exhaust gas recirculation (EGR) valve and cooler assembly.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).



E87319

6. Remove the LH EGR valve inlet tube.

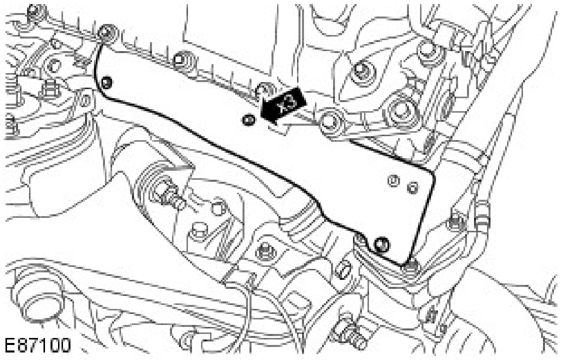
- Remove the 3 bolts.
- Remove and discard the gasket.



E87099

7. Remove the LH turbocharger heat shield.

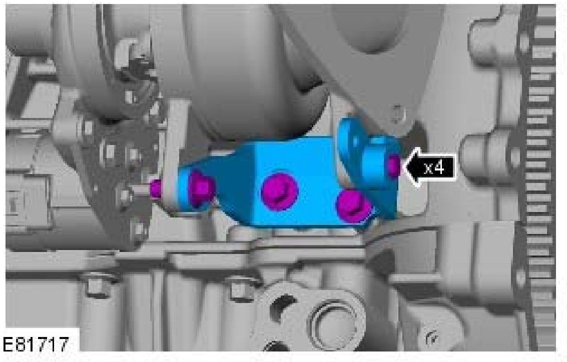
- Remove the 3 bolts.



E87100

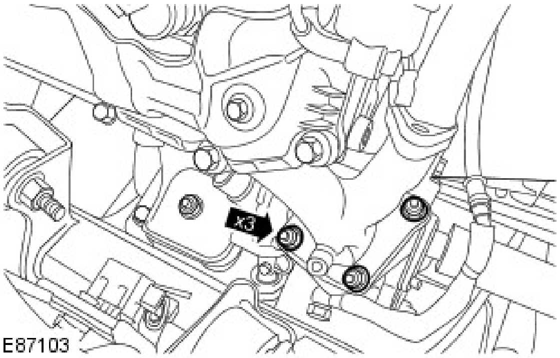
8. Remove the LH exhaust manifold heat shield.

- Remove the 3 bolts.



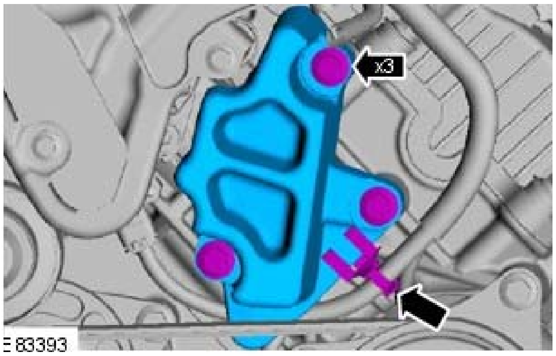
9. Loosen the turbocharger support bracket.

- Loosen the 4 bolts.



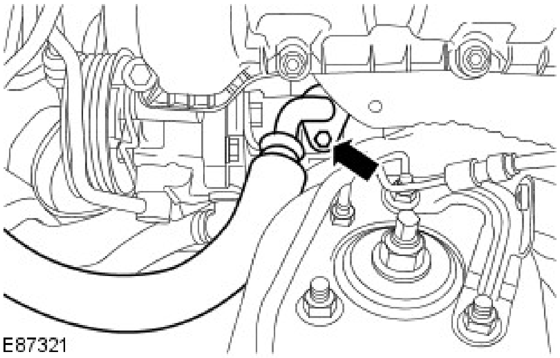
10. Release the LH turbocharger.

- Remove and discard the 3 nuts.



11. Remove the fuel pump crash protector.

- Release the engine wiring harness.
- Remove the 3 bolts.



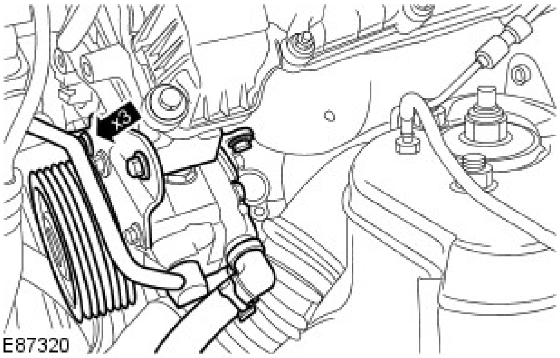
12. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the air conditioning (A/C) compressor low-pressure refrigerant line.

- Remove the bolt.
- Remove and discard the O-ring seal.

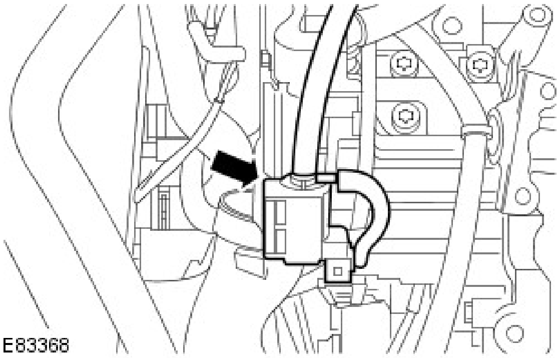
13. Release the cooling fan belt from the power steering pump pulley.

- Release the tension from the belt.

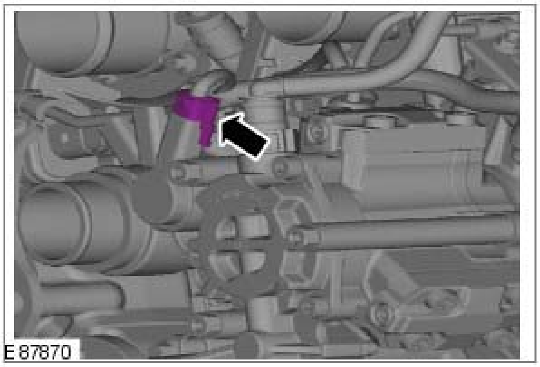


14. Release the power steering pump and mounting bracket.

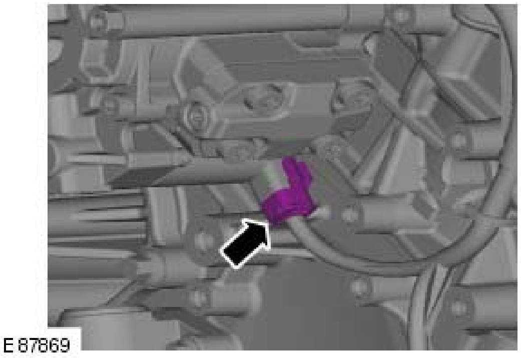
- Remove the 3 bolts.



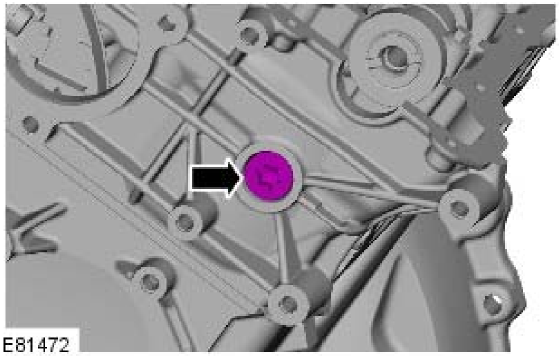
15. Release the vacuum solenoid.



16. Disconnect the fuel pressure regulator electrical connector.

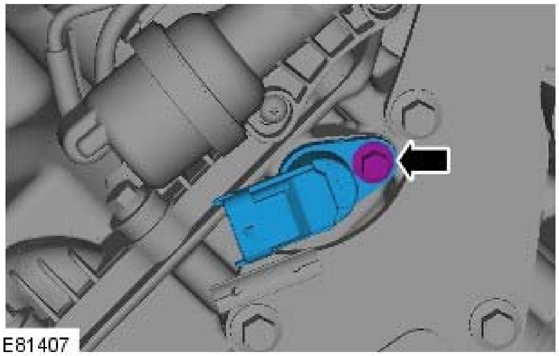


17. Disconnect the fuel metering valve electrical connector.



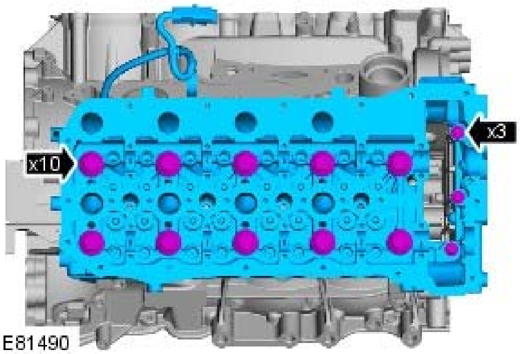
18. Remove the LH timing chain tensioner guide pin.

- Remove and discard the O-ring seal.



19. Remove the camshaft position (CMP) sensor.

- Remove the bolt.
- Remove and discard the O-ring seal.



20. CAUTIONS:

⚠ The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that no damage occurs to the timing chain and timing chain guides.

With assistance, remove the cylinder head assembly.

- Remove and discard the 13 bolts.
- Remove and discard the gasket.

21. Remove and discard the turbocharger gasket.

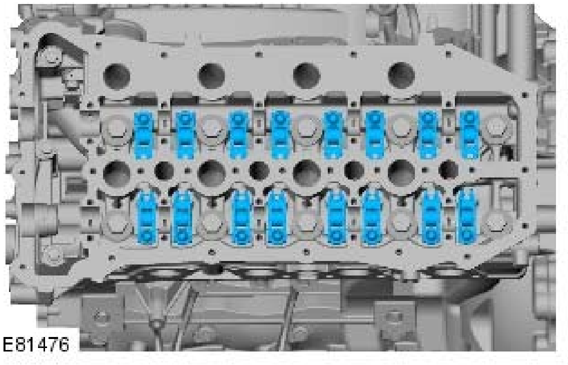
22. NOTE: Do not disassemble further if the component is removed for access only.

Remove the fuel pump.

- Remove the 3 bolts.
- Remove and discard the gasket.

23. Remove the exhaust manifold.

- Remove and discard the 8 nuts.
- Remove and discard the gasket.



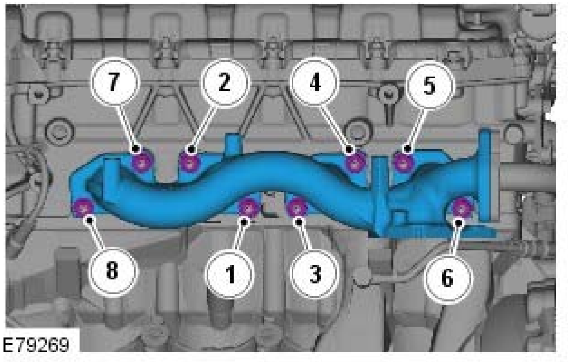
24. Remove the hydraulic adjuster and rocker assemblies.

Installation

1. NOTE: Make sure that all the components are clean.

• NOTE: Lubricate the hydraulic adjuster and rocker assemblies with clean engine oil.

Install the hydraulic adjuster and rocker assemblies.



2. ⚠CAUTION: To make sure that the exhaust manifold is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

• NOTE: Tighten the nuts in the sequence shown.

Install the exhaust manifold.

- Install the new gasket.
- Clean the component mating face.
- Stage 1: Tighten the new nuts to 23 Nm (17 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).

3. Install the fuel pump.

- Clean the component mating faces.
- Install a new gasket.
- Apply loctite 572 to the fuel pump bolt threads.
- Loosely install the bolts.

4. Install a new turbocharger gasket.

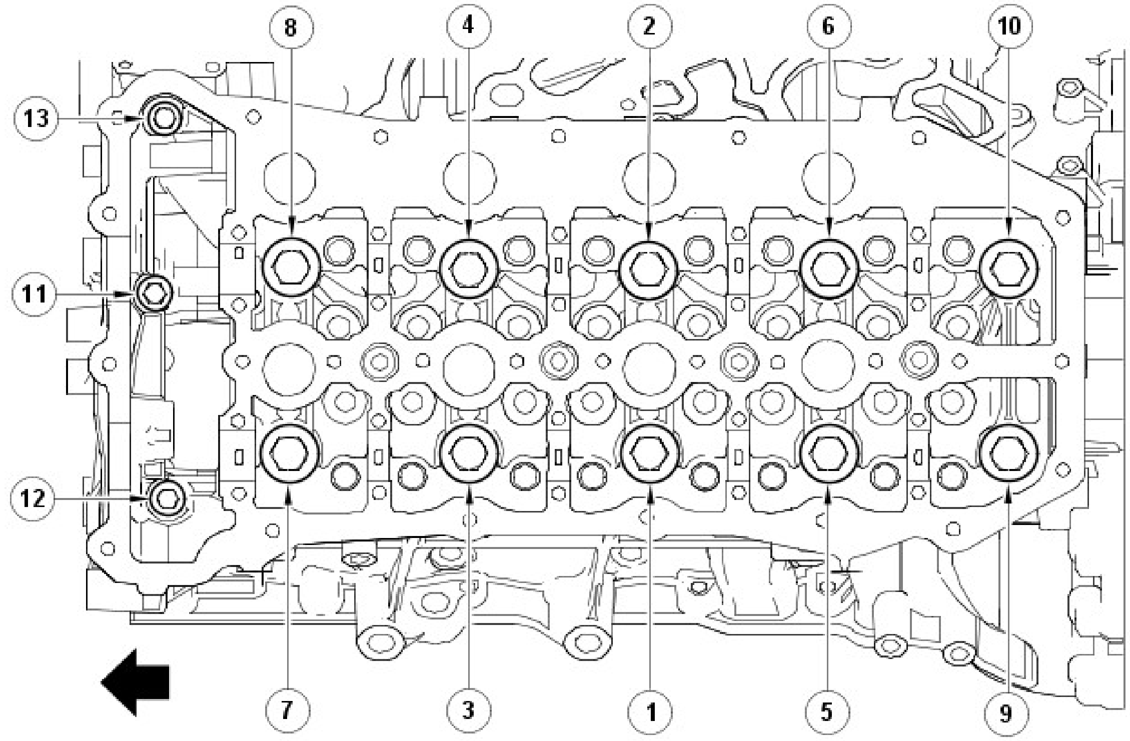
- Clean the components mating faces.

5. NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

Install a new LH cylinder head gasket.

- Clean the component mating face.

6. Check cylinder head face for distortion, across the center and from corner to corner.



E83621

7. CAUTIONS:

⚠ Tighten the bolts in the sequence shown.

⚠ Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

⚠ Make sure that no damage occurs to the timing chain and timing chain guides.

• NOTE: Make sure the cylinder head is installed in its original position.

With assistance, install the cylinder head assembly.

- Clean the component mating faces.
- Stage 1: Tighten the M13 bolts to 20 Nm (15 lb.ft).
- Stage 2: Tighten the M13 bolts to 40 Nm (30 lb.ft).
- Stage 3: Tighten the M13 bolts to 80 Nm (59 lb.ft).
- Stage 4: Tighten the M13 bolts a further 180 degrees.
- Stage 5: Tighten the M8 bolts to 20 Nm (15 lb.ft).

8. Install the CMP sensor.

- Install a new O-ring seal.
- Tighten the bolt to 10 Nm (7 lb.ft).

9. NOTE: Lubricate the O-ring seal with clean engine oil.

Install the LH timing chain tensioner guide pin.

- Install a new O-ring seal.
- Tighten to 28 Nm (21 lb.ft).

10. Connect the fuel metering valve electrical connector.

11. Connect the fuel pressure regulator electrical connector.

12. Secure the vacuum solenoid.

13. Secure the power steering pump and mounting bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).

14. NOTE: Make sure that the cooling fan belt is correctly located on each pulley.

Secure the cooling fan belt around the power steering pump pulley.

15. NOTE: Remove and discard the blanking caps.

Connect the A/C compressor low-pressure refrigerant line.

- Install a new O-ring seal.
- Install the bracket.
- Tighten the bolt to 23 Nm (17 lb.ft).

16. Install the fuel pump crash protector.

- Tighten the bolts to 23 Nm (17 lb.ft).
- Secure the engine wiring harness.

17. ⚠ WARNING: Make sure that new nuts are installed.

Secure the LH turbocharger.

- Tighten the nuts to 24 Nm (18 lb.ft).

18. Secure the LH turbocharger support bracket.

- Stage 1: Tighten the LH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).
- Stage 2: Tighten the LH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).

19. Check tightness of the turbocharger nuts.

- Tighten the nuts to 24 Nm (18 lb.ft).

20. Install the LH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

21. Install the LH turbocharger heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

22. Install the LH EGR valve inlet tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

23. Install the LH EGR valve and cooler assembly.

For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

24. Install the LH camshafts.
For additional information, refer to: Camshaft LH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

25. Install the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

26. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Cylinder Head RH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

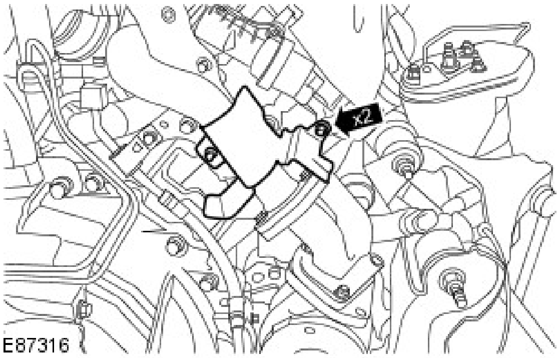
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

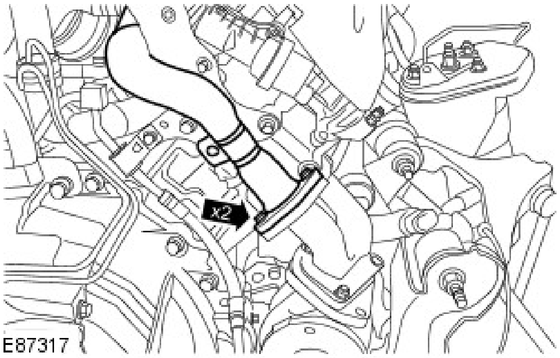
4. Remove the RH camshafts.
For additional information, refer to: Camshaft RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

5. Remove the RH exhaust gas recirculation (EGR) valve and cooler assembly.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).



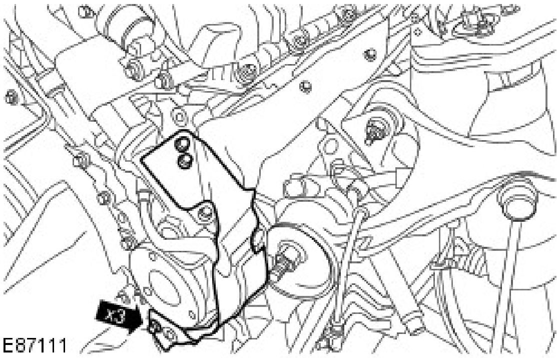
6. Remove the RH EGR valve inlet tube heat shield.

- Remove the 2 bolts.



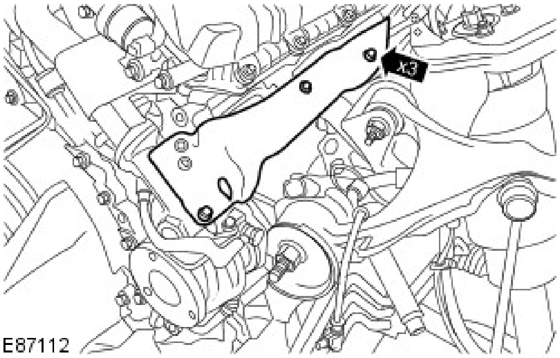
7. Remove the RH EGR valve inlet tube.

- Remove the 2 bolts.
- Remove and discard the gasket.



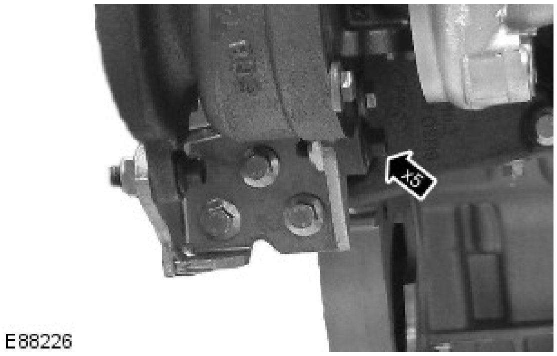
8. Remove the RH turbocharger heat shield.

- Remove the 3 bolts.



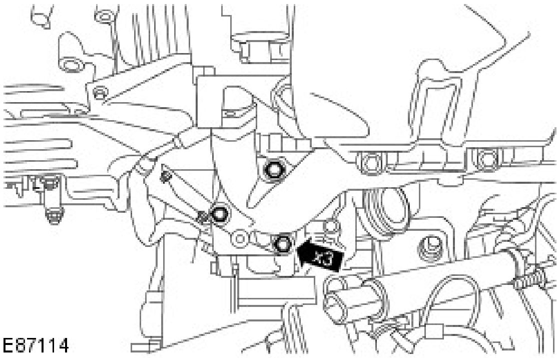
9. Remove the RH exhaust manifold heat shield.

- Remove the 3 bolts.



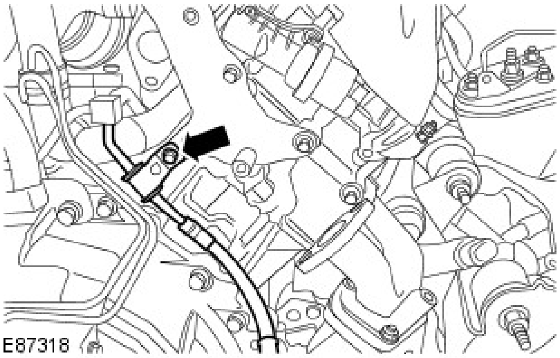
10. Loosen the turbocharger support bracket.

- Loosen the 5 bolts.



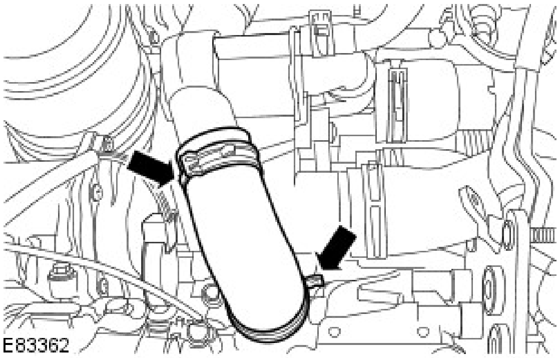
11. Release the RH turbocharger.

- Remove and discard the 3 nuts.



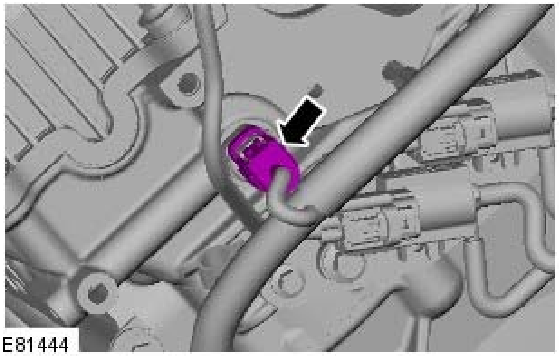
12. Release the turbocharger oil feed pipe.

- Remove the bolt.

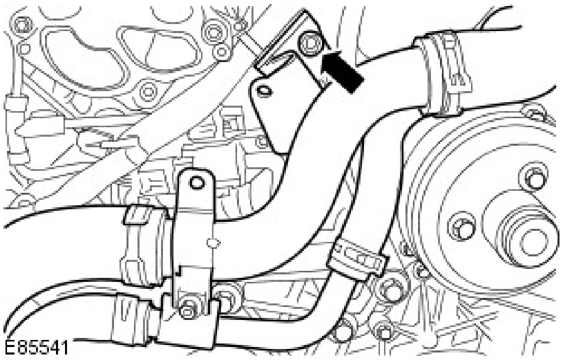


13. Remove the RH cylinder head coolant elbow.

- Release the 2 clips.

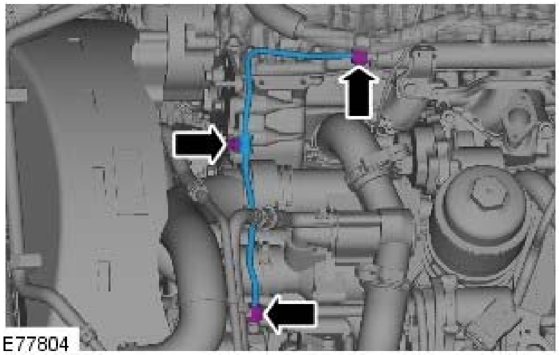


14. Disconnect the engine oil pressure (EOP) sensor electrical connector.



15. Release the coolant hose bracket.

- Remove the nut.



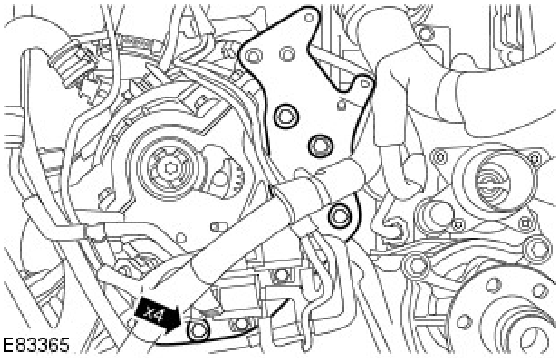
16. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

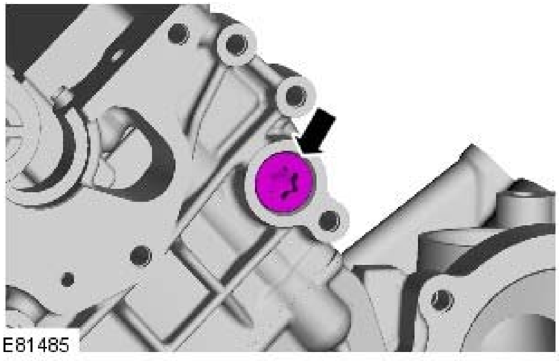
Remove and discard the high-pressure fuel rail supply line.

- Release the clip.



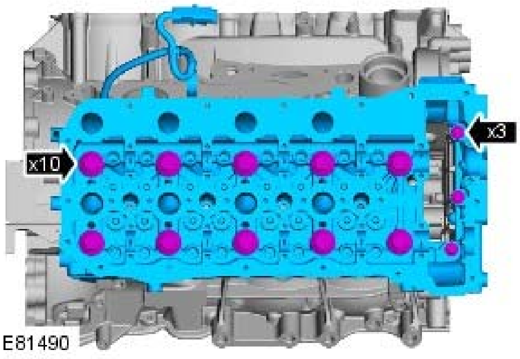
17. Release the engine lifting eye bracket.

- Remove the 4 bolts.



18. Remove the RH timing chain tensioner guide pin.

- Remove and discard the O-ring seal.



19. CAUTIONS:

⚠ The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that no damage occurs to the timing chain and timing chain guides.

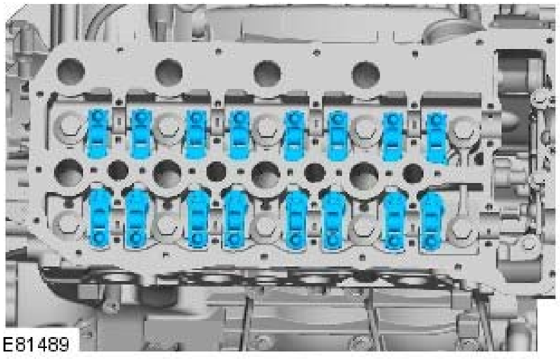
With assistance remove the cylinder head assembly.

- Remove the 13 bolts.
- Remove and discard the gasket.

20. Remove and discard the turbocharger gasket.

21. NOTE: Do not disassemble further if the component is removed for access only.

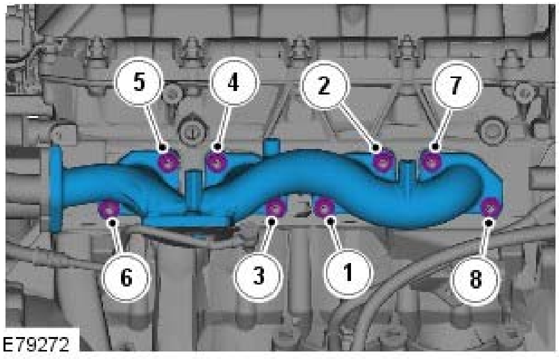
Remove the hydraulic adjuster and rocker assemblies.



22. Remove the exhaust manifold.

- Remove and discard the 8 nuts.
- Remove and discard the gasket.

Installation



1. CAUTION: To make sure that the exhaust manifold is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

• NOTE: Tighten the nuts in the sequence shown.

Install the exhaust manifold.

- Install the new gasket.
- Clean the component mating face.
- Stage 1: Tighten the new nuts to 23 Nm (17 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).

2. NOTE: Make sure that all the components are clean.

• NOTE: Lubricate the hydraulic adjuster and rocker assemblies with clean engine oil.

Install the hydraulic adjuster and rocker assemblies.

3. Install a new turbocharger gasket.

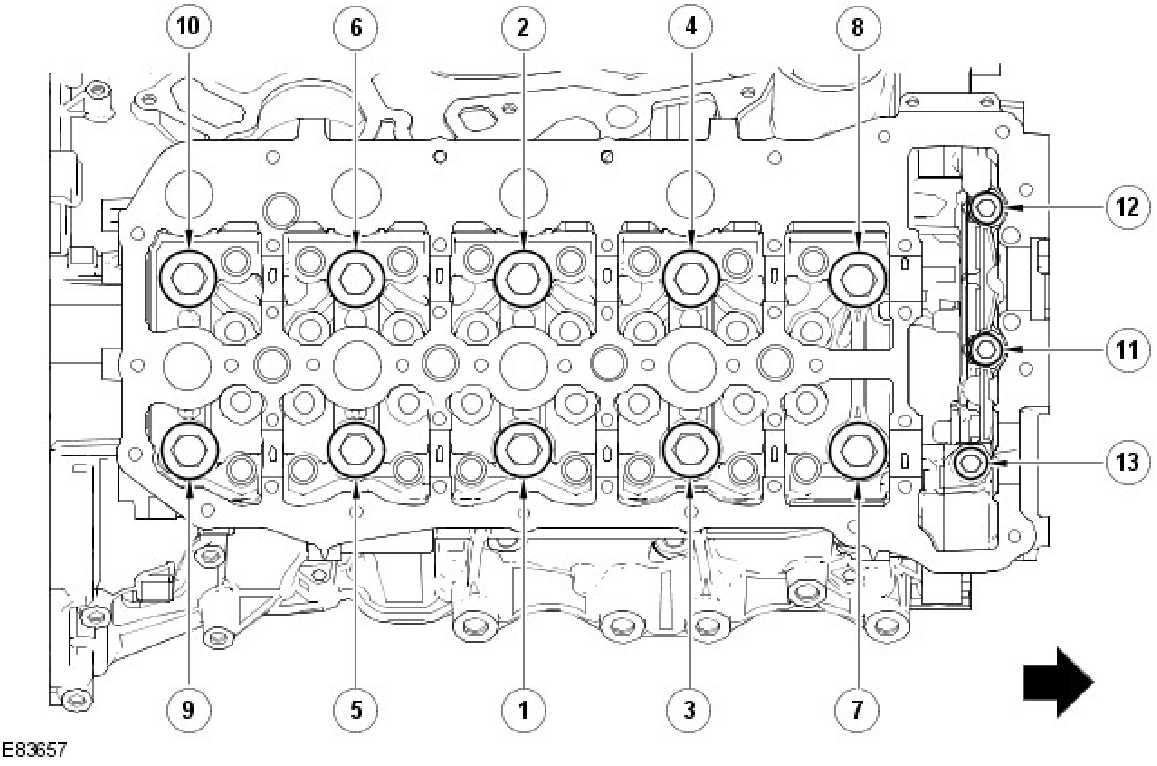
- Clean the components mating faces.

4. NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

Install a new RH cylinder head gasket.

- Clean the component mating face.

5. Check cylinder head face for distortion, across the center and from corner to corner.



6. CAUTIONS:

Tighten the bolts in the sequence shown.

Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

Make sure that no damage occurs to the timing chain and timing chain guides.

• NOTE: Make sure the cylinder head is installed in its original position.

With assistance install the cylinder head assembly.

- Clean the

component mating faces.

- Stage 1: Tighten the M13 bolts to 20 Nm (15 lb.ft).
- Stage 2: Tighten the M13 bolts to 40 Nm (30 lb.ft).
- Stage 3: Tighten the M13 bolts to 80 Nm (59 lb.ft).
- Stage 4: Tighten the M13 bolts a further 180 degrees.
- Stage 5: Tighten the M8 bolts to 20 Nm (15 lb.ft).

7. NOTE: Lubricate the O-ring seal with clean engine oil.

Install the RH timing chain tensioner guide pin.

- Install a new O-ring seal.
- Tighten to 28 Nm (21 lb.ft).

8. Secure the engine lifting eye bracket.

- Tighten the bolts to 25 Nm (18 lb.ft).

9. CAUTIONS:

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Maintain pressure on the high-pressure fuel supply line to keep the olives in contact with the fuel rail and the fuel injection pump cones while installing unions.

• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel rail supply line.

- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection pump to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection pump to 30 Nm (22 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel

rail to 30 Nm (22 lb.ft).

- Tighten the clip to 10 Nm (7 lb.ft).

10. Secure the coolant hose support bracket.

- Tighten the nut to 9 Nm (7 lb.ft)

11. Connect the EOP sensor electrical connector.

12. Install the RH cylinder head coolant elbow.

- Secure with the 2 clips.

13. Secure the turbocharger oil feed pipe.

- Tighten the bolt to 10 Nm (7 lb.ft).

14. WARNING: Make sure that new nuts are installed.

Secure the RH turbocharger.

- Tighten the nuts to 24 Nm (18 lb.ft).

15. Secure the RH turbocharger support bracket.

- Stage 1: Tighten the LH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).
- Stage 2: Tighten the LH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).

16. Check tightness of the turbocharger nuts.

- Tighten the nuts to 24 Nm (18 lb.ft).

17. Install the RH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

18. Install the RH turbocharger heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

19. Install the RH EGR valve inlet tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

20. Install the RH EGR valve inlet tube heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

21. Install the RH EGR valve and cooler assembly.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

22. Install the RH camshafts.
For additional information, refer to: Camshaft RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

23. Install the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

24. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine Mount LH

In-vehicle Repair

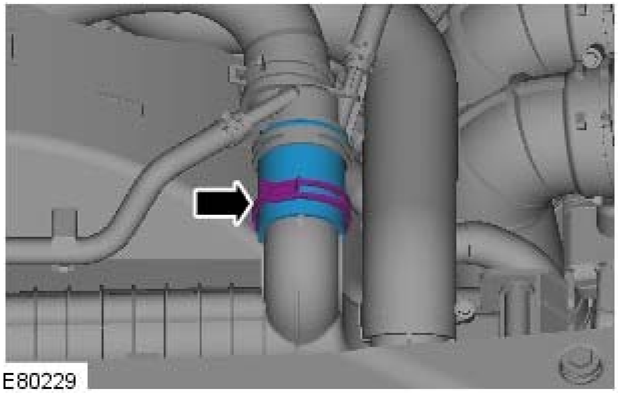
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

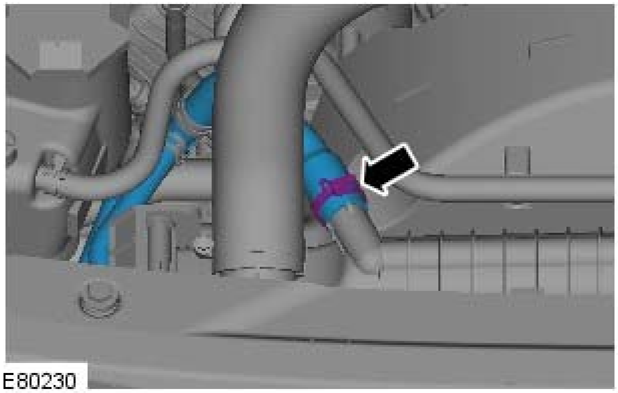
3. Remove the LH front wheel and tire.

4. Partially drain the cooling system.
For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).



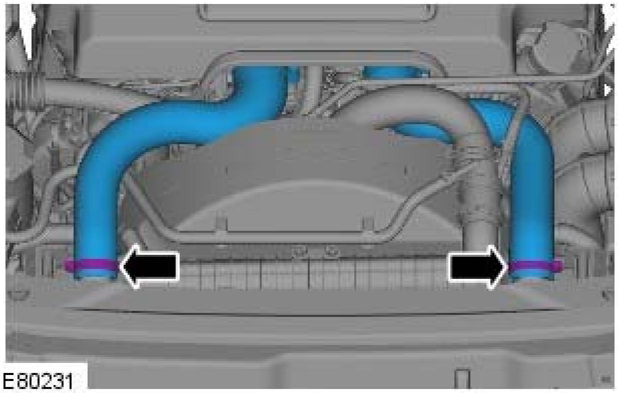
5. Disconnect the radiator upper hose.

- Release the clip.



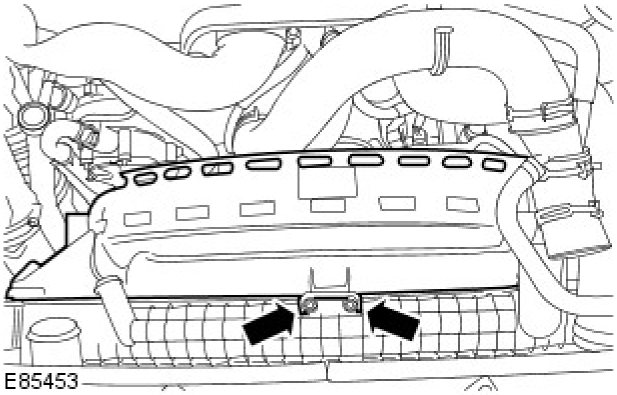
6. Disconnect the auxiliary radiator coolant hose.

- Release the clip.



7. Disconnect the 2 charge air cooler outlet hoses.

- Release the 2 clips.



8. Remove the cooling fan upper shroud.

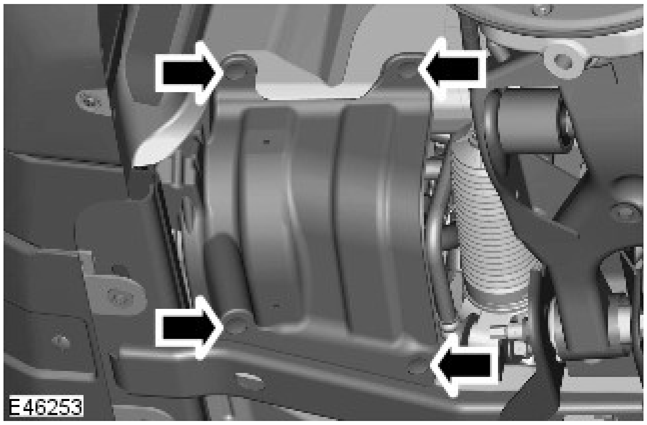
- Release from the 3 clips.

9. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

10. Remove the front RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

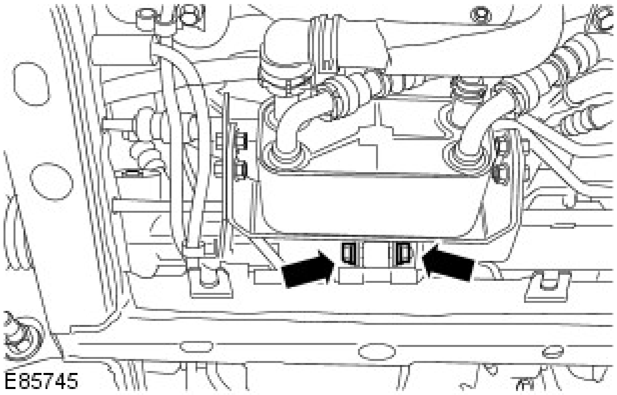
11. Release the engine ground cable.

- Remove the nut.



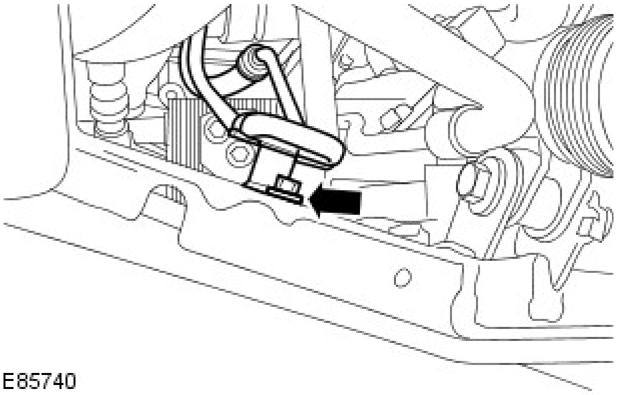
12. Remove the front LH splash shield.

- Remove the 4 clips.



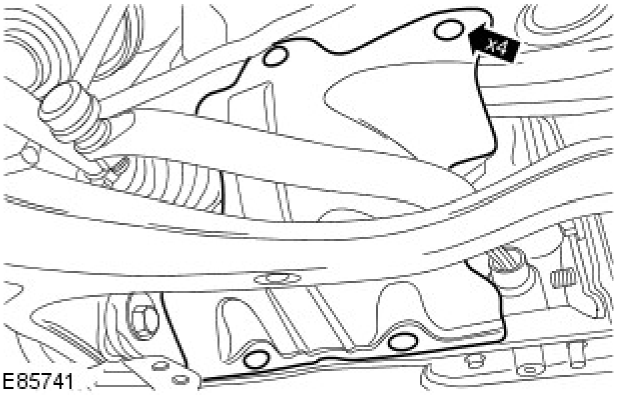
13. Release the engine stabilizer.

- Remove the nut and bolt.



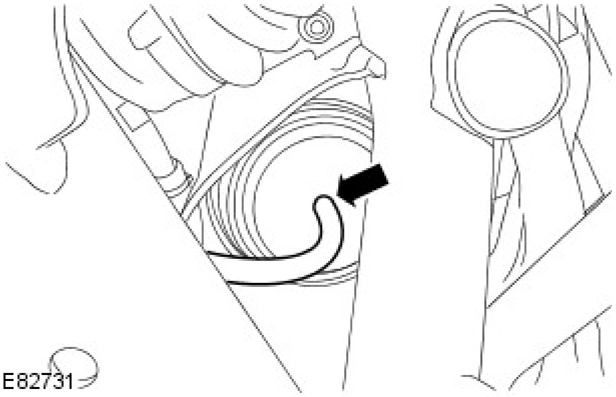
14. Release the power steering line support bracket.

- Remove the bolt.

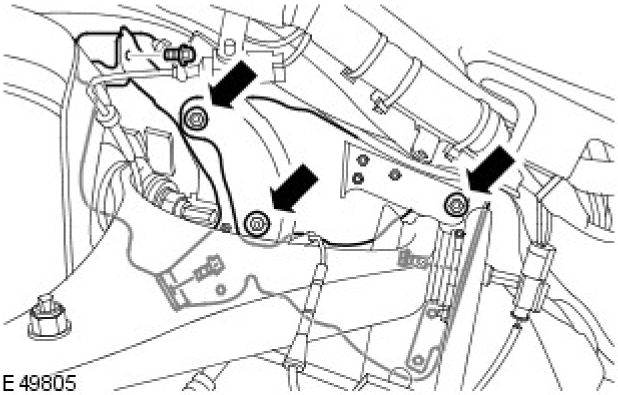


15. Remove the LH splash shield.

- Remove the 4 clips.



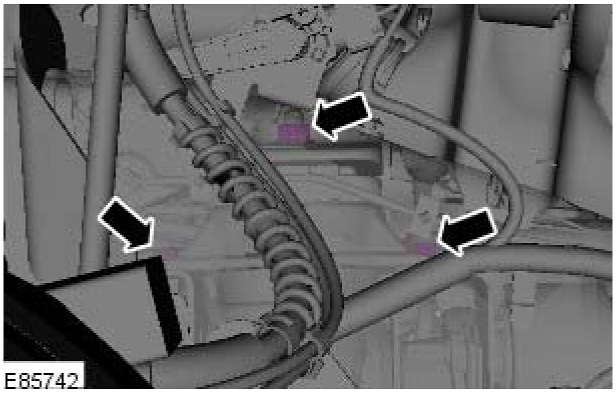
16. Disconnect the LH engine mount vacuum line.



17. NOTE: The heat shield consists of 3 parts.

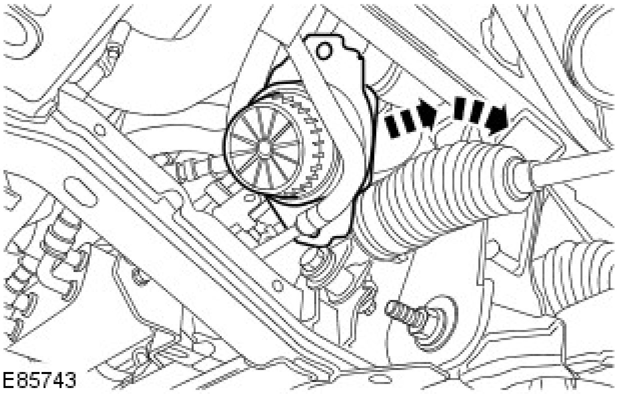
Remove the upper suspension arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.
- Remove the bracket.



18. Release the LH engine mount.

- Remove the 2 bolts.
- Remove the nut.
- Using a suitable hydraulic jack, raise and support the engine.



19. Remove the LH engine mount.

Installation

1. Install the LH engine mount.

2. Secure the LH engine mount.

- Tighten the nut to 100 Nm (74 lb.ft).
- Tighten the bolts to 56 Nm (41 lb.ft).
- Lower the engine onto the mount.

3. Connect the LH engine mount vacuum line.

4. NOTE: The heat shield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

5. Install the LH splash shield.

- Install the clips.

6. Secure the power steering line support bracket.

- Tighten the bolt.

7. Secure the engine stabilizer.

- Tighten the nut and bolt to 115 Nm (85 lb.ft).

8. Install the front LH splash shield.

- Install the clips.

9. Secure the engine ground cable.

- Tighten the nut.

10. Install the front RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

11. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

12. Install the cooling fan upper shroud.

- Secure in the clips.

13. Connect the charge air cooler outlet hoses.

- Tighten the clips.

14. Connect the auxiliary radiator coolant hose.

- Secure the clip.

15. Connect the radiator upper hose.

- Secure the clip.

16. Install the LH front wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

18. Fill and bleed the cooling system.
For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine Mount RH

In-vehicle Repair

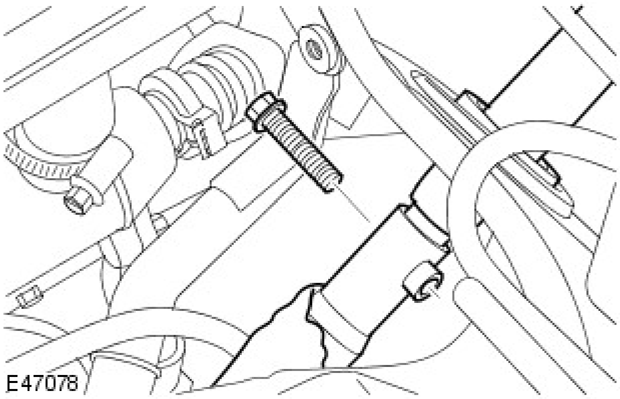
Removal

⚠ CAUTION: If a starter motor is being replaced, a snorkel must be installed. Failure to follow this instruction may result in damage to the vehicle.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

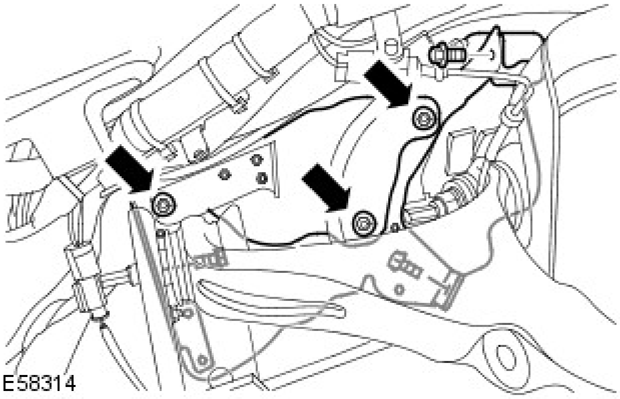
2. Remove the auxiliary battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

3. Raise and support the vehicle.



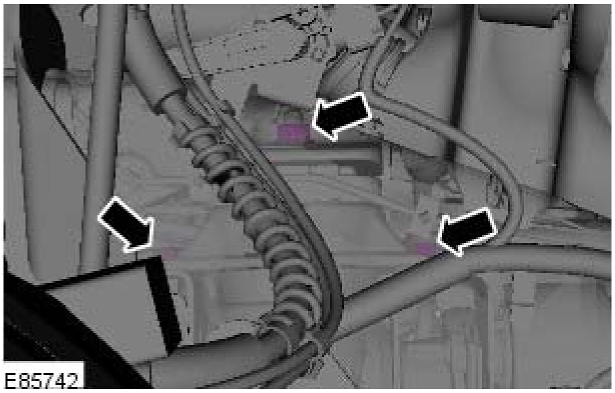
4. Disconnect the steering column lower shaft from the steering column.

- Remove and discard the bolt.



5. Remove the upper suspension arm and brake line heat shields for access.

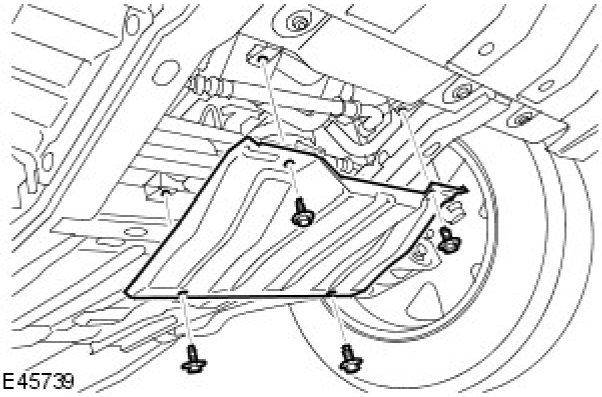
- Remove the 3 nuts.
- Remove the 3 bolts.
- Remove the heat shield bracket.



6. Release the RH engine mount.

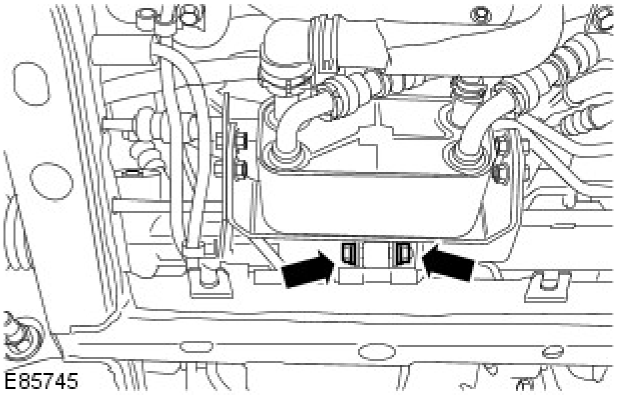
- Remove the nut.
- Remove the 2 bolts.

7. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



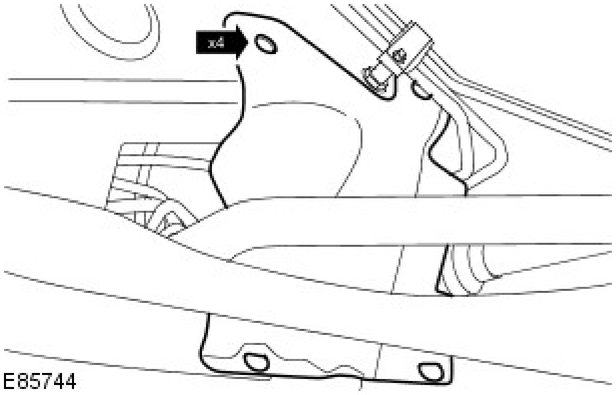
8. Remove the radiator splash shield.

- Remove the 4 bolts.



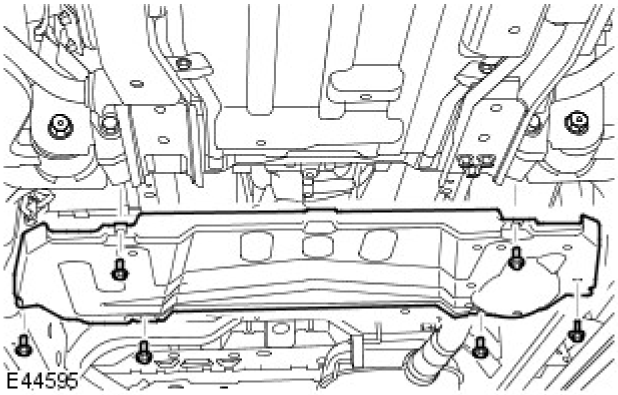
9. Release the engine stabilizer.

- Remove the nut and bolt.



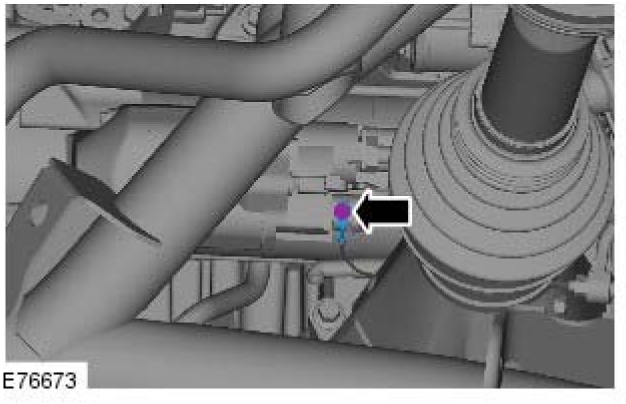
10. Remove the RH splash shield.

- Remove the 4 clips.



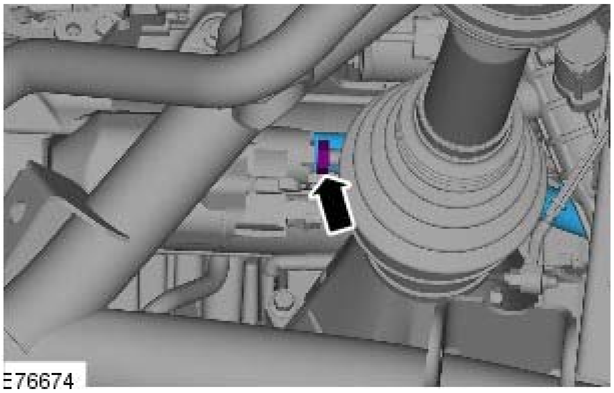
11. Remove the transmission undershield.

- Remove the 6 bolts.



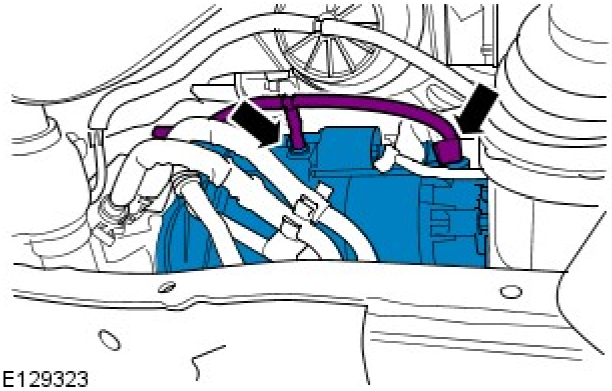
12. Disconnect the switch lead from the starter motor solenoid.

- Remove the bolt.



13. Disconnect the 2 battery positive cables from the starter motor solenoid.

- Remove the nut.

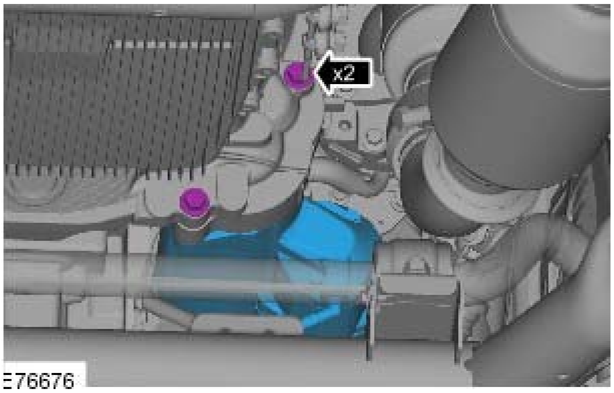


14. NOTE: Vehicles with snorkel installed.

• NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

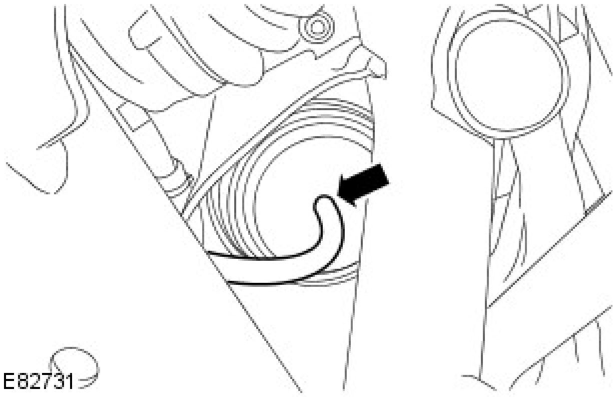
Disconnect the snorkel.

- Disconnect the 2 pipes.



15. Reposition the starter motor.

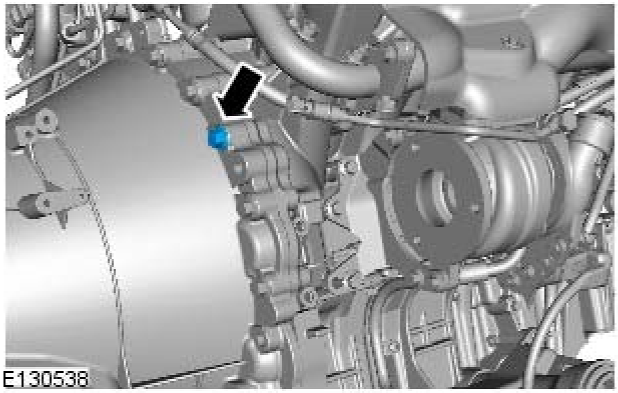
- Remove the 2 bolts.



16. Disconnect the RH engine mount vacuum line.

17. Remove the RH engine mount.

- Using a suitable hydraulic jack, raise and support the engine.

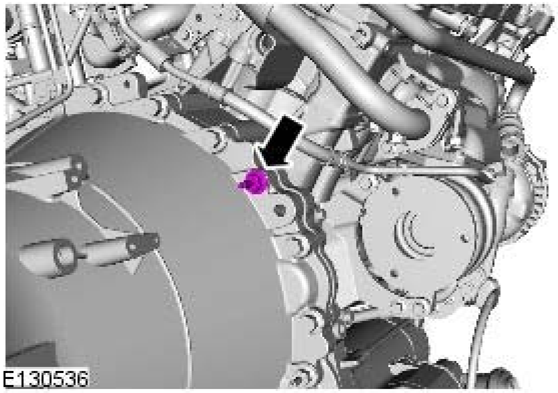


18. NOTE: Vehicles without snorkel installed.

• NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove and discard the bolt.

Installation



1. NOTE: Vehicles without snorkel installed.

• NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Install the stud.

- Tighten to 45 Nm (33 lb.ft)

2. Install the RH engine mount.

3. Connect the RH engine mount vacuum line.

4. Secure the starter motor.

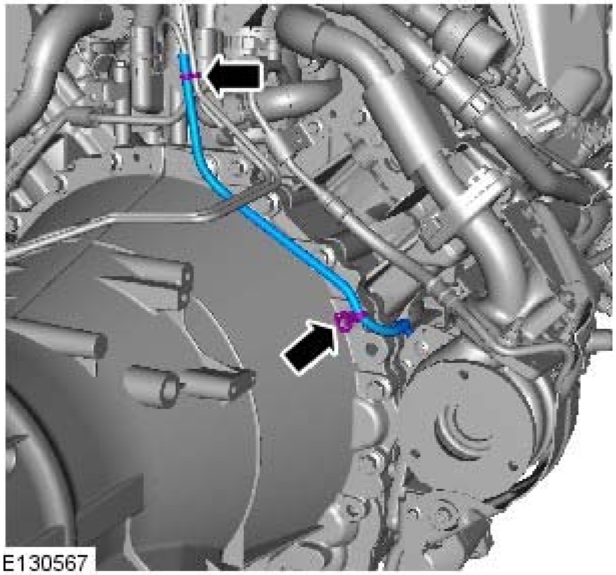
- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

5. Connect the battery positive cable.

- Tighten the nut to 22 Nm (16 lb.ft).

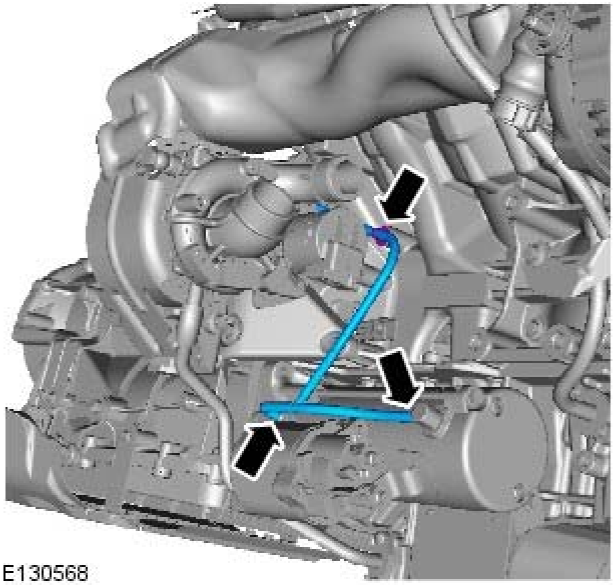
6. Connect the switch lead to the starter motor solenoid.

- Tighten the nut to 4 Nm (3 lb.ft).


E130567

7. Route the snorkel tube as shown.

- Secure the clips.


E130568

8. Fit the snorkel tube to the starter motor.

- Connect the 2 snorkel tubes.
- Secure the clip.

9. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

10. Secure the RH engine mount.

- Lower the engine.
- Tighten the nut to 100 Nm (74 lb.ft).
- Tighten the bolts to 56 Nm (41 lb.ft).

11. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.

12. Install the RH splash shield.

- Install the clips.

13. Secure the engine stablizer.

- Tighten the nut and bolt to 40 Nm (30 lb.ft).

14. Install the radiator splash shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

15. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

16. ⚠ WARNING: Make sure that a new bolt is installed.

Connect the steering column lower shaft to the steering column.

- Tighten the bolt.

17. Install the auxiliary battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

18. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Exhaust Manifold LH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

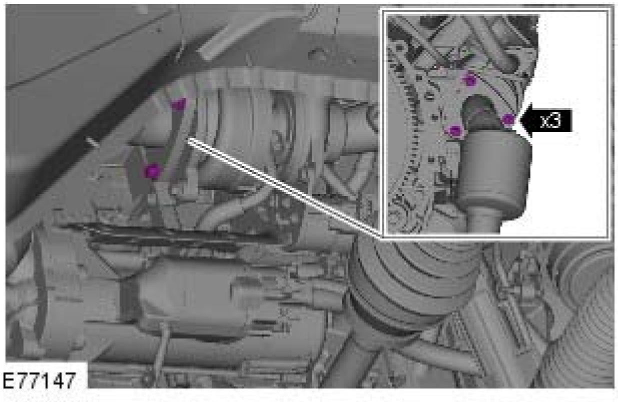
3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

4. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Release the LH turbocharger oil return tube.

- Remove and discard the gasket.
- Remove the 2 bolts.

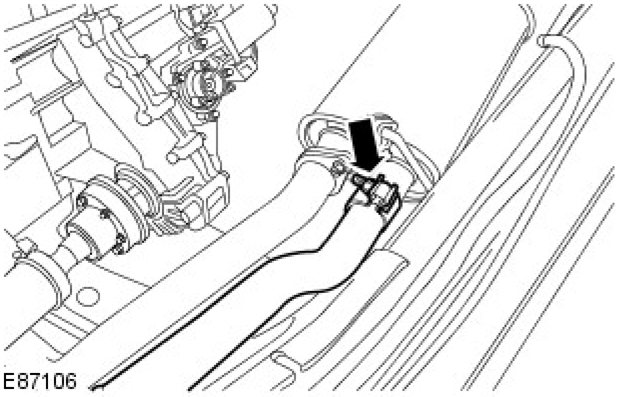
5. Remove the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).



6. NOTE: Right-hand shown, left-hand similar.

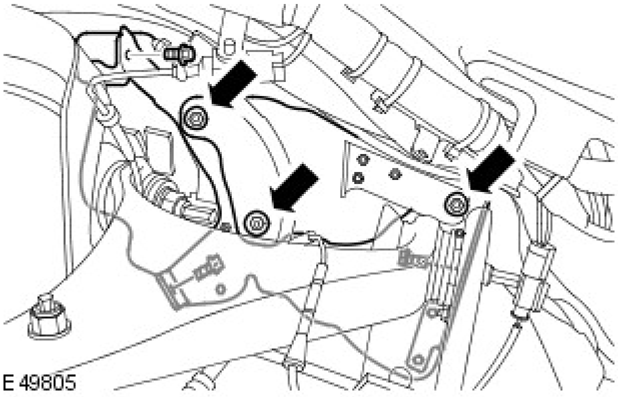
Release the exhaust system from the turbochargers.

- Remove the 6 bolts.
- Remove and discard the 2 gaskets.



7. Remove the LH catalytic converter.

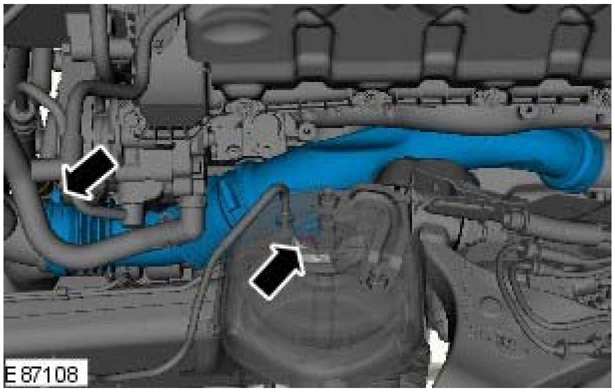
- Loosen the clamp.



8. NOTE: The heatshield consists of 3 parts.

Remove the upper suspension arm and brake line heat shields for access.

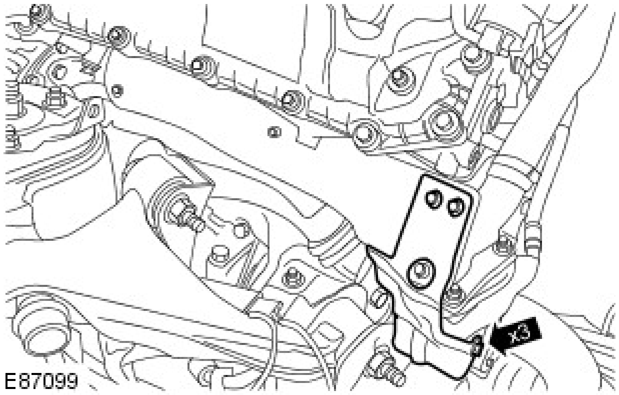
- Remove the 3 nuts.
- Remove the 3 bolts.
- Remove the bracket.



9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

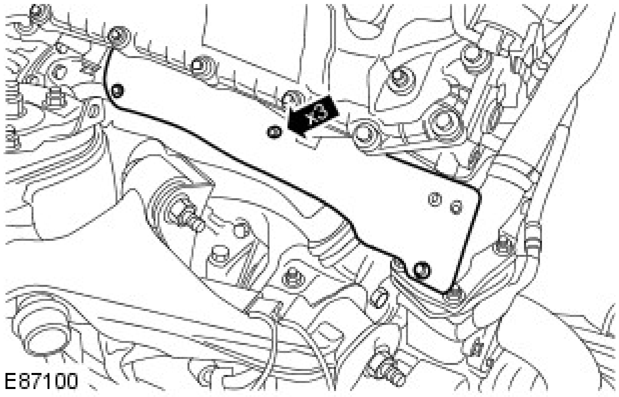
Remove the LH turbocharger intake tube.

- Remove the nut.
- Loosen the clip.



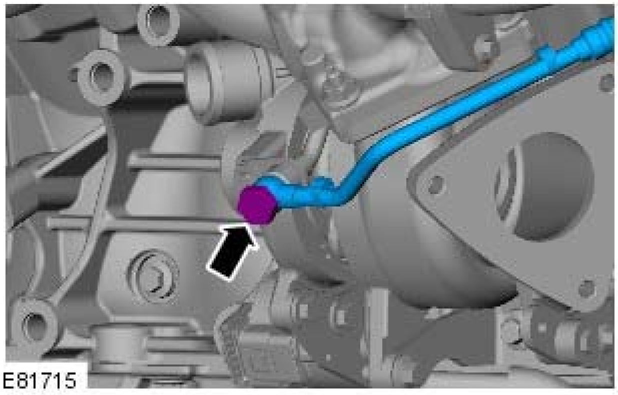
10. Remove the LH turbocharger heat shield.

- Remove the 3 bolts.



11. Remove the LH exhaust manifold heat shield.

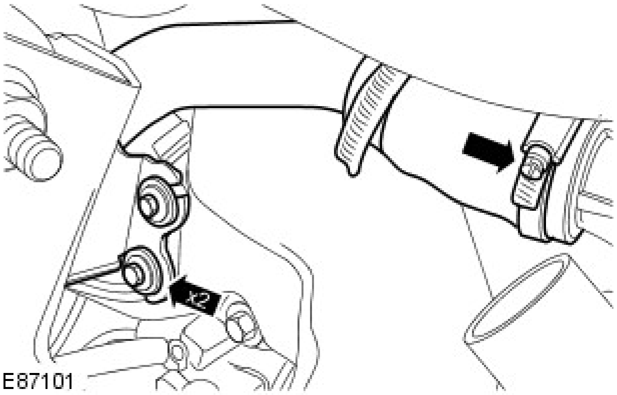
- Remove the 3 bolts.



12. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the LH turbocharger oil supply pipe.

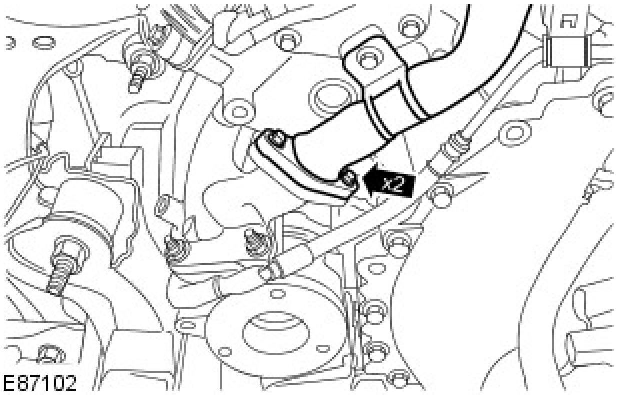
- Remove the banjo bolt.
- Remove and discard the 2 sealing washers.



13. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

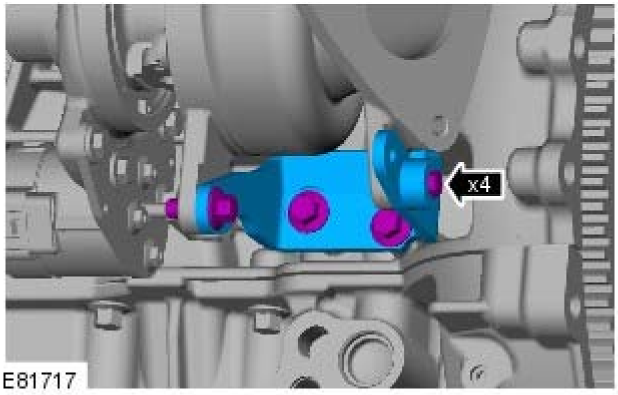
Reposition the LH turbocharger outlet pipe.

- Release the turbocharger outlet pipe clip.
- Remove the 2 bolts.



14. Release the LH exhaust gas recirculation (EGR) valve inlet tube.

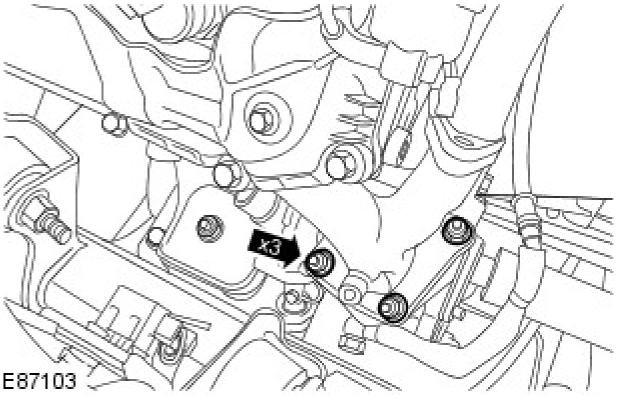
- Remove the 2 bolts.
- Remove and discard the gasket.



15. Remove the LH turbocharger support bracket.

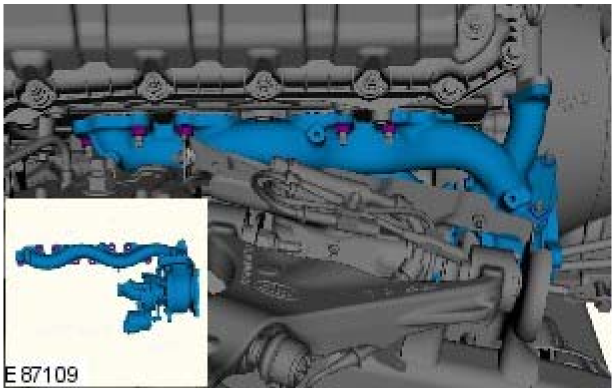
- Remove the 4 bolts.

16. Disconnect the LH turbocharger electrical connector.



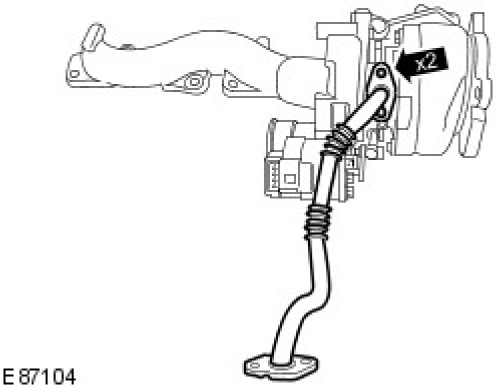
17. Release the LH turbocharger.

- Loosen the 3 nuts.



18. Remove the LH exhaust manifold and turbocharger assembly.

- Remove and discard the 8 nuts.
- Remove and discard the gasket.
- Remove and discard the 8 studs.



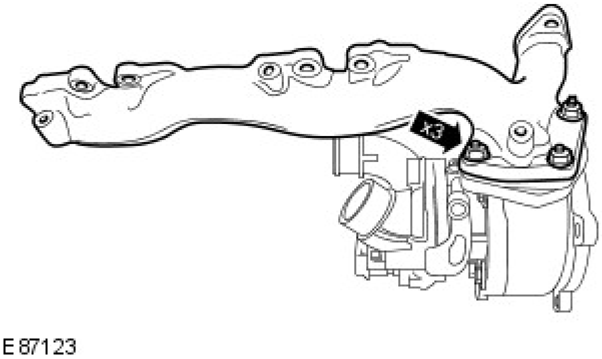
19. CAUTIONS:

⚠ Make sure that the area around the component is clean and free of foreign material.

⚠ Make sure that all openings are sealed. Use new blanking caps.

Remove the turbocharger oil return tube.

- Remove the 2 bolts.
- Remove and discard the gasket.



20. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the exhaust manifold from the turbocharger.

- Remove the 3 nuts.
- Remove and discard the gasket.

Installation

1. NOTE: Remove and discard the blanking caps.

Install the exhaust manifold to the turbocharger.

- Clean the component mating faces.
- Install a new gasket.
- Loosely install the nuts.

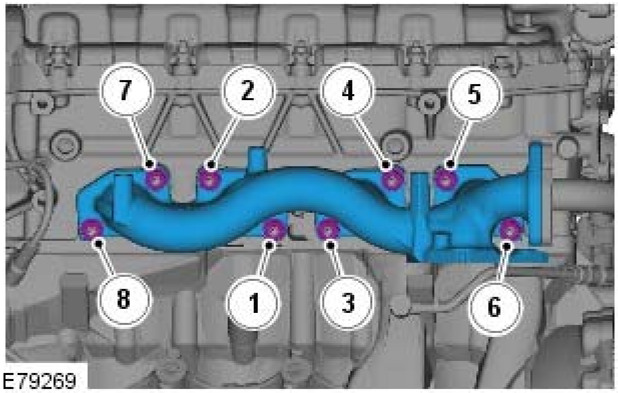
2. NOTE: Remove and discard the blanking caps.

Install the LH turbocharger oil return tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

3. Install the 8 studs.

- Tighten the new studs to 13 Nm (10 lb.ft).



4. ⚠ CAUTION: To make sure that the exhaust manifold is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

• NOTE: Tighten the nuts in the sequence shown.

Install the LH exhaust manifold and turbocharger assembly.

- Clean the component mating face.
- Stage 1: Tighten the new nuts to 23 Nm (17 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).

5. Connect the LH turbocharger electrical connector.

6. ⚠ CAUTION: Install but do not fully tighten the turbocharger support bracket bolts. This will allow for movement of components during the final torque stages. Failure to follow this instruction may result in damage to the vehicle.

Install the LH turbocharger support bracket.

- Install the bolts.

7. Secure the LH turbocharger.

- Tighten the nuts to 24 Nm (18 lb.ft).

8. Secure the LH turbocharger support bracket.

- Stage 1: Tighten the LH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).
- Stage 2: Tighten the LH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).

9. Check tightness of the turbocharger nuts.

- Tighten the nuts to 24 Nm (18 lb.ft).

10. Secure the LH EGR valve inlet tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

11. NOTE: Remove and discard the blanking caps.

Secure the LH turbocharger outlet pipe.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the clip.

12. NOTE: Remove and discard the blanking caps.

Connect the LH turbocharger oil supply pipe.

- Clean the component mating faces.
- Install new sealing washers.
- Tighten the banjo bolt to 24 Nm (18 lb.ft).

13. Install the LH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

14. Install the LH turbocharger heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

15. NOTE: Remove and discard the blanking caps.

Install the LH turbocharger intake tube.

- Tighten the nut to 10 Nm (7 lb.ft).
- Tighten the clip.

16. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

17. NOTE: Do not tighten the clamp at this stage.

Install the LH catalytic converter.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 25 Nm (18 lb.ft).

18. Secure the RH catalytic converter.

- Clean the components mating faces.
- Tighten the nuts to 25 Nm (18 lb.ft).

19. Secure the LH catalytic converter.

- Tighten the nut to 55 Nm (40 lb.ft).

20. Install the body.

For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

21. NOTE: Remove and discard the blanking caps.

Secure the LH turbocharger oil return tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

22. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

23. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Exhaust Manifold RH

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

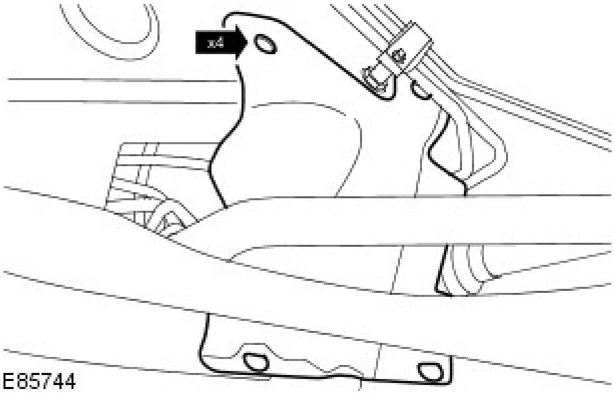
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

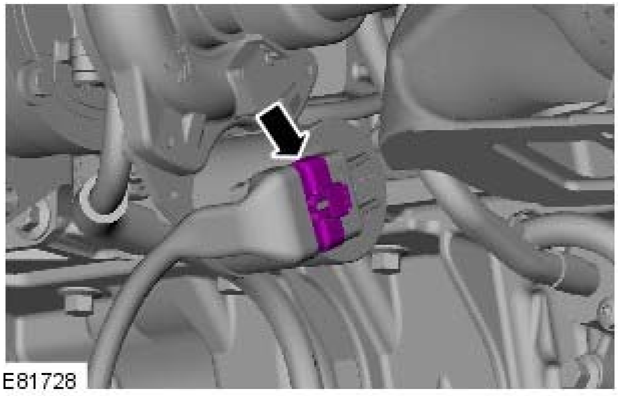
3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

4. Remove the RH splash shield.

- Remove the 4 clips.

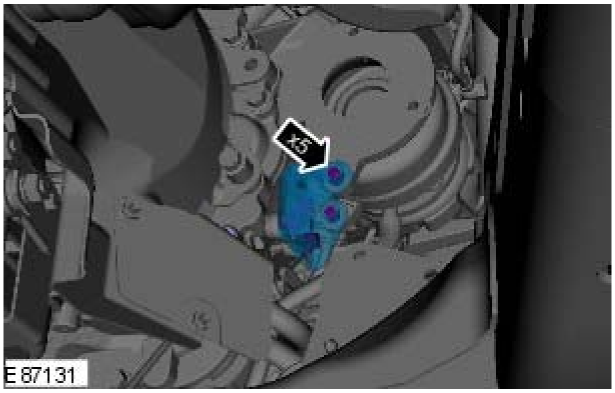


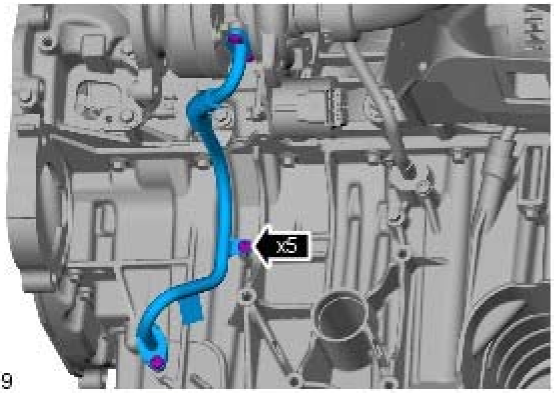
5. Disconnect the RH turbocharger electrical connector.



6. Remove the turbocharger support bracket.

- Remove the 5 bolts.





E81729

7. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

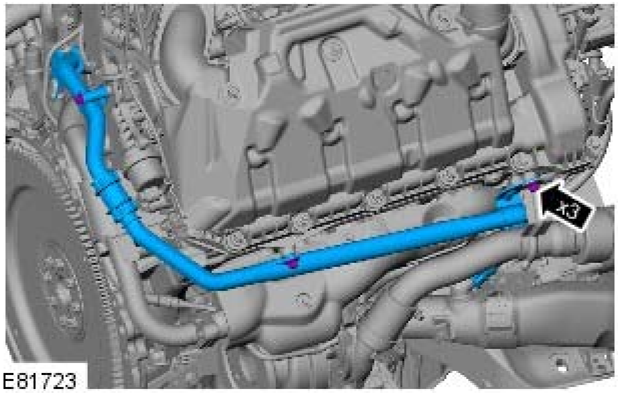
Remove the RH turbocharger oil return tube.

- Remove the 5 bolts.
- Remove and discard the 2 gaskets.

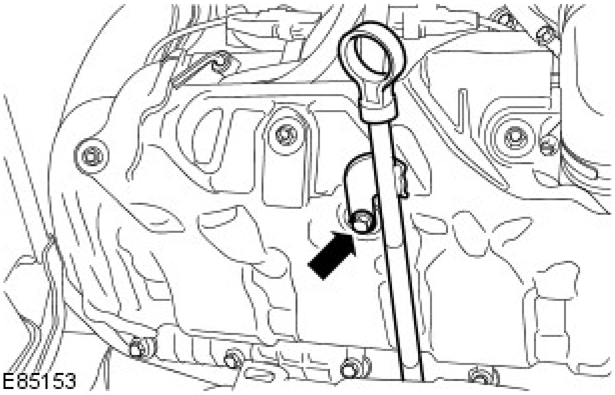
8. Remove the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

9. Release the breather line.

- Remove the 3 bolts.



E81723

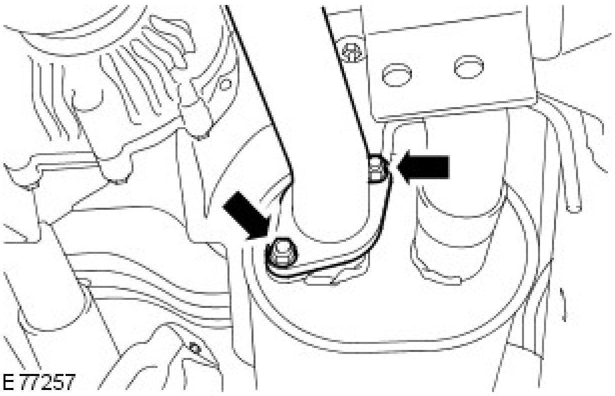


E85153

10. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator and upper oil level indicator tube.

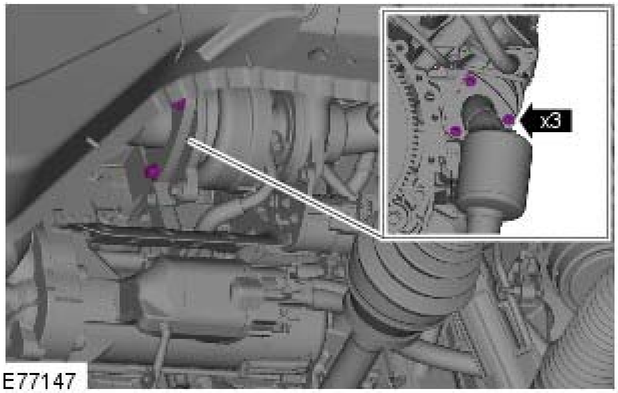
- Remove the bolt.
- Remove and discard the 2 O-ring seals.



E77257

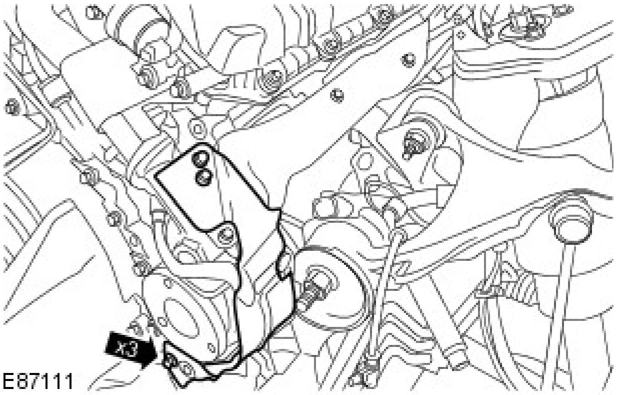
11. Release the RH catalytic converter.

- Remove the 2 nuts.



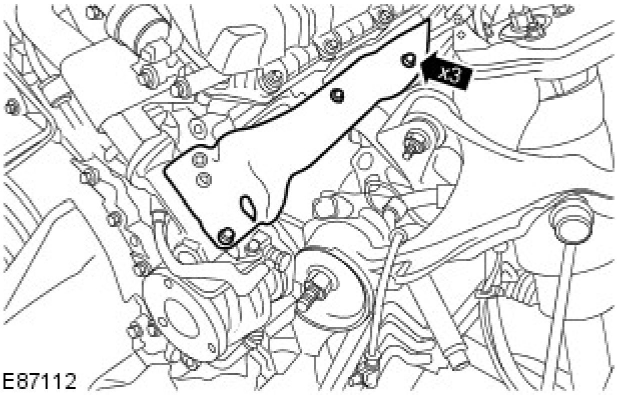
12. Remove the RH catalytic converter.

- Remove the 3 bolts.
- Remove and discard the gasket.



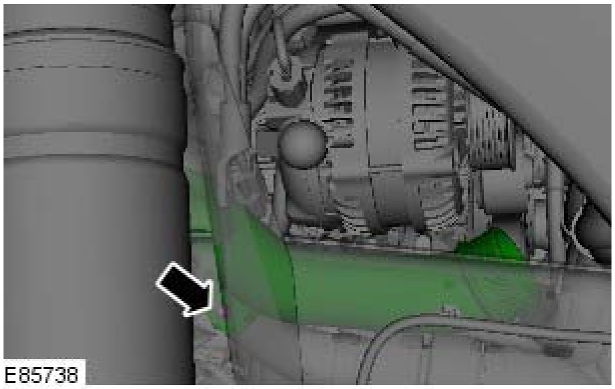
13. Remove the RH turbocharger heat shield.

- Remove the 3 bolts.



14. Remove the RH exhaust manifold heat shield.

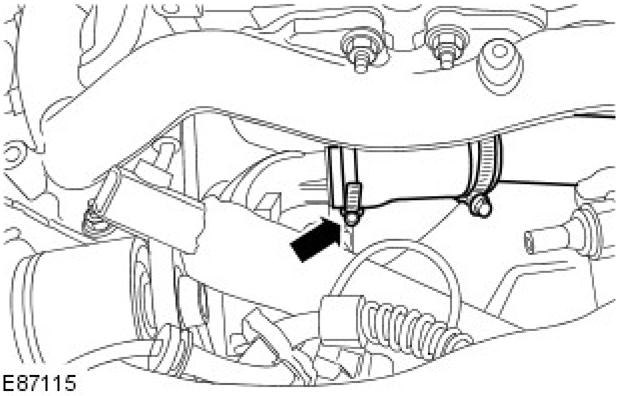
- Remove the 3 bolts.



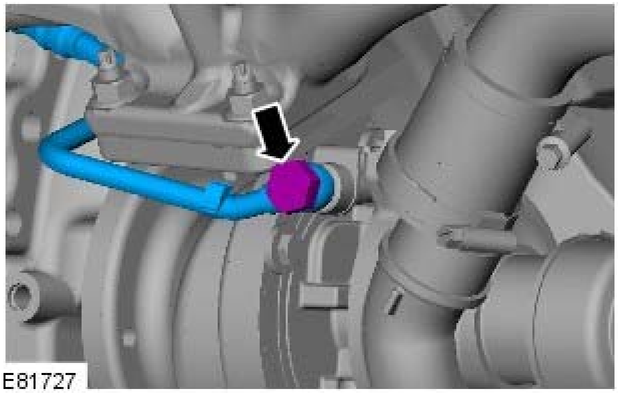
15. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Release the RH turbocharger intake tube.

- Remove the nut.



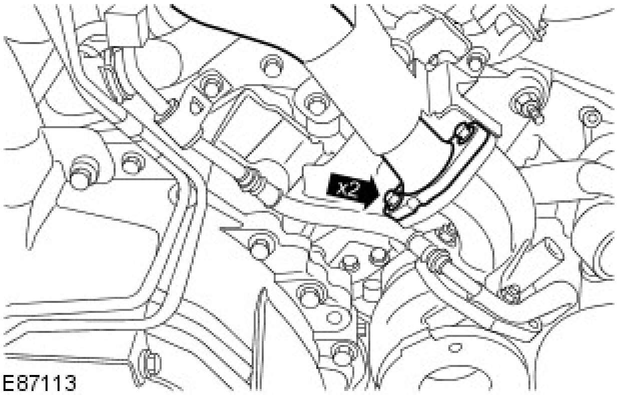
16. Release the RH turbocharger outlet pipe clip.



17. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

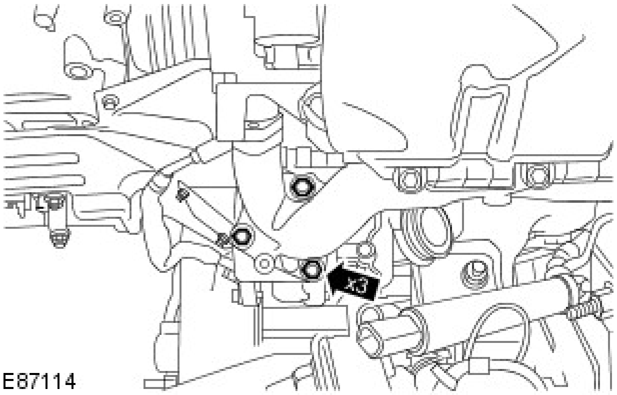
Disconnect the RH turbocharger oil supply pipe.

- Remove the banjo bolt.
- Remove and discard the 2 sealing washers.



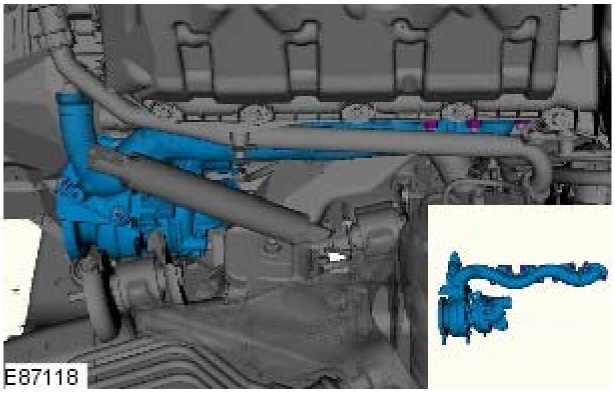
18. Release the RH exhaust gas recirculation (EGR) valve inlet tube.

- Remove the 2 bolts.
- Remove and discard the gasket.



19. Release the RH turbocharger.

- Loosen the 3 nuts.


E87118

20. Reposition the RH exhaust manifold and turbocharger assembly.

- Remove and discard the 8 nuts.
- Remove and discard the gasket.
- Remove and discard the 8 studs.

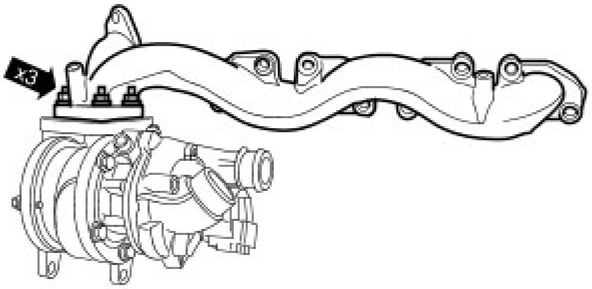
21. Disconnect the RH turbocharger outlet pipe.

22. Remove the RH exhaust manifold and turbocharger assembly.

- Remove and discard the gasket.

23. Remove the exhaust manifold from the turbocharger.

- Remove and discard the 3 nuts.
- Remove and discard the gasket.



E87117

Installation

1. Install the exhaust manifold to the turbocharger.

- Clean the components mating faces.
- Install a new gasket.
- Loosely install the nuts.

2. Install the 8 studs.

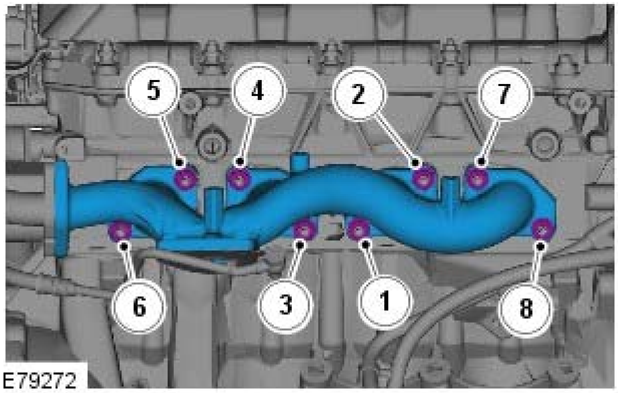
- Tighten the new studs to 13 Nm (10 lb.ft).

3. Install the RH exhaust manifold and turbocharger assembly.

- Clean the component mating faces.
- Install a new gasket.

4. Connect the RH turbocharger outlet pipe.

- Tighten the clip.



5. ⚠ CAUTION: To make sure that the exhaust manifold and turbocharger assembly is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

- NOTE: Tighten the nuts in the sequence shown.

Secure the RH exhaust manifold and turbocharger assembly.

- Clean the component mating face.
- Stage 1: Tighten the new nuts to 24 Nm (18 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 24 Nm (18 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 24 Nm (18 lb.ft).

6. ⚠ CAUTION: Install but do not fully tighten the turbocharger support bracket bolts. This will allow for movement of components during the final torque stages. Failure to follow this instruction may result in damage to the vehicle.

Install the RH turbocharger support bracket.

- Install the bolts.

7. Secure the RH turbocharger.

- Tighten the nuts to 24 Nm (18 lb.ft).

8. Secure the RH turbocharger support bracket.

- Stage 1: Tighten the RH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).
- Stage 2: Tighten the RH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).

9. Check tightness of the turbocharger nuts.

- Tighten the nuts to 24 Nm (18 lb.ft).

10. Secure the RH EGR valve inlet tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

11. NOTE: Remove and discard the blanking caps.

Connect the RH turbocharger oil supply pipe.

- Clean the component mating faces.
- Install new sealing washers.
- Tighten the banjo bolt to 24 Nm (18 lb.ft).

12. Tighten the RH turbocharger outlet pipe clip.

13. NOTE: Remove and discard the blanking caps.

Secure the RH turbocharger intake tube.

14. Install the RH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the nut to 10 Nm (7 lb.ft).

15. Install the RH turbocharger heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

16. Install the RH catalytic converter.

- Clean the components mating faces.
- Install a new gasket.
- Tighten the bolts to 25 Nm (18 lb.ft).

17. Secure the RH catalytic converter.

- Clean the components mating faces.
- Tighten the nuts to 55 Nm (40 lb.ft).

18. NOTE: Remove and discard the blanking caps.

Install the oil level indicator and upper oil level indicator tube.

- Clean the components mating faces.
- Install new O-ring seals.
- Tighten the bolt to 9 Nm (7 lb.ft).

19. Secure the breather line.

- Tighten the M6 bolts to 10 Nm (7 lb.ft).
- Tighten the M8 bolts to 23 Nm (17 lb.ft).

20. Install the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

21. NOTE: Remove and discard the blanking caps.

Install the RH turbocharger oil return tube.

- Clean the component mating faces.
- Install new gaskets.
- Tighten the bolts to 10 Nm (7 lb.ft).

22. Connect the RH turbocharger electrical connector.

23. Install the RH splash shield.

- Install the clips.

24. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

25. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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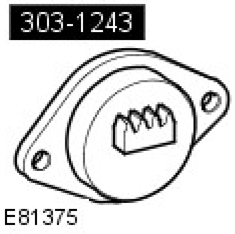
Engine - TDV8 3.6L Diesel - Flexplate

In-vehicle Repair

Special Tool(s)	
	Flexplate locking tool 303-1243

Removal

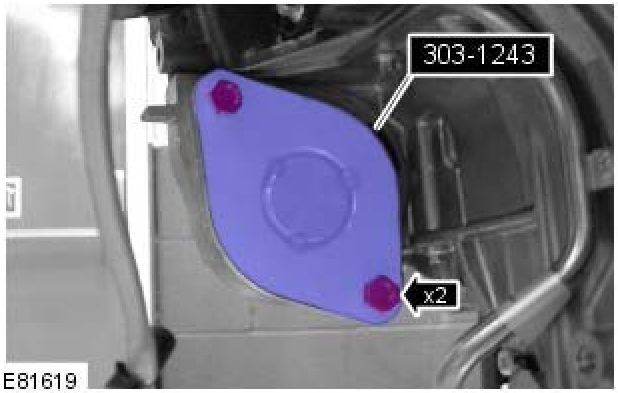
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

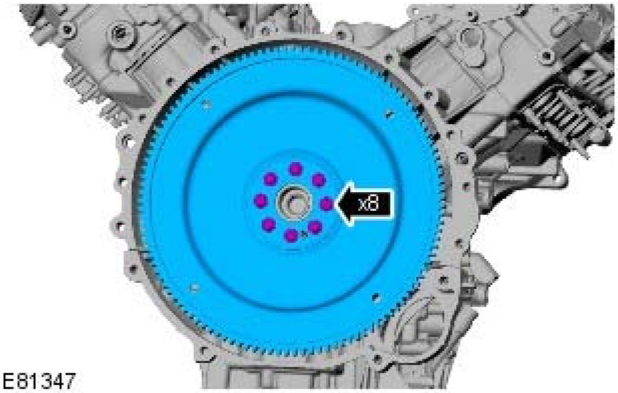
3. Remove the transmission.
For additional information, refer to: Transmission (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, Removal and Installation).

4. Install the special tool.



5. Remove the flexplate.

- Remove and discard the 8 bolts.



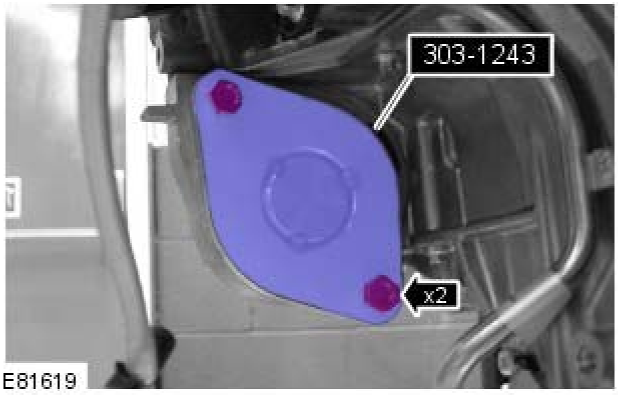
Installation

1. ⚠ CAUTION: Make sure that new bolts are installed.

   Install the flexplate.

   - Tighten the bolts to 95 Nm (70 lb.ft).

2. Remove the special tool.



3. Install the transmission.
   For additional information, refer to: Transmission (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, Removal and Installation).

4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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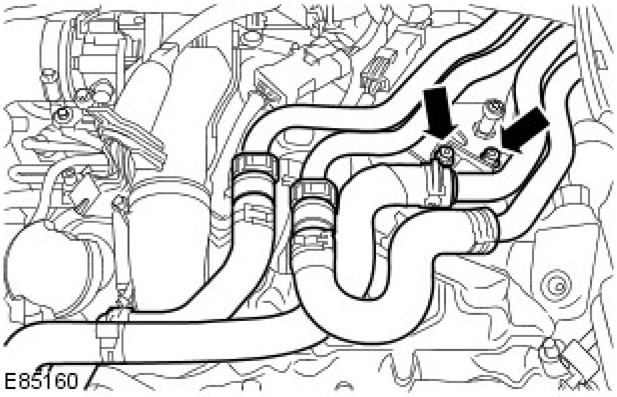
Engine - TDV8 3.6L Diesel - Intake Manifold Plenum Chamber

In-vehicle Repair

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

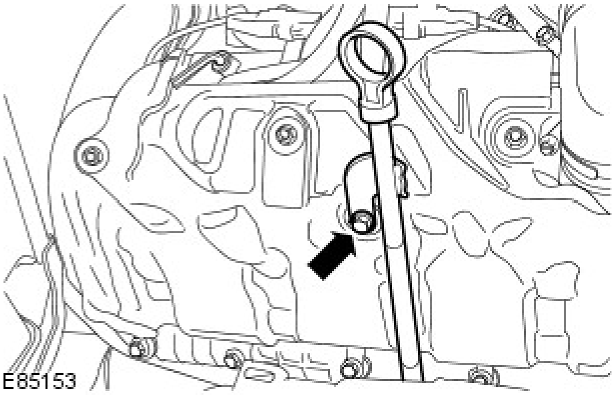
2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. Release the coolant lines.

- Remove the 2 nuts.

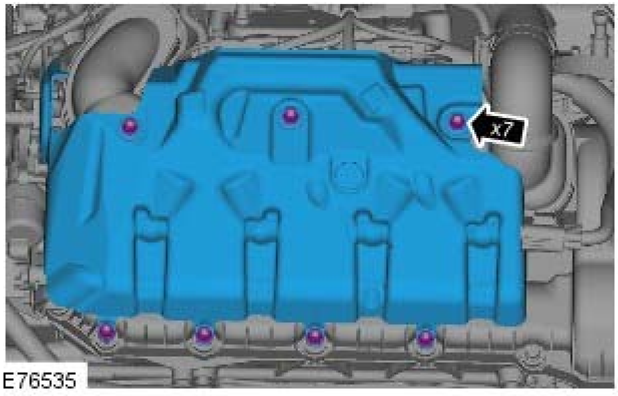
4. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).



5. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

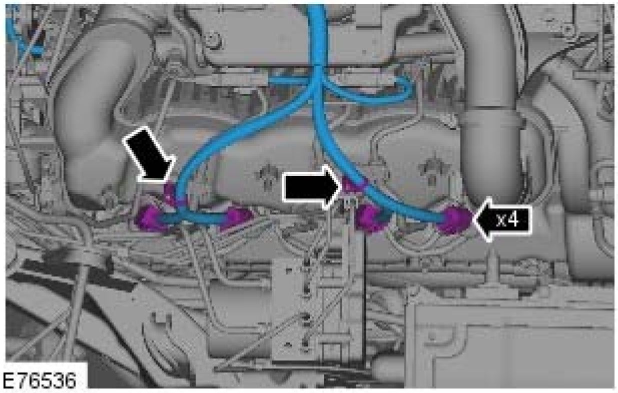
Remove the oil level indicator and upper oil level indicator tube.

- Remove the bolt.
- Remove and discard the 2 O-ring seals.



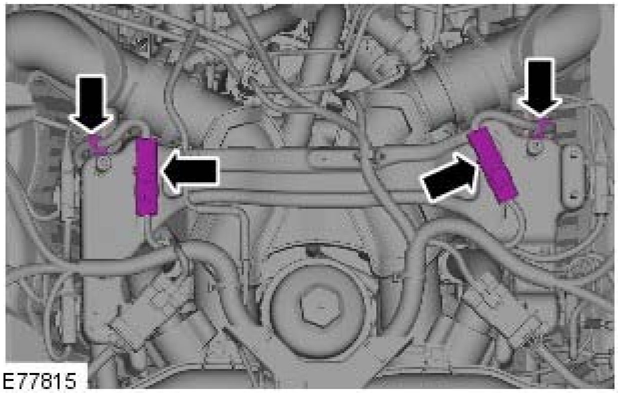
6. Remove the fuel line shield.

- Remove the 7 nuts.



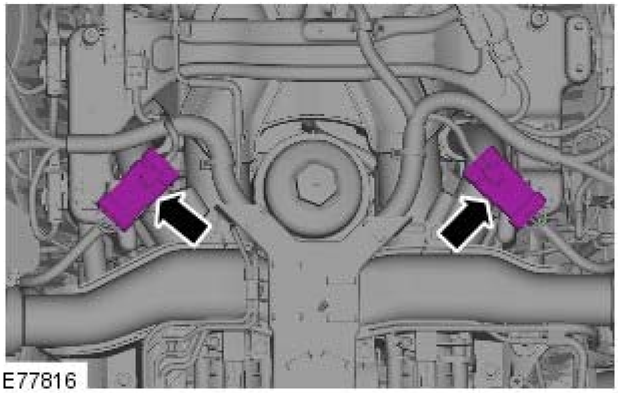
7. Disconnect the fuel injector electrical connectors.

- Release the fuel charging wiring harness.



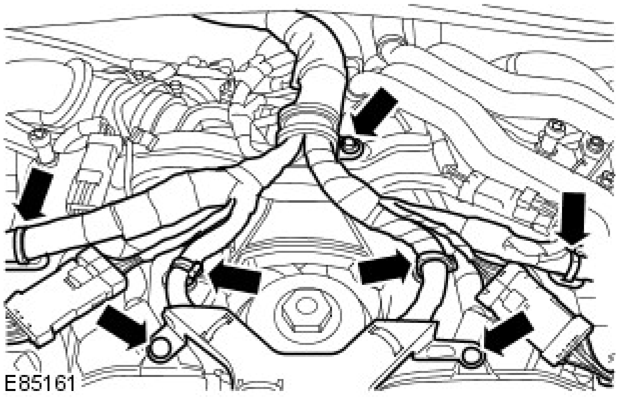
8. Disconnect the glow plug electrical connectors.

- Release the wiring harness.



9. Disconnect both exhaust gas recirculation (EGR) valve electrical connectors.

- Release the wiring harness.

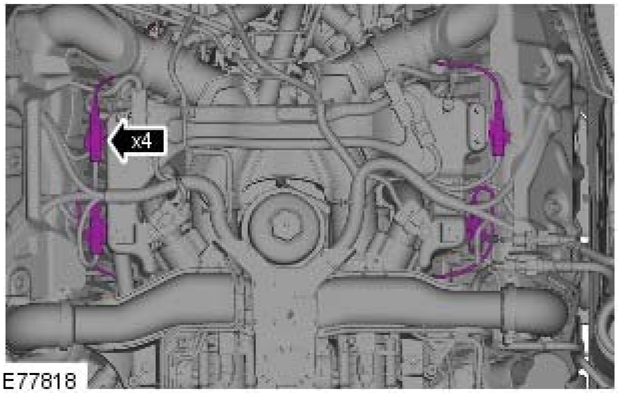


10. Release the engine wiring harness.

- Remove the nut.
- Release the 6 clips.

11. Disconnect the knock sensor (KS) electrical connectors.

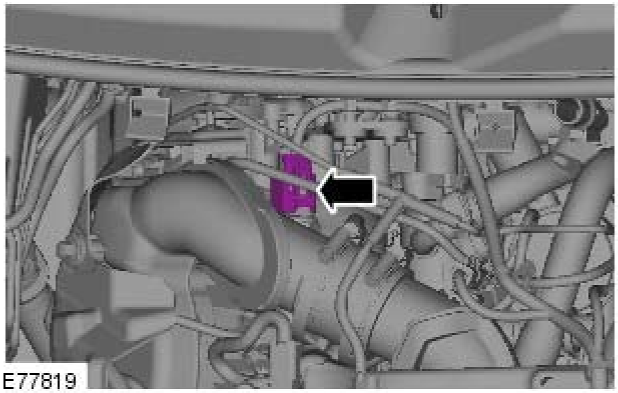
- Release the wiring harness.



E77818

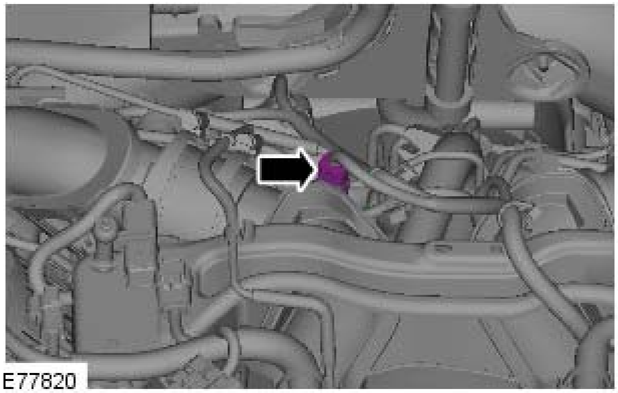
12. Disconnect the fuel rail pressure (FRP) sensor electrical connector.

- Release the wiring harness.



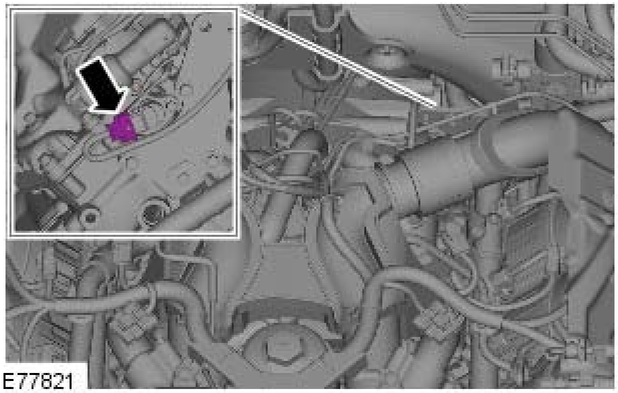
E77819

13. Disconnect the fuel temperature sensor electrical connector.

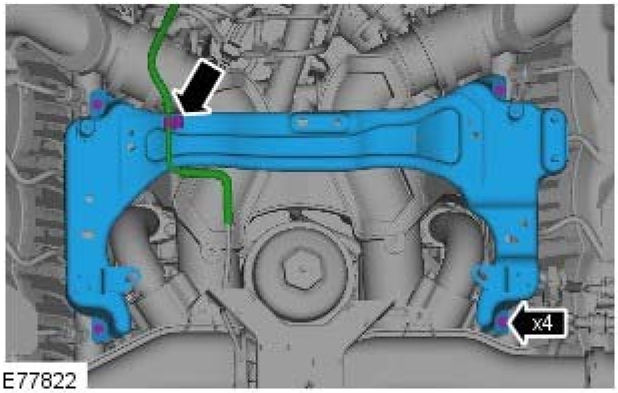


E77820

14. Disconnect the camshaft position (CMP) sensor electrical connector.

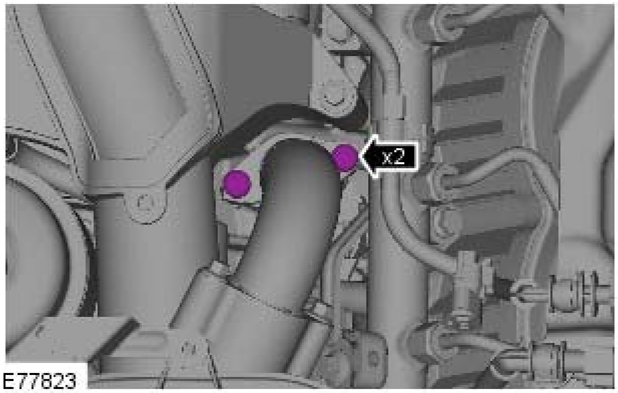


E77821



15. Remove the engine cover mounting bracket.

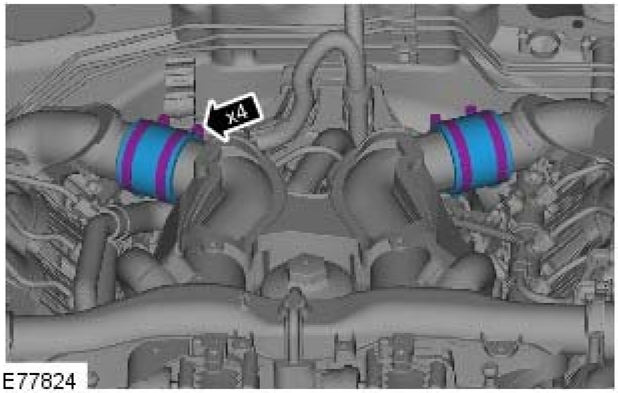
- Release the vacuum line.
- Remove the 4 bolts.



16. NOTE: Left-hand shown, right-hand similar.

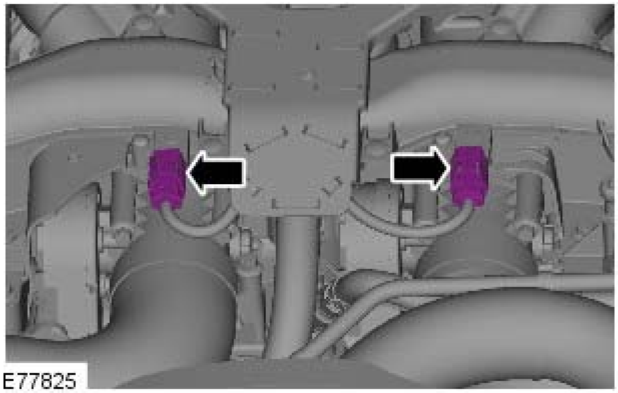
Release both EGR valve outlet tubes.

- Remove the 4 bolts.



17. Reposition the intake manifold plenum chamber rear hoses.

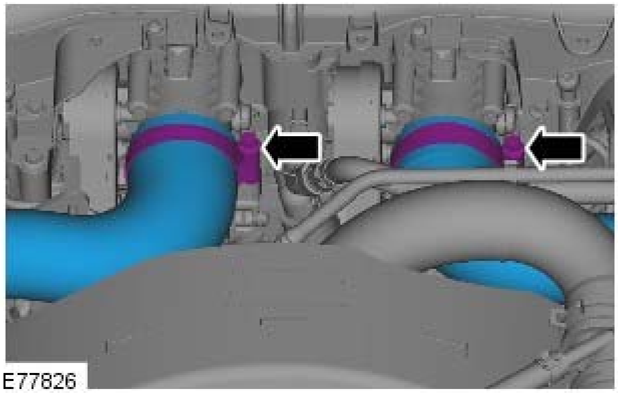
- Release the clips.



18. Disconnect both manifold absolute pressure and temperature (MAPT) sensor electrical connectors.

19. Disconnect the 2 charge air cooler outlet hoses.

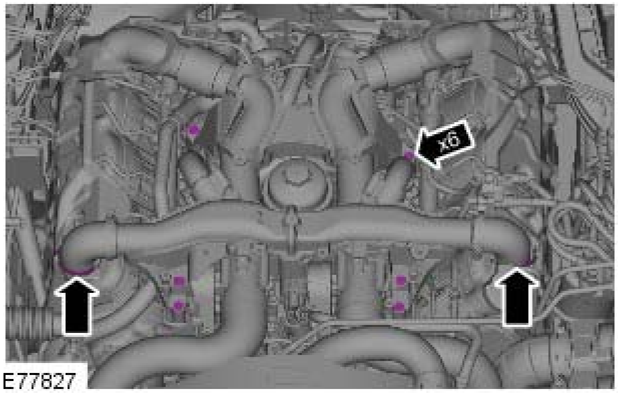
- Release the 2 clips.



E77826

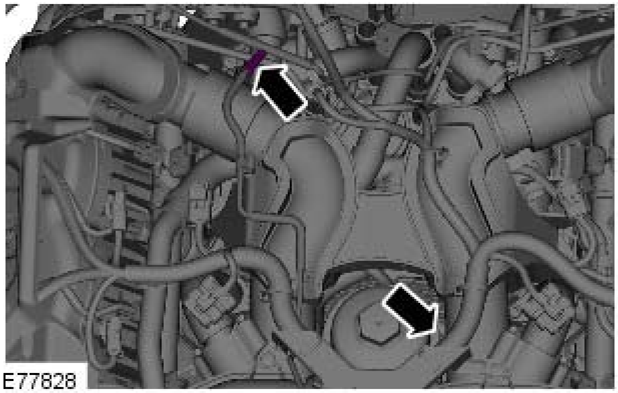
20. Release the intake manifold plenum chamber.

- Release the clips.
- Fully loosen the 6 bolts.



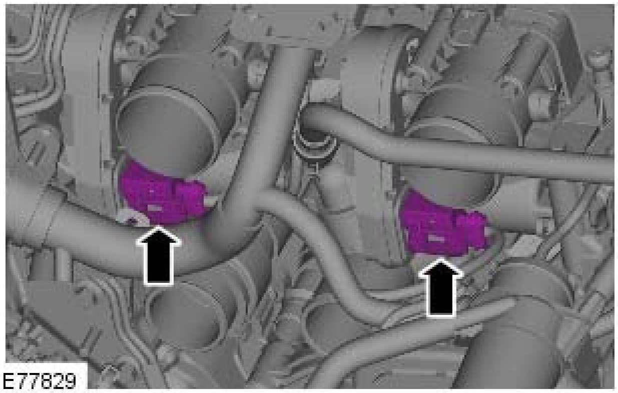
E77827

21. Disconnect the vacuum lines.



E77828

22. Disconnect both throttle body electrical connectors.

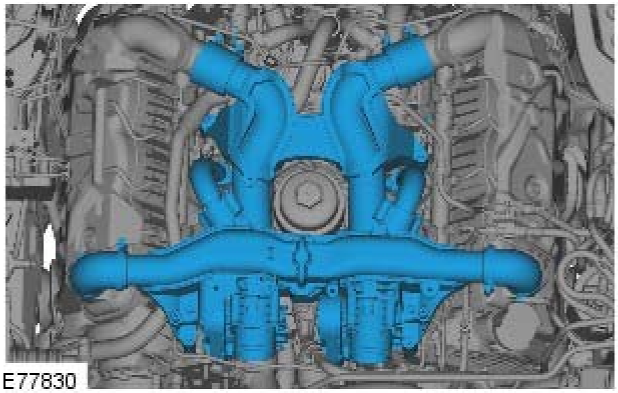


E77829

23. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the intake manifold plenum chamber.

- Remove and discard the EGR valve outlet tube gaskets.

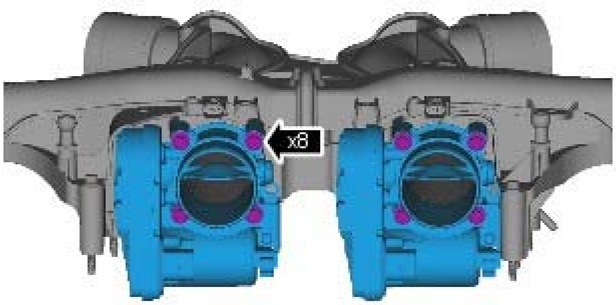


E77830

24. NOTE: Do not disassemble further if the component is removed for access only.

Remove the throttle bodies.

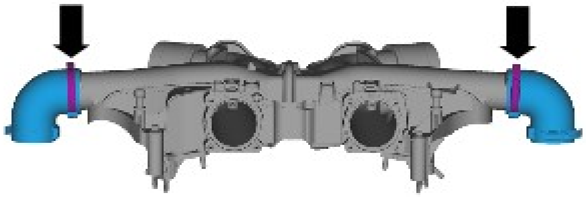
- Remove the 8 bolts.
- Remove and discard the 2 O-ring seals.



E77831

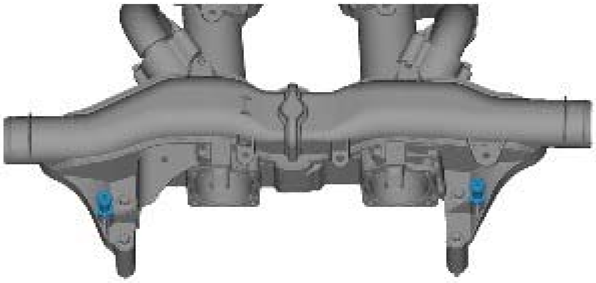
25. Remove the intake manifold plenum chamber front hoses.

- Release the clips.



E77832

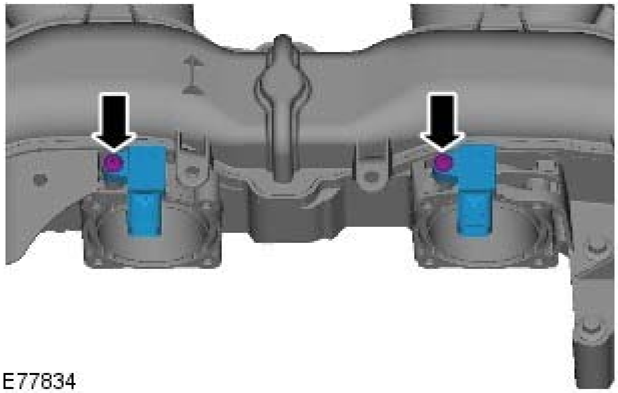
26. Remove the engine cover locating studs.



E77833

27. Remove the MAPT sensors.

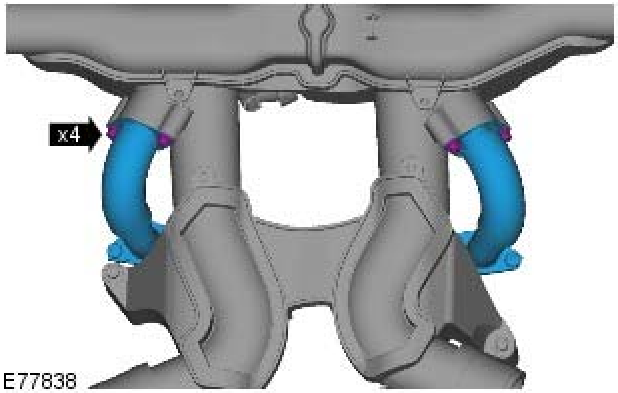
- Remove the 2 screws.



E77834

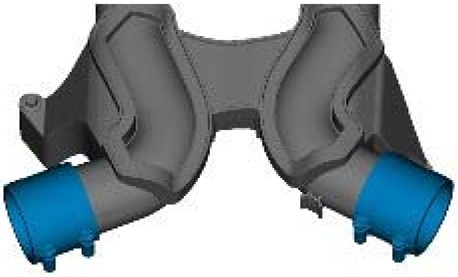
28. Remove both EGR valve outlet tubes.

- Remove the 4 bolts.
- Remove and discard the 2 O-ring seals.
- Remove and discard the 2 gaskets.



E77838

29. Remove the intake manifold plenum chamber rear hoses.



E77840

Installation

1. Install the intake manifold plenum chamber rear hoses.

2. NOTE: Only fully tighten the EGR valve outlet tube bolts when the intake manifold plenum chamber bolts are fully tightened.

Install both EGR valve outlet tubes.

- Clean the components mating faces.
- Install new O-ring seals.
- Install new gaskets.
- Tighten the bolts to 10 Nm (7 lb.ft).

3. Install both MAPT sensors.

- Clean the components mating faces.
- Tighten the screws to 3 Nm (2 lb.ft).

4. Install the engine cover locating studs.

5. Install the intake manifold plenum chamber front hoses.

- Tighten the clips to 3 Nm (2 lb.ft).

6. Install the throttle bodies.

- Clean the components mating faces.
- Install new O-ring seals.
- Tighten the bolts to 8 Nm (6 lb.ft).

7. NOTE: Remove and discard the blanking caps.

Install the intake manifold plenum chamber.

- Clean the components mating faces.
- Install new gaskets to the EGR valve outlet tubes.
- Loosely install the EGR valve outlet tube bolts.
- Loosely install the intake manifold plenum chamber bolts.

8. Connect both throttle body electrical connectors.

9. Connect the vacuum lines.

10. Secure the intake manifold plenum chamber.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the clips to 3 Nm (2 lb.ft).

11. Connect both charge air cooler outlet hoses.

- Tighten the clips to 5 Nm (4 lb.ft).

12. Connect both MAPT sensor electrical connectors.

13. Reposition the intake manifold plenum chamber rear hoses.

- Tighten the clips to 3 Nm (2 lb.ft).

14. Secure both EGR valve outlet tubes.

- Tighten the bolts to 10 Nm (7 lb.ft).

15. Install the engine cover mounting bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the vacuum line.

16. Connect the CMP sensor electrical connector.

17. Connect the fuel temperature sensor electrical connector.

18. Connect the FRP sensor electrical connector.

- Secure the wiring harness.

19. Connect the KS electrical connectors.

- Secure the wiring harness.

20. Secure the engine wiring harness.

- Tighten the nut.
- Secure the clips.

21. Connect both EGR valve electrical connectors.

- Secure the wiring harness.

22. Connect the glow plug electrical connectors.

- Secure the wiring harness.

23. Connect the fuel injector electrical connectors.

- Attach the fuel charging wiring harness.

24. Install the fuel line shield.

- Tighten the nuts to 5 Nm (4 lb.ft).

25. ⚠ CAUTION: Make sure the upper oil level indicator tube nut is not damaged, replace the nut as required. Failure to follow this instruction may result in damage to the vehicle.

• NOTE: Remove and discard the blanking caps.

Install the oil level indicator and upper oil level indicator tube.

- Clean the components mating faces.
- Install new O-ring seals.
- Tighten the bolt.

26. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

27. Secure the coolant lines.

- Tighten the nuts.

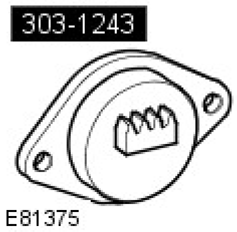
28. Install the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

29. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Oil Pan

In-vehicle Repair

Special Tool(s)	
 303-1243 E81375	Flexplate locking tool 303-1243

Removal

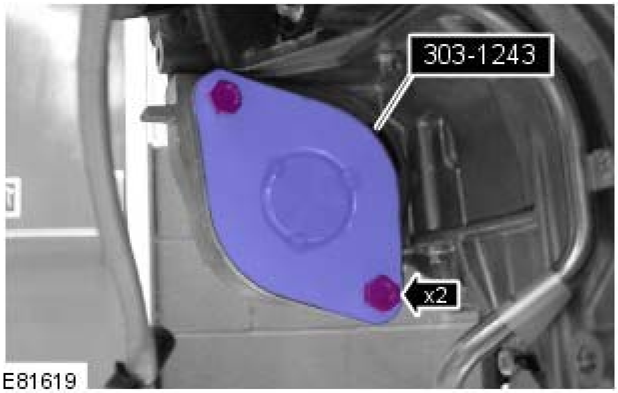
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the engine.
For additional information, refer to: Engine (303-01D Engine - TDV8 3.6L Diesel, Removal).

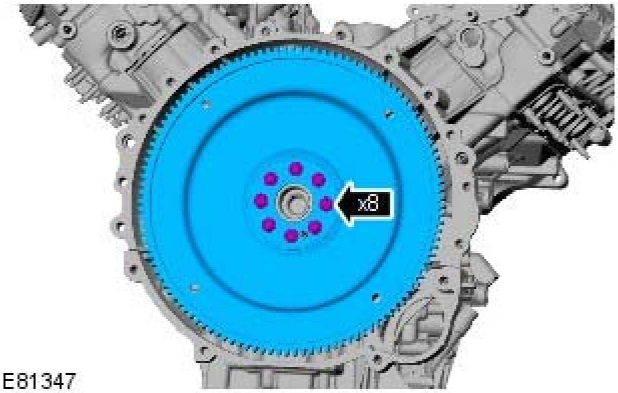
4. Install the special tool.



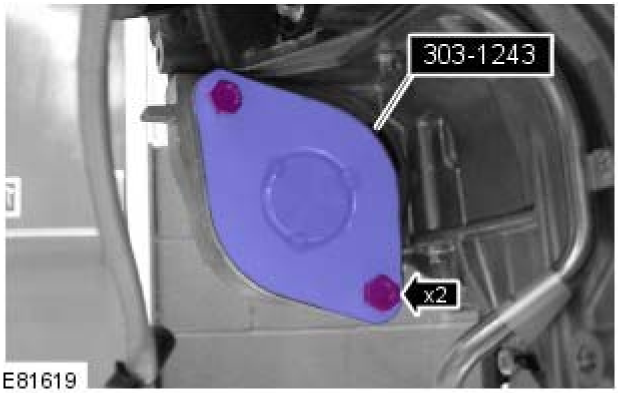
E81619

5. Remove the flexplate.

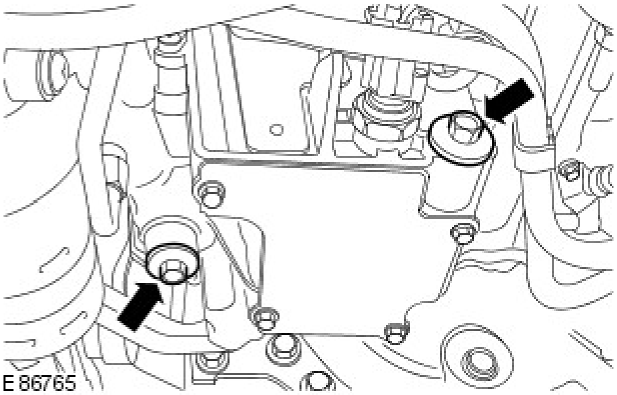
- Remove and discard the 8 bolts.



E81347



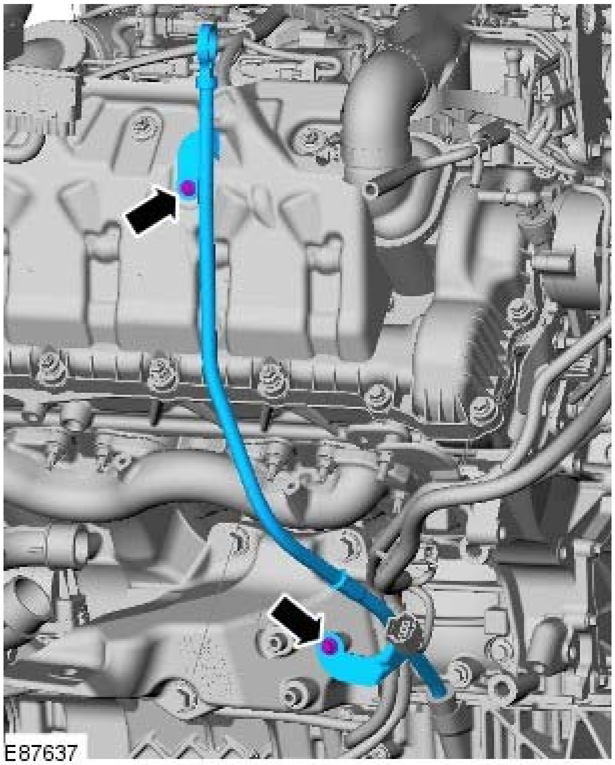
6. Remove the special tool.



7. Install the engine to a suitable engine stand.

8. Drain the engine oil.

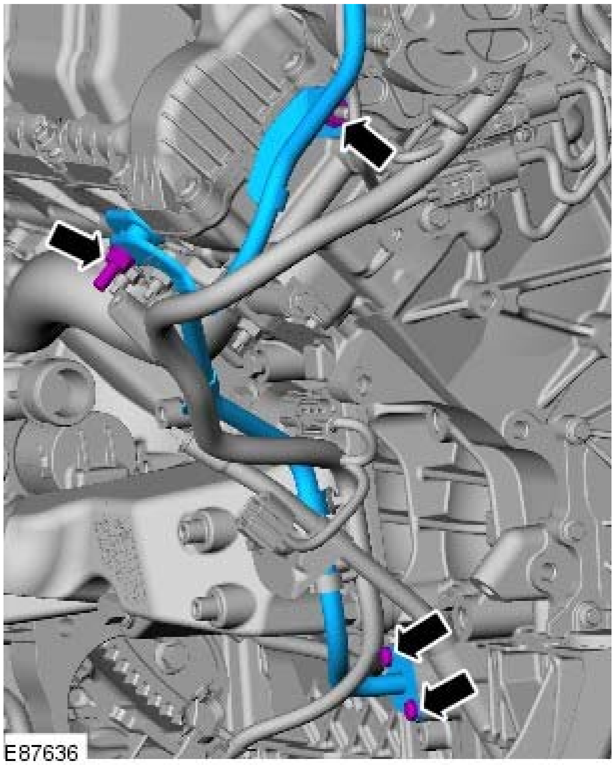
- Position a container to collect the fluid.
- Remove the drain plugs.
- Allow the fluid to drain.
- Install the drain plugs and tighten to 23 Nm (17 lb.ft).
- Remove the container.



9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Release the oil level indicator and tube.

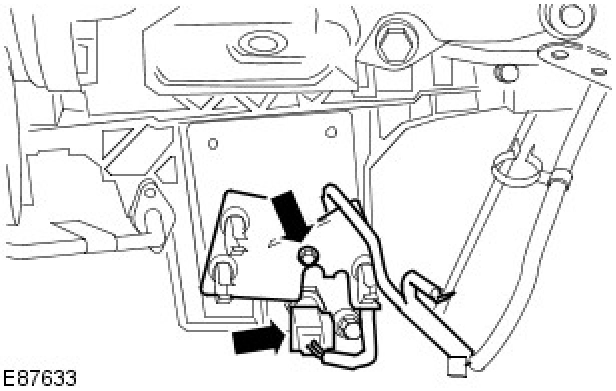
- Remove the 2 bolts.
- Remove and discard the O-ring seal.



10. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

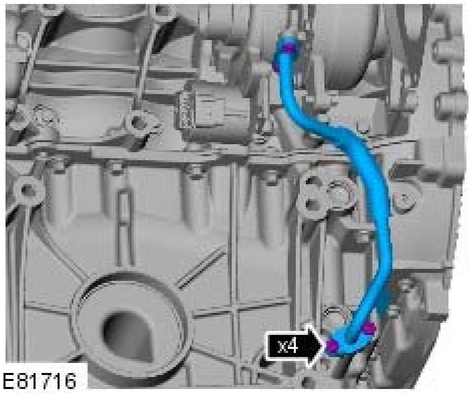
Release the oil pick-up pipe.

- Remove the 3 bolts.
- Loosen the nut.
- Remove and discard the O-ring seal.



11. Release the fuel line support bracket.

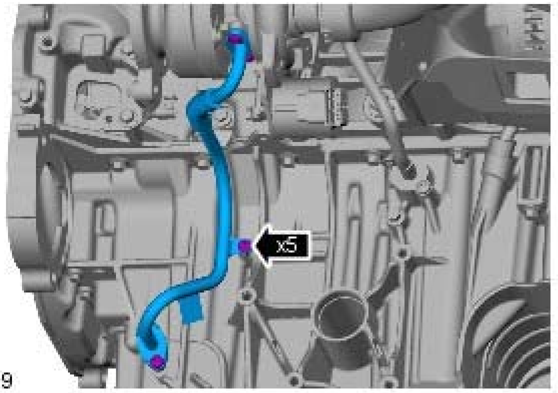
- Disconnect the engine oil temperature sensor electrical connector.
- Remove the bolt.



12. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the LH turbocharger oil return tube.

- Remove the 4 bolts.
- Remove and discard the 2 gaskets.

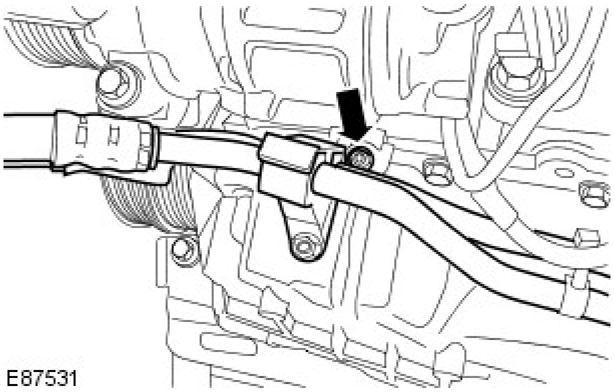


E81729

13. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the RH turbocharger oil return tube.

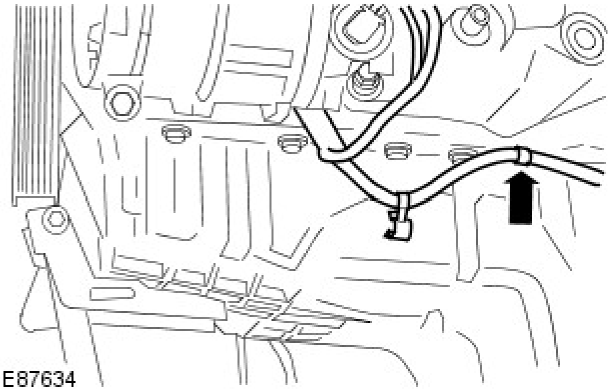
- Remove the 5 bolts.
- Remove and discard the 2 gaskets.



E87531

14. Remove the transmission cooler lines.

- Remove the bolt.

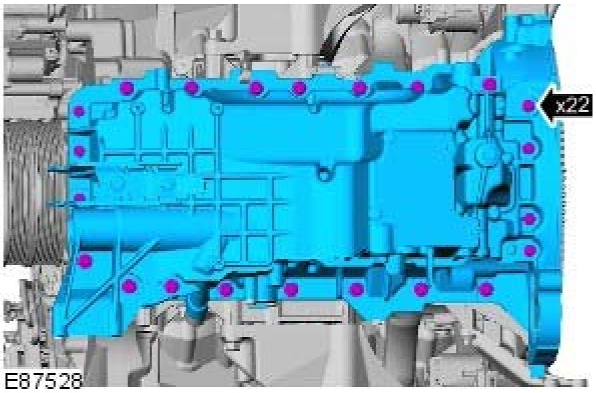


E87634

15. NOTE: RH illustration shown, LH is similar

Release the engine wiring harness from the oil pan.

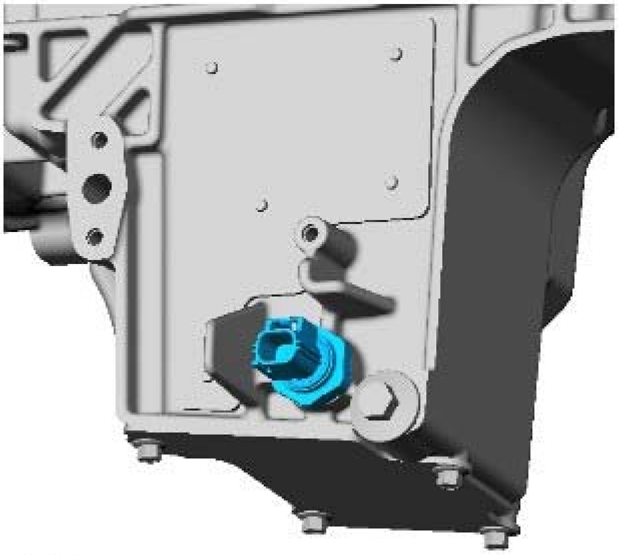
- Release the 2 clips.



E87528

16. Remove the oil pan.

- Remove the 22 bolts.
- Remove and discard the gasket.

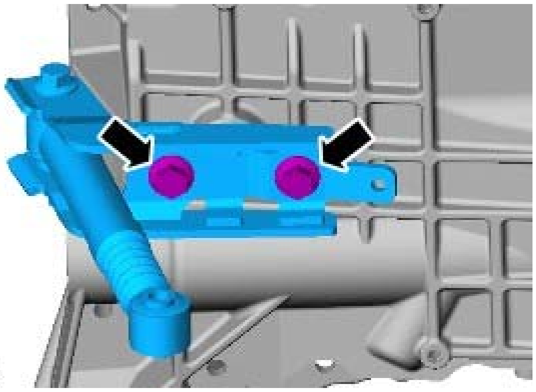


E87530

17. NOTE: Do not disassemble further if the component is removed for access only.

Remove the engine oil temperature sensor.

- Remove and discard the sealing washer.



E87635

18. NOTE: Do not disassemble further if the component is removed for access only.

Remove the engine stabilizer and engine stabilizer bracket.

- Remove the 2 bolts.

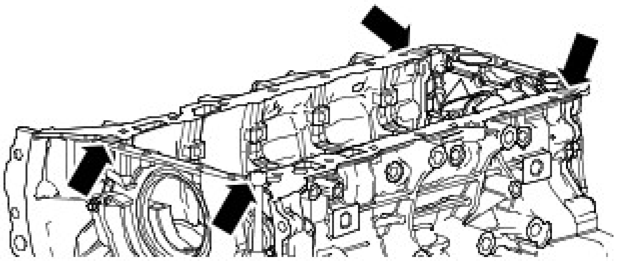
Installation

1. Install the engine stabilizer and engine stabilizer bracket.

- Tighten the bolts to 45 Nm (33 lb.ft).

2. Install the engine oil temperature sensor.

- Install a new sealing washer.
- Tighten the sensor to 23 Nm (17 lb.ft).



E83243

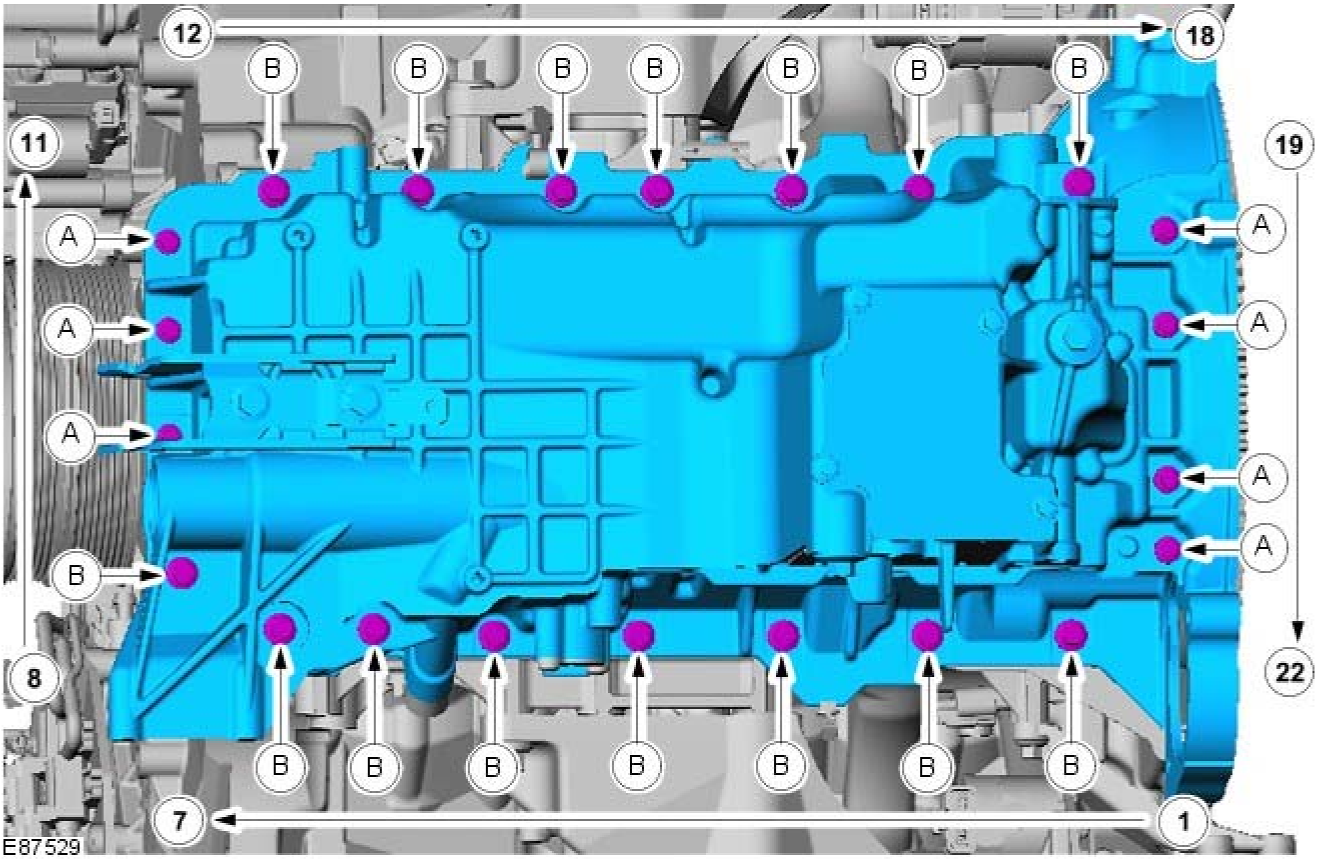
3. Install the oil pan.

- Clean the component mating faces.
- Apply sealant to the 4 places shown.
- Install a new gasket.

4. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Secure the oil pan.

- Tighten bolts A to 10 Nm (7 lb.ft).
- Tighten bolts B to 23 Nm (17 lb.ft).



E87529

5. Attach the engine wiring harness to the oil pan.

- Secure the 2 wiring harness clips.

6. Install the transmission cooler pipes.

- Tighten the bolt to 10 Nm (7 lb.ft).

7. NOTE: Remove and discard the blanking caps.

Install the LH turbocharger oil return tube.

- Clean the component mating faces.
- Install new gaskets.
- Tighten the bolts to 10 Nm (7 lb.ft).

8. NOTE: Remove and discard the blanking caps.

Install the RH turbocharger oil return tube.

- Clean the component mating faces.
- Install new gaskets.
- Tighten the bolts to 10 Nm (7 lb.ft).

9. Secure the fuel line support bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).
- Connect the engine oil temperature sensor electrical connector.

10. NOTE: Remove and discard the blanking caps.

Secure the oil pick-up pipe.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the M6 bolts to 10 Nm (7 lb.ft).
- Tighten the M8 bolt to 23 Nm (17 lb.ft).
- Tighten the nut to 23 Nm (17 lb.ft).

11. NOTE: Remove and discard the blanking caps.

Secure the oil level indicator and tube.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolts to 9 Nm (7 lb.ft).

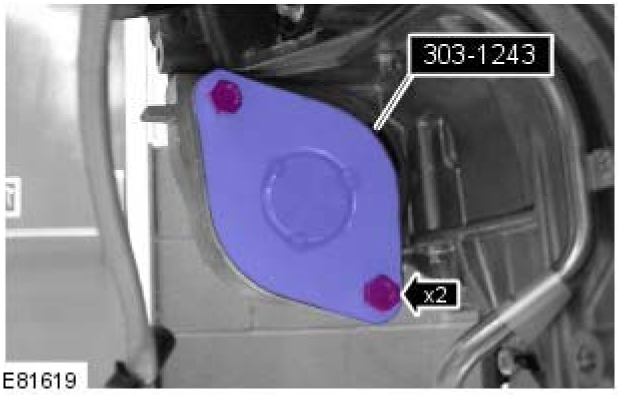
12. Remove the engine from the engine stand.

13. ⚠ CAUTION: Make sure that new bolts are installed.

Install the flexplate.

- Install the bolts, but do not tighten fully at this stage.

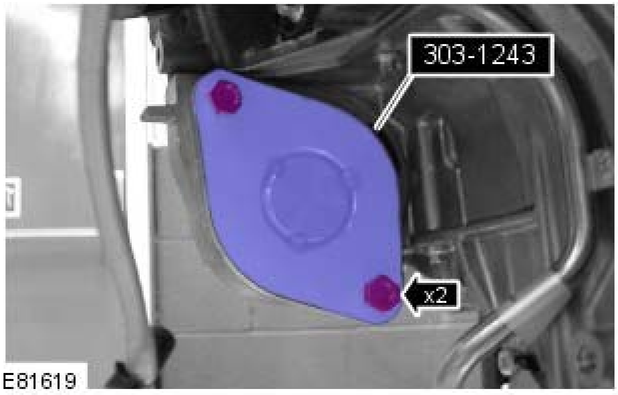
14. Install the special tool.



15. Secure the flexplate.

- Tighten the bolts to 95 Nm (70 lb.ft).

16. Remove the special tool.



17. Install the engine.
For additional information, refer to: Engine (303-01D Engine - TDV8 3.6L Diesel, Removal).

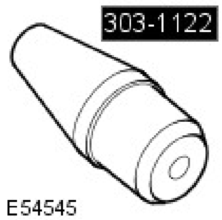
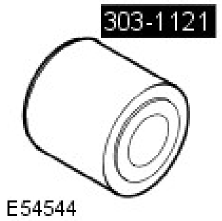
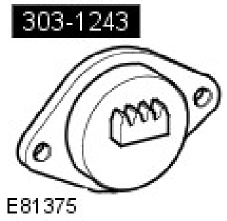
18. Fill the engine with the recommended oil to the correct level.

19. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Oil Pump

In-vehicle Repair

Special Tool(s)	
	Crankshaft Front Seal Sleeve 303-1122
	Crankshaft Front Seal Installer 303-1121
	Flexplate locking tool 303-1243

Removal

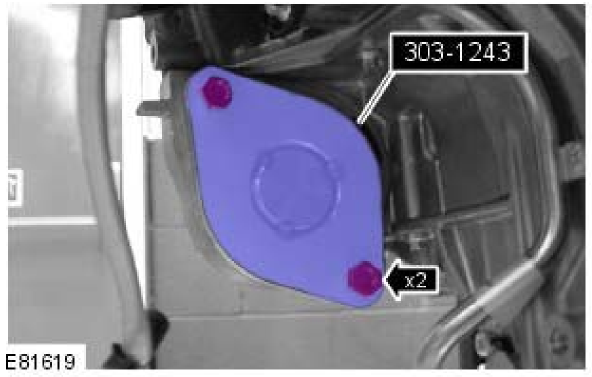
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

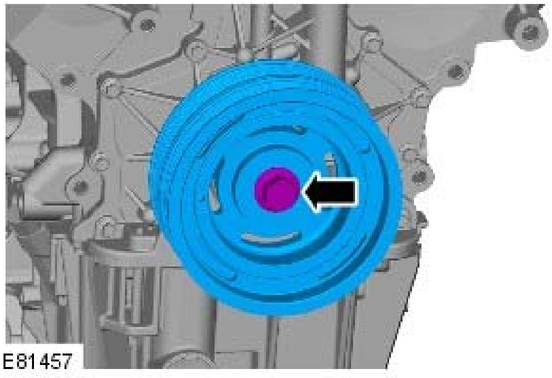
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

3. Remove the engine.
   For additional information, refer to: Engine (303-01D Engine - TDV8 3.6L Diesel, Removal).

4. Install the special tool.

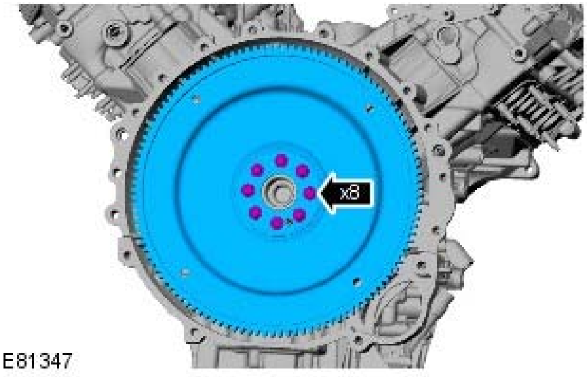




5. NOTE: The crankshaft pulley bolt will be very tight.

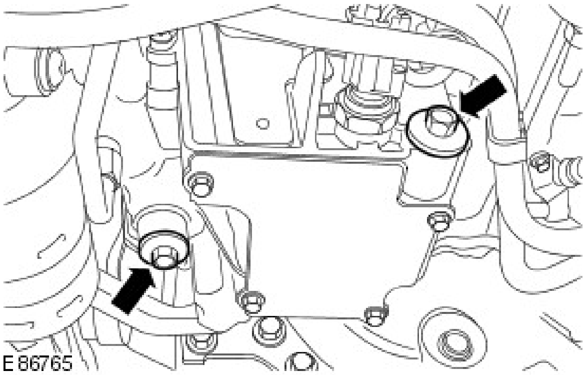
Remove the crankshaft pulley.

- Remove and discard the bolt.



6. Remove the flexplate.

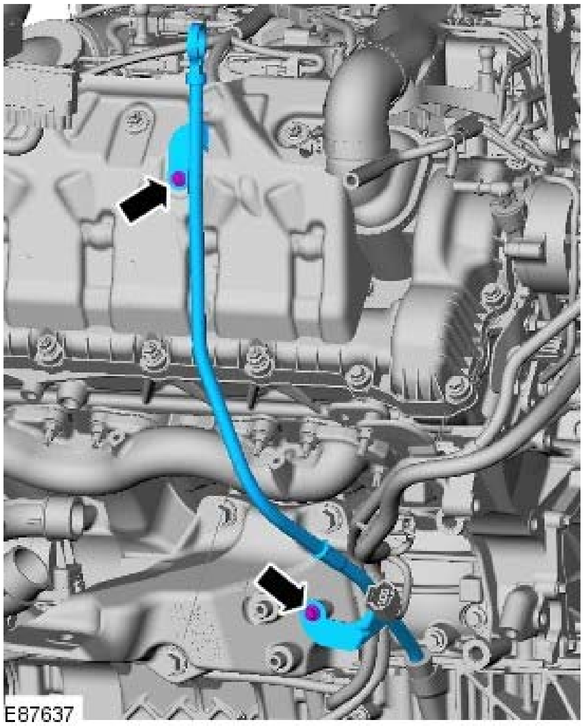
- Remove and discard the 8 bolts.



7. Install the engine to a suitable engine stand.

8. Drain the engine oil.

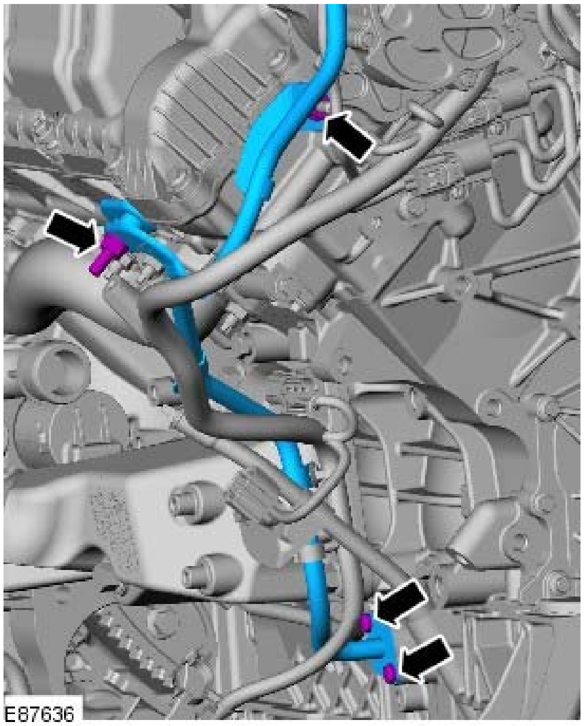
- Position a container to collect the fluid.
- Remove the drain plugs.
- Allow the fluid to drain.
- Install the drain plugs and tighten to 23 Nm (17 lb.ft).
- Remove the container.



9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Release the oil level indicator and tube.

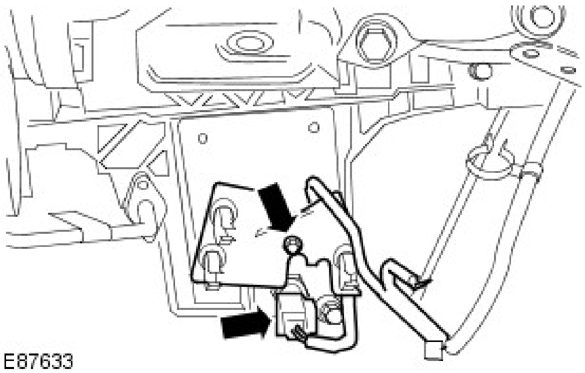
- Remove the 2 bolts.
- Remove and discard the O-ring seal.



10. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

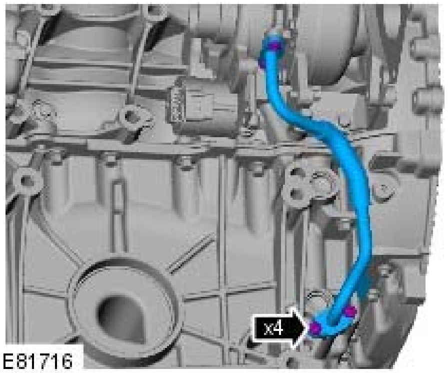
Release the oil pick-up pipe.

- Remove the 3 bolts.
- Loosen the nut.
- Remove and discard the O-ring seal.


E87633

11. Release the fuel line support bracket.

- Disconnect the engine oil temperature sensor electrical connector.
- Remove the bolt.

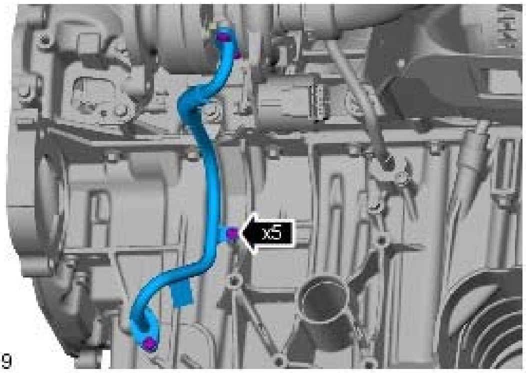


E81716

12. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the LH turbocharger oil return tube.

- Remove the 4 bolts.
- Remove and discard the 2 gaskets.

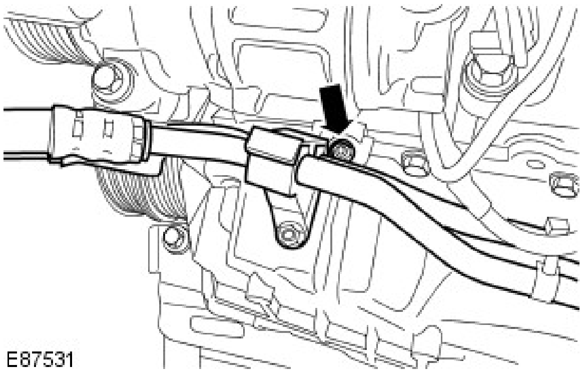


E81729

13. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

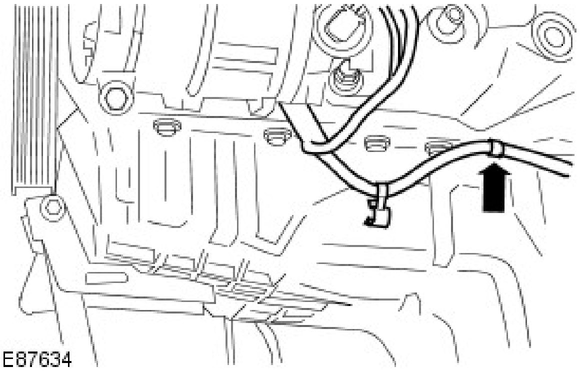
Remove the RH turbocharger oil return tube.

- Remove the 5 bolts.
- Remove and discard the 2 gaskets.


E87531

14. Remove the transmission cooler lines.

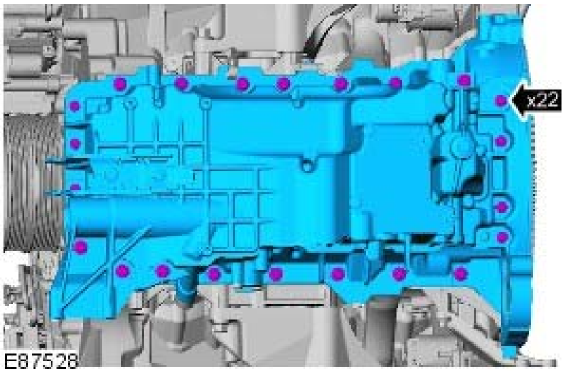
- Remove the bolt.


E87634

15. NOTE: RH illustration shown, LH is similar.

Release the engine wiring harness from the oil pan.

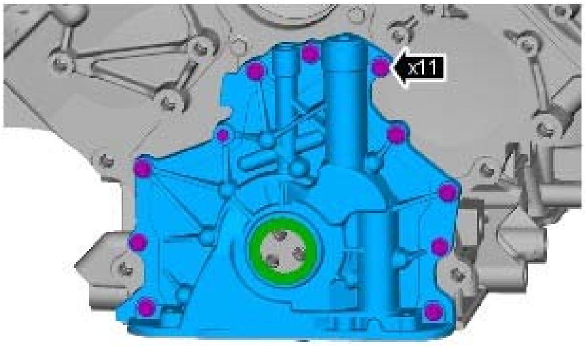
- Release the 2 clips.



E87528

16. Remove the oil pan.

- Remove the 22 bolts.
- Remove and discard the gasket.



E81468

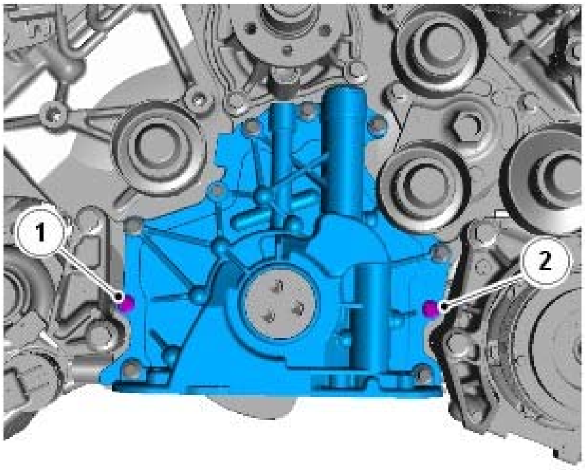
17. Remove the oil pump.

- Remove the 11 bolts.
- Remove and discard the gasket.
- Remove and discard the crankshaft front seal.

Installation

1. Prime the oil pump.

- Fill the orifice shown with 20 ml of engine oil.
- Rotate the oil pump drive 2 complete turns.



E132164

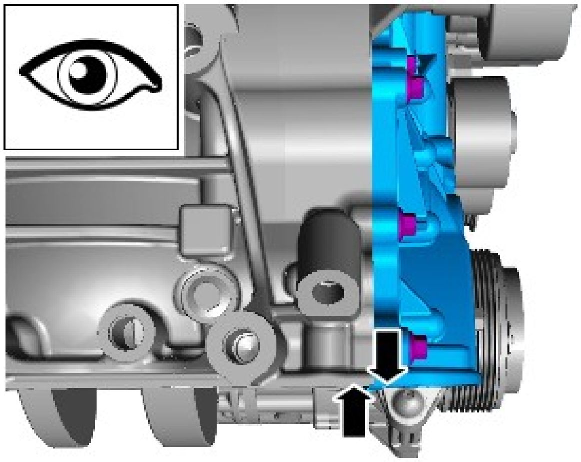
2. CAUTIONS:

⚠ Make sure that the mating faces are clean and free of foreign material.

⚠ Make sure the gasket is installed correctly.

Install the oil pump.

- Clean the component mating faces.
- Install a new gasket.
- Lightly tighten the bolts in the position shown.

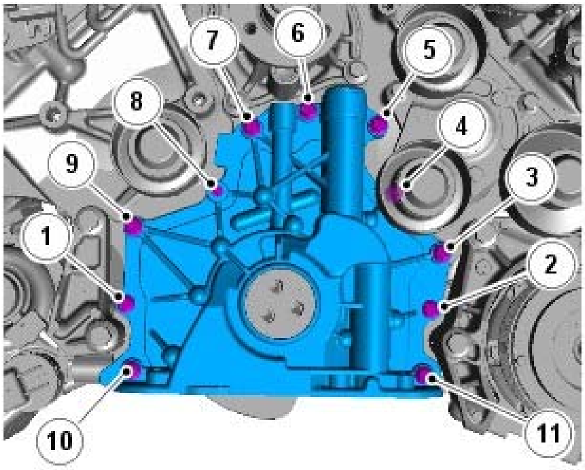


E132166

3. ⚠ CAUTION: Make sure the base of the oil pump is aligned within 0.2 mm of the base of the engine block. Failure to follow this instruction may result in damage to the vehicle.

• NOTE: Vehicles fitted with oil pumps without dowels.

Check the oil pump to engine block alignment.



E132165

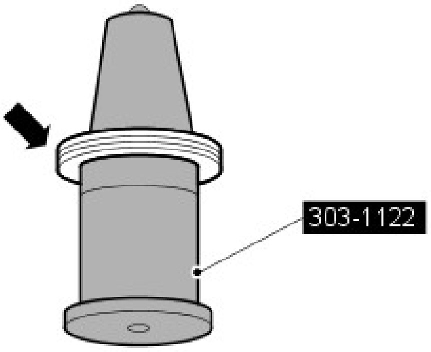
4. Secure the oil pump.

- Tighten the bolts in the sequence shown to 10 Nm .

5. Install the oil pump lower retaining bolts.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

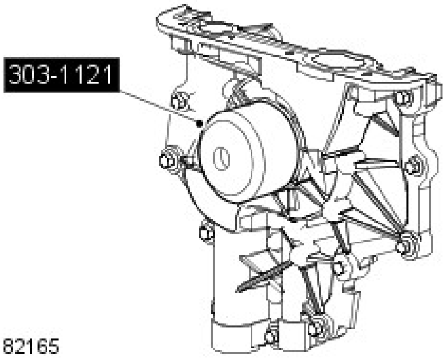
6. Install a new crankshaft front seal to the special tool.



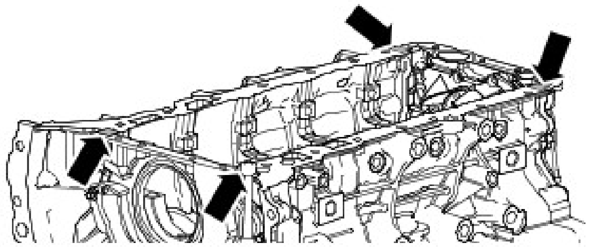
E54300

7. Remove the sleeve from the special tool.
8. Using the special tool, install a new crankshaft front seal.

- Use the discarded crankshaft bolt with the service tool.

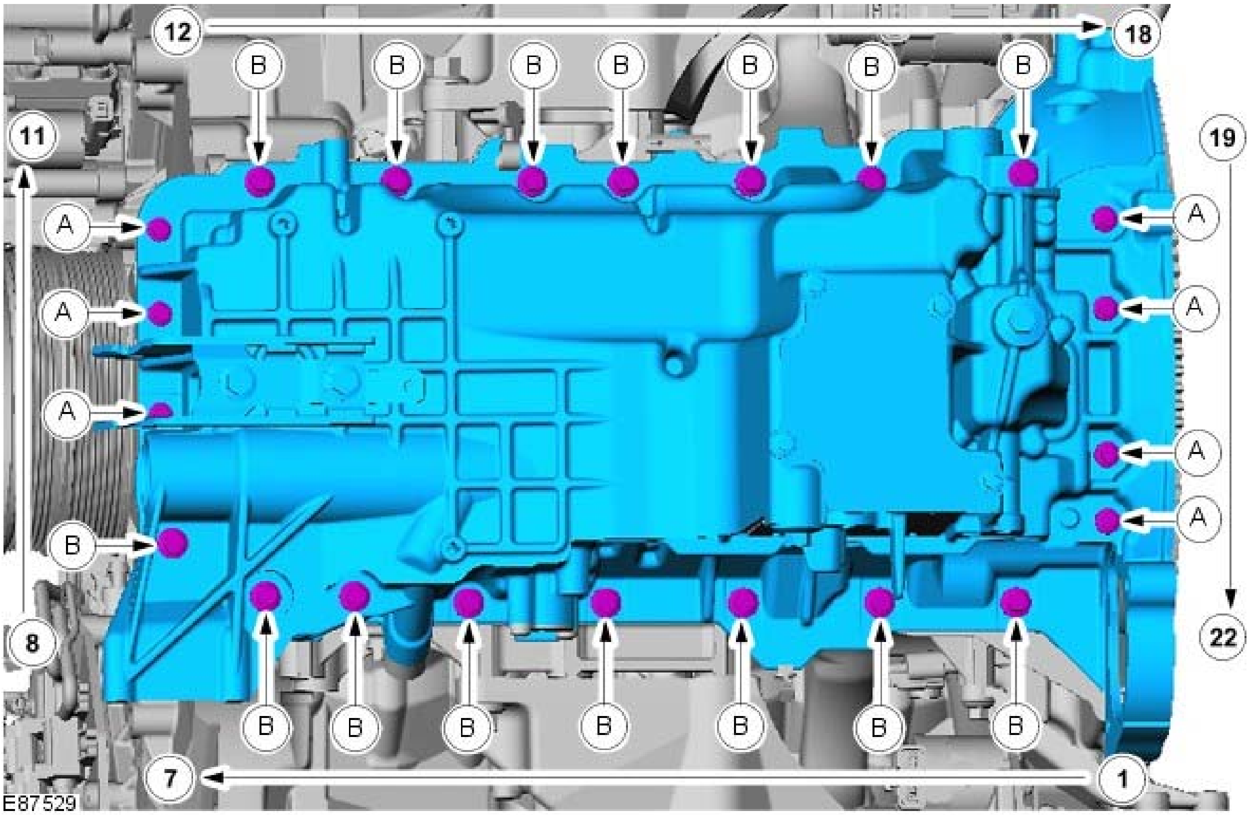


E82165


E83243

9. Install the oil pan.

- Clean the component mating faces.
- Apply sealant to the 4 places shown.
- Install a new gasket.



10. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Secure the oil pan.

- Tighten bolts A to 10 Nm (7 lb.ft).
- Tighten bolts B to 23 Nm (17 lb.ft).

11. Attach the engine wiring harness to the oil pan.

- Secure the 2 wiring harness clips.

12. Install the transmission cooler pipes.

- Tighten the bolt to 10 Nm (7 lb.ft).

13. NOTE: Remove and discard the blanking caps.

Install the LH turbocharger oil return tube.

- Clean the component mating faces.
- Install new gaskets.
- Tighten the bolts to 10 Nm (7 lb.ft).

14. NOTE: Remove and discard the blanking caps.

Install the RH turbocharger oil return tube.

- Clean the component mating faces.
- Install new gaskets.

- Tighten the bolts to 10 Nm (7 lb.ft).

15. Secure the fuel line support bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).
- Connect the engine oil temperature sensor electrical connector.

16. NOTE: Remove and discard the blanking caps.

Secure the oil pick-up pipe.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the M6 bolts to 10 Nm (7 lb.ft).
- Tighten the M8 bolt to 23 Nm (17 lb.ft).
- Tighten the nut to 23 Nm (17 lb.ft).

17. NOTE: Remove and discard the blanking caps.

Secure the oil level indicator and tube.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolts.

18. Remove the engine from the engine stand.

19. ⚠ CAUTION: Make sure that new bolts are installed.

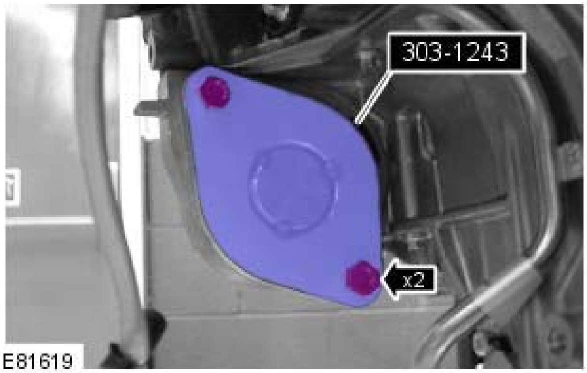
Install the flexplate.

- Tighten the bolts to 95 Nm (70 lb.ft).

20. Install the crankshaft pulley.

- A new crankshaft pulley bolt must be installed.
- Stage 1: Tighten the bolt to 140 Nm (103 lb.ft).
- Stage 2: Tighten the bolt a further 90 degrees.

21. Remove the special tool.



22. Install the engine.
For additional information, refer to: Engine (303-01D Engine - TDV8 3.6L Diesel, Removal).

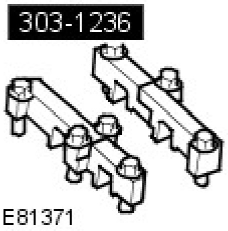
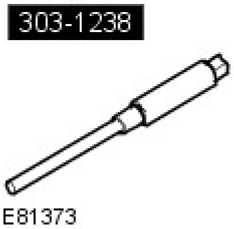
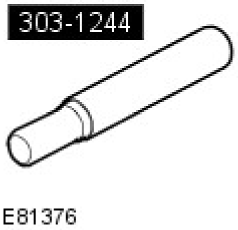
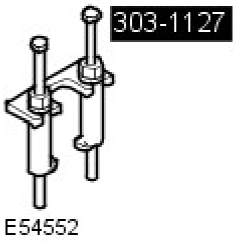
23. Fill the engine with the recommended oil to the correct level.

24. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Timing Drive Components

In-vehicle Repair

Special Tool(s)	
	Camshaft holding tool 303-1236
	Crankshaft timing pin 303-1238
	Valve cover alignment tool 303-1244
	Fuel Injector remover 303-1127

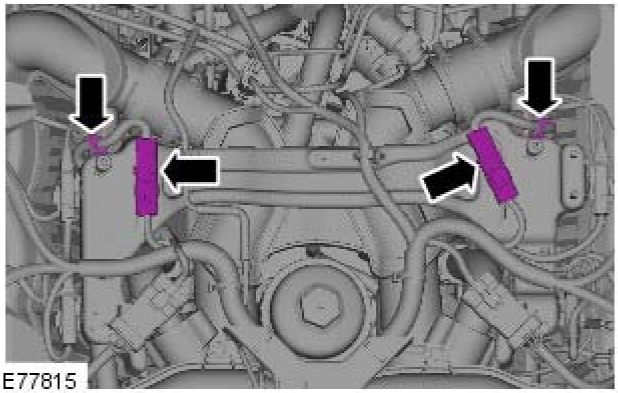
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

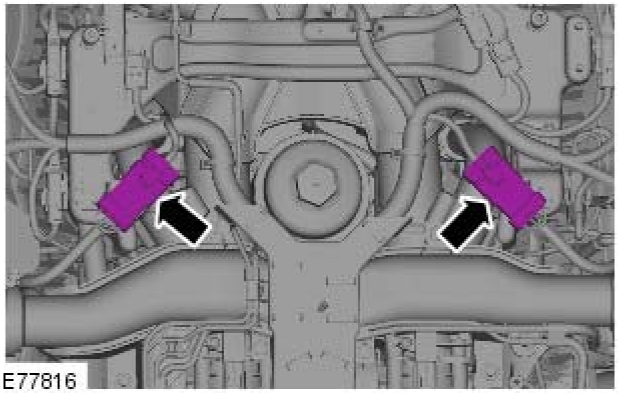
Raise and support the vehicle.

3. Remove the oil pump.
For additional information, refer to: Oil Pump (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).


E77815

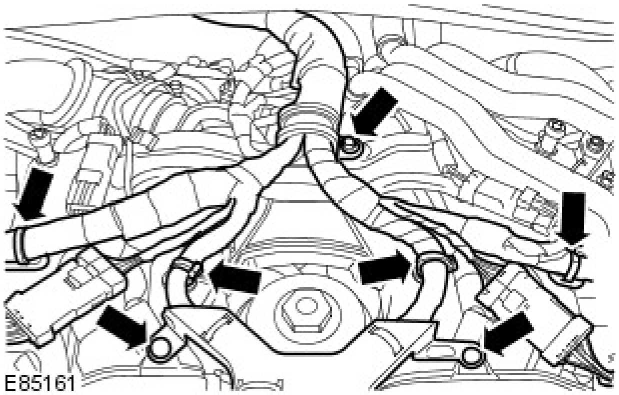
4. Disconnect the glow plug electrical connectors.

- Release the wiring harness.


E77816

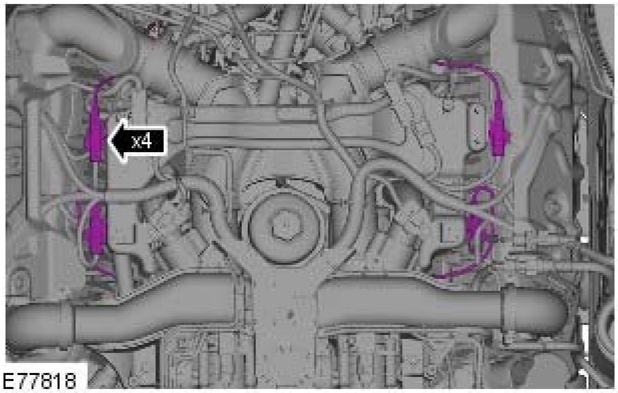
5. Disconnect both exhaust gas recirculation (EGR) valve electrical connectors.

- Release the wiring harness.


E85161

6. Release the engine wiring harness.

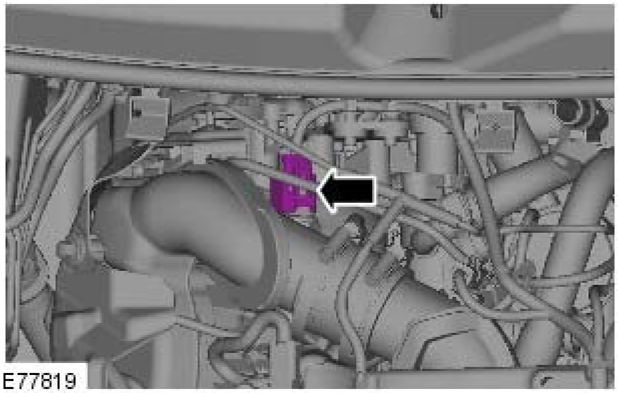
- Remove the nut.
- Release the 6 clips.



E77818

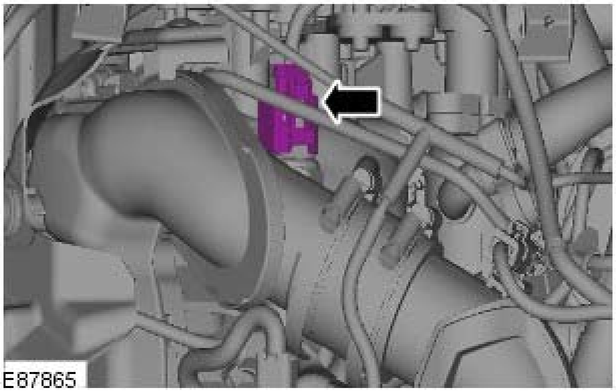
7. Disconnect the knock sensor (KS) electrical connectors.

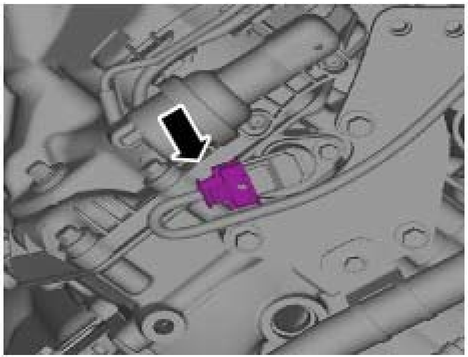
- Release the wiring harness.


E77819

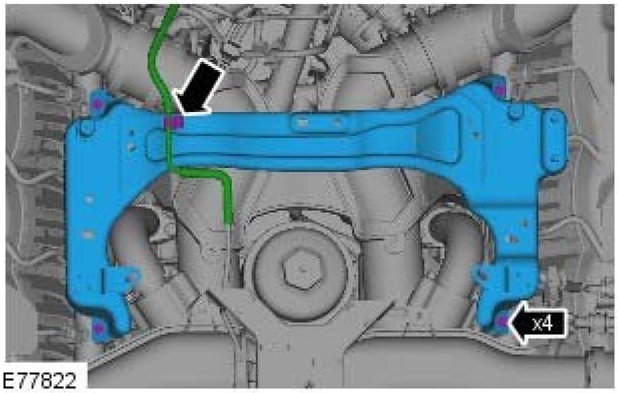
8. Disconnect the fuel rail pressure (FRP) sensor electrical connector.
   - Release the wiring harness.

9. Disconnect the fuel temperature sensor electrical connector.


E87865

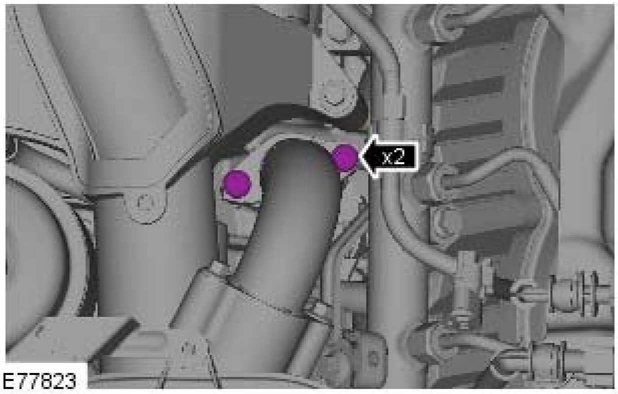

E87866

10. Disconnect the camshaft position (CMP) sensor electrical connector.



11. Remove the engine cover mounting bracket.

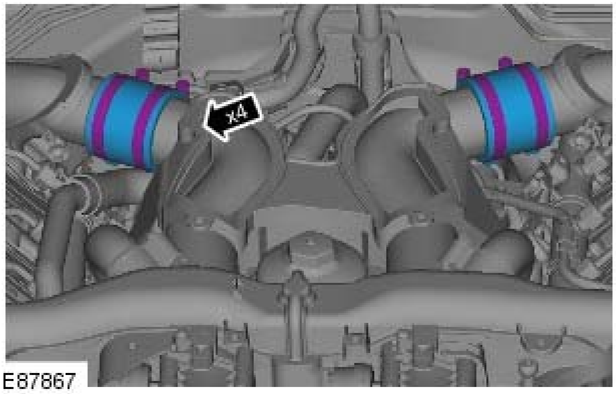
- Release the vacuum line.
- Remove the 4 bolts.



12. NOTE: Left-hand shown, right-hand similar.

Release both EGR valve outlet tubes.

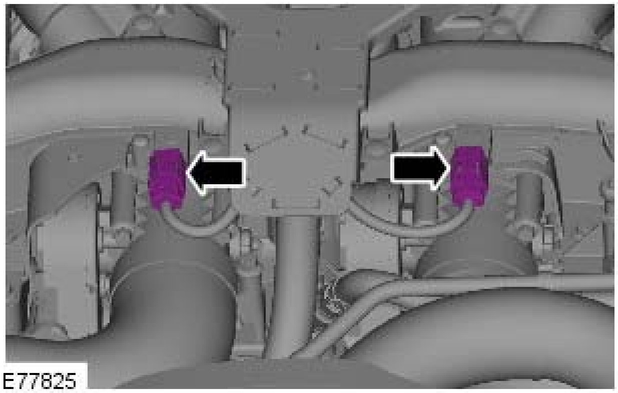
- Remove the 4 bolts.



13. Reposition the intake manifold plenum chamber rear hoses.

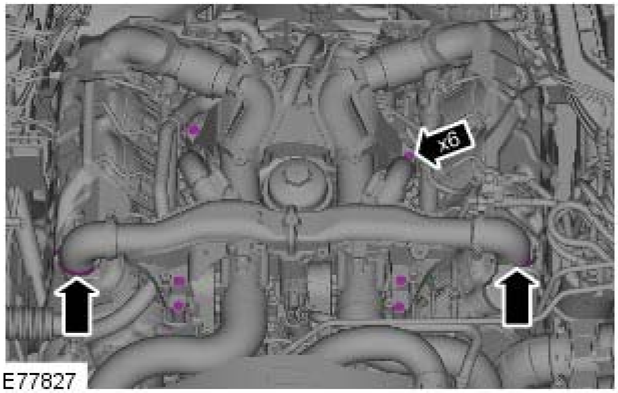
- Release the clips.

14. Disconnect both manifold absolute pressure and temperature (MAPT) sensor electrical connectors.


E77825

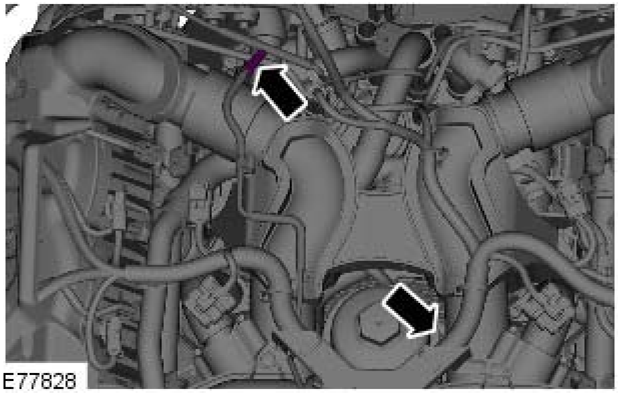
15. Release the intake manifold plenum chamber.

- Release the 2 clips.
- Fully loosen the 6 bolts.

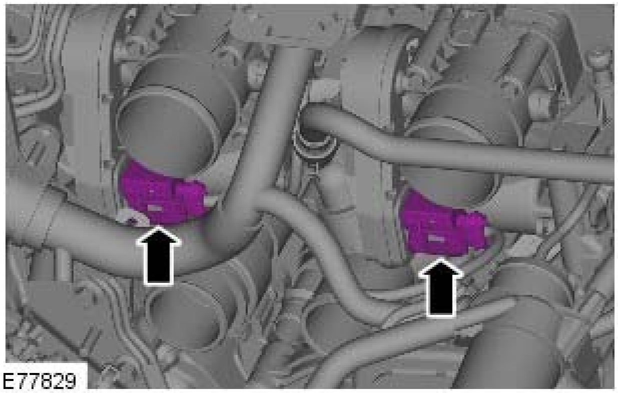


E77827

16. Disconnect the 2 vacuum lines.


E77828

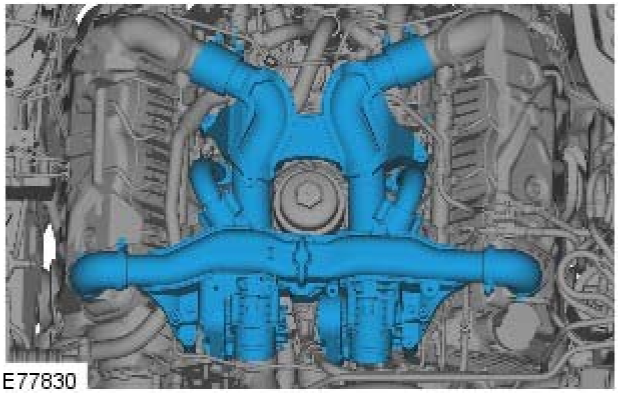
17. Disconnect both throttle body electrical connectors.


E77829

18. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

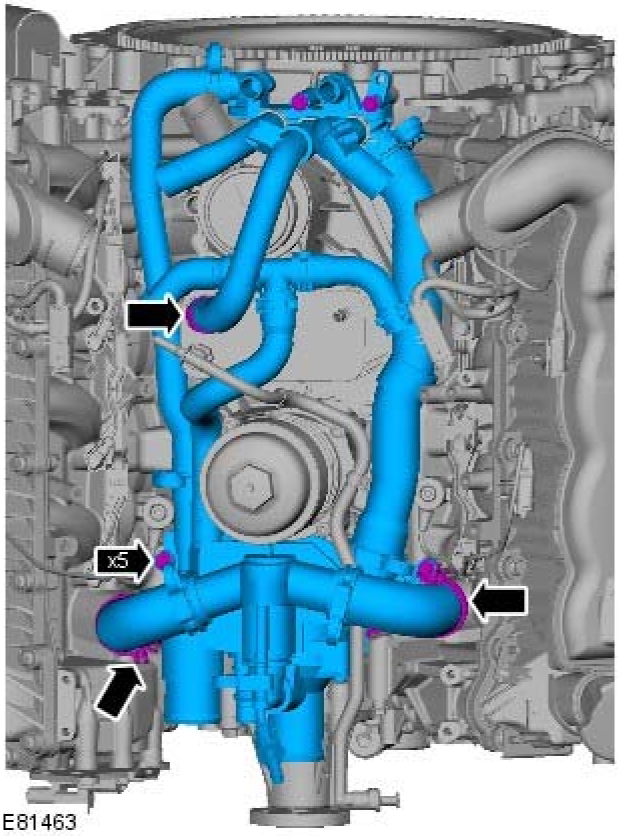
Remove the intake manifold plenum chamber.

- Remove and discard the EGR valve outlet tube gaskets.



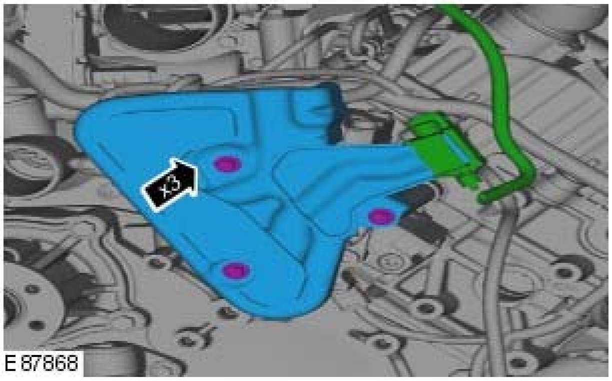
19. Release the coolant distribution manifold.

- Remove the 5 bolts.
- Release the 3 clips.
- Remove and discard the O-ring seal.



20. Remove the fuel pump shield.

- Release the vacuum solenoid.
- Remove the 3 bolts.



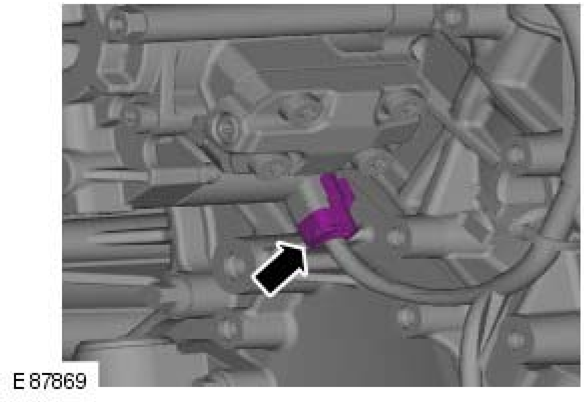
21. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection pump until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

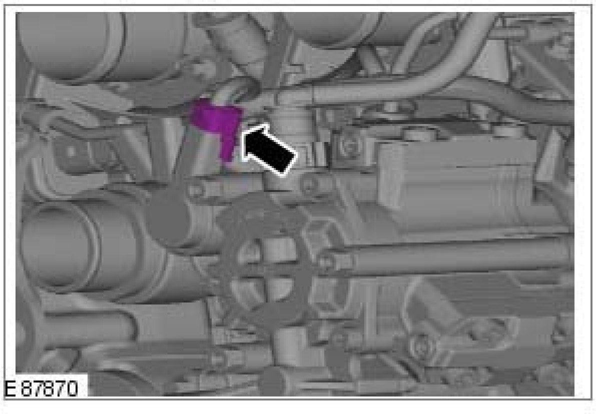
⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

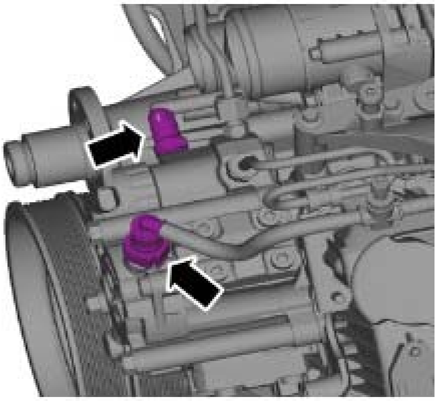
Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel rails and the fuel injection pump.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).

22. Disconnect the fuel metering valve electrical connector.



23. Disconnect the fuel injection control pressure sensor electrical connector.

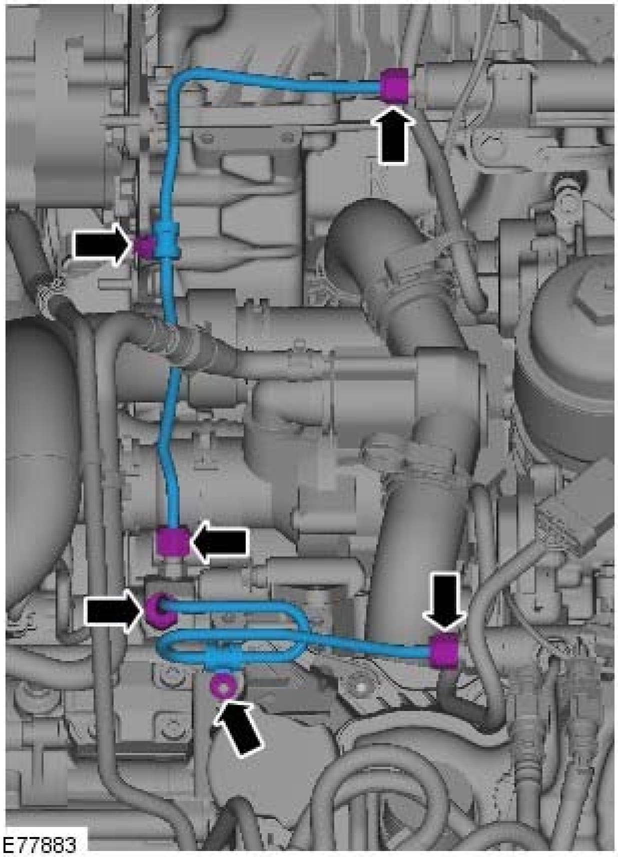




E87871

24. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the low-pressure fuel lines.

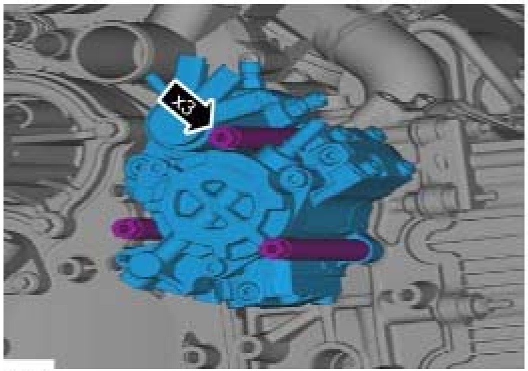


E77883

25. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the high-pressure fuel rail supply lines.

- Release the vacuum hose.
- Remove the 2 nuts.



E87872

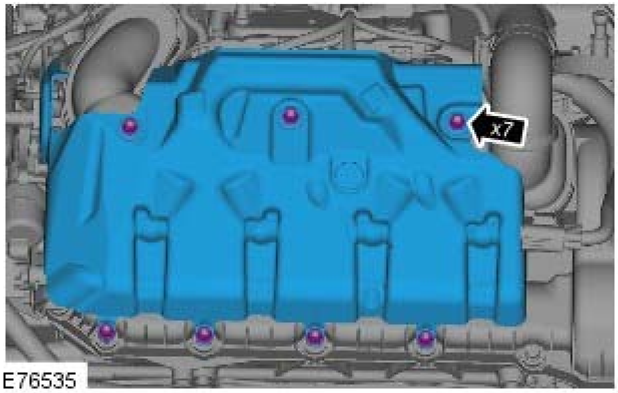
26. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the fuel pump.

- Remove the 3 bolts.
- Remove and discard the gasket.

27. Remove the LH fuel line shield.

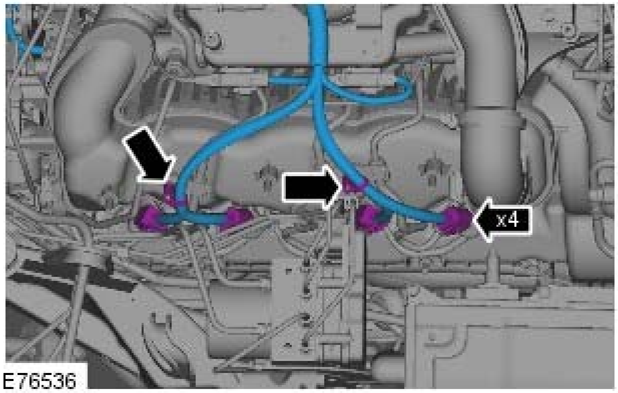
- Remove the 7 nuts.



28. NOTE: RH illustration shown, LH is similar.

Disconnect the fuel injector electrical connectors.

- Release the fuel charging wiring harness.

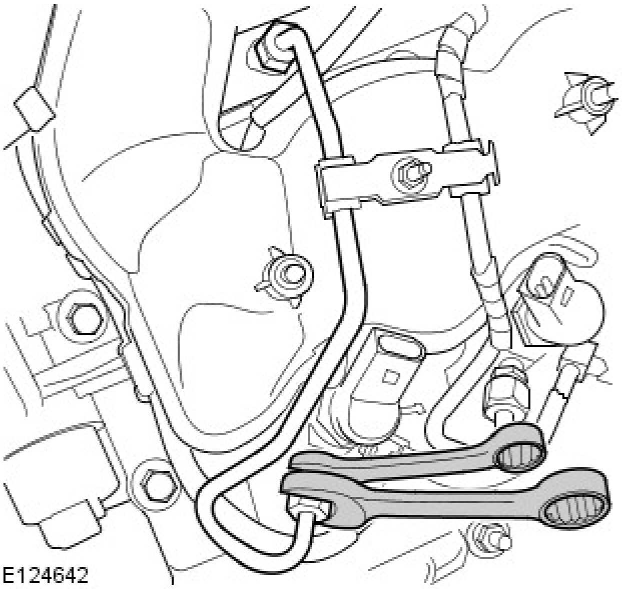


29. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection pump until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel injectors and the fuel rail.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).

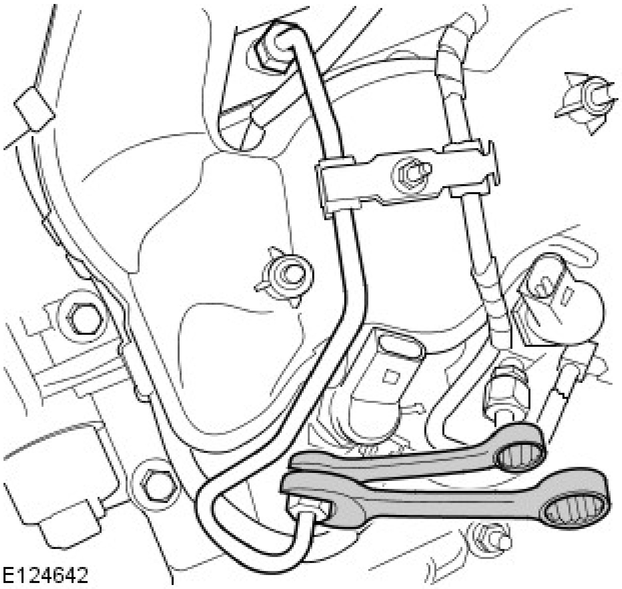


30. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

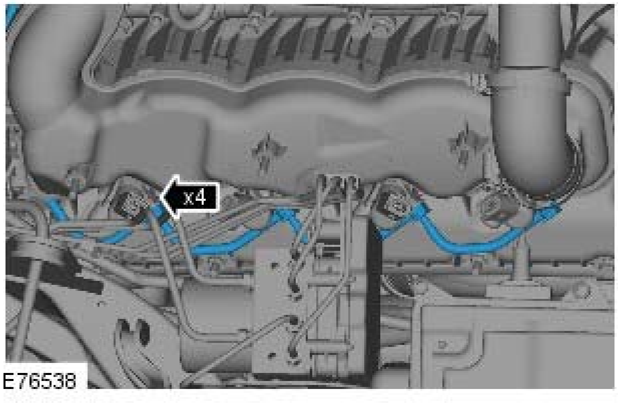
Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.



31. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

- NOTE: RH illustration shown, LH is similar.

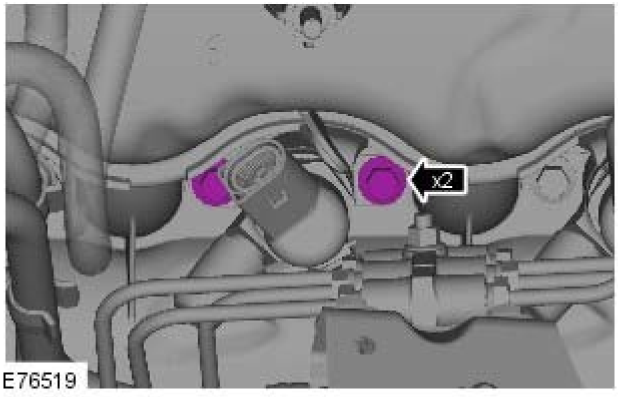
Remove and discard the high-pressure fuel supply lines.



32. NOTE: RH illustration shown, LH is similar.

Disconnect the fuel return line from the fuel injector.

- Remove and discard the fuel return line clip.



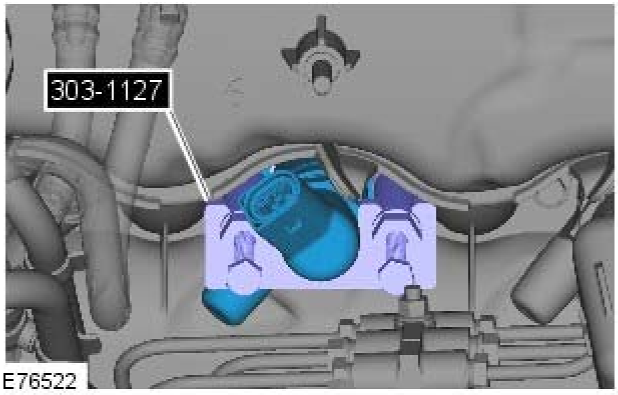
33. Remove the 2 fuel injector bolts.

34. Install the special tool studs.

35. ⚠CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

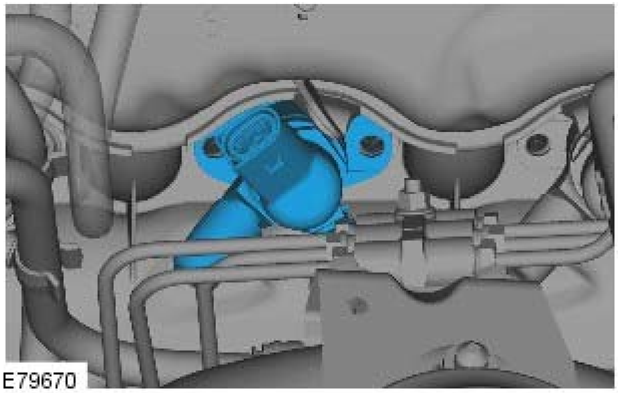
Install the special tool remover legs to the studs.

36. Install the special tool locking plate to the remover legs.



37. Release the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.

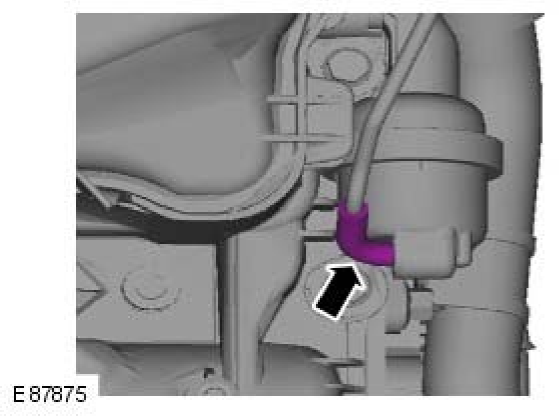


38. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

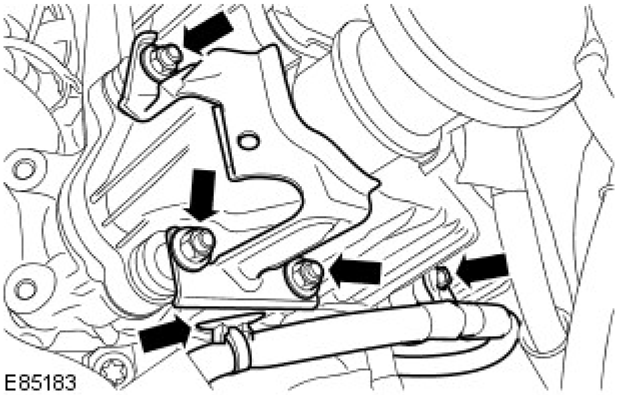
Remove the fuel injector.

- Remove and discard the fuel injector clamp.
- Remove and discard the sealing washer.

39. Remove the remaining fuel injectors.

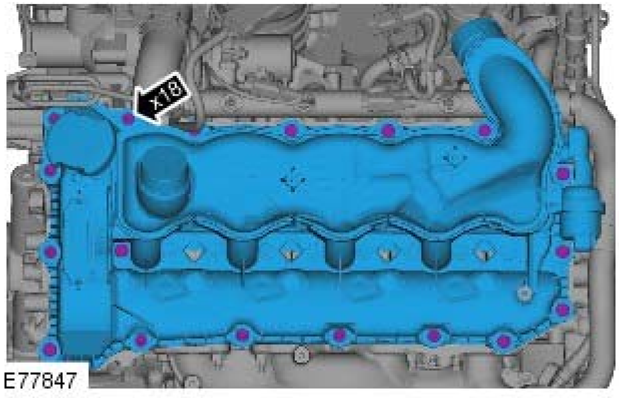


40. Disconnect the intake manifold plenum chamber tuning valve vacuum hose.



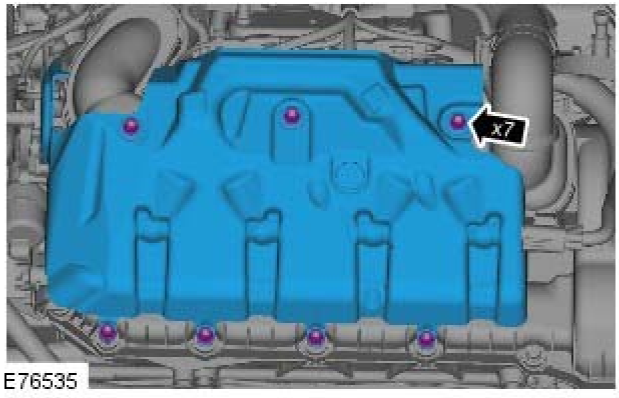
41. Remove the fuel line support bracket.

- Remove the 3 nuts.
- Release the 2 wiring harness clips.



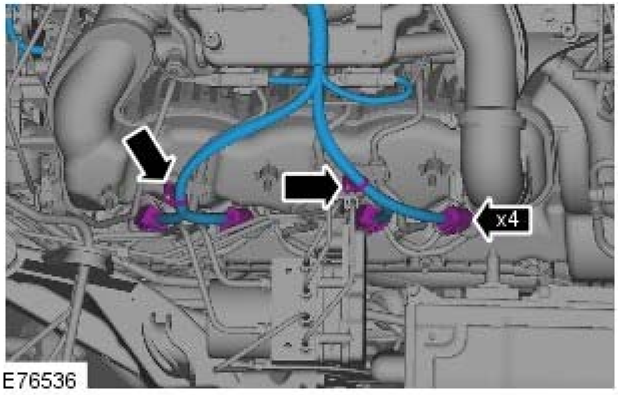
42. Remove the LH valve cover.

- Fully loosen the 18 bolts.
- Remove and discard the gasket.



43. Remove the RH fuel line shield.

- Remove the 7 nuts.



44. Disconnect the fuel injector electrical connectors.

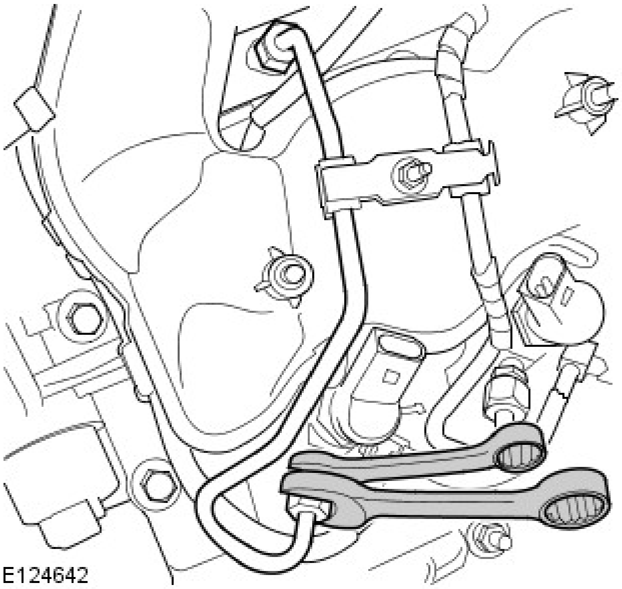
- Release the fuel charging wiring harness.

45. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection pump until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel injectors and the fuel rail.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).

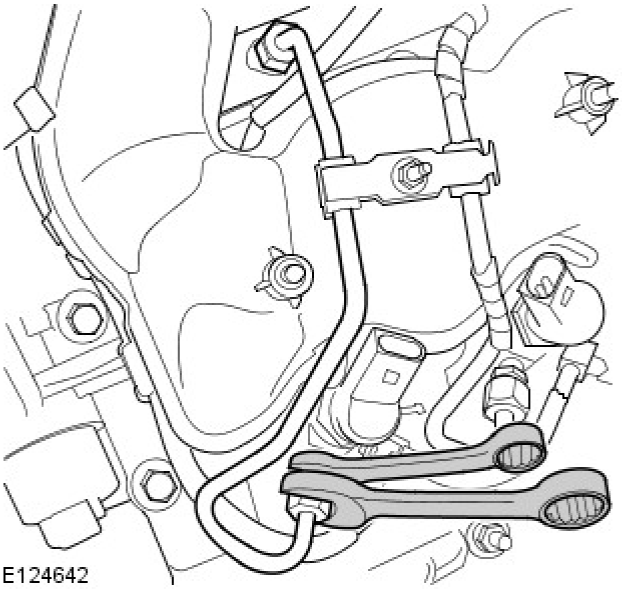


46. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

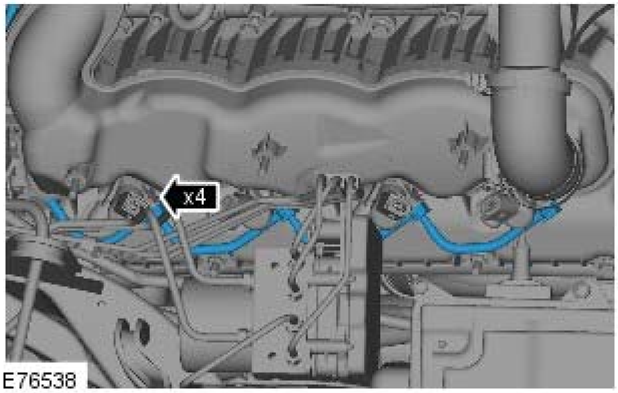
Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.



47. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

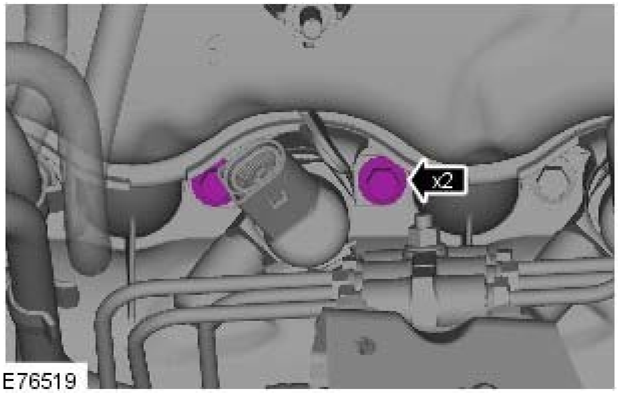
• NOTE: Right-hand shown, left-hand similar.

Remove and discard the high-pressure fuel supply line.



48. Disconnect the fuel return line from the fuel injector.

- Remove and discard the fuel return line clip.



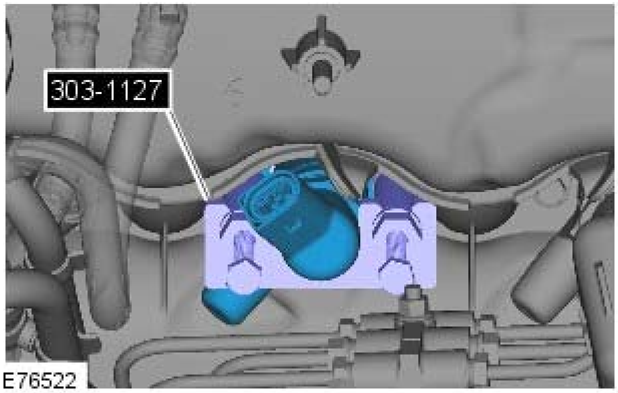
49. Remove the 2 fuel injector bolts.

50. Install the special tool studs.

51. ⚠ CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

Install the special tool remover legs to the studs.

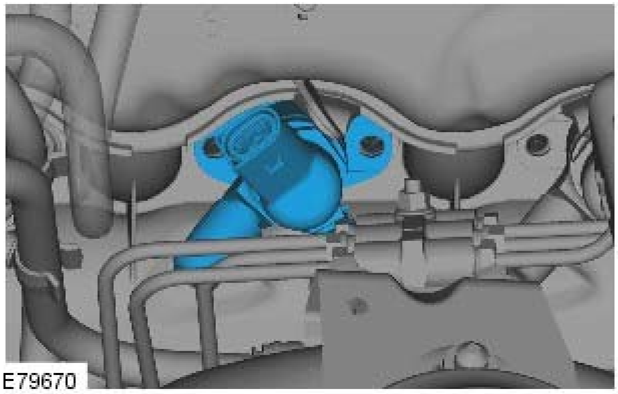
52. Install the special tool locking plate to the remover legs.



53. Release the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.

54. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.



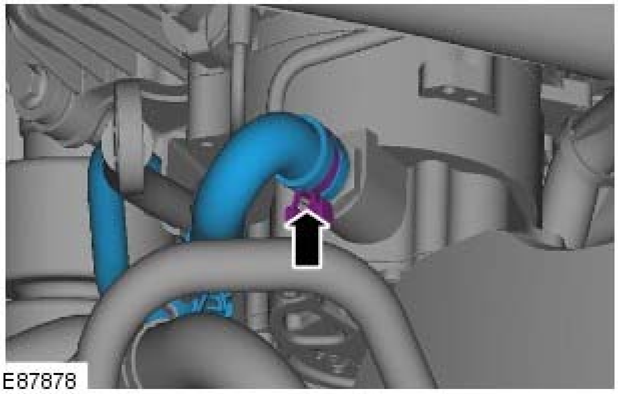
Remove the fuel injector.

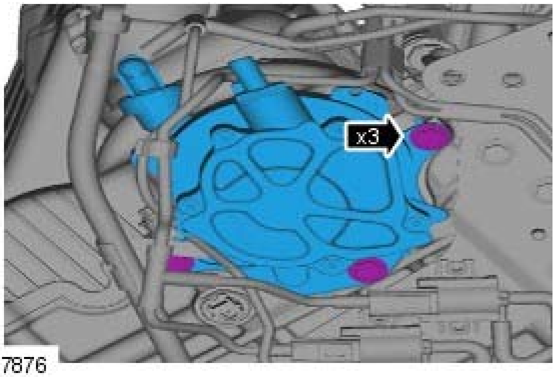
- Remove and discard the fuel injector clamp.
- Remove and discard the sealing washer.

55. Remove the remaining fuel injectors.

56. Disconnect the engine oil pick-up hose.

- Release the clip.

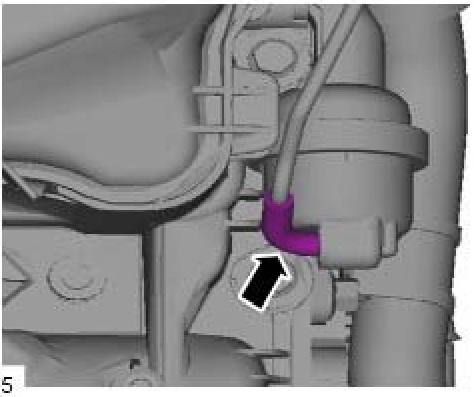




E 87876

57. Remove the brake vacuum pump.

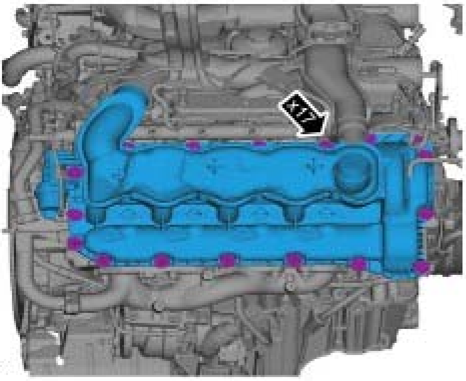
- Remove the nut.
- Remove the stud.
- Remove the 2 bolts.
- Remove and discard the gasket.



E 87875

58. NOTE: Left-hand shown, right-hand similar.

Disconnect the intake manifold plenum chamber tuning valve vacuum hose.



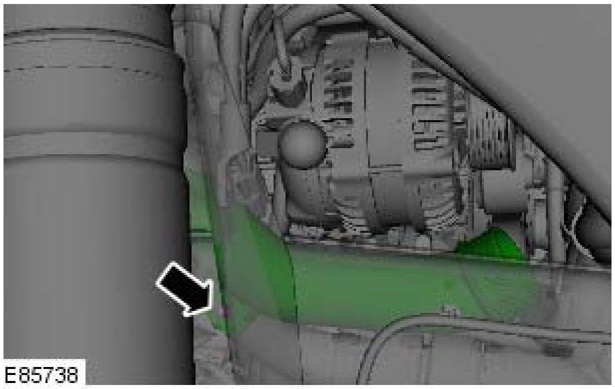
E 87877

59. Remove the RH valve cover.

- Fully loosen the 17 bolts.
- Remove and discard the gasket.

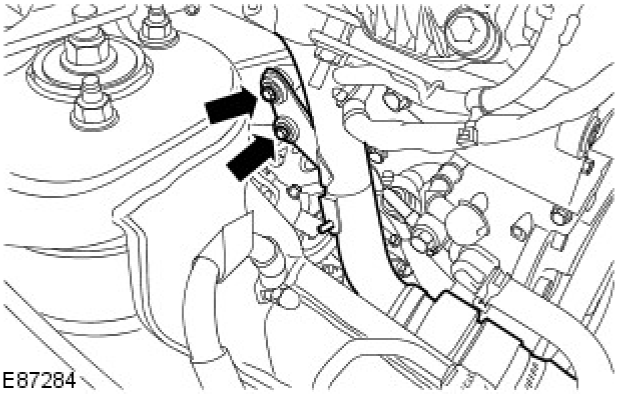
60. Disconnect the breather line.

- Release the clip.



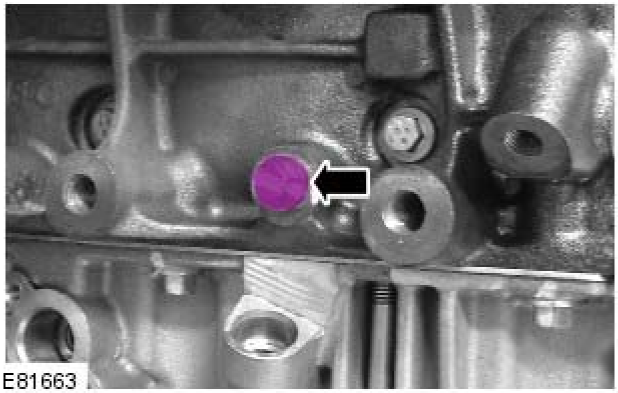
61. Remove the RH turbocharger intake tube.

- Remove the nut.

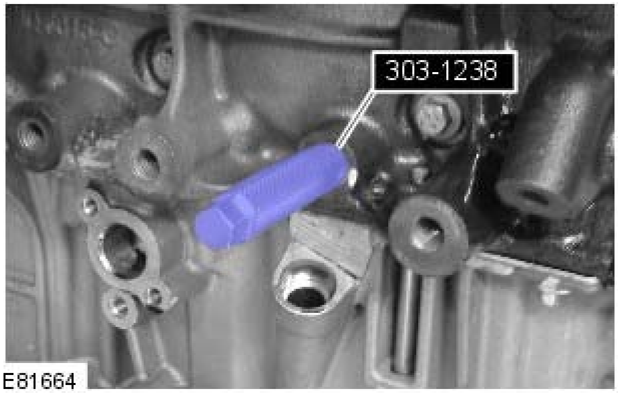


62. Release the RH turbocharger outlet pipe.

- Remove the 2 bolts.



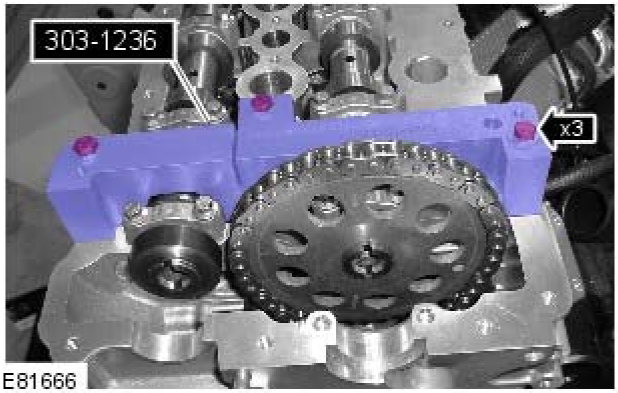
63. Remove the crankshaft timing pin plug.



64. ⚠ CAUTION: Crankshaft timing tool pistons number 2,4,7&8 are roughly at TDC as pin may lock on web instead of machined face.

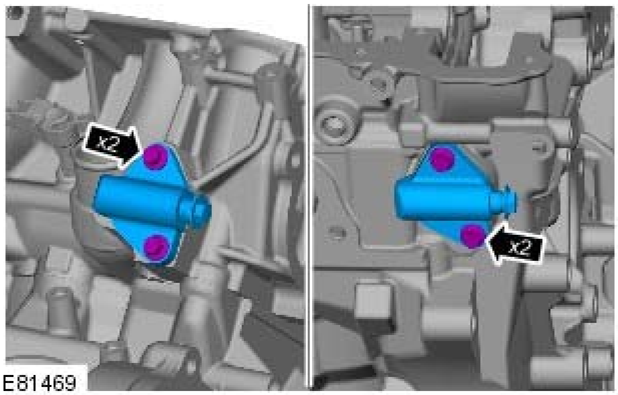
Install the special tool.

- Rotate the crankshaft on to the crankshaft timing pin.

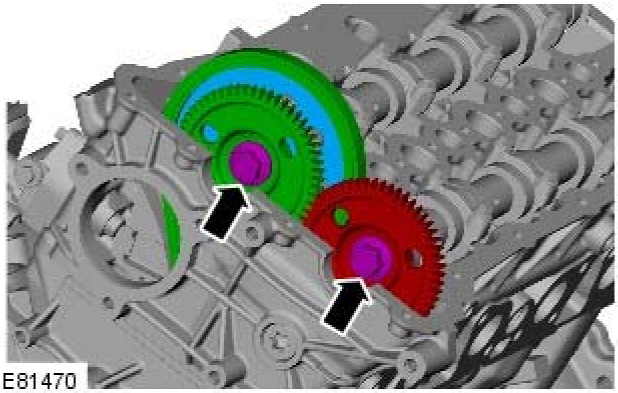

303-1236
x3
E81666

65. Install the special tools to both the LH bank and RH bank camshafts.

- Tighten the bolts to 10 Nm (7 lb.ft).

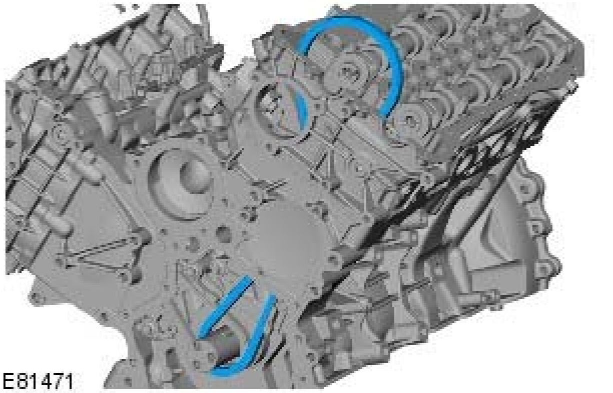

x2
x2
E81469

66. Remove and discard both hydraulic timing chain tensioners.

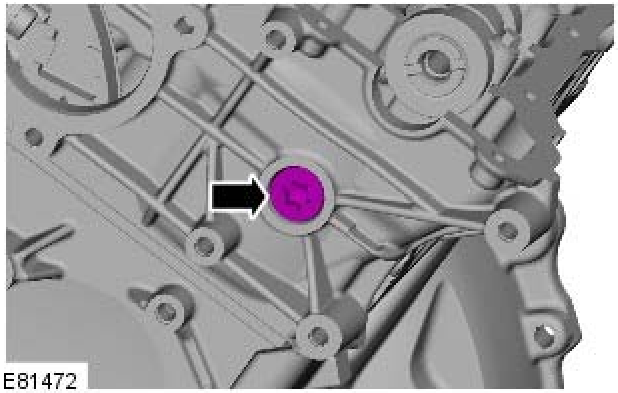


67. Remove the LH timing chain sprocket and gears.

- Remove and discard the 2 bolts.

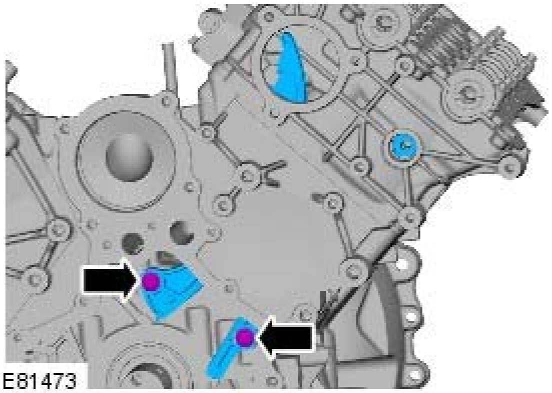


68. Remove the LH timing chain.

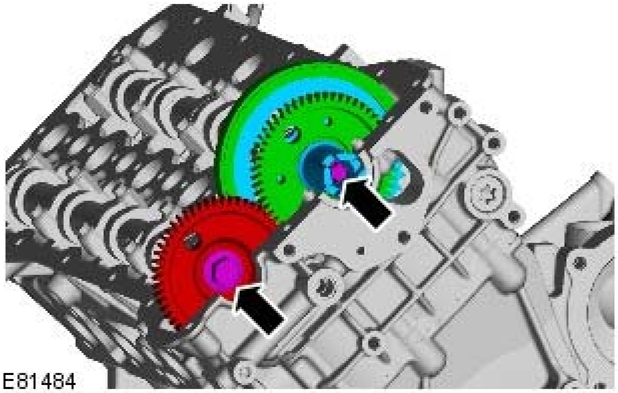

E81472

69. Remove the LH timing chain tensioner guide pin.

- Remove and discard the O-ring seal.

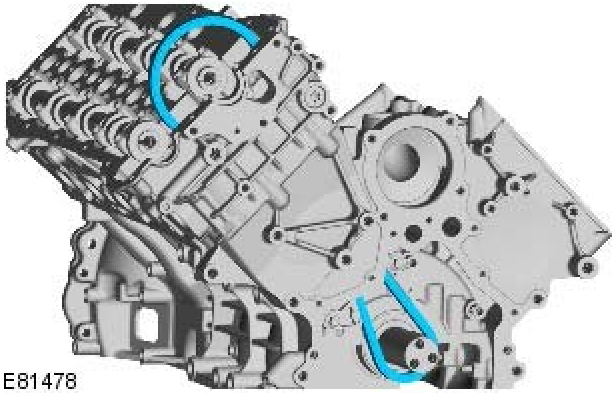

E81473

70. Remove the LH timing chain tensioner guides.

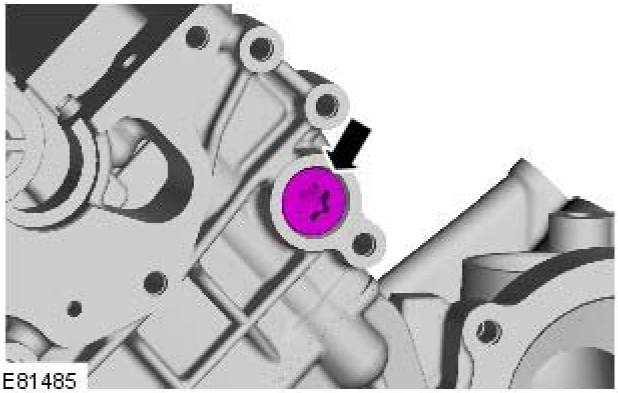

E81484

71. Remove the RH timing chain sprocket and gears.

- Remove and discard the 2 bolts.


E81478

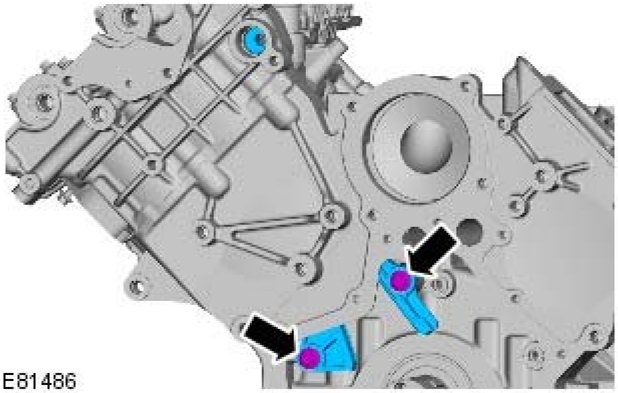
72. Remove the RH timing chain.



E81485

73. Remove the RH timing chain tensioner guide pin.

- Remove and discard the O-ring seal.



E81486

74. Remove the RH timing chain tensioner guides.

Installation

1. Install the RH timing chain tensioner guides.

- Tighten the bolts to 10 Nm (7 lb.ft).

2. NOTE: Lubricate the O-ring seal with clean engine oil.

Install the RH timing chain tensioner guide pin.

- Install a new O-ring seal.
- Tighten to 28 Nm (21 lb.ft).

3. Install the RH timing chain.

4. CAUTION: Do not tighten the camshaft sprocket bolts at this stage.

Install the RH timing chain sprocket and gears.

Loosely install the new bolts.

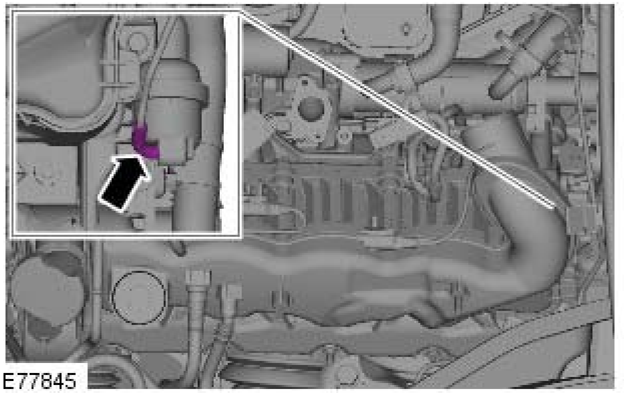
Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Valve Cover LH

In-vehicle Repair

Removal

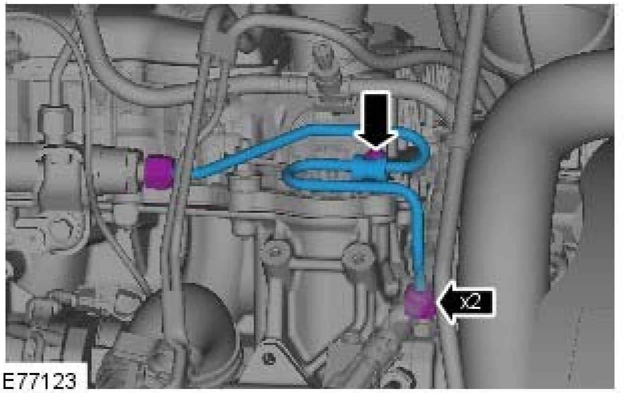
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the LH bank fuel injectors.
   For additional information, refer to: Fuel Injectors LH (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation).
3. Remove the intake manifold plenum chamber.
   For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).
4. Disconnect the intake manifold plenum chamber tuning valve vacuum hose.



5. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

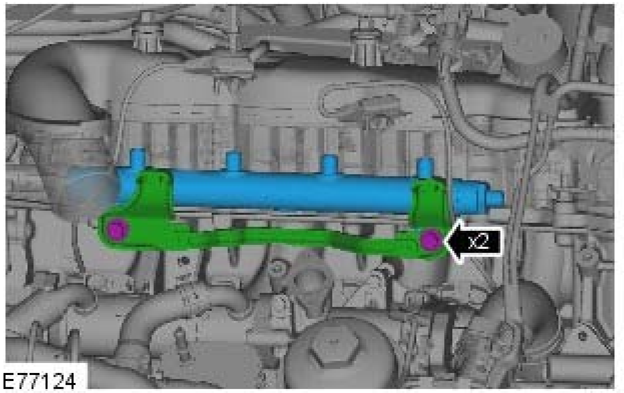
   Remove and discard the high-pressure fuel rail supply line.

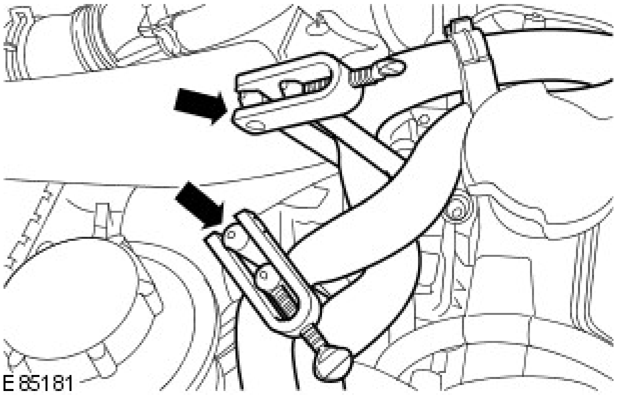
   - Release the clip.



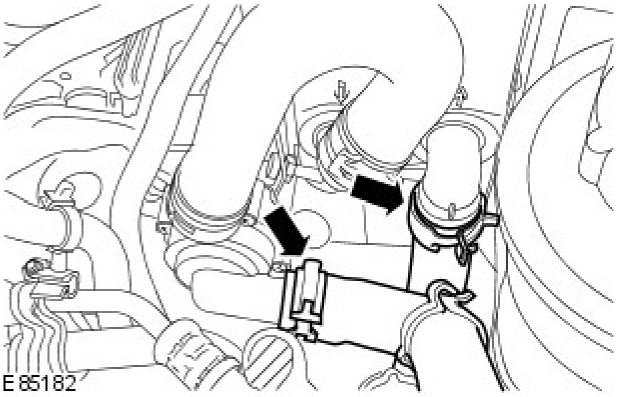
6. Remove the LH fuel rail.

   - Remove the 2 bolts.
   - Remove the bracket.



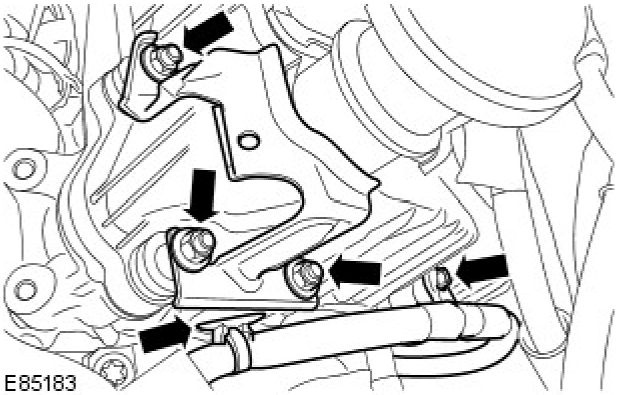


7. Clamp the 2 fuel fired booster heater coolant hoses.



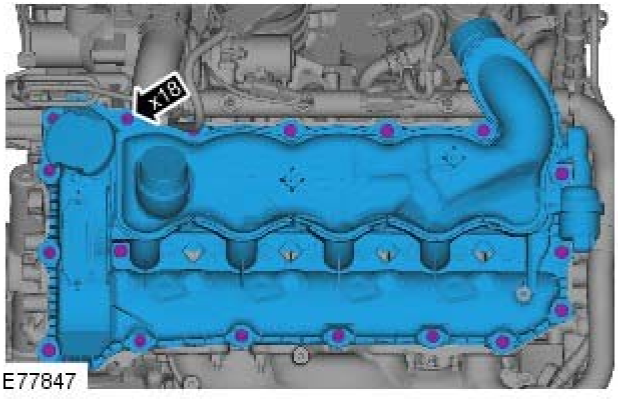
8. Release and reposition the 2 fuel fired booster heater coolant hoses.

- Release the 2 clips.



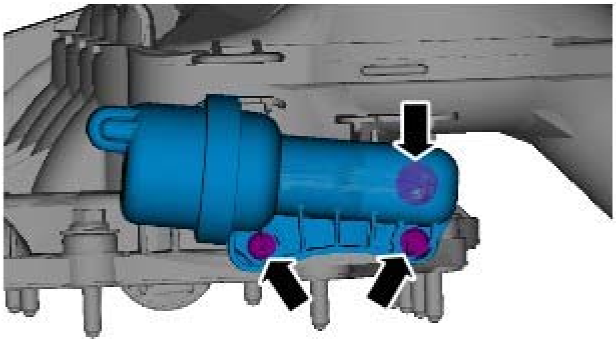
9. Remove the fuel line support bracket.

- Remove the 3 nuts.
- Release the 2 wiring harness clips.



10. Remove the valve cover.

- Fully loosen the 18 bolts.
- Remove and discard the gasket.



E77848

11. NOTE: Do not disassemble further if the component is removed for access only.

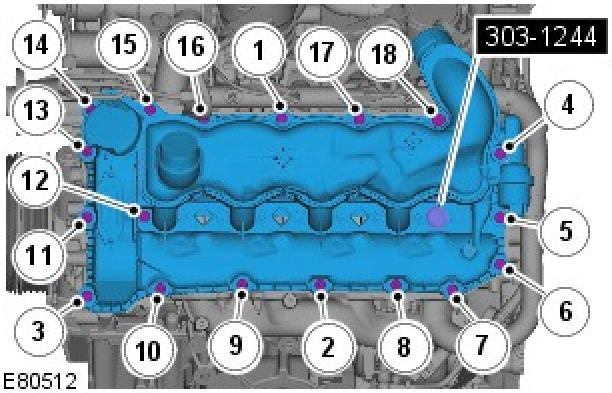
Remove the intake manifold tuning valve.

- Remove the 2 screws.
- Release the actuator rod.

Installation

1. Install the intake manifold tuning valve.

- Secure the actuator rod.
- Tighten the screws to 3 Nm (2 lb.ft).



E80512

2. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Install the valve cover.

- Install a new gasket.
- Install the special tool.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Remove the special tool.

3. Install the fuel line support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the wiring harness clips.

4. Secure the fuel fired booster heater coolant hoses.

- Secure the clips.
- Remove the hose clamps.

5. Install the LH fuel rail.

- Install the bracket.
- Tighten the bolts to 23 Nm (17 lb.ft).

6. NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel rail supply line.

- Stage 1: Tighten the high-pressure fuel supply line union at the fuel rail to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel pump to 15 Nm (11 lb.ft).

- Stage 3: Tighten the high-pressure fuel supply line union at the fuel rail to 30 Nm (22 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel pump to 30 Nm (22 lb.ft).
- Tighten the nut to 10 Nm (7 lb.ft).

7. Connect the intake manifold plenum chamber tuning valve vacuum hose.

8. Install the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

9. Install the LH bank fuel injectors.
For additional information, refer to: Fuel Injectors LH (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation).

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Valve Cover RH

In-vehicle Repair

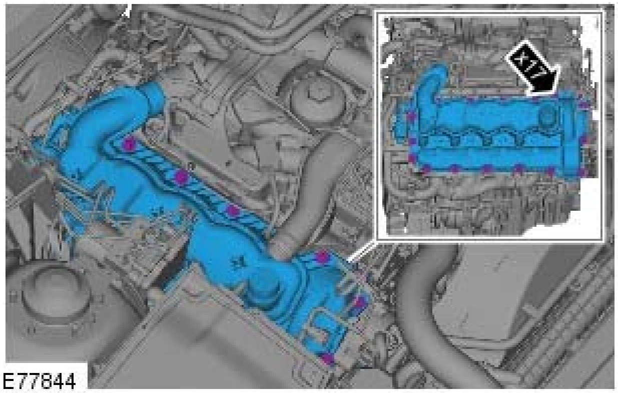
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the RH bank fuel injectors.
For additional information, refer to: Fuel Injectors RH (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation).

3. Remove the brake vacuum pump.
For additional information, refer to: Brake Vacuum Pump - TDV8 3.6L Diesel (206-07 Power Brake Actuation, Removal and Installation).

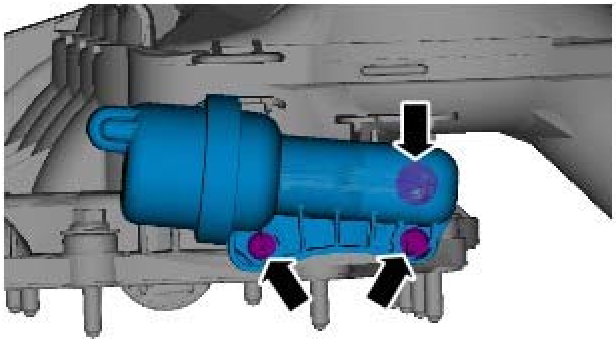
4. Remove the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).



E77844

5. Remove the valve cover.

- Fully loosen the 17 bolts.
- Remove and discard the gasket.



E77848

6. NOTE: Do not disassemble further if the component is removed for access only.

• NOTE: Left-hand shown, right-hand similar.

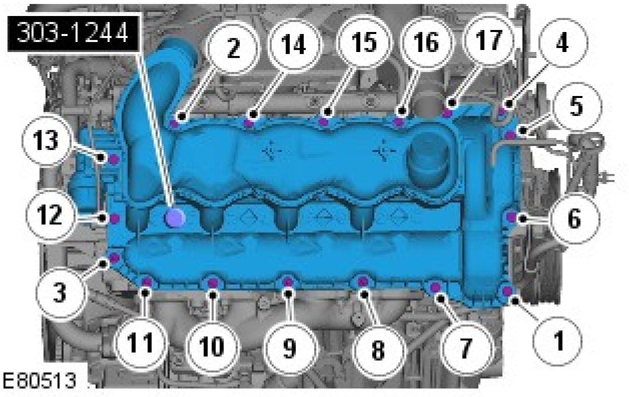
Remove the intake manifold plenum chamber tuning valve.

- Remove the 2 screws.
- Release the actuator rod.

Installation

1. Install the intake manifold plenum chamber tuning valve.

- Secure the actuator rod.
- Tighten the screws to 3 Nm (2 lb.ft).



2. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Install the valve cover.

- Install a new gasket.
- Install the special tool.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Remove the special tool.

3. Install the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

4. Install the brake vacuum pump.
For additional information, refer to: Brake Vacuum Pump - TDV8 3.6L Diesel (206-07 Power Brake Actuation, Removal and Installation).

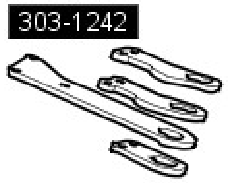
5. Install the RH bank fuel injectors.
For additional information, refer to: Fuel Injectors RH (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine

Removal

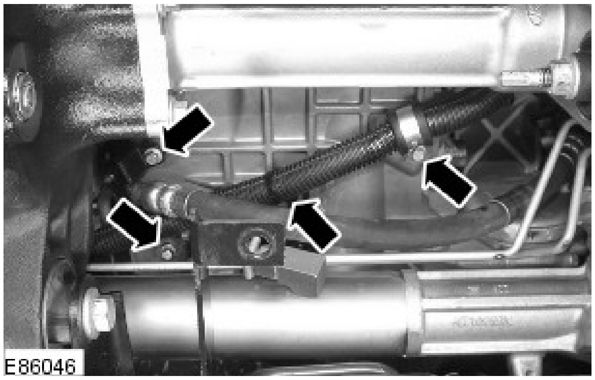
Special Tool(s)	
 E81377	Engine lifting brackets 303-1242

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

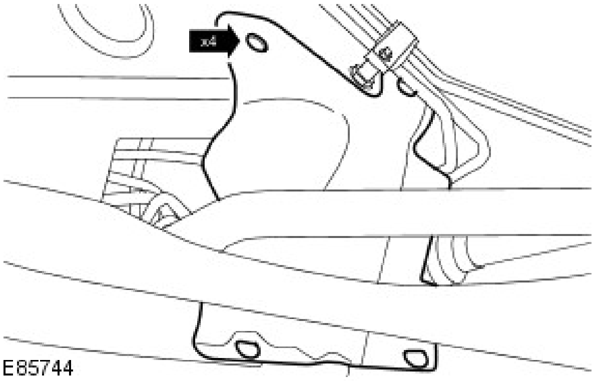
3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



E86046

4. Release the battery positive cable.

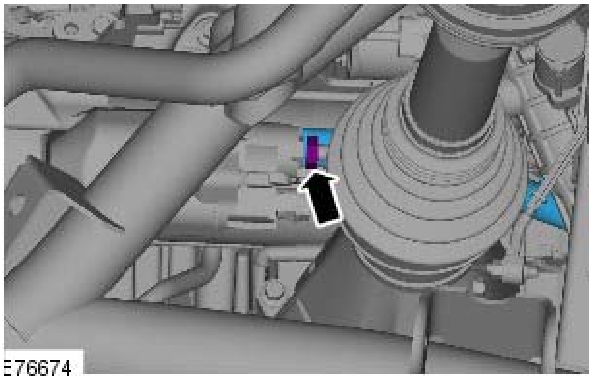
- Remove the 3 bolts.
- Release the clip.



E85744

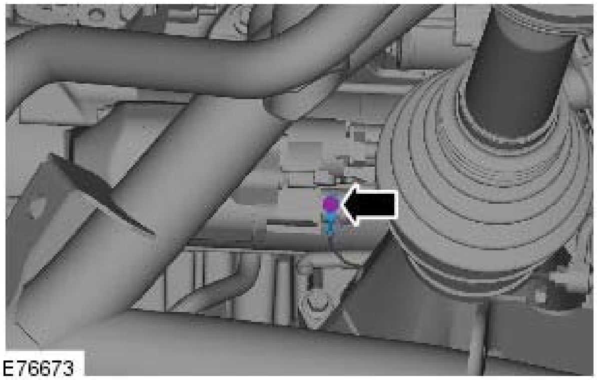
5. Remove the splash shield.

- Remove the 4 clips.



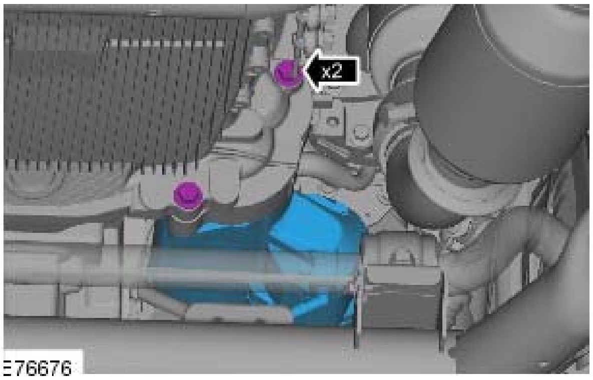
6. Disconnect the battery positive cable from the starter motor solenoid.

- Remove the cap.
- Remove the nut.



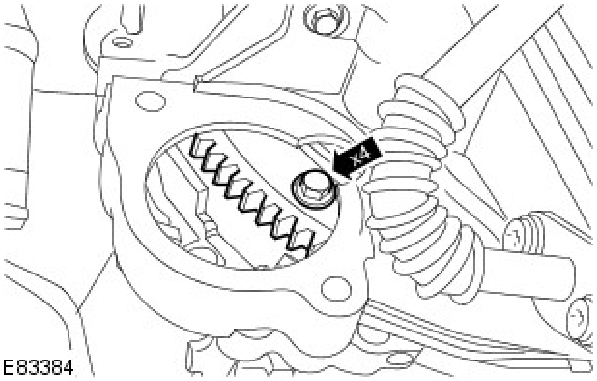
7. Disconnect the switch lead from the starter motor solenoid.

- Remove the bolt.



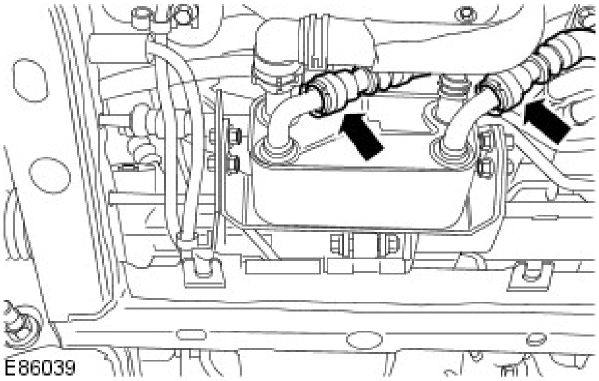
8. Reposition the starter motor.

- Remove the 2 bolts.



9. Release the flexplate from the torque converter.

- Remove and discard the 4 bolts.

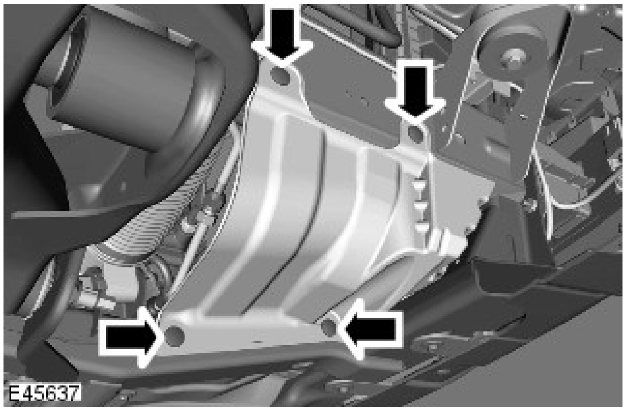


10. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Release the transmission fluid lines from the transmission fluid cooler.

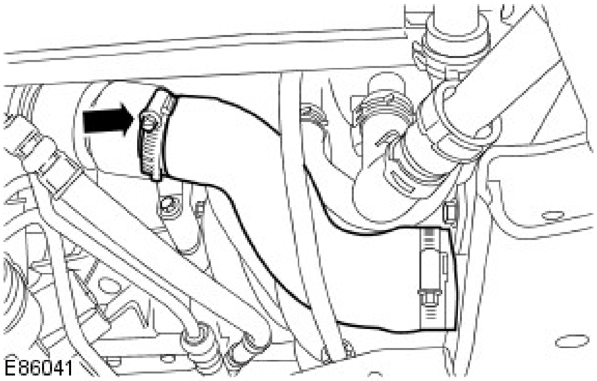
- Release the 2 quick release connectors.

11. Remove the wheels and tires.



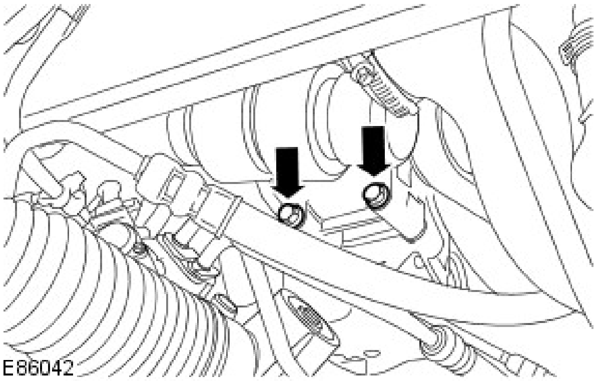
12. Remove the front RH splash shield.

- Remove the 4 clips.

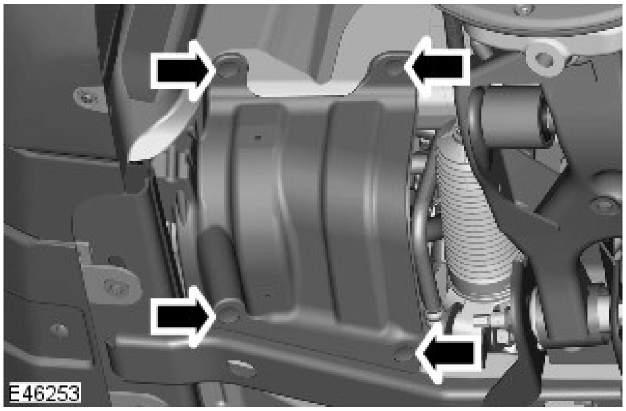


13. Disconnect the RH charge air cooler inlet pipe.

- Loosen the clip.

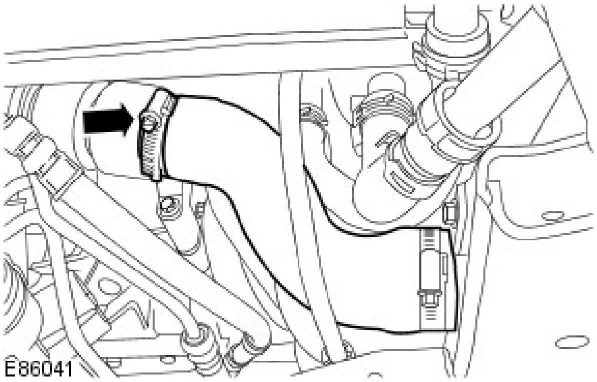


14. Remove the 2 fluid pump lower bolts.


E46253

15. Remove the front LH splash shield.

- Remove the 4 clips.

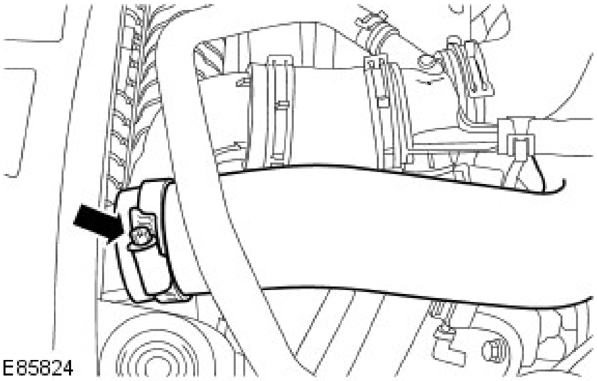

E86041

16. NOTE: RH illustration shown, LH is similar

Disconnect the LH charge air cooler inlet pipe.

- Loosen the clip.

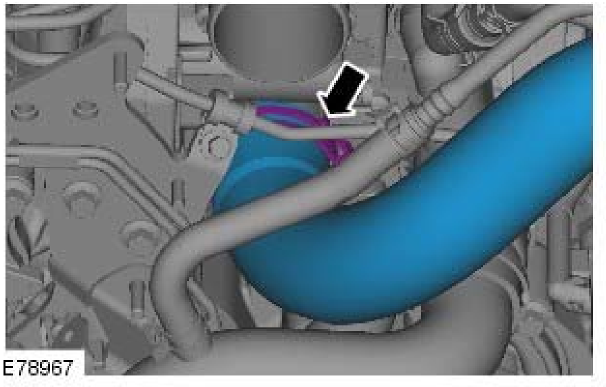
17. Remove the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).


E85824

18. Disconnect the LH charge air cooler outlet pipe.

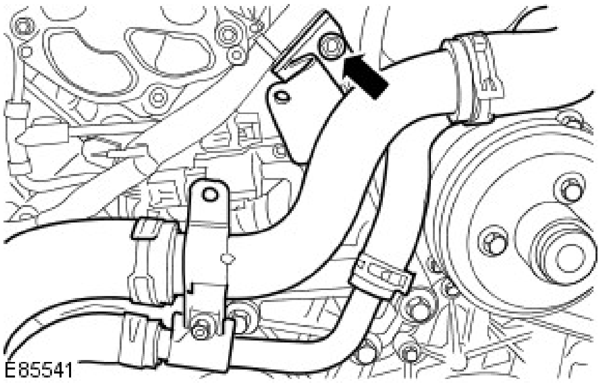
- Loosen the clip.

19. Remove the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).



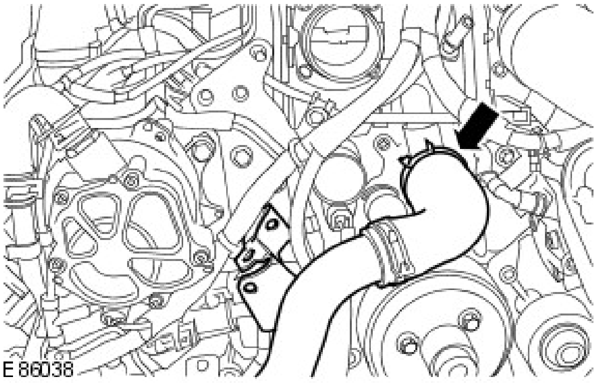
20. Disconnect the radiator top hose from the coolant distribution manifold.

- Release the clip.



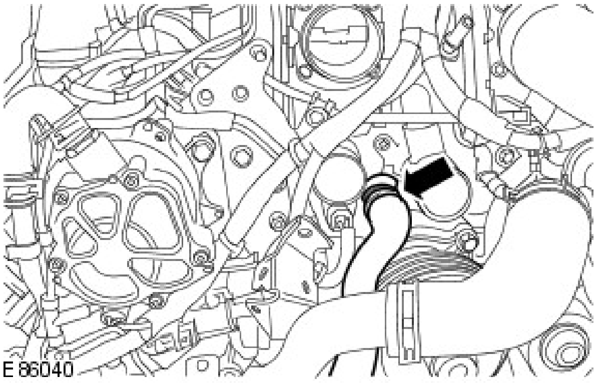
21. Release the coolant hose bracket.

- Remove the nut.



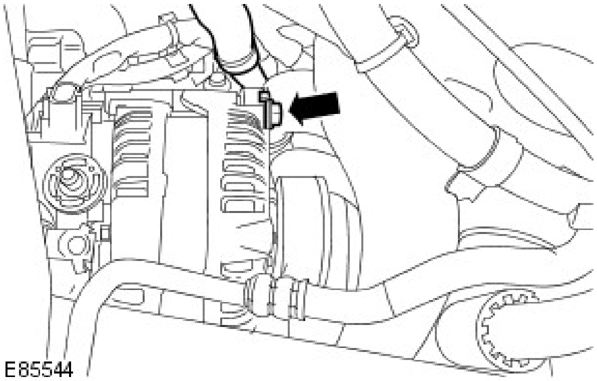
22. Disconnect the lower coolant hose from the coolant outlet elbow.

- Release the clip.



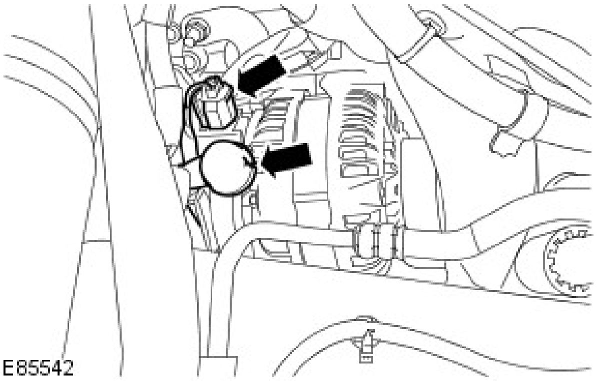
23. Disconnect the transmission cooler pipe from the coolant distribution manifold.

- Release the clip.



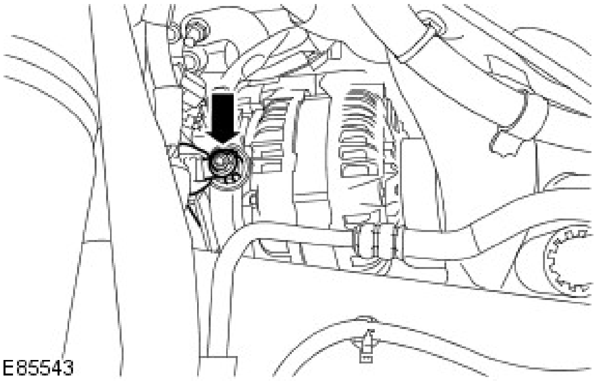
24. Release the engine ground cable.

- Remove the generator upper bolt.



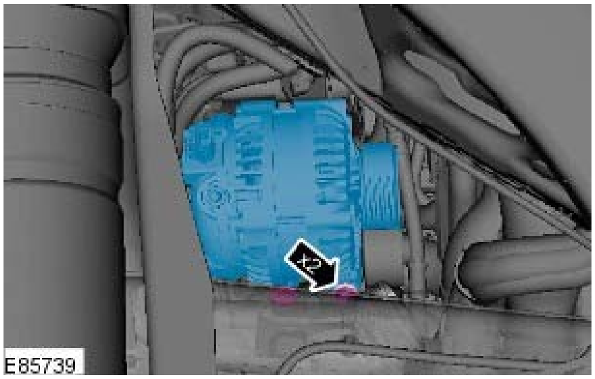
25. Disconnect the generator electrical connector.

- Reposition the rubber insulator.



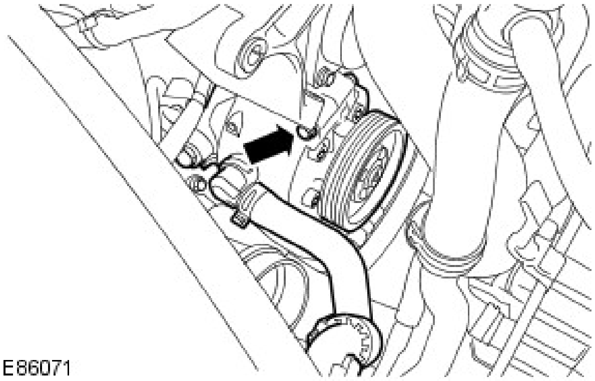
26. Disconnect the battery positive cable from the generator.

- Remove the nut.



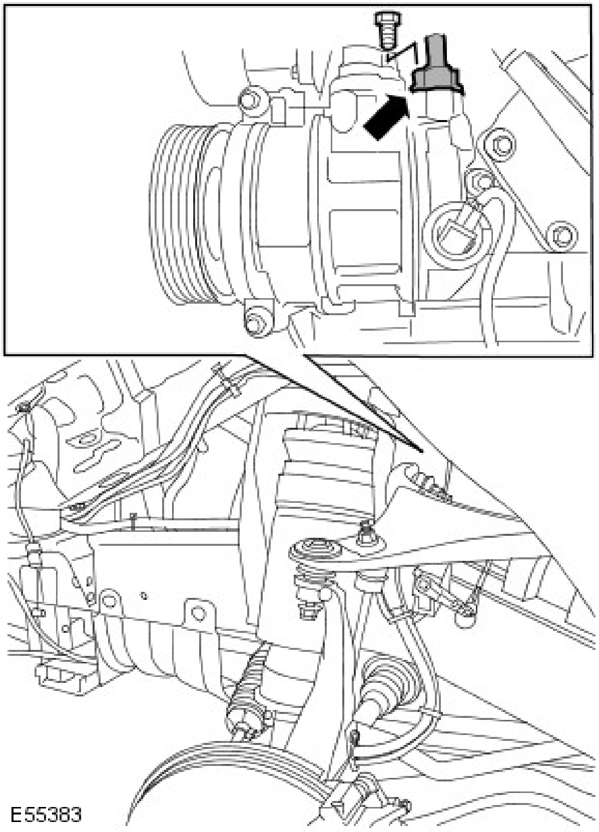
27. Remove the generator.

- Remove the 2 bolts.



28. Release the fluid pump.

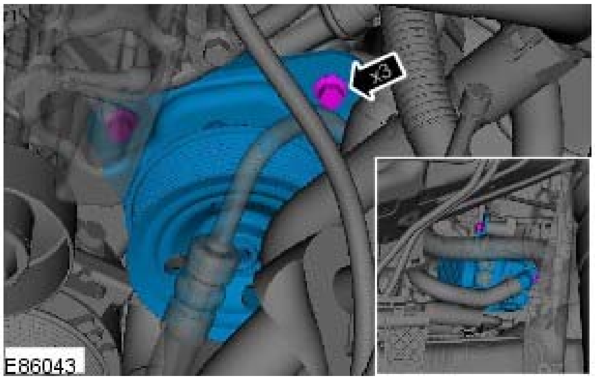
- Remove the remaining fluid pump bolt.



29. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

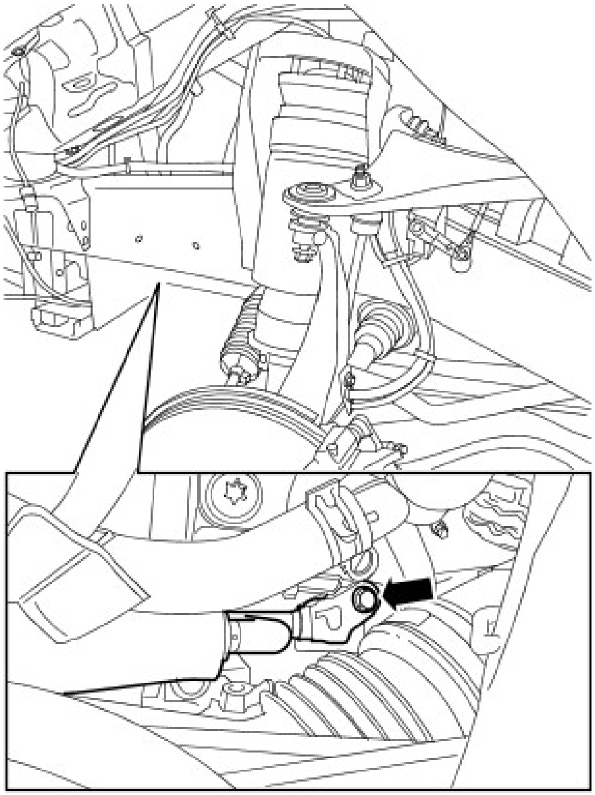
Remove the air conditioning (A/C) compressor low-pressure refrigerant line.

- Remove the bolt.
- Remove and discard the O-ring seal.



30. Release the power steering pump.

- Remove the 3 bolts.

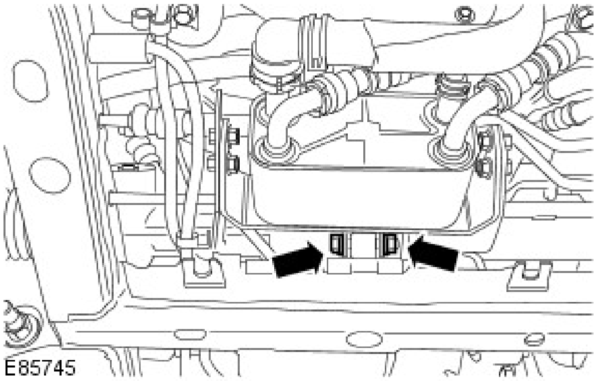


E85849

31. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the A/C compressor high-pressure refrigerant line.

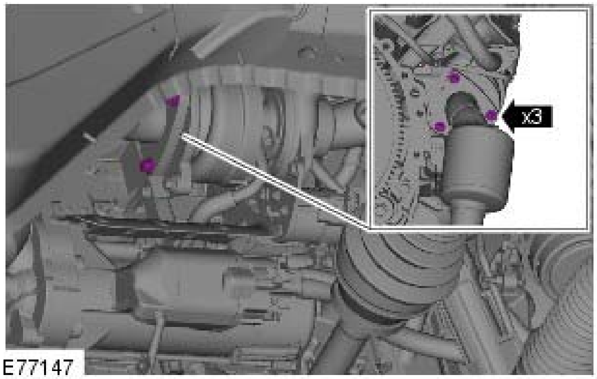
- Remove and discard the O-ring seals.



E85745

32. Release the engine stabilizer.

- Remove the nut and bolt.

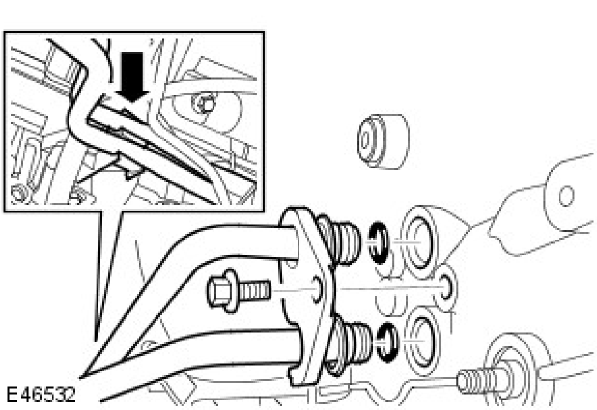


E77147

33. NOTE: RH illustration shown, LH is similar

Release the catalytic converters.

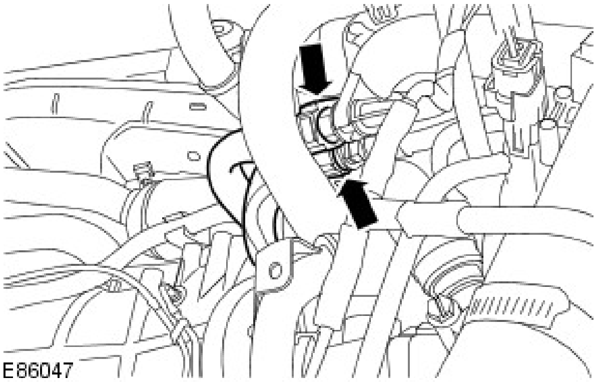
- Remove the 6 bolts.
- Remove and discard the 2 gaskets.



34. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

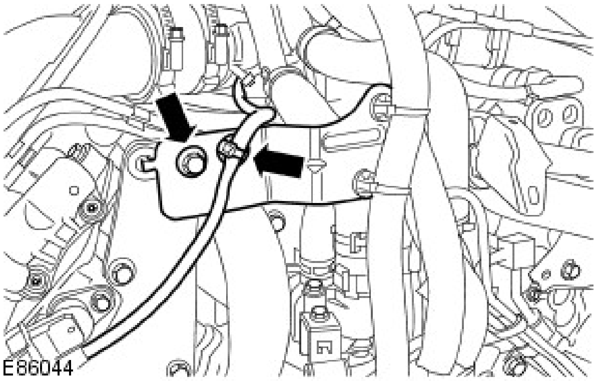
Release the transmission fluid lines from the transmission.

- Remove the bolt.
- Remove and discard the 2 O-ring seals.



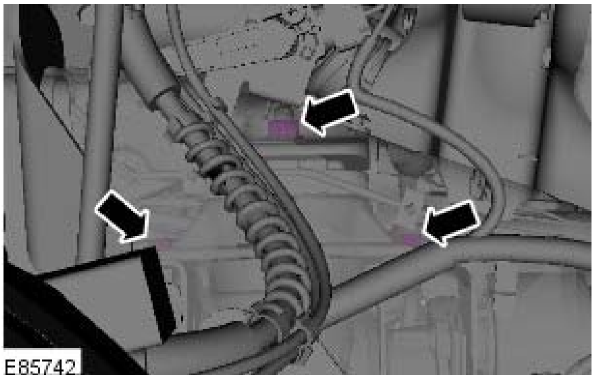
35. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 fuel lines.



36. Release the transmission wiring harness bracket from the rear of the engine.

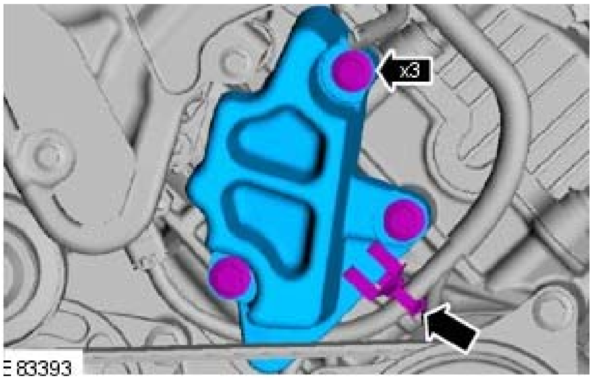
- Remove the bolt.
- Release the camshaft position (CMP) sensor harness clip.



37. NOTE: LH illustration shown, RH is similar.

Release both the LH and RH engine mounts.

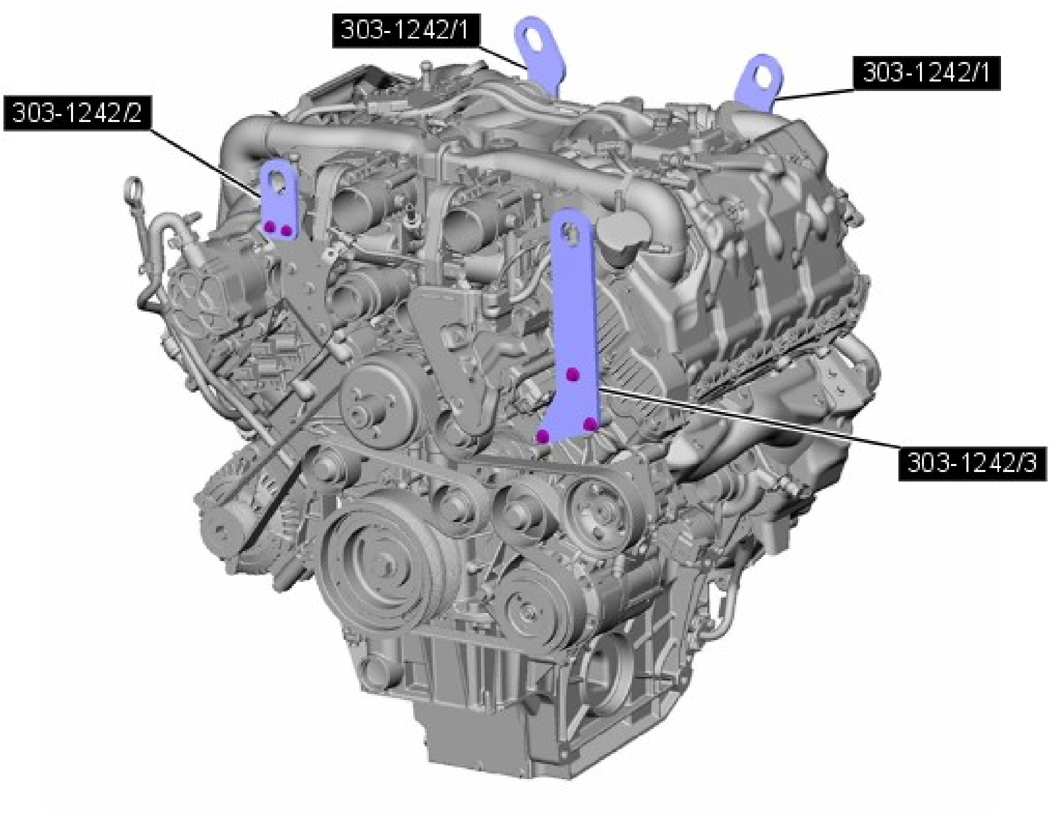
- Remove the 4 bolts.
- Remove the 2 nuts.



38. Remove the fuel pump crash protector.

- Release the engine wiring harness.
- Remove the 3 bolts.

39. Install the special tools.

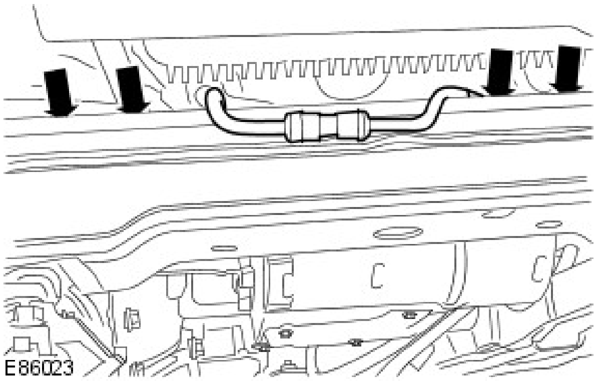

303-1242/1
303-1242/1
303-1242/2
303-1242/3
E83697

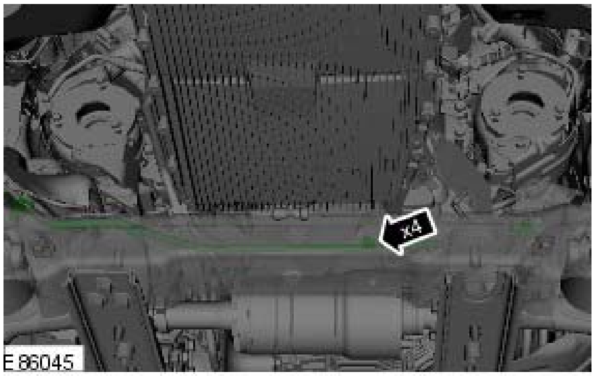
40. Using a suitable hydraulic jack, raise and support the engine.

41. Remove the starter motor.

42. Release the fuel fired booster heater fuel line from the chassis crossmember.

- Release the 4 clips.



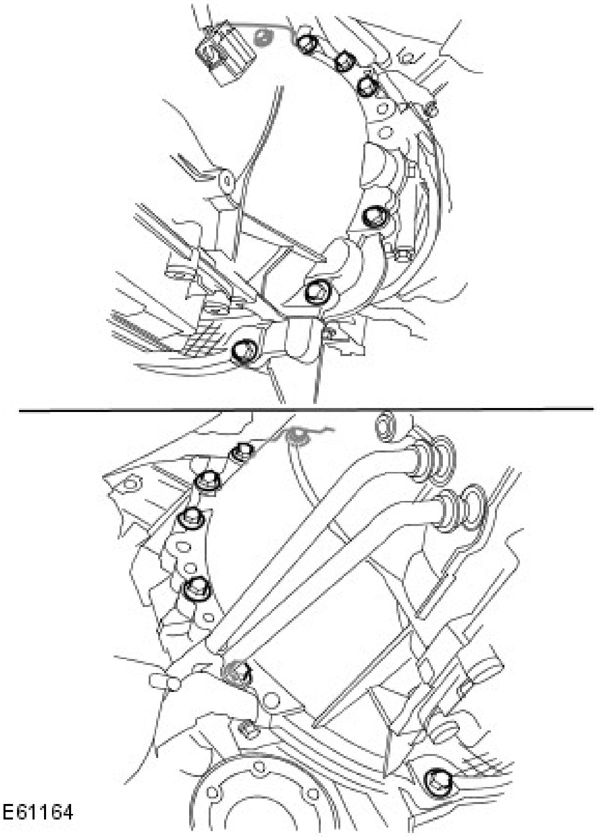


43. Release the RH engine mount vacuum hose from the chassis crossmember.

- Release from the 4 clips.

44. Using a suitable tool, support the transmission.

45. Remove the 14 engine to transmission bolts.

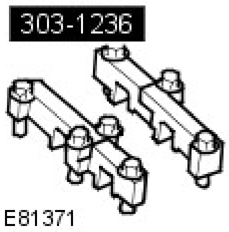
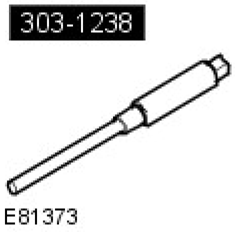
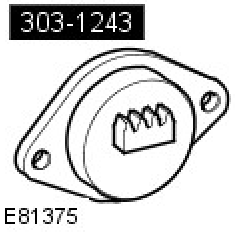
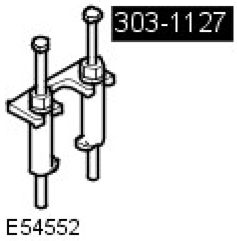


46. With assistance, carefully remove the engine.

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine

Disassembly

Special Tool(s)	
	Camshaft holding tool 303-1236
	Crankshaft timing pin 303-1238
	Flexplate locking tool 303-1243
	Remover - Fuel Injector 303-1127

Disassembly

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

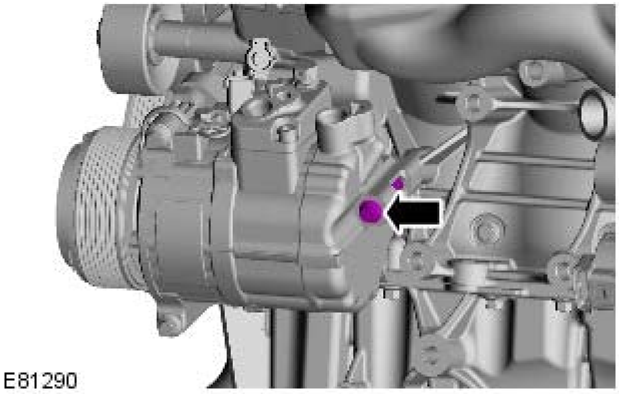
   Raise and support the vehicle.

3. Drain the engine oil.
   For additional information, refer to: Engine Oil Draining and Filling (303-01, General Procedures).

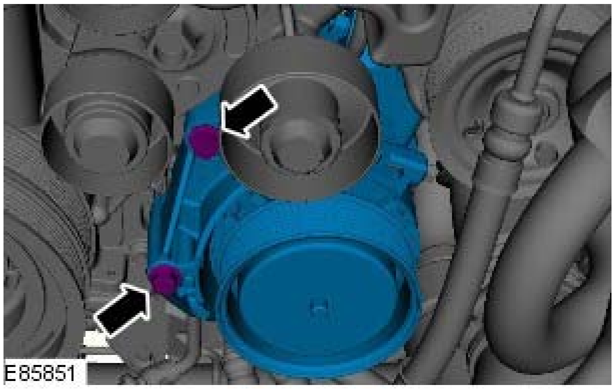
4. Remove the engine.
   For additional information, refer to: Engine (303-01, Removal).

5. Install the engine to a suitable engine stand.

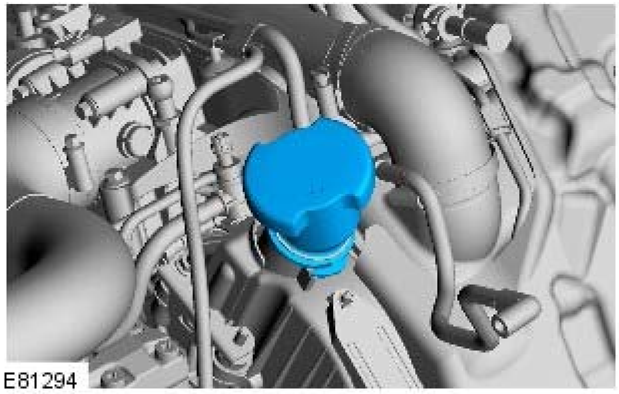
6. Disconnect the air conditioning (A/C) compressor electrical connector.



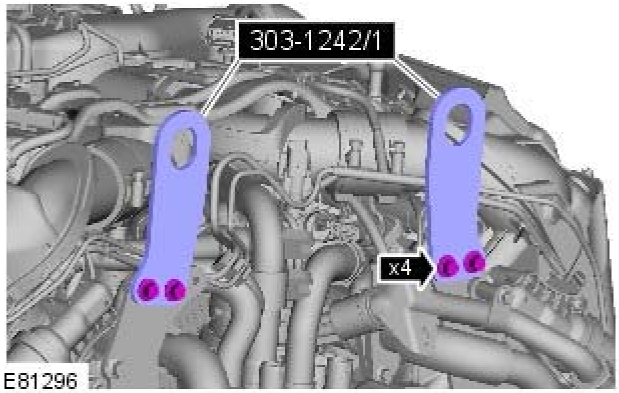
7. Remove the A/C compressor rear bolt.



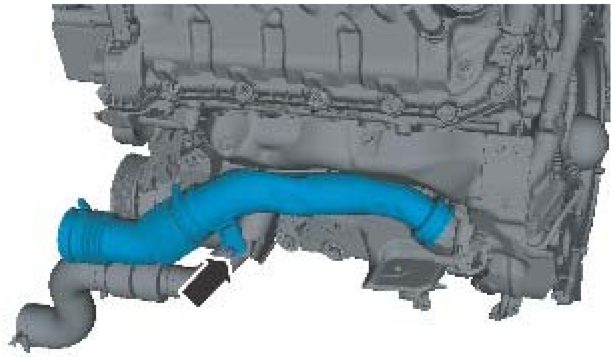
8. Remove the A/C compressor and support bracket.
   - Remove the 2 bolts.



9. Remove the engine oil filler cap.
   - Remove and discard the O-ring seal.


303-1242/1
x4
E81296

10. Remove the special tools.
    - Remove the 4 bolts.

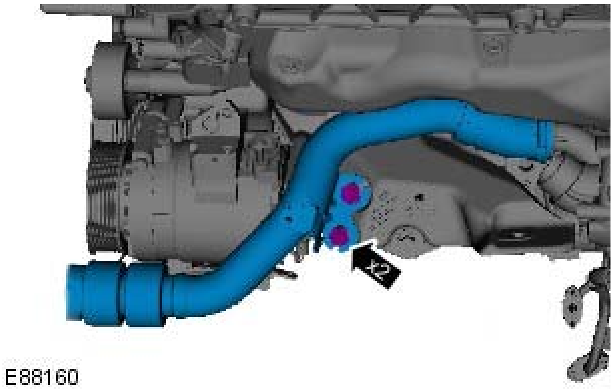


E88159

11. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the LH turbocharger intake tube.

- Remove the nut.

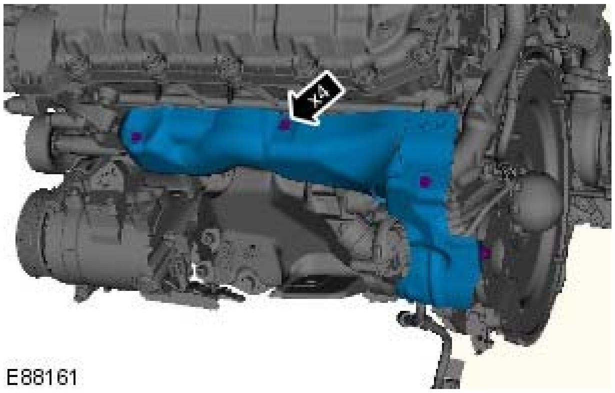


E88160

12. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the charge air cooler LH intake pipe.

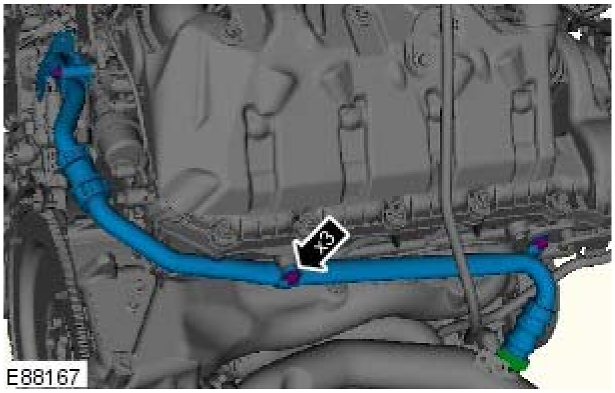
- Release the clip.
- Remove the 2 bolts.



E88161

13. Remove the LH turbocharger heat shield and the LH exhaust manifold heat shield.

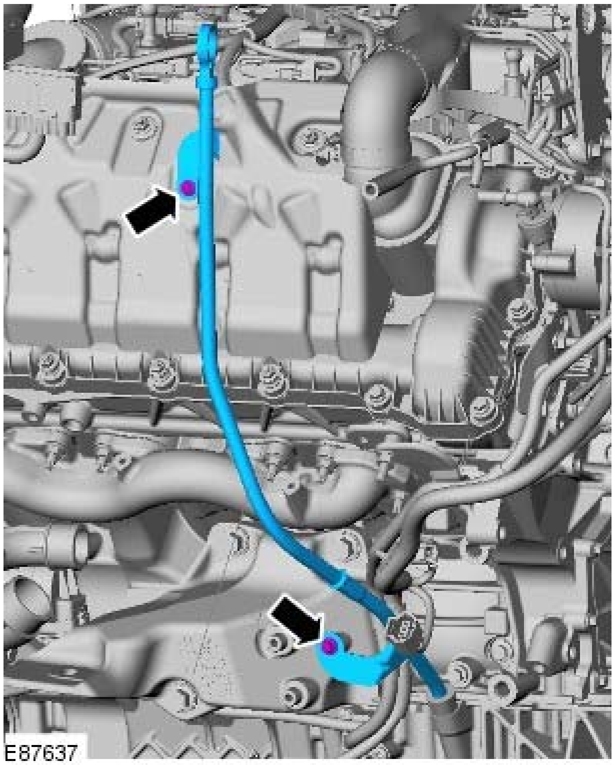
- Remove the 4 bolts.



E88167

14. Remove the breather line.

- Release the clip.
- Remove the 3 bolts.

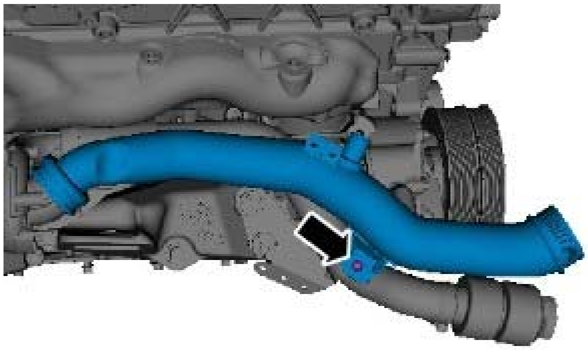


E87637

15. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator and tube.

- Remove and discard the O-ring seal.
- Remove the 2 bolts.

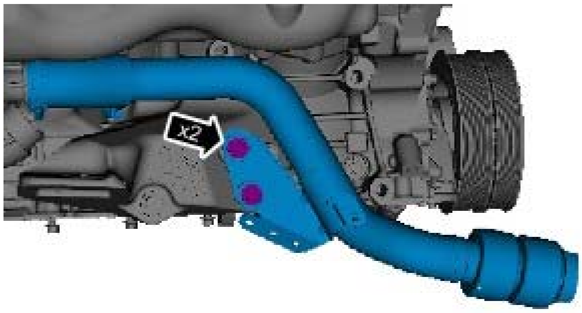


E88168

16. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the RH turbocharger intake tube.

- Remove the nut.

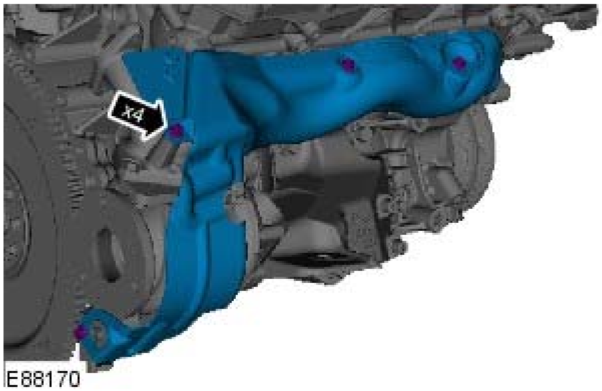


E88169

17. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the charge air cooler RH intake pipe.

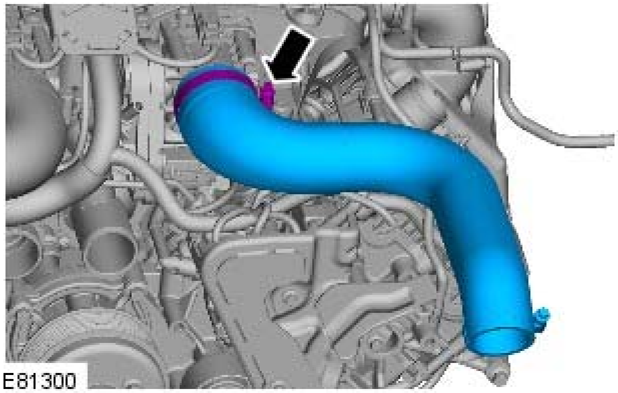
- Release the clip.
- Remove the 2 bolts.



E88170

18. Remove the RH turbocharger heat shield and the RH exhaust manifold heat shield.

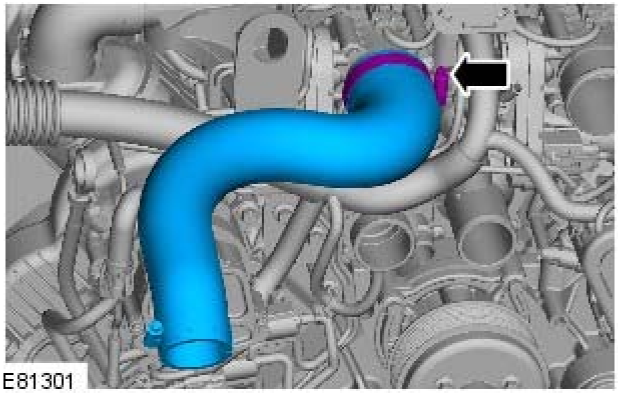
- Remove the 4 bolts.



E81300

19. Remove the charge air cooler LH outlet hose.

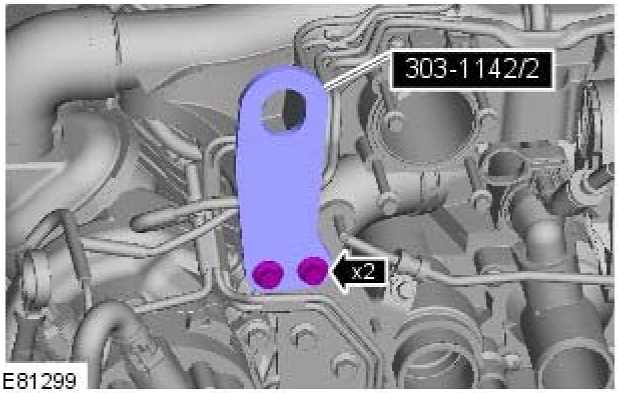
- Release the clip.



E81301

20. Remove the charge air cooler RH outlet hose.

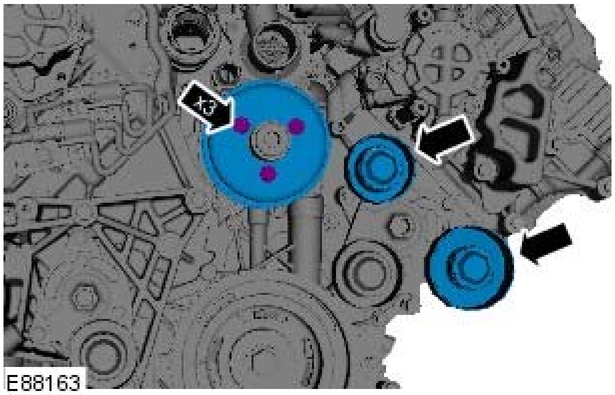
- Release the clip.



E81299

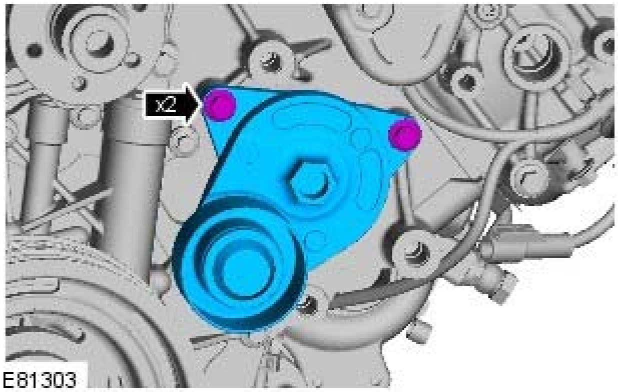
21. Remove the special tool.

- Remove the 2 bolts.



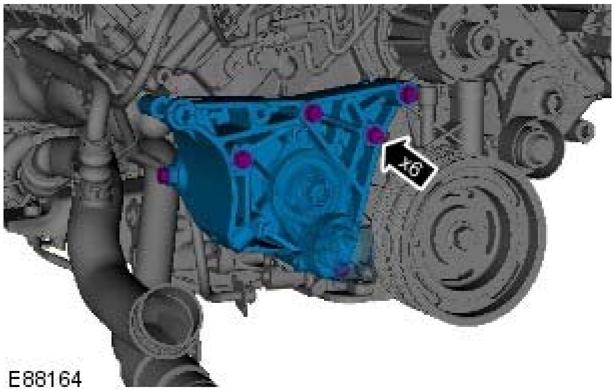
22. Remove the coolant pump pulley and the cooling fan belt idler pulleys.

- Remove and discard the 2 access covers.
- Remove the 5 bolts.



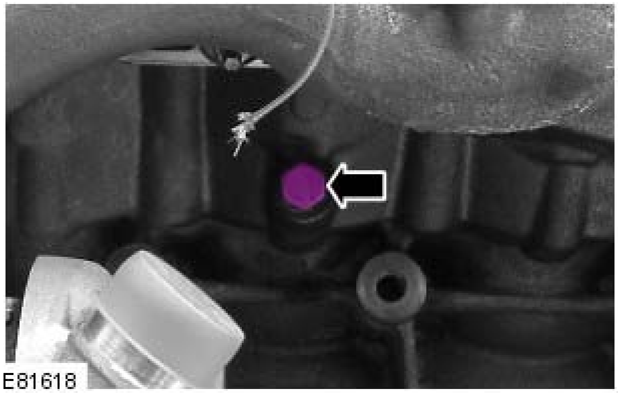
23. Remove the cooling fan belt tensioner.

- Remove the 2 bolts.



24. Remove the generator mounting bracket.

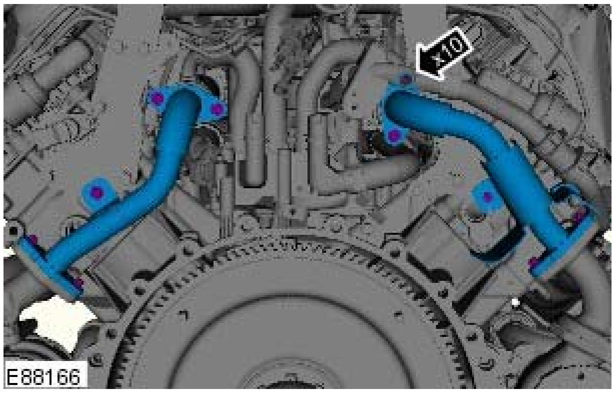
- Remove the 6 bolts.



25. NOTE: Right-hand shown, left-hand similar.

Drain the coolant.

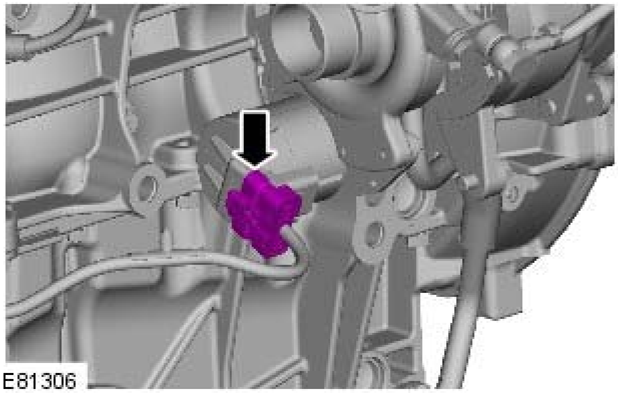
- Remove the drain plugs.
- Position a container to collect the fluid.
- Allow the fluid to drain.
- Clean the component mating faces.
- Apply loctite 572 to the drain plug threads.
- Install the drain plugs and tighten to 18 Nm (13 lb.ft).
- Remove the container.



26. Remove the exhaust gas recirculation (EGR) valve inlet tubes.

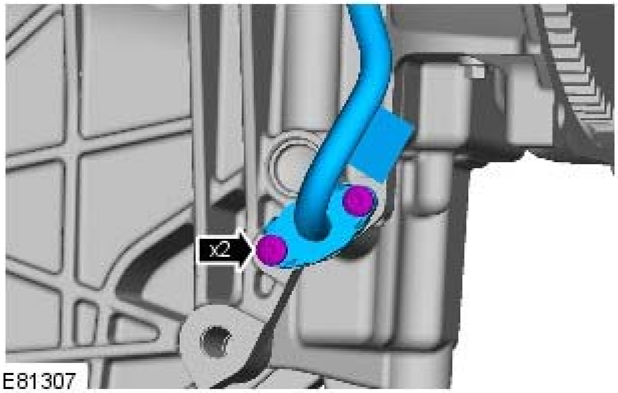
- Remove the 10 bolts.
- Remove the RH EGR valve inlet tube heat shield.
- Remove and discard the 4 gaskets.

27. Disconnect the LH turbocharger electrical connector.



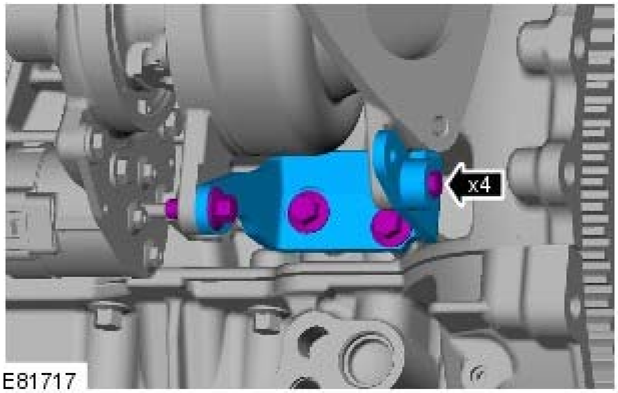
28. Release the LH turbocharger oil return tube.

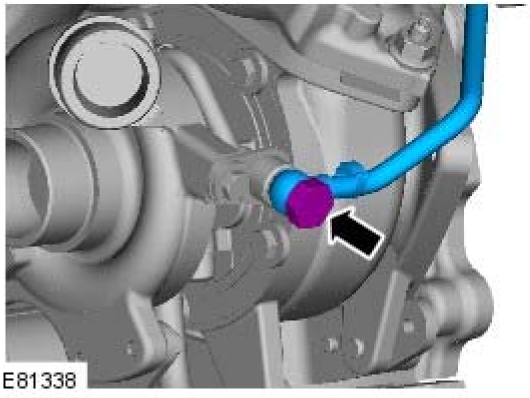
- Remove the 2 bolts.
- Remove and discard the gasket.



29. Remove the LH turbocharger support bracket.

- Remove the 4 bolts.

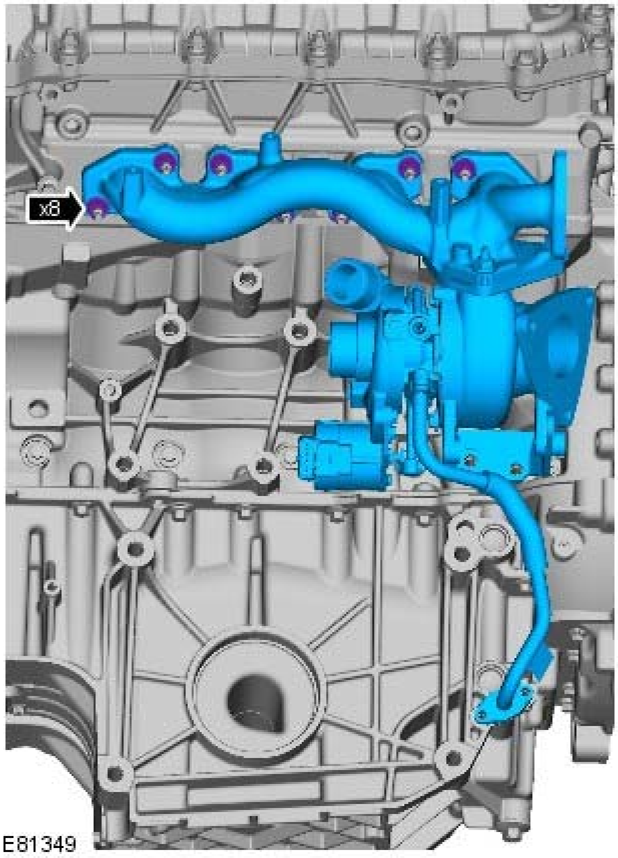




30. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

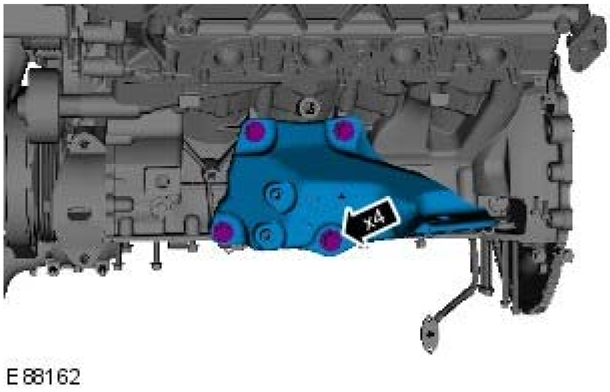
Disconnect the LH turbocharger oil supply pipe.

- Remove the banjo bolt.
- Remove and discard the 2 sealing washers.



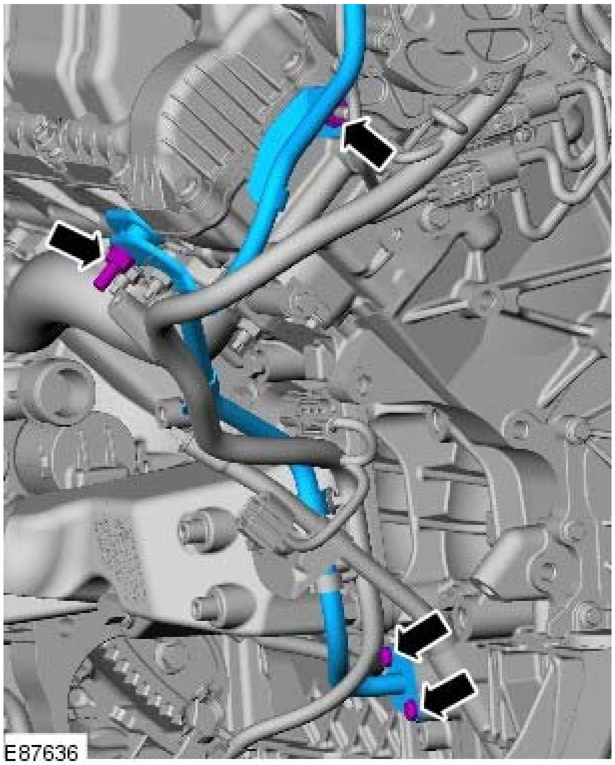
31. Remove the LH exhaust manifold and turbocharger assembly.

- Remove and discard the 8 nuts.
- Remove and discard the gasket.



32. Remove the LH engine mount bracket.

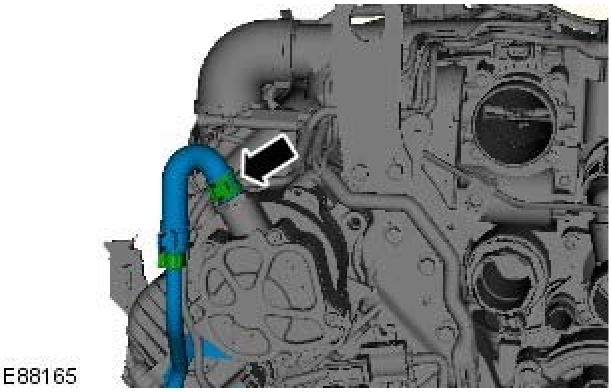
- Remove the 4 bolts.



33. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

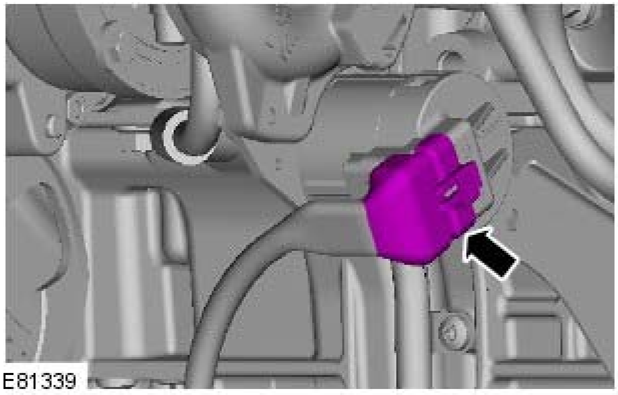
Release the oil pick-up pipe.

- Remove the 3 bolts.
- Remove the nut.
- Remove and discard the O-ring seal.

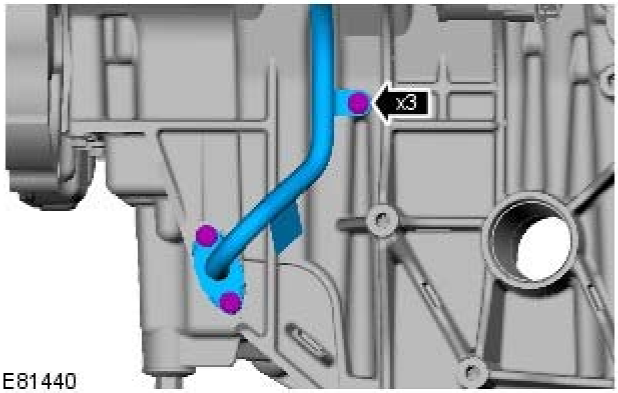


34. Remove the oil pick-up pipe.

- Release the clip.
- Release the wiring harness.



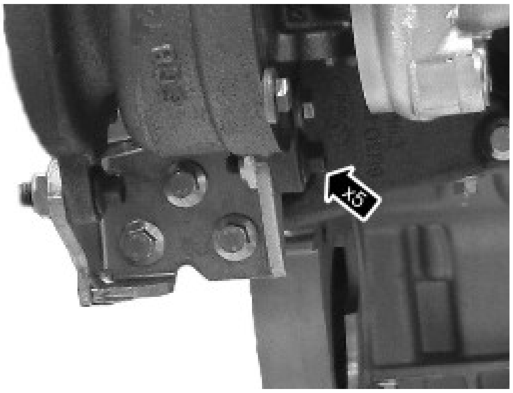
35. Disconnect the RH turbocharger electrical connector.



E81440

36. Release the RH turbocharger oil return tube.

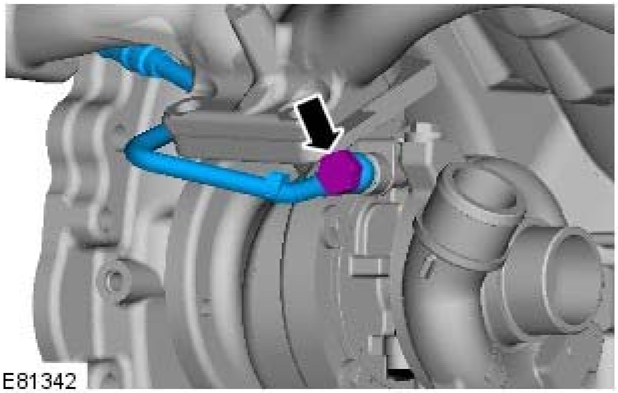
- Remove the 3 bolts.
- Remove and discard the gasket.



E88226

37. Remove the RH turbocharger support bracket.

- Remove the 5 bolts.

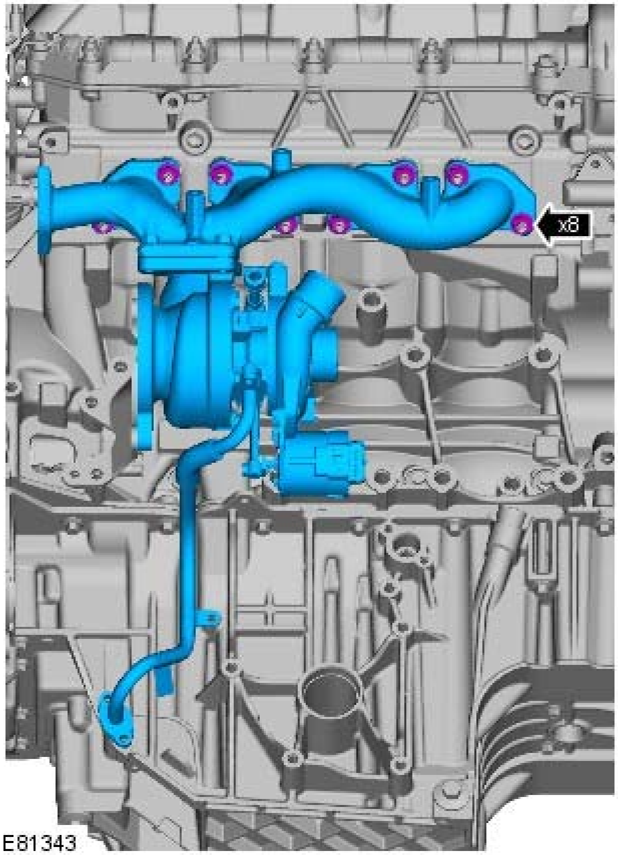


E81342

38. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

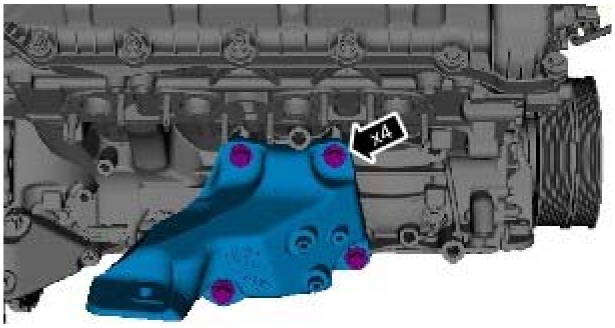
Disconnect the RH turbocharger oil supply pipe.

- Remove the banjo bolt.
- Remove and discard the 2 sealing washers.



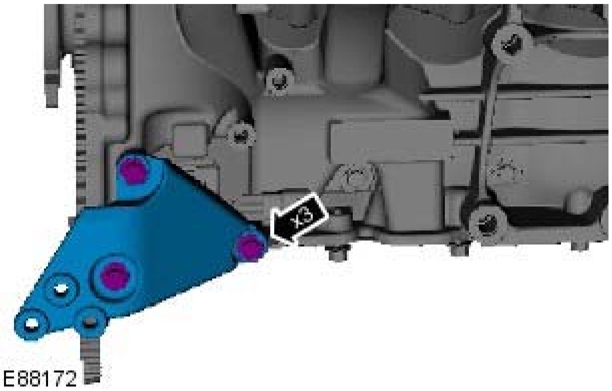
39. Remove the RH exhaust manifold and turbocharger assembly.

- Remove and discard the 8 nuts.
- Remove and discard the gasket.



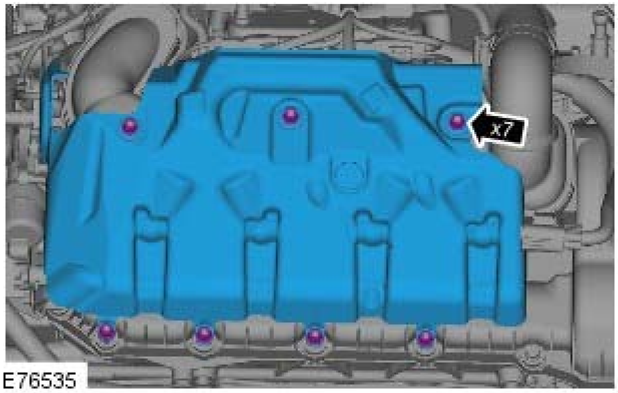
40. Remove the RH engine mount bracket.

- Remove the 4 bolts.



41. Remove the support bracket.

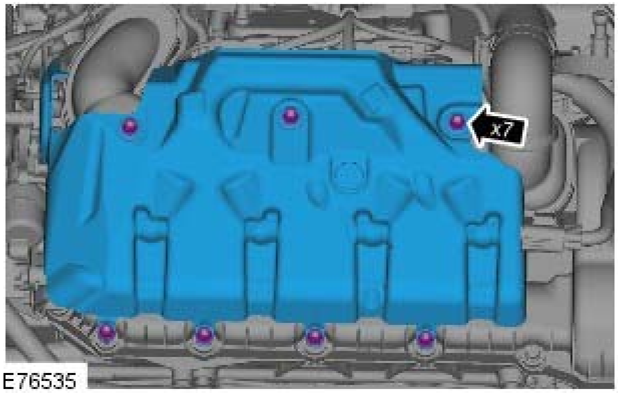
- Remove the 3 bolts.



42. NOTE: RH illustration shown, LH is similar

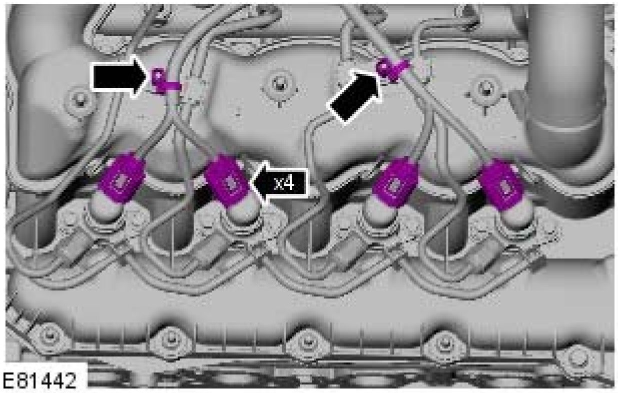
Remove the LH fuel line shield.

- Remove the 7 nuts.



43. Remove the RH fuel line shield.

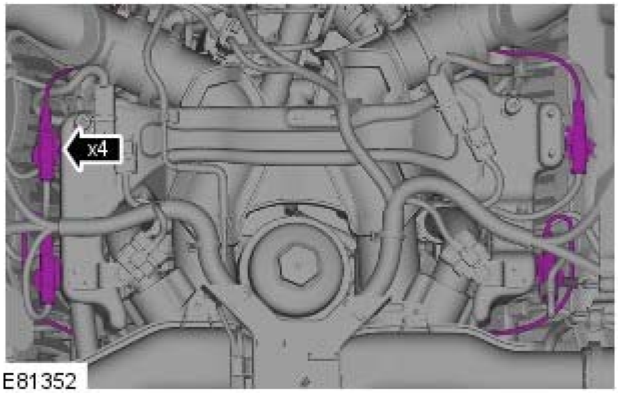
- Remove the 7 nuts.



44. NOTE: Left-hand shown, right-hand similar.

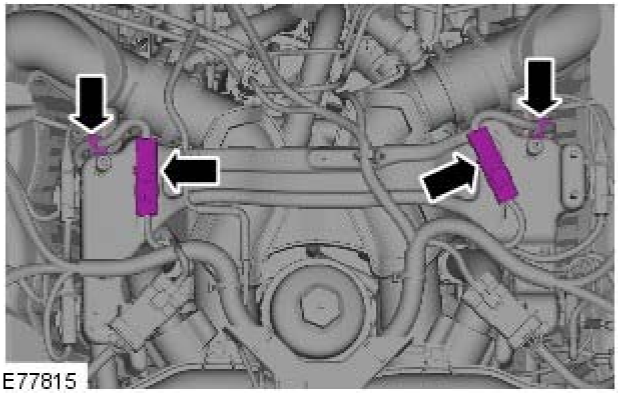
Disconnect the 8 fuel injector electrical connectors.

- Release the fuel charging wiring harness.



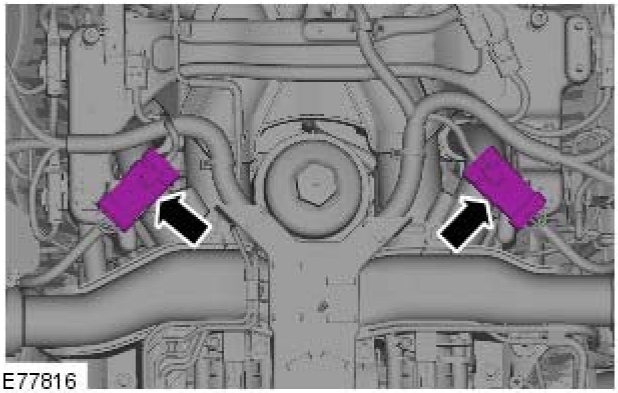
45. Disconnect the knock sensor (KS) electrical connectors.

- Release the wiring harness.


E77815

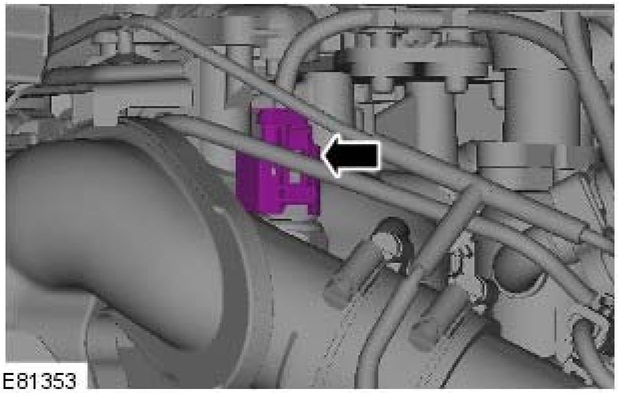
46. Disconnect the glow plug electrical connectors.

- Release the wiring harness.

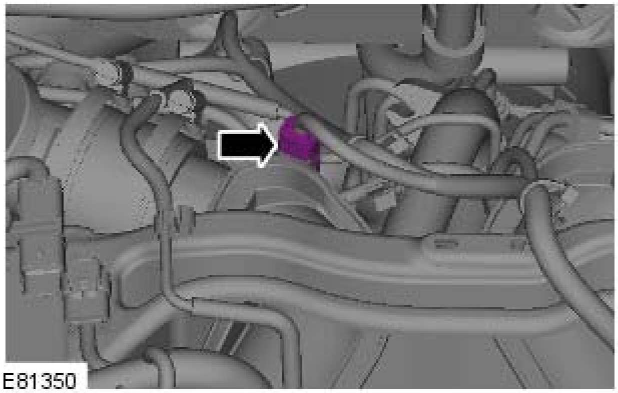

E77816

47. Disconnect both exhaust gas recirculation (EGR) valve electrical connectors.

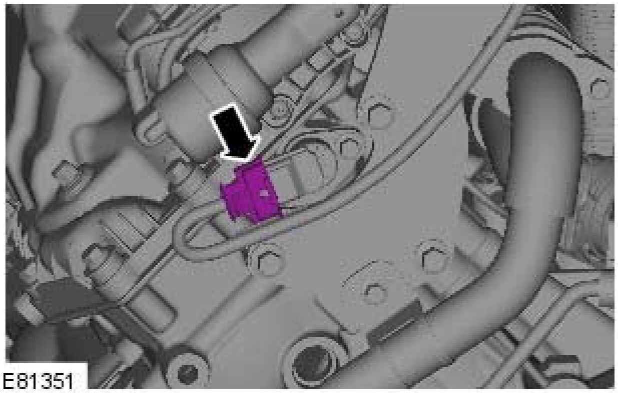
- Release the wiring harness.


E81353

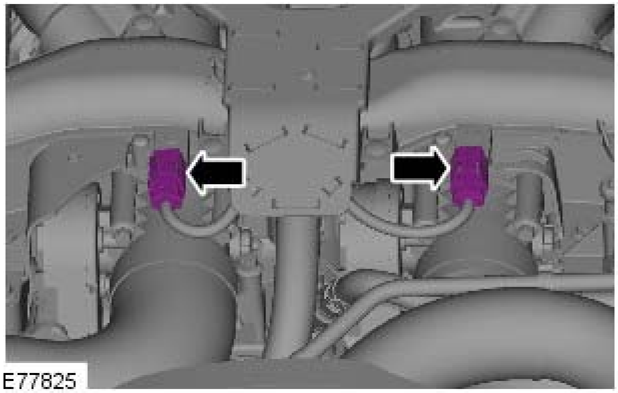
48. Disconnect the fuel rail pressure (FRP) sensor electrical connector.


E81350

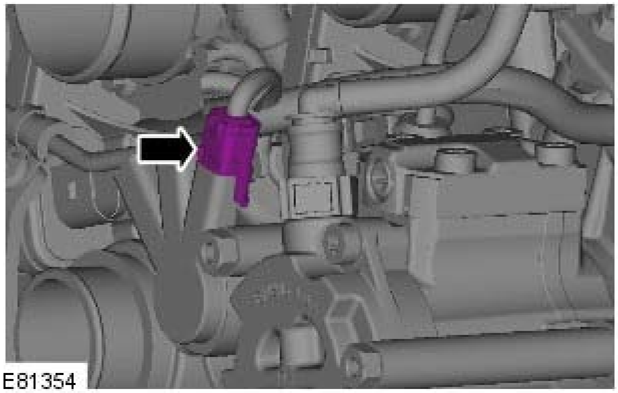
49. Disconnect the fuel temperature sensor electrical connector.


E81351

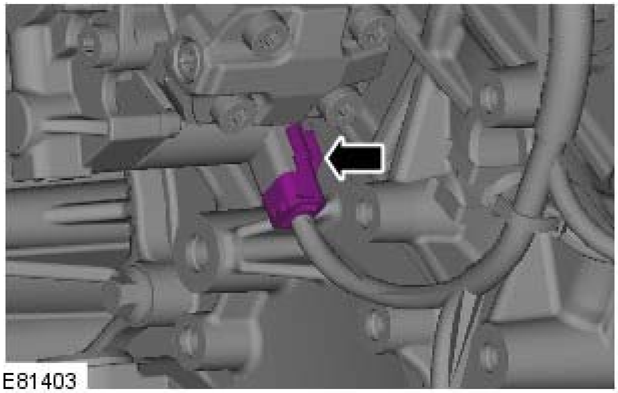
50. Disconnect the camshaft position (CMP) sensor electrical connector.


E77825

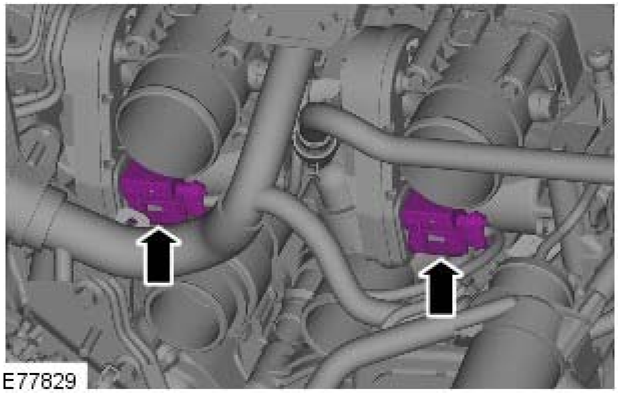
51. Disconnect both manifold absolute pressure and temperature (MAPT) sensor electrical connectors.


E81354

52. Disconnect the fuel pressure control valve electrical connector.

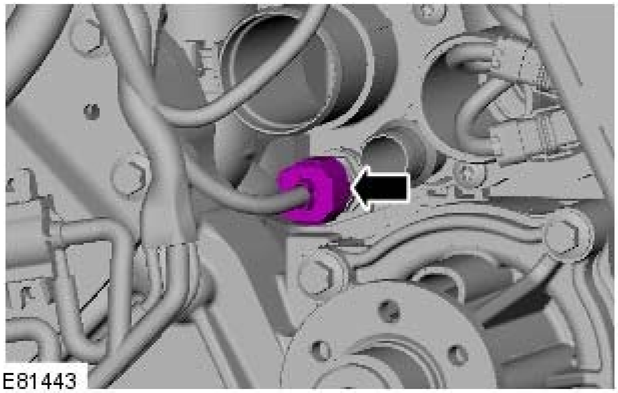

E81403

53. Disconnect the fuel metering valve electrical connector.

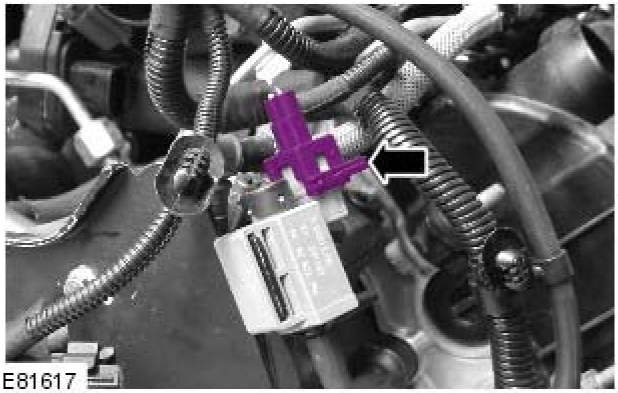


54. Disconnect both throttle body electrical connectors.

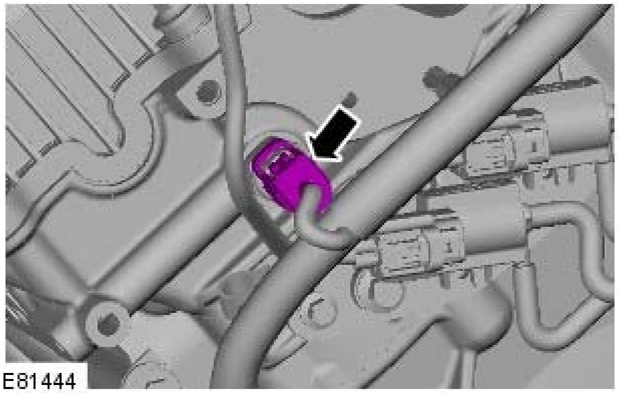
- Release the locking tangs.



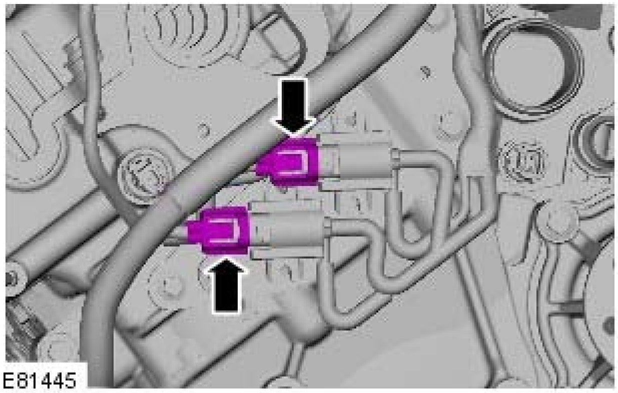
55. Disconnect the engine coolant temperature (ECT) sensor electrical connector.



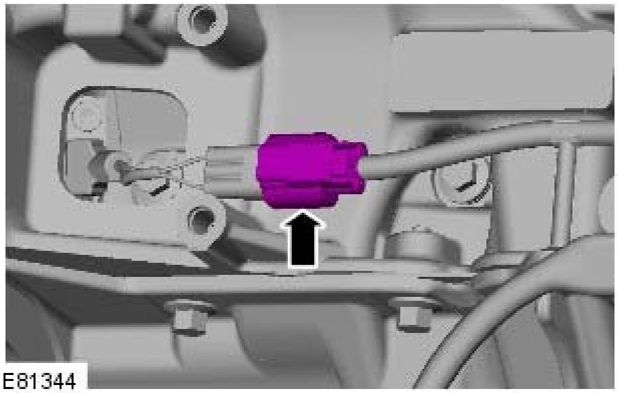
56. Disconnect the air suspension solenoid electrical connector.



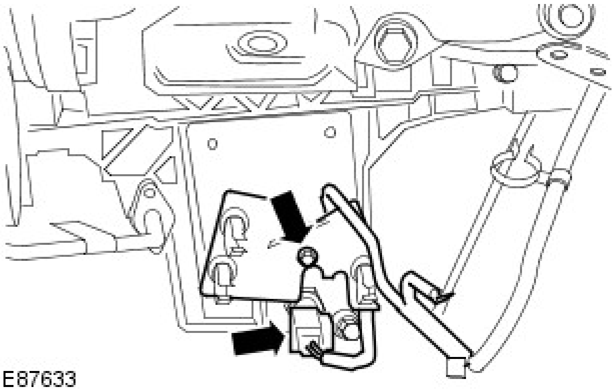
57. Disconnect the engine oil pressure (EOP) sensor electrical connector.



58. Disconnect the vacuum solenoid electrical connectors.



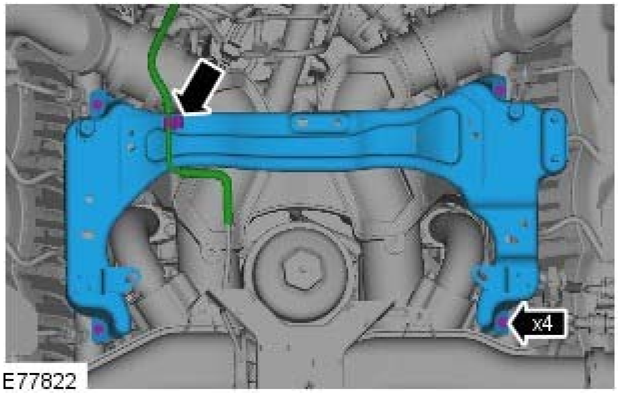
59. Disconnect the crankshaft position (CKP) sensor electrical connector.



60. Disconnect the engine oil temperature sensor electrical connector.

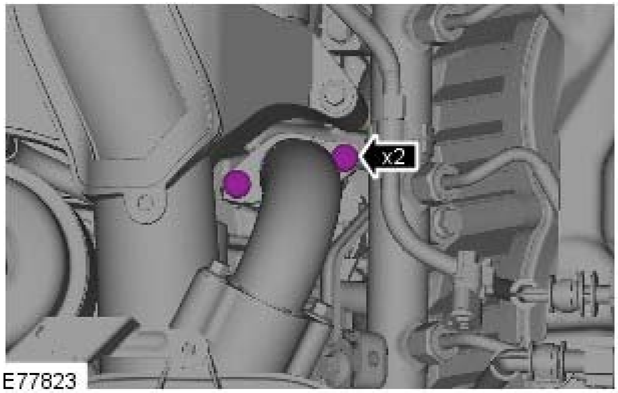
61. Remove the engine wiring harness.

- Release the clips.



62. Remove the engine cover mounting bracket.

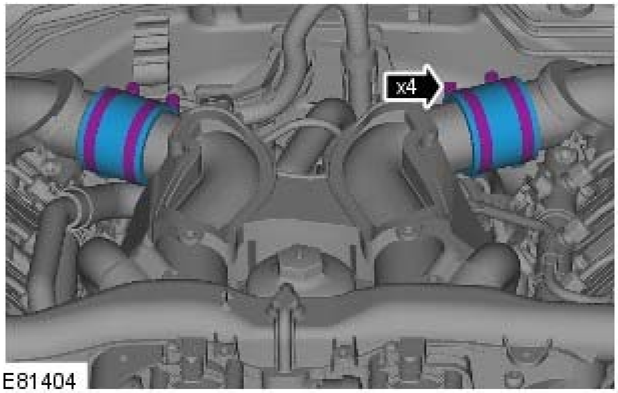
- Release the vacuum line.
- Remove the 4 bolts.



63. NOTE: Left-hand shown, right-hand similar.

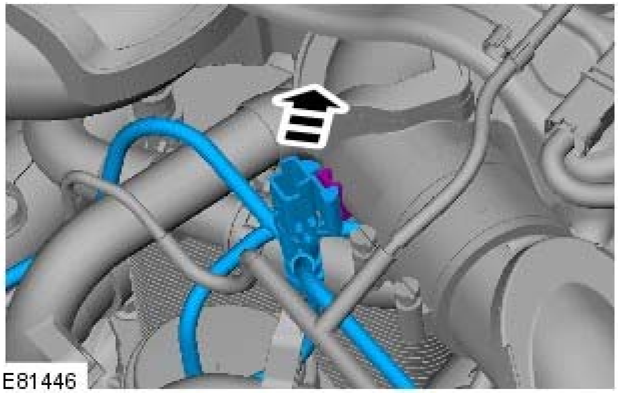
Release both EGR valve outlet tubes.

- Remove the 4 bolts.

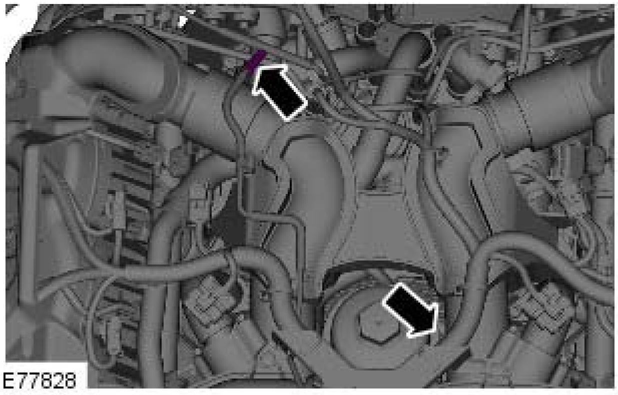


64. Reposition the intake manifold plenum chamber rear hoses.

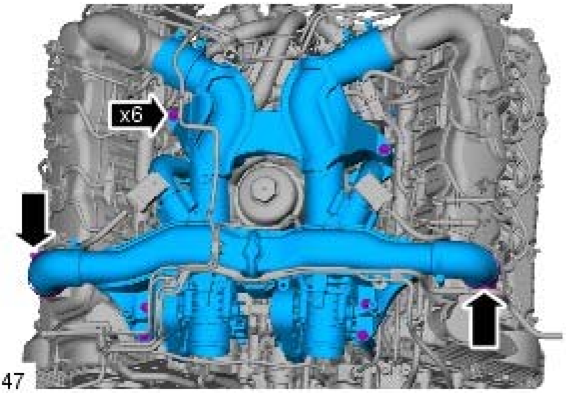
- Release the clips.



65. Release the fuel temperature sensor.


E77828

66. Disconnect the vacuum lines.

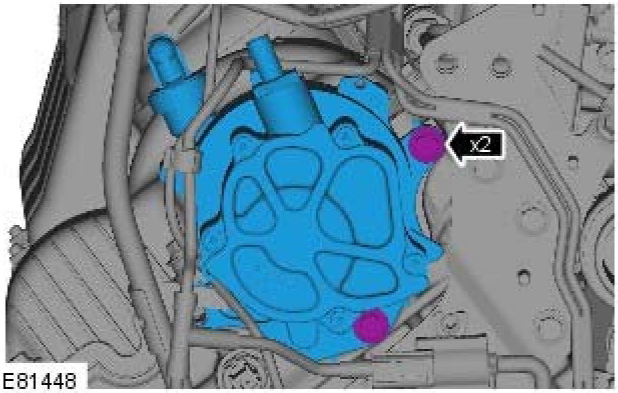


E81447

67. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the intake manifold plenum chamber.

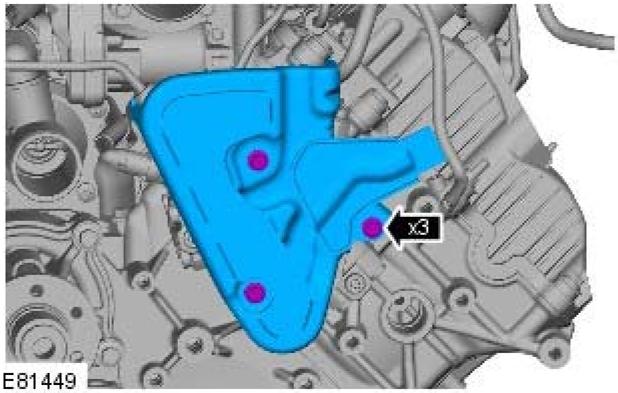
- Release the clips.
- Fully loosen the 6 bolts.
- Remove and discard the EGR valve outlet tube gaskets.



E81448

68. Remove the brake vacuum pump.

- Remove the 2 bolts.
- Remove and discard the gasket.

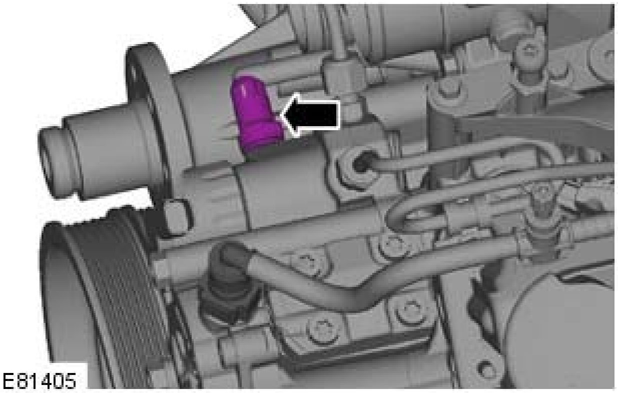


E81449

69. Remove the fuel pump shield.

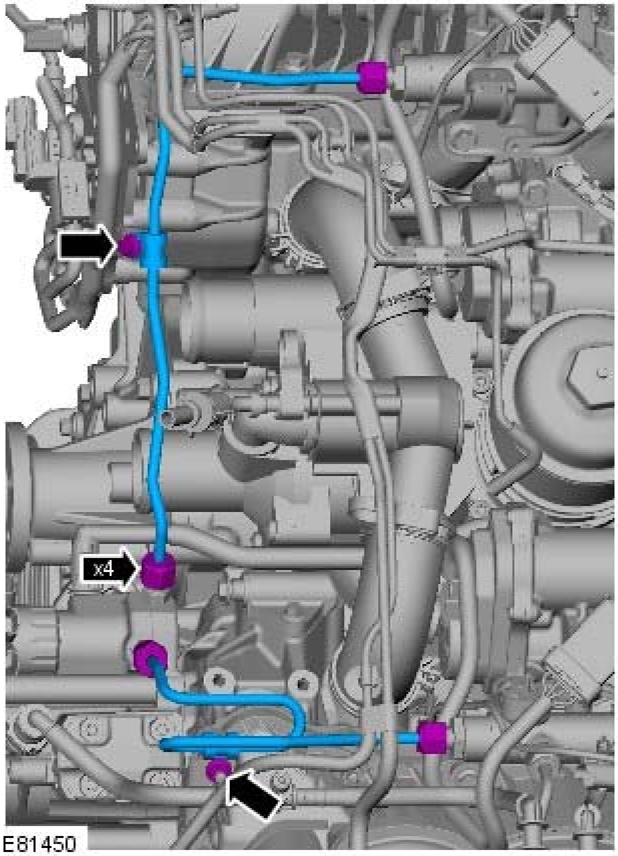
- Remove the 3 bolts.

70. Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel rails and the fuel injection pump.
For additional information, refer to: Fuel Injection Component Cleaning (303-04, General Procedures).



71. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

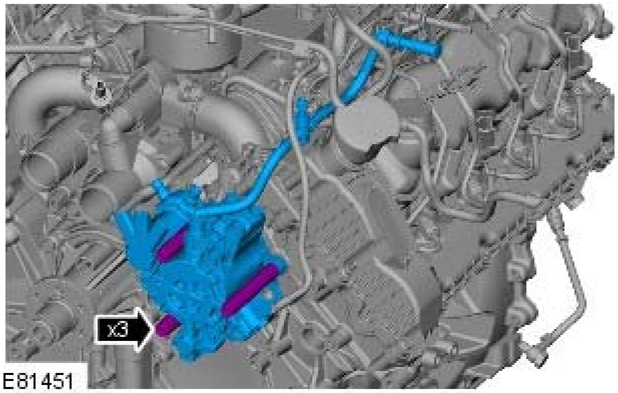
Disconnect the low-pressure fuel return line.



72. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

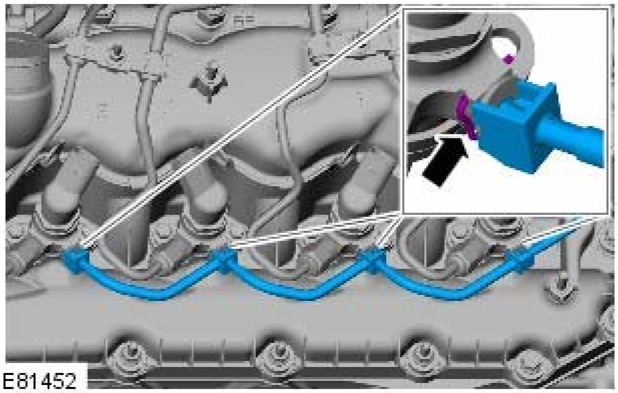
Remove and discard the high-pressure fuel supply lines.

- Remove the 2 bolts.



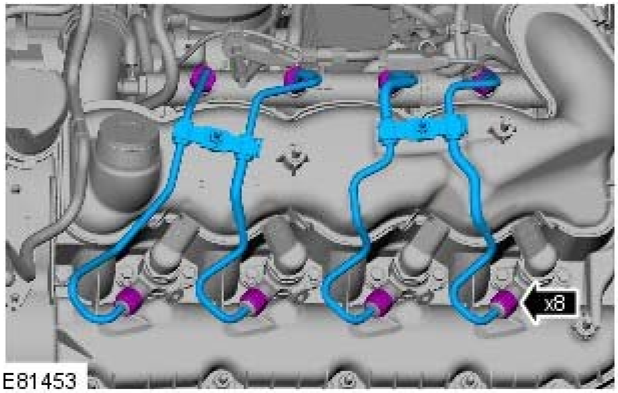
73. Remove the fuel pump.

- Release the low-pressure fuel supply line.
- Remove the 3 bolts.
- Remove and discard the gasket.



74. Disconnect the fuel return line from the fuel injectors.

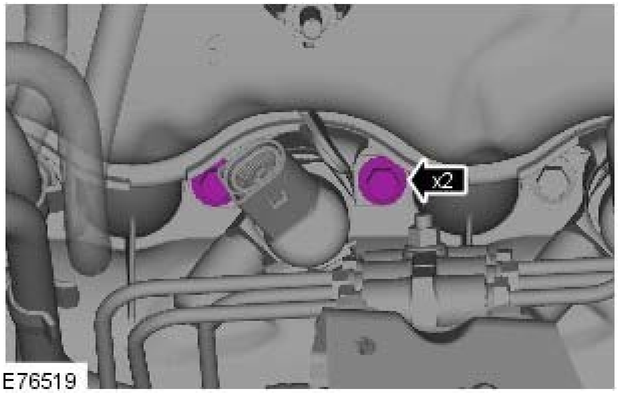
- Remove and discard the 8 fuel return line clips.



75. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

• NOTE: Left-hand shown, right-hand similar.

Remove and discard the high-pressure fuel supply lines.



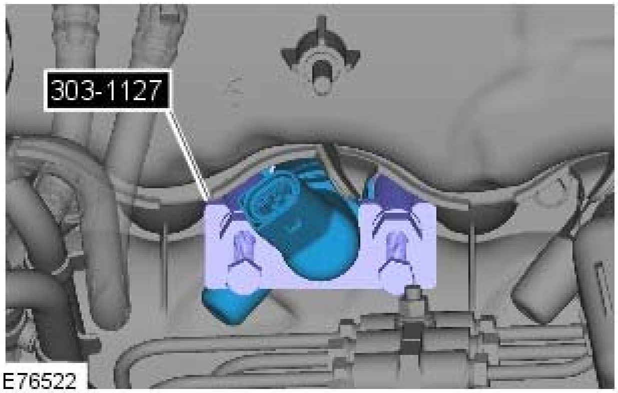
76. Remove the 2 fuel injector bolts.

77. Install the special tool studs.

78. ⚠CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

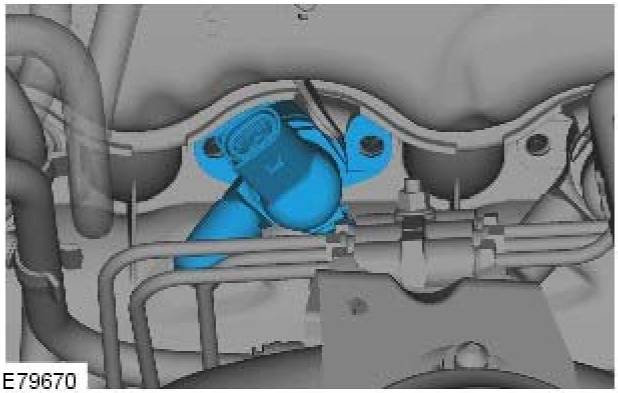
Install the special tool remover legs to the studs.

79. Install the special tool locking plate to the remover legs.



80. Remove the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.

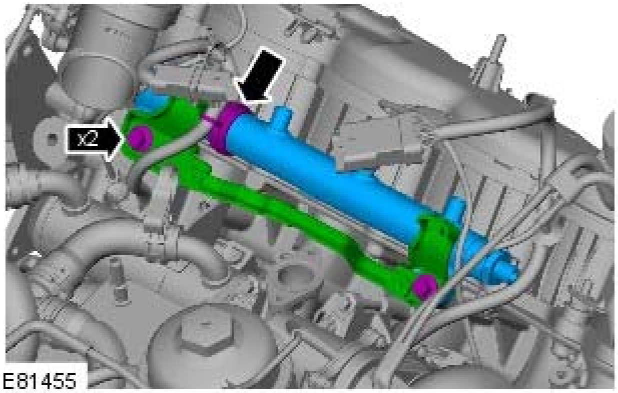


81. Remove the remaining fuel injectors.

82. NOTE: Left-hand shown, right-hand similar.

Remove the fuel rails.

- Release the glow plug wiring harness.
- Remove the 4 bolts.
- Remove the brackets.

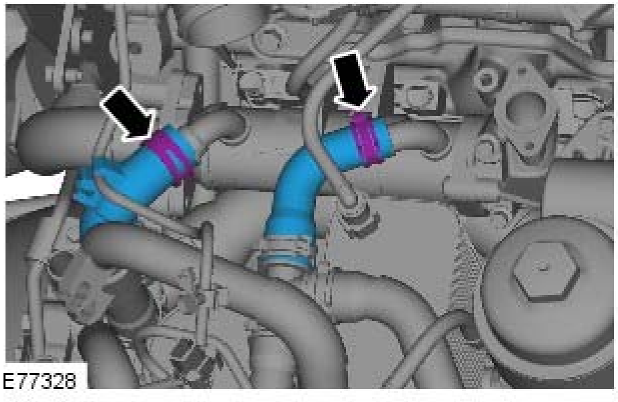


83. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

• NOTE: Left-hand shown, right-hand similar.

Disconnect the EGR cooler coolant hoses.

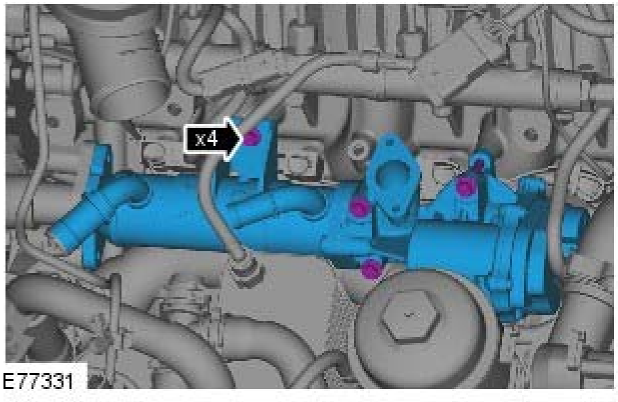
- Release the 4 clips.



84. NOTE: Left-hand shown, right-hand similar.

Remove the EGR valve and cooler assemblies.

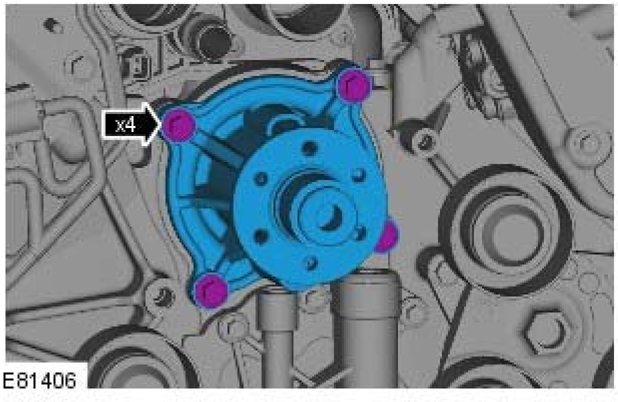
- Remove the 8 bolts.



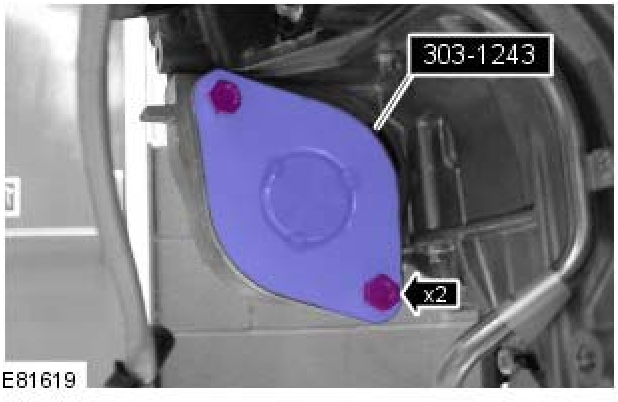
85. NOTE: Some fluid spillage is inevitable during this operation.

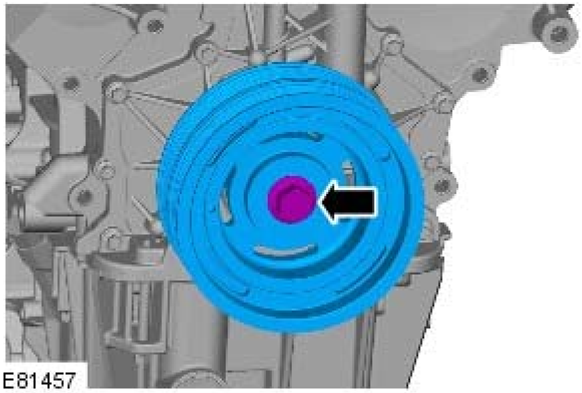
Remove the coolant pump.

- Position a container to collect the fluid spillage.
- Remove the 4 bolts.
- Remove and discard the O-ring seal.



86. Install the special tool.

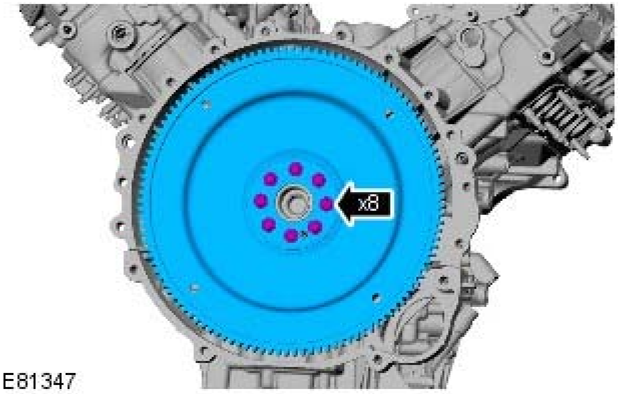



E81457

87. NOTE: The crankshaft pulley bolt will be very tight.

Remove the crankshaft pulley.

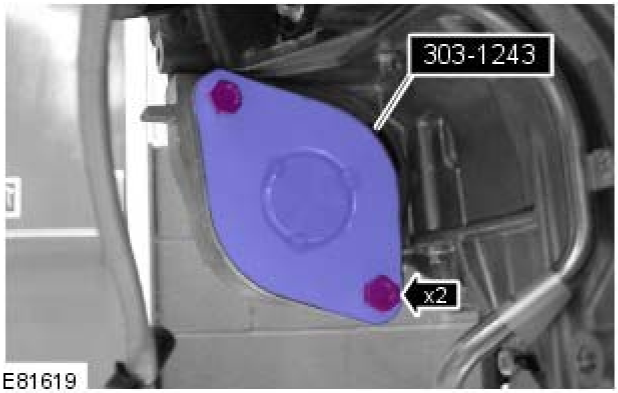
- Remove and discard the bolt.



E81347

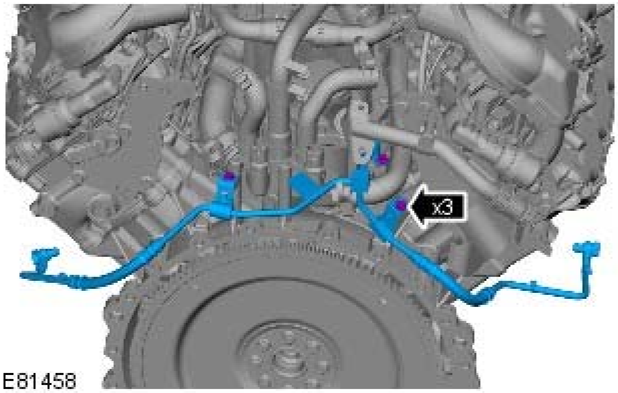
88. Remove the flexplate.

- Remove and discard the 8 bolts.



E81619

89. Remove the special tool.

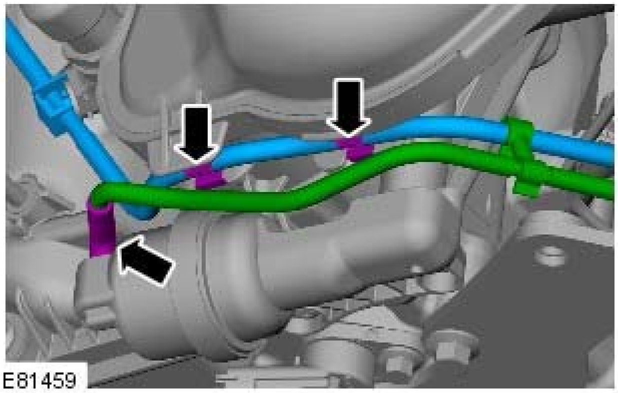


E81458

90. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the turbocharger oil supply line.

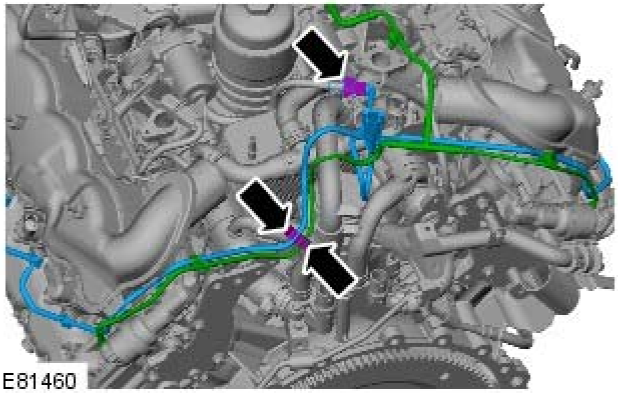
- Remove the 3 bolts.
- Remove and discard the 2 O-ring seals.



91. NOTE: Left-hand shown, right-hand similar.

Release the vacuum and fuel return lines.

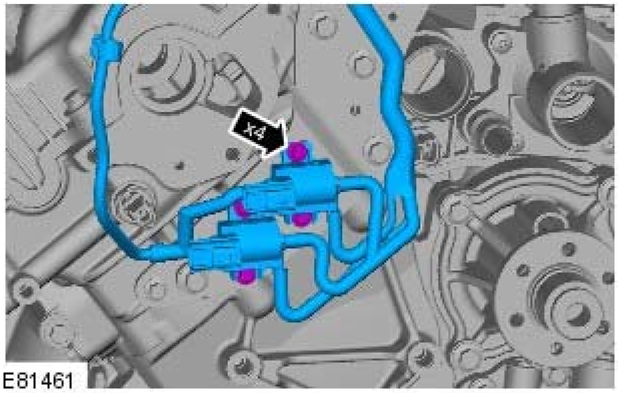
- Release the fuel return line from the valve covers.
- Disconnect the vacuum hose.



92. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

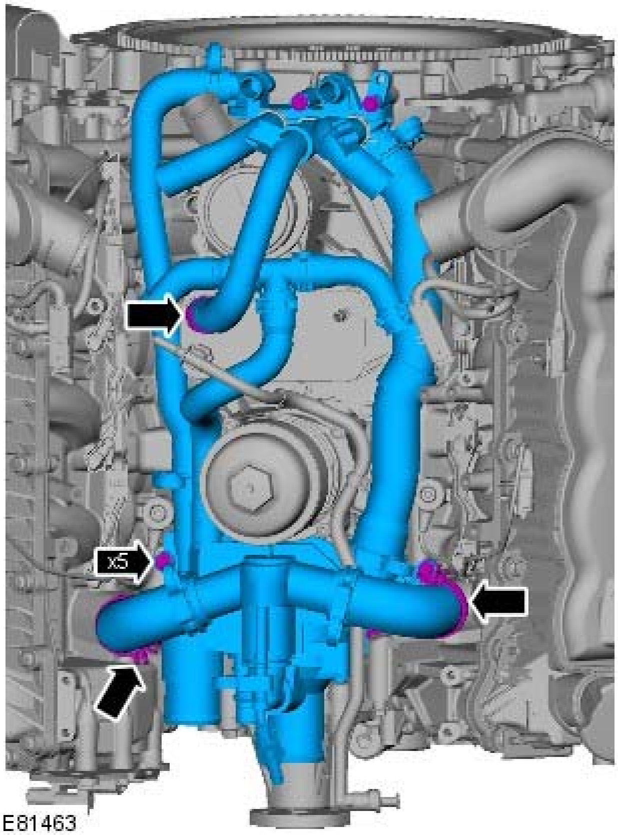
Remove the vacuum and fuel return lines.

- Disconnect the fuel return line from the fuel cooler.



93. Remove the vacuum solenoids and lines.

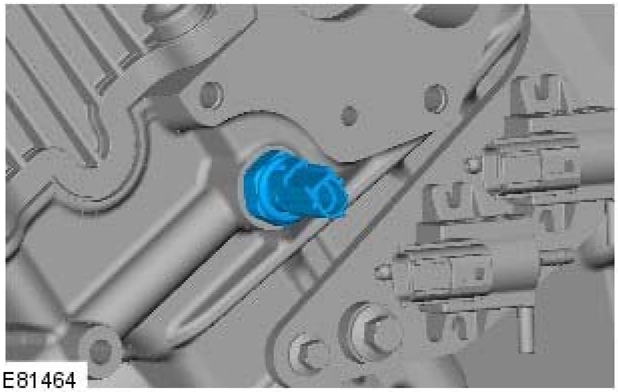
- Remove the 4 bolts.



E81463

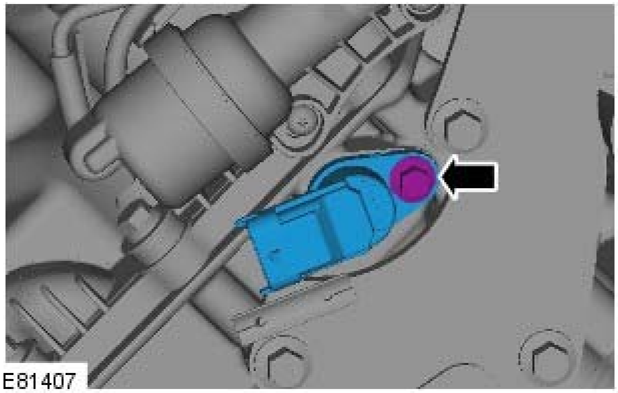
94. Remove the cylinder block coolant elbow and hose assembly.

- Disconnect the coolant hoses.
- Release the 3 clips.
- Remove the 5 bolts.
- Remove and discard the O-ring seal.



E81464

95. Remove the EOP sensor.



E81407

96. Remove the CMP sensor.

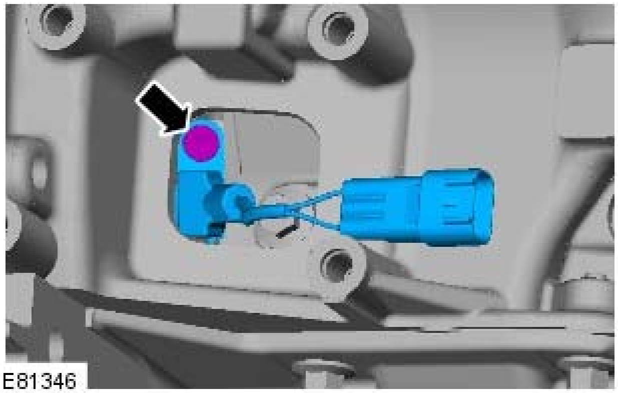
- Remove the bolt.
- Remove and discard the O-ring seal.

97. NOTE: CKP sensor blanking cover shown removed for clarity.

• NOTE: The CKP sensor bolt should not be removed from the CKP sensor.

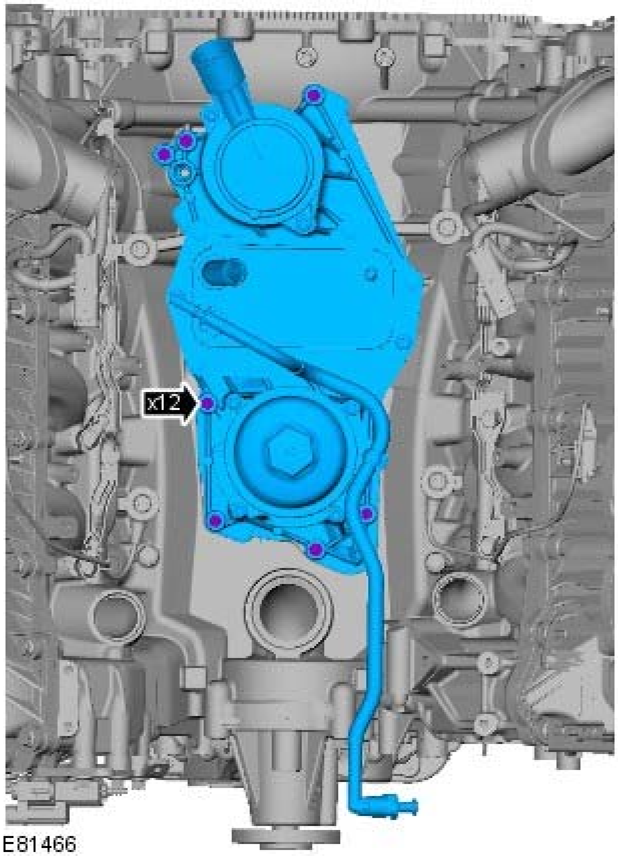
Remove the CKP sensor.

- Fully loosen the bolt.



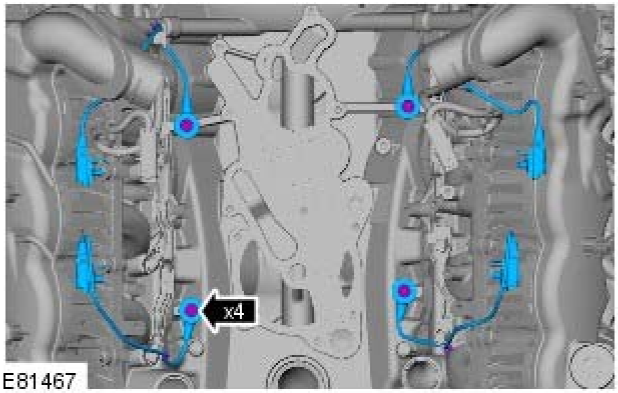
98. Remove the oil filter housing.

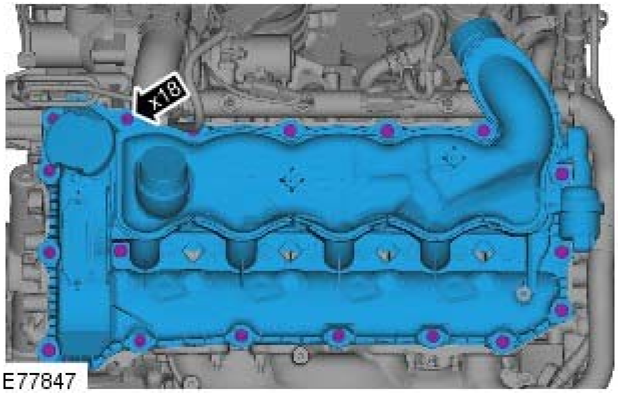
- Remove the 12 bolts.
- Remove and discard the gasket.



99. Remove the knock sensors (KS).

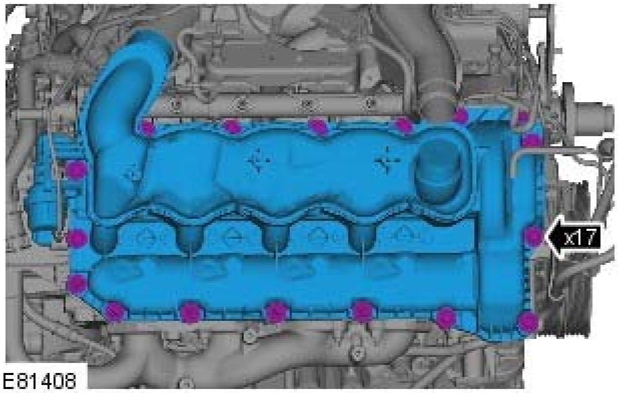
- Remove the bolts.





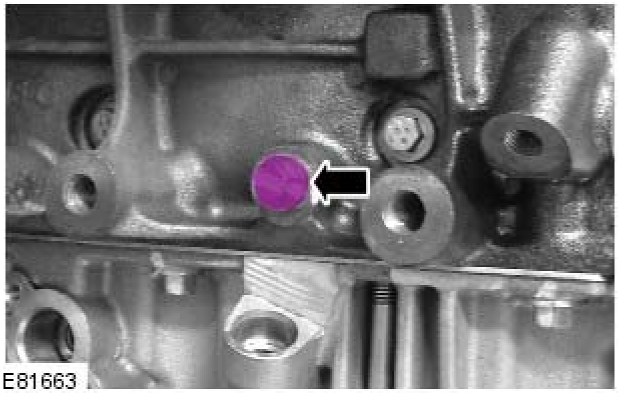
100. Remove the LH valve cover.

- Fully loosen the 18 bolts.
- Remove and discard the gasket.

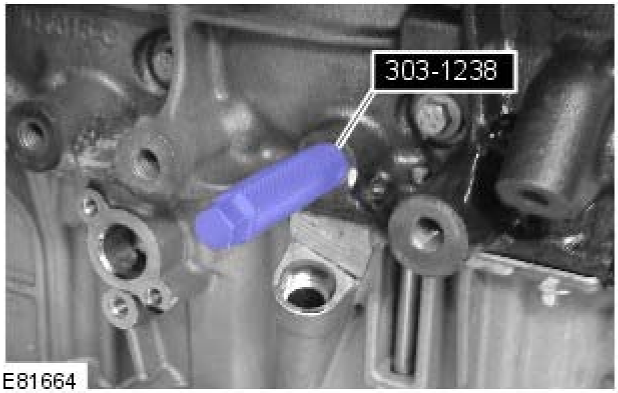


101. Remove the RH valve cover.

- Fully loosen the 17 bolts.
- Remove and discard the gasket.

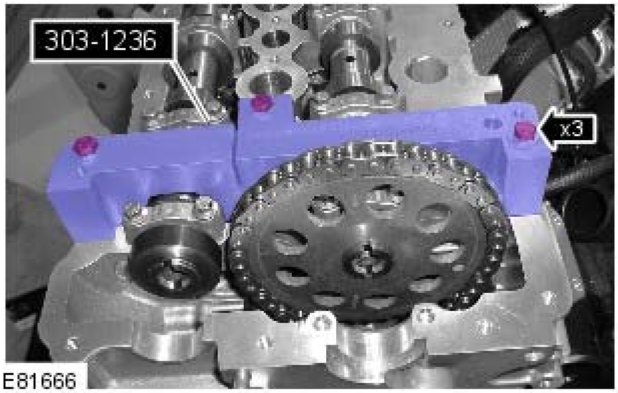


102. Remove the crankshaft timing pin plug.


303-1238
E81664

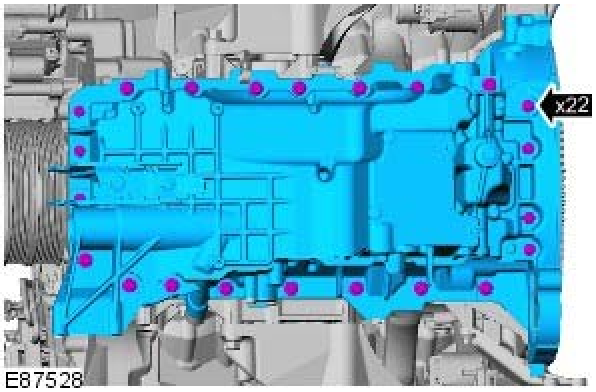
103. Install the special tool.

- Rotate the crankshaft clockwise until the crankshaft touches the crankshaft timing pin.


303-1236
x3
E81666

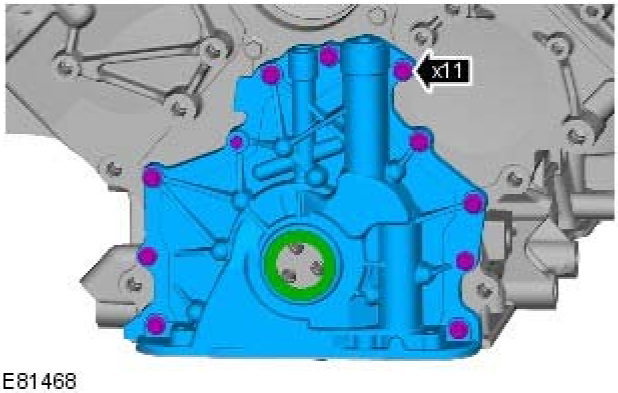
104. Install the special tools.

- Tighten the bolts to 10 Nm (7 lb.ft).



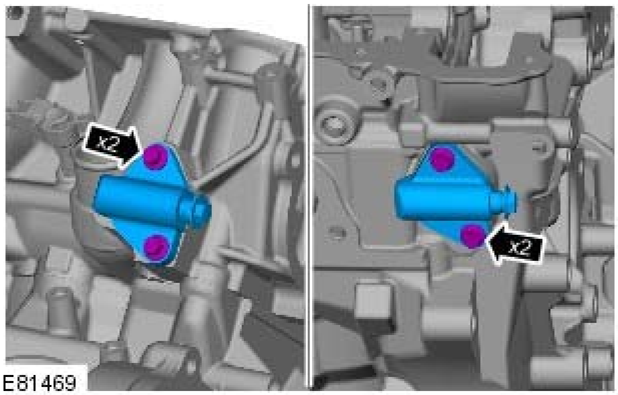
105. Remove the oil pan.

- Remove the 22 bolts.
- Remove and discard the gasket.

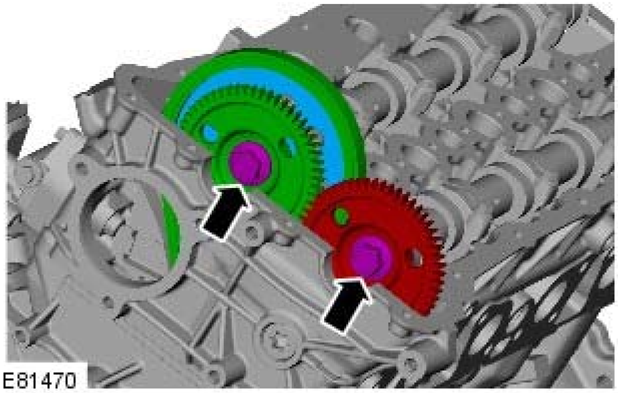


106. Remove the oil pump.

- Remove the 11 bolts.
- Remove and discard the gasket.
- Remove and discard the crankshaft front seal.

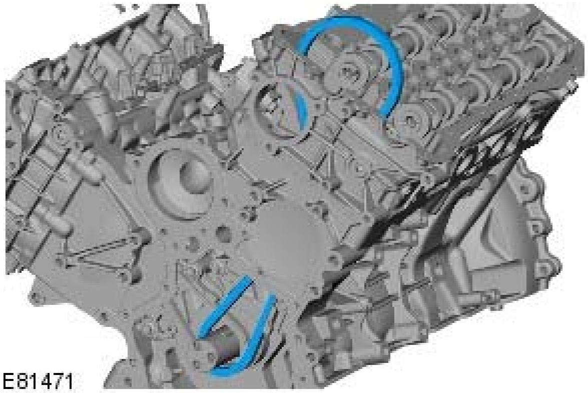

x2
x2
E81469

107. Remove and discard both hydraulic timing chain tensioners.

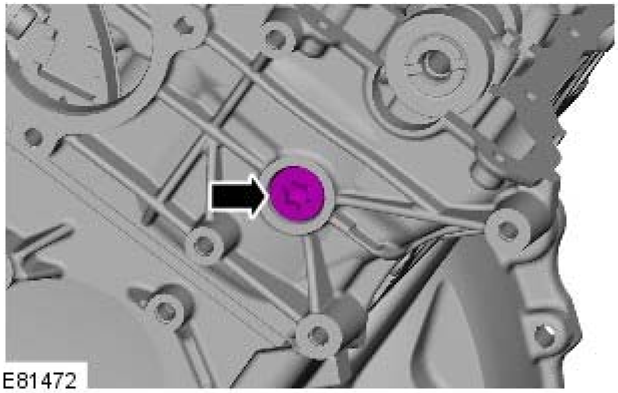

E81470

108. Remove the LH timing chain sprocket and gears.

- Remove and discard the 2 bolts.

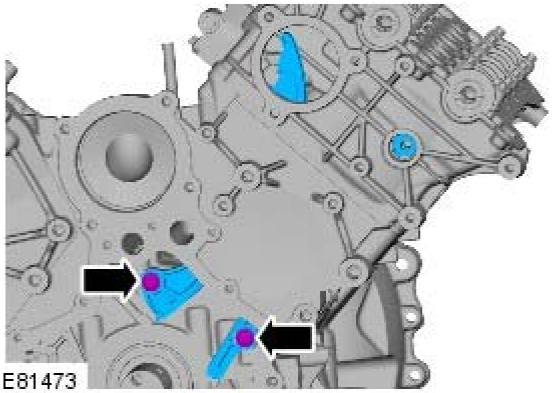

E81471

109. Remove the LH timing chain.

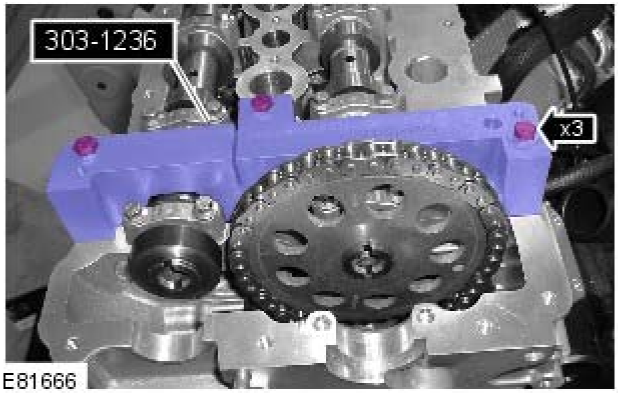

E81472

110. Remove the LH timing chain tensioner guide pin.

- Remove and discard the O-ring seal.


E81473

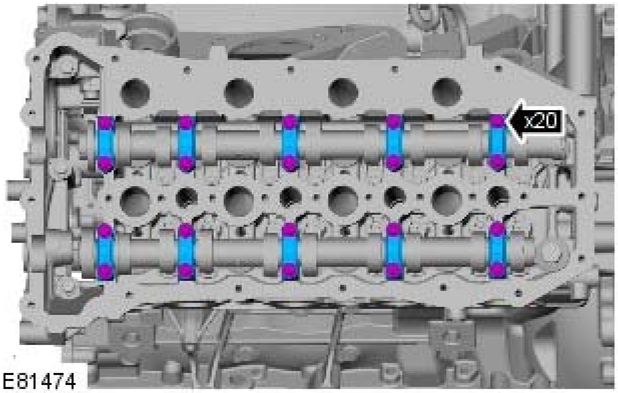
111. Remove the LH timing chain tensioner guides.



E81666

112. Remove the special tools.

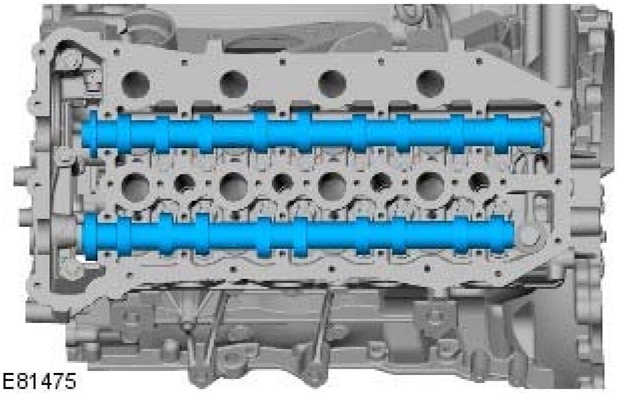
- Remove the bolts.



E81474

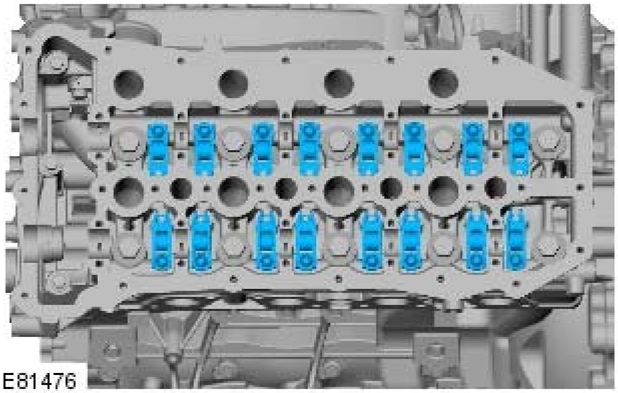
113. Remove the camshaft bearing caps.

- Remove the 20 bolts.



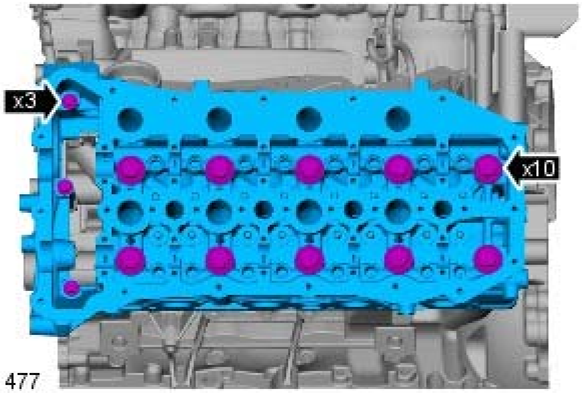
E81475

114. Remove the LH camshafts.



E81476

115. Remove the hydraulic adjuster and rocker assemblies.

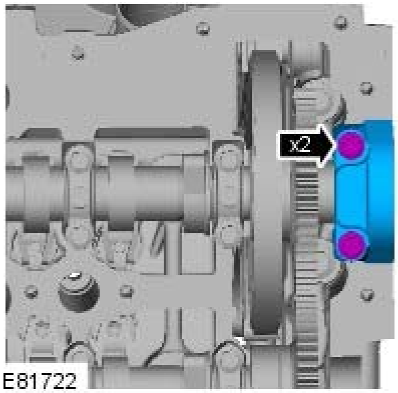


E81477

116. ⚠ CAUTION: The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

Remove the LH cylinder head assembly.

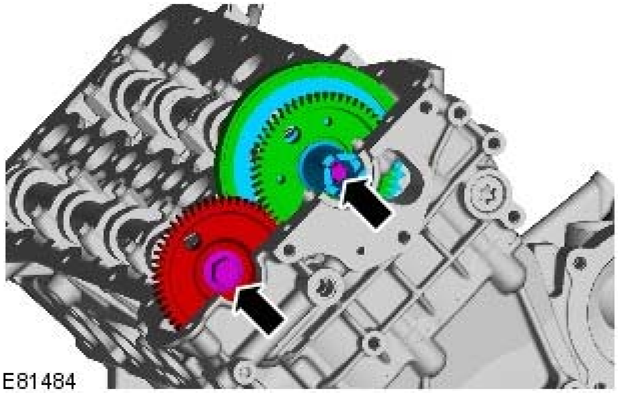
- Remove and discard the 13 bolts.
- Remove and discard the gasket.



E81722

117. Remove the vacuum pump cap.

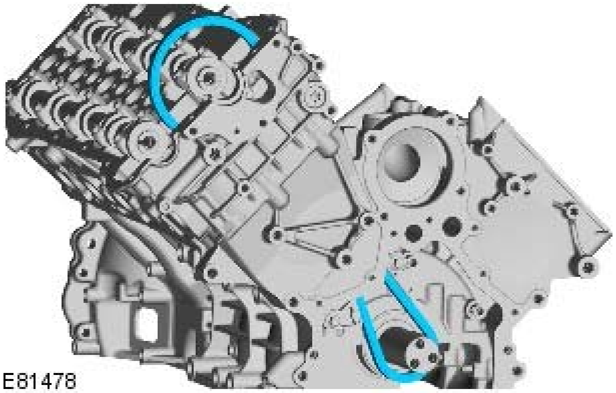
- Remove the 2 bolts.



E81484

118. Remove the RH timing chain sprocket and gears.

- Remove and discard the 2 bolts.
- Remove the vacuum pump drive gear.



E81478

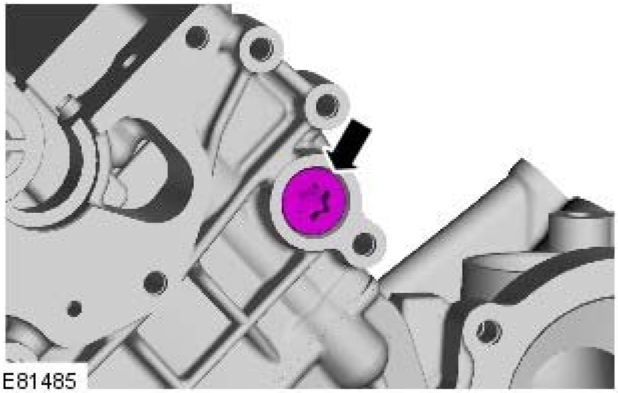
119. Remove the RH timing chain.

120. Remove the engine lifting eye bracket.

- Remove the 4 bolts.

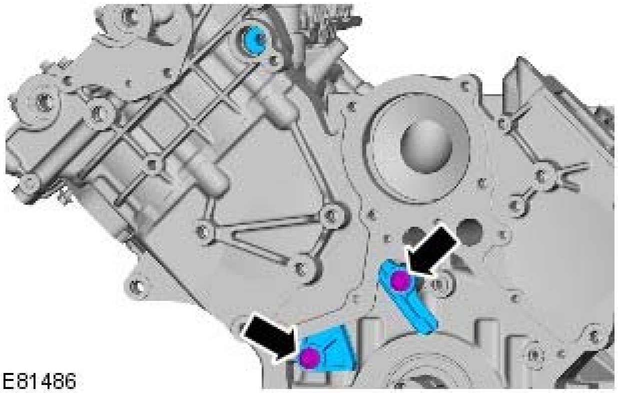
121. Remove the RH timing chain tensioner guide pin.

- Remove and discard the O-ring seal.



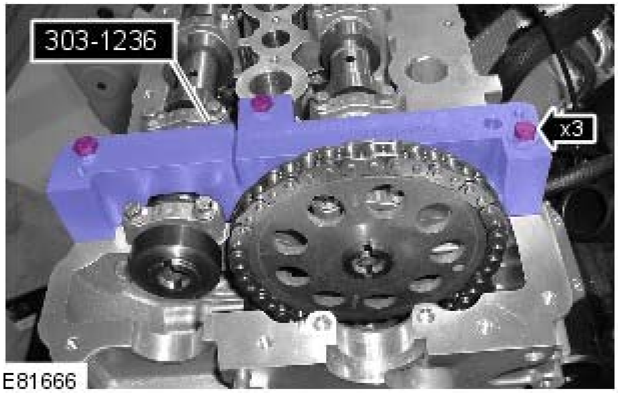
E81485

122. Remove the RH timing chain tensioner guides.

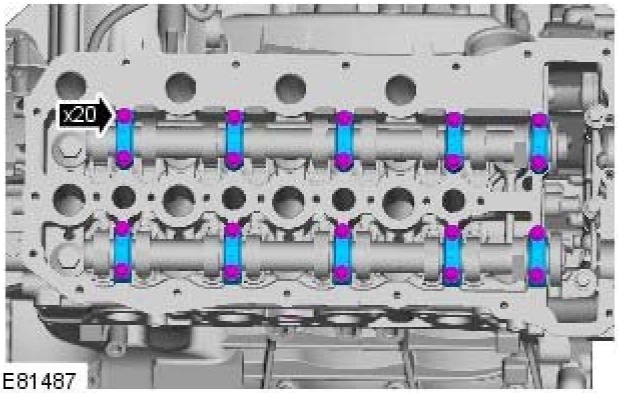


E81486

123. Remove the special tools.



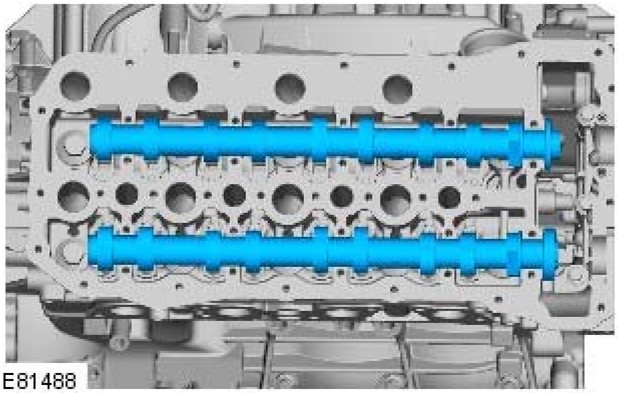
E81666



E81487

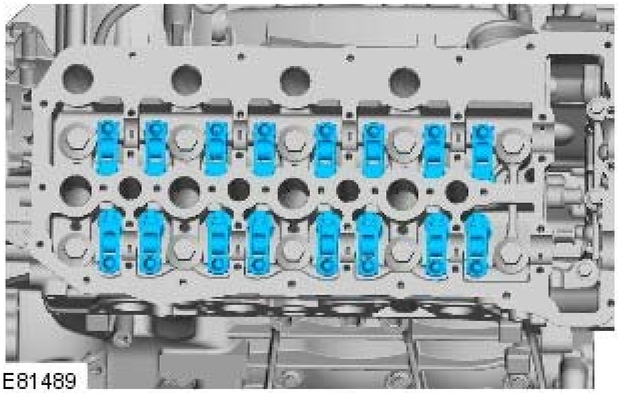
124. Remove the camshaft bearing caps.

- Remove the 20 bolts.



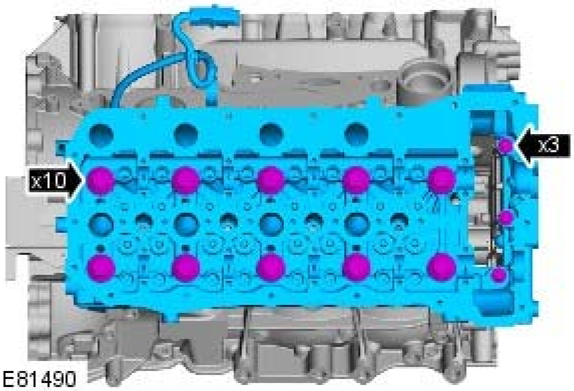
E81488

125. Remove the RH camshafts.



E81489

126. Remove the hydraulic adjuster and rocker assemblies.



E81490

127. ⚠CAUTION: The cylinder head must not be placed mating face down. Failure to follow this instruction may result in damage to the vehicle.

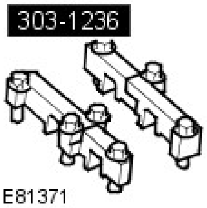
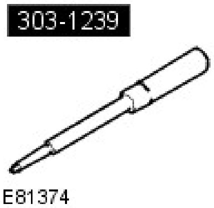
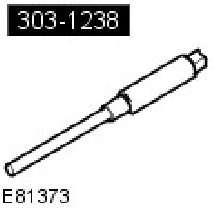
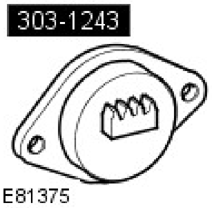
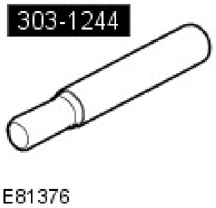
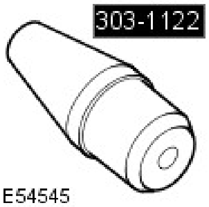
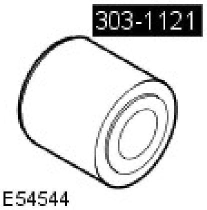
Remove the RH cylinder head assembly.

- Remove and discard the 13 bolts.
- Remove and discard the gasket.

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine

Assembly

Special Tool(s)	
 303-1236 E81371	Camshaft holding tool 303-1236
 303-1239 E81374	Camshaft rotation pin 303-1239
 303-1238 E81373	Crankshaft timing pin 303-1238
 303-1243 E81375	Flexplate locking tool 303-1243
 303-1244 E81376	Valve cover alignment tool 303-1244
 303-1122 E54545	Crankshaft Front Seal Sleeve 303-1122
 303-1121 E54544	Crankshaft Front Seal Installer 303-1121

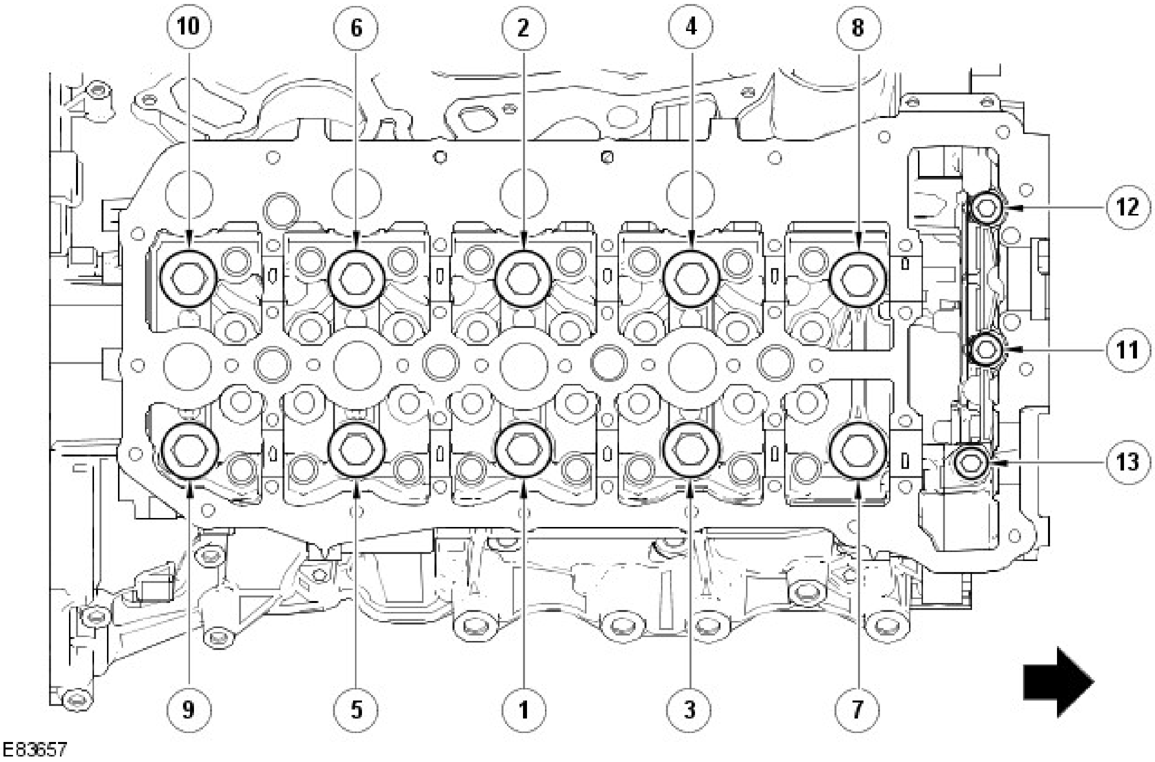
Assembly

1. NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

Install a new RH cylinder head gasket.

- Clean the component mating face.

2. Check cylinder head face for distortion, across the center and from corner to corner.



3. CAUTIONS:

⚠ Tighten the bolts in the sequence shown.

⚠ Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

⚠ Make sure that new cylinder head bolts are installed.

• NOTE: Make sure the cylinder head is installed in its original position.

• NOTE: No additional lubrication to the cylinder head bolts is required.

Install the RH cylinder head assembly.

- Clean the component mating face.
- Stage 1: Tighten the M13 bolts to 20 Nm (15 lb.ft).
- Stage 2: Tighten the M13 bolts to 40 Nm (30 lb.ft).
- Stage 3: Tighten the M13 bolts to 80 Nm (59 lb.ft).
- Stage 4: Tighten the M13 bolts a

further 180 degrees.

- Stage 5: Tighten the M8 bolts to 20 Nm (15 lb.ft).

4. NOTE: Make sure that all the components are clean.

• NOTE: Lubricate the hydraulic adjuster and rocker assemblies with clean engine oil.

Install the hydraulic adjuster and rocker assemblies.

5. NOTE: Make sure that all the components are clean.

Install the RH camshafts.

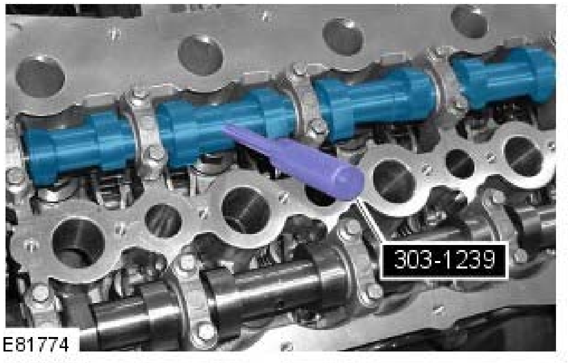
- Lubricate the camshaft journals and camshaft lobes.

6. ⚠CAUTION: Tighten the bolts evenly in the stages shown.

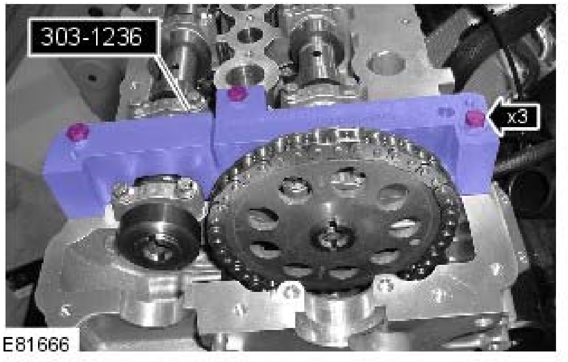
• NOTE: Make sure that all the components are clean.

Install the camshaft bearing caps.

- Lubricate the component mating faces with clean engine oil.
- Stage 1: Tighten the bolts to 1 Nm (0.7 lb.ft).
- Stage 2: Tighten the bolts to 5 Nm (3.7 lb.ft).
- Stage 3: Tighten the bolts to 10 Nm (7 lb.ft).



7. Using the special tool, rotate the camshafts and hold in the 12 o'clock position.



8. Install the special tool.

- Tighten the bolts to 10 Nm (7 lb.ft).

9. Install the RH timing chain tensioner guides.

- Tighten the bolts.

10. NOTE: Lubricate the O-ring seal with clean engine oil.

Install the RH timing chain tensioner guide pin.

- Install a new O-ring seal.
- Tighten to 28 Nm (21 lb.ft).

11. Install the engine lifting eye bracket.

- Tighten the bolts.

12. Install the RH timing chain.

13. ⚠ CAUTION: Do not tighten the camshaft sprocket bolts at this stage.

Install the RH timing chain sprocket and gears.

- Install the brake vacuum pump drive gear.
- Loosely install the new bolts.

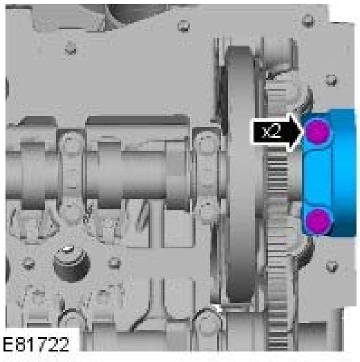
14. NOTE: Lubricate the O-ring seals with clean engine oil.

Install a new RH hydraulic timing chain tensioner.

- Tighten the bolts to 10 Nm (7 lb.ft).

15. Install the vacuum pump cap.

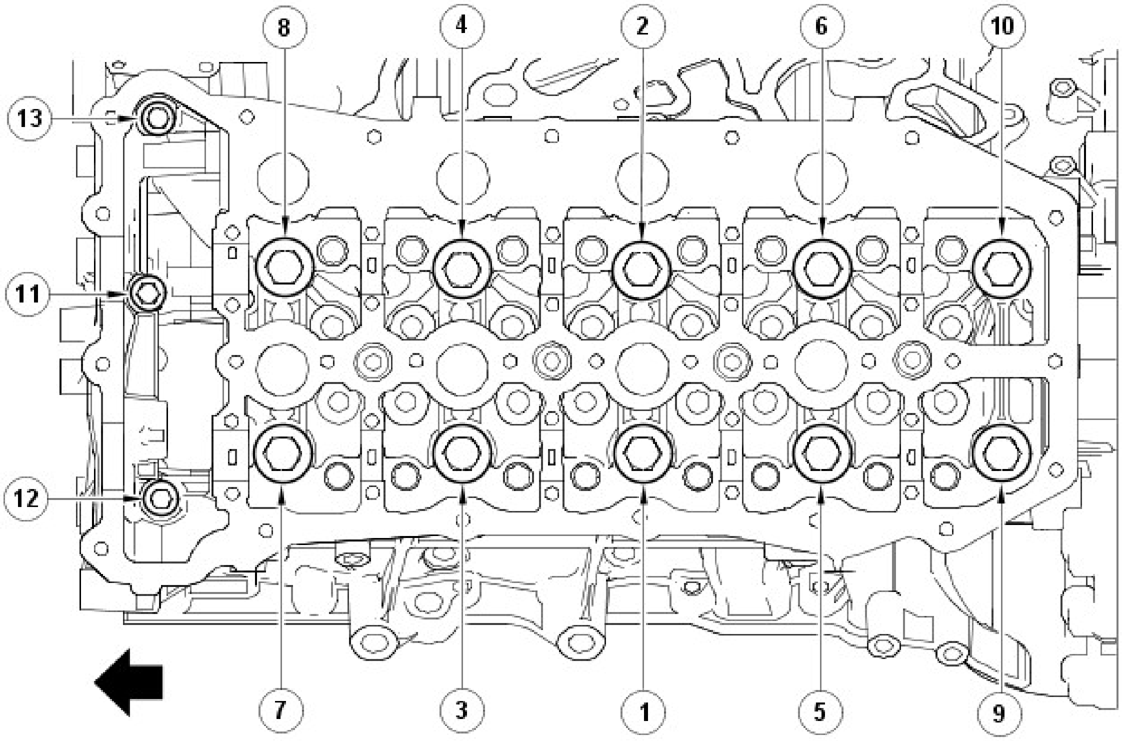
- Tighten the bolts to 10 Nm (7 lb.ft).



16. NOTE: The cylinder head gasket must be installed over the cylinder head to cylinder block dowels.

Install a new LH cylinder head gasket.

17. Check cylinder head face for distortion, across the center and from corner to corner.



E83621

18. CAUTIONS:

⚠ Tighten the bolts in the sequence shown.

⚠ Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

⚠ Make sure that new cylinder head bolts are installed.

• NOTE: Make sure the cylinder head is installed in its original position.

• NOTE: No additional lubrication to the cylinder head bolts is required.

Install the LH cylinder head assembly.

- Clean the component mating faces.
- Stage 1: Tighten the M13 bolts to 20 Nm (15 lb.ft).
- Stage 2: Tighten the M13 bolts to 40 Nm (30 lb.ft).
- Stage 3: Tighten the M13 bolts to 80 Nm (59 lb.ft).
- Stage 4: Tighten the M13 bolts a further 180 degrees.
- Stage 5: Tighten the M8 bolts to 20

Nm (15 lb.ft).

19. NOTE: Make sure that all the components are clean.

• NOTE: Lubricate the hydraulic adjuster and rocker assemblies with clean engine oil.

Install the hydraulic adjuster and rocker assemblies.

20. NOTE: Make sure that all the components are clean.

Install the LH camshafts.

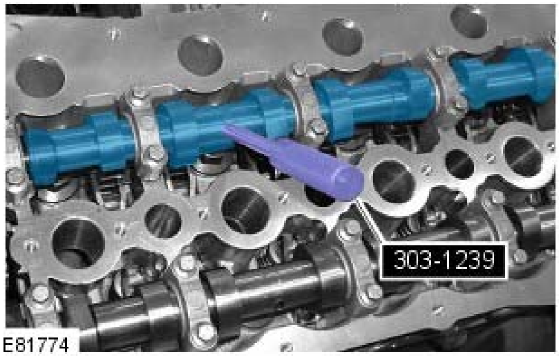
- Lubricate the camshaft journals and camshaft lobes.

21. ⚠ CAUTION: Tighten the bolts evenly in the stages shown.

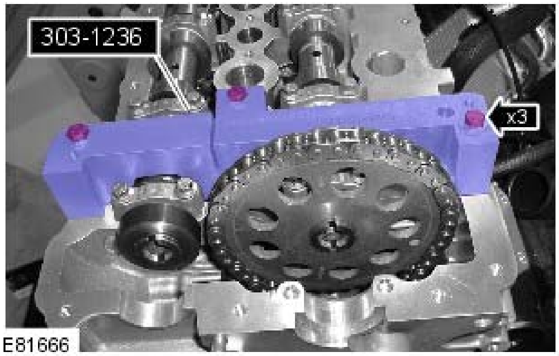
• NOTE: Make sure that all the components are clean.

Install the camshaft bearing caps.

- Stage 1: Tighten the bolts to 1 Nm (0.7 lb.ft).
- Stage 2: Tighten the bolts to 5 Nm (3.7 lb.ft).
- Stage 3: Tighten the bolts to 10 Nm (7 lb.ft).



22. Using the special tool, rotate the camshafts and hold in the 12 o'clock position.



23. Install the special tool.

- Tighten the bolts to 10 Nm (7 lb.ft).

24. Install the LH timing chain tensioner guides.

- Tighten the bolts.

25. NOTE: Lubricate the O-ring seal with clean engine oil.

Install the LH timing chain tensioner guide pin.

- Install a new O-ring seal.
- Tighten to 28 Nm (21 lb.ft).

26. Install the LH timing chain.

27. ⚠ CAUTION: Do not tighten the camshaft sprocket bolts at this stage.

Install the LH timing chain sprocket and gears.

- Loosely install the new bolts.

28. NOTE: Lubricate the O-ring seals with clean engine oil.

Install a new LH hydraulic timing chain tensioner.

- Tighten the bolts to 10 Nm (7 lb.ft).

29. Release the hydraulic timing chain tensioners.

- Tighten the bolts to 10 Nm (7 lb.ft).

30. ⚠ CAUTION: Make sure that the crankshaft is still touching the timing pin.

Tighten the LH camshaft sprocket and gears.

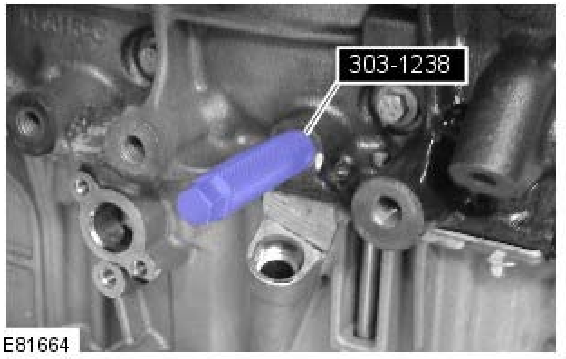
- Stage 1: Tighten the exhaust camshaft gear bolt to 80 Nm (59 lb.ft).
- Stage 2: Tighten the exhaust camshaft gear bolt a further 80 degrees.
- Stage 3: Tighten the intake camshaft sprocket and gear bolt to 80 Nm (59 lb.ft).
- Stage 4: Tighten the intake camshaft sprocket and gear bolt a further 80 degrees.

31. Tighten the RH camshaft sprocket and gears.

- Stage 1: Tighten the exhaust camshaft gear bolt to 80 Nm (59 lb.ft).
- Stage 2: Tighten the exhaust camshaft gear bolt a further 80 degrees.
- Stage 3: Tighten the intake camshaft sprocket and gear bolt to 80 Nm (59 lb.ft).
- Stage 4: Tighten the intake camshaft sprocket and gear bolt a further 80 degrees.

32. Remove the special tools.

33. Remove the special tool.

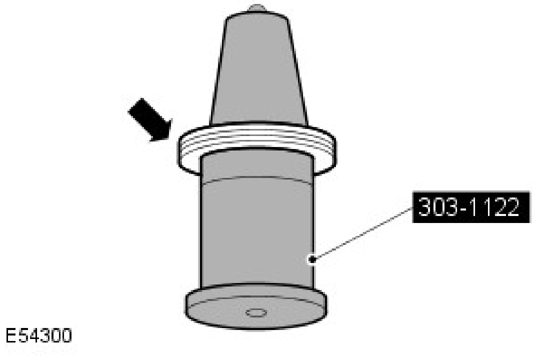


34. Install the crankshaft timing pin plug.

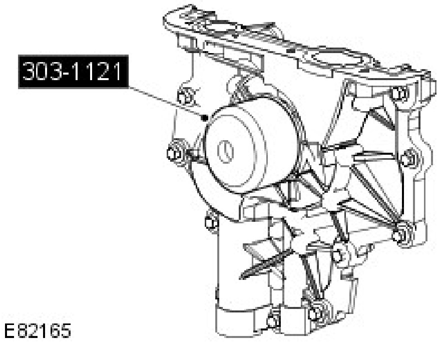
35. ⚠ CAUTION: Prime the oil pump with 20cc of engine oil.

Install the oil pump.

- Clean the component mating faces.
- Install a new gasket.
- Stage 1: Tighten the bolts to 4 Nm (3 lb.ft).
- Stage 2: Tighten the bolts to 10 Nm (7 lb.ft).



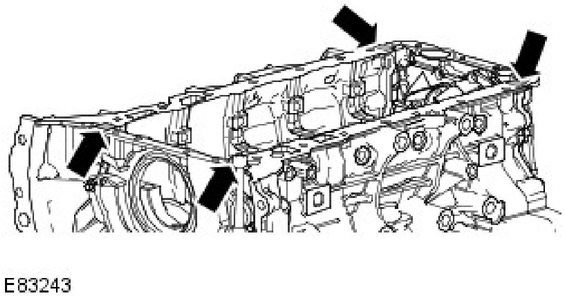
36. Install a new crankshaft front seal to the special tool.



37. Remove the sleeve from the special tool.

38. Using the special tool, install a new crankshaft front seal.

- Use the discarded crankshaft bolt with the special tool.



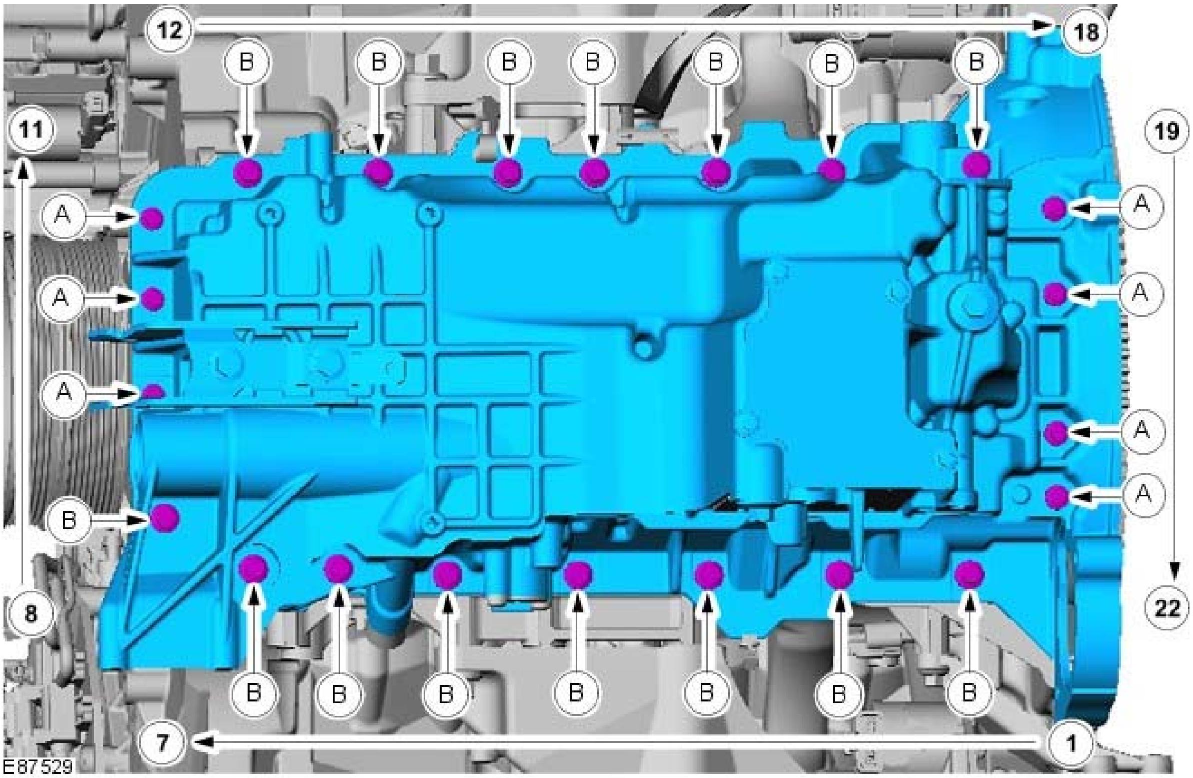
39. Install the oil pan.

- Clean the component mating faces.
- Apply sealant to the 4 places shown.
- Install a new gasket.

40. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Secure the oil pan.

- Tighten bolts A to 10 Nm (7 lb.ft).
- Tighten bolts B to 23 Nm (17 lb.ft).


12
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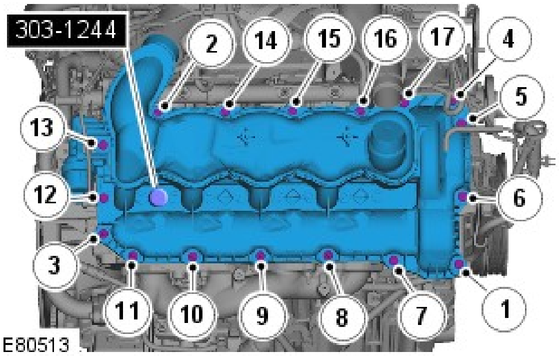
303-1244
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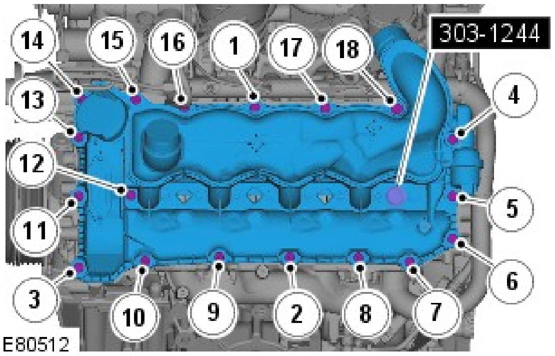
41. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Install the RH valve cover.

- Install a new gasket.
- Install the special tool.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Remove the special tool.


303-1244
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42. ⚠ CAUTION: Tighten the bolts in the sequence shown.

Install the LH valve cover.

- Install a new gasket.
- Install the special tool.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Remove the special tool.

43. Install the knock sensor (KS).

- Clean the component mating faces.
- Tighten the bolts to 20 Nm (15 lb.ft).

44. Install the oil filter housing.

- Install a new gasket.

- Tighten the bolts to 10 Nm (7 lb.ft).

45. CAUTION: Install the crankshaft position (CKP) sensor correctly into the housing. Failure to follow this instruction may result in damage to the CKP sensor.

Install the CKP sensor.

- Tighten the bolt to 5 Nm (4 lb.ft).

46. Install the camshaft position (CMP) sensor.

- Install a new O-ring seal.
- Tighten the bolt.

47. Install the engine oil pressure (EOP) sensor.

- Tighten the sensor to 15 Nm (11 lb.ft).

48. Install the cylinder block coolant elbow and hose assembly.

- Install a new O-ring seal.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Connect the coolant hoses.
- Secure with the clips.

49. Install the vacuum solenoids and lines.

- Tighten the bolts to 10 Nm (7 lb.ft).

50. NOTE: Remove and discard the blanking caps.

Install the vacuum and fuel return lines.

- Connect the fuel return line to the fuel cooler.
- Secure the fuel return line to the valve covers.
- Connect the vacuum lines.

51. NOTE: Remove and discard the blanking caps.

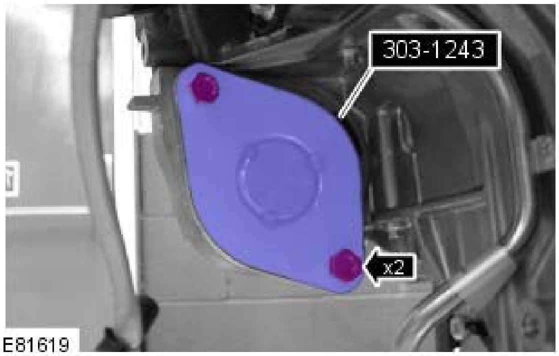
Install the fuel cooler fuel return line.

52. NOTE: Remove and discard the blanking caps.

Install the turbocharger oil supply line.

- Install new O-ring seals.
- Tighten the bolts to 10 Nm (7 lb.ft).

53. Install the special tool.



54. CAUTION: Make sure that new bolts are installed.

Install the flexplate.

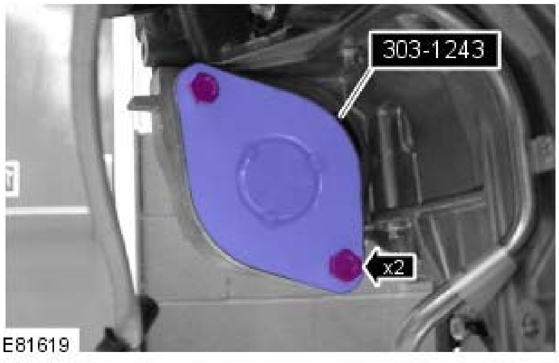
- Tighten the bolts to 95 Nm (70 lb.ft).

55. CAUTION: Make sure that the washer is installed between the nose of the crankshaft and the crankshaft pulley.

Install the crankshaft pulley.

- A new crankshaft pulley bolt must be installed.
- Stage 1: Tighten the bolt to 140 Nm (103 lb.ft).
- Stage 2: Tighten a further 90 degrees.

56. Remove the special tool.



57. Install the coolant pump.

- Install a new O-ring seal.
- Tighten the bolts to 23 Nm (17 lb.ft).

58. Install the exhaust gas recirculation (EGR) valve and cooler assemblies.

- Tighten the bolts to 10 Nm (7 lb.ft).

59. NOTE: Remove and discard the blanking caps.

Connect the EGR cooler coolant hoses.

- Secure with the clips.

60. CAUTION: Only tighten the bolts finger-tight at this stage.

Install both fuel rails.

- Install the brackets.
- Loosely install the bolts.

61. CAUTIONS:

Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

Do not use tools to install the new fuel return line clip. Failure to follow this instruction will result in damage to the clip.

Install a new fuel injector clamp.

- Install a new sealing washer.
- Install a new fuel return line clip.

62. CAUTION: Only tighten the bolts finger-tight at this stage.

• NOTE: Remove and discard the blanking caps.

Install the fuel injector.

- Loosely install the bolts.

63. Install the remaining fuel injectors.

- Loosely install the bolts.

64. Install the fuel pump.

- Install a new gasket.
- Tighten the bolts to 23 Nm (17 lb.ft).
- Secure the fuel line.

65. CAUTIONS:

⚠ Maintain pressure on the high-pressure fuel supply line to keep the olives in contact with the fuel injectors and the fuel rail cones while installing unions.

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the high-pressure fuel supply line and allow foreign matter to enter the fuel injection system.

⚠ Only tighten the unions finger-tight at this stage.

• NOTE: Remove and discard the blanking caps.

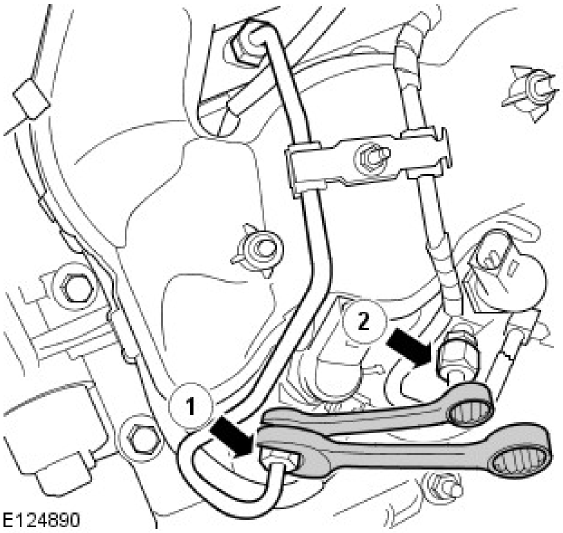
Loosely install the new high-pressure fuel supply lines.

66. Secure the fuel injectors.

- Tighten the bolts to 10 Nm (7 lb.ft).

67. Secure the fuel rails.

- Tighten the bolts to 23 Nm (17 lb.ft).



68. CAUTIONS:

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Maintain pressure on the high-pressure fuel supply lines to keep the olives in contact with the fuel injectors and the fuel rail cones while installing the unions.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fluid injector nozzle.

• NOTE: Remove and discard the blanking caps.

Install new high-pressure fuel supply lines.

1. Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.

- Tighten the high-pressure fuel supply line in the sequence shown:
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 30 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 30 Nm.

69. Secure the fuel line.

70. Secure the glow plug wiring harness.

71. ⚠ CAUTION: Make sure the fuel return line clip is correctly installed to the fuel injector before installing the return line.

Connect the fuel return line to the fuel injectors.

- Visually inspect the fuel return line O-ring seals for damage.
- Apply a light coating of petroleum jelly to the fuel return line O-ring seals.

72. NOTE: Remove and discard the blanking caps.

Connect the low-pressure fuel return line.

73. Install the fuel pump shield.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the vacuum solenoid.

74. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

Install the brake vacuum pump.

- Install a new gasket.
- Tighten the bolts to 23 Nm (17 lb.ft).

75. NOTE: Remove and discard the blanking caps.

Install the intake manifold plenum chamber.

- Install new gaskets to the EGR valve outlet tubes.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the clips to 3 Nm (2 lb.ft).

76. Connect the vacuum lines.

77. Secure the fuel temperature sensor.

78. Secure the intake manifold plenum chamber rear hoses.

- Tighten the clips to 3 Nm (2 lb.ft).

79. Secure both EGR valve outlet tubes.

- Tighten the bolts to 10 Nm (7 lb.ft).

80. Install the engine cover mounting bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the vacuum line.

81. Install the engine wiring harness.

- Secure with the clips.

82. Connect the engine oil temperature sensor electrical connector.

83. Connect the CKP sensor electrical connector.

84. Connect the vacuum solenoid electrical connectors.

85. Connect the EOP sensor electrical connector.

86. Connect the air suspension solenoid electrical connector.

87. Connect both throttle body electrical connectors.

- Secure the locking tangs.

88. Connect the ECT sensor electrical connector.

89. Connect the fuel pressure control valve electrical connector.

90. Connect the fuel metering valve electrical connector.

91. Connect both manifold absolute pressure and temperature (MAPT) sensor electrical connectors.

92. Connect the CMP sensor electrical connector.

93. Connect the fuel temperature sensor electrical connector.

94. Connect the fuel rail pressure (FRP) sensor electrical connector.

95. Connect both EGR valve electrical connectors.

- Secure the wiring harness.

96. Connect the glow plug electrical connectors.

- Secure the wiring harness.

97. Connect the KS electrical connectors.

- Secure the wiring harness.

98. Connect the fuel injector electrical connectors.

- Secure the wiring harness.

99. Install the RH fuel line shield.

- Tighten the nuts to 5 Nm (7 lb.ft).

100. Install the LH fuel line shield.

- Tighten the nuts to 5 Nm (7 lb.ft).

101. NOTE: Remove and discard the blanking caps.

Install the oil level indicator and tube.

- Install a new O-ring seal.
- Tighten the upper bolt to 10 Nm (7 lb.ft).
- Tighten the lower bolt to 7 Nm (5 lb.ft).

102. NOTE: Only carry out the following step if a new exhaust manifold is to be installed.

Install a new assembly spacer to the exhaust manifold stud number 8.

103. NOTE: Only carry out the following step if a new turbocharger and a new exhaust manifold is to be installed.

Install the 2 new assembly spacers to the turbocharger studs.

104. Install the RH exhaust manifold and turbocharger assembly.

- Clean the component mating faces.
- Install a new gasket.
- Loosely install the exhaust manifold nuts.

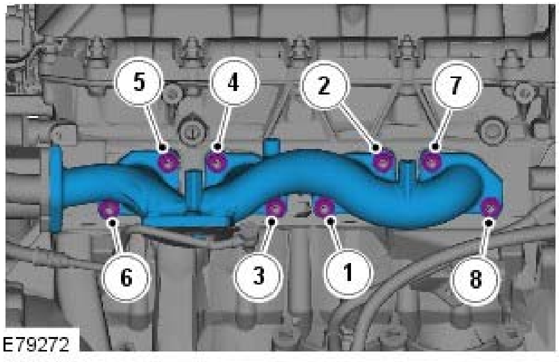
105. Install the support bracket.

- Tighten the bolts to 24 Nm (18 lb.ft).

106. ⚠ CAUTION: Install but do not fully tighten the turbocharger support bracket bolts. This will allow for movement of components during the final torque stages. Failure to follow this instruction may result in damage to the vehicle.

Install the RH turbocharger support bracket.

- Install the bolts.



107. ⚠ CAUTION: To make sure that the exhaust manifold and turbocharger assembly is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

• NOTE: Tighten the nuts in the sequence shown.

Secure the RH exhaust manifold and turbocharger assembly.

- Stage 1: Tighten the new nuts to 23 Nm (17 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).

108. Secure the RH turbocharger support bracket.

- Stage 1: Tighten the RH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).
- Stage 2: Tighten the RH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).

109. NOTE: Remove and discard the blanking caps.

Connect the RH turbocharger oil supply pipe.

- Install new sealing washers.
- Tighten the banjo bolt to 24 Nm (18 lb.ft).

110. Secure the RH turbocharger oil return tube.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

111. Connect the RH turbocharger electrical connector.

112. Install the RH engine mount bracket.

- Tighten the bolts to 115 Nm (85 lb.ft).

113. Install the oil pick-up pipe.

- Secure the clip.

114. Secure the oil pick-up pipe.

- Tighten the nut to 23 Nm (17 lb.ft).
- Tighten the bolts to 10 Nm (7 lb.ft).

115. NOTE: Only carry out the following step if a new exhaust manifold is to be installed.

Install a new assembly spacer to the exhaust manifold stud number 8.

116. NOTE: Only carry out the following step if a new turbocharger and a new exhaust manifold is to be installed.

Install the 2 new assembly spacers to the turbocharger studs.

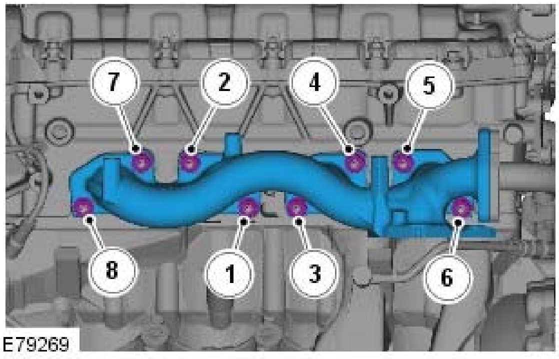
117. Install the LH exhaust manifold and turbocharger assembly.

- Clean the component mating faces.
- Install a new gasket.
- Loosely install the exhaust manifold nuts.

118. ⚠ CAUTION: Install but do not fully tighten the turbocharger support bracket bolts. This will allow for movement of components during the final torque stages. Failure to follow this instruction may result in damage to the vehicle.

Install the LH turbocharger support bracket.

- Install the bolts.



119. ⚠ CAUTION: To make sure that the exhaust manifold and turbocharger assembly is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

• NOTE: Tighten the nuts in the sequence shown.

Secure the LH exhaust manifold and turbocharger assembly.

- Stage 1: Tighten the new nuts to 23 Nm (17 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 23 Nm (17 lb.ft).

120. Secure the LH turbocharger support bracket.

- Stage 1: Tighten the LH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).
- Stage 2: Tighten the LH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).

121. Connect the LH turbocharger oil supply pipe.

- Install new sealing washers.
- Tighten the banjo bolt to 24 Nm (18 lb.ft).

122. Secure the LH turbocharger oil return tube.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

123. Connect the LH turbocharger electrical connector.

124. Install the LH engine mount bracket.

- Tighten the bolts to 115 Nm (85 lb.ft).

125. Install the EGR valve inlet tubes.

- Clean the component mating faces.
- Install new gaskets.
- Install the RH EGR valve inlet tube heat shield.
- Tighten the bolts to 10 Nm (7 lb.ft).

126. Install the generator mounting bracket.

- Tighten the M10 bolts to 47 Nm (35 lb.ft).
- Tighten the M12 bolt to 80 Nm (59 lb.ft).

127. Install the cooling fan belt tensioner.

- Tighten the bolts to 25 Nm (18 lb.ft).

128. Install the coolant pump pulley and accessory drive belt idler pulleys.

- Tighten the 65 mm idler pulleys to 48 Nm (35 lb.ft).
- Tighten the 80 mm idler pulley to 80 Nm (59 lb.ft).
- Install new access covers.
- Tighten the coolant pump pulley bolts to 25 Nm (18 lb.ft).

129. Install the charge air cooler LH outlet hose.

- Tighten the clip to 5 Nm (3.7 lb.ft).

130. Install the charge air cooler RH outlet hose.

- Tighten the clip to 5 Nm (3.7 lb.ft).

131. Install the special tools.

- Tighten the bolts.

132. Install the RH turbocharger heat shield and the RH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

133. NOTE: Remove and discard the blanking caps.

Install the RH turbocharger intake tube.

- Tighten the nut to 10 Nm (7 lb.ft).

134. Install the breather line.

- Secure with the clips.
- Tighten the bolts to 23 Nm (17 lb.ft).

135. NOTE: Remove and discard the blanking caps.

Install the charge air cooler RH intake pipe.

- Secure with the clip.
- Tighten the bolt to 10 Nm (7 lb.ft).

136. Install the special tools.

- Tighten the bolts.

137. Install the LH turbocharger heat shield and the LH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

138. NOTE: Remove and discard the blanking caps.

Install the charge air cooler LH intake pipe.

- Secure with the clip.
- Tighten the bolt to 10 Nm (7 lb.ft).

139. NOTE: Remove and discard the blanking caps.

Install the LH turbocharger intake tube.

- Tighten the bolt to 10 Nm (7 lb.ft).

140. Install the engine oil filler cap.

- Install a new O-ring seal.

141. Install the A/C compressor and support bracket.

- Loosely install the 2 A/C compressor bracket bolts.

142. Install the A/C compressor rear bolt.

- Tighten the bolt to 23 Nm (17 lb.ft).

143. Tighten the A/C compressor bracket bolts to 48 Nm (35 lb.ft).

144. Connect the A/C compressor electrical connector.

145. Remove the engine from the engine stand.

146. Install the engine.
For additional information, refer to: Engine (303-01D Engine - TDV8 3.6L

Diesel, Installation).

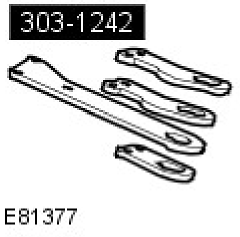
147. Fill the engine with the recommended oil to the correct level.
For additional information, refer to: Engine Oil Draining and Filling (303-01D Engine - TDV8 3.6L Diesel, General Procedures).

148. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine - TDV8 3.6L Diesel - Engine

Installation

Special Tool(s)	
	Engine lifting brackets 303-1242

Installation

1. CAUTIONS:

   ⚠ Apply grease of the correct specification to the torque converter spigot.

   ⚠ Make sure the torque converter is fully located into the oil pump drive.

   With assistance, carefully install the engine.

   - Clean the component mating faces.

2. ⚠ CAUTION: Make sure the torque converter remains connected to the transmission.

   Secure the engine to the transmission.

   - Tighten the bolts to 45 Nm (33 lb.ft).

3. Secure the RH engine mount vacuum hose to the chassis crossmember.

   - Secure in the clips.

4. Secure the fuel fired booster heater fuel line.

   - Secure the clips.

5. Install the starter motor.
6. Secure both the LH and the RH engine mounts.

   - Lower the engine onto its mounts.
   - Tighten the nuts to 100 Nm (74 lb.ft).
   - Tighten the bolts to 56 Nm (41 lb.ft).

7. Remove the special tools.
8. Install the fuel pump crash protector.

   - Tighten the bolts to 23 Nm (17 lb.ft).
   - Secure the engine wiring harness.

9. Secure the transmission wiring harness bracket to the rear of the engine.

   - Tighten the bolt.

- Secure the camshaft position (CMP) sensor wiring harness clip .

10. NOTE: Remove and discard the blanking caps.

Connect the fuel lines.

11. NOTE: Remove and discard the blanking caps.

• NOTE: Install new O-ring seals.

Secure the transmission fluid lines.

- Tighten the bolt to 6 Nm (4 lb.ft).

12. Secure both the LH and RH downpipe catalytic converters.

- Install new gaskets.
- Tighten the bolts to 21 Nm (15 lb.ft).

13. Secure the engine stabilizer.

- Tighten the nut and bolt to 40 Nm (30 lb.ft).

14. NOTE: Remove and discard the blanking caps.

• NOTE: Install a new O-ring seal.

Connect the A/C compressor high-pressure refrigerant line.

- Tighten the bolt to 10 Nm (7 lb.ft).

15. Secure the power steering pump.

- Tighten the bolts to 23 Nm (17 lb.ft).

16. NOTE: Remove and discard the blanking caps.

• NOTE: Install a new O-ring seal.

Install the A/C compressor low-pressure refrigerant line.

- Tighten the bolt to 10 Nm (7 lb.ft).

17. Secure the fluid pump.

- Tighten the bolts to 23 Nm (17 lb.ft).

18. Install the generator.

- Tighten the bolts to 47 Nm (35 lb.ft).

19. Connect the generator electrical connector.

20. Connect the battery positive cable to the generator.

- Tighten the nut to 22 Nm (16 lb.ft).
- Reposition the rubber insulator.

21. Secure the engine ground cable.

- Tighten the bolt to 47 Nm (35 lb.ft).

22. Connect the auxiliary radiator coolant hose.

23. Secure the coolant hose bracket.

- Tighten the nut 10 Nm (7lb.ft).

24. Connect the transmission cooler pipe to the coolant distribution manifold.

- Secure the clip.

25. Connect the radiator top hose to the coolant distribution manifold.

- Secure the clip.

26. Connect the radiator bottom hose to the coolant distribution manifold.

- Secure the clip.

27. Install the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

28. Connect the LH charge air cooler outlet pipe.

- Tighten the clip.

29. Install the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

30. Connect the RH charge air cooler inlet pipe.

- Tighten the clip.

31. Install the front RH splash shield.

- Install the clips.

32. Connect the LH charge air cooler inlet pipe.

- Tighten the clip.

33. Install the front LH splash shield.

- Install the clips.

34. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

35. NOTE: Remove and discard the blanking caps.

Secure the transmission fluid lines to the transmission fluid cooler.

- Secure the clips.

36. ⚠ CAUTION: Make sure that new bolts are installed.

Secure the flexplate to the torque converter.

- Tighten the bolts to 45 Nm (33 lb.ft).

37. Secure the starter motor.

- Tighten the bolts to 45 Nm (33 lb.ft).
- Tighten the transmission bolt to 45 Nm (33 lb.ft).

38. Connect the switch lead to the starter motor solenoid.

- Tighten the nut to 4 Nm (3 lb.ft).

39. Connect the battery positive cable to the starter motor solenoid.

- Tighten the nut to 22 Nm (16 lb.ft).
- Install the cap.

40. Install the splash shield.

- Install the clips.

41. Secure the battery positive cable.

- Secure the clip.
- Tighten the bolts.

42. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

43. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Cooling - V8 S/C 4.2L Petrol -

Fluids

Item	Specification
* Anti-freeze	Havoline Extended Life Coolant (XLC) or any ethylene glycol based anti-freeze containing no methanol with only Organic Acid Technology (OAT) corrosion inhibitors
Anti-freeze concentration - Will provide frost protection to -40°C (-40°F)	50%
Specific gravity of coolant at 20°C (68°F), to protect against frost down to -40°C (-40°F)	1.068
Amount of anti-freeze to use for 50% concentration	6.0 litres (10.5 pints) (6.3 US quarts)

⚠ CAUTION: No other anti-freeze should be used with Havoline Extended Life Coolant.

Capacity

Item	Capacity
Cooling system	12.0 litres (21 pints) (12.6 US quarts)

General Specifications

Item	Specification
Cooling system type	Pressurised, thermostatically controlled with remote header tank
Radiator	Cross flow with integral transmission fluid cooler
Charge air cooler radiator	Cross flow
Expansion tank	Remote - fitted with a bleed screw and low coolant level sensor
Pressure cap rating	110 kPa (1.1 bar) (16 lbf/in²)
Thermostat:	
Starts to open	88° C (190° F)
Fully open	95° C (203° F)
Cooling fan	Engine driven, viscous coupled with electronic control
Cooling fan diameter	470 mm (18.5 in)
Direction of rotation	Counter clockwise when viewed from front of engine
Coolant pump	Centrifugal flow impellor, belt driven from crankshaft
Charge air cooler coolant pump	Electrical coolant pump

Torque Specifications

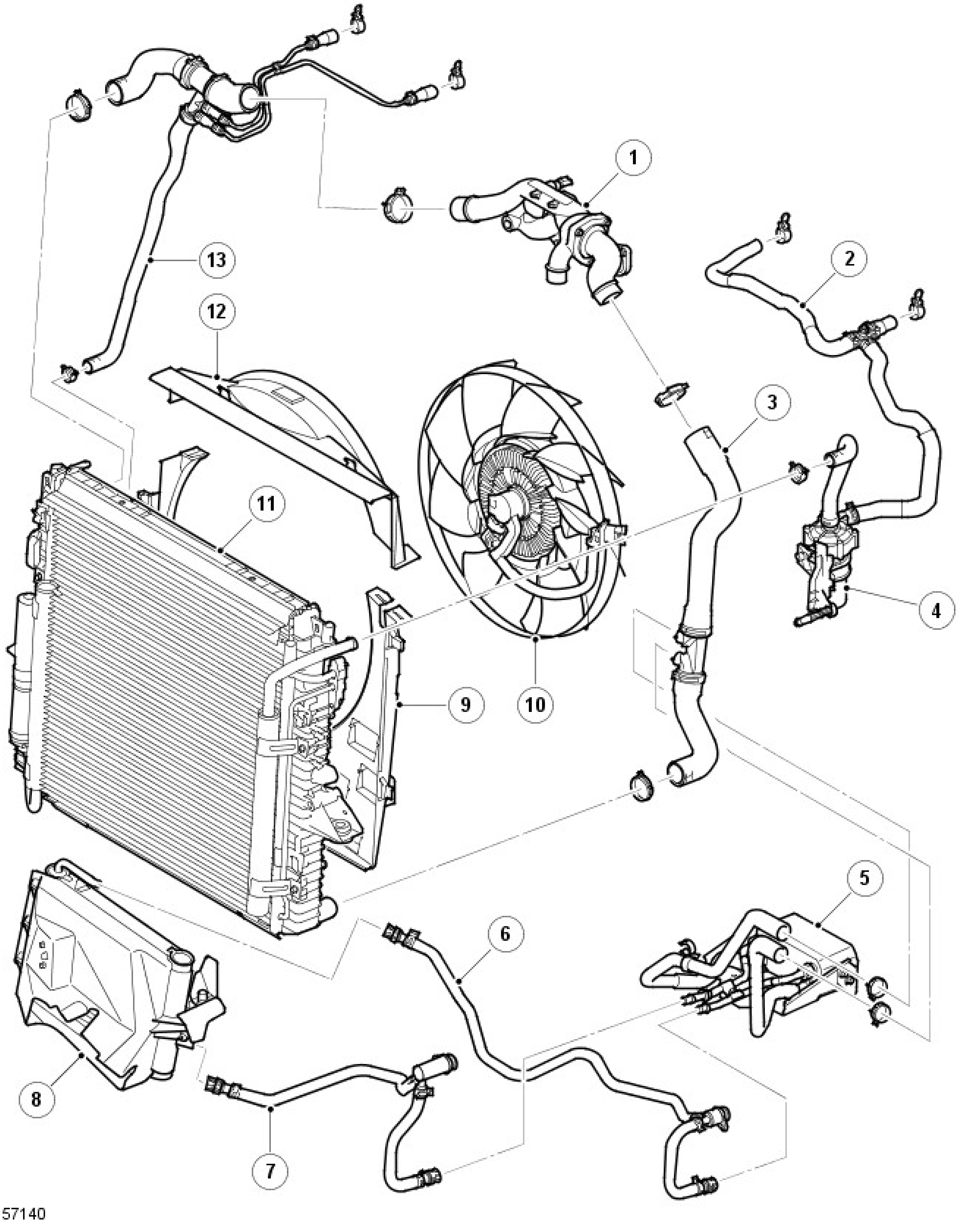
Description	Nm	lb-ft
Coolant pump bolts	10	7
Coolant pump pulley bolts	10	7
Coolant expansion tank bolt	10	7
Vacuum pump bolts	10	7
Radiator bolts	25	18
Air Conditioning (A/C) condenser bolt	6	4
Radiator access panel bolts	10	7
Cooling fan to viscous coupling bolts	10	7
Cooling fan assembly	65	48
Thermostat housing bolts	10	7
Coolant manifold Torx screws	10	7
Coolant hose support bracket bolt	6	4
A/C pipe securing bolts	10	7
Coolant bleed screw(s)	3	2

Published: 11-May-2011

Engine Cooling - V8 S/C 4.2L Petrol - Engine Cooling

Description and Operation

Cooling System Component Layout - Sheet 1 of 2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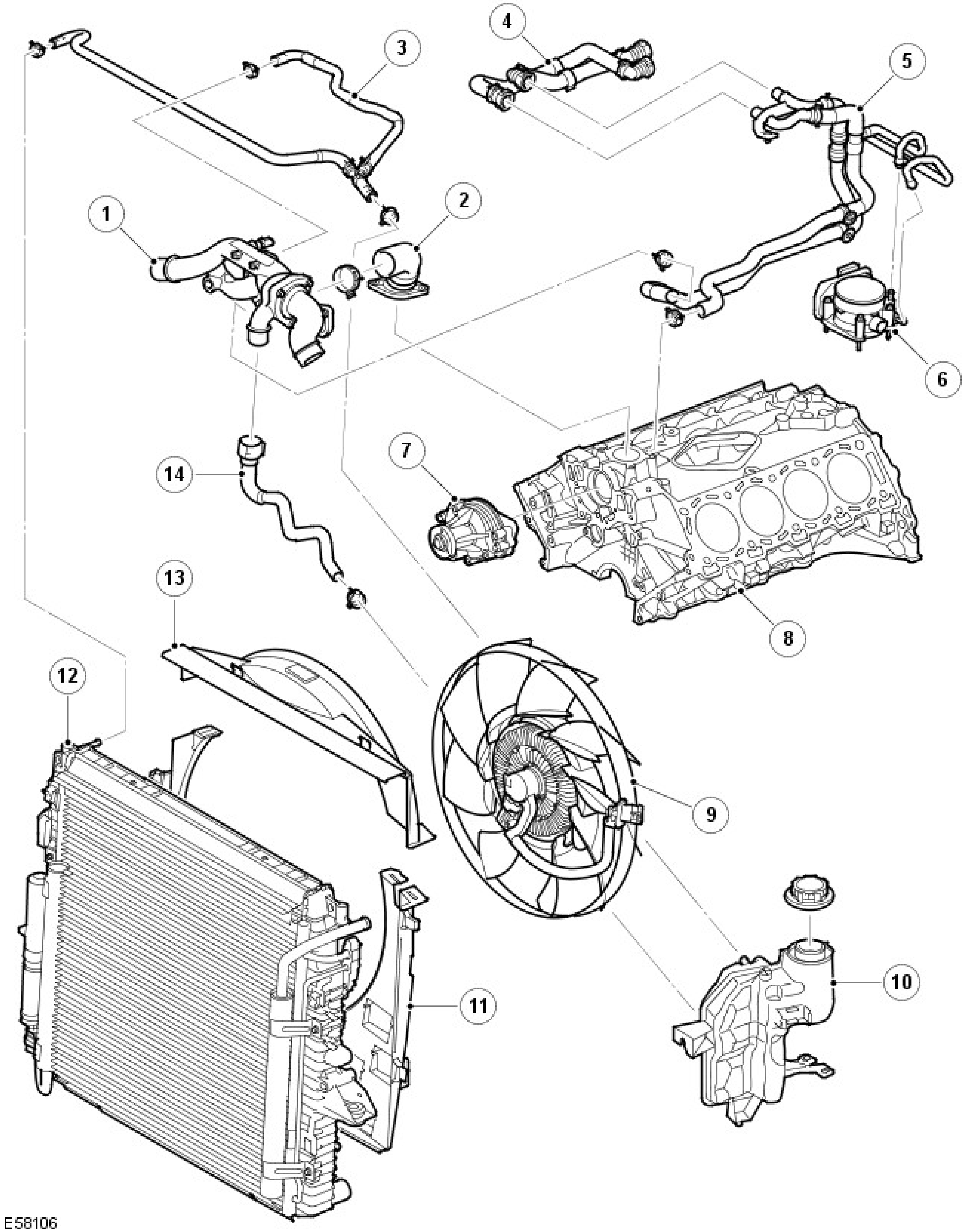
E57140

Item	Part Number	Description
1	-	Coolant outlet assembly
2	-	Hose, electric coolant pump to intercoolers
3	-	Hose, radiator to thermostat assembly
4	-	Electric coolant pump
5	-	Engine oil cooler plate
6	-	Hose, oil cooler to air blast cooler
7	-	Hose, air blast cooler to oil cooler
8	-	Air blast engine oil cooler
9	-	Shroud, lower
10	-	Engine cooling fan
11	-	Radiator assembly
12	-	Shroud, upper
13	-	Hose, engine to radiator

Cooling System Component Layout - Sheet 2 of 2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E58106

Item	Part Number	Description
1	-	Coolant outlet assembly
2	-	Coolant inlet housing
3	-	Hose, coolant outlet assembly to expansion tank
4	-	Hose, heater feed and return
5	-	Hose, heater feed and return

6	-	Electric throttle housing
7	-	Engine coolant pump
8	-	Engine block
9	-	Engine cooling fan
10	-	Expansion tank
11	-	Shroud, lower
12	-	Radiator assembly
13	-	Shroud, upper
14	-	Hose, expansion tank to coolant outlet assembly

GENERAL

The cooling system employed is of the pressure relief by-pass type, which allows coolant to circulate around the engine and the heater circuit while the thermostat main valve is closed. The primary function of the cooling system is to maintain the engine within an optimum temperature range under changing ambient and engine operating conditions. Secondary functions are to provide heating for the passenger compartment and cooling for the transmission fluid and engine oil.

The cooling system comprises:

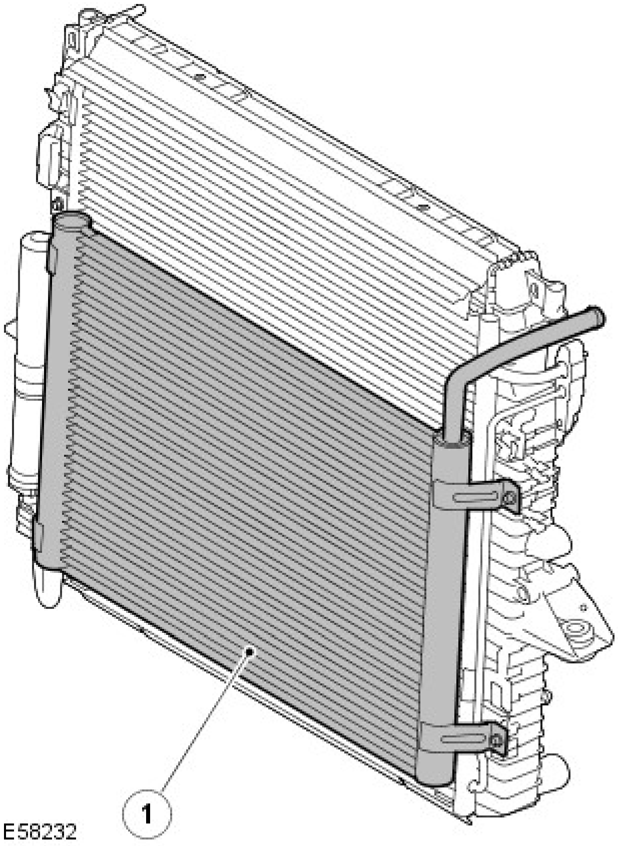
- A cooling module including common radiator, condenser, transmission oil cooler with additional charge air radiator
- A passenger compartment heater matrix
- An engine driven coolant pump
- An electric coolant pump
- A thermostat
- An expansion tank
- An electro-viscous cooling fan
- Transmission oil pipes
- Engine oil coolers
- Connecting hoses and pipes.

ENGINE COOLING SYSTEM

A centrifugal pump mounted on the front of the engine and driven by an ancillary drive 'polyvee' belt circulates the coolant. The engine driven coolant pump circulates coolant through the cylinder block and cylinder heads via a chamber located in the 'vee' of the engine. Having passed through the engine the coolant returns to the thermostat housing. The coolant then progresses down the 'top hose' to the heater pipe. The heater pipes lead to the bulkhead and return to the engine side of the thermostat.

The engine contains a normal thermostat, which is positioned such that the wax's temperature is controlled by both the coolant from the radiator and the bypass. This results in the thermostat being able to vary its opening temperature dependant on ambient conditions. The thermostat housing also contains a sprung loaded valve, which limits the amount flow using the bypass. This means that the engine can run without coolant flowing through the bypass temporarily, to improve heater performance.

The engine radiator is a cross flow type with an aluminium matrix and has a drain tap on the lower right-hand rear face. There is an additional charge air radiator, located in front of the engine radiator, to support the water charge air coolers on the engine.



Item	Part Number	Description
1	-	Charge air radiator

The coolant for the charge air cooling is driven by an electric pump at constant speed and is mounted on the engine radiator end tank. This circuit shares the engine coolant via a vortex connection, in the engine to radiator hose. The lower engine radiator mountings are located part way up the end tanks. The mountings are fitted with rubber bushes, which sit on the upper chassis rails. The radiator upper is mounted by pins, which are pushed through rubber bushes mounted in the Front End Carrier (FEC) above the radiator. The radiator also incorporates two connections for the transmission oil pipes.

The top and bottom hoses are mounted to the inlet and outlet sides of the thermostat housing.

The expansion tank is fitted forward of the LH suspension turret in the engine compartment. The expansion tank allows for the expansion of the coolant as the engine gets hot and also supplies the engine with coolant as the coolant in the engine contracts. The tank also allows any air trapped in the coolant to be removed.

The liquid cooled transmission fluid cooler is mounted in the cold side radiator end tank. It is positioned in the middle of the LH end tank.

There are two engine oil coolers working in parallel. The first engine oil cooler is fed coolant from the bottom hose. Coolant is diverted from between the radiator and the thermostat, directed to the cooler and then returned to the bottom hose. The second engine oil cooler is cooled by air and is mounted in front of the RH front wheel.

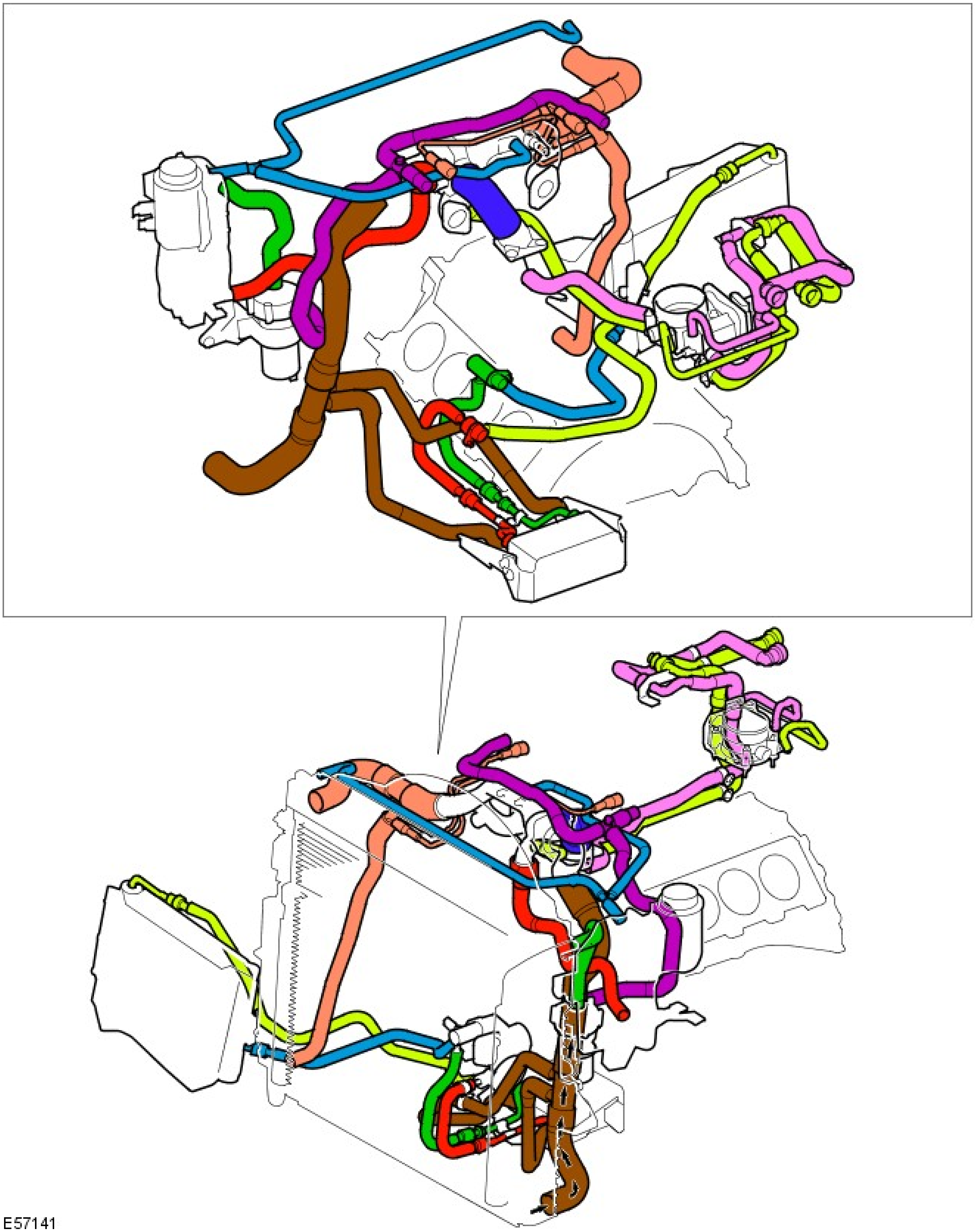
For additional airflow through the radiator matrix, particularly when the vehicle is stationary, there is an engine driven electro-viscous unit. This unit functions as a normal viscous fan, but with electronic control over the level engagement of the clutch. The Engine Control Module (ECM), which determines the required fan speed, controls the level of clutch engagement. The ECM determines engagement based on the coolant, ambient and transmission oil temperatures and air conditioning (A/C) system pressure. The fan is mounted using a left hand thread.

The viscous fan unit is electronically controlled by the ECM to optimise fan speed for all operating conditions.

• NOTE: If the electrical connections to the viscous fan are disconnected the fan will 'idle' and overheating may result. The ECM stores the appropriate fault codes in this case.

ENGINE COOLING SYSTEM OPERATION

Cooling System Coolant Flow



E57141

When the engine is running the coolant pump is driven by the ancillary drive belt. This forces coolant to circulate around the engine and heater, while the thermostat and bypass valve are shut. As the temperature and pressure increases the bypass valve is forced open allowing coolant to circulate through the bypass valve. When the temperature reaches 82°C (180°F) the main thermostat begins to open allowing coolant to circulate through the main radiator. As the thermostat progressively opens (fully open at 95°C (203°F)), the bypass valve progressively closes forcing any coolant through the heater or radiator. Once coolant is allowed to circulate through the radiator, the transmission fluid and the engine oil coolers begin to receive coolant flow.

The increased coolant volume, created by heat expansion, is directed to the expansion tank through a bleed hose from the top of the radiator. The expansion tank has an outlet hose, which is connected into the coolant circuit. This outlet hose returns the coolant to the system when the engine cools.

Coolant flows through the radiator from the top right hand tank to the bottom left hand tank and is cooled by air passing through the matrix. The temperature of the cooling system is monitored by the ECM via the Engine Coolant temperature (ECT) sensor located in the cylinder head. The ECM uses signals from this sensor to control the cooling fan operation and adjust fuelling according to engine temperature.
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation).

To control the cooling fan, the ECM sends a Pulse Width Modulated (PWM) signal to the cooling fan module (integral to the ECM). The frequency of the PWM signal is used by the cooling fan module to determine the output voltage supplied to the fan motor.

The ECM varies the duty cycle of the PWM signal between 0 and 100% to vary the fan speed. If the PWM signal is outside the 0 to 100% range, the cooling fan module interprets the signal as an open or short circuit and runs the fans at maximum speed to ensure the engine and gearbox do not overheat.

The ECM operates the fan in response to inputs from the ECT sensor, the transmission oil temperature sensor, the A/C switch and the A/C pressure sensor.
For additional information, refer to: Air Conditioning (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Description and Operation).

The speed of the cooling fan is also influenced by vehicle road speed. The ECM adjusts the speed of the cooling fans, to compensate for the ram effect of vehicle speed, using the Controller Area Network (CAN) road speed signal received from the Anti-lock Braking System (ABS) module.

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Engine Cooling - V8 S/C 4.2L Petrol - Engine Cooling

Diagnosis and Testing

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Coolant leaks ● Coolant Hoses ● Coolant expansion tank ● Radiator ● Heater core ● Accessory drive belt ● Viscous fan	● Fuses ● Wiring harness ● Loose or corroded connector(s) ● Engine coolant temperature (ECT) sensor

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible cause	Action
Coolant loss	● Hoses ● Hose connections ● Radiator ● Water pump ● Heater core ● Gaskets ● Engine casting cracks ● Engine block core plugs	Carry out a visual inspection. If there are no obvious leaks, carry out a pressure test using your workshop tester. Rectify as necessary.
Overheating	● Low/Contaminated coolant ● Thermostat ● Viscous fan ● ECT sensor ● Restricted air flow over the radiator	Check the coolant level and condition. Check the thermostat and rectify as necessary. Carry out a cooling system pressure test. Refer to the relevanat section of the workshop manual. Check the viscous fan operation, make sure the viscous fan rotates freely. Check for obstructions to the air flow over the radiator.
Engine not reaching normal temperature	● Thermostat ● Viscous fan	Check the thermostat operation. Check the viscous fan operation, make sure the viscous fan is not seized.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
P011623	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P011624	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck closed). Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011629	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	● ECT sensor disconnected ● Engine coolant temperature (ECT) sensor sensing circuit high resistance, short circuit to power ● ECT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011800	Engine Coolant Temperature Sensor 1 Circuit High	● Engine overheat condition/cooling fan failure ● ECT sensor wiring short circuit to ground ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck closed). Check for cooling fan DTCs. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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Engine Cooling - V8 S/C 4.2L Petrol - Cooling System Draining, Filling and Bleeding

General Procedures

⚠WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

1. Position the vehicle on a lift.

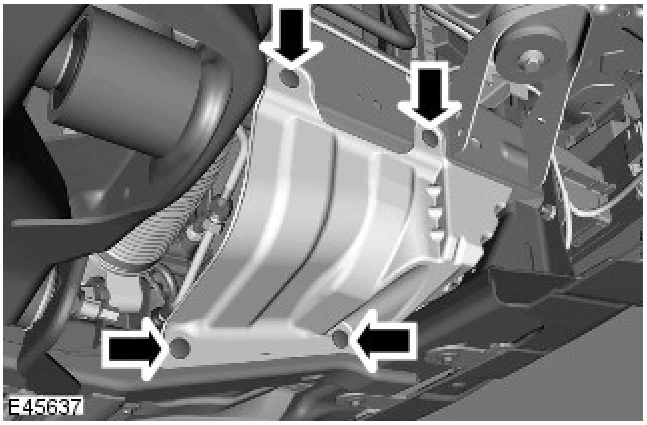
2. Set the heater controls to maximum.

3. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

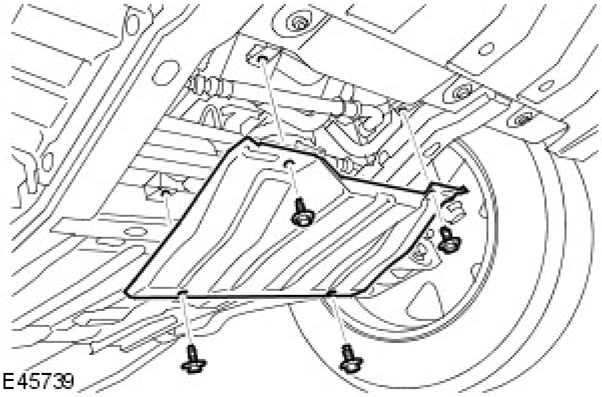
5. ⚠WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Remove the coolant expansion tank cap.



6. Remove the front RH and LH splash shields.

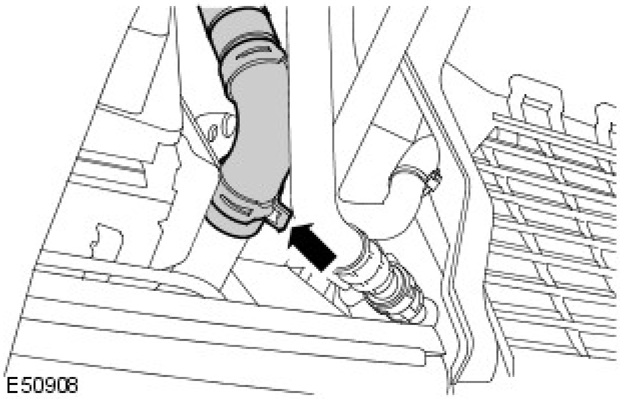
- Remove the 4 clips.



7. Remove the radiator access panel.

- Remove the 4 bolts.

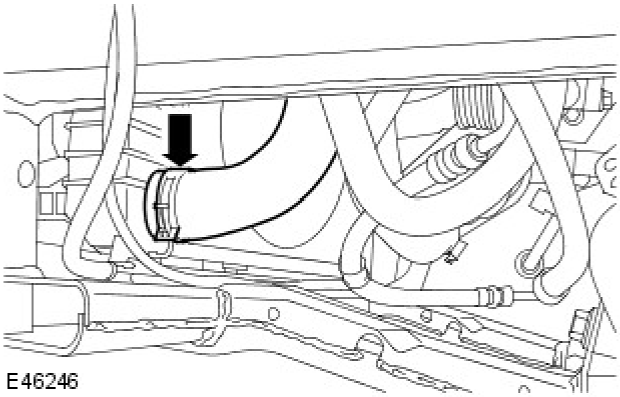
8. Position a container to collect the fluid.


E50908

9. ⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Disconnect the charge air radiator lower hose.

- Release the clip.
- Allow the coolant to drain.


E46246

10. Disconnect the radiator lower hose.

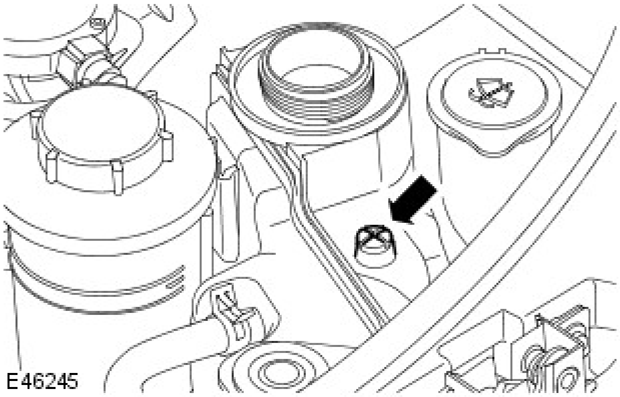
- Release the clip.
- Allow the coolant to drain.
- Remove the container.

11. Connect the lower hoses to the radiators.

- Secure the clips.

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

13. Connect exhaust extraction hoses to the tail pipes.


E46245

14. ⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Refill and bleed the cooling system.

- Remove the coolant expansion tank cap.
- Loosen the coolant expansion tank bleed screw.
- Add coolant to the expansion tank as required, until the upper level mark is achieved.

15. ⚠ CAUTION: Damage to the charge air cooler coolant pump will occur if the pump is allowed to cavitate.

• NOTE: Turning the ignition key to position II will run the electric coolant pump.

Set the heating system to MAX heat, the blower motor to MAX speed and the air distribution to the instrument panel registers.

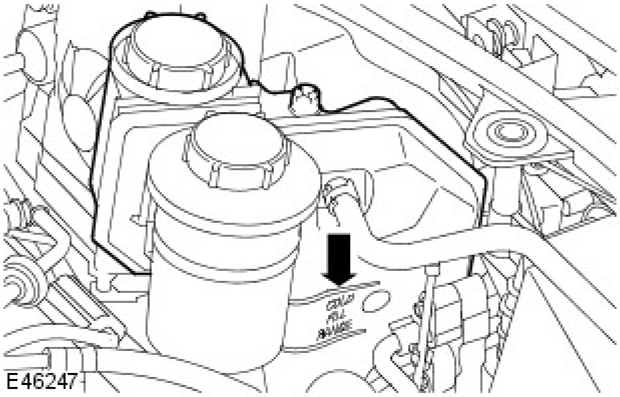
- Loosen the coolant bleed screw adjacent to the charge air cooler.
- Turn the ignition key to position II.
- When coolant runs from the bleed point bubble-free, tighten the bleed screw.

16. Start the engine and allow to idle.

- When coolant runs from the expansion tank bleed point bubble-free, tighten the bleed screw.
- Top-up the expansion tank to the upper level mark.
- Install the coolant expansion tank cap.
- Increase the engine speed to 2000 RPM, and maintain, until no air is seen returning to the expansion tank.

17. Switch the engine off and allow to cool.

18. Check for leaks and then fill the coolant expansion tank to the MAX mark.



19. Install the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

20. Clean any spilt coolant from the vehicle.

21. Install the radiator access panel.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

22. Install the splash shields.

23. Disconnect the exhaust extraction hoses from the tail pipes.

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Engine Cooling - V8 S/C 4.2L Petrol - Cooling System Pressure Test

General Procedures

• NOTE: The following procedure will enable the cooling system to be pressure tested for condition and leaks. Stage 1 will check the expansion tank cap register seal and the cap for leaks. Stage 2 will check the entire cooling system.

• NOTE: It will be necessary to use the cooling system test kit, Part Number LR-218, which is available under the equipment programme.

1. Examine the coolant hoses for signs of cracking, distortion and security of the hose connections.

2. WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Disconnect the coolant expansion tank bleed hose.

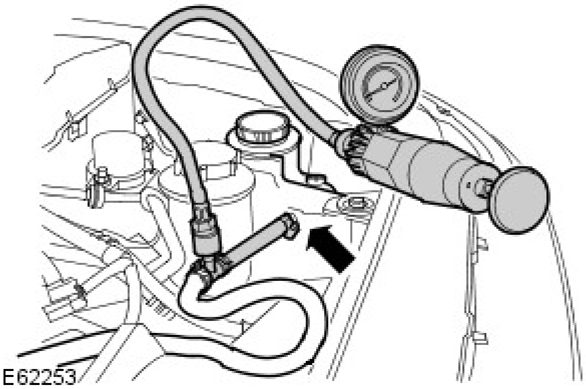
- Release the clip.

3. Install the 'T' piece adaptor (part of the cooling system test kit) between the coolant expansion tank and the coolant bleed hose.

- Secure with the 2 clips.

4. Install the coolant pressure pump assembly.

- Connect to the 'T' piece.



5. Pressurize the cooling system.

- Slowly pressurize the cooling system to 1.0 bar (100 kPa) (14.5 psi).
- Check the pressure remains above 0.9 bar (90 kPa) (13 psi) after waiting for 30 seconds.
- During the pressure drop check, listen for a hissing noise from the expansion tank cap.

6. NOTE: If the coolant expansion tank cap is found to be leaking, replace the cap.

Depressurize the cooling system.

- Disconnect the 'T' piece.
- Connect the coolant expansion tank bleed hose.
- Secure the clip.

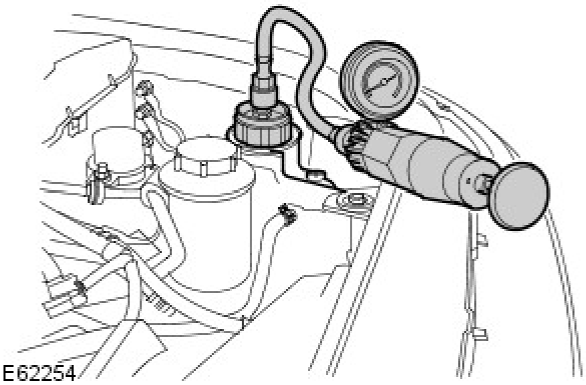
7. WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Remove the coolant expansion tank cap.

8. NOTE: This adaptor is part of the cooling system test kit.

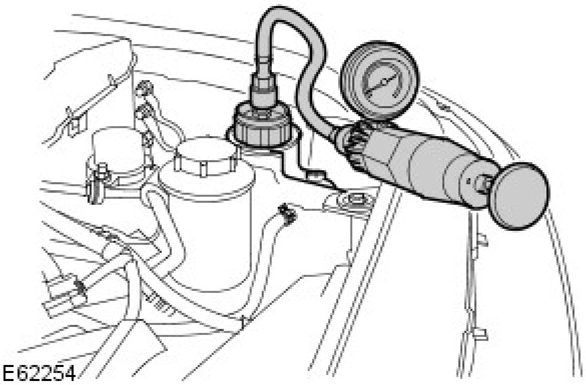
Install adaptor K83 to the coolant expansion tank.

- Clean the component mating faces.
- Lubricate the seal.



9. Install the coolant pressure pump assembly.

- Slowly pressurize the cooling system to 1.5 bar (150kPa) (22 psi), check the pressure over a 5 minute period. A small pressure decay of approximately 0.15 bar (15 »kPa) (1 psi) over the first minute is normal, as the air in the expansion tank cools.
- If the pressure continues to drop after the initial tolerance, there is a coolant leak.



10. Depressurize and remove the pressure pump and gauge.

- Install the coolant expansion tank cap.

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Engine Cooling - V8 S/C 4.2L Petrol - Coolant Expansion Tank

Removal and Installation

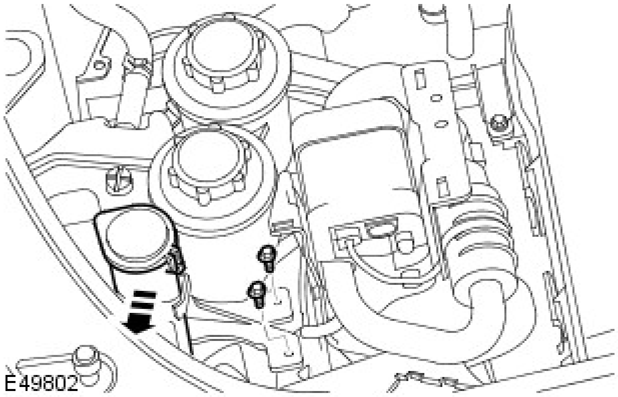
Removal

1. Remove the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

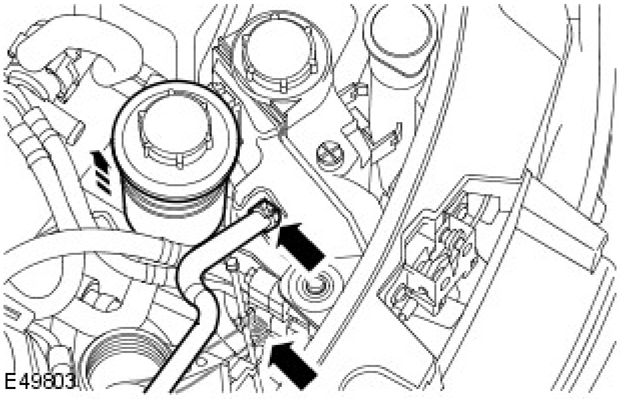
2. Release the windshield washer reservoir filler neck.

3. Release the coolant expansion tank.

- Remove the 2 bolts.



4. Release the power steering fluid reservoir.



5. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

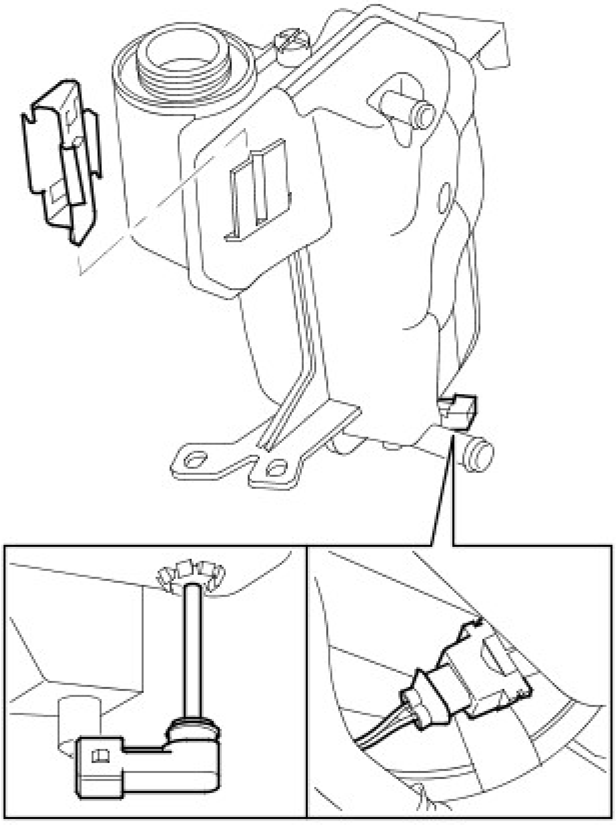
⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Disconnect the 2 hoses from the coolant expansion tank.

- Position an absorbent cloth to collect fluid spillage.
- Position a container to collect the fluid.
- Clamp the hoses
- Release the 2 clips.

6. Remove the coolant expansion tank.

- Disconnect the coolant low level sensor electrical connector.



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7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the coolant low level sensor.

- Remove the coolant expansion tank support bracket.

Installation

1. Install the bracket.

2. Install the coolant low level sensor.

3. Install the coolant expansion tank.

- Connect the coolant low level sensor electrical connector.

4. Connect the coolant hoses to the expansion tank.

- Secure with the clips.

5. Top-up the coolant.

- Loosen the coolant expansion tank bleed screw.
- Fill the coolant expansion tank until coolant emerges from the cooling system air bleed screw.
- Remove the hose clamps.
- Tighten the bleed screw to 8 Nm (6 lb.ft).

6. Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

7. Check and top-up the coolant.

- Install the coolant expansion tank pressure cap.

8. Secure the power steering fluid reservoir.

- Attach to the mounting bracket.

9. Secure the windshield washer reservoir filler neck.

- Locate in clip.

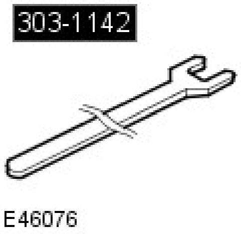
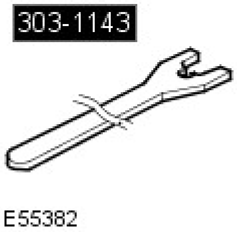
10. Install the LH headlamp assembly.

For additional information, refer to: Headlamp Assembly (417-01

Exterior Lighting, Removal and Installation).

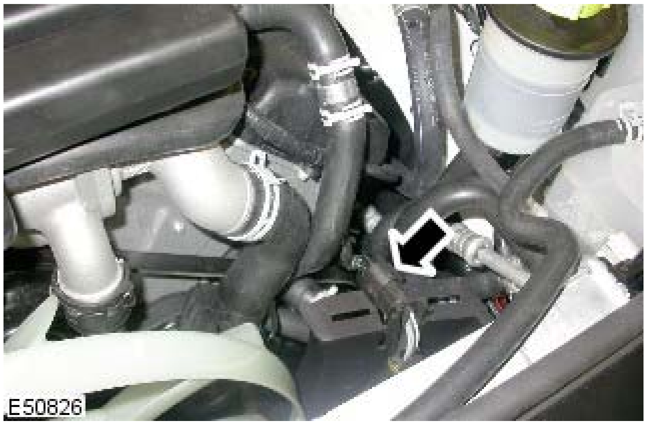
Engine Cooling - V8 S/C 4.2L Petrol - Cooling Fan

Removal and Installation

Special Tool(s)	
	Viscous coupling spanner 303-1142
	Viscous coupling pulley retaining tool 303-1143

Removal

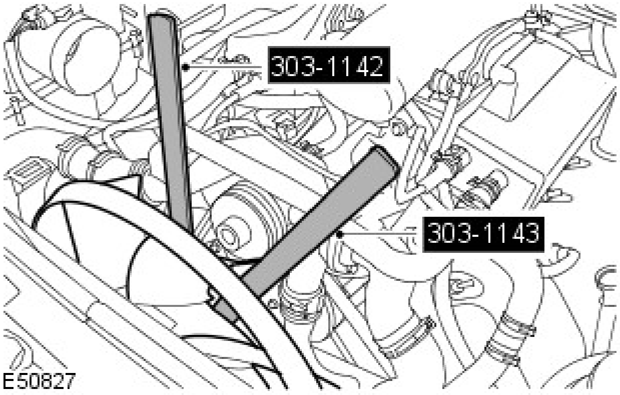
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the cooling fan shroud.
3. Disconnect the cooling fan control electrical connector.

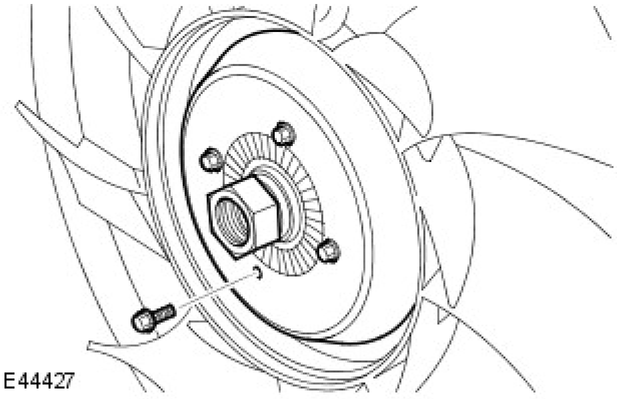


4. NOTE: The thread is right handed.

   Using the special tools, remove the cooling fan.

   - Remove the cooling fan assembly.





5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the viscous coupling from the cooling fan.

- Remove the 4 bolts.

Installation

1. To install, reverse the removal procedure.

- Install the cooling fan to the viscous coupling, tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the cooling fan assembly to 65 Nm (48 lb.ft).

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Engine Cooling - V8 S/C 4.2L Petrol - Coolant Manifold

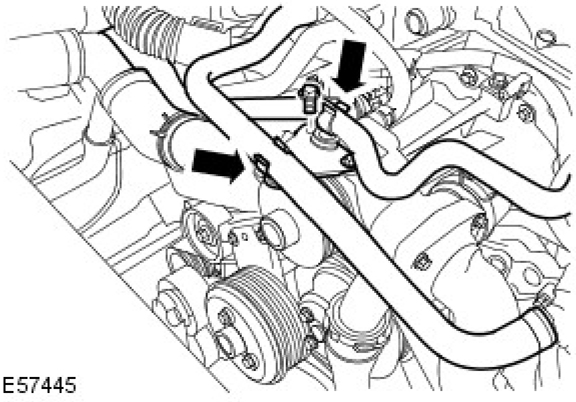
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the cooling fan belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

3. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).



4. Remove the coolant hose support bracket.

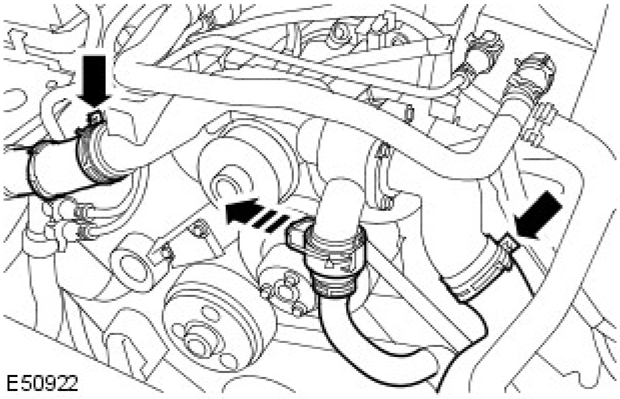
- Remove the 2 bolts.
- Release the 2 coolant hoses.

5. Disconnect the coolant manifold to radiator hose.

- Remove the clip.

6. Disconnect the thermostat housing to radiator hose.

- Release the clip.



7. Disconnect the coolant manifold to coolant reservoir hose.

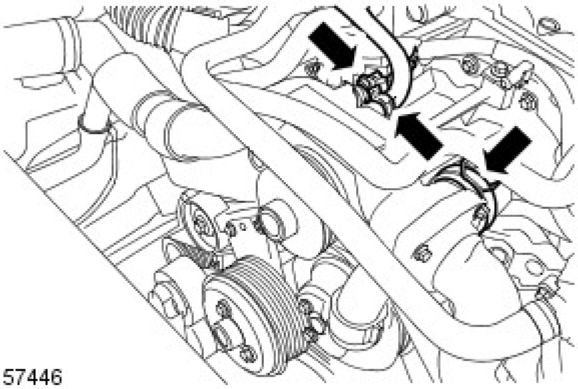
- Release the clip.

8. Disconnect the coolant manifold bleed hose.

- Release the clip.

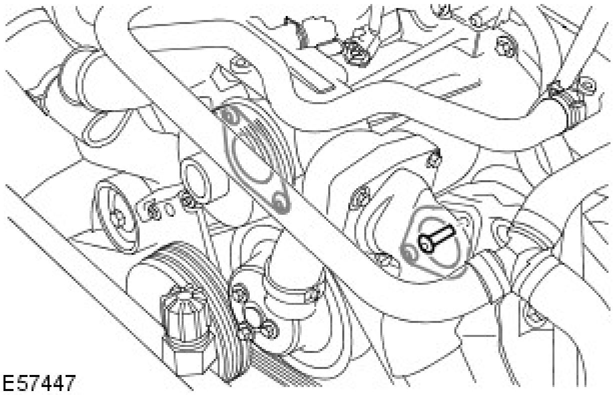
9. Disconnect the engine coolant temperature (ECT) sensor electrical connector.

- Release the clip.


E57446

10. Disconnect the cylinder block coolant hose.

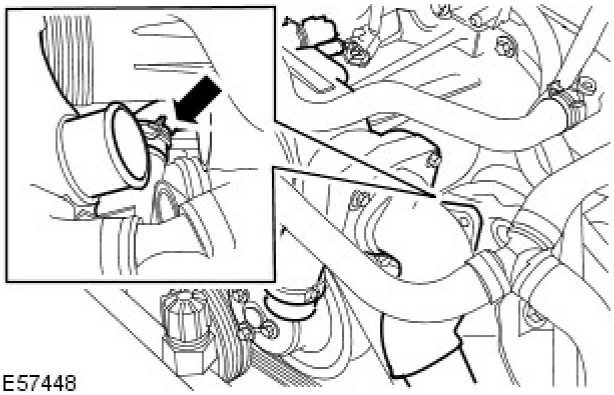
- Release the clip.


E57447

11. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Release the coolant manifold.

- Remove the 4 Torx screws.
- Position the wiring harness brackets aside.
- Remove and discard the 2 O-ring seals.


E57448

12. Disconnect the coolant manifold rear hose.

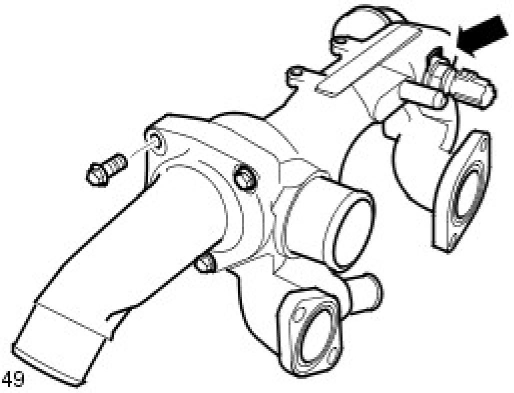
- Rotate the coolant manifold.
- Release the clip.

13. Remove the coolant manifold.

14. NOTE: Do not disassemble further if the component is removed for access only.

Remove the ECT sensor.

- Remove the clip.
- Remove and discard the O-ring seal.



E57449

15. Remove the thermostat housing.

- Remove the 3 bolts.
- Discard the O-ring seal.

Installation

1. Install the thermostat housing.

- Clean the components.
- Install a new O-ring seal.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the ECT sensor.

- Clean the component mating faces.
- Install a new O-ring seal.
- Secure with the clip.

3. Install the coolant manifold.

- Clean the components.
- Install new O-ring seals.
- Connect the rear hose and secure with the clip.
- Connect the cylinder block hose and secure with the clip.
- Attach the wiring harness bracket.
- Tighten the Torx screws to 10 Nm (7 lb.ft).

4. Connect the remaining coolant hoses.

- Secure with the clips.

5. Connect the ECT sensor electrical connector.

6. Install the coolant hose support bracket.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Secure the coolant hoses.

7. Install the cooling fan belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

9. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol,

General Procedures).

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Engine Cooling - V8 S/C 4.2L Petrol - Radiator

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Recover the A/C refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. Remove the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

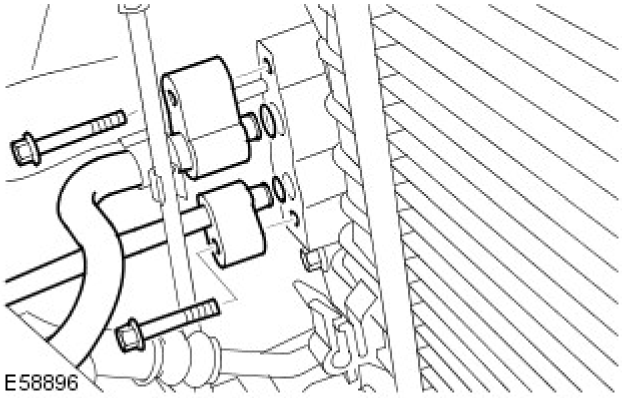
4. Remove the cooling fan drive pulley.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

5. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

6. Remove the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

7. Remove the auxiliary coolant pump.
For additional information, refer to: Coolant Pump (303-03D Supercharger Cooling, Removal and Installation).



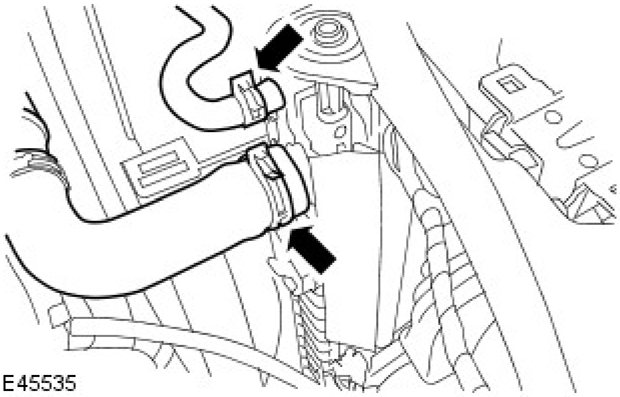
8. ⚠ WARNING: Eye protection must be worn.

⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

Disconnect the A/C pipes.

- Remove the 2 bolts.
- Discard the O-ring seals.

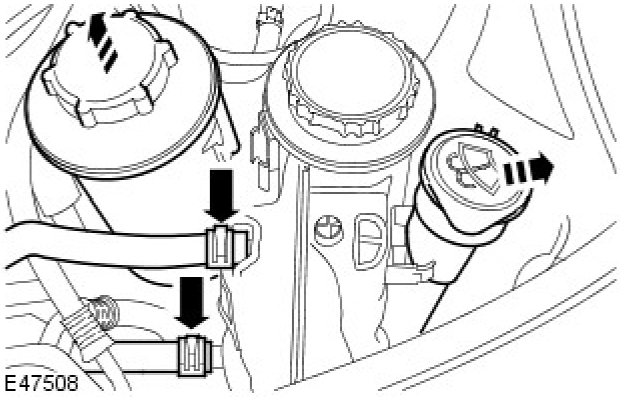


9. Disconnect the 2 upper radiator hoses.

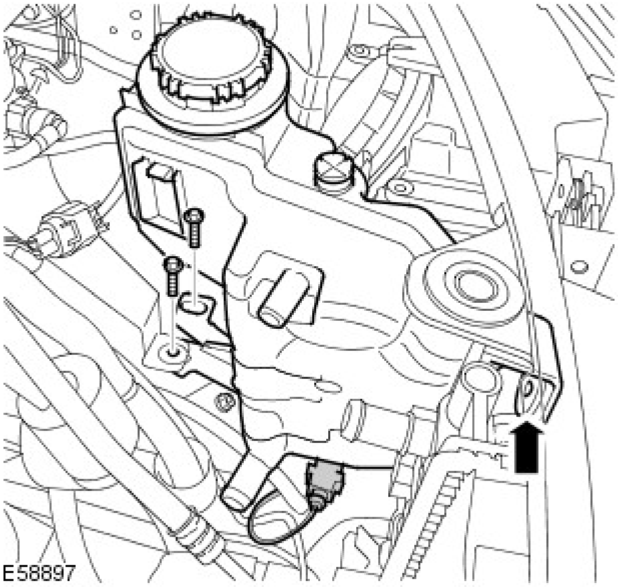
- Carefully release the clips.

10. Release the power steering fluid reservoir and position aside.

- Tie the reservoir aside.

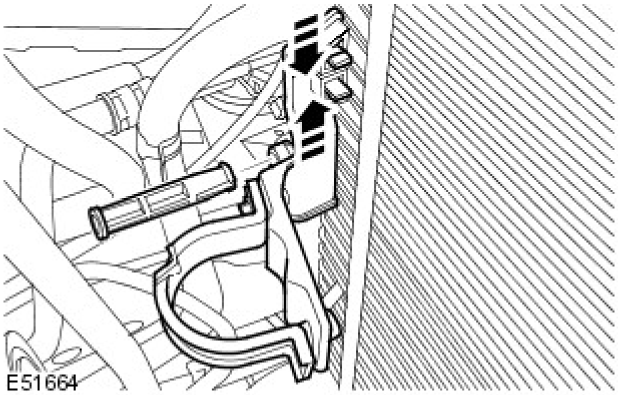


11. Release the windshield washer reservoir filler neck.



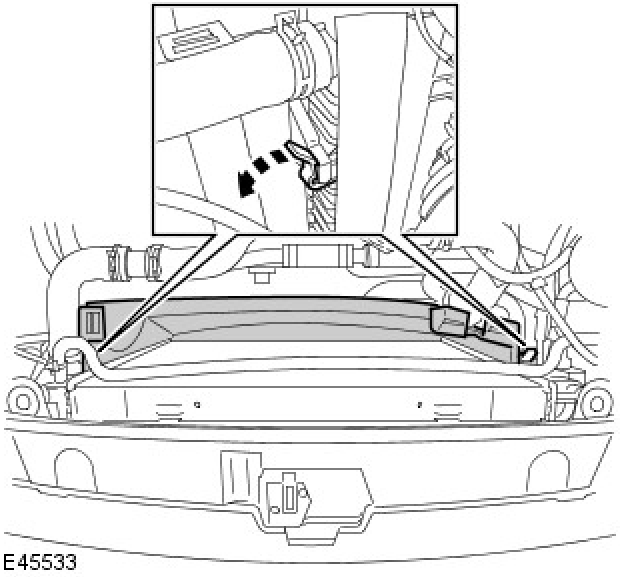
12. Remove the coolant expansion tank.

- Remove the 2 bolts.
- Release the spigot and lug.
- Disconnect the coolant low level sensor electrical connector.



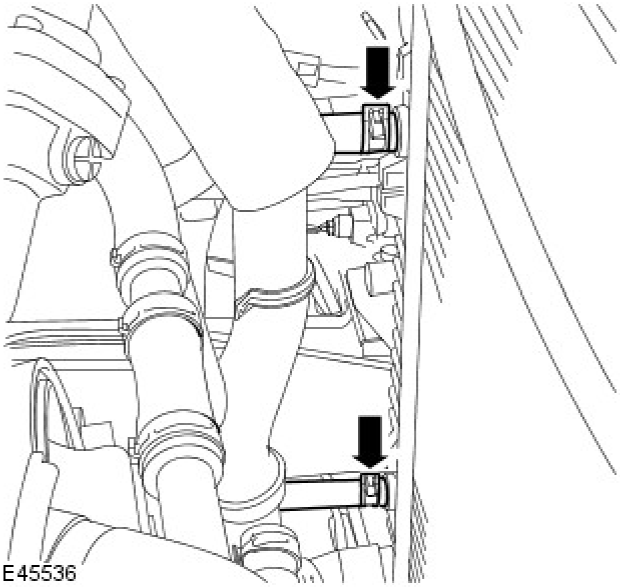
13. Remove the auxiliary coolant pump mounting bracket.

- Remove the peg.
- Release the clip.



14. Release and remove the cooling fan lower shroud from the cooling pack.

- Release the 2 clips.

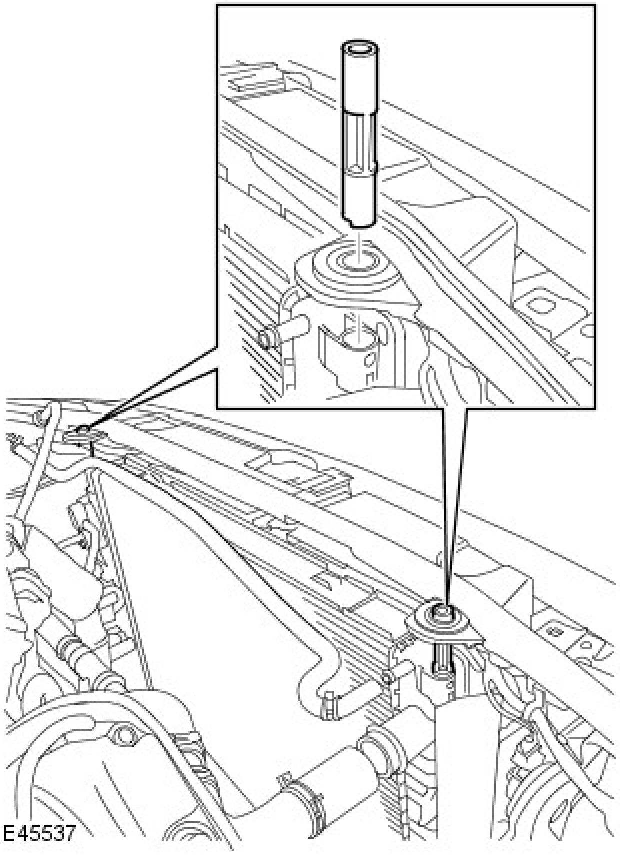


15. ⚠CAUTION: Always plug any open connections to prevent contamination.

Disconnect the transmission cooler hoses.

- Position a container to collect the fluid.
- Release the 2 clips.

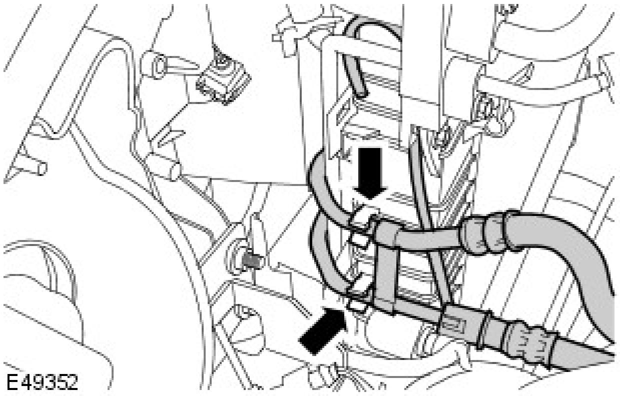
16. Remove the radiator securing pegs.



17. Release the breather hose and tie aside.

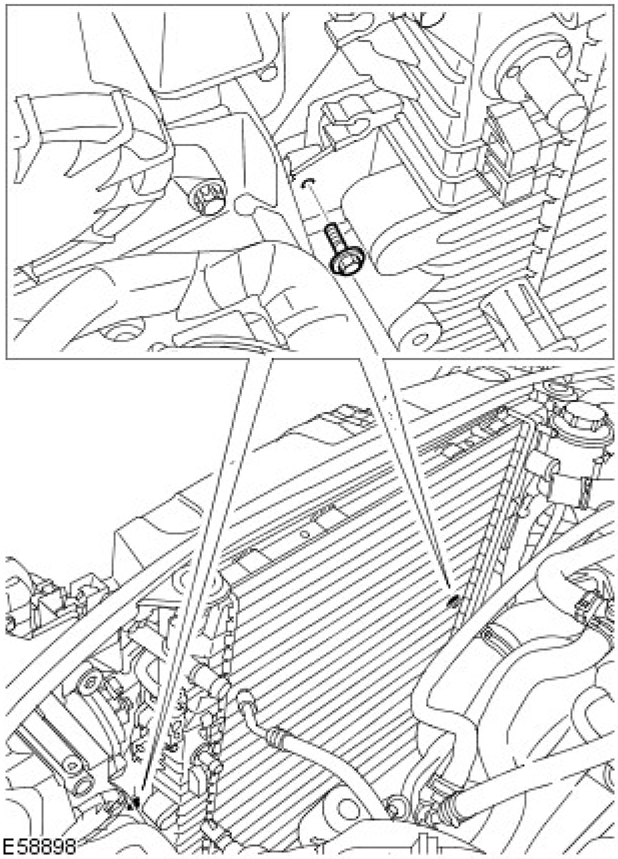
18. Release the power steering fluid cooler.

- Release the 3 clips.
- Tie the line aside.



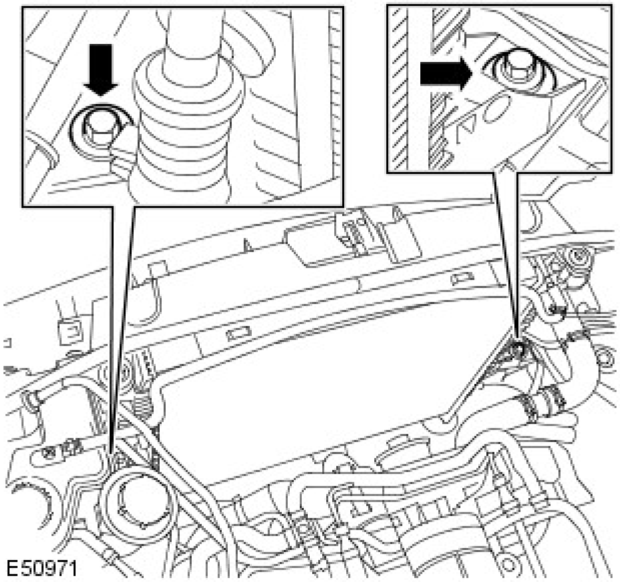
19. Release the bumper air ducting.

- Remove the 2 screws.


E58898

20. With assistance, remove the radiator assembly.

- Protect the elements from damage.
- Remove the 2 radiator retaining bolts.
- With assistance, remove the radiator.


E50971

Installation

1. With assistance, install the radiator assembly.

- With assistance, install the radiator assembly.
- Align the radiator.
- Remove the element protection.

2. Secure the bumper air ducting.

- Tighten the screws.

3. Install the power steering fluid cooler.

- Secure in the 3 clips.
- Tighten the bolts to 25 Nm (18 lb.ft).

4. Install the radiator securing pegs.

5. Connect the upper radiator hoses.

- Position and secure in the clips.

6. Install the transmission cooler hoses.

7. Install the radiator upper hoses.

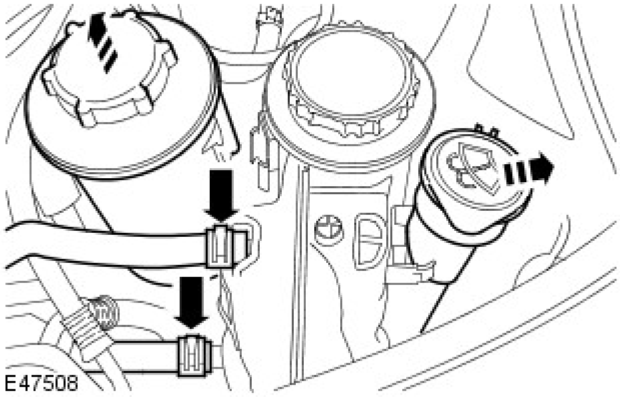
- Install the clip.

8. Secure the coolant expansion tank.

- Connect the coolant low level indicator electrical connector.
- Locate the lug and spigot.
- Tighten the 2 bolts to 10 Nm (7 lb.ft).

9. Install the power steering fluid reservoir.

10. Install the windshield washer reservoir filler neck.



11. NOTE: Lubricate the O ring seals with clean refrigerant oil.

Connect the A/C pipes.

- Install new O-ring seals.
- Tighten the bolts to 10 Nm (7 lb.ft).

12. Connect the coolant hoses to the expansion tank.

- Secure the clips.

13. Install the auxiliary coolant pump mounting bracket.

- Secure the clip.
- Install the securing peg.

14. Install the auxiliary coolant pump.
For additional information, refer to: Coolant Pump (303-03D Supercharger Cooling, Removal and Installation).

15. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

16. Install the cooling fan drive pulley.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

17. Install the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

18. Fill the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

19. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

20. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

21. Check automatic transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

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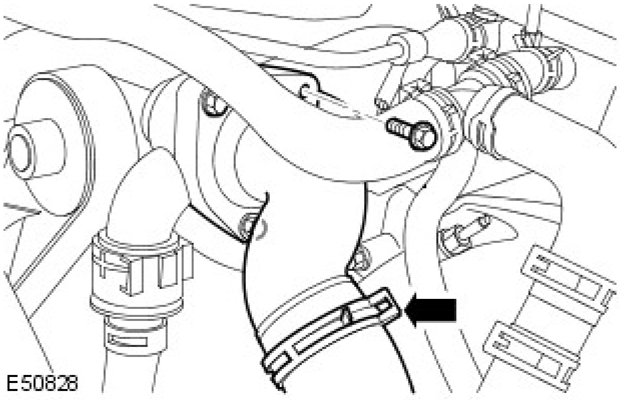
Engine Cooling - V8 S/C 4.2L Petrol - Thermostat

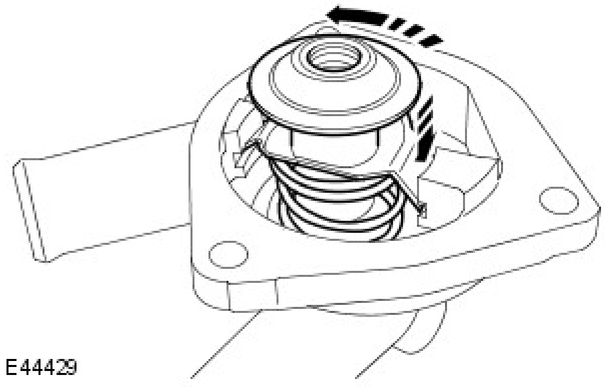
Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the fan cowl.
   For additional information, refer to: Cooling Fan Shroud (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).



4. Remove the thermostat housing.
   - Position a container to collect the fluid.
   - Disconnect the thermostat housing coolant hose.
   - Remove the 3 bolts.
   - Remove and discard the seal.



5. ⚠ WARNING: Eye protection must be worn.

   Remove the thermostat.
   - Position the thermostat housing in a vice.
   - Release and remove the thermostat.

Installation

1. To install, reverse the removal procedure.
   - Clean the component mating faces.
   - Install a new thermostat seal.
   - Tighten the bolts to 10 Nm (7 lb.ft).
2. Top-up and bleed the coolant.
3. NOTE: For NAS vehicles only.

   If required, carry out a long drive cycle.
   For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine

Controls - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Engine Cooling - V8 S/C 4.2L Petrol - Coolant Pump

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

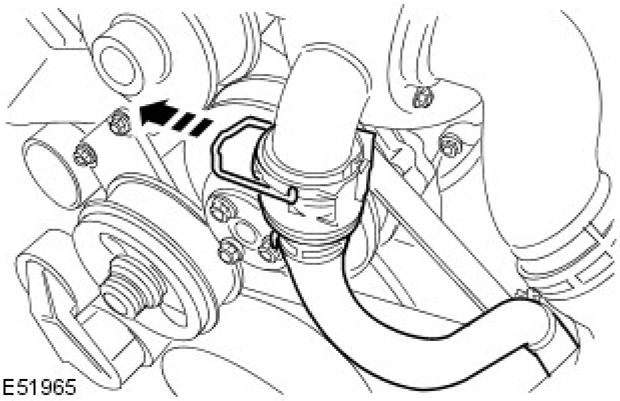
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Position the vehicle on a lift.

3. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

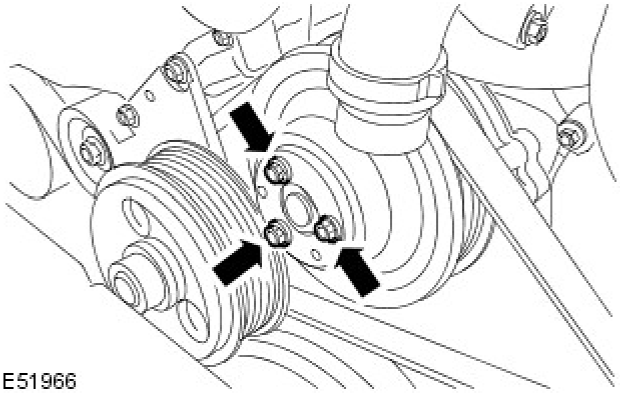
4. Disconnect the coolant hose for access.

- Release the clip.

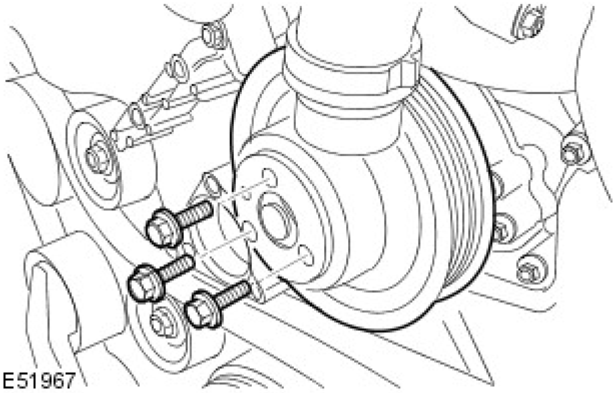


5. NOTE: Loosen the bolts prior to removing the accessory drive belt.

Loosen the 3 coolant pump pulley bolts.

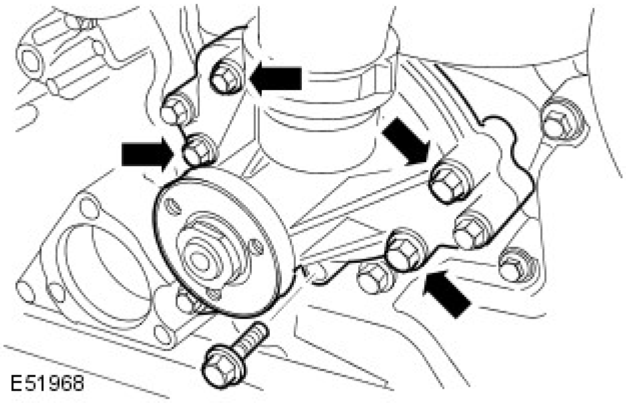


6. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).



7. Remove the coolant pump drive pulley.

- Remove the 3 bolts.



8. ⚠CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the coolant pump.

- Remove the 5 bolts.
- Discard the gasket.

Installation

1. Install the coolant pump.

- Clean the component mating faces.
- Install a new gasket.
- Install the bolts and tighten to 10 Nm (7 lb.ft).

2. Install the coolant pump drive pulley.

- Install, and lightly tighten the bolts.

3. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

4. Tighten the coolant pump pulley retaining bolts.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Connect and secure the coolant hose.

- Clean the component mating faces.

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

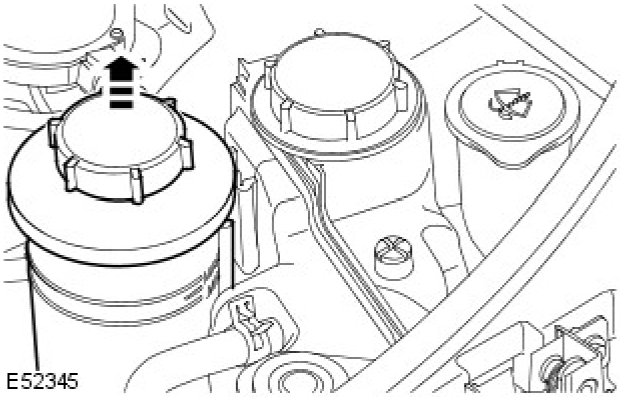
7. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

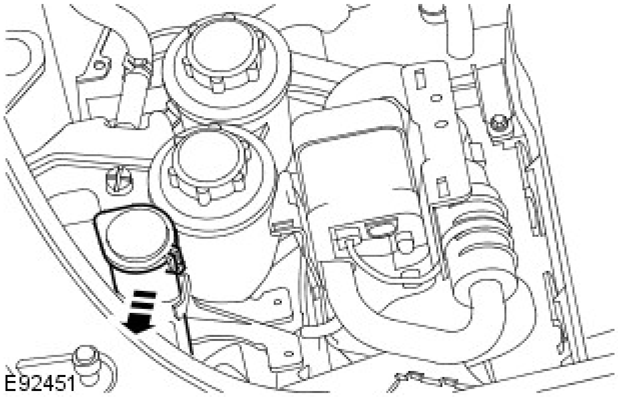
Engine Cooling - V8 S/C 4.2L Petrol - Engine Coolant Level Switch

Removal and Installation

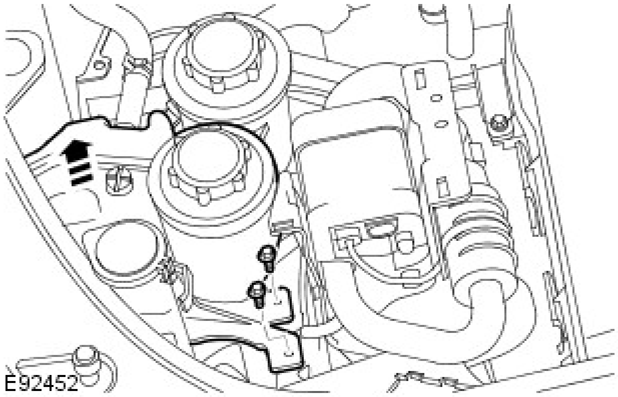
Removal



1. Release the power steering fluid reservoir from the bracket.

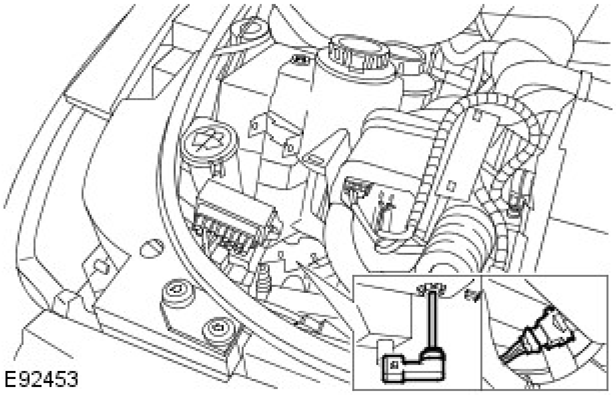


2. Release the windshield washer reservoir filler neck.



3. Reposition the coolant expansion tank.

- Remove the 2 bolts.



4. Remove the engine coolant level switch.

- Disconnect the engine coolant level switch electrical connector.

Installation

1. NOTE: An audible click can be heard when the engine coolant level switch is correctly installed.

Install the engine coolant level switch.

- Connect the engine coolant level switch electrical connector.

2. ⚠ CAUTION: Make sure that the component is correctly located on the locating pegs.

Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

3. Secure the windshield washer reservoir filler neck.

4. Secure the power steering fluid reservoir to the bracket.

Published: 11-May-2011

Engine Cooling - V8 S/C 4.2L Petrol - Cooling System Draining and Vacuum Filling

General Procedures

⚠ WARNING: To avoid having scalding hot coolant or steam blowing out of the cooling system, use extreme care when removing the coolant pressure cap from a hot cooling system. Wait until the engine has cooled, then wrap a thick cloth around the coolant pressure cap and turn it slowly until the pressure begins to release. Step back while the pressure is released from the system. When certain all the pressure has been released (still with a cloth) turn and remove the coolant pressure cap from the coolant expansion tank. Failure to follow these instructions may result in personal injury.

- CAUTIONS:

⚠ The engine cooling system must be maintained with the correct concentration and type of anti-freeze solution to prevent corrosion and frost damage. Failure to follow this instruction may result in damage to the vehicle.

⚠ Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

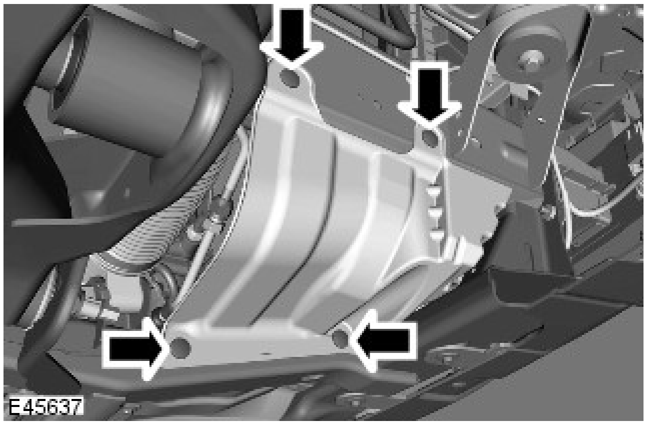
1. Set the heater controls to maximum HOT.

2. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Remove the coolant expansion tank cap.

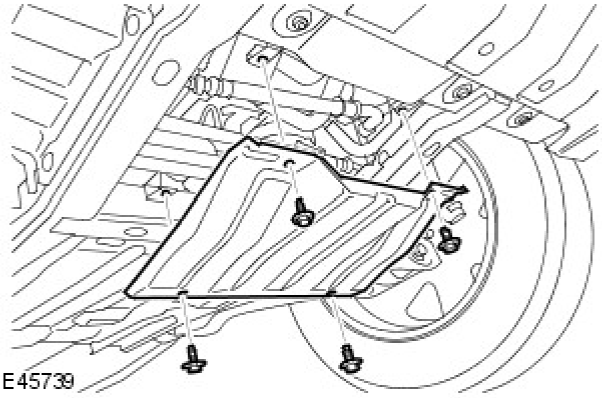
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



4. Remove the front LH splash shield.

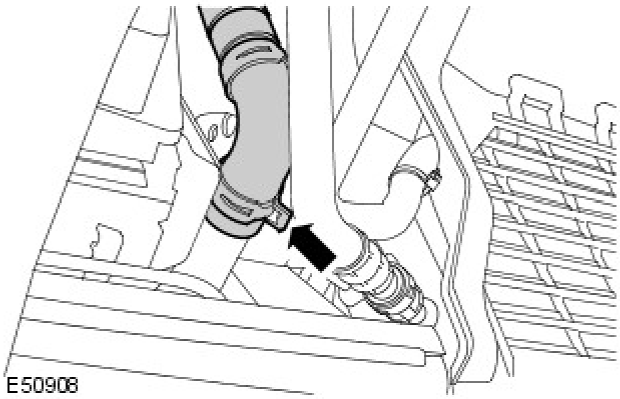
- Remove the 4 clips.



5. Remove the radiator access panel.

- Remove the 4 bolts.

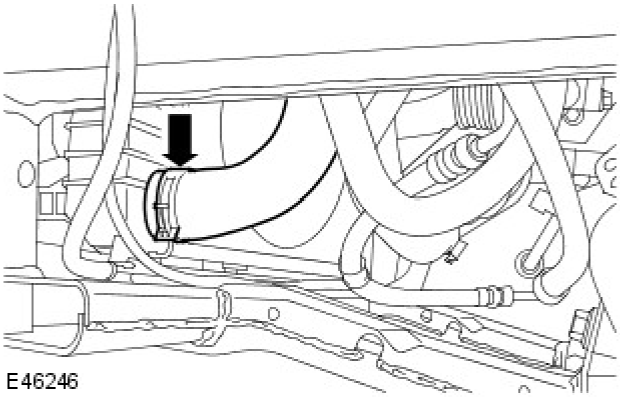
6. Position a container to collect the fluid.



7. CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Disconnect the charge air radiator lower hose.

- Release the clip.
- Allow the coolant to drain.



8. Disconnect the radiator lower hose.

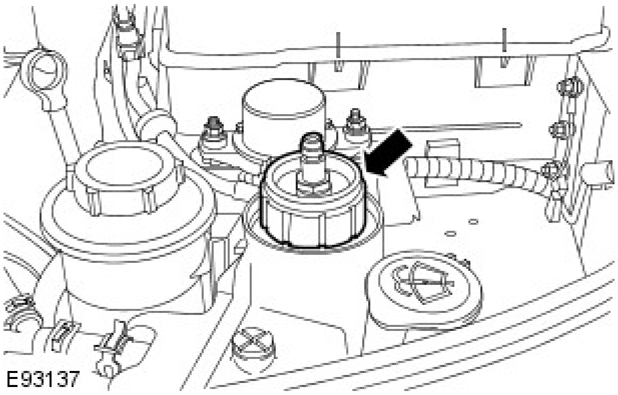
- Release the clip.
- Allow the coolant to drain.

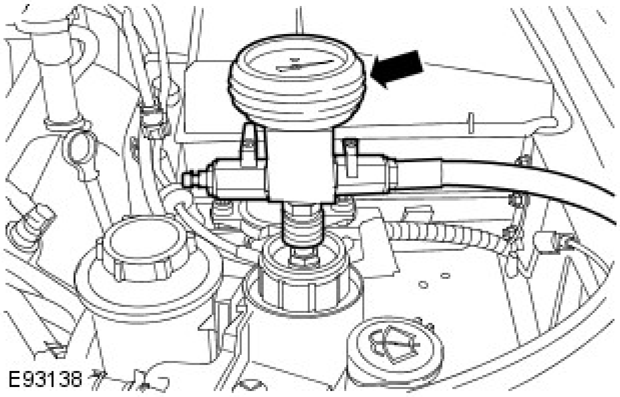
9. Connect the lower hoses to the radiators.

- Secure the clips.
- Remove the container.

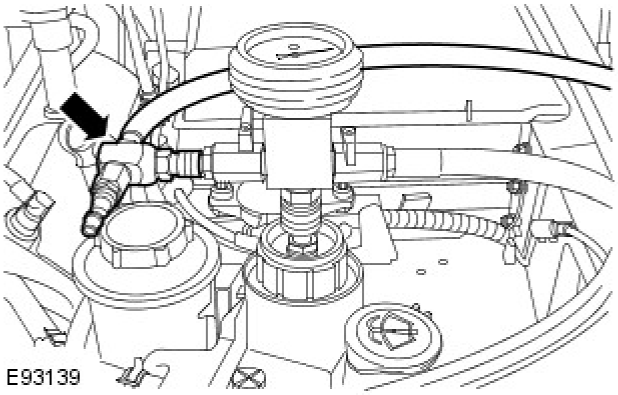
10. Prepare a sufficient amount of coolant to the specified concentration.

11. Install the cooling system vacuum refill adaptor to the expansion tank.

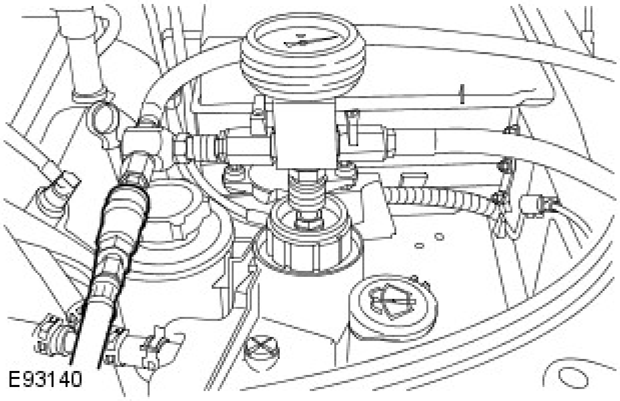




12. Install the vacuum filler gauge to the cooling system vacuum refill adaptor.



13. Install the venturi tube assembly to the vacuum filler gauge.



14. NOTE: Make sure both valves on gauge assembly are in the closed position.

- NOTE: Small diameter or long airlines may restrict airflow to the coolant vacuum fill tool.

- NOTE: The coolant vacuum fill tool needs an air pressure of 6 to 8 bar (87 to 116 psi) to operate correctly.

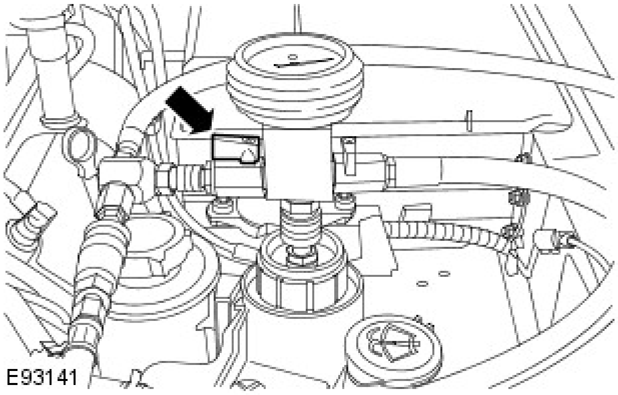
Connect a regulated compressed air supply to the venturi tube assembly.

15. NOTE: Make sure air cannot enter the hose.

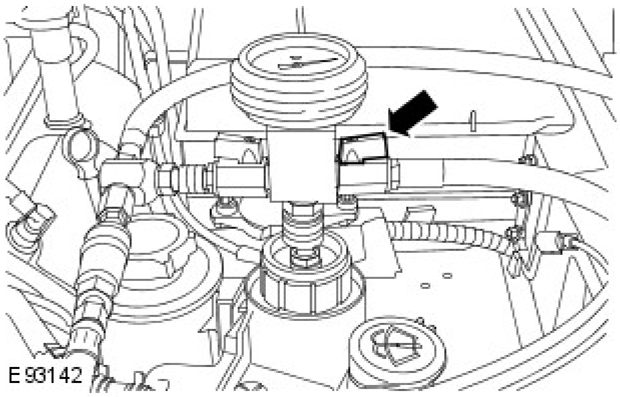
Position the coolant pick-up pipe into a container of clean coolant.

16. Position the evacuated air hose into a container.

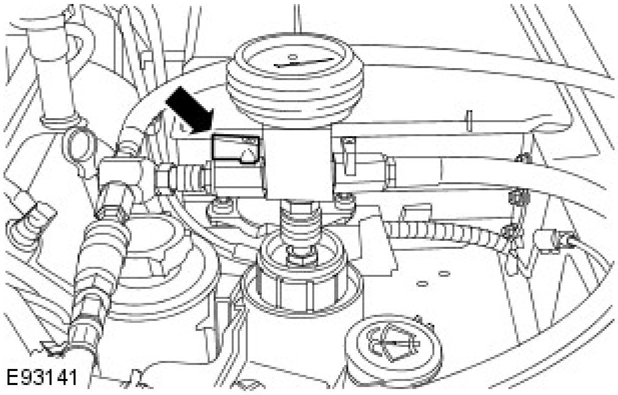
17. Open the air supply valve.



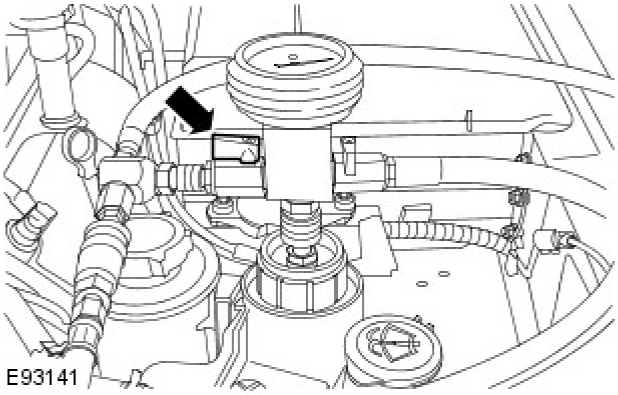
18. Open the coolant supply valve for 2 seconds to prime the coolant supply hose.

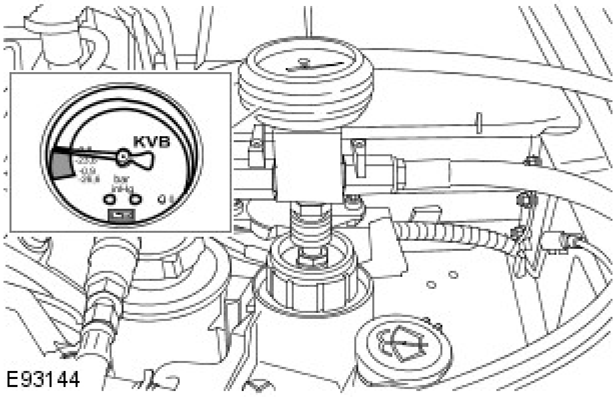


19. Apply air pressure progressively until the arrow on the vacuum filler gauge reaches the green segment.



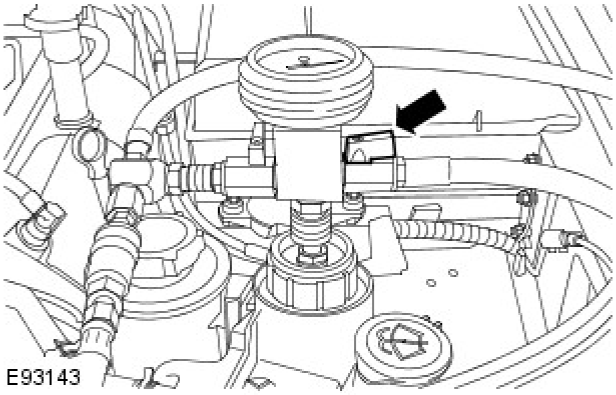
20. Close the air supply valve.





21. Allow one minute to check the vacuum is held.

- Disconnect the compressed air supply.



22. NOTE: Close the coolant supply valve when the coolant expansion tank MAX mark is reached or coolant movement has ceased.

Open the coolant supply valve and allow the coolant to be drawn into the system.

23. Remove the vacuum filler gauge and cooling system vacuum refill adaptor assembly.

24. Check and top-up the coolant if required.

25. Install the coolant expansion tank cap.

26. ⚠CAUTION: Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

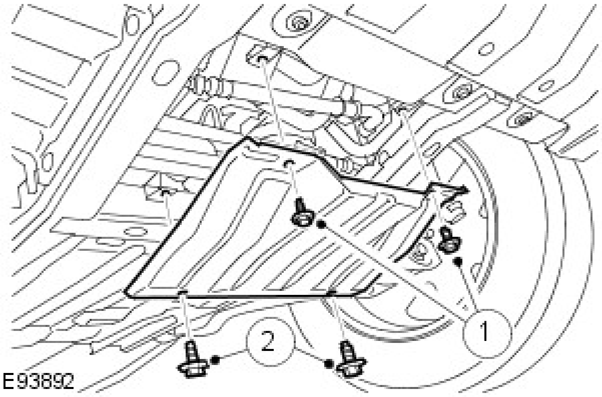
Start and run the engine until normal operating temperature is reached.

27. Switch the engine off and allow to cool.

28. Clean any spilt coolant from the vehicle.

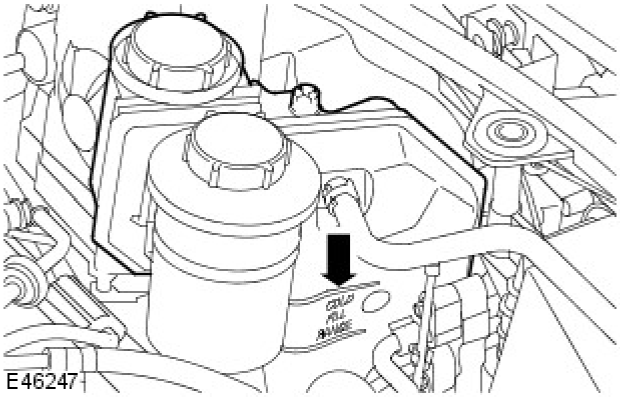
29. Install the radiator access panel.

1. Tighten the bolts to 10 Nm (7 lb.ft).
2. Tighten the bolts to 62 Nm (46 lb.ft).



30. Install the front LH splash shield.

- Install the 4 clips.


COLD
FILL
RANGE
E46247

31. Check for leaks and then fill the coolant expansion tank to the MAX mark.

Published: 05-Jul-2011

Engine Cooling - V8 4.4L Petrol -

Fluids

Item	**Specification**
* Anti-freeze	Havoline Extended Life Coolant (XLC) or any ethylene glycol based anti-freeze containing no methanol with only Organic Acid Technology (OAT) corrosion inhibitors
Anti-freeze concentration - Will provide frost protection to -40°C (-40°F)	50%
Specific gravity of coolant at 20°C (68°F), to protect against frost down to -40°C (-40°F)	1.068
Amount of anti-freeze to use for 50% concentration	4.6 litres (8.1 pints) (4.9 US quarts)

⚠ CAUTION: No other anti-freeze should be used with Havoline Extended Life Coolant.

Capacity

Item	**Capacity**
Cooling system	9.3 litres (16.3 pints) (9.8 US quarts)

General Specifications

Item	**Specification**
Cooling system type	Pressurised, thermostatically controlled with remote header tank
Radiator	Cross flow with integral transmission fluid cooler
Expansion tank	Remote - fitted with a bleed screw and low coolant level sensor
Pressure cap rating	110 kPa (1.1 bar) (16 lbf/in²)
Thermostat:	
Starts to open	88° C (190°F)
Fully open	95° C (203° F)
Cooling fan	Engine driven, viscous coupled with electronic control
Cooling fan diameter	500 mm (19.6 in)
Direction of rotation	Clockwise when viewed from front of engine
Coolant pump	Centrifugal flow impellor, belt driven from crankshaft

Torque Specifications

Description	**Nm**	**lb-ft**
Coolant pump bolts	10	7
Coolant pump pulley retaining bolts	10	7
Cooling fan to viscous coupling bolts	10	7
* Cooling fan assembly	65	48
Thermostat housing bolts	10	7
Radiator bolts	25	18
Air Conditioning (A/C) condenser clip bolts	6	4
Air Conditioning (A/C) manifold bolt	10	7
Expansion tank bolt	10	7
Vacuum pump bolts	10	7
Radiator access panel bolts	10	7
Coolant bleed screw(s)	3	2

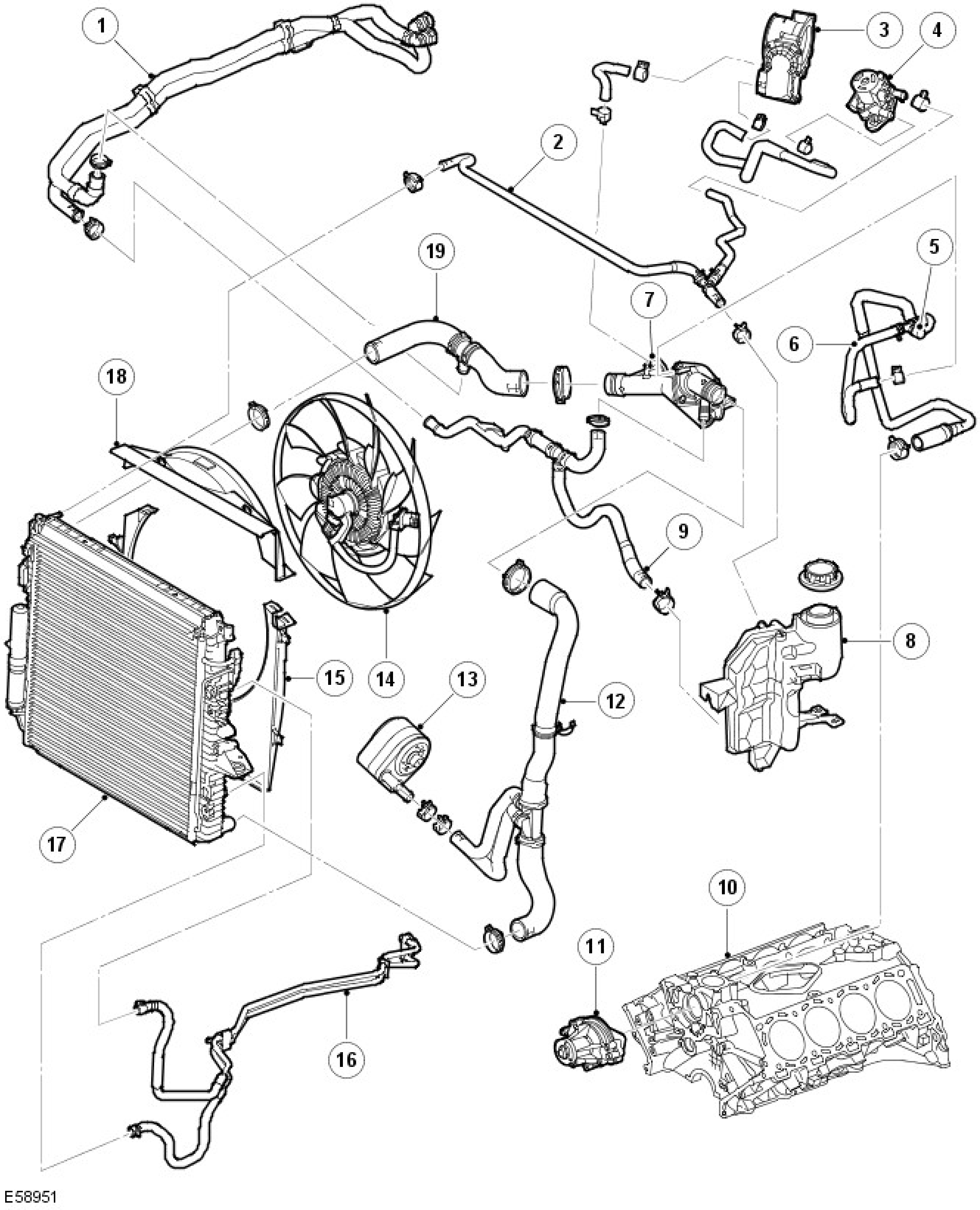
*** Note: Left-hand thread**

Published: 11-May-2011

Engine Cooling - V8 4.4L Petrol - Engine Cooling

Description and Operation

Cooling System Component Layout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Item	Part Number	Description
1	-	Heater hose, in and out
2	-	Hose, radiator to expansion tank
3	-	Throttle body
4	-	EGR valve
5	-	Bleed screw
6	-	Hose, water outlet to cylinder block
7	-	Water outlet pipe assembly
8	-	Expansion tank
9	-	Hose, heater to thermostat
10	-	Cylinder block
11	-	Water pump
12	-	Hose, radiator to thermostat
13	-	Oil cooler
14	-	Cooling fan
15	-	Shroud, lower
16	-	Transmission oil pipes
17	-	Radiator
18	-	Shroud, upper
19	-	Hose, water outlet to radiator

GENERAL

The cooling system employed is of the pressure relief by-pass type, which allows coolant to circulate around the engine and the heater circuit while the thermostat main valve is closed. The primary function of the cooling system is to maintain the engine within an optimum temperature range under changing ambient and engine operating conditions. Secondary functions are to provide heating for the passenger compartment and cooling for the transmission fluid and engine oil.

The cooling system comprises:

- A radiator
- A passenger compartment heater matrix
- A coolant pump
- A thermostat
- An expansion tank
- An electro-viscous fan
- Connecting hoses and pipes.

ENGINE COOLING SYSTEM

The coolant is circulated by a centrifugal pump mounted on the front of the engine and driven by an ancillary drive 'polyvee' belt. The coolant pump circulates coolant through the cylinder block and cylinder heads via a chamber located in the 'vee' of the engine. Having passed through the engine the coolant returns to the thermostat housing. The coolant then progresses down the 'top hose' to the heater pipe. The heater pipes lead to the bulkhead and return to the engine side of the thermostat.

The engine contains a normal thermostat, which is positioned such that the wax's temperature is controlled by both the coolant from the radiator and the bypass. This results in the thermostat being able to vary its opening temperature dependant on ambient conditions. The thermostat housing also contains a sprung loaded valve, which limits the amount of coolant using the bypass. This means the engine can run without coolant flowing through the bypass temporarily, to improve heater performance.

The radiator is a cross flow type with an aluminium matrix and has a drain tap on the lower right-hand rear face. The lower radiator mountings are located part way up the end tanks. The mountings are fitted with rubber bushes, which sit on the upper chassis rails. The radiator upper is mounted by pins, which are pushed through rubber bushes mounted in the Front End Carrier (FEC) above the radiator. The radiator also incorporates two connections for the transmission oil pipes.

The top and bottom hoses are mounted to the inlet and outlet sides of the thermostat housing.

The expansion tank is fitted forward of the LH suspension turret in the engine compartment. The expansion tank allows for the expansion of the coolant as the engine gets hot. It also supplies the engine with coolant as the coolant in the engine contracts. The tank also allows any air trapped in the coolant to be removed.

The liquid cooled transmission fluid cooler is mounted in the cold side radiator end tank. It is positioned in the middle of the LH end tank.

The engine oil cooler (EOC) is fed coolant from the bottom hose. Coolant is diverted from between the radiator and the thermostat, directed to the cooler and then returned to the bottom hose.

For additional airflow through the radiator matrix, particularly when the vehicle is stationary, there is an engine driven electro-viscous unit. This unit functions as a normal viscous fan, but with electronic control over the level engagement of the clutch. The

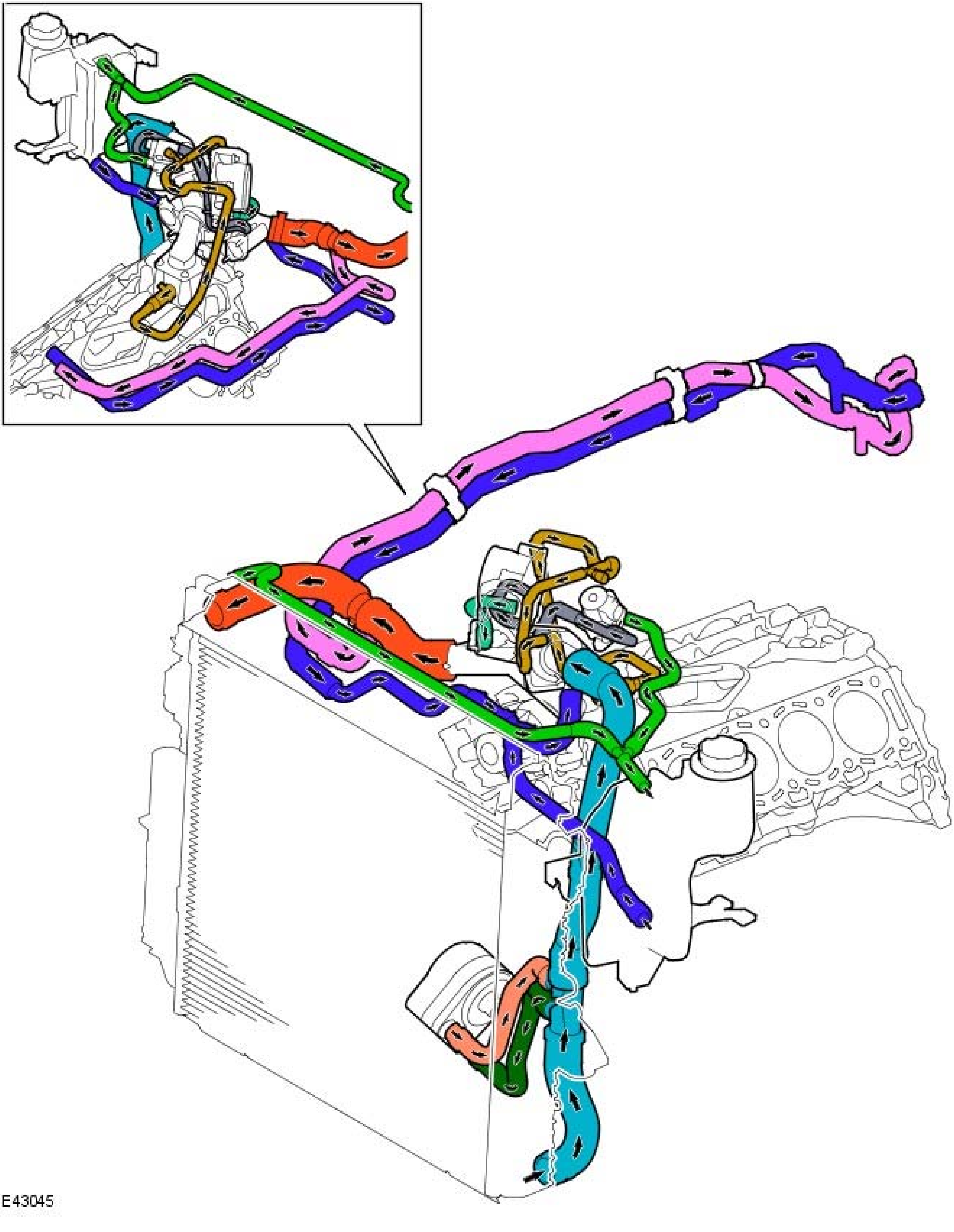
Engine Control Module (ECM), which determines the required fan speed, controls the level of clutch engagement. The ECM determines engagement based on the coolant, ambient and transmission oil temperatures and air conditioning (A/C) system pressure. The fan is mounted using a left hand thread.

The viscous fan unit is electronically controlled by the ECM to optimise fan speed for all operating conditions.

- NOTE: If the electrical connections to the viscous fan are disconnected the fan will 'idle' and overheating may result. The ECM stores the appropriate fault codes in this case.

ENGINE COOLING SYSTEM OPERATION

Cooling System Coolant Flow



E43045

When the engine is running the coolant pump is driven by the ancillary drive belt. This forces coolant to circulate around the engine and heater, while the thermostat and bypass valve are shut. As the temperature and pressure increases the bypass valve is forced open allowing coolant to circulate through the bypass valve. When the temperature reaches 82°C (180°F) the main thermostat begins to open allowing coolant to circulate through the main radiator. As the thermostat progressively opens (fully open at 95°C (203°F)), the bypass valve progressively closes forcing any coolant through the heater or radiator. Once coolant is allowed to circulate through the radiator, the transmission fluid and the engine oil coolers begin to receive coolant flow.

The increased coolant volume, created by heat expansion, is directed to the expansion tank through a bleed hose from the top of the radiator. The expansion tank has an outlet hose, which is connected into the coolant circuit. This outlet hose returns the coolant to the system when the engine cools.

Coolant flows through the radiator from the top right hand tank to the bottom left hand tank and is cooled by air passing through the matrix. The temperature of the cooling system is monitored by the ECM via the Engine Coolant temperature (ECT) sensor located in the cylinder head. The ECM uses signals from this sensor to control the cooling fan operation and adjust fuelling according to engine temperature.
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

To control the cooling fan, the ECM sends a Pulse Width Modulated (PWM) signal to the cooling fan module (integral to the ECM). The frequency of the PWM signal is used by the cooling fan module to determine the output voltage supplied to the fan motor.

The ECM varies the duty cycle of the PWM signal between 0 and 100% to vary the fan speed. If the PWM signal is outside the 0 to 100% range, the cooling fan module interprets the signal as an open or short circuit and runs the fans at maximum speed to ensure the engine and gearbox do not overheat.

The ECM operates the fan in response to inputs from the ECT sensor, the transmission oil temperature sensor, the A/C switch and the Air Conditioning (A/C) pressure sensor.
For additional information, refer to: Air Conditioning (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Description and Operation).

The speed of the cooling fan is also influenced by vehicle road speed. The ECM adjusts the speed of the cooling fans, to compensate for the ram effect of vehicle speed, using the Controller Area Network (CAN) road speed signal received from the Anti-lock Braking System (ABS) module.

Published: 11-May-2011

Engine Cooling - V8 4.4L Petrol - Engine Cooling

Diagnosis and Testing

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Coolant leaks ● Coolant Hoses ● Coolant expansion tank ● Radiator ● Heater core ● Accessory drive belt ● Viscous fan	● Fuses ● Wiring harness ● Loose or corroded connector(s) ● Engine coolant temperature (ECT) sensor

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible cause	Action
Coolant loss	● Hoses ● Hose connections ● Radiator ● Water pump ● Heater core ● Gaskets ● Engine casting cracks ● Engine block core plugs	Carry out a visual inspection. If there are no obvious leaks, carry out a pressure test using your workshop tester. Rectify as necessary. Refer ti the relevant section of the workshop manual.
Overheating	● Low/Contaminated coolant ● Thermostat ● Viscous fan ● ECT sensor ● Restricted air flow over the radiator	Check the coolant level and condition. Check the thermostat and rectify as necessary. Carry out a cooling system pressure test. Check the viscous fan operation, make sure the viscous fan rotates freely. Check for obstructions to the air flow over the radiator. Rectify as necessary. Refer to the relevant section of the workshop manual.
Engine not reaching normal temperature	● Thermostat ● Viscous fan	Check the thermostat operation. Check the viscous fan operation, make sure the viscous fan is not seized.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
P011623	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the relevant section of the workshop manual. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P011624	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the relevant section of the workshop manual. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011629	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the relevant section of the workshop manual. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	● ECT sensor disconnected ● Engine coolant temperature (ECT) sensor sensing circuit high resistance, short circuit to power ● ECT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011800	Engine Coolant Temperature Sensor 1 Circuit High	● Engine overheat condition/cooling fan failure ● ECT sensor wiring short circuit to ground ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck closed). Check for cooling fan DTCs. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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Engine Cooling - V8 4.4L Petrol - Cooling System Draining, Filling and Bleeding

General Procedures

⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

1. Position the vehicle on a lift.

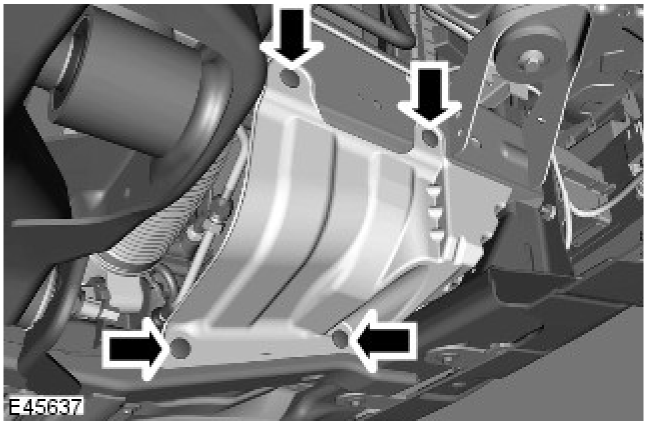
2. Set the heater controls to maximum.

3. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

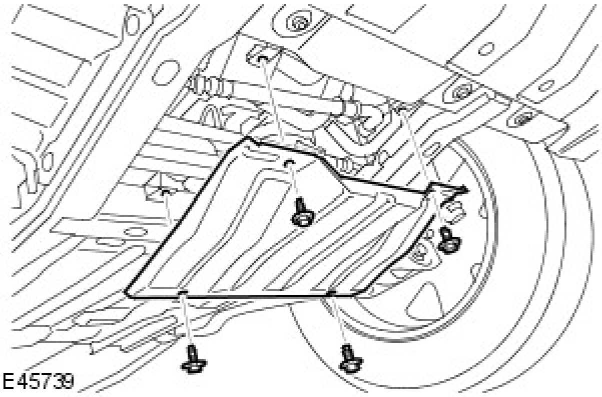
5. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Remove the coolant expansion tank cap.



6. Remove the front LH splash shield.

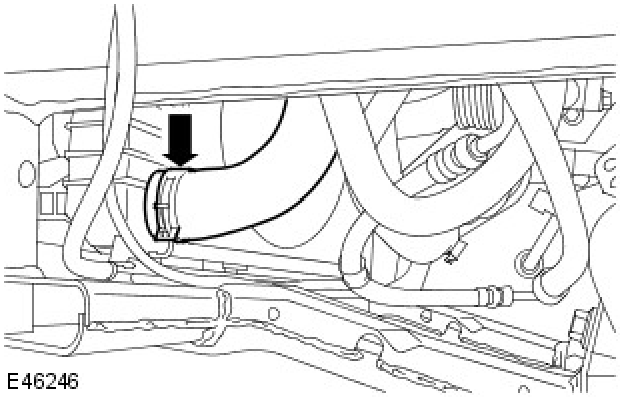
- Remove the 4 clips.



7. Remove the radiator access panel.

- Remove the 4 bolts.

8. Position a container to collect the fluid.



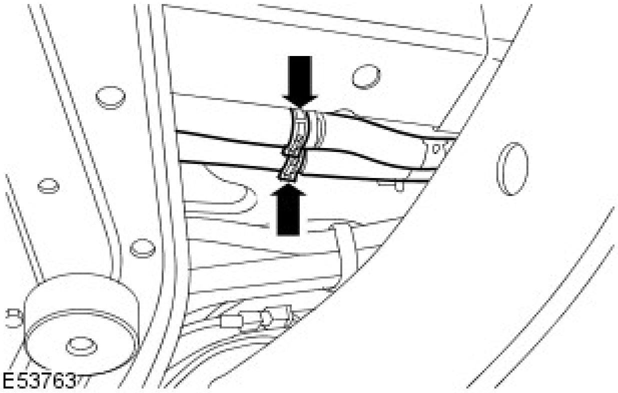
9. ⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Release the clip and disconnect the radiator lower hose, allow the coolant to drain.

10. Remove the spare wheel and tire.

- Remove the tool kit.
- Access the winch.

11. Position a container to collect the fluid.



12. Disconnect the rear heater coolant hoses.

- Release the 2 clips.
- Allow the coolant to drain.

13. Connect the rear heater coolant hoses.

- Secure the clips.

14. Install the spare wheel and tire.

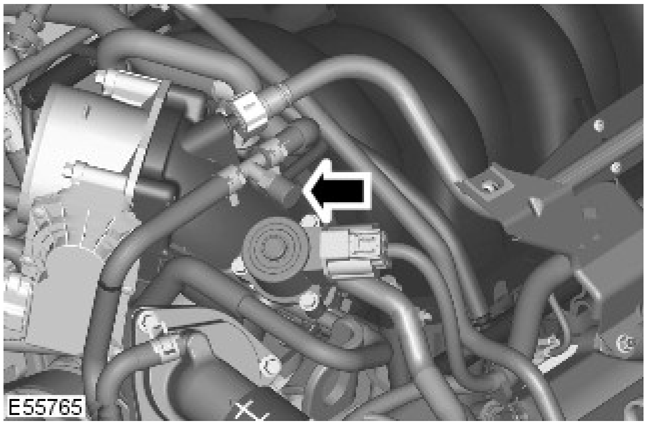
- Stow the tool kit.

15. Connect and secure the radiator lower hose.

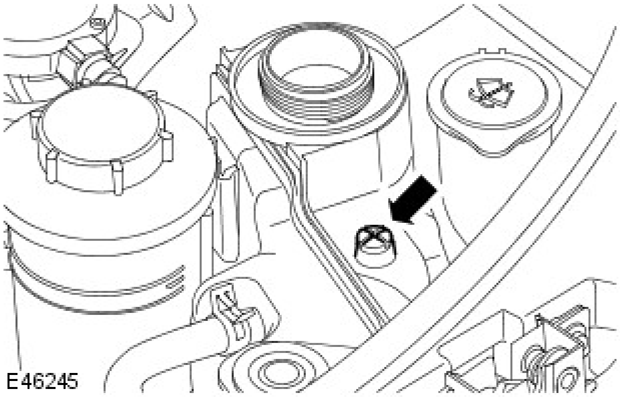
- Secure with the clip.

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

17. Connect exhaust extraction hoses to the tail pipes.



18. Loosen the coolant hose bleed screw.



19. Loosen the coolant expansion tank bleed screw.

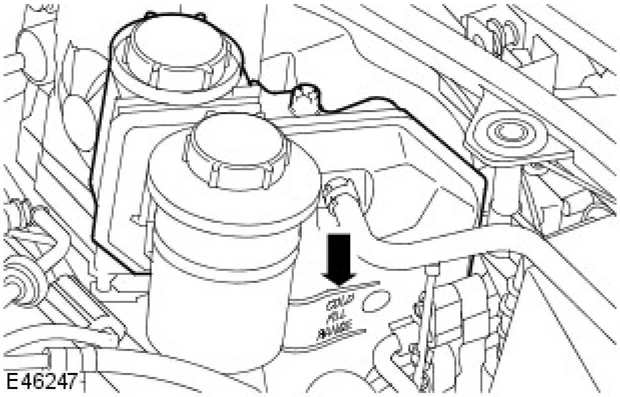
20. Fill the cooling system to the upper level mark of the expansion tank.

21. Start and run the engine.

- Hold the engine speed at 2,500 RPM for 30 seconds.
- Return the engine to idle for 30 seconds.
- Repeat the above procedure a further four times.

22. When a steady stream of coolant is running from the bleed point, close the coolant hose bleed screw.

23. Fill the cooling system, keeping coolant to the upper level mark of the expansion tank until a steady stream of coolant is seen returning to the expansion tank. Tighten the expansion tank bleed screw.



24. NOTE: When the coolant bleed is complete and prior to installing the expansion tank cap, top-up the expansion tank to 30mm above the maximum level.

Install the coolant expansion tank cap.

25. Run the engine until the thermostat opens.

26. Switch the engine off and allow to cool.

27. Install the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

28. Clean any spilt coolant from the vehicle.

29. Install the radiator access panel.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

30. Install the front LH splash shield.

31. Check and top-up the coolant if required.

Published: 11-May-2011

Engine Cooling - V8 4.4L Petrol - Cooling System Pressure Test

General Procedures

• NOTE: The following procedure will enable the cooling system to be pressure tested for condition and leaks. Stage 1 will check the expansion tank cap register seal and the cap for leaks. Stage 2 will check the entire cooling system.

• NOTE: It will be necessary to use the cooling system test kit, Part Number LR-218, which is available under the equipment programme.

1. Examine the coolant hoses for signs of cracking, distortion and security of the hose connections.

2. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Disconnect the coolant expansion tank bleed hose.

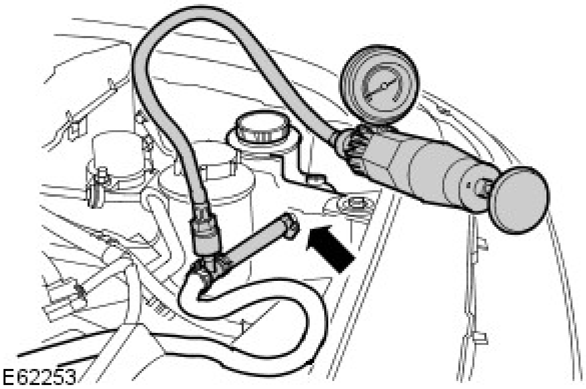
- Release the clip.

3. Install the 'T' piece adaptor (part of the cooling system test kit) between the coolant expansion tank and the coolant bleed hose.

- Secure with the 2 clips.

4. Install the coolant pressure pump assembly.

- Connect to the 'T' piece.



5. Pressurize the cooling system.

- Slowly pressurize the cooling system to 1.0 bar (100 kPa) (14.5 psi).
- Check the pressure remains above 0.9 bar (90 kPa) (13 psi) after waiting for 30 seconds.
- During the pressure drop check, listen for a hissing noise from the expansion tank cap.

6. NOTE: If the coolant expansion tank cap is found to be leaking, replace the cap.

Depressurize the cooling system.

- Disconnect the 'T' piece.
- Connect the coolant expansion tank bleed hose.
- Secure the clip.

7. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Remove the coolant expansion tank cap.

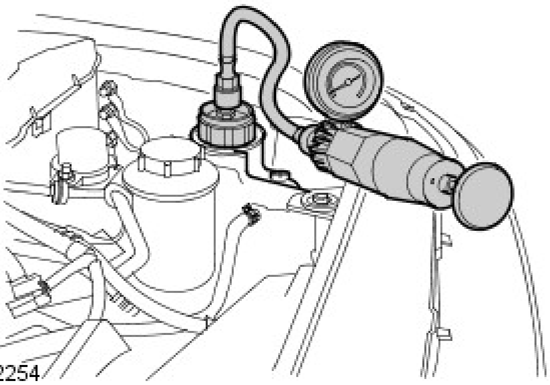
8. NOTE: This adaptor is part of the cooling system test kit.

Install adaptor K83 to the coolant expansion tank.

- Clean the component mating faces.
- Lubricate the seal.

9. Install the coolant pressure pump assembly.

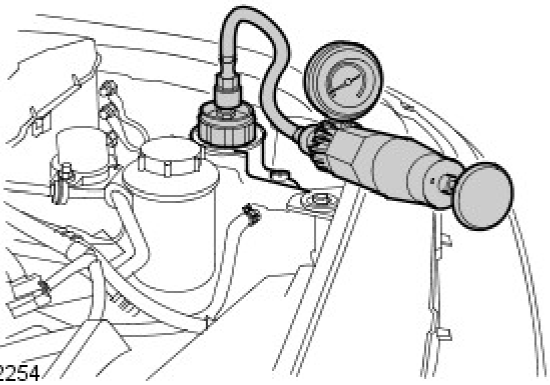
- Slowly pressurize the cooling system to 1.5 bar (150kPa) (22 psi), check the pressure over a 5 minute period. A small pressure decay of approximately 0.15 bar (15 »kPa) (1 psi) over the first minute is normal, as the air in the expansion tank cools.
- If the pressure continues to drop after the initial tolerance, there is a coolant leak.



E62254

10. Depressurize and remove the pressure pump and gauge.

- Install the coolant expansion tank cap.



E62254

Published: 11-May-2011

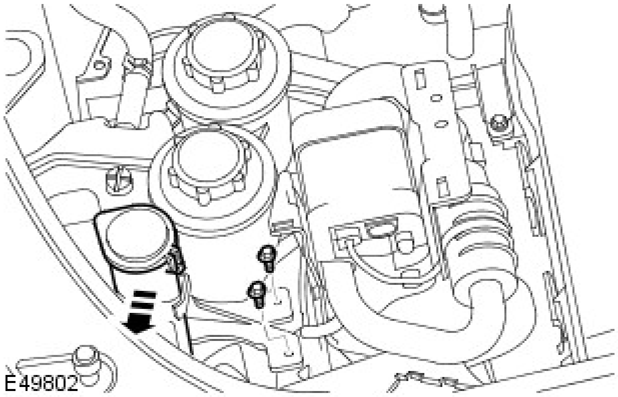
Engine Cooling - V8 4.4L Petrol - Coolant Expansion Tank

Removal and Installation

Removal

1. Remove the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

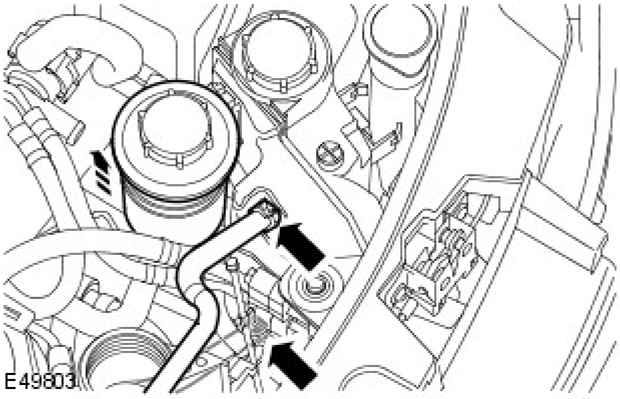
2. Release the windshield washer reservoir filler neck.



3. Release the coolant expansion tank.

- Remove the 2 bolts.

4. Release the power steering fluid reservoir.



5. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

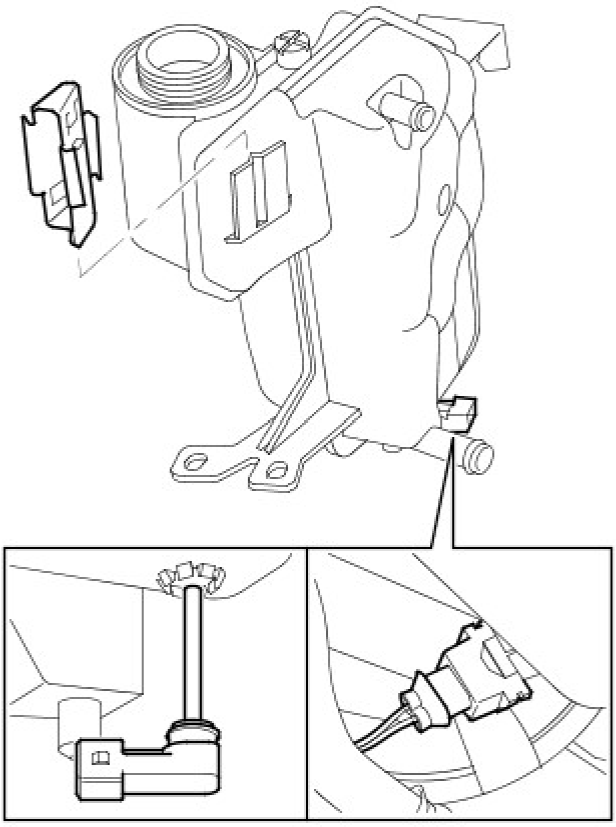
⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Disconnect the 2 hoses from the coolant expansion tank.

- Position an absorbent cloth to collect fluid spillage.
- Position a container to collect the fluid.
- Clamp the hoses
- Release the 2 clips.

6. Remove the coolant expansion tank.

- Disconnect the coolant low level sensor electrical connector.



E47510

7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the coolant low level sensor.

- Remove the coolant expansion tank support bracket.

Installation

1. Install the bracket.

2. Install the coolant low level sensor.

3. Install the coolant expansion tank.

- Connect the coolant low level sensor electrical connector.

4. Connect the coolant hoses to the expansion tank.

- Secure with the clips.

5. Top-up the coolant.

- Loosen the coolant expansion tank bleed screw.
- Fill the coolant expansion tank until coolant emerges from the cooling system air bleed screw.
- Remove the hose clamps.
- Tighten the bleed screw to 8 Nm (6 lb.ft).

6. Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

7. Check and top-up the coolant.

- Install the coolant expansion tank pressure cap.

8. Secure the power steering fluid reservoir.

- Attach to the mounting bracket.

9. Secure the windshield washer reservoir filler neck.

- Locate in clip.

10. Install the LH headlamp assembly.

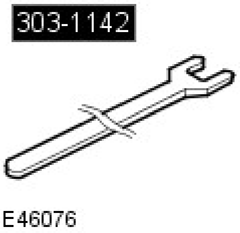
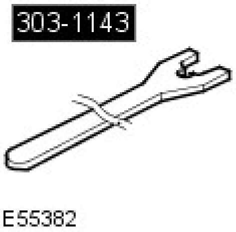
For additional information, refer to: Headlamp Assembly (417-01

Exterior Lighting, Removal and Installation).

Published: 11-May-2011

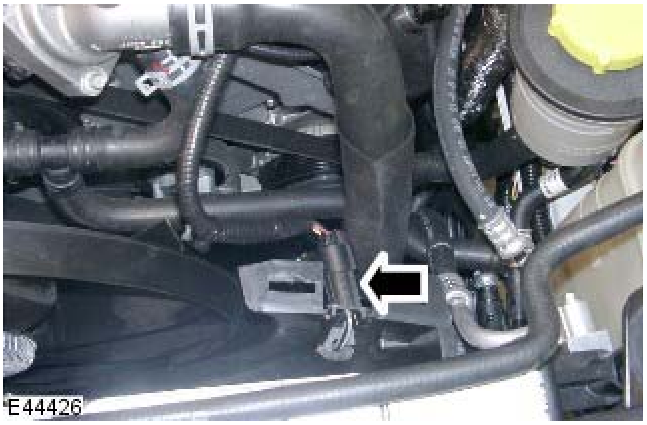
Engine Cooling - V8 4.4L Petrol - Cooling Fan

Removal and Installation

Special Tool(s)	
	Viscous coupling spanner 303-1142
	Viscous coupling pulley retaining tool 303-1143

Removal

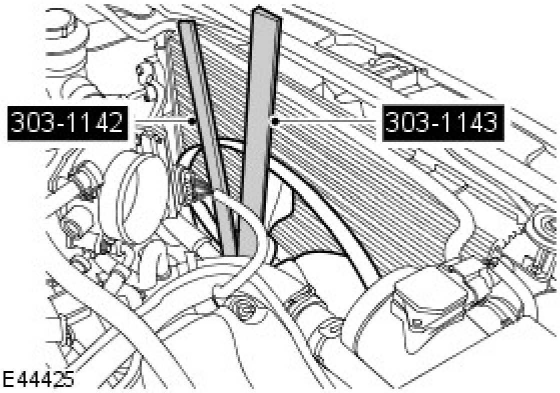
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the cooling fan shroud.
   For additional information, refer to: Cooling Fan Shroud (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).
3. Disconnect the cooling fan control electrical connector.

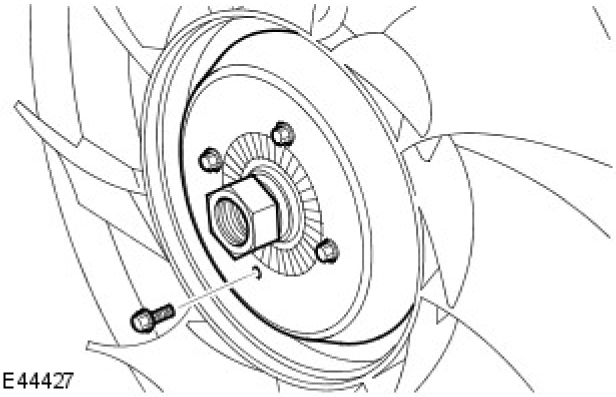


4. NOTE: The thread is left handed.

   Using the special tools, remove the cooling fan.

   - Remove the cooling fan assembly.




E44427

5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the viscous coupling from the cooling fan.

- Remove the 4 bolts.

Installation

1. To install, reverse the removal procedure.

- Install the cooling fan to the viscous coupling, tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the cooling fan assembly to 65 Nm (48 lb.ft).

Published: 11-May-2011

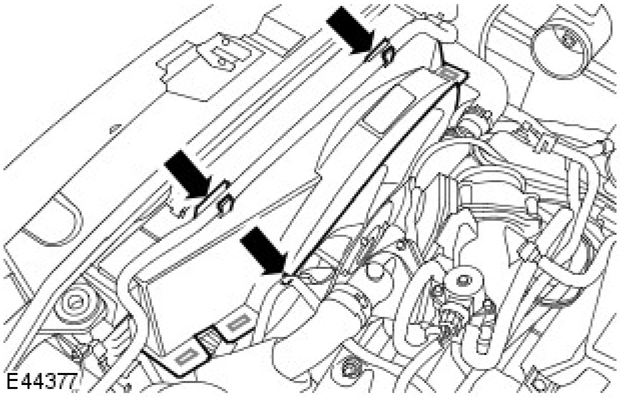
Engine Cooling - V8 4.4L Petrol - Cooling Fan Shroud

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the air intake resonator.
For additional information, refer to: Resonator (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).



3. Remove the upper fan shroud.

- Release the coolant expansion hose from the clips.
- Release the fan wiring harness clip.
- Release the 3 fan shroud clips.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Engine Cooling - V8 4.4L Petrol - Radiator

Removal and Installation

Removal

1. Raise and support the vehicle.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

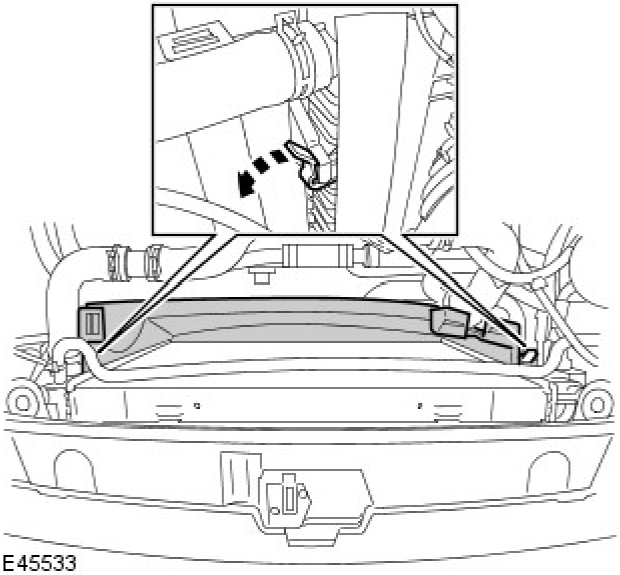
3. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

4. Remove the viscous fan assembly.
For additional information, refer to: Cooling Fan (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

5. Remove the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

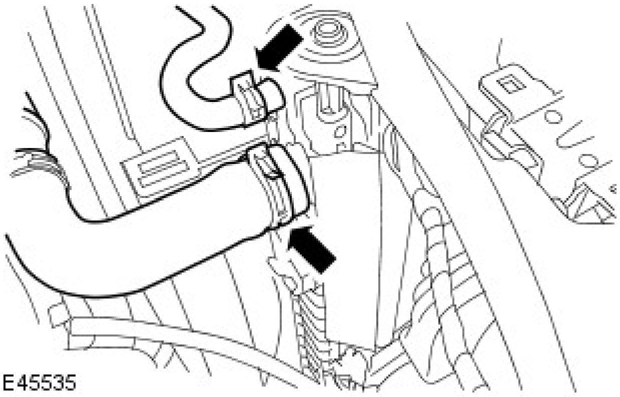
6. Remove the lower fan shroud.



- Release 2 clips from the cooling fan lower shroud.
- Release and remove the cooling fan lower shroud from the cooling pack.

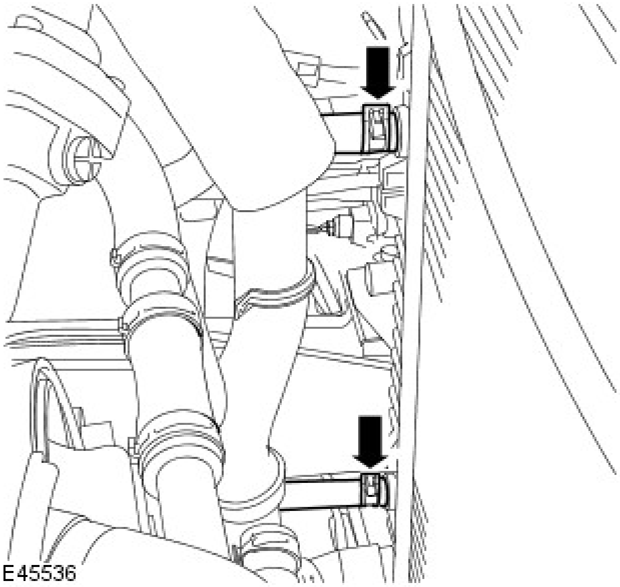
7. Disconnect the coolant expansion tank hose.

- Release the clip.



8. Disconnect the radiator upper hose.

- Release the clip.



9. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the transmission cooler hoses.

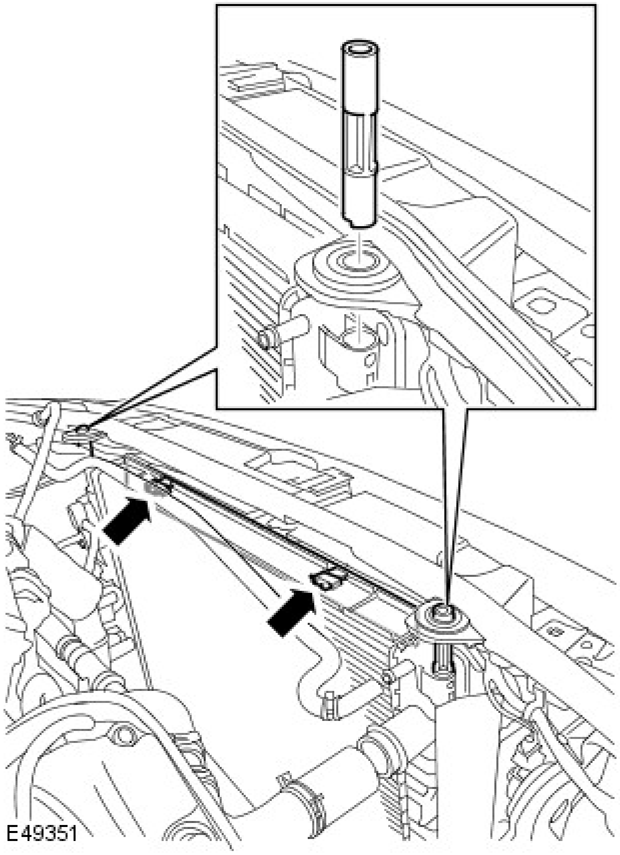
- Release the 2 clips.
- Position a container to collect the fluid.

10. Remove the radiator securing pegs.

- Depress the 2 clips.

11. Remove the radiator upper deflector.

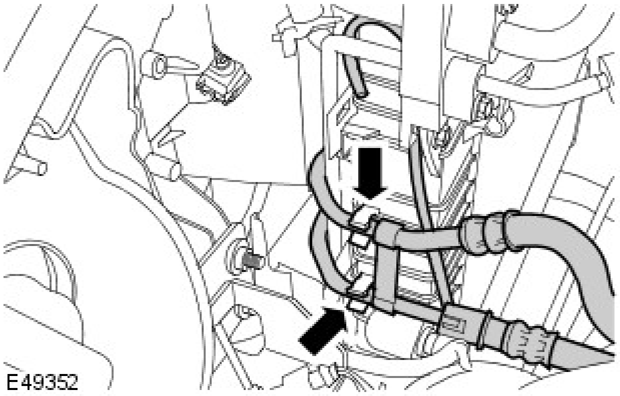
- Release the 2 clips.



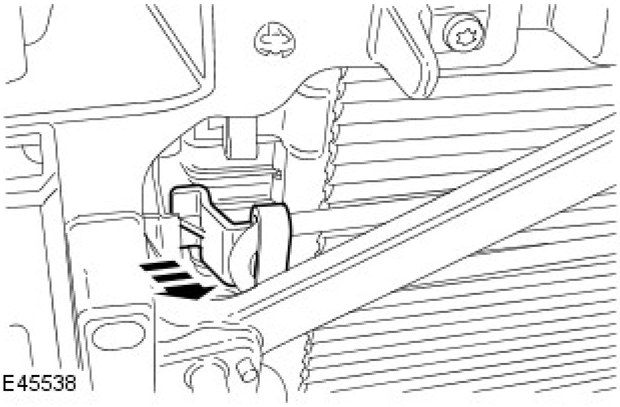
12. Release the power steering fluid cooler.

- Release the clips.
- Tie the line aside.

13. Release the front differential breather line.



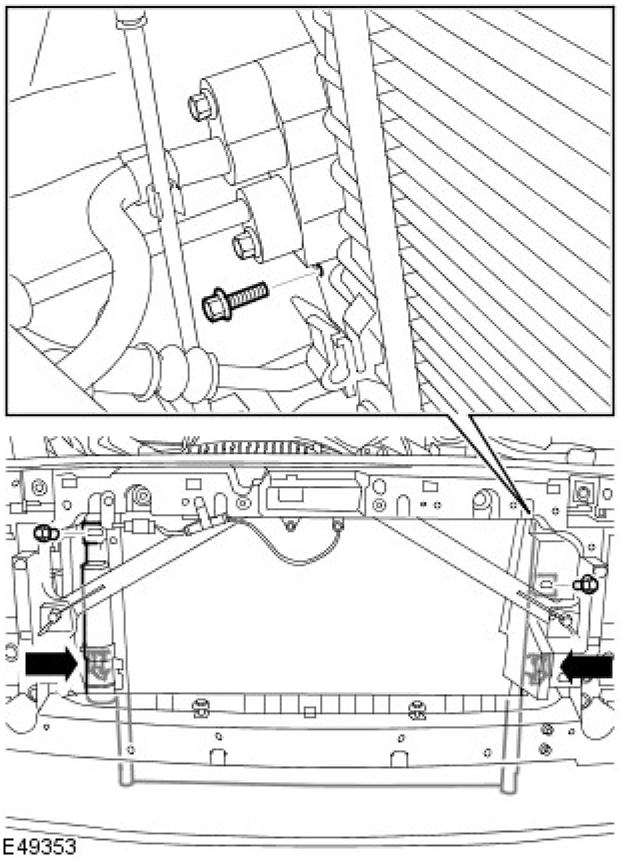
14. Remove the power steering fluid cooler line clip.

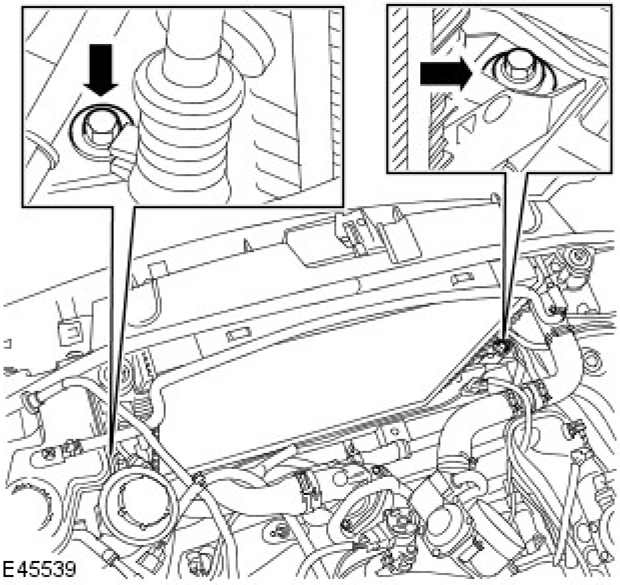


15. Remove the A/C manifold bolt.

16. Release the A/C condenser.

- Remove the 2 bolts.
- Release from the 2 clips.




E45539

17. Remove the radiator.

- Protect the elements from damage.
- With assistance, remove the radiator.
- Remove the 2 radiator retaining bolts.

Installation

1. Install the radiator.

- Remove the element protection.
- With assistance install the radiator.
- Align the radiator.
- Install the radiator retaining bolts.
- Tighten the bolts to 25 Nm (18 lb.ft).

2. Install the A/C condenser.

- Secure in the clips.
- Tighten the bolts to 6 Nm (4 lb.ft).

3. Install the A/C manifold bolt.

- Tighten the bolt to 10 Nm (7 lb.ft).

4. Install the power steering fluid cooler line clip.

5. Install the radiator upper deflector.

6. Install the power steering fluid cooler.

- Secure in the 3 clips.

7. Install the radiator securing pegs.

8. Install the transmission cooler hoses.

- Install the clips.

9. Install the radiator upper hose.

- Install the clip.

10. Install the radiator lower hose.

- Install the clip.

11. Install the coolant expansion tank hose to the upper radiator..

- Install the expansion tank hose clip.

12. Install the lower fan shroud.

- Install the cooling fan lower shroud.
- Install the 2 clips to the lower fan shroud.

13. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

14. Install the viscous fan assembly.
For additional information, refer to: Cooling Fan (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

15. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

17. Check automatic transmission fluid level.

Published: 11-May-2011

Engine Cooling - V8 4.4L Petrol - Thermostat

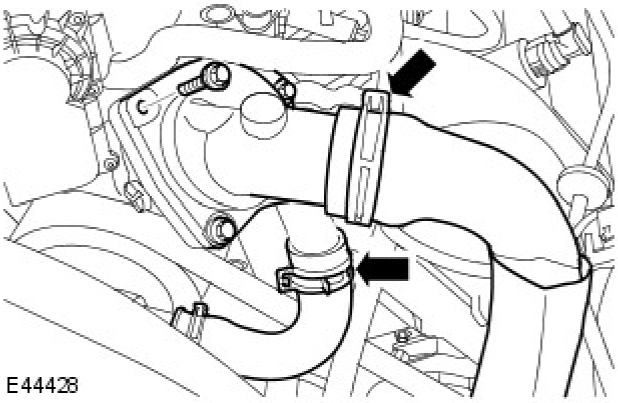
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the thermostat housing.

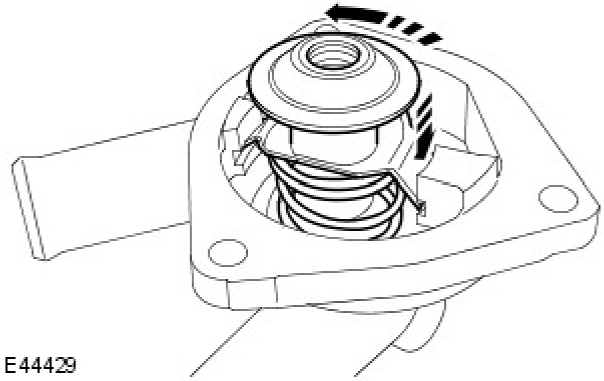
- Position a container to collect the fluid.
- Disconnect the coolant hoses from the thermostat housing.
- Remove the 3 bolts.
- Remove and discard the seal.



3. ⚠ WARNING: Eye protection must be worn.

Remove the thermostat.

- Position the thermostat housing in a vice.
- Release and remove the thermostat.



Installation

1. Clean the thermostat cover and housing mating faces.

2. To install, reverse the removal procedure.

- Install a new thermostat seal.
    1. Tighten the bolts to 10 Nm (7 lb.ft).

3. Top up and bleed the coolant.

4. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Engine Cooling - V8 4.4L Petrol - Coolant Pump

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

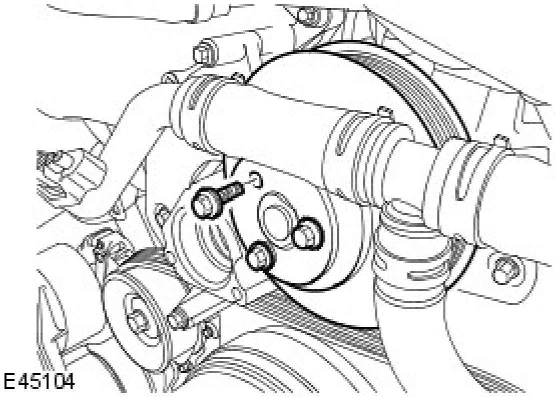
3. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

4. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

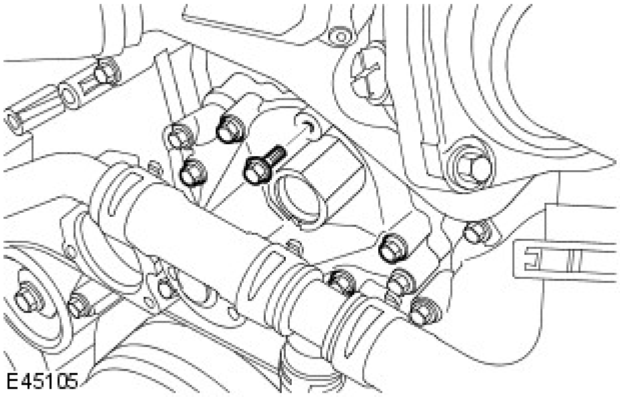
5. Remove the coolant pump drive pulley.

- Remove the 3 bolts.



6. Remove the coolant pump.

- Remove the 5 bolts.
- Discard the gasket.



Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.

2. Tighten the coolant pump retaining bolts.

   - Tighten the 5 bolts to 10 Nm (7 lb.ft).

3. Tighten the coolant pump pulley retaining bolts.

   - Tighten the bolts to 10 Nm (7 lb.ft).

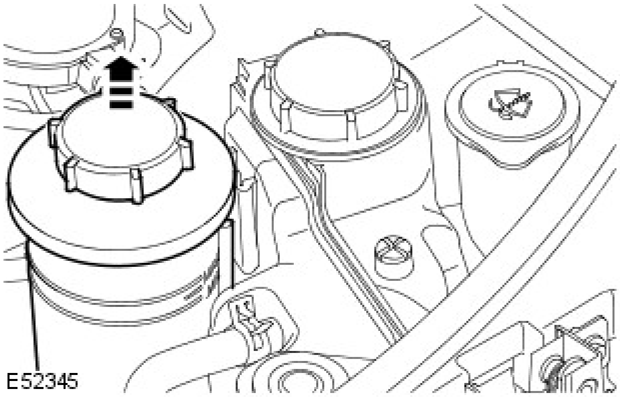
4. Install the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).
5. Refill the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

Published: 11-May-2011

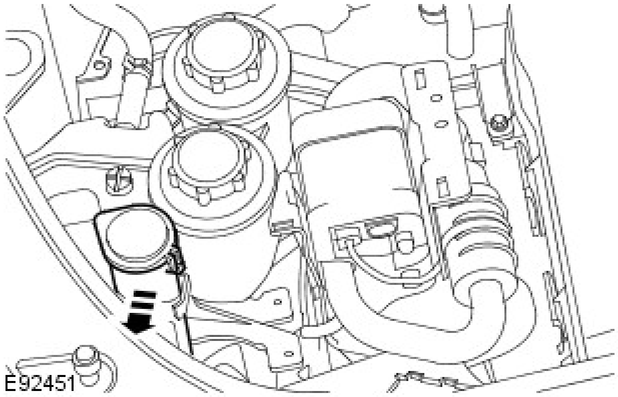
Engine Cooling - V8 4.4L Petrol - Engine Coolant Level Switch

Removal and Installation

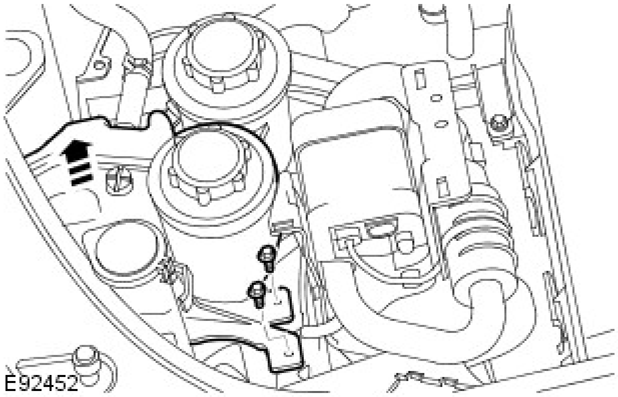
Removal



1. Release the power steering fluid reservoir from the bracket.

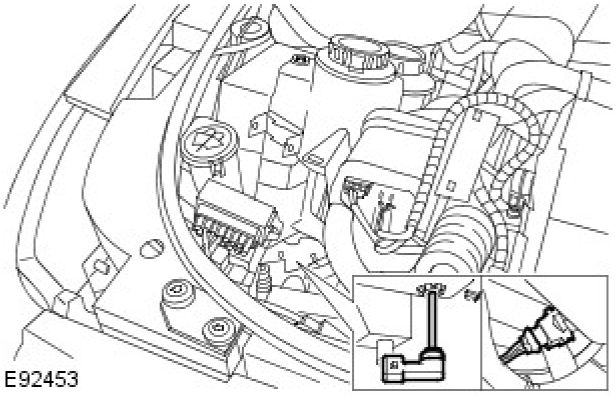


2. Release the windshield washer reservoir filler neck.



3. Reposition the coolant expansion tank.

- Remove the 2 bolts.



4. Remove the engine coolant level switch.

- Disconnect the engine coolant level switch electrical connector.

Installation

1. NOTE: An audible click can be heard when the engine coolant level switch is correctly installed.

Install the engine coolant level switch.

- Connect the engine coolant level switch electrical connector.

2. ⚠CAUTION: Make sure that the component is correctly located on the locating pegs.

Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

3. Secure the windshield washer reservoir filler neck.

4. Secure the power steering fluid reservoir to the bracket.

Published: 05-Jul-2011

Engine Cooling - TDV6 2.7L Diesel -

Fluids and Capacities

Item	**Specification**
* Anti-freeze	Havoline Extended Life Coolant (XLC) or any ethylene glycol based anti-freeze containing no methanol with only Organic Acid Technology (OAT) corrosion inhibitors
Anti-freeze concentration - Will provide frost protection to -40°C (-40°F)	50%
Specific gravity of coolant at 20°C (68°F), to protect against frost down to -40°C (-40°F)	1.068
Amount of anti-freeze to use for 50% concentration:	
Without fuel burning heater	4.7 litres (8.25 pints) (4.9 US quarts)
With fuel burning heater	5.1 litres (9.1 pints) (5.4 US quarts)

⚠ CAUTION: * No other anti-freeze should be used with Havoline Extended Life Coolant.

Capacity

Item	**Capacity**
Without fuel burning heater	9.4 litres (16.5 pints) (9.9 US quarts)
With fuel burning heater	10.35 litres (18.2 pints) (10.9 US pints)

General Specifications

Item	**Specification**
Cooling system type	Pressurised, thermostatically controlled with remote header tank
Radiator	Cross flow with integral transmission fluid and charge air coolers
Expansion tank	Remote - fitted with a bleed screw and low coolant level sensor
Pressure cap rating	110 kPa (1.1 bar) (16 lbf/in²)
Thermostat:	
Starts to open	88° C (190° F)
Fully open	95° C (203° F)
Cooling fan	Engine driven, viscous coupled with electronic control
Cooling fan diameter	500 mm (19.6 in)
Direction of rotation	Clockwise when viewed from front of engine
Coolant pump	Centrifugal flow impellor, belt driven from crankshaft

Torque Specifications

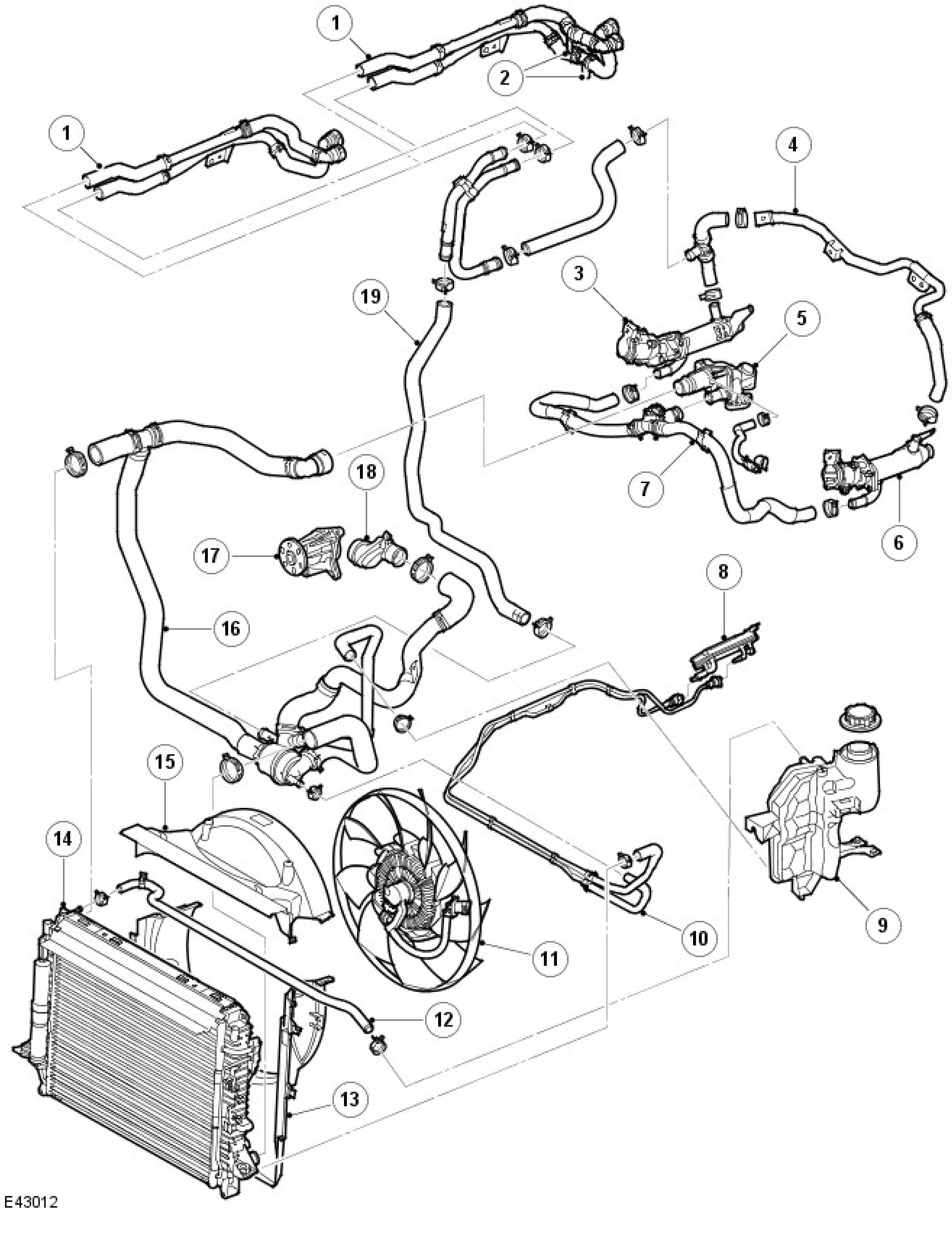
Description	**Nm**	**lb-ft**
Coolant expansion tank bolts	10	7
Radiator access panel	10	7
Coolant pump bolts	10	7
Coolant pump pulley bolts	25	18
Radiator securing bolts	25	18
Air Conditioning (A/C) condenser bolts	6	4
Charge air outlet hose clip	10	7
Charge air inlet hose clip	10	7
Cooling fan to viscous coupling bolts	10	7
* Cooling fan assembly	65	48
Coolant bleed screw(s)	3	2

*** Note: Left-hand thread**

Engine Cooling - TDV6 2.7L Diesel - Engine Cooling

Description and Operation

Cooling System Component Layout – Manual Gearbox Without Fuel Fired Booster Heater (FFBH)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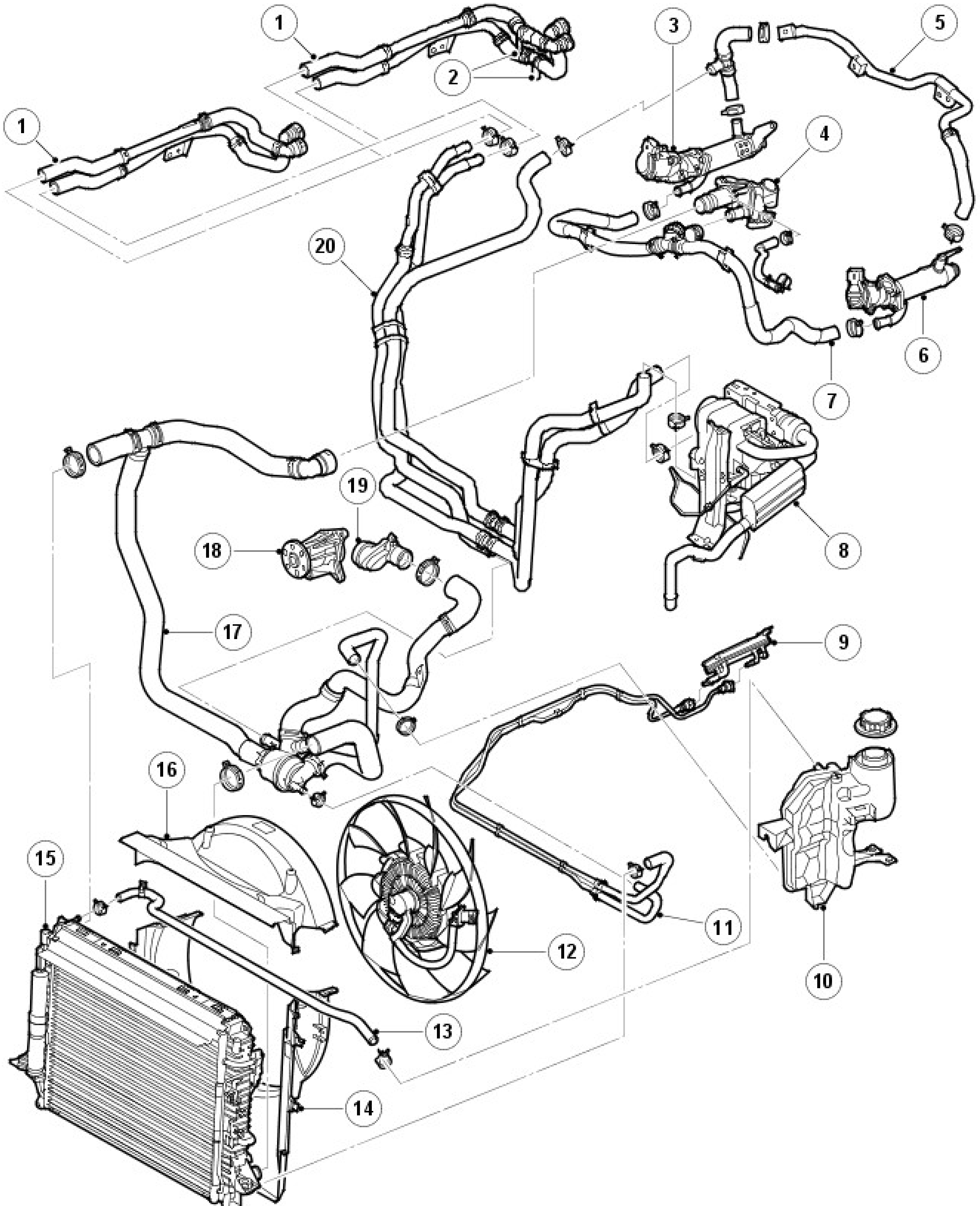
Item	Part Number	Description
1	-	Heater hose, in and out
2	-	Heater hose, in and out, for vehicles with rear heater (optional)
3	-	EGR valve
4	-	Hose, EGR
5	-	Water outlet assembly
6	-	EGR valve
7	-	Hose, EGR inlet
8	-	Fuel cooler
9	-	Expansion tank
10	-	Hose, fuel cooler
11	-	Cooling fan
12	-	Hose, radiator to expansion tank
13	-	Shroud, lower
14	-	Radiator
15	-	Shroud, upper
16	-	Hose and thermostat assembly
17	-	Water pump
18	-	Water inlet connector
19	-	Heater hose, thermostat

Cooling System Component Layout – Manual Gearbox, With FFBH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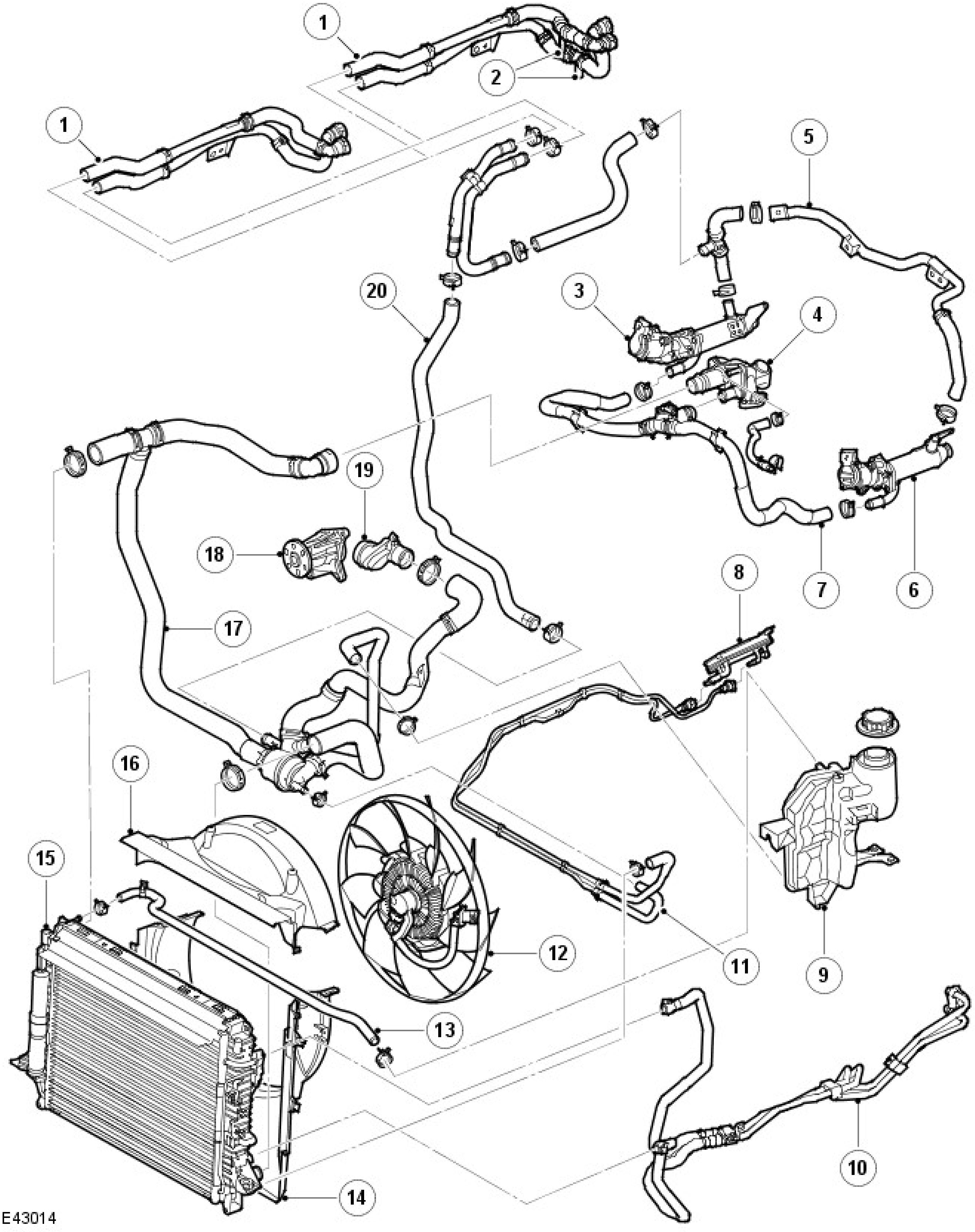
Item	Part Number	Description
1	-	Heater hose, in and out
2	-	Connections for rear heater (optional)
3	-	EGR valve
4	-	Water outlet assembly
5	-	Hose, EGR

6	-	EGR valve
7	-	Hose, EGR inlet
8	-	FFBH
9	-	Fuel cooler
10	-	Expansion tank
11	-	Hose, fuel cooler
12	-	Cooling fan
13	-	Hose, radiator to expansion tank
14	-	Shroud, lower
15	-	Radiator
16	-	Shroud, upper
17	-	Hose and thermostat assembly
18	-	Water pump
19	-	Water inlet connector
20	-	FFBH hose, in and out

Cooling System Component Layout – Automatic Gearbox Without FFBH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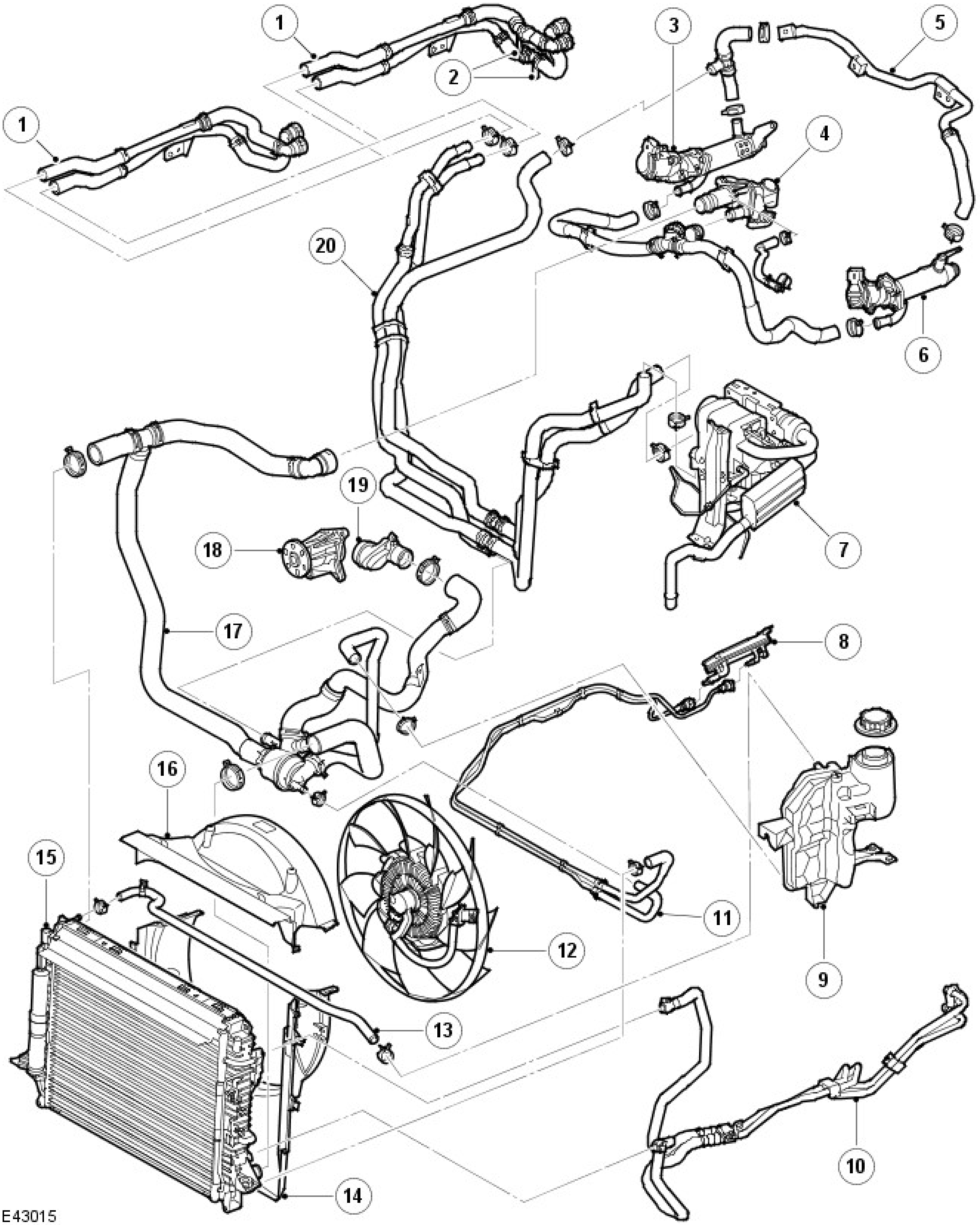
Item	Part Number	Description
1	-	Heater hose, in and out
2	-	Connections for rear heater (optional)
3	-	EGR valve
4	-	Water outlet assembly
5	-	Hose, EGR

6	-	EGR valve
7	-	Hose, EGR inlet
8	-	Fuel cooler
9	-	Expansion tank
10	-	Transmission oil cooler pipes
11	-	Hose, fuel cooler
12	-	Cooling fan
13	-	Hose, radiator to expansion tank
14	-	Shroud, lower
15	-	Radiator
16	-	Shroud, upper
17	-	Hose and thermostat assembly
18	-	Water pump
19	-	Water inlet connector
20	-	Heater hose, thermostat

Cooling System Component Layout – Automatic Gearbox, With FFBH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E43015

Item	Part Number	Description
1	-	Heater hose, in and out
2	-	Connections for rear heater (optional)
3	-	EGR valve
4	-	Water outlet assembly
5	-	Hose, EGR

6	-	EGR valve
7	-	FFBH
8	-	Fuel cooler
9	-	Expansion tank
10	-	Transmission oil cooler pipes
11	-	Hose, fuel cooler
12	-	Cooling fan
13	-	Hose, radiator to expansion tank
14	-	Shroud, lower
15	-	Radiator
16	-	Shroud, upper
17	-	Hose and thermostat assembly
18	-	Water pump
19	-	Water inlet connector
20	-	FFBH hose, in and out

GENERAL

The cooling system employed is of the pressure relief by-pass type, which allows coolant to circulate around the engine and the heater circuit while the thermostat main valve is closed. The primary function of the cooling system is to maintain the engine within an optimum temperature range under changing ambient and engine operating conditions. Secondary functions are to provide heating for the passenger compartment and cooling for the transmission fluid and engine oil.

The cooling system comprises:

- A radiator
- An intercooler
- A passenger compartment heater matrix
- Two fuel coolers
- Two Exhaust Gas Recirculation (EGR) coolers
- FFBH (Market dependant)
- A coolant pump
- A Pressure Relief Thermostat (PRT)
- An expansion tank
- An electro-viscous fan
- Connecting hoses and pipes.

ENGINE COOLING SYSTEM

The coolant is circulated by a centrifugal type pump mounted on the front of the engine and driven by the ancillary drive 'polyvee' belt. The coolant pump circulates coolant around the cylinder block and cylinder heads via a chamber located in the 'vee' of the engine. Some of the coolant flow is diverted through the integrated fuel and engine oil coolers. Having passed through the engine and oil coolers, the coolant returns to the thermostat housing via the by-pass pipe. Coolant also circulates through the EGR coolers to the heater matrix and returns to the engine side of the PRT.

On vehicles fitted with FFBH, the coolant circulates through the EGR coolers to the FFBH unit (whether active or not) and then on to the heater matrix. The coolant then returns to the engine side of the PRT.

The PRT housing contains a normal thermostat, which is positioned such that the wax's temperature is controlled by both the coolant from the radiator and the bypass. This results in the thermostat being able to vary its opening temperature dependant on ambient conditions. The PRT also contains a sprung loaded valve, which limits the amount flow using the bypass. This means that the engine can run without coolant flowing through the bypass temporarily, to improve heater performance.

The radiator is a cross flow type with an aluminium matrix and has a drain tap on the lower RH rear face. The lower radiator mountings are located part way up the end tanks. The mountings are fitted with rubber bushes, which sit on the upper chassis rails. The radiator upper is mounted by pins, which are pushed through rubber bushes mounted in the Front End Carrier (FEC) above the radiator.

The intercooler is attached to the bottom of the radiator by two pins, which locate into fittings in the radiator end tanks.

The radiator top hose is connected to the PRT by the bypass hose and the bottom hose is directly connected to the outlet side of the thermostat housing.

The expansion tank is fitted forward of the LH suspension turret in the engine compartment. The expansion tank allows for the expansion of the coolant as the engine gets hot and also supplies the engine with coolant as the coolant in the engine contracts. The tank also allows any air trapped in the coolant to be removed.

The liquid cooled transmission fluid cooler (automatic models only) is mounted in the cold side radiator end tank. It is positioned in the middle of the LH end tank.

The 2nd fuel cooler is fed from a sub-cooled section in the cold side end tank of the radiator and returns into the PRT housing on the radiator side.

On vehicles fitted with a FFBH, the unit is located forward of the LH suspension turret. Coolant flows through the FFBH whether it is active or not. The exhaust from the burner is vented into the front LH wheel arch.
For additional information, refer to: Auxiliary Heater (412-02B Auxiliary Heating, Description and Operation).

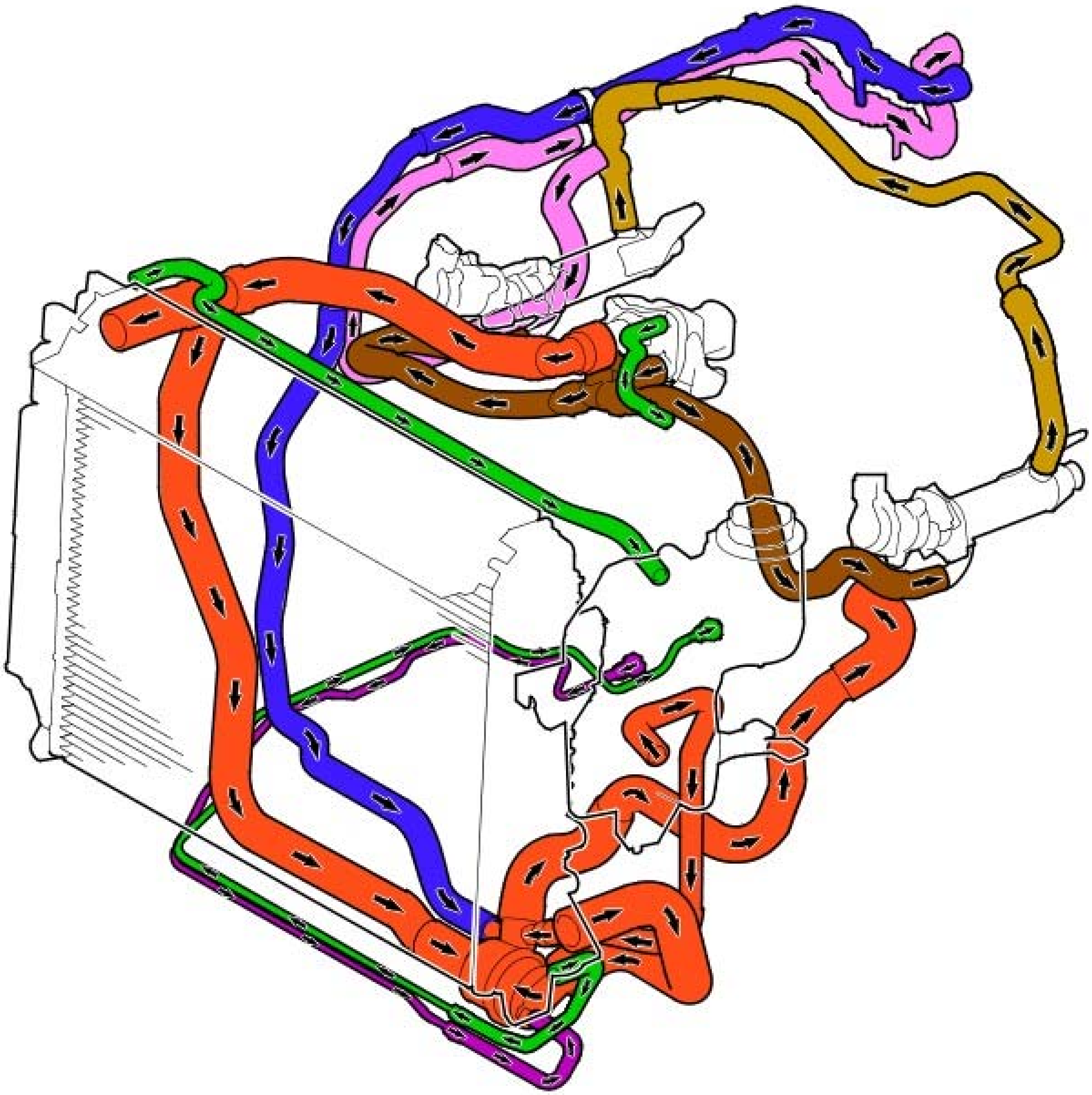
For additional airflow through the radiator matrix, particularly when the vehicle is stationary, there is an engine driven electro-viscous fan unit fitted to the rear of the radiator. The fan is used for engine cooling and for Air Conditioning (A/C) system cooling. This unit functions as a normal viscous fan, but with electronic control over the level engagement of the clutch. The Engine Control Module (ECM), which determines the required fan speed, controls the level of clutch engagement. The ECM determines engagement based on the coolant, charge air, ambient and transmission oil temperatures and the A/C pressure. The fan is mounted using a left hand thread.

The viscous fan unit is electronically controlled by the ECM to optimise fan speed for all operating conditions.

- NOTE: If the electrical connections to the viscous fan are disconnected the fan will 'idle' and overheating may result. The ECM stores the appropriate fault codes in this case.

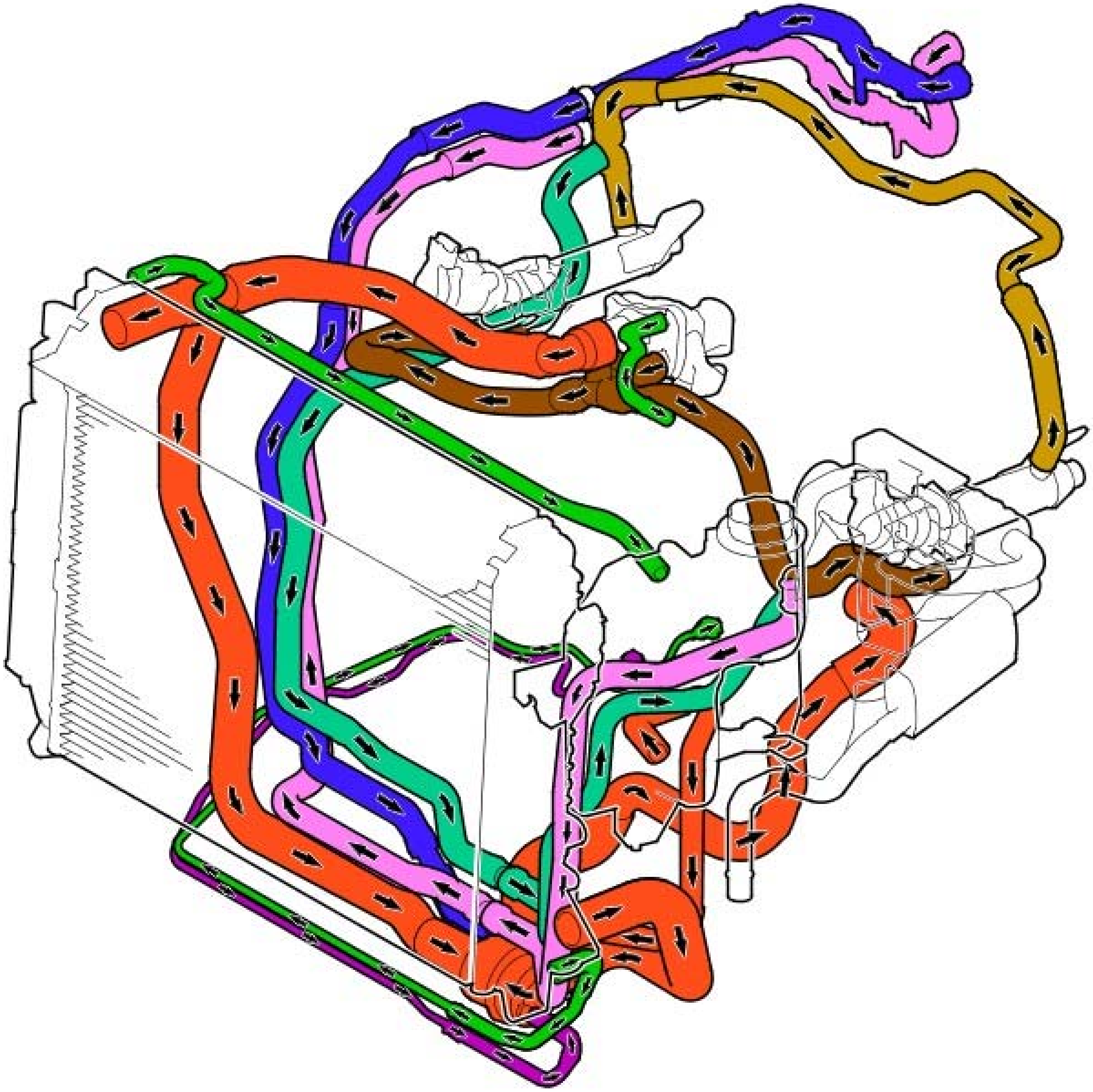
ENGINE COOLING SYSTEM OPERATION

Cooling System Coolant Flow – Manual Gearbox Without FFBH



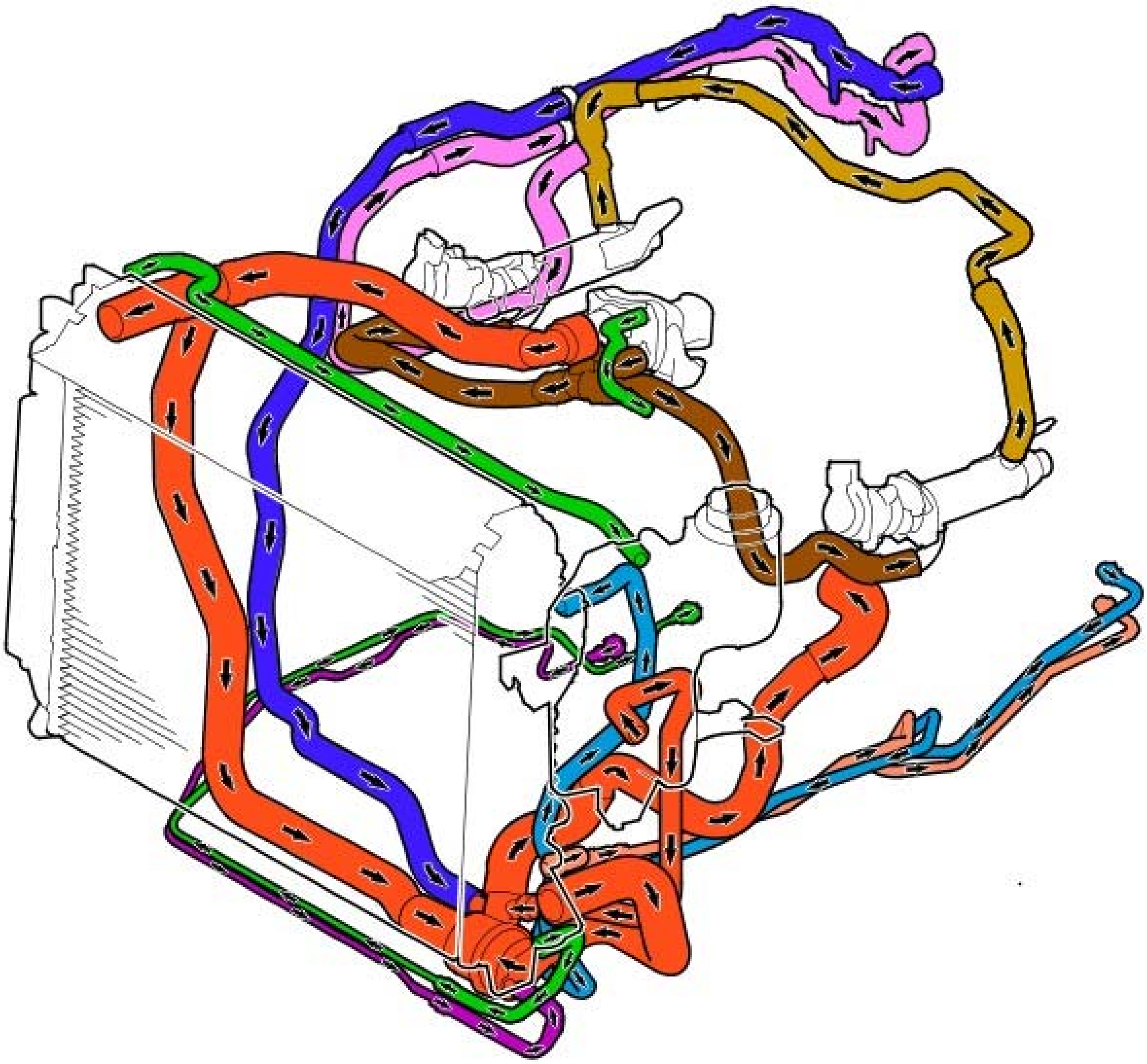
E43016

Cooling System Coolant Flow – Manual Gearbox With FFBH



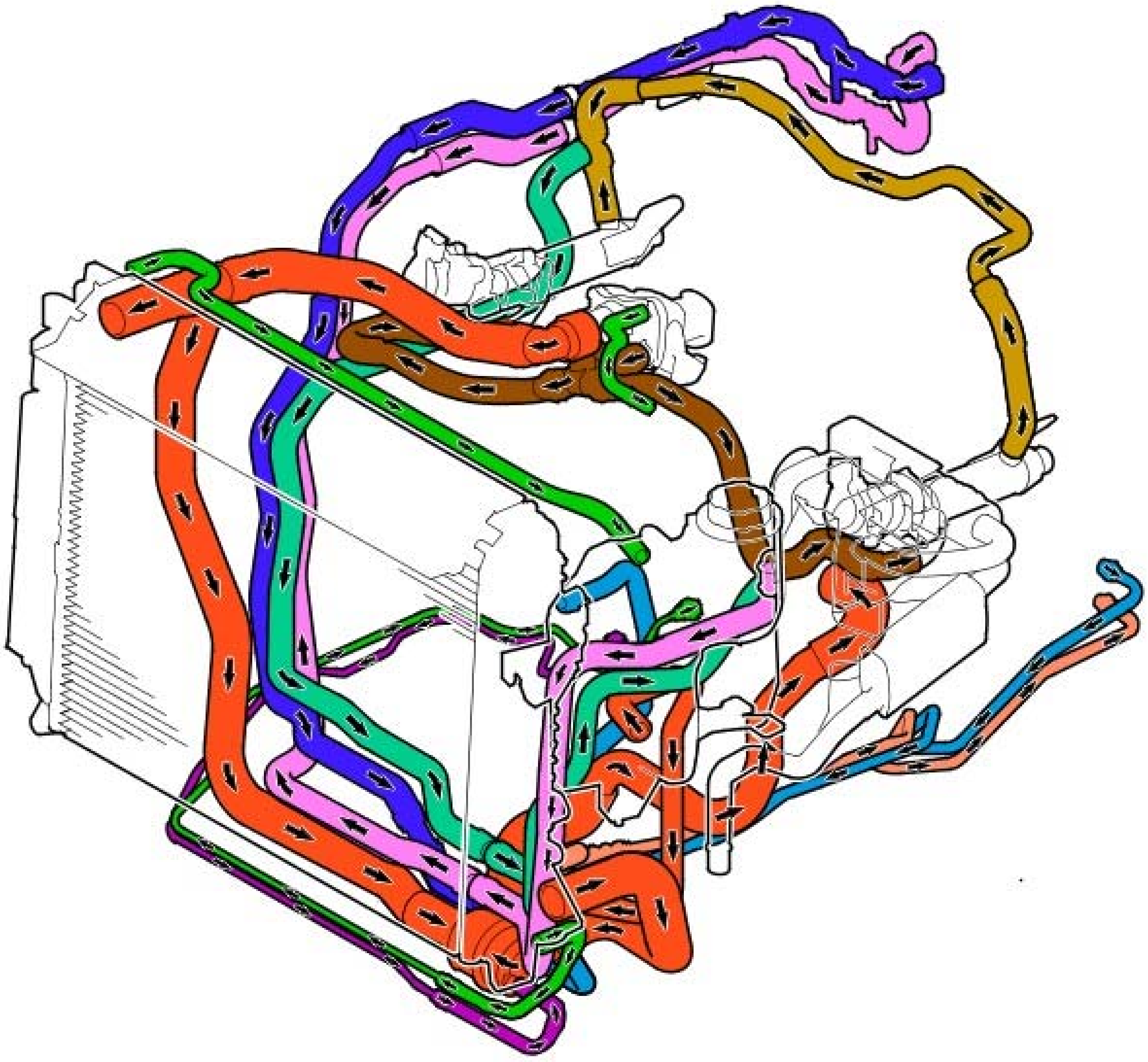
E43017

Cooling System Coolant Flow – Automatic Gearbox Without FFBH



E43018

Cooling System Coolant Flow – Automatic Gearbox With FFBH



E43019

When the engine is running the coolant pump is driven by the ancillary drive belt. This forces coolant to circulate around the engine and heater, while the thermostat and bypass valves are shut. As the temperature and pressure increases the bypass valve is forced open allowing coolant to circulate through the bypass valve. When the temperature reaches 82°C (180°F) the main thermostat begins to open, allowing coolant to circulate through the main radiator. As the thermostat progressively opens (fully open at 95°C (203°F)), the bypass valve progressively closes forcing any coolant through the heater or radiator. Once coolant is allowed to circulate through the radiator, the transmission fluid (automatic models only) and fuel coolers begin to receive coolant flow.

The increased coolant volume, created by heat expansion, is directed to the expansion tank through a bleed hose from the top of the radiator. The expansion tank has an outlet hose, which is connected into the coolant circuit. This outlet hose returns the coolant to the system when the engine cools.

Coolant flows through the radiator from the top right hand tank to the bottom left hand tank and is cooled by air passing through the matrix. The temperature of the cooling system is monitored by the ECM via the Engine Coolant temperature (ECT) sensor located in the cylinder head. The ECM uses signals from this sensor to control the cooling fan operation and adjust fuelling according to engine temperature.
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

To control the cooling fan, the ECM sends a Pulse Width Modulated (PWM) signal to the cooling fan module (integral to the ECM).

The frequency of the PWM signal is used by the cooling fan module to determine the output voltage supplied to the fan motor.

The ECM varies the duty cycle of the PWM signal between 0 and 100% to vary the fan speed. If the PWM signal is outside the 0 to 100% range, the cooling fan module interprets the signal as an open or short circuit and runs the fans at maximum speed to ensure the engine and gearbox do not overheat.

The ECM operates the fan in response to inputs from the ECT sensor, the transmission oil temperature sensor, the charge air temperature sensor, the A/C switch and the A/C pressure sensor.
For additional information, refer to: Air Conditioning (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Description and Operation).

The speed of the cooling fan is also influenced by vehicle road speed. The ECM adjusts the speed of the cooling fans, to compensate for the ram effect of vehicle speed, using the Controller Area Network (CAN) road speed signal received from the Anti-lock Braking System (ABS) module.

Pressure Relief Thermostat (PRT)

The thermostat is exposed to 85% hot coolant from the engine on one side and 15% cold coolant returning from the radiator bottom hose on the other. This allows the thermostat to react to the ambient conditions and provide coolant control for both winter and summer use. Hot coolant from the engine passes via holes in the by-pass flow valve into a tube which surrounds 85% of the thermostat sensitive area. Cold coolant from the radiator conducts through the remaining 15% of the sensitive area. In cold ambient conditions, the engine temperature is raised by approximately 10°C (50°F) to compensate for the heat loss of 15% exposure to the cold coolant returning from the bottom hose. This improves heater performance and engine warm-up.

The by-pass flow valve is held closed by a light spring and operates to further assists engine and heater warm-up. When the main valve is closed and the engine speed is at idle, the coolant pump does not produce sufficient flow and pressure to overcome the spring and open the valve. In this condition the valve prevents coolant circulating through the by-pass circuit and directs coolant through the heater matrix only. This provides a higher flow of coolant through the heater matrix improving passenger comfort in cold conditions.

When the engine speed increases above idle, the coolant pump produces a greater flow and pressure than the heater circuit can accommodate. The build up of pressure acts on the flow valve, overcoming the spring pressure, opening the valve and relieving the pressure in the heater circuit. The valve then modulates to provide maximum coolant flow through the heater matrix and allowing excess coolant to flow into the by-pass circuit to provide the engine's cooling requirements at higher engine speeds. The thermostat then regulates the flow through the radiator to maintain the engine at the optimum temperature. Maximum opening of the thermostat, and therefore maximum flow through the radiator, occurs if the coolant temperature reaches 95°C (203°F).

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Engine Cooling - TDV6 2.7L Diesel - Engine Cooling

Diagnosis and Testing

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
Coolant leaks Coolant Hoses Coolant expansion tank Radiator Heater core Accessory drive belt Viscous fan	Fuses Harnesses Loose or corroded connector(s) Engine coolant temperature (ECT) sensor

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible cause	Action
Coolant loss	Hoses Hose connections Radiator Water pump Heater core Gaskets Engine casting cracks Engine block core plugs	Carry out a visual inspection. If there are no obvious leaks, carry out a pressure test using your workshop tester. Rectify as necessary. Refer to the relevant section of the workshop manual.
Overheating	Low/Contaminated coolant Thermostat Viscous fan ECT sensor Restricted air flow over the radiator	Check the coolant level and condition. Check the thermostat and rectify as necessary. Carry out a cooling system pressure test. Refer to the relevant section of the workshop manual. Check the viscous fan operation, make sure the viscous fan rotates freely. Check for obstructions to the air flow over the radiator.
Engine not reaching normal temperature	Thermostat Viscous fan Thermostat Electric fan Fan speed module	Check the thermostat operation. Check the viscous fan operation, make sure the viscous fan is not seized.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
P011600	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine coolant temperature (ECT) sensor circuit high resistance ECT sensor circuit short	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not

DTC	Description	Possible causes	Action
		circuit to ground ● ECT sensor circuit short circuit to power ● ECT sensor failure	increased by more than 10°C, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	● ECT sensor disconnected ● Engine coolant temperature (ECT) sensor sensing circuit high resistance, short circuit to power ● ECT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011800	Engine Coolant Temperature Sensor 1 Circuit High	● Engine overheat condition/cooling fan failure ● ECT sensor wiring short circuit to ground ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck closed). Check for cooling fan DTCs. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011900	Engine Coolant Temperature Sensor 1 Circuit Intermittent/Erratic	● Engine coolant temperature (ECT) sensor circuit high resistance ● ECT sensor circuit short circuit to ground ● ECT sensor circuit short circuit to power ● ECT sensor failure	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10°C, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.

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Engine Cooling - TDV6 2.7L Diesel - Cooling System Draining, Filling and Bleeding

General Procedures

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Set the heater controls to maximum.

3. Disconnect the battery ground cable.

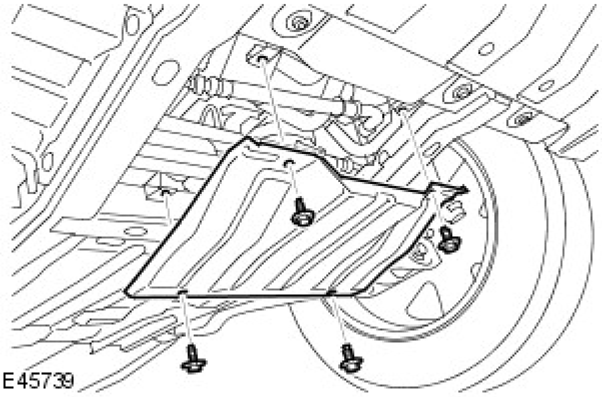
4. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

5. WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Remove the coolant expansion tank cap.

6. Remove the radiator access panel.

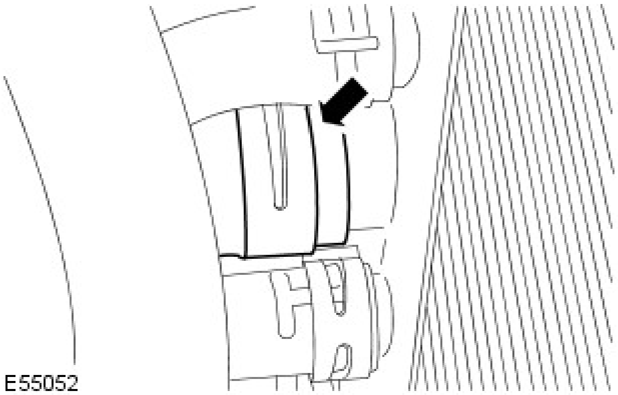
- Remove the 4 bolts.



7. Position a container to collect the fluid.

8. CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Release the clip and disconnect the radiator lower coolant hose, allow the coolant to drain.



9. Remove the container.

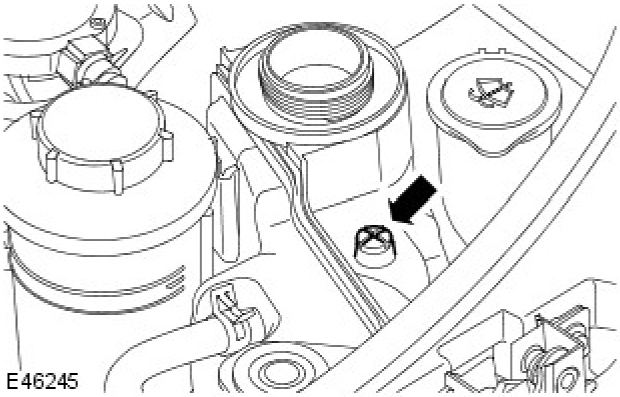
10. Connect and secure the radiator lower coolant hose.

- Secure with the clip.

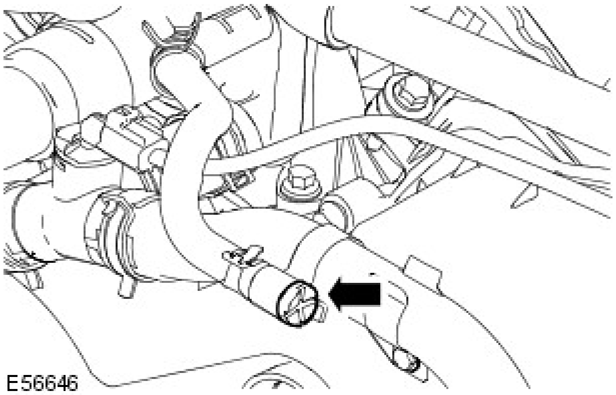
11. Connect the battery ground cable.

12. Connect exhaust extraction hoses to the tail pipes.

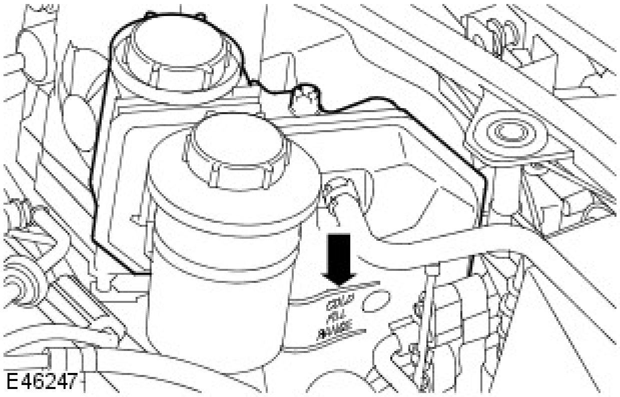
13. Loosen the coolant expansion tank bleed screw.



14. Loosen the cylinder head bleed hose bleed screw.



15. Fill the cooling system, keeping coolant to the upper level mark of the expansion tank.



16. Tighten the bleed screws.

17. Install the coolant expansion tank cap.

18. Start and run the engine.

- Hold the engine speed at 3,000 RPM for one minute.
- Return the engine to idle for five minutes.
- Hold the engine speed at 3,000 RPM for one minute.
- Run the engine until the thermostat opens.

19. WARNING: Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

• NOTE: When the coolant bleed is complete and prior to installing the expansion tank cap, top-up the expansion tank to 30mm above the maximum level.

Switch the engine off.

- Remove the coolant expansion cap, allow the level to settle and top-up so that the level is 30mm above the upper level.
- Allow the engine to cool.

20. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

21. Clean any spilt coolant from the vehicle.

22. Install the radiator access panel.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

23. Check and top-up the coolant if required.

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Engine Cooling - TDV6 2.7L Diesel - Cooling System Pressure Test

General Procedures

• NOTE: The following procedure will enable the cooling system to be pressure tested for condition and leaks. Stage 1 will check the expansion tank cap register seal and the cap for leaks. Stage 2 will check the entire cooling system.

• NOTE: It will be necessary to use the cooling system test kit, Part Number LR-218, which is available under the equipment programme.

1. Examine the coolant hoses for signs of cracking, distortion and security of the hose connections.

2. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Disconnect the coolant expansion tank bleed hose.

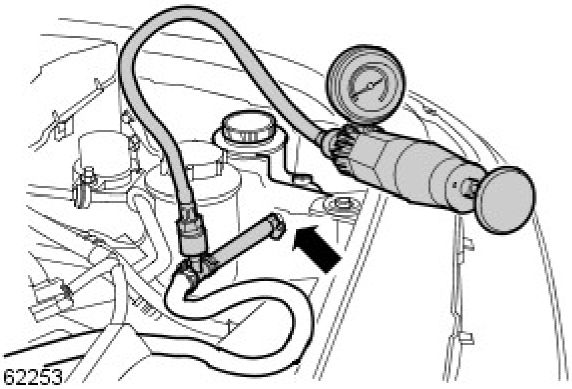
- Release the clip.

3. Install the 'T' piece adaptor (part of the cooling system test kit) between the coolant expansion tank and the coolant bleed hose.

- Secure with the 2 clips.

4. Install the coolant pressure pump assembly.

- Connect to the 'T' piece.



E62253

5. Pressurize the cooling system.

- Slowly pressurize the cooling system to 1.0 bar (100 kPa) (14.5 psi).
- Check the pressure remains above 0.9 bar (90 kPa) (13 psi) after waiting for 30 seconds.
- During the pressure drop check, listen for a hissing noise from the expansion tank cap.

6. NOTE: If the coolant expansion tank cap is found to be leaking, replace the cap.

Depressurize the cooling system.

- Disconnect the 'T' piece.
- Connect the coolant expansion tank bleed hose.
- Secure the clip.

7. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Remove the coolant expansion tank cap.

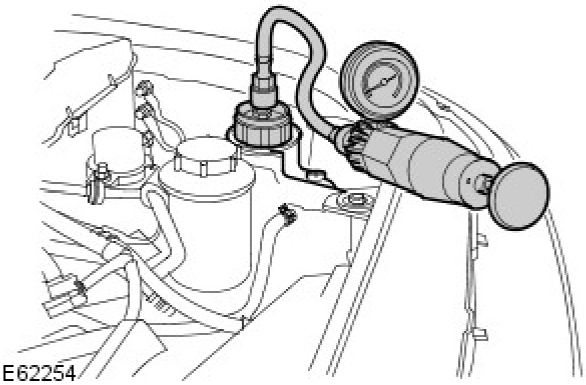
8. NOTE: This adaptor is part of the cooling system test kit.

Install adaptor K83 to the coolant expansion tank.

- Clean the component mating faces.
- Lubricate the seal.

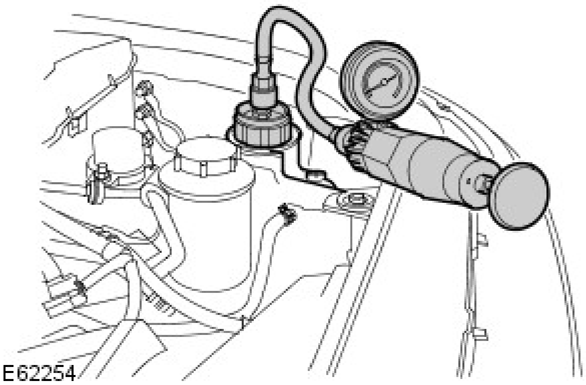
9. Install the coolant pressure pump assembly.

- Slowly pressurize the cooling system to 1.5 bar (150kPa) (22 psi), check the pressure over a 5 minute period. A small pressure decay of approximately 0.15 bar (15 »kPa) (1 psi) over the first minute is normal, as the air in the expansion tank cools.
- If the pressure continues to drop after the initial tolerance, there is a coolant leak.



10. Depressurize and remove the pressure pump and gauge.

- Install the coolant expansion tank cap.



Published: 11-May-2011

Engine Cooling - TDV6 2.7L Diesel - Coolant Expansion Tank

Removal and Installation

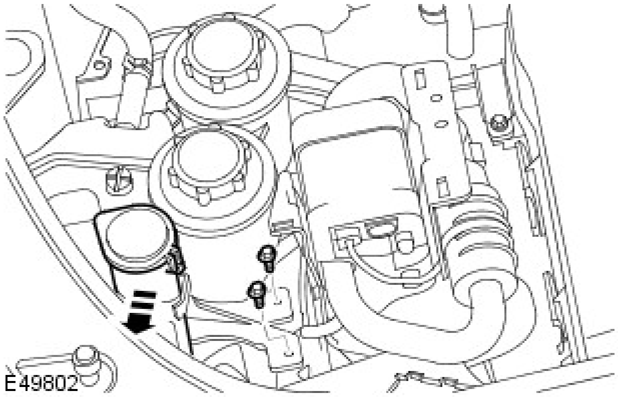
Removal

1. Remove the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01, Removal and Installation).

2. Release the windshield washer reservoir filler neck.

3. Release the coolant expansion tank.

- Remove the 2 bolts.



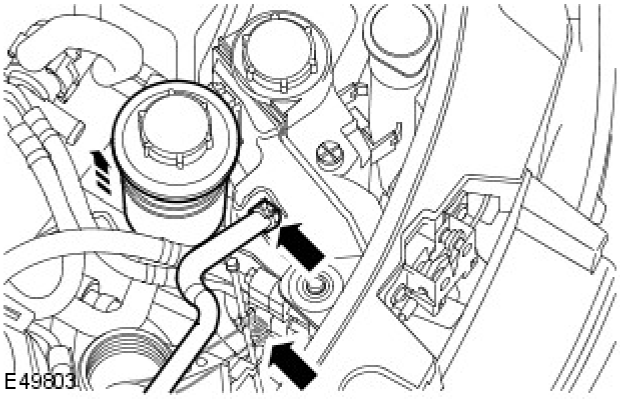
4. Release the power steering fluid reservoir.

5. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

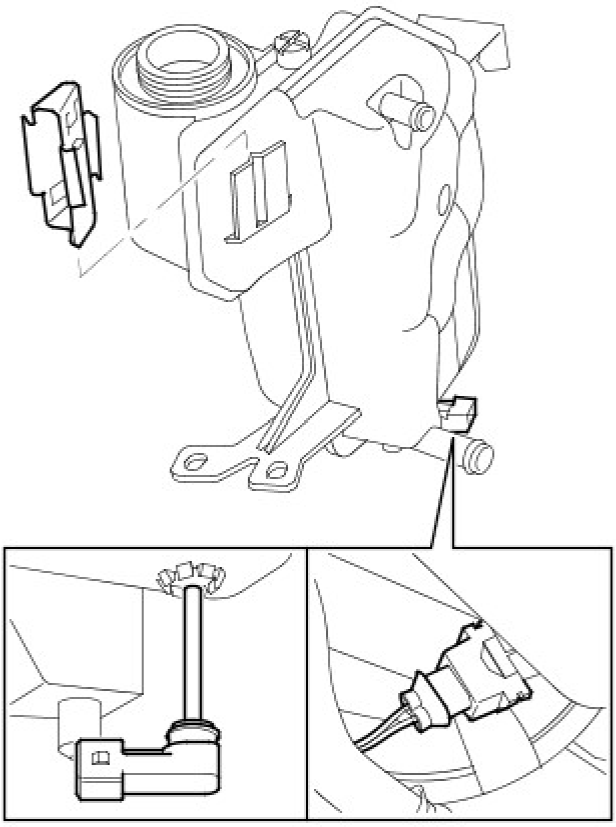
Disconnect the 2 hoses from the coolant expansion tank.

- Position an absorbent cloth to collect fluid spillage.
- Position a container to collect the fluid.
- Clamp the hoses
- Release the 2 clips.



6. Remove the coolant expansion tank.

- Disconnect the coolant low level sensor electrical connector.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7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the coolant low level sensor.

- Remove the coolant expansion tank support bracket.

Installation

1. Install the bracket.

2. Install the coolant low level sensor.

3. Install the coolant expansion tank.

- Connect the coolant low level sensor electrical connector.

4. Connect the coolant hoses to the expansion tank.

- Secure with the clips.

5. Top-up the coolant.

- Loosen the coolant expansion tank bleed screw.
- Fill the coolant expansion tank until coolant emerges from the cooling system air bleed screw.
- Remove the hose clamps.
- Tighten the bleed screw to 8 Nm (6 lb.ft).

6. Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

7. Check and top-up the coolant.

- Install the coolant expansion tank pressure cap.

8. Secure the power steering fluid reservoir.

- Attach to the mounting bracket.

9. Secure the windshield washer reservoir filler neck.

- Locate in clip.

10. Install the LH headlamp assembly.

For additional information, refer to: Headlamp Assembly (417-01, Removal and Installation).

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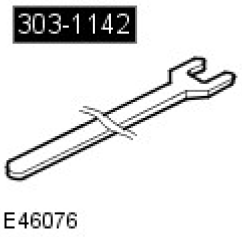
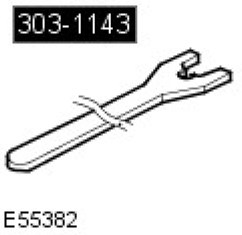
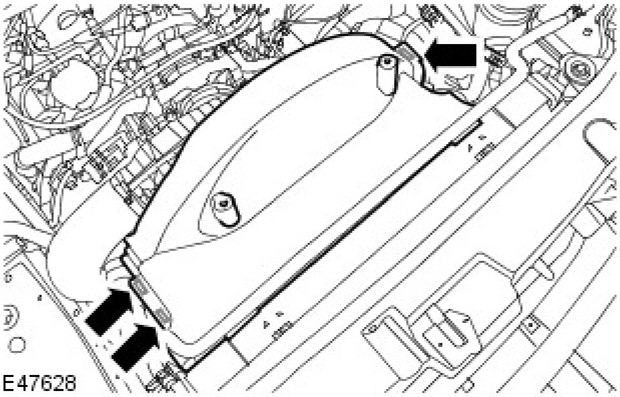
Engine Cooling - TDV6 2.7L Diesel - Cooling Fan

Removal and Installation

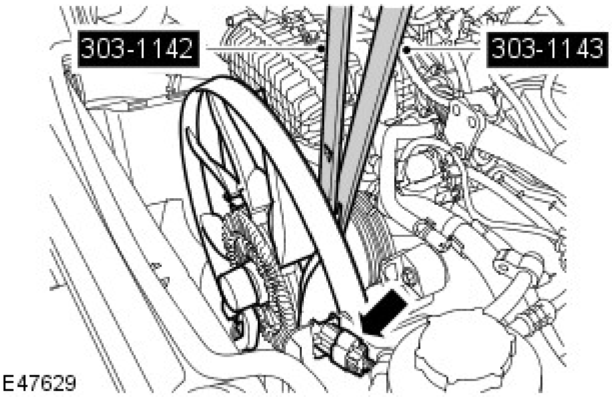
Special Tool(s)	
	Viscous coupling spanner 303-905 (LRT-12-094)
	Viscous coupling pulley retaining tool 303-1143

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the air cleaner assembly.
   For additional information, refer to: Air Cleaner (303-12C Intake Air Distribution and Filtering - TDV6 2.7L Diesel, Removal and Installation).

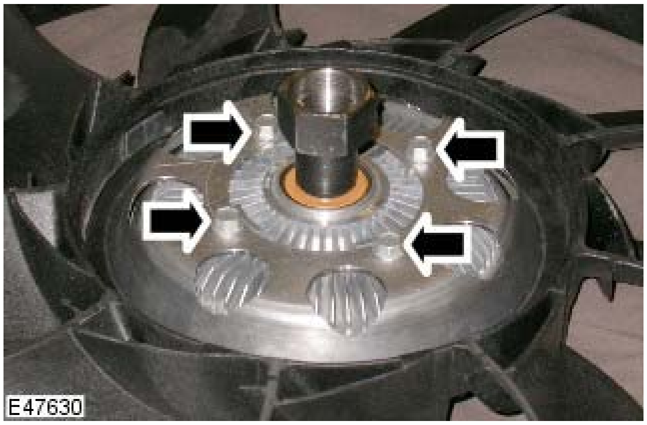


3. Remove the cooling fan shroud.
   - Release the coolant hose.
   - Release the 3 clips.



4. NOTE: The thread is left handed.

   Remove the cooling fan assembly.
   - Disconnect the electrical connector.
   - Use the special tools.



5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the viscous coupling.

- Remove the 4 bolts.

Installation

1. Install the viscous coupling.

- Clean the component mating faces.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the cooling fan assembly.

- Clean the component mating faces.
- Tighten the cooling fan assembly to 65 Nm (48 lb.ft).
- Connect the electrical connector.

3. Install the cooling fan shroud.

4. Install the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12C Intake Air Distribution and Filtering - TDV6 2.7L Diesel, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Engine Cooling - TDV6 2.7L Diesel - Cooling Fan Shroud

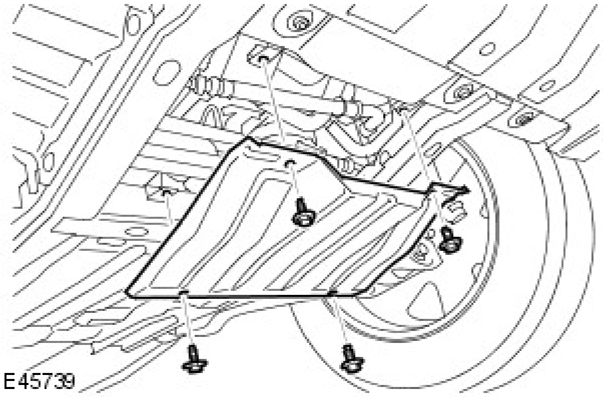
Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

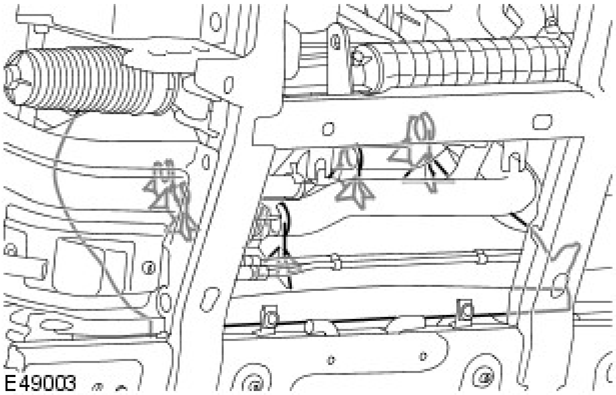
Raise and support the vehicle.

2. Remove the cooling fan assembly.
For additional information, refer to: Cooling Fan (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

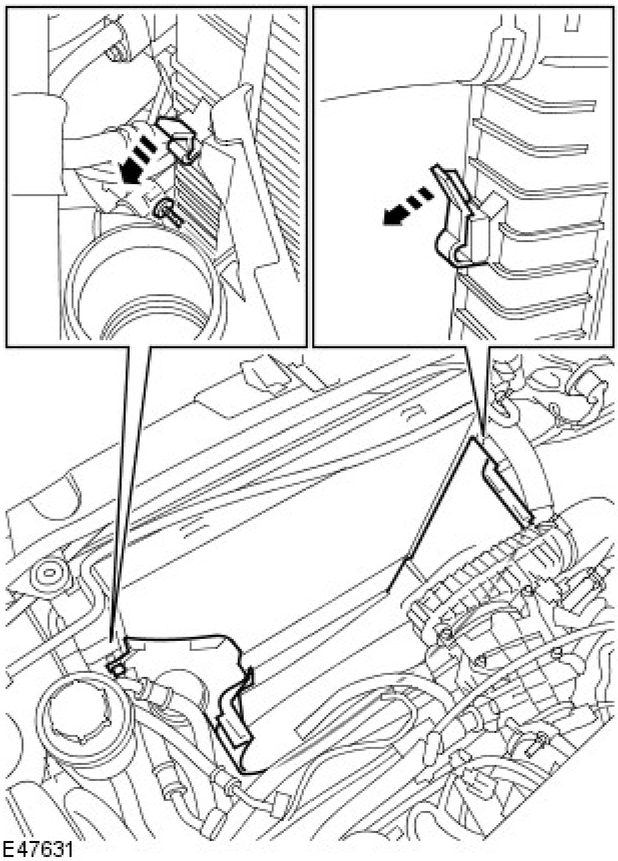


3. Remove the radiator access panel.

- Remove the 4 bolts.



4. Release the coolant pipes and hoses from the lower shroud.


E47631

5. Remove the cooling fan lower shroud.

- Release the 2 clips.
- Remove the screw.

Installation

1. Install the cooling fan lower shroud.

- Tighten the screw.
- Secure with the clips.

2. Install the coolant pipes and hoses to the lower shroud.

3. Install the radiator access panel.

- Tighten the bolts to 10 Nm (7 lb.ft).

4. Install the cooling fan assembly.
For additional information, refer to: Cooling Fan (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

Published: 11-May-2011

Engine Cooling - TDV6 2.7L Diesel - Radiator

Removal and Installation

Removal

All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

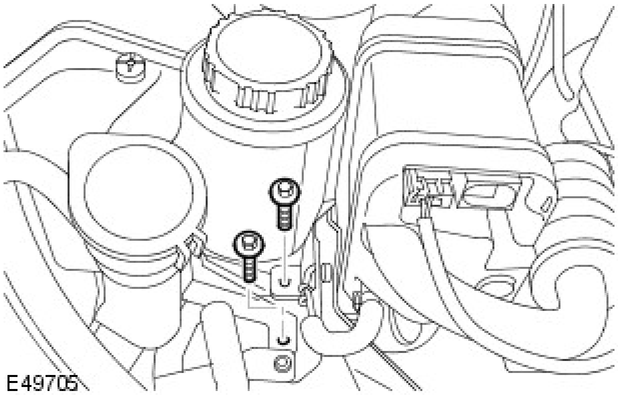
Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

4. Remove the cooling fan lower shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

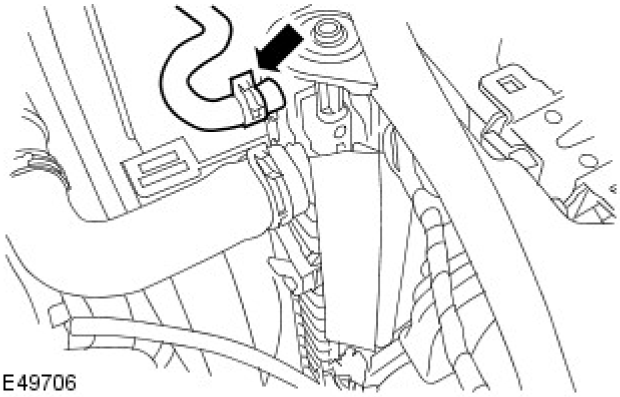
5. Remove the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

6. Remove the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

7. Release the coolant expansion tank.

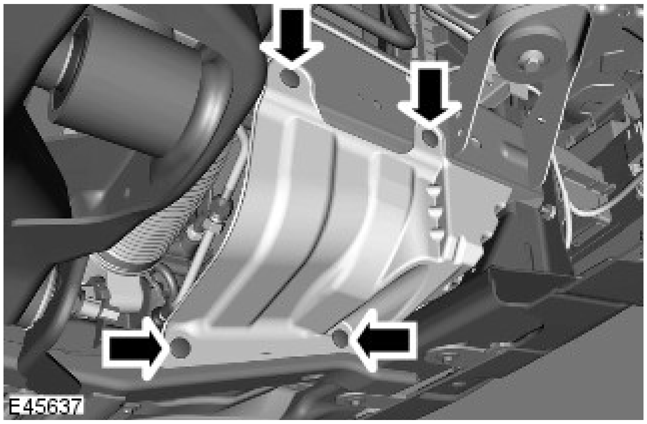


- Remove the 2 bolts.



8. Disconnect the radiator bleed hose.

- Release the clip.



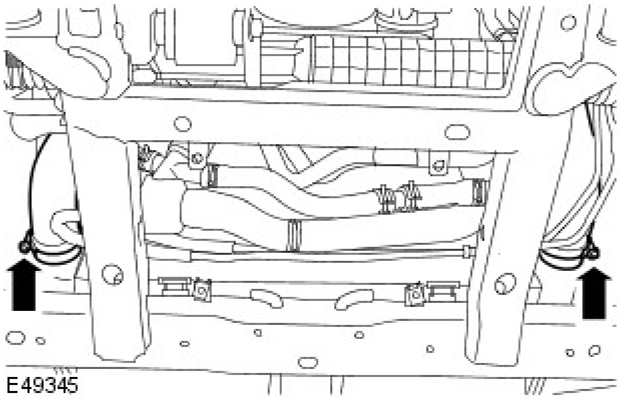
9. Remove the front RH splash shield.

- Remove the 4 retaining clips.

10. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the charge air cooler inlet hose.

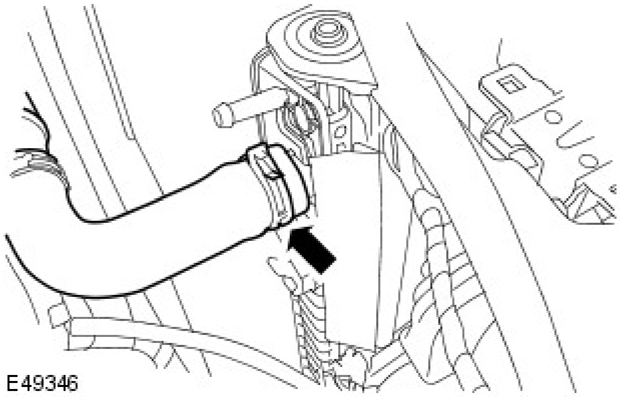
- Loosen the clip.
- Tie aside.



11. ⚠ CAUTION: Always plug any open connections to prevent contamination.

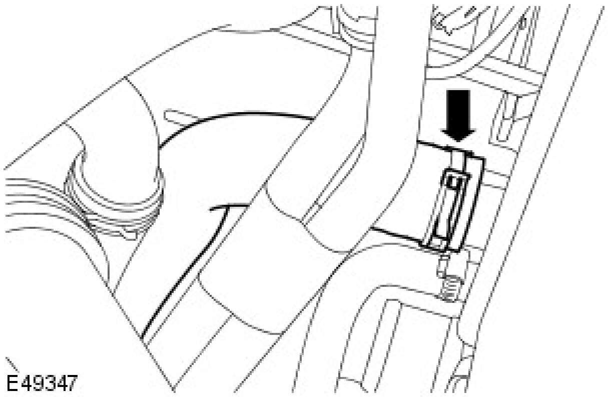
Disconnect the charge air cooler outlet hose.

- Loosen the clip.
- Tie aside.



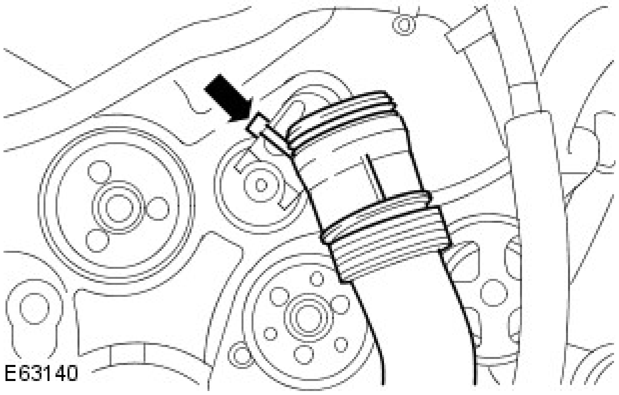
12. Disconnect the radiator upper hose.

- Release the clip.
- Tie aside.



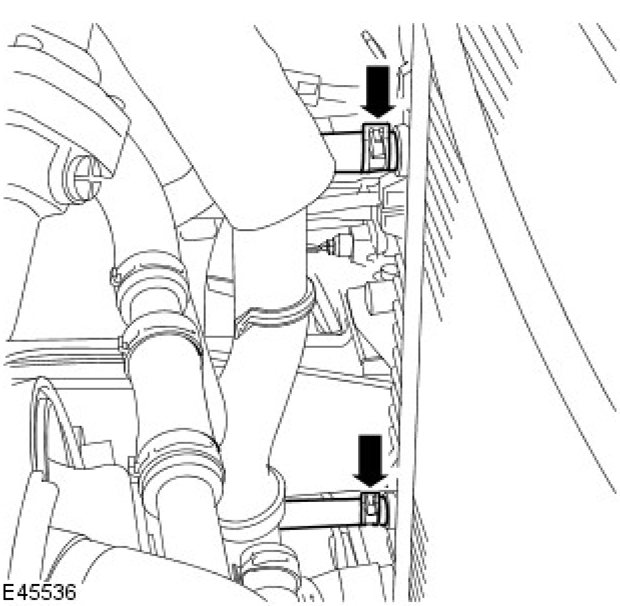
13. Disconnect the radiator lower hose.

- Release the clip.
- Tie aside.



14. Tie the engine air intake duct towards the engine.

Vehicles with automatic transmission



15. ⚠ CAUTION: Always plug any open connections to prevent contamination.

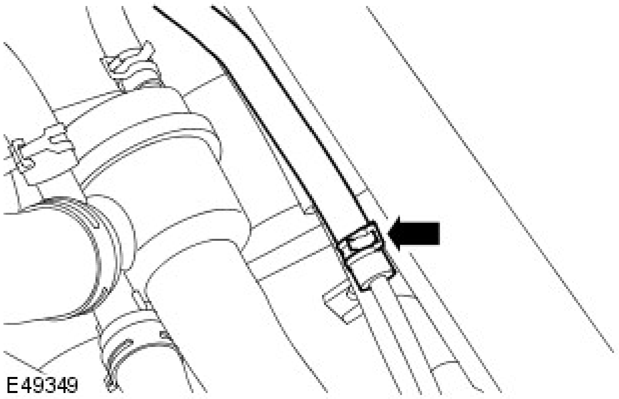
Disconnect the 2 transmission fluid cooler pipes.

- Release the clips.
- Position a container to collect the fluid spillage.
- Tie aside.

All vehicles

16. Disconnect the fuel cooler line.

- Release the clip.

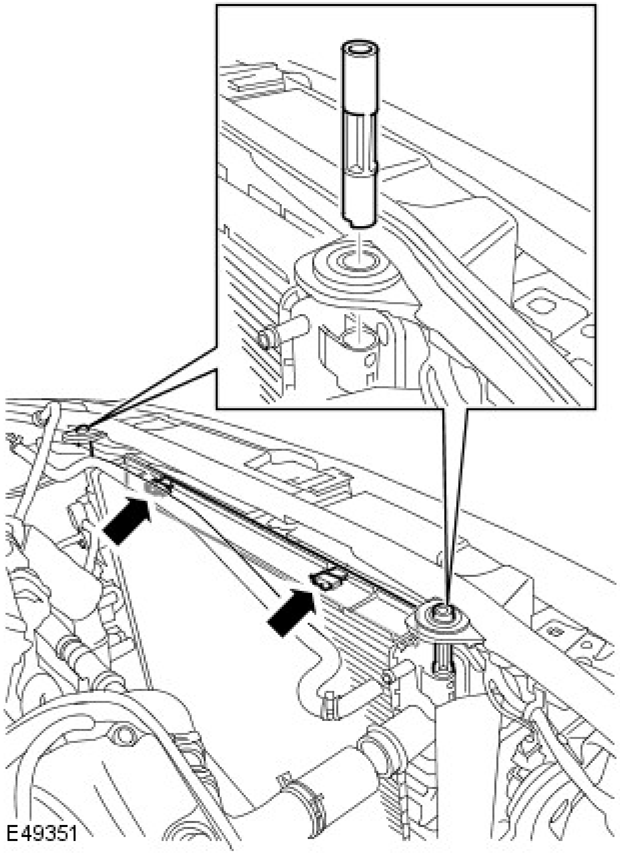


17. Remove the radiator securing pegs.

- Release the clips.

18. Remove the radiator upper deflector.

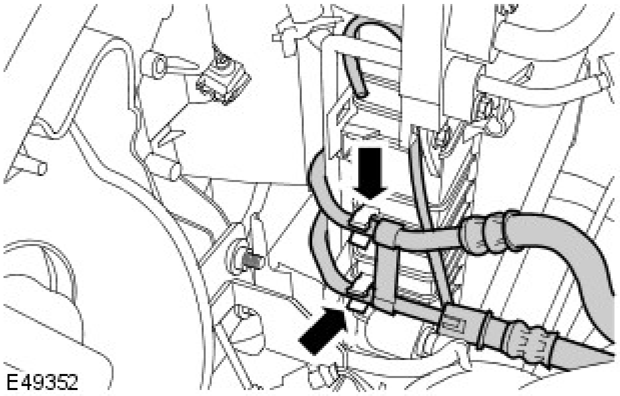
- Release the 2 clips.

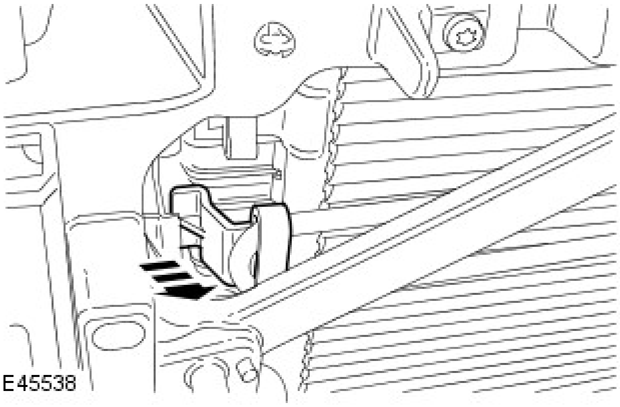


19. Release the power steering fluid cooler.

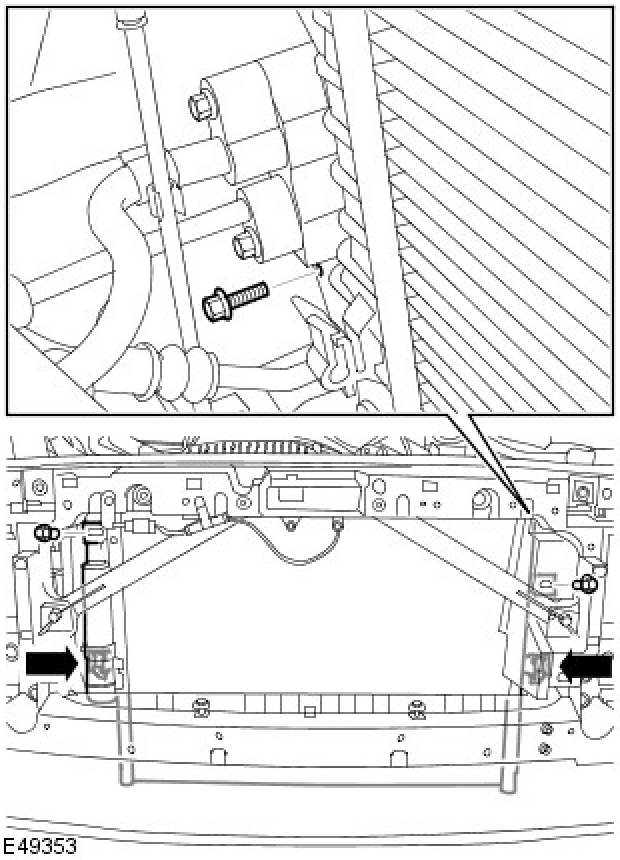
- Release the 2 clips.
- Tie the line aside.

20. Release the front differential breather line.



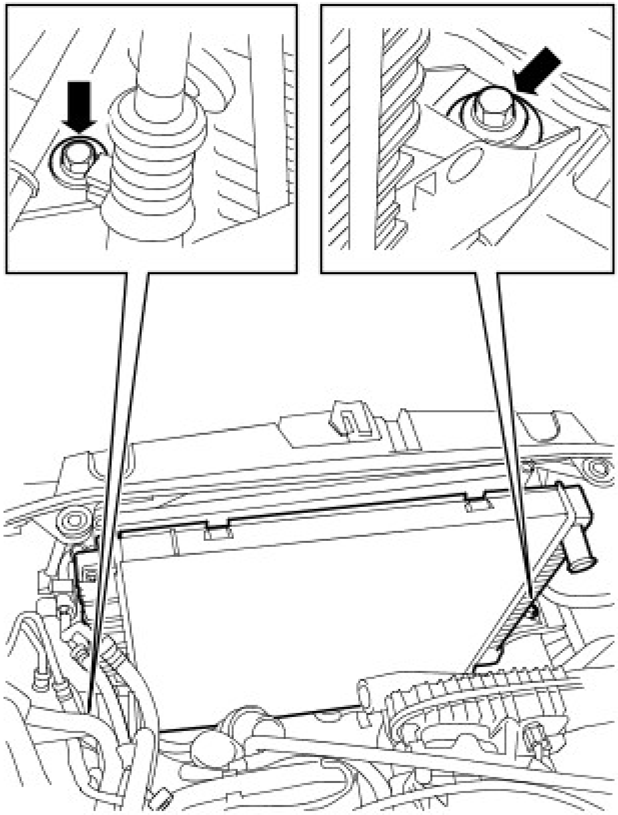


21. Remove the power steering fluid cooler line retaining clip.



22. Release the A/C condenser.

- Remove the 3 bolts.
- Release the 2 clips.



E49354

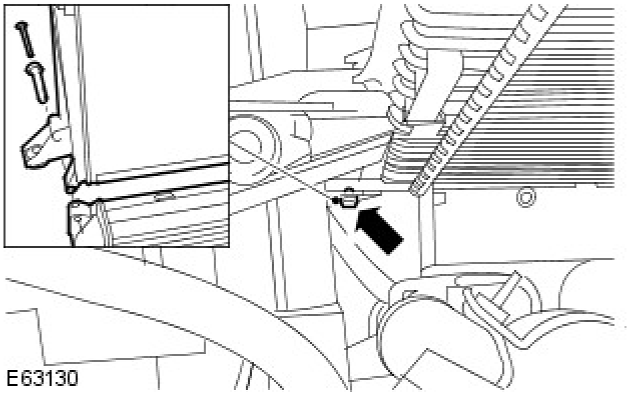
23. Release the radiator.

- Remove the 2 bolts.
- Lift the radiator clear of its mountings.

24. Tie the A/C condenser forwards, clear of the radiator.

25. NOTE: Left-hand shown, right-hand similar.

Remove the 2 clips retaining the radiator to the charge air cooler.

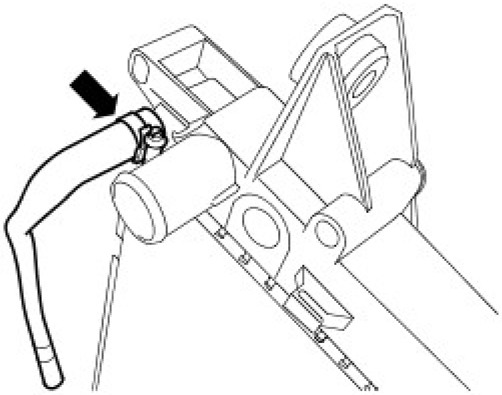


E63130

26. ⚠ CAUTION: Protect the radiator during this operation.

• NOTE: Do not disassemble further if the component is removed for access only.

Carefully remove the radiator.

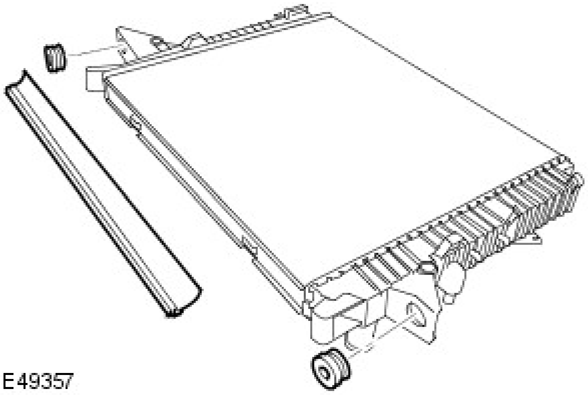


E49356

27. NOTE: Note the fitted position.

Remove the fuel cooler hose.

- Loosen the clip.



E49357

28. Remove the radiator lower deflector.

29. Remove the radiator rubber insulators.

Installation

All vehicles

1. Install the rubber insulators.

2. Install the radiator lower deflector.

3. Install the fuel cooler hose.

- Tighten the clip.

4. ⚠ CAUTION: Protect the radiator during this operation.

Carefully install the radiator.

5. Install the 2 clips, to retain the charge air cooler to the radiator.

6. Position the radiator.

- Lift the radiator onto its mountings.
- Tighten the bolts to 25 Nm (18 lb.ft).

7. Attach the A/C condenser.

- Remove and discard the 2 cable ties.
- Lift it into the clips.
- Tighten the bolt to 6 Nm (4 lb.ft).

8. Position the front differential breather line.

9. Attach the power steering fluid cooler.

- Secure into the 3 clips.

10. Install the radiator upper deflector.

11. Install the radiator securing pegs.

12. Connect the fuel cooler line.

- Secure with the clip.

Vehicles with automatic transmission

13. Connect the transmission fluid cooler coolant hoses.

- Install the clips.

All vehicles

14. Install the radiator lower hose.

- Secure with the clip.

15. Release the air intake duct.

- Remove and discard the cable tie.

16. Connect the radiator upper hose.

- Remove and discard the cable tie.
- Secure with the clip.

17. Connect the radiator lower hose.

- Remove and discard the cable tie.
- Secure with the clip.

18. Connect the charge air outlet hose.

- Tighten the clip to 10 Nm (7 lb.ft).

19. Connect the charge air inlet hose.

- Tighten the clip to 10 Nm (7 lb.ft).

20. Install the front RH splash shield.

- Install the four clips.

21. Secure the coolant expansion tank.

- Tighten the two retaining bolts to 10 Nm (7 lb.ft).

22. Connect the radiator bleed hose.

- Secure with the clip.

23. Install the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

24. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

25. Install the cooling fan lower shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

26. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

27. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

Vehicles with automatic transmission

28. Check automatic transmission fluid level.

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Engine Cooling - TDV6 2.7L Diesel - Coolant Pump

Removal and Installation

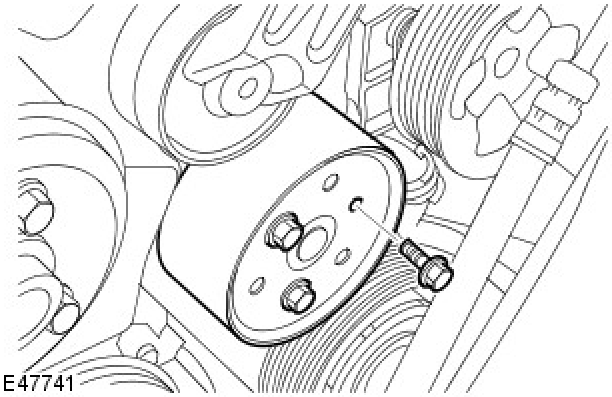
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

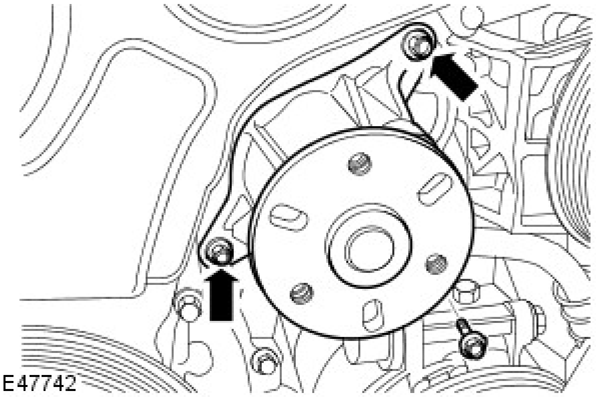
3. NOTE: Loosen the coolant pump pulley bolts prior to removing the accessory drive belt.

Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).



4. Remove the coolant pump pulley.

- Remove the 3 bolts.



5. Remove the coolant pump.

- Remove the 3 bolts.
- Discard the O-ring seal.

Installation

1. Install the coolant pump.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the coolant pump pulley.

- Clean the components.

- Tighten the bolts to 25 Nm (18 lb.ft).

3. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

4. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

5. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Cooling - TDV6 2.7L Diesel - Thermostat Housing

Removal and Installation

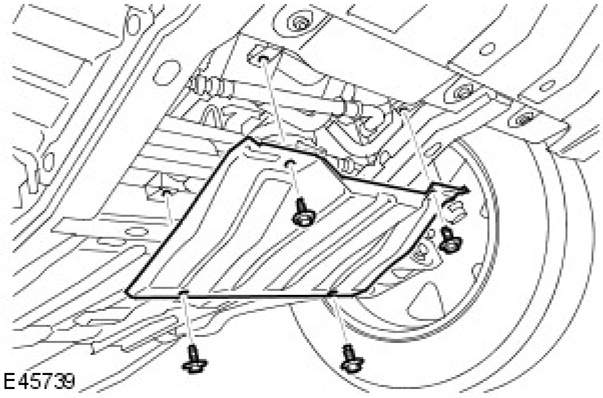
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

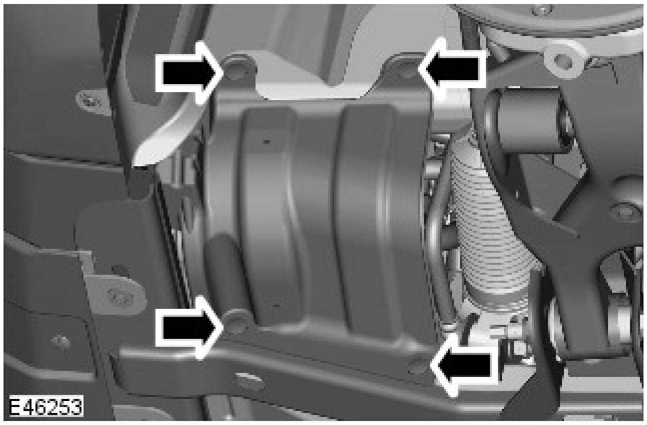
3. Remove the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the radiator access panel.



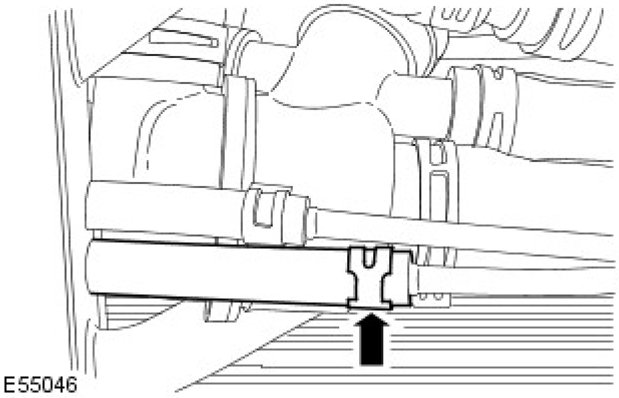
- Remove the four retaining bolts.

5. Remove the front LH splash shield.

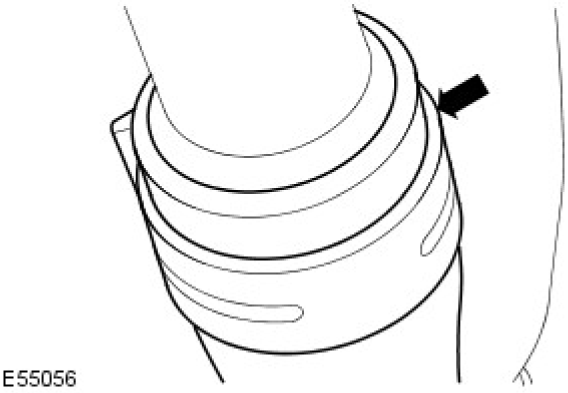


- Remove the four clips.

6. Disconnect the fuel cooler return hose from the thermostat.

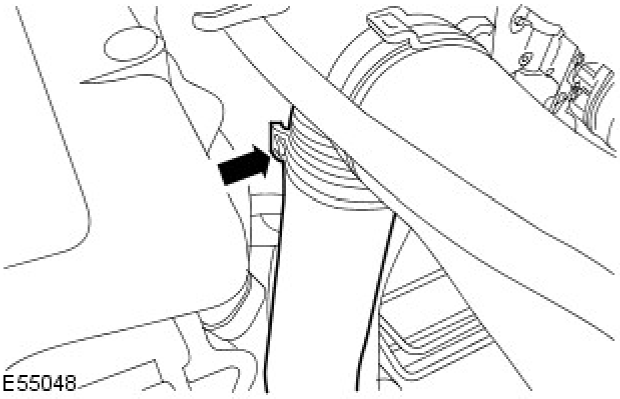


- Release the clip.



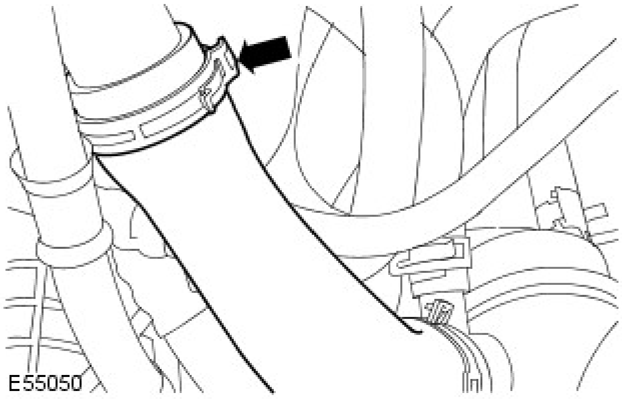
7. Disconnect the heater return hose from the heater return pipe.

- Release from the clip.



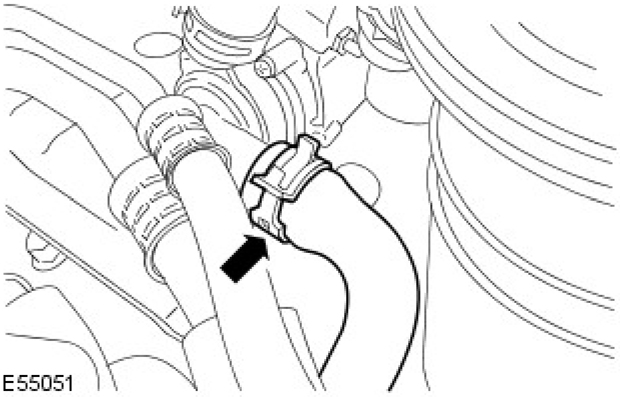
8. Disconnect the thermostat to top hose 'T' piece hose.

- Release from the clip.



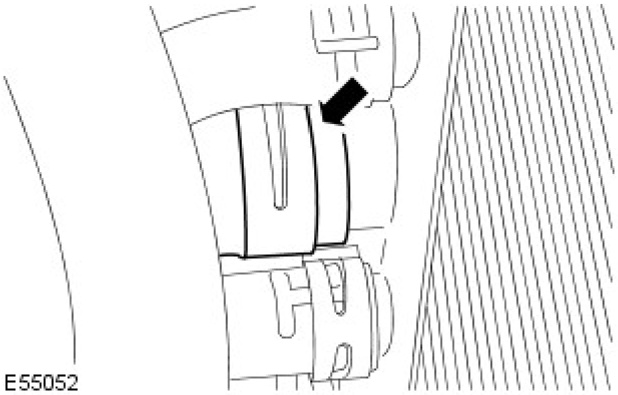
9. Disconnect the thermostat hose from the engine coolant rail.

- Release the clip.



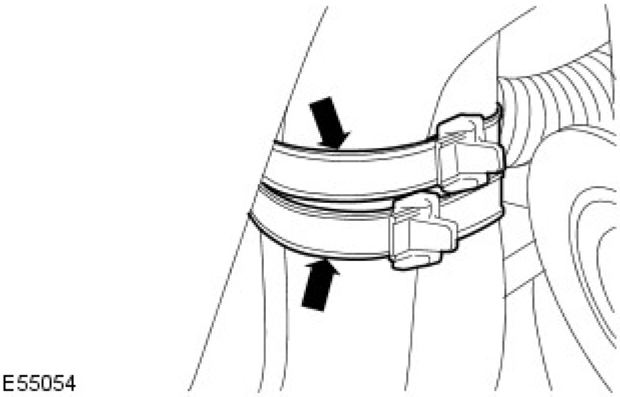
10. Disconnect the thermostat to fuel fired heater hose from the fuel fired heater.

- Release the clip.

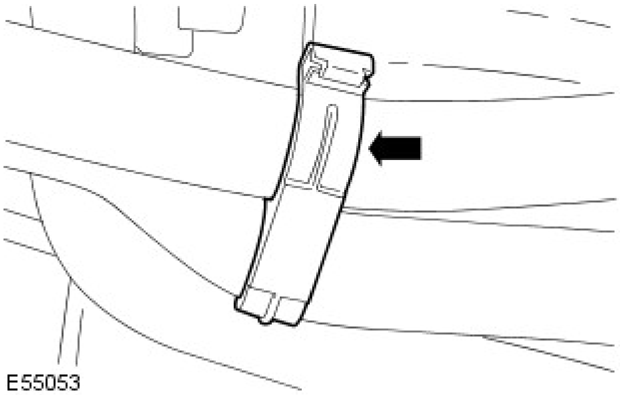


11. Disconnect the radiator lower hose from the radiator.

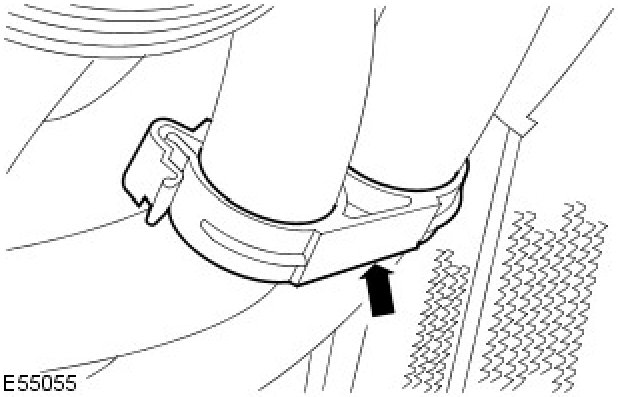
- Release the clip.



12. Release the securing straps.



13. Release the coolant hose retaining clip.



14. Release the coolant hose retaining clip.

15. Remove the thermostat and hose assembly.

Installation

1. Install the thermostat and hose assembly.

2. Install the coolant hose retaining clip.

3. Install the coolant hose retaining clip.

4. Install the securing straps.

5. Connect the radiator lower hose to the radiator.

6. Connect the thermostat to fuel fired heater hose to the fuel fired heater.

7. Connect the thermostat hose to the engine coolant rail.

8. Connect the thermostat to top hose 'T' piece hose.

9. Connect the heater return hose to the heater return pipe.

10. Connect the fuel cooler return hose to the thermostat.

11. Install the front LH splash shield.

- Install the four clips.

12. Install the radiator access panel.

- Install the four retaining bolts.

13. Install the cooling fan shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

14. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

15. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

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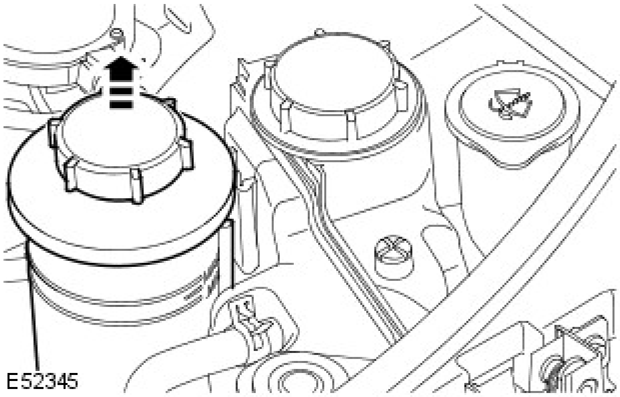
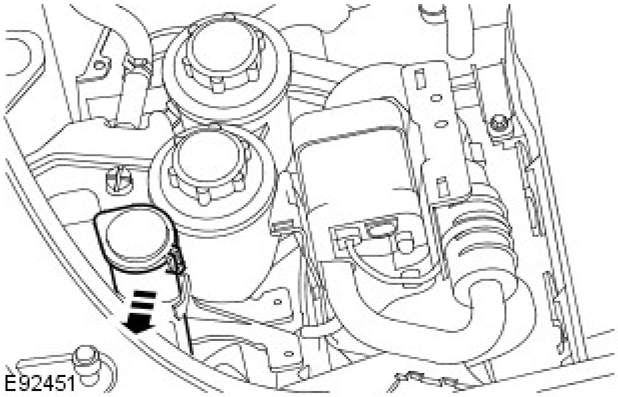
Engine Cooling - TDV6 2.7L Diesel - Engine Coolant Level Switch

Removal and Installation

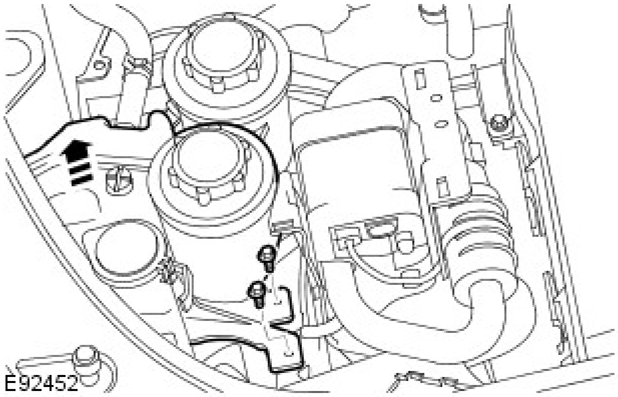
Removal



1. Release the power steering fluid reservoir from the bracket.

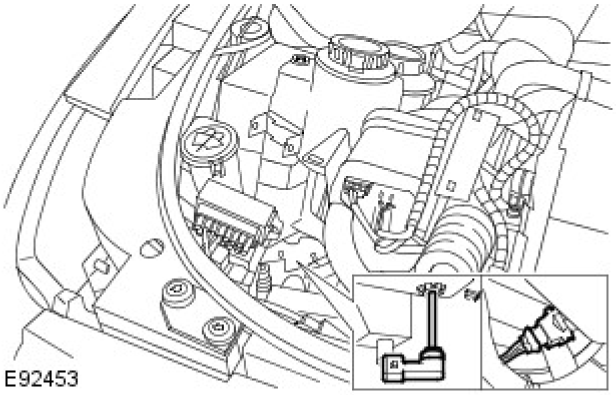


2. Release the windshield washer reservoir filler neck.



3. Reposition the coolant expansion tank.

- Remove the 2 bolts.



4. Remove the engine coolant level switch.

- Disconnect the engine coolant level switch electrical connector.

Installation

1. NOTE: An audible click can be heard when the engine coolant level switch is correctly installed.

Install the engine coolant level switch.

- Connect the engine coolant level switch electrical connector.

2. CAUTION: Make sure that the component is correctly located on the locating pegs.

Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

3. Secure the windshield washer reservoir filler neck.

4. Secure the power steering fluid reservoir to the bracket.

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Engine Cooling - TDV6 2.7L Diesel - Cooling System Draining and Vacuum Filling

General Procedures

1. ⚠ WARNING: To avoid having scalding hot coolant or steam blowing out of the cooling system, use extreme care when removing the coolant pressure cap from a hot cooling system. Wait until the engine has cooled, then wrap a thick cloth around the coolant pressure cap and turn it slowly until the pressure begins to release. Step back while the pressure is released from the system. When certain all the pressure has been released (still with a cloth) turn and remove the coolant pressure cap from the coolant expansion tank. Failure to follow these instructions may result in personal injury.

- CAUTIONS:

⚠ The engine cooling system must be maintained with the correct concentration and type of anti-freeze solution to prevent corrosion and frost damage. Failure to follow this instruction may result in damage to the vehicle.

⚠ Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

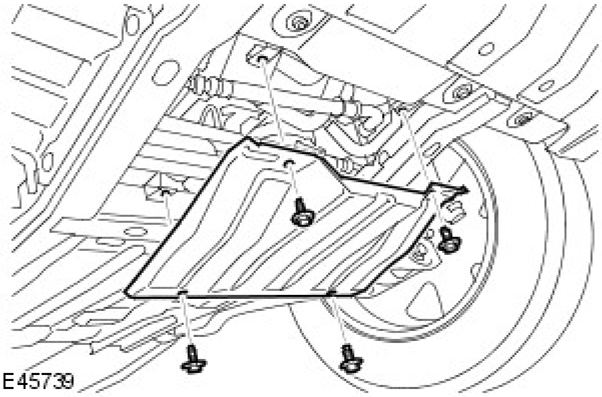
Set the heater controls to maximum HOT.

2. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Remove the coolant expansion tank cap.

3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

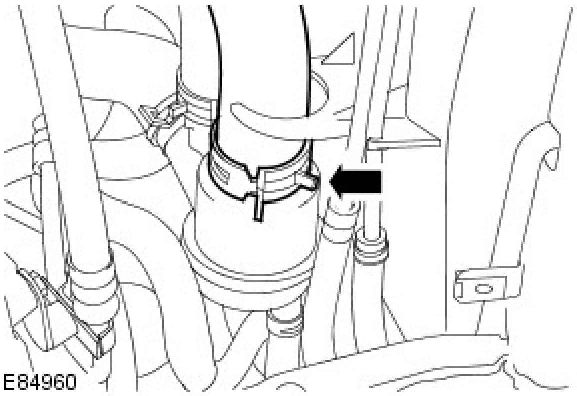
Raise and support the vehicle.



4. Remove the radiator access panel.

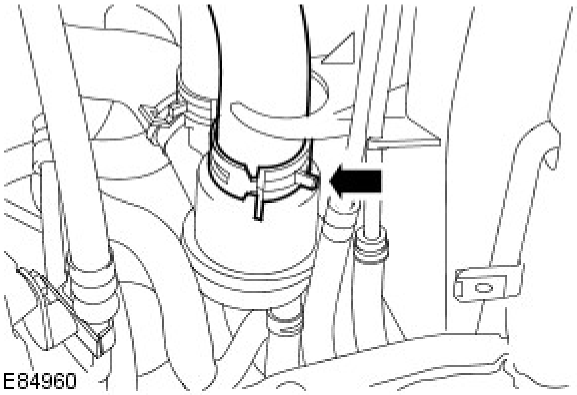
- Remove the 4 bolts.

5. Position a container to collect the fluid.



6. Disconnect the coolant hose from the thermostat.

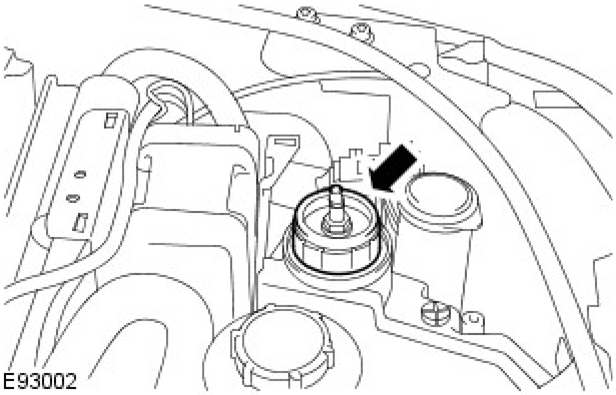
- Release the clip.
- Allow the coolant to drain.



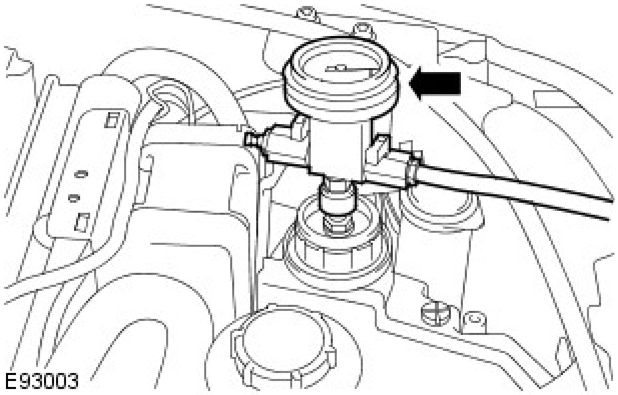
7. Connect the coolant hose to the thermostat.

- Secure the clip.
- Remove the container.

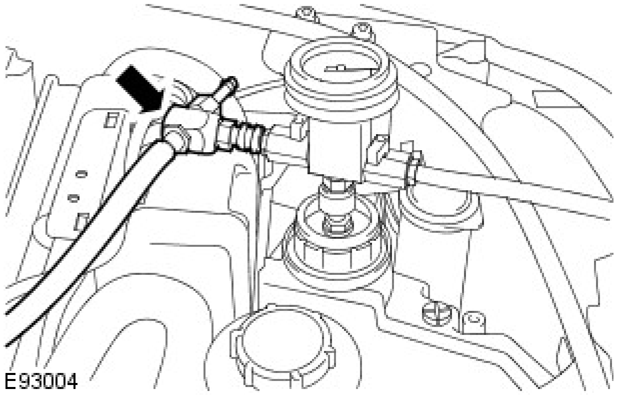
8. Prepare a sufficient amount of coolant to the specified concentration.



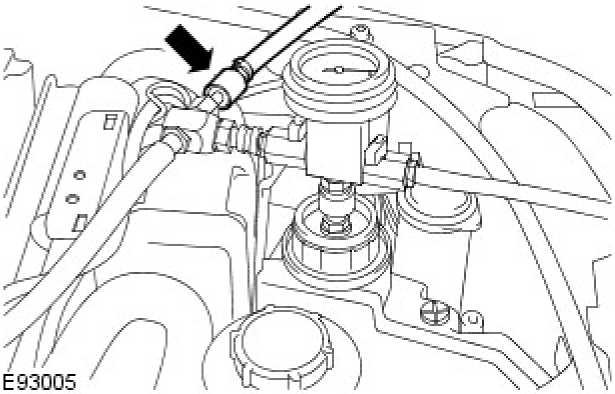
9. Install the cooling system vacuum refill adaptor to the expansion tank.



10. Install the vacuum filler gauge to the cooling system vacuum refill adaptor.



11. Install the venturi tube assembly to the vacuum filler gauge.



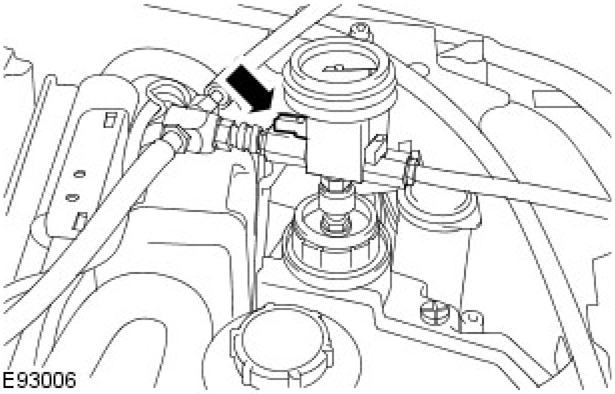
12. NOTE: Make sure both valves on gauge assembly are in the closed position.

Connect a regulated compressed air supply to the venturi tube assembly.

13. NOTE: Make sure air cannot enter the hose.

Position the coolant pick-up pipe into a container of clean coolant.

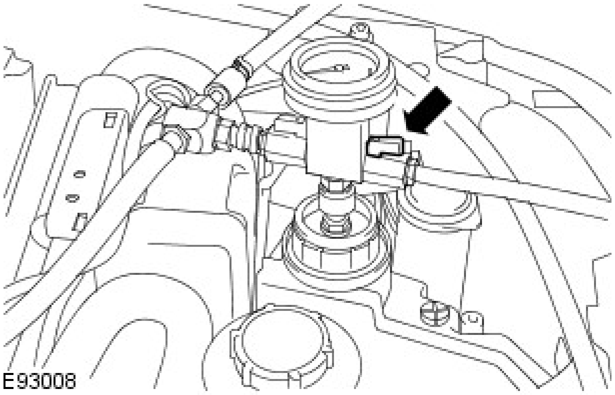
14. Position the evacuated air hose into a container.



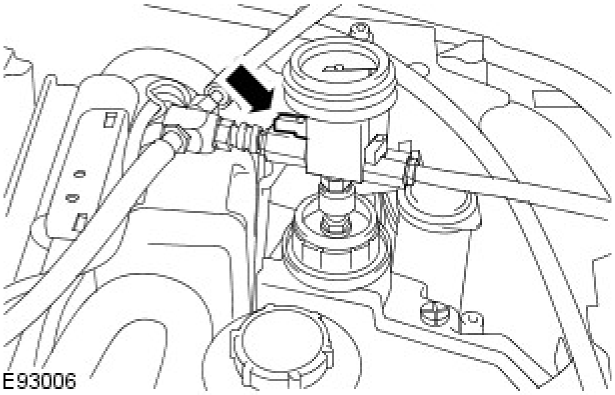
15. NOTE: Make sure the coolant supply valve is in the closed position on the vacuum filler gauge assembly.

- NOTE: Small diameter or long airlines may restrict airflow to the coolant vacuum fill tool.
- NOTE: The coolant vacuum fill tool needs an air pressure of 6 to 8 bar (87 to 116 psi) to operate correctly.

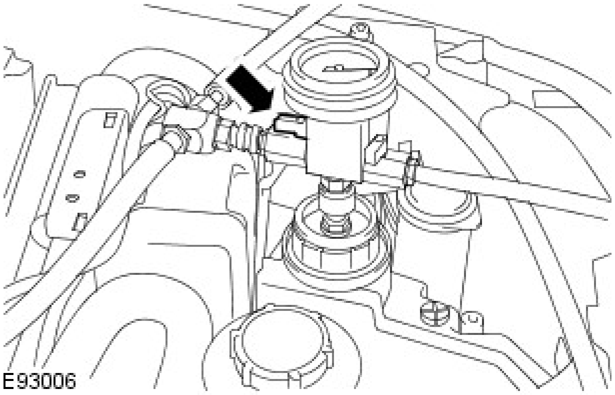
Open the air supply valve.



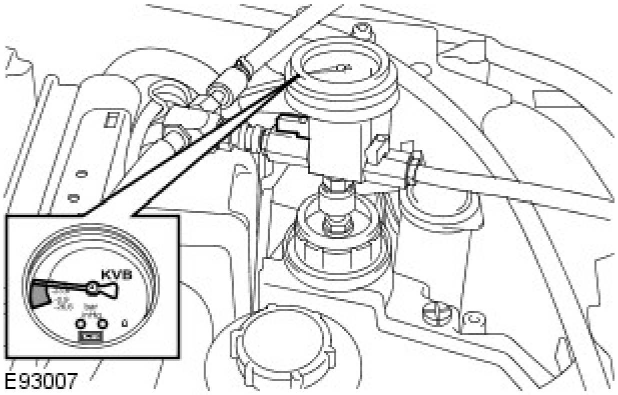
16. Open the coolant supply valve for 2 seconds to prime the coolant supply hose.



17. Apply air pressure progressively until the arrow on the vacuum filler gauge reaches the green segment.

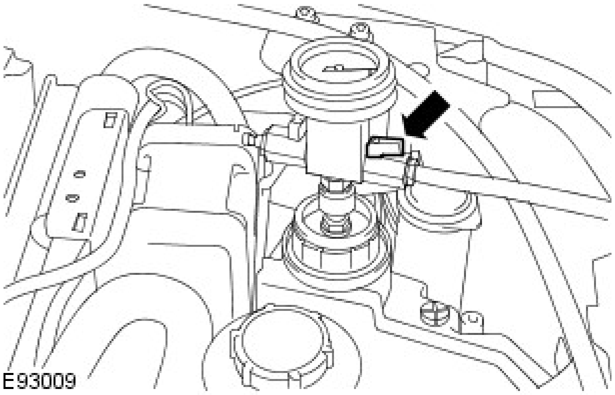


18. Close the air supply valve.



19. Allow one minute to check the vacuum is held.

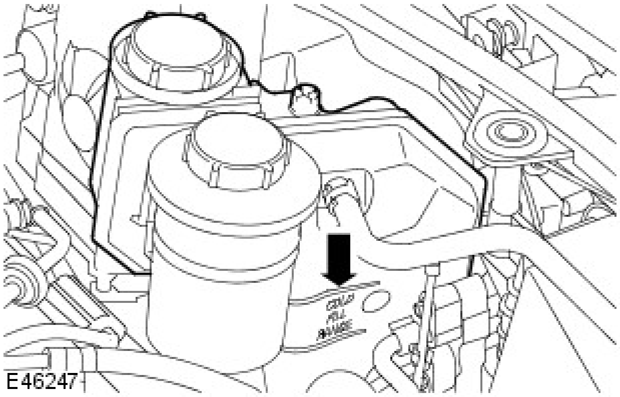
- Disconnect the compressed air supply.



20. NOTE: Close the coolant supply valve when the coolant expansion tank MAX mark is reached or coolant movement has ceased.

Open the coolant supply valve and allow the coolant to be drawn into the system.

21. Remove the vacuum filler gauge and cooling system vacuum refill adaptor assembly.



22. Check and top-up the coolant if required.

23. Install the coolant expansion tank cap.

24. CAUTION: Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

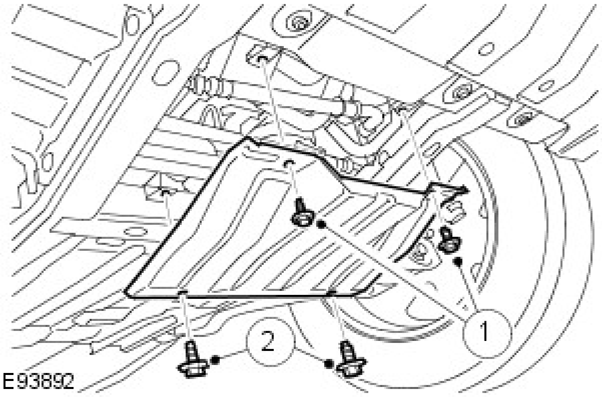
Start and run the engine.

- Hold the engine speed at 3,000 RPM for one minute.
- Return the engine to idle for five minutes.
- Hold the engine speed at 3,000 RPM for one minute.
- Run the engine until the thermostat opens.

25. Switch the engine off and allow to cool.

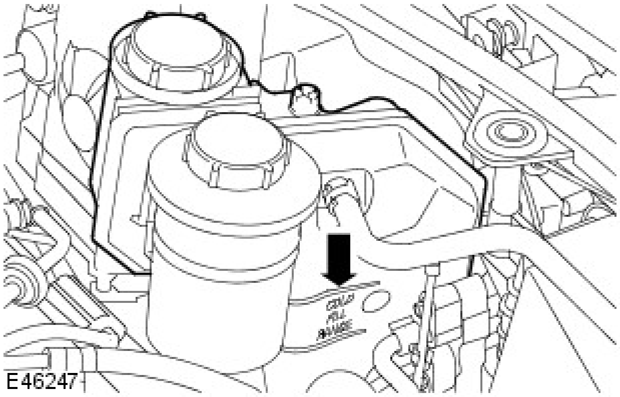
26. Clean any spilt coolant from the vehicle.

27. Install the radiator access panel.



1. Tighten the bolts to 10 Nm (7 lb.ft).
2. Tighten the bolts to 62 Nm (46 lb.ft).

28. Check for leaks and then fill the coolant expansion tank to the MAX mark.



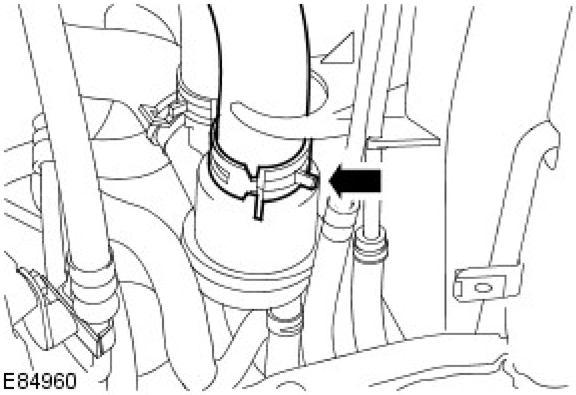
Published: 11-May-2011

Engine Cooling - TDV6 2.7L Diesel - Thermostat

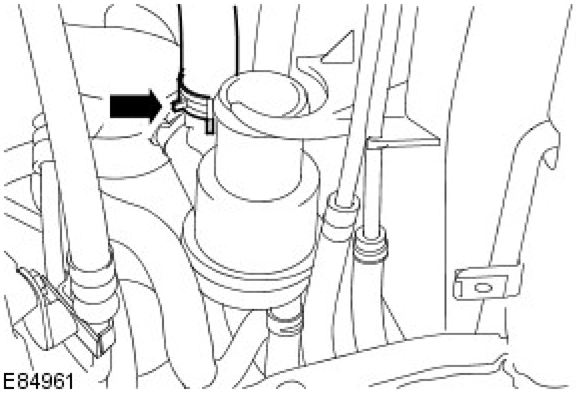
Removal and Installation

Removal

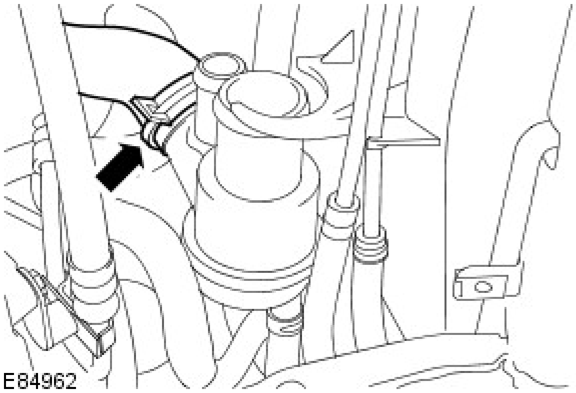
1. Drain the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03, General Procedures).
2. Position a container to collect the fluid spillage.
3. Disconnect the radiator upper hose from the thermostat.
   - Release the clip.

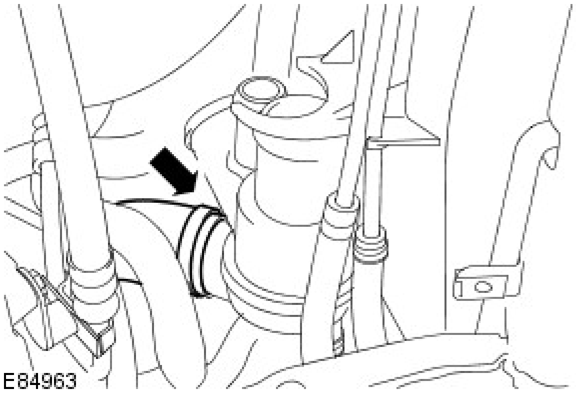


4. Disconnect the heater hose from the thermostat.
   - Release from the clip.



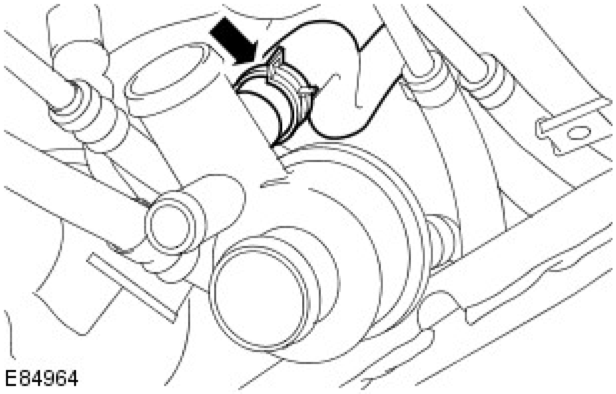
5. Disconnect the engine inlet hose from the thermostat.
   - Release the clip.





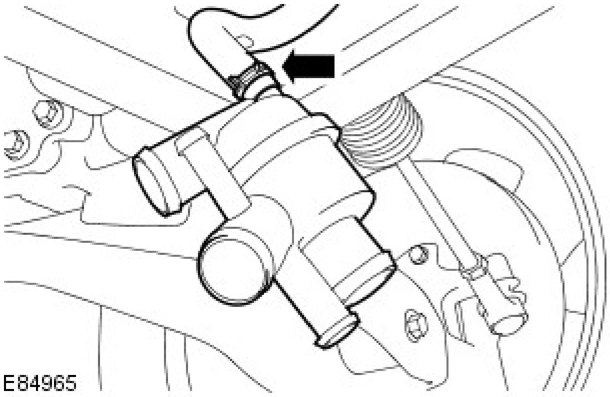
6. Disconnect the radiator lower hose from the thermostat.

- Release the clip.



7. Disconnect the coolant expansion tank hose from the thermostat.

- Release the clip.



8. Remove the thermostat.

- Disconnect the coolant hose from the thermostat.

9. Remove the container.

Installation

1. Install the thermostat.

- Connect the coolant hose to the thermostat.
- Secure with the clip.

2. Connect the coolant expansion tank hose to the thermostat.

- Secure with the clip.

3. Connect the radiator lower hose to the thermostat.

- Secure with the clip.

4. Connect the engine inlet hose to the thermostat.

5. Connect the heater hose to the thermostat.

- Secure with the clip.

- Secure with the clip.

6. Connect the radiator upper hose to the thermostat.

- Secure with the clip.
- Position the radiator upper hose to the cooling fan shroud.

7. Refill and bleed the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03, General Procedures).

Published: 11-May-2011

Supercharger Cooling -

Torque Specifications

Description	Nm	lb-ft
Supercharger coolant pump mounting bracket bolts	6	4
Supercharger radiator bolts	6	4

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Supercharger Cooling - Supercharger Cooling

Description and Operation

Supercharger Cooling

For additional information, refer to: Engine Cooling (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Description and Operation).

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Supercharger Cooling - Supercharger Cooling

Diagnosis and Testing

1. **1.** Verify the customer concern by operating the system.
2. **2.** Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

Mechanical	Electrical
● Leak(s) ● Hose(s) ● Charge air cooler radiator ● Supercharger cooling water pump ● Coolant expansion tank ● Coolant pressure cap ● Radiator ● Engine cooling water pump ● Cooling fan	● Fuse(S) ● Wiring harness ● Electrical connector(S) ● Engine coolant temperature sensor ● Cooling fan motor ● Supercharger cooling water pump

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the approved diagnostic system.

Component tests

For cooling system pressure, thermostat and radiator leak tests, refer to section 303-03 - Engine cooling of the workshop manual.

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Supercharger Cooling - Supercharger Cooling System Draining, Filling and Bleeding

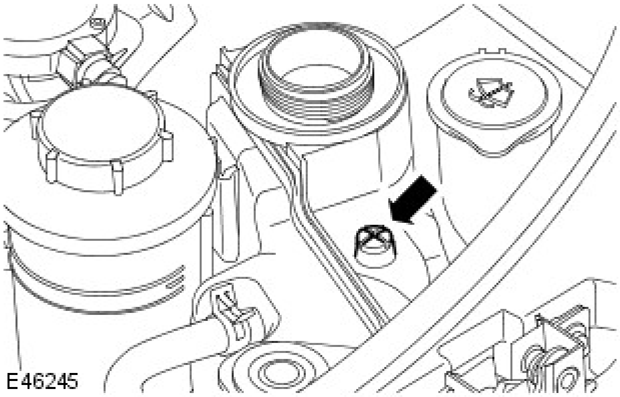
General Procedures

• NOTE: This procedure is used only when components within the supercharger cooling circuit are disconnected or replaced.

1. Disconnect the battery ground cable.
For additional information, refer to: Battery Disconnect (414-01, General Procedures).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Battery Disconnect (414-01, General Procedures).



4. CAUTIONS:

⚠ Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

⚠ Damage to the charge air cooler coolant pump will occur if the pump is allowed to cavitate.

• NOTE: With the ignition key turned to position II the charge air coolant pump will run, to aid coolant bleed. Make sure the charge air coolant pump is primed prior to running the pump.

Top-up and bleed the supercharger cooling system.

- Remove the coolant expansion tank cap.
- Loosen the coolant expansion tank bleed screw.
- Turn the ignition key to position II.
- Add coolant to the expansion tank as required.

5. When coolant runs from the expansion tank, bubble free, tighten the bleed screw.

6. Check and top-up the coolant.

- Turn the ignition switch to the OFF position.
- Install the coolant expansion tank cap.

7. Install the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

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Supercharger Cooling - Coolant Pump

Removal and Installation

Removal

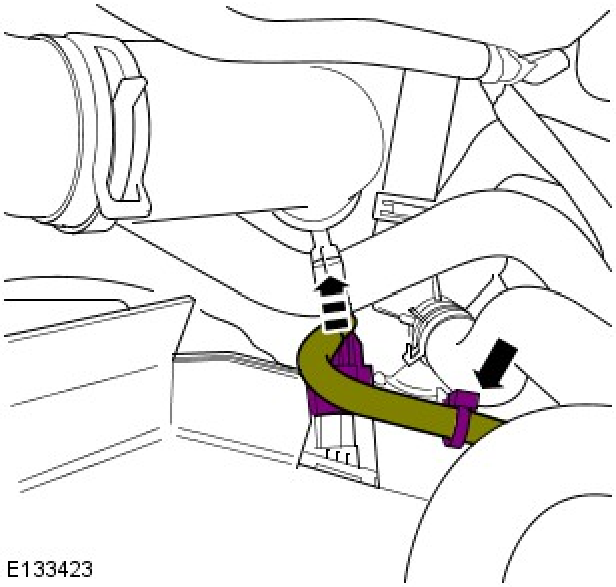
⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.

⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

- NOTE: This procedure covers the removal and installation of the supercharger auxiliary coolant pump.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



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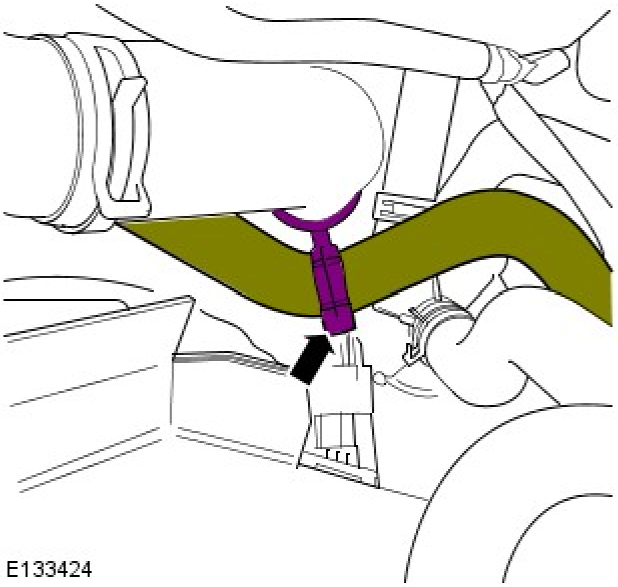
3. Release and disconnect the cooling fan electrical connector.

- Position the wiring harness aside.



E133424

4. Release the clip securing the coolant hose.

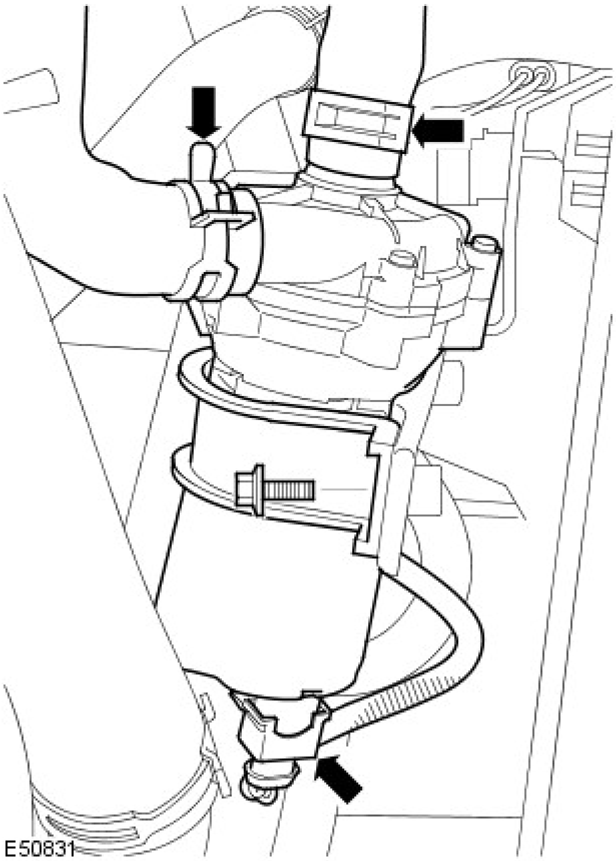
- Position aside.

5. ⚠ WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.

⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 coolant pump hoses.

- Clamp the relevant hoses, to minimise the coolant loss.
- Release the 2 clips.



6. Remove the coolant pump.

- Disconnect the electrical connector.
- Remove the clamp bolt.

Installation

1. Install the coolant pump.

- Install the coolant pump and align with bracket register.
- Tighten the bolt to 6 Nm (4 lb.ft).
- Connect the electrical connector.

2. Connect the coolant pump hoses.

- Secure with the clips.
- Remove the hose clamps.

3. Connect the cooling fan electical connector.

- Secure the electrical harness with the clip.

4. Secure the coolant hose.

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

6. Top-up and bleed the supercharger cooling system.
For additional information, refer to: Supercharger Cooling System Draining, Filling and Bleeding (303-03D Supercharger Cooling, General Procedures).

7. Install the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-May-2011

Supercharger Cooling - Radiator

Removal and Installation

Removal

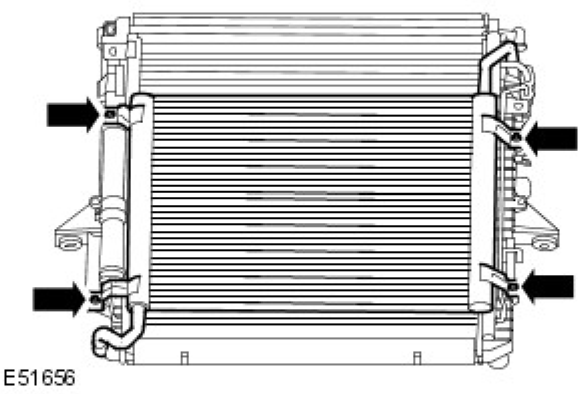
• NOTE: Always protect the cooling pack elements to prevent accidental damage.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the radiator assembly.
For additional information, refer to: Radiator (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

3. Remove the supercharger radiator.

- Remove the 4 bolts.



Installation

1. Install the supercharger radiator.

- Install the bolts and tighten to 6 Nm (4 lb.ft).

2. Install the radiator assembly.
For additional information, refer to: Radiator (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 05-Jul-2011

Engine Cooling - TDV8 3.6L Diesel -

Fluids

Item	Specification
* Anti-freeze	Havoline Extended Life Coolant (XLC) or any ethylene glycol based anti-freeze containing no methanol with only Organic Acid Technology (OAT) corrosion inhibitors
Anti-freeze concentration - Will provide frost protection to -40°C (-40°F)	50%
Specific gravity of coolant at 20°C (68°F), to protect against frost down to -40°C (-40°F)	1.068
Amount of anti-freeze to use for 50% concentration	6.9 liters (12.1 pints) (7.3 US quarts)

⚠ CAUTION: No other anti-freeze should be used with Havoline Extended Life Coolant.

Capacity

Item	Capacity
Cooling system - from dry	17 liters (30 pints) (18 US quarts)
Cooling system - re-fill	13.7 liters (24.1 pints) (14.5 US quarts)

General Specifications

Item	Specification
Cooling system type	Pressurized, thermostatically controlled with remote header tank
Radiator	Vertical flow
Expansion tank	Remote - fitted with a bleed screw and low coolant level sensor
Pressure cap rating	110 kPa (1.1 bar) (16 lbf/in^2)
Thermostat:	
Starts to open	88° C (190° F)
Fully open	98° C (208° F)
Cooling fan	Engine driven, viscous coupled with electronic control
Cooling fan diameter	500 mm (19.7 in)
Direction of rotation	Clockwise when viewed from front of engine
Coolant pump	Centrifugal flow impeller, belt driven from crankshaft

Torque Specifications

Description	Nm	lb-ft
Coolant pump bolts	24	18
Coolant pump pulley bolts	25	18
Cooling fan to viscous coupling bolts	10	7
* Cooling fan assembly	65	48
Thermostat housing bolts	10	7
Expansion tank bolts	10	7
Coolant bleed screw(s)	3	2

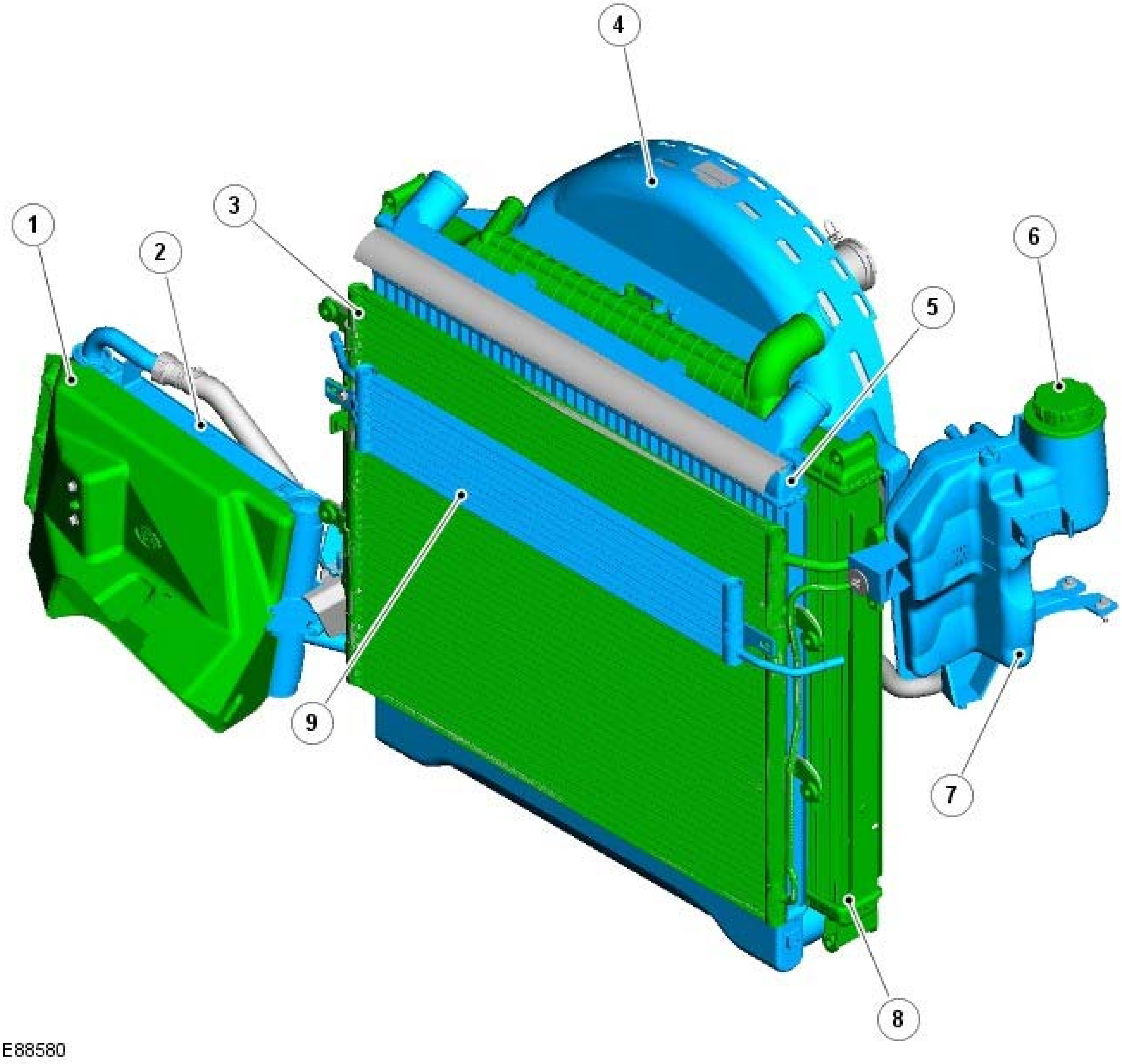
*** Note: Left-hand thread**

Published: 11-May-2011

Engine Cooling - TDV8 3.6L Diesel - Engine Cooling

Description and Operation

COMPONENT LOCATION



Item	Part Number	Description
1	-	Auxiliary engine cooler duct
2	-	Auxiliary engine coolant cooler
3	-	Condenser
4	-	Cooling fan shroud
5	-	Charge air cooler
6	-	Degas tank cap
7	-	Degas tank
8	-	Radiator
9	-	Fuel coolant cooler

OVERVIEW

The pressurized cooling system employed allows coolant to circulate around the engine and the heater circuit while the thermostat main valve is closed. The primary function of the cooling system is to maintain the engine within an optimum temperature range under changing ambient and engine operating conditions. Secondary functions are to provide:

- optimized cabin heating during the engine warm-up phase
- full automatic transmission fluid temperature control (including heating)
- low temperature fuel cooling via a dedicated low temperature sub-cooler
- Enhanced Exhaust Gas Recirculation (EGR) cooling via supply of low temperature coolant from the radiator outlet

During the initial engine warm-up, when the main thermostat is closed, warm coolant is directed to the ancillary heat exchangers:

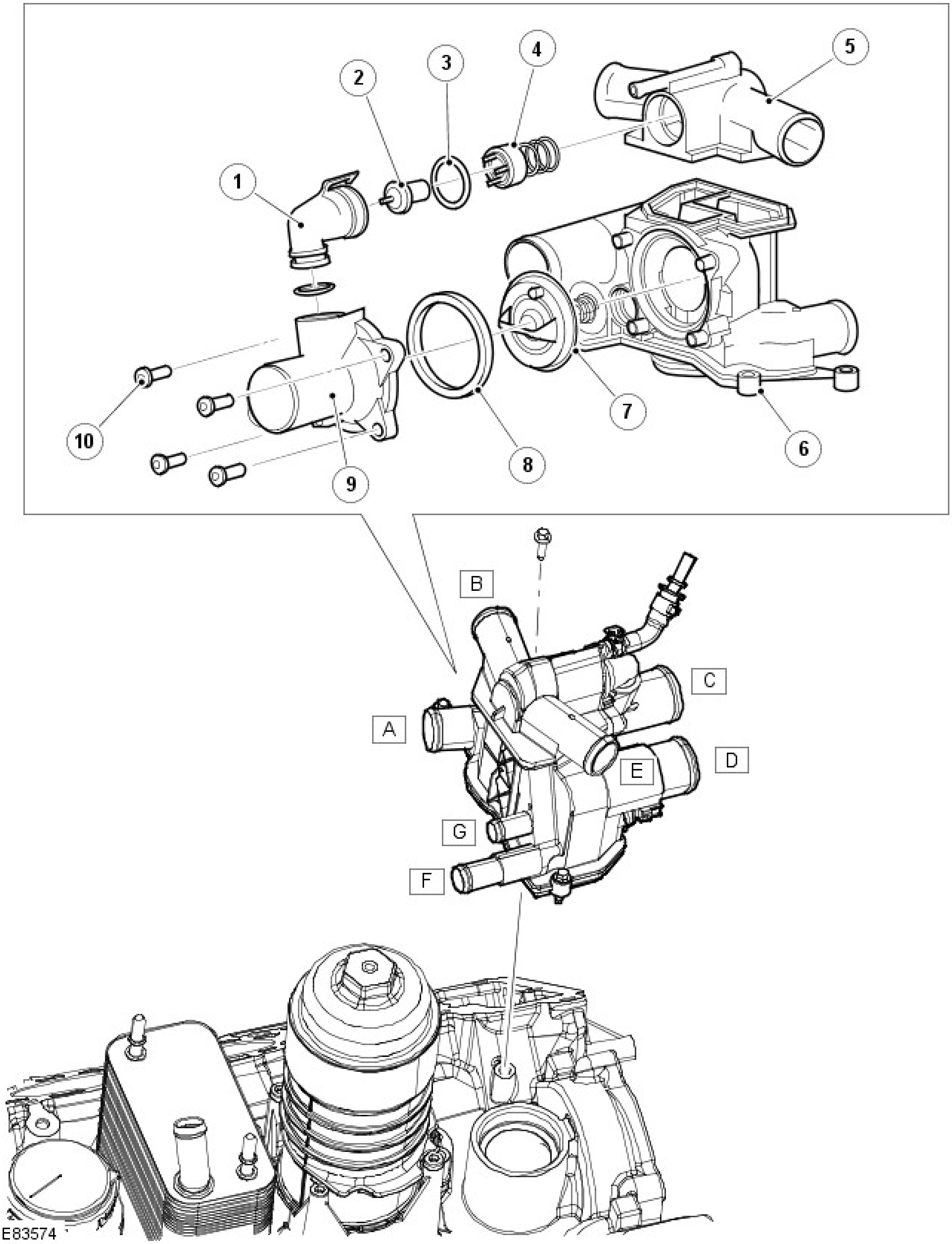
- Cabin heater
- Engine oil heat exchanger
- Automatic transmission fluid heat exchanger (limited flow at low engine speeds)

The main engine thermostat is of a pressure relief design. The prime function of this thermostat is to use the heater and ancillary circuit as the only radiator by-pass while the thermostat is closed.

The pressure relief thermostat gradually opens the main radiator by-pass circuit at engine speeds above 1500rpm. This system ensures that the maximum available coolant flow is directed to the heater and ancillary heat exchangers during warm-up without affecting the durability of the engine. By using this type of thermostat there is enough heater flow for all conditions without the need for a dedicated electric water pump.

ENGINE COOLING SYSTEM

The coolant is circulated at up to 400 liters per minute by a coolant pump mounted on the front of the engine and driven by an ancillary drive 'polyvee' belt. The coolant pump circulates coolant through the cylinder block and cylinder heads via a chamber located in the 'vee' of the engine. Having passed through the engine the coolant returns to the thermostat housing. The coolant then progresses down the 'top hose' to the heater pipe. The heater pipes lead to the bulkhead and return to the engine side of the thermostat.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Item	Part Number	Description
A	-	Coolant inlet connection
B	-	LH coolant cylinder head inlet connection
C	-	Radiator top hose connection
D	-	Radiator bottom hose connection
E	-	RH coolant cylinder head inlet connection

F	-	Heater feed hose connection
G	-	EGR cooling feed hose connection
1	-	Elbow
2	-	EGR thermostat wax motor
3	-	O-ring seal
4	-	EGR thermostat housing
5	-	Thermostat housing upper moulding
6	-	Thermostat housing
7	-	Thermostat
8	-	Seal
9	-	Coolant spigot housing
10	-	Bolt, 4 off

The engine contains a conventional wax thermostat, which is positioned such that the wax's temperature is controlled by the bypass coolant. The thermostat housing also contains a sprung loaded valve, which limits the amount of coolant using the bypass. At low engine speeds most coolant is diverted through the heater. At higher engine speeds the bypass opens to protect the heater matrix from to higher pressures and flow rates. This means the engine can run with minimal coolant flowing through the bypass at low engine speeds, to improve heater performance.

The radiator is a vertical flow-type with an aluminium matrix and has a drain tap on the bottom left-hand rear face. The lower radiator mountings are located part way up the module frame. The mountings are fitted with rubber bushes, which sit on plastic mounts clipped into the chassis rails. The top of the radiator is located in rubber bushes secured by brackets fitted to the bonnet locking platform.

The coolant degas tank is fitted behind the Left Hand (LH) side headlight of the LH in the engine compartment. The tank allows for system filling and any air trapped in the coolant to be removed.

The liquid cooled transmission oil cooler is mounted to the fan cowl. It is fed coolant from the sub-cooled section of the radiator, which is controlled by the oil cooler mixer valve.

The oil cooler mixer valve is a 2 stage valve, which controls the heating and cooling of the transmission oil. The operation of the first stage is to warm up oil from cold to improve emissions and driveability. The second stage is fully operational once the coolant temperature reaches 91°C (196°F) and allows cooling of the oil (starts to open at 84°C (183°F)).

For additional airflow through the radiator matrix, particularly when the vehicle is stationary or slow moving, there is an engine driven electro-viscous unit. This unit functions as a normal viscous fan, but with electronic control over the level of engagement of the viscous clutch. The Engine Control Module (ECM), which determines the required fan speed, controls the level of clutch engagement. The ECM determines engagement based on the coolant, ambient and transmission oil temperatures and Air Conditioning (AC) system pressure. The fan is mounted using a Left Hand (LH) thread.

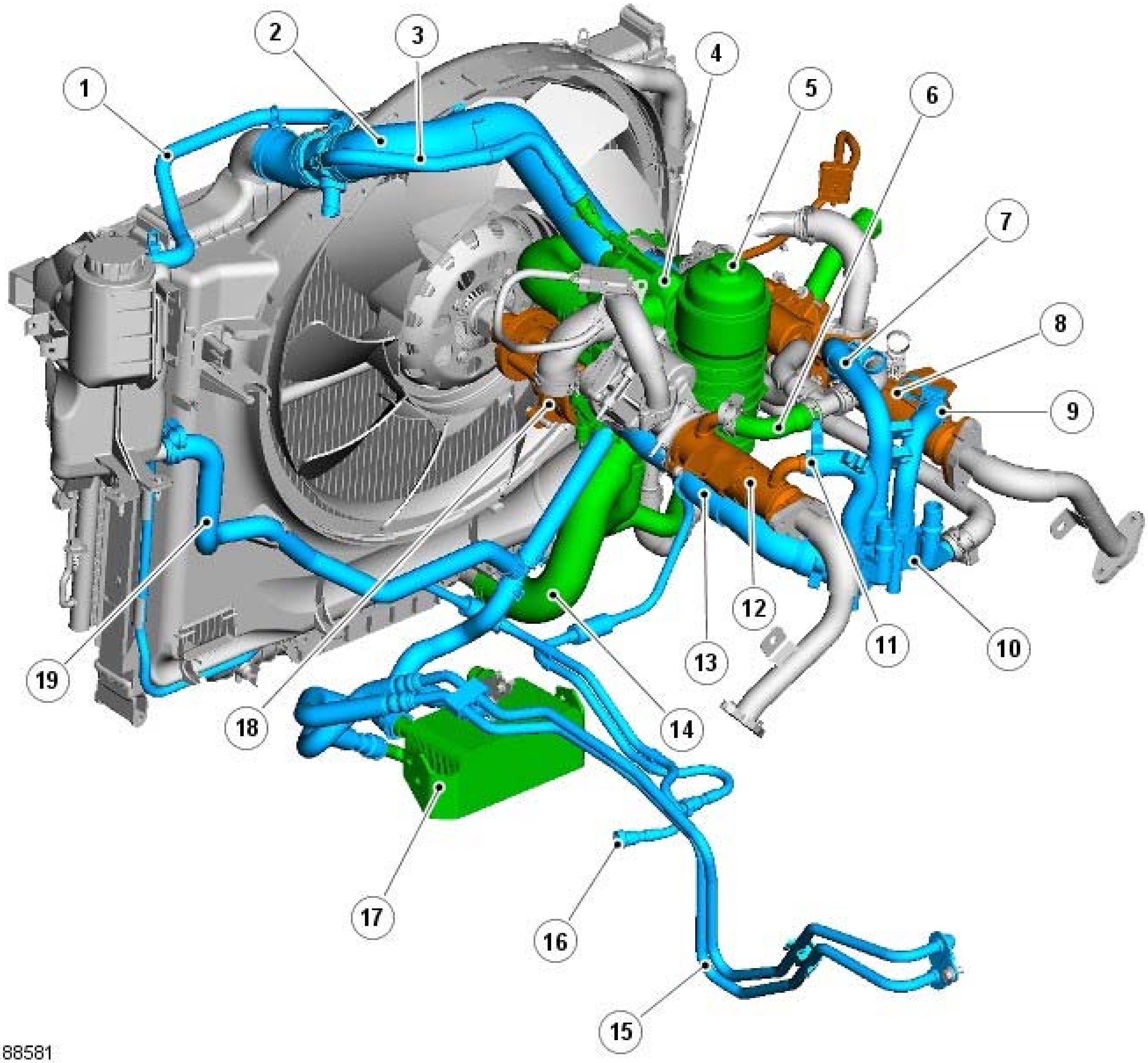
The viscous fan unit is electronically controlled by the ECM to optimise fan speed for all operating conditions.

• NOTE: If the electrical connections to the viscous fan are disconnected the fan will 'idle' and overheating may result. The ECM stores the appropriate fault codes in this case. A 'check engine light' will also be displayed in the instrument cluster.

Due to package constraints an auxiliary radiator is required to maintain acceptable coolant temperatures under arduous driving conditions such as high-load and high ambient temperatures. This radiator is located in the in the RH wheel arch area, with cooling airflow supplied by a dedicated aperture in the front bumper. The auxiliary radiator is connected in parallel with the main radiator, with the coolant flow being controlled by the main engine thermostat.

An air to air intercooler is located behind the AC condenser, but in front of the main radiator. This reduces the charge air temperature (post turbocharger compressor) by up to 130°C (266°F) before entering the engine. The intercooler has 2 separate air paths for the LH and RH cylinder banks.

ENGINE COOLING SYSTEM OPERATION



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Item	Part Number	Description
1	-	Hose, radiator top hose to degas tank
2	-	Radiator top hose
3	-	Hose, engine bleed
4	-	Thermostat housing
5	-	Oil filter and oil/fuel cooler assembly
6	-	Hose, Exhaust Gas Recirculation (EGR) cooler inlet
7	-	Hose, engine oil cooler outlet
8	-	RH EGR cooler
9	-	Hose, Exhaust Gas Recirculation (EGR) cooler outlet
10	-	Coolant hose connection assembly
11	-	Hose, Exhaust Gas Recirculation (EGR) cooler inlet
12	-	LH EGR cooler
13	-	Transmission oil cooler pipes
14	-	Bottom hose
15	-	Transmission oil cooler
16	-	Fuel cooler pipes

17	-	Transmission oil cooler
18	-	Engine coolant pump
19	-	Hose, engine coolant return

After the initial warm-up phase is complete (coolant temperature between 40°C (104°F) and 70°C (158°F), depending on ambient temperature), the EGR mixer valve begins to blend cold water from the radiator outlet. This has the effect of reducing the temperature of the coolant supplied by to the EGR coolers, thus improving their effectiveness and reducing the emissions of Nitrogen Oxides (NOx). The flow rate of this coolant is controlled by a thermostatic valve located in each EGR cooler exit and ensures that maximum EGR cooling is delivered without compromising engine warm-up or cabin heater performance.

As the temperature and pressure increases the bypass valve is forced open allowing coolant to circulate through the bypass valve. When the temperature reaches 88°C (190°F) the main engine thermostat and transmission oil cooler mixer thermostat begin to open allowing coolant to circulate through the main radiator. As the thermostat progressively opens (fully open at 95°C (203°F)), the bypass valve progressively closes forcing any coolant through the heater or radiator.

Coolant flows through the radiator from the top RH tank to the bottom LH tank and is cooled by air passing through the matrix. A small flow of coolant from the radiator and the top of the engine is directed to the degas tank where any trapped air is separated.

In arduous driving conditions such as towing and/or in high ambient temperatures the radiator sub-cooled section and dedicated fuel sub-cooler radiator supply low temperature coolant to the oil/fuel coolers. This enables sufficient heat exchange into the coolant from these systems to maintain the fluid temperatures within their required limits.

The temperature of the cooling system is monitored by the ECM via the Engine Coolant temperature (ECT) sensor located in the coolant housing. The ECM uses signals from this sensor to control the cooling fan operation.

Regulation of the coolant temperature is achieved via engagement of the electro-viscous fan assembly. This is controlled by a Pulse Width Modulated (PWM) signal with a duty cycle of between 0 and 100%, provided by the ECM and derived from inputs based on:

- Coolant temperature
- Ambient air temperature
- Engine inlet air temperature
- Air Conditioning (AC) system pressure
- AC switch operation
- Transmission oil temperature

Fan speed control is variable; however, because the fan is driven directly from the engine, the maximum fan speed available is tied to engine speed. At high engine speeds the fan is progressively disengaged to protect the clutch unit. This system provides very high levels of fan power, up to 5 kilo Watts (kW), with enhanced noise and fuel economy benefits compared to mechanically controlled viscous fans.

The speed of the cooling fan is also influenced by vehicle road speed. The ECM adjusts the speed of the cooling fans, to compensate for the ram effect of vehicle speed, using the Controller Area Network (CAN) road speed signal received from the Anti-lock Braking System (ABS) module.
For additional information, refer to: Air Conditioning (412-03D Air Conditioning - TDV8 3.6L Diesel, Description and Operation).

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Engine Cooling - TDV8 3.6L Diesel - Engine Cooling

Diagnosis and Testing

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Coolant leaks ● Coolant Hoses ● Coolant expansion tank ● Radiator ● Heater core ● Accessory drive belt ● Viscous fan	● Fuses - Fuse 7E, engine compartment ● Harnesses ● Loose or corroded connector(s) ● Engine coolant temperature (ECT) sensor ● Engine oil temperature (EOT) sensor ● Viscous fan solenoid ● Environmental box (E-Box) fan

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible cause	Action
Coolant loss	● Hoses ● Hose connections ● Radiator ● Water pump ● Heater core ● Gaskets ● Engine casting cracks ● Engine block core plugs	Carry out a visual inspection. If there are no obvious leaks, carry out a pressure test using your workshop tester. Rectify as necessary.
Overheating	● Low/Contaminated coolant ● Thermostat ● Viscous fan ● Engine coolant temperature (ECT) sensor ● Restricted air flow over the radiator	Check the coolant level and condition. Carry out a pressure test using your workshop tester. Rectify as necessary. Check the thermostat and rectify as necessary. Check the viscous fan operation, make sure the viscous fan rotates freely. Check for obstructions to the air flow over the radiator. Rectify as necessary.
Engine not reaching normal temperature	● Thermostat ● Viscous fan ● Thermostat ● Electric fan ● Fan speed module	Check the thermostat operation. Check the viscous fan operation, make sure the viscous fan is not seized. Rectify as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of engine control module (ECM) DTCs.
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible causes	Action

DTC	Description	Possible causes	Action
P011626	Engine coolant temperature (ECT) sensor circuit range/performance - signal rate of change below threshold	● ECT sensor circuit: intermittent high resistance ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a datalogger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10 °C, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011716	Engine coolant temperature (ECT) sensor circuit low input - voltage below threshold	● ECT sensor circuit: short circuit to ground ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Measure the resistance of the sensor. Nominal resistance at 20 °C (68 °F) should be between 35.47 and 39.21 Kohms. If the resistance is outside this range, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011817	Engine coolant temperature (ECT) sensor circuit high input - voltage above threshold	● ECT sensor circuit: short circuit to power ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Measure the resistance of the sensor. Nominal resistance at 20 °C (68 °F) should be between 35.47 and 39.21 Kohms. If the resistance is outside this range, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011927	Engine coolant temperature (ECT) sensor circuit intermittent/erratic - signal rate of change above threshold	● ECT sensor circuit: intermittent high resistance ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Read the coolant temperature using a datalogger function and record the value. Increase the engine speed to 2,000 rpm and recheck the value after two minutes at this engine speed. If the value has increased faster than 5 °C per second, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P019626	Engine oil temperature (EOT) sensor circuit range/performance- signal rate of change below threshold	● EOT sensor circuit: intermittent high resistance ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. From cold, start the engine and check the oil temperature using a datalogger function. Allow the engine to idle for ten minutes and recheck the oil temperature. If the value has not increased by more than 5 °C in this time, install a new sensor. Clear the DTCs and test for normal operation.
P019716	Engine oil temperature (EOT) sensor circuit low input - voltage below threshold	● EOT sensor circuit: short circuit to ground ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Rectify as necessary.
P019817	Engine oil temperature (EOT) sensor circuit high input - voltage above threshold	● EOT sensor circuit: short circuit to power ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Rectify as necessary.
P019927	Engine oil temperature (EOT) sensor circuit intermittent - signal rate of change above threshold	● EOT sensor circuit: intermittent high resistance ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the oil temperature using a datalogger function. Increase the engine speed to 2,000 rpm and recheck the value after two minutes at this engine speed. If the value has increased by more than 40 °C per second, install a new sensor. Clear the DTCs and test for normal operation.
P048011	Fan 1 control circuit	● Cooling fan control circuit: short circuit to ground ● Cooling fan fault	Check the cooling fan and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P048012	Fan 1 control circuit	• Cooling fan control circuit: short circuit to power • Cooling fan fault	Check the cooling fan and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P048013	Fan 1 control circuit	• Cooling fan control circuit: high resistance	Check the cooling fan and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P048300	Fan rationality check	• Cooling fan control circuit: short circuit to ground • Cooling fan control circuit: short circuit to power • Cooling fan control circuit: high resistance • Cooling fan fault	Check the cooling fan and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Check the pulse width modulated (PWM) signal, check the motor for sticking. Rectify as necessary.
P052721	Fan speed sensor circuit range/performance - signal amplitude less than minimum	• Fan circuit: short circuit to ground • Fan circuit: short circuit to power • Fan circuit: high resistance • Fan fault	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Check the motor for sticking. Rectify as necessary. Clear the DTCs and test for normal operation.
P052722	Fan speed sensor circuit range/performance - signal amplitude greater than maximum	• Fan circuit: short circuit to ground • Fan circuit: short circuit to power • Fan circuit: high resistance • Fan fault	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Check the motor for sticking. Rectify as necessary. Clear the DTCs and test for normal operation.
P052727	Fan speed sensor circuit range/performance - signal rate of change above threshold	• Sensor signal gradient not plausible	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Check the motor for sticking. Rectify as necessary. Clear the DTCs and test for normal operation.
P069311	Viscous fan control circuit low - circuit open	• Viscous fan control circuit: high resistance • Viscous fan solenoid fault	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P069313	Viscous fan control circuit low - circuit short to ground	• Viscous fan control circuit: short circuit to ground • Viscous fan solenoid fault	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P069412	Viscous fan control circuit high - circuit short to battery	• Viscous fan control circuit: short circuit to power • Viscous fan solenoid fault	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P150F68	Environmental box (E-Box) cooling fan performance - event information	● E-Box fan circuit: short circuit to ground ● E-Box fan circuit: short circuit to power ● E-Box fan circuit: high resistance ● E-Box fan fault ● Engine control module (ECM) fault	Check the E-Box fan and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a module is suspect.

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Engine Cooling - TDV8 3.6L Diesel - Cooling System Partial Draining, Filling and Bleeding

General Procedures

⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

- CAUTIONS:

⚠ The engine cooling system must be maintained with the correct concentration and type of anti-freeze solution to prevent corrosion and frost damage. Failure to follow this instruction may result in damage to the engine

⚠ Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

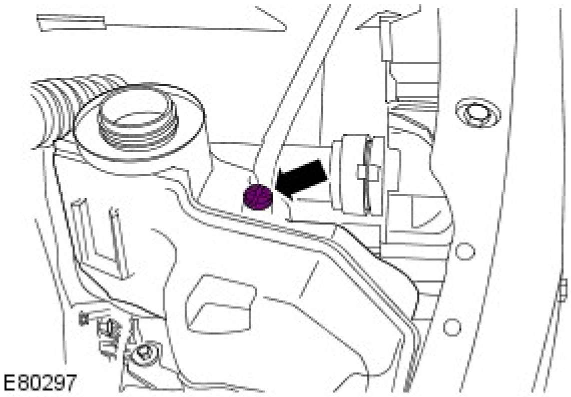
2. Set the heater controls to HOT.

3. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

Remove the coolant expansion tank cap.

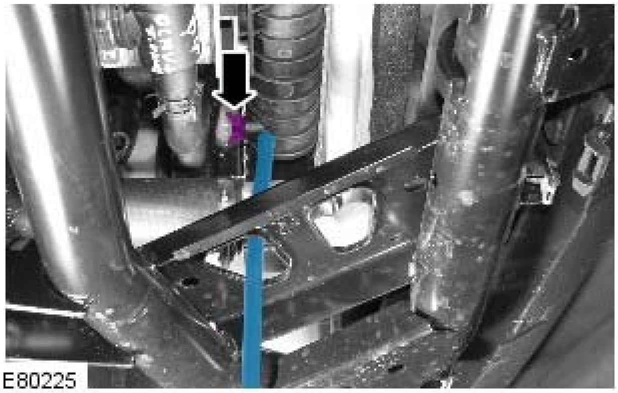
5. Loosen the coolant expansion tank bleed screw.



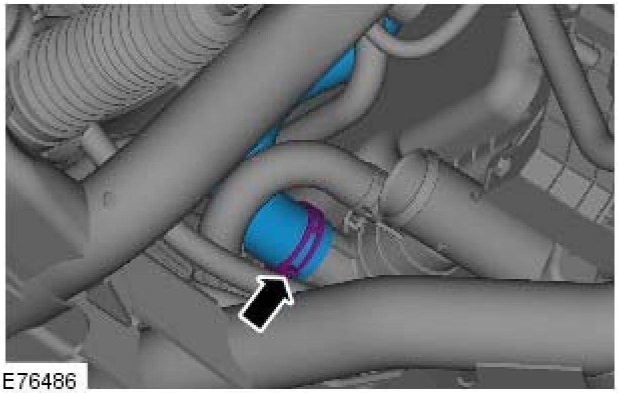
6. Remove the radiator splash shield.
For additional information, refer to: Radiator Splash Shield (501-02, Removal and Installation).

7. Drain the coolant from the radiator.

- Position a container to collect the fluid.
- Attach a hose to the radiator drain tap. Open the tap.



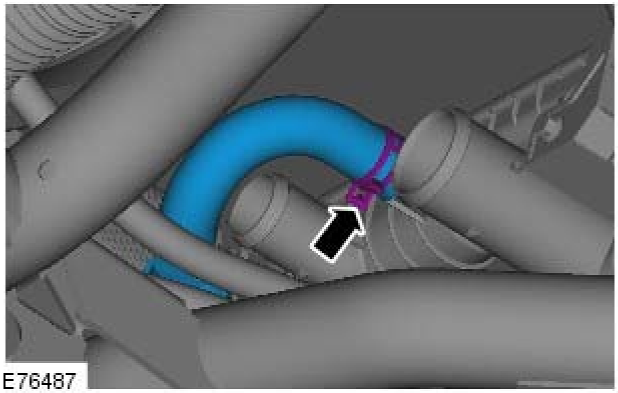
8. Close the radiator drain tap and remove the hose.



9. ⚠ WARNING: Eye protection must be worn.

Disconnect the radiator lower hose from the radiator.

- Release the clip.
- Allow the coolant to drain.



10. ⚠ WARNING: Eye protection must be worn.

Disconnect the oil cooler multi valve hose from the radiator.

- Allow the coolant to drain.

11. ⚠ WARNING: Eye protection must be worn.

Disconnect the coolant feed hose from the transmission fluid cooler.

- Allow the coolant to drain.

12. Connect the coolant hoses.

- Remove the container.

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

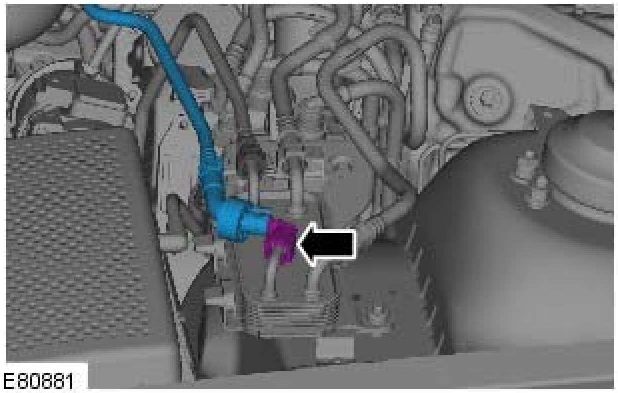
14. Connect exhaust extraction hoses to the tail pipes.

15. ⚠ CAUTION: Anti-freeze concentration must be maintained at 50%.

Fill the cooling system expansion tank until the coolant level becomes static with in the "COLD FILL RANGE".

16. ⚠ CAUTION: Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.

Start the engine and allow to idle.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17. ⚠ WARNING: Eye protection must be worn.

- CAUTIONS:

⚠ Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

⚠ Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure

Disconnect the fuel cooler coolant return line.

- Allow any trapped air to escape.

18. Connect the fuel cooler coolant return line.

19. When coolant runs from the expansion tank bleed point bubble-free, tighten the bleed screw.

20. Add coolant to the expansion tank until the coolant level is 25 mm (0.98 inch) above the "COLD FILL RANGE" upper mark.

21. Hold the engine speed at 2,000 RPM for 25 seconds.

22. Allow the engine to idle for 30 seconds.

23. CAUTIONS:

⚠ Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle

⚠ Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.

Repeat the above 2 steps 3 times or until hot air is emitted from the heater.

24. Allow the engine to idle for 30 seconds.

25. Add coolant to the expansion tank until the coolant level is 25 mm (0.98 inch) above the "COLD FILL RANGE" upper mark.

- Install the coolant expansion tank cap.

26. ⚠ CAUTION: Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle

Start and run the engine until the thermostat opens.

- Switch the engine off and allow to cool.

27. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

⚠CAUTION: If topping up the cooling system when HOT, the HOT fill level with the coolant expansion tank cap removed is significantly higher, 50 mm (2 inches) than the COLD fill level. Failure to compensate for this may lead to significant under filling of the cooling system and may lead to incorrect diagnosis and coolant loss.

Check and top-up the coolant if required.

28. Disconnect the exhaust extraction hoses from the tail pipes.

29. Clean any spilt coolant from the vehicle.

30. Install the engine undershield.
For additional information, refer to: Radiator Splash Shield (501-02, Removal and Installation).

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Engine Cooling - TDV8 3.6L Diesel - Auxiliary Radiator

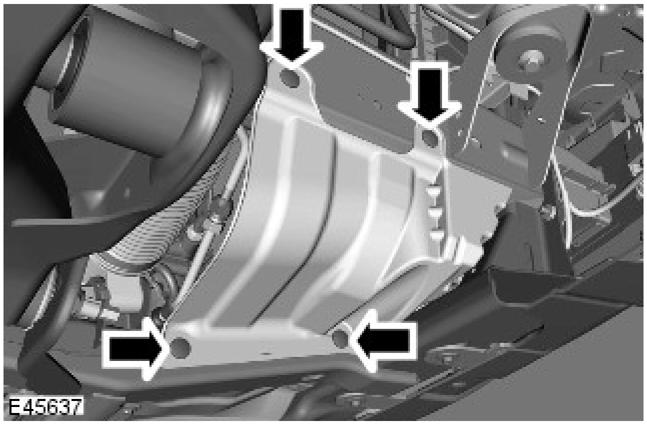
Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

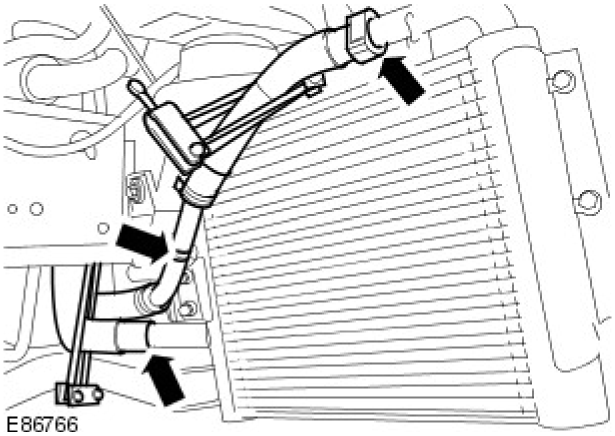
Raise and support the vehicle.

2. Remove the front RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



3. Remove the front RH splash shield.

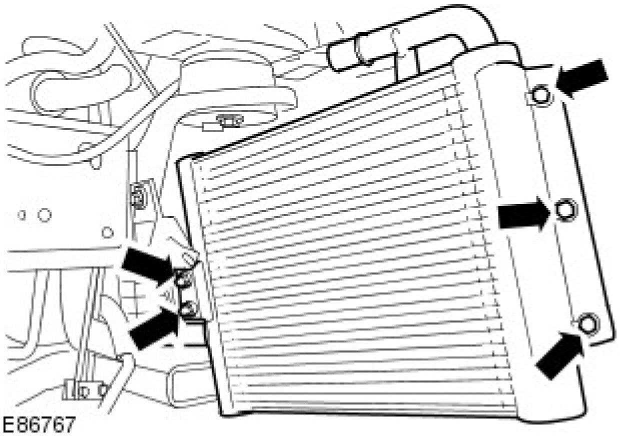
- Remove the 4 clips.



4. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 coolant hoses.

- Clamp the hose to minimize coolant loss.
- Release the coolant pipe from the clip.
- Position a container to collect the fluid spillage.



5. Remove the auxiliary radiator.

- Remove the 5 bolts.

Installation

1. Install the auxiliary radiator.
    - Tighten the bolts to 20 Nm (15 lb.ft).
2. NOTE: Remove and discard the blanking caps.

   Connect the coolant hoses.
    - Secure the coolant pipe in the clip.
    - Remove the coolant hose clamps.
    - Remove the container.
3. Install the front RH splash shield.
    - Install the clips.
4. Install the front RH fender splash shield.
   For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).
5. Check and top-up the coolant.

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Engine Cooling - TDV8 3.6L Diesel - Coolant Expansion Tank

Removal and Installation

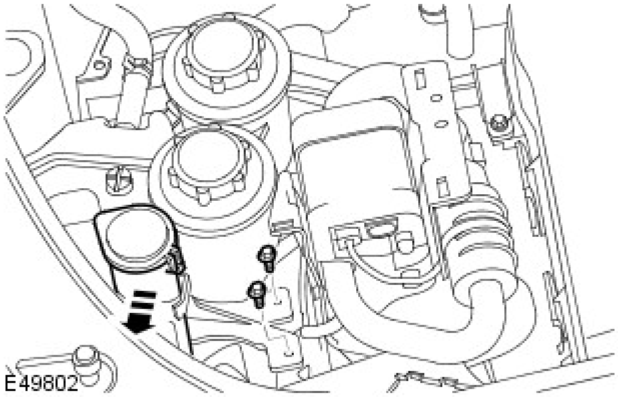
Removal

1. Remove the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

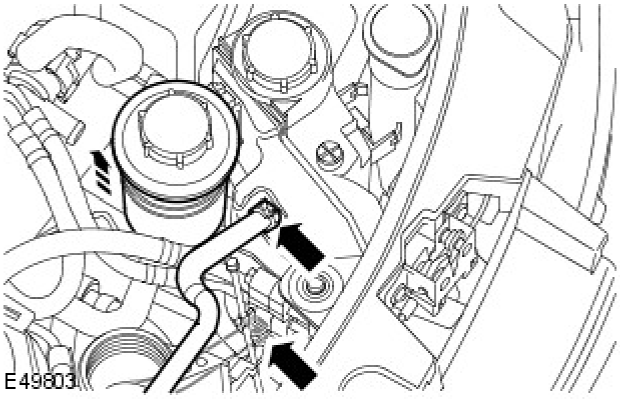
2. Release the windshield washer reservoir filler neck.

3. Release the coolant expansion tank.

- Remove the 2 bolts.



4. Release the power steering fluid reservoir.



5. WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

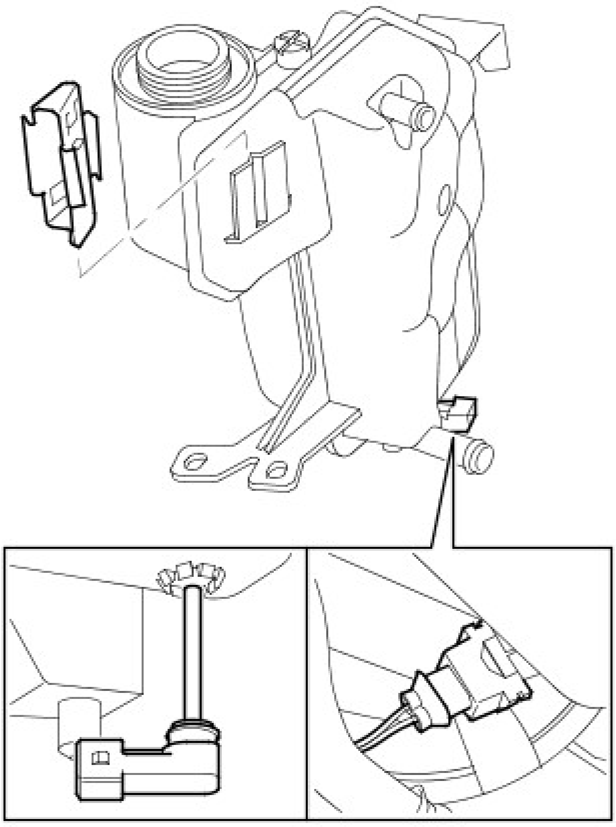
CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Disconnect the 2 hoses from the coolant expansion tank.

- Position an absorbent cloth to collect fluid spillage.
- Position a container to collect the fluid.
- Clamp the hoses
- Release the 2 clips.

6. Remove the coolant expansion tank.

- Disconnect the coolant low level sensor electrical connector.



7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the coolant low level sensor.

- Remove the coolant expansion tank support bracket.

Installation

1. Install the bracket.

2. Install the coolant low level sensor.

3. Install the coolant expansion tank.

- Connect the coolant low level sensor electrical connector.

4. Connect the coolant hoses to the expansion tank.

- Secure with the clips.

5. Top-up the coolant.

- Loosen the coolant expansion tank bleed screw.
- Fill the coolant expansion tank until coolant emerges from the cooling system air bleed screw.
- Remove the hose clamps.
- Tighten the bleed screw to 8 Nm (6 lb.ft).

6. Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

7. Check and top-up the coolant.

- Install the coolant expansion tank pressure cap.

8. Secure the power steering fluid reservoir.

- Attach to the mounting bracket.

9. Secure the windshield washer reservoir filler neck.

- Locate in clip.

10. Install the LH headlamp assembly.

For additional information, refer to: Headlamp Assembly (417-01

Exterior Lighting, Removal and Installation).

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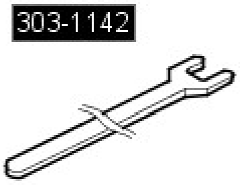
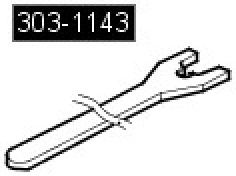
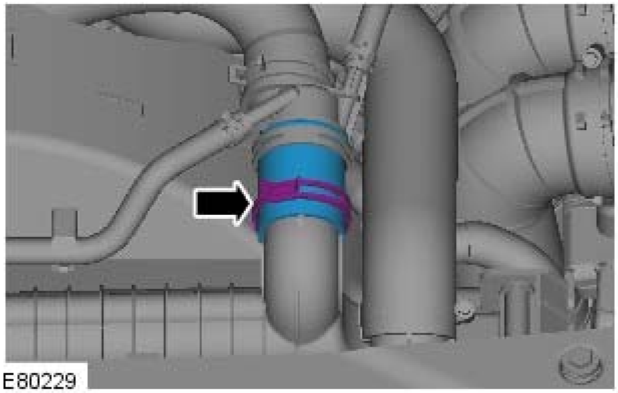
Engine Cooling - TDV8 3.6L Diesel - Cooling Fan

Removal and Installation

Special Tool(s)	
 E46076	Viscous coupling spanner 303-1142
 E55382	Viscous coupling pulley retaining tool 303-1143

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Partially drain the cooling system.
   For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).
4. Disconnect the radiator upper hose.
   - Release the clip.



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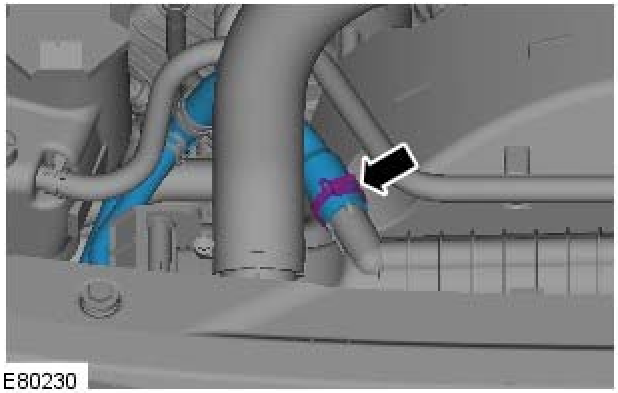
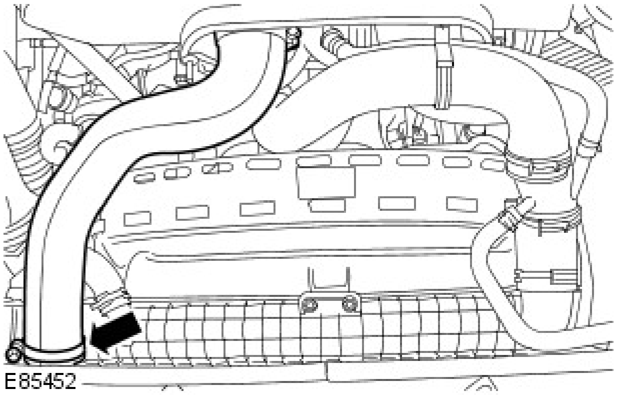
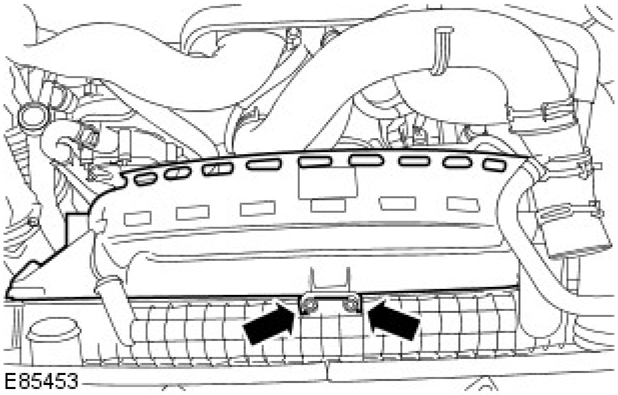


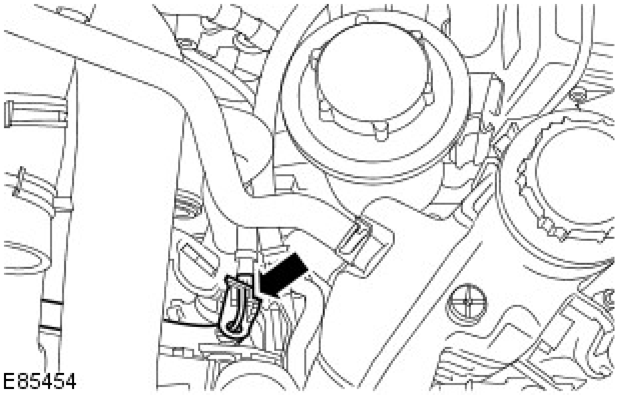
5. Disconnect the auxiliary radiator coolant hose.
    - Release the clip.



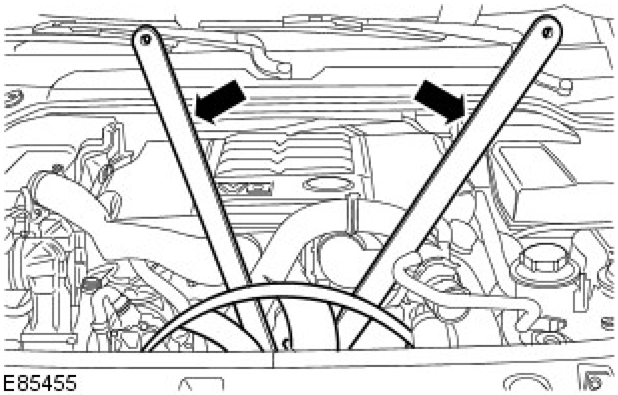
6. Disconnect the RH charge air cooler outlet pipe.
    - Loosen the clip.



7. Remove the cooling fan upper shroud.
    - Release from the 3 clips.

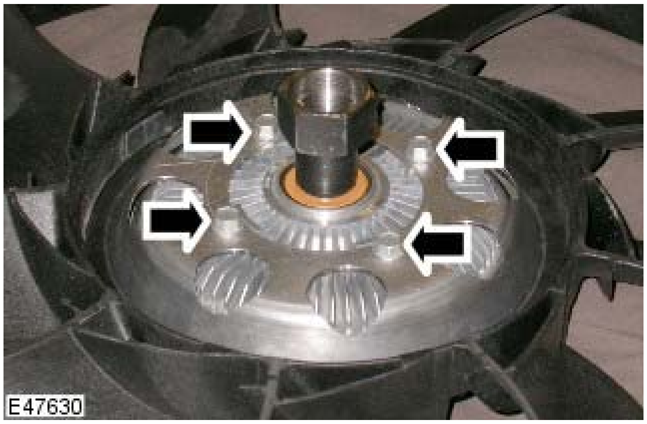


8. Disconnect the cooling fan control electrical connector.
    - Release the cooling fan control electrical connector from the cooling fan lower shroud.



9. NOTE: The thread is left handed.

Using the special tools, remove the cooling fan.



10. NOTE: Do not disassemble further if the component is removed for access only.

Remove the viscous coupling.

- Remove the 4 bolts.

Installation

1. To install, reverse the removal procedure.

- Tighten the viscous coupling bolts to 10 Nm (7 lb.ft).
- Tighten the cooling fan nut to 65 Nm (48 lb.ft).

2. Fill and bleed the cooling system.
For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).

Published: 11-May-2011

Engine Cooling - TDV8 3.6L Diesel - Cooling Fan Shroud

Removal and Installation

Removal

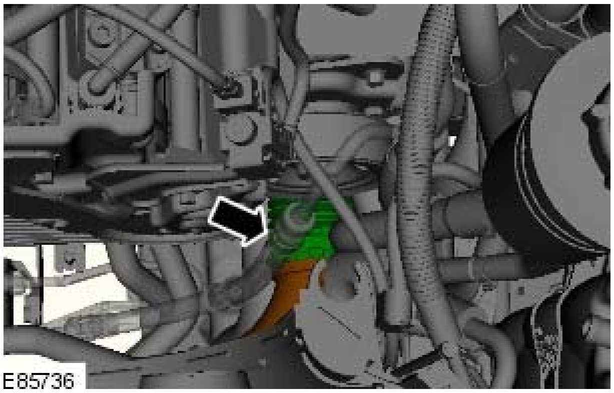
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

3. Remove the viscous fan assembly.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

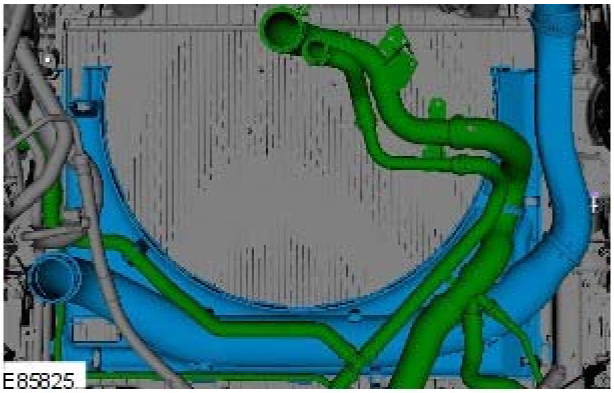
4. Release the LH turbocharger intake tube.

- Release the clip.



5. Remove the cooling fan shroud.

- Release the coolant pipes and hoses from the cooling fan shroud.
- Release the 4 clips and move the cooling fan shroud upwards.



Installation

1. Install the cooling fan shroud.

- Secure the coolant pipes and hoses in the cooling fan shroud.
- Secure in the clips.

2. Secure the LH turbocharger inlet tube.

- Tighten the clip.

3. Install the viscous fan assembly.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

4. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Cooling - TDV8 3.6L Diesel - Cooling Module

Removal and Installation

Removal

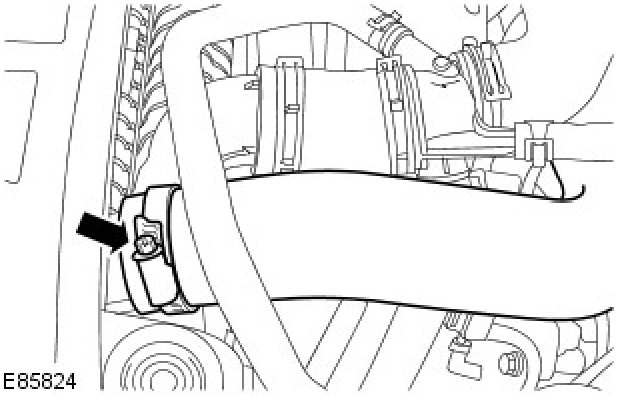
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

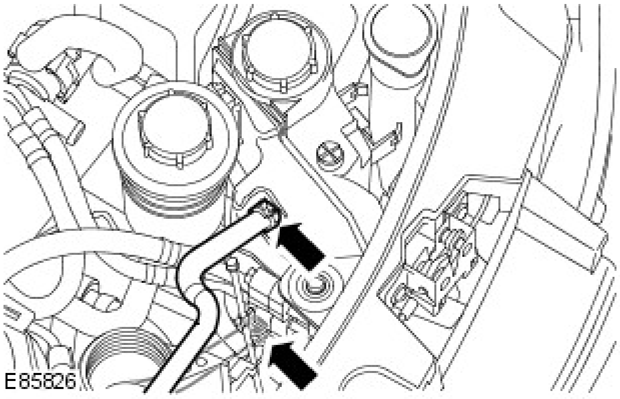
3. Recover the air conditioning (A/C) refrigerant.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

4. Remove the hood latch panel.
   For additional information, refer to: Hood Latch Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).



5. Release the LH charge air cooler outlet pipe.
   - Loosen the clip.

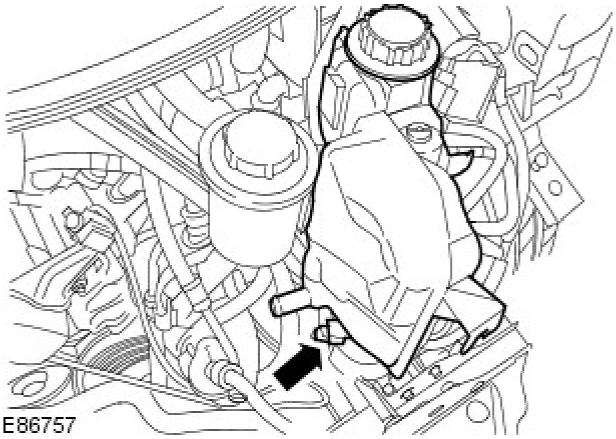
6. Remove the cooling fan lower shroud.
   For additional information, refer to: Cooling Fan Shroud (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).



7. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

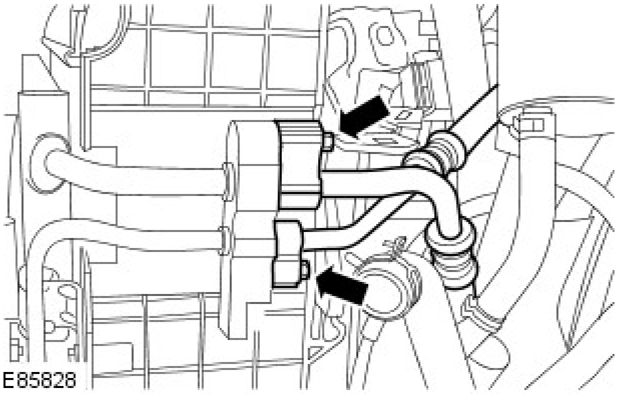
   ⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

   Disconnect the 2 hoses from the coolant expansion tank.
   - Release the 2 clips.



8. Remove the coolant expansion tank.

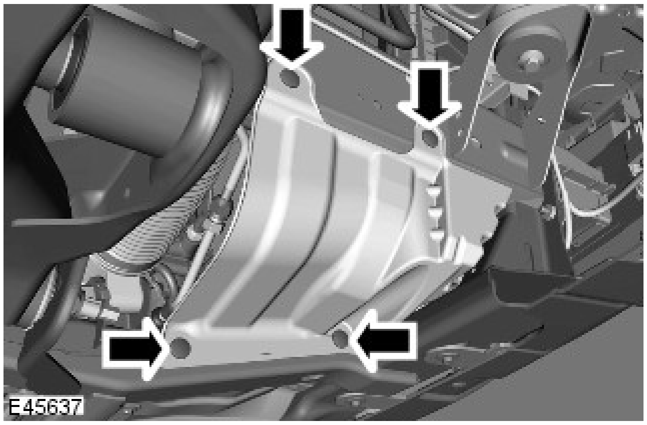
- Disconnect the coolant low level sensor electrical connector.



9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

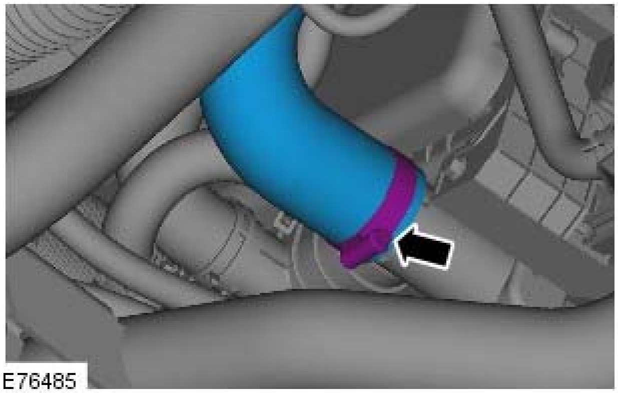
Release the 2 A/C refrigerant lines.

- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.



10. Remove the front RH splash shield.

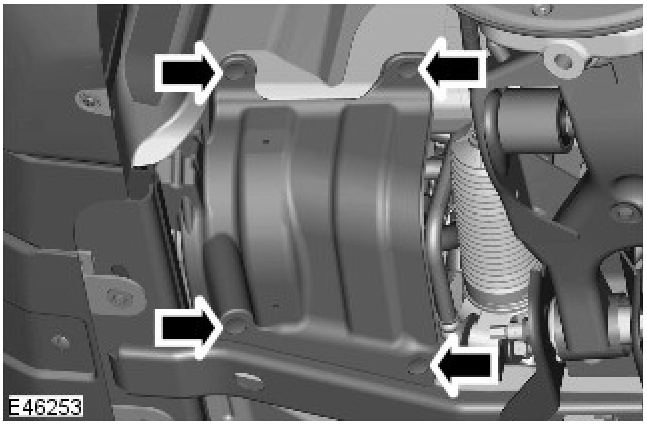
- Remove the 4 clips.



11. ⚠ CAUTION: Make sure that the inside of the pipe ends are clean and free of oil residue.

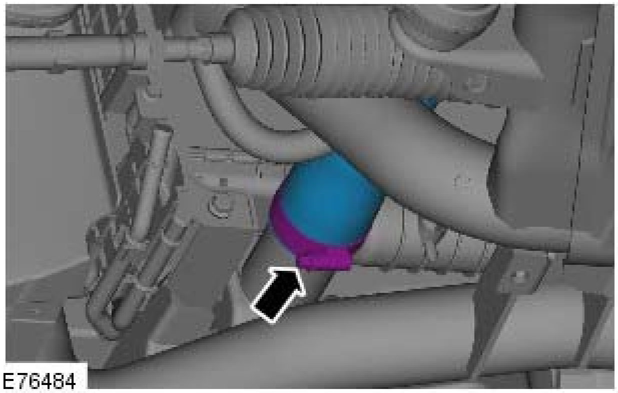
Disconnect the RH charge air cooler inlet hose.

- Release the clip.



12. Remove the front LH splash shield.

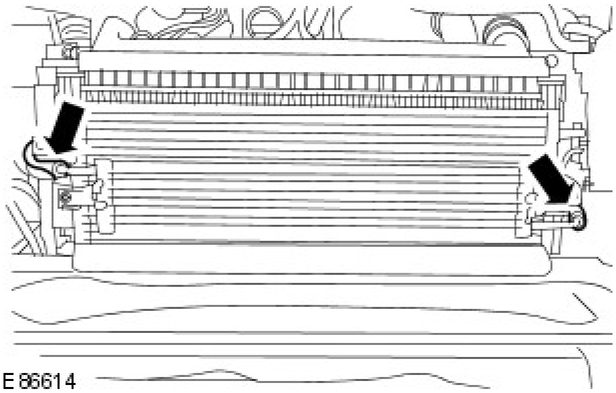
- Remove the 4 clips.



13. ⚠ CAUTION: Make sure that the inside of the pipe ends are clean and free of oil residue.

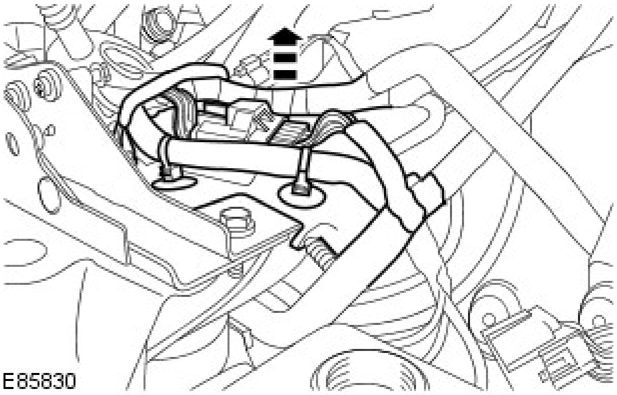
Disconnect the LH charge air cooler inlet hose.

- Release the clip.



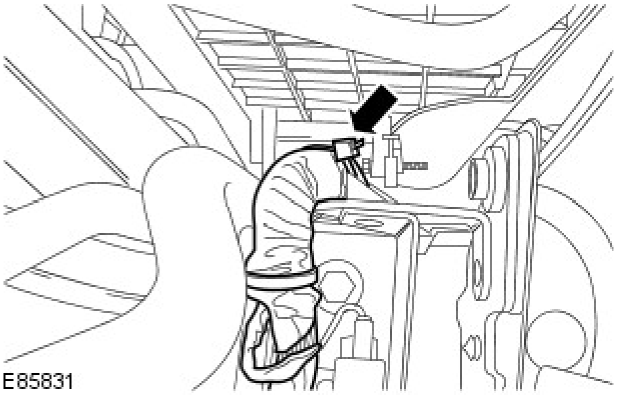
14. Disconnect the 2 coolant pipes from the auxiliary fuel cooler.

- Release the 2 quick release connectors.



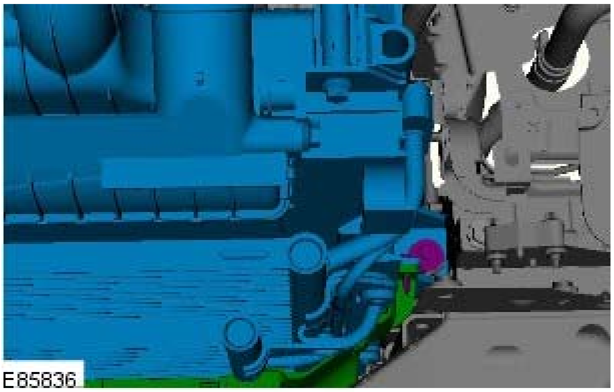
15. LH front, release the wiring harness bracket.

- Release the 2 clips.



16. RH front, release the wiring harness.

- Release the clip.



17. ⚠ CAUTION: Care must be taken to avoid damaging the engine bay wiring harnesses.

• NOTE: LH illustration is shown, RH is similar.

With assistance, remove the cooling module.

- Remove the 2 bolts.
- Remove the 2 screws.

Installation

1. ⚠ CAUTION: Care must be taken to avoid damaging the engine bay wiring harnesses.

With assistance, install the cooling module.

- Tighten the bolts to 24 Nm (18 lb.ft).

2. RH front, secure the wiring harness.

- Secure the clip.

3. LH front, secure the wiring harness.

- Secure the clips.

4. Secure the coolant pipes to the auxiliary fuel cooler.

- Secure the clips.

5. Install the front LH splash shield.

- Install the clips.

6. Connect the charge air cooler LH inlet hose.

- Secure with the clip.

7. Install the front RH splash shield.

- Install the clips.

8. Connect the charge air cooler RH inlet hose.

- Secure with the clip.

9. NOTE: Remove and discard the blanking caps.

Secure the A/C refrigerant lines.

- Install the new O-ring seals.
- Tighten the bolts to 10 Nm (7 lb.ft).

10. Install the coolant expansion tank.

- Connect the coolant low level sensor electrical connector.

11. Connect the coolant hoses to the expansion tank.

- Secure the clips.

12. Install the cooling fan lower shroud.
For additional information, refer to: Cooling Fan Shroud (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

13. Secure the LH charge air cooler outlet pipe.

- Tighten the clip.

14. Install the hood latch panel.
For additional information, refer to: Hood Latch Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

15. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Cooling - TDV8 3.6L Diesel - Coolant Pump

Removal and Installation

Removal

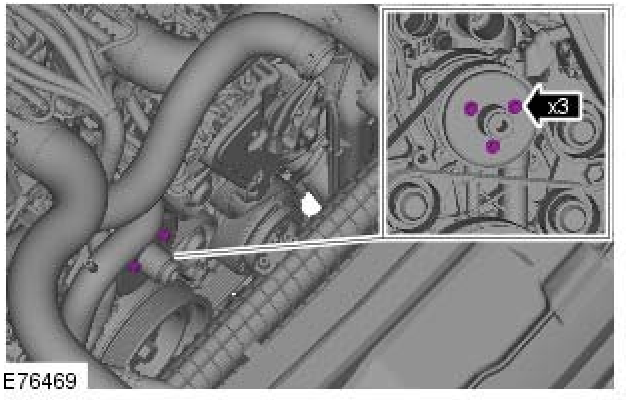
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

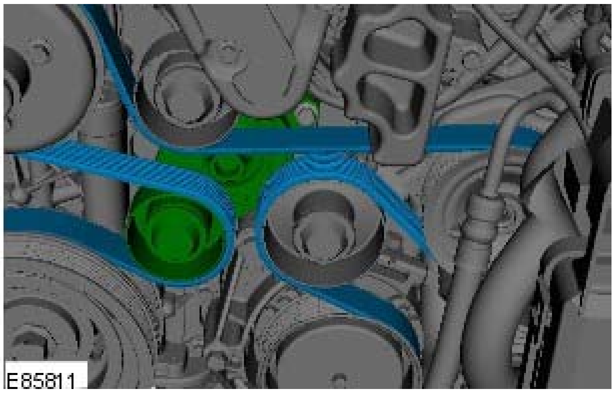
   Raise and support the vehicle.

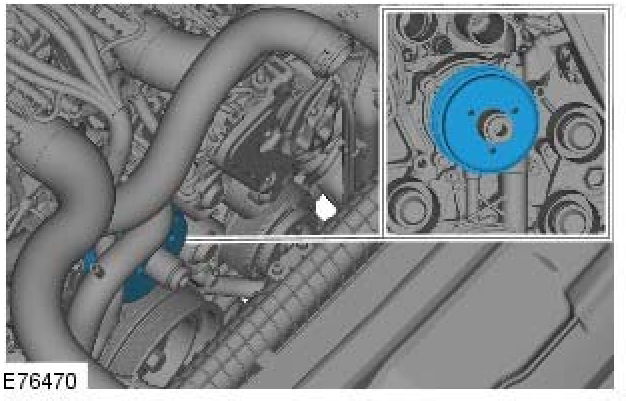
3. Remove the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

4. Loosen the 3 coolant pump pulley bolts.



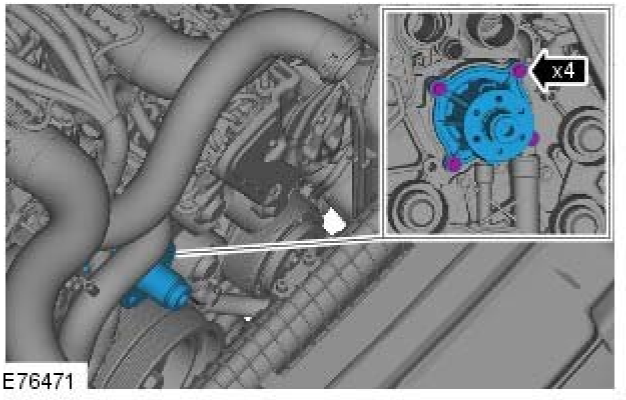
5. Remove the cooling fan belt.
   - Release the tension from the belt.





6. Remove the coolant pump pulley.

- Remove the 3 bolts.



7. ⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the coolant pump.

- Position a container to collect the fluid spillage.
- Remove the 4 bolts.
- Remove and discard the O-ring seal.

Installation

1. NOTE: Lubricate the new O-ring seal with clean engine coolant.

Install the coolant pump.

- Install a new O-ring seal.
- Tighten the bolts to 23 Nm (17 lb.ft).
- Remove the container.

2. Install the coolant pump pulley.

- Loosely install the bolts.

3. Install the cooling fan belt.

- Clean and inspect the drive pulleys for damage.

4. Tighten the coolant pump pulley bolts.

- Tighten the bolts to 25 Nm (18 lb.ft).

5. Install the accessory belt.
For additional information, refer to: Accessory Drive Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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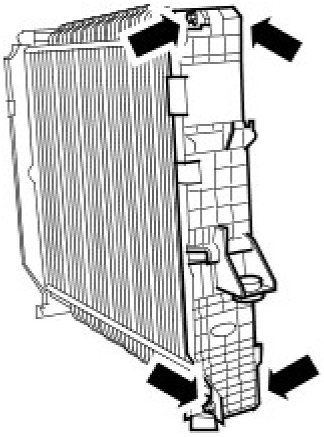
Engine Cooling - TDV8 3.6L Diesel - Radiator

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Remove the charge air cooler.
   For additional information, refer to: Charge Air Cooler (303-12D Intake Air Distribution and Filtering - TDV8 3.6L Diesel, Removal and Installation).
4. NOTE: LH illustration shown, RH is similar.



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Remove the 2 radiator mounting brackets.

- Remove the 8 bolts.

Installation

1. Install the radiator mounting brackets.
   - Tighten the bolts to 10 Nm (7 lb.ft).
2. Install the charge air cooler.
   For additional information, refer to: Charge Air Cooler (303-12D Intake Air Distribution and Filtering - TDV8 3.6L Diesel, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Cooling - TDV8 3.6L Diesel - Thermostat

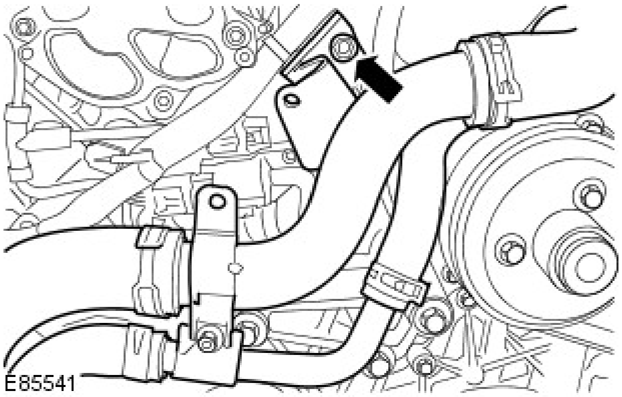
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

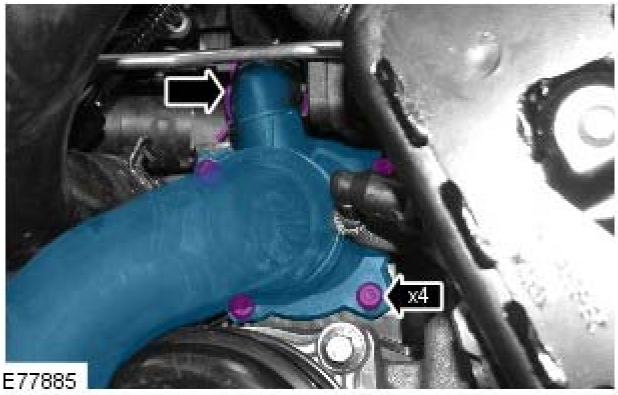
2. Raise and support the vehicle.

3. Remove the cooling fan assembly.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).



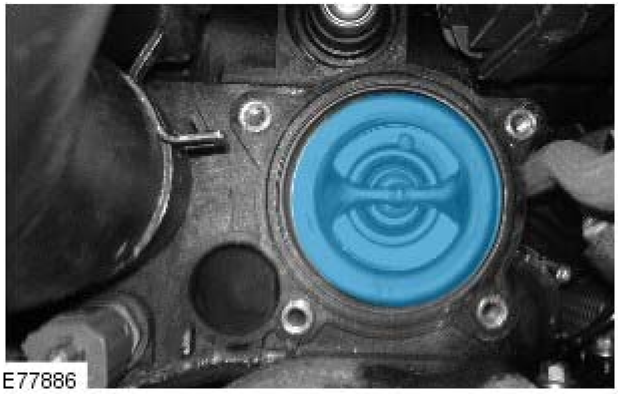
4. Release the coolant hose bracket.

- Remove the nut.
- Release the 2 wiring harness clips.



5. Release the thermostat housing.

- Remove the clip.
- Remove the 4 bolts.
- Remove and discard the O-ring seals.



6. Remove the thermostat.

- Remove and discard the O-ring seal.

Installation

1. NOTE: Lubricate the O-ring seal with clean coolant.

Install the thermostat.

- Install a new O-ring seal.
- Clean the component mating faces.

2. NOTE: Lubricate the O-ring seals with clean coolant.

Secure the thermostat housing.

- Install new O-ring seals.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Install the clip.

3. Secure the coolant hose bracket.

- Tighten the nut to 9 Nm (7 lb.ft).
- Secure the wiring harness.

4. Install the cooling fan assembly.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Cooling - TDV8 3.6L Diesel - Cooling System Pressure Test

General Procedures

• NOTE: The following procedure will enable the cooling system to be pressure tested for condition and leaks. Stage 1 will check the expansion tank cap register seal and the cap for leaks. Stage 2 will check the entire cooling system.

• NOTE: It will be necessary to use the cooling system test kit, Part Number LR-218, which is available under the equipment programme.

1. Examine the coolant hoses for signs of cracking, distortion and security of the hose connections.

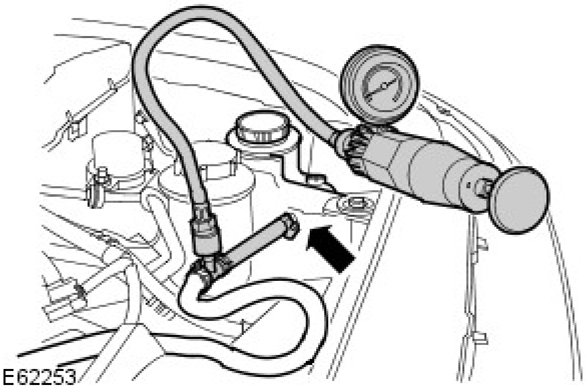
2. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Disconnect the coolant expansion tank bleed hose.

- Release the clip.

3. Install the 'T' piece adaptor (part of the cooling system test kit) between the coolant expansion tank and the coolant bleed hose.

- Secure with the 2 clips.



4. Install the coolant pressure pump assembly.

- Connect to the 'T' piece.

5. Pressurize the cooling system.

- Slowly pressurize the cooling system to 1.0 bar (100 kPa) (14.5 psi).
- Check the pressure remains above 0.9 bar (90 kPa) (13 psi) after waiting for 30 seconds.
- During the pressure drop check, listen for a hissing noise from the expansion tank cap.

6. NOTE: If the coolant expansion tank cap is found to be leaking, replace the cap.

Depressurize the cooling system.

- Disconnect the 'T' piece.
- Connect the coolant expansion tank bleed hose.
- Secure the clip.

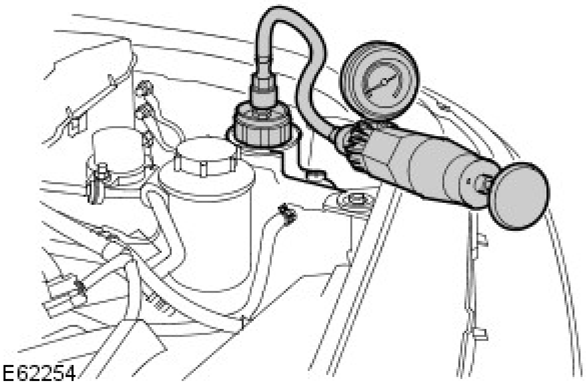
7. ⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

Remove the coolant expansion tank cap.

8. NOTE: This adaptor is part of the cooling system test kit.

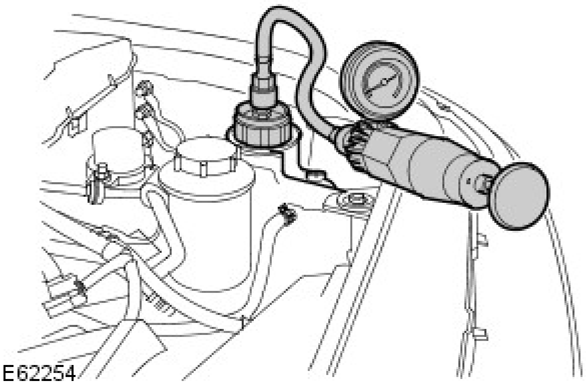
Install adaptor K83 to the coolant expansion tank.

- Clean the component mating faces.
- Lubricate the seal.



9. Install the coolant pressure pump assembly.

- Slowly pressurize the cooling system to 1.5 bar (150kPa) (22 psi), check the pressure over a 5 minute period. A small pressure decay of approximately 0.15 bar (15 »kPa) (1 psi) over the first minute is normal, as the air in the expansion tank cools.
- If the pressure continues to drop after the initial tolerance, there is a coolant leak.



10. Depressurize and remove the pressure pump and gauge.

- Install the coolant expansion tank cap.

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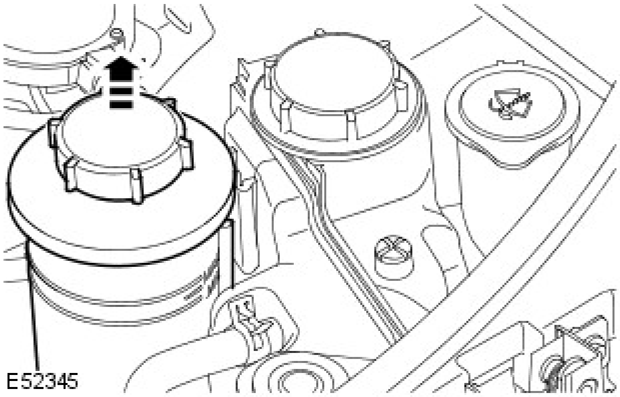
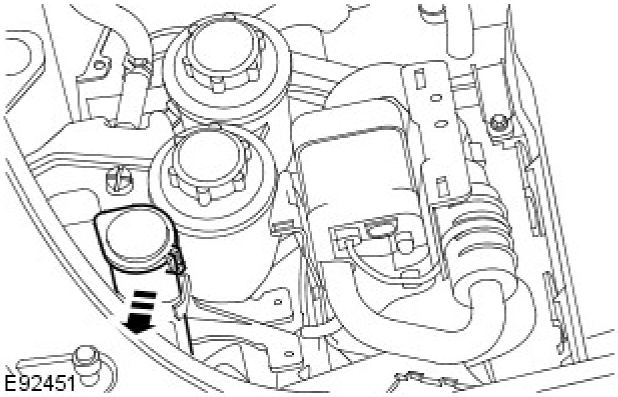
Engine Cooling - TDV8 3.6L Diesel - Engine Coolant Level Switch

Removal and Installation

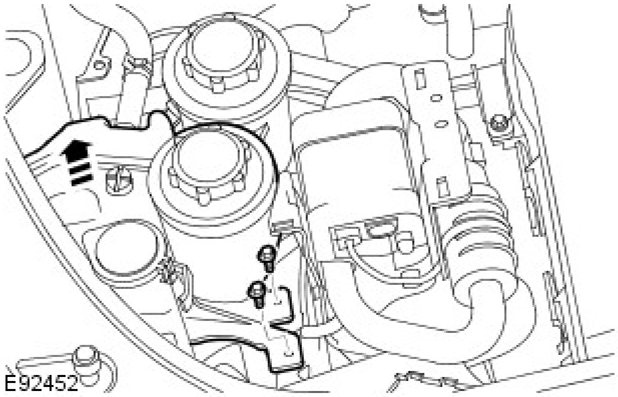
Removal



1. Release the power steering fluid reservoir from the bracket.

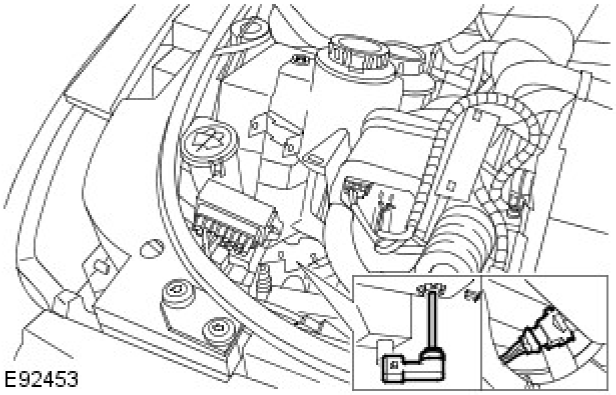


2. Release the windshield washer reservoir filler neck.



3. Reposition the coolant expansion tank.

- Remove the 2 bolts.



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4. Remove the engine coolant level switch.

- Disconnect the engine coolant level switch electrical connector.

Installation

1. NOTE: An audible click can be heard when the engine coolant level switch is correctly installed.

Install the engine coolant level switch.

- Connect the engine coolant level switch electrical connector.

2. ⚠CAUTION: Make sure that the component is correctly located on the locating pegs.

Secure the coolant expansion tank.

- Tighten the bolts to 10 Nm (7 lb.ft).

3. Secure the windshield washer reservoir filler neck.

4. Secure the power steering fluid reservoir to the bracket.

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Fuel Charging and Controls - V8 S/C 4.2L Petrol -

General Specification

Item	Specification
Recommended fuel:	
UK and ROW except NAS	Unleaded 95 RON to EN 228 Specification
NAS only	Premium unleaded gasoline with a CLC or AKI octane rating of 91 or higher
Fuel rail pressure	Variable dependant on demand
Fuel rail pressure with gauge attached, at idle and A/C switched off	335 kPa (3.35 bar) (48.57 lbf/in^2

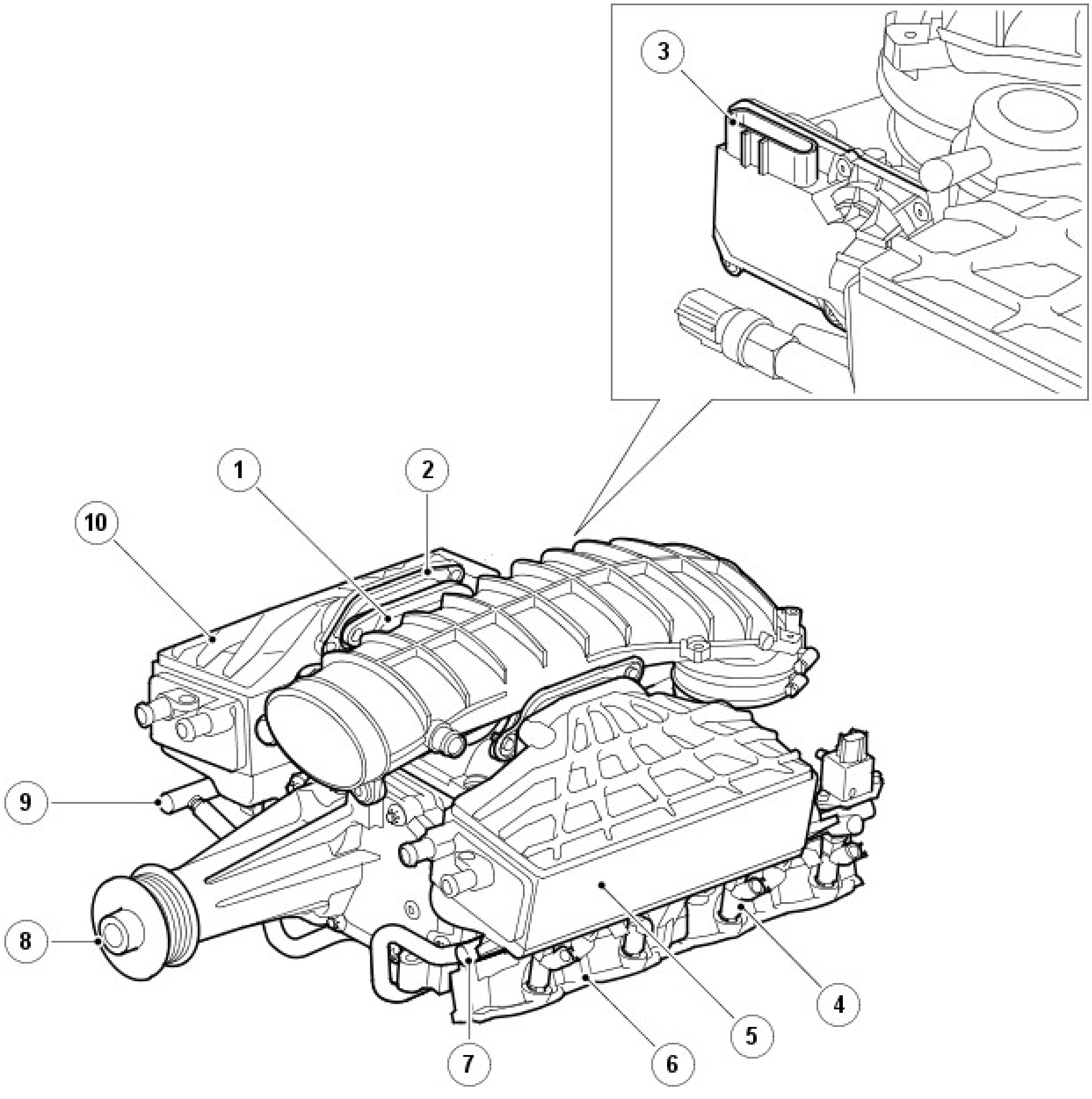
Torque Specifications

Item	Nm	lb-ft
Throttle body bolts	10	7
Fuel pressure regulator bolts	6	4
Fuel rail Torx screws	10	7
Fuel pump driver module	10	7
Fuel rail temperature sensor	7	5
Charge air cooler Torx screws	10	7

Fuel Charging and Controls - V8 S/C 4.2L Petrol - Fuel Charging and Controls

Description and Operation

Component Locations



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Item	Part Number	Description
1	-	Inlet air duct
2	-	Charge air ducts
3	-	Electronic throttle body
4	-	Injectors (8 of)
5	-	LH intercooler
6	-	Fuel rail adapter
7	-	LH fuel rail
8	-	Supercharger
9	-	RH fuel rail
10	-	RH intercooler

GENERAL

The major components of the fuel charging and control system comprise an outlet duct, a fuel pump and control module, fuel rails and eight injectors. The fuel pump supplies fuel from the tank, via a pipe routed along the side of the transmission, to the fuel rail. The fuel rail distributes the fuel equally to each of the eight injectors. The fuel injectors, which are controlled by the Engine Management System (EMS), are installed in the fuel rails on each side of the intercoolers. A cross over pipe connects the two fuel rails together at the front of the engine.

OUTLET DUCT

The outlet duct directs air from the supercharger into the two intercoolers. A filler point for the intercooler coolant system is integrated into the front and right side of the outlet duct. **This connection is not used on Land Rover vehicles.** A vacuum take-off for the speed control system is located on the right side of the outlet duct. Isolating bolts, to reduce noise, secure the outlet duct to the supercharger and a rubber gasket seals the supercharger to the outlet duct interface.

FUEL PUMP

The fuel pump module is mounted in the fuel tank and delivers fuel at variable flow and pressure to the fuel rails, which supply fuel to all fuel injectors. The fuel pump operation is regulated by a fuel pump control module, which is controlled by the EMS. For additional information, refer to:

> Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation),
> Fuel Tank and Lines (310-01A Fuel Tank and Lines - V8 S/C 4.2L Petrol, Description and Operation).

THROTTLE BODY

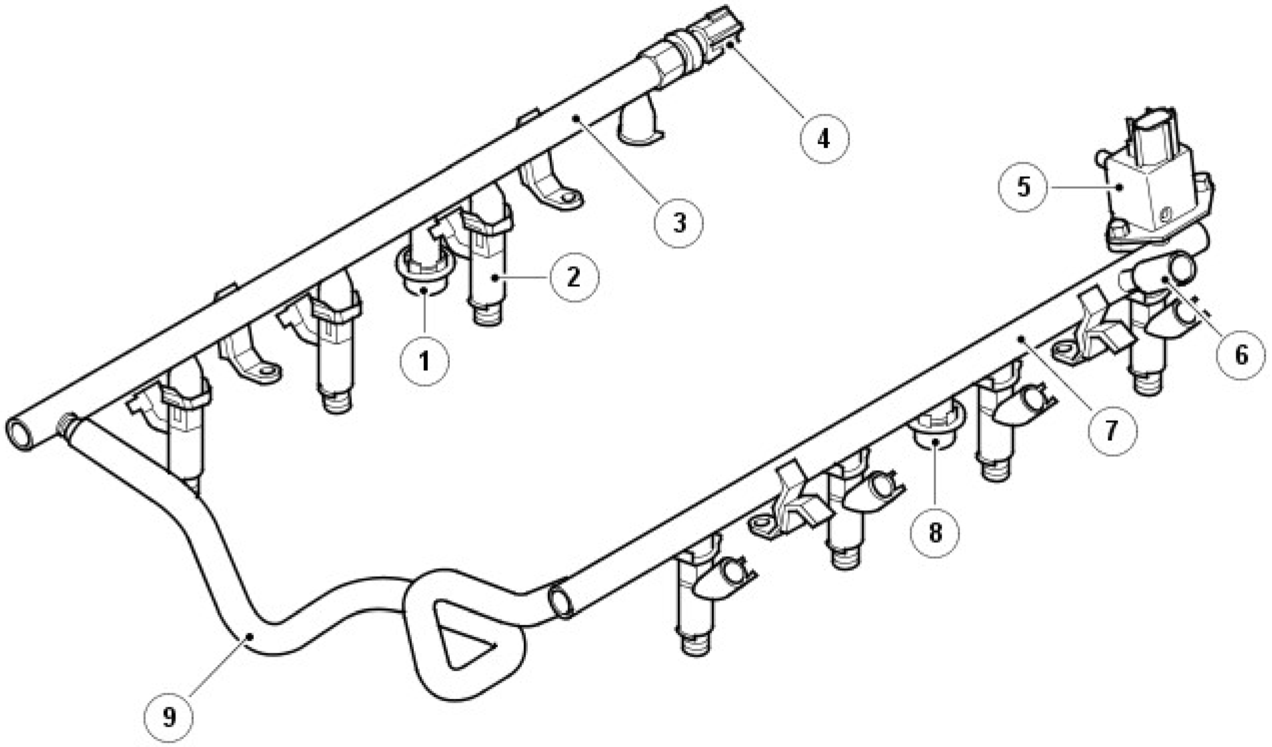
The electronic throttle body controls the engine torque and is located on the induction elbow at the rear of the engine. Its main components are an electronic throttle control valve, Accelerator Pedal Position (APP) sensor and the Engine Control Module (ECM).

The APP sensor determines the driver demand to control throttle opening. This value is received by the ECM and the throttle is then opened to the correct angle by means of an integral electric motor. Sensors in the throttle body are used to determine the position of the throttle plate and the rate of change in its angle.
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation).

Induction Elbow

The induction elbow provides the interface between the electronic throttle body and the supercharger. Connections on the induction elbow provide vacuum take off's for various vehicle systems.

FUEL RAIL



E56500

Item	Part Number	Description
1	-	RH fuel pressure damper
2	-	Injectors (8 of)
3	-	RH fuel rail
4	-	Fuel temperature sensor
5	-	Fuel pressure sensor
6	-	Fuel supply
7	-	LH fuel rail
8	-	LH fuel pressure damper
9	-	Fuel supply cross over pipe

Each fuel rail maintains a fuel pressure of typically 4.5bar (65 psi), however, this pressure will vary depending on engine requirements; lower at idle, higher at full load. Four fuel injectors are installed in each intercooler adapter and are connected to the fuel rail. 'O' ring seals are used to seal the injectors in the fuel rails and the intercooler adapters.

A fuel pressure damper is attached to each of the fuel rails.

FUEL PRESSURE DAMPER

A fuel pressure damper is attached centrally to each of the fuel rails. The damper acts to damp pulses from the fuel pump.

FUEL TEMPERATURE SENSOR

The fuel temperature sensor is located in the rear of the RH fuel rail. The sensor is an NTC sensor, which is connected to the ECM by two wires.
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation).

FUEL PRESSURE SENSOR

The fuel pressure sensor continuously monitors the fuel pressure in the fuel rail, this value is used by the ECM to calculate the injector pulse-width required to deliver the correctmass of fuel per injection.

The ECM also uses this information to demand a specific fuel flow-rate from the fuel pump via the fuel pump module.
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation).

INJECTORS

Eight, top fed, 12 hole, fuel injectors are installed in the fuel rails. Two 'O' rings seal each injector to the intercooler adapters and fuel rails and should be renewed whenever an injector is refitted to an engine. A small amount of engine oil can be applied to the 'O' rings to aid installation. No other form of lubrication should be used. The fuel jets from the injectors are directed onto the back of the intake valves.

The injectors are electromagnetic solenoid valves controlled by the ECM. Each injector contains a solenoid-operated needle valve, which is closed while the solenoid winding is de-energised. The solenoid winding is connected to a power feed from the main relay and to an earth through the ECM. The ECM switches the earth to control the opening and closing of the needle valve. While the needle valve is open, fuel is sprayed into the cylinder intake tract onto the back of the intake valves. The ECM metres the amount of fuel injected by adjusting the time that the needle valve is open.
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation).

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Fuel Charging and Controls - V8 S/C 4.2L Petrol - Fuel Charging and Controls

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the workshop manual section: 303-04 - Fuel Charging and Controls.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Fuel leaks ● Damaged fuel lines ● Damaged push connect fittings ● Fuel level ● Fuel contamination/grade/quality ● Throttle body ● Damaged fuel tank filler pipe cap ● Damaged fuel tank filler pipe	● Fuses ● Inertia switch ● Loose or corroded electrical connectors ● Harnesses ● Sensor(s) ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Engine cranks, but does not fire	● Low/Contaminated fuel ● Ignition system ● Fuel system ● Crankshaft position (CKP) sensor ● Harness ● ECM fault	Check the fuel level and condition. For ignition system tests, refer to the relevant section of the workshop manual. Check for injector DTCs. For CKP and harness tests. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Fuel system ● Spark plugs ● Ignition coil failure(s)	For purge valve tests, refer to the relevant section of the workshop manual. Check for injector DTCs. For ignition system tests, refer to the relevant section of the workshop manual.
Difficult to start cold	● Check coolant anti-freeze content ● Battery ● Crankshaft position (CKP) sensor ● Fuel system ● Evaporative emissions purge valve	For battery information, refer to the relevant section of the workshop manual. For CKP sensor tests, refer to the relevant section of the workshop manual. Check for injector DTCs. For purge valve tests, refer to the relevant section of the workshop manual.
Difficult to start hot	● Injector leak ● Fuel system ● Fuel temperature sensor ● Intake air temperature (IAT) sensor ● Mass air flow (MAF) sensor ● Evaporative emissions	Check for injector DTCs. For fuel temperature sensor, IAT sensor and MAF sensor tests, refer to the relevant section of the workshop manual. For purge valve and ignition system tests, refer to the relevant section of the workshop manual.

Symptom	Possible causes	Action
	purge valve ● Ignition system	
Difficult to start after hot soak (vehicle standing after engine has reached operating temperature)	● Injector leak ● Fuel system ● Fuel temperature sensor ● IAT sensor ● MAF sensor ● Evaporative emissions purge valve ● Ignition system	Check for injector DTCs. For fuel temperature sensor, IAT sensor and MAF sensor tests, refer to the relevant section of the workshop manual. For purge valve and ignition system tests, refer to the relevant section of the workshop manual.
Engine stalls soon after start	● Breather system disconnected/restricted ● ECM relay ● MAF sensor ● Fuel rail pressure (FRP) sensor ● Ignition system ● Air filter restricted ● Air leakage ● Fuel lines	Check the engine breather system. Check the ECM relay operation. For MAF sensor and FRP sensor and ignition system tests, refer to the relevant section of the workshop manual. For air intake and fuel line information, refer to the relevant section of the workshop manual.
Engine hesitates/poor acceleration	● Fuel pump ● Fuel lines ● Injector leak ● Fuel pressure ● Air leakage ● Throttle position (TP) sensors ● Accelerator pedal position (APP) sensor ● Throttle motor ● Ignition system ● HO2 sensors ● Transmission malfunction ● Restricted pedal travel (carpet, etc)	For fuel pump and fuel line information, refer to the relevant section of the workshop manual. Check for injector DTCs. For intake system checks, TP sensor and APP sensor tests, refer to the relevant section of the workshop manual. For throttle motor tests refer to the guided diagnostic routine on the approved diagnostic system. For ignition system tests, refer to the relevant section of the workshop manual. Check for DTCs relating to HO2 sensors, refer to the DTC index. For transmission information, refer to the relevant section of the workshop manual. Check the accelerator pedal travel.
Engine backfires	● Fuel pump ● Fuel lines ● Air leakage ● MAF sensor ● APP sensor ● HO2 sensors ● Ignition system	For fuel pump and fuel line and intake system information, refer to the relevant section of the workshop manual. For MAF sensor and APP sensor tests, refer to the relevant section of the workshop manual. Check for DTCs relating to HO2 sensors, refer to the DTC index. For ignition system tests, refer to the relevant section of the workshop manual.
Engine surges	● Fuel pump ● Fuel lines ● MAF sensor ● Harness ● TP sensors ● Throttle motor ● Ignition system	For fuel pump and fuel line information, refer to the relevant section of the workshop manual. For MAF sensor and TP sensor tests, refer to the relevant section of the workshop manual. For throttle motor tests refer to the guided diagnostic routine on the approved diagnostic system. For ignition system tests, refer to the relevant section of the workshop manual.
Engine detonates/knocks	● Fuel pump ● Fuel lines ● Fuel quality ● Knock sensor (KS)/circuit malfunction ● FRP sensor ● MAF sensor ● HO2 sensors ● Air leakage ● BARO sensor malfunction (internal ECM fault)	For fuel pump and fuel line information, refer to the relevant section of the workshop manual. For FRP sensor, MAF sensor and knock sensor tests, refer to the relevant section of the workshop manual. Check for DTCs relating to HO2 sensors, refer to the DTC index. For intake system, refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.

Symptom	Possible causes	Action
No throttle response	● APP sensor malfunction ● TP sensors ● Throttle motor	For APP sensor and TP sensor tests, refer to the relevant section of the workshop manual. For throttle motor tests refer to the guided diagnostic routine on the approved diagnostic system.
Poor throttle response	● APP sensor malfunction ● TP sensors ● ECT sensor ● MAF sensor ● Transmission malfunction ● Traction control event ● Air leakage ● Breather system disconnected/restricted	For APP sensor, TP sensor, ECT sensor and MAF sensor tests, refer to the relevant section of the workshop manual. For transmission information, refer to the relevant section of the workshop manual. For intake system checks, refer to the relevant section of the workshop manual. For breather system checks, refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls in the workshop manual.

DTC	Description	Possible Causes	Action
P008700	Fuel rail/system pressure too low	● Fuel rail pressure (FRP) sensor disconnected ● FRP sensor to ECM sensing circuit short circuit to ground ● FRP sensor supply circuit high resistance ● FRP sensor failure ● Fuel line leak ● Restricted fuel line ● Fuel pump module circuit high resistance ● Fuel pump module circuit short circuit to ground ● Fuel pump module failure	For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P008800	Fuel rail/system pressure too high	● Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense): short circuit to each other ● FRP sensor to ECM sense circuit short circuit to power ● FRP sensor failure ● Fuel pressure control valve (FPCV) fault ● Fuel pump module circuit short circuit to power ● Fuel pump module failure	For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P017100	System Too Lean (Bank 1)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCs.
P017200	System Too Rich (Bank 1)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.

DTC	Description	Possible Causes	Action
		enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	
P017400	System Too Lean (Bank 2)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCS.
P017500	System too Rich (Bank 2)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.
P020100	Cylinder 1 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020200	Cylinder 2 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020300	Cylinder 3 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020400	Cylinder 4 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020500	Cylinder 5 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020600	Cylinder 6 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020700	Cylinder 7 Injector Circuit/Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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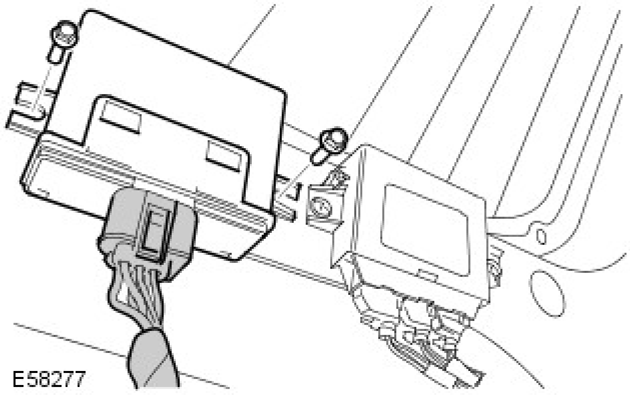
Fuel Charging and Controls - V8 S/C 4.2L Petrol - Fuel Pump Driver Module (FPDM)

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the LH lower rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the FPDM.
   - Remove the 2 bolts.
   - Disconnect the electrical connector.

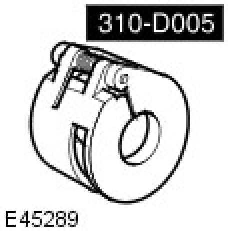


Installation

1. Install the FPDM.
   - Install the bolts and tighten to 10 Nm (7 lb.ft).
   - Connect and secure the electrical connector.
2. Install the rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Fuel Charging and Controls - V8 S/C 4.2L Petrol - Fuel Rail

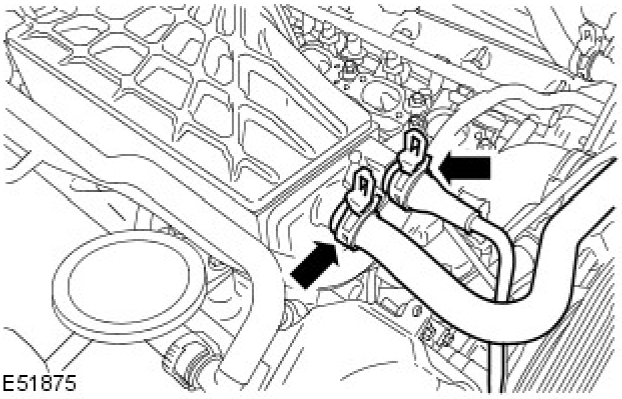
Removal and Installation

Special Tool(s)	
 E45289	Fuel spring lock decoupling tool 310-005

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the LH charge air cooler.
For additional information, refer to: Charge Air Cooler (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

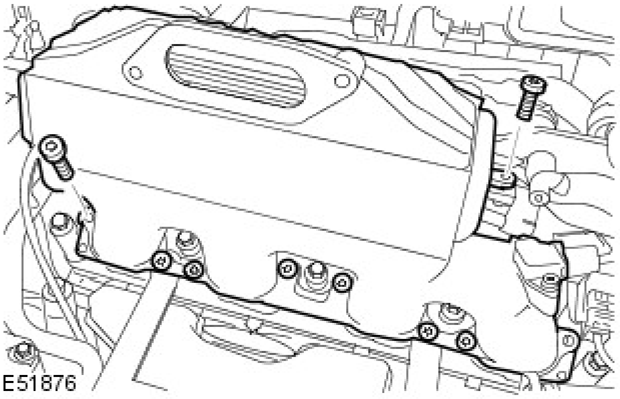


E51875

3. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the RH charge air cooler coolant hoses.

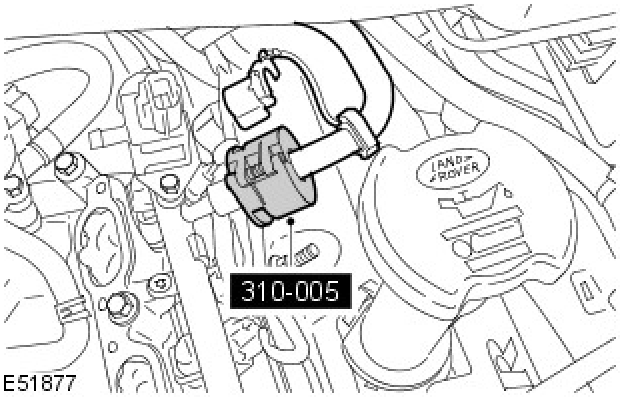
- Position an absorbent cloth to collect fluid spillage.
- Release the 2 clips.



E51876

4. Remove the RH charge air cooler.

- Remove the 8 Torx screws.
- Remove the Torx screw and nut.
- Discard the gasket.



5. WARNINGS:

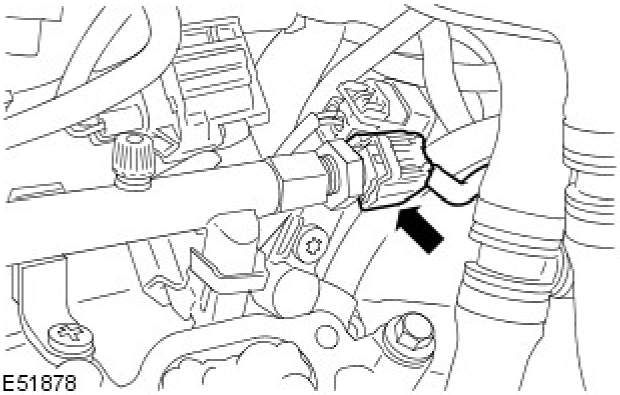
⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

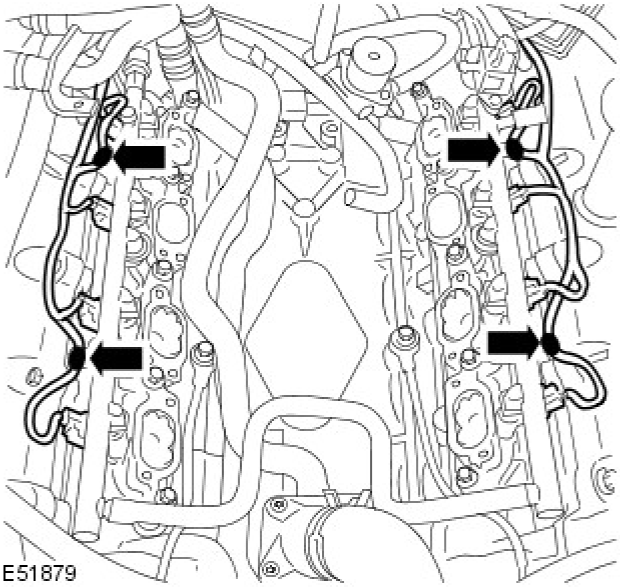
⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Using the special tool, disconnect the fuel line.

- Release the clip.
- Position an absorbent cloth to collect fluid spillage.

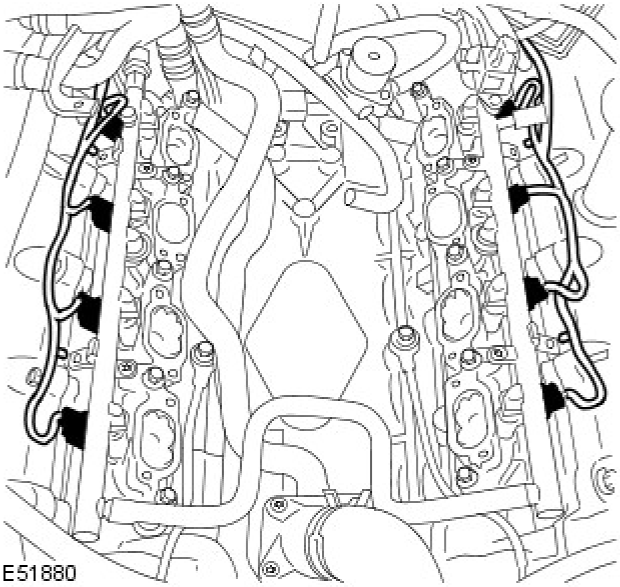


6. Disconnect the fuel temperature sensor electrical connector.



7. Release the fuel injector harness from the fuel rail.

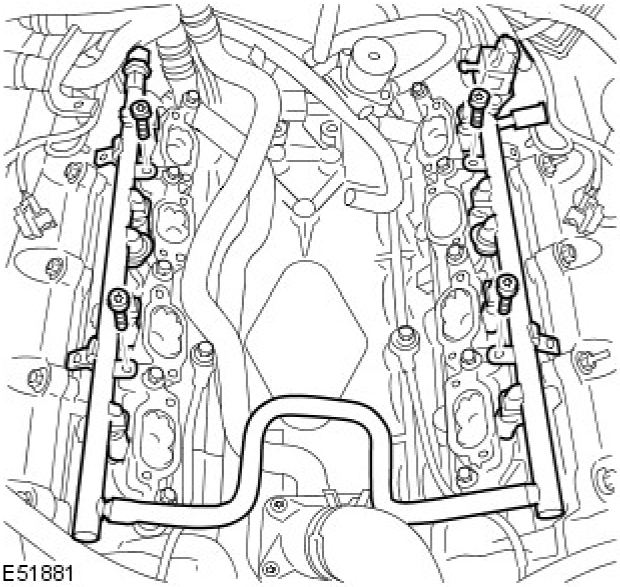
- Release the 4 clips.



E51880

8. Disconnect the fuel injector electrical connectors.

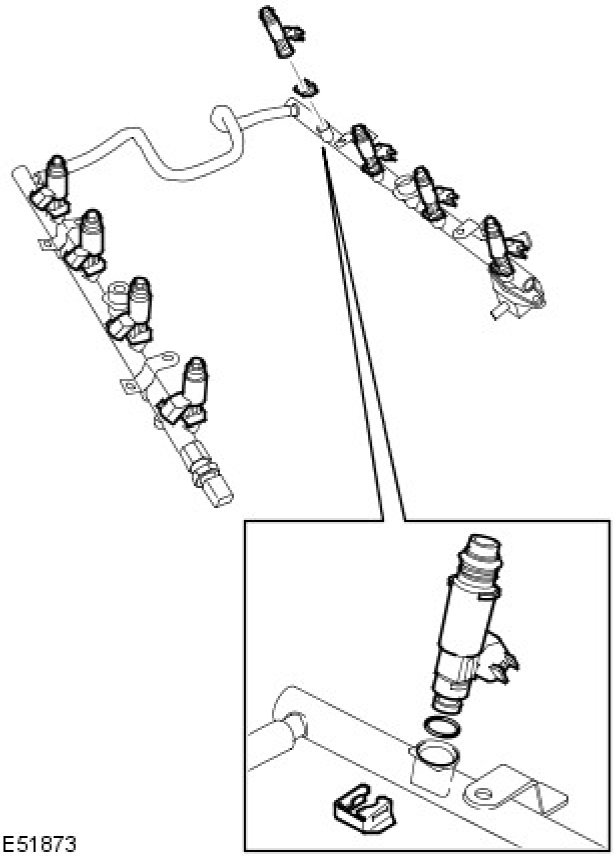
- Release the 8 clips.



E51881

9. Remove the fuel rail.

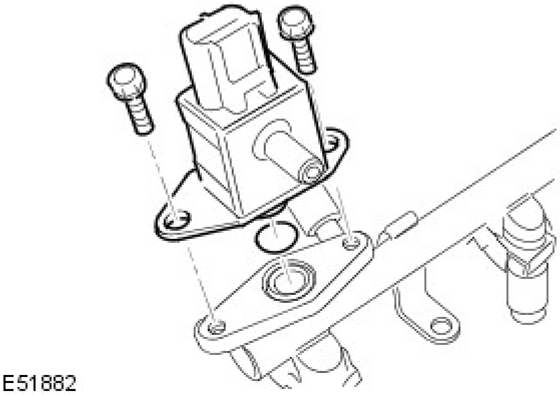
- Remove the 4 Torx screws.
- Remove and discard the fuel injector O-ring seals.



10. NOTE: Do not disassemble further if the component is removed for access only.

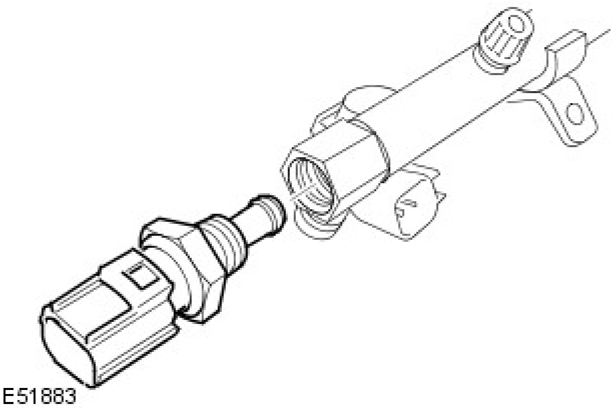
Release and remove the fuel injectors.

- Remove the 8 clips.
- Discard the O-ring seals.



11. Remove the fuel pressure sensor.

- Remove the 2 bolts.
- Discard the O-ring seals.



12. ⚠ CAUTION: To prevent damage to components, use an additional wrench when loosening or tightening unions.

Remove the fuel temperature sensor.

Installation

1. Install the fuel temperature sensor.
    - Clean the component mating faces.
    - Apply sealant to the sensor thread.
    - Tighten the sensor to 7 Nm (5 lb.ft).
2. Install the fuel pressure sensor.
    - Clean the component mating faces.
    - Install new O-ring seals.
    - Tighten the bolts to 6 Nm (4 lb.ft).
3. Install the fuel injectors to the fuel rail.
    - Clean the component mating faces.
    - Install new O-ring seals.
    - Secure with the clips.
4. Install the fuel rail and injectors.
    - Clean the component mating faces.
    - Install new O-ring seals.
    - Tighten the Torx screws to 10 Nm (7 lb.ft).
5. Install the injector harness.
    - Secure the clips.
    - Connect the electrical connectors.
6. Connect the fuel temperature sensor electrical connector.
7. Connect the fuel line to the fuel rail.
    - Clean the component mating faces.
    - Secure the clip.
8. Install the RH charge air cooler.
    - Clean the component mating faces.
    - Install a new gasket.
    - Tighten the Torx screws to 10 Nm (7 lb.ft).
9. Connect the charge air cooler coolant hoses.
    - Clean the component mating faces.
    - Secure with the clips.
10. Install the LH charge air cooler.
    For additional information, refer to: Charge Air Cooler (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).
11. Connect the battery ground cable.
    For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Fuel Charging and Controls - V8 S/C 4.2L Petrol - Fuel Injector

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

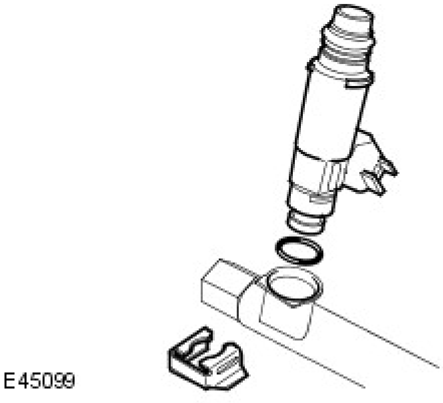
2. WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the fuel rail.
For additional information, refer to: Fuel Rail (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).



3. Remove the fuel injector.
   - Remove the clip.
   - Remove and discard the O-ring seal.

Installation

1. NOTE: Lubricate new seals with clean engine oil.

To install, reverse the removal procedure.

- Clean the component mating faces.
- Install the O-ring seal.

2. Install the fuel rail.
   For additional information, refer to: Fuel Rail (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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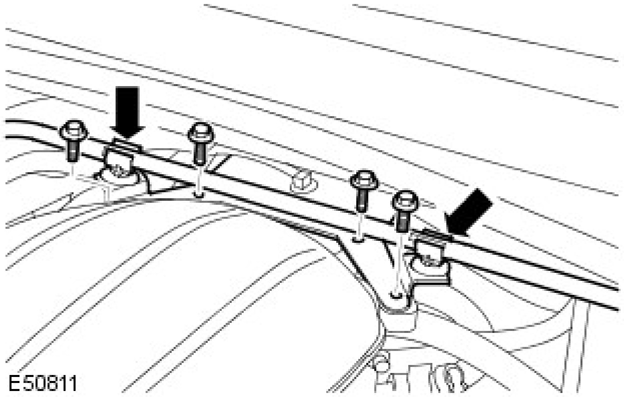
Fuel Charging and Controls - V8 S/C 4.2L Petrol - Throttle Body Gasket

Removal and Installation

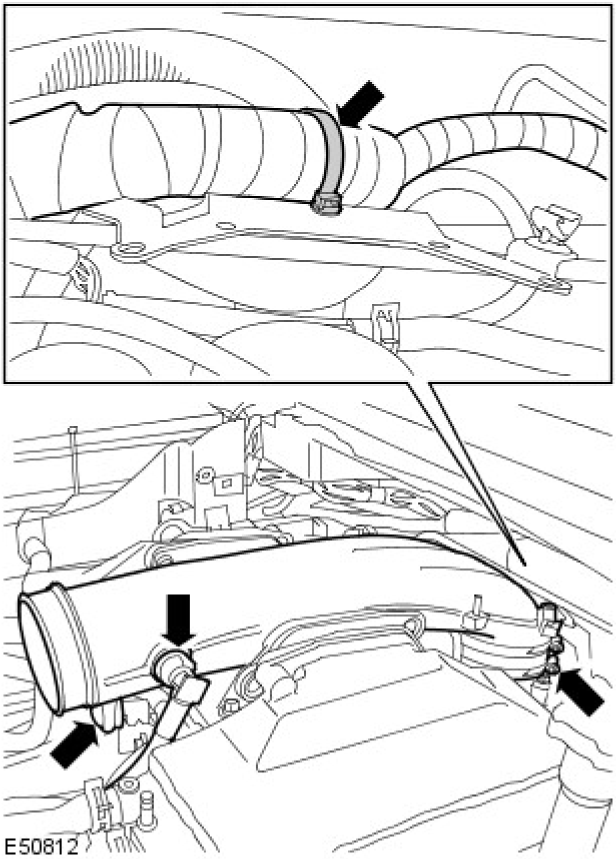
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the air intake resonator.
   For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).
4. Position the wiring harness support bracket aside.
   - Release the 2 fuel pipe clips.
   - Remove the 4 bolts.

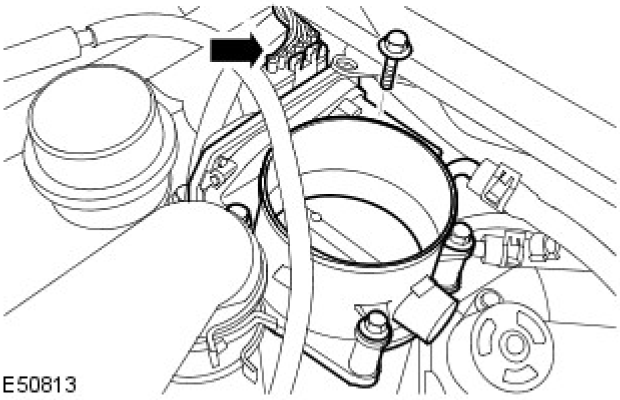


5. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

   Remove the throttle body intake.
   - Disconnect the breather line.
   - Release the clip.
   - Release the bushing.



6. Release the wiring harness clip.



7. Disconnect the throttle position (TP) sensor electrical connector.

8. Release the throttle body.

- Remove the 4 bolts.
- Remove and discard the throttle body gasket.

Installation

1. Install the throttle body.

- Clean the components.
- Install a new gasket.
- Tighten the 4 bolts to 10 Nm (7 lb.ft).

2. Connect the TP sensor electrical connector.

3. Secure the wiring harness clip.

4. Clean the component mating faces.

5. Install the throttle body intake.

- Align the bushing.
- Secure the clip.
- Connect the breather line.

6. Install the wiring harness support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

7. Install the air intake resonator.
For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

8. Install the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

10. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

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Fuel Charging and Controls - V8 4.4L Petrol -

General Specification

Item	Specification
Recommended fuel:	
UK and ROW except NAS	Unleaded 95 RON to EN228 Specification
NAS	Premium unleaded gasoline with a CLC or AKI octane rating of 91 or higher.
Injectors:	
Make	Denso
Type - Not NAS	2W93-9F593-BA
Type - NAS	2W93-9F593-AA

Fuel Pressures

Component	bar	psi
Fuel pump	4.5	65
Fuel Rail	4.5	65

Torque Specifications

Description	Nm	lb-ft
Engine cover mounting bracket nuts	6	4
Fuel rail Torx bolts	10	7
Intake manifold MAP sensor housing bolts	10	7
Intake manifold casting bolts	10	7
* Intake manifold bolts	20	15
Exhaust gas recirculation (EGR) valve bolts	10	7
Engine wiring harness support bracket bolts	10	7
Throttle body retaining bolts	10	7

*** Tighten bolts progressively, working from the centre outwards**

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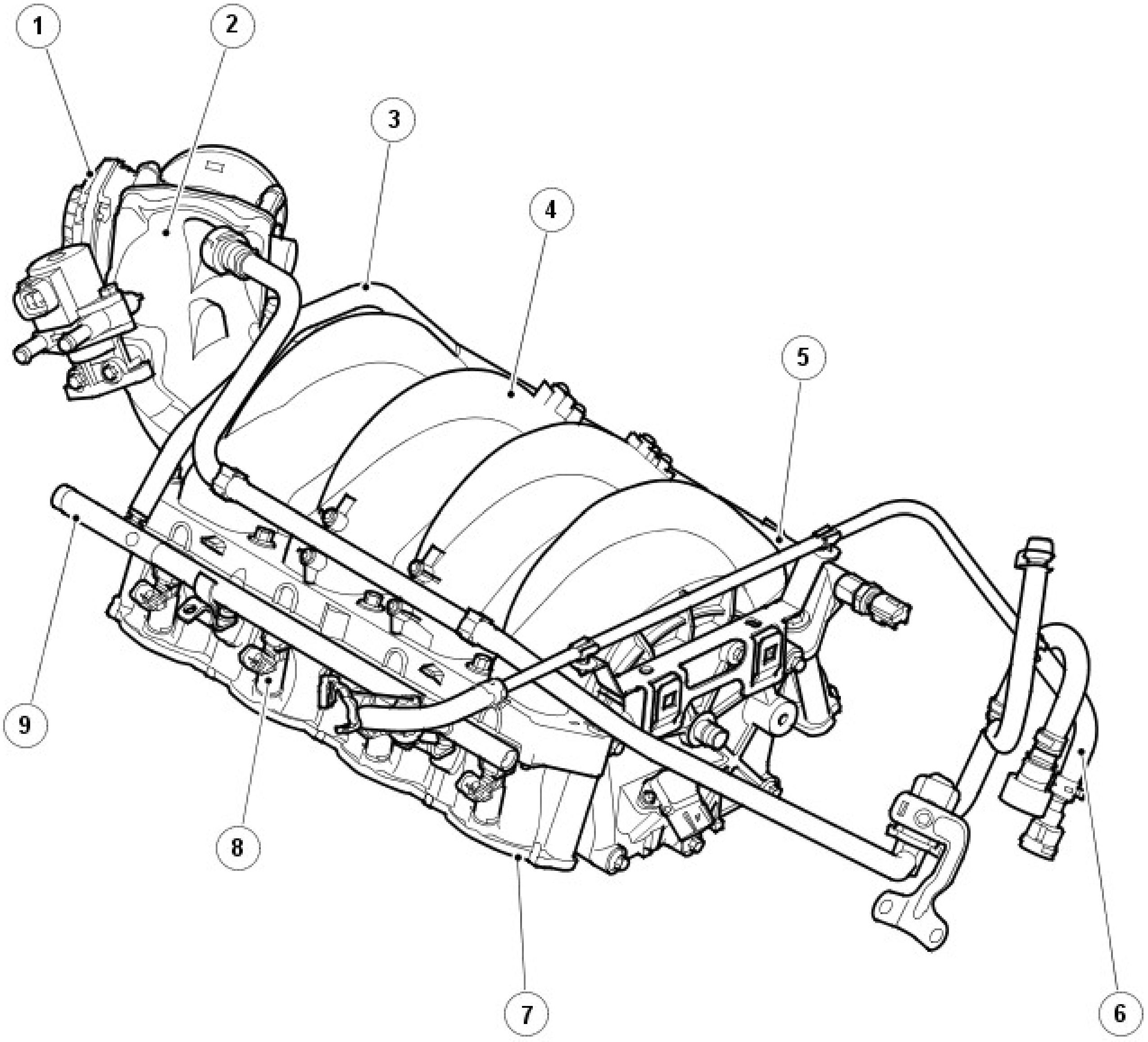
Fuel Charging and Controls - V8 4.4L Petrol - Fuel Charging and Controls

Description and Operation

Component Location



E50214

Item	Part Number	Description
1	-	Electronic throttle body
2	-	Induction elbow
3	-	Fuel supply cross over pipe
4	-	Intake manifold
5	-	RH fuel rail
6	-	Fuel jump hose
7	-	Injector housing
8	-	Injectors (8 of)
9	-	LH fuel rail

GENERAL

The major components of the fuel charging and control system comprise an intake manifold, a fuel pump, a fuel rail and eight injectors. The fuel pump supplies fuel from the tank at a constant pressure, via a pipe routed along the side of the transmission, to the fuel rail. The fuel rail distributes the fuel equally to each of the eight injectors. The fuel injectors, which are controlled by the Engine Control Module (ECM), are installed in the fuel rails on each side of the intake manifold. A cross over pipe connects the two fuel rails together at the front of the manifold. A Schraeder valve provides a pressure test connection for maintenance.

INTAKE MANIFOLD

The intake manifold is located on top of the engine between the two cylinder banks and is manufactured from a composite material. The manifold comprises a central chamber with eight tracts leading to the inlet ports on the engine. The air intake manifold is secured to the cylinder heads via 10 bolts.

Rubber gaskets, located in channels in the intake manifold, seal the joints between the ducts and the cylinder heads.
For additional information, refer to: Intake Air Distribution and Filtering (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Description and Operation).

FUEL PUMP

The submersible electric fuel pump is attached to a carrier and is located at the bottom of the swirl pot inside the fuel tank. The fuel pressure regulator, which controls the fuel pressure in the feed pipe to fuel rail, is located in the fuel manifold in the fuel tank.
For additional information, refer to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - V8 S/C 4.2L Petrol, Description and Operation).

THROTTLE BODY

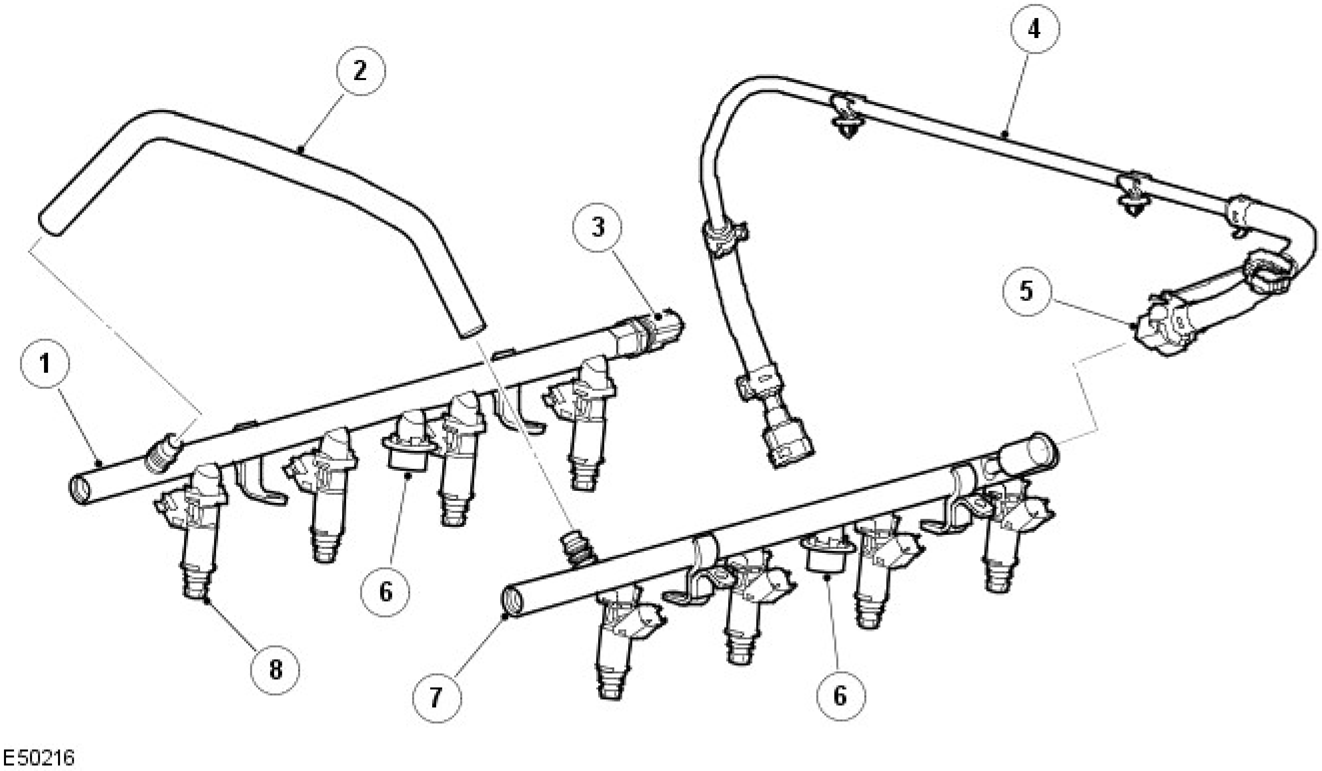
The electronic throttle body controls the engine torque and is located on the air intake manifold. Its main components are, an electronic throttle control valve, Accelerator Pedal Position (APP) sensor and the ECM.

The APP sensor determines the driver demand to control throttle opening. This value is received by the EMS and the throttle is then opened to the correct angle by means of an integral electric motor. Sensors in the throttle body are used to determine the position of the throttle plate and the rate of change in its angle.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

Induction Elbow

The induction elbow provides the interface between the electronic throttle body and the intake manifold. Connections on the induction elbow provide vacuum take off's for various vehicle systems. A boss on the rear of the elbow accommodates the Exhaust Gas Recirculation (EGR) valve.

FUEL RAIL



Item	Part Number	Description
1	-	RH fuel rail
2	-	Fuel supply cross over pipe
3	-	Fuel temperature sensor
4	-	Fuel jump hose
5	-	Cooper fitting
6	-	Fuel pressure damper
7	-	LH fuel rail
8	-	Injectors (8 of)

Each fuel rail maintains a constant fuel pressure of 4.5bar (65 psi). Four fuel injectors are installed in each injector housing and are connected to the fuel rail. 'O' ring seals are used to seal the injectors in the fuel rails and inlet manifold. A 'Cooper' style fitting is used to connect the fuel jump hose to the LH fuel rail.

A fuel pressure damper is attached to each of the fuel rails.

FUEL PRESSURE DAMPER

A fuel pressure damper is attached centrally to each of the fuel rails. The dampers act to damp pulses from the pump and ensure that the fuel pressure in the rail and to the injectors is constant.

FUEL TEMPERATURE SENSOR

The fuel temperature sensor is located in the rear of the RH fuel rail. The sensor is an NTC sensor, which is connected to the ECM by two wires.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

INJECTORS

Eight, top fed, eight hole, fuel injectors are installed in the fuel rails. Two 'O' rings seal each injector to the manifold interface and should be renewed whenever an injector is refitted to an engine. A small amount of engine oil can be applied to the 'O' rings to aid installation. No other form of lubrication should be used. The fuel jets from the injectors are directed onto the back of the intake valves.

The injectors are electromagnetic solenoid valves controlled by the ECM. Each injector contains a solenoid-operated needle valve,

which is closed while the solenoid winding is de-energised. The solenoid winding is connected to a power feed from the main relay and to an earth through the ECM. The ECM switches the earth to control the opening and closing of the needle valve. While the needle valve is open, fuel is sprayed into the cylinder intake tract onto the back of the intake valves. The ECM meters the amount of fuel injected by adjusting the time that the needle valve is open.
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation).

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Fuel Charging and Controls - V8 4.4L Petrol - Fuel Charging and Controls

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the workshop manual section 303-04 - Fuel Charging and Controls.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Fuel leaks ● Damaged fuel lines ● Damaged push connect fittings ● Fuel level ● Fuel contamination/grade/quality ● Throttle body ● Damaged fuel tank filler pipe cap ● Damaged fuel tank filler pipe	● Fuses ● Inertia switch ● Loose or corroded electrical connectors ● Harnesses ● Sensor(s) ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Engine cranks, but does not fire	● Low/Contaminated fuel ● Ignition system ● Fuel system ● Crankshaft position (CKP) sensor ● Harness ● ECM fault	Check the fuel level and condition. For ignition system tests, refer to the relevant section of the workshop manual. Check for injector DTCs. For CKP and harness tests. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Fuel system ● Spark plugs ● Ignition coil failure(s)	For purge valve tests, refer to the relevant section of the workshop manual. Check for injector DTCs. For ignition system tests, refer to the relevant section of the workshop manual.
Difficult to start cold	● Check coolant anti-freeze content ● Battery ● Crankshaft position (CKP) sensor ● Exhaust gas recirculation (EGR) valve stuck open ● Fuel system ● Evaporative emissions purge valve	For battery information, refer to the relevant section of the workshop manual. For CKP sensor tests, refer to the relevant section of the workshop manual. Check for injector DTCs. For purge valve tests, refer to the relevant section of the workshop manual.
Difficult to start hot	● Injector leak ● Fuel system ● Fuel temperature sensor ● Intake air temperature (IAT) sensor ● Mass air flow (MAF)	Check for injector DTCs. For fuel temperature sensor, IAT sensor and MAF sensor tests, refer to the relevant section of the workshop manual. For purge valve and ignition system tests, refer to the relevant section of the workshop manual.

Symptom	Possible causes	Action
	sensor ● Evaporative emissions purge valve ● Ignition system	
Difficult to start after hot soak (vehicle standing after engine has reached operating temperature)	● Injector leak ● Fuel system ● Fuel temperature sensor ● IAT sensor ● MAF sensor ● Evaporative emissions purge valve ● Ignition system	Check for injector DTCs. For fuel temperature sensor, IAT sensor and MAF sensor tests, refer to the relevant section of the workshop manual. For purge valve and ignition system tests, refer to the relevant section of the workshop manual.
Engine stalls soon after start	● Breather system disconnected/restricted ● ECM relay ● MAF sensor ● Ignition system ● Air filter restricted ● Air leakage ● Fuel lines	Check the engine breather system. Check the ECM relay operation. For MAF sensor and FRP sensor and ignition system tests, refer to the relevant section of the workshop manual. For air intake and fuel line information, refer to the relevant section of the workshop manual.
Engine hesitates/poor acceleration	● Fuel pump ● Fuel lines ● Injector leak ● Fuel pressure ● Air leakage ● Throttle position (TP) sensors ● Accelerator pedal position (APP) sensor ● Throttle motor ● Ignition system ● EGR valve stuck ● HO2 sensors ● Transmission malfunction ● Restricted pedal travel (carpet, etc)	For fuel pump and fuel line information, refer to the relevant section of the workshop manual. Check for injector DTCs. For intake system checks, TP sensor and APP sensor tests, refer to the relevant section of the workshop manual. For throttle motor tests refer to the guided diagnostic routine on the approved diagnostic system. For ignition system tests, refer to the relevant section of the workshop manual. Check for DTCs relating to HO2 sensors, refer to the DTC index. For transmission information, refer to the relevant section of the workshop manual. Check the accelerator pedal travel.
Engine backfires	● Fuel pump ● Fuel lines ● Air leakage ● MAF sensor ● APP sensor ● HO2 sensors ● Ignition system	For fuel pump and fuel line and intake system information, refer to the relevant section of the workshop manual. For MAF sensor and APP sensor tests, refer to the relevant section of the workshop manual. Check for DTCs relating to HO2 sensors, refer to the DTC index. For ignition system tests, refer to the relevant section of the workshop manual.
Engine surges	● Fuel pump ● Fuel lines ● MAF sensor ● Harness ● TP sensors ● Throttle motor ● Ignition system	For fuel pump and fuel line information, refer to the relevant section of the workshop manual. For MAF sensor and TP sensor tests, refer to the relevant section of the workshop manual. For throttle motor tests refer to the guided diagnostic routine on the approved diagnostic system. For ignition system tests, refer to the relevant section of the workshop manual.
Engine detonates/knocks	● Fuel pump ● Fuel lines ● Fuel quality ● Knock sensor (KS)/circuit malfunction ● MAF sensor ● HO2 sensors ● Air leakage ● BARO sensor malfunction (internal ECM fault)	For fuel pump and fuel line information, refer to the relevant section of the workshop manual. For FRP sensor, MAF sensor and knock sensor tests, refer to the relevant section of the workshop manual. Check for DTCs relating to HO2 sensors, refer to the DTC index. For intake system, refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.

Symptom	Possible causes	Action
No throttle response	● APP sensor malfunction ● TP sensors ● Throttle motor	For APP sensor and TP sensor tests, refer to the relevant section of the workshop manual. For throttle motor tests refer to the guided diagnostic routine on the approved diagnostic system.
Poor throttle response	● APP sensor malfunction ● TP sensors ● ECT sensor ● MAF sensor ● Transmission malfunction ● Traction control event ● Air leakage ● Breather system disconnected/restricted	For APP sensor, TP sensor, ECT sensor and MAF sensor tests, refer to the relevant section of the workshop manual. For transmission information, refer to the relevant section of the workshop manual. For intake system checks, refer to the relevant section of the workshop manual. For breather system checks, refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible Causes	Action
P008700	Fuel rail/system pressure too low	● Fuel rail pressure (FRP) sensor disconnected ● FRP sensor to ECM sensing circuit short circuit to ground ● FRP sensor supply circuit high resistance ● FRP sensor failure ● Fuel line leak ● Restricted fuel line ● Fuel pump module circuit high resistance ● Fuel pump module circuit short circuit to ground ● Fuel pump module failure	For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P008800	Fuel rail/system pressure too high	● Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense): short circuit to each other ● FRP sensor to ECM sense circuit short circuit to power ● FRP sensor failure ● Fuel pressure control valve (FPCV) fault ● Fuel pump module circuit short circuit to power ● Fuel pump module failure	For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P017100	System Too Lean (Bank 1)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCs.
P017200	System Too Rich (Bank 1)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.

DTC	Description	Possible Causes	Action
		enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	
P017400	System Too Lean (Bank 2)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCS.
P017500	System too Rich (Bank 2)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.
P020100	Cylinder 1 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020200	Cylinder 2 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020300	Cylinder 3 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020400	Cylinder 4 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020500	Cylinder 5 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020600	Cylinder 6 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020700	Cylinder 7 Injector Circuit/Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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Fuel Charging and Controls - V8 4.4L Petrol - Fuel Injectors

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

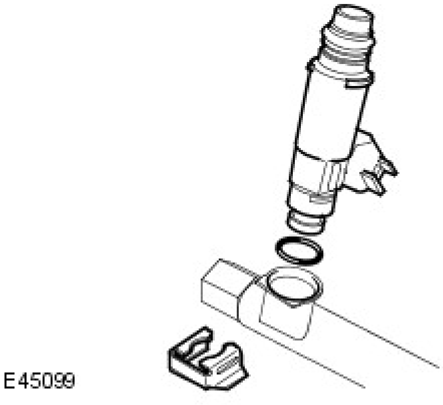
2. WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the fuel rail.
For additional information, refer to: Intake Manifold Assembly (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).



3. Remove the fuel injectors.
   - Release the 8 clips.
   - Discard the fuel injector O-ring seals.

Installation

1. Clean the component mating faces.
2. To install, reverse the removal procedure.
   - Install fuel injector O-ring seals.
   - Lubricate the O-ring seals with clean engine oil.

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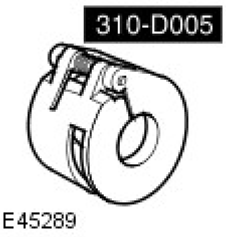
Fuel Charging and Controls - V8 4.4L Petrol - Intake Manifold Assembly

Removal and Installation

Special Tool(s)	
	Fuel spring lock decoupling tool 310-005

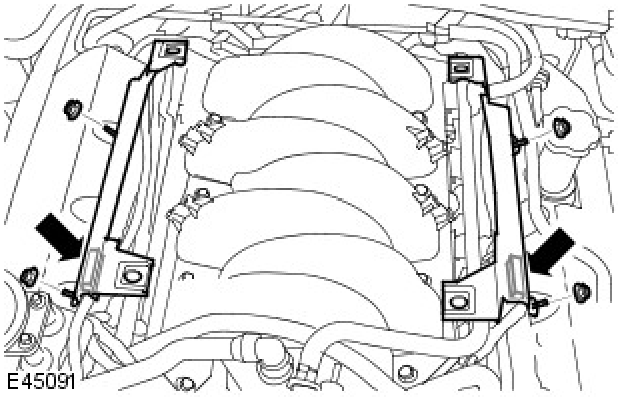
Removal

1. Secure the hood in the service position.

- Release the support struts.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).



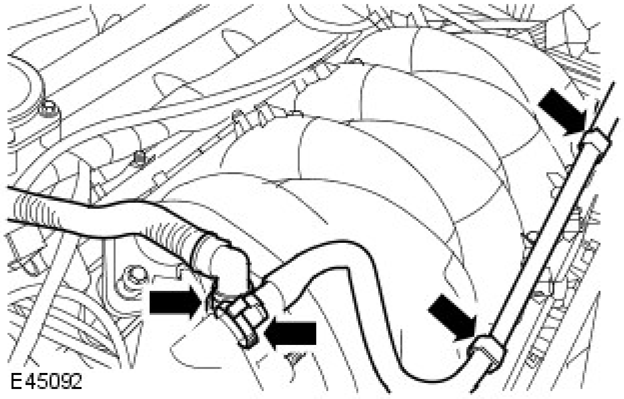
4. Remove the engine cover brackets.

- Release the electrical connectors from the engine cover brackets.
- Remove the 4 nuts.

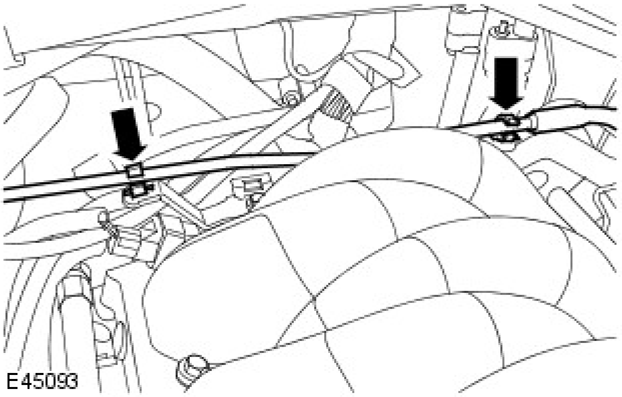
5. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the crankcase vent hoses.

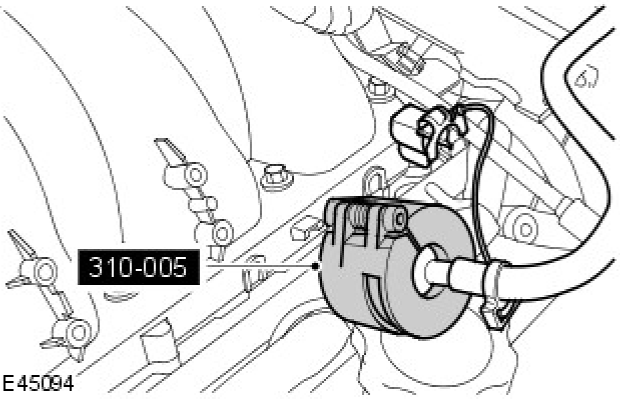
6. Disconnect the evaporative emission hose from the intake manifold assembly.



7. Release the evaporative loss control valve from the intake manifold mounting, move the hose assembly aside for access.

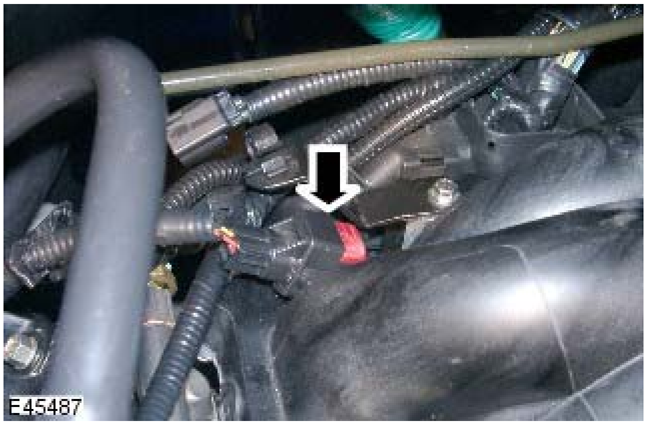


8. Release the fuel pipe from the clips.

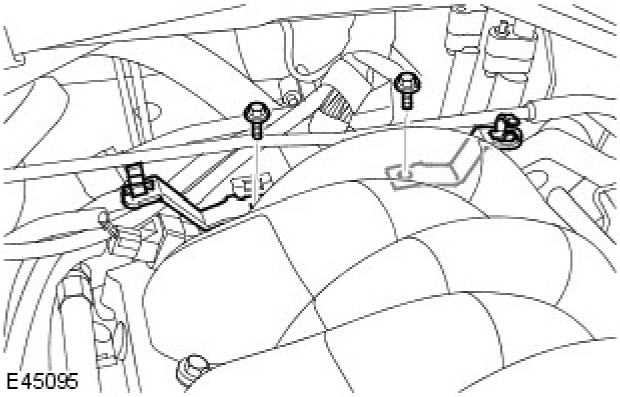


9. Using the special tool, disconnect the fuel line.

- Position an absorbent cloth to collect fluid spillage.

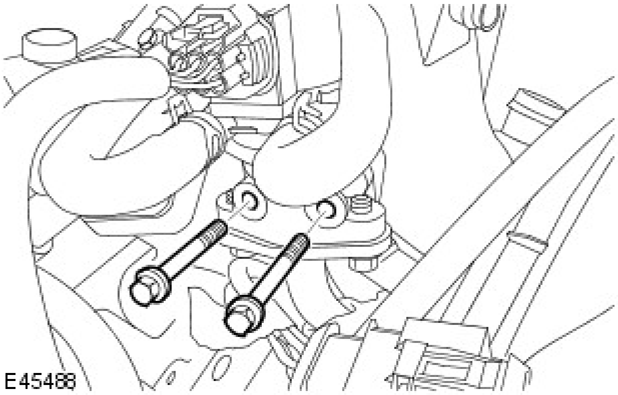


10. Release the camshaft position (CMP) sensor connector block from the intake manifold assembly.



11. Position the wiring harness support bracket aside for access.

- Remove the 2 bolts.

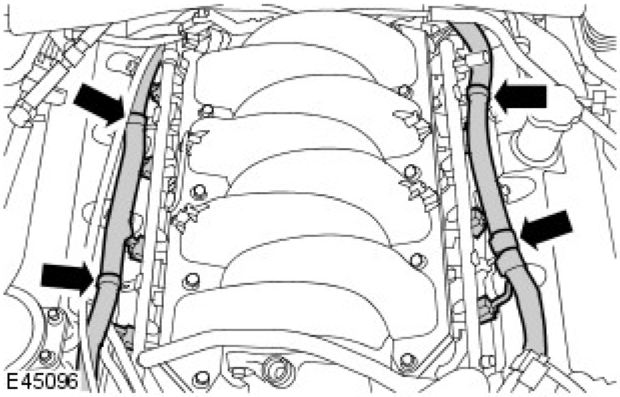


12. Release the EGR valve.

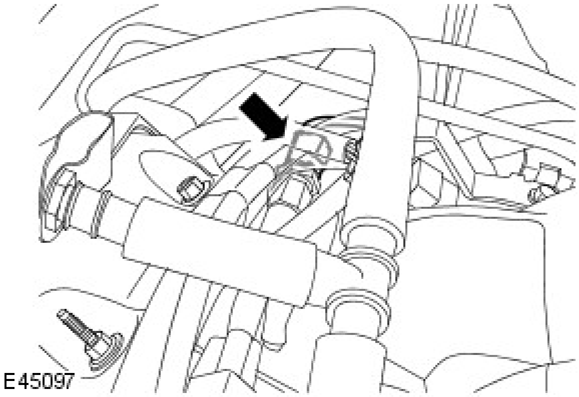
- Remove the 2 bolts.
- Discard the gasket.

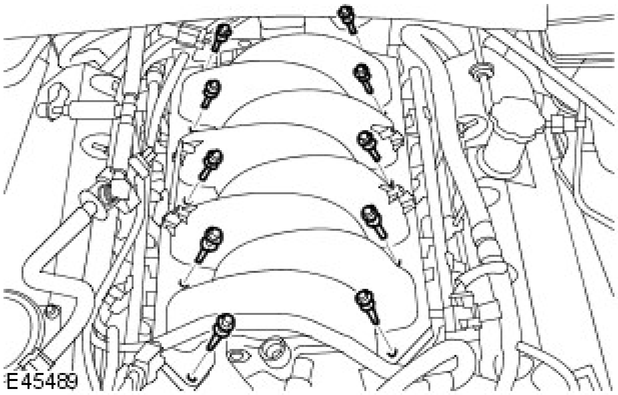
13. Release the engine wiring harness clips from the fuel rail.

14. Disconnect the fuel injector electrical connectors.

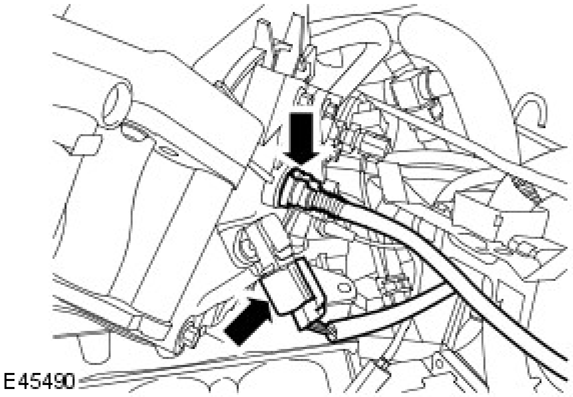


15. Disconnect the fuel temperature sensor electrical connector.





16. Remove the 10 intake manifold bolts.



17. Remove the intake manifold.

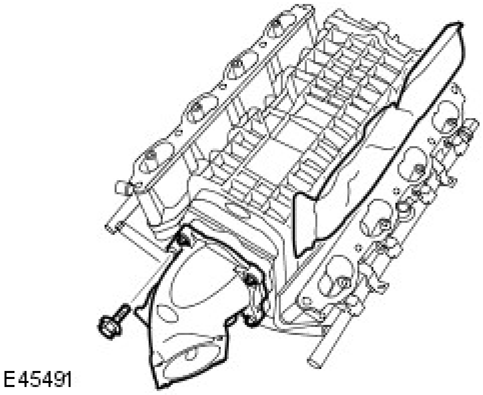
- Disconnect the mass air flow (MAF) sensor electrical connector.
- Disconnect the brake booster vacuum hose from the intake manifold.
- Discard the gaskets.

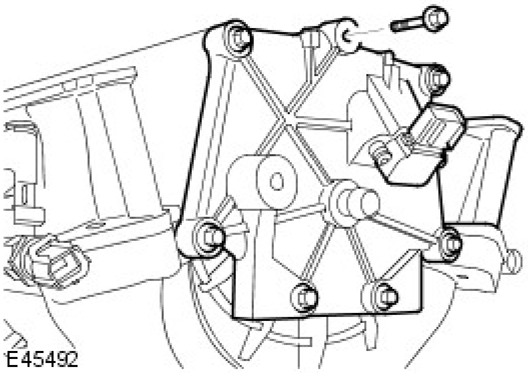
18. NOTE: Do not disassemble further if the component is removed for access only.

Remove the NVH pad from the RH side of the intake manifold.

19. Remove the intake manifold casting.

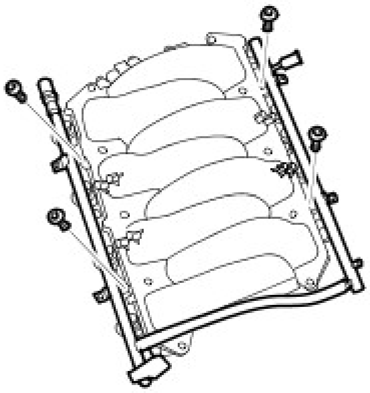
- Disconnect the vacuum hose from the intake manifold.
- Remove the 4 bolts.




E45492

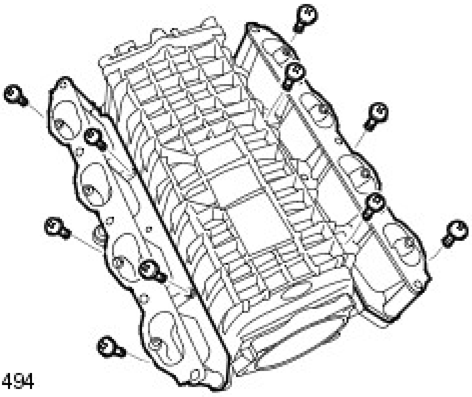
20. Remove the intake manifold MAP sensor housing.

- Remove the 7 bolts.


E45493

21. Remove the fuel rail.

- Remove the 4 Torx bolts.
- Release the fuel injectors.
- Discard the fuel injector O-ring seals.


E45494

22. Remove the fuel injector housings.

- Remove the 10 Torx screws.
- Release the fuel injector housings and discard the gaskets.

Installation

1. Install the fuel injector housings.

- Clean the component mating faces.
- Install the gaskets.
- Install the Torx screws.

2. Install the fuel rail.

- Clean the component mating faces.
- Install fuel injector O-ring seals.
- Lubricate the O-ring seals with clean engine oil.

- Tighten the 4 Torx bolts to 10 Nm (7 lb.ft).

3. Install the intake manifold MAP sensor housing.

- Clean the component mating faces.
- Tighten the 7 bolts to 10 Nm (7 lb.ft).

4. Install the intake manifold casting.

- Clean the component mating faces.
- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).

5. Install the NVH pad to the RH side of the intake manifold.

6. Clean the components.

7. With assistance, install the intake manifold.

- Install the gaskets.
- Connect the mass air flow (MAF) sensor electrical connector.
- Connect the brake booster vacuum hose to the intake manifold.

8. Install the bolts.

- Evenly and progressively tighten the bolts to 20 Nm (15 lb.ft).

9. Connect the fuel temperature sensor electrical connector.

10. Connect the fuel injector electrical connectors.

11. Connect the engine wiring harness to the intake manifold.

12. Install the EGR valve.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

13. Install the engine wiring harness support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

14. Position the CMP sensor electrical connector block, to the intake manifold.

15. Connect the fuel line to the fuel rail.

- Clean the component mating faces.
- Position the fuel pipe into clips.

16. Install the evaporative loss valve assembly to the intake manifold bracket and connect the hose.

- Clean the component mating faces.

17. Connect the crankcase vent hoses.

- Clean the component mating faces.

18. Install the engine cover mounting brackets.

- Tighten the nuts to 6 Nm (4 lb.ft).
- Attach the wiring harness connector blocks to the brackets.

19. Install the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

20. Connect the battery ground cable.

21. Connect the hood support struts.

Published: 11-May-2011

Fuel Charging and Controls - V8 4.4L Petrol - Throttle Body Gasket

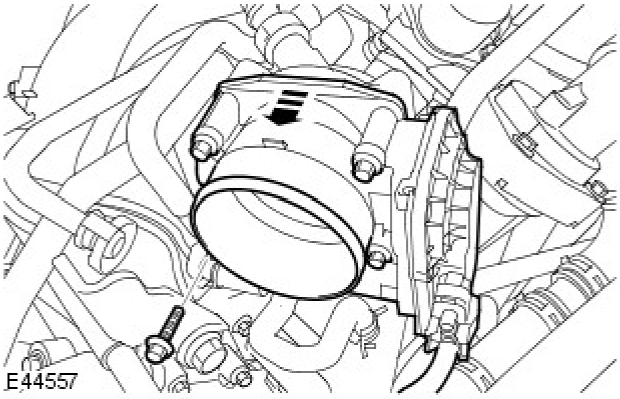
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Remove the air intake resonator. For additional information, refer to: Intake Air Resonator (303-12B, Removal and Installation).



4. Release the throttle body.

- Remove the 4 bolts.
- Remove and discard the throttle body gasket.

Installation

1. Install the throttle body.

- Clean the components.
- Install a new gasket.
- Tighten the 4 bolts to 10 Nm (7 lb.ft).

2. Install the air intake resonator. For additional information, refer to: Intake Air Resonator (303-12B, Removal and Installation).

3. Install the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

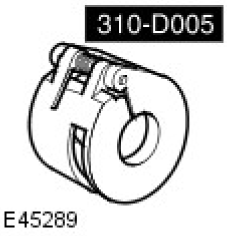
4. Connect the battery ground cable.

5. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Published: 11-May-2011

Fuel Charging and Controls - V8 4.4L Petrol - Fuel Rail

Removal and Installation

Special Tool(s)	
	Fuel spring lock decoupling tool 310-D005

Removal

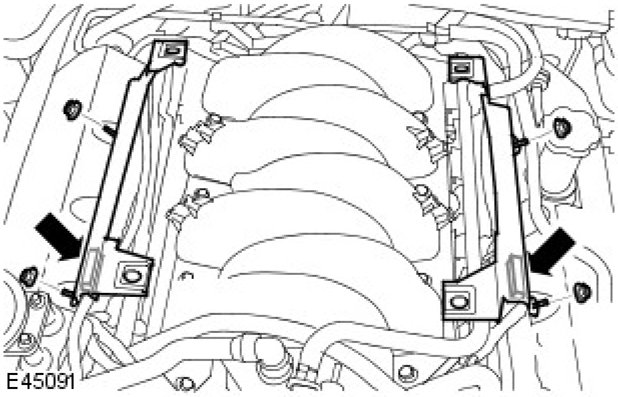
• WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



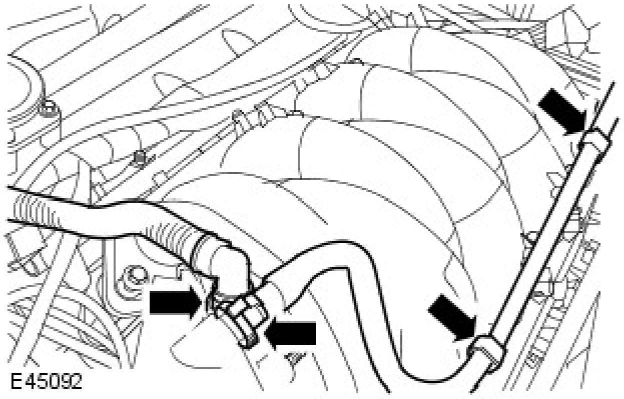
3. Remove the engine cover studs.

- Release the electrical connectors from the engine cover brackets.
- Remove the 4 nuts.

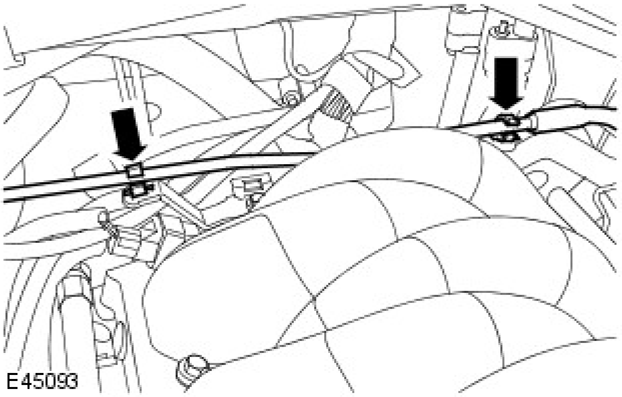
4. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the crankcase vent hoses.

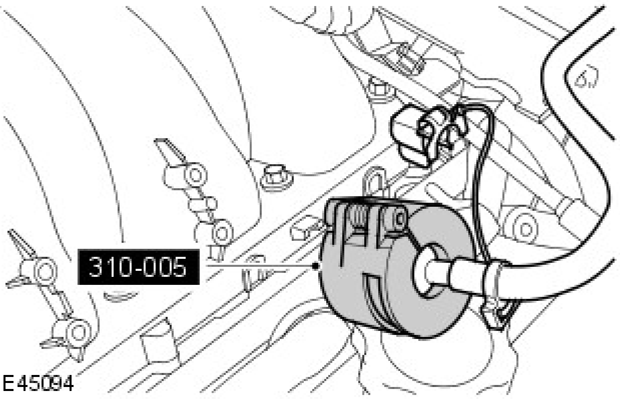
5. Disconnect the evaporative emission hose from the intake manifold assembly.



6. Release the evaporative loss control valve from the intake manifold mounting, move the hose assembly aside for access.



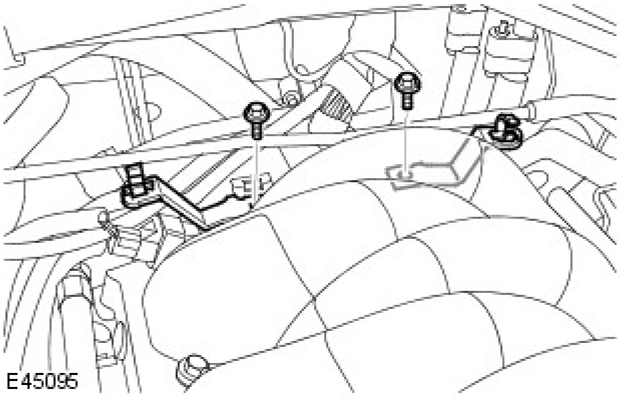
7. Release the fuel pipe from the clips.



8. ⚠ WARNING: The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Using the special tool, disconnect the fuel line.

- Position an absorbent cloth to collect fluid spillage.

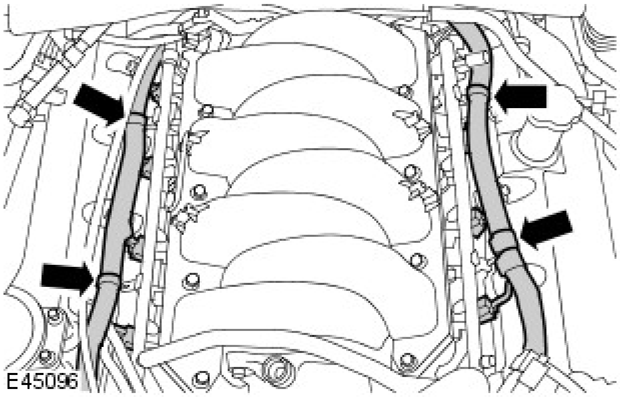


9. Position the wiring harness support bracket aside for access.

- Remove the 2 bolts.

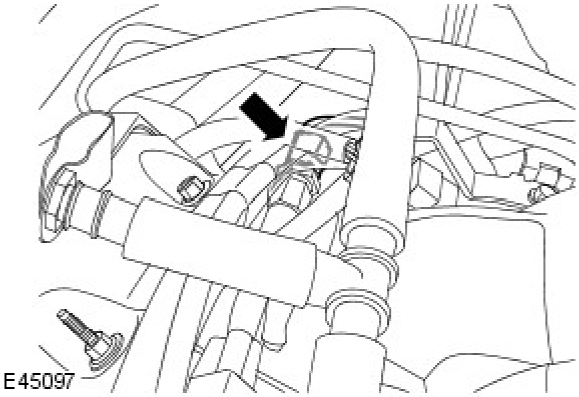
10. Release the engine wiring harness clips from the fuel rail.

11. Disconnect the fuel injector electrical connectors.



12. Disconnect the engine gas recirculation modulator electrical connection.

13. Disconnect the fuel temperature sensor electrical connector.

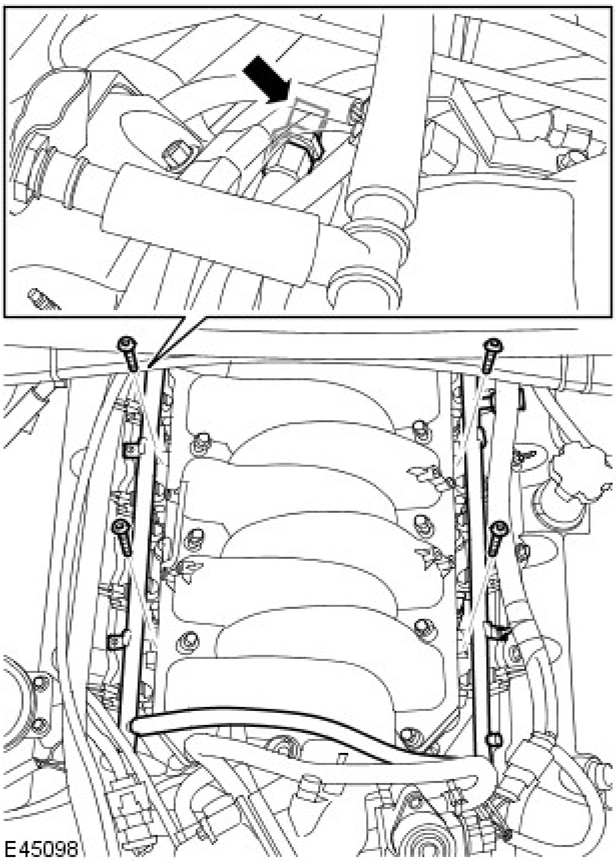


14. NOTE: Do not disassemble further if the component is removed for access only.

Remove the fuel rail.

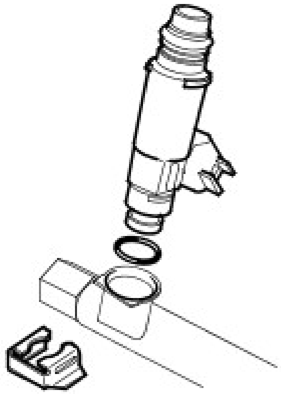
- Remove the 4 Torx bolts.
- Remove and discard the fuel injector O-ring seals.

15. Remove the fuel temperature sensor.


E45098

16. Remove the fuel injectors.

- Remove the retaining clips.
- Release the fuel injectors.
- Remove and discard the fuel injector O-ring seals.


E45099

Installation

1. Clean the components.

2. Install the fuel injectors to the fuel rail.

- Install fuel injector O-ring seals.
- Lubricate the O-ring seals with clean engine oil.
- Install the fuel injectors.
- Secure the fuel injector retaining clips.

3. Clean the components.

4. Install the fuel temperature sensor.

- Apply sealant to the sensor thread.

5. Install the fuel rail.

- Install fuel injector O-ring seals.

- Lubricate the O-ring seals with clean engine oil.
- Tighten the Torx bolts to 10 Nm (7 lb.ft).

6. Connect the fuel temperature sensor electrical connector.

7. Connect the fuel injector electrical connectors.

8. Connect the engine wiring harness to the intake manifold.

9. Install the engine wiring harness support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

10. Connect the fuel line to the fuel rail.

- Clean the component mating faces.
- Position the fuel pipe into clips.

11. Install the evaporative loss valve assembly to the intake manifold bracket and connect the hose.

- Clean the component mating faces.

12. Connect the crankcase vent hoses.

- Clean the component mating faces.

13. Install the engine cover mounting brackets.

- Tighten the nuts to 6 Nm (4 lb.ft).
- Attach the wiring harness connector blocks to the brackets.

14. Install the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

15. Connect the battery ground cable.

Published: 09-Aug-2011

Fuel Charging and Controls - TDV6 2.7L Diesel -

General Specification

Item	Description
* Recommended fuel	Diesel or Automotive Gas Oil (AGO) to EN590 Specification

*** This engine is NOT compatible with 'Bio-diesel' fuel**

Torque Specifications

Description	Nm	lb-ft
High pressure fuel supply lines to injector and supply manifold unions:		
Stage 1 - Union to injector	15	11
Stage 2 - Union to supply manifold	15	11
Stage 3 - Union to injector	30	22
Stage 4 - Union to supply manifold	30	22
High pressure fuel supply lines to supply manifold and diverter rail unions:		
Stage 1 - Union to supply manifold	15	11
Stage 2 - Union to diverter rail	15	11
Stage 3 - Union to supply manifold	35	26
Stage 4 - Union to diverter rail	35	26
Fuel injection diverter rail studs	23	17
Fuel supply line retaining bolts	10	7
Crankcase vent oil separator locating stud	10	7
EGR coolant cross-over pipe bolts	13	10
Intake air shut-off throttle retaining stud	10	7
Intake air shut-off throttle elbow retaining bolt	10	7
Fuel injection pump pulley nut	50	37
Fuel injection pump securing bolts	23	17
Fuel injection pump belt rear cover retaining bolt	7	5
Fuel injection pump belt tensioner retaining bolt	25	18
Fuel injector retaining bolts	10	7

Fuel Pressures

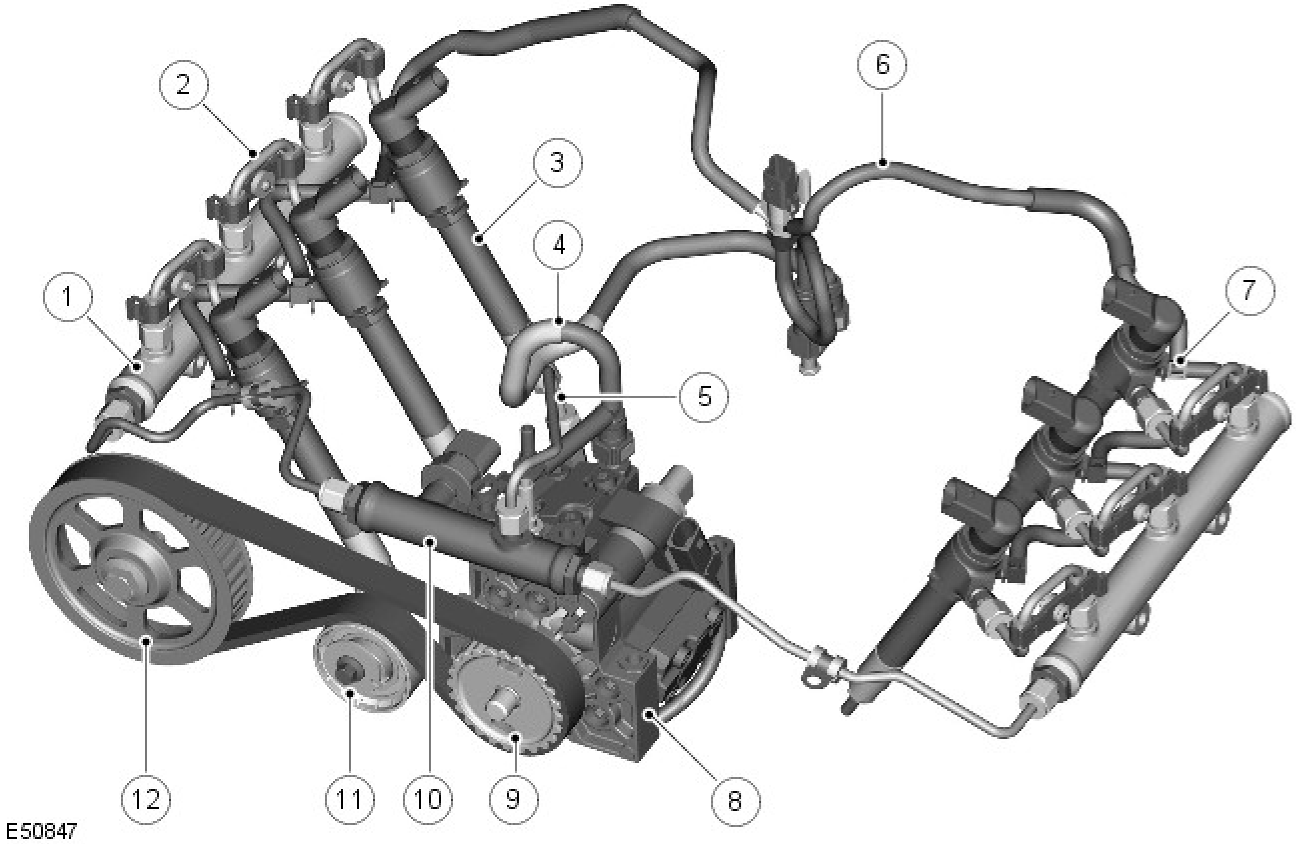
Component	bar	psi
Fuel pump	0.5	7.25
High pressure fuel injection pump	1650 maximum	23931 maximum

Published: 11-May-2011

Fuel Charging and Controls - TDV6 2.7L Diesel - Fuel Charging and Controls

Description and Operation

Component Locations



Item	Part Number	Description
1	-	High-pressure (HP) fuel rail (2 of)
2	-	HP pipe - Fuel rail to injector (6 of)
3	-	Injectors (6 of)
4	-	Low Pressure (LP) pipe - Fuel return
5	-	HP pipe - High Pressure Pump (HPP) to fuel diverter rail
6	-	LP pipe - Injector leak-back
7	-	Connector to injector (part of 6)
8	-	HPP
9	-	HPP pulley
10	-	HP diverter rail
11	-	Rear Engine Accessory Drive (READ) belt tensioner
12	-	LH exhaust camshaft pulley

GENERAL

The TdV6 engine is equipped with a High-Pressure (HP) common rail fuel injection system. With this fuel injection process, a High-Pressure Pump (HPP) delivers a uniform level of pressure to the shared fuel lines (the common rails), which serve all six fuel injectors. Pressure is controllable, to the optimum level for smooth operation, up to 1650 bar.

The common rail system supports a pre-injection (pilot) phase, which reduces combustion noise and mechanical load.

Fuel injection pressure is generated independently of engine speed and fuel injection events.

The fuel injection timing and volume are calculated by the Engine Control Module (ECM), which then energizes the appropriate piezo actuated injector.

The common rail fuel injection system has the following features:

- High fuel injection pressures of up to 1650 bar for greater atomisation of fuel (increasing performance and lowering emissions)
- Variable injection to optimise combustion in all engine operating conditions
- Low tolerances and high precision throughout the life of the system

The fuel system is divided into 2 sub systems:

- Low-Pressure (LP) system
- HP system.

The LP system features the following components:

- In-tank fuel pump
- Fuel pressure regulator (integral to the fuel delivery module)
- Fuel filter
- Return pipes and fuel cooler
- Injector return pipes
- Fuel coolers (engine and vehicle)

The LP system pressure is regulated to 0.5 bar.

The HP system features the following components:

- HPP
- Common fuel rails and diverter rail
- HP fuel pipes
- Injectors.

LP SYSTEM

In-tank Fuel Pump

The electric fuel pump is located inside the fuel tank. Fuel is pumped from the tank via the in-tank fuel pump, to the HPP via the fuel filter.
For additional information, refer to: Fuel Tank and Lines (310-01C Fuel Tank and Lines - TDV6 2.7L Diesel, Description and Operation).

Fuel Filter

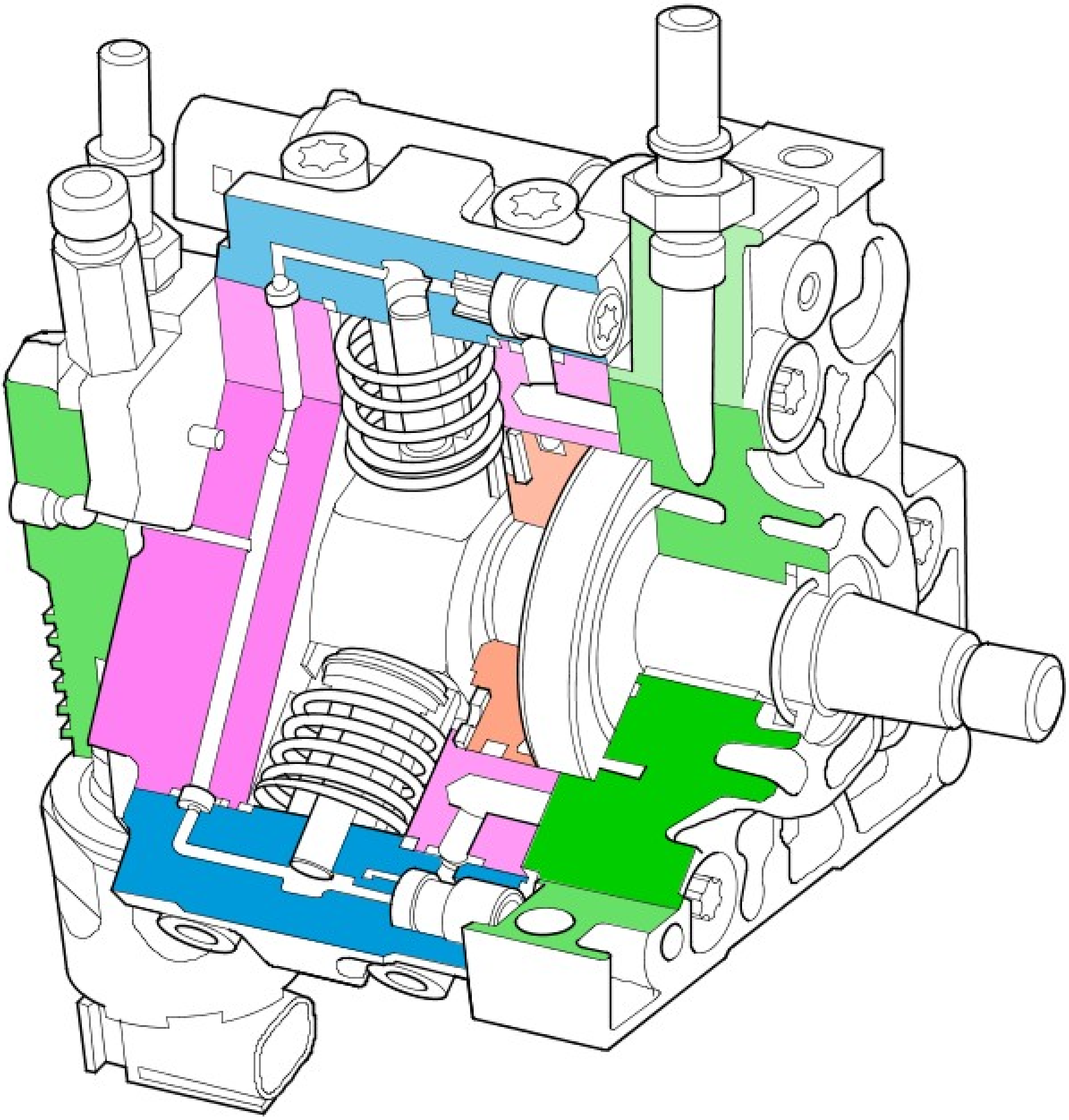
The fuel filter is located in the engine compartment on the left hand side, packaged to be protected against damage. Incorporated in the fuel filter housing is a bimetallic temperature valve, which will start to close at 30°C (86°F) and will fully close at 50°C (122°F). This allows pre-heated diesel fuel to circulate inside the fuel filter to prevent waxing in cold operating conditions.

Fuel Cooler

Two fuel coolers are fitted to the vehicle. One is located in the 'vee' of the engine block, and has a coolant system connection to aid heat transfer. The second cooler is located in the fuel return line and is a fuel to air cooler.
For additional information, refer to: Fuel Tank and Lines (310-01C Fuel Tank and Lines - TDV6 2.7L Diesel, Description and Operation).

HP SYSTEM

HPP



E50833

The HPP is a three-piston (120 degree apart) radial plunger pump with a HP displacement of 0.8 cc. As mentioned, it has the ability to produce a maximum pressure of 1650 bar. The housing is cast from iron, the flange is cast from aluminium.

The pump is driven from the camshaft via a toothed belt. It does not need to be timed to the engine during belt replacement in service.

The required supply pressure to the HPP is -0.3 bar to +0.5 bar gauge. The return pressure is -0.3 bar to +0.8 bar gauge.

The pump is sized to deliver sufficient fuel to the HP rails for all engine-operating conditions.

The HPP consists of the following components:

- Internal Transfer Pump (ITP)
- Volume Control Valve (VCV)
- HP pumping elements (3 of)
- Pressure Control Valve (PCV)

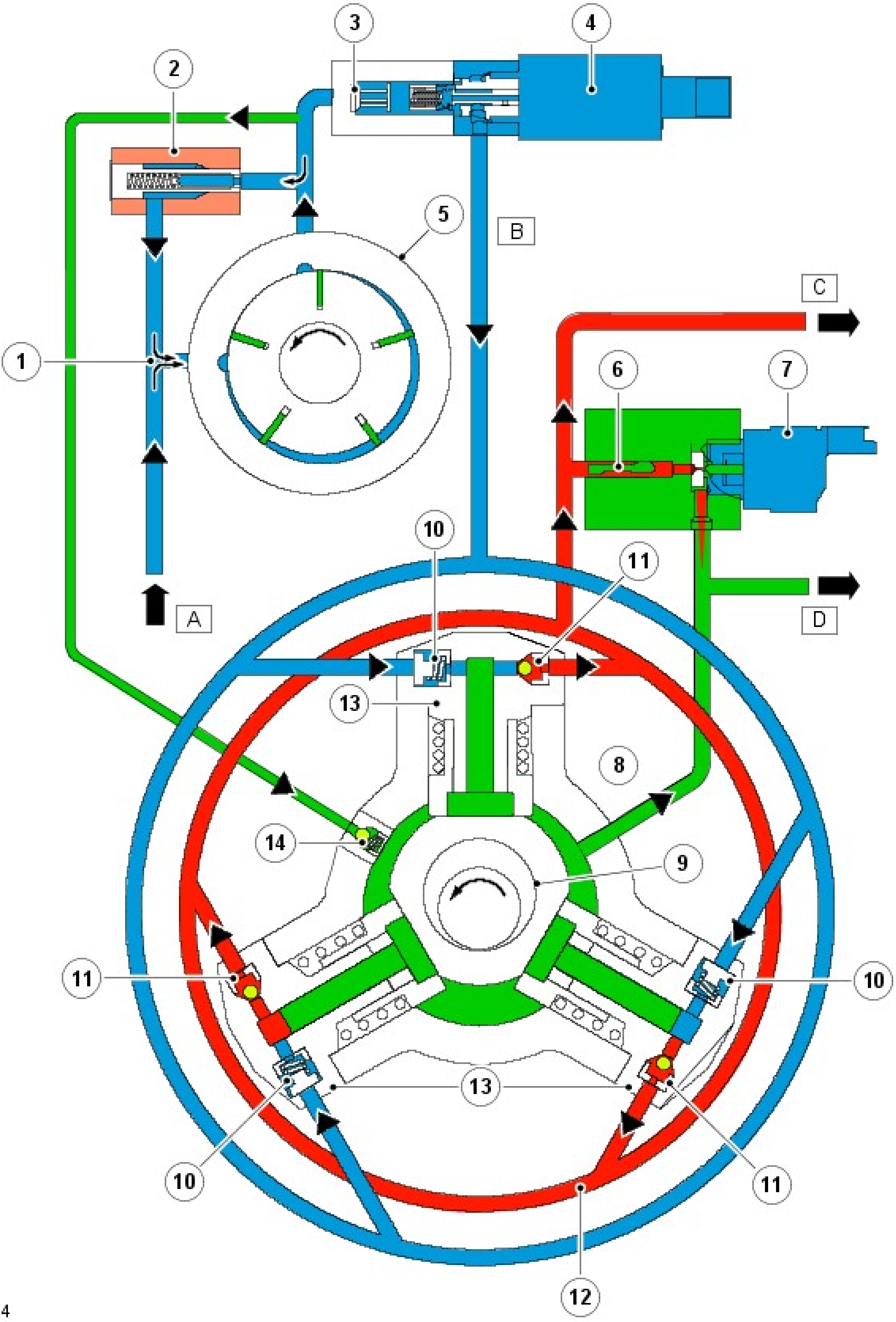
The ITP is a 5 vane pump. This conveys fuel to the VCV.

The VCV is a variable position solenoid valve electronically controlled by the ECM. The VCV is located between the ITP and the HP pumping elements. The VCV determines the amount of fuel that is delivered to the HP pumping elements. When there is no signal to the VCV the valve is closed, therefore no fuel delivery.

The 3 HP pumping elements are connected together in a fuel ring circuit within the pump. There is a single HP outlet connection for the HP pipe to the HP diverter rail.

The PCV is a variable position solenoid valve electronically controlled by the ECM. The PCV is located between the HP pumping elements and the HP outlet connection. The PCV regulates the amount of fuel pressure in the fuel rails and is controlled by the ECM. When there is no signal to the PCV the valve is open, therefore no rail pressure can be generated.

High Pressure Fuel Flow


3
4
2
5
B
1
C
6
7
A
10
11
D
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12

E50834

Item	Part Number	Description
A	-	LP fuel supply
B	-	Fuel supply to the HP pumping elements
C	-	HP outlet connection to the HP diverter rail
D	-	LP fuel return (spill)
1	-	LP side of ITP

2	-	ITP pressure relief valve
3	-	Screen filter
4	-	VCV
5	-	ITP
6	-	Edge filter (to protect PCV)
7	-	PCV
8	-	N/A
9	-	Eccentric on HPP drive shaft
10	-	Pumping element inlet valve
11	-	Pumping element outlet valve
12	-	HP ring line
13	-	HPP elements (3 of)
14	-	Lubricating valve

The fuel induced by the ITP (5) is conveyed to the VCV (4) and the lubricating valve (14).

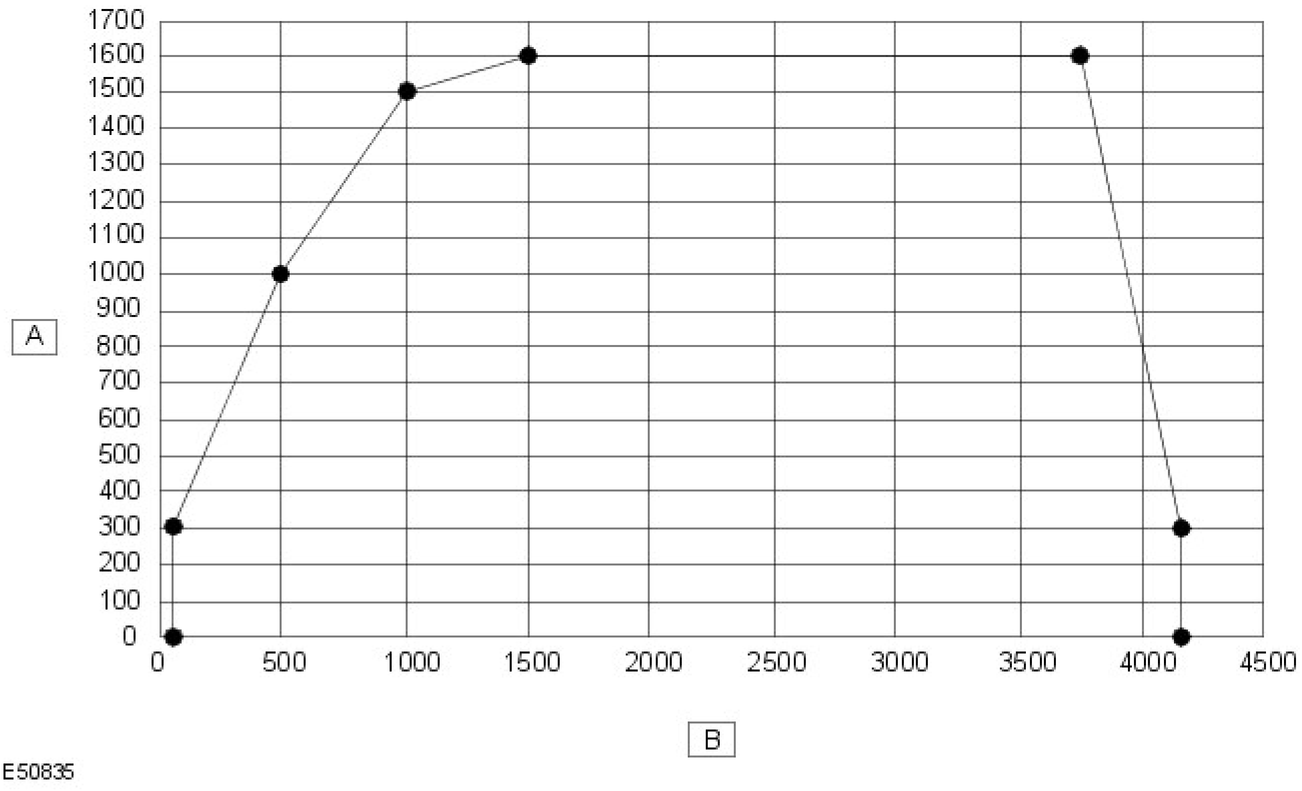
When the VCV is closed, the ITP pressure relief valve (2), lying parallel to the transfer pump, opens and conveys the fuel back to the LP side (1) of the transfer pump.

The fuel passes through the lubricating valve (14) into the interior of the HPP and from there to the fuel return (D). The fuel is used to lubricate the pump.

The VCV (4) determines the quantity of fuel (B) that is supplied to the pumping elements (13).

The fuel from the HP outlets (11) of the three pumping elements comes together in a ring line (12) and is conveyed through the HP outlet of the HPP to the rails.

The PCV (7) regulates the fuel pressure in the fuel rails. Reducing rail pressure via the PCV results in fuel from the rail returning to the LP fuel return (D).



Item	Part Number	Description
A	-	Pump pressure (bar)
B	-	Pump speed (rpm)

The HPP can supply up to 1600 bar fuel pressure continuously with short excursions to 1650 bar. Pump speed is 5/6 engine speed. However it is calibrated to deliver fuel pressure dependant upon engine speed and load and is always under full control.

When the HPP is rotated, pressure is created when the VCV is open and the PCV is closed. The VCV and PCV are variable position to allow variable fuel delivery and pressure control.

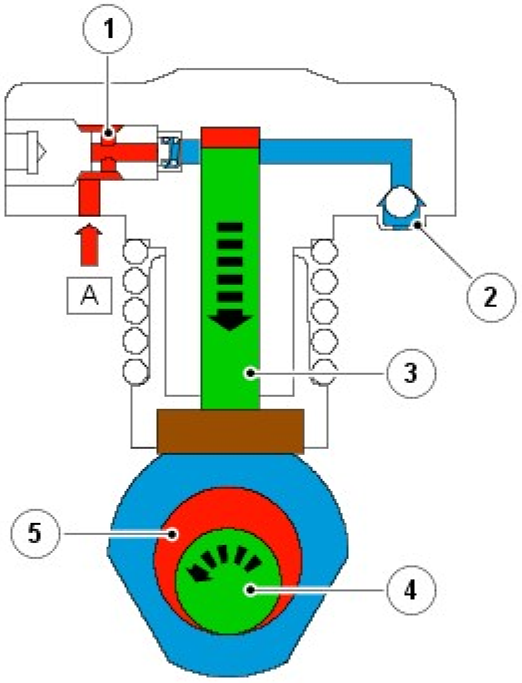
When the ECM actuates the piezo actuators, the rail pressure drop is off-set by additional fuel being delivered to the HP rails by the PCV.

Pressure Reduction After Engine Has Stopped

The fuel pressure in the system is reduced within a few seconds after the engine has stopped as the PCV no longer has the holding current it requires, and therefore opens. No residual pressure remains in the system and the fuel is returned to the fuel return line (D) through the open PCV. The system is pressureless.

Function of a High Pressure Element

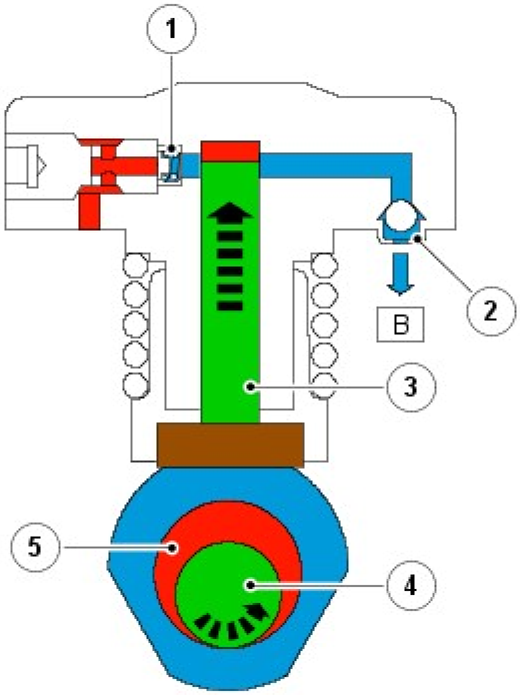
Fuel Induction



E50836

During the downward motion of the piston (3), a vacuum in the pump cylinder is generated, which opens the inlet valve (1) against the force exerted by the valve spring. The fuel (A), which is flowing past the VCV, is sucked in. At the same time the outlet valve (2) is closed due to the pressure difference between the pump cylinder and the HP fuel in the ring line.

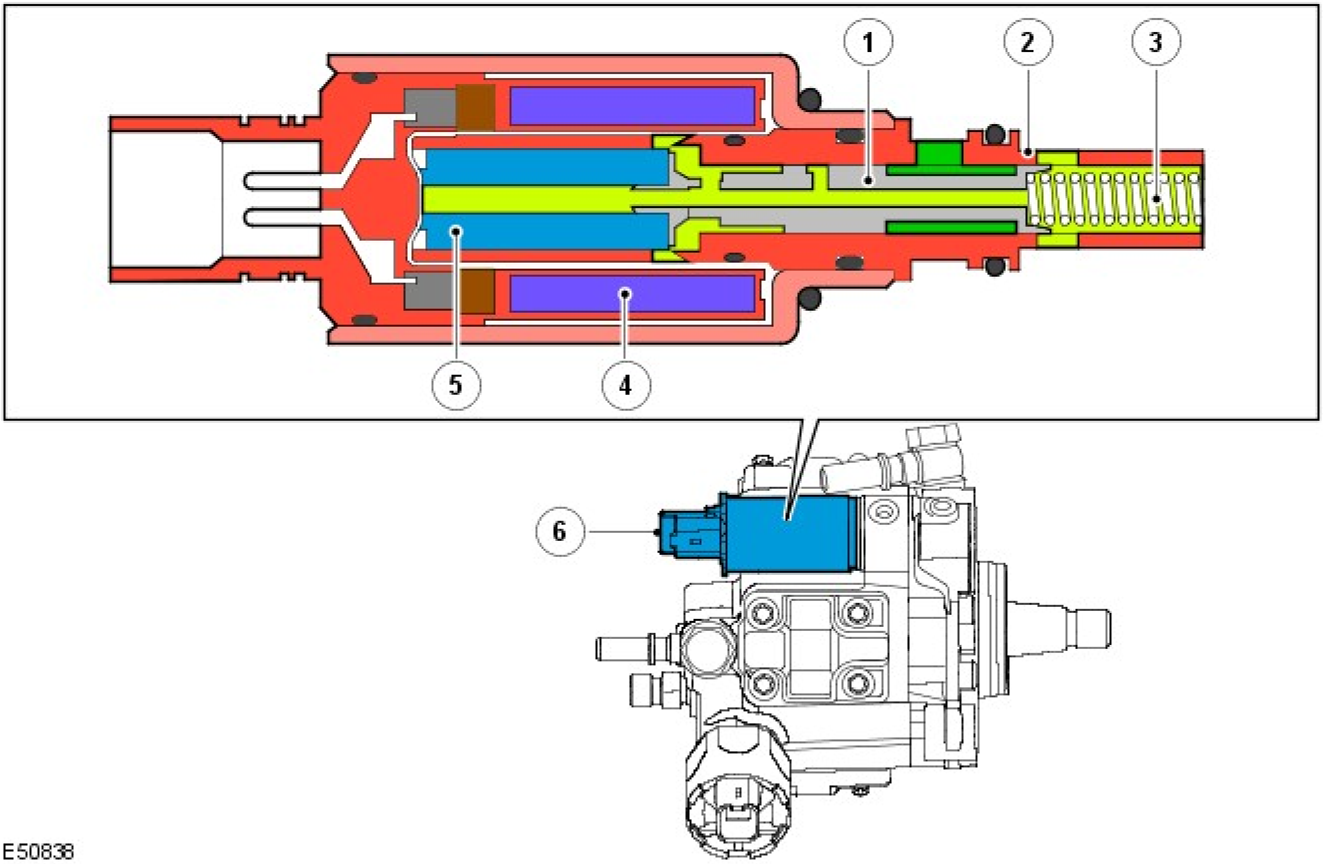
Fuel Delivery



E50837

The eccentric on the HPP driveshaft (5) presses the piston (3) upwards. The inlet valve (1) is then closed through the force exerted by the valve spring and the pressure being built up in the pump cylinder. The outlet valve (2) opens when the pressure in the pump cylinder is greater than the fuel pressure in the ring line (B).

Volume Control Valve (VCV)



Item	Part Number	Description
1	-	Piston
2	-	Sleeve
3	-	Compression spring
4	-	Coil
5	-	Armature
6	-	VCV

The VCV is fixed directly to the HPP.

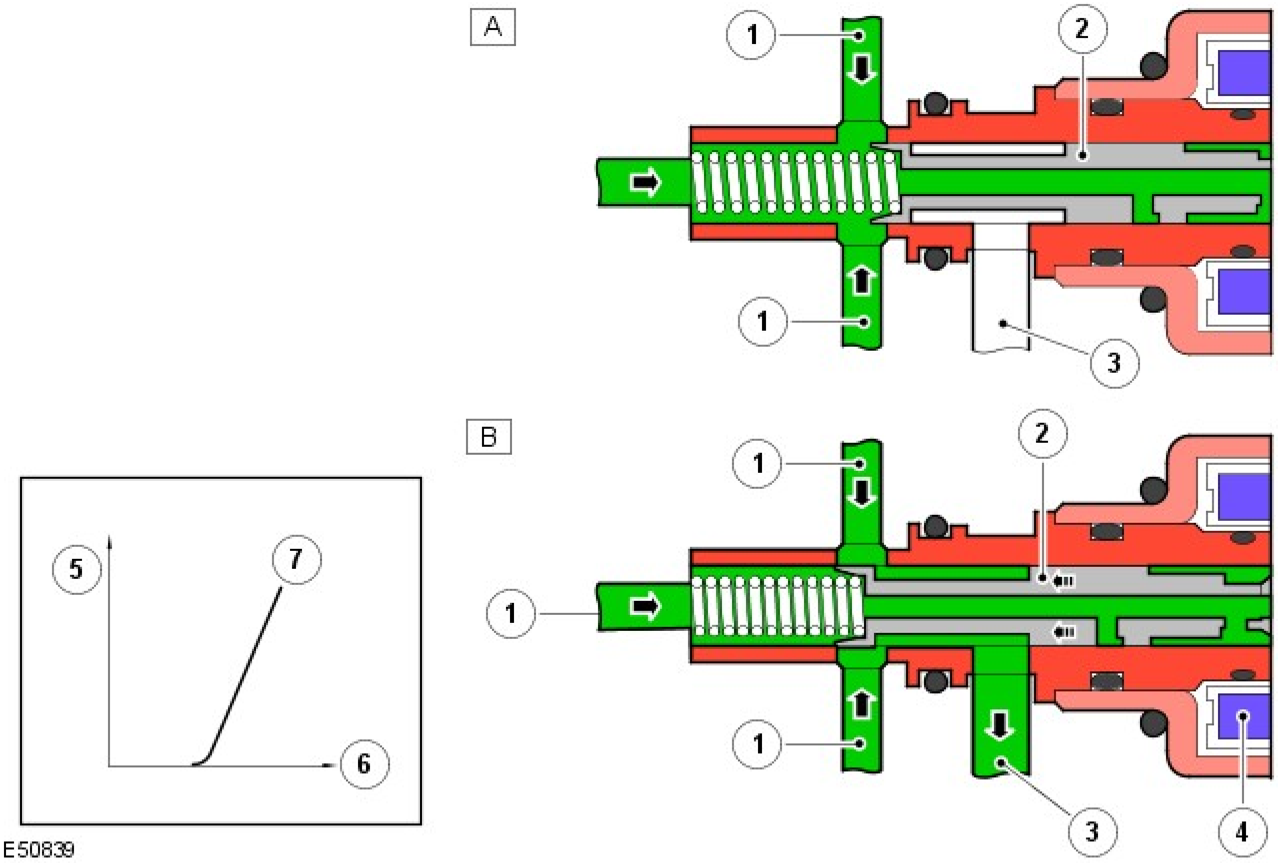
The VCV regulates the fuel supply (and hence the quantity of fuel) from the transfer pump to the HPP elements, depending on the fuel pressure in the rail.

This makes it possible to match the delivery of the HPP to the requirements of the engine from the low-pressure side. The quantity of fuel flowing back to the main fuel supply line is kept to a minimum.

In addition, this adjustment reduces the power consumption of the HPP, improving the efficiency of the engine.

- NOTE: The fuel volume control valve default is closed without electrical supply. An open circuit connector will prevent the engine from running.

- NOTE: The VCV cannot be replaced as a separate component in service.



Item	Part Number	Description
A	-	VCV not actuated
B	-	VCV actuated
1	-	Fuel supply from the transfer pump
2	-	Piston
3	-	Fuel supply to the HPP
4	-	Coil energised
5	-	Quantity of fuel
6	-	Control current
7	-	VCV at constant engine speed

VCV Not Actuated (A)

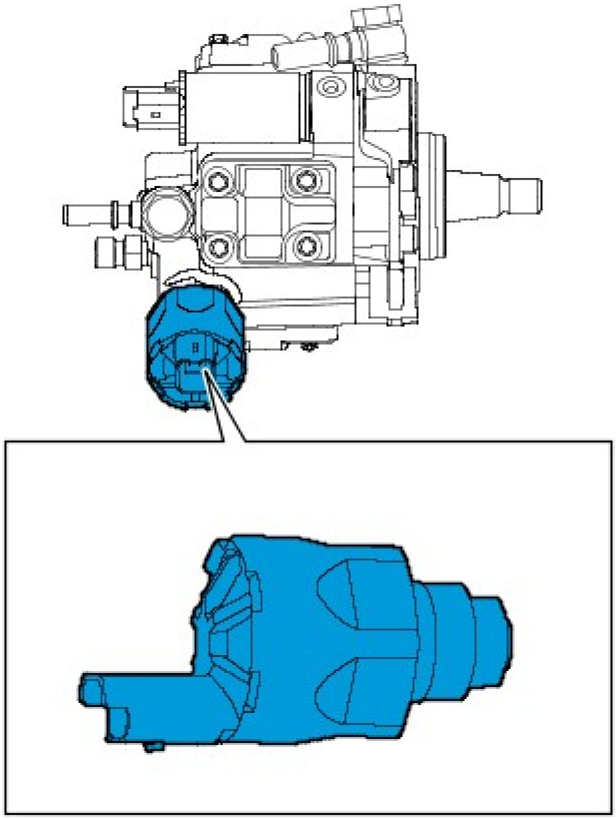
When there is no power supplied, the piston (2) closes the opening between the two connections (1) and (3) through the force of the compression spring. The fuel supply to the HPP is interrupted.

VCV Actuated (B)

The ECM energizes the coil (4) of the valve, according to the engines requirements. The armature force is proportional to the control current and counteracts the compression spring through the moving piston (2).

As a result, the opening between the two connections (1) and (3) and hence the quantity of fuel (5) supplied through the connector (3) to the HPP is also proportional to the control current (6). This means that the greater the opening cross-section, the greater the quantity of fuel supplied.

Pressure Control Valve (PCV)



E50840

The PCV is located on the HPP. It governs the fuel pressure at the HP outlet of the HPP and thus, the fuel pressure within the rail. In addition, the PCV dampens any fluctuations in pressure, which occur during the delivery of fuel through the HPP and through the injection process.

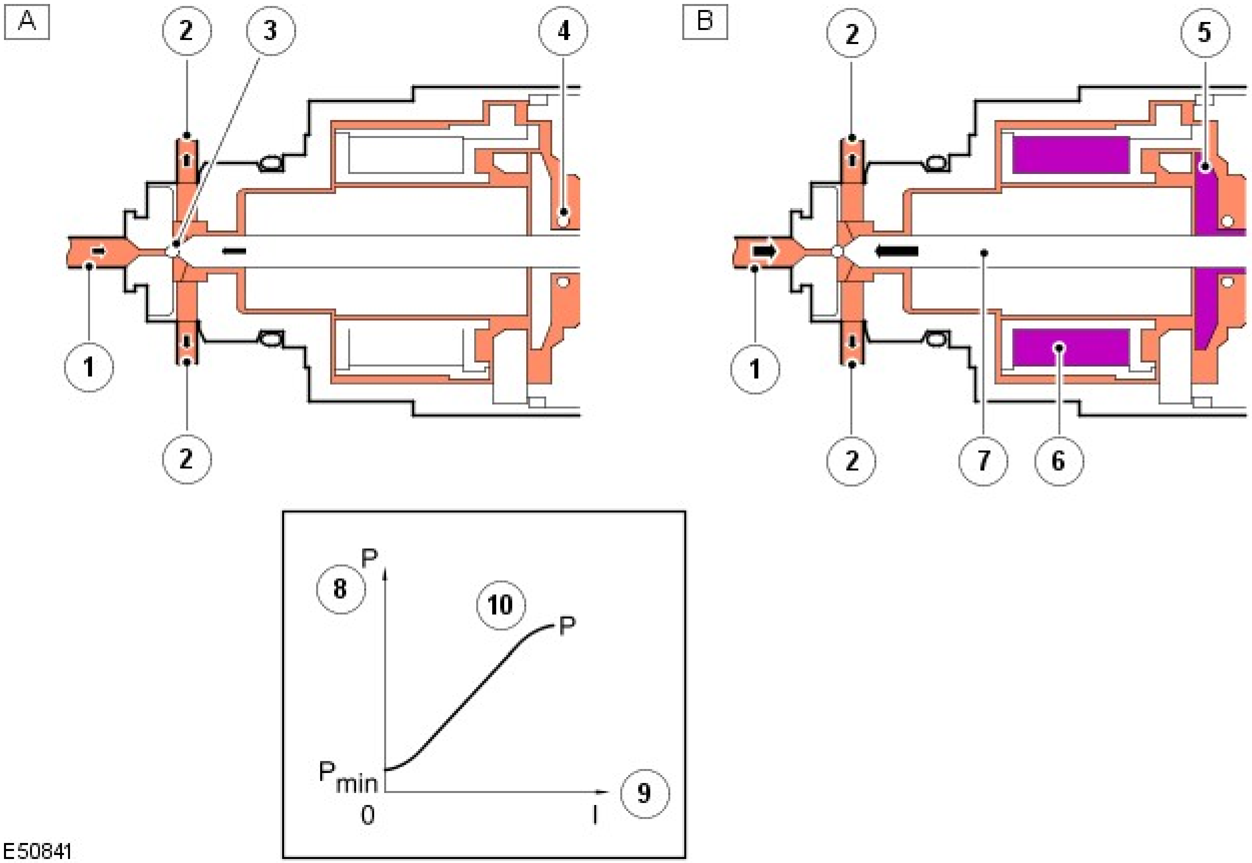
The PCV ensures that optimum pressure exists in the rail for every operating condition of the engine.

The PCV is an electro-magnetically operated valve with spring support.

The electrical current supplied by the ECM through the solenoid pulls back the control pin. This allows the diesel fuel to pass the ball valve and thus the fuel flow into the common rails.

The entire armature is coated with fuel for lubrication and cooling.

- NOTE: The PCV cannot be replaced as a separate component in service.



E50841

Item	Part Number	Description
A	-	PCV non-controlled
B	-	PCV controlled
1	-	Fuel from the HPP
2	-	To fuel return
3	-	Ball valve
4	-	Compression spring
5	-	Armature
6	-	Coil energised
7	-	Control pin
8	-	High pressure fuel
9	-	Control current
10	-	Characteristic of the PCV

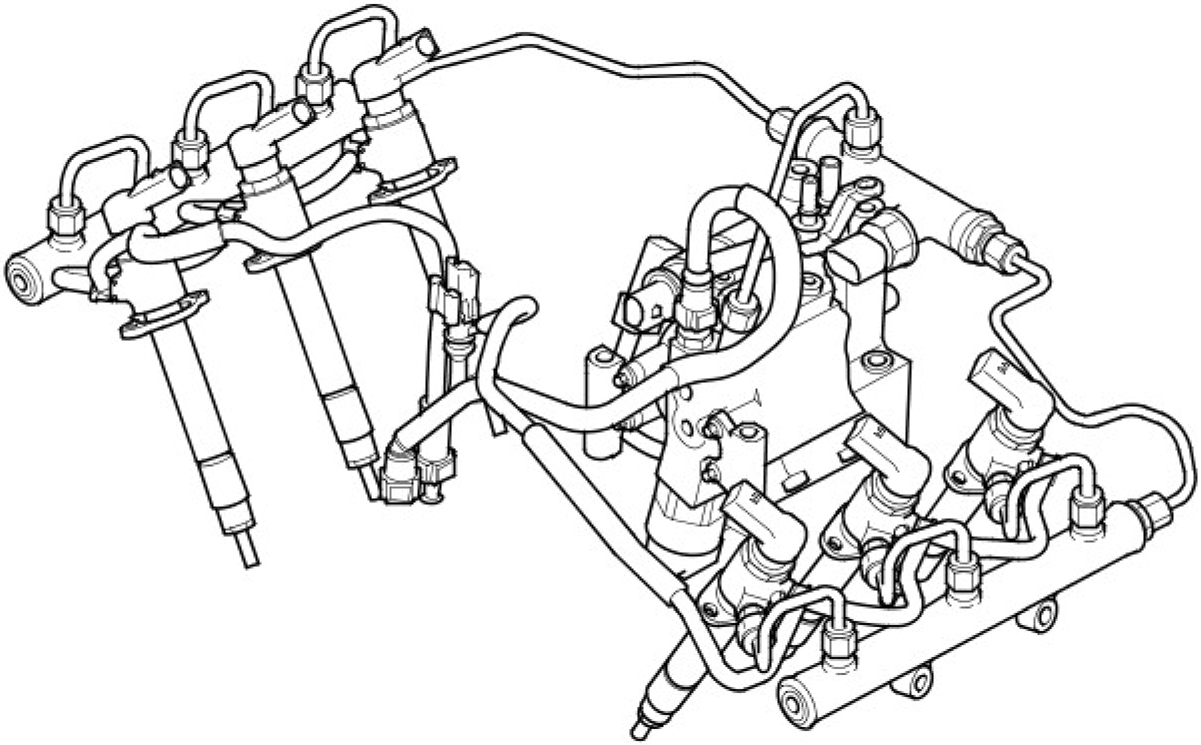
PCV Non-controlled (A)

The ball valve (3) will only be operated through the force exerted upon it by the spring (4). Thereby, the PCV is classed as open.

PCV Controlled (B)

The current flowing through the solenoid (6) draws the pin (7) down. This in turn transfers the magnetic force via the pin to the ball valve (3). The pull of the pin, and the pressure on the ball valve, is proportional to the valve flow (9).

HP Common Fuel Rails

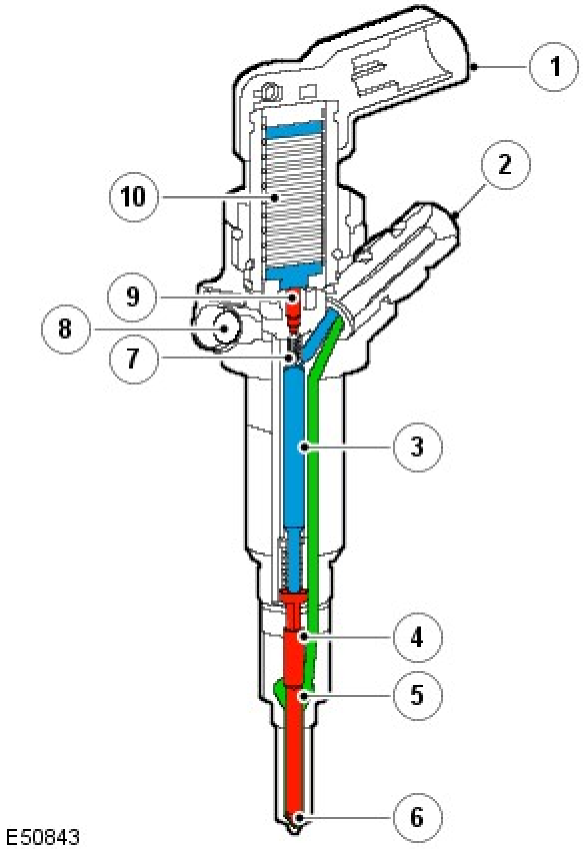


E50842

The fuel rails are manufactured from forged steel. They store the fuel at high pressure and prevent pressure fluctuations in the HP system.

All HP pipes have an internal diameter of 2.5mm except the pipes to the injectors, which are 3.0mm. Total rail volume is 33cc.

FUEL INJECTORS



Item	Part Number	Description
1	-	Harness connection
2	-	HP connection
3	-	Control piston
4	-	Nozzle needle
5	-	Nozzle HP chamber
6	-	Nozzle spray holes
7	-	Valve mushroom
8	-	Fuel return
9	-	Valve piston
10	-	Piezo actuator

The fuel injectors are operated directly by the ECM for fuel metering (start of injection and quantity of fuel injected).

The operating components of the piezo fuel injectors are:

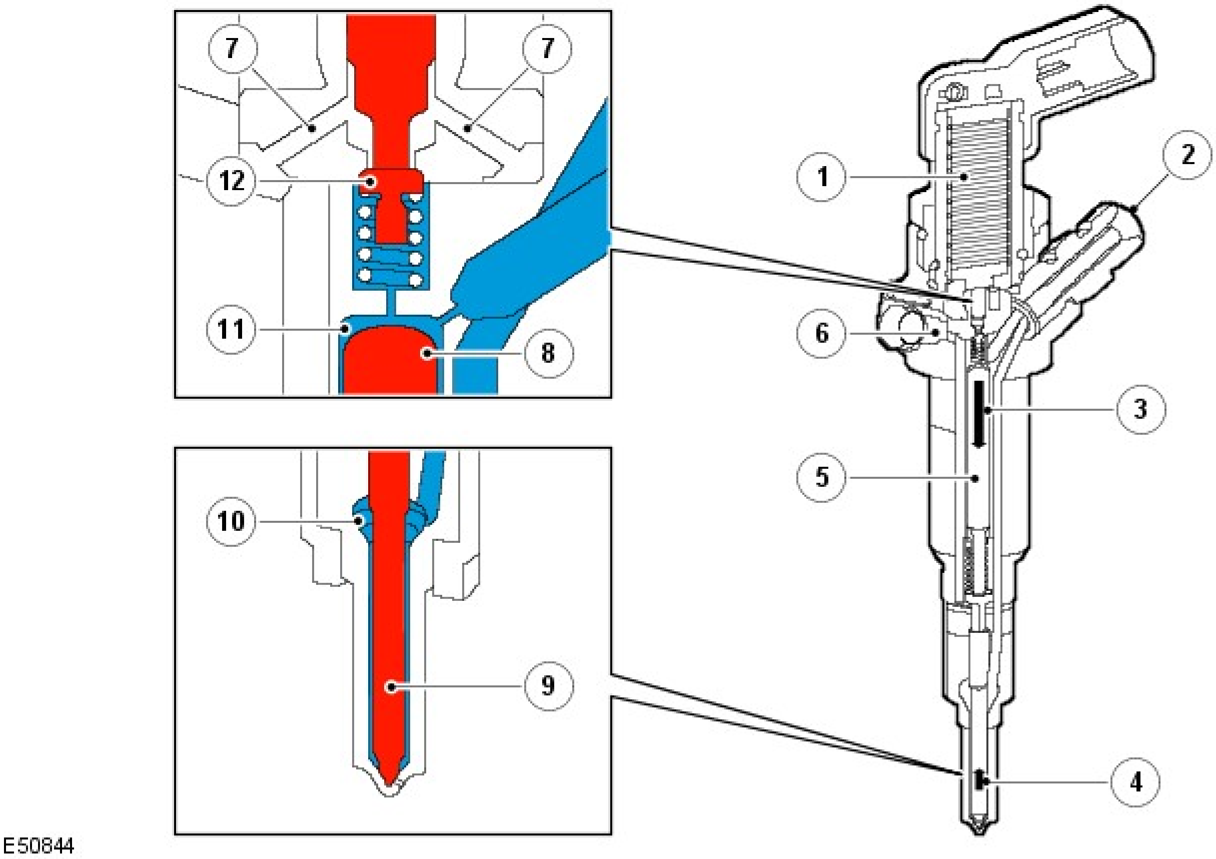
- The piezo actuator
- The injector body containing the hydraulic servo system
- The fuel injector nozzle

• NOTE: New injectors can be installed in any cylinder and DO NOT have to be configured.

• NOTE: Each injection event is controlled by a charge and discharge cycle allowing energy to dissipate in, and recover from, the injector. Never disconnect the wiring connector when the vehicle is running. The injector may remain open thus causing engine damage.

• NOTE: For safety reasons, the engine must be at standstill for 30 seconds before starting work on the HP fuel system.

Fuel Injector Not Actuated (Not Injecting Fuel)



Item	Part Number	Description
1	-	Piezo actuator
2	-	HP connection
3	-	Hydraulic force applied on control piston
4	-	Hydraulic force acting on tip of nozzle
5	-	Control piston
6	-	Fuel return
7	-	Fuel return
8	-	Control piston
9	-	Nozzle needle
10	-	High pressure chamber of nozzle
11	-	Control chamber
12	-	Valve mushroom

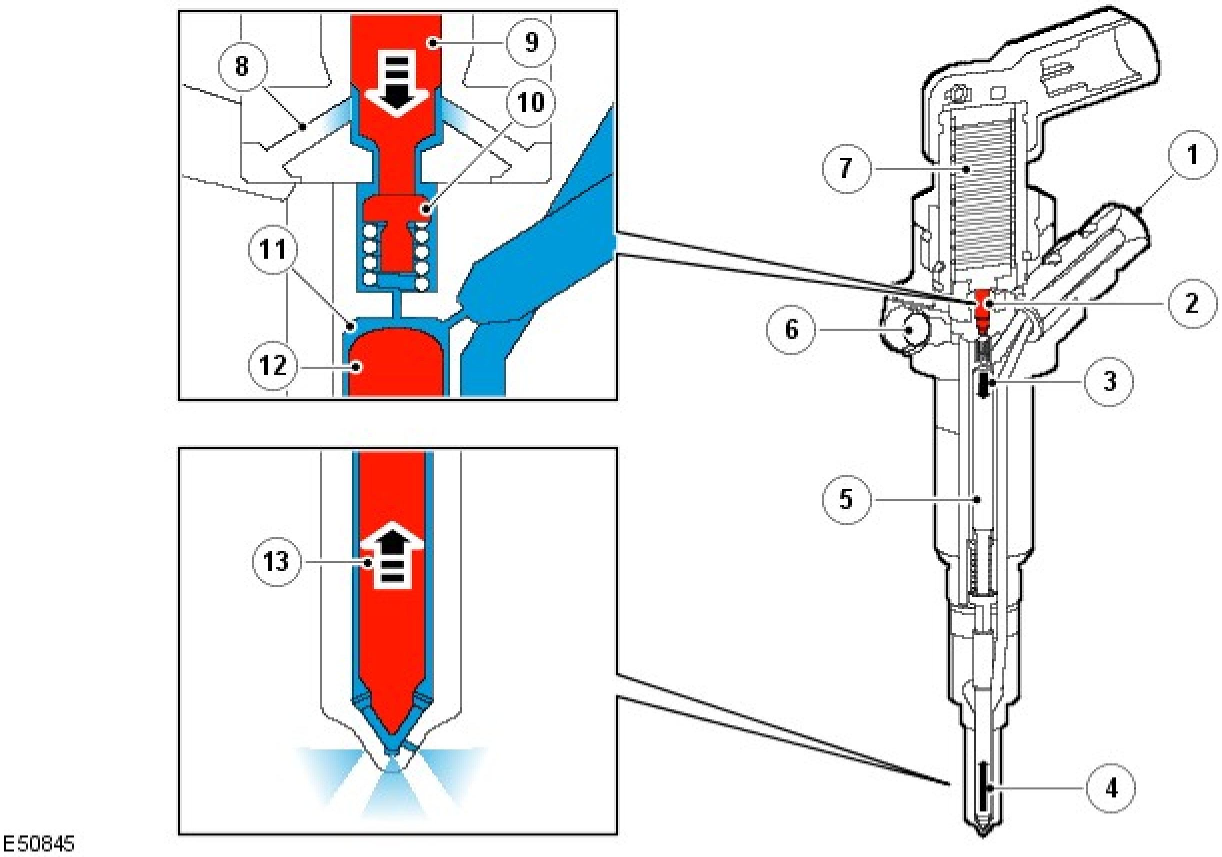
The HP fuel from the fuel-rail passes through the HP connection (2) into the control chamber (11) and into the HP chamber (10) of the fuel injector nozzle.

The piezo actuator (1) is currentless and the valve mushroom (12) closes the bore to the fuel return (7) by means of spring pressure.

There is however a continuous fuel return (6) to vent internal leakage within the injector.

The hydraulic force (3), which is now applied on the control piston by the fuel under high pressure in the control chamber (11) through the control piston (8), is greater than the hydraulic force (4) acting on the tip of the nozzle (since the area of the control piston in the control chamber is greater than the area of the tip of the nozzle).

Fuel Injector Actuated (Injecting Fuel)



Item	Part Number	Description
1	-	High pressure supply
2	-	Valve piston
3	-	Hydraulic force applied on control piston
4	-	Hydraulic force acting on tip of nozzle
5	-	Control piston
6	-	Fuel return
7	-	Piezo actuator
8	-	Fuel return
9	-	Valve piston
10	-	Valve mushroom
11	-	Control chamber
12	-	Control piston
13	-	Nozzle needle

The piezo actuator (7) energized by the ECM extends (charging phase) and presses on the valve piston (9). The valve mushroom (10) opens the bore, which connects the control chamber (11) to the fuel return (8 then 6).

As a result, the pressure in the control chamber drops, and the hydraulic force (4) acting on the tip of the nozzle needle is now greater than the force (3) acting on the control piston in the control chamber.

The nozzle needle (13) moves upwards and the fuel passes through the six spray holes into the combustion chamber.

Engine Starting

During starting, the fuel rail pressure must be at least 150 bar. Should the pressure be below this figure, the injectors will not operate, resulting in the vehicle not starting.

Engine Stopped

To stop the engine the ECM stops energising the piezo actuators, therefore, no fuel is injected and the engine speed drops to zero.

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Fuel Charging and Controls - TDV6 2.7L Diesel - Fuel Charging and Controls

Diagnosis and Testing

Overview

Common rail diesel

The 2.7L fuel injection system is a common-rail design, running at the high-pressures of up to 1,600 bar (23,206 lb/in²) typical of such systems.

The fuel volume control valve (FVCV) regulates the amount of fuel supplied to the high-pressure side of the fuel injection pump, while the fuel pressure control valve (FPCV) regulates the pressure.

The high-pressure fuel is delivered to the fuel rail where it is stored, ready for use by the fuel injectors.

The fuel injectors are Piezo type, and are controlled by the engine control module (ECM) from inputs from the engine management sensors.

The fuel injectors operate in stages, giving a pilot injection before the main injection to reduce detonation noise and help improve the efficiency of the engine.

For additional information, refer to the workshop manual section 303-04 - Fuel Charging and Controls.

Inspection and Verification

- WARNINGS:

⚠ Do **NOT** carry out any work on the fuel system with the engine running. The fuel pressure within the system can be as high as 1600 bar (23,206 lb/in²). Failure to follow this instruction may result in personal injury.

⚠ Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.

⚠ After carrying out repairs, the fuel system must be checked visually for leaks. This should be done after the engine has been run, but with the engine switched **OFF**. Failure to follow this instruction may result in personal injury.

⚠ If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

⚠ The fuel pipes between the injectors and the rail must be discarded after each use, and new pipes installed. Failure to follow this instruction may result in damage to the vehicle.

⚠ It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that the workshop area in which the vehicle is being worked on is as clean and dust-free as possible. Areas in which work on clutches, brakes or where welding or machining are carried out are not suitable in view of the risk of contamination to the fuel system. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that any protective clothing worn is clean and made from lint-free non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that any protective gloves worn are new and are of the non-powdered latex type. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that clean, non-plated tools are used. Clean tools using a new brush that will not lose it's bristles and fresh cleaning fluid prior to starting work on the vehicle. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a steel-topped work bench and cover it with clean, lint-free, non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

• NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to 3 decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Fuel level ● Contaminated fuel ● Fuel supply line(s) ● Fuel return line(s) ● High-pressure fuel supply line(s) ● Fuel tank filler pipe ● Fuel leak(s) ● Fuel tank ● Fuel filler cap ● Fuel filter ● Push connect fittings ● Fuel rail ● Fuel injection pump ● Exhaust gas recirculation (EGR) system	● Glow plug indicator ● Inertia fuel shutoff (IFS) switch ● Fuel pump module ● Sensor(s) ● Engine control module (ECM) ● Fuel volume control valve (FVCV) ● Fuel pressure control valve (FPCV) ● Fuel rail pressure (FRP) sensor ● Fuel temperature sensor ● Fuel injector(s) ● EGR system

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - ○ Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Engine cranks, but does not start	● IFS switch ● Low/Contaminated fuel ● Air ingress ● Low pressure fuel system fault ● Fuel pump module fault ● Blocked fuel filter ● FVCV blocked/contaminated ● FPCV blocked/contaminated ● Fuel injection pump failure ● Crankshaft position (CKP) sensor ● ECM fault	Check that the inertia switch has not tripped. Check the fuel level/condition. Check the low pressure fuel system for leaks/damage. Check the fuel pump module operation. Check the fuel filter, FVCV and FPCV for blockages or contamination. Check the fuel injection pump. For CKP sensor circuit tests, refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

Power latch

There are references to "power latch" within the DTC index. This is where the module must be reset by means of a complete power down and power up.

DTC	Condition	Possible causes	Action
P000100	Fuel Volume Regulator Control Circuit / Open	● Fuel volume control valve (VCV) circuit	• NOTE: An open circuit will prevent the engine from running.

DTC	Condition	Possible causes	Action
		high resistance - VCV circuit open circuit - VCV failure	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000200	Fuel Volume Regulator Control Circuit Range/Performance	- Fuel volume control valve (VCV) circuit high resistance - VCV circuit short circuit to ground - VCV circuit short circuit to power - VCV failure	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000300	Fuel Volume Regulator Control Low	- Fuel volume control valve (VCV) circuit high resistance - VCV circuit short circuit to ground - VCV failure - ECM failure	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000400	Fuel Volume Regulator Control Circuit High	- Fuel volume control valve (VCV) circuit short circuit to power - VCV failure - ECM failure	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P008700	Fuel rail/system pressure too low	- Fuel rail pressure (FRP) sensor disconnected - FRP sensor to ECM sensing circuit short circuit to ground - FRP sensor supply circuit high resistance - FRP sensor failure - Fuel line leak - Restricted fuel line - Fuel pump module circuit high resistance - Fuel pump module circuit short circuit to ground - Fuel pump module failure - Volume control valve fault - Pressure control valve fault	Refer to the electrical guides and check the FRP sensor circuits. For FRP sensor tests, refer to the relevant workshop manual section. Check the low pressure fuel lines for damage or restrictions. Check the fuel pressure. Check the low pressure fuel pump module circuits and operation. Check for fuel rail and high pressure fuel line leaks. Check for VCV and PCV DTCs and rectify as necessary.
P008800	Fuel rail/system pressure too high	- Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense): short circuit to each other - FRP sensor to ECM sense circuit short circuit to power - FRP sensor failure - Fuel pressure control valve (FPCV) fault - Fuel pump module circuit short circuit to power - Fuel pump module	Check the FRP sensor circuits. Refer to the electrical guides. For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.

DTC	Condition	Possible causes	Action
		failure	
P009000	Fuel Pressure Regulator 1 Control Circuit/Open	- Fuel pressure control valve (PCV) circuit high resistance - FPCV circuit short circuit to ground - PCV failure	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009100	Fuel Pressure Regulator 1 Control Circuit Low	- Fuel pressure control valve (PCV) circuit high resistance - PCV circuit short circuit to ground - PCV failure	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009200	Fuel Pressure Regulator 1 Control Circuit High	- Fuel pressure control valve (PCV) circuit short circuit to power - PCV failure	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P018100	Fuel Temperature Sensor A Circuit Range/Performance	- Fuel temperature sensor circuit high resistance - Fuel temperature sensor circuit short circuit to ground - Fuel temperature sensor circuit short circuit to power - Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018200	Fuel Temperature Sensor A Circuit Low	- Fuel temperature sensor circuit high resistance - Fuel temperature sensor circuit short circuit to ground - Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018300	Fuel Temperature Sensor A Circuit High	- Fuel temperature sensor circuit short circuit to power - Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018400	Fuel Temperature Sensor A Circuit Intermittent	- Fuel temperature sensor circuit high resistance - Fuel temperature sensor circuit short circuit to ground - Fuel temperature sensor circuit short circuit to power - Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.

DTC	Condition	Possible causes	Action
P019100	Fuel Rail Pressure Sensor A Circuit Range/Performance	● Air in fuel system, unable to maintain correct fuel pressure at start up.	• NOTE: If DTC P229000 is also logged, deal with that code first. Check the fuel level and the condition and correct connection of the low-pressure fuel circuit lines (incorrect connection of the lines to and from the fuel filter can cause serious fuel pressure fluctuations). Check fuel system including all lines and components for leaks/air ingress. Perform fuel system bleed procedure. Clear the DTCs and test for normal operation.
P019200	Fuel Rail Pressure Sensor A Circuit Low	● Fuel rail pressure (FRP) sensor circuit high resistance ● FRP sensor circuit short circuit to ground ● FRP sensor failure	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is 0 MPa (0 lbs/in²), install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019300	Fuel Rail Pressure Sensor A Circuit High	● Fuel rail pressure (FRP) sensor circuit short circuit to power ● FRP sensor failure	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is greater than 180 MPa (26,106 lbs/in²), install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019400	Fuel Rail Pressure Sensor A Circuit Intermittent/Erratic	● Fuel rail pressure (FRP) sensor circuit high resistance ● FRP sensor circuit short circuit to ground ● FRP sensor circuit short circuit to power ● FRP sensor failure	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Increase the engine speed to 2,000 rpm and recheck the fuel pressure. If the value has changed by more than 40 MPa (5,801 lbs/in²) per 10 ms, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P020100	Cylinder 1 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020200	Cylinder 2 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020300	Cylinder 3 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020400	Cylinder 4 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or

DTC	Condition	Possible causes	Action
		• Fuel injector failure	the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020500	Cylinder 5 Injector Circuit / Open	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020600	Cylinder 6 Injector Circuit / Open	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020A00	Cylinder 1 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020B00	Cylinder 2 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020C00	Cylinder 3 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020D00	Cylinder 4 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Condition	Possible causes	Action
P020E00	Cylinder 5 Injection Timing	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020F00	Cylinder 6 Injection Timing	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P029A00	Cylinder 1- Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P029B00	Cylinder 1- Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P029E00	Cylinder 2- Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all

DTC	Condition	Possible causes	Action
		low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	within range, install a new injector.
P029F00	Cylinder 2 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A200	Cylinder 3 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A300	Cylinder 3 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.

DTC	Condition	Possible causes	Action
P02A600	Cylinder 4 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A700	Cylinder 4 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AA00	Cylinder 5 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AB00	Cylinder 5 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.

DTC	Condition	Possible causes	Action
		- Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	
P02AE00	Cylinder 6 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AF00	Cylinder 6 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P062D00	Fuel Injector Driver Circuit Performance Bank 1	● Injector(s) disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure ● ECM failure	Refer to the electrical guides and check the injector circuits. Rectify as necessary. Clear the DTCs and test for normal operation. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P062D01	Fuel Injector Driver Circuit Performance Bank 1	● Injector(s) short circuit ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure ● ECM failure	If non start condition check for shorts on injector circuits. If rough running check for intermitent open circuits or high resistance on injector circuits. If no wiring faults are found, using approved diagnostic equipment perform injector spill tests. Follow actions recommended based on results from spill tests.

DTC	Condition	Possible causes	Action
P062E00	Fuel Injector Driver Circuit Performance Bank 2	● Injector(s) disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure ● ECM failure	Refer to the electrical guides and check the injector circuits. Rectify as necessary. Clear the DTCs and test for normal operation. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P062E01	Fuel Injector Driver Circuit Performance Bank 2	● Injector(s) short circuit ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure ● ECM failure	If non start condition check for shorts on injector circuits. If rough running check for intermitent open circuits or high resistance on injector circuits. If no wiring faults are found, using approved diagnostic equipment perform injector spill tests. Follow actions recommended based on results from spill tests.
P120000	Injector Range/Performance	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector leaking ● Fuel injector failure ● ECM failure	Refer to the electrical guides and check the injector circuits. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P155100	Cylinder 1 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155200	Cylinder 2 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155300	Cylinder 3 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155400	Cylinder 4 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155400	Cylinder 5 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155600	Cylinder 6 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground,	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.

DTC	Condition	Possible causes	Action
		short circuit to power - Injector failure	
P156300	Injection Pump Control Module Requesting Engine Stop	- Internal control module monitoring performance	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P226900	Water in Fuel Condition	- Water in fuel condition - Water in fuel sensor circuit short circuit to ground - Water in fuel sensor fault	Drain the water from the fuel filter. Clear the DTC and retest. If the DTC resets, check the sensor circuit. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor.
P228800	Injector Control Pressure Too High	- Fuel pressure control valve (FPCV) minimum limit reached - Fuel injector control pressure too high - FPCV circuit fault - FPCV failure - Fuel pump module circuit short circuit to power - Fuel pump module failure - Fuel injection pump failure	Check the fuel pressure, refer to the relevant section of the workshop manual. Check the fuel pump module circuits and the FPCV circuits. Refer to the electrical guides. For FPCV and fuel injection pump, refer to the relevant workshop manual section.
P229000	Injector Control Pressure Too Low	- Fuel pressure control valve (FPCV) maximum limit reached - Fuel injector control pressure too low - Fuel line leak - Fuel filter/system restriction - FPCV circuit fault - FPCV failure - Fuel pump module circuit short circuit to ground - Fuel pump module failure - Fuel injection pump failure	Check the fuel pressure, refer to the relevant section of the workshop manual. Check the fuel pump module circuits and the FPCV circuits. Refer to the electrical guides. For FPCV and fuel injection pump, refer to the relevant workshop manual section.
P229200	Injector Control Pressure Erratic	- Fuel injector control pressure erratic - FPCV circuit fault - FPCV failure - Fuel pump module circuit high resistance, short circuit to ground, short circuit to power - Fuel pump module failure - Fuel injection pump failure	Check the fuel pressure, refer to the relevant section of the workshop manual. Check the fuel pump module circuits and the FPCV circuits. Refer to the electrical guides. For FPCV and fuel injection pump, refer to the relevant workshop manual section.

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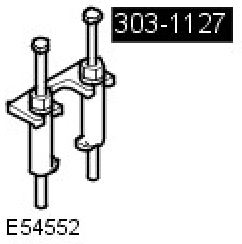
Fuel Charging and Controls - TDV6 2.7L Diesel - Fuel Injector

Removal and Installation

Special Tool(s)	
	Fuel Injector remover 303-1127

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

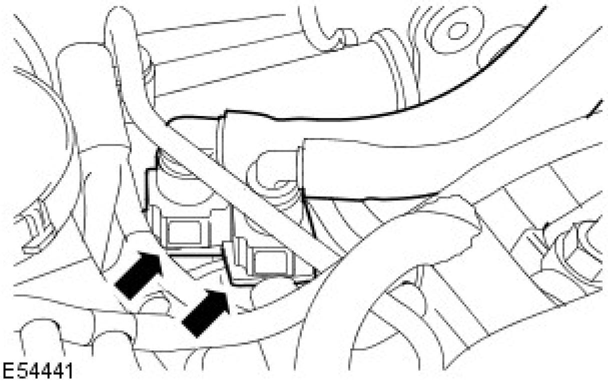
⚠ Do not disconnect the fuel injector electrical connectors with the engine running. Failure to follow this instruction may result in serious damage to the engine.

⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

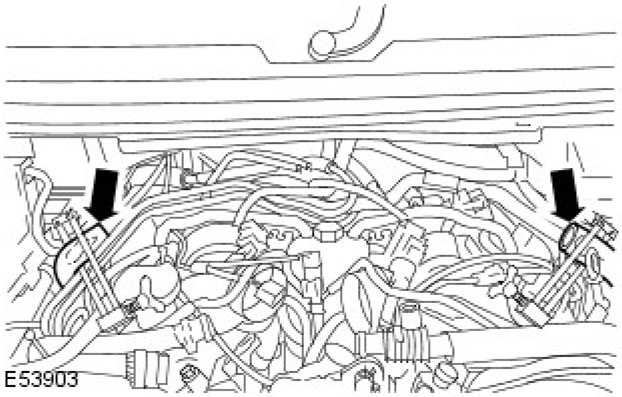
⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).


E54441

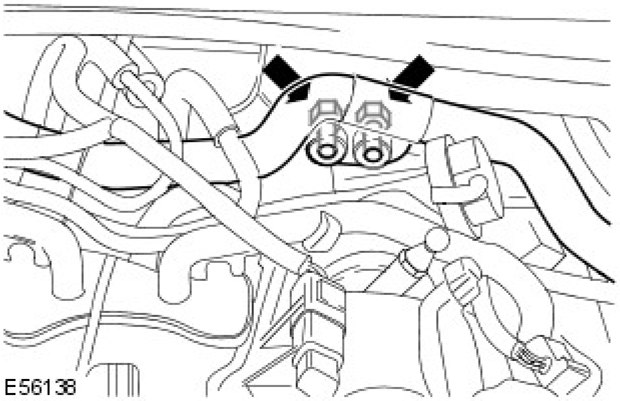
3. Disconnect the low-pressure fuel lines.

- Install blanking caps to the exposed ports.


E53903

4. Disconnect both exhaust gas recirculation (EGR) coolant cross-over pipe hoses.

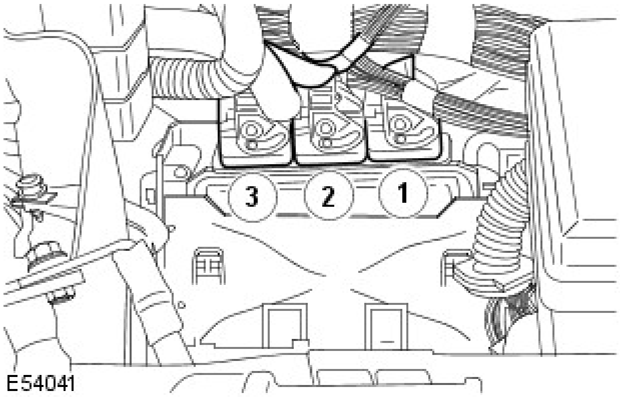
- Clamp the EGR coolant hoses to minimize coolant loss.


E56138

5. Remove the EGR coolant cross-over pipe.

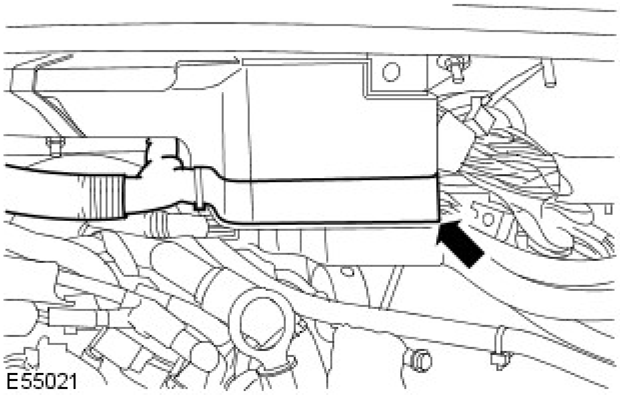
- Remove the two retaining bolts.

6. Remove the battery.
For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).

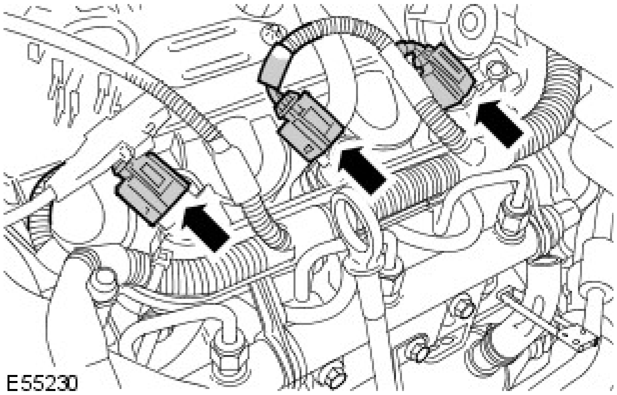


7. NOTE: Right hand drive shown, for Left hand drive reverse the sequence.

Disconnect the three engine harness electrical connectors in the order shown.

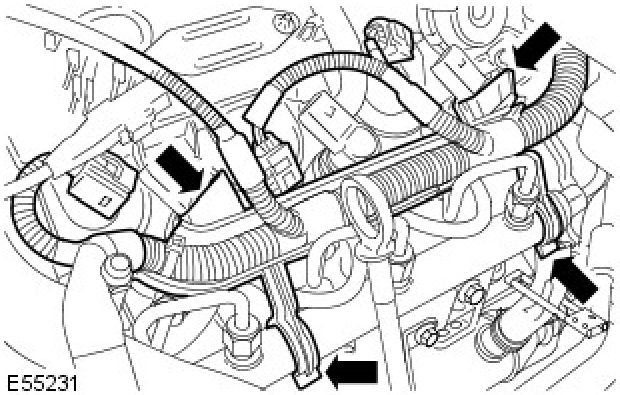


8. Release the engine wiring harness from the bulkhead.



9. Remove the injector sound proofing.

10. Disconnect the fuel injector electrical connectors.



11. Release the engine wiring harness.

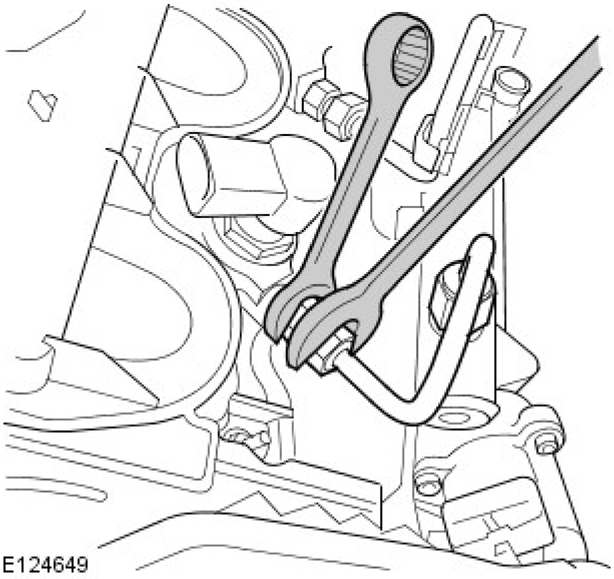
- Release the 4 clips.

12. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel pump and fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply line, the fuel injector and the fuel injection supply manifold.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).

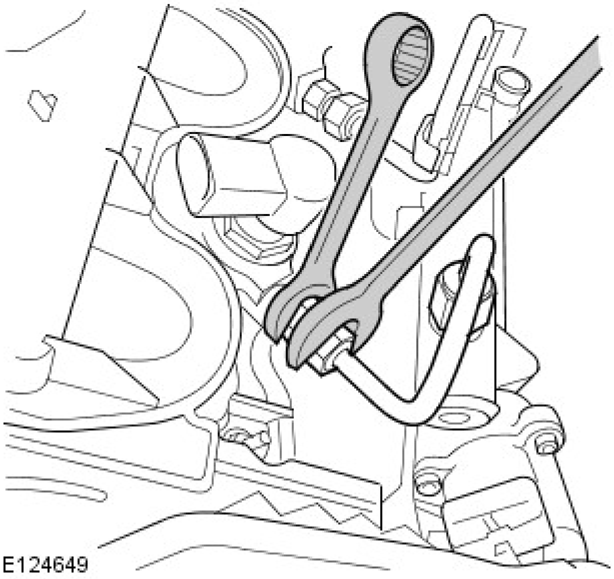


13. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

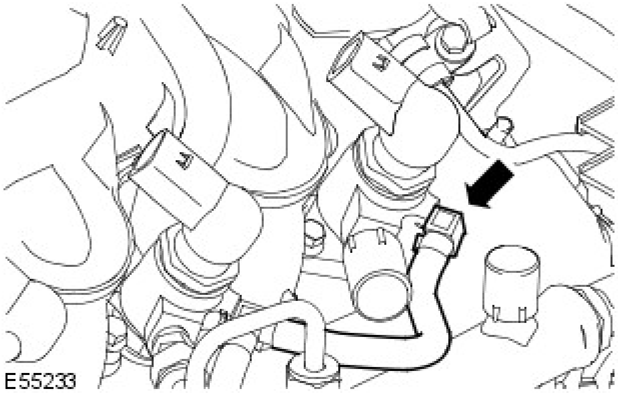
Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.



14. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

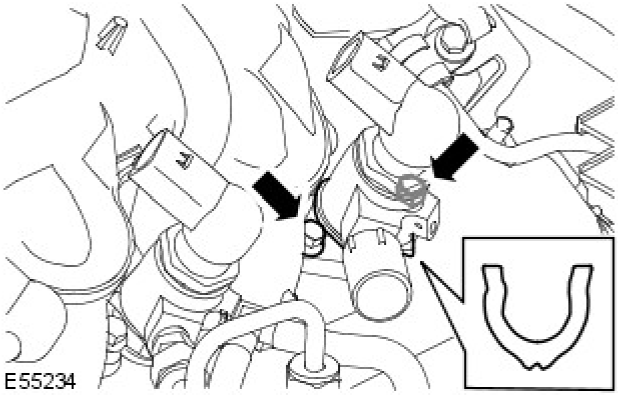
- NOTE: Right-hand shown, left-hand similar.

Remove and discard the high-pressure fuel supply line.



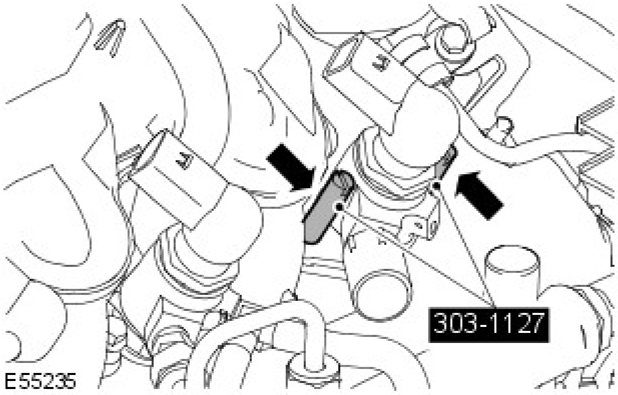
15. Disconnect the fuel return line from the fuel injector.

- Remove and discard the fuel return line retaining clip.

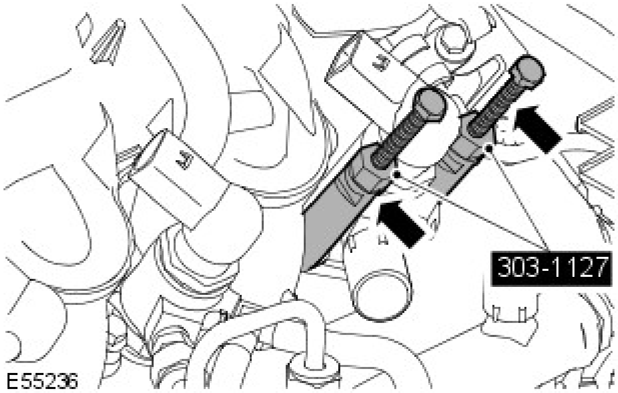


16. Remove the two fuel injector retaining bolts.

- Remove the fuel injector retaining clamp spacer.

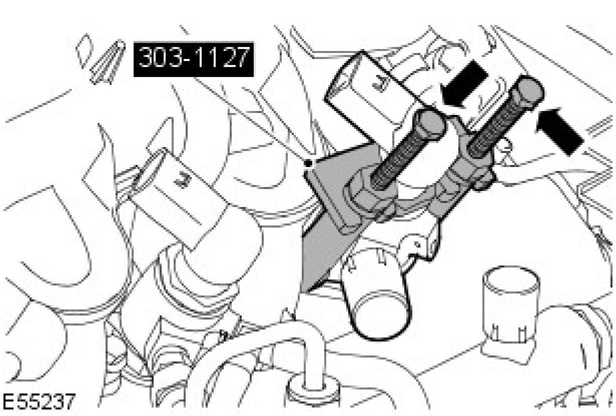


17. Install the special tool studs.



18. ⚠CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

Install the special tool remover legs to the studs.

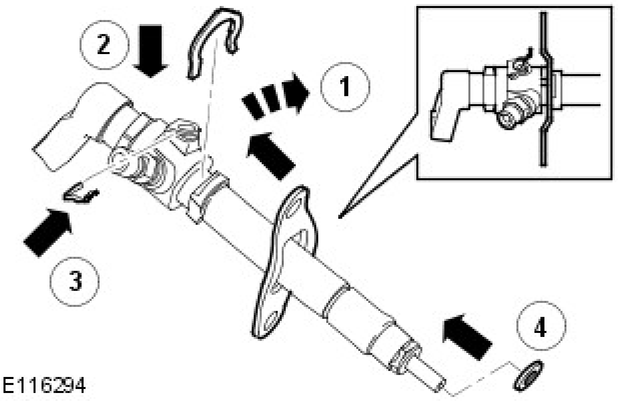


19. ⚠ CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

Remove the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.
- Remove and discard the fuel injector retaining clamp.
- Remove and discard the sealing washer.

Installation



1. CAUTIONS:

⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

⚠ Do not use tools to install the new fuel return line clip. Failure to follow this instruction will result in damage to the retaining clip.

Install a new fuel injector retaining clamp.

1. Install a new fuel injector retaining clamp.
2. Install the fuel injector retaining clamp spacer.
3. Install a new fuel return line retaining clip.
4. Install a new sealing washer.

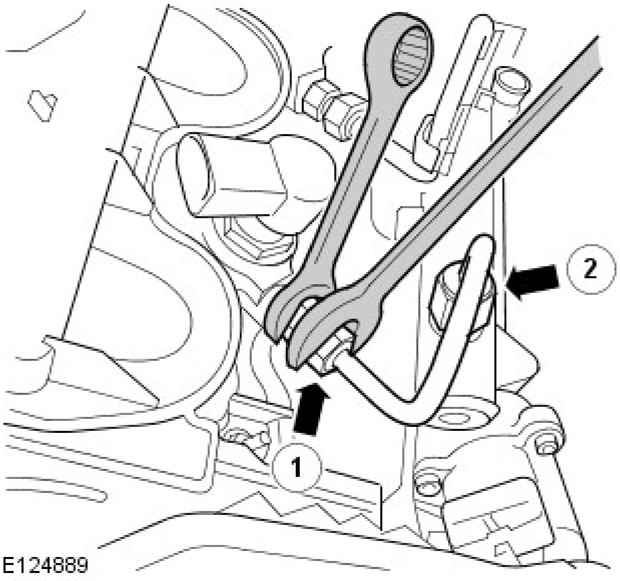
2. Install the fuel injector.

- Install the two bolts and tighten to 10 Nm (7 lb.ft).

3. ⚠ CAUTION: Make sure the fuel return line retaining clip is correctly installed to the fuel injector before installing the return line.

Connect the fuel return line to the fuel injector.

- Visually inspect the fuel return line O-ring seals for damage.
- Apply a light coating of petroleum jelly to the fuel return line O-ring seals.



4. CAUTIONS:

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Maintain pressure on the high-pressure fuel supply lines to keep the olives in contact with the fuel rail and the fuel injector cones while installing unions.

• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel supply lines.

- Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.
- Tighten the high-pressure fuel supply line in the shown sequence.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 35 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 35 Nm.

5. Attach the engine wiring harness.

6. Connect the fuel injector electrical connectors.

7. Install the injector sound proofing.

8. Attach the engine wiring harness to the bulkhead.

9. Connect the three engine harness electrical connectors.

10. Install the battery.
For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).

11. Install the EGR coolant cross-over pipe.

- Install the two retaining bolts.
- Tighten the bolts to 13 Nm (10 lb.ft).

12. Connect both EGR coolant cross-over pipe hoses.

- Remove the EGR coolant hose clamps.

13. Connect the low-pressure fuel lines.

- Remove the blanking caps from the ports.

14. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

15. Check and top-up the coolant.

16. Bleed the fuel system.

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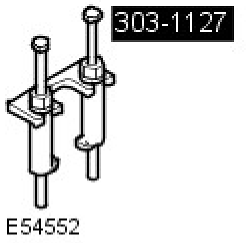
Fuel Charging and Controls - TDV6 2.7L Diesel - Fuel Injectors

Removal and Installation

Special Tool(s)	
	Fuel Injector remover 303-1127

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

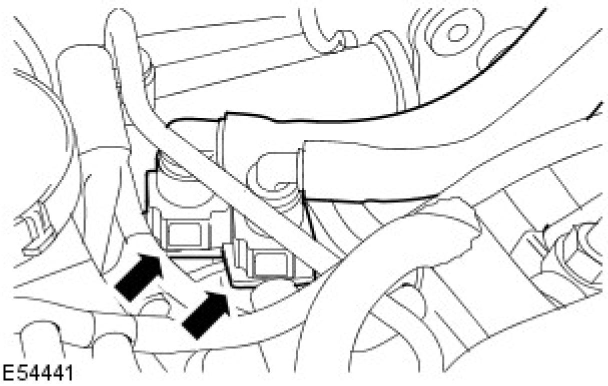
⚠ Do not disconnect the fuel injector electrical connectors with the engine running. Failure to follow this instruction may result in serious damage to the engine.

⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

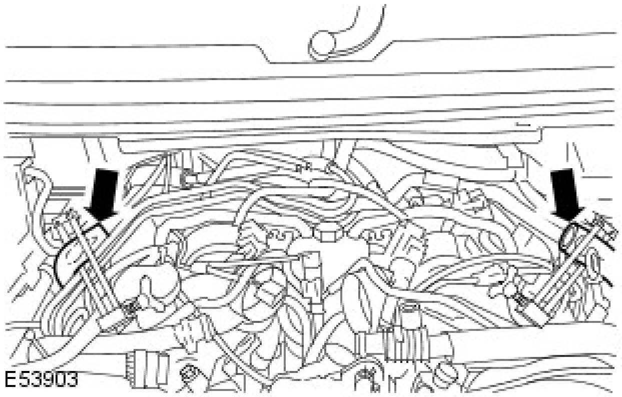
⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



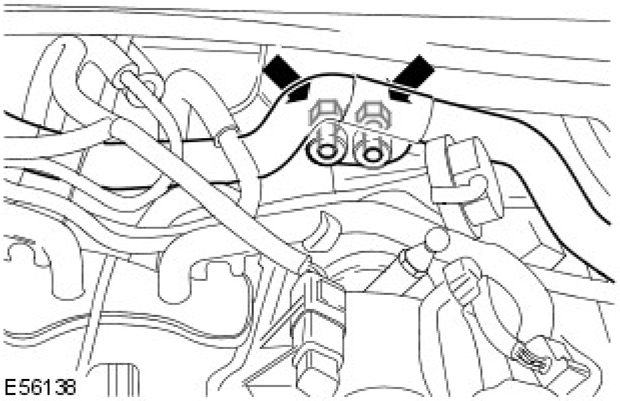
3. Disconnect the low-pressure fuel lines.

- Install blanking caps to the exposed ports.



4. Disconnect both exhaust gas recirculation (EGR) coolant cross-over pipe hoses.

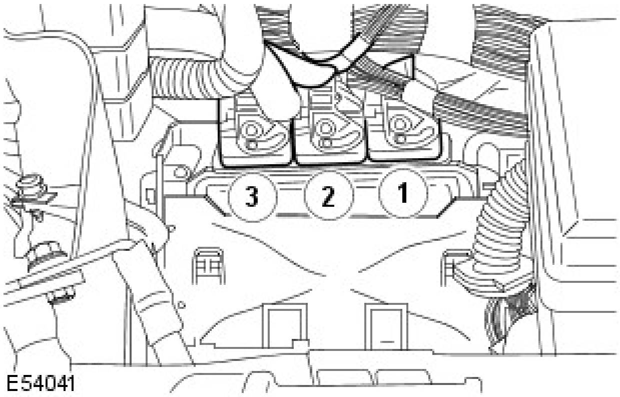
- Clamp the EGR coolant hoses to minimize coolant loss.



5. Remove the EGR coolant cross-over pipe.

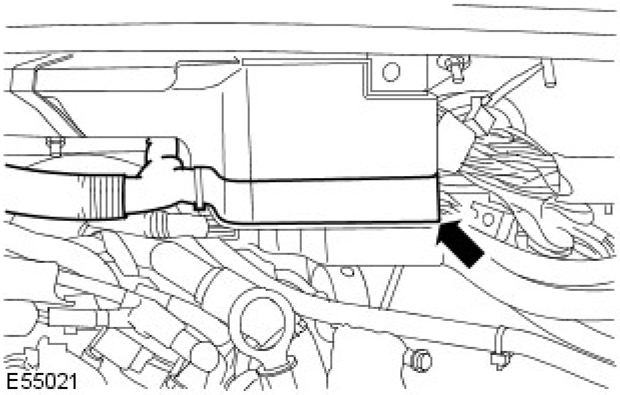
- Remove the two retaining bolts.

6. Remove the battery.
For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).

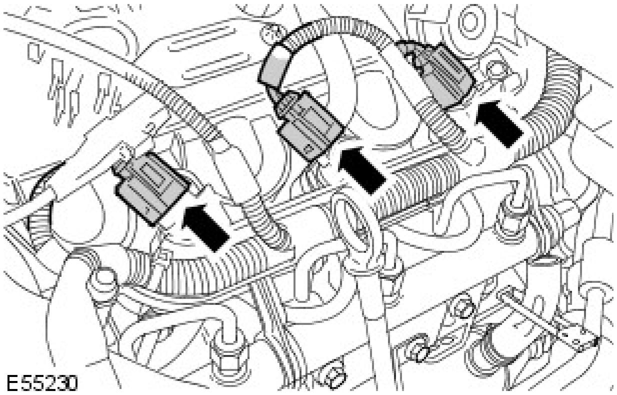


7. NOTE: Right hand drive shown, for Left hand drive reverse the sequence.

Disconnect the three engine harness electrical connectors in the order shown.

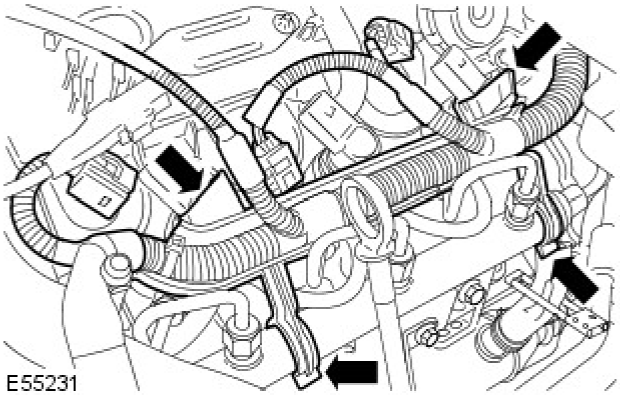


8. Release the engine wiring harness from the bulkhead.



9. Remove the NVH pads from each cylinder bank.

10. Disconnect the fuel injector electrical connectors.



11. Release the engine wiring harness.

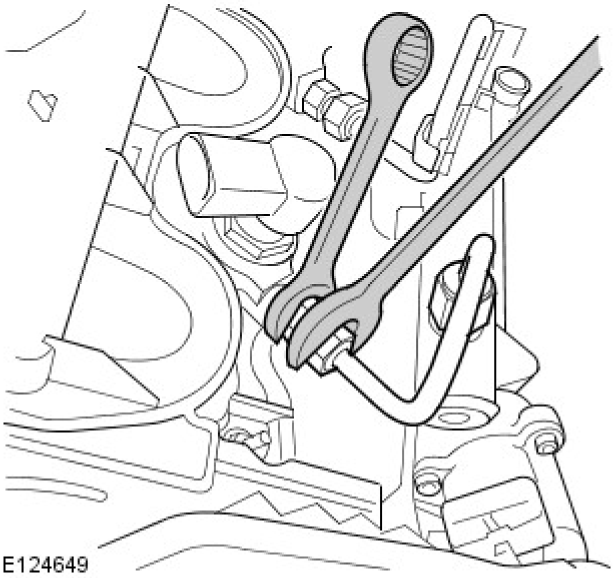
- Release the 4 clips.

12. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel pump and fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply line, the fuel injector and the fuel injection supply manifold.

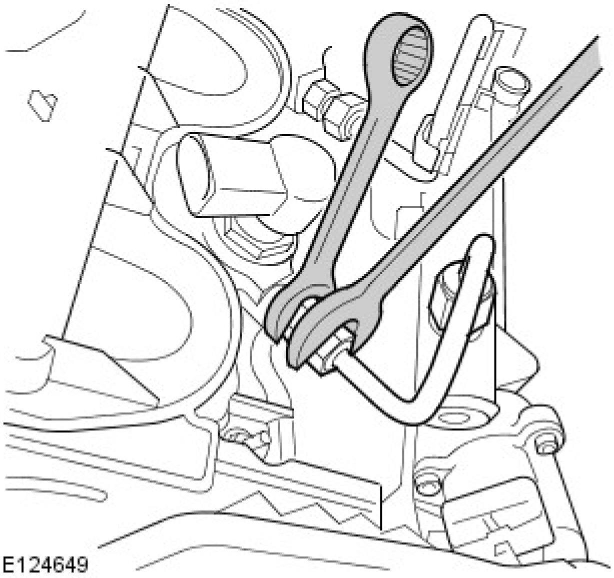


13. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.



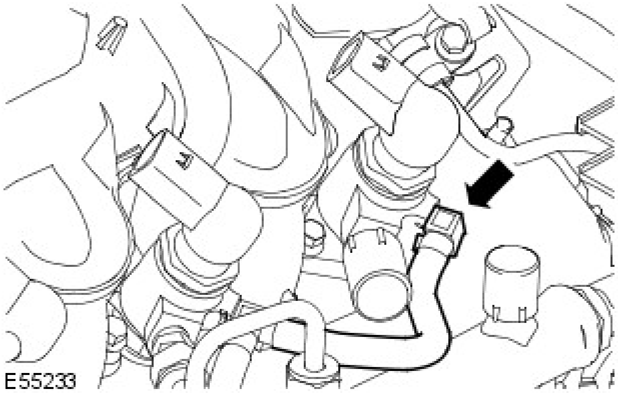
14. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

- NOTE: Right-hand shown, left-hand similar.

Remove and discard the high-pressure fuel supply line.

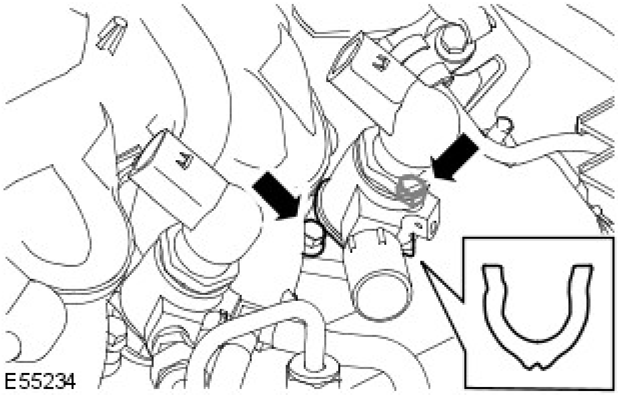
15. Disconnect the fuel return line from the fuel injector.

- Remove and discard the fuel return line retaining clip.

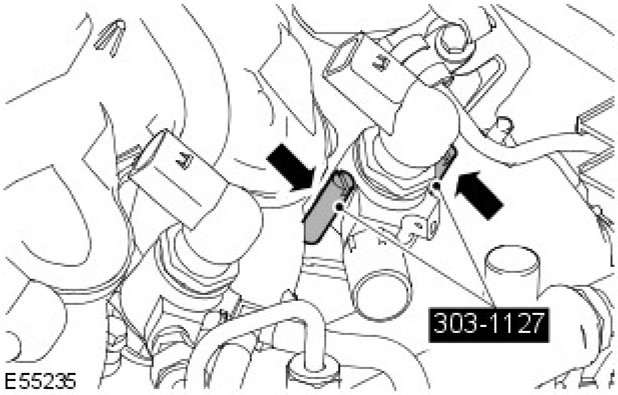


16. Remove the two fuel injector retaining bolts.

- Remove the fuel injector retaining clamp spacer.

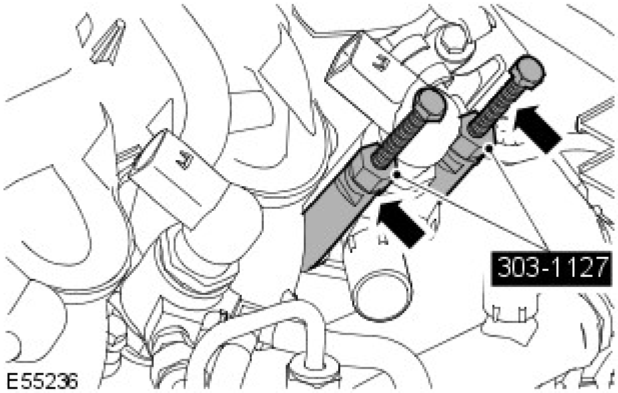


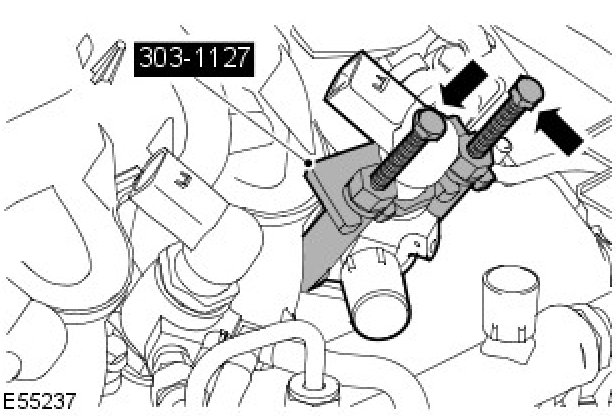
17. Install the special tool studs.



18. ⚠ CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

Install the special tool remover legs to the studs.



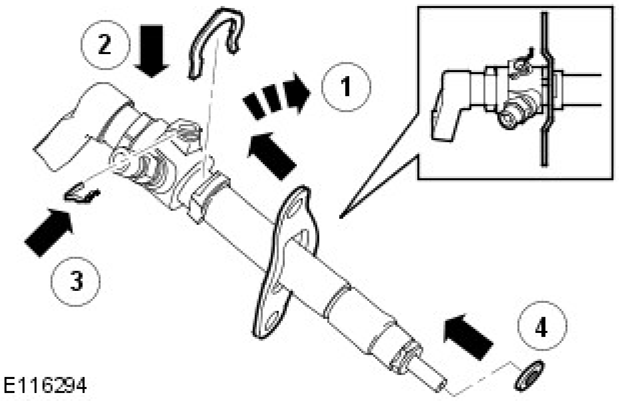


19. ⚠ CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

Remove the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.
- Remove and discard the fuel injector retaining clamp.
- Remove and discard the sealing washer.

Installation



1. CAUTIONS:

⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

⚠ Do not use tools to install the new fuel return line clip. Failure to follow this instruction will result in damage to the retaining clip.

Install a new fuel injector retaining clamp.

1. Install a new fuel injector retaining clamp.
2. Install the fuel injector retaining clamp spacer.
3. Install a new fuel return line retaining clip.
4. Install a new sealing washer.

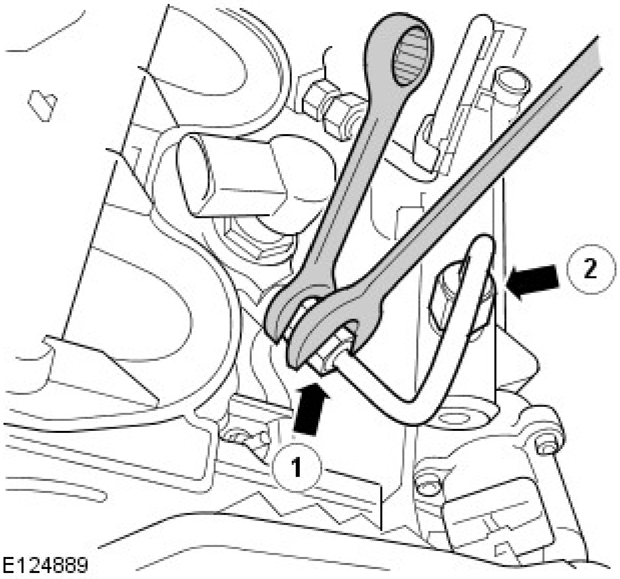
2. Install the fuel injector.

- Install the two bolts and tighten to 10 Nm (7 lb.ft).

3. ⚠ CAUTION: Make sure the fuel return line retaining clip is correctly installed to the fuel injector before installing the return line.

Connect the fuel return line to the fuel injector.

- Visually inspect the fuel return line O-ring seals for damage.
- Apply a light coating of petroleum jelly to the fuel return line O-ring seals.



4. CAUTIONS:

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Maintain pressure on the high-pressure fuel supply lines to keep the olives in contact with the fuel rail and the fuel injector cones while installing unions.

• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel supply lines.

- Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.
- Tighten the high-pressure fuel supply line in the shown sequence.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 35 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 35 Nm.

5. Attach the engine wiring harness.

6. Connect the fuel injector electrical connectors.

7. Install the NVH pads on the cylinder banks.

8. Attach the engine wiring harness to the bulkhead.

9. Connect the three engine harness electrical connectors.

10. Install the battery.
For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).

11. Install the EGR coolant cross-over pipe.

- Install the two retaining bolts.
- Tighten the bolts to 13 Nm (10 lb.ft).

12. Connect both EGR coolant cross-over pipe hoses.

- Remove the EGR coolant hose clamps.

13. Connect the low-pressure fuel lines.

- Remove the blanking caps from the ports.

14. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

15. Check and top-up the coolant.

16. Bleed the fuel system.

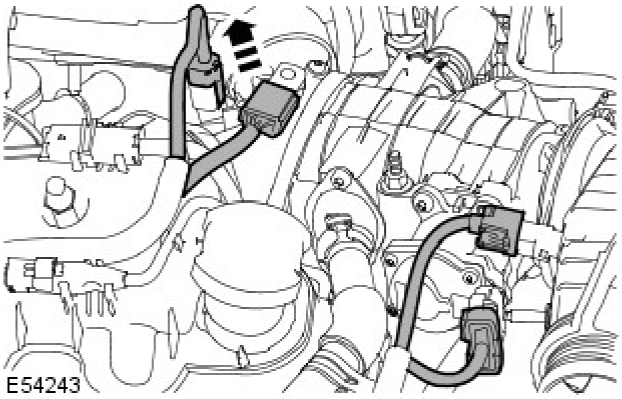
Published: 11-May-2011

Fuel Charging and Controls - TDV6 2.7L Diesel - Intake Air Shutoff Throttle

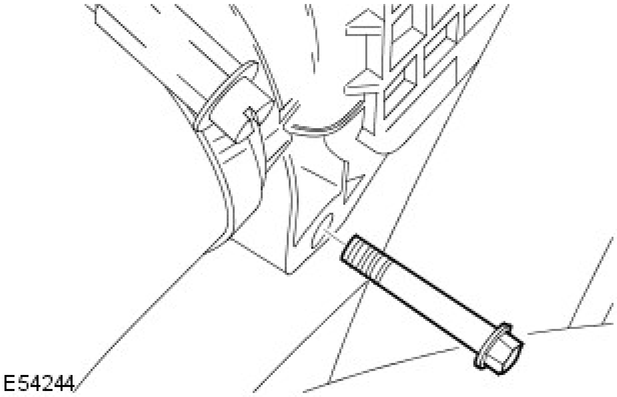
Removal and Installation

Removal

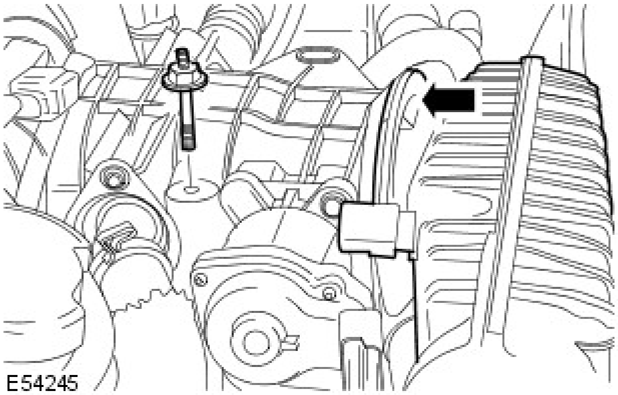
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. Disconnect the three electrical connectors.
   - Release the fuel return line valve.

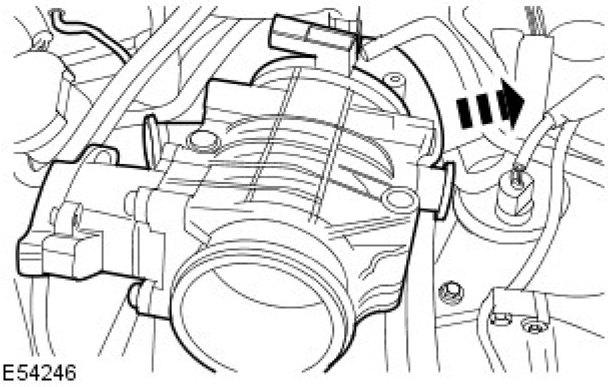


4. Remove the intake air shutoff throttle elbow retaining bolt.

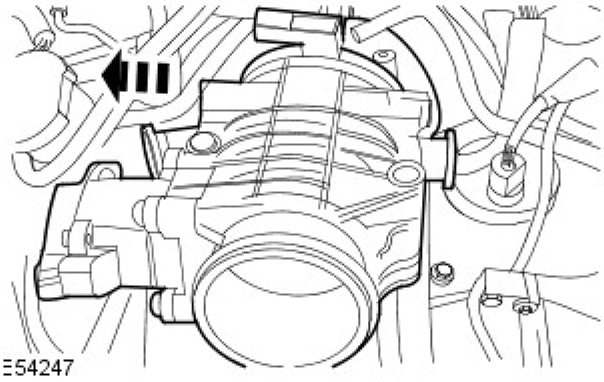


5. Release the intake air shutoff throttle elbow.
   - Remove the intake air shutoff throttle retaining stud.
6. Release the LH EGR valve outlet tube retaining clip.
7. Release the RH EGR valve outlet tube retaining clip.

8. Reposition the intake air shutoff throttle.

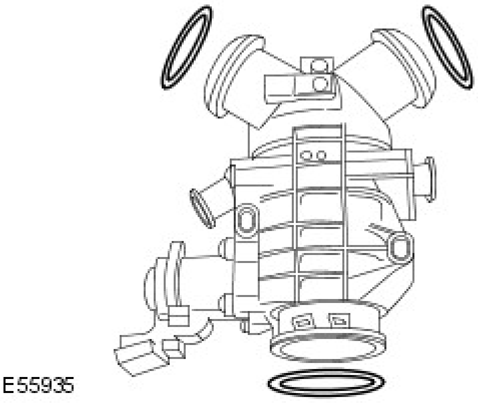

E54246

9. Remove the intake air shutoff throttle.


E54247

10. NOTE: Do not disassemble further if the component is removed for access only.

Remove and discard the O-ring seals.


E55935

Installation

1. ⚠CAUTION: The O-ring seals are to be reused unless damaged.

Install the intake air shutoff throttle.

2. Align the intake air shutoff throttle.

3. Secure the RH EGR valve outlet tube.

4. Secure the LH EGR valve outlet tube.

5. Secure the intake air shutoff throttle elbow.

- Tighten the intake air shutoff throttle retaining stud to 10 Nm (7 lb.ft).

6. Tighten the intake air shutoff throttle elbow retaining bolt to 10

Nm (7 lb.ft).

7. Connect the three electrical connectors.

   - Secure the fuel line return valve.

8. Install the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

9. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 19-Aug-2011

Fuel Charging and Controls - TDV6 2.7L Diesel - Fuel Diverter Rail

Removal and Installation

General Equipment

Pneumatic vacuum gun

Removal

- WARNINGS:

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

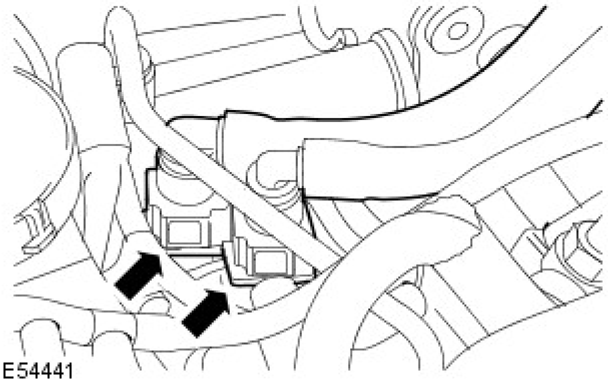
⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not remove the fuel rail pressure sensor from the fuel injection diverter rail.

- NOTE: If a new fuel rail pressure sensor is to be installed, a new fuel injection diverter rail and fuel rail pressure sensor must be installed as an assembly.

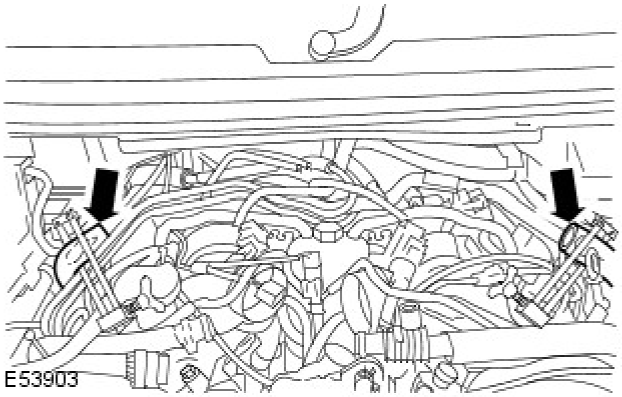
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



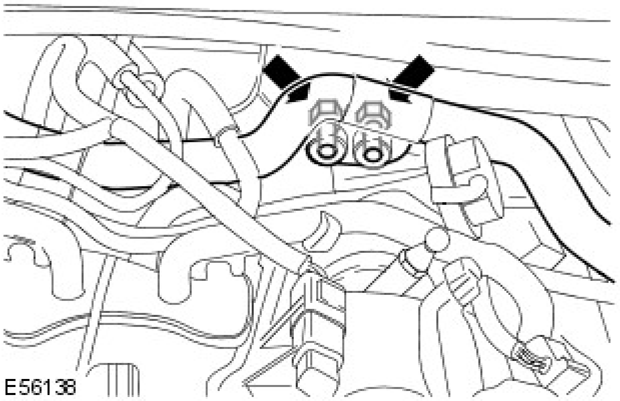
3. Disconnect the low-pressure fuel lines.

- Install blanking caps to the exposed ports.



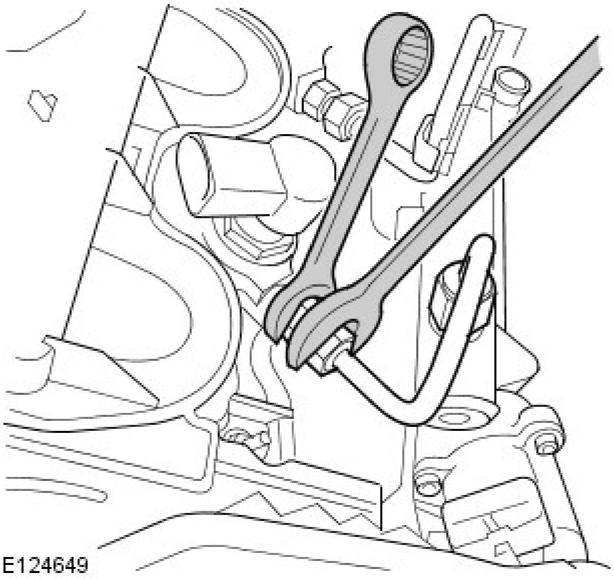
4. Disconnect both exhaust gas recirculation (EGR) coolant cross-over pipe hoses.

- Clamp the EGR coolant hoses to minimize coolant loss.



5. Remove the EGR coolant cross-over pipe.

- Remove the two retaining bolts.

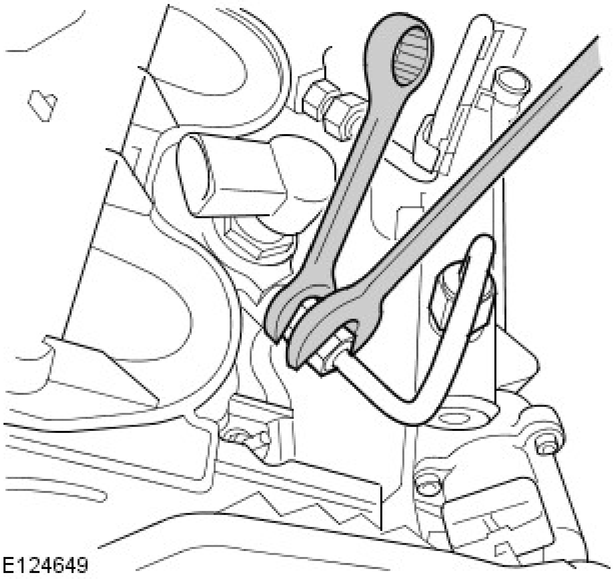


6. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

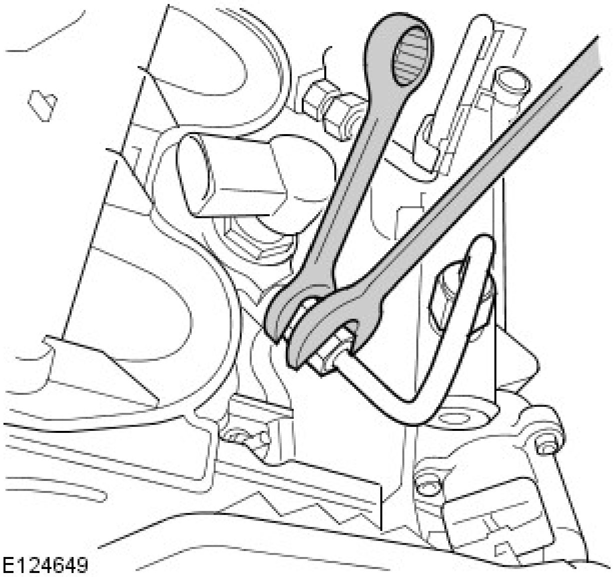
Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.



7. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

- NOTE: Right-hand shown, left-hand similar.

Remove and discard the high-pressure fuel supply line.



8. ⚠ CAUTION: Make sure that the high-pressure fuel supply line remains in contact with the fuel pump and fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

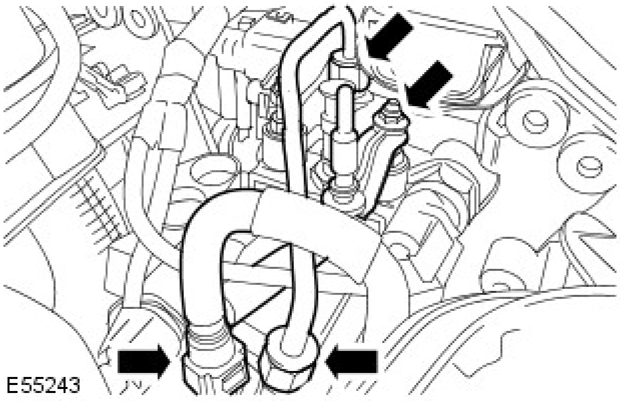
• NOTE: Crankcase vent oil separator shown removed for clarity.

Remove and discard the high-pressure fuel supply line.

- Install blanking caps to the exposed ports.

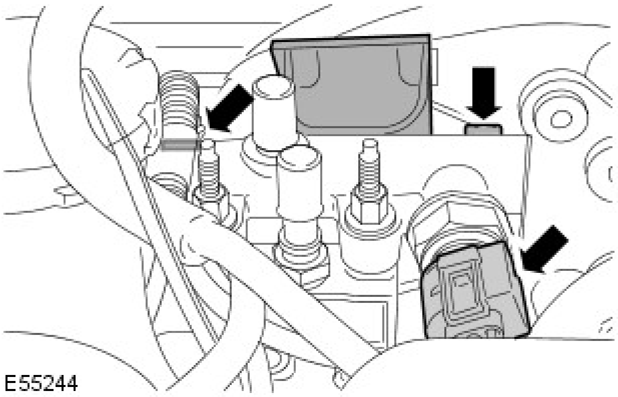
9. ⚠ CAUTION: Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply line, the fuel injectors and the fuel rail.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).



10. Release the low-pressure fuel line.

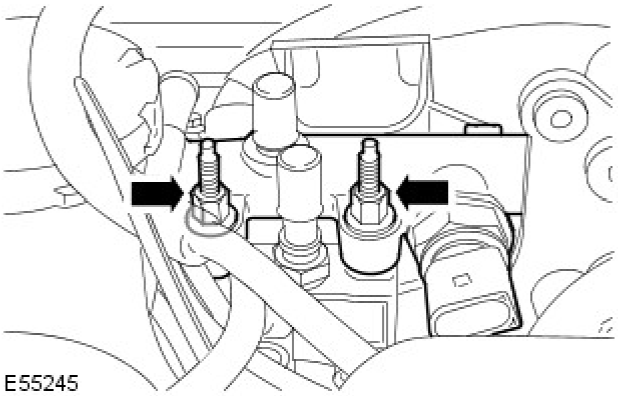
- Disconnect the low-pressure fuel line.
- Install blanking caps to the exposed ports.



E55244

11. Disconnect the fuel rail pressure (FRP) sensor electrical connector.

- Release the fuel charging wiring harness.



E55245

12. Remove the FRP and fuel injection diverter rail assembly.

- Remove the 2 studs.

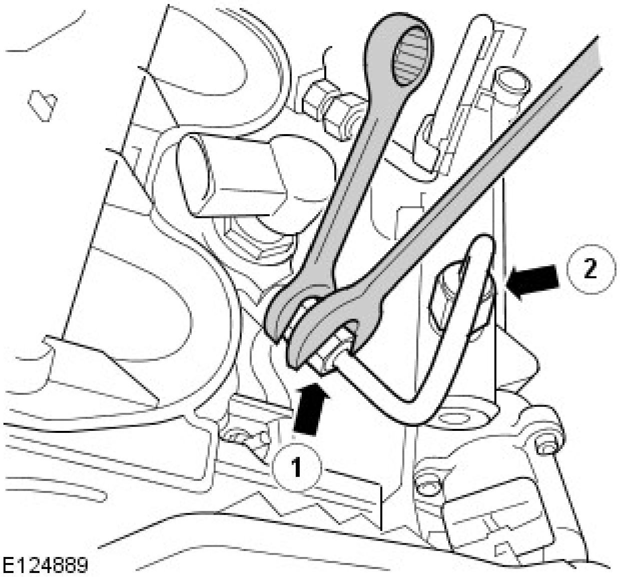
Installation

1. Install the FRP and fuel injection diverter rail assembly.

- Install the two retaining studs, but do not fully tighten at this stage.

2. Connect the FRP sensor electrical connector.

- Attach the fuel charging wiring harness.



E124889

3. CAUTIONS:

⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Install the new high-pressure fuel supply line.

- Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.
- Tighten the high-pressure fuel supply line in the shown sequence.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.

- Tighten the high-pressure fuel supply line union 1 to fuel injector to 35 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 35 Nm.

4. Attach the low-pressure fuel line.

- Remove the blanking caps from the ports.
- Connect the low-pressure fuel line.

5. Install the new high-pressure fuel supply lines.

- Remove the blanking caps from the ports.
- Loosely install the new high-pressure fuel supply lines.
- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 35 Nm (26 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel injection diverter rail to 35 Nm (26 lb.ft).

6. Secure the high-pressure fuel supply lines.

- Tighten the two retaining bolts to 10 Nm (7 lb.ft).

7. Install the EGR coolant cross-over pipe.

- Install the two EGR coolant cross-over pipe retaining bolts.
- Tighten to 13 Nm (10 lb.ft).

8. Connect both EGR coolant cross-over pipe hoses.

- Remove the EGR coolant hose clamps.

9. Connect the low-pressure fuel lines.

- Remove the blanking caps from the ports.

10. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

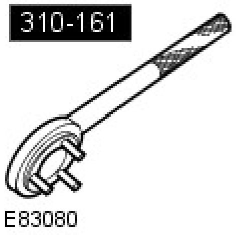
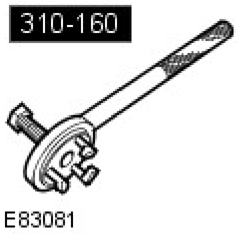
12. Bleed the fuel system.
For additional information, refer to: Low-Pressure Fuel System Bleeding - TDV6 2.7L Diesel (310-00 Fuel System - General Information, General Procedures).

13. Check and top-up the coolant.

Published: 17-Aug-2011

Fuel Charging and Controls - TDV6 2.7L Diesel - Fuel PumpVIN Range: 07 MODEL YEAR->CURRENT

Removal and Installation

Special Tool(s)	
	Holding tool 310-161
	Remover 310-160

Removal

- WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

- CAUTIONS:

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

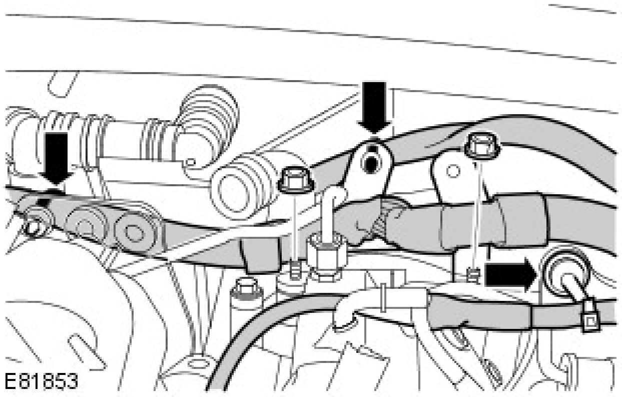
⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not disassemble or clean inside the fuel pump, even with an ultrasonic cleaner. Always install a new fuel pump when required.

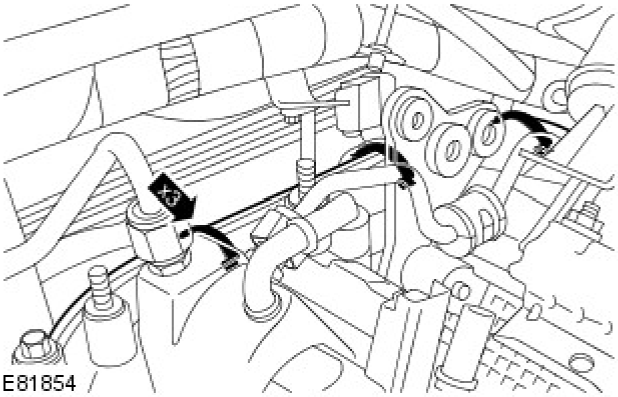
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the crankcase vent oil separator.

For additional information, refer to: Crankcase Vent Oil Separator (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).



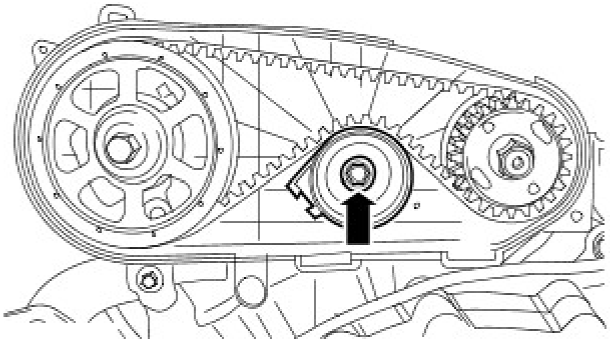
3. Release the fuel charging wiring harness.

- Release the 3 clips.
- Remove the 2 nuts.



4. Remove the fuel injection pump belt cover.

- Reposition the engine wiring harness to allow access to the fuel injection pump belt cover.
- Release the 3 clips.



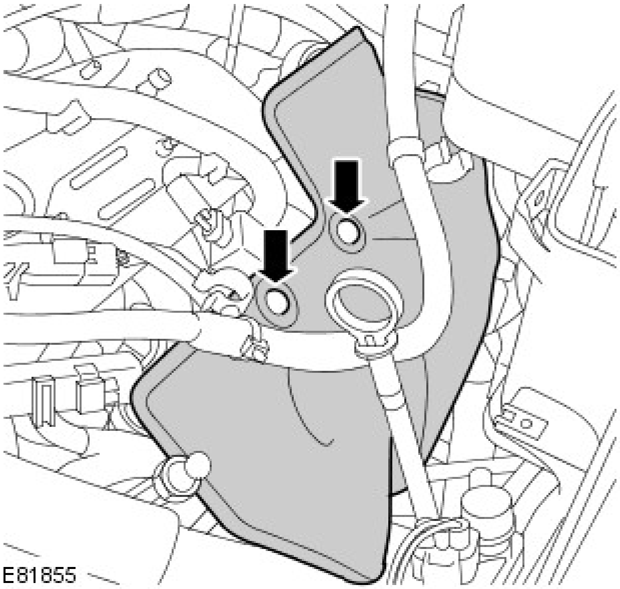
5. NOTE: The fuel injection pump belt is not timed to the engine.

Remove and discard the fuel injection pump belt tensioner.

- Remove and discard the fuel injection pump belt tensioner securing bolt.

6. NOTE: The fuel injection pump rotates in a counter-clockwise direction when viewed from the rear of the engine.

Remove and discard the fuel injection pump belt.



7. NOTE: Left-hand shown, right-hand similar.

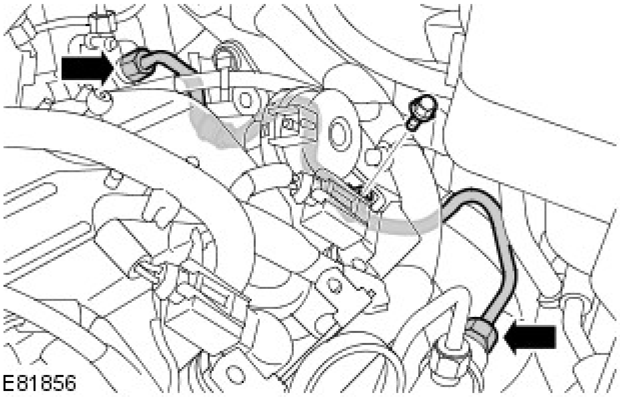
Remove the injector sound proofing.

- Remove the 4 clips.

- NOTE: Right hand (RH) high-pressure fuel supply line already removed when removing the crankcase vent oil separator.

8. Release the left hand (LH) high-pressure fuel supply line.

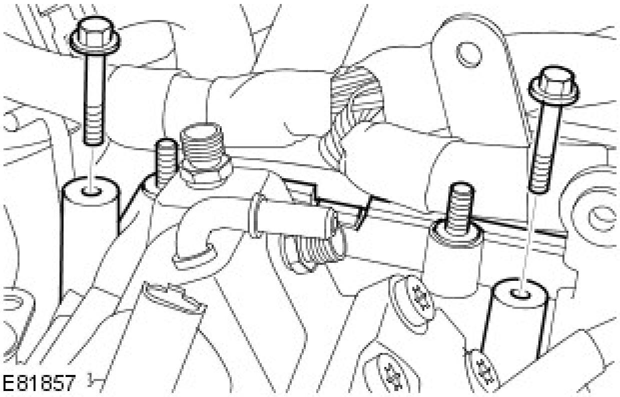
- Remove the bolt.



9. CAUTION: Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection pump until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

Remove and discard the LH high-pressure fuel supply lines.

- Install blanking caps to the exposed ports.

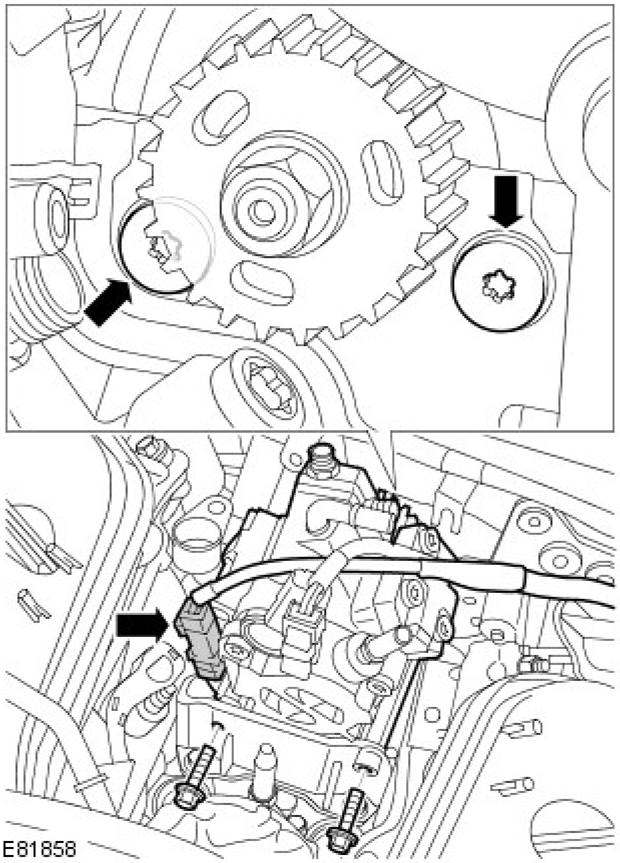


10. Remove the timing belt rear cover access panel.

- Remove the 2 bolts.

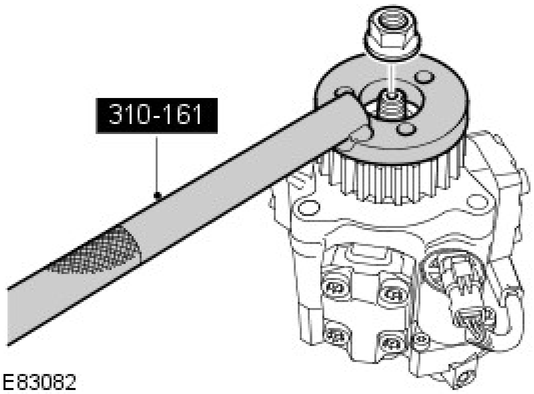
11. Remove the fuel injection pump.

- Remove and discard the 2 Torx bolts.
- Remove and discard the 2 bolts.
- Release the electrical connector.


E81858

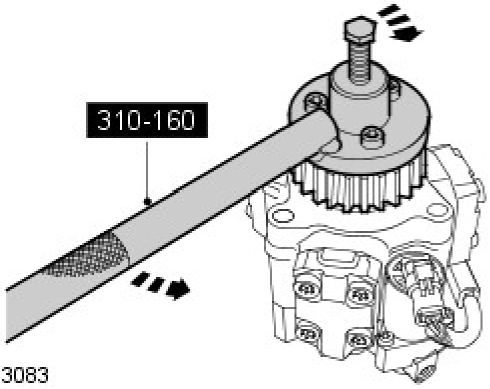
12. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove the fuel injection pump pulley retaining nut.



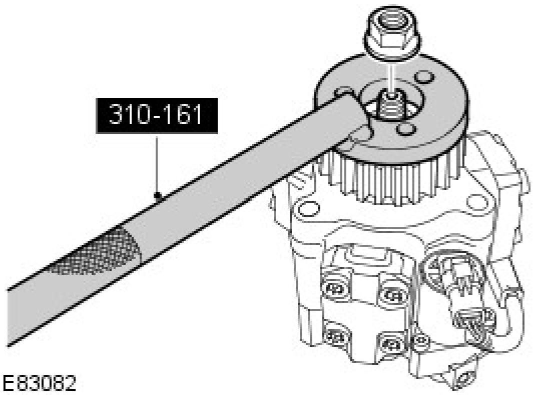
E83082

13. Using the special tool, remove the fuel injection pump pulley.



E83083

Installation



E83082

1. Using the special tool, install the fuel injection pump pulley.

- Clean the component mating faces.
- Tighten the nut to 50 Nm (37 lb.ft).

2. Install the fuel injection pump.

- Clean the component mating faces.
- Loosely install the new bolts.
- Stage 1: Tighten the Torx bolts to 23 Nm (17 lb.ft).
- Stage 2: Tighten the M8 bolts to 23 Nm (17 lb.ft).
- Connect the electrical connector.

3. Install the timing belt rear cover access panel.

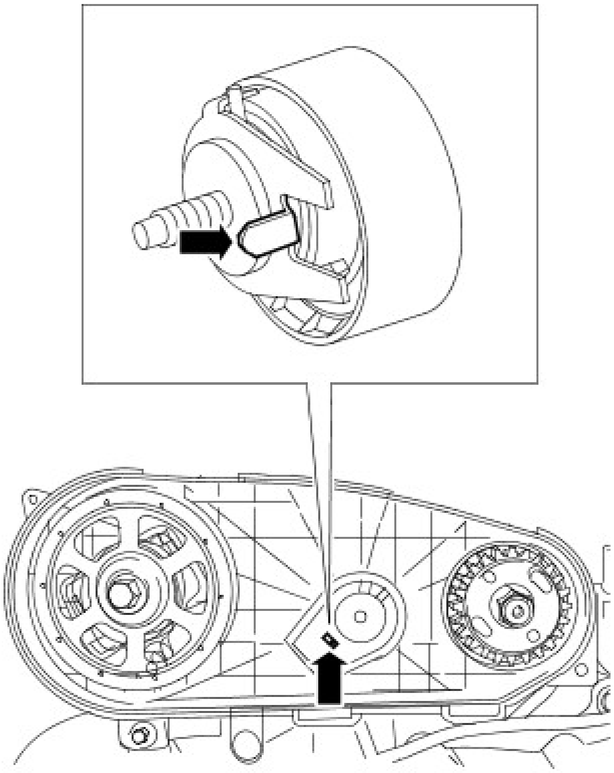
- Tighten the bolts to 10 Nm (7 lb.ft).

4. ⚠ CAUTION: Make sure that the fuel injection pump belt tensioner tang is correctly located to the fuel injection pump belt rear cover. Failure to follow this instruction may result in damage to the engine.

• NOTE: Do not remove the fuel injection pump belt tensioner locking pin at this stage.

Install a new fuel injection pump belt tensioner.

- Clean the components mating faces.
- Locate the tang on the new fuel injection pump belt tensioner into the fuel injection pump rear cover.
- Tighten the bolt to 25 Nm (18 lb.ft).



E81861

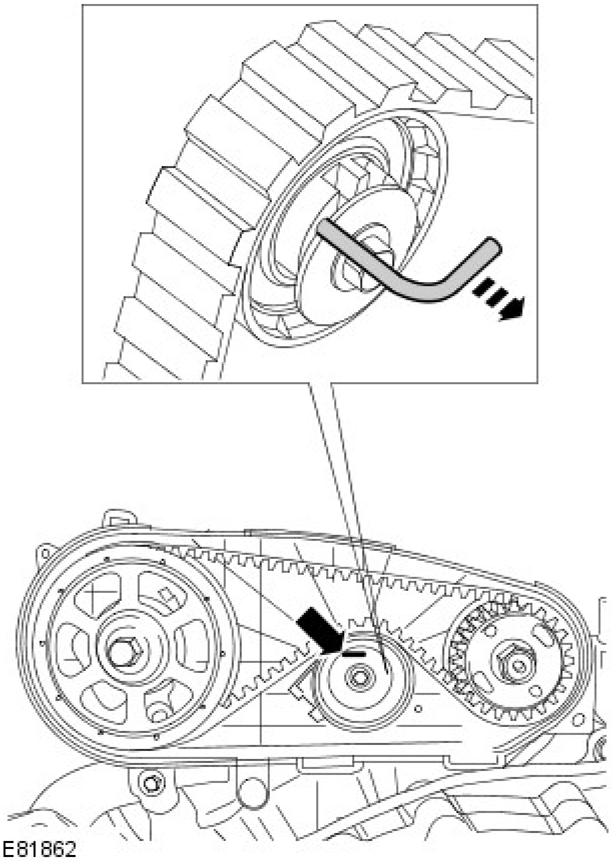
5. CAUTION: Do not install the new fuel injection pump belt to the pulleys with the fuel pump belt tensioner locking pin removed. Failure to follow this instruction may result in damage to the fuel pump belt.

• NOTE: The fuel injection pump rotates in a counter-clockwise direction when viewed from the rear of the engine.

Install the new fuel injection pump belt.

- Make sure the components are clean and dry.

6. Remove and discard the fuel injection pump belt tensioner locking pin.



E81862

7. Install the fuel injection pump belt cover.

- Secure with the 3 clips.
- Reposition the engine wiring harness to allow access to the fuel injection pump belt cover.

8. Attach the fuel charging wiring harness.

- Secure with the 3 clips.
- Tighten the nuts to 10 Nm (7 lb.ft).

9. Install the new left hand (LH) high-pressure fuel supply line.

- Remove the blanking caps from the ports.
- Clean the components mating faces.
- Loosely install the new high-pressure fuel supply lines.
- Stage 1: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 15 Nm (11 lb.ft).

- Stage 2: Tighten the high-pressure fuel supply line union at the fuel injection pump to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel injection supply manifold to 36 Nm (26 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel injection pump to 35 Nm (26 lb.ft).

10. Attach the LH high-pressure fuel supply line.

- Align the clip.
- Tighten the bolt to 10 Nm (7 lb.ft).

11. Install the LH injector sound proofing.

- Secure the 2 clips.

12. Install the crankcase vent oil separator.
For additional information, refer to: Crankcase Vent Oil Separator (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

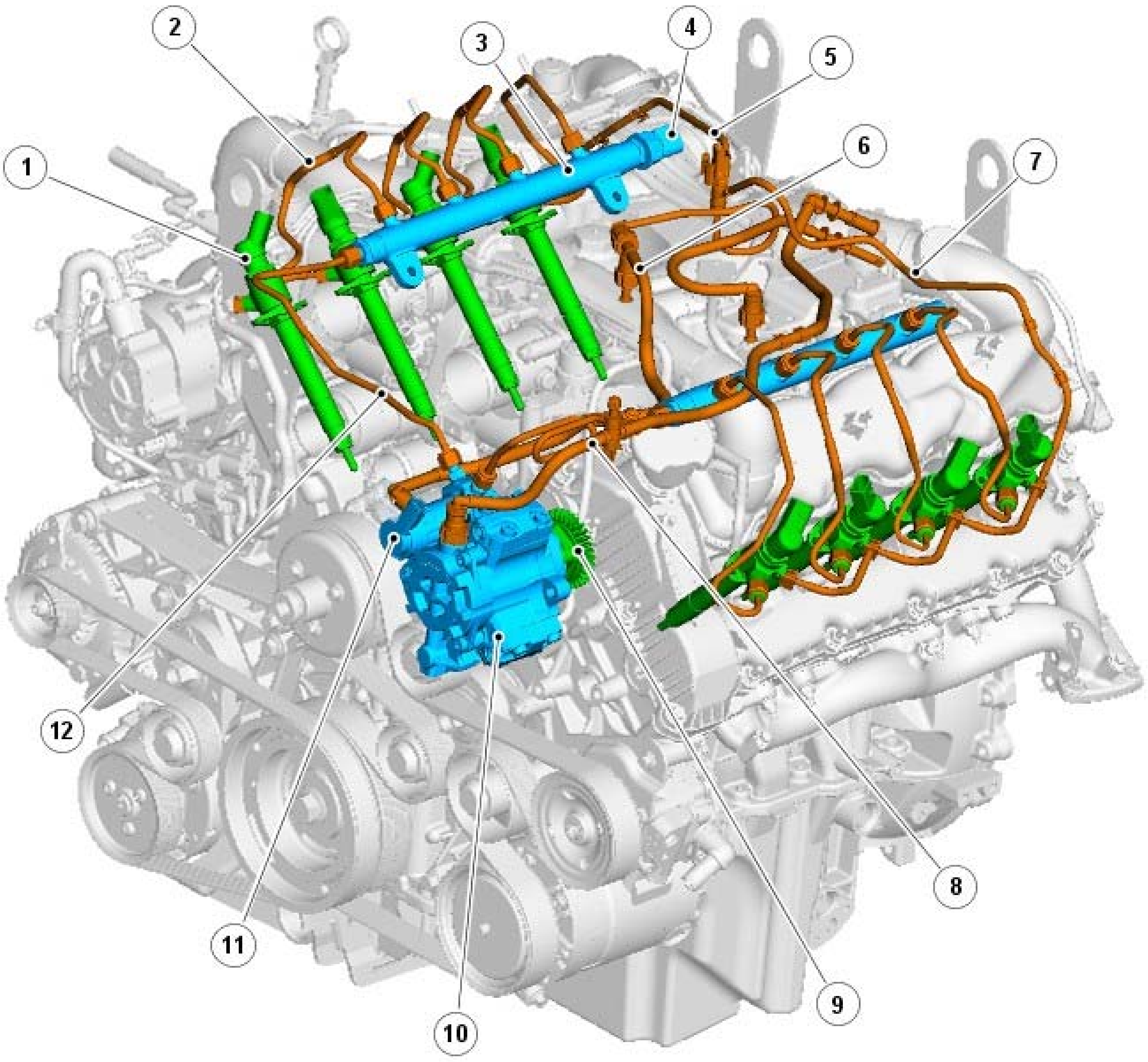
14. Bleed the fuel system.
For additional information, refer to: Low-Pressure Fuel System Bleeding - TDV6 2.7L Diesel (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Charging and Controls

Description and Operation

COMPONENT LOCATION



E88402

Item	Part Number	Description
1	-	Fuel injectors (8 off, 4 per cylinder head)
2	-	High-pressure fuel pipe - fuel rail to injectors (8 off)
3	-	High-pressure fuel rail (2 off)
4	-	Fuel rail pressure sensor
5	-	RH injector leak-back pipe
6	-	Fuel return pipe - high-pressure fuel pump to fuel cooler
7	-	LH injector leak-back pipe
8	-	Fuel supply pipe - High-pressure fuel pump to LH fuel rail
9	-	High-pressure fuel pump drive gear
10	-	High-pressure fuel pump

11	-	Pressure control valve
12	-	Fuel supply pipe - High-pressure fuel pump to RH fuel rail

GENERAL

The TDV8 engine is equipped with a high-pressure common rail fuel injection system. With this fuel injection process, a high-pressure fuel pump delivers a uniform level of pressure to the shared fuel lines (the common rails), which serve all 8 fuel injectors. Pressure is controllable, to the optimum level for smooth operation, up to 1750 bar.

The common rail system supports a pre-injection (pilot) phase, which reduces combustion noise and mechanical load.

Fuel injection pressure is generated independently of engine speed and fuel injection events.

The fuel injection timing and volume are calculated by the Engine Control Module (ECM), which then energizes the appropriate piezo actuated injector.

The common rail fuel injection system has the following features:

- High fuel injection pressures of up to 1750 bar for greater atomisation of fuel (increasing performance and lowering emissions)
- Variable injection to optimize combustion in all engine operating conditions
- Low tolerances and high precision throughout the life of the system

The fuel system is divided into 2 sub systems:

- Low-pressure system
- High-pressure system

The low-pressure system features the following components:

- In-tank fuel pump
- Fuel pressure regulator (integral to the fuel delivery module)
- Fuel filter
- Return pipes and fuel cooler
- Injector return pipes
- Fuel coolers (engine and vehicle)

The low-pressure system pressure is regulated to 0.5 bar.

The high-pressure system features the following components:

- High-pressure fuel pump
- Common fuel rails and diverter rail
- High-pressure fuel pipes
- Injectors

LOW-PRESSURE SYSTEM

In-tank Fuel Pump

The electric fuel pump is located inside the fuel tank. Fuel is pumped from the tank via the in-tank fuel pump, to the high-pressure fuel pump via the fuel filter.
For additional information, refer to: Fuel Tank and Lines (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Description and Operation).

Fuel Filter

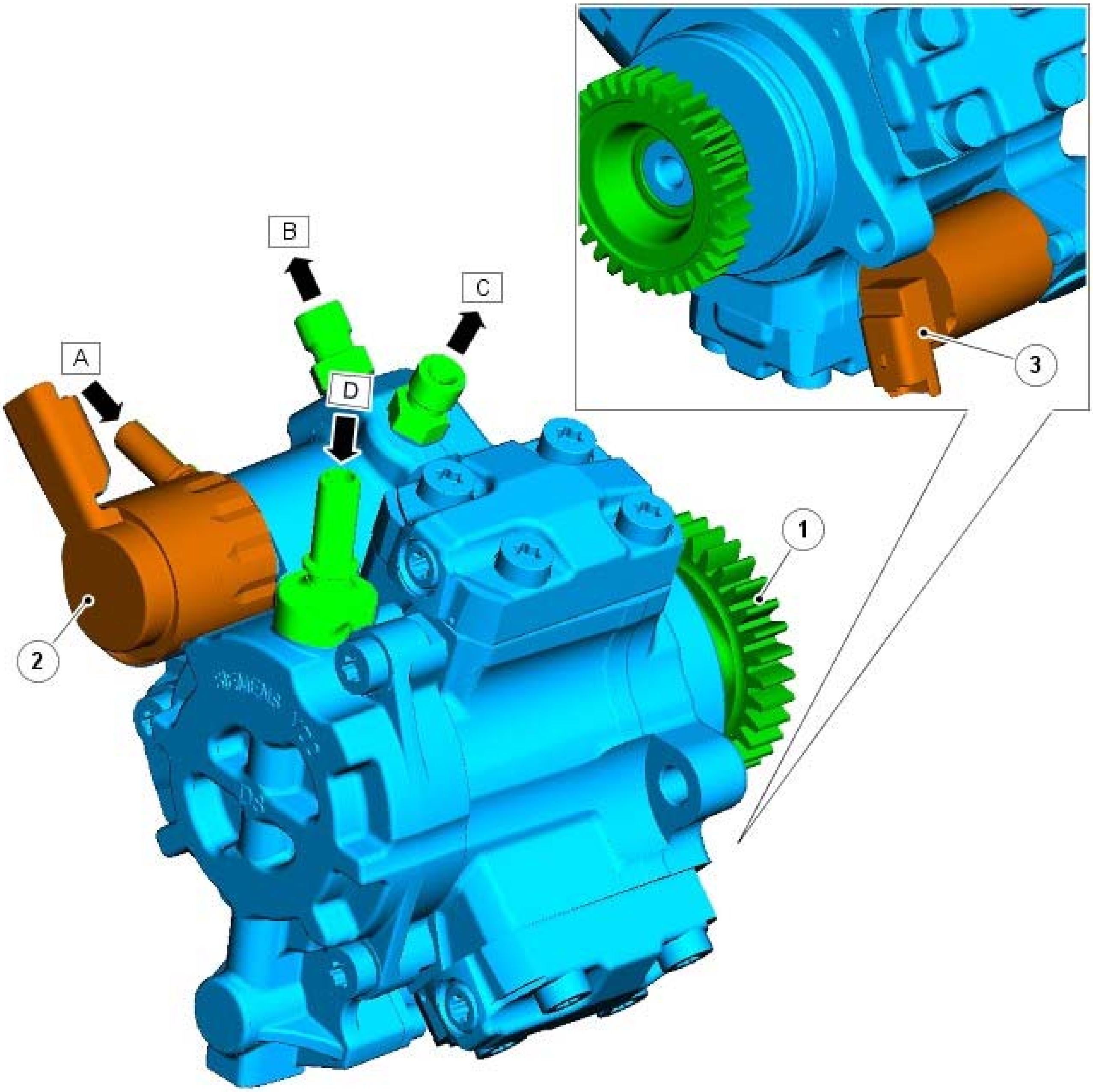
The fuel filter is located in the engine compartment on the left hand side, packaged to be protected against damage. Incorporated in the fuel filter housing is a bimetallic temperature valve, which will start to close at 30°C (86°F) and will fully close at 50°C (122°F). This allows pre-heated diesel fuel to circulate inside the fuel filter to prevent waxing in cold operating conditions.

Fuel Cooler

Two fuel coolers are fitted to the vehicle. One is located in the 'vee' of the engine block, and has a coolant system connection to aid heat transfer. The second cooler is located in the fuel return line and is a fuel to air cooler.
For additional information, refer to: Fuel Tank and Lines (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Description and Operation).

HIGH-PRESSURE SYSTEM

High-Pressure Fuel Pump



E81897

Item	Part Number	Description
A	-	Fuel return
B	-	Fuel supply - high-pressure fuel pump to RH fuel rail
C	-	Fuel supply - high-pressure fuel pump to LH fuel rail
D	-	Fuel supply
1	-	High-pressure fuel pump drive gear
2	-	Pressure control valve

The high-pressure fuel pump is a three-piston (120 degree apart) radial plunger pump with a high-pressure displacement of 0.8 cc. As mentioned, it has the ability to produce a maximum pressure of 1750 bar.

The pump is driven from the LH inlet camshaft via a drive gear and does not need to be timed to the engine.

The required supply pressure to the pump is -0.3 bar to +0.5 bar gauge. The return pressure is -0.3 bar to +0.8 bar gauge.

The pump is sized to deliver sufficient fuel to the high-pressure rails for all engine-operating conditions.

The high-pressure fuel pump consists of the following components:

- Internal Transfer Pump (ITP)
- Volume Control Valve (VCV)

- HP pumping elements (3 of)
- Pressure Control Valve (PCV)

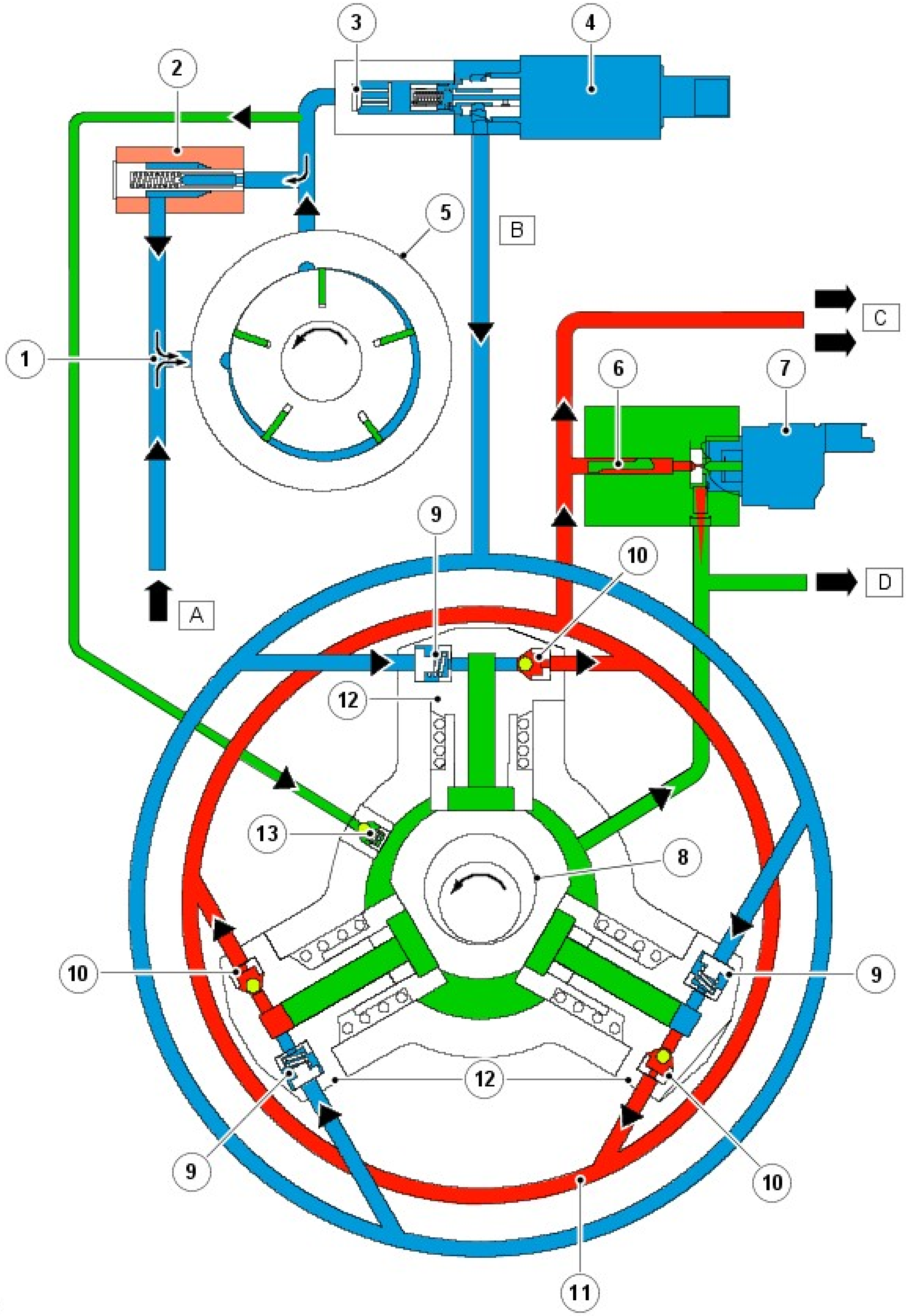
The ITP is a 5 vane pump. This conveys fuel to the VCV.

The VCV is a variable position solenoid valve electronically controlled by the ECM. The VCV is located between the ITP and the high-pressure pumping elements. The VCV determines the amount of fuel that is delivered to the high-pressure pumping elements. When there is no signal to the VCV the valve is closed, therefore no fuel delivery.

The 3 high-pressure pumping elements are connected together in a fuel ring circuit within the pump. There is a single high-pressure outlet connection for the high-pressure pipe to the high-pressure diverter rail.

The PCV is a variable position solenoid valve electronically controlled by the ECM. The PCV is located between the high-pressure pumping elements and the high-pressure outlet connection. The PCV regulates the amount of fuel pressure in the fuel rails and is controlled by the ECM. When there is no signal to the PCV the valve is open, therefore no rail pressure can be generated.

High-Pressure Fuel Flow


3
4
2
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B
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1
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A
9
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D
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E81898

Item	Part Number	Description
A	-	Low-pressure fuel supply
B	-	Fuel supply to the high-pressure pumping elements
C	-	High-pressure outlet connection to the high-pressure diverter rail
D	-	Low-pressure fuel return (spill)
1	-	Low-pressure side of ITP

2	-	ITP pressure relief valve
3	-	Screen filter
4	-	VCV
5	-	ITP
6	-	Edge filter (to protect PCV)
7	-	PCV
8	-	Eccentric on high-pressure fuel pump drive shaft
9	-	Pumping element inlet valve
10	-	Pumping element outlet valve
11	-	High-pressure ring line
12	-	High-pressure fuel pump elements (3 of)
13	-	Lubricating valve

The fuel induced by the ITP (5) is conveyed to the VCV (4) and the lubricating valve (13).

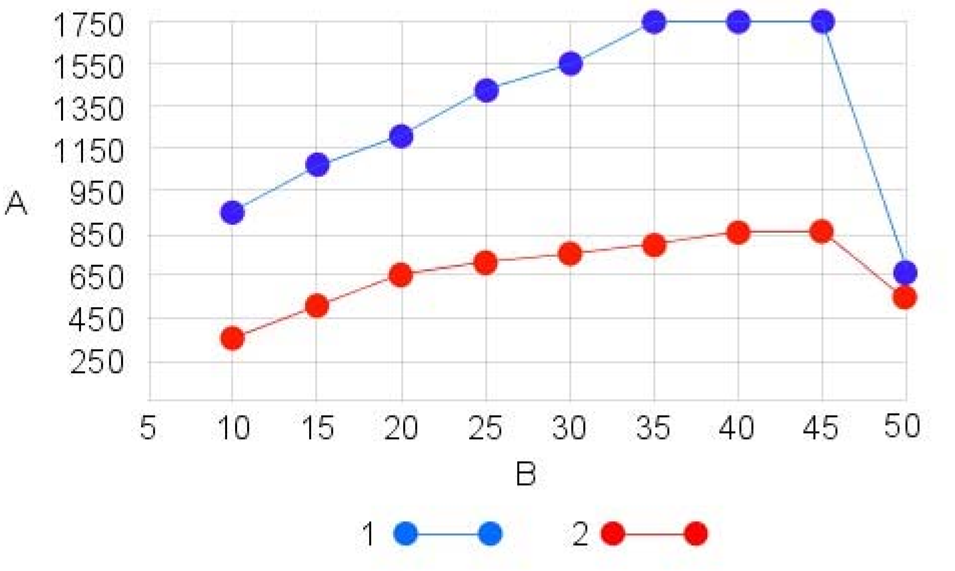
When the VCV is closed, the ITP pressure relief valve (2), lying parallel to the transfer pump, opens and conveys the fuel back to the low-pressure side (1) of the transfer pump.

The fuel passes through the lubricating valve (13) into the interior of the high-pressure fuel pump and from there to the fuel return (D). The fuel is used to lubricate the pump.

The VCV (4) determines the quantity of fuel (B) that is supplied to the pumping elements (12).

The fuel from the high-pressure outlets (10) of the 3 pumping elements comes together in a ring line (11) and is conveyed through the high-pressure outlet of the high-pressure fuel pump to the rails.

The PCV (7) regulates the fuel pressure in the fuel rails. Reducing rail pressure via the PCV results in fuel from the rail returning to the low-pressure fuel return (D).



E81899

Item	Part Number	Description
A	-	Injection pressure (bar)
B	-	Engine r/min x 100
1	-	High-boost fuel pressure
2	-	Low-boost fuel pressure

The high-pressure fuel pump can supply up to 1700 bar fuel pressure continuously with short excursions to 1750 bar. Pump speed is 5/6 engine speed. However it is calibrated to deliver fuel pressure dependant upon engine speed and load and is always under full control.

When the high-pressure fuel pump is rotated, pressure is created when the VCV is open and the PCV is closed. The VCV and PCV are variable position to allow variable fuel delivery and pressure control.

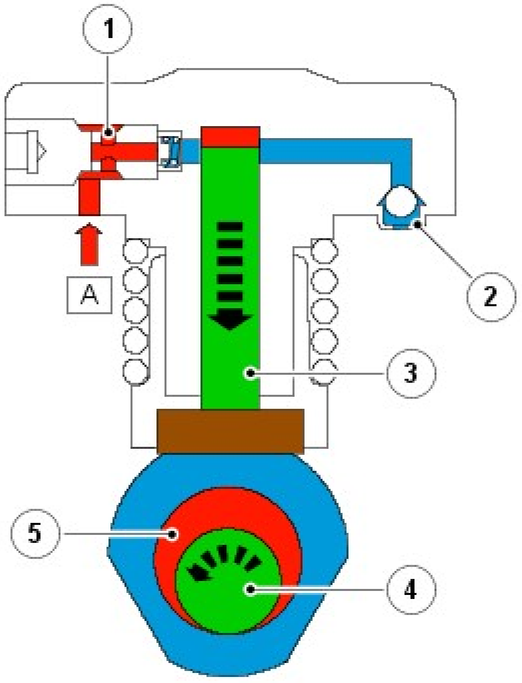
When the ECM actuates the piezo injectors, the rail pressure drop is off-set by additional fuel being delivered to the high-pressure rails by the PCV.

Pressure Reduction After Engine Has Stopped

The fuel pressure in the system is reduced within a few seconds after the engine has stopped as the PCV no longer has the holding current it requires, and therefore opens. No residual pressure remains in the system and the fuel is returned to the fuel return line (D) through the open PCV. The system is pressureless.

Function of a High Pressure Element

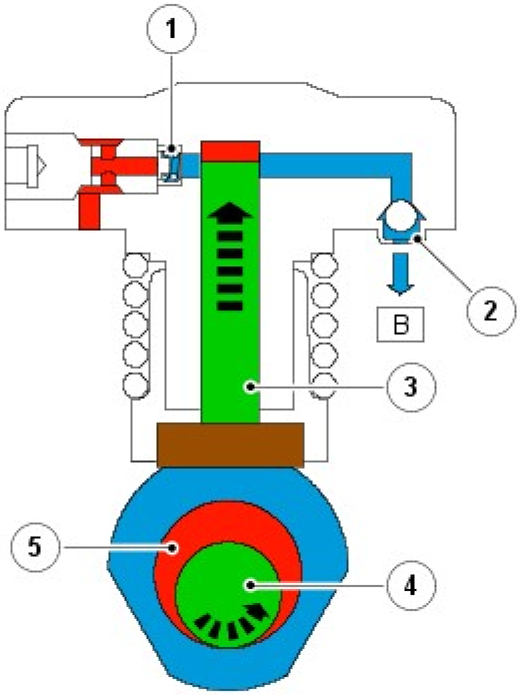
Fuel Induction



E50836

During the downward motion of the piston (3), a vacuum in the pump cylinder is generated, which opens the inlet valve (1) against the force exerted by the valve spring. The fuel (A), which is flowing past the VCV, is sucked in. At the same time the outlet valve (2) is closed due to the pressure difference between the pump cylinder and the high-pressure fuel in the ring line.

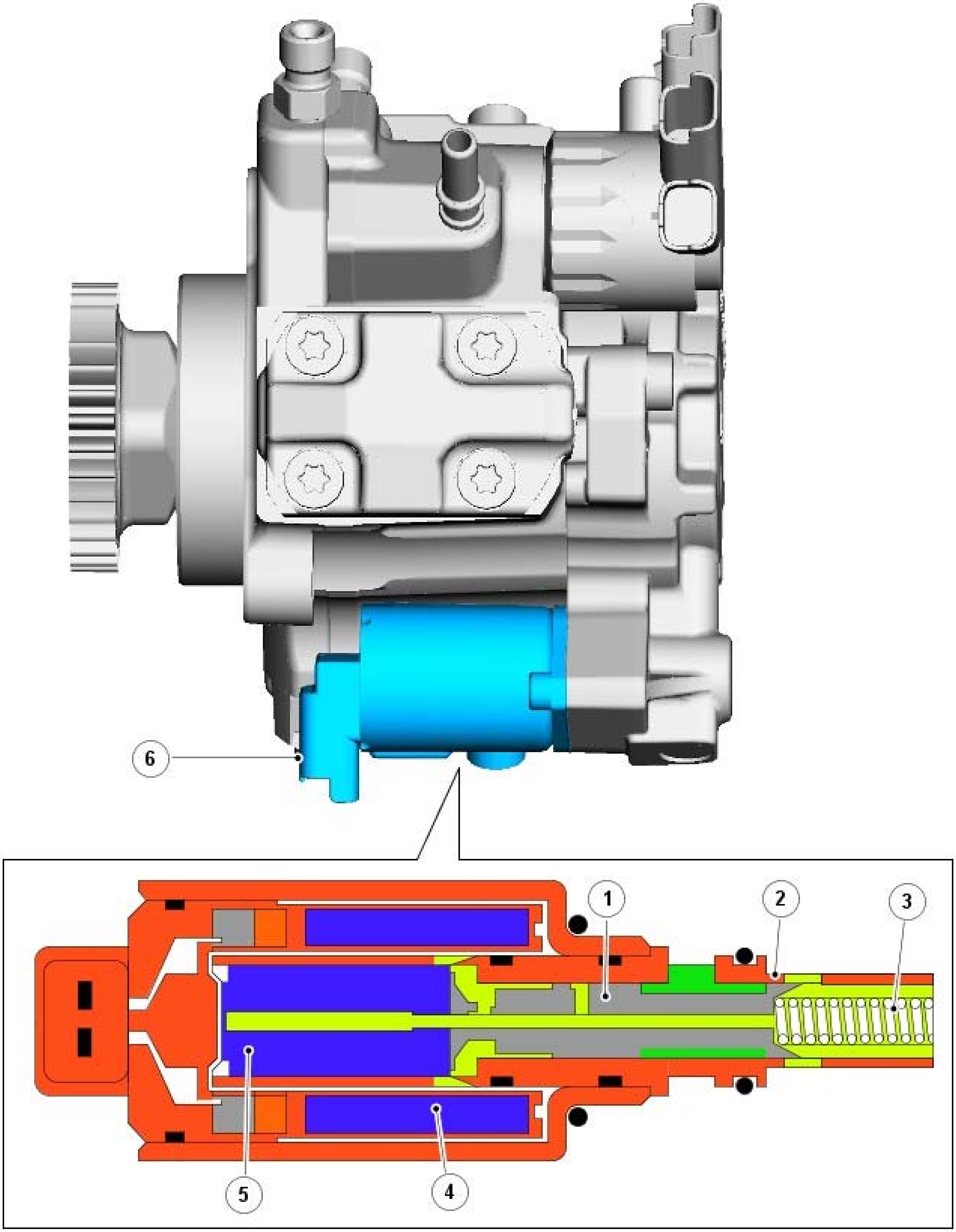
Fuel Delivery



E50837

The eccentric on the high-pressure fuel pump driveshaft (5) presses the piston (3) upwards. The inlet valve (1) is then closed through the force exerted by the valve spring and the pressure being built up in the pump cylinder. The outlet valve (2) opens when the pressure in the pump cylinder is greater than the fuel pressure in the ring line (B).

Volume Control Valve (VCV)



E81900

Item	Part Number	Description
1	-	Piston
2	-	Sleeve
3	-	Compression spring
4	-	Coil
5	-	Armature

6	-	VCV

The VCV is fixed directly to the high-pressure fuel pump.

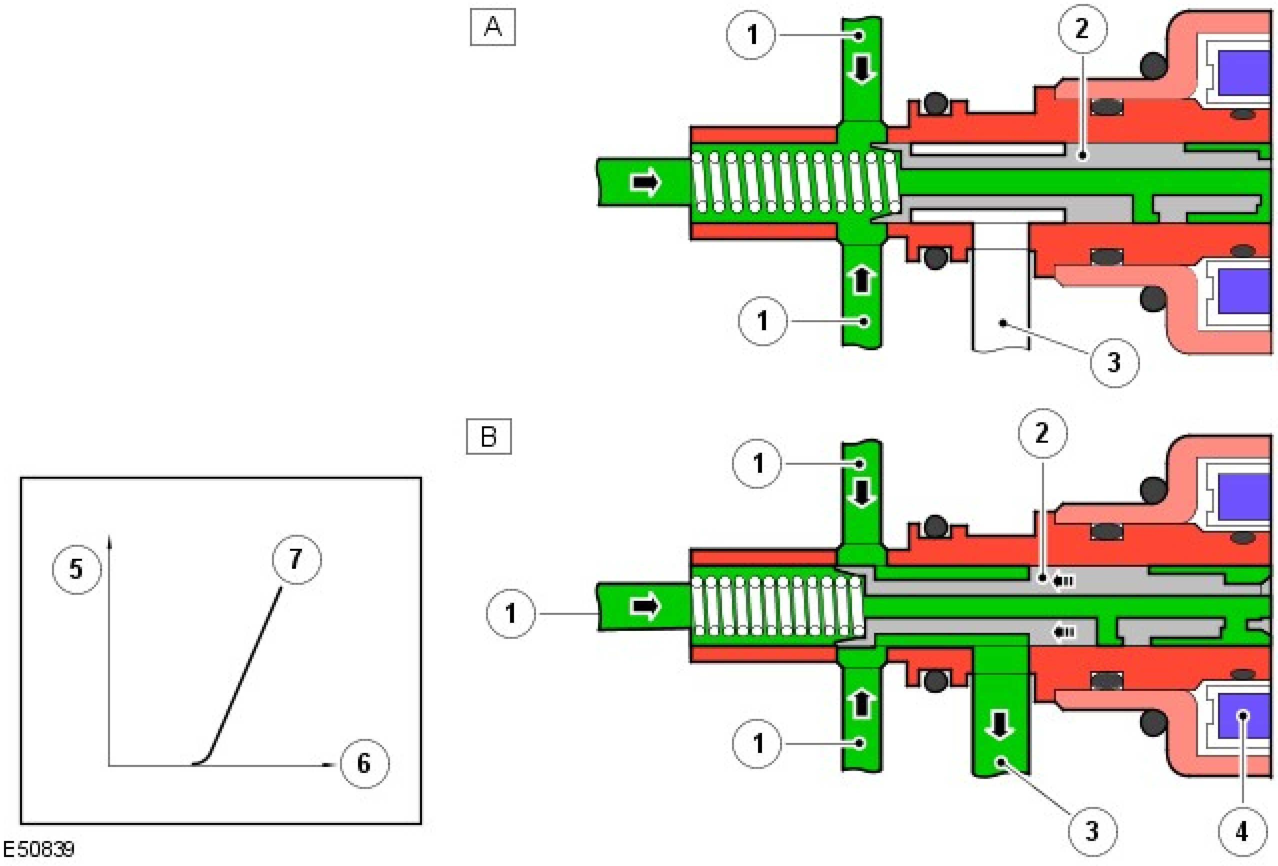
The VCV regulates the fuel supply (and hence the quantity of fuel) from the transfer pump to the high-pressure fuel pump elements, depending on the fuel pressure in the rail.

This makes it possible to match the delivery of the high-pressure fuel pump to the requirements of the engine from the low-pressure side. The quantity of fuel flowing back to the main fuel supply line is kept to a minimum.

In addition, this adjustment reduces the power consumption of the high-pressure fuel pump, improving the efficiency of the engine.

- NOTE: The fuel volume control valve default is closed without electrical supply. An open circuit connector will prevent the engine from running.

- NOTE: The VCV cannot be replaced as a separate component in service.



Item	Part Number	Description
A	-	VCV not actuated
B	-	VCV actuated
1	-	Fuel supply from the transfer pump
2	-	Piston
3	-	Fuel supply to the high-pressure fuel pump
4	-	Coil energized
5	-	Quantity of fuel
6	-	Control current
7	-	VCV at constant engine speed

VCV Not Actuated (A)

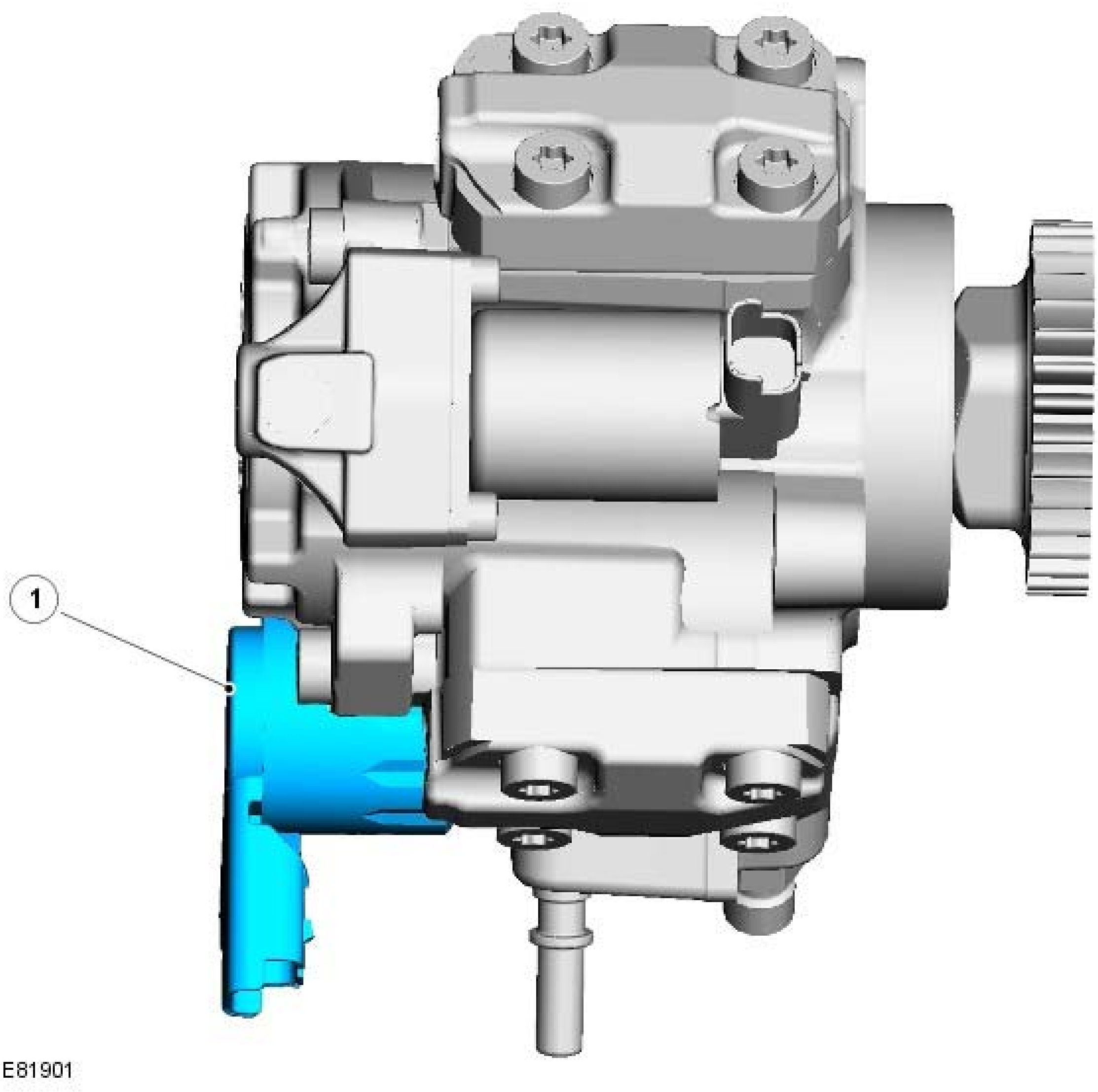
When there is no power supplied, the piston (2) closes the opening between the 2 connections (1) and (3) through the force of the compression spring. The fuel supply to the high-pressure fuel pump is interrupted.

VCV Actuated (B)

The ECM energizes the coil (4) of the valve, according to the engines requirements. The armature force is proportional to the control current and counteracts the compression spring through the moving piston (2).

As a result, the opening between the 2 connections (1) and (3) and hence the quantity of fuel (5) supplied through the connector (3) to the high-pressure fuel pump is also proportional to the control current (6). This means that the greater the opening cross-section, the greater the quantity of fuel supplied.

Pressure Control Valve (PCV)



Item	Part Number	Description
1	-	PCV

The PCV is located on the high-pressure fuel pump. It governs the fuel pressure at the high-pressure outlet of the high-pressure fuel pump and thus, the fuel pressure within the rail. In addition, the PCV dampens any fluctuations in pressure, which occur during the delivery of fuel through the high-pressure fuel pump and through the injection process.

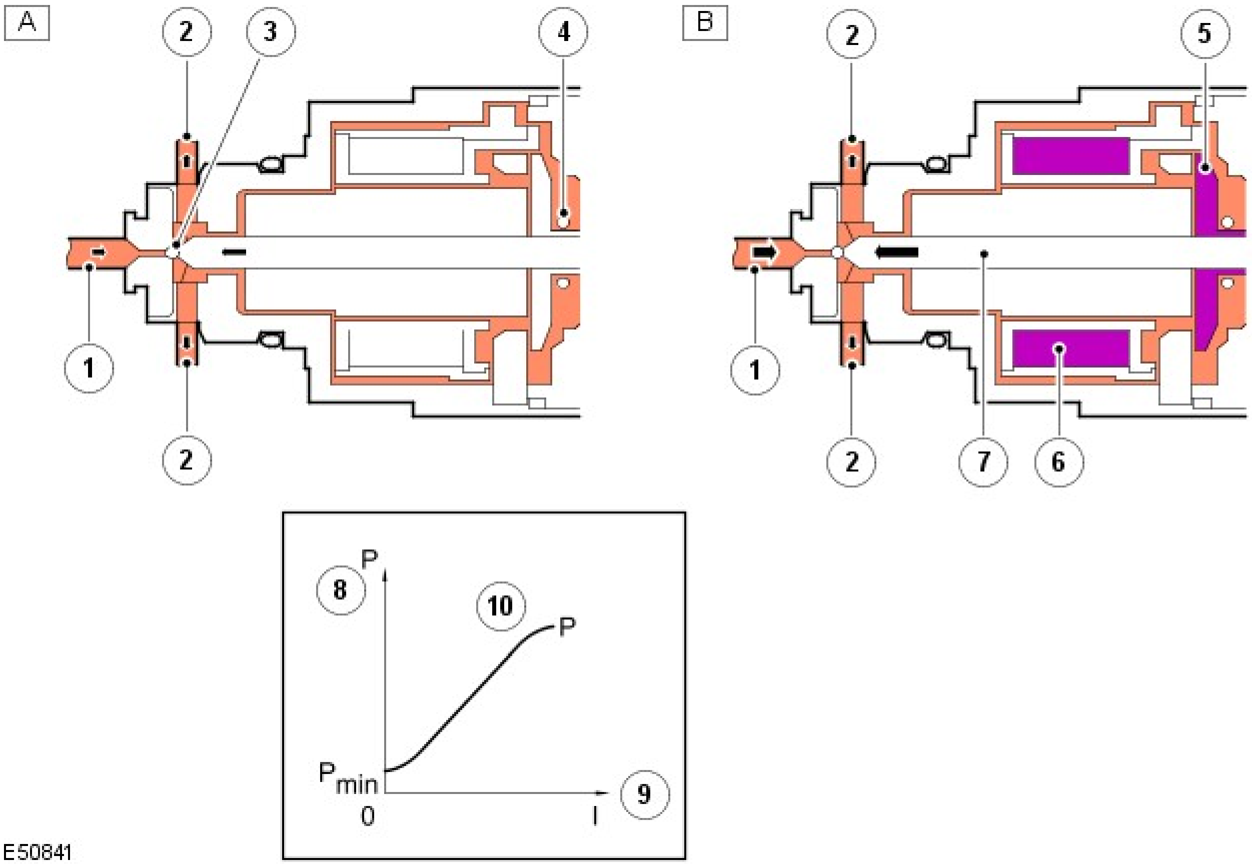
The PCV ensures that optimum pressure exists in the rail for every operating condition of the engine.

The PCV is an electro-magnetically operated valve with spring support.

The electrical current supplied by the ECM through the solenoid pulls back the control pin. This allows the diesel fuel to pass the ball valve and thus the fuel flow into the common rails.

The entire armature is coated with fuel for lubrication and cooling.

- NOTE: The PCV cannot be replaced as a separate component in service.



Item	Part Number	Description
A	-	PCV non-controlled
B	-	PCV controlled
1	-	Fuel from the high-pressure fuel pump
2	-	To fuel return
3	-	Ball valve
4	-	Compression spring
5	-	Armature
6	-	Coil energized
7	-	Control pin
8	-	High pressure fuel
9	-	Control current
10	-	Characteristic of the PCV

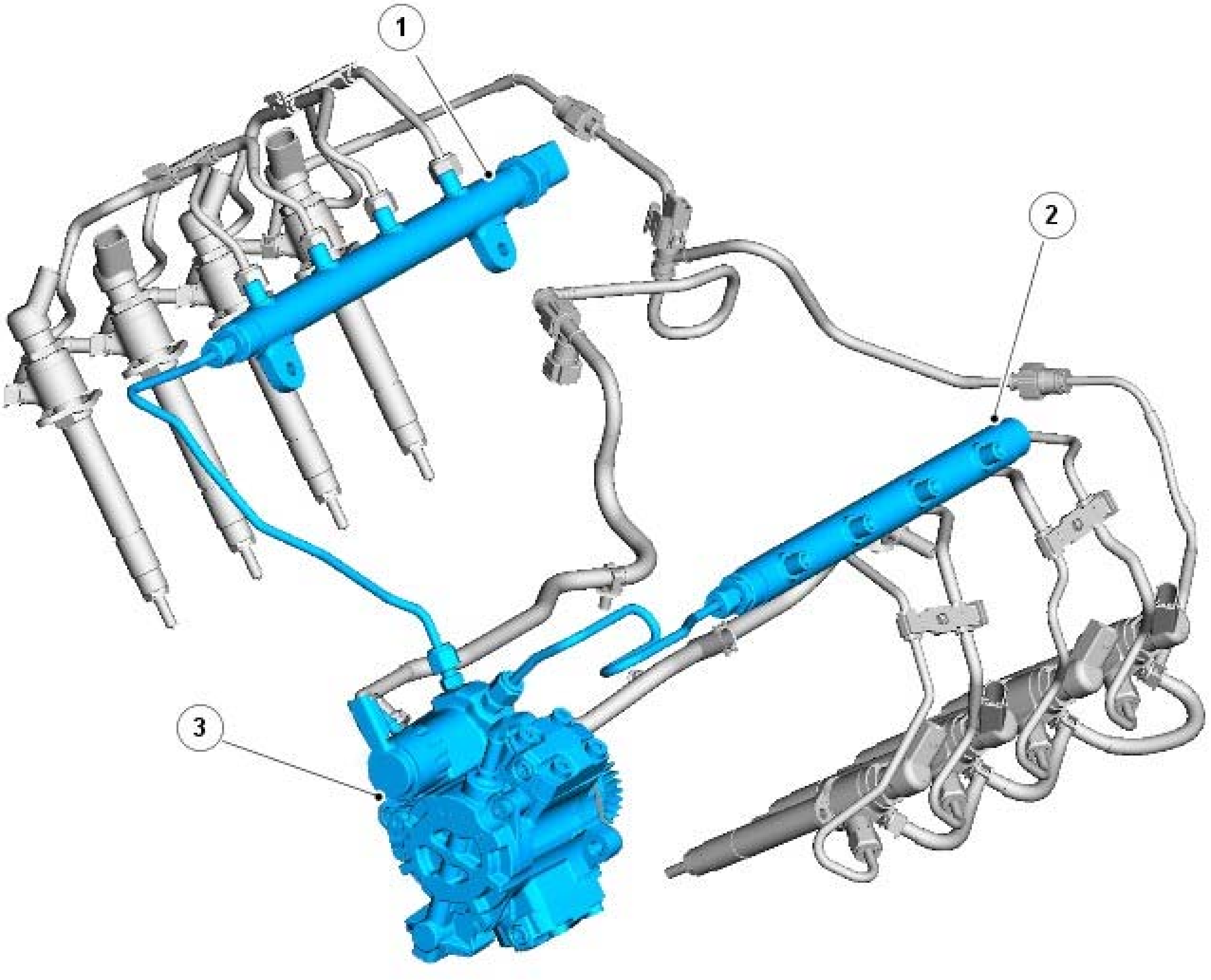
PCV Non-controlled (A)

The ball valve (3) will only be operated through the force exerted upon it by the spring (4). Thereby, the PCV is classed as open.

PCV Controlled (B)

The current flowing through the solenoid (6) draws the pin (7) down. This in turn transfers the magnetic force via the pin to the ball valve (3). The pull of the pin, and the pressure on the ball valve, is proportional to the valve flow (9).

High-Pressure Common Fuel Rails



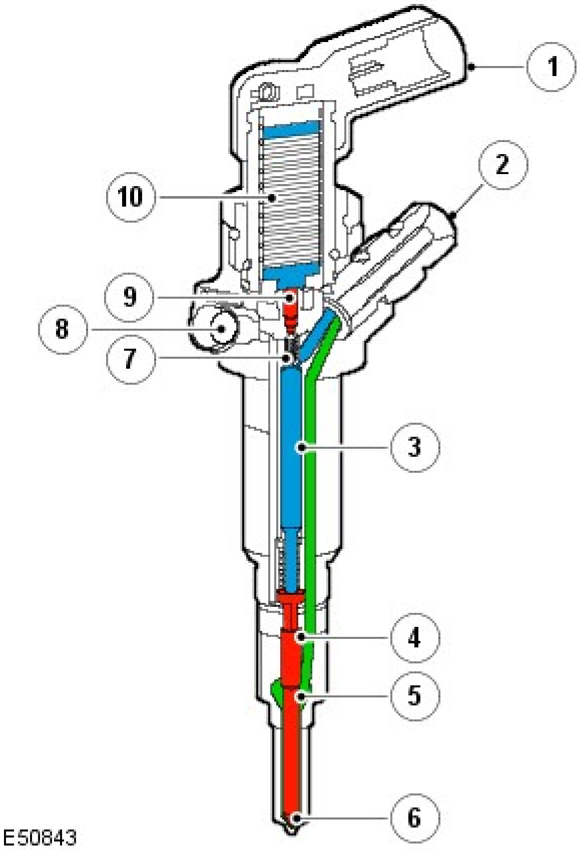
E81902

Item	Part Number	Description
1	-	RH high-pressure common fuel rail
2	-	LH high-pressure common fuel rail
3	-	High-pressure fuel pump

The fuel rails are manufactured from forged steel. They store the fuel at high-pressure and prevent pressure fluctuations in the high-pressure system.

All high-pressure pipes have an internal diameter of 2.5mm except the pipes to the injectors, which are 3.0mm. Total rail volume is 33cc.

FUEL INJECTORS



Item	Part Number	Description
1	-	Harness connection
2	-	High-pressure connection
3	-	Control piston
4	-	Nozzle needle
5	-	Nozzle high-pressure chamber
6	-	Nozzle spray holes
7	-	Valve mushroom
8	-	Fuel return
9	-	Valve piston
10	-	Piezo actuator

The fuel injectors are operated directly by the ECM for fuel metering (start of injection and quantity of fuel injected).

The operating components of the piezo fuel injectors are:

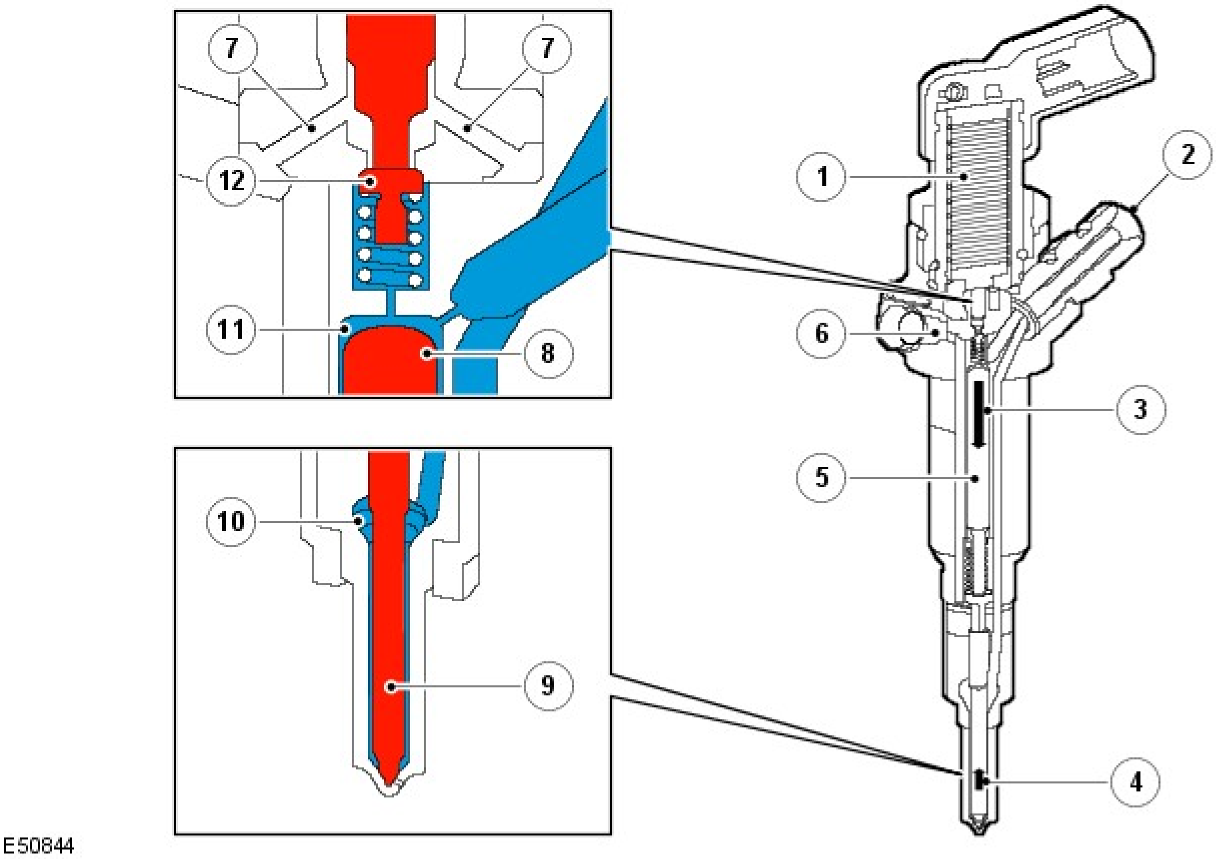
- The piezo actuator
- The injector body containing the hydraulic servo system
- The fuel injector nozzle

• NOTE: New injectors can be installed in any cylinder and DO NOT have to be configured.

• NOTE: Each injection event is controlled by a charge and discharge cycle allowing energy to dissipate in, and recover from, the injector. Never disconnect the wiring connector when the vehicle is running. The injector may remain open thus causing engine damage.

• NOTE: For safety reasons, the engine must be at standstill for 30 seconds before starting work on the high-pressure fuel system.

Fuel Injector Not Actuated (Not Injecting Fuel)



Item	Part Number	Description
1	-	Piezo actuator
2	-	High-pressure connection
3	-	Hydraulic force applied on control piston
4	-	Hydraulic force acting on tip of nozzle
5	-	Control piston
6	-	Fuel return
7	-	Fuel return
8	-	Control piston
9	-	Nozzle needle
10	-	High pressure chamber of nozzle
11	-	Control chamber
12	-	Valve mushroom

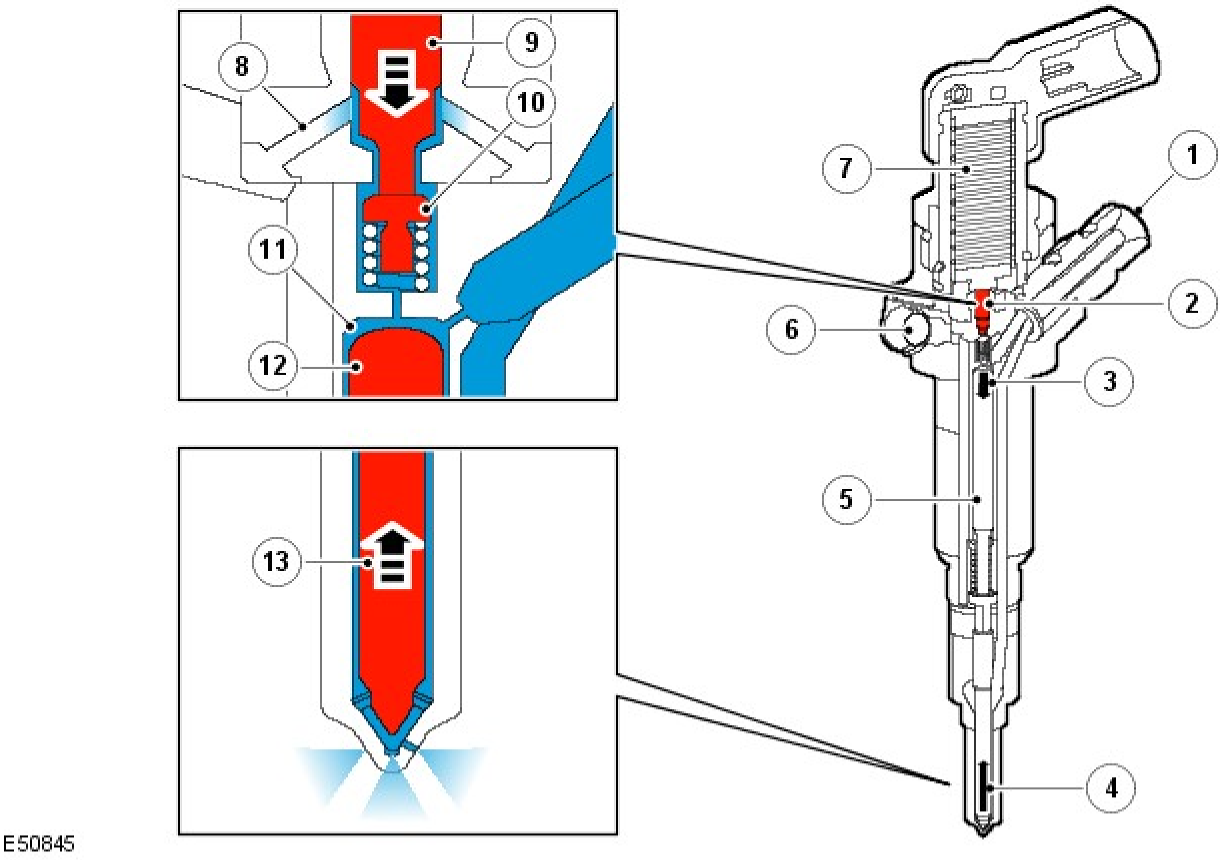
The high-pressure fuel from the fuel-rail passes through the high-pressure connection (2) into the control chamber (11) and into the high-pressure chamber (10) of the fuel injector nozzle.

The piezo actuator (1) is currentless and the valve mushroom (12) closes the bore to the fuel return (7) by means of spring pressure.

There is however a continuous fuel return (6) to vent internal leakage within the injector.

The hydraulic force (3), which is now applied on the control piston by the fuel under high-pressure in the control chamber (11) through the control piston (8), is greater than the hydraulic force (4) acting on the tip of the nozzle (since the area of the control piston in the control chamber is greater than the area of the tip of the nozzle).

Fuel Injector Actuated (Injecting Fuel)



Item	Part Number	Description
1	-	High-pressure supply
2	-	Valve piston
3	-	Hydraulic force applied on control piston
4	-	Hydraulic force acting on tip of nozzle
5	-	Control piston
6	-	Fuel return
7	-	Piezo actuator
8	-	Fuel return
9	-	Valve piston
10	-	Valve mushroom
11	-	Control chamber
12	-	Control piston
13	-	Nozzle needle

The piezo actuator (7) energized by the ECM extends (charging phase) and presses on the valve piston (9). The valve mushroom (10) opens the bore, which connects the control chamber (11) to the fuel return (8 then 6).

As a result, the pressure in the control chamber drops, and the hydraulic force (4) acting on the tip of the nozzle needle is now greater than the force (3) acting on the control piston in the control chamber.

The nozzle needle (13) moves upwards and the fuel passes through the 6 spray holes into the combustion chamber.

Engine Starting

During starting, the fuel rail pressure must be at least 150 bar. Should the pressure be below this figure, the injectors will not operate, resulting in the vehicle not starting.

Engine Stopped

To stop the engine the ECM stops energizing the piezo actuators, therefore, no fuel is injected and the engine speed drops to zero.

Published: 11-May-2011

Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Charging and Controls

Diagnosis and Testing

Overview

This section covers the fuel system from the fuel filter to the fuel injectors, and includes the fuel rail and pump.

For information on the low-pressure fuel system:
REFER to: Fuel Tank and Lines (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Description and Operation).

For information on the operation of the systems:
REFER to: Fuel Charging and Controls (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Description and Operation).

Inspection and Verification

⚠ WARNING: Make sure that all suitable safety precautions are observed when carrying out any work on the fuel system. failure to observe this warning may result in personal injury.

⚠ CAUTION: Make sure that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. failure to follow this instruction may result in damage to the vehicle.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Low/Contaminated fuel ● Fuel supply/return line(s) ● Fuel tank and filler pipe ● Fuel leak(s) ● Fuel filler cap ● Fuel filter ● Push connect fittings ● Fuel rail ● Fuel pump ● Exhaust gas recirculation (EGR) system	● Fuses - Fuse F6, engine compartment junction box - Fuse 1E, engine compartment junction box - Fuse 4E, engine compartment junction box - Fuse 13E, engine compartment junction box - Fuse 17E, engine compartment junction box - Fuse 27E, engine compartment junction box - Fuse 25P, passenger compartment junction box - Fuse 60P, passenger compartment junction box ● Links - Link 1E, engine compartment junction box - Link 4E, engine compartment junction box - Link 6E, engine compartment junction box - Link 11E, engine compartment junction box - Link 14E, engine compartment junction box ● Glow plug indicator ● Inertia fuel shutoff (IFS) switch ● Fuel pump module ● Sensor(s) ● Engine control module (ECM) ● Fuel volume control valve ● Fuel pressure control valve ● Fuel rail pressure (FRP) sensor ● Fuel temperature sensor ● Fuel injector(s) ● EGR system

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - ○ Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action

Symptom	Possible causes	Action
Engine cranks, but does not start	● Inertia fuel shutoff (IFS) switch ● Low/Contaminated fuel ● Air leakage ● Low-pressure fuel system fault ● Fuel pump module (lift pump) fault ● Blocked fuel filter ● Fuel volume regulator blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● Fuel pump fault ● Crankshaft position (CKP) sensor	Check that the IFS switch has not tripped. Check the fuel level and condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump: REFER to: Fuel Charging and Controls (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Diagnosis and Testing). Check the CKP sensor circuits. Refer to the electrical guides.
Difficult to start	● Glow plug system fault (very cold conditions) ● Low/Contaminated fuel ● Air leakage ● Fuel pump module (lift pump) fault ● Low-pressure fuel system fault ● Blocked fuel filter ● Fuel volume control valve blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● Exhaust gas recirculation (EGR) valve(s) fault	Check the glow plug circuits. Refer to the electrical guides. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing).
Rough idle	● Intake air system fault ● Low/Contaminated fuel ● Low-pressure fuel system fault ● Blocked fuel filter ● Fuel volume control valve blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● Exhaust gas recirculation (EGR) valve(s) fault	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing).
Lack of power when accelerating	● Intake air system fault ● Restricted exhaust system ● Low fuel pressure ● Exhaust gas recirculation (EGR) valve(s) fault ● Turbocharger actuator fault	Check the intake air system for leakage or restriction. Check for a blockage/restriction in the exhaust system, install new components as necessary: REFER to: Exhaust System (309-00C Exhaust System - 3.6L (TdV8) Diesel, Removal and Installation). Check for DTCs indicating a fuel pressure fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing). For turbocharger actuator checks: REFER to: Turbocharger (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Diagnosis and Testing).
Engine stops/stalls	● Air leakage ● Low/Contaminated fuel ● Low-pressure fuel system fault ● High-pressure fuel leak ● Fuel volume control	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the fuel system for leaks/damage: Check for DTCs indicating a fuel volume or pressure control valve fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8

Symptom	Possible causes	Action
	valve blocked/contaminated • Fuel pressure control valve blocked/contaminated • Exhaust gas recirculation (EGR) valve fault	3.6L Diesel, Diagnosis and Testing).
Engine judders	• Low/Contaminated fuel • Air ingress • Low-pressure fuel system fault • Fuel metering valve blocked/contaminated • Fuel volume control valve blocked/contaminated • Fuel pressure control valve blocked/contaminated • High-pressure fuel leak • Fuel pump fault	Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the low-pressure fuel system for leaks/damage. Check the high-pressure fuel system for leaks, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump: REFER to: Fuel Charging and Controls (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Diagnosis and Testing).
Excessive fuel consumption	• Low-pressure fuel system fault • Fuel volume control valve blocked/contaminated • Fuel pressure control valve blocked/contaminated • Fuel temperature sensor leak • High-pressure fuel leak • Injector(s) fault • Exhaust gas recirculation (EGR) valve(s) fault	Check the low-pressure fuel system for leaks/damage. Check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel temperature sensor, fuel pump, etc for leaks. Check for injector DTCs. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of engine control module (ECM) DTCs:
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

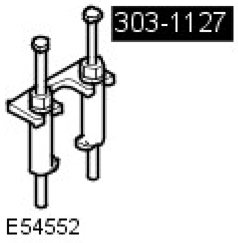
DTC	Description	Possible causes	Action
P000113	Fuel volume control valve control circuit open	• Fuel volume control valve circuit: high resistance • Fuel volume control valve circuit: short circuit to ground • Fuel volume control valve fault	Check fuse 13E of the engine compartment junction box. Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P000311	Fuel volume control valve control circuit low	• Fuel volume control valve circuit: high resistance • Fuel volume control valve circuit: short circuit to ground • Fuel volume control valve circuit: short circuit to power • Fuel volume control	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		valve fault	
P000319	Fuel volume control valve control circuit low	● Fuel volume control valve circuit: short circuit to ground ● Fuel volume control valve fault	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P000412	Fuel volume control valve control circuit high	● Fuel volume control valve circuit: short circuit to power ● Fuel volume control valve fault	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P000E21	Fuel volume control valve control exceeded learning limit	● Fuel volume control valve amplitude is less than the minimum specified	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P000E22	Fuel volume control valve control exceeded learning limit	● Fuel volume control valve amplitude is greater than the maximum specified	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P008700	Fuel rail/system pressure too low	● Fuel lift pump circuit fault ● Fuel lift pump relay fault ● Fuel lift pump fault	Check the lift pump and circuits. Refer to the electrical guides. Check fuse 1E of the engine compartment junction box. Check the fuel pump relay in the engine compartment junction box. Rectify as necessary. Clear the DTCs and test for normal operation.
P008800	Fuel rail/system pressure too high	● Fuel rail pressure (FRP) sensor to engine control module (ECM) wiring (supply/sense): short circuit to each other ● FRP sensor to ECM sense circuit: short circuit to power ● FRP sensor fault ● Fuel pressure control valve fault ● Fuel pump circuit: short circuit to power ● Fuel pump fault	Check for DTCs indicating a fuel pressure sensor fault. Rectify as necessary. Clear the DTCs and test for normal operation. Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the fuel pump and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P008921	Fuel pressure regulator performance	● Fuel pressure control valve circuit: high resistance ● Fuel pressure control valve circuit: short circuit to ground ● Fuel pressure control valve circuit: short circuit to power ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new fuel pump (the fuel pressure control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

Published: 19-Aug-2011

Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Injectors LH

Removal and Installation

Special Tool(s)	
	Remover - Fuel Injector 303-1127

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

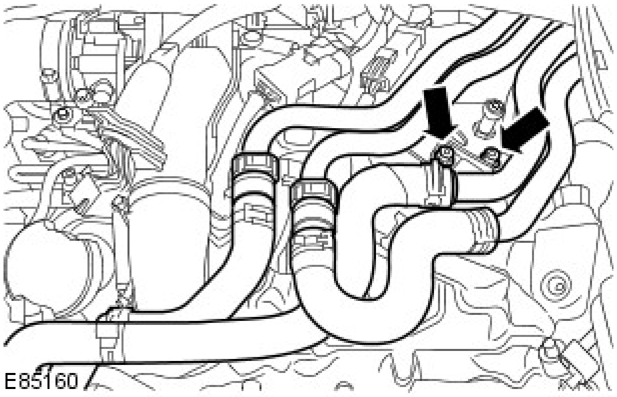
⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1700 bar (24,656 lb-sq-in). Failure to follow this instruction may result in personal injury.

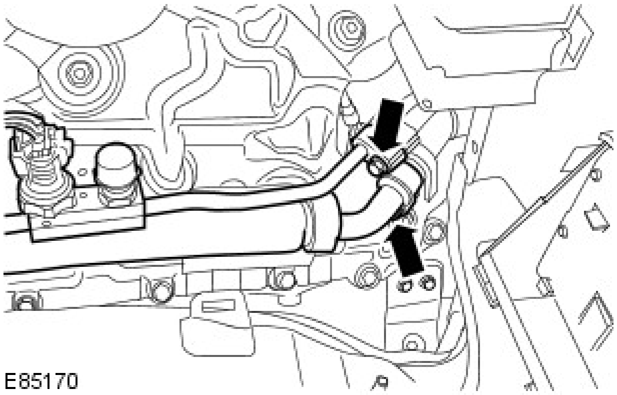
⚠CAUTION: Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the battery tray.
   For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).
4. Recover the air conditioning (A/C) refrigerant.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).



5. Release the coolant lines.

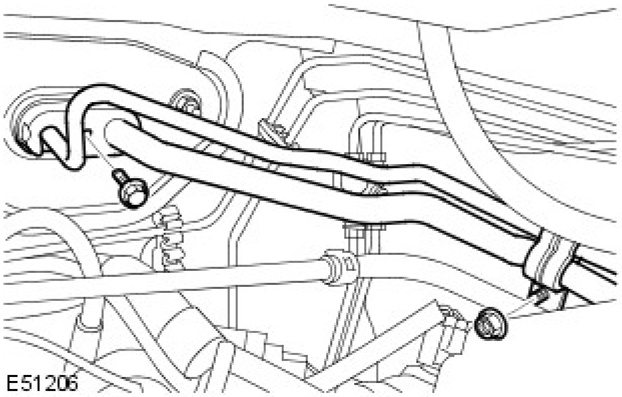
- Remove the 2 nuts.



6. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the high and low-pressure A/C lines.

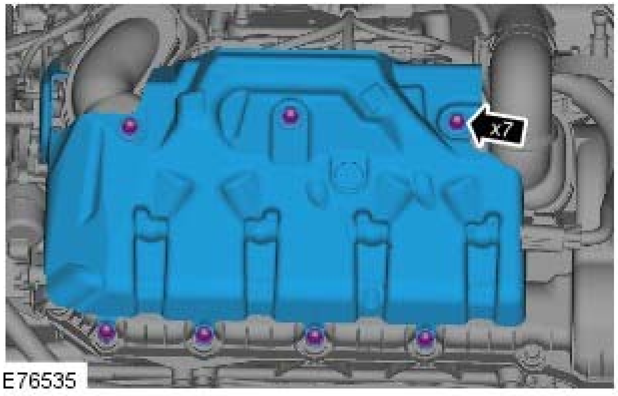
- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.



7. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

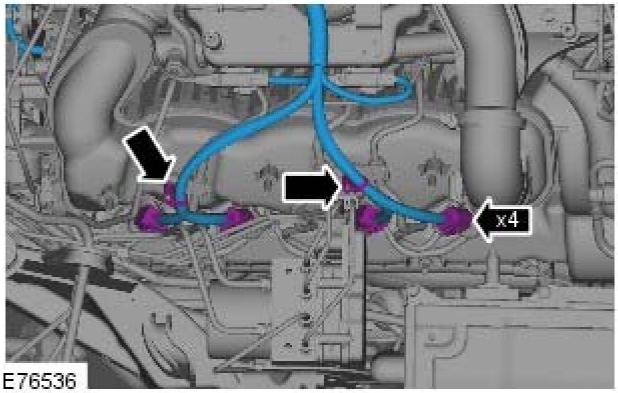
Remove the 2 A/C lines.

- Remove the bolt.
- Remove the nut.
- Release the clamp.
- Remove and discard the 2 O-ring seals.



8. Remove the fuel line shield.

- Remove the 7 nuts.

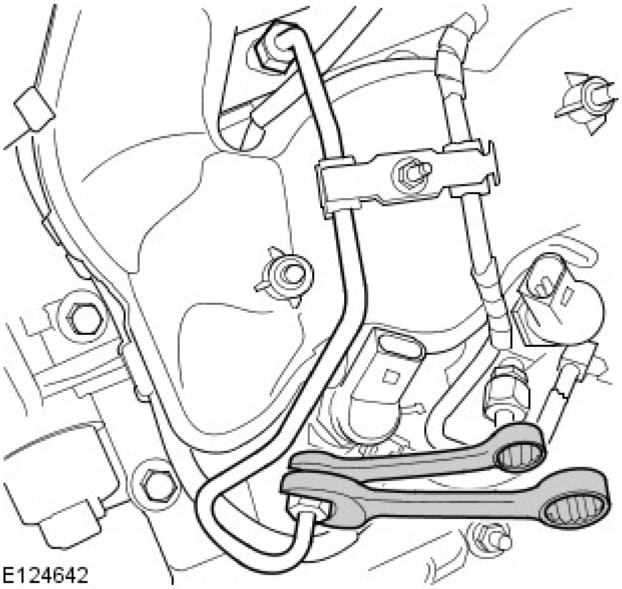


E76536

9. Disconnect the fuel injector electrical connectors.

- Release the fuel charging wiring harness.

10. Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel injectors and the fuel rail.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).



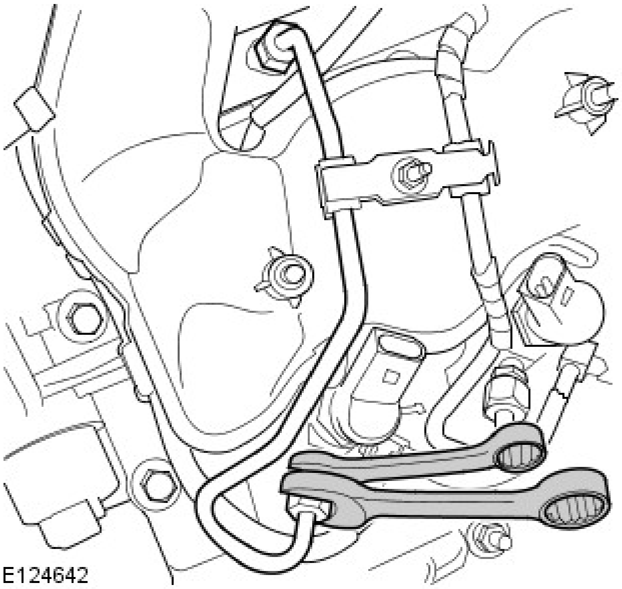
E124642

11. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.

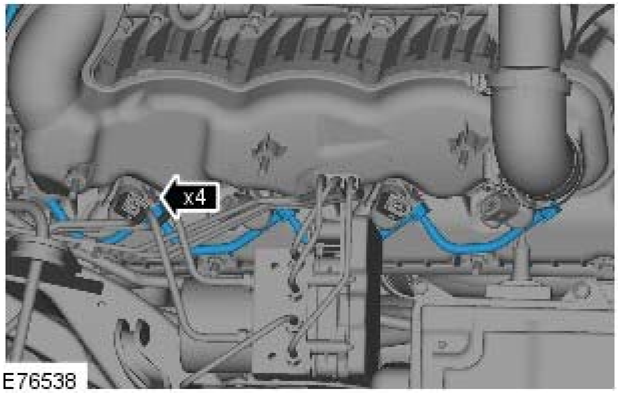


E124642

12. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

• NOTE: Right-hand shown, left-hand similar.

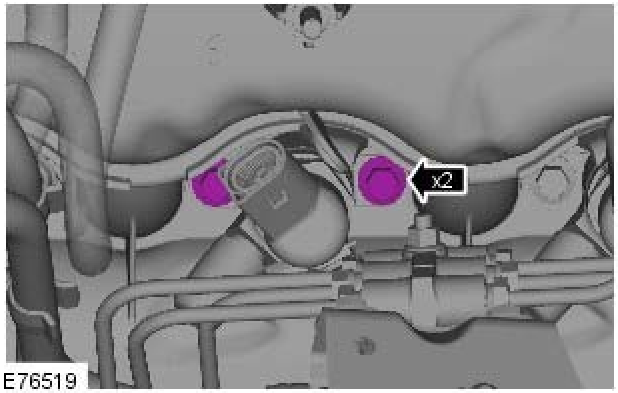
Remove and discard the high-pressure fuel supply line.



E76538

13. Disconnect the fuel return line from the fuel injector.

- Remove and discard the fuel return line clip.



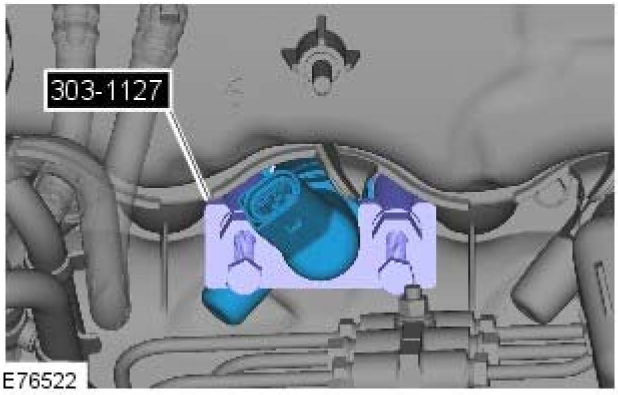
E76519

14. Remove the 2 fuel injector bolts.

15. Install the special tool studs.

16. CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

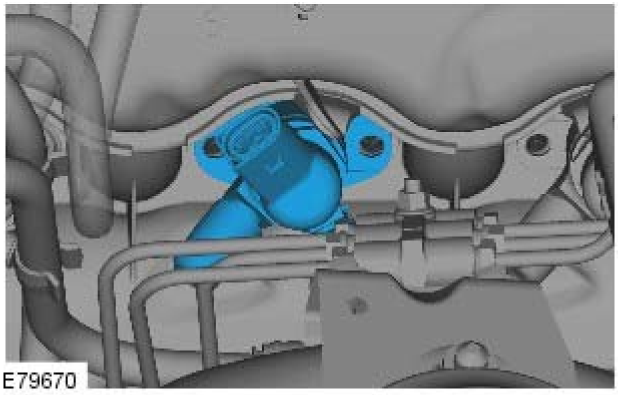
Install the special tool remover legs to the studs.



17. Install the special tool locking plate to the remover legs.

18. Release the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.



19. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the fuel injector.

- Remove and discard the fuel injector clamp.
- Remove and discard the sealing washer.

20. Remove the remaining fuel injectors.

21. ⚠ CAUTION: Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection pump until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply line, the fuel injectors and the fuel rail.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).

Installation

1. CAUTIONS:

⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

⚠ Do not use tools to install the new fuel return line clip. Failure to follow this instruction will result in damage to the clip.

Install a new fuel injector clamp.

- Install a new sealing washer.
- Install a new fuel return line clip.

2. ⚠ CAUTION: Only tighten the bolts finger-tight at this stage.

• NOTE: Remove and discard the blanking caps.

Install the fuel injector.

- Loosely install the bolts.

3. ⚠ CAUTION: Make sure the fuel return line clip is correctly installed to the fuel injector before installing the fuel return line.

Connect the fuel return line to the fuel injector.

- Visually inspect the fuel return line O-ring seal for damage.
- Lubricate the O-ring seal with a suitable lubricant.

4. Install the remaining fuel injectors.

5. CAUTIONS:

⚠ Maintain pressure on the high-pressure fuel supply line to keep the olives in contact with the fuel injectors and the fuel rail cones while installing unions.

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the high-pressure fuel supply line and allow foreign matter to enter the fuel injection system.

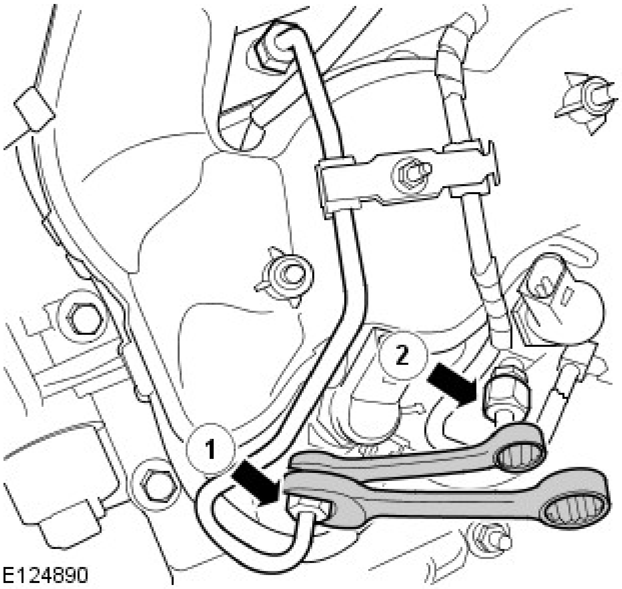
⚠ Only tighten the unions finger-tight at this stage.

• NOTE: Remove and discard the blanking caps.

Loosely install the new high-pressure fuel supply lines.

6. Secure the fuel injectors.

- Evenly and progressively tighten the bolts to 10 Nm (7 lb.ft).



7. CAUTIONS:

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Caution | Fuel | Maintain pressure on the high-pressure fuel supply lines to keep the olives in contact with the fuel rail and the fuel injector cones while installing unions.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel supply lines.

- Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.
- Tighten the high-pressure fuel supply line in the shown sequence.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 35 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 35 Nm.

8. Connect the fuel injector electrical connectors.

- Secure the fuel charging wiring harness.

9. Install the fuel line shield.

- Tighten the nuts to 10 Nm (7 lb.ft).

10. Secure the coolant lines.

- Tighten the bolt.
- Tighten the nuts.

11. NOTE: Remove and discard the blanking caps.

Install the A/C lines.

- Install new O-ring seals.
- Tighten the bolt.
- Attach the clamp.
- Tighten the nut.

12. NOTE: Remove and discard the blanking caps.

Connect the high and low-pressure A/C lines.

- Install new O-ring seals.
- Tighten the bolts.

13. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

14. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

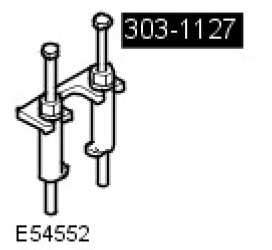
15. Install the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 17-Aug-2011

Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Injectors RH

Removal and Installation

Special Tool(s)	
	Remover - Fuel Injector 303-1127

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1700 bar (24,656 lb-sq-in). Failure to follow this instruction may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

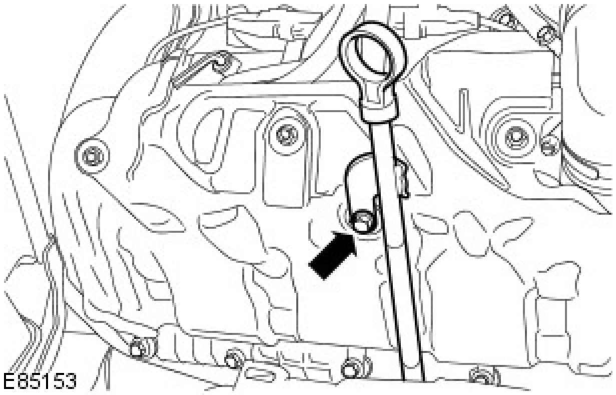
⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠CAUTION: Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

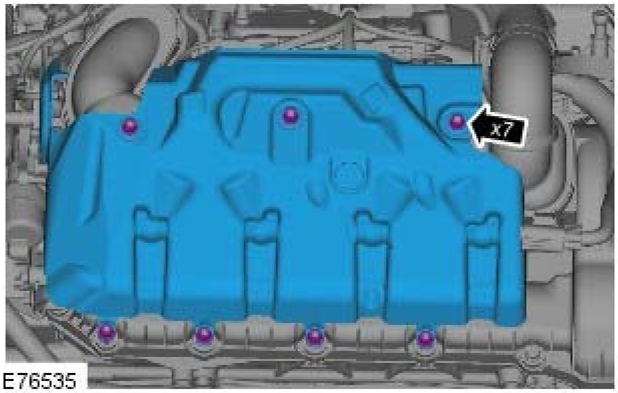
3. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).



4. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

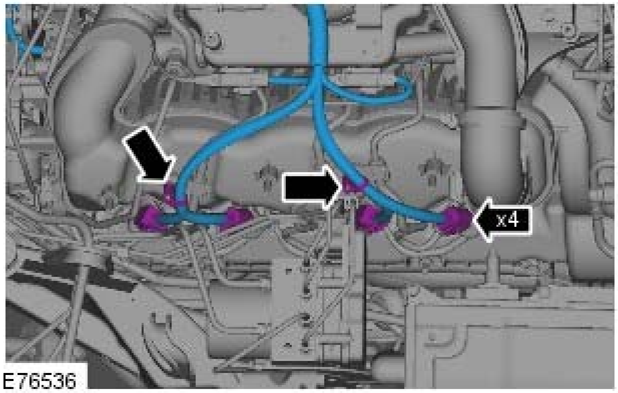
Remove the oil level indicator and upper oil level indicator tube.

- Remove the bolt.
- Remove and discard the 2 O-ring seals.



5. Remove the fuel line shield.

- Remove the 7 nuts.



6. Disconnect the fuel injector electrical connectors.

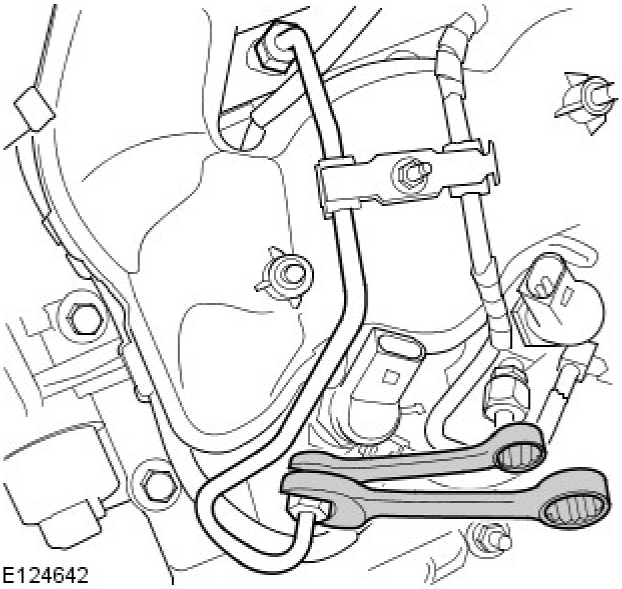
- Release the fuel charging wiring harness.

7. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel pump and fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel injectors and the fuel rail.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).



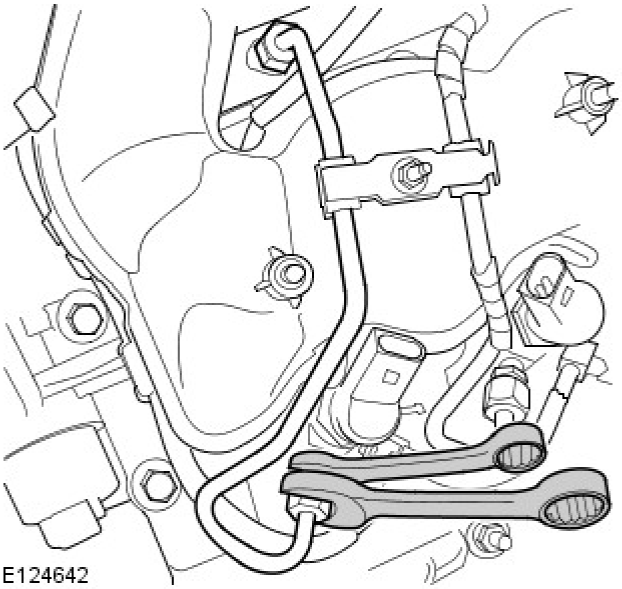
E124642

8. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.

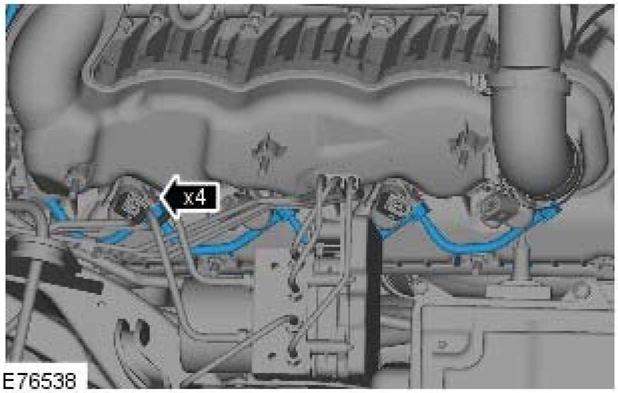


E124642

9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

• NOTE: Right-hand shown, left-hand similar.

Remove and discard the high-pressure fuel supply line.

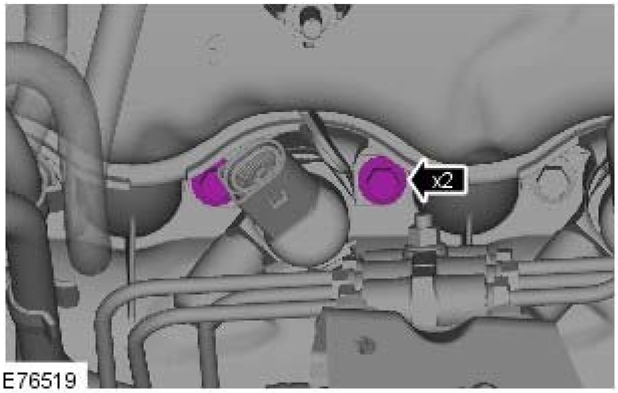


E76538

10. Disconnect the fuel return line from the fuel injector.

- Remove and discard the fuel return line clip.

11. Remove the 2 fuel injector bolts.

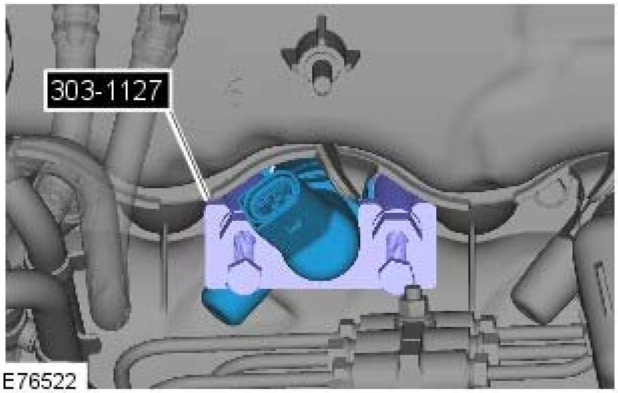


12. Install the special tool studs.

13. ⚠ CAUTION: Make sure the fuel injector remover legs are correctly engaged to the fuel injector. Failure to follow this instruction may result in damage to the component.

Install the special tool remover legs to the studs.

14. Install the special tool locking plate to the remover legs.



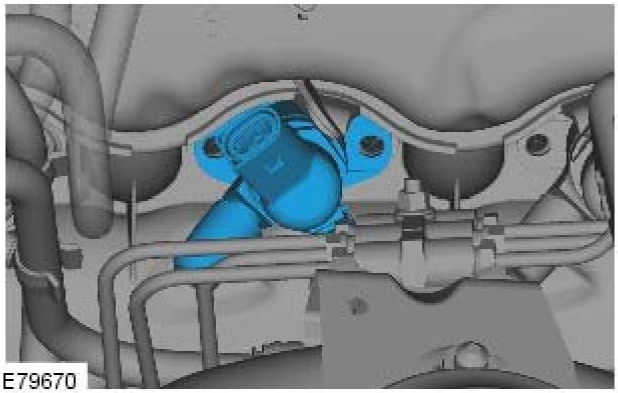
15. Release the fuel injector.

- Rotate the special tool bolts evenly, in a clockwise direction.
- Remove the special tool.

16. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the fuel injector.

- Remove and discard the fuel injector clamp.
- Remove and discard the sealing washer.



17. Remove the remaining fuel injectors.

Installation

1. CAUTIONS:

⚠ Do not disassemble the fuel injectors or clean the nozzles, even with an ultrasonic cleaner. Always install new fuel injectors when required.

⚠ Do not use tools to install the new fuel return line clip. Failure to follow this instruction will result in damage to the clip.

Install a new fuel injector clamp.

- Install a new sealing washer.
- Install a new fuel return line clip.

2. ⚠ CAUTION: Only tighten the bolts finger-tight at this stage.

• NOTE: Remove and discard the blanking caps.

Install the fuel injector.

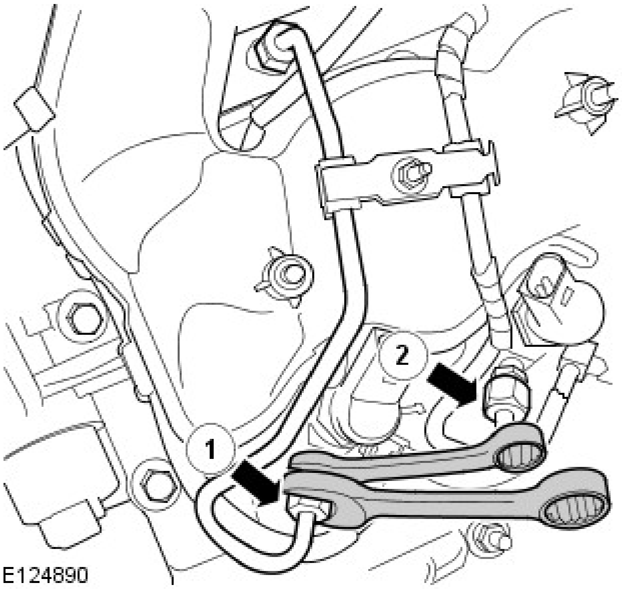
- Loosely install the bolts.

3. Install the remaining fuel injectors.

4. ⚠ CAUTION: Make sure the fuel return line clip is correctly installed to the fuel injector before installing the return line.

Connect the fuel return line to the fuel injector.

- Visually inspect the fuel return line O-ring seal for damage.
- Lubricate the O-ring seal with petroleum jelly.



5. CAUTIONS:

⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Caution | Fuel | Maintain pressure on the high-pressure fuel supply lines to keep the olives in contact with the fuel rail and the fuel injector cones while installing unions.

• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel supply lines.

- Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.
- Tighten the high-pressure fuel supply line in the shown sequence.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 35 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 35 Nm.

6. Connect the fuel injector electrical connectors.

- Attach the fuel charging wiring harness.

7. Install the fuel line shield.

- Tighten the nuts to 10 Nm (7 lb.ft).

8. ⚠ CAUTION: Make sure the upper oil level indicator tube nut is not damaged, replace the nut as required. Failure to follow this instruction may result in damage to the vehicle.

• NOTE: Remove and discard the blanking caps.

Install the oil level indicator and upper oil level indicator tube.

- Clean the components mating faces.
- Install new O-ring seals.
- Tighten the bolt.

9. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

10. Install the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 19-Aug-2011

Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Pump

Removal and Installation

Removal

- WARNINGS:

The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

CAUTION: Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

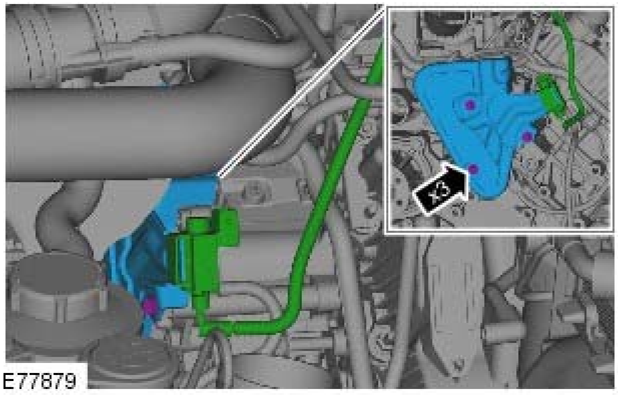
2. Raise and support the vehicle.

3. Remove the intake manifold.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

4. Remove the cooling fan assembly.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

5. Remove the fuel pump shield.

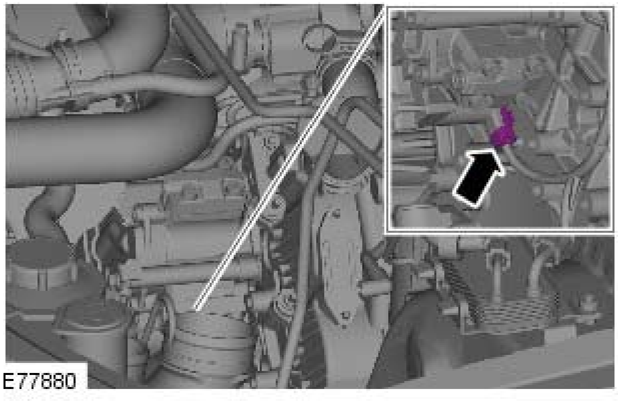
- Release the vacuum solenoid.
- Remove the 3 bolts.



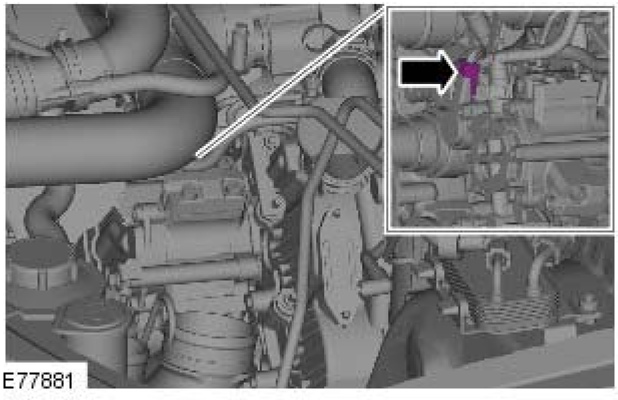
6. Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel rails and the fuel injection pump.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel,

General Procedures).

7. Disconnect the fuel metering valve electrical connector.

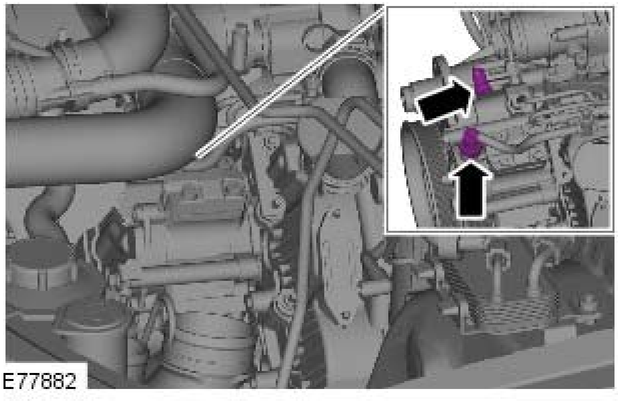

E77880

8. Disconnect the fuel injection control pressure sensor electrical connector.


E77881

9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the low-pressure fuel lines.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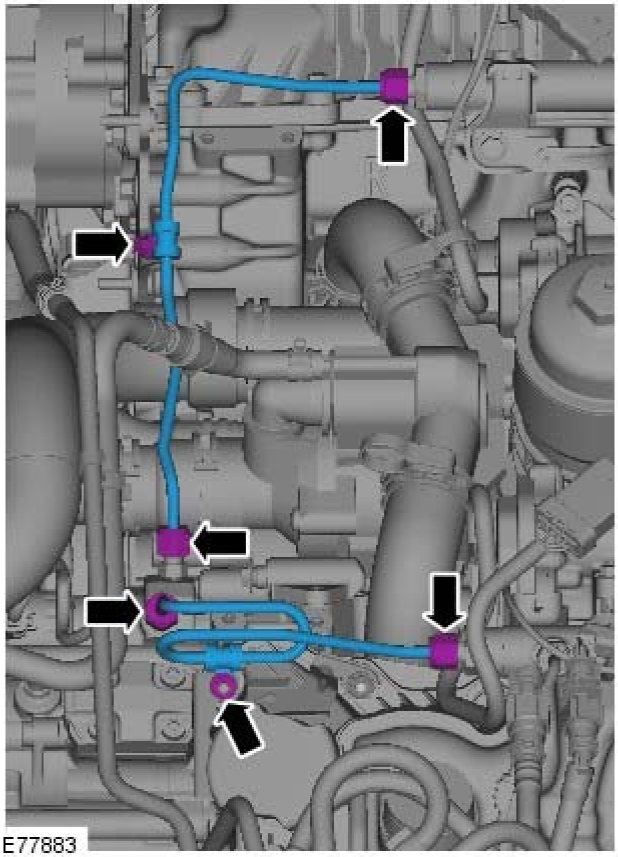
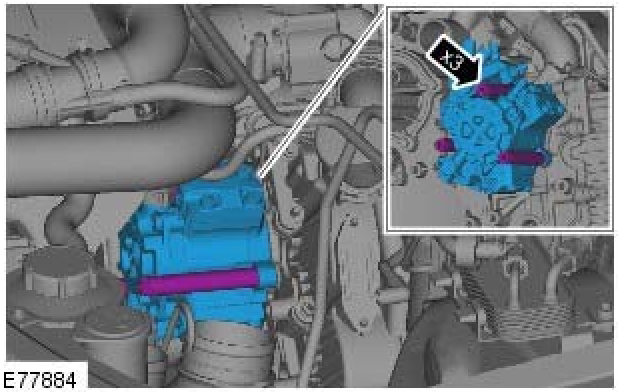


E77883

10. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the high-pressure fuel supply lines.

- Release the vacuum hose.
- Remove the 2 nuts.



E77884

11. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the fuel pump.

- Remove the 3 bolts.
- Remove and discard the gasket.

Installation

1. Install the fuel pump.

- Clean the component mating faces.
- Install a new gasket.
- Apply loctite 572 to the fuel pump bolt threads.
- Loosely install the bolts.

2. Loosely install the new high-pressure fuel supply lines.

3. Secure the fuel pump.

- Tighten the bolts to 23 Nm (17 lb.ft).

4. NOTE: Remove and discard the blanking caps.

Secure the high-pressure fuel supply lines.

- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rails to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line unions at the fuel pump to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line unions at the fuel rail to 35 Nm (26 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line unions at the fuel pump to 35 Nm (26 lb.ft).
- Secure the vacuum hose.

5. Secure the high-pressure fuel supply line clips.

- Tighten the bolts to 10 Nm (7 lb.ft).

6. NOTE: Remove and discard the blanking caps.

Connect the low-pressure fuel lines.

7. Connect the fuel injection control pressure sensor electrical connector.

8. Connect the fuel metering valve electrical connector.

9. Install the fuel pump shield.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the vacuum solenoid.

10. Install the intake manifold.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

11. Install the cooling fan assembly.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

12. Carry out the low-pressure fuel system bleeding.
For additional information, refer to: Low-Pressure Fuel System Bleeding - TDV8 3.6L Diesel (310-00 Fuel System - General Information, General Procedures).

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Rail LH

Removal and Installation

Removal

- WARNINGS:

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1700 bar (24,656 lb-sq-in). Failure to follow this instruction may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

- CAUTIONS:

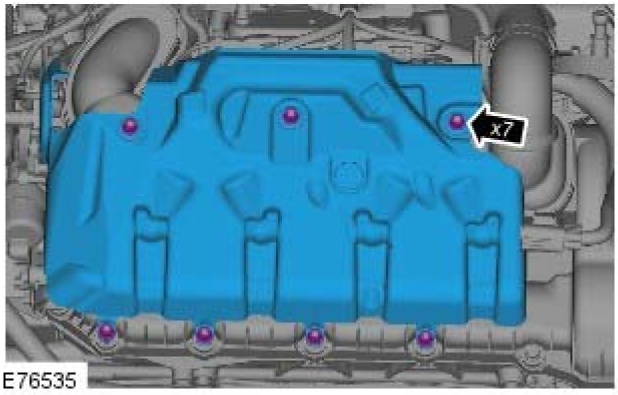
⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not disconnect the fuel injector electrical connectors with the engine running. Failure to follow this instruction may result in serious damage to the engine.

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the intake manifold plenum chamber.
   For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).



3. Remove the LH fuel line shield.

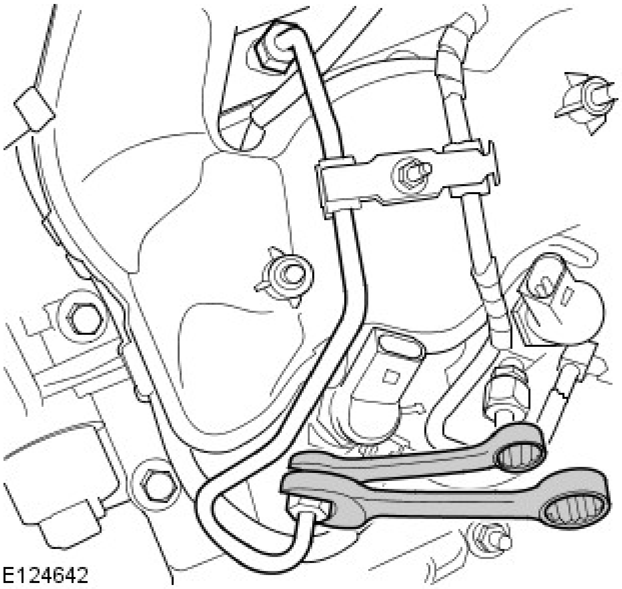
- Release the fuel lines.
- Remove the 7 nuts.

4. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel pump and fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel rail supply lines, the fuel injectors, the fuel rail and the fuel pump.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).

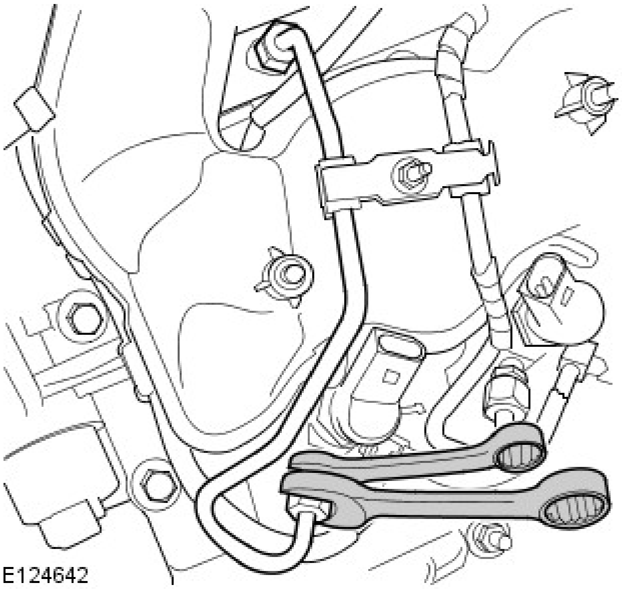


5. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

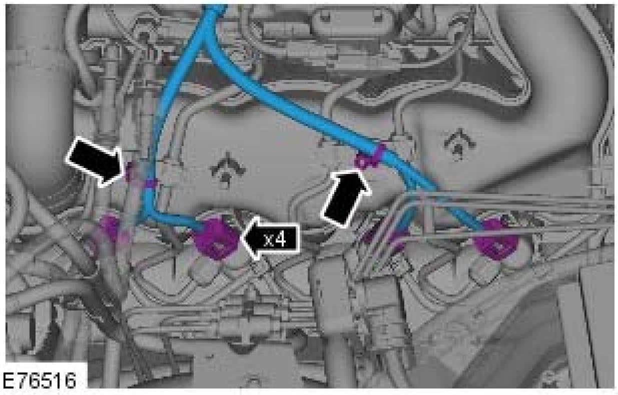
Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.



6. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

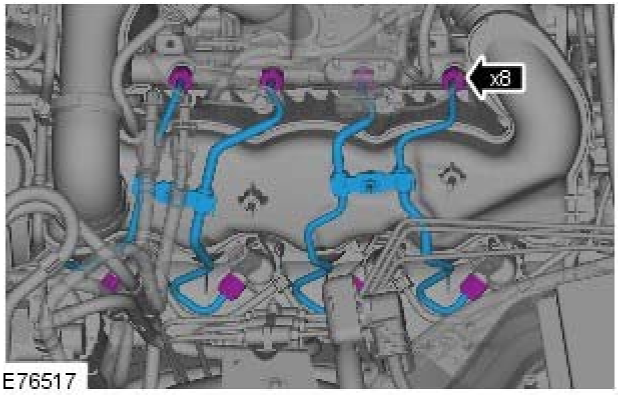
• NOTE: Right-hand shown, left-hand similar.

Remove and discard the high-pressure fuel rail supply line.



7. Disconnect the fuel injector electrical connectors.

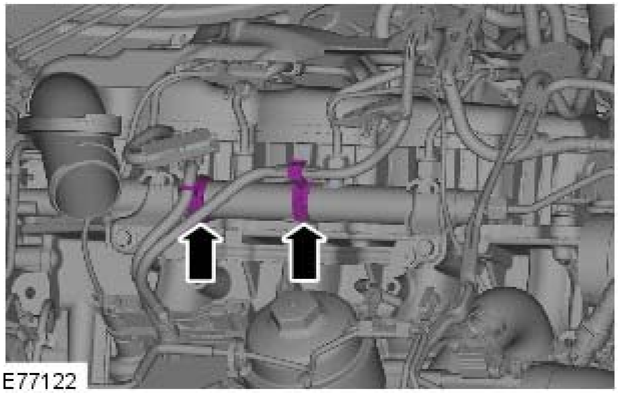
- Release the fuel charging wiring harness.



8. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

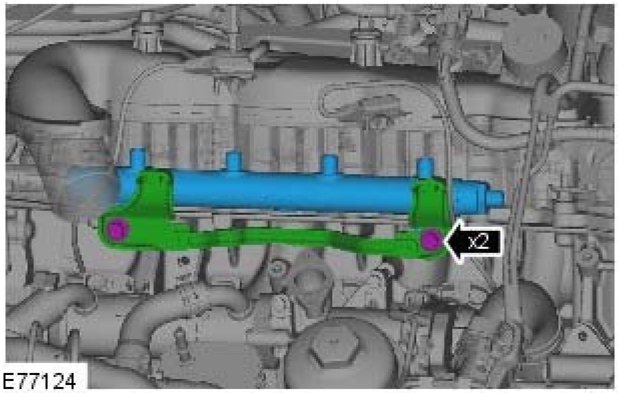
Remove and discard the high-pressure fuel supply lines.

9. Release the glow plug wiring harness.



10. Remove the fuel rail.

- Remove the 2 bolts.
- Remove the bracket.



Installation

1. ⚠ CAUTION: Only tighten the bolts finger-tight at this stage.

Install the fuel rail.

- Install the bracket.
- Loosely install the bolts.

2. CAUTIONS:

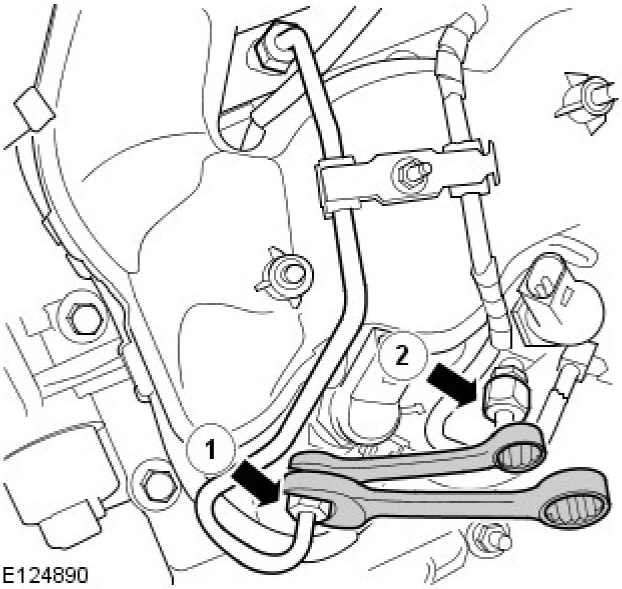
⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.

⚠ Maintain pressure on the high-pressure fuel supply lines to keep the olives in contact with the fuel rail and the fuel injector cones while installing unions.

• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel injector supply lines.

- Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.
- Tighten the high-pressure fuel supply line in the shown sequence.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.



- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 35 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 35 Nm.

3. Secure the glow plug wiring harness.

4. Connect the fuel injector electrical connectors.

- Attach the fuel charging wiring harness.

5. Install the LH fuel line shield.

- Tighten the nuts to 10 Nm (7 lb.ft).
- Secure the fuel lines.

6. Install the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Rail RH

Removal and Installation

Removal

- WARNINGS:

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1700 bar (24,656 lb-sq-in). Failure to follow this instruction may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

- CAUTIONS:

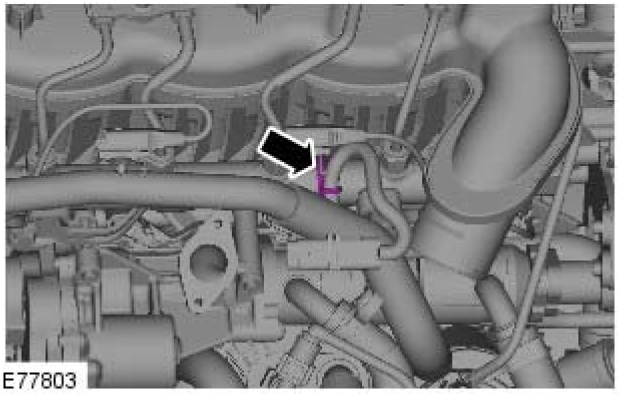
⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

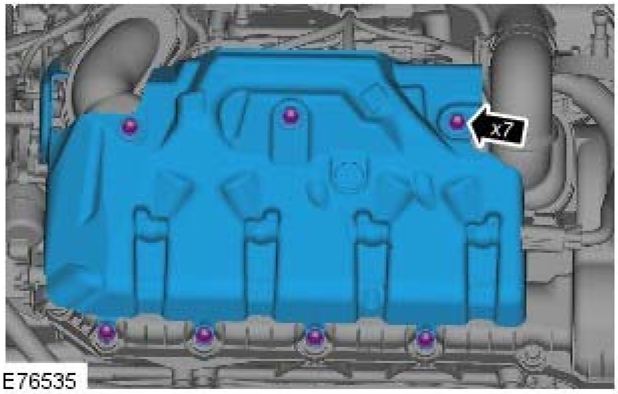
⚠ Do not disconnect the fuel injector electrical connectors with the engine running. Failure to follow this instruction may result in serious damage to the engine.

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the intake manifold plenum chamber.
   For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

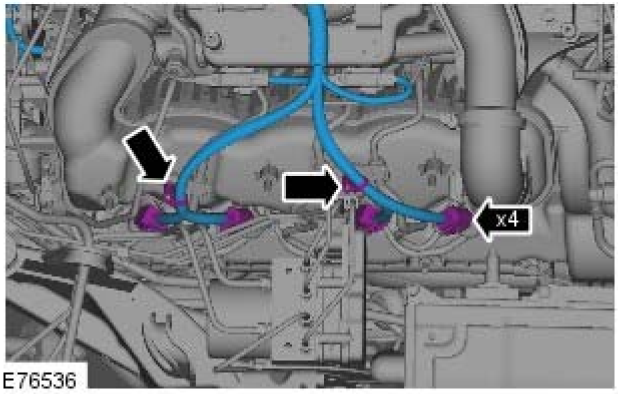


3. Release the glow plug wiring harness.



4. Remove the RH fuel line shield.

- Remove the 7 nuts.



5. Disconnect the fuel injector electrical connectors.

- Release the fuel charging wiring harness.

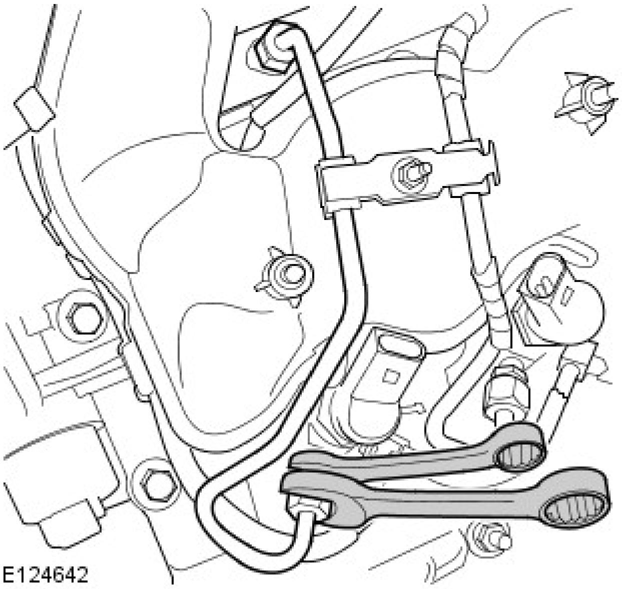
6. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel pump and fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Do not use any aggressive cleaning fluid or a wire brush to clean the fuel injector nozzle.

Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel rail supply lines, the fuel injectors, the fuel rail and the fuel pump.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel,

General Procedures).

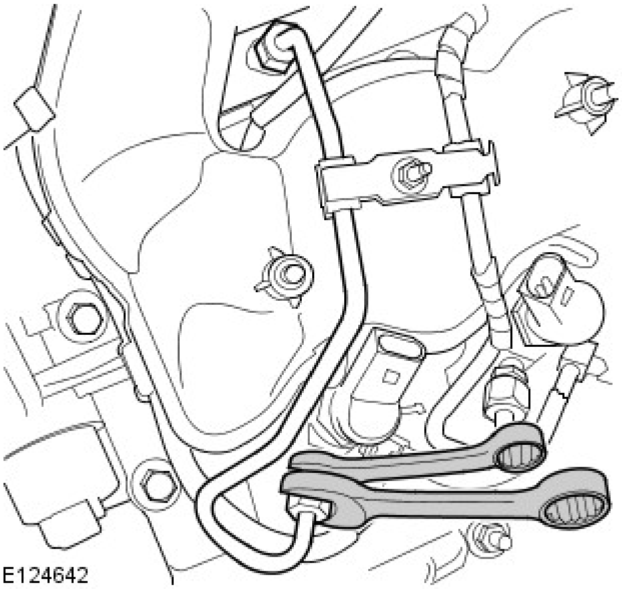

E124642

7. CAUTIONS:

⚠ Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection diverter rail until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure that the fuel injector adaptor union does not move when loosening the high-pressure fuel supply lines. Failure to follow this instruction may result in damage to the fuel injector or the fuel injector adaptor union.

Loosen the high-pressure fuel supply line from the fuel injector and fuel rail.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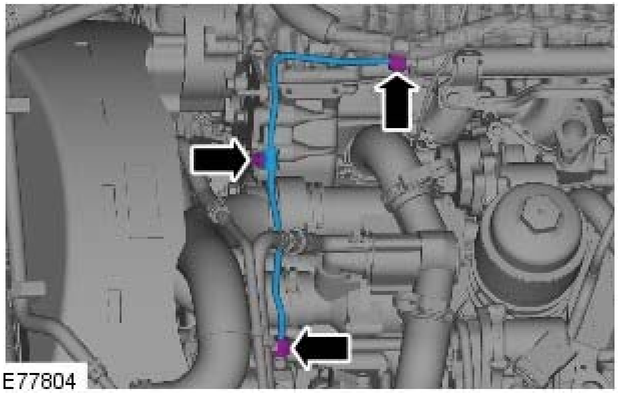
8. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

- NOTE: Right-hand shown, left-hand similar.

Remove and discard the high-pressure fuel supply line.


E77804

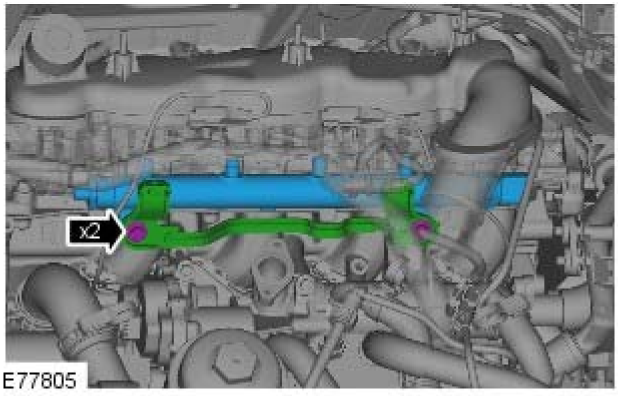
9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the high-pressure fuel rail supply line.

- Release the clip.

10. Remove the fuel rail.

- Remove the 2 bolts.
- Remove the bracket.



Installation

1. ⚠ CAUTION: Only tighten the bolts finger-tight at this stage.

Install the fuel rail.

- Install the bracket.
- Loosely install the bolts.

2. CAUTIONS:

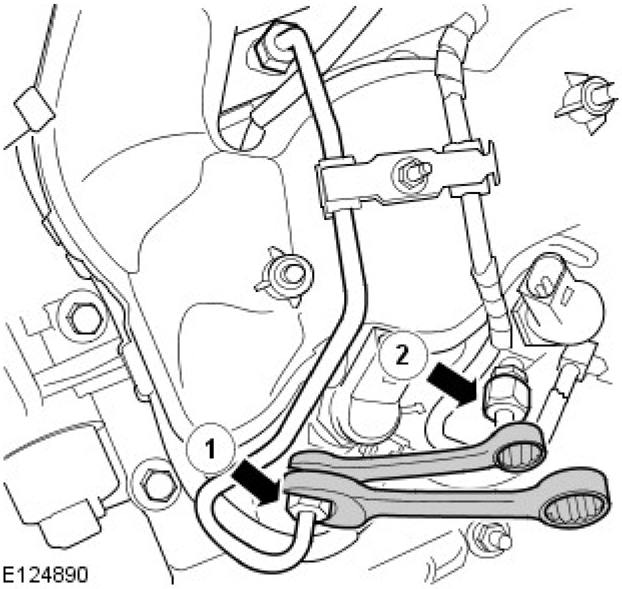
⚠ Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the high-pressure fuel supply line and allow foreign matter to enter the fuel injection system.

⚠ Maintain pressure on the high-pressure fuel supply lines to keep the olives in contact with the fuel rail and the fuel injector cones while installing unions.

• NOTE: Remove and discard the blanking caps.

Install the new high-pressure fuel supply lines.

- Install the new high-pressure fuel supply line, tighten the fuel supply line unions finger tight.
- Tighten the high-pressure fuel supply line in the shown sequence.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 15 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 15 Nm.
- Tighten the high-pressure fuel supply line union 1 to fuel injector to 35 Nm.
- Tighten the high-pressure fuel supply line union 2 to fuel rail to 35 Nm.



3. Connect the fuel injector electrical connectors.

- Attach the fuel charging wiring harness.

4. Install the RH fuel line shield.

- Tighten the nuts to 10 Nm (7 lb.ft).

5. Secure the glow plug wiring harness.

6. Install the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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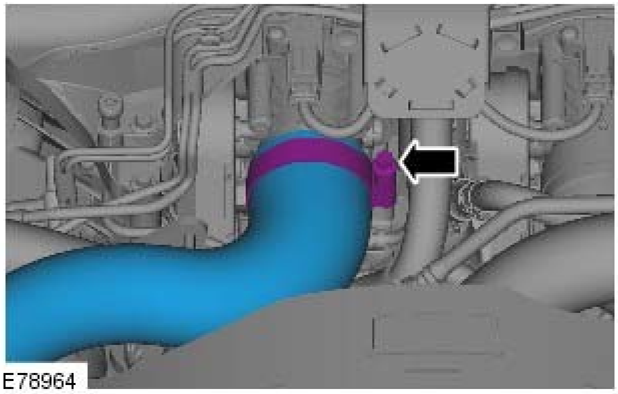
Fuel Charging and Controls - TDV8 3.6L Diesel - Throttle Body

Removal and Installation

Removal

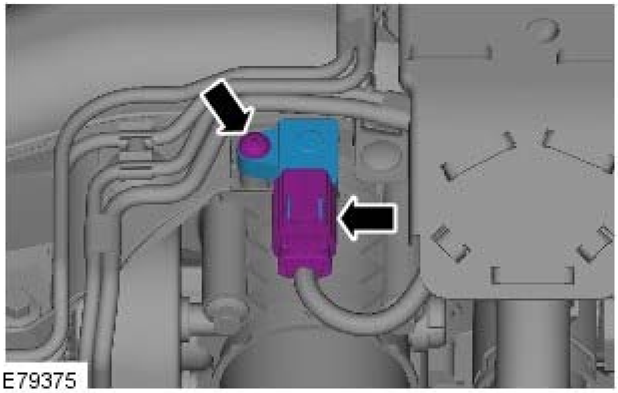
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
3. NOTE: Right-hand shown, left-hand similar.


E78964

Disconnect the charge air cooler outlet hose.

- Release the clip.

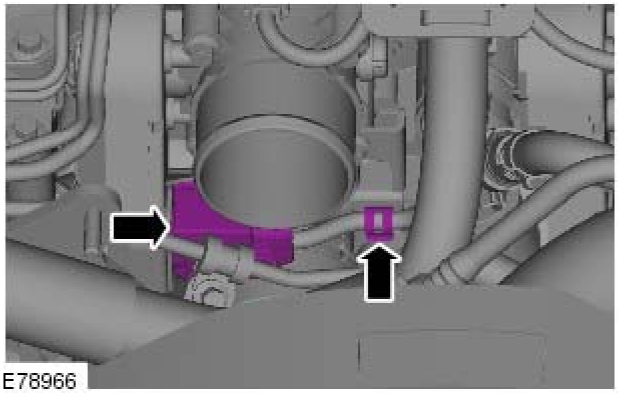
4. NOTE: RH throttle body only.


E79375

Remove the manifold absolute pressure and temperature (MAPT) sensor.

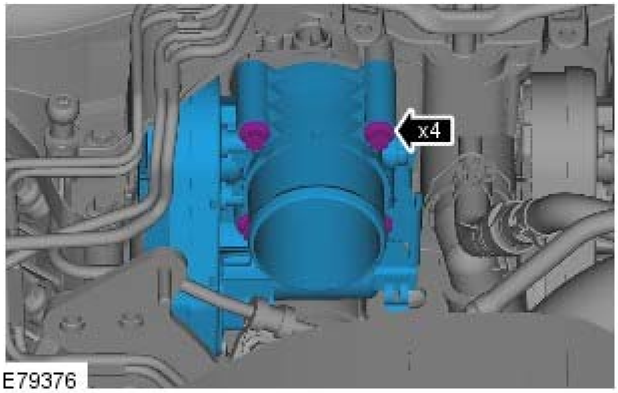
- Disconnect the electrical connector.
- Remove the screw.

5. NOTE: Right-hand shown, left-hand similar.


E78966

Disconnect the throttle body electrical connector.

6. NOTE: Right-hand shown, left-hand similar.



Remove the throttle body.

- Remove the 4 bolts.
- Remove and discard the O-ring seal.

Installation

1. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

Install the throttle body.

- Install a new O-ring seal.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Connect the throttle body electrical connector.

3. NOTE: RH throttle body only.

Install the MAPT sensor.

- Tighten the screw to 3 Nm (2 lb.ft).
- Connect the electrical connector.

4. Connect the charge air cooler outlet hose.

- Tighten the clip to 5 Nm (3.7 lb.ft).

5. Install the engine cover.

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Injection Component Cleaning

General Procedures

- WARNINGS:

Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1700 bar (24,656 lb-sq-in). Failure to follow this instruction may result in personal injury.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

- CAUTIONS:

Before using the cleaning fluid, protect all electrical components and connectors with lint-free non-flocking material.

Make sure that all parts removed from the vehicle are placed on the lint-free non-flocking material.

Make sure that any protective clothing worn is clean and made from lint-free non-flocking material.

Make sure that clean non-plated tools are used. Clean tools using a new brush that will not lose its bristles and fresh cleaning fluid, prior to starting work on the vehicle.

Use a steel topped workbench and cover it with clean, lint-free non-flocking material.

Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

- NOTE: Pneumatic vacuum gun

1. Using a new brush that will not lose its bristles, brush cleaning fluid onto the components being removed and onto the surrounding area.
2. Using a pneumatic vacuum gun, remove all traces of cleaning fluid and foreign material.
3. Dispose of any used cleaning fluid and the brush after completing the repair.

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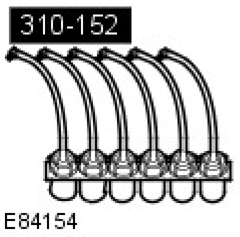
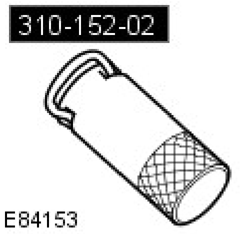
Fuel Charging and Controls - TDV8 3.6L Diesel - Fuel Injector Balance and Spill Check

General Procedures

Special Tool(s)	
	Fuel Injector Spill Test Kit 310-152
	Fuel Return Blanking Caps 310-152-02

- WARNINGS:

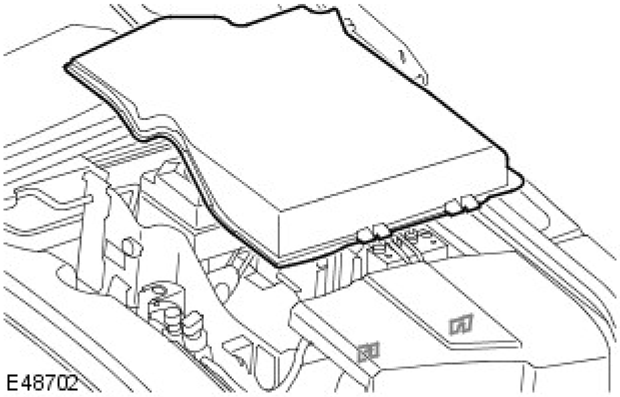
Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

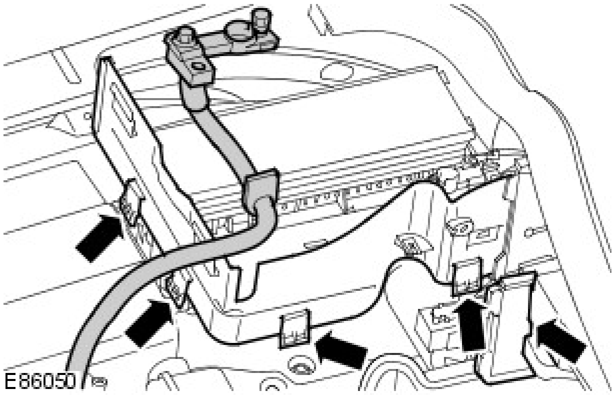
The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

CAUTION: Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

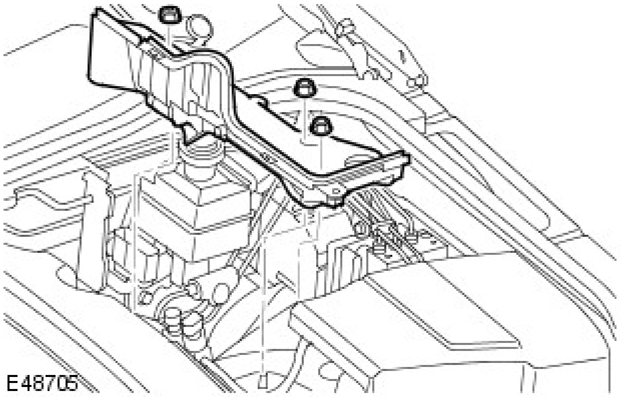
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the driver side battery compartment lid.
   - Release the 2 clips.





4. Remove the driver side battery compartment side wall.

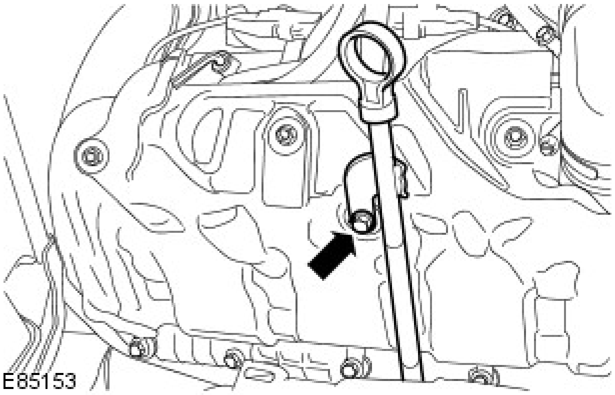
- Release the 4 clips.



5. Remove the driver side battery compartment side wall extension.

6. Remove the driver side battery compartment tray.

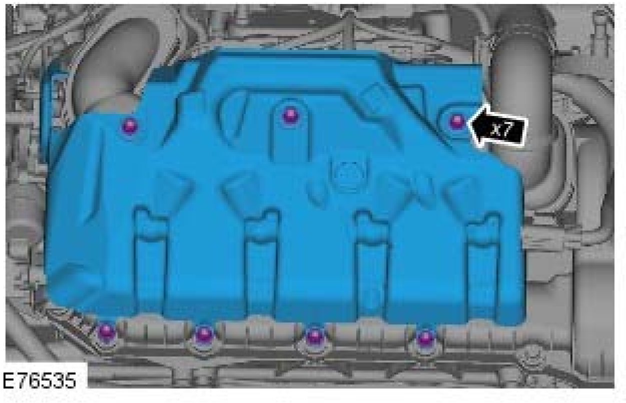
- Remove the 3 nuts.



7. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator and upper oil level indicator tube.

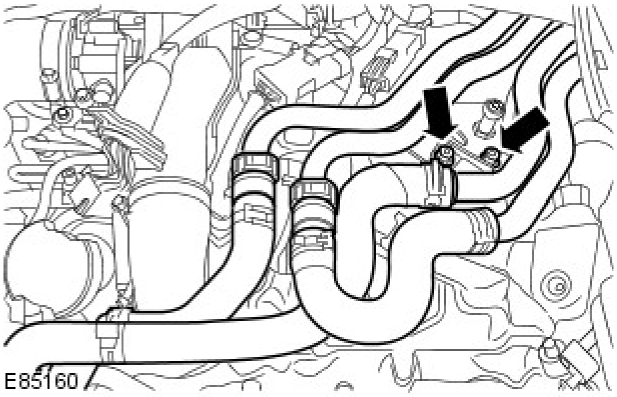
- Remove the bolt.
- Remove and discard the 2 O-ring seals.



8. Remove the RH fuel line shield.

- Remove the 7 nuts.

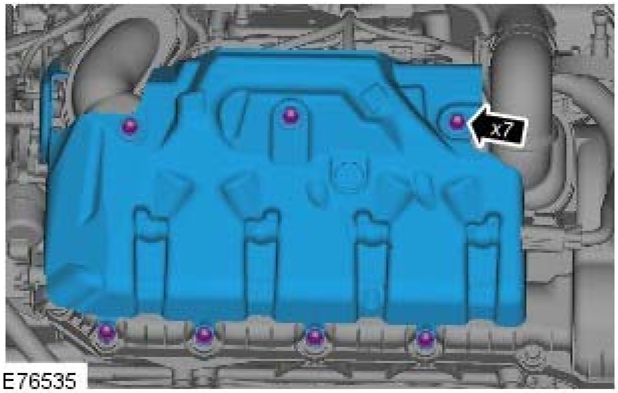
9. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).



10. Release the coolant lines.

- Remove the 2 nuts.

11. Remove the oil filler cap.



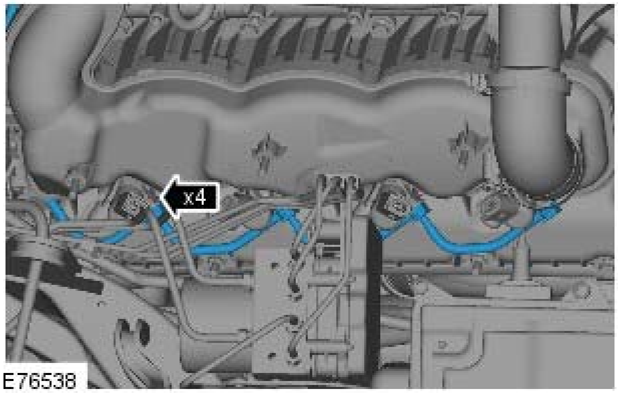
12. NOTE: RH illustration shown, LH is similar

Remove the LH fuel line shield.

- Remove the 7 nuts.

13. Install the oil filler cap.

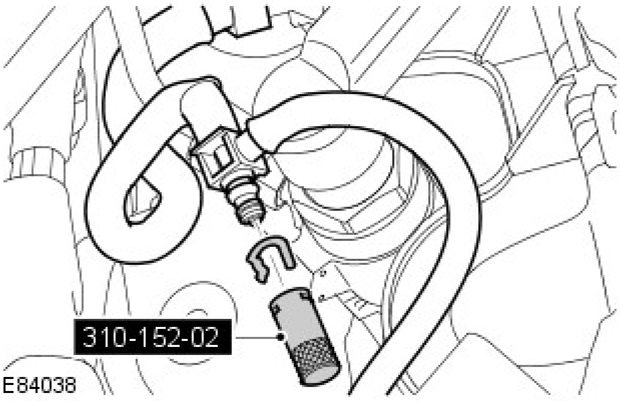
14. Using the pneumatic vacuum gun, vacuum foreign material from the high-pressure fuel supply lines, the fuel injectors and the fuel rail.
For additional information, refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, General Procedures).



15. WARNING: The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

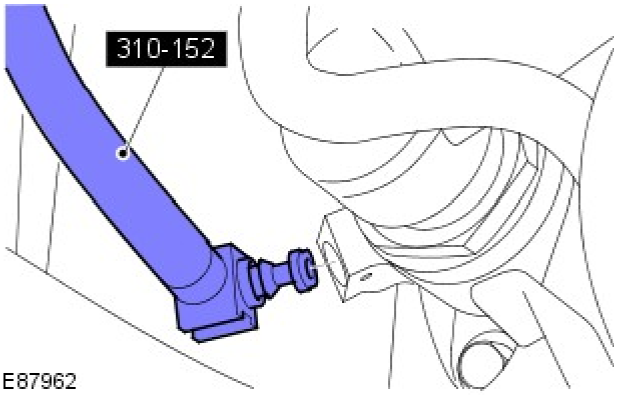
Disconnect the fuel return line from the LH bank fuel injectors.

- Remove and discard the 4 fuel return line clips.



16. Blank-off each of the fuel return line ends with blanking caps from the kit.

- Install the clips.



17. Connect a spill bottle line to each of the injectors.

18. Install the battery tray.

19. Install the battery.

20. Connect the battery positive cable.

- Tighten the battery positive lead nut to 10 Nm (7 lb.ft).

21. Connect the battery ground cable.

- Tighten the battery positive lead nut to 10 Nm (7 lb.ft).

22. Connect the Land Rover approved diagnostic system to the vehicle.

23. Run cylinder balance test from 'live data'.

- Injector balance limits are between 960 and 1.4 k.
- Note any injector that is outside of these figures (a figure below the limit will usually mean a reduction in fuelling, and a figure above will result in an increase to fuelling).

24. Start the engine and allow to run for 2 minutes, stop the engine.

25. ⚠ CAUTION: Do not reject any of the injectors if the spill rates are even but outside of the correct rates shown. The spill rate can be affected by varying fuel rail pressure and fuel temperature. Only suspect a faulty injector(s) if the amount of fuel collected is significantly higher or lower than the others.

• NOTE: The figures shown are to be used as a guide only.

• NOTE: A faulty injector could fill a bottle within 2 minutes.

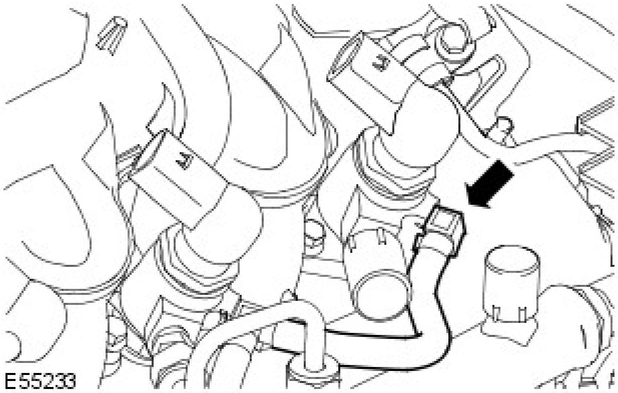
Observe the spill into bottles, if any bottle starts to fill up quickly stop engine to prevent further spillage.

26. Disconnect the battery ground cable.

27. Disconnect the spill bottle lines from the injectors.

28. Remove the blanking caps from the fuel return line ends.

- Remove the clips.



29. ⚠ CAUTION: Make sure the fuel return line clip is correctly installed to the fuel injector before installing the fuel return line.

Connect the fuel return line to the fuel injectors.

- Install new fuel return line clips.
- Visually inspect the fuel return line O-ring seals for damage.
- Apply a light coating of petroleum jelly to the fuel return line O-ring seals.

30. Carry out steps 14 to 17, step 21 and steps 23 to 29 on the RH bank injectors.

31. Disconnect the battery positive cable.

32. Remove the battery.

33. Remove the battery tray.

34. Remove the oil filler cap.

- Remove and discard the O-ring seal.

35. Install the LH fuel line shield.

- Tighten the nuts to 5 Nm (4 lb.ft).

36. Install the oil filler cap.

- Install a new O-ring seal.

37. Secure the coolant lines.

- Tighten the nuts to 10 Nm (7 lb.ft).

38. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

39. Install the RH fuel line shield.

- Tighten the nuts to 5 Nm (4 lb.ft).

40. NOTE: Remove and discard the blanking caps.

Install the oil level indicator and upper oil level indicator tube.

- Clean the components mating faces.
- Install new O-ring seals.
- Tighten the bolt.

41. Install the driver side battery compartment tray.

- Tighten the nuts to 12 Nm (9 lb.ft).

42. Install the driver side battery compartment side wall.

- Secure the clips.

43. Install the driver side battery compartment side wall extension.
44. Install the driver side battery compartment lid.
    - Secure the clips.
45. Install the engine cover.
    For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
46. Connect the battery ground cable.
    For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
47. Disconnect the Land Rover approved diagnostic system from the vehicle.

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Fuel Charging and Controls - TDV8 3.6L Diesel -

Lubricants, Fluids, Sealers and Adhesives

Description	Specification
Apply loctite to the fuel pump bolt threads	Loctite 572

Torque Specifications

Description	Nm	lb-ft
Fuel injector bolts	10	7
Fuel line shield nuts	5	4
Fuel pump bolts	23	17
Fuel pump crash protector bolts	23	17
Fuel pump shield bolts	10	7
Fuel rail bolts	23	17
High-pressure fuel supply line unions	A	–
High-pressure fuel supply line clamps	10	7

A = Refer to the procedure for the correct torque sequence

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Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel -

Torque Specifications

Description	Nm	lb-ft
Oil supply tube union to turbocharger retaining bolt	30	22
Oil supply tube to cylinder block retaining bolt	10	7
Oil return tube to turbocharger retaining bolts	10	7
Oil return tube to cylinder block retaining bolt	10	7
Exhaust gas recirculation (EGR) valve to cylinder head retaining bolts	10	7
EGR cooler mount bracket retaining bolt	10	7
EGR valve tube to exhaust manifold retaining bolts	10	7
* Turbocharger to exhaust manifold retaining nuts	24	18
Turbocharger heatshield retaining bolts	10	7
* Exhaust manifold retaining studs	13	10
*+ Exhaust manifold retaining nuts	24	18
Differential mounting bracket heat shield bolts	10	7
Exhaust heat shield bolts	10	7
Exhaust heat shield nut	10	7
Oil level indicator tube retaining bolt	10	7
Turbocharger securing bracket stud	13	10
Turbocharger securing bracket bolts	32	24
Turbocharger to transmission support bracket nut	25	18
Turbocharger to transmission support bracket bolts	48	35

+ Nuts must be tightened in sequence

*** New nuts/studs must be installed**

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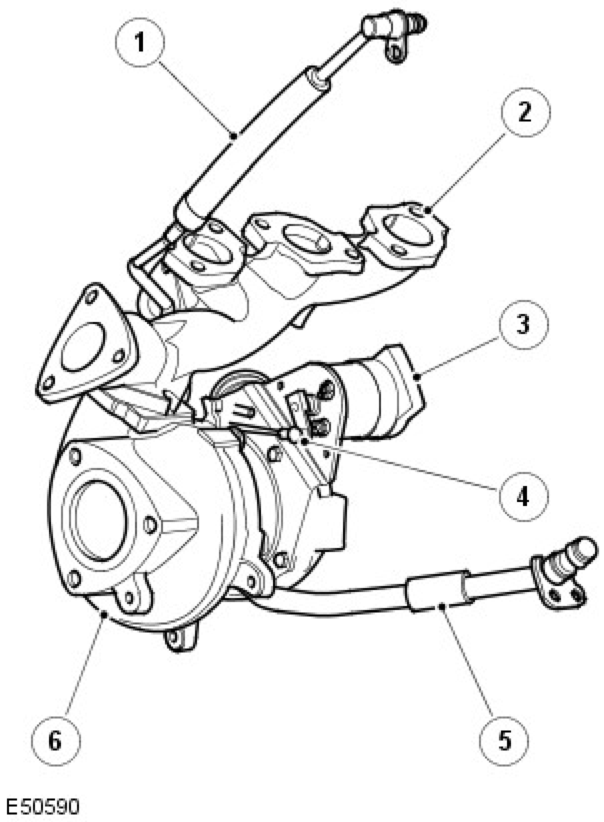
Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel - Turbocharger

Description and Operation



Item	Part Number	Description
1	-	Oil feed pipe
2	-	LH exhaust manifold
3	-	Actuator motor
4	-	Actuator lever
5	-	Oil return pipe
6	-	Turbocharger

The variable vane turbocharger, fitted to the LH exhaust manifold of the TdV6 engine, makes it possible to vary the exhaust gas flow of the turbine, dependent on engine operation. This improves the power transfer to the turbine wheel and compressor, particularly at low engine speeds, thus increasing the boost pressure. The guide vanes are opened progressively as the engine speed increases so that the power transfer always remains in balance with the required charger speed and the required boost pressure level. Variable vanes facilitate better use of the exhaust gas energy so as to further improve the efficiency of the turbocharger and thus of the engine, compared to the more conventional 'wastegate control'.

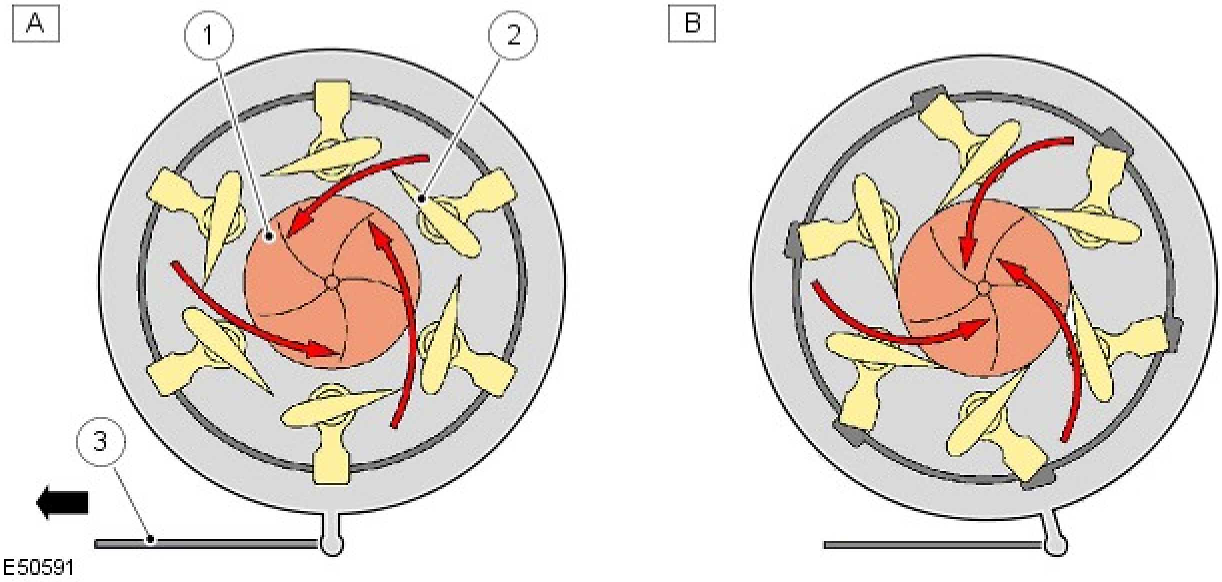
Advantages:

- High torque at both high and low engine speeds
- Continuous and optimum adjustment for all engine speeds
- No wastegate valve required as exhaust energy is better utilised. Less back-pressure in conjunction with same compressor work
- Low thermal and mechanical load improves engine power output
- Low emissions
- Optimised fuel consumption over the entire engine speed range

The DC rotary actuator motor operates a drive shaft. The drive shaft is connected to the vanes by an actuating lever. Adjustment of the vanes is achieved by moving the actuating lever. When the drive shaft is turned, a signal is created at the end of the drive shaft; this feedback signal is used to determine the angular position of the vanes. This information is transmitted to the Engine Control Module (ECM).

There is a temperature sensor in the control unit, which drives the stepper motor to a safe position (vanes fully opened) if the maximum temperature is exceeded. The ECM detects any malfunctions in the stepper motor and generates Diagnostic Trouble

Codes (DTC).



Item	Part Number	Description
A	-	Closed (fast)
B	-	Open (slow), default position
1	-	Turbine
2	-	Vanes
3	-	Actuator lever

At low engine speeds, because of the flat setting of the vanes, the relatively low flow of exhaust gases are accelerated and routed in such a way that they meet the vanes of the turbine wheel at the outermost edge. Consequently, a high torque is produced at the turbine wheel, and a high turbine speed is therefore achieved.

At high engine speeds the vanes are progressively opened, so that a large flow of exhaust gas is delayed and is directed more and more towards the centre of the turbine wheel.

The torque at the turbine wheel is artificially lowered. In this way the turbine speed, and therefore the air quantity required by the engine, are matched to engine speed. Consequently, the boost pressure is approximately constant over the whole engine speed range.

The operating parameters are controlled electronically by the ECM using powertrain sensors and driver inputs.
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

The turbocharger is designed for fail-safe operation. If a fault occurs regarding the control of the unit, the vanes default to the fully open position so as to produce minimum boost.

Published: 11-May-2011

Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel - Turbocharger

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the relevant section in the workshop manual.

Inspection and verification

- WARNINGS:

⚠ The following tests may involve working in close proximity to hot components. Make sure adequate protection is used. Failure to follow this instruction may result in personal injury.

⚠ The turbocharger can continue to rotate after the engine has stopped. Do not attempt to check the turbocharger until one minute has elapsed since the engine was switched off. Failure to follow this instruction may result in personal injury.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection chart

Mechanical	Electrical
● Intake air system ● Hose(s)/hose connections ● Turbocharger ● General engine condition.	● Circuit(s) ● Turbocharger actuator ● Engine control module (ECM) ● Electrical connections and harnesses

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible source	Action
Poor performance	● Low/Contaminated fuel ● Restricted air intake system ● General engine condition ● ECM failure	Check the fuel level and condition. Check the air intake for restriction. Check the engine condition, compressions, etc. Check for DTCs. Refer to the warranty policy and procedures manual if an ECM is suspect.
No boost	● Electrical connections and harnesses ● Restricted air intake system ● Charge air cooler restricted/leaking ● Turbocharger actuator failure ● Turbocharger failure ● ECM failure	Check the electrical connections and harnesses. Check the air intake for restriction/leakage (see visual inspection). For air intake checks. Check the turbocharger actuator and circuits. Refer to the electrical guides. Check the turbocharger mechanical condition. Refer to the warranty policy and procedures manual if an ECM is suspect.
No boost/excessive noise	● Turbocharger failure	Disconnect the turbocharger intake and outlet pipework and turn the turbocharger by hand. Any roughness indicates a fault. Check any up and down movement in the turbocharger shaft. Excessive movement indicates a fault. If in doubt, compare the suspect unit with a new turbocharger.

DTC index

- NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to

the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of powertrain DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Condition	Possible causes	Action
P004500	Turbocharger/Supercharger Boost Control A Circuit / Open	● Variable geometry turbocharger (VGT) actuator circuit high resistance ● VGT actuator circuit short circuit to ground ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P004600	Turbocharger/Supercharger Boost Control A Circuit Range/Performance	● Variable geometry turbocharger (VGT) actuator circuit high resistance ● VGT actuator circuit short circuit to ground ● VGT actuator circuit short circuit to power ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P004700	Turbocharger/Supercharger Boost Control A Circuit Low	● Variable geometry turbocharger (VGT) actuator circuit high resistance ● VGT actuator circuit short circuit to ground ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P004800	Turbocharger/Supercharger Boost Control A Circuit High	● Variable geometry turbocharger (VGT) actuator circuit short circuit to power ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P023400	Turbocharger/Supercharger A Overboost Condition	● Air leakage ● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure ● Exhaust gas recirculation (EGR) fault ● VGT actuator fault	Refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. For EGR valve tests, refer to the relevant workshop manual section. Check for DTCs indicating EGR or VGT actuator faults. Refer to the warranty policy and procedures manual if a module is suspect.
P029900	Turbocharger/Supercharger A Underboost Condition	● Air leakage post turbocharger ● MAP sensor circuit high resistance ● MAP sensor circuit	Refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. For EGR valve tests, refer to the relevant workshop manual section. Check for DTCs indicating EGR or VGT actuator faults. Refer to the warranty policy and procedures manual if a

DTC	Condition	Possible causes	Action
		short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure ● Exhaust gas recirculation (EGR) fault ● VGT fault ● ECM failure	module is suspect.
P226300	Turbocharger/Supercharger Boost System Performance	● Air leakage post turbocharger ● Intake air temperature (IAT) sensor circuit high resistance, short circuit to ground, short circuit to power ● Manifold absolute pressure (MAP) sensor circuit high resistance, short circuit to ground, short circuit to power ● Mass air flow (MAF) sensor circuit high resistance, short circuit to ground, short circuit to power ● Exhaust gas recirculation (EGR) circuit high resistance, short circuit to ground, short circuit to power ● VGT actuator failure ● Turbocharger vanes stuck/sticking	Check the turbocharger and linkage mechanical condition. Check the intake air system condition, rectify as necessary. Check for sensor DTCs. Check the IAT and MAP sensor circuits. Refer to the electrical guides and rectify as necessary. Using a datalogger function, check the turbocharger actuator position. Turn the ignition on, engine off and command the turbocharger actuator to 95% pulse width modulated (PWM) then to 5% pulse width modulated (PWM) and recheck the turbocharger actuator position. The value at 95% pulse width modulated (PWM) should be 80 - 95%, and at 5% pulse width modulated (PWM), 0 - 20%. If this is not the case, install a new turbocharger. Clear the DTCs and test for normal operation.

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Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel - Turbocharger

Removal and Installation

Removal

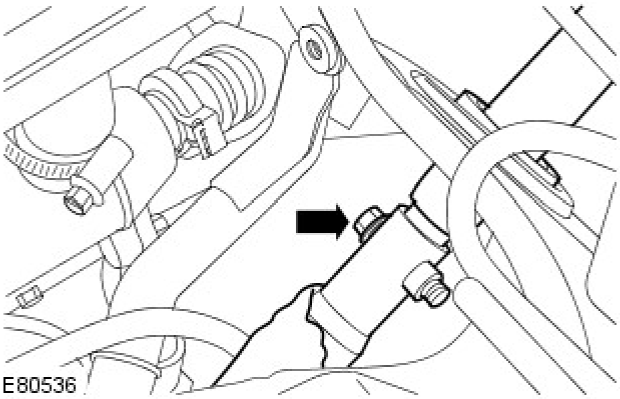
All vehicles

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Open the hood.

Left-hand drive vehicles



3. CAUTIONS:

   ⚠ Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

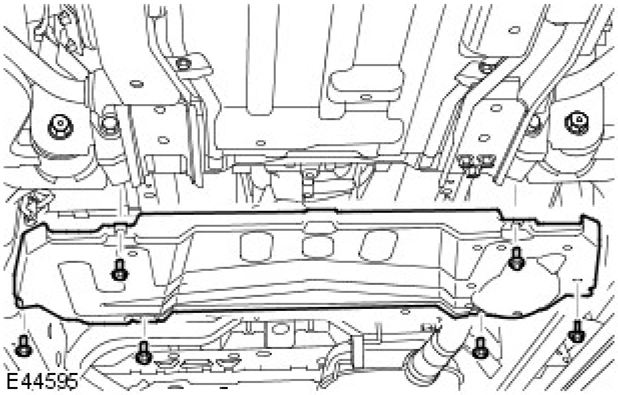
   ⚠ Make sure the steering is in the straight ahead position.

   • NOTE: Note the fitted position.

   Loosen the steering column lower shaft to steering column upper shaft bolt.

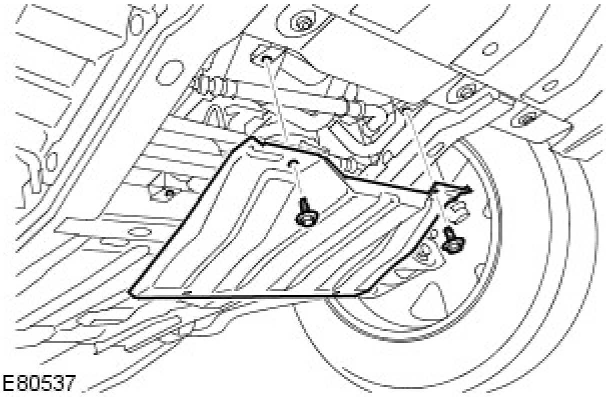
All vehicles

4. Remove the LH front wheel and tire.
5. Remove the transmission undershield.
   - Remove the 6 bolts.



6. Remove the engine undershield.
   For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

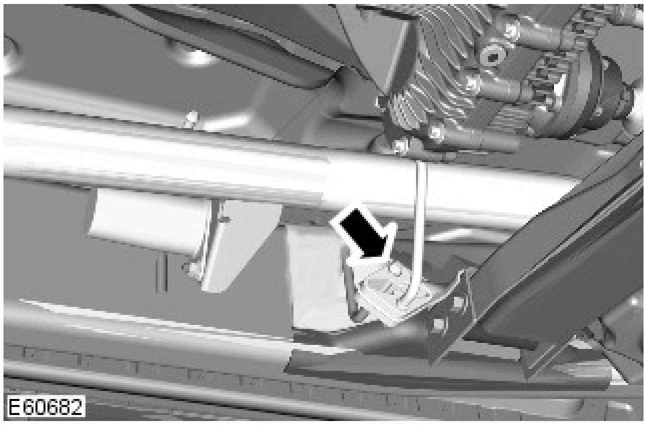
Left-hand drive vehicles



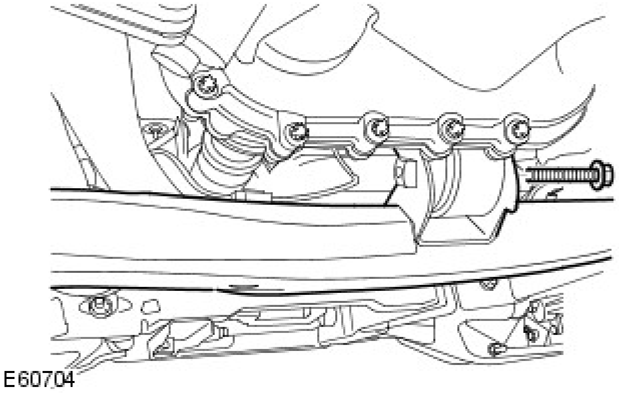
7. Remove the radiator access panel.

- Remove the 2 bolts.

All vehicles

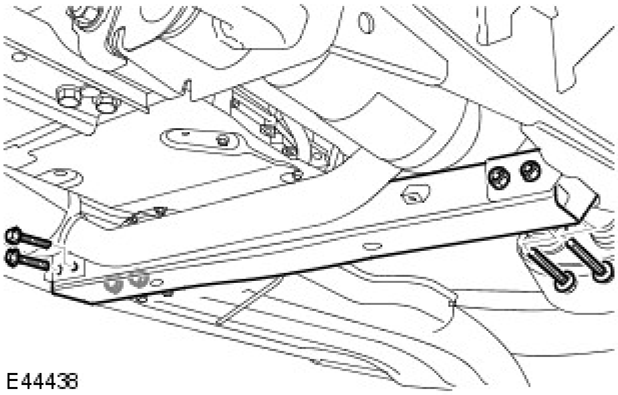


8. Release the downpipe catalytic converter support insulator.



9. Remove the transmission support insulator through-bolt.

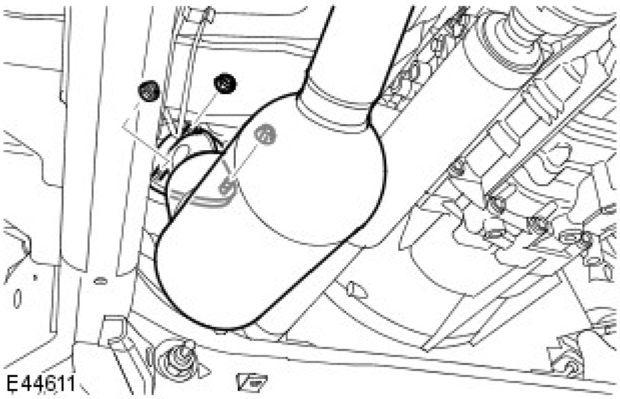
- Using a transmission jack, support the transmission.



E44438

10. With assistance, remove the transmission support crossmember.

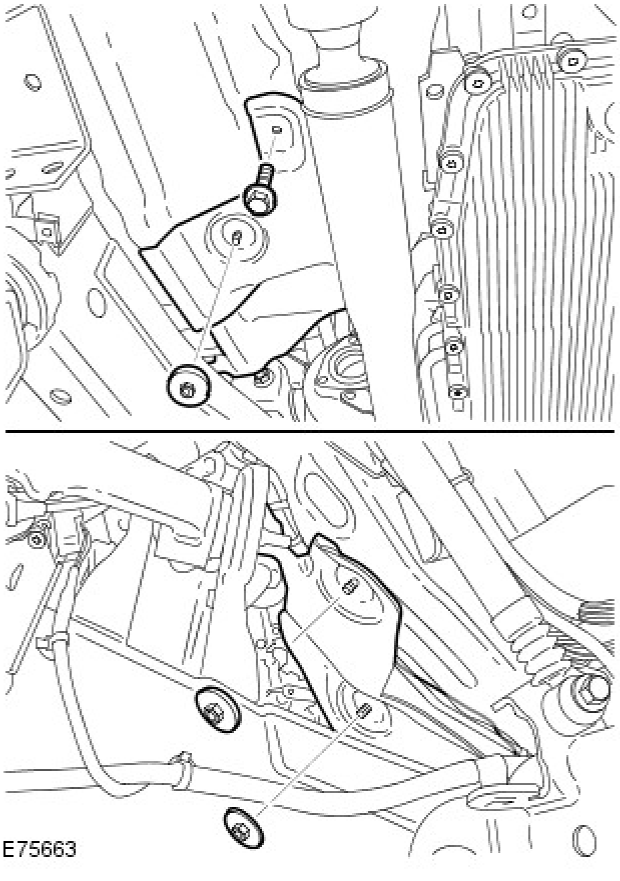
- Remove the 4 nuts and bolts.



E44611

11. With assistance, remove the downpipe catalytic converter.

- Loosen the clamp.
- Remove and discard the 3 nuts.
- Remove and discard the gasket.



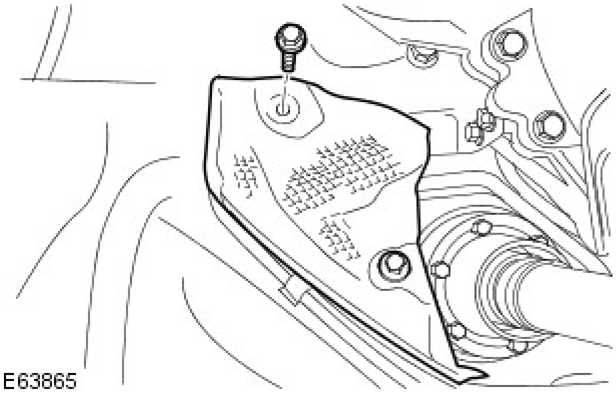
E75663

12. Remove the exhaust front heat shield.

- Remove the 3 nuts.
- Remove the bolt.

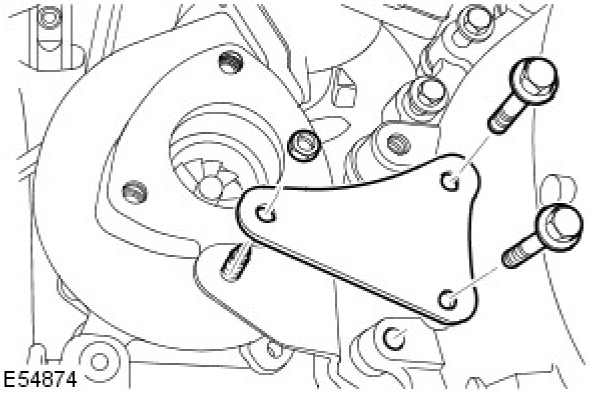
13. Install the transmission support crossmember.

- Install but do not fully tighten at this stage the 2 transmission support crossmember bolts.
- Install but do not fully tighten at this stage the transmission support insulator through-bolt.
- Remove the transmission jack.



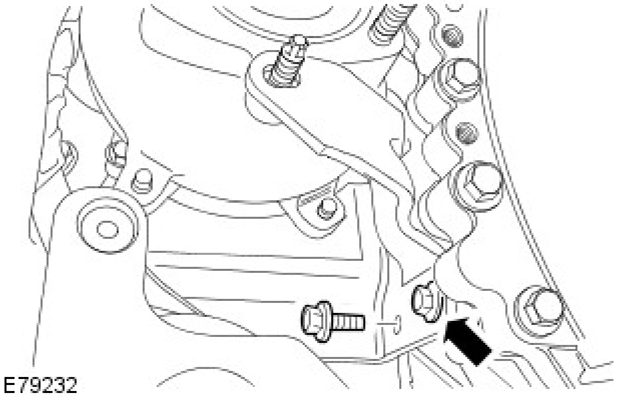
14. Remove the differential mounting bracket heat shield.

- Remove the 2 bolts.



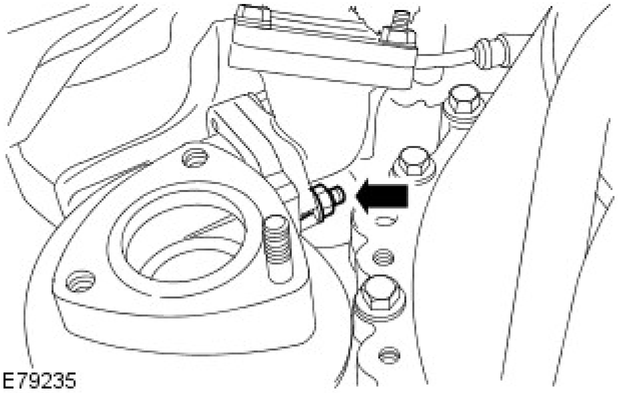
15. Remove the turbocharger support bracket.

- Remove the 2 bolts.
- Remove the nut.



16. Remove the 2 bolts from the turbocharger support bracket.

17. Loosen the turbocharger lower nut.

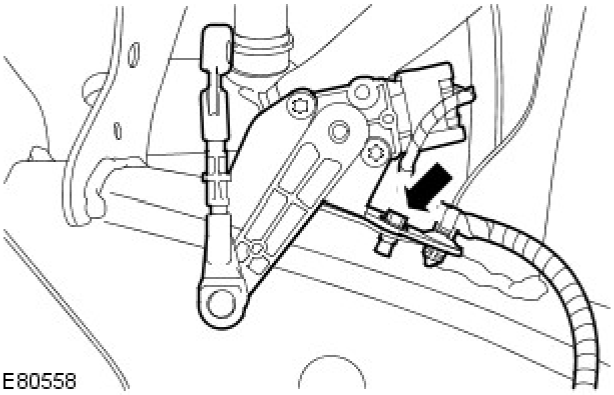


18. Remove the LH upper arm.
For additional information, refer to: Upper Arm (204-01, Removal and Installation).

Left-hand drive vehicles

19. Remove the height sensor bracket bolt.

- Position the height sensor bracket aside.

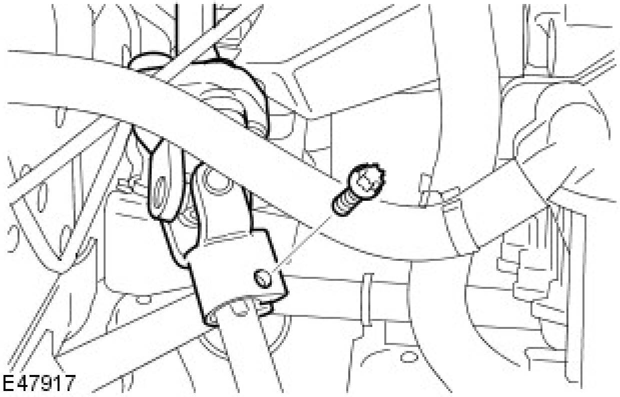


20. Turn the ignition key to position I.

- Turn the steering wheel until the head of the steering column lower shaft bolt can be seen through the LH wheel arch.

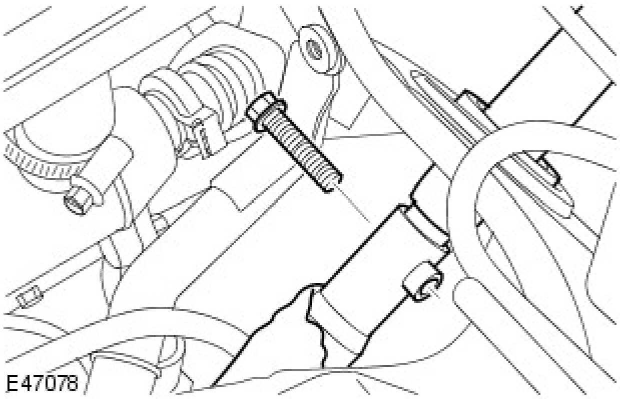
21. ⚠ CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

Remove and discard the steering column lower shaft bolt.



22. Turn the steering wheel to the straight ahead position.

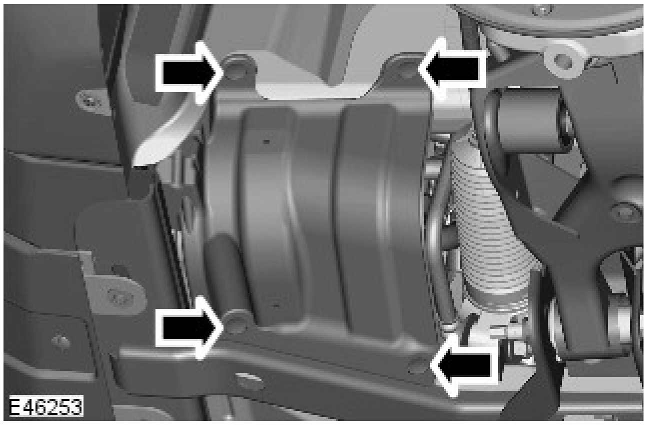
- Remove the ignition key.



23. Remove the steering column lower shaft.

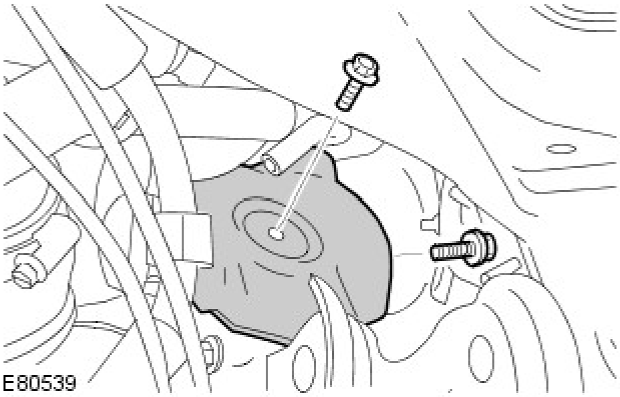
- Remove and discard the steering column lower shaft upper bolt.

All vehicles



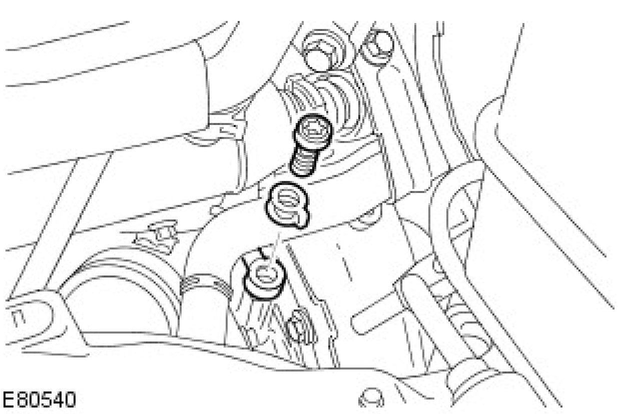
24. Remove the fender splash shield lower trim.

- Remove the 4 clips.



25. Remove the turbocharger heat shield.

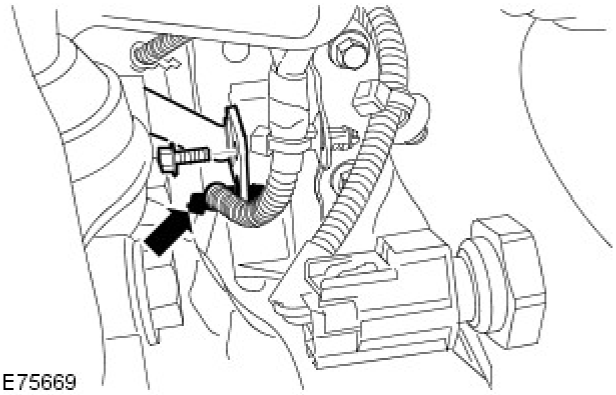
- Remove the 2 bolts.



26. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the turbocharger oil supply tube.

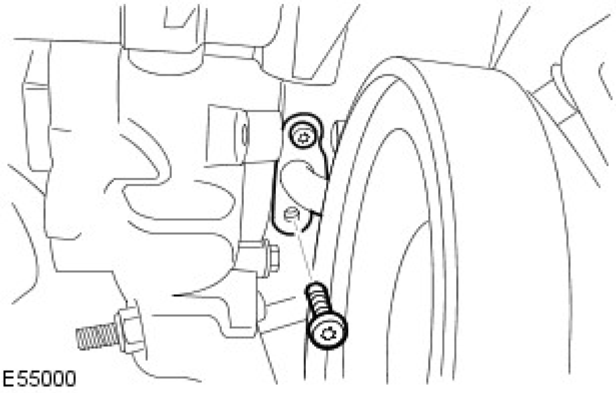
- Remove the turbocharger banjo bolt.
- Remove and discard the sealing washers.



27. ⚠ CAUTION: Always plug any open connections to prevent contamination.

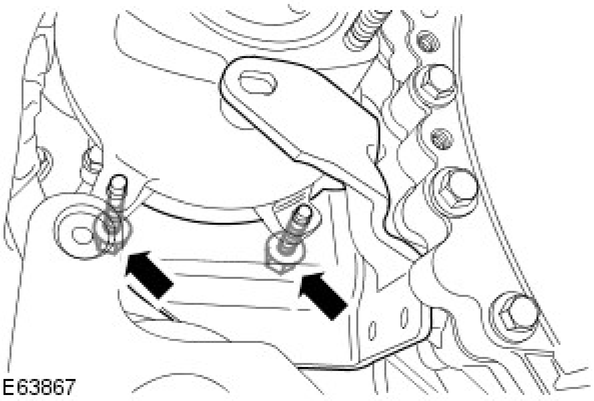
Remove the turbocharger oil return tube bolt.

- Release the wiring harness clip.



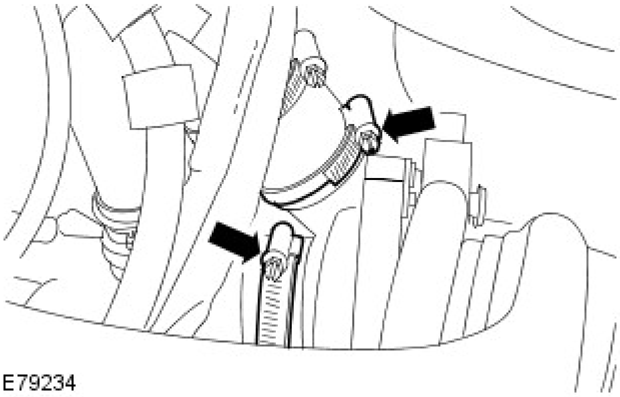
28. Remove the turbocharger oil return tube.

- Remove the 2 bolts.
- Remove and discard the gasket.
- Remove and discard the O-ring seal.



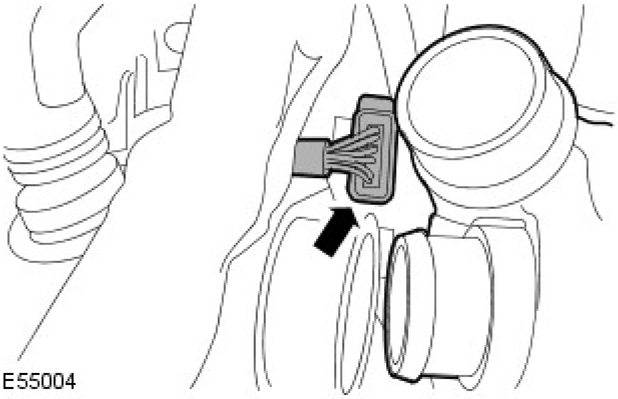
29. Remove the turbocharger support bracket.

- Remove the 2 bolts.



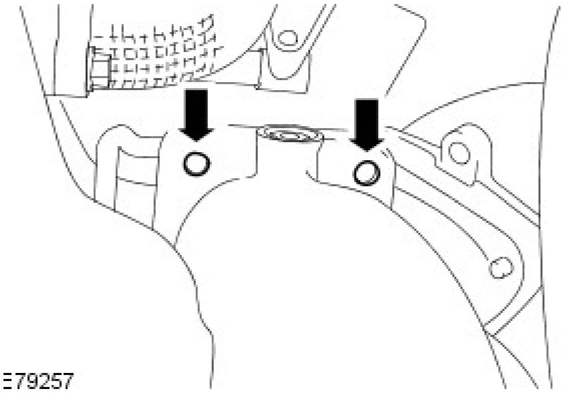
E79234

30. Loosen the turbocharger intake and outlet pipe clips.



E55004

31. Disconnect the turbocharger electrical connector.



E79257

32. ⚠ WARNING: Eye protection must be worn.

• CAUTIONS:

⚠ Make sure that only the turbocharger studs are drilled.

⚠ Make sure that the depth of the drill does not exceed 14 mm (0.6 inch).

Carefully drill the turbocharger 2 upper studs.

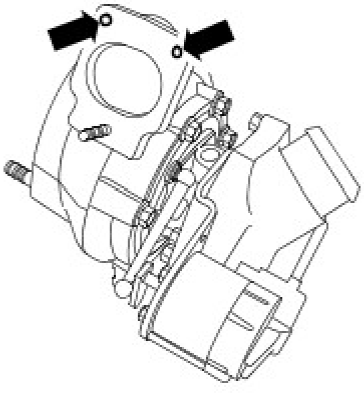
- Center punch the turbocharger 2 upper studs.
- Drill a pilot hole in the center of the turbocharger studs progressively drill out the studs until a 8 mm (0.3 inch) hole is achieved.

33. With assistance, remove the turbocharger.

- Loosen the turbocharger lower nut.

Installation

All vehicles



E55006

1. WARNINGS:

⚠ Eye protection must be worn.

⚠ Never direct a high-pressure nozzle at the skin as the high-pressure air may penetrate to the underlying tissue, and cause serious injury.

⚠ CAUTION: Always keep high-pressure equipment in good condition, and regularly maintained, particularly at joints and unions.

Drill two 8 mm (0.3 inches) holes in the turbocharger as shown.

- Clean the turbocharger and blow out with an air line.

2. Install a new stud to turbocharger lower hole.

3. With assistance, install the turbocharger.

- Clean the turbocharger mating faces.
- Align the turbocharger intake and outlet pipes.

4. With assistance, tighten the turbocharger upper nuts and bolts to 24 Nm (18 lb.ft).

5. Tighten the turbocharger lower nut to 24 Nm (18 lb.ft).

6. Connect the turbocharger electrical connector.

7. Tighten the turbocharger intake and outlet pipe clips.

8. Install the turbocharger support bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).

9. Connect the turbocharger oil supply tube.

- Install new sealing washers.
- Tighten the turbocharger oil supply tube bolt to 30 Nm (22 lb.ft).

10. Install the turbocharger heat shield.

- Install the 2 bolts.

11. Install the 2 turbocharger oil return tube bolts.

- Install a new gasket.
- Install a new O-ring seal.
- Tighten the 2 bolts to 10 Nm (7 lb.ft).

12. Install the turbocharger oil return tube bolt.

- Attach the wiring harness clip.

13. Install the fender splash shield lower trim.

- Install the 4 clips.

Left-hand drive vehicles

14. Install the steering column lower shaft.

- Connect the steering column lower shaft to the steering column upper shaft.

- Connect the universal joint to the steering gear.

15. Install but do not fully tighten at this stage a new steering column lower shaft to steering column upper shaft bolt.

16. ⚠ CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

Turn the ignition key to position I.

- Turn the steering wheel until the steering column lower shaft bolt hole can be seen through the LH wheel arch.

17. Install the steering column lower shaft to steering gear bolt.

- Install a new bolt and tighten to 30 Nm (22 lb.ft).

18. Turn the steering wheel to the straight ahead position.

- Remove the ignition key.

19. Tighten the steering column lower shaft to steering column upper shaft bolt to 30 Nm (22 lb.ft).

20. Install the height sensor bracket bolt.

- Position the height sensor bracket to the intergrated body frame.

All vehicles

21. Install the LH upper arm.
For additional information, refer to: Upper Arm (204-01, Removal and Installation).

22. Install the 2 turbocharger support bracket bolts.

- Tighten the 2 bolts to 23 Nm (17 lb.ft).

23. Install the turbocharger support bracket.

- Install the turbocharger support bracket stud.
- Tighten the 2 bolts to 48 Nm (35 lb.ft).
- Tighten the nut to 25 Nm (18 lb.ft).

24. Install the differential mounting bracket heat shield.

- Install the 2 bolts and tighten to 10 Nm (7 lb.ft).

25. Remove the transmission support crossmember.

- Using a transmission jack, support the transmission.

26. Install the exhaust front heat shield.

- Install the 3 nuts.
- Install the bolt.

27. With assistance, install the downpipe catalytic converter.

- Install new studs and nuts.
- Install a new gasket.
- Tighten the downpipe catalytic converter nuts and clamp to

48 Nm (35 lb.ft).

28. Install the transmission support crossmember.

- Tighten the nuts and bolts to 90 Nm (66 lb.ft).
- Install the transmission support insulator through-bolt and tighten to 175 Nm (129 lb.ft).
- Remove the transmission jack.

29. Attach the downpipe catalytic converter hanger.

Left-hand drive vehicles

30. Install the radiator access panel.

- Tighten the 2 bolts to 10 Nm (7 lb.ft).

All vehicles

31. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

32. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

33. Install the LH front wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

34. Check and top-up the engine oil.

35. Close the hood.

Published: 11-May-2011

Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel - Turbocharger Intake Tube

Removal and Installation

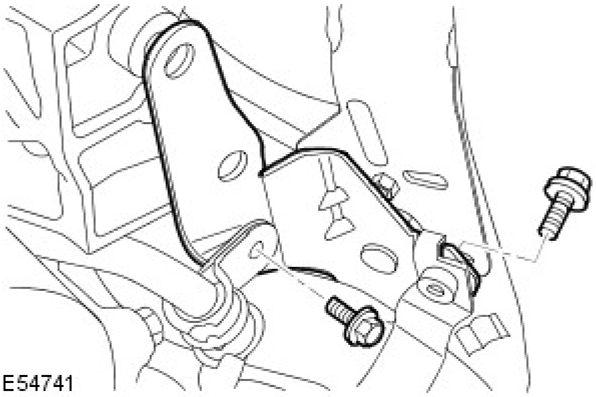
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the power steering pump.
For additional information, refer to: Power Steering Pump - 2.7L Diesel (211-02, Removal and Installation).

3. Remove the support bracket.

- Remove the two retaining bolts.

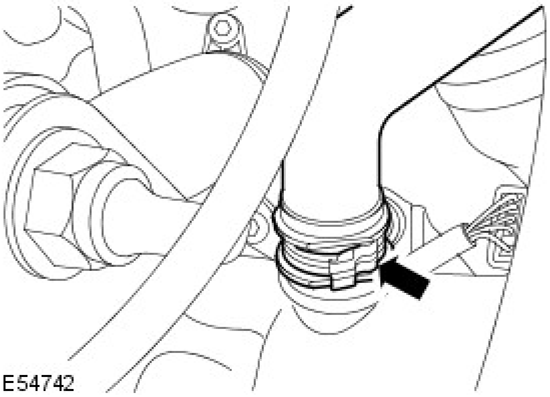


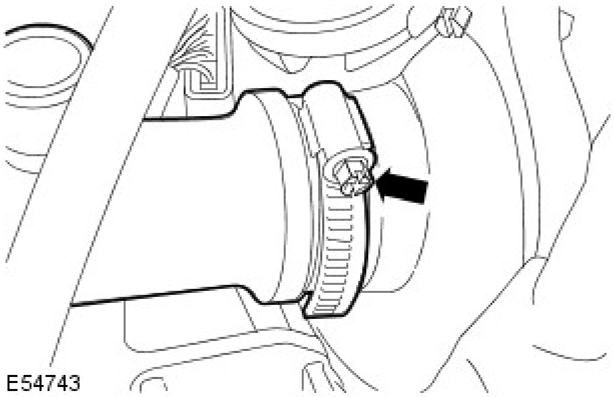
4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise the vehicle.

5. Disconnect the breather hose.

- Release the clip.





6. Disconnect the turbocharger intake tube.

- Loosen the clip.

7. Remove the charge air cooler intake pipe.

- With assistance, reposition the turbocharger intake tube.

8. With assistance, remove the turbocharger intake tube.

Installation

1. To install, reverse the removal procedure.

- Tighten the two retaining bolts to 10 Nm (7 lb.ft).

Published: 11-May-2011

Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel - Turbocharger Actuator Rod

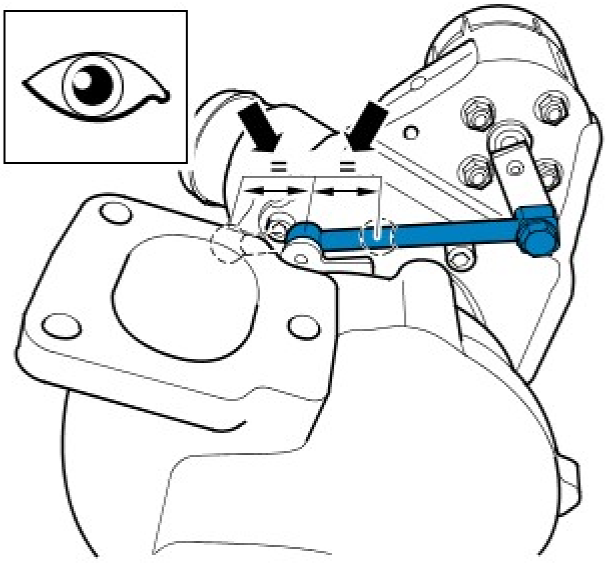
Removal and Installation

Removal

⚠ CAUTION: Always plug any open connections to prevent contamination.

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

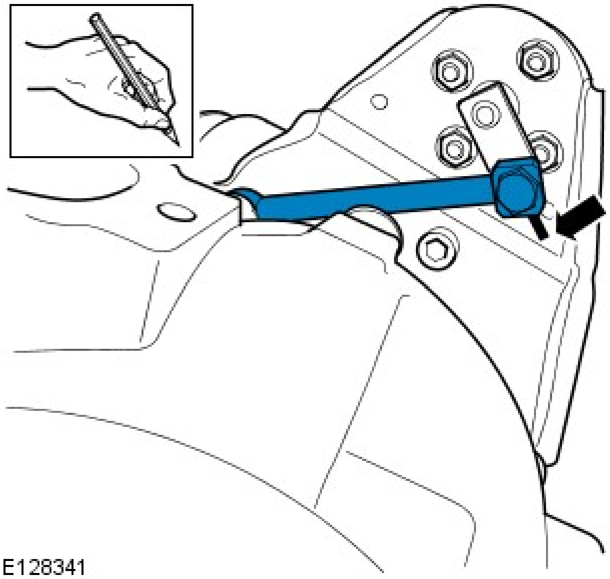
1. Remove the turbocharger.For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Removal and Installation).



E128338

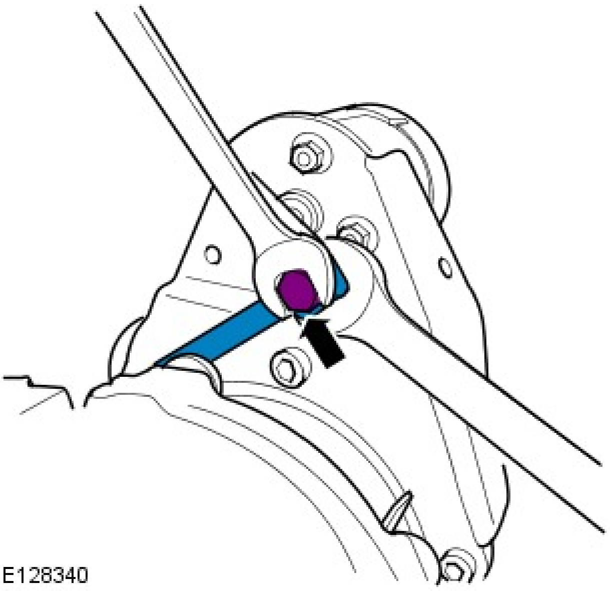
2. ⚠ CAUTION: Make sure that no parts of the turbocharger actuator linkage are allowed to move beyond the normal operating limits. Failure to follow this instruction may result in damage to the vehicle.

Position the turbocharger actuator connecting rod to the mid point position.



E128341

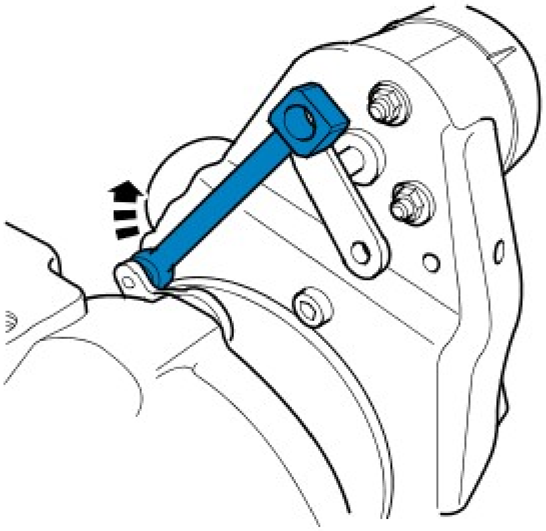
3. Using a suitable marker, mark the mid point position of the actuator arm.



E128340

4. ⚠ CAUTION: Make sure that two spanners are used to remove the bolt. Failure to follow this instruction may result in damage to the vehicle.

Remove the bolt.



E128339

5. Remove the turbocharger actuator connecting rod.

Installation

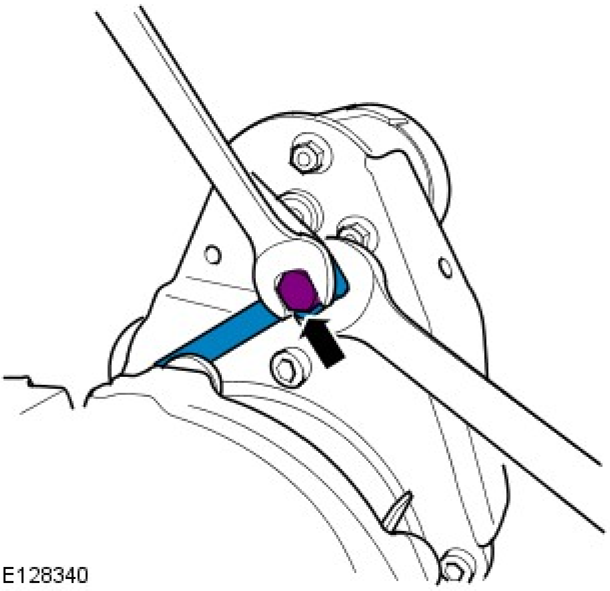
1. CAUTIONS:

⚠ Make sure that no parts of the turbocharger actuator linkage are allowed to move beyond the normal operating limits. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that the marks are aligned. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that two spanners are used to install the bolt. Failure to follow this instruction may result in damage to the vehicle.

To install, reverse the removal procedure.



2. Tighten the bolt to 5 Nm.

3. Install the turbocharger.For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Removal and Installation).

Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel -

Description	Nm	lb-ft
Oil supply pipe to turbocharger banjo bolts	24	18
Oil supply pipe to cylinder block bolts	10	7
Turbocharger oil return tube bolts	10	7
*+ Turbocharger to exhaust manifold nuts	24	18
Turbocharger to exhaust manifold studs	13	10
Turbocharger heat shield bolts	10	7
*+ Exhaust manifold nuts	24	18
Exhaust manifold studs	13	10
Exhaust manifold heat shield bolts	10	7
+ Turbocharger support bracket bolts	24	18
Exhaust gas recirculation (EGR) valve inlet tube bolts	10	7
Turbocharger outlet pipe bolts	10	7
Turbocharger intake tube nut	10	7
Turbocharger to catalytic converter bolts	25	18

*** New nuts must be installed**

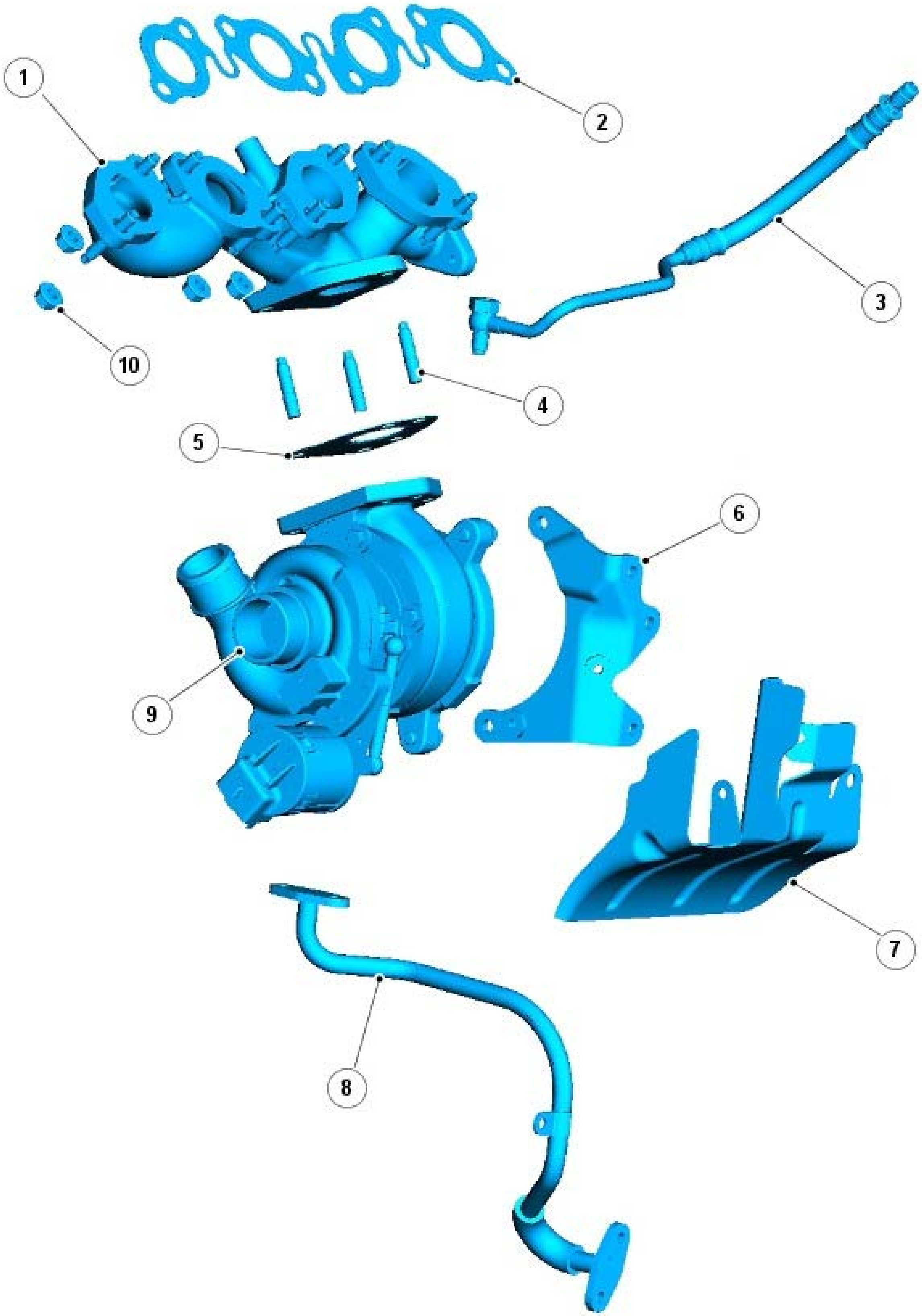
+ Nuts must be tightened in sequence

Published: 11-May-2011

Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel - Turbocharger

Description and Operation

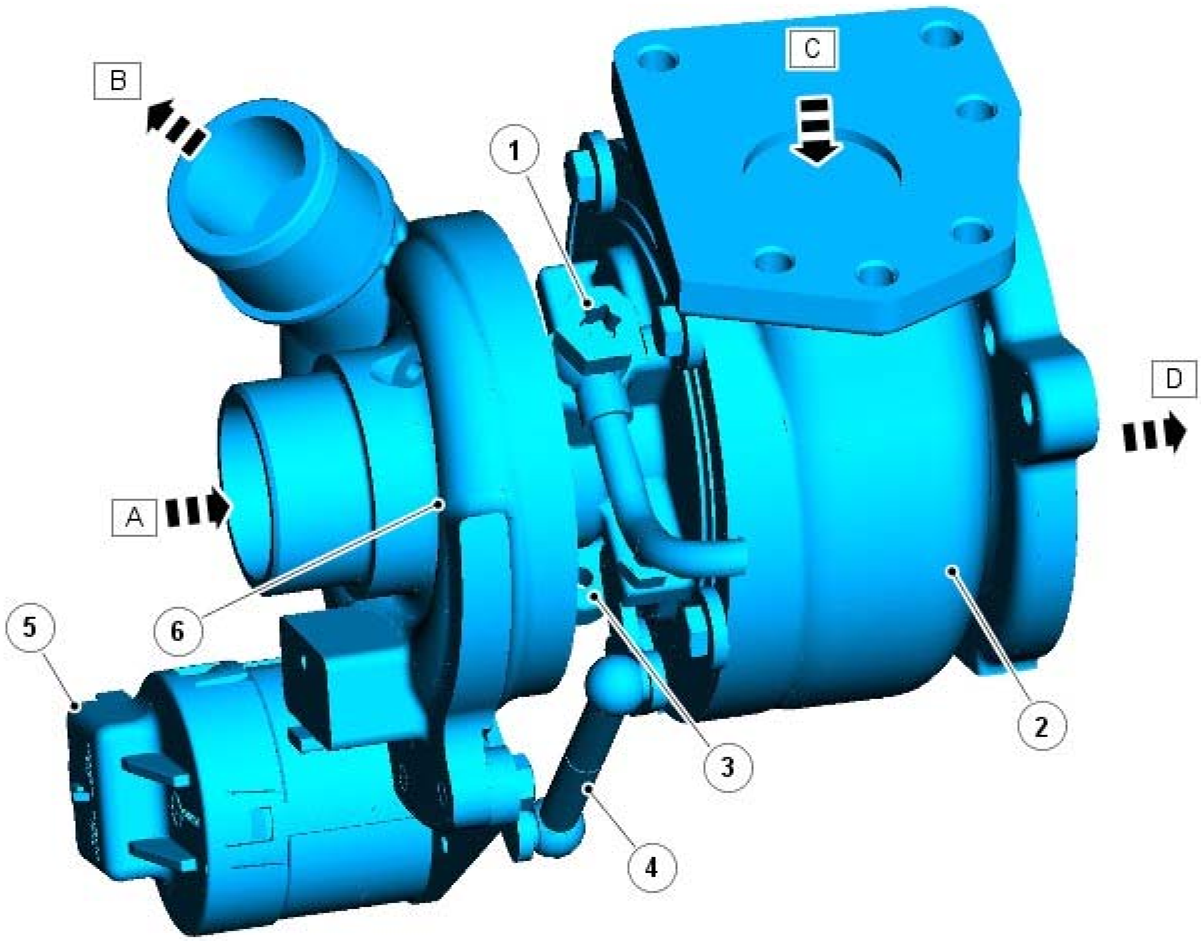
Component Locations



E80501

Item	Part Number	Description
1	-	Exhaust manifold
2	-	Gasket - Exhaust manifold to cylinder head
3	-	Oil feed pipe
4	-	Stud - Exhaust manifold to turbocharger (3 per turbocharger)
5	-	Gasket - Exhaust manifold to turbocharger
6	-	Turbocharger support bracket
7	-	Shield
8	-	Oil drain pipe
9	-	Turbocharger assembly
10	-	Nut - Exhaust manifold to cylinder head (8 per manifold)

Turbocharger



E80502

Item	Part Number	Description
A	-	Cool atmospheric air
B	-	Hot compressed air
C	-	Exhaust inlet
D	-	Exhaust outlet
1	-	Oil feed connection
2	-	Turbine housing
3	-	Oil return connection
4	-	Actuator lever
5	-	Actuator motor
6	-	Compressor housing

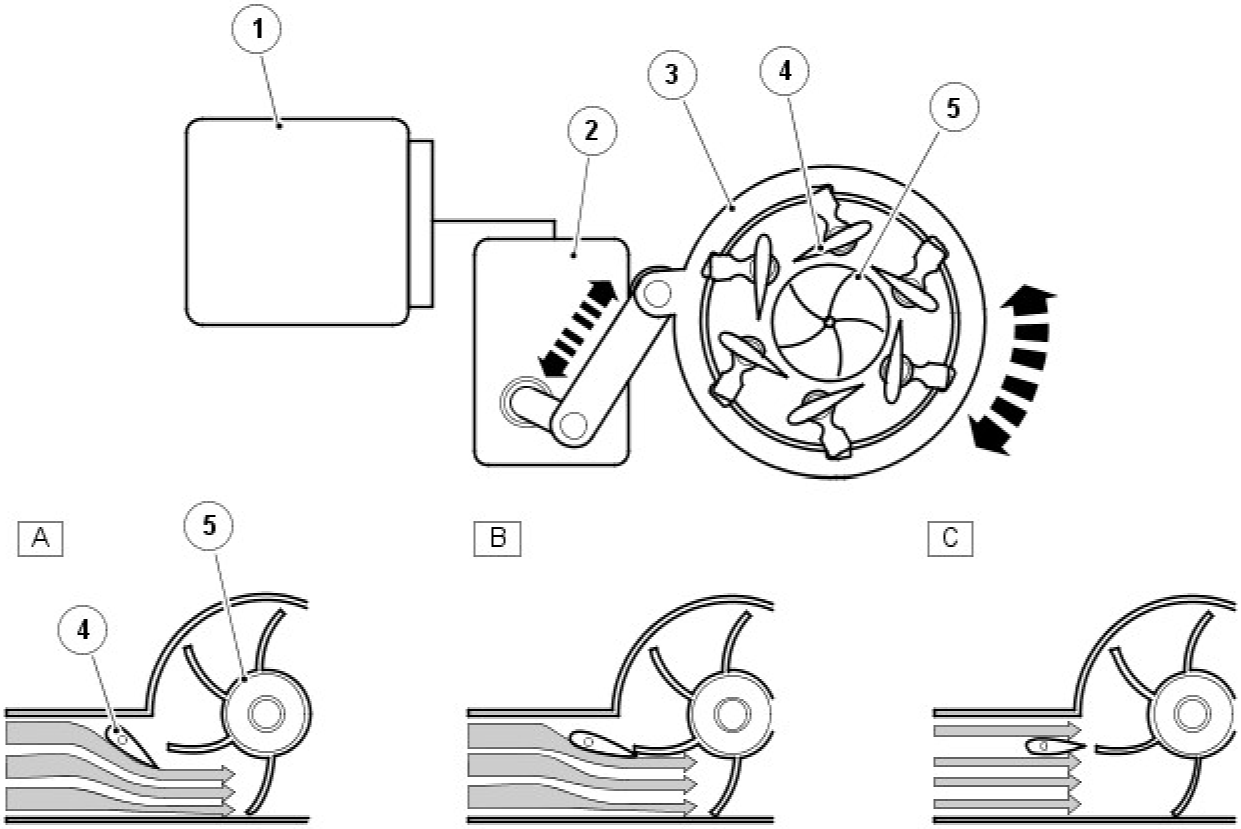
OVERVIEW

Two variable vane Borg Warner turbochargers are fitted to the TDV8 engine, 1 to each exhaust manifold. Each turbocharger works independently from each other supplying air, via twin intercoolers, into the intake manifold. A balance pipe between each bank equalizes the pressure. Each turbocharger has its own electric motor to operate the vanes and is controlled by the Engine Control Module (ECM). The vane positions are varied to control the speed of the turbine wheel maintaining optimum boost pressure over a wide engine speed range and minimising turbo lag (turbo lag is a term used to describe the response time from the time the accelerator is pressed to the time when the turbocharger begins to affect performance), as seen with normal waste-gated turbochargers, during vehicle acceleration.

The exhaust turbine wheel is 39 mm diameter and the compressor wheel is 49 mm diameter. The turbine wheel is made from a high strength high temperature 'Inconel alloy' (a nickel-chromium alloy containing significant amounts of iron, niobium, and molybdenum along with lesser amounts of aluminum and titanium to combine corrosion resistance with high strength) and the compressor is high-grade aluminium alloy. The shaft assembly rotates at a maximum speed of 210,000 rpm to produce a charge air pressure of up to 1.7 bar with a pre-turbine pressure of 3 bar and 800°C (1472°F).

The position of the vanes are controlled by the ECM via a torque motor, lever and linkage rod. A feed back sensor in the motor continuously informs the ECM as to the position of the vanes during the turbochargers operation. If the vanes fail to reach the requested position an error code is generated known as a Diagnostic Trouble Code (DTC).

SYSTEM OPERATION



E80503

Item	Part Number	Description
A	-	Low engine speed
B	-	Moderate engine speed
C	-	Maximum engine speed
1	-	ECM
2	-	Actuator motor
3	-	Adjusting ring
4	-	Vanes
5	-	Turbine

A - Low Engine Speed

At low engine speeds the volume of exhaust gas is low so the vanes are moved towards the closed position to reduce the turbine inlet area. This reduction causes an increase in the gas velocity into the turbine wheel thereby increasing wheel speed and boost.

B - Moderate Engine Speed

As the engine speed increases and the volume of exhaust gas increases and the vanes are moved towards the open position to increase the turbine inlet area and maintain the gas velocity.

C - Maximum Engine Speed

At maximum engine speed the vanes are almost fully open maintaining the gas velocity into the turbine wheel.

Barometric Pressure Sensor

When the vehicle is driven at high altitudes the ambient pressure reduces causing the compressor wheel to do less work for the same boost pressure. To prevent the turbine wheel from over-speeding under these conditions a barometric pressure sensor, located in the ECM, protects the turbocharger by opening the vanes further to reduce the turbine wheel speed. This is known as the altitude margin of the turbocharger.

Turbocharger Lubrication

The rapid acceleration and deceleration response demands of the turbocharger rely greatly on a steady flow of clean oil. The oil supplied from the engine's lubrication system provides lubrication to the turbocharger's spindle and bearings, while also acting as a coolant for the turbocharger centre housing.

To maintain the life expectancy of the turbocharger, it is essential that the oil has a free-flow through the turbocharger and unrestricted return to the engines sump. It is therefore imperative that the engine oil is replenished at regular service intervals with the recommended quality and quantity of oil.

Charge Air Cooler

The charge air cooler is used to increase the density of air as it flows from the turbochargers compressor to the intake manifold.

Compression of the charge air by the turbochargers raises the temperature of the air. This generation of heat expands the air density and consequently less oxygen is able to enter the cylinders, reducing the engines power. To overcome this, the air is routed through the charge air cooler before it enters the engine; the temperature is reduced by transferring the heat to atmosphere.

Cooling of the intake air also helps to reduce engine emissions by limiting nitrogen oxides (NOx) production.

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Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel - Turbocharger

Diagnosis and Testing

Overview

The turbocharger system for this vehicle differs from previous models in that it uses twin turbochargers rather than a single unit serving both banks.

For information on the operation of the system:
REFER to: Turbocharger (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Description and Operation).

Inspection and Verification

- WARNINGS:

⚠ The following tests may involve working in close proximity to hot components. Make sure adequate protection is used. Failure to follow this instruction may result in personal injury.

⚠ The turbocharger can continue to rotate after the engine has stopped. Do not attempt to check the turbocharger until one minute has elapsed since the engine was switched off. Failure to follow this instruction may result in personal injury.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection chart

Mechanical	Electrical
● Intake air system ● Hose(s)/hose connections ● Turbochargers ● General engine condition.	● Circuit(s) ● Electrical connections and harnesses ● Turbocharger actuators ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible source	Action
Poor performance (off-boost)	● Low/Contaminated fuel ● Restricted intake air system ● General engine condition ● Engine control module (ECM) failure	Check the fuel level and condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for restriction. Check the engine condition, compressions, etc if there are indications of a mechanical fault. Check for DTCs indicating a module fault. Refer to the warranty policy and procedures manual if an ECM is suspect.
No boost	● Electrical connections and harnesses ● Restricted intake air system ● Charge air cooler restricted/leaking ● Turbocharger actuator failure(s) ● Turbocharger failure(s) ● Engine control	Check the electrical connections and harnesses. Check the intake air system for restriction/leakage. Check the turbocharger actuators and circuits. Refer to the electrical guides. Check the turbochargers for wear. Disconnect the turbocharger intake and outlet pipework and turn the turbochargers by hand. Any roughness indicates a fault. Check any up and down movement in the turbocharger shafts. Excessive movement indicates a fault. If in doubt, compare the suspect unit with a new turbocharger. Check for DTCs indicating an actuator or module fault. Refer to the warranty policy and procedures manual if an ECM is suspect.

Symptom	Possible source	Action
	module (ECM) failure	
No boost/excessive noise	- Turbocharger failure(s)	Disconnect the turbocharger intake and outlet pipework and turn the turbochargers by hand. Any roughness indicates a fault. Check any up and down movement in the turbocharger shafts. Excessive movement indicates a fault. If in doubt, compare the suspect unit with a new turbocharger.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of engine control module (ECM) DTCs:
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible causes	Action
P004711	Right-hand turbocharger control circuit low	● Turbocharger control circuit: short circuit to ground ● Turbocharger actuator failure	Check the right-hand turbocharger and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation).
P004812	Right-hand turbocharger control circuit high	● Turbocharger control circuit: short circuit to power ● Turbocharger actuator failure	Check the right-hand turbocharger and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation).
P004C11	Left-hand turbocharger control circuit low	● Turbocharger control circuit: short circuit to ground ● Turbocharger actuator failure	Check the left-hand turbocharger and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation).
P004D12	Left-hand turbocharger control circuit high	● Turbocharger control circuit: short circuit to power ● Turbocharger actuator failure	Check the left-hand turbocharger and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation).
P006A21	Manifold absolute pressure (MAP) sensor - mass or volume air flow correlation - signal amplitude less than minimum	● Air leakage in the intake path between the turbocharger and the engine	Check the intake air system for leakage after the turbocharger. Check for DTCs indicating a MAPT sensor fault. Clear the DTCs and test for normal operation.
P006A22	Manifold absolute pressure and temperature (MAPT) sensor - mass or volume air flow correlation, right-hand bank - signal amplitude greater than maximum	● Oil ingress into the intake manifold ● MAPT sensor circuit fault ● MAPT sensor fault ● MAF sensor fault ● Turbocharger fault	With the engine at idle, check the manifold air pressure and indicated torque set points using a datalogger function. If the manifold air pressure is greater than 140 KPa (20.31 lbs/in²) or the torque less than 70 Nm (51.63 lbf/ft), check for oil being drawn into the intake manifold. Rectify as necessary. Clear the DTCs and test for normal operation. With the ignition on, engine off and using a datalogger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% PWM and check the angle values. The angle at 5% PWM should be 0 - 20%, and at 95% 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

DTC	Description	Possible causes	Action
			If the values are outside this range, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00B821	Manifold absolute pressure and temperature (MAPT) - mass or volume air correlation, left-hand bank - signal amplitude less than minimum	- Air leakage in intake path between turbocharger and engine	Check the intake air system for leakage after the turbocharger. Check for DTCs indicating a MAPT sensor fault. Refer to the warranty policy and procedures manual if a module is suspect.
P00B822	Manifold absolute pressure and temperature (MAPT) sensor - mass or volume air correlation, left-hand bank - signal amplitude greater than maximum	- Oil ingress into the intake manifold - MAPT sensor circuit fault - MAPT sensor fault - MAF sensor fault - Turbocharger fault	With the engine at idle, check the manifold air pressure and indicated torque set points using a datalogger function. If the manifold air pressure is greater than 140 KPa (20.31 lbs/in²) or the torque less than 70 Nm (51.63 lbf/ft), check for oil being drawn into the intake manifold. Rectify as necessary. Clear the DTCs and test for normal operation. With the ignition on, engine off and using a datalogger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% PWM and check the angle values. The angle at 5% PWM should be 0 - 20%, and at 95% PWM 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011C00	Right-hand bank charge air temperature (MAPT)/intake air temperature (IAT) sensor correlation - signal invalid (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	- Right-hand MAPT sensor temperature circuits: short circuit to ground - Right-hand MAPT sensor temperature circuits: short circuit to power - Right-hand MAPT sensor temperature circuits: high resistance - Right-hand MAPT sensor fault - Right-hand mass air flow (MAF) sensor temperature circuits: short circuit to ground - Right-hand MAF sensor temperature circuits: short circuit to power - Right-hand MAF sensor temperature circuits: high resistance - Right-hand MAF sensor fault	Check the right-hand MAPT and MAF sensors and circuits. Refer to the electrical guides. Monitor the charge air temperature and intake air temperature signals using a datalogger function. Start the engine and "wiggle" the sensor connectors with the engine running. Check the recorded values for the two sensors, the maximum difference should not exceed +40 ° to -30 °C (104 °C to -22 °F). If the IAT sensor is suspect, swap the MAF sensors side to side and recheck. If the DTC resets, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011D00	Left-hand bank charge air temperature (MAPT)/intake air temperature (IAT) sensor correlation - signal invalid (the	- Left-hand MAPT sensor temperature circuits: short circuit to ground	Check the left-hand MAPT and MAF sensors and circuits. Refer to the electrical guides. Monitor the charge air temperature and intake air temperature signals using a datalogger function. Start the engine and "wiggle" the

DTC	Description	Possible causes	Action
	IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	• Left-hand MAPT sensor temperature circuits: short circuit to power • Left-hand MAPT sensor temperature circuits: high resistance • Left-hand MAPT sensor fault • Right-hand MAF sensor temperature circuits: short circuit to ground • Right-hand MAF sensor temperature circuits: short circuit to power • Right-hand MAF sensor temperature circuits: high resistance • Right-hand MAF sensor fault	sensor connectors with the engine running. Check the recorded values for the two sensors, the maximum difference should not exceed 40 ° to -30 °C (104 °C to -22 °F). If the IAT sensor is suspect, swap the MAF sensors side to side and recheck. If the DTC resets, install a new left-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023627	Right-hand turbocharger boost sensor circuit high - signal rate of change above threshold	• Manifold absolute pressure and temperature (MAPT) sensor circuit: intermittent high resistance • MAPT sensor failure	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. Start the engine and check the manifold air pressure at idle using a datalogger function. Increase the engine speed to 1,500 rpm and recheck the manifold air pressure. If the pressure has increased by more than 50 KPa per 10 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023716	Right-hand turbocharger boost sensor circuit low - voltage below threshold	• Manifold absolute pressure and temperature (MAPT) sensor circuit: short circuit to ground • MAPT sensor failure	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023817	Right-hand turbocharger boost sensor circuit high - voltage above threshold	• Manifold absolute pressure and temperature (MAPT) sensor circuit: short circuit to power • MAPT sensor failure	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023D21	Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude less than minimum	• Intake air system fault • Turbocharger mechanical fault • Oil ingestion into manifold	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for oil being drawn into the intake manifold. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P023D22	Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude greater than maximum	● Intake air system fault ● Turbocharger mechanical fault ● Intake air temperature (IAT) sensor fault ● Mass air flow (MAF) sensor fault ● Manifold absolute pressure and temperature (MAPT) sensor fault ● Exhaust gas recirculation (EGR) sensor fault ● Turbocharger actuator position sensor fault	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for DTCs indicating a listed sensor fault. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023E21	Manifold absolute pressure (MAP) sensor/left-hand turbocharger boost sensor correlation - signal amplitude less than minimum	● Intake air system fault ● Turbocharger mechanical fault ● Oil ingestion into manifold	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for oil being drawn into the intake manifold. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023E22	Manifold absolute pressure (MAP) sensor/left-hand turbocharger boost sensor correlation - signal amplitude greater than maximum	● Intake air system fault ● Turbocharger mechanical fault ● Intake air temperature (IAT) sensor fault ● Mass air flow (MAF) sensor fault ● Manifold absolute pressure and temperature (MAPT) sensor fault ● Exhaust gas recirculation (EGR) sensor fault ● Turbocharger actuator position sensor fault	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for DTCs indicating a listed sensor fault. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P024027	Left-hand turbocharger boost sensor range/performance - signal rate of change above threshold	● Manifold absolute pressure and temperature (MAPT) sensor circuit: intermittent high resistance ● MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. Using a datalogger function, check the manifold pressure at idle and record the measurement. Increase the engine speed to 1,500 rpm and recheck the value. If the pressure has increased by more than 50KPa (7.25 lbs/in²) per 10 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P024116	Left-hand turbocharger boost sensor circuit low - voltage below threshold	● Manifold absolute pressure and temperature (MAPT) sensor circuit: short circuit to ground ● MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P024217	Left-hand turbocharger boost sensor circuit high - voltage above threshold	● Manifold absolute pressure and temperature (MAPT) sensor connector fault ● MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P123A21	Barometric - turbocharger boost sensor A (right-hand manifold absolute pressure temperature (MAPT) sensor) correlation - signal amplitude less than minimum	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P123A22	Barometric - turbocharger boost sensor A (right-hand manifold absolute pressure temperature (MAPT) sensor) correlation - signal amplitude greater than maximum	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P123B21	Barometric - turbocharger boost sensor B (left-hand manifold absolute pressure temperature (MAPT) sensor) correlation -	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition

DTC	Description	Possible causes	Action
	signal amplitude less than minimum	module (ECM) fault	on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P123B22	Barometric - turbocharger boost sensor B (left-hand manifold absolute pressure temperature (MAPT) sensor) correlation - signal amplitude greater than maximum	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P132A00	Right-hand turbocharger boost control A electrical	● Turbocharger circuit fault ● Turbocharger fault ● Engine control module (ECM) fault	Check the turbocharger and circuits. Refer to the electrical guides. Turn the ignition on and using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are within these ranges, clear the codes and retest. If the angles are outside these ranges, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P132A19	Right-hand turbocharger boost control A electrical - circuit current above threshold	● Turbocharger circuit fault ● Turbocharger fault ● Engine control module (ECM) fault	Check the turbocharger and circuits. Refer to the electrical guides. Turn the ignition on and using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are within these ranges, clear the codes and retest. If the angles are outside these ranges, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P132B21	Right-hand turbocharger boost control A performance - signal amplitude less than minimum	● Turbocharger connections: water ingress, poor contacts ● Turbocharger actuator circuits: short circuit to ground ● Turbocharger actuator circuits: short circuit to power ● Turbocharger actuator circuits: high resistance ● Turbocharger actuator fault - Turbocharger actuator control deviation below minimum threshold	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angle at idle and at 3,000 rpm. From idle, "blip" the throttle to maximum and allow to idle and record the turbocharger actuator angles. At idle, the angle should be approximately 95%, at 3,000 rpm, approximately 40%, and when "blipped" the voltage should change smoothly at approximately 25% per 100 ms. If the angles do not change, or do not change at the expected rate, suspect the turbocharger actuator is sticking. Install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P132B22	Right-hand turbocharger boost control A performance - signal amplitude greater than maximum	● Turbocharger connections: water ingress, poor contacts ● Turbocharger actuator circuits: short circuit to ground ● Turbocharger actuator circuits: short circuit to power ● Turbocharger actuator circuits: high resistance ● Turbocharger actuator fault - Turbocharger actuator control deviation above maximum threshold	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angle at idle and at 3,000 rpm. From idle, "blip" the throttle to maximum and allow to idle and record the turbocharger actuator angles. At idle, the angle should be approximately 95%, at 3,000 rpm, approximately 40%, and when "blipped" the voltage should change smoothly at approximately 25% per 100 ms. If the angles do not change, or do not change at the expected rate, suspect the turbocharger actuator is sticking. Install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P132D00	Left-hand turbocharger boost control B electrical	● Turbocharger circuit fault ● Turbocharger fault ● Engine control module (ECM) fault	Check the turbocharger and circuits. Refer to the electrical guides. Turn the ignition on and using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are within these ranges, clear the codes and retest. If the angles are outside these ranges, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P132D19	Left-hand turbocharger boost control B electrical - circuit current above threshold	● Turbocharger circuit fault ● Turbocharger fault ● Engine control module (ECM) fault	Check the turbocharger and circuits. Refer to the electrical guides. Turn the ignition on and using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are within these ranges, clear the codes and retest. If the angles are outside these ranges, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P132E21	Left-hand turbocharger boost control B performance - signal amplitude less than minimum	● Turbocharger connections: water ingress, poor contacts ● Turbocharger actuator circuits: short circuit to ground ● Turbocharger actuator circuits: short circuit to power ● Turbocharger actuator circuits: high resistance ● Turbocharger actuator fault - Turbocharger actuator control deviation below minimum threshold	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angle at idle and at 3,000 rpm. From idle, "blip" the throttle to maximum and allow to idle and record the turbocharger actuator angles. At idle, the angle should be approximately 95%, at 3,000 rpm, approximately 40%, and when "blipped" the voltage should change smoothly at approximately 25% per 100 ms. If the voltages do not change or do not change at the expected rate, suspect the turbocharger actuator is sticking. Install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P132E22	Left-hand turbocharger boost control B performance - signal amplitude greater than maximum	● Turbocharger connections: water ingress, poor contacts ● Turbocharger actuator circuits: short circuit to ground ● Turbocharger actuator circuits: short circuit to power ● Turbocharger actuator circuits: high resistance ● Turbocharger actuator fault - Turbocharger actuator control deviation above maximum threshold	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angle at idle and at 3,000 rpm. From idle, "blip" the throttle to maximum and allow to idle and record the turbocharger actuator angles. At idle, the angle should be approximately 95%, at 3,000 rpm, approximately 40%, and when "blipped" the voltage should change smoothly at approximately 25% per 100 ms. If the voltages do not change or do not change at the expected rate, suspect the turbocharger actuator is sticking. Install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P138E21	Right-hand turbocharger boost control position sensor A minimum/maximum stop performance - signal amplitude less than minimum	● Right-hand turbocharger boost control position sensor A adaption diagnosis below bottom limit	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are outside these ranges, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P138E22	Right-hand turbocharger boost control position sensor A minimum/maximum stop performance - signal amplitude greater than maximum	● Right-hand turbocharger boost control position sensor A adaption diagnosis above top limit	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are outside these ranges, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation).

DTC	Description	Possible causes	Action
			Clear the DTCs and test for normal operation.
P138F21	Left-hand turbocharger boost control position sensor B minimum/maximum stop performance - signal amplitude less than minimum	● Left-hand turbocharger boost control position sensor B adaption diagnosis below bottom limit	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are outside these ranges, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P138F22	Left-hand turbocharger boost control position sensor B minimum/maximum stop performance - signal amplitude greater than maximum	● Left-hand turbocharger boost control position sensor B adaption diagnosis above top limit	Check the turbocharger and circuits. Refer to the electrical guides. Using a datalogger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% PWM and recheck the recorded angles. The value at 5% PWM should be 0 - 20%, and at 95% PWM, 80 - 95%. If the angles are outside these ranges, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P226300	Left-hand turbocharger boost system performance	● Left-hand turbocharger failure	Where a check calls for a road test to be carried out, do not attempt this without assistance. Check the turbocharger and linkage mechanical condition. Check the intake air system condition, rectify as necessary. Check for sensor DTCs, rectify as necessary. Using a datalogger function, check the turbocharger actuator position. Command the turbocharger actuator to 95% pulse width modulated (PWM) then to 5% PWM and recheck the turbocharger actuator position. The value at 95% PWM should be 80 - 95%, and at 5% PWM, 0 - 20%. If the angles are outside these ranges, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P256327	Right-hand turbocharger boost control position sensor A circuit range/performance - signal rate of change above threshold	● Turbocharger position sensor circuit: high resistance	Check the turbocharger circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P256421	Right-hand turbocharger boost control position sensor A circuit low - signal amplitude less than minimum	● Turbocharger position sensor circuit: short circuit to ground ● Turbocharger failure	Check the turbocharger circuits. Refer to the electrical guides. Rectify as necessary. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P256522	Right-hand turbocharger boost control position sensor A circuit high - signal amplitude greater than maximum	● Turbocharger position sensor circuit: short circuit to power ● Turbocharger failure	Check the turbocharger circuits. Refer to the electrical guides. Rectify as necessary. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P258727	Left-hand turbocharger boost control position sensor B circuit range/performance - signal rate of change above threshold	● Turbocharger position sensor circuit: high resistance	Check the turbocharger circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. If any DTCs reset, recheck the circuits.

DTC	Description	Possible causes	Action
P258821	Left-hand turbocharger boost control position sensor B circuit low - signal amplitude less than minimum	- Turbocharger position sensor circuit: short circuit to ground - Turbocharger failure	Check the turbocharger circuits. Refer to the electrical guides. Rectify as necessary. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P258922	Left-hand turbocharger boost control position sensor B circuit high - signal amplitude greater than maximum	- Turbocharger position sensor circuit: short circuit to power - Turbocharger failure	Check the turbocharger circuits. Refer to the electrical guides. Rectify as necessary. If no fault is found in the circuits, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

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Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel - Turbocharger LH

Removal and Installation

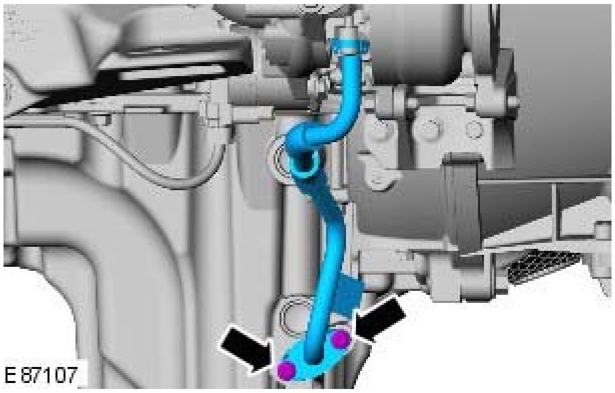
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

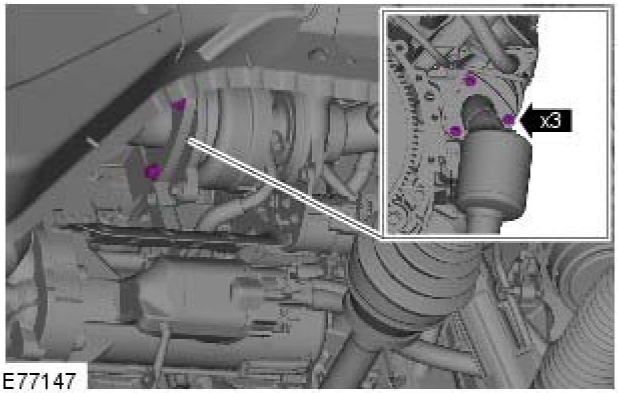


4. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Release the LH turbocharger oil return tube.

- Remove and discard the gasket.
- Remove the 2 bolts.

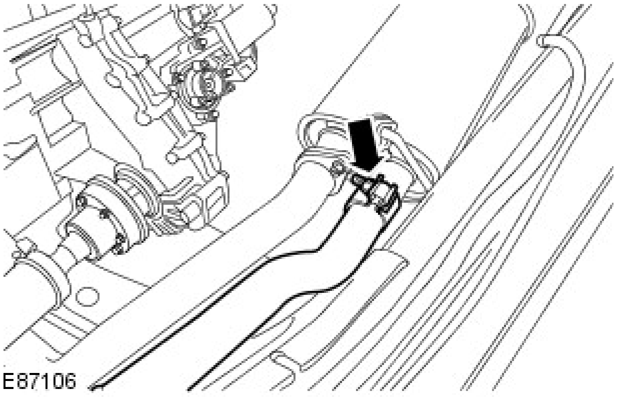
5. Remove the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).



6. NOTE: Right-hand shown, left-hand similar.

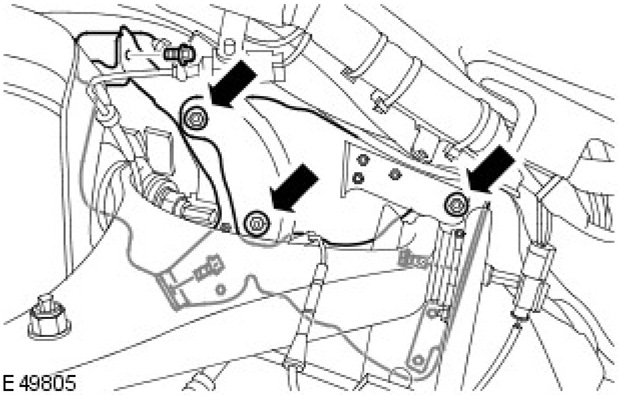
Release the exhaust system from the turbochargers.

- Remove the 6 bolts.
- Remove and discard the 2 gaskets.



7. Remove the LH catalytic converter.

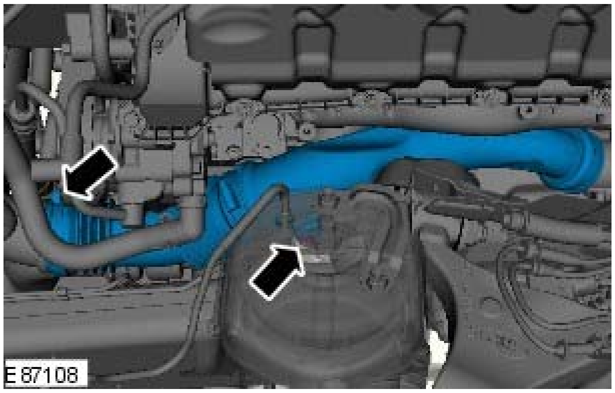
- Loosen the clamp.



8. NOTE: The heat shield consists of 3 parts.

Remove the upper suspension arm and brake line heat shields for access.

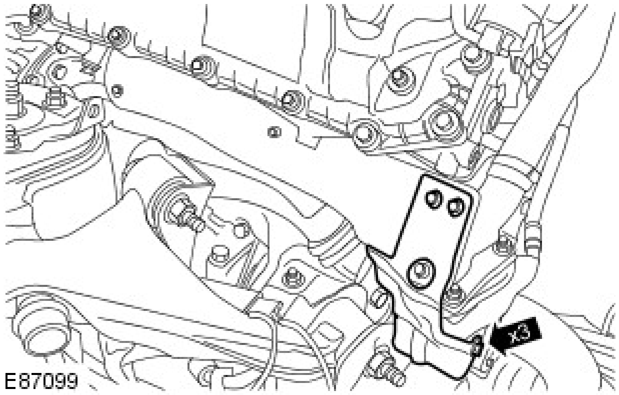
- Remove the 3 nuts.
- Remove the 3 bolts.
- Remove the bracket.



9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

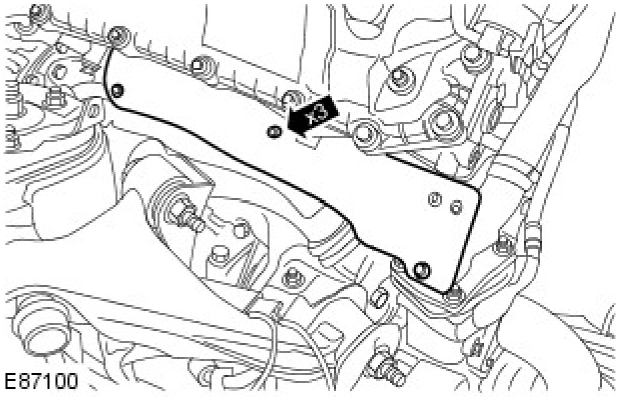
Remove the LH turbocharger intake tube.

- Remove the nut.
- Loosen the clip.



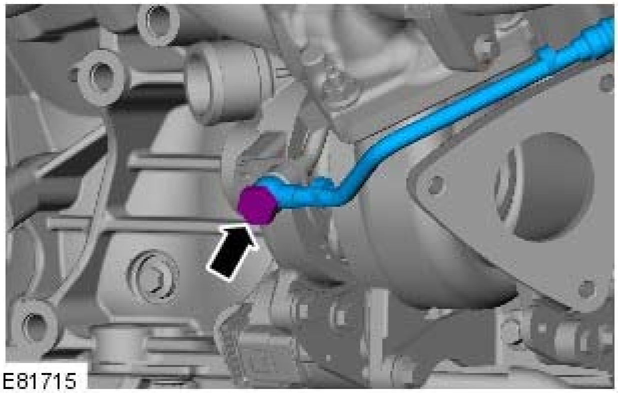
10. Remove the LH turbocharger heat shield.

- Remove the 3 bolts.



11. Remove the LH exhaust manifold heat shield.

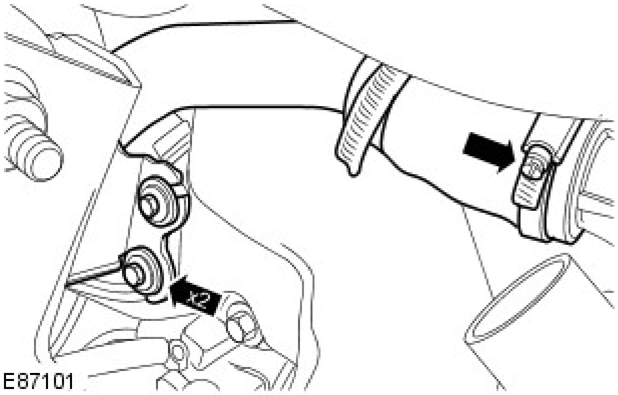
- Remove the 3 bolts.



12. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the LH turbocharger oil supply pipe.

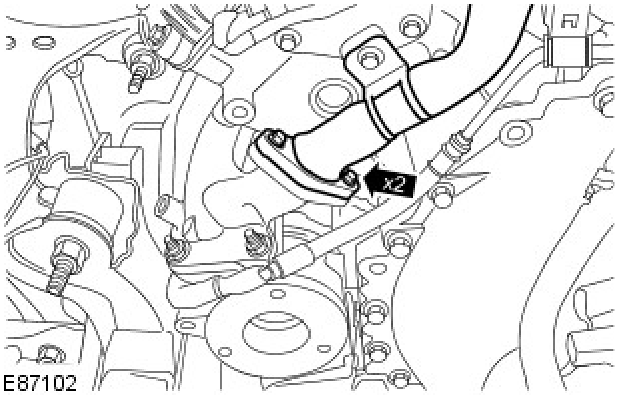
- Remove the banjo bolt.
- Remove and discard the 2 sealing washers.



13. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

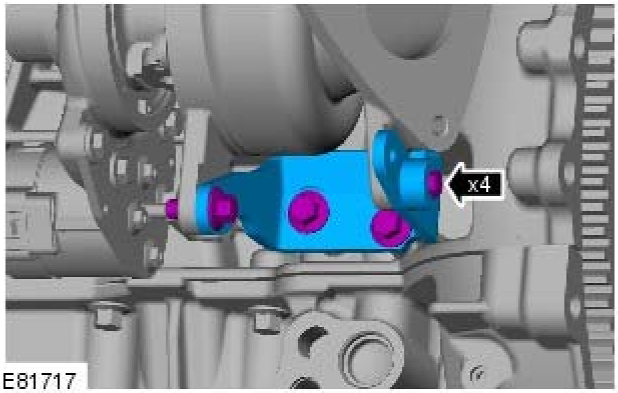
Reposition the LH turbocharger outlet pipe.

- Release the turbocharger outlet pipe clip.
- Remove the 2 bolts.



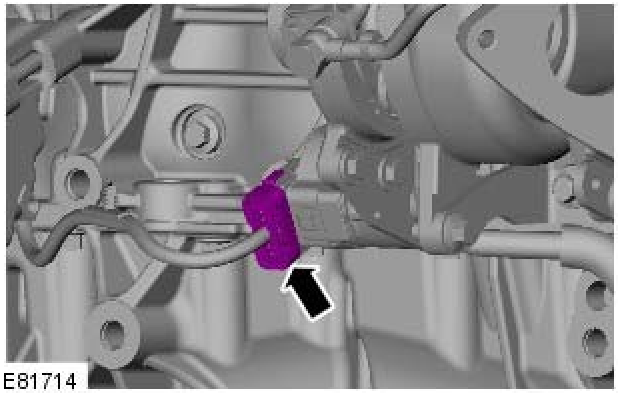
14. Release the LH exhaust gas recirculation (EGR) valve inlet tube.

- Remove the 2 bolts.
- Remove and discard the gasket.

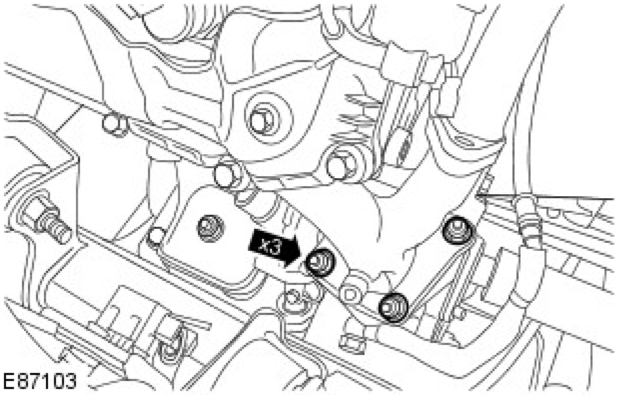


15. Remove the LH turbocharger support bracket.

- Remove the 4 bolts.

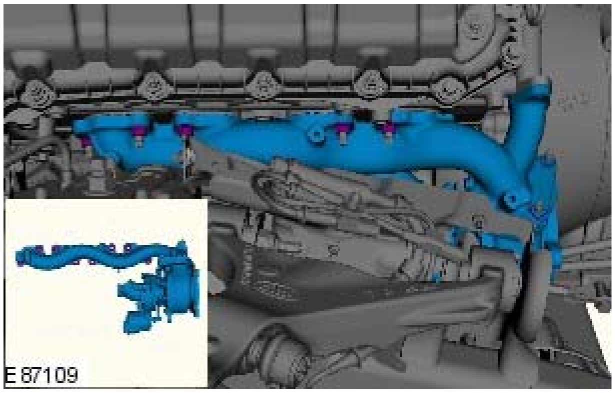


16. Disconnect the LH turbocharger electrical connector.



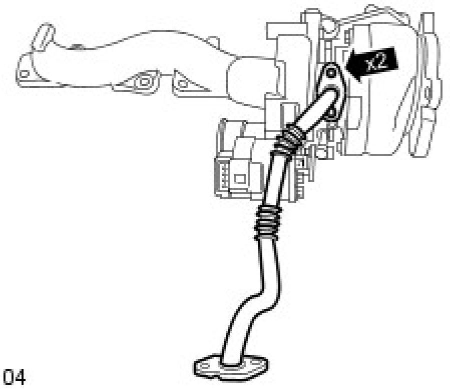
17. Release the LH turbocharger.

- Loosen the 3 nuts.



18. Remove the LH exhaust manifold and turbocharger assembly.

- Remove and discard the 8 nuts.
- Remove and discard the gasket.



E87104

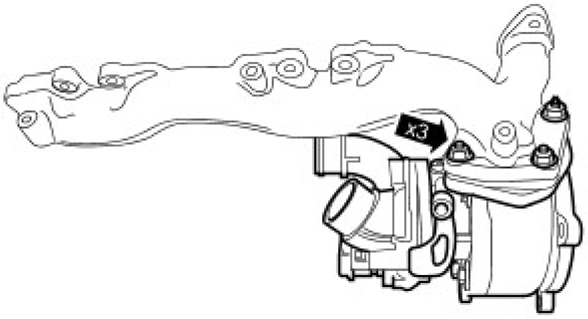
19. CAUTIONS:

⚠ Make sure that the area around the component is clean and free of foreign material.

⚠ Make sure that all openings are sealed. Use new blanking caps.

Remove the turbocharger oil return tube.

- Remove the 2 bolts.
- Remove and discard the gasket.



E87105

20. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the LH turbocharger.

- Remove the 3 nuts.
- Remove and discard the gasket.

Installation

1. NOTE: Remove and discard the blanking caps.

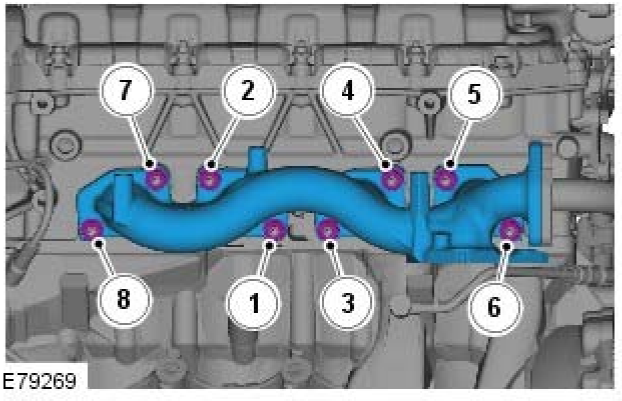
Install the LH turbocharger.

- Clean the component mating faces.
- Install a new gasket.
- Loosely install the nuts.

2. NOTE: Remove and discard the blanking caps.

Install the LH turbocharger oil return tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).



3. ⚠ CAUTION: To make sure that the exhaust manifold is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

• NOTE: Tighten the nuts in the sequence shown.

Install the LH exhaust manifold and turbocharger assembly.

- Clean the component mating face.
- Stage 1: Tighten the new nuts to 24 Nm (18 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 24 Nm (18 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 24 Nm (18 lb.ft).

4. Connect the LH turbocharger electrical connector.

5. ⚠ CAUTION: Install but do not fully tighten the turbocharger support bracket bolts. This will allow for movement of components during the final torque stages. Failure to follow this instruction may result in damage to the vehicle.

Install the LH turbocharger support bracket.

- Install the bolts.

6. Secure the LH turbocharger.

- Tighten the nuts to 24 Nm (18 lb.ft).

7. Secure the LH turbocharger support bracket.

- Stage 1: Tighten the LH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).
- Stage 2: Tighten the LH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).

8. Check tightness of the turbocharger nuts.

- Tighten the nuts to 24 Nm (18 lb.ft).

9. Secure the LH EGR valve inlet tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

10. NOTE: Remove and discard the blanking caps.

Secure the LH turbocharger outlet pipe.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the clip.

11. NOTE: Remove and discard the blanking caps.

Connect the LH turbocharger oil supply pipe.

- Clean the component mating faces.
- Install new sealing washers.

- Tighten the banjo bolt to 24 Nm (18 lb.ft).

12. Install the LH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Install the LH turbocharger heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

14. NOTE: Remove and discard the blanking caps.

Install the LH turbocharger intake tube.

- Tighten the nut to 10 Nm (7 lb.ft).
- Tighten the clip.

15. NOTE: The heat shield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.
- Tighten to 6 Nm (4 lb.ft).

16. NOTE: Do not tighten the clamp at this stage.

Install the LH catalytic converter.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 25 Nm (18 lb.ft).

17. Secure the RH catalytic converter.

- Clean the components mating faces.
- Tighten the nuts to 25 Nm (18 lb.ft).

18. Secure the LH catalytic converter.

- Tighten the nut to 55 Nm (40 lb.ft).

19. Install the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

20. NOTE: Remove and discard the blanking caps.

Secure the LH turbocharger oil return tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

21. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

22. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel - Turbocharger RH

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

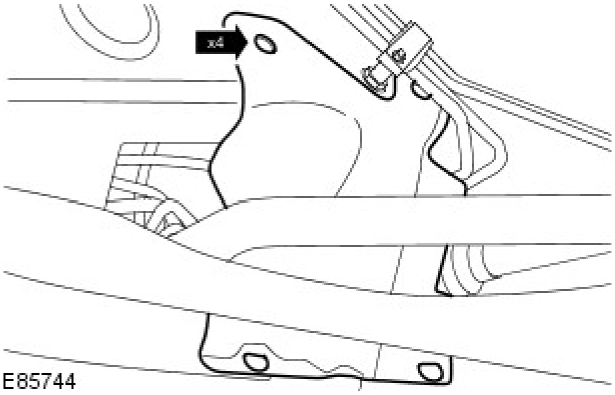
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

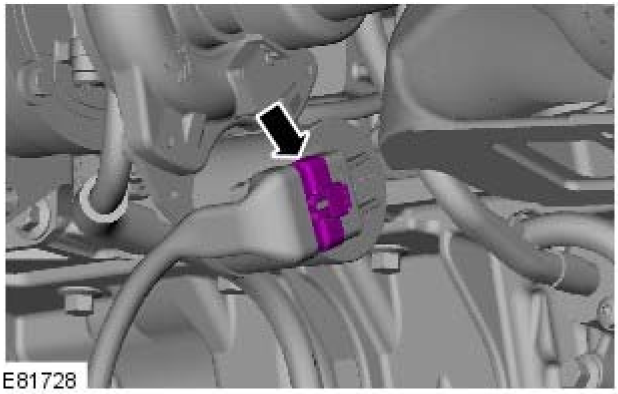
3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

4. Remove the RH splash shield.

- Remove the 4 clips.

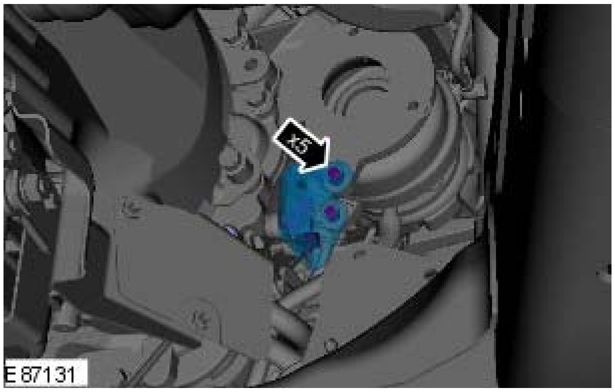


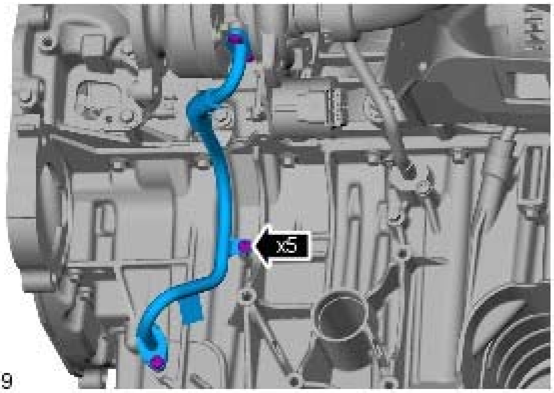
5. Disconnect the RH turbocharger electrical connector.



6. Remove the turbocharger support bracket.

- Remove the 5 bolts.





E81729

7. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

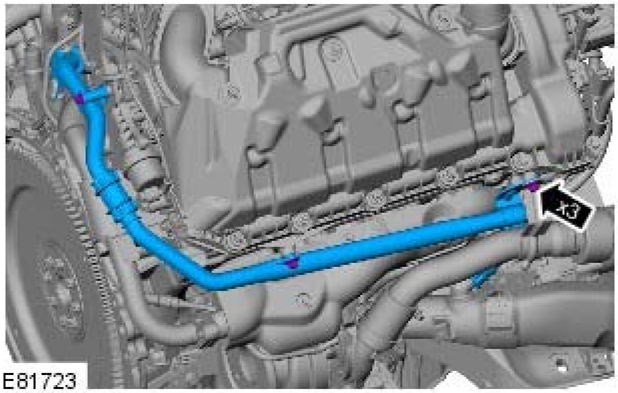
Remove the RH turbocharger oil return tube.

- Remove the 5 bolts.
- Remove and discard the 2 gaskets.

8. Remove the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

9. Release the breather line.

- Remove the 3 bolts.

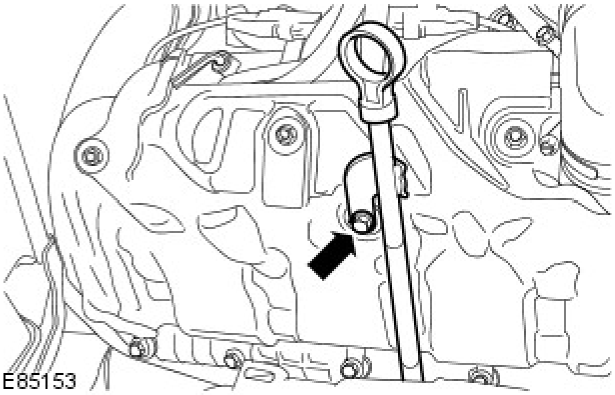


E81723

10. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator and upper oil level indicator tube.

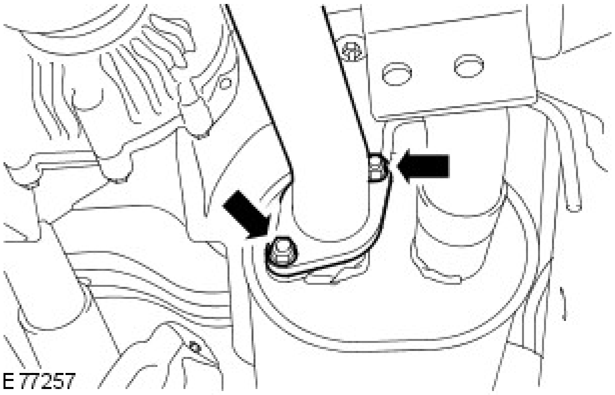
- Remove the bolt.
- Remove and discard the 2 O-ring seals.



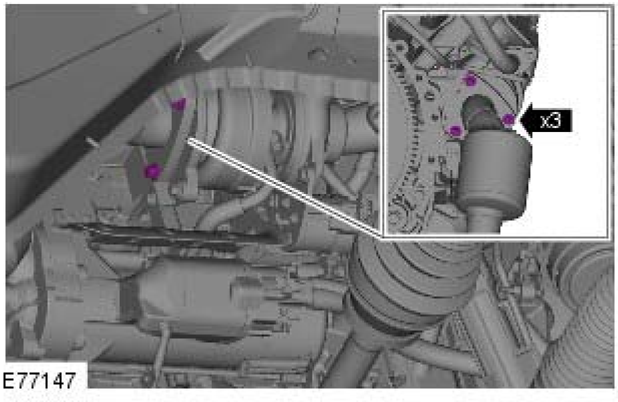
E85153

11. Release the RH catalytic converter.

- Remove the 2 nuts.

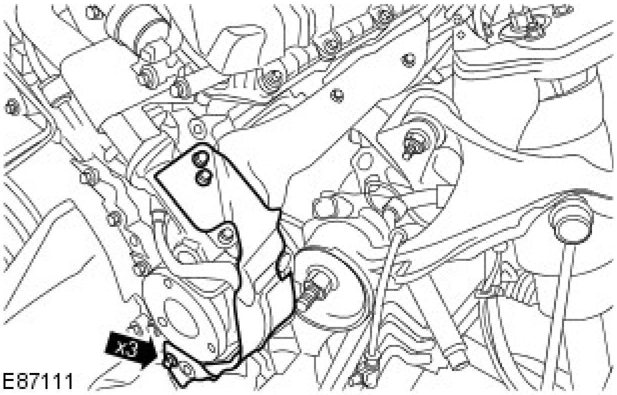


E77257



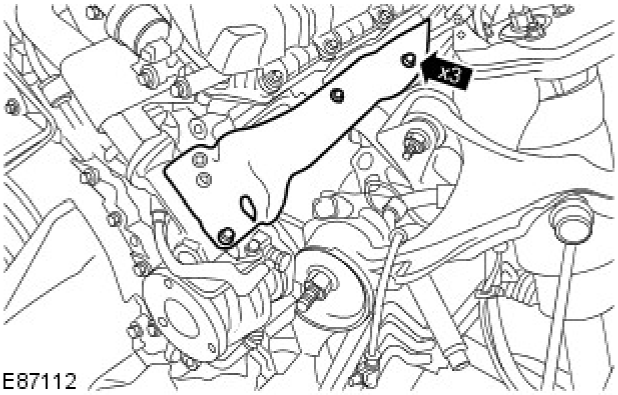
12. Remove the RH catalytic converter.

- Remove the 3 bolts.
- Remove and discard the gasket.



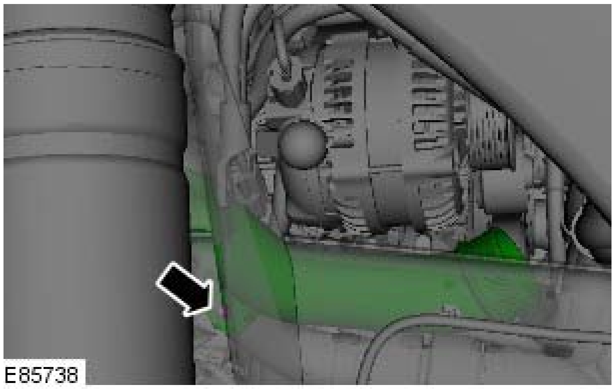
13. Remove the RH turbocharger heat shield.

- Remove the 3 bolts.



14. Remove the RH exhaust manifold heat shield.

- Remove the 3 bolts.

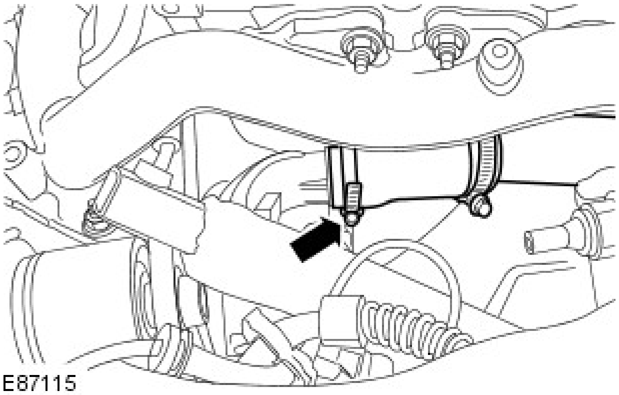


15. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Reposition the RH turbocharger intake tube.

- Remove the nut.

16. Release the RH turbocharger outlet pipe clip.

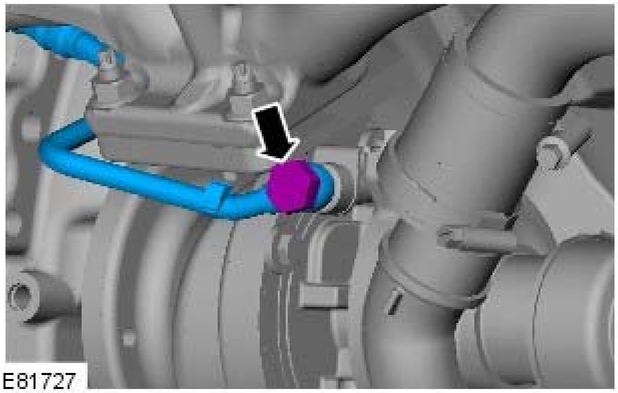


E87115

17. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the RH turbocharger oil supply pipe.

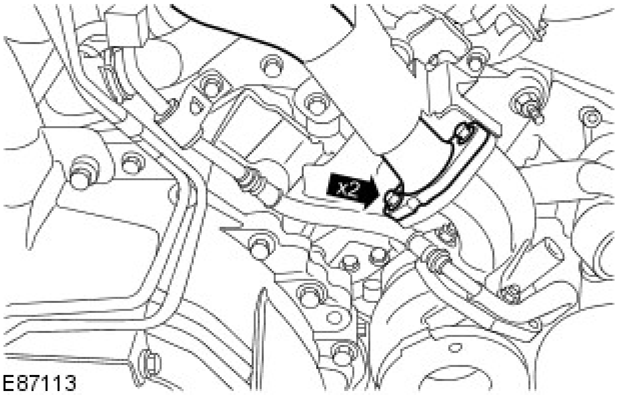
- Remove the banjo bolt.
- Remove and discard the 2 sealing washers.



E81727

18. Release the RH exhaust gas recirculation (EGR) valve inlet tube.

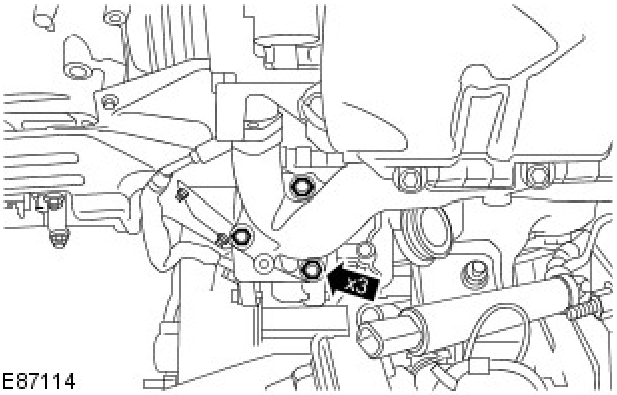
- Remove the 2 bolts.
- Remove and discard the gasket.



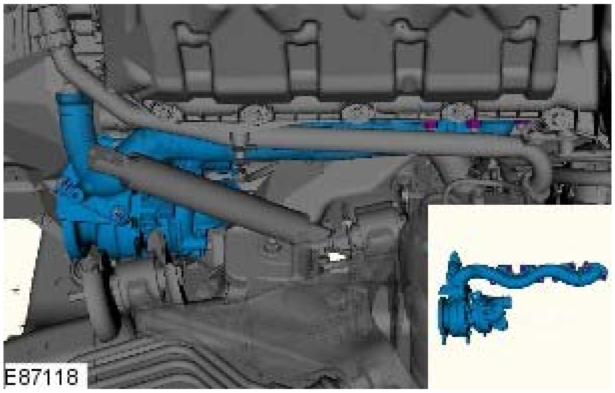
E87113

19. Release the RH turbocharger.

- Loosen the 3 nuts.



E87114


E87118

20. Reposition the RH exhaust manifold and turbocharger assembly.

- Remove and discard the 8 nuts.

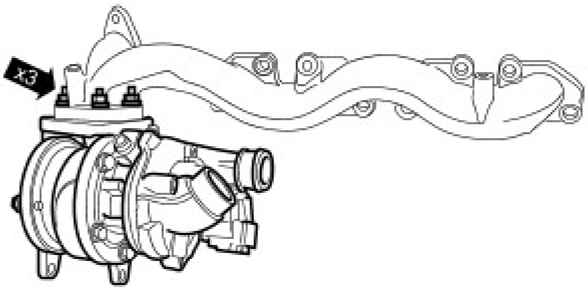
21. Disconnect the RH turbocharger outlet pipe.

22. Remove the RH exhaust manifold and turbocharger assembly.

- Remove and discard the gasket.

23. Remove the turbocharger from the exhaust manifold.

- Remove and discard the 3 nuts.
- Remove and discard the gasket.



E87116

Installation

1. Install the turbocharger to the exhaust manifold.

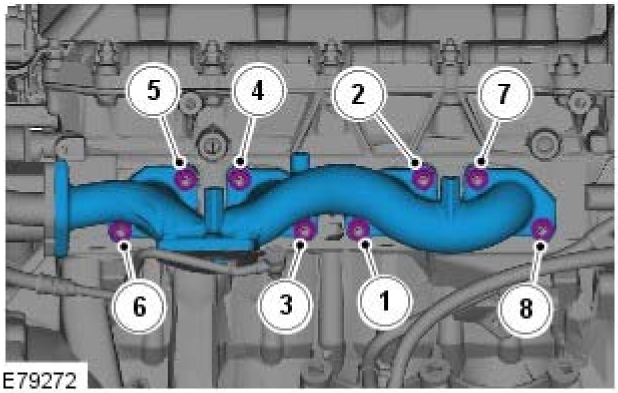
- Clean the components mating faces.
- Install a new gasket.
- Loosely install the nuts.

2. Install the RH exhaust manifold and turbocharger assembly.

- Clean the component mating faces.
- Install a new gasket.

3. Connect the RH turbocharger outlet pipe.

- Tighten the clip.



4. ⚠ CAUTION: To make sure that the exhaust manifold and turbocharger assembly is correctly installed and the exhaust manifold nuts are correctly torqued, it is critical that the tightening torque is checked 2 further times after the initial torque has been applied.

• NOTE: Tighten the nuts in the sequence shown.

Secure the RH exhaust manifold and turbocharger assembly.

- Clean the component mating face.
- Stage 1: Tighten the new nuts to 24 Nm (18 lb.ft).
- Stage 2: Wait for 2 minutes and tighten the nuts to 24 Nm (18 lb.ft).
- Stage 3: Wait for 2 minutes and tighten the nuts to 24 Nm (18 lb.ft).

5. ⚠ CAUTION: Install but do not fully tighten the turbocharger support bracket bolts. This will allow for movement of components during the final torque stages. Failure to follow this instruction may result in damage to the vehicle.

Install the RH turbocharger support bracket.

- Install the bolts.

6. Secure the RH turbocharger.

- Tighten the nuts to 24 Nm (18 lb.ft).

7. Secure the RH turbocharger support bracket.

- Stage 1: Tighten the RH turbocharger support bracket bolts at the cylinder block to 24 Nm (18 lb.ft).
- Stage 2: Tighten the RH turbocharger support bracket bolts at the turbocharger to 24 Nm (18 lb.ft).

8. Check tightness of the turbocharger nuts.

- Tighten the nuts to 24 Nm (18 lb.ft).

9. Secure the RH EGR valve inlet tube.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

10. NOTE: Remove and discard the blanking caps.

Connect the RH turbocharger oil supply pipe.

- Clean the component mating faces.
- Install new sealing washers.
- Tighten the banjo bolt to 24 Nm (18 lb.ft).

11. Tighten the RH turbocharger outlet pipe clip.

12. NOTE: Remove and discard the blanking caps.

Secure the RH turbocharger intake tube.

13. Install the RH exhaust manifold heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Tighten the nut to 10 Nm (7 lb.ft).

14. Install the RH turbocharger heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

15. Install the RH catalytic converter.

- Clean the components mating faces.
- Install a new gasket.
- Tighten the bolts to 25 Nm (18 lb.ft).

16. Secure the RH catalytic converter.

- Clean the components mating faces.
- Tighten the nuts to 55 Nm (40 lb.ft).

17. NOTE: Remove and discard the blanking caps.

Install the oil level indicator and upper oil level indicator tube.

- Clean the components mating faces.
- Install new O-ring seals.
- Tighten the bolt 9 Nm (7 lb.ft).

18. Secure the breather line.

- Tighten the M8 bolts to 23 Nm (17 lb.ft).
- Tighten the M6 bolt to 10 Nm (7 lb.ft).

19. Install the body.
For additional information, refer to: Body - TDV8 3.6L Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

20. NOTE: Remove and discard the blanking caps.

Install the RH turbocharger oil return tube.

- Clean the component mating faces.
- Install new gaskets.
- Tighten the bolts to 10 Nm (7 lb.ft).

21. Connect the RH turbocharger electrical connector.

22. Install the RH splash shield.

- Install the clips.

23. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

24. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel - Turbocharger Actuator Rod

Removal and Installation

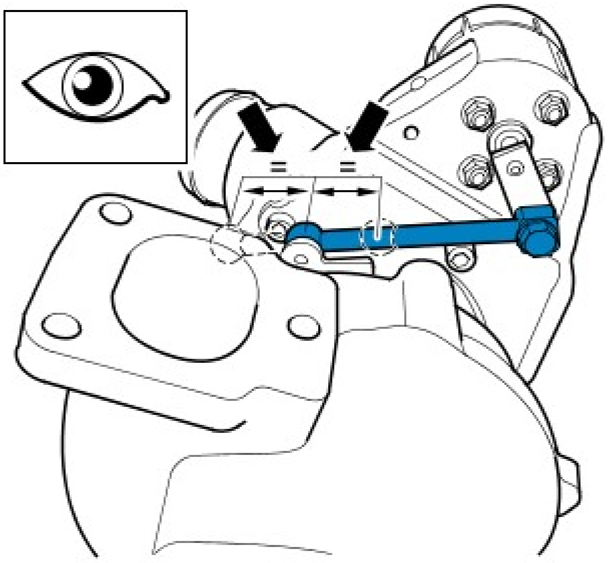
Removal

⚠ CAUTION: Always plug any open connections to prevent contamination.

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Remove the left hand turbocharger or right hand turbocharger as necessary.For additional information, refer to: (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel)

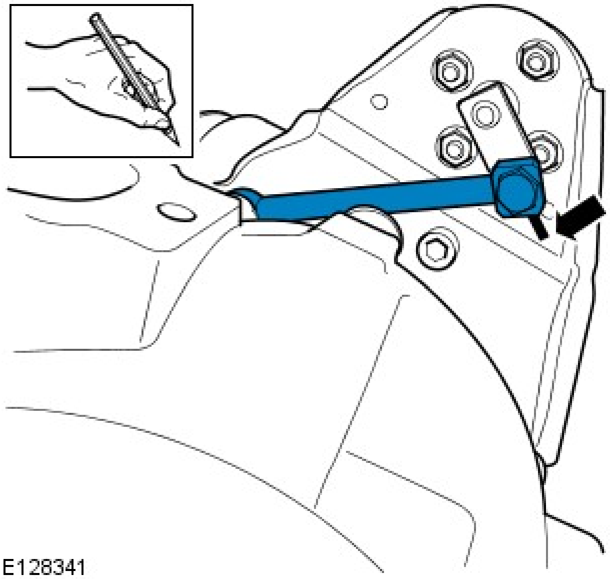
Turbocharger LH (Removal and Installation),
Turbocharger RH (Removal and Installation).



E128338

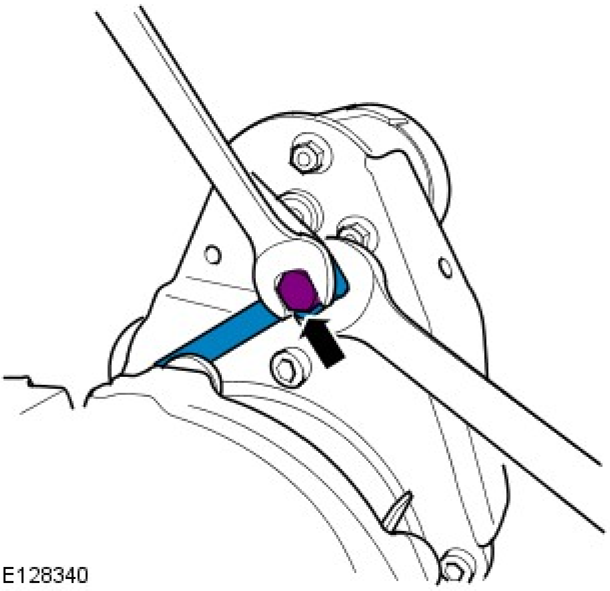
2. ⚠ CAUTION: Make sure that no parts of the turbocharger actuator linkage are allowed to move beyond the normal operating limits. Failure to follow this instruction may result in damage to the vehicle.

Position the turbocharger actuator connecting rod to the mid point position.



E128341

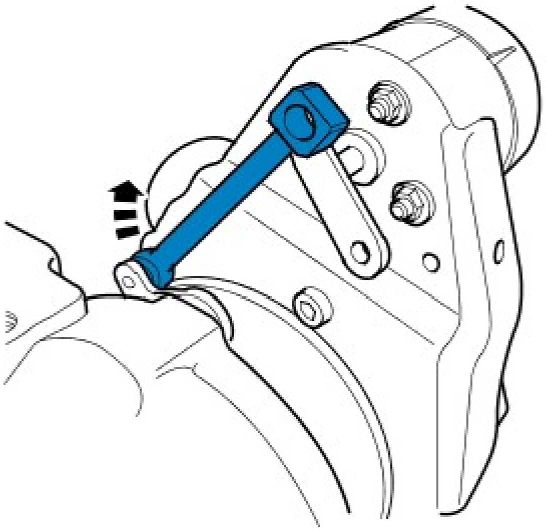
3. Using a suitable marker, mark the mid point position of the actuator arm.



E128340

4. ⚠ CAUTION: Make sure that two spanners are used to remove the bolt. Failure to follow this instruction may result in damage to the vehicle.

Remove the bolt.



E128339

5. Remove the turbocharger actuator connecting rod.

Installation

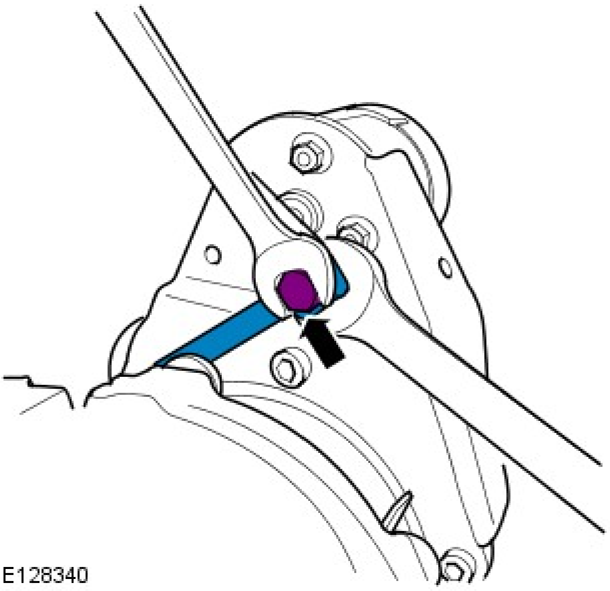
1. CAUTIONS:

⚠ Make sure that no parts of the turbocharger actuator linkage are allowed to move beyond the normal operating limits. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that the marks are aligned. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that two spanners are used to install the bolt. Failure to follow this instruction may result in damage to the vehicle.

To install, reverse the removal procedure.



2. Tighten the bolt to 5 Nm.

3. Install the left hand turbocharger or right hand turbocharger as necessary.For additional information, refer to: (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel)

Turbocharger LH (Removal and Installation),
Turbocharger RH (Removal and Installation).

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Accessory Drive - V8 S/C 4.2L Petrol -

Torque Specifications

Description	Nm	lb-ft
Cooling fan drive belt tensioner pulley retaining bolt	25	18
Cooling fan drive belt tensioner retaining bolt	40	30
Cooling fan drive hub bearing retaining bolts	10	7
Cooling fan drive pulley bolts	25	18
Accessory drive belt idler pulley bolt	40	30
Accessory drive belt tensioner retaining bolt	40	30

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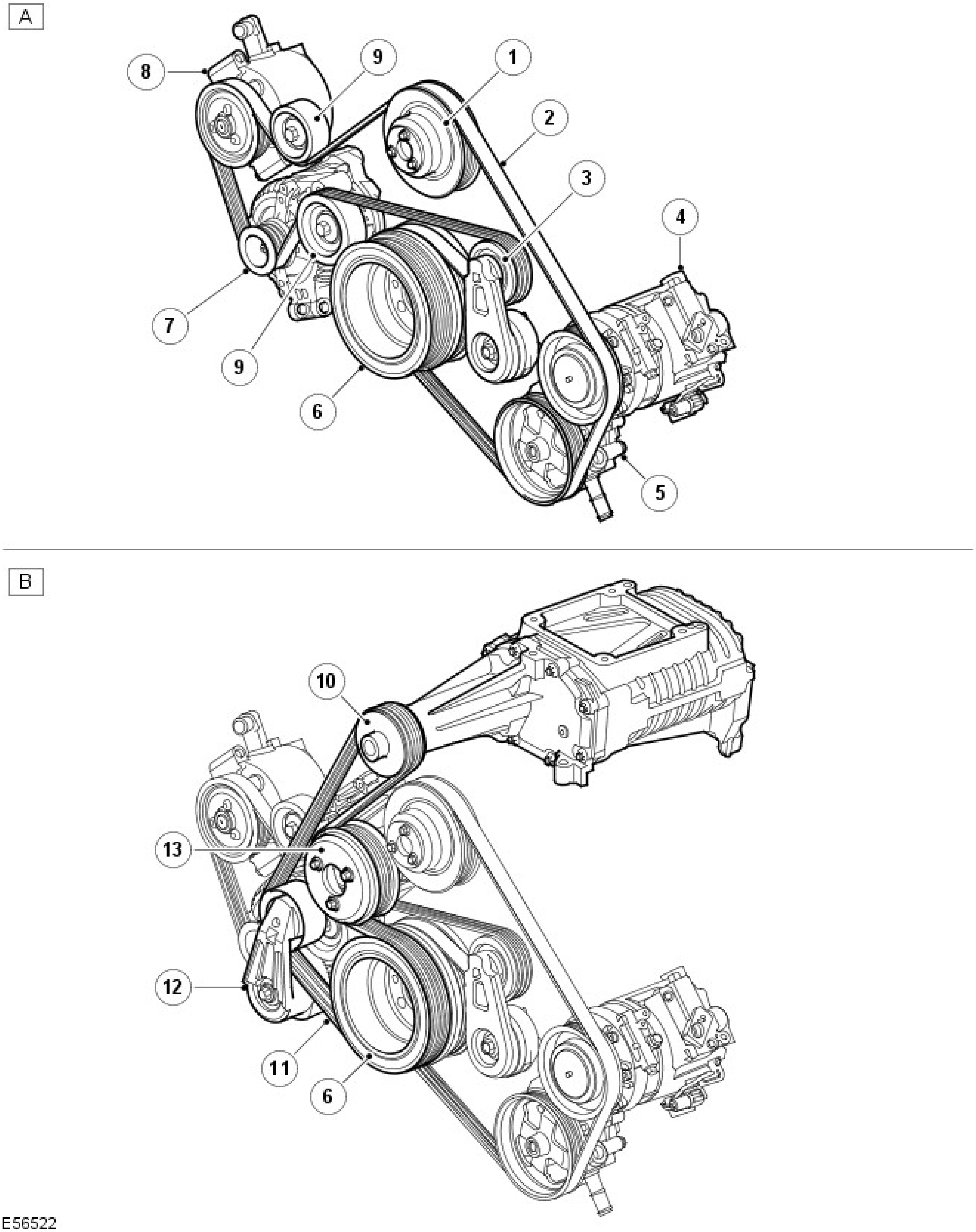
Accessory Drive - V8 S/C 4.2L Petrol - Accessory Drive

Description and Operation

Component Locations


A
8
9
1
2
3
4
7
9
6
5
B
10
13
12
11
6

E56522

Item	Part Number	Description
A	-	Primary accessory drive
B	-	Secondary accessory drive
1	-	Coolant pump
2	-	Primary accessory drive belt
3	-	Primary tensioner assembly
4	-	A/C compressor
5	-	Power steering pump
6	-	Crankshaft pulley
7	-	Generator
8	-	Dynamic Response pump pulley
9	-	Deflection pulley
10	-	Supercharger pulley
11	-	Secondary accessory drive belt
12	-	Secondary tensioner assembly
13	-	Engine cooling fan pulley

GENERAL

A single six-ribbed belt drives all the primary engine mounted accessories and a secondary double-sided eight-ribbed belt drives the engine driven cooling fan and the supercharger.

Both the primary and secondary belts are crankshaft driven via the torsional vibration damper. An automatic tensioner, located on the LH accessory-mounting bracket, keeps the belt at the correct tension. A deflection pulley on the RH accessory-mounting bracket increases the wrap angle around the generator pulley.

The torsional vibration damper incorporates compressed rubber between its inner and outer diameters to absorb vibration and shock loads.

The automatic tensioner consists of a deflection pulley on the end of a spring loaded pivot arm. The pivot arm can be turned counter-clockwise (viewed from the front of the engine) for removal and installation of the belt.

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Accessory Drive - V8 S/C 4.2L Petrol - Accessory Drive

Diagnosis and Testing

Overview

There are two accessory drive belts on the supercharged engine and this section covers basic checks for both.

For ease of identification, the two belts are referred to as primary and secondary drive belts.

For additional information on the description and operation of the system, refer to the relevant workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Symptom chart

Mechanical
● Primary drive belt condition (cracking/damage/contamination) ● Secondary drive belt condition (cracking/damage/contamination) ● Belt tension ● Pulley alignment ● Coolant pump ● Primary tensioner assembly ● Air conditioning compressor ● Power steering pump ● Crankshaft pulley ● Generator ● Dynamic response pump pulley ● Deflection pulley ● Supercharger pulley ● Secondary tensioner assembly ● Cooling fan pulley

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

⚠ CAUTION: If the engine is run without the accessory drive belts connected to eliminate driven components, diagnostic trouble codes, (DTCs) may be set which must be cleared before the vehicle is returned to the owner. The engine should not be run for more than 2-3 minutes with the belts disconnected. Failure to follow this instruction may result in damage to the vehicle.

4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible cause	Action
Noise	● Belt condition ● Belt tension ● Pulleys misaligned ● Driven components (including tensioners)	Check the belt condition (see visual inspection). Check the tensioner function. Check the pulley alignment. Check the driven components for excessive resistance to rotation. Rectify as necessary.
Drive belt does not hold tension	● Belt condition ● Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible source	Action
P050600	Idle Air Control System RPM Lower Than Expected	- Air intake restriction - Accessory drive overload (defective/seized component)	Check the air intake system. Check the accessory drive belt and components. Refer to the relevant workshop manual section.

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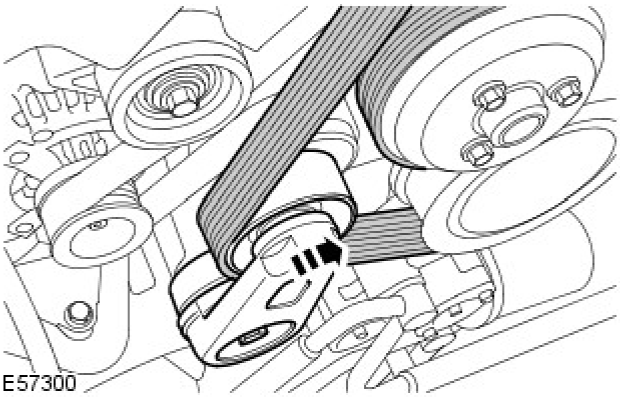
Accessory Drive - V8 S/C 4.2L Petrol - Cooling Fan Belt

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the cooling fan.
   For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).



3. Remove the cooling fan drive belt.
   - Rotate the drive belt tensioner arm clockwise.

Installation

1. To install, reverse the removal procedure.

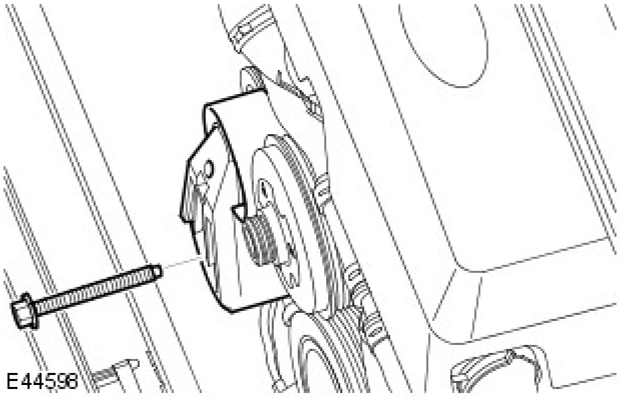
Published: 11-May-2011

Accessory Drive - V8 S/C 4.2L Petrol - Cooling Fan Belt Tensioner

Removal and Installation

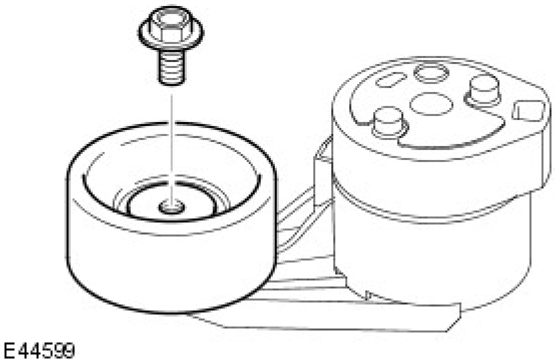
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the cooling fan belt.
   For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).
3. Remove the cooling fan drive belt tensioner.
   - Remove the bolt.



4. NOTE: Do not disassemble further if the component is removed for access only.

   Remove the drive belt pulley.
   - Remove the bolt.



Installation

1. To install, reverse the removal procedure.
   - Tighten the pulley bolt to 25 Nm (18 lb.ft).
   - Tighten the tensioner bolt to 40 Nm (30 Ib.ft).

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Accessory Drive - V8 S/C 4.2L Petrol - Accessory Drive Belt

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

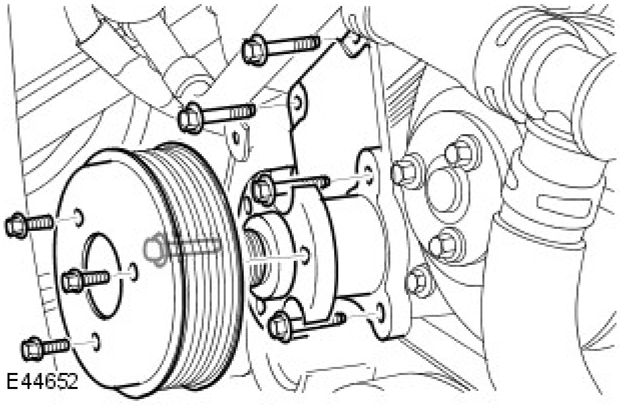
2. Remove the cooling fan drive belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

3. Remove the cooling fan drive pulley.

- Remove the 3 bolts.

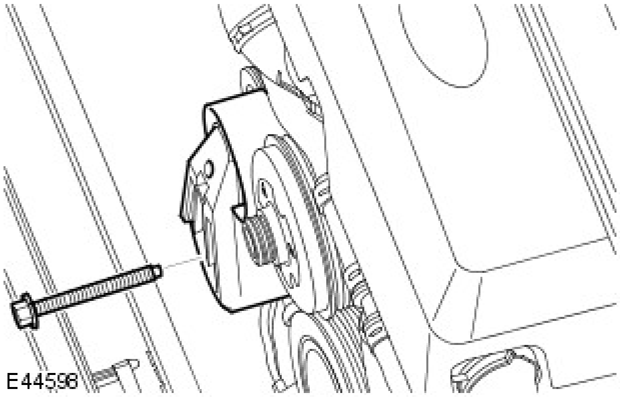
4. Remove the cooling fan drive hub bearing.

- Remove the 5 bolts.



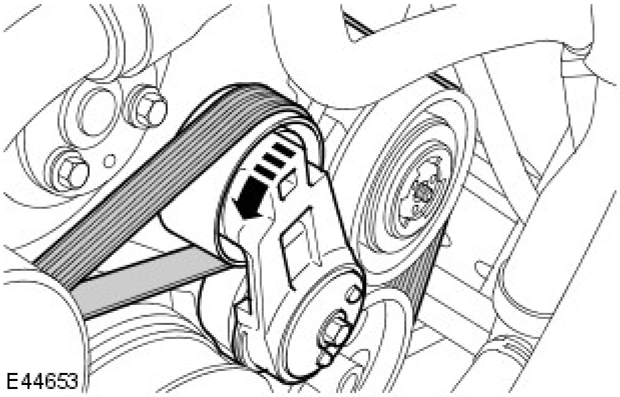
5. Remove the cooling fan belt tensioner.

- Remove the bolt.



6. Release the accessory drive belt.

- Rotate the accessory drive belt tensioner counterclockwise.

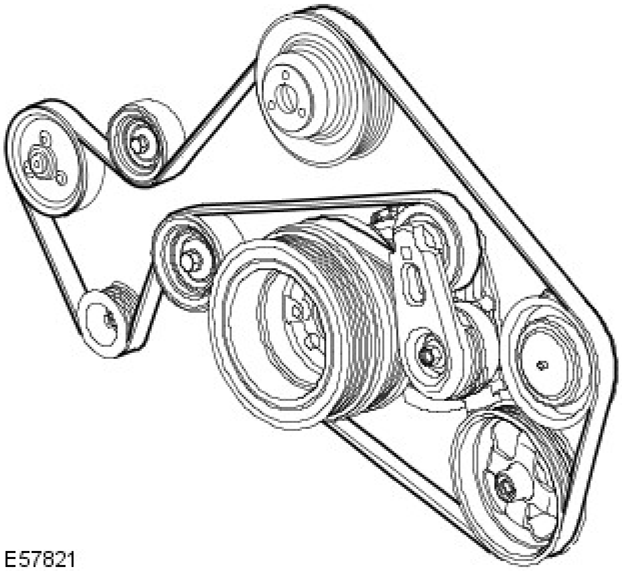


7. NOTE: Note the fitted position.

Remove the accessory drive belt.

Installation

1. Install the accessory drive belt.



2. Install the cooling fan belt tensioner.

- Tighten the M10 bolt to 45 Nm (33 lb.ft).

3. Install the cooling fan drive hub bearing.

- Tighten the bolts to 10 Nm (7 lb.ft).

4. Install the cooling fan drive pulley.

- Tighten the bolts evenly to 25 Nm (18 lb.ft).

5. Install the cooling fan drive belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

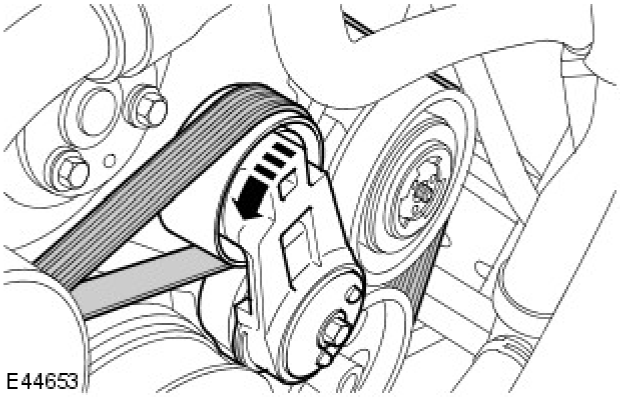
Published: 11-May-2011

Accessory Drive - V8 S/C 4.2L Petrol - Accessory Drive Belt Tensioner

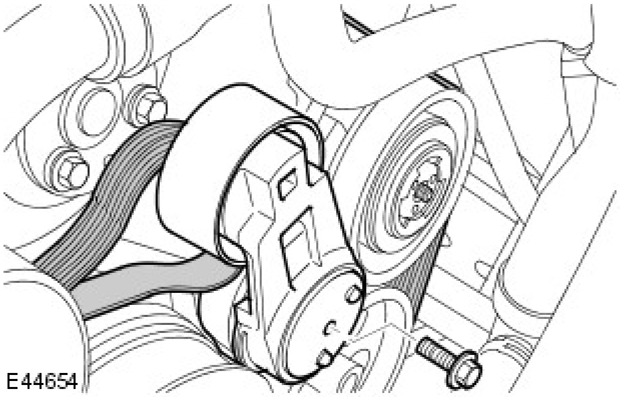
Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the cooling fan assembly.
   For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).



3. Release the accessory drive belt.
   - Rotate the accessory drive belt tensioner counter-clockwise, using a 3/8 " drive wrench.



4. Remove the accessory drive belt tensioner.
   - Remove the bolt.

Installation

1. To install, reverse the removal procedure.
   - Clean and inspect the drive pulleys for damage.
   - Tighten the tensioner bolt to 40 Nm (30 lb.ft).

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Accessory Drive - V8 S/C 4.2L Petrol - Accessory Drive Belt Idler Pulley

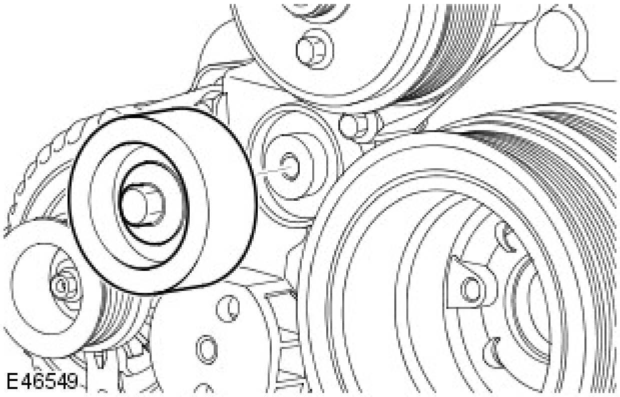
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

3. Remove the accessory drive belt idler pulley.



- Remove the bolt.

Installation

1. Install the accessory drive belt idler pulley.

- Tighten the bolt to 45 Nm (33 lb.ft).

2. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Accessory Drive - V8 4.4L Petrol -

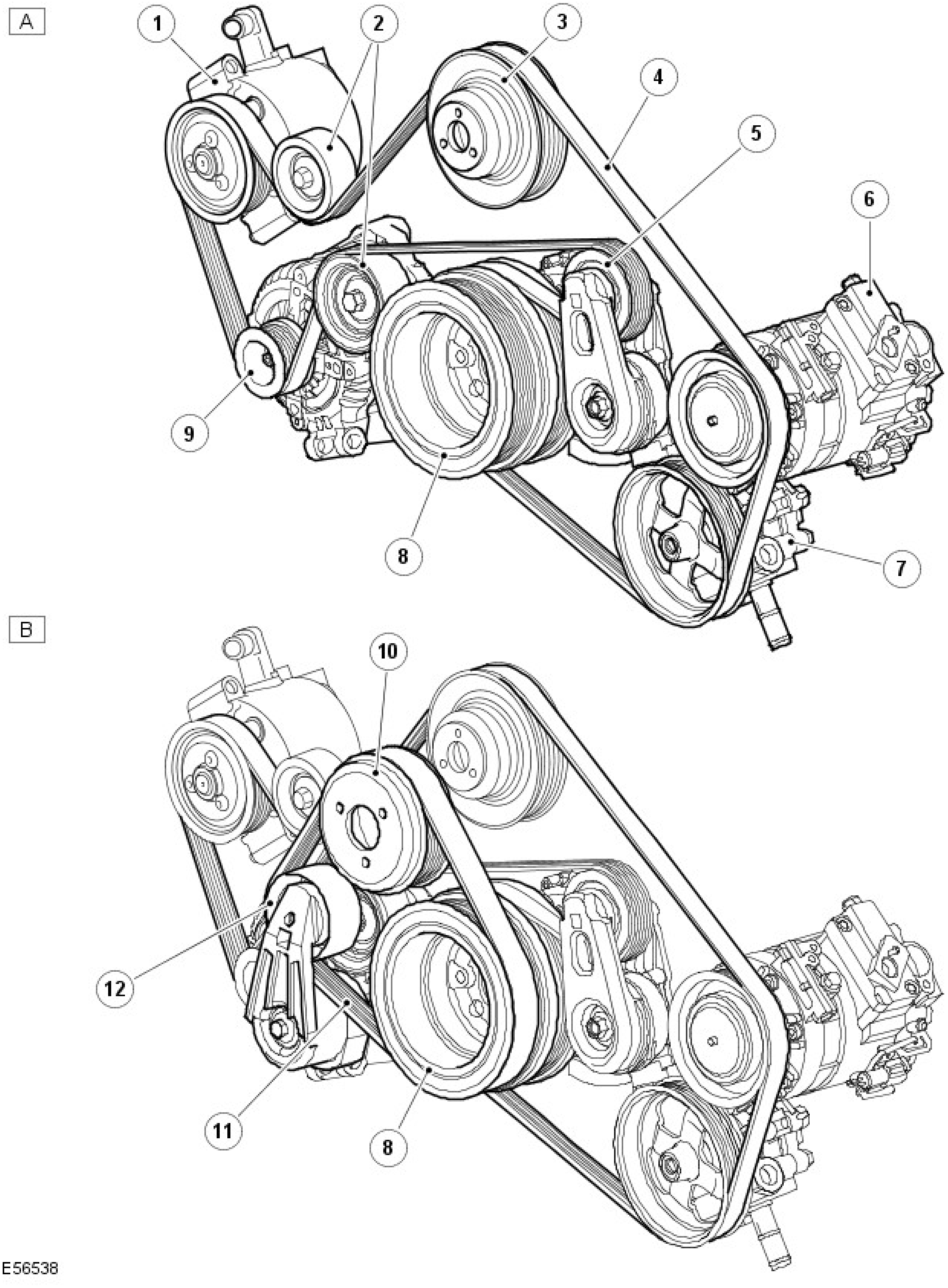
Torque Specifications

Description	Nm	lb-ft
Cooling fan belt tensioner pulley bolt	25	18
Cooling fan belt tensioner bolt	45	33
Cooling fan drive pulley bolts	25	18
Accessory drive belt idler pulley bolt	25	18
Viscous fan drive hub bearing/pulley bolts	10	7
Accessory drive belt tensioner retaining bolt	40	30

Published: 11-May-2011

Accessory Drive - V8 4.4L Petrol - Accessory Drive

Description and Operation


A
1
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E56538

Item	Part Number	Description

A	-	Primary accessory drive
B	-	Secondary accessory drive
1	-	Dynamic Response pump pulley (if fitted)
2	-	Deflection pulley
3	-	Coolant pump
4	-	Primary accessory drive belt
5	-	Primary tensioner assembly
6	-	A/C compressor
7	-	Power steering pump
8	-	Crankshaft pulley
9	-	Generator
10	-	Engine cooling fan pulley
11	-	Secondary accessory drive belt
12	-	Secondary tensioner assembly

GENERAL

A single six-ribbed belt drives all the primary engine mounted accessories and a secondary double-sided single eight-ribbed belt drives the engine driven cooling fan.

Both the primary and secondary belts are crankshaft driven via the torsional vibration damper. An automatic tensioner, located on the LH accessory-mounting bracket, keeps the belt at the correct tension. A deflection pulley on the RH accessory-mounting bracket increases the wrap angle around the generator pulley.

The torsional vibration damper incorporates compressed rubber between its inner and outer diameters to absorb vibration and shock loads.

The automatic tensioner consists of a deflection pulley on the end of a spring loaded pivot arm. The pivot arm can be turned counter-clockwise (viewed from the front of the engine) for removal and installation of the belt.

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Accessory Drive - V8 4.4L Petrol - Accessory Drive

Diagnosis and Testing

Overview

There are 2 accessory drive belts on the supercharged engine and this section covers basic checks for both.

For ease of identification, the 2 belts are referred to as primary and secondary drive belts.

For additional information on the description and operation of the system, refer to the relevant workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Symptom chart

Mechanical
● Primary drive belt condition (cracking/damage/contamination) ● Secondary drive belt condition (cracking/damage/contamination) ● Belt tension ● Pulley alignment ● Coolant pump ● Primary tensioner assembly ● Air conditioning compressor ● Power steering pump ● Crankshaft pulley ● Generator ● Dynamic response pump pulley ● Deflection pulley ● Supercharger pulley ● Secondary tensioner assembly ● Cooling fan pulley

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

CAUTION: If the engine is run without the accessory drive belts connected to eliminate driven components, diagnostic trouble codes, (DTCs) may be set which must be cleared before the vehicle is returned to the owner. The engine should not be run for more than 2-3 minutes with the belts disconnected. Failure to follow this instruction may result in damage to the vehicle.

4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible cause	Action
Noise	● Belt condition ● Belt tension ● Pulleys misaligned ● Driven components (including tensioners)	Check the belt condition (see visual inspection). Check the tensioner function. Check the pulley alignment. Check the driven components for excessive resistance to rotation. Rectify as necessary.
Drive belt does not hold tension	● Belt condition ● Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible source	Action
P050600	Idle Air Control System RPM Lower Than Expected	- Air intake restriction - Accessory drive overload (defective/seized component)	Check the air intake system. Check the accessory drive belt and components. Refer to the relevant workshop manual section.

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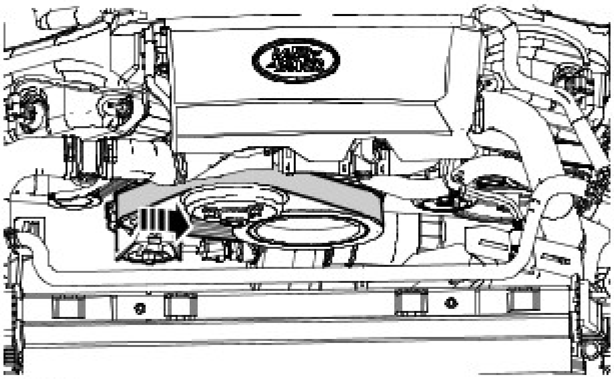
Accessory Drive - V8 4.4L Petrol - Cooling Fan Belt

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Coupling unit - viscous fan -renew
For additional information, refer to: Cooling Fan (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).



E56140

3. Remove the cooling fan drive belt.

- Using a 1/2 inch square drive bar, rotate the drive belt tensioner clockwise.

Installation

1. To install, reverse the removal procedure.

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Accessory Drive - V8 4.4L Petrol - Cooling Fan Belt Tensioner

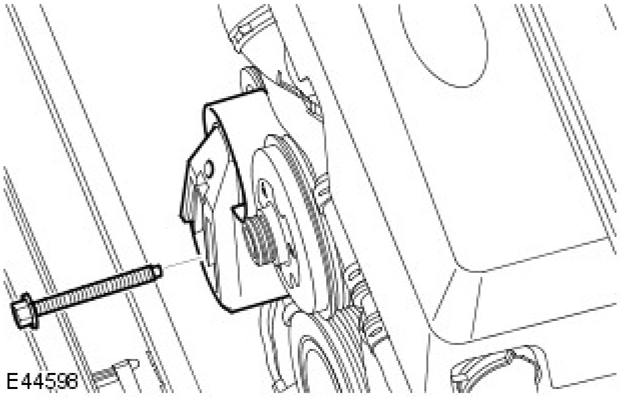
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

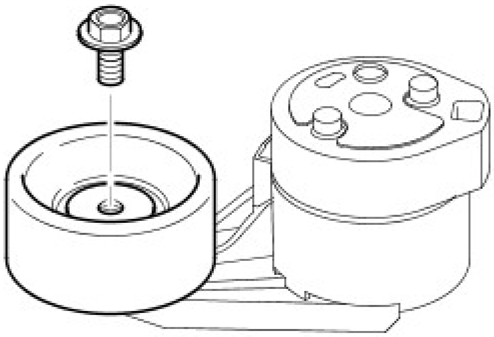
2. Remove the viscous fan drive belt.
For additional information, refer to: Cooling Fan Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

3. Remove the viscous fan drive belt tensioner.



- Remove the bolt.

4. NOTE: Do not disassemble further if the component is removed for access only.



Remove the drive belt pulley.

- Remove the bolt.

Installation

1. To install, reverse the removal procedure.

- Tighten the pulley bolt to 25 Nm (18 lb.ft).
- Tighten the tensioner bolt to 40 Nm (30 lb.ft).

2. Install the viscous fan drive belt.
For additional information, refer to: Cooling Fan Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

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Accessory Drive - V8 4.4L Petrol - Accessory Drive Belt

Removal and Installation

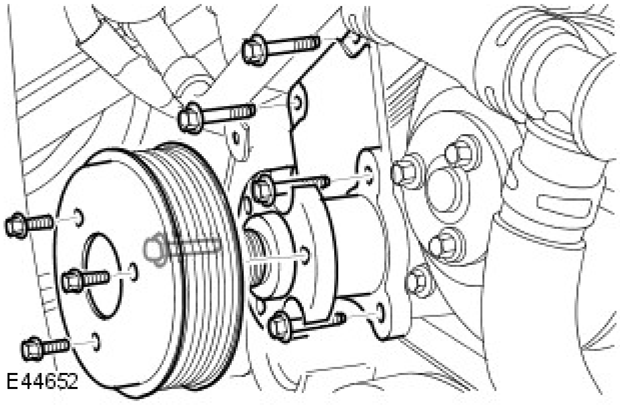
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the viscous fan drive belt.
For additional information, refer to: Cooling Fan Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

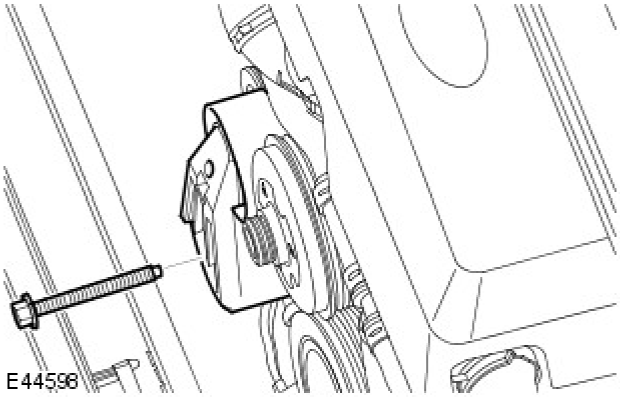
3. Remove the cooling fan drive pulley.

- Remove the 3 bolts.



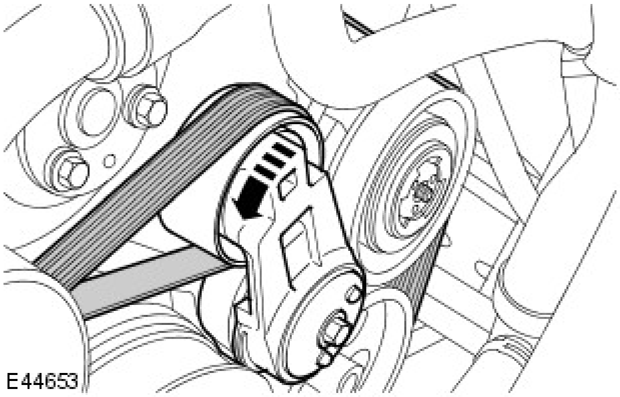
4. Remove the cooling fan drive hub bearing.

- Remove the 5 bolts.



5. Remove the cooling fan belt tensioner.

- Remove the bolt.



6. Release the accessory drive belt.

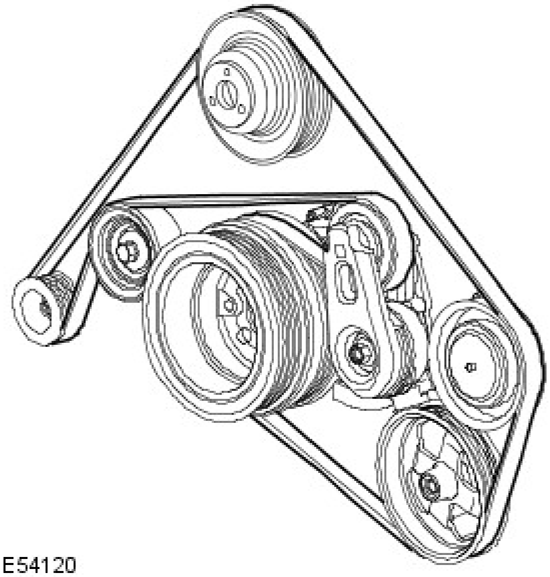
- Rotate the accessory drive belt tensioner counterclockwise.

7. NOTE: Note the fitted position.

Remove the accessory drive belt.

Installation

1. Install the accessory drive belt.



2. Install the cooling fan belt tensioner.

- Tighten the M10 bolt to 45 Nm (33 lb.ft).

3. Install the cooling fan drive hub bearing.

- Tighten the bolts to 10 Nm (7 lb.ft).

4. Install the cooling fan drive pulley.

- Tighten the bolts evenly to 25 Nm (18 lb.ft).

5. Install the viscous fan drive belt.
For additional information, refer to: Cooling Fan Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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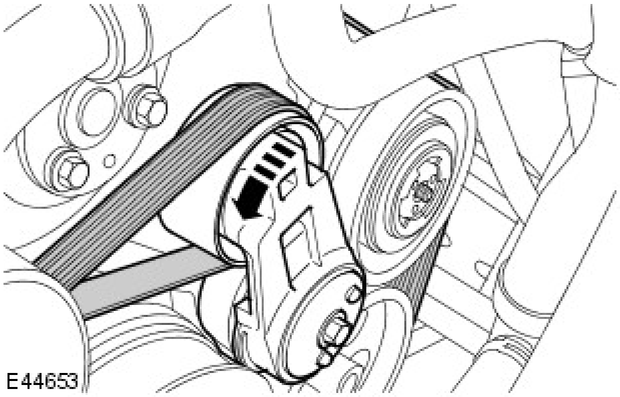
Accessory Drive - V8 4.4L Petrol - Accessory Drive Belt Tensioner

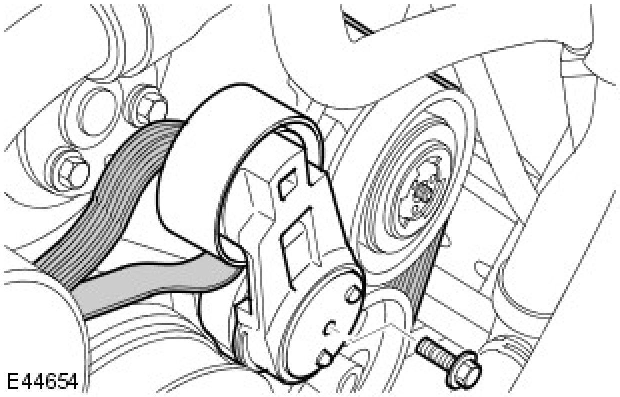
Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the viscous fan assembly.
   For additional information, refer to: Cooling Fan (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).



3. Release the accessory drive belt.
   - Rotate the accessory drive belt tensioner counterclockwise.



4. Remove the accessory drive belt tensioner.
   - Remove the bolt.

Installation

1. To install, reverse the removal procedure.
   - Clean and inspect the drive pulleys for damage.
   - Tighten the tensioner bolt to 40 Nm (30 lb.ft).
2. Install the viscous fan assembly.
   For additional information, refer to: Cooling Fan (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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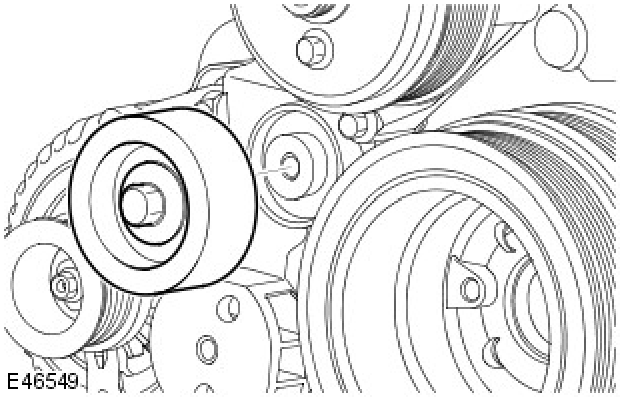
Accessory Drive - V8 4.4L Petrol - Accessory Drive Belt Idler Pulley

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).
3. Remove the accessory drive belt idler pulley.



- Remove the bolt.

Installation

1. Install the accessory drive belt idler pulley.
   - Tighten the bolt to 25 Nm (18 lb.ft).
2. Install the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).
3. Connect the battery ground cable.

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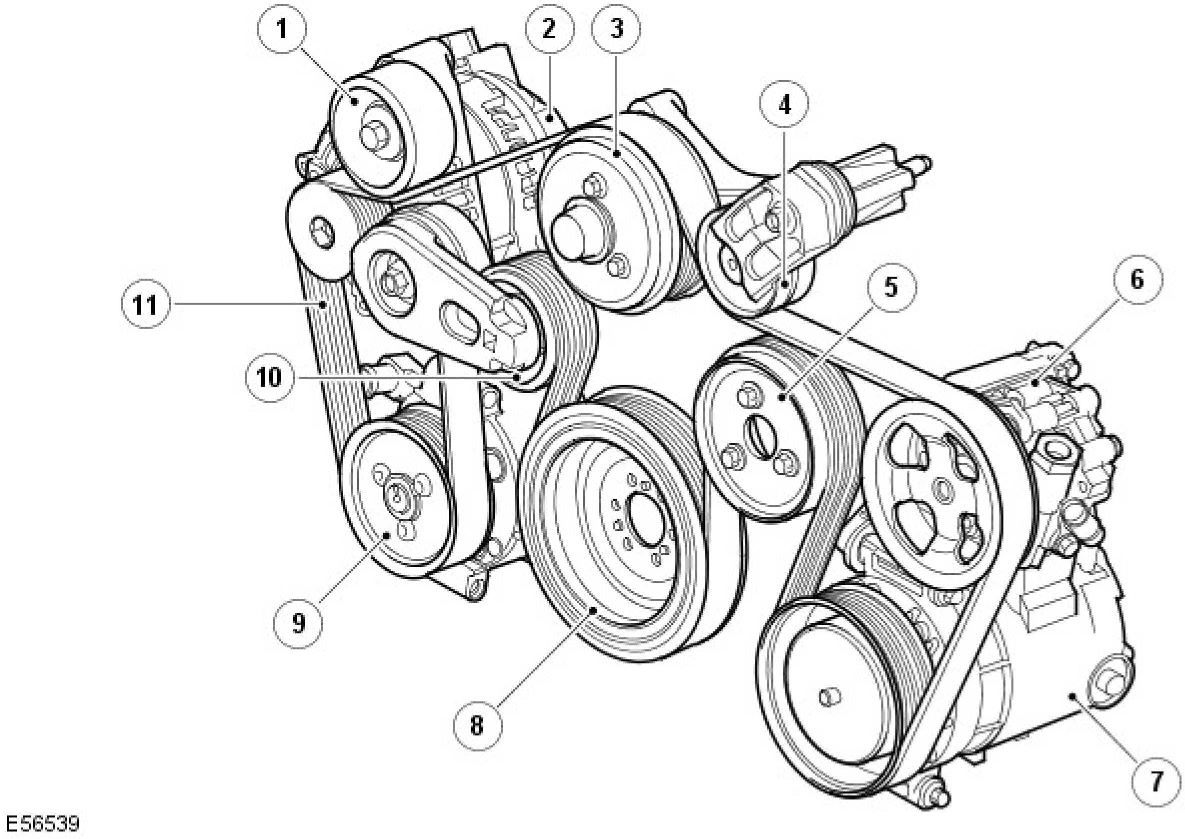
Accessory Drive - TDV6 2.7L Diesel -

Torque Specifications

Description	Nm	lb-ft
Accessory drive belt tensioner pulley Torx bolt	25	18
Accessory drive belt tensioner retaining bolt	45	33
Accessory drive belt idler retaining bolt	45	33
Fuel injection high pressure pump drive belt tensioner	25	18
EGR coolant cross over pipe	22	16

Accessory Drive - TDV6 2.7L Diesel - Accessory Drive

Description and Operation



Item	Part Number	Description
1	-	Idler assembly
2	-	Generator
3	-	Engine cooling fan
4	-	Tensioner assembly
5	-	Engine coolant pump
6	-	Power steering pump
7	-	A/C compressor
8	-	Torsional vibration damper
9	-	Dynamic Response pump (if fitted)
10	-	Tensioner assembly
11	-	Accessory drive belt

GENERAL

The engine crankshaft pulley drives the accessory components, which comprise the torsional vibration damper, generator, power steering pump, A/C compressor, Dynamic Response pump and coolant pump, via the accessory drive belt.

The belt, which is a maintenance free poly-V type belt, is automatically pre-loaded by the tensioning rollers and routed over deflection pulleys in order to maintain sufficient adhesion about the drive wheels. This ensures slip-free drive of the accessory components.

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Accessory Drive - TDV6 2.7L Diesel - Accessory Drive

Diagnosis and Testing

Overview

There is an additional drive belt on diesel engines for the fuel injection pump, this section covers basic checks for both.

For information on the description and operation of the system, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Visual inspection

Mechanical
● Drive belt condition (cracking/damage/contamination) ● Idler assembly ● Generator ● Engine cooling fan ● Tensioner assembly ● Engine coolant pump ● Power steering pump ● Air conditioning (A/C) compressor ● Torsional vibration damper ● Dynamic response pump ● Tensioner assembly ● Accessory drive belt ● Security/Correct installation of the fuel injection pump cover ● Fuel injection pump belt condition (cracking/damage/contamination) ● Fuel injection pump belt tensioner assembly ● Fuel injection pump ● Fuel injection pump belt

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

⚠ CAUTION: If the engine is run without the accessory drive belts connected to eliminate driven components, diagnostic trouble codes, (DTCs) may be set which must be cleared before the vehicle is returned to the owner. The engine should not be run for more than 2-3 minutes with the belts disconnected. Failure to follow this instruction may result in damage to the vehicle.

4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart (accessory drive belt)

Symptom	Possible cause	Action
Noise	● Belt condition ● Belt tension ● Pulleys misaligned ● Driven components (including tensioners)	Check the belt condition (see visual inspection). Check the tensioner function. Check the pulley alignment. Check the driven components for excessive resistance to rotation. Rectify as necessary.
Drive belt does not hold tension	● Belt condition ● Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary.

Symptom chart (fuel injection pump belt)

Symptom	Possible causes	Action
Noise	● Belt condition ● Belt fouling cover	Check the belt condition (see visual inspection). Check the belt cover for indications of fouling (this may indicate a pump misalignment), refer to the relevant workshop manual section. The belt tensioner must be renewed if the belt is removed, making a

Symptom	Possible causes	Action
	- Tensioner bearing failure - Fuel injection pump failure	check of the bearing impractical. Remove the belt, check the fuel injection pump pulley for security. Check the fuel injection pump for excessive resistance to rotation (excessive resistance in the pump will cause the pulley securing nut to loosen as a design feature). Check for diagnostic trouble codes (DTCs) indicating a pump malfunction.
Drive belt does not hold tension	- Belt condition - Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary.
Loss of drive (with no drive to the fuel injection pump, the engine will not run)	- Belt broken/stripped teeth - Drive pulleys loose	Investigate the cause of the belt breakage/damage (a belt broken at a 45 degree angle normally indicates a shear, a break straight across the belt normally indicates that the belt has been crimped). Check the fuel injection pump for excessive resistance to rotation (excessive resistance in the pump will cause the pulley securing nut to loosen as a design feature). Check for DTCs indicating a pump malfunction.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P050600	Idle Air Control System RPM Lower Than Expected	- Air intake restriction - Accessory drive overload (defective/seized component)	Check the air intake system. Check the accessory drive belt and components. Refer to the relevant workshop manual section.

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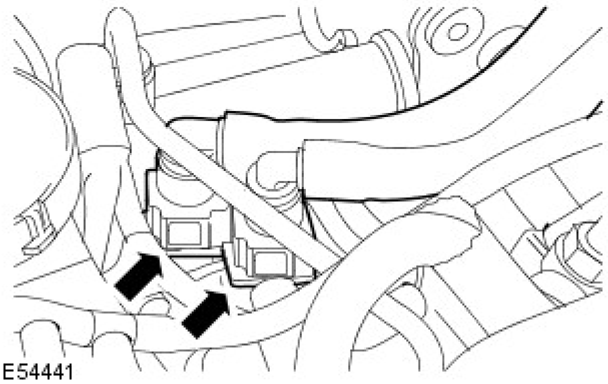
Accessory Drive - TDV6 2.7L Diesel - Fuel Injection Pump Belt

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

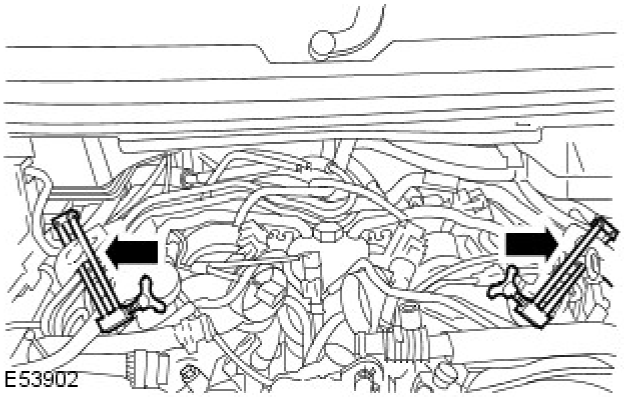
2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



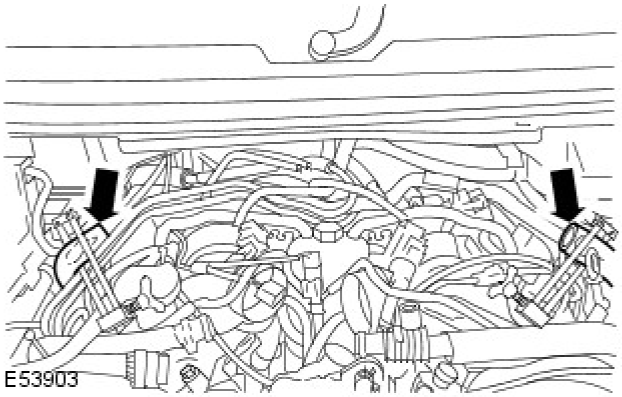
3. ⚠ WARNING: The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Disconnect the two fuel lines.

- Install blanking caps to the exposed ports.

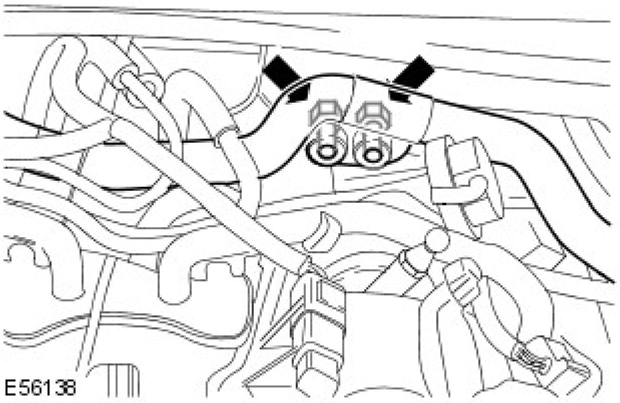


4. Clamp the exhaust gas recirculation (EGR) coolant hoses to minimize coolant loss.



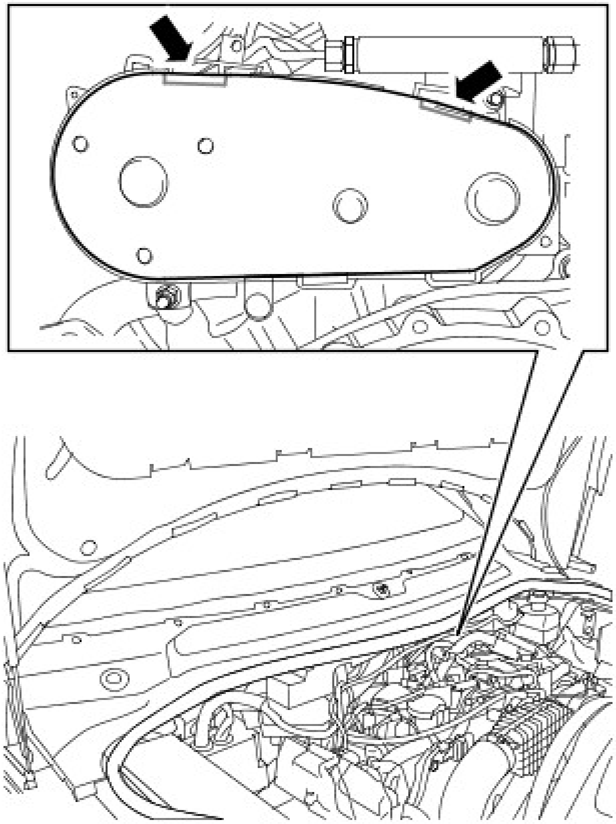
5. Disconnect the coolant hoses.

- Release the clips.



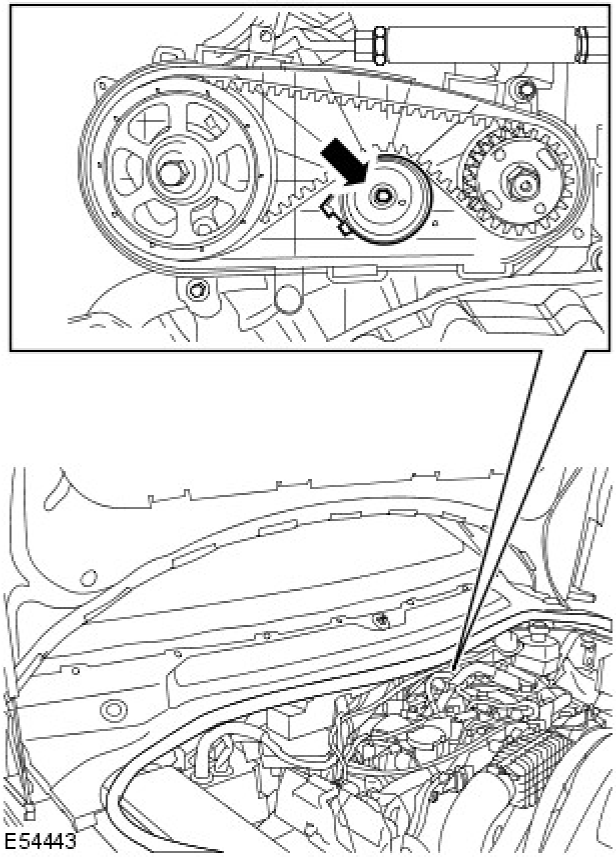
6. Remove the EGR coolant cross-over pipe.

- Remove the two retaining bolts.



7. Remove the fuel injection pump belt cover.

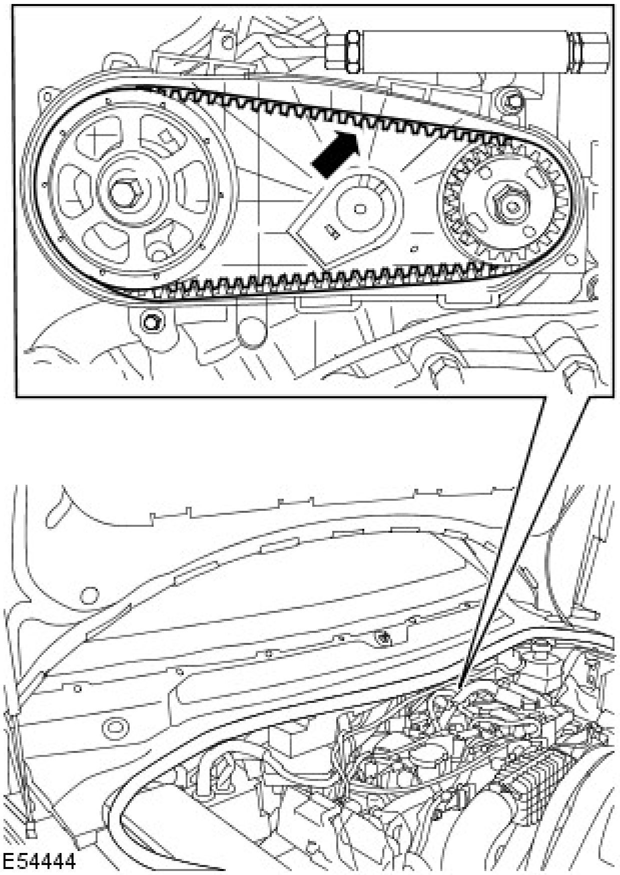
- Reposition the fuel charging wiring harness to allow access to the fuel injection pump belt cover.


E54443

8. NOTE: The fuel injection pump belt is not timed to the engine.

Remove and discard the fuel injection pump belt tensioner.

- Remove the retaining bolt.


E54444

9. NOTE: The fuel injection pump rotates in a counter-clockwise direction when viewed from the rear of the engine.

Remove and discard the fuel injection pump belt.

Installation

1. ⚠ CAUTION: Do not install the new fuel injection pump belt to the pulleys with the fuel pump belt tensioner installed. Failure to follow this instruction may result in damage to the fuel pump belt.

• NOTE: The fuel injection pump rotates in a counter-clockwise direction when viewed from the rear of the engine.

Install the new fuel injection pump belt.

2. ⚠ CAUTION: Make sure that the fuel injection pump belt tensioner tang is correctly located to the fuel injection pump belt rear cover. Failure to follow this instruction may result in damage to the engine.

Install a new fuel injection pump belt tensioner.

- Locate the tang on the new fuel injection pump belt tensioner into the fuel injection pump rear cover.
- Tighten to 25 Nm (18 lb.ft).
- Remove and discard the fuel injection pump belt tensioner locking pin.

3. Install the fuel injection pump belt cover.

- Reposition the fuel charging wiring harness back onto the diverter rail.

4. Install the EGR coolant cross-over pipe.

- Install the two retaining bolts.
- Tighten the bolts to 22 Nm (16 lb.ft).

5. Connect the coolant hoses.

- Remove the hose clamps.

6. Attach the fuel lines.

- Connect the two fuel lines.
- Remove the blanking caps from the ports.

7. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

9. Check and top-up the coolant.

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Accessory Drive - TDV6 2.7L Diesel - Accessory Drive Belt

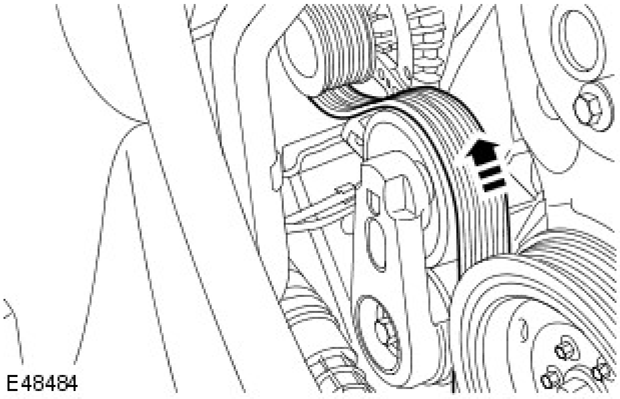
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the cooling fan.
For additional information, refer to: Cooling Fan (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

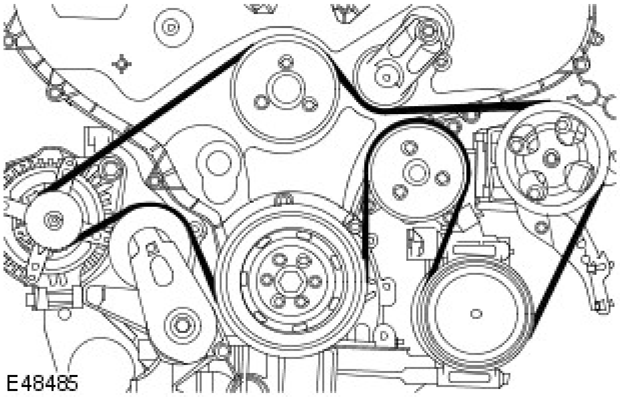
3. NOTE: Using a 3/8 square drive wrench, rotate the tensioner counter clockwise.



Remove the accessory drive belt.

- Release the tension from the belt.

Installation



1. To install, reverse the removal procedure.

- Clean and inspect the drive pulleys for damage.

Published: 11-May-2011

Accessory Drive - TDV6 2.7L Diesel - Accessory Drive Belt Tensioner

Removal and Installation

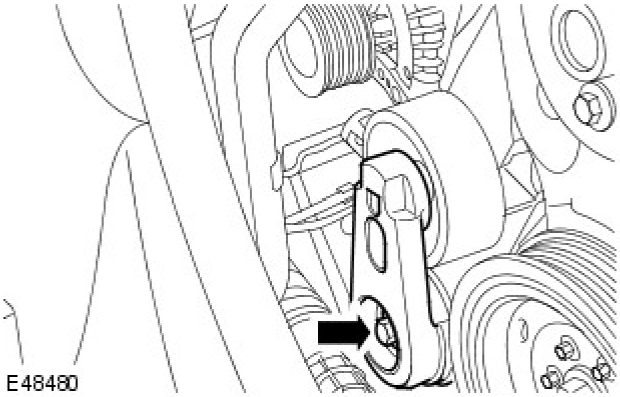
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

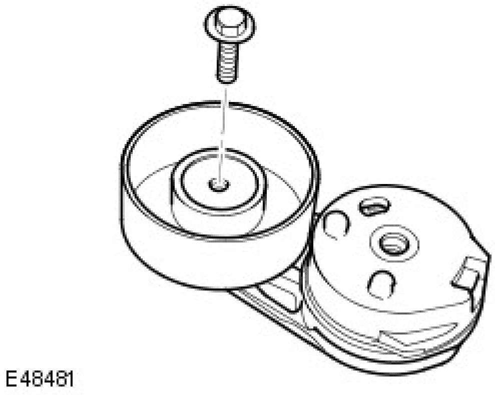
3. Remove the accessory drive belt tensioner.

- Remove the bolt.



4. Remove the accessory drive belt tensioner pulley.

- Remove the Torx bolt.



Installation

1. Install the accessory drive belt tensioner pulley.

- Clean the components.
- Tighten the bolt to 25 Nm (18 lb.ft).

2. Install the accessary drive belt tensioner.

- Clean the components.
- Tighten the bolt to 45 Nm (33 lb.ft).

3. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

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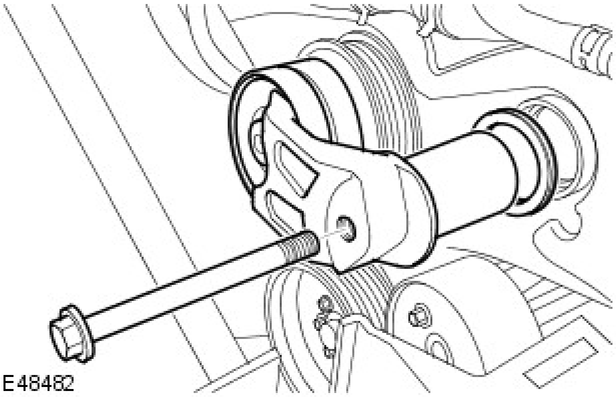
Accessory Drive - TDV6 2.7L Diesel - Accessory Drive Belt Idler Pulley

Removal and Installation

Removal

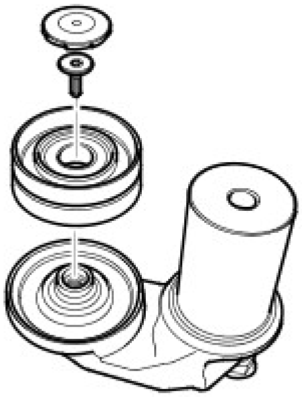
1. Disconnect the battery ground cable.

2. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).


E48482

3. Remove the accessory drive belt idler.

- Remove the bolt.
- Remove and discard the seal.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4. Remove the accessory drive belt idler pulley.

- Remove the bolt cover.
- Remove the Torx bolt.

Installation

1. Install the accessory drive belt idler pulley.

- Clean the components.
- Tighten the Torx bolt to 25 Nm (18 lb.ft).
- Install the bolt cover.

2. Install the accessory drive belt idler.

- Clean the components.
- Install a new seal.
- Tighten the bolt to 45 Nm (33 lb.ft).

3. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

Accessory Drive - TDV6 2.7L Diesel - Fuel Injection Pump Pulley

Removal and Installation

Removal

1. Refer to Fuel Pump.
   For additional information, refer to: Fuel Pump (303-04C, Removal and Installation).

Installation

1. Refer to Fuel Pump.
   For additional information, refer to: Fuel Pump (303-04C, Removal and Installation).

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Accessory Drive - TDV8 3.6L Diesel -

Torque Specifications

Item	Nm	lb-ft
65 mm cooling fan belt idler pulley bolt	48	35
80 mm cooling fan belt idler pulley bolt	80	59
Cooling fan belt tensioner bolts	25	18
Accessory drive belt tensioner bolts	25	18

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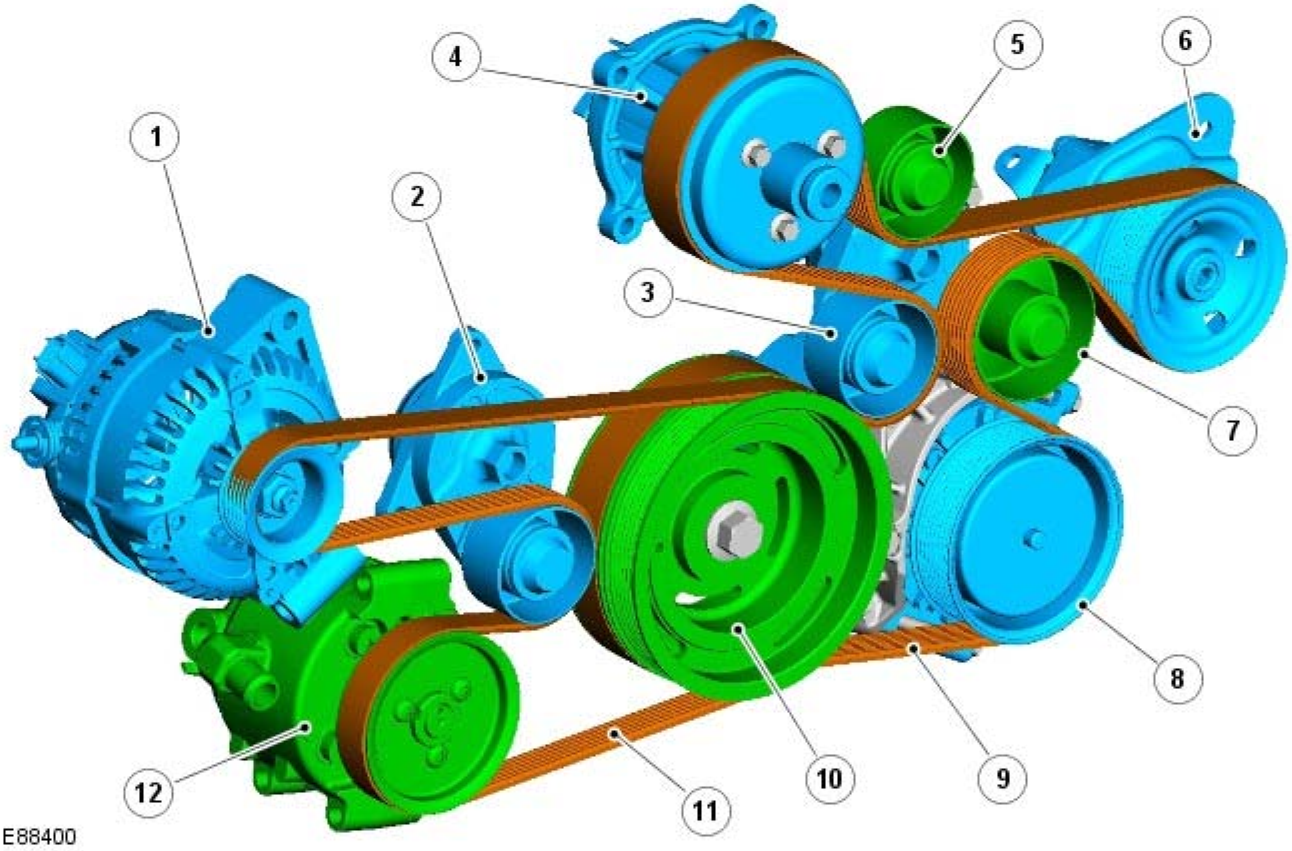
Accessory Drive - TDV8 3.6L Diesel - Accessory Drive

Description and Operation

COMPONENT LOCATION



Item	Part Number	Description
1	-	Generator
2	-	Tensioner assembly
3	-	Tensioner assembly
4	-	Engine cooling fan/coolant pump
5	-	Idler assembly
6	-	Power steering pump
7	-	Idler assembly
8	-	Air Conditioning (A/C) compressor
9	-	Primary accessory drive belt
10	-	Crankshaft pulley
11	-	Secondary accessory drive belt
12	-	Dynamic Response pump

The engine crankshaft pulley drives the accessory components, which comprise the generator, power steering pump, A/C compressor, coolant pump and Dynamic Response pump, via one of two accessory drive belts.

The primary belt is an 8-ribbed, maintenance free poly-V type belt which is 28.5 mm wide. The secondary belt is a 6 rib, maintenance free poly-V type belt which is 21.4 mm wide. The belts are automatically pre-loaded by tensioners (one per belt) and routed over deflection idler pulleys in order to maintain sufficient grip between the belt and the driven pulleys. This ensures slip-free drive of the accessory components.

The poly-V type belts are designed to achieve fit-for-life performance through normal use (due to the risk of off-road stone damage, the belt is inspected periodically and, if necessary, replaced. Refer to the vehicles service schedule for more information). The belts unique rib profile provides higher dimensional accuracy, whilst the surface of the ribs themselves have been specially treated to reduce noise.

Engine durability during wading is protected by sealed bearings on the belt idlers and tensioners. The generator, A/C compressor and starter motor are also fully sealed.

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Accessory Drive - TDV8 3.6L Diesel - Accessory Drive

Diagnosis and Testing

Overview

There is an additional drive belt on diesel engines for the fuel injection pump, this section covers basic checks for both.

For information on the description and operation of the system:
REFER to: Accessory Drive (303-05D Accessory Drive - TDV8 3.6L Diesel, Description and Operation).

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Visual inspection

Mechanical
● Drive belt condition (cracking/damage/contamination) ● Idler assembly ● Generator ● Engine cooling fan ● Tensioner assembly ● Engine coolant pump ● Power steering pump ● Air conditioning (A/C) compressor ● Torsional vibration damper ● Dynamic response pump ● Tensioner assembly ● Accessory drive belt ● Security/Correct fitment of the fuel injection pump cover ● Fuel injection pump belt condition (cracking/damage/contamination) ● Fuel injection pump belt tensioner assembly ● Fuel injection pump ● Fuel injection pump belt

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

⚠ CAUTION: If the engine is run without the accessory drive belts connected to eliminate driven components, diagnostic trouble codes, (DTCs) may be set which must be cleared before the vehicle is returned to the owner. The engine should not be run for more than 2-3 minutes with the belts disconnected. Failure to follow this instruction may result in damage to the vehicle.

4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - ○ Make sure that all DTCs are cleared following rectification.

Symptom chart (accessory drive belt)

Symptom	Possible cause	Action
Noise	● Belt condition ● Belt tension ● Pulleys misaligned ● Driven components (including tensioners)	Check the belt condition (see visual inspection). Check the tensioner function. Check the pulley alignment. Check the driven components for excessive resistance to rotation. Rectify as necessary.
Drive belt does not hold tension	● Belt condition ● Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary.

Symptom chart (fuel injection pump belt)

Symptom	Possible causes	Action
Noise	● Belt condition ● Belt fouling	Check the belt condition (see visual inspection). Check the belt cover for indications of fouling (this may indicate a pump misalignment). The belt tensioner must be

Symptom	Possible causes	Action
	cover - Tensioner bearing failure - Fuel injection pump failure	renewed if the belt is removed, making a check of the bearing impractical. Remove the belt, check the fuel injection pump pulley for security. Check the fuel injection pump for excessive resistance to rotation (excessive resistance in the pump will cause the pulley securing nut to loosen as a design feature). Check for diagnostic trouble codes (DTCs) indicating a pump malfunction.
Drive belt does not hold tension	- Belt condition - Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary.
Loss of drive (with no drive to the fuel injection pump, the engine will not run)	- Belt broken/stripped teeth - Drive pulleys loose	Investigate the cause of the belt breakage/damage (a belt broken at a 45 degree angle normally indicates a shear, a break straight across the belt normally indicates that the belt has been crimped). Check the fuel injection pump for excessive resistance to rotation (excessive resistance in the pump will cause the pulley securing nut to loosen as a design feature). Check for DTCs indicating a pump malfunction.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs.
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible causes	Action
P151B00	Idle air control system RPM lower than expected	- Oil level - Driven component fault - Engine compression	Check the engine oil level and condition. Check the driven components (generator, air conditioning compressor, etc). Rectify as necessary. Check the engine compressions only once other options are ruled out. Rectify as necessary. Clear the DTCs and test for normal operation.
P151C00	Idle air control - RPM higher than expected	- Oil level - Driven component fault - Engine compression	Check the engine oil level and condition. Check the driven components (generator, air conditioning compressor, etc). Rectify as necessary. Check the engine compressions only once other options are ruled out. Rectify as necessary. Clear the DTCs and test for normal operation.

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Accessory Drive - TDV8 3.6L Diesel - Accessory Drive Belt

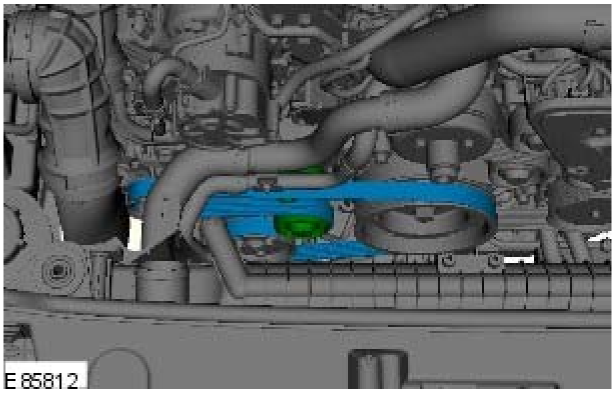
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

3. Remove the viscous coupling.
For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).



4. Remove the accessory drive belt.

- Release the tension from the belt.

Installation

1. To install, reverse the removal procedure.

- Clean and inspect the drive pulleys for damage.

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Accessory Drive - TDV8 3.6L Diesel - Accessory Drive Belt Tensioner

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

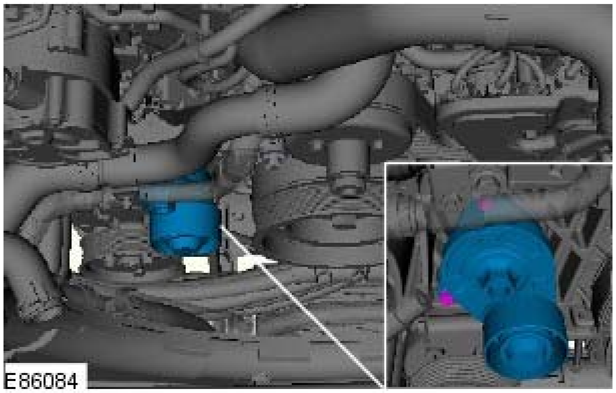
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

4. Remove the accessory drive belt tensioner.

- Remove the 2 bolts.



Installation

1. To install, reverse the removal procedure.

- Tighten the bolts to 25 Nm (18 lb.ft).

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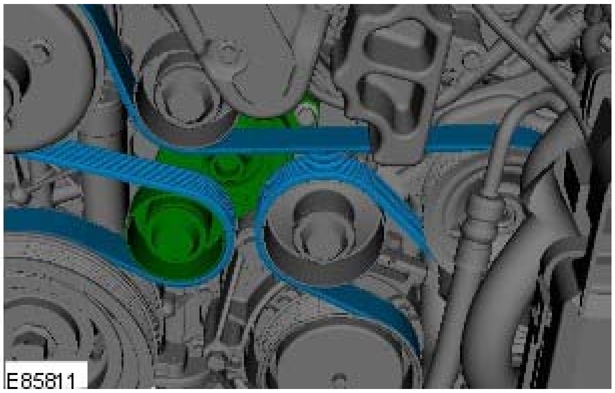
Accessory Drive - TDV8 3.6L Diesel - Cooling Fan Belt

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Remove the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).



4. Remove the cooling fan belt.
   - Release the tension from the belt.

Installation

1. To install, reverse the removal procedure.
   - Clean and inspect the drive pulleys for damage.

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Accessory Drive - TDV8 3.6L Diesel - Cooling Fan Belt Tensioner

Removal and Installation

Removal

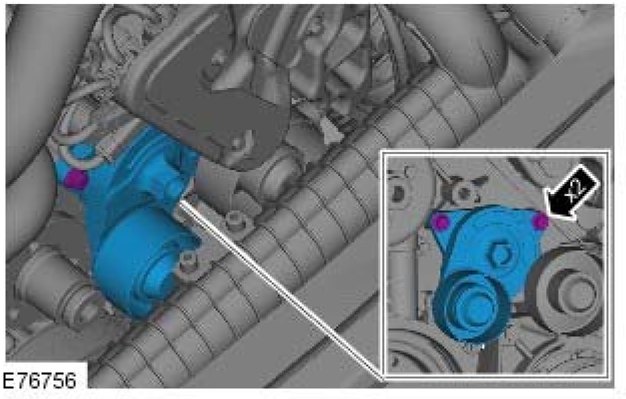
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

3. Remove the cooling fan belt idler pulley.
For additional information, refer to: Cooling Fan Belt Idler Pulley (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

4. Remove the cooling fan belt tensioner.

- Remove the 2 bolts.



Installation

1. Install the cooling fan belt tensioner.

- Tighten the bolts to 25 Nm (18 lb.ft).

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Accessory Drive - TDV8 3.6L Diesel - Cooling Fan Belt Idler Pulley

Removal and Installation

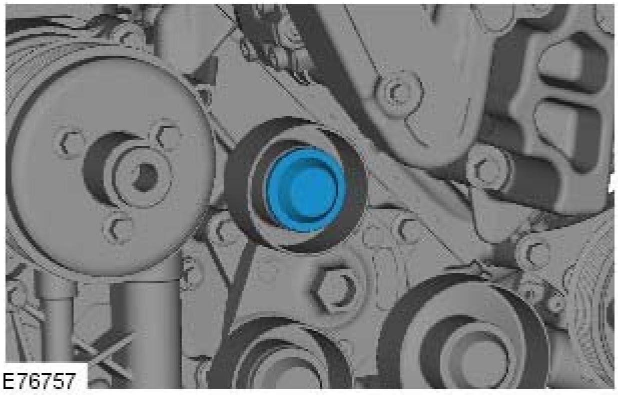
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

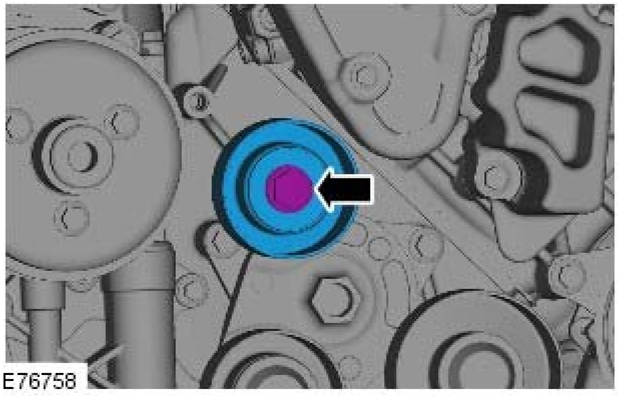
3. Remove the cooling fan belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

4. Remove and discard the access cover.



5. NOTE: The bolt and spacer will remain captive to the accessory drive belt idler pulley.

Remove the cooling fan belt idler pulley.



Installation

1. To install, reverse the removal procedure.

- Tighten the 65 mm idler pulleys to 48 Nm (35 lb.ft).
- Tighten the 80 mm idler pulley to 80 Nm (59 lb.ft).

Starting System - V8 S/C 4.2L Petrol -

Starter Motor

Item	Specification
Starter motor:	
Make	Denso
Type	RA - Pre-engaged
Voltage	12
Current consumption	1.8 kW

Torque Specifications

Description	Nm	lb-ft
* Starter motor positive terminal nut	10	7
Starter motor bolts	45	33
** Lower steering column universal joint retaining bolt	25	18
Upper suspension arm and brake line heat shield nuts and bolts	10	7

⚠ CAUTION: * Damage to the internal connections will occur if this torque is exceeded

**** New patchlok bolt must be installed**

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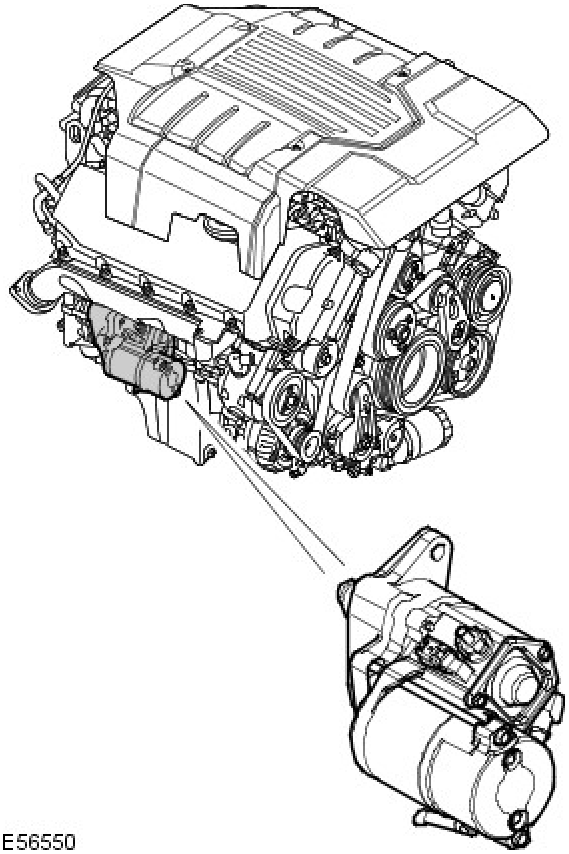
Starting System - V8 S/C 4.2L Petrol - Starting System

Description and Operation



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GENERAL

The starter motor is rated as a 1.8kW and is a Denso level three-sealed unit. It is an RA type starter motor, which is of the offset design with the solenoid being directly behind the pinion to give a more positive engagement to the ring gear. The motor is geared directly to the pinion. Each starter motor is of the pre-engaged type and comprises a series wound motor and an overrunning clutch. This starter incorporates labyrinth-breathing tubes to help with sealing and drainage.

The starter solenoid is energised by a signal from the Engine Control Module (ECM) when the ignition switch is moved to the crank position. When engine cranking is requested, the ECM checks that a valid key code has been received before granting the crank request.

The power for starter operation is supplied on a substantial single cable connected direct from the battery positive terminal. The cable is connected to the solenoid via a copper threaded stud with an anti-rotational device and secured with a nut.

The starter motor is located on the rear RH side of the engine block. The motor is secured to the block and protrudes through an aperture to drive the flywheel via a ring gear.

Starting System - V8 S/C 4.2L Petrol - Starting System

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
• Gear selector lever cable adjustment (vehicles with automatic transmission) • Starter motor • Engine (turns freely)	• Battery • Fuses - Central and battery junction boxes - Megafuses • Wiring harness(es) • Damaged, loose or corroded connectors • Ignition switch • Starter relay • Transmission control module (TCM) • Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
The engine does not crank (starter motor does **not** turn)	• Gear selector not in **P** or **N** position (vehicles with automatic transmission) • Battery • Starter relay • Invalid key code received by central junction box (CJB) • Harness/Connectors • Starter motor • Ignition switch • Generator • Transmission control module (TCM) • Engine control module (ECM) • Engine seized	Make sure the gear selector is in the **P** or **N** position and correctly adjusted. Check the battery condition and state of charge. Check for DTCs indicating an immobilizer fault. Check the starter motor relay, ignition switch and generator circuits. Refer to the electrical guides. Check for TCM and ECM DTCs. Check that the engine turns freely.
The engine does not crank (starter motor **does** turn)	• Starter motor installation • Starter motor • Flywheel/Drive plate ring gear	Check the starter motor installation (fasteners tight, starter motor square to engine, etc). Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.
Engine cranks too slowly	• Battery • Harness/Connectors • Starter motor • Oil grade	Check the battery condition and state of charge. Check the starter motor circuits. Refer to the electrical guides. Check the engine oil grade and condition.

Symptom	Possible causes	Action
Engine cranks too fast	● Low engine compression	Check the engine compressions.
Excessive starter motor noise	● Starter motor ● Flywheel/Drive plate ring gear ● Starter motor installation/casing	Check the starter motor installation (fasteners tight, motor square to engine, etc). Check the starter motor casing condition. Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P051216	Starter Request Circuit	● Crank request circuit low input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051217	Starter Request Circuit	● Crank request circuit high input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051300	Incorrect Immobilizer Key	● Security key invalid	Program keys using the approved diagnostic system. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P061600	Starter Relay Circuit Low	● Starter relay drive circuit short circuit to ground ● Starter relay drive circuit high resistance ● Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P061700	Starter Relay Circuit High	● Starter relay drive circuit short circuit to battery ● Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P063305	Immobilizer Key Not Programmed - ECM/PCM	● Security target ID transfer process failed	Program the key using the approved diagnostic system.
P063355	Immobilizer Key Not Programmed - ECM/PCM	● Security no target in EMS	Program the module using the approved diagnostic system.
B1C5024	Crank Switch	● Ignition switch crank position short circuit ● Ignition switch fault	Refer to the electrical guides and check the ignition switch circuit. Check the switch operation, renew as necessary.

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Starting System - V8 S/C 4.2L Petrol - Starter Motor

Removal and Installation

Removal

All vehicles

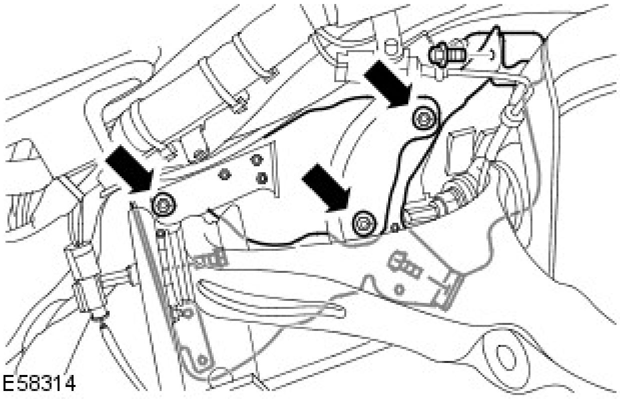
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the RH front wheel.

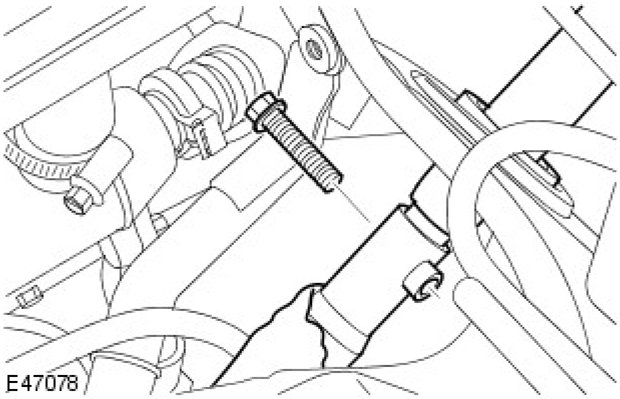
4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



5. Remove the upper suspension arm and brake line heat shields for access.

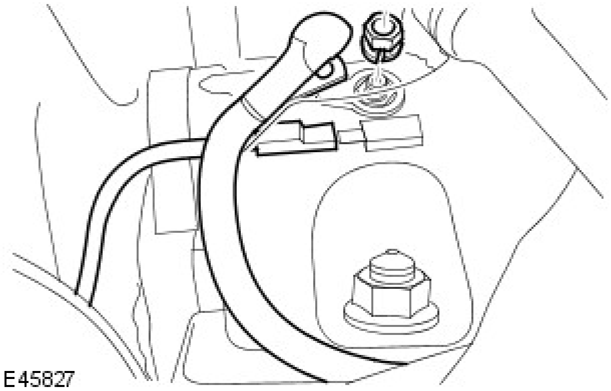
- Remove the 3 nuts.
- Remove the 3 bolts.
- Remove the 3 heat shields.

Right-hand drive vehicles



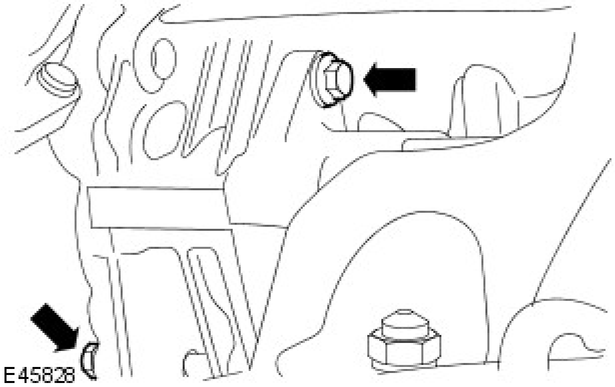
6. NOTE: Make sure the steering is in the straight ahead position.

Disconnect the steering column lower shaft from the steering column.



7. Disconnect the starter motor electrical connection.

- Release the terminal cover.
- Remove the terminal nut insulator.
- Remove the nut.



8. Release the starter motor.

- Remove the starter motor retaining bolts.

9. Remove the starter motor.

- Rotate the starter motor to access the electrical connector.
- Disconnect the electrical connector.

Installation

All vehicles

1. Install the starter motor.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

2. Connect the electrical connectors.

- Tighten the starter motor nut to 10 Nm (7 lb.ft).
- Install the terminal nut insulator.
- Install the terminal cover.
- Secure the electrical connector

Right-hand drive vehicles

3. Connect the steering column lower shaft.

- Clean the component mating faces.
- Install new patchlock bolt and tighten to 25 Nm (18 lb.ft).

All vehicles

4. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.

5. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

6. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Starting System - V8 4.4L Petrol -

Starter Motor

Item	Specification
Starter motor:	
Make	Denso
Type	RA - Pre-engaged
Voltage	12
Current consumption	1.8 kW

Torque Specifications

Description	Nm	lb-ft
* Starter motor positive terminal nut	10	7
Starter motor bolts	45	33
** Lower steering column universal joint retaining bolt	25	18
Upper steering arm and brake line heat shield nuts and bolts	10	7

⚠CAUTION: * Damage to the internal connections will result if this torque is exceeded

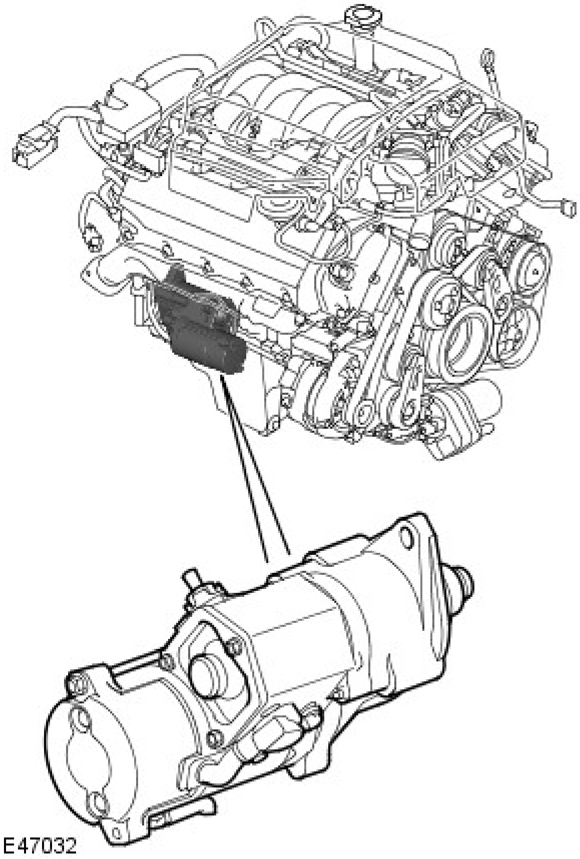
**** New patchlok bolt must be installed**

+ New nut must be fitted

Published: 11-May-2011

Starting System - V8 4.4L Petrol - Starting System

Description and Operation



The starter motor is rated as a 1.8kW and is a Denso level three-sealed unit. It is an RA type starter motor, which is of the offset design with the solenoid being directly behind the pinion to give a more positive engagement to the ring gear. The motor is geared directly to the pinion. Each starter motor is of the pre-engaged type and comprises a series wound motor and an overrunning clutch. This starter incorporates labyrinth-breathing tubes to help with sealing and drainage.

The starter solenoid is energised by a signal from the Engine Control Module (ECM) when the ignition switch is moved to the crank position. When engine cranking is requested, the ECM checks that a valid key code has been received before granting the crank request.

The power for starter operation is supplied on a substantial single cable connected direct from the battery positive terminal. The cable is connected to the solenoid via a copper threaded stud with an anti-rotational device and secured with a nut.

The starter motor is located on the rear RH side of the engine block. The motor is secured to the block and protrudes through an aperture to drive the flywheel via a ring gear.

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Starting System - V8 4.4L Petrol - Starting System

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
- Gear selector lever cable adjustment (vehicles with automatic transmission) - Starter motor - Engine (turns freely)	- Battery - Fuses - Central and battery junction boxes - Megafuses - Wiring harness(es) - Damaged, loose or corroded connectors - Ignition switch - Starter relay - Transmission control module (TCM) - Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
The engine does not crank (starter motor does **not** turn)	- Gear selector not in **P** or **N** position (vehicles with automatic transmission) - Battery - Starter relay - Invalid key code received by central junction box (CJB) - Harness/Connectors - Starter motor - Ignition switch - Generator - Transmission control module (TCM) - Engine control module (ECM) - Engine seized	Make sure the gear selector is in the **P** or **N** position and correctly adjusted. Check the battery condition and state of charge. Check for DTCs indicating an immobilizer fault. Check the starter motor relay, ignition switch and generator circuits. Refer to the electrical guides. Check for TCM and ECM DTCs. Check that the engine turns freely.
The engine does not crank (starter motor **does** turn)	- Starter motor installation - Starter motor - Flywheel/Drive plate ring gear	Check the starter motor installation (fasteners tight, starter motor square to engine, etc). Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.
Engine cranks too slowly	- Battery - Harness/Connectors - Starter motor - Oil grade	Check the battery condition and state of charge. Check the starter motor circuits. Refer to the electrical guides. Check the engine oil grade and condition.

Symptom	Possible causes	Action
Engine cranks too fast	● Low engine compression	Check the engine compressions.
Excessive starter motor noise	● Starter motor ● Flywheel/Drive plate ring gear ● Starter motor installation/casing	Check the starter motor installation (fasteners tight, motor square to engine, etc). Check the starter motor casing condition. Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P051216	Starter Request Circuit	● Crank request circuit low input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051217	Starter Request Circuit	● Crank request circuit high input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051300	Incorrect Immobilizer Key	● Security key invalid	Program keys using the approved diagnostic system. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P061600	Starter Relay Circuit Low	● Starter relay drive circuit short circuit to ground ● Starter relay drive circuit high resistance ● Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P061700	Starter Relay Circuit High	● Starter relay drive circuit short circuit to battery ● Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P063305	Immobilizer Key Not Programmed - ECM/PCM	● Security target ID transfer process failed	Program the key using the approved diagnostic system.
P063355	Immobilizer Key Not Programmed - ECM/PCM	● Security no target in EMS	Program the module using the approved diagnostic system.
B1C5024	Crank Switch	● Ignition switch crank position short circuit ● Ignition switch fault	Refer to the electrical guides and check the ignition switch circuit. Check the switch operation, renew as necessary.

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Starting System - V8 4.4L Petrol - Starter Motor

Removal and Installation

Removal

All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

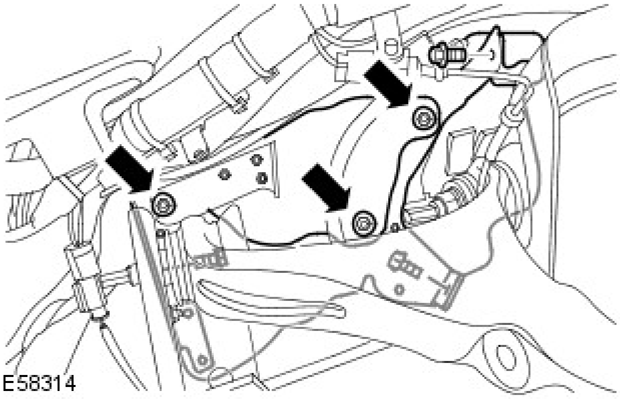
Raise and support the vehicle.

3. Remove the RH front wheel.

4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Remove the upper suspension arm and brake line heat shields for access.

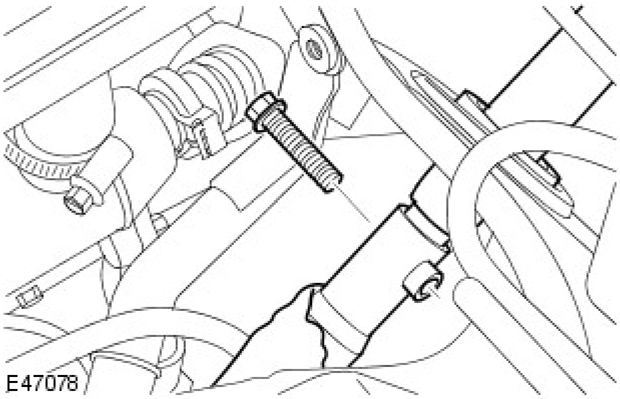
- Remove the 3 nuts.
- Remove the 3 bolts.
- Remove the 3 heat shields.



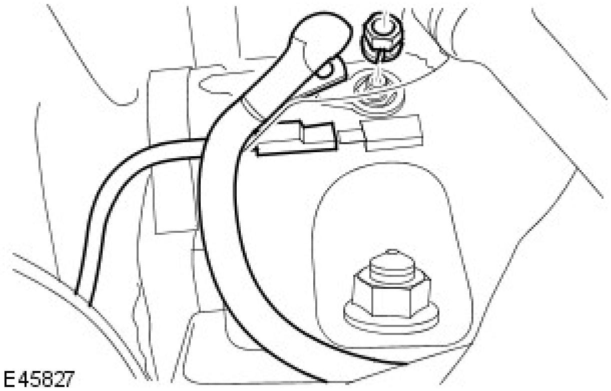
Right-hand drive vehicles

6. NOTE: Make sure the steering is in the straight ahead position.

Disconnect the steering column lower shaft from the steering column.

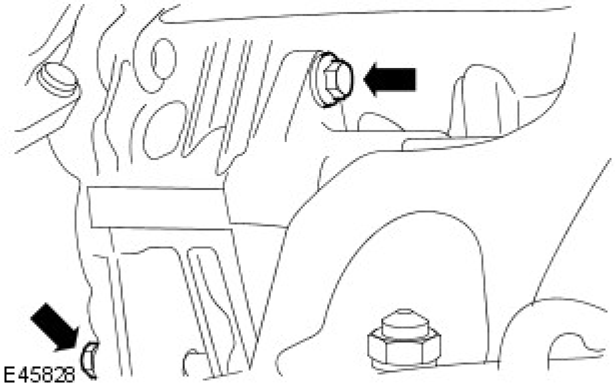


All vehicles



7. Disconnect the starter motor electrical connection.

- Release the terminal cover.
- Remove the terminal nut insulator.
- Remove the nut.



8. Release the starter motor.

- Remove the starter motor retaining bolts.

9. Remove the starter motor.

- Rotate the starter motor to access the electrical connector.
- Disconnect the electrical connector.

Installation

All vehicles

1. Install the starter motor.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

2. Connect the electrical connectors.

- Tighten the starter motor nut to 10 Nm (7 lb.ft).
- Install the terminal nut insulator.
- Install the terminal cover.
- Secure the electrical connector

Right-hand drive vehicles

3. Connect the steering column lower shaft.

- Clean the component mating faces.
- Install new patchlock bolt and tighten to 25 Nm (18 lb.ft).

All vehicles

4. NOTE: The heatshield consists of 3 parts.

Install the upper suspension arm and brake line heat shields.

- Install the bolts.
- Install the nuts.

5. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

6. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Starting System - TDV6 2.7L Diesel -

Starter Motor

Item	Specification
Starter motor:	
Make	Denso
Type	P76S - Pre-engaged
Voltage	12
Current consumption	2.0 kW

Torque Specifications

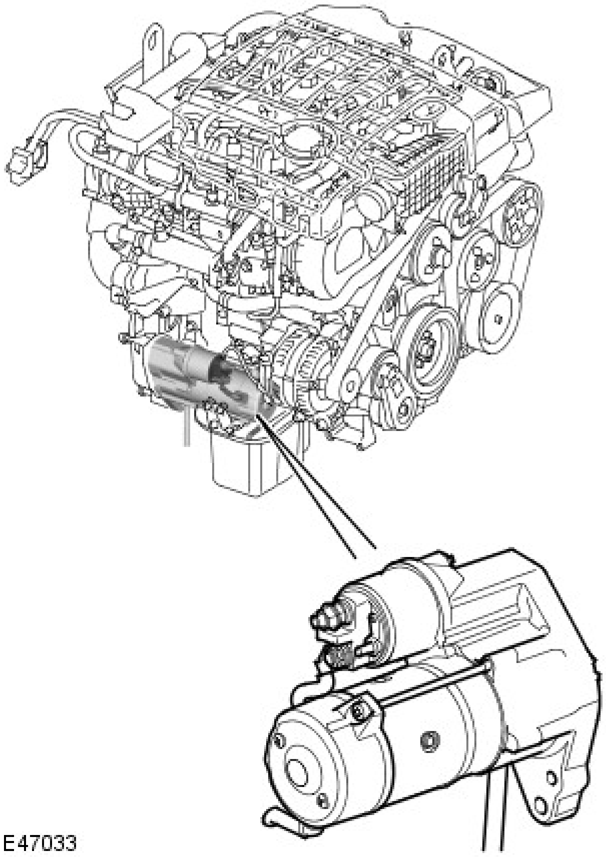
Description	Nm	lb-ft
Starter motor retaining bolts	48	35
* Battery positive terminal integral connector retaining nut	11	8
* Solenoid terminal integral connector retaining nut	7	5
Starter motor bracket retaining bolts	10	7
Fuel filter housing retaining bolts	10	7
Fuel cooler retaining bolts	10	7

Caution * Damage to the internal connections will occur if the torque values are exceeded.

Starting System - TDV6 2.7L Diesel - Starting System

Description and Operation

GENERAL



The starter motor is rated as 2.0 kW and is a Denso level three-sealed unit. It is a P76S type starter motor and is of conventional design with the motor in line and the drive pinion and solenoid mounted above. Each starter motor is of the pre-engaged type and comprises a series wound motor, an overrunning clutch and an integral solenoid. This starter incorporates labyrinth-breathing tubes to help with sealing and drainage.

The starter solenoid is energised by a signal from the Engine Control Module (ECM) when the ignition switch is moved to the crank position. When engine cranking is requested, the ECM checks that a valid key code has been received before granting the crank request. The power for starter operation is supplied on a substantial single cable connected direct from the battery positive terminal. The cable is connected to the solenoid via a copper threaded stud and secured with a nut.

The starter motor is located on the rear RH side of the engine block and protrudes through an aperture to drive the flywheel via a ring gear. The motor is secured to the cylinder block by two bolts and to the ladder frame by four bolts and a support bracket. The bracket provides crucial support for the starter motor and must not be omitted when installing or reinstalling the unit.

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Starting System - TDV6 2.7L Diesel - Starting System

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
• Gear selector lever cable adjustment (vehicles with automatic transmission) • Starter motor • Engine (turns freely)	• Battery • Fuses - Battery junction box (BJB) - Megafuse • Starter relay • Wiring harness(es) • Damaged, loose or corroded connectors • Ignition switch • Generator • Transmission control module (TCM) • Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
The engine does not crank (starter motor does **not** turn)	• Gear selector not in **P** or **N** position (vehicles with automatic transmission) • Battery • Starter relay • Invalid key code received by central junction box (CJB) • Harness/Connectors • Starter motor • Ignition switch • Generator • Transmission control module (TCM) • Engine control module (ECM) • Engine seized	Make sure the gear selector is in the **P** or **N** position and correctly adjusted. Check the battery condition and state of charge. Check for DTCs indicating an immobilizer fault. Check the starter motor relay, ignition switch and generator circuits. Refer to the electrical guides. Check for TCM and ECM DTCs. Check that the engine turns freely.
The engine does not crank (starter motor **does** turn)	• Starter motor installation • Starter motor • Flywheel/Drive plate ring gear	Check the starter motor installation (fasteners tight, starter motor square to engine, etc). Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.
Engine cranks too slowly	• Battery • Harness/Connectors • Starter motor • Oil grade	Check the battery condition and state of charge. Check the starter motor circuits. Refer to the electrical guides. Check the engine oil grade and condition.

Symptom	Possible causes	Action
Engine cranks too fast	- Low engine compression	Check the engine compressions.
Excessive starter motor noise	- Starter motor - Flywheel/Drive plate ring gear - Starter motor installation/casing	Check the starter motor installation (fasteners tight, motor square to engine, etc). Check the starter motor casing condition. Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P061700	Starter Relay Circuit High	- Starter relay drive circuit short circuit to battery - Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P125900	Immobilizer to PCM Signal Error	- Incorrect ID received from instrument pack	Configure the system using the approved diagnostic system.
P160200	Immobilizer/ECM Communication Error	- CAN Link ECM/instrument cluster CAN timeout	Refer to the Network Communications section in the workshop manual.
P162100	Immobilizer Code Words Do Not Match	- Challenge does not match	Configure the system using the approved diagnostic system.
P162200	Immobilizer ID Does Not Match	- Key status unknown	Program the key using the approved diagnostic system.

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Starting System - TDV6 2.7L Diesel - Starter Motor

Removal and Installation

Removal

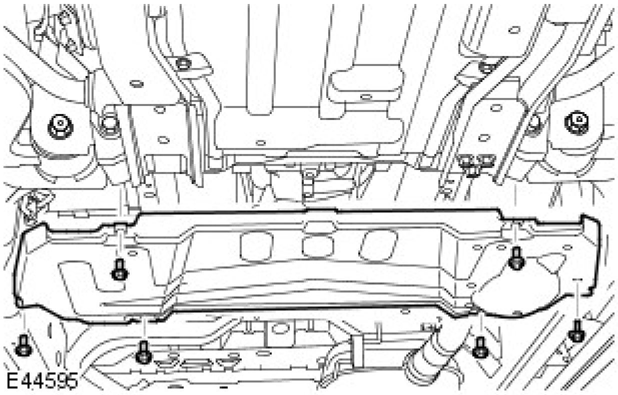
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transmission undershield.

- Remove the 6 bolts.

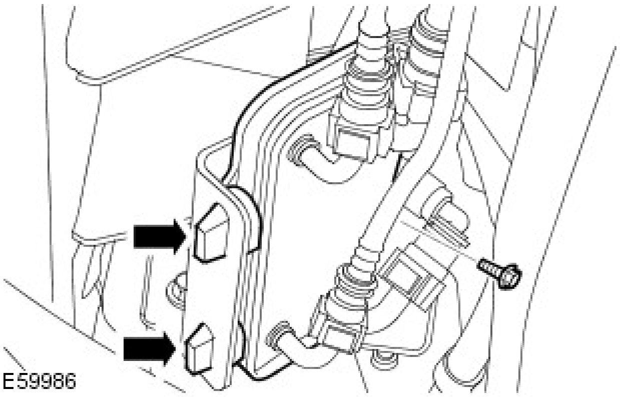


4. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. NOTE: Note the fitted position of the rubber mounts.

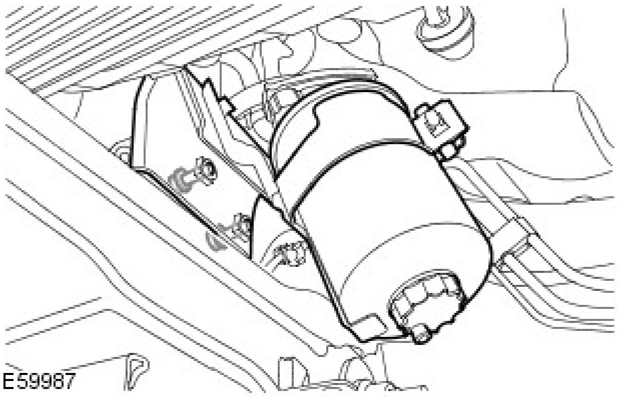
Release the fuel cooler.

- Remove the retaining bolt.

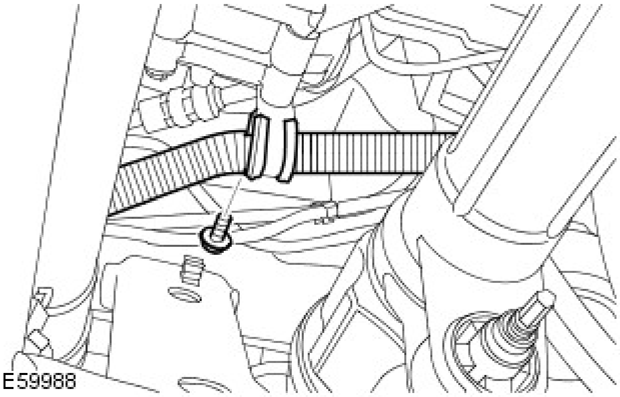


6. Release the fuel filter housing and support bracket.

- Remove the two retaining bolts.

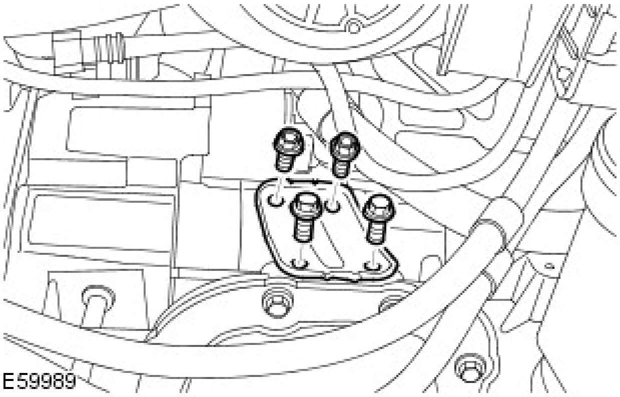


7. Reposition the fuel cooler and the fuel filter housing and support bracket.



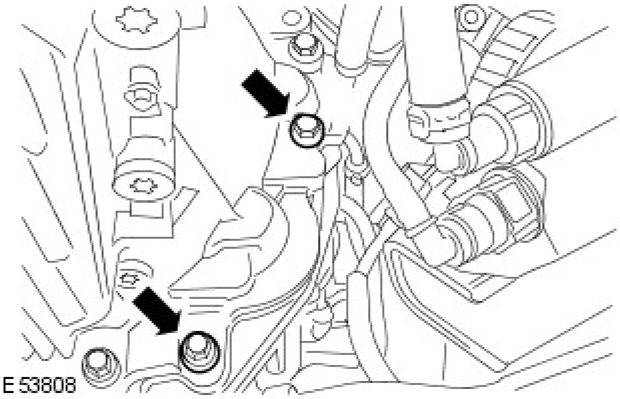
8. Release the battery positive cable.

- Remove the clip retaining bolt.



9. Remove the starter motor support bracket.

- Remove the four retaining bolts.



10. Release the starter motor.

- Remove the two retaining bolts.

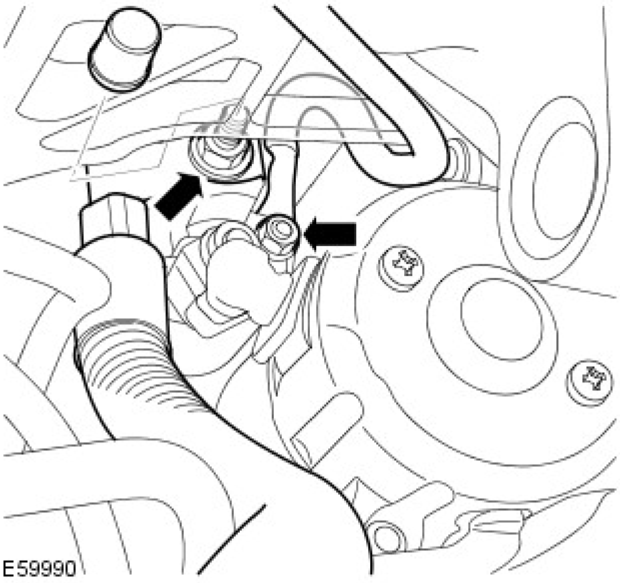
11. Disconnect the battery positive cable from the starter motor solenoid.

- Remove the terminal nut insulator.
- Remove the nut.

12. Disconnect the switch lead from the starter motor solenoid.

- Remove the integral connector nut.

13. Remove the starter motor.



Installation

1. Install the starter motor.

- Clean the component mating faces.

2. ⚠CAUTION: Damage to internal components will result if this torque is exceeded.

Connect the battery positive cable and the switch lead to the starter motor solenoid.

- Tighten the integral connector nut to 8 Nm (6 lb.ft).
- Tighten the battery positive lead nut to 11 Nm (8 lb.ft).
- Install the terminal nut insulator.

3. Install the starter motor retaining bolts.

- Tighten the bolts to 48 Nm (35 lb.ft).

4. Secure the battery positive cable.

- Align the clip.
- Tighten the bolt to 22 Nm (16 lb.ft).

5. Install the starter motor support bracket.

- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).

6. Reposition the fuel cooler and the fuel filter housing and support bracket.

7. Attach the fuel filter support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. ⚠ CAUTION: Make sure the rubber mounts are installed correctly.

Attach the fuel cooler.

- Install the bolt and tighten to 10 Nm (7 lb.ft).

9. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

10. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Starting System - TDV8 3.6L Diesel - Starting System

Diagnosis and Testing

Overview

For information on the operation of the system:
REFER to: Starting System (303-06D Starting System - TDV8 3.6L Diesel, Description and Operation).

Inspection and verification

1. **1.** Verify the customer concern.

2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
- Gear selector lever cable adjustment (vehicles with automatic transmission) - Starter motor - Engine (turns freely)	- Battery - Fuses - Link 14E, engine compartment junction box - Megafuse - Starter relay - Wiring harness(es) - Damaged, loose or corroded connectors - Ignition switch - Generator - Engine control module (ECM) - Transmission control module (TCM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
The engine does not crank (starter motor does **not** turn)	- Gear selector not in **P** or **N** position (vehicles with automatic transmission) - Battery - Starter relay - Output circuit: high resistance - Output circuit: short circuit to power - Invalid key code received by central junction box (CJB) - Harness/Connectors - Starter motor - Ignition switch - Generator - Engine seized	Make sure the gear selector is in the **P** or **N** position and correctly adjusted. REFER to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures), Selector Lever Cable Adjustment (307-05B Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol, General Procedures), Selector Lever Cable Adjustment (307-05D Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel, General Procedures). Check the battery condition and state of charge. Check for DTCs indicating an immobilizer fault. Check the starter motor relay, ignition switch and generator circuits. Refer to the electrical guides. Check that the engine turns freely.
The engine does not crank (starter motor **does** turn)	- Starter motor fitment - Starter motor - Flywheel/Drive plate ring gear	Check the starter motor fitment (fasteners tight, starter motor square to engine, etc). Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.
Engine cranks too slowly	- Battery - Harness/Connectors - Starter motor - Oil grade	Check the battery condition and state of charge. Check the starter motor circuits. Refer to the electrical guides. Check the engine oil grade and condition.

Symptom	Possible causes	Action
Engine cranks too fast	- Low engine compression	Check the engine condition and compressions.
Excessive starter motor noise	- Starter motor - Flywheel/Drive plate ring gear - Starter motor fitment/casing	Check the starter motor fitment (fasteners tight, motor square to engine, etc). Check the starter motor casing condition. Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs:
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible causes	Action
P061712	Starter relay circuit high	- Starter relay drive circuit: short circuit to power - Starter relay failure	Check the starter circuits. Refer to the electrical guides. Activate the relay and listen for an audible "click". Rectify as necessary. Clear the DTCs and test for normal operation.
P085062	Park/Neutral switch input circuit - signal compare failure	- Park/Neutral switch plausibility check - Controller area network (CAN) circuit fault	Check the switch and circuits. Refer to the electrical guides. Check for DTCs indicating a CAN fault. Rectify as necessary. Clear the DTCs and test for normal operation.
P085212	Park/Neutral switch input circuit high - circuit short to battery	- Park/Neutral switch circuit: short circuit to power	Check the switch and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P125900	Immobilizer to ECM signal error	- Incorrect ID received from instrument pack	Check the circuits between the modules. Refer to the electrical guides. Check for network DTCs. Rectify as necessary. Clear the DTCs and test for normal operation. If the DTC resets, contact the technical help desk.
P125987	Immobilizer to ECM signal error - missing message	- ECM ID timeout occurred	Check the circuits between the modules. Refer to the electrical guides. Check for network DTCs. Rectify as necessary. Clear the DTCs and test for normal operation. If the DTC resets, contact the technical help desk.
U016700	Lost communication with the vehicle immobilizer control module	- ECM ID transfer failed	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.

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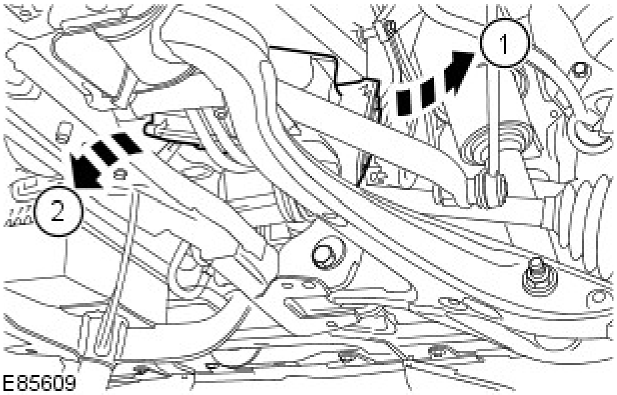
Starting System - TDV8 3.6L Diesel - Starter Motor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine RH mount.
   For additional information, refer to: Engine Mount RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).
3. Remove the starter motor.



Installation

1. Install the starter motor.
2. Install the RH engine mount.
   For additional information, refer to: Engine Mount RH (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Starting System - TDV8 3.6L Diesel -

Torque Specifications

Item	Nm	lb-ft	lb-in
Battery positive cable nut	22	16	-
Starter motor bolts	45	33	-
Starter motor heat shield bolts	10	-	89
Switch lead to the starter motor solenoid nut	4	-	35

Published: 11-May-2011

Engine Ignition - V8 S/C 4.2L Petrol -

General Specification

Item	Specification
Spark plugs:	
Make	NGK
Type	1FR5N10 Iridium plug
Gap	1.0 mm (0.039 in)
Ignition coils:	
Make	Denso
Type	2W93-12A366-BA
Firing Order:	1-5-4-2-6-3-7-8

Torque Specifications

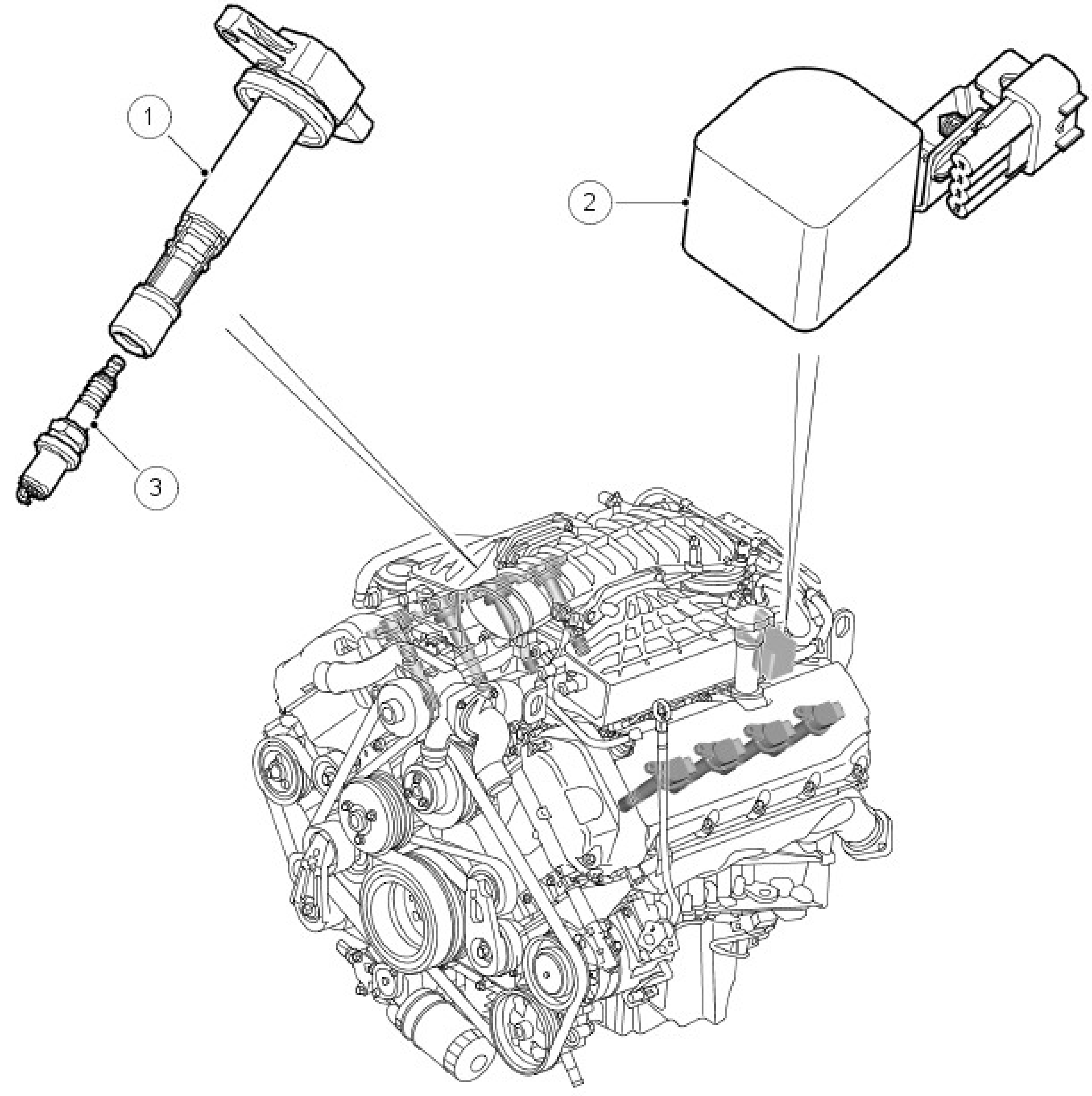
Description	Nm	lb-ft
Ignition coil bolt	6	4
Spark plugs	25	18

Published: 11-May-2011

Engine Ignition - V8 S/C 4.2L Petrol - Engine Ignition

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	Ignition coil
2	-	Capacitor
3	-	Spark plug

GENERAL

The 4.2L engine ignition system has a single iridium tipped spark plug per cylinder, with each spark plug powered by an on-plug ignition coil. The ignition coils are directly driven by the engine control module (ECM).

Power for the ignition coils is supplied from the main relay and a fuse in the battery junction box (BJB). A capacitor is connected in parallel with the power supplies to the ignition coils to suppress RFI (radio frequency interference).

Each ignition coil contains a power stage to switch the current in the primary circuit. The ECM controls the switching with a signal to the power stage. The ECM monitors operation of the ignition coils using a feedback signal from each of the power stages. If a fault is detected the ECM stores an appropriate fault code.

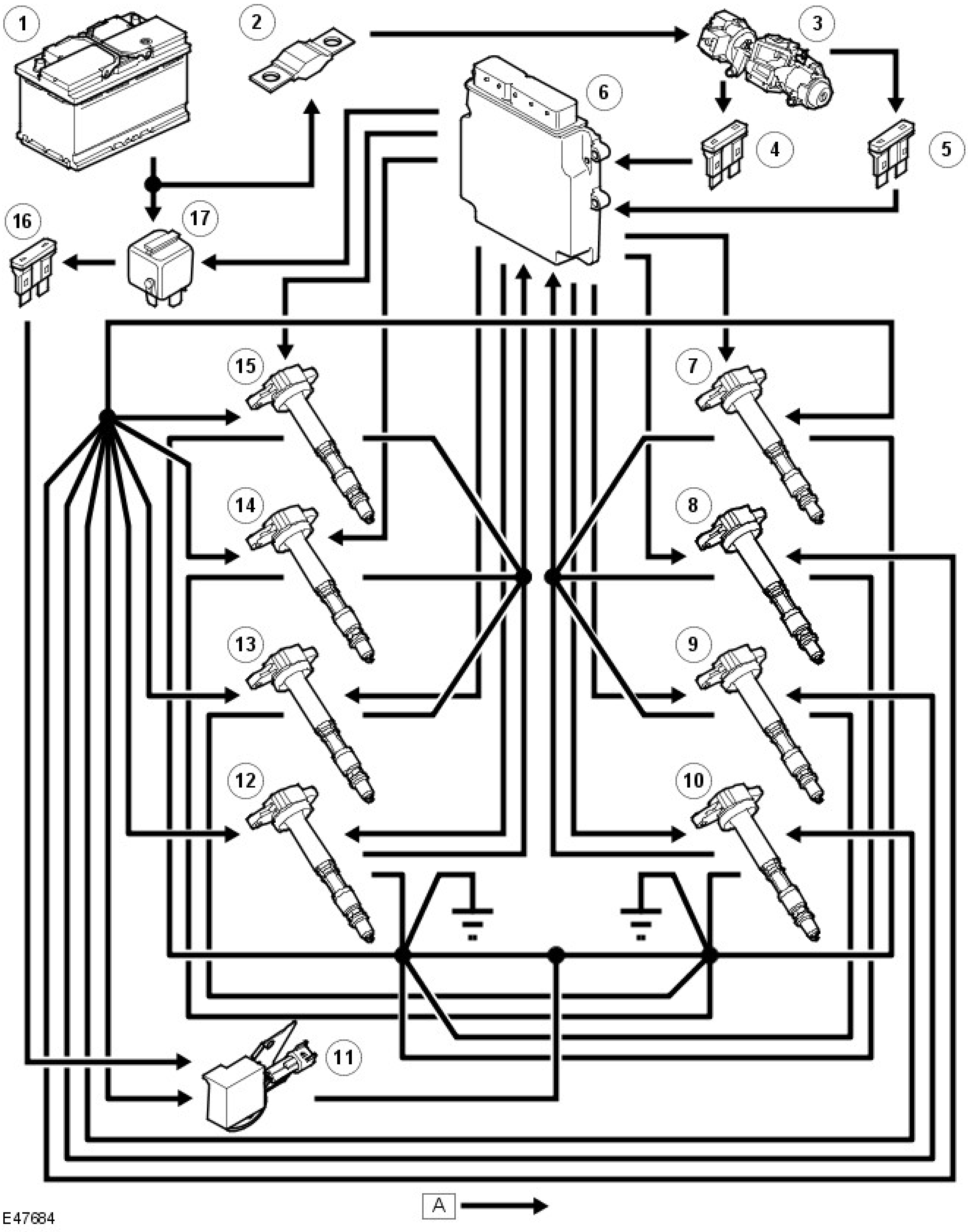
The ECM varies the dwell time of the ignition coils depending on battery voltage and engine speed, to ensure a constant energy level is produced in the secondary coil each time the power stage is switched. This ensures a good spark is always produced by the spark plug without excessive primary current flow, thus avoiding overheating or damage to the ignition coils.

The ECM calculates the ignition timing for individual cylinders from:

- Engine speed.
- Camshaft position.
- Engine load.
- Engine temperature.
- The knock control function.
- The shift control function.
- The idle speed control function.

ENGINE IGNITION CONTROL DIAGRAM

• NOTE: A = Hardwired connections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Item	Part Number	Description
1	-	Battery
2	-	Fusible link 11E, BJB
3	-	Ignition switch
4	-	Fuse 25P, ignition feed, central junction box (CJB)
5	-	Fuse 60P, crank feed, CJB

6	-	ECM
7	-	Ignition coil and spark plug 5
8	-	Ignition coil and spark plug 2
9	-	Ignition coil and spark plug 3
10	-	Ignition coil and spark plug 8
11	-	Capacitor
12	-	Ignition coil and spark plug 4
13	-	Ignition coil and spark plug 7
14	-	Ignition coil and spark plug 6
15	-	Ignition coil and spark plug 1
16	-	Fuse 6E, BJB
17	-	Main relay

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Engine Ignition - V8 S/C 4.2L Petrol - Engine Ignition

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Engine oil level ● Cooling system coolant level ● Fuel level ● Fuel contamination/grade/quality	● Fuses ● Wiring harness ● Loose or corroded electrical connectors ● Ignition coils ● Sensor(s) ● Engine control module (ECM) ● Transmission control module (TCM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom (general)	Symptom (specific)	Possible causes	Action
Non-Start	Engine cranks, but does not fire	● Low/Contaminated fuel ● Ignition system ● Fuel system ● Crankshaft position (CKP) sensor ● Harness ● ECM fault	Check the fuel level and condition. For ignition system tests, refer to the coil failure DTCs in this index. Check the fuel system. Check the CKP sensor circuits. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
	Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Fuel system ● Spark plugs ● Ignition coil failure(s) ● Harness	Check the evaporative emissions purge valve. Check the fuel system. Refer to the relevant workshop manual section. Check the spark plug conditions and gaps. For ignition coil tests, refer to the coil failure DTCs in this index.
Difficult to start	Difficult to start hot	● Injector leak ● Fuel system ● Fuel temperature sensor ● Intake air temperature (IAT) sensor ● Mass air flow (MAF) sensor ● Evaporative emissions purge valve ● Ignition system	Check the fuel injectors and fuel system. Check the fuel temperature, IAT and MAF sensor circuits. Check the evaporative emissions purge valve. Refer to the relevant workshop manual section. For ignition coil tests, refer to the coil failure DTCs in this index.
	Difficult to start after hot soak (vehicle standing after engine has reached operating temperature)	● Injector leak ● Fuel system ● Fuel temperature sensor ● IAT sensor ● MAF sensor	Check the fuel injectors and fuel system. Check the fuel temperature, IAT and MAF sensor circuits. Check the evaporative emissions purge valve. For ignition coil tests, refer to the coil failure DTCs in this index. Refer to the relevant workshop manual section.

Symptom (general)	Symptom (specific)	Possible causes	Action
		• Evaporative emissions purge valve • Ignition system	
Engine stalls	Engine stalls soon after start	• Breather system disconnected/restricted • ECM relay • MAF sensor • Ignition system • Air filter restricted • Air leakage • Fuel lines • Fuel rail pressure (FRP) sensor	Check the engine breather system. Check the ECM relay operation. Check the MAF sensor circuits. For ignition coil tests, refer to the coil failure DTCs in this index. For intake air system information. Check the fuel lines for leaks/damage. Refer to the relevant workshop manual section.
Poor driveability	Engine hesitates/poor acceleration	• Fuel pump module • Fuel lines • Injector leak • Fuel pressure • Air leakage • TP sensors • Throttle motor • Ignition system • HO2 sensors • Transmission malfunction • Restricted pedal travel (carpet, etc) • Accelerator pedal position (APP) sensor	Check the fuel pump module operation. Check the fuel lines for leaks/damage. Check the fuel injectors. Check the intake air system for leaks. Check the TP sensor and throttle motor circuits. For ignition coil tests, refer to the coil failure DTCs in this index. Check the EGR valves. Check for DTCs relating to HO2 sensors. For transmission information. Check the accelerator pedal travel. Check the APP sensor circuits. Refer to the relevant workshop manual section.
	Engine backfires	• Fuel pump module • Fuel lines • Air leakage • MAF sensor • HO2 sensors • Ignition system • APP sensor	Check the fuel pump module operation. Check the fuel lines for leaks/damage. Check the intake air system for leaks. Check the MAF sensor circuits. Check for DTCs relating to HO2 sensors. For ignition coil tests, refer to the coil failure DTCs in this index. Check the VCT and APP sensor circuits. Refer to the relevant workshop manual section.
	Engine surges	• Fuel pump module • Fuel lines • MAF sensor • Harness • TP sensors • Throttle motor • Ignition system	Check the fuel pump module operation. Check the fuel lines for leaks/damage. Check the MAF sensor, TP sensor and throttle motor circuits, refer to the electrical guides. For ignition coil tests, refer to the coil failure DTCs in this index.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P030000	Random Misfire Detected	• ECM to ignition coil primary circuit faults (cylinder misfire detected DTCs also logged) • Ignition coil failure • Spark plug failure/fouled /incorrect gap • Fuel delivery pressure (low/high) • Fuel injector circuit fault(s) (injector DTCs also logged) • Fuel injectors restricted/leaking	For ignition coil tests, refer to the coil failure DTCs in this index. Check the spark plug conditions and gaps. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
		- Fuel injectors continuously open - Fuel contamination - Cylinder compression low - Worn camshaft/broken valve springs - Valve clearance adjustment	
P030100	Cylinder 1 Misfire Detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALQ** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030200	Cylinder 2 Misfire Detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALT** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030300	Cylinder 3 Misfire Detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALR** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030400	Cylinder 4 misfire detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALU** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030500	Cylinder 5 misfire detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALS** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030600	Cylinder 6 misfire detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALV** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030700	Cylinder 7 misfire detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETAME** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030800	Cylinder 8 misfire detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETAMF** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P031600	Misfire Detected On Startup (First 1000 Revolutions)	- Misfire detected on first 1000 revs - Refer to P030000 possible sources	Carry out the tests indicated for a normal misfire code, but on a cold engine.
P035100	Ignition Coil A Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit high resistance, short circuit to ground - Ignition module/coil ground circuit high resistance - Ignition module/coil battery	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALQ** for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		supply circuit high resistance (including relay, if installed)	
P035200	Ignition Coil B Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALT** for this code on the approved diagnostic system.
P035300	Ignition Coil C Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALR** for this code on the approved diagnostic system.
P035400	Ignition Coil D Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALU** for this code on the approved diagnostic system.
P035500	Ignition Coil E Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALS** for this code on the approved diagnostic system.
P035600	Ignition Coil F Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALV** for this code on the approved diagnostic system.
P035700	Cylinder 7 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETAME** for this code on the approved diagnostic system.
P035800	Cylinder 8 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETAMF** for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P131500	Persistent Misfire	● ECM to ignition coil primary circuit fault (cylinder misfire detected DTC also flagged) ● Ignition coil failure ● Spark plug failure/fouled /incorrect gap ● Fuel delivery pressure low ● Fuel injector circuit fault(s) (injector DTCs also flagged) ● Cylinder compression low	For ignition coil tests, refer to the coil failure DTCs in this index. Check the spark plug conditions and gaps. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P136700	Ignition Spare	● Ignition coil group A monitoring circuit to ECM high resistance, short circuit to ground, short circuit to power ● Ignition module/coils ground circuit fault, right hand bank	Refer to the electrical guides and check the ignition monitoring circuit between the ignition coils and ECM. Repair as necessary. For ignition coil tests, refer to the coil failure DTCs in this index.
P136800	Ignition Spare	● Ignition coil group B monitoring circuit to ECM high resistance, short circuit to ground, short circuit to power ● Ignition module/coils ground circuit fault left hand bank	Refer to the electrical guides and check the ignition monitoring circuit between the ignition coils and ECM. Repair as necessary. For ignition coil tests, refer to the coil failure DTCs in this index.

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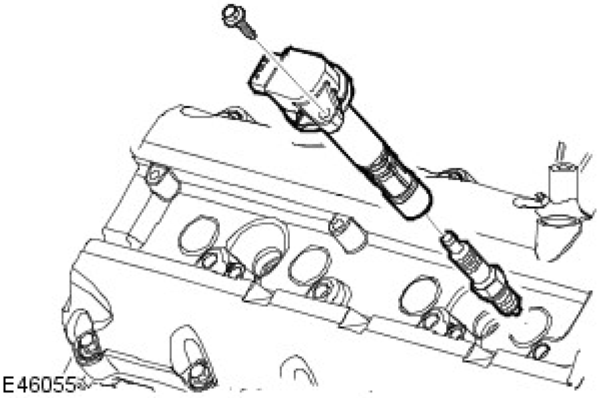
Engine Ignition - V8 S/C 4.2L Petrol - Spark Plugs

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the ignition coil-on-plugs.
   For additional information, refer to: Ignition Coil-On-Plug (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and Installation).
3. Remove the remaining ignition coil-on-plugs.
4. Clean the area surrounding the spark plugs.
5. Remove the spark plugs.



Installation

1. Install the spark plugs.
   - Tighten the spark plugs to 25 Nm (18 lb.ft).
2. Install the ignition coil-on-plug.
   For additional information, refer to: Ignition Coil-On-Plug (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Removal and Installation).
3. Install the remaining coil-on-plugs.
4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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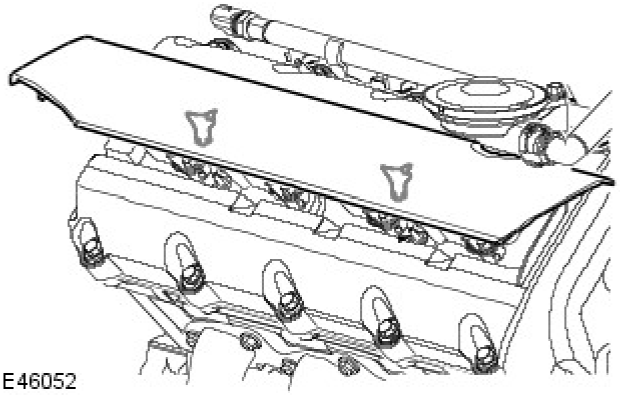
Engine Ignition - V8 S/C 4.2L Petrol - Ignition Coil-On-Plug

Removal and Installation

Removal

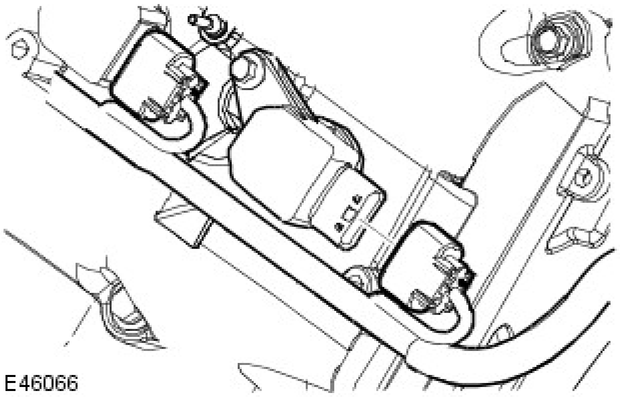
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

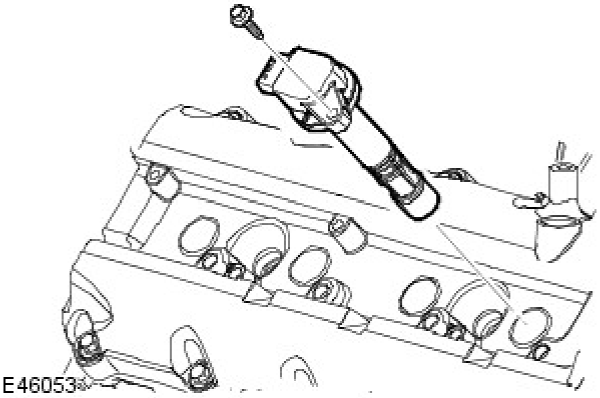


3. Remove the ignition coil cover.

- Release from the 2 clips.



4. Disconnect the ignition coil-on-plug electrical connector.



5. Remove the ignition coil-on-plug.

- Remove the bolt.
- Remove and discard the seal.

Installation

1. To install, reverse the removal procedure.

- Tighten the bolt to 6 Nm (4 lb.ft).

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Engine Ignition - V8 4.4L Petrol -

General Specifications

Item	Specification
Spark plugs:	
Make	NGK
Type	1FR5N10 Iridium plug
Gap	1.0 mm (0.04 in)
Ignition coil:	
Make	Denso
Type	2W93-12A366-BA
Firing Order:	1-5-4-2-6-3-7-8

Torque Specifications

Description	Nm	lb-ft
Ignition coil bolt	6	4
Spark plugs	25	18

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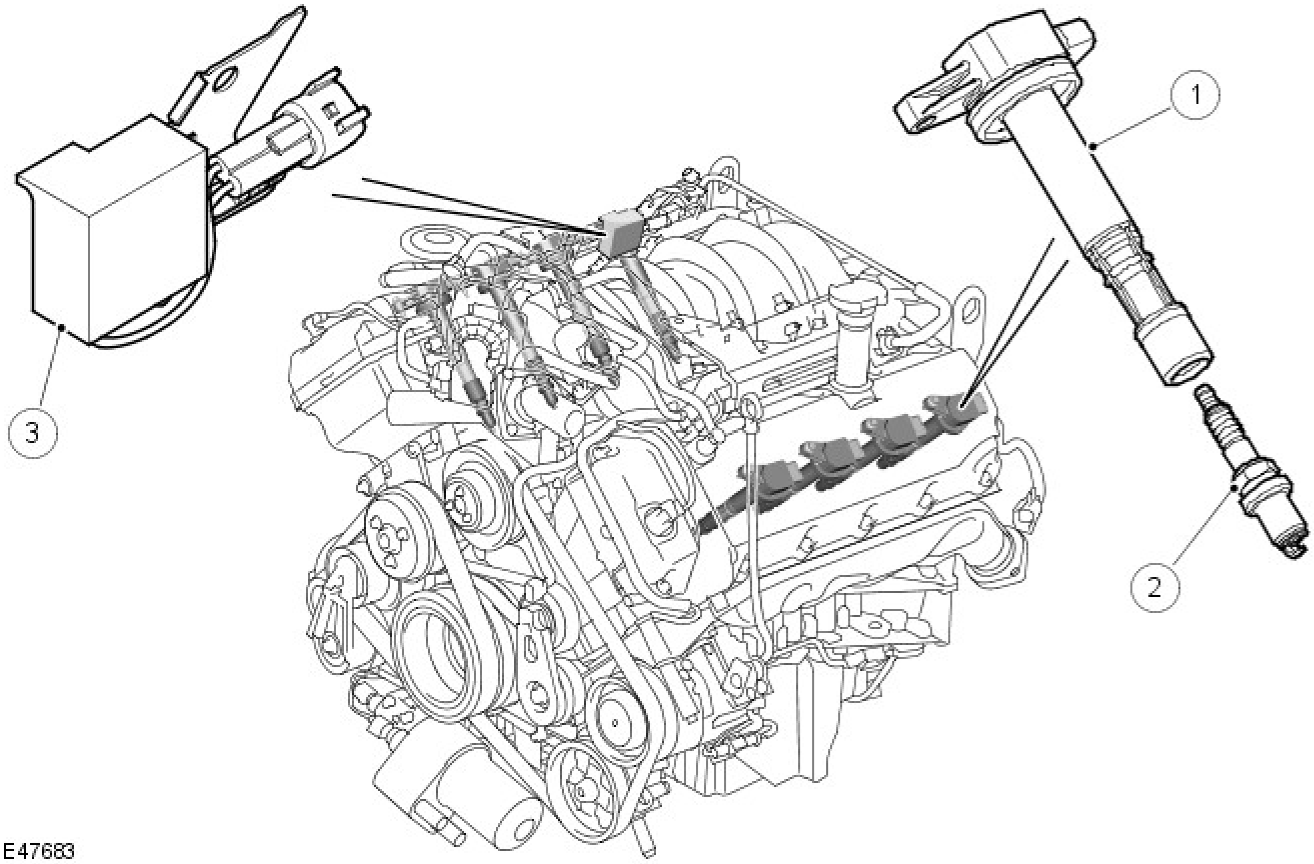
Engine Ignition - V8 4.4L Petrol - Engine Ignition

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	Ignition coil
2	-	Spark plug
3	-	Capacitor

GENERAL

The 4.4L engine ignition system has a single iridium tipped spark plug per cylinder, with each spark plug powered by an on-plug ignition coil. The ignition coils are directly driven by the engine control module (ECM).

Power for the ignition coils is supplied from the main relay and a fuse in the battery junction box (BJB). A capacitor is connected in parallel with the power supplies to the ignition coils to suppress RFI (radio frequency interference).

Each ignition coil contains a power stage to switch the current in the primary circuit. The ECM controls the switching with a signal to the power stage. The ECM monitors operation of the ignition coils using a feedback signal from each of the power stages. If a fault is detected the ECM stores an appropriate fault code.

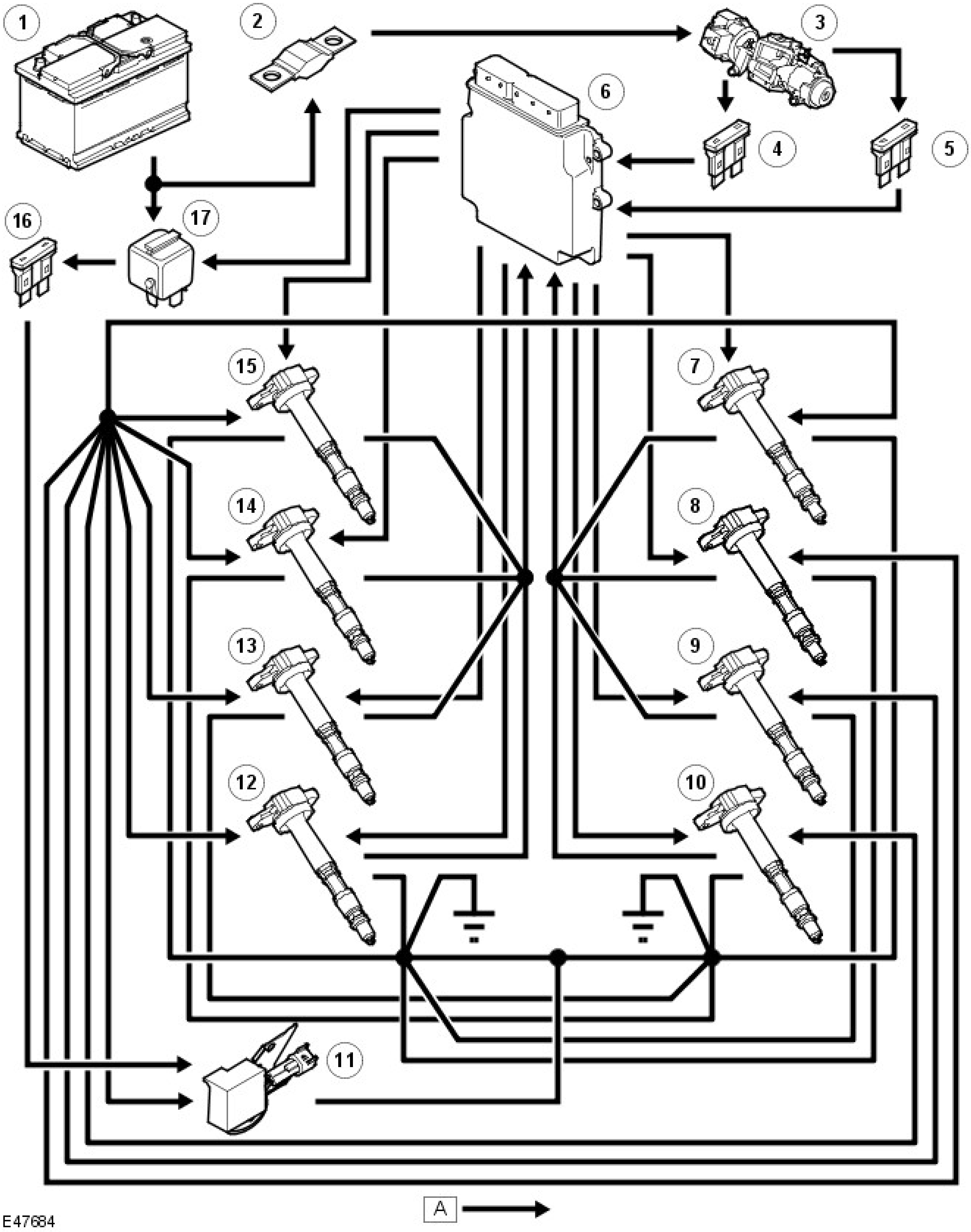
The ECM varies the dwell time of the ignition coils depending on battery voltage and engine speed, to ensure a constant energy level is produced in the secondary coil each time the power stage is switched. This ensures a good spark is always produced by the spark plug without excessive primary current flow, thus avoiding overheating or damage to the ignition coils.

The ECM calculates the ignition timing for individual cylinders from:

- Engine speed.
- Camshaft position.
- Engine load.
- Engine temperature.
- The knock control function.
- On automatic transmission models, the shift control function.
- The idle speed control function.

ENGINE IGNITION CONTROL DIAGRAM

- NOTE: A = Hardwired connections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E47684
A

Item	Part Number	Description
1	-	Battery

2	-	Fusible link 11E, BJB
3	-	Ignition switch
4	-	Fuse 25P, ignition feed, central junction box (CJB)
5	-	Fuse 60P, crank feed, CJB
6	-	ECM
7	-	Ignition coil and spark plug 5
8	-	Ignition coil and spark plug 2
9	-	Ignition coil and spark plug 3
10	-	Ignition coil and spark plug 8
11	-	Capacitor
12	-	Ignition coil and spark plug 4
13	-	Ignition coil and spark plug 7
14	-	Ignition coil and spark plug 6
15	-	Ignition coil and spark plug 1
16	-	Fuse 6E, BJB
17	-	Main relay

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Engine Ignition - V8 4.4L Petrol - Engine Ignition

Diagnosis and Testing

Overview

For information on the operation of the system, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Engine oil level ● Cooling system coolant level ● Fuel level ● Fuel contamination/grade/quality ● Exhaust gas recirculation (EGR) valves	● Fuses ● Wiring harness ● Loose or corroded electrical connectors ● Ignition coils ● Sensor(s) ● Engine control module (ECM) ● Transmission control module (TCM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom (general)	Symptom (specific)	Possible causes	Action
Non-Start	Engine cranks, but does not fire	● Low/Contaminated fuel ● Ignition system ● Fuel system ● Crankshaft position (CKP) sensor ● Harness ● ECM fault	Check the fuel level and condition. For ignition system tests, refer to the coil failure DTCs in this index. Check the fuel system. Check the CKP sensor circuits. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
	Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Fuel system ● Spark plugs ● Ignition coil failure(s) ● Harness	Check the evaporative emissions purge valve. Check the fuel system. Refer to the relevant workshop manual section. Check the spark plug conditions and gaps. For ignition coil tests, refer to the coil failure DTCs in this index.
Difficult to start	Difficult to start hot	● Injector leak ● Fuel system ● Fuel temperature sensor ● Intake air temperature (IAT) sensor ● Mass air flow (MAF) sensor ● Evaporative emissions purge valve ● Ignition system	Check the fuel injectors and fuel system. Check the fuel temperature, IAT and MAF sensor circuits. Check the evaporative emissions purge valve. Refer to the relevant workshop manual section. For ignition coil tests, refer to the coil failure DTCs in this index.
	Difficult to start after hot soak (vehicle standing after engine has reached operating temperature)	● Injector leak ● Fuel system ● Fuel temperature sensor ● IAT sensor ● MAF sensor	Check the fuel injectors and fuel system. Check the fuel temperature, IAT and MAF sensor circuits. Check the evaporative emissions purge valve. For ignition coil tests, refer to the coil failure DTCs in this index. Refer to the relevant workshop manual section.

Symptom (general)	Symptom (specific)	Possible causes	Action
		- Evaporative emissions purge valve - Ignition system	
Engine stalls	Engine stalls soon after start	- Breather system disconnected/restricted - ECM relay - MAF sensor - Ignition system - Air filter restricted - Air leakage - Fuel lines	Check the engine breather system. Check the ECM relay operation. Check the MAF sensor circuits. For ignition coil tests, refer to the coil failure DTCs in this index. For intake air system information. Check the fuel lines for leaks/damage. Refer to the relevant workshop manual section.
Poor driveability	Engine hesitates/poor acceleration	- Fuel pump module - Fuel lines - Injector leak - Fuel pressure - Air leakage - TP sensors - Throttle motor - Ignition system - EGR valve stuck - HO2 sensors - Transmission malfunction - Restricted pedal travel (carpet, etc) - Accelerator pedal position (APP) sensor	Check the fuel pump module operation. Check the fuel lines for leaks/damage. Check the fuel injectors. Check the intake air system for leaks. Check the TP sensor and throttle motor circuits. For ignition coil tests, refer to the coil failure DTCs in this index. Check the EGR valves. Check for DTCs relating to HO2 sensors. For transmission information. Check the accelerator pedal travel. Check the APP sensor circuits. Refer to the relevant workshop manual section.
	Engine backfires	- Fuel pump module - Fuel lines - Air leakage - MAF sensor - HO2 sensors - Ignition system - Sticking variable camshaft timing (VCT) hub - APP sensor	Check the fuel pump module operation. Check the fuel lines for leaks/damage. Check the intake air system for leaks. Check the MAF sensor circuits. Check for DTCs relating to HO2 sensors. For ignition coil tests, refer to the coil failure DTCs in this index. Check the VCT and APP sensor circuits. Refer to the relevant workshop manual section.
	Engine surges	- Fuel pump module - Fuel lines - MAF sensor - Harness - TP sensors - Throttle motor - Ignition system	Check the fuel pump module operation. Check the fuel lines for leaks/damage. Check the MAF sensor, TP sensor and throttle motor circuits, refer to the electrical guides. For ignition coil tests, refer to the coil failure DTCs in this index.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P030000	Random/Multiple cylinder misfire detected	- ECM to ignition coil primary circuit faults (cylinder misfire detected DTCs also logged) - Ignition coil failure - Spark plug failure/fouled /incorrect gap - Fuel delivery pressure (low/high) - Fuel injector circuit fault(s) (injector DTCs also logged)	For ignition coil tests, refer to the coil failure DTCs in this index. Check the spark plug conditions and gaps. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
		● Fuel injectors restricted/leaking ● Fuel injectors continuously open ● Fuel contamination ● Cylinder compression low ● Worn camshaft/broken valve springs ● Valve clearance adjustment	
P030100	Cylinder 1 Misfire Detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALQ** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030200	Cylinder 2 Misfire Detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALT** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030300	Cylinder 3 Misfire Detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALR** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030400	Cylinder 4 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALU** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030500	Cylinder 5 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALS** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030600	Cylinder 6 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETALV** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030700	Cylinder 7 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETAME** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030800	Cylinder 8 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine **ETAMF** for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P031600	Misfire Detected On Startup (First 1000 Revolutions)	● Misfire detected on first 1000 revs ● Refer to P030000 possible sources	Carry out the tests indicated for a normal misfire code, but on a cold engine.
P035100	Cylinder 1 ignition coil primary/secondary circuit	● ECM to ignition module/coil drive circuit: high resistance, short circuit to ground ● Ignition module/coil ground circuit: high resistance	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALQ** for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		- Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	
P035200	Cylinder 2 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALT** for this code on the approved diagnostic system.
P035300	Cylinder 3 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALR** for this code on the approved diagnostic system.
P035400	Cylinder 4 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALU** for this code on the approved diagnostic system.
P035500	Cylinder 5 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALS** for this code on the approved diagnostic system.
P035600	Cylinder 6 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETALV** for this code on the approved diagnostic system.
P035700	Cylinder 7 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETAME** for this code on the approved diagnostic system.
P035800	Cylinder 8 ignition coil primary/secondary circuit	- ECM to ignition module/coil drive circuit: high resistance, short circuit to ground - Ignition module/coil ground circuit: high resistance - Ignition module/coil battery supply circuit: high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine **ETAMF** for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P131500	Persistent Misfire	● ECM to ignition coil primary circuit fault (cylinder misfire detected DTC also flagged) ● Ignition coil failure ● Spark plug failure/fouled /incorrect gap ● Fuel delivery pressure low ● Fuel injector circuit fault(s) (injector DTCs also flagged) ● Cylinder compression low	For ignition coil tests, refer to the coil failure DTCs in this index. Check the spark plug conditions and gaps. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P136700	Ignition Spare	● Ignition coil group A monitoring circuit to ECM high resistance, short circuit to ground, short circuit to power ● Ignition module/coils ground circuit fault, right hand bank	Refer to the electrical guides and check the ignition monitoring circuit between the ignition coils and ECM. Repair as necessary. For ignition coil tests, refer to the coil failure DTCs in this index.
P136800	Ignition Spare	● Ignition coil group B monitoring circuit to ECM high resistance, short circuit to ground, short circuit to power ● Ignition module/coils ground circuit fault left hand bank	Refer to the electrical guides and check the ignition monitoring circuit between the ignition coils and ECM. Repair as necessary. For ignition coil tests, refer to the coil failure DTCs in this index.

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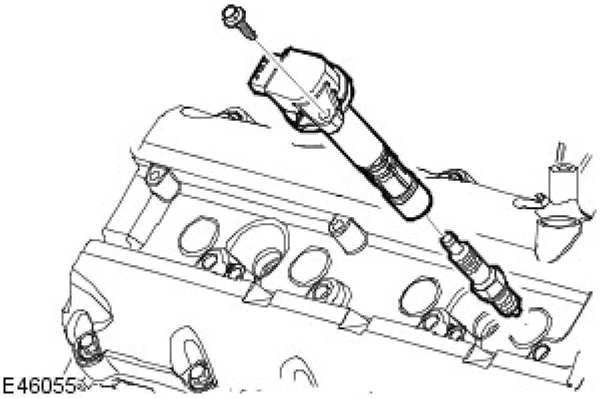
Engine Ignition - V8 4.4L Petrol - Spark Plugs

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the ignition coil-on-plugs.
   For additional information, refer to: Ignition Coil-On-Plug (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).
3. Remove the remaining ignition coil-on-plugs.
4. Clean the area surrounding the spark plugs.
5. Remove the spark plugs.



Installation

1. Install the spark plugs.
   - Tighten the spark plugs to 25 Nm (18 lb.ft).
2. Install the ignition coil-on-plug.
   For additional information, refer to: Ignition Coil-On-Plug (303-07B Engine Ignition - V8 4.4L Petrol, Removal and Installation).
3. Install the remaining coil-on-plugs.
4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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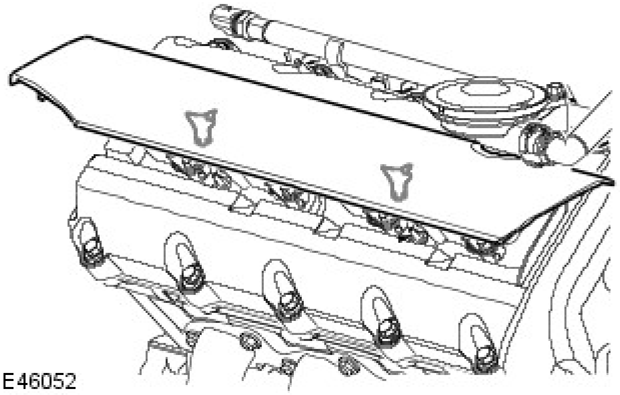
Engine Ignition - V8 4.4L Petrol - Ignition Coil-On-Plug

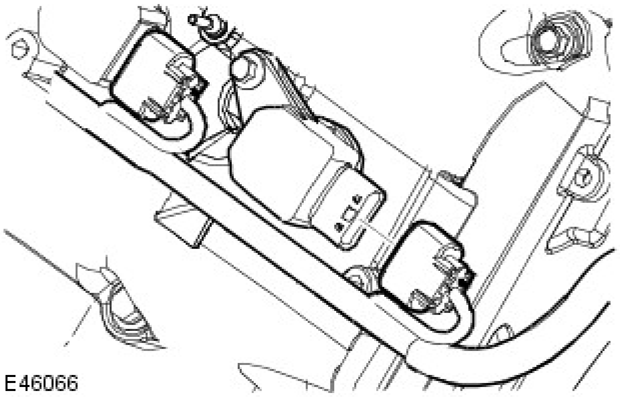
Removal and Installation

Removal

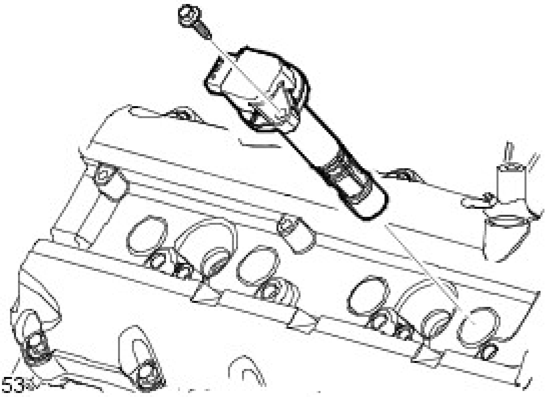
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the ignition coil cover.
   - Release from the 2 clips.


E46052

4. Disconnect the ignition coil-on-plug electrical connector.


E46066

5. Remove the ignition coil-on-plug.
   - Remove the bolt.
   - Remove and discard the seal.


E46053

Installation

1. To install, reverse the removal procedure.

- Tighten the bolt to 6 Nm (4 lb.ft).

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Glow Plug System - TDV6 2.7L Diesel -

General Specifications

Item	Description
Glow plugs - Make	Beru

Torque Specifications

Description	Nm	lb-ft
Glow plugs	10	7

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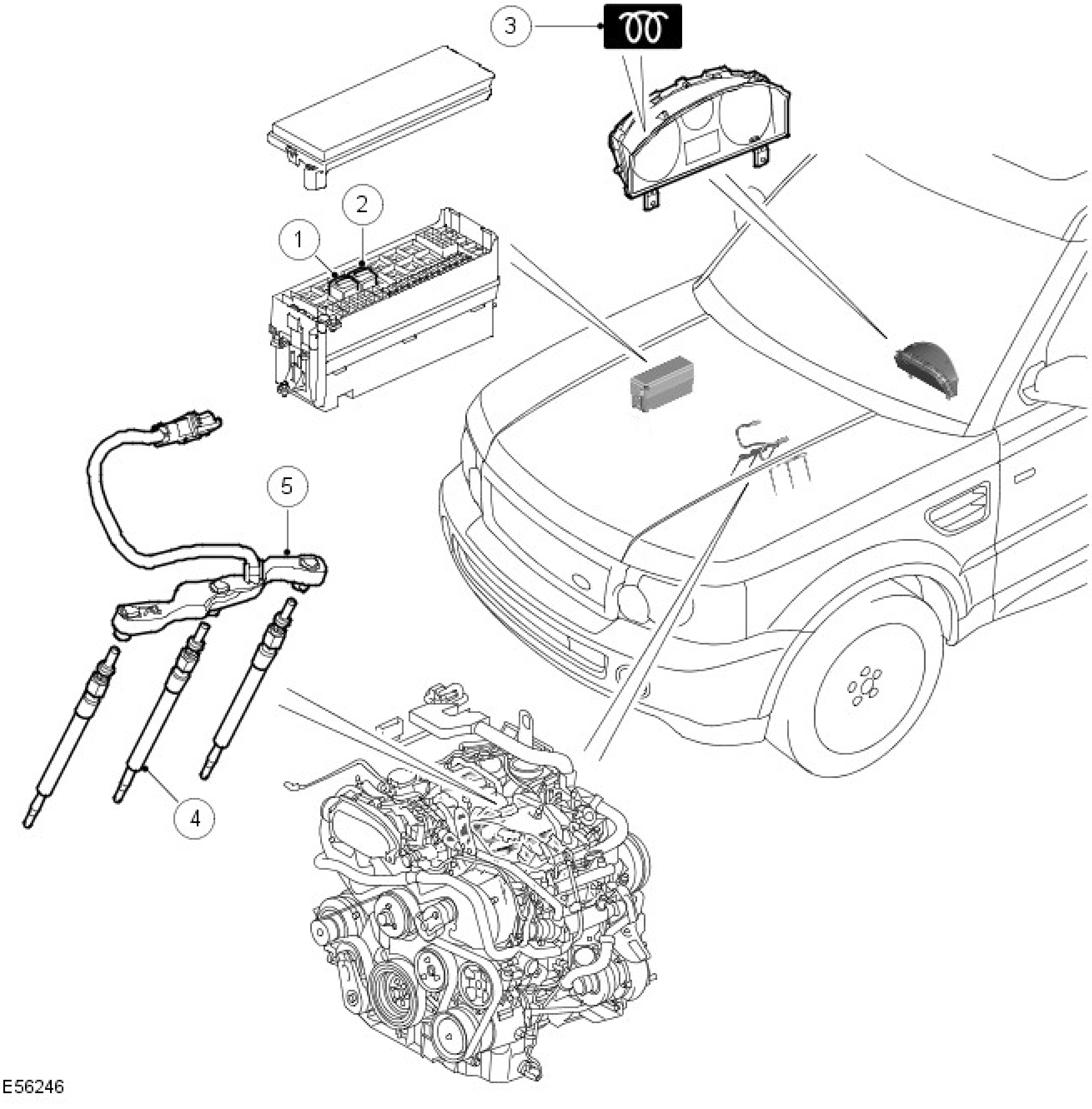
Glow Plug System - TDV6 2.7L Diesel - Glow Plug System

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	B (left-hand (LH)) bank glow plug relay
2	-	A (right-hand (RH)) bank glow plug relay
3	-	Glow plug indicator
4	-	Glow plug (x 6)
5	-	Glow plug harness (x 2)

GENERAL

The glow plug system has a glow plug installed in the inlet side of each cylinder. The glow plugs heat the combustion chambers before and during cranking, to aid cold starting, and after the engine starts to reduce emissions and engine noise when idling with a cold engine.

A glow plug wiring harness on each bank of glow plugs is connected to a separate relay and fusible link in the battery junction box (BJB). The individual glow plugs are grounded through their fixing in the cylinder head. Operation of the glow plug relays is controlled by the engine control module (ECM), which also controls the illumination of the glow plug indicator in the instrument cluster.

Each glow plug is a tubular heating element which contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil, and connected in series, is a control coil. The control coil regulates the current to the heater coil to ensure that it does not overheat.

SYSTEM OPERATION

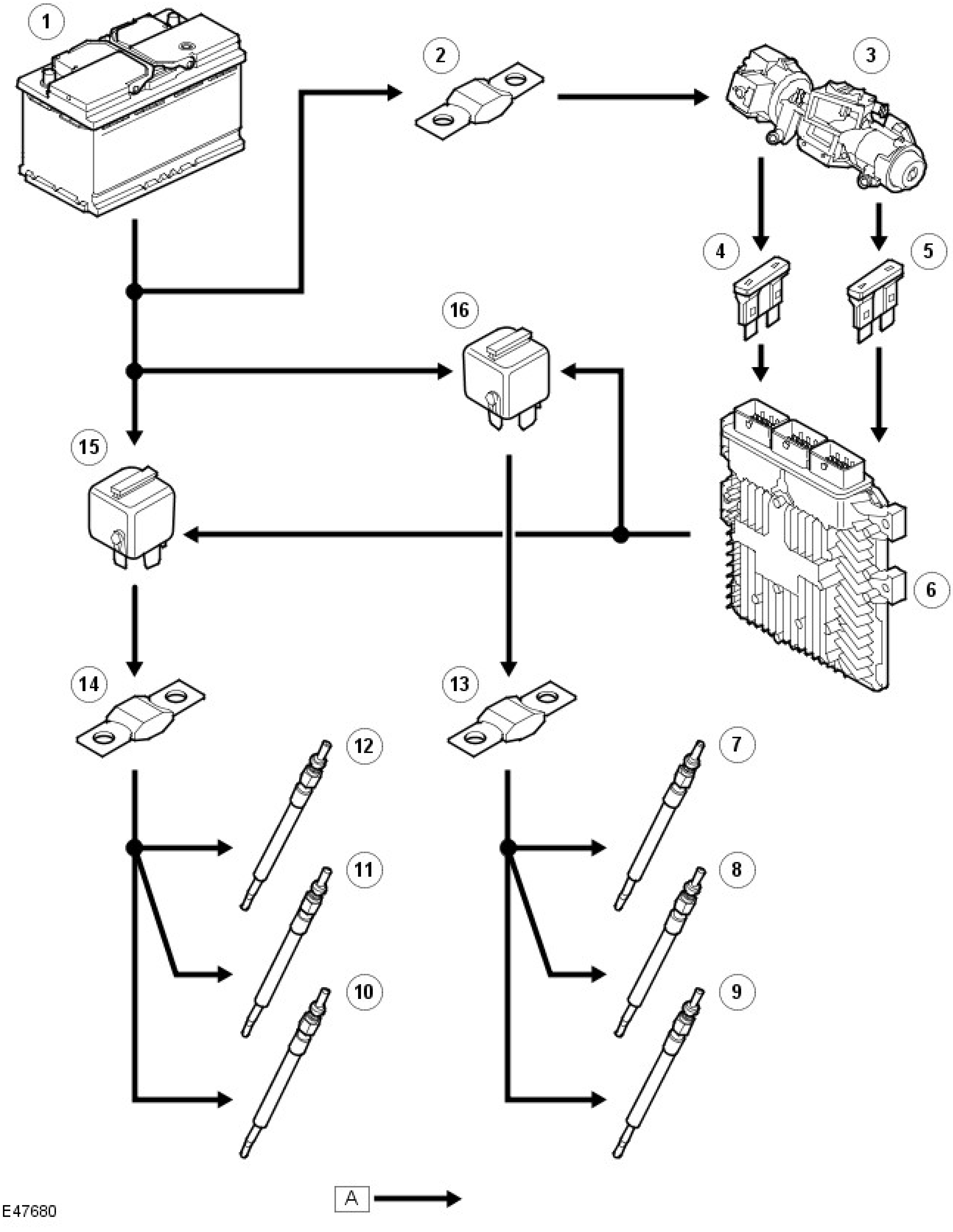
There are three phases of glow plug heating: Pre heating, crank heating and post heating. The ECM determines the heating times from the engine coolant temperature (ECT). The lower the ECT, the longer the heating times.

When the ignition switch is turned to position II, the ECM calculates any required heating times and, if heating is required, energizes the glow plug relays in the BJB. When pre heating is required, the ECM also sends a message to the instrument cluster, on the high speed controller area network (CAN) bus, to request illumination of the glow plug indicator. The glow plug indicator remains illuminated for the duration of the pre heating phase, or until the ignition switch is turned to the crank position, whichever occurs first. If required, the ECM keeps the glow plug relays energized during cranking and for the duration of any post heating phase.

The ECM monitors the drive circuit of the glow plug relays for plausibility of operation, continuity, and short and open circuits. If a fault is detected, the ECM stores a related fault code and permanently illuminates the glow plug indicator while the ignition switch is in position II.

GLOW PLUG SYSTEM CONTROL DIAGRAM

- NOTE: A = Hardwired Connections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Item	Part Number	Description
1	-	Battery
2	-	Fusible link 11E, BJB
3	-	Ignition switch
4	-	Fuse 25P, central junction box (CJB) (ignition)
5	-	Fuse 60P, CJB (crank)

6	-	ECM
7	-	Glow plug 6
8	-	Glow plug 5
9	-	Glow plug 4
10	-	Glow plug 1
11	-	Glow plug 2
12	-	Glow plug 3
13	-	Fusible link 4E, BJB
14	-	Fusible link 1E, BJB
15	-	A (RH) bank glow plug relay
16	-	B (LH) bank glow plug relay

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Glow Plug System - TDV6 2.7L Diesel - Glow Plug System

Diagnosis and Testing

Overview

For information on the system operation, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual inspection

Electrical
Glow plug lamp Fuses Glow plug relays Engine management control relay Wiring harness(es) Electrical connector(s) Glow plug(s) Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible cause	Action
Poor starting (extreme weather conditions)	Glow plugs inoperative/inefficient Fuel temperature too low	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. The fuel system recycles fuel until operating temperature is reached to reduce this possibility.
High cold-engine emissions	After-glow phase inoperative	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. After-glow is designed to function at engine temperatures below 50 degrees C (122 degrees F), and below 2,500 rpm.
High cold-engine noise, vibration or harshness	After-glow phase inoperative	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. After-glow is designed to function at engine temperatures below 50 degrees C (122 degrees F), and below 2,500 rpm.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P038300	Glow Plug Control Module Control Circuit Low	Glow plug relay, control circuit high resistance Glow plug relay, control circuit short circuit to ground Glow plug relay failure	Refer to the electrical guides and check the circuit. Check the relay operation. Repair/renew as necessary.

DTC	Description	Possible causes	Action
P038400	Glow Plug Control Module Control Circuit High	● Glow plug relay, control circuit short circuit to power ● Glow plug relay failure	Refer to the electrical guides and check the circuit. Check the relay operation. Repair/renew as necessary.
P067000	Glow Plug Control Module Control Circuit / Open	● Glow plug relay, control circuit high resistance ● Glow plug relay, control circuit short circuit to ground ● Glow plug relay failure	Check the glow plug relay circuits. Refer to the electrical guides. Check the relay operation. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.

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Glow Plug System - TDV6 2.7L Diesel - Glow Plugs

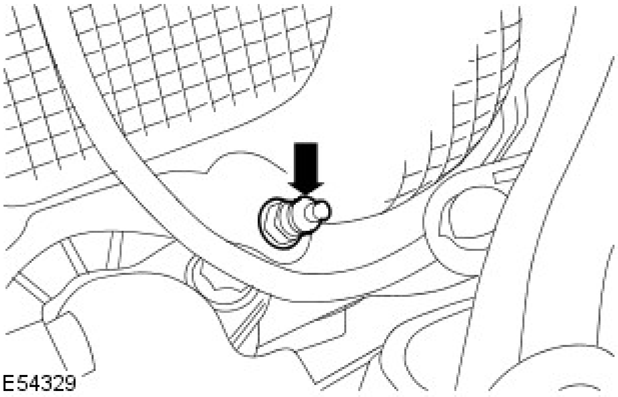
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the crankcase vent oil separator.
For additional information, refer to: Crankcase Vent Oil Separator (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

3. Remove the glow plugs.



Installation

1. To install, reverse the removal procedure.

- Tighten the glow plugs to 10 Nm (7 lb.ft).

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Glow Plug System - TDV6 2.7L Diesel - Glow Plug Module

Removal and Installation

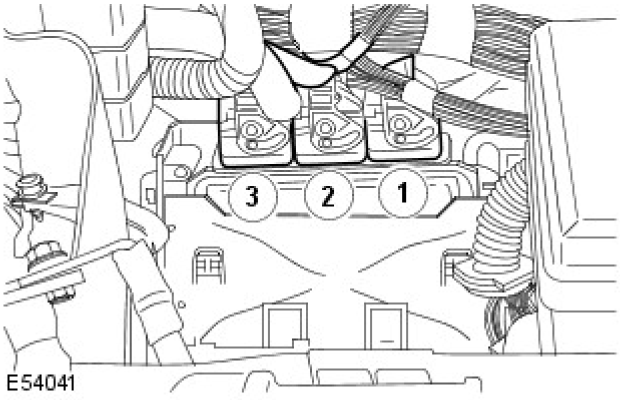
Removal

- NOTE: The glow plug module is an integral part of the engine control module and cannot be replaced separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

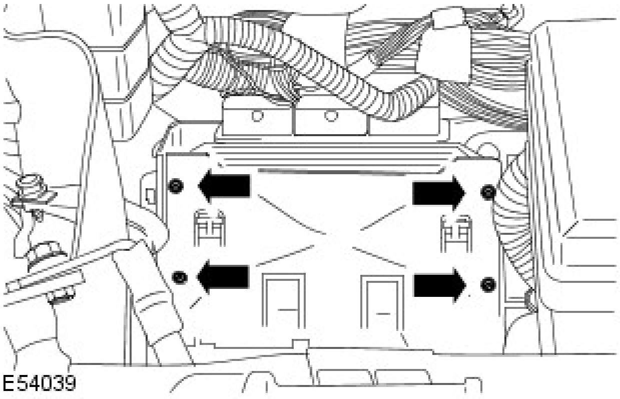
2. Remove the four-wheel drive (4WD) control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

3. NOTE: Right hand drive shown, for Left hand drive reverse the sequence.



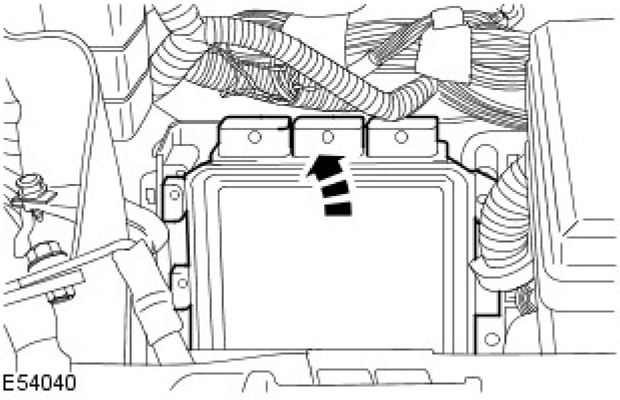
Disconnect the three glow plug module electrical connectors in the sequence shown.

- Position the three engine harness electrical connectors aside for access.



4. Remove the glow plug module securing plate.

- Remove the four retaining bolts.



5. Remove the glow plug module.

- Remove the glow plug module top cover.

Installation

1. Install the glow plug module.
   - Install the glow plug module top cover.
2. Install the glow plug module securing plate.
   - Install the four retaining bolts.
3. Connect the three glow plug module electrical connectors.
4. Install the 4WD control module.
   For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).
5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
6. Connect T4 to calibrate a new ECM.

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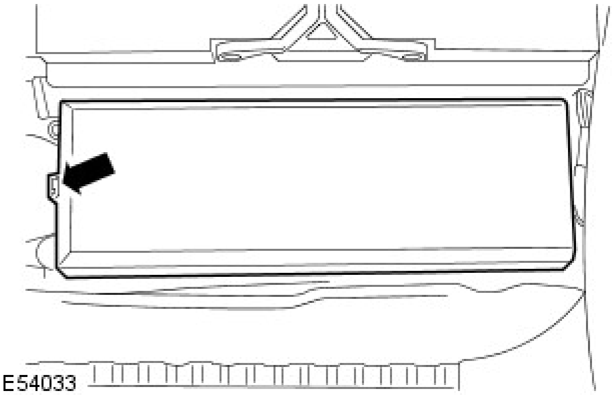
Glow Plug System - TDV6 2.7L Diesel - Glow Plug Relay

Removal and Installation

Removal

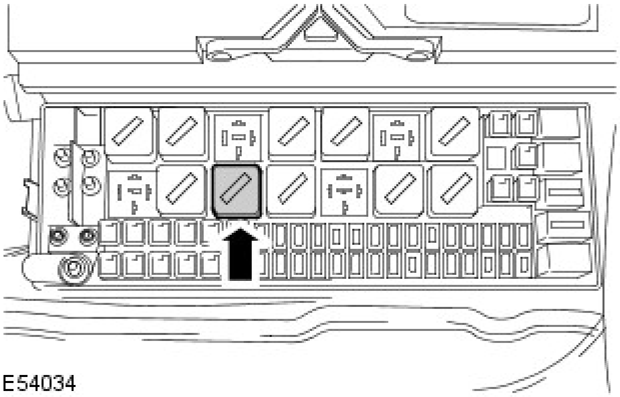
• NOTE: This procedure shows the removal and installation of the right hand bank and left hand bank glow plug relays. The glow plug relays are available individually.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

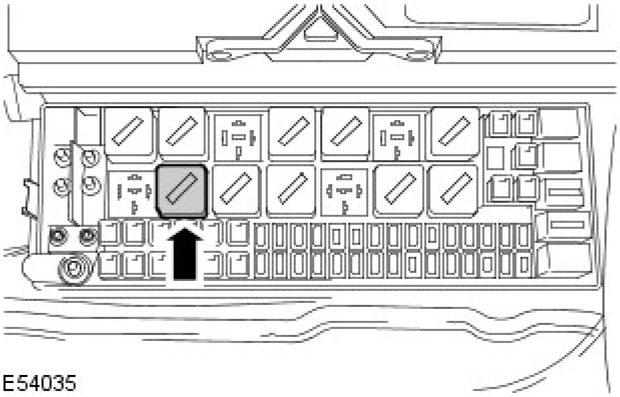


2. Remove the battery junction box (BJB) lid.

- Release the BJB latch.



3. Remove the RH bank glow plug relay.



4. Remove the LH bank glow plug relay.

Installation

1. To install, reverse the removal procedure.

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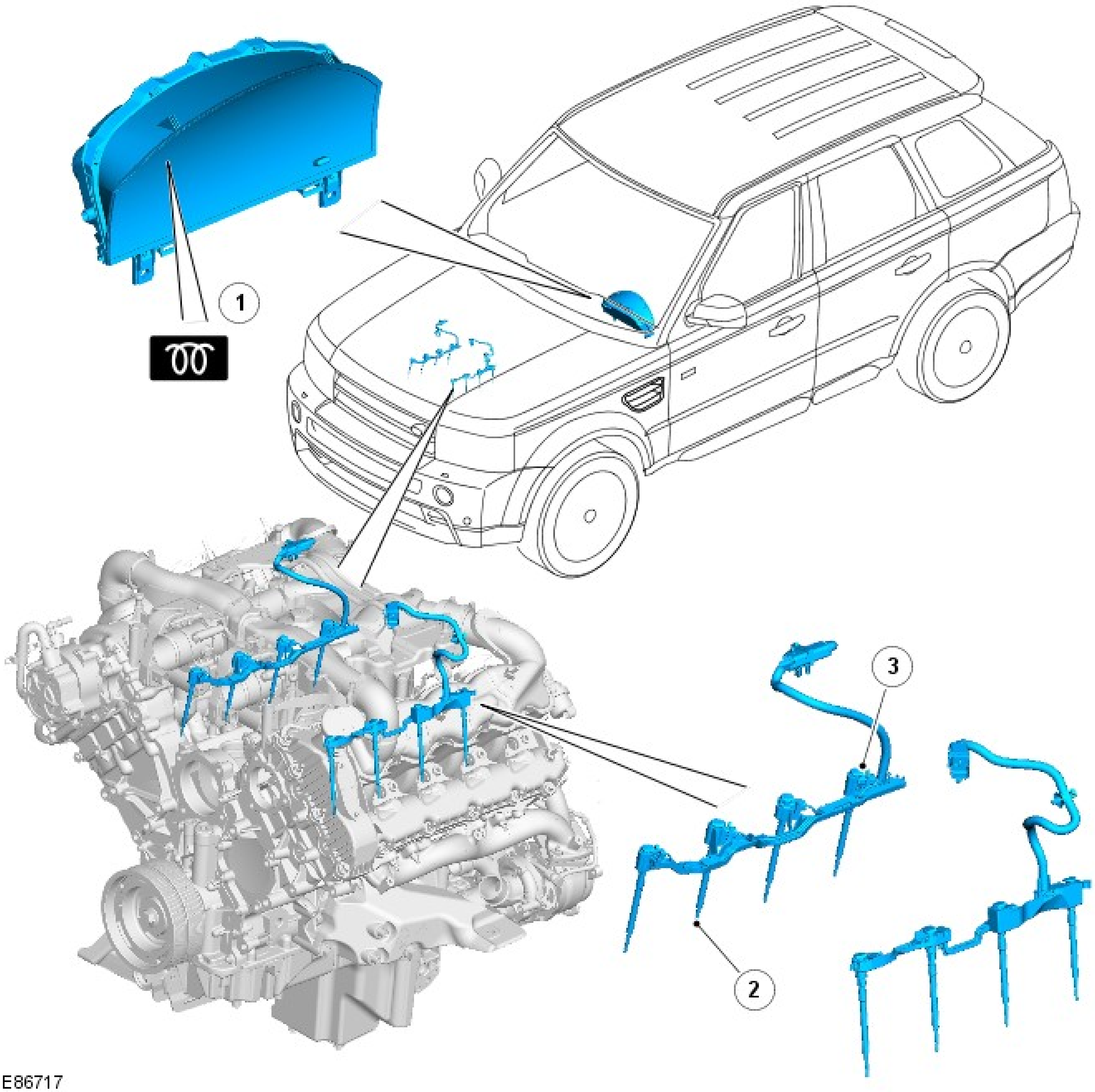
Glow Plug System - TDV8 3.6L Diesel - Glow Plug System

Description and Operation

COMPONENT LOCATION



E86717

Item	Part Number	Description
1	-	Glow plug warning lamp
2	-	Glow plugs (8 off)
3	-	Glow plug harness

OVERVIEW

The glow plug system has a glow plug installed in the inlet side of each cylinder. The glow plugs heat the combustion chambers before and during cranking, to aid cold starting, and after the engine starts to reduce emissions and engine noise when idling with a cold engine.

A glow plug wiring harness on each bank of glow plugs is connected to a separate relay and fusible link in the battery junction box

(BJB). The individual glow plugs are grounded through their fixing in the cylinder head. Operation of the glow plug relays is controlled by the engine control module (ECM) , which also controls the illumination of the glow plug indicator in the instrument cluster.

Each glow plug is a tubular heating element which contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil, and connected in series, is a control coil. The control coil regulates the current to the heater coil to safeguard against overheating.

SYSTEM OPERATION

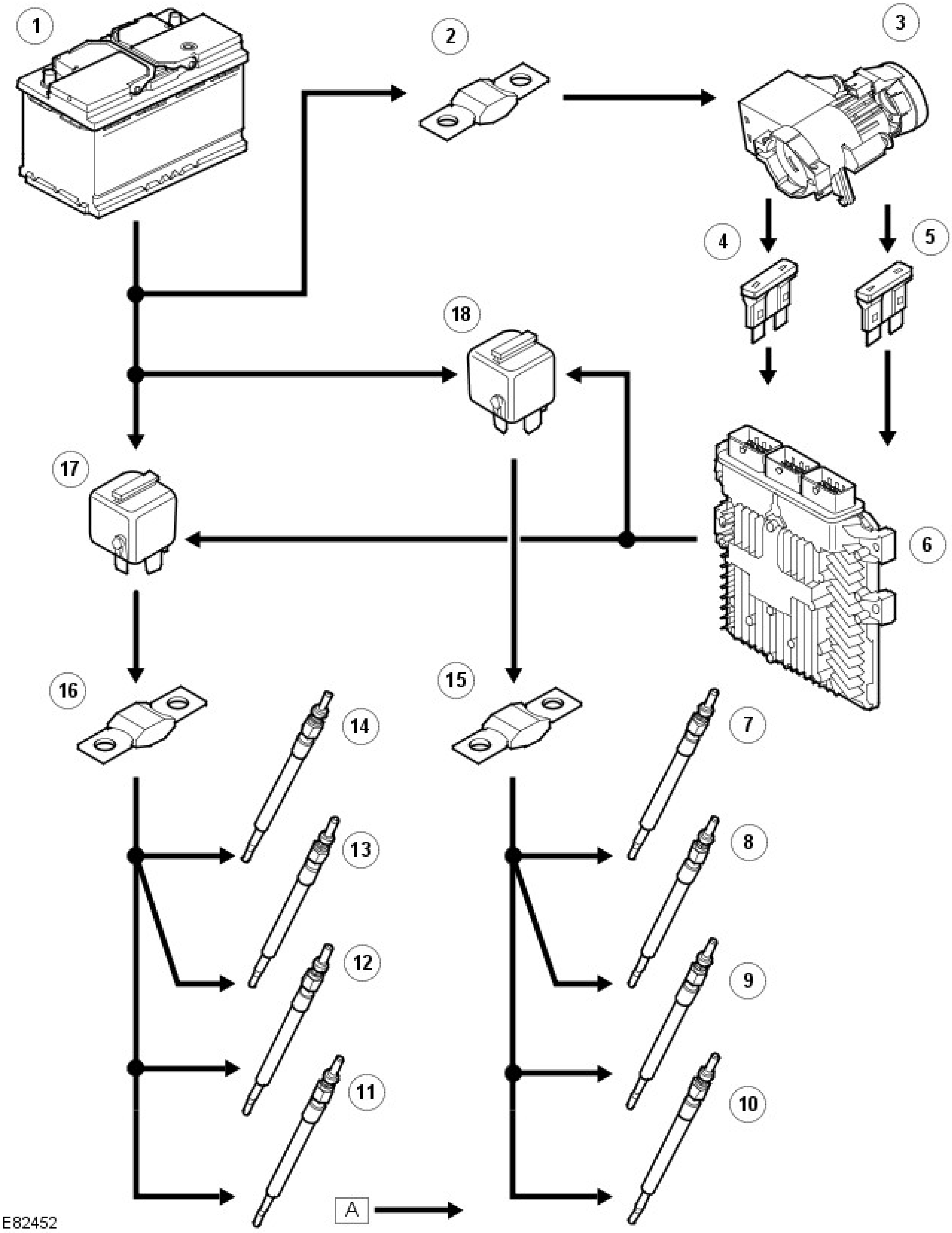
There are three phases of glow plug heating: Pre heating, crank heating and post heating. The ECM determines the heating times from the engine coolant temperature (ECT). The lower the ECT, the longer the heating times.

When the ignition switch is turned to position II, the ECM calculates any required heating times and, if heating is required, energizes the glow plug relays in the BJB. When pre heating is required, the ECM also sends a message to the instrument cluster, on the high speed controller area network (CAN), to request illumination of the glow plug indicator. The glow plug indicator remains illuminated for the duration of the pre heating phase, or until the ignition switch is turned to the crank position, whichever occurs first. If required, the ECM keeps the glow plug relays energized during cranking and for the duration of any post heating phase.

The ECM monitors the drive circuit of the glow plug relays for plausibility of operation, continuity, and short and open circuits. If a fault is detected, the ECM stores a related fault code and permanently illuminates the glow plug indicator while the ignition switch is in position II.

CONTROL DIAGRAM

- NOTE: A = Hardwired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Item	Part Number	Description
1	-	Battery
2	-	Fuse 9E
3	-	Ignition switch
4	-	Fuse
5	-	Fuse

6	-	ECM
7	-	Glow plug
8	-	Glow plug
9	-	Glow plug
10	-	Glow plug
11	-	Glow plug
12	-	Glow plug
13	-	Glow plug
14	-	Glow plug
15	-	Fuse 1/2 G
16	-	Fuse 3/4 G
17	-	Glow plug relay
18	-	Glow plug relay

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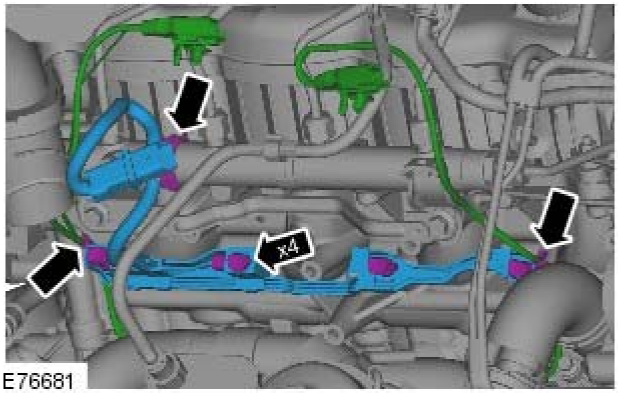
Glow Plug System - TDV8 3.6L Diesel - Glow Plugs

Removal and Installation

Removal

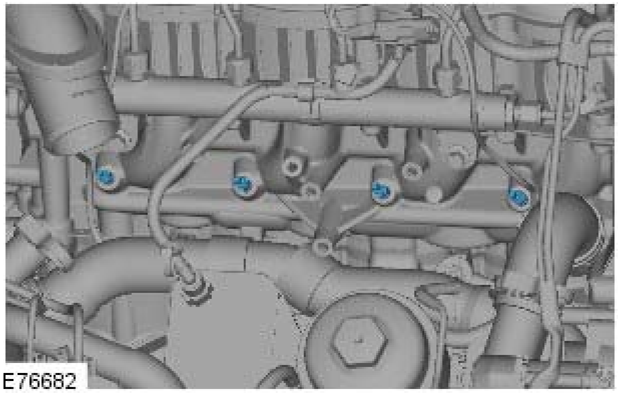
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the RH exhaust gas recirculation (EGR) valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).
3. Remove the LH EGR valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).
4. NOTE: LH illustration shown, RH is similar.



Remove the LH and RH glow plug wiring harnesses.

- Release the LH and RH knock sensor (KS) wiring harnesses.
- Disconnect the LH and RH wiring harnesses from the glow plugs.

5. NOTE: LH illustration shown, RH is similar.



Remove the glow plugs.

Installation

1. Install the glow plugs.
   - Tighten the glow plugs to 10 Nm (7 lb.ft).
2. Install the LH and RH glow plug wiring harnesses.
   - Connect the LH and RH wiring harnesses to the glow plugs.
   - Secure the LH and RH KS wiring harnesses.
3. Install the RH EGR valve and cooler assembly.
   For additional information, refer to: Exhaust Gas Recirculation

(EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

4. Install the LH EGR valve and cooler assembly.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Glow Plug System - TDV8 3.6L Diesel - Glow Plug Module

Removal and Installation

Removal

- NOTE: The Glow Plug Module is part of the ECM.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the glow plug module.
For additional information, refer to: Engine Control Module (ECM) (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

Installation

1. Install the glow plug module.
For additional information, refer to: Engine Control Module (ECM) (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

2. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Glow Plug System - TDV8 3.6L Diesel - Glow Plug Relay

Removal and Installation

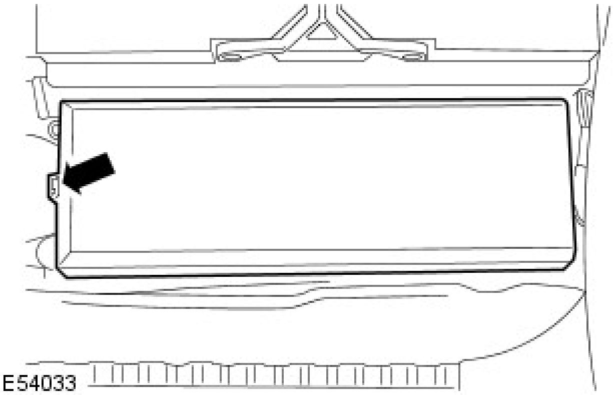
Removal

• NOTE: This procedure shows the removal and installation of the right hand bank and left hand bank glow plug relays. The glow plug relays are available individually.

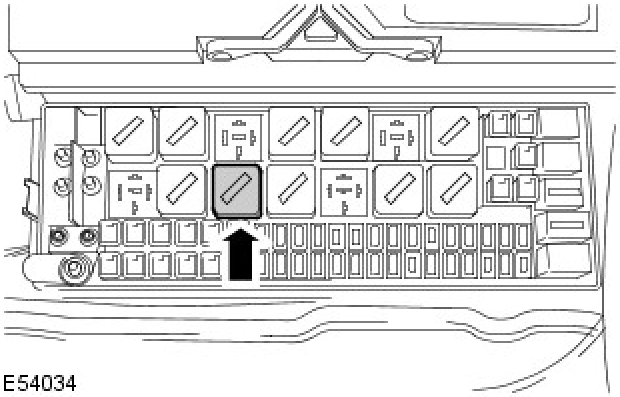
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the battery junction box (BJB) lid.

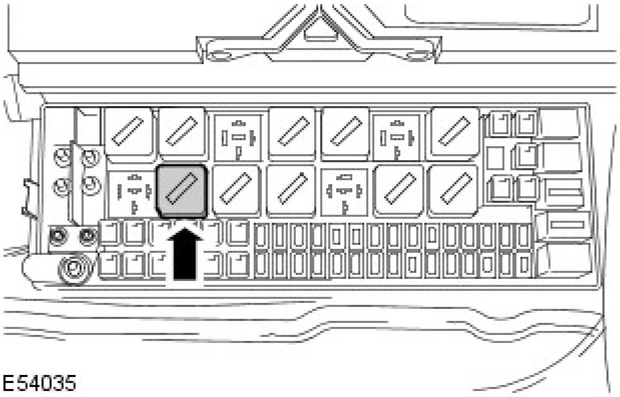
- Release the BJB latch.



3. Remove the RH bank glow plug relay.



4. Remove the LH bank glow plug relay.



Installation

1. To install, reverse the removal procedure.

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Glow Plug System - TDV8 3.6L Diesel -

Torque Specifications

Item	Nm	lb-ft	lb-in
Glow plugs	10	-	89

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Engine Emission Control - V8 S/C 4.2L Petrol -

Torque Specifications

Description	Nm	lb-ft
Positive Crankcase Ventilation (PCV) valve bolts	10	7

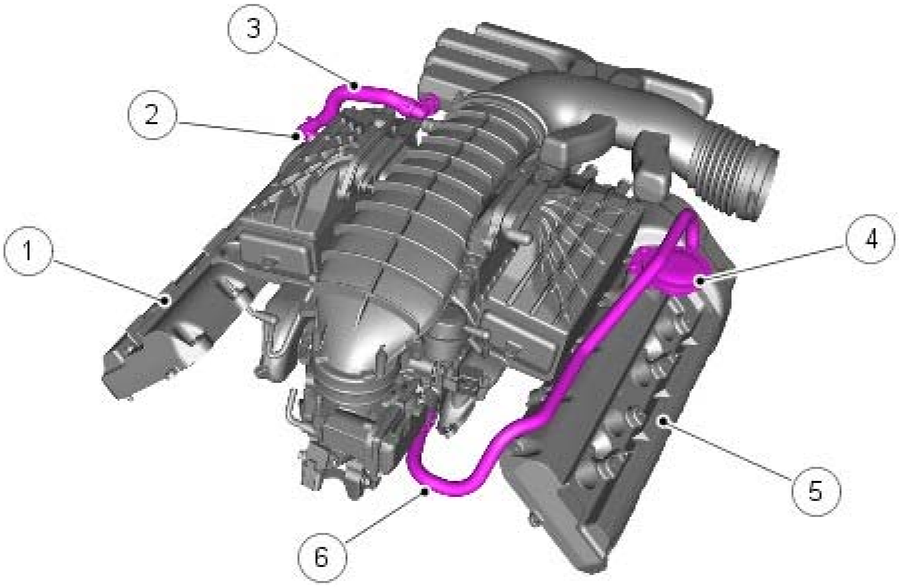
Published: 11-May-2011

Engine Emission Control - V8 S/C 4.2L Petrol - Engine Emission Control

Description and Operation

CRANKCASE VENTILATION

Crankcase Ventilation Component Location



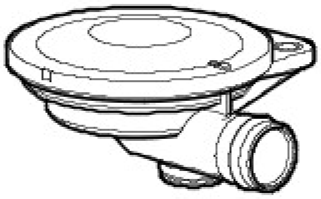
E56079

Item	Part Number	Description
1	-	Cylinder head cover bank B
2	-	Part load breather valve
3	-	Part load breather hose
4	-	positive crankcase ventilation (PCV) valve
5	-	Cylinder head cover bank A
6	-	PCV hose

The V8 engine is ventilated through a part load and a full load breather.

The part load breather is a flexible composite hose connected between the PCV valve and the induction elbow at the rear of the engine. The PCV valve prevents reverse flow into the crankcase.

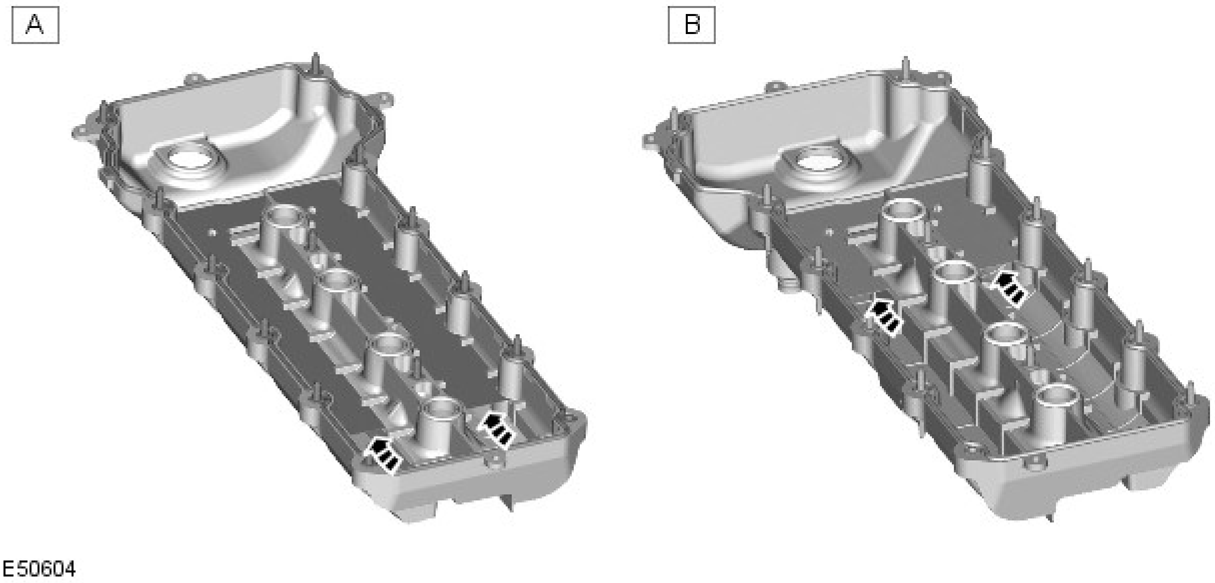
PCV Valve



E48519

The full load breather is a flexible hose connected between the oil separator in the bank B camshaft cover and the alloy intake air duct .

The ends of the breather hoses incorporate quick release connectors.



The oil separators consist of wire gauze packed into an open ended enclosure below the breather outlet.

Published: 11-May-2011

Engine Emission Control - V8 S/C 4.2L Petrol - Engine Emission Control

Diagnosis and Testing

Overview

This section covers the basic checks for the engine breather system on the supercharged engine.

For information on the operation of the emission control systems, refer to relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Visual Inspection Chart

Mechanical
● Engine breather hoses ● Oil separators ● Positive crankcase ventilation valve

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls in the workshop manual.

Symptom	Possible cause	Action
Engine stalls soon after start	● Breather system disconnected/restricted	Check the engine breather system hoses, separators, etc., refer to relevant workshop manual section Rectify as necessary.
Poor throttle response	● Breather system disconnected/restricted	Check the engine breather system hoses, separators, etc., refer to relevant workshop manual section Rectify as necessary.
Engine oil leaks	● Crankcase ventilation system restricted	Check the engine breather system hoses, separators, etc., refer to relevant workshop manual section. Rectify as necessary.

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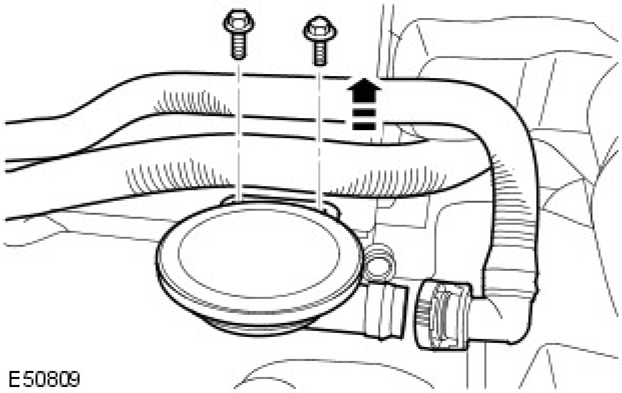
Engine Emission Control - V8 S/C 4.2L Petrol - Positive Crankcase Ventilation (PCV) Valve

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the PCV valve.

- Disconnect the PCV hose.
- Position the engine wiring harness aside for access.
- Remove the 2 bolts.
- Release the PCV valve.

Installation

1. To install, reverse the removal procedure.

- Clean the components.
- Lubricate the seal with clean engine oil.
- Tighten the bolts to 10 Nm (7 lb.ft).

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Engine Emission Control - V8 4.4L Petrol -

General Specifications

Item	Specification
Exhaust gas recirculation (EGR) valve:	
Make	Denso
Type	2W93-9E456-BB

Torque Specifications

Description	Nm	lb-ft
Positive crankcase ventilation (PCV) valve bolts	10	7
Exhaust gas recirculation (EGR) valve bolts	10	7

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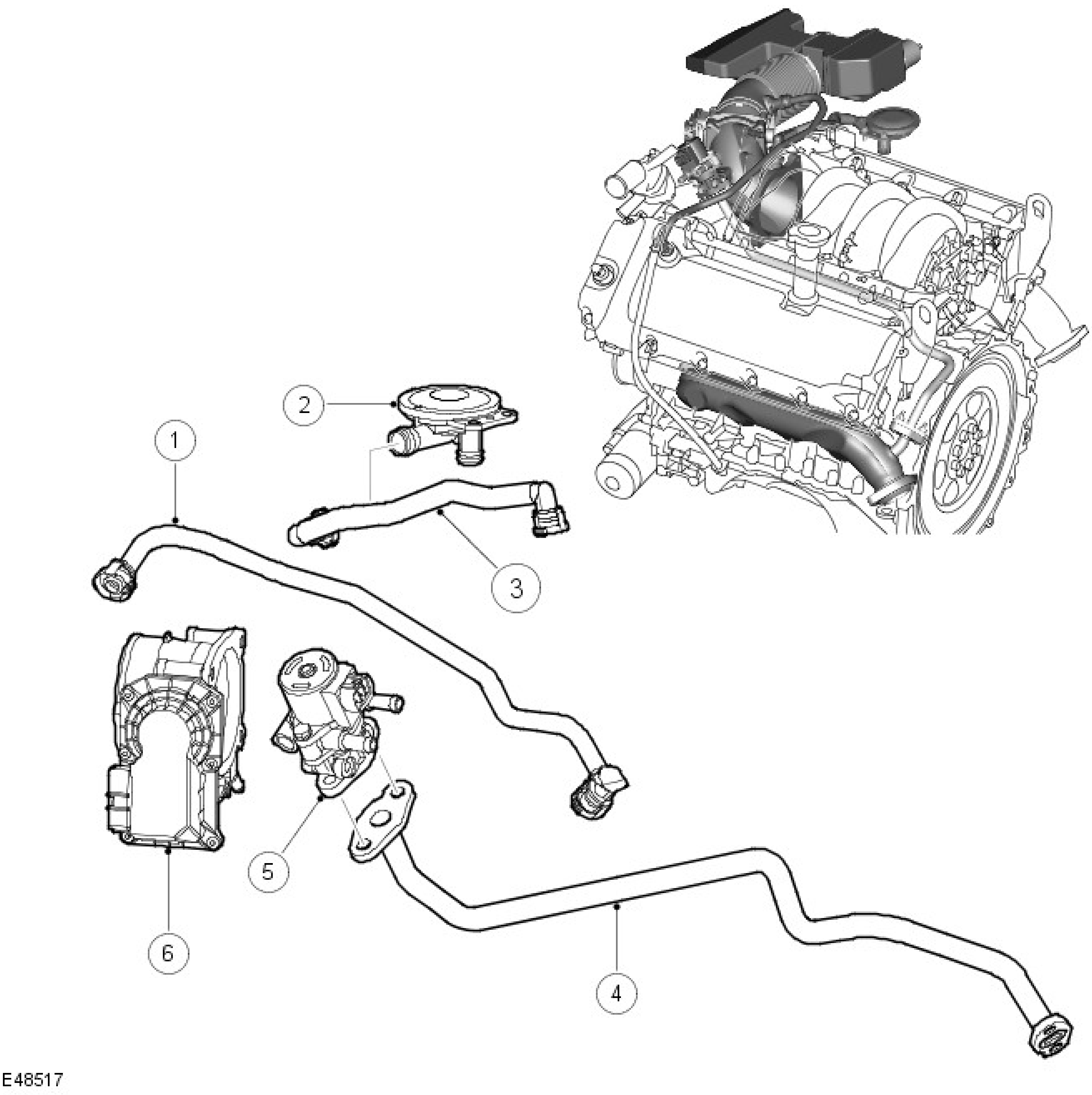
Engine Emission Control - V8 4.4L Petrol - Engine Emission Control

Description and Operation

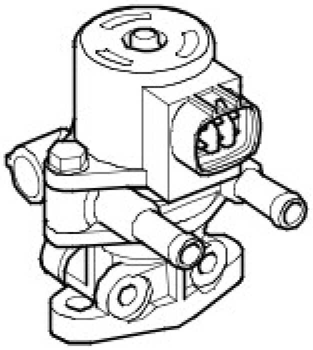
EXHAUST GAS RECIRCULATION (EGR)

EGR and Crankcase Ventilation Component Location



Item	Part Number	Description
1	-	Full load tube
2	-	Pressure Control Valve (PCV)
3	-	Part load tube
4	-	EGR tube
5	-	EGR valve
6	-	Electric throttle

The exhaust gas recirculation (EGR) system is controlled by a PWM signal from the engine control module (ECM). The system comprises an EGR valve and a gas transfer pipe.



E48518

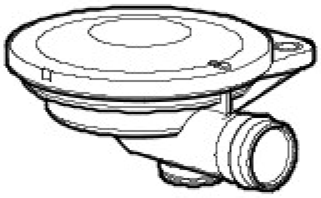
The EGR valve is a 4 pole 60 point stepper motor with an integral cooler unit which is mounted on the side of the induction elbow. The EGR valve receive four 12 Volt signals from the ECM. The EGR valve is cooled by the return coolant flow from the electric throttle.

The EGR valve is connected to the LH exhaust manifold via the gas transfer pipe.

CRANKCASE VENTILATION

The V8 engine is ventilated through a part load and a full load breather.

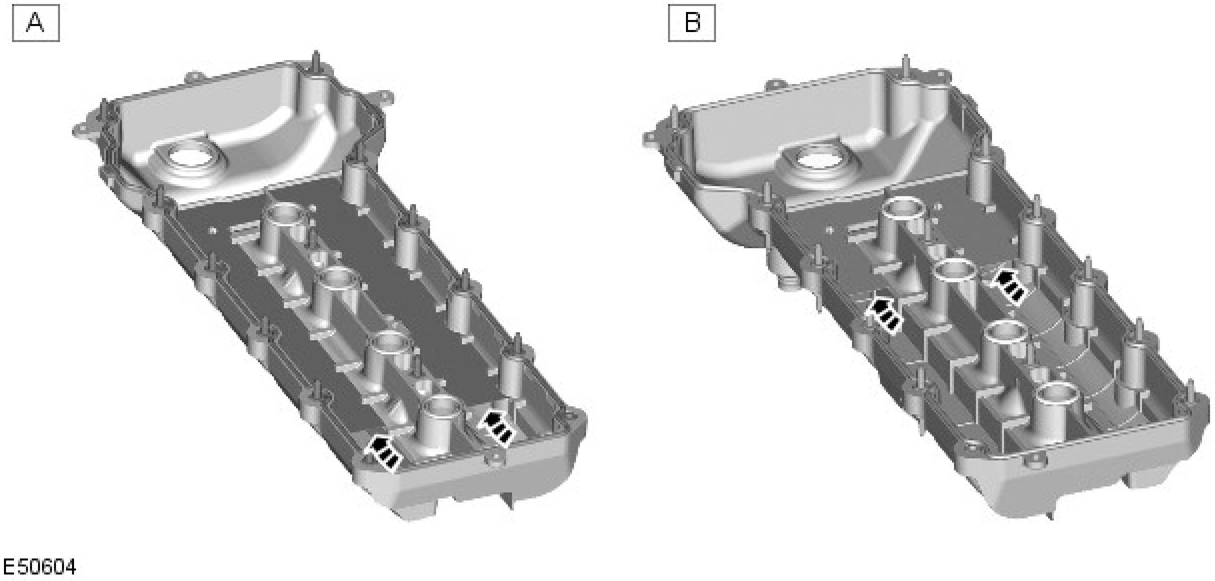
The part load breather is a flexible composite hose connected between the positive crankcase ventilation (PCV) valve mounted above the oil separator in the bank A camshaft cover and the induction elbow. The PCV valve prevents reverse flow into the crankcase.



E48519

The full load breather is a flexible hose connected between the oil separator in the bank B camshaft cover and the air intake duct.

The ends of the breather hoses incorporate quick release connectors.



The oil separators consist of wire gauze packed into an open ended enclosure below the breather outlet.

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Engine Emission Control - V8 4.4L Petrol - Engine Emission Control

Diagnosis and Testing

Overview

For information on the operation of the emissions systems, refer to relevant workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Visual inspection

Mechanical	Electrical
● Exhaust gas recirculation (EGR) pipes ● Breather hoses ● Positive crankcase ventilation valve ● Fuel level ● Fuel contamination/grade/quality ● Throttle body	● Fuse 5 of the battery junction box ● Loose or corroded electrical connectors ● Exhaust gas recirculation (EGR) valve ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

• NOTE: For a more comprehensive symptom chart, refer to workshop manual section 303-14 - Electronic Engine Controls

Symptom	Possible cause	Action
Difficult to start cold	● Battery ● Crankshaft position (CKP) sensor ● Exhaust gas recirculation (EGR) valve stuck open ● Fuel system ● Evaporative emissions purge valve	For battery information, CKP sensor tests, fuel system and purge valve tests, refer to relevant workshop manual section. Check the EGR valve. Refer to the guided diagnostic routine on the approved diagnostic system.
Engine stalls soon after start	● Breather system disconnected/restricted ● ECM relay ● MAF sensor ● Ignition system ● Air filter restricted ● Air leakage ● Fuel lines	Check the engine breather hoses, PCV, etc. Check the ECM relay operation. For MAF sensor, ignition system tests, air intake information and fuel line information, refer to relevant workshop manual section.
Poor throttle response	● APP sensor malfunction ● TP sensors ● ECT sensor ● MAF sensor ● Transmission malfunction ● Traction control event ● Air leakage ● Breather system disconnected/restricted	For APP, TP, ECT, MAF sensor tests, intake system checks and transmission information, refer to relevant workshop manual section. Check the breather system hoses, PCV, etc.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to

the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

- NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls

DTC	Description	Possible cause	Action
P040100	Exhaust Gas Recirculation A Flow Insufficient Detected	● EGR pipe blocked ● EGR valve incorrectly installed or loose ● EGR valve stuck closed/blocked ● EGR valve failure	Check the EGR pipes. Check the EGR valve installation, refer to relevant workshop manual section Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P048900	Exhaust Gas Recirculation Control Circuit Low	● EGR valve power supply circuit high resistance ● EGR valve power supply circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P049000	Exhaust Gas Recirculation Control Circuit High	● EGR valve drive circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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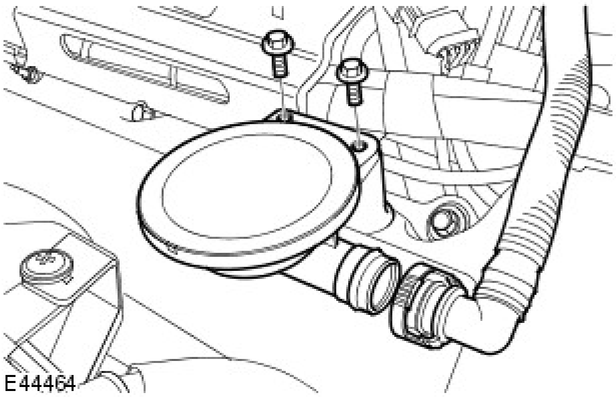
Engine Emission Control - V8 4.4L Petrol - Positive Crankcase Ventilation (PCV) Valve

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the PCV valve.

- Disconnect the PCV hose.
- Remove the 2 bolts.
- Release the PCV valve.

Installation

1. To install, reverse the removal procedure.

- Clean the components.
- Lubricate the seal with clean engine oil.
- Tighten the bolts to 10 Nm (7 lb.ft).

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Engine Emission Control - V8 4.4L Petrol - Exhaust Gas Recirculation (EGR) Valve

Removal and Installation

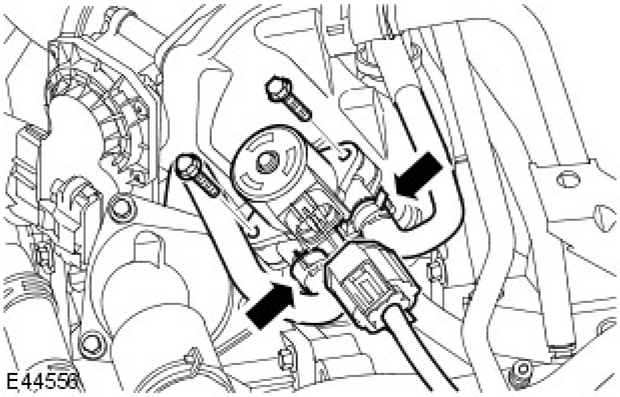
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Disconnect the EGR valve electrical connector.

3. Release the clips and disconnect the hoses from the EGR valve cooler.

- Position an absorbent cloth to collect fluid spillage.
- Clamp the EGR coolant hoses to minimize coolant loss.



4. Remove the EGR valve.

- Remove the 2 bolts from the EGR cooler valve body.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Check and top up the coolant.

4. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A, General Procedures).

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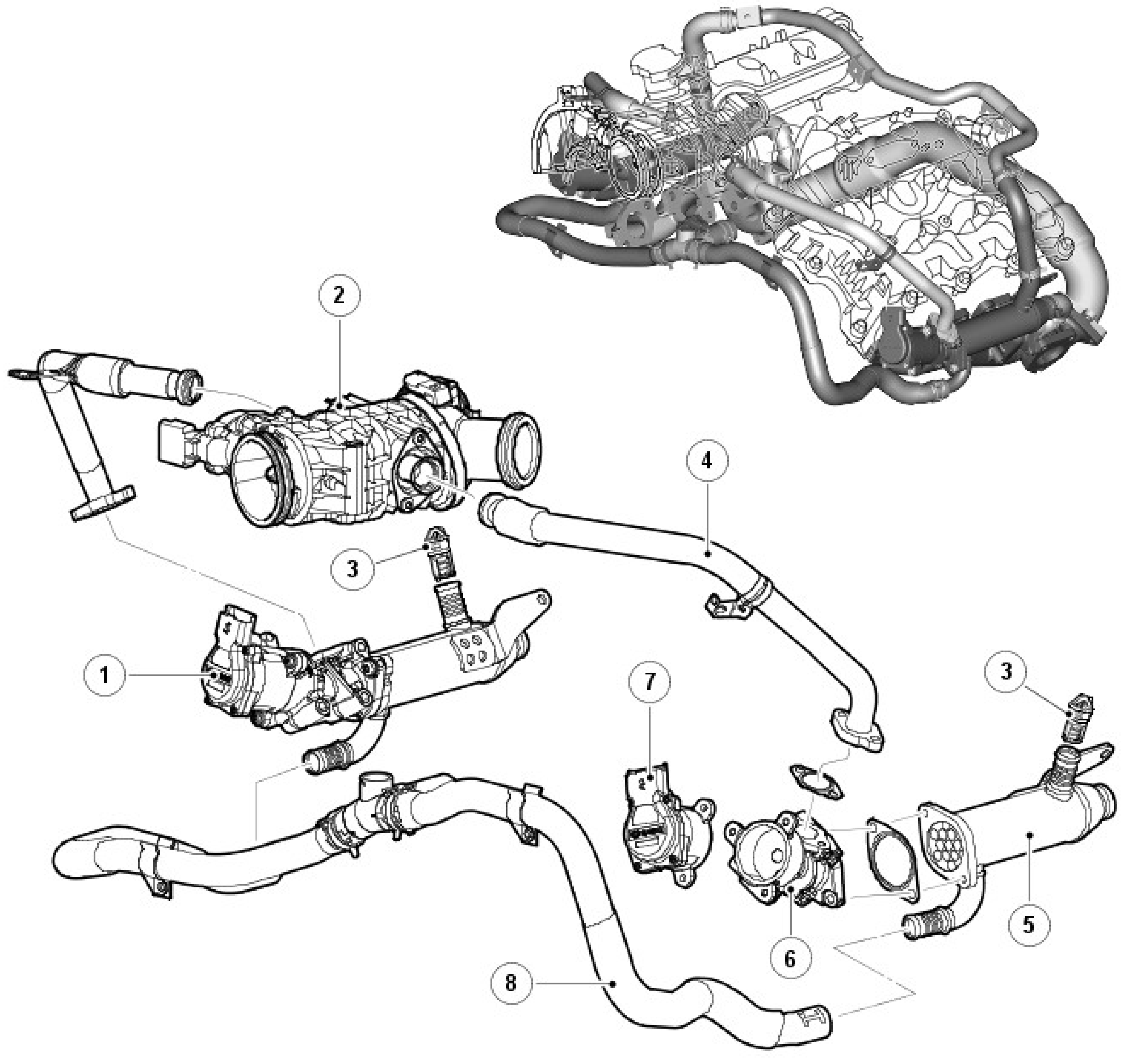
Engine Emission Control - TDV6 2.7L Diesel -

Torque Specifications

Description	Nm	lb-ft
EGR valve outlet tube bolts	10	7
Wiring harness Torx screw	5	4
EGR valve inlet tube bolts	10	7
EGR valve bolts	10	7
Fuel line retaining bracket bolt	10	7
EGR valve support bracket bolts	10	7
Oil level indicator tube bolt	10	7
Oil filter element	25	18
EGR cooler cross-over pipe securing bolt	13	10
Upper suspension arm and brake line heat shield nuts and bolts	10	7
EGR valve to cooler retaining Torx screws	10	7

Engine Emission Control - TDV6 2.7L Diesel - Engine Emission Control

Description and Operation



E48444

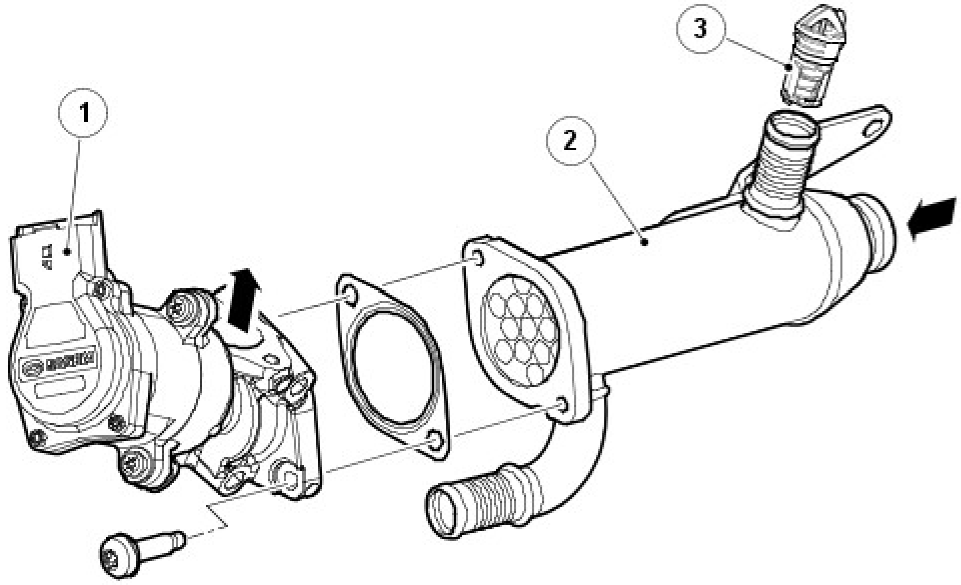
Item	Part Number	Description
1	-	exhaust gas recirculation (EGR) modulator/ cooler assembly
2	-	Electric throttle
3	-	EGR thermstat (from 2007MY)
4	-	EGR to electric throttle tube
5	-	EGR cooler
6	-	EGR modulator valve
7	-	EGR modulator solenoid valve
8	-	EGR coolant hoses

EGR SYSTEM

The EGR system comprises:

- EGR modulator x 2
- EGR cooler x 2
- Associated connecting pipes

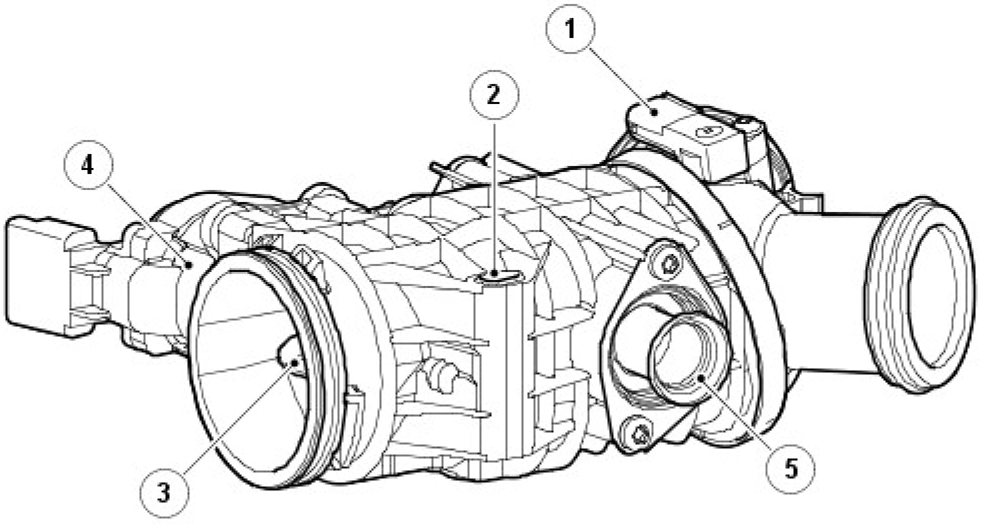
EGR Cooler and Modulator



E48446

Item	Part Number	Description
1	-	EGR modulator
2	-	EGR cooler
3	-	EGR thermostat (from 2007MY)

Electric Throttle Body



E48447

Item	Part Number	Description
1	-	intake air temperature (IAT) sensor
2	-	Electric throttle body
3	-	Electric throttle flap
4	-	Electric throttle control motor
5	-	Gas inlet port

The combined EGR modulator and cooler is located under each cylinder bank, between the exhaust manifold and the cylinder head. The cooler side of the EGR is connected to the vehicle cooling system, via hoses. The inlet exhaust side is connected directly into the exhaust manifolds on each side. The exhaust gas passes through the cooler and is expelled via the actuator and a metal pipe into the throttle housing. The EGR modulator is a solenoid operated valve which is controlled by the engine control module

(ECM). The ECM uses the EGR modulator to control the amount of exhaust gas being recirculated in order to reduce exhaust emissions and combustion noise. The EGR is enabled when the engine is at normal operating temperature and under cruising conditions.

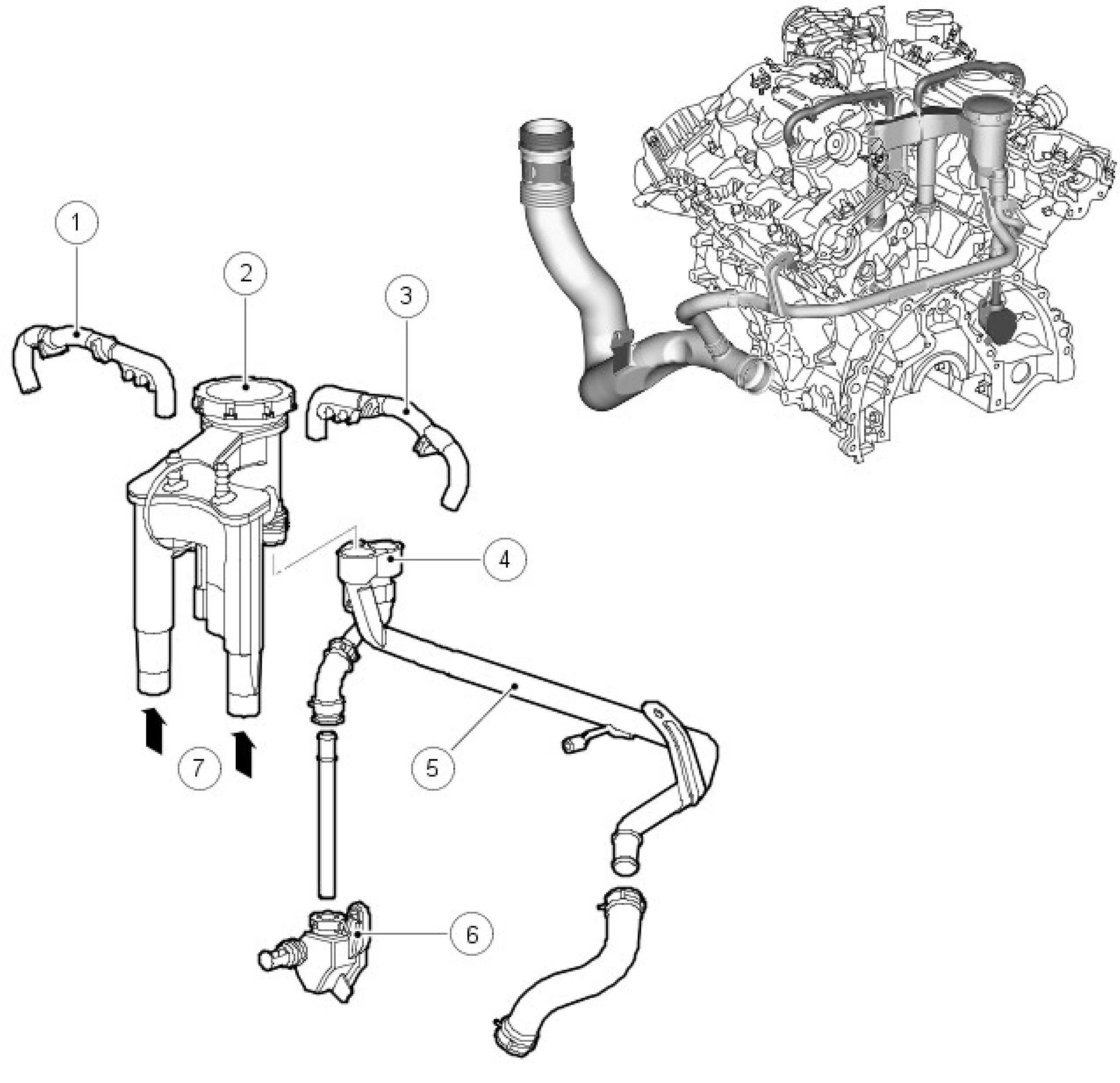
On vehicles from 2007MY, a flow regulating, wax thermostat is fitted to the coolant outlet of the EGR cooler. The purpose of the thermostat is to promote faster engine warm-up, improve cabin heater performance and assist the emissions to comply with the requirements of EU4 regulations. The thermostat is closed when cold, starts to open at 75°C (167°F) and is fully open at normal operating temperatures. The thermostat has a small bleed hole which allows a small amount of leakage when cold.

The EGR modulator receives a 12V supply from the main relay. The ground for the solenoid is via the ECM and is controlled using a pulse width modulation (PWM) signal. The PWM duty signal of the solenoid ground is varied to determine the precise amount of exhaust gas delivered to the cylinders.

The modulators are operated through their full range at each engine start-up, to clear any carbon deposits that may have built up whilst the engine was running

In the event of a failure of the EGR modulator, the EGR function will become inoperative. The ECM can monitor the EGR modulator solenoid for short circuits and store fault codes in the event of failure. The modulator can also be activated for testing using T4.

CRANKCASE VENTILATION



E48445

Item	Part Number	Description
1	-	Breather tube
2	-	Oil separator
3	-	Breather tube
4	-	Crankcase oil return connection
5	-	Oil return tube
6	-	Crankcase oil return valve
7	-	Breather flow

The crankcase ventilation system on the TdV6 ensures that all gasses emitted from the crankcase during engine running are separated from any oil particles.

Crankcase gasses are drawn into the oil separator unit from the crankcase and the cylinder head covers (both banks) where the gas and oil are separated. The gas is returned to the inlet side of the air induction system prior to the turbo charger. The oil is drained down to the sump via an oil return valve locate at the rear of the cylinder block.

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Engine Emission Control - TDV6 2.7L Diesel - Engine Emission Control

Diagnosis and Testing

Overview

For information on the operation of the emission control systems, refer to relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Engine breather hoses ● Oil separator ● Exhaust gas recirculation (EGR) pipes (check for cracks) ● EGR valve(s) ● EGR cooler(s)	● Fuse(s) ● Wiring harness ● Loose or corroded electrical connector(s) ● Intake air shut off throttle ● EGR valve(s) ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - ○ Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom (specific)	Possible cause	Action
Difficult to start	● EGR valve stuck open	Check the EGR valve.
Poor/Erratic idle		
Lack of power when accelerating		
Engine stops/stalls	● EGR valve stuck open ● Breather system disconnected/restricted/blocked	Check the EGR valve. Check the engine breather system. Check the oil separator. Check for EGR DTCs.
Excessive fuel consumption	● EGR valve stuck open ● EGR not operating ● Breather system restricted/blocked	
Excessive black smoke		
Excessive emissions		
Excessive blow-by	● Breather system restricted/blocked	Check the engine breather hoses. Check the oil separator.
Engine oil leaks	● Breather system restricted/blocked	Check the engine breather hoses. Check the oil separator.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a more comprehensive symptom chart, refer to workshop manual section 303-14 - Electronic Engine Controls

DTC	Description	Possible cause	Action
P040100	Exhaust Gas Recirculation A Flow Insufficient Detected	● Exhaust gas recirculation (EGR) valve incorrectly installed or loose ● EGR pipe blocked ● EGR valve stuck closed, blocked	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is

DTC	Description	Possible cause	Action
		EGR coolers blocked EGR valve failure MAF sensor fault	not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040200	Exhaust Gas Recirculation A Flow Excessive Detected	Exhaust gas recirculation (EGR) valve incorrectly installed or loose EGR pipe blocked EGR valve stuck/sticking EGR coolers blocked EGR valve circuit high resistance EGR valve circuit short circuit to ground EGR valve circuit short circuit to power EGR valve failure MAF sensor fault	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040300	Exhaust Gas Recirculation A Control Circuit	Exhaust gas recirculation (EGR) valve circuit high resistance EGR valve circuit short circuit to ground EGR valve circuit short circuit to power EGR valve failure	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040400	Exhaust Gas Recirculation A Control Circuit Range/Performance	Intake air temperature (IAT) sensor fault Manifold air pressure (MAP) sensor fault MAF sensor fault Exhaust gas recirculation (EGR) valve stuck/sticking EGR valve circuit high resistance EGR valve circuit short circuit to ground EGR valve circuit short circuit to power EGR valve failure	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040500	Exhaust Gas Recirculation Sensor A Circuit Low	Exhaust gas recirculation (EGR) valve circuit high resistance EGR valve circuit short circuit to ground EGR valve failure	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040600	Exhaust Gas Recirculation Sensor A Circuit High	Exhaust gas recirculation (EGR) valve circuit short circuit to power EGR valve failure	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible cause	Action
P040700	Exhaust Gas Recirculation Sensor B Circuit Low	● Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance ● EGR throttle position sensor circuit short circuit to ground ● EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P040800	Exhaust Gas Recirculation Sensor B Circuit High	● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power ● EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P048700	Exhaust Gas Recirculation Throttle Control Circuit A / Open	● Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance ● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to ground ● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power ● EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048800	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	● Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance ● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to ground ● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power ● EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P133400	EGR Throttle Position Sensor Minimum/Maximum Stop Performance	● Exhaust gas recirculation (EGR) valve stuck/sticking ● EGR valve circuit high resistance ● EGR valve circuit short circuit to ground ● EGR valve circuit short circuit to power ● Intake air shut off throttle stuck/sticking ● Intake air shut off throttle circuit high resistance ● Intake air shut off throttle circuit short circuit to ground ● Intake air shut off throttle circuit short	Check the EGR valve and circuits. Refer to the electrical guides. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible cause	Action
		circuit to power ● Intake air shut off throttle failure ● ECM failure	
P133500	EGR Position Sensor Minimum/Maximum Stop Performance	● EGR valve circuit high resistance ● EGR valve circuit short circuit to ground ● EGR valve circuit short circuit to power ● EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be 0 - 20%. If the value is outside this range, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P140A00	Exhaust Gas Recirculation Sensor C Circuit Low	● EGR valve circuit (left-hand bank) high resistance ● EGR valve circuit short circuit to ground ● EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle with the ignition on and the engine off. Command the valve angle to 0% pulse width modulated (PWM), then to 100% pulse width modulated (PWM) and recheck the angles. The angles should range between 0 - 20% and 80 - 95%. If this is not the case, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P140B00	Exhaust Gas Recirculation Sensor C Circuit High	● EGR valve circuit (left-hand bank) short circuit to power ● EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle with the ignition on and the engine off. Command the valve angle to 0% pulse width modulated (PWM), then to 100% pulse width modulated (PWM) and recheck the angles. The angles should range between 0 - 20% and 80 - 95%. If this is not the case, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P140C00	Exhaust Gas Recirculation Control Circuit B	● Intake air shut off throttle circuit high resistance ● Intake air shut off throttle circuit short circuit to ground ● Intake air shut off throttle circuit short circuit to power ● Intake air shut off throttle failure ● ECM failure	Check the EGR valve and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P140D00	Exhaust Gas Recirculation Control Circuit B Range/Performance	● Exhaust gas recirculation (EGR) control circuit range/performance (left-hand bank) ● Intake air temperature (IAT) sensor fault ● Manifold absolute pressure (MAP) sensor fault ● Mass air flow (MAF) sensor fault ● EGR valve stuck closed, blocked ● EGR valve circuit high resistance ● EGR valve circuit short circuit to ground ● EGR valve circuit short circuit to power ● EGR valve failure	Check the IAT, MAP and MAF sensors and circuits. Refer to the electrical guides. For left-hand bank EGR valve circuit tests, refer to the relevant workshop manual section.

DTC	Description	Possible cause	Action
P140E00	EGR Position Sensor C Minimum/Maximum Stop Performance	● Exhaust gas recirculation (EGR) valve circuit (left-hand bank) high resistance ● EGR valve circuit short circuit to ground ● EGR valve circuit short circuit to power ● EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be between 0 - 20%. If the value is outside this range, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P141A00	Exhaust Gas Recirculation Sensor A Circuit Intermittent/Erratic	● EGR valve circuit (right-hand bank) high resistance ● EGR valve circuit short circuit to ground ● EGR valve circuit short circuit to power ● EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P141B00	Exhaust Gas Recirculation Sensor B Circuit Intermittent/Erratic	● Intake air shut off throttle circuit high resistance ● Intake air shut off throttle circuit short circuit to ground ● Intake air shut off throttle circuit short circuit to power ● Intake air shut off throttle failure	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P141C00	Exhaust Gas Recirculation Sensor C Circuit Intermittent/Erratic	● EGR valve circuit (left-hand bank) high resistance ● EGR valve circuit short circuit to ground ● EGR valve circuit short circuit to power ● EGR valve failure ● ECM failure	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P214100	Exhaust Gas Recirculation Throttle Control Circuit A Low	● EGR sensor circuits short circuit (to ground/power/other circuits ● EGR sensor circuits high resistance ● EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle set point and the actual throttle position, and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between set point and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new right-hand valve as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P214200	Exhaust Gas Recirculation Throttle Control Circuit A High	● EGR sensor circuits short circuit (to ground/power/other circuits ● EGR sensor circuits high resistance ● EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle set point and the actual throttle position, and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between set point and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new left-hand valve as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.

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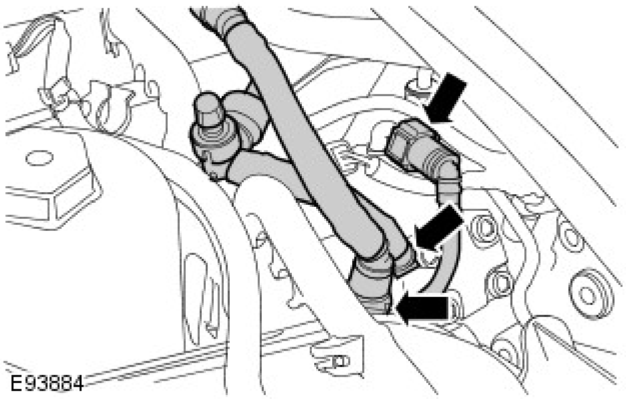
Engine Emission Control - TDV6 2.7L Diesel - Crankcase Vent Oil Separator

Removal and Installation

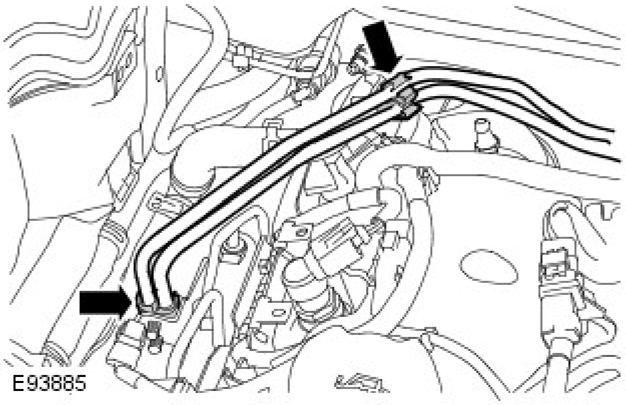
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the intake air shutoff throttle.
   For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

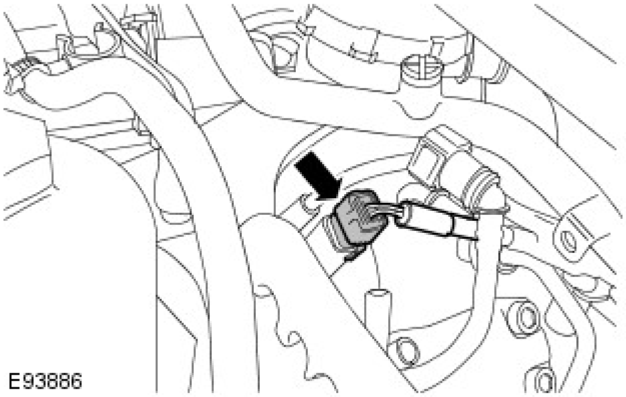


3. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

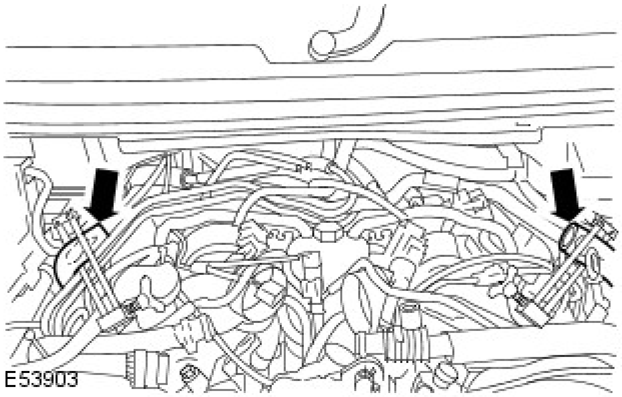
   Disconnect the low-pressure fuel lines.



4. Release the 2 fuel lines.
   - Release from the 4 clips.

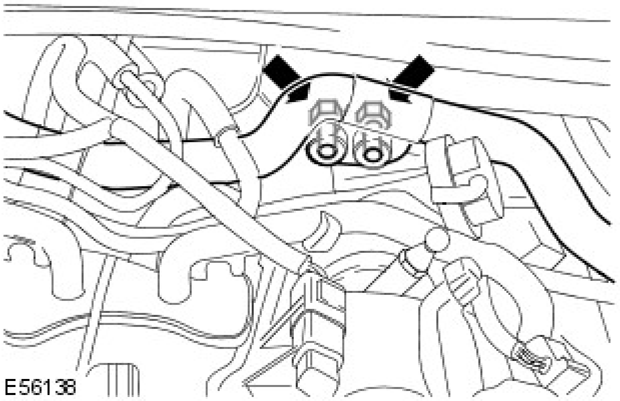


5. Disconnect the fuel high-pressure pump electrical connector.



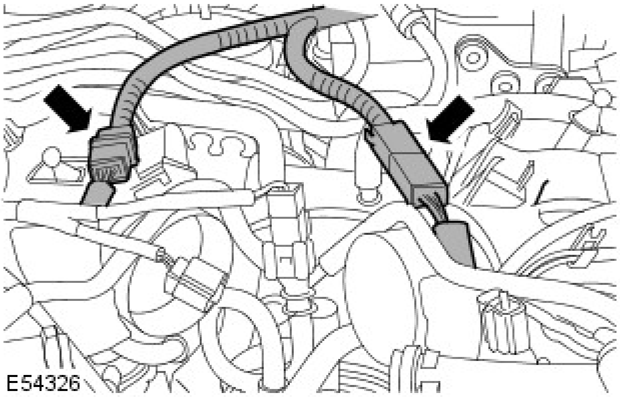
6. Disconnect both exhaust gas recirculation (EGR) coolant cross-over pipe hoses.

- Clamp the EGR coolant hoses to minimize coolant loss.



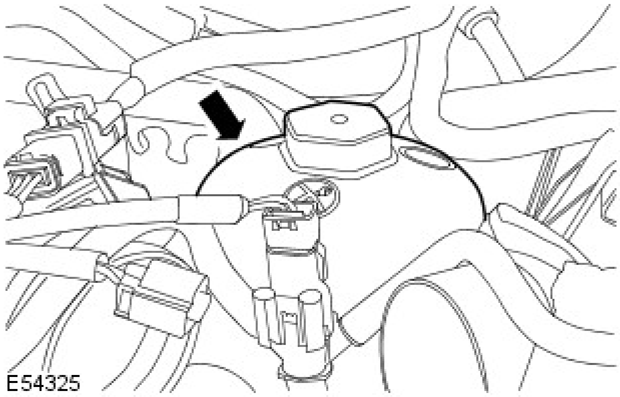
7. Remove the EGR coolant cross-over pipe.

- Remove the two retaining bolts.



8. Disconnect the glow plug electrical connectors.

- Release from the 2 clips.



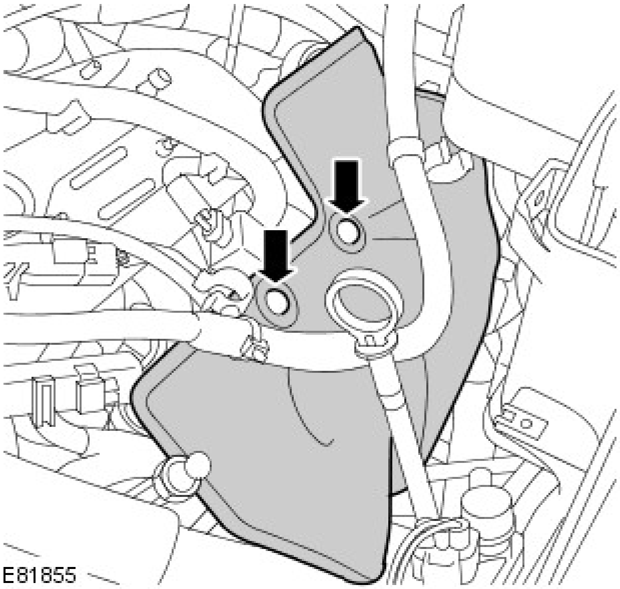
9. CAUTIONS:

⚠ Ensure any open connections are plugged to prevent contamination.

⚠ The O-ring seal is to be reused unless damaged.

Remove the oil filter cover and oil filter element.

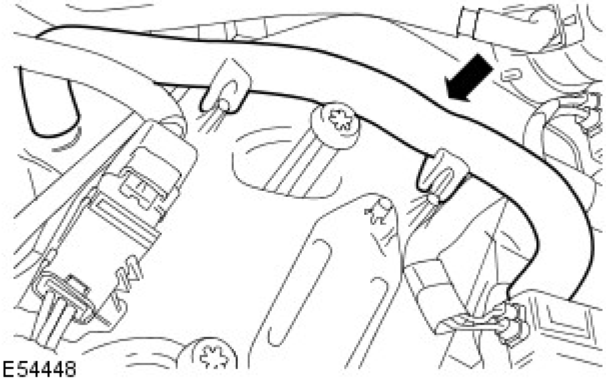
- Loosen the element cover 4 complete turns to allow engine oil to drain from the filter cover.
- Remove element cover.
- Clean the immediate area.



10. NOTE: Left-hand shown, right-hand similar.

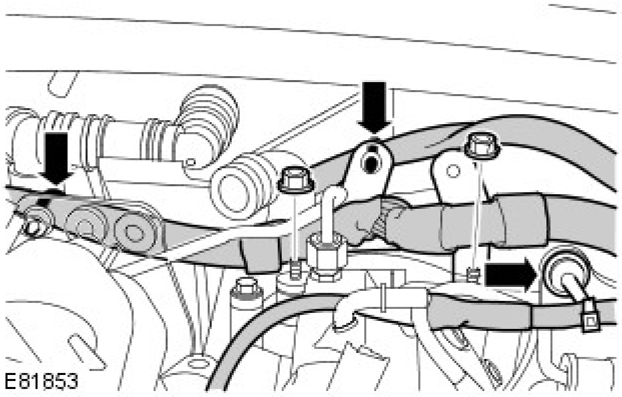
Remove the injector sound proofing.

- Remove the 4 clips.



11. NOTE: Left-hand shown, right-hand similar.

Remove the breather pipes.

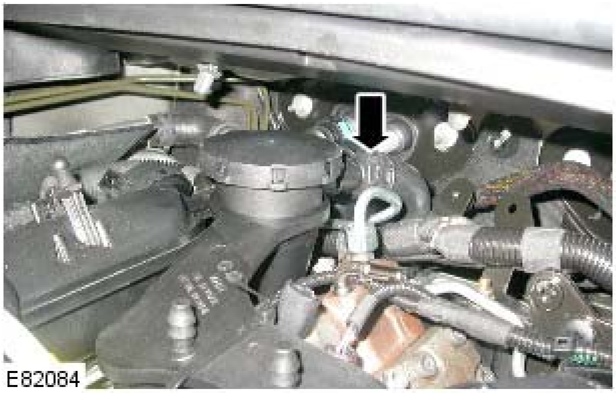


12. Release the fuel charging wiring harness.

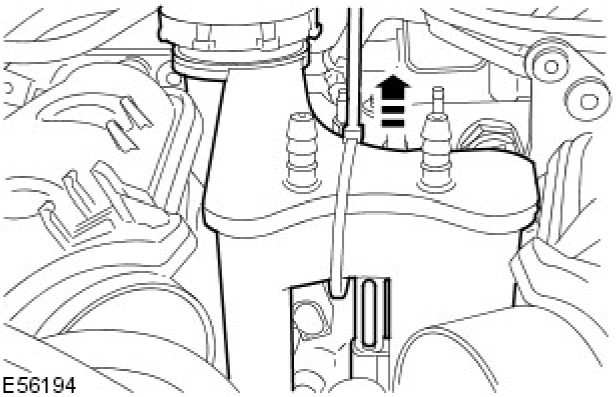
- Release the 3 clips.
- Remove the 2 nuts.

13. Disconnect the engine breather line.

- Release the clip.

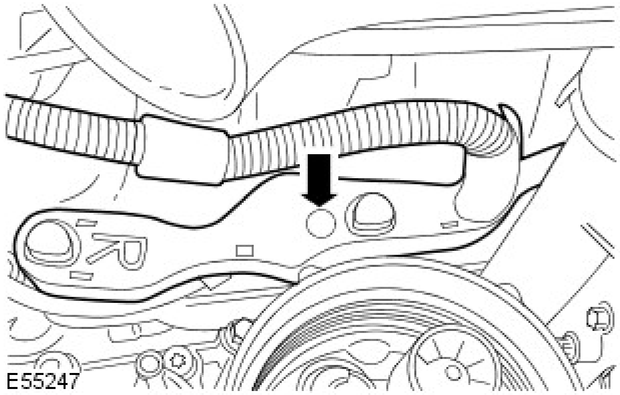


14. Release the crankcase vent oil separator.



15. NOTE: Right-hand shown, left-hand similar.

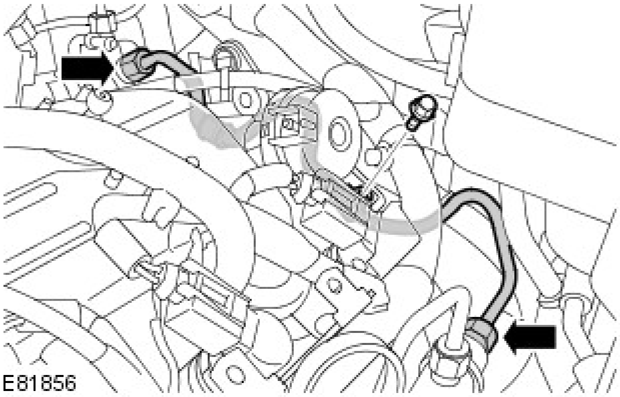
Remove the glow plug wires.



16. NOTE: Left-hand shown, right-hand similar.

Release the high-pressure fuel supply lines.

- Remove the bolt.



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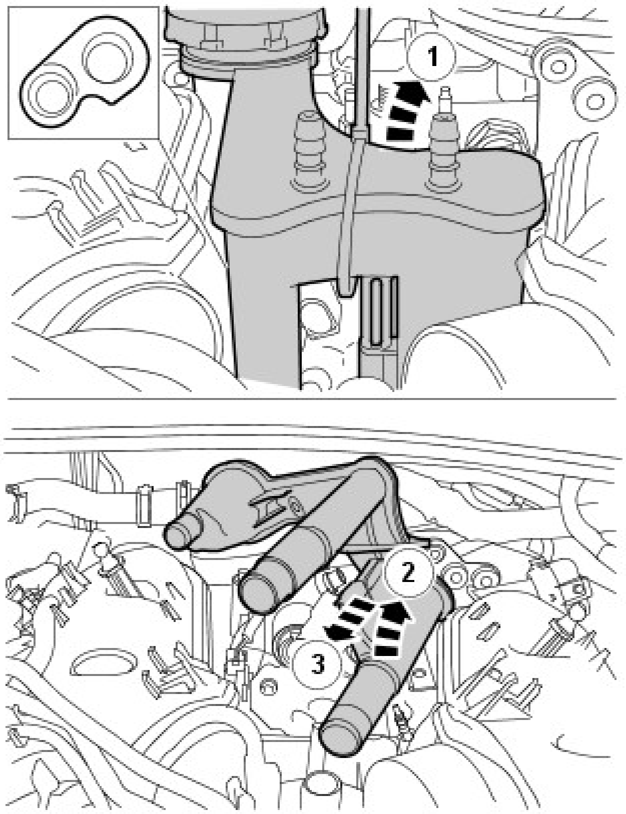
17. CAUTION: Make sure that the high-pressure fuel supply line remains in contact with the fuel injection supply manifold and the fuel injection pump until both unions have been detached and cleaned. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

• NOTE: Left-hand shown, right-hand similar.

Remove and discard the high-pressure fuel supply lines.

- Install blanking caps to the exposed ports.



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18. CAUTIONS:

Always plug any open connections to prevent contamination.

The O-ring seals are to be reused unless damaged.

Remove the crankcase vent oil separator.

Installation

1. WARNING: Before installing the components, ensure the area around the joint faces and connections are clean.

CAUTION: The O-ring seals are to be reused unless damaged.

Position the crankcase vent oil seperator, but do not fully install at this stage.

2. WARNING: Before installing the components, ensure the area around the joint faces and connections are clean.

Install the new high-pressure fuel rail supply lines and line clips.

- Loosely install the new high-pressure fuel rail supply lines.

- Stage 1: Tighten the high-pressure fuel supply line union at the fuel pump to 15 Nm (11 lb.ft).
- Stage 2: Tighten the high-pressure fuel supply line union at the fuel injection rail to 15 Nm (11 lb.ft).
- Stage 3: Tighten the high-pressure fuel supply line union at the fuel pump to 30 Nm (22 lb.ft).
- Stage 4: Tighten the high-pressure fuel supply line union at the fuel injection rail to 30 Nm (22 lb.ft).
- Tighten the clip screws to 10 Nm (7 lb.ft).

3. Install the glow plug wires.

4. Install the crankcase vent oil separator.

5. Connect and secure the engine breather line.

6. Install the injector sound proofing.

- Secure the 4 clips.

7. Install the EGR coolant cross-over pipe.

- Install the two retaining bolts.
- Tighten to 13 Nm (10 lb.ft).

8. Connect both EGR coolant cross-over pipe hoses.

- Remove the EGR coolant hose clamps.

9. Secure the fuel charging wiring harness.

10. Connect the fuel high-pressure pump electrical connector.

11. Install the breather pipes.

12. Connect the glow plug electrical connectors.

13. ⚠ WARNING: Before installing the components, ensure the area around the joint faces and connections are clean.

Connect and secure the low-pressure fuel lines.

- Remove the blanking caps from the ports.

14. ⚠ WARNING: Before installing the components, ensure the area around the joint faces and connections are clean.

⚠ CAUTION: The O-ring seal is to be reused unless damaged.

Install the oil filter element.

- Clean the components.
- Tighten the oil filter element cover to 25 Nm (18 lb.ft).

15. Install the intake air shutoff throttle.
For additional information, refer to: Intake Air Shutoff Throttle (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Removal and Installation).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

17. Check and top-up the engine oil.

18. Check and top-up the coolant.

19. Bleed the fuel system.

For additional information, refer to: Low-Pressure Fuel System Bleeding - TDV6 2.7L Diesel (310-00 Fuel System - General Information, General Procedures).

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Engine Emission Control - TDV6 2.7L Diesel - Exhaust Gas Recirculation (EGR) Valve LHVehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

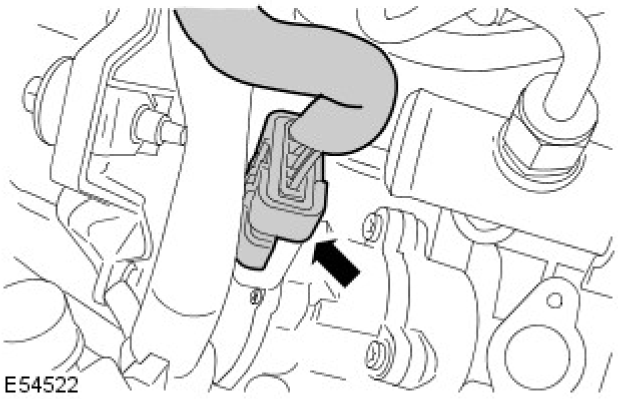
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

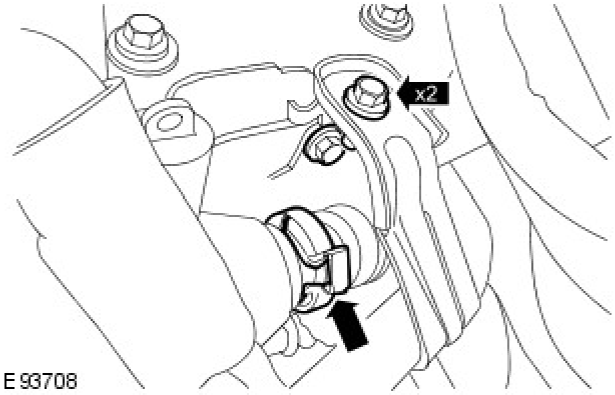
3. Remove the LH exhaust gas recirculation (EGR) outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

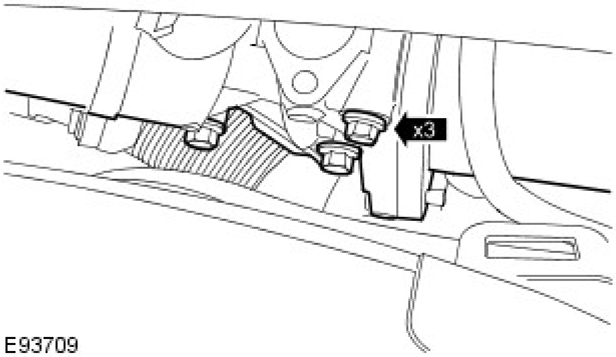
4. Disconnect the LH EGR valve electrical connector.



5. Release the LH EGR cooler.

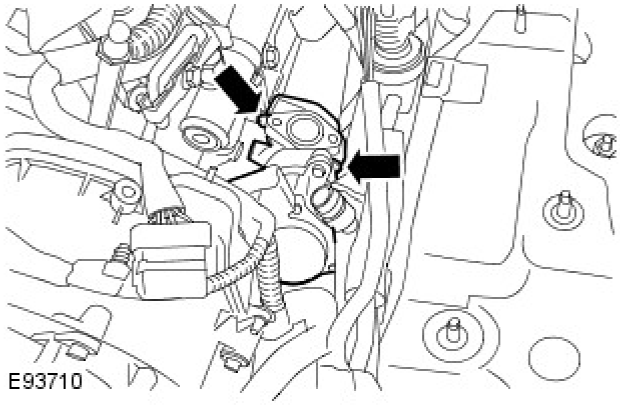
- Remove and discard the clip.
- Loosen the 2 bolts.





6. Release the LH EGR valve from the cylinder head.

- Remove the 3 bolts.



7. Remove the LH EGR valve.

- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. Install the LH EGR valve.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. NOTE: Do not tighten at this stage.

Install the LH EGR valve bolts.

3. NOTE: Install a new clip.

Secure the LH EGR cooler.

1. Secure the clip.
2. Tighten the bolts to 10 Nm (7 lb.ft).

4. Secure the LH EGR valve.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Connect the LH EGR valve electrical connector.

6. Install the LH EGR valve outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

7. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

8. Connect the battery ground cable.

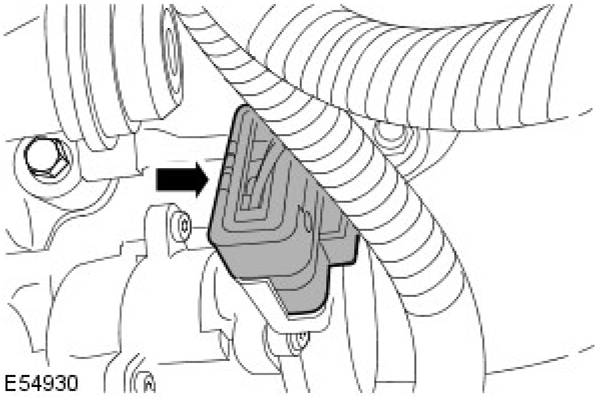
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Engine Emission Control - TDV6 2.7L Diesel - Exhaust Gas Recirculation (EGR) Valve RHVehicles Without: Diesel Particulate Filter (DPF)

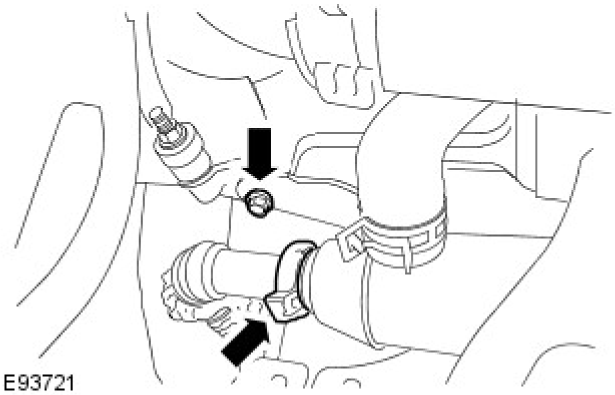
Removal and Installation

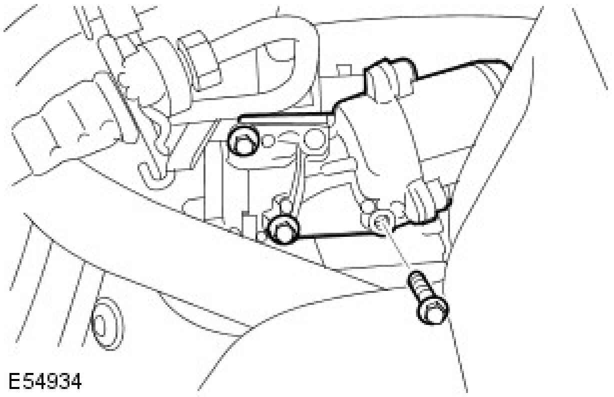
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the auxiliary battery tray.
   For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).
3. Remove the RH exhaust gas recirculation (EGR) valve outlet tube.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).
4. Disconnect the RH EGR valve electrical connector.



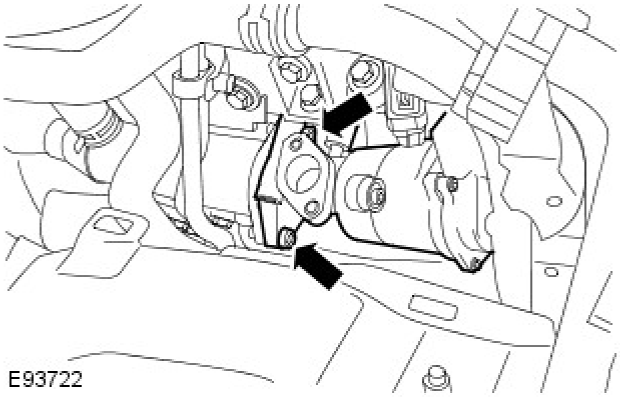
5. Release the RH EGR cooler.
   - Remove and discard the clip.
   - Loosen the bolt.





6. Release the RH EGR valve from the cylinder head.

- Remove the 3 bolts.



7. Remove the RH EGR valve.

- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. Install the RH EGR valve.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. NOTE: Do not tighten at this stage.

Install the RH EGR valve bolts.

3. NOTE: Install a new clip.

Secure the RH EGR cooler.

1. Secure the clip.
2. Tighten the bolt to 10 Nm (7 lb.ft).

4. Secure the RH EGR valve.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Connect the RH EGR valve electrical connector.

6. Install the RH EGR valve outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

7. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Emission Control - TDV6 2.7L Diesel - Exhaust Gas Recirculation (EGR) Valve Outlet Tube

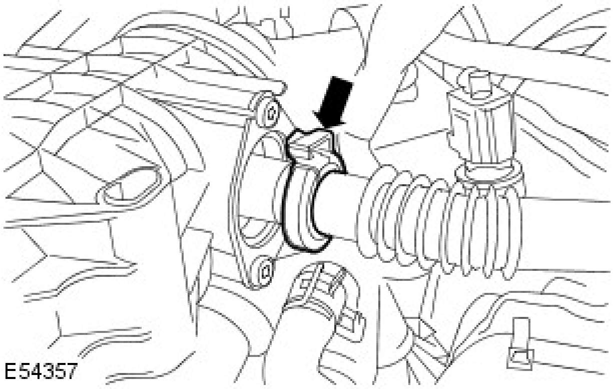
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

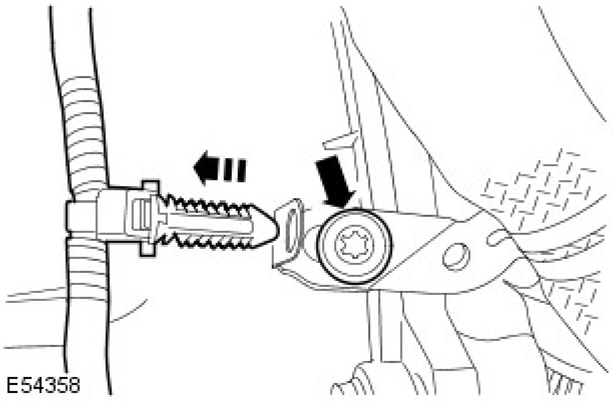
3. NOTE: Left-hand shown, right-hand similar.



Release the EGR valve outlet tube.

- Release the clip.

4. NOTE: Left-hand shown, right-hand similar.

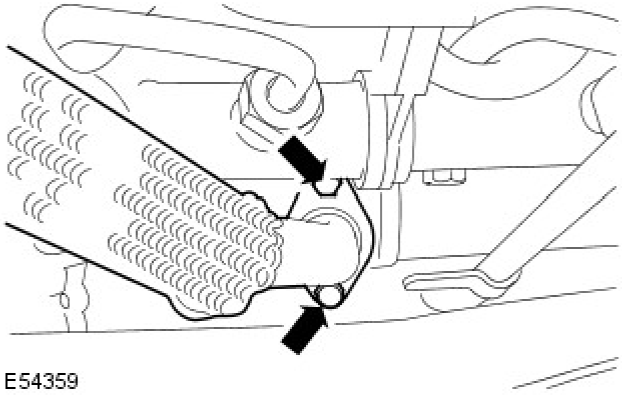


Release the EGR valve outlet tube.

- Disconnect the engine wiring harness.
- Remove the Torx screw.

5. NOTE: Left-hand shown, right-hand similar.

- NOTE: Discard the gasket.
- NOTE: Discard the retaining clip.



Remove the EGR valve outlet tube.

- Remove the two bolts.

Installation

1. NOTE: Install a new retaining clip.

• NOTE: Install a new gasket.

• NOTE: Do not fully close the retaining clip at this stage.

Loosely install the EGR valve outlet tube.

- Install the two EGR valve outlet tube retaining bolts, but do not fully tighten at this stage.

2. Fully close the EGR valve outlet tube retaining clip.

3. Tighten the EGR valve outlet tube retaining bolts to 10 Nm (7 lb.ft).

4. Secure the engine wiring harness.

- Install the Torx screw and tighten to 5 Nm (4 lb.ft).
- Secure the engine wiring harness to the bracket with the clip.

5. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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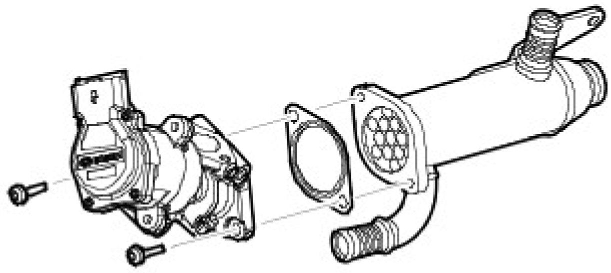
Engine Emission Control - TDV6 2.7L Diesel - Exhaust Gas Recirculation (EGR) Cooler

Removal and Installation

Removal

- NOTE: Left-hand shown, right-hand similar.



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1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the LH exhaust gas recirculation (EGR) valve.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH - Vehicles Without: Diesel Particulate Filter (DPF) (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).
3. Remove the EGR cooler.
   - Remove the 2 Torx bolts.
   - Discard the gasket.

Installation

1. NOTE: Make sure all component mating faces are clean.

   Install the EGR cooler.
   - Install the new gasket.
   - Tighten the Torx bolts to 10 Nm (7 lb.ft).
2. Install the EGR valve.
   For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH - Vehicles Without: Diesel Particulate Filter (DPF) (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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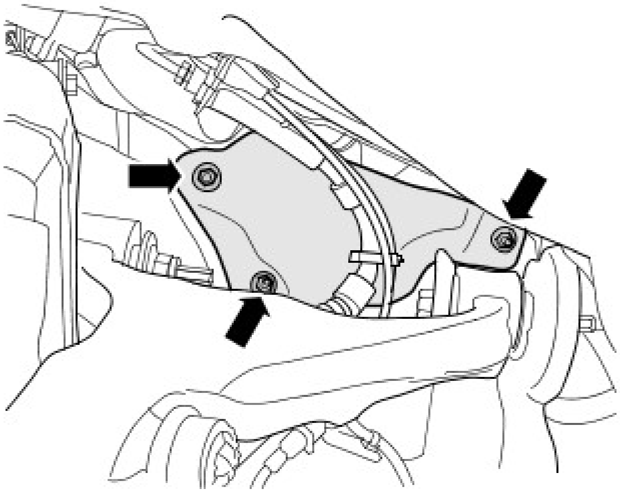
Engine Emission Control - TDV6 2.7L Diesel - Exhaust Gas Recirculation (EGR) Valve LHVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

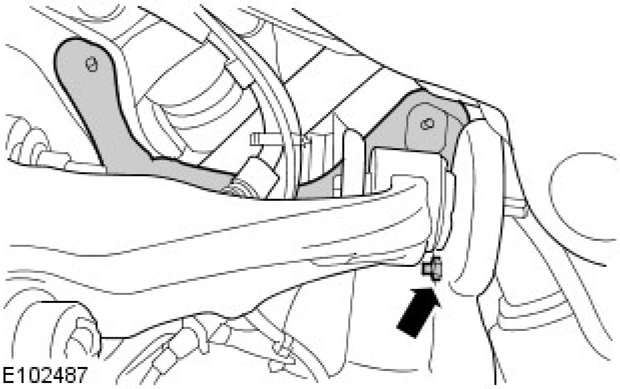
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the battery tray.
   For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).
3. Raise and support the vehicle.
4. Remove the exhaust heat shield.
   - Access through the LH wheel arch.
   - Remove the 3 nuts.



E102486

5. Remove the exhaust heat shield.
   - Access through the LH wheel arch.
   - Remove the bolt.



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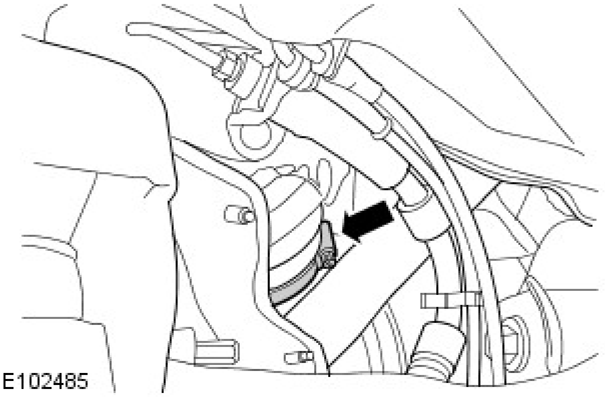


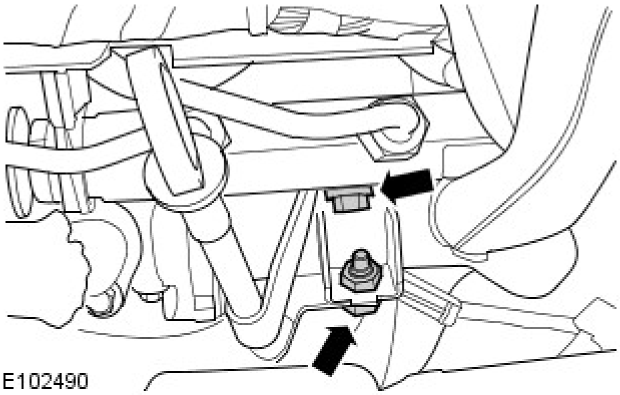
6. NOTE: Do not fully release the turbocharger outlet hose.

Release the turbocharger hose lower clip.

7. Lower the vehicle.

8. Remove the LH exhaust gas recirculation (EGR) outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

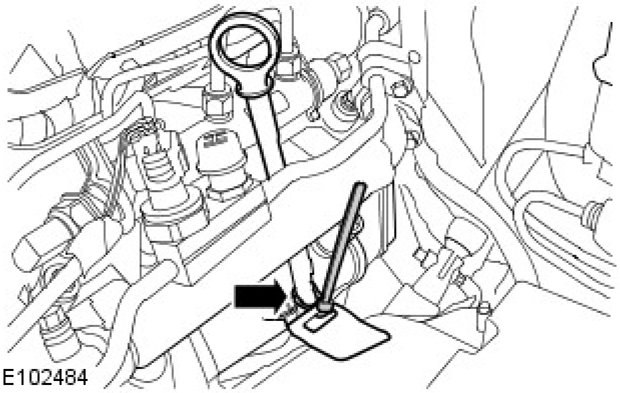
9. Release the oil level indicator tube.

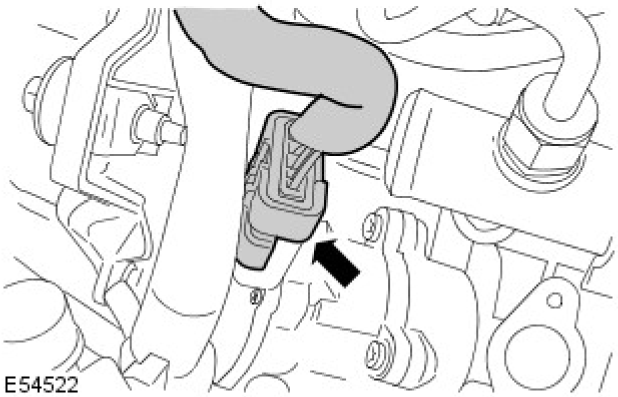


10. NOTE: Make sure that the turbocharger outlet pipe is free to be repositioned and allow the oil level indicator tube to be repositioned against the vehicle body.

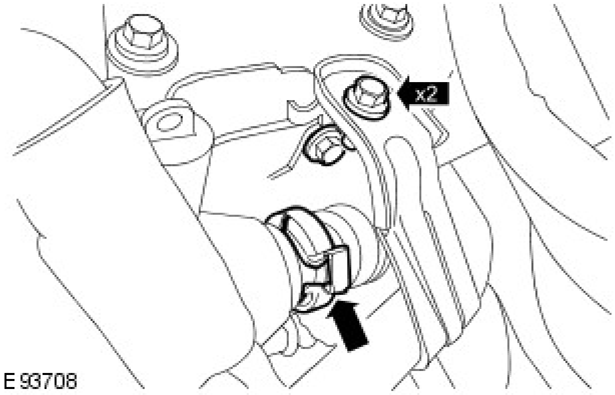
Reposition the oil level indicator tube.

- Using a suitable tie strap, reposition and secure the oil level indicator tube to the vehicle body.



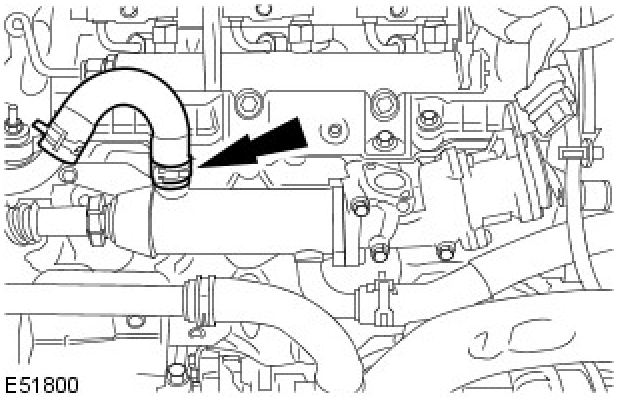


11. Disconnect the LH EGR valve electrical connector.



12. Release the LH EGR cooler.

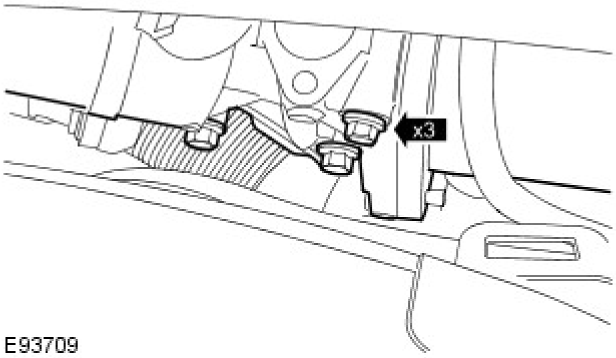
- Remove and discard the clip.
- Loosen the 2 bolts.



13. NOTE: RH illustration shown, LH is similar.

Disconnect LH EGR cooler rear coolant hose.

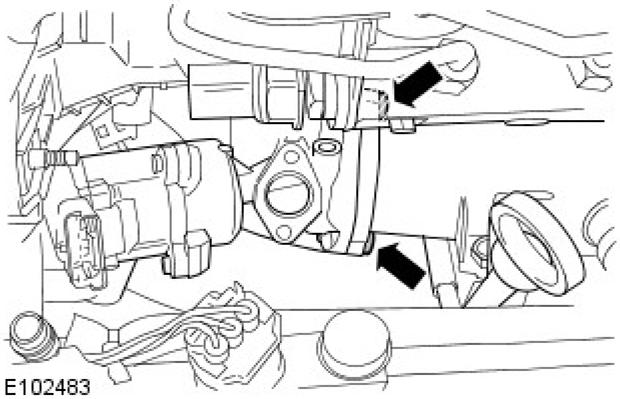
- Clamp the hoses to minimize coolant loss.
- Release the clip.



14. NOTE: The EGR valve front bolt cannot be removed with the EGR valve in its original orientation. The EGR valve must be removed before the front bolt can be removed.

Release the LH EGR valve from the cylinder head.

- Remove the 3 bolts.



15. NOTE: Reposition the EGR valve and EGR valve cooler assembly to gain access to the Torx bolts.

Remove the LH EGR valve.

- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. NOTE: The EGR valve front bolt must be fitted to the EGR valve before the EGR valve is installed.

• NOTE: Reposition the EGR valve and EGR valve cooler assembly to gain access to the Torx bolts.

Install the LH EGR valve.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. NOTE: Do not tighten at this stage.

Install the LH EGR valve bolts.

3. NOTE: Install a new clip.

Secure the LH EGR cooler.

1. Secure the clip.
2. Tighten the bolts to 10 Nm (7 lb.ft).

4. Secure the LH EGR valve.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Connect the LH EGR valve electrical connector.

6. Connect the coolant outlet hose to the LH EGR valve.

- Position and secure the clip.
- Remove the coolant hose clamps.

7. Secure the oil level indicator and tube.

- Reposition the turbocharger outlet pipe.
- Cut the cable tie.
- Tighten the 2 bolts to 10 Nm (7 ib.ft).

8. Install the LH EGR valve outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

9. Raise the vehicle.

10. Secure the turbocharger outlet hose.

- Secure the clip.

11. Install the heat shields.

12. Lower the vehicle.

13. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

14. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

15. Check and top-up the coolant.

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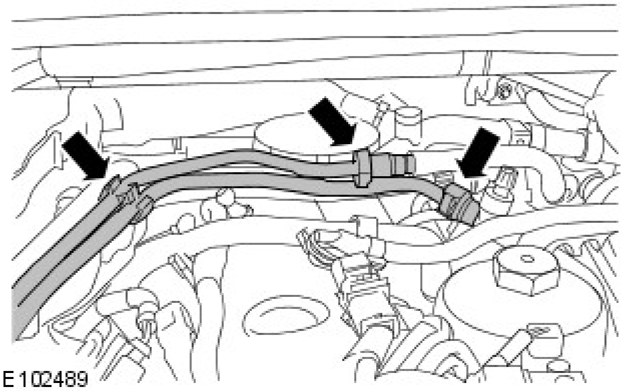
Engine Emission Control - TDV6 2.7L Diesel - Exhaust Gas Recirculation (EGR) Valve RHVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

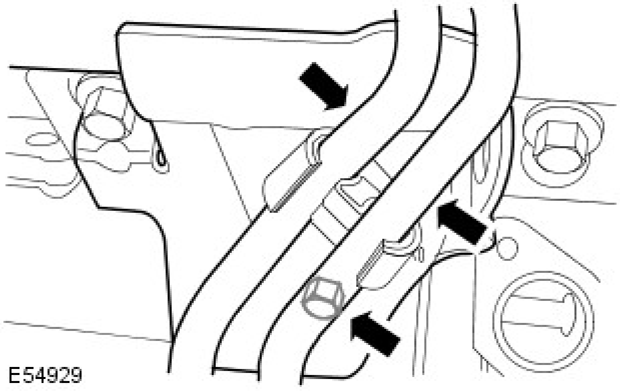
2. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).



3. ⚠ WARNING: This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

Disconnect the 2 fuel pipes.

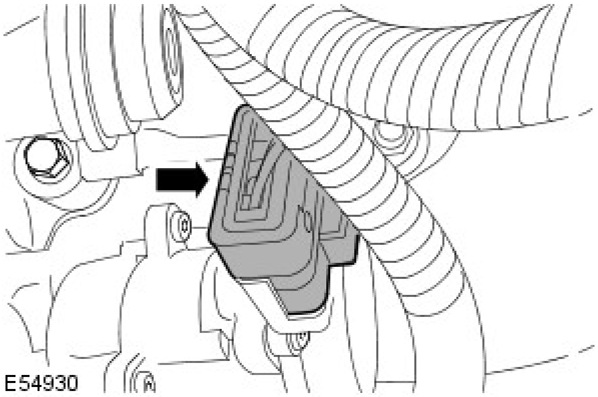
- Release the 2 fuel pipe clips.



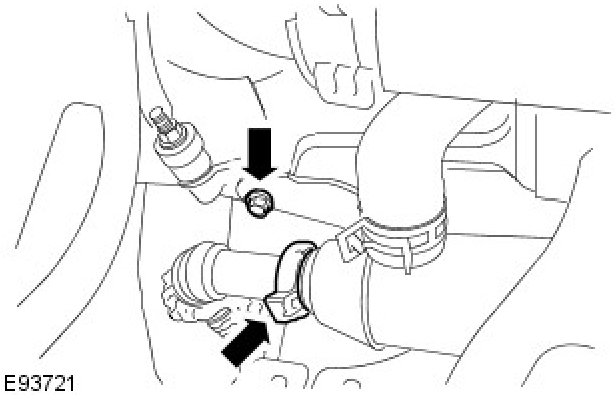
4. Remove the fuel line support bracket.

- Release the fuel pipe from the clips.
- Remove the bolt.

5. Remove the RH exhaust gas recirculation (EGR) valve outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

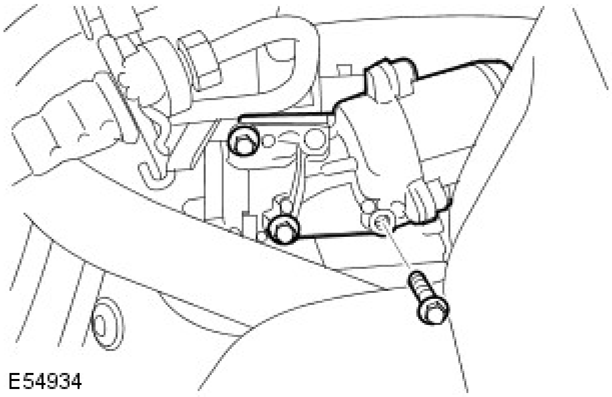


6. Disconnect the RH EGR valve electrical connector.



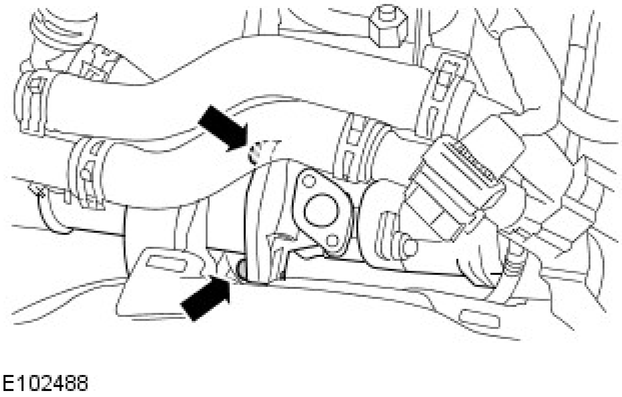
7. Release the RH EGR cooler.

- Remove and discard the clip.
- Loosen the bolt.



8. Release the RH EGR valve from the cylinder head.

- Remove the 3 bolts.



9. NOTE: Reposition the EGR valve and EGR valve cooler assembly to gain access to the Torx bolts.

Remove the RH EGR valve.

- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. NOTE: Reposition the EGR valve and EGR valve cooler assembly to gain access to the Torx bolts.

Install the RH EGR valve.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. NOTE: Do not tighten at this stage.

Install the RH EGR valve bolts.

3. NOTE: Install a new clip.

Secure the RH EGR cooler.

1. Secure the clip.
2. Tighten the bolt to 10 Nm (7 lb.ft).

4. Secure the RH EGR valve.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Connect the RH EGR valve electrical connector.

6. Install the RH EGR valve outlet tube.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

7. Install the fuel line support bracket.

8. Connect and secure the low-pressure fuel lines.

9. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Emission Control - TDV8 3.6L Diesel -

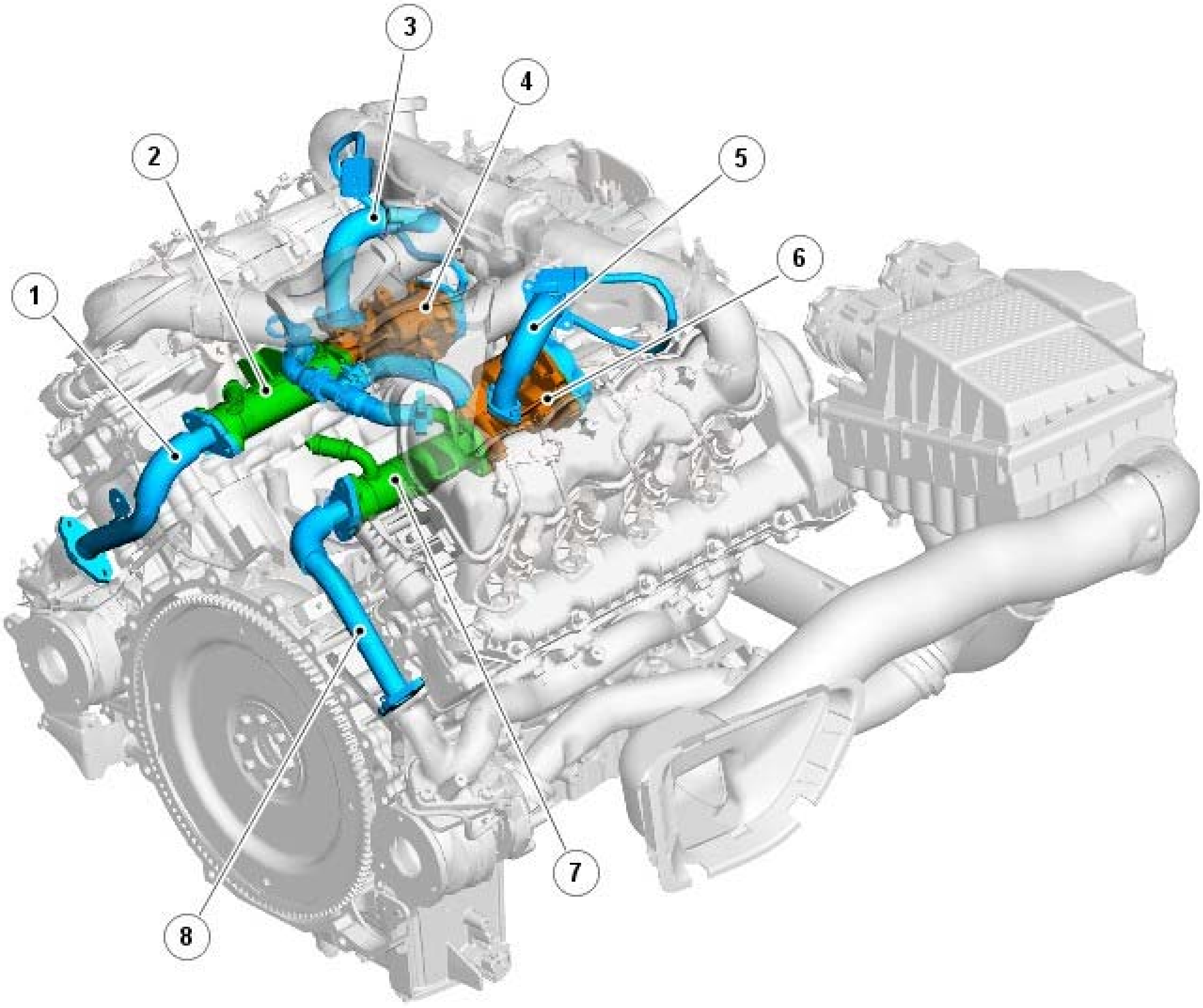
Torque Specifications

Item	Nm	lb-ft	lb-in
EGR valve bolts	10	-	89
EGR valve inlet tube bolts	10	-	89
EGR valve inlet tube bracket bolt	10	-	89
EGR valve outlet tube bolts	10	-	89

Engine Emission Control - TDV8 3.6L Diesel - Engine Emission Control

Description and Operation

COMPONENT LOCATION



E86632

Item	Part Number	Description
1	-	exhaust gas recirculation (EGR) intake pipe
2	-	EGR coolant outlaet pipe
3	-	EGR gas outlet pipe
4	-	EGR valve
5	-	EGR gas outlet pipe
6	-	EGR valve
7	-	EGR cooler
8	-	EGR intake pipe

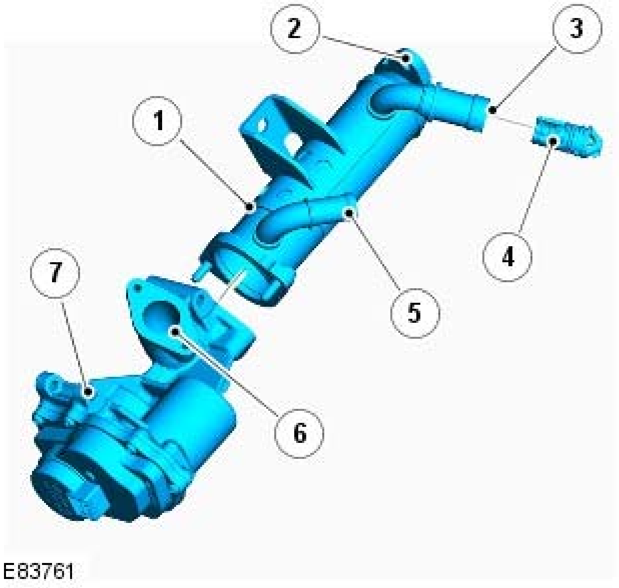
EGR SYSTEM

The EGR system comprises:

- EGR modulator x 2
- EGR cooler x 2
- Associated connecting pipes

The combined EGR modulator and cooler is located between the V of the cylinder banks. The cooler side of the EGR is connected to the vehicle cooling system, via hoses. The inlet exhaust side is connected to the exhaust manifolds on each side via a metal pipe. The exhaust gas passes through the cooler and is expelled via the actuator and a metal pipe into the throttle housing. The EGR modulator is a solenoid operated valve which is controlled by the engine control module (ECM). The ECM uses the EGR modulator to control the amount of exhaust gas being recirculated in order to reduce exhaust emissions and combustion noise. The EGR is enabled when the engine is at normal operating temperature and under cruising conditions.

EGR Valve and Cooler Asembly



Item	Part Number	Description
1	-	EGR cooler
2	-	EGR gas intake
3	-	EGR cooler coolant outlet
4	-	EGR coolant thermostat
5	-	EGR coolant inlet
6	-	EGR gas outlet
7	-	EGR valve

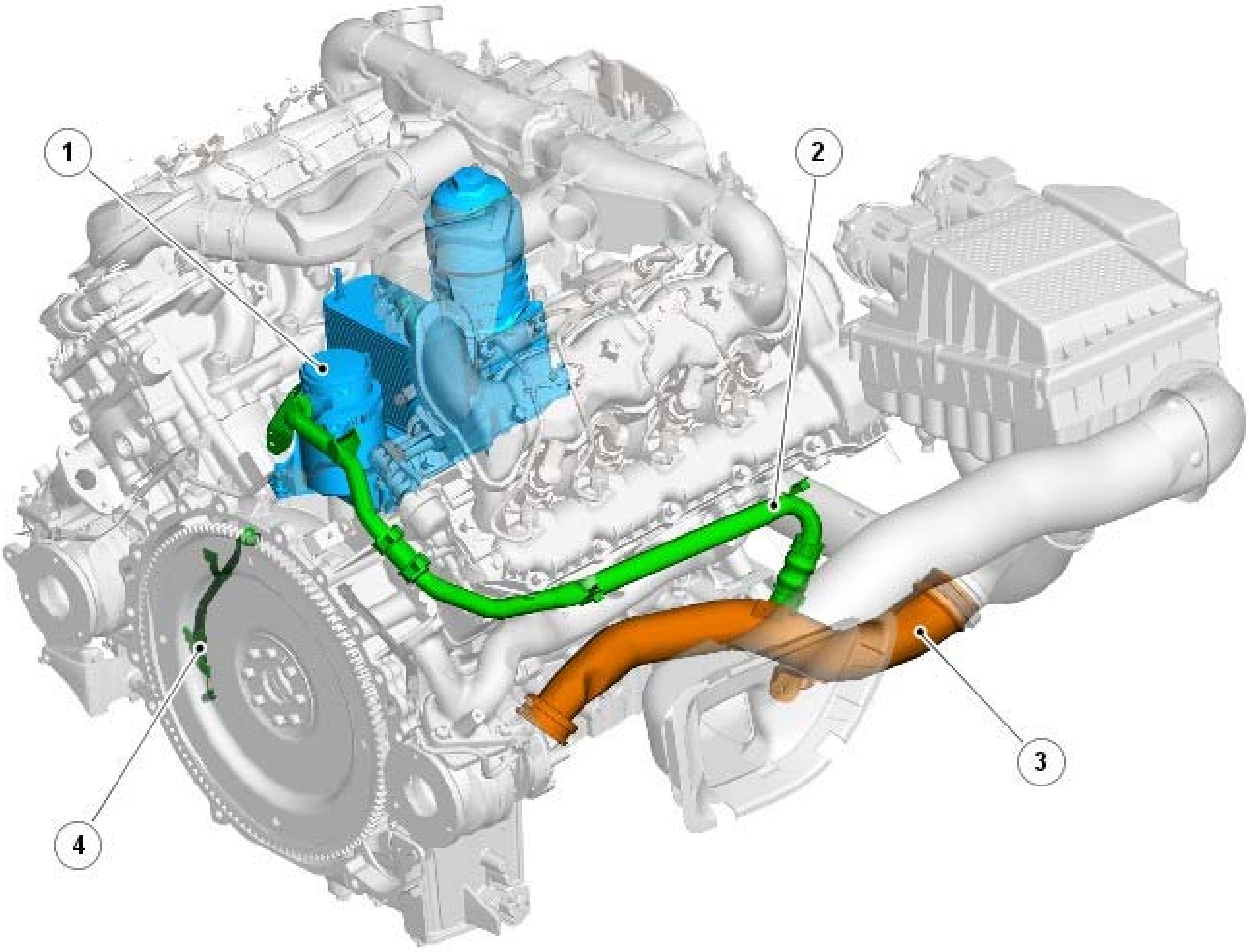
The EGR modulator receives a 12V supply from the main relay. The ground for the solenoid is via the ECM and is controlled using a pulse width modulation (PWM) signal. The PWM duty signal of the solenoid ground is varied to determine the precise amount of exhaust gas delivered to the cylinders.

The modulators are operated through their full range at each engine start-up, to clear any carbon deposits that may have built up whilst the engine was running.

In the event of a failure of the EGR modulator, the EGR function will become inoperative. The ECM can monitor the EGR modulator solenoid for short circuits and store fault codes in the event of failure. The modulator can also be activated for testing using the Land Rover recommended diagnostic tool.

Each EGR cooler has a thermostat located in the coolant outlet. This alows for more accurate control of the coolant temperature and the exhaust gas.

COMPONENT LOCATION



E86633

Item	Part Number	Description
1	-	Crankcase ventilation oil seperator
2	-	Crankcase ventilation gas breather to air intake pipe
3	-	Air intake pipe
4	-	Crankcase ventilation oil return drain pipe

CRANKCASE VENTILATION

The crankcase ventilation system on the engine ensures that all gasses emitted from the crankcase during engine running are separated from any oil particles.

Crankcase gasses are drawn internally into the oil separator unit located in the engine V. The oil separator removes oil from the crankcase gasses. The seperated gas is returned to the inlet side of the air induction system prior to the right-hand (RH) turbo charger. The oil is drained from the separator to the oil pan via an oil return pipe located at the rear of the cylinder block.

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Engine Emission Control - TDV8 3.6L Diesel - Engine Emission Control

Diagnosis and Testing

Overview

For information on the description and operation of the emission control system:
REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Description and Operation).

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Engine breather hoses ● Oil separator ● Exhaust gas recirculation (EGR) pipes (check for cracks) ● EGR valve(s) ● EGR cooler(s)	● Fuse(s) ● Wiring harness ● Loose or corroded electrical connector(s) ● Intake manifold tuning (IMT) valve ● EGR valve(s) ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom (specific)	Possible cause	Action
Difficult to start	● Exhaust gas recirculation (EGR) valve(s) stuck open	Check the EGR valve and circuits. Refer to the electrical guides. Check the mechanical condition of the EGR valves. Rectify as necessary.
Poor/Erratic idle		
Lack of power when accelerating		
Engine stops/stalls	● Exhaust gas recirculation (EGR) valve(s) stuck open ● Breather system disconnected/restricted/blocked	Check the EGR valve and circuits. Refer to the electrical guides. Check the mechanical condition of the EGR valves. Check the engine breather system. Check the oil separator. REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Description and Operation). Check for DTCs indicating an EGR valve, throttle or sensor fault. Rectify as necessary.
Excessive fuel consumption	● Exhaust gas recirculation (EGR) valve(s) stuck open ● EGR not operating ● Breather system restricted/blocked	
Excessive black smoke		
Excessive emissions		
Excessive blow-by	● Breather system restricted/blocked	Check the engine breather hoses. Check the oil separator. REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Description and Operation). Rectify as necessary.
Engine oil leaks	● Breather system restricted/blocked	Check the engine breather hoses. Check the oil separator. REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Description and Operation). Rectify as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of engine control module (ECM) DTCs:

REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible cause	Action
P040100	Exhaust gas recirculation (EGR) insufficient flow detected	● EGR control deviation lower limit, right-hand bank (intake manifold tuning (IMT) valve closed - bank specific control of EGR)	Allow the engine to warm up, switch off and turn the ignition on. Using a datalogger function, check the EGR valve angle for the right-hand bank. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040121	Exhaust gas recirculation (EGR) insufficient flow detected - signal amplitude less than minimum	● EGR control deviation lower limit right-hand bank (intake manifold tuning (IMT) valve closed) bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a datalogger function, check the EGR valve angles for both banks. Command the valve actuators to 100% then 0% pulse width modulated (PWM), and recheck the valve angles. The angles should range between 95% and 5%. If this is not the case, install new valves as necessary. REFER to: (303-08D Engine Emission Control - TDV8 3.6L Diesel) Exhaust Gas Recirculation (EGR) Valve LH (Removal and Installation), Exhaust Gas Recirculation (EGR) Valve RH (Removal and Installation). Clear the DTCs and test for normal operation.
P040200	Right-hand exhaust gas recirculation (EGR) excessive flow detected	● EGR control deviation upper limit right-hand bank (intake manifold tuning (IMT) valve closed) - bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a datalogger function, check the EGR valve angle for the right-hand bank. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040222	Right-hand exhaust gas recirculation (EGR) excessive flow detected - signal amplitude greater than maximum	● EGR control deviation upper limit right-hand bank (intake manifold tuning (IMT) valve closed) bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a datalogger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM), and recheck the valve angles. The angles should range between 5% and 95%. If this is not the case, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040300	Right-hand exhaust gas recirculation (EGR) control circuit	● EGR valve circuit fault ● EGR valve fault ● Engine control module (ECM) fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% PWM and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P040319	Right-hand exhaust gas recirculation (EGR) control circuit - current over threshold	● EGR valve control circuit: short circuit to ground ● EGR valve control circuit: short circuit to power	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width

DTC	Description	Possible cause	Action
			modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% PWM and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the engine control module (ECM). Refer to the warranty policy and procedures manual if an ECM is suspect.
P040521	Right-hand exhaust gas recirculation (EGR) sensor circuit low - signal amplitude less than minimum	● EGR valve position sensor circuit: short circuit to ground ● EGR valve position sensor fault	Check the right-hand EGR sensor and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle. With the ignition on, engine off, command the valve actuator to 0% pulse width modulated (PWM), and then to 100% PWM and recheck the EGR valve angle. The value should range from 0 - 20% to 80 - 95%. If this is not the case, install a new sensor. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040622	Right-hand exhaust gas recirculation (EGR) sensor circuit high - signal amplitude greater than maximum	● EGR valve position sensor circuit: short circuit to power ● EGR valve position sensor fault	Check the right-hand EGR sensor and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle. With the ignition on, engine off, command the valve actuator to 0% pulse width modulated (PWM), and then to 100% PWM and recheck the EGR valve angle. The value should range from 0 - 20% to 80 - 95%. If this is not the case, install a new sensor. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040721	Right-hand exhaust gas recirculation (EGR) throttle position sensor circuit low - signal amplitude less than minimum	● EGR throttle position sensor circuit: short circuit to ground ● EGR throttle position sensor circuit: high resistance ● EGR sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040822	Right-hand exhaust gas recirculation (EGR) throttle position sensor circuit low - signal amplitude greater than maximum	● EGR throttle position sensor circuit: short circuit to power ● EGR throttle position sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P045A00	Left-hand exhaust gas recirculation (EGR) control circuit	● EGR valve circuit fault ● EGR valve fault ● Engine control module (ECM) fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% PWM and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.

DTC	Description	Possible cause	Action
P045A19	Left-hand exhaust gas recirculation (EGR) control circuit - current over threshold	- EGR valve control circuit: short circuit to ground - EGR valve control circuit: short circuit to power	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% PWM and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the engine control module (ECM). Refer to the warranty policy and procedures manual if an ECM is suspect.
P045C00	Left-hand exhaust gas recirculation (EGR) control circuit low	- EGR valve sticking - Intake air temperature (IAT) sensor circuit fault - Ambient pressure (AMP) sensor circuit fault - Manifold absolute pressure and temperature (MAPT) sensor circuit fault - Mass air flow (MAF) sensor circuit fault - EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P045D00	Left-hand exhaust gas recirculation (EGR) control circuit high	- EGR valve sticking - Intake air temperature (IAT) sensor circuit fault - Ambient pressure (AMP) sensor circuit fault - Manifold absolute pressure and temperature (MAPT) sensor circuit fault - Mass air flow (MAF) sensor circuit fault - EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P048700	Right-hand exhaust gas recirculation (EGR) throttle control circuit - open	- EGR valve circuit fault - EGR valve fault - Engine control module (ECM) fault	Using a datalogger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% PWM and recheck the position reading. The value should be 0 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 to 2,500 ohms. If the values are not in this range, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.

DTC	Description	Possible cause	Action
P048819	Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - current above threshold	- Right-hand EGR throttle over current check	Using a datalogger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% PWM and recheck the position reading. The value should be 0 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 to 2,500 ohms. If the values are not in this range, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the engine control module (ECM). Refer to the warranty policy and procedures manual if an ECM is suspect.
P048821	Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - signal amplitude less than minimum	- Right-hand EGR throttle adaption is at the bottom limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR throttle position then command the throttle position setpoint to 0% pulse width modulated (PWM) and recheck the position. If the 0% PWM position is not 0 - 20%, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P048822	Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - signal amplitude greater than maximum	- Right-hand EGR throttle adaption is at the top limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR throttle position then command the throttle position setpoint to 0% pulse width modulated (PWM) and recheck the position. If the 0% PWM position is not 0 - 20%, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P048900	Right-hand exhaust gas recirculation (EGR) control circuit low	- EGR valve sticking - Intake air temperature (IAT) sensor circuit fault - Ambient pressure (AMP) sensor circuit fault - Manifold absolute pressure and temperature (MAPT) sensor circuit fault - Mass air flow (MAF) sensor circuit fault - EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P049000	Right-hand exhaust gas recirculation (EGR) control circuit high	- EGR valve sticking - Intake air temperature (IAT) sensor circuit fault - Ambient pressure (AMP) sensor circuit fault - Manifold absolute pressure and temperature (MAPT) sensor circuit fault - Mass air flow (MAF) sensor circuit fault - EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible cause	Action
P049B00	Left-hand exhaust gas recirculation (EGR) insufficient flow detected	- EGR control deviation lower limit (intake manifold tuning (IMT) valve closed) - bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a datalogger function, check the EGR valve position and command the valve to 0% then 100% pulse width modulated (PWM). Check the values. If the valve positions are not 5 - 95%, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P049C00	Left-hand exhaust gas recirculation (EGR) excessive flow detected - signal amplitude greater than maximum	- EGR control deviation upper limit left-hand bank (intake manifold tuning (IMT) valve closed) - bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a datalogger function, check the EGR valve position and command the valve to 0% then 100% pulse width modulated (PWM). Check the values. If the valve positions are not 5 - 95%, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P133521	Right-hand exhaust gas recirculation (EGR) position sensor minimum/maximum stop performance - signal amplitude less than minimum	- EGR valve circuit: short circuit to ground - EGR valve fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be 0 - 20%. If the value is outside this range, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P133522	Right-hand exhaust gas recirculation (EGR) position sensor minimum/maximum stop performance - signal amplitude greater than maximum	- EGR valve circuit: short circuit to power - EGR valve fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be 0 - 20%. If the value is outside this range, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P140A21	Left-hand exhaust gas recirculation (EGR) sensor C circuit low - signal amplitude less than minimum	- EGR valve circuit: short circuit to ground - EGR valve fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle with the ignition on and the engine off. Command the valve angle to 0% pulse width modulated (PWM), then to 100% PWM and recheck the angles. The angles should be between 0 - 20% and 80 - 95%. If this is not the case, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P140B22	Left-hand exhaust gas recirculation (EGR) sensor C circuit high - signal amplitude greater than maximum	- EGR valve circuit: short circuit to power	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle with the ignition on and the engine off. Command the valve angle to 0% pulse width modulated (PWM), then to 100% PWM and recheck the angles. The angles should be between 0 - 20% and 80 - 95%. If this is not the case, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P140E21	Left-hand exhaust gas recirculation (EGR) sensor C minimum/maximum stop performance - signal amplitude less than minimum	- EGR valve adaption 1 bottom limit check	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be 0 - 20%. If the value is outside this range, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

DTC	Description	Possible cause	Action
			Clear the DTCs and test for normal operation.
P140E22	Exhaust gas recirculation (EGR) sensor C minimum/maximum stop performance - signal amplitude greater than maximum	- EGR valve adaption 1 top limit check	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be 0 - 20%. If the value is outside this range, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P141A27	Right-hand exhaust gas recirculation (EGR) sensor A circuit intermittent/erratic - signal rate of change above threshold	- EGR valve position sensor circuit: intermittent high resistance - EGR sensor fault	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P141B1C	Right-hand exhaust gas recirculation (EGR) sensor B circuit intermittent/erratic - circuit voltage out of range	- EGR throttle position sensor circuit: intermittent high resistance - EGR sensor fault	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P141C27	Left-hand exhaust gas recirculation (EGR) sensor C circuit intermittent/erratic - signal rate of change above threshold	- EGR valve position sensor circuit: intermittent high resistance - EGR sensor fault	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P142D21	Left-hand exhaust gas recirculation (EGR) sensor D circuit low - signal amplitude less than minimum	- EGR throttle position sensor circuit: short circuit to ground - EGR throttle position sensor circuit: high resistance - EGR sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P142E22	Left-hand exhaust gas recirculation (EGR) sensor D circuit high - signal amplitude greater than maximum	- EGR throttle position sensor circuit: short circuit to power - EGR throttle position sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P142F1C	Left-hand exhaust gas recirculation (EGR) sensor D circuit intermittent/erratic - circuit voltage out of range	- EGR throttle position sensor circuit: intermittent high resistance - EGR sensor fault	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible cause	Action
P213A00	Left-hand exhaust gas recirculation (EGR) throttle control circuit B open	- Left-hand EGR throttle H Bridge electrical check	Using a datalogger function, check the EGR throttle position with the engine running and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% PWM and recheck the position reading. The value should be 0 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 to 2,500 ohms. If the values are not in this range, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the engine control module (ECM). Refer to the warranty policy and procedures manual if an ECM is suspect.
P213B19	Left-hand exhaust gas recirculation (EGR) throttle control circuit B range/performance - circuit current above threshold	- Left-hand EGR throttle overcurrent check	Using a datalogger function, check the EGR throttle position with the engine running and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% PWM and recheck the position reading. The value should be 0 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 to 2,500 ohms. If the values are not in this range, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the engine control module (ECM). Refer to the warranty policy and procedures manual if an ECM is suspect.
P213B21	Left-hand exhaust gas recirculation (EGR) throttle control circuit B range/performance - signal amplitude less than minimum	- Left-hand EGR throttle adaption is at the lower limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR throttle position then command the throttle position setpoint to 0% pulse width modulated (PWM) and recheck the position. If the 0% PWM position is not 0 - 20%, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P213B22	Left-hand exhaust gas recirculation (EGR) throttle control circuit B range/performance - signal amplitude greater than maximum	- Left-hand EGR throttle adaption is at the upper limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR throttle position then command the throttle position setpoint to 0% pulse width modulated (PWM) and recheck the position. If the 0% PWM position is not 0 - 20%, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P213C00	Left-hand exhaust gas recirculation (EGR) throttle control circuit B low	- EGR sensor circuits: short circuit (to ground/power/other circuits - EGR sensor circuits: high resistance - EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle setpoint and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between setpoint and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible cause	Action
P213D00	Left-hand exhaust gas recirculation (EGR) throttle control circuit B high	- EGR sensor circuits: short circuit (to ground/power/other circuits - EGR sensor circuits: high resistance - EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle setpoint and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between setpoint and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P214100	Right-hand exhaust gas recirculation (EGR) throttle control circuit A low	- EGR sensor circuits: short circuit (to ground/power/other circuits - EGR sensor circuits: high resistance - EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle setpoint and the actual throttle position, and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between setpoint and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P214200	Right-hand exhaust gas recirculation (EGR) throttle control circuit A high	- EGR sensor circuits: short circuit (to ground/power/other circuits - EGR sensor circuits: high resistance - EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle setpoint and the actual throttle position, and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between setpoint and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

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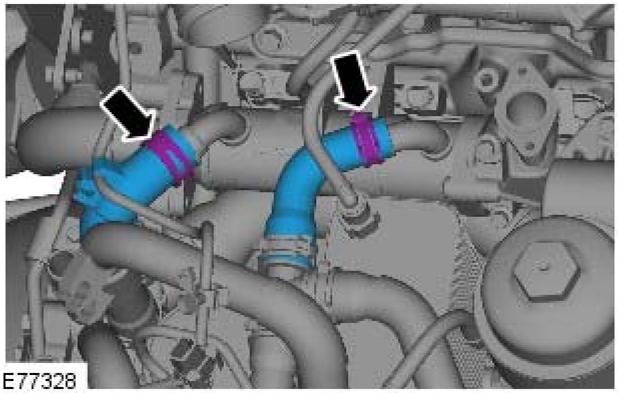
Engine Emission Control - TDV8 3.6L Diesel - Exhaust Gas Recirculation (EGR) Valve LH

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

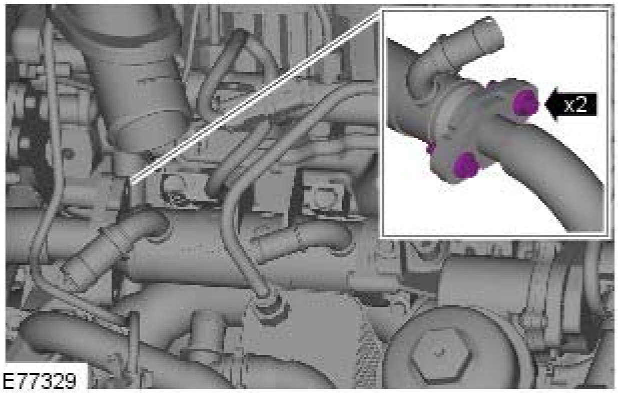
2. Remove the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).



3. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

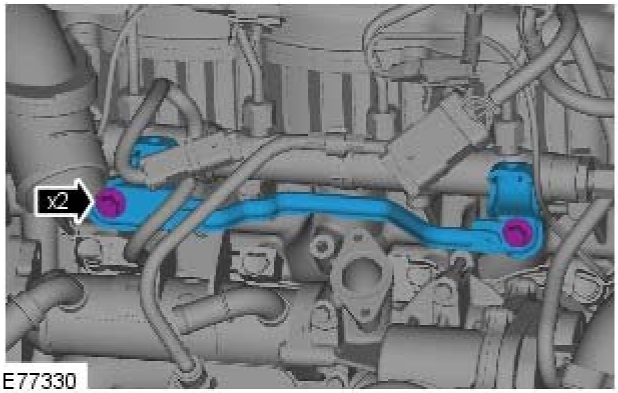
Disconnect the exhaust gas recirculation (EGR) cooler coolant hoses.

- Clamp the hoses to minimize coolant loss.
- Release the 2 clips.



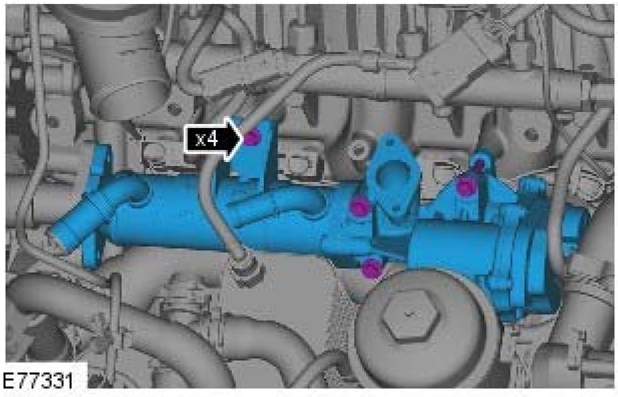
4. Release the EGR valve inlet tube.

- Remove the 2 bolts.



5. Remove the fuel rail support bracket.

- Remove the 2 bolts.



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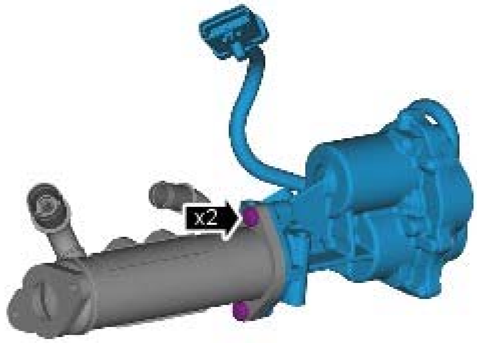
6. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the EGR valve and cooler assembly.

- Remove the 4 bolts.
- Remove and discard the gasket.



E77332

7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the EGR valve.

- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

Install the EGR valve.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

• NOTE: Remove and discard the blanking caps.

Install the EGR valve and cooler assembly.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

3. Install the fuel rail support bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).

4. Secure the EGR valve inlet tube.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. NOTE: Remove and discard the blanking caps.

Connect the EGR cooler coolant hoses.

- Secure with the clips.
- Remove the hose clamps.

6. Install the intake manifold plenum chamber.
   For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).
7. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
8. Check and top-up the coolant if required.

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Engine Emission Control - TDV8 3.6L Diesel - Exhaust Gas Recirculation (EGR) Valve RH

Removal and Installation

Removal

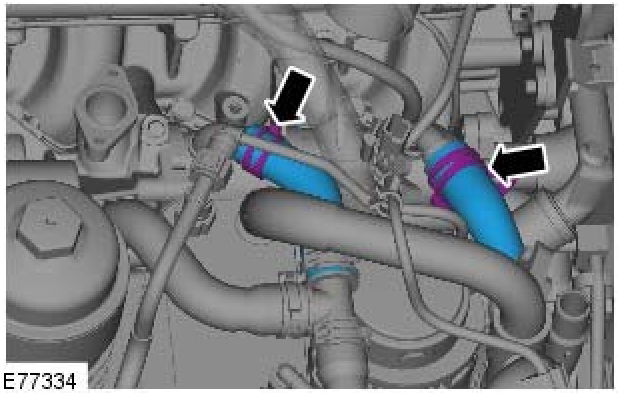
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

3. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

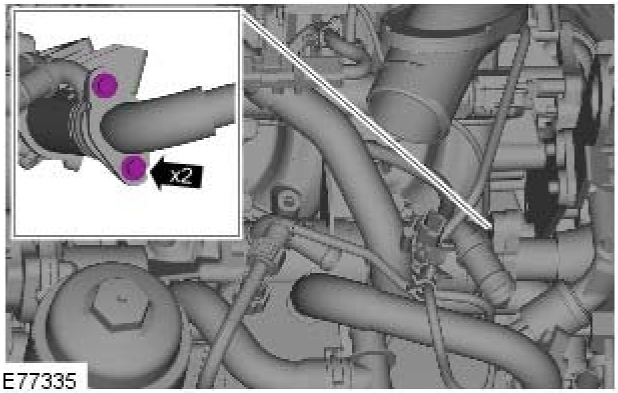
Disconnect the exhaust gas recirculation (EGR) cooler coolant hoses.

- Clamp the hoses to minimize coolant loss.
- Release the 2 clips.



4. Release the EGR valve inlet tube.

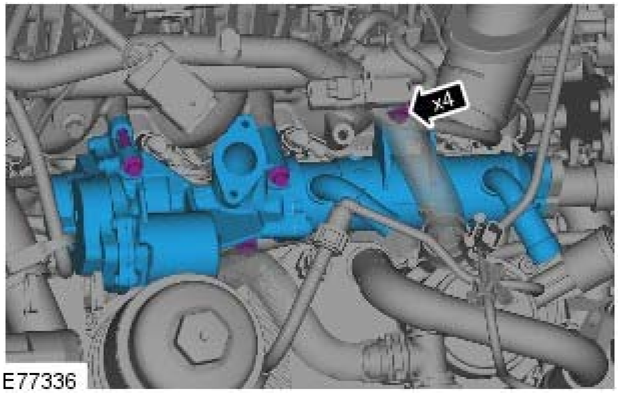
- Remove the 2 bolts.

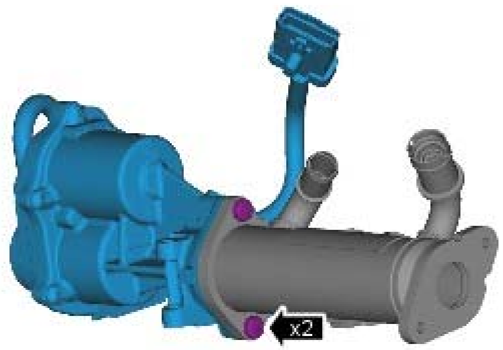


5. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the EGR valve and cooler assembly.

- Remove the 4 bolts.
- Remove and discard the gasket.





E77337

6. NOTE: Do not disassemble further if the component is removed for access only.

Remove the EGR valve.

- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

Install the EGR valve.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

• NOTE: Remove and discard the blanking caps.

Install the EGR valve and cooler assembly.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

3. Secure the EGR valve inlet tube.

- Tighten the bolts to 10 Nm (7 lb.ft).

4. NOTE: Remove and discard the blanking caps.

Connect the EGR cooler coolant hoses.

- Secure with the clips.
- Remove the hose clamps.

5. Install the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

7. Check and top-up the coolant if required.

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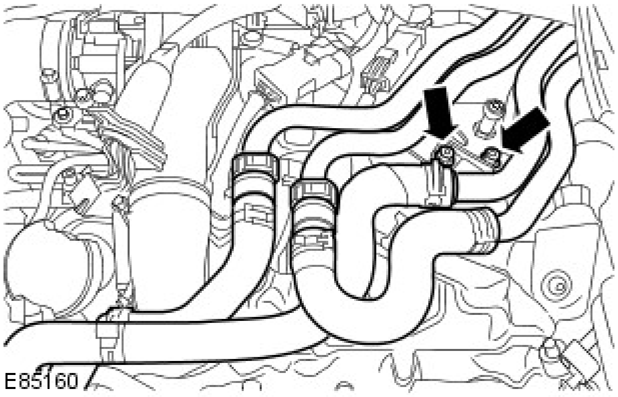
Engine Emission Control - TDV8 3.6L Diesel - Exhaust Gas Recirculation (EGR) Valve Outlet Tube

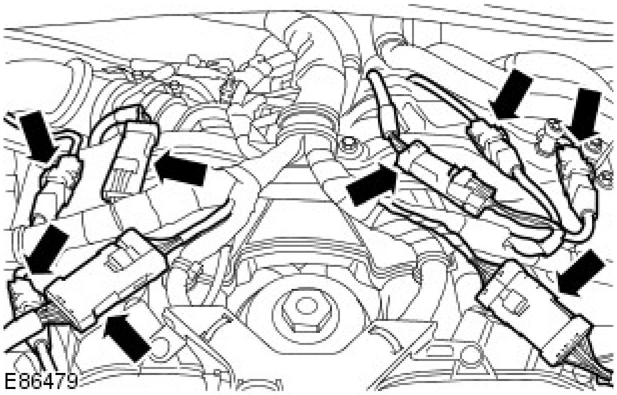
Removal and Installation

Removal

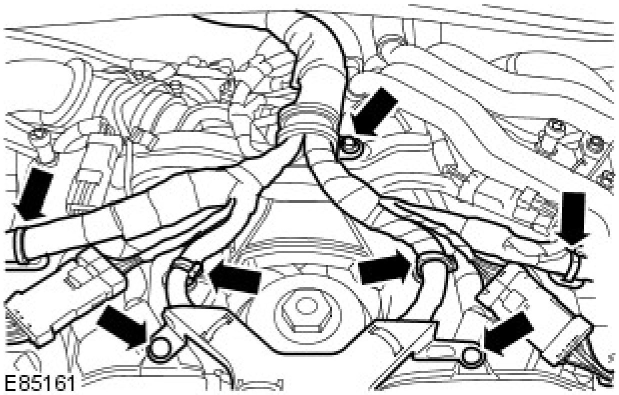
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Release the coolant lines.
   - Remove the 2 nuts.

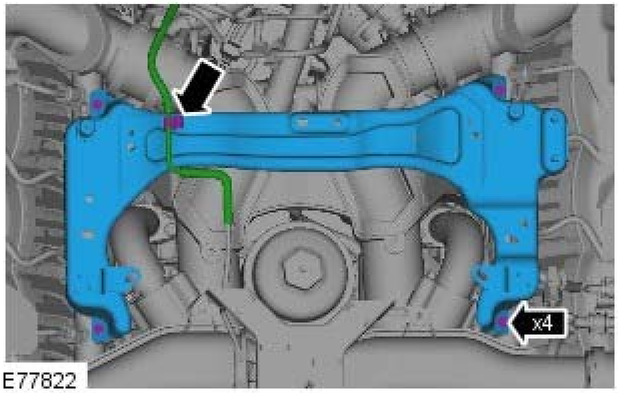


4. Release the exhaust gas recirculation (EGR) valve wiring harness.



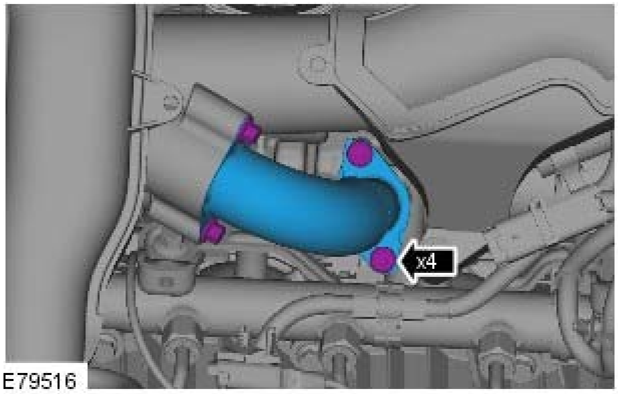
5. Release the knock sensor (KS) wiring harness.
6. Release the glow plug wiring harness.
7. Release the engine wiring harness.
   - Release the 6 clips.
   - Remove the bolt.





8. Remove the engine cover mounting bracket.

- Release the vacuum line.
- Remove the 4 bolts.



9. Remove the EGR valve outlet tube.

- Remove the 4 bolts.
- Remove and discard the O-ring seal.
- Remove and discard the gasket.

Installation

1. Install the EGR valve outlet tube.

- Install a new gasket.
- Install a new O-ring seal.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the engine cover mounting bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the vacuum line.

3. Secure the glow plug wiring harness.

4. Secure the KS wiring harness.

5. Secure the EGR valve wiring harness.

6. Secure the engine wiring harness.

- Tighten the bolt.
- Secure the clips.

7. Secure the coolant lines.

- Tighten the nuts to 10 Nm (7 lb.ft).

8. Install the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

9. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Engine Emission Control - TDV8 3.6L Diesel - Exhaust Gas Recirculation (EGR) Cooler

Removal and Installation

Removal

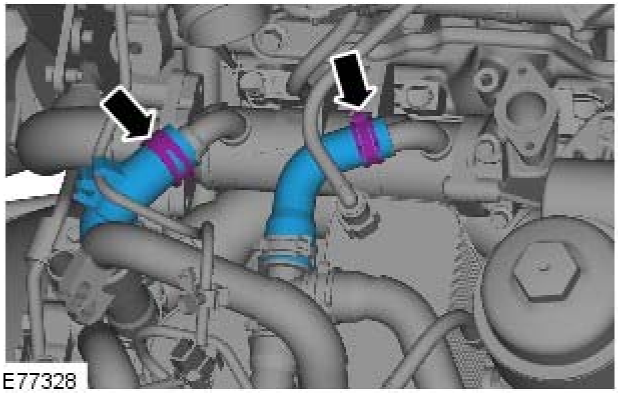
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the intake manifold plenum chamber.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

3. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

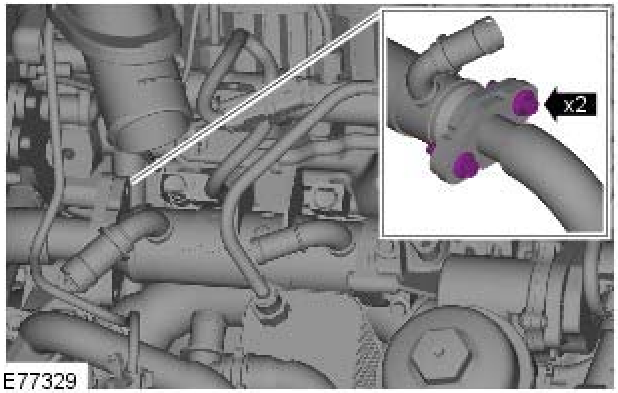
Disconnect the exhaust gas recirculation (EGR) cooler coolant hoses.

- Clamp the hoses to minimize coolant loss.
- Release the 2 clips.



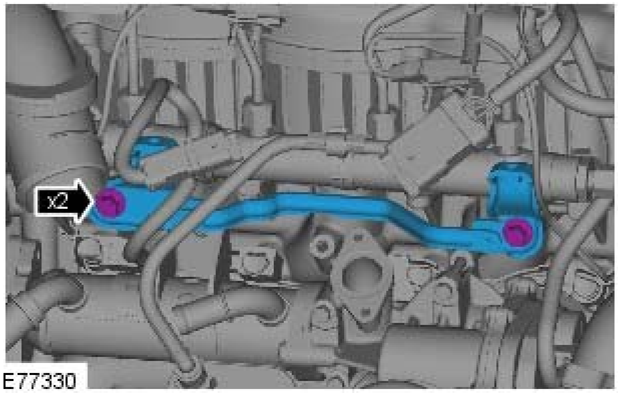
4. Release the EGR valve inlet tube.

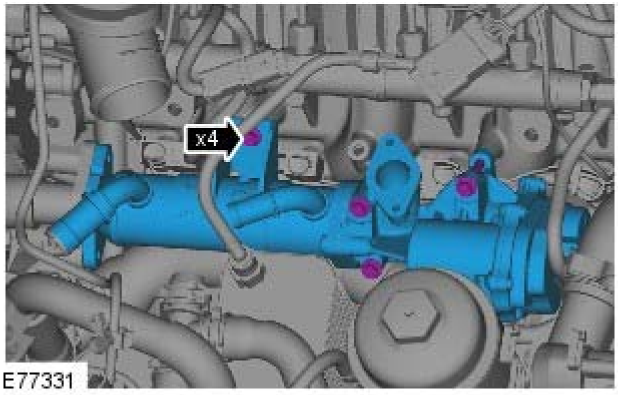
- Remove the 2 bolts.



5. Remove the fuel rail support bracket.

- Remove the 2 bolts.

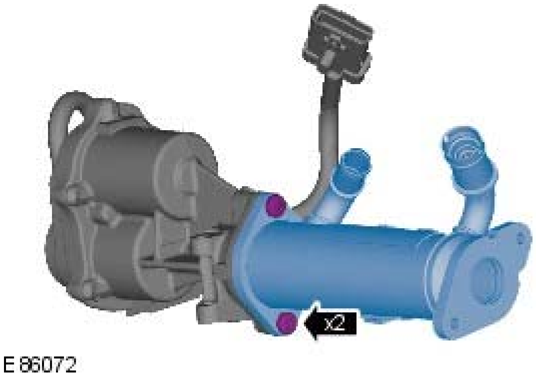




6. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the EGR valve and cooler assembly.

- Remove the 4 bolts.
- Remove and discard the gasket.



7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the EGR cooler.

- Remove the 2 bolts.
- Remove and discard the gasket.

Installation

1. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

Install the EGR cooler.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

• NOTE: Remove and discard the blanking caps.

Install the EGR valve and cooler assembly.

- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).

3. Install the fuel rail support bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).

4. Secure the EGR valve inlet tube.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. NOTE: Remove and discard the blanking caps.

Connect the EGR cooler coolant hoses.

- Secure with the clips.

- Remove the hose clamps.

6. Install the intake manifold plenum chamber.
   For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).
7. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
8. Check and top-up the coolant if required.

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Engine Emission Control - TDV8 3.6L Diesel - Crankcase Vent Oil Separator

Removal and Installation

Removal

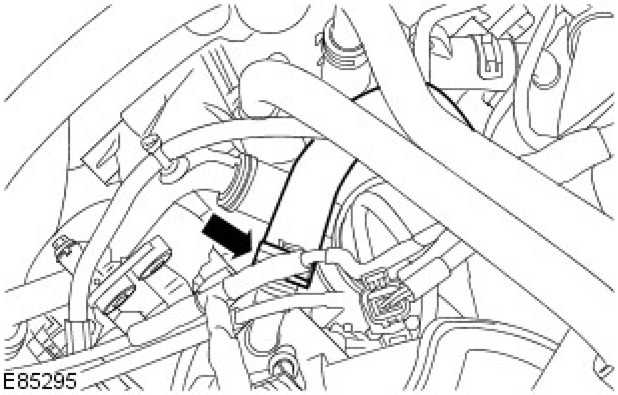
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Partially drain the cooling system.
For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).

3. Remove the intake manifold.
For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

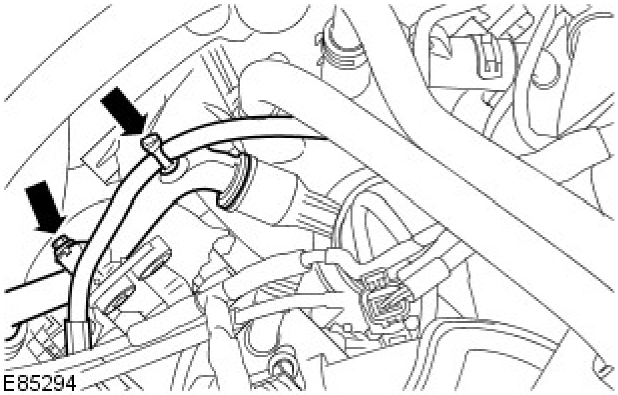
4. Disconnect the RH exhaust gas recirculation (EGR) coolant hose.

- Release the clip.



5. Disconnect the breather line.

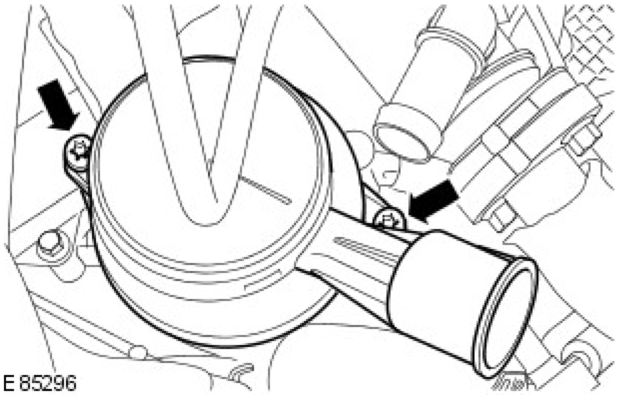
- Release the wiring harness.
- Remove the bolt.



6. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the crankcase vent oil separator.

- Remove the 2 bolts.



Installation

1. NOTE: Remove and discard the blanking caps.

   Install a new crankcase vent oil separator.

   - Clean the component mating faces.
   - Lubricate the O-ring seals with clean engine oil.
   - Tighten the bolts to 8 Nm (6 lb.ft).

2. Connect the breather line.

   - Tighten the bolt to 10 Nm (7 lb.ft).
   - Secure the wiring harness.

3. Connect the RH EGR coolant hose.

   - Secure with the clip.

4. Install the intake manifold.
   For additional information, refer to: Intake Manifold Plenum Chamber (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).
5. Fill and bleed the cooling system.
   For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).
6. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol -

General Specification

Item	Specification
Air cleaner	Mann and Hummel fitted with replaceable paper element and Mass Air Flow (MAF) meter
MAF meter:	
Make	Denso
Location	In the air cleaner outlet duct

Torque Specification

Description	NM	lb-ft
Throttle body intake spigot	25	18
Supercharger retaining bolt	21	15
Charge air cooler intake duct to supercharger outlet pipe	10	7
Supercharger outlet pipe	10	7
Wiring harness support bracket	10	7
Charge air cooler retaining Torx screws	10	7
Coolant hose support bracket Torx screw	10	7
Throttle body elbow retaining bolts	25	18
Supercharger pressure relief actuator bolt	10	7
Manifold Absolute Pressure (MAP) sensor retaining Allen screw	3	2

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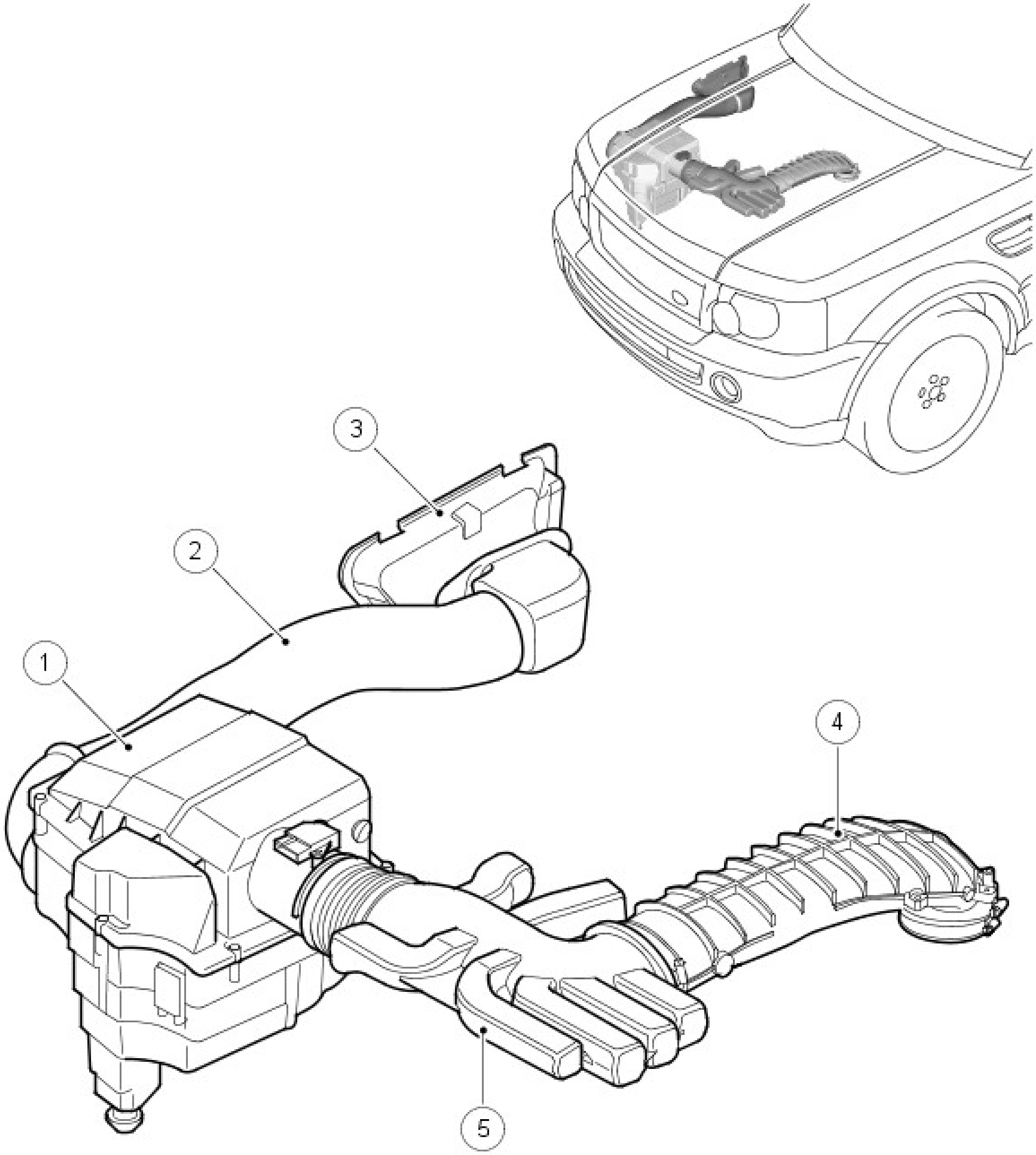
Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Intake Air Distribution and Filtering

Description and Operation

AIR INTAKE SYSTEM



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Item	Part Number	Description
1	-	Air filter box
2	-	Porous duct
3	-	Air intake
4	-	Throttle body intake
5	-	Induction resonator chambers

The 4.2 Liter V8 supercharger (SC) engine air intake and distribution system comprises:

- Air filter box
- Air intake

- Porus duct
- Air filter and filter box
- Intake duct
- Electronic throttle.

Air Filter Box

The air filter box is located in the front of the engine bay on the inside of the right-hand (RH) front wing. Air is drawn from the air intake in the wing through a porous duct and into the air filter box. The filter box contains a paper air filter element.

Air Intake Duct

The air intake duct runs from the throttle body to the air filter box. The duct comprises two separate pieces. One piece runs from the air filter box to the front of the engine and the other from the front of the engine to the rear of the engine locating on the throttle body. The front half is manufactured from plastic and incorporates a number of resonator chambers. The rear part of the duct is manufactured from cast aluminum.

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Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Intake Air Distribution and Filtering

Diagnosis and Testing

Overview

For information on the description and operation of the intake system, refer to the relevant workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of damage.

Visual inspection

Mechanical	Electrical
• Hoses and ducts (damage/connections) • Air cleaner element (contaminated/blocked) • Restricted air intake • Supercharger • Supercharger (cooling fan) drive belt • Supercharger seals and gaskets • Charge air coolers (damage/connection)	• Mass air flow (MAF) sensor • Manifold absolute pressure (MAP) sensor • Manifold absolute pressure/temperature (MAPT) sensor • Throttle body • Harness (security/damage) • Connections (security/damage)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
Vehicle does not start/hard starting/poor performance	• Restricted/Blocked air intake • Restricted/Blocked air cleaner element	Clear the restriction. Replace the air cleaner element as necessary.
Excessive intake noise	• Intake pipe disconnected/damaged after the air cleaner • Air cleaner assembly incorrectly assembled/damaged	Check the intake system and hoses for correct installation/damage.
Lack of boost	• Supercharger drive belt broken/slipping • Supercharger fault • supercharger air intake fault • Major air leakage (after the supercharger)	Check the supercharger and drive belt. Check the charge air coolers.
Noise	• Supercharger drive belt slipping • Supercharger fault • Major air leakage (after the supercharger)	Check the supercharger and drive belt. Remove the supercharger drive belt and recheck for noise. Turn the supercharger by hand and check for excessive resistance. Check for excessive play at the supercharger pulley. Check the charge air coolers.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P010100	Mass or Volume Air Flow A Circuit	● Blocked air cleaner ● Air intake leak ● Engine breather leak ● Mass air flow (MAF) sensor sensing circuit high resistance, intermittent short circuit to ground ● MAF sensor supply circuit high resistance	Check the air cleaner for blockage, etc. Check the air intake system for leaks. Check the engine breather system. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010600	Manifold Absolute Pressure/BARO Sensor Range/Performance	● Intake manifold air leak (loose or missing component) ● MAP sensor circuit(s) fault ● MAP sensor failure	Check the intake manifold for security, etc. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P017100	System Too Lean (Bank 1)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCs.
P017200	System Too Rich (Bank 1)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.
P017400	System Too Lean (Bank 2)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCS.
P017500	System too Rich (Bank 2)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.
P050600	Idle Air Control System RPM Lower Than Expected	● Air intake restriction ● Accessory drive overload (defective/seized component)	Check the air intake system. Check the accessory drive belt and components. Refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
P050700	Idle Air Control System RPM Higher Than Expected	● Intake air leak between the mass air flow (MAF) sensor and throttle ● Intake air leak between throttle and engine ● Engine crankcase breather leak	Check the air intake system. Check the engine breather system. Refer to the relevant workshop manual section.

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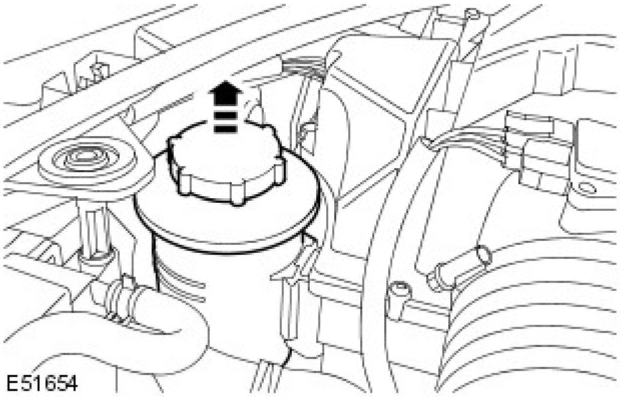
Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Air Cleaner

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Release the Dynamic Response reservoir.



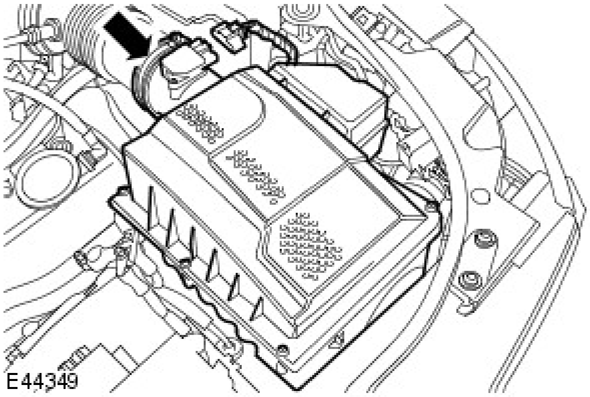
- Release the clip.
- Tie the reservoir aside.

3. Disconnect the air intake resonator.

- Release the clip.

4. Disconnect the mass air flow (MAF) sensor electrical connector.

5. Remove the air cleaner assembly.



Installation

1. NOTE: When installing the air cleaner, make sure the locating pegs fit securely into the grommets.

To install, reverse the removal procedure.

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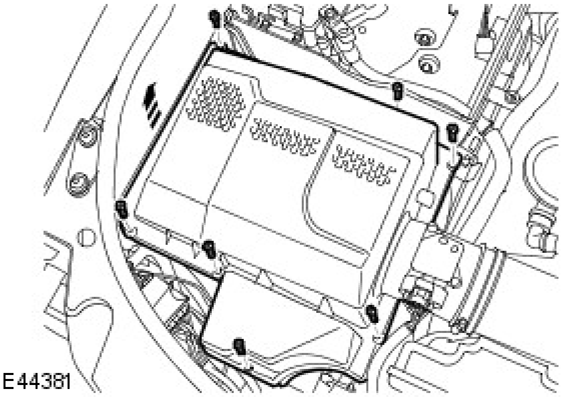
Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Air Cleaner Element

Removal and Installation

Removal

1. Disconnect the battery ground cable.
2. Remove the air cleaner housing cover.
   - Remove the 7 screws.



3. Remove the air cleaner element.

Installation

1. Clean the base of the air cleaner.
2. To install, reverse the removal procedure.

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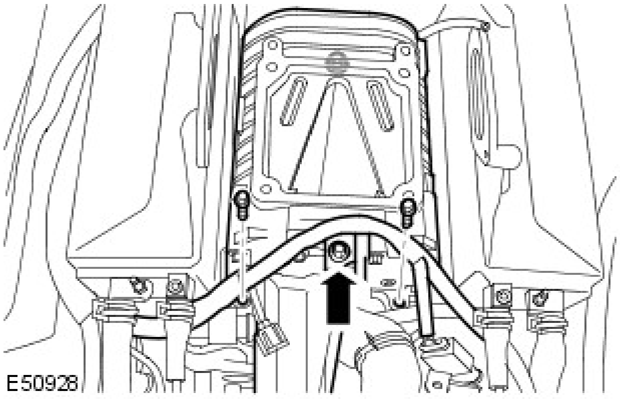
Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Supercharger

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the coolant manifold.
   For additional information, refer to: Coolant Manifold (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).
3. Remove the throttle body elbow.
   For additional information, refer to: Throttle Body Elbow (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).
4. Position the throttle body intake spigot and wiring harness aside.
   - Remove the bolt.
5. Remove the supercharger.
   - Remove the 3 bolts.



Installation

1. Install the supercharger.
   - Clean the component mating faces.
   - Clean the locating dowels.
   - Tighten the bolts to 25 Nm (18 lb.ft).
2. Install the throttle body intake spigot.
   - Tighten the bolt to 25 Nm (18 lb.ft).
3. Install the throttle body elbow.
   For additional information, refer to: Throttle Body Elbow (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).
4. Install the coolant manifold.
   For additional information, refer to: Coolant Manifold (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).
5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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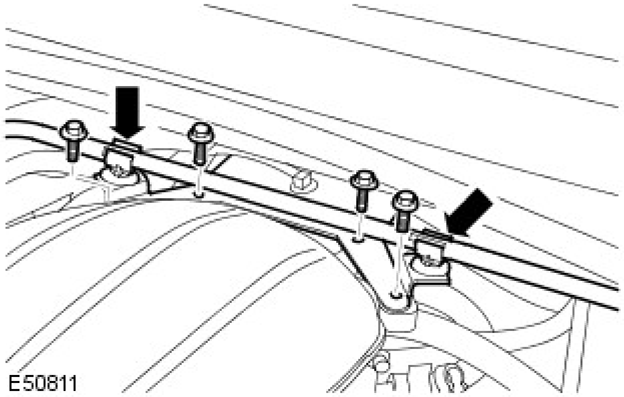
Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Supercharger Outlet Pipe

Removal and Installation

Removal

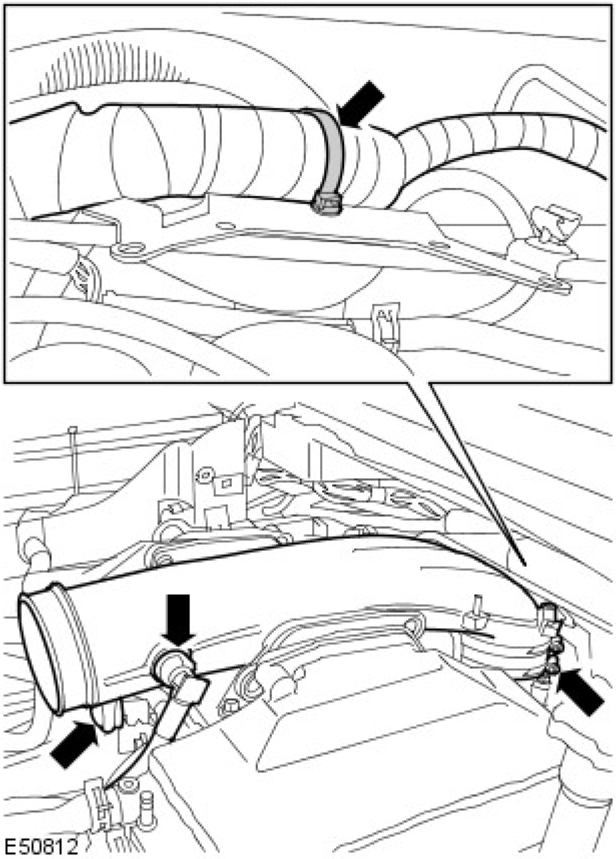
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the air intake resonator.
For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).



3. Position the wiring harness support bracket aside.

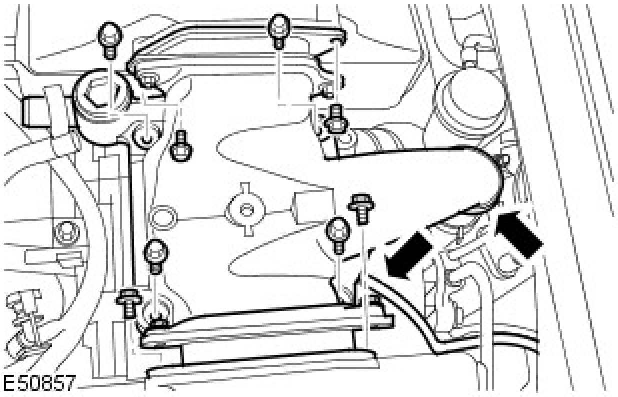
- Release the 2 fuel pipe clips.
- Remove the 4 bolts.



4. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the throttle body intake.

- Disconnect the breather line.
- Release the clip.
- Release the bushing.



5. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the supercharger outlet pipe.

- Remove the 8 bolts.
- Disconnect the vacuum line.
- Release the clip.
- Discard the gasket.

6. NOTE: Do not disassemble further if the component is removed for access only.

Remove the charge air cooler intake ducts.

- Remove the 4 nuts.

Installation

1. Install the charge air cooler intake ducts.

- Clean the component mating faces.
- Tighten the nuts to 10 Nm (7 lb.ft).

2. Install the supercharger outlet pipe.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the hose with the clip.
- Connect the vacuum line.

3. Install the throttle body intake.

- Clean the component mating faces.
- Align the bushing.
- Secure the clip.
- Connect the breather line.

4. Install the wiring harness support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Install the air intake resonator.
For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Charge Air Cooler

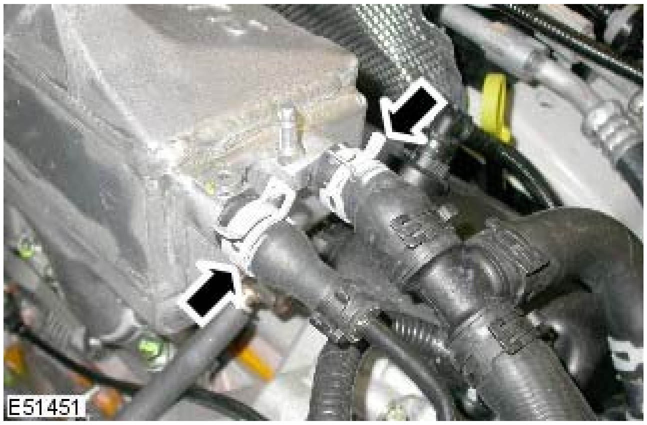
Removal and Installation

Removal

• NOTE: This procedure shows removal and installation of the LH charge air cooler. The procedure to remove and install the RH charge air cooler is similar the LH. The additional steps for the LH side are shown at the end of the removal section.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

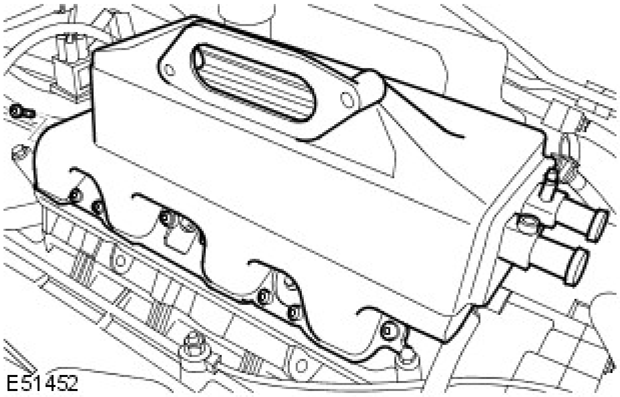
2. Remove the supercharger.
For additional information, refer to: Supercharger (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).



3. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

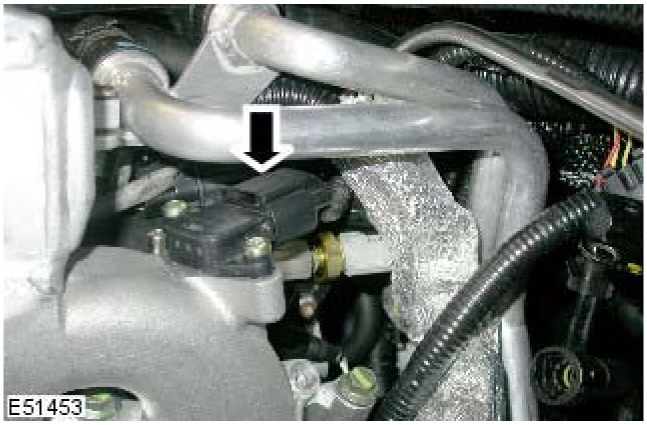
Disconnect the charge air cooler coolant hoses.

- Position an absorbent cloth to collect fluid spillage.
- Release the 2 clips.

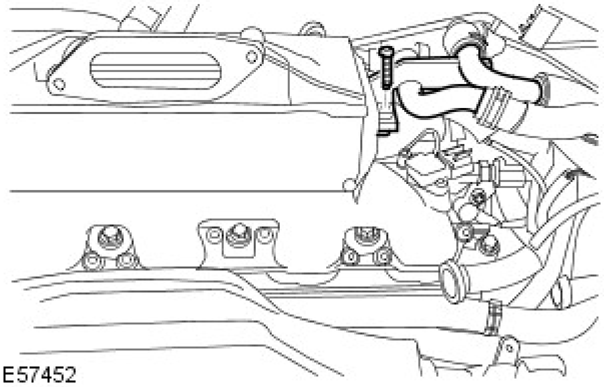


4. Remove the charge air cooler.

- Remove the 8 Torx screws.
- Discard the gasket.



5. RH side only: Disconnect the IAT sensor electrical connector.



6. RH side only: Release the coolant hose support bracket.

- Remove the Torx screw.

Installation

1. Install the charge air cooler.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the Torx screws to 10 Nm (7 lb.ft).

2. RH side only: Connect the IAT sensor electrical connector and coolant hose support bracket.

- Tighten the Torx screw to 10 Nm (7 lb.ft).

3. Connect the charge air cooler coolant hoses.

- Clean the component mating faces.
- Secure with the clips.

4. Install the supercharger.
For additional information, refer to: Supercharger (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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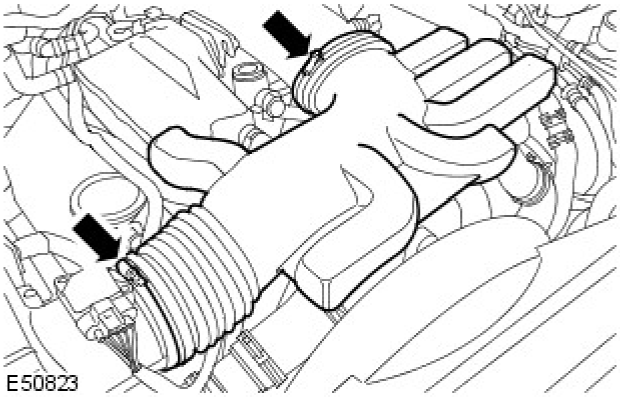
Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Intake Air Resonator

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the air cleaner outlet pipe and intake air resonator.



- Release the 2 mounting clips.

Installation

1. To install, reverse the removal procedure.

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Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol - Throttle Body Elbow

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

3. Disconnect the brake booster vacuum hose quick release connector.

4. WARNINGS:

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

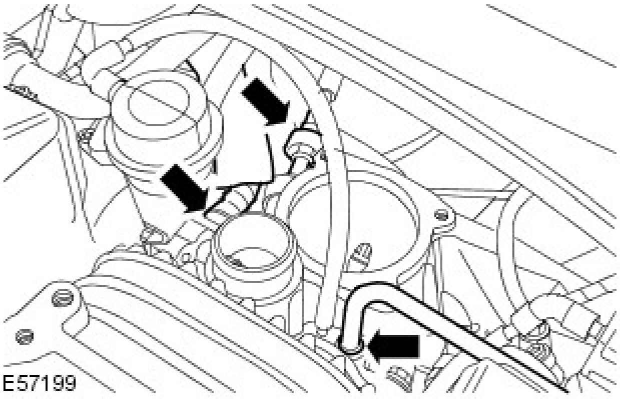
⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the supercharger fuel tank purge line quick release connector.

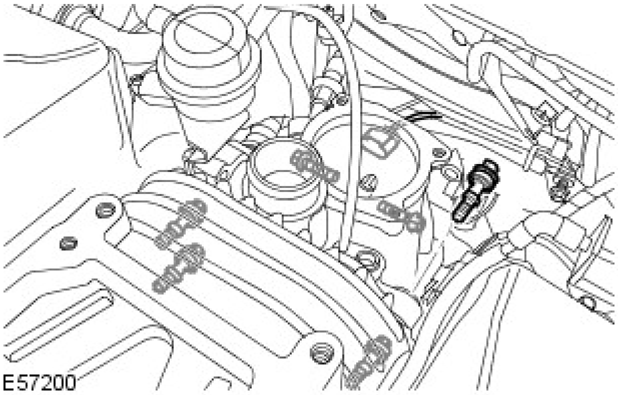
- Release the dust seal.

5. Disconnect the supercharger engine breather line.

- With assistance release the clip.



6. Disconnect the manifold absolute pressure (MAP) sensor electrical connector.


E57200

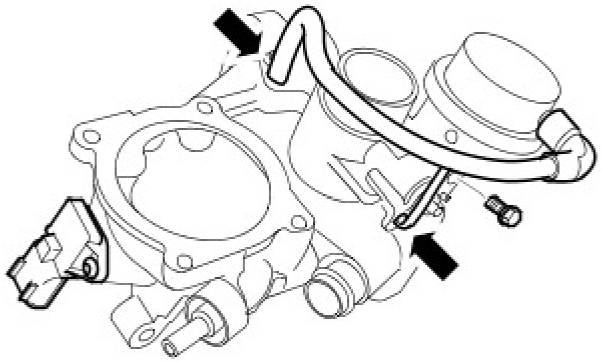
7. Remove the throttle body elbow.

- Remove the 6 bolts.
- Remove and discard the O-ring seals.
- Discard the gasket.

8. NOTE: Do not disassemble further if the component is removed for access only.

Remove the MAP sensor.

- Remove the Allen screw.
- Discard the O-ring seal.


E57201

9. Remove the supercharger pressure relief actuator.

- Remove the bolt.
- Disconnect the actuator link.
- Remove the vacuum line.

Installation

1. Install the supercharger pressure relief actuator.

- Clean the component mating faces.
- Connect the actuator link.
- Tighten the bolt to 10 Nm (7 lb.ft).
- Connect the vacuum line.

2. Install the MAP sensor.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the Allen screw to 3 Nm (2 lb.ft).

3. Install the throttle body elbow.

- Clean the component mating faces.
- Install a new gasket.
- Install new O-ring seals.

- Tighten the bolts to 25 Nm (18 lb.ft).

4. Connect the MAP sensor electrical connector.

5. Connect the supercharger engine breather line.

- Clean the component mating faces.

6. Connect the supercharger fuel tank purge line.

- Clean the component mating faces.
- Replace the dust seal.

7. Connect the brake booster vacuum hose.

8. Install the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Intake Air Distribution and Filtering - V8 4.4L Petrol -

General Specifications

Item	Specification
Air cleaner	Mann and Hummel fitted with replaceable paper element and Mass Air Flow (MAF) meter
MAF meter:	
Make	Denso
Location	In the air cleaner outlet duct

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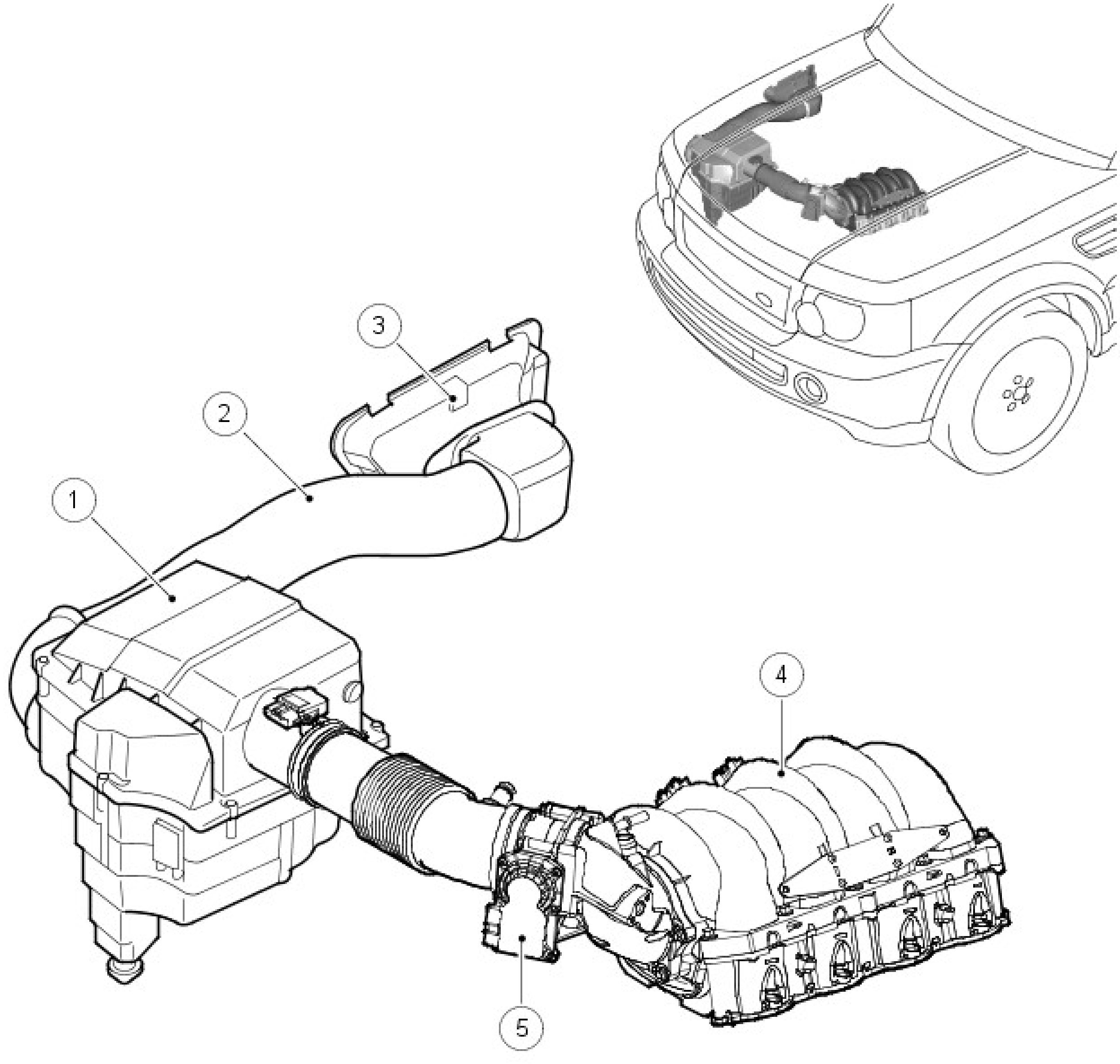
Intake Air Distribution and Filtering - V8 4.4L Petrol - Intake Air Distribution and Filtering

Description and Operation



E56255

Item	Part Number	Description
1	-	Air filter box
2	-	Porous duct
3	-	Air intake
4	-	Intake manifold
5	-	Electronic throttle

The 4.4 Liter V8 engine air intake and distribution system comprises:

- Air filter box
- Air intake
- Intake manifold
- Electronic throttle

Air Filter Box

The air filter box is located in the front of the engine bay on the inside of the right-hand (RH) front wing. Air is drawn from the air intake in the wing through a porous duct and into the air filter box.

Intake Manifold

The intake manifold is located on top of the engine between the two engine banks. The manifold is manufactured from a composite material with metal insert fixings. The intake manifold comprises a central chamber with eight tracts leading to the inlet ports on the engine.

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Intake Air Distribution and Filtering - V8 4.4L Petrol - Intake Air Distribution and Filtering

Diagnosis and Testing

Overview

For information on the description and operation of the intake system, refer to the relevant workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of damage.

Visual inspection chart

Mechanical	Electrical
• Hoses and ducts (damage/connections) • Air cleaner element (contaminated/blocked) • Restricted air intake	• Mass air flow (MAF) sensor • Manifold absolute pressure (MAP) sensor • Throttle body • Harness (security/damage) • Connections (security/damage)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible cause	Action
Vehicle does not start/hard starting/poor performance	• Restricted/Blocked air intake • Restricted/Blocked air cleaner element	Clear the restriction. Replace the air cleaner element as necessary.
Excessive intake noise	• Intake pipe disconnected/damaged after the air cleaner • Air cleaner assembly incorrectly assembled/damaged	Check the intake system and hoses for correct installation/damage.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P010100	Mass or Volume Air Flow A Circuit	• Blocked air cleaner • Air intake leak • Engine breather leak • Mass air flow (MAF) sensor sensing circuit high resistance, intermittent short circuit to ground • MAF sensor supply circuit high resistance	Check the air cleaner for blockage, etc. Check the air intake system for leaks. Check the engine breather system. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010600	Manifold Absolute Pressure/BARO Sensor Range/Performance	• Intake manifold air leak (loose or missing component) • MAP sensor circuit(s) fault • MAP sensor failure	Check the intake manifold for security, etc. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P017100	System Too Lean (Bank 1)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCs.
P017200	System Too Rich (Bank 1)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.
P017400	System Too Lean (Bank 2)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCS.
P017500	System too Rich (Bank 2)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Check for MAF sensor and evaporative emission DTCs.
P050600	Idle Air Control System RPM Lower Than Expected	● Air intake restriction ● Accessory drive overload (defective/seized component)	Check the air intake system. Check the accessory drive belt and components. Refer to the relevant workshop manual section.
P050700	Idle Air Control System RPM Higher Than Expected	● Intake air leak between the mass air flow (MAF) sensor and throttle ● Intake air leak between throttle and engine ● Engine crankcase breather leak	Check the air intake system. Check the engine breather system. Refer to the relevant workshop manual section.

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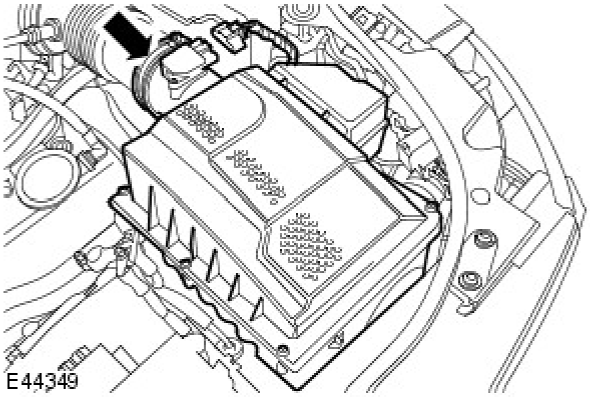
Intake Air Distribution and Filtering - V8 4.4L Petrol - Air Cleaner

Removal and Installation

Removal

1. Disconnect the battery ground cable.
2. Release the air cleaner intake pipe.
    - Loosen the air cleaner intake pipe clip.
3. Disconnect the mass air flow (MAF) sensor electrical connector.
4. Remove the air cleaner assembly.



Installation

1. NOTE: When installing the air cleaner, make sure the locating pegs fit securely into the grommets.

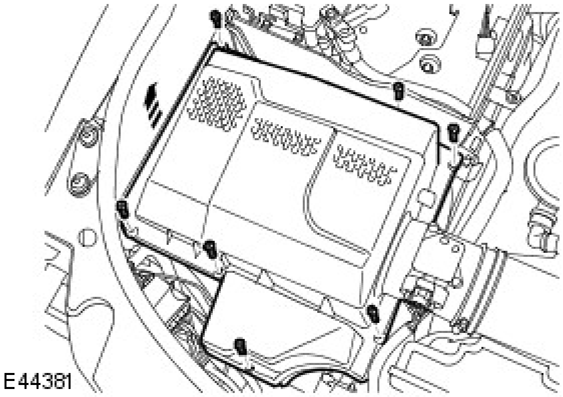
To install, reverse the removal procedure.

Intake Air Distribution and Filtering - V8 4.4L Petrol - Air Cleaner Element

Removal and Installation

Removal

1. Disconnect the battery ground cable.
2. Remove the air cleaner housing cover.
    - Remove the 7 screws.
3. Remove the air cleaner element.



Installation

1. Clean the base of the air cleaner.
2. To install, reverse the removal procedure.

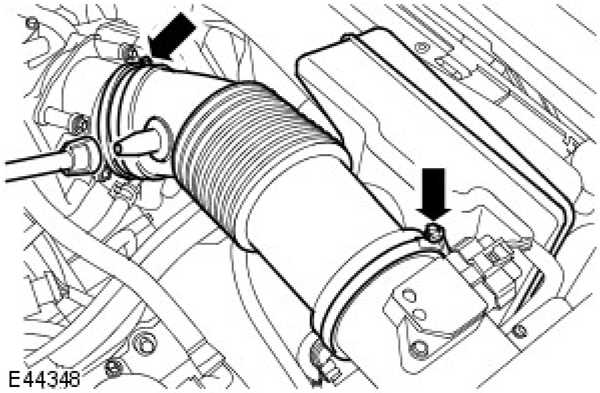
Published: 11-May-2011

Intake Air Distribution and Filtering - V8 4.4L Petrol - Resonator

Removal and Installation

Removal

1. Disconnect the battery ground cable.
2. Remove the air cleaner outlet pipe and intake air resonator.
   - Release the 2 mounting clips.
   - Disconnect the breather hose.



Installation

1. To install, reverse the removal procedure.

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Intake Air Distribution and Filtering - TDV6 2.7L Diesel -

General Specifications

Item	Specification
Air cleaner	Mann and Hummel fitted with replaceable paper element, and Mass Air Flow (MAF) meter
MAF meter:	
Make	Denso
Location	In the air cleaner outlet duct

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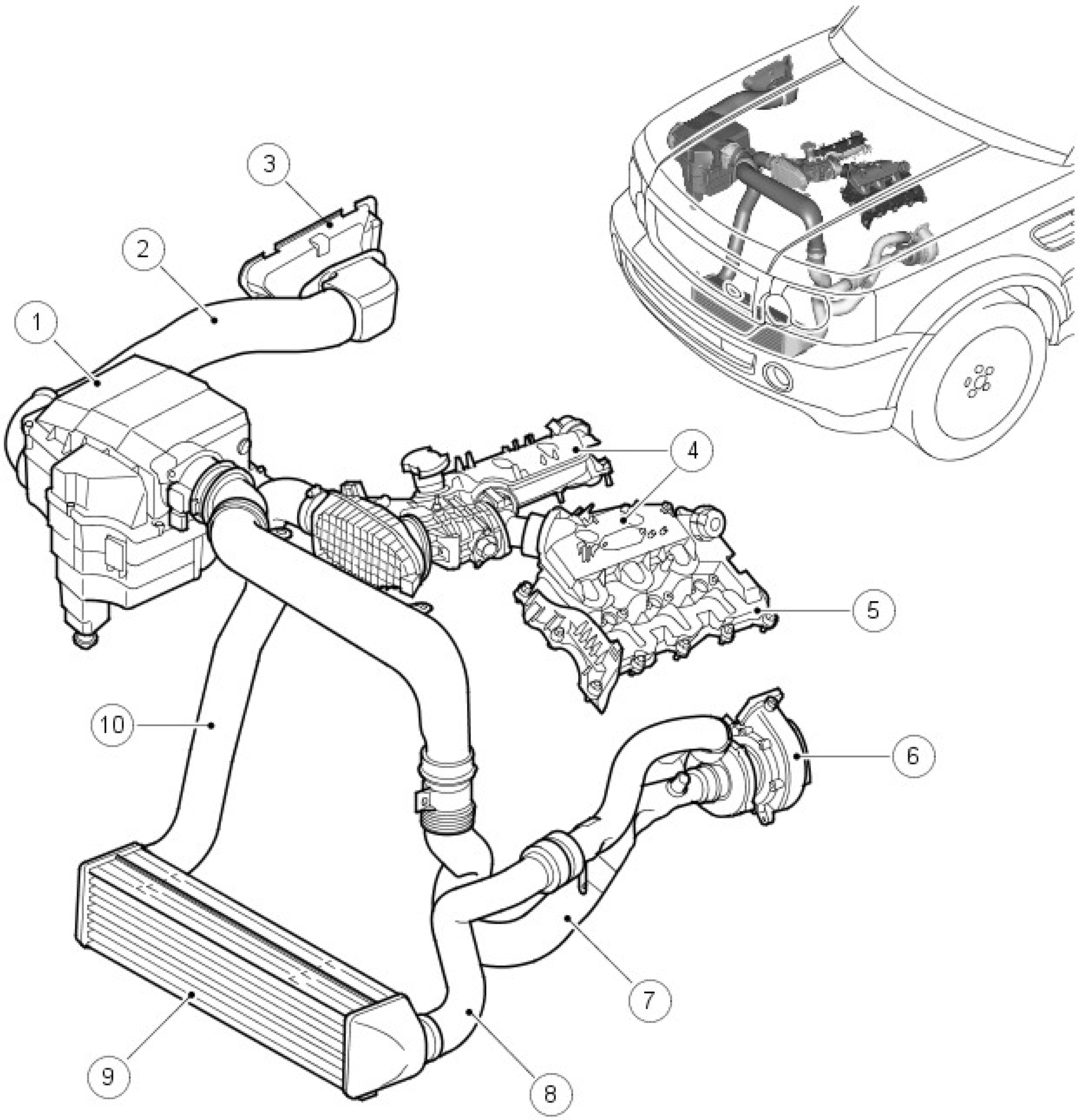
Intake Air Distribution and Filtering - TDV6 2.7L Diesel - Intake Air Distribution and Filtering

Description and Operation

Intake Air Distribution



E56256

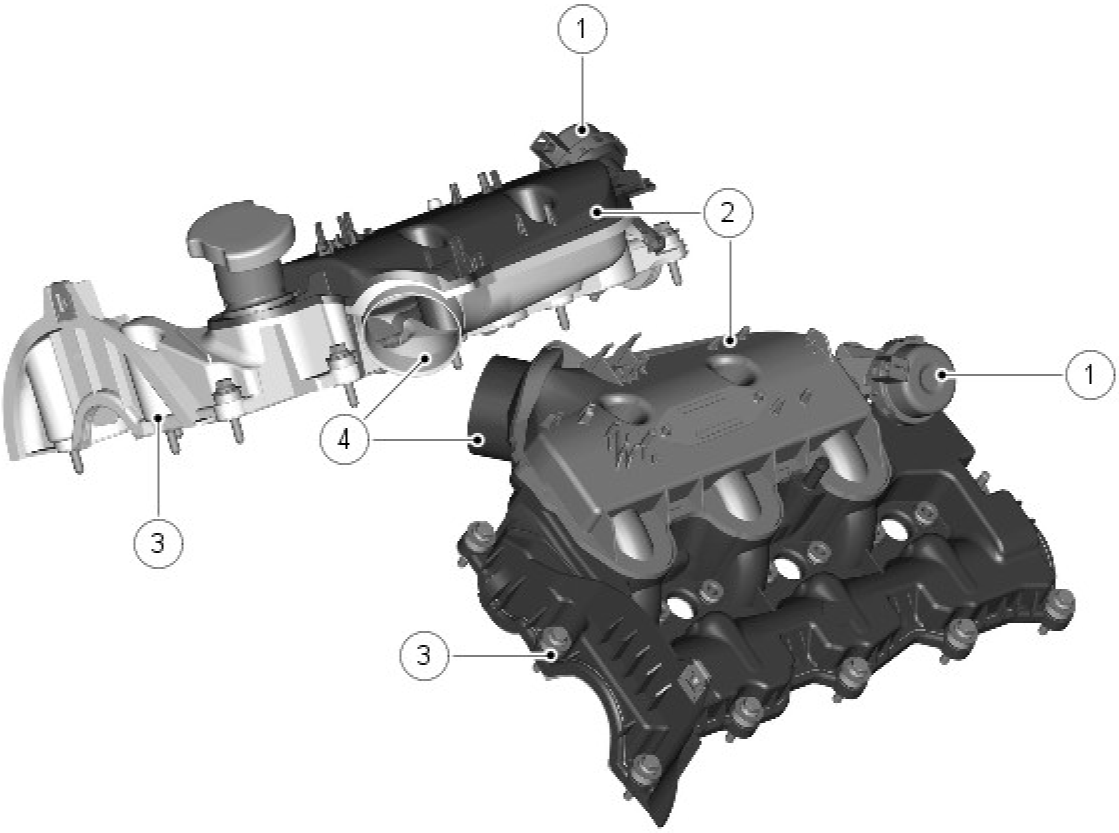
Item	Part Number	Description
1	-	Air filter box
2	-	Porous duct
3	-	Air intake
4	-	Air intake manifolds
5	-	Camshaft cover
6	-	Turbo charger
7	-	Air filter to turbo pipe
8	-	Turbo to charge air cooler pipe
9	-	Charge air cooler

10	-	Charge air cooler to intake manifold pipe

The 2.7 Liter Diesel air intake and distribution system comprises:

- Wing mounted intake duct
- A filter minder sensor
- Camshaft cover mounted intake manifolds (x2)
- Charge air cooler
- Turbo charger

Air is drawn in from the vehicle exterior via the right-hand (RH) wing mounted intake duct, along the inside of the wing to the air filter box intake. Once the air has passed through the air filter it is drawn along a duct to the turbo charger. From the turbo charger the air is forced through the charge air cooler up to the electric throttle assembly and then to the inlet manifold assembly.



E45595

Item	Part Number	Description
1	-	Port deactivation control valves (not used)
2	-	Air intake manifolds
3	-	Cylinder head covers
4	-	Air intake ducts

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Intake Air Distribution and Filtering - TDV6 2.7L Diesel - Intake Air Distribution and Filtering

Diagnosis and Testing

Overview

For additional information on the operation of intake air distribution and filtering, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
• Hoses and ducts condition and installation • Air cleaner element condition and installation • Restricted air intake • Vacuum hoses condition and installation • Pipework to turbocharger condition and installation • Turbocharger condition and installation • Charge air coolers	• Fuse(s) • Wiring harness • Loose or corroded electrical connector(s) • Mass air flow (MAF) sensor • Air charge temperature (ACT) sensor • Manifold absolute pressure (MAP) sensor • Intake air temperature (IAT) sensor • Intake air shut-off throttle solenoid

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
Vehicle does not start/hard starting	• Restricted/Blocked air intake • Restricted/Blocked air cleaner element	Clear the restriction. Replace the air cleaner element as necessary.
Poor performance	• Turbocharger fault • Throttle body fault • Intercooler hoses	Check the turbocharger. Check the intake air shutoff throttle function (make sure the throttle body returns to the open position). Check the intercooler hoses.
Excessive intake noise	• Intake air leak after the turbocharger • Intake pipe disconnected/damaged after the air cleaner • Air cleaner assembly incorrectly assembled/damaged	Check the joint between the air intake elbow and the intake air shutoff throttle. Check the joints between the throttle body outlets and the intake manifolds. Check the charge air cooler seals. Check the intake system and hoses for correct installation/damage.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to workshop manual section 303-14 - Electronic Engine Controls.

DTC	Description	Possible causes	Action
P009700	Intake Air Temperature Sensor 2 Circuit Low (Bank 1)	• Air charge temperature (ACT) sensor circuit high resistance	Refer to the electrical guides. and check the ACT sensor and circuits.

DTC	Description	Possible causes	Action
		● ACT sensor circuit short circuit to ground ● ACT sensor failure	
P009800	Intake Air Temperature Sensor 2 Circuit High (Bank 1)	● Air charge temperature (ACT) sensor circuit short circuit to power ● ACT sensor failure	Refer to the electrical guides. and check the ACT sensor and circuits.
P009900	Intake Air Temperature Sensor 2 Circuit Intermittent/Erratic (Bank 1)	● Air charge temperature (ACT) sensor circuit high resistance ● ACT sensor circuit short circuit to ground ● ACT sensor circuit short circuit to power ● ACT sensor failure	Refer to the electrical guides. and check the ACT sensor and circuits.
P010000	Mass or Volume Air Flow A Circuit	● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure	Refer to the electrical guides and check the MAF sensor and circuits. Clear the DTCs and test for normal operation. If the problem persists, renew the MAF sensor.
P010400	Mass or Volume Air Flow A Circuit Intermittent/Erratic	● Air leakage ● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure	Refer to the electrical guides and check the MAF sensor and circuits. Clear the DTCs and test for normal operation. If the problem persists, renew the MAF sensor.
P010600	Manifold Absolute Pressure/BARO Sensor Range/Performance	● Intake manifold air leak (loose or missing component) ● MAP sensor circuit(s) fault ● MAP sensor failure	Check the intake manifold for security, etc. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010700	Manifold Absolute Pressure/BARO Sensor Low	● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor failure	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010800	Manifold Absolute Pressure/BARO Sensor High	● Manifold absolute pressure (MAP) sensor circuit short circuit to power ● MAP sensor failure	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010900	Manifold Absolute Pressure/BARO Sensor Intermittent	● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P010A00	Mass or Volume Air Flow B Circuit	● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure	Check the MAF sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010E00	Mass or Volume Air Flow B Circuit Intermittent/Erratic	● Air leakage ● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure	Refer to the relevant workshop manual section. Check the MAF sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010F00	Mass or Volume Air Flow Sensor A/B Correlation	● Air leakage (post turbocharger) ● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure ● VGT actuator circuit high resistance ● VGT actuator circuit short circuit to ground ● VGT actuator circuit short circuit to power ● VGT actuator failure	Refer to the relevant workshop manual section. Check the MAF sensor and circuits. Refer to the electrical guides. For VGT actuator circuit tests, refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P011200	Intake Air Temperature Sensor 1 Circuit Low (Bank 1)	● Intake air temperature (IAT) sensor circuit high resistance ● IAT sensor circuit short circuit to ground ● IAT sensor failure	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the values are outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011300	Intake Air Temperature Sensor 1 Circuit High (Bank 1)	● Intake air temperature (IAT) sensor circuit short circuit to power ● IAT sensor failure	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the values are outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011400	Intake Air Temperature Sensor 1 Intermittent/Erratic (Bank 1)	● Intake air temperature (IAT) sensor circuit high resistance ● IAT sensor circuit short circuit to ground ● IAT sensor circuit short circuit to power ● IAT sensor failure	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the values are outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P023400	Turbocharger/Supercharger A Overboost Condition	● Air leakage ● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short	Refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. For EGR valve tests, refer to the relevant workshop manual section. Check for DTCs indicating EGR or VGT actuator faults. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		circuit to power - MAP sensor failure - Exhaust gas recirculation (EGR) fault - VGT actuator fault	
P029900	Turbocharger/Supercharger A Underboost Condition	- Air leakage, post turbocharger - Manifold absolute pressure (MAP) sensor circuit high resistance - MAP sensor circuit short circuit to ground - MAP sensor circuit short circuit to power - MAP sensor failure - Exhaust gas recirculation (EGR) fault - VGT actuator fault	Check for a post turbocharger air leak, for additional information, refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. For EGR valve tests, refer to the relevant workshop manual section. Check for DTCs indicating EGR or VGT actuator faults. Refer to the warranty policy and procedures manual if a module is suspect.
P200800	Intake Manifold Runner Control Circuit / Open (Bank 1)	- Port de-activation solenoid circuit high resistance - Port de-activation solenoid circuit short circuit to ground - Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P200900	Intake Manifold Runner Control Circuit Low (Bank 1)	- Port de-activation solenoid circuit high resistance - Port de-activation solenoid circuit short circuit to ground - Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P201000	Intake Manifold Runner Control Circuit High (Bank 1)	- Port de-activation solenoid circuit short circuit to power - Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P219900	Intake Air Temperature ½ Correlation	- Intake air temperature (IAT) sensor circuit high resistance, short circuit to ground, short circuit to power - Air charge temperature (ACT) sensor circuit high resistance, short circuit to ground, short circuit to power - IAT sensor failure - ACT sensor failure - ECM failure	Check the IAT sensor and circuits. Refer to the electrical guides. For ACT sensor, refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.

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Intake Air Distribution and Filtering - TDV6 2.7L Diesel - Air Cleaner

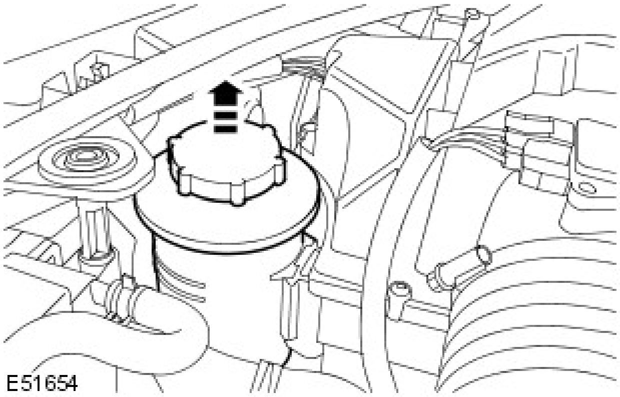
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

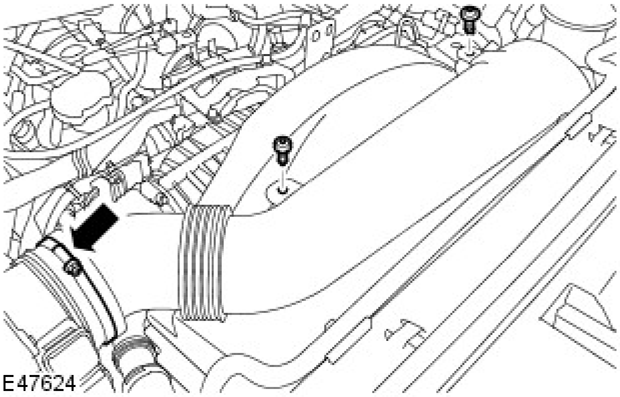
2. If installed, release the Dynamic Response reservoir.

- Release the clip.
- Tie the reservoir aside.



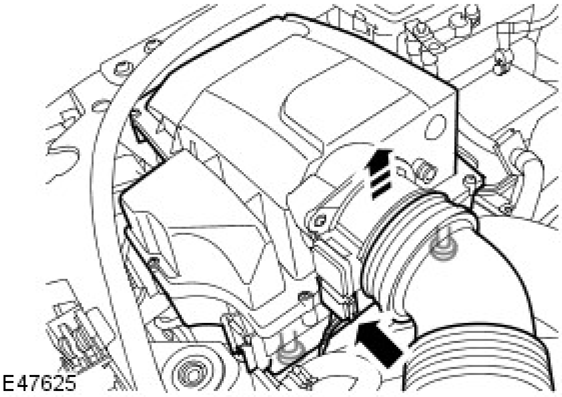
3. Remove the air cleaner outlet pipe.

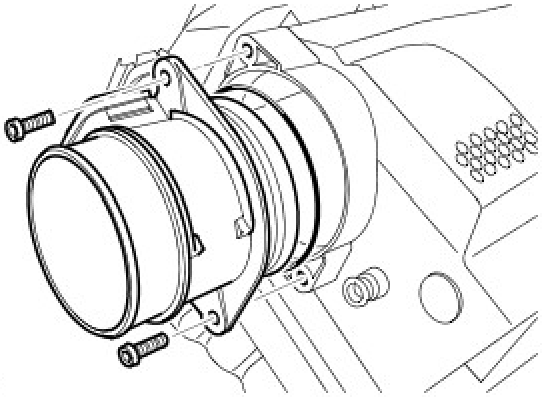
- Remove the 2 screws.
- Loosen the clip.



4. Remove the air cleaner assembly.

- Disconnect the electrical connector.
- Release the air cleaner from the 2 grommets.




E47626

5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the manifold absolute pressure (MAP) sensor.

- Remove the 2 Torx screws.
- Remove the O-ring seal.

Installation

1. NOTE: When installing the air cleaner, make sure the locating pegs fit securely into the grommets.

To install, reverse the removal procedure.

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Intake Air Distribution and Filtering - TDV6 2.7L Diesel - Air Cleaner Element

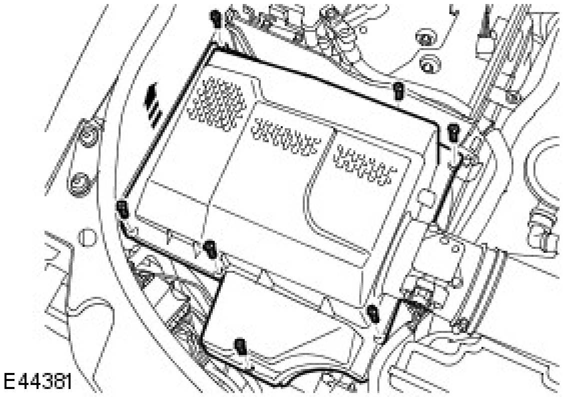
Removal and Installation

Removal

1. Release the air cleaner housing cover.

- Remove the 7 screws.

2. Remove the air cleaner element.



Installation

1. To install, reverse the removal procedure.

- Clean the base of the air cleaner.
- Check that the drain valve is clear.

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Intake Air Distribution and Filtering - TDV6 2.7L Diesel - Charge Air Cooler

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

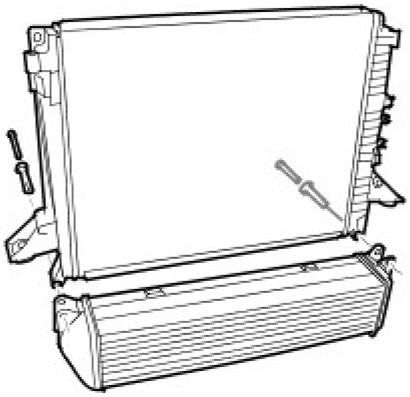
Raise and support the vehicle.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the radiator.
For additional information, refer to: Radiator (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the charge air cooler.

- Remove the 2 retaining pins.


E49355

Installation

1. Install the charge air cooler.

- Install the 2 retaining pins.

2. Install the radiator.
For additional information, refer to: Radiator (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Intake Air Distribution and Filtering - TDV8 3.6L Diesel -

Item	**Specification**
Air Cleaner	Mann and Hummel fitted with replaceable air cleaner element, and Mass Air Flow (MAF) sensors
MAF Sensors:	
Make	Siemens
Location	In the air cleaner outlet duct

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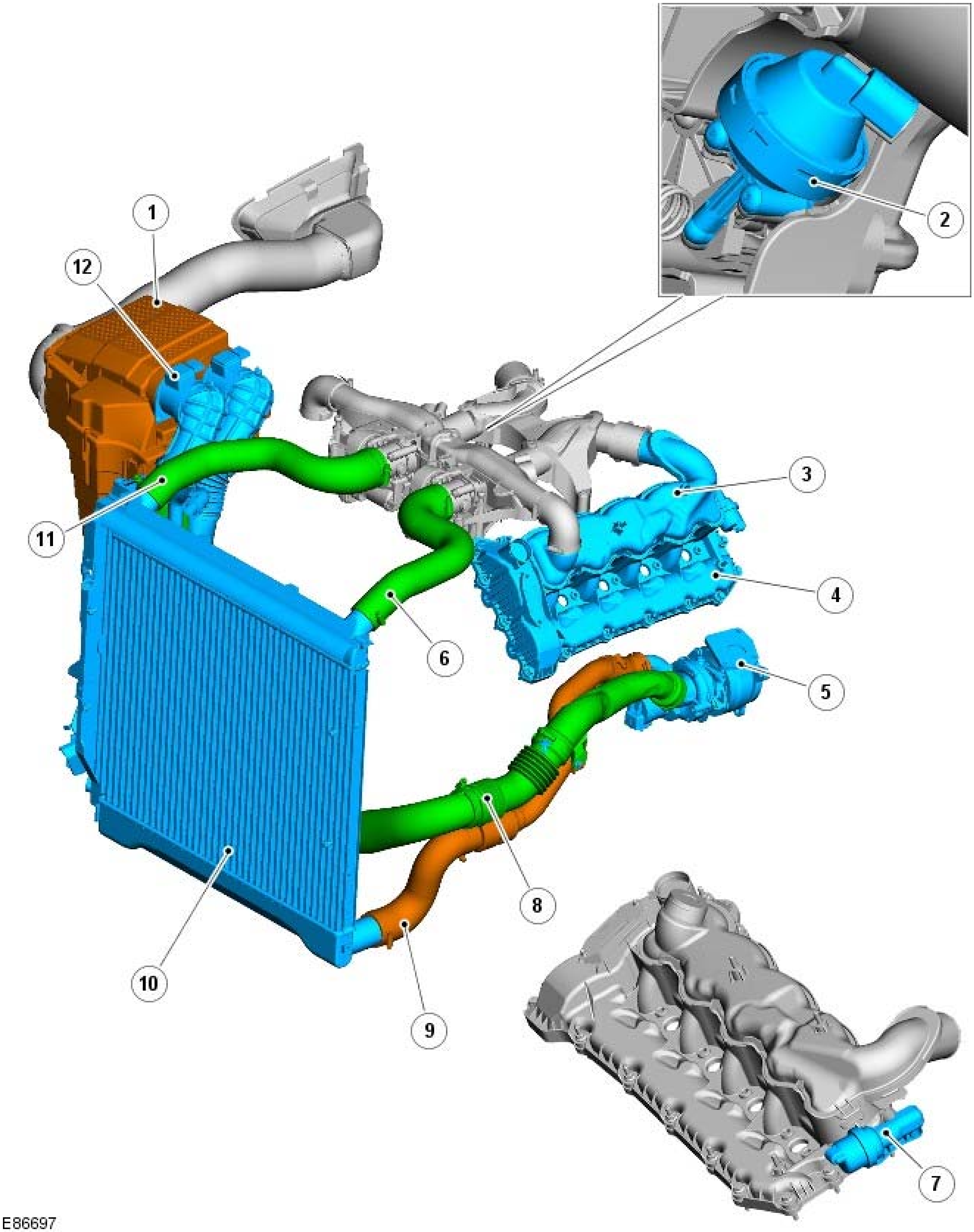
Intake Air Distribution and Filtering - TDV8 3.6L Diesel - Intake Air Distribution and Filtering

Description and Operation

COMPONENT LOCATION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E86697

Item	Part Number	Description
1	-	Air cleaner housing
2	-	Variable intake actuator
3	-	LH intake manifold
4	-	LH cylinder head cover
5	-	LH turbocharger

6	-	Charge air cooler to intake manifold tube
7	-	Intake port deactivation actuator
8	-	Air cleaner to turbo tube
9	-	Turbocharger to charge air cooler tube
10	-	Charge air cooler
11	-	Charge air cooler to intake manifold tube
12	-	mass air flow (MAF) sensors

paragraph

OVERVIEW

The intake air distribution system comprises:

- Twin MAF/intake air temperature (IAT) sensors
- Air cleaner and air cleaner housing
- Charge air cooler
- Twin turbochargers
- Intake port deactivation system

Air is drawn in from the vehicle exterior via the right-hand (RH) wing mounted intake duct, along the inside of the wing to the air cleaner housing intake. The air passes through the air cleaner and exits the air cleaner housing via 2 ports. The clean air then passes through a MAF/IAT sensor (1 per cylinder bank) and is drawn down to the turbochargers. The turbocharger forces the air up to the charge air cooler and out to the electric throttles, where it then flows into the respective intake air manifolds and down to the cylinder heads. The air intake manifold has a variable intake valve which allows the two sides of the manifolds to be connected/separated to balance the airflow.

PORT DEACTIVATION

The cylinder head of the engine has been designed to optimize levels of swirl across the engine speed range. If there is too much swirl as fuel is injected, the high velocity of the swirling gases prevent the jets of atomized fuel reaching the edges of the combustion chamber which will result in poor combustion and higher than normal emissions.

The TDV8 engine features a port deactivation system to achieve the correct amount of swirl in the cylinder.

Each cylinder features two intake ports one is designed as a helical 'swirl' port, configured to create the optimum swirl for good combustion whilst the other is designed as a 'filling-port', capable of supplying high volumes of air without disturbing in-cylinder swirl.

The helical port is open under all operating conditions. At low loads, gas flow is so low that the filling port is closed off raising the gas velocity through the helical port to increase in-cylinder swirl to the required rate. The filling port is opened under high gas-flow conditions to help maintain consistent optimum swirl across the engine's operating range. This ensures that even under high gas flow conditions the amount of swirl is regulated to the optimum amount.

Port deactivation is controlled by butterfly valves operating within the intake manifold. The valves are controlled by vacuum operated solenoids at the rear of each cylinder head. The vacuum solenoids are operated by a vacuum control solenoid in response to control signals from the engine control module (ECM). The solenoids are linked to the butterfly valves via a small arm and cam.

Published: 11-May-2011

Intake Air Distribution and Filtering - TDV8 3.6L Diesel - Intake Air Distribution and Filtering

Diagnosis and Testing

Overview

For information on the description and operation of the intake air distribution and filtering system:
REFER to: Intake Air Distribution and Filtering (303-12D Intake Air Distribution and Filtering - TDV8 3.6L Diesel, Description and Operation).

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Hoses and ducts: condition and fitment ● Air cleaner element condition and fitment ● Restricted air intake ● Vacuum hoses condition and fitment ● Pipework to/from turbochargers: condition and fitment ● Turbochargers: condition and fitment ● Charge air coolers	● Fuse(s) ● Wiring harness(es) ● Loose or corroded electrical connector(s) ● Mass air flow (MAF) sensors ● Manifold absolute pressure/temperature (MAPT) sensors ● Intake air temperature (IAT) sensor - The IAT sensor is built into the right-hand MAF sensor ● Intake manifold tuning (IMT) valve

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
Vehicle does not start/hard starting	● Restricted/Blocked air intake ● Restricted/Blocked air cleaner element	Check the intake air system for blockages or restriction. Rectify as necessary.
Poor performance	● Intake air system fault ● Turbocharger fault(s) ● Exhaust gas recirculation (EGR) valve(s) fault ● Low fuel pressure ● Restricted exhaust system	Check the intake air system for blockages or restriction. Rectify as necessary. Check for DTCs indicating a turbocharger, EGR valve or fuel pressure fault. Rectify as necessary. Check the exhaust system for evidence of damage or restriction. Rectify as necessary.
Excessive intake noise	● Intake air leak after the turbocharger ● Intake pipe disconnected/damaged after the air cleaner ● Air cleaner assembly incorrectly assembled/damaged	Check the intake air system for loose or disconnected hoses or ducts. Check the hoses and ducts for damage, splits, etc. Rectify as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of engine control module (ECM) DTCs:
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible causes	Action
P006A21	Manifold absolute pressure temperature (MAPT) sensor - mass or volume air flow correlation - signal amplitude less than minimum	● Air leakage in the intake path between the turbocharger and the engine	Check the intake air system for leakage after the turbocharger. Check for DTCs indicating a MAPT sensor fault. Clear the DTCs and test for normal operation.
P006A22	Manifold absolute pressure and temperature (MAPT) sensor - mass or volume air flow correlation, right-hand bank - signal amplitude greater than maximum	● Oil ingress into the intake manifold ● MAPT sensor circuit fault ● MAPT sensor fault ● MAF sensor fault ● Turbocharger fault	With the engine at idle, check the manifold air pressure and indicated torque set points using a datalogger function. If the manifold air pressure is greater than 140 KPa (20.31 lbs/in²) or the torque less than 70 Nm (51.63 lbf/ft), check for oil being drawn into the intake manifold. Rectify as necessary. Clear the DTCs and test for normal operation. Stop the engine and turn the ignition on. Using a datalogger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% pulse PWM and check the angle values. The angle at 5% PWM should be 0 - 20%, and at 95% 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P007C16	Right-hand charge air temperature sensor circuit low (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor)	● Charge air temperature sensor circuit: high resistance ● Charge air temperature sensor circuit: short circuit to ground ● Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20 °C (68 °F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P007D17	Right-hand charge air temperature sensor circuit high (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor)	● Charge air temperature sensor circuit: short circuit to power ● Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20 °C (68 °F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P007E27	Right-hand charge air temperature sensor circuit intermittent/erratic (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor)	● Charge air temperature sensor circuit: high resistance ● Charge air temperature sensor circuit: short circuit to ground ● Charge air temperature sensor circuit: short circuit to power ● Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. With the engine running and at operating temperature, check the boost air temperature using a datalogger function. Record the measurement at idle and increase the engine speed to 3,000 rpm. Record the reading and compare with the idle figure. If the value has increased by more than 20 °C in 100 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P007F62	Charge air temperature sensor left and right-hand bank correlation (the charge air temperature sensors are part of the manifold absolute pressure and temperature (MAPT) sensors)	- Intake system fault between the sensor(s) and the engine - Charge air temperature sensor circuit(s): high resistance - Charge air temperature sensor circuit(s): short circuit to ground - Charge air temperature sensor circuit(s): short circuit to power - MAPT sensor(s) fault	Check the intake air system for mechanical faults, leakage, etc. Check the left and right-hand MAPT sensors and circuits. Refer to the electrical guides. With the engine running and at operating temperature, check the boost air temperature using a datalogger function. Record the measurement at idle and increase the engine speed to 3,000 rpm. Record the reading and compare with the idle figure. If the value has changed by more than 30 °C and there are no other DTCs set, install two new sensors. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00A216	Left-hand charge air temperature sensor circuit low (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor)	- Charge air temperature sensor circuit: high resistance - Charge air temperature sensor circuit: short circuit to ground - Left-hand MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20 °C (68 °F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00A317	Left-hand charge air temperature sensor circuit high (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor)	- Charge air temperature sensor circuit: high resistance - Charge air temperature sensor circuit: short circuit to ground - Left-hand MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20 °C (68 °F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00A427	Left-hand charge air temperature sensor circuit intermittent/erratic (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor)	- Charge air temperature sensor circuit: high resistance - Charge air temperature sensor circuit: short circuit to ground - Charge air temperature sensor circuit: short circuit to power - Left-hand MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. With the engine running and at operating temperature, check the boost air temperature using a datalogger function. Record the measurement at idle and increase the engine speed to 3,000 rpm. Record the reading and compare with the idle figure. If the value has increased by more than 20 °C in 100 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00B821	Manifold absolute pressure and temperature (MAPT) sensor - mass or volume air correlation, left-hand bank - signal amplitude less than minimum	- Air leakage in intake path between turbocharger and engine	Check the intake air system for leakage after the turbocharger. Check for DTCs indicating a MAPT sensor fault. Rectify as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P00B822	Manifold absolute pressure and temperature (MAPT) sensor - mass or volume air correlation, left-hand bank - signal amplitude greater than maximum	● Oil ingress into the intake manifold ● MAPT sensor circuit fault ● MAPT sensor fault ● MAF sensor fault ● Turbocharger fault	With the engine at idle, check the manifold air pressure and indicated torque set points using a datalogger function. If the manifold air pressure is greater than 140 KPa (20.31 lbs/in²) or the torque less than 70 Nm (51.63 lbf/ft), check for oil being drawn into the intake manifold. Rectify as necessary. Clear the DTCs and test for normal operation. Stop the engine and turn the ignition on. Using a datalogger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% PWM and check the angle values. The angle at 5% PWM should be 0 - 20%, and at 95% PWM 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010036	Right-hand mass air flow (MAF) sensor circuit - signal frequency too low	● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor circuit: high resistance ● MAF sensor fault	Check the right-hand MAF sensor and circuits. Refer to the electrical guides. With the engine at idle, check the air flow using a datalogger function. If the value is greater than 13.88 g/s or less than 11.11 g/s install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010116	Right-hand mass air flow (MAF) sensor range/performance - voltage below threshold	● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault	Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a datalogger function. If the value is less than 11.11 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010117	Right-hand mass air flow (MAF) sensor range/performance - voltage above threshold	● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault	Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a datalogger function. If the value is greater than 13.88 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010121	Right-hand mass air flow (MAF) sensor range/performance - signal amplitude less than minimum	● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault	Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a datalogger function. If the value is less than 11.11 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

DTC	Description	Possible causes	Action
P010122	Right-hand mass air flow (MAF) sensor range/performance - signal amplitude greater than maximum	● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault	Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a datalogger function. If the value is greater than 13.88 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010221	Right-hand mass air flow (MAF) sensor circuit low - signal amplitude less than minimum	● Intake air system fault ● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks, etc. Rectify as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. Check that the EGR valves are not stuck. Using a datalogger function, monitor the air flow and EGR valve position for both banks and road test the vehicle. Check that the EGR valves are in synch. Rectify as necessary. Clear the DTCs and test for normal operation.
P010322	Right-hand mass air flow (MAF) sensor circuit high - signal amplitude greater than maximum	● Intake air system fault ● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault ● Turbocharger fault	Check the intake air system for leaks, etc. Rectify as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. With the ignition on, engine off, and using a datalogger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% PWM and check the angle values. The angle at 5% PWM should be 0 - 20%, and at 95% PWM 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010438	Right-hand mass air flow (MAF) sensor circuit intermittent/erratic - signal frequency incorrect	● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor circuit: high resistance	Check the right-hand MAF sensor and circuits. Refer to the electrical guides. Measure the mass air flow at idle using a datalogger function and record the value. Increase the engine speed to 2,000 rpm and record the value. If the value has changed by more than 30.55 g/s install a new MAF sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010A36	Left-hand mass air flow (MAF) sensor circuit - signal frequency too low	● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor circuit: high resistance	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. With the engine at idle, check the air flow using a datalogger function. If the value is greater than 13.88 g/s or less than 11.11 g/s install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P010B21	Left-hand mass air flow (MAF) sensor range/performance - signal amplitude less than minimum	● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault	Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a datalogger function. If the value is less than 11.11 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010B22	Left-hand mass air flow (MAF) sensor range/performance - signal amplitude greater than maximum	● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. With the engine at idle, check the air flow using a datalogger function. If the value is greater than 13.88 g/s or less than 11.11 g/s install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010C21	Left-hand mass air flow (MAF) sensor circuit low - signal amplitude less than minimum	● Intake air system fault ● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks, etc. Rectify as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. Check that the EGR valves are not stuck. Using a datalogger function, monitor the air flow and EGR valve position for both banks and road test the vehicle. Check that the EGR valves are in synch. Rectify as necessary. Clear the DTCs and test for normal operation.
P010D22	Left-hand mass air flow (MAF) sensor circuit high - signal amplitude greater than maximum	● Intake air system fault ● MAF sensor circuit: high resistance ● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor fault ● Turbocharger fault	Check the intake air system for leaks, etc. Rectify as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Rectify as necessary. With the ignition on, engine off, and using a datalogger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% PWM and check the angle values. The angle at 5% PWM should be 0 - 20%, and at 95% PWM 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010E38	Left-hand mass air flow (MAF) sensor circuit intermittent/erratic - signal frequency incorrect	● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor circuit: high resistance	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. Measure the mass air flow at idle using a datalogger function and record the value. Increase the engine speed to 2,000 rpm and record the value. If the value has changed by more than 30.55 g/s install a new MAF sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).

DTC	Description	Possible causes	Action
P010F62	Mass or volume air flow sensor right/left-hand correlation - signal compare fault (difference between right and left-hand mass air flow sensors too great)	● MAF sensor circuit: short circuit to ground ● MAF sensor circuit: short circuit to power ● MAF sensor circuit: high resistance ● Air leakage in the intake path	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. Check the intake air path for leaks. Check the MAF sensor for carbon or oil contamination. Install a new MAF sensor as necessary. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011216	Intake air temperature (IAT) sensor circuit low input - voltage below threshold (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	● IAT sensor circuit: high resistance ● IAT sensor circuit: short circuit to ground ● IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20 °C (68 °F) should be 2.5 Kohms. As the two MAF sensors are identical, it is possible to confirm the diagnosis by swapping the units from side to side and testing to see if the DTC resets.
P011317	Intake air temperature (IAT) sensor circuit high input - voltage above threshold (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	● IAT sensor circuit: short circuit to power ● IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20 °C (68 °F) should be 2.5 Kohms. As the two MAF sensors are identical, it is possible to confirm the diagnosis by swapping the units from side to side and testing to see if the DTC resets.
P011427	Intake air temperature (IAT) sensor intermittent/erratic - signal rate of change above threshold (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	● IAT sensor circuit: intermittent high resistance ● IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Read the intake air temperature using a datalogger function and record the value. After ten minutes, read the value again and compare to the first reading. If the value has increased by more than 10°C per 100 ms swap the MAF sensors side to side and recheck.
P011C00	Right-hand bank charge air temperature (MAPT)/intake air temperature (IAT) sensor correlation - signal invalid (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	● Right-hand MAPT sensor temperature circuits: short circuit to ground ● Right-hand MAPT sensor temperature circuits: short circuit to power ● Right-hand MAPT sensor temperature circuits: high resistance ● Right-hand MAPT sensor fault ● Right-hand MAF sensor temperature circuits: short circuit to ground ● Right-hand MAF sensor temperature circuits: short circuit to power ● Right-hand MAF sensor temperature circuits: high resistance ● Right-hand MAF	Check the right-hand MAPT and MAF sensors and circuits. Refer to the electrical guides. Monitor the charge air temperature and intake air temperature signals using a datalogger function. Start the engine and "wiggle" the sensor connectors with the engine running. Check the recorded values for the two sensors, the maximum difference should not exceed +40 °C to -30 °C (104 °F to -22 °F). If the IAT sensor is suspect, swap the MAF sensors side to side and recheck. If the fault remains, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		sensor fault	
P011D00	Left-hand bank charge air temperature (MAPT)/intake air temperature (IAT) sensor correlation - signal invalid (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	● Left-hand MAPT sensor temperature circuits: short circuit to ground ● Left-hand MAPT sensor temperature circuits: short circuit to power ● Left-hand MAPT sensor temperature circuits: high resistance ● Left-hand MAPT sensor fault ● Right-hand MAF sensor temperature circuits: short circuit to ground ● Right-hand MAF sensor temperature circuits: short circuit to power ● Right-hand MAF sensor temperature circuits: high resistance ● Right-hand MAF sensor fault	Check the left-hand MAPT and MAF sensors and circuits. Refer to the electrical guides. Monitor the charge air temperature and intake air temperature signals using a datalogger function. Start the engine and "wiggle" the sensor connectors with the engine running. Check the recorded values for the two sensors, the maximum difference should not exceed 40 °C to -30 °C (104 °F to -22 °F). If the IAT sensor is suspect, swap the MAF sensors side to side and recheck. If the fault remains, install a new left-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023D21	Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude less than minimum	● Intake air system fault ● Turbocharger mechanical fault ● Oil ingestion into manifold	Check the intake air system. Check the turbochargers mechanical condition and operation. Check for oil being drawn into the intake manifold. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023D22	Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude greater than maximum	● Intake air system fault ● Turbocharger mechanical fault ● Intake air temperature (IAT) sensor fault ● Mass air flow (MAF) sensor fault ● Manifold absolute pressure and temperature (MAPT) sensor fault	Check the intake air system. Check the turbochargers mechanical condition and operation. Check for DTCs indicating a listed sensor fault. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		- Exhaust gas recirculation (EGR) sensor fault - Turbocharger actuator position sensor fault	
P023E21	Manifold absolute pressure (MAP) sensor/left-hand turbocharger boost sensor correlation - signal amplitude less than minimum	- Intake air system fault - Turbocharger mechanical fault - Oil ingestion into manifold	Check the intake air system. Check the turbochargers mechanical condition and operation. Check for oil being drawn into the intake manifold. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023E22	Manifold absolute pressure (MAP) sensor/left-hand turbocharger boost sensor correlation - signal amplitude greater than maximum	- Intake air system fault - Turbocharger mechanical fault - Intake air temperature (IAT) sensor fault - Mass air flow (MAF) sensor fault - Manifold absolute pressure and temperature (MAPT) sensor fault - Exhaust gas recirculation (EGR) sensor fault - Turbocharger actuator position sensor fault	Check the intake air system. Check the turbochargers mechanical condition and operation. Check for DTCs indicating a listed sensor fault. Rectify as necessary. Using a datalogger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% PWM in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P065E00	Intake manifold tuning (IMT) valve performance	- IMT valve circuit fault - IMT valve fault	Check the IMT valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new IMT valve. Clear the DTCs and test for normal operation.
P066013	Intake manifold tuning (IMT) valve control circuit open	- IMT valve control circuit: high resistance - IMT valve fault	Check the IMT valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new IMT valve. Clear the DTCs and test for normal operation.
P066111	Intake manifold tuning (IMT) valve control circuit low - circuit short to ground	- IMT valve control circuit: short circuit to ground - IMT valve fault	Check the IMT valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new IMT valve. Clear the DTCs and test for normal operation.
P066212	Intake manifold tuning (IMT) valve control circuit high - circuit short to battery	- IMT valve control circuit: short circuit to power - IMT valve fault	Check the IMT valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new IMT valve. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P123A21	Barometric - turbocharger boost sensor A (right-hand manifold absolute pressure temperature (MAPT) sensor) correlation - signal amplitude less than minimum	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P123A22	Barometric - turbocharger boost sensor A (right-hand manifold absolute pressure temperature (MAPT) sensor) correlation - signal amplitude greater than maximum	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P123B21	Barometric - turbocharger boost sensor B (left-hand manifold absolute pressure temperature (MAPT) sensor) correlation - signal amplitude less than minimum	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor.

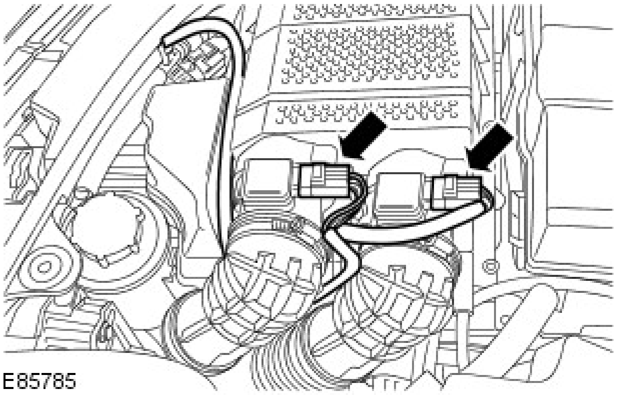
DTC	Description	Possible causes	Action
			REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P123B22	Barometric - turbocharger boost sensor B (left-hand manifold absolute pressure temperature (MAPT) sensor) correlation - signal amplitude greater than maximum	● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensors and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0 °C (32 °F) and with the ignition on, check the manifold absolute pressure in both banks using a datalogger function. If the values are significantly different, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. Compare the right-hand bank manifold absolute pressure with ambient pressure. If the difference exceeds 20 Kpa (2.90 lbs/in²), suspect the ECM. Start the engine and allow to idle. Check the manifold absolute pressure in both banks and compare with the values at ignition on, engine not running. The pressures should have increased together to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a module is suspect.
P200813	Intake manifold runner (port deactivation) control circuit open	● Port deactivation control circuit: high resistance	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P200911	Intake manifold runner (port deactivation) control circuit low	● Port deactivation control circuit: short circuit to ground	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P201012	Intake manifold runner (port deactivation) control circuit high	● Port deactivation control circuit: short circuit to power	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P207000	Intake manifold tuning (IMT) valve - stuck open	● IMT valve circuit fault ● IMT valve fault	Check the IMT valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P207100	Intake manifold tuning (IMT) valve - stuck closed	● IMT valve circuit fault ● IMT valve fault	Check the IMT valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P210502	Throttle actuator control system - forced engine shutdown - general signal fault	● Engine stop by throttle	Check for associated DTCs and rectify as necessary. If this DTC resets, contact the technical help desk.

Intake Air Distribution and Filtering - TDV8 3.6L Diesel - Air Cleaner

Removal and Installation

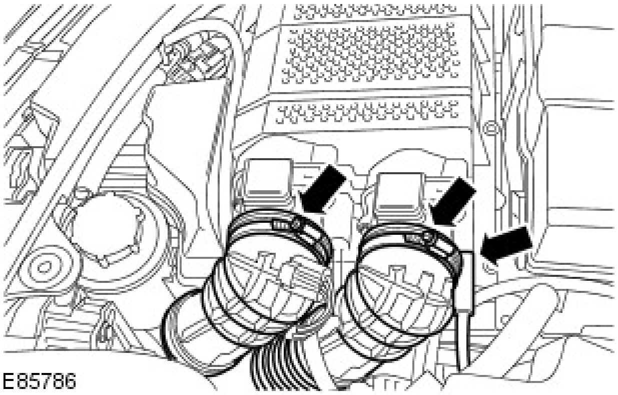
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



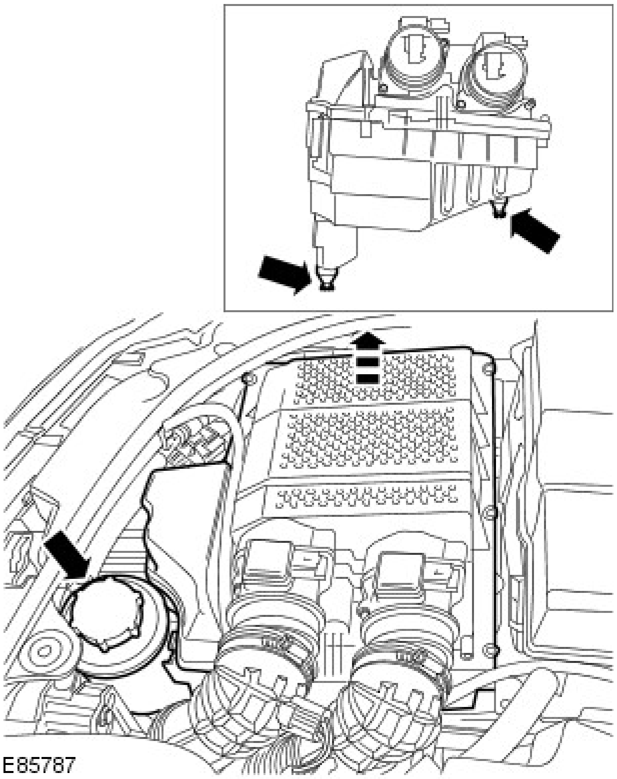
2. Disconnect both mass air flow (MAF) sensor electrical connectors.

- Release and reposition the wiring harness.



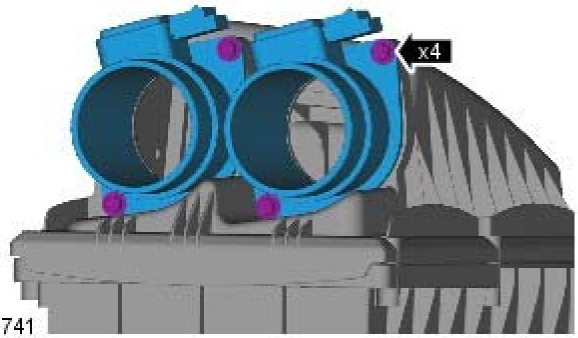
3. Release both MAF sensor outlet pipes.

- Release the 2 clips.
- Release the port deactivation valve hose.


E85787

4. Remove the air cleaner.

- Release the air cleaner from the 2 rubber grommets.
- Release the active cornering enhancement (ACE) reservoir.



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5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the MAF sensors.

- Remove the 4 screws.
- Remove and discard the 2 O-ring seals.

Installation

1. NOTE: When installing the air cleaner, make sure the locating pegs fit securely into the grommets.

To install, reverse the removal procedure.

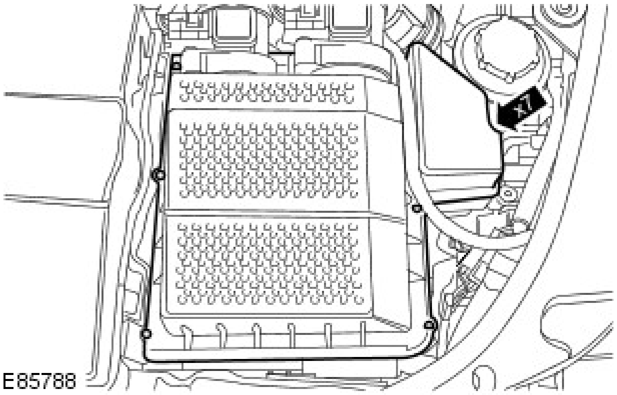
Published: 11-May-2011

Intake Air Distribution and Filtering - TDV8 3.6L Diesel - Air Cleaner Element

Removal and Installation

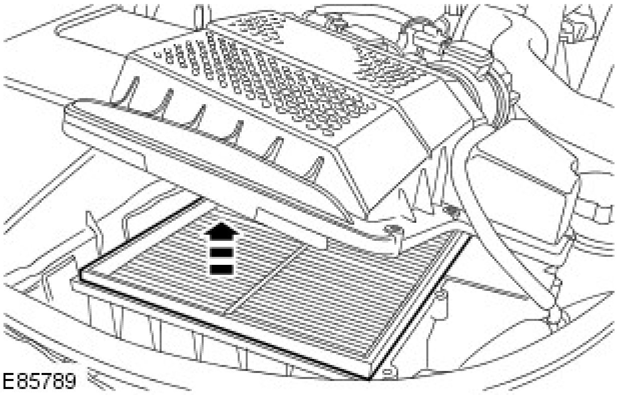
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



2. Release the air cleaner housing cover.

- Fully loosen the 7 screws.



3. Remove the air cleaner element.

Installation

1. Clean the base of the air cleaner.

2. To install, reverse the removal procedure.

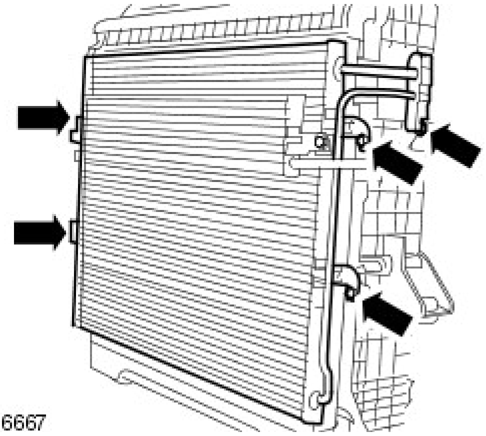
Published: 11-May-2011

Intake Air Distribution and Filtering - TDV8 3.6L Diesel - Charge Air Cooler

Removal and Installation

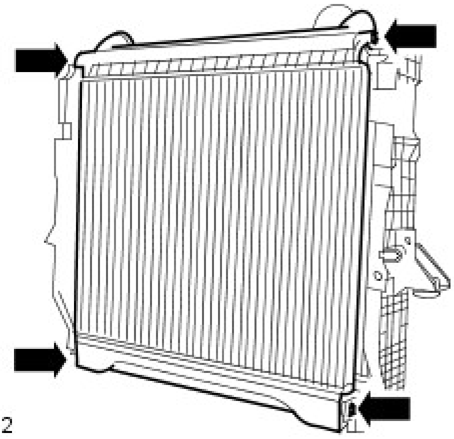
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Remove the cooling module.
   For additional information, refer to: Cooling Module (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).



E86667

4. Remove the condenser core and auxiliary radiator.
   - Remove the 5 bolts.



E86672

5. Remove the charge air cooler.
   - Remove the 4 screws.

Installation

1. Install the charge air cooler.
   - Tighten the screws.
2. Install the condenser core and auxiliary radiator.
   - Tighten the bolts to 8 Nm (6 lb.ft).
3. Install the cooling module.
   For additional information, refer to: Cooling Module (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).
4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Evaporative Emissions - V8 S/C 4.2L Petrol -

Torque Specifications

Description	Nm	lb-ft
Evaporative emissions canister bolts	23	17

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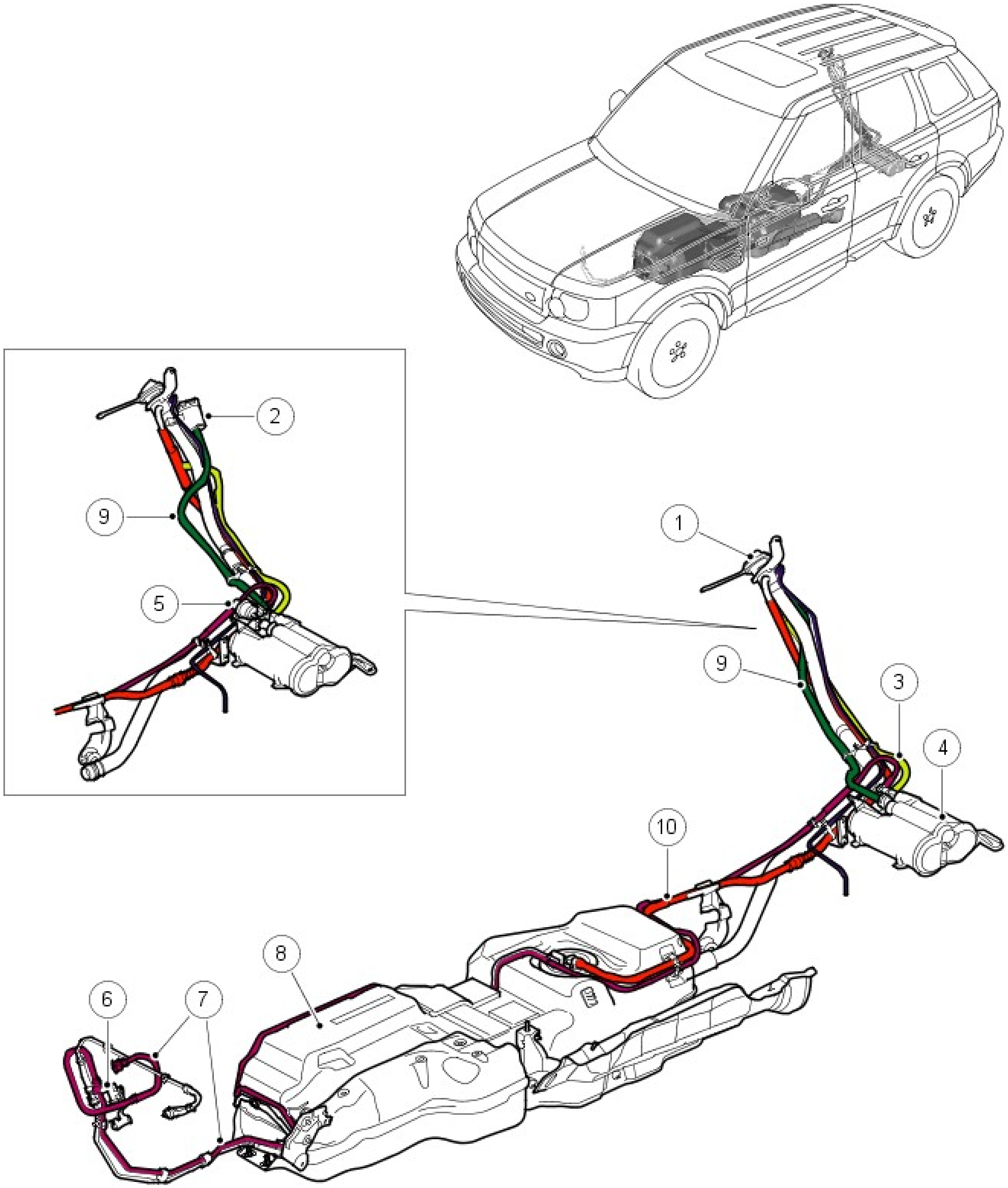
Evaporative Emissions - V8 S/C 4.2L Petrol - Evaporative Emissions

Description and Operation

Evaporative Emissions Component Layout - 4.2L V8 Supercharged



E57468

Item	Part Number	Description
1	-	Fuel filler pipe/cap
2	-	DMTL pump filter (NAS only)
3	-	Fuel tank vent hose to canister
4	-	Charcoal canister
5	-	DMTL pump (NAS only)
6	-	Purge valve
7	-	Purge hose
8	-	Fuel tank
9	-	Charcoal canister vent hose (All except NAS) or DMTL pump vent hose (NAS)
10	-	Fuel tank breather hose from tank

GENERAL

The evaporative emission (EVAP) control system reduces the level of hydrocarbons released into the atmosphere by fuel vapor venting from the fuel tank. The system comprises a charcoal canister, purge valve and interconnecting vent pipes and hoses. The vent pipes are connected to the system components using quick release connectors.

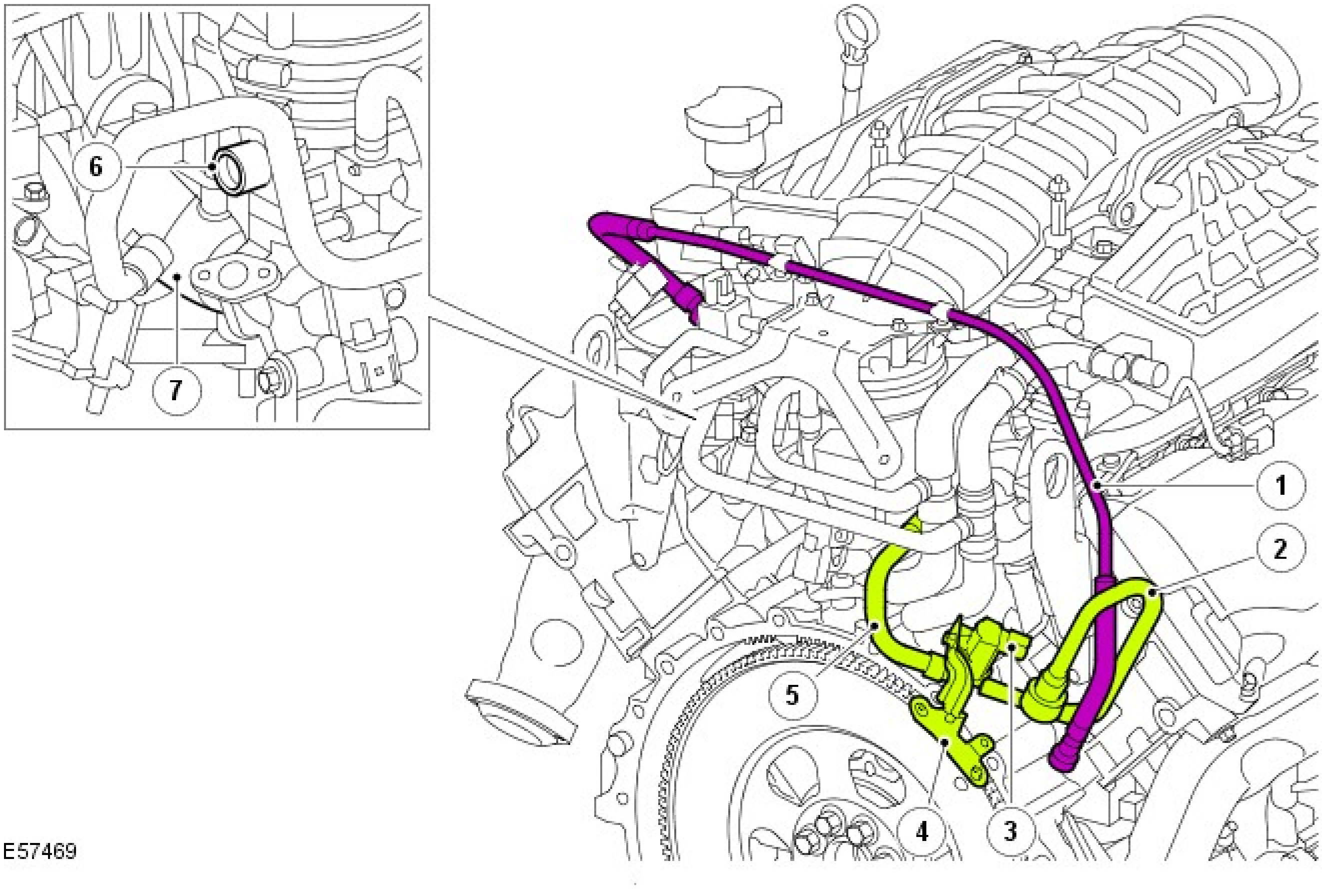
Fuel vapor is generated by the fuel in the tank and the amount of vapor produced increases as the fuel heats up. Fuel vapor can flow freely to the charcoal canister via the tank venting system. The venting system consists of roll over valves and a liquid vapor separator mounted internally in the tank and then externally via a breather hose. The breather line allows the fuel vapor to flow to the charcoal canister via a 'Y' piece mounted on the filler pipe.

On NAS vehicles the vapor generated in the fuel tank during refueling flows without restriction to the charcoal canister.

On all vehicles except NAS, the vapor is restricted in its path to the charcoal canister but can flow freely during the fuel filling operation to atmosphere, via the filler opening.

The vapor passes into the charcoal canister where it is absorbed and stored by the charcoal. Because there is a limit to the amount of vapor the canister can contain, the fuel vapor is purged from the canister when the engine is running and burned in the engine.

PURGE VALVE AND HOSES



Item	Part Number	Description

1	-	Fuel feed jump hose (Ref. only)
2	-	Purge hose connector
3	-	Purge valve
4	-	Bracket
5	-	Purge hose
6	-	Electronic throttle
7	-	Induction elbow

The purge valve is located at the rear of the engine, on a bracket which is attached to the transmission bell housing. The purge hose is routed from the purge valve, into the induction elbow and is secured with a quick fit conector.

The purge hose is connected, at the right hand rear of the engine, with a quick release coupling to the purge line which runs parallel with the fuel feed line along the top of the fuel tank to the charcoal canister.

The purge hose continues from the purge valve and is routed to a connection on the air intake elbow assembly. The hose is connected to the elbow with a quick release connector.

The purge valve is located on a bracket on the bell housing and is secured with a single bolt. The purge valve is a solenoid operated valve which is closed when de-energized. The valve is controlled by the Engine Control Module (ECM) and is operated when engine operating conditions are correct to allow purging of the charcoal canister.

The purge valve is Pulse Width Modulated (PWM) at 10Hz by the ECM. At this high frequency, the pulses of purge gas flow into the induction elbow in an almost a continuous flow. The valve operates between 7% and 100% duty or mark space ratio (% open time).

The atmospheric pressure at the air intake vent of the system is higher than the inlet manifold pressure under all throttled engine running conditions. It is this pressure differential across the system that causes the air to flow through the air intake, through the purge system, and in to the engine. The operation of the supercharger does not affect the purging process.

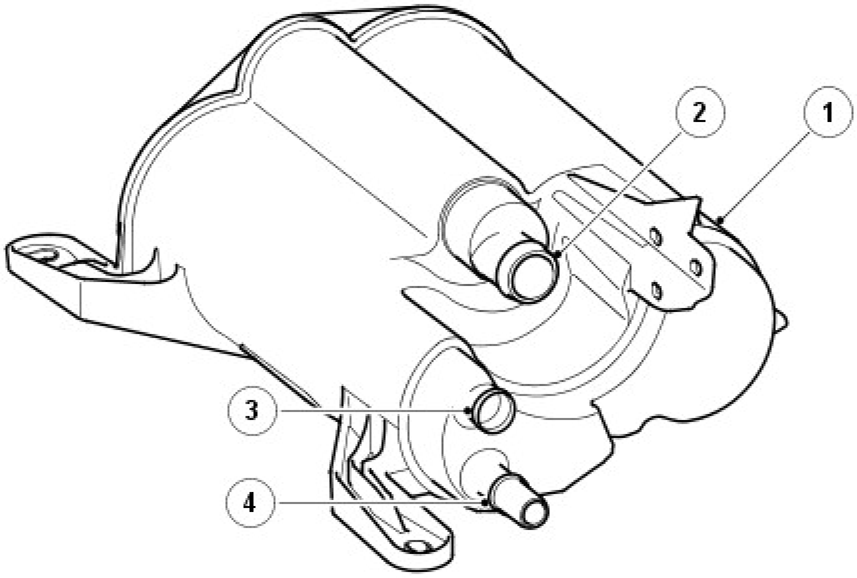
The ECM waits until the engine is running above 40°C (104°F) coolant temperature with closed loop fuel operational before the purging process is activated. Under these conditions the engine should be running smoothly with no warm up enrichment. The purge valve duty (and flow) is initially ramped slowly because the vapour concentration is unknown (a sudden increase in purge could cause the engine to flood). The concentration is then determined from the amount of adjustment that the closed loop fuelling is required to make to achieve the target Air Fuel Ratio (AFR). Once the concentration has been determined, the purge flow can be increased rapidly and the injected fuel can be proactively adjusted to compensate for the known purge vapour and the target AFR control is maintained.

When the purging process is active, fresh air is drawn into the charcoal canister via the DMTL valve atmospheric vent connection and its filter on NAS vehicles or, via the vent hose connection and the spider trap on non NAS vehicles.

On NAS vehicles the system does not include a pressure test point. Pressure testing of the purge valve hose is achieved by disconnecting the purge valve joint on the underside of the vehicle, forward of the fuel tank and connecting a special tool to allow the system to be pressure tested. The test performs a pressure test on the purge hose connection forward of the fuel tank back to the charcoal canister. The special tool is then connected to the purge hose connection forward of the fuel tank to perform a pressure test on the purge hose to the purge valve.

CHARCOAL CANISTER

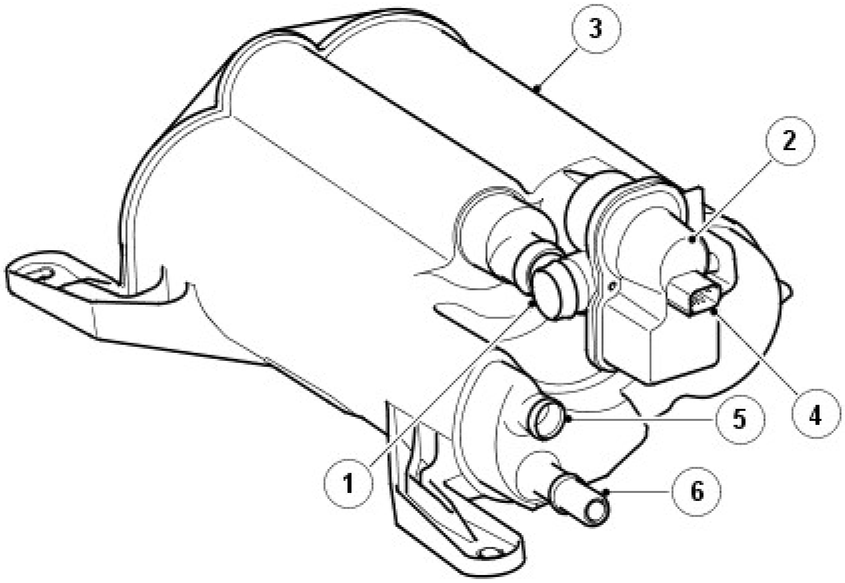
Charcoal Canister - All except NAS



E44560

Item	Part Number	Description
1	-	Charcoal canister
2	-	Charcoal canister atmospheric vent connection
3	-	Purge hose connection
4	-	Charcoal canister tank vent connection

Charcoal Canister - NAS



E44561

Item	Part Number	Description
1	-	Charcoal canister atmospheric vent connection (via DMTL pump)
2	-	DMTL pump
3	-	Charcoal canister
4	-	Electrical connector
5	-	Purge hose connection
6	-	Charcoal canister tank vent hose connection

The charcoal canister is located in a central position, forward of the spare wheel. It is attached at the rear with two bolts which screw into the spare wheel carrier. At the front, the canister has two lugs which locate in the parking brake module support bracket.

The canister on ROW vehicles has a capacity of 1400cc (85.4 in^3).

The canister on NAS vehicles has a capacity of 3000cc (183 in^3).

The canister has three ports which allow for the attachment of the atmospheric vent hose, the purge hose and the tank vent hose. On NAS vehicles the atmospheric vent hose connection allows for the attachment of the DMTL pump.

The canister contains a bed of activated charcoal or carbon. The charcoal is produced using special manufacturing techniques to treat the charcoal with oxygen. The oxygen treatment opens up millions of pores between the carbon atoms resulting in a highly porous charcoal with a very large effective surface area which is capable of absorbing large quantities of fuel vapor. Once treated the charcoal is known as 'activated' carbon or charcoal. The charcoal canister on NAS vehicles uses a higher grade charcoal to meet the requirements of LEV2 emission regulations.

DIAGNOSTIC MONITORING OF TANK LEAKAGE (DMTL) - NAS ONLY

The DMTL system is a legislative requirement for NAS vehicles. The DMTL system periodically checks the EVAP system and the fuel tank for leaks when the ignition is switched off.

The DMTL system comprises the previously described components of the EVAP system with the following additional components; a DMTL pump and a DMTL filter.

The DMTL pump is connected to the atmospheric vent of the charcoal canister and incorporates a Positive Temperature Co-efficient (PTC) heating element, a normally open valve and a reference orifice. The DMTL pump is only operated when the ignition is switched off and is controlled by the ECM. The ECM also monitors the electric air pump operation and the normally open valve for faults.

The DMTL filter protects the pump from dust being drawn into the system when the pump is being operated. The filter is located on the fuel filler pipe and is connected to the DMTL pump by a hose.

DMTL Operation

To check the fuel tank and the EVAP system for leaks, the ECM operates the DMTL pump and monitors the current draw. Initially, the ECM establishes a reference current by pumping air through the reference orifice and back to atmosphere. Once the reference current is determined, the ECM closes the normally open valve which seals the EVAP system. The purge valve remains de-energized and is therefore closed. The output from the air pump is diverted from the reference orifice and into the EVAP system.

When the normally open valve is closed, the load on the air pump falls to zero. Providing there are no leaks, the air pump will begin to pressurise the EVAP system and the load and current draw in the pump increases. By monitoring the rate and level of the current increase, the ECM can determine if there is a leak in the EVAP system.

During normal vehicle operation, the ECM energizes the heating element in the pump to prevent condensation formation and possible incorrect current readings.

Leaks are classified as:

- Minor - equivalent to a hole diameter of 0.5 to 1.0 mm (0.02 to 0.04 in)
- Major - equivalent to hole diameter of 1.0 mm (0.04 in) or greater.

The ECM performs a check for major leaks each time the ignition is switched off, providing the following conditions are met:

- The vehicle speed is zero
- The engine speed is zero
- The pressure altitude (70 kPa (10.15 lbf/in^2) derived from engine load calculations) is below 3047 m (10000 feet)
- The ambient temperature is between 0 and 40°C (32 and 104°F)
- The charcoal canister load factor is 2 or less (where the load factor is a measure, between -1 and +30, of the fuel vapor stored in the charcoal canister. Where -1 is 0% fuel vapor, 0 is stoichiometric fuel vapor level and +30 is 100% saturated with fuel vapor.
- The fuel tank level is valid and between 15 and 85% of nominal capacity
- The engine running time during the previous cycle was more than 10 minutes
- The battery voltage is between 10 and 15 volts
- The last engine off time was more than 180 minutes
- No errors are detected with the EVAP components, the ambient air temperature and the fuel level
- High range must be selected on the transfer box.

• NOTE: A leak test can be performed using T4. This overrides the above conditions and is useful for checking correct system and component operation.

The ECM performs a check for minor leaks after every 2nd major leak check or after refuelling is detected.

When the leak check is complete, the ECM stops the DMTL pump and opens (de-energizes) the normally open valve.

If the fuel filler cap is opened or refuelling is detected during the leak check, by a sudden drop in the current draw or a rise in the fuel level, the ECM aborts the leak check.

If a leak is detected during the check, the ECM stores an appropriate fault code in its memory. If a leak is detected on two consecutive checks, the ECM illuminates the Malfunction Indicator Lamp (MIL) in the instrument cluster on the next drive cycle.

The duration of a leak check can be between 60 and 600 seconds depending on the results and fuel tank level.

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Evaporative Emissions - V8 S/C 4.2L Petrol - Evaporative Emission Canister

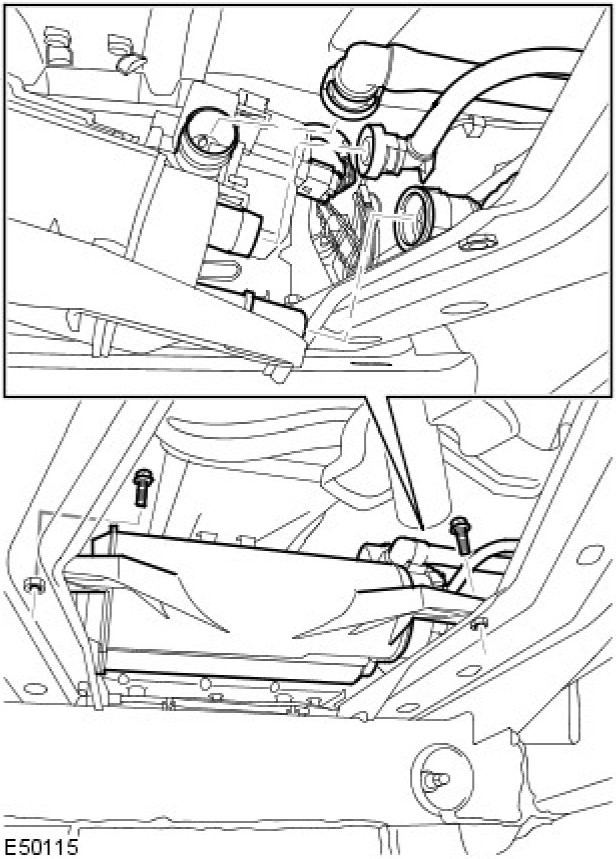
Removal and Installation

Removal

1. Remove the spare wheel and tire.

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

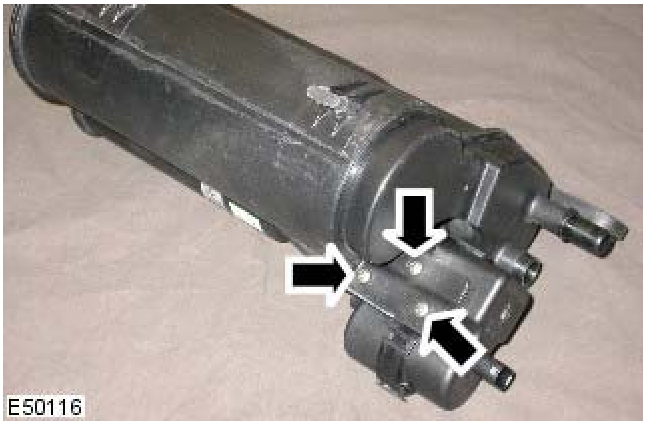
Raise and support the vehicle.



E50115

3. Remove the evaporative emissions canister.

- Remove the 2 bolts.
- Disconnect the 3 lines.
- Disconnect the electrical connector.



E50116

4. NOTE: Do not disassemble further if the component is removed for access only.

NAS vehicles: Remove the fuel tank leakage detection module.

- Remove the 3 screws.

Installation

1. NAS vehicles: Install the fuel tank leakage detection module.

- Install the screws.

2. Install the evaporative emissions canister.

- Connect the electrical connector.
- Connect the lines.
- Tighten the bolts to 23 Nm (17 lb.ft).

3. Install the spare wheel and tire.

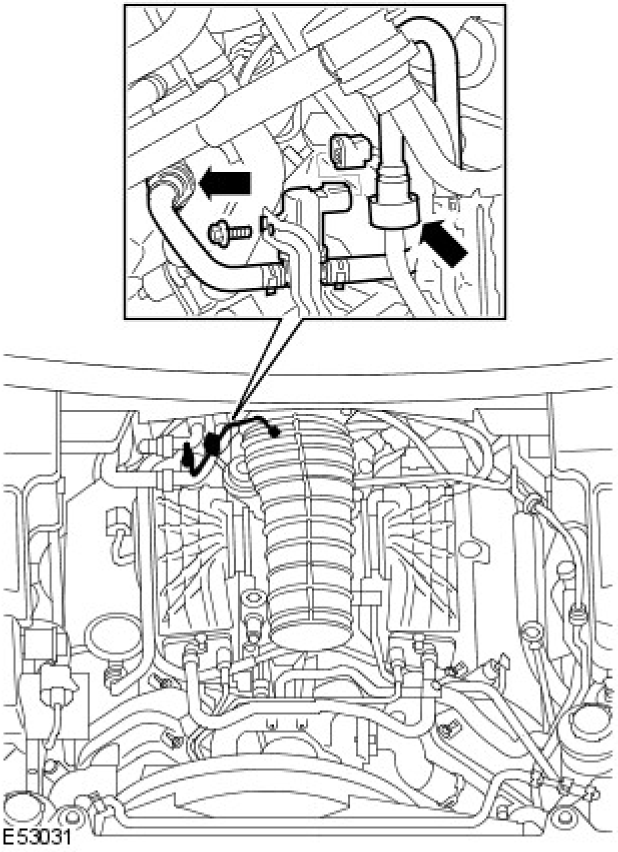
Published: 11-May-2011

Evaporative Emissions - V8 S/C 4.2L Petrol - Evaporative Emission Canister Vent Solenoid

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).
2. Remove the throttle body.
   For additional information, refer to: Throttle Body Gasket (303-04, Removal and Installation).
3. Remove the exhaust system.
   For additional information, refer to: Exhaust System (309-00, Removal and Installation).
4. Disconnect the purge hose at the intake elbow.
   - Release the clip.
5. Raise the vehicle on the lift.
6. Remove the emission canister vent solenoid.
   - Release and disconnect the electrical connector.
   - Release the clip and disconnect the purge line.
   - Remove the bolt.



Installation

1. Install the purge valve.
   - Install the bolt.
   - Connect the hose.
   - Connect and secure the electrical connector.
2. Connect the purge line to the intake elbow.

3. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00, Removal and Installation).

4. Install the throttle body.
For additional information, refer to: Throttle Body Gasket (303-04, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00, Specifications).

Published: 11-May-2011

Evaporative Emissions - V8 S/C 4.2L Petrol - Evaporative Emission Canister Ventilation Filter

Removal and Installation

Removal

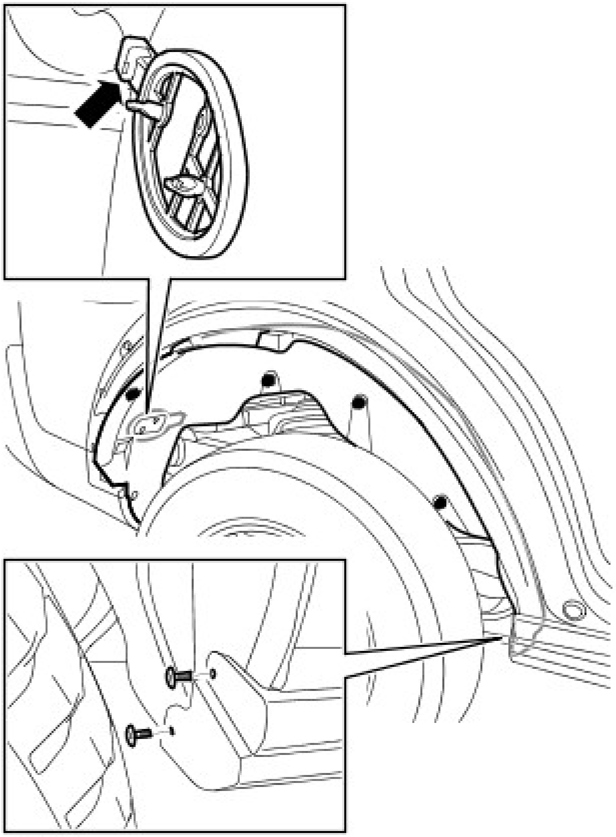
⚠ WARNING: Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the RH rear wheel and tire.

3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



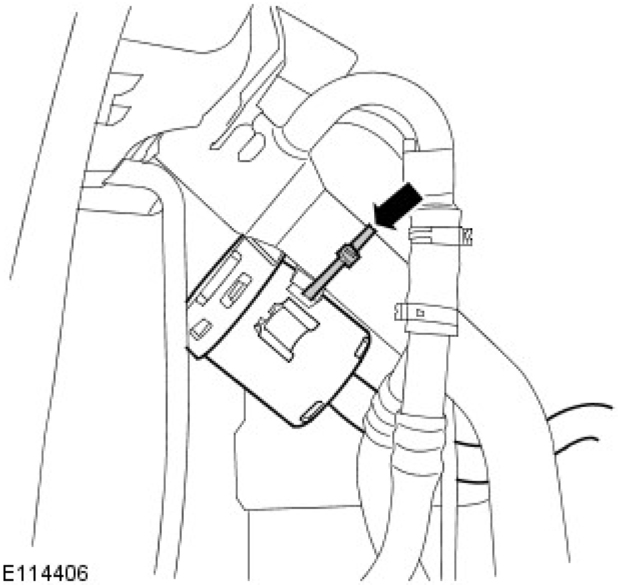
E48478

Remove the RH rear fender splash shield.

- Remove the 2 screws.
- Remove the 6 retainers.
- Disconnect the electrical connector.

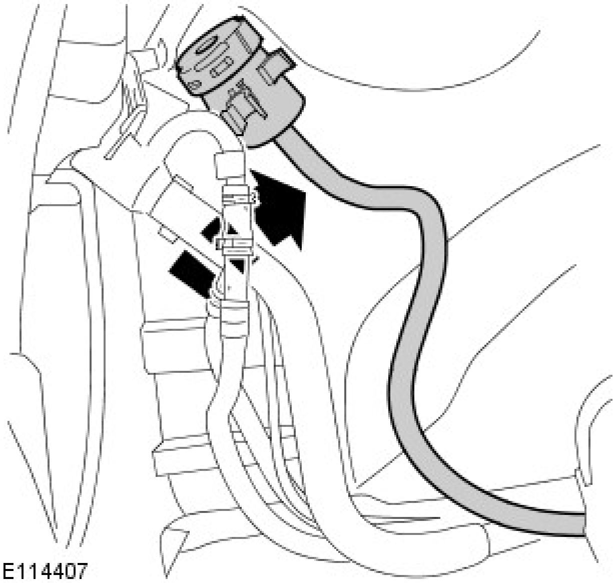
4. Release the evaporative emission canister ventilation filter from the fuel filler pipe.

- Cut the cable tie.



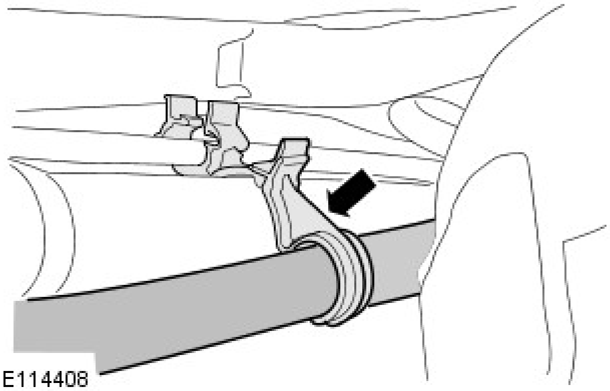
E114406

5. Position the evaporative emission canister ventilation filter to one side.

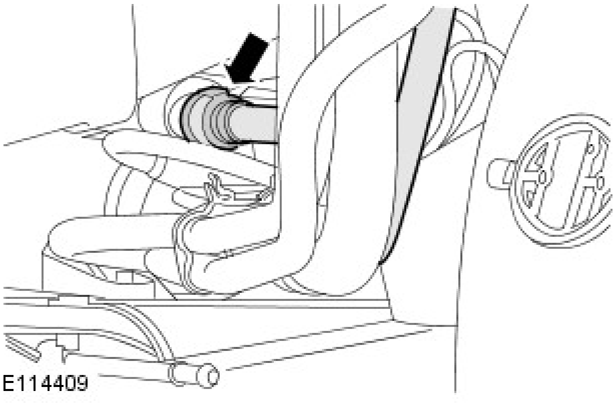


E114407

6. Release the evaporative emission ventilation filter from the clip.



E114408



7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove the evaporative emission canister ventilation filter.

- Release the evaporative emission canister ventilation filter from the evaporative emission canister.

Installation

1. To install, reverse the removal procedure.

Published: 26-Oct-2011

Evaporative Emissions - V8 S/C 4.2L Petrol - Evaporative Emissions

Diagnosis and Testing

Principles of Operation

For a detailed description of the evaporative emission system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Evaporative Emissions (303-13 Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Description and Operation).

Inspection and Verification

⚠CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Fuel filler cap and seal • Fuel filler neck • DMTL fresh air filter (restriction, etc) • Fuel tank (leaks, damage, etc) • Fuel lines and joints, etc • Carbon canister • Purge valve • Diagnostic module fuel tank leak (DMTL) pump module	• Fuses • Connectors • Harness • Purge valve • Diagnostic module fuel tank leak (DMTL) pump

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.
5. **5.** Where K-Line, Vacutec or other proprietary smoke test equipment is available, it should be utilized to assist with Evaporative Emissions System leak diagnosis.

Symptom Chart

Symptom	Possible Causes	Action
Difficulty in filling fuel tank	• Restriction in the vapour line between the fuel tank and the carbon canister outlet/atmospheric port	Check for restrictions/damage, etc (see visual inspection)
Fuel smell	• System leak • Purge valve inoperative	Check for leaks, check the purge valve operation
'Check Fuel Filler Cap' displayed on Message Center	• Fuel filler cap missing/not tightened after refuelling	Check the fuel filler cap and seal

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Evaporative Leak OBD Fault Rectification Guide

Determine Which DTC Has Been Stored

Using the manufacturer approved diagnostic system, choose **diagnostic session**, then choose the following symptom paths : **Powertrain / engine system / fuel vapour and odor, Powertrain / engine system / fuel tank, Electrical / instruments / warning lamps / engine malfunction lamp / lamp illuminated, Powertrain / engine system / engine performance / fuel consumption high**

• NOTE: This guide covers DTCs that relate to evaporative leak monitoring, as listed in the table below

DTC	Description
P0442-00	DMTL small leak
P0447-00	DMTL COV electrical low (open)
P0448-00	DMTL COV electrical high
P0455-00	DMTL rough leak
P2401-00	DMTL pump electrical low (open)
P2402-00	DMTL pump electrical high
P2404-2F	DMTL noise fault
P2404-29	DMTL reference leak
P2405-00	DMTL reference current low
P2406-00	DMTL reference current high
P2450-00	DMTL COV stuck open
P2451-00	DMTL COV stuck closed
P240B-00	DMTL heater electrical low (open)
P240C-00	DMTL heater electrical high

Attempt To Replicate The Fault Using The "Fuel Leak Check" Forced Test

1. **1.** Record any DTCs that has been logged
2. **2.** Using the manufacturer approved diagnostic system, in the **Recommendations** tab run the **Fuel Leak Check** forced test
3. **3.** For the test to run the fuel level must be between 15% and 85%
4. **4.** During this procedure the engine must be off
5. **5.** The possible responses from the test and the associated DTCs are listed below
6. **6.** If again no fault is found it could suggest that the failure mode is a borderline condition (refer to section 3) or that it was caused by incorrect fitment of the fuel cap or the fuel filler neck is at fault therefore it is important not disturb the fuel cap
7. **7.** Disconnect purge pipe from the purge valve, observe the condition of connection (the seating and condition of the "O" ring) and then reconnect. Using the manufacturer approved diagnostic system, run **Purge Valve Self Test** (to clean the purge valve) then run the **Fuel Leak Check**
8. **8.** If the test failed, a smoke test is required to determine the cause of the leak

• NOTE: P240B & P240C are not included in the **Fuel Leak Check** forced test (these monitors run at every ignition on and complete within 30 seconds)

Response Description	ID	Equivalent DTC
Function running: Reference leak measurement	1	
Function running: Rough leak measurement	2	
Function running: Small leak measurement	3	
Function running: 2nd ref leak measurement	4	
Function running: COV Cleaning	5	
Function aborted due to conditions: Vbatt conditions not correct (too high/ low)	11	
Function aborted due to conditions: Variation Ref. I (reference current) too high	12	P2404-29
Function aborted due to conditions: DMTL electrical fault	13	P0447, P0448
Function aborted due to conditions: Maximum diagnostic time exceeded	14	
Function aborted due to conditions: Crash detected	15	
Function aborted due to conditions: Refuel detected	20	
Function aborted due to conditions: Filler cap opened	21	
Function aborted due to conditions: Engine start	23	
Function aborted due to conditions: Noisy current measurement	24	P2404-2F
Function aborted due to conditions: Ambient temp outside range	26	
Function aborted due to conditions: Ambient pressure outside range	27	
Function aborted due to conditions: Other conditions	29	
Function complete - Tight system, fault free	30	
Function complete - Fine leak detected	31	P0442
Function complete - Rough leak detected	32	P0455
Function complete - Module error	33	P2401, P2402, P2450, P2451, P2405, P2406, P2404-29
Function complete - Medium leak detected	34	P0442, P0455

Read The "Ranking values" To Determine How Far Away The Result Is From The Failure Threshold

9. **9.** When the **Fuel Leak Check** forced test has completed the test results (known as ranking values) will be displayed
10. **10.** These should be compared against the limits shown in the table below
11. **11.** If the test result is borderline then there is a risk that a failure will occur at a later date (during customer usage of the vehicle)
12. **12.** To avoid this the vehicle should be carefully checked for any small leaks

Ranking Value	Normal Result For Tight System	Leak Failure Condition
Rough Leak (40 thou+)	0 > = 50	>= 128
Small Leak (20 thou+)	0 > = 60	>= 128

TRACE THE ROOT CAUSE OF THE FAULT

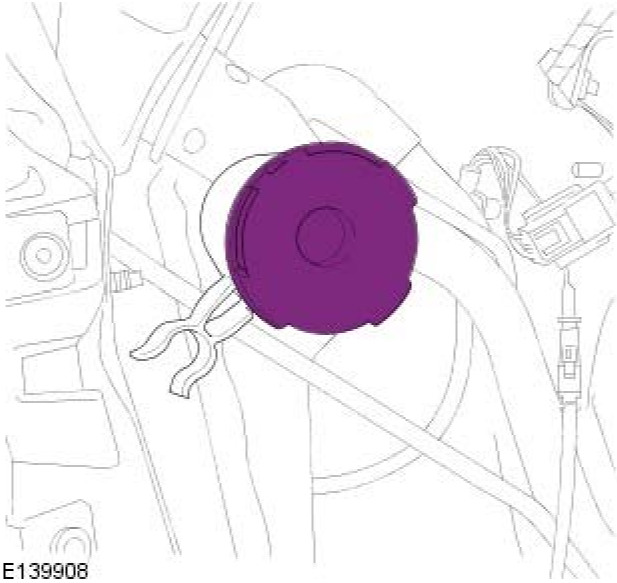
The list below provides some suggested actions to help trace the root cause of the fault

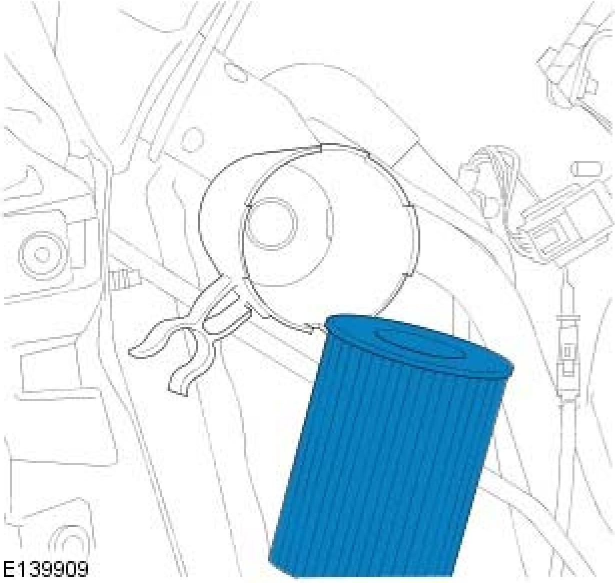
Each action should be followed up with a **Fuel Leak Check** forced test (and ranking value check) in order to determine if any improvement has been made

DTC	Fault Description	Fault Rectification Actions after smoke test
P0442-00	DMTL small leak	● 1. Inspect / refit filler cap after smoke test (inspect filler neck for correct fitment to pocket so that filer neck protrudes) ● 2. Run engine at idle; Using the manufacturer approved diagnostic system, run **Purge Valve Self Test** (to clean the purge valve) ● 3. Check that the DMTL module wiring connector has been installed correctly and that the seals around the connector body and individual wires are in good condition ● 4. Check all fuel system connections are correctly installed and secure ● 5. Visually inspect purge canister, purge pipes, fuel tank and filler neck for any obvious damage ● 6. Try isolating the purge valve by fitting a blanking plug to the purge pipe ● 7. Carry out a smoke test ● 8. Replace the DMTL module
P0447-00	DMTL COV electrical low (open)	● 1. Check fuse ● 2. Check that fuse fits tightly into the fuse holder ● 3. Check that the DMTL module wiring connector has been fitted correctly ● 4. Check wiring harness continuity between DMTL module and ECU connectors ● 5. Replace DMTL module
P0448-00	DMTL COV electrical high	● 1. Check wiring ● 2. Replace DMTL module
P0455-00	DMTL rough leak	● 1. Inspect / refit filler cap after smoke test (inspect filler neck for correct fitment to pocket so that filer neck protrudes) ● 2. Run engine at idle; Using the manufacturer approved diagnostic system, run "Purge Valve Self Test" (to help clean the purge valve) ● 3. Check that the DMTL module wiring connector has been installed correctly and that the seals around the connector body and individual wires are in good condition (surprisingly, this is a potential leakage path!) ● 4. Check all fuel system connections are correctly installed and secure ● 5. Visually inspect purge canister, purge pipes, fuel tank and filler neck for any obvious damage ● 6. Try isolating the purge valve by fitting a blanking plug to the purge pipe ● 7. Carry out a smoke test ● 8. Replace DMTL module
P2401-00	DMTL pump electrical low (open)	● 1. Check fuse ● 2. Check that fuse fits correctly into the fuse holder ● 3. Check that the DMTL module wiring connector has been fitted correctly ● 4. Check wiring harness continuity between DMTL module and ECU connectors ● 5. Replace DMTL module
P2402-00	DMTL pump electrical high	● 1. Check wiring ● 2. Replace DMTL module
P2404-2F	DMTL noise fault	● Replace DMTL module
P2404-29	DMTL reference leak	● Replace DMTL module

DTC	Fault Description	Fault Rectification Actions after smoke test
P2405-00	DMTL reference current low	● Replace DMTL module
P2406-00	DMTL reference current high	● 1. Check for any blockages in the DMTL ventilation pipe & filter ● 2. Replace DMTL module
P2450-00	DMTL COV stuck open	● Replace DMTL module
P2451-00	DMTL COV stuck close	● Replace DMTL module
P240B-00	DMTL heater electrical low (open)	● 1. Check fuse ● 2. Check that fuse fits tightly into the fuse holder ● 3. Check that the DMTL module wiring connector has been fitted correctly ● 4. Check wiring harness continuity between DMTL module and ECU connectors ● 5. Replace DMTL module
P240C-00	DMTL heater electrical high	● 1. Check wiring ● 2. Replace DMTL module

Pre and 10MY Denso/Bosch PCM Systems

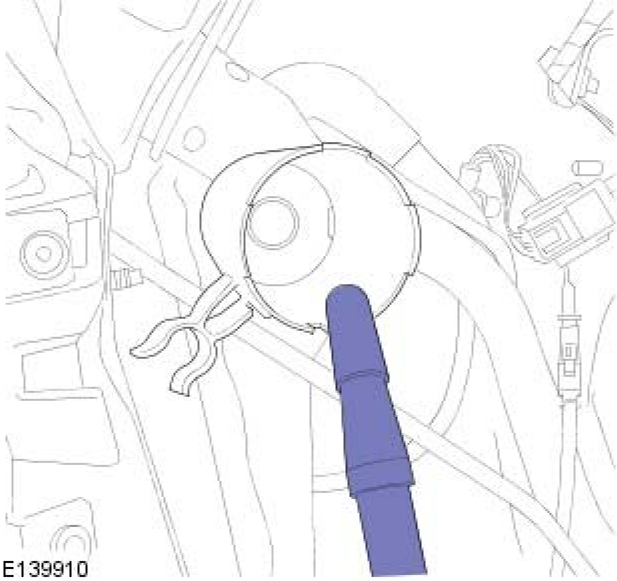




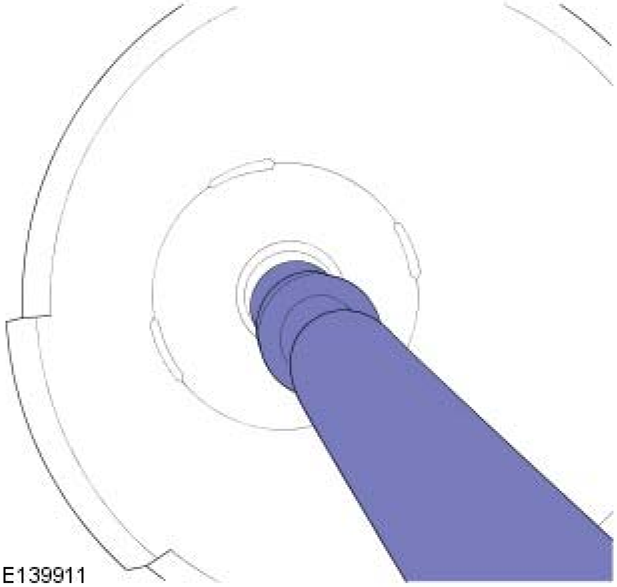
⚠ CAUTION: The Maximum pressure of the EVAP system is 0.07 bar **do not exceed**

• NOTE: Apart from the purge valve connection, it is recommended to smoke test the EVAP system without disturbing any joints associated with the system, this will determine the leak more accurately and quickly

- 1. Remove rear wheel arch liner to access fuel filler neck
- 2. On the fuel filler neck the DMTL filter will be visible as shown in picture. Unclip filter housing from fuel filler neck to gain better access to DMTL filter
- 3. Remove carefully the top of filter to expose filter and remove
- 4. Attach rubber adapter to tip of smoke machine nozzle to ensure tight seal to filter housing. Disconnect the purge pipe from purge valve; this will be an escape point for the smoke to exit
- 5. Allow tester to complete self-test and green READY light to turn ON 2. For best Tester performance; completely unwind Tester’s supply hose
- 6. Press **Smoke** on control panel to fill EVAP system with smoke vapour. The control panel **Smoke** light will light indicating smoke production. The smoke setting is on a 15 minute timer. Pressing the **Smoke** button again turns Tester off. It is normal for the flow meter ball, while in the smoke mode, not to be as steady as when it is in the **Test** mode. Note: The pressure gauge is active only after smoke cycle is complete
- 7. Continue introducing smoke into the EVAP System until the flow meter’s ball stops descending and this assures the system test pressure is met and smoke will appear from the purge pipe, then close off purge pipe with special tool (Test Adapter Hose/EVAP Port 310-142)



E139910



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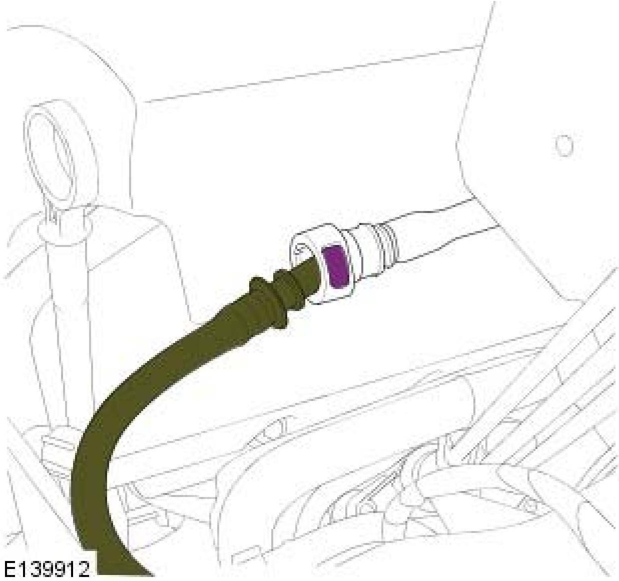
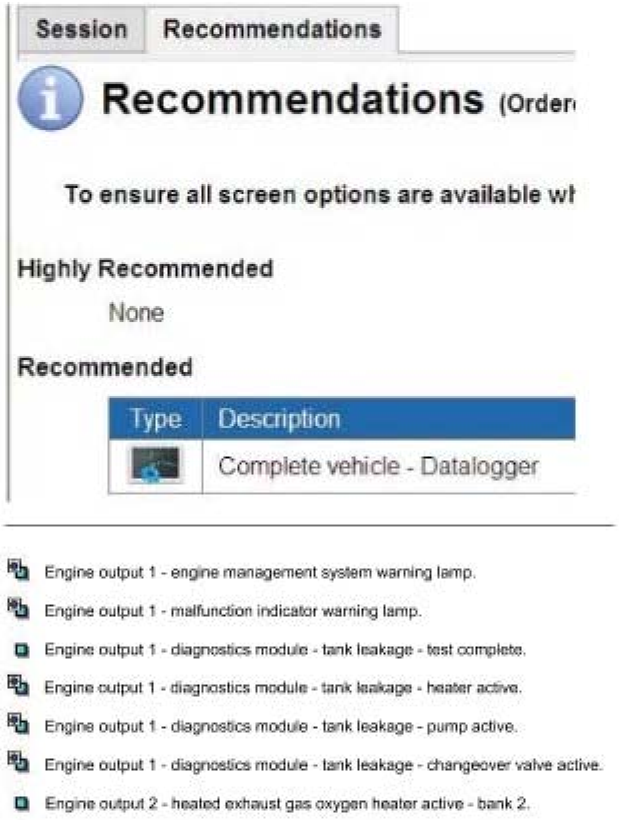


E139912

⚠CAUTION: On some vehicles, the DMTL filter can not be removed, in these instances fill the system through the purge valve and smoke will appear from the filter

Pre 10MY Vehicles

On pre 10MY DMTL systems, Using the manufacturer approved diagnostic system, select **Measurement application** session then select the **Recommendations** tab which will give you access to **Datalogger**. Then select **Engine systems** then select the **Output state control** data-logger signal **Engine output 1 – diagnostic module – tank leakage -change over valve active** which will close the system. Then select **Engine output 1 – diagnostic module – tank leakage – pump active** this will pressurize the EVAP system



Recommendations (Order

To ensure all screen options are available wh

Highly Recommended

None

Recommended

Type	Description
	Complete vehicle - Datalogger

Engine output 1 - engine management system warning lamp.

Engine output 1 - malfunction indicator warning lamp.

Engine output 1 - diagnostics module - tank leakage - test complete.

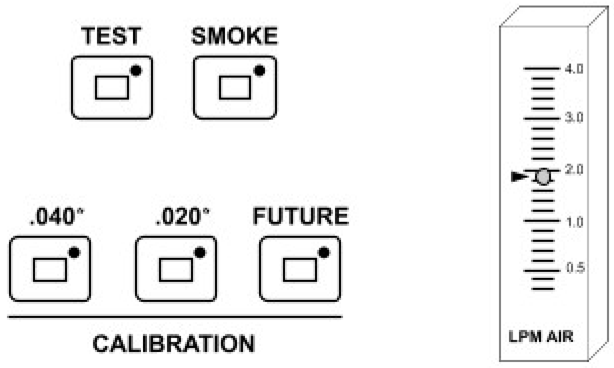
Engine output 1 - diagnostics module - tank leakage - heater active.

Engine output 1 - diagnostics module - tank leakage - pump active.

Engine output 1 - diagnostics module - tank leakage - changeover valve active.

Engine output 2 - heated exhaust gas oxygen heater active - bank 2.

E139916



E139913

10MY vehicles

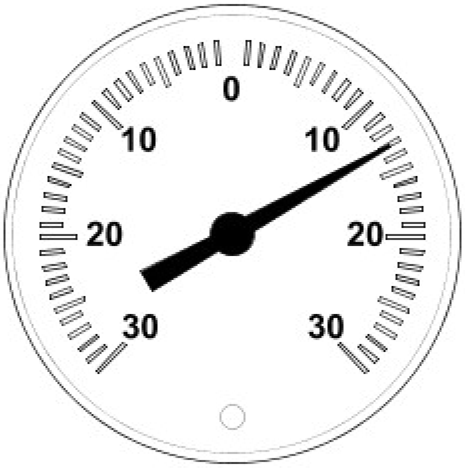
On 10MY vehicles a smoke test application is available so therefore only smoke fill the system and then run the application

- 8. Follow the EVAP system path with the halogen light provided and looks for the smoke exiting the leak(s) or use the UV light provided and look for the dye deposited at the exact location of the leak(s)
- 9. Repair the leak(s) and perform the **Fuel Leak Check** application again or smoke test to verify repair, as well as to make sure there are no additional leaks in the EVAP system

The UltraTraceUV® smoke solution’s dye feature is especially helpful when the leak is in an area that is not readily visible, as on the top of the fuel tank or behind a panel. Once you gain access to the area of the leak, wear the yellow UV glasses and shine the UV light provided to identify the exact location of the leak(s). Smoke exiting a very small leak is even easier to see with lower pressure. If you encounter smoke leaking out of an area but find it difficult to pinpoint exactly where the source of the leak is; try reducing the pressure in the system being tested by turning the Tester OFF and allow the pressure to dissipate. The longer a particular leak is allowed to leak, the more fluorescent dye material will be deposited at that leak. With some vapour system leaks, the leak may only present itself under vacuum and not under pressure. If equipment permits, test the system in both states. Purge valve faults [P0441, P0444, P0458 and P0459] should all inhibit DMTL leak test and therefore need to be resolved prior to any DMTL issues. For this reason, when smoke testing the vapour system, it should be sufficient to enter the system at the connection up stream of the purge valve. If no leak is found then testing the remainder of the system up to the purge valve is recommended

• NOTE: It may be possible to search for small leaks using a gas analyzer and looking for HC (hydro carbon) spikes. This should enable leaks to be detected in areas of the vapor system that our out of sight of the technician. The solenoid should be deactivated after five minutes to prevent potential damage. Check that connector and individual terminals are sealed correctly

Phase-One – (quantifying the leak)



E139914

- 1. Connect the tester supply hose to vehicle EVAP system. > Refer to appropriate vehicle application
- 2. Determine if the vehicle's EVAP system you are testing is governed by a .020" (0.5 mm) or .040" (1 mm) acceptable leak standard. Press the appropriate calibration standard on the tester's control panel and observe the position of the flow meter ball. > This function automatically turns off in 10 seconds
- 3. Position the flow meter's pointer flag so that it aligns with the measurement observed in step 2 above. > This sets PASS / FAIL mark
- 4. Close vehicle's EVAP Vent Solenoid. > Refer to appropriate vehicle application

- 5. Press TEST on control panel and fill EVAP system. > This introduces 5-minutes of nitrogen gas
- 6. Look for flow meter ball to stop descending indicating that the vehicle system is full. > Fill time 1-4 minutes depending on system volume
- 7. Compare flow meter ball reading to pointer flag. > ABOVE flag = FAIL (go to Phase-Two). > BELOW flag = PASS (test complete)

Testing With Pressure and Vacuum Decay

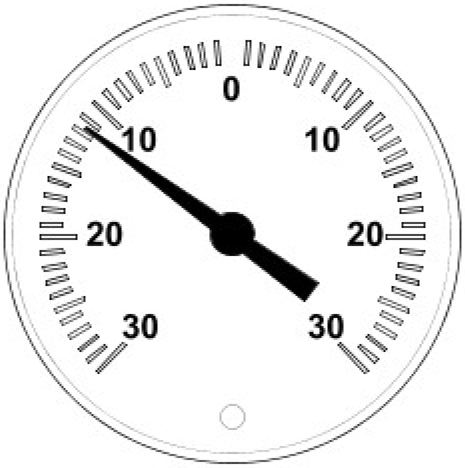
In addition to quantifying the leak with the Phase-One flow test, the Tester allows you the flexibility of testing the vehicle's EVAP system by using either **Pressure Decay** or **Vacuum Decay** methods. Below are instructions for performing both decay tests

Pressure-Decay Test

• NOTE: The Pressure Decay test is best performed immediately after the Phase-one flow test, since the system has already built up pressure

At the completion of the Phase-one flow test, the EVAP system is fully pressurized, since the Phase-one test uses pressure to perform its flow test. Testing pressure decay with the Vacutec® 522B-J/LR is very simple. All you need to do is the following:

- 1. Allow tester to complete self-test and green **READY** light to turn ON
- 2. Connect Tester supply hose to vehicle EVAP system
- 3. Close vehicle's EVAP Vent solenoid > Refer to appropriate vehicle application
- 4. Press **VACUUM** switch on the tester control panel
  - NOTE: The vacuum switch is on a 30-second timer, which should be sufficient time to draw the appropriate vacuum from the EVAP system. Press VACUUM switch again if additional time is required
- 5. After vacuum timer turns off, observe the vacuum gauge for any decay (loss of vacuum) indicating a leak in the EVAP system



E139915

• NOTE: Disconnect the Tester from the vehicle after the Vacuum Decay Test. The fuel pressure in the vehicle’s fuel tank is constantly changing due to the vehicle’s fuel volatility and that could cause the Tester’s pressure gauge to exceed its maximum reading limits

Published: 11-May-2011

Evaporative Emissions - V8 4.4L Petrol -

Torque Specifications

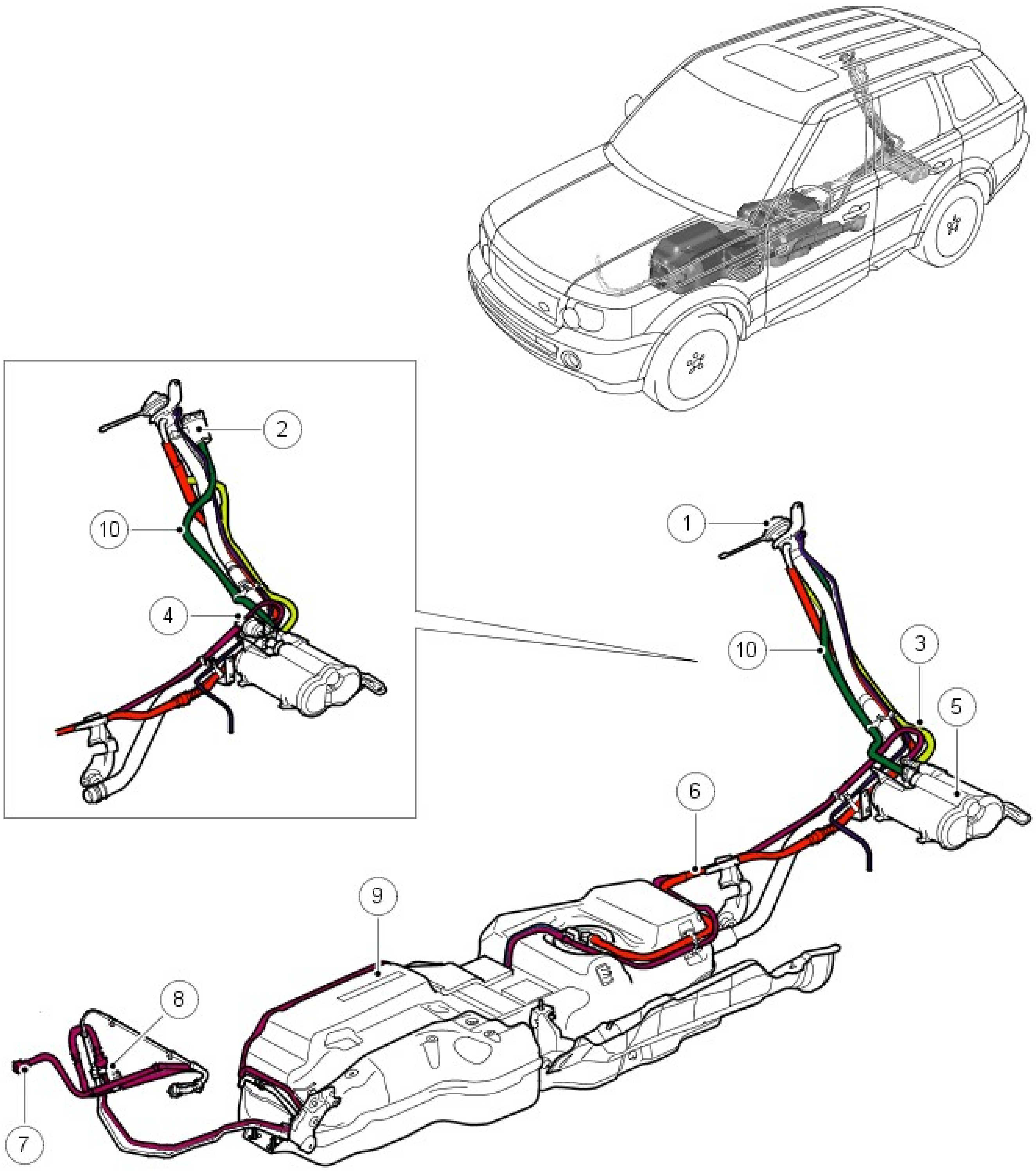
Description	Nm	lb-ft
Evaporative emissions canister retaining bolts	23	17

Published: 11-May-2011

Evaporative Emissions - V8 4.4L Petrol - Evaporative Emissions

Description and Operation

Evaporative Emissions Component Layout - 4.4L V8



E57486

Item	Part Number	Description
1	-	Fuel filler pipe/cap
2	-	DMTL pump filter (NAS only)
3	-	Fuel tank vent hose to canister
4	-	DMTL pump (NAS only)
5	-	Charcoal canister
6	-	Fuel tank breather hose from tank
7	-	Purge hose
8	-	Purge valve
9	-	Fuel tank
10	-	Charcoal canister vent hose (All except NAS) or DMTL pump vent hose (NAS)

GENERAL

The evaporative emission (EVAP) control system reduces the level of hydrocarbons released into the atmosphere by fuel vapor venting from the fuel tank. The system comprises a charcoal canister, purge valve and interconnecting vent pipes and hoses. The vent pipes are connected to the system components using quick release connectors.

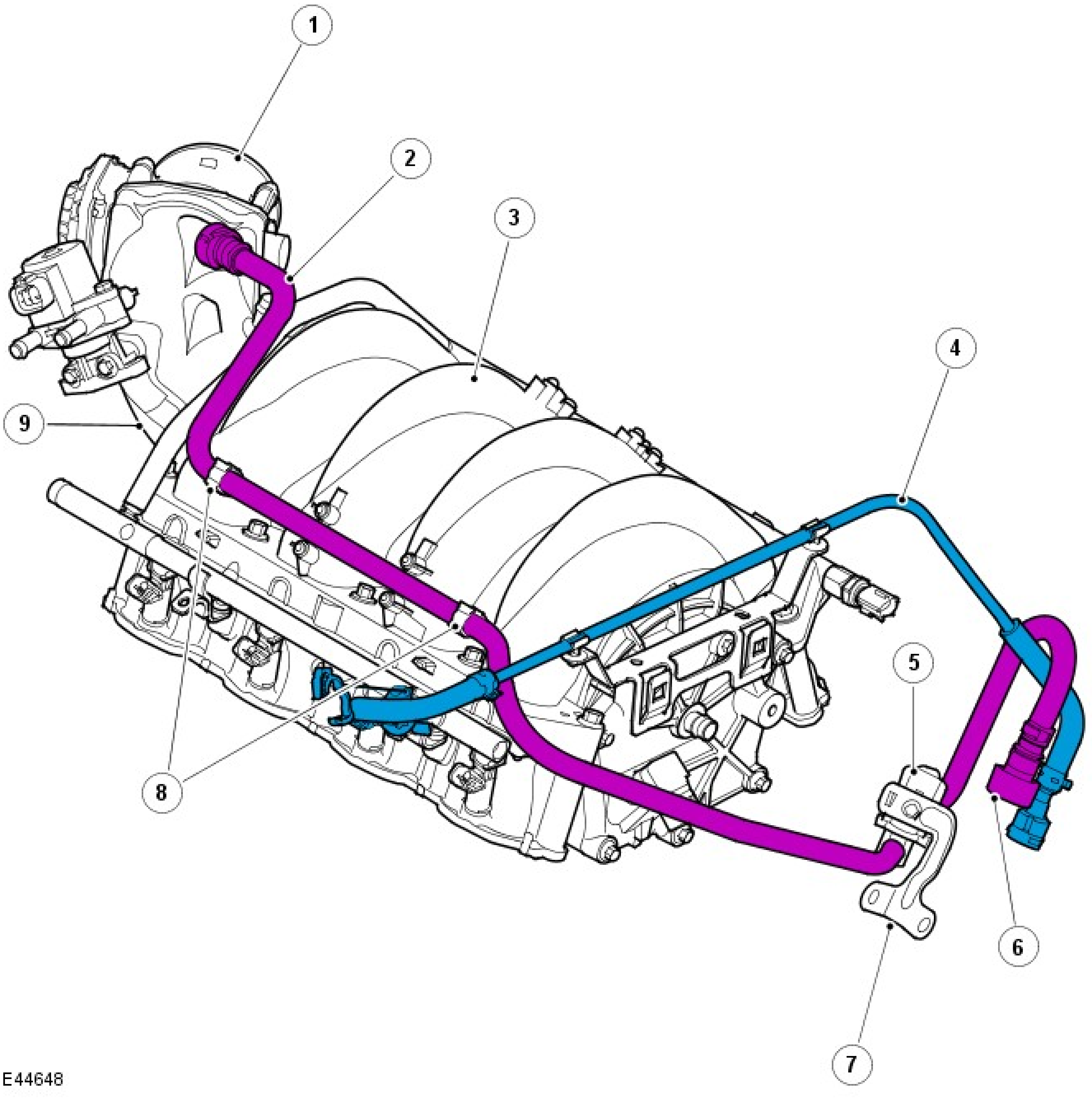
Fuel vapor is generated by the fuel in the tank and the amount of vapor produced increases as the fuel heats up. Fuel vapor can flow freely to the charcoal canister via the tank venting system. The venting system consists of roll over valves and a liquid vapor separator mounted internally in the tank and then externally via a breather line. The breather line allows the fuel vapor to flow to the charcoal canister via a 'Y' piece mounted on the filler pipe.

On NAS vehicles the vapor generated in the fuel tank during refueling flows without restriction to the charcoal canister.

On all vehicles except NAS, the vapor is restricted in its path to the charcoal canister but can flow freely during the refueling operation to atmosphere, via the filler opening.

The vapor passes into the charcoal canister where it is absorbed and stored by the charcoal. Because there is a limit to the amount of vapor the canister can contain, the fuel vapor is purged from the canister when the engine is running and burned in the engine.

PURGE VALVE AND HOSES



Item	Part Number	Description
1	-	Electric throttle
2	-	Purge hose
3	-	Intake manifold
4	-	Fuel feed jump hose (Ref. only)
5	-	Purge valve
6	-	Purge hose connector
7	-	Bracket
8	-	Hose clamps
9	-	Elbow assembly

The purge valve is located at the rear of the engine, on a bracket which is attached to the transmission bell housing. The purge hose is routed from the purge valve, along the left hand side of the air intake manifold, to the elbow assembly which locates the electric throttle.

The purge hose is connected, at the right hand rear of the engine, with a quick release coupling to the purge line which runs parallel with the fuel feed line along the top of the fuel tank to the charcoal canister.

The purge hose continues from the purge valve and is routed to a connection on the air intake elbow assembly. The hose is connected to the elbow with a quick release connector.

The purge valve is located on a bracket on the bell housing and is secured with a single bolt. The purge valve is a solenoid operated valve which is closed when de-energized. The valve is controlled by the Engine Control Module (ECM) and is operated when engine operating conditions are correct to allow purging of the charcoal canister.

The purge valve is Pulse Width Modulated (PWM) at 10Hz by the ECM. At this high frequency, the pulses of purge gas flow into the inlet manifold in an almost a continuous flow. The valve operates between 7% and 100% duty or mark space ratio (% open time).

The atmospheric pressure at the air intake vent of the system is higher than the inlet manifold pressure under all throttled engine running conditions. It is this pressure differential across the system that causes the air to flow through the air intake, through the purge system, and in to the engine.

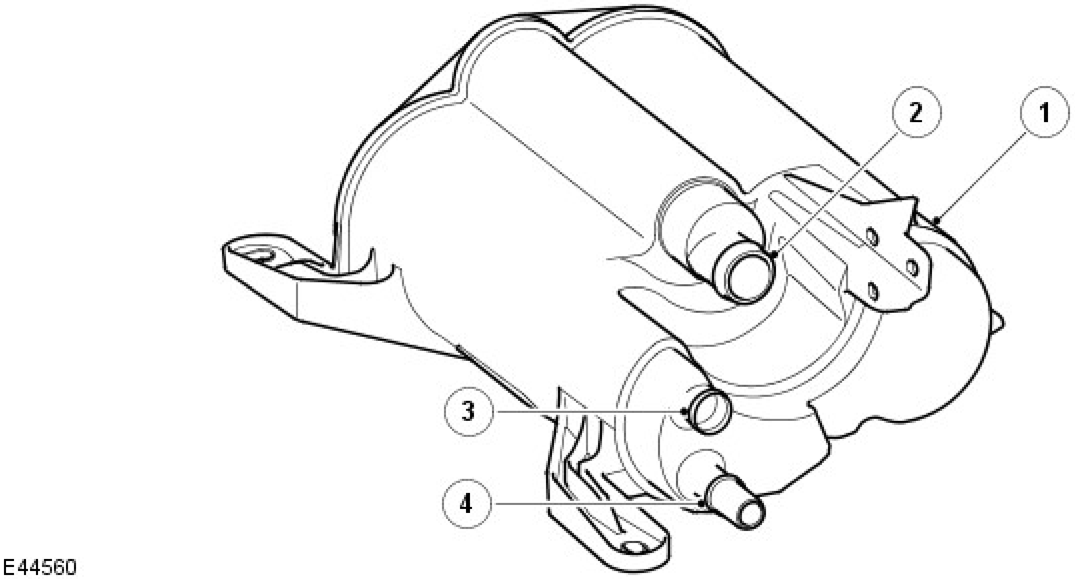
The ECM waits until the engine is running above 40°C (104°F) coolant temperature with closed loop fuel operational before the purging process is activated. Under these conditions the engine should be running smoothly with no warm up enrichment. The purge valve duty (and flow) is initially ramped slowly because the vapour concentration is unknown (a sudden increase in purge could cause the engine to flood). The concentration is then determined from the amount of adjustment that the closed loop fuelling is required to make to achieve the target Air Fuel Ratio (AFR). Once the concentration has been determined, the purge flow can be increased rapidly and the injected fuel can be proactively adjusted to compensate for the known purge vapour and the target AFR control is maintained.

When the purging process is active, fresh air is drawn into the charcoal canister via the DMTL valve atmospheric vent connection and its filter on NAS vehicles or, via the vent hose connection and the spider trap on non NAS vehicles.

On NAS vehicles the system does not include a pressure test point. Pressure testing of the purge valve hose is achieved by disconnecting the purge valve joint on the underside of the vehicle, forward of the fuel tank and connecting a special tool to allow the system to be pressure tested. The test performs a pressure test on the purge hose connection forward of the fuel tank back to the charcoal canister. The special tool is then connected to the purge hose connection forward of the fuel tank to perform a pressure test on the purge hose to the purge valve.

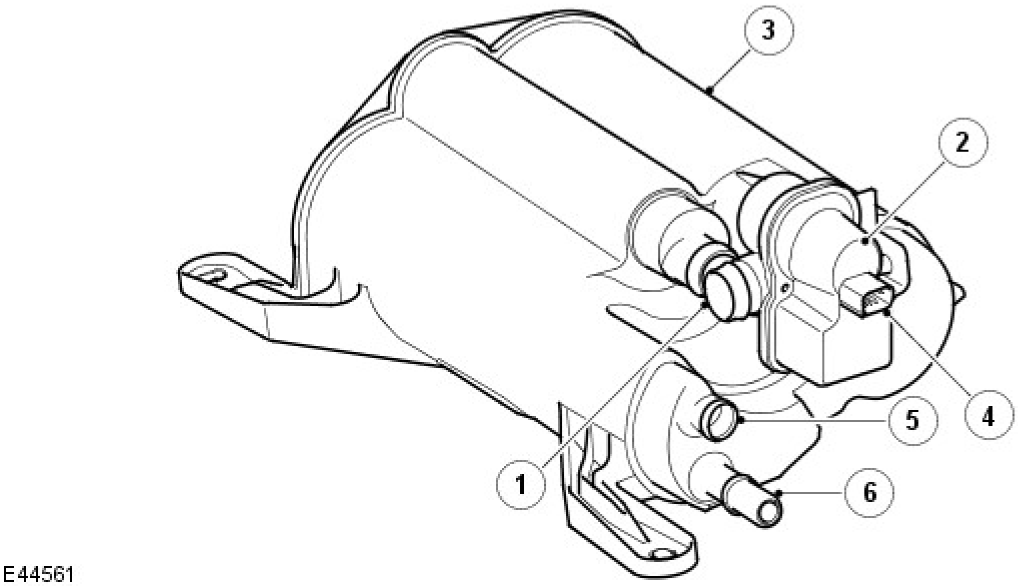
CHARCOAL CANISTER

Charcoal Canister - All except NAS



Item	Part Number	Description
1	-	Charcoal canister
2	-	Charcoal canister atmospheric vent connection
3	-	Purge hose connection
4	-	Charcoal canister tank vent connection

Charcoal Canister - NAS



Item	Part Number	Description
1	-	Charcoal canister atmospheric vent connection (via DMTL pump)
2	-	DMTL pump
3	-	Charcoal canister
4	-	Electrical connector
5	-	Purge hose connection
6	-	Charcoal canister tank vent hose connection

The charcoal canister is located in a central position, forward of the spare wheel. It is attached at the rear with two bolts which screw into the spare wheel carrier. At the front, the canister has two lugs which locate in the parking brake module support bracket.

The canister on ROW vehicles has a capacity of 1400cc (85.4 in^3).

The canister on NAS vehicles has a capacity of 3000cc (183 in^3).

The canister has three ports which allow for the attachment of the atmospheric vent hose, the purge hose and the tank vent hose. On NAS vehicles the atmospheric vent hose connection allows for the attachment of the DMTL pump.

The canister contains a bed of activated charcoal or carbon. The charcoal is produced using special manufacturing techniques to treat the charcoal with oxygen. The oxygen treatment opens up millions of pores between the carbon atoms resulting in a highly porous charcoal with a very large effective surface area which is capable of absorbing large quantities of fuel vapor. Once treated the charcoal is known as 'activated' carbon or charcoal. The charcoal canister on NAS vehicles uses a higher grade charcoal to meet the requirements of LEV2 emission regulations.

DIAGNOSTIC MONITORING OF TANK LEAKAGE (DMTL) - NAS ONLY

The DMTL system is a legislative requirement for NAS vehicles. The DMTL system periodically checks the EVAP system and the fuel tank for leaks when the ignition is switched off.

The DMTL system comprises the previously described components of the EVAP system with the following additional components; a DMTL pump and a DMTL filter.

The DMTL pump is connected to the atmospheric vent of the charcoal canister and incorporates a Positive Temperature Co-efficient (PTC) heating element, a normally open valve and a reference orifice. The DMTL pump is only operated when the ignition is switched off and is controlled by the ECM. The ECM also monitors the electric air pump operation and the normally open valve for faults.

The DMTL filter protects the pump from dust being drawn into the system when the pump is being operated. The filter is located on the fuel filler head and is connected to the DMTL pump by a hose.

DMTL Operation

To check the fuel tank and the EVAP system for leaks, the ECM operates the DMTL pump and monitors the current draw. Initially, the ECM establishes a reference current by pumping air through the reference orifice and back to atmosphere. Once the reference current is determined, the ECM closes the normally open valve which seals the EVAP system. The purge valve remains de-energized and is therefore closed. The output from the air pump is diverted from the reference orifice and into the EVAP system.

When the normally open valve is closed, the load on the air pump falls to zero. Providing there are no leaks, the air pump will begin to pressurise the EVAP system and the load and current draw in the pump increases. By monitoring the rate and level of the current increase, the ECM can determine if there is a leak in the EVAP system.

During normal vehicle operation, the ECM energizes the heating element in the pump to prevent condensation formation and possible incorrect current readings.

Leaks are classified as:

- Minor - equivalent to a hole diameter of 0.5 to 1.0 mm (0.02 to 0.04 in)
- Major - equivalent to hole diameter of 1.0 mm (0.04 in) or greater.

The ECM performs a check for major leaks each time the ignition is switched off, providing the following conditions are met:

- The vehicle speed is zero
- The engine speed is zero
- The pressure altitude (70 kPa (10.15 lbf/in^2) derived from engine load calculations) is below 3047 m (10000 feet)
- The ambient temperature is between 0 and 40°C (32 and 104°F)
- The charcoal canister load factor is 2 or less (where the load factor is a measure, between -1 and +30, of the fuel vapor stored in the charcoal canister. Where -1 is 0% fuel vapor, 0 is stoichiometric fuel vapor level and +30 is 100% saturated with fuel vapor.
- The fuel tank level is valid and between 15 and 85% of nominal capacity
- The engine running time during the previous cycle was more than 10 minutes
- The battery voltage is between 10 and 15 volts
- The last engine off time was more than 180 minutes
- No errors are detected with the EVAP components, the ambient air temperature and the fuel level
- High range must be engaged on the transfer box.

• NOTE: A leak test can be performed using T4. This overrides the above conditions and is useful for checking correct system and component operation.

The ECM performs a check for minor leaks after every 2nd major leak check or after refueling is detected.

When the leak check is complete, the ECM stops the DMTL pump and opens (de-energizes) the normally open valve.

If the fuel filler cap is opened or refuelling is detected during the leak check, by a sudden drop in the current draw or a rise in the fuel level, the ECM aborts the leak check.

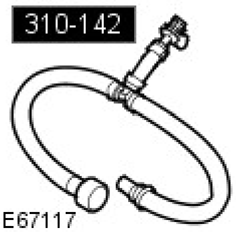
If a leak is detected during the check, the ECM stores an appropriate fault code in its memory. If a leak is detected on two consecutive checks, the ECM illuminates the Malfunction Indicator Lamp (MIL) in the instrument cluster on the next drive cycle.

The duration of a leak check can be between 60 and 600 seconds depending on the results and fuel tank level.

Published: 11-May-2011

Evaporative Emissions - V8 4.4L Petrol - Evaporative Emission System Leak Test

General Procedures

Special Tool(s)	
 E67117	EVAP tool 310-142

• NOTE: The following procedure allows a fuel leak, indicated by the Malfunction Indicator Lamp (MIL), to be accurately located. The test must only be carried out once it has been established that there are no obvious faults with any of the fuel system components.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Position the vehicle on a lift.

2. Check the components in the fuel and EVAP system for obvious damage. Make sure all the connections are secure.

3. Connect T4 to the vehicle.

- Run the DMTL test.
- Follow the on-screen prompts and force the DMTL to close.

4. WARNINGS:

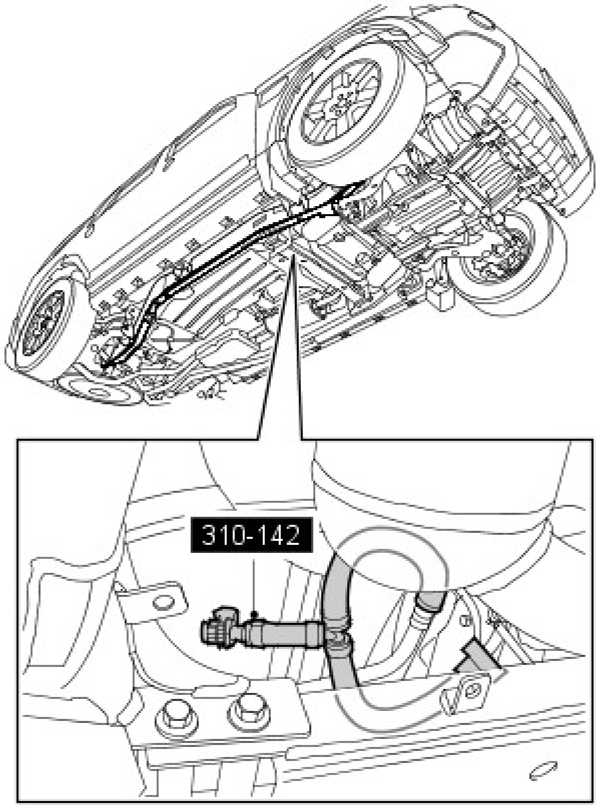
⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Install the special tool to the purge line.

- Release the clip and disconnect the purge line.
- Clean the component mating faces.
- Connect the special tool.



E67118

5. ⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

   Disconnect the purge line at the emission canister line.

   - Release the clip.

6. Carry out the procedures in order, from the instruction sheet supplied with the EVAPS diagnostic testing station 310-115 (LRA-19-004) or (LRA-19-005A).
7. When a leak is detected, replace the component as necessary and repeat the test to validate the repair.
8. Connect the purge line to the emission canister line.

   - Clean the component mating faces.
   - Secure with the clip.

9. Disconnect the special tool from the purge line.

   - Clean the component mating faces.
   - Connect the purge line.

10. Disconnect T4 from the vehicle.

Published: 11-May-2011

Evaporative Emissions - V8 4.4L Petrol - Evaporative Emission Canister

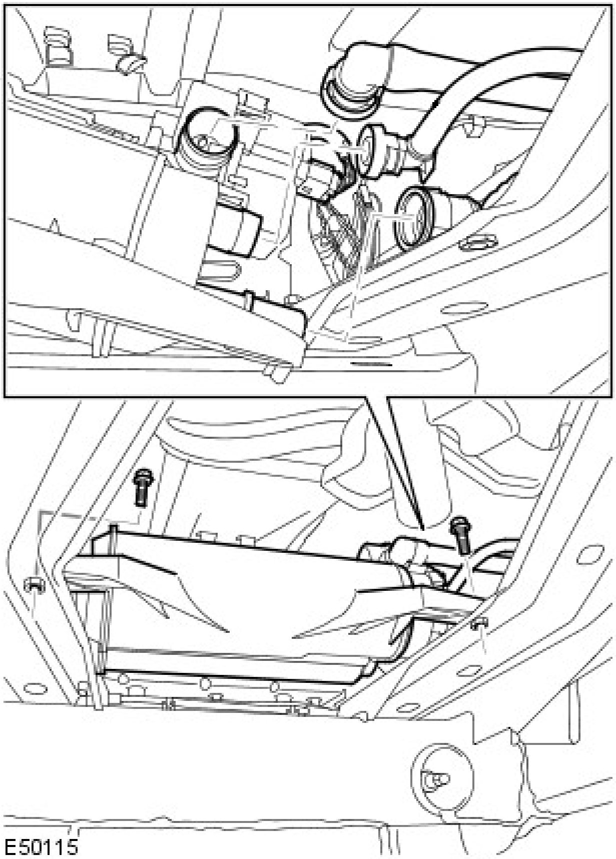
Removal and Installation

Removal

1. Remove the spare wheel and tire.

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

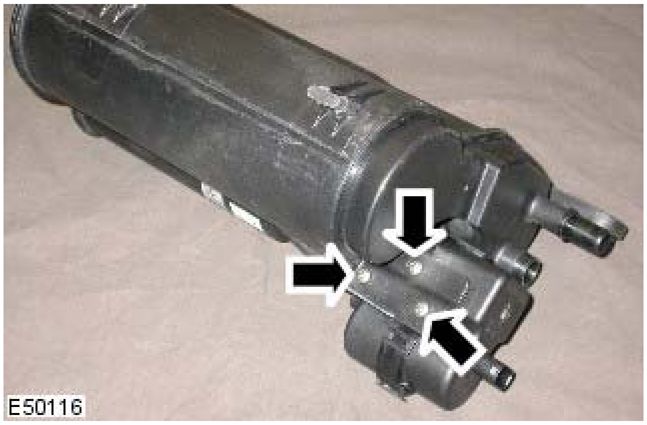
Raise and support the vehicle.



E50115

3. Remove the evaporative emissions canister.

- Remove the 2 bolts.
- Disconnect the 3 lines.
- Disconnect the electrical connector.



E50116

4. NOTE: Do not disassemble further if the component is removed for access only.

NAS vehicles: Remove the fuel tank leakage detection module.

- Remove the 3 screws.

Installation

1. NAS vehicles: Install the fuel tank leakage detection module.

- Install the screws.

2. Install the evaporative emissions canister.

- Connect the electrical connector.
- Connect the lines.
- Tighten the bolts to 23 Nm (17 lb.ft).

3. Install the spare wheel and tire.

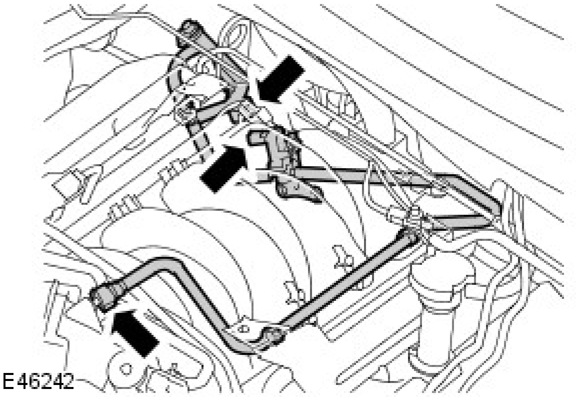
Evaporative Emissions - V8 4.4L Petrol - Evaporative Emission Canister Purge Valve

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Disconnect the emission canister vent solenoid electrical connector.
4. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

   Disconnect the emission canister vent line from the intake manifold.
5. Disconnect and remove the solenoid valve from the emission canister vent line.



6. Remove the solenoid vent valve from the mounting bracket
   - Remove the bolt.

Installation

1. Clean the component mating faces.
2. To install, reverse the removal procedure.
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Evaporative Emissions - V8 4.4L Petrol - Evaporative Emission Canister Ventilation Filter

Removal and Installation

Removal

⚠ WARNING: Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

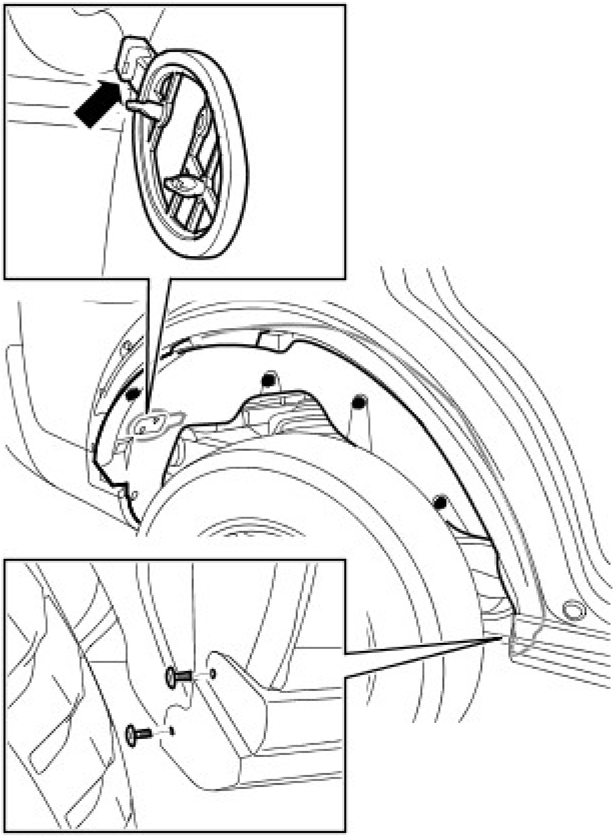
Raise and support the vehicle.

2. Remove the RH rear wheel and tire.

3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove the RH rear fender splash shield.

- Remove the 2 screws.
- Remove the 6 retainers.
- Disconnect the electrical connector.



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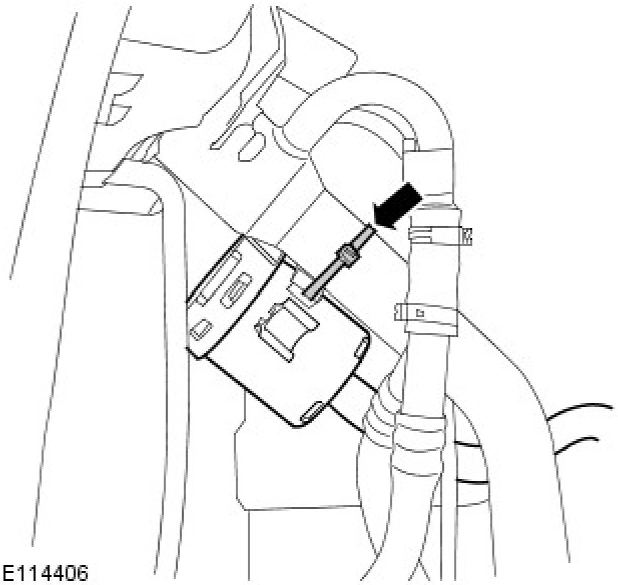
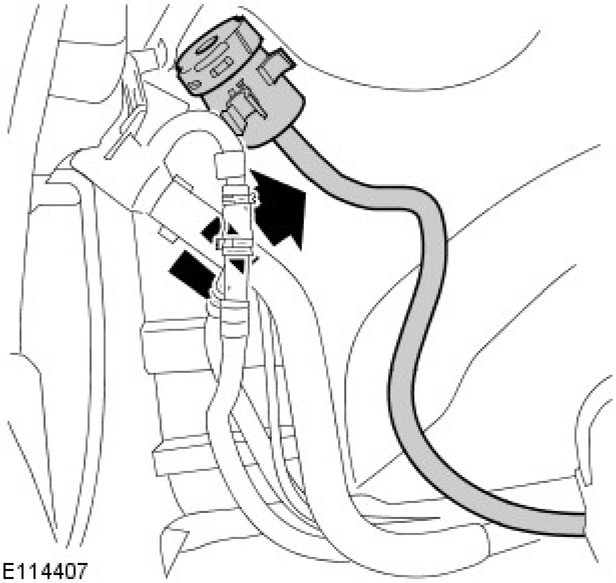
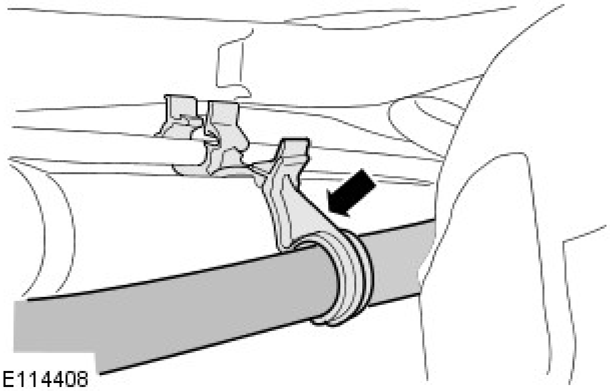

E114406

4. Release the evaporative emission canister ventilation filter from the fuel filler pipe.

- Cut the cable tie.


E114407

5. Position the evaporative emission canister ventilation filter to one side.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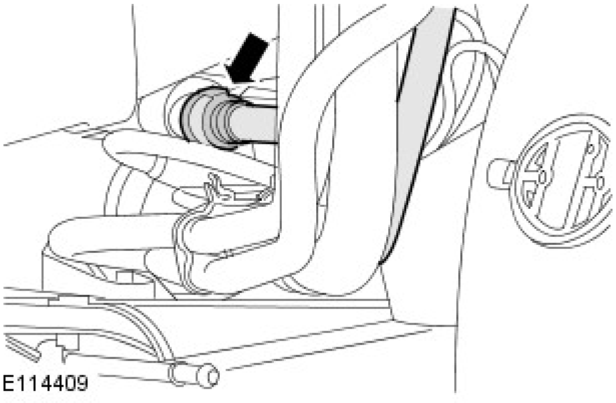
6. Release the evaporative emission ventilation filter from the clip.



7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove the evaporative emission canister ventilation filter.

- Release the evaporative emission canister ventilation filter from the evaporative emission canister.

Installation

1. To install, reverse the removal procedure.

Published: 26-Oct-2011

Evaporative Emissions - V8 4.4L Petrol - Evaporative Emissions

Diagnosis and Testing

Principles of Operation

For a detailed description of the evaporative emission system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Evaporative Emissions (303-13 Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Fuel filler cap and seal • Fuel filler neck • DMTL fresh air filter (restriction, etc) • Fuel tank (leaks, damage, etc) • Fuel lines and joints, etc • Carbon canister • Purge valve • Diagnostic module fuel tank leak (DMTL) pump module	• Fuses • Connectors • Harness • Purge valve • Diagnostic module fuel tank leak (DMTL) pump

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.
5. **5.** Where K-Line, Vacutec or other proprietary smoke test equipment is available, it should be utilized to assist with Evaporative Emissions System leak diagnosis.

Symptom Chart

Symptom	Possible Causes	Action
Difficulty in filling fuel tank	• Restriction in the vapour line between the fuel tank and the carbon canister outlet/atmospheric port	Check for restrictions/damage, etc (see visual inspection)
Fuel smell	• System leak • Purge valve inoperative	Check for leaks, check the purge valve operation
'Check Fuel Filler Cap' displayed on Message Center	• Fuel filler cap missing/not tightened after refuelling	Check the fuel filler cap and seal

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Evaporative Leak OBD Fault Rectification Guide

Determine Which DTC Has Been Stored

Using the manufacturer approved diagnostic system, choose **diagnostic session**, then choose the following symptom paths : **Powertrain/engine system/fuel vapour and odor, Powertrain/engine system/fuel tank, Electrical/instruments/warning lamps/engine malfunction lamp/lamp illuminated, Powertrain/engine system/engine performance/fuel consumption high**

• NOTE: This guide covers DTCs that relate to evaporative leak monitoring, as listed in the table below

DTC	Description
P0442-00	DMTL small leak
P0447-00	DMTL COV electrical low (open)
P0448-00	DMTL COV electrical high
P0455-00	DMTL rough leak
P2401-00	DMTL pump electrical low (open)
P2402-00	DMTL pump electrical high
P2404-2F	DMTL noise fault
P2404-29	DMTL reference leak
P2405-00	DMTL reference current low
P2406-00	DMTL reference current high
P2450-00	DMTL COV stuck open
P2451-00	DMTL COV stuck closed
P240B-00	DMTL heater electrical low (open)
P240C-00	DMTL heater electrical high

Attempt To Replicate The Fault Using The "Fuel Leak Check" Forced Test

1. **1.** Record any DTCs that has been logged
2. **2.** Using the manufacturer approved diagnostic system, in the **Recommendations** tab run the **Fuel Leak Check** forced test
3. **3.** For the test to run the fuel level must be between 15% and 85%
4. **4.** During this procedure the engine must be off
5. **5.** The possible responses from the test and the associated DTCs are listed below
6. **6.** If again no fault is found it could suggest that the failure mode is a borderline condition (refer to section 3) or that it was caused by incorrect fitment of the fuel cap or the fuel filler neck is at fault therefore it is important not disturb the fuel cap
7. **7.** Disconnect purge pipe from the purge valve, observe the condition of connection (the seating and condition of the "O" ring) and then reconnect. Using the manufacturer approved diagnostic system, run **Purge Valve Self Test** (to clean the purge valve) then run the **Fuel Leak Check**
8. **8.** If the test failed, a smoke test is required to determine the cause of the leak

• NOTE: P240B & P240C are not included in the **Fuel Leak Check** forced test (these monitors run at every ignition on and complete within 30 seconds)

Response Description	ID	Equivalent DTC
Function running: Reference leak measurement	1	
Function running: Rough leak measurement	2	
Function running: Small leak measurement	3	
Function running: 2nd ref leak measurement	4	
Function running: COV Cleaning	5	
Function aborted due to conditions: Vbatt conditions not correct (too high/ low)	11	
Function aborted due to conditions: Variation Ref. I (reference current) too high	12	P2404-29
Function aborted due to conditions: DMTL electrical fault	13	P0447, P0448
Function aborted due to conditions: Maximum diagnostic time exceeded	14	
Function aborted due to conditions: Crash detected	15	
Function aborted due to conditions: Refuel detected	20	
Function aborted due to conditions: Filler cap opened	21	
Function aborted due to conditions: Engine start	23	
Function aborted due to conditions: Noisy current measurement	24	P2404-2F
Function aborted due to conditions: Ambient temp outside range	26	
Function aborted due to conditions: Ambient pressure outside range	27	
Function aborted due to conditions: Other conditions	29	
Function complete - Tight system, fault free	30	
Function complete - Fine leak detected	31	P0442
Function complete - Rough leak detected	32	P0455
Function complete - Module error	33	P2401, P2402, P2450, P2451, P2405, P2406, P2404-29
Function complete - Medium leak detected	34	P0442, P0455

Read The "Ranking values" To Determine How Far Away The Result Is From The Failure Threshold

9. **9.** When the **Fuel Leak Check** forced test has completed the test results (known as ranking values) will be displayed
10. **10.** These should be compared against the limits shown in the table below
11. **11.** If the test result is borderline then there is a risk that a failure will occur at a later date (during customer usage of the vehicle)
12. **12.** To avoid this the vehicle should be carefully checked for any small leaks

Ranking Value	Normal Result For Tight System	Leak Failure Condition
Rough Leak (40 thou+)	0 > = 50	>= 128
Small Leak (20 thou+)	0 > = 60	>= 128

TRACE THE ROOT CAUSE OF THE FAULT

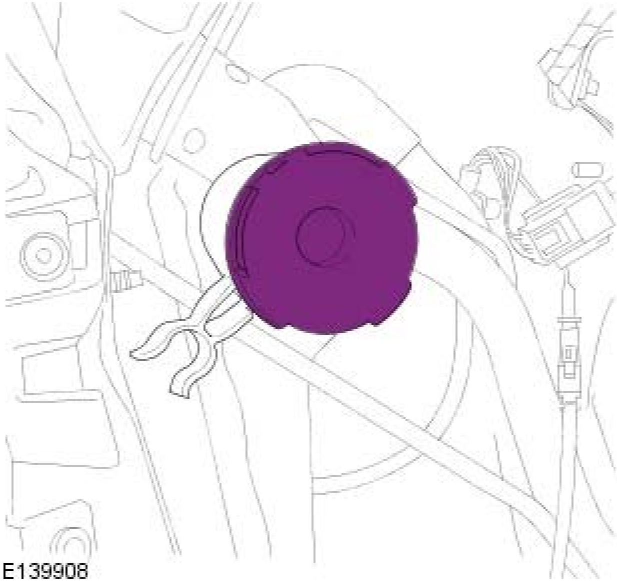
The list below provides some suggested actions to help trace the root cause of the fault

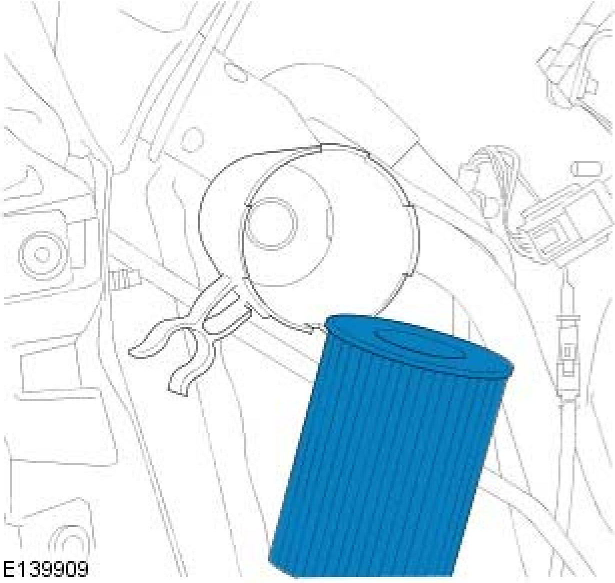
Each action should be followed up with a **Fuel Leak Check** forced test (and ranking value check) in order to determine if any improvement has been made

DTC	Fault Description	Fault Rectification Actions after smoke test
P0442-00	DMTL small leak	● 1. Inspect / refit filler cap after smoke test (inspect filler neck for correct fitment to pocket so that filer neck protrudes) ● 2. Run engine at idle; Using the manufacturer approved diagnostic system, run **Purge Valve Self Test** (to clean the purge valve) ● 3. Check that the DMTL module wiring connector has been installed correctly and that the seals around the connector body and individual wires are in good condition ● 4. Check all fuel system connections are correctly installed and secure ● 5. Visually inspect purge canister, purge pipes, fuel tank and filler neck for any obvious damage ● 6. Try isolating the purge valve by fitting a blanking plug to the purge pipe ● 7. Carry out a smoke test ● 8. Replace the DMTL module
P0447-00	DMTL COV electrical low (open)	● 1. Check fuse ● 2. Check that fuse fits tightly into the fuse holder ● 3. Check that the DMTL module wiring connector has been fitted correctly ● 4. Check wiring harness continuity between DMTL module and ECU connectors ● 5. Replace DMTL module
P0448-00	DMTL COV electrical high	● 1. Check wiring ● 2. Replace DMTL module
P0455-00	DMTL rough leak	● 1. Inspect / refit filler cap after smoke test (inspect filler neck for correct fitment to pocket so that filer neck protrudes) ● 2. Run engine at idle; Using the manufacturer approved diagnostic system, run "Purge Valve Self Test" (to help clean the purge valve) ● 3. Check that the DMTL module wiring connector has been installed correctly and that the seals around the connector body and individual wires are in good condition (surprisingly, this is a potential leakage path!) ● 4. Check all fuel system connections are correctly installed and secure ● 5. Visually inspect purge canister, purge pipes, fuel tank and filler neck for any obvious damage ● 6. Try isolating the purge valve by fitting a blanking plug to the purge pipe ● 7. Carry out a smoke test ● 8. Replace DMTL module
P2401-00	DMTL pump electrical low (open)	● 1. Check fuse ● 2. Check that fuse fits correctly into the fuse holder ● 3. Check that the DMTL module wiring connector has been fitted correctly ● 4. Check wiring harness continuity between DMTL module and ECU connectors ● 5. Replace DMTL module
P2402-00	DMTL pump electrical high	● 1. Check wiring ● 2. Replace DMTL module
P2404-2F	DMTL noise fault	● Replace DMTL module
P2404-29	DMTL reference leak	● Replace DMTL module

DTC	Fault Description	Fault Rectification Actions after smoke test
P2405-00	DMTL reference current low	● Replace DMTL module
P2406-00	DMTL reference current high	● 1. Check for any blockages in the DMTL ventilation pipe & filter ● 2. Replace DMTL module
P2450-00	DMTL COV stuck open	● Replace DMTL module
P2451-00	DMTL COV stuck close	● Replace DMTL module
P240B-00	DMTL heater electrical low (open)	● 1. Check fuse ● 2. Check that fuse fits tightly into the fuse holder ● 3. Check that the DMTL module wiring connector has been fitted correctly ● 4. Check wiring harness continuity between DMTL module and ECU connectors ● 5. Replace DMTL module
P240C-00	DMTL heater electrical high	● 1. Check wiring ● 2. Replace DMTL module

Pre and 10MY Denso/Bosch PCM Systems

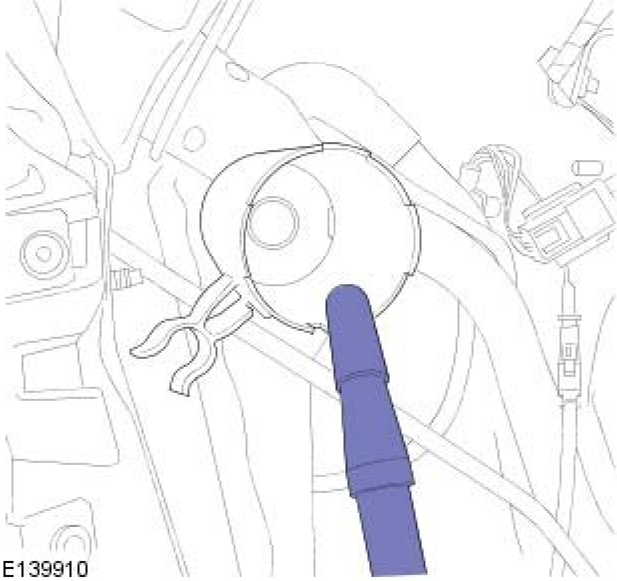




⚠ CAUTION: The Maximum pressure of the EVAP system is 0.07 bar **do not exceed**

• NOTE: Apart from the purge valve connection, it is recommended to smoke test the EVAP system without disturbing any joints associated with the system, this will determine the leak more accurately and quickly

- 1. Remove rear wheel arch liner to access fuel filler neck
- 2. On the fuel filler neck the DMTL filter will be visible as shown in picture. Unclip filter housing from fuel filler neck to gain better access to DMTL filter
- 3. Remove carefully the top of filter to expose filter and remove
- 4. Attach rubber adapter to tip of smoke machine nozzle to ensure tight seal to filter housing. Disconnect the purge pipe from purge valve; this will be an escape point for the smoke to exit
- 5. Allow tester to complete self-test and green READY light to turn ON 2. For best Tester performance; completely unwind Tester's supply hose
- 6. Press **Smoke** on control panel to fill EVAP system with smoke vapour. The control panel **Smoke** light will light indicating smoke production. The smoke setting is on a 15 minute timer. Pressing the **Smoke** button again turns Tester off. It is normal for the flow meter ball, while in the smoke mode, not to be as steady as when it is in the **Test** mode. Note: The pressure gauge is active only after smoke cycle is complete
- 7. Continue introducing smoke into the EVAP System until the flow meter's ball stops descending and this assures the system test pressure is met and smoke will appear from the purge pipe, then close off purge pipe with special tool (Test Adapter Hose/EVAP Port 310-142)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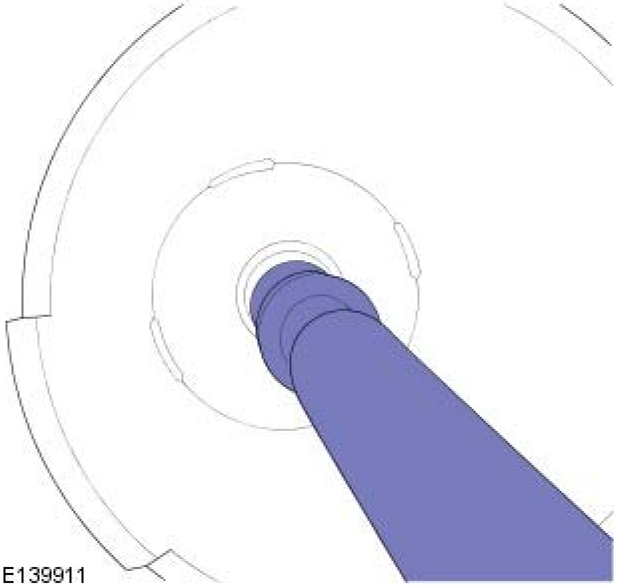
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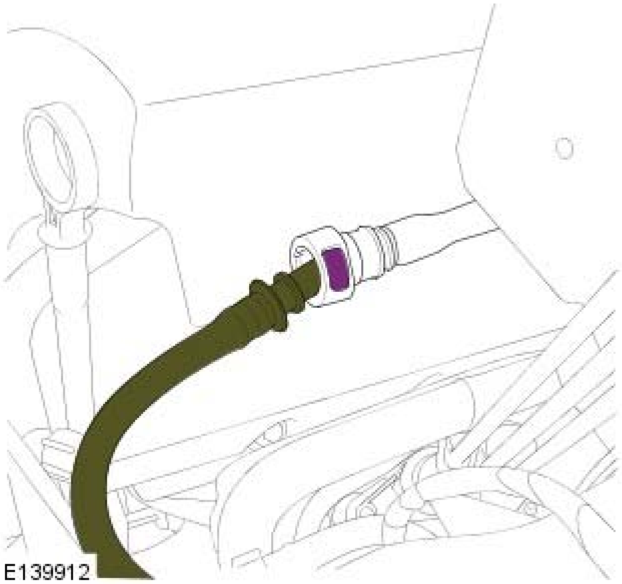
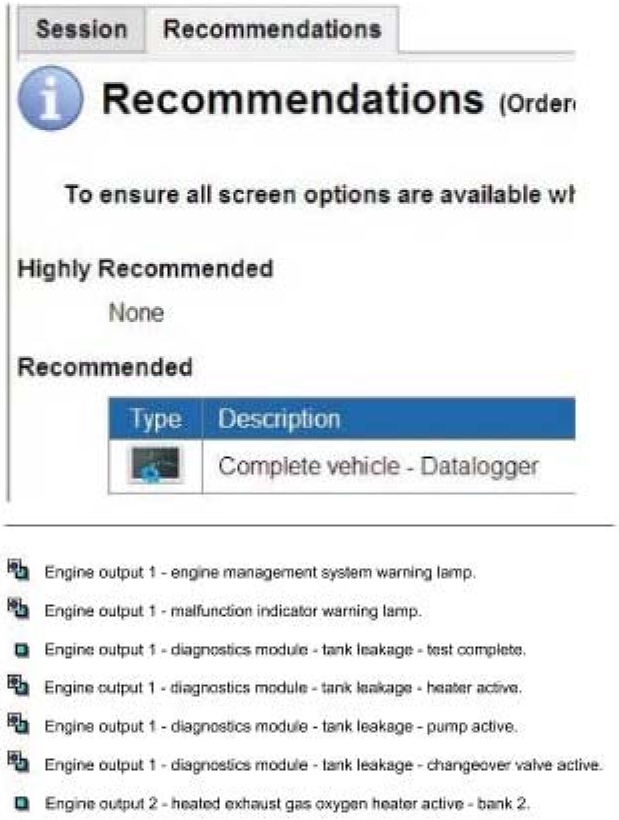

E139912

⚠ CAUTION: On some vehicles, the DMTL filter can not be removed, in these instances fill the system through the purge valve and smoke will appear from the filter

Pre 10MY Vehicles

On pre 10MY DMTL systems, Using the manufacturer approved diagnostic system, select **Measurement application** session then select the **Recommendations** tab which will give you access to **Datalogger**. Then select **Engine systems** then select the **Output state control** data-logger signal **Engine output 1 – diagnostic module – tank leakage -change over valve active** which will close the system. Then select **Engine output 1 – diagnostic module – tank leakage – pump active** this will pressurize the EVAP system



Recommendations (Order

To ensure all screen options are available wh

Highly Recommended

None

Recommended

Type	Description
	Complete vehicle - Datalogger

Engine output 1 - engine management system warning lamp.

Engine output 1 - malfunction indicator warning lamp.

Engine output 1 - diagnostics module - tank leakage - test complete.

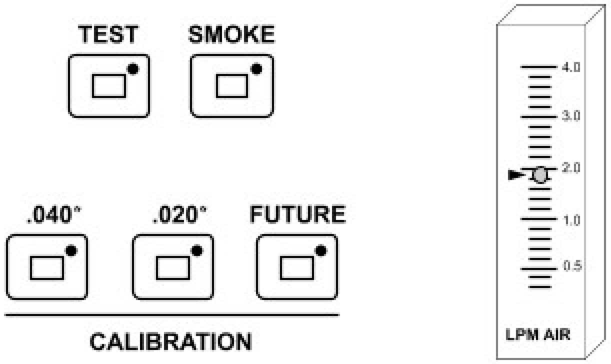
Engine output 1 - diagnostics module - tank leakage - heater active.

Engine output 1 - diagnostics module - tank leakage - pump active.

Engine output 1 - diagnostics module - tank leakage - changeover valve active.

Engine output 2 - heated exhaust gas oxygen heater active - bank 2.

E139916



E139913

10MY vehicles

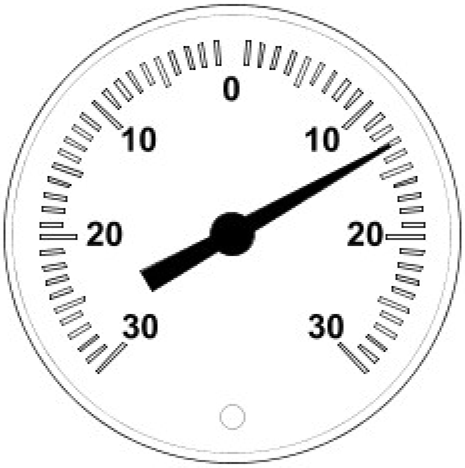
On 10MY vehicles a smoke test application is available so therefore only smoke fill the system and then run the application

- 8. Follow the EVAP system path with the halogen light provided and looks for the smoke exiting the leak(s) or use the UV light provided and look for the dye deposited at the exact location of the leak(s)
- 9. Repair the leak(s) and perform the **Fuel Leak Check** application again or smoke test to verify repair, as well as to make sure there are no additional leaks in the EVAP system

The UltraTraceUV® smoke solution's dye feature is especially helpful when the leak is in an area that is not readily visible, as on the top of the fuel tank or behind a panel. Once you gain access to the area of the leak, wear the yellow UV glasses and shine the UV light provided to identify the exact location of the leak(s). Smoke exiting a very small leak is even easier to see with lower pressure. If you encounter smoke leaking out of an area but find it difficult to pinpoint exactly where the source of the leak is; try reducing the pressure in the system being tested by turning the Tester OFF and allow the pressure to dissipate. The longer a particular leak is allowed to leak, the more fluorescent dye material will be deposited at that leak. With some vapour system leaks, the leak may only present itself under vacuum and not under pressure. If equipment permits, test the system in both states. Purge valve faults [P0441, P0444, P0458 and P0459] should all inhibit DMTL leak test and therefore need to be resolved prior to any DMTL issues. For this reason, when smoke testing the vapour system, it should be sufficient to enter the system at the connection up stream of the purge valve. If no leak is found then testing the remainder of the system up to the purge valve is recommended

• NOTE: It may be possible to search for small leaks using a gas analyzer and looking for HC (hydro carbon) spikes. This should enable leaks to be detected in areas of the vapor system that our out of sight of the technician. The solenoid should be deactivated after five minutes to prevent potential damage. Check that connector and individual terminals are sealed correctly

Phase-One – (quantifying the leak)



E139914

- 1. Connect the tester supply hose to vehicle EVAP system. > Refer to appropriate vehicle application
- 2. Determine if the vehicle’s EVAP system you are testing is governed by a .020” (0.5 mm) or .040” (1 mm) acceptable leak standard. Press the appropriate calibration standard on the tester’s control panel and observe the position of the flow meter ball. > This function automatically turns off in 10 seconds
- 3. Position the flow meter's pointer flag so that it aligns with the measurement observed in step 2 above. > This sets PASS / FAIL mark
- 4. Close vehicle’s EVAP Vent Solenoid. > Refer to appropriate vehicle application

- 5. Press TEST on control panel and fill EVAP system. > This introduces 5-minutes of nitrogen gas
- 6. Look for flow meter ball to stop descending indicating that the vehicle system is full. > Fill time 1-4 minutes depending on system volume
- 7. Compare flow meter ball reading to pointer flag. > ABOVE flag = FAIL (go to Phase-Two). > BELOW flag = PASS (test complete)

Testing With Pressure and Vacuum Decay

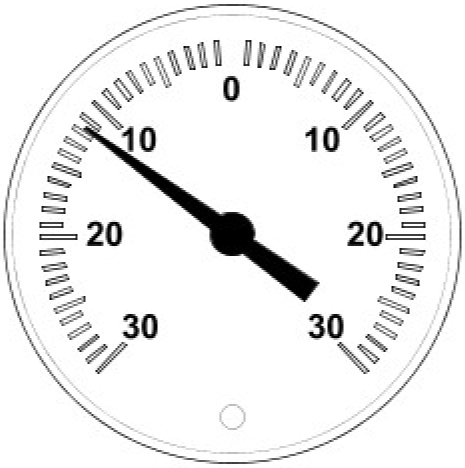
In addition to quantifying the leak with the Phase-One flow test, the Tester allows you the flexibility of testing the vehicle’s EVAP system by using either **Pressure Decay** or **Vacuum Decay** methods. Below are instructions for performing both decay tests

Pressure-Decay Test

• NOTE: The Pressure Decay test is best performed immediately after the Phase-one flow test, since the system has already built up pressure

At the completion of the Phase-one flow test, the EVAP system is fully pressurized, since the Phase-one test uses pressure to perform its flow test. Testing pressure decay with the Vacutec® 522B-J/LR is very simple. All you need to do is the following:

- 1. Allow tester to complete self-test and green **READY** light to turn ON
- 2. Connect Tester supply hose to vehicle EVAP system
- 3. Close vehicle’s EVAP Vent solenoid > Refer to appropriate vehicle application
- 4. Press **VACUUM** switch on the tester control panel
  - NOTE: The vacuum switch is on a 30-second timer, which should be sufficient time to draw the appropriate vacuum from the EVAP system. Press VACUUM switch again if additional time is required
- 5. After vacuum timer turns off, observe the vacuum gauge for any decay (loss of vacuum) indicating a leak in the EVAP system



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- NOTE: Disconnect the Tester from the vehicle after the Vacuum Decay Test. The fuel pressure in the vehicle’s fuel tank is constantly changing due to the vehicle’s fuel volatility and that could cause the Tester’s pressure gauge to exceed its maximum reading limits

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 4.2L Petrol - Powertrain Control Module (PCM) Long Drive Cycle Self-Test

General Procedures

WARNING: Where possible, all road tests should be on well surfaced and dry roads. Always comply with speed limits and local traffic regulations.

- NOTE: This procedure is an overcheck only. If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

- NOTE: The vehicle must exceed 50mph (80 km/h) during the road test.

1. Connect the diagnostic equipment to the vehicle.

2. Follow on screen prompts and check for engine management fault codes.

3. Clear the fault codes following the on screen procedure.

4. Disconnect the diagnostic equipment from the vehicle.

5. NOTE: Make sure cruise control is not engaged.

Make sure the engine temperature is above 60 ºC (140 ºF).

Carry out a road test and perform the following operations.

1. Accelerate to 55 mph (88 km/h) in 5th gear and cruise for 2 minutes with the engine speed at or above 1800rpm.
2. Lift off the throttle and allow the vehicle to decelerate until the engine speed is less than 1000 rpm.
3. Stop the vehicle.
4. Release brake, allow the vehicle to move with no throttle for 1 minute.
5. Road test is now complete.

6. Connect the diagnostic equipment to the vehicle.

7. NOTE: If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

Follow on screen prompts and check for engine management fault codes.

8. Disconnect the diagnostic equipment from the vehicle.

Electronic Engine Controls - V8 S/C 4.2L Petrol - Powertrain Control Module (PCM) Short Drive Cycle Self-Test

General Procedures

• NOTE: This procedure is an overcheck only. If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

1. Connect the diagnostic equipment to the vehicle.

2. Follow on screen prompts and check for engine management fault codes.

3. Clear the fault codes following the on screen procedure.

4. Start the engine.

- Allow the engine to idle for 30 seconds.
- Raise the engine speed to 1500 rpm and hold for 3 minutes until a temperature of 70ºC (158 ºF) is achieved.
- Allow the engine to idle for 30 seconds.
- Switch off the engine.

5. NOTE: If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

Follow on screen prompts and check for engine management fault codes.

6. Disconnect the diagnostic equipment from the vehicle.

Electronic Engine Controls - V8 S/C 4.2L Petrol - Brake Pedal Position (BPP) Switch Adjustment

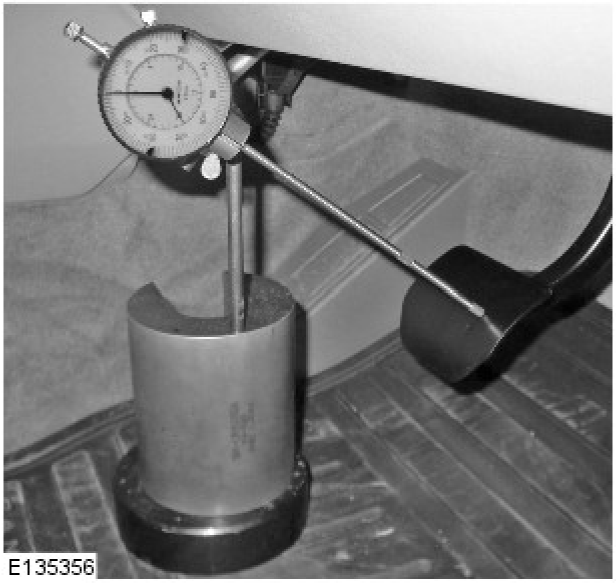
General Procedures

Check

1. Remove the brake pedal rubber.

2. NOTE: Make sure that the dial test indicator (DTI) gauge is in line with the brake pedal movement.

Position the DTI gauge on a suitable mounting block, as illustrated.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3. With the aid of another technician, gently press the brake pedal until the stoplamps illuminate.

4. NOTE: The specification is that the stoplamps should illuminate at between 5.5mm and 8.5mm brake pedal travel.

Note the measurement of the brake pedal travel from rest position until the stoplamps illuminated.

Adjust

1. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠

Remove the stoplamp switch.
For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

2. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠ Only use light finger pressure when installing the stoplamp switch. Failure to follow this instruction may result in an incorrectly adjusted stoplamp switch.

Install the stoplamp switch.

For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

3. Check the adjustment of the stoplamp switch by following the **Check** procedure in this procedure and carry out the **Adjust** procedure if required.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 4.2L Petrol -

Lubricants

Item	Land Rover Part No.
* HO2s removal	STC 50545
HO2s threads	Apply suitable high temperature anti-seize compound to threads of sensor

*** Apply to area around sensor threads prior to attempting to remove sensor**

Engine Management System

Item	Description
Engine management system:	
Make	Denso
Type	PAG EMS - Generation 1
Camshaft position sensor:	
Make	Denso
Type	Left-hand XR83-6B288-AB and Right-hand 2W93-6B288-AA
Crankshaft position sensor:	
Make	Denso
Type	XW43-6C315-BB

Torque Specifications

Description	Nm	lb-ft
+ Heated oxygen sensor (HO2S)	45	33
* RH catalytic converter to exhaust manifold bolts	22	16
* LH catalytic converter to exhaust manifold bolts	22	16
+ Catalyst monitor sensor	45	33
Catalyst monitor sensor heat shield bolts	10	7
Mass air flow (MAF) sensor Torx screws	2	1.5
Camshaft position (CMP) sensor bolt	7	5
Throttle body bolts	10	7
Crankshaft position (CKP) sensor Torx screw	8	6
Knock sensor (KS) bolt	20	15
Oil pressure sensor	12	9
Radiator access panel bolts	10	7
Oil temperature sensor	20	15
Manifold Absolute Pressure (MAP) sensor	3	2
Fuel rail temperature sensor	7	5
Wiring harness support bracket retaining bolt	10	7
Supercharger pressure relief actuator	10	7
Intake air temperature sensor torx screws	6	4
Fuel rail pressure sensor bolts	6	4

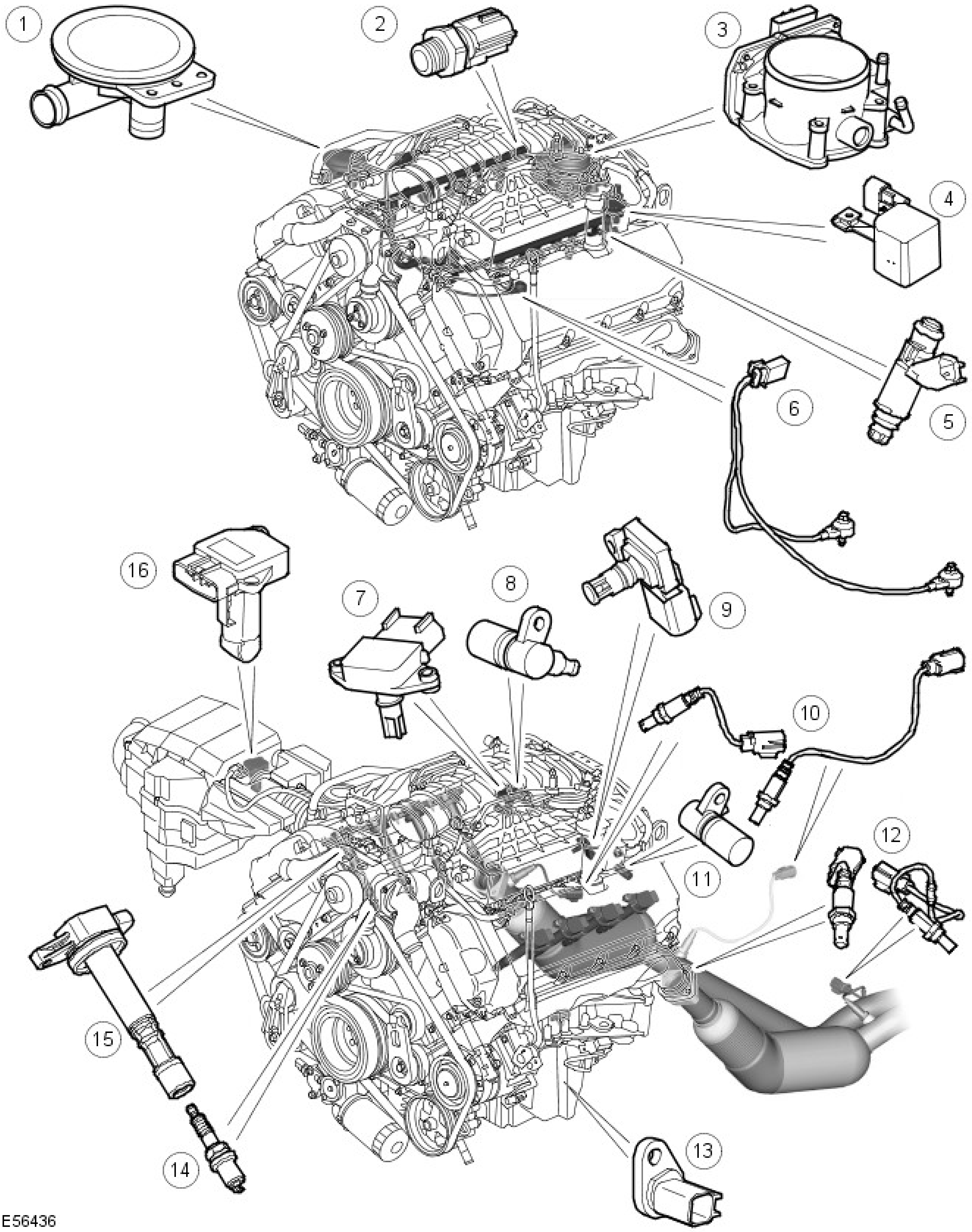
+ Apply anti-seize lubricant to threads of sensor - See Lubricants

*** New bolts must be installed**

Electronic Engine Controls - V8 S/C 4.2L Petrol - Electronic Engine Controls

Description and Operation

V8 4.2 Liter Electronic Engine Controls-Component Location (Sheet 1of 2)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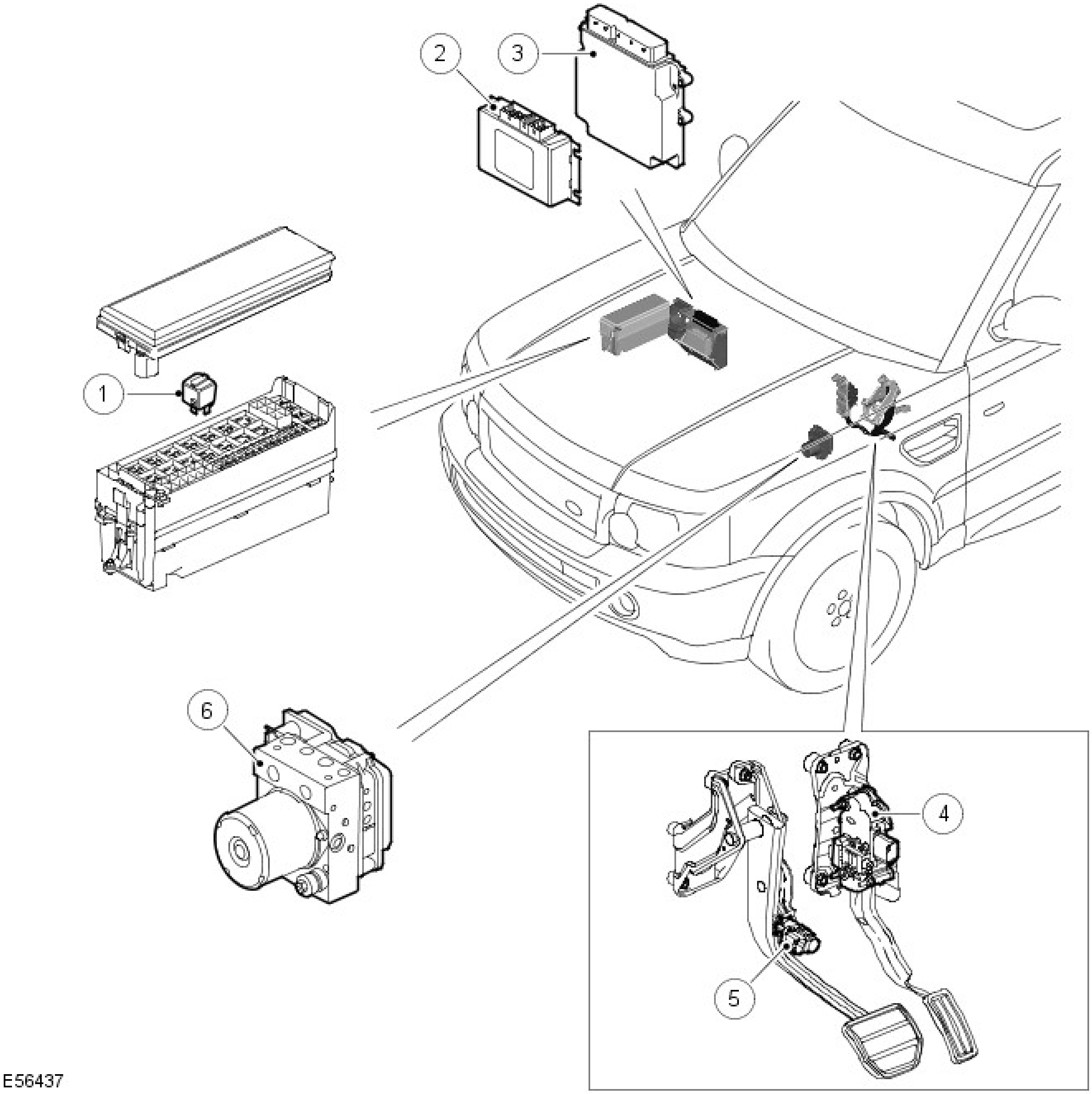
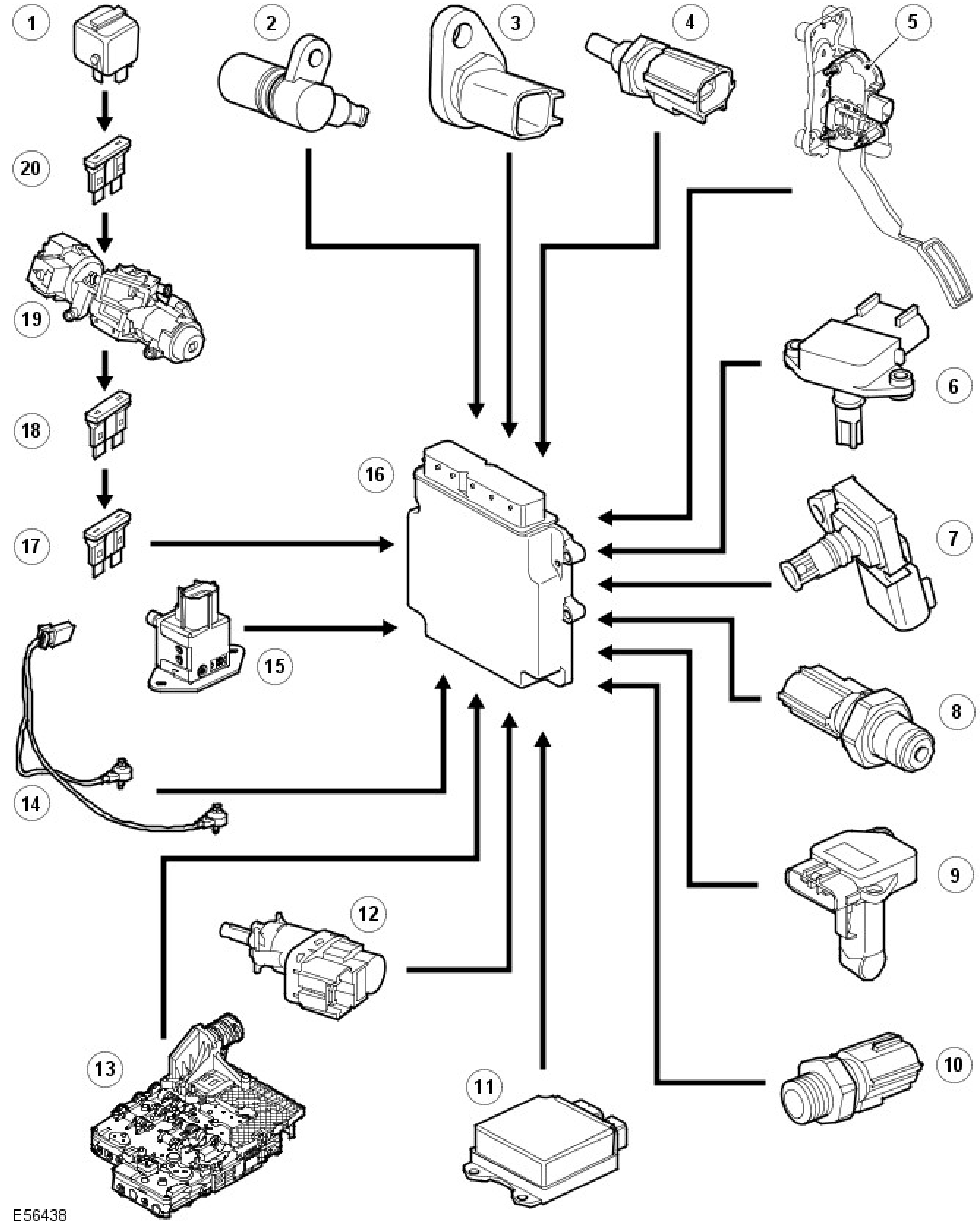
Item	Part Number	Description
1	-	positive crankcase ventilation (PCV) valve
2	-	Fuel rail temperature sensor
3	-	Electric throttle
4	-	RFI capacitor
5	-	Injectors
6	-	Knock sensor
7	-	manifold absolute pressure and temperature (MAPT) sensor
8	-	camshaft position (CMP) sensor
9	-	manifold absolute pressure (MAP) sensor
10	-	Universal Heated Exhaust Gas Oxygen (UHEGO) sensors
11	-	CMP sensor
12	-	Heated Exhaust Gas Oxygen (HEGO) sensors
13	-	crankshaft position (CKP) sensor
14	-	Spark plugs
15	-	Ignition coils
16	-	mass air flow (MAF)/intake air temperature (IAT)

V8 4.2 Liter Electronic Engine Controls - Component Location (Sheet 2 of 2)



Item	Part Number	Description
1	-	Main relay
2	-	Transfer box control module
3	-	engine control module (ECM)
4	-	accelerator pedal position (APP)
5	-	Brake light switch
6	-	anti-lock brake system (ABS) control module

4.2 Liter Electronic Engine Controls - Input Control Diagram (Sheet 1 of 2)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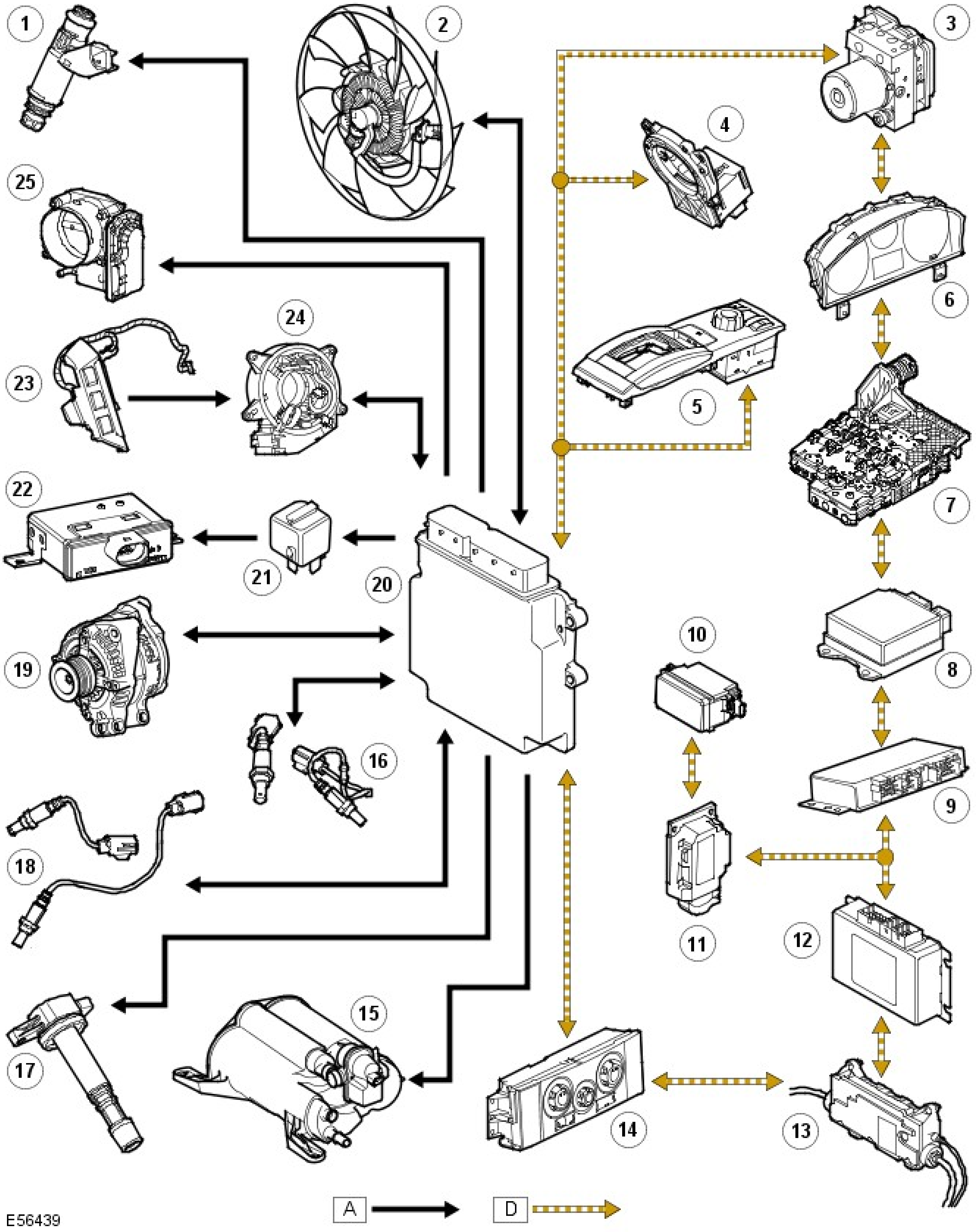
Item	Part Number	Description
1	-	Main relay
2	-	CMP sensor x2
3	-	CKP sensor
4	-	engine coolant temperature (ECT) sensor
5	-	APP sensor

6	-	MAPT sensor
7	-	MAP sensor
8	-	Engine oil temperature sensor
9	-	MAF/IAT sensor
10	-	Fuel rail temperature sensor
11	-	restraints control module (RCM)
12	-	Brake light switch
13	-	Park/ neutral signal from transmission control module (TCM)
14	-	Knock sensors
15	-	Fuel rail pressure sensor
16	-	ECM
17	-	Fuse 27E
18	-	Fuse 13E
19	-	Ignition switch
20	-	Fuse 10E

4.2 Liter Electronic Engine Controls - Control Diagram (Sheet 2 of 2)

- NOTE: **A** = Hardwired; **D** = High speed CAN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E56439

Item	Part Number	Description
1	-	Injectors
2	-	Engine cooling fan control/monitor
3	-	ABS control module
4	-	Steering angle sensor
5	-	Terrain response control module

6	-	Instrument cluster
7	-	TCM
8	-	RCM
9	-	Differential control module
10	-	Adaptive speed control sensor
11	-	Adaptive speed control module
12	-	Transfer box control module
13	-	Electric park brake control module
14	-	automatic temperature control (ATC) control module
15	-	DMTL pump
16	-	UHEGOs
17	-	Ignition coils
18	-	HEGOs
19	-	Generator
20	-	ECM
21	-	Fuel pump relay
22	-	fuel pump driver module (FPDM)
23	-	Speed control switches
24	-	Clock spring
25	-	Electric throttle

OVERVIEW

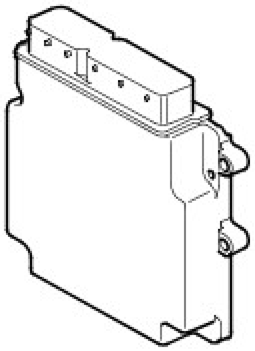
The V8 4.2 Liter supercharged engine is controlled by an ECM manufactured by DENSO. The Engine Management System (EMS) controls the following:

- Engine fueling
- Ignition timing
- Closed loop fueling
- Knock control
- Idle speed control
- Emission control
- on-board diagnostic (OBD)
- Interface with the immobilization system
- Speed control

The ECM controls the engine fueling by providing sequential fuel injection to all cylinders. Ignition is controlled by a direct ignition system, provided by eight plug top coils. The ECM is able to detect and correct for ignition knock on each cylinder and adjust the ignition timing for each cylinder to achieve optimum performance.

The ECM uses a torque-based strategy to generate the torque required by the driver and other vehicle control modules. The EMS uses various sensors to determine the torque required from the engine. The EMS also interfaces with other vehicle electronic control modules's, via the controller area network (CAN) bus, to obtain additional information (e.g. road speed from the ABS control module). The EMS processes these signals and decides how much torque to generate. Torque is then generated by using various actuators to supply air, fuel and spark to the engine (electronic throttle, injectors, coils, etc.).

ENGINE CONTROL MODULE (ECM)



E46330

The ECMis located in the E-Box in the plenum area on the passenger side of the engine compartment attached to the bulkhead.

System ECM has the following inputs:

- RCM
- Park/neutral switch
- Ignition coil feedback x2
- Fuel rail temperature
- Fuel rail pressure
- Supercharger inlet pressure
- Mass air flow
- Engine speed
- Camshaft position x2
- Driver demand
- Brake pedal position switch
- Speed control switches
- Generator load
- Oxygen sensors pre catalyst x2
- Oxygen sensors post catalyst x2
- Throttle position
- Cooling fan speed
- Ignition switch position
- Knock sensors x2
- MAP
- Intercooler temperature
- Coolant temperature
- Engine oil temperature

The ECM outputs to the following:

- Throttle Actuator
- Brake vacuum pump relay
- Ignition coils (x8)
- Oxygen sensor heaters (4)
- Fuel injectors (8)
- Purge Valve
- Engine Cooling Fan
- Fuel pump relay
- Starter Relay
- EMS Main Relay
- Viscous Fan Control
- Generator Control
- Diagnostic Module Tank Leakage (DMTL) (NAS Only)
- E box fan
- FPDM

ECM Connector C0634 Pin Out Table

Pin No	Description	Input/Output
1	Not used	-
2	Not used	-
3	Generator monitor	Input
4	Not used	-
5	Not used	-
6	CKP sensor -	Input
7	CMP sensor 1ground (GND)	-
8	CMP sensor 2GND	-
9	Not used	-
10	throttle position (TP) sensor GND	-
11	MAP sensor ground	-
12	fuel rail pressure (FRP) sensor ground	-
13	Not used	-
14	Not used	Input
15	ECT ground	-
16	Not used MAF ground	-
17	Not used	-
18	MAF sensor ground	-
19	Knock sensor 1A ground	-
20	Knock sensor 1B ground	-
21	Not used	-
22	Not used	-

Pin No	Description	Input/Output
23	Oil temperature sensor	Input
24	MAPT sensor 5v ref	Output
25	Not used	-
26	UHEGO sensor bank B signal	Input
27	UHEGO sensor bank B GND	-
28	UHEGO sensor bank A signal	Input
29	UHEGO sensor bank A GND	-
30	CKP sensor +	Input
31	Not used	-
32	Not used	-
33	CMP signal bank B	Input
34	CMP signal bank A	Input
35	Not used	-
36	Not used	-
37	Not used	-
38	MAPsignal	Input
39	IAT	Input
40	Not used	Input
41	Not used	Input
42	Knock sensor 1 A +	Input
43	Knock sensor 1 B +	Input
44	Not used	-
45	Not used	-
46	Fuel rail temperature sensor	Input
47	Fuel rail pressure sensor 5 V ref voltage	Output
48	MAP sensor 5 V ref voltage	Output
49	Not used	-
50	Not used	-
51	Not used	-
52	Not used	-
53	Not used	-
54	Ignition coil cylinder 4B	Output
55	Ignition coil cylinder 4A	Output
56	Ignition coil cylinder 3B	Output
57	Ignition coil cylinder 3A	Output
58	Ignition coil cylinder 2B	Output
59	Ignition coil cylinder 2A	Output
60	Ignition coil cylinder 1B	Output
61	Ignition coil cylinder 1A	Output
62	Ignition failure signal bank A	Input
63	Viscous fan speed monitor	Input
64	Ignition failure signal bank B	Input
65	TP sensor 1	Input
66	MAF	Input
67	TP sensor 2	Input
68	ECT	Input
69	Inlet manifold boost pressure	Input
70	MAF	Input
71	Fuel rail pressure sensor signal	Input
72	Electric throttle 5V reference	Output
73	Not used	-
74	Throttle valve open direction -	Output
75	Throttle valve open direction +	Output
76	UHEGO Heater bank A	Output
77	UHEGO Heater bank B	Output
78	Injector cylinder 1A	Output
79	Injector cylinder 1B	Output
80	Injector cylinder 2A	Output
81	Injector cylinder 2B	Output
82	Injector cylinder 3A	Output
83	Injector cylinder 3B	Output

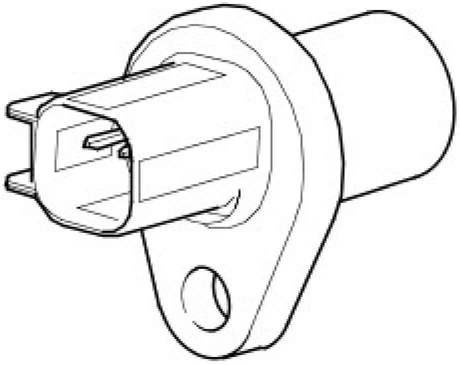
Pin No	Description	Input/Output
84	Injector cylinder 4A	Output
85	Injector cylinder 4B	Output
86	Not used	-
87	Not used	-
88	Not used	-
89	Not used	-
90	Not used	-
91	Not used	-
92	Purge valve	Output
93	Viscous fan request	Output
94	E box fan	Output
95	FPDM power	Output
96	Generator control	Output

ECM Connector C0635 Pin Out Table

Pin No	Description	Input/Output
1	Signal ground 1	-
2	Power ground 1	-
3	Power ground 3	-
4	Power ground 2	-
5	ECM power	Output
6	Electric throttle power	Input
7	APP sensor ground 1	-
8	APP sensor ground 2	-
9	Not used	-
10	Not used	-
11	Not used	-
12	Not used	-
13	Not used	-
14	Not used	-
15	Park/ Neutral signal	Input
16	EMS relay	Output
17	Crank request	Input
18	Not used	-
19	APP sensor 2 5V ref	Output
20	FPDM control	Output
21	FPDM monitor	Input
22	HEGO sensor A GND	-
23	DMTL heater	Output
24	APP sensor 1 signal	Output
25	HEGO sensor A	Input
26	HEGO sensor B	Input
27	Not used	-
28	RCM	Input
29	Not used	-
30	Ignition switch	Input
31	Not used	-
32	APP sensor 1 5V reference	Output
33	DMTL pump	Output
34	HEGO sensor B GND	-
35	Speed control switch -	Output
36	Speed control switch +	Input
37	Not used	-
38	APP sensor 2 demand	Input
39	Not used	-
40	Not used	-
41	Brake pedal switch	Input
42	Not used	-
43	Not used	-
44	CAN out -	Input/output
45	CAN in -	Input/output
46	HEGO heater A	Output

Pin No	Description	Input/Output
47	HEGO heater B	Output
48	DMTL valve	Output
49	Not used	-
50	Vacuum pump relay	Output
51	Starter relay	Output
52	Not used	-
53	Not used	-
54	Battery voltage	Input
55	Not used	-
56	Not used	-
57	CAN out +	Input/output
58	CAN in +	Input/output

CRANKSHAFT POSITION (CKP) SENSOR



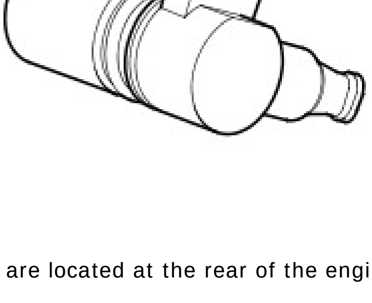
E46331

The crankshaft position sensor is mounted at the rear underside of the engine near the transmission bell housing. Connection between the sensor and the harness is via a link harness and a two-way connector. Both wires go directly to the ECM. The sensor produces the signal which enables the ECM to determine the angle of the crankshaft, and the engine rpm. From this, the point of ignition, fuel injection, etc. is calculated. If the signal wires are reversed a 3 degrees advance in timing will occur, as the electronics within the ECM uses the falling edge of the signal waveform as its reference / timing point for each tooth.

The reluctor is pressed into the flywheel and has a "tooth" pattern based on 36 teeth at 10° intervals and approximately 5° wide: one of the teeth is removed to provide a hardware reference mark which is 30 degrees before top dead center (BTDC) No.1 cylinder. Because of the crankshaft sensor's orientation, the target wheel uses windows stamped into the face, rather than actual teeth.

The sensor operates by generating an output voltage caused by the change in magnetic field that occurs as the windows pass in front of the sensor. The output voltage varies with the speed of the windows passing the sensor, the higher the engine speed, the higher the output voltage. Note that the output is also dependent on the air gap between the sensor and the teeth (the larger the gap, the weaker the signal, the lower the output voltage). The ECM transmits the engine speed to other vehicle control modules on CAN.

CAMSHAFT POSITION (CMP) SENSOR



E46332

Two sensors are located at the rear of the engine, in the cylinder head (one per bank), above the rear cylinders. The sensors are

Variable Reluctor Sensor (VRS) type, producing four pulses for every two engine crankshaft revolutions. The sensing element is positioned between 0 and 2mm from the side of the cam gear wheel.

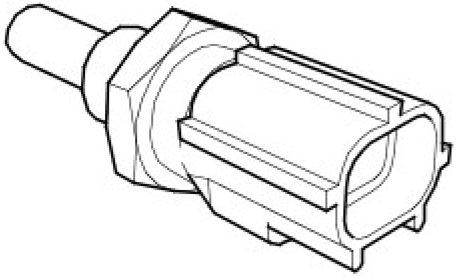
The camshaft timing wheel is a sintered component which has four teeth on it to enable the EMS to detect cylinder identification. The signal is used for:

- Cylinder recognition
- Enabling sequential fuel injection
- Knock control
- Cylinder identification for diagnostic purposes.

Failure symptoms include:

- Ignition timing reverting to the base mapping, with no cylinder correction.
- Active knock control is disabled, along with its diagnostic (Safe ignition map - loss of performance).
- Quick cam/crank synchronisation on start disabled.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

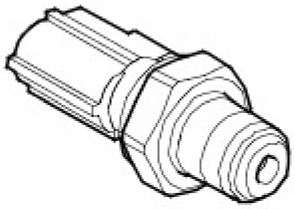


E47309

The ECT sensor is located at the front of the engine at the rear of the thermostat housing. The ECT sensor is a thermistor used to monitor the engine coolant temperature. The engine coolant temperature sensor is vital to the correct running of the engine as a richer mixture is required at lower block temperatures for good quality starts and smooth running, leaning off as the temperature rises to maintain emissions and performance.

The sensor has an operating temperature range of -30 Degrees Celsius to 125 Degrees Celsius. The maximum engine coolant temperature the ECM outputs on the CAN is the 119 Degrees Celsius. When a defective coolant sensor is detected, the ECM uses the oil temperature sensor value.

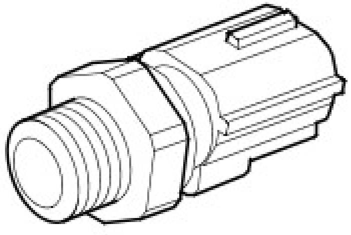
ENGINE OIL TEMPERATURE SENSOR



E46333

Oil temperature is monitored through a temperature sensor mounted in the oil system. This component is a negative temperature coefficient (NTC). The sensor is mounted next to the oil pressure sensor at the front of the engine and locates into the oil filter bracket.

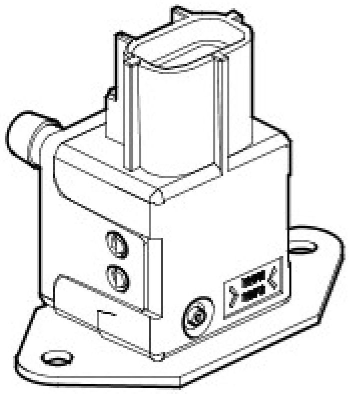
FUEL RAIL TEMPERATURE SENSOR



E47606

The fuel rail temperature sensor measures the temperature of the fuel in the fuel rail. This input is then used to deliver the correct quantity of fuel to the engine. The sensors operating range is -40 Degrees Celsius to 150 Degrees Celsius. The fuel rail temperature sensor is fitted on the rear of the right hand bank (bank A) fuel rail.

FUEL RAIL PRESSURE SENSOR

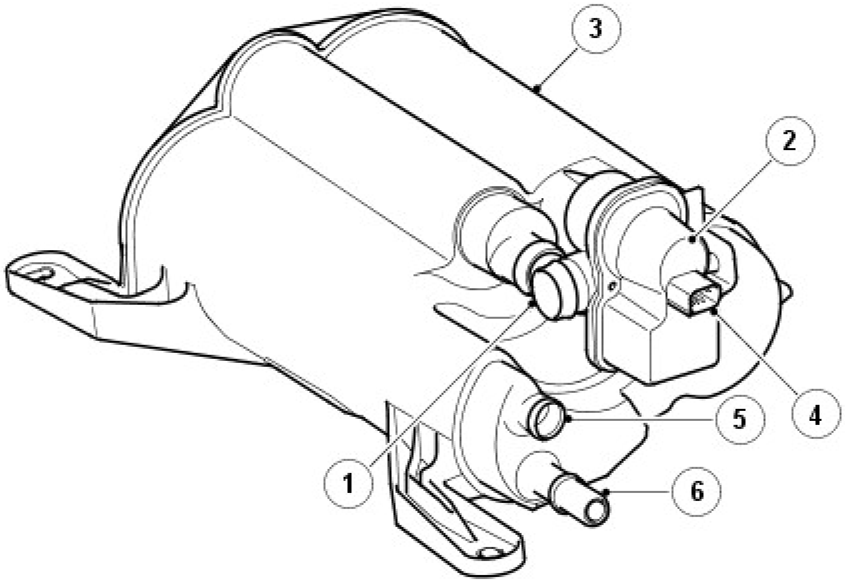


E58945

The fuel rail pressure sensor is located on top of the fuel rail adjacent to the fuel inlet. The fuel rail pressure sensor measures the pressure of the fuel in the fuel rail. This input is then used by the fuel pump driver module to control the amount of fuel delivered to the fuel rail.

DIAGNOSTIC MONITORING OF TANK LEAKAGE (DMTL) - NAS ONLY

Charcoal Canister with DMTL Pump (NAS only)



E44561

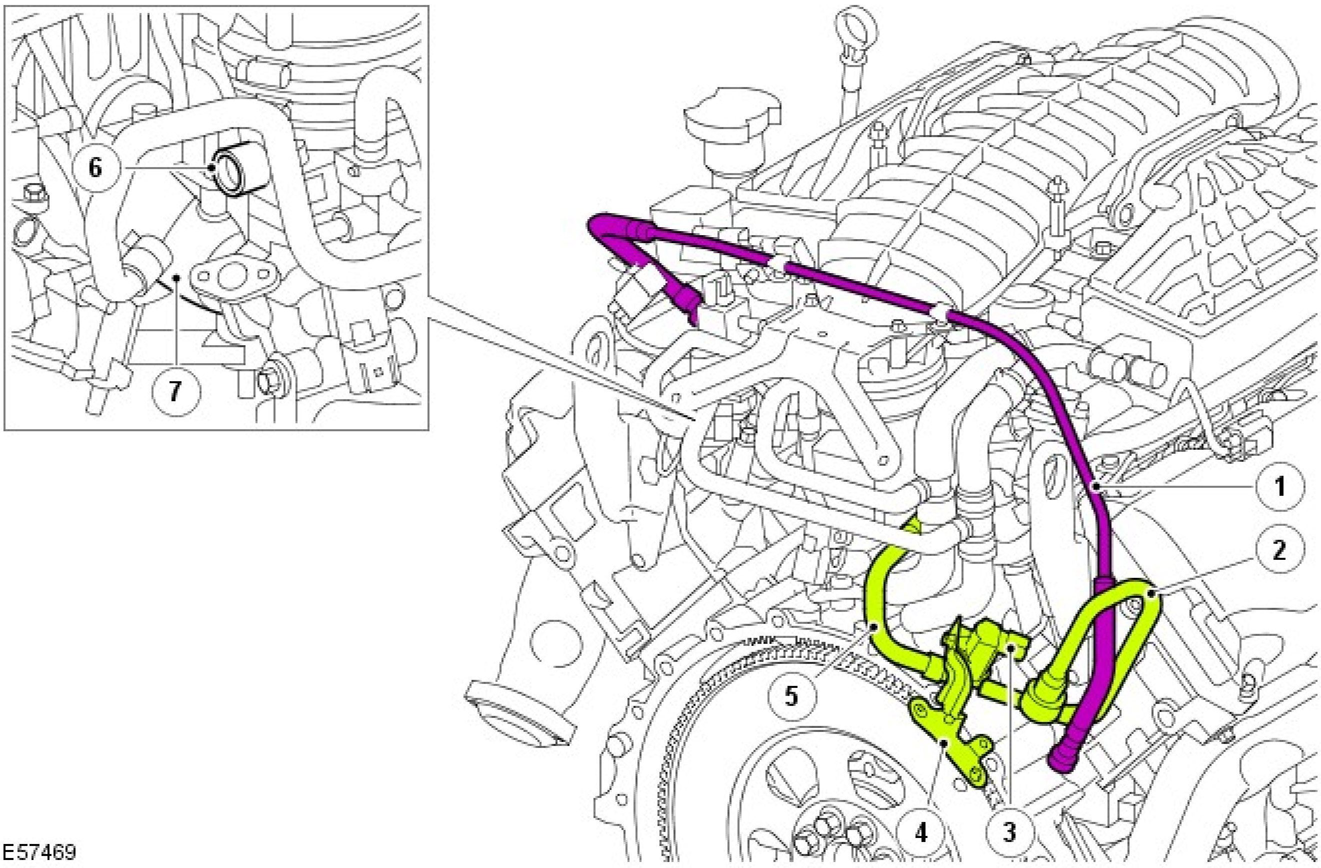
Item	Part Number	Description
1	-	Charcoal canister atmospheric pressure vent connection (via DMTL pump)
2	-	DMTL pump
3	-	Charcoal canister
4	-	Electrical connector
5	-	Purge hose connection
6	-	Charcoal canister tank vent hose connection

The DMTL system periodically checks the evaporative system and the fuel tank for leaks when the ignition is switched off. The DMTL pump is connected to the atmospheric vent of the charcoal cannister and incorporates a positive temperature coefficient (PTC) heating element a normally open valve and a reference orifice. The DMTL pump is only operated when the ignition is switched off and is controlled by the ECM. The ECM also monitors the electric air pump operation and the normally open valve for faults. To check the fuel tank and EVAP system for leaks the ECM operates the DMTL pump and monitors the current draw. This is compared to a referenced figure established from the current draw when air is pumped through the reference orifice.

For additional information, refer to: Evaporative Emissions (303-13A Evaporative Emissions - V8 S/C 4.2L Petrol, Description and Operation).

PURGE VALVE

Purge Valve and Hoses location



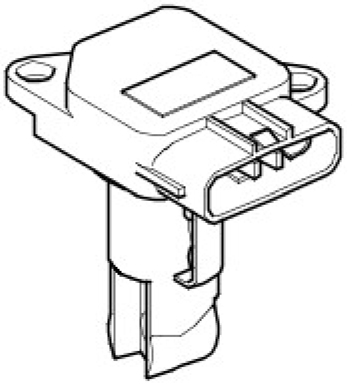
Item	Part Number	Description
1	-	Fuel feed jump hose (ref only)
2	-	Purge hose connector
3	-	Purge valve
4	-	Bracket
5	-	Purge hose
6	-	Electronic throttle
7	-	Induction elbow

The purge valve is located at the rear of the engine on a bracket which is attached to the transmission bell housing. The purge valve is a solenoid operated valve which is closed when de-energized. The purge valve is controlled by a 10Hz pulse width modulation (PWM) signal from the ECM. When the engine operating conditions are correct, the ECM opens the purge valve which causes fuel vapor and fresh air to be drawn through the charcoal cannister. The fresh air is drawn through the charcoal cannister via the DMTL pump fresh air vent.

For additional information, refer to: Evaporative Emissions (303-13A Evaporative Emissions - V8 S/C 4.2L Petrol, Description and

Operation).

MASS AIR FLOW / INLET AIR TEMPERATURE (MAF / AT) SENSOR



E47308

The MAF/IATis located in the clean air duct immediately after the air filter box.

The air mass flow is determined by the cooling effect of inlet air passing over a “hot film” element contained within the device. The higher the air flow the greater the cooling effect and the lower the electrical resistance of the “hot film” element. The ECM then uses this signal from the MAF to calculate the air mass flowing into the engine.

The measured air mass flow is used in determining the fuel quantity to be injected in order to maintain the stichometric air/fuel mixture required for correct operation of the engine and exhaust catalysts. Should the device fail there is a software backup strategy that will be evoked once a fault has been diagnosed.

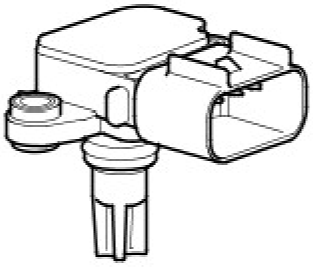
The following symptoms may be observed if the sensor fails:

- During driving the engine RPM might dip, before recovering.
- Difficulty in starting or start - stall.
- Poor throttle response / engine performance.
- Lambda control and idle speed control halted.
- Emissions incorrect.
- AFM signal offset

The IAT sensor is integrated into the MAF meter. It is a temperature dependent resistor (thermistor), i.e. the resistance of the sensor varies with temperature. This thermistor is a NTC type element meaning that the sensor resistance decreases as the sensor temperature increases. The sensor forms part of a voltage divider chain with an additional resistor in the ECM. The voltage from this sensor changes as the sensor resistance changes, thus relating the air temperature to the voltage measured by the ECM.

The ECM stores a 25 Degrees Celsius default value for air temperature in the event of a sensor failure.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR- SUPERCHARGER INLET PRESSURE



E47588

The MAP sensor provides a voltage proportional to the absolute pressure in the supercharger intake. This signal allows the load on the engine to be calculated and used within the internal calculations of the ECM. The sensor is located below the electric throttle on the induction elbow.

MAP Pin Out Table

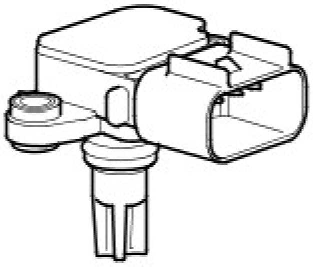
Pin No	Description
1	MAPsignal
2	Sensor supply
3	Not used
4	Sensor ground

The output signal from the MAP sensor, together with the CKP and IAT sensors, is used by the ECM to calculate the amount of air induced into the cylinders. This enables the ECM to determine ignition timing and fuel injection duration values.

The MAP sensor receives a 5V supply voltage from pin 48 of ECM connector C0634 and provides an analogue signal to pin 38 of ECM connector C0634, which relates to the absolute manifold pressure and allows the ECM to calculate engine load. The ECM provides a ground for the sensor via pin 11 of ECM connector C0634.

If the MAP signal is missing, the ECM will substitute a default manifold pressure reading based on crankshaft speed and throttle angle. The engine will continue to run with reduced drivability and increased emissions, although this may not be immediately apparent to the driver. The ECM will store fault codes which can be retrieved using T4.

MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE (MAPT) SENSOR



E47588

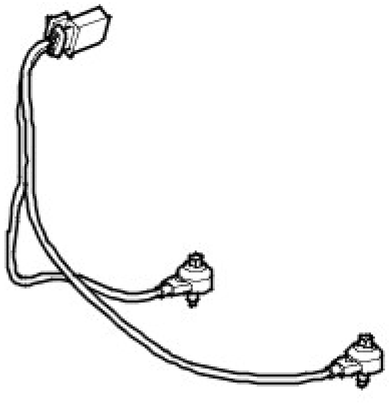
The MAPT is located to the rear of the right-hand (RH) engine bank intercooler outlet. The sensor measures the pressure and temperature of the inducted air prior to it entering the cylinders.

The sensor fits and seals using a radial ‘O’ ring seal directly to the inlet manifold.

The MAPT signal is used to retard the ignition timing relative to boost pressure. The intercooler temperature is used for air charge density calculations and for intercooler diagnostic purposes.

Pin No	Description	Input/Output
1	Boost pressure	Output
2	Sensor supply	Input
3	Intercooler outlet temperature	Output
4	Sensor ground	-

KNOCK SENSORS



E47296

The V8 EMS has two knock sensors located in the V of the engine, one per cylinder bank. The sensors are connected to the ECM via a twisted pair.

The knock sensors produce a voltage signal in proportion to the amount of mechanical vibration generated at each ignition point. Each sensor monitors the related cylinder bank.

The knock sensors incorporate a piezo-ceramic crystal. This crystal produces a voltage whenever an outside force tries to deflect it, (i.e. exerts a mechanical load on it). When the engine is running, the compression waves in the material of the cylinder block, caused by the combustion of the fuel/air mixture within the cylinders, deflect the crystal and produce an output voltage signal. The signals are supplied to the ECM, which compares them with `mapped' signals stored in memory. From this, the ECM can determine when detonation occurs on individual cylinders. When detonation is detected, the ECM retards the ignition timing on that cylinder for a number of engine cycles, then gradually returns it to the original setting.

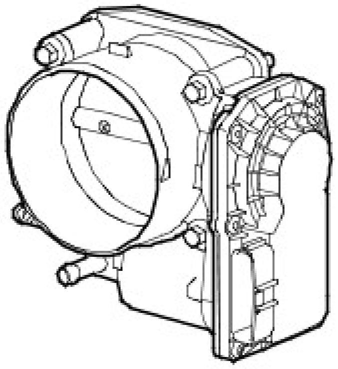
Care must be taken at all times to avoid damaging the knock sensors, but particularly during removal and fitting procedures. The recommendations regarding torque and surface preparation must be adhered to. The torque applied to the sensor and the quality of the surface preparation both have an influence over the transfer of mechanical noise from the cylinder block to the crystal.

The ECM uses the signals supplied by the knock sensors, in conjunction with the signal it receives from the camshaft sensor, to determine the optimum ignition point for each cylinder. The ignition point is set according to preprogrammed ignition maps stored within the ECM. The ECM is programmed to use ignition maps for 98 research octane number (RON) premium specification fuel. It will also function on 91 RON regular specification fuel and learn new adaptions. If the only fuel available is of poor quality, or the customer switches to a lower grade of fuel after using a high grade for a period of time, the engine may suffer slight pre-ignition for a short period. This amount of pre-ignition will not damage the engine. This situation will be evident while the ECM learns and then modifies its internal mapping to compensate for the variation in fuel quality. This feature is called adaption. The ECM has the capability of adapting its fuel and ignition control outputs in response to several sensor inputs.

The ECM will cancel closed loop control of the ignition system if the signal received from either knock sensor becomes implausible. In these circumstances the ECM will default to a safe ignition map. This measure ensures the engine will not become damaged if low quality fuel is used. The malfunction indicator lamp (MIL) will not illuminate, although the driver may notice that the engine 'pinks' in some driving conditions and displays a drop in performance and smoothness.

When a knock sensor fault is stored, the ECM will also store details of the engine speed, engine load and the coolant temperature.

ELECTRONIC THROTTLE



E47298

The V8 EMS incorporates an electric throttle control system. The electronic throttle body is located on the air intake manifold in the engine compartment. The system comprises three main components:

- Electronic throttle control valve
- APP
- ECM

When the accelerator pedal is depressed the APP sensor provides a change in the monitored signals. The ECM compares this against an electronic “map” and moves the electronic throttle valve via a PWM control signal which is in proportion to the APP angle signal. The system is required to:

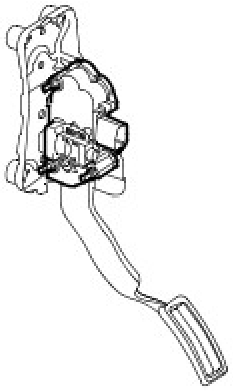
- Regulate the calculated intake air load based on the accelerator pedal sensor input signals and programmed mapping.
- Monitor the drivers input request for cruise control operation.
- Automatically position the electronic throttle for accurate cruise control.
- Perform all dynamic stability control throttle control interventions.
- Monitor and carry out maximum engine and road speed cut out.
- Provide differing responses for differing Terrain response modes.

A software strategy within the ECM enables the throttle position to be calibrated each ignition cycle. When the ignition is turned ON, the ECM performs a self test and calibration routine on the electronic throttle by closing the throttle full, then opening again. This tests the default position springs.

Electronic Throttle Pin Out Table

Pin No	Description
1	Motor +
2	Motor -
3	Sensor ground
4	Sensor 2 signal
5	5 volt supply
6	Sensor 1 signal

ACCELERATOR PEDAL POSITION (APP) SENSOR



E47297

The APP sensors are located on the accelerator pedal assembly.

The APP sensors are used to determine the driver's request for vehicle speed, acceleration and deceleration. This value is used by the ECM and the throttle is opened to the correct angle by an electric motor integrated into the throttle body.

The APP Sensor signals are checked for range and plausibility. Two separate reference voltages are supplied to the pedal. Should one sensor fail, the other is used as a 'limp – home' input. In limp home mode due to an APP signal failure the ECM will limit the maximum engine speed to 2000 rpm.

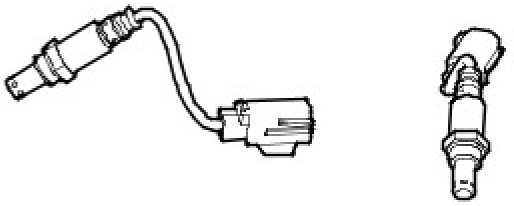
APP Pin Out Table

Pin No	Description
1	APP 1 ground
2	APP 1 demand
3	APP2 ground
4	Not used
5	APP 2 demand
6	Supply 2, 5 volt
7	Supply 1, 5 volt
8	Not used

OXYGEN SENSORS

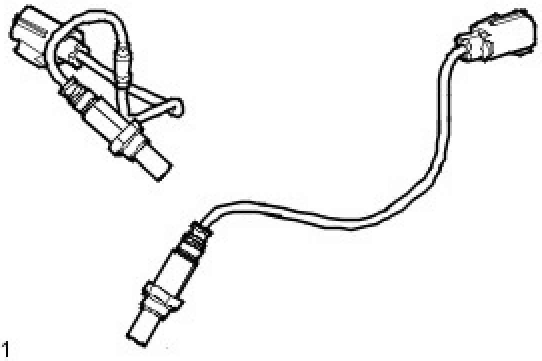
There are four oxygen sensors located in the exhaust system. Two upstream before the catalytic converter and two down stream after the catalytic converter. The sensor monitors the level of oxygen in the exhaust gases and is used to control the fuel/air mixture. Positioning a sensor in the stream of exhaust gasses from each bank enables the ECM to control the fueling on each bank independently of the other, allowing much closer control of the air / fuel ratio and catalyst conversion efficiency.

Upstream Oxygen Sensors



E47300

Downstream Oxygen Sensors



E47301

The oxygen sensors need to operate at high temperatures in order to function correctly. To achieve the high temperatures required, the sensors are fitted with heater elements that are controlled by a PWM signal from the ECM. The heater elements are operated immediately following engine start and also during low load conditions when the temperature of the exhaust gases is insufficient to maintain the required sensor temperatures. A non-functioning heater delays the sensor's readiness for closed loop control and influences emissions. The PWM duty cycle is carefully controlled to prevent thermal shock to cold sensors.

UHEGO (Universal Heated Exhaust Gas Oxygen) sensors also known as Linear or "Wide Band" sensors produces a constant voltage, with a variable current that is proportional to the oxygen content. This allows closed loop fueling control to a target lambda, i.e. during engine warm up (after the sensor has reached operating temperature and is ready for operation). This improves emission control.

The HEGO sensor uses Zirconium technology that produces an output voltage dependant upon the ratio of exhaust gas oxygen to the ambient oxygen. The device contains a Galvanic cell surrounded by a gas permeable ceramic, the voltage of which depends upon the level of O2 defusing through. Nominal output voltage of the device for l =1 is 300 to 500m volts. As the fuel mixture becomes richer (l<1) the voltage tends towards 900m volts and as it becomes leaner (l>1) the voltage tends towards 0 volts. Maximum tip temperature is 1,000 Degrees Celsius for a maximum of 100 hours.

Sensors age with mileage, increasing their response time to switch from rich to lean and lean to rich. This increase in response time influences the ECM closed loop control and leads to progressively increased emissions. Measuring the period of rich to lean and lean to rich switching monitors the response rate of the upstream sensors.

Diagnosis of electrical faults is continually monitored in both the upstream and downstream sensors. This is achieved by checking the signal against maximum and minimum threshold, for open and short circuit conditions.

Oxygen sensors must be treated with the utmost care before and during the fitting process. The sensors have ceramic material within them that can easily crack if dropped / banged or over-torqued. The sensors must be torqued to the required figure, (40-50Nm), with a calibrated torque wrench. Care should be taken not to contaminate the sensor tip when anti-seize compound is used on the thread. Heated sensor signal pins are tinned and universal are gold plated. Mixing up sensors could contaminate the connectors and affect system performance.

Failure Modes

- Mechanical fitting & integrity of the sensor.
- Sensor open circuit / disconnected.
- Short circuit to vehicle supply or ground.
- Lambda ratio outside operating band.

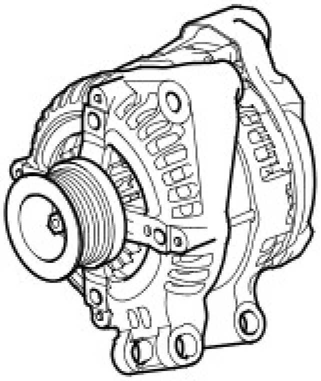
- Crossed sensors bank A & B.
- Contamination from leaded fuel or other sources.
- Change in sensor characteristic.
- Harness damage.
- Air leak into exhaust system.

Failure Symptoms

- Default to Open Loop fueling for the particular cylinder bank
- High CO reading.
- Strong smell of H02S (rotten eggs) till default condition.
- Excess Emissions.

It is possible to fit front and rear sensors in their opposite location. However the harness connections are of different gender and color to ensure that the sensors cannot be incorrectly connected. In addition to this the upstream sensors have two holes in the shroud, whereas the down stream sensors have four holes in the shroud for the gas to pass through.

GENERATOR



E47591

The Generator has a multifunction voltage regulator for use in a 14V charging system with 6÷12 zener diode bridge rectifiers.

The ECM monitors the load on the electrical system via PWM signal and adjusts the generator output to match the required load. The ECM also monitors the battery temperature to determine the generator regulator set point. This characteristic is necessary to protect the battery; at low temperatures battery charge acceptance is very poor so the voltage needs to be high to maximize any rechargeability, but at high temperatures the charge voltage must be restricted to prevent excessive gassing of the battery with consequent water loss.

The generator has a smart charge capability that will reduce the electrical load on the generator reducing torque requirements, this is implemented to utilize the engine torque for other purposes. This is achieved by monitoring three signals to the ECM:

- Generator sense (A sense), measures the battery voltage at the central junction box (CJB).
- Generator communication (Alt Com) communicates desired generator voltage set point from ECM to Generator.
- Generator monitor (Alt Mon) communicates the extent of generator current draw to ECM. This signal also transmits faults to the ECM which will then sends a message to the instrument cluster on the CAN bus to illuminate the charge warning lamp.
  For additional information, refer to: Generator (414-02A Generator and Regulator - V8 S/C 4.2L Petrol, Description and Operation).

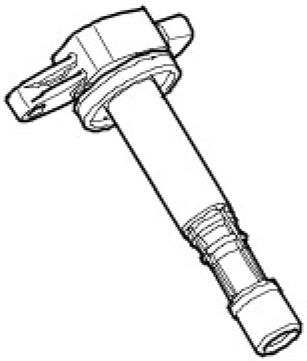
FUEL INJECTORS

E47305

The engine has 8 fuel injectors (one per cylinder), each injector is directly driven by the ECM. The injectors are fed by a common fuel rail as part of a 'return less' fuel system. The fuel rail pressure is regulated to 4.5 bar by a fuel pressure regulator which is integral to the fuel pump module, within the fuel tank. The injectors can be checked by resistance checks. There is a fuel pressure test Schrader valve attached to the fuel rail on the front left-hand (LH). The ECM monitors the output power stages of the injector drivers for electrical faults.

The injectors have a resistance of 13.8 Ohms ± 0.7 Ohms @ 20 Degrees Celsius
For additional information, refer to: Fuel Charging and Controls (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Description and Operation).

IGNITION COILS



E47306

The V8 engine is fitted with eight plug-top coils that are driven directly by the ECM. This means that the ECM, at the point where sufficient charge has built up, switches the primary circuit of each coil and a spark is produced in the spark plug. The positive supply to the coil is fed from a common fuse. Each coil contains a power stage to trigger the primary current. The ECM sends a signal to each of the coils power stage to trigger the power stage switching. Each bank has a feedback signal that is connected to each power stage. If the coil power stage has a failure the feedback signal is not sent, causing the ECM to store a fault code appropriate to the failure.

The ECM calculates the dwell time depending on battery voltage and engine speed to ensure constant secondary energy. This ensures sufficient secondary (spark) energy is always available, without excessive primary current flow thus avoiding overheating or damage to the coils.

The individual cylinder spark timing is calculated from a variety of inputs:

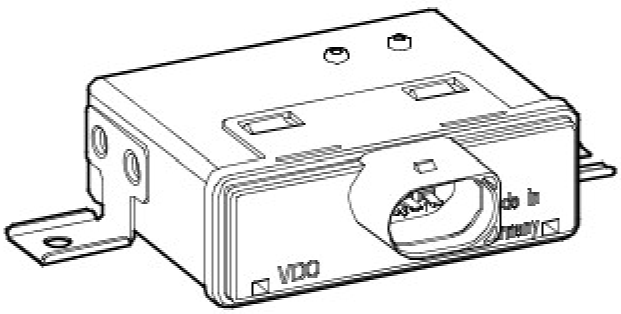
- Engine speed and load.
- Engine temperature.
- Knock control.
- Auto gearbox shift control.
- Idle speed control.

For additional information, refer to: Engine Ignition (303-07A Engine Ignition - V8 S/C 4.2L Petrol, Description and Operation).

FUEL PUMP RELAY

The ECM controls the fuel pump relay which in turn controls the power supply to the fuel pump driver module. The ECM energizes the relay ON with ignition ON, via pin A95 of the ECM.

FUEL PUMP DRIVER MODULE (FPDM)



E58398

The fuel pump driver module is located in the rear LH quarter, adjacent to the parking aid control module.

The fuel pump is controlled by the ECM. The ECM sends a PWM signal to the fuel pump driver module from pin B20 of the ECM, the frequency of the signal determines the duty cycle of the pump. The PWM signal to the pump represents half the ON time of the pump. If the ECM transmits a 50% on time, the fuel pump driver module drives the pump at 100%. If the ECM transmits a 5% ON time, the fuel pump driver module drives the pump at 10%. The fuel pump driver module will only turn the fuel pump ON if it receives a valid signal between 4% and 50%. When The ECM requires the fuel pump to be turned OFF, the ECM transmits a duty cycle signal of 75%.

The status of the fuel pump driver module is monitored by the ECM on pin B21. Any errors can be retrieved from the ECM. The fuel pump driver module cannot be interrogated for diagnostic purposes.

The MAP sensor controls the fuel pump driver module in response to inputs from the fuel rail pressure sensor, the MAP sensor and the MAF/IAT sensor.

Harness Connector C2369 pin out details

Pin No	Description	Input/Output
1	Pump +	Output
2	Pump -	-
3	ECMPWM signal	Input
4	Diagnostic signal	Output
5	Battery voltage	Input
6	GND	-

VISCOUS FAN CONTROL

The ECM controls a viscous coupled fan to provide engine cooling. The ECM supplies the fan with a PWM signal that controls the amount of slippage of the fan, thus providing the correct amount of cooling fan speed and airflow. The EMS uses a Hall effect sensor to determine the fan speed.
For additional information, refer to: Engine Cooling (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Description and Operation).

ECM ADAPTIONS

The ECM has the ability to adapt the values it uses to control certain outputs. This capability ensures the EMS can meet emissions legislation and improve the refinement of the engine throughout its operating range.

The components which have adaptions associated with them are:

- The APP sensor
- The oxygen sensors
- The MAF/IAT sensor
- The CKP sensor
- The Electric throttle body.

UHEGO/HEGO and MAF/AT Sensor

There are several adaptive maps associated with the fueling strategy. Within the fueling strategy the ECM calculates short-term adaptions and long term adaptions. The ECM will monitor the deterioration of the oxygen sensors (HEGO and UHEGO) over a period of time. It will also monitor the current correction associated with the sensors.

The ECM will store a fault code in circumstances where an adaption is forced to exceed its operating parameters. At the same time, the ECM will record the engine speed, engine load and intake air temperature.

Crankshaft Position Sensor

The characteristics of the signal supplied by the CKP sensor is learnt by the ECM. This enables the ECM to set an adaption and support the engine misfire detection function. Due to the small variation between different flywheels and different CKP sensors, the adaption must be reset if either component is renewed, or removed and refitted. It is also necessary to reset the flywheel adaption if the ECM is renewed or replaced. The ECM supports four flywheel adaptions for the CKP sensor. Each adaption relates to a specific engine speed range. The engine speed ranges are detailed in the table below:

Adaptions	Engine Speed, rev/min
1	1800 - 3000
2	3001 - 3800
3	3801 - 4600
4	4601 - 5400

Misfire Detection

Legislation requires that the ECM must be able to detect the presence of an engine misfire. It must be able to detect misfires at two separate levels. The first level is a misfire that could lead to the vehicle emissions exceeding 1.5 times the Federal Test Procedure (FTP) requirements for the engine. The second level is a misfire that may cause catalyst damage.

The ECM monitors the number of misfire occurrences within two engine speed ranges. If the ECM detects more than a predetermined number of misfire occurrences within either of these two ranges, over two consecutive journeys, the ECM will record a fault code and details of the engine speed, engine load and engine coolant temperature. In addition, the ECM monitors the number of misfire occurrences that happen in a 'window' of 200 engine revolutions. The misfire occurrences are assigned a weighting according to their likely impact on the catalysts. If the number of misfires exceeds a certain value, the ECM stores catalyst-damaging fault codes, along with the engine speed, engine load and engine coolant temperature.

The signal from the crankshaft position sensor indicates how fast the poles on the flywheel are passing the sensor tip. A sine wave is generated each time a pole passes the sensor tip. The ECM can detect variations in flywheel speed by monitoring the sine wave signal supplied by the crankshaft position sensor.

By assessing this signal, the ECM can detect the presence of an engine misfire. At this time, the ECM will assess the amount of variation in the signal received from the CKP and assigns a roughness value to it. This roughness value can be viewed within the real time monitoring feature, using a Land Rover approved diagnostic system. The ECM will evaluate the signal against a number of factors and will decide whether to count the occurrence or ignore it. The ECM can assign a roughness and misfire signal for each cylinder, (i.e. identify which cylinder is misfiring).

Diagnostics

The ECM stores faults as diagnostic trouble code (DTC), referred to as 'P' codes. The 'P' codes are defined by OBD legislation and, together with their associated environmental and freeze frame data, can be read using a third party scan tool or a Land Rover approved diagnostic system. A Land Rover approved diagnostic system can also read real time data from each sensor, the adaptive values currently being employed and the current fueling, ignition and idle settings.

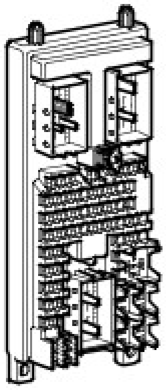
TERRAIN RESPONSE™

Terrain Response™ system allows the driver to select a program which will provide the optimum settings for traction and performance for prevailing terrain conditions.

As part of Terrain Response™ there will be different throttle pedal progression maps associated with different Terrain Response™ modes. The two extremes are likely to be a sand map (quick build up of torque with pedal travel) and grass/gravel/snow (very cautious build up of torque).

The V8 Super Charged implementation of throttle progression is based on a fixed blend time. The torque will blend from that on one map to that on the new map (for the same pedal position) over a fixed time. This means blending will always take the same amount of time but when the torque change is small the torque increase over time will be small, whilst if the torque change is greater then the torque increase over time will be steeper. The resulting acceleration of the vehicle will depend on the torque difference between the two maps as well as on the gear and range selected.
For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

CENTRAL JUNCTION BOX



E47607

The ECM is connected to ignition switch positions I and II. When the ignition is turned ON, 12V is applied to the ignition sense input. The ECM then starts its power up routines and turns ON the ECM main relay, the main power to the ECM and it's associated system components. When the ignition is turned OFF the ECM will maintain its powered up state for up to 20 minutes while it initiates its power down routine and on completion will turn OFF the ECM main relay. The ECM will normally power down in approximately 60 seconds, do not disconcert the battery until the ECM is completely powered down.

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Electronic Engine Controls - V8 S/C 4.2L Petrol - Electronic Engine Controls

Diagnosis and Testing

Principle of Operation

This section covers the sensors and units for the engine management system.

For more information on the system, refer to section 303-14A - Electronic Engine Controls - 4.2L workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection chart

Mechanical	Electrical
● Engine oil level ● Cooling system coolant level ● Fuel level ● Fuel contamination/grade/quality ● Sensor installation/condition ● Viscous fan and solenoid	● Fuses ● Wiring harness ● Electrical connector(s) ● Sensor(s) ● Engine control module (ECM) ● Transmission control module (TCM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared **following** rectification.

Symptom chart

Symptom (general)	Symptom (specific)	Possible causes	Action
Non-Start	Engine does not crank	● Security system /Immobilizer engaged ● ECM relay ● Battery ● Starting system ● Harness ● Engine seized	Check that the security system is disarmed. Check the ECM relay operation. Check the battery condition and state of charge. For starting system tests, refer to the relevant workshop manual section. Check that the engine turns by hand.
	Engine cranks, but does not fire	● Low/Contaminated fuel ● Ignition system ● Fuel system ● Crankshaft position (CKP) sensor ● Harness ● ECM fault	Check the fuel level and condition. For ignition system tests and fuel system tests, refer to the relevant workshop manual section. For CKP and harness tests refer to the guided diagnostic routine on the approved diagnostic system. Refer to the warranty policy and procedures manual if an ECM is suspect.
	Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Fuel system ● Spark plugs ● Ignition coil failure(s) ● Harness	For purge valve tests, fuel system tests and ignition system tests, refer to the relevant workshop manual section.
Difficult to start	Difficult to start cold	● Check coolant anti-freeze content ● Battery ● Crankshaft position (CKP) sensor ● Fuel system ● Evaporative emissions purge valve	Check the coolant condition. Check the battery condition and state of charge, refer to the relevant workshop manual section. For CKP sensor tests refer to the guided diagnostic routine on the approved diagnostic system. For fuel system tests and purge valve tests, refer to the relevant workshop manual section.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
C003100	Left Front Wheel Speed Sensor	● Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003400	Right Front Wheel Speed Sensor	● Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003700	Left Rear Wheel Speed Sensor	● Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003A00	Right Rear Wheel Speed Sensor	● Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
P003100	HO2S Heater Control Circuit Low (Bank 1, Sensor 1)	● Heated 0² sensor heater power supply circuit high resistance ● Heated 0² sensor heater control circuit high resistance ● Heated 0² sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P003200	HO2S Heater Control Circuit High (Bank 1, Sensor 1)	● Heated 0² sensor heater power supply circuit high resistance ● Heated 0² sensor heater control circuit high resistance ● Heated 0² sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P003600	HO2S Heater Control Circuit (Bank 1, Sensor 2)	● Catalyst monitor sensor heater control circuit short circuit to ground ● Catalyst monitor sensor heater control circuit high resistance ● Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005100	HO2S Heater Control Circuit Low (Bank 2, Sensor 1)	● Heated 0² sensor heater power supply circuit high resistance ● Heated 0² sensor heater control circuit high resistance ● Heated 0² sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005200	HO2S Heater Control Circuit High (Bank 2, Sensor 1)	● Heated 0² sensor heater power supply circuit high resistance ● Heated 0² sensor heater control circuit high resistance ● Heated 0² sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005600	HO2S Heater Control Circuit (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) heater control circuit short circuit to ground ● Catalyst monitor sensor heater control circuit high resistance ● Catalyst monitor sensor heater failure	For left-hand catalyst monitor sensor heater circuit tests. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P006900	(MAP) - Barometric pressure correlation	• Manifold absolute pressure (MAP) sensor failure • BARO sensor failure (internal ECM fault)	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if an ECM is suspect.
P007100	Ambient Air Temperature Sensor Range/Performance	• Ambient temperature sensor range performance (stuck)	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P007200	Ambient Air Temperature Sensor Circuit Low	• Ambient temperature sensor circuit low input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P007300	Ambient Air Temperature Sensor Circuit High	• Ambient temperature sensor circuit high input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P008700	Fuel rail/system pressure too low	• Fuel rail pressure (FRP) sensor disconnected • FRP sensor to ECM sensing circuit short circuit to ground • FRP sensor supply circuit high resistance • FRP sensor failure • Fuel line leak • Restricted fuel line • Fuel pump module circuit high resistance • Fuel pump module circuit short circuit to ground • Fuel pump module failure	For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits. Refer to the electrical guides.
P008800	Fuel rail/system pressure too high	• Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense) short circuit to each other • FRP sensor to ECM sense circuit short circuit to power • FRP sensor failure • Fuel pressure control valve (FPCV) fault • Fuel pump module circuit short circuit to power • Fuel pump module failure	For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits. Refer to the electrical guides.
P009300	Fuel System Leak Detected - Large Leak	• Fuel rail pressure (FRP) sensor disconnected • FRP sensor to ECM sensing circuit short circuit to ground • FRP sensor supply circuit high resistance • FRP sensor failure • Fuel line leak • Restricted fuel line • Fuel pump module circuit high resistance • Fuel pump module circuit short circuit to ground • Fuel pump module failure	For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P009623	Intake Air Temperature Sensor 2 Circuit Range/Performance (Bank 1)	• Air charge temperature (ACT) sensor circuit short circuit to power • ACT sensor failure • ECM failure	Check the ACT sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P009624	Intake Air Temperature Sensor 2 Circuit Range/Performance (Bank 1)	• Air charge temperature (ACT) sensor circuit short circuit to power • ACT sensor failure • ECM failure	Check the ACT sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P009629	Intake Air Temperature Sensor 2 Circuit Range/Performance (Bank 1)	● Air charge temperature (ACT) sensor circuit short circuit to power ● ACT sensor failure ● ECM failure	Check the ACT sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P009700	Intake Air Temperature Sensor 2 Circuit Low (Bank 1)	● Air charge temperature (ACT) sensor circuit high resistance ● ACT sensor circuit short circuit to ground ● ACT sensor failure ● ECM failure	Check the ACT sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P009800	Intake Air Temperature Sensor 2 Circuit High (Bank 1)	● Air charge temperature (ACT) sensor circuit short circuit to power ● ACT sensor failure ● ECM failure	Check the ACT sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010100	Mass or Volume Air Flow A Circuit	● Blocked air cleaner ● Air intake leak ● Engine breather leak ● Mass air flow (MAF) sensor sensing circuit high resistance, intermittent short circuit to ground ● MAF sensor supply circuit high resistance	Check the air cleaner for blockage, etc. Check the air intake system for leaks. Check the engine breather system. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010200	Mass or Volume Air Flow A Circuit Low	● MAF sensor supply circuit high resistance, short circuit to ground ● MAF sensor ground circuit high resistance ● MAF sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010300	Mass or Volume Air Flow A Circuit High	● MAF sensor sensing circuit short circuit to battery ● MAF sensor return circuit high resistance ● MAF sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010600	Manifold Absolute Pressure/BARO Sensor Range/Performance	● Intake manifold air leak (loose or missing component) ● MAP sensor circuit(s) fault ● MAP sensor failure	Check the intake manifold for security, etc. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010700	Manifold Absolute Pressure/BARO Sensor Low	● MAP sensor circuit high resistance, short circuit to ground ● MAP sensor supply circuit high resistance ● MAP sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010800	Manifold Absolute Pressure/BARO Sensor High	● MAP sensor return circuit high resistance ● MAP sensor sense circuit short circuit to power ● MAP sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011123	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1)	● Signal stuck low at engine start ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P011124	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1)	● Signal stuck high at engine start ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011129	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1)	● Signal invalid ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011200	Intake Air Temperature Sensor 1 Circuit Low (Bank 1)	● Intake air temperature IAT sensor disconnected ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011300	Intake Air Temperature Sensor 1 Circuit High (Bank 1)	● IAT sensor circuit(s) short circuit to ground ● IAT sensor sensing circuit short circuit to power ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011623	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011624	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck closed). Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011629	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	● ECT sensor disconnected ● Engine coolant temperature (ECT) sensor sensing circuit high resistance, short circuit to power ● ECT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011800	Engine Coolant Temperature Sensor 1 Circuit High	● Engine overheat condition/cooling fan failure ● ECT sensor wiring short circuit to ground ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck closed). Check for cooling fan DTCs. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P012100	Throttle/Pedal Position Sensor A Circuit Range/Performance	● Throttle position sensor wiring high resistance ● Throttle position sensor sensing circuits (Throttle position 1 or Throttle position 2) short circuit to power ● Throttle position sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P012200	Throttle/Pedal Position Sensor A Circuit Low	● Throttle position sensor sensing circuit 1 short circuit to ground, high resistance ● Throttle position sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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Electronic Engine Controls - V8 S/C 4.2L Petrol - Engine Oil Pressure (EOP) Sensor

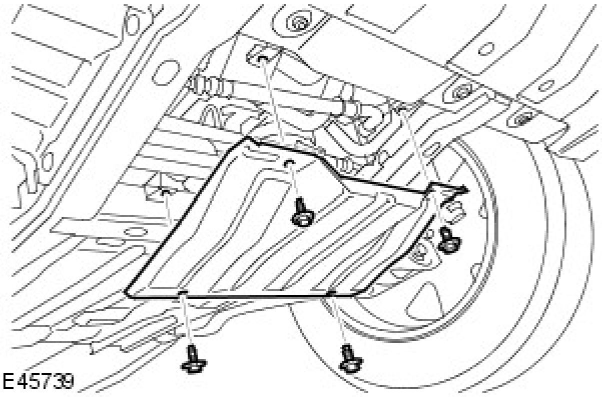
Removal and Installation

Removal

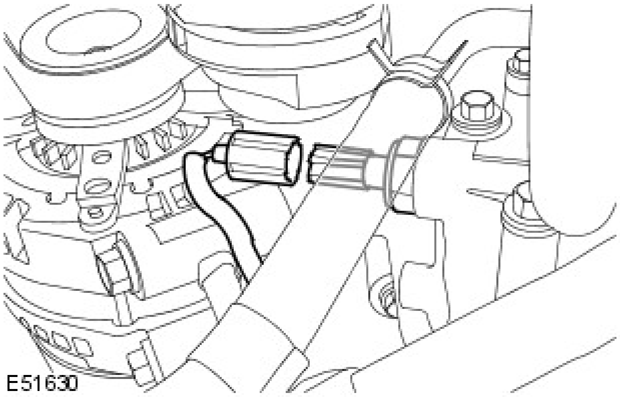
1. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

   Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the radiator access panel.
   - Remove the 4 bolts.



3. Remove the oil pressure sensor.
   - Disconnect the electrical connector.
   - Position a container to collect the fluid.



Installation

1. To install, reverse the removal procedure.
   - Tighten the oil pressure sensor to 12 Nm (9 lb.ft).
   - Tighten the 4 bolts to 10 Nm (7 lb.ft).

2. Check and top-up the engine oil.

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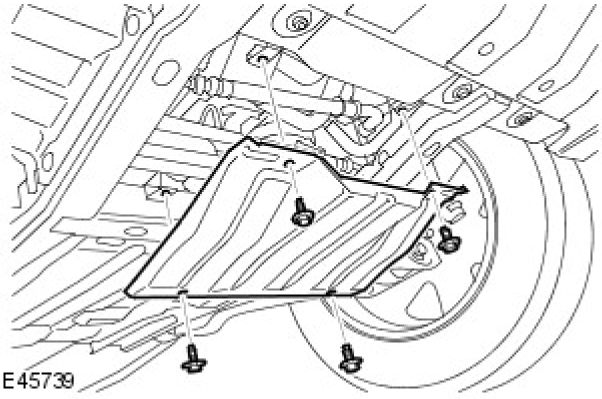
Electronic Engine Controls - V8 S/C 4.2L Petrol - Oil Temperature Sensor

Removal and Installation

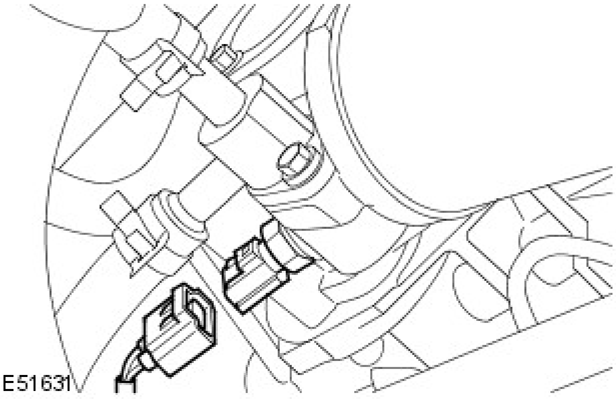
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



2. Remove the radiator access panel.

- Remove the 4 bolts.



3. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the oil temperature sensor.

- Disconnect the electrical connector.
- Position a container to collect the fluid.

Installation

1. To install, reverse the removal procedure.

- Tighten the oil temperature sensor to 20 Nm (15 lb.ft).
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Check and top-up the engine oil.

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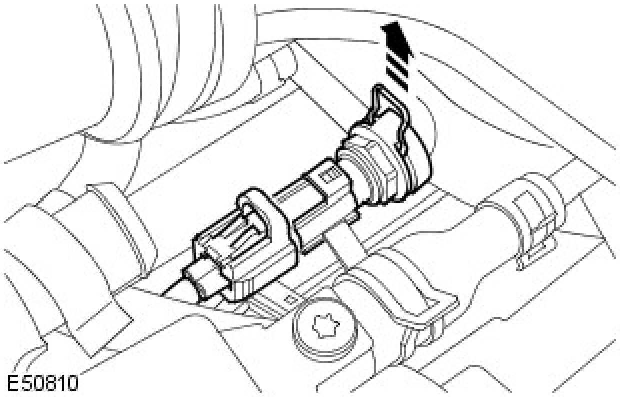
Electronic Engine Controls - V8 S/C 4.2L Petrol - Engine Coolant Temperature (ECT) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the ECT sensor.



   - Position an absorbent cloth to collect fluid spillage.
   - Disconnect the electrical connector.
   - Release the clip.
   - Remove the sensor and discard the seal.

Installation

1. To install, reverse the removal procedure.
   - Clean the component mating faces.
   - Check and top-up the coolant if required.

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Electronic Engine Controls - V8 S/C 4.2L Petrol - Engine Control Module (ECM)

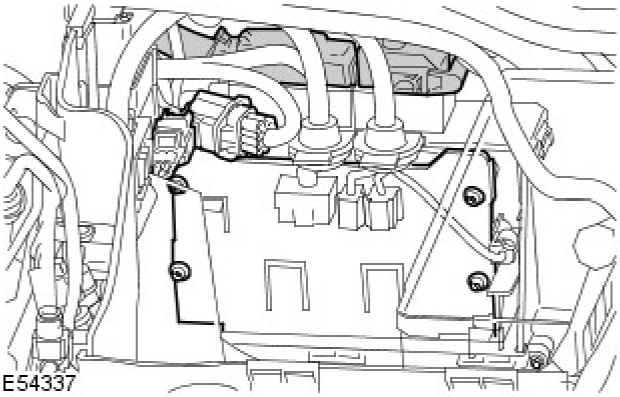
Removal and Installation

Removal

• NOTE: If the ECM is to be replaced, the T4 must be connected prior to battery disconnection and on-screen instructions must be followed.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

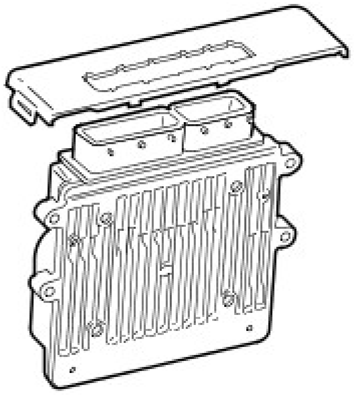
2. Remove the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).



E54337

3. Remove the ECM cover.

- Disconnect 2 electrical connectors for access.
- Disconnect the 2 ECM electrical connectors.
- Remove the 4 Torx screws.



E54338

4. Remove the ECM.

- Remove the ECM top cover.

Installation

1. Install the ECM.

- Install the ECM cover and secure with Torx screws.
- Install the ECM upper cover.

2. Connect the ECM electrical connectors.

3. Connect the 2 electrical connectors disconnected for access.

4. Install the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

5. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

6. Connect T4 to calibrate a new ECM.

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Electronic Engine Controls - V8 S/C 4.2L Petrol - Crankshaft Position (CKP) Sensor

Removal and Installation

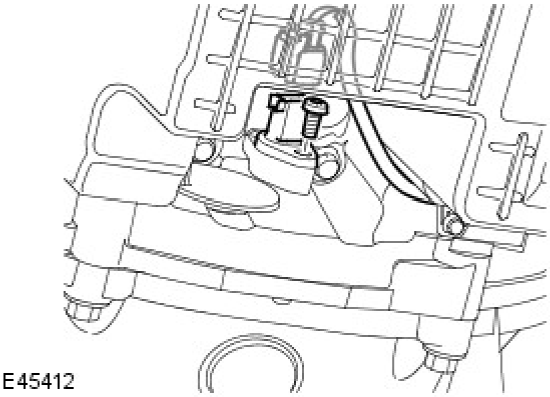
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



4. ⚠ CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the crankshaft position (CKP) sensor.

- Disconnect the electrical connector.
- Remove the Torx screw.

Installation

1. To install, reverse the removal procedure.

- Tighten the Torx screw to 8 Nm (6 lb.ft).

2. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 4.2L Petrol - Throttle Position (TP) Sensor

Removal and Installation

Removal

- NOTE: NOTE: The TP sensor is part of the throttle body assembly and cannot be serviced separately.

1. Remove the throttle body.
For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

Installation

1. Install the throttle body.
For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

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Electronic Engine Controls - V8 S/C 4.2L Petrol - Camshaft Position (CMP) Sensor

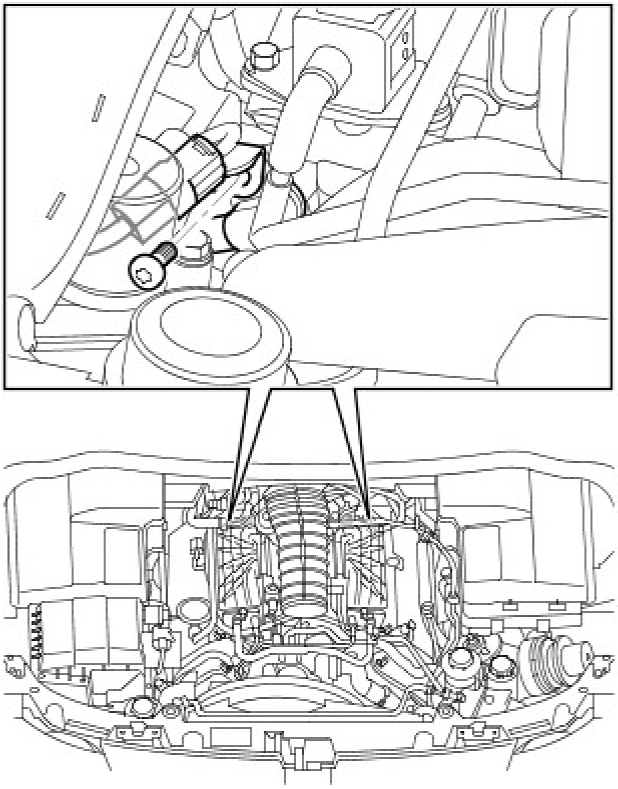
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

3. NOTE: Removal of the RH sensor is similar to this procedure.



E52435

Remove the camshaft position (CMP) sensor.

- Disconnect the electrical connector.
- Remove the Torx screw.
- Discard the O-ring seal.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the Torx screw to 7 Nm (5 lb.ft).

Published: 11-May-2011

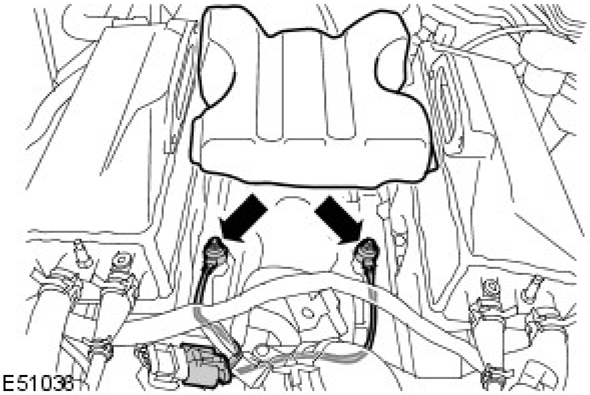
Electronic Engine Controls - V8 S/C 4.2L Petrol - Knock Sensor (KS)

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the supercharger.
For additional information, refer to: Supercharger (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).



3. Remove the knock sensors (KS).

- Disconnect the electrical connector.
- Remove the acoustic pad.
- Remove the 2 bolts.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Tighten the bolts to 20 Nm (15 lb.ft).
- Install the acoustic pad.

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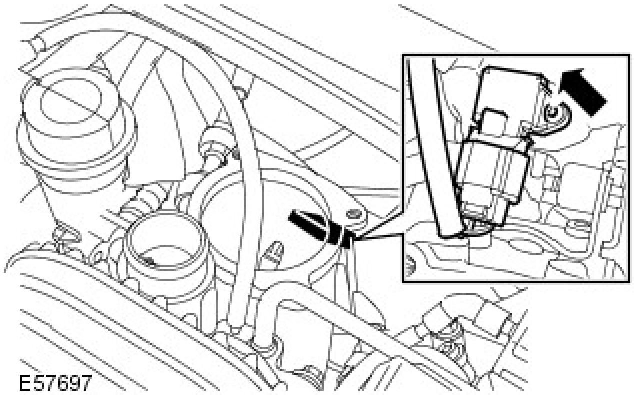
Electronic Engine Controls - V8 S/C 4.2L Petrol - Manifold Absolute Pressure (MAP) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).



3. Remove the manifold absolute pressure (MAP) sensor.

- Disconnect the electrical connector.
- Remove the Allen screw.
- Discard the O-ring seal.

Installation

1. Install the MAP sensor.

- Clean the components.
- Install a new O-ring seal.
- Tighten the Allen screw to 3 Nm (2 lb.ft).
- Connect the electrical connector.

2. Install the throttle body gasket.
For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. NOTE: For NAS vehicles only.

If required, carry out a short drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Short Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 4.2L Petrol - Fuel Temperature Sensor

Removal and Installation

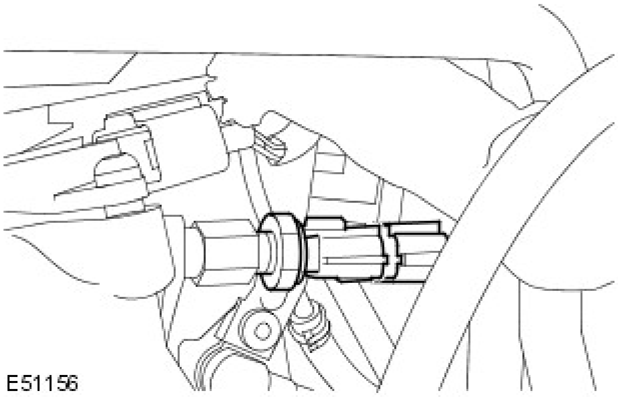
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the throttle body gasket.
   For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).
3. WARNING: The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

• CAUTIONS:

To prevent damage to components, use an additional wrench when loosening or tightening unions.

Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.



Remove the fuel temperature sensor.

- Disconnect the electrical connector.

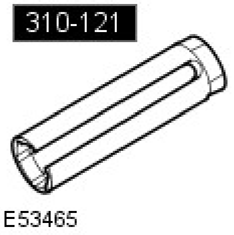
Installation

1. Install the fuel temperature sensor.
   - Clean the component mating faces.
   - Apply sealant to the sensor thread.
   - Tighten the sensor to 7 Nm (5 lb.ft).
   - Connect the electrical connector.
2. Install the throttle body gasket.
   For additional information, refer to: Throttle Body Gasket (303-04A Fuel Charging and Controls - V8 S/C 4.2L Petrol, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 4.2L Petrol - Heated Oxygen Sensor (HO2S) LH

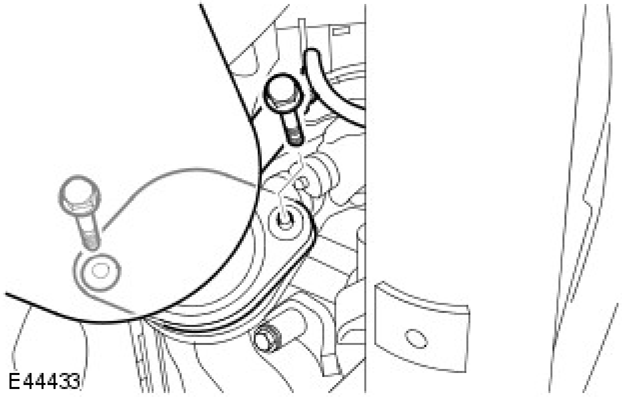
Removal and Installation

Special Tool(s)	
	Wrench, HO2S 310-121(LRT-19-014)

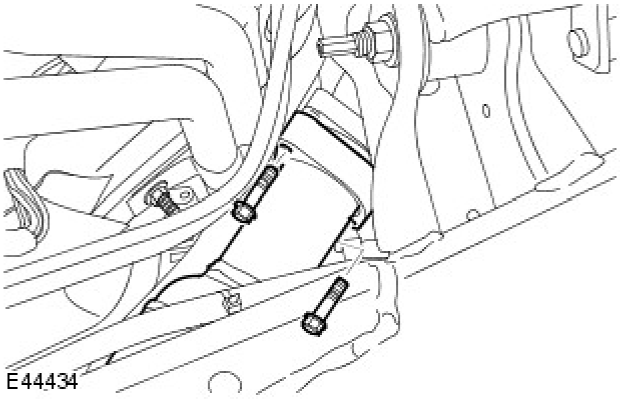
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

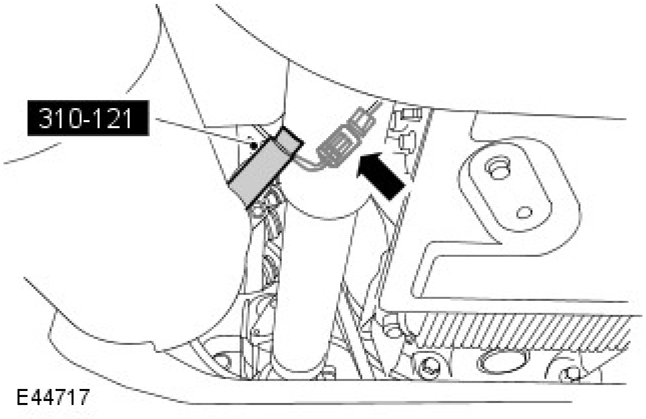
   Raise and support the vehicle.



2. Disconnect the LH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 bolts.



3. Disconnect the RH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 bolts.



4. Using the special tool, remove the HO2S.

- Release the wiring harness.
- Disconnect the electrical connector.

Installation

1. CAUTIONS:

⚠ Make sure the anti-seize compound does not contact the HO2S tip.

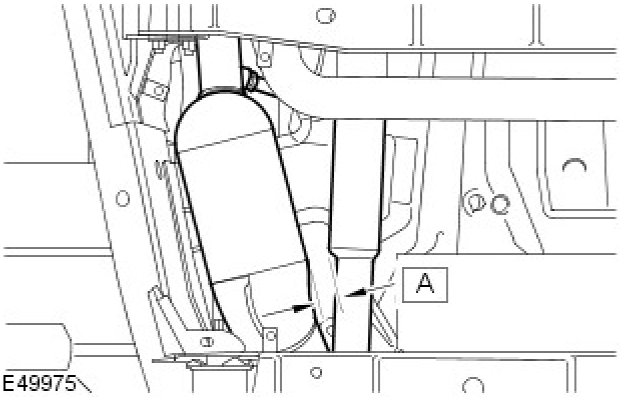
⚠ Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Using the special tool, install the HO2S.

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the HO2S to 45 Nm (33 lb.ft).
- Connect the electrical connector.
- Attach the wiring harness.

2. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).



3. ⚠ CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Position the LH catalytic converter to the exhaust manifold.

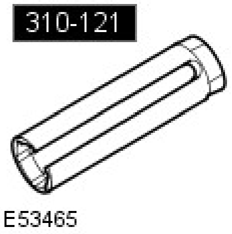
- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

4. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 4.2L Petrol - Catalyst Monitor Sensor LH

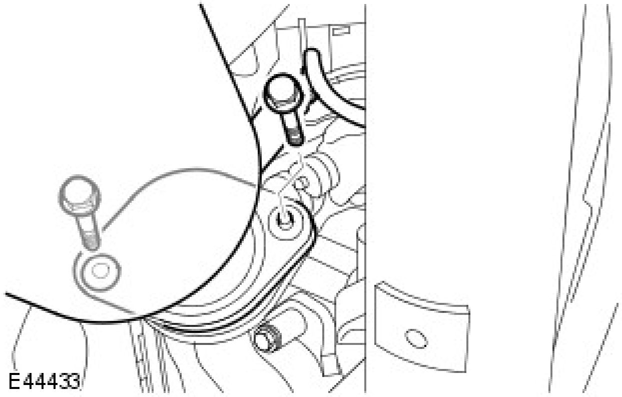
Removal and Installation

Special Tool(s)	
	Wrench, HO2S 310-121 (LRT-19-014)

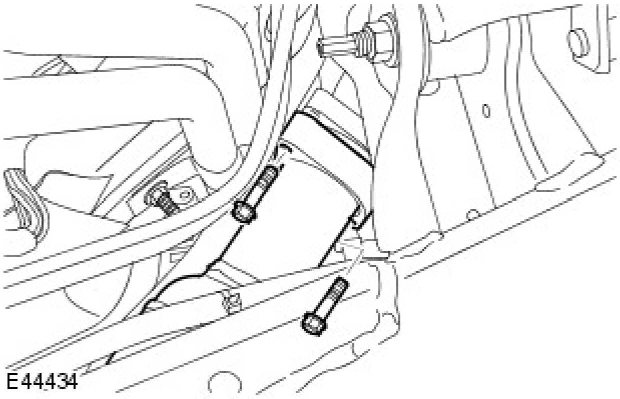
Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

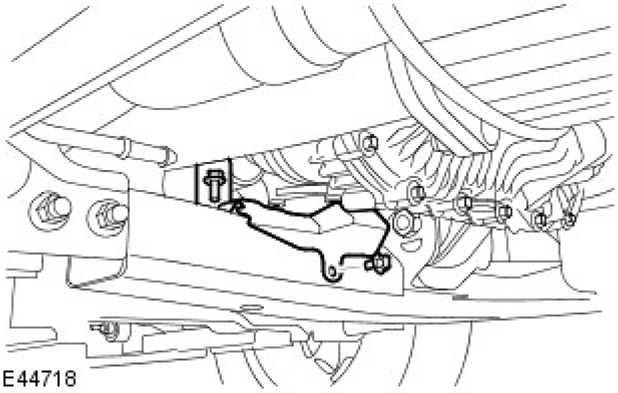
   Raise and support the vehicle.



2. Disconnect the LH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 bolts.

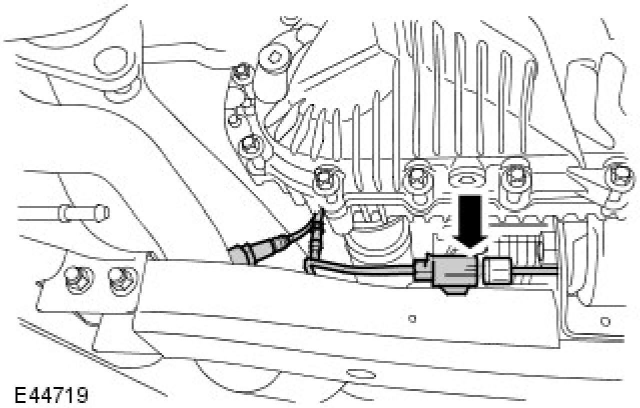


3. Disconnect the RH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 bolts.


E44718

4. Remove the catalyst monitor sensor electrical connector heat shield.

- Remove the 2 bolts.


E44719

5. Using the special tool, remove the catalyst monitor sensor.

- Release the wiring harness.
- Disconnect the electrical connector.

Installation

1. CAUTIONS:

⚠ Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

⚠ Make sure the catalyst monitor sensor wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Using the special tool, install the catalyst monitor sensor.

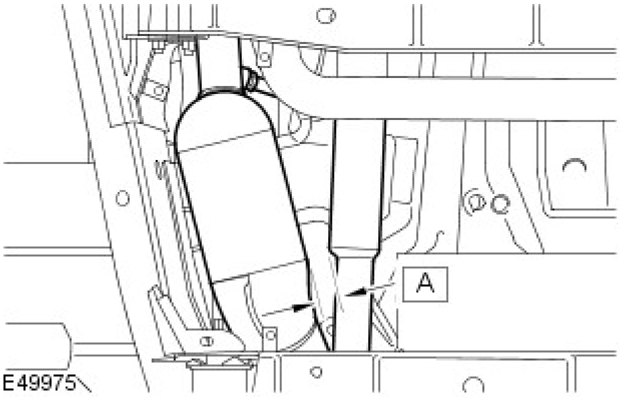
- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the catalyst monitor sensor to 45 Nm (33 lb.ft).
- Connect the electrical connector.
- Attach the wiring harness.

2. Install the heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

3. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).



4. ⚠ CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Position the LH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

5. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

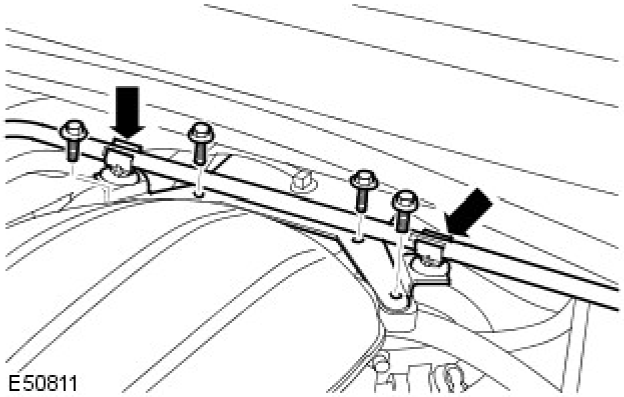
Electronic Engine Controls - V8 S/C 4.2L Petrol - Intake Air Temperature (IAT) Sensor

Removal and Installation

Removal

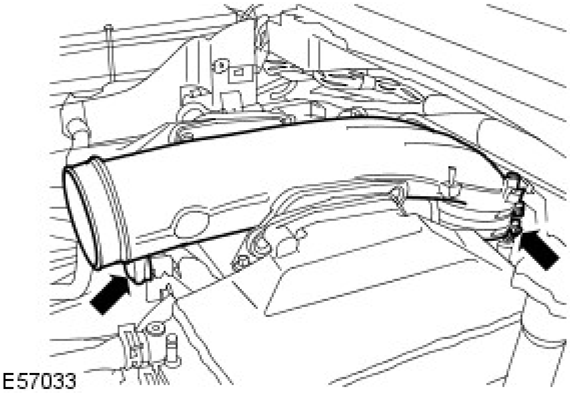
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the air intake resonator.
For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).



3. Position the wiring harness support bracket aside.

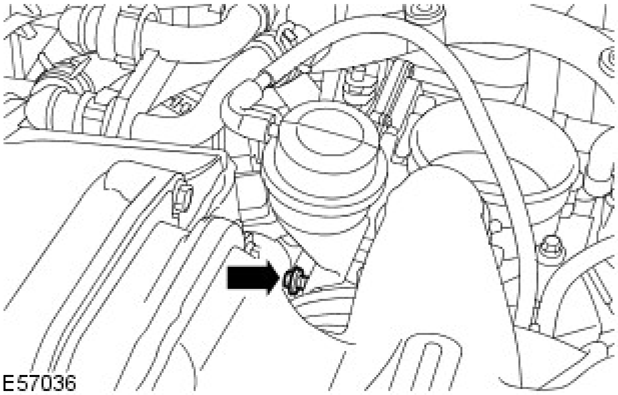
- Release the 2 fuel pipe clips.
- Remove the 4 bolts.



4. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

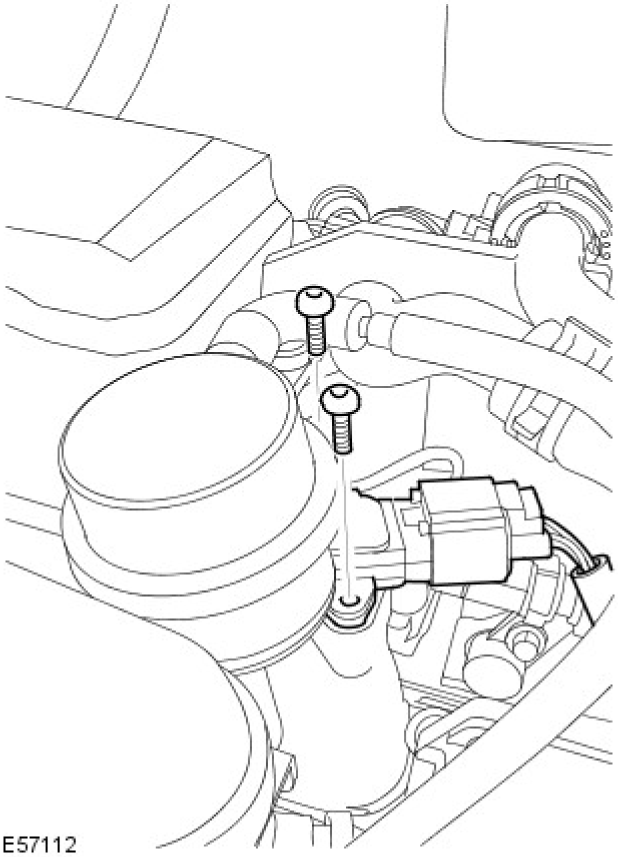
Remove the throttle body intake.

- Release the clip.
- Release the bushing.



5. Position the supercharger pressure relief actuator aside for access.

- Remove the bolt.



6. Remove the intake air temperature (IAT) sensor.

- Disconnect the electrical connector.
- Remove the 2 Torx screws.
- Remove and discard the O-ring seal.

Installation

1. Install the IAT sensor.

- Clean the components.
- Install a new O-ring seal.
- Tighten the Torx screws to 6 Nm (4 lb.ft).
- Connect the electrical connector.

2. Secure the supercharger pressure relief actuator.

- Tighten the bolt to 10 Nm (7 lb.ft).

3. Install the throttle body intake.

- Align the bushing.
- Secure the clip.

4. Install the wiring harness support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

5. Install the air intake resonator.
For additional information, refer to: Intake Air Resonator (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

7. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Published: 11-May-2011

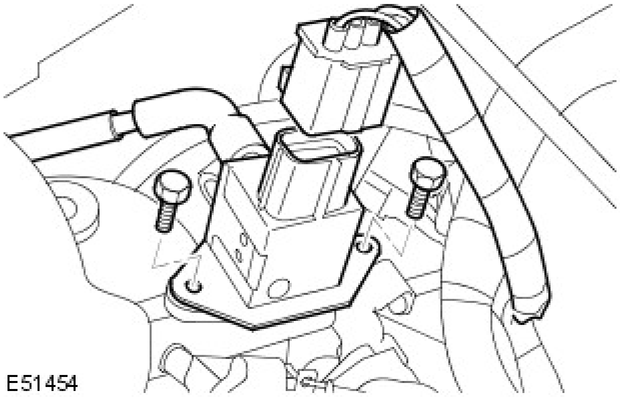
Electronic Engine Controls - V8 S/C 4.2L Petrol - Fuel Rail Pressure (FRP) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. ⚠ WARNING: The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Remove the FRP sensor.

- Disconnect the vacuum line.
- Disconnect the electrical connector.
- Position an absorbent cloth to collect fluid spillage.
- Remove the 2 bolts.
- Discard the O-ring seals.

Installation

1. Install the FRP sensor.

- Clean the component mating faces.
- Install the new O-ring seals.
- Tighten the bolts to 6 Nm (4 lb.ft).
- Connect the electrical connector.
- Connect the vacuum line.

2. Install the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

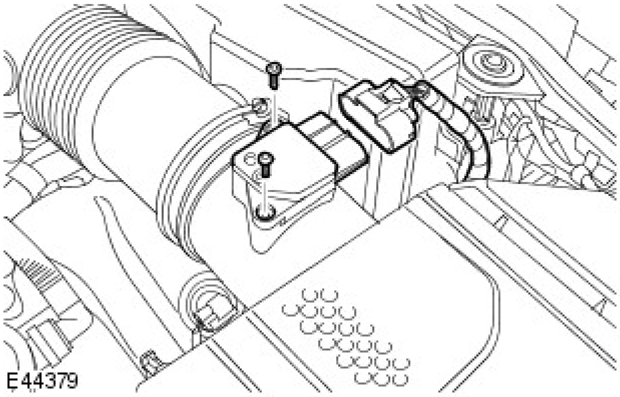
Published: 11-May-2011

Electronic Engine Controls - V8 S/C 4.2L Petrol - Mass Air Flow (MAF) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the MAF sensor.
   - Disconnect the electrical connector.
   - Remove the 2 screws.



Installation

1. To install, reverse the removal procedure.
   - Tighten Torx screws to 2 Nm (1.5 lb.ft).
2. NOTE: Federal market vehicles only.

   If required, carry out a short drive cycle.
   For additional information, refer to: Powertrain Control Module (PCM) Short Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).
3. NOTE: Non federal market vehicles only.

   Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol - Powertrain Control Module (PCM) Long Drive Cycle Self-Test

General Procedures

⚠WARNING: Where possible, all road tests should be on well surfaced and dry roads. Always comply with speed limits and local traffic regulations.

- NOTE: This procedure is an overcheck only. If fault codes are found, interrogation of the relevant system must be carried out and claimed against.
- NOTE: The vehicle must exceed 50mph (80 km/h) during the road test.

1. Connect the diagnostic equipment to the vehicle.

2. Follow on screen prompts and check for engine management fault codes.

3. Clear the fault codes following the on screen procedure.

4. Disconnect the diagnostic equipment from the vehicle.

5. NOTE: Make sure cruise control is not engaged.

Make sure the engine temperature is above 60 ºC (140 ºF).

Carry out a road test and perform the following operations.

1. Accelerate to 55 mph (88 km/h) in 5th gear and cruise for 2 minutes with the engine speed at or above 1800rpm.
2. Lift off the throttle and allow the vehicle to decelerate until the engine speed is less than 1000 rpm.
3. Stop the vehicle.
4. Release brake, allow the vehicle to move with no throttle for 1 minute.
5. Road test is now complete.

6. Connect the diagnostic equipment to the vehicle.

7. NOTE: If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

Follow on screen prompts and check for engine management fault codes.

8. Disconnect the diagnostic equipment from the vehicle.

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol - Powertrain Control Module (PCM) Short Drive Cycle Self-Test

General Procedures

• NOTE: This procedure is an overcheck only. If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

1. Connect the diagnostic equipment to the vehicle.

2. Follow on screen prompts and check for engine management fault codes.

3. Clear the fault codes following the on screen procedure.

4. Start the engine.

- Allow the engine to idle for 30 seconds.
- Raise the engine speed to 1500 rpm and hold for 3 minutes until a temperature of 70ºC (158 ºF) is achieved.
- Allow the engine to idle for 30 seconds.
- Switch off the engine.

5. NOTE: If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

Follow on screen prompts and check for engine management fault codes.

6. Disconnect the diagnostic equipment from the vehicle.

Published: 09-Mar-2011

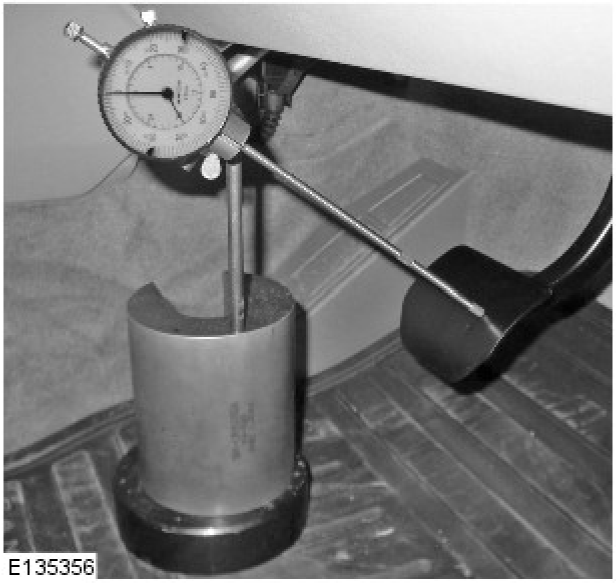
Electronic Engine Controls - V8 4.4L Petrol - Brake Pedal Position (BPP) Switch Adjustment

General Procedures

Check

1. Remove the brake pedal rubber.

2. NOTE: Make sure that the dial test indicator (DTI) gauge is in line with the brake pedal movement.


E135356

Position the DTI gauge on a suitable mounting block, as illustrated.

3. With the aid of another technician, gently press the brake pedal until the stoplamps illuminate.

4. NOTE: The specification is that the stoplamps should illuminate at between 5.5mm and 8.5mm brake pedal travel.

Note the measurement of the brake pedal travel from rest position until the stoplamps illuminated.

Adjust

1. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠

Remove the stoplamp switch.
For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

2. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠ Only use light finger pressure when installing the stoplamp switch. Failure to follow this instruction may result in an incorrectly adjusted stoplamp switch.

Install the stoplamp switch.

For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

3. Check the adjustment of the stoplamp switch by following the **Check** procedure in this procedure and carry out the **Adjust** procedure if required.

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol -

Lubricants

Item	Land Rover Part No.
* HO2s removal	STC 50545
HO2s threads	Apply suitable high temperature anti-seize compound to threads of sensor

*** Apply to area around sensor threads prior to attempting to remove sensor**

General Specification

Item	Description
Engine management system:	
Make	Denso
Type	PAG EMS Generation 1
Camshaft position sensor:	
Make	Denso
Type	Left-hand XR83-6B288-AB and Right-hand 2W93-6B288-AA
Crankshaft position sensor:	
Make	Denso
Type	XW43-6C315-BB

Torque Specifications

Description	Nm	lb-ft
Variable camshaft timing (VCT) oil control solenoid bolt	10	7
Knock sensor (KS) bolts	20	15
Crankshaft position (CKP) sensor Torx screw	8	6
+ Heated oxygen sensor (HO2S)	45	33
* RH catalytic converter to exhaust manifold bolts	22	16
* LH catalytic converter to exhaust manifold bolts	22	16
Mass air flow (MAF) sensor Torx screws	2	1.5
Camshaft position (CMP) sensor Torx screw	7	5
Engine coolant temperature (ECT) sensor	18	13
++ Fuel temperature sensor	7	5
+ Catalyst monitor sensor	45	33
Catalyst monitor sensor heat shield bolts	10	7
Engine oil pressure sensor	12	9
ECM retaining bolts	1.5	1.1
MAP sensor retaining bolts	3	2
Radiator access panel bolts	10	7
Engine oil temperature sensor	20	15

+ Apply suitable high temperature anti-seize compound to threads of sensor

*** New bolts must be installed**

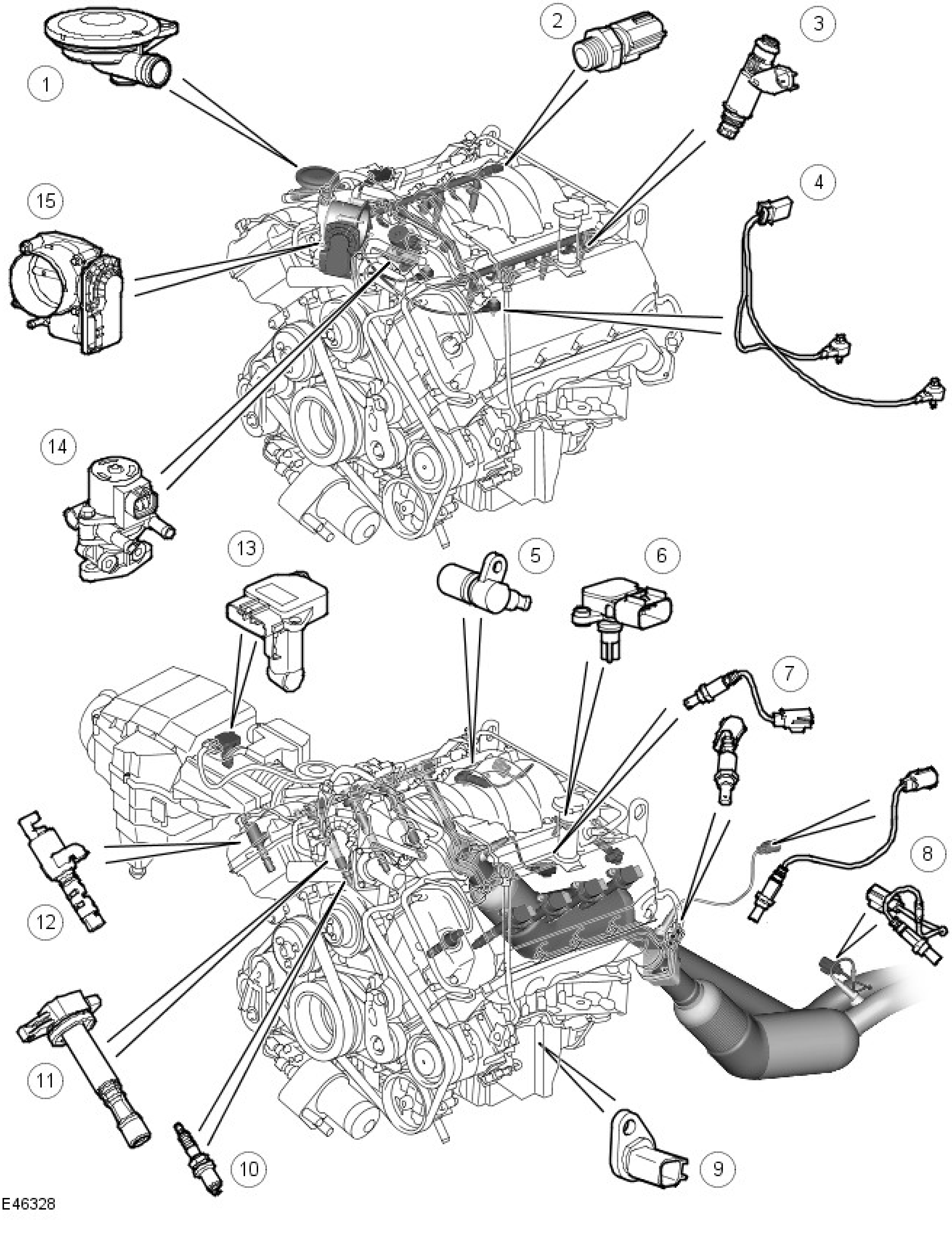
++ Apply anti-seize lubricant to threads - See Lubricants

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol - Electronic Engine Controls

Description and Operation

4.4 Liter Electronic Engine Controls-Component Location (Sheet 1of 2)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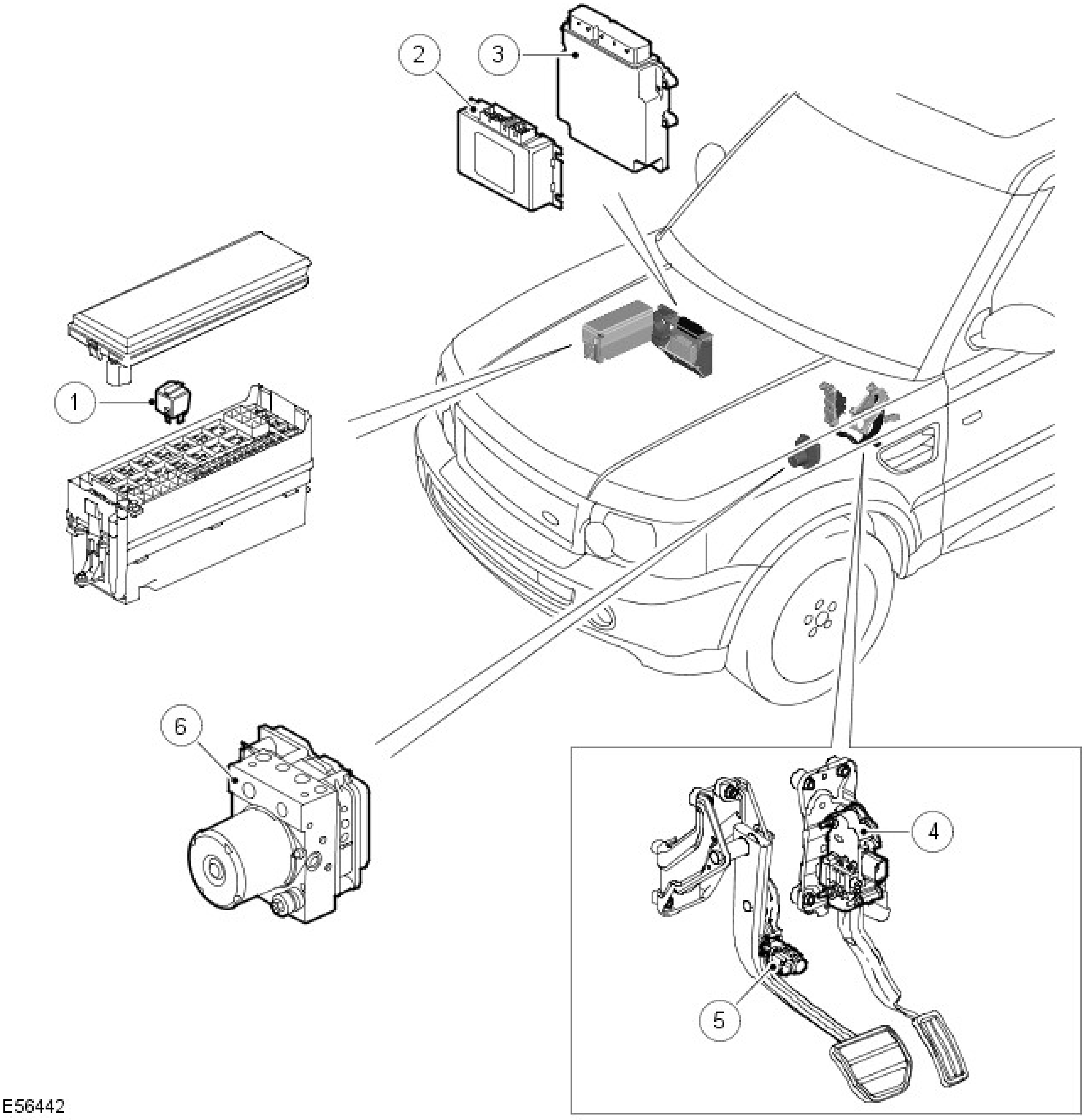
E46328

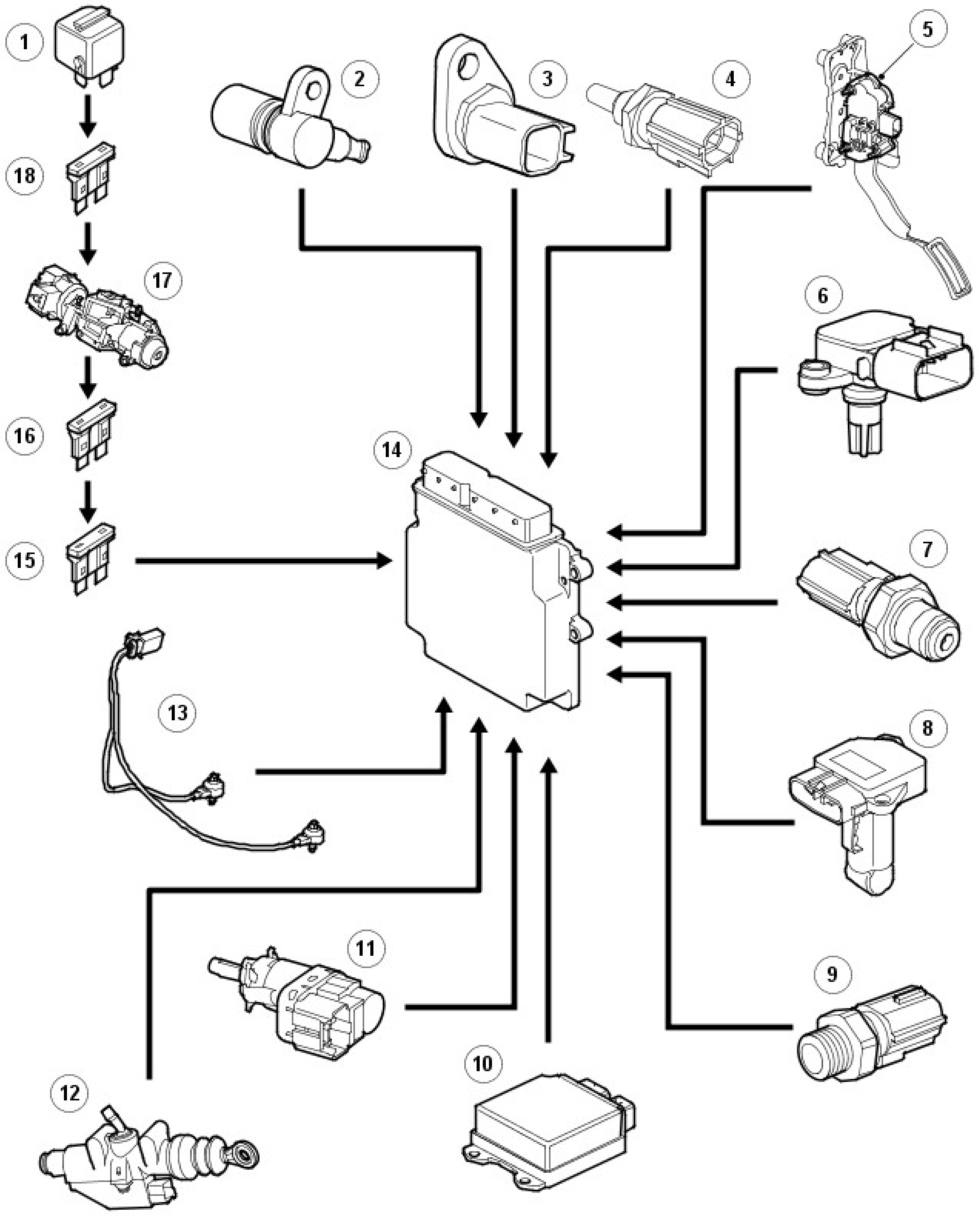
Item	Part Number	Description
1	-	positive crankcase ventilation (PCV) valve
2	-	Fuel rail temperature sensor
3	-	Injectors
4	-	Knock sensor
5	-	camshaft position (CMP) sensor
6	-	manifold absolute pressure (MAP) sensor
7	-	Universal Heated Exhaust Gas Oxygen (UHEGO) sensors
8	-	Heated Exhaust Gas Oxygen (HEGO) sensors
9	-	crankshaft position (CKP) sensor
10	-	Spark plugs
11	-	Ignition coils
12	-	Variable Valve Timing (VVT) oil control solenoid
13	-	mass air flow (MAF) sensor
14	-	exhaust gas recirculation (EGR) valve
15	-	Electric throttle

4.4 Liter Electronic Engine Controls-Component Location (Sheet 2 of 2)



Item	Part Number	Description
1	-	Main relay
2	-	Transfer box control module
3	-	engine control module (ECM)
4	-	accelerator pedal position (APP)
5	-	Brake light switch
6	-	anti-lock brake system (ABS) control module

4.4 Liter Electronic Engine Controls-Input Control Diagram (Sheet 1 of 2)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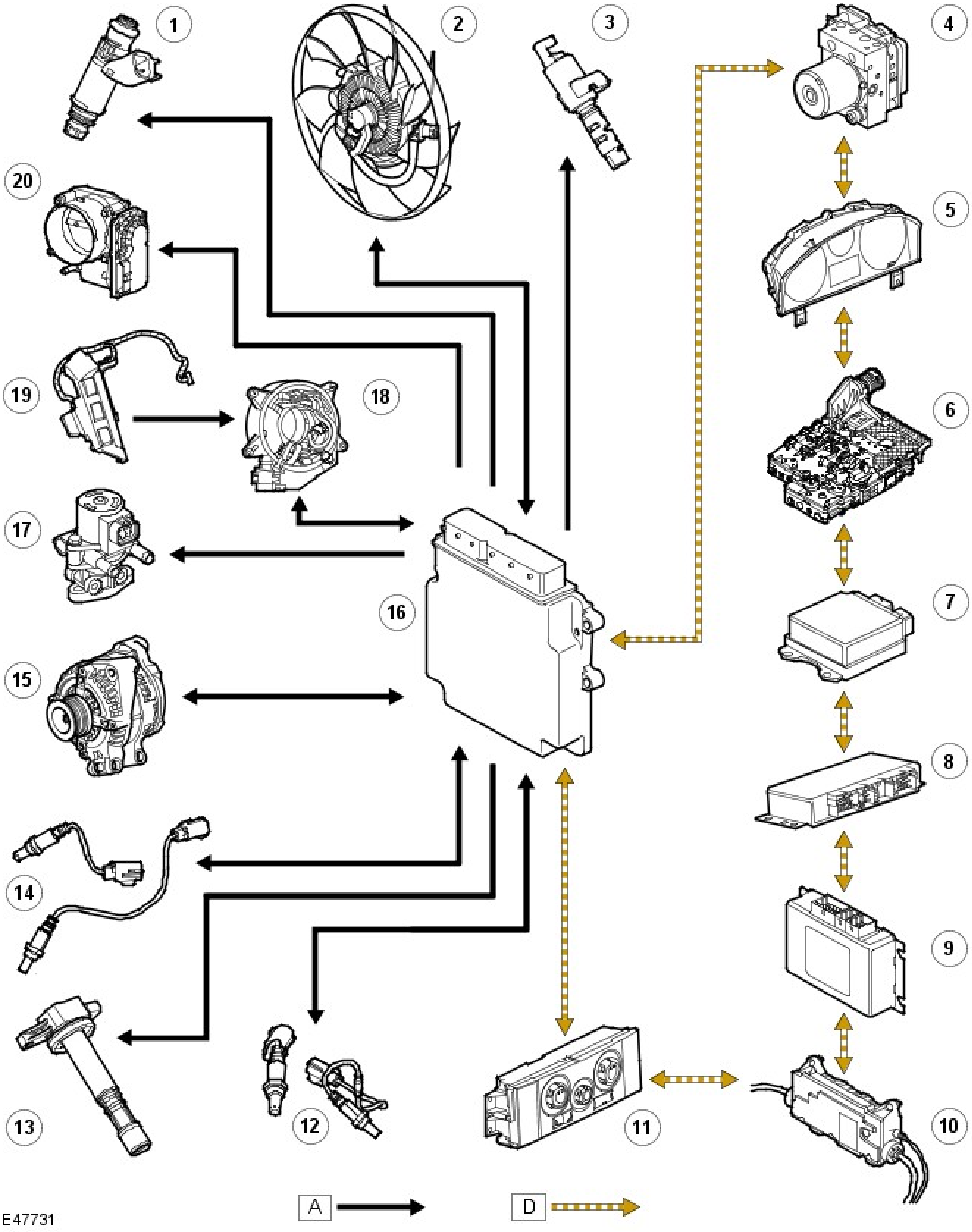
E46329

Item	Part Number	Description
1	-	Main relay
2	-	CMP sensor
3	-	CKP sensor
4	-	engine coolant temperature (ECT) sensor
5	-	APP sensor

6	-	MAP sensor
7	-	Engine oil temperature sensor
8	-	MAF/intake air temperature (IAT) sensor
9	-	Fuel rail temperature sensor
10	-	restraints control module (RCM)
11	-	Brake light switch
12	-	Clutch switch (Not used)
13	-	Knock sensors
14	-	ECM
15	-	Fuse 60 P
16	-	Fuse 25 P
17	-	Ignition switch
18	-	Fuseable link 11 E

4.4 Liter Electronic Engine Controls-Control Diagram (Sheet 2 of 2)

- NOTE: A= Hardwired D= controller area network (CAN)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E47731

Item	Part Number	Description
1	-	Injectors
2	-	Engine cooling fan
3	-	Variable Valve Timing (VVT) oil control solenoids
4	-	ABS control module
5	-	Instrument pack

6	-	transmission control module (TCM)
7	-	RCM
8	-	Differential control module
9	-	Transfer box control module
10	-	Electric park brake control module
11	-	ATC control module
12	-	UHEGO
13	-	Ignition coils
14	-	HEGO
15	-	Generator
16	-	ECM
17	-	EGR valve
18	-	Clock spring
19	-	Speed control switches
20	-	Electric throttle

GENERAL

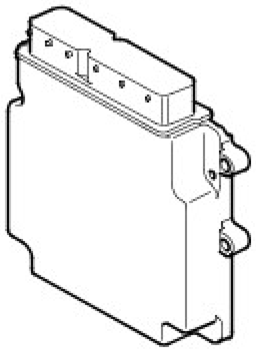
The V8 4.4 Liter engine is controlled by a ECM manufactured by DENSO. The Engine Management System (EMS) controls the following:

- Engine fueling
- Ignition timing
- Closed loop fueling
- Knock control
- Idle speed control
- Emission control
- On Board Diagnostic
- Interface with the immobilization system
- Speed control

The ECM controls the engine fueling by providing sequential fuel injection to all cylinders. Ignition is controlled by a direct ignition system, provided by eight plug top coils. The ECM is able to detect and correct for ignition knock on each cylinder and adjust the ignition timing for each cylinder to achieve optimum performance.

The ECM uses a torque-based strategy to generate the torque required by the driver and other vehicle control modules. The EMS uses various sensors to determine the torque required from the engine. The EMS also interfaces with other vehicle electronic control modules's, via the CAN bus, to obtain additional information (e.g. road speed from the ABS control module). The EMS processes these signals and decides how much torque to generate. Torque is then generated by using various actuators to supply air, fuel and spark to the engine (electronic throttle, injectors, coils, etc.).

ENGINE CONTROL MODULE (ECM)



E46330

The ECMis located in the E-Box in the plenum area on the passenger side of the engine compartment attached to the bulkhead.

The ECM has the following inputs:

- RCM
- Park/neutral switch
- Ignition coil feedback x2
- Fuel rail temperature
- Mass air flow

- Engine speed
- Camshaft position x2
- Driver demand
- Brake pedal position switch
- Speed control switches
- Generator load
- Oxygen sensors pre catalyst x2
- Oxygen sensors post catalyst x2
- Throttle position
- Cooling fan speed
- Ignition switch position
- Knock sensors x2
- MAP
- Coolant temperature
- Engine oil temperature

The ECM outputs to the following:

- Throttle Actuator
- Brake vacuum pump relay
- Ignition coils (x8)
- Oxygen sensor heaters (4)
- Fuel injectors (8)
- Purge Valve
- Engine Cooling Fan
- Fuel pump relay
- Starter Relay
- EMS Main Relay
- Viscous Fan Control
- Generator Control
- Diagnostic Module Tank Leakage (DMTL) (NAS Only)
- E box fan

ECM Connector C0634 Pin Out Table

Pin No	Description	Input/Output
1	Not used	-
2	Not used	-
3	Generator monitor	Input
4	Not used	-
5	Not used	-
6	CKP sensor -	Input
7	CMP sensor 1ground (GND)	-
8	CMP sensor 2GND	-
9	Not used	-
10	throttle position (TP) sensor GND	-
11	MAP sensor ground	-
12	fuel rail pressure (FRP) sensor ground	-
13	Not used	-
14	Not used	Input
15	ECT ground	-
16	Not used MAF ground	-
17	Not used	-
18	MAF sensor ground	-
19	Knock sensor 1A ground	-
20	Knock sensor 1B ground	-
21	Not used	-
22	Not used	-
23	Oil temperature sensor	Input
24	Not used	-
25	Not used	-
26	UHEGO sensor bank B signal	Input
27	UHEGO sensor bank B GND	-
28	UHEGO sensor bank A signal	Input
29	UHEGO sensor bank A GND	-
30	CKP sensor +	Input

Pin No	Description	Input/Output
31	Not used	-
32	Not used	-
33	CMP signal bank B	Input
34	CMP signal bank A	Input
35	Not used	-
36	Not used	-
37	Not used	-
38	Not used	-
39	Not used	Input
40	Not used	Input
41	Not used	Input
42	Knock sensor 1 A +	Input
43	Knock sensor 1 B +	Input
44	Not used	-
45	Not used	-
46	Fuel rail temperature sensor	Input
47	Not used	-
48	MAP sensor 5 V ref voltage	Output
49	Not used	-
50	EGR 4	Output
51	EGR 3	Output
52	EGR 2	Output
53	EGR 1	Output
54	Ignition coil cylinder 4B	Output
55	Ignition coil cylinder 4A	Output
56	Ignition coil cylinder 3B	Output
57	Ignition coil cylinder 3A	Output
58	Ignition coil cylinder 2B	Output
59	Ignition coil cylinder 2A	Output
60	Ignition coil cylinder 1B	Output
61	Ignition coil cylinder 1A	Output
62	Ignition failure signal bank A	Input
63	Viscous fan speed monitor	Input
64	Ignition failure signal bank B	Input
65	TP sensor 1	Input
66	MAF	Input
67	TP sensor 2	Input
68	ECT	Input
69	Inlet manifold boost pressure	Input
70	MAF	Input
71	Not used	-
72	Electric throttle 5V reference	Output
73	Not used	-
74	Throttle valve open direction -	Output
75	Throttle valve open direction +	Output
76	UHEGO Heater bank A	Output
77	UHEGO Heater bank B	Output
78	Injector cylinder 1A	Output
79	Injector cylinder 1B	Output
80	Injector cylinder 2A	Output
81	Injector cylinder 2B	Output
82	Injector cylinder 3A	Output
83	Injector cylinder 3B	Output
84	Injector cylinder 4A	Output
85	Injector cylinder 4B	Output
86	VVT control bank A	Output
87	VVT control bank B	Output
88	Not used	-
89	Not used	-
90	Not used	-
91	Not used	-

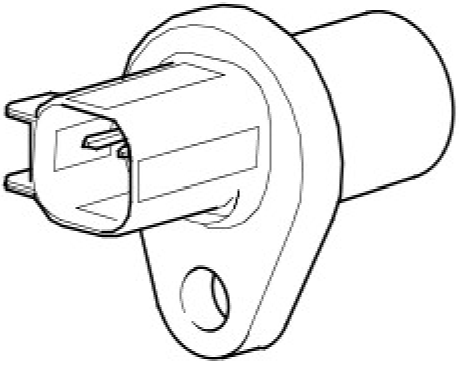
Pin No	Description	Input/Output
92	Purge valve	Output
93	Viscous fan request	Output
94	E box fan	Output
95	Fuel pump relay	Output
96	Generator control	Output

ECM Connector C0635 Pin Out Table

Pin No	Description	Input/Output
1	Signal ground 1	-
2	Power ground 1	-
3	Power ground 3	-
4	Power ground 2	-
5	ECM power	Output
6	Electric throttle power	Input
7	APP sensor ground 1	-
8	APP sensor ground 2	-
9	Not used	-
10	Not used	-
11	Not used	-
12	Not used	-
13	Not used	-
14	Not used	-
15	Park/ Neutral signal	Input
16	EMS relay	Output
17	Crank request	Input
18	Not used	-
19	APP sensor 2 5V ref	-
20	Not used	-
21	Not used	Input
22	HEGO sensor A GND	-
23	DMTL heater	Output
24	APP sensor 1 signal	Output
25	HEGO sensor A	Input
26	HEGO sensor B	Input
27	Not used	-
28	RCM	Input
29	Not used	-
30	Ignition switch	Input
31	Not used	-
32	APP sensor 1 5V reference	Output
33	DMTL pump	Output
34	HEGO sensor B GND	-
35	Speed control switch -	Output
36	Speed control switch +	Input
37	Not used	-
38	APP sensor 2 demand	Input
39	Not used	-
40	Not used	-
41	Brake pedal switch	Input
42	Not used	-
43	Not used	-
44	CAN out -	Input/output
45	CAN in -	Input/output
46	HEGO heater A	Output
47	HEGO heater B	Output
48	DMTL valve	Output
49	Not used	-
50	Vacuum pump relay	Output
51	Starter relay	Output
52	Not used	-
53	Not used	-
54	Battery voltage	Input

Pin No	Description	Input/Output
55	Not used	-
56	Not used	-
57	CAN out +	Input/output
58	CAN in +	Input/output

CRANKSHAFT POSITION SENSOR (CKP)



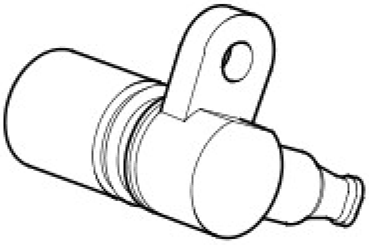
E46331

The crankshaft position sensor is mounted at the rear underside of the engine near the transmission bell housing. Connection between the sensor and the harness is via a link harness and a two-way connector. Both wires go directly to the ECM. The sensor produces the signal which enables the ECM to determine the angle of the crankshaft, and the engine rpm. From this, the point of ignition, fuel injection, etc. is calculated. If the signal wires are reversed a 3 degrees advance in timing will occur, as the electronics within the ECM uses the falling edge of the signal waveform as its reference / timing point for each tooth.

The reluctor is pressed into the flywheel and has a "tooth" pattern based on 36 teeth at 10° intervals and approximately 5° wide: one of the teeth is removed to provide a hardware reference mark which is 30 degrees before top dead center (BTDC) No.1 cylinder. Because of the crankshaft sensor's orientation, the target wheel uses windows stamped into the face, rather than actual teeth.

The sensor operates by generating an output voltage caused by the change in magnetic field that occurs as the windows pass in front of the sensor. The output voltage varies with the speed of the windows passing the sensor, the higher the engine speed, the higher the output voltage. Note that the output is also dependent on the air gap between the sensor and the teeth (the larger the gap, the weaker the signal, the lower the output voltage). The ECM transmits the engine speed to other vehicle control modules on CAN.

CAMSHAFT POSITION SENSOR (CMP)



E46332

Two sensors are located at the rear of the engine, in the cylinder head (one per bank), above the rear cylinders. The sensors are Variable Reluctor Sensor (VRS) type, producing four pulses for every two engine revolutions. The sensing element is positioned between 0 and 2mm from the side of the cam gear wheel.

The camshaft timing wheel is a sintered component which has four teeth on it to enable the EMS to detect cylinder identification. The signal is used for:

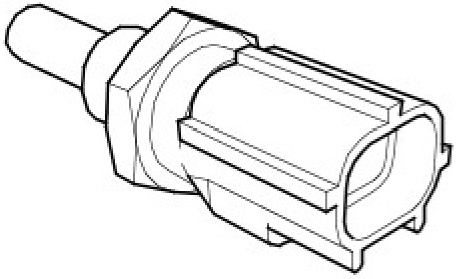
- Cylinder recognition
- Enabling sequential fuel injection
- Knock control

- Cylinder identification for diagnostic purposes.

Failure symptoms include:

- Ignition timing reverting to the base mapping, with no cylinder correction.
- Active knock control is disabled, along with its diagnostic (Safe ignition map - loss of performance).
- Quick cam/crank synchronisation on start disabled.

ENGINE COOLANT TEMPERATURE SENSOR (ECT)

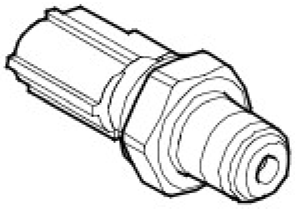


E47309

The sensor is located at the front of the engine in the water pipe below the throttle body. The ECT sensor is a thermistor used to monitor the engine coolant temperature. The engine coolant temperature sensor is vital to the correct running of the engine as a richer mixture is required at lower block temperatures for good quality starts and smooth running, leaning off as the temperature rises to maintain emissions and performance.

The sensor has an operating temperature range of -30 Degrees Celsius to 125 Degrees Celsius. When a defective coolant sensor is detected, the ECM uses the oil temperature sensor value.

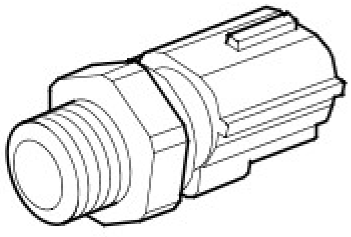
ENGINE OIL TEMPERATURE SENSOR



E46333

Oil temperature is monitored through a temperature sensor mounted in the oil system. This component is a negative temperature coefficient (NTC). The sensor is mounted next to the oil pressure sensor at the front of the engine and locates into the oil filter bracket.

FUEL RAIL TEMPERATURE SENSOR

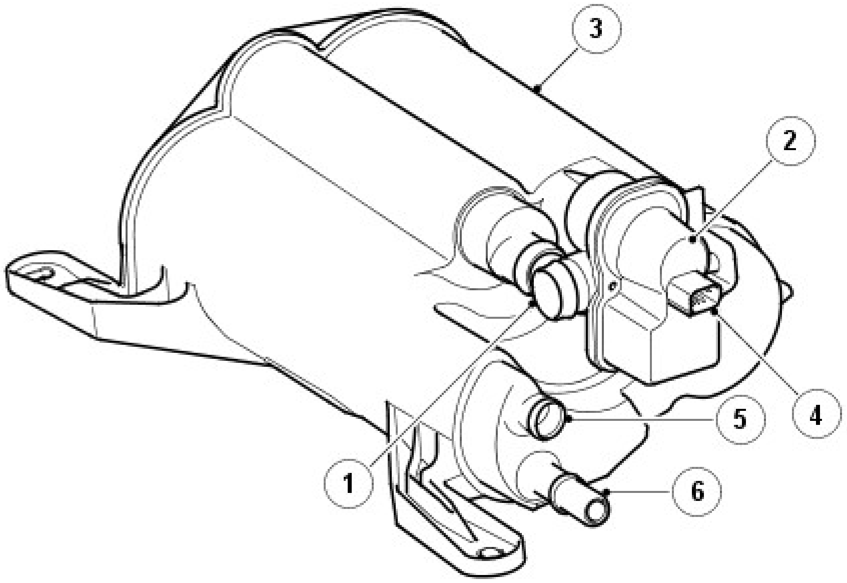


E47606

The fuel rail temperature sensor measures the temperature of the fuel in the fuel rail. This input is then used to deliver the correct quantity of fuel to the engine. Operating Range -40 Degrees Celsius to 150 Degrees Celsius. The fuel rail temperature sensor is fitted on the rear of the right hand bank (bank A) fuel rail.

DIAGNOSTIC MONITORING OF TANK LEAKAGE (DMTL) - NAS ONLY

Charcoal Canister with DMTL Pump (NAS only)



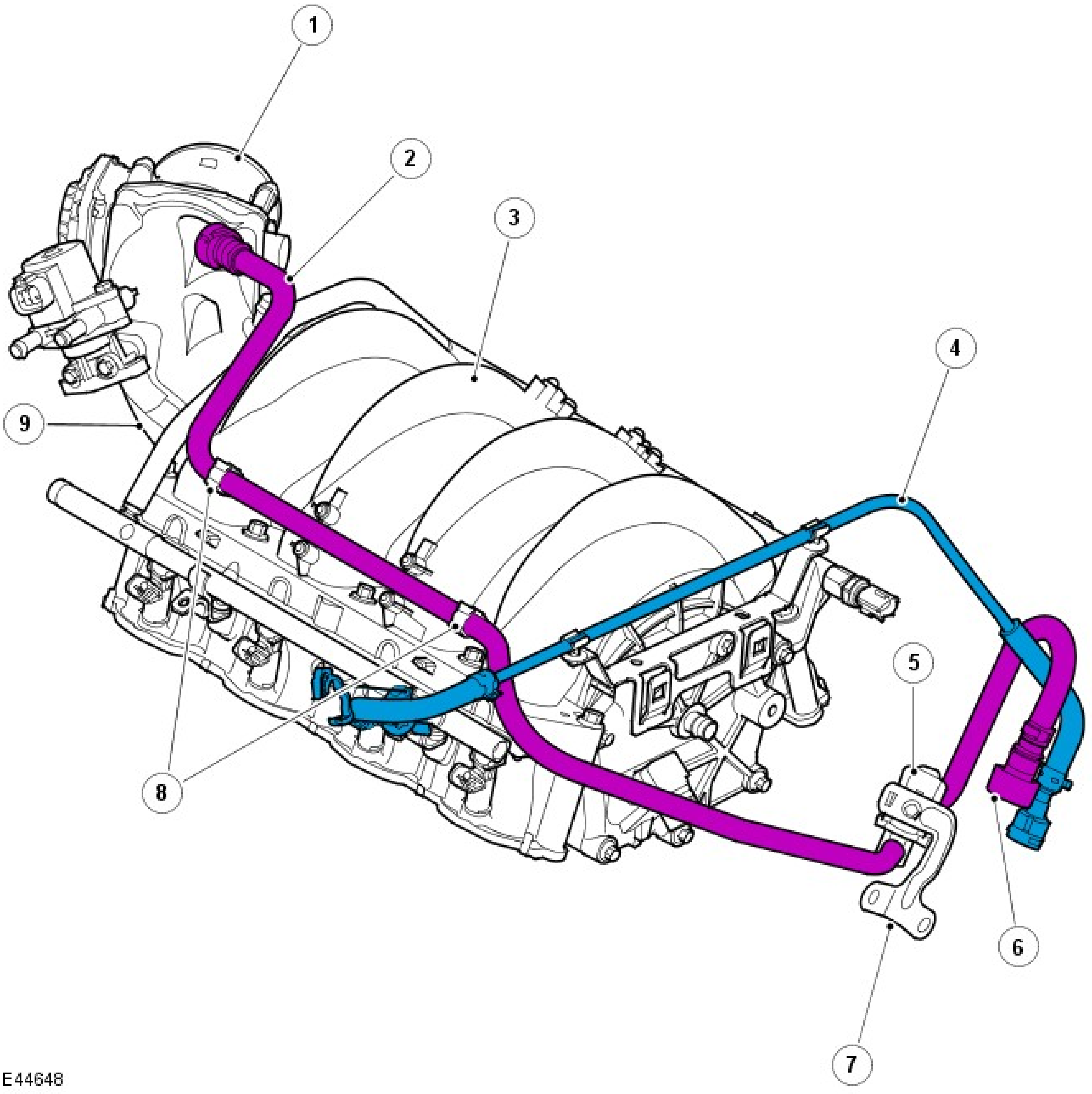
E44561

Item	Part Number	Description
1	-	Charcoal canister atmospheric pressure vent connection (via DMTL pump)
2	-	DMTL pump
3	-	Charcoal canister
4	-	Electrical connector
5	-	Purge hose connection
6	-	Charcoal canister tank vent hose connection

The DMTL system periodically checks the evaporative system and the fuel tank for leaks when the ignition is switched off. The DMTL pump is connected to the atmospheric vent of the charcoal cannister and incorporates a positive temperature coefficient (PTC) heating element a normally open valve and a reference orifice. The DMTL pump is only operated when the ignition is switched off and is controlled by the ECM. The ECM also monitors the electric air pump operation and the normally open valve for faults. To check the fuel tank and EVAP system for leaks the ECM operates the DMTL pump and monitors the current draw. This is compared to a referenced figure established from the current draw when air is pumped through the reference orifice.
For additional information, refer to: Evaporative Emissions (303-13A Evaporative Emissions - V8 S/C 4.2L Petrol, Description and Operation).

PURGE VALVE

Purge Valve and Hoses location



Item	Part Number	Description
1	-	Electric throttle
2	-	Purge hose
3	-	Intake manifold
4	-	Fuel feed jump hose (Ref. only)
5	-	Purge valve
6	-	Purge hose connector
7	-	Bracket
8	-	Hose clamps
9	-	Elbow assembly

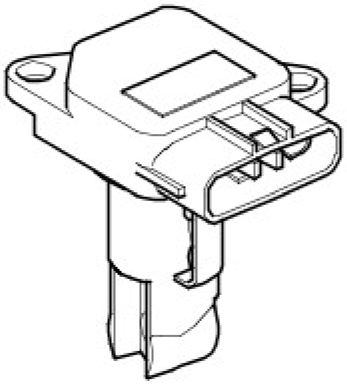
The purge valve is located at the rear of the engine, on a bracket which is attached to the transmission bell housing. The purge hose is routed from the purge valve, along the left hand side of the air intake manifold, to the elbow assembly which locates the electric throttle.

The purge hose is connected, at the right hand rear of the engine, with a quick release coupling to the purge line which runs parallel with the fuel feed line along the top of the fuel tank to the charcoal canister.

The purge hose continues from the purge valve and is routed to a connection on the air intake elbow assembly. The hose is connected to the elbow with a quick release connector.

The purge valve is a solenoid operated valve which is closed when de-energized. The purge valve is controlled by a 10Hz pulse width modulation (PWM) signal from the ECM. When the engine operating conditions are correct, the ECM opens the purge valve which causes fuel vapor and fresh air to be drawn through the charcoal cannister. The fresh air is drawn through the charcoal cannister via the DMTL pump fresh air vent.
For additional information, refer to: Evaporative Emissions (303-13A Evaporative Emissions - V8 S/C 4.2L Petrol, Description and Operation).

MASS AIR FLOW / INLET AIR TEMPERATURE SENSOR (MAF / IAT)



E47308

The air flow meter is located in the clean air duct immediately after the air filter box.

The air mass flow is determined by the cooling effect of inlet air passing over a “hot film” element contained within the device. The higher the air flow the greater the cooling effect and the lower the electrical resistance of the “hot film” element. The ECM then uses this signal from the MAF meter to calculate the air mass flowing into the engine.

The measured air mass flow is used in determining the fuel quantity to be injected in order to maintain the stichometric air/fuel mixture required for correct operation of the engine and exhaust catalysts. Should the device fail there is a software backup strategy that will be evoked once a fault has been diagnosed.

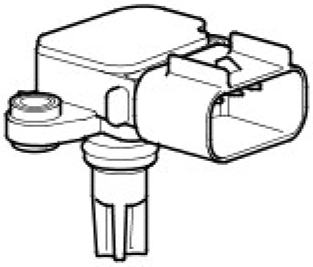
The following symptoms may be observed if the sensor fails:

- During driving the engine RPM might dip, before recovering.
- Difficulty in starting or start - stall.
- Poor throttle response / engine performance.
- Lambda control and idle speed control halted.
- Emissions incorrect.
- AFM signal offset

The IAT sensor is integrated into the MAF meter. It is a temperature dependent resistor (thermistor), i.e. the resistance of the sensor varies with temperature. This thermistor is a NTC type element meaning that the sensor resistance decreases as the sensor temperature increases. The sensor forms part of a voltage divider chain with an additional resistor in the ECM. The voltage from this sensor changes as the sensor resistance changes, thus relating the air temperature to the voltage measured by the ECM.

The ECM stores a 25°C default value for air temperature in the event of a sensor failure.

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP)



E47588

The MAPsensor provides a voltage proportional to the absolute pressure in the intake manifold. This signal allows the load on the engine to be calculated and used within the internal calculations of the ECM. The sensor is located on the rear of the air intake manifold.

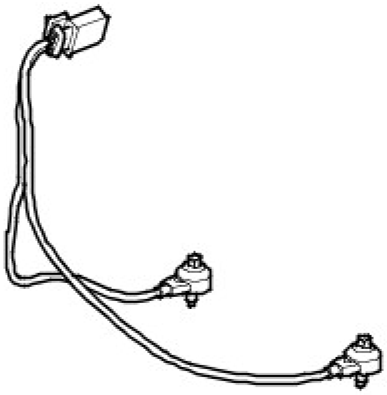
Pin No	Description
1	MAP signal
2	Sensor supply
3	Not used
4	Sensor ground

The output signal from the MAP sensor, together with the CKP and IAT sensors, is used by the ECM to calculate the amount of air induced into the cylinders. This enables the ECM to determine ignition timing and fuel injection duration values.

The MAP sensor receives a 5V supply voltage from pin 48 of ECM connector C0634 and provides an analogue signal to pin 69 of ECM connector C0634, which relates to the absolute manifold pressure and allows the ECM to calculate engine load. The ECM provides a ground for the sensor via pin 11 of ECM connector C0634.

If the MAP signal is missing, the ECM will substitute a default manifold pressure reading based on crankshaft speed and throttle angle. The engine will continue to run with reduced drivability and increased emissions, although this may not be immediately apparent to the driver. The ECM will store fault codes which can be retrieved using T4.

KNOCK SENSORS



E47296

The V8 EMS has two knock sensors located in the V of the engine, one per cylinder bank. The sensors are connected to the ECM via a twisted pair.

The knock sensors produce a voltage signal in proportion to the amount of mechanical vibration generated at each ignition point. Each sensor monitors the related cylinder bank.

The knock sensors incorporate a piezo-ceramic crystal. This crystal produces a voltage whenever an outside force tries to deflect it, (i.e. exerts a mechanical load on it). When the engine is running, the compression waves in the material of the cylinder block, caused by the combustion of the fuel/air mixture within the cylinders, deflect the crystal and produce an output voltage signal. The signals are supplied to the ECM, which compares them with `mapped' signals stored in memory. From this, the ECM can determine when detonation occurs on individual cylinders. When detonation is detected, the ECM retards the ignition timing on that cylinder for a number of engine cycles, then gradually returns it to the original setting.

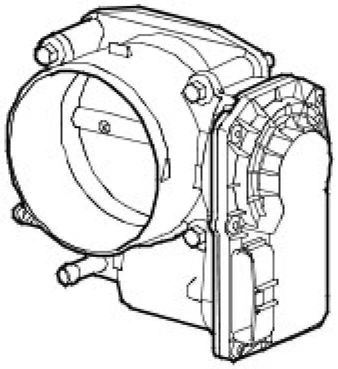
Care must be taken at all times to avoid damaging the knock sensors, but particularly during removal and fitting procedures. The recommendations regarding torque and surface preparation must be adhered to. The torque applied to the sensor and the quality of the surface preparation both have an influence over the transfer of mechanical noise from the cylinder block to the crystal.

The ECM uses the signals supplied by the knock sensors, in conjunction with the signal it receives from the camshaft sensor, to determine the optimum ignition point for each cylinder. The ignition point is set according to preprogrammed ignition maps stored within the ECM. The ECM is programmed to use ignition maps for 98 RON premium specification fuel. It will also function on 91 research octane number (RON) regular specification fuel and learn new adaptions. If the only fuel available is of poor quality, or the customer switches to a lower grade of fuel after using a high grade for a period of time, the engine may suffer slight pre-ignition for a short period. This amount of pre-ignition will not damage the engine. This situation will be evident while the ECM learns and then modifies its internal mapping to compensate for the variation in fuel quality. This feature is called adaption. The ECM has the capability of adapting its fuel and ignition control outputs in response to several sensor inputs.

The ECM will cancel closed loop control of the ignition system if the signal received from either knock sensor becomes implausible. In these circumstances the ECM will default to a safe ignition map. This measure ensures the engine will not become damaged if low quality fuel is used. The malfunction indicator lamp (MIL) will not illuminate, although the driver may notice that the engine 'pinks' in some driving conditions and displays a drop in performance and smoothness.

When a knock sensor fault is stored, the ECM will also store details of the engine speed, engine load and the coolant temperature.

ELECTRONIC THROTTLE



E47298

The V8 EMS incorporates an electric throttle control system. The electronic throttle body is located on the air intake manifold in the engine compartment. The system comprises three main components:

- Electronic throttle control valve
- APP sensor
- ECM

When the accelerator pedal is depressed the APP sensor provides a change in the monitored signals. The ECM compares this against an electronic “map” and moves the electronic throttle valve via a PWM control signal which is in proportion to the APP angle signal. The system is required to:

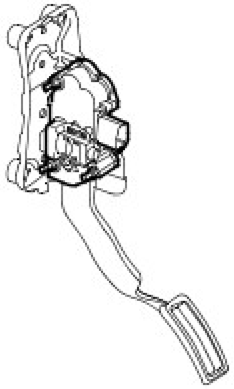
- Regulate the calculated intake air load based on the accelerator pedal sensor input signals and programmed mapping.
- Monitor the drivers input request for cruise control operation.
- Automatically position the electronic throttle for accurate cruise control.
- Perform all dynamic stability control throttle control interventions.
- Monitor and carry out maximum engine and road speed cut out.
- Provide differing responses for differing Terrain response modes.

A software strategy within the ECM enables the throttle position to be calibrated each ignition cycle. When the ignition is turned ON, the ECM performs a self test and calibration routine on the electronic throttle by closing the throttle full, then opening again. This tests the default position springs.

Electronic Throttle Pin Out Table

Pin No	Description
1	Motor +
2	Motor -
3	Sensor ground
4	Sensor 2 signal
5	5 volt supply
6	Sensor 1 signal

ACCELERATOR PEDAL POSITION SENSOR (APP)



E47297

The APP sensors are located on the accelerator pedal assembly.

The APP sensors are used to determine the driver's request for vehicle speed, acceleration and deceleration. This value is used by the ECM and the throttle is opened to the correct angle by an electric motor integrated into the throttle body.

The APP sensor signals are checked for range and plausibility. Two separate reference voltages are supplied to the pedal. Should one sensor fail, the other is used as a 'limp – home' input. In limp home mode due to an APP signal failure the ECM will limit the maximum engine speed to 2000 rpm.

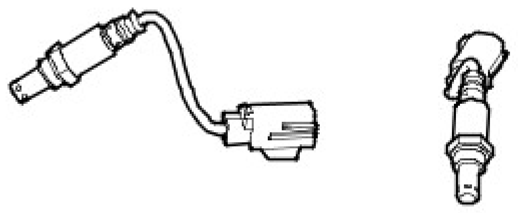
APP Pin Out Table

Pin No	Description
1	APP 1 ground
2	APP 1 demand
3	APP2 ground
4	Not used
5	APP 2 demand
6	Supply 2, 5 volt
7	Supply 1, 5 volt
8	Not used

OXYGEN SENSORS

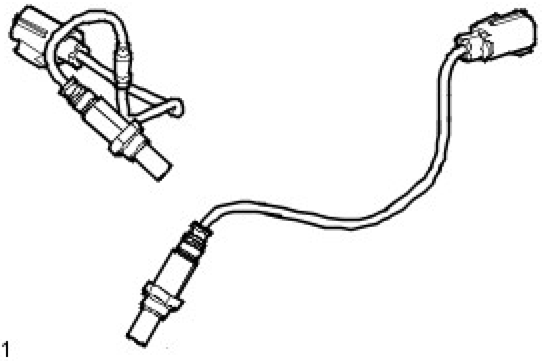
There are four oxygen sensors located in the exhaust system. Two upstream before the catalytic converter and two down stream after the catalytic converter. The sensor monitors the level of oxygen in the exhaust gases and is used to control the fuel/air mixture. Positioning a sensor in the stream of exhaust gasses from each bank enables the ECM to control the fueling on each bank independently of the other, allowing much closer control of the air / fuel ratio and catalyst conversion efficiency.

Upstream Oxygen Sensors



E47300

Downstream Oxygen Sensors



E47301

The oxygen sensors need to operate at high temperatures in order to function correctly. To achieve the high temperatures required, the sensors are fitted with heater elements that are controlled by a PWM signal from the ECM. The heater elements are operated immediately following engine start and also during low load conditions when the temperature of the exhaust gases is insufficient to maintain the required sensor temperatures. A non-functioning heater delays the sensor’s readiness for closed loop control and influences emissions. The PWM duty cycle is carefully controlled to prevent thermal shock to cold sensors.

UHEGO (Universal Heated Exhaust Gas Oxygen) sensors also known as Linear or "Wide Band" sensors produces a constant voltage, with a variable current that is proportional to the oxygen content. This allows closed loop fueling control to a target lambda, i.e. during engine warm up (after the sensor has reached operating temperature and is ready for operation). This improves emission control.

The HEGO sensor uses Zirconium technology that produces an output voltage dependant upon the ratio of exhaust gas oxygen to the ambient oxygen. The device contains a Galvanic cell surrounded by a gas permeable ceramic, the voltage of which depends upon the level of O2 defusing through. Nominal output voltage of the device for l =1 is 300 to 500m volts. As the fuel mixture becomes richer (l<1) the voltage tends towards 900m volts and as it becomes leaner (l>1) the voltage tends towards 0 volts. Maximum tip temperature is 1,000 Degrees Celsius for a maximum of 100 hours.

Sensors age with mileage, increasing their response time to switch from rich to lean and lean to rich. This increase in response time influences the ECM closed loop control and leads to progressively increased emissions. Measuring the period of rich to lean and lean to rich switching monitors the response rate of the upstream sensors.

Diagnosis of electrical faults is continually monitored in both the upstream and downstream sensors. This is achieved by checking the signal against maximum and minimum threshold, for open and short circuit conditions.

Oxygen sensors must be treated with the utmost care before and during the fitting process. The sensors have ceramic material within them that can easily crack if dropped / banged or over-torqued. The sensors must be torqued to the required figure, (40-50Nm), with a calibrated torque wrench. Care should be taken not to contaminate the sensor tip when anti-seize compound is used on the thread. Heated sensor signal pins are tinned and universal are gold plated. Mixing up sensors could contaminate the connectors and affect system performance.

Failure Modes

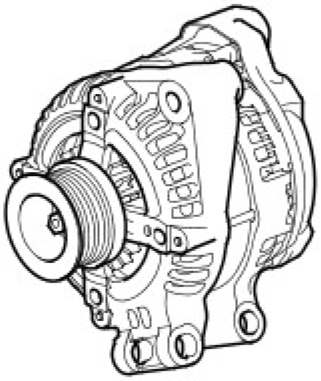
- Mechanical fitting & integrity of the sensor.
- Sensor open circuit / disconnected.
- Short circuit to vehicle supply or ground.
- Lambda ratio outside operating band.
- Crossed sensors bank A & B.
- Contamination from leaded fuel or other sources.
- Change in sensor characteristic.
- Harness damage.
- Air leak into exhaust system.

Failure Symptoms

- Default to Open Loop fueling for the particular cylinder bank
- High CO reading.
- Strong smell of H02S (rotten eggs) till default condition.
- Excess Emissions.

It is possible to fit front and rear sensors in their opposite location. However the harness connections are of different gender and color to ensure that the sensors cannot be incorrectly connected. In addition to this the upstream sensors have two holes in the shroud, whereas the down stream sensors have four holes in the shroud for the gas to pass through.

GENERATOR



E47591

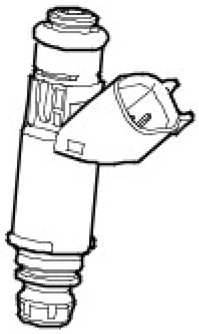
The Generator has a multifunction voltage regulator for use in a 14V charging system with 6÷12 zener diode bridge rectifiers.

The ECM monitors the load on the electrical system via PWM signal and adjusts the generator output to match the required load. The ECM also monitors the battery temperature to determine the generator regulator set point. This characteristic is necessary to protect the battery; at low temperatures battery charge acceptance is very poor so the voltage needs to be high to maximize any rechargeability, but at high temperatures the charge voltage must be restricted to prevent excessive gassing of the battery with consequent water loss.

The Generator has a smart charge capability that will reduce the electrical load on the Generator reducing torque requirements, this is implemented to utilize the engine torque for other purposes. This is achieved by monitoring three signals to the ECM:

- Generator sense (A sense), measures the battery voltage at the central junction box (CJB).
- Generator communication (Alt Com) communicates desired Generator voltage set point from ECM to Generator.
- Generator monitor (Alt Mon) communicates the extent of Generator current draw to ECM. This signal also transmits faults to the ECM which will then sends a message to the instrument pack on the CAN bus to illuminate the charge warning lamp. For additional information, refer to: Generator (414-02B Generator and Regulator - V8 4.4L Petrol, Description and Operation).

FUEL INJECTORS

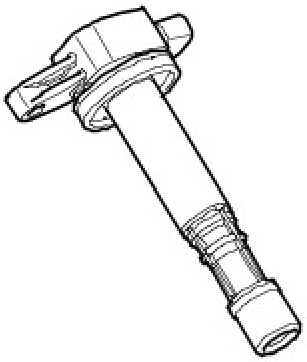


E47305

The engine has 8 fuel injectors (one per cylinder), each injector is directly driven by the ECM. The injectors are fed by a common fuel rail as part of a ‘returnless’ fuel system. The fuel rail pressure is regulated to 4.5 bar by a fuel pressure regulator which is integral to the fuel pump module, within the fuel tank. The injectors can be checked by resistance checks. There is a fuel pressure test Schrader valve attached to the fuel rail on the front left-hand (LH) side for fuel pressure testing purposes. The ECM monitors the output power stages of the injector drivers for electrical faults.

The injectors have a resistance of 13.8 Ohms ± 0.7 Ohms @ 20 Degrees Celsius
For additional information, refer to: Fuel Charging and Controls (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Description and Operation).

IGNITION COILS



E47306

The V8 engine is fitted with eight plug-top coils that are driven directly by the ECM. This means that the ECM, at the point where sufficient charge has built up, switches the primary circuit of each coil and a spark is produced in the spark plug. The positive supply to the coil is fed from a common fuse. Each coil contains a power stage to trigger the primary current. The ECM sends a signal to each of the coils power stage to trigger the power stage switching. Each bank has a feedback signal that is connected to each power stage. If the coil power stage has a failure the feedback signal is not sent, causing the ECM to store a fault code appropriate to the failure.

The ECM calculates the dwell time depending on battery voltage and engine speed to ensure constant secondary energy. This ensures sufficient secondary (spark) energy is always available, without excessive primary current flow thus avoiding overheating or damage to the coils.

The individual cylinder spark timing is calculated from a variety of inputs:

- Engine speed and load.

- Engine temperature.
- Knock control.
- Auto gearbox shift control.
- Idle speed control.

For additional information, refer to: Engine Ignition (303-07B Engine Ignition - V8 4.4L Petrol, Description and Operation).

FUEL PUMP RELAY

The V8 engine has a returnless fuel system. The system pressure is maintained at a constant 4 bar (59 Psi), with no reference to intake manifold pressure. The fuel is supplied to the injectors from a fuel pump fitted within the fuel tank. The electrical supply to this fuel pump is controlled by the ECM via a relay and an Inertia Switch which will turn the fuel off upon a vehicle impact. The fuel system is pressurized as soon as the ECM is powered up, the pump is then switched off until engine start has been achieved.

VISCOUS FAN CONTROL

The ECM controls a viscous coupled fan to provide engine cooling. The ECM supplies the fan with a PWM signal that controls the amount of slippage of the fan, thus providing the correct amount of cooling fan speed and airflow. The EMS uses a Hall effect sensor to determine the fan speed.
For additional information, refer to: Fuel Charging and Controls (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Description and Operation).

VARIABLE VALVE TIMING (VVT)

Variable valve timing is used on the V8 engine to enhance low and high speed engine performance and idle speed quality.

For each inlet camshaft the VVT system comprises:

- VVT unit
- Valve timing solenoid

The VVT system alters the phase of the intake valves relative to the fixed timing of the exhaust valves, to alter:

- The mass of air flow to the cylinders.
- The engine torque response.
- Emissions.

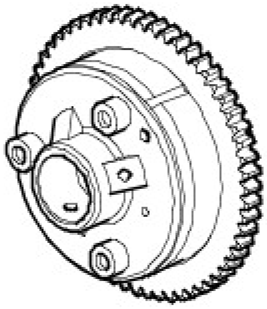
The VVT unit uses a vane type device to control the camshaft angle. The system operates over a range of 48 degrees and is advanced or retarded to its optimum position within this range.

The VVT system is controlled by the ECM based on engine load and speed along with engine oil temperature to calculate the appropriate camshaft position.

The VVT system provides the following advantages:

- Reduced engine emissions and improved fuel consumption which in turn improves the engines internal EGR effect over a wider operating range.
- Enhanced full load torque characteristics.
- Improved fuel economy through optimized torque over the engine speed range.

Variable Valve Timing Unit



E47303

The VVT unit is a hydraulic actuator mounted on the end of the inlet camshaft. The unit advances or retards the camshaft timing to alter the camshaft to crankshaft phase. The ECM controls the VVT timing unit via a oil control solenoid. The oil control solenoid routes oil pressure to the advance or retard chambers either side of the vanes within the VVT unit.

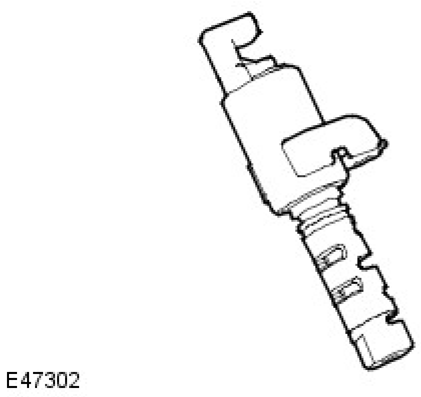
The VVT unit is driven by the primary drive chain and rotates relative to the exhaust camshaft. When the ECM requests a retard in camshaft timing the oil control solenoid is energized which moves the shuttle valve in the solenoid to the relevant position allowing oil pressure to flow out of the advance chambers in the VVT unit whilst simultaneously allowing oil pressure into the retard chambers.

The ECM controls the advancing and retarding of the VVT unit based on engine load and speed. The ECM sends an energize signal to the oil control solenoid until the desired VVT position is achieved. When the desired VVT position is reached, the energizing signal is reduced to hold the oil control solenoid position and consequently desired VVT position. This function is under closed loop control and the ECM can sense any variance in shuttle valve oil pressure via the camshaft position sensor and can adjust the energizing signal to maintain the shuttle valve hold position.

VVT operation can be affected by engine oil temperature and properties. At very low oil temperatures the movement of the VVT mechanism will be slow due to the high viscosity of the oil. While at high oil temperatures the low oil viscosity may impair the VVT operation at low oil pressures. The oil pump has the capacity to cope with these variations in oil pressure while an oil temperature sensor is monitored by the ECM to provide oil temperature feedback. At extremely high oil temperatures the ECM may limit the amount of VVT advance in order to prevent the engine from stalling when returning to idle speed.

VVT does not operate when engine oil pressure is below 1.25 bar. This is because there is insufficient pressure to release the VVT units internal stopper pin. This occurs when the engine is shut down and the VVT unit has returned to the retarded position. The stopper pin locks the VVT unit to the camshaft to ensure camshaft stability during the next start up.
For additional information, refer to: Engine (303-01B Engine - V8 4.4L Petrol, Description and Operation).

Valve Timing Solenoid

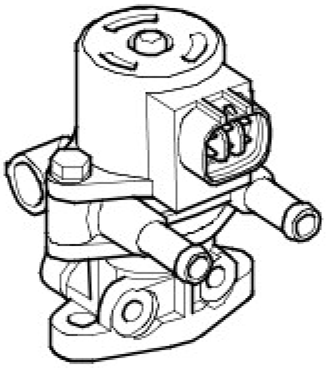


Valve Timing Solenoid

The valve timing solenoid controls the position of the shuttle valve in the bush carrier. A plunger on the solenoid extends when the solenoid is energized and retracts when the solenoid is de-energized.

When the valve timing solenoids are de-energized, the coil springs in the bush carriers position the shuttle valves to connect the valve timing units to drain. In the valve timing units, the return springs hold the ring pistons and gears in the retarded position. When the valve timing solenoids are energized by the ECM, the solenoid plungers position the shuttle valves to direct engine oil to the valve timing units. In the valve timing units, the oil pressure overcomes the force of the return springs and moves the gears and ring pistons to the advanced position. System response times are 1.0 second maximum for advancing and 0.7 second maximum for retarding. While the valve timing is in the retarded mode, the ECM produces a periodic lubrication pulse. This momentarily energizes the valve timing solenoids to allow a spurt of oil into the valve timing units. The lubrication pulse occurs once every 5 minutes.

EXHAUST GAS RECIRCULATION (EGR) VALVE



E47299

The EGR valve is an electrically controlled valve that allows burned exhaust gas to be recirculated back into the engine. The EGR valve consists of a stepper motor that opens and closes the valve in steps. Since exhaust gas has much less oxygen than air, it is basically inert. It takes the place of air in the cylinder and reduces combustion temperature. As the combustion temperature is reduced, so are the oxides of nitrogen (NOx).

The EGR valve is located on the intake manifold with a pipe connecting the exhaust manifold to the valve. Connection between the sensor and the harness is via a six-way connector.
For additional information, refer to: Engine Emission Control (303-08B Engine Emission Control - V8 4.4L Petrol, Description and Operation).

ECM ADAPTIONS

The ECM has the ability to adapt the values it uses to control certain outputs. This capability ensures the EMS can meet emissions legislation and improve the refinement of the engine throughout its operating range.

The components which have adaptions associated with them are:

- The APP sensor
- The heated oxygen sensor (HO2S)
- The MAF/IAT sensor
- The CKP sensor
- Electric throttle body.

UHEGO/HEGO and MAF/IAT Sensor

There are several adaptive maps associated with the fueling strategy. Within the fueling strategy the ECM calculates short-term adaptions and long term adaptions. The ECM will monitor the deterioration of the oxygen sensors (HEGO and UHEGO) over a period of time. It will also monitor the current correction associated with the sensors.

The ECM will store a fault code in circumstances where an adaption is forced to exceed its operating parameters. At the same time, the ECM will record the engine speed, engine load and intake air temperature.

CKP Sensor

The characteristics of the signal supplied by the CKP sensor are learned by the ECM. This enables the ECM to set an adaption and support the engine misfire detection function. Due to the small variation between different flywheels and different CKP sensors, the adaption must be reset if either component is renewed, or removed and refitted. It is also necessary to reset the flywheel adaption if the ECM is renewed or replaced. The ECM supports four flywheel adaptions for the CKP sensor. Each adaption relates to a specific engine speed range. The engine speed ranges are detailed in the table below:

Adaptions	Engine Speed, rev/min
1	1800 - 3000
2	3001 - 3800
3	3801 - 4600
4	4601 - 5400

Misfire Detection

Legislation requires that the ECM must be able to detect the presence of an engine misfire. It must be able to detect misfires at two separate levels. The first level is a misfire that could lead to the vehicle emissions exceeding 1.5 times the Federal Test Procedure (FTP) requirements for the engine. The second level is a misfire that may cause catalyst damage.

The ECM monitors the number of misfire occurrences within two engine speed ranges. If the ECM detects more than a predetermined number of misfire occurrences within either of these two ranges, over two consecutive journeys, the ECM will record a fault code and details of the engine speed, engine load and engine coolant temperature. In addition, the ECM monitors the number of misfire occurrences that happen in a 'window' of 200 engine revolutions. The misfire occurrences are assigned a weighting according to their likely impact on the catalysts. If the number of misfires exceeds a certain value, the ECM stores catalyst-damaging fault codes, along with the engine speed, engine load and engine coolant temperature.

The signal from the crankshaft position sensor indicates how fast the poles on the flywheel are passing the sensor tip. A sine wave is generated each time a pole passes the sensor tip. The ECM can detect variations in flywheel speed by monitoring the sine wave signal supplied by the crankshaft position sensor.

By assessing this signal, the ECM can detect the presence of an engine misfire. At this time, the ECM will assess the amount of variation in the signal received from the CKP and assigns a roughness value to it. This roughness value can be viewed within the real time monitoring feature, using T4. The ECM will evaluate the signal against a number of factors and will decide whether to count the occurrence or ignore it. The ECM can assign a roughness and misfire signal for each cylinder, (i.e. identify which cylinder is misfiring).

T4 Diagnostics

The ECM stores faults as diagnostic trouble code (DTC), referred to as 'P' codes. The 'P' codes are defined by on-board diagnostic (OBD) legislation and, together with their associated environmental and freeze frame data, can be read using a third party scan tool or T4. T4 can also read real time data from each sensor, the adaptive values currently being employed and the current fueling, ignition and idle settings.

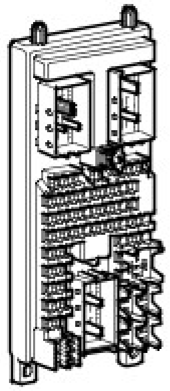
TERRAIN RESPONSE ™

Terrain Response ™ system allows the driver to select a program which will provide the optimum settings for traction and performance for prevailing terrain conditions.

As part of Terrain Response ™ there will be different throttle pedal progression maps associated with different Terrain Response ™ modes. The two extremes are likely to be a sand map (quick build up of torque with pedal travel) and grass/gravel/snow (very cautious build up of torque).

The TdV6 implementation of throttle progression is based on a fixed blend time. The torque will blend from that on one map to that on the new map (for the same pedal position) over a fixed time. This means blending will always take the same amount of time but when the torque change is small the torque increase over time will be small, whilst if the torque change is greater then the torque increase over time will be steeper. The resulting acceleration of the vehicle will depend on the torque difference between the two maps as well as on the gear and range selected. The worst case blending that could ever occur has been calibrated to match the blend rate for petrol derivatives as closely as possible, so as to give a transparent behavior to customers. For additional information, refer to: Specifications (204-06 Ride and Handling Optimization, Specifications).

CENTRAL JUNCTION BOX



E47607

The ECM is connected to ignition switch I and II. When the ignition is turned on 12V is applied to the Ignition Sense input. The ECM then starts its power up routines and turns on the ECM main relay; the main power to the ECM and it's associated system components. When the ignition is turned OFF the ECM will maintain its powered up state for up to 20 minutes while it initiates its power down routine and on completion will turn off the ECM main relay. The ECM will normally power down in approximately 60 seconds, do not disconcert the battery until the ECM is completely powered down.

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Electronic Engine Controls - V8 4.4L Petrol - Electronic Engine Controls

Diagnosis and Testing

Overview

This section covers the sensors and units for the engine management system.

For more information on the system, refer to section 303-14B - Electronic Engine Controls - 4.4L workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection chart

Mechanical	Electrical
● Engine oil level ● Cooling system coolant level ● Fuel level ● Fuel contamination/grade/quality ● Sensor installation/condition ● Viscous fan and solenoid	● Fuses ● Wiring harness ● Electrical connector(s) ● Sensor(s) ● Engine control module (ECM) ● Transmission control module (TCM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom (general)	Symptom (specific)	Possible causes	Action
Non-Start	Engine does not crank	● Security system /Immobilizer engaged ● ECM relay ● Battery ● Starting system ● Harness ● Engine seized	Check that the security system is disarmed. Check the ECM relay operation. For battery information and starting system tests, refer to the relevant workshop manual section. Check that the engine turns by hand.
	Engine cranks, but does not fire	● Low/Contaminated fuel ● Ignition system ● Fuel system ● Crankshaft position (CKP) sensor ● Harness ● ECM fault	Check the fuel level and condition. For ignition system tests and fuel system tests, refer to the relevant workshop manual section. For CKP and harness tests refer to the guided diagnostic routine on the approved diagnostic system. Refer to the warranty policy and procedures manual if an ECM is suspect.
	Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Fuel system ● Spark plugs ● Ignition coil failure(s) ● Harness	For purge valve tests, fuel system tests and ignition system tests, refer to the relevant workshop manual section.
Difficult to start	Difficult to start cold	● Check coolant anti-freeze content ● Battery ● Crankshaft position (CKP) sensor ● Exhaust gas recirculation (EGR) valve stuck open ● Fuel system	For battery information, refer to the relevant workshop manual section. For CKP and harness tests refer to the guided diagnostic routine on the approved diagnostic system. For EGR system tests, fuel system tests and purge valve tests, refer to the relevant workshop manual section.

Symptom (general)	Symptom (specific)	Possible causes	Action
		● Evaporative emissions purge valve	
	Difficult to start hot	● Injector leak ● Fuel system ● Fuel temperature sensor ● Intake air temperature (IAT) sensor ● Mass air flow (MAF) sensor ● Evaporative emissions purge valve ● Ignition system	For injector and fuel system tests, refer to the relevant workshop manual section. For fuel temperature sensor, IAT sensor, MAF sensor and purge valve tests refer to the guided diagnostic routines on the approved diagnostic system. For ignition system tests, refer to the relevant workshop manual section.
	Difficult to start after hot soak (vehicle standing after engine has reached operating temperature)	● Injector leak ● Fuel system ● Fuel temperature sensor ● IAT sensor ● MAF sensor ● Evaporative emissions purge valve ● Ignition system	For injector and fuel system tests, refer to the relevant workshop manual section. For fuel temperature sensor, IAT sensor, MAF sensor and purge valve tests refer to the guided diagnostic routines on the approved diagnostic system. For ignition system tests, refer to the relevant workshop manual section.
	Engine cranks too fast/slow	● Compressions high/low ● Battery ● Starting system	Check compressions. For battery information and starting system tests, refer to the relevant workshop manual section.
Engine stalls	Engine stalls soon after start	● Breather system disconnected/restricted ● ECM relay ● MAF sensor ● Ignition system ● Air filter restricted ● Air leakage ● Fuel lines	Check the engine breather system. Check the ECM relay operation. For MAF sensor tests refer to the guided diagnostic routines on the approved diagnostic system. For ignition system test, air intake information and fuel line information, refer to the relevant workshop manual section.
	Engine stalls on overrun	● ECM relay ● Throttle position (TP) sensors	Check the ECM relay operation. For TP sensor tests refer to the guided diagnostic routines on the approved diagnostic system.
	Engine stalls at steady speed	● ECM relay ● CKP sensor ● TP sensors	Check the ECM relay operation. For CKP sensor and TP sensor tests refer to the guided diagnostic routines on the approved diagnostic system.
	Engine stalls with speed control enabled	● ECM relay	Check the ECM relay operation.
	Engine stalls when maneuvering	● ECM relay ● TP sensors ● Additional engine loads (PAS, air conditioning, etc) ● Transmission malfunction ● CAN malfunction	Check the ECM relay operation. For TP sensor tests refer to the guided diagnostic routines on the approved diagnostic system. For accessory drive and transmission information, refer to the relevant workshop manual section. Check for CAN fault codes.
Poor driveability	Engine hesitates/poor acceleration	● Fuel pump ● Fuel lines ● Injector leak ● Fuel pressure ● Air leakage ● TP sensors ● Throttle motor ● Ignition system ● EGR valve stuck ● HO2 sensors ● Transmission malfunction ● Restricted pedal travel (carpet, etc)	For fuel pump and fuel line information, injector tests and intake system checks, refer to the relevant workshop manual section. For TP sensor and throttle motor tests refer to the guided diagnostic routines on the approved diagnostic system. For ignition system tests and EGR tests, refer to the relevant workshop manual section. Check for DTCs relating to HO2 sensors, refer to the DTC index. For transmission information, refer to the relevant workshop manual section. Check the accelerator pedal travel. For APP sensor tests refer to the guided diagnostic routines on the approved diagnostic system.

Symptom (general)	Symptom (specific)	Possible causes	Action
		- Accelerator pedal position (APP) sensor	
	Engine backfires	- Fuel pump - Fuel lines - Air leakage - MAF sensor - HO2 sensors - Ignition system - Sticking variable camshaft timing (VCT) hub - APP sensor	For fuel pump and fuel line information and intake system, refer to the relevant workshop manual section. For MAF sensor tests refer to the guided diagnostic routines on the approved diagnostic system. Check for DTCs relating to HO2 sensors, refer to the DTC index. For ignition system tests, refer to the relevant workshop manual section. For VCT and APP sensor tests refer to the guided diagnostic routines on the approved diagnostic system.
	Engine surges	- Fuel pump - Fuel lines - MAF sensor - Harness - TP sensors - Throttle motor - Ignition system	For fuel pump and fuel line information, refer to the relevant workshop manual section. For MAF sensor, TP sensor and throttle motor tests refer to the guided diagnostic routines on the approved diagnostic system. For ignition system tests, refer to the relevant workshop manual section.
	Engine detonates/knocks	- Knock sensor (KS)/circuit malfunction - Fuel pump - Fuel lines - Fuel quality - MAF sensor - HO2 sensors - Air leakage - Sticking VCT hub - BARO sensor malfunction (internal ECM fault)	For KS circuit tests refer to the guided diagnostic routines on the approved diagnostic system. For fuel pump and fuel line information, refer to the relevant workshop manual section. For MAF sensor tests refer to the guided diagnostic routine on the approved diagnostic system. Check for DTCs relating to HO2 sensors, refer to the DTC index. For intake system, refer to the relevant workshop manual section. For VCT tests refer to the guided diagnostic routines on the approved diagnostic system. Refer to the warranty policy and procedures manual if an ECM is suspect.
	No throttle response	- APP sensor malfunction - TP sensors - Throttle motor	For APP sensor, TP sensor and throttle motor tests refer to the guided diagnostic routines on the approved diagnostic system.
	Speed control inhibited or disabled	- Default mode enabled - Speed control switch(es) - TP sensors - CAN fault	Check message center for default message. For speed control switch information, refer to the relevant workshop manual section. For TP sensor tests refer to the guided diagnostic routine on the approved diagnostic system. Check for CAN fault codes.
	Poor throttle response	- APP sensor malfunction - TP sensors - ECT sensor - MAF sensor - Transmission malfunction - Traction control event - Air leakage - Breather system disconnected/restricted	For APP sensor, TP sensor, ECT sensor and MAF sensor tests refer to the guided diagnostic routines on the approved diagnostic system. For transmission information, intake system checks and breather system checks, refer to the relevant workshop manual section.
	Engine defaults, warning lamp and messages. Refer to the owner handbook	- TP sensors - MAF sensor - ECT sensor - Harness	For TP sensor, MAF sensor and ECT sensor tests refer to the guided diagnostic routines on the approved diagnostic system.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
C003100	Left Front Wheel Speed	- Invalid data received from ABS	Check for ABS DTCs. Refer to the relevant workshop

DTC	Description	Possible causes	Action
	Sensor	wheel speed signal	manual section.
C003400	Right Front Wheel Speed Sensor	● Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003700	Left Rear Wheel Speed Sensor	● Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003A00	Right Rear Wheel Speed Sensor	● Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
P001100	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	● Cam timing (right-hand bank) has not been set up correctly ● Timing chain has slipped	Check the engine timing. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P001200	Intake (A) Camshaft Position Timing - Over-Retarded (Bank 1)	● Cam timing (right-hand bank) has not been set up correctly ● Timing chain has slipped	Check the engine timing. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P002100	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 2)	● Cam timing (left-hand bank) has not been set up correctly ● Timing chain has slipped	Check the engine timing. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P002200	Intake (A) Camshaft Position Timing - Over-Retarded (Bank 2)	● Cam timing (left-hand bank) has not been set up correctly ● Timing chain has slipped	Check the engine timing. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P002671	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	● Variable camshaft timing (VCT) control solenoid circuit range/performance (right-hand bank) - actuator stuck open ● Oil contamination ● VCT oil flow fault ● VCT solenoid fault ● VCT/Camshaft mechanical failure	Check the oil level and condition, check for adequate oil flow. Check the camshaft and VCT hub. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P002677	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	● Variable camshaft timing (VCT) control solenoid circuit range/performance (right-hand bank) - commanded position not reachable ● Oil contamination ● VCT oil flow fault ● VCT solenoid fault ● VCT/Camshaft mechanical failure	Check the oil level and condition, check for adequate oil flow. Check the camshaft and VCT hub. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P002871	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	● Variable camshaft timing (VCT) control solenoid circuit range/performance (left-hand bank) - actuator stuck open ● Oil contamination ● VCT oil flow fault ● VCT solenoid fault ● VCT/Camshaft mechanical failure	Check the oil level and condition, check for adequate oil flow. Check the camshaft and VCT hub. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P002877	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	● Variable camshaft timing (VCT) control solenoid circuit range/performance (left-hand bank) - commanded position not reachable ● Oil contamination ● VCT oil flow fault ● VCT solenoid fault ● VCT/Camshaft mechanical failure	Check the oil level and condition, check for adequate oil flow. Check the camshaft and VCT hub. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P003100	HO2S Heater Control Circuit Low (Bank 1, Sensor 1)	• Heated 0^2 sensor heater power supply circuit high resistance • Heated 0^2 sensor heater control circuit high resistance • Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P003200	HO2S Heater Control Circuit High (Bank 1, Sensor 1)	• Heated 0^2 sensor heater power supply circuit high resistance • Heated 0^2 sensor heater control circuit high resistance • Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P003600	HO2S Heater Control Circuit (Bank 1, Sensor 2)	• Catalyst monitor sensor heater control circuit short circuit to ground • Catalyst monitor sensor heater control circuit high resistance • Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005100	HO2S Heater Control Circuit Low (Bank 2, Sensor 1)	• Heated 0^2 sensor heater power supply circuit high resistance • Heated 0^2 sensor heater control circuit high resistance • Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005200	HO2S Heater Control Circuit High (Bank 2, Sensor 1)	• Heated 0^2 sensor heater power supply circuit high resistance • Heated 0^2 sensor heater control circuit high resistance • Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005600	HO2S Heater Control Circuit (Bank 2, Sensor 2)	• Catalyst monitor sensor (left-hand bank) heater control circuit short circuit to ground • Catalyst monitor sensor heater control circuit high resistance • Catalyst monitor sensor heater failure	For left-hand catalyst monitor sensor heater circuit tests. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P006900	(MAP) - Barometric pressure correlation	• Manifold absolute pressure (MAP) sensor failure • BARO sensor failure (internal ECM fault)	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if an ECM is suspect.
P007100	Ambient Air Temperature Sensor Range/Performance	• Ambient temperature sensor range performance (stuck)	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P007200	Ambient Air Temperature Sensor Circuit Low	• Ambient temperature sensor circuit low input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P007300	Ambient Air Temperature Sensor Circuit High	• Ambient temperature sensor circuit high input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P007500	Intake Valve Control Circuit (Bank 1)	• Variable camshaft timing (VCT) control circuit (right-hand bank) • VCT solenoid valve PWM drive circuit: high resistance • VCT solenoid failure	For right-hand VCT circuit tests. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P007600	Intake Valve Control Circuit Low (Bank 1)	• Variable camshaft timing (VCT) control circuit low (right-hand bank) • VCT solenoid valve PWM drive circuit; short circuit to ground • VCT solenoid failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P007700	Intake Valve Control Circuit High (Bank 1)	● Variable camshaft timing (VCT) control circuit high (right-hand bank) ● VCT solenoid valve PWM drive circuit; short circuit to power ● VCT solenoid failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P008100	Intake Valve Control Circuit (Bank 2)	● Variable camshaft timing (VCT) control circuit (left-hand bank) ● VCT solenoid valve PWM drive circuit: high resistance ● VCT solenoid failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P008200	Intake Valve Control Circuit Low (Bank 2)	● Variable camshaft timing (VCT) control circuit low (left-hand bank) ● VCT solenoid valve PWM drive circuit; short circuit to ground ● VCT solenoid failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P008300	Intake Valve Control Circuit High (Bank 2)	● Variable camshaft timing (VCT) control circuit high (left-hand bank) ● VCT solenoid valve PWM drive circuit; short circuit to power ● VCT solenoid failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010100	Mass or Volume Air Flow A Circuit	● Blocked air cleaner ● Air intake leak ● Engine breather leak ● Mass air flow (MAF) sensor sensing circuit: high resistance, intermittent short circuit to ground ● MAF sensor supply circuit: high resistance	Check the air cleaner for blockage, etc. Check the air intake system for leaks. Check the engine breather system. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the relevant workshop manual section.
P010200	Mass or Volume Air Flow A Circuit Low	● MAF sensor supply circuit high resistance, short circuit to ground ● MAF sensor ground circuit high resistance ● MAF sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010300	Mass or Volume Air Flow A Circuit High	● MAF sensor sensing circuit short circuit to battery ● MAF sensor return circuit high resistance ● MAF sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010600	Manifold Absolute Pressure/BARO Sensor Range/Performance	● Intake manifold air leak (loose or missing component) ● MAP sensor circuit(s) fault ● MAP sensor failure	Check the intake manifold for security, etc. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010700	Manifold Absolute Pressure/BARO Sensor Low	● MAP sensor circuit: high resistance, short circuit to ground ● MAP sensor supply circuit: high resistance ● MAP sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P010800	Manifold Absolute Pressure/BARO Sensor High	● MAP sensor return circuit: high resistance ● MAP sensor sense circuit; short circuit to power ● MAP sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P011123	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1)	● Signal stuck low at engine start ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011124	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1)	● Signal stuck high at engine start ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011129	Intake Air Temperature Sensor 1 Circuit Range/Performance (Bank 1)	● Signal invalid ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011200	Intake Air Temperature Sensor 1 Circuit Low (Bank 1)	● Intake air temperature IAT sensor disconnected ● IAT sensor circuit(s) high resistance ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011300	Intake Air Temperature Sensor 1 Circuit High (Bank 1)	● IAT sensor circuit(s) short circuit to ground ● IAT sensor sensing circuit short circuit to power ● IAT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011623	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the relevant section of the workshop manual. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011624	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the relevant section of the workshop manual. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011629	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Low coolant level ● Engine coolant thermostat failure ● ECT sensor sensing circuit intermittent high resistance ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck open). Refer to the relevant section of the workshop manual. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	● ECT sensor disconnected ● Engine coolant temperature (ECT) sensor sensing circuit high resistance, short circuit to power ● ECT sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P011800	Engine Coolant Temperature Sensor 1 Circuit High	● Engine overheat condition/cooling fan failure ● ECT sensor wiring short circuit to ground ● ECT sensor failure	Check the coolant level and the thermostat operation (stuck closed). Check for cooling fan DTCs. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P012100	Throttle/Pedal Position Sensor A Circuit Range/Performance	● Throttle position sensor wiring high resistance ● Throttle position sensor sensing circuits (Throttle position 1 or Throttle position 2) short circuit to power ● Throttle position sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P012200	Throttle/Pedal Position Sensor A Circuit Low	• Throttle position sensor sensing circuit 1 short circuit to ground, high resistance • Throttle position sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P012300	Throttle/Pedal Position Sensor A Circuit High	• Throttle position sensor sensing circuit (Throttle position1) short circuit to power • Throttle position sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P012500	Insufficient Coolant Temp For Closed Loop Fuel Control	• Low coolant level • Engine thermostat failure • ECT sensor sensing circuit intermittent high resistance • ECT sensor failure	Check the coolant level and thermostat operation. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P012800	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature)	• Contaminated coolant • Engine coolant thermostat failure • ECT sensor failure - ECT sensor DTC may also be flagged	Check the coolant level/condition and thermostat operation. Check for ECT sensor DTCs.
P01301A	O2 Circuit (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) element impedance low • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01301B	O2 Circuit (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) element impedance low • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013100	O2 Circuit (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) element impedance high • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013200	O2 Circuit High Voltage (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) signal circuit short circuit to power • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013300	O2 Circuit Slow Response (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) to ECM wiring high resistance • Exhaust leak • HO2 sensor failure	Check the exhaust system for leaks. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013400	O2 Circuit No Activity Detected (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) slow activation	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013700	O2 Circuit Low Voltage (Bank 1, Sensor 2)	• Catalyst monitor sensor (right-hand bank) to ECM wiring high resistance • Catalyst monitor sensor short circuit to ground • Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013800	O2 Circuit High Voltage (Bank 1, Sensor 2)	• Catalyst monitor sensor (right-hand bank) sensing circuit short circuit to power • Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013900	O2 Circuit Slow Response (Bank 1, Sensor 2)	• Catalyst monitor sensor (right-hand bank) slow response	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P014000	O2 Circuit Slow Response (Bank 1, Sensor 2)	• Catalyst monitor (right-hand bank) to ECM wiring high resistance • Catalyst monitor sensing circuit	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		short circuit to power ● Catalyst monitor short circuit to ground	
P014100	O2 Heater Circuit (Bank 1, Sensor 2)	● Catalyst monitor sensor (right-hand bank) heater control circuit high resistance ● Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01501A	O2 Circuit (Bank 2, Sensor 1)	● Circuit (left-hand bank) resistance below threshold ● Element impedance low ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01501B	O2 Circuit (Bank 2, Sensor 1)	● Circuit (left-hand bank) resistance above threshold ● Element impedance high ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015100	O2 Circuit Low Voltage (Bank 2, Sensor 1)	● Heated 0^2 sensor (left-hand bank) signal circuit high resistance ● Heated 0^2 sensor signal circuit short circuit to ground ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015200	O2 Circuit High Voltage (Bank 2, Sensor 1)	● Heated 0^2 sensor (left-hand bank) signal circuit short circuit to power ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015300	O2 Circuit Slow Response (Bank 2, Sensor 1)	● Heated 0^2 sensor (left-hand bank) to ECM wiring high resistance ● Exhaust leak ● Heated 0^2 sensor failure	Check the exhaust system for leaks. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015400	O2 Circuit No Activity Detected (Bank 2, Sensor 1)	● Heated 0^2 sensor (left-hand bank) slow activation	Check the HO2S and circuits. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015700	O2 Circuit Low Voltage (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) to ECM wiring high resistance ● Catalyst monitor sensor short circuit to ground ● Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015800	O2 Circuit High Voltage (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) sensing circuit short circuit to power ● Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015900	O2 Circuit Slow Response (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) slow response	Check the catalyst monitor sensor and circuits. Refer to the electrical guides.
P016000	O2 Circuit No Activity Detected (Bank 2, Sensor 2)	● Catalyst monitor (left-hand bank) to ECM wiring high resistance ● Catalyst monitor sensing (left-hand bank) circuit short circuit to power ● Catalyst monitor short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P016100	O2 Heater Circuit (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) heater control circuit malfunction	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P017000	Fuel Trim (Bank 1)	● Fuel adaption Bank 1 exceeds threshold	Check for other DTCs and rectify as necessary. Clear DTC and retest.
P017100	System Too Lean (Bank 1)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. refer to the relevant workshop manual section. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Check for evaporative emission DTCS.
P017200	System Too Rich (Bank 1)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions. Check the fuel system for leaks and check the fuel pressure. Check the fuel injectors. Check for fuel system DTCs. Check the oil for contamination/grade/quality. Refer to the relevant section of the workshop manual. Check for MAF sensor and evaporative emission DTCs.
P017300	Fuel Trim (Bank 2)	● Fuel adaption Bank 1 exceeds threshold	Check for other DTCs and rectify as necessary. Clear DTC and retest.
P017400	System Too Lean (Bank 2)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Refer to the relevant section of the workshop manual. Check for evaporative emission DTCS.
P017500	System too Rich (Bank 2)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Refer to the relevant section of the workshop manual. Check for MAF sensor and evaporative emission DTCs.
P019623	Engine Oil Temperature Sensor Range/Performance	● Oil temperature sensor sensing circuit intermittent high resistance ● Oil temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P019624	Engine Oil Temperature Sensor Range/Performance	● Oil temperature sensor sensing circuit intermittent high resistance ● Oil temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P018124	Fuel Temperature Sensor A Circuit Range/Performance	● Fuel temperature sensor sensing circuit high resistance, short circuit to power ● Fuel temperature sensor ground circuit high resistance ● Fuel temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P018129	Fuel Temperature Sensor A Circuit Range/Performance	● Fuel temperature sensor sensing circuit high resistance, short circuit to ground, short circuit to power ● Fuel temperature sensor ground circuit high resistance ● Fuel temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P018200	Fuel Temperature Sensor A Circuit Low	● Fuel temperature sensor sensing circuit short circuit to ground ● Fuel temperature sensor ground circuit short circuit ● Fuel temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P018300	Fuel Temperature Sensor A Circuit High	● Fuel temperature sensor sensing circuit high resistance, short circuit to power ● Fuel temperature sensor ground circuit high resistance ● Fuel temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P019623	Engine Oil Temperature Sensor Range/Performance	● Oil temperature sensor sensing circuit intermittent high resistance ● Oil temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P019624	Engine Oil Temperature Sensor Range/Performance	● Oil temperature sensor sensing circuit intermittent high resistance ● Oil temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P019629	Oil temperature sensor circuit range/performance - signal invalid	● Oil temperature sensor sensing circuit intermittent high resistance ● Oil temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P019700	Engine Oil Temperature Sensor Circuit Low	● Oil temperature sensor sensing circuit short circuit to ground ● Oil temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P019800	Engine Oil Temperature Sensor Circuit High	● Oil temperature sensor sensing circuit high resistance, short circuit to power ● Oil temperature sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020100	Cylinder 1 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020200	Cylinder 2 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020300	Cylinder 3 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground ● Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020400	Cylinder 4 Injector Circuit / Open	● Injector disconnected ● Injector harness wiring high resistance, short circuit to ground	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		- Injector failure	
P020500	Cylinder 5 Injector Circuit / Open	- Injector disconnected - Injector harness wiring high resistance, short circuit to ground - Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020600	Cylinder 6 Injector Circuit / Open	- Injector disconnected - Injector harness wiring high resistance, short circuit to ground - Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020700	Cylinder 7 Injector Circuit/Open	- Injector disconnected - Injector harness wiring high resistance, short circuit to ground - Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P020800	Cylinder 8 Injector Circuit/Open	- Injector disconnected - Injector harness wiring high resistance, short circuit to ground - Injector failure	For fuel system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P022200	Throttle/Pedal Position Sensor/Switch B Circuit Low	- Throttle position sensor circuit 2 low input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P022300	Throttle/Pedal Position Sensor/Switch B Circuit High	- Throttle position sensor circuit 2 high input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P022628	Throttle/Pedal Position Sensor/Switch C Circuit Range/Performance	- Throttle position sensor circuit range monitoring error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P022662	Throttle/Pedal Position Sensor/Switch C Circuit Range/Performance	- Throttle position sensor circuit range monitoring error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P022700	Throttle/Pedal Position Sensor/Switch C Circuit Low	- Throttle position sensor circuit 1 short circuit to ground - Throttle position sensor circuit 1 high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P022800	Throttle/Pedal Position Sensor/Switch C Circuit High	- Throttle position sensor circuit 1 short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P030000	Random Misfire Detected	- ECM to ignition coil primary circuit faults (cylinder misfire detected DTCs also logged) - Ignition coil failure - Spark plug failure/fouled /incorrect gap - Fuel delivery pressure (low/high) - Fuel injector circuit fault(s) (injector DTCs also logged) - Fuel injectors restricted/leaking - Fuel injectors continuously open - Fuel contamination - Cylinder compression low - Worn camshaft/broken valve springs - Valve clearance adjustment	Check for ignition coil DTCs. Check the condition of the spark plugs and the gaps. Check the fuel pressure. Check for fuel injector DTCs. Check the fuel for contamination/grade/quality. Check the cylinder compressions, check the valve clearances, check the condition of the camshaft and valve springs. Refer to the relevant section of the workshop manual.
P030100	Cylinder 1 Misfire Detected	- Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap.

DTC	Description	Possible causes	Action
			Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030200	Cylinder 2 Misfire Detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030300	Cylinder 3 Misfire Detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030400	Cylinder 4 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030500	Cylinder 5 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030600	Cylinder 6 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030700	Cylinder 7 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P030800	Cylinder 8 misfire detected	● Refer to P030000 possible sources	For ignition coil tests, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the spark plug condition and gap. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P031300	Misfire Detected With Low Fuel	● Misfire detected during low fuel level condition	Add fuel, clear the DTC and test for normal operation.
P031600	Misfire Detected On Startup (First 1000 Revolutions)	● Misfire detected on first 1000 revs ● Refer to P030000 possible sources	Carry out the tests indicated for a normal misfire code, but on a cold engine.
P032700	Knock Sensor 1 Circuit Low (Bank1)	● Poor right-hand sensor contact with the cylinder block ● Knock sensor to ECM sense circuit short circuit to ground ● Knock sensor failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P032800	Knock Sensor 1 Circuit High (Bank 1)	● Poor right-hand sensor contact with the cylinder block ● Knock sensor sense circuit high resistance, short circuit to power ● Knock sensor failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P033200	Knock Sensor 2 Circuit Low (Bank 2)	● Poor left-hand sensor contact with the cylinder block ● Knock sensor sense circuit short circuit to ground ● Knock sensor failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P033300	Knock Sensor 2 Circuit High (Bank 2)	● Poor left-hand sensor contact with the cylinder block ● Knock sensor sense circuit high resistance, short circuit to power ● Knock sensor failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P033592	Crankshaft Position Sensor A Circuit	● Crankshaft position (CKP) sensor gap incorrect/foreign matter on sensor face or damaged teeth on rotor ● CKP sensor sensing circuit high resistance, short circuit to ground, short circuit to power ● CKP sensor failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P033594	Crankshaft Position Sensor A Circuit	● Crankshaft position (CKP) sensor gap incorrect/foreign matter on sensor face or damaged teeth on rotor ● CKP sensor sensing circuit high resistance, short circuit to ground, short circuit to power ● CKP sensor failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P033600	Crankshaft position (CKP) sensor A circuit range/performance	● CKP sensor gap incorrect/ foreign matter on sensor face /damaged teeth on rotor ● CKP sensor sensing circuit intermittent high resistance, short circuit to ground, short circuit to power ● CKP sensor failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P034092	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	● Camshaft position sensor (CMP) sensor gap incorrect/ foreign matter on sensor face /damaged rotor ● CMP sensor sensing circuit high resistance, short circuit to ground, short circuit to power ● CMP sensor 1 failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P034094	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	● Camshaft position sensor (CMP) sensor gap incorrect/ foreign matter on sensor face /damaged rotor ● CMP sensor sensing circuit high resistance, short circuit to ground, short circuit to power ● CMP sensor 1 failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P034100	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	● Camshaft position sensor (CMP) sensor gap incorrect/ foreign matter on sensor face /damaged rotor ● CMP sensor sensing circuit high resistance, short circuit to ground, short circuit to power ● CMP sensor 1 failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P034592	Camshaft Position Sensor A Circuit (Bank 2)	● Camshaft position sensor (CMP) sensor gap incorrect/ foreign matter on sensor face /damaged rotor ● CMP sensor sensing circuit high resistance, short circuit to ground, short circuit to power	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		● CMP sensor 2 failure	
P034594	Camshaft Position Sensor A Circuit (Bank 2)	● Camshaft position sensor (CMP) sensor gap incorrect/ foreign matter on sensor face /damaged rotor ● CMP sensor sensing circuit high resistance short circuit to ground, short circuit to power ● CMP sensor 2 failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P034600	Camshaft Position Sensor A Circuit Range/Performance (Bank 2)	● Camshaft position sensor (CMP) sensor gap incorrect/ foreign matter on sensor face /damaged rotor ● CMP sensor sensing circuit high resistance, short circuit to ground, short circuit to power ● CMP sensor 2 failure	Check the installation of the sensor. Refer to the relevant workshop manual section. Check for debris/damage on the sensor face and rotor. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P035100	Ignition Coil A Primary/Secondary Circuit	● ECM to ignition module/coil drive circuit high resistance, short circuit to ground ● Ignition module/coil ground circuit high resistance ● Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P035200	Ignition Coil B Primary/Secondary Circuit	● ECM to ignition module/coil drive circuit short circuit to ground, high resistance ● Ignition module/coil ground circuit high resistance ● Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P035300	Ignition Coil C Primary/Secondary Circuit	● ECM to ignition module/coil drive circuit short circuit to ground, high resistance ● Ignition module/coil ground circuit high resistance ● Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P035400	Ignition Coil D Primary/Secondary Circuit	● ECM to ignition module/coil drive circuit short circuit to ground, high resistance ● Ignition module/coil ground circuit high resistance ● Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P035500	Ignition Coil E Primary/Secondary Circuit	● ECM to ignition module/coil drive circuit short circuit to ground, high resistance ● Ignition module/coil ground circuit high resistance ● Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P035600	Ignition Coil F Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P035700	Ignition Coil G Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P035800	Ignition Coil H Primary/Secondary Circuit	- ECM to ignition module/coil drive circuit short circuit to ground, high resistance - Ignition module/coil ground circuit high resistance - Ignition module/coil battery supply circuit high resistance (including relay, if installed)	Refer to the electrical guides and check the ignition coil circuits. For ignition system tests, refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P040100	Exhaust Gas Recirculation A Flow Insufficient Detected	- EGR pipe blocked - EGR valve incorrectly installed or loose - EGR valve stuck closed/blocked - EGR valve failure	Check the EGR pipes. Check the EGR valve installation. For emission system tests. Refer to the relevant workshop manual section.
P042000	Catalyst System Efficiency Below Threshold (Bank 1)	- Catalyst failure due to overheating damage caused by misfire and/or lean combustion - Catalyst failure due to poisoning caused by excessive oil consumption and/or contaminated fuel	Check the catalyst condition. Refer to the warranty policy and procedures manual if the catalyst is suspect.
P043000	Catalyst System Efficiency Below Threshold (Bank 2)	- Catalyst failure due to overheating damage caused by misfire and/or lean combustion - Catalyst failure due to poisoning caused by excessive oil consumption and/or contaminated fuel	Check the catalyst condition. Refer to the warranty policy and procedures manual if the catalyst is suspect.
P044100	Evaporative Emission System Incorrect Purge Flow	- Evaporative emission (EVAP) canister purge valve pipe restricted/leaking - Canister vent restricted - Purge valve failure	Check the charcoal canister pipework and vent for integrity. Refer to the relevant workshop manual section.
P044200	Evaporative Emission System Leak Detected (small leak)	- Fuel filler cap not correctly installed - Fuel filler cap seal faulty - Evaporative emission system leak (canister, pipes, etc) - Fuel tank leak - Canister dynamic monitoring of tank leakage (DMTL) valve fault	Refer to the relevant workshop manual section.
P044700	Evaporative Emission System Vent Control Circuit Open	- EVAP DMTL valve circuit short circuit to ground	Refer to the electrical guides and check the DMTL valve circuit. Repair/renew as necessary. Refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
P044800	Evaporative Emission System Vent Control Circuit Shorted	● EVAP DMTL valve circuit short circuit to power	Refer to the electrical guides and check the DMTL valve circuit. Repair/renew as necessary. Refer to the relevant workshop manual section.
P045500	Evaporative Emission System Leak Detected (gross leak/no flow)	● Fuel filler cap not installed ● Fuel filler cap seal faulty/missing ● Evaporative emission system leak (canister, pipes, etc) ● Fuel tank leak ● DMTL valve fault	Check the fuel filler cap and seal, check the canister, pipes, etc. Check the fuel tank for leaks, etc. Refer to the relevant workshop manual section.
P045800	Evaporative Emission System Purge Control Valve Circuit Low	● Purge valve control circuit short circuit to ground ● Purge valve control circuit high resistance ● EVAP canister purge valve failure	Refer to the electrical guides and check the DMTL valve circuit. Repair/renew as necessary. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P045900	Evaporative Emission System Purge Control Valve Circuit High	● Purge valve control circuit short circuit to power	Refer to the electrical guides and check the DMTL valve circuit. Repair/renew as necessary. Refer to the relevant workshop manual section. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P046129	Fuel Level Sensor A Circuit Range/Performance	● Fuel level sensor circuits intermittent short circuit or high resistance ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P04612F	Fuel Level Sensor A Circuit Range/Performance	● Fuel level sensor circuits intermittent short circuit or high resistance ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P046200	Fuel Level Sensor A Circuit Low	● Fuel level sensor circuits intermittent short circuit to ground or high resistance ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P046300	Fuel Level Sensor A Circuit High	● Fuel level sensor circuits intermittent short circuit to power ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P048014	Fan 1 Control Circuit	● Viscous fan speed sensor circuit high resistance	Refer to the electrical guides and check the viscous fan speed sensor circuit. Repair/renew as necessary.
P048015	Fan 1 Control Circuit	● Viscous fan control circuit short circuit to power ● Viscous fan control circuit short circuit to ground	Refer to the electrical guides and check the viscous fan speed sensor circuit. Repair/renew as necessary.
P048300	Fan Performance	● Cooling fan control circuit short circuit to ground ● Cooling fan control circuit short circuit to power ● Cooling fan control circuit high resistance ● Cooling fan fault	Check the cooling fan operation. Refer to the electrical guides and check the fan circuit, Repair/renew as necessary. Clear the DTCs and test for normal operation. Check the pulse width modulated (PWM) signal and check the motor for sticking. Repair/renew as necessary.
P048900	Exhaust Gas Recirculation Control Circuit Low	● EGR valve power supply circuit: high resistance ● EGR valve power supply circuit short circuit to ground	Refer to the relevant workshop manual section.
P049000	Exhaust Gas Recirculation Control Circuit High	● EGR valve drive circuit short circuit to power	Refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
P049300	Fan Overspeed (clutch locked)	● Seized viscous coupling ● Fan speed sensor failure	Check that the viscous coupling turns independently of the fan. Refer to the electrical guides and check the viscous fan speed sensor circuit. Repair/renew as necessary.
P050000	Vehicle Speed Sensor A	● Vehicle speed invalid signal received over CAN	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050162	Vehicle Speed Sensor A Range/Performance	● Vehicle speed range/performance	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050164	Vehicle Speed Sensor A Range/Performance	● Vehicle speed range/performance	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050429	Brake Switch A / B Correlation	● Brake switch malfunction (sub-processor)	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P050464	Brake Switch A / B Correlation	● Brake switch malfunction	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P050600	Idle Air Control System RPM Lower Than Expected	● Air intake restriction ● Accessory drive overload (defective/seized component)	Check the air intake system, accessory drive belt and components. Refer to the relevant workshop manual section.
P050700	Idle Air Control System RPM Higher Than Expected	● Intake air leak between the mass air flow (MAF) sensor and throttle ● Intake air leak between throttle and engine ● Engine crankcase breather leak	Check the air intake system. Check the engine breather system. Refer to the relevant workshop manual section.
P051216	Starter Request Circuit	● Crank request circuit low input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051217	Starter Request Circuit	● Crank request circuit high input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051300	Incorrect Immobilizer Key	● Security key invalid	Program keys using the approved diagnostic system. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P052500	Cruise Control Servo Control Circuit Range/Performance	● Internal control module software corruption	Refer to the warranty policy and procedures manual if a module is suspect.
P052616	Fan Speed Sensor Circuit	● Viscous fan speed sensor low	Refer to the electrical guides and check the viscous fan speed sensor circuit.
P052617	Fan speed sensor circuit	● Viscous fan speed sensor high	Refer to the electrical guides and check the viscous fan speed sensor circuit.
P056000	System Voltage	● Battery back-up malfunction ● Battery voltage low ● Battery ground cable: high resistance ● Battery connections loose/corroded ● Battery current drain	Check the battery condition and state of charge.
P056200	System Voltage Low	● Battery voltage low ● Battery ground cable: high resistance ● Battery connections loose/corroded ● Battery current drain	Check the battery condition and state of charge.
P056300	System Voltage High	● System boosted from high voltage ● Battery voltage high ● Generator over charge condition	Check if the vehicle has been jump-started. Check the battery condition and state of charge.
P057400	Cruise Control System - Vehicle Speed Too High	● Incorrect speed sensor signal	Check for ABS DTCs. Refer to the relevant workshop manual section DTC index.

DTC	Description	Possible causes	Action
P057600	Cruise Control Input Circuit Low	● Speed control switch short circuit to ground ● Speed control switch high resistance	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057700	Cruise Control Input Circuit High	● Speed control switch short circuit to power	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057800	Cruise Control Multi-Function Input A Circuit Stuck	● Speed control multi-function input A circuit high resistance ● Speed control multi-function input A circuit; short circuit to ground ● Speed control multi-function input A circuit; short circuit to power ● Speed control switch stuck	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057900	Cruise Control Multi-Function Input A Circuit Range/Performance	● Speed control multi-function input A circuit high resistance ● Speed control multi-function input A circuit; short circuit to ground ● Speed control multi-function input A circuit; short circuit to power ● Speed control switch stuck	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P058500	Cruise Control Multi-Function Input A / B Correlation	● Cruise control acceleration monitor fault	Check for other DTCs and Repair/renew those first. Clear this DTC and retest.
P060143	Internal Control Module Memory Check Sum Error	● Transmission control module (TCM) Internal control module memory check sum error - special memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060145	Internal Control Module Memory Check Sum Error	● Transmission control module (TCM) internal control module memory check sum error - program memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060442	Internal Control Module Random Access Memory (RAM) Error	● ECM internal control module RAM error	Refer to the warranty policy and procedures manual if a module is suspect.
P060443	Internal Control Module Random Access Memory (RAM) Error	● ECM general memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060444	Internal Control Module Random Access Memory (RAM) Error	● ECM shut off RAM test - special memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060445	Internal Control Module Random Access Memory (RAM) Error	● ECM RAM check sum - data memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060542	Internal Control Module Read Only Memory (ROM) Error	● TCM - general memory failure ROM checksum	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060543	Internal Control Module Read Only Memory (ROM) Error	● TCM - shut off ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060544	Internal Control Module Read Only Memory (ROM) Error	● TCM - initial ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060545	Internal Control Module Read Only Memory (ROM) Error	● TCM - continuous ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P060546	Internal Control Module Read Only Memory (ROM) Error	- TCM - continuous ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060548	Internal Control Module Read Only Memory (ROM) Error	- ECM circuits short circuit to ground - ECM circuits short circuit to power - ECM circuits high resistance - TCM - shut off ROM test - supervision software fault	Check the ECM circuits. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060601	Control Module Processor	- PCM/ECM processor controller test - general electrical failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060604	Control Module Processor	- PCM/ECM processor error capturing instructions	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060605	Control Module Processor	- PCM/ECM processor scheduling sequence check - system programming failures	Program the module using the approved diagnostic system.
P060641	Control Module Processor	- PCM/ECM processor watch dog timer fault - general checksum failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060642	Control Module Processor	- PCM/ECM processor error capturing instructions - general memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060643	Control Module Processor	- PCM/ECM processor duplication memory fault - special memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060644	Control Module Processor	- PCM/ECM processor duplication memory fault - data memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060645	Control Module Processor	- PCM/ECM processor detection of write to internal ROM - program memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060646	Control Module Processor	- PCM/ECM processor detection of write to internal ROM - calibration/parameter memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060647	Control Module Processor	- PCM/ECM processor watch dog timer fault/processor fault	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060648	Control Module Processor	- PCM/ECM processor scheduling sequence check/processor - supervision software failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060649	Control Module Processor	- PCM/ECM processor controller test/processor - internal electronic failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060700	Control Module Performance	- ECM event information - CPU watch dog	Check the ECM circuits and connectors. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060D00	Internal Control Module Accelerator Pedal Position Performance	- ECM internal communication error	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P060E62	Internal Control Module Throttle Position Performance	● Throttle motor amplifier failure for valve sensor malfunction - ECM internal signal compare failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060E64	Internal Control Module Throttle Position Performance	● Throttle position communication - ECM internal signal plausibility failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P061000	Control Module Vehicle Options Error	● Car configuration file (CCF) settings mismatch	Configure the module using the approved diagnostic system.
P061600	Starter Relay Circuit Low	● Starter relay drive circuit short circuit to ground ● Starter relay drive circuit high resistance ● Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P061700	Starter Relay Circuit High	● Starter relay drive circuit short circuit to battery ● Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P061A00	Internal Control Module Torque Performance	● Pedal follower error	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and Repair/renew other DTCs first. If this code still sets, contact the technical help desk.
P061A29	Internal Control Module Torque Performance	● Absolute engine torque calculation failure - sub-processor	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and Repair/renew other DTCs first. If this code still sets, contact the technical help desk.
P061A64	Internal Control Module Torque Performance	● Absolute engine torque calculation failure	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and Repair/renew other DTCs first. If this code still sets, contact the technical help desk.
P061B29	Internal Control Module Torque Calculation Performance	● Internal control module torque calculation performance	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and Repair/renew other DTCs first. If this code still sets, contact the technical help desk.
P061B64	Internal Control Module Torque Calculation Performance	● Internal control module torque calculation performance	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and Repair/renew other DTCs first. If this code still sets, contact the technical help desk.
P062000	Generator Control Circuit	● Generator failure	Refer to the relevant workshop manual section DTC index.
P062500	Generator Field Terminal Circuit Low	● Voltage sense circuit high resistance ● Generator B+ circuit high resistance/intermittent ● Generator monitor circuit short circuit to ground	Check the main charging circuit fuse. Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P062600	Generator Field Terminal Circuit High	● Generator connector loose/not connected ● Generator monitor circuit short circuit to power ● Generator monitor circuit high resistance	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P062800	Fuel Pump A Control Circuit Low	● Fuel pump control circuit short circuit to ground ● Fuel pump control circuit high resistance	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		- Fuel pump relay fault	
P062900	Fuel Pump A Control Circuit High	- Fuel pump control circuit short circuit to power - Fuel pump relay fault	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P063000	VIN Not Programmed or Incompatible - ECM/ECM	- VIN not programmed - VIN incompatible with vehicle specification	Configure the module using the approved diagnostic system.
P063305	Immobilizer Key Not Programmed - ECM/PCM	- Security target ID transfer process failed	Program the key using the approved diagnostic system.
P063355	Immobilizer Key Not Programmed - ECM/PCM	- Security no target in EMS	Program the module using the approved diagnostic system.
P063422	PCM / ECM / TCM Internal Temperature A Too High	- ECM internal temperature too high - E box cooling fan obstruction - E box cooling fan operation - ECM internal sensor error	Consider atmospheric and customer driving conditions before carrying out any other action. Check the E box cooling fan function. Refer to the electrical guides and check the ECM circuits. Using a datalogger function, check the ECM temperature. If the temperature value is greater than 130°C (266°F) suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P063424	PCM / ECM / TCM Internal Temperature A Too High	- ECM internal temperature too high - E box cooling fan obstruction - E box cooling fan operation - ECM internal sensor error	Consider atmospheric and customer driving conditions before carrying out any other action. Check the E box cooling fan function. Refer to the electrical guides and check the ECM circuits. Using a datalogger function, check the ECM temperature. If the temperature value is greater than 130°C (266°F) suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P066800	PCM / ECM / TCM Internal Temperature Sensor A Circuit Low	- ECM temperature sensor circuit short circuit to ground	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P066900	PCM / ECM / TCM Internal Temperature Sensor A Circuit High	- TCM temperature sensor circuit short circuit to power	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P068700	ECM/PCM Power Relay Control Circuit High	- ECM control relay malfunction	Check the ECM relay and circuit. Refer to the electrical guides.
P069500	Fan 3 Control Circuit Low	- E box fan circuit short circuit to ground	Check the E box fan operation and circuit. Refer to the electrical guides.
P069600	Fan 3 Control Circuit High	- E box fan circuit short circuit to power	Check the E box fan operation and circuit. Refer to the electrical guides.
P070000	Transmission Control System (MIL Request)	- Transmission fault	Check for other DTCs and rectify those first. Clear this DTC and retest.
P085100	Park / Neutral Switch Input Circuit Low	- Park/Neutral switch circuit short to ground	Check the switch and circuits. Refer to the electrical guides and repair/renew as necessary. Clear the DTCs and test for normal operation.
P085200	Park / Neutral Switch Input Circuit High	- Park/Neutral switch circuit short to power	Check the switch and circuits. Refer to the electrical guides and repair/renew as necessary. Clear the DTCs and test for normal operation.
P131500	Persistent Misfire	- ECM to ignition coil primary circuit fault (cylinder misfire detected DTC also flagged) - Ignition coil failure - Spark plug failure/fouled /incorrect gap - Fuel delivery pressure low - Fuel injector circuit fault(s) (injector DTCs also flagged) - Cylinder compression low	For ignition coil tests, refer to the coil failure DTCs in this index. Check the spark plug conditions and gaps. Check the fuel pressure, check for fuel injector DTCs and refer to the relevant workshop manual section.
P131600	Injector Driver Module Codes Detected	- Engine misfire - injector driver module codes detected	Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P136700	Ignition Spare	• Ignition coil group A monitoring circuit to ECM high resistance, short circuit to ground, short circuit to power • Ignition module/coils ground circuit fault, right hand bank	Refer to the electrical guides and check the ignition monitoring circuit between the ignition coils and ECM. Repair as necessary. For ignition coil tests, refer to the coil failure DTCs in this index.
P136800	Ignition Spare	• Ignition coil group B monitoring circuit to ECM high resistance, short circuit to ground, short circuit to power • Ignition module/coils ground circuit fault left hand bank	Refer to the electrical guides and check the ignition monitoring circuit between the ignition coils and ECM. Repair as necessary. For ignition coil tests, refer to the coil failure DTCs in this index.
P160300	EEPROM Malfunction	• ECM fault	Refer to the warranty policy and procedure manual if an ECM is suspect.
P210129	Throttle Actuator A Control Motor Circuit Range/Performance	• Jammed throttle blade, gearing or motor	Check for fuel charging DTCs and a message in the instrument cluster. Rectify as necessary. If the problem persists, renew the throttle body. Refer to the relevant workshop manual section.
P210162	Throttle Actuator A Control Motor Circuit Range/Performance	• Jammed throttle blade, gearing or motor	Check for fuel charging DTCs and a message in the instrument cluster. Rectify as necessary. If the problem persists, renew the throttle body. Refer to the relevant workshop manual section.
P210164	Throttle Actuator A Control Motor Circuit Range/Performance	• Jammed throttle blade, gearing or motor	Check for fuel charging DTCs and a message in the instrument cluster. Rectify as necessary. If the problem persists, renew the throttle body. Refer to the relevant workshop manual section.
P210177	Throttle Actuator A Control Motor Circuit Range/Performance	• Jammed throttle blade, gearing or motor	Check for fuel charging DTCs and a message in the instrument cluster. Rectify as necessary. If the problem persists, renew the throttle body. Refer to the relevant workshop manual section.
P210329	Throttle Actuator A Control Motor Circuit High	• Throttle Actuator control circuit short circuit to power • ECM fault	Check the electric throttle unit and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedure manual if an ECM is suspect.
P210364	Throttle Actuator A Control Motor Circuit High	• Control circuit short circuit to power • ECM fault	Check the electric throttle unit and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedure manual if an ECM is suspect.
P210500	Throttle Motor Control System - Forced Engine Shutdown	• Throttle MIL request due to fuel cut	Check for DTCs indicating the reason for the fuel cut. Follow the action indicated for those DTCs.
P210629	Throttle Actuator Control System - Forced Limited Power	• Intended reduced availability fault (limp home)	Check for fuel charging DTCs and a message in the instrument cluster. Rectify as necessary. If the problem persists, renew the throttle body. Refer to the relevant workshop manual section.
P210664	Throttle Actuator Control System - Forced Limited Power	• Intended reduced availability fault (limp home)	Check for fuel charging DTCs and a message in the instrument cluster. Rectify as necessary. If the problem persists, renew the throttle body. Refer to the relevant workshop manual section.
P211800	Throttle Actuator Control Motor Current Range/Performance	• Throttle motor over current condition detected • ECM fault	Refer to the electrical guides and check the wiring between the ECM and throttle actuator. Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if an ECM is suspect.
P211900	Throttle Actuator Control Throttle Body Range/Performance	• Throttle spring faulty	Check the throttle return spring on the throttle body. Repair/renew as necessary. Check for fuel charging DTCs and a message in the instrument cluster. Rectify as necessary. If the problem persists, renew the throttle body. Refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
P212200	Throttle/Pedal Position Sensor/Switch D Circuit	- Throttle position sensor circuit 2 low input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P212300	Throttle/Pedal Position Sensor/Switch D Circuit High	- Throttle position sensor circuit 2 high input	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P213529	Throttle/Pedal Position Sensor/Switch A / B Voltage Correlation	- Driver demand sensor - circuit 1 and 2 range/performance - sub-processor	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if an ECM is suspect.
P213564	Throttle/Pedal Position Sensor/Switch A / B Voltage Correlation	- Driver demand sensor - circuit 1 and 2 range/performance - sub-processor	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the warranty policy and procedures manual if an ECM is suspect.
P222800	Barometric Pressure Sensor A Circuit Low	- Barometric sensor failure (internal ECM fault)	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if an ECM is suspect.
P222900	Barometric Pressure Sensor A Circuit High	- Barometric sensor failure (internal ECM fault)	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if an ECM is suspect.
P240100	Evaporative Emission System Leak Detection Pump Control Circuit Low	- Diagnostic monitoring of tank leaks (DMTL) pump circuit(s) short circuit to ground - DMTL pump circuit(s) high resistance	Refer to the electrical guides and check the wiring between the ECM and DMTL pump. Repair as necessary.
P240200	Evaporative Emission System Leak Detection Pump Control Circuit High	- DMTL pump circuit(s) short circuit to power	Refer to the electrical guides and check the wiring between the ECM and DMTL pump. Repair as necessary.
P240429	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	- DMTL reference leak	Check the evaporative emission system for serviceability and leaks. Check the DMTL pump and circuits. Refer to the electrical guides. Complete a DMTL test. Refer to the relevant workshop manual section.
P24042F	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	- DMTL signal erratic	Check the DMTL pump and circuits. Refer to the electrical guides. Refer to the relevant workshop manual section.
P240500	Evaporative Emission System Leak Detection Pump Sense Circuit Low	- DMTL pump circuit reference circuit low	Refer to the electrical guides and check the wiring between the ECM and DMTL pump. Repair as necessary.
P240600	Evaporative Emission System Leak Detection Pump Sense Circuit High	- DMTL pump circuit reference circuit high	Refer to the electrical guides and check the wiring between the ECM and DMTL pump. Repair as necessary.
P240B00	Evaporative Emission System Leak Detection Pump Heater Circuit Low	- DMTL heater control circuit low	Refer to the electrical guides and check the wiring between the ECM and DMTL pump. Repair as necessary.
P240C00	Evaporative Emission System Leak Detection Pump Heater Circuit High	- DMTL heater control circuit high	Refer to the electrical guides and check the wiring between the ECM and DMTL pump. Repair as necessary.
P245000	Evaporative Emission Control System Switching Valve Performance/Stuck Open	- DMTL pump circuit short circuit, high resistance - DMTL change over valve failed	Refer to the electrical guides and check the wiring between the ECM and DMTL valve. Repair/renew as necessary. Refer to the relevant workshop manual section.
P245100	Evaporative Emission Control System Switching Valve Stuck Closed	- DMTL pump circuit short circuit, high resistance - DMTL change over valve failed	Refer to the electrical guides and check the wiring between the ECM and DMTL valve. Repair/renew as necessary. Refer to the relevant workshop manual section.
P252516	Vacuum reservoir pressure sensor circuit	- Brake booster vacuum pump relay short circuit to ground	Refer to the electrical guides and check the brake pump relay circuits/relay operation.
P252517	Vacuum reservoir pressure sensor circuit	- Brake booster vacuum pump relay short circuit to power	Refer to the electrical guides and check the brake pump relay circuits/relay operation.
P261000	ECM Internal engine off timer performance	- ECM internal error	Refer to the warranty policy and procedures manual if an ECM is suspect.

DTC	Description	Possible causes	Action
P277200	Four Wheel Drive (4WD) Low Switch Circuit Range/Performance	- Low gear ratio plausibility check (CAN TCCM message v actual)	Check for four wheel drive system DTCs. Carry out a complete vehicle read.
U007300	Control Module Communication Bus "A" Off	- CAN Link circuit malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U010100	Lost Communication With TCM	- CAN Link ECM/TCM network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U010200	Lost Communication With Transfer Case Control Module	- CAN Link ECM/transfer case control module network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U010400	Lost Communication With Cruise Control Module	- CAN Link engine control module ECM/Speed control module CAN timeout	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U012100	Lost Communication With Anti-Lock Brake System (ABS) Control Module	- CAN Link ECM/ABS network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U012600	Lost Communication With Steering Angle Sensor Module	- CAN Link ECM/steering angle sensor network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U012800	Lost Communication With Park Brake Control Module	- CAN Link ECM/electric park brake signal missing network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U013300	Lost Communication With Suspension Control Module "A"	- CAN Link ECM/active roll control module network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U013800	Lost Communication with All Terrain Control Module	- CAN Link ECM/terrain optimization switch network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U015100	Lost Communication With Restraints Control Module	- Lost communications - CAN or hardwired	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
U01511F	Lost Communication With Restraints Control Module	● Lost communications - SRS fault	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U015157	Lost Communication With Restraints Control Module	● Lost communications - CAN fault	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U015500	Lost Communication With Instrument Panel Cluster (IPC) Control Module	● CAN Link ECM/IPC network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U016700	Lost Communication With Vehicle Immobilizer Control Module	● Security challenge response timeout	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U023500	Lost Communication With Cruise Control Front Distance Range Sensor	● Lost communication ● Fault status transmitted	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U040264	Invalid Data Received from TCM	● Invalid data received from transmission control module - actual gear position status	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U040267	Invalid Data Received from TCM	● Invalid data received from transmission control module - gear shifter position status	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U040281	Invalid Data Received from TCM	● Invalid data received from transmission control module - output shaft speed signal	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U042381	Invalid Data Received From Instrument Panel Control Module	● External ambient temperature	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U042386	Invalid Data Received From Instrument Panel Control Module	● Battery voltage level	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U042600	Invalid Data Received From Vehicle Immobilizer Control Module	● Security code mismatch	Check the configuration of the modules using the approved diagnostic system.
U206400	Warning Indicator Requested by Another Control Module	● Crash event has occurred	Check for SRS DTCs. Refer to the relevant workshop manual section DTC index.

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Electronic Engine Controls - V8 4.4L Petrol - Camshaft Position (CMP) Sensor

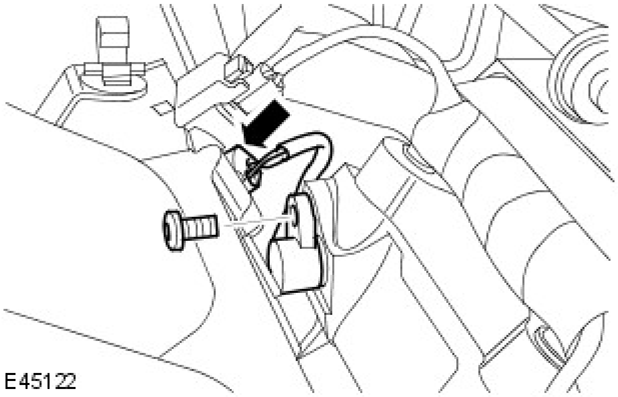
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. NOTE: Removal of the RH is similar to this procedure.



Remove the CMP sensor.

- Disconnect the electrical connector.
- Remove the Torx screw.
- Discard the O-ring seal.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the Torx screw to 7 Nm (5 lb.ft).

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Electronic Engine Controls - V8 4.4L Petrol - Crankshaft Position (CKP) Sensor

Removal and Installation

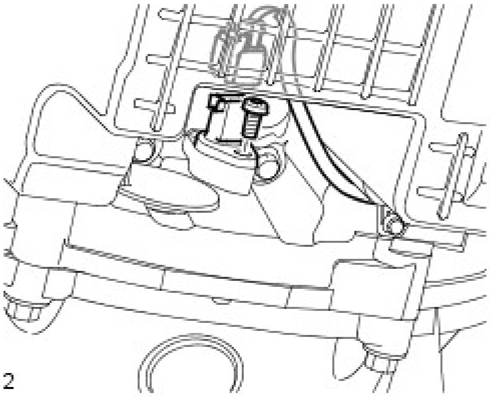
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).



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4. CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the CKP sensor.

- Disconnect the electrical connector.
- Remove the Torx screw.

Installation

1. To install, reverse the removal procedure.

- Tighten the Torx screw to 8 Nm (6 lb.ft).

2. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

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Electronic Engine Controls - V8 4.4L Petrol - Engine Control Module (ECM)

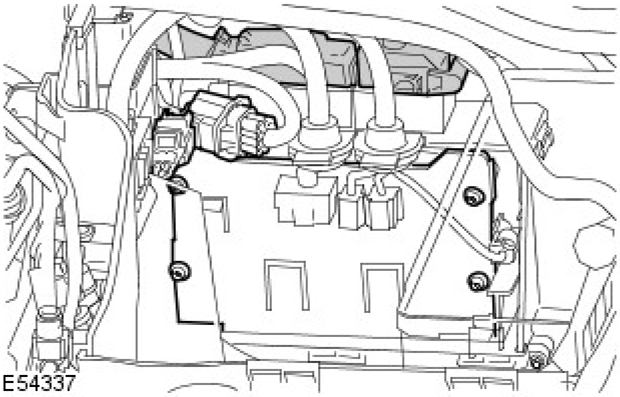
Removal and Installation

Removal

• NOTE: If the ECM is to be replaced, the T4 must be connected prior to battery disconnection and on-screen instructions must be followed.

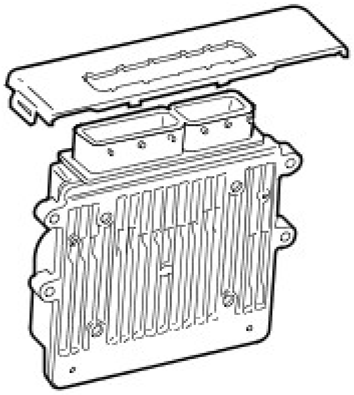
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).



3. Remove the ECM cover.

- Disconnect 2 electrical connectors for access.
- Disconnect the 2 ECM electrical connectors.
- Remove the 4 Torx screws.



4. Remove the ECM.

- Remove the ECM top cover.

Installation

1. Install the ECM.

- Install the ECM cover and secure with Torx screws.
- Install the ECM upper cover.

2. Connect the ECM electrical connectors.

3. Connect the 2 electrical connectors disconnected for access.

4. Install the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

5. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

6. Connect T4 to calibrate a new ECM.

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Electronic Engine Controls - V8 4.4L Petrol - Throttle Position (TP) Sensor

Removal and Installation

Removal

- NOTE: The TP sensor is part of the throttle body assembly and cannot be serviced separately.

1. Remove the throttle body.
For additional information, refer to: Throttle Body Gasket (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

Installation

1. Install the throttle body.
For additional information, refer to: Throttle Body Gasket (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

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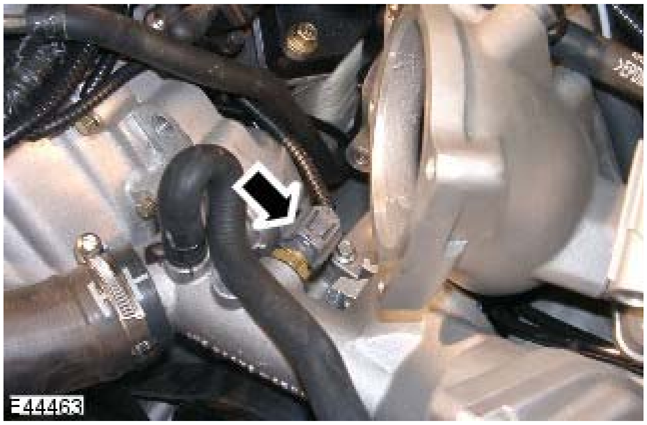
Electronic Engine Controls - V8 4.4L Petrol - Engine Coolant Temperature (ECT) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the throttle body.
   For additional information, refer to: Throttle Body Gasket (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).



3. Remove the ECT sensor.
   - Position the engine gas recirculation (EGR) coolant hose aside for access.
   - Position an absorbent cloth to collect fluid spillage.
   - Disconnect the electrical connector.
   - Remove the sensor and discard the seal.

Installation

1. To install, reverse the removal procedure.
   - Clean the components.
2. Tighten the ECT sensor to 18 Nm (13 lb.ft).
3. Top-up the coolant.

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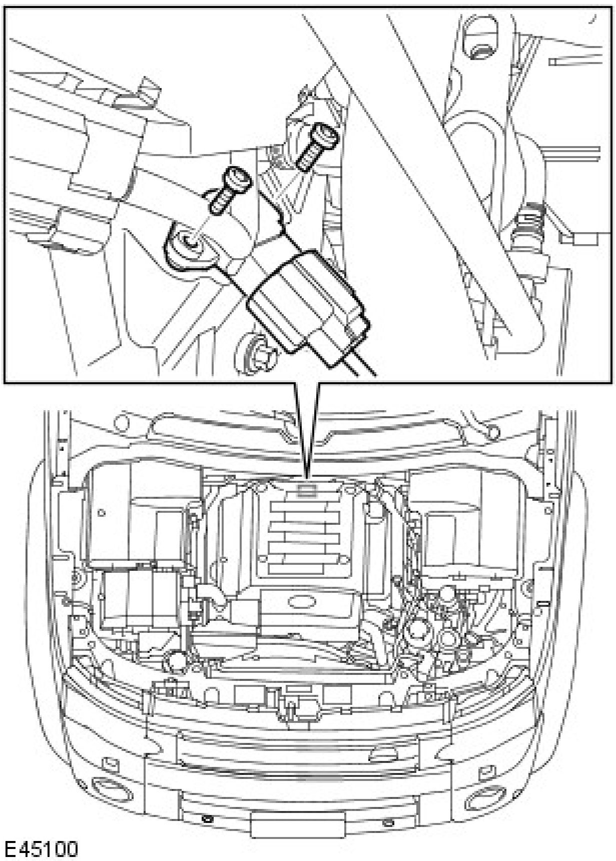
Electronic Engine Controls - V8 4.4L Petrol - Manifold Absolute Pressure (MAP) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the manifold absolute pressure (MAP) sensor.
   - Disconnect the electrical connector.
   - Remove the 2 Torx screws.



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Installation

1. To install, reverse the removal procedure.
   - Clean the component mating faces.
2. NOTE: For NAS vehicles only.

   If required, carry out a short drive cycle.
   For additional information, refer to: Powertrain Control Module (PCM) Short Drive Cycle Self-Test (303-14A, General Procedures).

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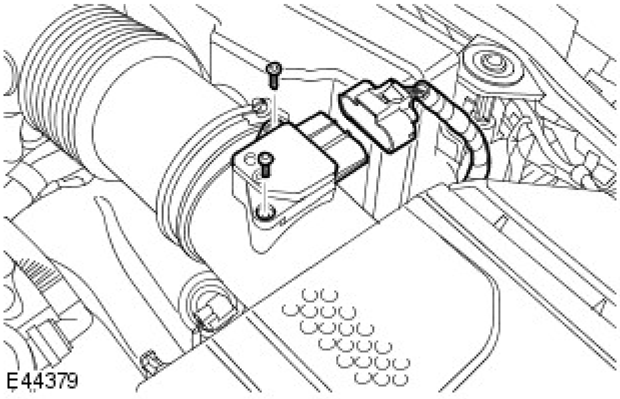
Electronic Engine Controls - V8 4.4L Petrol - Mass Air Flow (MAF) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the MAF sensor.
   - Disconnect the electrical connector.
   - Remove the 2 screws.



Installation

1. To install, reverse the removal procedure.
   - Tighten Torx screws to 2 Nm (1.5 lb.ft).
2. NOTE: Federal market vehicles only.

   If required, carry out a short drive cycle.
   For additional information, refer to: Powertrain Control Module (PCM) Short Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).
3. NOTE: Non federal market vehicles only.

   Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

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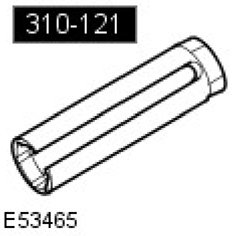
Electronic Engine Controls - V8 4.4L Petrol - Heated Oxygen Sensor (HO2S) LH

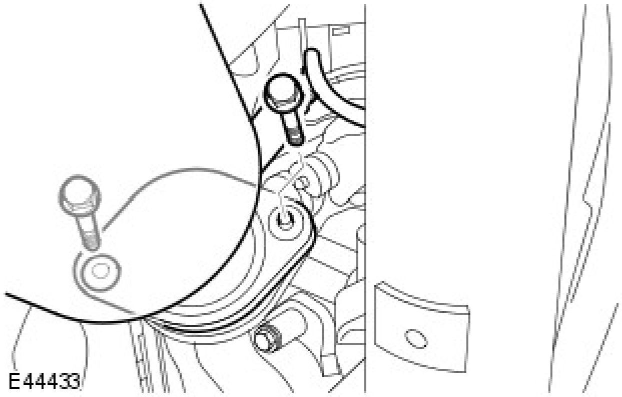
Removal and Installation

Special Tool(s)	
	Wrench, HO2S 310-121(LRT-19-014)

Removal

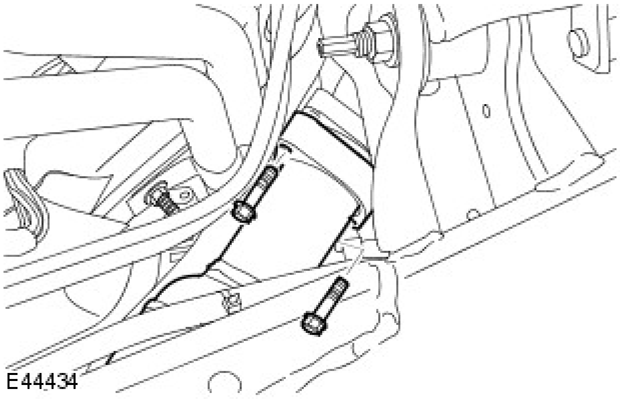
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



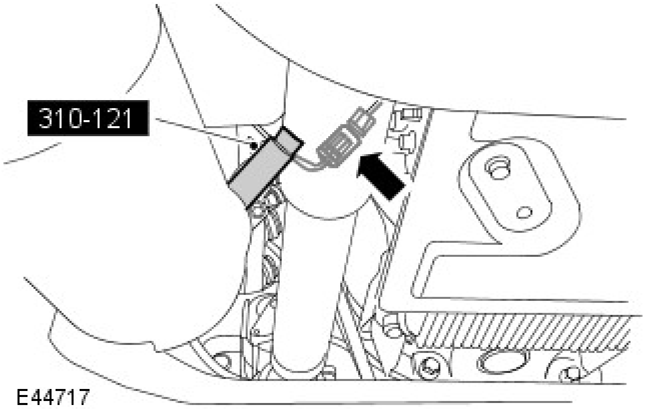
2. Disconnect the LH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.



3. Disconnect the RH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.



4. Using the special tool, remove the HO2S.

- Release the wiring harness.
- Disconnect the electrical connector.

Installation

1. CAUTIONS:

⚠ Make sure the anti-seize compound does not contact the HO2S tip.

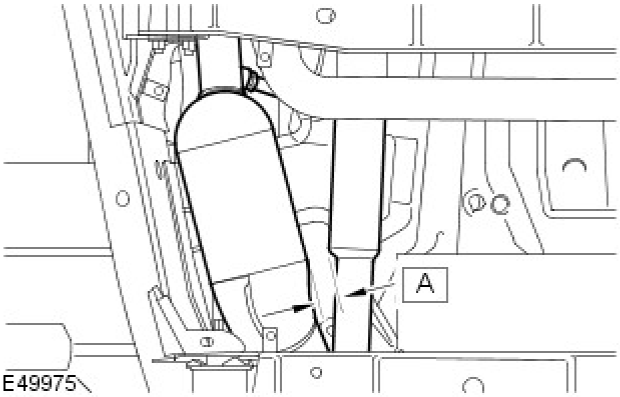
⚠ Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Using the special tool, install the HO2S.

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the HO2S to 45 Nm (33 lb.ft).
- Connect the electrical connector.
- Attach the wiring harness.

2. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).



3. ⚠ CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

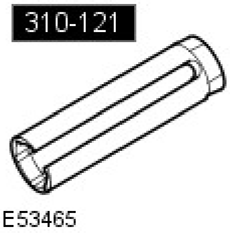
Position the LH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

4. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Electronic Engine Controls - V8 4.4L Petrol - Catalyst Monitor Sensor LH

Removal and Installation

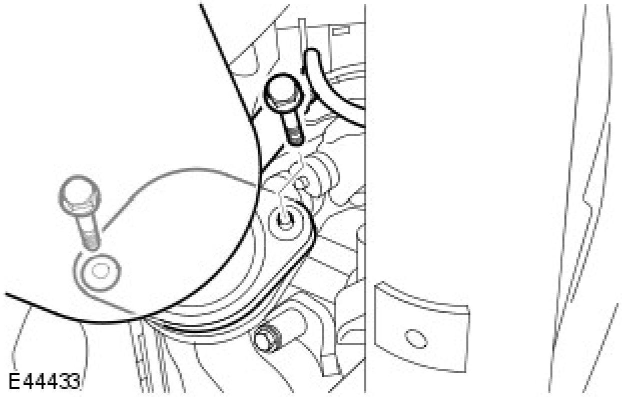
Special Tool(s)	
	Wrench, HO2S 310-121 (LRT-19-014)

Removal

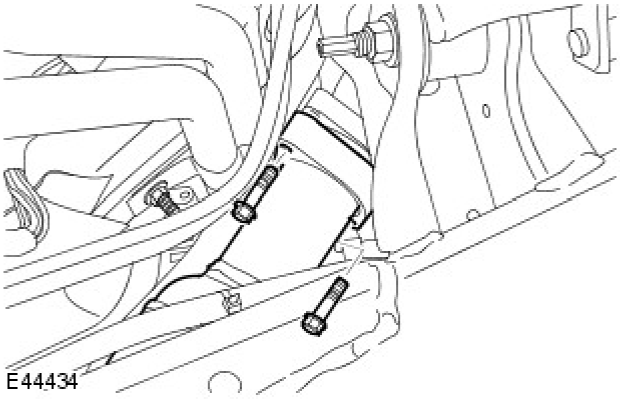
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

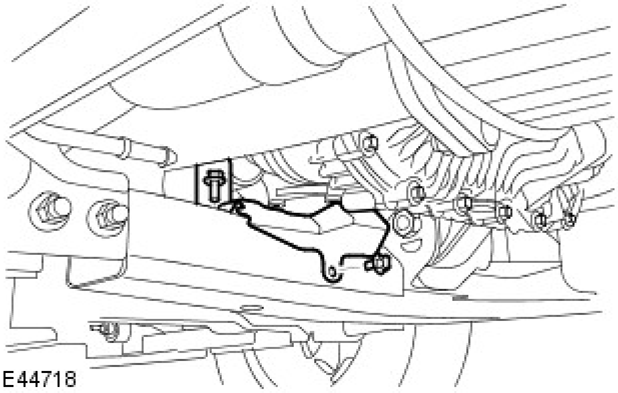
   Raise and support the vehicle.

2. Disconnect the LH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 bolts.



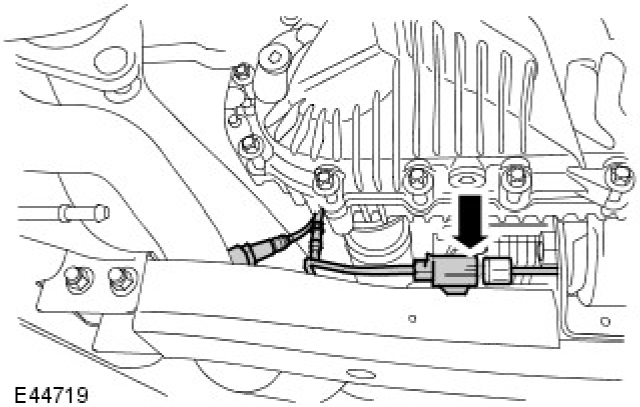
3. Disconnect the RH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 bolts.




E44718

4. Remove the catalyst monitor sensor electrical connector heat shield.

- Remove the 2 bolts.


E44719

5. Using the special tool, remove the catalyst monitor sensor.

- Release the wiring harness.
- Disconnect the electrical connector.

Installation

1. CAUTIONS:

⚠ Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

⚠ Make sure the catalyst monitor sensor wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Using the special tool, install the catalyst monitor sensor.

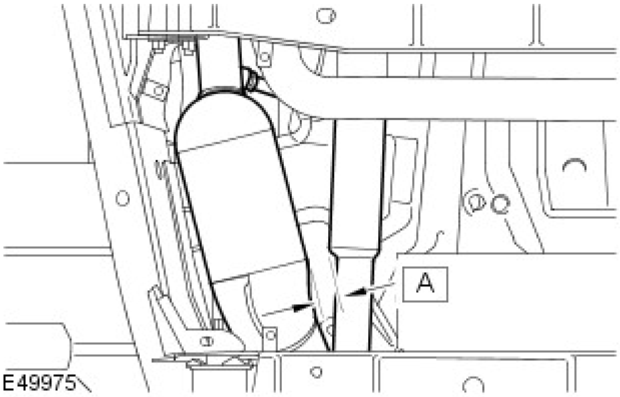
- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the catalyst monitor sensor to 45 Nm (33 lb.ft).
- Connect the electrical connector.
- Attach the wiring harness.

2. Install the heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

3. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).



4. ⚠ CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Position the LH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

5. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

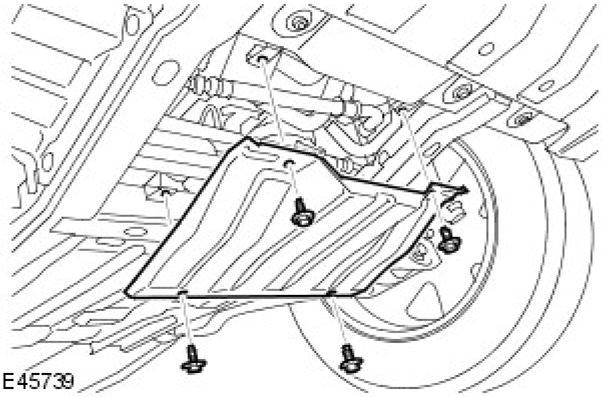
Electronic Engine Controls - V8 4.4L Petrol - Engine Oil Pressure (EOP) Sensor

Removal and Installation

Removal

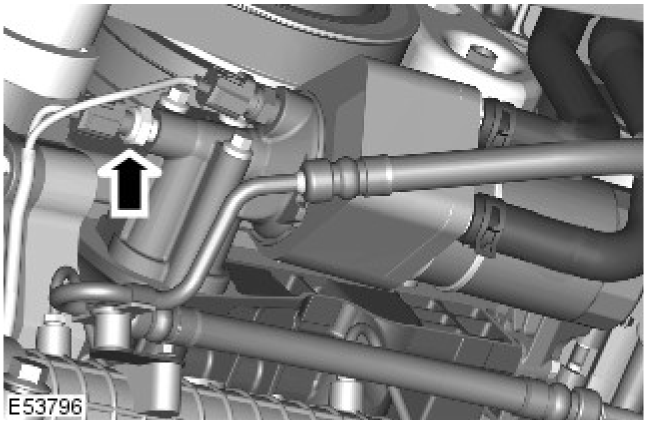
1. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



2. Remove the radiator access panel.

- Remove the 4 bolts.



3. Remove the oil pressure sensor.

- Disconnect the electrical connector.
- Position a container to collect the fluid.

Installation

1. To install, reverse the removal procedure.

- Tighten the oil pressure sensor to 12 Nm (9 lb.ft).
- Tighten the M6 bolts to 10 Nm (7 lb.ft).
- Tighten the M10 bolts to 45 Nm (33 lb.ft).

2. Check and top-up the engine oil.

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol - Fuel Temperature Sensor

Removal and Installation

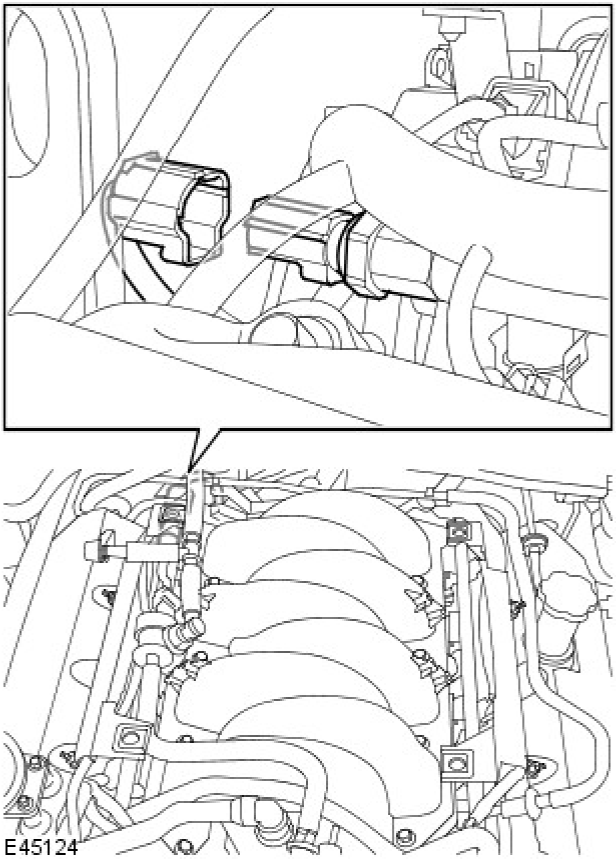
Removal

1. Secure the hood in the service position.

- Release the support struts.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



4. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the fuel temperature sensor.

- Disconnect the electrical connector.
- Position an absorbent cloth to collect fluid spillage.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Apply sealant to the sensor thread.
- Tighten the sensor to 7 Nm (5 lb.ft).

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol - Oil Temperature Sensor

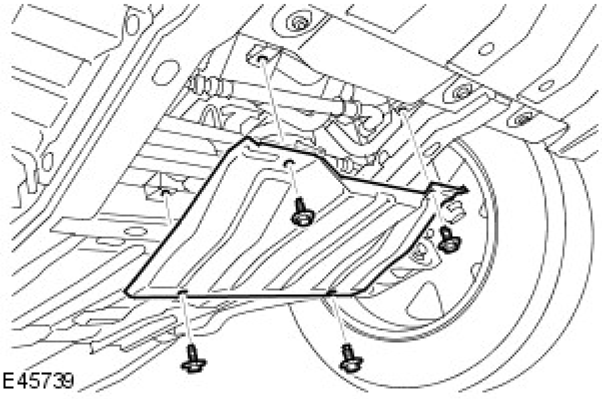
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the radiator access panel.

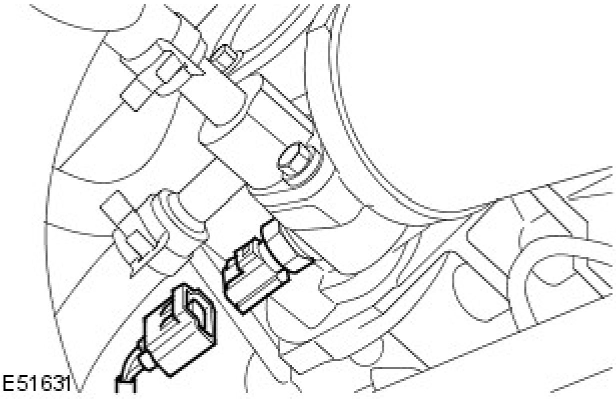
- Remove the 4 bolts.



3. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the oil temperature sensor.

- Disconnect the electrical connector.
- Position a container to collect the fluid.



Installation

1. To install, reverse the removal procedure.

- Tighten the oil temperature sensor to 20 Nm (15 lb.ft).
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Check and top-up the engine oil.

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol - Variable Camshaft Timing (VCT) Oil Control Solenoid

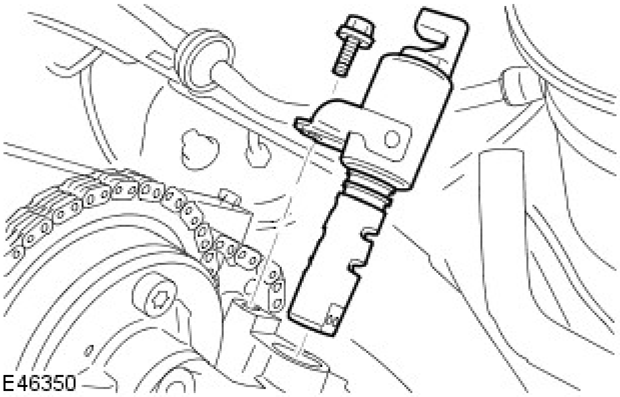
Removal and Installation

Removal

- NOTE: Removal of the RH is similar to this procedure.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the valve cover.
For additional information, refer to: Valve Cover LH (303-01B Engine - V8 4.4L Petrol, In-vehicle Repair).



3. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the variable camshaft timing (VCT) oil control solenoid.

- Remove the bolt.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. NOTE: For NAS vehicles only

If required, carry out a short drive cycle
For additional information, refer to: Powertrain Control Module (PCM) Short Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Electronic Engine Controls - V8 4.4L Petrol - Knock Sensor (KS)

Removal and Installation

Removal

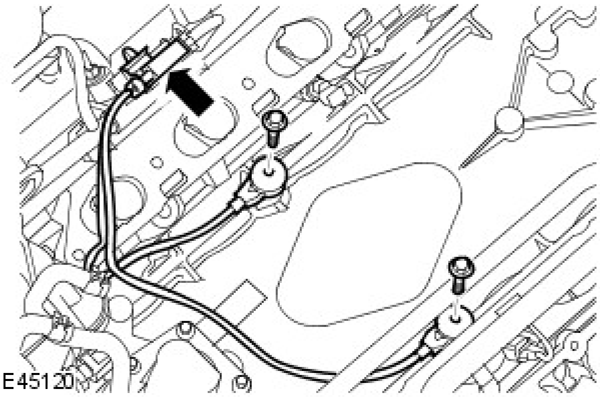
• NOTE: The LH and RH Knock sensors are removed and serviced as a pair.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the intake manifold gaskets.
For additional information, refer to: Intake Manifold Assembly (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Removal and Installation).

3. Remove the KS.

- Disconnect the electrical connector.
- Remove the 2 bolts.



Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Tighten the bolts to 20 Nm (15 lb.ft).

Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel -

Torque Specifications

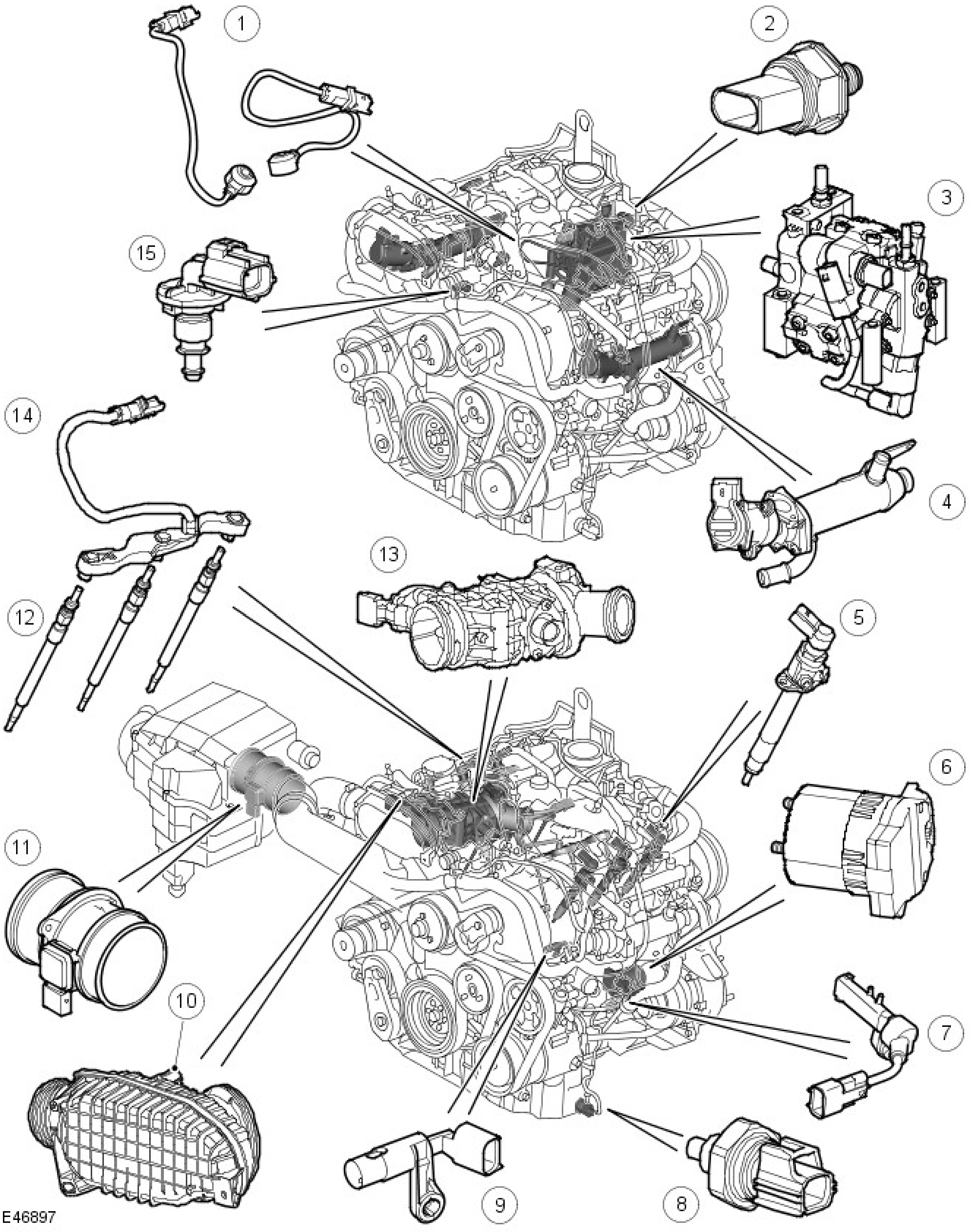
Description	Nm	lb-ft
Camshaft position (CMP) sensor retaining bolt	10	7
Crankshaft position (CKP) sensor retaining bolt	5	4
Engine oil pressure (EOP) sensor	15	11
Knock sensor (KS) LH retaining bolt	20	15
KS RH retaining bolt	20	15
Manifold absolute pressure (MAP) sensor	3	2
Mass air flow (MAF) sensor retaining screws	2	1
Oil temperature sensor	10	7
Fuel injection diverter rail studs	23	17
High pressure fuel supply line to fuel pump and diverter rail:		
Stage 1 - Union to fuel pump	15	11
Stage 2 - Union to diverter rail	15	11
Stage 3 - Union to fuel pump	30	22
Stage 4 - Union to diverter rail	30	22
RH and LH High pressure fuel supply lines to fuel injection supply manifold and diverter rail:		
Stage 1 - Union to fuel injection supply manifold	15	11
Stage 2 - Union to diverter rail	15	11
Stage 3 - Union to fuel injection supply manifold	30	22
Stage 4 - Union to diverter rail	30	22
High pressure fuel supply line retaining bolts	10	7
EGR coolant cross-over pipe retaining bolts	13	10
ECM retaining bolts	1.5	1.1

Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel - Electronic Engine Controls

Description and Operation

TdV6 ENGINE MANAGEMENT COMPONENT LOCATION - SHEET 1 of 2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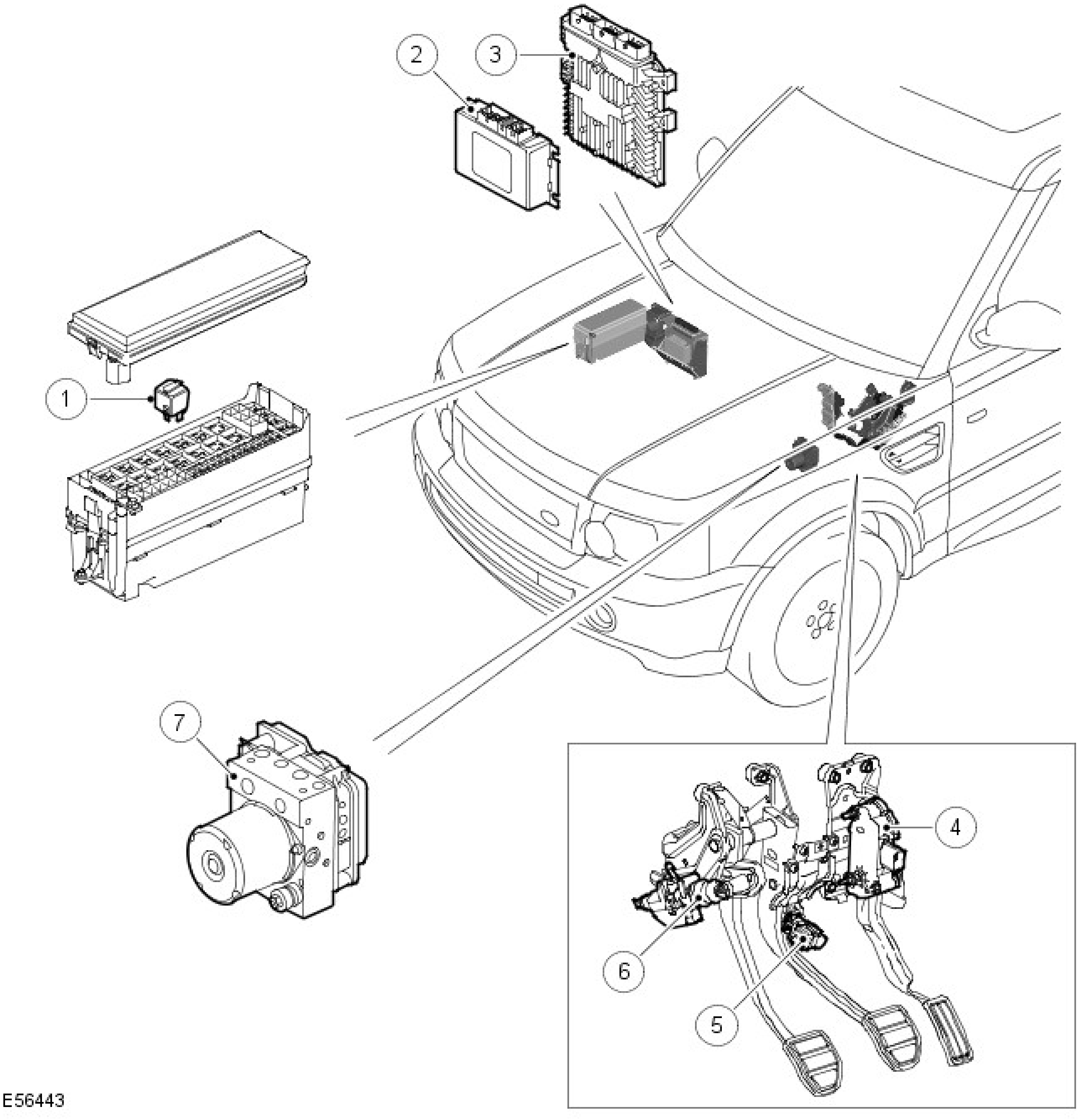
E46897

Item	Part Number	Description
1	-	Knock sensors
2		Fuel rail pressure sensor
3		High pressure fuel pump
4		exhaust gas recirculation (EGR) valve / cooler
5		Injector
6		Turbo boost pressure control
7		crankshaft position (CKP) sensor
8		Oil temperature sensor
9		camshaft position (CMP) sensor
10	-	Air charge temperature sensor
11		mass air flow (MAF)intake air temperature (IAT) sensor
12		Glow plugs
13		Electronic throttle incorporating manifold absolute pressure (MAP) sensor
14		Glow plug wiring harness
15		engine coolant temperature (ECT) sensor

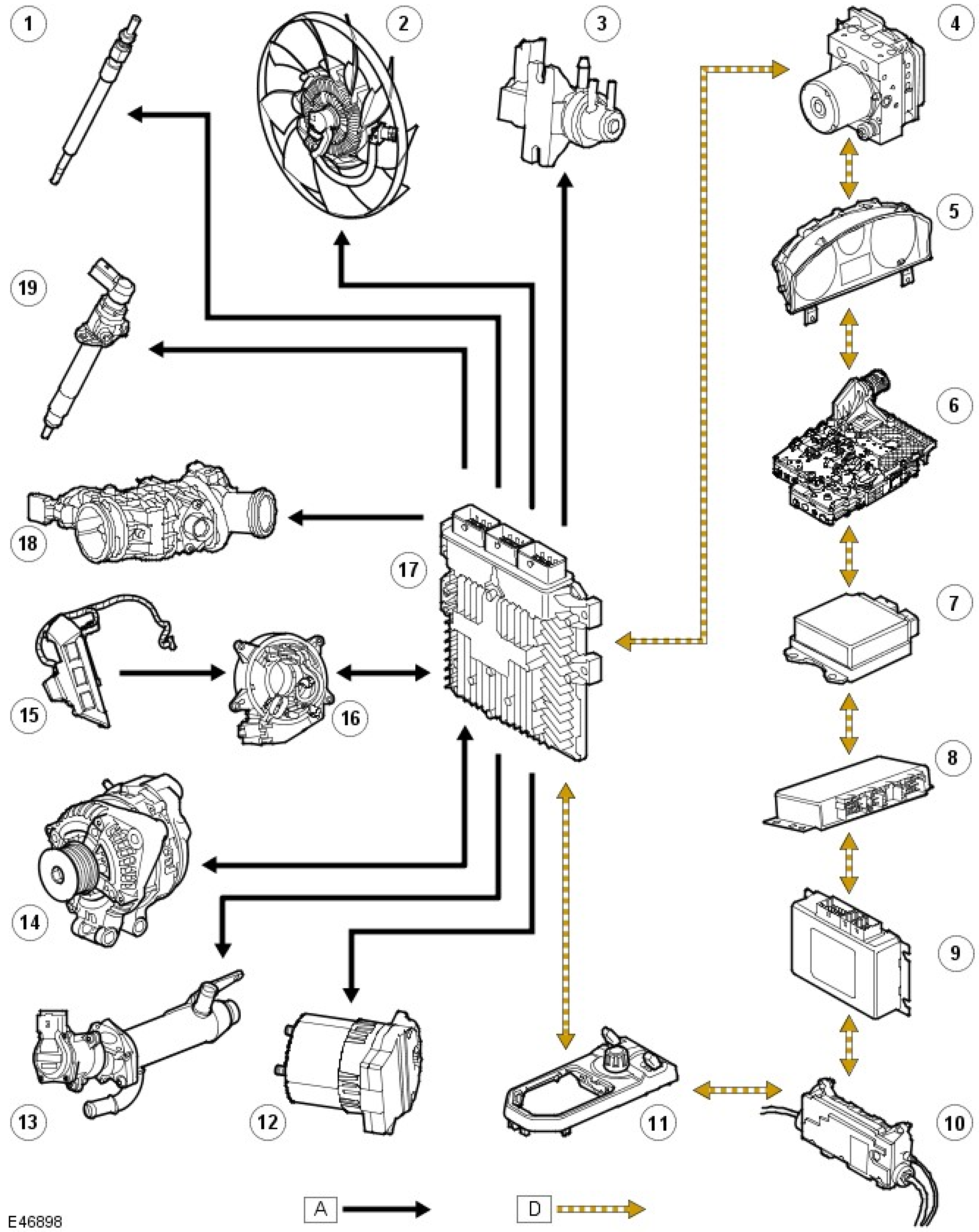
TdV6 ENGINE MANAGEMENT COMPONENT LOCATION - SHEET 2 of 2



Item	Part Number	Description
1		Main relay
2		Transfer box control module
3		engine control module (ECM)
4		accelerator pedal position (APP) sensor
5		brake pedal position (BPP) switch
6		Clutch switch
7		anti-lock brake system (ABS) module

TdV6 ENGINE MANAGEMENT CONTROL DIAGRAM - SHEET 1 of 2

- NOTE: **A** = Hardwired; **D** = High speed CAN bus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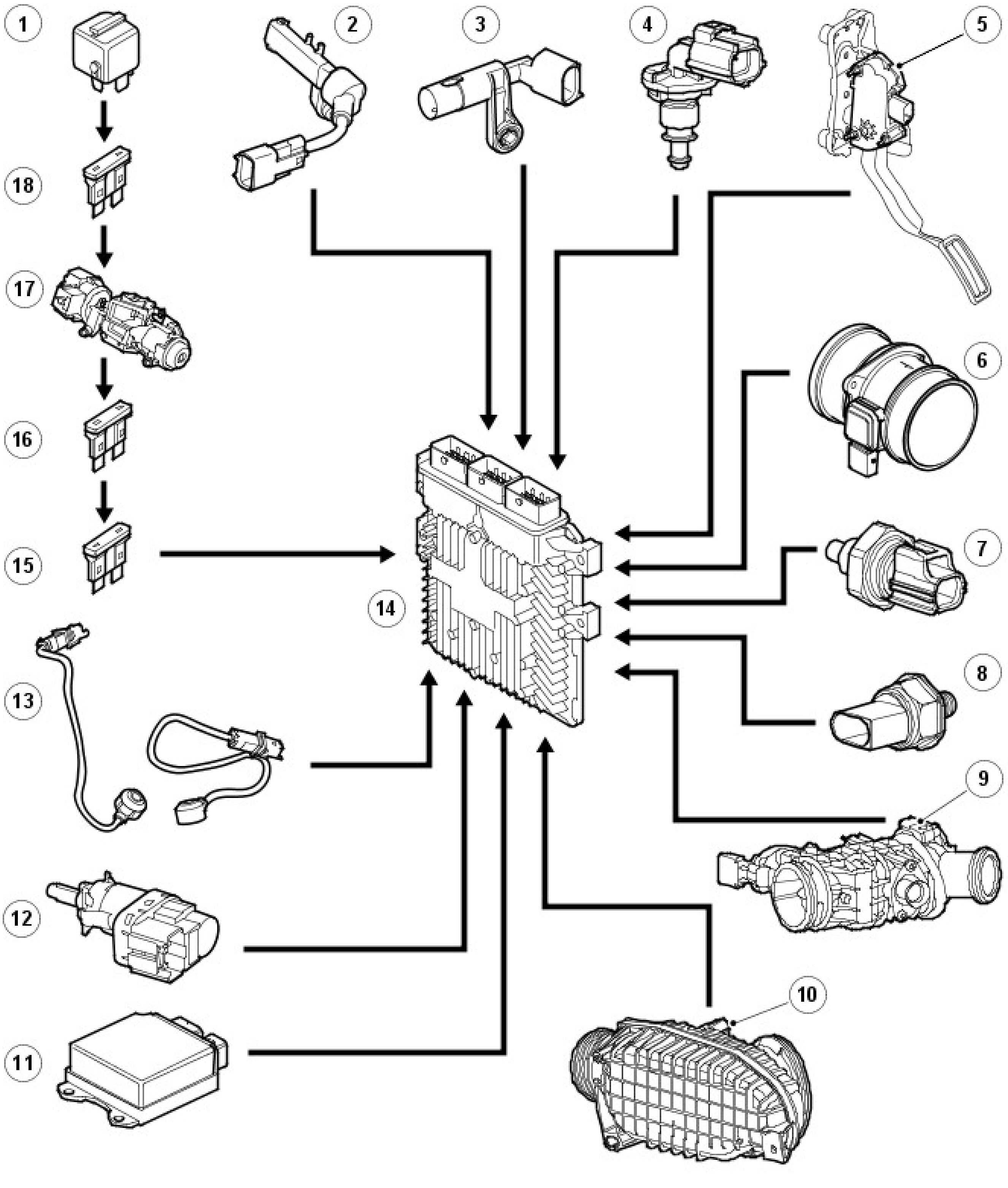
E46898

Item	Part Number	Description
1	-	Glow plugs
2	-	Electro viscous engine cooling fan
3		Port de-activation vacuum actuator (not used)
4		ABS module
5		Instrument cluster

6	transmission control module (TCM)
7	restraints control module (RCM)
8	Transfer box control module
9	Differential control module
10	Electric park brake control module
11	Terrain Response™ control module
12	Turbo boost pressure controller
13	EGR valve/ cooler
14	Generator
15	Steering wheel mounted speed control switches
16	Clock spring
17	ECM
18	Electric throttle valve
19	Injectors

TdV6 ENGINE MANAGEMENT CONTROL DIAGRAM - SHEET 2 of 2

- NOTE: **A** = Hardwired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E46908

Item	Part Number	Description
1		Main relay
2		CKP sensor
3		CMP sensor
4		ECT sensor
5		APP sensor

6		MAF/IAT sensor
7		Engine oil temperature sensor
8		Fuel rail temperature sensor
9		Boost pressure sensor
10	-	Boost air temperature sensor
11		RCM
12		Stop light switch
13		Knock sensors
14		ECM
15		Fuse 60P
16		Fuse 25P
17		Ignition switch
18		Fuse 11E

OVERVIEW

The TdV6 engine has an Electronic Diesel Control (EDC) engine management system supplied by Siemens. The system is controlled by an ECM and is able to monitor, adapt and precisely control the fuel injection. The ECM uses multiple sensor inputs and precision control of actuators to achieve optimum performance during all driving conditions.

The ECM controls fuel delivery to all six cylinders via a Common Rail (CR) injection system. The CR system uses a fuel rail to accumulate highly pressurized fuel and feed the six, electronically controlled injectors. The fuel rail is located in close proximity to the injectors, which assists in maintaining full system pressure at each injector at all times.

The ECM uses the drive by wire principle for acceleration control. There are no control cables or physical connections between the accelerator pedal and the engine. Accelerator pedal demand is communicated to the ECM by two potentiometers located in a throttle position sensor. The ECM uses the two signals to determine the position, rate of movement and direction of movement of the pedal. The ECM then uses this data, along with other engine information from other sensors, to achieve the optimum engine response.

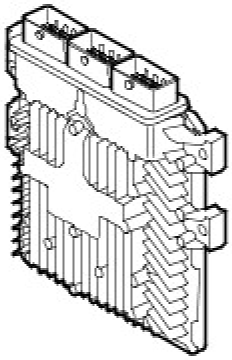
The ECM processes information from the following input sources:

- CKP
- CMP
- Manifold air temperature and pressure
- Coolant temperature
- Oil temperature
- Inlet air flow and temperature
- Fuel rail temperature
- Knock sensors (one per cylinder bank)

The ECM outputs controlling signals to the following sensors and actuators:

- Fuel injectors
- Cooling fan solenoid
- Electronic Throttle
- Electronically controlled turbo vanes
- Port deactivation
- Fuel pressure control valve
- Fuel volume control valve
- E-box fan
- Electronic EGR
- Glow plugs

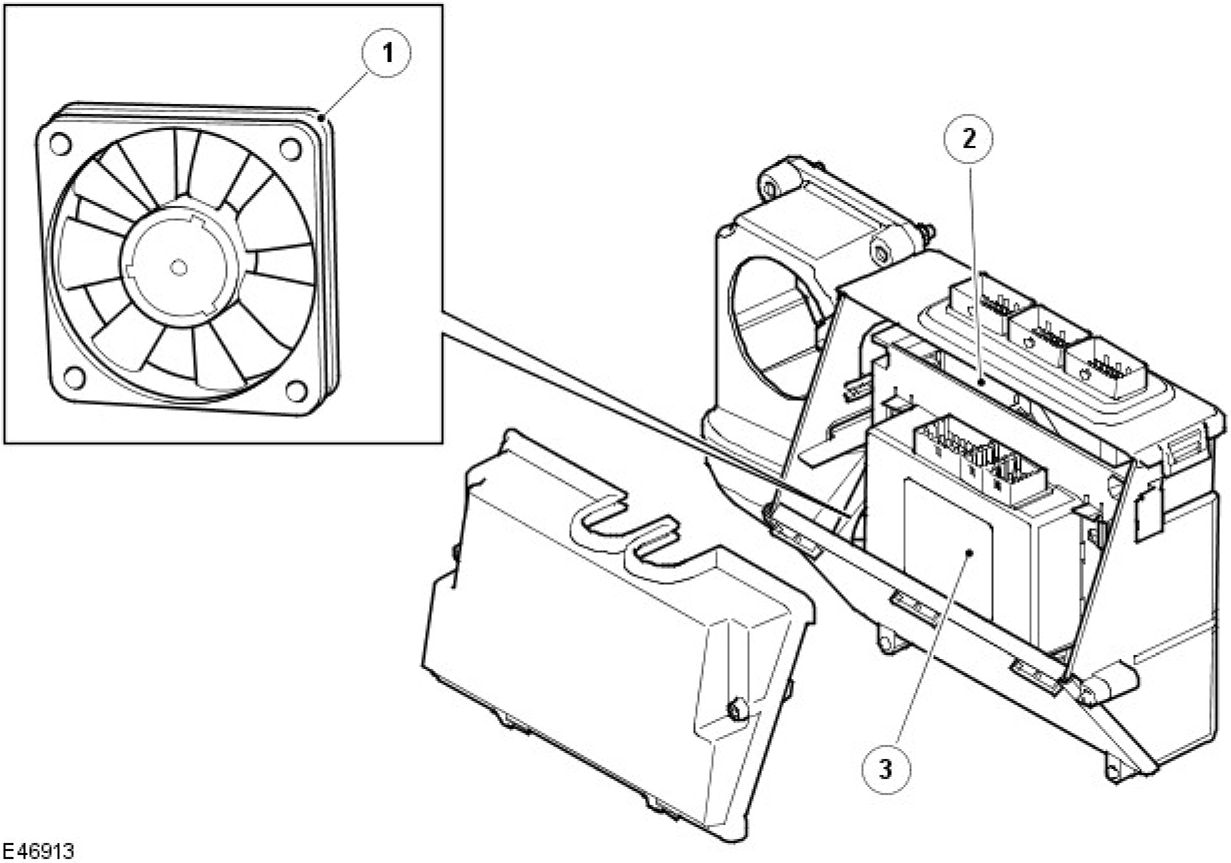
ENGINE CONTROL MODULE (ECM)



E46899

The ECM is located in the E-Box in the plenum area attached to the bulkhead. The E-Box is always on the opposite side to the hand of drive.

E Box



E46913

Item	Part Number	Description
1		E box fan
2		ECM
3		Transfer box control module

Inputs

The ECM has the following inputs:

- Engine coolant temperature
- Stop lamp switch (two signals one via ABS module on controller area network (CAN) and one hardwired)
- MAP
- Throttle pedal position 1
- Throttle pedal position 2
- Electronic throttle position
- Viscous fan speed

- Engine speed and position sensor (CKP)
- CMP
- Engine oil temperature
- Speed control switches (resistive ladders)
- Vehicle speed (via CAN bus)
- Generator monitor
- RCM
- MAF/IAT.

Outputs

The ECM outputs to the following:

- Throttle actuator
- Fuel injectors (6)
- EGR Valves
- Engine cooling fan
- Fuel pump relay
- Starter relay
- EMS main relay
- Generator control

The ECM is connected to the vehicle harnesses via three connectors. The ECM contains data processors and memory microchips. The output signals to the actuators are in the form of ground paths provided by driver circuits within the ECM. The ECM driver circuits produce heat during normal operation and dissipate this heat via the casing. The fan in the E-box assists with the cooling process by maintaining a constant temperature within the E-box. The fan is controlled by ECM. The E-box has pipe connections to the vehicle interior and receives additional cooled air via the air conditioning (A/C) system. Some sensors receive a regulated voltage supplied by the ECM. This avoids incorrect signals caused by voltage drop during cranking.

The ECM performs self diagnostic routines and stores fault codes in its memory. These fault codes and diagnostics can be accessed using a Land Rover approved diagnostic system. If the ECM is to be replaced, the new ECM is supplied 'blank' and must be configured to the vehicle using a Land Rover approved diagnostic system. A 'flash' electrically erasable programmable read only memory (EEPROM) allows the ECM to be externally configured, using a Land Rover approved diagnostic system, with market specific or new tune information up to 14 times. If a fifteenth update is required the ECM must be replaced. The current engine tune data can be accessed and read using a Land Rover approved diagnostic system.

When a new ECM is fitted, it must also be synchronized to the central junction box (CJB) using a Land Rover approved diagnostic system. ECM's cannot be 'swapped' between vehicles.

The ECM is connected to the engine sensors which allow it to monitor the engine operating conditions. The ECM processes these signals and decides the actions necessary to maintain optimum engine performance in terms of driveability, fuel efficiency and exhaust emissions. The memory of the ECM is programmed with instructions for how to control the engine, this is known as the strategy. The memory also contains data in the form of maps which the ECM uses as a basis for fueling and emission control. By comparing the information from the sensors to the to the data in the maps, the ECM is able to calculate the various output requirements. The ECM contains an adaptive strategy which updates the system when components vary due to production tolerances or ageing.

The ECM receives a vehicle speed signal on a CAN bus connection from the ABS module. Vehicle speed is an important input to the ECM strategies. The ABS module derives the speed signal from the ABS wheel speed sensors. The frequency of this signal changes according to road speed. The ECM uses this signal to determine the following:

- How much to reduce engine torque during gear changes
- When to permit speed control operation
- To control the operation of the speed control system
- Implementation of the idle strategy when the vehicle is stationary.

ECM Harness Connector C0872 Pin details

Pin No	Description	Input/Output
A1	Not used	-
A2	Not used	-
A3	CAN Low	Input/Output
A4	CAN High	Input/Output
B1	Starter motor enable	Output
B2	APP 2 sensor ground	-
B3	Not used	-
B4	Speed control ground	-
C1	APP 1 Sensor ground	-
C2	APP sensor 2 signal	Input
C3	Not used	-

Pin No	Description	Input/Output
C4	Speed control	Input
D1	APP 1 signal	Input
D2	APP 2 Sensor reference voltage	Output
D3	Not used	-
D4	Not used	-
E1	APP sensor 1 reference voltage	Output
E2	Not used	-
E3	Park/neutral switch	Input
E4	Inertia switch	Input
F1	Intake air temperature sensor	Input
F2	Not used	-
F3	Engine crank request	Input
F4	Mass air flow sensor	Input
G1	Low pressure fuel pump power monitor	Input
G2	Stop light switch 1	Input
G3	Not used	-
G4	Not used	-
H1	Not used	-
H2	Not used	-
H3	Not used	-
H4	Not used	-
J1	Not used	-
J2	E box fan drive	Output
J3	Main relay drive	Output
J4	Fuel pump relay drive	Output
K1	Not used	-
K2	Not used	-
K3	Ignition switch sense	Input
K4	Keep alive power supply	Input
L1	Battery voltage after main relay	Input
L2	Battery voltage after main relay	Input
L3	Battery voltage after main relay	Input
L4	MAF/IAT ground	-
M1	Power ground	-
M2	Power ground	-
M3	Power ground	-
M4	Power ground	-

ECM Harness Connector C0411 Pin details

Pin No	Description	Input/Output
A1	Engine oil temperature sensor	Input
A2	Not used	-
A3	Not used	-
A4	Not used	-
B1	Not used	-
B2	Not used	-
B3	CAN loop Low	Input/Output
B4	CAN loop High	Input/Output
C1	Not used	Input
C2	Not used	-
C3	Not used	-
C4	Knock sensor B -	Input
D1	Fuel rail pressure sensor signal	Input
D2	Fuel rail pressure sensor supply	Output
D3	Knock sensor B +	Input
D4	Knock sensor A-	Input
E1	Throttle valve position sensor signal	Input
E2	Fuel rail pressure sensor ground	-
E3	Not used	-
E4	Knock sensor bank A+	Input
F1	Electric throttle position sensor and turbo vane position sensor supply	Output
F2	Electric throttle position sensor and turbo vane position sensor ground	-

Pin No	Description	Input/Output
F3	Not used	-
F4	Not used	-
G1	Not used	-
G2	Not used	-
G3	Glow plug relay control	Output
G4	Throttle position actuator	Output
H1	Alternator command	Output
H2	Not used	-
H3	Not used	-
H4	Not used	-
J1	Not used	-
J2	Not used	-
J3	Not used	-
J4	Fuel volume control valve drive	Output
K1	Oil temperature sensor ground	-
K2	Viscous cooling fan control	Output
K3	Fuel pressure control valve drive	Output
K4	Not used	-
L1	Injector 2 command	Output
L2	Injector 2 common	-
L3	Injector 4 common	-
L4	Not used	-
M1	Injector 4 command	Output
M2	Injector 6 command	Output
M3	Injector 6 common	-
M4	Not used	-

ECM Harness Connector C2518 Pin details

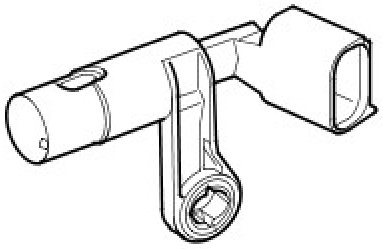
Pin No	Description	Input/Output
A1	Not used	-
A2	EGR valve position sensor bank B	Input
A3	EGR valve position sensor bank A	Input/Output
A4	Not used	-
B1	Air charge temperature sensor signal	Input
B2	Fuel temperature sensor signal	Input
B3	Not used	-
B4	Not used	-
C1	MAP sensor signal	Input
C2	Engine coolant temperature sensor signal	Input
C3	EGR valve bank A and B position sensor supply	Output
C4	Turbo vane position sensor signal	Input
D1	MAP sensor supply	Output
D2	EGR valve bank A position sensor ground	-
D3	Not used	
D4	Not used	
E1	Engine cooling fan monitor	Input
E2	MAP and ECT sensor signal ground	-
E3	Not used	-
E4	Not used	-
F1	CKP sensor	Input
F2	Generator load monitor signal	Input
F3	Not used	-
F4	Not used	-
G1	CKP sensor supply	Output
G2	CKP sensor ground	-
G3	EGR bank B/ air charge temperature sensor/fuel rail temperature sensor ground	-
G4	CMP sensor signal	Input
H1	EGR bank A +	Output
H2	EGR bank A -	Output
H3	CMP sensor ground	-
H4	CMP sensor supply	Output
J1	EGR bank B+	Output

Pin No	Description	Input/Output
J2	Not used	-
J3	Not used	Output
J4	Turbo vane actuator +	Output
K1	EGR Bank B-	-
K2	Not used	-
K3	Not used	Input
K4	Throttle valve actuator -	-
L1	Not used	-
L2	Injector 3 common	-
L3	Injector 1 common	-
L4	Injector 5 common	-
M1	Not used	-
M2	Injector 3 command	Output
M3	Injector 1 command	Output
M4	Injector 5 command	Output

IMMOBILIZATION

Vehicle immobilization is controlled by the CJB. The CJB is connected to the medium speed CAN bus, which it uses to communicate with the ECM via the instrument cluster and the high speed CAN bus. The CJB wakes up the immobilization system when a key is inserted in the ignition switch key barrel. The CJB then validates the coded data it receives from the transponder coil in the key via the transponder coil. The CJB then signals the ECM to allow engine starting.
For additional information, refer to: Anti-Theft - Passive (419-01B Anti-Theft - Passive, Description and Operation).

CAMSHAFT POSITION (CMP) SENSOR



E46902

The CMP sensor is located on the front face of the left hand cylinder head. The sensor tip protrudes through the face to pick up on the reluctor behind the camshaft pulley. The CMP sensor is a Hall effect type sensor

The ECM uses the CMP sensor signal to determine if the piston in No. 1 cylinder is at injection top dead center (TDC) or exhaust TDC. Once this has been established, the ECM can then operate the correct injector to inject fuel into the cylinder when the piston is at injection TDC.

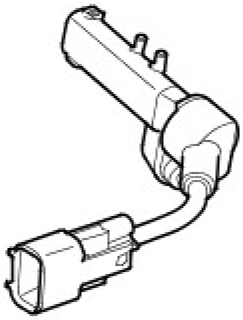
The CMP sensor is used by the ECM at engine start-up to synchronize the ECM with the CKP sensor signal. The ECM does this by using the CMP sensor signal to identify number one cylinder to ensure the correct injector timing. Once the ECM has established the injector timing, the CMP sensor signal is no longer used.

The CMP sensor receives a 5V supply from the ECM. Two further connections to the ECM provide ground and signal output.

If a fault occurs, an error is registered in the ECM. Two types of failure can occur; camshaft signal frequency too high or total failure of the camshaft signal. The error recorded by the ECM can also relate to a total failure of the crankshaft signal or crankshaft signal dynamically implausible. Both components should be checked to determine the cause of the fault.

If a fault occurs with the CMP sensor when the engine is running, the engine will continue to run but the ECM will deactivate boost pressure control. Once the engine is switched off, the engine will crank but will not restart while the fault is present.

CRANKSHAFT POSITION (CKP) SENSOR



E46903

The CKP sensor is located at the rear of the engine block on the left hand side. The sensor tip is aligned with a magnetic trigger which is attached to the crankshaft. The reluctor is a press fit on the end of the crankshaft. The trigger wheel must be carefully aligned to the crankshaft to ensure correct timing. The sensor produces a square wave signal, the frequency of which is proportional to engine speed.

The ECM monitors the CKP sensor signal and can detect engine over-speed. The ECM counteracts engine over-speed by gradually fading out speed synchronized functions. The CKP is a Hall effect sensor. The sensor measures the magnetic field variation induced by the magnetized trigger wheel.

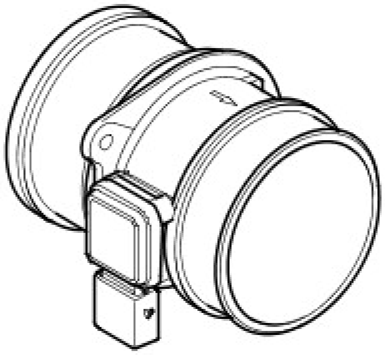
The trigger wheel has two missing teeth representing 6º of crankshaft rotation. The two missing teeth provide a reference point for the angular position of the crankshaft.

When the space with the two missing teeth pass the sensor tip, a gap in the signal is produced which the ECM uses to determine the crankshaft position. The air gap between the sensor tip and the ring is important to ensure correct signals are output to the ECM. The recommended air gap between the CKP and the trigger wheel is 0.4 mm- 1.5 mm.

The ECM uses the signal from the CKP sensor for the following functions:

- Synchronisation.
- Determine fuel injection timing.
- Enable the fuel pump relay circuit (after the priming period).
- Produce an engine speed signal which is broadcast on the CAN bus for use by other systems.

MASS AIR FLOW/INTAKE AIR TEMPERATURE (MAF/IAT) SENSOR



E46904

The MAF/IAT sensor is located on the inlet air duct directly after the air filter box. The sensor combines the two functions of a MAF sensor and an IAT sensor in one unit. The sensor is housed in a plastic moulding which is connected between the intake manifold and the air intake pipe.

The MAF sensor works on the hot film principle. Two sensing elements are contained within a film. One element is maintained at ambient (air intake) temperature, e.g. 25°Celsius (77°F). The other element is heated to 200°Celsius (392°F) above the ambient temperature, e.g. 225°Celsius (437°F). Intake air entering the engine passes through the MAF sensor and has a cooling effect on the film. The ECM monitors the current required to maintain the 200°Celsius (392°F) differential between the two elements and uses the differential to provide a precise, non-linear, signal which equates to the volume of air being drawn into the engine.

The MAF sensor output is a digital signal proportional to the mass of the incoming air. The ECM uses this data, in conjunction with signals from other sensors and information from stored fueling maps, to determine the precise fuel quantity to be injected into the cylinders. The signal is also used as a feedback signal for the EGR system.

The IAT sensor incorporates a negative temperature coefficient (NTC) thermistor in a voltage divider circuit. The NTC thermistor works on the principle of decreasing resistance in the sensor as the temperature of the intake air increases. As the thermistor allows more current to pass to ground, the voltage sensed by the ECM decreases. The change in voltage is proportional to the temperature change of the intake air. Using the voltage output from the IAT sensor, the ECM can correct the fueling map for intake air temperature. The correction is an important requirement because hot air contains less oxygen than cold air for any given volume.

The MAF sensor receives a 12V supply from the Battery Junction Box (BJB) and a ground connection via the ECM. Two further connections to the ECM provide a MAF signal and IAT signal.

The IAT sensor receives a 5V reference voltage from the ECM and shares a ground with the MAF sensor. The signal output from the IAT sensor is calculated by the ECM by monitoring changes in the supplied reference voltage to the IAT sensor voltage divider circuit.

The ECM checks the calculated air mass against the engine speed. If the calculated air mass is not plausible, the ECM uses a default air mass figure which is derived from the average engine speed compared to a stored characteristic map. The air mass value will be corrected using values for boost pressure, atmospheric pressure and air temperature.

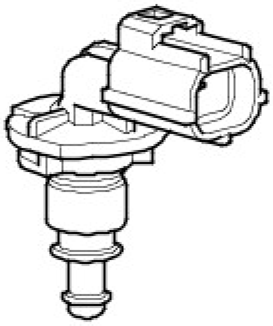
If the MAF sensor fails the ECM implements the default strategy based on engine speed. In the event of a MAF sensor signal failure, the following symptoms may be observed:

- EGR system off
- Delayed engine response
- Reduced engine performance.

If the IAT sensor fails the ECM uses a default intake air temperature of 40°Celsius (104°F). In the event of an IAT sensor failure, any of the following symptoms may be observed:

- Under fueling, resulting in reduced engine performance.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR



E46905

The ECT sensor is located in the top hose at the coolant manifold junction. The ECT sensor provides the ECM and the instrument cluster with engine coolant temperature status.

The ECM uses the temperature information for the following functions:

- Fueling calculations
- Limit engine operation if engine coolant temperature becomes too high
- Cooling fan operation
- Glow plug activation time.

The instrument cluster uses the temperature information for temperature gauge operation. The engine coolant temperature signal is also transmitted on the CAN bus by the instrument cluster for use by other systems.

The ECM/ECT sensor circuit consists of an internal voltage divider circuit which incorporates an NTC thermistor. As the coolant temperature rises the resistance through the sensor decreases and vice versa. The output from the sensor is the change in voltage as the thermistor allows more current to pass to earth relative to the temperature of the coolant.

The ECM compares the signal voltage to stored values and adjusts fuel delivery to ensure optimum driveability at all times. The engine will require more fuel when it is cold to overcome fuel condensing on the cold metal surfaces inside the combustion chamber. To achieve a richer air/fuel ratio, the ECM extends the injector opening time. As the engine warms up the air/fuel ratio is leaned off.

The input to the sensor is a 5V reference voltage supplied from the voltage divider circuit within the ECM. The ground from the sensor is also connected to the ECM which measures the returned current and calculates a resistance figure for the sensor which relates to the coolant temperature.

The following table shows engine coolant temperature values and the corresponding sensor resistance and voltage values.

Coolant Temperature Sensor Response

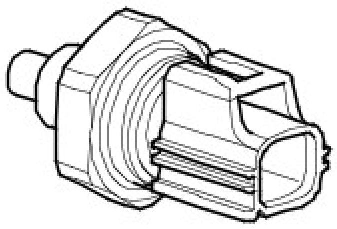
Temperature (Degrees Celsius)	Resistance (Kohms)	Voltage (Volts)
-40	925	4.54
-30	496	4.46
-20	277	4.34
-10	160	4.15
0	96	3.88
10	59	3.52
20	37	3.09
30	24	2.62
40	16	2.15
50	11	1.72
60	7.5	1.34
70	5.6	1.04
80	3.8	0.79
90	2.9	0.64
100	2.08	0.49
110	1.56	0.38
120	1.19	0.29
130	0.918	0.22
140	0.673	0.17
150	0.563	0.14

If the ECT sensor fails, the following symptoms may be observed:

- Difficult cold start (under extreme conditions).
- Engine performance compromised.
- Temperature gauge inoperative or inaccurate reading.

In the event of ECT sensor signal failure, the ECM applies a default value of 80°Celsius (176°F) coolant temperature for fueling purposes. The ECM will also permanently operate the cooling fan at all times when the ignition is switched on, to protect the engine from overheating.

ENGINE OIL TEMPERATURE SENSOR



E46906

The oil temperature sensor is located in the engine oil pan. The temperature sensor is a NTC type which operates in the -30 Degrees Celsius to +150 Degrees Celsius temperature range.

Oil Temperature Sensor Response

Temperature Degrees Celsius	Resistance Ohms
60	620
90	255
120	117
150	60

FUEL RAIL TEMPERATURE SENSOR

The fuel rail temperature sensor is located on the LP return line.

The sensor is an NTC sensor which is connected to the ECM by two wires. The ECM fuel temperature sensor circuit consists of an internal voltage divider circuit which incorporates an NTC thermistor. As the fuel temperature rises the resistance through the sensor decreases. The output from the sensor is the change in voltage as the thermistor allows more current to pass to earth relative to the temperature of the fuel.

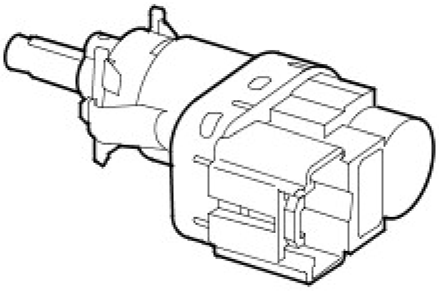
The ECM monitors the fuel temperature constantly. If the fuel temperature exceeds 85°Celsius (185°F), the ECM invokes an engine 'derate' strategy. This reduces the amount of fuel delivered to the injectors in order to allow the fuel to cool. When this occurs, the driver may notice a loss of performance.

Further fuel cooling is available by a bi-metallic valve diverting fuel through the fuel cooler when the fuel reaches a predetermined temperature. In hot climate markets, an electrically operated cooling fan is positioned in the air intake ducting to the fuel cooler. This is controlled by a thermostatic switch, which switches the fan on and off when the fuel reaches a predetermined temperature.

The wires to the fuel sensor are monitored by the ECM for short and open circuit. The ECM also monitors the 5V supply. If a failure occurs a fault is recorded in the ECM memory and the ECM uses a default fuel pressure value.

If the ECM registers an 'out of range' deviation between the pressure signal from the sensor and the pre-programmed 'set point' a fault is stored in the ECM memory. Depending on the extent of the deviation, the ECM will reduce the injection quantity, stop the engine immediately or prevent further engine starting.

BRAKE LIGHT SWITCH



E46910

The brake switch is located on the brake pedal and is operated by the brake pedal. The switch has a normally open circuit switch which closes the circuit when the driver has applied the brakes. The switch is connected directly to the ECM and the ECM also receives a brake light signal on the CAN bus from the ABS control module.

The ECM uses the brake signal for the following:

To limit fueling during braking

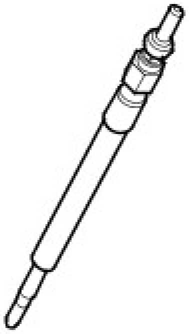
To inhibit/cancel Speed control if the brakes are applied.

In the event of a brake switch failure, the following symptoms may be observed:

Speed control inactive

Increased fuel consumption.

GLOW PLUGS


E46912

Three glow plugs are located in each of the cylinder heads, on the inlet side. The glow plugs and the glow plug relay are a vital part of the engine starting strategy. The glow plugs heat the air inside the cylinder during cold starts to assist combustion. The use of glow plugs helps reduce the amount of additional fuel required on start-up, and consequently reduces the emission of black smoke. The use of glow plugs also reduces the amount of injection advance required, which reduces engine noise, particularly when idling with a cold engine.

There are three phases of glow plug activity:

- Pre-heat
- During crank
- Post heat

The main part of the glow plug is a tubular heating element which protrudes into the combustion chamber of the engine. The heating element contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil, and connected in series, is a control coil. The control coil regulates the heater coil to ensure that it does not overheat.

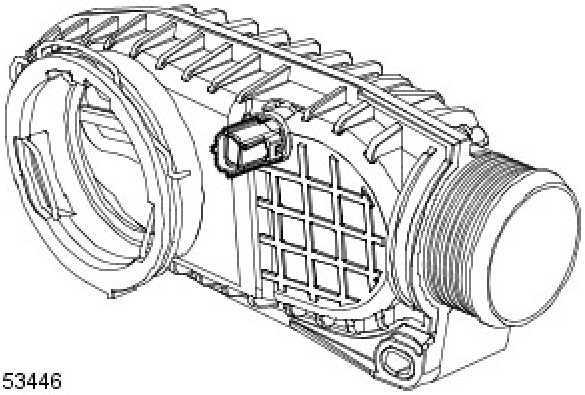
Pre-heat is the length of time the glow plugs operate prior to engine cranking. The ECM controls the pre-heat time based on ECT sensor output and battery voltage. If the ECT sensor fails, the ECM will use the IAT sensor value as a default value. The pre-heat duration is extended if the coolant temperature is low and the battery is not fully charged.

Post heat is the length of time the glow plugs operate after the engine starts. The ECM controls the post heating time based on ECT sensor output. The post heat phase reduces engine noise, improves idle quality and reduces hydrocarbon emissions.

When the ignition is switched on to position II, the glow plug warning lamp illuminates and the instrument cluster displays 'PREHEATING' in the message centre. The glow-lamp is activated separately from the glow-plugs, so is not illuminated during or after start. The plugs can still be ON when the lamp is off in these two phases.

In the event of glow plug failure, the engine may be difficult to start and excessive smoke emissions may be observed after starting.
For additional information, refer to: Glow Plug System (303-07C Glow Plug System - TDV6 2.7L Diesel, Description and Operation).

BOOST AIR TEMPERATURE SENSOR


E53446

The is boost air temperature sensor is located in the rear of the intake chamber immediately preceding the electric throttle. The sensor is used to measure the intake air temperature from the turbo in order to calculate the required amount of fueling.

BOOST PRESSURE CONTROL

The Boost Pressure (BP) sensor is located post turbo after the electric throttle valve. The sensor provides a voltage signal to the ECM relative to the intake manifold pressure. The BP sensor has a three pin connector which is connected to the ECM and provides a 5V reference supply from the ECM, a signal input to the ECM and a ground for the sensor.

The BP sensor uses a diaphragm transducer to measure pressure. The ECM uses the BP sensor signal for the following functions:

- Maintain manifold boost pressure.
- Reduce exhaust smoke emissions when driving at high altitude.
- Control of the EGR system.

If the BP sensor fails, the ECM uses a default pressure of 1013 mbar (14 lbf/in²). In the event of a BP sensor failure, the following symptoms may be observed:

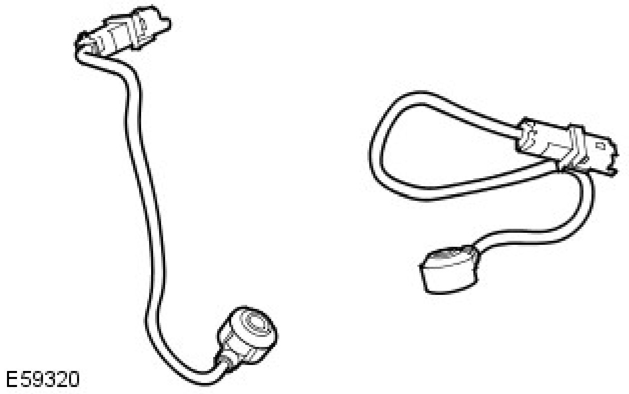
- Altitude compensation inoperative (black smoke emitted from the exhaust).
- Active boost control inoperative.

Boost control is achieved by the use of a direct drive electric actuator. The actuator is attached to the side of the turbo unit and is connected with the control mechanism via a linkage. The electric actuator works on the torque motor principal and has integrated control module.

The electric actuator moves the control vanes through an 60 degree stroke and has the capability to learn its own maximum stroke positions. The electric actuator is controlled via pulse width modulation (PWM) signals from the ECM.
For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Description and Operation).

If the ECM detects a fault with the Boost Pressure (BP) sensor, it uses an open loop boost control based on engine speed and airflow as a default value.

KNOCK SENSORS



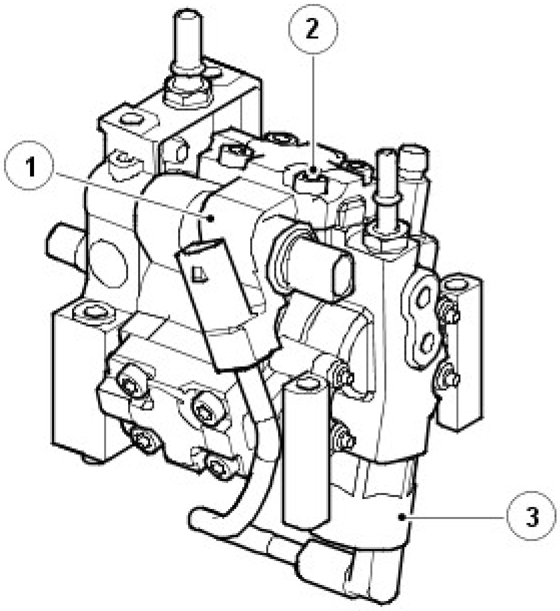
The TdV6 diesel EMS has two knock sensors located in the cylinder head of the inboard side of the V of the engine, adjacent to cylinders 2 and 5. The sensors are connected to the ECM via a twisted pair.

The knock sensors produce a voltage signal in proportion to the amount of mechanical vibration generated at each ignition point. Each sensor monitors the related cylinder bank.

The knock sensors incorporate a piezo-ceramic crystal. This crystal produces a voltage whenever an outside force tries to deflect it, (i.e. exerts a mechanical load on it). When the engine is running, the compression waves in the material of the cylinder block, caused by the combustion of the fuel/air mixture within the cylinders, deflect the crystal and produce an output voltage signal. The signals are supplied to the ECM, which compares them with `mapped' signals stored in memory. From this, the ECM can determine when detonation occurs on individual cylinders. When detonation is detected, the ECM can adjust the pilot fuel quantity to reduce combustion noise, compensating for fuel quantity variations due to injector wear.

Care must be taken at all times to avoid damaging the knock sensors, but particularly during removal and fitting procedures. The recommendations regarding torque and surface preparation must be adhered to. The torque applied to the sensor and the quality of the surface preparation both have an influence over the transfer of mechanical noise from the cylinder block to the crystal.

FUEL RAIL PRESSURE CONTROL VALVE



E46984

Item	Part Number	Description
1	-	Fuel volume control valve
2	-	High pressure fuel pump
3	-	Fuel rail pressure control valve

The fuel rail pressure control valve is incorporated into the high pressure fuel pump. The control valve regulates the fuel pressure within the fuel rail and is controlled by the ECM. The control valve is a PWM controlled solenoid valve.

When the solenoid is de-energized, an internal spring holds an internal valve closed. At fuel pressure of 100 bar (1450 lbf/in²) or higher, the force of the spring is overcome, opening the valve and allowing fuel pressure to decay into the fuel return pipe. When the pressure in the fuel rail decays to approximately 100 bar (1450 lbf/in²) or less, the spring force overcomes the fuel pressure and closes the valve. When the ECM energizes the solenoid, the valve is closed allowing the fuel pressure to build. The pressure in the fuel rail in this condition can reach approximately 1600 bar.

The ECM controls the fuel rail pressure by operating the control valve solenoid using a PWM signal. By varying the duty cycle of the PWM signal, the ECM can accurately control the fuel rail pressure and hence the pressure delivered to the injectors according to engine load. This is achieved by the control valve allowing a greater or lesser volume of fuel to pass from the high pressure side of the pump to the un-pressurized fuel return line, regulating the pressure on the high pressure side.

The fuel rail pressure control valve receives a PWM signal from the ECM of between 0 and 12V. The ECM controls the operation of the control valve using the following information to determine the required fuel pressure:

- Fuel rail pressure
- Engine load
- Accelerator pedal position
- Engine temperature
- Engine speed.

In the event of a total failure of the fuel rail pressure control valve, the engine will not start.

In the event of a partial failure of the fuel rail pressure control valve, the ECM will activate the solenoid with the minimum duty cycle which results in the injection quantity being limited.

FUEL VOLUME CONTROL VALVE (VCV)

The fuel rail volume control valve is incorporated into the high pressure fuel pump. The VCV spills unwanted fuel back to the tank (or LP system) or forwards it to the fuel rail pressure control valve. This avoids unused fuel being pressurized by the HP stage of the pump, only to be spilt back to LP by the pressure control valve wasting energy and heating the fuel.

INJECTORS

There are six electronic fuel injectors (one for each cylinder) located in a central position between the four valves of each cylinder. The ECM divides the injectors into two banks of three with cylinders 1 to 3 being designated bank A and cylinders 4 to 6 designated bank B, with injector numbers 1 and 4 at the front of the engine.

The following table details the injector number to cylinder number relationship. The injectors follow the engine firing order.

Cylinder Number	Injector Number
1	1
2	3
3	5
4	2
5	4
6	6

Each injector is supplied with pressurized fuel from the fuel rail and delivers finely atomized fuel directly into the combustion chambers. Each injector is individually controlled by the ECM which operates each injector in the firing order and controls the injector opening period via PWM signals. Each injector receives a 120V supply from the ECM and, using programmed injection/timing maps and sensor signals, determines the precise pilot and main injector timing for each cylinder. If battery voltage falls to between 6 and 9V, fuel injector operation is restricted, affecting emissions, engine speed range and idle speed. In the event of a failure of a fuel injector, the following symptoms may be observed:

- Engine misfire
- Idle irregular
- Reduced engine performance
- Reduced fuel economy
- Difficult starting
- Increased smoke emissions.

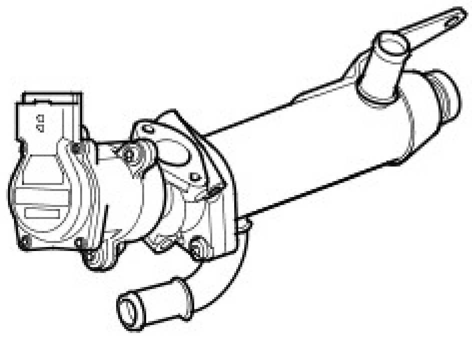
The ECM monitors the wires for each injector for short circuit and open circuit, each injector and the transient current within the ECM. If a defect is found, an error is registered in the ECM for the injector in question.
For additional information, refer to: Fuel Charging and Controls (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Description and Operation).

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

The EGR system comprises:

- EGR modulator x 2
- EGR cooler x 2
- Associated connecting pipes

EGR Modulator and Cooler



E46914

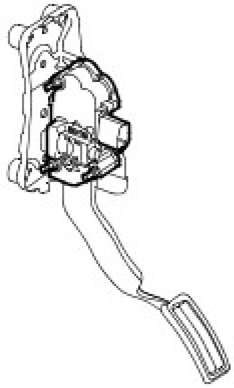
The combined EGR modulator and cooler is located under each cylinder bank, between the exhaust manifold and the cylinder head. The cooler side of the EGR is connected to the vehicle cooling system via hoses. The inlet exhaust side is connected directly into the exhaust manifolds on each side. The exhaust gas passes through the cooler and is expelled via the actuator and a metal pipe into the throttle housing. The EGR modulator is a solenoid operated valve which is controlled by the ECM. The ECM uses the EGR modulator to control the amount of exhaust gas being re-circulated in order to reduce exhaust emissions and combustion noise.

The EGR modulator is controlled by an H bridge driver to control the precise amount of exhaust gas delivered to the cylinders.

The modulators are operated through their full range at each engine shut down, to clear any carbon deposits that may have built up whilst the engine was running

In the event of a failure of the EGR modulator, the EGR function will become inoperative. The ECM can monitor the EGR modulator solenoid for short circuits and store fault codes in the event of failure. The modulator can also be activated for testing using a Land Rover approved diagnostic system.
For additional information, refer to: Engine Emission Control (303-08C Engine Emission Control - TDV6 2.7L Diesel, Description and Operation).

ACCELERATOR PEDAL POSITION (APP) SENSOR



E47297

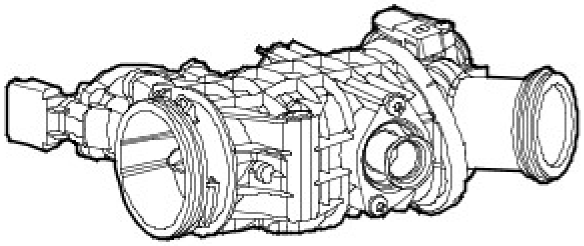
The APP sensor is incorporated into the pedal assembly. The sensor is a twin track rotary potentiometer type.

The APP sensor is located in plastic housing which is integral with the throttle pedal. The housing is injection moulded and provides location for the APP sensor. The sensor is mounted externally on the housing and is secured with two Torx screws. The external body of the sensor has a six pin connector which accepts a connector on the vehicle wiring harness.

The APP sensor is installed on the pedal box and consists of a twin track potentiometer with wipers driven by a linkage connected to the accelerator pedal. Each potentiometer track has a 5 volt supply and ground connection from the ECM, and produces a linear signal voltage to the ECM proportional to the position of the accelerator pedal. The signal voltage from track 1 of the potentiometer is approximately double that of the signal voltage from track 2.

From the sensor signals, the ECM determines driver demand as a percentage of pedal travel, where 0% is with the pedal released and 100% is with the pedal fully depressed. Driver demand is then used to calculate throttle angle, fuel quantity and ignition timing. The ECM also outputs driver demand on the CAN system, for use by the brake and gearbox control systems.

ELECTRONIC THROTTLE



E46900

The electric throttle body is located in the inlet tract prior to where the inlet splits to divert air flow into the two separate air intake manifolds. The electric throttle controls the volume of air allowed into the inlet manifold by means of a DC motor which controls a flap in the body of the throttle. The throttle is used for protecting against engine runaway in the event of engine oil pullover. A detection strategy is used to enable the valve to be closed to shutdown the engine via oxygen starvation. The throttle is on a physical spring return which holds it in the open position. The throttle is only driven closed electronically when required by a diagnostic strategy.

Just after the throttle flap the tubes from the EGR valves/coolers are joined into the assembly.

DIESEL PARTICULATE FILTER (DPF) CONTROL - VEHICLES FROM 2008MY

Vehicles from 2008MY are fitted with a Diesel Particulate Filter (DPF) which collects the particulate matter produced during the combustion process and reduces the particulates entering the atmosphere.

The DPF is located in the exhaust system, downstream of the catalytic converter. A major feature of the DPF is its ability for regeneration. Regeneration is the burning of particulates trapped by the filter to prevent obstruction to the free flow of exhaust gasses. The regeneration process is controlled by the ECM and takes place at calculated intervals and is not noticeable by the driver of the vehicle.

For details of the DPF and the regeneration processes refer to the relevant exhaust system section.
For additional information, refer to: Exhaust System (309-00C Exhaust System - TDV6 2.7L Diesel, Description and Operation).

Regeneration is most important, since an overfilled filter can damage the engine through excessive exhaust back pressure and can itself be damaged or destroyed.

The exhaust gas and DPF temperatures are controlled by the DPF software located in the ECM. The DPF software monitors the load status of the DPF based on driving style, distance travelled and signals from a differential pressure sensor and temperature sensors located before and after the DPF in the exhaust system. When the particulate loading of the DPF reaches predetermined levels, the DPF is actively regenerated by adjusting, in conjunction with the ECM, various engine control functions such as:

- fuel injection
- intake air throttle
- EGR
- turbocharger boost pressure control.

The regeneration process is possible because of the flexibility of the common-rail fuel injection engine which provides precise control of fuel flow, fuel pressure and injection timing which are essential requirements to promote the efficient regeneration process.

The ECM contains the DPF software which controls and monitors the DPF and the regeneration process. The software is broken down into three separate modules; a DPF supervisor module, a DPF fuel management module and a DPF air management module, which interact with each other to provide precise DPF control.

These three modules are controlled by a fourth software module known as the DPF co-ordinator module. The co-ordinator module manages the operation of the other modules when an active regeneration is requested. The DPF supervisor module is a sub-system of the DPF co-ordinator module.

DPF Co-Ordinator Module

The DPF co-ordinator module reacts to a regeneration request from the supervisor module by initiating and controlling the following DPF regeneration requests:

- EGR cut-off
- Turbocharger boost pressure control
- Engine load increase
- Control of air pressure and temperature in the intake manifold
- Fuel injection control.

When the supervisor module issues a regeneration request, the co-ordinator module requests EGR cut-off and a regeneration specific turbocharger boost pressure control. It then waits for a feedback signal from the EGR system confirming that the EGR valve is closed.

• NOTE: The EGR valve is open at idle to allow reduced NO_x. EGR is not used during part load due to intake manifold contamination.

When the EGR valve is closed, the co-ordinator module initiates requests to increase engine load by controlling the intake air temperature and pressure.

Once confirmation is received that intake conditions are controlled or a calibration time has expired, the co-ordinator module then changes to a state awaiting an accelerator pedal release manoeuvre from the driver. If this occurs or a calibration time has expired, the co-ordinator module generates a request to control fuel injections to increase exhaust gas temperature.

DPF Fuel Management Module

The DPF fuel management module controls the following functions:

- Timing and quantity of the four split injections per stroke (pilot, main and two post injections).
- Injection pressure and the transition between the three different calibration levels of injection.

The above functions are dependant on the condition of the catalytic converter and the DPF.

The controlled injection determines the required injection level in addition to measuring the activity of the catalytic converter and the DPF. The fuel management calculates the quantity and timing for the four split injections, for each of the three calibration levels for injection pressure, and also manages the transition between the levels.

The two post injections are required to separate the functionality of increasing in-cylinder gas temperatures and the production of hydrocarbons. The first post injection is used to generate the higher in-cylinder gas temperature while simultaneously retaining the same engine torque output produced during normal (non-regeneration) engine operation. The second post injection is used to generate hydrocarbons by allowing unburnt fuel into the catalytic converter without producing increased engine torque.

DPF Air Management Module

The DPF air management module controls the following functions:

- EGR control
- Turbocharger boost pressure control
- Intake air temperature and pressure control.

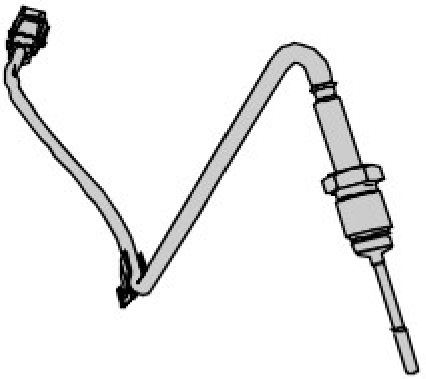
During active regeneration, the EGR operation is disabled and the closed-loop activation of the turbocharger boost controller is calculated. The air management module controls the air in the intake manifold to a predetermined level of pressure and temperature. This control is required to achieve the correct in-cylinder conditions for stable and robust combustion of the post injected fuel.

Restricting the air intake during DPF regeneration has the following functions:

- Increase in engine load
- Slower combustion
- Reduction in the mass of air taken in
- A reduction in the speed of the exhaust gases and therefore an increase in the time for which the gases are in the catalytic converter.

The module controls the intake air temperature by actuating the EGR throttle and by adjustment of the turbocharger boost pressure control.

DPF Temperature Sensors



E48497

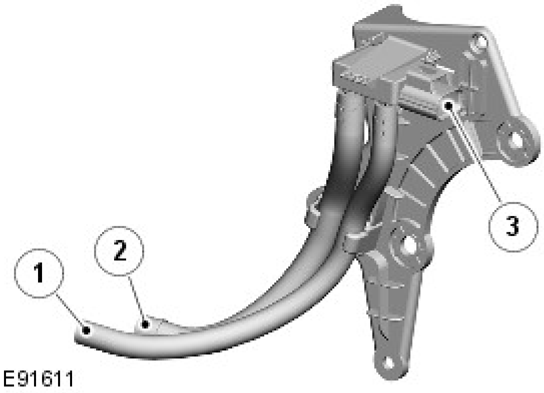
Three temperature sensors are used in the DPF system. One is located in the turbocharger outlet elbow, the second sensor is after the catalytic converter and the third sensor is located after the DPF.

The sensors measure the temperature of exhaust gas exiting the turbocharger, before it passes through the DPF and after it has passed through the DPF and provides the information required by the ECM to calculate the DPF temperature. The information is used, in conjunction with other data, to estimate the amount of accumulated particulate and to control the DPF temperature.

The sensors are Negative Temperature Co-efficient (NTC) type resistors, which measure the temperature of the exhaust gases. The resistance, and subsequently the voltage at the sensor will decrease as the exhaust gas temperature increases.

In the event of a fault in a temperature sensor, the ECM uses a substitute value of 350°C (1202°F).

Differential Pressure Sensor



Item	Part Number	Description
1	-	Low pressure connection
2	-	High pressure connection
3	-	Electrical connector

The differential pressure sensor is located on the rear of the transfer box, adjacent to the DPF.

The differential pressure sensor is used by the DPF software to monitor the condition of the DPF. Two pipe connections on the sensor are connected by pipes to the inlet and outlet ends of the DPF. The pipes allow the sensor to measure the inlet and outlet pressures of the DPF.

As the amount of particulates trapped by the DPF increases, the pressure at the inlet side of the DPF increases in comparison to the DPF outlet. The DPF software uses this comparison, in conduction with other data, to calculate the accumulated amount of trapped particulates.

By measuring the pressure difference between the DPF inlet and outlet air flow and the DPF temperature, the DPF software can determine if the DPF is becoming blocked and requires regeneration.

A DPF is recognized as overloaded if the differential pressure under certain operating conditions exceeds the overload limit calculated by the ECM. The DPF software may start regeneration attempts but be unable to complete them. These attempts are counted by the ECM and, if the maximum number of regeneration attempts is reached, a fault entry is recorded in the ECM at the next ignition on cycle.

The DPF software performs the following checks using the DPF differential pressure sensor:

- Plausibility check
- Diesel particulate filter efficiency
- Diesel particulate filter overloaded
- Diesel particulate filter clogged
- Monitoring of the maximum regeneration attempts in the lower load range.

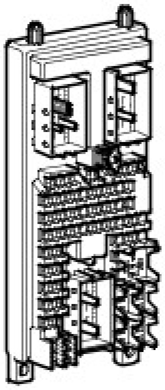
TERRAIN RESPONSE™

The Terrain Response system allows the driver to select a program which will provide the optimum settings for traction and performance for prevailing terrain conditions.

As part of Terrain Response there will be different throttle pedal progression maps associated with different Terrain Response modes. The two extremes are likely to be a sand map (quick build up of torque with pedal travel) and grass/gravel/snow (very cautious build up of torque).

The TdV6 implementation of throttle progression is based on a fixed blend time. The torque will blend from that on one map to that on the new map (for the same pedal position) over a fixed time. This means blending will always take the same amount of time but when the torque change is small the torque increase over time will be small, whilst if the torque change is greater then the torque increase over time will be steeper. The resulting acceleration of the vehicle will depend on the torque difference between the two maps as well as on the gear and range selected. The worst case blending that could ever occur has been calibrated to match the blend rate for petrol derivatives as closely as possible, so as to give a transparent behaviour to customers. For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

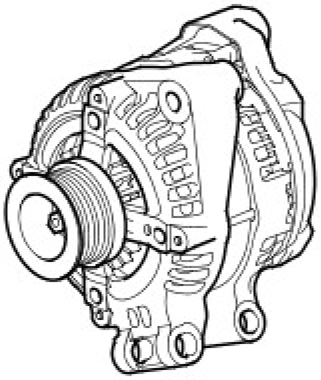
CENTRAL JUNCTION BOX (CJB)



E47607

The CJB initiates the power up and power down routines within the ECM. When the ignition is turned on 12V is applied to the Ignition Sense input. The ECM then starts its power up routines and turns on the ECM main relay; the main power to the ECM and it's associated system components. When the ignition is turned OFF the ECM will maintain its powered up state for up to 60 seconds while it initiates its power down routine and on completion will turn off the ECM main relay.

GENERATOR



E47591

The generator has a multifunction voltage regulator for use in a 14V charging system with 6÷12 zener diode bridge rectifiers.

The ECM monitors the load on the electrical system via PWM signal and adjusts the generator output to match the required load. The ECM also monitors the battery temperature to determine the generator regulator set point. This characteristic is necessary to protect the battery; at low temperatures battery charge acceptance is very poor so the voltage needs to be high to maximize any rechargeability, but at high temperatures the charge voltage must be restricted to prevent excessive gassing of the battery with consequent water loss.
For additional information, refer to: Generator (414-02C Generator and Regulator - TDV6 2.7L Diesel, Description and Operation).

The generator has a smart charge capability that will reduce the electrical load on the generator reducing torque requirements, this is implemented to utilize the engine torque for other purposes. This is achieved by monitoring three signals to the ECM:

- Generator sense (A sense), measures the battery voltage at the CJB.
- Generator communication (Alt Com) communicates desired generator voltage set point from ECM to generator.
- Generator monitor (Alt Mon) communicates the extent of generator current draw to ECM. This signal also transmits faults to the ECM which will then sends a message to the instrument cluster on the CAN bus to illuminate the charge warning lamp.

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Electronic Engine Controls - TDV6 2.7L Diesel - Electronic Engine Controls

Diagnosis and Testing

Overview

This section covers the sensors and units for the engine management system, refer to section 303-14C - Electronic Engine Controls - 2.7L workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Engine oil level ● Cooling system coolant level ● Fuel level ● Fuel contamination/grade/quality ● Fuel leaks ● Accessory drive belt ● Sensor installation/condition ● Viscous fan and solenoid	● Fuses ● Wiring harness ● Electrical connector(s) ● 5 volt sensor supply ● Sensor(s) ● Engine control module (ECM) ● Transmission control module (TCM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Engine cranks, but does not start	● Inertia fuel shut off (IFS) switch ● Low/Contaminated fuel ● Air leakage ● Low pressure fuel system fault ● Fuel pump module fault ● Blocked fuel filter ● Fuel volume control valve (VCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Fuel injection pump failure ● Crankshaft position (CKP) sensor ● ECM fault	Check that the inertia switch has not tripped. Check the fuel level/condition. Check the intake air system for leaks. Check the fuel pump module operation, check the low pressure fuel system for leaks/damage. Check the fuel filter, check the VCV and FPCV. Check the fuel injection pump. Refer to the relevant workshop manual section. Check the CKP sensor circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
Difficult to start	● Glow plug system fault (very cold conditions) ● Low/Contaminated fuel ● Air leakage ● Fuel pump module fault ● Low pressure fuel system fault ● Blocked fuel filter ● Fuel volume control valve (VCV) blocked/contaminated	Check the glow plug circuits. Check the fuel level/condition. Check the intake air system for leaks. Check the fuel pump module operation, check the low pressure fuel system for leaks/damage. Check the fuel filter, check the VCV and FPCV. For EGR valve tests, refer to the relevant workshop manual section.

Symptom	Possible causes	Action
	● Fuel pressure control valve (FPCV) blocked/contaminated ● Exhaust gas recirculation (EGR) valve(s) fault	
Rough idle	● Air ingress ● Low/Contaminated fuel ● Low pressure fuel system fault ● Blocked fuel filter ● Fuel volume control valve (VCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Exhaust gas recirculation (EGR) valve(s) fault	Check the intake air system for leaks. Check the fuel level/condition. Check the low pressure fuel system for leaks/damage. Check the fuel filter, check the VCV and FPCV and EGR valve tests, refer to the relevant workshop manual section.
Lack of power when accelerating	● Intake air system fault ● Restricted exhaust system ● Low fuel pressure ● Exhaust gas recirculation (EGR) valve(s) fault ● Variable geometry turbocharger (VGT) actuator fault	Check the intake air system. Check for a blockage/restriction in the exhaust system, install new components as necessary. Check the fuel pressure. For EGR valve tests and VGT actuator tests, refer to the relevant workshop manual section.
Engine stops/stalls	● Air leakage ● Low/Contaminated fuel ● Low pressure fuel system fault ● High pressure fuel leak ● Fuel volume control valve (VCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks. Check the fuel level/condition. Check the fuel system for leaks/damage. Check for fuel system leaks, check the VCV and FPCV. For EGR valve tests, refer to the relevant workshop manual section.
Engine judders	● Low/Contaminated fuel ● Air ingress ● Low pressure fuel system fault ● Fuel metering valve blocked/contaminated ● Fuel volume control valve (VCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● High pressure fuel leak ● Fuel injection pump fault	Check the fuel level/condition. Check the intake air system for leaks. Check the low pressure fuel system for leaks/damage. Check the high pressure fuel system for leaks, check the VCV and FPCV. Check the fuel injection pump. Refer to the relevant workshop manual section.
Excessive fuel consumption	● Low pressure fuel system fault ● Fuel volume control valve (VCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Fuel temperature sensor leak	Check the low pressure fuel system for leaks/damage. Check the VCV and FPCV, the fuel temperature sensor, fuel injection pump, etc for leaks. Refer to the relevant workshop manual section. Check for injector DTCs. For EGR valve tests, refer to the relevant workshop manual section.

Symptom	Possible causes	Action
	- High pressure fuel leak - Injector(s) failure - Exhaust gas recirculation (EGR) valve(s) fault	

DTC Index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

Power latch

There are references to "power latch" within the DTC index. This is where the module must be reset by means of a complete power down and power up.

EU3 Base Engine DTCs

DTC	Description	Possible causes	Action
C003100	Left Front Wheel Speed Sensor	- Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003400	Right Front Wheel Speed Sensor	- Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003700	Left Rear Wheel Speed Sensor	- Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
C003A00	Right Rear Wheel Speed Sensor	- Invalid data received from ABS wheel speed signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
P000100	Fuel Volume Regulator Control Circuit / Open	- Fuel volume control valve (VCV) circuit high resistance - VCV circuit open circuit - VCV failure	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000200	Fuel Volume Regulator Control Circuit Range/Performance	- Fuel volume control valve (VCV) circuit high resistance - VCV circuit short circuit to ground - VCV circuit short circuit to power - VCV failure	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000300	Fuel Volume Regulator Control Low	- Fuel volume control valve (VCV) circuit high resistance - VCV circuit short circuit to ground - VCV failure - ECM failure	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000400	Fuel Volume Regulator Control Circuit High	- Fuel volume control valve (VCV) circuit short circuit to power - VCV failure - ECM failure	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced

DTC	Description	Possible causes	Action
			separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P004500	Turbocharger/Supercharger Boost Control A Circuit / Open	● Variable geometry turbocharger (VGT) actuator circuit high resistance ● VGT actuator circuit short circuit to ground ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P004600	Turbocharger/Supercharger Boost Control A Circuit Range/Performance	● Variable geometry turbocharger (VGT) actuator circuit high resistance ● VGT actuator circuit short circuit to ground ● VGT actuator circuit short circuit to power ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P004700	Turbocharger/Supercharger Boost Control A Circuit Low	● Variable geometry turbocharger (VGT) actuator circuit high resistance ● VGT actuator circuit short circuit to ground ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P004800	Turbocharger/Supercharger Boost Control A Circuit High	● Variable geometry turbocharger (VGT) actuator circuit short circuit to power ● VGT actuator failure ● ECM failure	Refer to the electrical guides and check the VGT circuit. Refer to the warranty policy and procedures manual if a module is suspect.
P006900	MAP - Barometric Pressure Correlation	● Air leakage in intake path between turbocharger and engine ● MAP sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure ● ECM failure	Refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P006A00	MAP - Mass or Volume Air Flow Correlation	● Air leakage in intake path between turbocharger and engine ● MAP sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure ● ECM failure	Check the intake air system for leakage after the turbocharger. Refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P008700	Fuel rail/system pressure too low	● Fuel rail pressure (FRP) sensor disconnected ● FRP sensor to ECM sensing circuit short circuit to ground	Refer to the electrical guides and check the FRP sensor circuits. For FRP sensor tests, refer to the relevant workshop manual section. Check the low pressure fuel lines for damage or restrictions. Check the fuel pressure. Check the low pressure fuel pump module

DTC	Description	Possible causes	Action
		● FRP sensor supply circuit high resistance ● FRP sensor failure ● Fuel line leak ● Restricted fuel line ● Fuel pump module circuit high resistance ● Fuel pump module circuit short circuit to ground ● Fuel pump module failure ● Volume control valve fault ● Pressure control valve fault	circuits and operation. Check for fuel rail and high pressure fuel line leaks. Check for VCV and PCV DTCs and rectify as necessary.
P008800	Fuel rail/system pressure too high	● Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense): short circuit to each other ● FRP sensor to ECM sense circuit short circuit to power ● FRP sensor failure ● Fuel pressure control valve (FPCV) fault ● Fuel pump module circuit short circuit to power ● Fuel pump module failure	Check the FRP sensor circuits. Refer to the electrical guides. For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P009000	Fuel Pressure Regulator 1 Control Circuit/Open	● Fuel pressure control valve (PCV) circuit high resistance ● FPCV circuit short circuit to ground ● PCV failure	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009100	Fuel Pressure Regulator 1 Control Circuit Low	● Fuel pressure control valve (PCV) circuit high resistance ● PCV circuit short circuit to ground ● PCV failure	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009200	Fuel Pressure Regulator 1 Control Circuit High	● Fuel pressure control valve (PCV) circuit short circuit to power ● PCV failure	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009700	Intake Air Temperature Sensor 2 Circuit Low (Bank 1)	● Air charge temperature (ACT) sensor circuit high resistance ● ACT sensor circuit short circuit to ground ● ACT sensor failure	Refer to the electrical guides. and check the ACT sensor and circuits.
P009800	Intake Air Temperature Sensor 2 Circuit High (Bank 1)	● Air charge temperature (ACT) sensor circuit short circuit to power ● ACT sensor failure	Refer to the electrical guides. and check the ACT sensor and circuits.

DTC	Description	Possible causes	Action
P009900	Intake Air Temperature Sensor 2 Circuit Intermittent/Erratic (Bank 1)	● Air charge temperature (ACT) sensor circuit high resistance ● ACT sensor circuit short circuit to ground ● ACT sensor circuit short circuit to power ● ACT sensor failure	Refer to the electrical guides. and check the ACT sensor and circuits.
P010000	Mass or Volume Air Flow A Circuit	● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure	Refer to the electrical guides and check the MAF sensor and circuits. Clear the DTCs and test for normal operation. If the problem persists, renew the MAF sensor.
P010400	Mass or Volume Air Flow A Circuit Intermittent/Erratic	● Air leakage ● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure	Refer to the electrical guides and check the MAF sensor and circuits. Clear the DTCs and test for normal operation. If the problem persists, renew the MAF sensor.
P010600	Manifold Absolute Pressure/BARO Sensor Range/Performance	● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010700	Manifold Absolute Pressure/BARO Sensor Low	● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor failure	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010800	Manifold Absolute Pressure/BARO Sensor High	● Manifold absolute pressure (MAP) sensor circuit short circuit to power ● MAP sensor failure	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010900	Manifold Absolute Pressure/BARO Sensor Intermittent	● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure	Check the MAP sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010A00	Mass or Volume Air Flow B Circuit	● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor failure	Check the MAF sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P010E00	Mass or Volume Air Flow B Circuit Intermittent/Erratic	● Air leakage ● Mass air flow (MAF) sensor circuit high resistance ● MAF sensor circuit short	Refer to the relevant workshop manual section. Check the MAF sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		circuit to ground - MAF sensor circuit short circuit to power - MAF sensor failure	
P010F00	Mass or Volume Air Flow Sensor A/B Correlation	- Air leakage (post turbocharger) - Mass air flow (MAF) sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor failure - VGT actuator circuit high resistance - VGT actuator circuit short circuit to ground - VGT actuator circuit short circuit to power - VGT actuator failure	Refer to the relevant workshop manual section. Check the MAF sensor and circuits. Refer to the electrical guides. For VGT actuator circuit tests, refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P011200	Intake Air Temperature Sensor 1 Circuit Low (Bank 1)	- Intake air temperature (IAT) sensor circuit high resistance - IAT sensor circuit short circuit to ground - IAT sensor failure	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the values are outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011300	Intake Air Temperature Sensor 1 Circuit High (Bank 1)	- Intake air temperature (IAT) sensor circuit short circuit to power - IAT sensor failure	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the values are outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011400	Intake Air Temperature Sensor 1 Intermittent/Erratic (Bank 1)	- Intake air temperature (IAT) sensor circuit high resistance - IAT sensor circuit short circuit to ground - IAT sensor circuit short circuit to power - IAT sensor failure	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the values are outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011600	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	- Engine coolant temperature (ECT) sensor circuit high resistance - ECT sensor circuit short circuit to ground - ECT sensor circuit short circuit to power - ECT sensor failure	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10°C, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	- Engine coolant temperature (ECT) sensor circuit high resistance - ECT sensor circuit short circuit to ground - ECT sensor failure	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10°C, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011800	Engine Coolant Temperature Sensor 1 Circuit High	- Engine coolant temperature (ECT) sensor circuit short circuit to power	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and

DTC	Description	Possible causes	Action
		ECT sensor failure	allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10°C, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011900	Engine Coolant Temperature Sensor 1 Circuit Intermittent/Erratic	Engine coolant temperature (ECT) sensor circuit high resistance ECT sensor circuit short circuit to ground ECT sensor circuit short circuit to power ECT sensor failure	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10°C, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018100	Fuel Temperature Sensor A Circuit Range/Performance	Fuel temperature sensor circuit high resistance Fuel temperature sensor circuit short circuit to ground Fuel temperature sensor circuit short circuit to power Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018200	Fuel Temperature Sensor A Circuit Low	Fuel temperature sensor circuit high resistance Fuel temperature sensor circuit short circuit to ground Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018300	Fuel Temperature Sensor A Circuit High	Fuel temperature sensor circuit short circuit to power Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018400	Fuel Temperature Sensor A Circuit Intermittent	Fuel temperature sensor circuit high resistance Fuel temperature sensor circuit short circuit to ground Fuel temperature sensor circuit short circuit to power Fuel temperature sensor failure	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019100	Fuel Rail Pressure Sensor A Circuit Range/Performance	Fuel rail pressure (FRP) sensor circuit high resistance FRP sensor circuit short circuit to ground FRP sensor circuit short circuit to power FRP sensor failure	Check the fuel level and the condition and correct connection of the low-pressure fuel circuit lines (incorrect connection of the lines to and from the fuel filter can cause serious fuel pressure fluctuations). Check the FRP sensor and circuits. Check the fuel pump module and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P019200	Fuel Rail Pressure Sensor A Circuit Low	Fuel rail pressure (FRP) sensor circuit high resistance FRP sensor circuit short	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is 0 MPa (0 lbs/in^2), install a new

DTC	Description	Possible causes	Action
		circuit to ground - FRP sensor failure	sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019300	Fuel Rail Pressure Sensor A Circuit High	- Fuel rail pressure (FRP) sensor circuit short circuit to power - FRP sensor failure	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is greater than 180 MPa (26,106 lbs/in²), install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019400	Fuel Rail Pressure Sensor A Circuit Intermittent/Erratic	- Fuel rail pressure (FRP) sensor circuit high resistance - FRP sensor circuit short circuit to ground - FRP sensor circuit short circuit to power - FRP sensor failure	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Increase the engine speed to 2,000 rpm and recheck the fuel pressure. If the value has changed by more than 40 MPa (5,801 lbs/in²) per 10 ms, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019500	Engine Oil Temperature Sensor Circuit	- Engine oil temperature (EOT) sensor circuit high resistance - EOT sensor circuit short circuit to ground - EOT sensor circuit short circuit to power - EOT sensor failure	Check the EOT sensor and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P019600	Engine Oil Temperature Sensor Range/Performance	- Engine oil temperature (EOT) sensor circuit high resistance - EOT sensor circuit short circuit to ground - EOT sensor circuit short circuit to power - EOT sensor failure	Check the EOT sensor and circuits. Refer to the electrical guides. From cold, start the engine and check the oil temperature using a data logger function. Allow the engine to idle for ten minutes and recheck the oil temperature. If the value has not increased by more than 5°C in this time, install a new sensor. Clear the DTCs and test for normal operation.
P019700	Engine Oil Temperature Sensor Circuit Low	- Engine oil temperature (EOT) sensor circuit high resistance - EOT sensor circuit short circuit to ground - EOT sensor failure	Check the EOT sensor and circuits. Refer to the electrical guides. Repair/renew as necessary.
P019800	Engine Oil Temperature Sensor Circuit High	- Engine oil temperature (EOT) sensor circuit short circuit to power - EOT sensor failure	Check the EOT sensor and circuits. Refer to the electrical guides. Repair/renew as necessary.
P019900	Engine Oil Temperature Sensor Circuit Intermittent/Erratic	- Engine oil temperature (EOT) sensor circuit high resistance - EOT sensor circuit short circuit to ground - EOT sensor circuit short circuit to power - EOT sensor failure	Check the EOT sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the oil temperature using a data logger function. Increase the engine speed to 2,000 rpm and recheck the value after two minutes at this engine speed. If the value has increased by more than 40°C per second, install a new sensor. Clear the DTCs and test for normal operation.
P020100	Cylinder 1 Injector Circuit / Open	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short

DTC	Description	Possible causes	Action
			circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020200	Cylinder 2 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020300	Cylinder 3 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020400	Cylinder 4 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020500	Cylinder 5 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020600	Cylinder 6 Injector Circuit / Open	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high

DTC	Description	Possible causes	Action
			resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020A00	Cylinder 1 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020B00	Cylinder 2 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020C00	Cylinder 3 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020D00	Cylinder 4 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020E00	Cylinder 5 Injection Timing	• Fuel injector circuit high resistance • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew

DTC	Description	Possible causes	Action
			as necessary. Clear the DTCs and test for normal operation.
P020F00	Cylinder 6 Injection Timing	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector failure	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P021900	Engine Overspeed Condition	● Crankshaft position (CKP) sensor circuit high resistance ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CMP sensor circuit high resistance ● Camshaft position (CMP) sensor circuit short circuit to ground ● CMP sensor circuit short circuit to power ● CKP sensor failure ● CMP sensor failure	Check the CKP and CMP sensor circuits. Refer to the electrical guides. Rectify as necessary. If no fault is found in the circuits, install new sensors as necessary. Clear the DTCs and test for normal operation. Check for oil ingestion into the intake air path. Rectify as necessary.
P023400	Turbocharger/Supercharger A Overboost Condition	● Air leakage ● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure ● Exhaust gas recirculation (EGR) fault ● VGT actuator fault	Refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. For EGR valve tests, refer to the relevant workshop manual section. Check for DTCs indicating EGR or VGT actuator faults. Refer to the warranty policy and procedures manual if a module is suspect.
P029900	Turbocharger/Supercharger A Underboost Condition	● Air leakage, post turbocharger ● Manifold absolute pressure (MAP) sensor circuit high resistance ● MAP sensor circuit short circuit to ground ● MAP sensor circuit short circuit to power ● MAP sensor failure ● Exhaust gas recirculation (EGR) fault ● VGT actuator fault	Check for a post turbocharger air leak, for additional information, refer to the relevant workshop manual section. Check the MAP sensor and circuits. Refer to the electrical guides. For EGR valve tests, refer to the relevant workshop manual section. Check for DTCs indicating EGR or VGT actuator faults. Refer to the warranty policy and procedures manual if a module is suspect.
P029A00	Cylinder 1- Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC

DTC	Description	Possible causes	Action
		- Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P029B00	Cylinder 1- Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P029E00	Cylinder 2- Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P029F00	Cylinder 2 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A200	Cylinder 3 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above

DTC	Description	Possible causes	Action
		the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	tests are all within range, install a new injector.
P02A300	Cylinder 3 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A600	Cylinder 4 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A700	Cylinder 4 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AA00	Cylinder 5 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.

DTC	Description	Possible causes	Action
		● Injector fault	
P02AB00	Cylinder 5 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AE00	Cylinder 6 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AF00	Cylinder 6 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P032600	Knock Sensor 1 Circuit Range/Performance (Bank 1)	● Knock sensor (KS) circuit high resistance ● KS circuit short circuit to ground ● KS circuit short circuit to power ● KS failure	Check that the knock sensors are correctly installed and tightened to the correct torque. Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033100	Knock Sensor 1 Circuit Range/Performance (Bank 2)	● Knock sensor (KS) circuit high resistance ● KS circuit short circuit to ground ● KS circuit short circuit to power ● KS failure	Check that the knock sensors are correctly installed and tightened to the correct torque. Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.

DTC	Description	Possible causes	Action
P033500	Crankshaft Position Sensor A Circuit	● Crankshaft position (CKP) sensor gap incorrect/foreign matter on sensor face /damaged teeth on rotor ● CKP sensor circuit high resistance ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor failure	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P033600	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor gap incorrect/foreign matter on sensor face /damaged teeth on rotor ● CKP sensor circuit high resistance ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor failure	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P033700	Crankshaft Position Sensor A Circuit Low	● Crankshaft position (CKP) sensor gap incorrect/foreign matter on sensor face /damaged teeth on rotor ● CKP sensor circuit high resistance ● CKP sensor circuit short circuit to ground ● CKP sensor failure	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P033900	Crankshaft Position Sensor A Circuit Intermittent	● Crankshaft position (CKP) sensor gap incorrect/foreign matter on sensor face /damaged teeth on rotor ● CKP sensor circuit high resistance ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor failure	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P034100	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	● Camshaft position (CMP) sensor gap incorrect/foreign matter on sensor face /damaged rotor ● CMP sensor circuit high resistance ● CMP sensor circuit short circuit to ground ● CMP sensor circuit short circuit to power ● CMP sensor failure	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P034200	Camshaft Position Sensor A Circuit Low (Bank 1 or single sensor)	● Camshaft position (CMP) sensor gap incorrect/foreign matter on sensor face /damaged rotor	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		- CMP sensor circuit high resistance - CMP sensor circuit short circuit to ground - CMP sensor failure	
P038300	Glow Plug Control Module Control Circuit Low	- Glow plug relay, control circuit high resistance - Glow plug relay, control circuit short circuit to ground - Glow plug relay failure	Check the battery condition and state of charge. Check the relay and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new relay. Clear the DTCs and test for normal operation.
P038400	Glow Plug Control Module Control Circuit High	- Glow plug relay, control circuit short circuit to power - Glow plug relay failure	Check the battery condition and state of charge. Check the relay and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new relay. Clear the DTCs and test for normal operation.
P040100	Exhaust Gas Recirculation A Flow Insufficient Detected	- Exhaust gas recirculation (EGR) valve incorrectly installed or loose - EGR pipe blocked - EGR valve stuck closed, blocked - EGR coolers blocked - EGR valve failure - MAF sensor fault	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040200	Exhaust Gas Recirculation A Flow Excessive Detected	- Exhaust gas recirculation (EGR) valve incorrectly installed or loose - EGR pipe blocked - EGR valve stuck/sticking - EGR coolers blocked - EGR valve circuit high resistance - EGR valve circuit short circuit to ground - EGR valve circuit short circuit to power - EGR valve failure - MAF sensor fault	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040300	Exhaust Gas Recirculation A Control Circuit	- Exhaust gas recirculation (EGR) valve circuit high resistance - EGR valve circuit short circuit to ground - EGR valve circuit short circuit to power - EGR valve failure	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040400	Exhaust Gas Recirculation A Control Circuit Range/Performance	- Intake air temperature (IAT) sensor fault - Manifold air pressure (MAP) sensor fault - MAF sensor fault - Exhaust gas recirculation (EGR) valve stuck/sticking - EGR valve circuit high resistance - EGR valve circuit short circuit to ground - EGR valve circuit short	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		circuit to power - EGR valve failure	
P040500	Exhaust Gas Recirculation Sensor A Circuit Low	- Exhaust gas recirculation (EGR) valve circuit high resistance - EGR valve circuit short circuit to ground - EGR valve failure	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040600	Exhaust Gas Recirculation Sensor A Circuit High	- Exhaust gas recirculation (EGR) valve circuit short circuit to power - EGR valve failure	Refer to the relevant workshop manual section. Check the EGR valve, coolers and pipework. Refer to the electrical guides and check the MAF sensor and circuits. Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040700	Exhaust Gas Recirculation Sensor B Circuit Low	- Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance - EGR throttle position sensor circuit short circuit to ground - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P040800	Exhaust Gas Recirculation Sensor B Circuit High	- Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P048300	Fan Performance	- Cooling fan control circuit short circuit to ground - Cooling fan control circuit short circuit to power - Cooling fan control circuit high resistance - Cooling fan fault	Check the cooling fan operation. Refer to the electrical guides and check the fan circuit, repair/renew as necessary. Clear the DTCs and test for normal operation. Check the pulse width modulated (PWM) signal and check the motor for sticking. Repair/renew as necessary.
P048700	Exhaust Gas Recirculation Throttle Control Circuit A / Open	- Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance - Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to ground - Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048800	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	- Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command

DTC	Description	Possible causes	Action
		● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to ground ● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power ● EGR modulator failure	the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P049300	Fan Overspeed (clutch locked)	● Seized viscous coupling ● Fan speed sensor failure	Check that the viscous coupling turns independently of the fan. Refer to the electrical guides and check the viscous fan speed sensor circuit. Repair/renew as necessary.
P049400	Fan Speed Low	● Viscous fan restriction ● Viscous fan solenoid circuit high resistance ● Viscous fan solenoid circuit short circuit to ground ● Viscous fan solenoid failure	Clear any obstruction from the viscous fan. Refer to the electrical guides and check the viscous fan solenoid and circuits. Refer to the relevant workshop manual section.
P049500	Fan Speed High	● Viscous fan solenoid circuit short circuit to power ● Viscous fan solenoid failure	Refer to the electrical guides and check the viscous fan solenoid and circuits. Refer to the electrical guides.
P050000	Vehicle Speed Sensor A	● Vehicle speed invalid signal received over CAN	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050162	Vehicle Speed Sensor A Range/Performance	● Vehicle speed range/performance	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050164	Vehicle Speed Sensor A Range/Performance	● Vehicle speed range/performance	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050400	Brake switch A/B Correlation	● The brake pressure reading does not agree with the brake lamp switch value ● Brake switch failure ● ECM failure	Check the brake switch and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P050429	Brake Switch A / B Correlation	● Brake switch malfunction (sub-processor)	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P050464	Brake Switch A / B Correlation	● Brake switch malfunction	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P050600	Idle Air Control System RPM Lower Than Expected	● Intake air restriction ● Accessory drive overload (defective/seized component)	Check the air intake system. Check the accessory drive belt and components. Refer to the relevant workshop manual section.
P050700	Idle Air Control System RPM Higher Than Expected	● Intake air leak between the mass air flow (MAF) sensor and throttle ● Intake air leak between throttle and engine ● Engine crankcase breather leak	Check the air intake system. Check the engine breather system. Refer to the relevant workshop manual section.
P051216	Starter Request Circuit	● Crank request circuit low input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051217	Starter Request Circuit	● Crank request circuit high input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.

DTC	Description	Possible causes	Action
P051300	Incorrect Immobilizer Key	● Security key invalid	Program keys using the approved diagnostic system. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P052900	Fan Speed Sensor Circuit Intermittent	● Fan obstruction ● Viscous fan circuit issue ● Viscous fan damage/fault	Clear any obstruction, refer to the electrical guides and check the viscous fan solenoid and circuits. Repair/renew as necessary. Refer to the relevant workshop manual section.
P056000	System Voltage	● Battery back-up malfunction ● Battery voltage low ● Battery ground cable: high resistance ● Battery connections loose/corroded ● Battery current drain	Check the battery condition and state of charge. Refer to the relevant workshop manual section.
P056200	System Voltage Low	● Battery condition/state of charge ● Battery ground cable high resistance ● Battery connections loose/corroded ● Battery current drain ● Battery power distribution circuits	Check the battery connections and condition and charge as necessary. Refer to the electrical guides and check the battery power supplies to the ECM, etc. Repair/renew as necessary. Refer to the relevant workshop manual section.
P056300	System Voltage High	● System boosted from high voltage ● Battery voltage high ● Generator over charge condition	Check if the vehicle has been jump-started. Check the battery condition and state of charge. Refer to the relevant workshop manual section.
P056600	Cruise Control OFF Signal	● Speed control (CANCEL) switch signal circuit short circuit to power ● Speed control cancel switch stuck/jammed ● Speed control cancel switch failure	Check the operation of the cancel switch. Refer to the electrical guides and check the circuit. Repair/renew as necessary. Refer to the relevant workshop manual section.
P056700	Cruise Control RESUME Signal	● Speed control (RESUME) switch signal circuit short circuit to power ● Speed control resume switch stuck/jammed ● Speed control resume switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P056900	Cruise Control COAST Signal	● Speed control (-) switch signal circuit short circuit to power ● Speed control - switch stuck/jammed ● Speed control - switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P057000	Cruise Control ACCEL Signal	● Speed control + switch signal circuit short circuit to power ● Speed control + switch stuck/jammed ● Speed control + switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P057100	Brake Switch A Circuit	● The brake pressure reading does not agree with the brake lamp switch value	Check the brake switch and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		- Brake switch failure - ECM failure	
P057400	Cruise Control System - Vehicle Speed Too High	- Incorrect speed sensor signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
P057600	Cruise Control Input Circuit Low	- Speed control switch short circuit to ground - Speed control switch high resistance	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057700	Cruise Control Input Circuit High	- Speed control switch short circuit to power	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057800	Cruise Control Multi-Function Input A Circuit Stuck	- Speed control multi-function input A circuit high resistance - Speed control multi-function input A circuit short circuit to ground - Speed control multi-function input A circuit short circuit to power - Speed control switch stuck	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057900	Cruise Control Multi-Function Input A Circuit Range/Performance	- Speed control multi-function input A circuit high resistance - Speed control multi-function input A circuit short circuit to ground - Speed control multi-function input A circuit short circuit to power - Speed control switch stuck	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P058500	Cruise Control Multi-Function Input A / B Correlation	- Cruise control acceleration monitor fault	Check for other DTCs and Repair/renew those first. Clear this DTC and retest.
P060000	Serial Communication Link	- Internal control module communication link	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060143	Internal Control Module Memory Check Sum Error	- Transmission control module (TCM) internal control module memory check sum error - special memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060145	Internal Control Module Memory Check Sum Error	- Transmission control module (TCM) internal control module memory check sum error - program memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060300	Internal Control Module Keep Alive Memory (KAM) Error	- ECM internal control module KAM error	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060400	Internal Control Module Random Access Memory (RAM) Error	- ECM internal control module RAM error	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060442	Internal Control Module Random Access Memory (RAM) Error	- ECM general memory failure	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060443	Internal Control Module Random Access Memory (RAM) Error	- ECM shut off RAM test - special memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P060444	Internal Control Module Random Access Memory (RAM) Error	- ECM RAM check sum - data memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060445	Internal Control Module Random Access Memory (RAM) Error	- ECM failure - program memory failure	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060500	Internal Control Module Read Only Memory (ROM) Error	- ECM internal control module ROM error	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060542	Internal Control Module Read Only Memory (ROM) Error	- TCM - general memory failure ROM checksum	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060543	Internal Control Module Read Only Memory (ROM) Error	- TCM - shut off ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060544	Internal Control Module Read Only Memory (ROM) Error	- TCM - initial ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060545	Internal Control Module Read Only Memory (ROM) Error	- TCM - continuous ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060546	Internal Control Module Read Only Memory (ROM) Error	- TCM - continuous ROM test	Clear DTC and retest. If the problem persists, renew the TCM. Refer to the warranty policy and procedures manual if a module is suspect.
P060548	Internal Control Module Read Only Memory (ROM) Error	- ECM circuits short circuit to ground - ECM circuits short circuit to power - ECM circuits high resistance - TCM - shut off ROM test - supervision software fault	Check the ECM circuits. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060601	Control Module Processor	- PCM/ECM processor - Controller test - general electrical failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060604	Control Module Processor	- PCM/ECM processor error capturing instructions	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060605	Control Module Processor	- PCM/ECM processor scheduling sequence check - system programming failures	Program the module using the approved diagnostic system.
P060641	Control Module Processor	- PCM/ECM processor watch dog timer fault - general checksum failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060642	Control Module Processor	- PCM/ECM processor error capturing instructions - general memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060643	Control Module Processor	- PCM/ECM processor duplication memory fault - special memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060644	Control Module Processor	- PCM/ECM processor duplication memory fault - data memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060645	Control Module Processor	- PCM/ECM processor detection of write to internal ROM - program memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P060646	Control Module Processor	- PCM/ECM processor detection of write to internal ROM - calibration/parameter memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060647	Control Module Processor	- PCM/ECM processor watch dog timer fault/processor fault	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060648	Control Module Processor	- PCM/ECM processor scheduling sequence check/processor - supervision software failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060649	Control Module Processor	- PCM/ECM processor controller test/processor - internal electronic failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060700	Control Module Performance	- ECM - event information - CPU watch dog	Check the ECM circuits and connectors. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060A00	Internal Control Module Monitoring Processor Performance	- ECM - event information - CPU watch dog	Check the ECM circuits and connectors. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060B00	Internal Control Module A/D Processing Performance	- ECM - event information - Processor monitoring conversion not plausible	Check the ECM circuits and connectors. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060C00	Internal Control Module Main Processor Performance	- ECM - event information processor monitoring speed not plausible	Check the ECM circuits and connectors. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060D00	Internal Control Module Accelerator Pedal Position Performance	- ECM internal communication error	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060E62	Internal Control Module Throttle Position Performance	- Throttle motor amplifier failure for valve sensor malfunction - ECM internal signal compare failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060E64	Internal Control Module Throttle Position Performance	- Throttle position communication - ECM internal signal plausibility failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P061000	Control Module Vehicle Options Error	- Car configuration file (CCF) settings mismatch	Configure the module using the approved diagnostic system.
P061600	Starter Relay Circuit Low	- Starter relay drive circuit short circuit to ground - Starter relay drive circuit high resistance - Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.
P061700	Starter Relay Circuit High	- Starter relay drive circuit short circuit to battery - Starter relay failure	Check the starter relay operation. Refer to the electrical guides and check the starter relay circuit. Repair/renew as necessary.

DTC	Description	Possible causes	Action
P061A00	Internal Control Module Torque Performance	● Pedal follower error	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061A29	Internal Control Module Torque Performance	● Absolute engine torque calculation failure - sub-processor	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061A64	Internal Control Module Torque Performance	● Absolute engine torque calculation failure	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061B29	Internal Control Module Torque Calculation Performance	● Internal control module torque calculation performance	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061B64	Internal Control Module Torque Calculation Performance	● Internal control module torque calculation performance	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061C00	Internal Control Module Engine RPM Performance	● Processor monitoring speed not plausible	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061E00	Internal Control Module Brake Signal Performance	● Cruise intervention not plausible	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P062000	Generator Control Circuit	● Generator failure	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P062200	Generator Field Terminal Circuit	● Generator circuit fault ● Generator failure	Refer to the electrical guides and check the generator circuit. Repair/renew as necessary. Refer to the relevant workshop manual section.
P062500	Generator Field Terminal Circuit Low	● Voltage sense circuit high resistance ● Generator B+ circuit high resistance/intermittent ● Generator monitor circuit short circuit to ground	Check the main charging circuit fuse. Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P062600	Generator Field Terminal Circuit High	● Generator connector loose/not connected ● Generator monitor circuit short circuit to power ● Generator monitor circuit high resistance	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P062700	Fuel Pump A Control Circuit / Open	● Fuel pump module relay control circuit short circuit to power ● Fuel pump module relay failure	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Refer to the relevant workshop manual section. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062800	Fuel Pump A Control Circuit Low	● Fuel pump control circuit short circuit to ground ● Fuel pump control circuit high resistance ● Fuel pump relay fault	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062900	Fuel Pump A Control Circuit High	● Fuel pump control circuit short circuit to power ● Fuel pump relay fault	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P062B00	Internal Control Module Fuel Injector Control Performance	● Fuel cut not plausible ● Monitoring of post injection ● Monitoring of fuel mass adaption ● Monitoring of accelerator pedal position	Check and Repair/renew other DTCs first. If this code still sets, contact the technical help desk.
P062D00	Fuel Injector Driver Circuit Performance Bank 1	● Injector(s) disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure ● ECM failure	Refer to the electrical guides and check the injector circuits. Rectify as necessary. Clear the DTCs and test for normal operation. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P062E00	Fuel Injector Driver Circuit Performance Bank 2	● Injector(s) disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure ● ECM failure	Refer to the electrical guides and check the injector circuits. Rectify as necessary. Clear the DTCs and test for normal operation. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P063000	VIN Not Programmed or Incompatible - ECM/PCM	● VIN not programmed ● VIN incompatible with vehicle specification	Configure the module using the approved diagnostic system.
P063305	Immobilizer Key Not Programmed - ECM/PCM	● Security target ID transfer process failed	Program the key using the approved diagnostic system.
P063355	Immobilizer Key Not Programmed - ECM/PCM	● Security no target in EMS	Program the module using the approved diagnostic system.
P063400	PCM / ECM / TCM Internal Temperature A Too High	● ECM internal temperature too high ● E box cooling fan obstruction ● E box cooling fan operation ● ECM internal sensor error	Consider atmospheric and customer driving conditions before carrying out any other action. Check the E box cooling fan function. Refer to the electrical guides and check the ECM circuits. Using a datalogger function, check the ECM temperature. If the temperature value is greater than 130°C (266°F) suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P063422	PCM / ECM / TCM Internal Temperature A Too High	● ECM internal temperature too high ● E box cooling fan obstruction ● E box cooling fan operation ● ECM internal sensor error	Consider atmospheric and customer driving conditions before carrying out any other action. Check the E box cooling fan function. Refer to the electrical guides and check the ECM circuits. Using a datalogger function, check the ECM temperature. If the temperature value is greater than 130°C (266°F) suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P063424	PCM / ECM / TCM Internal Temperature A Too High	● ECM internal temperature too high ● E box cooling fan obstruction ● E box cooling fan operation ● ECM internal sensor error	Consider atmospheric and customer driving conditions before carrying out any other action. Check the E box cooling fan function. Refer to the electrical guides and check the ECM circuits. Using a datalogger function, check the ECM temperature. If the temperature value is greater than 130°C (266°F) suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P064200	Sensor Reference Voltage A Circuit Low	● ECM power supply circuit high resistance ● ECM power supply circuit short circuit to ground ● ECM ground circuit high resistance ● 5 Volt supply ● ECM relay malfunction ● ECM failure	Check the ECM power supply and relay circuits. Check the 5 volt sensor supply. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P064300	Sensor Reference Voltage A Circuit High	• ECM power supply circuit short circuit to power • ECM ground circuit short circuit to power • 5 Volt supply • ECM relay malfunction • ECM failure	Check the ECM power supply and relay circuits. Check the 5 volt sensor supply. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P060644	Control Module Processor	• PCM/ECM processor duplication memory fault - data memory failure	Clear DTC and retest. If the problem persists, renew the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P065200	Sensor Reference Voltage B Circuit Low	• ECM power supply circuit high resistance • ECM power supply circuit short circuit to ground • ECM ground circuit high resistance • 5 Volt supply • ECM relay malfunction • ECM failure	Check the ECM power supply and relay circuits. Check the 5 volt sensor supply. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P065300	Sensor Reference Voltage B Circuit High	• ECM power supply circuit short circuit to power • ECM ground circuit short circuit to power • 5 Volt supply • ECM relay malfunction • ECM failure	Check the ECM power supply and relay circuits. Check the 5 volt sensor supply. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P066700	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance	• ECM internal temperature sensor range/performance	Check the ECM circuits. Refer to the electrical guides. Using a data logger function, check the ECM internal temperature. Start the engine and allow to idle for five minutes before rechecking the temperature. If the temperature has increased by more than 10°C per 100 ms suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P066800	PCM / ECM / TCM Internal Temperature Sensor A Circuit Low	• ECM temperature sensor circuit short circuit to ground	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, check the ECM circuits. Refer to the electrical guides. Using a datalogger function, check the ECM internal temperature. If the value is less than -40°C (-40°F), suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P066900	PCM / ECM / TCM Internal Temperature Sensor A Circuit High	• TCM temperature sensor circuit short circuit to power	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P067000	Glow Plug Control Module Control Circuit / Open	• Glow plug relay, control circuit high resistance • Glow plug relay, control circuit short circuit to ground • Glow plug relay failure	Check the glow plug relay circuits. Refer to the electrical guides. Check the relay operation. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P068700	ECM/PCM Power Relay Control Circuit High	• ECM control relay malfunction	Check the ECM relay and circuit. Refer to the electrical guides.
P069300	Fan 2 Control Circuit Low	• Viscous fan control circuit short circuit to ground • Viscous fan control circuit high resistance • Viscous fan solenoid failure	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P069400	Fan 2 Control Circuit High	• Viscous fan control circuit short circuit to power • Viscous fan solenoid failure	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P069500	Fan 3 Control Circuit Low	● E box fan circuit short circuit to ground	Check the E box fan operation and circuit. Refer to the electrical guides.
P069600	Fan 3 Control Circuit High	● E box fan circuit short circuit to power	Check the E box fan operation and circuit. Refer to the electrical guides.
P070000	Transmission Control System (MIL Request)	● Transmission fault	Check for other DTCs and rectify those first. Clear this DTC and retest.
P085100	Park / Neutral Switch Input Circuit Low	● Park/Neutral switch circuit short to ground	Check the switch and circuits. Refer to the electrical guides and repair/renew as necessary. Clear the DTCs and test for normal operation.
P085200	Park / Neutral Switch Input Circuit High	● Park/Neutral switch circuit short to power	Check the switch and circuits. Refer to the electrical guides and repair/renew as necessary. Clear the DTCs and test for normal operation.
P0A0900	DC/DC Converter Status Circuit Low	● DC/DC converter circuit low	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P0A1000	DC/DC Converter Status Circuit High	● DC/DC converter circuit high	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P113600	E box fan circuit performance	● E box fan circuit short circuit to ground ● E box fan circuit short circuit to power ● E box fan circuit high resistance ● E box fan failure	Check the E box fan and circuits and fan operation. Refer to the electrical guides.
P120000	Injector Range/Performance	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector leaking ● Fuel injector failure ● ECM failure	Refer to the electrical guides and check the injector circuits. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P125900	Immobilizer to PCM Signal Error	● Incorrect ID received from instrument pack	Configure the system using the approved diagnostic system.
P133400	EGR Throttle Position Sensor Minimum/Maximum Stop Performance	● Exhaust gas recirculation (EGR) valve stuck/sticking ● EGR valve circuit high resistance ● EGR valve circuit short circuit to ground ● EGR valve circuit short circuit to power ● Intake air shut off throttle stuck/sticking ● Intake air shut off throttle circuit high resistance ● Intake air shut off throttle circuit short circuit to ground ● Intake air shut off throttle circuit short circuit to power ● Intake air shut off throttle failure ● ECM failure	Check the EGR valve and circuits. Refer to the electrical guides. Refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P133500	EGR Position Sensor Minimum/Maximum Stop Performance	● EGR valve circuit high resistance ● EGR valve circuit short circuit to ground	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The

DTC	Description	Possible causes	Action
		• EGR valve circuit short circuit to power • EGR valve failure	value should be 0 - 20%. If the value is outside this range, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P133600	Crankshaft/Camshaft Sensor Range/Performance	• CKP sensor circuit high resistance • CKP sensor circuit short circuit to ground • CKP sensor circuit short circuit to power • CMP sensor circuit high resistance • CMP sensor circuit short circuit to ground • CMP sensor circuit short circuit to power • CKP sensor failure • CMP sensor failure	Check the CMP and CKP sensors and circuits. Refer to the electrical guides. If no fault is found in the circuits, install new sensors as necessary. Clear the DTCs and test for normal operation.
P140A00	Exhaust Gas Recirculation Sensor C Circuit Low	• EGR valve circuit (left-hand bank) high resistance • EGR valve circuit short circuit to ground • EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle with the ignition on and the engine off. Command the valve angle to 0% pulse width modulated (PWM), then to 100% pulse width modulated (PWM) and recheck the angles. The angles should range between 0 - 20% and 80 - 95%. If this is not the case, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P140B00	Exhaust Gas Recirculation Sensor C Circuit High	• EGR valve circuit (left-hand bank) short circuit to power • EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angle with the ignition on and the engine off. Command the valve angle to 0% pulse width modulated (PWM), then to 100% pulse width modulated (PWM) and recheck the angles. The angles should range between 0 - 20% and 80 - 95%. If this is not the case, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P140C00	Exhaust Gas Recirculation Control Circuit B	• Intake air shut off throttle circuit high resistance • Intake air shut off throttle circuit short circuit to ground • Intake air shut off throttle circuit short circuit to power • Intake air shut off throttle failure • ECM failure	Check the EGR valve and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P140D00	Exhaust Gas Recirculation Control Circuit B Range/Performance	• Exhaust gas recirculation (EGR) control circuit range/performance (left-hand bank) • Intake air temperature (IAT) sensor fault • Manifold absolute pressure (MAP) sensor fault • Mass air flow (MAF) sensor fault • EGR valve stuck closed, blocked • EGR valve circuit high resistance • EGR valve circuit short circuit to ground	Check the IAT, MAP and MAF sensors and circuits. Refer to the electrical guides. For left-hand bank EGR valve circuit tests, refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
		- EGR valve circuit short circuit to power - EGR valve failure	
P140E00	EGR Position Sensor C Minimum/Maximum Stop Performance	- Exhaust gas recirculation (EGR) valve circuit (left-hand bank) high resistance - EGR valve circuit short circuit to ground - EGR valve circuit short circuit to power - EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Using a datalogger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be between 0 - 20%. If the value is outside this range, install a new valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P141A00	Exhaust Gas Recirculation Sensor A Circuit Intermittent/Erratic	- EGR valve circuit (right-hand bank) high resistance - EGR valve circuit short circuit to ground - EGR valve circuit short circuit to power - EGR valve failure	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P141B00	Exhaust Gas Recirculation Sensor B Circuit Intermittent/Erratic	- Intake air shut off throttle circuit high resistance - Intake air shut off throttle circuit short circuit to ground - Intake air shut off throttle circuit short circuit to power - Intake air shut off throttle failure	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P141C00	Exhaust Gas Recirculation Sensor C Circuit Intermittent/Erratic	- EGR valve circuit (left-hand bank) high resistance - EGR valve circuit short circuit to ground - EGR valve circuit short circuit to power - EGR valve failure - ECM failure	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a datalogger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P151B00	Idle Speed Control - RPM Lower Than Expected	- Oil level - Intake air restriction - Accessory drive overload (defective/seized component) - Engine compression	Check the engine oil level and condition. Check the driven components (generator, air conditioning compressor, etc). Repair/renew as necessary. Check the engine compressions only once other options are ruled out. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P151C00	Idle Speed Control - RPM Higher Than Expected	- Intake air leak between MAF sensor and intake air shut off throttle - Intake air leak between intake air shut off throttle and engine - Engine crankcase breather leak	Inspect the engine intake AND breather system, refer to the relevant workshop manual section.
P155100	Cylinder 1 Injector Circuit Range/Performance	- Injector disconnected - Injector circuit high resistance, short circuit to ground, short circuit to power - Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
P155200	Cylinder 2 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155300	Cylinder 3 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155400	Cylinder 4 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155500	Cylinder 5 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P155600	Cylinder 6 Injector Circuit Range/Performance	● Injector disconnected ● Injector circuit high resistance, short circuit to ground, short circuit to power ● Injector failure	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Refer to the relevant workshop manual section.
P156300	Injection Pump Control Module Requesting Engine Stop	● Internal control module monitoring performance	Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, refer to the warranty policy and procedures manual if a module is suspect.
P159000	Cruise Control INCREASE DISTANCE Signal	● Speed control headway plus switch stuck/jammed ● Speed control headway plus switch signal circuit short circuit to power ● Speed control headway plus switch failure	Check the cruise control switch operation. Refer to the electrical guides and check the circuits. Rectify as necessary. Refer to the relevant workshop manual section.
P159100	Cruise Control DECREASE DISTANCE Signal	● Speed control headway minus switch stuck/jammed ● Speed control headway minus switch signal circuit short circuit to power ● Speed control headway minus switch failure	Check the cruise control switch operation. Refer to the electrical guides and check the circuits. Rectify as necessary. Refer to the relevant workshop manual section.
P160200	Immobilizer/ECM Communication Error	● CAN Link ECM/instrument cluster CAN timeout	Refer to the Network Communications section in the workshop manual.
P162100	Immobilizer Code Words Do Not Match	● Challenge does not match	Configure the system using the approved diagnostic system.
P162200	Immobilizer ID Does Not Match	● Key status unknown	Program the key using the approved diagnostic system.
P163900	Vehicle ID Block Corrupted, Not Programmed	● Vehicle configuration	Configure the system using the approved diagnostic system.
P193400	Vehicle Speed Signal	● Vehicle speed invalid signal received over CAN	Check for ABS and TCM DTCs and rectify as necessary. Refer to the relevant workshop manual section. Refer to the Network Communications section in the workshop manual.

DTC	Description	Possible causes	Action
P193500	Brake Switch/Sensor Signal	● Error on brake switch sensor coming on CAN	Check the brake switch operation. Refer to the electrical guides and check the circuits. Refer to the Network Communications section in the workshop manual.
P193600	Clutch Switch/Sensor Signal	● Clutch switch/sensor CAN signal plausibility	Check for DTCs indicating CAN serial bus errors. Refer to the Network Communications section in the workshop manual.
P193A00	Invalid Scan Tool Communication/Request	● Invalid scan tool communication request	This is not a fault, but event information of the communication between the scan tool and ECM. Clear/ignore this DTC.
P200800	Intake Manifold Runner Control Circuit / Open (Bank 1)	● Port de-activation solenoid circuit high resistance ● Port de-activation solenoid circuit short circuit to ground ● Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P200900	Intake Manifold Runner Control Circuit Low (Bank 1)	● Port de-activation solenoid circuit high resistance ● Port de-activation solenoid circuit short circuit to ground ● Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P201000	Intake Manifold Runner Control Circuit High (Bank 1)	● Port de-activation solenoid circuit short circuit to power ● Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P212200	Throttle/Pedal Position Sensor/Switch D Circuit Low	● Circuit voltage below threshold - track 1 ● Accelerator pedal position (APP) sensor circuits short circuit to ground ● APP sensor circuits short circuit to power ● APP sensor fault	Check the APP sensor circuits. Refer to the electrical guides. Using a datalogger function, check the APP sensor track 1 value with the pedal in the rest position. If the value is not approximately 0%, install a new pedal. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P212300	Throttle/Pedal Position Sensor/Switch D Circuit High	● Circuit voltage above threshold - track 1 ● Accelerator pedal position (APP) sensor circuits short circuit to ground ● APP sensor circuits short circuit to power ● APP sensor fault	Check the APP sensor circuits. Refer to the electrical guides. Using a datalogger function, check the APP sensor track 1 value with the pedal in the rest position. If the value is not approximately 99%, install a new pedal. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P212700	Throttle/Pedal Position Sensor/Switch E Circuit Low	● Circuit voltage below threshold - track 2 ● Accelerator pedal position (APP) sensor circuits short circuit to ground ● APP sensor circuits short circuit to power ● APP sensor fault	Check the APP sensor circuits. Refer to the electrical guides. Using a datalogger function, check the APP sensor track 2 value with the pedal in the rest position. If the value is not approximately 0%, install a new pedal. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P212800	Throttle/Pedal Position Sensor/Switch E Circuit High	● Circuit voltage above threshold - track 2 ● Accelerator pedal position (APP) sensor circuits short circuit to ground ● APP sensor circuits short circuit to power ● APP sensor fault	Check the APP sensor circuits. Refer to the electrical guides. Using a datalogger function, check the APP sensor track 2 value with the pedal in the wide open position. If the value is not approximately 99%, install a new pedal. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P213800	Throttle/Pedal Position Sensor/Switch D / E Voltage Correlation	• Signal compare fault (the value difference between channels is greater than it should be • Accelerator pedal position (APP) sensor circuits short circuit to ground • APP sensor circuits short circuit to power • APP sensor fault	Check the APP sensor circuits. Refer to the electrical guides. Using a datalogger function, check the APP sensor values for tracks 1 and 2 with the pedal in the idle position, and again in the wide open position. Both tracks should read approximately 0% in the idle position and 99% in the wide open position. If any of the values are incorrect, install a new pedal. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P214100	Exhaust Gas Recirculation Throttle Control Circuit A Low	• EGR sensor circuits short circuit (to ground/power /other circuits • EGR sensor circuits high resistance • EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle set point and the actual throttle position, and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between set point and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new right-hand valve as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P214200	Exhaust Gas Recirculation Throttle Control Circuit A High	• EGR sensor circuits short circuit (to ground/power /other circuits • EGR sensor circuits high resistance • EGR sensor fault	Check the EGR sensor circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation. Using a datalogger function, read the difference between the EGR throttle set point and the actual throttle position, and the EGR throttle position. Check that the throttle is open and command the throttle closed. Check that the throttle position value increases to above 90%. Check the difference between set point and actual. This value should not exceed either maximum 5% or minimum -15%. Check that the EGR throttle is not sticking. Install a new left-hand valve as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P219900	Intake Air Temperature ½ Correlation	• Intake air temperature (IAT) sensor circuit high resistance, short circuit to ground, short circuit to power • Air charge temperature (ACT) sensor circuit high resistance, short circuit to ground, short circuit to power • IAT sensor failure • ACT sensor failure • ECM failure	Check the IAT sensor and circuits. Refer to the electrical guides. For ACT sensor, refer to the relevant workshop manual section. Refer to the warranty policy and procedures manual if a module is suspect.
P222800	Barometric Pressure Sensor A Circuit Low	• Barometric sensor failure (internal ECM fault)	Using a datalogger function, check the ambient pressure and the manifold absolute pressures in both banks with the engine off. If the ambient pressure is significantly different to the manifold pressures suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P222900	Barometric Pressure Sensor A Circuit High	• Barometric sensor failure (internal ECM fault)	Using a datalogger function, check the ambient pressure and the manifold absolute pressures in both banks with the engine off. If the ambient pressure is significantly different to the manifold pressures suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.

DTC	Description	Possible causes	Action
P223000	Barometric Pressure Sensor A Circuit Intermittent/Erratic	● BARO sensor failure (internal ECM fault)	Check the ECM circuits. Refer to the electrical guides. Using a datalogger function, check the ambient pressure. Increase the engine speed to 1,500 rpm and recheck the pressure. If the pressure has increased by more than 30 KPa (4.35 lbs/in²) per 100 ms, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P226300	Turbocharger/Supercharger Boost System Performance	● Air leakage post turbocharger ● Intake air temperature (IAT) sensor circuit high resistance, short circuit to ground, short circuit to power ● Manifold absolute pressure (MAP) sensor circuit high resistance, short circuit to ground, short circuit to power ● Mass air flow (MAF) sensor circuit high resistance, short circuit to ground, short circuit to power ● Exhaust gas recirculation (EGR) circuit high resistance, short circuit to ground, short circuit to power ● VGT actuator failure ● Turbocharger vanes stuck/sticking	Check the turbocharger and linkage mechanical condition. Check the intake air system condition, rectify as necessary. Check for sensor DTCs. Check the IAT and MAP sensor circuits. Refer to the electrical guides and rectify as necessary. Using a datalogger function, check the turbocharger actuator position. Turn the ignition on, engine off and command the turbocharger actuator to 95% pulse width modulated (PWM) then to 5% pulse width modulated (PWM) and recheck the turbocharger actuator position. The value at 95% pulse width modulated (PWM) should be 80 - 95%, and at 5% pulse width modulated (PWM), 0 - 20%. If this is not the case, install a new turbocharger. Clear the DTCs and test for normal operation.
P226900	Water in Fuel Condition	● Water in fuel condition ● Water in fuel sensor circuit short circuit to ground ● Water in fuel sensor fault	Drain the water from the fuel filter. Clear the DTC and retest. If the DTC resets, check the sensor circuit. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor.
P228800	Injector Control Pressure Too High	● Fuel pressure control valve (FPCV) minimum limit reached ● Fuel injector control pressure too high ● FPCV circuit fault ● FPCV failure ● Fuel pump module circuit short circuit to power ● Fuel pump module failure ● Fuel injection pump failure	Check the fuel pressure, refer to the relevant section of the workshop manual. Check the fuel pump module circuits and the FPCV circuits. Refer to the electrical guides. For FPCV and fuel injection pump, refer to the relevant workshop manual section.
P229000	Injector Control Pressure Too Low	● Fuel pressure control valve (FPCV) maximum limit reached ● Fuel injector control pressure too low ● Fuel line leak ● Fuel filter/system restriction ● FPCV circuit fault ● FPCV failure ● Fuel pump module circuit short circuit to ground ● Fuel pump module failure ● Fuel injection pump failure	Check the fuel pressure, refer to the relevant section of the workshop manual. Check the fuel pump module circuits and the FPCV circuits. Refer to the electrical guides. For FPCV and fuel injection pump, refer to the relevant workshop manual section.
P229200	Injector Control Pressure Erratic	● Fuel injector control pressure erratic ● FPCV circuit fault	Check the fuel pressure, refer to the relevant section of the workshop manual. Check the fuel pump module circuits and the FPCV circuits. Refer to the electrical

DTC	Description	Possible causes	Action
		- FPCV failure - Fuel pump module circuit high resistance, short circuit to ground, short circuit to power - Fuel pump module failure - Fuel injection pump failure	guides. For FPCV and fuel injection pump, refer to the relevant workshop manual section.
P229900	Brake Pedal Position/Accelerator Pedal Position Incompatible	- Event information (this code indicates unexpected simultaneous operation of the accelerator and brake pedals) - Brake lamp switch fault - Accelerator pedal position (APP) sensor fault - APP sensor circuits short circuit to ground - APP sensor circuits short circuit to power - APP sensor circuits high resistance - Brake lamp switch circuits short circuit to ground - Brake lamp switch circuits short circuit to power - Brake lamp switch circuits high resistance	Check the brake lamp function. If the brake lights function correctly, check the APP sensor using a datalogger function. Check both APP sensor tracks with the pedal in the rest position. Recheck the values with the pedal in the wide-open position. Both tracks should range between 0% at idle to 99% at wide open throttle. If the values are correct, check the APP sensor and brake lamp switch circuits. Refer to the electrical guides. Also note that the driver may have been left-foot-braking. If the values are incorrect, install a new pedal. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P250500	ECM / PCM Power Input Signal	- ECM relay circuit high resistance - ECM relay circuit short circuit to ground - ECM relay failure	Check the ECM relay circuits. Refer to the electrical guides. Activate the relay and check for an audible 'click'. Install a new relay as necessary. Clear the DTCs and test for normal operation.
P250700	ECM / PCM Power Input Signal Low	- ECM relay circuit high resistance - ECM relay circuit short circuit to ground - ECM relay failure	Check the ECM relay circuits. Refer to the electrical guides. Activate the relay and check for an audible 'click'. Install a new relay as necessary. Clear the DTCs and test for normal operation.
P250800	ECM / PCM Power Input Signal High	- ECM relay circuit short circuit to power - ECM relay failure	Check the ECM relay circuits. Refer to the electrical guides. Activate the relay and check for an audible 'click'. Install a new relay as necessary. Clear the DTCs and test for normal operation.
U000100	High Speed CAN Communication Bus	- CAN Mute	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U007300	Control Module Communication Bus "A" Off	- CAN Link circuit malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U010100	Lost Communication With TCM	- CAN Link ECM/TCM network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Action
U010200	Lost Communication With Transfer Case Control Module	- CAN Link ECM/transfer case control module network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U010400	Lost Communication With Cruise Control Module	- CAN Link engine control module ECM/Speed control module CAN timeout	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U012100	Lost Communication With Anti-Lock Brake System (ABS) Control Module	- CAN Link ECM/ABS network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U012600	Lost Communication With Steering Angle Sensor Module	- CAN Link ECM/steering angle sensor network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U012800	Lost Communication With Park Brake Control Module	- CAN Link ECM/electric park brake signal missing network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U013300	Lost Communication With Suspension Control Module "A"	- CAN Link ECM/active roll control module network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U013800	Lost Communication with All Terrain Control Module	- CAN Link ECM/terrain optimization switch network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U015100	Lost Communication With Restraints Control Module	- Lost communications - CAN or hardwired	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U01511F	Lost Communication With Restraints Control Module	- Lost communications - SRS fault	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Action
U015157	Lost Communication With Restraints Control Module	● Lost communications - CAN fault	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U015500	Lost Communication With Instrument Panel Cluster (IPC) Control Module	● CAN Link ECM/IPC network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U016400	Lost Communication With HVAC Control Module	● CAN communication error	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U016700	Lost Communication With Vehicle Immobilizer Control Module	● Security challenge response timeout	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U017000	Lost Communication With "Restraints System Sensor A"	● CAN Link ECM/restraints control module (RCM) network malfunction	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U023500	Lost Communication With Cruise Control Front Distance Range Sensor	● Lost communication ● Fault status transmitted	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U040264	Invalid Data Received from TCM	● Invalid data received from transmission control module - actual gear position status	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U040267	Invalid Data Received from TCM	● Invalid data received from transmission control module - gear shifter position status	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U040281	Invalid Data Received from TCM	● Invalid data received from transmission control module - output shaft speed signal	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Action
U042381	Invalid Data Received From Instrument Panel Control Module	- External ambient temperature	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U042386	Invalid Data Received From Instrument Panel Control Module	- Battery voltage level	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.
U042600	Invalid Data Received From Vehicle Immobilizer Control Module	- Security code mismatch	Check the configuration of the modules using the approved diagnostic system.
U040500	Invalid Data Received From Cruise Control Module	- ECM/speed control module invalid data received	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. Refer to the Network Communications section of the workshop manual.

EU4 Additional DTCs

DTC	Description	Possible causes	Action
B10A231	Crash Input	- Inertia event circuit open circuit	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A236	Crash Input	- Inertia event circuit frequency low	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A237	Crash Input	- Inertia event circuit frequency high	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A239	Crash Input	- Inertia event circuit frequency below mid level	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A23A	Crash Input	- Inertia event circuit frequency above mid level	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
P000113	Fuel Volume Regulator Control Circuit / Open	- Fuel volume control valve circuit high resistance - Fuel volume control valve circuit open circuit - Fuel volume control valve fault	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000311	Fuel Volume Regulator Control Circuit Low	- Fuel volume control valve circuit short circuit to ground - Fuel volume control valve fault	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P000319	Fuel Volume Regulator Control Circuit Low	- Fuel volume control valve circuit short circuit to ground - Fuel volume control valve fault	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the

DTC	Description	Possible causes	Action
			resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000412	Fuel Volume Regulator Control Circuit High	● Fuel volume control valve (VCV) circuit short circuit to power ● VCV failure	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a HPP is suspect.
P000E21	Fuel Volume Regulator Control Exceeded Learning Limit	● Fuel volume control valve amplitude is less than the minimum specified	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P000E22	Fuel Volume Regulator Control Exceeded Learning Limit	● Fuel volume control valve amplitude is greater than the maximum specified	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P006A21	MAP - Mass or Volume Air Flow Correlation	● Air leakage in the intake path between the turbocharger and the engine	Check the intake air system for leakage after the turbocharger. Check for DTCs indicating a MAP sensor fault. Rectify as necessary. Clear the DTCs and test for normal operation.
P006A22	MAP - Mass or Volume Air Flow Correlation	● Mass or volume air flow correlation: right-hand bank - signal amplitude greater than maximum ● Oil ingress into the intake manifold ● Manifold absolute sensor and temperature (MAPT) sensor circuit fault ● MAPT sensor fault ● MAF sensor fault ● Turbocharger fault	With the engine at idle, check the manifold air pressure and indicated torque set points using a data logger function. If the manifold air pressure is greater than 140 KPa (20.31 lbs/in²) or the torque less than 70 Nm (51.63 lbf/ft), check for oil being drawn into the intake manifold. Repair/renew as necessary. Clear the DTCs and test for normal operation. Stop the engine and turn the ignition on. Using a data logger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% pulse width modulated (PWM) and check the angle values. The angle at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% 80 - 95%. If the values are inside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. If the values are outside this range, install a new turbocharger. Clear the DTCs and test for normal operation.
P007C16	Charge Air Cooler Temperature Sensor Circuit Low (Bank 1)	● Right-hand charge air temperature sensor circuit high resistance (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) ● Charge air temperature sensor circuit short circuit to ground ● Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. Install a new MAPT if necessary. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P007D17	Charge Air Cooler Temperature Sensor Circuit High (Bank 1)	● Charge air temperature sensor circuit short circuit to power (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) ● Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. Install a new MAPT if necessary. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P007E27	Charge Air Cooler Temperature Sensor Circuit Intermittent/Erratic (Bank 1)	● Right-hand charge air temperature sensor circuit high resistance (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) ● Charge air temperature sensor circuit short circuit to ground ● Charge air temperature sensor circuit short circuit to power ● Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. With the engine running and at operating temperature, check the charge air temperature using a data logger function. Record the measurement at idle and increase the engine speed to 3,000 rpm. Record the reading and compare with the idle figure. If the value has increased by more than 20°C in 100 ms, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P008772	Fuel rail/system pressure too low	● Pressure control valve fault	Refer to the electrical guides and check the PCV actuator circuits and rectify as necessary. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect.
P008873	Fuel rail/system pressure too high	● Fuel pressure control valve (PCV) stuck closed	Refer to the electrical guides and check the PCV actuator circuits and rectify as necessary. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect.
P008921	Fuel Pressure Regulator Performance	● Fuel pressure control valve performance - signal amplitude less than minimum ● Fuel pressure control valve circuit high resistance ● Fuel pressure control valve circuit short circuit to ground ● Fuel pressure control valve circuit short circuit to power ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P008922	Fuel Pressure Regulator Performance	● Fuel pressure control valve performance - signal amplitude greater than maximum ● Fuel pressure control valve circuit high resistance	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the warranty policy and

DTC	Description	Possible causes	Action
		- Fuel pressure control valve circuit short circuit to ground - Fuel pressure control valve circuit short circuit to power - Fuel pressure control valve fault	procedures manual if a high pressure fuel pump is suspect. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P00892F	Fuel Pressure Regulator Performance	- Fuel pressure control valve performance - signal erratic - Fuel pressure control valve circuit high resistance - Fuel pressure control valve circuit short circuit to ground - Fuel pressure control valve circuit short circuit to power - Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P009013	Fuel Pressure Regulator 1 Control Circuit/Open	- Fuel pressure control valve circuit high resistance - Fuel pressure control valve circuit open circuit - Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009111	Fuel Pressure Regulator 1 Control Circuit Low	- Fuel pressure control valve circuit short circuit to ground - Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009119	Fuel Pressure Regulator 1 Control Circuit Low	- Fuel pressure control valve circuit short circuit to power (circuit current above threshold) - Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009212	Fuel Pressure Regulator 1 Control Circuit High	- Fuel pressure control valve circuit short circuit to power - Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P010036	Mass or Volume Air Flow A Circuit	- Mass air flow (MAF) sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor circuit high resistance	Refer to the electrical guides and check the MAF sensor and circuits. Clear the DTCs and test for normal operation. If the problem persists, renew the MAF sensor.

DTC	Description	Possible causes	Action
		- MAF sensor fault	
P010116	Mass or Volume Air Flow A Circuit Range/Performance	- Intake air path fault - Mass air flow (MAF) sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor fault	Check the intake air system for leaks, restrictions, etc. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. If the problem persists, renew the MAF sensor.
P010117	Mass or Volume Air Flow A Circuit Range/Performance	- Intake air path fault - Mass air flow (MAF) sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor fault	Check the intake air system for leaks, restrictions, etc. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. If the problem persists, renew the MAF sensor.
P010221	Mass or Volume Air Flow A Circuit Low	- Intake air system fault - Mass air flow (MAF) sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks, etc. Repair/renew as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Check that the EGR valves are not stuck. Using a data logger function, monitor the air flow and EGR valve position for both banks and road test the vehicle. Check that the EGR valves are in synch. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P010322	Mass or Volume Air Flow A Circuit High	- Check for water ingress into the Mass air flow (MAF) sensor - Water in the air intake can give the impression of high air flow - Intake air system fault - MAF sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor fault - Turbocharger fault	Check the intake air system for leaks, etc. Repair/renew as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. With the ignition on, engine off, and using a data logger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% pulse width modulated (PWM) and check the angle values. The angle at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM) 80 - 95%. If the values are inside this range, install a new MAF sensor. If the values are outside this range, install a new turbocharger. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P010438	Mass or Volume Air Flow A Circuit Intermittent/Erratic	- Mass air flow (MAF) sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor circuit high resistance	Check the MAF sensor and circuits. Refer to the electrical guides. Measure the mass air flow at idle using a data logger function and record the value. Increase the engine speed to 2,000 rpm and record the value. If the value has changed by more than 30.55 g/s install a new MAF sensor and recheck. Clear the DTCs and test for normal operation.
P011216	Intake Air Temperature Sensor 1 Circuit Low (Bank 1)	- Intake air temperature (IAT) sensor circuit low input - voltage below threshold - IAT sensor circuit high resistance - IAT sensor circuit short circuit to ground - IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the values are outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011317	Intake Air Temperature Sensor 1 Circuit High (Bank 1)	- Intake air temperature (IAT) sensor circuit short circuit to power - IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the

DTC	Description	Possible causes	Action
			resistance is outside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011427	Intake Air Temperature Sensor 1 Intermittent/Erratic (Bank 1)	● Intake air temperature (IAT) sensor circuit intermittent high resistance ● IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Read the intake air temperature using a data logger function and record the value. After ten minutes, read the value again and compare to the first reading. If the value has increased by more than 10° C per 100 ms, install a new MAF sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011626	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	● Engine coolant temperature (ECT) sensor circuit range/performance - signal rate of change below threshold ● ECT sensor circuit intermittent high resistance ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10°C, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011716	Engine Coolant Temperature Sensor 1 Circuit Low	● Engine coolant temperature (ECT) sensor circuit low input - voltage below threshold ● ECT sensor circuit short circuit to ground ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Measure the resistance of the sensor. Nominal resistance at 20°C (68°F) should be between 35.47 and 39.21 Kohms. If the resistance is outside this range, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011817	Engine Coolant Temperature Sensor 1 Circuit High	● Engine coolant temperature (ECT) sensor circuit high input - voltage above threshold ● ECT sensor circuit short circuit to power ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Measure the resistance of the sensor. Nominal resistance at 20°C (68°F) should be between 35.47 and 39.21 Kohms. If the resistance is outside this range, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P011927	Engine Coolant Temperature Sensor 1 Circuit Intermittent/Erratic	● Engine coolant temperature (ECT) sensor circuit intermittent/erratic - signal rate of change above threshold ● ECT sensor circuit intermittent high resistance ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Read the coolant temperature using a data logger function and record the value. Increase the engine speed to 2,000 rpm and recheck the value after two minutes at this engine speed. If the value has increased faster than 5°C per second, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018126	Fuel Temperature Sensor A Circuit Range/Performance	● Fuel temperature sensor circuit range/performance - signal rate of change below threshold ● Fuel temperature sensor circuit intermittent high resistance ● Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018216	Fuel Temperature Sensor A Circuit Low	● Fuel temperature sensor circuit low input - voltage below threshold ● Fuel temperature sensor circuit short circuit to ground ● Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Measure the sensor resistance. Nominal resistance at 20°C (68°F) should be between 5.86 and 6.62 Kohms. If the resistance is outside this range, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P018317	Fuel Temperature Sensor A Circuit High	● Fuel temperature sensor circuit high input - voltage above threshold ● Fuel temperature sensor circuit short circuit to power ● Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Measure the sensor resistance. Nominal resistance at 20°C (68°F) should be between 5.86 and 6.62 Kohms. If the resistance is outside this range, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P018427	Fuel Temperature Sensor A Circuit Intermittent	● Fuel temperature sensor circuit intermittent - signal rate of change above threshold ● Fuel temperature sensor circuit intermittent high resistance ● Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Check the fuel temperature using a data logger function. Increase the engine speed to 2,000 rpm and recheck the value. If the value has increased by more than 10°C per 100 ms, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019123	Fuel Rail Pressure Sensor A Circuit Range/Performance	● Fuel rail pressure (FRP) sensor circuit range/performance - signal stuck low ● Low fuel level ● Blocked/incorrectly connected low-pressure fuel lines ● FRP sensor circuit short circuit to ground ● FRP sensor circuit short circuit to power ● FRP sensor circuit high resistance ● FRP sensor fault ● Fuel pump module circuit short circuit to ground ● Fuel pump module circuit short circuit to power ● Fuel pump module circuit high resistance ● Fuel pump module fault	Check the fuel level and the condition and correct connection of the low-pressure fuel circuit lines (incorrect connection of the lines to and from the fuel filter can cause serious fuel pressure fluctuations). Check the FRP sensor and circuits. Check the fuel pump module and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P019124	Fuel Rail Pressure Sensor A Circuit Range/Performance	● Fuel rail pressure (FRP) sensor circuit range/performance - signal stuck high ● FRP sensor circuit short circuit to ground ● FRP sensor circuit short circuit to power ● FRP sensor circuit high resistance ● FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Stop the engine, turn the ignition on, and recheck the fuel pressure. If the pressure is greater than 10 MPa (1,450 lbs/in²) after 0.4 seconds, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019165	Fuel Rail Pressure Sensor A Circuit Range/Performance	● Fuel rail pressure (FRP) sensor circuit range/performance - signal has too few transitions/events ● FRP sensor circuit high resistance ● FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Increase the engine speed to 2,000 rpm and recheck the fuel pressure. If the value has changed by more than 40 MPa (5,801 lbs/in²) per 10 ms, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019216	Fuel Rail Pressure Sensor A Circuit Low	● Fuel rail pressure (FRP) sensor circuit low input - voltage below threshold ● FRP sensor circuit short circuit to ground	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is 0 MPa (0 lbs/in²), install a new sensor. Refer to the relevant section of the

DTC	Description	Possible causes	Action
		- FRP sensor fault	workshop manual. Clear the DTCs and test for normal operation.
P019317	Fuel Rail Pressure Sensor A Circuit High	- Fuel rail pressure (FRP) sensor circuit high input - voltage above threshold - FRP sensor circuit short circuit to power - FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is greater than 180 MPa (26,106 lbs/in²), install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019427	Fuel Rail Pressure Sensor A Circuit Intermittent/Erratic	- Fuel rail pressure (FRP) sensor circuit intermittent/erratic - signal rate of change above threshold - FRP sensor circuit high resistance - FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Increase the engine speed to 2,000 rpm and recheck the fuel pressure. If the value has changed by more than 40 MPa (5,801 lbs/in²) per 10 ms, install a new sensor. Refer to the relevant section of the workshop manual. Clear the DTCs and test for normal operation.
P019626	Engine Oil Temperature Sensor Range/Performance	- Engine oil temperature (EOT) sensor circuit range/performance- signal rate of change below threshold - EOT sensor circuit intermittent high resistance - EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. From cold, start the engine and check the oil temperature using a data logger function. Allow the engine to idle for ten minutes and recheck the oil temperature. If the value has not increased by more than 5°C in this time, install a new sensor. Clear the DTCs and test for normal operation.
P019716	Engine Oil Temperature Sensor Circuit Low	- Engine oil temperature (EOT) sensor circuit low input - voltage below threshold - EOT sensor circuit short circuit to ground - EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Repair/renew as necessary.
P019817	Engine Oil Temperature Sensor Circuit High	- Engine oil temperature (EOT) sensor circuit high input - voltage above threshold - EOT sensor circuit short circuit to power - EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Repair/renew as necessary.
P019927	Engine Oil Temperature Sensor Circuit Intermittent/Erratic	- Engine oil temperature (EOT) sensor circuit intermittent - signal rate of change above threshold - EOT sensor circuit intermittent high resistance - EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the oil temperature using a data logger function. Increase the engine speed to 2,000 rpm and recheck the value after two minutes at this engine speed. If the value has increased by more than 40°C per second, install a new sensor. Clear the DTCs and test for normal operation.
P020101	Cylinder 1 Injector Circuit / Open	- Fuel injector circuit open cylinder 1 - general electrical fault - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P020201	Cylinder 2 Injector Circuit / Open	• Fuel injector circuit open cylinder 2 - general electrical fault • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020301	Cylinder 3 Injector Circuit / Open	• Fuel injector circuit open cylinder 3 - general electrical fault • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020401	Cylinder 4 Injector Circuit / Open	• Fuel injector circuit open cylinder 4 - general electrical fault • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020501	Cylinder 5 Injector Circuit / Open	• Fuel injector circuit open cylinder 5 - general electrical fault • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020601	Cylinder 6 Injector Circuit / Open	• Fuel injector circuit open cylinder 6 - general electrical fault • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P020A33	Cylinder 1 Injection Timing	● Cylinder 1 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020A35	Cylinder 1 Injection Timing	● Cylinder 1 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020B33	Cylinder 2 Injection Timing	● Cylinder 2 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020B35	Cylinder 2 Injection Timing	● Cylinder 2 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020C33	Cylinder 3 Injection Timing	● Cylinder 3 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P020C35	Cylinder 3 Injection Timing	• Cylinder 3 injection timing - signal high time greater than maximum • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020D33	Cylinder 4 Injection Timing	• Cylinder 4 injection timing - signal low time greater than maximum • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020D35	Cylinder 4 Injection Timing	• Cylinder 4 injection timing - signal high time greater than maximum • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020E33	Cylinder 5 Injection Timing	• Cylinder 5 injection timing - signal low time greater than maximum • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020E35	Cylinder 5 Injection Timing	• Cylinder 5 injection timing - signal high time greater than maximum • Fuel injector circuit short circuit to ground • Fuel injector circuit short circuit to power • Fuel injector circuit high resistance • Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P020F33	Cylinder 6 Injection Timing	● Cylinder 6 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P020F35	Cylinder 6 Injection Timing	● Cylinder 6 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P023627	Turbocharger/Supercharger Boost Sensor A Circuit Range/Performance	● Right-hand turbocharger boost sensor circuit high - signal rate of change above threshold ● Manifold absolute pressure and temperature (MAPT) sensor circuit intermittent high resistance ● Manifold absolute pressure and temperature (MAPT) sensor fault	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. Start the engine and check the manifold air pressure at idle using a data logger function. Increase the engine speed to 1,500 rpm and recheck the manifold air pressure. If the pressure has increased by more than 50 KPa per 10 ms, install a new sensor. Clear the DTCs and test for normal operation.
P023716	Turbocharger/Supercharger Boost Sensor A Circuit Low	● Right-hand turbocharger boost sensor circuit low - voltage below threshold ● Manifold absolute pressure and temperature (MAPT) sensor circuit short circuit to ground ● Manifold absolute pressure and temperature (MAPT) sensor fault	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. Clear the DTCs and test for normal operation.
P023817	Turbocharger/Supercharger Boost Sensor A Circuit High	● Right-hand turbocharger boost sensor circuit high - voltage above threshold ● Manifold absolute pressure and temperature (MAPT) sensor circuit short circuit to power ● Manifold absolute pressure and temperature (MAPT) sensor fault	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. Clear the DTCs and test for normal operation.
P023D21	Manifold Absolute Pressure - Turbocharger/Supercharger Boost Sensor A Correlation	● Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude less than minimum ● Intake air system fault	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for oil being drawn into the intake manifold. Rectify as necessary. Using a data logger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) in 5% steps.

DTC	Description	Possible causes	Action
		● Turbocharger mechanical fault ● Oil ingestion into manifold	Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. Clear the DTCs and test for normal operation.
P023D22	Manifold Absolute Pressure - Turbocharger/Supercharger Boost Sensor A Correlation	● Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude greater than maximum ● Intake air system fault ● Turbocharger mechanical fault ● Intake air temperature (IAT) sensor fault ● Mass air flow (MAF) sensor fault ● Manifold absolute pressure and temperature (MAPT) sensor fault ● Exhaust gas recirculation (EGR) sensor fault ● Turbocharger actuator position sensor fault	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for DTCs indicating a listed sensor fault. Rectify as necessary. Using a data logger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. Clear the DTCs and test for normal operation.
P026300	Cylinder 1 Contribution/Balance	● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P026600	Cylinder 2 Contribution/Balance	● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P026900	Cylinder 3 Contribution/Balance	● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P027200	Cylinder 4 Contribution/Balance	● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC

DTC	Description	Possible causes	Action
			resets. If the above tests are all within range, install a new injector.
P027500	Cylinder 5 Contribution/Balance	● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P027800	Cylinder 6 Contribution/Balance	● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P029C00	Cylinder 1 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P029D00	Cylinder 1- Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A000	Cylinder 2 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above

DTC	Description	Possible causes	Action
		the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	tests are all within range, install a new injector.
P02A100	Cylinder 2 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A400	Cylinder 3 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A500	Cylinder 3 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02A800	Cylinder 4 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.

DTC	Description	Possible causes	Action
		● Injector fault	
P02A900	Cylinder 4 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AC00	Cylinder 5 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02AD00	Cylinder 5 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P02B000	Cylinder 6 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.

DTC	Description	Possible causes	Action
P02B100	Cylinder 6 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector.
P032621	Knock Sensor 1 Circuit Range/Performance (Bank 1)	● Knock sensor (KS) 1 circuit range/performance, right-hand bank (rear) - signal amplitude less than minimum ● KS incorrectly installed ● KS connections reversed ● KS circuit short circuit to ground	Check that the knock sensors are correctly installed and tightened to the correct torque. Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P032622	Knock Sensor 1 Circuit Range/Performance (Bank 1)	● Knock sensor (KS) 1 circuit range/performance, right-hand bank (rear) - signal amplitude greater than maximum ● KS incorrectly installed ● KS connections reversed ● KS circuit short circuit to ground	Check that the KNOCK SENSORS are correctly installed and tightened to the correct torque. Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033121	Knock Sensor 1 Circuit Range/Performance (Bank 2)	● Knock sensor (KS) 2 circuit range/performance, left-hand bank (rear) - signal amplitude less than minimum ● KS incorrectly installed ● KS connections reversed ● KS circuit short circuit to ground	Check that the (KS) are correctly installed and tightened to the correct torque. Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033122	Knock Sensor 1 Circuit Range/Performance (Bank 2)	● Knock sensor (KS) 2 circuit range/performance, left-hand bank (rear) - signal amplitude greater than maximum ● KS incorrectly installed ● (KS) connections reversed ● (KS) circuit short circuit to ground	Check that the KNOCK SENSORS are correctly installed and tightened to the correct torque. Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033578	Crankshaft Position Sensor A Circuit	● Crankshaft position (CKP) sensor - alignment or adjustment incorrect ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P033631	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal missing ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P033638	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal frequency ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P033664	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal plausibility fault ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P033666	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal has too many transitions/events ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. Clear the DTCs and test for normal operation.
P034129	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	● Camshaft position (CMP) sensor range/performance - signal invalid ● CMP sensor circuit short circuit to ground ● CMP sensor circuit short circuit to power ● CMP sensor circuit high resistance ● CMP sensor fault	Check the CMP sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. Clear the DTCs and test for normal operation.
P03413A	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	● Camshaft position (CMP) sensor range/performance - too many pulses ● Camshaft segment period too short	Check the CMP sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P034231	Camshaft Position Sensor A Circuit Low (Bank 1 or single sensor)	● Camshaft position (CMP) sensor circuit low input - no signal ● CMP sensor circuit short circuit to ground ● CMP sensor circuit short circuit to power ● CMP sensor circuit high resistance ● CMP sensor fault	Check the CMP sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. Clear the DTCs and test for normal operation.
P038072	Glow Plug/Heater Circuit A	● Right-hand bank glow plug circuit - actuator stuck open ● Low battery voltage ● Relay circuit **from** relay	Check the battery condition and state of charge. Check the relay and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new relay. Clear the DTCs and test for normal operation.
P038073	Glow Plug/Heater Circuit A	● Right-hand bank glow plug circuit - actuator stuck closed ● Low battery voltage ● Relay circuit **to** relay	Check the battery condition and state of charge. Check the relay and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new relay. Clear the DTCs and test for normal operation.
P040121	Exhaust Gas Recirculation A Flow Insufficient Detected	● Exhaust gas recirculation (EGR) insufficient flow detected - signal amplitude less than minimum ● EGR control deviation lower limit right-hand bank (intake manifold tuning (IMT) valve closed) bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angles for both banks. Command the valve actuators to 100% then 0% pulse width modulated (PWM), and recheck the valve angles. The angles should range between 95% and 5%. If this is not the case, install new valves as necessary. Clear the DTCs and test for normal operation.
P040222	Exhaust Gas Recirculation A Flow Excessive Detected	● Right-hand exhaust gas recirculation (EGR) excessive flow detected - signal amplitude greater than maximum ● EGR control deviation upper limit right-hand bank (intake manifold tuning (IMT) valve closed) bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM), and recheck the valve angles. The angles should range between 5% and 95%. If this is not the case, install a new valve as necessary. Clear the DTCs and test for normal operation.
P040319	Exhaust Gas Recirculation A Control Circuit	● Right-hand exhaust gas recirculation (EGR) control circuit - current over threshold ● EGR valve control circuit short circuit to ground ● EGR valve control circuit short circuit to power	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% pulse width modulated (PWM) and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P040521	Exhaust Gas Recirculation Sensor A Circuit Low	● Right-hand exhaust gas recirculation (EGR) sensor circuit low - signal amplitude less than minimum ● EGR valve position sensor circuit short circuit to ground	Check the right-hand EGR sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angle. With the ignition on, engine off, command the valve actuator to 0% pulse width modulated (PWM), and then to 100% pulse width modulated (PWM) and recheck the EGR valve angle. The value should range from 0 - 20% to 80 - 95%. If this is not the case, install a new sensor.

DTC	Description	Possible causes	Action
		- EGR valve position sensor fault	Clear the DTCs and test for normal operation.
P040622	Exhaust Gas Recirculation Sensor A Circuit High	- Right-hand exhaust gas recirculation (EGR) sensor circuit high - signal amplitude greater than maximum - EGR valve position sensor circuit short circuit to power - EGR valve position sensor fault	Check the right-hand EGR sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angle. With the ignition on, engine off, command the valve actuator to 0% pulse width modulated (PWM), and then to 100% pulse width modulated (PWM) and recheck the EGR valve angle. The value should range from 0 - 20% to 80 - 95%. If this is not the case, install a new sensor. Clear the DTCs and test for normal operation.
P040721	Exhaust Gas Recirculation Sensor B Circuit Low	- Right-hand exhaust gas recirculation (EGR) throttle position sensor circuit low - signal amplitude less than minimum - EGR throttle position sensor circuit short circuit to ground - EGR throttle position sensor circuit high resistance - EGR sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P040822	Exhaust Gas Recirculation Sensor B Circuit High	- Right-hand exhaust gas recirculation (EGR) throttle position sensor circuit low - signal amplitude greater than maximum - EGR throttle position sensor circuit short circuit to power - EGR throttle position sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P045A00	Exhaust Gas Recirculation B Control Circuit	- EGR valve circuit fault - EGR valve fault - engine control module (ECM) fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% pulse width modulated (PWM) and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P045A19	Exhaust Gas Recirculation B Control Circuit	- Left-hand exhaust gas recirculation (EGR) control circuit - current over threshold - EGR valve control circuit short circuit to ground - EGR valve control circuit short circuit to power	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% pulse width modulated (PWM) and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.

DTC	Description	Possible causes	Action
P045C00	Exhaust Gas Recirculation B Control Circuit Low	- Left-hand exhaust gas recirculation (EGR) control circuit low - EGR valve sticking - Intake air temperature (IAT) sensor circuit fault - Ambient pressure (AMP) sensor circuit fault - Manifold absolute pressure and temperature (MAPT) sensor circuit fault - Mass air flow (MAF) sensor circuit fault - EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P045D00	Exhaust Gas Recirculation B Control Circuit High	- Left-hand exhaust gas recirculation (EGR) control circuit high - EGR valve sticking - Intake air temperature (IAT) sensor circuit fault - Ambient pressure (AMP) sensor circuit fault - Manifold absolute pressure and temperature (MAPT) sensor circuit fault - Mass air flow (MAF) sensor circuit fault - EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P048811	Exhaust gas recirculation (EGR) - intake air shut off throttle range/performance	- Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to ground - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048812	Exhaust gas recirculation (EGR) - intake air shut off throttle range/performance	- Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048813	Exhaust gas recirculation (EGR) - intake air shut off throttle range/performance	- Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance - Exhaust gas recirculation	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width

DTC	Description	Possible causes	Action
		(EGR) throttle position sensor circuit open circuit ● EGR modulator failure	modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048821	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	● Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - signal amplitude less than minimum ● Right-hand EGR throttle adaption is at the bottom limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position then command the throttle position set point to 0% pulse width modulated (PWM) and recheck the position. If the 0% pulse width modulated (PWM) position is not between 0% and 20%, install a new EGR valve. Clear the DTCs and test for normal operation.
P048822	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	● Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - signal amplitude greater than maximum ● Right-hand EGR throttle adaption is at the top limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position then command the throttle position set point to 0% pulse width modulated (PWM) and recheck the position. If the 0% pulse width modulated (PWM) position is not between 0% and 20%, install a new EGR valve. Clear the DTCs and test for normal operation.
P048900	Exhaust Gas Recirculation Control Circuit Low	● Right-hand exhaust gas recirculation (EGR) control circuit low ● EGR valve sticking ● Intake air temperature (IAT) sensor circuit fault ● Ambient pressure (AMP) sensor circuit fault ● Manifold absolute pressure and temperature (MAPT) sensor circuit fault ● Mass air flow (MAF) sensor circuit fault ● EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P049000	Exhaust Gas Recirculation A Control Circuit High	● Right-hand exhaust gas recirculation (EGR) control circuit high ● EGR valve sticking ● Intake air temperature (IAT) sensor circuit fault ● Ambient pressure (AMP) sensor circuit fault ● Manifold absolute pressure and temperature (MAPT) sensor circuit fault ● Mass air flow (MAF) sensor circuit fault ● EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P049313	Fan Overspeed (clutch locked)	● Fan circuit open circuit	Refer to the electrical guides and check the viscous fan speed sensor circuit. Repair/renew as necessary.
P049411	Fan Speed Low	● Viscous fan solenoid circuit short circuit to ground ● Viscous fan solenoid failure	Refer to the electrical guides and check the viscous fan solenoid and circuits. Refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
P049512	Fan Speed High	● Viscous fan solenoid circuit short circuit to power ● Viscous fan solenoid failure	Refer to the electrical guides and check the viscous fan solenoid and circuits. Refer to the relevant workshop manual section.
P050100	Vehicle Speed Sensor A Range/Performance	● Vehicle speed sensor 1 range/performance - signal out of range ● Investigate for anti-lock braking system (ABS) faults - the signal from the wheel speed sensors is not plausible	Check for DTCs indicating an ABS fault. Speed sensor codes are listed at the head of this table.
P050462	Brake Switch A / B Correlation	● Brake switch A/B correlation - signal compare fault ● Brake lamp switch fault ● Brake lamp switch circuit fault	Check the brake switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P052721	Fan Speed Sensor Circuit Range/Performance	● Fan speed sensor circuit range/performance - signal amplitude less than minimum ● Fan circuit short circuit to ground ● Fan circuit short circuit to power ● Fan circuit high resistance ● Fan fault	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Check the motor for sticking. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P052722	Fan Speed Sensor Circuit Range/Performance	● Fan speed sensor circuit range/performance - signal amplitude greater than maximum ● Fan circuit short circuit to ground ● Fan circuit short circuit to power ● Fan circuit high resistance ● Fan fault	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P052727	Fan Speed Sensor Circuit Range/Performance	● Fan speed sensor circuit range/performance - signal rate of change above threshold ● Fan circuit intermittent high resistance - Loose connections	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P056216	System Voltage Low	● Battery condition/state of charge ● Battery ground cable high resistance ● Battery connections loose/corroded ● Battery current drain ● Battery power distribution circuits	Check the battery connections and condition and charge as necessary. Refer to the electrical guides and check the battery power supplies to the ECM, etc. Repair/renew as necessary. Refer to the relevant workshop manual section.
P056317	System Voltage High	● System voltage high - circuit voltage above threshold ● Battery voltage greater than maximum threshold	Check the battery connections and condition and charge as necessary. Check the battery power supplies to the ECM, etc. Repair/renew as necessary.

DTC	Description	Possible causes	Action
P056A00	Cruise Control INCREASE DISTANCE Signal	● Speed control switch 3 stuck closed (HEADDOWN)	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P056B00	Cruise Control DECREASE DISTANCE Signal	● Speed control switch 4 stuck closed (HEADUP)	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P057162	Brake Switch A Circuit	● Brake switch A circuit - signal compare fault ● Brake lamp switch circuit fault	Check the brake switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P05781C	Cruise Control Multi-Function Input A Circuit Stuck	● Speed control multi-function input A circuit stuck - circuit voltage out of range ● Switch circuit high resistance ● Switch fault	Check the switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P05791C	Cruise Control Multi-Function Input A Circuit Range/Performance	● Speed control multi-function input A circuit stuck - circuit voltage out of range ● Switch circuit high resistance ● Switch fault	Check the switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P057929	Cruise Control Multi-Function Input A Circuit Range/Performance	● Speed control multi-function input A circuit range/performance - signal invalid ● Switch circuit short circuit to ground ● Switch circuit short circuit to power ● Switch fault	Check the switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P060448	Internal Control Module Random Access Memory (RAM) Error	● ECM circuits short circuit to ground ● ECM circuits short circuit to power ● ECM circuits high resistance	Check the ECM circuits. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060768	Control Module Performance	● Engine control module (ECM) performance - event information ● ECM circuits short circuit to ground ● ECM circuits short circuit to power ● ECM circuits high resistance	Check the ECM circuits. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060A48	Internal Control Module Monitoring Processor Performance	● Engine control module (ECM) monitoring processor performance - supervision software fault ● ECM circuits short circuit to ground ● ECM circuits short circuit to power ● ECM circuits high resistance	Check the ECM circuits. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P060B48	Internal Control Module A/D Processing Performance	● Engine control module (ECM) A/D processing performance - supervision software fault ● ECM circuits short circuit to ground	Check the ECM circuits. Refer to the electrical guides. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
		- ECM circuits short circuit to power - ECM circuits high resistance	
P060D46	Internal Control Module Accelerator Pedal Position Performance	- Internal control module accelerator pedal position performance - calibration/parameter memory fault - Pedal value not plausible - Engine control module (ECM) circuits short circuit to ground - Engine control module (ECM) circuits short circuit to power - Engine control module (ECM) circuits high resistance	Check and Repair/renew other DTCs first. If this code still sets, contact the technical help desk.
P061712	Starter Relay Circuit High	- Starter relay drive circuit short circuit to power - Starter relay fault	Check the starter circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P061A46	Internal Control Module Torque Performance	- Calibration/parameter memory fault - Torque not plausible - Monitoring of driveability functions	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061C48	Internal Control Module Engine RPM Performance	- Supervision software fault - Processor monitoring speed not plausible	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P061E46	Internal Control Module Brake Signal Performance	- Calibration/parameter memory fault - Cruise intervention not plausible	Retrieve the flight recorder data using the approved diagnostic system and the customer statement relating to the concern. Check and rectify other DTCs first. If this code still sets, contact the technical help desk.
P062101	Generator Lamp Terminal Circuit	- Generator brushes low	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Clear the DTCs and test for normal operation.
P062116	Generator Lamp Terminal Circuit	- Generator system voltage low	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Clear the DTCs and test for normal operation.
P062229	Generator Lamp Terminal Circuit	- Charging circuit fault - Generator fault	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Clear the DTCs and test for normal operation.
P062511	Generator Field Terminal Circuit Low	- Generator field terminal (altmon) circuit short circuit to ground - Generator control (altcom) circuit short circuit to ground - Generator control (altcom) circuit high resistance - Generator fault	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Clear the DTCs and test for normal operation.
P062615	Generator Field Terminal Circuit High	- Generator field terminal (altmon) circuit short circuit to power - Generator field terminal (altmon) circuit high	Check the charging voltage. Check the charging system circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new generator. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		resistance ● Generator fault	
P062712	Fuel Pump A Control Circuit / Open	● Fuel pump relay control circuit short circuit to power ● Fuel pump relay fault	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Refer to the relevant workshop manual section. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062811	Fuel Pump A Control Circuit Low	● Fuel pump relay control circuit short circuit to ground ● Fuel pump relay fault	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062913	Fuel Pump A Control Circuit High	● Fuel pump relay control circuit high resistance ● Fuel pump relay control circuit open circuit ● Fuel pump relay fault	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062D01	Fuel Injector Driver Circuit Performance Bank 1	● Fuel injector circuits short circuit to ground ● Fuel injector circuits short circuit to power ● Fuel injector circuits high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition switch off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections at fuel injectors 1, 2, 3 and 4. Disconnect the injectors and measure the resistance and capacitance of each injector. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If one or more injectors are outside this range, install new injectors as necessary. Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P062E01	Fuel Injector Driver Circuit Performance Bank 2	● Fuel injector circuits short circuit to ground ● Fuel injector circuits short circuit to power ● Fuel injector circuits high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition switch off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections at fuel injectors 5, 6, 7 and 8. Disconnect the injectors and measure the resistance and capacitance of each injector. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If one or more injectors are outside this range, install new injectors as necessary. Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P063468	PCM / ECM / TCM Internal Temperature A Too High	● ECM internal temperature too high ● E box cooling fan obstruction ● E box cooling fan operation ● ECM internal sensor error	Consider atmospheric and customer driving conditions before carrying out any other action. Check the ECM circuits. Refer to the electrical guides. Using a data logger function, check the ECM temperature. If the temperature value is greater than 130°C (266°F) suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P064216	Sensor Reference Voltage A Circuit Low	● ECM circuits short circuit to ground ● ECM circuits high resistance ● ECM fault	Check the ECM power supply and relay circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P064317	Sensor Reference Voltage A Circuit High	● ECM circuits short circuit to power ● ECM fault	Check the ECM power supply and relay circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
P065216	Sensor Reference Voltage B Circuit Low	- ECM circuits short circuit to ground - ECM circuits high resistance - ECM fault	Check the ECM power supply and relay circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P065317	Sensor Reference Voltage B Circuit High	- ECM circuits short circuit to power - ECM fault	Check the ECM power supply and relay circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P065B11	Generator Control Circuit Range/Performance	- Generator control circuit (altcom) short circuit to ground - Generator control circuit (altcom) high resistance - Generator fault	Check the generator and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P065B12	Generator Control Circuit Range/Performance	- Generator control circuit (altcom) short circuit to power - Generator fault	Check the generator and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P066727	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance	- ECM circuits intermittent high resistance - ECM fault	Check the ECM circuits. Refer to the electrical guides. Using a data logger function, check the ECM internal temperature. Start the engine and allow to idle for five minutes before rechecking the temperature. If the temperature has increased by more than 10°C per 100 ms suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P066816	PCM / ECM / TCM Internal Temperature Sensor A Circuit Low	- ECM circuits short circuit to ground - ECM fault	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, check the ECM circuits. Refer to the electrical guides. Using a data logger function, check the ECM internal temperature. If the value is less than -40°C (-40°F), suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P066917	PCM / ECM / TCM Internal Temperature Sensor A Circuit High	- ECM circuits short circuit to power - ECM fault	Clear the DTC, cycle the ignition, allow power latch and retest. If the DTC resets, check the ECM circuits. Refer to the electrical guides. Using a data logger function, check the ECM internal temperature. If the value is greater than 130°C (266°F), suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P067013	Glow Plug Control Module Control Circuit / Open	- Glow plug relay, control circuit high resistance - Glow plug relay, control circuit short circuit to ground - Glow plug relay failure	Check the glow plug relay circuits. Refer to the electrical guides. Check the relay operation. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P069311	Fan 2 Control Circuit Low	- Viscous fan control circuit high resistance - Viscous fan solenoid fault	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P069313	Fan 2 Control Circuit Low	- Viscous fan control circuit short circuit to ground - Viscous fan solenoid fault	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P069412	Fan 2 Control Circuit High	- Viscous fan control circuit short circuit to power - Viscous fan solenoid fault	Check the viscous fan solenoid and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P083100	Clutch Pedal Switch A Circuit Low	- Clutch pedal switch circuit short to ground	Check the switch and circuits. Refer to the electrical guides and repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P083200	Clutch Pedal Switch A Circuit High	- Clutch pedal switch circuit short to battery	Check the switch and circuits. Refer to the electrical guides and repair/renew as necessary. Clear the DTCs and test for normal operation.
P085062	Park/Neutral Switch Input Circuit	- Park/Neutral switch plausibility check - signal compare fault - Controller area network (CAN) circuit fault	Check the switch and circuits. Refer to the electrical guides. Check for DTCs indicating a CAN fault. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P085212	Park / Neutral Switch Input Circuit High	- Park/Neutral switch circuit short circuit to power	Check the switch and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P0A0916	DC/DC Converter Status Circuit Low	- DC/DC converter less than minimum	Clear the DTCs, turn the ignition off and allow power latch. Check for DTCs. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P0A1017	DC/DC Converter Status Circuit High	- DC/DC converter greater than maximum	Clear the DTCs, turn the ignition off and allow power latch. Check for DTCs. If the DTC resets, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P115A68	Low Fuel Level - Forced Limited Power	- Low fuel level - forced limited power - event information (anti air suction intervention occurred) - Low fuel - Fuel level sensor circuit short circuit to ground - Fuel level sensor circuit high resistance - Fuel level sensor fault	Check that there is sufficient fuel in the tank. Check the fuel level sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new fuel level sensor. Clear the DTCs and test for normal operation.
P115B68	Low Fuel Level - Forced Engine Shutdown	- Low fuel level - forced engine shutdown - event information (anti air suction intervention occurred) - Low fuel - Fuel level sensor circuit short circuit to ground - Fuel level sensor circuit high resistance - Fuel level sensor fault	Check that there is sufficient fuel in the tank. Check the fuel level sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new fuel level sensor. Clear the DTCs and test for normal operation.
P115F11	Electronic Control Module Cooling Fan Circuit	- E-box fan circuits short circuit to ground - E-box fan fault	Check the E-box fan and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new fan. Clear the DTCs and test for normal operation.
P115F12	Electronic Control Module Cooling Fan Circuit	- E-box fan circuits short circuit to power - E-box fan fault	Check the E-box fan and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new fan. Clear the DTCs and test for normal operation.
P115F13	Electronic Control Module Cooling Fan Circuit	- E-box fan circuits high resistance - E-box fan fault	Check the E-box fan and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new fan. Clear the DTCs and test for normal operation.
P116F2F	Fuel Volume Regulator Control Exceeded Control Limits	- Fuel volume control valve circuit fault - signal erratic - Fuel volume control valve fault	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P117D00	Fuel Volume Regulator Control Exceeded Maximum Control Limit	- Fuel volume control valve circuit fault - Fuel volume control valve fault	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced

DTC	Description	Possible causes	Action
			separately). Clear the DTCs and test for normal operation.
P117E00	Fuel Volume Regulator Control Exceeded Minimum Control Limit	● Fuel volume control valve circuit fault ● Fuel volume control valve fault	Check the fuel volume control valve and circuits. Refer to the electrical guides. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P123A21	BARO - Turbocharger/Supercharger Boost Sensor A Correlation	● Barometric - turbocharger boost sensor A (manifold absolute pressure temperature [MAPT] sensor) correlation - signal amplitude less than minimum ● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensor and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0°C (32°F) and with the ignition on, engine not running, check the manifold absolute pressure using a data logger function. If the values are significantly different from ambient pressure, install a new MAPT sensor. Clear the DTCs and test for normal operation. Start the engine and allow to idle. Check the manifold absolute pressure and compare with the values at ignition on, engine not running. The pressure should have increased to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. Refer to the relevant section of the workshop manual. If the problem persists, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P123A22	BARO - Turbocharger/Supercharger Boost Sensor A Correlation	● Barometric - turbocharger boost sensor A (manifold absolute pressure temperature [MAPT] sensor) correlation - signal amplitude greater than maximum ● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensor and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0°C (32°F) and with the ignition on, engine not running, check the manifold absolute pressure using a data logger function. If the values are significantly different from ambient pressure, install a new MAPT sensor. Clear the DTCs and test for normal operation. Start the engine and allow to idle. Check the manifold absolute pressure and compare with the values at ignition on, engine not running. The pressure should have increased to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. Refer to the relevant section of the workshop manual. If the problem persists, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P123B21	BARO - Turbocharger/Supercharger Boost Sensor B Correlation	● Barometric - turbocharger boost sensor B (manifold absolute pressure temperature [MAPT] sensor) correlation - signal amplitude less than minimum ● MAPT sensor circuit fault ● MAPT sensor fault ● Engine control module (ECM) fault	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensor and circuits. Refer to the electrical guides. Make sure the coolant temperature is above 0°C (32°F) and with the ignition on, engine not running, check the manifold absolute pressure using a data logger function. If the values are significantly different from ambient pressure, install a new MAPT sensor. Clear the DTCs and test for normal operation. Start the engine and allow to idle. Check the manifold absolute pressure and compare with the values at ignition on, engine not running. The pressure should have increased to between 52.7 Kpa and 120 Kpa (7.64 and 17.40 lbs/in²). If this is not the case, install a new MAPT sensor. Refer to the relevant section of the workshop manual. If the problem persists, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P123B22	BARO - Turbocharger/Supercharger Boost Sensor B Correlation	● Barometric - turbocharger boost sensor B (manifold absolute pressure	Recover the freeze-frame data to determine when the code was set. Check the MAPT sensor and circuits. Refer to the electrical guides. Make sure the coolant

DTC	Description	Possible causes	Action
		temperature [MAPT] sensor) correlation - signal amplitude greater than maximum - MAPT sensor circuit fault - MAPT sensor fault - Engine control module (ECM) fault	temperature is above 0°C (32°F) and with the ignition on, engine not running, check the manifold absolute pressure using a data logger function. If the values are significantly different from ambient pressure, install a new MAPT sensor. Clear the DTCs and test for normal operation. Start the engine and allow to idle. Check the manifold absolute pressure and compare with the values at ignition on, engine not running. The pressure should have increased to between 52.7KPa and 120 Kpa (7.64 and 17.40lbs/in²). If this is not the case, install a new MAPT sensor. Refer to the relevant section of the workshop manual. If the problem persists, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P125987	Immobilizer to PCM Signal Error	- ECM ID timeout occurred	Check the circuits between the modules. Refer to the electrical guides. Check for network DTCs. Repair/renew as necessary. Clear the DTCs and test for normal operation. If the DTC resets, contact the technical help desk.
P132A00	Turbocharger/Supercharger Boost Control A Electrical	- Turbocharger boost control A electrical - Turbocharger circuit fault - Turbocharger fault - Engine control module (ECM) fault	Check the turbocharger and circuits. Refer to the electrical guides. Turn the ignition on and using a data logger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) and recheck the recorded angles. The value at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM), 80 - 95%. If the angles are within these ranges, clear the codes and retest. If the angles are outside the range, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P132A19	Turbocharger/Supercharger Boost Control A Electrical	- Turbocharger boost control A electrical - circuit current above threshold - Turbocharger circuit fault - Turbocharger fault - Engine control module (ECM) fault	Check the turbocharger and circuits. Refer to the electrical guides. Turn the ignition on and using a data logger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) and recheck the recorded angles. The value at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM), 80 - 95%. If the angles are within these ranges, clear the codes and retest. If the angles are outside the range, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P132B21	Turbocharger/Supercharger Boost Control A Performance	- Turbocharger boost control A performance - signal amplitude less than minimum - Turbocharger connections: water ingress, poor contacts - Turbocharger actuator circuits short circuit to ground - Turbocharger actuator circuits short circuit to power - Turbocharger actuator circuits high resistance - Turbocharger actuator fault - Turbocharger actuator control deviation below minimum threshold	Check the turbocharger and circuits. Refer to the electrical guides. Using a data logger function, record the turbocharger actuator angle at idle and at 3,000 rpm. From idle, 'blip' the throttle to maximum and allow to idle and record the turbocharger actuator angles. At idle, the angle should be approximately 95%, at 3,000 rpm, approximately 40%, and when 'blipped' the voltage should change smoothly at approximately 25% per 100 ms. If the angles do not change, or do not change at the expected rate, suspect the turbocharger actuator is sticking. Install a new turbocharger. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P132B22	Turbocharger/Supercharger Boost Control A Performance	● Turbocharger boost control A performance - signal amplitude greater than maximum ● Turbocharger connections: water ingress, poor contacts ● Turbocharger actuator circuits short circuit to ground ● Turbocharger actuator circuits short circuit to power ● Turbocharger actuator circuits high resistance ● Turbocharger actuator fault - Turbocharger actuator control deviation above maximum threshold	Check the turbocharger and circuits. Refer to the electrical guides. Using a data logger function, record the turbocharger actuator angle at idle and at 3,000 rpm. From idle, 'blip' the throttle to maximum and allow to idle and record the turbocharger actuator angles. At idle, the angle should be approximately 95%, at 3,000 rpm, approximately 40%, and when 'blipped' the voltage should change smoothly at approximately 25% per 100 ms. If the angles do not change, or do not change at the expected rate, suspect the turbocharger actuator is sticking. Install a new turbocharger. Clear the DTCs and test for normal operation.
P133521	EGR Position Sensor Minimum/Maximum Stop Performance	● Right-hand exhaust gas recirculation (EGR) position sensor - signal amplitude less than minimum ● EGR valve circuit short circuit to ground ● EGR valve fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be 0 - 20%. If the value is outside this range, install a new valve. Clear the DTCs and test for normal operation.
P133522	EGR Position Sensor Minimum/Maximum Stop Performance	● Right-hand exhaust gas recirculation (EGR) position sensor minimum/maximum stop performance - signal amplitude greater than maximum ● EGR valve circuit short circuit to power ● EGR valve fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be 0 - 20%. If the value is outside this range, install a new valve. Clear the DTCs and test for normal operation.
P133676	Crankshaft/Camshaft Sensor Range/Performance	● CKP sensor incorrectly installed/damaged ● CMP sensor incorrectly installed/damaged ● CKP sensor fault ● CMP sensor fault	Check the CMP and CKP sensors and circuits. Refer to the electrical guides. If no fault is found in the circuits, install new sensors as necessary. Clear the DTCs and test for normal operation.
P133678	Crankshaft/Camshaft Sensor Range/Performance	● Camshaft - one tooth off	Check the CMP and CKP sensors and circuits. Refer to the electrical guides. If no fault is found in the circuits, install new sensors as necessary. Clear the DTCs and test for normal operation.
P138E21	Turbocharger Boost Control Position Sensor A Minimum/Maximum Stop Performance	● Signal amplitude less than minimum ● Right-hand turbocharger boost control position sensor A adaption diagnosis below bottom limit	Check the turbocharger and circuits. Refer to the electrical guides. Using a data logger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) and recheck the recorded angles. The value at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM), 80 - 95%. If the angles are outside these ranges, install a new turbocharger. Clear the DTCs and test for normal operation.
P138E22	Turbocharger Boost Control Position Sensor A Minimum/Maximum Stop Performance	● Signal amplitude greater than maximum ● Right-hand turbocharger boost control position sensor A adaption diagnosis above top limit	Check the turbocharger and circuits. Refer to the electrical guides. Using a data logger function, record the turbocharger actuator angles. Command the turbocharger actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) and recheck the recorded angles. The value at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM), 80 - 95%. If the

DTC	Description	Possible causes	Action
			angles are outside these ranges, install a new turbocharger. Clear the DTCs and test for normal operation.
P140E21	EGR Position Sensor C Minimum/Maximum Stop Performance	● Signal amplitude less than minimum ● EGR valve adaption 1 bottom limit check	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be between 0 - 20%. If the value is outside this range, install a new valve. Clear the DTCs and test for normal operation.
P140E22	EGR Position Sensor C Minimum/Maximum Stop Performance	● Signal amplitude greater than maximum ● EGR valve adaption 1 top limit check	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angles and command the valve to 0% pulse width modulated (PWM). Recheck the angle. The value should be between 0 - 20%. If the value is outside this range, install a new valve. Clear the DTCs and test for normal operation.
P141A27	Exhaust Gas Recirculation Sensor A Circuit Intermittent/Erratic	● Signal rate of change above threshold ● EGR valve position sensor circuit intermittent high resistance ● EGR sensor fault	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a data logger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P141B1C	Exhaust Gas Recirculation Sensor B Circuit Intermittent/Erratic	● Circuit voltage out of range ● EGR throttle position sensor circuit intermittent high resistance ● EGR sensor fault	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a data logger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P141C27	Exhaust Gas Recirculation Sensor C Circuit Intermittent/Erratic	● signal rate of change above threshold ● EGR valve position sensor circuit intermittent high resistance ● EGR sensor fault	Check the EGR valve and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Using a data logger function, check the EGR valve position. After a further 5 seconds, recheck the position. If the value has increased by more than 80% per 10 ms, recheck the circuits. If no fault is found in the circuits, install a new EGR valve. Clear the DTCs and test for normal operation.
P150A01	Cylinder 1 Injector Circuit Range/Performance	● Injector circuit short circuit to ground ● Injector circuit short circuit to power ● Injector circuit high resistance ● Injector fault	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Disconnect the injector and measure the resistance and capacitance of the component. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If the values are outside this range, install a new injector as necessary.
P150B01	Cylinder 2 Injector Circuit Range/Performance	● Injector circuit short circuit to ground ● Injector circuit short circuit to power ● Injector circuit high resistance ● Injector fault	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Disconnect the injector and measure the resistance and capacitance of the component. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If the values are outside this range, install a new injector as necessary.
P150C01	Cylinder 3 Injector Circuit Range/Performance	● Injector circuit short circuit to ground ● Injector circuit short circuit to power ● Injector circuit high resistance ● Injector fault	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Disconnect the injector and measure the resistance and capacitance of the component. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If the values are outside this range, install a new injector as necessary.

DTC	Description	Possible causes	Action
P155401	Cylinder 4 Injector Circuit Range/Performance	● Injector circuit short circuit to ground ● Injector circuit short circuit to power ● Injector circuit high resistance ● Injector fault	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Disconnect the injector and measure the resistance and capacitance of the component. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If the values are outside this range, install a new injector as necessary.
P155501	Cylinder 5 Injector Circuit Range/Performance	● Injector circuit short circuit to ground ● Injector circuit short circuit to power ● Injector circuit high resistance ● Injector fault	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Disconnect the injector and measure the resistance and capacitance of the component. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If the values are outside this range, install a new injector as necessary.
P155601	Cylinder 6 Injector Circuit Range/Performance	● Injector circuit short circuit to ground ● Injector circuit short circuit to power ● Injector circuit high resistance ● Injector fault	Check the injector circuits. Refer to the electrical guides. Rectify as necessary. Disconnect the injector and measure the resistance and capacitance of the component. Resistance should be 180 - 220 Kohms, capacitance should be greater than 3 microfarad at 20°C (68°F). If the values are outside this range, install a new injector as necessary.
P157262	Brake Pedal Switch Circuit	● Brake lamp switch/brake travel switch circuit fault - signal compare fault ● Engine control module (ECM) fault	Check the brake lamp switch/brake travel switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation. Refer to the warranty policy and procedures manual if a module is suspect.
P162300	Immobilizer Code Word/ID Number Write Failure	● Challenge failed due to timeout	Check the circuits between the modules. Refer to the electrical guides. Check for network DTCs. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P167C00	CAN Link PCM/PCM Circuit/Network	● Controller area network (CAN) link to engine control module (ECM) circuit network ● ECM circuits short circuit to ground ● ECM circuits short circuit to power ● ECM circuits high resistance ● ECM fault	Cycle the ignition and allow power latch. Check the ECM and circuits. Refer to the electrical guides. Repair/renew as necessary. If no fault is found in the circuits, suspect the ECM. Refer to the warranty policy and procedures manual if a module is suspect.
P193A68	Invalid Scan Tool Communication/Request	● Invalid scan tool communication request	This is not a fault, but event information of the communication between the scan tool and ECM. Clear/ignore this DTC.
P200813	Intake Manifold Runner Control Circuit / Open (Bank 1)	● Port de-activation solenoid circuit high resistance ● Port de-activation solenoid circuit short circuit to ground ● Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P200911	Intake Manifold Runner Control Circuit Low (Bank 1)	● Port de-activation solenoid circuit high resistance ● Port de-activation solenoid circuit short circuit to ground ● Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.
P201012	Intake Manifold Runner Control Circuit High (Bank 1)	● Port deactivation control circuit short circuit to power ● Port de-activation solenoid failure	Check the port deactivation valve and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new valve. Clear the DTCs and test for normal operation.

Diesel Particulate Filter (DPF) Related DTCs

DTC	Description	Possible causes	Action
P02CD00	Cylinder 1 Fuel Injector	Fuel injector failure	Replace fuel injector for related cylinder

DTC	Description	Possible causes	Action
	Offset Learning at Max Limit		
P02CF00	Cylinder 2 Fuel Injector Offset Learning at Max Limit	Fuel injector failure	Replace fuel injector for related cylinder
P02D100	Cylinder 3 Fuel Injector Offset Learning at Max Limit	Fuel injector failure	Replace fuel injector for related cylinder
P02D300	Cylinder 4 Fuel Injector Offset Learning at Max Limit	Fuel injector failure	Replace fuel injector for related cylinder
P02D500	Cylinder 5 Fuel Injector Offset Learning at Max Limit	Fuel injector failure	Replace fuel injector for related cylinder
P02D700	Cylinder 6 Fuel Injector Offset Learning at Max Limit	Fuel injector failure	Replace fuel injector for related cylinder
P042562	Catalyst Temperature Sensor Circuit (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor signal compare failure (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor correlation compare with at least two other sensors ● Pre-catalytic converter temperature sensor failure ● Pre-catalytic converter temperature sensor circuit - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Check pre-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace pre-catalytic converter temperature sensor
P042600	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor gradient check (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor failure ● Pre-catalytic converter temperature sensor circuit - short to ground, power or open circuit ● Pre-catalytic converter temperature sensor circuit high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required
P04261A	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor circuit resistance below threshold (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor plausibility at cold start, temperature difference too high ● Pre-catalytic converter temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for low resistance, short to ground. Replace pre-catalytic converter temperature sensor

DTC	Description	Possible causes	Action
P04261B	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor circuit resistance above threshold (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor plausibility at cold start, temperature difference too low ● Pre-catalytic converter temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for high resistance, open circuit. Replace pre-catalytic converter temperature sensor
P04261E	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor circuit resistance out of range (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor plausibility at engine running, temperature too low ● Pre-catalytic converter temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Check pre-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace pre-catalytic converter temperature sensor
P042700	Catalyst Temperature Sensor Circuit Low (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor signal below minimum threshold voltage (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor failure ● Pre-catalytic converter temperature sensor circuit - short to ground	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for short to ground. Install a new sensor as required
P042800	Catalyst Temperature Sensor Circuit High (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor signal above maximum threshold voltage (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor failure ● Pre-catalytic converter temperature sensor circuit - short power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check Pre-catalytic converter temperature sensor circuit for short to power, open circuit. Install a new sensor as required
P042A62	Catalyst Temperature Sensor Circuit (Bank 1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor signal compare failure (right hand bank sensor 2) ● Post-catalytic converter temperature sensor correlation compare with at least two other sensors ● Post-catalytic converter temperature sensor	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. check post-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post-catalytic converter temperature sensor

DTC	Description	Possible causes	Action
		failure ● Post-catalytic converter temperature sensor circuit - short to ground, power or open circuit	
P042B00	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor gradient check (right hand bank sensor 2) ● Post-catalytic converter temperature sensor failure ● Post-catalytic converter temperature sensor circuit - short to ground, power or open circuit ● Post-catalytic converter temperature sensor circuit - high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required
P042B1A	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor circuit resistance below threshold (right hand bank sensor 2) ● Post-catalytic converter temperature sensor plausibility at cold start, temperature difference too high ● Post-catalytic converter temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for low resistance, short to ground. Replace post-catalytic converter temperature sensor
P042B1B	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor circuit resistance above threshold (right hand bank sensor 2) ● Post-catalytic converter temperature sensor plausibility at cold start, temperature difference too low ● Post-catalytic converter temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for high resistance, open circuit. Replace post-catalytic converter temperature sensor
P042B1E	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor circuit resistance out of range (right hand bank sensor 2) ● Post-catalytic converter temperature sensor plausibility at engine running, temperature too low ● Post-catalytic converter temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. check post-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post-catalytic converter temperature sensor

DTC	Description	Possible causes	Action
P042C00	Catalyst Temperature Sensor Circuit Low (Bank 1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor signal below minimum threshold voltage (right hand bank sensor 2) ● Post-catalytic converter temperature sensor failure ● Post-catalytic converter temperature sensor circuit - short to ground	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for short to ground. Install a new sensor as required
P042D00	Catalyst Temperature Sensor Circuit High (Bank 1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor signal above maximum threshold voltage (right hand bank sensor 2) ● Post-catalytic converter temperature sensor failure ● Post-catalytic converter temperature sensor circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for short to power, open circuit. Install a new sensor as required
P242A62	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 3	● Post DPF temperature sensor signal compare failure (right hand bank sensor 3) ● Post DPF temperature sensor correlation compare with at least two other sensors ● Post DPF temperature sensor failure	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for open circuit, short to ground, short to power. Check post DPF temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post DPF temperature sensor
P242B1A	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 3	● Post DPF temperature sensor circuit resistance below threshold (right hand bank sensor 3) ● Post DPF temperature sensor plausibility at cold start, temperature difference too high ● Post DPF temperature sensor failure ● Post DPF temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for low resistance, short to ground. Replace post DPF temperature sensor
P242B1B	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 3	● Post DPF temperature sensor circuit resistance above threshold (right hand bank sensor 3) ● Post DPF temperature sensor plausibility at cold start, temperature difference too low ● Post DPF temperature sensor failure ● Post DPF temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for high resistance, open circuit. Replace post DPF temperature sensor
P242B1E	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 3	● Post DPF temperature sensor circuit resistance out of range (right hand bank sensor 3)	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for open circuit, short to ground, short to power.

DTC	Description	Possible causes	Action
		• Post DPF temperature sensor plausibility at engine running, temperature too low • Post DPF temperature sensor failure • Post DPF temperature sensor stuck at low temperature value	Check post DPF temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post DPF temperature sensor
P242C00	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 3	• Post DPF temperature sensor signal below minimum threshold voltage (right hand bank sensor 3) • Post DPF temperature sensor failure • Post DPF temperature sensor circuit -short to ground, high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for short to ground, high resistance. Install a new sensor as required
P242D00	Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 3	• Post DPF temperature sensor signal above max threshold voltage (right hand bank sensor 3) • Post DPF temperature sensor failure • Post DPF temperature sensor circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for short to power, open circuit. Install a new sensor as required
P242E00	Exhaust Gas Temperature Sensor Circuit Intermittent/Erratic Bank 1 Sensor 3	• Post DPF temperature sensor gradient check (right hand bank sensor 3) • Post DPF temperature sensor failure • Post DPF temperature sensor circuit - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required
P242F68	Diesel Particulate Filter Restriction - Ash Accumulation	• DPF event information • DPF partially blocked • DPF circuit internal to ECM	DPF regeneration required. Refer to driver handbook.
P244A00	Diesel Particulate Filter Differential Pressure Too Low(Bank1)	• Differential pressure on particulate filter too low right hand bank	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Check DPS system external pipework for breakage or leakage. Check DPF internal filter brick for failure. Install DPF as required
P244B00	Diesel Particulate Filter Differential Pressure Too High (Bank 1)	• Differential pressure on particulate filter too high right hand bank • Diesel particulate filter internal failure	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Contact Dealer Technical Support
P245300	Diesel Particulate Filter Pressure Sensor A Circuit Range/Performance	• Differential pressure on particulate filter sensor plausibility before start • DPS system contaminated or blocked • DPS stuck • DPS - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Check DPS system for contamination or blockage. Check DPS for sticking. Install sensor as required

DTC	Description	Possible causes	Action
P245329	Diesel Particulate Filter Pressure Sensor A Circuit Range/Performance	● DPS signal invalid ● Differential pressure on particulate filter sensor plausibility check at engine running ● DPS system contaminated or blocked ● DPS stuck ● DPS - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Check DPS system for contamination or blockage. Check DPS system external pipework for breakage or leakage. Check DPS for sticking. Install sensor as required
P245400	Diesel Particulate Filter Pressure Sensor A Circuit Low	● DPS signal below minimum threshold ● DPS failure ● DPS circuit - short to ground, high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for short to ground, high resistance. Install sensor as required
P245500	Diesel Particulate Filter Pressure Sensor A Circuit High	● DPS signal above maximum threshold ● DPS failure ● DPS circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to power. Install sensor as required
P245600	Diesel Particulate Filter Pressure Sensor A Circuit Intermittent/Erratic	● DPS signal gradient not plausible ● DPS failure ● DPS circuit - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Install sensor as required
P245800	Diesel Particulate Filter Regeneration Duration	● Delay timer for regeneration exceeds threshold ● DPF circuit internal to ECM	Contact Dealer Technical Support

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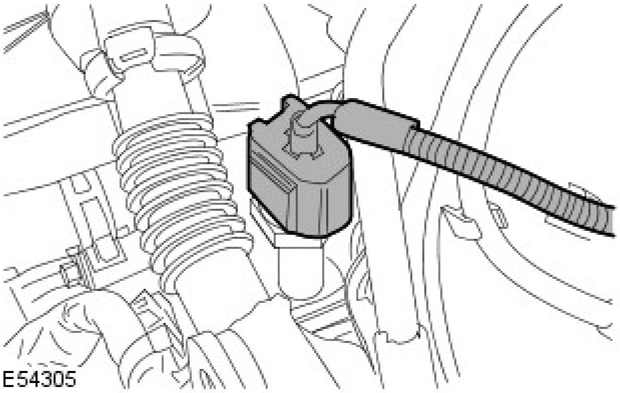
Electronic Engine Controls - TDV6 2.7L Diesel - Engine Oil Pressure (EOP) Sensor

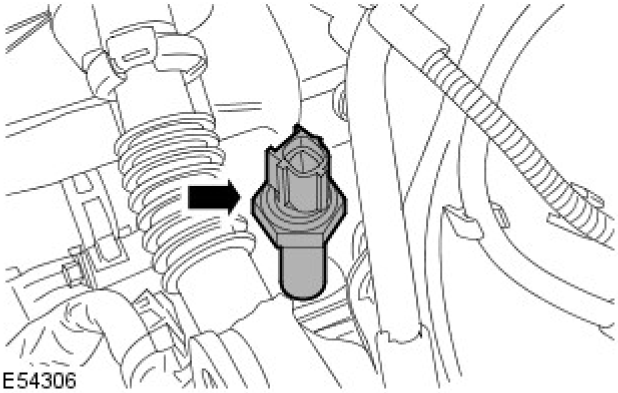
Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Disconnect the engine oil pressure (EOP) sensor electrical connector.



4. Remove the EOP sensor.



Installation

1. To install, reverse the removal procedure.
   - Tighten the EOP sensor to 15 Nm (11 lb.ft).
2. Check and top-up the engine oil.

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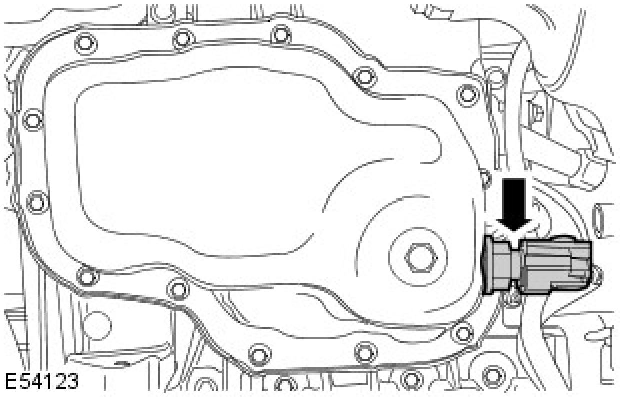
Electronic Engine Controls - TDV6 2.7L Diesel - Oil Temperature Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Drain the engine oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures).



3. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the oil temperature sensor.

- Disconnect the engine oil temperature sensor electrical connector.
- Position a container to collect the oil spillage.
- Remove and discard the O-ring seal.

Installation

1. NOTE: Lubricate new seals with clean engine oil.

Install the oil temperature sensor.

- Clean the component mating faces.
- Install a new O-ring seal.
- Tighten the oil temperature sensor to 20 Nm (15 lb.ft).
- Connect the engine oil temperature sensor electrical connector.

2. Fill the engine with oil.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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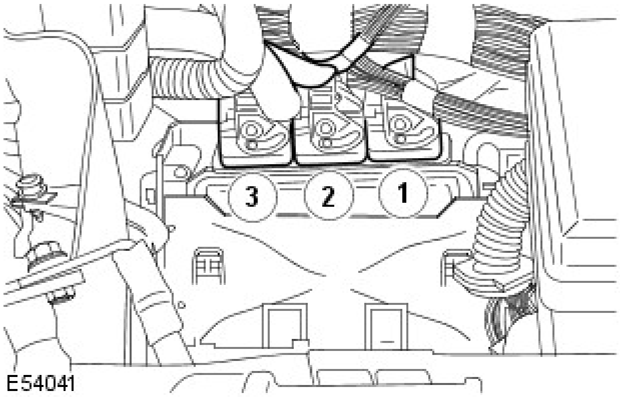
Electronic Engine Controls - TDV6 2.7L Diesel - Engine Control Module (ECM)

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

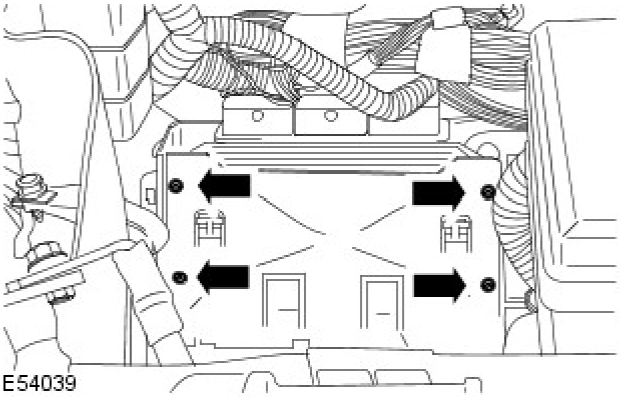
2. Remove the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).



3. NOTE: Right hand drive shown, for Left hand drive reverse the sequence.

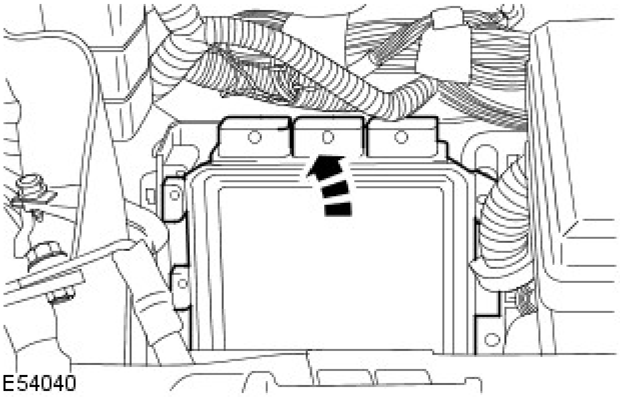
Disconnect the three engine harness electrical connectors in the order shown.

- Position the three engine harness electrical connectors aside for access.



4. Remove the ECM securing plate.

- Remove the four ECM securing bolts



5. Remove the ECM.

- Remove the ECM top cover.

Installation

1. Install the ECM.

- Install the ECM top cover.

2. Install the ECM securing plate.

- Install and tighten the four securing bolts.

3. Connect the three engine harness electrical connectors.

4. Install the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

6. NOTE: Vehicles with DPF (Diesel Particulate Filter) installed only.

Renew the engine oil and filter.
For additional information, refer to: Engine Oil Draining and Filling (303-01C Engine - TDV6 2.7L Diesel, General Procedures).

7. Connect T4 to calibrate a new ECM.

Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel - Engine Coolant Temperature (ECT) Sensor

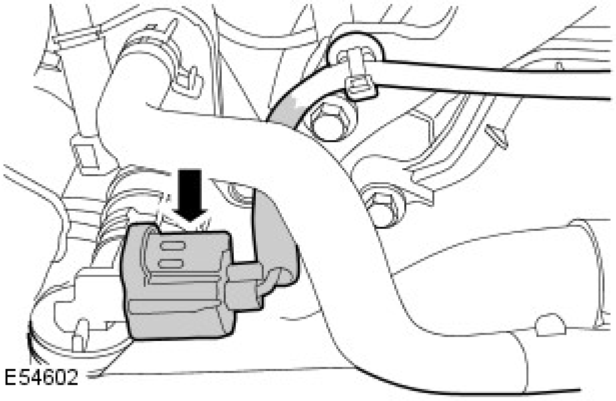
Removal and Installation

Removal

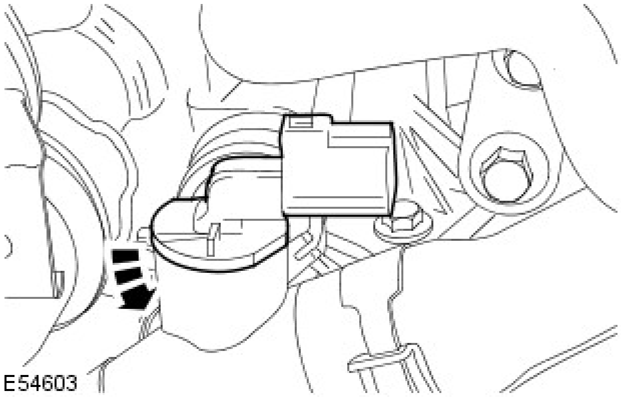
⚠ WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the engine coolant temperature sensor while the system is hot.

⚠ CAUTION: Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Disconnect the ECT sensor electrical connector.



4. Remove the ECT sensor.
   - Lift the tang and rotate the ECT sensor anti-clockwise.
   - Remove and discard the O-ring seal.



Installation

1. Install the ECT sensor.
   - Clean the component mating faces.
   - Install a new O-ring seal.
2. Connect the ECT sensor electrical connector.
3. Check and top-up the coolant.

- Clean any remaining coolant from around the hoses and pipes.

4. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

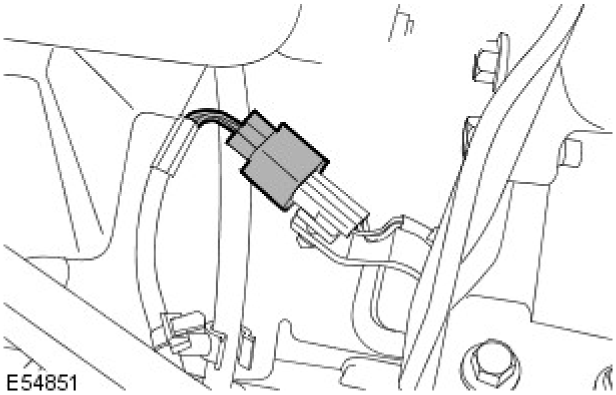
Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel - Crankshaft Position (CKP) Sensor

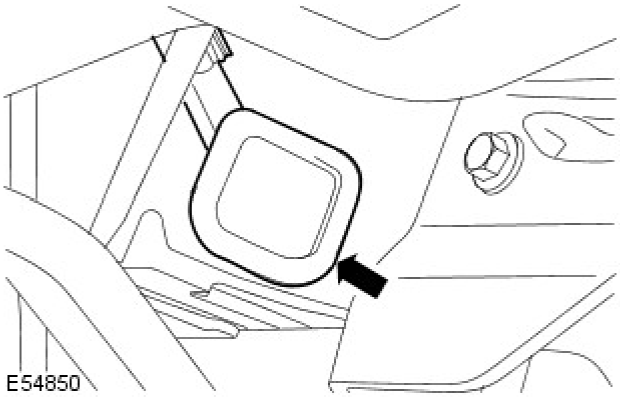
Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the turbocharger.
   For additional information, refer to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Removal and Installation).
3. Disconnect the CKP sensor electrical connector.



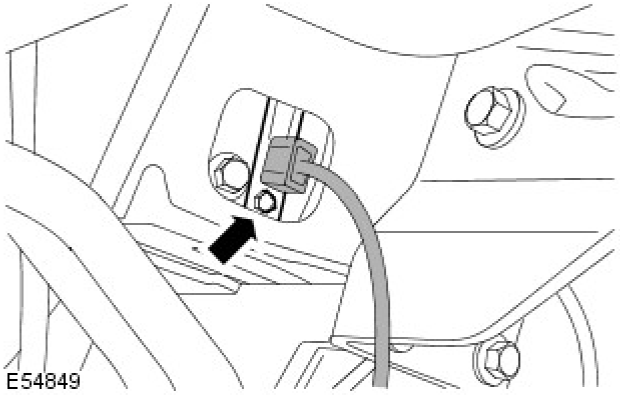
4. Remove the CKP sensor blanking cover.



5. NOTE: The CKP sensor retaining bolt should not be removed from the CKP sensor.

   Remove the CKP sensor.

   - Fully loosen the CKP sensor retaining bolt.



Installation

1. ⚠ CAUTION: Install the CKP sensor correctly into the housing. Failure to follow this instruction may result in damage to the CKP sensor.

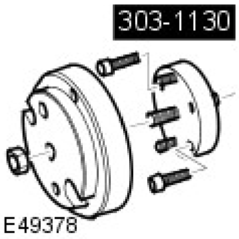
To install, reverse the removal procedure.

- Tighten the CKP sensor bolt to 5 Nm (4 lb.ft)

Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel - Crankshaft Position (CKP) Sensor Ring

Removal and Installation

Special Tool(s)	
	Installer - Crankshaft Position (CKP) Sensor Ring 303-1130

Removal

• NOTE: The CKP sensor ring must always be discarded and replaced when removed.

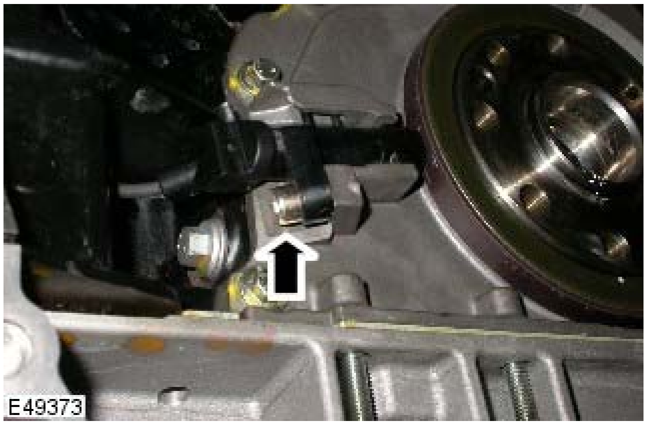
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

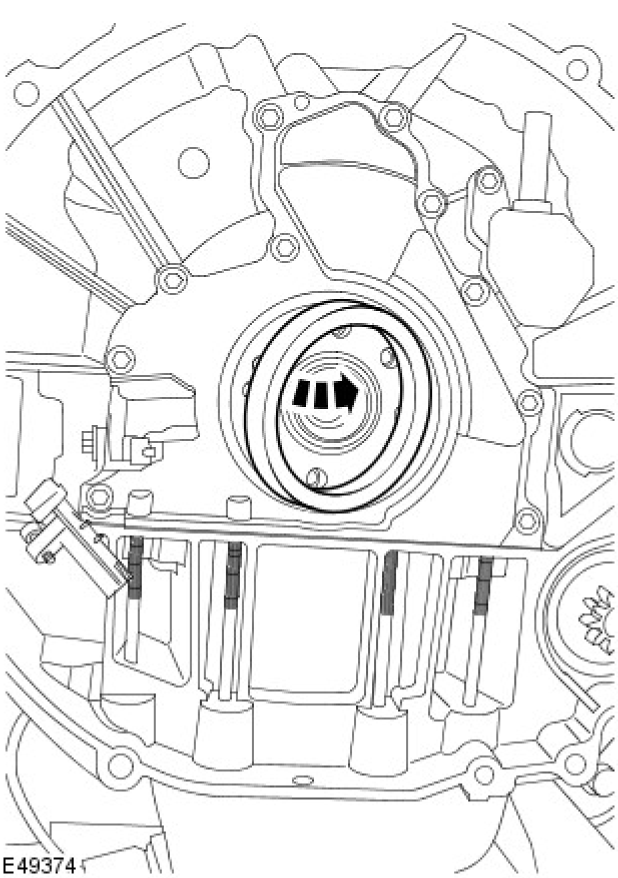
Raise and support the vehicle.

3. Remove the torque converter flexplate.
For additional information, refer to: Flexplate (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

4. Release the CKP sensor.



- Release the Allen screw.

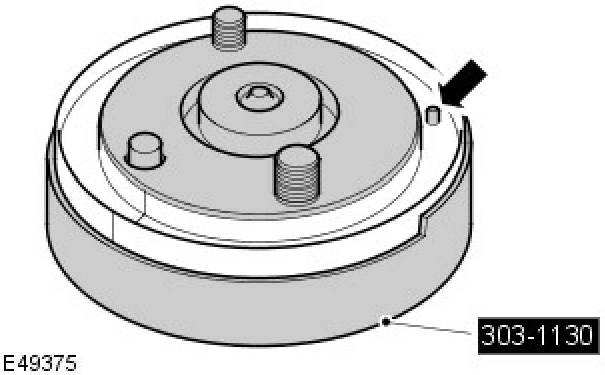

E49374

5. ⚠ CAUTION: Care must be taken to avoid damage to the crankshaft.

Remove the CKP sensor ring.

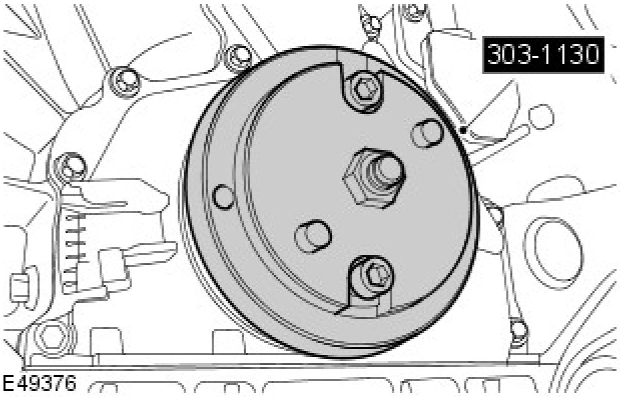
- Carefully remove the CKP sensor ring.

Installation



E49375

1. Install the new CKP sensor ring to the special tool.
   - Wind the special tool nut back to the end of the thread.
   - Engage the CKP sensor ring to the locating pin.



2. Install the CKP sensor ring to the crankshaft.

- Clean the component mating faces.
- Align the dowel and install the special tool to the crankshaft.
- Tighten the 2 Allen screws.
- Tighten the special tool nut, to install the CKP sensor ring to the crankshaft.
- Remove the special tool.

3. Install the CKP sensor.

- Tighten the Allen screw to 6 Nm (4 lb.ft).

4. Install the torque converter flexplate.
For additional information, refer to: Flexplate (303-01C Engine - TDV6 2.7L Diesel, In-vehicle Repair).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Electronic Engine Controls - TDV6 2.7L Diesel - Camshaft Position (CMP) Sensor

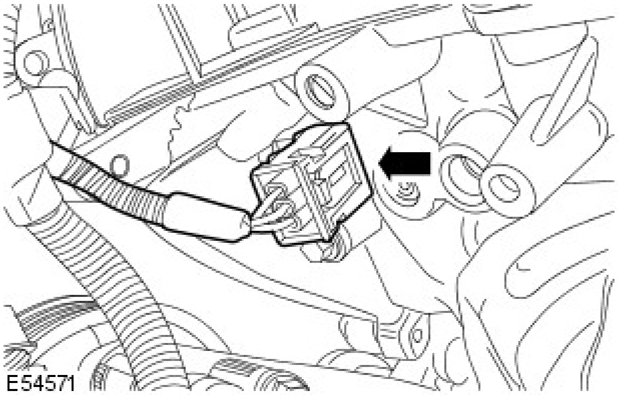
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

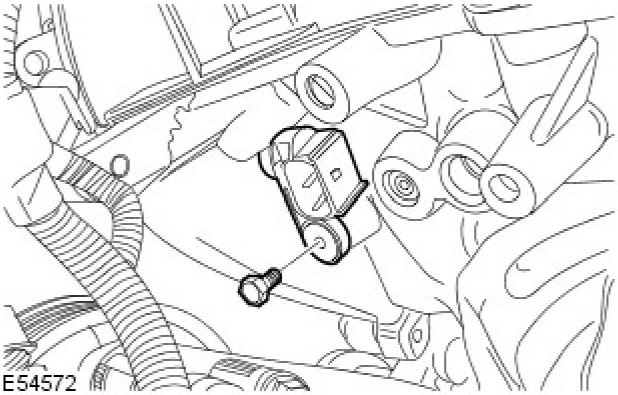
2. Remove the LH exhaust gas recirculation (EGR) valve.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH - Vehicles Without: Diesel Particulate Filter (DPF) (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

3. Disconnect the CMP sensor electrical connector.



4. Remove and discard the CMP sensor.

- Remove the CMP sensor retaining bolt.

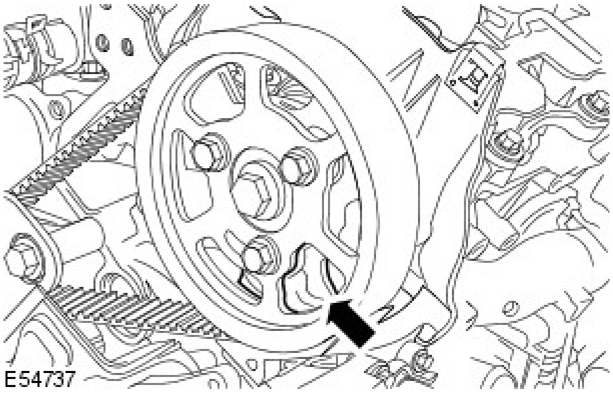


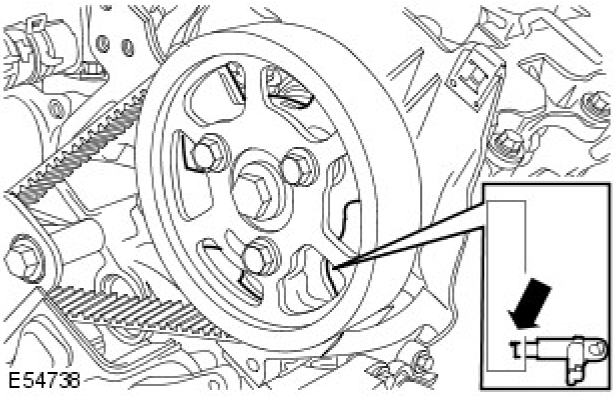
Installation

1. NOTE: Only turn the engine in the normal direction of rotation.

Turn the engine until one of the three webs on the back of the camshaft pulley is visible through the CMP sensor housing.

- Timing belt cover shown removed for clarity.
- Use a mirror, to view the webs on the camshaft pulley through the CMP sensor locating hole.





2. ⚠ CAUTION: The Camshaft position (CMP) sensor tip must rest on one of the three webs on the back of the camshaft pulley. Incorrect installation may result in the CMP sensor being damaged.

Install a new CMP sensor

3. Install the retaining bolt.

- Tighten the bolt to 10 Nm (7 lb.ft).

4. Connect the CMP sensor electrical connector.

5. Install the LH EGR valve.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH - Vehicles Without: Diesel Particulate Filter (DPF) (303-08C Engine Emission Control - TDV6 2.7L Diesel, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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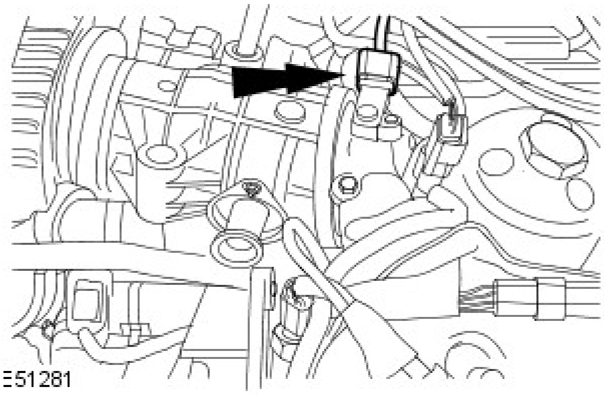
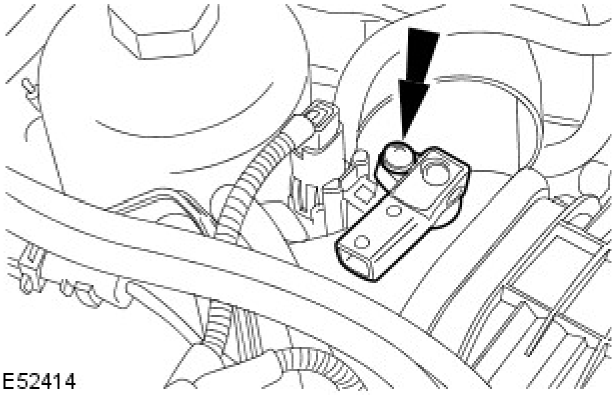
Electronic Engine Controls - TDV6 2.7L Diesel - Manifold Absolute Pressure (MAP) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Disconnect the MAP sensor electrical connector.





4. Remove the MAP sensor.
   - Remove the Torx screw.
   - Remove the O-ring seal.

Installation

1. To install, reverse the removal procedure.
   - Tighten the Torx screw to 3 Nm (2 lb.ft).

Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel - Fuel Temperature Sensor

Removal and Installation

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

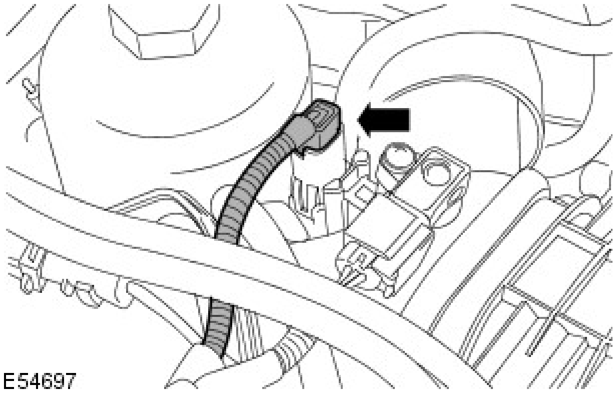
- CAUTIONS:

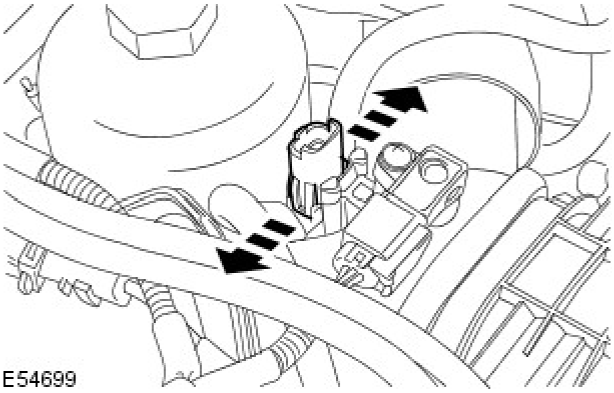
⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

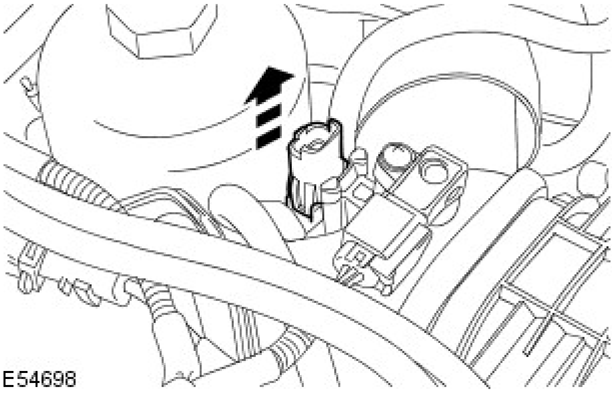
⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Disconnect the fuel temperature sensor electrical connector.





4. Release the fuel temperature sensor locking tangs.



5. ⚠CAUTION: Always plug any open connections to prevent contamination.

Remove the fuel temperature sensor from the fuel return line.

- Position an absorbent cloth to collect fluid spillage.
- Discard the O-ring seal.
- Clean the seal contact area.
- Install a clean blanking plug to the fuel return line.

Installation

1. To install, reverse the removal procedure.

- Clean the immediate area.

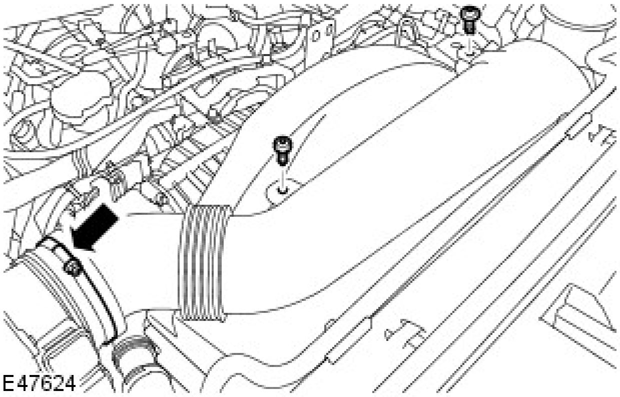
Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel - Mass Air Flow (MAF) Sensor

Removal and Installation

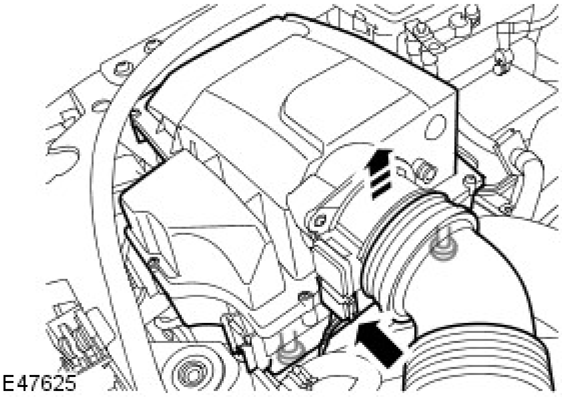
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



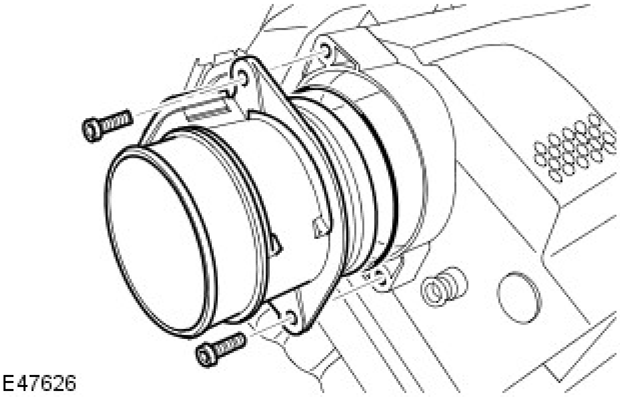
2. Release the air outlet pipe.

- Remove the 2 screws.
- Loosen the clip.



3. Remove the RH air cleaner assembly.

- Disconnect the electrical connector.
- Release the air cleaner from the 2 grommets.



4. Remove the MAF sensor.

- Remove the 2 Torx screws.
- Remove the O-ring seal.

Installation

1. NOTE: When installing the air cleaner, make sure the locating pegs fit securely into the grommets.

To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 2.7L Diesel - Intake Air Temperature (IAT) Sensor

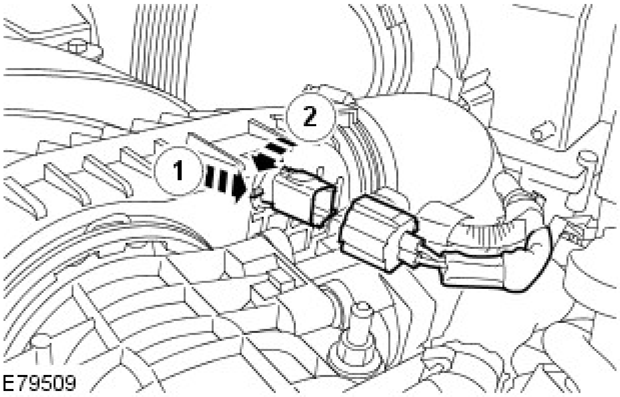
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Remove the intake air temperature (IAT) sensor.



- Disconnect the electrical connector.

Installation

1. To install, reverse the removal procedure.

Published: 09-Mar-2011

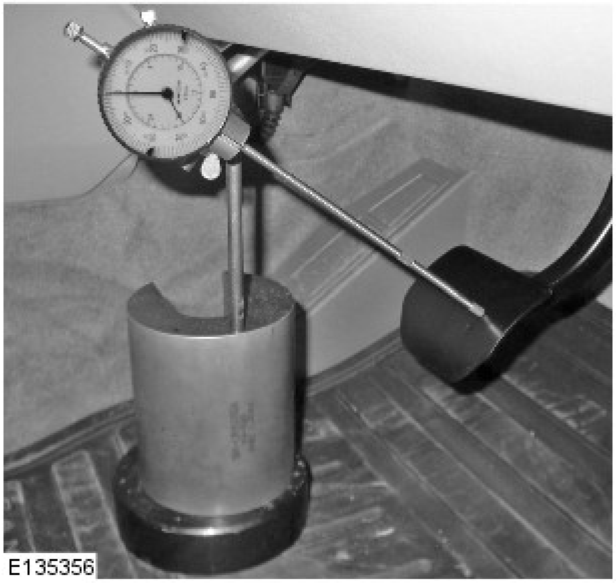
Electronic Engine Controls - TDV6 2.7L Diesel - Brake Pedal Position (BPP) Switch Adjustment

General Procedures

Check

1. Remove the brake pedal rubber.

2. NOTE: Make sure that the dial test indicator (DTI) gauge is in line with the brake pedal movement.



Position the DTI gauge on a suitable mounting block, as illustrated.

3. With the aid of another technician, gently press the brake pedal until the stoplamps illuminate.

4. NOTE: The specification is that the stoplamps should illuminate at between 5.5mm and 8.5mm brake pedal travel.

Note the measurement of the brake pedal travel from rest position until the stoplamps illuminated.

Adjust

1. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠

Remove the stoplamp switch.
For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

2. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠ Only use light finger pressure when installing the stoplamp switch. Failure to follow this instruction may result in an incorrectly adjusted stoplamp switch.

Install the stoplamp switch.

For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

3. Check the adjustment of the stoplamp switch by following the **Check** procedure in this procedure and carry out the **Adjust** procedure if required.

Published: 11-May-2011

Electronic Engine Controls - TDV8 3.6L Diesel -

Engine management system

Item	Description
Make	Siemens
Type	SID 203

Torque specifications

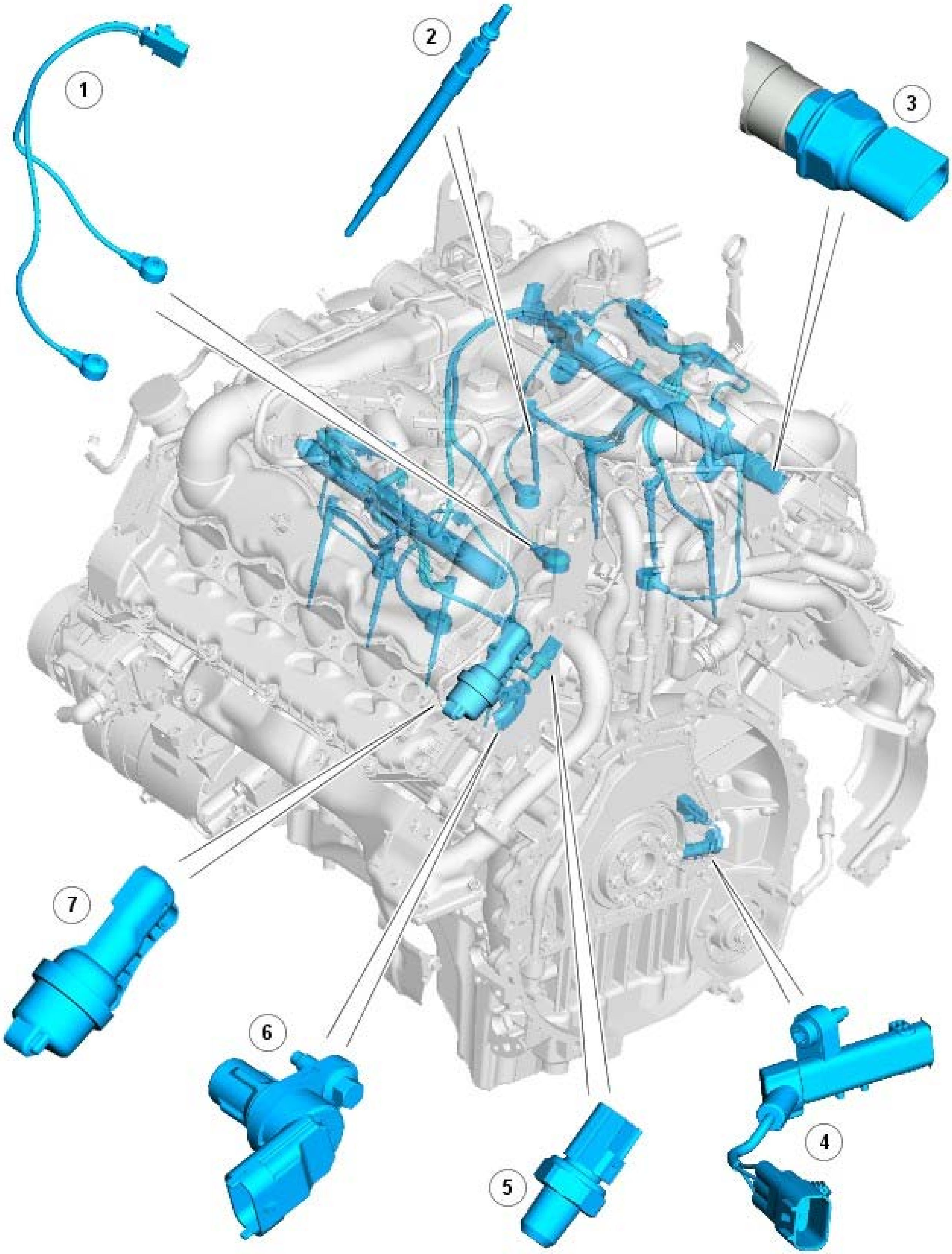
Description	Nm	lb-ft
Camshaft position (CMP) sensor bolt	10	7
Engine oil pressure (EOP) sensor bolt	15	11
Manifold absolute pressure and temperature (MAPT) sensor bolt	3	2
Crankshaft position (CKP) sensor bolt	5	4
Knock (KS) sensor bolt	20	15
Mass air flow (MAF) sensor screws	2	1

Published: 11-May-2011

Electronic Engine Controls - TDV8 3.6L Diesel - Electronic Engine Controls

Description and Operation

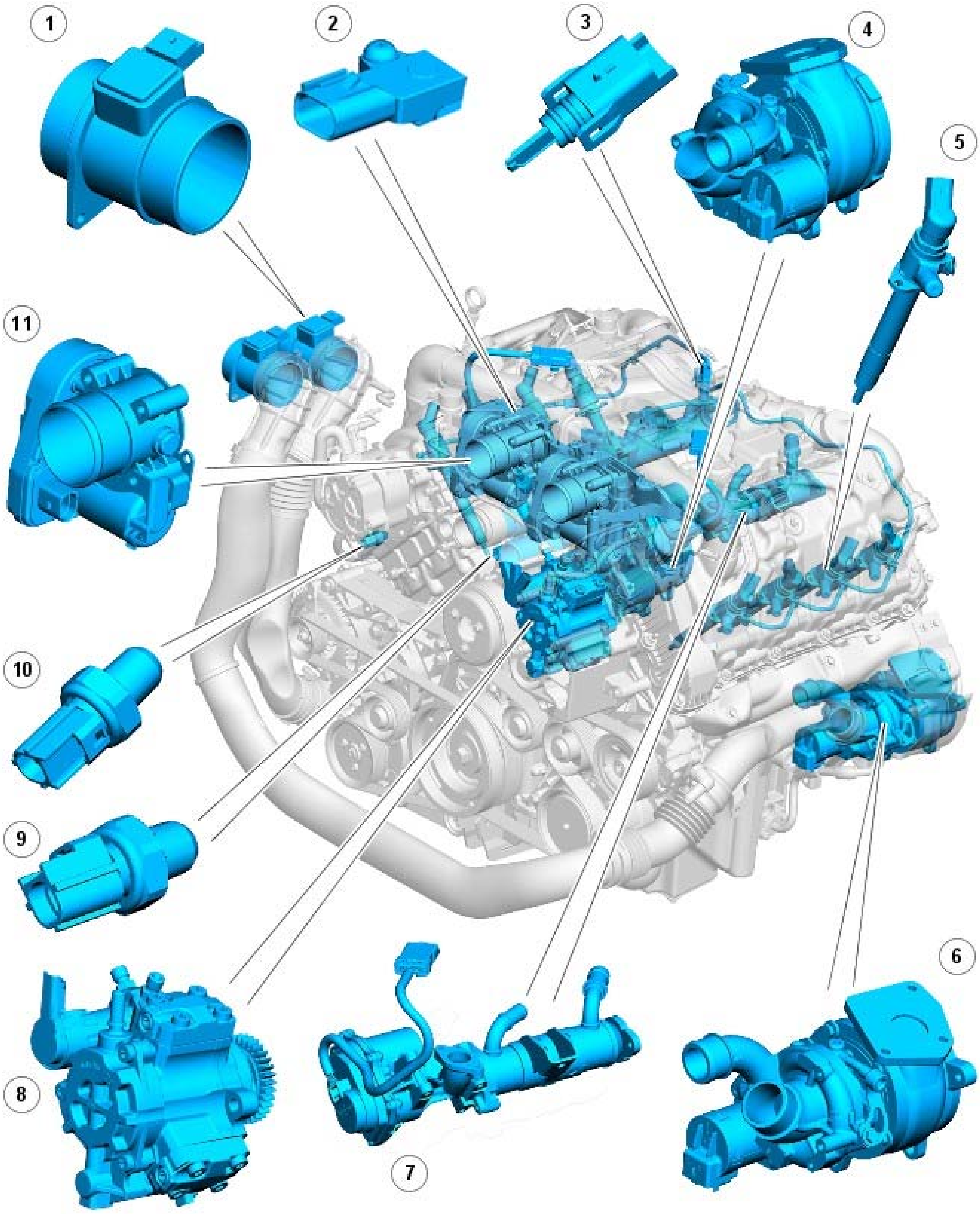
COMPONENT LOCATION - SHEET 1 OF 3



E88657

Item	Part Number	Description
1	-	Knock sensors 4 off
2		Glow plugs
3		Fuel rail pressure sensor
4		crankshaft position (CKP) sensor
5		Oil temperature sensor (in oil pan)
6		camshaft position (CMP) sensor
7		Port deactivation actuator 2 off

COMPONENT LOCATION - SHEET 2 OF 3


1
2
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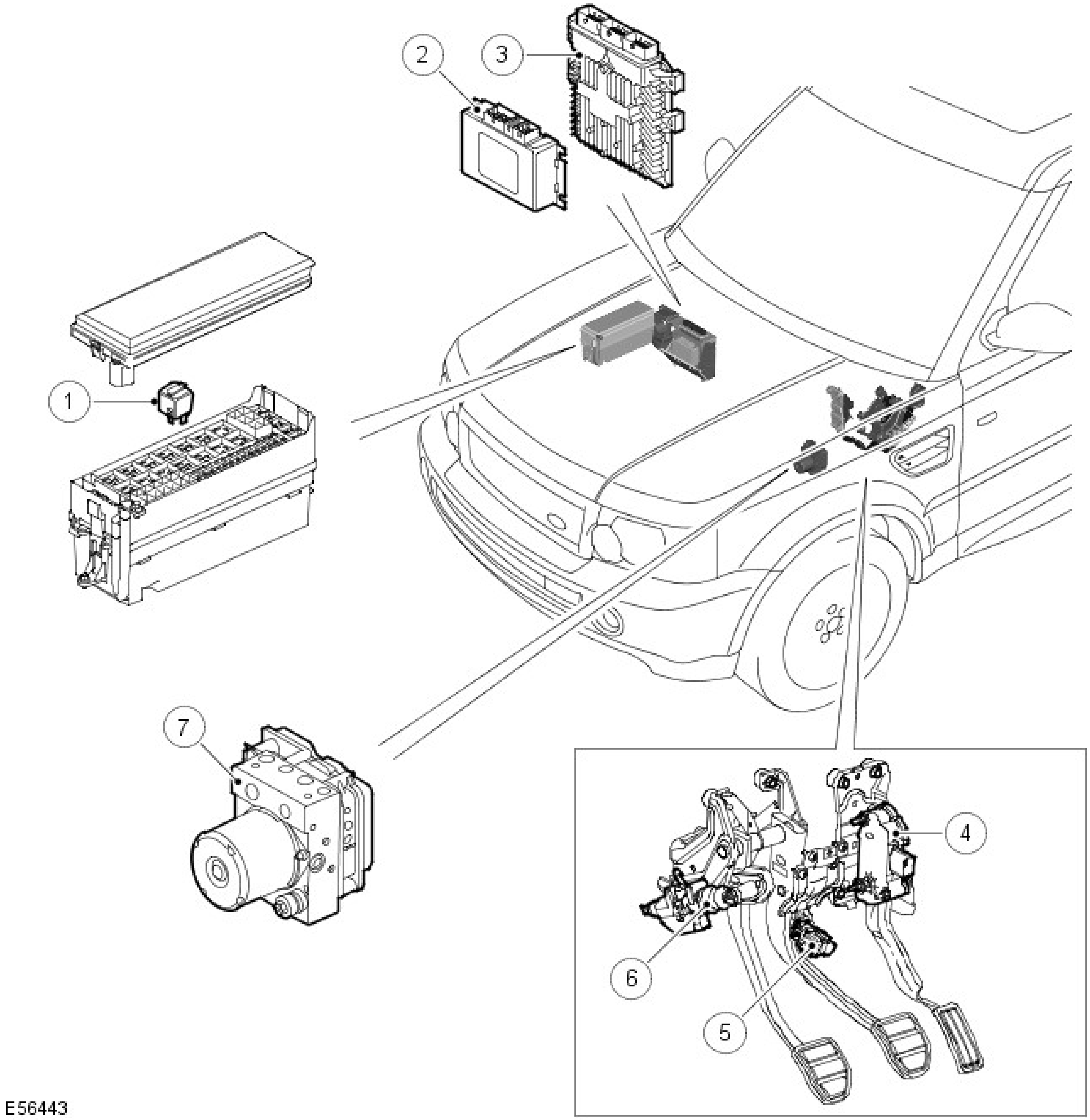
E88658

Item	Part Number	Description
1	-	mass air flow (MAF)/intake air temperature (IAT) sensors
2	-	Boost pressure sensor
3	-	Fuel temperature sensor
4	-	right-hand (RH) turbo
5	-	Injectors (8 off)

6	-	left-hand (LH) Turbo
7	-	LHexhaust gas recirculation (EGR) valve and cooler
8		engine coolant temperature (ECT) sensor
9		LH Turbo
10		Oil pressure sensor
11	-	Electric throttles (2 off)

COMPONENT LOCATION - SHEET 3 OF 3



Item	Part Number	Description
1		Main relay
2		Transfer box control module
3		engine control module (ECM)
4		accelerator pedal position (APP)
5		BPP (brake pedal position) switch
6		Clutch switch
7		anti-lock brake system (ABS) module

OVERVIEW

The TDV8 engine has an engine management system controlled by an ECM and is able to monitor, adapt and precisely control the fuel injection. The ECM uses multiple sensor inputs and precision control of actuators to achieve optimum performance during all driving conditions.

The ECM controls fuel delivery to all 8 cylinders via a Common Rail (CR) injection system. The CR system uses a fuel rail to accumulate highly pressurized fuel and feed the 8, electronically controlled injectors. The fuel rail is located in close proximity to the injectors, which assists in maintaining full system pressure at each injector at all times.

The ECM uses the drive by wire principle for acceleration control. There are no control cables or physical connections between the accelerator pedal and the engine. Accelerator pedal demand is communicated to the ECM by two potentiometers located in a throttle position sensor. The ECM uses the two signals to determine the position, rate of movement and direction of movement of the pedal. The ECM then uses this data, along with other engine information from other sensors, to achieve the optimum engine response.

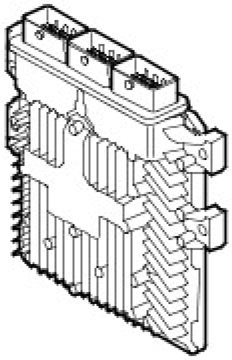
The ECM processes information from the following input sources:

- CKP sensor
- CMP sensor
- Manifold air temperature and pressure
- Coolant temperature
- Oil temperature
- Inlet air flow and temperature
- Fuel rail temperature
- Knock sensors (2 per cylinder bank)

The ECM outputs controlling signals to the following sensors and actuator:

- Fuel injectors
- Cooling fan solenoid
- Electronic Throttle
- Electronic vane controlled turbo
- Port deactivation
- Fuel pressure control valve
- Fuel volume control valve
- E-box fan
- Engine mounts
- Electronic EGR
- Glow plugs

ENGINE CONTROL MODULE (ECM)



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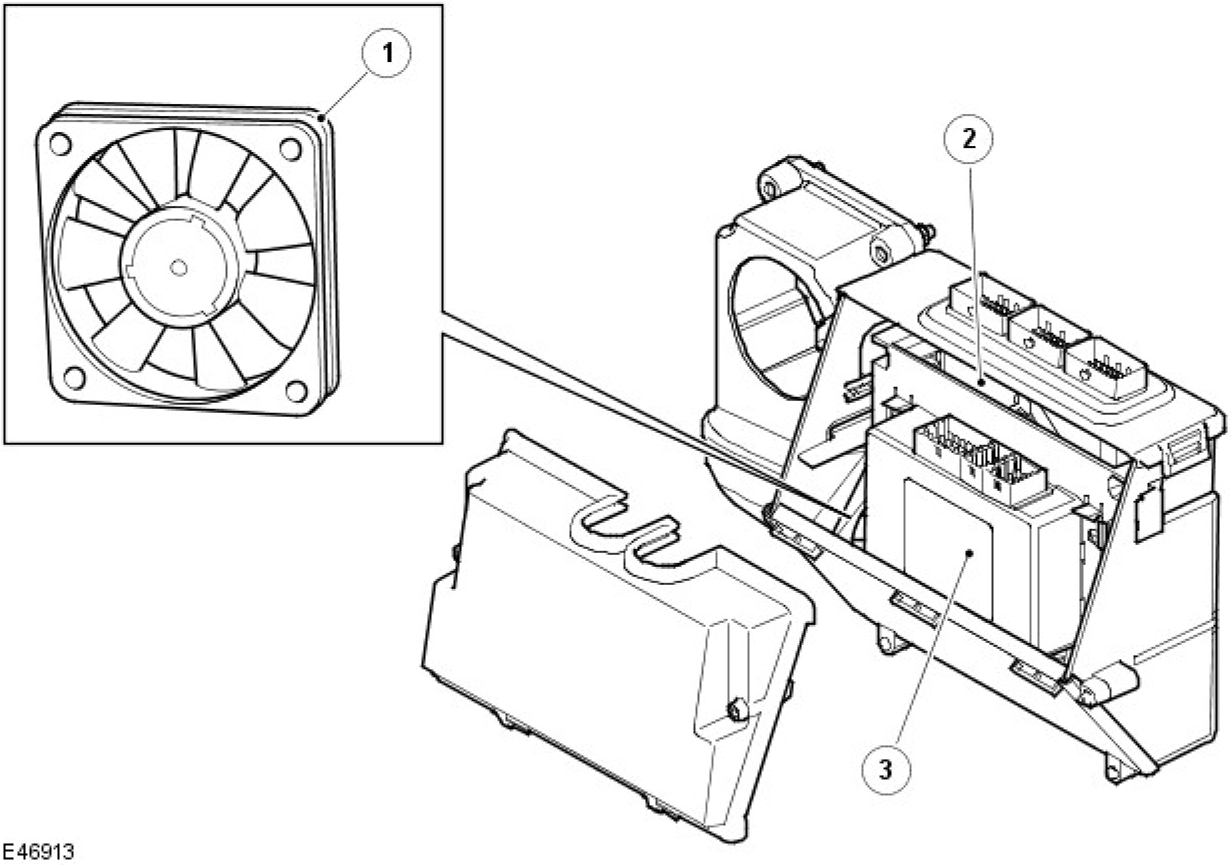
The ECM is located in the E-Box in the plenum area attached to the bulkhead. The E-Box is always on the opposite side to the hand of drive.

E Box



Item	Part Number	Description
1	-	E box fan
2	-	ECM
3	-	Transfer box control module

Inputs

The ECM has the following inputs:

- Engine Coolant Temperature
- Mass airflow (2 off)
- Stop lamp switch (via ABS module on controller area network (CAN)) and hardwired to the ECM
- Manifold Absolute Pressure
- APP sensor - Throttle Pedal Position 1
- APP sensor - Throttle Pedal Position 2
- Electronic throttle Position
- Viscous Fan Speed
- Crankshaft position (engine speed)
- Camshaft position
- Engine Oil Temperature
- Speed Control Switches (resistive ladders)
- Vehicle Speed (via CAN bus)
- Generator Monitor
- Restraints Control Module (RCM)
- Manifold Absolute Pressure and Intake Air Temperature (MAP/IAT)
- Knock sensors (4off)
- Fuel temperature and pressure
- Water in fuel sensor
- Boost air temperature
- Intake air temperature
- Park/neutral switch

Outputs

The ECM outputs to the following:

- Throttle actuators (2of)

- Fuel injectors (8 off)
- EGR Valves
- Electric cooling fan
- Fuel pump relay
- Starter relay
- Air conditioning condenser fan module
- EMS Main relay
- Viscous fan control
- Generator control
- E-box fan control
- Glow plugs
- Fuel volume control valve
- Fuel pressure control valve
- Active engine mounts
- Port deactivation control solenoid valve

The ECM connected to the vehicle harnesses via three connectors. The ECM contains data processors and memory microchips. The output signals to the actuators are in the form of ground paths provided by driver circuits within the ECM. The ECM driver circuits produce heat during normal operation and dissipate this heat via the casing. The fan in the E-box assists with the cooling process by maintaining a constant temperature with the E-box. The E box fan is controlled by the ECM via its internal temperature sensor. The E-box draws air from the vehicle interior and receives additional cooled air via the air conditioning (A/C) system. Some sensors receive a regulated voltage supplied by the ECM. This avoids incorrect signals caused by voltage drop during cranking.

The ECM performs self diagnostic routines and stores fault codes in its memory. These fault codes and diagnostics can be accessed using a Land Rover approved diagnostic system. If the ECM is to be replaced, the new ECM is supplied 'blank' and must be configured to the vehicle using a Land Rover approved diagnostic system. A 'flash' Electronic Erasable Programmable Read Only Memory (EEPROM) allows the ECM to be externally configured, using a Land Rover approved diagnostic system, with market specific or new tune information up to 14 times. If a fifteenth update is required the ECM must be replaced. The current engine tune data can be accessed and read using a Land Rover approved diagnostic system.

When a new ECM is fitted, it must also be synchronized to the CJB using a Land Rover approved diagnostic system. ECM's cannot be 'swapped' between vehicles.

The ECM is connected to the engine sensors which allow it to monitor the engine operating conditions. The ECM processes these signals and decides the actions necessary to maintain optimum engine performance in terms of driveability, fuel efficiency and exhaust emissions. The memory of the ECM is programmed with instructions for how to control the engine, this known as the strategy. The memory also contains data in the form of maps which the ECM uses as a basis for fueling and emission control. By comparing the information from the sensors to the to the data in the maps, the ECM is able to calculate the various output requirements. The ECM contains an adaptive strategy which updates the system when components vary due to production tolerances or ageing.

The ECM receives a vehicle speed signal on a CAN bus connection from the ABS Module. Vehicle speed is an important input to the ECM strategies. The ABS derives the speed signal from the ABS wheel speed sensors. The frequency of this signal changes according to road speed. The ECM uses this signal to determine the following:

- How much to reduce engine torque during gear changes.
- When to permit speed control operation.
- To control the operation of the speed control system.
- Implementation of the idle strategy when the vehicle is stationary.

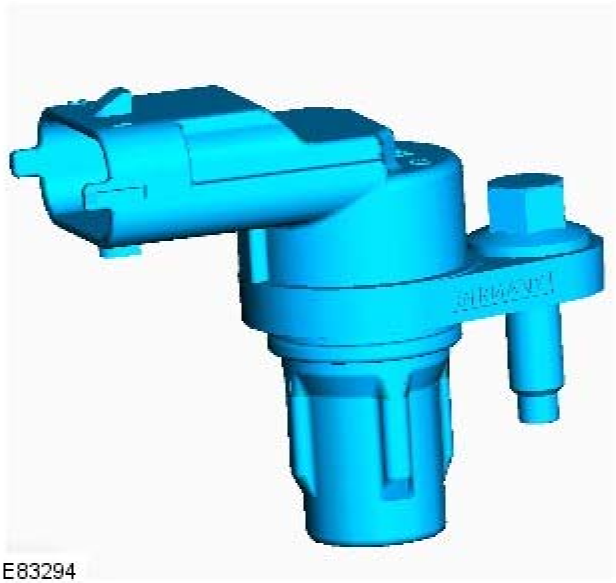
IMMOBILIZATION

The Central Junction Box (CJB) receives information from related systems on the vehicle and passes a coded signal to the ECM to allow starting if all starting parameters have been met. The information is decoded by the ECM which will allow the engine to run if the information is correct.

The information is on a rolling code system and both the CJB and the ECM will require synchronisation if either component is renewed.

The ECM also protects the starter motor from inadvertent operation. The CJB receives an engine speed signal from the ECM via the instrument cluster. When the engine speed exceeds a predetermined value, the CJB prevents operation of the starter motor via an integral starter disable relay.

CAMSHAFT POSITION (CMP) SENSOR



The CMP is located on the rear face of the left hand cylinder head. The sensor tip protrudes through the face to pick up on the reluctor behind the camshaft pulley. The CMP sensor is a Hall effect type sensor

The ECM uses the CMP sensor signal to determine if the piston in No. 1 cylinder is at injection TDC or exhaust TDC. Once this has been established, the ECM can then operate the correct injector to inject fuel into the cylinder when the piston is at injection TDC.

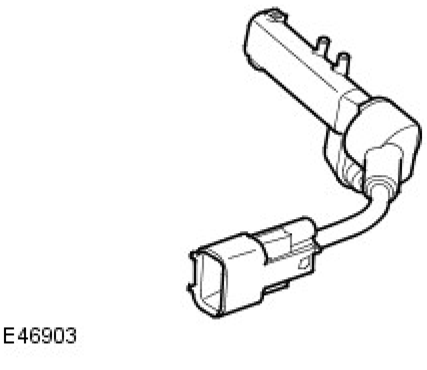
The sensor is a Hall effect sensor which used by the ECM at engine start-up to synchronize the ECM with the CKP sensor signal. The ECM does this by using the CMP sensor signal to identify number one cylinder to ensure the correct injector timing. Once the ECM has established the injector timing, the CMP sensor signal is no longer used.

The CMP sensor receives a 5V supply from the ECM. Two further connections to the ECM provide ground and signal output.

If a fault occurs, an error is registered in the ECM. Two types of failure can occur; camshaft signal frequency too high or total failure of the camshaft signal. The error recorded by the ECM can also relate to a total failure of the crankshaft signal or crankshaft signal dynamically implausible. Both components should be checked to determine the cause of the fault.

If a fault occurs with the CMP sensor when the engine is running, the engine will continue to run but the ECM will deactivate boost pressure control. Once the engine is switched off, the engine will crank but will not restart while the fault is present.

CRANKSHAFT POSITION (CKP) SENSOR



The CKP sensor is located at the rear of the engine block on the left hand side. The sensor tip is aligned with a magnetic trigger which is attached to the crankshaft. The reluctor is a press fit on the end of the crankshaft. The trigger wheel must be carefully aligned to the crankshaft to ensure correct timing. The sensor produces a square wave signal, the frequency of which is proportional to engine speed.

The ECM monitors the CKP sensor signal and can detect engine over-speed. The ECM counteracts engine over-speed by gradually fading out speed synchronized functions. The CKP sensor is a Hall effect sensor. The sensor measures the magnetic field variation induced by the magnetized trigger wheel.

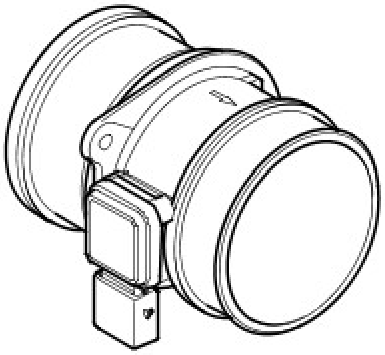
The trigger wheel has two missing teeth representing 12° of crankshaft rotation. The two missing teeth provide a reference point for the angular position of the crankshaft.

When the space with the two missing teeth pass the sensor tip, a gap in the signal is produced which the ECM uses to determine the crankshaft position. The air gap between the sensor tip and the ring is important to ensure correct signals are output to the ECM. The recommended air gap between the CKP sensor and the trigger wheel is 0.4 mm- 1.5 mm.

The ECM uses the signal from the CKP sensor for the following functions:

- Synchronisation.
- Determine fuel injection timing.
- Enable the fuel pump relay circuit (after the priming period).
- Produce an engine speed signal which is broadcast on the CAN bus for use by other systems.

MASS AIR FLOW / INTAKE AIR TEMPERATURE (MAF / IAT) SENSOR



E46904

Two MAF/IAT sensors are located on the intake air duct directly after the air filter box. Each sensor is housed in a plastic molding which is connected between the intake manifold and the air intake pipe.

• NOTE: The MAF/IAT which monitors the LH bank intake does not use the IAT portion of the sensor.

The MAF sensor works on the hot film principle. Two sensing elements are contained within a film. One element is maintained at ambient (air intake) temperature, e.g. 25°Celsius (77°F). The other element is heated to 200°Celsius (392°F) above the ambient temperature, e.g. 225°Celsius (437°F). Intake air entering the engine passes through the MAF sensor and has a cooling effect on the film. The ECM monitors the current required to maintain the 200°Celsius (392°F) differential between the two elements and uses the differential to provide a precise, non-linear, frequency based signal which equates to the volume of air being drawn into the engine.

The MAF sensor output is a digital signal proportional to the mass of the incoming air. The ECM uses this data, in conjunction with signals from other sensors and information from stored fueling maps, to determine the precise fuel quantity to be injected into the cylinders. The signal is also used as a feedback signal for the EGR system.

The IAT sensor incorporates a Negative Temperature Coefficient (NTC) thermistor in a voltage divider circuit. The NTC thermistor works on the principle of decreasing resistance in the sensor as the temperature of the intake air increases. As the thermistor allows more current to pass to ground, the voltage sensed by the ECM decreases. The change in voltage is proportional to the temperature change of the intake air. Using the voltage output from the IAT sensor, the ECM can correct the fueling map for intake air temperature. The correction is an important requirement because hot air contains less oxygen than cold air for any given volume.

The MAF sensor receives a 12V supply from the Battery Junction Box (BJB) and a ground connection via the ECM. Two further connections to the ECM provide a MAF signal and IAT signal.

The IAT sensor receives a 5V reference voltage from the ECM and shares a ground with the MAF sensor. The signal output from the IAT sensor is calculated by the ECM by monitoring changes in the supplied reference voltage to the IAT sensor voltage divider circuit.

The ECM checks the calculated air mass against the engine speed. If the calculated air mass is not plausible, the ECM uses a default air mass figure which is derived from the average engine speed compared to a stored characteristic map. The air mass value will be corrected using values for boost pressure, atmospheric pressure and air temperature.

If the MAF sensor fails the ECM implements the default strategy based on engine speed. In the event of a MAF sensor signal failure, any of the following symptoms may be observed:

- Difficult starting
- Engine stalls after starting
- Delayed engine response

- Emission control inoperative
- Idle speed control inoperative
- Reduced engine performance.

If the IAT sensor fails the ECM uses a default intake air temperature of -5°Celsius (23°F). In the event of an IAT sensor failure, any of the following symptoms may be observed:

- Over fueling, resulting black smoke emitting from the exhaust.
- Idle speed control inoperative.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

E83295

The engine coolant temperature sensor is located in the top hose at the coolant manifold junction. The ECT sensor provides the ECM and the instrument cluster with engine coolant temperature status.

The ECM uses the temperature information for the following functions:

- Fueling calculations
- Limit engine operation if engine coolant temperature becomes too high
- Cooling fan operation
- Glow plug activation time.

The instrument cluster uses the temperature information for temperature gauge operation. The engine coolant temperature signal is also transmitted on the CAN bus by the instrument cluster for use by other systems.

The ECM circuit for the ECT sensor consists of an internal voltage divider circuit which incorporates an NTC thermistor. As the coolant temperature rises the resistance through the sensor decreases and vice versa. The output from the sensor is the change in voltage as the thermistor allows more current to pass to earth relative to the temperature of the coolant.

The ECM compares the signal voltage to stored values and adjusts fuel delivery to ensure optimum driveability at all times. The engine will require more fuel when it is cold to overcome fuel condensing on the cold metal surfaces inside the combustion chamber. To achieve a richer air/fuel ratio, the ECM extends the injector opening time. As the engine warms up the air/fuel ratio is leaned off.

The input to the sensor is a 5V reference voltage supplied from the voltage divider circuit within the ECM. The ground from the sensor is also connected to the ECM which measures the returned current and calculates a resistance figure for the sensor which relates to the coolant temperature.

The following table shows engine coolant temperature values and the corresponding sensor resistance and voltage values.

Coolant Temperature Sensor Response

Temperature (Degrees Celsius)	Resistance (Kohms)	Voltage (Volts)
-40	925	4.54
-30	496	4.46
-20	277	4.34
-10	160	4.15
0	96	3.88

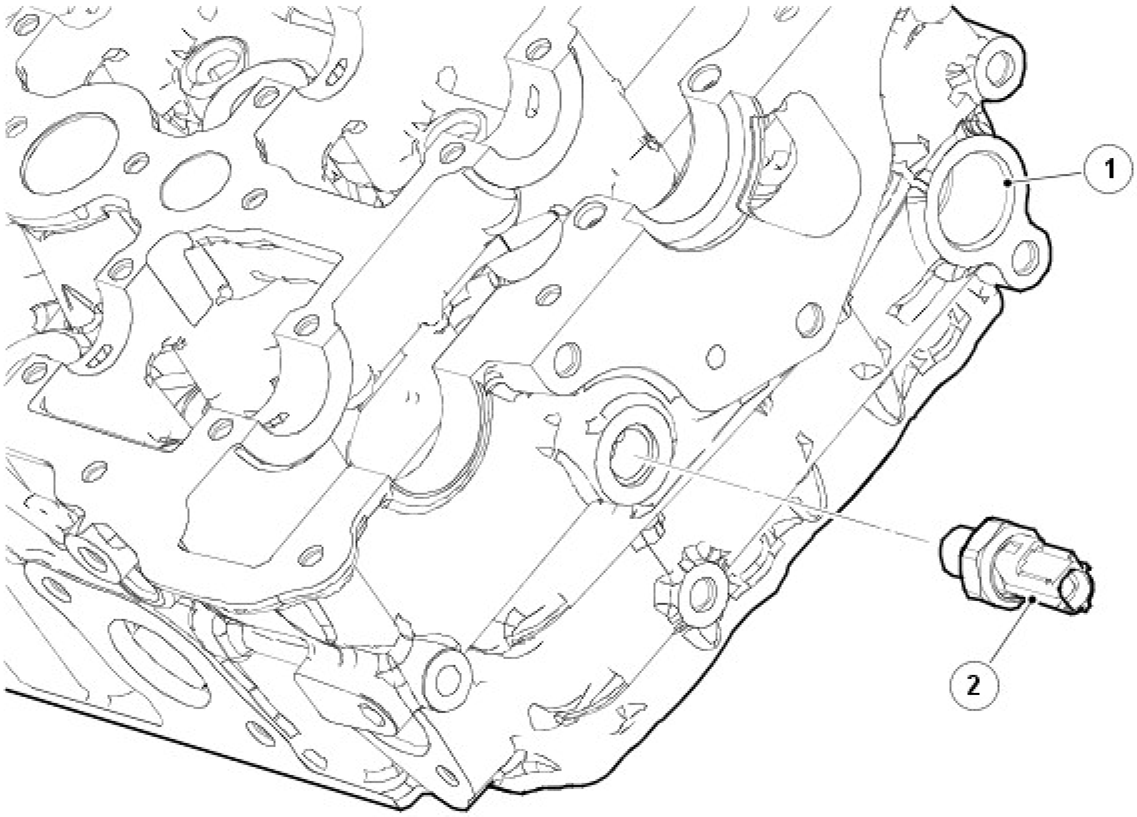
Temperature (Degrees Celsius)	Resistance (Kohms)	Voltage (Volts)
10	59	3.52
20	37	3.09
30	24	2.62
40	16	2.15
50	11	1.72
60	7.5	1.34
70	5.6	1.04
80	3.8	0.79
90	2.9	0.64
100	2.08	0.49
110	1.56	0.38
120	1.19	0.29
130	0.918	0.22
140	0.673	0.17
150	0.563	0.14

If the ECT sensor fails, the following symptoms may be observed:

- Difficult cold start.
- Difficult hot start.
- Engine performance compromised.
- Temperature gauge inoperative or inaccurate reading.

In the event of ECT sensor signal failure, the ECM applies a default value of 80°Celsius (176°F) coolant temperature for Fueling purposes. The ECM will also permanently operate the cooling fan at all times when the ignition is switched on, to protect the engine from overheating.

ENGINE OIL PRESSURE SENSOR

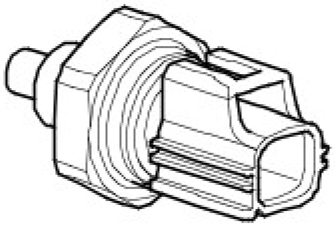


E79909

Item	Part Number	Description
1	-	RH cylinder head
2	-	Oil pressure switch

The oil pressure switch, located in the front of the RH cylinder head, connects a ground input to the instrument cluster when oil pressure is present. The switch operates at a pressure of 0.15 to 0.41 bar (2.2 to 5.9 lbf/in^2).

ENGINE OIL TEMPERATURE SENSOR



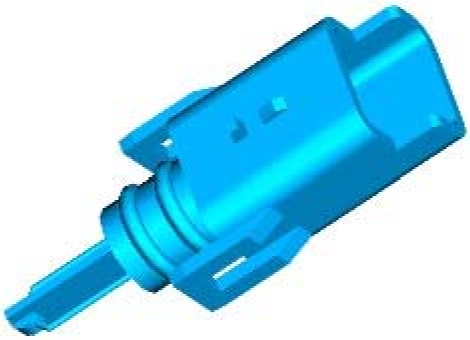
E46906

The oil temperature sensor is located in the engine oil pan. The temperature sensor is a negative temperature coefficient (NTC) type which operates in the -30 Degrees Celsius to +150 Degrees Celsius temperature range.

Oil Temperature Sensor Response

Temperature Degrees Celsius	Resistance Ohms
60	620
90	255
120	117
150	60

FUEL TEMPERATURE SENSOR



E83303

The fuel rail temperature sensor is located on the LP return line at the front of the engine.

The sensor is an NTC sensor which is connected to the ECM by two wires. The ECM fuel temperature sensor circuit consists of an internal voltage divider circuit which incorporates an NTC thermistor. As the fuel temperature rises the resistance through the sensor decreases. The output from the sensor is the change in voltage as the thermistor allows more current to pass to earth relative to the temperature of the fuel.

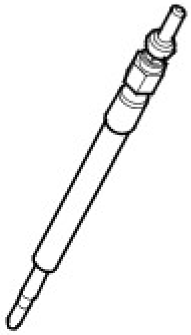
The ECM monitors the fuel temperature constantly. If the fuel temperature exceeds 85°Celsius (185°F), the ECM invokes an engine 'derate' strategy. This reduces the amount of fuel delivered to the injectors in order to allow the fuel to cool. When this occurs, the driver may notice a loss of performance.

Further fuel cooling is available by a bi-metallic valve diverting fuel through the fuel cooler when the fuel reaches a predetermined temperature. In hot climate markets, an electrically operated cooling fan is positioned in the air intake ducting to the fuel cooler. This is controlled by a thermostatic switch, which switches the fan on and off when the fuel reaches a predetermined temperature.

The wires to the fuel sensor are monitored by the ECM for short and open circuit. The ECM also monitors the 5V supply. If a failure occurs a fault is recorded in the ECM memory and the ECM uses a default fuel pressure value.

If the ECM registers an 'out of range' deviation between the pressure signal from the sensor and the pre-programmed 'set point' a fault is stored in the ECM memory. Depending on the extent of the deviation, the ECM will reduce the injection quantity, stop the engine immediately or prevent further engine starting.

GLOW PLUGS



E46912

Three glow plugs are located in each of the cylinder heads, on the inlet side. The glow plugs and the glow plug relay are a vital part of the engine starting strategy. The glow plugs heat the air inside the cylinder during cold starts to assist combustion. The use of glow plugs helps reduce the amount of additional fuel required on start-up, and consequently reduces the emission of black smoke. The use of glow plugs also reduces the amount of injection advance required, which reduces engine noise, particularly when idling with a cold engine.

There are three phases of glow plug activity:

- Pre-heat
- During crank
- Post heat

The main part of the glow plug is a tubular heating element which protrudes into the combustion chamber of the engine. The heating element contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil, and connected in series, is a control coil. The control coil regulates the heater coil to ensure that it does not overheat.

Pre-heat is the length of time the glow plugs operate prior to engine cranking. The ECM controls the pre-heat time based on ECT sensor output and battery voltage. If the ECT sensor fails, the ECM will use the IAT sensor value as a default value. The pre-heat duration is extended if the coolant temperature is low and the battery is not fully charged.

Post heat is the length of time the glow plugs operate after the engine starts. The ECM controls the post heating time based on ECT sensor output. The post heat phase reduces engine noise, improves idle quality and reduces hydrocarbon emissions.

When the ignition is switched on to position II, the glow plug warning lamp illuminates and the instrument cluster displays 'PREHEATING' in the message center. The glow-lamp is activated separately from the glow-plugs, so is not illuminated during or after start. The plugs can still be ON when the lamp is off in these two phases.

In the event of glow plug failure, the engine may be difficult to start and excessive smoke emissions may be observed after starting.

The glow plug warning lamp also serves a second function within the EDC system. If a major EDC system fault occurs, the glow plug warning lamp will be illuminated permanently and a message generated in the instrument cluster. The driver must seek attention to the engine management system at a Land Rover dealer as soon as possible.

BOOST PRESSURE CONTROL

Two manifold absolute pressure and temperature (MAPT) sensors are located post turbo after the electric throttle valves. The sensors provide a voltage signal to the ECM relative to the intake manifold pressure. The MAPT sensor has a three pin connector which is connected to the ECM and provides a 5V reference supply from the ECM, a signal input to the ECM and a ground for the sensor.

The MAPT sensors use diaphragm transducer to measure pressure. The ECM uses the boost pressure sensor signal for the following functions:

- Maintain manifold boost pressure.
- Reduce exhaust smoke emissions when driving at high altitude.
- Control of the EGR system.
- Control of the vacuum control module.

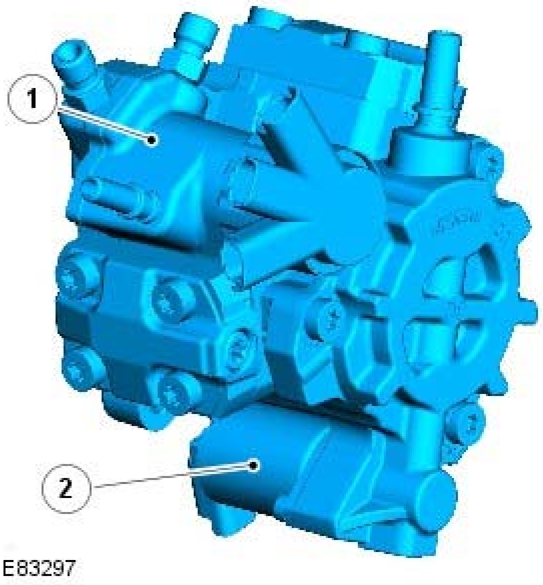
If the MAPT sensors fail, the ECM uses a default pressure of 1013 mbar (14 lbf/in^2). In the event of a MAPT sensor failure, the following symptoms may be observed:

- Altitude compensation inoperative (black smoke emitted from the exhaust).
- Active boost control inoperative.

Boost control is achieved by the use of a direct drive electric actuator. The actuator is attached to the side of the turbo unit and is connected with the control mechanism via a linkage. The electric actuator works on the torque motor principal and has integrated control module.

The electric actuator moves the control vanes through an 60 degree stroke and has the capability to learn its own maximum stroke positions. The electric actuator is controlled via pulse width modulation (PWM) signals from the ECM.

FUEL RAIL PRESSURE CONTROL VALVE



Item	Part Number	Description
1	-	Fuel volume control valve
2	-	Fuel pressure control valve

The fuel pressure control valve is incorporated into the high pressure fuel pump. The control valve regulates the fuel pressure within the fuel rail and is controlled by the ECM. The control valve is a PWM controlled solenoid valve.

When the solenoid is de-energized, an internal spring holds an internal valve closed. At fuel pressure of 100 bar (1450 lbf/in²) or higher, the force of the spring is overcome, opening the valve and allowing fuel pressure to decay into the fuel return pipe. When the pressure in the fuel rail decays to approximately 100 bar (1450 lbf/in²) or less, the spring force overcomes the fuel pressure and closes the valve. When the ECM energizes the solenoid, the valve is closed allowing the fuel pressure to build. The pressure in the fuel rail in this condition can reach approximately 1300 bar (18854 lbf/in²).

The ECM controls the fuel rail pressure by operating the control valve solenoid using a PWM signal. By varying the duty cycle of the PWM signal, the ECM can accurately control the fuel rail pressure and hence the pressure delivered to the injectors according to engine load. This is achieved by the control valve allowing a greater or lesser volume of fuel to pass from the high pressure side of the pump to the un-pressurized fuel return line, regulating the pressure on the high pressure side.

The fuel rail pressure control valve receives a PWM signal from the ECM of between 0 and 12V. The ECM controls the operation of the control valve using the following information to determine the required fuel pressure:

- Fuel rail pressure
- Engine load
- Accelerator pedal position
- Engine temperature
- Engine speed.

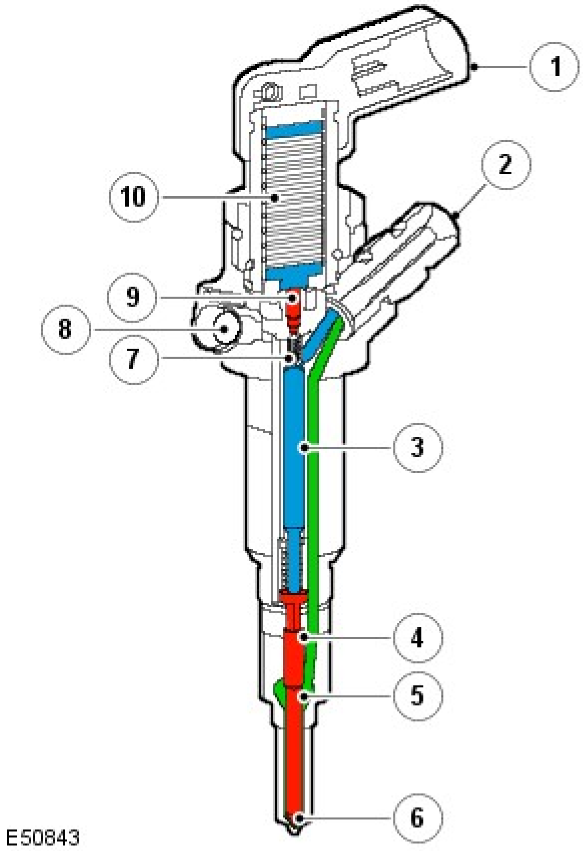
In the event of a total failure of the fuel rail pressure control valve, the engine will not start.

In the event of a partial failure of the fuel rail pressure control valve, the ECM will activate the solenoid with the minimum duty cycle which results in the injection quantity being limited.

FUEL VOLUME CONTROL VALVE

The fuel rail volume control valve is incorporated into the high pressure fuel pump. The VCV spills unwanted fuel back to the tank (or LP system) or forwards it to the PCV. This avoids unused fuel being pressurized by the HP stage of the pump, only to be spilt back to LP by the PCV wasting energy and heating the fuel.

INJECTORS



Item	Part Number	Description
1	-	Harness connection
2	-	HP connection
3	-	Control piston
4	-	Nozzle needle
5	-	Nozzle HP chamber
6	-	Nozzle spray holes
7	-	Valve mushroom
8	-	Fuel return
9	-	Valve piston
10	-	Piezo actuator

There are 8 electronic fuel injectors (one for each cylinder) located in a central position between the four valves of each cylinder. The ECM divides the injectors into two banks of 4 cylinders.

Each injector is supplied with pressurized fuel from the fuel rail and delivers finely atomized fuel directly into the combustion chambers. Each injector is individually controlled by the ECM which operates each injector in the firing order and controls the injector opening period via PWM signals. Each injector receives a 12V supply from the ECM and, using programmed injection/timing maps and sensor signals, determines the precise pilot and main injector timing for each cylinder. If battery voltage falls to between 6 and 9V, fuel injector operation is restricted, affecting emissions, engine speed range and idle speed. In the event of a failure of a fuel injector, the following symptoms may be observed:

- Engine misfire
- Idle irregular
- Reduced engine performance
- Reduced fuel economy
- Difficult starting
- Increased smoke emissions.

The ECM monitors the wires for each injector for short circuit and open circuit, each injector and the transient current within the ECM. If a defect is found, an error is registered in the ECM for the failed injector.

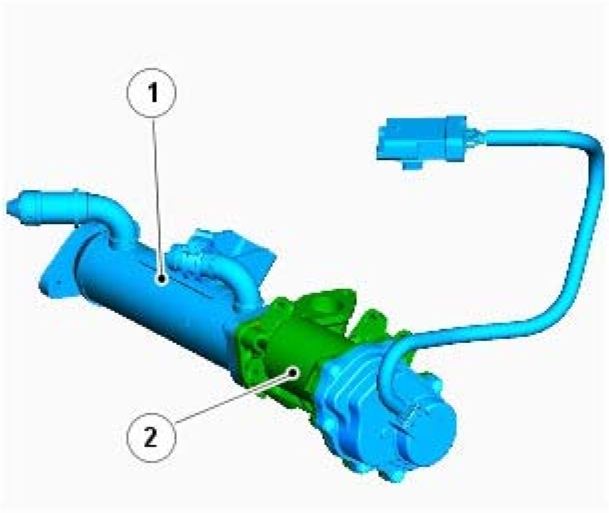
EXHAUST GAS RECIRCULATION (EGR) SYSTEM

The EGR system comprises:

- EGR modulator x 2

- EGR cooler x 2
- Associated connecting pipes

EGR Valve and Cooler



E83298

Item	Part Number	Description
1	-	EGR cooler
2	-	EGR valve

The EGR modulator and cooler are a combined unit.

The combined EGR modulator and cooler is located under each cylinder bank, between the exhaust manifold and the cylinder head. The cooler side of the EGR is connected to the vehicle cooling system, via hoses. The inlet exhaust side is connected directly into the exhaust manifolds on each side. The exhaust gas passes through the cooler and is expelled via the actuator and a metal pipe into the throttle housing. The EGR modulator is a solenoid operated valve which is controlled by the ECM. The ECM uses the EGR modulator to control the amount of exhaust gas being re-circulated in order to reduce exhaust emissions and combustion noise. The EGR is enabled when the engine is at normal operating temperature and under cruising conditions.

The EGR modulator receives a 12V supply from the ECM and is controlled using a PWM signal. The PWM duty signal of the solenoid ground is varied to determine the precise amount of exhaust gas delivered to the cylinders.

The modulators are operated through their full range at each engine shut down, to clear any carbon deposits that may have built up whilst the engine was running

In the event of a failure of the EGR modulator, the EGR function will become inoperative. The ECM can monitor the EGR modulator solenoid for short circuits and store fault codes in the event of failure. The modulator can also be activated for testing using a Land Rover approved diagnostic system.

CYLINDER HEAD PORT DE-ACTIVATION

The cylinder head layout of the engine has been designed to optimize levels of swirl within the combustion chamber across the engine speed range. If there is too much swirl, then as fuel is injected, the high velocity of the swirling gases prevent the jets of atomized fuel reaching the edges of the combustion chamber. This poor distribution of fuel within the combustion chamber causes increased emissions.

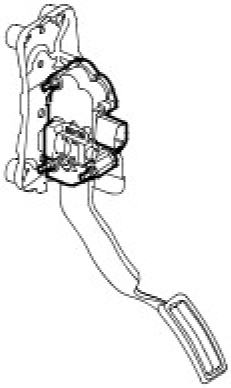
The engine features an intake port deactivation system to enhance the fuel distribution around the combustion chamber.

Each cylinder features two intake ports; one is designed as a helical 'swirl' port, configured to create the optimum swirl for good combustion whilst the other is designed as a 'filling-port', capable of supplying high volumes of air without disturbing in-cylinder swirl.

The helical port is open under all operating conditions. At low loads the filling port is closed off raising gas velocity through the helical port to increase in-cylinder swirl to the required rate. To avoid any risk of high gas flow creating excessive swirl, the filling port is then opened under high gas-flow conditions to help maintain consistent optimum swirl across the engine's operating range.

Port deactivation is controlled by butterfly valves operating within the intake manifold. These are controlled by the ECM via a vacuum operated actuator mounted on the back of the intake manifold for each cylinder bank.

ACCELERATOR PEDAL POSITION (APP) SENSOR



E47297

The APP sensor is incorporated into the pedal assembly. The sensor is a twin track rotary potentiometer type.

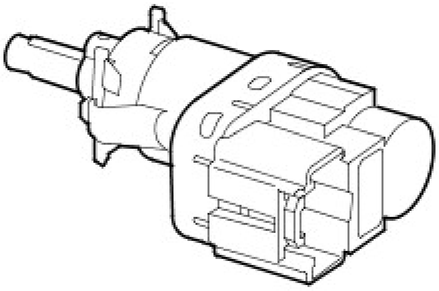
The APP sensor is located in plastic housing which is integral with the throttle pedal. The housing is injection molded and provides location for the APP sensor. The sensor is mounted externally on the housing and is secured with two Torx screws. The external body of the sensor has a six pin connector which accepts a connector on the vehicle wiring harness.

The sensor has a spigot which protrudes into the housing and provides the pivot point for the pedal mechanism. The spigot has a slot which allows for a pin, which is attached to the sensor potentiometers, to rotate through approximately 90°, which relates to pedal movement. The pedal is connected via a link to a drum, which engages with the sensor pin, changing the linear movement of the pedal into rotary movement of the drum. The drum has two steel cables attached to it. The cables are secured to two tension springs which are secured in the opposite end of the housing. The springs provide 'feel' on the pedal movement and require an effort from the driver similar to that of a cable controlled throttle. A detente mechanism is located at the forward end of the housing and is operated by a ball located on the drum. At near maximum throttle pedal movement, the ball contacts the detente mechanism. A spring in the mechanism is compressed and gives the driver the feeling of depressing a 'kickdown' switch when full pedal travel is achieved.

The APP sensor has two potentiometer tracks which each receive a 5V input voltage from the ECM. Track 1 provides an output of 0.5V with the pedal at rest and 2.0V at 100% full throttle. Track 2 provides an output of 0.5V with the pedal at rest and 4.5V at 100% full throttle. The signals from the two tracks are used by the ECM to determine fueling for engine operation and also by the ECM and the transmission control module (TCM) to initiate a kickdown request for the automatic transmission.

The ECM monitors the outputs from each of the potentiometer tracks and can determine the position, rate of change and direction of movement of the throttle pedal. The 'closed throttle' position signal is used by the ECM to initiate idle speed control and also overrun fuel cut-off.

BRAKE LAMP SWITCH



E46910

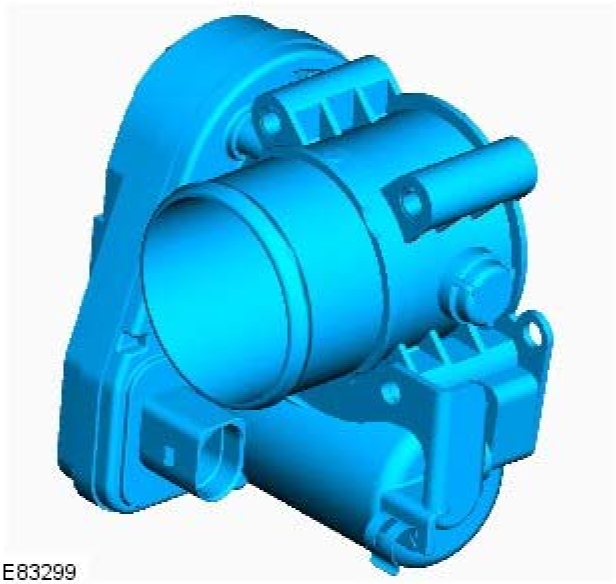
The brake switch is located on the brake pedal and is operated by the brake pedal. The switch has a normally open circuit switch which closes the circuit when the driver has applied the brakes. The switch is connected directly to the ECM and the ECM also receives a brake light signal on the CAN (controller area network) bus from the ABS (anti-lock brake system) control module. .

- To limit fueling during braking
- To inhibit/cancel speed control if the brakes are applied.

In the event of a brake switch failure, the following symptoms may be observed:

- Speed control inactive
- Increased fuel consumption.

ELECTRIC THROTTLE



The electric throttle bodies are located in the intake tract prior to where the inlet splits to divert air flow into the two separate air intake manifolds. The electric throttles control the volume of air allowed into the inlet manifold by means of a direct current (DC) motor which controls a flap in the body of the throttle. This is done in response to inputs from the engine management system.

DIESEL PARTICULATE FILTER (DPF) CONTROL - VEHICLES FROM 2008MY

Vehicles from 2008MY are fitted with a Diesel Particulate Filter (DPF) which collects the particulate matter produced during the combustion process and reduces the particulates entering the atmosphere.

The DPF is located in the exhaust system, downstream of the catalytic converter. A major feature of the DPF is its ability for regeneration. Regeneration is the burning of particulates trapped by the filter to prevent obstruction to the free flow of exhaust gasses. The regeneration process is controlled by the ECM and takes place at calculated intervals and is not noticeable by the driver of the vehicle.

For details of the DPF and the regeneration processes refer to the relevant exhaust system section.
For additional information, refer to: Exhaust System (309-00D Exhaust System - TDV8 3.6L Diesel, Description and Operation).

Regeneration is most important, since an overfilled filter can damage the engine through excessive exhaust back pressure and can itself be damaged or destroyed.

The exhaust gas and DPF temperatures are controlled by the DPF software located in the ECM. The DPF software monitors the load status of the DPF based on driving style, distance travelled and signals from a differential pressure sensor and temperature sensors located before and after the DPF in the exhaust system. When the particulate loading of the DPF reaches predetermined levels, the DPF is actively regenerated by adjusting, in conjunction with the ECM, various engine control functions such as:

- fuel injection
- intake air throttle
- EGR
- turbocharger boost pressure control.

The regeneration process is possible because of the flexibility of the common-rail fuel injection engine which provides precise control of fuel flow, fuel pressure and injection timing which are essential requirements to promote the efficient regeneration process.

The ECM contains the DPF software which controls and monitors the DPF and the regeneration process. The software is broken down into three separate modules; a DPF supervisor module, a DPF fuel management module and a DPF air management module, which interact with each other to provide precise DPF control.

These three modules are controlled by a fourth software module known as the DPF co-ordinator module. The co-ordinator module manages the operation of the other modules when an active regeneration is requested. The DPF supervisor module is a sub-system of the DPF co-ordinator module.

DPF Co-Ordinator Module

The DPF co-ordinator module reacts to a regeneration request from the supervisor module by initiating and controlling the following DPF regeneration requests:

- EGR cut-off
- Turbocharger boost pressure control
- Engine load increase
- Control of air pressure and temperature in the intake manifold
- Fuel injection control.

When the supervisor module issues a regeneration request, the co-ordinator module requests EGR cut-off and a regeneration specific turbocharger boost pressure control. It then waits for a feedback signal from the EGR system confirming that the EGR valve is closed.

• NOTE: The EGR valve is open at idle to allow reduced NO_x. EGR is not used during part load due to intake manifold contamination.

When the EGR valve is closed, the co-ordinator module initiates requests to increase engine load by controlling the intake air temperature and pressure.

Once confirmation is received that intake conditions are controlled or a calibration time has expired, the co-ordinator module then changes to a state awaiting an accelerator pedal release manoeuvre from the driver. If this occurs or a calibration time has expired, the co-ordinator module generates a request to control fuel injections to increase exhaust gas temperature.

DPF Fuel Management Module

The DPF fuel management module controls the following functions:

- Timing and quantity of the four split injections per stroke (pilot, main and two post injections).
- Injection pressure and the transition between the three different calibration levels of injection.

The above functions are dependant on the condition of the catalytic converter and the DPF.

The controlled injection determines the required injection level in addition to measuring the activity of the catalytic converter and the DPF. The fuel management calculates the quantity and timing for the four split injections, for each of the three calibration levels for injection pressure, and also manages the transition between the levels.

The two post injections are required to separate the functionality of increasing in-cylinder gas temperatures and the production of hydrocarbons. The first post injection is used to generate the higher in-cylinder gas temperature while simultaneously retaining the same engine torque output produced during normal (non-regeneration) engine operation. The second post injection is used to generate hydrocarbons by allowing unburnt fuel into the catalytic converter without producing increased engine torque.

DPF Air Management Module

The DPF air management module controls the following functions:

- EGR control
- Turbocharger boost pressure control
- Intake air temperature and pressure control.

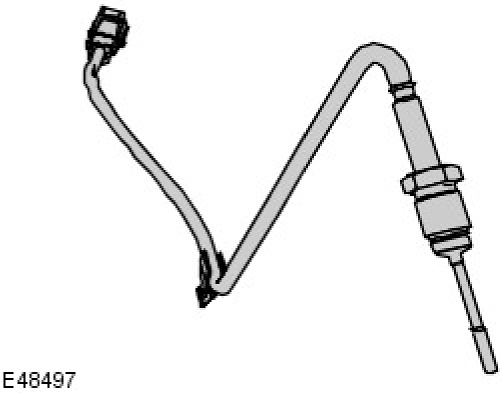
During active regeneration, the EGR operation is disabled and the closed-loop activation of the turbocharger boost controller is calculated. The air management module controls the air in the intake manifold to a predetermined level of pressure and temperature. This control is required to achieve the correct in-cylinder conditions for stable and robust combustion of the post injected fuel.

Restricting the air intake during DPF regeneration has the following functions:

- Increase in engine load
- Slower combustion
- Reduction in the mass of air taken in
- A reduction in the speed of the exhaust gases and therefore an increase in the time for which the gases are in the catalytic converter.

The module controls the intake air temperature by actuating the EGR throttle and by adjustment of the turbocharger boost pressure control.

DPF Temperature Sensors



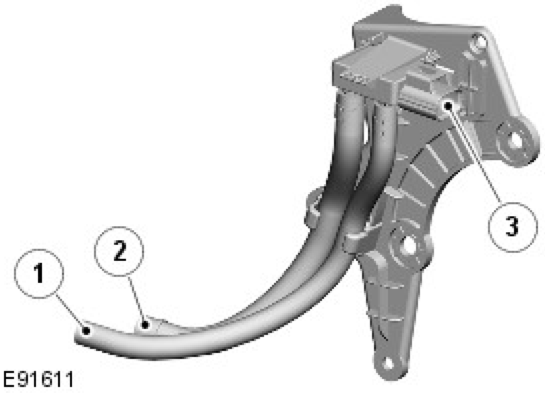
Five temperature sensors are used in the DPF system. One is located in each of the turbocharger outlet elbows, another sensor is located after each catalytic converter and the one sensor is located after the DPF.

The sensors measure the temperature of exhaust gas exiting the turbocharger, before it passes through the DPF and after it has passed through the DPF and provides the information required by the ECM to calculate the DPF temperature. The information is used, in conjunction with other data, to estimate the amount of accumulated particulate and to control the DPF temperature.

The sensors are Negative Temperature Co-efficient (NTC) type resistors, which measure the temperature of the exhaust gases. The resistance, and subsequently the voltage at the sensor will decrease as the exhaust gas temperature increases.

In the event of a fault in a temperature sensor, the ECM uses a substitute value of 350°C (1202°F).

Differential Pressure Sensor



Item	Part Number	Description
1	-	Low pressure connection
2	-	High pressure connection
3	-	Electrical connector

The differential pressure sensor is located on the rear of the transfer box, adjacent to the DPF.

The differential pressure sensor is used by the DPF software to monitor the condition of the DPF. Two pipe connections on the sensor are connected by pipes to the inlet and outlet ends of the DPF. The pipes allow the sensor to measure the inlet and outlet pressures of the DPF.

As the amount of particulates trapped by the DPF increases, the pressure at the inlet side of the DPF increases in comparison to the DPF outlet. The DPF software uses this comparison, in conduction with other data, to calculate the accumulated amount of trapped particulates.

By measuring the pressure difference between the DPF inlet and outlet air flow and the DPF temperature, the DPF software can determine if the DPF is becoming blocked and requires regeneration.

A DPF is recognized as overloaded if the differential pressure under certain operating conditions exceeds the overload limit calculated by the ECM. The DPF software may start regeneration attempts but be unable to complete them. These attempts are counted by the ECM and, if the maximum number of regeneration attempts is reached, a fault entry is recorded in the ECM at the next ignition on cycle.

The DPF software performs the following checks using the DPF differential pressure sensor:

- Plausibility check
- Diesel particulate filter efficiency
- Diesel particulate filter overloaded
- Diesel particulate filter clogged
- Monitoring of the maximum regeneration attempts in the lower load range.

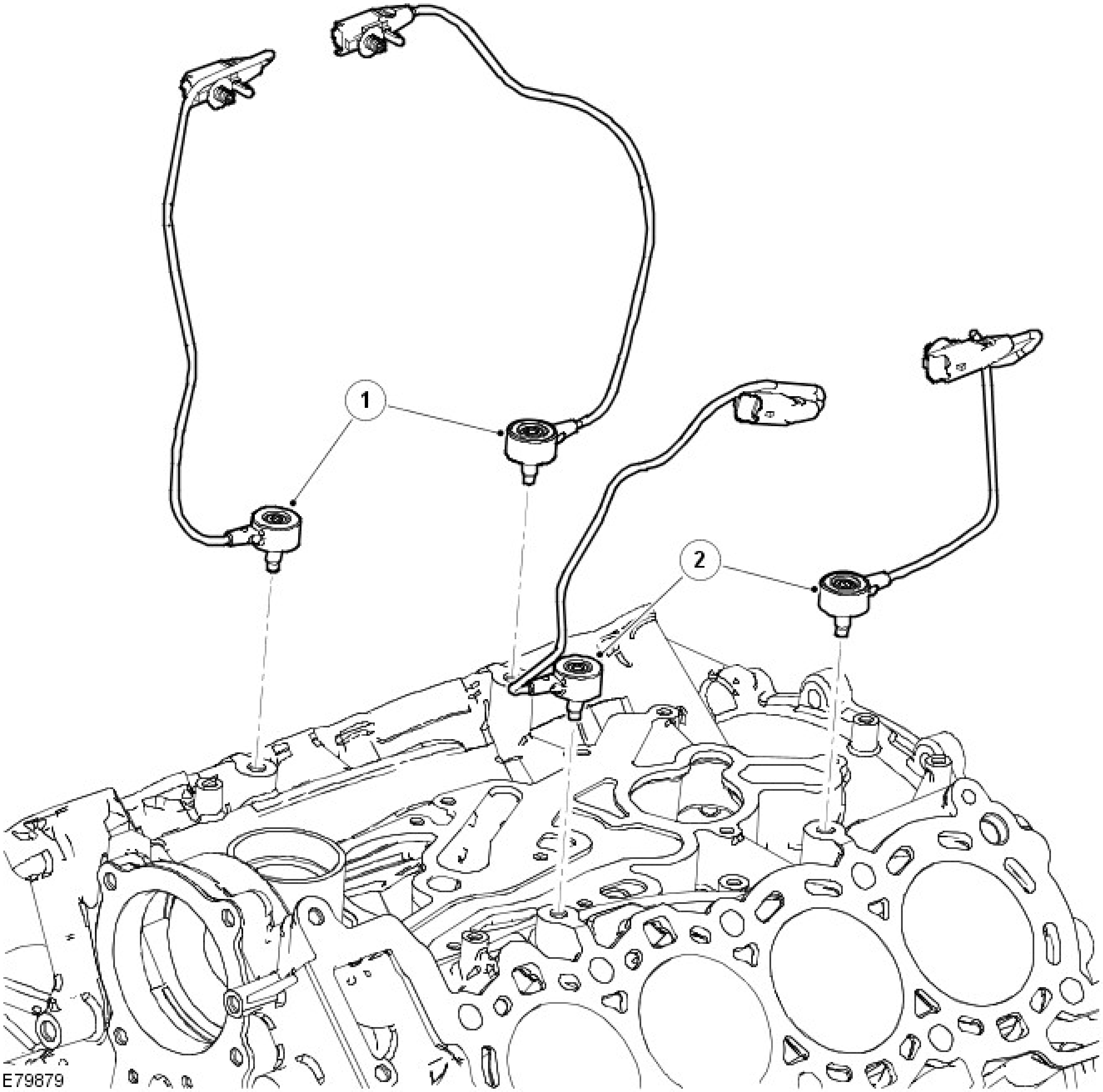
TERRAIN RESPONSE™

Terrain Response system allows the driver to select a program which will provide the optimum settings for traction and performance for prevailing terrain conditions.

As part of Terrain Response there are be different throttle pedal progression maps associated with different Terrain Response modes. The two extremes are likely to be a sand map (quick build up of torque with pedal travel) and grass/gravel/snow (very cautious build up of torque).

The TdV8 implementation of throttle progression is based on a fixed blend time. The torque will blend from that on one map to that on the new map (for the same pedal position) over a fixed time. This means blending will always take the same amount of time but when the torque change is small the torque increase over time will be small, whilst if the torque change is greater then the torque increase over time will be steeper. The resulting acceleration of the vehicle will depend on the torque difference between the two maps as well as on the gear and range selected. The worst case blending that could ever occur has been calibrated to match the blend rate for petrol derivatives as closely as possible, so as to give a transparent behavior to customers.

KNOCK SENSORS



Item	Part Number	Description
1	-	Right Hand Sensors
2	-	Left Hand Sensors

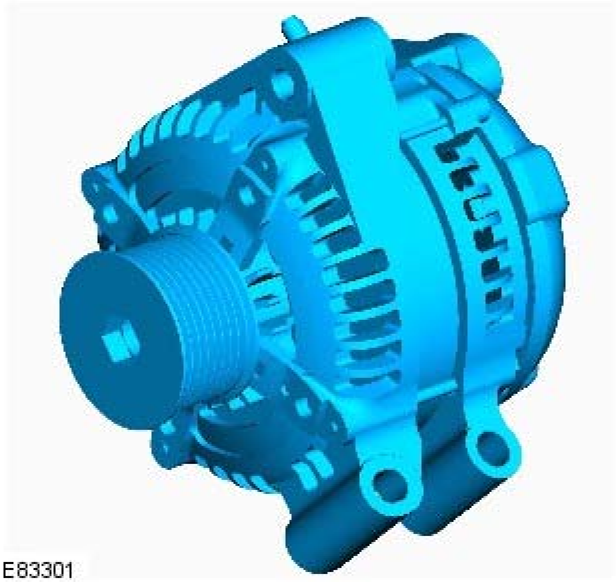
The EMS has 4 knock sensors (2 per bank) located in the cylinder head of the inboard side of the 'V' of the engine. The sensors are connected to the ECM via a twisted pair of wires to minimize electrical interference.

The knock sensors produce a voltage signal in proportion to the amount of mechanical vibration generated at each ignition point. Each sensor monitors the related cylinder bank.

The knock sensors incorporate a piezo-ceramic crystal. This crystal produces a voltage whenever an outside force tries to deflect it, (i.e. exerts a mechanical load on it). When the engine is running, the compression waves in the material of the cylinder block, caused by the combustion of the fuel/air mixture within the cylinders, deflect the crystal and produce an output voltage signal. The signals are supplied to the ECM, which compares them with `mapped' signals stored in memory. From this, the ECM can determine when detonation occurs on individual cylinders. When detonation is detected, the ECM can adjust the pilot fuel quantity to reduce combustion noise, compensating for fuel quantity variations due to injector wear.

Care must be taken at all times to avoid damaging the knock sensors, but particularly during removal and fitting procedures. The recommendations regarding torque and surface preparation must be adhered to. The torque applied to the sensor and the quality of the surface preparation both have an influence over the transfer of mechanical noise from the cylinder block to the crystal.

GENERATOR



The generator has a multifunction voltage regulator for use in a 14V charging system with 6÷12 zener diode bridge rectifiers.

The ECM monitors the load on the electrical system via PWM signal and adjusts the generator output to match the required load. The ECM also monitors the battery temperature to determine the generator regulator set point. This characteristic is necessary to protect the battery; at low temperatures battery charge acceptance is very poor so the voltage needs to be high to maximize any recharge ability, but at high temperatures the charge voltage must be restricted to prevent excessive gassing of the battery with consequent water loss.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Description and Operation).

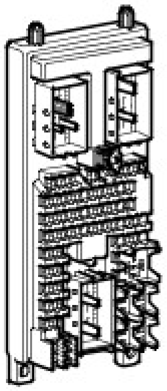
The generator has a smart charge capability that will reduce the electrical load on the generator reducing torque requirements, this is implemented to utilize the engine torque for other purposes. This is achieved by monitoring three signals to the ECM:

- Generator sense (A sense), measures the battery voltage at the CJB.
- Generator communication (Alt Com) communicates desired generator voltage set point from ECM to generator.
- Generator monitor (Alt Mon) communicates the extent of generator current draw to ECM. This signal also transmits faults to the ECM which will then sends a message to the instrument cluster on the CAN bus to illuminate the charge warning lamp.

WATER IN FUEL SENSOR

The water in fuel sensor is located in the base of the fuel filter and is hardwired to the ECM. The sensor operates on the principle of differing resistance values to the transmission of current through water and fuel. When the volume of water in the fuel reaches 85 cm^3 or more, the sensor value is sensed by the ECM. The ECM transmits a message on the high speed controller area network (CAN) bus to the instrument cluster which displays a message 'WATER IN FUEL VISIT DEALER' in the message center.

CENTRAL JUNCTION BOX (CJB)

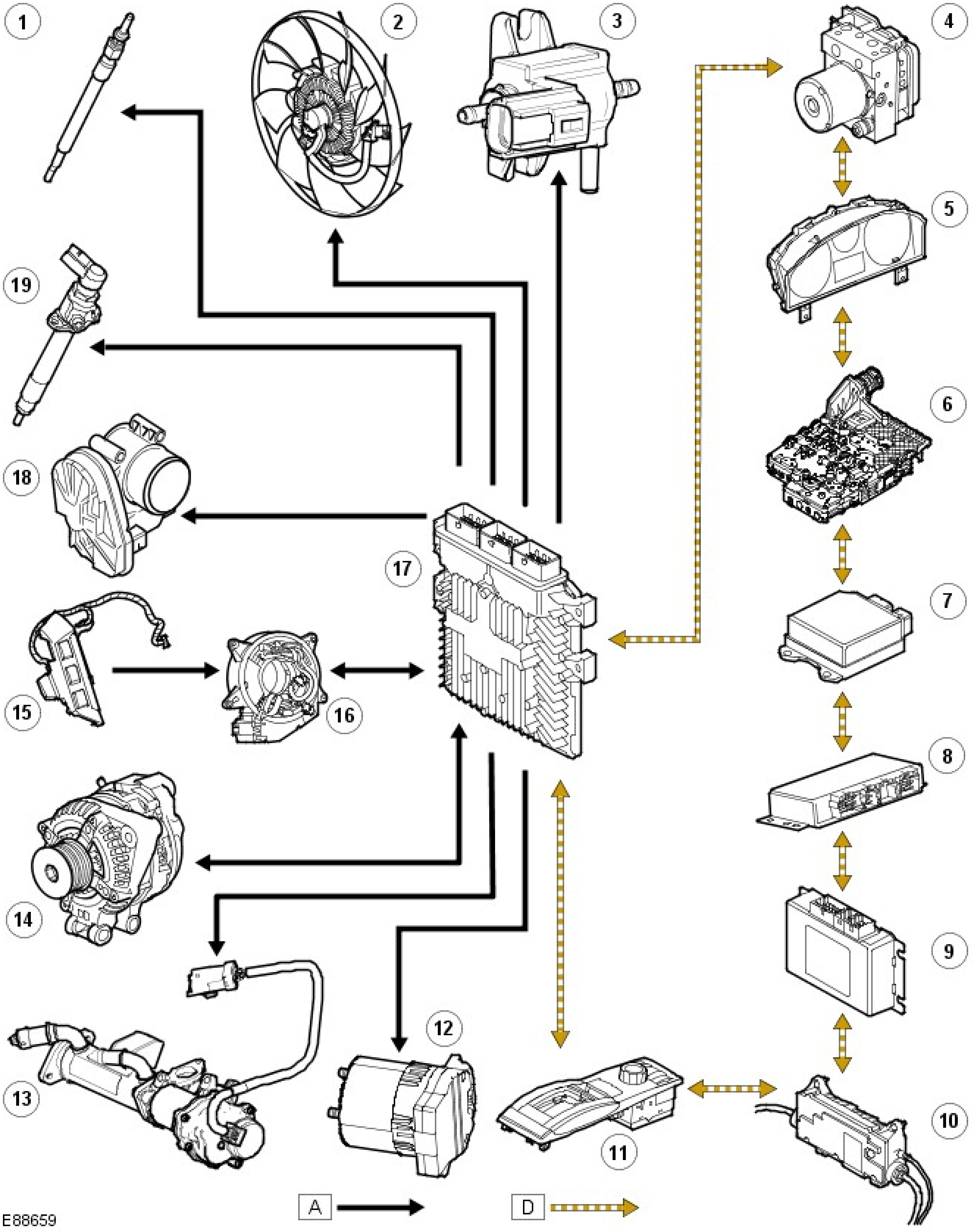


The CJB initiates the power up and power down routines within the ECM. When the ignition is turned on, 12V is applied to the

'Ignition Sense' input. The ECM then starts its power up routines and turns on the ECM main relay; the main power to the ECM and it's associated system components. When the ignition is turned OFF the ECM will maintain its powered up state for up to 60 seconds while it initiates its power down routine and on completion will turn off the ECM main relay.

CONTROL DIAGRAM SHEET 1 OF 2

- NOTE: A = Hardwired; D= High speed CAN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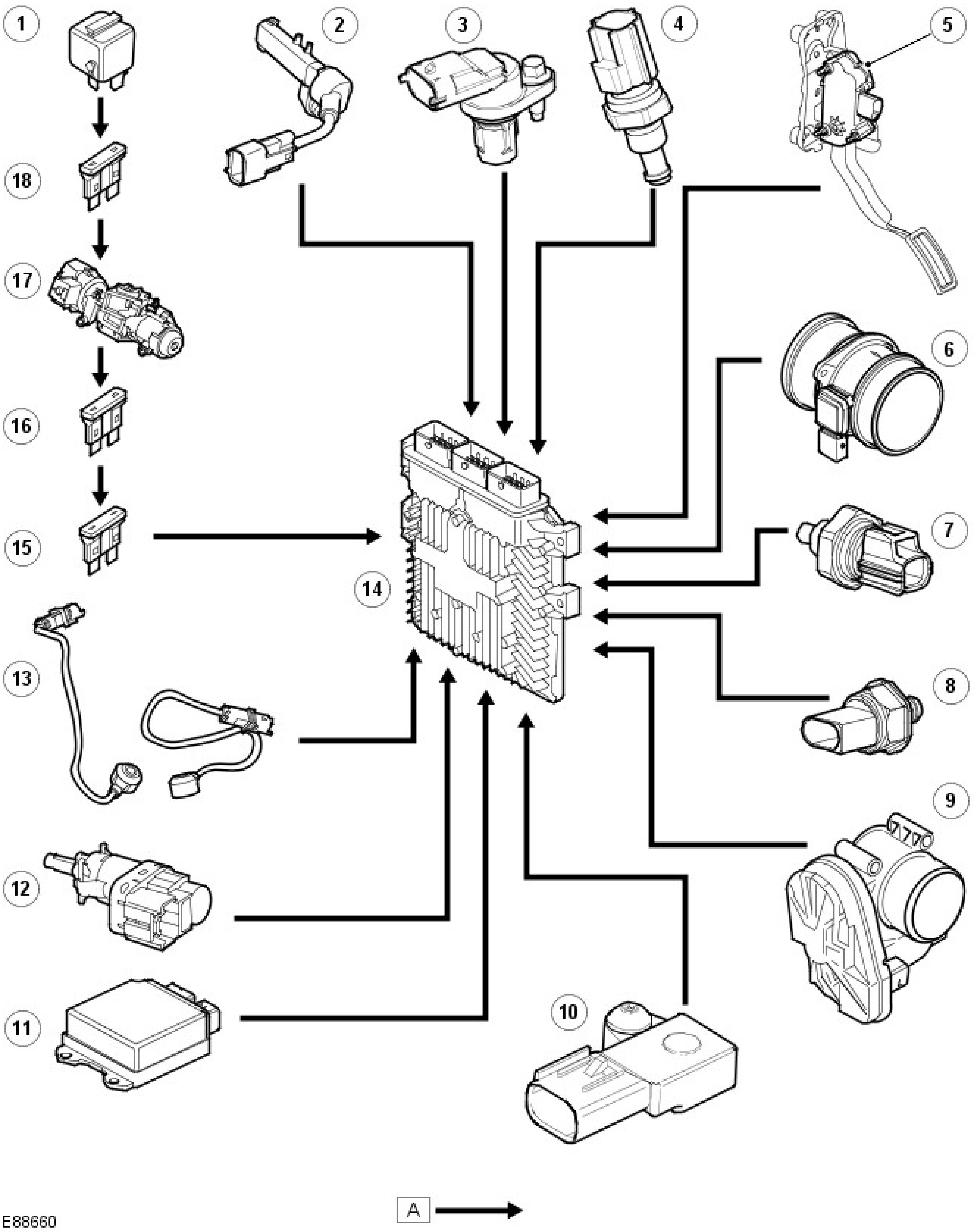
Item	Part Number	Description
1	-	Glow plugs
2	-	Cooling fan
3		Port deactivation vacuum actuator
4		ABS module
5		Instrument cluster
6		TCM control module
7	-	restraints control module (RCM)
8		Differential control module
9		Transfer box control module
10		Electric park brake control module
11		Terrain Response™ control module
12		Turbo boost pressure controller
13		EGR valve/ cooler
14	-	Generator
15	-	Speed control switches
16	-	Clock spring
17		ECM
18		Electric throttle valves
19		Injectors

CONTROL DIAGRAM SHEET 2 OF 2

- NOTE: A= Hardwired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Item	Part Number	Description
1		Main relay
2		CKP sensor
3		CMP sensor
4		Engine coolant temperature sensor
5		Accelerator pedal position sensor

6		MAF/IAT sensor
7		Engine oil temperature sensor
8		Fuel temperature sensor
9		Electric throttle
10		Boost pressure sensor
11		RCM
12	-	Brake lamp switch
13	-	Knock sensors
14	-	ECM
15	-	Fuse 25P
16	-	Fuse 60P
17	-	Ignition switch
18	-	Fuse 13E

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Electronic Engine Controls - TDV8 3.6L Diesel - Electronic Engine Controls

Diagnosis and Testing

Overview

This section covers the components of the engine management system.

For information on description and operation, refer to section 303-14 - Electronic Engine Controls - 3.6L (TdV8) of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
Engine oil level Cooling system coolant level Fuel level/contamination Fuel leaks Fuel pumps Intake air system Accessory drive belt Sensor installation/condition Viscous fan and solenoid	Fuses - Fuse F6, engine compartment junction box - Fuse 1E, engine compartment junction box - Fuse 4E, engine compartment junction box - Fuse 13E, engine compartment junction box - Fuse 17E, engine compartment junction box - Fuse 27E, engine compartment junction box - Fuse 25P, passenger compartment junction box - Fuse 60P, passenger compartment junction box Links - Link 1E, engine compartment junction box - Link 4E, engine compartment junction box - Link 6E, engine compartment junction box - Link 11E, engine compartment junction box - Link 14E, engine compartment junction box Wiring harness Electrical connector(s) Injectors Glow plugs 5 volt sensor supply Sensor(s) Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Engine does not crank	Starter relay output circuit high resistance Starter relay output circuit short circuit to power Starter motor fault Ignition switch fault Controller area network (CAN) fault	Check the starter relay and circuits. Refer to the electrical guides. Check the ignition switch operation. Check for DTCs indicating a CAN fault.
Engine cranks, but does not start	Inertia fuel shut off (IFS) switch Main engine control module (ECM) relay fault	Check that the IFS switch has not tripped. Check the main ECM relay and circuits, refer to the electrical guides. Check the fuel level and condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the

Symptom	Possible causes	Action
	- Low/Contaminated fuel - Air leakage - Low-pressure fuel system fault - Fuel pump module (lift pump) fault - Blocked fuel filter - Fuel volume regulator blocked/contaminated - Fuel pressure control valve blocked/contaminated - Fuel pump fault - Crankshaft position (CKP) sensor	fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump: REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Check the CKP sensor circuits. Refer to the electrical guides.
Difficult to start	- Glow plug system fault (very cold conditions) - Low/Contaminated fuel - Air leakage - Fuel pump module (lift pump) fault - Low-pressure fuel system fault - Blocked fuel filter - Fuel volume control valve blocked/contaminated - Fuel pressure control valve blocked/contaminated - Exhaust gas recirculation (EGR) valve(s) fault	Check the glow plug circuits. Refer to the electrical guides. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing).
Rough idle	- Intake air system fault - Low/Contaminated fuel - Low-pressure fuel system fault - Blocked fuel filter - Fuel volume control valve blocked/contaminated - Fuel pressure control valve blocked/contaminated - Exhaust gas recirculation (EGR) valve(s) fault	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing).
Lack of power when accelerating	- Intake air system fault - Restricted exhaust system - Low fuel pressure - Exhaust gas recirculation (EGR) valve(s) fault - Turbocharger actuator fault	Check the intake air system for leakage or restriction. Check for a blockage/restriction in the exhaust system, install new components as necessary: REFER to: Exhaust System (309-00D Exhaust System - TDV8 3.6L Diesel, Description and Operation). Check for DTCs indicating a fuel pressure fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing). For turbocharger actuator checks: REFER to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Diagnosis and Testing).
Engine stops/stalls	- Air leakage - Low/Contaminated fuel - Low-pressure fuel system fault - High-pressure fuel leak - Fuel volume control valve blocked/contaminated - Fuel pressure control	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the fuel system for leaks/damage: Check for DTCs indicating a fuel volume or pressure control valve fault. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing).

Symptom	Possible causes	Action
	valve blocked/contaminated ● Exhaust gas recirculation (EGR) valve fault	
Engine judders	● Low/Contaminated fuel ● Air ingress ● Low-pressure fuel system fault ● Fuel metering valve blocked/contaminated ● Fuel volume control valve blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● High-pressure fuel leak ● Fuel pump fault	Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the low-pressure fuel system for leaks/damage. Check the high-pressure fuel system for leaks, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump: REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation).
Excessive fuel consumption	● Low-pressure fuel system fault ● Fuel volume control valve blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● Fuel temperature sensor leak ● High-pressure fuel leak ● Injector(s) fault ● Exhaust gas recirculation (EGR) valve(s) fault	Check the low-pressure fuel system for leaks/damage. Check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel temperature sensor, fuel pump, etc for leaks. Check for injector DTCs. For EGR valve checks: REFER to: Engine Emission Control (303-08D Engine Emission Control - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B10A231	Crash Input	● Inertia event circuit open circuit	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A236	Crash Input	● Inertia event circuit frequency low	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A237	Crash Input	● Inertia event circuit frequency high	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A239	Crash Input	● Inertia event circuit frequency below mid level	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
B10A23A	Crash Input	● Inertia event circuit frequency above mid level	Refer to the electrical guides and check the inertia event circuit between the restraints control module and the engine control module.
P000113	Fuel Volume Regulator Control Circuit / Open	● Fuel volume control valve circuit high resistance ● Fuel volume control valve circuit open circuit ● Fuel volume control valve fault	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and

DTC	Description	Possible causes	Action
			test for normal operation.
P000311	Fuel Volume Regulator Control Circuit Low	- Fuel volume control valve circuit short circuit to ground - Fuel volume control valve fault	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P000319	Fuel Volume Regulator Control Circuit Low	- Fuel volume control valve circuit short circuit to ground - Fuel volume control valve fault	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P000412	Fuel Volume Regulator Control Circuit High	- Fuel volume control valve circuit short circuit to power - Fuel volume control valve fault	• NOTE: An open circuit will prevent the engine from running. Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P000E21	Fuel Volume Regulator Control Exceeded Learning Limit	- Fuel volume control valve amplitude is less than the minimum specified	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P000E22	Fuel Volume Regulator Control Exceeded Learning Limit	- Fuel volume control valve amplitude is greater than the maximum specified	Refer to the electrical guides and check the fuel volume control valve and circuits. Check the resistance of the valve and install a new high pressure fuel pump if the resistance is not between 1.5 and 15 ohms (the fuel volume control valve cannot be serviced separately). Clear the DTCs and test for normal operation.
P004711	Turbocharger/Supercharger Boost Control A Circuit Low	- Right-hand turbocharger control circuit short circuit to ground - Turbocharger actuator fault	Check the right-hand turbocharger and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. REFER to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Diagnosis and Testing).
P004812	Turbocharger/Supercharger Boost Control A Circuit High	- Right-hand turbocharger control circuit short circuit to power - Turbocharger actuator fault	Check the right-hand turbocharger and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. REFER to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Diagnosis and Testing).
P004C11	Turbocharger/Supercharger Boost Control B Circuit Low	- Left-hand turbocharger control circuit short circuit to ground - Turbocharger actuator fault	Check the left-hand turbocharger and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. REFER to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Diagnosis and Testing).

DTC	Description	Possible causes	Action
P004D12	Turbocharger/Supercharger Boost Control B Circuit High	- Left-hand turbocharger control circuit short circuit to power - Turbocharger actuator fault	Check the left-hand turbocharger and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. REFER to: Turbocharger (303-04E Fuel Charging and Controls - Turbocharger - TDV6 2.7L Diesel, Diagnosis and Testing).
P006A21	MAP - Mass or Volume Air Flow Correlation	- Air leakage in the intake path between the turbocharger and the engine	Check the intake air system for leakage after the turbocharger. Check for DTCs indicating a MAP sensor fault. Rectify as necessary. Clear the DTCs and test for normal operation.
P006A22	MAP - Mass or Volume Air Flow Correlation	- Mass or volume air flow correlation: right-hand bank - signal amplitude greater than maximum - Oil ingress into the intake manifold - Manifold absolute sensor and temperature (MAPT) sensor circuit fault - MAPT sensor fault - MAF sensor fault - Turbocharger fault	With the engine at idle, check the manifold air pressure and indicated torque set points using a data logger function. If the manifold air pressure is greater than 140 KPa (20.31 lbs/in²) or the torque less than 70 Nm (51.63 lbf/ft), check for oil being drawn into the intake manifold. Repair/renew as necessary. Clear the DTCs and test for normal operation. Stop the engine and turn the ignition on. Using a data logger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% pulse width modulated (PWM) and check the angle values. The angle at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% 80 - 95%. If the values are inside this range, install a new MAF sensor. Refer to the relevant section of the workshop manual. If the values are outside this range, install a new turbocharger. Clear the DTCs and test for normal operation.
P007C16	Charge Air Cooler Temperature Sensor Circuit Low (Bank 1)	- Right-hand charge air temperature sensor circuit high resistance (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) - Charge air temperature sensor circuit short circuit to ground - Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P007D17	Charge Air Cooler Temperature Sensor Circuit High (Bank 1)	- Right-hand charge air temperature sensor circuit short circuit to power (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) - Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P007E27	Charge Air Cooler Temperature Sensor Circuit Intermittent/Erratic (Bank 1)	- Right-hand charge air temperature sensor circuit high resistance (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) - Charge air temperature sensor circuit short circuit to ground - Charge air temperature sensor circuit short circuit to power - Right-hand MAPT sensor fault	Check the right-hand MAPT sensor and circuits. Refer to the electrical guides. With the engine running and at operating temperature, check the charge air temperature using a data logger function. Record the measurement at idle and increase the engine speed to 3,000 rpm. Record the reading and compare with the idle figure. If the value has increased by more than 20°C in 100 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P007F62	Charge Air Cooler Temperature Sensor Bank ½ Correlation	● Charge air temperature sensor left and right-hand bank correlation (the charge air temperature sensors are part of the manifold absolute pressure and temperature (MAPT) sensors) ● Intake air system fault between the sensor(s) and the engine ● Charge air temperature sensor circuit high resistance ● Charge air temperature sensor circuit short circuit to ground ● Charge air temperature sensor circuit short circuit to power ● MAPT sensor(s) fault	Check the intake air system for mechanical faults, leakage, etc. Check the left and right-hand MAPT sensors and circuits. Refer to the electrical guides. With the engine running and at operating temperature, check the charge air temperatures using a data logger function. Record the measurements at idle and increase the engine speed to 3,000 rpm. Record the readings and compare with the idle figures. If the values have changed by more than 30°C higher or lower and there are no other DTCs set, install two new sensors. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P008700	Fuel rail/system pressure too low	● Fuel rail pressure (FRP) sensor disconnected ● FRP sensor to ECM sensing circuit short circuit to ground ● FRP sensor supply circuit high resistance ● FRP sensor failure ● Fuel line leak ● Restricted fuel line ● Fuel pump module circuit high resistance ● Fuel pump module circuit short circuit to ground ● Fuel pump module failure ● Volume control valve fault ● Pressure control valve fault	Refer to the electrical guides and check the FRP sensor circuits. For FRP sensor tests, refer to the relevant workshop manual section. Check the low pressure fuel lines for damage or restrictions. Check the fuel pressure. Check the low pressure fuel pump module circuits and operation. Check for fuel rail and high pressure fuel line leaks. Check for VCV and PCV DTCs and rectify as necessary.
P008800	Fuel rail/system pressure too high	● Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense): short circuit to each other ● FRP sensor to ECM sense circuit short circuit to power ● FRP sensor failure ● Fuel pressure control valve (FPCV) fault ● Fuel pump module circuit short circuit to power ● Fuel pump module failure	Check the FRP sensor circuits. Refer to the electrical guides. For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P008921	Fuel Pressure Regulator Performance	● Fuel pressure control valve performance - signal amplitude less than minimum ● Fuel pressure control valve circuit high resistance ● Fuel pressure control valve circuit short circuit to ground ● Fuel pressure control valve circuit short circuit to power ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P008922	Fuel Pressure Regulator Performance	● Fuel pressure control valve performance - signal amplitude greater than maximum ● Fuel pressure control valve	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve

DTC	Description	Possible causes	Action
		circuit high resistance ● Fuel pressure control valve circuit short circuit to ground ● Fuel pressure control valve circuit short circuit to power ● Fuel pressure control valve fault	cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P00892F	Fuel Pressure Regulator Performance	● Fuel pressure control valve performance - signal erratic ● Fuel pressure control valve circuit high resistance ● Fuel pressure control valve circuit short circuit to ground ● Fuel pressure control valve circuit short circuit to power ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009013	Fuel Pressure Regulator 1 Control Circuit/Open	● Fuel pressure control valve circuit high resistance ● Fuel pressure control valve circuit open circuit ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009111	Fuel Pressure Regulator 1 Control Circuit Low	● Fuel pressure control valve circuit short circuit to ground ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009119	Fuel Pressure Regulator 1 Control Circuit Low	● Fuel pressure control valve circuit short circuit to power (circuit current above threshold) ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the DTCs and test for normal operation.
P009212	Fuel Pressure Regulator 1 Control Circuit High	● Fuel pressure control valve circuit short circuit to power ● Fuel pressure control valve fault	Check the fuel pressure control valve and circuits. Refer to the electrical guides. Check the resistance of the fuel pressure control valve. If the resistance is not between 0 and 5.4 ohms, install a new high pressure fuel pump (the fuel pressure control valve cannot be serviced separately). REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Refer to the warranty policy and procedures manual if a high pressure fuel pump is suspect. Clear the

DTC	Description	Possible causes	Action
			DTCs and test for normal operation.
P00A216	Charge Air Cooler Temperature Sensor Circuit Low (Bank 2)	● Left-hand charge air temperature sensor circuit low (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) ● Charge air temperature sensor circuit high resistance ● Charge air temperature sensor circuit short circuit to ground ● Left-hand MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00A317	Charge Air Cooler Temperature Sensor Circuit High (Bank 2)	● Left-hand charge air temperature sensor circuit high (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) ● Charge air temperature sensor circuit high resistance ● Charge air temperature sensor circuit short circuit to ground ● Left-hand MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. Check the resistance of the temperature sensor (pins 1 and 4 of the MAPT). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. Install a new MAPT if necessary. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00A427	Charge Air Cooler Temperature Sensor Circuit Intermittent/Erratic (Bank 2)	● Left-hand charge air temperature sensor circuit intermittent/erratic (the charge air temperature sensor is part of the manifold absolute pressure and temperature (MAPT) sensor) ● Charge air temperature sensor circuit high resistance ● Charge air temperature sensor circuit short circuit to ground ● Charge air temperature sensor circuit short circuit to power ● Left-hand MAPT sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. With the engine running and at operating temperature, check the charge air temperature using a data logger function. Record the measurement at idle and increase the engine speed to 3,000 rpm. Record the reading and compare with the idle figure. If the value has increased by more than 20°C in 100 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P00B821	MAP - Mass or Volume Air Flow Correlation (Bank 2)	● Manifold absolute pressure and temperature (MAPT) sensor - mass or volume air correlation, left-hand bank - signal amplitude less than minimum ● Air leakage in the intake path between the turbocharger and the engine	Check the intake air system for leakage after the turbocharger. Check for DTCs indicating a MAPT sensor fault. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P00B822	MAP - Mass or Volume Air Flow Correlation (Bank 2)	● Manifold absolute pressure and temperature (MAPT) sensor - mass or volume air correlation, left-hand bank - signal amplitude greater than maximum ● Oil ingress into the intake manifold ● MAPT sensor circuit fault ● MAPT sensor fault ● MAF sensor fault	With the engine at idle, check the manifold air pressure and indicated torque set points using a data logger function. If the manifold air pressure is greater than 140 KPa (20.31 lbs/in²) or the torque less than 70 Nm (51.63 lbf/ft), check for oil being drawn into the intake manifold. Repair/renew as necessary. Clear the DTCs and test for normal operation. With the ignition on, engine off and using a data logger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% pulse width

DTC	Description	Possible causes	Action
		- Turbocharger fault	modulated (PWM) and check the angle values. The angle at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM) 80 - 99%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010036	Mass or Volume Air Flow A Circuit	- Right-hand mass air flow (MAF) sensor circuit - signal frequency too low - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor circuit high resistance - MAF sensor fault	Check the right-hand MAF sensor and circuits. Refer to the electrical guides. With the engine at idle, check the air flow using a data logger function. If the value is greater than 13.88 g/s or less than 11.11 g/s install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010116	Mass or Volume Air Flow A Circuit Range/Performance	- Right-hand mass air flow (MAF) sensor range/performance - voltage below threshold - Intake air path fault - MAF sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor fault	Check the intake air system for leaks, restrictions, etc. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a data logger function. If the value is less than 11.11 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010117	Mass or Volume Air Flow A Circuit Range/Performance	- Right-hand mass air flow (MAF) sensor range/performance - voltage above threshold - Intake air path fault - MAF sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor fault	Check the intake air system for leaks, restrictions, etc. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a data logger function. If the value is greater than 13.88 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010121	Mass or Volume Air Flow A Circuit Range/Performance	- Right-hand mass air flow (MAF) sensor range/performance - signal amplitude less than minimum - MAF sensor circuit high resistance - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor fault	Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a data logger function. If the value is less than 11.11 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010122	Mass or Volume Air Flow A Circuit Range/Performance	- Right-hand mass air flow (MAF) sensor range/performance - signal amplitude greater than	Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a data logger

DTC	Description	Possible causes	Action
		maximum ● MAF sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor fault	function. If the value is greater than 13.88 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010221	Mass or Volume Air Flow A Circuit Low	● Right-hand mass air flow (MAF) sensor circuit low - signal amplitude less than minimum ● Intake air system fault ● MAF sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks, etc. Repair/renew as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Check that the EGR valves are not stuck. Using a data logger function, monitor the air flow and EGR valve position for both banks and road test the vehicle. Check that the EGR valves are in synch. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P010322	Mass or Volume Air Flow A Circuit High	● Right-hand mass air flow (MAF) sensor circuit high - signal amplitude greater than maximum ● Check for water ingress into the MAF sensor - Water in the air intake can give the impression of high air flow ● Intake air system fault ● MAF sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor fault ● Turbocharger fault	Check the intake air system for leaks, etc. Repair/renew as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. With the ignition on, engine off, and using a data logger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% pulse width modulated (PWM) and check the angle values. The angle at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM) 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010438	Mass or Volume Air Flow A Circuit Intermittent/Erratic	● Right-hand mass air flow (MAF) sensor circuit intermittent/erratic - signal frequency incorrect ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor circuit high resistance	Check the right-hand MAF sensor and circuits. Refer to the electrical guides. Measure the mass air flow at idle using a data logger function and record the value. Increase the engine speed to 2,000 rpm and record the value. If the value has changed by more than 30.55 g/s install a new MAF sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010A36	Mass or Volume Air Flow B Circuit	● Left-hand mass air flow (MAF) sensor circuit - signal frequency too low ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor circuit high resistance	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. With the engine at idle, check the air flow using a data logger function. If the value is greater than 13.88 g/s or less than 11.11 g/s install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P010B21	Mass or Volume Air Flow B Circuit Range/Performance	● Left-hand mass air flow (MAF) sensor range/performance - signal amplitude less than minimum ● MAF sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor fault	Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation. With the engine at idle, check the air flow using a data logger function. If the value is less than 11.11 g/s, install a new sensor and recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010B22	Mass or Volume Air Flow B Circuit Range/Performance	● Left-hand mass air flow (MAF) sensor range/performance - signal amplitude greater than maximum ● MAF sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor fault	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. With the engine at idle, check the air flow using a data logger function. If the value is greater than 13.88 g/s or less than 11.11 g/s install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010C21	Mass or Volume Air Flow B Circuit Low	● Left-hand mass air flow (MAF) sensor circuit low - signal amplitude less than minimum ● Intake air system fault ● MAF sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks, etc. Repair/renew as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Check that the EGR valves are not stuck. Using a data logger function, monitor the air flow and EGR valve position for both banks and road test the vehicle. Check that the EGR valves are in synch. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P010D22	Mass or Volume Air Flow B Circuit High	● Left-hand mass air flow (MAF) sensor circuit high - signal amplitude greater than maximum ● Check for water ingress into the MAF sensor - Water in the air intake can give the impression of high air flow ● Intake air system fault ● MAF sensor circuit high resistance ● MAF sensor circuit short circuit to ground ● MAF sensor circuit short circuit to power ● MAF sensor fault ● Turbocharger fault	Check the intake air system for leaks, etc. Repair/renew as necessary. Check the MAF sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. With the ignition on, engine off, and using a data logger function, monitor the turbocharger actuator angles. Command the actuator to 5% pulse width modulated (PWM) then to 95% pulse width modulated (PWM) and check the angle values. The angle at 5% pulse width modulated (PWM) should be 0 - 20%, and at 95% pulse width modulated (PWM) 80 - 95%. If the values are inside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). If the values are outside this range, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P010E38	Mass or Volume Air Flow B Circuit Intermittent/Erratic	● Left-hand mass air flow (MAF) sensor circuit intermittent/erratic - signal frequency incorrect ● MAF sensor circuit short circuit to ground	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. Measure the mass air flow at idle using a data logger function and record the value. Increase the engine speed to 2,000 rpm and record the value. If the value has changed by more than 30.55 g/s install a new MAF sensor and

DTC	Description	Possible causes	Action
		- MAF sensor circuit short circuit to power - MAF sensor circuit high resistance	recheck. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation).
P010F62	Mass or Volume Air Flow Sensor A/B Correlation	- Mass or volume air flow sensor right/left-hand correlation - signal compare fault (difference between right and left-hand mass air flow sensors too great) - MAF sensor circuit short circuit to ground - MAF sensor circuit short circuit to power - MAF sensor circuit high resistance - Air leakage in the intake path	Check the left-hand MAF sensor and circuits. Refer to the electrical guides. Check the intake air path for leaks. Check the MAF sensor for carbon or oil contamination. Install a new MAF sensor as necessary. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011216	Intake Air Temperature Sensor 1 Circuit Low (Bank 1)	- Intake air temperature (IAT) sensor circuit low input - voltage below threshold (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used) - IAT sensor circuit high resistance - IAT sensor circuit short circuit to ground - IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. As the two MAF sensors are identical, it is possible to confirm the diagnosis by swapping the units from side to side and testing to see if the DTC resets.
P011317	Intake Air Temperature Sensor 1 Circuit High (Bank 1)	- Intake air temperature (IAT) sensor circuit high input - voltage above threshold (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used) - IAT sensor circuit short circuit to power - IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Measure the resistance of the IAT sensor (pins 2 and 3 of the MAF sensor). Nominal resistance at 20°C (68°F) should be 2.5 Kohms. If the resistance is outside this range, install a new MAF sensor. REFER to: Mass Air Flow (MAF) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). As the two MAF sensors are identical, it is possible to confirm the diagnosis by swapping the units from side to side and testing to see if the DTC resets.
P011427	Intake Air Temperature Sensor 1 Intermittent/Erratic (Bank 1)	- Intake air temperature (IAT) sensor intermittent/erratic - signal rate of change above threshold (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used) - IAT sensor circuit intermittent high resistance - IAT sensor fault	Check the IAT sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Read the intake air temperature using a data logger function and record the value. After ten minutes, read the value again and compare to the first reading. If the value has increased by more than 10° C per 100 ms, swap the MAF sensors side to side and see if the DTC resets.
P011626	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	- Engine coolant temperature (ECT) sensor circuit range/performance - signal rate of change below threshold - ECT sensor circuit intermittent high resistance - ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. With the engine cold, read the coolant temperature sensor using a data logger function and start the engine. Record the value and allow the engine to idle for 20 minutes. After 20 minutes, recheck the value. If the value has not increased by more than 10°C, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P011716	Engine Coolant Temperature Sensor 1 Circuit Low	● Engine coolant temperature (ECT) sensor circuit low input - voltage below threshold ● ECT sensor circuit short circuit to ground ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Measure the resistance of the sensor. Nominal resistance at 20°C (68°F) should be between 35.47 and 39.21 Kohms. If the resistance is outside this range, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011817	Engine Coolant Temperature Sensor 1 Circuit High	● Engine coolant temperature (ECT) sensor circuit high input - voltage above threshold ● ECT sensor circuit short circuit to power ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Measure the resistance of the sensor. Nominal resistance at 20°C (68°F) should be between 35.47 and 39.21 Kohms. If the resistance is outside this range, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011927	Engine Coolant Temperature Sensor 1 Circuit Intermittent/Erratic	● Engine coolant temperature (ECT) sensor circuit intermittent/erratic - signal rate of change above threshold ● ECT sensor circuit intermittent high resistance ● ECT sensor fault	Check the ECT sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Read the coolant temperature using a data logger function and record the value. Increase the engine speed to 2,000 rpm and recheck the value after two minutes at this engine speed. If the value has increased faster than 5°C per second, install a new sensor. REFER to: Engine Coolant Temperature (ECT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011C00	Charge Air Temperature / Intake Air Temperature Correlation (Bank 1)	● Right-hand bank charge air temperature (MAPT)/intake air temperature (IAT) sensor correlation - signal invalid (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used) ● Right-hand MAPT sensor temperature circuits short circuit to ground ● Right-hand MAPT sensor temperature circuits short circuit to power ● Right-hand MAPT sensor temperature circuits high resistance ● Right-hand MAPT sensor fault ● Right-hand MAF sensor temperature circuits short circuit to ground ● Right-hand MAF sensor temperature circuits short circuit to power ● Right-hand MAF sensor temperature circuits high resistance ● Right-hand MAF sensor fault	Check the right-hand MAPT and MAF sensors and circuits. Refer to the electrical guides. Monitor the charge air temperature and intake air temperature signals using a data logger function. Start the engine and "wiggle" the sensor connectors with the engine running. Check the recorded values for the two sensors, the maximum difference should not exceed +40° to -30°C (104° to -22°F). If the IAT sensor is suspect, swap the MAF sensors side to side and recheck. If the fault remains, install a new right-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P011D00	Charge Air Temperature / Intake Air Temperature Correlation (Bank 2)	● Left-hand bank charge air temperature (MAPT)/intake air temperature (IAT) sensor correlation - signal invalid (the IAT sensor is part of the right-hand MAF sensor. The IAT sensor in the left-hand MAF is not used)	Check the left-hand MAPT and MAF sensors and circuits. Refer to the electrical guides. Monitor the charge air temperature and intake air temperature signals using a data logger function. Start the engine and "wiggle" the sensor connectors with the engine running. Check the recorded values for the two sensors, the maximum difference should not exceed 40° to -30°C (104° to -22°F). If the IAT

DTC	Description	Possible causes	Action
		• Left-hand MAPT sensor temperature circuits short circuit to ground • Left-hand MAPT sensor temperature circuits short circuit to power • Left-hand MAPT sensor temperature circuits high resistance • Left-hand MAPT sensor fault • Right-hand MAF sensor temperature circuits short circuit to ground • Right-hand MAF sensor temperature circuits short circuit to power • Right-hand MAF sensor temperature circuits high resistance • Right-hand MAF sensor fault	sensor is suspect, swap the MAF sensors side to side and recheck. If the fault remains, install a new left-hand MAPT sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P018126	Fuel Temperature Sensor A Circuit Range/Performance	• Fuel temperature sensor circuit range/performance - signal rate of change below threshold • Fuel temperature sensor circuit intermittent high resistance • Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Check the fuel temperature using a data logger function. Make sure the fuel temperature is less than 30°C (86°F). Start the engine and allow to warm up for ten minutes. Recheck the fuel temperature. If the value has not increased by more than 8°C in this time, install a new sensor. REFER to: Fuel Temperature Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P018216	Fuel Temperature Sensor A Circuit Low	• Fuel temperature sensor circuit low input - voltage below threshold • Fuel temperature sensor circuit short circuit to ground • Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Measure the sensor resistance. Nominal resistance at 20°C (68°F) should be between 5.86 and 6.62 Kohms. If the resistance is outside this range, install a new sensor. REFER to: Fuel Temperature Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P018317	Fuel Temperature Sensor A Circuit High	• Fuel temperature sensor circuit high input - voltage above threshold • Fuel temperature sensor circuit short circuit to power • Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Measure the sensor resistance. Nominal resistance at 20°C (68°F) should be between 5.86 and 6.62 Kohms. If the resistance is outside this range, install a new sensor. REFER to: Fuel Temperature Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P018427	Fuel Temperature Sensor A Circuit Intermittent	• Fuel temperature sensor circuit intermittent - signal rate of change above threshold • Fuel temperature sensor circuit intermittent high resistance • Fuel temperature sensor fault	Check the fuel temperature sensor and circuits. Refer to the electrical guides. Start the engine and allow to warm up. Check the fuel temperature using a data logger function. Increase the engine speed to 2,000 rpm and recheck the value. If the value has increased by more than 10°C per 100 ms, install a new sensor. REFER to: Fuel Temperature Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P019123	Fuel Rail Pressure Sensor A Circuit Range/Performance	• Fuel rail pressure (FRP) sensor circuit range/performance - signal stuck low • Low fuel level	Check the fuel level and the condition and correct connection of the low-pressure fuel circuit lines (incorrect connection of the lines to and from the fuel filter can cause serious fuel pressure fluctuations). Check the FRP sensor and circuits.

DTC	Description	Possible causes	Action
		- Blocked/incorrectly connected low-pressure fuel lines - FRP sensor circuit short circuit to ground - FRP sensor circuit short circuit to power - FRP sensor circuit high resistance - FRP sensor fault - Fuel pump module circuit short circuit to ground - Fuel pump module circuit short circuit to power - Fuel pump module circuit high resistance - Fuel pump module fault	Check the fuel pump module and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P019124	Fuel Rail Pressure Sensor A Circuit Range/Performance	- Fuel rail pressure (FRP) sensor circuit range/performance - signal stuck high - FRP sensor circuit short circuit to ground - FRP sensor circuit short circuit to power - FRP sensor circuit high resistance - FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Stop the engine, turn the ignition on, and recheck the fuel pressure. If the pressure is greater than 10 MPa (1,450 lbs/in²) after 0.4 seconds, install a new sensor. REFER to: Fuel Rail Pressure (FRP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P019165	Fuel Rail Pressure Sensor A Circuit Range/Performance	- Fuel rail pressure (FRP) sensor circuit range/performance - signal has too few transitions/events - FRP sensor circuit high resistance - FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Increase the engine speed to 2,000 rpm and recheck the fuel pressure. If the value has changed by more than 40 MPa (5,801 lbs/in²) per 10 ms, install a new sensor. REFER to: Fuel Rail Pressure (FRP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P019216	Fuel Rail Pressure Sensor A Circuit Low	- Fuel rail pressure (FRP) sensor circuit low input - voltage below threshold - FRP sensor circuit short circuit to ground - FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is 0 MPa (0 lbs/in²), install a new sensor. REFER to: Fuel Rail Pressure (FRP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P019317	Fuel Rail Pressure Sensor A Circuit High	- Fuel rail pressure (FRP) sensor circuit high input - voltage above threshold - FRP sensor circuit short circuit to power - FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. If the value is greater than 180 MPa (26,106 lbs/in²), install a new sensor. REFER to: Fuel Rail Pressure (FRP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P019427	Fuel Rail Pressure Sensor A Circuit Intermittent/Erratic	- Fuel rail pressure (FRP) sensor circuit intermittent/erratic - signal rate of change above threshold - FRP sensor circuit high resistance - FRP sensor fault	Check the FRP sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the fuel pressure value using a data logger function. Increase the engine speed to 2,000 rpm and recheck the fuel pressure. If the value has changed by more than 40 MPa (5,801 lbs/in²) per 10 ms, install a new sensor. REFER to: Fuel Rail Pressure (FRP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel,

DTC	Description	Possible causes	Action
			Removal and Installation). Clear the DTCs and test for normal operation.
P019626	Engine Oil Temperature Sensor Range/Performance	● Engine oil temperature (EOT) sensor circuit range/performance- signal rate of change below threshold ● EOT sensor circuit intermittent high resistance ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. From cold, start the engine and check the oil temperature using a data logger function. Allow the engine to idle for ten minutes and recheck the oil temperature. If the value has not increased by more than 5°C in this time, install a new sensor. Clear the DTCs and test for normal operation.
P019716	Engine Oil Temperature Sensor Circuit Low	● Engine oil temperature (EOT) sensor circuit low input - voltage below threshold ● EOT sensor circuit short circuit to ground ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Repair/renew as necessary.
P019817	Engine Oil Temperature Sensor Circuit High	● Engine oil temperature (EOT) sensor circuit high input - voltage above threshold ● EOT sensor circuit short circuit to power ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Repair/renew as necessary.
P019927	Engine Oil Temperature Sensor Circuit Intermittent/Erratic	● Engine oil temperature (EOT) sensor circuit intermittent - signal rate of change above threshold ● EOT sensor circuit intermittent high resistance ● EOT sensor fault	Check the EOT sensor and circuits. Refer to the electrical guides. Start the engine and allow to idle. Check the oil temperature using a data logger function. Increase the engine speed to 2,000 rpm and recheck the value after two minutes at this engine speed. If the value has increased by more than 40°C per second, install a new sensor. Clear the DTCs and test for normal operation.
P020101	Cylinder 1 Injector Circuit / Open	● Fuel injector circuit open cylinder 1 - general electrical fault ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020201	Cylinder 2 Injector Circuit / Open	● Fuel injector circuit open cylinder 2 - general electrical fault ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P020301	Cylinder 3 Injector Circuit / Open	- Fuel injector circuit open cylinder 3 - general electrical fault - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020401	Cylinder 4 Injector Circuit / Open	- Fuel injector circuit open cylinder 4 - general electrical fault - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020501	Cylinder 5 Injector Circuit / Open	- Fuel injector circuit open cylinder 5 - general electrical fault - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020601	Cylinder 6 Injector Circuit / Open	- Fuel injector circuit open cylinder 6 - general electrical fault - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear

DTC	Description	Possible causes	Action
			the DTCs and test for normal operation.
P020701	Cylinder 7 Injector Circuit / Open	● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020801	Cylinder 8 Injector Circuit / Open	● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020A33	Cylinder 1 Injection Timing	● Cylinder 1 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020A35	Cylinder 1 Injection Timing	● Cylinder 1 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short

DTC	Description	Possible causes	Action
			circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020B33	Cylinder 2 Injection Timing	● Cylinder 2 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020B35	Cylinder 2 Injection Timing	● Cylinder 2 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020C33	Cylinder 3 Injection Timing	● Cylinder 3 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020C35	Cylinder 3 Injection Timing	● Cylinder 3 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
			If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020D33	Cylinder 4 Injection Timing	● Cylinder 4 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020D35	Cylinder 4 Injection Timing	● Cylinder 4 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020E33	Cylinder 5 Injection Timing	● Cylinder 5 injection timing - signal low time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P020E35	Cylinder 5 Injection Timing	● Cylinder 5 injection timing - signal high time greater than maximum ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Fuel injector circuit high resistance ● Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel)

DTC	Description	Possible causes	Action
			Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P020F33	Cylinder 6 Injection Timing	- Cylinder 6 injection timing - signal low time greater than maximum - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P020F35	Cylinder 6 Injection Timing	- Cylinder 6 injection timing - signal high time greater than maximum - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. If the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P021900	Engine Overspeed Condition	- Crankshaft position (CKP) sensor circuit high resistance - Crankshaft position (CKP) sensor circuit short circuit to ground - Crankshaft position (CKP) sensor circuit short circuit to power - Camshaft position (CMP) sensor circuit high resistance - Camshaft position (CMP) sensor circuit short circuit to ground - Camshaft position (CMP) sensor circuit short circuit to power - Oil ingestion	Check the CKP and CMP sensor circuits. Refer to the electrical guides. Rectify as necessary. If no fault is found in the circuits, install new sensors as necessary. REFER to: (303-14D Electronic Engine Controls - TDV8 3.6L Diesel) Crankshaft Position (CKP) Sensor (Removal and Installation), Camshaft Position (CMP) Sensor (Removal and Installation). Clear the DTCs and test for normal operation. Check for oil ingestion into the intake air path. Rectify as necessary.
P021A33	Cylinder 7 Injection Timing	- Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. if the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to:

DTC	Description	Possible causes	Action
			(303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P021A35	Cylinder 7 Injection Timing	- Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. if the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P021B33	Cylinder 8 Injection Timing	- Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. if the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P021B35	Cylinder 8 Injection Timing	- Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Fuel injector circuit high resistance - Fuel injector fault	During the following, clear DTCs and recheck after each step. Turn the ignition off and wait 20 seconds before turning the ignition back on to recheck DTCs. Check the connections for security. Disconnect the injector and measure the resistance and capacitance of the injector. if the resistance is not between 180 and 220 Kohms, or the capacitance not greater than 3 microfarad, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). If the injector is within specification, check the injector circuits for short circuit to ground, short circuit to power and for high resistance. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P023627	Turbocharger/Supercharger Boost Sensor A Circuit Range/Performance	- Right-hand turbocharger boost sensor circuit high - signal rate of change above threshold - Manifold absolute pressure and temperature (MAPT)	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. Start the engine and check the manifold air pressure at idle using a data logger function. Increase the engine speed to 1,500 rpm and recheck the manifold air pressure. If the

DTC	Description	Possible causes	Action
		sensor circuit intermittent high resistance - Manifold absolute pressure and temperature (MAPT) sensor fault	pressure has increased by more than 50 KPa per 10 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023716	Turbocharger/Supercharger Boost Sensor A Circuit Low	- Right-hand turbocharger boost sensor circuit low - voltage below threshold - Manifold absolute pressure and temperature (MAPT) sensor circuit short circuit to ground - Manifold absolute pressure and temperature (MAPT) sensor fault	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023817	Turbocharger/Supercharger Boost Sensor A Circuit High	- Right-hand turbocharger boost sensor circuit high - voltage above threshold - Manifold absolute pressure and temperature (MAPT) sensor circuit short circuit to power - Manifold absolute pressure and temperature (MAPT) sensor fault	During the following, clear DTCs and recheck after each step. Check the MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023D21	Manifold Absolute Pressure - Turbocharger/Supercharger Boost Sensor A Correlation	- Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude less than minimum - Intake air system fault - Turbocharger mechanical fault - Oil ingestion into manifold	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for oil being drawn into the intake manifold. Rectify as necessary. Using a data logger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023D22	Manifold Absolute Pressure - Turbocharger/Supercharger Boost Sensor A Correlation	- Manifold absolute pressure (MAP) sensor/right-hand turbocharger boost sensor correlation - signal amplitude greater than maximum - Intake air system fault - Turbocharger mechanical fault - Intake air temperature (IAT) sensor fault - Mass air flow (MAF) sensor fault - Manifold absolute pressure and temperature (MAPT) sensor fault - Exhaust gas recirculation (EGR) sensor fault - Turbocharger actuator position sensor fault	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for DTCs indicating a listed sensor fault. Rectify as necessary. Using a data logger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger RH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023E21	Manifold Absolute Pressure - Turbocharger/Supercharger Boost Sensor B Correlation	- Manifold absolute pressure (MAP) sensor/left-hand turbocharger boost sensor correlation - signal amplitude	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for oil being drawn into the intake manifold. Rectify as necessary. Using a data logger function, monitor the

DTC	Description	Possible causes	Action
		less than minimum - Intake air system fault - Turbocharger mechanical fault - Oil ingestion into manifold	turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P023E22	Manifold Absolute Pressure - Turbocharger/Supercharger Boost Sensor B Correlation	- Manifold absolute pressure (MAP) sensor/left-hand turbocharger boost sensor correlation - signal amplitude greater than maximum - Intake air system fault - Turbocharger mechanical fault - Intake air temperature (IAT) sensor fault - Mass air flow (MAF) sensor fault - Manifold absolute pressure and temperature (MAPT) sensor fault - Exhaust gas recirculation (EGR) sensor fault - Turbocharger actuator position sensor fault	Check the intake air system. Check the turbocharger mechanical condition and operation. Check for DTCs indicating a listed sensor fault. Rectify as necessary. Using a data logger function, monitor the turbocharger actuator position and command the actuator to 5% pulse width modulated (PWM), then 95% pulse width modulated (PWM) in 5% steps. Check the results. There should be a smooth curve between the minimum and maximum values. If not, install a new turbocharger. REFER to: Turbocharger LH (303-04F Fuel Charging and Controls - Turbocharger - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P024027	Turbocharger/Supercharger Boost Sensor B Circuit Range/Performance	- Left-hand turbocharger boost sensor range/performance - signal rate of change above threshold - Manifold absolute pressure and temperature (MAPT) sensor circuit intermittent high resistance - Manifold absolute pressure and temperature (MAPT) sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. Using a data logger function, check the manifold pressure at idle and record the measurement. Increase the engine speed to 1,500 rpm and recheck the value. If the pressure has increased by more than 50 KPa (7.25 lbs/in²) per 10 ms, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P024116	Turbocharger/Supercharger Boost Sensor B Circuit Low	- Left-hand turbocharger boost sensor circuit low - voltage below threshold - Manifold absolute pressure and temperature (MAPT) sensor circuit short circuit to ground - Manifold absolute pressure and temperature (MAPT) sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P024217	Turbocharger/Supercharger Boost Sensor B Circuit High	- Left-hand turbocharger boost sensor circuit high - voltage above threshold - Manifold absolute pressure and temperature (MAPT) sensor connector fault - Manifold absolute pressure and temperature (MAPT) sensor fault	Check the left-hand MAPT sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Manifold Absolute Pressure and Temperature (MAPT) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P026300	Cylinder 1 Contribution/Balance	- Injector leak - Cylinder compression low - Blow-by past the injector	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the

DTC	Description	Possible causes	Action
		- Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P026600	Cylinder 2 Contribution/Balance	● Injector leak ● Cylinder compression low - Blow-by past the injector - Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P026900	Cylinder 3 Contribution/Balance	● Injector leak ● Cylinder compression low - Blow-by past the injector - Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P027200	Cylinder 4 Contribution/Balance	● Injector leak ● Cylinder compression low - Blow-by past the injector - Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P027500	Cylinder 5 Contribution/Balance	● Injector leak ● Cylinder compression low - Blow-by past the injector - Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all

DTC	Description	Possible causes	Action
			within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P027800	Cylinder 6 Contribution/Balance	● Injector leak ● Cylinder compression low - Blow-by past the injector - Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P028100	Cylinder 7 Contribution/Balance	● Injector leak ● Cylinder compression low - Blow-by past the injector - Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P028400	Cylinder 8 Contribution/Balance	● Injector leak ● Cylinder compression low - Blow-by past the injector - Blow-by past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for blow-by etc and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P029A00	Cylinder 1- Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P029B00	Cylinder 1- Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P029C00	Cylinder 1 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P029D00	Cylinder 1- Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P029E00	Cylinder 2- Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P029F00	Cylinder 2 - Fuel Trim at Min Limit	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Injector leak - Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc - Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A000	Cylinder 2 - Injector Restricted	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Injector leak - Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc - Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A100	Cylinder 2 - Injector Leaking	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Injector leak - Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc - Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A200	Cylinder 3 - Fuel Trim at Max Limit	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Injector leak - Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc - Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P02A300	Cylinder 3 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A400	Cylinder 3 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A500	Cylinder 3 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A600	Cylinder 4 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P02A700	Cylinder 4 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A800	Cylinder 4 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02A900	Cylinder 4 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02AA00	Cylinder 5 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P02AB00	Cylinder 5 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02AC00	Cylinder 5 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02AD00	Cylinder 5 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02AE00	Cylinder 6 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P02AF00	Cylinder 6 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B000	Cylinder 6 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B100	Cylinder 6 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B200	Cylinder 7 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P02B300	Cylinder 7 - Fuel Trim at Min Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B400	Cylinder 7 - Injector Restricted	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B500	Cylinder 7 - Injector Leaking	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B600	Cylinder 8 - Fuel Trim at Max Limit	● Fuel injector circuit high resistance ● Fuel injector circuit short circuit to ground ● Fuel injector circuit short circuit to power ● Injector leak ● Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc ● Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).

DTC	Description	Possible causes	Action
P02B700	Cylinder 8 - Fuel Trim at Min Limit	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Injector leak - Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc - Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B800	Cylinder 8 - Injector Restricted	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Injector leak - Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc - Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02B900	Cylinder 8 - Injector Leaking	- Fuel injector circuit high resistance - Fuel injector circuit short circuit to ground - Fuel injector circuit short circuit to power - Injector leak - Cylinder compression low - Cylinder leakage past the injector - Cylinder leakage past the glow plug - Mechanical fault, valve, piston/ring, etc - Injector fault	Refer to the electrical guides and check the fuel injector circuit. Check the injector and surrounding area for evidence of fuel leakage. Disconnect the injector and check for evidence of fuel leakage in the connector. Rectify as necessary. Clear the DTCs. Reconnect the injector and start the engine. Allow to warm up to above 60°C (140°F) and allow to idle (cylinder balance diagnosis is now active). If the DTC resets, check for Cylinder leakage and rectify as necessary. Clear the DTCs and recheck. Carry out a compression test only if the DTC resets. If the above tests are all within range, install a new injector. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation).
P02CD00	Cylinder 1 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder.
P02CF00	Cylinder 2 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder.
P02D100	Cylinder 3 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder.
P02D300	Cylinder 4 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder.
P02D500	Cylinder 5 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder.
P02D700	Cylinder 6 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder.
P02D900	Cylinder 7 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder
P02DB00	Cylinder 8 fuel injector offset learning at maximum limit	- Fuel injector failure	Replace fuel injector for related cylinder.

DTC	Description	Possible causes	Action
P032621	Knock Sensor 1 Circuit Range/Performance (Bank 1)	- Knock sensor (KS) 1 circuit range/performance, right-hand bank (rear) - signal amplitude less than minimum - KS incorrectly installed - KS connections reversed - KS circuit short circuit to ground	Check that the knock sensors are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P032622	Knock Sensor 1 Circuit Range/Performance (Bank 1)	- Knock sensor (KS) 1 circuit range/performance, right-hand bank (rear) - signal amplitude greater than maximum - KS incorrectly installed - KS connections reversed - KS circuit short circuit to ground	Check that the knock sensors are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P032B21	Knock Sensor 3 Circuit Range/Performance (Bank1)	- Knock sensor (KS) 3 circuit range/performance, right-hand bank (front) - signal amplitude less than minimum - KS incorrectly installed - KS connections reversed - KS circuit short circuit to ground	Check that the knock sensors are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P032B22	Knock Sensor 3 Circuit Range/Performance (Bank1)	- Knock sensor (KS) 3 circuit range/performance, right-hand bank (front) - signal amplitude greater than maximum - KS incorrectly installed - KS connections reversed - KS circuit short circuit to ground	Check that the knock sensors are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033121	Knock Sensor 1 Circuit Range/Performance (Bank 2)	- Knock sensor (KS) 2 circuit range/performance, left-hand bank (rear) - signal amplitude less than minimum - KS incorrectly installed - KS connections reversed - KS circuit short circuit to ground	Check that the KS are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033122	Knock Sensor 1 Circuit Range/Performance (Bank 2)	- Knock sensor (KS) 2 circuit range/performance, left-hand bank (rear) - signal amplitude greater than maximum - KS incorrectly installed - (KS) connections reversed - (KS) circuit short circuit to ground	Check that the KS are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033578	Crankshaft Position Sensor A Circuit	- Crankshaft position (CKP) sensor - alignment or adjustment incorrect - CKP sensor circuit short circuit to ground - CKP sensor circuit short circuit to power - CKP sensor circuit high resistance - CKP sensor fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. REFER to: (303-14D Electronic Engine Controls - TDV8 3.6L Diesel) Crankshaft Position (CKP) Sensor (Removal and Installation), Crankshaft Position (CKP) Sensor Ring (Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		● CKP sensor wheel fault	
P033631	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal missing ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. REFER to: (303-14D Electronic Engine Controls - TDV8 3.6L Diesel) Crankshaft Position (CKP) Sensor (Removal and Installation), Crankshaft Position (CKP) Sensor Ring (Removal and Installation). Clear the DTCs and test for normal operation.
P033638	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal frequency ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. REFER to: (303-14D Electronic Engine Controls - TDV8 3.6L Diesel) Crankshaft Position (CKP) Sensor (Removal and Installation), Crankshaft Position (CKP) Sensor Ring (Removal and Installation). Clear the DTCs and test for normal operation.
P033664	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal plausibility fault ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. REFER to: (303-14D Electronic Engine Controls - TDV8 3.6L Diesel) Crankshaft Position (CKP) Sensor (Removal and Installation), Crankshaft Position (CKP) Sensor Ring (Removal and Installation). Clear the DTCs and test for normal operation.
P033666	Crankshaft position (CKP) sensor circuit range/performance	● Crankshaft position (CKP) sensor range/performance - signal has too many transitions/events ● CKP sensor circuit short circuit to ground ● CKP sensor circuit short circuit to power ● CKP sensor circuit high resistance ● CKP sensor fault ● CKP sensor wheel fault	Check the CKP sensor and circuits. Refer to the electrical guides. Check the sensor and wheel for correct installation and condition. Rectify as necessary. REFER to: (303-14D Electronic Engine Controls - TDV8 3.6L Diesel) Crankshaft Position (CKP) Sensor (Removal and Installation), Crankshaft Position (CKP) Sensor Ring (Removal and Installation). Clear the DTCs and test for normal operation.
P033B21	Knock Sensor 4 Circuit Range/Performance (Bank 2)	● Knock sensor (KS) 4 circuit range/performance, left-hand bank (front) - signal amplitude less than minimum ● KS incorrectly installed ● KS connections reversed ● KS circuit short circuit to ground	Check that the KS are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.
P033B22	Knock Sensor 4 Circuit Range/Performance (Bank 2)	● Knock sensor (KS) 4 circuit range/performance, left-hand bank (front) - signal amplitude greater than maximum ● KS incorrectly installed ● KS connections reversed ● KS circuit short circuit to	Check that the KS are correctly installed and tightened to the correct torque. REFER to: Knock Sensor (KS) RH (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Check that the KS connections are connected to the correct sensor. Check the KS circuit, refer to the electrical guides. Rectify as necessary.

DTC	Description	Possible causes	Action
		ground	
P034129	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	● Camshaft position (CMP) sensor range/performance - signal invalid ● CMP sensor circuit short circuit to ground ● CMP sensor circuit short circuit to power ● CMP sensor circuit high resistance ● CMP sensor fault	Check the CMP sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Camshaft Position (CMP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P03413A	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	● Camshaft position (CMP) sensor range/performance - too many pulses ● Camshaft segment period too short	Check the CMP sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Camshaft Position (CMP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P034231	Camshaft Position Sensor A Circuit Low (Bank 1 or single sensor)	● Camshaft position (CMP) sensor circuit low input - no signal ● CMP sensor circuit short circuit to ground ● CMP sensor circuit short circuit to power ● CMP sensor circuit high resistance ● CMP sensor fault	Check the CMP sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor. REFER to: Camshaft Position (CMP) Sensor (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P038072	Glow Plug/Heater Circuit A	● Right-hand bank glow plug circuit - actuator stuck open ● Low battery voltage ● Relay circuit **from** relay	Check the battery condition and state of charge. Check the relay and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new relay. Clear the DTCs and test for normal operation.
P038073	Glow Plug/Heater Circuit A	● Right-hand bank glow plug circuit - actuator stuck closed ● Low battery voltage ● Relay circuit **to** relay	Check the battery condition and state of charge. Check the relay and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new relay. Clear the DTCs and test for normal operation.
P038311	Glow plug control module - control circuit low	● Glow plug relay control circuit short circuit to ground ● Glow plug relay fault	Check the relay and circuits. Refer to the electrical guides. Activate the relay and check for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P038412	Glow Plug Control Module Control Circuit High	● Glow plug relay, control circuit short circuit to power ● Glow plug relay fault	Check the relay and circuits. Refer to the electrical guides. Activate the relay and check for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P040100	Exhaust Gas Recirculation A Flow Insufficient Detected	● EGR control deviation lower limit, right-hand bank (intake manifold tuning (IMT) valve closed - bank specific control of EGR)	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle for the right-hand bank. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040121	Exhaust Gas Recirculation A Flow Insufficient Detected	● Exhaust gas recirculation (EGR) insufficient flow detected - signal amplitude less than minimum ● EGR control deviation lower limit right-hand bank (intake manifold tuning (IMT) valve	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angles for both banks. Command the valve actuators to 100% then 0% pulse width modulated (PWM), and recheck the valve angles. The angles should range between 95% and 5%. If this is not the case, install new valves as necessary.

DTC	Description	Possible causes	Action
		closed) bank specific control of EGR	REFER to: (303-08D Engine Emission Control - TDV8 3.6L Diesel) Exhaust Gas Recirculation (EGR) Valve LH (Removal and Installation), Exhaust Gas Recirculation (EGR) Valve RH (Removal and Installation). Clear the DTCs and test for normal operation.
P040200	Exhaust Gas Recirculation A Flow Excessive Detected	● Right-hand exhaust gas recirculation (EGR) excessive flow detected ● EGR control deviation upper limit right-hand bank (intake manifold tuning (IMT) valve closed) - bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle for the right-hand bank. Command the valve actuator to 0% then 100% pulse width modulated (PWM) and recheck the values. The angle should range between 5% and 95%. If this is not the case, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040222	Exhaust Gas Recirculation A Flow Excessive Detected	● Right-hand exhaust gas recirculation (EGR) excessive flow detected - signal amplitude greater than maximum ● EGR control deviation upper limit right-hand bank (intake manifold tuning (IMT) valve closed) bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve angle. Command the valve actuator to 0% then 100% pulse width modulated (PWM), and recheck the valve angles. The angles should range between 5% and 95%. If this is not the case, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040300	Exhaust Gas Recirculation A Control Circuit	● Right-hand exhaust gas recirculation (EGR) control circuit ● EGR valve circuit fault ● EGR valve fault ● engine control module (ECM) fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% pulse width modulated (PWM) and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P040319	Exhaust Gas Recirculation A Control Circuit	● Right-hand exhaust gas recirculation (EGR) control circuit - current over threshold ● EGR valve control circuit short circuit to ground ● EGR valve control circuit short circuit to power	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% pulse width modulated (PWM) and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If

DTC	Description	Possible causes	Action
			there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P040521	Exhaust Gas Recirculation Sensor A Circuit Low	● Right-hand exhaust gas recirculation (EGR) sensor circuit low - signal amplitude less than minimum ● EGR valve position sensor circuit short circuit to ground ● EGR valve position sensor fault	Check the right-hand EGR sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angle. With the ignition on, engine off, command the valve actuator to 0% pulse width modulated (PWM), and then to 100% pulse width modulated (PWM) and recheck the EGR valve angle. The value should range from 0 - 20% to 80 - 95%. If this is not the case, install a new sensor. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040622	Exhaust Gas Recirculation Sensor A Circuit High	● Right-hand exhaust gas recirculation (EGR) sensor circuit high - signal amplitude greater than maximum ● EGR valve position sensor circuit short circuit to power ● EGR valve position sensor fault	Check the right-hand EGR sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR valve angle. With the ignition on, engine off, command the valve actuator to 0% pulse width modulated (PWM), and then to 100% pulse width modulated (PWM) and recheck the EGR valve angle. The value should range from 0 - 20% to 80 - 95%. If this is not the case, install a new sensor. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040721	Exhaust Gas Recirculation Sensor B Circuit Low	● Right-hand exhaust gas recirculation (EGR) throttle position sensor circuit low - signal amplitude less than minimum ● EGR throttle position sensor circuit short circuit to ground ● EGR throttle position sensor circuit high resistance ● EGR sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P040822	Exhaust Gas Recirculation Sensor B Circuit High	● Right-hand exhaust gas recirculation (EGR) throttle position sensor circuit low - signal amplitude greater than maximum ● EGR throttle position sensor circuit short circuit to power ● EGR throttle position sensor fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P042562	Catalyst Temperature Sensor Circuit (Bank 1 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor signal compare failure ● Close coupled catalytic converter inlet temperature sensor correlation compare with at least two other sensors ● Close coupled catalytic converter inlet temperature sensor failure ● Close coupled catalytic converter inlet temperature sensor circuit - short to ground, power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for open circuit, short to ground, short to power. Check close coupled catalytic converter inlet temperature sensor for dirt contamination, corrosion, water ingress damage. Replace close coupled catalytic converter inlet temperature sensor.

DTC	Description	Possible causes	Action
P042600	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 1)	• Close coupled catalytic converter inlet temperature sensor gradient check • Close coupled catalytic converter inlet temperature sensor failure • Close coupled catalytic converter inlet temperature sensor circuit - short to ground, power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required.
P04261A	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 1)	• Close coupled catalytic converter inlet temperature sensor circuit resistance below threshold • Close coupled catalytic converter inlet temperature sensor plausibility at cold start, temperature difference too high • Close coupled catalytic converter inlet temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for low resistance, short to ground. Replace close coupled catalytic converter inlet temperature sensor.
P04261B	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 1)	• Close coupled catalytic converter inlet temperature sensor circuit resistance above threshold • Close coupled catalytic converter inlet temperature sensor plausibility at cold start, temperature difference too low • Close coupled catalytic converter inlet temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for high resistance, open circuit. Replace close coupled catalytic converter inlet temperature sensor.
P04261E	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 1)	• Close coupled catalytic converter inlet temperature sensor circuit resistance out of range • Close coupled catalytic converter inlet temperature sensor plausibility at engine running, temperature too low • Close coupled catalytic converter inlet temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for open circuit, short to ground, short to power. Check close coupled catalytic converter inlet temperature sensor for dirt contamination, corrosion, water ingress damage. Replace close coupled catalytic converter inlet temperature sensor.
P042700	Catalyst Temperature Sensor Circuit Low (Bank 1 Sensor 1)	• Close coupled catalytic converter inlet temperature sensor signal below minimum threshold voltage • Close coupled catalytic converter inlet temperature sensor failure • Close coupled catalytic converter inlet temperature sensor circuit - short to ground	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for short to ground. Install a new sensor as required.
P042800	Catalyst Temperature Sensor Circuit High (Bank 1 Sensor 1)	• Close coupled catalytic converter inlet temperature sensor signal above maximum threshold voltage	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor

DTC	Description	Possible causes	Action
		- Close coupled catalytic converter inlet temperature sensor failure - Close coupled catalytic converter inlet temperature sensor circuit - short to power, open circuit	circuit for short to power, open circuit. Install a new sensor as required.
P042A62	Catalyst Temperature Sensor Circuit (Bank 1 Sensor 2)	- Close coupled catalytic converter outlet temperature sensor signal compare failure - Close coupled catalytic converter outlet temperature sensor correlation compare with at least two other sensors - Close coupled catalytic converter outlet temperature sensor failure - Close coupled catalytic converter outlet temperature sensor circuit - short to ground, power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for open circuit, short to ground, short to power. check close coupled catalytic converter outlet temperature sensor for dirt contamination, corrosion, water ingress damage. Replace close coupled catalytic converter outlet temperature sensor.
P042B00	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 2)	- Close coupled catalytic converter outlet temperature sensor gradient check - Close coupled catalytic converter outlet temperature sensor failure - Close coupled catalytic converter outlet temperature sensor circuit - short to ground, power, open circuit - Close coupled catalytic converter outlet temperature sensor circuit high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required.
P042B1A	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 2)	- Close coupled catalytic converter outlet temperature sensor circuit resistance below threshold - Close coupled catalytic converter outlet temperature sensor plausibility at cold start, temperature difference too high - Close coupled catalytic converter outlet temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for low resistance, short to ground. Replace close coupled catalytic converter outlet temperature sensor.
P042B1B	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 2)	- Close coupled catalytic converter outlet temperature sensor circuit resistance above threshold - Close coupled catalytic converter outlet temperature sensor plausibility at cold start, temperature difference too low - Close coupled catalytic converter outlet temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for high resistance, open circuit. Replace close coupled catalytic converter outlet temperature sensor.

DTC	Description	Possible causes	Action
P042B1E	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor circuit resistance out of range ● Close coupled catalytic converter outlet temperature sensor plausibility at engine running, temperature too low ● Close coupled catalytic converter outlet temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for open circuit, short to ground, short to power. check close coupled catalytic converter outlet temperature sensor for dirt contamination, corrosion, water ingress damage. Replace close coupled catalytic converter outlet temperature sensor.
P042C00	Catalyst Temperature Sensor Circuit Low (Bank 1 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor signal below minimum threshold voltage ● Close coupled catalytic converter outlet temperature sensor failure ● Close coupled catalytic converter outlet temperature sensor circuit - short to ground	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for short to ground. Install a new sensor as required.
P042D00	Catalyst Temperature Sensor Circuit High (Bank 1 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor signal above maximum threshold voltage ● Close coupled catalytic converter outlet temperature sensor failure ● Close coupled catalytic converter outlet temperature sensor circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for short to power, open circuit. Install a new sensor as required.
P043562	Catalyst Temperature Sensor Circuit (Bank 2 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor signal compare failure ● Close coupled catalytic converter inlet temperature sensor correlation compare with at least two other sensors ● Close coupled catalytic converter inlet temperature sensor failure ● Close coupled catalytic converter inlet temperature sensor circuit - short to ground, power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for open circuit, short to ground, short to power. Check close coupled catalytic converter inlet temperature sensor for dirt contamination, corrosion, water ingress damage. Replace close coupled catalytic converter inlet temperature sensor.
P043600	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor gradient check ● Close coupled catalytic converter inlet temperature sensor failure ● Close coupled catalytic converter inlet temperature sensor circuit - short to ground, power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required.
P04361A	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor circuit resistance below threshold	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor

DTC	Description	Possible causes	Action
		● Close coupled catalytic converter inlet temperature sensor plausibility at cold start, temperature difference too high ● Close coupled catalytic converter inlet temperature sensor stuck at high temperature value	circuit for low resistance, short to ground. Replace close coupled catalytic converter inlet temperature sensor.
P04361B	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor circuit resistance above threshold ● Close coupled catalytic converter inlet temperature sensor plausibility at cold start, temperature difference too low ● Close coupled catalytic converter inlet temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for high resistance, open circuit. Replace close coupled catalytic converter inlet temperature sensor.
P04361E	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor circuit resistance out of range ● Close coupled catalytic converter inlet temperature sensor plausibility at engine running, temperature too low ● Close coupled catalytic converter inlet temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for open circuit, short to ground, short to power. Check close coupled catalytic converter inlet temperature sensor for dirt contamination, corrosion, water ingress damage. Replace close coupled catalytic converter inlet temperature sensor.
P043700	Catalyst Temperature Sensor Circuit Low (Bank 2 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor signal below minimum threshold voltage ● Close coupled catalytic converter inlet temperature sensor failure ● Close coupled catalytic converter inlet temperature sensor circuit - short to ground	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for short to ground. Install a new sensor as required.
P043800	Catalyst Temperature Sensor Circuit High (Bank 2 Sensor 1)	● Close coupled catalytic converter inlet temperature sensor signal above maximum threshold voltage ● Close coupled catalytic converter inlet temperature sensor failure ● Close coupled catalytic converter inlet temperature sensor circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter inlet temperature sensor circuit for short to power, open circuit. Install a new sensor as required.
P043A62	Catalyst Temperature Sensor Circuit (Bank 2 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor signal compare failure ● Close coupled catalytic converter outlet temperature sensor correlation compare with at least two other	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for open circuit, short to ground, short to power. check close coupled catalytic converter outlet temperature sensor for dirt contamination,

DTC	Description	Possible causes	Action
		sensors ● Close coupled catalytic converter outlet temperature sensor failure ● Close coupled catalytic converter outlet temperature sensor circuit - short to ground, power, open circuit	corrosion, water ingress damage. Replace close coupled catalytic converter outlet temperature sensor.
P043B00	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor gradient check ● Close coupled catalytic converter outlet temperature sensor failure ● Close coupled catalytic converter outlet temperature sensor circuit - short to ground, power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required.
P043B1A	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor circuit resistance below threshold ● Close coupled catalytic converter outlet temperature sensor plausibility at cold start, temperature difference too high ● Close coupled catalytic converter outlet temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for low resistance, short to ground. Replace close coupled catalytic converter outlet temperature sensor.
P043B1B	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor circuit resistance above threshold ● Close coupled catalytic converter outlet temperature sensor plausibility at cold start, temperature difference too low ● Close coupled catalytic converter outlet temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for high resistance, open circuit. Replace close coupled catalytic converter outlet temperature sensor.
P043B1E	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor circuit resistance out of range ● Close coupled catalytic converter outlet temperature sensor plausibility at engine running, temperature too low ● Close coupled catalytic converter outlet temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for open circuit, short to ground, short to power. check close coupled catalytic converter outlet temperature sensor for dirt contamination, corrosion, water ingress damage. Replace close coupled catalytic converter outlet temperature sensor.
P043C00	Catalyst Temperature Sensor Circuit Low (Bank 2 Sensor 2)	● Close coupled catalytic converter outlet temperature sensor signal below minimum threshold voltage ● Close coupled catalytic converter outlet temperature sensor failure	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for short to ground. Install a new sensor as required.

DTC	Description	Possible causes	Action
		- Close coupled catalytic converter outlet temperature sensor circuit - short to ground	
P043D00	Catalyst Temperature Sensor Circuit High (Bank 2 Sensor 2)	- Close coupled catalytic converter outlet temperature sensor signal above maximum threshold voltage - Close coupled catalytic converter outlet temperature sensor failure - Close coupled catalytic converter outlet temperature sensor circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check close coupled catalytic converter outlet temperature sensor circuit for short to power, open circuit. Install a new sensor as required.
P045A00	Exhaust Gas Recirculation B Control Circuit	- EGR valve circuit fault - EGR valve fault - engine control module (ECM) fault	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% pulse width modulated (PWM) and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P045A19	Exhaust Gas Recirculation B Control Circuit	- Left-hand exhaust gas recirculation (EGR) control circuit - current over threshold - EGR valve control circuit short circuit to ground - EGR valve control circuit short circuit to power	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, turn the ignition on and check the EGR valve values for both banks. Turn the ignition off and make sure the cleaning cycle is performed (the valves should cycle from 0% to 100% approximately 6 times). Turn the ignition on, command the actuators to 0% pulse width modulated (PWM) and check the sensor reading. The value should be 0 - 20%. Command the actuators to 100% pulse width modulated (PWM) and check the sensor reading. The value should be 80 - 95%. If the values are outside this range, install a new valve as necessary. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P045C00	Exhaust Gas Recirculation B Control Circuit Low	- Left-hand exhaust gas recirculation (EGR) control circuit low - EGR valve sticking - Intake air temperature (IAT) sensor circuit fault - Ambient pressure (AMP) sensor circuit fault - Manifold absolute pressure and temperature (MAPT)	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		sensor circuit fault ● Mass air flow (MAF) sensor circuit fault ● EGR sensor circuit fault	
P045D00	Exhaust Gas Recirculation B Control Circuit High	● Left-hand exhaust gas recirculation (EGR) control circuit high ● EGR valve sticking ● Intake air temperature (IAT) sensor circuit fault ● Ambient pressure (AMP) sensor circuit fault ● Manifold absolute pressure and temperature (MAPT) sensor circuit fault ● Mass air flow (MAF) sensor circuit fault ● EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P048011	Fan 1 Control Circuit	● Cooling fan control circuit short circuit to ground ● Cooling fan fault	Check the cooling fan and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P048012	Fan 1 Control Circuit	● Cooling fan control circuit short circuit to power ● Cooling fan fault	Check the cooling fan and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P048013	Fan 1 Control Circuit	● Cooling fan control circuit high resistance	Check the cooling fan and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P048300	Fan Performance	● Cooling fan control circuit short circuit to ground ● Cooling fan control circuit short circuit to power ● Cooling fan control circuit high resistance ● Cooling fan fault	Check the cooling fan operation. Refer to the electrical guides and check the fan circuit, Repair/renew as necessary. Clear the DTCs and test for normal operation. Check the pulse width modulated (PWM) signal and check the motor for sticking. Repair/renew as necessary.
P048700	Exhaust Gas Recirculation Throttle Control Circuit A / Open	● Right-hand exhaust gas recirculation (EGR) valve circuit fault ● EGR valve fault ● engine control module (ECM) fault	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048800	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	● Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance ● Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to ground ● Exhaust gas recirculation (EGR) throttle position sensor	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and

DTC	Description	Possible causes	Action
		circuit short circuit to power - EGR modulator failure	recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048811	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	- Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to ground - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048812	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	- Exhaust gas recirculation (EGR) throttle position sensor circuit short circuit to power - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048813	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	- Exhaust gas recirculation (EGR) throttle position sensor circuit high resistance - Exhaust gas recirculation (EGR) throttle position sensor circuit open circuit - EGR modulator failure	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048819	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	- Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - current above threshold - Right-hand EGR throttle over current check	Check the EGR throttle position sensor and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position with the ignition on, engine off and record the value. Command the actuator to 100% pulse width modulated (PWM) and recheck the position reading. The value should be 80 - 95%. Command the actuator to 0% pulse width modulated (PWM) and recheck the position reading. The value should be 5 - 20%. Manually close and open the throttle and

DTC	Description	Possible causes	Action
			check the resistance. The resistance should range from 300 - 2,500 ohms. If the values are not in this range, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If there is still an issue, suspect the ECM. Refer to the warranty policy and procedures manual if an ECM is suspect.
P048821	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	● Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - signal amplitude less than minimum ● Right-hand EGR throttle adaption is at the bottom limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position then command the throttle position set point to 0% pulse width modulated (PWM) and recheck the position. If the 0% pulse width modulated (PWM) position is not between 0% and 20%, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P048822	Exhaust Gas Recirculation Throttle Control Circuit A Range/Performance	● Right-hand exhaust gas recirculation (EGR) throttle control circuit range/performance - signal amplitude greater than maximum ● Right-hand EGR throttle adaption is at the top limit	Check the EGR valve and circuits. Refer to the electrical guides. Using a data logger function, check the EGR throttle position then command the throttle position set point to 0% pulse width modulated (PWM) and recheck the position. If the 0% pulse width modulated (PWM) position is not between 0% and 20%, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P048900	Exhaust Gas Recirculation Control Circuit Low	● Right-hand exhaust gas recirculation (EGR) control circuit low ● EGR valve sticking ● Intake air temperature (IAT) sensor circuit fault ● Ambient pressure (AMP) sensor circuit fault ● Manifold absolute pressure and temperature (MAPT) sensor circuit fault ● Mass air flow (MAF) sensor circuit fault ● EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P049000	Exhaust Gas Recirculation A Control Circuit High	● Right-hand exhaust gas recirculation (EGR) control circuit high ● EGR valve sticking ● Intake air temperature (IAT) sensor circuit fault ● Ambient pressure (AMP) sensor circuit fault ● Manifold absolute pressure and temperature (MAPT) sensor circuit fault ● Mass air flow (MAF) sensor circuit fault ● EGR sensor circuit fault	Check for DTCs indicating a sensor fault. Check the IAT, AMP, MAPT, MAF and EGR sensor circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new EGR valve. REFER to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P049300	Fan Overspeed (clutch locked)	● Seized viscous coupling ● Fan speed sensor failure	Check that the viscous coupling turns independently of the fan. Refer to the electrical guides and check the viscous fan speed sensor circuit. Repair/renew as necessary.

DTC	Description	Possible causes	Action
P049313	Fan Overspeed (clutch locked)	● Fan circuit open circuit	Refer to the electrical guides and check the viscous fan speed sensor circuit. Repair/renew as necessary.
P049400	Fan Speed Low	● Viscous fan restriction ● Viscous fan solenoid circuit high resistance ● Viscous fan solenoid circuit short circuit to ground ● Viscous fan solenoid failure	Clear any obstruction from the viscous fan. Refer to the electrical guides and check the viscous fan solenoid and circuits. Refer to the relevant workshop manual section.
P049411	Fan Speed Low	● Viscous fan solenoid circuit short circuit to ground ● Viscous fan solenoid failure	Refer to the electrical guides and check the viscous fan solenoid and circuits. Refer to the relevant workshop manual section.
P049512	Fan Speed High	● Viscous fan solenoid circuit short circuit to power ● Viscous fan solenoid failure	Refer to the electrical guides and check the viscous fan solenoid and circuits. Refer to the relevant workshop manual section.
P049B00	Exhaust Gas Recirculation B Flow Insufficient Detected	● Left-hand exhaust gas recirculation (EGR) insufficient flow detected ● EGR control deviation lower limit (intake manifold tuning [IMT] valve closed) - bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve position and command the valve to 0% then 100% pulse width modulated (PWM). Check the values. If the valve positions are not between 5% and 95%, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P049C00	Exhaust Gas Recirculation B Flow Excessive Detected	● Left-hand exhaust gas recirculation (EGR) excessive flow detected - signal amplitude greater than maximum ● EGR control deviation upper limit left-hand bank (intake manifold tuning [IMT] valve closed) - bank specific control of EGR	Allow the engine to warm up, switch off and turn the ignition on. Using a data logger function, check the EGR valve position and command the valve to 0% then 100% pulse width modulated (PWM). Check the values. If the valve positions are not between 5% and 95%, install a new valve. REFER to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.
P050000	Vehicle Speed Sensor A	● Vehicle speed invalid signal received over CAN	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050100	Vehicle Speed Sensor A Range/Performance	● Vehicle speed sensor 1 range/performance - signal out of range ● Investigate for anti-lock braking system (ABS) faults - the signal from the wheel speed sensors is not plausible	Check for DTCs indicating an ABS fault. Speed sensor codes are listed at the head of this table.
P050162	Vehicle Speed Sensor A Range/Performance	● Vehicle speed range/performance	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050164	Vehicle Speed Sensor A Range/Performance	● Vehicle speed range/performance	Check for wheel speed sensor DTCs. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P050400	Brake switch A / B Correlation	● The brake pressure reading does not agree with the brake lamp switch value ● Brake switch failure ● ECM failure	Check the brake switch and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P050429	Brake Switch A / B Correlation	● Brake switch malfunction (sub-processor)	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P050462	Brake Switch A / B Correlation	● Brake switch A/B correlation - signal compare fault ● Brake lamp switch fault ● Brake lamp switch circuit fault	Check the brake switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P050464	Brake Switch A / B Correlation	● Brake switch malfunction	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P050600	Idle Air Control System RPM Lower Than Expected	● Air intake restriction ● Accessory drive overload (defective/seized component)	Refer to the relevant workshop manual section. Check the accessory drive belt and components, Refer to the relevant workshop manual section.
P050700	Idle Air Control System RPM Higher Than Expected	● Intake air leak between the mass air flow (MAF) sensor and throttle ● Intake air leak between throttle and engine ● Engine crankcase breather leak	Check the air intake system. Check the engine breather system. Refer to the relevant workshop manual section.
P051216	Starter Request Circuit	● Crank request circuit low input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P051300	Incorrect Immobilizer Key	● Security key invalid	Program keys using the approved diagnostic system. Investigate and repair any codes stored in other CAN modules. Clear the codes and retest.
P051217	Starter Request Circuit	● Crank request circuit high input	Refer to the electrical guides and check the starter circuit. Repair/renew as necessary.
P052721	Fan Speed Sensor Circuit Range/Performance	● Fan speed sensor circuit range/performance - signal amplitude less than minimum ● Fan circuit short circuit to ground ● Fan circuit short circuit to power ● Fan circuit high resistance ● Fan fault	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Check the motor for sticking. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P052722	Fan Speed Sensor Circuit Range/Performance	● Fan speed sensor circuit range/performance - signal amplitude greater than maximum ● Fan circuit short circuit to ground ● Fan circuit short circuit to power ● Fan circuit high resistance ● Fan fault	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P052727	Fan Speed Sensor Circuit Range/Performance	● Fan speed sensor circuit range/performance - signal rate of change above threshold ● Fan circuit intermittent high resistance - Loose connections	Check the fan and circuits, including the pulse width modulated (PWM) signal circuit. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P056000	System Voltage	● Battery back-up malfunction ● Battery voltage low ● Battery ground cable: high resistance ● Battery connections loose/corroded ● Battery current drain	Check the battery condition and state of charge. Refer to the relevant workshop manual section.

DTC	Description	Possible causes	Action
P056200	System Voltage Low	● Battery condition/state of charge ● Battery ground cable high resistance ● Battery connections loose/corroded ● Battery current drain ● Battery power distribution circuits	Check the battery connections and condition and charge as necessary. Refer to the electrical guides and check the battery power supplies to the ECM, etc. Repair/renew as necessary. Refer to the relevant workshop manual section.
P056216	System Voltage Low	● Battery condition/state of charge ● Battery ground cable high resistance ● Battery connections loose/corroded ● Battery current drain ● Battery power distribution circuits	Check the battery connections and condition and charge as necessary. Refer to the electrical guides and check the battery power supplies to the ECM, etc. Repair/renew as necessary. Refer to the relevant workshop manual section.
P056300	System Voltage High	● System boosted from high voltage ● Battery voltage high ● Generator over charge condition	Check if the vehicle has been jump-started. Check the battery condition and state of charge. Refer to the relevant workshop manual section.
P056317	System Voltage High	● System voltage high - circuit voltage above threshold ● Battery voltage greater than maximum threshold	Check the battery connections and condition and charge as necessary. Check the battery power supplies to the ECM, etc. Repair/renew as necessary.
P056500	Cruise Control ON Signal	● Speed control (ON) switch signal circuit short circuit to power ● Speed control resume switch stuck/jammed ● Speed control resume switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P056600	Cruise Control OFF Signal	● Speed control (OFF) switch signal circuit short circuit to power ● Speed control resume switch stuck/jammed ● Speed control resume switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P056700	Cruise Control RESUME Signal	● Speed control (+) switch signal circuit short circuit to power ● Speed control - switch stuck/jammed ● Speed control - switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P056900	Cruise Control COAST Signal	● Speed control (-) witch signal circuit short circuit to power ● Speed control - switch stuck/jammed ● Speed control - switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P056A00	Cruise Control INCREASE DISTANCE Signal	● Speed control switch 3 stuck closed (HEADDOWN)	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P056B00	Cruise Control DECREASE DISTANCE Signal	● Speed control switch 4 stuck closed (HEADUP)	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P057000	Cruise Control ACCEL Signal	● Speed control + switch signal circuit short circuit to power ● Speed control + switch stuck/jammed ● Speed control + switch failure	Check the switch operation. Check the switch circuits. Refer to the electrical guides. Repair/renew as necessary. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.
P057100	Brake Switch A Circuit	● The brake pressure reading does not agree with the brake lamp switch value ● Brake switch failure ● ECM failure	Check the brake switch and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P057162	Brake Switch A Circuit	● Brake switch A circuit - signal compare fault ● Brake lamp switch circuit fault	Check the brake switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P057400	Cruise Control System - Vehicle Speed Too High	● Incorrect speed sensor signal	Check for ABS DTCs. Refer to the relevant workshop manual section.
P057600	Cruise Control Input Circuit Low	● Speed control switch short circuit to ground ● Speed control switch high resistance	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057700	Cruise Control Input Circuit High	● Speed control switch short circuit to power	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057800	Cruise Control Multi-Function Input A Circuit Stuck	● Speed control multi-function input A circuit high resistance ● Speed control multi-function input A circuit short circuit to ground ● Speed control multi-function input A circuit short circuit to power ● Speed control switch stuck	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P05781C	Cruise Control Multi-Function Input A Circuit Stuck	● Speed control multi-function input A circuit stuck - circuit voltage out of range ● Switch circuit high resistance ● Switch fault	Check the switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P057900	Cruise Control Multi-Function Input A Circuit Range/Performance	● Speed control multi-function input A circuit high resistance ● Speed control multi-function input A circuit short circuit to ground ● Speed control multi-function input A circuit short circuit to power ● Speed control switch stuck	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P05791C	Cruise Control Multi-Function Input A Circuit Range/Performance	● Speed control multi-function input A circuit stuck - circuit voltage out of range ● Switch circuit high resistance ● Switch fault	Check the switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.
P057929	Cruise Control Multi-Function Input A Circuit Range/Performance	● Speed control multi-function input A circuit range/performance - signal invalid ● Switch circuit short circuit to ground ● Switch circuit short circuit to power ● Switch fault	Check the switch and circuits. Refer to the electrical guides. Clear the DTCs and test for normal operation.

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Electronic Engine Controls - TDV8 3.6L Diesel - Camshaft Position (CMP) Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

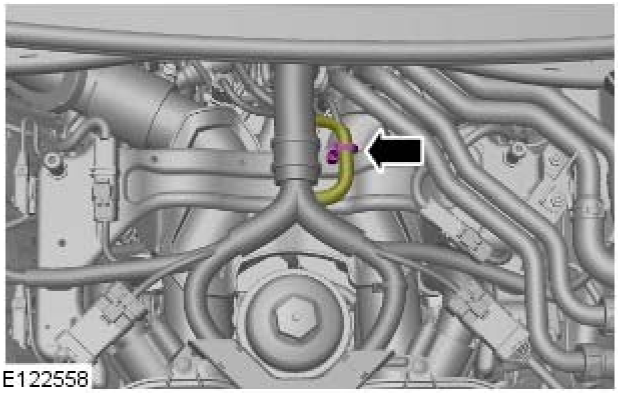
2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Partially drain the cooling system.
For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).

4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

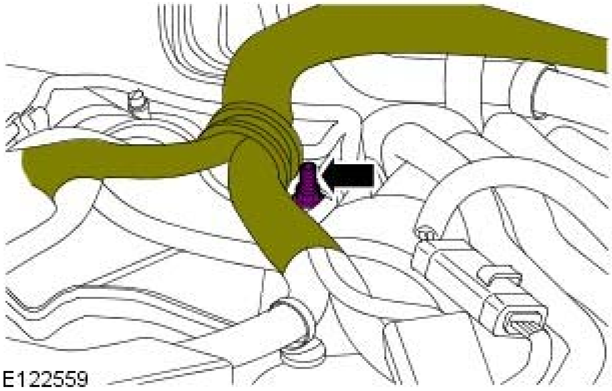
Raise and support the vehicle.

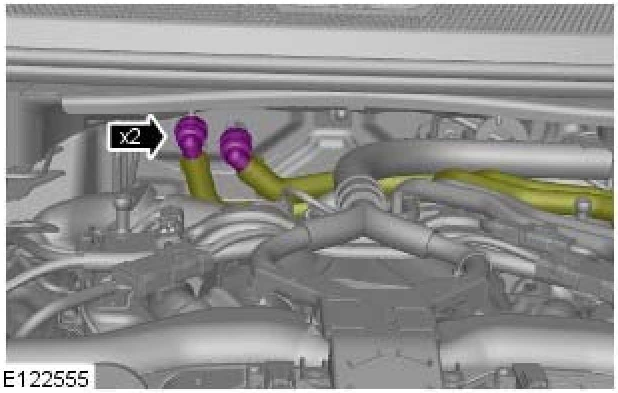
5. Release the wiring harness clip.



6. Release the engine wiring harness bracket.

- Remove the bolt.
- Reposition the engine wiring harness.

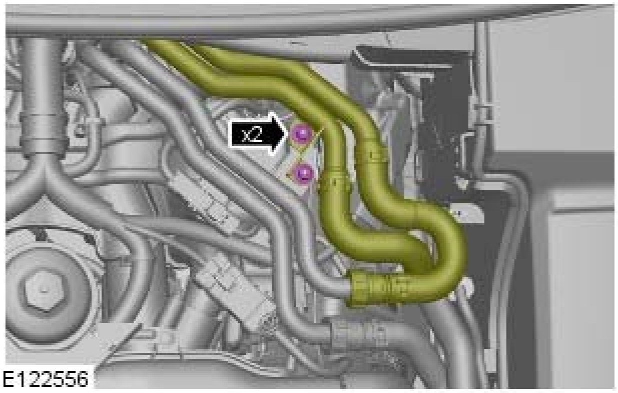




7. ⚠ CAUTION: Be prepared to collect escaping coolant.

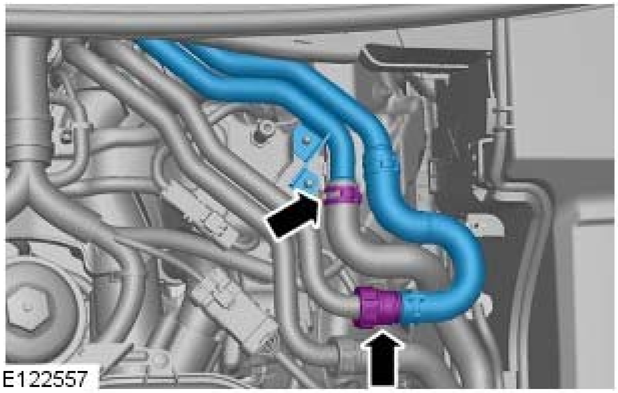
Release the 2 coolant hoses.

- Position container to collect fluid loss.



8. Release the coolant pipes.

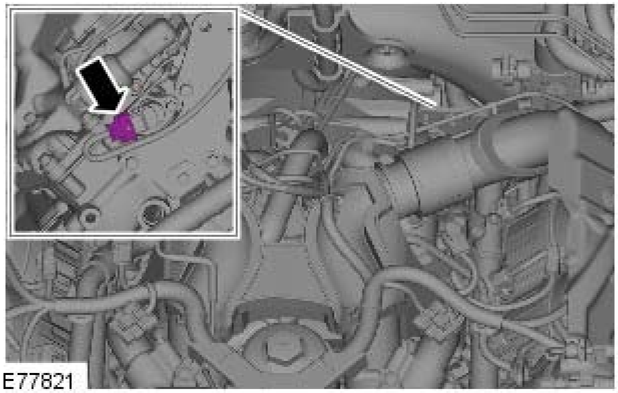
- Remove the 2 nuts.



9. ⚠ CAUTION: Note the fitted position of the component prior to removal.

Remove the coolant pipe assembly.

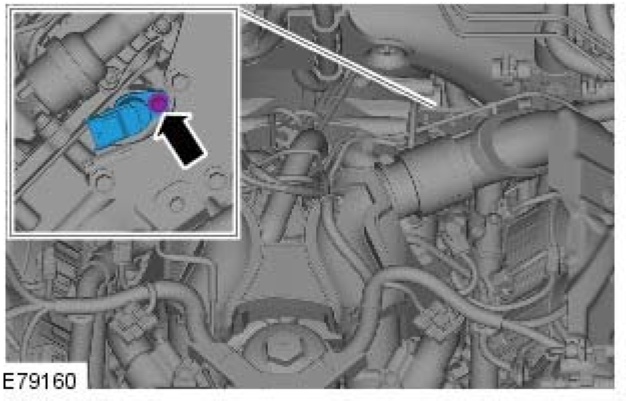
- Release the 2 coolant hoses.



10. Disconnect the camshaft position (CMP) sensor electrical connector.

11. Remove the CMP sensor.

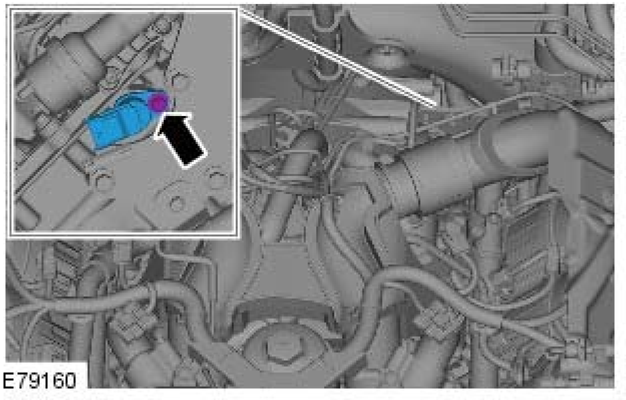
- Remove the bolt.
- Remove and discard the O-ring seal.



Installation

1. To install, reverse the removal procedure.

- Install a new O-ring seal.
- Tighten the bolt to 10 Nm (7 lb.ft).



Published: 11-May-2011

Electronic Engine Controls - TDV8 3.6L Diesel - Crankshaft Position (CKP) Sensor

Removal and Installation

Removal

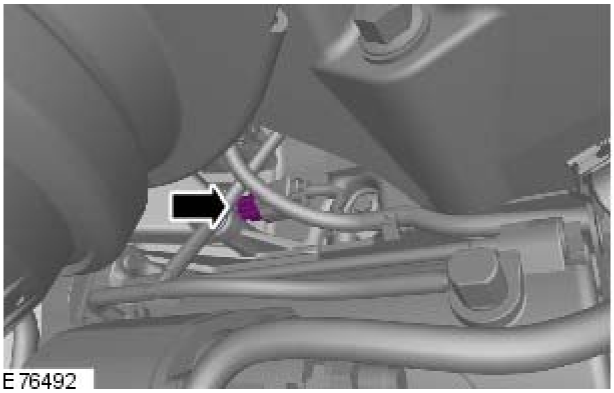
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the flexplate.
For additional information, refer to: Flexplate (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

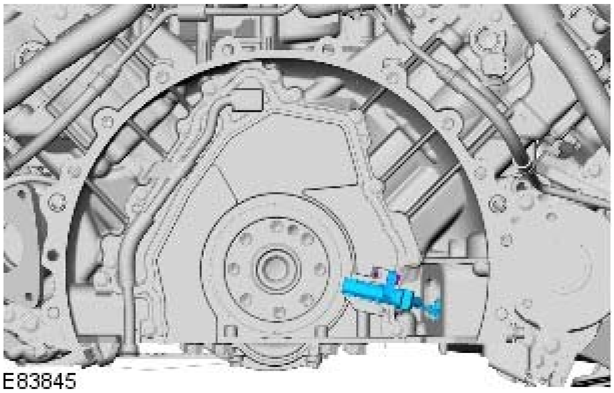
4. Disconnect the crankshaft position (CKP) sensor electrical connector.



5. NOTE: The CKP sensor bolt should not be removed from the CKP sensor.

Remove the crankshaft position (CKP) sensor.

- Fully loosen the bolt.
- Release the CKP sensor blanking cover.



Installation

1. ⚠ CAUTION: Install the CKP sensor correctly into the housing. Failure to follow this instruction may result in damage to the CKP sensor.

Install the CKP sensor.

- Tighten the bolt to 5 Nm (4 lb.ft).
- Secure the CKP sensor blanking cover.

2. Connect the CKP sensor electrical connector.

3. Install the flexplate.

For additional information, refer to: Flexplate (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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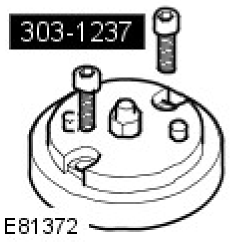
Electronic Engine Controls - TDV8 3.6L Diesel - Crankshaft Position (CKP) Sensor Ring

Removal and Installation

Special Tool(s)	
	Installer - Crankshaft Position (CKP) Sensor Ring 303-1237

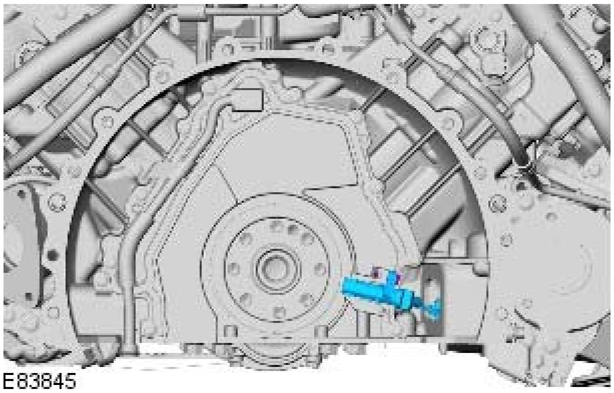
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

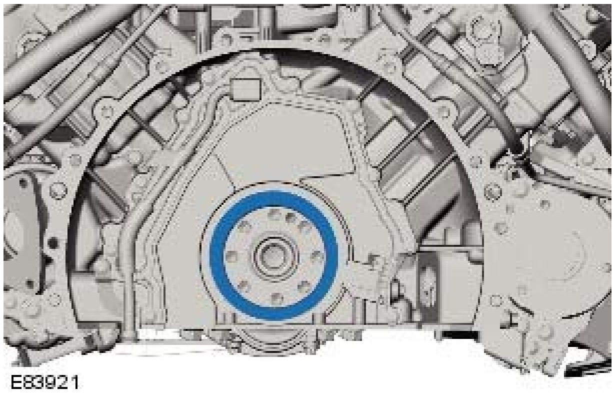
Raise and support the vehicle.

3. Remove the flexplate.
For additional information, refer to: Flexplate (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).



4. Remove the crankshaft position (CKP) sensor.

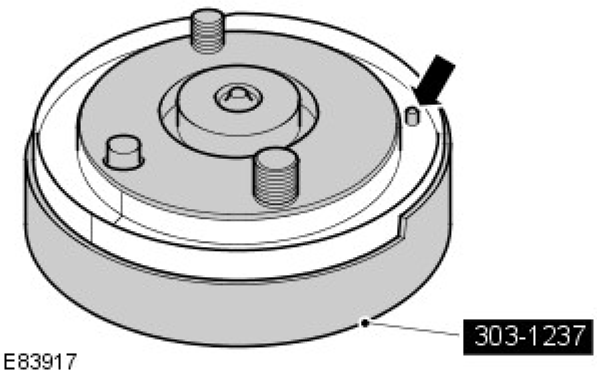
- Remove the bolt.



5. ⚠ CAUTION: Care must be taken to avoid damage to the crankshaft.

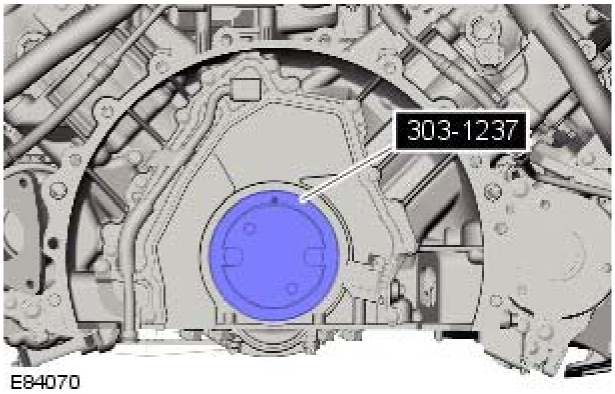
Remove and discard the CKP sensor ring.

Installation



1. Install a new CKP sensor ring to the special tool.

- Wind the special tool nut back to the end of the thread.
- Engage the CKP sensor ring to the locating pin.



2. Install the CKP sensor ring to the crankshaft.

- Clean the component mating faces.
- Align the dowel and install the special tool to the crankshaft.
- Tighten the 2 bolts.
- Tighten the special tool nut, to install the CKP sensor ring to the crankshaft.
- Remove the special tool.

3. Install the CKP sensor.

- Tighten the bolt to 5 Nm (4 lb.ft).

4. Install the flexplate.
For additional information, refer to: Flexplate (303-01D Engine - TDV8 3.6L Diesel, In-vehicle Repair).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Electronic Engine Controls - TDV8 3.6L Diesel - Engine Control Module (ECM)

Removal and Installation

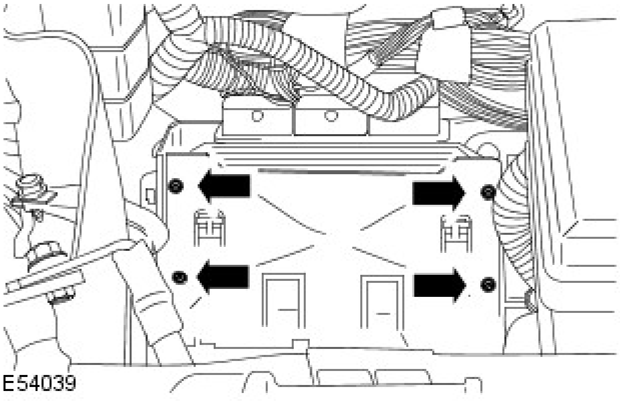
Removal

- NOTE: RHD shown, LHD is similar.

1. NOTE: All vehicles.

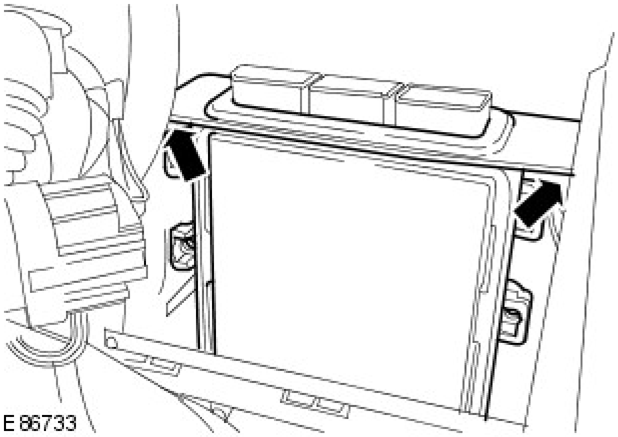
Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the four-wheel drive (4WD) control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).



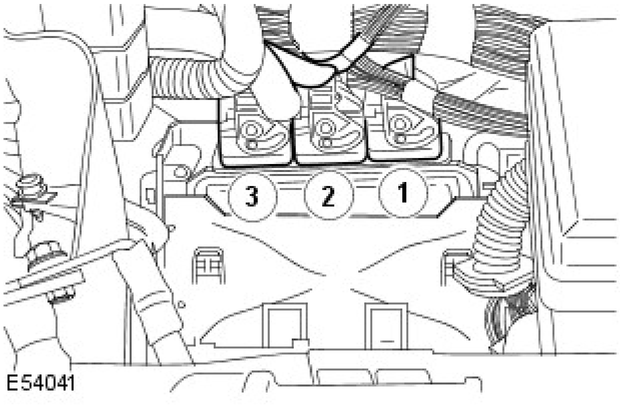
3. Remove the engine control module (ECM) front cover.

- Fully loosen the 4 screws.

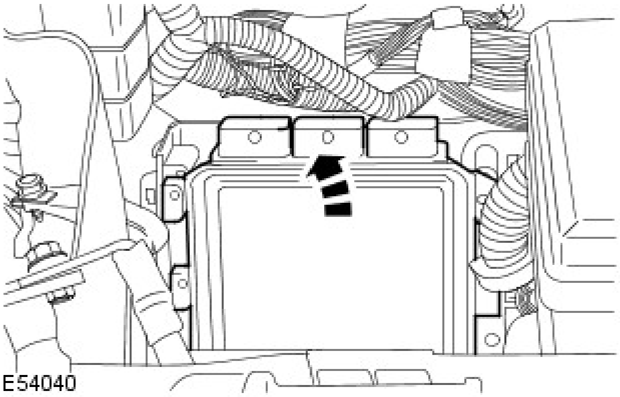


4. Release the ECM top cover.

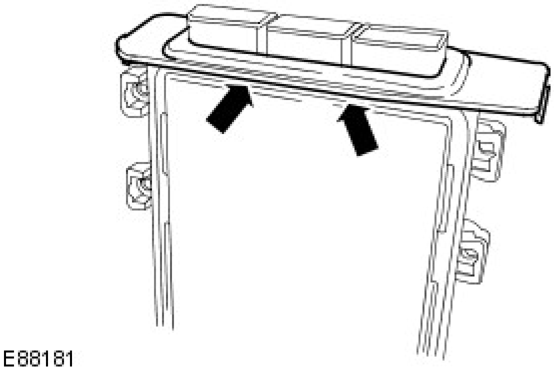
- Release the 2 clips.



5. Disconnect the 3 electrical connectors.



6. Remove the ECM.



7. NOTE: Do not disassemble further if the component is removed for access only.

Remove the ECM top cover from the ECM.

- Release the clips.

Installation

1. NOTE: All vehicles.

Install the ECM top cover to the ECM.

- Secure with the clips.

2. Install the ECM.

3. Connect the electrical connectors.

4. Secure the ECM top cover.

- Secure the clips.

5. Install the ECM front cover.

- Tighten the screws to 2 Nm (1 lb.ft).

6. Install the 4WD control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

8. NOTE: Vehicles with DPF (Diesel Particulate Filter) installed only.

• NOTE: Only carry out the following step if a new ECM is to be installed.

Renew the engine oil and filter.
For additional information, refer to: Engine Oil Draining and Filling (303-01D Engine - TDV8 3.6L Diesel, General Procedures).

9. NOTE: All vehicles.

- NOTE: Only carry out the following step if a new ECM is to be installed.

  Using the Land Rover approved diagnostic system, calibrate a new ECM.

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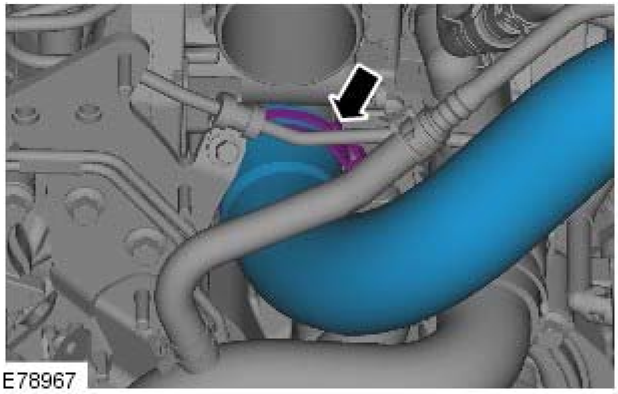
Electronic Engine Controls - TDV8 3.6L Diesel - Engine Coolant Temperature (ECT) Sensor

Removal and Installation

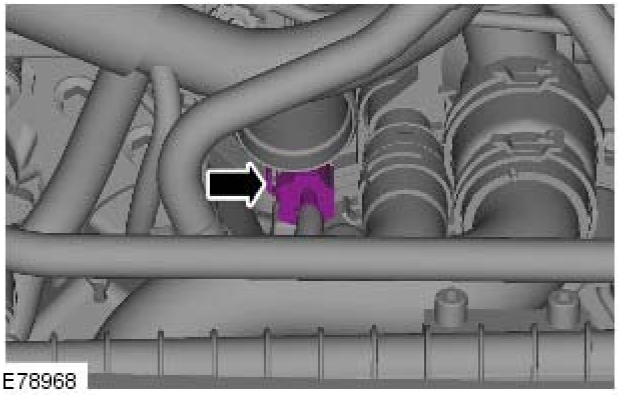
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Remove the cooling fan assembly.
   For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).



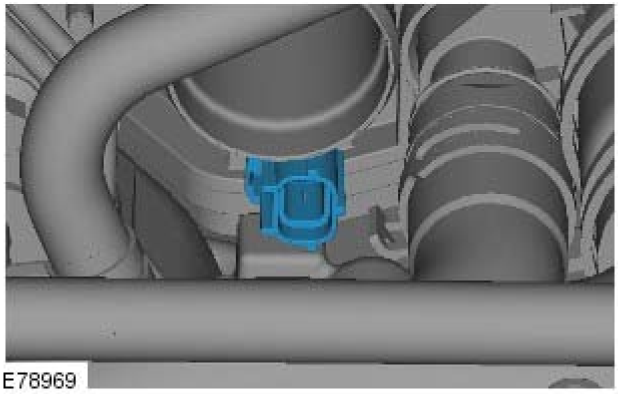
E78967

4. Disconnect the upper coolant hose from the coolant distribution manifold.
   - Release the clip.



E78968

5. Disconnect the engine coolant temperature (ECT) sensor electrical connector.



E78969

6. Remove the ECT sensor.
   - Remove and discard the clip.
   - Remove and discard the O-ring seal.

Installation

1. NOTE: Lubricate the O-ring seal with clean coolant.

   Install the ECT sensor.

   - Install a new O-ring seal.
   - Install a new clip.

2. Connect the ECT sensor electrical connector.
3. Connect the upper coolant hose to the coolant distribution manifold.

   - Secure the clip.

4. Install the cooling fan assembly.
   For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).
5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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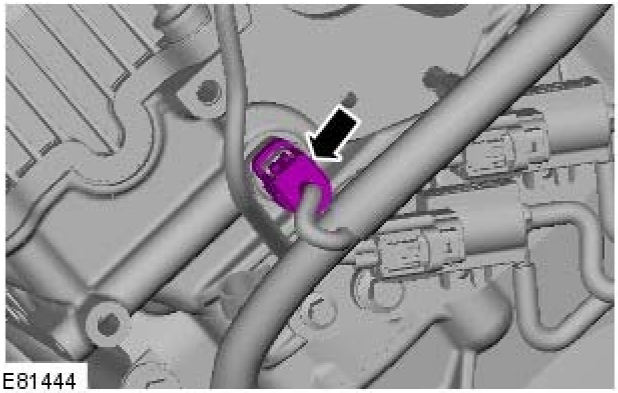
Electronic Engine Controls - TDV8 3.6L Diesel - Engine Oil Pressure (EOP) Sensor

Removal and Installation

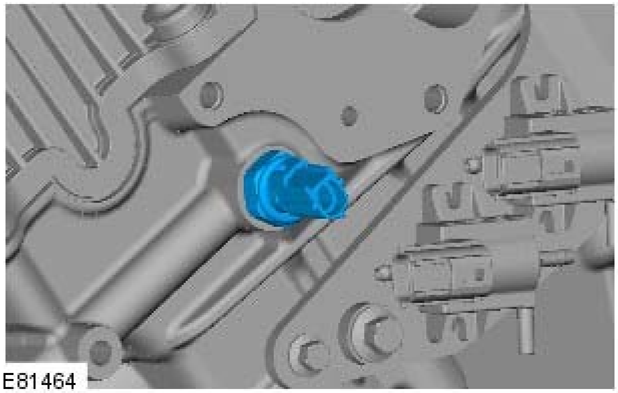
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the brake vacuum pump.
For additional information, refer to: Brake Vacuum Pump - TDV8 3.6L Diesel (206-07 Power Brake Actuation, Removal and Installation).



3. Disconnect the engine oil pressure (EOP) sensor electrical connector.



4. Remove the EOP sensor.

Installation

1. Install the EOP sensor.

- Tighten the sensor to 15 Nm (11 lb.ft).

2. Connect the EOP sensor electrical connector.

3. Install the brake vacuum pump.
For additional information, refer to: Brake Vacuum Pump - TDV8 3.6L Diesel (206-07 Power Brake Actuation, Removal and Installation).

4. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Electronic Engine Controls - TDV8 3.6L Diesel - Fuel Rail Pressure (FRP) Sensor

Removal and Installation

Removal

1. NOTE: The fuel rail pressure (FRP) sensor is part of the RH fuel rail and cannot be serviced separately.

Remove the RH fuel rail.
For additional information, refer to: Fuel Rail RH (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation).

Installation

1. Install the RH fuel rail.
For additional information, refer to: Fuel Rail RH (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation).

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Electronic Engine Controls - TDV8 3.6L Diesel - Fuel Temperature Sensor

Removal and Installation

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

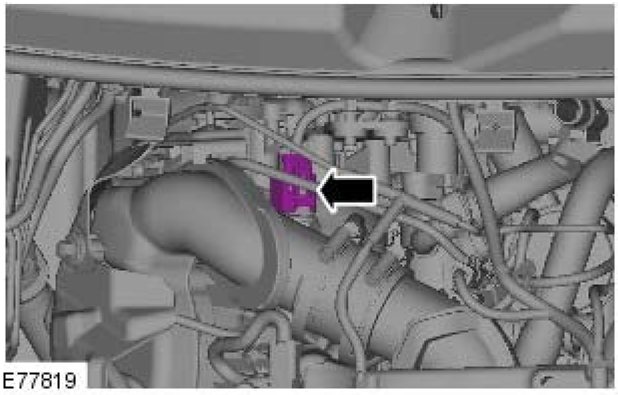
- CAUTIONS:

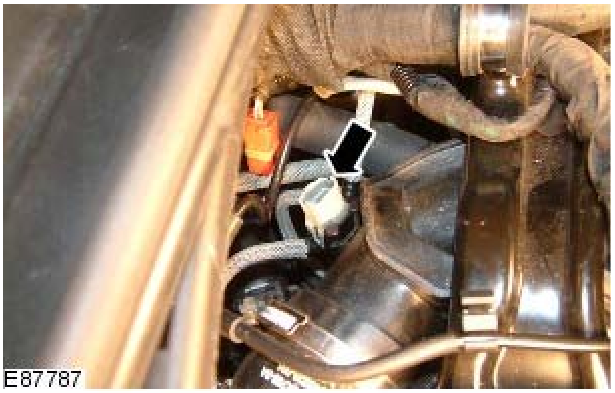
⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

⚠ Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Disconnect the fuel temperature sensor electrical connector.




E87787

4. ⚠CAUTION: Always plug any open connections to prevent contamination.

Remove the fuel temperature sensor from the fuel return line.

- Position an absorbent cloth to collect fluid spillage.
- Release the 2 clips.
- Discard the O-ring seal.
- Clean the seal contact area.

Installation

1. To install, reverse the removal procedure.

- Clean the immediate area.
- Install a new O-ring seal.

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Electronic Engine Controls - TDV8 3.6L Diesel - Knock Sensor (KS) LH

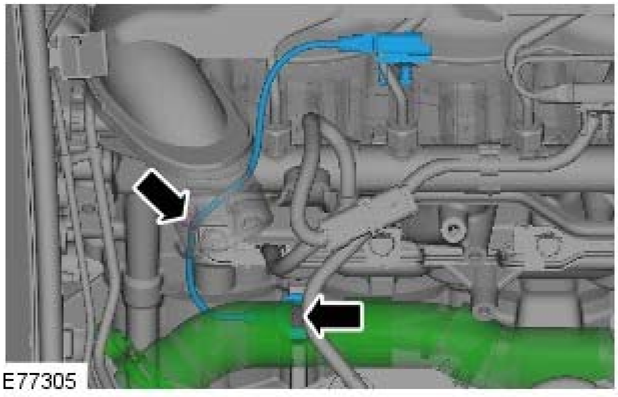
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the LH exhaust gas recirculation (EGR) valve.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).

3. Remove the knock sensor (KS).



- Release the KS wiring harness.
- Reposition the coolant hose.
- Remove the bolt.

Installation

1. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

To install, reverse the removal procedure.

- Tighten the bolt to 20 Nm (15 lb.ft).

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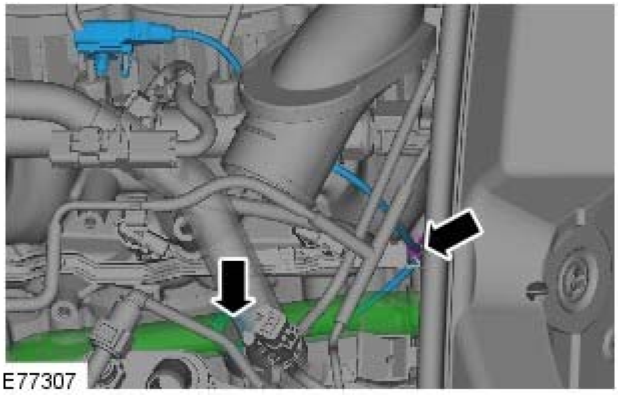
Electronic Engine Controls - TDV8 3.6L Diesel - Knock Sensor (KS) RH

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the RH exhaust gas recirculation (EGR) valve.
For additional information, refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08D Engine Emission Control - TDV8 3.6L Diesel, Removal and Installation).



3. Remove the knock sensor (KS).

- Release the KS wiring harness.
- Reposition the coolant hose.
- Remove the bolt.

Installation

1. ⚠ CAUTION: Make sure that the mating faces are clean and free of foreign material.

To install, reverse the removal procedure.

- Tighten the bolt to 20 Nm (15 lb.ft).

Electronic Engine Controls - TDV8 3.6L Diesel - Manifold Absolute Pressure and Temperature (MAPT) Sensor

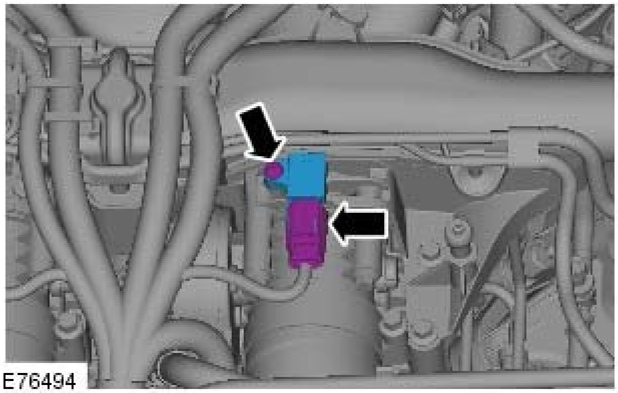
Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. NOTE: Left-hand shown, right-hand similar.

   Remove the manifold absolute pressure and temperature (MAPT) sensor.

   - Disconnect the electrical connector.
   - Remove the screw.



Installation

1. To install, reverse the removal procedure.

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Electronic Engine Controls - TDV8 3.6L Diesel - Mass Air Flow (MAF) Sensor

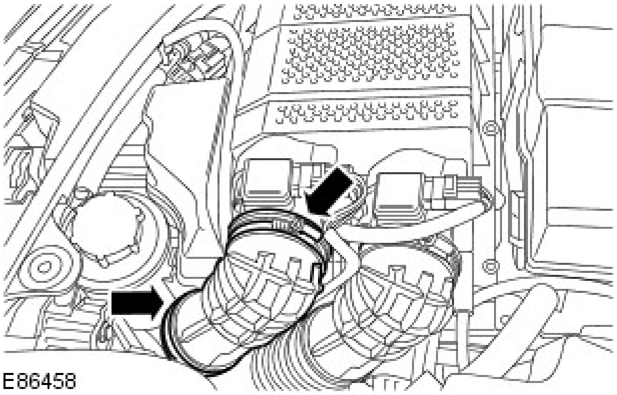
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

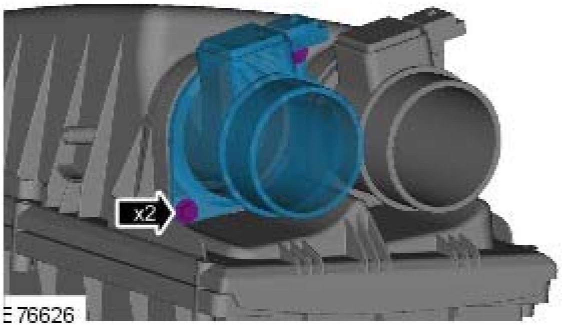
2. Remove the mass air flow (MAF) outlet pipe.

- Disconnect the MAF sensor electrical connector.
- Loosen the 2 clips.



3. Remove the MAF sensor.

- Remove the 2 screws.
- Remove and discard the O-ring seal.



Installation

1. Install the MAF sensor.

- Install a new O-ring seal.
- Tighten the 2 screws to 2 Nm (1 lb.ft).

2. Install the MAF outlet pipe.

- Tighten the clips.
- Connect the MAF sensor electrical connector.

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Electronic Engine Controls - TDV8 3.6L Diesel - Exhaust Gas Temperature Sensor

Removal and Installation

Removal

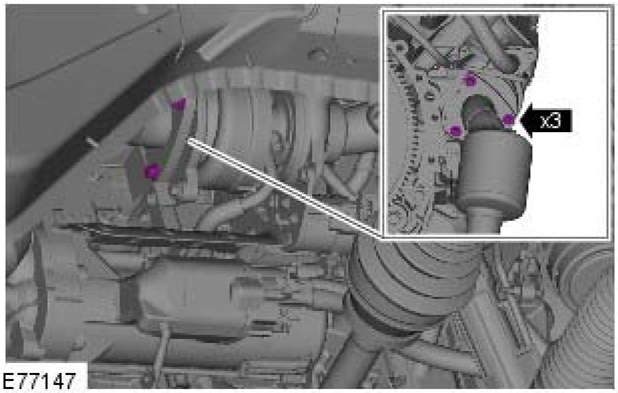
⚠ WARNING: Observe due care when working near a hot exhaust system.

• NOTE: LH pre-catalytic converter exhaust gas temperature sensor shown, post catalytic converter and post diesel particulate filter (DPF) sensors similar.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

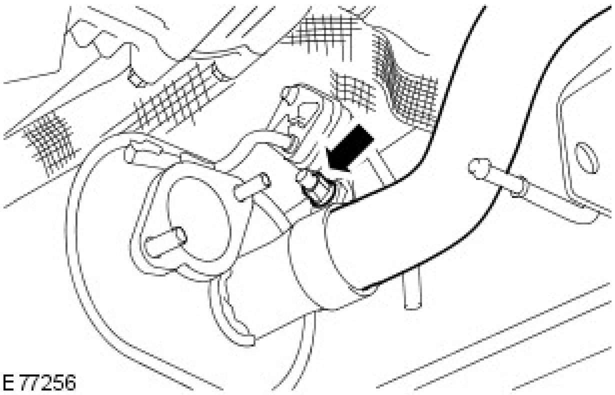
2. NOTE: RH shown, LH is similar.



Release the LH catalytic converter.

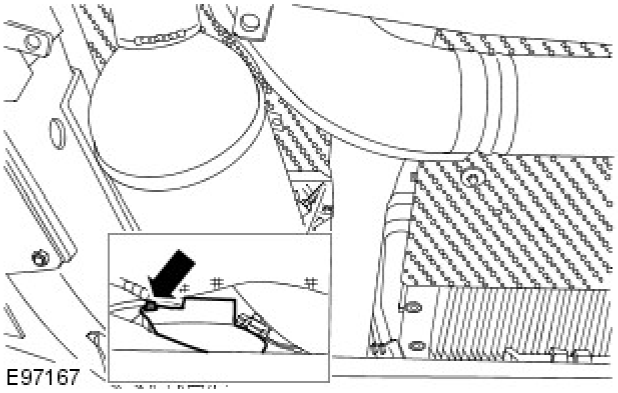
- Remove the 3 bolts.

3. NOTE: RH catalytic converter shown removed for clarity.

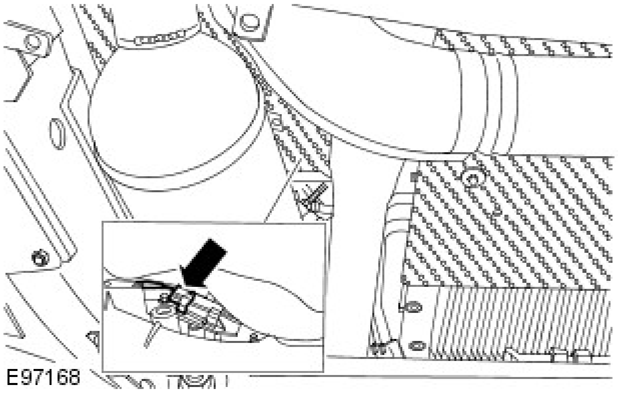


Loosen the catalytic converter to diesel particulate filter (DPF) retaining clamp.

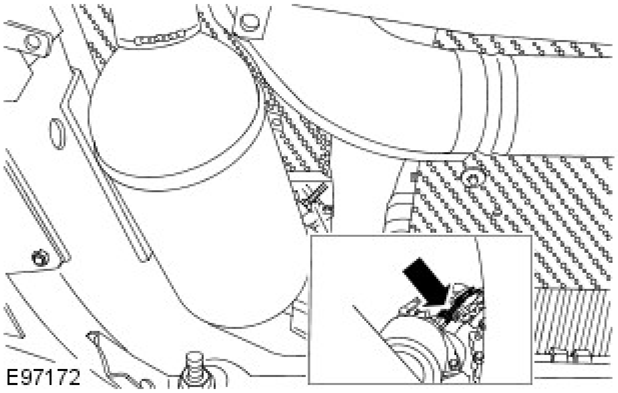
4. Remove the exhaust gas temperature sensor electrical connector heat shield.



- Remove the bolt.



5. Disconnect the exhaust gas temperature sensor electrical connector.



6. Remove the exhaust gas temperature sensor.

- Reposition the LH catalytic converter.

Installation

1. Install the exhaust gas temperature sensor.

- Tighten to 35 Nm (26 lb.ft).

2. Connect the exhaust gas temperature sensor electrical connector.

3. Install the exhaust gas temperature sensor connector heat shield.

- Tighten the bolt to 10 Nm (7 lb.ft).

4. Secure the LH catalytic converter.

- Tighten the bolts to 25 Nm (18 lb.ft).

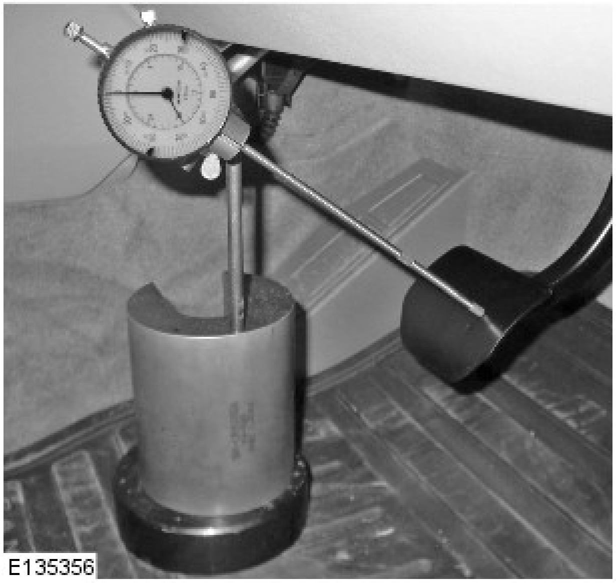
5. Tighten the LH catalytic converter to DPF clamp.

- Tighten the nut to 48 Nm (35 lb.ft).

Published: 09-Mar-2011

Electronic Engine Controls - TDV8 3.6L Diesel - Brake Pedal Position (BPP) Switch Adjustment

General Procedures



Check

1. Remove the brake pedal rubber.

2. NOTE: Make sure that the dial test indicator (DTI) gauge is in line with the brake pedal movement.

Position the DTI gauge on a suitable mounting block, as illustrated.

3. With the aid of another technician, gently press the brake pedal until the stoplamps illuminate.

4. NOTE: The specification is that the stoplamps should illuminate at between 5.5mm and 8.5mm brake pedal travel.

Note the measurement of the brake pedal travel from rest position until the stoplamps illuminated.

Adjust

1. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠

Remove the stoplamp switch.
For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

2. CAUTIONS:

⚠ The brake pedal **must not** be pressed during this operation. Failure to follow this instruction may result in damage to the component.

⚠ Only use light finger pressure when installing the stoplamp switch. Failure to follow this instruction may result in an incorrectly adjusted stoplamp switch.

Install the stoplamp switch.

For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

3. Check the adjustment of the stoplamp switch by following the **Check** procedure in this procedure and carry out the **Adjust** procedure if required.

Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol -

Lubricants

Item	Specification
* Recommended lubricant	Shell M13754
+ Torque converter nose	Molybdenum disulphide grease to specification FB180

- CAUTIONS:

⚠ * Do not use any lubricant other than that specified

⚠ + Do not over lubricate

Capacity

Item	Capacity
+ Initial dry fill	9.5 litres (16.7 pints) (10.0 US qts)

⚠ CAUTION: + A final fluid level check/drain down/top-up must be carried out when the unit has been installed

General specifications

Item	Specification
Automatic transmission	ZF 6HP26
Speeds	6 forward, 1 reverse
Gear ratios:	
First	4.17:1
Second	2.340:1
Third	1.521:1
Fourth	1.143:1
Fifth	0.867:1
Sixth	0.691:1
Reverse	3.403:1
Torque converter	Sachs W280 2GWK with slip controlled, dual friction faced lock-up clutch
Transmission control module:	
Location	Located in transmission casing
Type	1904

Torque Specification

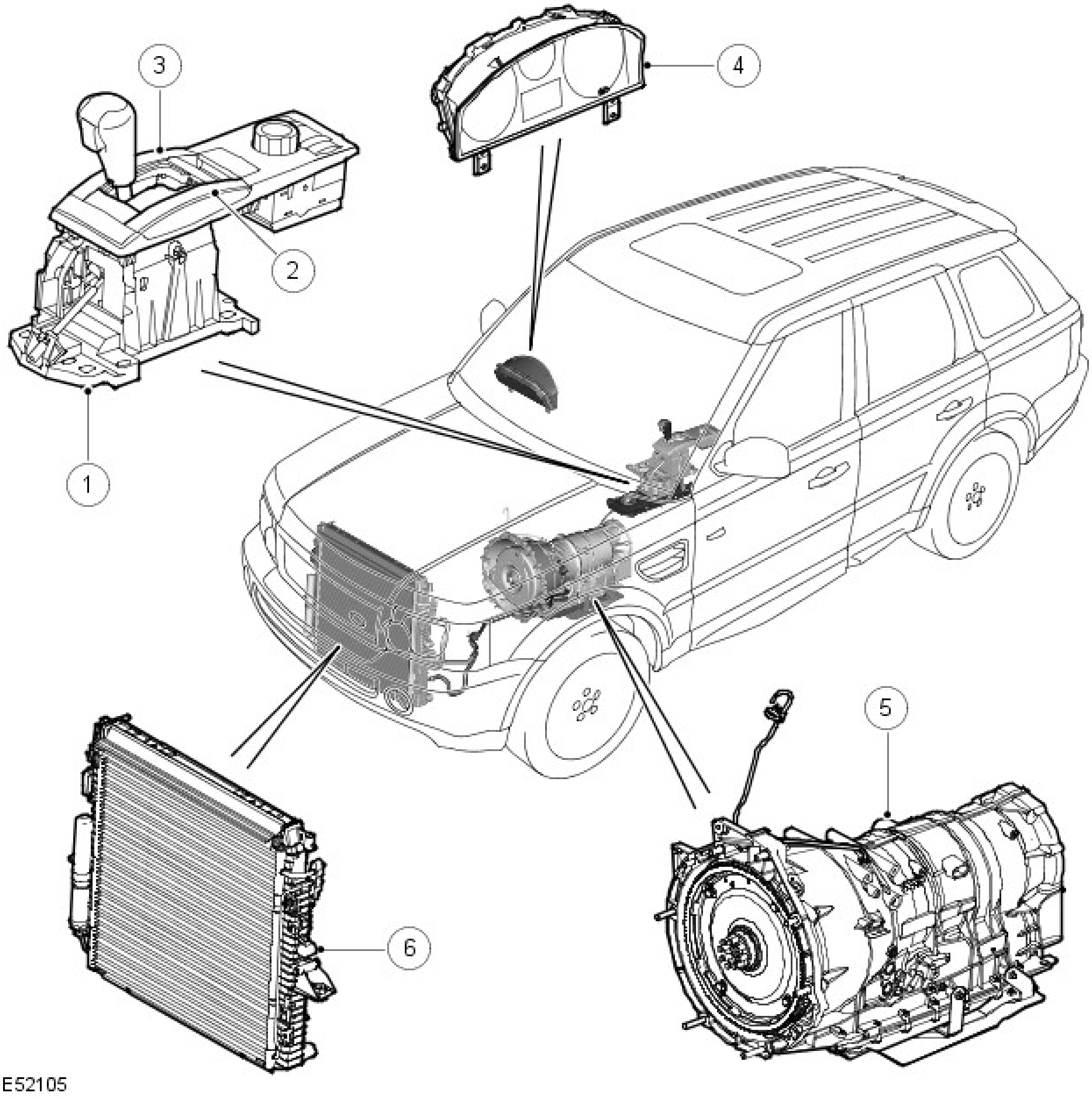
Description	Nm	lb-ft
Transmission under shield bolts	10	7
Transmission heat shield bolts	10	7
Transmission fluid drain plug	9	6.5
Transmission fluid fill level plug	35	26
Gear selector cable lever nut	12	9
Transmission support insulator	60	44

Published: 11-May-2011

Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Automatic Transmission

Description and Operation

ZF 6HP26 Automatic Transmission Component Location



Item	Part Number	Description
1	-	Selector lever assembly
2	-	M/S LCD display
3	-	PRND LCD display
4	-	Instrument cluster
5	-	Automatic transmission
6	-	Transmission fluid cooler

OVERVIEW

The ZF 6HP26 transmission is an electronically controlled, six speed unit. The transmission is manufactured by ZF Transmissions GmbH in Saarbrücken, Germany. This transmission represents the latest in automatic transmission technology and incorporates new features to enhance the transmission functionality:

- The hydraulic and electronic control elements of the transmission are now incorporated in a single unit located inside the transmission and is known as 'Mechatronic'
- Another new strategy is Adaptive Shift Strategy (ASIS). ASIS represents the continuous adaptation of shift changes to suit the driving style of the driver which can vary from sporting to economical. Further details of the ASIS function are contained in the 'Driving Modes' section.

The transmission used in the 4.2L V8 Supercharged version of the Range Rover Sport is an uprated derivative of the 6HP26 transmission used in the 4.4L V8 and 2.7L TdV6 models. The uprated transmission includes an additional pinion gear in the planetary gear train and additional clutch plates to enable the transmission to manage the additional power output of the supercharged engine.

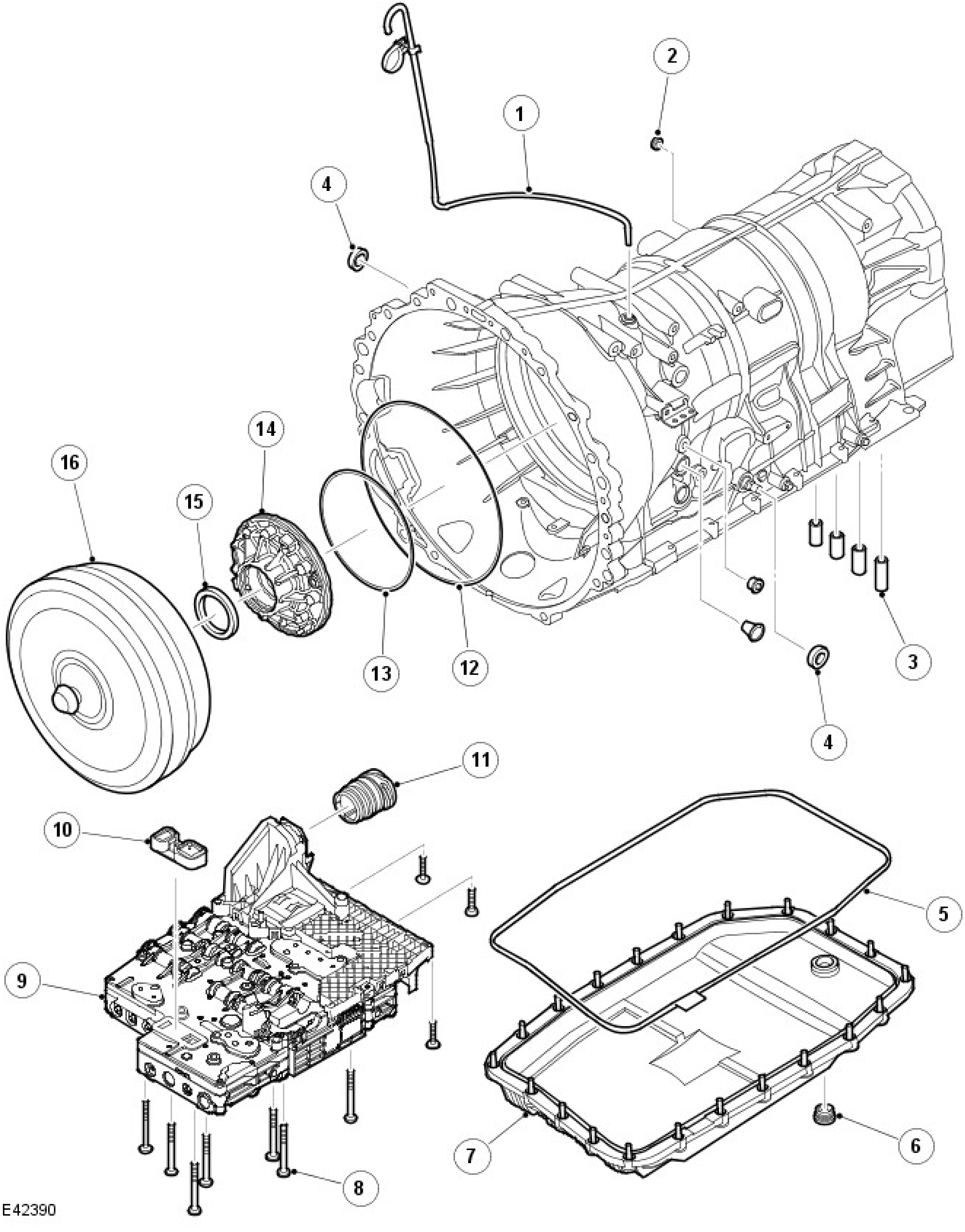
The transmission is controlled by a Transmission Control Module (TCM) which contains software to provide operation as a semi-automatic 'CommandShift™' transmission. The TCM allows the transmission to be operated as a conventional automatic unit by selecting P, R, N, D on the selector lever. Movement of the selector lever across the gate to the 'M/S' position puts the transmission into electronic 'Sport' mode. Further movement of the lever in a lateral direction to the + or – position puts the transmission into electronic manual 'CommandShift™' mode.

The 6HP26 transmission has the following features:

- Designed to be maintenance free
- Transmission fluid is 'fill for life'
- The torque converter features a controlled slip feature with electronically regulated control of lock-up, creating a smooth transition to the fully locked condition
- Shift programs controlled by the TCM
- Connected to the ECM via the High Speed CAN for communications
- Default mode if major faults occur
- Diagnostics available from the TCM via the CAN

ZF 6HP26 Automatic Transmission – Exploded View

• NOTE: The transmission shown is exploded to the extent of the serviceable items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Item	Part Number	Description
1	-	Breather tube
2	-	Plug
3	-	Seal sleeves
4	-	Seal - Selector shaft (2 off)
5	-	Gasket

6	-	Drain plug
7	-	Fluid pan
8	-	Torx screws
9	-	Mechatronic valve block
10	-	Element seal
11	-	Electrical connector – guide sleeve
12	-	O-ring
13	-	O-ring
14	-	Pump housing
15	-	Input shaft seal
16	-	Torque converter

The gearbox comprises the main casing which houses all of the transmission components. The main case also incorporates an integral bell housing.

A fluid pan is bolted to the lower face of the main case and is secured with bolts. The fluid pan is sealed to the main case with a gasket. Removal of the fluid pan allows access to the Mechatronic valve block. The fluid pan has a magnet located around the drain plug which collects any metallic particles present in the transmission fluid.

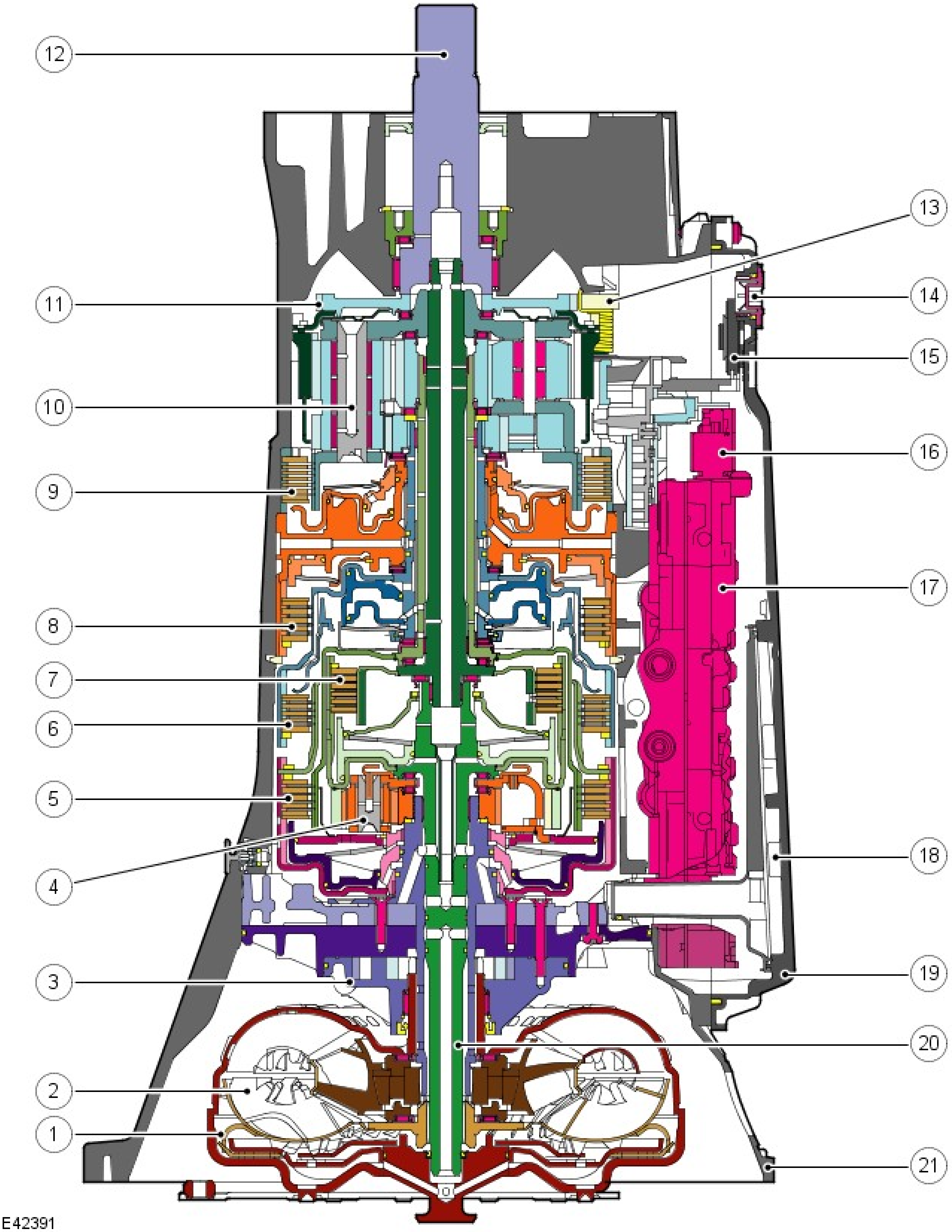
A fluid filter is located inside the fluid pan. If the transmission fluid becomes contaminated or after any service work, the fluid pan with integral filter must be replaced.

The integral bell housing provides protection for the torque converter assembly and also provides the attachment for the gearbox to the engine cylinder block. The torque converter is a non-serviceable assembly which also contains the lock-up clutch mechanism. The torque converter drives a crescent type pump via drive tangs. The fluid pump is located in the main case, behind the torque converter.

The main case contains the following major components:

- Input shaft
- Output shaft
- Mechatronic valve block which contains the solenoids, speed sensors and the TCM
- Three rotating multiplate drive clutches
- Two fixed multiplate brake clutches
- A single planetary gear train and a double planetary gear train.

ZF 6HP26 Automatic Transmission – Sectional View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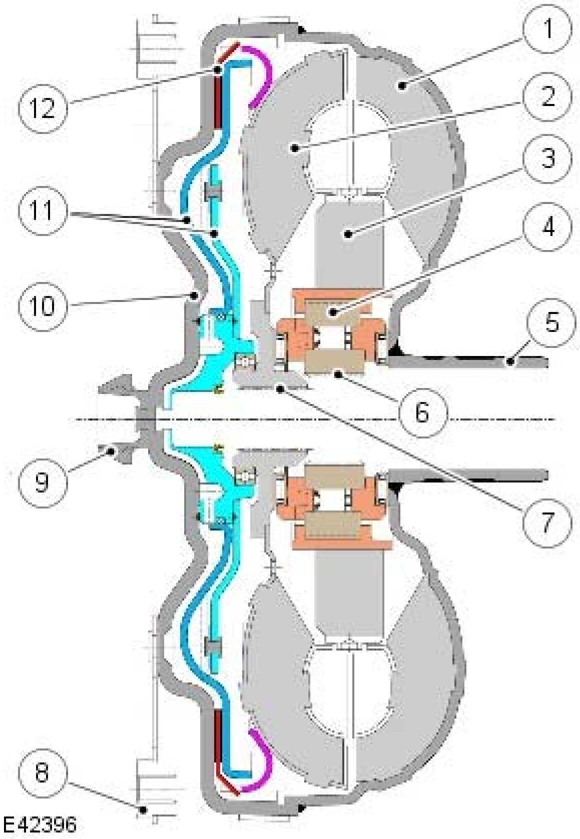
Item	Part Number	Description
1	-	Torque converter lock-up clutch
2	-	Torque converter
3	-	Fluid pump
4	-	Single planetary gearset
5	-	Clutch A

6	-	Clutch B
7	-	Clutch E
8	-	Brake C
9	-	Brake D
10	-	Double planetary gearset
11	-	Park lock gear
12	-	Output shaft
13	-	Park lock pawl
14	-	Drain plug
15	-	Magnet
16	-	Pressure regulator
17	-	Mechatronic valve block
18	-	Fluid filter
19	-	Fluid pan
20	-	Input shaft
21	-	Transmission casing

TORQUE CONVERTER

Torque Converter Components - 4.2L V8SC



Item	Part Number	Description
1	-	Impeller
2	-	Turbine
3	-	Stator
4	-	Freewheel
5	-	Torque converter hub
6	-	Stator shaft
7	-	Turbine shaft
8	-	Drive plate
9	-	Journal - Drive plate/crankshaft location
10	-	Torque converter cover
11	-	Lock-up clutch piston

12	-	Lock-up clutch plate

The torque converter is the coupling element between the engine and the gearbox and is located in the transmission housing, on the engine side of the transmission. The driven power from the engine crankshaft is transmitted hydraulically and mechanically through the torque converter to the transmission. The torque converter is connected to the engine by a drive plate.

The torque converter comprises an impeller, a stator and a turbine. The torque converter is a sealed unit with all components located between the converter housing cover and the impeller. The two components are welded together to form a sealed, fluid filled housing. With the impeller welded to the converter housing cover, the impeller is therefore driven at engine crankshaft speed.

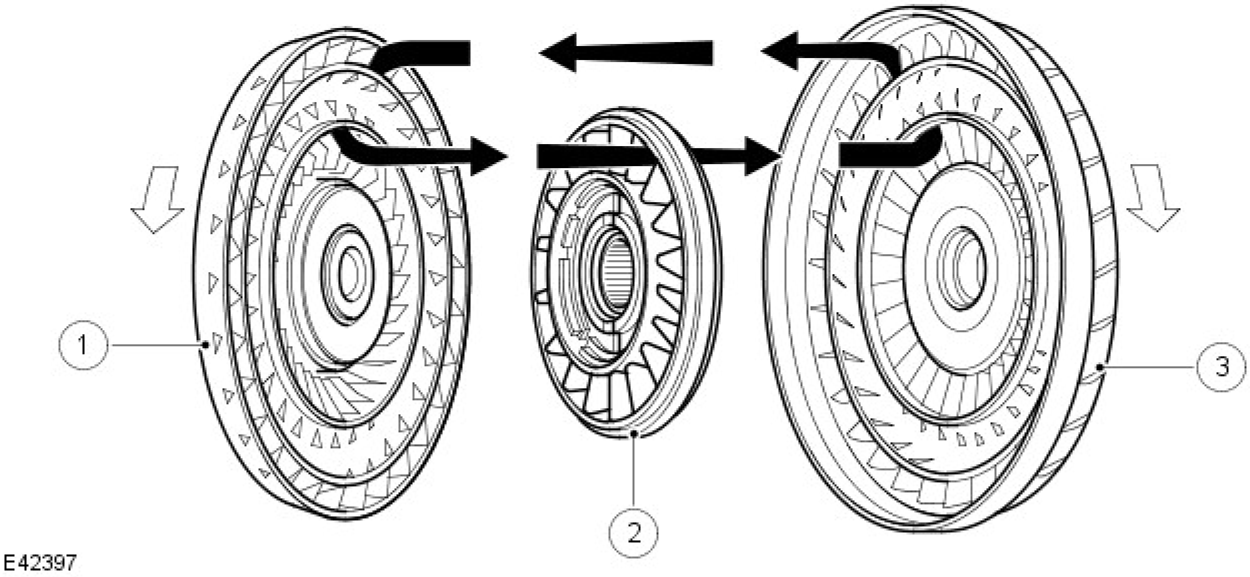
The converter housing cover has threaded bosses which provide for attachment of the engine drive plate which is connected to the engine crankshaft. The threaded bosses also provide for location of special tools which are required to remove the torque converter from the bell housing.

The torque converter used on TdV6 models is similar in construction to the torque converter on petrol models but contains a torsional vibration damper. The damper smooths the output from the engine and prevents unwanted vibration from being passed to the transmission.

Impeller

Fluid Flow

- NOTE: Typical torque converter shown



Item	Part Number	Description
1	-	Turbine
2	-	Stator
3	-	Impeller

When the engine is running the rotating impeller acts as a centrifugal pump, picking up fluid at its centre and discharging it at high velocity through the blades on its outer rim. The design and shape of the blades and the curve of the impeller body cause the fluid to rotate in a clockwise direction as it leaves the impeller. This rotation improves the efficiency of the fluid as it contacts the outer row of blades on the turbine.

The centrifugal force of the fluid leaving the blades of the impeller is passed to the curved inner surface of the turbine via the tip of the blades. The velocity and clockwise rotation of the fluid causes the turbine to rotate.

Turbine

The turbine is similar in design to the impeller with a continuous row of blades. Fluid from the impeller enters the turbine through the tip of the blades and is directed around the curved body of the turbine to the root of the blades. The curved surface redirects the fluid back in the opposite direction to which it entered the turbine, effectively increasing the turning force applied to the turbine from the impeller. This principle is known as torque multiplication.

When engine speed increases, turbine speed also increases. The fluid leaving the inner row of the turbine blades is rotated in an anti-clockwise direction due to the curve of the turbine and the shape of the blades. The fluid is now flowing in the opposite direction to the engine rotation and therefore the impeller. If the fluid was allowed to hit the impeller in this condition, it would have the effect of applying a brake to the impeller, eliminating the torque multiplication effect. To prevent this, the stator is located between the impeller and the turbine.

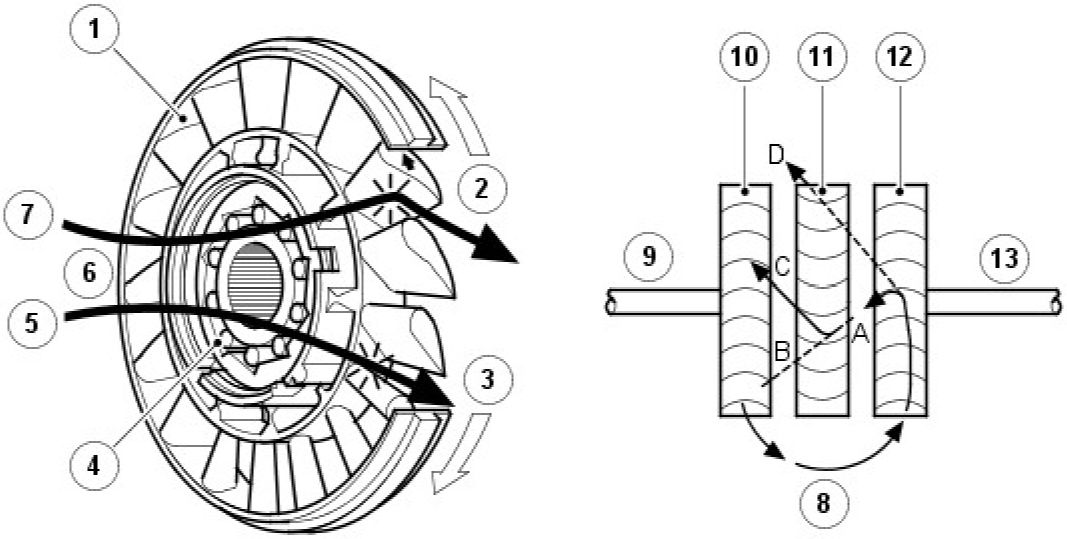
Stator

The stator is located on the splined transmission input shaft via a freewheel clutch. The stator comprises a number of blades which are aligned in an opposite direction to those of the impeller and turbine. The main function of the stator is to redirect the returning fluid from the turbine, changing its direction to that of the impeller.

The redirected fluid from the stator is directed at the inner row of blades of the impeller, assisting the engine in turning the impeller. This sequence increases the force of the fluid emitted from the impeller and thereby increases the torque multiplication effect of the torque converter.

Stator Functions

- NOTE: Typical stator shown



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Item	Part Number	Description
1	-	Blades
2	-	Stator held – fluid flow redirected
3	-	Stator rotates freely
4	-	Roller
5	-	Converter at coupling speed
6	-	Fluid flow from turbine
7	-	Converter multiplying
8	-	Fluid flow from impeller
9	-	Drive from engine
10	-	Impeller
11	-	Stator
12	-	Turbine
13	-	Output to transmission

Refer to the 'Stator Functions' illustration

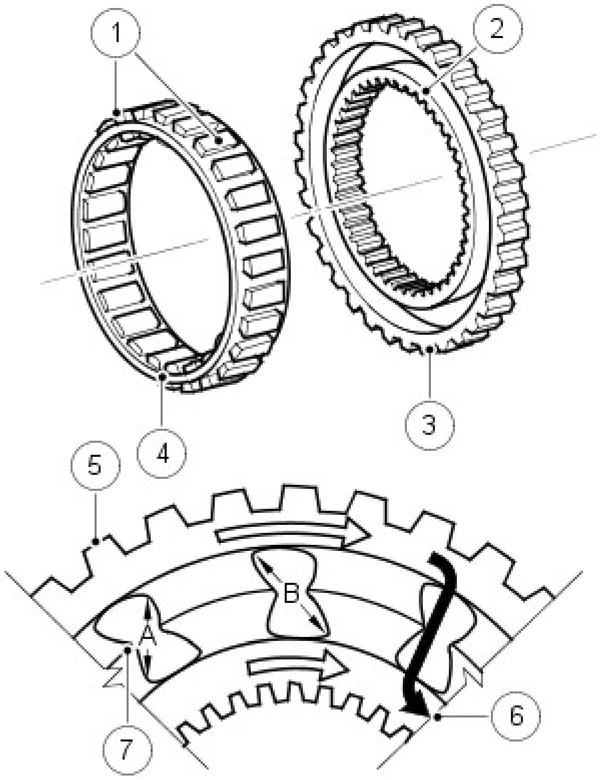
Fluid emitted from the impeller acts on the turbine. If the turbine is rotating at a slower speed than the fluid from the impeller, the fluid will be deflected by the turbine blades in the path '**A**'. The fluid is directed at and deflected by the stator blades from path '**B**' to path '**C**'. This ensures that the fluid is directed back to the pump in the optimum direction. In this condition the sprag clutch is engaged and the force of the fluid on the stator blades assists the engine in rotating the impeller

As the rotational speed of the engine and therefore the turbine increases, the direction of the fluid leaving the turbine changes to path '**D**'. The fluid is now directed from the turbine to the opposite side of the stator blades, rotating the stator in the opposite direction. To prevent the stator from resisting the smooth flow of the fluid from the turbine, the sprag clutch releases, allowing the stator to rotate freely on its shaft.

When the stator becomes inactive, the torque converter no longer multiplies the engine torque. When the torque converter reaches this operational condition it ceases to multiply the engine torque and acts solely as a fluid coupling, with the impeller and the turbine rotating at approximately the same speed.

The stator uses a sprag type, one way, freewheel clutch. When the stator is rotated in a clockwise direction the sprags twist and are wedged between the inner and outer races. In this condition the sprags transfer the rotation of the outer race to the inner race which rotates at the same speed.

One Way Free Wheel Clutch – Typical



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Item	Part Number	Description
1	-	Sprags
2	-	Inner race
3	-	Outer race
4	-	Sprag and cage assembly
5	-	Sprag outer race
6	-	Sprag inner race
7	-	Retaining ring

The free wheel clutch can perform three functions; hold the stator stationary, drive the stator and free wheel allowing the stator to rotate without a drive output. The free wheel clutch used in the 6HP26 transmission is of the sprag type and comprises an inner and outer race and a sprag and cage assembly. The inner and outer races are pressed into their related components with which they rotate. The sprag and cage assembly is located between the inner and outer races.

The sprags are located in a cage which is a spring which holds the sprags in the 'wedge' direction and maintains them in contact with the inner and outer races.

Referring to the illustration, the sprags are designed so that the dimension 'B' is larger than the distance between the inner and outer race bearing surfaces. When the outer race rotates in a clockwise direction, the sprags twist and the edges across the dimension 'B' wedge between the races, providing a positive drive through each sprag to the inner race. The dimension 'A' is smaller than the distance between the inner and outer race bearing surfaces. When the outer race rotates in an anti-clockwise direction, the dimension 'A' is too small to allow the sprags to wedge between the races, allowing the outer race to rotate freely.

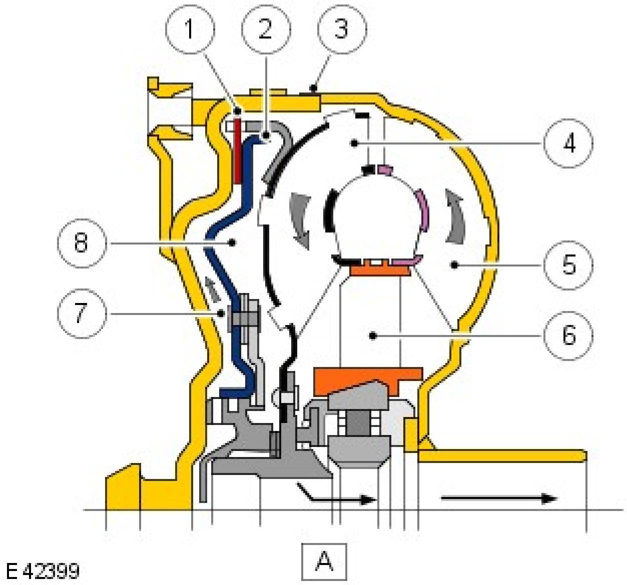
On the illustration shown, when the outer race is rotated in a clockwise direction, the sprags twist and are 'wedged' between the inner and outer races. The sprags then transfer the rotation of the outer race to the inner race, which rotates at the same speed.

Lock-Up Clutch Mechanism

The Torque Converter Clutch (TCC) is hydraulically controlled by an electronic pressure regulating solenoid (EPRS6) which is controlled by the TCM. This allows the torque converter to have three states of operation as follows:

- Fully engaged
- Controlled slip variable engagement
- Fully disengaged

The TCC is controlled by two hydraulic spool valves located in the valve block. These valves are actuated by pilot pressure supplied via a solenoid valve which is also located in the valve block. The solenoid valve is operated by PWM signals from the TCM to give full, partial or no lock-up of the torque converter.



Item	Part Number	Description
A	-	Unlocked condition
B	-	Locked condition
1	-	Clutch plate
2	-	Clutch piston
3	-	Torque converter body
4	-	Turbine
5	-	Impeller
6	-	Stator
7	-	Piston chamber
8	-	Turbine chamber

The lock-up clutch is a hydro-mechanical device which eliminates torque converter slip, improving fuel consumption. The engagement and disengagement is controlled by the TCM to allow a certain amount of controlled 'slip'. This allows a small difference in the rotational speeds of the impeller and the turbine which results in improved shift quality. The lock-up clutch comprises a piston and a clutch friction plate.

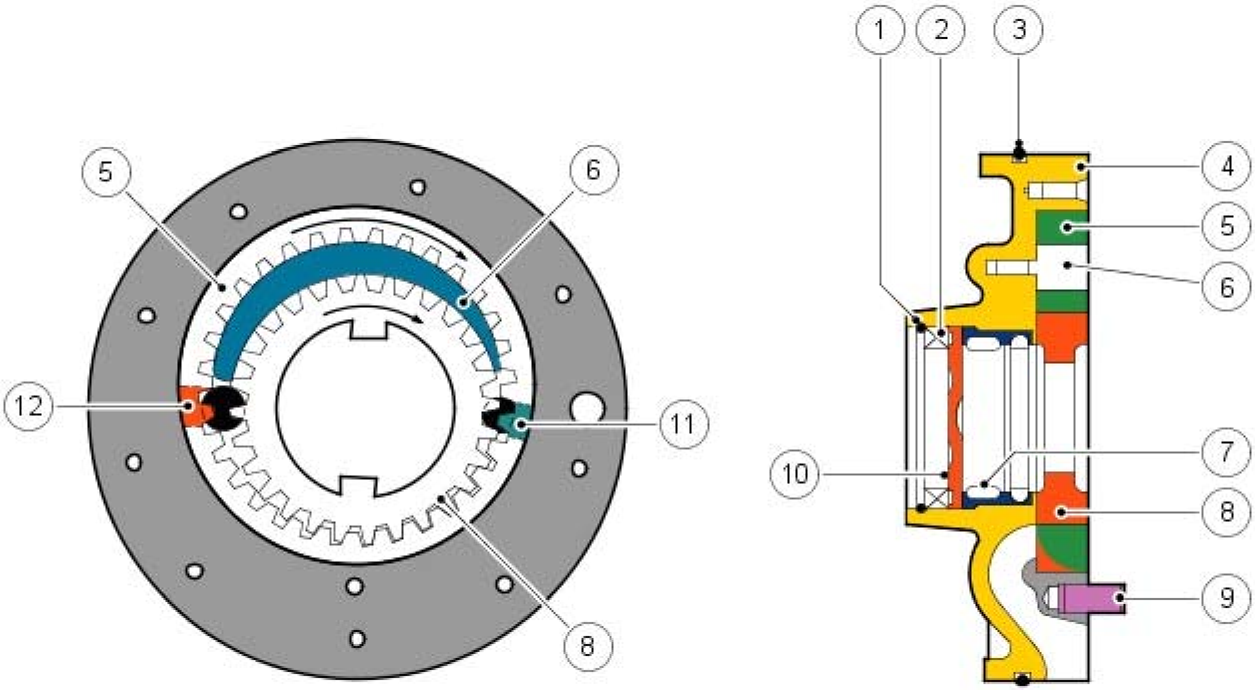
In the unlocked condition, the oil pressure supplied to the piston chamber and the turbine chamber is equal. Pressurised fluid flows through a drilling in the turbine shaft and through the piston chamber to the turbine chamber. In this condition the clutch plate is held away from the torque converter body and torque converter slip is permitted.

In the locked condition, the TCC spool valves are actuated by the electronic pressure regulating solenoid (EPRS6). The fluid flow in the unlocked condition is reversed and the piston chamber is vented. Pressurised fluid is directed into the turbine chamber and is applied to the clutch piston. The piston moves with the pressure and pushes the clutch plate against the torque converter body. As the pressure increases, the friction between the clutch plate and the body increases, finally resulting in full lock-up of the clutch plate with the body. In this condition there is direct mechanical drive from the engine crankshaft to the transmission planetary gear train.

FLUID PUMP

The fluid pump is an integral part of the transmission. The fluid pump is used to supply hydraulic pressure for the operation of the control valves and clutches, to pass the fluid through the transmission cooler and to lubricate the gears and shafts.

The 6HP26 fluid pump is a crescent type pump and is located between the intermediate plate and the torque converter. The pump has a delivery rate of 16cm^3 per revolution.



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Item	Part Number	Description
1	-	Securing ring
2	-	Shaft oil seal
3	-	O-ring seal
4	-	Pump housing
5	-	Ring gear
6	-	Crescent spacer
7	-	Roller bearing
8	-	Impeller
9	-	Centring pin
10	-	Spring washer
11	-	Outlet port (high pressure)
12	-	Inlet port (low pressure)

The pump comprises a housing, a crescent spacer, an impeller and a ring gear. The housing has inlet and outlet ports to direct flow and is located in the intermediate plate by a centring pin. The pump action is achieved by the impeller, ring gear and crescent spacer.

The crescent spacer is fixed in its position by a pin and is located between the ring gear and the impeller. The impeller is driven by the torque converter hub which is located on a needle roller bearing in the pump housing. The impeller teeth mesh with those of the ring gear. When the impeller is rotated, the motion is transferred to the ring gear which rotates in the same direction.

The rotational motion of the ring gear and the impeller collects fluid from the intake port in the spaces between the teeth. When the teeth reach the crescent spacer, the oil is trapped in the spaces between the teeth and is carried with the rotation of the gears. The spacer tapers near the outlet port. This reduces the space between the gear teeth causing a build up of fluid pressure as the oil reaches the outlet port. When the teeth pass the end of the spacer the pressurised fluid is released into the outlet port.

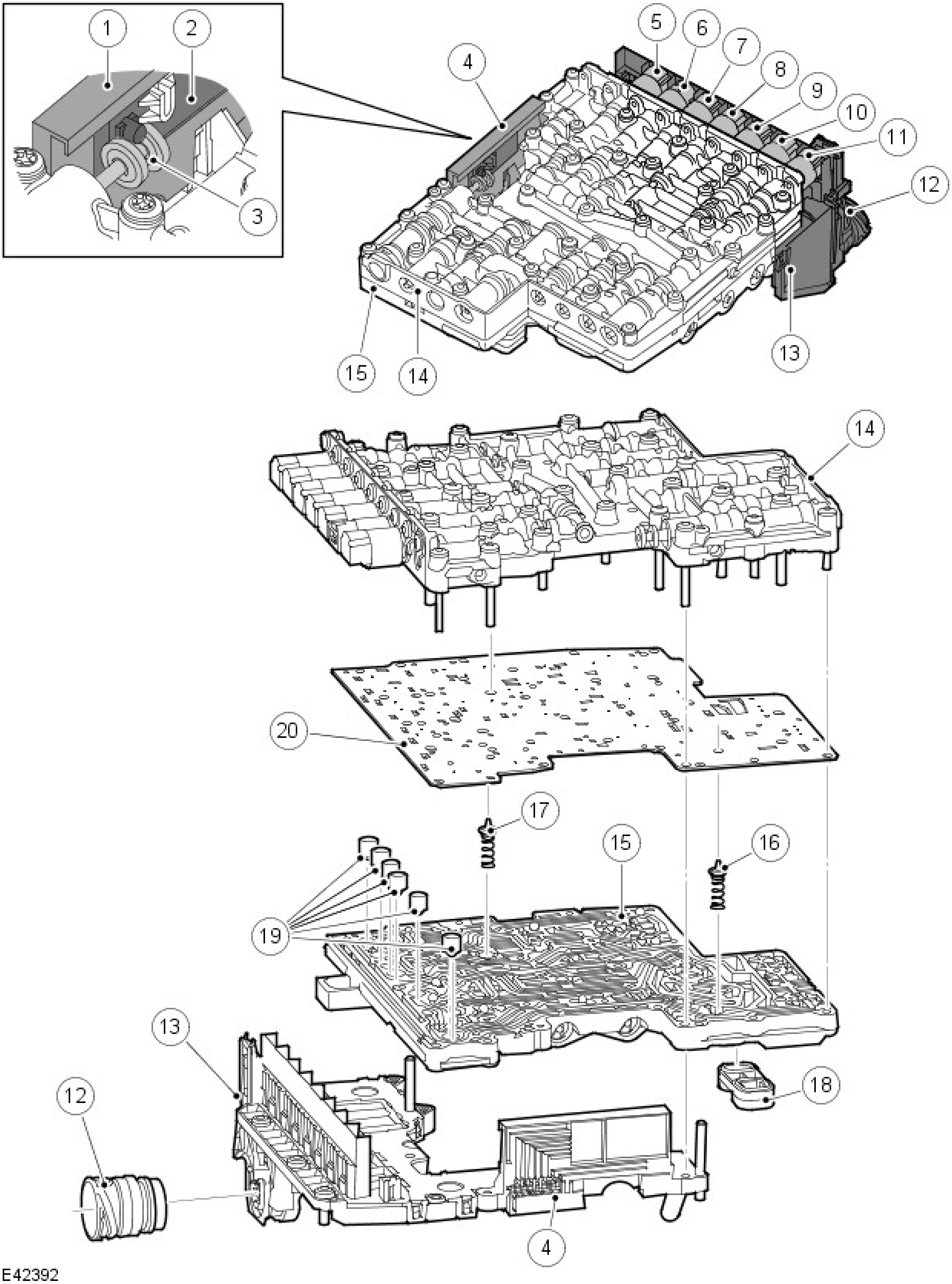
The fluid emerging from the outlet port is passed through the fluid pressure control valve. At high operating speeds the pressure control valve maintains the output pressure to the gearbox at a predetermined maximum level. Excess fluid is relieved from the pressure control valve and is directed, via the main pressure valve in the valve block, back to the pump inlet port. This provides a pressurised feed to the pump inlet which prevents cavitation and reduces pump noise.

MECHATRONIC VALVE BLOCK

The Mechatronic valve block is located in the bottom of the transmission and is covered by the fluid pan. The valve block houses the TCM, electrical actuators, speed sensors and control valves which provide all electro-hydraulic control for all transmission functions. The Mechatronic valve block comprises the following components:

- TCM
- Six pressure regulator solenoids
- One shift control solenoid
- One damper
- Twenty one hydraulic spool valves
- Manually operated selector valve
- Temperature sensor
- Turbine speed sensor
- Output shaft speed sensor.

ZF 6HP26 Automatic Transmission – Mechatronic Valve Block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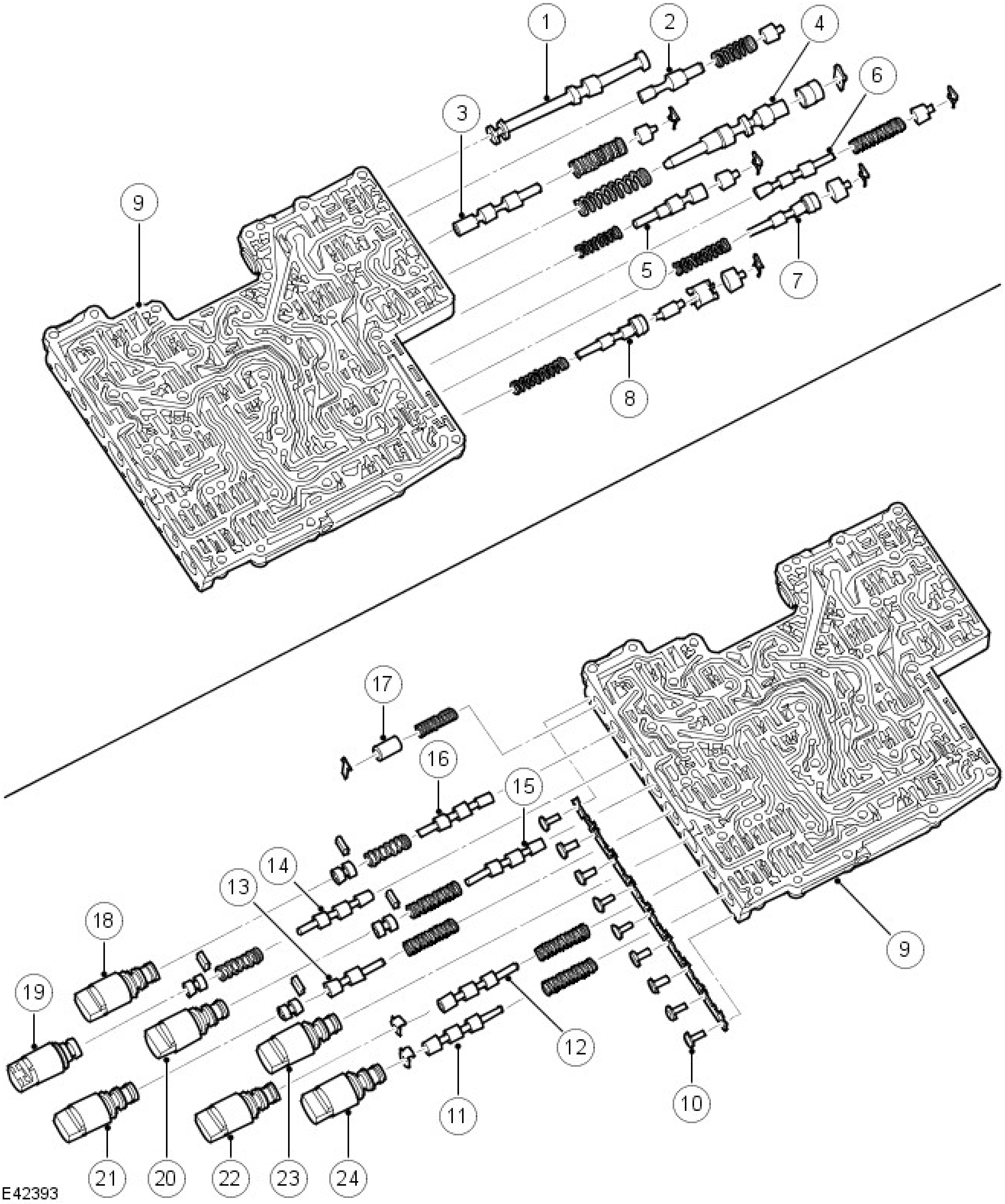
Item	Part Number	Description
1	-	Position switch
2	-	Sliding block
3	-	Selector spool valve
4	-	Position switch assembly
5	-	Electronic Pressure Regulator Solenoid (EPRS) 6

6	-	Solenoid Valve 1
7	-	EPRS 4
8	-	EPRS 5
9	-	EPRS 3
10	-	EPRS 2
11	-	EPRS 1
12	-	Electrical connector
13	-	Transmission Control Module (TCM)
14	-	Valve housing
15	-	Valve plate
16	-	Torque converter retaining valve
17	-	Clutch return valve
18	-	Element seal
19	-	Pressure regulator dampers
20	-	Intermediate plate

ZF 6HP26 Automatic Transmission – Valve Housing Components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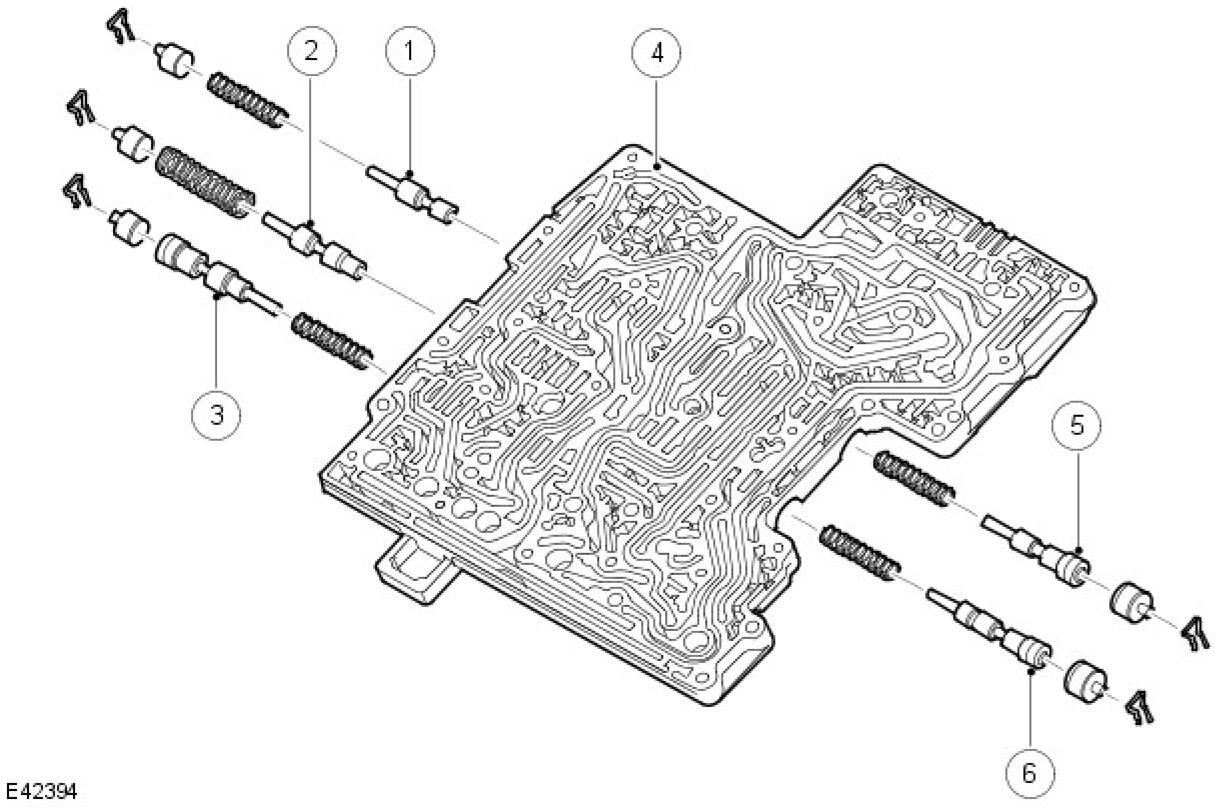
Item	Part Number	Description
1	-	Selector spool valve
2	-	Lubricating valve
3	-	Torque converter pressure valve
4	-	System pressure valve
5	-	Torque converter clutch valve

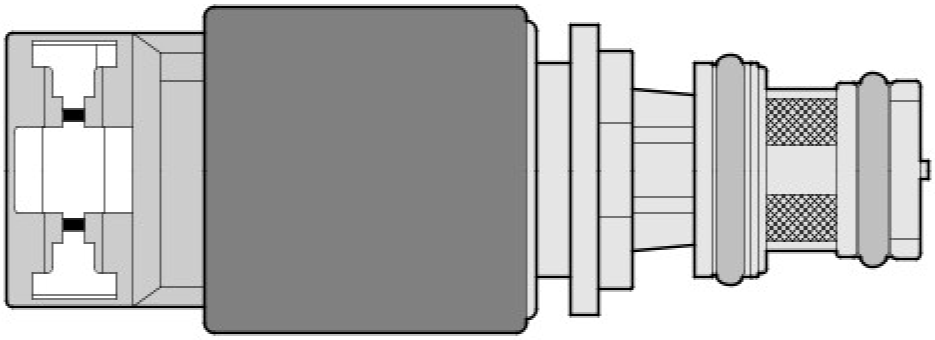
6	-	Retaining valve – Clutch E
7	-	Clutch valve E
8	-	Clutch valve A
9	-	Valve housing
10	-	Bolts
11	-	Retaining valve – Clutch A
12	-	Retaining valve – Clutch B
13	-	Pressure reducing valve
14	-	Shift valve 1
15	-	Retaining valve – Brake D
16	-	Shift valve 2
17	-	Damper
18	-	Electronic Pressure Regulator Solenoid (EPRS) 6
19	-	Solenoid valve 1
20	-	EPRS 4
21	-	EPRS 5
22	-	EPRS 2
23	-	EPRS 3
24	-	EPRS 1

ZF 6HP26 Automatic Transmission – Valve Plate Components



Item	Part Number	Description
1	-	Retaining valve – Brake D2
2	-	Clutch valve – Brake D2
3	-	Clutch valve B
4	-	Valve plate
5	-	Clutch valve – Brake D1
6	-	Clutch valve – Brake C

Electronic Pressure Regulator Solenoids (EPRS)



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Six Electronic Pressure Regulator Solenoids (EPRS) are located in the valve block. The solenoids are controlled by Pulse Width Modulation (PWM) signals from the TCM. The solenoids convert the electrical signals into hydraulic control pressure proportional to the signal to actuate the spool valves for precise transmission operation.

The following table shows EPRS and their associated functions:

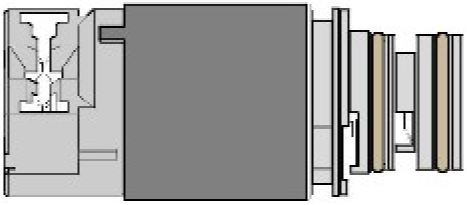
EPRS	Function
1	Clutch A
2	Clutch B
3	Clutch C
4	Brake clutches D and E
5	System pressure control
6	Torque converter lock-up control

Solenoids EPRS 1, 3 and 6 supply a lower control pressure as the signal amperage increases and can be identified by a black connector cap. The TCM operates the solenoids using PWM signals. The TCM monitors engine load and clutch slip and varies the solenoid duty cycle accordingly. The solenoids have a 12V operating voltage and a pressure range of 0 - 4.6 bar (0 - 67 lbf.in^2).

Solenoids EPRS 2, 4 and 5 supply a higher control pressure as the signal amperage increases and can be identified by a green connector cap. The solenoids are normally open, regulating flow solenoid valves. The TCM operates the solenoids using a PWM ground proportional to the required increasing or decreasing clutch pressures. The solenoids have a 12V operating voltage and a pressure range of 4.6 - 0 bar (67 - 0 lbf.in^2).

The resistance of the coil winding for the EPRS solenoids is 5.05 ohms at 20°C (68°F).

Control Solenoid



E42714

A shift control Solenoid Valve (SV) is located in the valve block. The solenoid is controlled by the TCM and converts electrical signals into hydraulic control signals to control clutch application.

The shift control solenoid is an open/closed, on/off solenoid which is controlled by the TCM switching the solenoid to ground. The

TCM also supplies power to the solenoid. The TCM energises the solenoid in a programmed sequence for clutch application for gear ratio changes and shift control.

The resistance of the solenoid coil winding within the solenoid valve is between 26 to 30.4 ohms at 20°C (68°F).

Sensors

Speed Sensors

The turbine speed sensor and the output shaft speed sensor are Hall effect type sensors located in the Mechatronic valve block and are not serviceable items. The TCM monitors the signals from each sensor to determine the input (turbine) speed and the output shaft speed.

The turbine speed is monitored by the TCM to calculate the slip of the torque converter clutch and internal clutch slip. This signal allows the TCM to accurately control the slip timing during shifts and adjust clutch application or release pressure for overlap shift control.

The output shaft speed is monitored by the TCM and compared to engine speed signals received on the CAN bus from the ECM. Using a comparison of the two signals the TCM calculates the transmission slip ratio for plausibility and maintains adaptive pressure control.

Temperature Sensor

The temperature sensor is also located in the Mechatronic valve block. The TCM uses the temperature sensor signals to determine the temperature of the transmission fluid. These signals are used by the TCM to control the transmission operation to promote faster warm-up in cold conditions or to assist with fluid cooling by controlling the transmission operation when high fluid temperatures are experienced. If the sensor fails, the TCM will use a default value and a fault code will be stored in the TCM.

Damper

There is one damper located in the valve housing. The damper is used to regulate and dampen the regulated pressure supplied via EPRS 5. The damper is load dependent through modulation of the damper against return spring pressure.

The damper comprises a piston, a housing bore and a spring. The piston is subject to the pressure applied by the spring. The bore has a connecting port to the function to which it applies. Fluid pressure applied to the applicable component (i.e. a clutch) is also subjected to the full area of the piston, which moves against the opposing force applied by the spring. The movement of the piston creates an action similar to a shock absorber, momentarily delaying the build up of pressure in the circuit. This results in a more gradual application of clutches improving shift quality.

Spool Valves

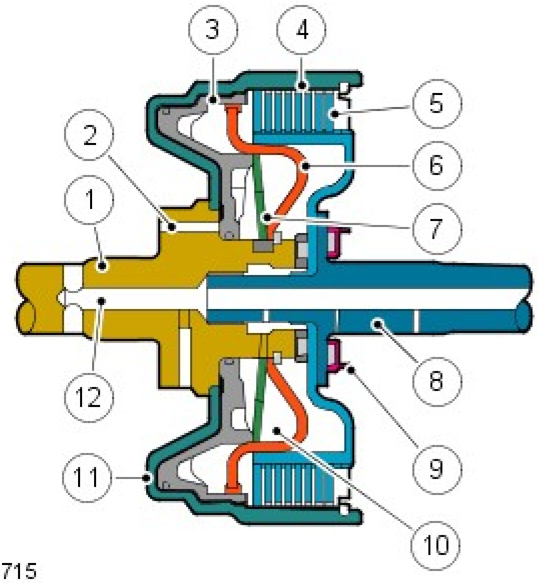
The valve block contains twenty one spool valves which control various functions of the transmission. The spool valves are of conventional design and are operated by fluid pressure.

Each spool valve is located in its spool bore and held in a default (unpressurised) position by a spring. The spool bore has a number of ports which allow fluid to flow to other valves and clutches to enable transmission operation. Each spool has a piston which is waisted to allow fluid to be diverted into the applicable ports when the valve is operated.

When fluid pressure moves a spool, one or more ports in the spool bore are covered or uncovered. Fluid is prevented from flowing or is allowed to flow around the applicable waisted area of the spool and into another uncovered port. The fluid is either passed through galleries to actuate another spool, operate a clutch or is returned to the fluid pan.

DRIVE CLUTCHES

Multiplate Drive or Brake Clutch – Typical



E42715

Item	Part Number	Description
1	-	Input shaft
2	-	Main pressure supply port
3	-	Piston
4	-	Cylinder – External plate carrier
5	-	Clutch plate assembly
6	-	Baffle plate
7	-	Diaphragm spring
8	-	Output shaft
9	-	Bearing
10	-	Dynamic pressure equalisation chamber
11	-	Piston chamber
12	-	Lubrication channel

There are three drive clutches and two brake clutches used in the 6HP26 transmission. Each clutch comprises one or more friction plates dependent on the output controlled. A typical clutch consists of a number of steel outer plates and inner plates with friction material bonded to each face.

The clutch plates are held apart mechanically by a diaphragm spring and hydraulically by dynamic pressure. The pressure is derived from a lubrication channel which supplies fluid to the bearings etc. The fluid is passed via a drilling in the output shaft into the chamber between the baffle plate and the piston. To prevent inadvertent clutch application due to pressure build up produced by centrifugal force, the fluid in the dynamic pressure equalisation chamber overcomes any pressure in the piston chamber and holds the piston off the clutch plate assembly.

When clutch application is required, main pressure from the fluid pump is applied to the piston chamber from the supply port. This main pressure overcomes the low pressure fluid present in the dynamic pressure equalisation chamber. The piston moves, against the pressure applied by the diaphragm spring, and compresses the clutch plate assembly. When the main pressure falls, the diaphragm spring pushes the piston away from the clutch plate assembly, disengaging the clutch.

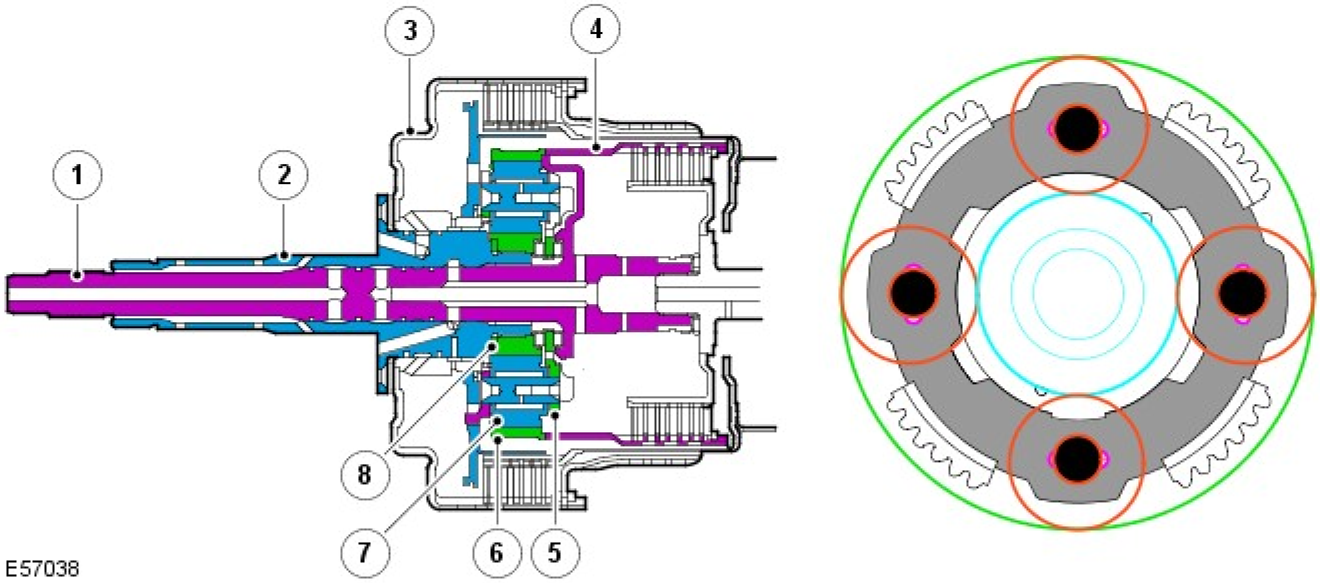
PLANETARY GEAR TRAINS

The planetary gear trains used on the 6HP26 transmission comprise a single web planetary gear train and a double web planetary gear train. These gear trains are known as Lepelletier type gear trains and together produce the six forward gears and the one reverse gear.

Single Web Planetary Gear Train

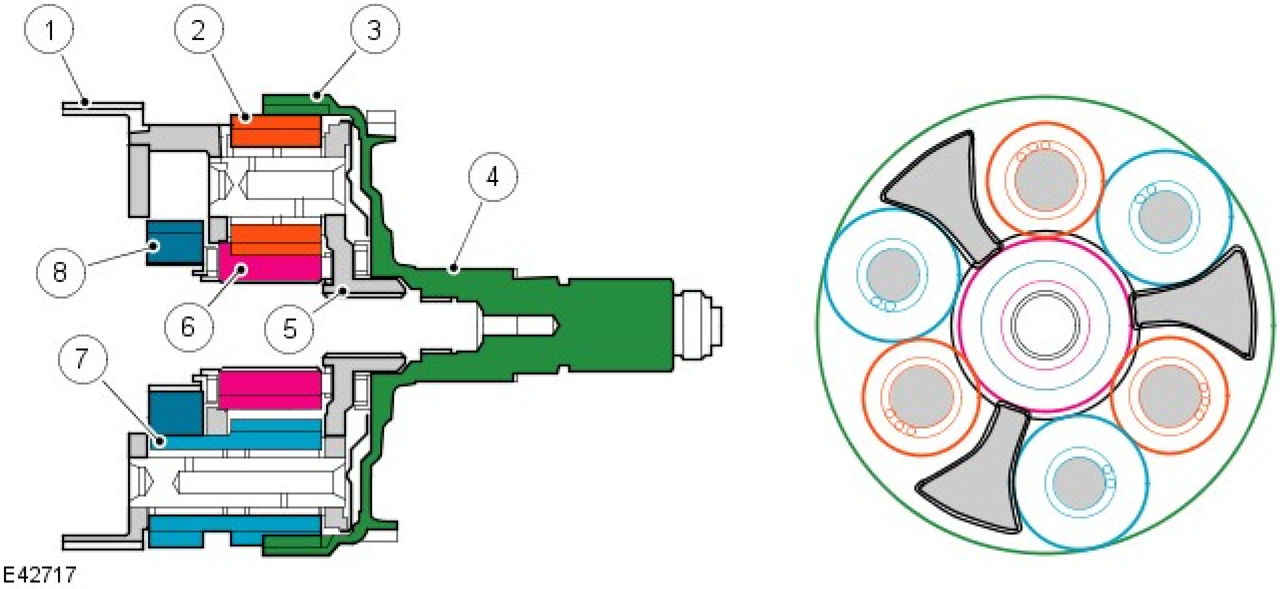
The single web planetary gear train comprises:

- One sunwheel
- Four planetary gears
- One planetary gear carrier (spider)
- One ring gear or annulus



Item	Part Number	Description
1	-	Torque converter input shaft
2	-	Stator shaft
3	-	Multi-disc clutch A
4	-	Multi-disc clutch E
5	-	Planetary gear carrier
6	-	Ring gear 1
7	-	Planetary gear
8	-	Sunwheel 1

Double Web Planetary Gear Train



Item	Part Number	Description
1	-	Planetary gear spider
2	-	Planetary gears (short)
3	-	Ring gear
4	-	Output shaft
5	-	Planetary gear carrier
6	-	Sunwheel
7	-	Double planetary gears (long)
8	-	Sunwheel

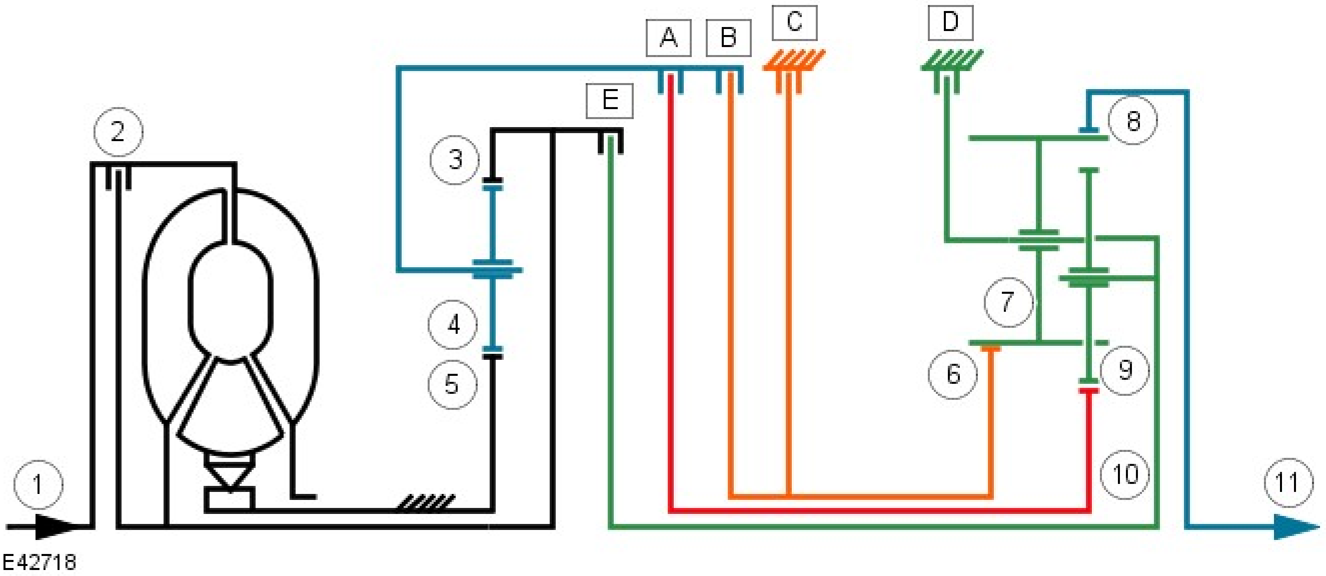
The double planetary gear train comprises:

- Two sunwheels
- Three short planetary gears
- Three long planetary gears
- One planetary gear carrier
- One ring gear or annulus

POWER FLOWS

Operation of the transmission is controlled by the TCM which electrically activates various solenoids to control the transmission gear selection. The sequence of solenoid activation is based on programmed information in the module memory and physical transmission operating conditions such as vehicle speed, throttle position, engine load and selector lever position.

Powerflow Schematic



Item	Part Number	Description
1	-	Torque input from engine
2	-	Torque converter lock-up clutch
3	-	Single web planetary gear carrier
4	-	Single web planetary gears
5	-	Single web sunwheel 1
6	-	Double web sunwheel 2
7	-	Double web planetary gears - Long
8	-	Double web planetary gear carrier
9	-	Double web planetary gears - Short
10	-	Double web sunwheel 3
11	-	Torque output from transmission
A	-	Multiplate clutch
B	-	Multiplate clutch
C	-	Multiplate brake
D	-	Multiplate brake
E	-	Multiplate clutch

Engine torque is transferred, via operation of single or combinations of clutches to the two planetary gear trains. Both gear trains are controlled by reactionary inputs from brake clutches to produce the six forward gears and one reverse gear. The ratios are as follows:

Gear	1st	2nd	3rd	4th	5th	6th	Reverse
Ratio	4.171	2.340	1.521	1.143	0.867	0.691	3.403

The following table shows which solenoids are activated to produce the required torque output from the transmission.

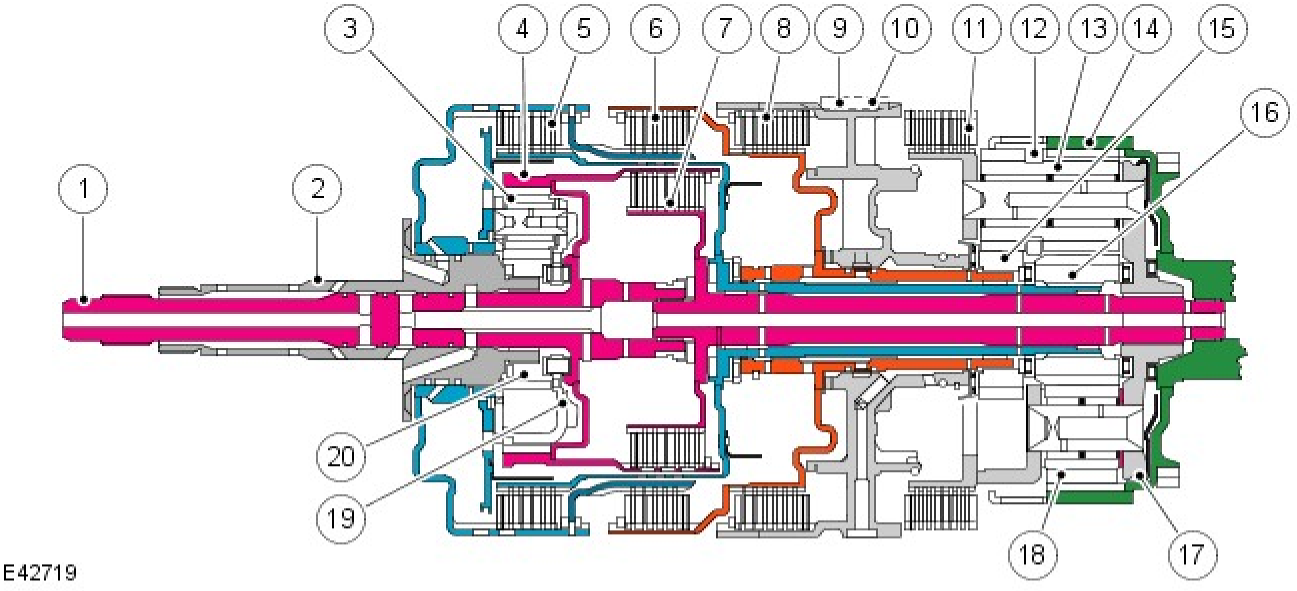
Gear Selector Lever Position	Shift Control Solenoid Valve	Electronic Pressure Regulator Solenoids (EPRS)					
		1	2	3	4	5	6
P					ON	-ON-	
R			ON		ON	-ON-	
N					ON	-ON-	

Gear Selector Lever Position	Shift Control Solenoid Valve	Electronic Pressure Regulator Solenoids (EPRS)					
		1	2	3	4	5	6
D 1		ON			ON	-ON-	-ON-
D 2		ON		ON		-ON-	-ON-
D 3		ON	ON			-ON-	-ON-
D 4	ON	ON			ON	-ON-	-ON-
D 5	ON		ON		ON	-ON-	-ON-
D 6	ON			ON	ON	-ON-	-ON-
ON = Active (pressure build up) **OFF** = Inactive **-ON-** = Inactive (pressure drain)							

The following table shows which clutches are operating for selected gear ratios to produce the required torque output from the transmission.

Gear Selector Lever Position	Shift Control Solenoid Valve	Clutch				Brake	
		A	B	E	WK	C	D
P							X
R			X				X
N							X
D 1		X			X		X
D 2		X			X	X	
D 3		X	X		X		
D 4	ON	X		X	X		
D 5	ON		X	X	X		
D 6	ON			X	X	X	
X = clutch applied							

Shift Elements



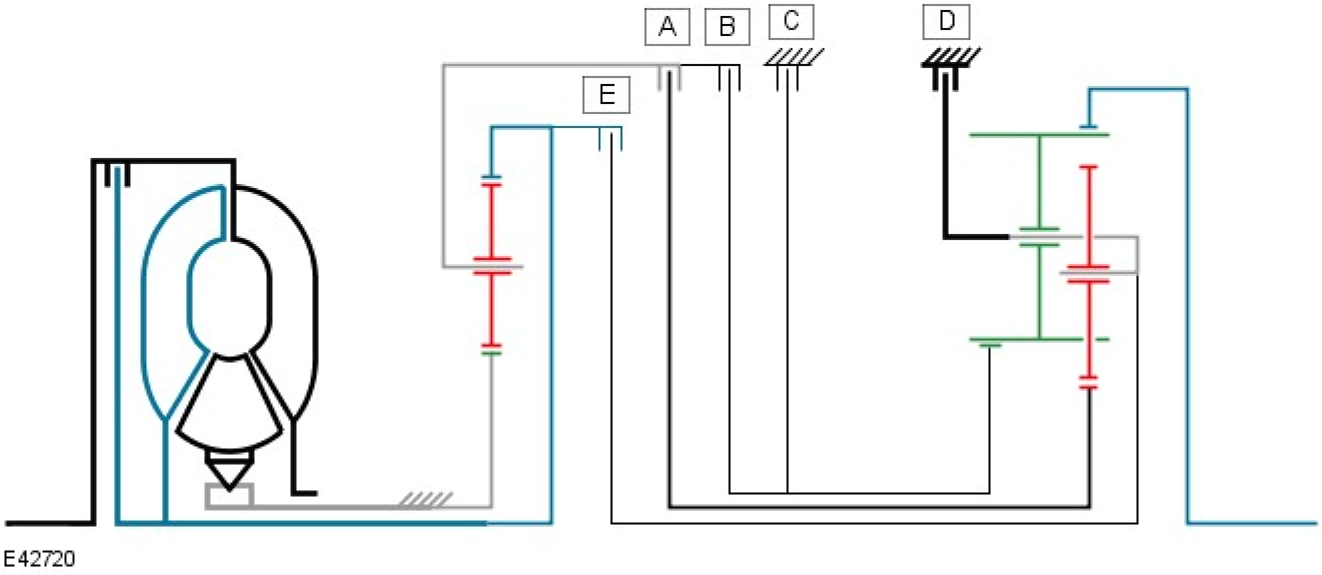
Item	Part Number	Description
1	-	Turbine shaft
2	-	Stator shaft
3	-	Single web planetary gear train
4	-	Ring gear 1
5	-	Clutch A
6	-	Clutch B
7	-	Clutch E
8	-	Brake clutch C
9	-	Fixed connection to transmission housing
10	-	Shaft key
11	-	Brake clutch D
12	-	Double web planetary gear train
13	-	Planetary gears - Long

14	-	Ring gear 2
15	-	Sunwheel 2
16	-	Sunwheel 3
17	-	Double web planetary gear carrier
18	-	Planetary gears - short
19	-	Single web planetary gear carrier
20	-	Sunwheel 1

The shift elements are three rotating multiplate clutches (A, B and E) and two fixed multiplate brakes © and D). All shifts from 1st to 6th gears are power-on overlapping shifts. Overlapping shifts can be described as one of the clutches continuing to transmit drive at a lower main pressure until the next required clutch is able to accept the input torque.

The shift elements, clutches and brakes are actuated hydraulically. Fluid pressure is applied to the required clutch and/or brake, pressing the plates together and allowing drive to be transmitted through the plates. The purpose of the shift elements is to perform power-on shifts with no interruption to traction and smooth transition between gear ratios.

Power Flow 1st Gear



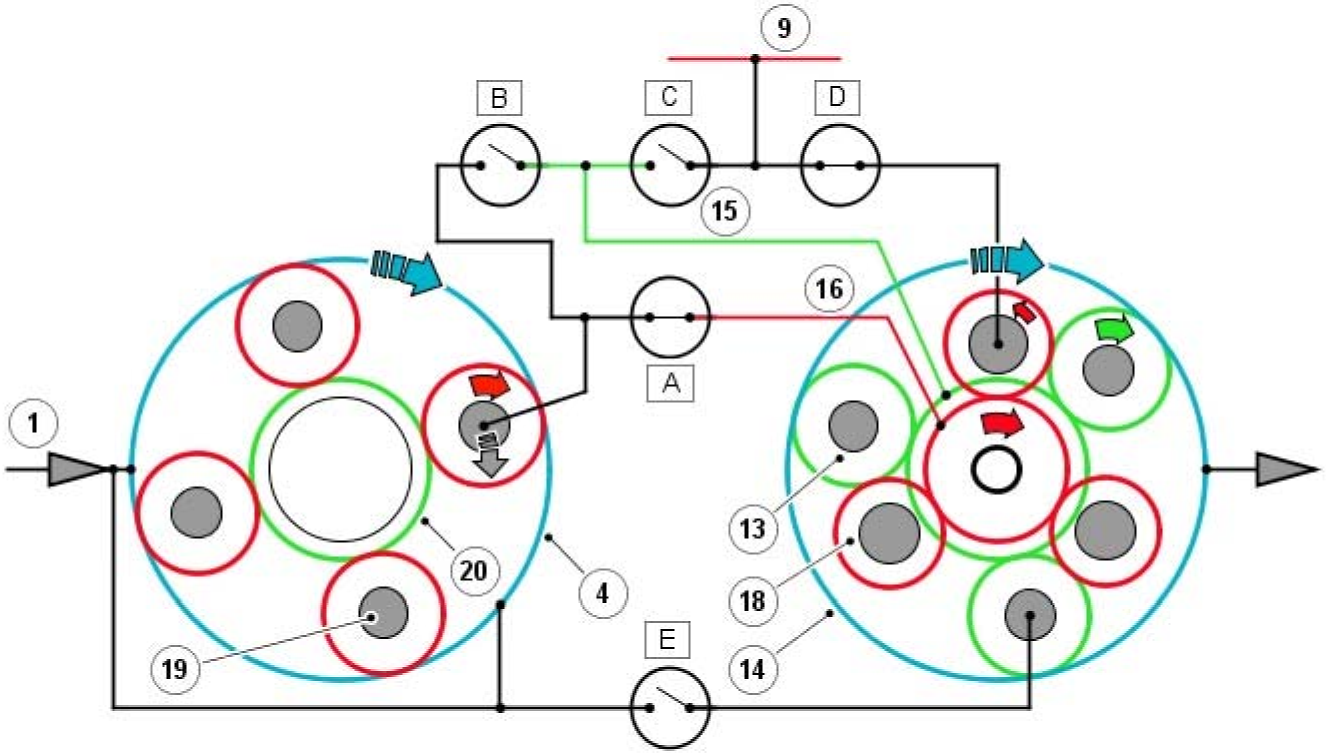
The gear selector lever and the manual selector valve spool are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

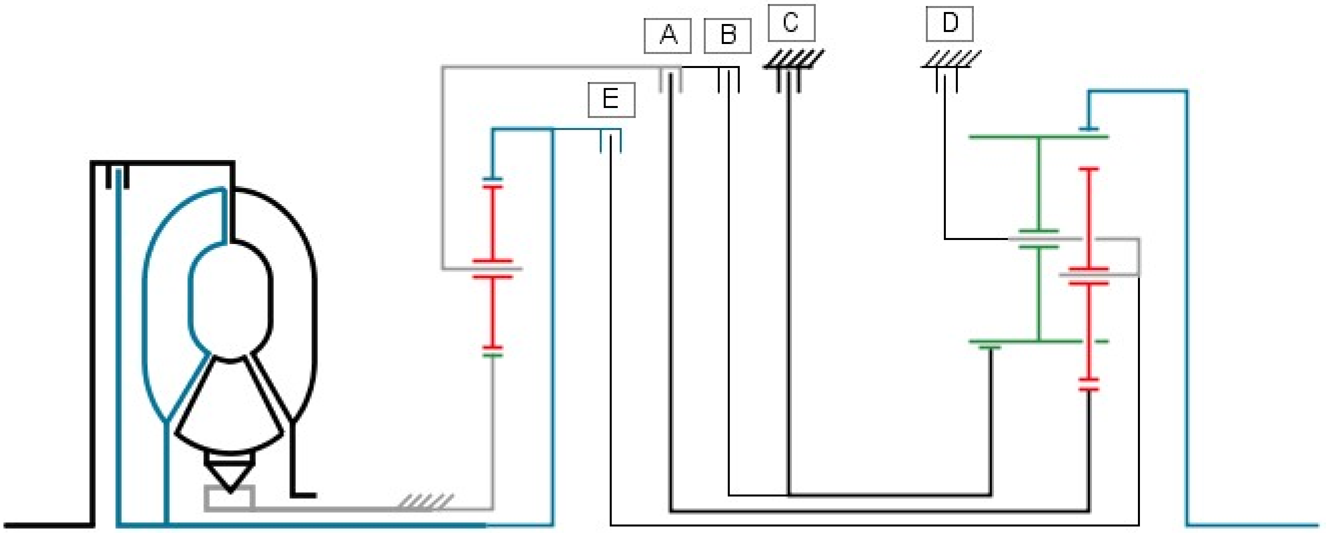
The double web planetary gear train is locked against the transmission housing by brake 'D'. This allows ring gear 2 (output shaft) to be driven in the same direction as the engine via the long planetary gears.

- NOTE: Refer to 'Shift Elements' illustration for key



E56815

Power Flow 2nd Gear



E42722

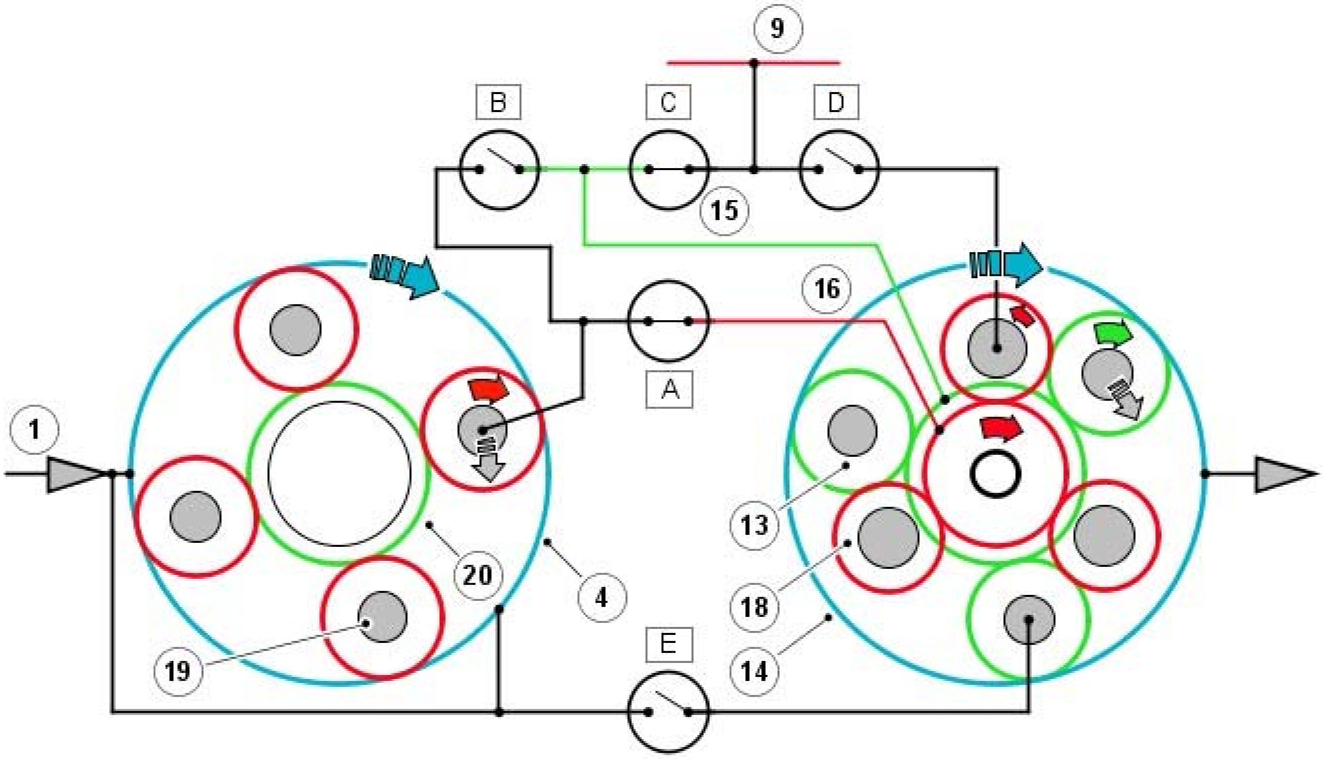
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

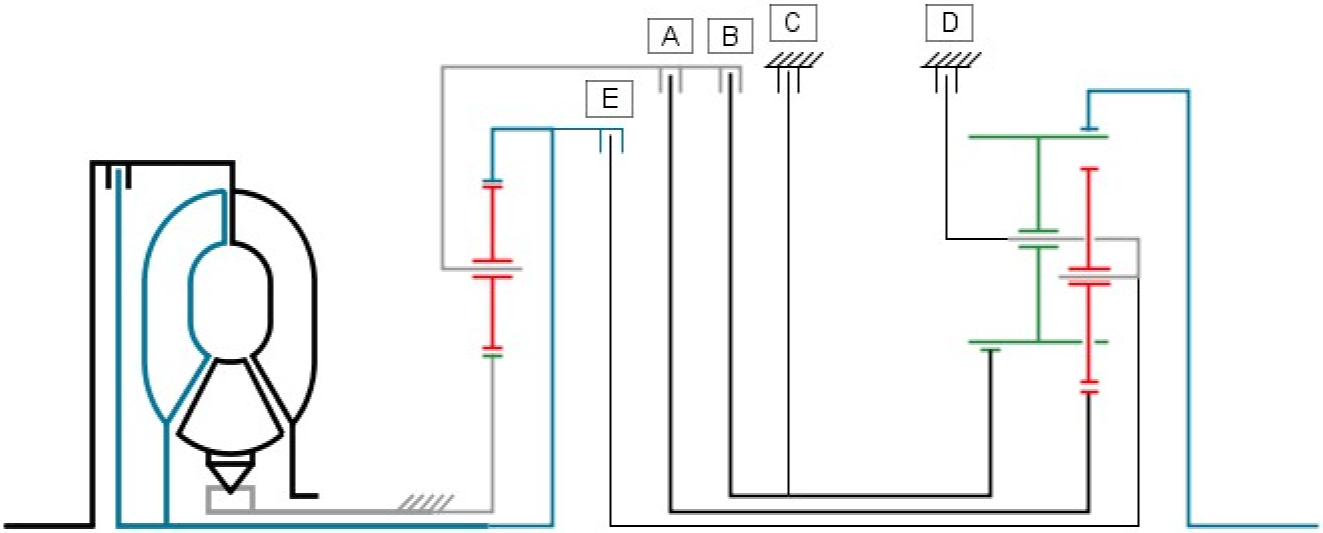
Sunwheel 2 is locked to the transmission housing by brake clutch 'C'. The long planetary gears, which are also meshed with the short planetary gears, roll around the fixed sunwheel 2 and transmit drive to the double web planetary gear train carrier and ring gear 2 in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E56816

Power Flow 3rd Gear



E42724

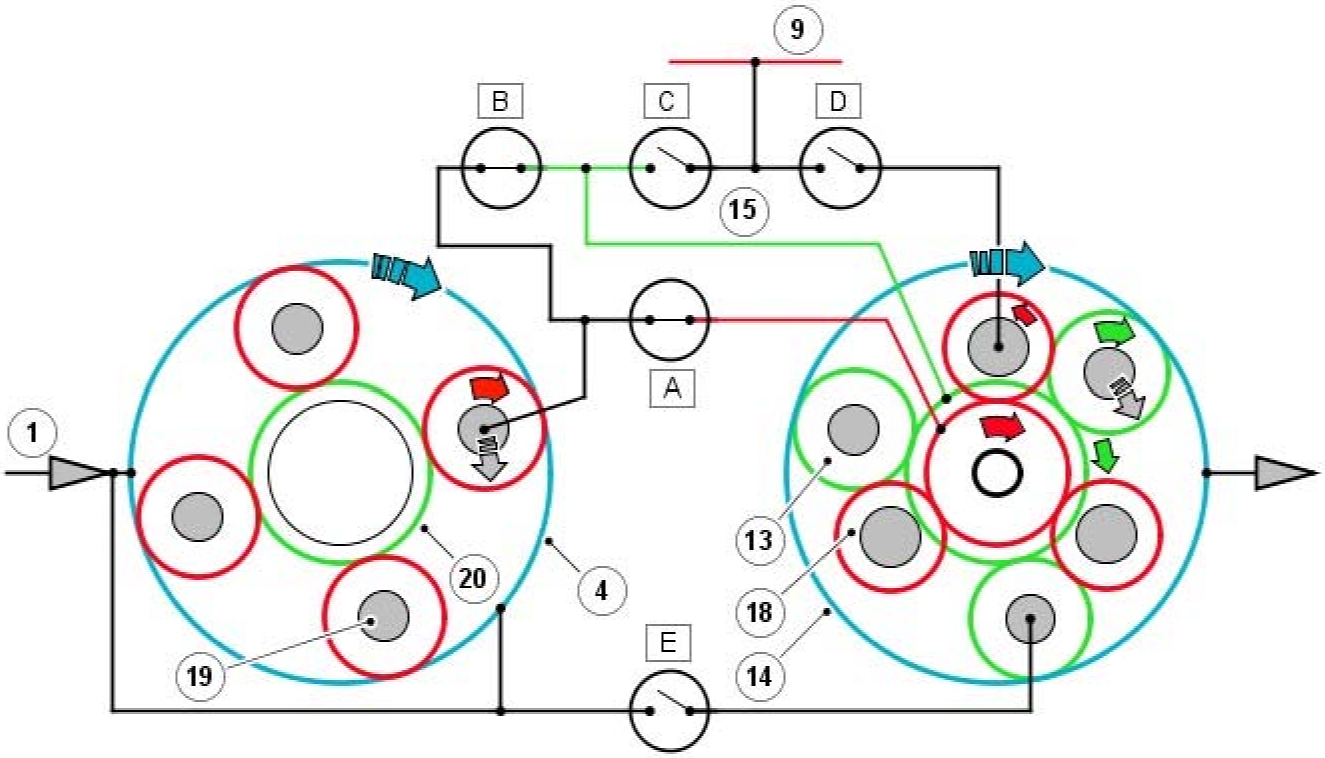
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

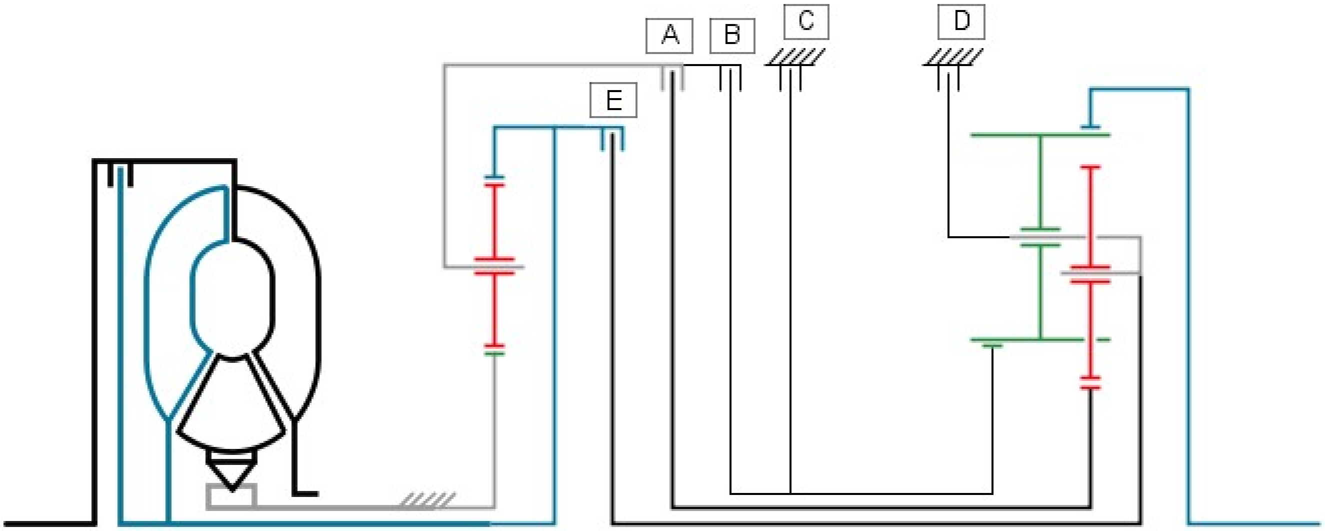
Sunwheel 2 is driven via clutch 'B' which is engaged. The long planetary gears, which are also meshed with the short planetary gears, cannot roll around the fixed sunwheel 2 and transmit drive to the locked double web planetary gear train carrier in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E56817

Power Flow 4th Gear



E42726

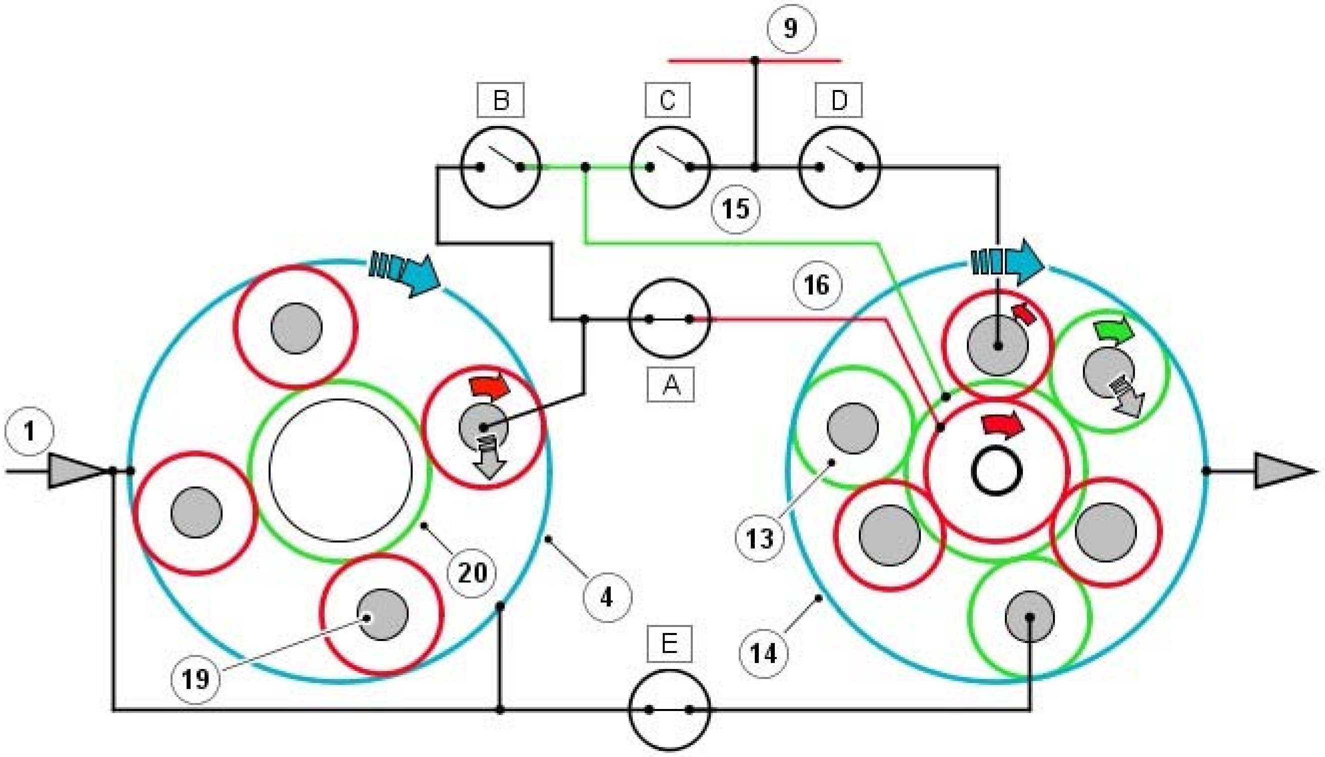
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

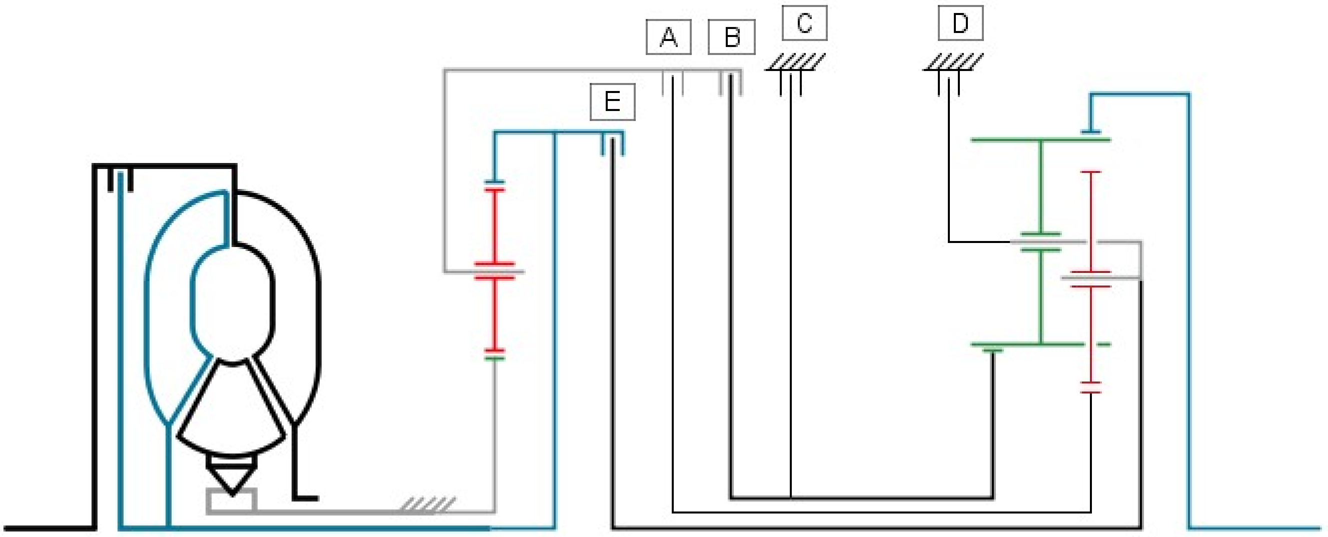
The double web planetary gear carrier is driven via clutch 'E' which is engaged. The long planetary gears, which are also meshed with the short planetary gears, and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E56818

Power Flow 5th Gear



E42728

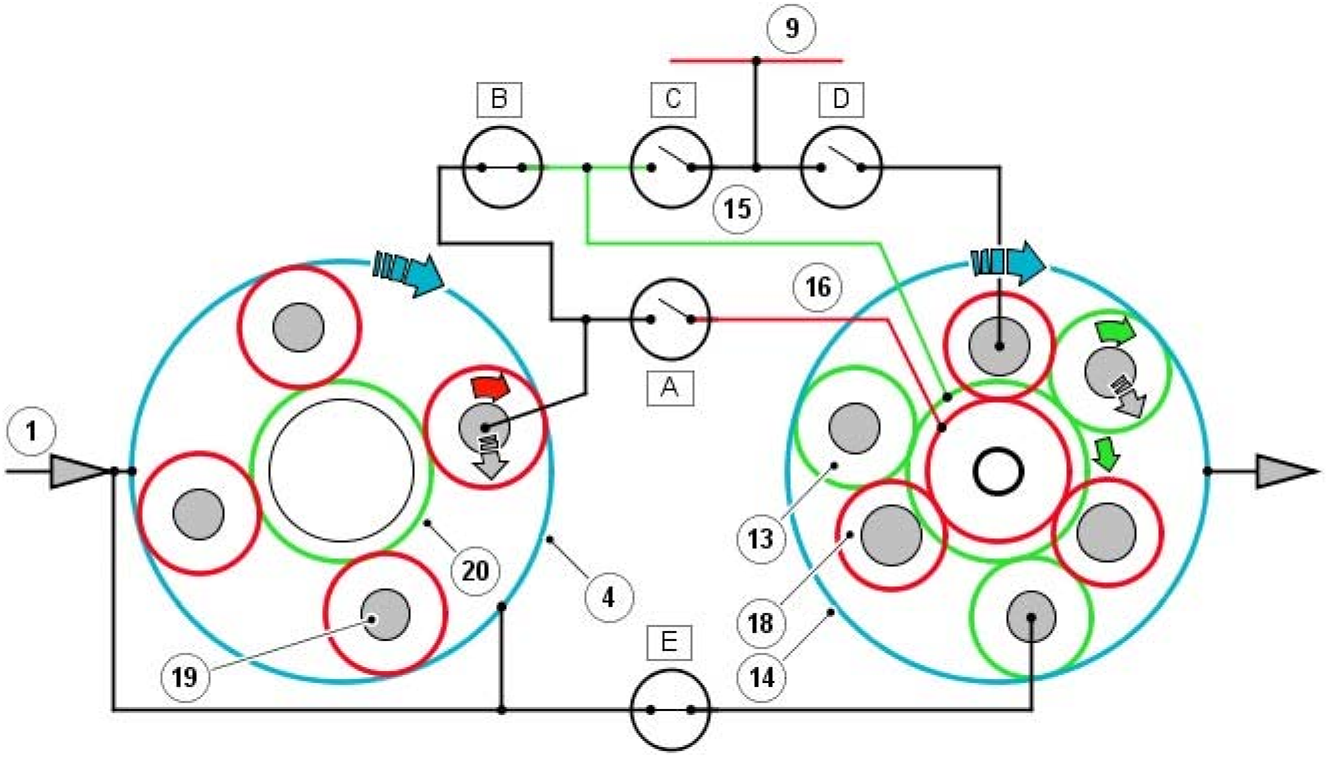
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

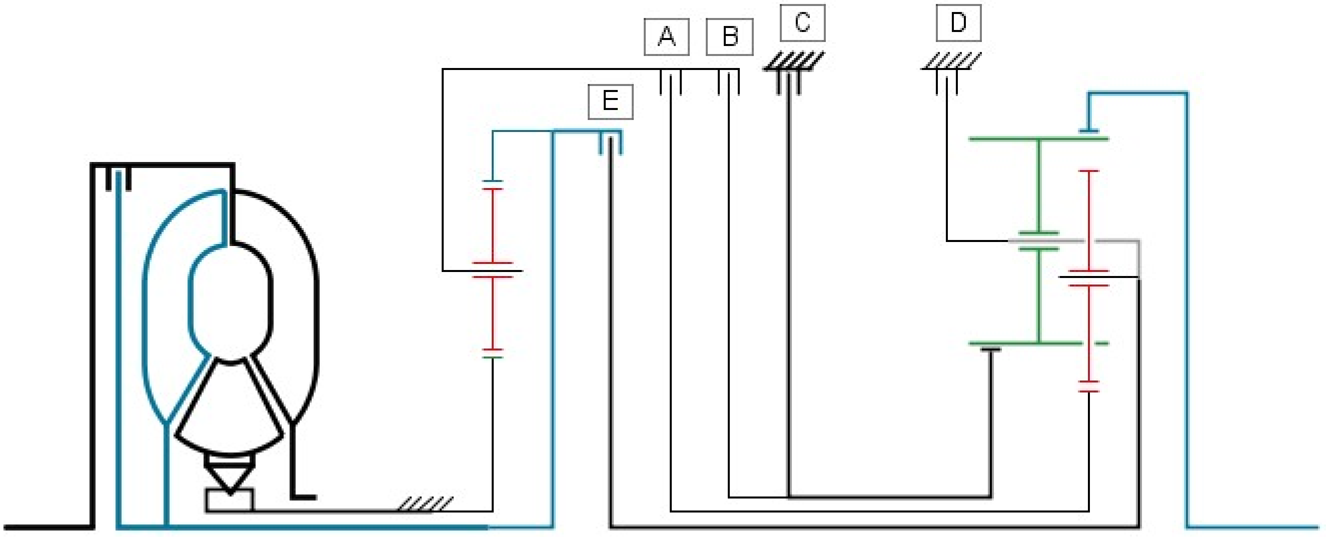
The long planetary gears, which are also meshed with the short planetary gears, and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E56819

Power Flow 6th Gear



E42730

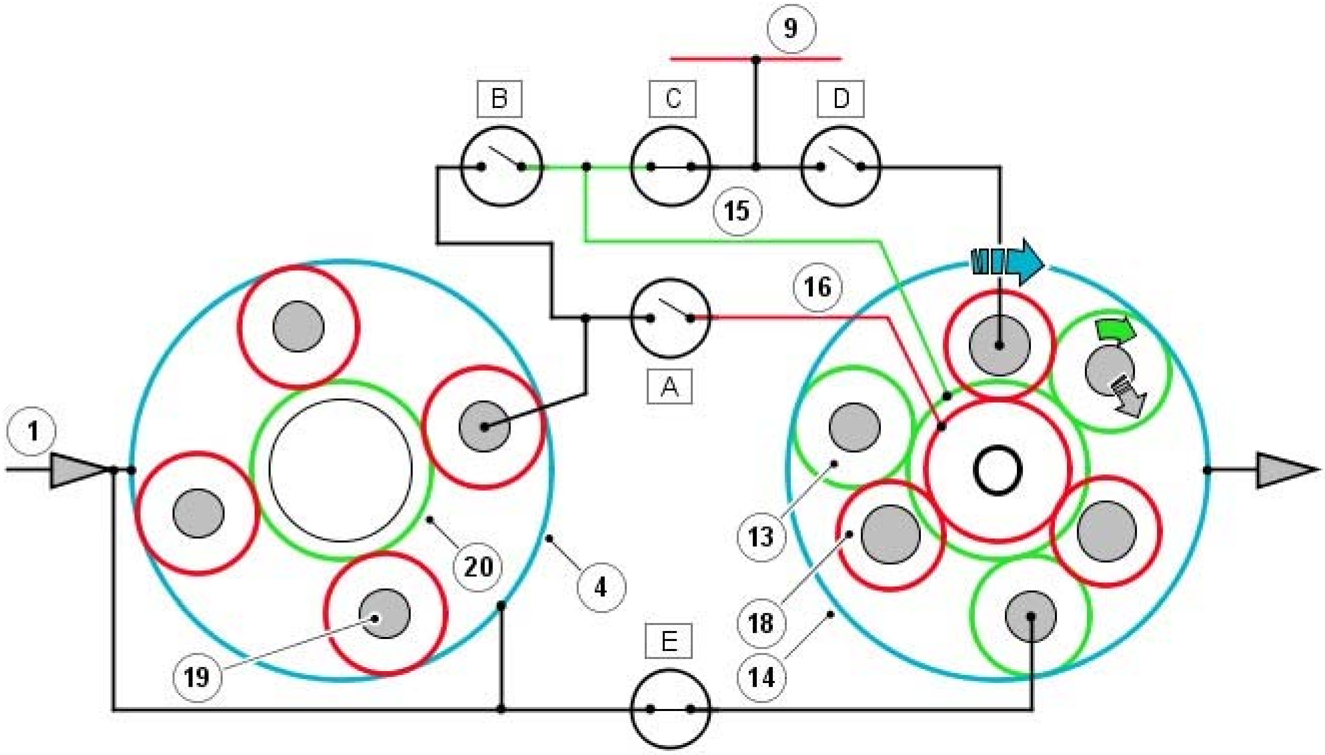
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Clutches 'A' and 'B' are released, removing the effect of the single web planetary gear train.

Clutch brake 'C' is applied which locks sunwheel 2 to the transmission housing.

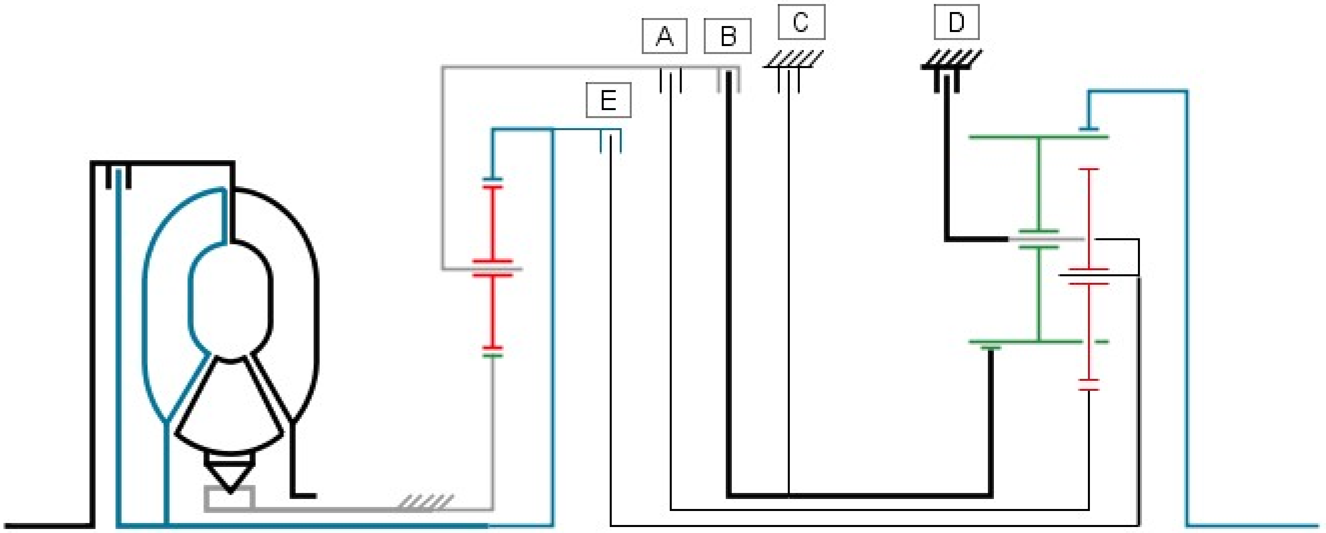
Clutch 'E' is engaged and drives the double web planetary gear carrier. This causes the long planetary gears to rotate around the fixed sunwheel 2 and transmit drive to ring gear 2 which is driven in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E56820

Power Flow Reverse Gear



E42732

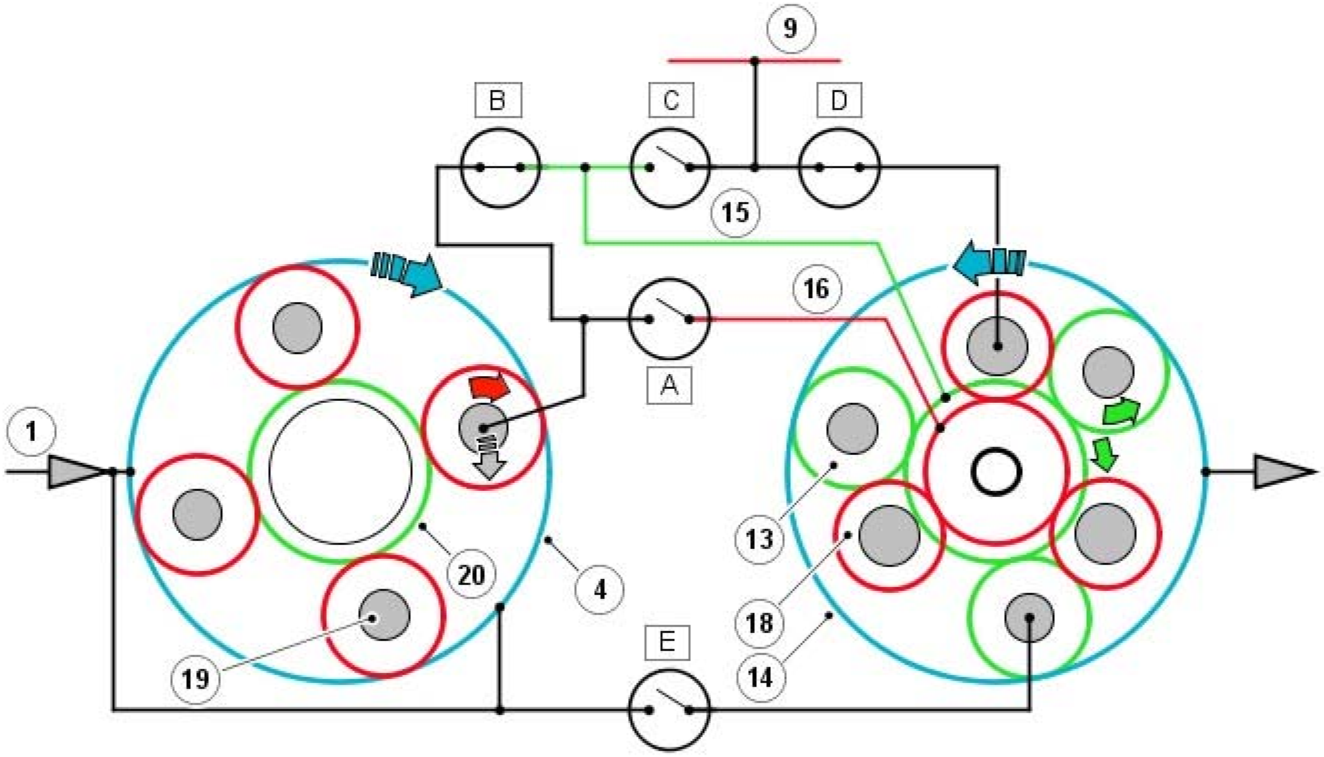
The gear selector lever and the manual selector spool valve are in the 'R' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears of the single web planetary gear train which rotate around the fixed sunwheel 1. This transmits the drive to the single web planetary gear carrier, the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

With clutch 'B' applied, sunwheel 2 in the double web planetary gear train is driven and meshes with the long planetary gears.

The double web planetary gear carrier is locked to the transmission housing by brake clutch 'D'. This allows ring gear 2 to be driven in the opposite direction to engine rotation by the long planetary gears.

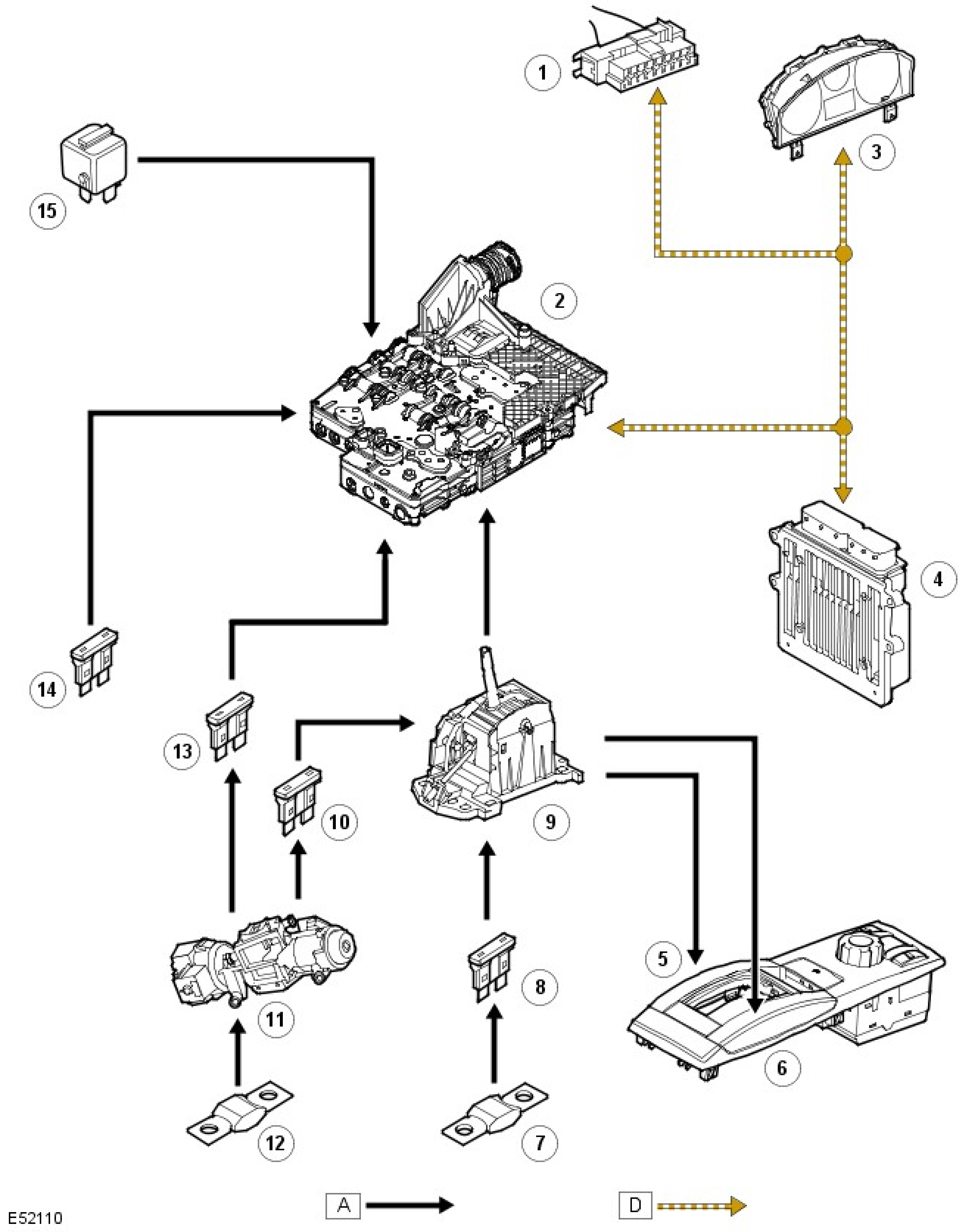
- NOTE: Refer to 'Shift Elements' illustration for key



E56821

CONTROL DIAGRAM

- NOTE: **A** = Hardwired; **D**= High Speed CAN Bus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E52110
A
D

Item	Part Number	Description
1	-	Diagnostic socket
2	-	Mechatronic Valve (including TCM, sensors and solenoids)
3	-	Instrument cluster
4	-	Engine Control Module (ECM)
5	-	Selector indicator (PRND)

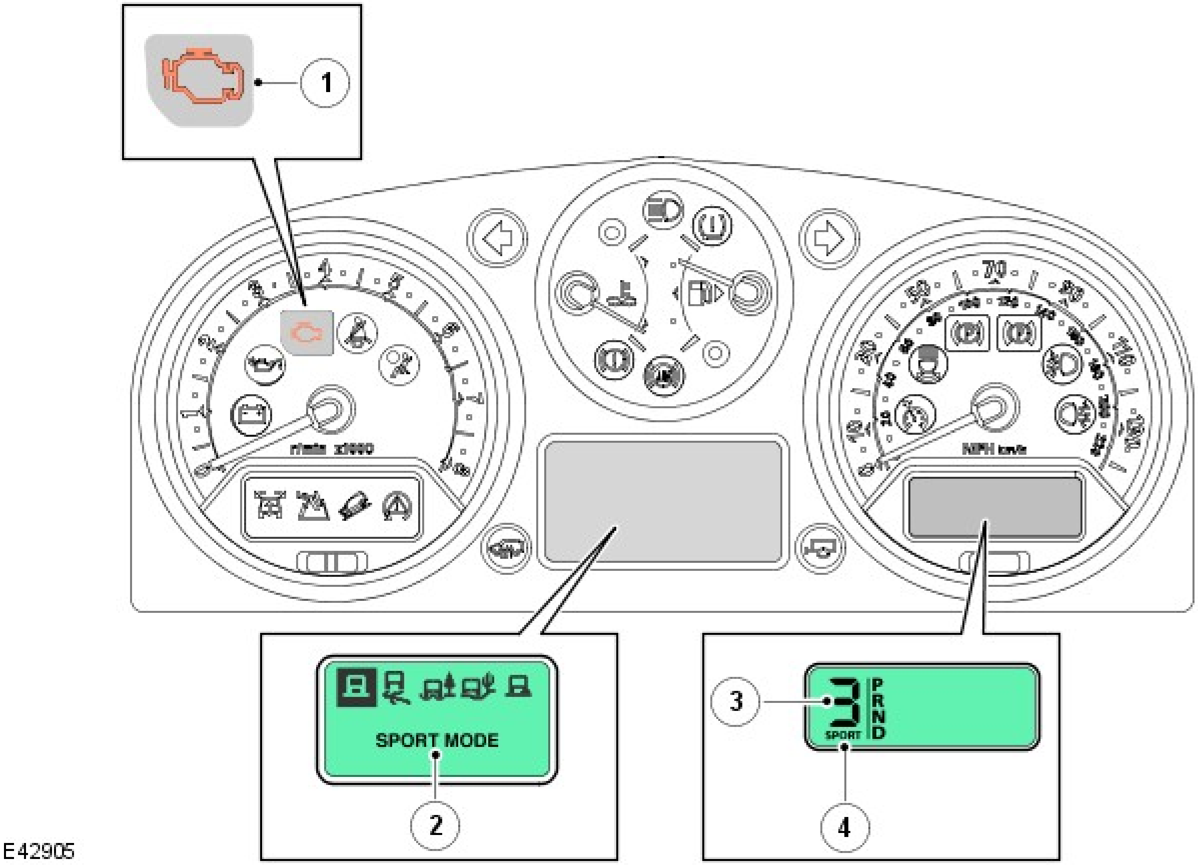
6	-	Selector indicator (M/S +/-)
7	-	Fusible link 7E (50A)
8	-	Fuse 43P (5A)
9	-	Selector lever assembly
10	-	Fuse 33P (5A)
11	-	Ignition switch
12	-	Fusible link 10E (30A)
13	-	Fuse 27P (5A) – Ignition feed
14	-	Fuse 4E (10A) – Permanent feed
15	-	Starter relay

SELECTOR POSITION SWITCH

The Mechatronic valve block contains a position switch which is mechanically connected to the selector spool valve. The selector spool valve is connected by a selector shaft to the selector lever via a 'Bowden' selector cable.

The signals from the position switch are used by the TCM to determine the P, R, N or D selection made by the driver.

INSTRUMENT CLUSTER



Item	Part Number	Description
1	-	Malfunction Indicator Lamp (MIL)
2	-	Message centre
3	-	Selector lever position indicator
4	-	Mode display

The instrument cluster is connected to the TCM via the high speed CAN bus. Transmission status is transmitted by the TCM and displayed to the driver in one of two displays in the instrument cluster.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

Malfunction Indicator Lamp (MIL)

The MIL is located in the tachometer in the instrument cluster. Transmission related faults which may affect the vehicle emissions output will illuminate the MIL.

The MIL is illuminated by the ECM on receipt of a relevant fault message from the TCM on the high speed CAN. The nature of the fault can be diagnosed using a Land Rover approved diagnostic system which reads the fault codes stored in the TCM memory.

Transmission Status Display

The transmission status display is located in a Liquid Crystal Display (LCD) within the speedometer housing. The LCD shows the selector lever position and the selected transmission mode. When the selector lever is in the manual CommandShift™ position, the selector lever position display will show the selected gear ratio.

The following table shows the displays and their descriptions.

Symbol	Description
P	Park selected
R	Reverse selected
N	Neutral selected
D	Drive selected
1	1st gear selected (Manual CommandShift™ mode)
2	2nd gear selected (Manual CommandShift™ mode)
3	3rd gear selected (Manual CommandShift™ mode)
4	4th gear selected (Manual CommandShift™ mode)
5	5th gear selected (Manual CommandShift™ mode)
6	6th gear selected (Manual CommandShift™ mode)

Message Centre Display

The message centre is located in the lower centre of the instrument cluster. The message centre is a LCD to relay vehicle status and operating information to the driver. The message centre can display messages relating to a number of the vehicle systems. The following list shows the possible transmission related messages:

- TRANSMISSION FAULT LIMITED GEARS AVAILABLE
- TRANSMISSION FAULT AND OVERHEAT
- TRANSMISSION FAULT
- TRANSMISSION OVERHEAT

TRANSMISSION CONTROL MODULE (TCM)

The TCM is an integral part of the Mechatronic valve block which is located at the bottom of the transmission, within the fluid pan. The TCM is the main controlling component of the transmission.

The TCM processes signals from the transmission speed and temperature sensors, engine control module and other vehicle systems. From the received signal inputs and pre-programmed data, the module calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-up clutch control.

The TCM outputs signals to control the shift control solenoid valve and the Electronic Pressure Regulator Solenoids (EPRS) to control the hydraulic operation of the transmission.

The ECM supplies the engine management data on the high speed CAN bus system. The TCM requires engine data to efficiently control the transmission operation, for example; flywheel torque, engine speed, accelerator pedal angle, engine temperature etc.

The steering angle sensor and the ABS module also supply data to the TCM on the high speed CAN bus system. The TCM uses data from these systems to suspend gear changes when the vehicle is cornering and/or the ABS module is controlling braking or traction control.

The selector lever is connected to the automatic transmission and the position switch in the transmission by a Bowden cable. Movement of the selector lever moves the position switch via the Bowden cable and the switch position informs the TCM of the selected position. The sport/manual +/- CommandShift switch passes manual/sport selections to the TCM. An additional switch provides a selector lever in park position signal. Once the selector lever position is confirmed, the TCM outputs appropriate information which is received by the instrument cluster to display the gear selection information in the message centre.

The Mechatronic valve block also contains the speed and temperature sensors. These are integral with the Mechatronic valve block and cannot be serviced individually. The speed sensors measure the transmission input and output speeds and pass signals to the TCM. The fluid temperature sensor is also located in the valve block and measures the fluid temperature of the transmission fluid in the fluid pan.

The TCM is connected to the starter relay coil. When the selector lever is in PARK or NEUTRAL, the module provides a ground for the coil allowing the starter relay to be energised and allow starter motor operation. If the selector lever is in any other position, the module will not provide the ground preventing starter motor operation.

DIAGNOSTICS

The diagnostic socket is located in the lower instrument panel closing panel, on the driver's side, below the steering column.

The diagnostic socket allows the exchange of information between the various modules on the bus systems and a Land Rover approved diagnostic system or a diagnostic tool using ISO14229 protocol. The information is communicated to the socket via the high speed CAN bus from the TCM. This allows the retrieval of diagnostic information and programming of certain functions using a Land Rover approved diagnostic system or a suitable diagnostic tool.

CONTROLLER AREA NETWORK (CAN)

The high speed CAN broadcast bus network is used to connect the powertrain modules. The CAN bus is connected between the following electronic units:

High Speed CAN Bus

- TCM
- Instrument cluster
- Air suspension module
- Steering angle sensor
- Rear differential module
- Centre console switch pack
- Electric park brake module
- Restraints control module
- Engine Control Module (ECM)
- ABS module
- Adaptive front lighting control module
- Transfer box control module
- Adaptive cruise control module
- Diagnostic socket.

The CAN bus allows a fast exchange of data between modules. The CAN bus comprises two wires which are identified as CAN high (H) and CAN low (L). The two wires are coloured yellow/black (H) and yellow/brown (L) and are twisted together to minimise electromagnetic interference (noise) produced by the CAN bus messages.
For additional information, refer to: Communications Network (418-00 Module Communications Network, Description and Operation).

In the event of CAN bus failure, the following symptoms may be observed:

- Transmission operates in default mode
- Torque converter lock-up clutch control is disabled
- Gear position indication in instrument cluster message centre inoperative (this will also occur with any transmission fault).

DRIVING MODES

There are a number of different driving modes of operation. Some can be selected by the driver and some are automatically initiated by the TCM during driving:

- Normal mode
- Sport mode
- Manual (CommandShift™) mode
- Adaptive Shift Strategy (ASIS)
- Hill Descent Control (HDC) mode
- Cruise mode
- Hill mode
- Default (Limp home) mode
- Reverse lock-out mode
- Cooling strategy.
- Curve recognition mode
- Fast off recognition

Normal Mode

Normal mode is automatically selected by the TCM on power up. In this mode all automatic and adaptive modes are active. Normal mode uses gear shift and lock-up maps to allow for vehicle operation which offers fuel consumption and emissions or driveability depending on the driving style. If the transmission is operated in sport or manual mode and the selector lever is moved to the 'D' position, normal mode is automatically resumed.

Sport Mode

Sport mode operates in high range only and provides enhanced acceleration and responsiveness. In sport mode the TCM uses shift maps which allow the transmission to downshift more readily, hold gears for longer at higher engine speeds, and limits the transmission to the first five gears (6th gear is not used).

Sport mode is selected by moving the selector lever to the left into the 'M/S' position. When the sport mode is first selected, 'SPORT' is displayed in the message centre for 6 seconds and, if 6th gear is currently engaged, the TCM downshifts to 5th.

Manual (CommandShift™) Mode

Manual mode allows the transmission to operate as a semi-automatic 'CommandShift™' unit. The driver can change up and down the six forward gears with the freedom of a manual transmission.

Shift maps are provided for manual mode to protect the engine at high engine speeds. The TCM will automatically change up to a higher gear ratio to prevent engine overspeed and change down to a lower gear ratio to avoid engine labouring and stalling.

When kickdown is requested the TCM downshifts at least 2 gears.

When the vehicle is stationary, to drive off the driver can select 1st , 2nd or 3rd gear in low and high range. Any other gear selection will be rejected by the TCM.

When driving off, upshifts can be pre-selected by making + selections with the selector lever for the number of upshifts required. The TCM then automatically performs a corresponding number of upshifts when the appropriate shift points are reached. So, for example, when starting off in 1st gear, if three + selections are made in quick succession, the TCM will automatically change up through the box to 4th gear as the vehicle accelerates, without any further selections being made.

In manual mode a low gear can be selected to provide engine braking for descending a slope without HDC or continuous use of the brake pedal. The driver can prepare for the end of the descent by moving the selector lever to D. The TCM will maintain the low gear and only revert to automatic shift control when the throttle is opened and vehicle speed increases.

Adaptive Shift Strategy (ASIS)

The ASIS system is a new feature on automatic transmissions. With the TCM linked via the CAN bus to other vehicle systems, signals are received which can allow the TCM to calculate the way in which the vehicle is being driven. The type of signals include the following:

- Longitudinal and lateral acceleration
- Engine speed
- Engine torque
- Oil temperature
- Accelerator pedal position
- Wheel speed.

Using these signals, additional transmission control can be obtained. The TCM can calculate when the vehicle is cornering, all wheels are gripping, the driver is braking or if the driver is accelerating. This is the conventional 'Adaptive' transmission control. ASIS uses this system but adds the continuous adaptation of the gear changes to the individual driving style of the driver.

HDC Mode

The HDC mode assists the ABS module in controlling the downhill speed of the vehicle. When HDC is selected on, the ABS module selects the most appropriate gear for the descent, to maximise engine braking.

Cruise Mode

When speed control is activated, the TCM receives a cruise active message on the CAN bus. The TCM activates a speed control map which prevents locking and unlocking of the torque converter clutch and minimises up and down shifts.

Hill Mode

Hill mode is initiated by the TCM when the engine torque, via ECM signals on the CAN bus, exceeds the theoretical load curve for normal operation. The TCM monitors this signal to determine when the vehicle is travelling up or down a steep gradient.

In hill mode the TCM adopts one of four shift maps, three uphill and one downhill. The shift map chosen depends on the severity of the slope as determined from the engine signals and the appropriate gear is selected to assist with the ascent or descent.

Hill mode can also be initiated when the vehicle is at very high altitudes or ambient temperatures, and also when the vehicle is towing.

Default (Limp Home) Mode

If a transmission fault is detected by the TCM, the TCM adopts a limp home mode strategy. 'TRANS. FAILSAFE' is displayed in the message centre and, if the fault has an effect on engine emissions, the MIL will also be illuminated.

In default mode, P, R and N functions operate normally (if the fault allows these selections) and the TCM locks the transmission in 3rd or 5th gear to allow the driver to take the vehicle to the nearest dealer. The torque converter lock-up clutch is disabled and reverse lock-out will not function.

If the vehicle is stopped and subsequently restarted in the default mode condition, the TCM operates normally until the fault which caused the condition is detected again.

When limp home mode is active, the gear position indicator will show one of the following letters which defines the fault type:

- 'F' - transmission is operating in limp home mode
- 'H' - transmission has reached overheat threshold temperature and transmission is operating in limp home mode
- 'E' - CAN bus is off and transmission is operating in limp home mode.

If electrical power is lost and the transmission is operating in mechanical limp home mode, the selector lever will not be locked in the 'N' position by the shift interlock solenoid. The lever will be locked in the 'P' position and can only be released by using the interlock emergency release lever or by correcting the electrical fault.

Reverse Lock-Out Mode

When the vehicle is travelling forwards, selecting reverse could cause transmission damage. To protect against this, reverse gear is prohibited if the vehicle is travelling forwards at a road speed of 5 mph (8 km/h) or higher.

Cooling Strategy

The purpose of the cooling strategy is to reduce engine and transmission temperatures during high load conditions, when towing a trailer for example. Under these conditions the engine and transmission may generate excessive heat.

If the transmission fluid temperature increases to 125ºC (257ºF) or higher, the TCM employs the cooling strategy. The message 'TRANSMISSION OVERHEAT' is displayed in the message centre.

The strategy uses a specific shift and torque converter lock-up clutch map. This map allows torque converter clutch lock-up and gear shifts to operate outside of their normal operation. This will reduce the engine speed and/or slip in the torque converter, therefore reducing heat generated by the engine and the transmission.

If the transmission fluid temperature increases to 137°C (278ºF) or higher, the transmission will use the default (limp home mode). 'H' is displayed in the gear position indicator. If the temperature exceeds 140ºC (284ºF), CAN bus transmission is disabled and 'E' is displayed in the gear position indicator.

The cooling strategy is cancelled when the transmission fluid temperature decreases to less than 120ºC (248ºF) or below.

Curve Recognition

Curve recognition is activated when high levels of lateral acceleration and/or steering angle are detected via the ABS module and steering angle sensor signals on the CAN bus. When this condition is detected, the TCM prevents the transmission from changing to a higher gear to assist with cornering. When the vehicle completes it manoeuvre, the transmission will shift to the correct ratio.

Fast Off Recognition

Fast off recognition is activated when the TCM detects that the driver has backed off the accelerator pedal quickly in a 'change of mind' manoeuvre. This is detected by monitoring for a high level of negative pedal angle from the engine control module signal on the CAN bus. If this condition is detected, the TCM holds the current gear ratio to allow the driver to complete his original action without the need for a downshift. The mode remains active for a predetermined time period or if the driving style remains passive.

Terrain Response™ Mode

If the vehicle has the Terrain Response system fitted, the following additional modes are available.
For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

Grass/Gravel/Snow

When the driver selects the Terrain Response grass/gravel/snow special program with the transfer box in either high or low range, the TCM uses a specific set of shift and torque converter maps to optimise the delivery of torque to the wheels and to minimise wheel slip in these terrains. To assist with the vehicle moving from a standstill, the TCM automatically selects 2nd gear in high range and 3rd gear in low range. This special program is fully integrated with hill mode to enhance vehicle control during ascents and descents.

Mud/Ruts

When the driver selects the Terrain Response mud/ruts special program with the transfer box in either high or low range, the TCM uses a specific set of shift and torque converter maps to optimise vehicle traction in this terrain.

Sand

When the driver selects the Terrain Response sand special program with the transfer box in either high or low range, the TCM uses a specific set of shift and torque converter maps to optimise the tractive performance in sand by holding onto gears longer and downshifting more readily. This mode is fully integrated with the hill mode to further enhance performance during ascents.

Rock Crawl

When the driver selects the Terrain Response rock crawl special program, which is only available with the transfer box in low range, the TCM uses a specific shift map which maximises torque delivery at slow speeds associated with this type of terrain.

TRANSMISSION FAULT STATUS

If the TCM detects a fault with the transmission system, it will enter a default mode to prevent further damage to the transmission and allow the vehicle to be driven.

When a fault is detected a CAN message is sent from the TCM and is received by the instrument cluster. The instrument cluster illuminates the MIL and displays 'TRANS. FAILSAFE' in the message centre.

Some transmission faults may not illuminate the MIL or display a fault message, but the driver may notice a reduction in shift quality.

ENGINE SPEED AND TORQUE MONITORING

The ECM constantly supplies the TCM with information on engine speed and torque through messages on the CAN bus. The TCM uses this information to calculate the correct and appropriate timing of shift changes.

If the messages are not received by the ECM, the TCM will implement a back-up strategy to protect the transmission from damage and allow the vehicle to be driven.

In the event of an engine speed or torque signal failure, the transmission will adopt the electrical limp home mode with the transmission operating in a fixed gear.

TOWING FOR RECOVERY

The following procedure must be used to ensure that the vehicle is towed in a safe condition and damage to the vehicle transmission system is prevented.

- Secure the towing attachment from the recovery vehicle to the towing eye of the vehicle to be recovered.
- Make sure that the parking brake is on. Turn the ignition key to the ignition position II.
- Apply the footbrake and move the automatic transmission selector lever to the neutral position. If electrical power is not available, use the manual interlock release tab on the selector lever to move the lever to the neutral (N) position.
- Make sure that the ignition is in the auxiliary position I or, if the stop lamps and turn signal indicators are required, in the ignition position II.
- Make sure that the parking brake is released before the vehicle is towed.
- The vehicle can only be towed for a maximum of 31 miles (50 km) at a maximum speed of 30 mph (50 km/h). Towing the vehicle for longer distances and/or faster speeds will damage the transmission.

⚠ WARNING: Do not remove the key or move the ignition switch to position 'O' when the vehicle is being towed. The steering lock will be engaged preventing the steering from being turned.

With the engine not running, the brake booster and power steering pump will be inoperative. Care must be taken to ensure the vehicle is manoeuvred and driven accordingly.

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Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Automatic Transmission

Diagnosis and Testing

Overview

This section is intended to provide a means for the technician to diagnose transmission component faults, rather than replacing the entire unit.

However, there are a number of situations where the replacement of the unit is the only practical solution, and this section will cover the diagnosis necessary to gather the information required for transmission replacement to be authorized by the warranty prior approval program (WPAP) where it applies, as well as covering the diagnostic trouble codes (DTCs) stored by the control module.

The basic checks of the transmission (fluid condition and level, etc) should be carried out first, and this will mean using the approved diagnostic system or other equipment with data logging facility to monitor temperatures, etc.

For information on the operation of the transmission, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection Chart

Mechanical	Electrical
● Fluid condition ● Fluid level ● Fluid leaks ● Fluid cooler ● External linkages ● Gear selector lever	● Fuses ● Wiring harnesses ● Electrical connector(s) ● Transmission control module (TCM) ● Engine control module (ECM) ● Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification.

Preliminary inspection

1. **1.** As much information as possible should be obtained from the owner/driver about the fault in order to assist with the diagnosis. Time spent on this will reduce the necessity for extensive road testing and possible missed diagnosis.
    - The information required for WPAP is still useful as an aid to diagnosis, even where the system is not in operation

Required information for WPAP (where applicable)

- The nature of the fault (loss of drive, slip, judder, gear shift quality, noise, etc)
- The frequency with which the fault occurs
- The conditions under which the fault occurs, including temperature (coolant and ambient), selected gear, road speed, engine speed, and any specific conditions
- Check and rectify non-transmission related DTCs before continuing with transmission diagnosis

2. **2.** Record the vehicle details, including:

- Service history
- The transmission serial number
- The transmission software level

3. **3.** Visually inspect the transmission for fluid leaks, damage, etc.
4. **4.** Check the transmission fluid condition.

• NOTE: Fluid condition is a good indicator of the transmission internal condition. If the fluid is burnt and/or contaminated, this would usually mean the internal damage to the transmission is at such a level that unit replacement is the best option. Compare the fluid drained from the transmission with fresh fluid for color and odor.

5. **5.** Check the transmission fluid level. Refer to the relevant workshop manual section.

• NOTE: This is crucial to the operation of the transmission, and the procedure must be closely followed to avoid inaccurate diagnosis, with the resultant possible rejection of a warranty claim.

6. **6.** Check the engine idle speed and throttle sensor using the approved diagnostic system or a scan tool.
7. **7.** Check the transmission selector cable adjustment. Refer to the relevant workshop manual section.
8. **8.** Check the transmission range sensor adjustment.
    - A comprehensive procedure for transmission range sensor setting is accessible through the approved diagnostic system.

If any faults are found and rectified in the above sequence, clear any DTCs and test the vehicle for normal operation.

If a failure condition is found indicating the need to renew the transmission assembly, the request must go through the warranty prior approval program (where applicable) before work is begun.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
P012100	Throttle/Pedal Position Sensor A Circuit Range/Performance	● Throttle position sensor wiring high resistance ● Throttle position sensor sensing circuits (Throttle position 1 or Throttle position 2) short circuit to power ● Throttle position sensor failure ● Range/Performance - Kickdown at low pedal openings	Check for pedal position sensor DTCs. Configure the module using the approved diagnostic system.
P021900	Engine Overspeed Condition	● Engine speed implausible	Check for engine management DTCs.
P050000	Vehicle Speed Sensor A	● Vehicle speed signal not detected	Check for ABS DTCs. Check the CAN circuits. Refer to the electrical guides.
P050100	Vehicle Speed Sensor A Range/Performance	● Range/Performance	Check for input/output sensor DTCs. Check the CAN circuits. Refer to the electrical guides.
P056100	System Voltage Unstable	● Power supply voltage is out of range when the engine is running	Check the battery and charging system. Refer to the relevant workshop manual section.
P056200	System Voltage Low	● Supply voltage to TCM very low	Check the battery condition and state of charge. Check the TCM supply circuits. Refer to the electrical guides.
P056300	System Voltage High	● Power supply voltage is too high if the engine is running and there has been no jump-start or transmission limp-home event	Check the battery and charging system. Refer to the relevant workshop manual section. Check if the vehicle has been jump-started.
P060100	Internal Control Module Memory Check Sum Error	● Checksum error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P060300	Internal Control Module Keep Alive Memory (KAM) Error	● Keep-alive memory (KAM) error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P060500	Internal Control Module Read Only Memory (ROM) Error	● Read only memory (ROM) error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P061300	TCM Processor	● Processor	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P062F00	Internal Control Module EEPROM Error	● EEPROM error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P064200	Sensor Reference Voltage A Circuit Low	● Reference voltage circuit: short circuit to ground ● Reference voltage circuit: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P064300	Sensor Reference Voltage A Circuit High	● Reference voltage circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P065700	Actuator Supply Voltage A Circuit / Open	● Supply voltage circuit: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P065800	Actuator Supply Voltage A Circuit Low	● Supply voltage circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P065900	Actuator Supply Voltage A Circuit High	● Supply voltage circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P066800	PCM / ECM / TCM Internal Temperature Sensor A Circuit Low	● Temperature sensor circuit: high resistance ● Temperature sensor circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P066900	PCM / ECM / TCM Internal Temperature Sensor A Circuit High	● Temperature sensor circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P070500	Transmission Range Sensor A Circuit (PRNDL Input)	● Signal implausible	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071000	Transmission Fluid Temperature Sensor A Circuit	● Temperature rise rate too low	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071100	Transmission Fluid Temperature Sensor A Circuit Range/Performance	● Sensor circuits: short circuit to each other	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071200	Transmission Fluid Temperature Sensor A Circuit Low	● Sensor circuit: high resistance ● Sensor circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071300	Transmission Fluid Temperature Sensor A Circuit High	● Sensor circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071600	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance	● Sensor circuit: high resistance ● Sensor circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071700	Turbine/Input Shaft Speed Sensor A Circuit No Signal	● Sensor circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072000	Output Shaft Speed Sensor Circuit	● Sensor circuit: short circuit to power ● Sensor circuit: high resistance ● Sensor circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072122	Output Shaft Speed Sensor Circuit Range/Performance	● Range/Performance - Signal amplitude	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072127	Output Shaft Speed Sensor Circuit Range/Performance	● Range/Performance ● Signal rate of change above threshold	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072164	Output Shaft Speed Sensor Circuit Range/Performance	● Range/Performance ● Signal plausibility failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072900	Gear 6 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
P073000	Incorrect Gear Ratio	● Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073100	Gear 1 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073200	Gear 2 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073300	Gear 3 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073400	Gear 4 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073500	Gear 5 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073600	Reverse Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P074000	Torque Converter Clutch Solenoid Circuit / Open	● Solenoid circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P074100	Torque Converter Clutch Solenoid Circuit Performance/Stuck Off	● Solenoid circuit stuck off	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P074800	Pressure Control Solenoid A Electrical	● Solenoid current too high/low	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075113	Shift Solenoid A Performance/Stuck Off	● Performance ● Stuck off ● Solenoid circuit: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075114	Shift Solenoid A Performance/Stuck Off	● Performance ● Stuck off ● Solenoid circuit: high resistance ● Solenoid circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075200	Shift Solenoid A Stuck On	● Stuck on	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075300	Shift Solenoid A Electrical	● Solenoid circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P077800	Pressure Control Solenoid B Electrical	● Solenoid current too high	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P078000	Shift malfunction	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078123	1 - 2 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P078162	1 - 2 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078164	1 - 2 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.

DTC	Description	Possible causes	Action
P078262	2 - 3 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078264	2 - 3 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078323	3 - 4 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P078362	3 - 4 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078364	3 - 4 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078423	4 - 5 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P078462	4 - 5 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078464	4 - 5 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P079800	Pressure Control Solenoid C Electrical	● Solenoid current too high	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P081C00	Park Input Circuit	● Park lock signal fault	Check the gear selector input circuits. Refer to the electrical guides.
P082600	Up and Down Switch Circuit	● Implausible signal	Check the up and down switch circuits. Refer to the electrical guides.
P082923	5-6 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P082962	5-6 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P082964	5-6 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P085000	Park / Neutral Switch Input Circuit	● Starter inhibit signal fault	Check the starter inhibit circuits. Refer to the electrical guides.
P089700	Transmission Fluid Deteriorated	● Temperature too high over too long a time	Renew the fluid.
P092800	Gear Shift Lock Solenoid/Actuator Circuit A / Open	● Solenoid circuit: high resistance	Check the solenoid circuits. Refer to the electrical guides.
P092900	Gear Shift Lock Solenoid/Actuator Circuit A Range/Performance	● Solenoid circuit: short circuit to ground ● Solenoid circuit: high resistance	Check the solenoid circuits. Refer to the electrical guides.
P093000	Gear Shift Lock Solenoid/Actuator Circuit A Low	● Solenoid circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P093100	Gear Shift Lock Solenoid/Actuator Circuit A High	● Solenoid circuit: short circuit to power	Check the solenoid circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
P093800	Hydraulic Oil Temperature Sensor Range/Performance	- Range/Performance - Signal not plausible	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P096013	Pressure Control Solenoid A Control Circuit / Open	- Control circuit: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P096014	Pressure Control Solenoid A Control Circuit / Open	- Control circuit: high resistance - Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096200	Pressure Control Solenoid A Control Circuit Low	- Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096300	Pressure Control Solenoid A Control Circuit High	- Control circuit: short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P096413	Pressure Control Solenoid B Control Circuit / Open	- Control circuit: high resistance	Check the solenoid circuits. Refer to the electrical guides.
P096414	Pressure Control Solenoid B Control Circuit / Open	- Control circuit: high resistance - Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096600	Pressure Control Solenoid B Control Circuit Low	- Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096700	Pressure Control Solenoid B Control Circuit High	- Control circuit: short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P096813	Pressure Control Solenoid C Control Circuit / Open	- Control circuit: high resistance	Check the solenoid circuits. Refer to the electrical guides.
P096814	Pressure Control Solenoid C Control Circuit / Open	- Control circuit: high resistance - Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P097000	Pressure Control Solenoid C Control Circuit Low	- Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P097100	Pressure Control Solenoid C Control Circuit High	- Control circuit: short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P178300	Transmission Overtemperature Condition	- Valve body module shut-down detected on last drive cycle	Check the fluid level and condition. Check for associated DTCs.
P271600	Pressure Control Solenoid D Electrical	- Solenoid current too high	Check the solenoid circuits. Refer to the electrical guides.
P271813	Pressure Control Solenoid D Control Circuit / Open	- Control circuit: high resistance	Check the solenoid circuits. Refer to the electrical guides.
P271814	Pressure Control Solenoid D Control Circuit / Open	- Control circuit: high resistance - Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P272000	Pressure Control Solenoid D Control Circuit Low	- Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P272100	Pressure Control Solenoid D Control Circuit High	- Control circuit: short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P272500	Pressure Control Solenoid E Electrical	- Solenoid current too high	Check the solenoid circuits. Refer to the electrical guides.
P272713	Pressure Control Solenoid E Control Circuit / Open	- Control circuit: high resistance	Check the solenoid circuits. Refer to the electrical guides.
P272714	Pressure Control Solenoid E Control Circuit / Open	- Control circuit: high resistance - Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P272900	Pressure Control Solenoid E Control Circuit Low	- Control circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
P273000	Pressure Control Solenoid E Control Circuit High	● Control circuit: short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P275900	Torque Converter Clutch Pressure Control Solenoid Electrical	● Pressure control solenoid fault	Check the solenoid circuits. Refer to the electrical guides.
P276100	Torque Converter Clutch Pressure Control Solenoid Control Circuit / Open	● Pressure control solenoid circuit: high resistance	Check the solenoid circuits. Refer to the electrical guides.
P276200	Torque Converter Clutch Pressure Control Solenoid Control Circuit Range / Perf	● Pressure control solenoid circuit: current too low	Check the solenoid circuits. Refer to the electrical guides.
P276300	Torque Converter Clutch Pressure Control Solenoid Control Circuit High	● Pressure control solenoid circuit: short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P276400	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low	● Pressure control solenoid circuit: short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
U000188	High Speed CAN Communication Bus	● Bus off	The module setting this code has disabled CAN transmission. Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
U010087	Lost Communication With ECM/PCM "A"	● Missing message	Check the ECM and circuits. Refer to the electrical guides.
U010287	Lost Communication with Transfer Case Control Module	● Missing message	Check the transfer case control module and circuits. Refer to the electrical guides.
U010487	Lost Communication With Cruise Control Module	● Missing message	Check the speed control control module and circuits. Refer to the electrical guides.
U012287	Lost Communication With Vehicle Dynamics Control Module	● Missing message	Check the ABS module and circuits. Refer to the electrical guides.
U012687	Lost Communication With Steering Angle Sensor Module	● Missing message	Check the steering angle sensor and circuits. Refer to the electrical guides.
U012887	Lost Communication With Park Brake Control Module	● Missing message	Check the parking brake control module and circuits. Refer to the electrical guides.
U013887	Lost Communication with All Terrain Control Module	● Missing message	Check the all-terrain control module and circuits. Refer to the electrical guides.
U015587	Lost Communication With Instrument Panel Cluster (IPC) Control Module	● Missing message	Check the instrument cluster and circuits. Refer to the electrical guides.
U030055	Internal Control Module Software Incompatibility	● Module is not configured	Configure the module using the approved diagnostic system.
U040186	Invalid Data Received from ECM/PCM A	● Signal invalid	Check the engine speed at the instrument cluster. Check for ECM DTCs.
U041686	Invalid Data Received From Vehicle Dynamics Control Module	● Signal invalid	Check for ABS DTCs.
U30004A	Control Module	● Incorrect component installed - Mismatch between configuration data and read configuration	Configure the module using the approved diagnostic system.

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Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Transmission Fluid Drain and Refill

General Procedures

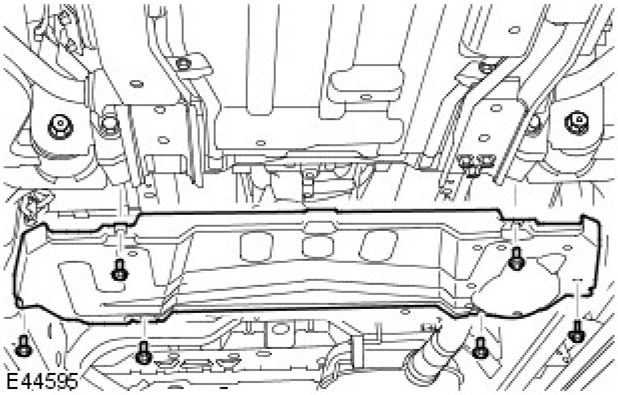
- WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

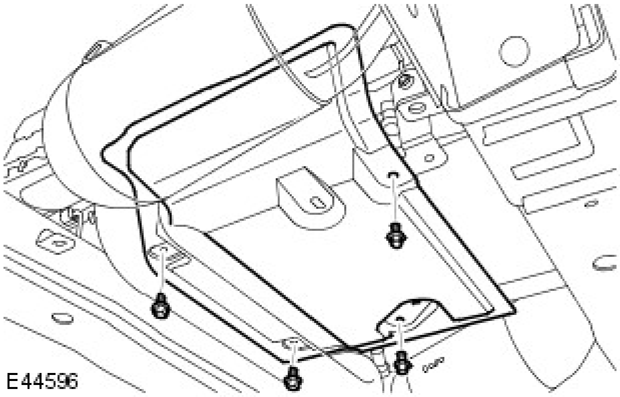
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. Remove the transmission undershield.

- Remove the 6 bolts.

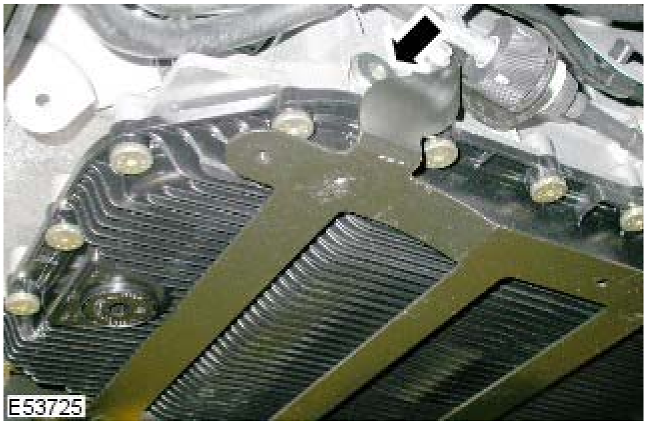


3. If installed, remove the transmission heat shield.

- Remove the 4 bolts.

4. Clean the area around the transmission fluid drain and filler plugs.

5. Place a container under the transmission.



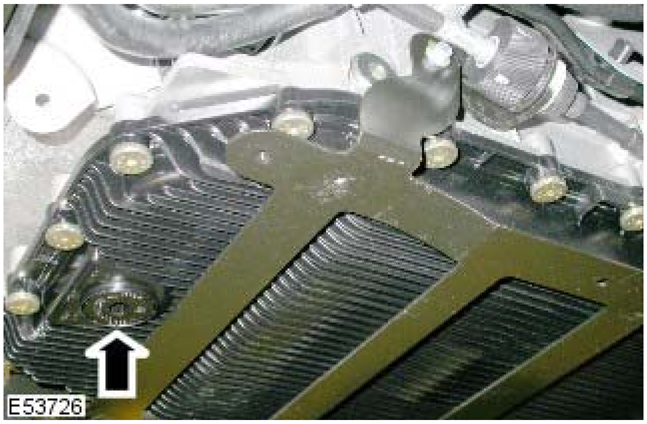
6. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

Remove the transmission fluid filler/level plug.

- Remove and discard the sealing washer.



7. Remove the transmission fluid drain plug.

- Remove and discard the sealing washer.
- Allow the fluid to drain.

8. Install the transmission fluid drain plug and tighten to 9 Nm (7 lb.ft).

- Install a new sealing washer.

9. Add 3.5 to 4 liters of the correct transmission fluid, or until a small thread of fluid runs from the filler/level hole.

10. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Transmission Fluid Level Check

General Procedures

• WARNINGS:

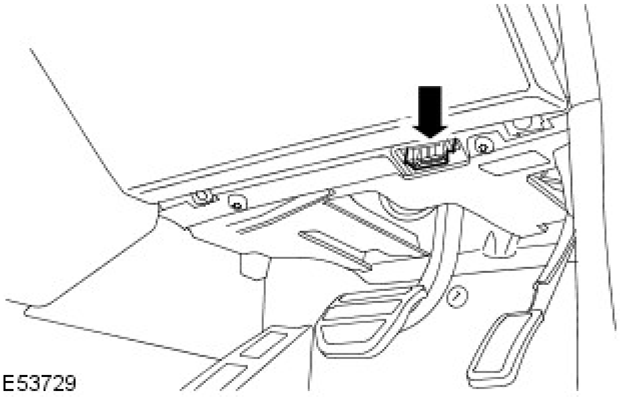
⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

⚠ CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

1. The following steps must be observed before starting the transmission fluid level check and top-up.

- The vehicle must be on a horizontal ramp.
- The parking brake must be applied.
- The wheels must be chocked.



2. ⚠ CAUTION: Make sure the transmission fluid temperature is below 30 degrees before starting the fluid level check.

Using the approved Land Rover diagnostic equipment, monitor the transmission fluid temperature.

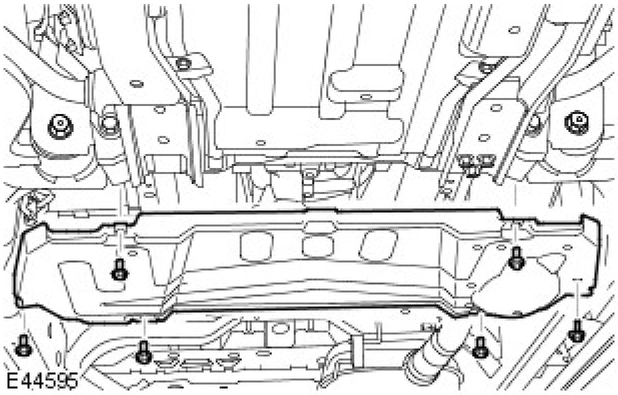
3. Start the engine. Move the selector lever from 'P' through all gear positions, pausing in each gear position for 2-3 seconds and return to the 'P' position.

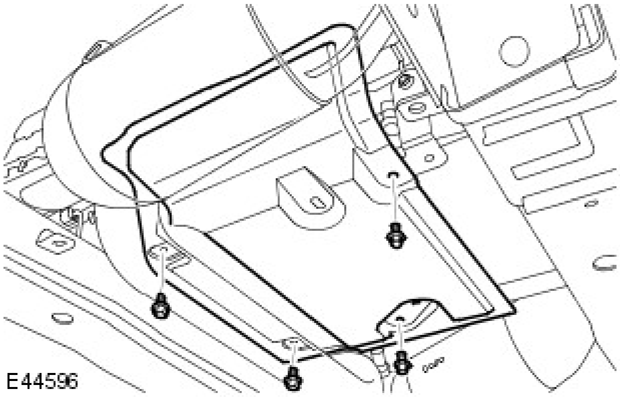
4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

5. Remove the transmission undershield.

- Remove the 6 bolts.

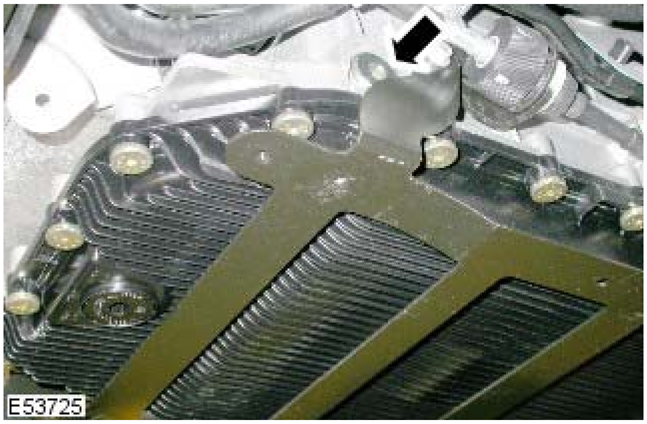




6. If installed, remove the transmission heat shield.

- Remove the 4 bolts.

7. Place a container under the transmission.



8. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

⚠ CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

Remove the transmission fluid filler/level plug.

- Clean the area around the filler/level plug.
- Remove and discard the sealing washer.

9. If no fluid loss is apparent when the filler/level plug is removed, with the engine at idle, continue to fill the transmission until a small thread of oil runs from oil filler/level hole.

10. Install the transmission fluid filler/level plug and tighten to 35 Nm (26 lb.ft).

- Install a new sealing washer.
- Remove the container.

11. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

12. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Disconnect the approved Land Rover diagnostic equipment from the vehicle.

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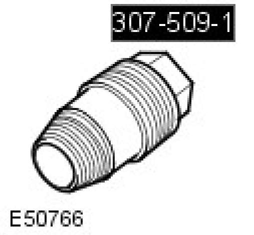
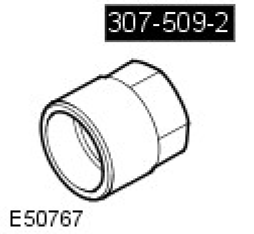
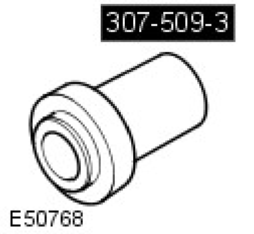
Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Selector Shaft Seal

In-vehicle Repair

Special Tool(s)	
	Seal extractor 307-509/1 (LRT-44-033/1)
	Seal extractor 307-509/2 (LRT-44-033/2)
	Seal installer 307-509/3 (LRT-44-033/3)

Removal

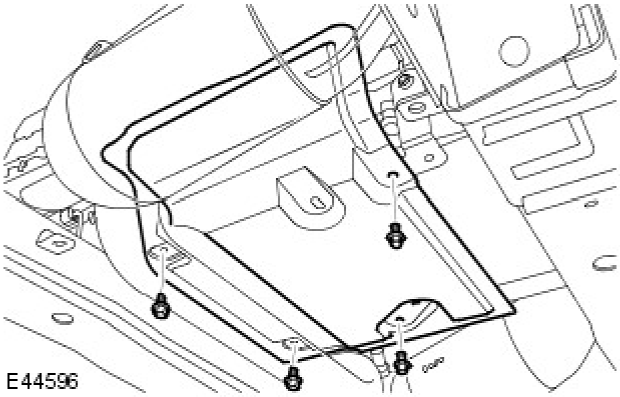
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

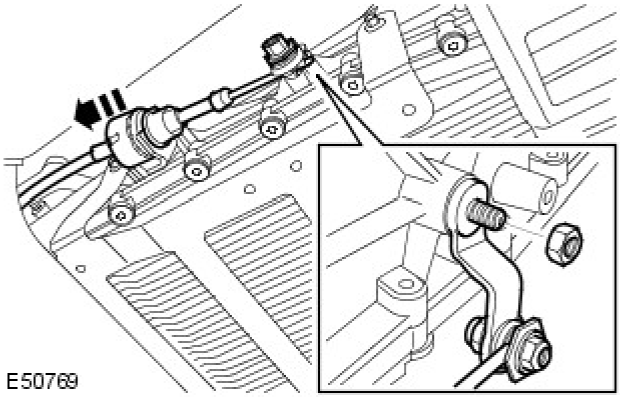
Raise and support the vehicle.

2. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

3. Remove the transmission heat shield.

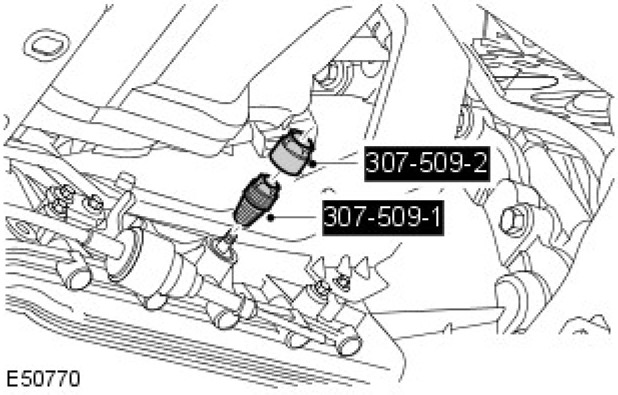
- Remove the 4 bolts.




E50769

4. Release the selector cable and lever.

- Remove the nut.
- Compress the latch and release the cable.



E50770

5. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

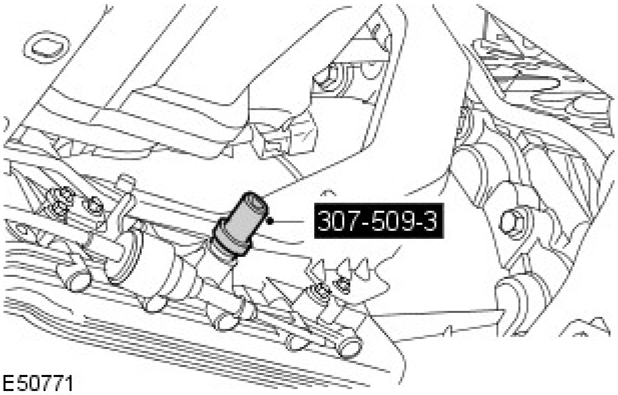
Remove the selector shaft seal.

- Install 307-509-1 to the seal.
- Install 307-509-2 to 307-509-1 and extract the seal.

Installation

1. Using 307-509-3, install the selector shaft seal.

- Clean the components.



E50771

2. Install the selector cable and bracket.

- Secure with the clip.
- Tighten the nut to 12 Nm (9 lb.ft).

3. Install the transmission heat shield.

- Install the bolts.

4. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).

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Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Transmission Control Module (TCM)

In-vehicle Repair

Removal

- NOTE: The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.

1. Remove the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, In-vehicle Repair).

Installation

1. Install the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, In-vehicle Repair).

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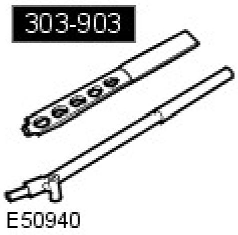
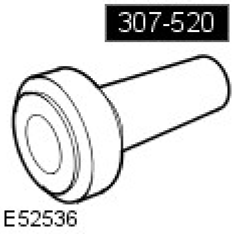
Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Output Shaft Seal

In-vehicle Repair

Special Tool(s)	
	Oil seal remover (LRT-12-092) 303-903
	Oil seal installer 307-520

Removal

1. Disconnect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

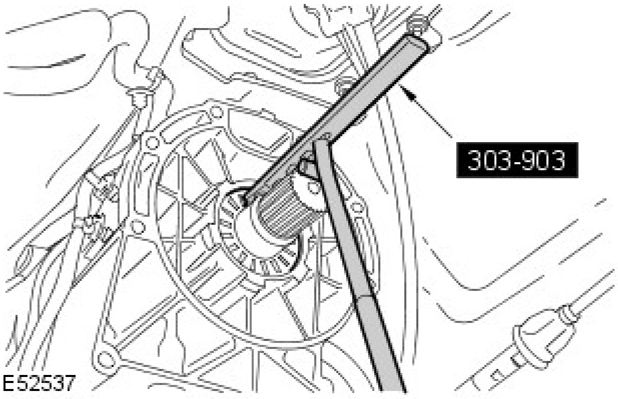
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transfer case.

For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

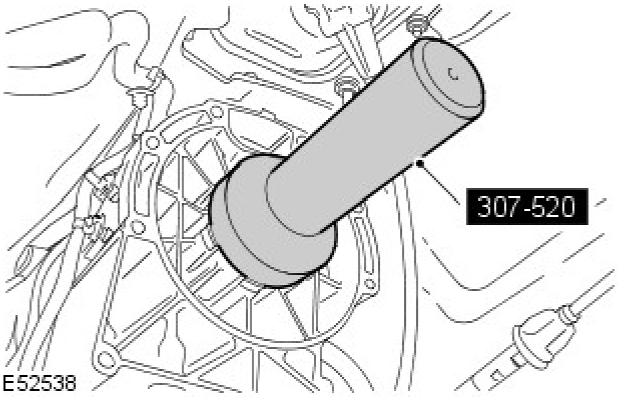
4. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.



Remove the transmission output shaft oil seal.

- Use the special tool.

Installation



1. ⚠ CAUTION: Oil seals must be fitted dry.

   Install a new transmission output shaft oil seal.

   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
4. Check and top-up the transmission fluid level.
   For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Fluid Pan, Gasket and Filter

In-vehicle Repair

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

   Remove the main control valve body.
   For additional information, refer to: Main Control Valve Body (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, In-vehicle Repair).

Installation

1. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

   Install the main control valve body.
   For additional information, refer to: Main Control Valve Body (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, In-vehicle Repair).

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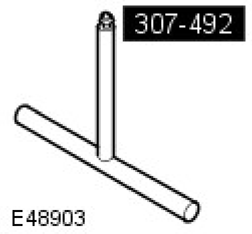
Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Main Control Valve Body

In-vehicle Repair

Special Tool(s)	
	Seal extractor 307-492(LRT-44-005)

Removal

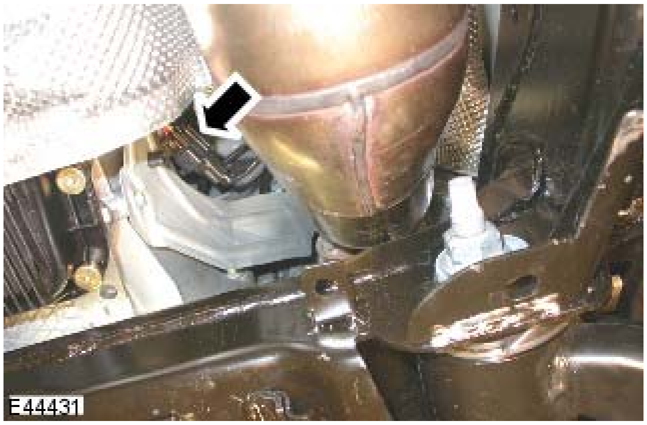
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

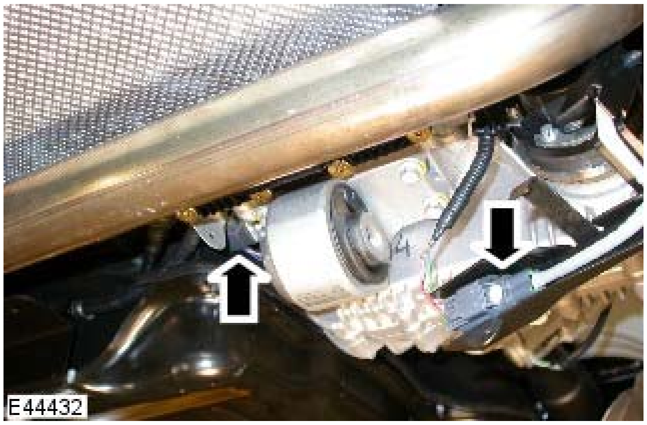
3. Drain the transmission fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

4. Remove the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).



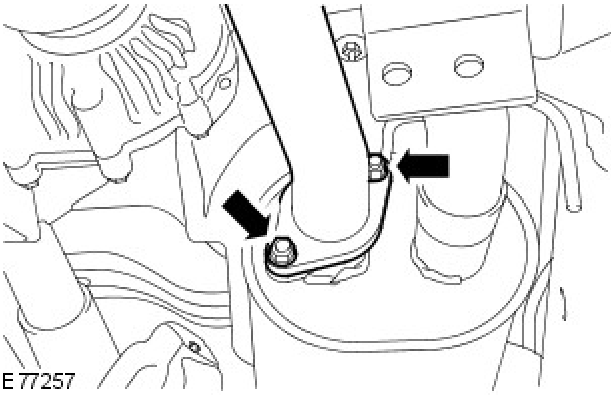
5. Release the RH front HO2S wiring harness.

- Disconnect the electrical connector.



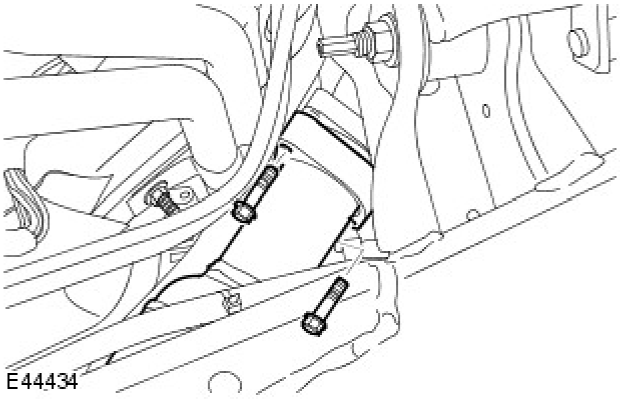
6. Release the RH rear HO2S wiring harness.

- Disconnect the electrical connector.



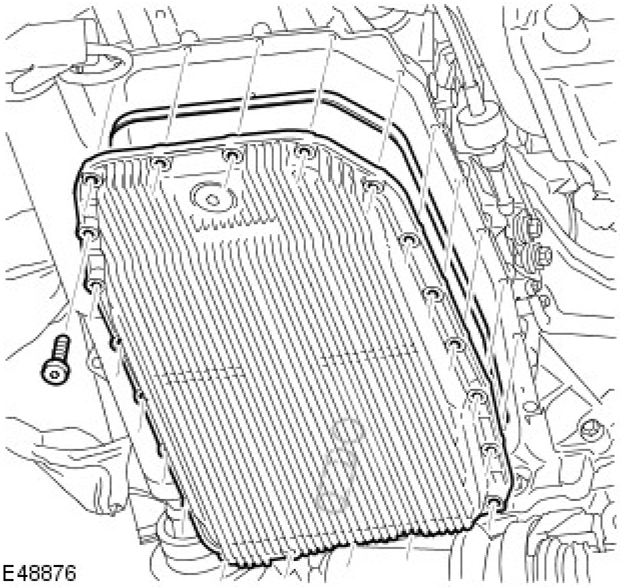
7. Disconnect the RH catalytic converter from the muffler assembly.

- Remove the 2 nuts.
- Discard the gasket.



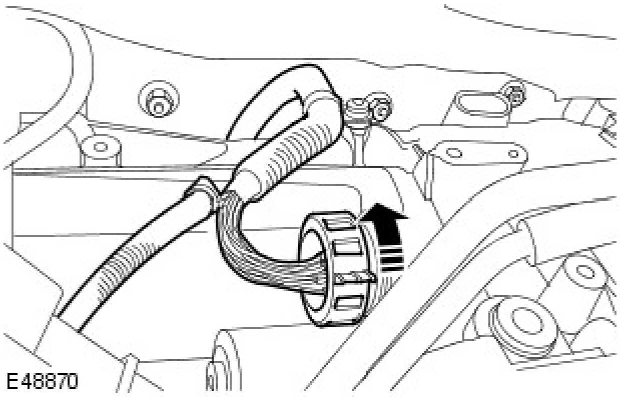
8. Disconnect the RH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.

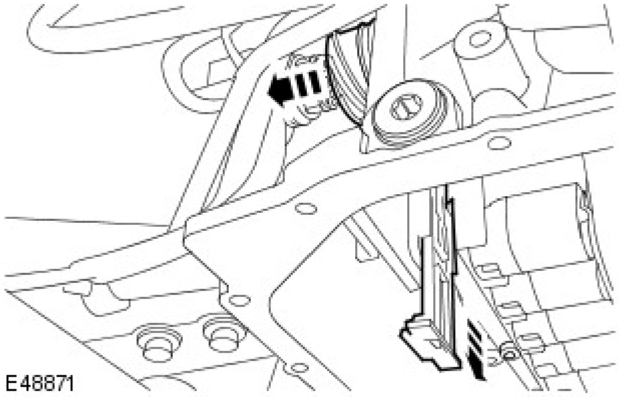


9. Release the oil pan.

- Position a container to collect the oil spillage.
- Remove the 21 Torx screws.



10. Release and disconnect the electrical connector.

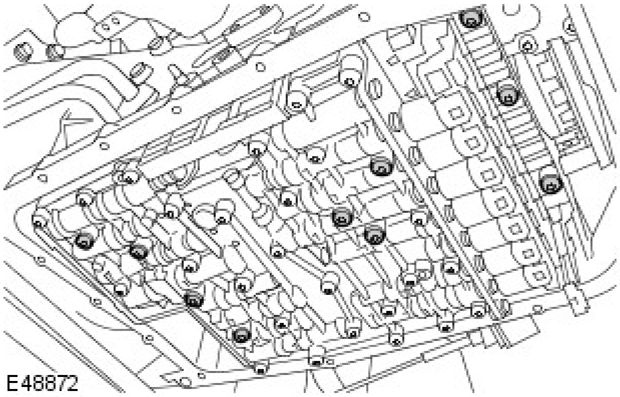


11. Remove and discard the electrical connector sleeve.

- Release the retainer.

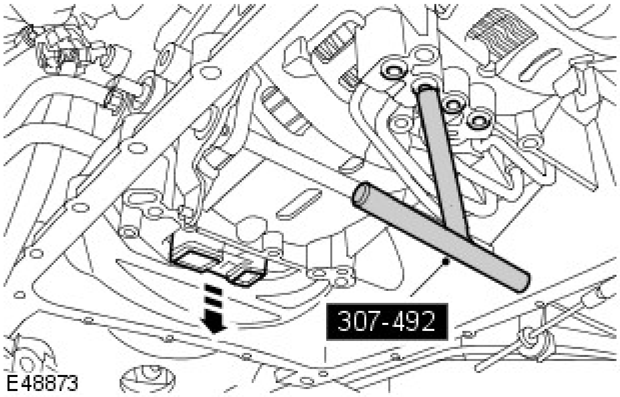
12. Remove the valve block and oil pan.

- Remove the 7 Torx bolts.
- Discard the O-ring seal.

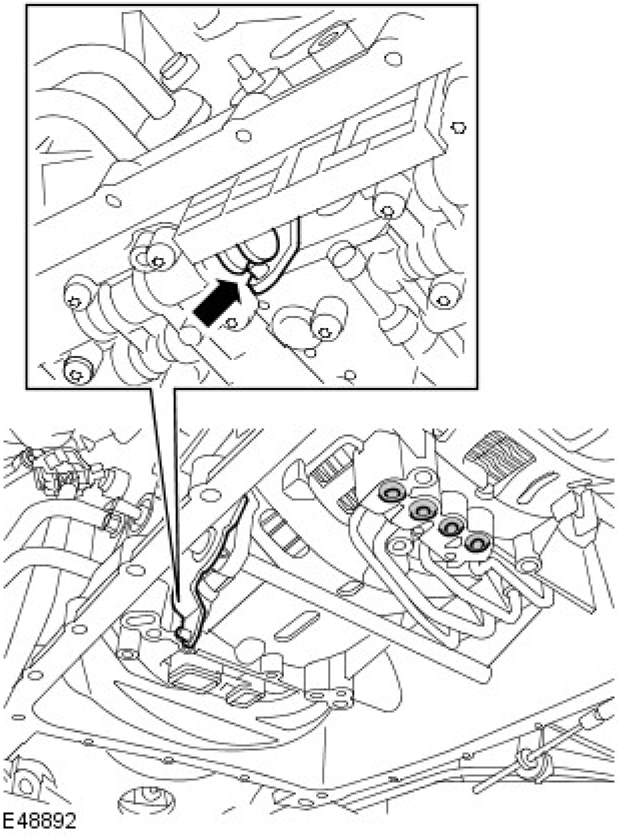


13. Using the special tool, remove the 4 seals.

14. Remove the seal block.


307-492
E48873

Installation



1. CAUTIONS:

⚠ Make sure that when fully fitted, all seals protrude by the same amount.

⚠ Engage the selector lever with the groove in the piston rod.

Install the valve block and oil pan.

- Clean the component mating faces.
- Install new seals.
- Install a new seal block.
- Tighten the Torx screws to 8 Nm (6 lb.ft).

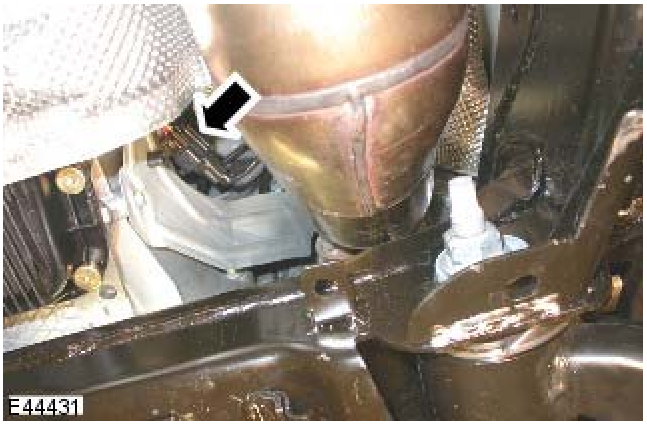
2. Install a new electrical connector sleeve.

- Secure with retainer.

3. Connect the electrical connector.

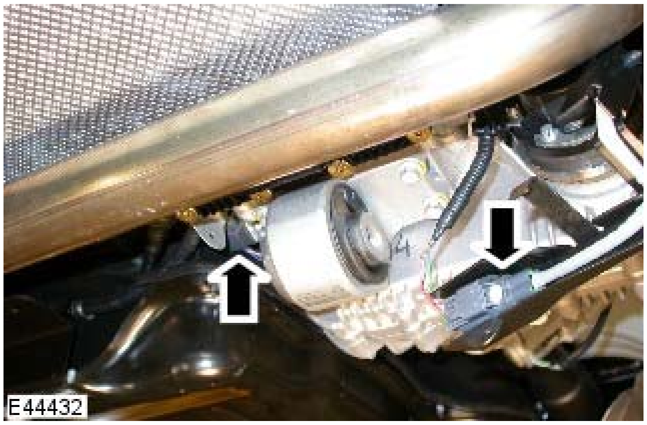
4. Secure the oil pan.

- Tighten the Torx screws to 8 Nm (6 lb.ft).



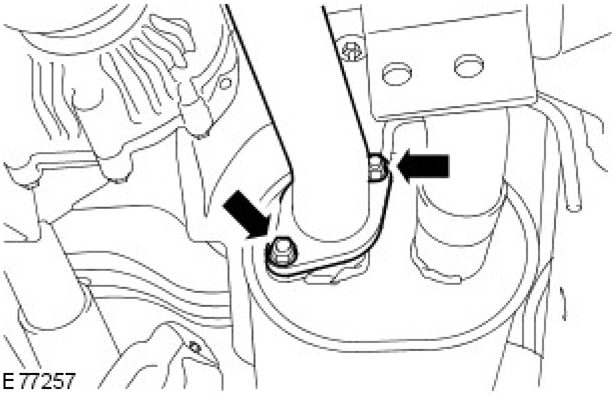
5. Connect the RH front HO2S electrical connector.

- Connect the electrical connector.



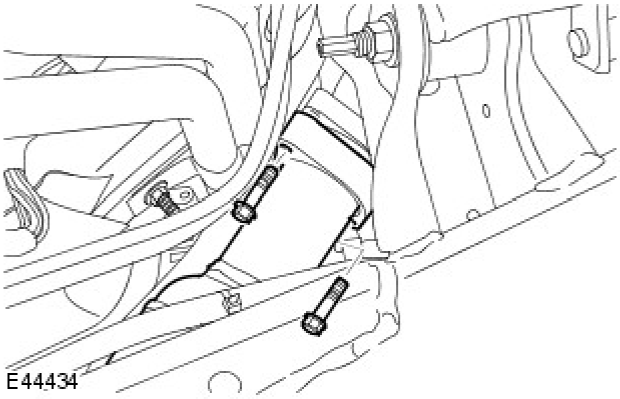
6. Connect the RH front HO2S electrical connector.

- Connect the electrical connector.



7. Secure the RH catalytic converter to the front muffler.

- Install a new gasket.
- Tighten the new bolts to 22 Nm (16 lb.ft).



8. Secure the RH catalytic converter to the exhaust manifold.

- Install and tighten the 2 bolts.

9. Install the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

11. Fill the transmission with fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

12. Using the Land Rover approved diagnostic equipment, calibrate the control valve body.

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Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Transmission Support Insulator

In-vehicle Repair

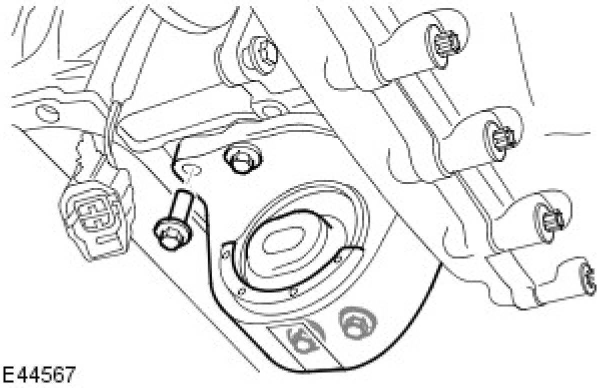
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. NOTE: 4.4L illustration shown, 4.0L and 2.7L Diesel are similar.



Remove the transmission support insulator.

- Remove the 4 bolts.

Installation

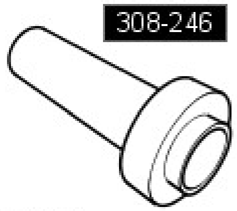
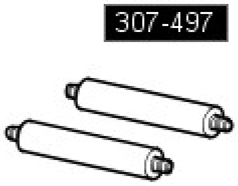
1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Tighten the bolts to 60 Nm (44 lb.ft).

Published: 11-May-2011

Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol - Transmission

Removal and Installation

Special Tool(s)	
 E46737	Torque converter seal installer 308-246
 E46738	Torque converter support handles (LRT-44-010) 307-497

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

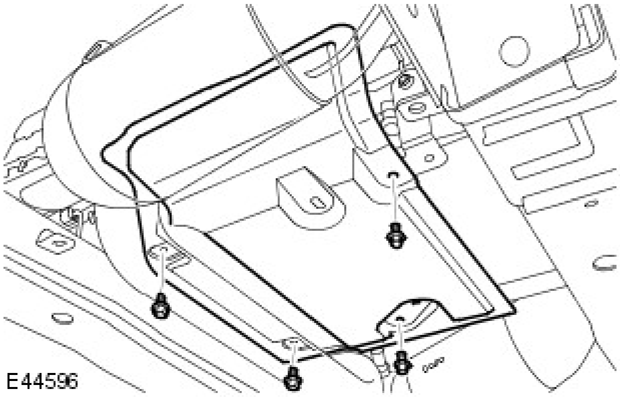
Raise and support the vehicle.

3. Drain the transmission fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

5. Remove the transmission heat shield.

- Remove the 4 bolts.



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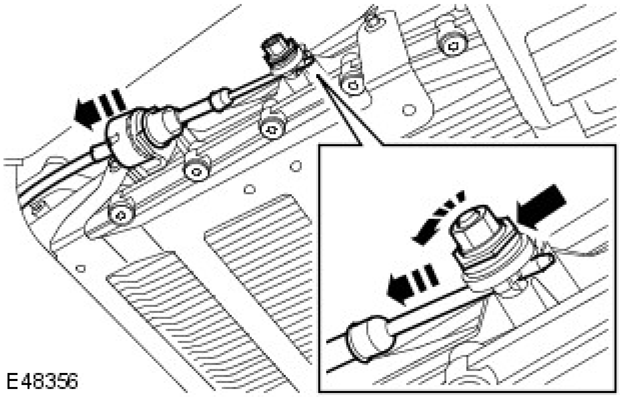
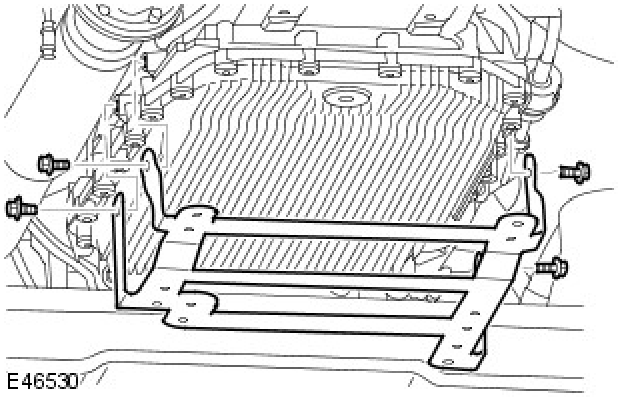


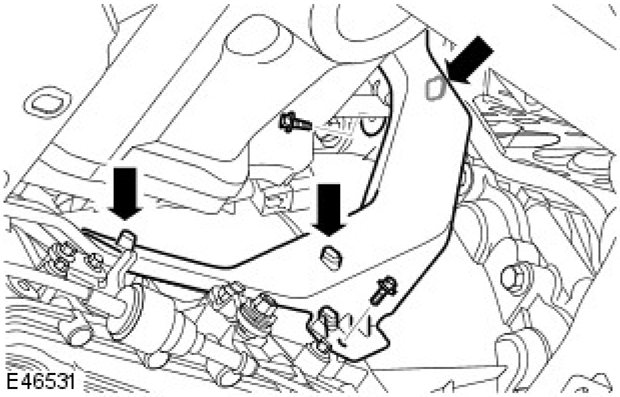
6. Release the selector cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Compress the latch and release the cable.



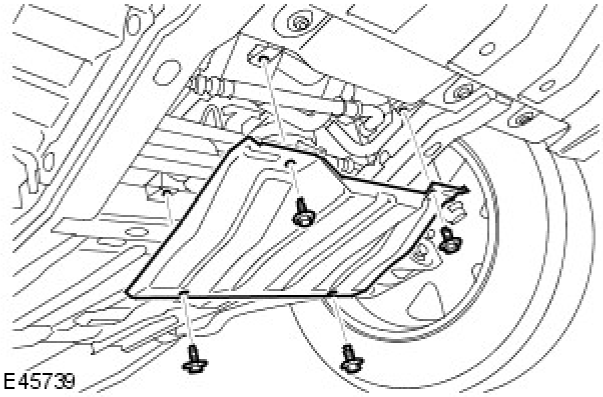
7. Remove the transmission heat shield bracket.

- Remove the 4 bolts.



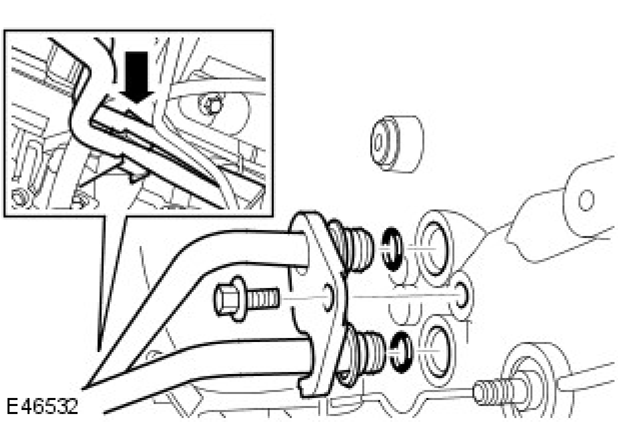
8. Remove the fuel pipe heat shield.

- Remove the 2 bolts.
- Release the fuel pipes from the 3 clips.



9. Remove the radiator access panel.

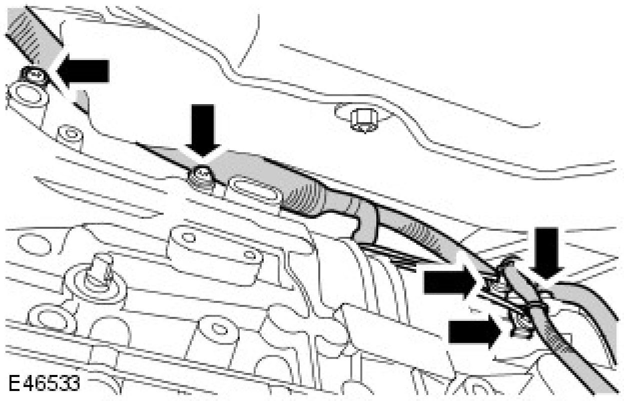
- Remove the 4 bolts.



10. ⚠ CAUTION: Always plug any open connections to prevent contamination.

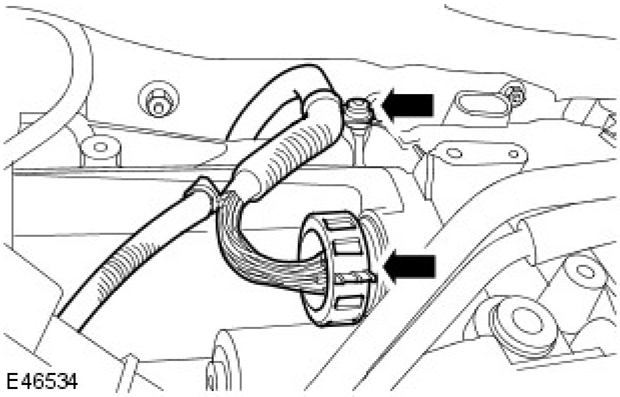
Release the transmission fluid lines.

- Remove the bolt.
- Release the clip.
- Remove and discard both O-ring seals.



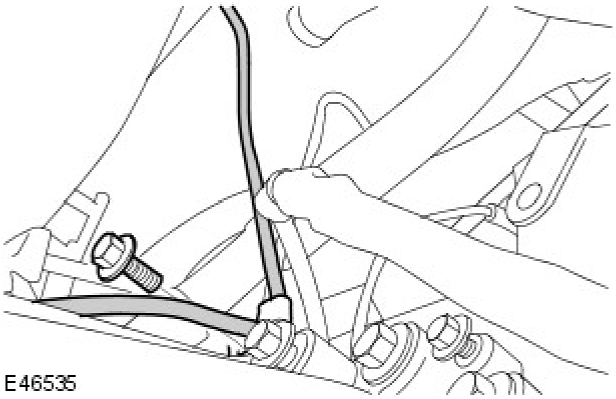
11. Release the wiring harness from the LH side of the transmission.

- Remove the 3 Torx screws.
- Release the 2 clips.



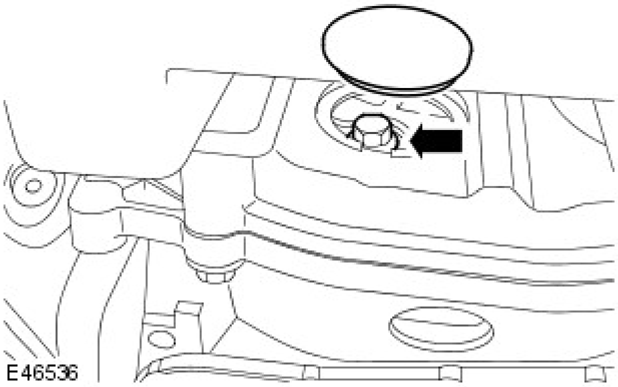
12. Release the wiring harness from the RH side of the transmission.

- Remove the Torx screw.
- Disconnect the electrical connector.



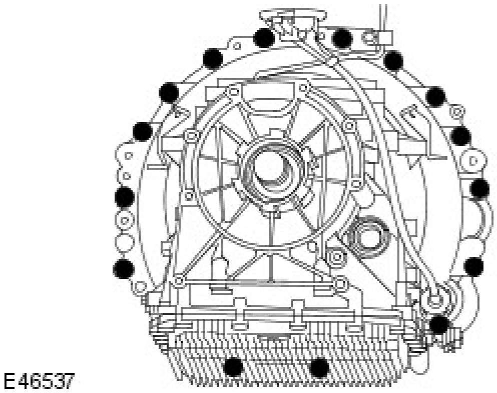
13. Release the transmission breather line clip.

- Remove the bolt.



14. Release the flexplate.

- Remove the access plugs.
- Rotate the crankshaft to access the retaining bolts.
- Remove the 3 bolts.



15. WARNINGS:

Secure the transmission to the transmission jack.

Support the engine. The engine will fall forward when the transmission is removed.

CAUTION: Make sure the torque converter remains connected to the transmission.

With assistance, remove the transmission.

- Using a transmission jack, support the transmission.
- Remove the 16 bolts.

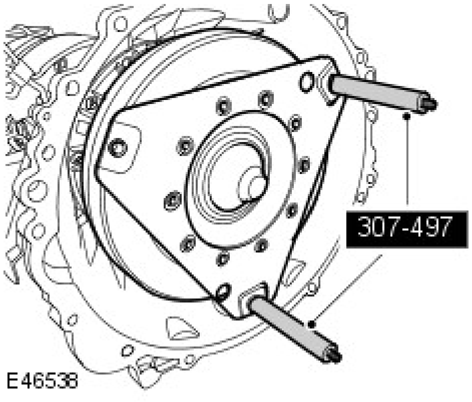
16. Install the torque converter retainer.

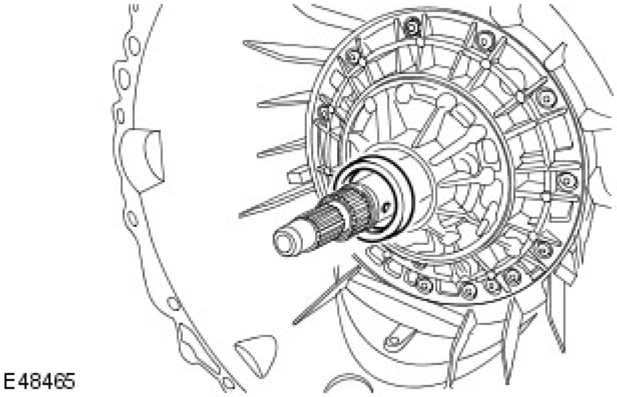
17. NOTE: Do not disassemble further if the component is removed for access only.

Remove the transmission from the transmission jack.

18. Remove the torque converter retainer.

19. Using the special tools, remove the torque converter.

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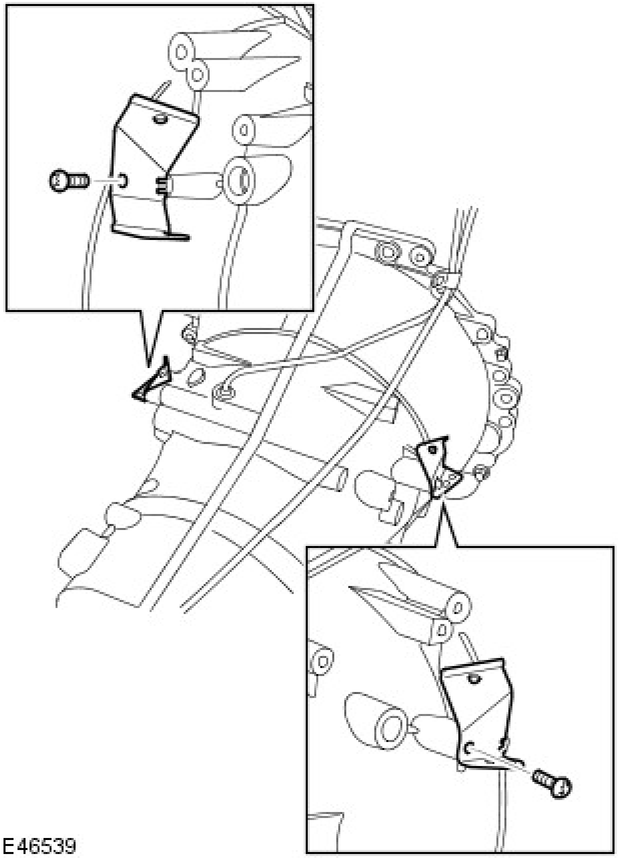
20. Carefully remove and discard the torque converter fluid seal.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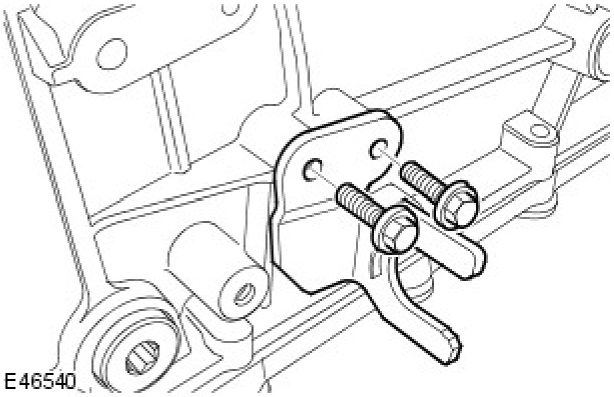
21. Remove the wiring harness bracket.

- Remove the Torx screw.
- Repeat the above procedure for the other side.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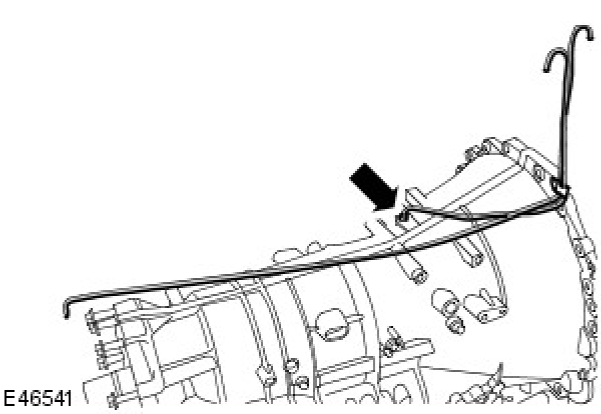
22. Remove the selector cable bracket.

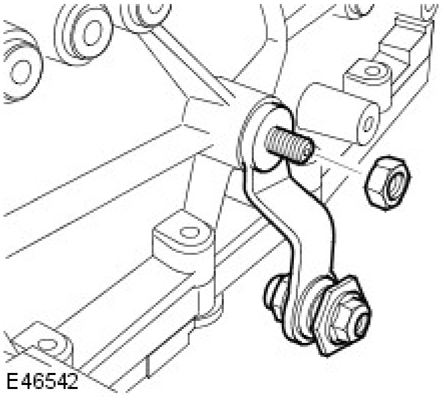
- Remove the 2 bolts.



23. ⚠CAUTION: Always plug any open connections to prevent contamination.

Remove the transmission breather lines.

- Depress the locking ring.



24. Remove the selector lever.

- Remove the nut.

Installation

⚠CAUTION: If the automatic transmission fluid is very dirty or it contains metallic particles, then along with a new transmission, install a new automatic transmission fluid cooler and lines.

1. Attach the selector lever.

- Tighten the nut to 12 Nm (9 lb.ft).

2. Attach the transmission breather lines.

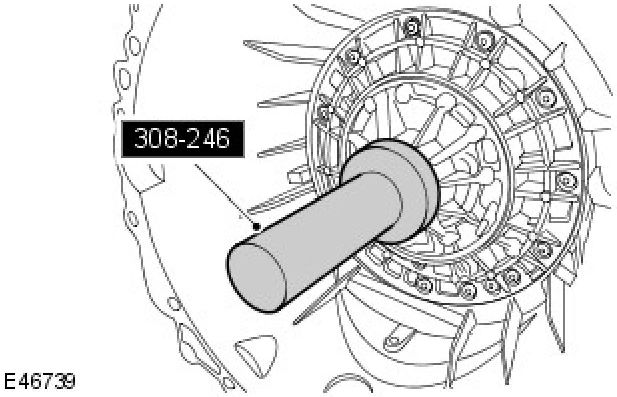
- Secure with the clip.

3. Attach the selector cable bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

4. Attach the wiring harness bracket.

- Tighten the Torx bolt to 10 Nm (7 lb.ft).
- Repeat the above procedure for the other side.



5. Using the special tool, install a new torque converter fluid seal.

- Clean the seal register.

6. Install the torque converter.

- Clean the seal contact area.
- Remove the special tools.

7. Install the torque converter retainer.

8. Position the transmission to the transmission jack.

9. Remove the torque converter retainer.

10. ⚠ CAUTION: Apply grease of the correct specification to the torque converter spigot.

With assistance, install the transmission.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

11. Attach the flexplate to the torque converter.

- Rotate the crankshaft to access the retaining bolts.
- Tighten the bolts to 45 Nm (33 lb.ft).
- Install the access plugs.

12. Install the radiator access panel.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

13. Attach the transmission breather pipe clip.

- Tighten the bolt to 25 Nm (18 lb.ft).

14. Attach the wiring harness.

- Tighten the Torx screws.
- Connect the electrical connector.

15. Attach the transmission fluid lines.

- Clean the components.
- Install the new O-ring seals.
- Secure with the clip.
- Tighten the bolt to 10 Nm (7 lb.ft).

16. Install the fuel pipe heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure with the clips.

17. Install the transmission heat shield bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

18. NOTE: Do not tighten the locking nut at this stage.

Connect the selector cable to the transmission.

- Engage the inner cable with the lever clamping bush.
- Install the selector cable to its abutment bracket.

19. Install the transfer case.
For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Installation).

20. Refill the transmission with fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

21. Install the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

22. Adjust the selector cable.
For additional information, refer to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures).

23. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

24. Install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

25. NOTE: For NAS vehicles only.

If fitting new or exchange components, carry out long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

Automatic Transmission/Transaxle - V8 4.4L Petrol -

Lubricants

Item	**Specification**
* Recommended lubricant	Shell M13754. Land Rover Part No. TYK500050
+ Torque converter nose	Molybdenum disulphide grease to specification FB180

- CAUTIONS:

⚠ * Do not use any lubricant other than that specified.

⚠ + Do not over lubricate.

Capacity

Item	**Capacity**
+ Initial dry fill	9.5 litres (16.7 pints) (10.0 US qts)

⚠ CAUTION: + A final fluid level check/drain down/top-up must be carried out when the unit has been installed.

General Specification

Item	**Specification**
Automatic transmission	ZF 6HP26
Speeds	6 Forward, 1 Reverse
Gear ratios:	
First	4.17:1
Second	2.340:1
Third	1.521:1
Fourth	1.143:1
Fifth	0.867:1
Sixth	0.691:1
Reverse	3.403:1
Torque converter	Sachs W260 2GWK with slip controlled, dual friction faced lock-up clutch
Transmission control module:	
Location	Located in transmission casing
Type	1904

Torque Specifications

Description	**Nm**	**lb-ft**
Transmission fluid filler/level plug	35	26
Transmission fluid drain plug	9	7
Selector lever nut	12	9
Selector cable bracket bolts	10	7
Main control valve body Torx screws	8	6
Fluid pan Torx screws	8	6
Engine RH support bolts	45	33
Transmission heat shield bracket bolts	10	7
Transmission heat shield bolts	10	7
Wiring harness bracket Torx bolt	10	7
Torque converter bolts	45	33
Transmission bolts	45	33
Radiator access panel bolts	10	7
Breather pipe clip bolt	25	18
Fluid line clip bolt	10	7
Fuel pipe heat shield bolts	10	7
Transmission under shield bolts	10	7
Transmission support insulator	60	44

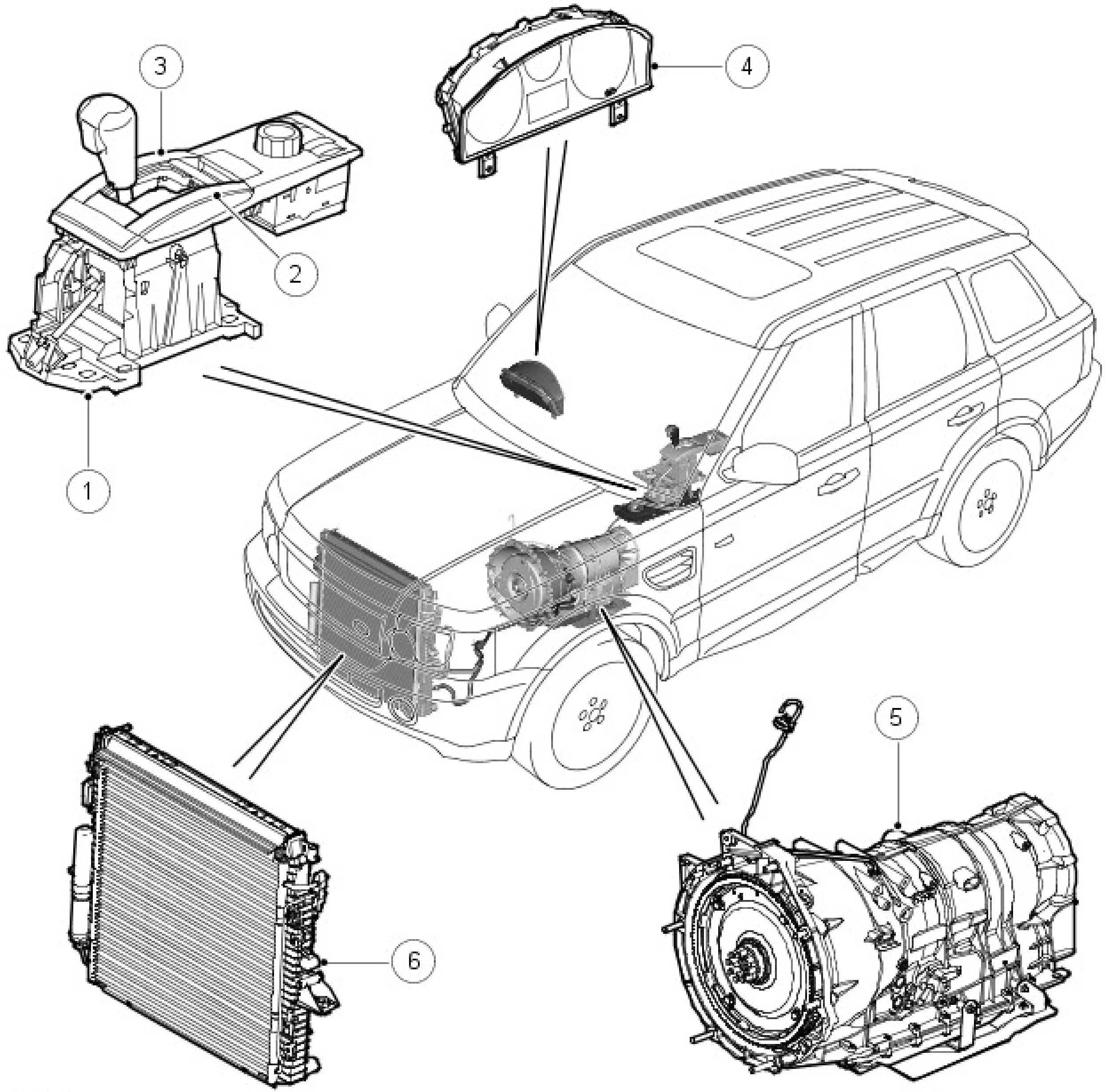
Published: 11-May-2011

Automatic Transmission/Transaxle - V8 4.4L Petrol - Automatic Transmission

Description and Operation

Automatic Transmission

ZF 6HP26 Automatic Transmission Component Location



E52105

Item	Part Number	Description
1	-	Selector lever assembly
2	-	M/S LCD display
3	-	PRND LCD display
4	-	Instrument cluster
5	-	Automatic transmission
6	-	Transmission fluid cooler

OVERVIEW

• NOTE: This section contains information for the 4.4L V8 and the TdV6 transmissions.

4.2L V8 Supercharged is covered in a separate section.
For additional information, refer to: Automatic Transmission (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, Description and Operation).

The ZF 6HP26 transmission is an electronically controlled, six speed unit. The transmission is manufactured by ZF Transmissions GmbH in Saarbrücken, Germany. This transmission represents the latest in automatic transmission technology and incorporates new features to enhance the transmission functionality:

- The hydraulic and electronic control elements of the transmission are now incorporated in a single unit located inside the transmission and is known as 'Mechatronic'
- Another new strategy is Adaptive Shift Strategy (ASIS). ASIS represents the continuous adaptation of shift changes to suit the driving style of the driver which can vary from sporting to economical. Further details of the ASIS function are contained in the 'Driving Modes' section.

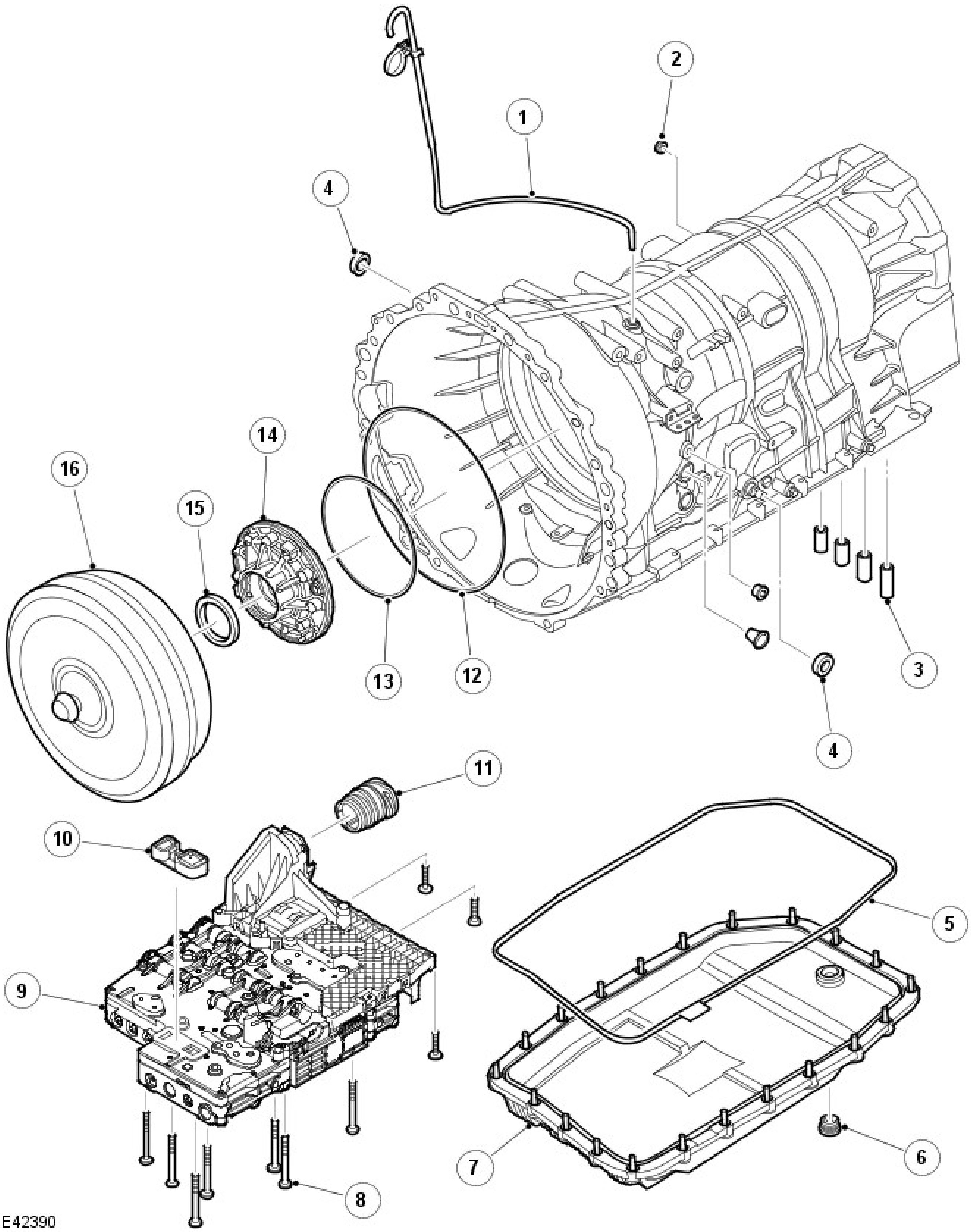
The transmission is controlled by a Transmission Control Module (TCM) which contains software to provide operation as a semi-automatic 'CommandShift™' transmission. The TCM allows the transmission to be operated as a conventional automatic unit by selecting P, R, N, D on the selector lever. Movement of the selector lever across the gate to the 'M/S' position puts the transmission into electronic 'Sport' mode. Further movement of the lever in a lateral direction to the + or – position puts the transmission into electronic manual 'CommandShift™' mode.

The 6HP26 transmission has the following features:

- Designed to be maintenance free
- Transmission fluid is 'fill for life'
- The torque converter features a controlled slip feature with electronically regulated control of lock-up, creating a smooth transition to the fully locked condition
- Shift programs controlled by the TCM
- Connected to the ECM via the High Speed CAN for communications
- Default mode if major faults occur
- Diagnostics available from the TCM via the CAN

ZF 6HP26 Automatic Transmission – Exploded View

• NOTE: The transmission shown is exploded to the extent of the serviceable items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Item	Part Number	Description
1	-	Breather tube
2	-	Plug
3	-	Seal sleeves
4	-	Selector shaft seal
5	-	Gasket

6	-	Drain plug
7	-	Fluid pan and filter assembly
8	-	Torx screws
9	-	Mechatronic valve block
10	-	Element seal
11	-	Electrical connector – guide sleeve
12	-	O-ring
13	-	O-ring
14	-	Pump housing
15	-	Input shaft seal
16	-	Torque converter

The gearbox comprises the main casing which houses all of the transmission components. The main case also incorporates an integral bell housing.

A fluid pan is bolted to the lower face of the main case and is secured with bolts. The fluid pan is sealed to the main case with a gasket. Removal of the fluid pan allows access to the Mechatronic valve block. The fluid pan has a magnet located around the drain plug which collects any metallic particles present in the transmission fluid.

A fluid filter is located inside the fluid pan. If the transmission fluid becomes contaminated or after any service work, the fluid pan with integral filter must be replaced.

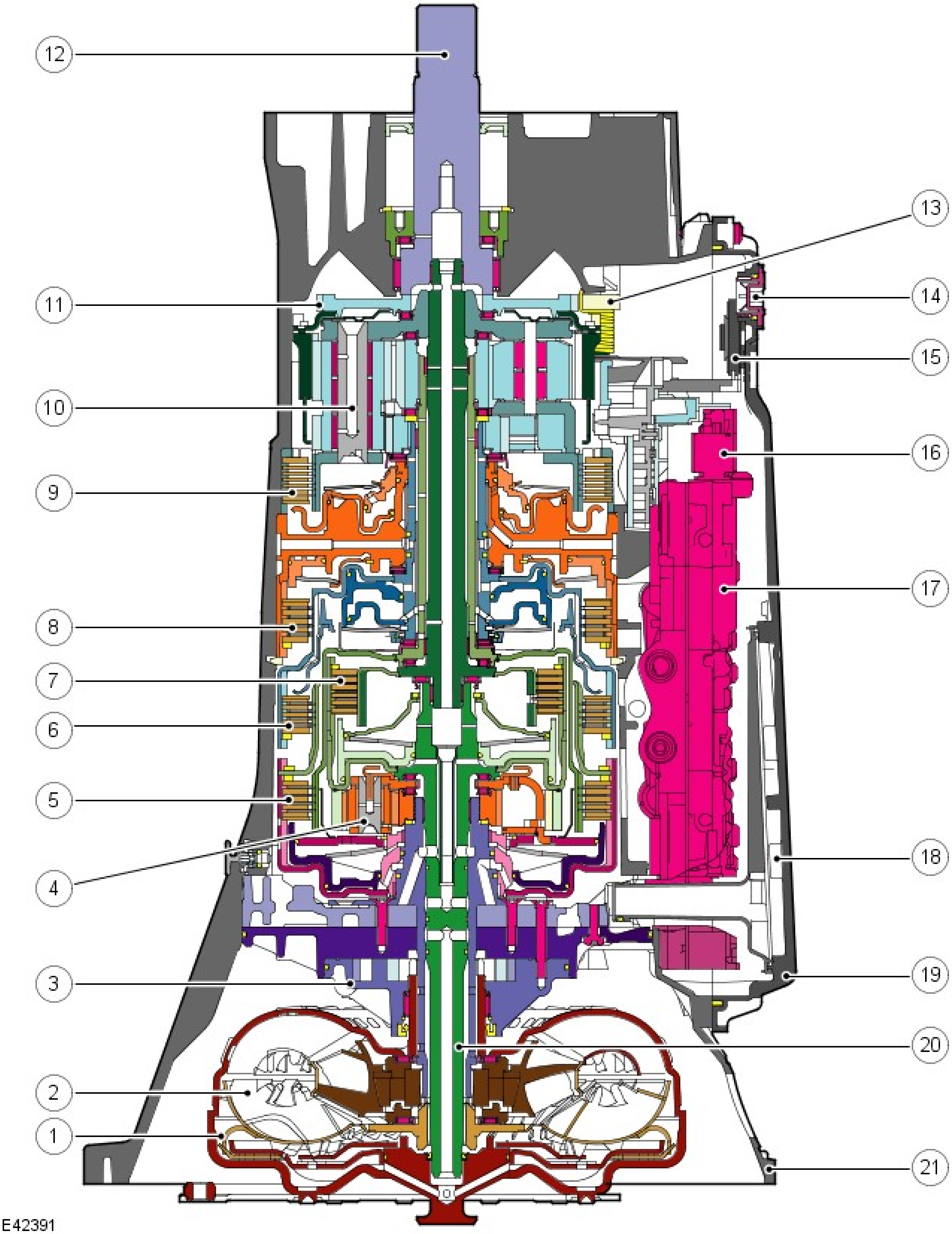
The integral bell housing provides protection for the torque converter assembly and also provides the attachment for the gearbox to the engine cylinder block. The torque converter is a non-serviceable assembly which also contains the lock-up clutch mechanism. The torque converter drives a crescent type pump via drive tangs. The fluid pump is located in the main case, behind the torque converter.

The main case contains the following major components:

- Input shaft
- Output shaft
- Mechatronic valve block which contains the solenoids, speed sensors and the TCM
- Three rotating multiplate drive clutches
- Two fixed multiplate brake clutches
- A single planetary gear train and a double planetary gear train.

ZF 6HP26 Automatic Transmission – Sectional View

• NOTE: 4.4L V8 transmission shown, TdV6 similar except for torque converter.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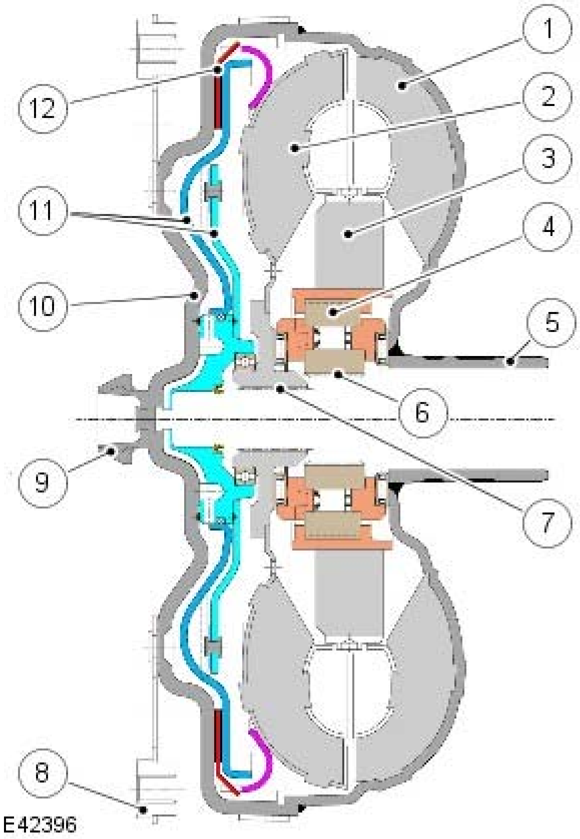
E42391

Item	Part Number	Description
1	-	Torque converter lock-up clutch
2	-	Torque converter
3	-	Fluid pump
4	-	Single planetary gearset
5	-	Clutch A

6	-	Clutch B
7	-	Clutch E
8	-	Brake C
9	-	Brake D
10	-	Double planetary gearset
11	-	Park lock gear
12	-	Output shaft
13	-	Park lock pawl
14	-	Drain plug
15	-	Magnet
16	-	Pressure regulator
17	-	Mechatronic valve block
18	-	Fluid filter
19	-	Fluid pan
20	-	Input shaft
21	-	Bell housing

TORQUE CONVERTER

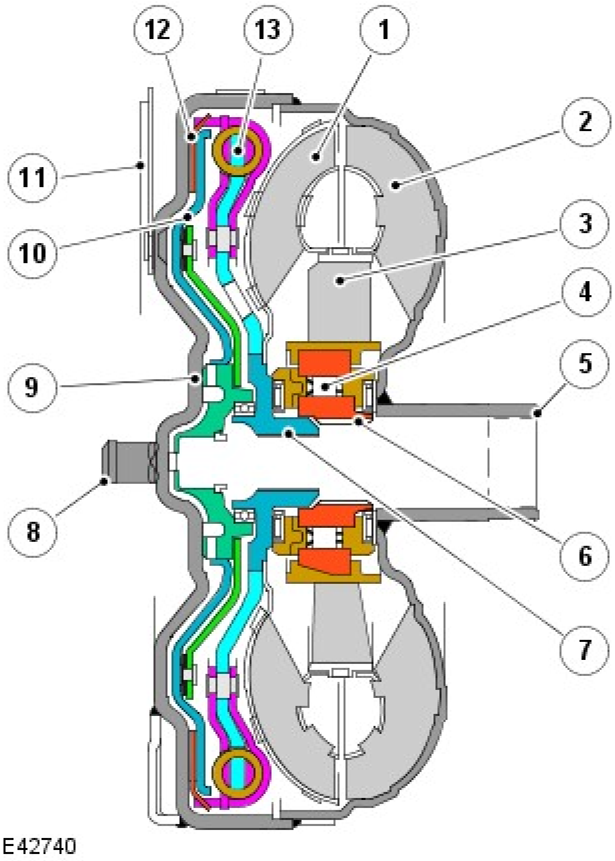
Torque Converter Components - 4.4L V8 Models



Item	Part Number	Description
1	-	Impeller
2	-	Turbine
3	-	Stator
4	-	Freewheel
5	-	Torque converter hub
6	-	Stator shaft
7	-	Turbine shaft
8	-	Drive plate
9	-	Journal - Drive plate/crankshaft location
10	-	Torque converter cover
11	-	Lock-up clutch piston

12	-	Lock-up clutch plate

Torque Converter Components - TdV6 Models



Item	Part Number	Description
1	-	Turbine
2	-	Impeller
3	-	Stator
4	-	Freewheel
5	-	Torque converter hub
6	-	Stator shaft
7	-	Turbine shaft
8	-	Journal - Drive plate/crankshaft location
9	-	Torque converter cover
10	-	Lock-up clutch piston
11	-	Drive plate
12	-	Lock-up clutch plate
13	-	Torsional vibration damper

The torque converter is the coupling element between the engine and the gearbox and is located in the bell housing, on the engine side of the transmission. The driven power from the engine crankshaft is transmitted hydraulically and mechanically through the torque converter to the transmission. The torque converter is connected to the engine by a drive plate.

The torque converter comprises an impeller, a stator and a turbine. The torque converter is a sealed unit with all components located between the converter housing cover and the impeller. The two components are welded together to form a sealed, fluid filled housing. With the impeller welded to the converter housing cover, the impeller is therefore driven at engine crankshaft speed.

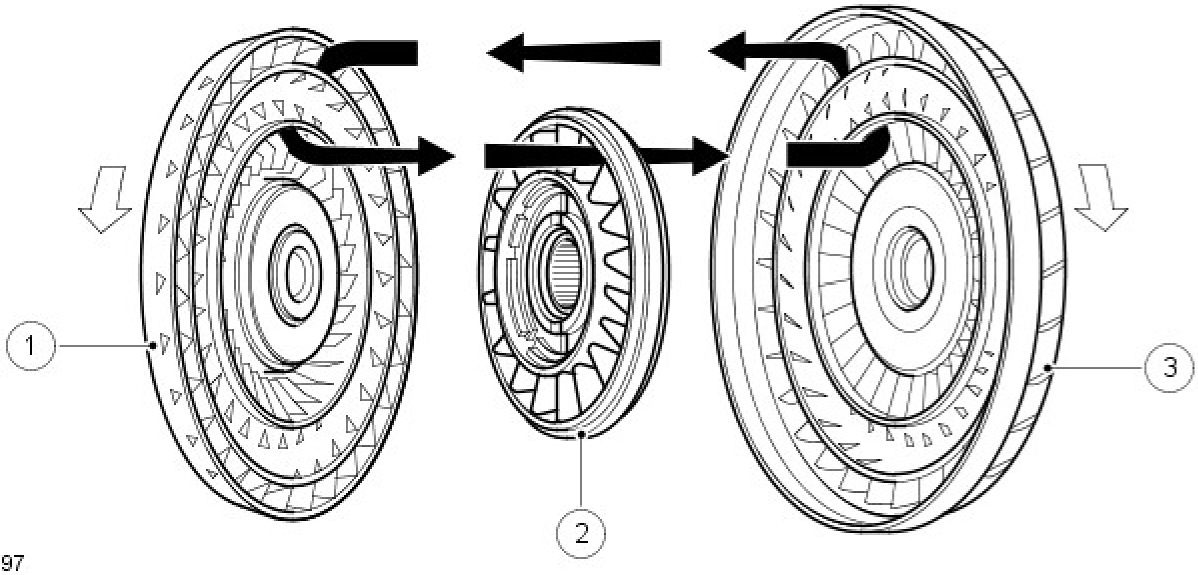
The converter housing cover has four threaded bosses which provide for attachment of the engine drive plate which is connected to the engine crankshaft. The threaded bosses also provide for location of special tools which are required to remove the torque converter from the bell housing.

The torque converter used on TdV6 models is similar in construction to the torque converter on petrol models but contains a torsional vibration damper. The damper smooths the output from the engine and prevents unwanted vibration from being passed to the transmission.

Impeller

Fluid Flow

- NOTE: Typical torque converter shown



E42397

Item	Part Number	Description
1	-	Turbine
2	-	Stator
3	-	Impeller

When the engine is running the rotating impeller acts as a centrifugal pump, picking up fluid at its centre and discharging it at high velocity through the blades on its outer rim. The design and shape of the blades and the curve of the impeller body cause the fluid to rotate in a clockwise direction as it leaves the impeller. This rotation improves the efficiency of the fluid as it contacts the outer row of blades on the turbine.

The centrifugal force of the fluid leaving the blades of the impeller is passed to the curved inner surface of the turbine via the tip of the blades. The velocity and clockwise rotation of the fluid causes the turbine to rotate.

Turbine

The turbine is similar in design to the impeller with a continuous row of blades. Fluid from the impeller enters the turbine through the tip of the blades and is directed around the curved body of the turbine to the root of the blades. The curved surface redirects the fluid back in the opposite direction to which it entered the turbine, effectively increasing the turning force applied to the turbine from the impeller. This principle is known as torque multiplication.

When engine speed increases, turbine speed also increases. The fluid leaving the inner row of the turbine blades is rotated in an anti-clockwise direction due to the curve of the turbine and the shape of the blades. The fluid is now flowing in the opposite direction to the engine rotation and therefore the impeller. If the fluid was allowed to hit the impeller in this condition, it would have the effect of applying a brake to the impeller, eliminating the torque multiplication effect. To prevent this, the stator is located between the impeller and the turbine.

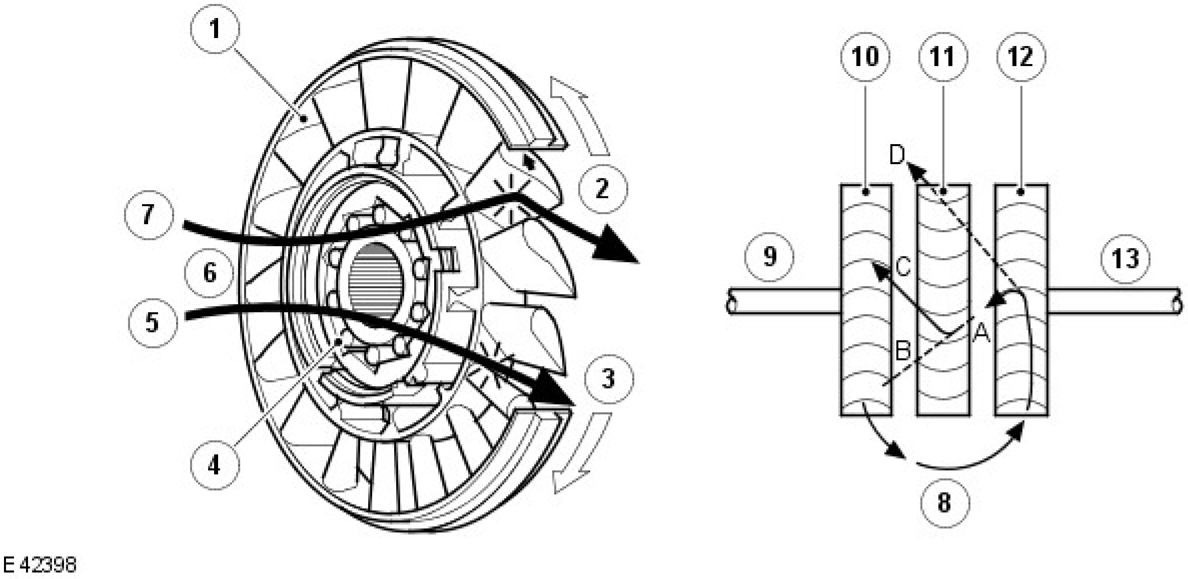
Stator

The stator is located on the splined transmission input shaft via a freewheel clutch. The stator comprises a number of blades which are aligned in an opposite direction to those of the impeller and turbine. The main function of the stator is to redirect the returning fluid from the turbine, changing its direction to that of the impeller.

The redirected fluid from the stator is directed at the inner row of blades of the impeller, assisting the engine in turning the impeller. This sequence increases the force of the fluid emitted from the impeller and thereby increases the torque multiplication effect of the torque converter.

Stator Functions

- NOTE: Typical stator shown



Item	Part Number	Description
1	-	Blades
2	-	Stator held – fluid flow redirected
3	-	Stator rotates freely
4	-	Roller
5	-	Converter at coupling speed
6	-	Fluid flow from turbine
7	-	Converter multiplying
8	-	Fluid flow from impeller
9	-	Drive from engine
10	-	Impeller
11	-	Stator
12	-	Turbine
13	-	Output to transmission

Refer to the 'Stator Functions' illustration

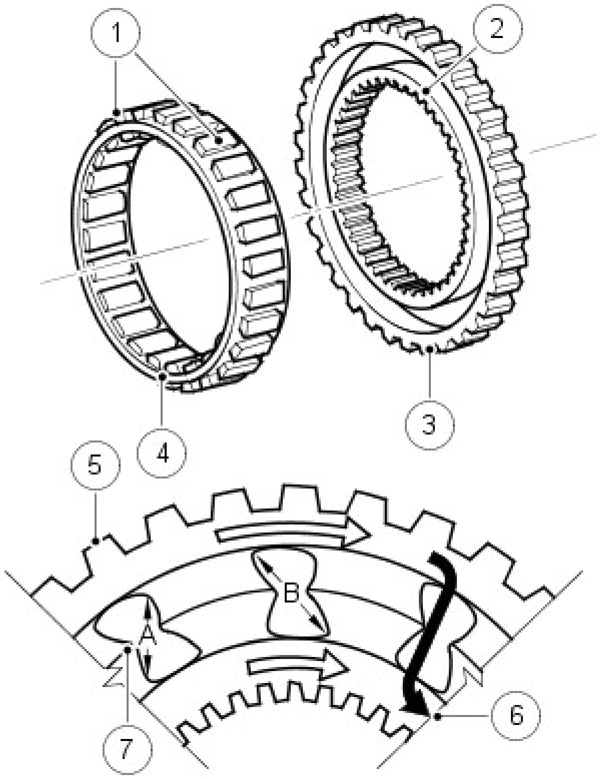
Fluid emitted from the impeller acts on the turbine. If the turbine is rotating at a slower speed than the fluid from the impeller, the fluid will be deflected by the turbine blades in the path '**A**'. The fluid is directed at and deflected by the stator blades from path '**B**' to path '**C**'. This ensures that the fluid is directed back to the pump in the optimum direction. In this condition the sprag clutch is engaged and the force of the fluid on the stator blades assists the engine in rotating the impeller

As the rotational speed of the engine and therefore the turbine increases, the direction of the fluid leaving the turbine changes to path '**D**'. The fluid is now directed from the turbine to the opposite side of the stator blades, rotating the stator in the opposite direction. To prevent the stator from resisting the smooth flow of the fluid from the turbine, the sprag clutch releases, allowing the stator to rotate freely on its shaft.

When the stator becomes inactive, the torque converter no longer multiplies the engine torque. When the torque converter reaches this operational condition it ceases to multiply the engine torque and acts solely as a fluid coupling, with the impeller and the turbine rotating at approximately the same speed.

The stator uses a sprag type, one way, freewheel clutch. When the stator is rotated in a clockwise direction the sprags twist and are wedged between the inner and outer races. In this condition the sprags transfer the rotation of the outer race to the inner race which rotates at the same speed.

One Way Free Wheel Clutch – Typical



E42712

Item	Part Number	Description
1	-	Sprags
2	-	Inner race
3	-	Outer race
4	-	Sprag and cage assembly
5	-	Sprag outer race
6	-	Sprag inner race
7	-	Retaining ring

The free wheel clutch can perform three functions; hold the stator stationary, drive the stator and free wheel allowing the stator to rotate without a drive output. The free wheel clutch used in the 6HP26 transmission is of the sprag type and comprises an inner and outer race and a sprag and cage assembly. The inner and outer races are pressed into their related components with which they rotate. The sprag and cage assembly is located between the inner and outer races.

The sprags are located in a cage which is a spring which holds the sprags in the 'wedge' direction and maintains them in contact with the inner and outer races.

Referring to the illustration, the sprags are designed so that the dimension 'B' is larger than the distance between the inner and outer race bearing surfaces. When the outer race rotates in a clockwise direction, the sprags twist and the edges across the dimension 'B' wedge between the races, providing a positive drive through each sprag to the inner race. The dimension 'A' is smaller than the distance between the inner and outer race bearing surfaces. When the outer race rotates in an anti-clockwise direction, the dimension 'A' is too small to allow the sprags to wedge between the races, allowing the outer race to rotate freely.

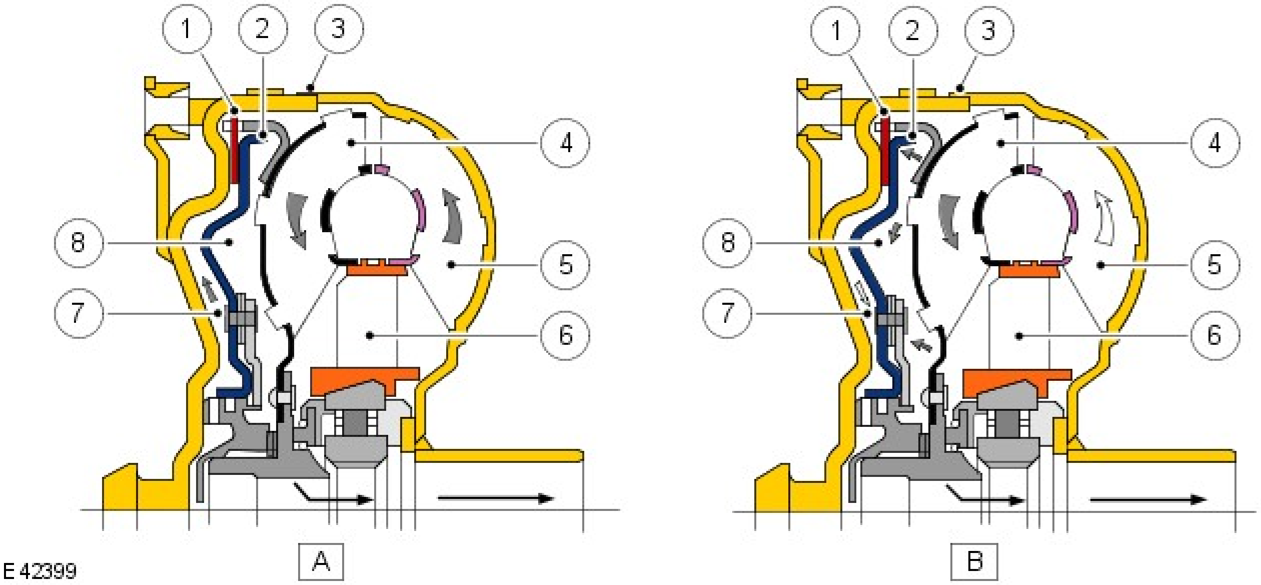
On the illustration shown, when the outer race is rotated in a clockwise direction, the sprags twist and are 'wedged' between the inner and outer races. The sprags then transfer the rotation of the outer race to the inner race, which rotates at the same speed.

Lock-Up Clutch Mechanism

The Torque Converter Clutch (TCC) is hydraulically controlled by an electronic pressure regulating solenoid (EPRS6) which is controlled by the TCM. This allows the torque converter to have three states of operation as follows:

- Fully engaged
- Controlled slip variable engagement
- Fully disengaged.

The TCC is controlled by two hydraulic spool valves located in the valve block. These valves are actuated by pilot pressure supplied via a solenoid valve which is also located in the valve block. The solenoid valve is operated by PWM signals from the TCM to give full, partial or no lock-up of the torque converter.



Item	Part Number	Description
A	-	Unlocked condition
B	-	Locked condition
1	-	Clutch plate
2	-	Clutch piston
3	-	Torque converter body
4	-	Turbine
5	-	Impeller
6	-	Stator
7	-	Piston chamber
8	-	Turbine chamber

The lock-up clutch is a hydro-mechanical device which eliminates torque converter slip, improving fuel consumption. The engagement and disengagement is controlled by the TCM to allow a certain amount of controlled 'slip'. This allows a small difference in the rotational speeds of the impeller and the turbine which results in improved shift quality. The lock-up clutch comprises a piston and a clutch friction plate.

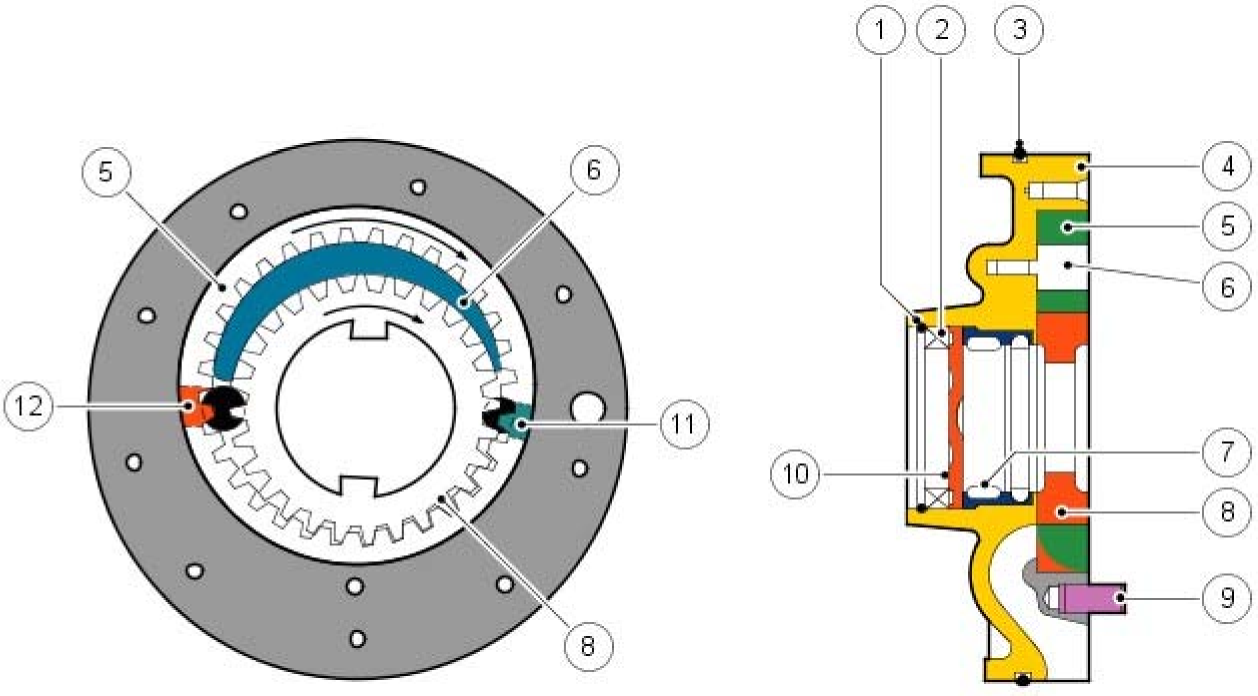
In the unlocked condition, the oil pressure supplied to the piston chamber and the turbine chamber is equal. Pressurised fluid flows through a drilling in the turbine shaft and through the piston chamber to the turbine chamber. In this condition the clutch plate is held away from the torque converter body and torque converter slip is permitted.

In the locked condition, the TCC spool valves are actuated by the electronic pressure regulating solenoid (EPRS6). The fluid flow in the unlocked condition is reversed and the piston chamber is vented. Pressurised fluid is directed into the turbine chamber and is applied to the clutch piston. The piston moves with the pressure and pushes the clutch plate against the torque converter body. As the pressure increases, the friction between the clutch plate and the body increases, finally resulting in full lock-up of the clutch plate with the body. In this condition there is direct mechanical drive from the engine crankshaft to the transmission planetary gear train.

FLUID PUMP

The fluid pump is an integral part of the transmission. The fluid pump is used to supply hydraulic pressure for the operation of the control valves and clutches, to pass the fluid through the transmission cooler and to lubricate the gears and shafts.

The 6HP26 fluid pump is a crescent type pump and is located between the intermediate plate and the torque converter. The pump has a delivery rate of 16cm^3 per revolution.



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Item	Part Number	Description
1	-	Securing ring
2	-	Shaft oil seal
3	-	O-ring seal
4	-	Pump housing
5	-	Ring gear
6	-	Crescent spacer
7	-	Roller bearing
8	-	Impeller
9	-	Centring pin
10	-	Spring washer
11	-	Outlet port (high pressure)
12	-	Inlet port (low pressure)

The pump comprises a housing, a crescent spacer, an impeller and a ring gear. The housing has inlet and outlet ports to direct flow and is located in the intermediate plate by a centring pin. The pump action is achieved by the impeller, ring gear and crescent spacer.

The crescent spacer is fixed in its position by a pin and is located between the ring gear and the impeller. The impeller is driven by drive from the torque converter hub which is located on a needle roller bearing in the pump housing. The impeller teeth mesh with those of the ring gear. When the impeller is rotated, the motion is transferred to the ring gear which rotates in the same direction.

The rotational motion of the ring gear and the impeller collects fluid from the intake port in the spaces between the teeth. When the teeth reach the crescent spacer, the oil is trapped in the spaces between the teeth and is carried with the rotation of the gears. The spacer tapers near the outlet port. This reduces the space between the gear teeth causing a build up of fluid pressure as the oil reaches the outlet port. When the teeth pass the end of the spacer the pressurised fluid is released into the outlet port.

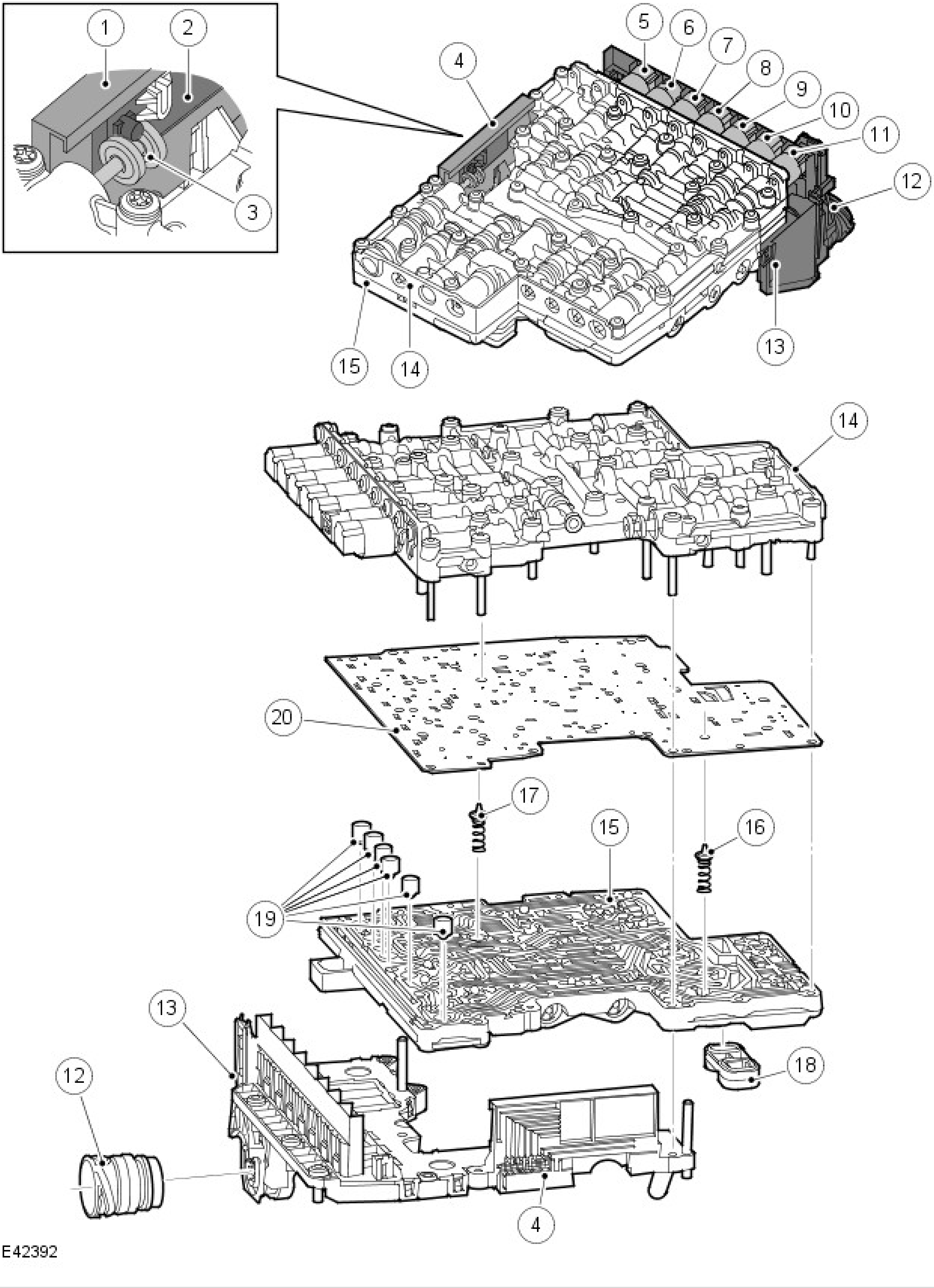
The fluid emerging from the outlet port is passed through the fluid pressure control valve. At high operating speeds the pressure control valve maintains the output pressure to the gearbox at a predetermined maximum level. Excess fluid is relieved from the pressure control valve and is directed, via the main pressure valve in the valve block, back to the pump inlet port. This provides a pressurised feed to the pump inlet which prevents cavitation and reduces pump noise.

MECHATRONIC VALVE BLOCK

The Mechatronic valve block is located in the bottom of the transmission and is covered by the fluid pan. The valve block houses the TCM, electrical actuators, speed sensors and control valves which provide all electro-hydraulic control for all transmission functions. The Mechatronic valve block comprises the following components:

- TCM
- Six pressure regulator solenoids
- One shift control solenoid
- One damper
- Twenty one hydraulic spool valves
- Manually operated selector valve
- Temperature sensor
- Turbine speed sensor
- Output shaft speed sensor.

ZF 6HP26 Automatic Transmission – Mechatronic Valve Block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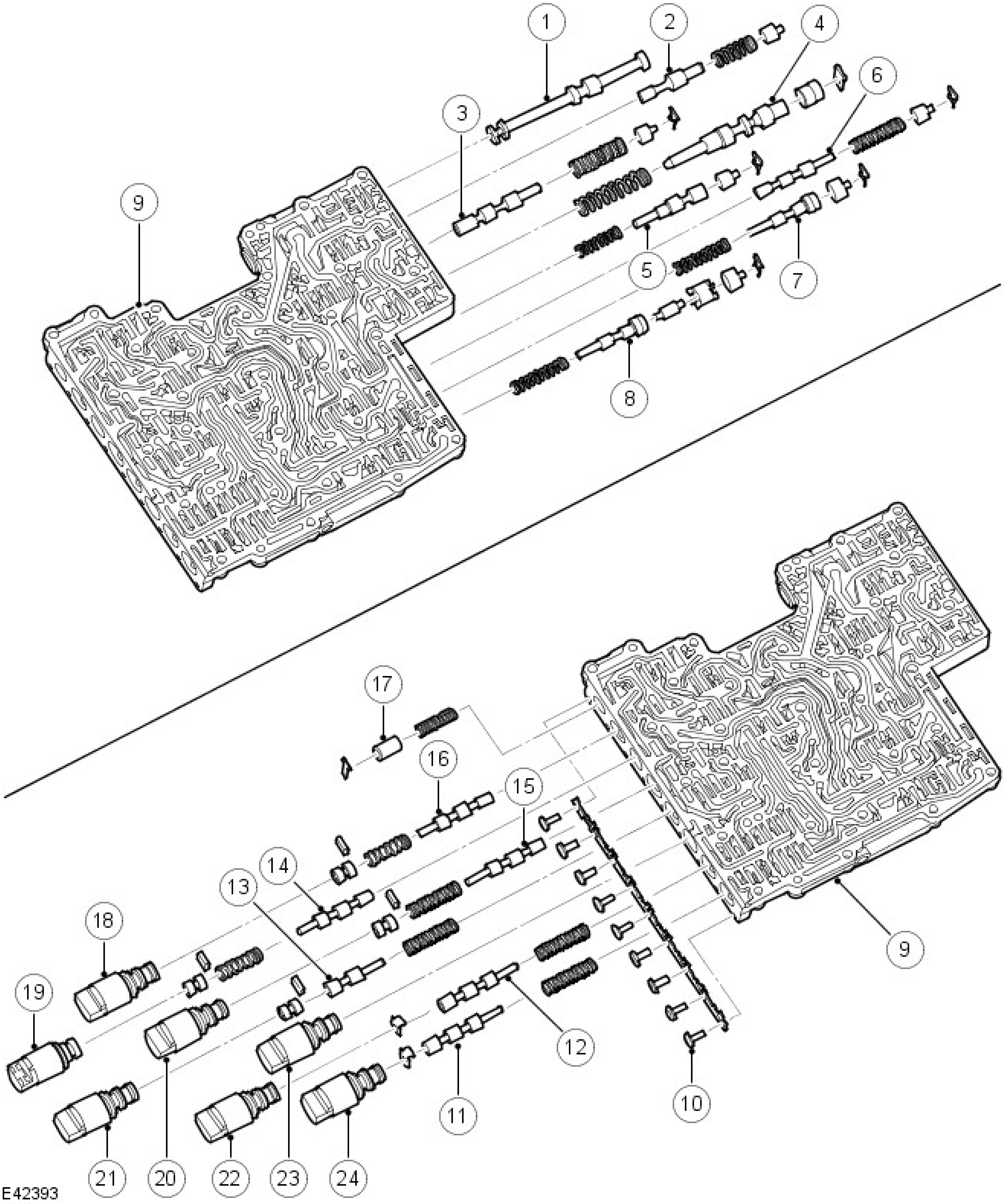
E42392

Item	Part Number	Description
1	-	Position switch
2	-	Sliding block
3	-	Selector spool valve
4	-	Position switch assembly
5	-	Electronic Pressure Regulator Solenoid (EPRS) 6

6	-	Solenoid Valve 1
7	-	EPRS 4
8	-	EPRS 5
9	-	EPRS 3
10	-	EPRS 2
11	-	EPRS 1
12	-	Electrical connector
13	-	Transmission Control Module (TCM)
14	-	Valve housing
15	-	Valve plate
16	-	Torque converter retaining valve
17	-	Clutch return valve
18	-	Element seal
19	-	Pressure regulator dampers
20	-	Intermediate plate

ZF 6HP26 Automatic Transmission – Valve Housing Components



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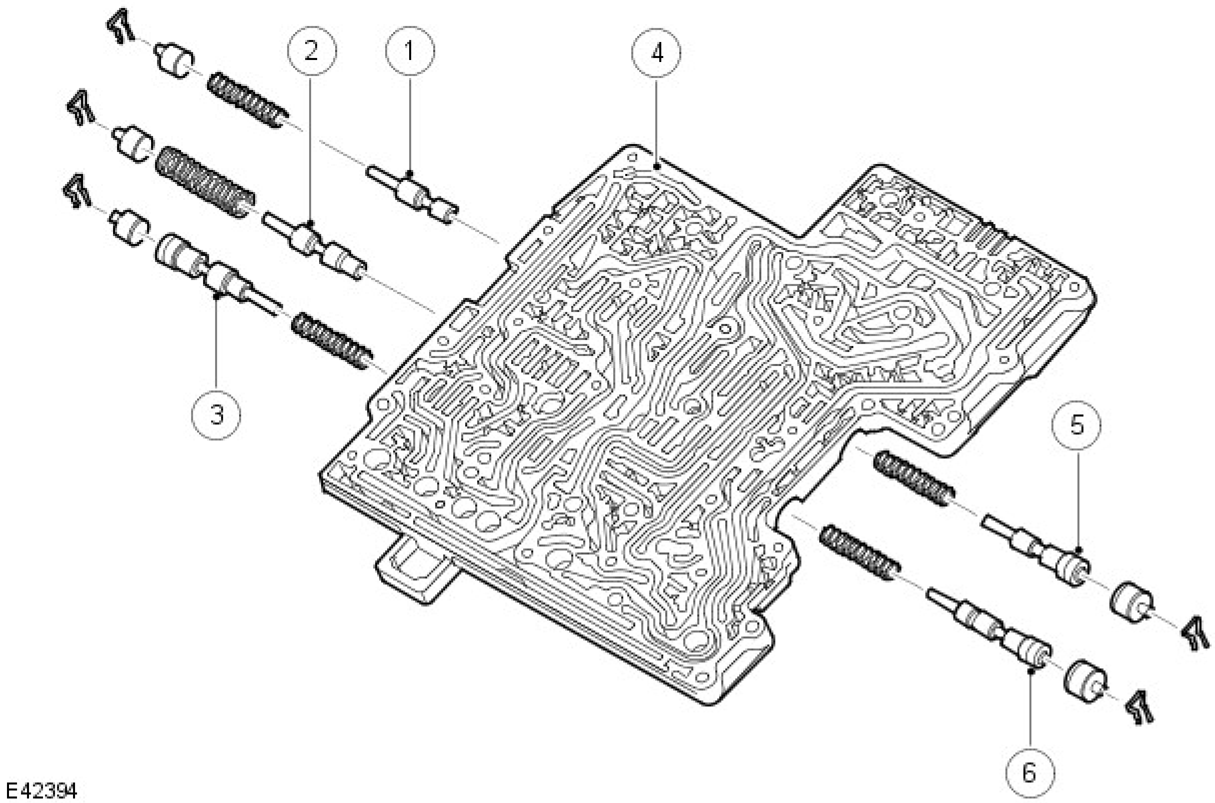
E42393

Item	Part Number	Description
1	-	Selector spool valve
2	-	Lubricating valve
3	-	Torque converter pressure valve
4	-	System pressure valve
5	-	Torque converter clutch valve

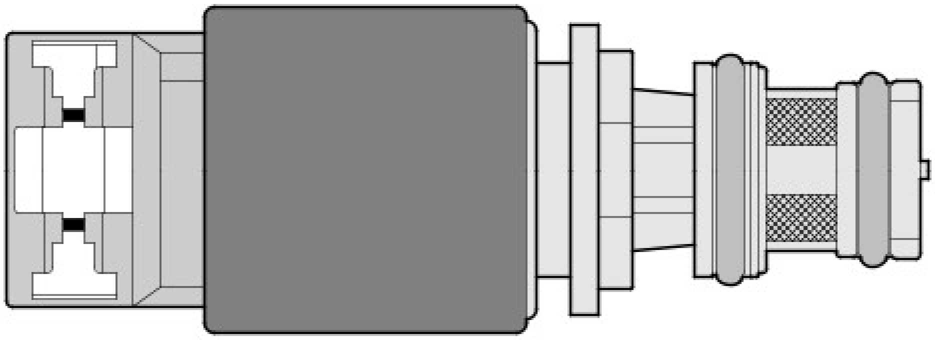
6	-	Retaining valve – Clutch E
7	-	Clutch valve E
8	-	Clutch valve A
9	-	Valve housing
10	-	Bolts
11	-	Retaining valve – Clutch A
12	-	Retaining valve – Clutch B
13	-	Pressure reducing valve
14	-	Shift valve 1
15	-	Retaining valve – Brake D
16	-	Shift valve 2
17	-	Damper
18	-	Electronic Pressure Regulator Solenoid (EPRS) 6
19	-	Solenoid valve 1
20	-	EPRS 4
21	-	EPRS 5
22	-	EPRS 2
23	-	EPRS 3
24	-	EPRS 1

ZF 6HP26 Automatic Transmission – Valve Plate Components



Item	Part Number	Description
1	-	Retaining valve – Brake D2
2	-	Clutch valve – Brake D2
3	-	Clutch valve B
4	-	Valve plate
5	-	Clutch valve – Brake D1
6	-	Clutch valve – Brake C

Electronic Pressure Regulator Solenoids (EPRS)



E42713

Six Electronic Pressure Regulator Solenoids (EPRS) are located in the valve block. The solenoids are controlled by Pulse Width Modulation (PWM) signals from the TCM. The solenoids convert the electrical signals into hydraulic control pressure proportional to the signal to actuate the spool valves for precise transmission operation.

The following table shows EPRS and their associated functions:

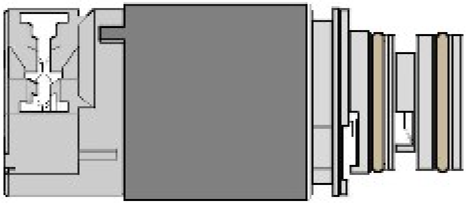
EPRS	Function
1	Clutch A
2	Clutch B
3	Clutch C
4	Brake clutches D and E
5	System pressure control
6	Torque converter lock-up control

Solenoids EPRS 1, 3 and 6 supply a lower control pressure as the signal amperage increases and can be identified by a black connector cap. The TCM operates the solenoids using PWM signals. The TCM monitors engine load and clutch slip and varies the solenoid duty cycle accordingly. The solenoids have a 12V operating voltage and a pressure range of 0 - 4.6 bar (0 - 67 lbf.in^2).

Solenoids EPRS 2, 4 and 5 supply a higher control pressure as the signal amperage increases and can be identified by a green connector cap. The solenoids are normally open, regulating flow solenoid valves. The TCM operates the solenoids using a PWM ground proportional to the required increasing or decreasing clutch pressures. The solenoids have a 12V operating voltage and a pressure range of 4.6 - 0 bar (67 - 0 lbf.in^2).

The resistance of the coil winding for the EPRS solenoids is 5.05 ohms at 20°C (68°F).

Control Solenoid



E42714

A shift control Solenoid Valve (SV) is located in the valve block. The solenoid is controlled by the TCM and converts electrical signals into hydraulic control signals to control clutch application.

The shift control solenoid is an open/closed, on/off solenoid which is controlled by the TCM switching the solenoid to earth. The

TCM also supplies power to the solenoid. The TCM energises the solenoid in a programmed sequence for clutch application for gear ratio changes and shift control.

The resistance of the solenoid coil winding within the solenoid is between 26 to 30.4 ohms at 20°C (68°F).

Sensors

Speed Sensors

The turbine speed sensor and the output shaft speed sensor are Hall effect type sensors located in the Mechatronic valve block and are not serviceable items. The TCM monitors the signals from each sensor to determine the input (turbine) speed and the output shaft speed.

The turbine speed is monitored by the TCM to calculate the slip of the torque converter clutch and internal clutch slip. This signal allows the TCM to accurately control the slip timing during shifts and adjust clutch application or release pressure for overlap shift control.

The output shaft speed is monitored by the TCM and compared to engine speed signals received on the CAN bus from the ECM. Using a comparison of the two signals the TCM calculates the transmission slip ratio for plausibility and maintains adaptive pressure control.

Temperature Sensor

The temperature sensor is also located in the Mechatronic valve block. The TCM uses the temperature sensor signals to determine the temperature of the transmission fluid. These signals are used by the TCM to control the transmission operation to promote faster warm-up in cold conditions or to assist with fluid cooling by controlling the transmission operation when high fluid temperatures are experienced. If the sensor fails, the TCM will use a default value and a fault code will be stored in the TCM.

Damper

There is one damper located in the valve housing. The damper is used to regulate and dampen the regulated pressure supplied via EPRS 5. The damper is load dependent through modulation of the damper against return spring pressure.

The damper comprises a piston, a housing bore and a spring. The piston is subject to the pressure applied by the spring. The bore has a connecting port to the function to which it applies. Fluid pressure applied to the applicable component (i.e. a clutch) is also subjected to the full area of the piston, which moves against the opposing force applied by the spring. The movement of the piston creates an action similar to a shock absorber, momentarily delaying the build up of pressure in the circuit. This results in a more gradual application of clutches improving shift quality.

Spool Valves

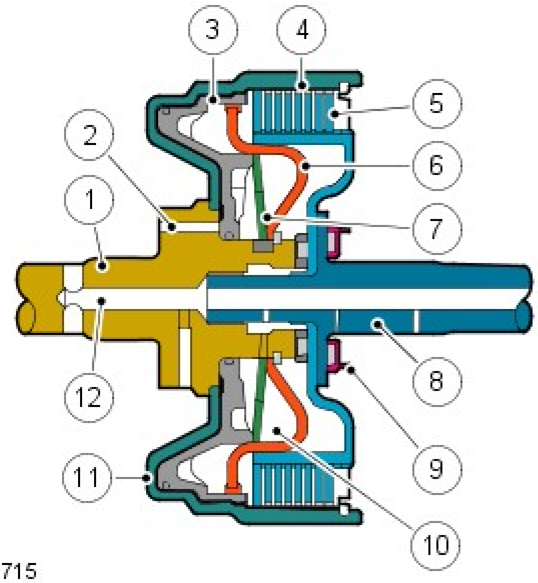
The valve block contains twenty one spool valves which control various functions of the transmission. The spool valves are of conventional design and are operated by fluid pressure.

Each spool valve is located in its spool bore and held in a default (unpressurised) position by a spring. The spool bore has a number of ports which allow fluid to flow to other valves and clutches to enable transmission operation. Each spool has a piston which is waisted to allow fluid to be diverted into the applicable ports when the valve is operated.

When fluid pressure moves a spool, one or more ports in the spool bore are covered or uncovered. Fluid is prevented from flowing or is allowed to flow around the applicable waisted area of the spool and into another uncovered port. The fluid is either passed through galleries to actuate another spool, operate a clutch or is returned to the fluid pan.

DRIVE CLUTCHES

Multiplate Drive or Brake Clutch – Typical



Item	Part Number	Description
1	-	Input shaft
2	-	Main pressure supply port
3	-	Piston
4	-	Cylinder – External plate carrier
5	-	Clutch plate assembly
6	-	Baffle plate
7	-	Diaphragm spring
8	-	Output shaft
9	-	Bearing
10	-	Dynamic pressure equalisation chamber
11	-	Piston chamber
12	-	Lubrication channel

There are three drive clutches and two brake clutches used in the 6HP26 transmission. Each clutch comprises one or more friction plates dependent on the output controlled. A typical clutch consists of a number of steel outer plates and inner plates with friction material bonded to each face.

The clutch plates are held apart mechanically by a diaphragm spring and hydraulically by dynamic pressure. The pressure is derived from a lubrication channel which supplies fluid to the bearings etc. The fluid is passed via a drilling in the output shaft into the chamber between the baffle plate and the piston. To prevent inadvertent clutch application due to pressure build up produced by centrifugal force, the fluid in the dynamic pressure equalisation chamber overcomes any pressure in the piston chamber and holds the piston off the clutch plate assembly.

When clutch application is required, main pressure from the fluid pump is applied to the piston chamber from the supply port. This main pressure overcomes the low pressure fluid present in the dynamic pressure equalisation chamber. The piston moves, against the pressure applied by the diaphragm spring, and compresses the clutch plate assembly. When the main pressure falls, the diaphragm spring pushes the piston away from the clutch plate assembly, disengaging the clutch.

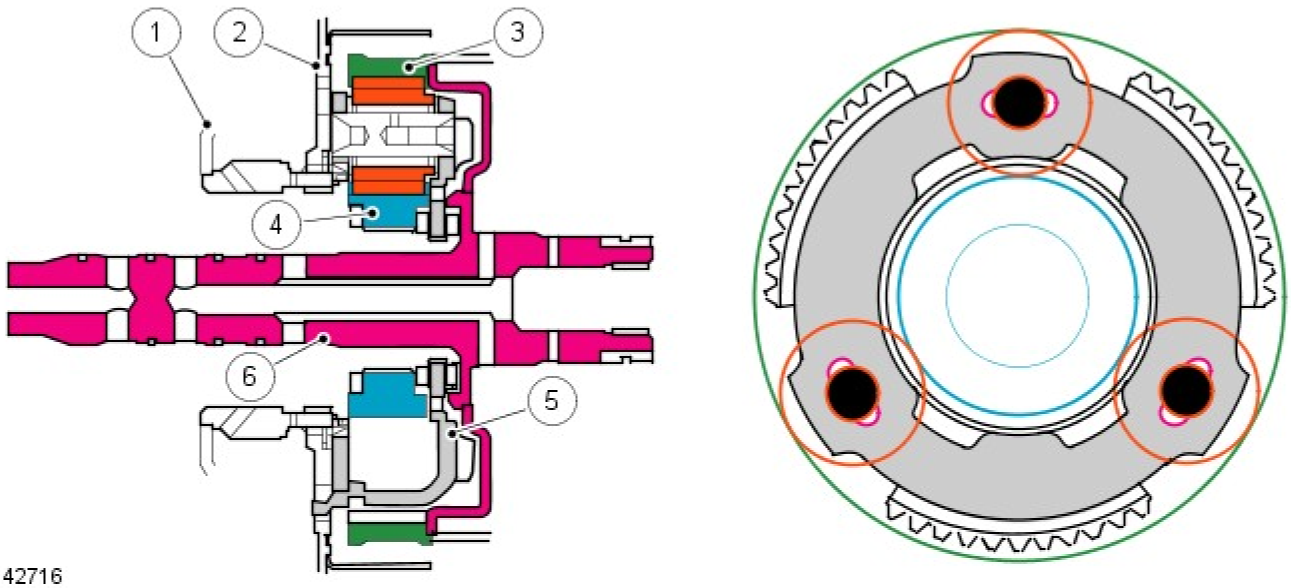
PLANETARY GEAR TRAINS

The planetary gear trains used on the 6HP26 transmission comprise a single web planetary gear train and a double web planetary gear train. These gear trains are known as Lepelletier type gear trains and together produce the six forward gears and the one reverse gear.

Single Web Planetary Gear Train

The single web planetary gear train comprises:

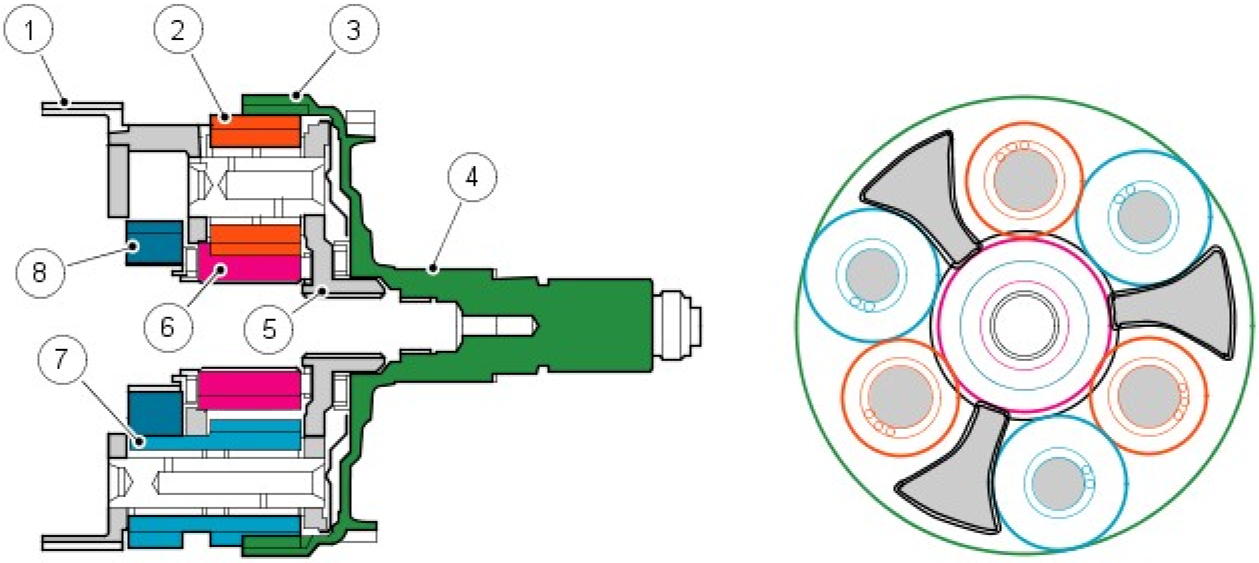
- One sunwheel
- Three planetary gears
- One planetary gear carrier (spider)
- One ring gear or annulus



E42716

Item	Part Number	Description
1	-	Cylinder
2	-	Baffle plate
3	-	Ring gear
4	-	Sun gear
5	-	Planetary gear spider
6	-	Torque converter input shaft

Double Web Planetary Gear Train



E42717

Item	Part Number	Description
1	-	Planetary gear spider
2	-	Planetary gears (short)
3	-	Ring gear
4	-	Output shaft
5	-	Planetary gear carrier
6	-	Sunwheel
7	-	Double planetary gears (long)
8	-	Sunwheel

The double planetary gear train comprises:

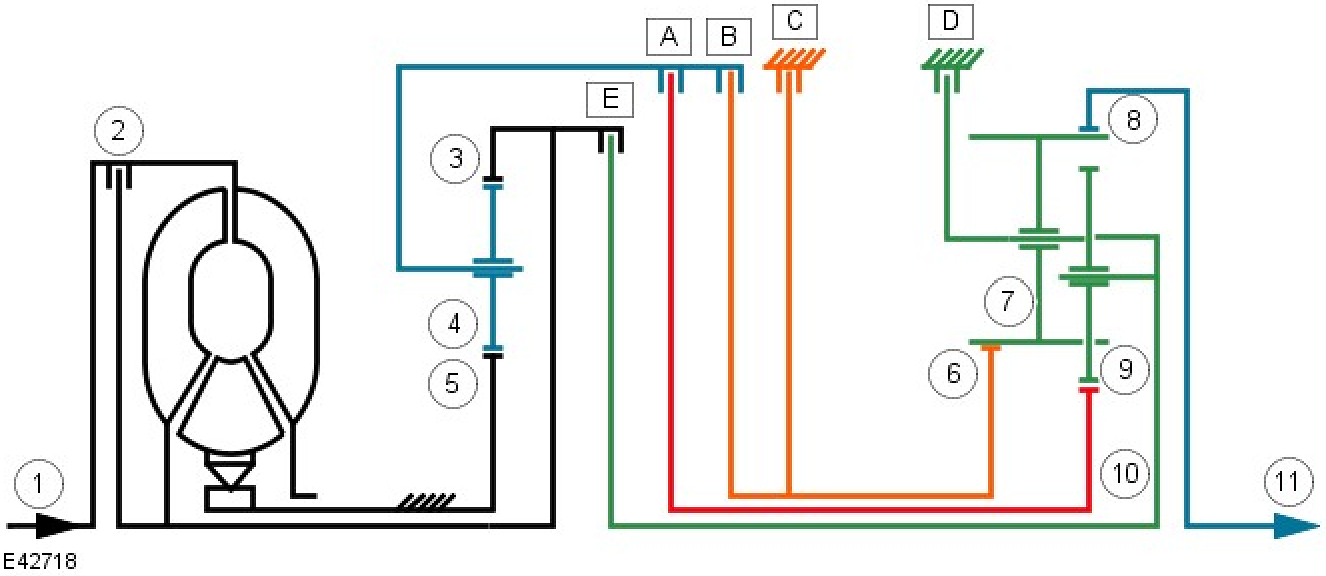
- Two sunwheels

- Three short planetary gears
- Three long planetary gears
- One planetary gear carrier
- One ring gear or annulus

POWER FLOWS

Operation of the transmission is controlled by the TCM which electrically activates various solenoids to control the transmission gear selection. The sequence of solenoid activation is based on programmed information in the module memory and physical transmission operating conditions such as vehicle speed, throttle position, engine load and selector lever position.

Powerflow Schematic



Item	Part Number	Description
1	-	Torque input from engine
2	-	Torque converter lock-up clutch
3	-	Single web planetary gear carrier
4	-	Single web planetary gears
5	-	Single web sunwheel 1
6	-	Double web sunwheel 2
7	-	Double web planetary gears - Long
8	-	Double web planetary gear carrier
9	-	Double web planetary gears - Short
10	-	Double web sunwheel 3
11	-	Torque output from transmission
A	-	Multiplate clutch
B	-	Multiplate clutch
C	-	Multiplate brake
D	-	Multiplate brake
E	-	Multiplate clutch

Engine torque is transferred, via operation of single or combinations of clutches to the two planetary gear trains. Both gear trains are controlled by reactionary inputs from brake clutches to produce the six forward gears and one reverse gear. The ratios are as follows:

Gear	1st	2nd	3rd	4th	5th	6th	Reverse
Ratio	4.171	2.340	1.521	1.143	0.867	0.691	3.403

The following table shows which solenoids are activated to produce the required torque output from the transmission.

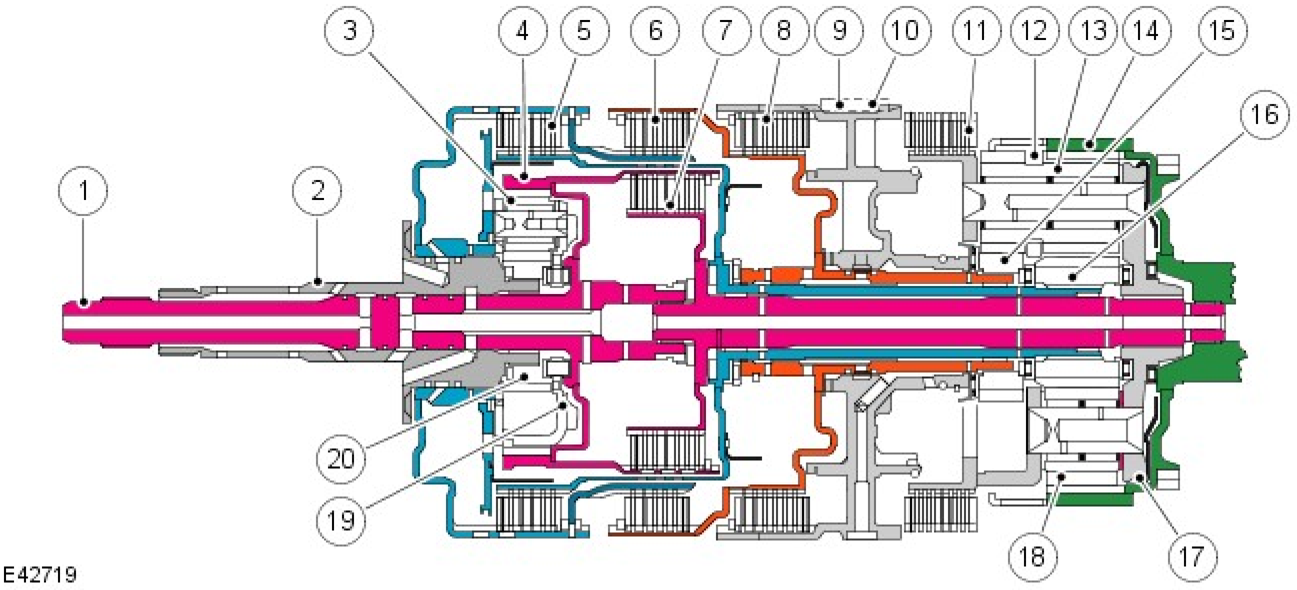
Gear Selector Lever Position	Shift Control Solenoid Valve	Electronic Pressure Regulator Solenoids (EPRS)					
		1	2	3	4	5	6
P					ON	-ON-	
R			ON		ON	-ON-	
N					ON	-ON-	
D 1		ON			ON	-ON-	-ON-

Gear Selector Lever Position	**Shift Control Solenoid Valve**	**Electronic Pressure Regulator Solenoids (EPRS)**					
		1	**2**	**3**	**4**	**5**	**6**
D 2		ON		ON		-ON-	-ON-
D 3		ON	ON			-ON-	-ON-
D 4	ON	ON			ON	-ON-	-ON-
D 5	ON		ON		ON	-ON-	-ON-
D 6	ON			ON	ON	-ON-	-ON-
ON = Active (pressure build up) **OFF** = Inactive **-ON-** = Inactive (pressure drain)							

The following table shows which clutches are operating for selected gear ratios to produce the required torque output from the transmission.

Gear Selector Lever Position	**Shift Control Solenoid Valve**	**Clutch**				**Brake**	
		A	**B**	**E**	**WK**	**C**	**D**
P							X
R			X				X
N							X
D 1		X			X		X
D 2		X			X	X	
D 3		X	X		X		
D 4	ON	X		X	X		
D 5	ON		X	X	X		
D 6	ON			X	X	X	
X = clutch applied							

Shift Elements



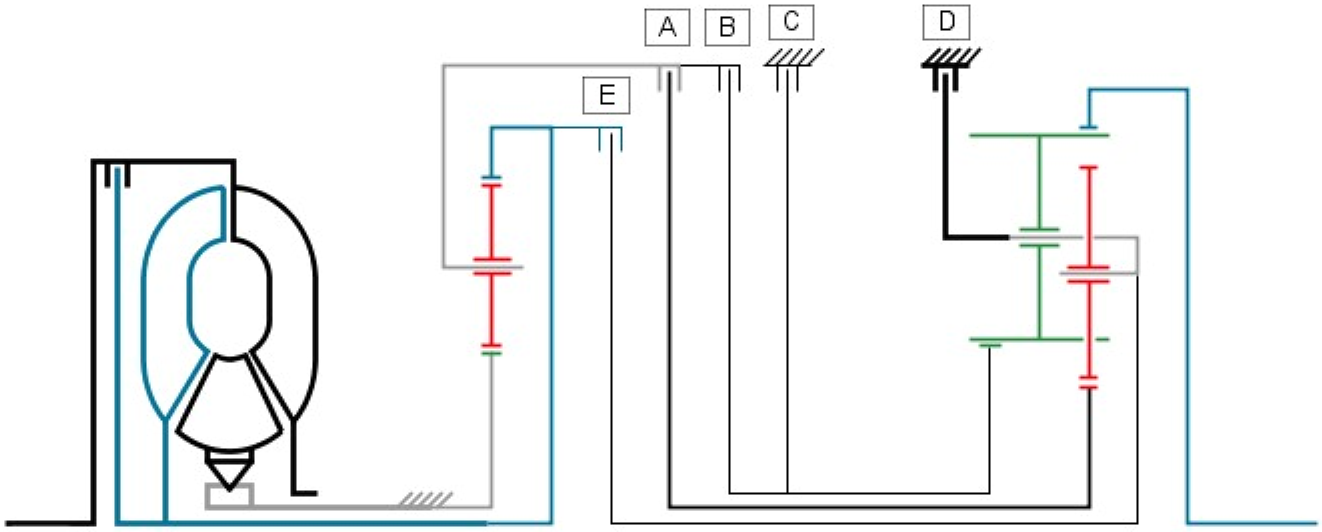
Item	**Part Number**	**Description**
1	-	Turbine shaft
2	-	Stator shaft
3	-	Single web planetary gear train
4	-	Ring gear 1
5	-	Clutch A
6	-	Clutch B
7	-	Clutch E
8	-	Brake clutch C
9	-	Fixed connection to transmission housing
10	-	Shaft key
11	-	Brake clutch D
12	-	Double web planetary gear train
13	-	Planetary gears - Long
14	-	Ring gear 2

15	-	Sunwheel 2
16	-	Sunwheel 3
17	-	Double web planetary gear carrier
18	-	Planetary gears - short
19	-	Single web planetary gear carrier
20	-	Sunwheel 1

The shift elements are three rotating multiplate clutches (A, B and E) and two fixed multiplate brakes © and D). All shifts from 1st to 6th gears are power-on overlapping shifts. Overlapping shifts can be described as one of the clutches continuing to transmit drive at a lower main pressure until the next required clutch is able to accept the input torque.

The shift elements, clutches and brakes are actuated hydraulically. Fluid pressure is applied to the required clutch and/or brake, pressing the plates together and allowing drive to be transmitted through the plates. The purpose of the shift elements is to perform power-on shifts with no interruption to traction and smooth transition between gear ratios.

Power Flow 1st Gear



E42720

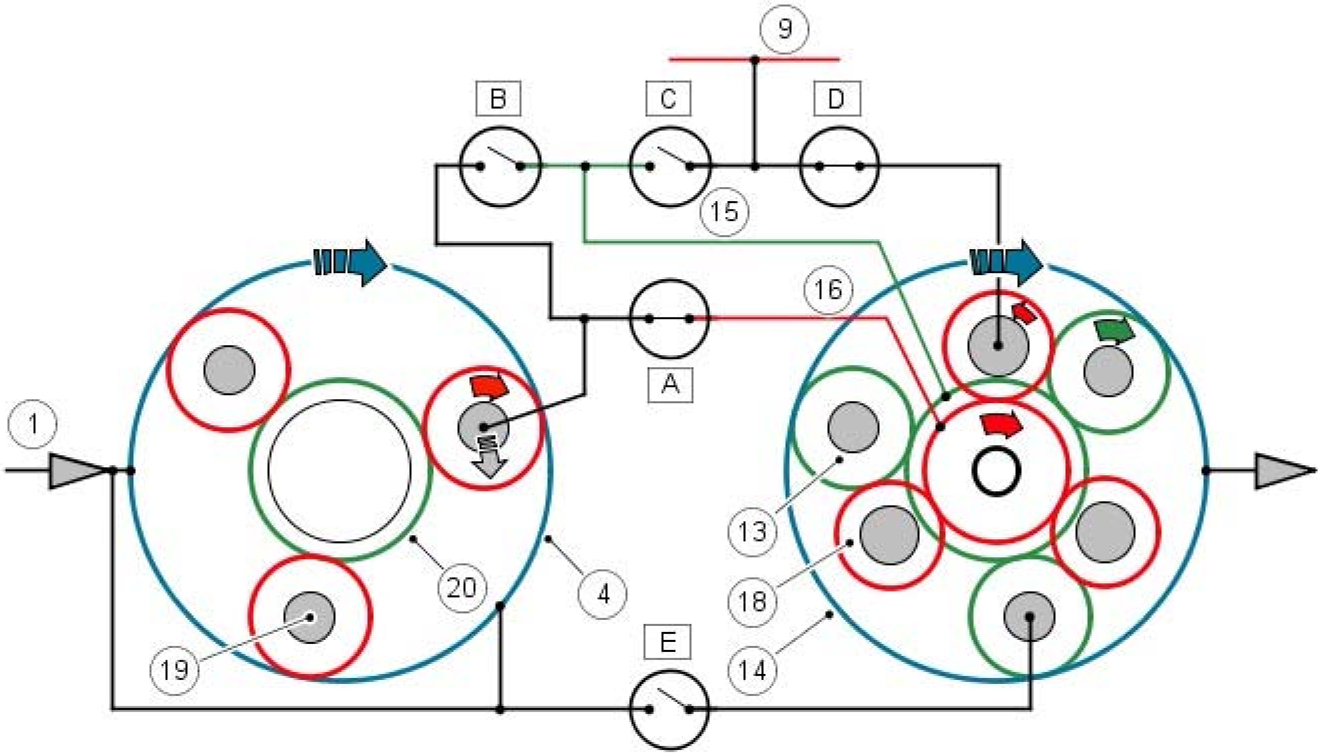
The gear selector lever and the manual selector valve spool are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

The double web planetary gear train is locked against the transmission housing by brake 'D'. This allows ring gear 2 (output shaft) to be driven in the same direction as the engine via the long planetary gears.

- NOTE: Refer to 'Shift Elements' illustration for key



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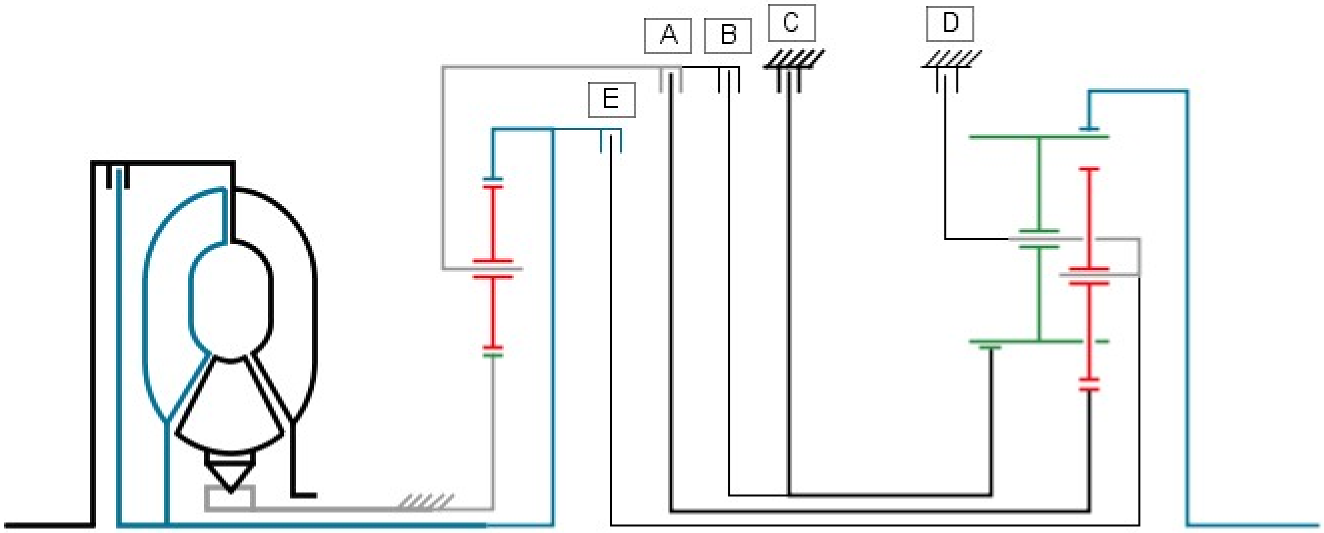
Power Flow 2nd Gear



E42722

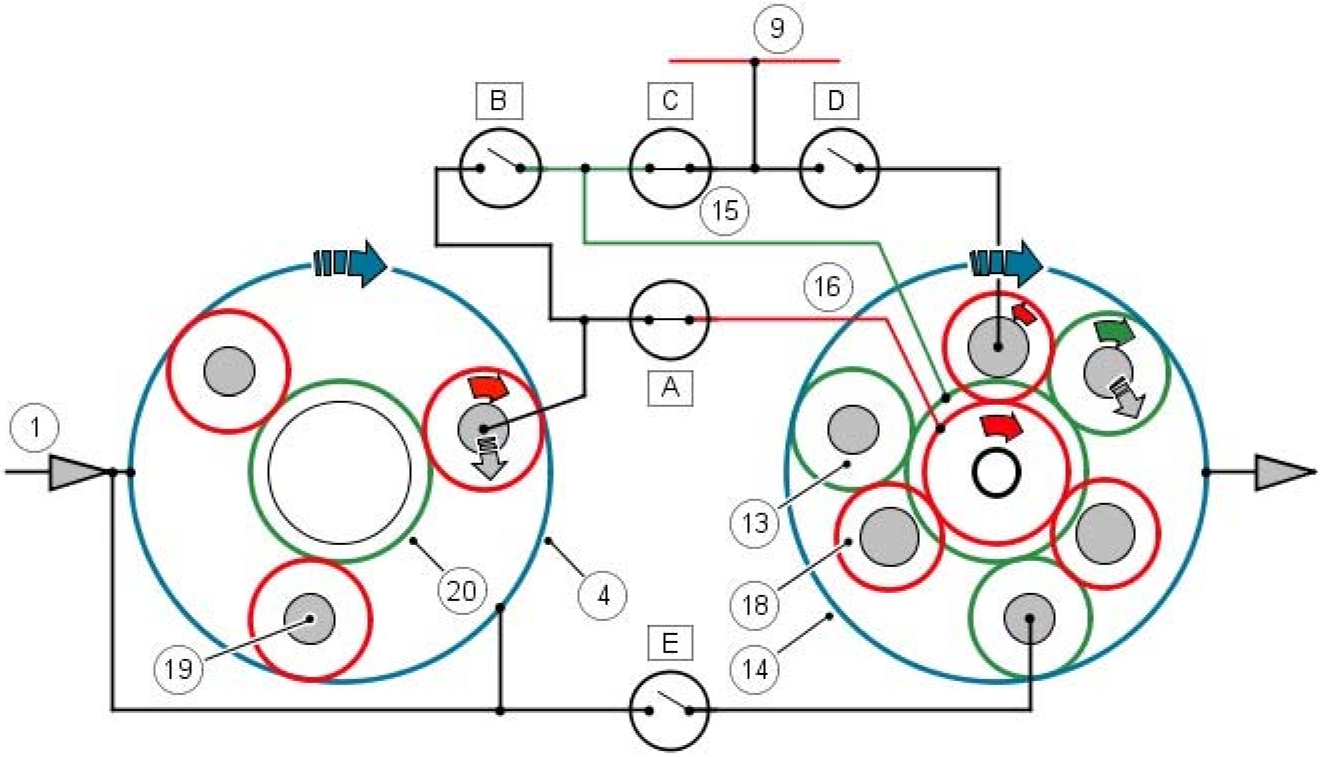
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

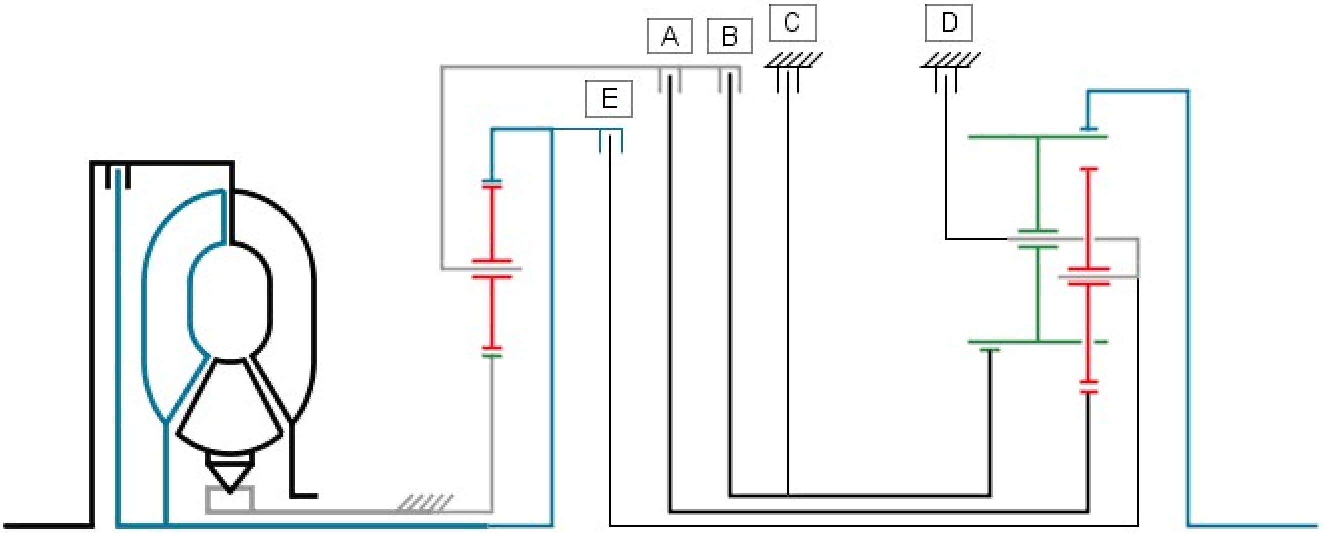
Sunwheel 2 is locked to the transmission housing by brake clutch 'C'. The long planetary gears, which are also meshed with the short planetary gears, roll around the fixed sunwheel 2 and transmit drive to the double web planetary gear train carrier and ring gear 2 in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E42723

Power Flow 3rd Gear



E42724

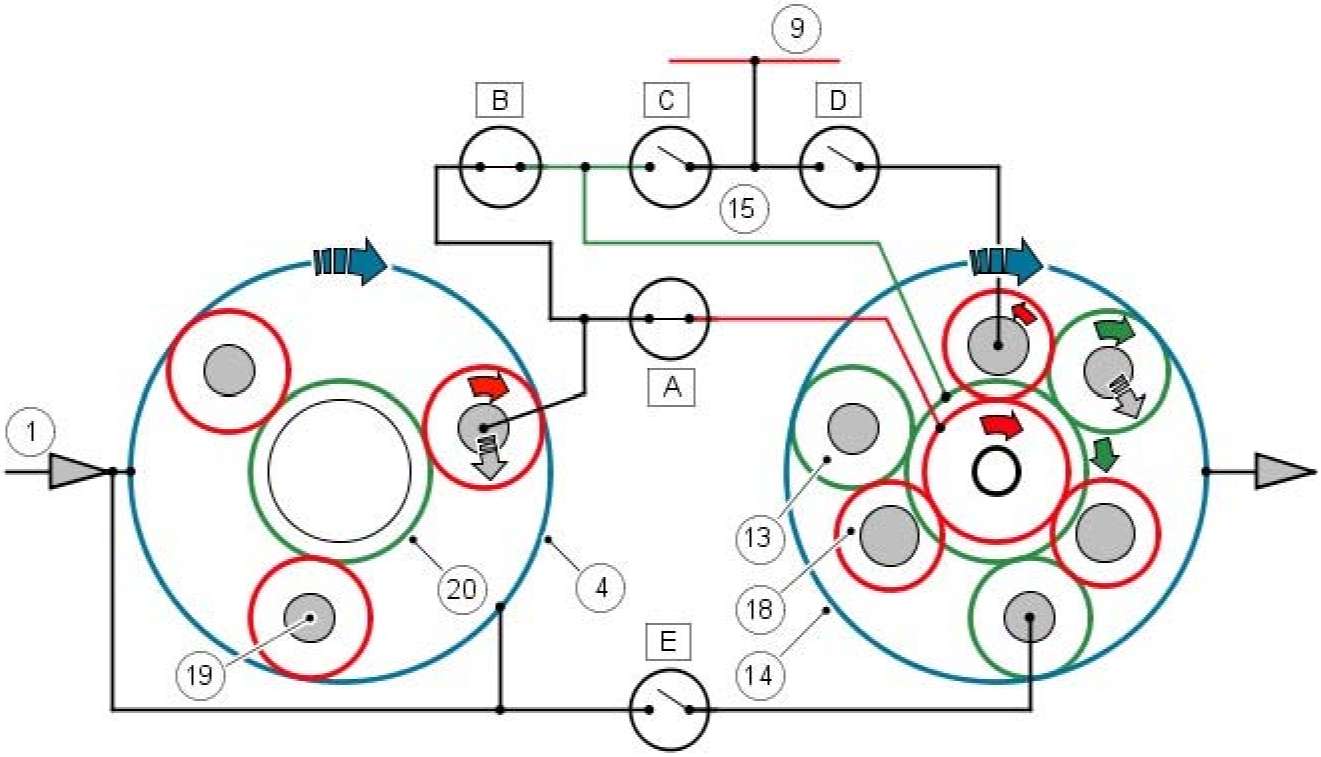
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

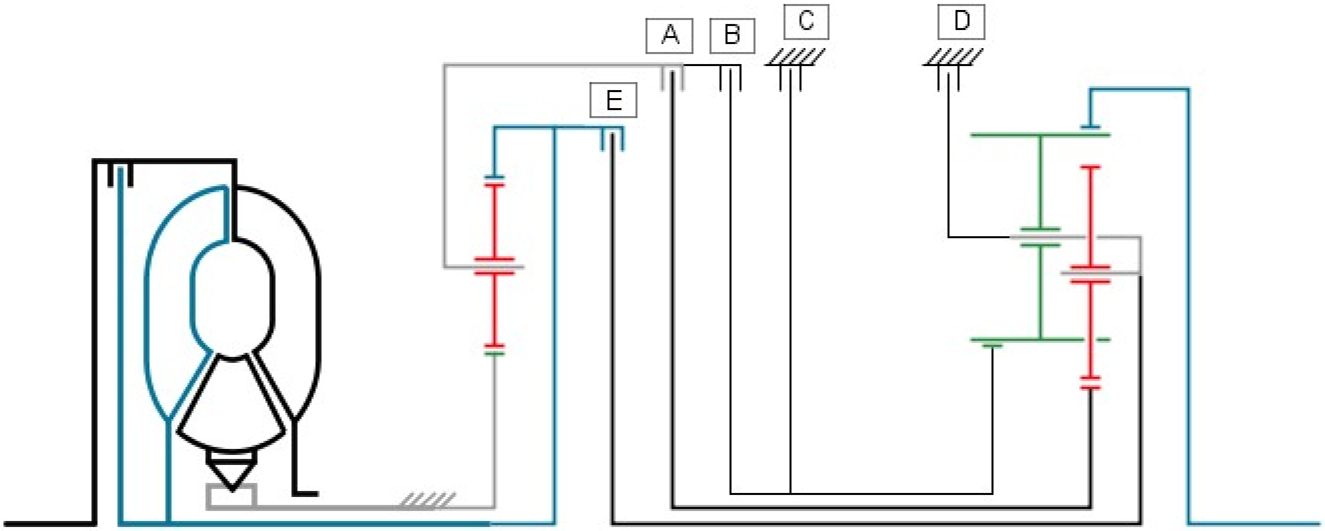
Sunwheel 2 is driven via clutch 'B' which is engaged. The long planetary gears, which are also meshed with the short planetary gears, cannot roll around the fixed sunwheel 2 and transmit drive to the locked double web planetary gear train carrier in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E42725

Power Flow 4th Gear



E42726

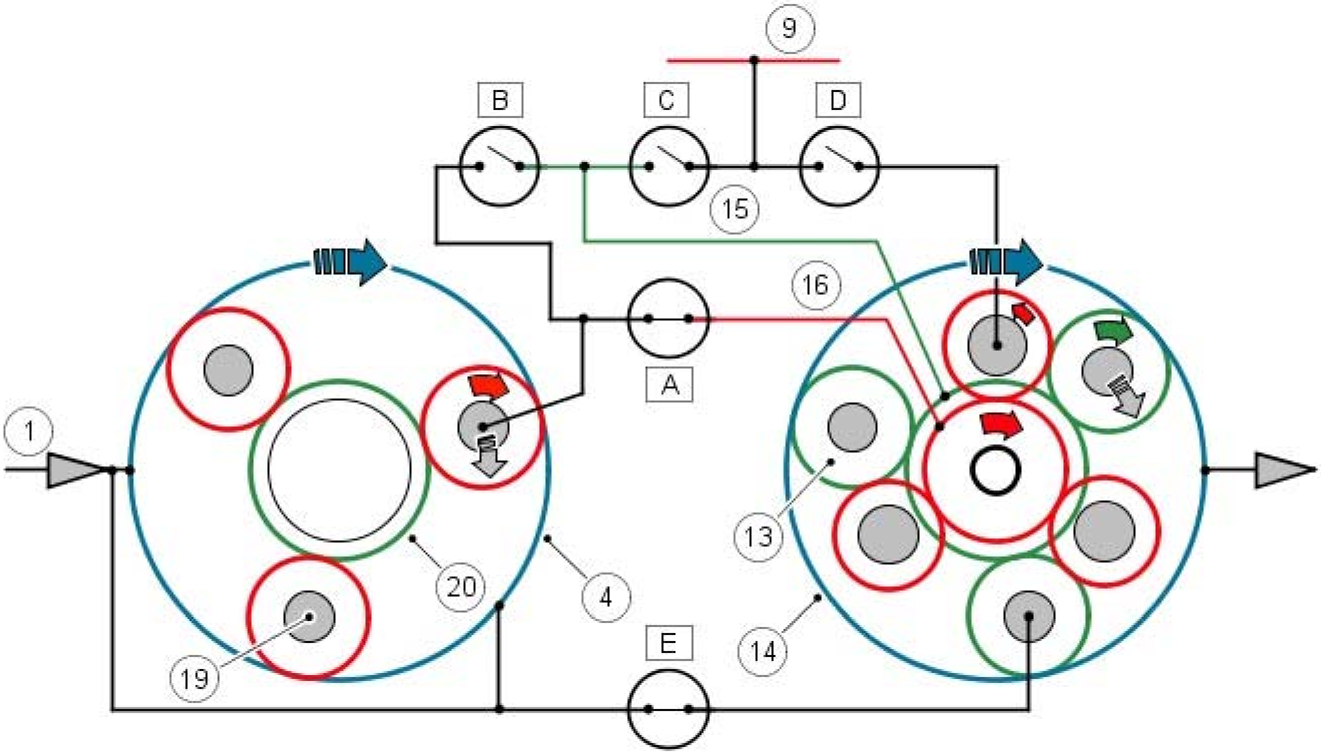
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

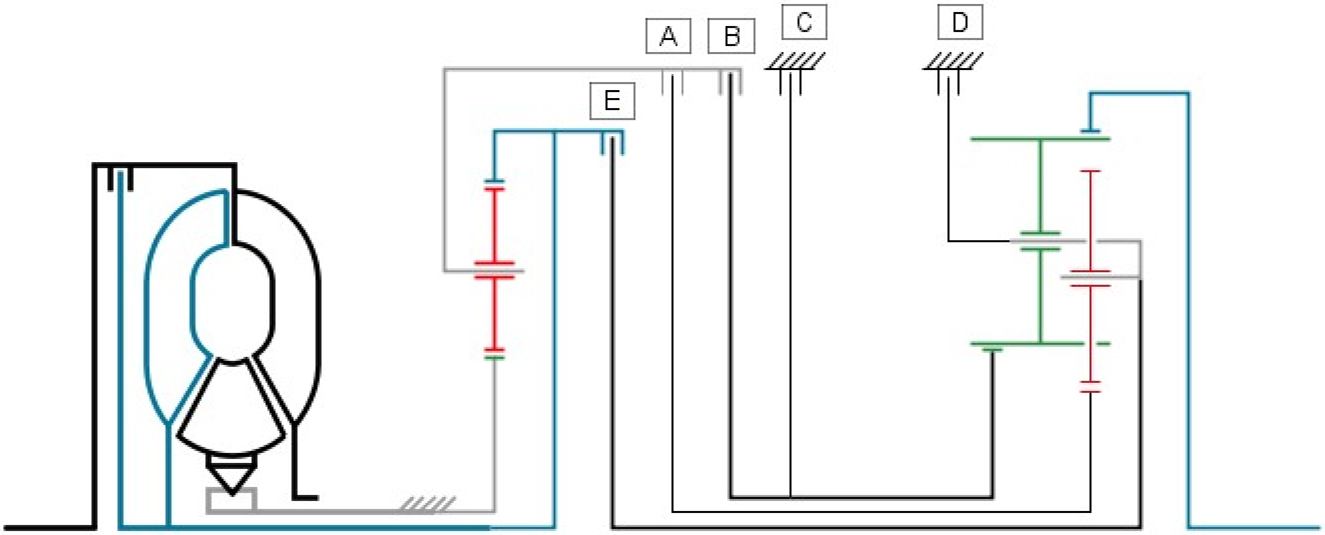
The double web planetary gear carrier is driven via clutch 'E' which is engaged. The long planetary gears, which are also meshed with the short planetary gears, and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E42727

Power Flow 5th Gear



E42728

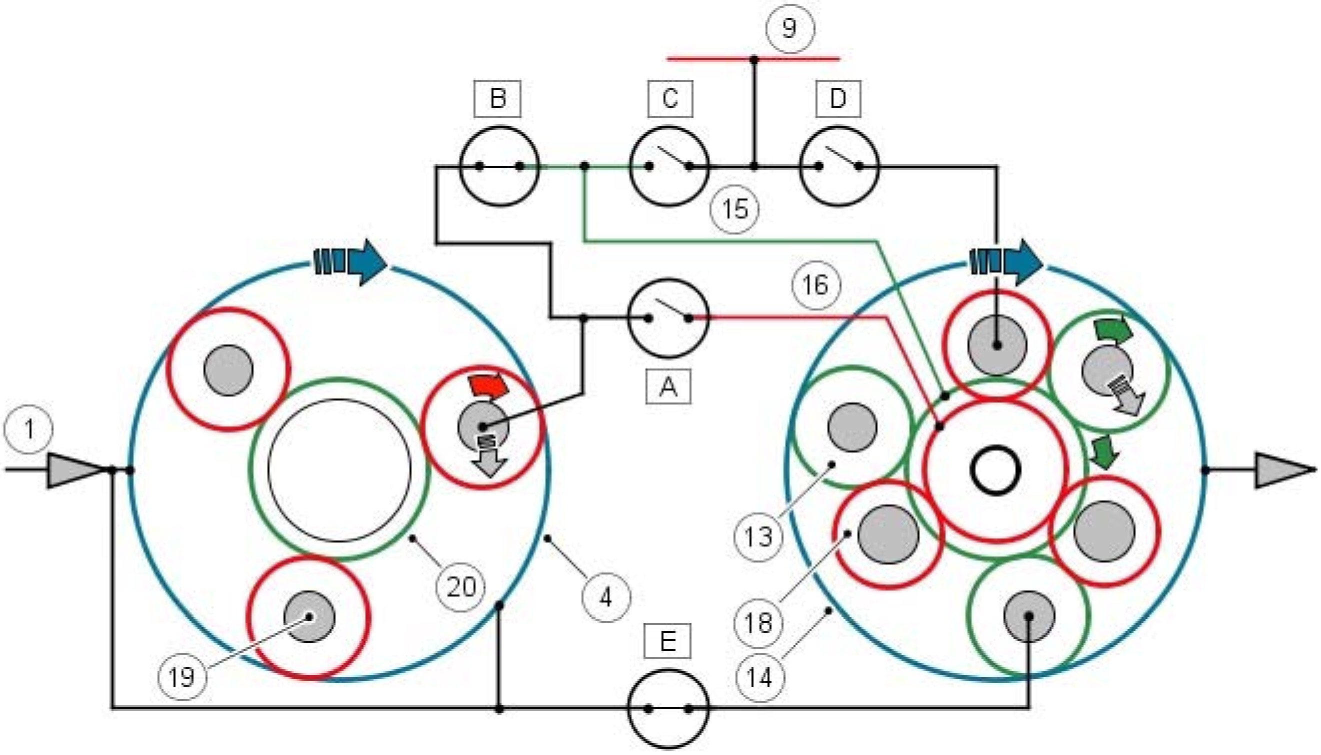
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

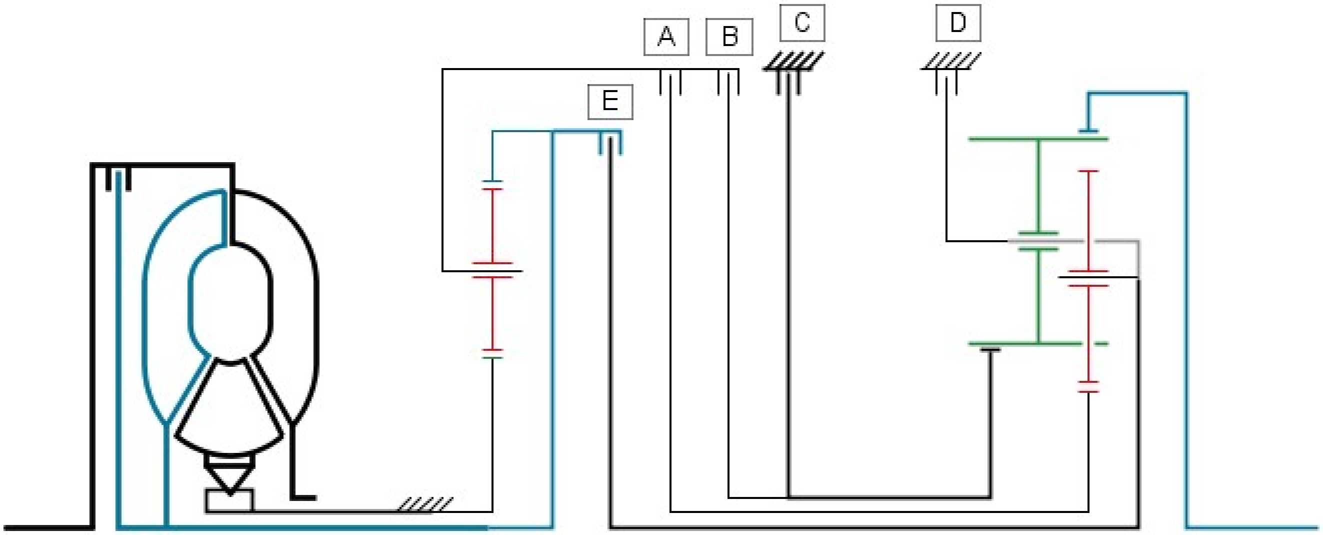
The long planetary gears, which are also meshed with the short planetary gears, and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E42729

Power Flow 6th Gear



E42730

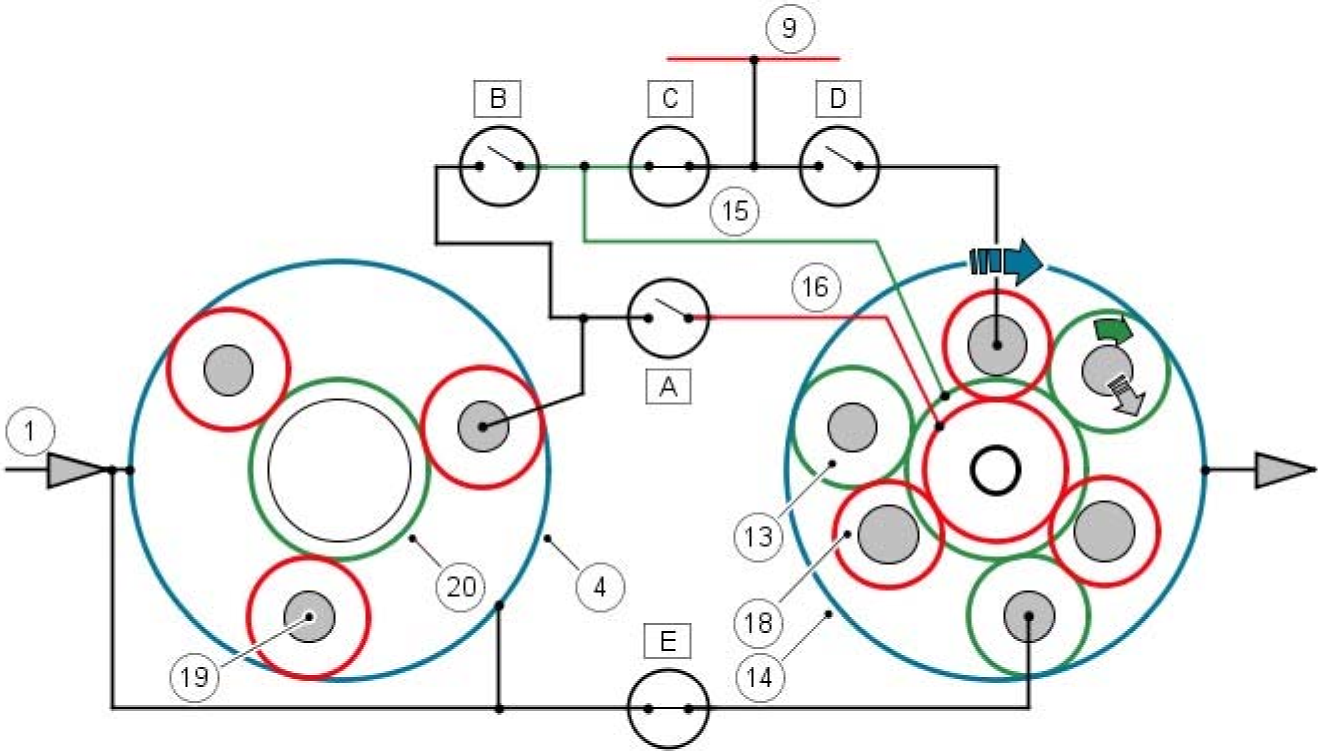
The gear selector lever and the manual selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Clutches 'A' and 'B' are released, removing the effect of the single web planetary gear train.

Clutch brake 'C' is applied which locks sunwheel 2 to the transmission housing.

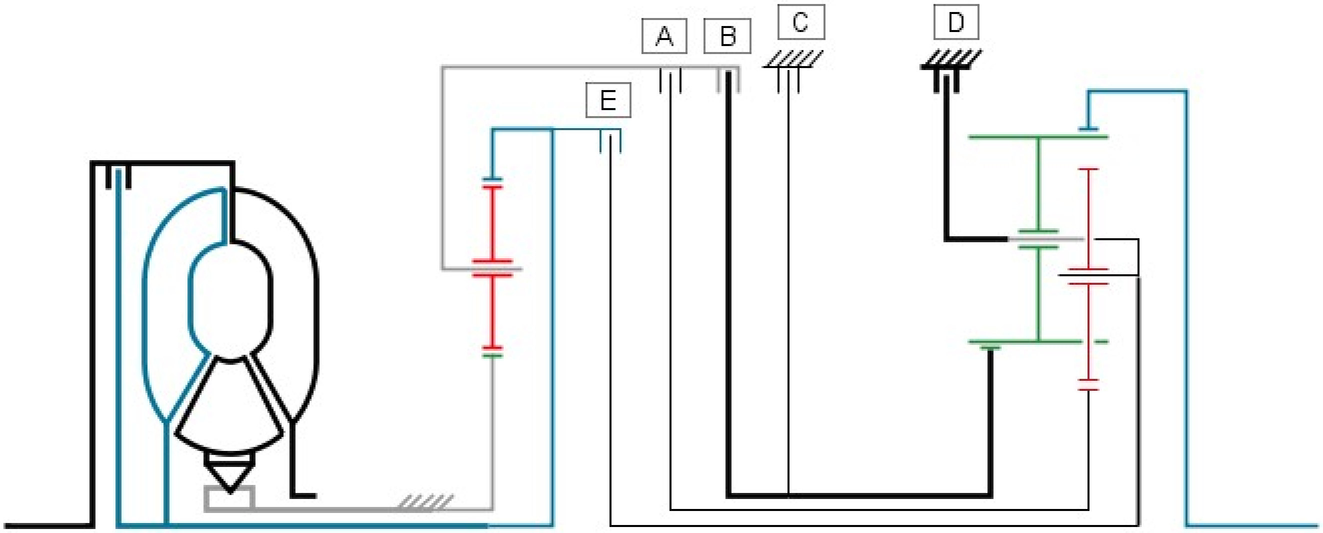
Clutch 'E' is engaged and drives the double web planetary gear carrier. This causes the long planetary gears to rotate around the fixed sunwheel 2 and transmit drive to ring gear 2 which is driven in the direction of engine rotation.

- NOTE: Refer to 'Shift Elements' illustration for key



E42731

Power Flow Reverse Gear



E42732

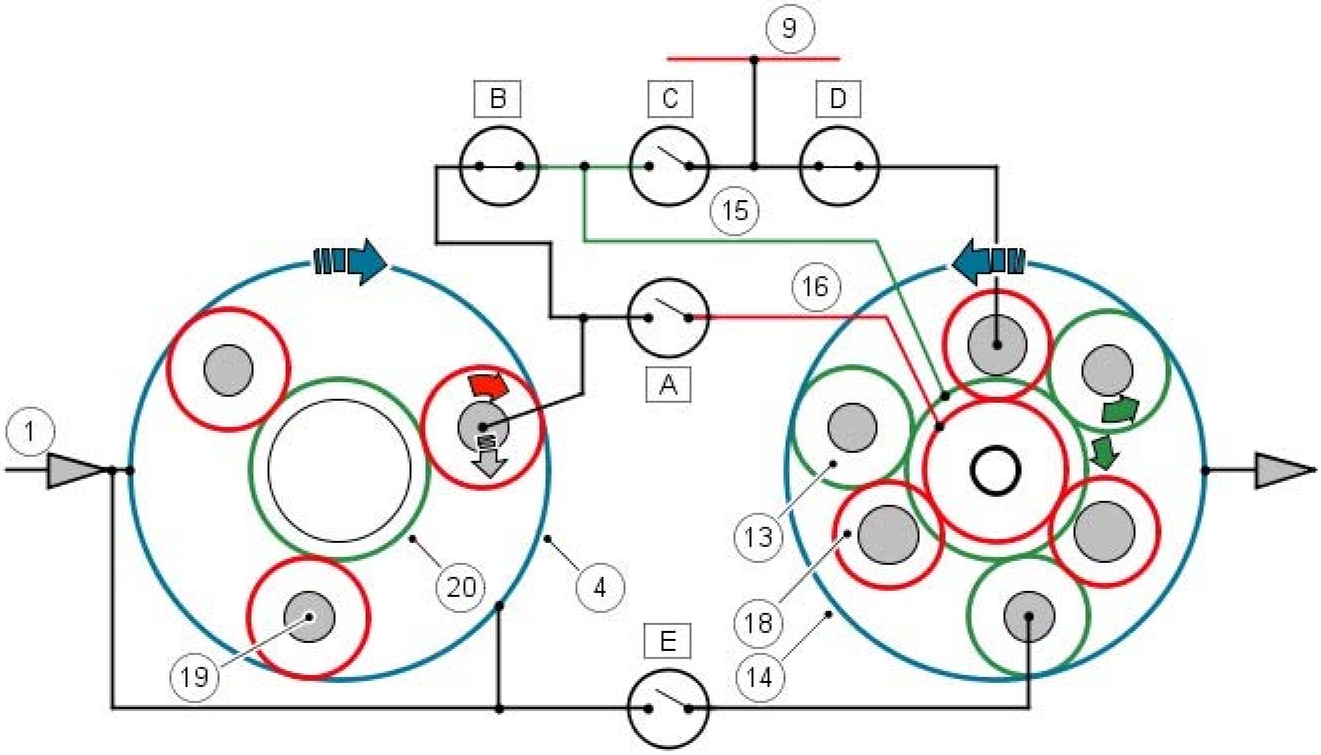
The gear selector lever and the manual selector spool valve are in the 'R' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears of the single web planetary gear train which rotate around the fixed sunwheel 1. This transmits the drive to the single web planetary gear carrier, the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

With clutch 'B' applied, sunwheel 2 in the double web planetary gear train is driven and meshes with the long planetary gears.

The double web planetary gear carrier is locked to the transmission housing by brake clutch 'D'. This allows ring gear 2 to be driven in the opposite direction to engine rotation by the long planetary gears.

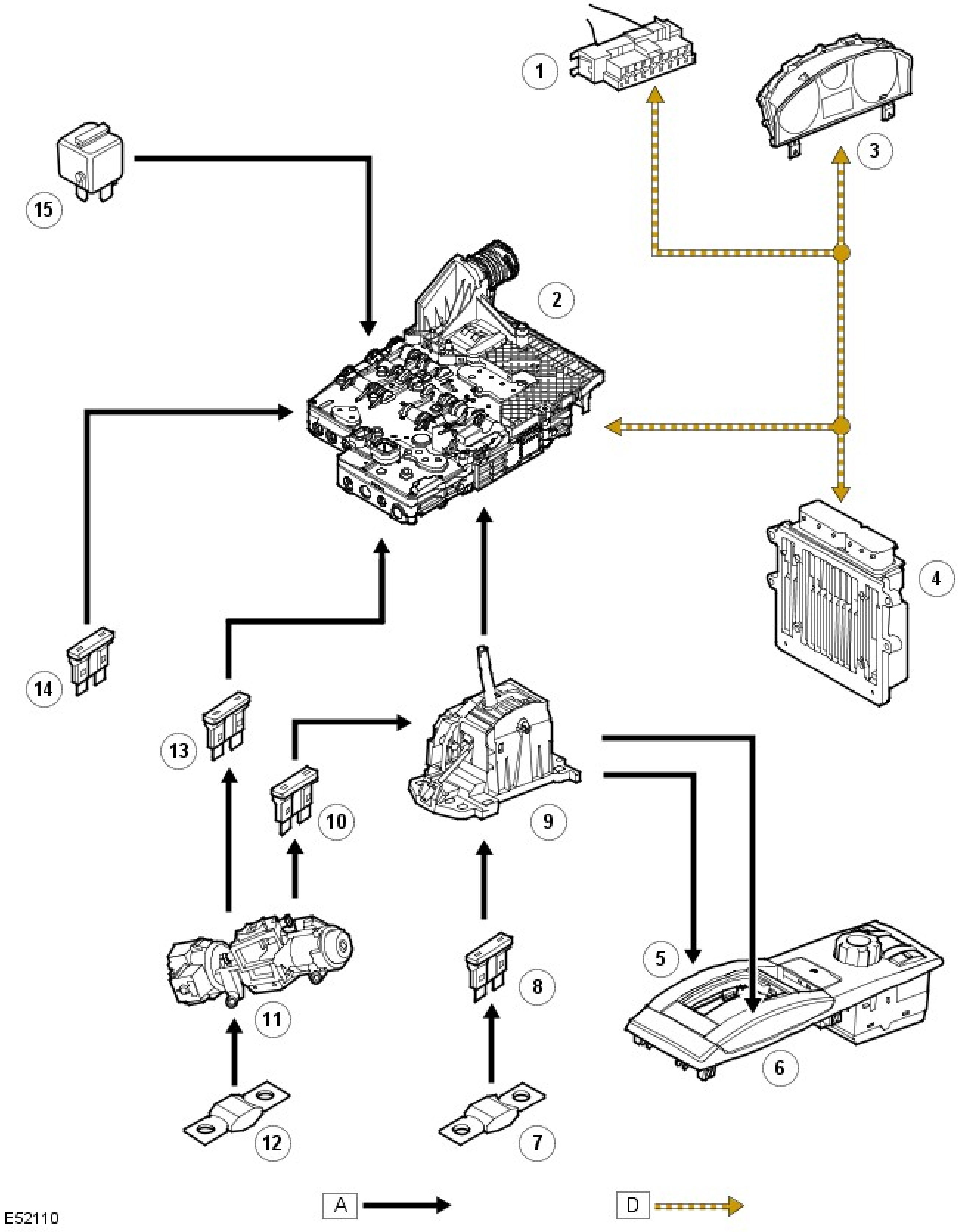
- NOTE: Refer to 'Shift Elements' illustration for key



E42733

CONTROL DIAGRAM

- NOTE: **A** = Hardwired; **D**= High Speed CAN Bus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E52110
A
D

Item	Part Number	Description
1	-	Diagnostic socket
2	-	Mechatronic Valve (including TCM, sensors and solenoids)
3	-	Instrument cluster
4	-	Engine Control Module (ECM)
5	-	Selector indicator (PRND)

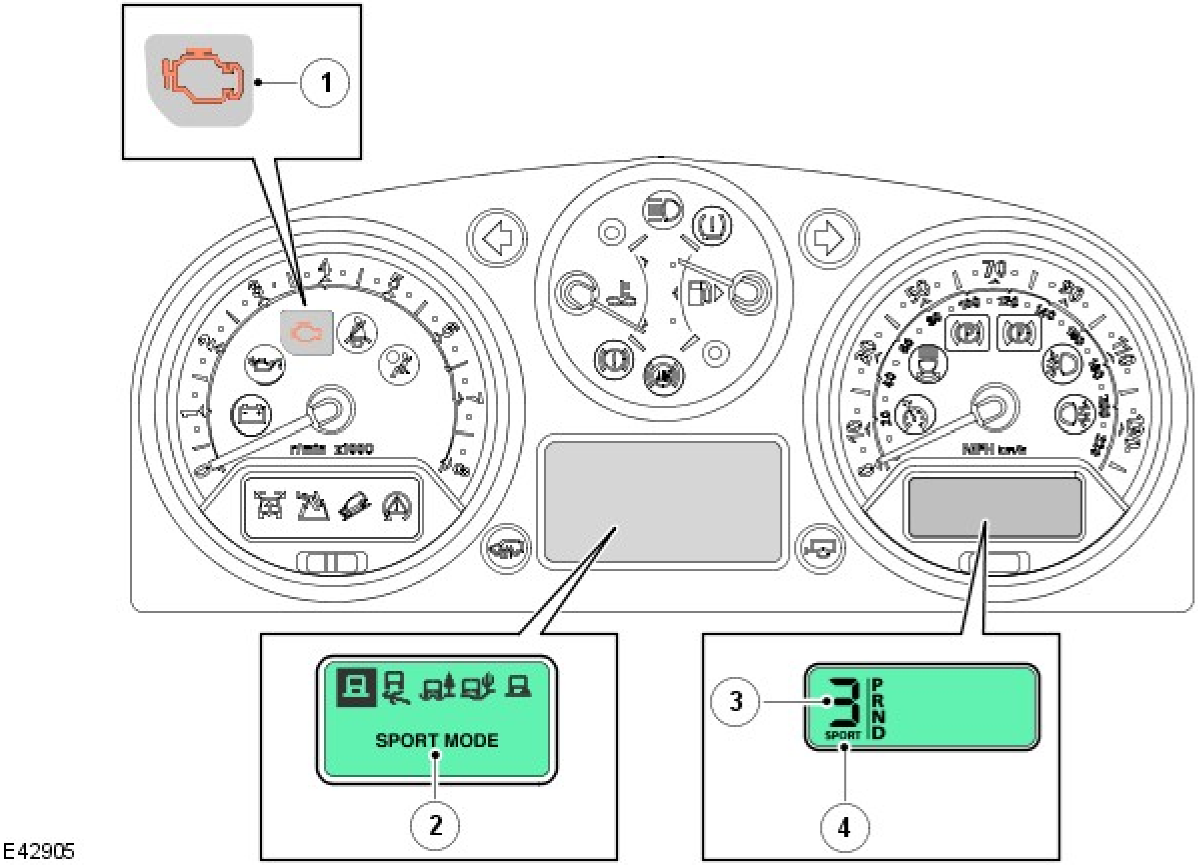
6	-	Selector indicator (M/S +/-)
7	-	Fusible link 7E (50A)
8	-	Fuse 43P (5A)
9	-	Selector lever assembly
10	-	Fuse 33P (5A)
11	-	Ignition switch
12	-	Fusible link 10E (30A)
13	-	Fuse 27P (5A) – Ignition feed
14	-	Fuse 4E (10A) – Permanent feed
15	-	Starter relay

SELECTOR POSITION SWITCH

The Mechatronic valve block contains a position switch which is mechanically connected to the selector spool valve. The selector spool valve is connected by a selector shaft to the selector lever via a 'Bowden' selector cable.

The signals from the position switch are used by the TCM to determine the P, R, N or D selection made by the driver.

INSTRUMENT CLUSTER



Item	Part Number	Description
1	-	Malfunction Indicator Lamp (MIL)
2	-	Message centre
3	-	Selector lever position indicator
4	-	Mode display

The instrument cluster is connected to the TCM via the high speed CAN bus. Transmission status is transmitted by the TCM and displayed to the driver in one of two displays in the instrument cluster.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

Malfunction Indicator Lamp (MIL)

The MIL is located in the tachometer in the instrument cluster. Transmission related faults which may affect the vehicle emissions output will illuminate the MIL.

The MIL is illuminated by the ECM on receipt of a relevant fault message from the TCM on the high speed CAN. The nature of the fault can be diagnosed using a Land Rover approved diagnostic system which reads the fault codes stored in the TCM memory.

Transmission Status Display

The transmission status display is located in a Liquid Crystal Display (LCD) within the speedometer housing. The LCD shows the selector lever position and the selected transmission mode. When the selector lever is in the manual CommandShift™ position, the selector lever position display will show the selected gear ratio.

The following table shows the displays and their descriptions.

Symbol	Description
P	Park selected
R	Reverse selected
N	Neutral selected
D	Drive selected
1	1st gear selected (Manual CommandShift™ mode)
2	2nd gear selected (Manual CommandShift™ mode)
3	3rd gear selected (Manual CommandShift™ mode)
4	4th gear selected (Manual CommandShift™ mode)
5	5th gear selected (Manual CommandShift™ mode)
6	6th gear selected (Manual CommandShift™ mode)

Message Centre Display

The message centre is located in the lower centre of the instrument cluster. The message centre is a LCD to relay vehicle status and operating information to the driver. The message centre can display messages relating to a number of the vehicle systems. The following list shows the possible transmission related messages:

- TRANSMISSION FAULT LIMITED GEARS AVAILABLE
- TRANSMISSION FAULT AND OVERHEAT
- TRANSMISSION FAULT
- TRANSMISSION OVERHEAT

TRANSMISSION CONTROL MODULE (TCM)

The TCM is an integral part of the Mechatronic valve block which is located at the bottom of the transmission, within the fluid pan. The TCM is the main controlling component of the transmission.

The TCM processes signals from the transmission speed and temperature sensors, engine control module and other vehicle systems. From the received signal inputs and pre-programmed data, the module calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-up clutch control.

The TCM outputs signals to control the shift control solenoid valve and the Electronic Pressure Regulator Solenoids (EPRS) to control the hydraulic operation of the transmission.

The ECM supplies the engine management data on the high speed CAN bus system. The TCM requires engine data to efficiently control the transmission operation, for example; flywheel torque, engine speed, accelerator pedal angle, engine temperature etc.

The steering angle sensor and the ABS module also supply data to the TCM on the high speed CAN bus system. The TCM uses data from these systems to suspend gear changes when the vehicle is cornering and/or the ABS module is controlling braking or traction control.

The selector lever is connected to the automatic transmission and the position switch in the transmission by a Bowden cable. Movement of the selector lever moves the position switch via the Bowden cable and the switch position informs the TCM of the selected position. The sport/manual +/- CommandShift switch passes manual/sport selections to the TCM. An additional switch provides a selector lever in park position signal. Once the selector lever position is confirmed, the TCM outputs appropriate information which is received by the instrument cluster to display the gear selection information in the message centre.

The Mechatronic valve block also contains the speed and temperature sensors. These are integral with the Mechatronic valve block and cannot be serviced individually. The speed sensors measure the transmission input and output speeds and pass signals to the TCM. The fluid temperature sensor is also located in the valve block and measures the fluid temperature of the transmission fluid in the fluid pan.

The TCM is connected to the starter relay coil. When the selector lever is in PARK or NEUTRAL, the module provides a ground for the coil allowing the starter relay to be energised and allow starter motor operation. If the selector lever is in any other position, the module will not provide the ground preventing starter motor operation.

DIAGNOSTICS

The diagnostic socket is located in the lower instrument panel closing panel, on the driver's side, below the steering column.

The diagnostic socket allows the exchange of information between the various modules on the bus systems and a Land Rover approved diagnostic system or a diagnostic tool using ISO14229 protocol. The information is communicated to the socket via the high speed CAN bus from the TCM. This allows the retrieval of diagnostic information and programming of certain functions using a Land Rover approved diagnostic system or a suitable diagnostic tool.

CONTROLLER AREA NETWORK (CAN)

The high speed CAN broadcast bus network is used to connect the powertrain modules. The CAN bus is connected between the following electronic units:

High Speed CAN Bus

- TCM
- Instrument cluster
- Air suspension module
- Steering angle sensor
- Rear differential module
- Centre console switch pack
- Electric park brake module
- Restraints control module
- Engine Control Module (ECM)
- ABS control module
- Adaptive front lighting control module
- Transfer box control module
- Adaptive cruise control module
- Diagnostic socket.

The CAN bus allows a fast exchange of data between modules. The CAN bus comprises two wires which are identified as CAN high (H) and CAN low (L). The two wires are coloured yellow/black (H) and yellow/brown (L) and are twisted together to minimise electromagnetic interference (noise) produced by the CAN bus messages.
For additional information, refer to: Communications Network (418-00 Module Communications Network, Description and Operation).

In the event of CAN bus failure, the following symptoms may be observed:

- Transmission operates in default mode
- Torque converter lock-up clutch control is disabled
- Gear position indication in instrument cluster message centre inoperative (this will also occur with any transmission fault).

DRIVING MODES

There are a number of different driving modes of operation. Some can be selected by the driver and some are automatically initiated by the TCM during driving:

- Normal mode
- Sport mode
- Manual (CommandShift™) mode
- Adaptive Shift Strategy (ASIS)
- Hill Descent Control (HDC) mode
- Cruise mode
- Hill mode
- Default (Limp home) mode
- Reverse lock-out mode
- Cooling strategy
- Curve recognition mode
- Fast off recognition.

Normal Mode

Normal mode is automatically selected by the TCM on power up. In this mode all automatic and adaptive modes are active. Normal mode uses gear shift and lock-up maps to allow for vehicle operation which offers fuel consumption and emissions or driveability depending on the driving style. If the transmission is operated in sport or manual mode and the selector lever is moved to the 'D' position, normal mode is automatically resumed.

Sport Mode

The sport mode operates in high range only and provides enhanced acceleration and responsiveness. In sport mode the TCM uses shift maps which allow the transmission to downshift more readily, hold gears for longer at higher engine speeds, and limits the transmission to the first five gears (6th gear is not used).

Sport mode is selected by moving the selector lever to the left into the 'M/S' position. When the sport mode is first selected, 'SPORT' is displayed in the message centre for 6 seconds and, if 6th gear is currently engaged, the TCM downshifts to 5th.

Manual (CommandShift™) Mode

Manual mode allows the transmission to operate as a semi-automatic 'CommandShift™' unit. The driver can change up and down the six forward gears with the freedom of a manual transmission.

Shift maps are provided for manual mode to protect the engine at high engine speeds. The TCM will automatically change up to a higher gear ratio to prevent engine overspeed and change down to a lower gear ratio to avoid engine labouring and stalling.

When kickdown is requested the TCM downshifts at least 2 gears.

When the vehicle is stationary, to drive off the driver can select 1st , 2nd or 3rd gear in low and high range. Any other gear selection will be rejected by the TCM.

When driving off, upshifts can be pre-selected by making + selections with the selector lever for the number of upshifts required. The TCM then automatically performs a corresponding number of upshifts when the appropriate shift points are reached. So, for example, when starting off in 1st gear, if three + selections are made in quick succession, the TCM will automatically change up through the box to 4th gear as the vehicle accelerates, without any further selections being made.

In manual mode a low gear can be selected to provide engine braking for descending a slope without HDC or continuous use of the brake pedal. The driver can prepare for the end of the descent by moving the selector lever to D. The TCM will maintain the low gear and only revert to automatic shift control when the throttle is opened and vehicle speed increases.

Adaptive Shift Strategy (ASIS)

The ASIS system is a new feature on automatic transmissions. With the TCM linked via the CAN bus to other vehicle systems, signals are received which can allow the TCM to calculate the way in which the vehicle is being driven. The type of signals include the following:

- Longitudinal and lateral acceleration
- Engine speed
- Engine torque
- Oil temperature
- Accelerator pedal position
- Wheel speed.

Using these signals, additional transmission control can be obtained. The TCM can calculate when the vehicle is cornering, all wheels are gripping, the driver is braking or if the driver is accelerating. This is the conventional 'Adaptive' transmission control. ASIS uses this system but adds the continuous adaptation of the gear changes to the individual driving style of the driver.

HDC Mode

The HDC mode assists the ABS module in controlling the downhill speed of the vehicle. When HDC is selected on, the ABS module selects the most appropriate gear for the descent, to maximise engine braking.

Cruise Mode

When speed control is activated, the TCM receives a cruise active message on the CAN bus. The TCM activates a speed control map which prevents locking and unlocking of the torque converter clutch and minimises up and down shifts.

Hill Mode

Hill mode is initiated by the TCM when the engine torque, via ECM signals on the CAN bus, exceeds the theoretical load curve for normal operation. The TCM monitors this signal to determine when the vehicle is travelling up or down a steep gradient.

In hill mode the TCM adopts one of four shift maps, three uphill and one downhill. The shift map chosen depends on the severity of the slope as determined from the engine signals and the appropriate gear is selected to assist with the ascent or descent.

Hill mode can also be initiated when the vehicle is at very high altitudes or ambient temperatures, and also when the vehicle is towing.

Default (Limp Home) Mode

If a transmission fault is detected by the TCM, the TCM adopts a limp home mode strategy. 'TRANS. FAILSAFE' is displayed in the message centre and, if the fault has an effect on engine emissions, the MIL will also be illuminated.

In default mode, P, R and N functions operate normally (if the fault allows these selections) and the TCM locks the transmission in 3rd or 5th gear to allow the driver to take the vehicle to the nearest dealer. The torque converter lock-up clutch is disabled and reverse lock-out will not function.

If the vehicle is stopped and subsequently restarted in the default mode condition, the TCM operates normally until the fault which caused the condition is detected again.

When limp home mode is active, the gear position indicator will show one of the following letters which defines the fault type:

- 'F' - transmission is operating in limp home mode
- 'H' - transmission has reached overheat threshold temperature and transmission is operating in limp home mode
- 'E' - CAN bus is off and transmission is operating in limp home mode.

If electrical power is lost and the transmission is operating in mechanical limp home mode, the selector lever will not be locked in the 'N' position by the shift interlock solenoid. The lever will be locked in the 'P' position and can only be released by using the interlock emergency release lever or by correcting the electrical fault.

Reverse Lock-Out Mode

When the vehicle is travelling forwards, selecting reverse could cause transmission damage. To protect against this, reverse gear is prohibited if the vehicle is travelling forwards at a road speed of 5 mph (8 km/h) or higher.

Cooling Strategy

The purpose of the cooling strategy is to reduce engine and transmission temperatures during high load conditions, when towing a trailer for example. Under these conditions the engine and transmission may generate excessive heat.

If the transmission fluid temperature increases to 125ºC (257ºF) or higher, the TCM employs the cooling strategy. The message 'TRANSMISSION OVERHEAT' is displayed in the message centre.

The strategy uses a specific shift and torque converter lock-up clutch map. This map allows torque converter clutch lock-up and gear shifts to operate outside of their normal operation. This will reduce the engine speed and/or slip in the torque converter, therefore reducing heat generated by the engine and the transmission.

If the transmission fluid temperature increases to 137ºC (278ºF) or higher, the transmission will use the default (limp home mode). 'H' is displayed in the gear position indicator. If the temperature exceeds 140ºC (284ºF), CAN bus transmission is disabled and 'E' is displayed in the gear position indicator.

The cooling strategy is cancelled when the transmission fluid temperature decreases to less than 120ºC (248ºF) or below.

Curve Recognition

Curve recognition is activated when high levels of lateral acceleration and/or steering angle are detected via the ABS module and steering angle sensor signals on the CAN bus. When this condition is detected, the TCM prevents the transmission from changing to a higher gear to assist with cornering. When the vehicle completes it manoeuvre, the transmission will shift to the correct ratio.

Fast Off Recognition

Fast off recognition is activated when the TCM detects that the driver has backed off the accelerator pedal quickly in a 'change of mind' manoeuvre. This is detected by monitoring for a high level of negative pedal angle from the engine control module signal on the CAN bus. If this condition is detected, the TCM holds the current gear ratio to allow the driver to complete his original action without the need for a downshift. The mode remains active for a predetermined time period or if the driving style remains passive.

Terrain Response™ Mode

If the vehicle has the Terrain Response system fitted, the following additional modes are available.
For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

Grass/Gravel/Snow

When the driver selects the Terrain Response grass/gravel/snow special program with the transfer box in either high or low range, the TCM uses a specific set of shift and torque converter maps to optimise the delivery of torque to the wheels and to minimise wheel slip in these terrains. To assist with the vehicle moving from a standstill, the TCM automatically selects 2nd gear in high range and 3rd gear in low range. This special program is fully integrated with hill mode to enhance vehicle control during ascents and descents.

Mud/Ruts

When the driver selects the Terrain Response mud/ruts special program with the transfer box in either high or low range, the TCM uses a specific set of shift and torque converter maps to optimise vehicle traction in this terrain.

Sand

When the driver selects the Terrain Response sand special program with the transfer box in either high or low range, the TCM uses a specific set of shift and torque converter maps to optimise the tractive performance in sand by holding onto gears longer and downshifting more readily. This mode is fully integrated with the hill mode to further enhance performance during ascents.

Rock Crawl

When the driver selects the Terrain Response rock crawl special program, which is only available with the transfer box in low range, the TCM uses a specific shift map which maximises torque delivery at slow speeds associated with this type of terrain.

TRANSMISSION FAULT STATUS

If the TCM detects a fault with the transmission system, it will enter a default mode to prevent further damage to the transmission and allow the vehicle to be driven.

When a fault is detected a CAN message is sent from the TCM and is received by the instrument cluster. The instrument cluster illuminates the MIL and displays 'TRANS. FAILSAFE' in the message centre.

Some transmission faults may not illuminate the MIL or display a fault message, but the driver may notice a reduction in shift quality.

ENGINE SPEED AND TORQUE MONITORING

The ECM constantly supplies the TCM with information on engine speed and torque through messages on the CAN bus. The TCM uses this information to calculate the correct and appropriate timing of shift changes.

If the messages are not received by the ECM, the TCM will implement a back-up strategy to protect the transmission from damage and allow the vehicle to be driven.

In the event of an engine speed or torque signal failure, the transmission will adopt the electrical limp home mode with the transmission operating in a fixed gear.

TOWING FOR RECOVERY

The following procedure must be used to ensure that the vehicle is towed in a safe condition and damage to the vehicle transmission systems is prevented.

- Secure the towing attachment from the recovery vehicle to the towing eye of the vehicle to be recovered.
- Make sure that the parking brake is on. Turn the ignition key to the ignition position II.
- Apply the footbrake and move the automatic transmission selector lever to the neutral position. If electrical power is not available, use the manual interlock release tab on the selector lever to move the lever to the neutral (N) position.
- Make sure that the ignition is in the auxiliary position I or, if the stop lamps and turn signal indicators are required, in the ignition position II.
- Make sure that the parking brake is released before the vehicle is towed.
- The vehicle can only be towed for a maximum of 31 miles (50 km) at a maximum speed of 30 mph (50 km/h). Towing the vehicle for longer distances and/or faster speeds will damage the transmission.

WARNING: Do not remove the key or move the ignition switch to position 'O' when the vehicle is being towed. The steering lock will be engaged preventing the steering from being turned.

With the engine not running, the brake booster and power steering pump will be inoperative. Care must be taken to ensure the vehicle is manoeuvred and driven accordingly.

Published: 11-May-2011

Automatic Transmission/Transaxle - V8 4.4L Petrol - Automatic Transmission

Diagnosis and Testing

Overview

This section is intended to provide a means for the technician to diagnose transmission component faults, rather than replacing the entire unit.

However, there are a number of situations where the replacement of the unit is the only practical solution, and this section will cover the diagnosis necessary to gather the information required for transmission replacement to be authorized by the warranty prior approval program (WPAP) where it applies, as well as covering the diagnostic trouble codes (DTCs) stored by the control module.

The basic checks of the transmission (fluid condition and level, etc) should be carried out first, and this will mean using the approved diagnostic system or other equipment with data logging facility to monitor temperatures, etc.

For information on the operation of the transmission, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection Chart

Mechanical	Electrical
Fluid condition Fluid level Fluid leaks Fluid cooler External linkages Gear selector lever	Fuses Wiring harnesses Electrical connector(s) Transmission control module (TCM) Engine control module (ECM) Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification.

Preliminary inspection

1. **1.** As much information as possible should be obtained from the owner/driver about the fault in order to assist with the diagnosis. Time spent on this will reduce the necessity for extensive road testing and possible missed diagnosis.
    - The information required for WPAP is still useful as an aid to diagnosis, even where the system is not in operation

Required information for WPAP (where applicable)

- The nature of the fault (loss of drive, slip, judder, gear shift quality, noise, etc)
- The frequency with which the fault occurs
- The conditions under which the fault occurs, including temperature (coolant and ambient), selected gear, road speed, engine speed, and any specific conditions
- Check and rectify non-transmission related DTCs before continuing with transmission diagnosis

2. **2.** Record the vehicle details, including:

- Service history
- The transmission serial number
- The transmission software level

3. **3.** Visually inspect the transmission for fluid leaks, damage, etc.
4. **4.** Check the transmission fluid condition.

• NOTE: Fluid condition is a good indicator of the transmission internal condition. If the fluid is burnt and/or contaminated, this would usually mean the internal damage to the transmission is at such a level that unit replacement is the best option. Compare the fluid drained from the transmission with fresh fluid for color and odor.

5. **5.** Check the transmission fluid level. Refer to the relevant workshop manual section.

• NOTE: This is crucial to the operation of the transmission, and the procedure must be closely followed to avoid inaccurate diagnosis, with the resultant possible rejection of a warranty claim.

6. **6.** Check the engine idle speed and throttle sensor using the approved diagnostic system or a scan tool.
7. **7.** Check the transmission selector cable adjustment. Refer to the relevant workshop manual section.
8. **8.** Check the transmission range sensor adjustment.
    - A comprehensive procedure for transmission range sensor setting is accessible through the approved diagnostic system.

If any faults are found and rectified in the above sequence, clear any DTCs and test the vehicle for normal operation.

If a failure condition is found indicating the need to renew the transmission assembly, the request must go through the warranty prior approval program (where applicable) before work is begun.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
P012100	Throttle/Pedal Position Sensor A Circuit Range/Performance	● Throttle position sensor wiring high resistance ● Throttle position sensor sensing circuits (Throttle position 1 or Throttle position 2) short circuit to power ● Throttle position sensor failure ● Range/Performance - Kickdown at low pedal openings	Check for pedal position sensor DTCs. Configure the module using the approved diagnostic system.
P021900	Engine Overspeed Condition	● Engine speed implausible	Check for engine management DTCs.
P050000	Vehicle Speed Sensor A	● Vehicle speed signal not detected	Check for ABS DTCs. Check the CAN circuits. Refer to the electrical guides.
P050100	Vehicle Speed Sensor A Range/Performance	● Range/Performance	Check for input/output sensor DTCs. Check the CAN circuits. Refer to the electrical guides.
P056100	System Voltage Unstable	● Power supply voltage is out of range when the engine is running	Check the battery and charging system. Refer to the relevant workshop manual section.
P056200	System Voltage Low	● Supply voltage to TCM very low	Check the battery condition and state of charge. Check the TCM supply circuits. Refer to the electrical guides.
P056300	System Voltage High	● Power supply voltage is too high if the engine is running and there has been no jump-start or transmission limp-home event	Check the battery and charging system. Refer to the relevant workshop manual section. Check if the vehicle has been jump-started.
P060100	Internal Control Module Memory Check Sum Error	● Checksum error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P060300	Internal Control Module Keep Alive Memory (KAM) Error	● Keep-alive memory (KAM) error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P060500	Internal Control Module Read Only Memory (ROM) Error	● Read only memory (ROM) error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P061300	TCM Processor	● Processor	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P062F00	Internal Control Module EEPROM Error	● EEPROM error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P064200	Sensor Reference Voltage A Circuit Low	● Reference voltage circuit short circuit to ground ● Reference voltage circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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Automatic Transmission/Transaxle - V8 4.4L Petrol - Transmission Fluid Drain and Refill

General Procedures

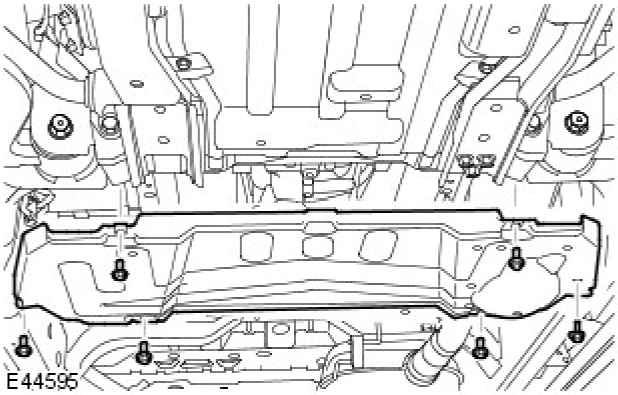
- WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

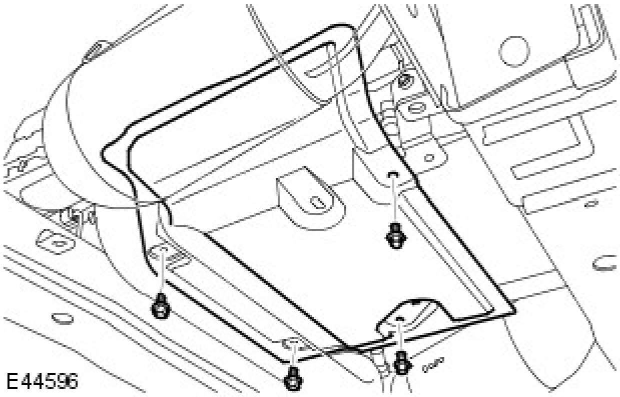
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. Remove the transmission undershield.

- Remove the 6 bolts.

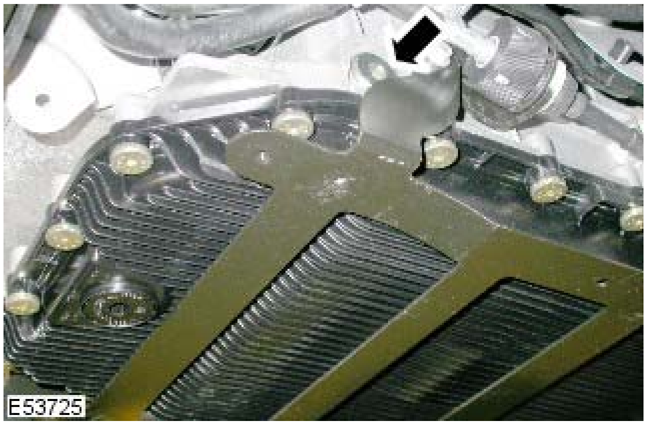


3. If installed, remove the transmission heat shield.

- Remove the 4 bolts.

4. Clean the area around the transmission fluid drain and filler plugs.

5. Place a container under the transmission.



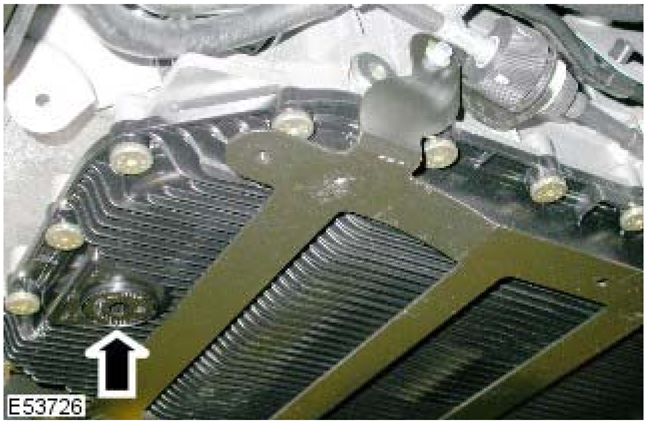
6. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

Remove the transmission fluid filler/level plug.

- Remove and discard the sealing washer.



7. Remove the transmission fluid drain plug.

- Remove and discard the sealing washer.
- Allow the fluid to drain.

8. Install the transmission fluid drain plug and tighten to 9 Nm (7 lb.ft).

- Install a new sealing washer.

9. Add 3.5 to 4 liters of the correct transmission fluid, or until a small thread of fluid runs from the filler/level hole.

10. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - V8 4.4L Petrol - Transmission Fluid Level Check

General Procedures

- WARNINGS:

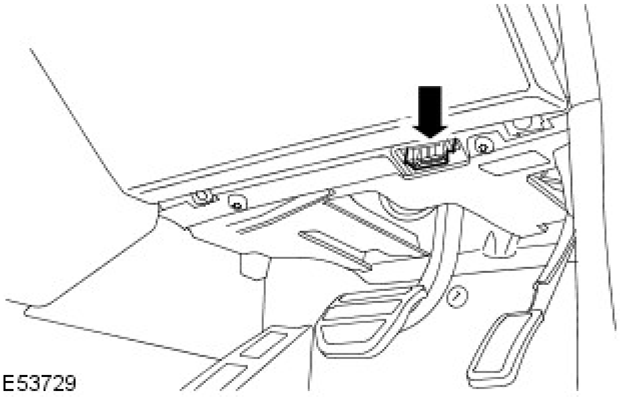
⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

⚠ CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

1. The following steps must be observed before starting the transmission fluid level check and top-up.

- The vehicle must be on a horizontal ramp.
- The parking brake must be applied.
- The wheels must be chocked.



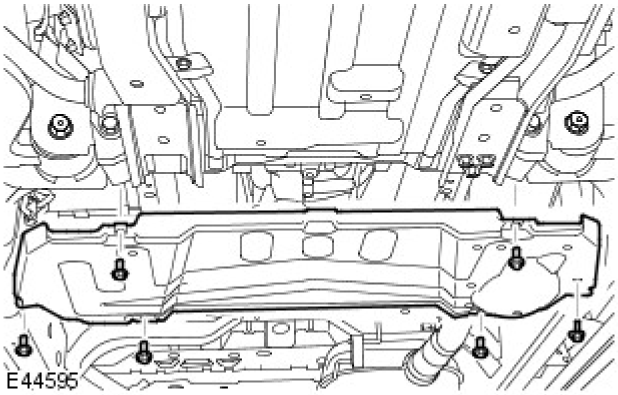
2. ⚠ CAUTION: Make sure the transmission fluid temperature is below 30 degrees before starting the fluid level check.

Using the approved Land Rover diagnostic equipment, monitor the transmission fluid temperature.

3. Start the engine. Move the selector lever from 'P' through all gear positions, pausing in each gear position for 2-3 seconds and return to the 'P' position.

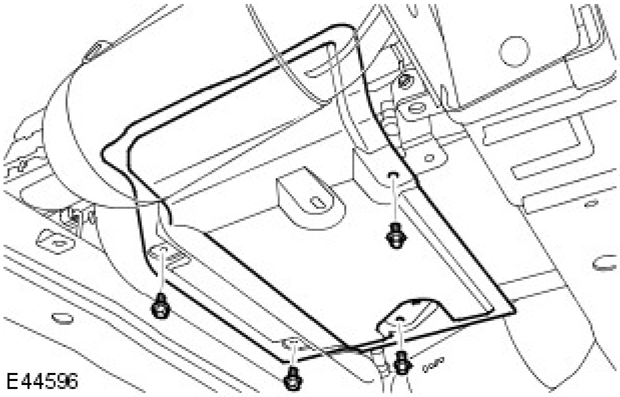
4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



5. Remove the transmission undershield.

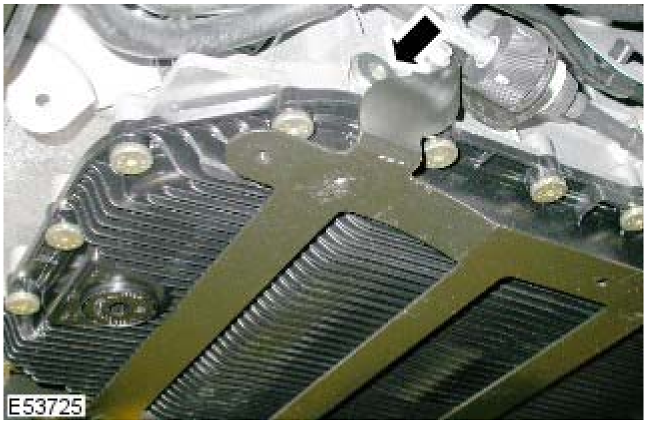
- Remove the 6 bolts.


E44596

6. If installed, remove the transmission heat shield.

- Remove the 4 bolts.

7. Place a container under the transmission.


E53725

8. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

⚠ CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

Remove the transmission fluid filler/level plug.

- Clean the area around the filler/level plug.
- Remove and discard the sealing washer.

9. If no fluid loss is apparent when the filler/level plug is removed, with the engine at idle, continue to fill the transmission until a small thread of oil runs from oil filler/level hole.

10. Install the transmission fluid filler/level plug and tighten to 35 Nm (26 lb.ft).

- Install a new sealing washer.
- Remove the container.

11. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

12. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Disconnect the approved Land Rover diagnostic equipment from the vehicle.

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Automatic Transmission/Transaxle - V8 4.4L Petrol - Transmission Support Insulator

In-vehicle Repair

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

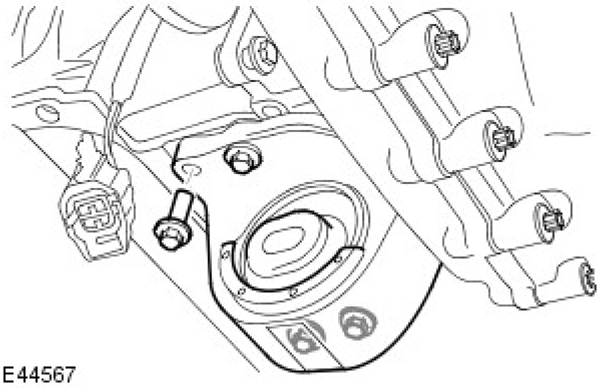
   Raise and support the vehicle.

2. Remove the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. NOTE: 4.4L illustration shown, 4.0L and 2.7L Diesel are similar.

   Remove the transmission support insulator.

   - Remove the 4 bolts.



Installation

1. To install, reverse the removal procedure.
   - Clean the component mating faces.
   - Tighten the bolts to 60 Nm (44 lb.ft).

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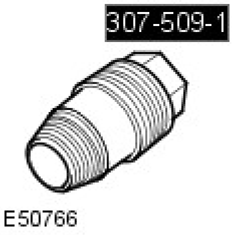
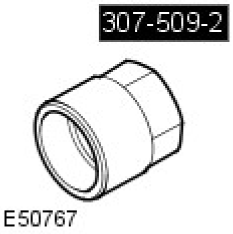
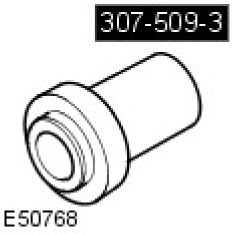
Automatic Transmission/Transaxle - V8 4.4L Petrol - Selector Shaft Seal

In-vehicle Repair

Special Tool(s)	
	Seal extractor 307-509-1 (LRT-44-033/1)
	Seal extractor 307-509-2 (LRT-44-033/2)
	Seal installer 307-509-3 (LRT-44-033/3)

Removal

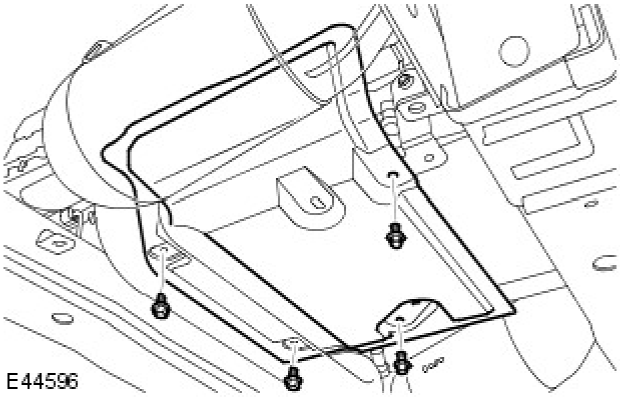
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

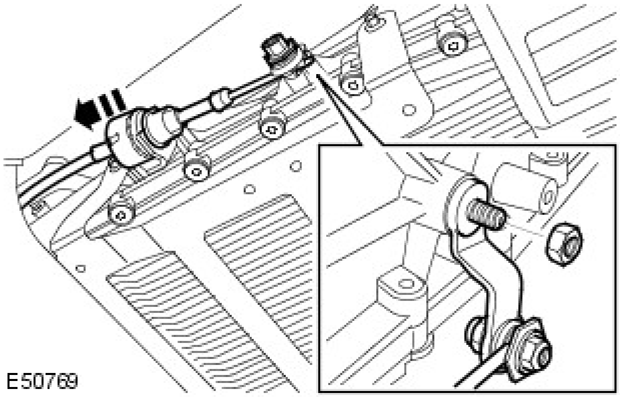
Raise and support the vehicle.

2. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

3. Remove the transmission heat shield.

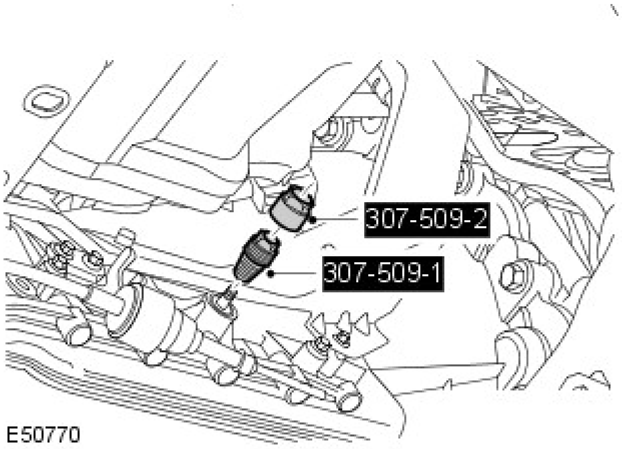
- Remove the 4 bolts.





4. Release the selector cable and lever.

- Remove the nut.
- Compress the latch and release the cable.

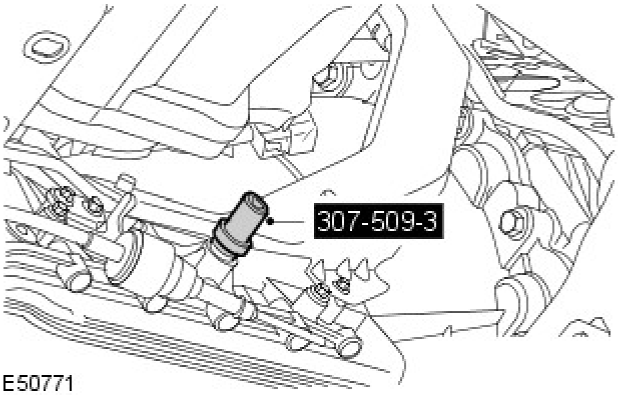


5. ⚠CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the selector shaft seal.

- Install 307-509-1 to the seal.
- Install 307-509-2 to 307-509-1 and extract the seal.

Installation



1. Using 307-509-3, install the selector shaft seal.

- Clean the components.

2. Install the selector cable and bracket.

- Secure with the clip.
- Tighten the nut to 12 Nm (9 lb.ft).

3. Install the transmission heat shield.

- Install the bolts.

4. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

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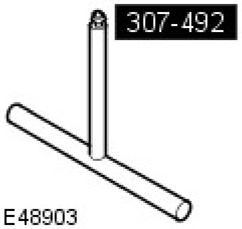
Automatic Transmission/Transaxle - V8 4.4L Petrol - Transmission Control Module (TCM)

In-vehicle Repair

Special Tool(s)	
 E48903	ZF Automatic transmission valve block seals remover 307-492 (LRT-44-005)

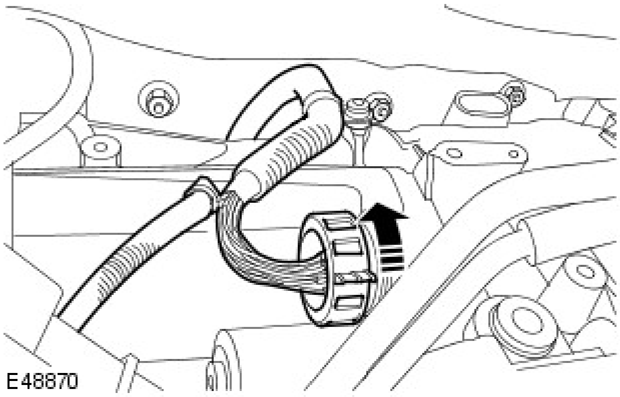
Removal

- NOTE: The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

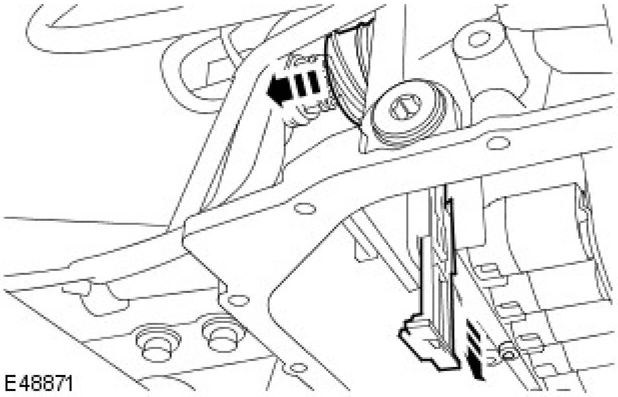
Raise and support the vehicle.

2. Remove the fluid pan.
For additional information, refer to: Fluid Pan, Gasket and Filter (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, In-vehicle Repair).



E48870

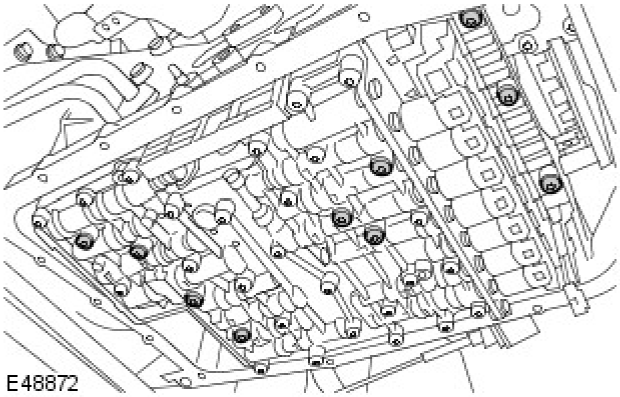
3. Disconnect the electrical connector.



E48871

4. Remove and discard the electrical connector sleeve.

- Release the retainer.

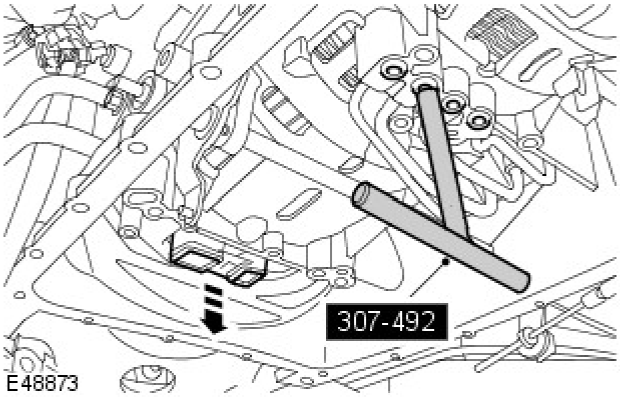


5. Remove the valve body.

- Position a container to collect spillage.
- Remove the 10 Torx screws.

6. Using the special tool, remove the 4 seals.

7. Remove the seal block.


307-492
E48873

Installation

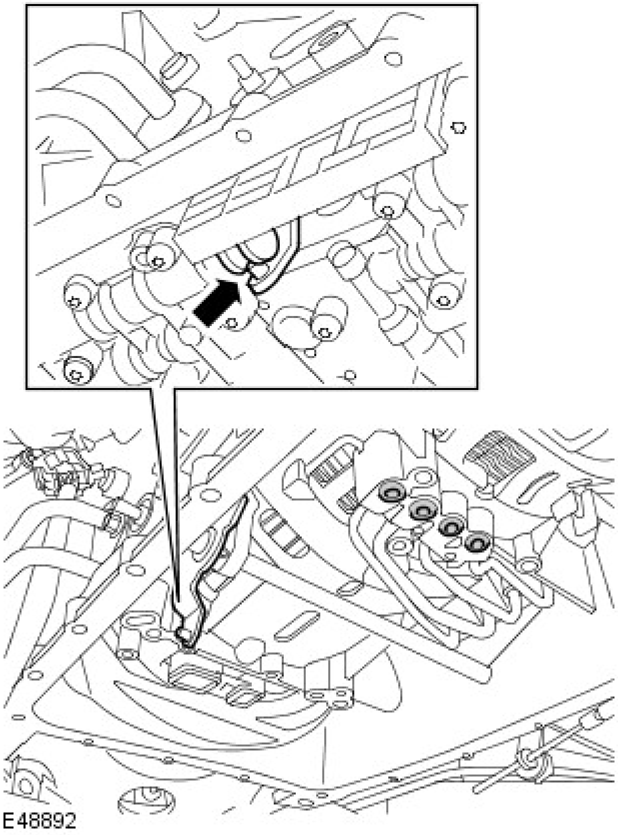
1. CAUTIONS:

⚠ Make sure that when fully fitted, all seals protrude by the same amount.

⚠ Engage the selector lever with the groove in the piston rod.

Install the valve body.

- Clean the component mating faces.
- Install new seals.
- Install a new seal block.
- Tighten the Torx screws to 8 Nm (6 lb.ft).



2. Install a new electrical connector sleeve.

- Secure with retainer.

3. Connect the electrical connector.

4. Install the fluid pan.
For additional information, refer to: Fluid Pan, Gasket and Filter (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, In-vehicle Repair).

5. Calibrate a new main control valve body using T4.

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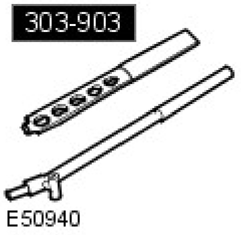
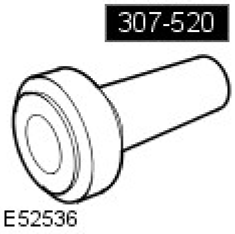
Automatic Transmission/Transaxle - V8 4.4L Petrol - Output Shaft Seal

In-vehicle Repair

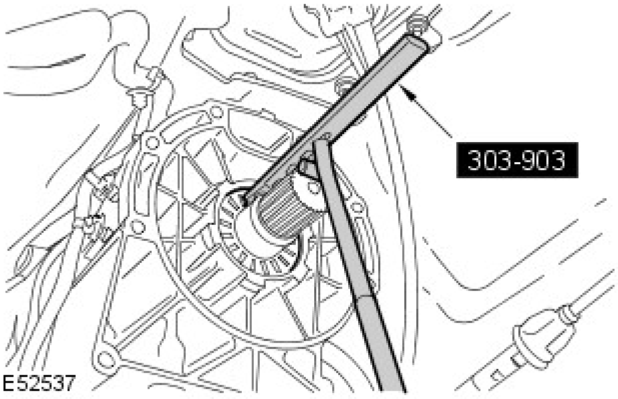
Special Tool(s)	
	Oil seal remover 303-903 (LRT-12-092)
	Oil seal installer 307-520

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the transfer case.
   For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).

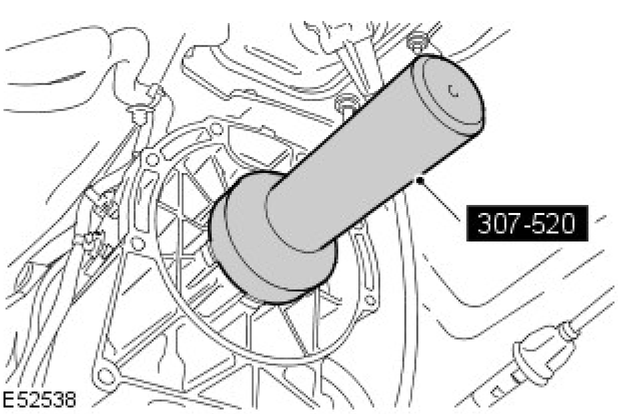


3. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

   Remove the transmission output shaft oil seal.

   - Use the special tool.

Installation



1. ⚠ CAUTION: Oil seals must be fitted dry.

   Install a new transmission output shaft oil seal.

   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).
3. Check and top-up the transmission fluid level.
   For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

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Automatic Transmission/Transaxle - V8 4.4L Petrol - Fluid Pan, Gasket and Filter

In-vehicle Repair

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

Remove the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, In-vehicle Repair).

Installation

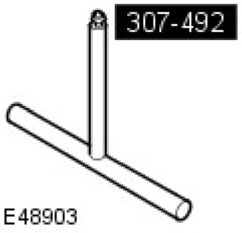
1. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

Install the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, In-vehicle Repair).

Published: 11-May-2011

Automatic Transmission/Transaxle - V8 4.4L Petrol - Main Control Valve Body

In-vehicle Repair

Special Tool(s)	
	Seal extractor 307-492(LRT-44-005)

Removal

- NOTE: The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.

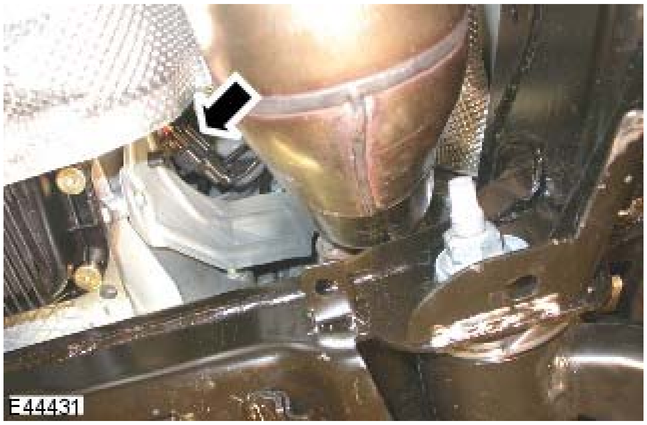
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

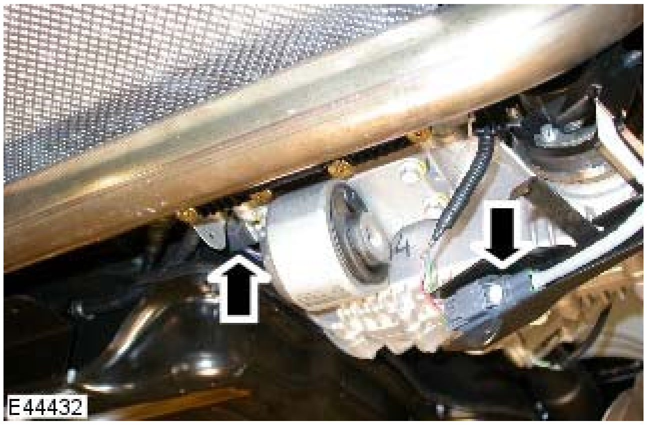
3. Drain the transmission fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01, General Procedures).

4. Remove the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

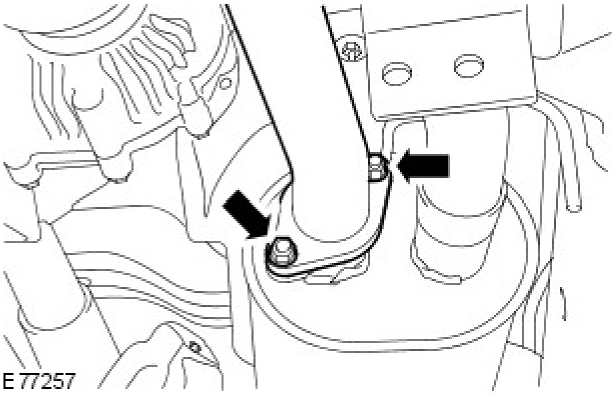


5. Release the RH front HO2S wiring harness.

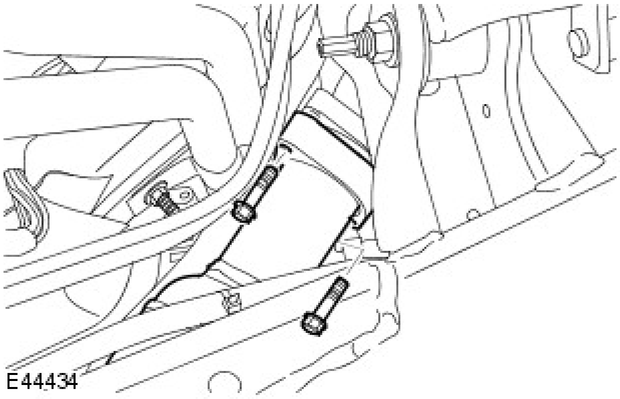
- Disconnect the electrical connector.



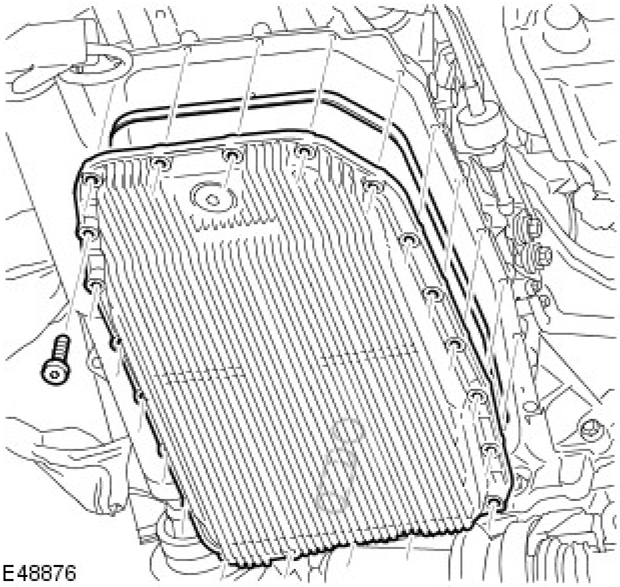
6. Release the RH rear HO2S wiring harness.
   - Disconnect the electrical connector.



7. Disconnect the RH catalytic converter from the muffler assembly.
   - Remove the 2 nuts.
   - Discard the gasket.

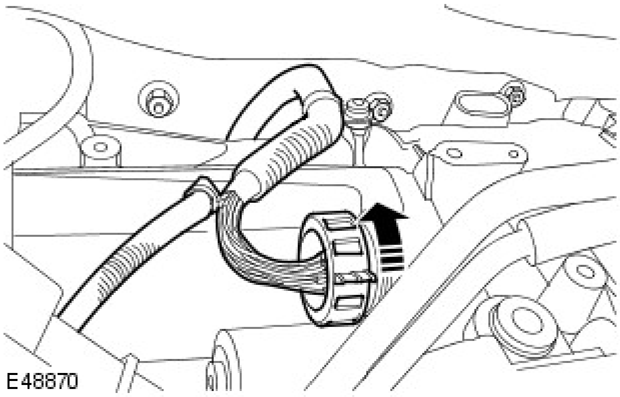


8. Disconnect the RH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 bolts.

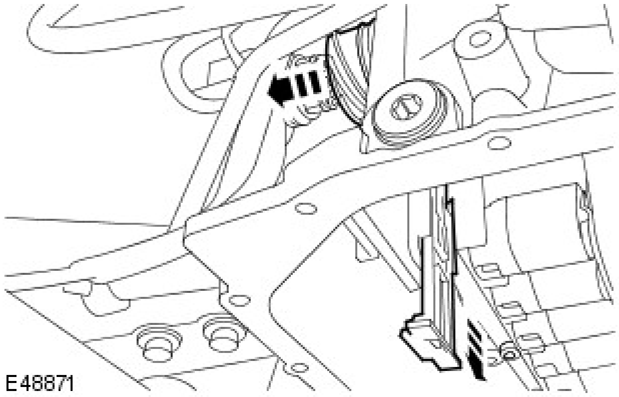


9. Release the oil pan.

- Position a container to collect the oil spillage.
- Remove the 21 Torx screws.

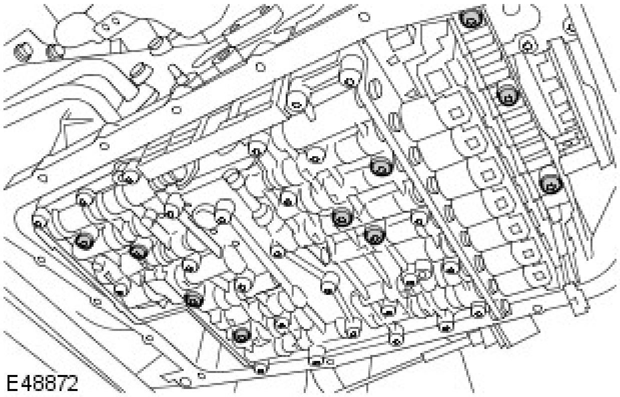


10. Release and disconnect the electrical connector.



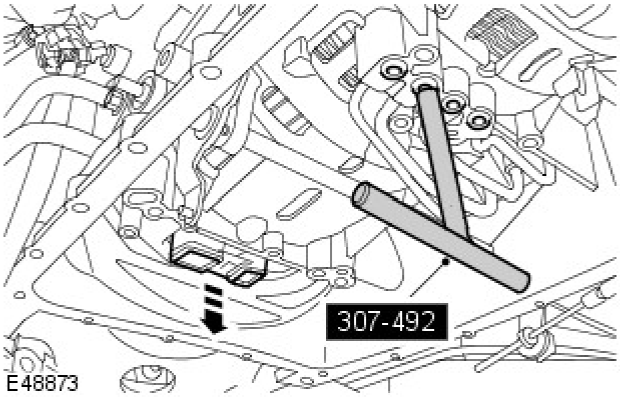
11. Remove and discard the electrical connector sleeve.

- Release the retainer.



12. Remove the valve block and oil pan.

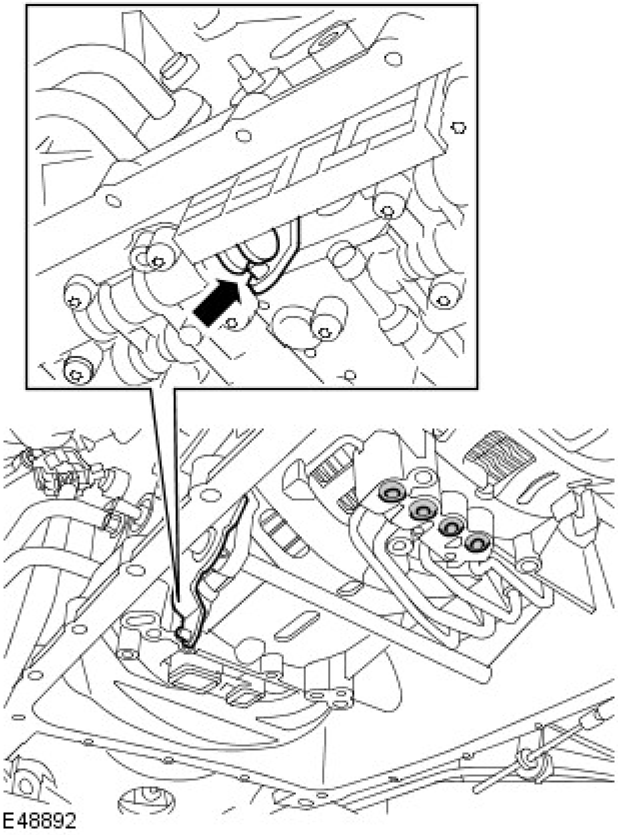
- Remove the 7 Torx bolts.
- Discard the O-ring seal.


307-492
E48873

13. Using the special tool, remove the 4 seals.

14. Remove the seal block.

Installation



1. CAUTIONS:

⚠ Make sure that when fully fitted, all seals protrude by the same amount.

⚠ Engage the selector lever with the groove in the piston rod.

Install the valve block and oil pan.

- Clean the component mating faces.
- Install new seals.
- Install a new seal block.
- Tighten the Torx screws to 8 Nm (6 lb.ft).

2. Install a new electrical connector sleeve.

- Secure with retainer.

3. Connect the electrical connector.

4. Secure the oil pan.

- Tighten the Torx screws to 8 Nm (6 lb.ft).

5. Install the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

6. Reconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

7. Fill the transmission with fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01, General Procedures).

8. Using the Land Rover approved diagnostic equipment, calibrate the control valve body.

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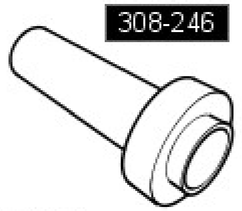
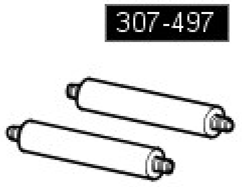
Automatic Transmission/Transaxle - V8 4.4L Petrol - Transmission

Removal and Installation

Special Tool(s)	
 E46737	Torque converter seal installer 308-246
 E46738	Torque converter support handles 307-497 (LRT-44-010)

Removal

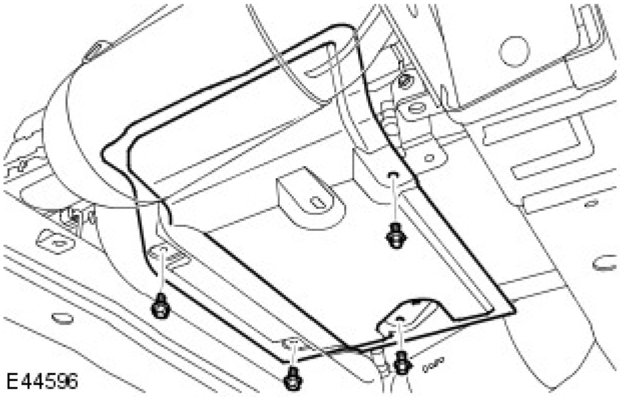
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

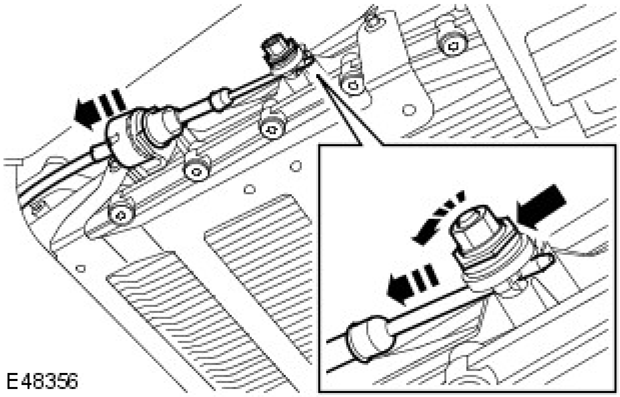
   Raise and support the vehicle.

2. Remove the transfer case.
   For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).

3. Remove the transmission heat shield.

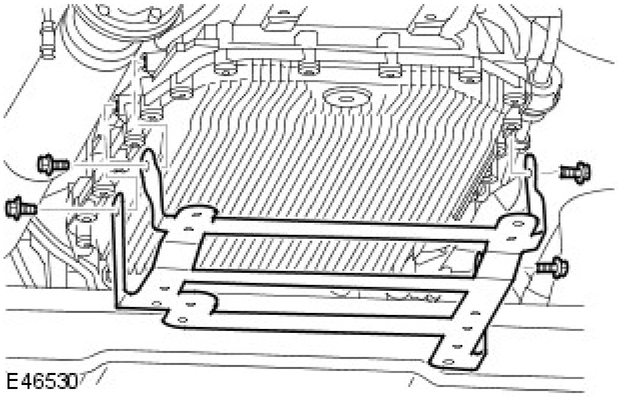
   - Remove the 4 bolts.


E44596



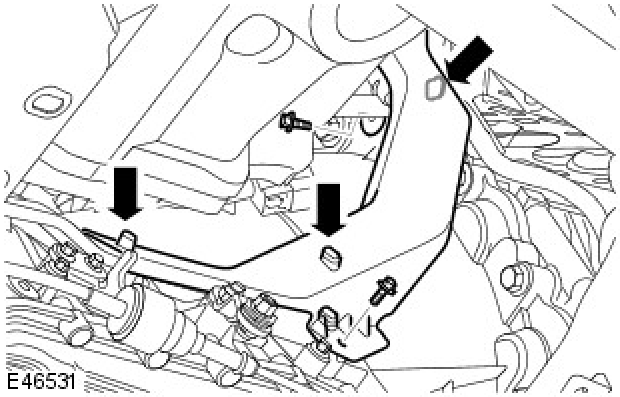
4. Release the selector cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Compress the latch and release the cable.



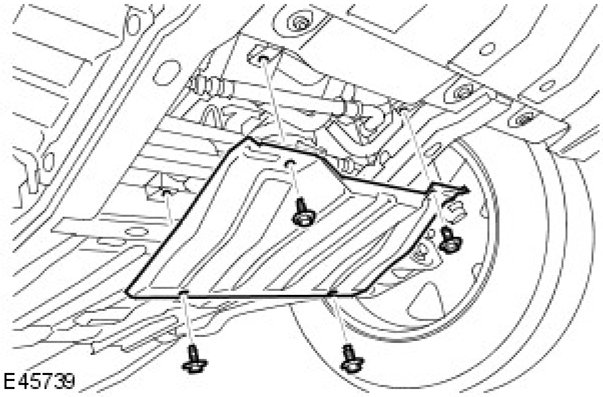
5. Remove the transmission heat shield bracket.

- Remove the 4 bolts.



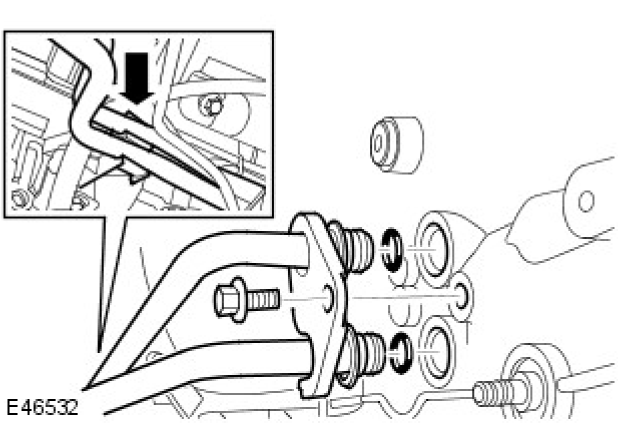
6. Remove the fuel pipe heat shield.

- Remove the 2 bolts.
- Release the fuel pipes from the 3 clips.



7. Remove the radiator access panel.

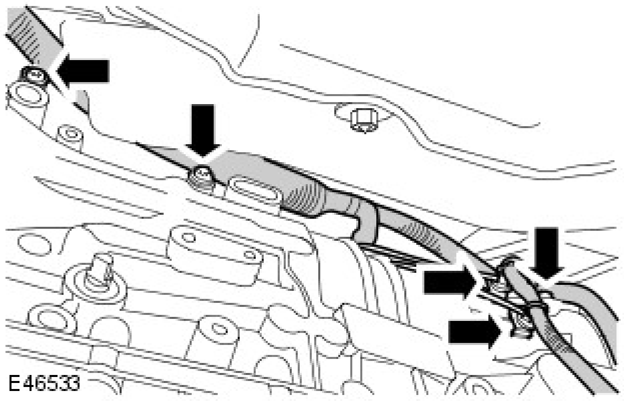
- Remove the 4 bolts.


E46532

8. CAUTION: Always plug any open connections to prevent contamination.

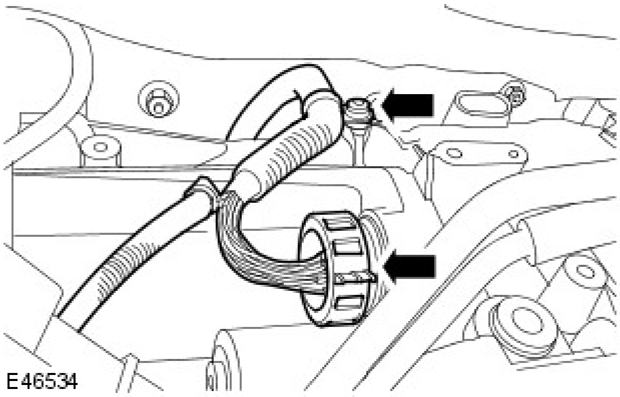
Release the transmission fluid lines.

- Remove the bolt.
- Release the clip.
- Remove and discard both O-ring seals.


E46533

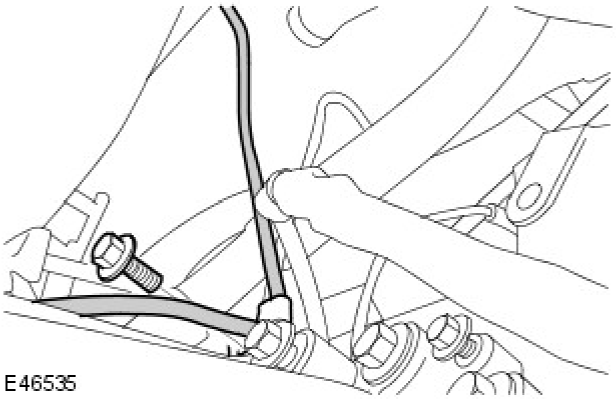
9. Release the wiring harness from the LH side of the transmission.

- Remove the 3 Torx screws.
- Release the 2 clips.


E46534

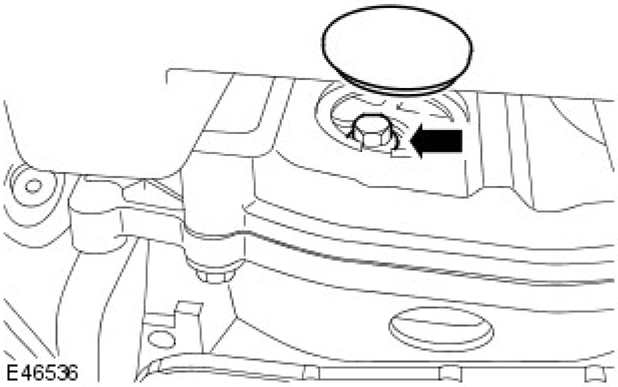
10. Release the wiring harness from the RH side of the transmission.

- Remove the Torx screw.
- Disconnect the electrical connector.


E46535

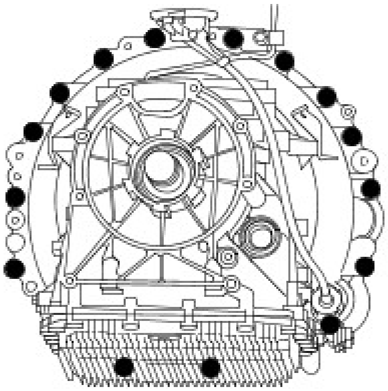
11. Release the transmission breather pipe clip.

- Remove the bolt.



12. Release the flexplate.

- Remove access plugs.
- Rotate the crankshaft to access the bolts.
- Remove the 3 bolts.



13. WARNINGS:

⚠ Secure the transmission to the transmission jack.

⚠ Support the engine. The engine will fall forward when the transmission is removed.

⚠CAUTION: Make sure the torque converter remains connected to the transmission.

With assistance, remove the transmission.

- Using a transmission jack, support the transmission.
- Remove the 15 bolts.

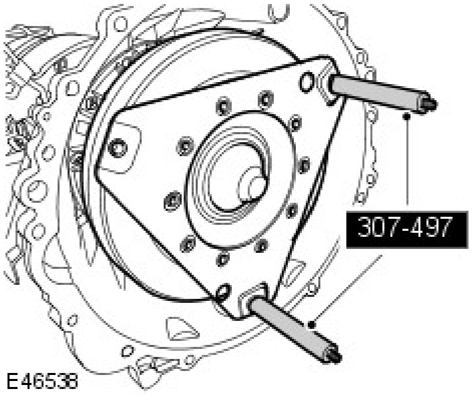
14. Install the torque converter retainer.

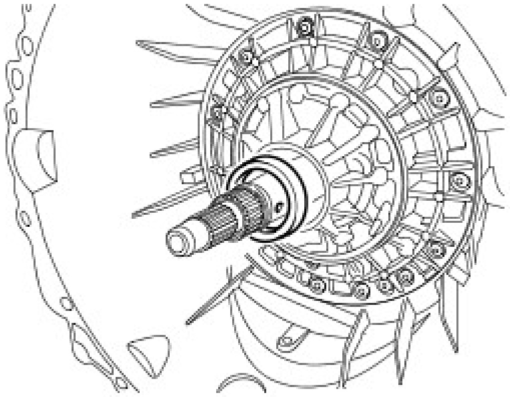
15. NOTE: Do not disassemble further if the component is removed for access only.

Remove the transmission from the transmission jack.

16. Remove the torque converter retainer.

17. Using the special tools, remove the torque converter.

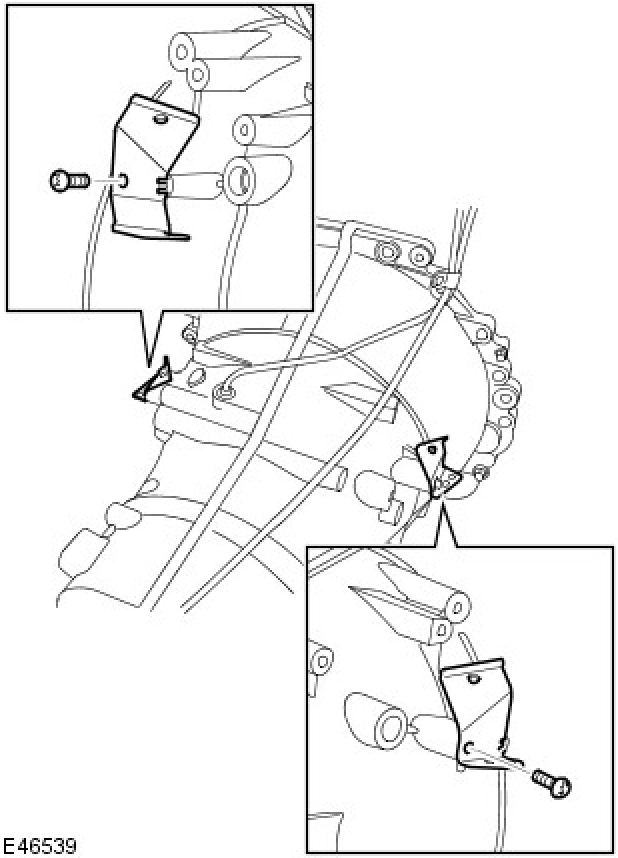




E48465

18. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

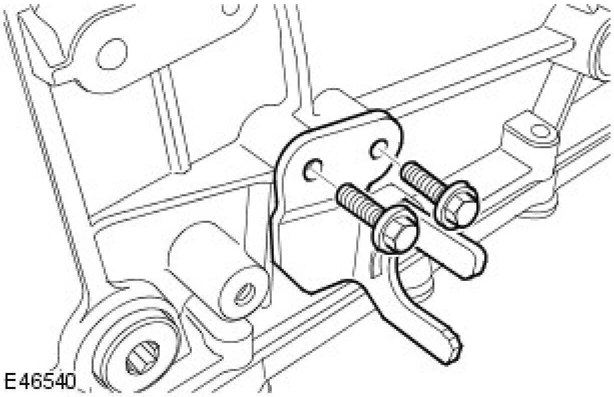
Carefully remove and discard the torque converter fluid seal.



E46539

19. Remove the wiring harness bracket.

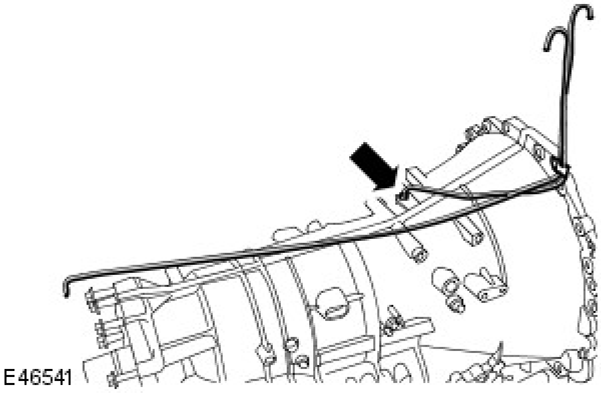
- Remove the Torx screw.
- Repeat the above procedure for the other side.



E46540

20. Remove the selector cable bracket.

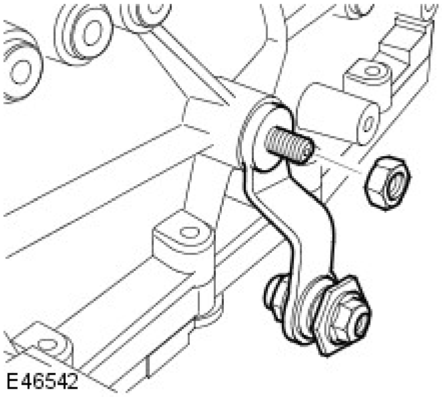
- Remove the 2 bolts.



21. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the transmission breather lines.

- Depress the locking ring.



22. Remove the selector lever.

- Remove the nut.

Installation

⚠ CAUTION: If the automatic transmission fluid is very dirty or it contains metallic particles, then along with a new transmission, install a new automatic transmission fluid cooler and lines.

1. Attach the selector lever.

- Tighten the nut to 12 Nm (9 lb.ft).

2. Attach the transmission breather lines.

- Secure with the clip.

3. Attach the selector cable bracket.

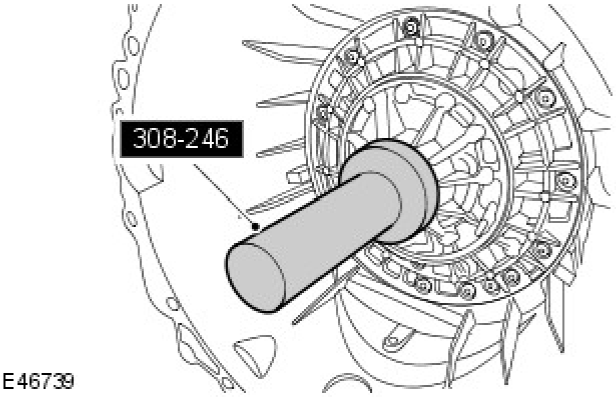
- Tighten the bolts to 10 Nm (7 lb.ft).

4. Attach the wiring harness bracket.

- Tighten the Torx bolt to 10 Nm (7 lb.ft).
- Repeat the above procedure for the other side.

5. Using the special tool, install a new torque converter oil seal.

- Clean the seal register.



6. Install the torque converter.

- Clean the seal contact area.
- Remove the special tools.

7. Install the torque converter retainer.

8. Position the transmission to the transmission jack.

9. Remove the torque converter retainer.

10. ⚠ CAUTION: Apply grease of the correct specification to the torque converter spigot.

With assistance, install the transmission.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

11. Attach the flexplate to the torque converter.

- Rotate the crankshaft to access the bolts.
- Tighten the bolts to 45 Nm (33 lb.ft).
- Install the access plugs.

12. Install the radiator access panel.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

13. Attach the transmission breather pipe clip.

- Tighten the bolt to 25 Nm (18 lb.ft).

14. Attach the wiring harness.

- Tighten the Torx screws.
- Connect the electrical connector.

15. Attach the transmission fluid lines.

- Clean the components.
- Install the new O-ring seals.
- Secure with the clip.
- Tighten the bolt to 10 Nm (7 lb.ft).

16. Install the fuel pipe heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure with the clips.

17. Install the transmission heat shield bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

18. NOTE: Do not tighten the locking nut at this stage.

Connect the selector cable to the transmission.

- Engage the inner cable with the lever clamping bush.
- Install the selector cable to its abutment bracket.

19. Install the transfer case. For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Installation).

20. Adjust the selector cable.
For additional information, refer to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures).

21. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

22. Install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

23. NOTE: For NAS vehicles only.

If fitting new or exchange components, carry out long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV6 2.7L Diesel -

Item	Specification
* Recommended lubricant	Shell M13754
+ Torque converter nose	Molybdenum disulphide grease to specification FB180

- CAUTIONS:

⚠ * Do not use any lubricant other than that specified.

⚠ + Do not over lubricate.

Capacity

Item	Capacity
+ Initial dry fill	9.5 litres (16.7 pints) (10.0 US qts)

⚠ CAUTION: + A final oil level check/drain down/top-up must be carried out when the unit has been installed.

General Specification

Item	Specification
Automatic transmission	ZF 6HP26
Speeds	6 Forward, 1 Reverse
Gear ratios:	
First	4.17:1
Second	2.340:1
Third	1.521:1
Fourth	1.143:1
Fifth	0.867:1
Sixth	0.691:1
Reverse	3.403:1
Torque converter	Sachs W255 2GWK with turbine torsional damper and slip controlled, dual friction faced lock-up clutch
Transmission control module:	
Location	Located in gearbox casing
Type	1904

Torque Specifications

Description	Nm	lb-ft
Main control valve body Torx screws	8	6
Transmission heat shield bolts	10	7
Transmission heat shield bracket bolts	10	7
Selector cable bracket nut	12	9
Selector cable bracket bolts	10	7
Wiring harness bracket Torx bolt	10	7
Fluid pan Torx screws	8	6
Engine RH support nut	90	66
Transmission support insulator bolts	60	44
Selector shaft nut	12	9
Selector cable bracket bolts	10	7
Flexplate to torque converter bolts	45	33
Transmission bolts	45	33
Transmission breather pipe clip bolt	25	18
Transmission fluid lines clip bolt	10	7
Radiator access panel bolts	10	7
Exhaust cross-over pipe center support bracket bolts	25	18
Exhaust cross-over pipe LH/RH support bracket bolts	25	18
Turbocharger support bracket nut and bolts	22	16
Transmission fluid drain plug	9	6.5
Transmission fluid filler/level plug	35	26
transmission heat shield bolts	10	7
Transmission under shield bolts	10	7

Description	Nm	lb-ft
Transfer case retaining bolts	45	33
* Exhaust crossover pipe retaining nuts	22	16
Exhaust manifold heat shield retaining bolts	10	7

*** New nuts must be installed**

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Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Automatic Transmission

Description and Operation

AUTOMATIC TRANSMISSION

Refer to Automatic Transmission 4.4L V8 for details.
For additional information, refer to: Automatic Transmission (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, Description and Operation).

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Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Automatic Transmission

Diagnosis and Testing

Overview

This section is intended to provide a means for the technician to diagnose transmission component faults, rather than replacing the entire unit.

However, there are a number of situations where the replacement of the unit is the only practical solution, and this section will cover the diagnosis necessary to gather the information required for transmission replacement to be authorized by the warranty prior approval program (WPAP) where it applies, as well as covering the diagnostic trouble codes (DTCs) stored by the control module.

The basic checks of the transmission (fluid condition and level, etc) should be carried out first, and this will mean using the approved diagnostic system or other equipment with data logging facility to monitor temperatures, etc.

For information on the operation of the transmission, refer to the relevant workshop manual section.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection Chart

Mechanical	Electrical
• Fluid condition • Fluid level • Fluid leaks • Fluid cooler • External linkages • Gear selector lever	• Fuses • Wiring harnesses • Electrical connector(s) • Transmission control module (TCM) • Engine control module (ECM) • Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification.

Preliminary inspection

1. **1.** As much information as possible should be obtained from the owner/driver about the fault in order to assist with the diagnosis. Time spent on this will reduce the necessity for extensive road testing and possible missed diagnosis.
    - The information required for WPAP is still useful as an aid to diagnosis, even where the system is not in operation

   Required information for WPAP (where applicable)

- The nature of the fault (loss of drive, slip, judder, gear shift quality, noise, etc)
- The frequency with which the fault occurs
- The conditions under which the fault occurs, including temperature (coolant and ambient), selected gear, road speed, engine speed, and any specific conditions
- Check and rectify non-transmission related DTCs before continuing with transmission diagnosis

2. **2.** Record the vehicle details, including:

- Service history
- The transmission serial number
- The transmission software level

3. **3.** Visually inspect the transmission for fluid leaks, damage, etc.
4. **4.** Check the transmission fluid condition.

• NOTE: Fluid condition is a good indicator of the transmission internal condition. If the fluid is burnt and/or contaminated, this would usually mean the internal damage to the transmission is at such a level that unit replacement is the best option. Compare the fluid drained from the transmission with fresh fluid for color and odor.

5. **5.** Check the transmission fluid level. Refer to the relevant workshop manual section.

• NOTE: This is crucial to the operation of the transmission, and the procedure must be closely followed to avoid inaccurate diagnosis, with the resultant possible rejection of a warranty claim.

6. **6.** Check the engine idle speed and throttle sensor using the approved diagnostic system or a scan tool.
7. **7.** Check the transmission selector cable adjustment. Refer to the relevant workshop manual section.
8. **8.** Check the transmission range sensor adjustment.
    - A comprehensive procedure for transmission range sensor setting is accessible through the approved diagnostic system.

If any faults are found and rectified in the above sequence, clear any DTCs and test the vehicle for normal operation.

If a failure condition is found indicating the need to renew the transmission assembly, the request must go through the warranty prior approval program (where applicable) before work is begun.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
P012100	Throttle/Pedal Position Sensor A Circuit Range/Performance	● Throttle position sensor wiring high resistance ● Throttle position sensor sensing circuits (Throttle position 1 or Throttle position 2) short circuit to power ● Throttle position sensor failure ● Range/Performance - Kickdown at low pedal openings	Check for pedal position sensor DTCs. Configure the module using the approved diagnostic system.
P021900	Engine Overspeed Condition	● Engine speed implausible	Check for engine management DTCs.
P050000	Vehicle Speed Sensor A	● Vehicle speed signal not detected	Check for ABS DTCs. Check the CAN circuits. Refer to the electrical guides.
P050100	Vehicle Speed Sensor A Range/Performance	● Range/Performance	Check for input/output sensor DTCs. Check the CAN circuits. Refer to the electrical guides.
P056100	System Voltage Unstable	● Power supply voltage is out of range when the engine is running	Check the battery and charging system. Refer to the relevant workshop manual section.
P056200	System Voltage Low	● Supply voltage to TCM very low	Check the battery condition and state of charge. Check the TCM supply circuits. Refer to the electrical guides.
P056300	System Voltage High	● Power supply voltage is too high if the engine is running and there has been no jump-start or transmission limp-home event	Check the battery and charging system. Refer to the relevant workshop manual section. Check if the vehicle has been jump-started.
P060100	Internal Control Module Memory Check Sum Error	● Checksum error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P060300	Internal Control Module Keep Alive Memory (KAM) Error	● Keep-alive memory (KAM) error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P060500	Internal Control Module Read Only Memory (ROM) Error	● Read only memory (ROM) error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P061300	TCM Processor	● Processor	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P062F00	Internal Control Module EEPROM Error	● EEPROM error	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P064200	Sensor Reference Voltage A Circuit Low	● Reference voltage circuit short circuit to ground ● Reference voltage circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P064300	Sensor Reference Voltage A Circuit High	● Reference voltage circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P065700	Actuator Supply Voltage A Circuit / Open	● Supply voltage circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P065800	Actuator Supply Voltage A Circuit Low	● Supply voltage circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P065900	Actuator Supply Voltage A Circuit High	● Supply voltage circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P066800	PCM / ECM / TCM Internal Temperature Sensor A Circuit Low	● Temperature sensor circuit high resistance ● Temperature sensor circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P066900	PCM / ECM / TCM Internal Temperature Sensor A Circuit High	● Temperature sensor circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P070500	Transmission Range Sensor A Circuit (PRNDL Input)	● Signal implausible	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071000	Transmission Fluid Temperature Sensor A Circuit	● Temperature rise rate too low	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071100	Transmission Fluid Temperature Sensor A Circuit Range/Performance	● Sensor circuits: short circuit to each other	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071200	Transmission Fluid Temperature Sensor A Circuit Low	● Sensor circuit high resistance ● Sensor circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071300	Transmission Fluid Temperature Sensor A Circuit High	● Sensor circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071600	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance	● Sensor circuit high resistance ● Sensor circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P071700	Turbine/Input Shaft Speed Sensor A Circuit No Signal	● Sensor circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072000	Output Shaft Speed Sensor Circuit	● Sensor circuit short circuit to power ● Sensor circuit high resistance ● Sensor circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072122	Output Shaft Speed Sensor Circuit Range/Performance	● Range/Performance - Signal amplitude	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072127	Output Shaft Speed Sensor Circuit Range/Performance	● Range/Performance ● Signal rate of change above threshold	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072164	Output Shaft Speed Sensor Circuit Range/Performance	● Range/Performance ● Signal plausibility failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P072900	Gear 6 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073000	Incorrect Gear Ratio	● Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
P073100	Gear 1 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073200	Gear 2 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073300	Gear 3 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073400	Gear 4 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073500	Gear 5 Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P073600	Reverse Incorrect Ratio	● Incorrect ratio - Slip too high between input and output shaft speeds	Check for speed sensor DTCs. Check the sensor circuits. Refer to the electrical guides.
P074000	Torque Converter Clutch Solenoid Circuit / Open	● Solenoid circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P074100	Torque Converter Clutch Solenoid Circuit Performance/Stuck Off	● Solenoid circuit stuck off	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P074800	Pressure Control Solenoid A Electrical	● Solenoid current too high/low	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075113	Shift Solenoid A Performance/Stuck Off	● Performance ● Stuck off ● Solenoid circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075114	Shift Solenoid A Performance/Stuck Off	● Performance ● Stuck off ● Solenoid circuit high resistance ● Solenoid circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075200	Shift Solenoid A Stuck On	● Stuck on	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P075300	Shift Solenoid A Electrical	● Solenoid circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P077800	Pressure Control Solenoid B Electrical	● Solenoid current too high	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P078000	Shift malfunction	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078123	1 - 2 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P078162	1 - 2 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078164	1 - 2 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078262	2 - 3 Shift	● Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.

DTC	Description	Possible causes	Action
P078264	2 - 3 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078323	3 - 4 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P078362	3 - 4 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078364	3 - 4 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078423	4 - 5 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P078462	4 - 5 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P078464	4 - 5 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P079800	Pressure Control Solenoid C Electrical	- Solenoid current too high	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P081C00	Park Input Circuit	- Park lock signal fault	Check the gear selector input circuits. Refer to the electrical guides.
P082600	Up and Down Switch Circuit	- Implausible signal	Check the up and down switch circuits. Refer to the electrical guides.
P082923	5-6 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open	Check the fluid level and condition. Check for associated DTCs.
P082962	5-6 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P082964	5-6 Shift	- Input/Output shaft ratio too high during a shift - Clutch does not open or close	Check the fluid level and condition. Check for associated DTCs.
P085000	Park / Neutral Switch Input Circuit	- Starter inhibit signal fault	Check the starter inhibit circuits. Refer to the electrical guides.
P089700	Transmission Fluid Deteriorated	- Temperature too high over too long a time	Renew the fluid.
P092800	Gear Shift Lock Solenoid/Actuator Circuit A / Open	- Solenoid circuit high resistance	Check the solenoid circuits. Refer to the electrical guides.
P092900	Gear Shift Lock Solenoid/Actuator Circuit A Range/Performance	- Solenoid circuit short circuit to ground - Solenoid circuit high resistance	Check the solenoid circuits. Refer to the electrical guides.
P093000	Gear Shift Lock Solenoid/Actuator Circuit A Low	- Solenoid circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P093100	Gear Shift Lock Solenoid/Actuator Circuit A High	- Solenoid circuit short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P093800	Hydraulic Oil Temperature Sensor Range/Performance	- Range/Performance - Signal not plausible	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P096013	Pressure Control Solenoid A Control Circuit / Open	- Control circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P096014	Pressure Control Solenoid A Control Circuit / Open	- Control circuit high resistance - Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096200	Pressure Control Solenoid A Control Circuit Low	- Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096300	Pressure Control Solenoid A Control Circuit High	- Control circuit short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P096413	Pressure Control Solenoid B Control Circuit / Open	- Control circuit high resistance	Check the solenoid circuits. Refer to the electrical guides.
P096414	Pressure Control Solenoid B Control Circuit / Open	- Control circuit high resistance - Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096600	Pressure Control Solenoid B Control Circuit Low	- Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P096700	Pressure Control Solenoid B Control Circuit High	- Control circuit short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P096813	Pressure Control Solenoid C Control Circuit / Open	- Control circuit high resistance	Check the solenoid circuits. Refer to the electrical guides.
P096814	Pressure Control Solenoid C Control Circuit / Open	- Control circuit high resistance - Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P097000	Pressure Control Solenoid C Control Circuit Low	- Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P097100	Pressure Control Solenoid C Control Circuit High	- Control circuit short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P178300	Transmission Overtemperature Condition	- Valve body module shut-down detected on last drive cycle	Check the fluid level and condition. Check for associated DTCs.
P271600	Pressure Control Solenoid D Electrical	- Solenoid current too high	Check the solenoid circuits. Refer to the electrical guides.
P271813	Pressure Control Solenoid D Control Circuit / Open	- Control circuit high resistance	Check the solenoid circuits. Refer to the electrical guides.
P271814	Pressure Control Solenoid D Control Circuit / Open	- Control circuit high resistance - Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P272000	Pressure Control Solenoid D Control Circuit Low	- Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P272100	Pressure Control Solenoid D Control Circuit High	- Control circuit short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P272500	Pressure Control Solenoid E Electrical	- Solenoid current too high	Check the solenoid circuits. Refer to the electrical guides.
P272713	Pressure Control Solenoid E Control Circuit / Open	- Control circuit high resistance	Check the solenoid circuits. Refer to the electrical guides.
P272714	Pressure Control Solenoid E Control Circuit / Open	- Control circuit high resistance - Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P272900	Pressure Control Solenoid E Control Circuit Low	- Control circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
P273000	Pressure Control Solenoid E Control Circuit High	- Control circuit short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P275900	Torque Converter Clutch Pressure Control Solenoid Electrical	- Pressure control solenoid fault	Check the solenoid circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
P276100	Torque Converter Clutch Pressure Control Solenoid Control Circuit / Open	- Pressure control solenoid circuit high resistance	Check the solenoid circuits. Refer to the electrical guides.
P276200	Torque Converter Clutch Pressure Control Solenoid Control Circuit Range / Perf	- Pressure control solenoid circuit current too low	Check the solenoid circuits. Refer to the electrical guides.
P276300	Torque Converter Clutch Pressure Control Solenoid Control Circuit High	- Pressure control solenoid circuit short circuit to power	Check the solenoid circuits. Refer to the electrical guides.
P276400	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low	- Pressure control solenoid circuit short circuit to ground	Check the solenoid circuits. Refer to the electrical guides.
U000188	High Speed CAN Communication Bus	- Bus off	The module setting this code has disabled CAN transmission. Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
U010087	Lost Communication With ECM/PCM "A"	- Missing message	Check the ECM and circuits. Refer to the electrical guides.
U010287	Lost Communication with Transfer Case Control Module	- Missing message	Check the transfer case control module and circuits. Refer to the electrical guides.
U010487	Lost Communication With Cruise Control Module	- Missing message	Check the speed control module and circuits. Refer to the electrical guides.
U012287	Lost Communication With Vehicle Dynamics Control Module	- Missing message	Check the ABS module and circuits. Refer to the electrical guides.
U012687	Lost Communication With Steering Angle Sensor Module	- Missing message	Check the steering angle sensor and circuits. Refer to the electrical guides.
U012887	Lost Communication With Park Brake Control Module	- Missing message	Check the parking brake control module and circuits. Refer to the electrical guides.
U013887	Lost Communication with All Terrain Control Module	- Missing message	Check the all-terrain control module and circuits. Refer to the electrical guides.
U015587	Lost Communication With Instrument Panel Cluster (IPC) Control Module	- Missing message	Check the instrument cluster and circuits. Refer to the electrical guides.
U030055	Internal Control Module Software Incompatibility	- Module is not configured	Configure the module using the approved diagnostic system.
U040186	Invalid Data Received from ECM/PCM A	- Signal invalid	Check the engine speed at the instrument cluster. Check for ECM DTCs.
U041686	Invalid Data Received From Vehicle Dynamics Control Module	- Signal invalid	Check for ABS DTCs.
U30004A	Control Module	- Incorrect component installed - Mismatch between configuration data and read configuration	Configure the module using the approved diagnostic system.

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Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Transmission Fluid Drain and Refill

General Procedures

- WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

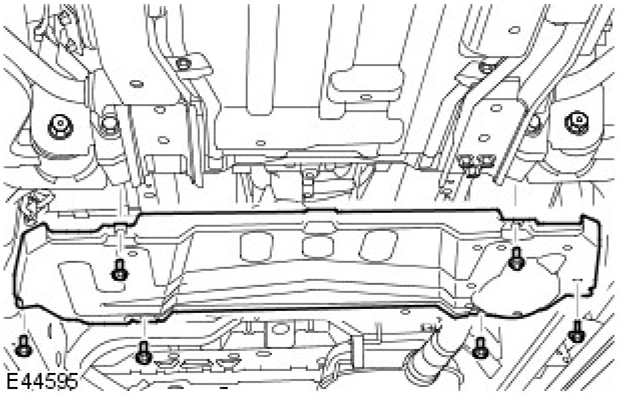
⚠ Observe due care when working near a hot exhaust system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

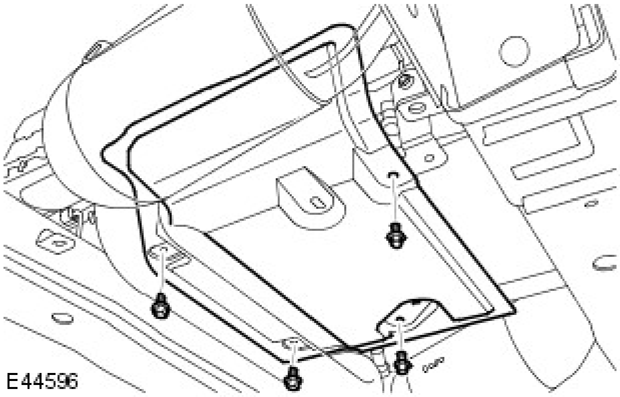
2. Remove the transmission undershield.

- Remove the 6 bolts.



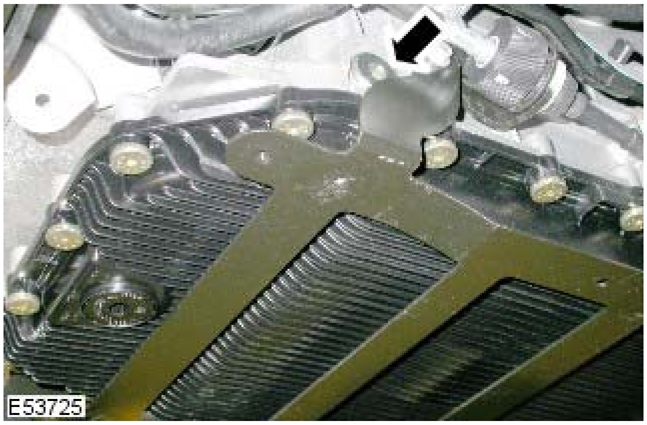
3. If installed, remove the transmission heat shield.

- Remove the 4 bolts.



4. Clean the area around the transmission fluid drain and filler plugs.

5. Place a container under the transmission.



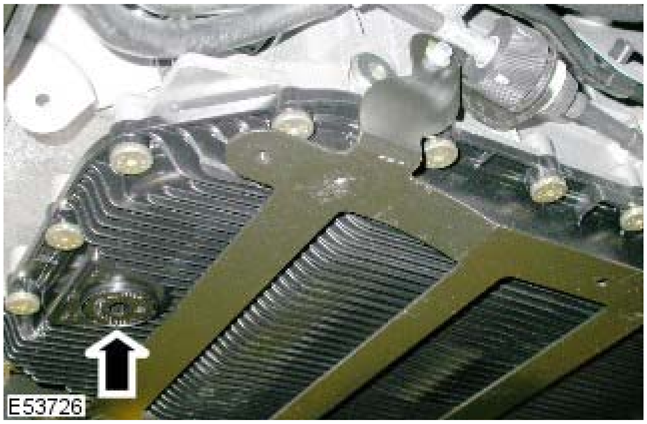
6. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

Remove the transmission fluid filler/level plug.

- Remove and discard the sealing washer.



7. Remove the transmission fluid drain plug.

- Remove and discard the sealing washer.
- Allow the fluid to drain.

8. Install the transmission fluid drain plug and tighten to 9 Nm (7 lb.ft).

- Install a new sealing washer.

9. Add 3.5 to 4 liters of the correct transmission fluid, or until a small thread of fluid runs from the filler/level hole.

10. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Transmission Fluid Level Check

General Procedures

- WARNINGS:

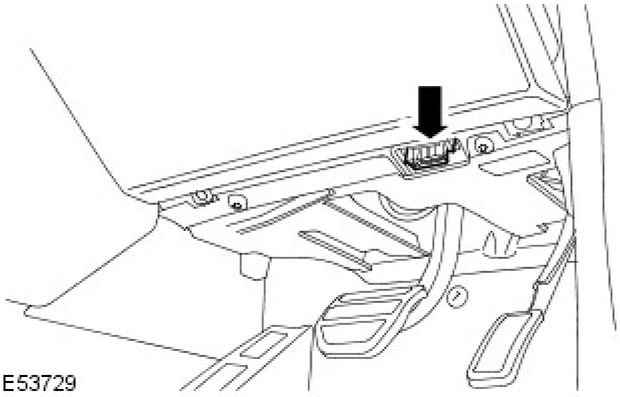
⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

⚠ CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

1. The following steps must be observed before starting the transmission fluid level check and top-up.

- The vehicle must be on a horizontal ramp.
- The parking brake must be applied.
- The wheels must be chocked.



2. ⚠ CAUTION: Make sure the transmission fluid temperature is below 30 degrees before starting the fluid level check.

Using the approved Land Rover diagnostic equipment, monitor the transmission fluid temperature.

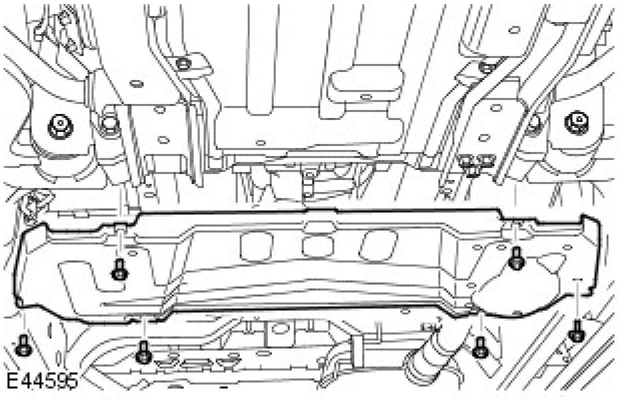
3. Start the engine. Move the selector lever from 'P' through all gear positions, pausing in each gear position for 2-3 seconds and return to the 'P' position.

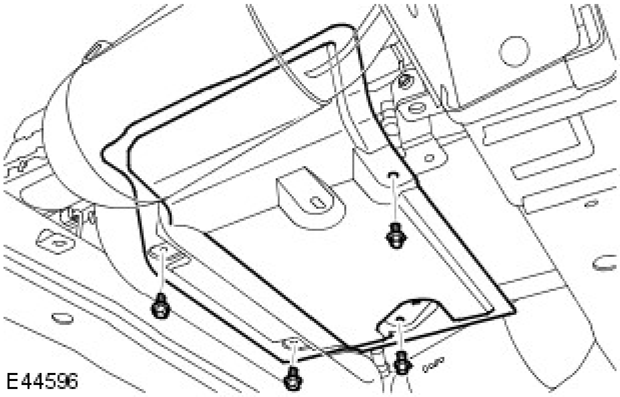
4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

5. Remove the transmission undershield.

- Remove the 6 bolts.

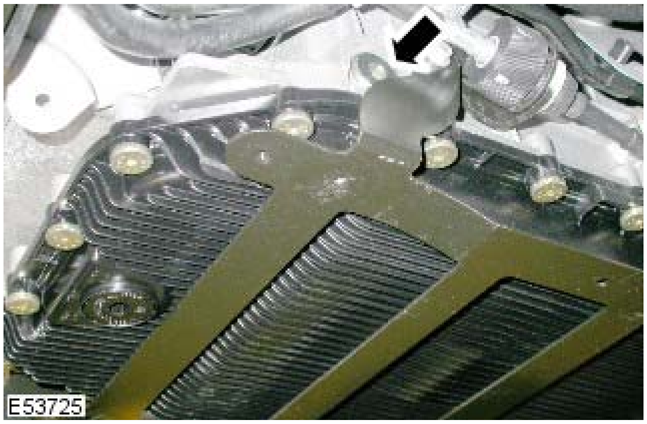




6. If installed, remove the transmission heat shield.

- Remove the 4 bolts.

7. Place a container under the transmission.



8. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

⚠CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

Remove the transmission fluid filler/level plug.

- Clean the area around the filler/level plug.
- Remove and discard the sealing washer.

9. If no fluid loss is apparent when the filler/level plug is removed, with the engine at idle, continue to fill the transmission until a small thread of oil runs from oil filler/level hole.

10. Install the transmission fluid filler/level plug and tighten to 35 Nm (26 lb.ft).

- Install a new sealing washer.
- Remove the container.

11. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

12. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Disconnect the approved Land Rover diagnostic equipment from the vehicle.

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Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Transmission Support Insulator

In-vehicle Repair

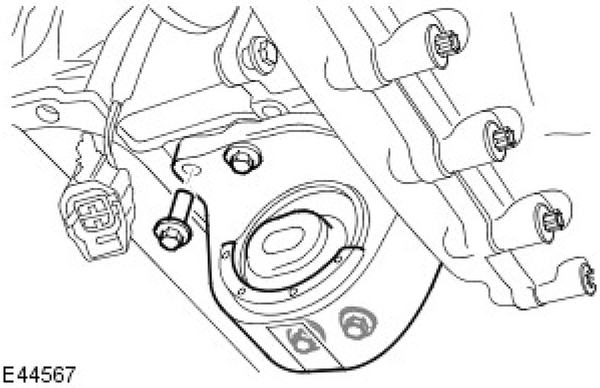
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. NOTE: 4.4L illustration shown, 4.0L and 2.7L Diesel are similar.



Remove the transmission support insulator.

- Remove the 4 bolts.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.
- Tighten the bolts to 60 Nm (44 lb.ft).

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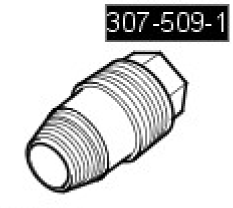
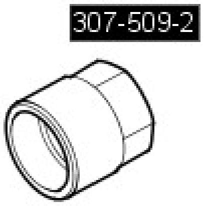
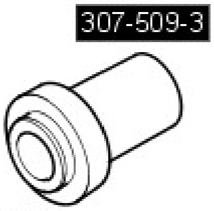
Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Selector Shaft Seal

In-vehicle Repair

Special Tool(s)	
 E50766	Seal extractor (LRT-44-033/1) 307-509-1
 E50767	Seal extractor (LRT-44-033/2) 307-509-2
 E50768	Seal installer (LRT-44-033/3) 307-509-3

Removal

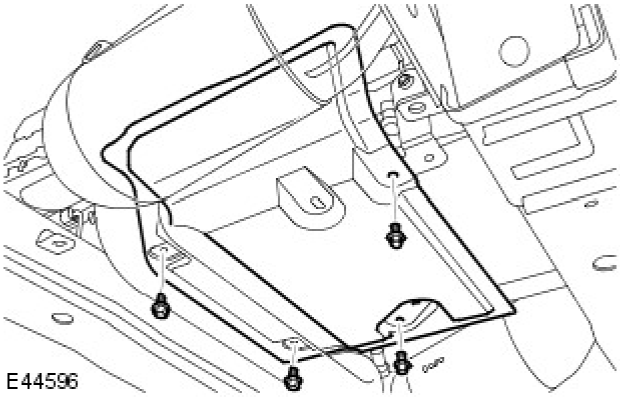
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

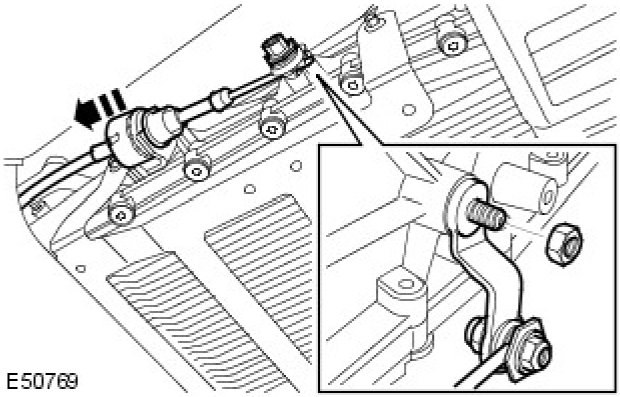
2. Remove the exhaust system.
   For additional information, refer to: Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

3. Remove the transmission heat shield.

   - Remove the 4 bolts.

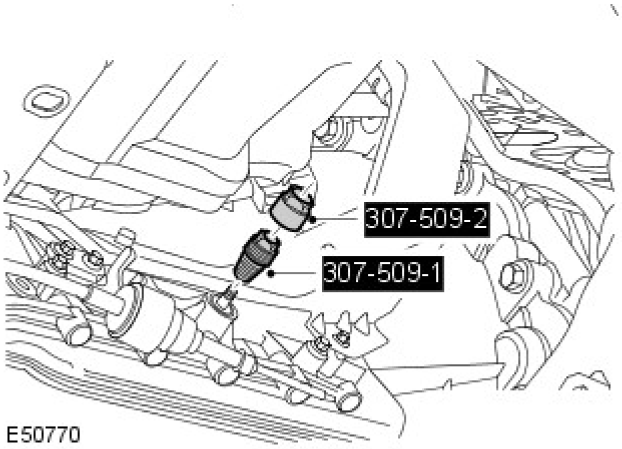


E44596


E50769

4. Release the selector cable and lever.

- Remove the nut.
- Compress the latch and release the cable.



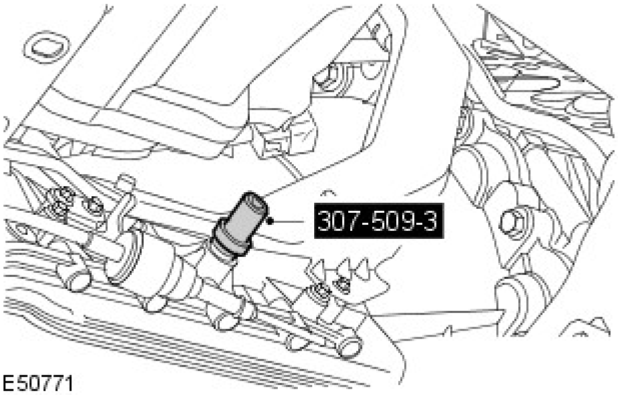
E50770

5. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the selector shaft seal.

- Install 307-509-1 to the seal.
- Install 307-509-2 to 307-509-1 and extract the seal.

Installation



E50771

1. Using 307-509-3, install the selector shaft seal.

- Clean the components.

2. Install the selector cable and bracket.

- Secure with the clip.
- Tighten the nut to 12 Nm (9 lb.ft).

3. Install the transmission heat shield.

- Install the bolts.

4. Install the exhaust system.
For additional information, refer to: Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (309-00C Exhaust System

- TDV6 2.7L Diesel, Removal and Installation).

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Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Transmission Control Module (TCM)

In-vehicle Repair

Removal

- NOTE: The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.

1. Remove the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, In-vehicle Repair).

Installation

1. Install the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, In-vehicle Repair).

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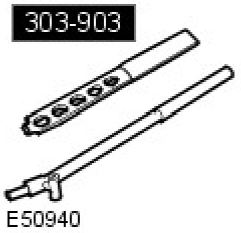
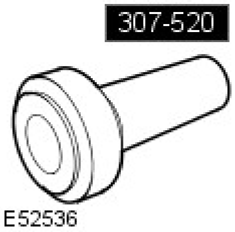
Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Output Shaft Seal

In-vehicle Repair

Special Tool(s)	
	Oil seal remover 303-903 (LRT-12-092)
	Oil seal installer 307-520

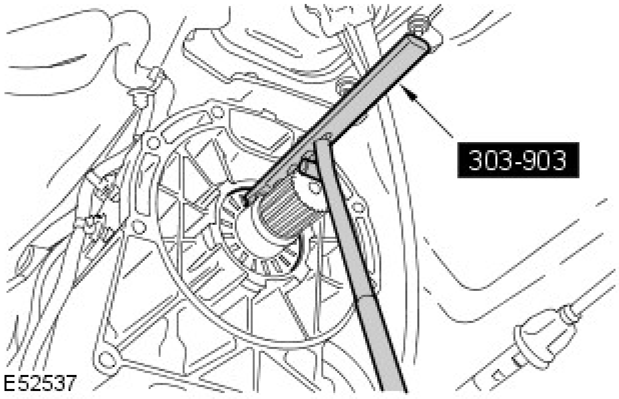
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transfer case.

For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

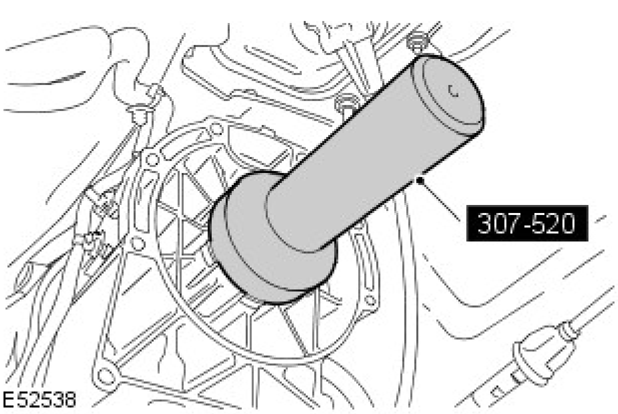


3. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the transmission output shaft oil seal.

- Use the special tool.

Installation



1. ⚠ CAUTION: Oil seals must be fitted dry.

   Install a new transmission output shaft oil seal.

   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

3. Check and top-up the transmission fluid level.
   For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

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Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Fluid Pan, Gasket and Filter

In-vehicle Repair

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

   Remove the main control valve body.
   For additional information, refer to: Main Control Valve Body (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, In-vehicle Repair).

Installation

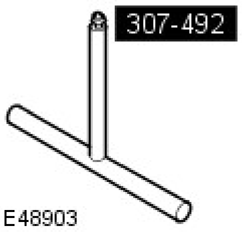
1. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

   Install the main control valve body.
   For additional information, refer to: Main Control Valve Body (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, In-vehicle Repair).

Published: 11-May-2011

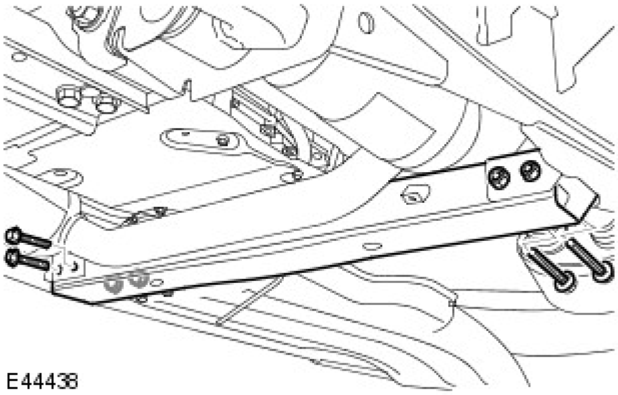
Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Main Control Valve Body

In-vehicle Repair

Special Tool(s)	
 E48903	Seal extractor 307-492(LRT-44-005)

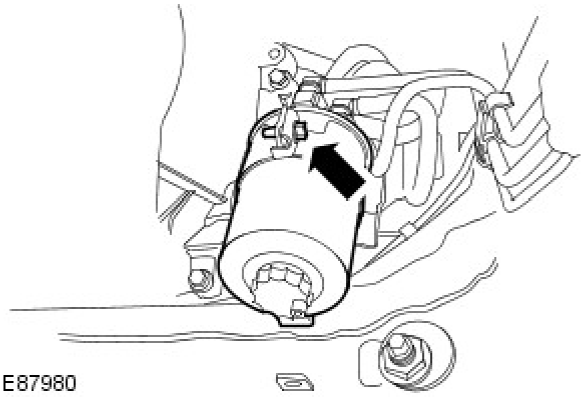
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Drain the transmission fluid.
   For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).



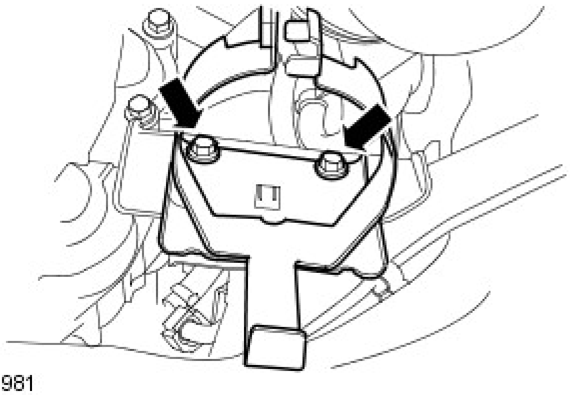
E44438

4. Remove the transmission support crossmember.
   - Support the transmission on a jack.
   - Remove the transmission mounting securing bolt.
   - Remove the 4 bolts.
   - Remove the transmission support insulator through-bolt.



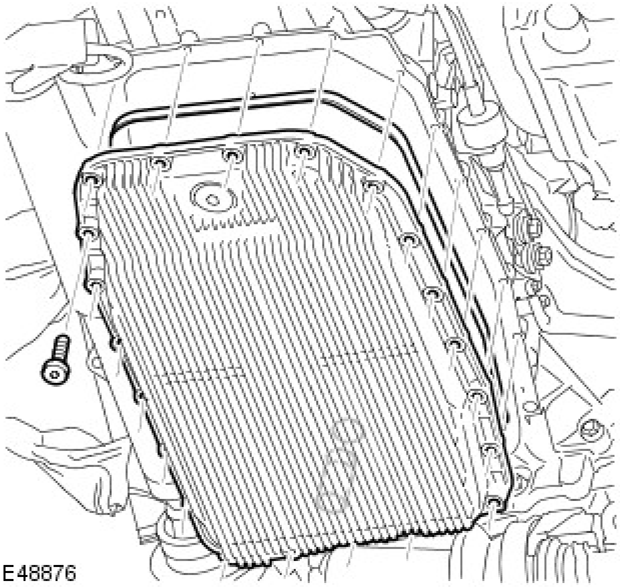
E87980

5. Release the fuel filter from its bracket.
   - Tie aside.


E87981

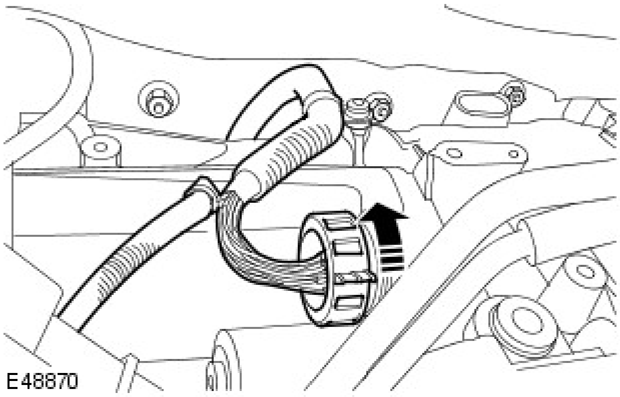
6. Release the support bracket.

- Remove the bolt closest to the engine.
- Release but do not remove the second bolt.

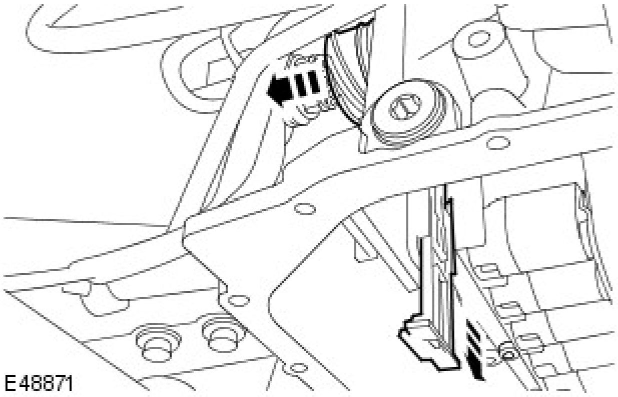

E48876

7. Release the oil pan.

- Position a container to collect the oil spillage.
- Remove the 21 Torx screws.

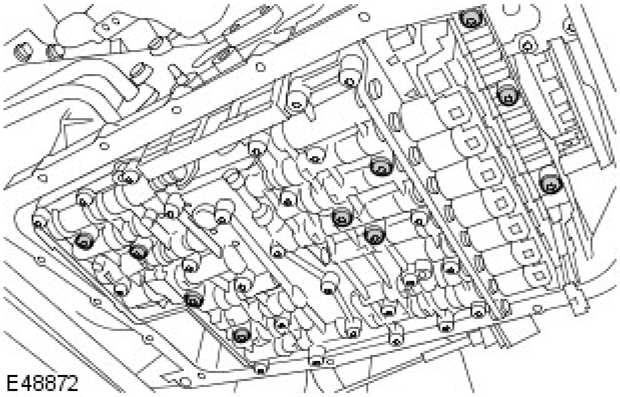

E48870

8. Release and disconnect the electrical connector.



9. Remove and discard the electrical connector sleeve.

- Release the retainer.

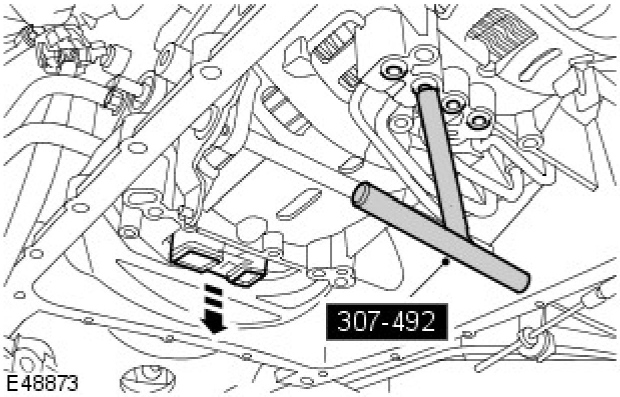


10. Remove the valve block and oil pan.

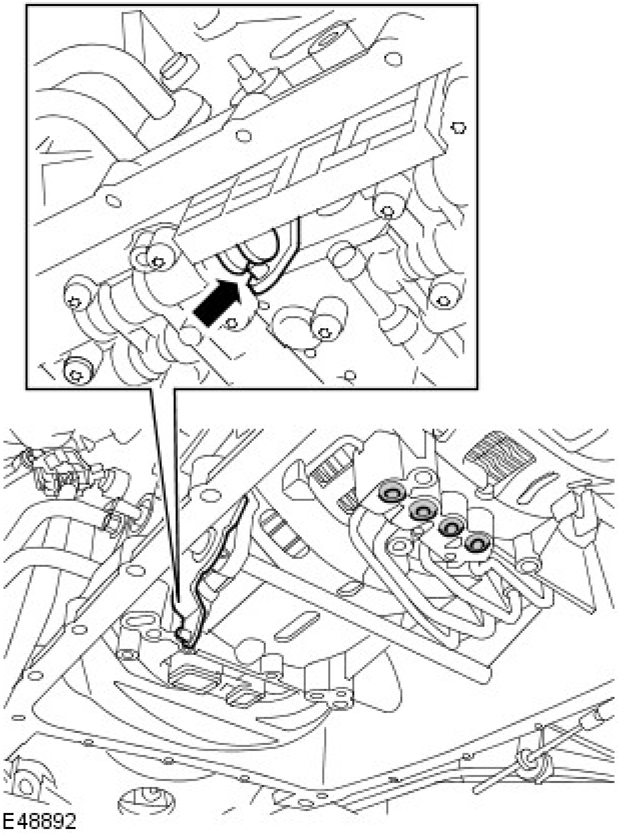
- Remove the 7 Torx bolts.
- Discard the O-ring seal.

11. Using the special tool, remove the 4 seals.

12. Remove the seal block.


307-492
E48873

Installation


E48892

1. CAUTIONS:

⚠ Make sure that when fully fitted, all seals protrude by the same amount.

⚠ Engage the selector lever with the groove in the piston rod.

Install the valve block and oil pan.

- Clean the component mating faces.
- Install new seals.
- Install a new seal block.
- Tighten the Torx screws to 8 Nm (6 lb.ft).

2. Install a new electrical connector sleeve.

- Secure with retainer.

3. Connect the electrical connector.

4. Secure the oil pan.

- Tighten the Torx screws to 8 Nm (6 lb.ft).

5. Install the fuel filter support bracket.

6. Install the fuel filter.

7. Install the transmission support crossmember.

- Install the transmission support insulator through-bolt and tighten to 175 Nm (129 lb.ft).
- Install the 4 bolts.
- Tighten the nuts and bolts to 90 Nm (66 lb.ft).
- Remove the transmission jack.

8. Fill the transmission with fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

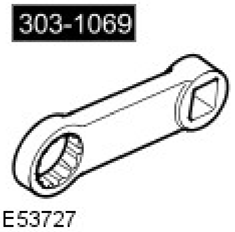
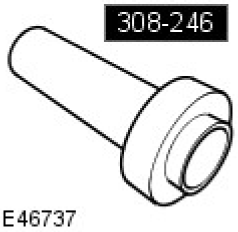
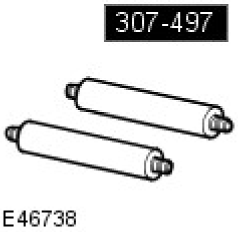
9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

10. Using the Land Rover approved diagnostic equipment, calibrate the control valve body.

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV6 2.7L Diesel - Transmission

Removal and Installation

Special Tool(s)	
	Wrench adaptor 303-1069
	Torque converter seal installer 308-246
	Torque converter support handles (LRT-44-010) 307-497

Removal

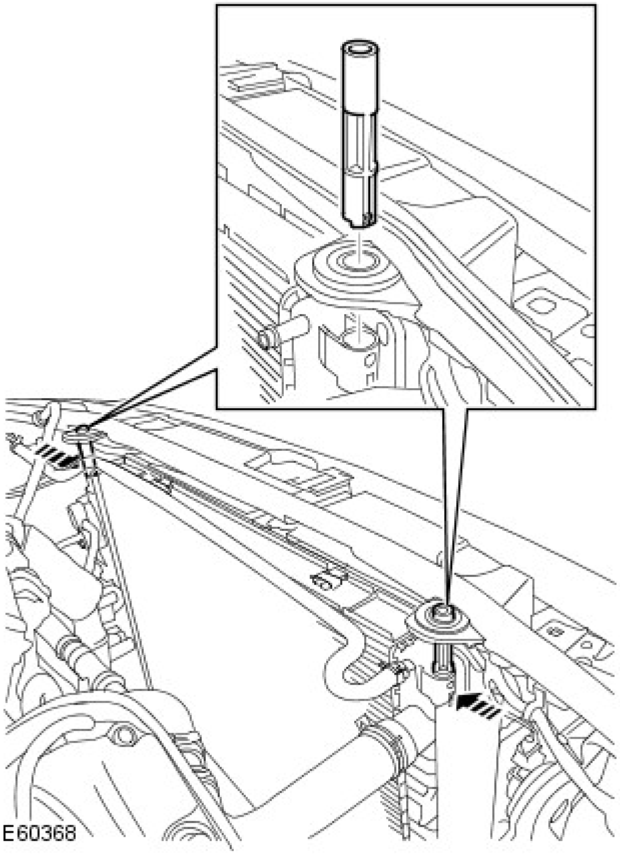
- NOTE: The front end of the body is raised from the integrated body frame to aid removal of the transmission.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

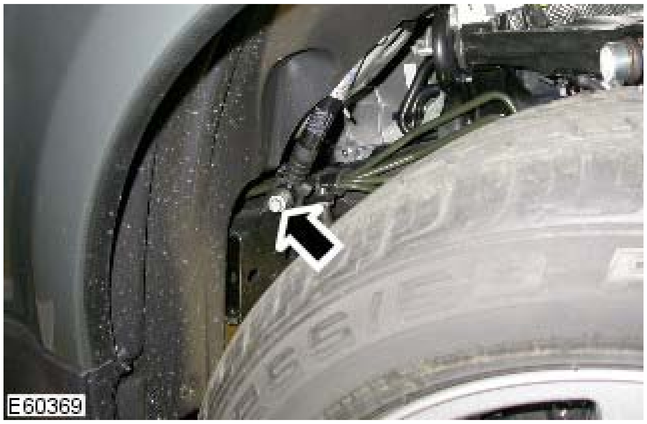
3. Remove the radiator securing pegs.

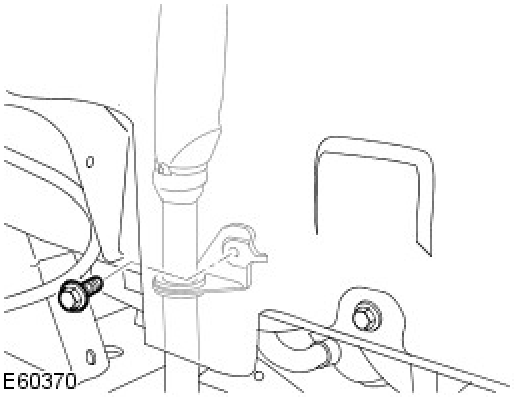


4. Remove the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

5. Release both front absorbers from the integrated body frame.

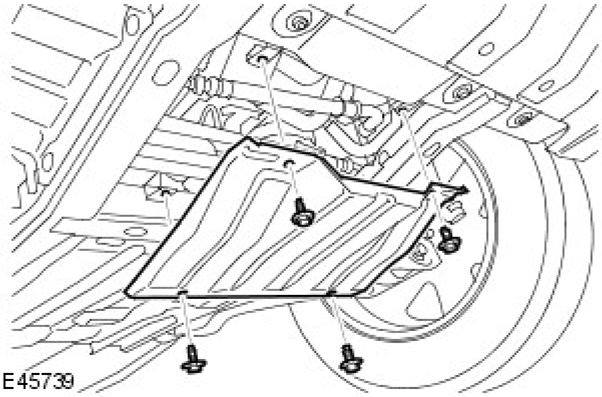
- Remove the 2 bolts.





6. Release the fuel fired booster heater exhaust bracket.

- Remove the bolt.



7. Remove the radiator access panel.

- Remove the 4 bolts.

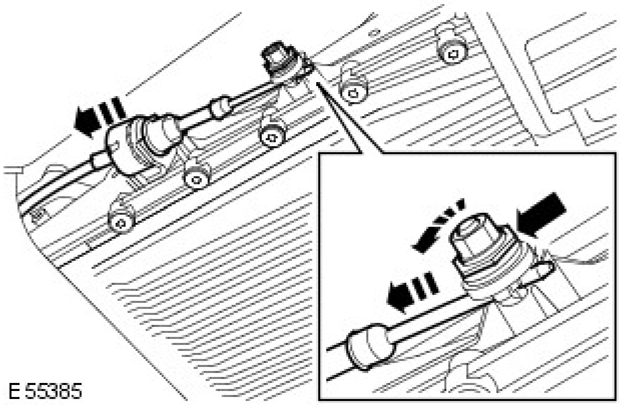
8. Remove the starter motor.
For additional information, refer to: Starter Motor (303-06C Starting System - TDV6 2.7L Diesel, Removal and Installation).

9. Drain the transmission fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

10. Remove the exhaust system.
For additional information, refer to: Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

11. Remove the front driveshaft.
For additional information, refer to: Front Driveshaft - TDV6 2.7L Diesel (205-01 Driveshaft, Removal and Installation).

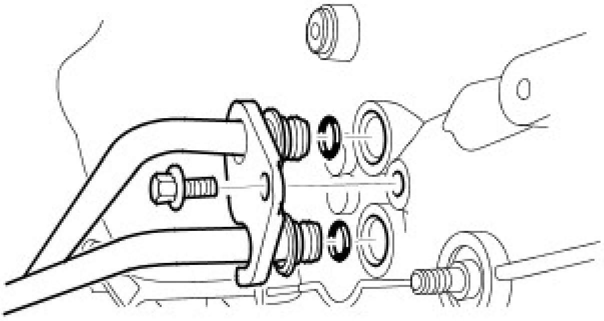
12. Remove the rear driveshaft.
For additional information, refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).



E 55385

13. Release the transmission selector lever cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Compress the latch and release the cable.



E60442

14. ⚠ CAUTION: Always plug any open connections to prevent contamination.

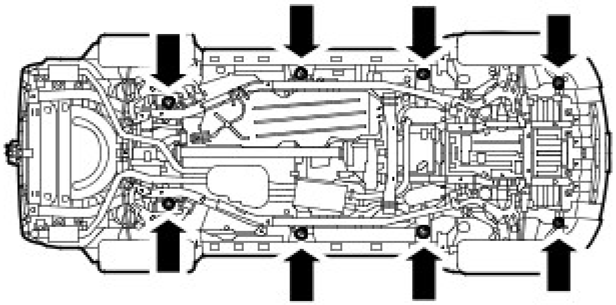
• NOTE: Some fluid spillage is inevitable during this operation.

Release the transmission fluid lines.

- Remove the retaining bolt.
- Remove and discard both O-ring seals.

15. Release the front end of the body from the integrated body frame.

- Remove the 8 bolts.
- Remove the 8 spacing washers.



E60378

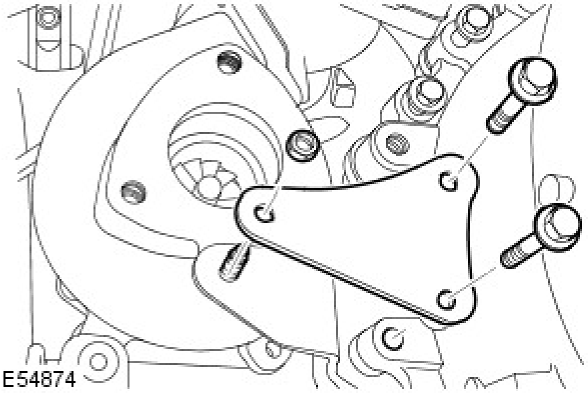
16. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

⚠ CAUTION: Only raise the body sufficiently to remove the transmission.

Carefully raise the body.

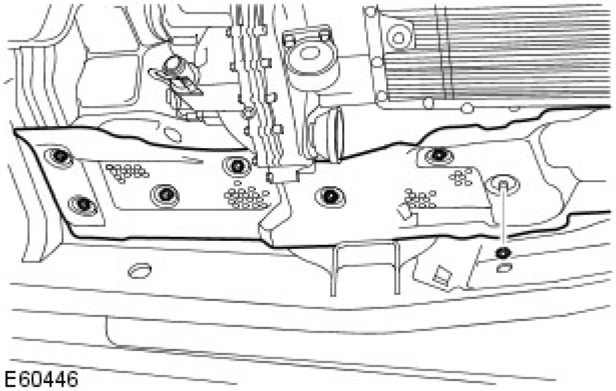
17. Remove the turbocharger support bracket.

- Remove the nut and 2 bolts.


E54874

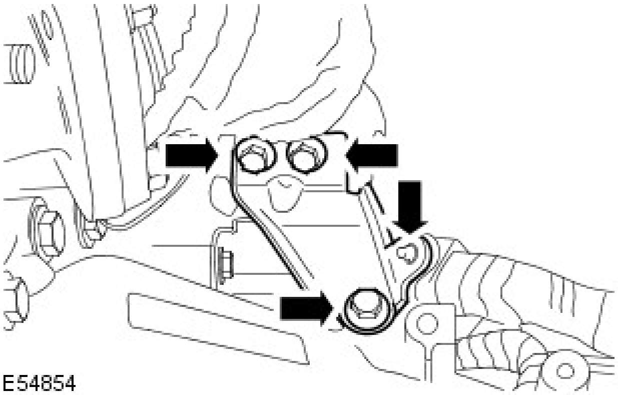
18. Remove the exhaust heat shield.

- Remove the 7 nuts.


E60446

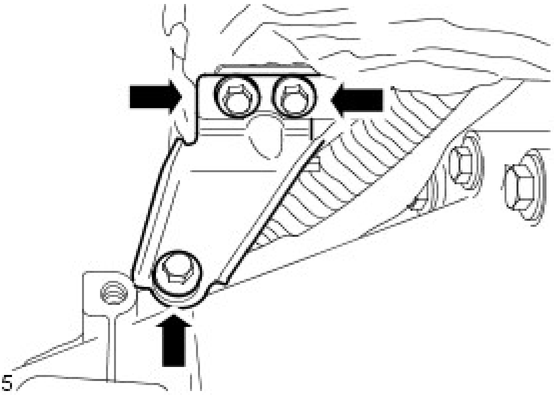
19. Remove the exhaust cross-over pipe LH support bracket.

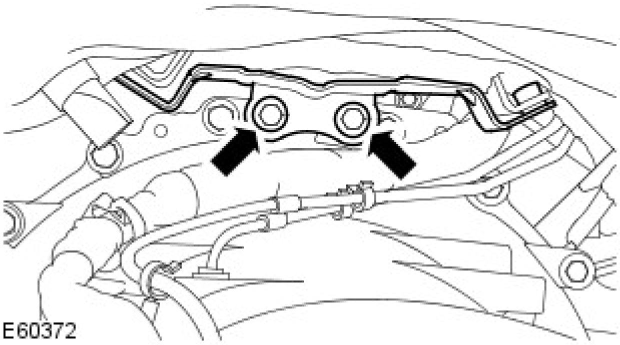
- Remove the 3 bolts.
- Release the transmission wiring harness.


E54854

20. Remove the exhaust cross-over pipe RH support bracket.

- Remove the 3 bolts.

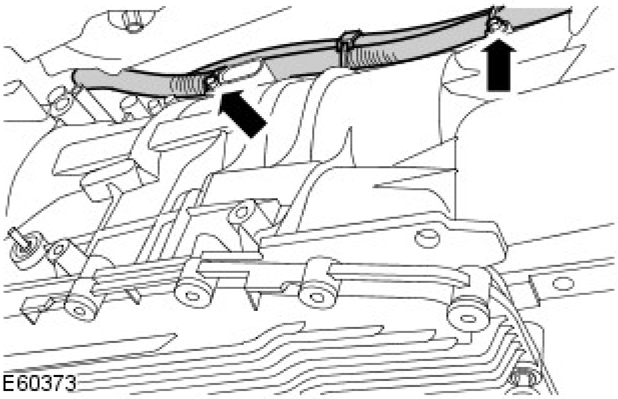

E54855



21. NOTE: The transmission is lowered for access.

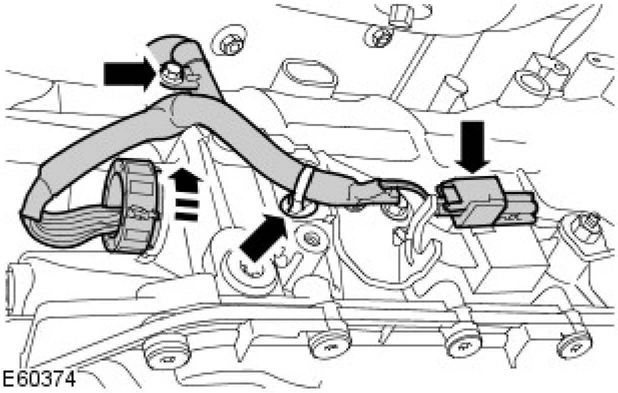
Remove the exhaust cross-over pipe center support bracket.

- Remove the 2 bolts.



22. Release the wiring harness from the LH side of the transmission.

- Remove the 2 bolts.

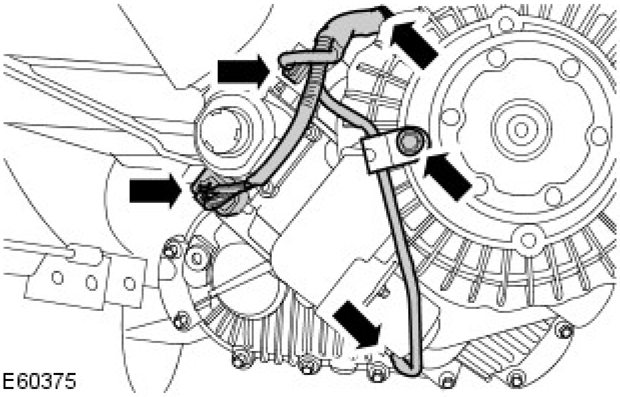


23. Release the wiring harness from the RH side of the transmission.

- Remove the retaining bolt.
- Disconnect the 2 electrical connectors.
- Release the wiring harness retaining clip.

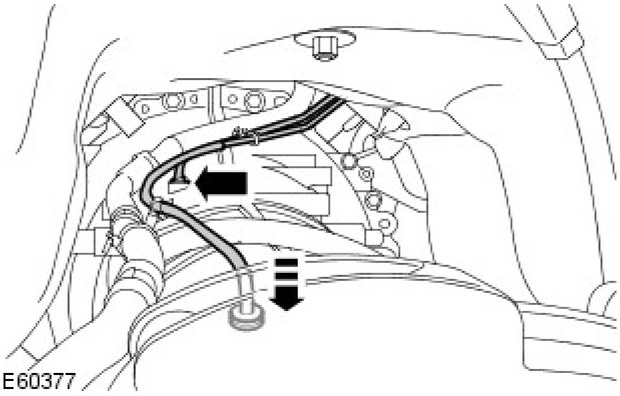
24. Disconnect the transfer case electrical connectors.

- Disconnect the three electrical connectors.


E60375

25. Release the wiring harness from the transfer case.

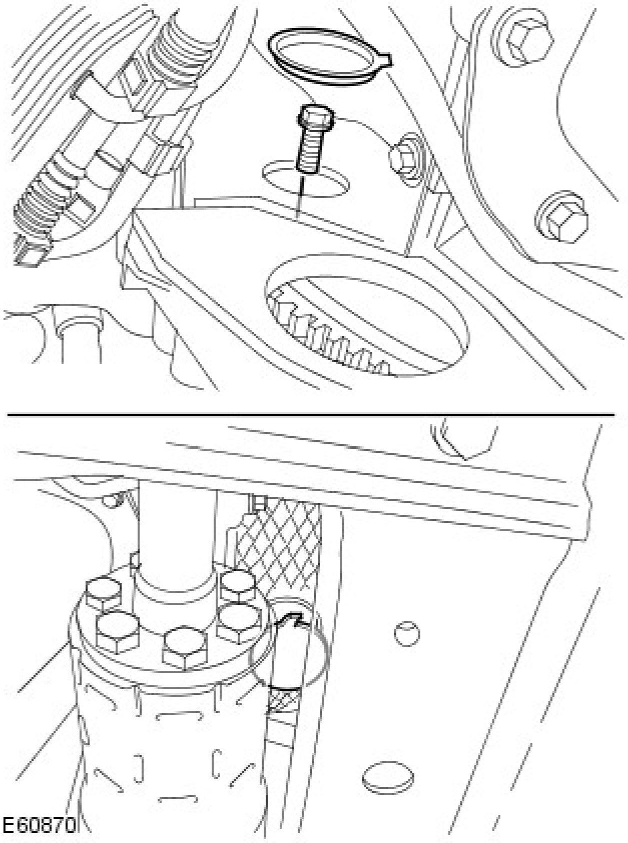
- Remove the bolt.
- Release the clip.


E60377

26. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the transmission and transfer case breather lines.

- Depress the locking rings.

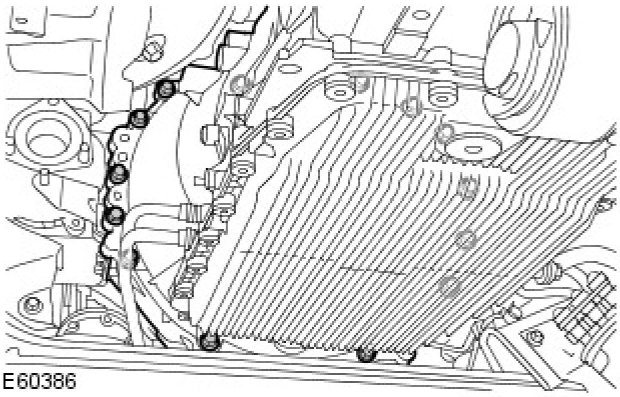


27. Release the flexplate.

- Remove the access plugs.
- Rotate the crankshaft in a clockwise direction to access the retaining bolts.
- Remove and discard the 4 bolts.

28. ⚠ WARNING: Secure the transmission to the transmission jack.

Using a transmission jack, support the transmission.



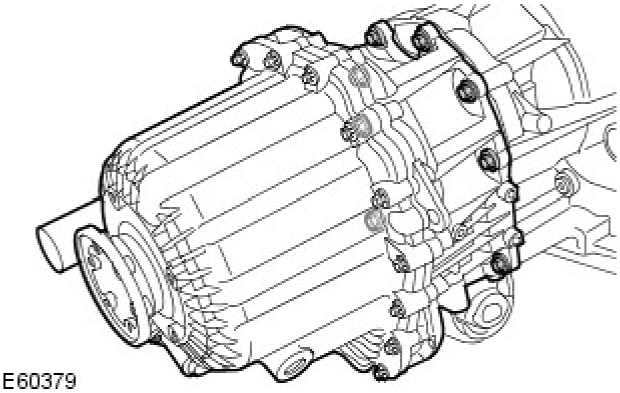
29. ⚠ WARNING: Make sure the torque converter remains with the transmission.

⚠ CAUTION: Support the engine on a jack. The angle may need to be adjusted during this procedure.

With assistance, remove the transmission.

- Remove the 14 bolts.

30. Install the torque converter retainer.


E60379

31. NOTE: Do not disassemble further if the component is removed for access only.

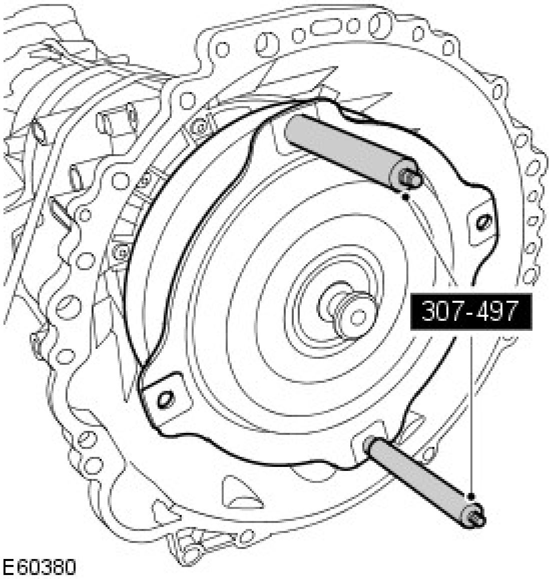
With assistance, remove the transfer case.

- Remove the 8 bolts.
- Remove and discard the O-ring seal.

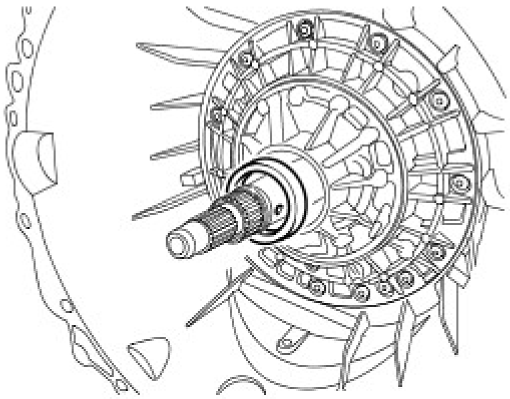
32. Remove the transmission from the transmission jack.

33. Remove the torque converter retainer.

34. Using the special tools, remove the torque converter.

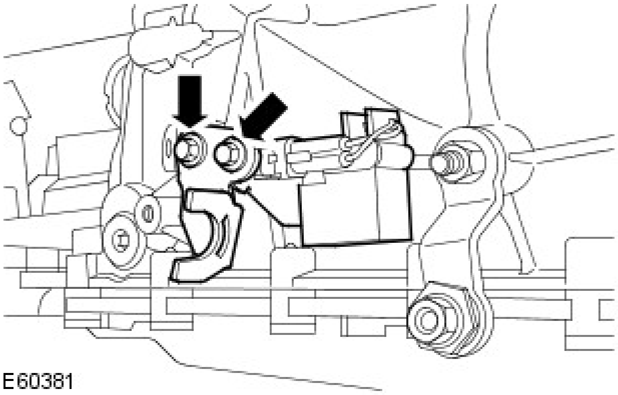


E60380


E48465

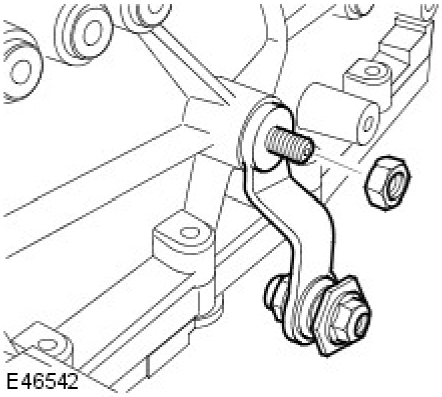
35. ⚠CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Carefully remove and discard the torque converter fluid seal.


E60381

36. Remove the selector cable bracket and suppressor.

- Remove the 2 bolts.


E46542

37. Remove the selector lever.

- Remove the retaining nut.

Installation

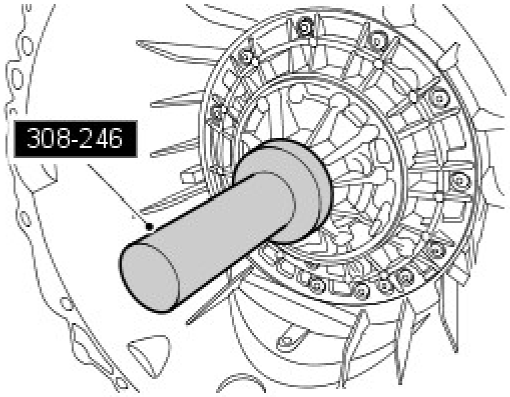
⚠ CAUTION: If the automatic transmission fluid is very dirty or it contains metallic particles, then along with a new transmission, install a new automatic transmission fluid cooler and lines.

1. Install the selector lever.

- Tighten the nut to 12 Nm (9 lb.ft).

2. Install the suppressor and selector cable bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).



E46739

3. Using the special tool, install a new torque converter fluid seal.

- Clean the seal register.

4. Install the torque converter.

- Clean the seal contact area.

- Remove the special tools.

5. Install the torque converter retainer.

6. Position the transmission to the transmission jack.

7. With assistance, install the transfer case.

- Clean the component mating faces.
- Lubricate input shaft splines with 'Weicon TL7391' grease.
- Install the O-ring seal.
- Using the special tool, tighten the bolts to 45 Nm (33 lb.ft).

8. Remove the torque converter retainer.

9. ⚠ CAUTION: Apply grease of the correct specification to the torque converter spigot.

With assistance, install the transmission.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

10. Attach the flexplate to the torque converter.

- Rotate the crankshaft clockwise to align the flexplate bolt holes.
- Rotate the torque converter to align with the flexplate bolt holes.
- Tighten the four retaining bolts to 45 Nm (33 lb.ft).
- Install the access plugs.

11. Attach the transmission and the transfer case breather lines.

- Position transmission and transfer case harness.

12. Secure the wiring harness to the transmission.

- Connect the electrical connectors.
- Secure the clip.
- Tighten the bolts to 10 Nm (7 lb.ft).

13. Secure the wiring harness to the transfer case.

- Tighten the bolt to 10 Nm (7 lb.ft).

14. Connect the transfer case electrical connectors

15. Install the exhaust manifold crossover pipe center support bracket.

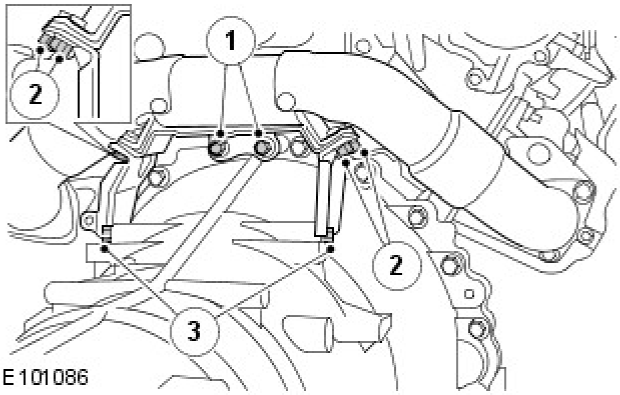
- Loosely install the 2 bolts.

16. Install the exhaust manifold crossover pipe RH support bracket.

- Loosely install the 3 bolts.

17. Install the exhaust manifold crossover pipe LH support bracket.

- Loosely install the 3 bolts.



18. Tighten the exhaust manifold crossover pipe mounting bracket bolts in the following sequence.

- Tighten the 2 bolts marked 1 to 10 Nm (7 lb.ft).
- Loosen the 2 bolts by 90 degrees.
- Tighten the 2 bolts marked 3 to 10 Nm (7lb.ft).
- Loosen the 2 bolts by 90 degrees.
- Tighten the 4 bolts maked 2 to 25 Nm (18 lb. ft).
- Tighten the 2 bolts maked 1 to 25 Nm (18 lb. ft).
- Tighten the 2 bolts maked 3 to 25 Nm (18 lb. ft).
- Attach the wiring harness.

19. Attach the transmission fluid lines.

- Clean the components mating faces.
- Install the new O-ring seals.
- Tighten the bolt to 10 Nm (7 lb.ft).

20. Install the turbocharger support bracket.

- Tighten the nut and 2 bolts to 22 Nm (16 lb.ft).

21. ⚠CAUTION: Make sure the body mounts are correctly installed.

Secure the body to the integrated body frame.

- Carefully lower the body.
- Install the spacing washers.
- Tighten the bolts to 133 Nm (98 lb.ft).

22. Secure both front absorbers to the integrated body frame.

- Tighten the bolts to 45 Nm (33 lb.ft).

23. Secure the fuel fired booster heater exhaust bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).

24. Install the radiator securing pegs.

25. Install the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

26. NOTE: Do not tighten the locking nut at this stage.

Connect the selector cable to the transmission.

- Engage the inner cable with the lever clamping bush.
- Install the selector cable to its abutment bracket.

27. Install the exhaust heat shield.

- Tighten the nuts.

28. Install the front driveshaft.
For additional information, refer to: Front Driveshaft - TDV6 2.7L Diesel (205-01 Driveshaft, Removal and Installation).

29. Install the rear driveshaft.
For additional information, refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

30. Install the exhaust system.
For additional information, refer to: Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

31. Install the starter motor.
For additional information, refer to: Starter Motor (303-06C Starting System - TDV6 2.7L Diesel, Removal and Installation).

32. Install the radiator access panel.

- Tighten the bolts to 10 Nm (7 lb.ft).

33. Adjust the selector cable.
For additional information, refer to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures).

34. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

35. Refill the transmission with fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

36. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Fluid Pan, Gasket and Filter

In-vehicle Repair

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

   Remove the main control valve body.
   For additional information, refer to: Main Control Valve Body (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, In-vehicle Repair).

Installation

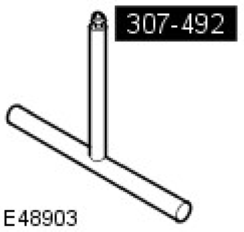
1. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

   Install the main control valve body.
   For additional information, refer to: Main Control Valve Body (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, In-vehicle Repair).

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Main Control Valve Body

In-vehicle Repair

Special Tool(s)	
	Seal extractor 307-492(LRT-44-005)

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

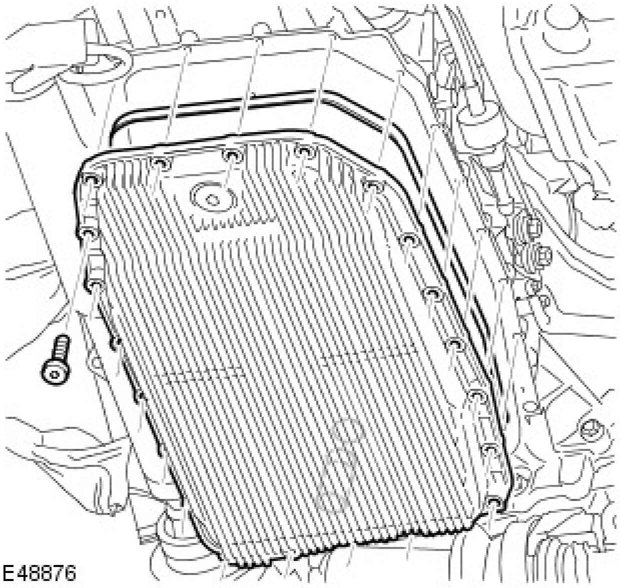
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Drain the transmission fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

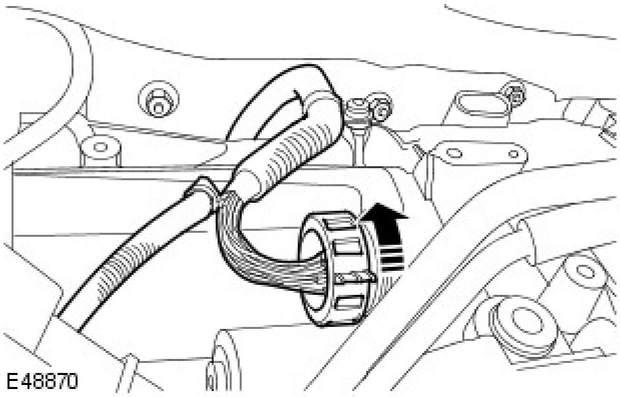
4. Remove the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

5. Remove the RH catalytic converter.
For additional information, refer to: Catalytic Converter RH - Vehicles Without: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

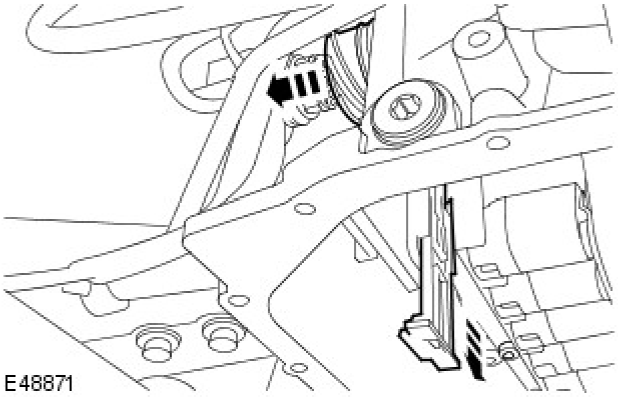


6. Release the oil pan.

- Position a container to collect the oil spillage.
- Remove the 21 Torx screws.

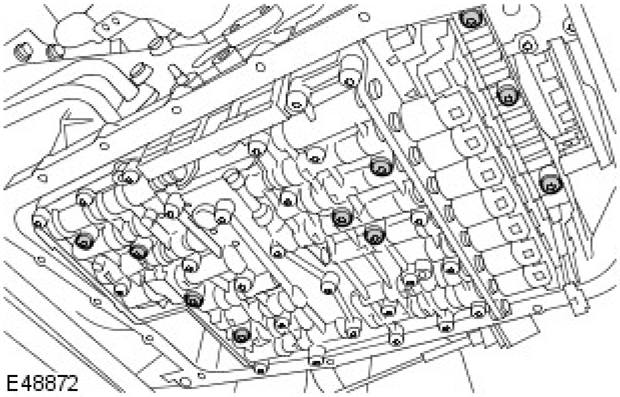


7. Release and disconnect the electrical connector.



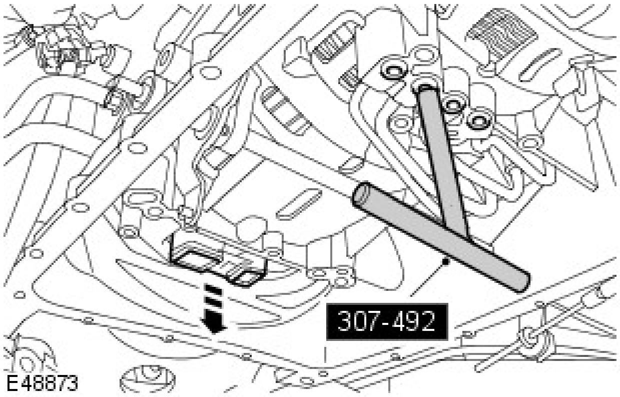
8. Remove and discard the electrical connector sleeve.

- Release the retainer.



9. Remove the valve block and oil pan.

- Remove the 7 Torx bolts.
- Discard the O-ring seal.


307-492
E48873

10. Using the special tool, remove the 4 seals.

11. Remove the seal block.

Installation

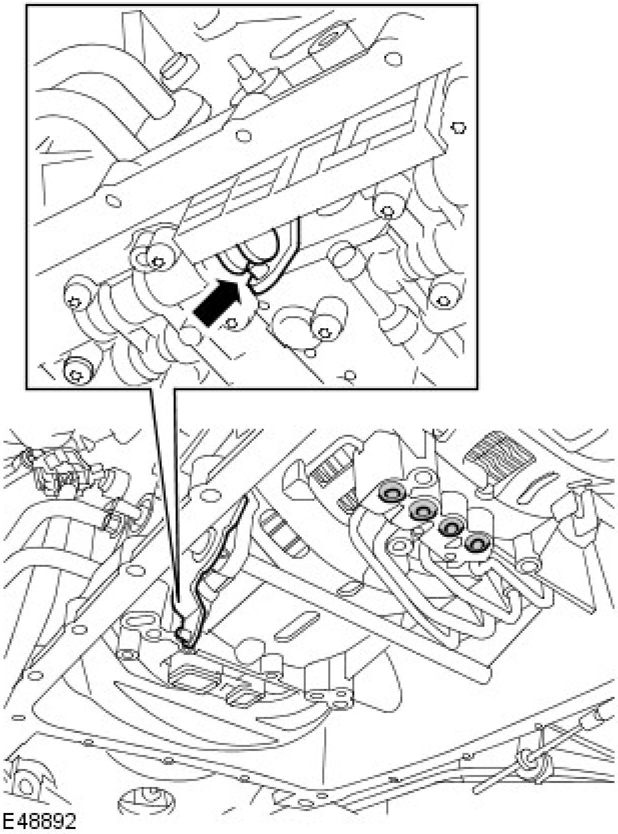
1. CAUTIONS:

⚠ Make sure that when fully fitted, all seals protrude by the same amount.

⚠ Engage the selector lever with the groove in the piston rod.

Install the valve block and oil pan.

- Clean the component mating faces.
- Install new seals.
- Install a new seal block.
- Tighten the Torx screws to 8 Nm (6 lb.ft).



2. Install a new electrical connector sleeve.

- Secure with retainer.

3. Connect the electrical connector.

4. Secure the oil pan.

- Tighten the Torx screws to 8 Nm (6 lb.ft).

5. Install the RH catalytic converter.
For additional information, refer to: Catalytic Converter RH - Vehicles Without: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

6. Install the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

7. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

8. Fill the transmission with fluid.
For additional information, refer to: Transmission Fluid Drain and Refill (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

9. Using the Land Rover approved diagnostic equipment, calibrate the control valve body.

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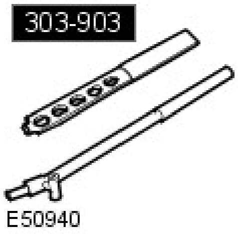
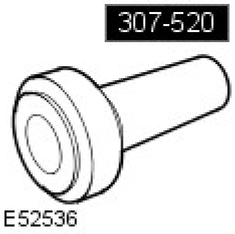
Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Output Shaft Seal

In-vehicle Repair

Special Tool(s)	
	Oil seal remover 303-903(LRT-12-092)
	Oil seal installer 307-520

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

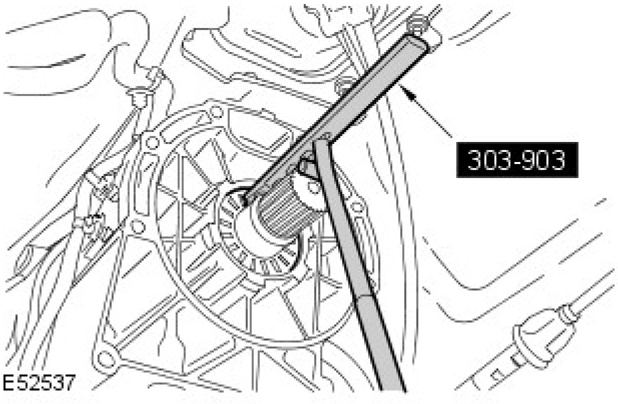
Raise and support the vehicle.

3. Remove the transfer case.
For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).

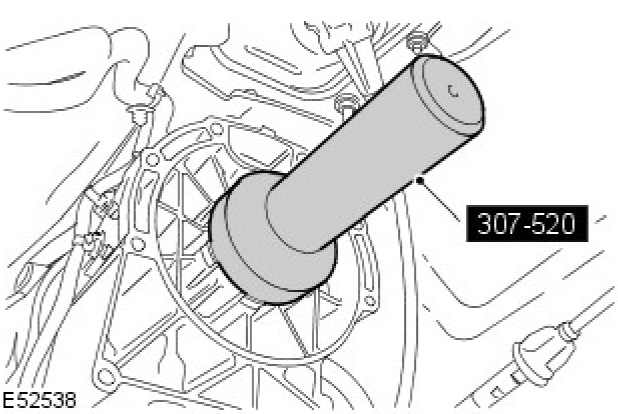
4. CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the transmission output shaft oil seal.

- Use the special tool.



Installation



1. ⚠ CAUTION: Oil seals must be fitted dry.

   Install a new transmission output shaft oil seal.

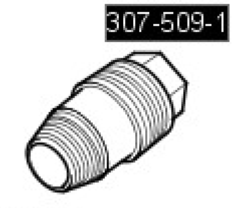
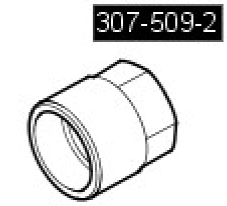
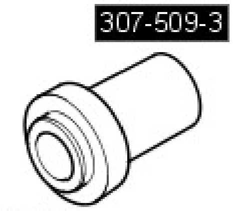
   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
4. Check and top-up the transmission fluid level.
   For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Selector Shaft Seal

In-vehicle Repair

Special Tool(s)	
 E50766	Seal extractor 307-509-1(LRT-44-033/1)
 E50767	Seal extractor 307-509-2(LRT-44-033/2)
 E50768	Seal installer 307-509-3(LRT-44-033/3)

Removal

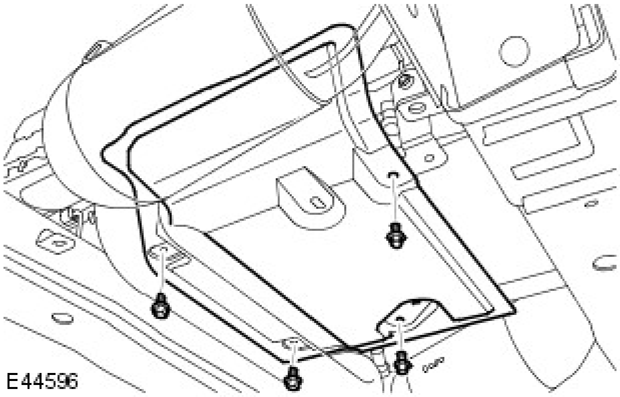
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

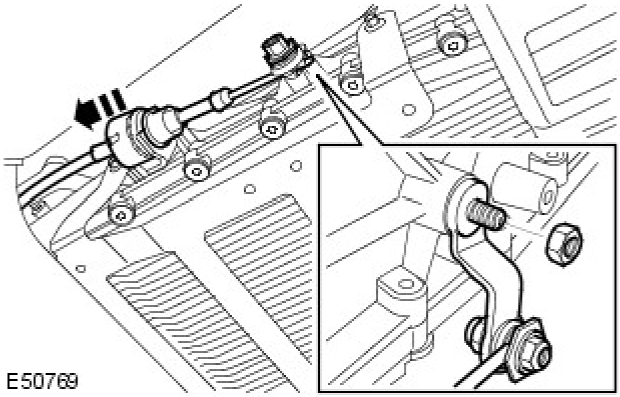
2. Remove the RH catalytic converter.
   For additional information, refer to: Catalytic Converter RH - Vehicles Without: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation) / Catalytic Converter RH - Vehicles With: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

3. Remove the transmission heat shield.

   - Remove the 4 bolts.

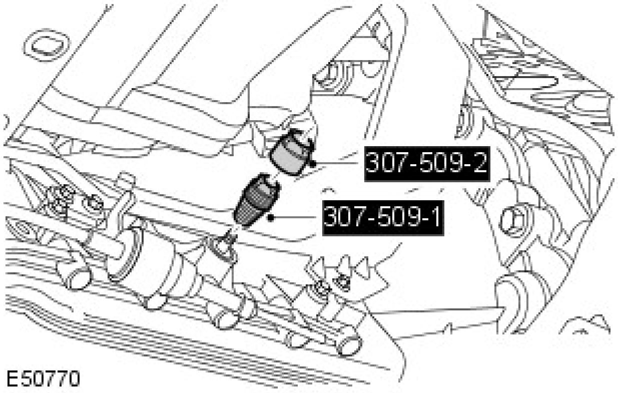


E44596


E50769

4. Release the selector cable and lever.

- Remove the nut.
- Compress the latch and release the cable.

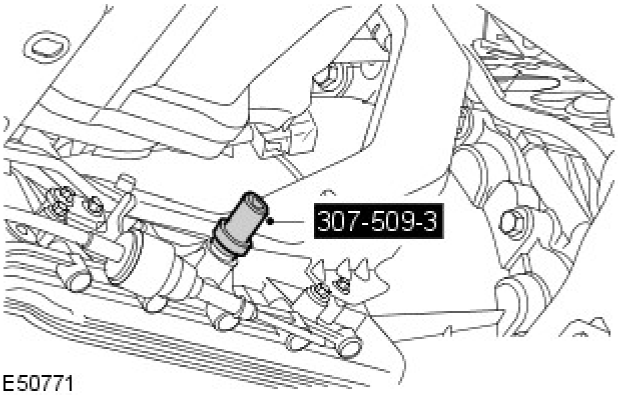


E50770

5. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

Using the special tools, remove the selector shaft seal.

Installation



E50771

1. Using the special tool, install the selector shaft seal.

- Clean the components.

2. Secure the selector cable and lever.

- Secure with the clip.
- Tighten the nut to 12 Nm (9 lb.ft).

3. Install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

4. Install the RH catalytic converter.
For additional information, refer to: Catalytic Converter RH - Vehicles Without: Diesel Particulate Filter (DPF) (309-00D Exhaust

System - TDV8 3.6L Diesel, Removal and Installation) / Catalytic Converter RH - Vehicles With: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

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Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Transmission Control Module (TCM)

In-vehicle Repair

Removal

- NOTE: The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.

1. Remove the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, In-vehicle Repair).

Installation

1. Install the main control valve body.
For additional information, refer to: Main Control Valve Body (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, In-vehicle Repair).

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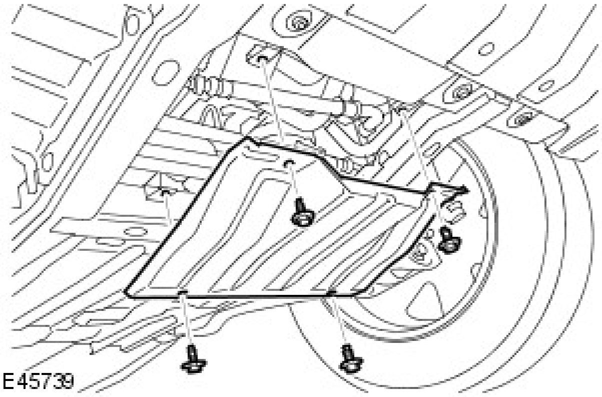
Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Transmission

Removal and Installation

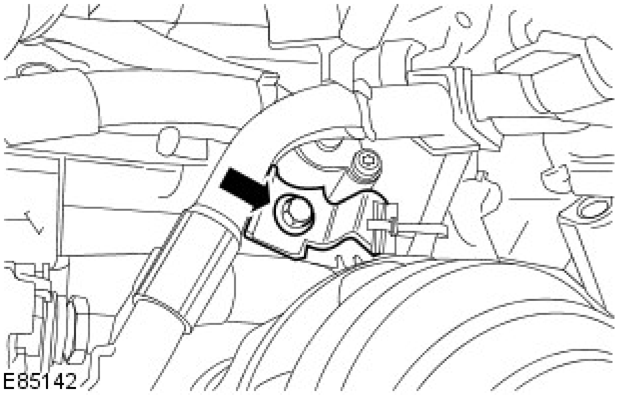
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Raise and support the vehicle.
3. Remove the radiator splash shield.



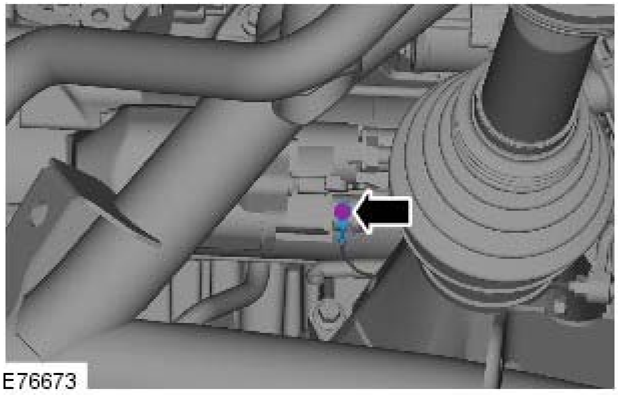
- Remove the 4 bolts.

4. Remove the engine undershield.
   For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).
5. Remove the transfer case.
   For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).
6. Release the battery positive cable support bracket.

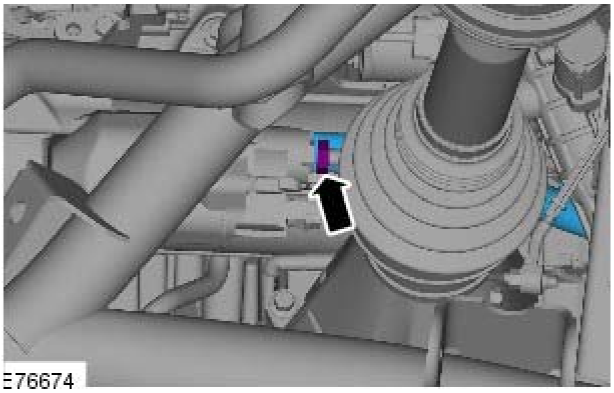


- Remove the bolt.

7. Disconnect the switch lead from the starter motor solenoid.

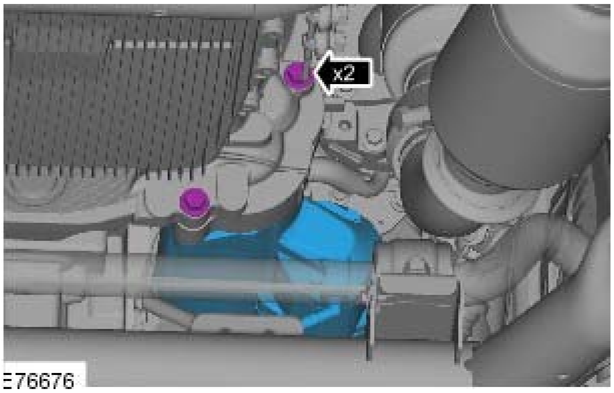


- Remove the bolt.



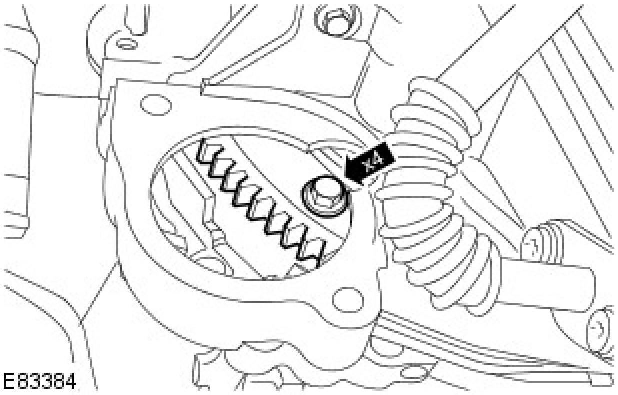
8. Disconnect the battery positive cables from the starter motor solenoid.

- Remove the nut.



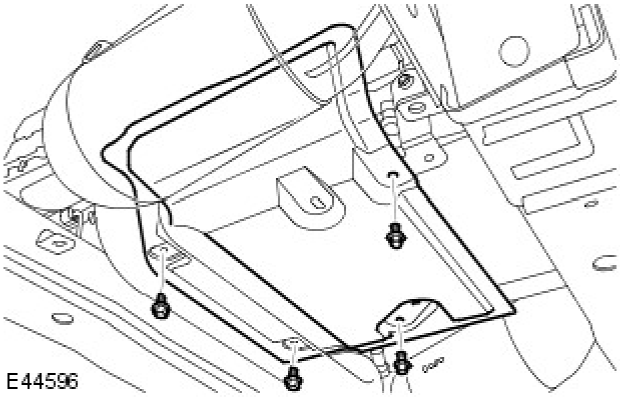
9. Reposition the starter motor.

- Remove the 2 bolts.



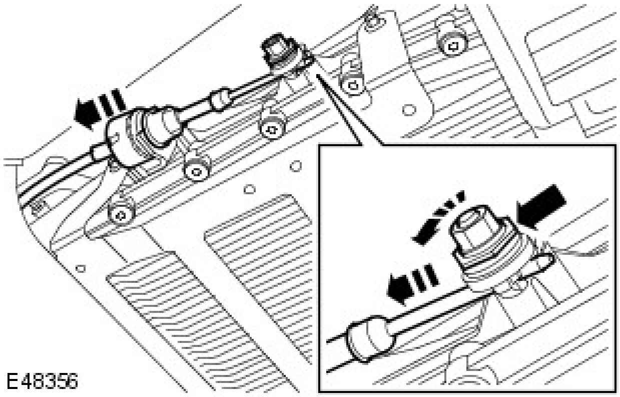
10. Release the flexplate from the torque converter.

- Remove the 4 bolts.



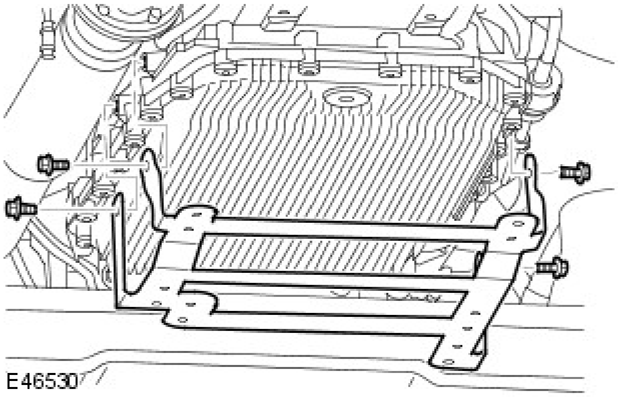
11. Remove the transmission heat shield.

- Remove the 4 bolts.



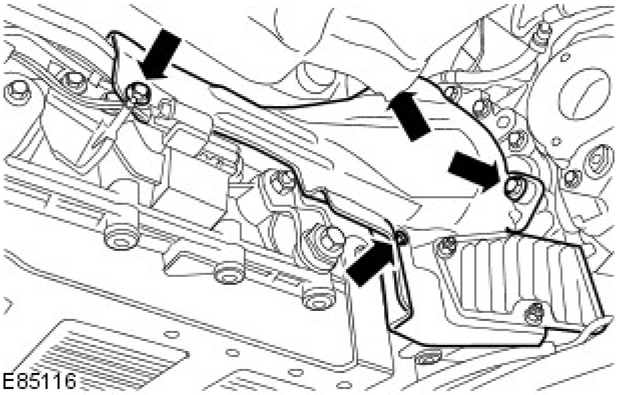
12. Release the selector lever cable.

- Compress the latch and release the cable.
- Loosen the nut.



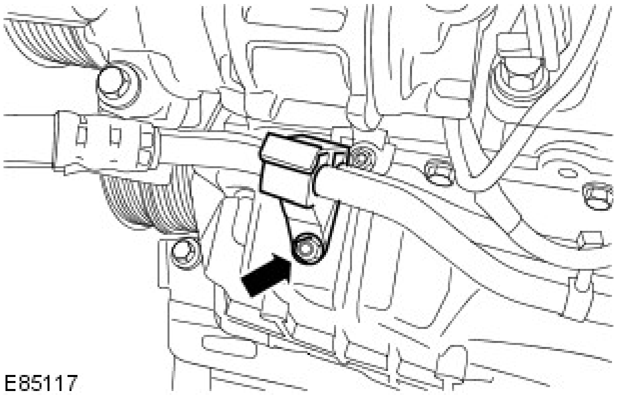
13. Remove the transmission heat shield bracket.

- Remove the 4 bolts.



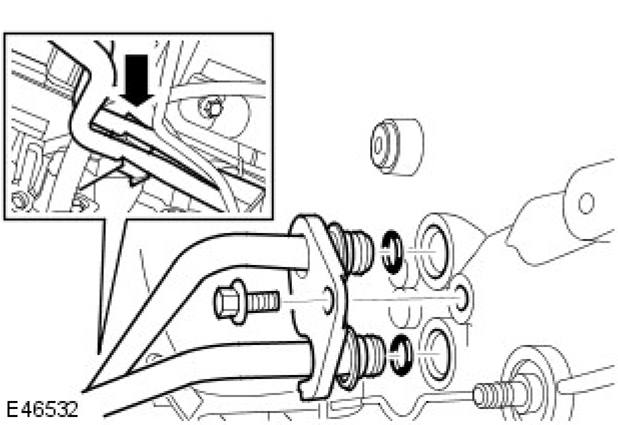
14. Remove the fuel pipe heat shield.

- Remove the 4 bolts.
- Release the fuel pipes from the clips.



15. Release the transmission fluid line bracket.

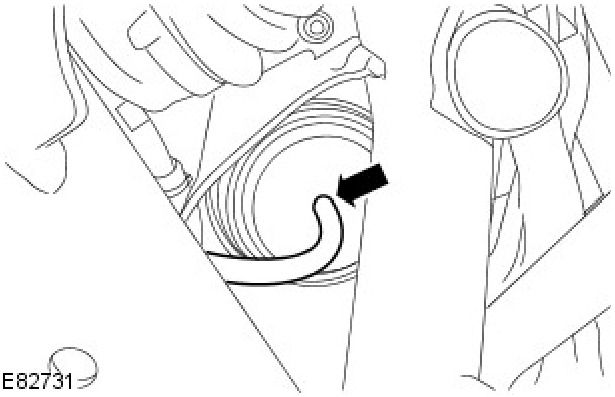
- Remove the nut.



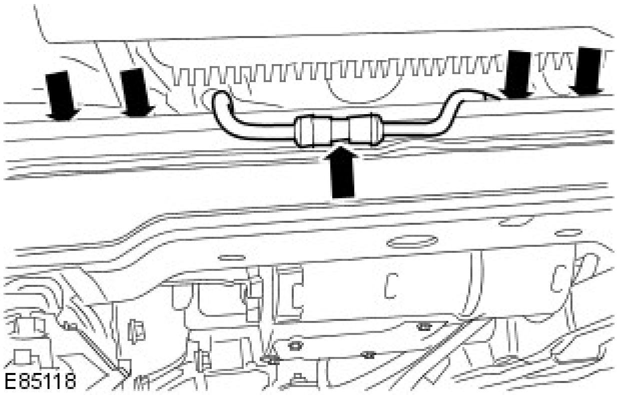
16. ⚠CAUTION: Always plug any open connections to prevent contamination.

Release the transmission fluid lines.

- Remove the bolt.
- Release the clip.
- Remove and discard both O-ring seals.

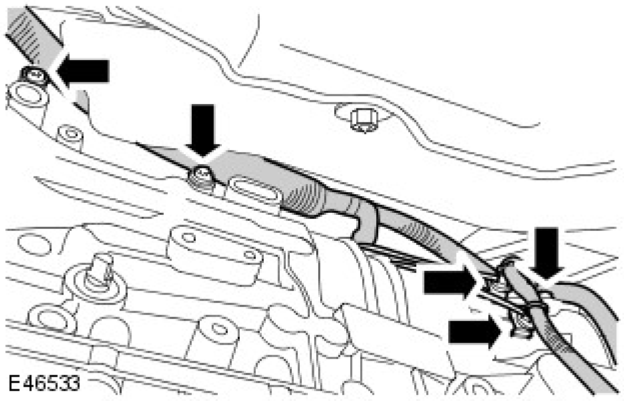


17. Disconnect and reposition the RH engine mount vacuum line.



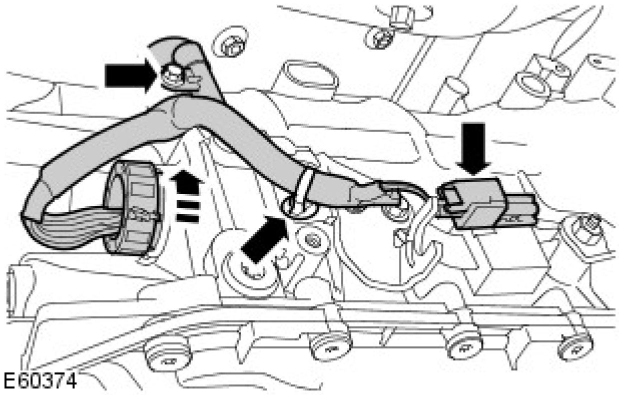
18. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect and reposition the fuel fired booster heater fuel line.



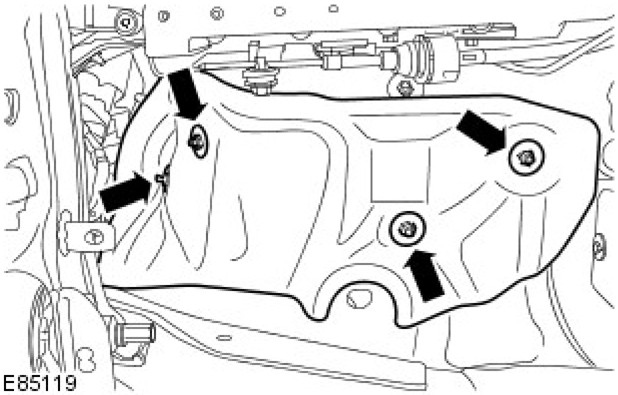
19. Release the wiring harness from the LH side of the transmission.

- Remove the 3 bolts.

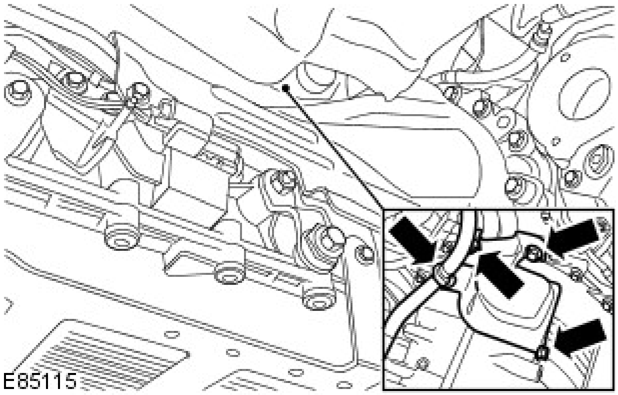


20. Release the wiring harness from the RH side of the transmission.
    - Remove the bolt.
    - Disconnect the 2 electrical connectors.
    - Release the clip.

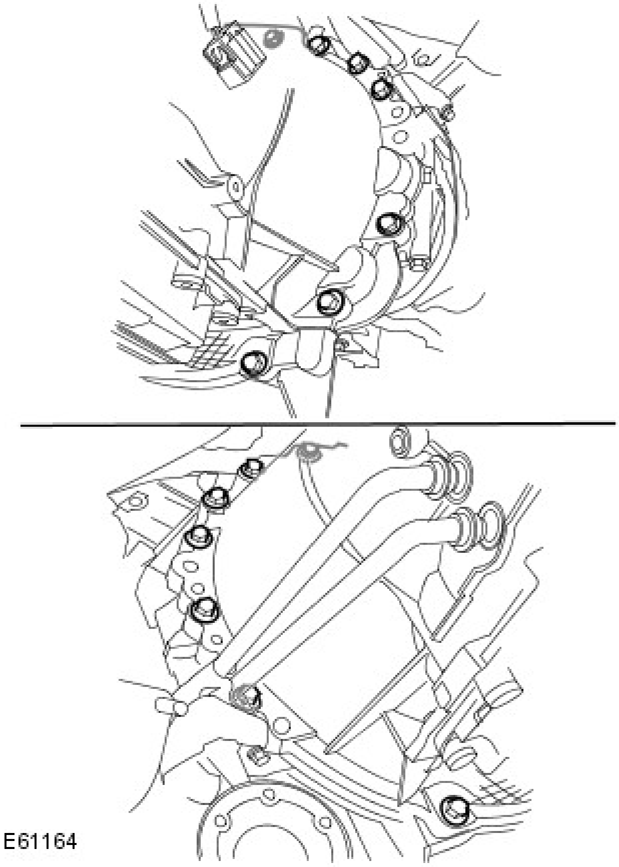
21. Release the transmission breather line clip.
    - Remove the bolt.



22. Remove the RH catalytic converter heat shield.
    - Remove the 4 nuts.



23. Remove the fuel pipe shield.
    - Remove the 3 bolts.
    - Release the wiring harness.
    - Release the fuel pipes from the fuel pipe shield.



24. ⚠ WARNING: Secure the transmission to the transmission jack.

⚠ CAUTION: Make sure the torque converter remains connected to the transmission.

With assistance, remove the transmission.

- Using a transmission jack, support the transmission.
- Remove the 14 bolts.

Installation

1. ⚠ CAUTION: Apply grease of the correct specification to the torque converter spigot.

With assistance, install the transmission.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

2. Install the RH catalytic converter heat shield.

- Tighten the nuts.

3. Install the fuel pipe shield.

- Tighten the bolts.
- Secure the wiring harness.
- Secure the fuel pipes to the fuel pipe shield.

4. Secure the transmission breather pipe clip.

- Tighten the bolt to 25 Nm (18 lb.ft).
- Secure the transmission breather pipe clip.

5. Secure the wiring harness to the RH side of the transmission.

- Tighten the bolts.
- Connect the electrical connectors.

- Secure the clip.

6. Secure the wiring harness to the LH side of the transmission.

- Tighten the bolts.

7. Secure the transmission fluid lines.

- Clean the components.
- Install the new O-ring seals.
- Secure with the clip.
- Tighten the bolt to 10 Nm (7 lb.ft).

8. Secure the transmission fluid line bracket.

- Tighten the nut to 10 Nm (7 lb.ft).

9. Connect and secure the RH engine mount vacuum line.

10. NOTE: Remove and discard the blanking caps.

Connect and secure the fuel fired booster heater fuel line.

11. Install the fuel pipe heat shield.

- Secure the fuel pipes in the clips.
- Tighten the bolts.

12. Install the transmission heat shield bracket.

- Tighten the bolts to 9 Nm (7 lb.ft).

13. NOTE: Do not fully tighten the locking nut at this stage.

Connect the selector cable to the transmission.

14. Install the transmission heat shield.

- Tighten the bolts 9 Nm (7 lb.ft).

15. Secure the flexplate to the torque converter.

- Tighten the bolts to 55 Nm (41 lb.ft).

16. Secure the starter motor.

- Clean the component mating faces.
- Tighten the bolts to 45 Nm (33 lb.ft).

17. Secure the battery positive cable support bracket.

- Tighten the bolt.

18. Connect the battery positive cables.

- Tighten the nut to 22 Nm (16 lb.ft).

19. Connect the switch lead to the starter motor solenoid.

- Tighten the nut to 4 Nm (3 lb.ft).

20. Install the transfer case.
For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).

21. Adjust the selector cable.

For additional information, refer to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures).

22. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

23. Install the radiator splash shield.

- Tighten the bolts.

24. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

25. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

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Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Transmission Fluid Drain and Refill

General Procedures

- WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

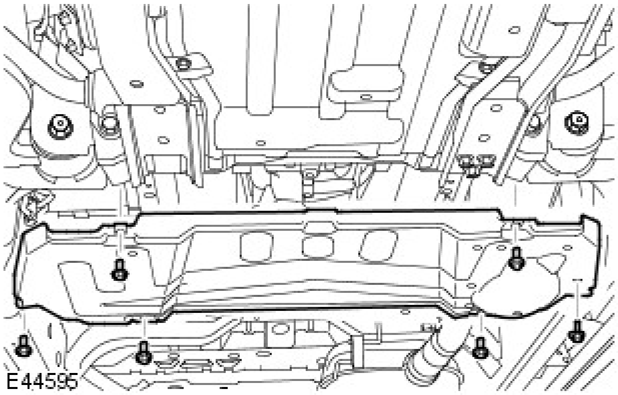
⚠ Observe due care when working near a hot exhaust system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

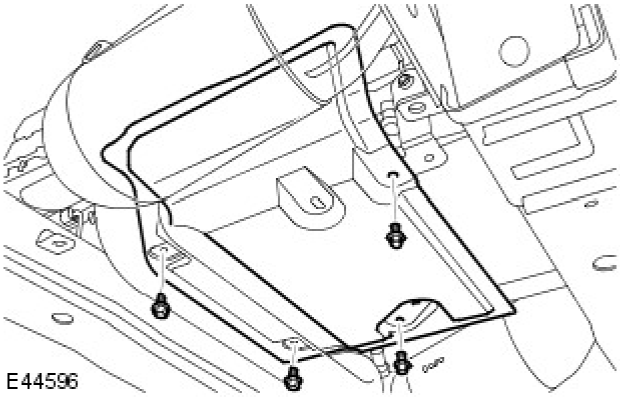
2. Remove the transmission undershield.

- Remove the 6 bolts.



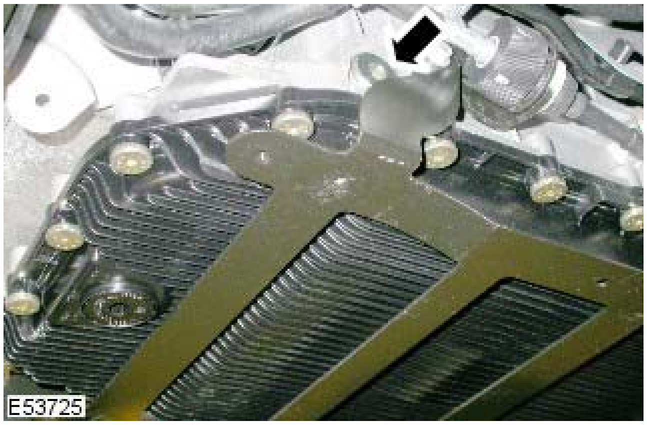
3. If installed, remove the transmission heat shield.

- Remove the 4 bolts.



4. Clean the area around the transmission fluid drain and filler plugs.

5. Place a container under the transmission.



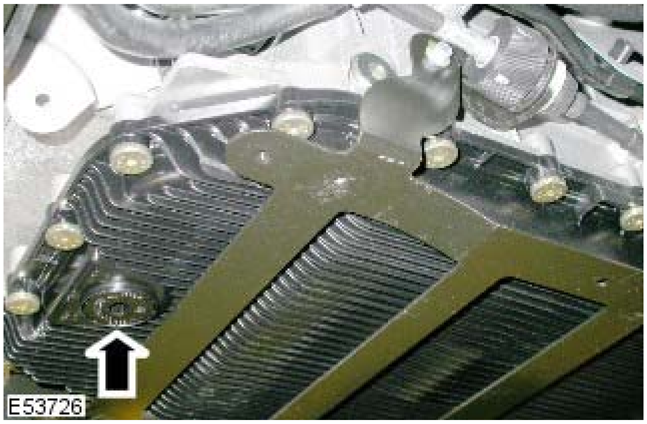
6. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

Remove the transmission fluid filler/level plug.

- Remove and discard the sealing washer.



7. Remove the transmission fluid drain plug.

- Remove and discard the sealing washer.
- Allow the fluid to drain.

8. Install the transmission fluid drain plug and tighten to 9 Nm (7 lb.ft).

- Install a new sealing washer.

9. Add 3.5 to 4 liters of the correct transmission fluid, or until a small thread of fluid runs from the filler/level hole.

10. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Transmission Fluid Level Check

General Procedures

- WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

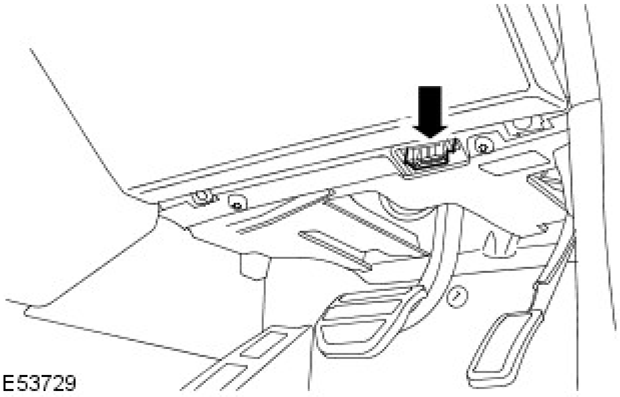
⚠ Observe due care when working near a hot exhaust system.

⚠ CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

1. The following steps must be observed before starting the transmission fluid level check and top-up.

- The vehicle must be on a horizontal ramp.
- The parking brake must be applied.
- The wheels must be chocked.

2. ⚠ CAUTION: Make sure the transmission fluid temperature is below 30 degrees before starting the fluid level check.



Using the approved Land Rover diagnostic equipment, monitor the transmission fluid temperature.

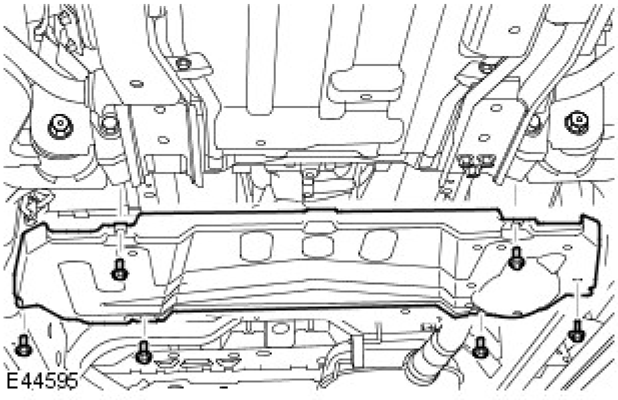
3. Start the engine. Move the selector lever from 'P' through all gear positions, pausing in each gear position for 2-3 seconds and return to the 'P' position.

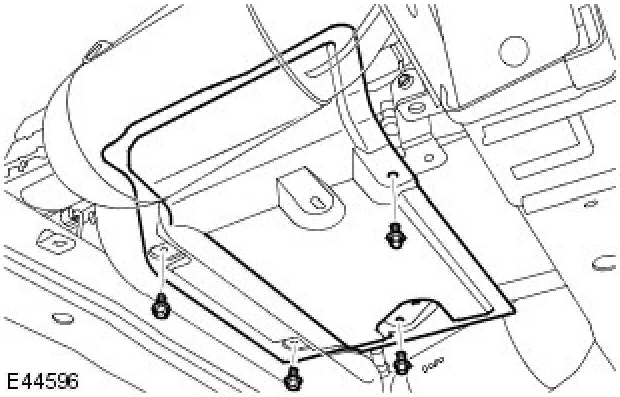
4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

5. Remove the transmission undershield.

- Remove the 6 bolts.

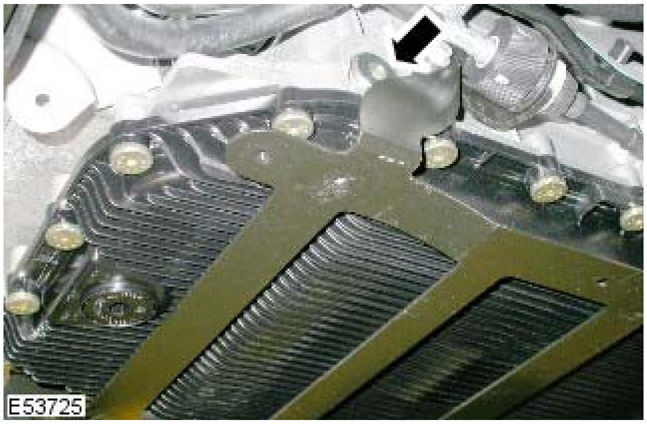




6. If installed, remove the transmission heat shield.

- Remove the 4 bolts.

7. Place a container under the transmission.



8. WARNINGS:

⚠ Observe due care when draining transmission fluid as the fluid can be very hot.

⚠ Observe due care when working near a hot exhaust system.

⚠ CAUTION: The gearbox fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

Remove the transmission fluid filler/level plug.

- Clean the area around the filler/level plug.
- Remove and discard the sealing washer.

9. If no fluid loss is apparent when the filler/level plug is removed, with the engine at idle, continue to fill the transmission until a small thread of oil runs from oil filler/level hole.

10. Install the transmission fluid filler/level plug and tighten to 35 Nm (26 lb.ft).

- Install a new sealing washer.
- Remove the container.

11. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

12. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

13. Disconnect the approved Land Rover diagnostic equipment from the vehicle.

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Automatic Transmission/Transaxle - TDV8 3.6L Diesel -

Item	Specification
* Recommended lubricant	Shell M1375.4
+ Torque converter nose	Molybdenum disulphide grease to specification FB180

• CAUTIONS:

⚠ * Do not use any lubricant other than that specified.

⚠ + Do not over lubricate.

Capacity

Item	Capacity
+ Initial dry fill	9.5 liters (16.7 pints) (10.0 US qts)

⚠ CAUTION: + A final oil level check/drain down/top-up must be carried out when the unit has been installed.

General Specification

Item	Specification
Automatic transmission	ZF 6HP26
Speeds	6 Forward, 1 Reverse
Gear ratios:	
First	4.17:1
Second	2.340:1
Third	1.521:1
Fourth	1.143:1
Fifth	0.867:1
Sixth	0.691:1
Reverse	3.403:1
Torque converter	Sachs W270 4GWK with turbine torsional damper and slip controlled, dual friction faced lock-up clutch
Transmission control module:	
Location	Located in gearbox casing
Type	19.04

Torque Specifications

Description	Nm	lb-ft
Main control valve body Torx screws	8	6
Transmission heat shield bolts	9	7
Transmission heat shield bracket bolts	9	7
Selector cable bracket bolts	9	7
Wiring harness bracket bolts	10	7
Fluid pan Torx screws	8	6
Transmission support insulator bolts	60	44
Selector shaft nut	12	9
Flexplate to torque converter bolts	55	41
Transmission bolts	45	33
Transmission breather pipe clip bolt	25	18
Transmission fluid lines clip bolt	10	7
Radiator access panel bolts	10	7
Transmission fluid drain plug	8	6
Transmission fluid filler/level plug	35	26
Transmission under shield bolts	10	7
Transfer case bolts	45	33
Selector cable to selector lever nut	10	7

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Automatic Transmission/Transaxle - TDV8 3.6L Diesel - Transmission Support Insulator

In-vehicle Repair

Removal

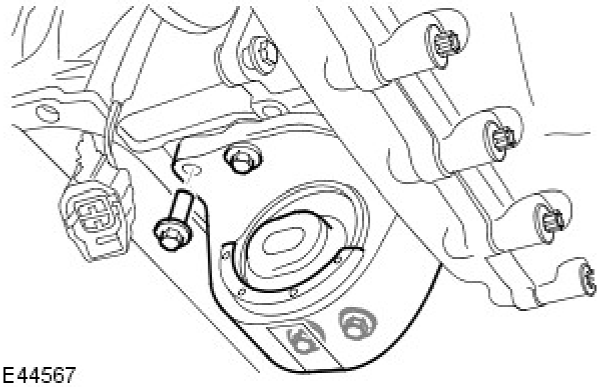
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. Remove the transmission support insulator.

   - Remove the 4 bolts.



Installation

1. To install, reverse the removal procedure.

   - Clean the component mating faces.
   - Tighten the bolts to 60 Nm (44 lb.ft).

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV8 3.6L Diesel/V8 4.4L Petrol/V8 S/C 4.2L Petrol/TDV6 2.7L Diesel - Input Shaft Seal

Removal and Installation

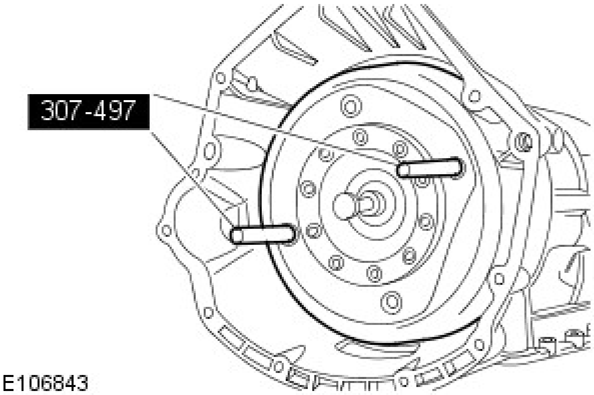
Removal

1. **1.** WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

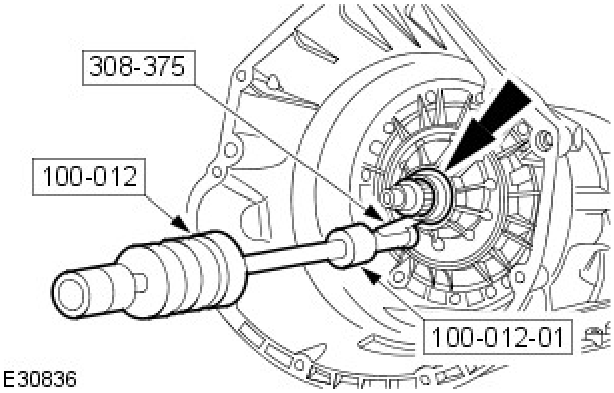
2. Remove the transmission assembly.

   Refer to: Transmission (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, Removal and Installation).
   Refer to: Transmission (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, Removal and Installation).
   Refer to: Transmission (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, Removal and Installation).
   Refer to: Transmission (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, Removal and Installation).



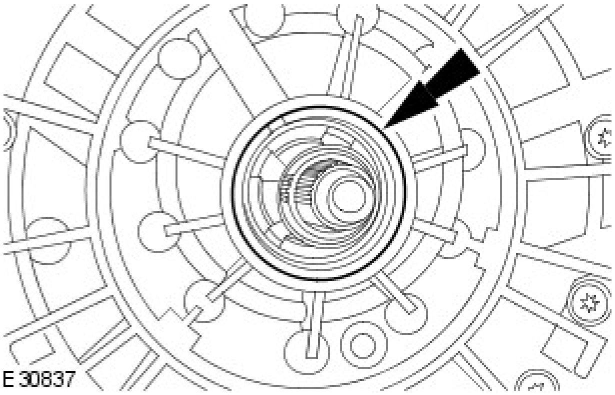
3. **3.** WARNING: Do not let the torque converter drop out of the transmission. Failure to follow this instruction may result in personal injury.

   Using the special tools, remove the torque converter. Drain any remaining fluid into a suitable container.



4. **4.** WARNING: Make sure the transmission housing seal face is not damaged when removing the torque converter seal. Failure to follow this instruction may result in damage to the vehicle.

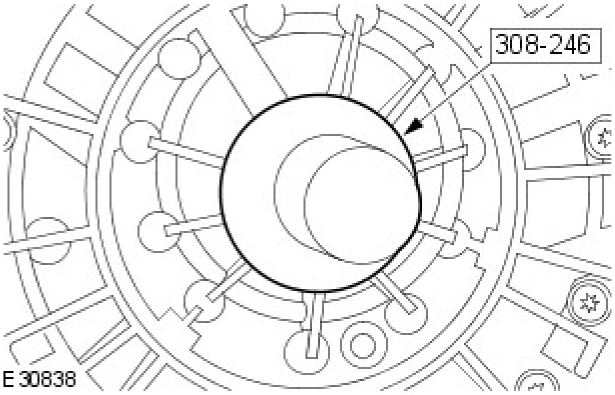
   Using the special tools, remove the input shaft seal.



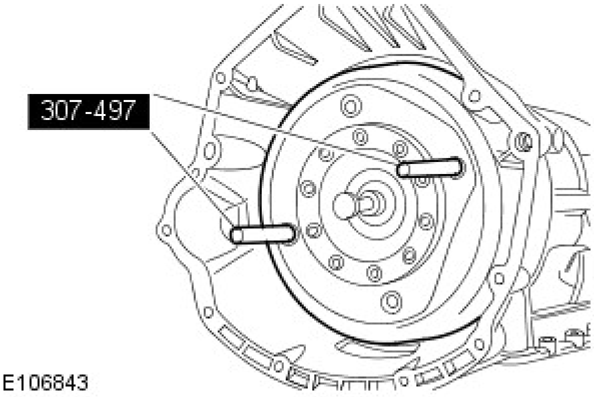
5. **5.** NOTE: Using a suitable metal surface cleaner meeting Jaguar specification. clean the seal face on the housing before fitting the new seal.

   Clean and inspect the transmission housing seal face.

Installation



1. Using the special tool, install a new input shaft seal.



2. **2.** ⚠ WARNING: Do not let the torque converter drop out of the transmission. Failure to follow this instruction may result in personal injury.

   • NOTE: The torque converter hub must engage fully in the oil pump drive gear.

   Using the special tools, install the torque converter. Remove the special tools.

3. Install the transmission assembly.

   Refer to: Transmission (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, Removal and Installation).
   Refer to: Transmission (307-01B Automatic Transmission/Transaxle - V8 4.4L Petrol, Removal and Installation).
   Refer to: Transmission (307-01C Automatic Transmission/Transaxle - TDV6 2.7L Diesel, Removal and Installation).
   Refer to: Transmission (307-01D Automatic Transmission/Transaxle - TDV8 3.6L Diesel, Removal and Installation).

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Transmission/Transaxle Cooling - V8 S/C 4.2L Petrol - Transmission Cooling

Diagnosis and Testing

For additional information, refer to the relevant workshop manual section.

Published: 11-May-2011

Transmission/Transaxle Cooling - V8 S/C 4.2L Petrol - Transmission Fluid Cooler

Removal and Installation

Removal

- NOTE: The transmission fluid cooler is part of the radiator assembly and cannot be serviced separately.

1. Remove the radiator.
For additional information, refer to: Radiator (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

Installation

1. Install the radiator.
For additional information, refer to: Radiator (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

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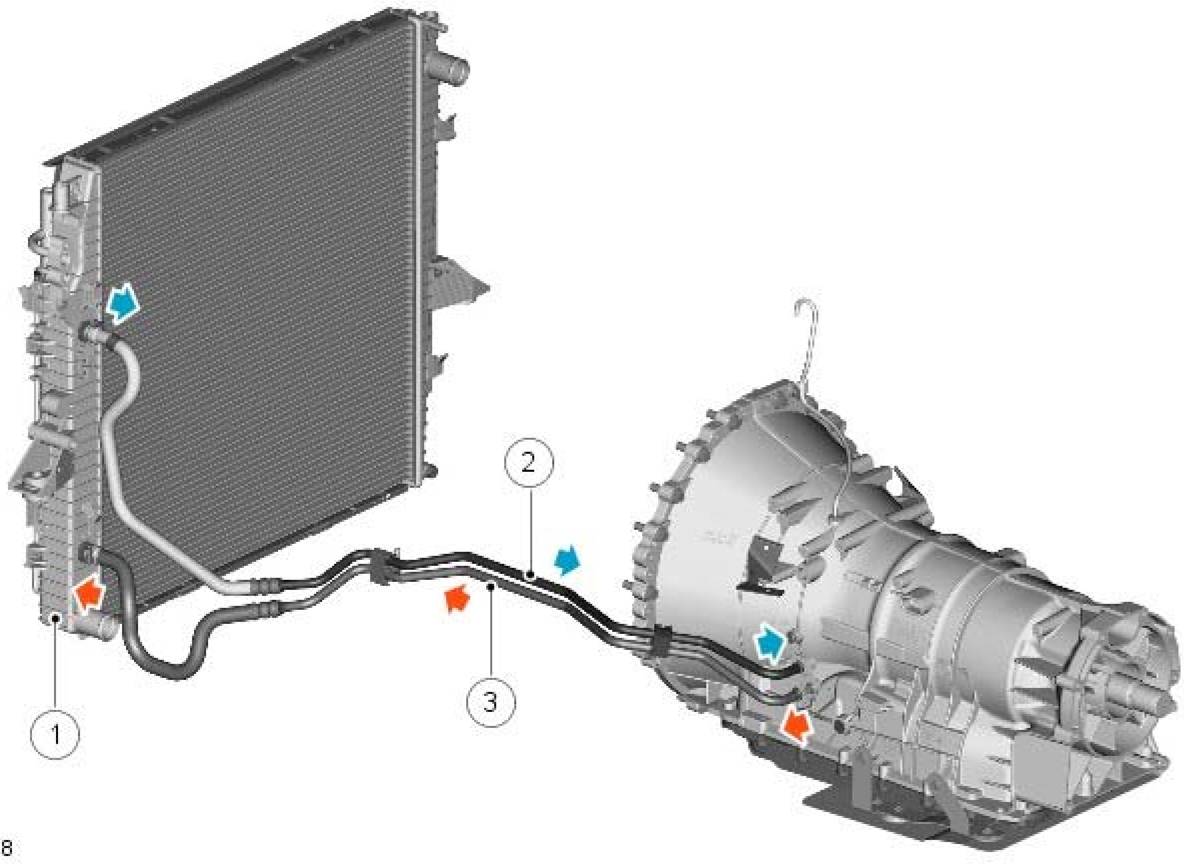
Transmission/Transaxle Cooling - V8 S/C 4.2L Petrol - Transmission Cooling

Description and Operation

TRANSMISSION FLUID COOLING - 4.2L V8 SUPERCHARGED

The transmission fluid cooler is an integral part of the engine cooling radiator. The transmission is connected to the fluid cooler via flexible hoses and metal pipes.



Item	Part Number	Description
1	-	Transmission cooler (within radiator)
2	-	Return pipe (To transmission)
3	-	Feed pipe (From transmission)

The transmission cooler is integrated into the left hand end tank of the engine cooling radiator. The transmission fluid is cooled by the temperature differential between the transmission fluid and the engine coolant and also by airflow over cooling fins on the end tank.

Fluid is supplied from the transmission fluid pump into the lower connection of the cooler. After passing through the cooler, the fluid passes out of the upper connection and is returned to the transmission fluid pan.

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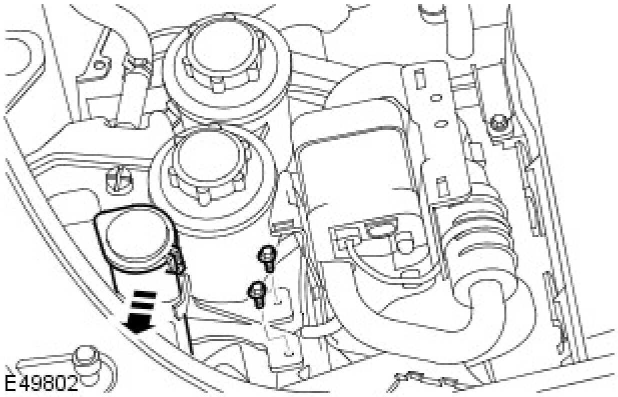
Transmission/Transaxle Cooling - V8 S/C 4.2L Petrol - Transmission Fluid Cooler Tubes

Removal and Installation

Removal

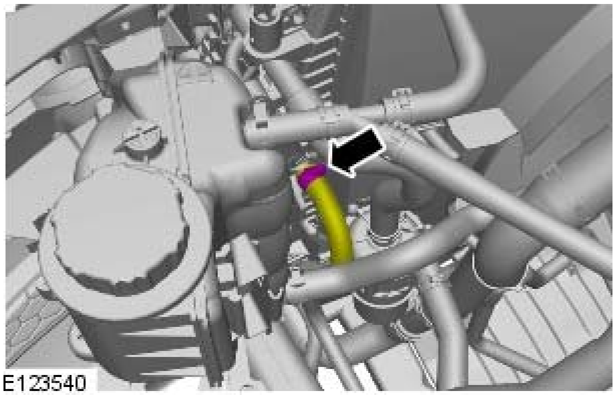
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).



3. Reposition the coolant expansion tank.

- Remove the 2 bolts.
- Release the windshield washer reservoir filler neck.



4. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

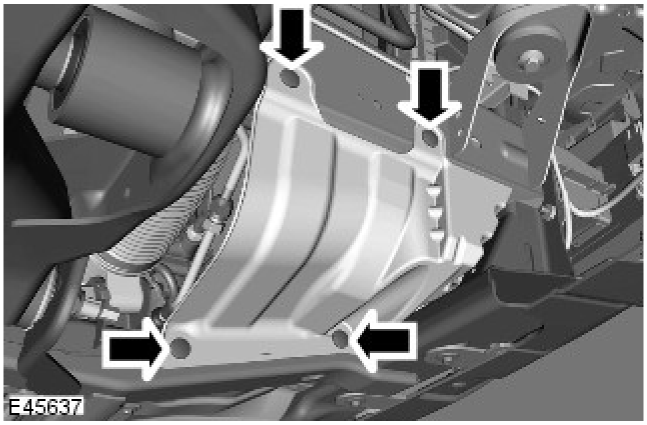
• NOTE: Some fluid spillage is inevitable during this operation.

Release the transmission fluid cooler hose.

- Position container to collect fluid loss.
- Release the clip.
- Install blanking caps to the exposed ports.

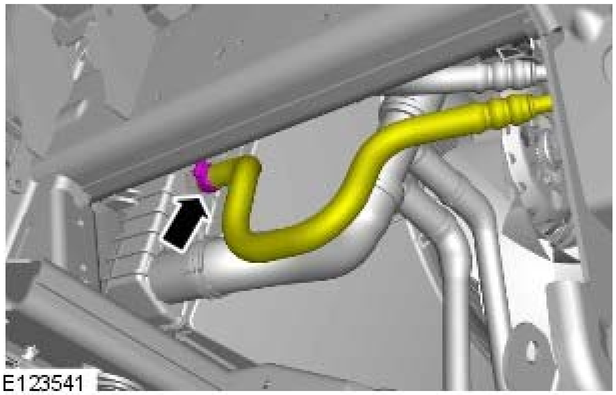
5. Raise and support the vehicle.

6. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).



7. Remove the front LH splash shield.

- Remove the 4 clips.

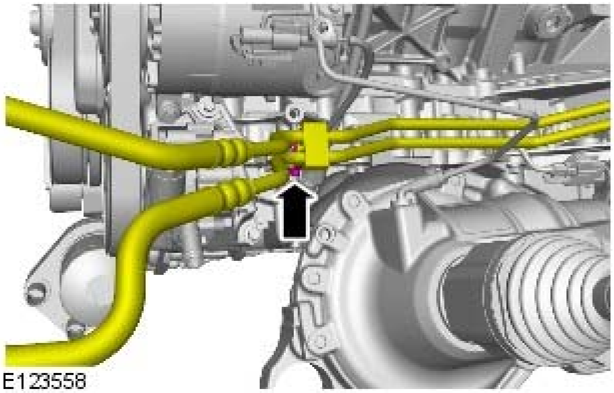


8. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

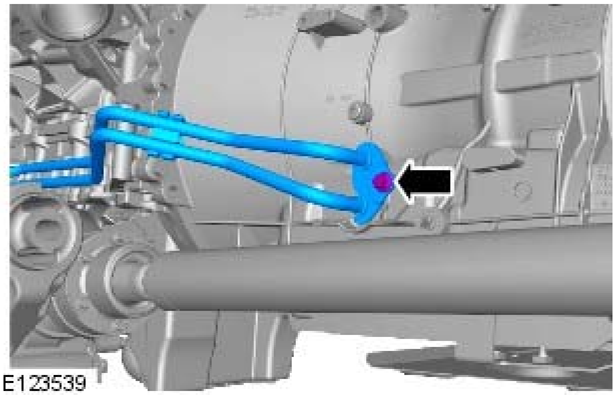
Release the transmission fluid cooler hose.

- Position container to collect fluid loss.
- Release the clip.
- Install blanking caps to the exposed ports.



9. Release the transmission fluid cooler pipe bracket.

- Remove the bolt.



10. CAUTIONS:

⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Note the fitted position of the component prior to removal.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the fluid cooler hoses.

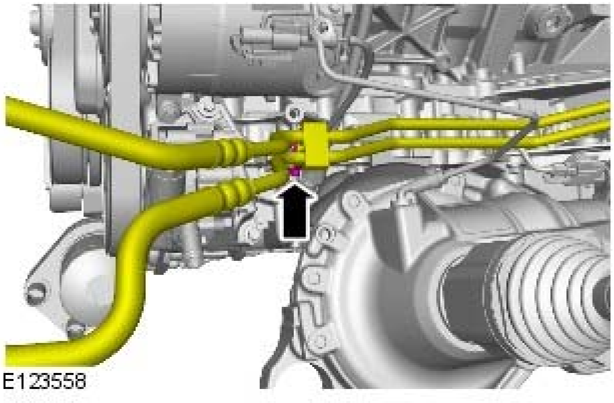
- Position a container to collect spillage.
- Remove the bolt.

11. Remove and discard both O-ring seals.

Installation

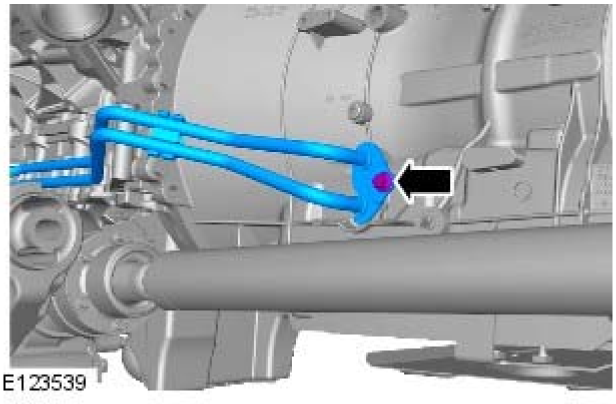
1. To install, reverse the removal procedure.

2. Install the transmission cooler hoses.



- Tighten the bolts to 25 Nm.

3. Connect the oil cooler hoses.



- Tighten the bolt to 10 Nm.

4. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

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Transmission/Transaxle Cooling - V8 4.4L Petrol - Transmission Cooling

Diagnosis and Testing

For additional information, refer to the relevant workshop manual section.

Transmission/Transaxle Cooling - V8 4.4L Petrol - Transmission Fluid Cooler

Removal and Installation

Removal

- NOTE: The transmission fluid cooler is part of the radiator assembly and cannot be serviced separately.

1. Remove the radiator.
For additional information, refer to: Radiator (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

Installation

1. Install the radiator.
For additional information, refer to: Radiator (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

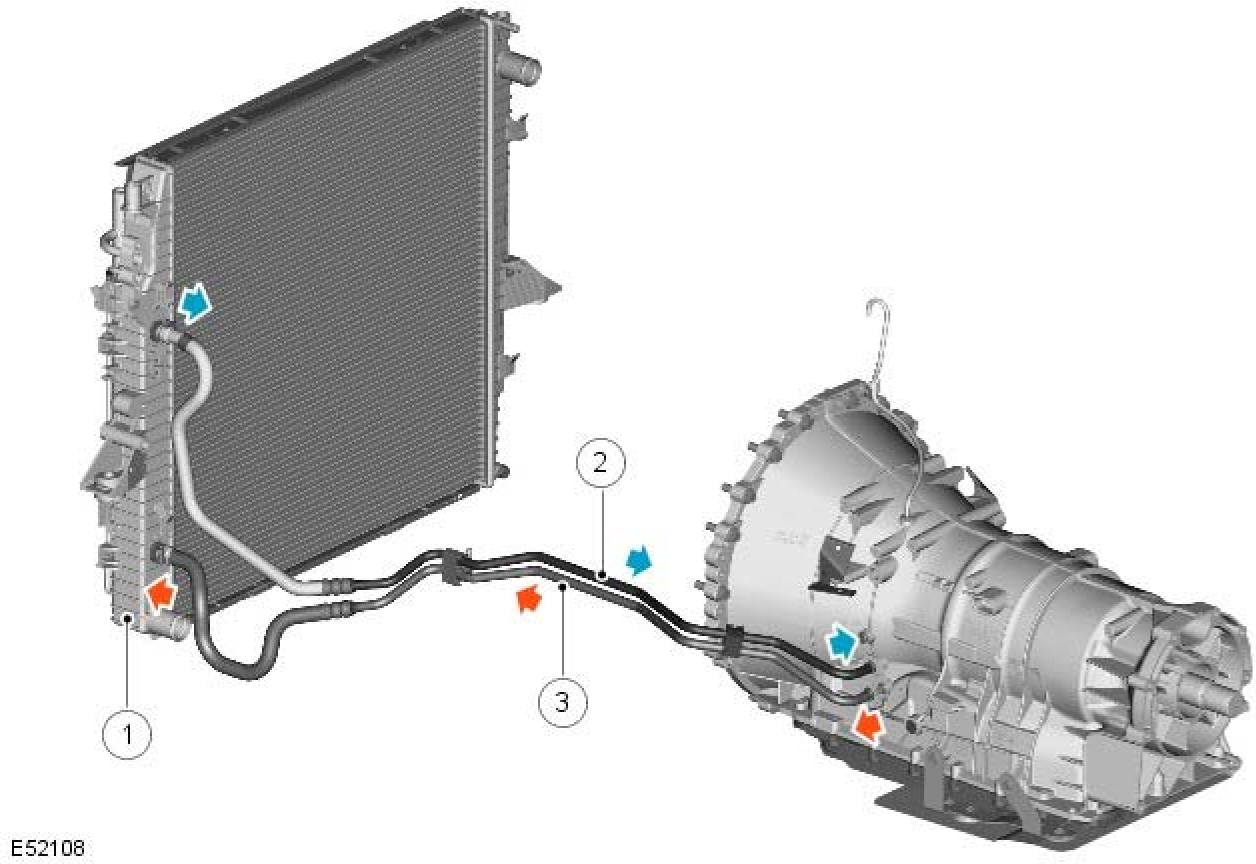
Published: 11-May-2011

Transmission/Transaxle Cooling - V8 4.4L Petrol - Transmission Cooling

Description and Operation

TRANSMISSION FLUID COOLING - 4.4L V8 NATURALLY ASPIRATED

The transmission fluid cooler is an integral part of the engine cooling radiator. The transmission is connected to the fluid cooler via flexible hoses and metal pipes.



Item	Part Number	Description
1	-	Transmission cooler (within radiator)
2	-	Return pipe (To transmission)
3	-	Feed pipe (From transmission)

The transmission cooler is integrated into the left hand end tank of the engine cooling radiator. The transmission fluid is cooled by the temperature differential between the transmission fluid and the engine coolant and also by airflow over cooling fins on the end tank.

Fluid is supplied from the transmission fluid pump into the lower connection of the cooler. After passing through the cooler, the fluid passes out of the upper connection and is returned to the transmission fluid pan.

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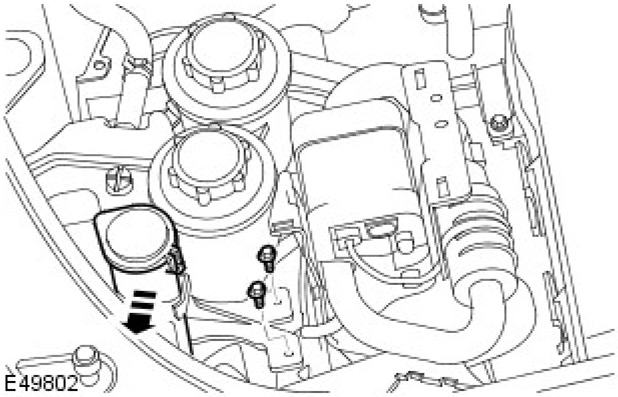
Transmission/Transaxle Cooling - V8 4.4L Petrol - Transmission Fluid Cooler Tubes

Removal and Installation

Removal

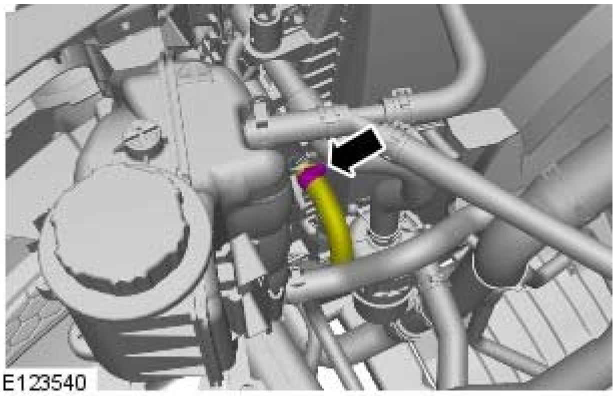
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the LH headlamp assembly.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).



3. Reposition the coolant expansion tank.

- Remove the 2 bolts.
- Release the windshield washer reservoir filler neck.



4. ⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

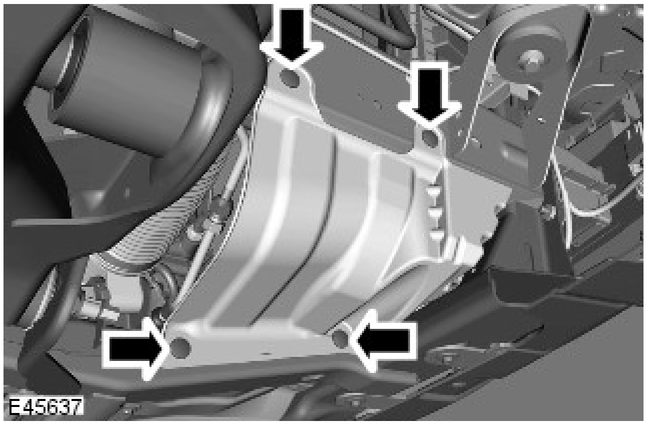
• NOTE: Some fluid spillage is inevitable during this operation.

Release the transmission fluid cooler hose.

- Position container to collect fluid loss.
- Release the clip.
- Install blanking caps to the exposed ports.

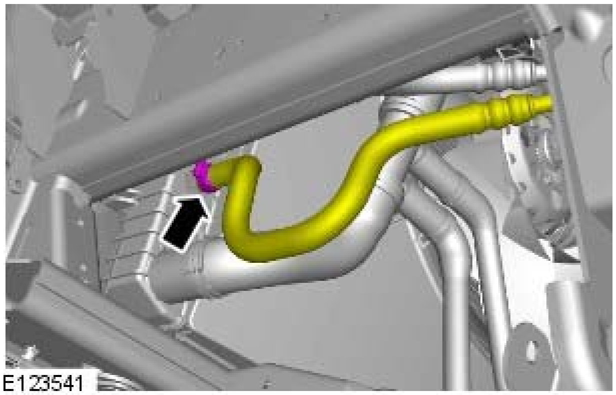
5. Raise and support the vehicle.

6. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00A Exhaust System - V8 S/C 4.2L Petrol, Removal and Installation).



7. Remove the front LH splash shield.

- Remove the 4 clips.

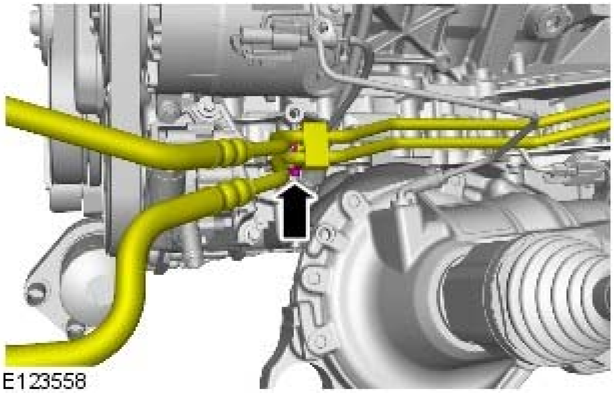


8. ⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

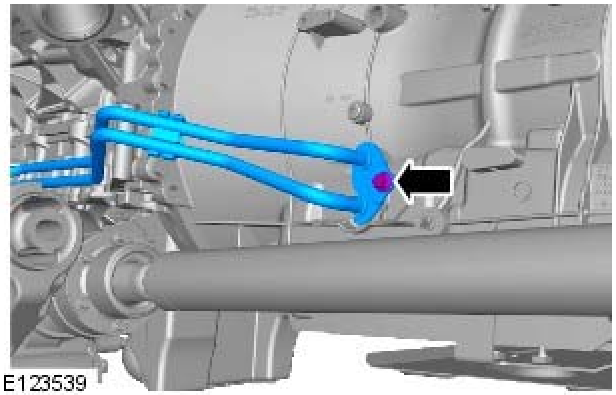
Release the transmission fluid cooler hose.

- Position container to collect fluid loss.
- Release the clip.
- Install blanking caps to the exposed ports.



9. Release the transmission fluid cooler pipe bracket.

- Remove the bolt.



10. CAUTIONS:

⚠ Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ Note the fitted position of the component prior to removal.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the fluid cooler hoses.

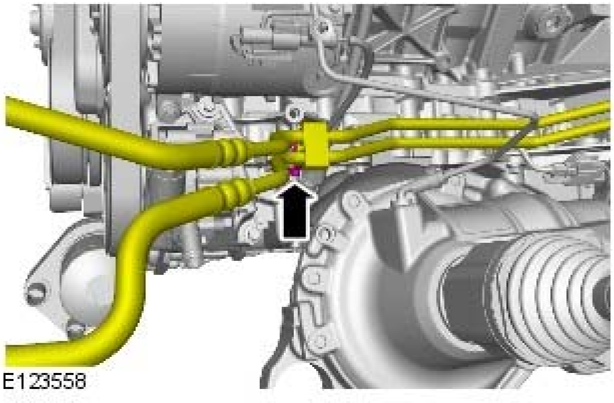
- Position a container to collect spillage.
- Remove the bolt.

11. Remove and discard both O-ring seals.

Installation

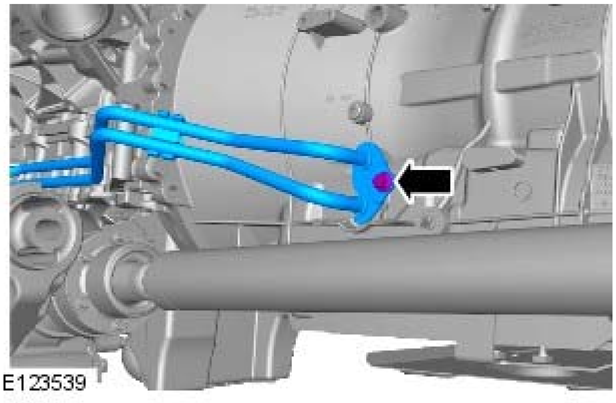
1. To install, reverse the removal procedure.

2. Install the transmission cooler hoses.



- Tighten the bolts to 25 Nm.

3. Connect the oil cooler hoses.



- Tighten the bolt to 10 Nm.

4. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

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Transmission/Transaxle Cooling - TDV6 2.7L Diesel - Transmission Cooling

Diagnosis and Testing

For additional information, refer to the relevant workshop manual section.

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Transmission/Transaxle Cooling - TDV6 2.7L Diesel - Transmission Fluid Cooler

Removal and Installation

Removal

- NOTE: The transmission fluid cooler is part of the radiator assembly and cannot be serviced separately.

1. Remove the radiator.
For additional information, refer to: Radiator (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

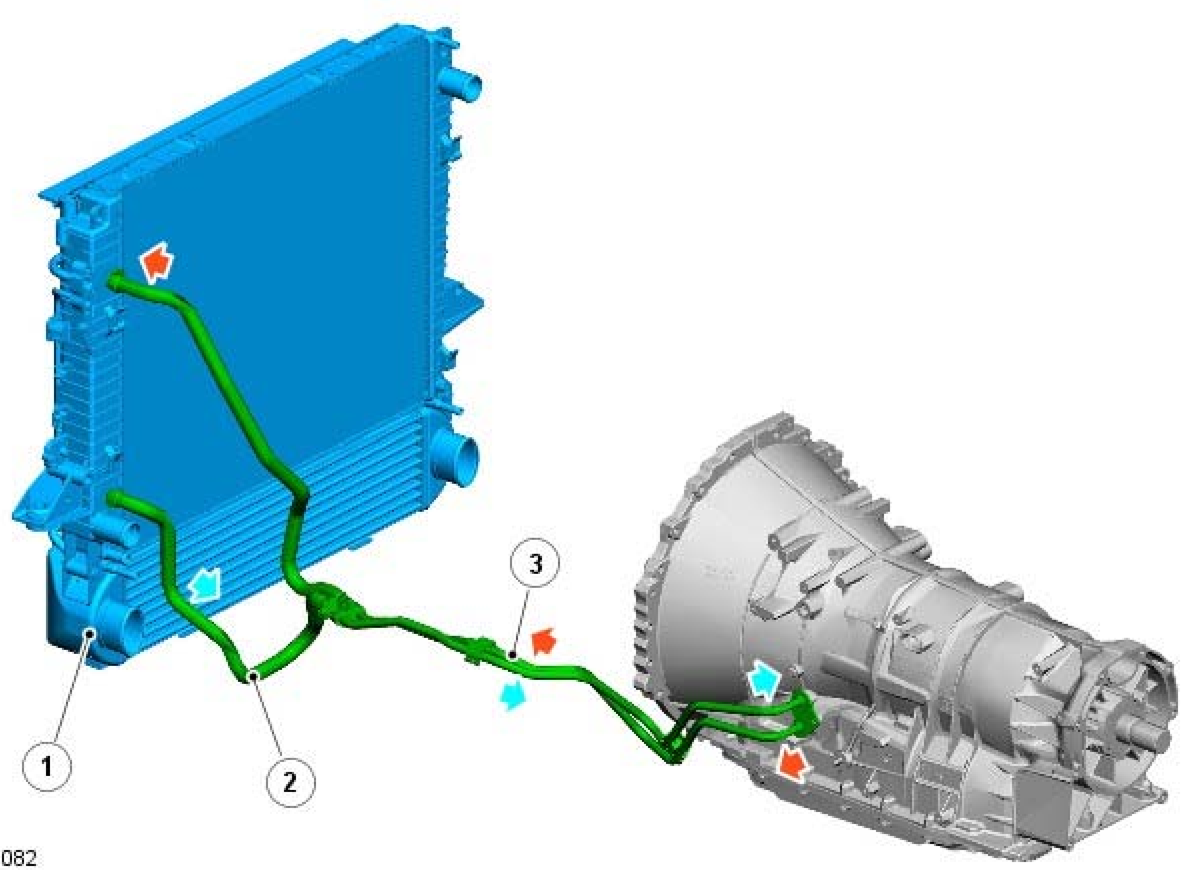
Installation

1. Install the radiator.
For additional information, refer to: Radiator (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

Transmission/Transaxle Cooling - TDV6 2.7L Diesel - Transmission Cooling

Description and Operation

TRANSMISSION FLUID COOLING - 2.7L TdV6



Item	Part Number	Description
1	-	Engine cooling radiator
2	-	Return pipe (to transmission)
3	-	Feed pipe (from transmission)

The transmission cooler is integrated into the left hand end tank of the engine cooling radiator. The transmission fluid is cooled by the temperature differential between the transmission fluid and the engine coolant.

Fluid is supplied from the transmission fluid pump into the lower connection of the cooler. After passing through the cooler, the fluid passes out of the upper connection and is returned to the transmission fluid pan.

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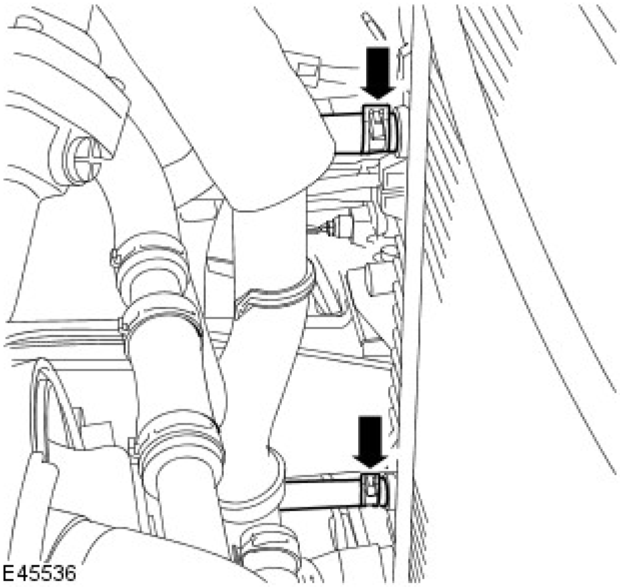
Transmission/Transaxle Cooling - TDV6 2.7L Diesel - Transmission Fluid Cooler Tubes

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the coolant expansion tank.
   For additional information, refer to: Coolant Expansion Tank (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).



3. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

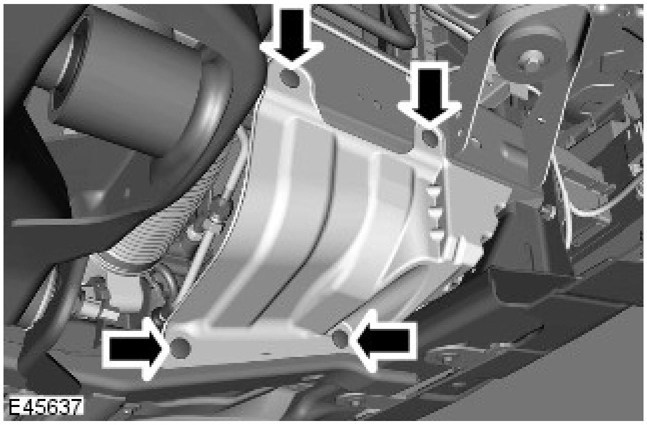
- NOTE: Some fluid spillage is inevitable during this operation.
- NOTE: Fan shroud shown removed for clarity.

Disconnect the 2 transmission fluid cooler coolant hoses.

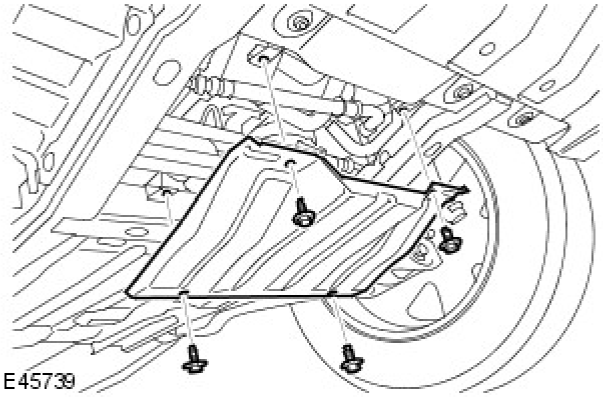
- Position a container to collect the fluid spillage.
- Release the 2 clips.

4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



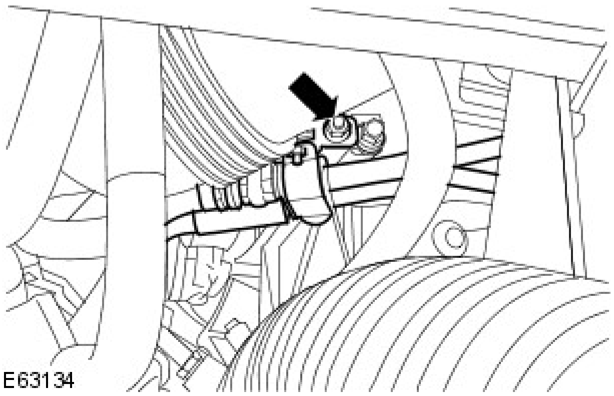
5. Remove the front LH splash shield.
   - Remove the 4 clips.



6. Remove the radiator access panel.

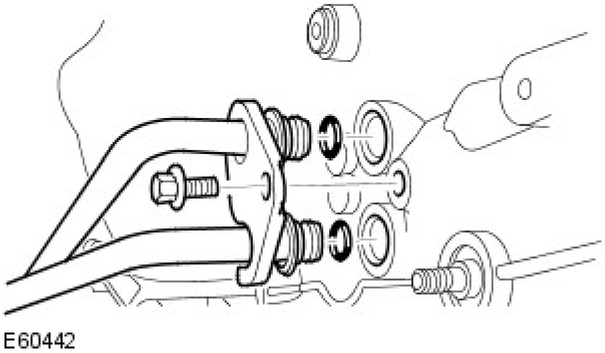
- Remove the 4 bolts.

7. Remove the front driveshaft.
For additional information, refer to: Front Driveshaft - TDV6 2.7L Diesel (205-01 Driveshaft, Removal and Installation).



8. Release the transmission fluid cooler hoses bracket.

- Remove the bolt.



9. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Some fluid spillage is inevitable during this operation.

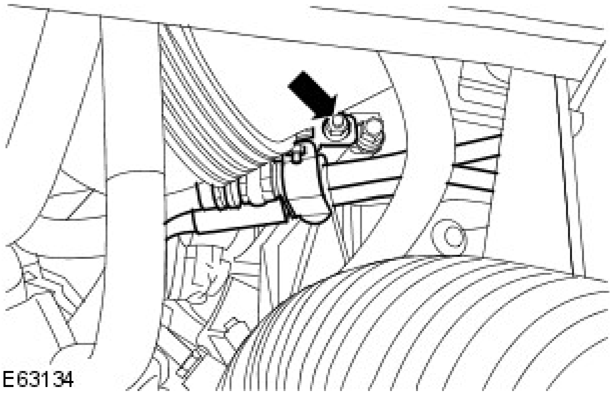
Remove the transmission fluid cooler hoses.

- Position a container to collect spillage.
- Remove the bolt.

10. Remove and discard both O-ring seals.

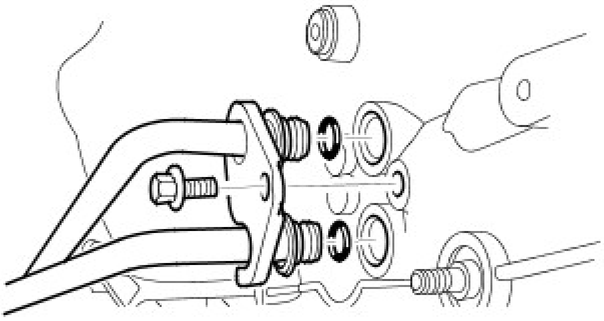
Installation

1. To install, reverse the removal procedure.


E63134

2. Install the transmission fluid cooler hoses.

- Tighten the bolt to 10 Nm.


E60442

3. Connect the transmission fluid cooler hoses.

- Tighten the bolt to 10 Nm.

4. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

Published: 11-May-2011

Transmission / Transaxle Cooling - TDV8 3.6L Diesel -

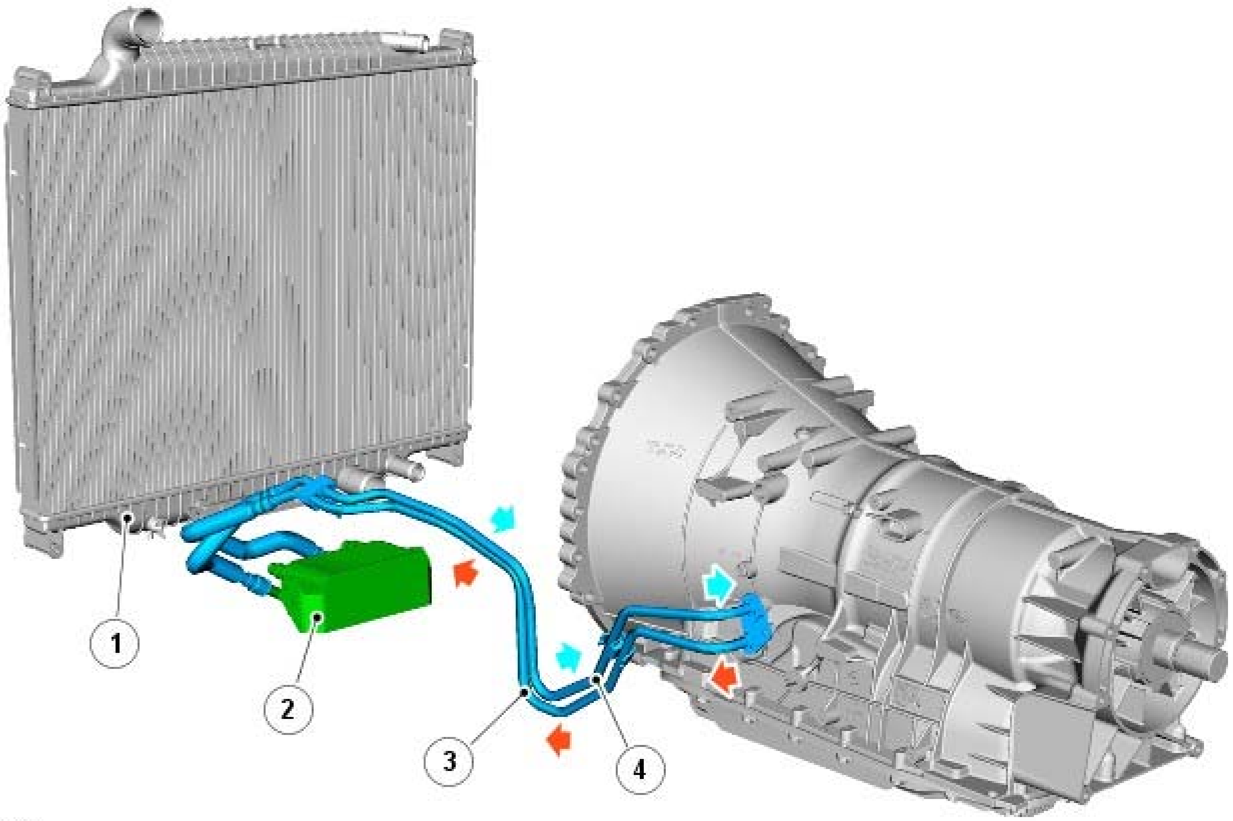
Torque Specifications

Description	Nm	lb-ft
Transmission fluid cooler nuts	20	15
Radiator splash shield M6 bolts	10	7
Radiator splash shield M10 bolts	62	46
Transmission fluid cooler tubes nut	10	7
Transmission fluid cooler tubes bolt	10	7

Transmission/Transaxle Cooling - TDV8 3.6L Diesel - Transmission Cooling

Description and Operation

TRANSMISSION FLUID COOLING 3.6L TdV8



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Item	Part Number	Description
1	-	Engine cooling radiator
2	-	Transmission fluid cooler
3	-	Feed pipe (From transmission)
4	-	Return pipe (To transmission)

INTRODUCTION

The transmission fluid cooler is a separate cooling unit located behind the engine cooling radiator. The transmission is connected to the fluid cooler via flexible hoses and metal pipes.

The transmission cooler is a dedicated fluid cooler which is connected into the engine cooling system circuit. The transmission fluid is cooled by the temperature differential between the transmission fluid and the engine coolant flowing through the cooler.

Fluid is supplied from the transmission fluid pump into the Right Hand (RH) connection of the cooler. After passing through the cooler, the fluid passes out of the Left Hand (LH) connection and is returned to the transmission fluid pan.

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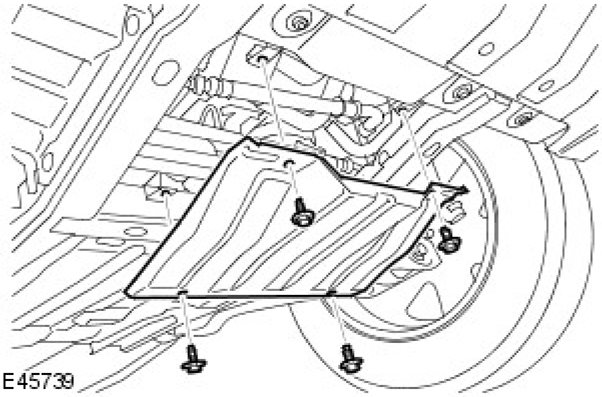
Transmission/Transaxle Cooling - TDV8 3.6L Diesel - Transmission Fluid Cooler

Removal and Installation

Removal

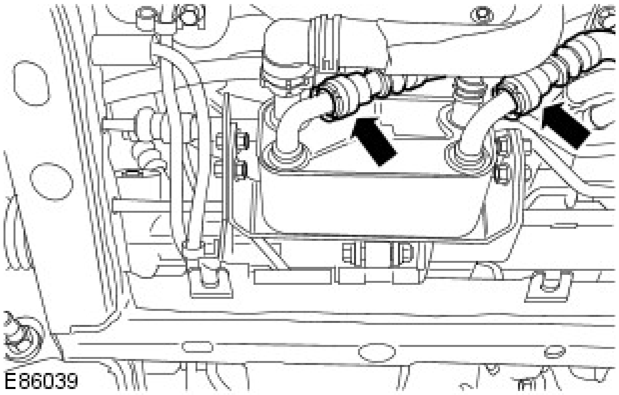
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. Remove the radiator splash shield.

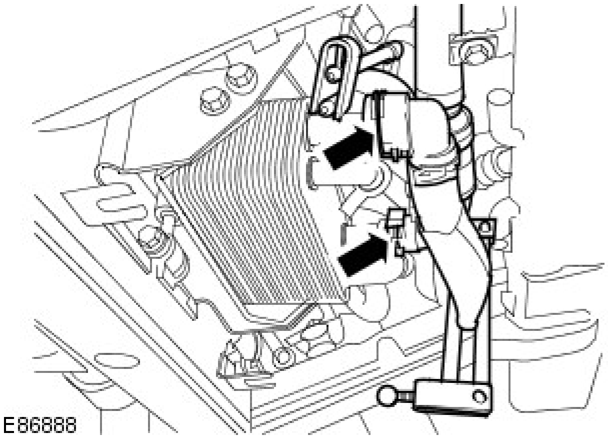
- Remove the 4 bolts.



3. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

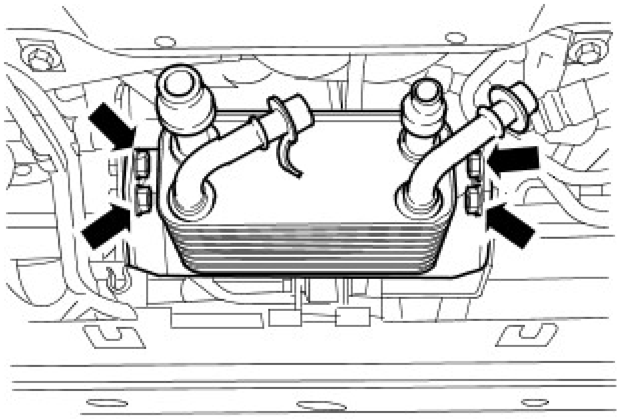
Disconnect the 2 transmission fluid cooler tubes from the transmission fluid cooler.

- Position a container to collect the fluid spillage.
- Release the 2 quick release connectors.



4. Disconnect the 2 transmission fluid cooler coolant hoses.

- Clamp 2 the coolant hoses to minimize coolant loss.
- Release the 2 clips.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5. Remove the transmission fluid cooler.
   - Remove the 4 nuts and bolts.

Installation

1. Install the transmission fluid cooler.
   - Tighten the nuts and bolts to 20 Nm (15 lb.ft).
2. Connect the transmission fluid cooler coolant hoses.
   - Secure the clips.
   - Remove the coolant hose clamps.
3. NOTE: Remove and discard the blanking caps.

   Connect the transmission fluid cooler tubes to the transmission fluid cooler.
   - Remove the container.
4. Install the radiator splash shield.
   - Tighten the M6 bolts to 10 Nm (7 lb.ft).
   - Tighten the M10 bolts to 62 Nm (46 lb.ft).
5. Check and top-up the transmission fluid level.
   For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).
6. Check and top-up the coolant.

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Transmission/Transaxle Cooling - TDV8 3.6L Diesel - Transmission Fluid Cooler Tubes

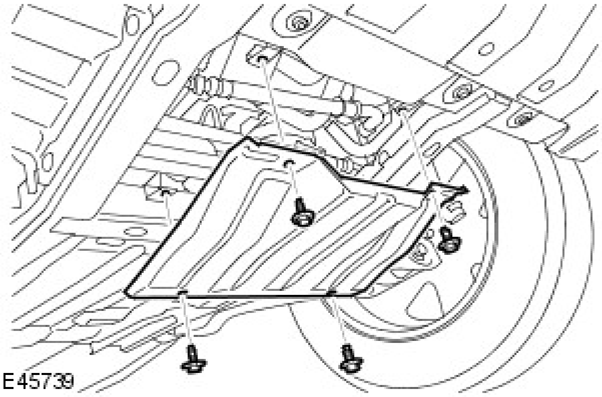
Removal and Installation

Removal

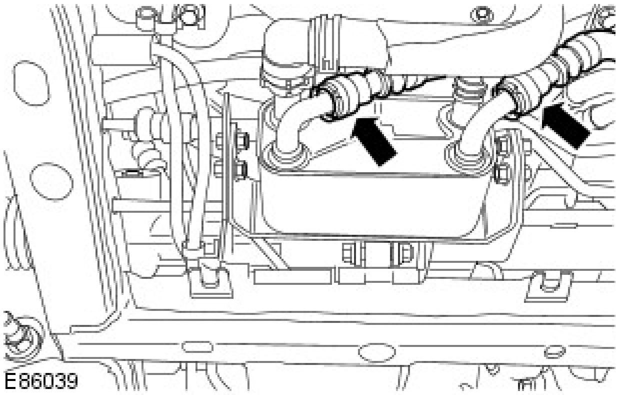
1. Raise and support the vehicle.

2. Remove the front axle assembly.
For additional information, refer to: Axle Assembly - TDV8 3.6L Diesel (205-03 Front Drive Axle/Differential, Removal and Installation).

3. Remove the radiator splash shield.



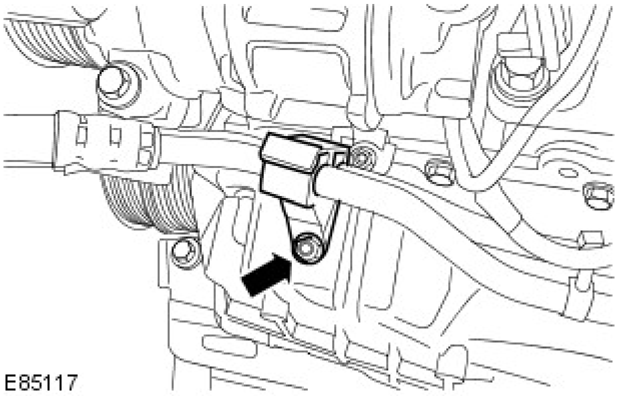
- Remove the 4 bolts.



4. ⚠CAUTION: Make sure that all openings are sealed. Use new blanking caps.

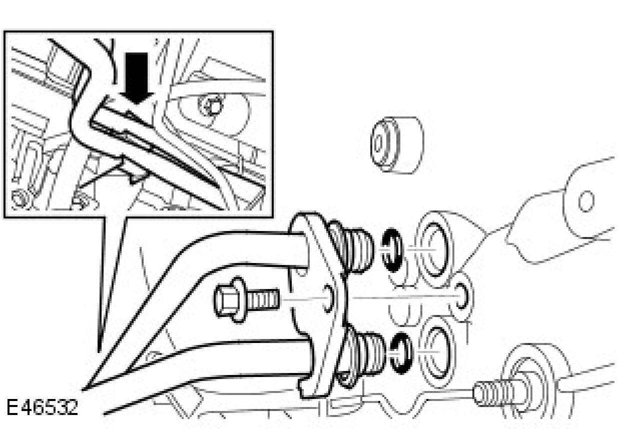
Disconnect the 2 transmission fluid cooler tubes from the transmission fluid cooler.

- Position a container to collect the fluid spillage.
- Release the 2 quick release connectors.



5. Release the transmission fluid cooler tubes bracket.

- Remove the nut.



6. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the 2 transmission fluid cooler tubes.

- Remove the bolt.
- Remove and discard both O-ring seals.

Installation

1. NOTE: Remove and discard the blanking caps.

Install the transmission fluid cooler tubes.

- Clean the components.
- Install the new O-ring seals.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. Secure the transmission fluid cooler tubes bracket.

- Tighten the nut to 10 Nm (7 lb.ft).

3. NOTE: Remove and discard the blanking caps.

Connect the transmission fluid cooler tubes to the transmission fluid cooler.

- Remove the container.

4. Install the radiator splash shield.

- Tighten the M6 bolts to 10 Nm (7 lb.ft).
- Tighten the M10 bolts to 62 Nm (46 lb.ft).

5. Check and top-up the transmission fluid level.
For additional information, refer to: Transmission Fluid Level Check (307-01A Automatic Transmission/Transaxle - V8 S/C 4.2L Petrol, General Procedures).

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Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol -

Item	**Description**
Type	Cable operated from shift mechanism to bellcrank on side of transmission with manual release from 'P' position in the event of electrical failure

Torque Specifications

Description	**Nm**	**lb-ft**
Selector lever locknut	14	10
Transmission heat shield bolts	10	7
Transmission under shield bolts	10	7
Transmission selector nuts	10	7

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Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol - External Controls

Diagnosis and Testing

For additional information, refer to the relevant workshop manual section.

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Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol - Selector Lever Cable Adjustment

General Procedures

1. ⚠ WARNING: The hand brake and foot brake MUST BE applied.

Check for correct cable adjustment.

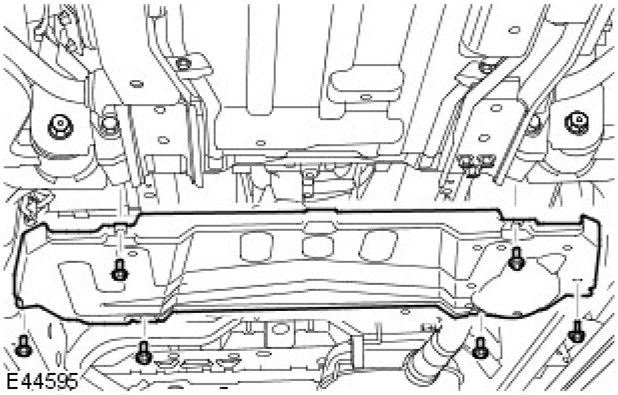
- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

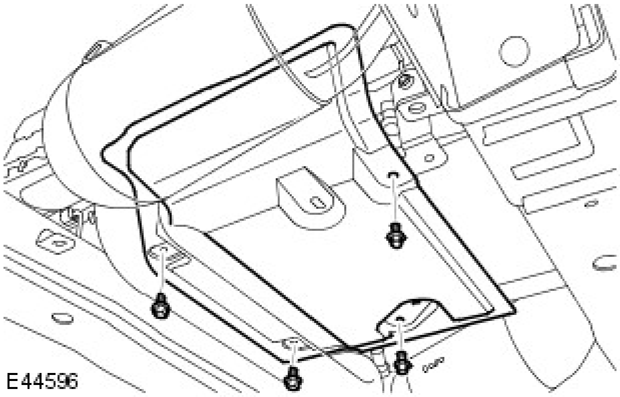
3. Remove the transmission undershield.

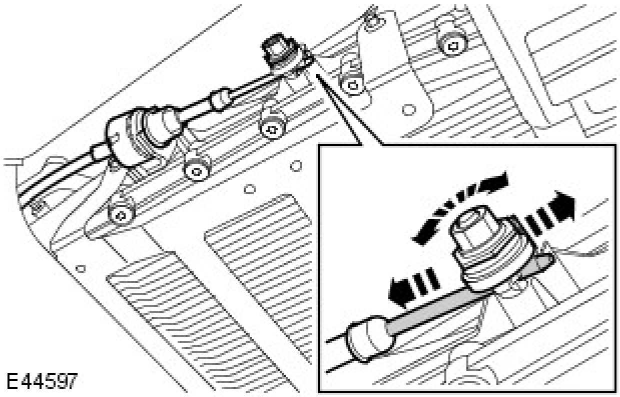
- Remove the 6 bolts.



4. If installed, remove the transmission heat shield.

- Remove the 4 bolts.





5. Adjust the selector cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Move the selector lever on the gearbox fully forward and release it. The lever will return to the 'P' position.
- Make sure the selector lever is in the 'P' position.
- Push the cable inner rearward then release it.
- Tighten the locknut to 14 Nm (10 lb.ft).

6. ⚠ WARNING: The hand brake and foot brake MUST BE applied.

Check for correct cable adjustment.

- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

7. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

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Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol - Selector Lever Assembly

Removal and Installation

Removal

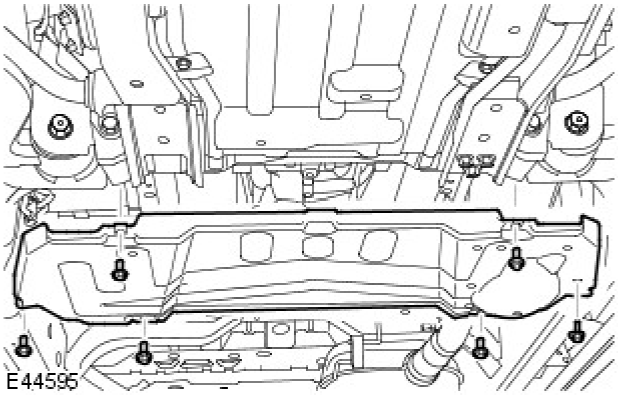
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

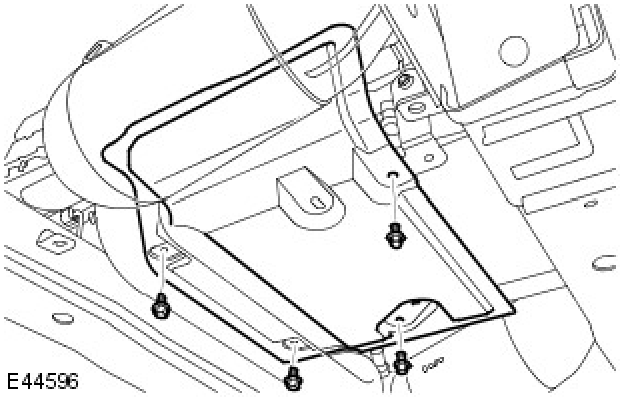
3. Remove the transmission undershield.

- Remove the 6 bolts.



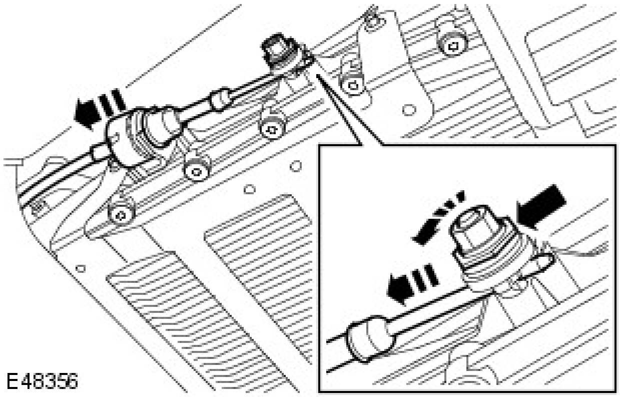
4. If installed, remove the transmission heat shield.

- Remove the 4 bolts.



5. Release the selector cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Compress the latch and release the cable.



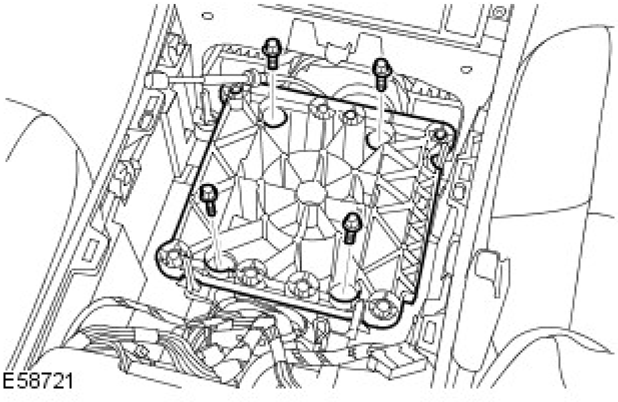
6. Remove the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

7. Release the transmission selector lever.

- Disconnect the electrical connector.
- Remove the 4 bolts.

8. Remove the transmission selector lever mount bracket.

- Remove the 4 bolts.



9. Remove the transmission selector lever.

- Release the selector cable from the body.

Installation

1. Install the selector lever cable.

2. Install the transmission selector lever mount bracket.

- Tighten the bolts to 12 Nm (8 lb.ft).

• NOTE: Discard old fixings and replace with new on all vehicles.

3. Install to the selector lever.

- Connect and secure the electrical connector.
- Install the bolts and tighten to 10 Nm (7 lb.ft).

4. NOTE: Do not tighten the locking nut at this stage.

Connect the selector cable to the transmission.

- Engage the inner cable with the lever clamping bush.
- Install the selector cable to its abutment bracket.

5. Install the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

6. Adjust the selector cable.
For additional information, refer to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures).

7. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

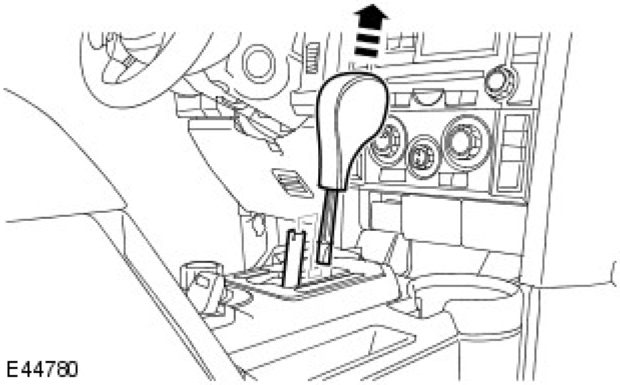
9. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol - Selector Lever Knob

Removal and Installation

Removal



1. ⚠ WARNING: The gear lever knob will be released suddenly, keep face clear during removal.

   Remove the selector lever knob.

   - Pull the knob upwards.

Installation

1. ⚠ CAUTION: Only fit the selector knob when the selector lever is in the 'P' position.

   Install the selector lever knob.

   - Engage the locating tang of the knob with the slot in the selector lever.
   - Push the knob fully onto the selector lever.

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Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol - Selector Lever Cable

Removal and Installation

Removal

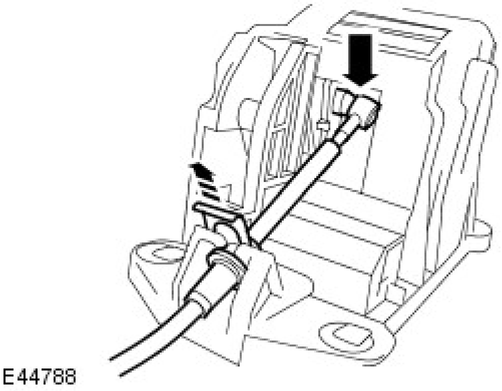
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

3. Remove the transmission selector lever.
   For additional information, refer to: Selector Lever Assembly (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the selector lever cable.
   - Remove the clip.
   - Release the cable.



Installation

1. Install the selector lever cable.
   - Clean the components.
   - Secure the cable.
   - Install the clip.

2. Install the transmission selector lever.
   For additional information, refer to: Selector Lever Assembly (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol - Selector Lever Gate Finish Panel

Removal and Installation

Removal

- NOTE: The process for removing and installing the selector lever gate finish panel is shown in the Ride and Handling Optimization Switch procedure. These two components cannot be serviced separately.

1. Remove the selector lever gate finish panel.
For additional information, refer to: Ride and Handling Optimization Switch (204-06 Ride and Handling Optimization, Removal and Installation).

Installation

1. Install the selector lever gate finish panel.
For additional information, refer to: Ride and Handling Optimization Switch (204-06 Ride and Handling Optimization, Removal and Installation).

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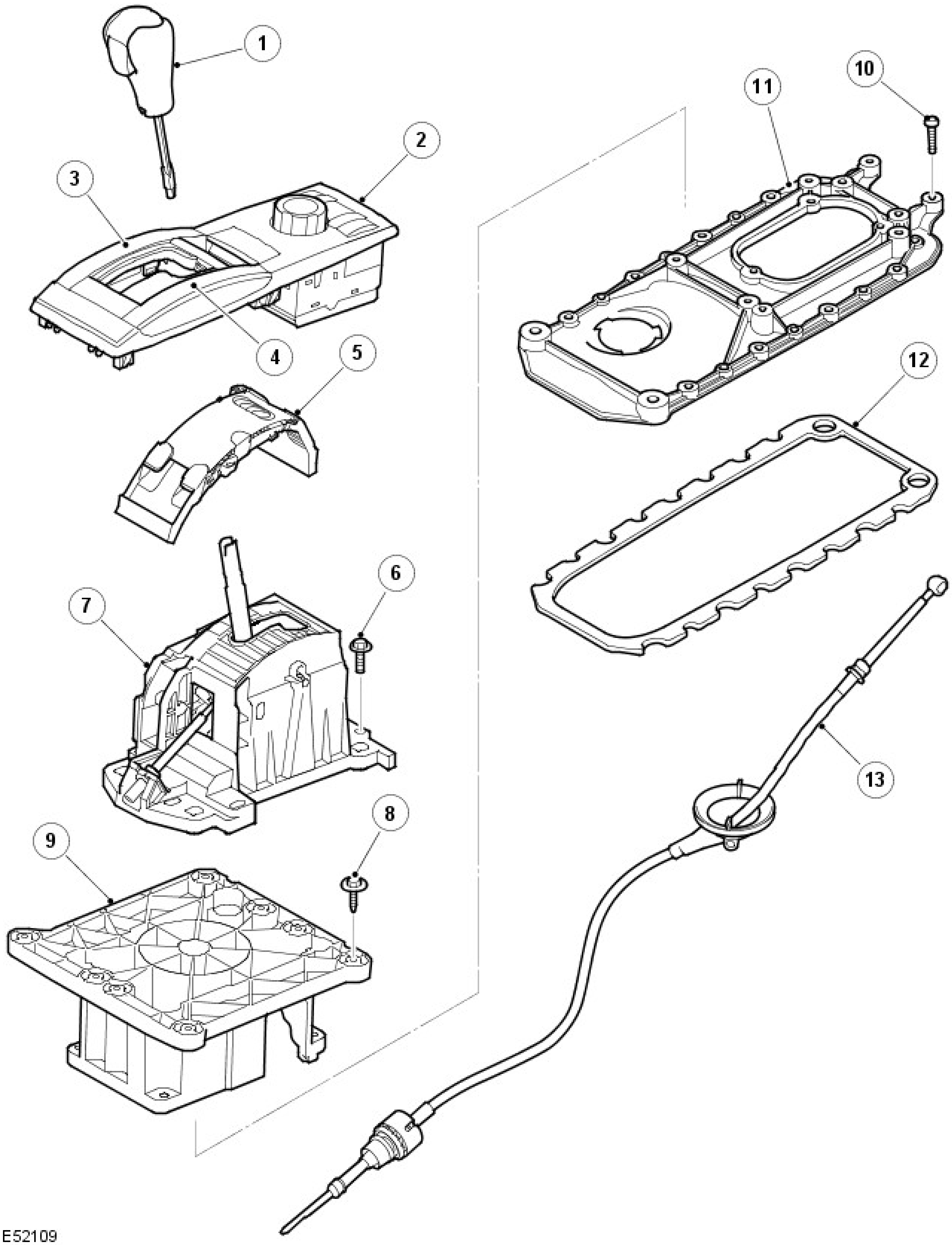
Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol - External Controls

Description and Operation

GEAR SELECTOR LEVER ASSEMBLY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Item	Part Number	Description
1	-	Selector lever
2	-	Switch pack and finisher
3	-	PRND display
4	-	M/S display
5	-	Shutter

6	-	Screw
7	-	Interlock emergency release lever and selector assembly
8	-	Screw and washer
9	-	Plinth
10	-	Screw
11	-	Mounting plate
12	-	Seal
13	-	Selector cable

The gear selector lever assembly is located in a central position on the transmission tunnel, between the front driver and passenger seats and is secured to the transmission tunnel closure plate. The selector lever assembly comprises a moulded plastic housing which provides for the location of the selector components.

The lever is connected to a crosspiece which allows for the selection of P, R, N, D in a forward or backward direction and selection between automatic and manual/sport mode in a left/right transverse direction.

When manual/sport mode is selected the lever can be moved in a forward or backward direction to select + or - for manual (CommandShift™) operation. If left in Sport mode all gear changes are performed automatically.

If Manual (CommandShift™) mode is selected, all gear changes are based on inputs received by the TCM from the manual +/- hall effect sensors located on the PCB.

The selector lever mechanism houses the following components:

- Electronic Printed Circuit Board (PCB)
- Shift Interlock solenoid
- Park and Neutral locking levers.

There are four selector lever positions and two additional positions for manual/sport operation:

- P (Park) - Prevents the vehicle from moving by locking the transmission
- R (Reverse) - Select only when the vehicle is stationary and the engine is at idle
- N (Neutral) - No torque transmitted to drive wheels
- D (Drive) - This position uses all six forward gears in high and low ranges
- M/S (Sport Mode) - This position uses all forward gears in 'D' but will upshift at higher engine speeds to improve acceleration
- + and - (Manual 'CommandShift™' mode) - Movement of the selector lever in the +/- positions, when the lever is in the M/S position, will operate the transmission in manual (CommandShift™) mode allowing the driver to manually select all six forward gears

The selector lever position is displayed to the driver on the selector position LED display and in the instrument cluster. In 'CommandShift™' mode, if a gear is selected but the TCM logic prevents selection of that gear, the requested gear will be initially displayed. The TCM will engage the next allowed gear and then display that gear.

Sport/Manual +/- CommandShift™ Switch

The PCB contains the hall effect sensors to activate the sport/manual mode and also the sensors which provide the +/- signals. When the selector lever is moved to the manual/sport position, the lower magnet located in the selector lever is moved within proximity of the M/S hall effect sensor on the PCB. This provides the momentary signal which is received by the TCM, which in turn initiates sport mode.

When the lever is moved to the + or - position, the magnet is moved within proximity of one of the hall effect sensors positioned either side of the M/S hall effect sensor. When an input from either the + or - sensors is received, manual CommandShift™ mode will be initiated. In this position a spring will move the selector lever back to the centre position when released. To leave the CommandShift™ mode, return the lever to the 'D' position.

Selector Position LED Display

The P, R, N, D LED display is located on the right hand side of the selector lever and the M/S (MANUAL/SPORT) +/- LED display is located on the left hand side of the selector lever. Each LED display is connected via a separate harness to the selector lever position switch. When the lever is moved to the required position, the switch contact for that position is made and the LED is illuminated.

P, R, N, D Position Switch

The P, R, N, D position switch is located within the Mechatronic valve block in the transmission. The switch is operated by movement of the selector lever to the P, R, N or D positions via the Bowden cable which is connected between the selector lever and the transmission selector shaft.

The switch is electrically connected to the TCM which outputs a common power supply to each of the four switch contacts. This power supply is also used by the two speed sensors and the fluid temperature sensor. Each of the four switch contacts have a separate feed input to the TCM which can detect which selector lever position has been selected.

Shift Interlock Solenoid

The shift interlock solenoid is located on the side of the selector lever assembly. The solenoid operates two locking levers which engage in the lower lever and lock it in the Park (P) and Neutral (N) positions. When the ignition is on or the engine is running, the solenoid is de-energised and prevents the lever from moving.

When energised, by the depression of the footbrake, the solenoid is energised and the selector lever may be moved from the P position. If the selector lever is left in the 'N' position for more than 800m/s the solenoid will be energised and the selector lever will become locked in the 'N' position. To move the selector lever from the 'N' position in this condition the footbrake must be applied. This prevents the selector lever from being moved to the 'D' or 'R' position unintentionally and the application of the brakes also prevents the vehicle 'creeping' when the gear is engaged.

Movement of the selector lever from the 'P' or 'N' positions is also prevented if the TCM senses the engine speed is above 2500 rev/min, even if the brake pedal is depressed.

In the event of an electrical failure of the vehicle or failure of the interlock solenoid or its associated wiring, it is possible to move the selector lever from the Park 'P' position by removing the selector lever and the switch pack and finisher and lifting the white coloured tab on the rear of the selector lever assembly. Whilst holding the tab in this position move the selector lever from the 'P' position.

- NOTE: The key cannot be removed from the ignition barrel if the selector lever is not in the 'Park' position. The selector lever cannot be moved from the 'Park' position if the ignition is switched off.

The selector lever will also be locked in the 'N' position during the transfer box changing range from high to low or vice versa.

Selector Cable

A selector cable is used as a mechanical connection between the selector lever and the transmission. The cable is a Bowden type cable which is connected to the selector lever. Movement of the lever in the P, R, N or D positions moves the cable. Movement of the cable is prevented when the selector lever is in the Manual/Sport position.

The cable is passed through a sealing grommet in the floorpan and is attached to a bracket on the transmission. The inner cable is connected to a lever which is positively attached to the transmission selector shaft.

Movement of the selector lever in the P, R, N or D positions moves the inner cable which in turn moves the lever. The lever transforms the linear movement of the cable into rotary movement of the selector shaft. The rotation of the shaft moves the position switch located within the Mechatronic valve block and also moves the manual spool valve to the applicable position.

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Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol -

Item	Specification
Type	Cable operated from shift mechanism to bellcrank on side of gearbox with manual release from Park 'P' position in the event of electrical failure

Torque Specifications

Description	Nm	lb-ft
Selector lever locknut	14	10
Transmission heat shield bolts	10	7
Transmission undershield bolts	10	7
Transmission selector nuts	8*	6

*Before VIN257100, discard old fixings and tighten new fixings to the torque value given.

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Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol - External Controls

Diagnosis and Testing

For additional information, refer to the relevant workshop manual section.

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol - Selector Lever Cable Adjustment

General Procedures

1. ⚠ WARNING: The hand brake and foot brake MUST BE applied.

Check for correct cable adjustment.

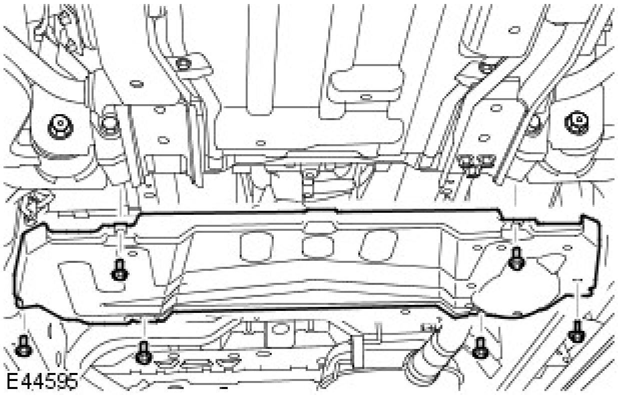
- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

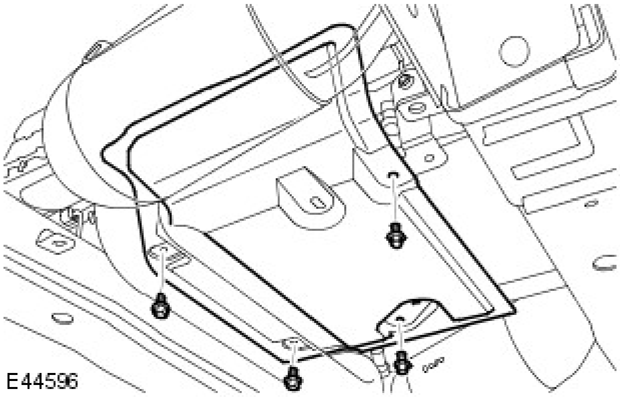
3. Remove the transmission undershield.

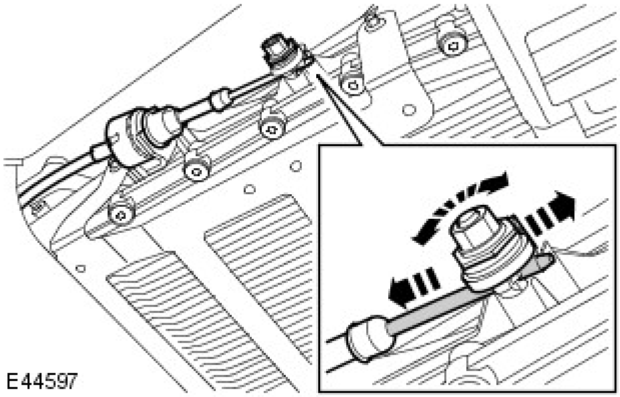
- Remove the 6 bolts.



4. If installed, remove the transmission heat shield.

- Remove the 4 bolts.





5. Adjust the selector cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Move the selector lever on the gearbox fully forward and release it. The lever will return to the 'P' position.
- Make sure the selector lever is in the 'P' position.
- Push the cable inner rearward then release it.
- Tighten the locknut to 14 Nm (10 lb.ft).

6. ⚠ WARNING: The hand brake and foot brake MUST BE applied.

Check for correct cable adjustment.

- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

7. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol - Selector Lever Assembly

Removal and Installation

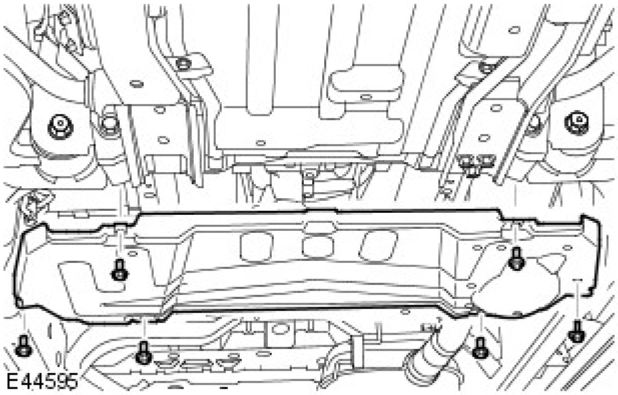
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

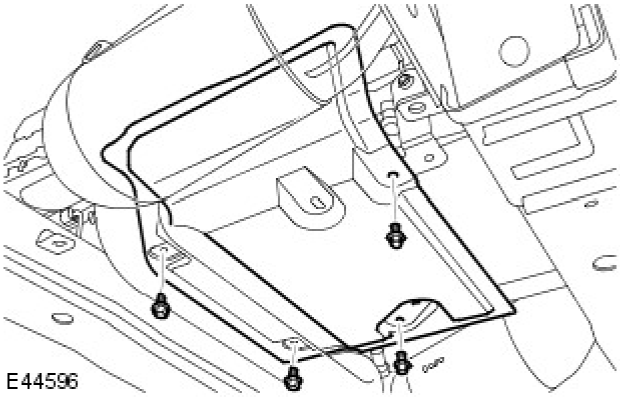
Raise and support the vehicle.

3. Remove the transmission undershield.



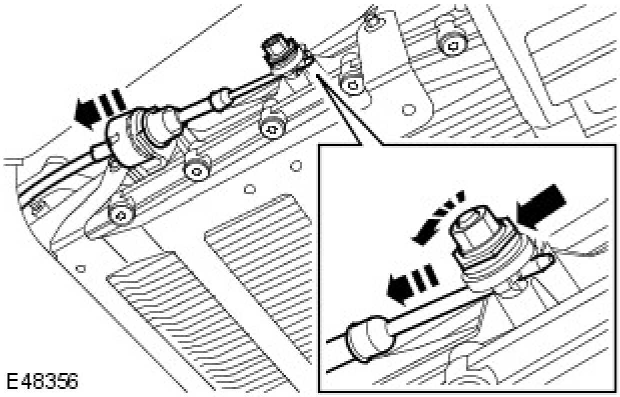
- Remove the 6 bolts.

4. If installed, remove the transmission heat shield.



- Remove the 4 bolts.

5. Release the selector cable.



- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Compress the latch and release the cable.

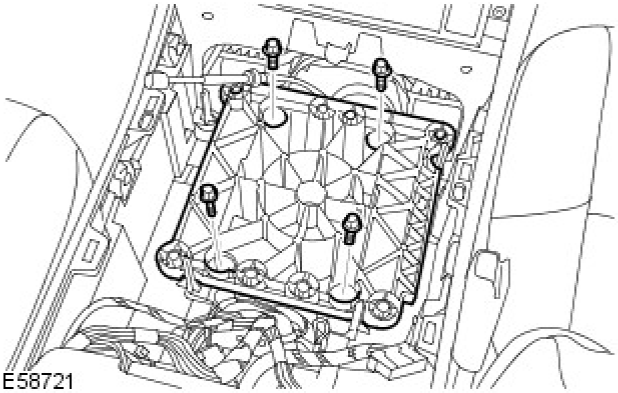
6. Remove the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

7. Release the transmission selector lever.

- Disconnect the electrical connector.
- Remove the 4 bolts.

8. Remove the transmission selector lever mount bracket.

- Remove the 4 bolts.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9. Remove the transmission selector lever.

- Release the selector cable from the body.

Installation

1. Install the selector lever cable.

2. Install the transmission selector lever mount bracket.

- Tighten the bolts to 12 Nm (8 lb.ft).

- NOTE: Discard old fixings and replace with new on all vehicles.

3. Install to the selector lever.

- Connect and secure the electrical connector.
- Install the bolts and tighten to 10 Nm (7 lb.ft).

4. NOTE: Do not tighten the locking nut at this stage.

Connect the selector cable to the transmission.

- Engage the inner cable with the lever clamping bush.
- Install the selector cable to its abutment bracket.

5. Install the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

6. Adjust the selector cable.
For additional information, refer to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures).

7. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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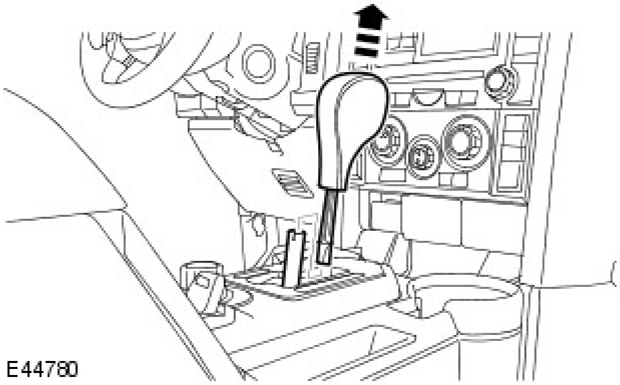
Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol - Selector Lever Knob

Removal and Installation

Removal



1. ⚠ WARNING: The gear lever knob will be released suddenly, keep face clear during removal.

Remove the selector lever knob.

- Pull the knob upwards.

Installation

1. ⚠ CAUTION: Only fit the selector knob when the selector lever is in the 'P' position.

Install the selector lever knob.

- Engage the locating tang of the knob with the slot in the selector lever.
- Push the knob fully onto the selector lever.

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Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol - Selector Lever Cable

Removal and Installation

Removal

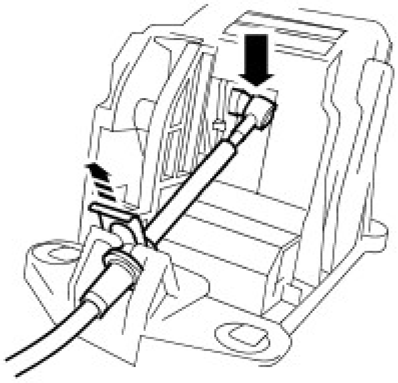
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

3. Remove the transmission selector lever.
   For additional information, refer to: Selector Lever Assembly (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the selector lever cable.
   - Remove the clip.
   - Release the cable.



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Installation

1. Install the selector lever cable.
   - Clean the components.
   - Secure the cable.
   - Install the clip.

2. Install the transmission selector lever.
   For additional information, refer to: Selector Lever Assembly (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol - Selector Lever Gate Finish Panel

Removal and Installation

Removal

- NOTE: The process for removing and installing the selector lever gate finish panel is shown in the Ride and Handling Optimization Switch procedure. These two components cannot be serviced separately.

1. Remove the selector lever gate finish panel.
For additional information, refer to: Ride and Handling Optimization Switch (204-06 Ride and Handling Optimization, Removal and Installation).

Installation

1. Install the selector lever gate finish panel.
For additional information, refer to: Ride and Handling Optimization Switch (204-06 Ride and Handling Optimization, Removal and Installation).

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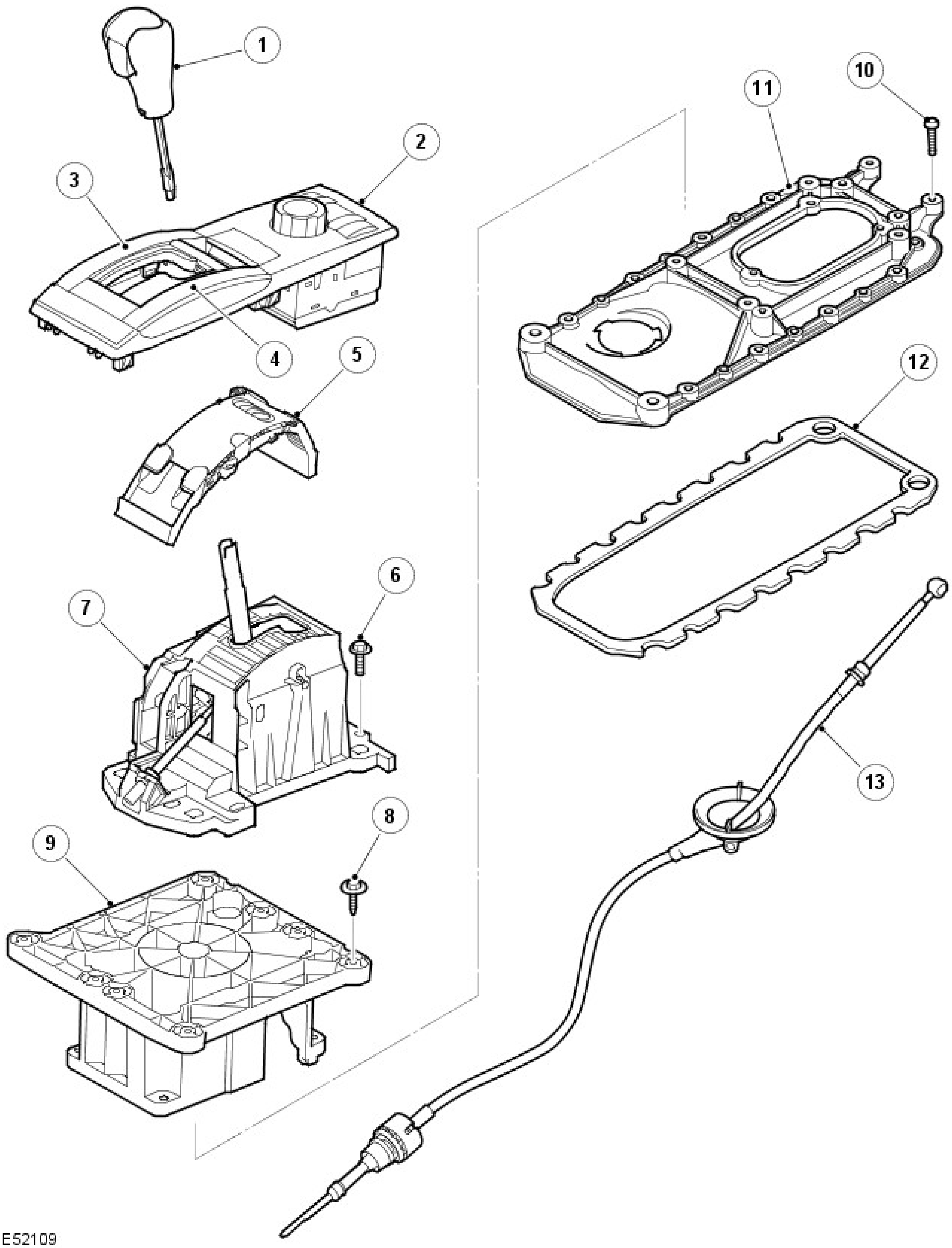
Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol - External Controls

Description and Operation

GEAR SELECTOR LEVER ASSEMBLY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Item	Part Number	Description
1	-	Selector lever
2	-	Switch pack and finisher
3	-	PRND display
4	-	M/S display
5	-	Shutter

6	-	Screw
7	-	Interlock emergency release lever and selector assembly
8	-	Screw and washer
9	-	Plinth
10	-	Screw
11	-	Mounting plate
12	-	Seal
13	-	Selector cable

The gear selector lever assembly is located in a central position on the transmission tunnel, between the front driver and passenger seats and is secured to the transmission tunnel closure plate. The selector lever assembly comprises a moulded plastic housing which provides for the location of the selector components.

The lever is connected to a crosspiece which allows for the selection of P, R, N, D in a forward or backward direction and selection between automatic and manual/sport mode in a left/right transverse direction.

When manual/sport mode is selected the lever can be moved in a forward or backward direction to select + or - for manual (CommandShift™) operation. If left in Sport mode all gear changes are performed automatically.

If Manual (CommandShift™) mode is selected, all gear changes are based on inputs received by the TCM from the manual +/- hall effect sensors located on the PCB.

The selector lever mechanism houses the following components:

- Electronic Printed Circuit Board (PCB)
- Shift Interlock solenoid
- Park and Neutral locking levers.

There are four selector lever positions and two additional positions for manual/sport operation:

- P (Park) - Prevents the vehicle from moving by locking the transmission
- R (Reverse) - Select only when the vehicle is stationary and the engine is at idle
- N (Neutral) - No torque transmitted to drive wheels
- D (Drive) - This position uses all six forward gears in high and low ranges
- M/S (Sport Mode) - This position uses all forward gears in 'D' but will upshift at higher engine speeds to improve acceleration
- + and - (Manual 'CommandShift™' mode) - Movement of the selector lever in the +/- positions, when the lever is in the M/S position, will operate the transmission in manual (CommandShift™) mode allowing the driver to manually select all six forward gears.

The selector lever position is displayed to the driver on the selector position LED display and in the instrument cluster. In 'CommandShift™' mode, if a gear is selected but the TCM logic prevents selection of that gear, the requested gear will be initially displayed. The TCM will engage the next allowed gear and then display that gear.

Sport/Manual +/- CommandShift™ Switch

The PCB contains the hall effect sensors to activate the sport/manual mode and also the sensors which provide the +/- signals. When the selector lever is moved to the manual/sport position, the lower magnet located in the selector lever is moved within proximity of the M/S hall effect sensor on the PCB. This provides the momentary signal which is received by the TCM, which in turn initiates sport mode.

When the lever is moved to the + or - position, the magnet is moved within proximity of one of the hall effect sensors positioned either side of the M/S hall effect sensor. When an input from either the + or - sensors is received, manual CommandShift™ mode will be initiated. In this position a spring will move the selector lever back to the centre position when released. To leave the CommandShift™ mode, return the lever to the 'D' position.

Selector Position LED Display

The P, R, N, D LED display is located on the right hand side of the selector lever and the M/S (MANUAL/SPORT) +/- LED display is located on the left hand side of the selector lever. Each LED display is connected via a separate harness to the selector lever position switch. When the lever is moved to the required position, the switch contact for that position is made and the LED is illuminated.

P, R, N, D Position Switch

The P, R, N, D position switch is located within the Mechatronic valve block in the transmission. The switch is operated by movement of the selector lever to the P, R, N or D positions via the Bowden cable which is connected between the selector lever and the transmission selector shaft.

The switch is electrically connected to the TCM which outputs a common power supply to each of the four switch contacts. This power supply is also used by the two speed sensors and the fluid temperature sensor. Each of the four switch contacts have a separate feed input to the TCM which can detect which selector lever position has been selected.

Shift Interlock Solenoid

The shift interlock solenoid is located on the side of the selector lever assembly. The solenoid operates two locking levers which engage in the lower lever and lock it in the Park (P) and Neutral (N) positions. When the ignition is on or the engine is running, the solenoid is de-energised and prevents the lever from moving.

When energised, by the depression of the footbrake, the solenoid is energised and the selector lever may be moved from the 'P' position. If the selector lever is left in the 'N' position for more than 800m/s the solenoid will be energised and the selector lever will become locked in the 'N' position. To move the selector lever from the 'N' position in this condition the footbrake must be applied. This prevents the selector lever from being moved to the 'D' or 'R' position unintentionally and the application of the brakes also prevents the vehicle 'creeping' when the gear is engaged.

Movement of the selector lever from the 'P' or 'N' positions is also prevented if the TCM senses the engine speed is above 2500 rev/min, even if the brake pedal is depressed.

In the event of an electrical failure of the vehicle or failure of the interlock solenoid or its associated wiring, it is possible to move the selector lever from the Park 'P' position by removing the selector lever and the switch pack and finisher and lifting the white coloured tab on the rear of the selector lever assembly. Whilst holding the tab in this position move the selector lever from the 'P' position.

- NOTE: The key cannot be removed from the ignition barrel if the selector lever is not in the 'Park' position. The selector lever cannot be moved from the 'Park' position if the ignition is switched off.

The selector lever will also be locked in the 'N' position during the transfer box changing range from high to low or vice versa.

Selector Cable

A selector cable is used as a mechanical connection between the selector lever and the transmission. The cable is a Bowden type cable which is connected to the selector lever. Movement of the lever in the P, R, N or D positions moves the cable. Movement of the cable is prevented when the selector lever is in the Manual/Sport position.

The cable is passed through a sealing grommet in the floorpan and is attached to a bracket on the transmission. The inner cable is connected to a lever which is positively attached to the transmission selector shaft.

Movement of the selector lever in the P, R, N or D positions moves the inner cable which in turn moves the lever. The lever transforms the linear movement of the cable into rotary movement of the selector shaft. The rotation of the shaft moves the position switch located within the Mechatronic valve block and also moves the manual spool valve to the applicable position.

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Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel -

Item	Specification
Type	Cable operated from shift mechanism to bellcrank on side of transmission with manual release from Park 'P' position in the event of electrical failure

Torque Specifications

Description	Nm	lb-ft
Selector lever locknut	14	10
Transmission heat shield bolts	10	7
Transmission under shield bolts	10	7
Transmission selector nuts	10	7

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Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel - External Controls

Diagnosis and Testing

For additional information, refer to the relevant workshop manual section.

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Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel - Selector Lever Cable Adjustment

General Procedures

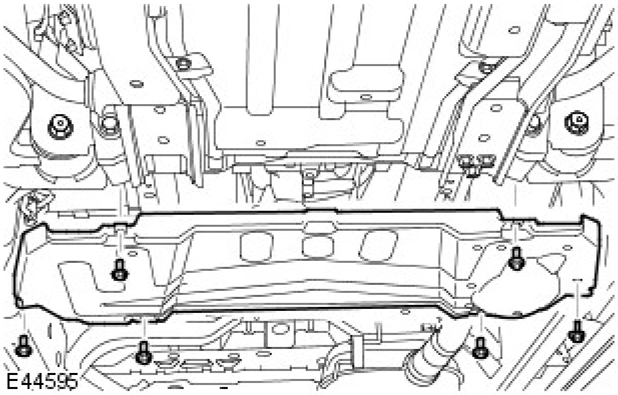
1. ⚠ WARNING: The hand brake and foot brake MUST BE applied.

Check for correct cable adjustment.

- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

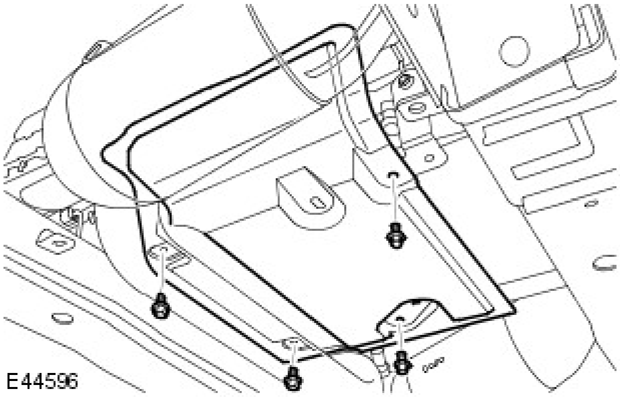
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



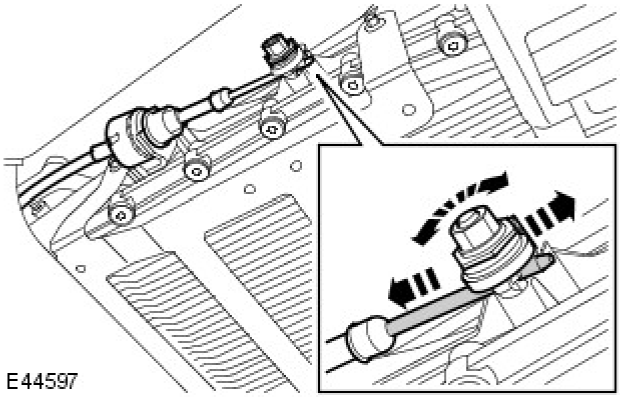
3. Remove the transmission undershield.

- Remove the 6 bolts.



4. If installed, remove the transmission heat shield.

- Remove the 4 bolts.



5. Adjust the selector cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Move the selector lever on the gearbox fully forward and release it. The lever will return to the 'P' position.
- Make sure the selector lever is in the 'P' position.
- Push the cable inner rearward then release it.
- Tighten the locknut to 14 Nm (10 lb.ft).

6. ⚠ WARNING: The hand brake and foot brake MUST BE applied.

Check for correct cable adjustment.

- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

7. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

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Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel - Selector Lever Assembly

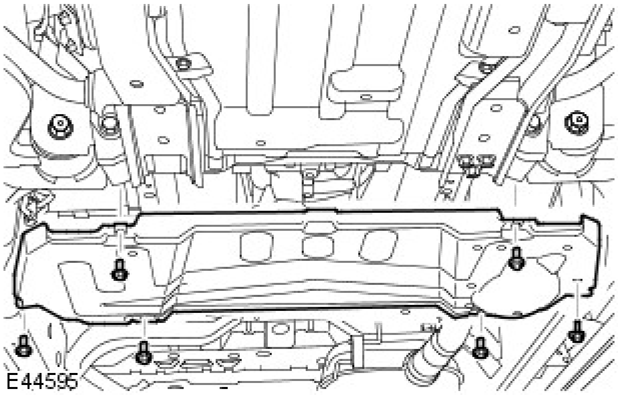
Removal and Installation

Removal

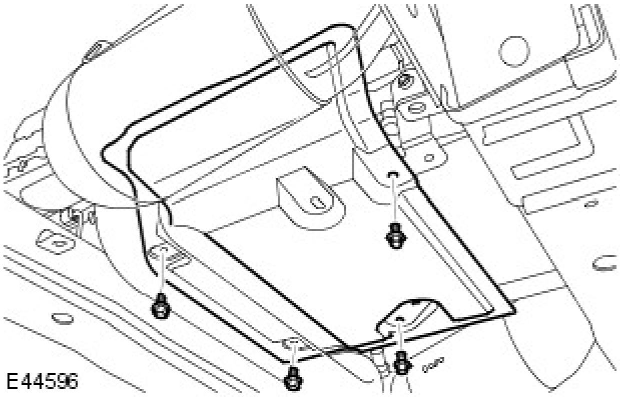
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

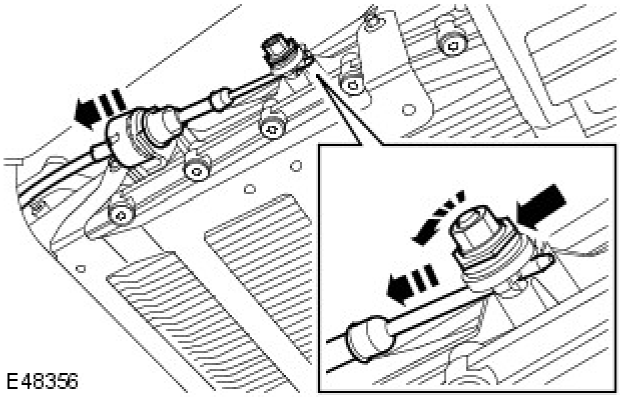
   Raise and support the vehicle.



3. Remove the transmission undershield.
   - Remove the 6 bolts.



4. If installed, remove the transmission heat shield.
   - Remove the 4 bolts.



5. Release the selector cable.
   - Using an additional wrench, restrain the clamping bush and loosen the locknut.
   - Compress the latch and release the cable.

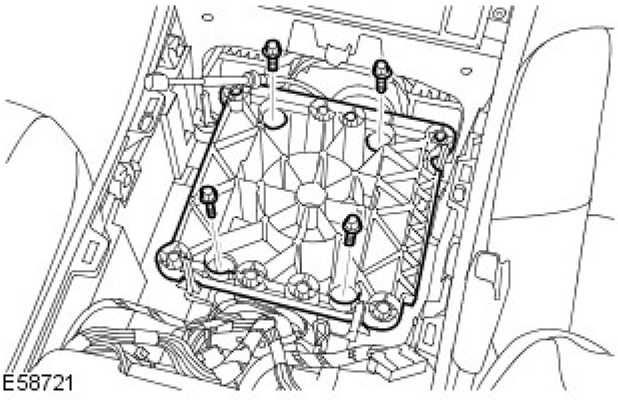
6. Remove the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

7. Release the transmission selector lever.

- Disconnect the electrical connector.
- Remove the 4 bolts.

8. Remove the transmission selector lever mount bracket.

- Remove the 4 bolts.



9. Remove the transmission selector lever.

- Release the selector cable from the body.

Installation

1. Install the selector lever cable.

2. Install the transmission selector lever mount bracket.

- Tighten the bolts to 12 Nm (8 lb.ft).

• NOTE: Discard old fixings and replace with new on all vehicles.

3. Install to the selector lever.

- Connect and secure the electrical connector.
- Install the bolts and tighten to 10 Nm (7 lb.ft).

4. NOTE: Do not tighten the locking nut at this stage.

Connect the selector cable to the transmission.

- Engage the inner cable with the lever clamping bush.
- Install the selector cable to its abutment bracket.

5. Install the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

6. Adjust the selector cable.
For additional information, refer to: Selector Lever Cable Adjustment (307-05A Automatic Transmission/Transaxle External Controls - V8 S/C 4.2L Petrol, General Procedures).

7. If installed, install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

9. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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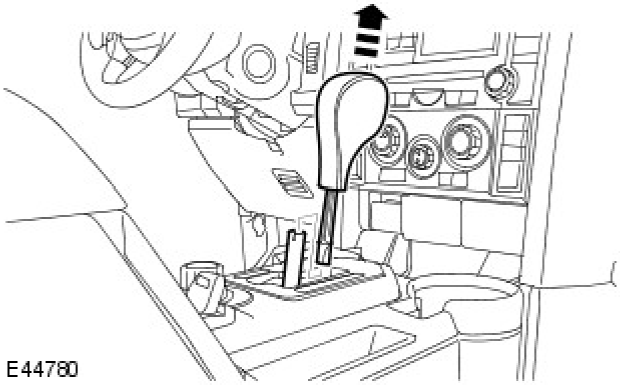
Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel - Selector Lever Knob

Removal and Installation

Removal



1. ⚠ WARNING: The gear lever knob will be released suddenly, keep face clear during removal.

Remove the selector lever knob.

- Pull the knob upwards.

Installation

1. ⚠ CAUTION: Only fit the selector knob when the selector lever is in the 'P' position.

Install the selector lever knob.

- Engage the locating tang of the knob with the slot in the selector lever.
- Push the knob fully onto the selector lever.

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Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel - Selector Lever Cable

Removal and Installation

Removal

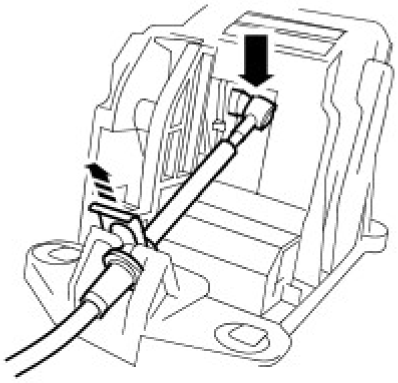
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transmission selector lever.
For additional information, refer to: Selector Lever Assembly (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the selector lever cable.



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- Remove the clip.
- Release the cable.

Installation

1. Install the selector lever cable.

- Clean the components.
- Secure the cable.
- Install the clip.

2. Install the transmission selector lever.
For additional information, refer to: Selector Lever Assembly (307-05C Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel - Selector Lever Gate Finish Panel

Removal and Installation

Removal

- NOTE: The process for removing and installing the selector lever gate finish panel is shown in the Ride and Handling Optimization Switch procedure. These two components cannot be serviced separately.

1. Remove the selector lever gate finish panel.
For additional information, refer to: Ride and Handling Optimization Switch (204-06 Ride and Handling Optimization, Removal and Installation).

Installation

1. Install the selector lever gate finish panel.
For additional information, refer to: Ride and Handling Optimization Switch (204-06 Ride and Handling Optimization, Removal and Installation).

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Automatic Transmission/Transaxle External Controls - TDV6 2.7L Diesel - External Controls

Description and Operation

EXTERNAL CONTROLS

Refer to External Controls 4.4L V8 for details.
For additional information, refer to: External Controls (307-05B Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol, Description and Operation).

Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel -

Item	Specification
Type	Cable operated from shift mechanism to bellcrank on side of gearbox with manual release from Park 'P' position in the event of electrical failure

Torque Specifications

Description	Nm	lb-ft
Selector lever locknut	10	7
Transmission heat shield bolts	10	7
Transmission undershield bolts	10	7
Transmission selector nuts	10	7

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Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel - External Controls

Description and Operation

EXTERNAL CONTROLS

Refer to External Controls 4.4L V8 for details.
For additional information, refer to: External Controls (307-05B Automatic Transmission/Transaxle External Controls - V8 4.4L Petrol, Description and Operation).

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel - Selector Lever Cable Adjustment

General Procedures

⚠ WARNING: Observe due care when working near a hot exhaust system.

1. NOTE: All vehicles.

Check for correct cable adjustment.

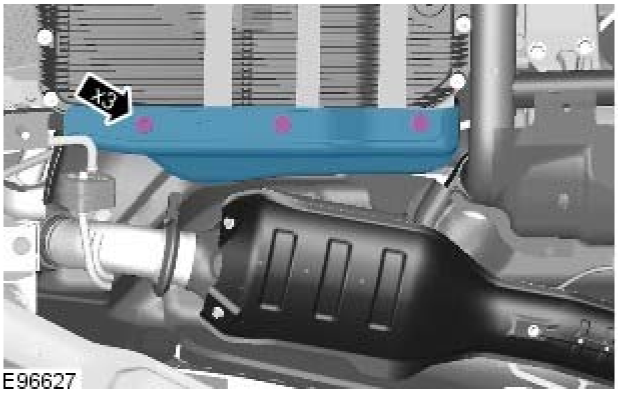
- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

2. Raise and support the vehicle.

3. NOTE: Vehicles with diesel particulate filter (DPF).

Remove the RH heat shield.

- Remove the 2 bolts.



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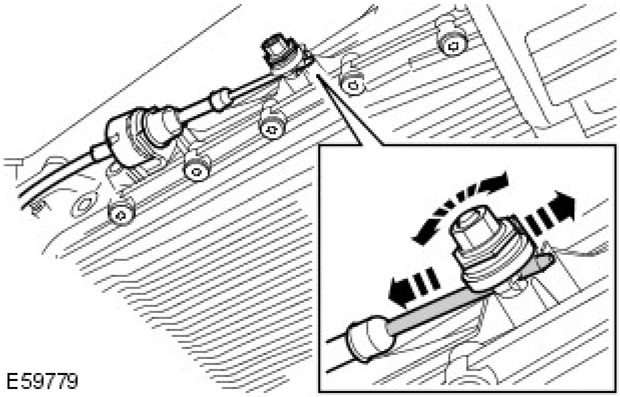
4. NOTE: All vehicles.

Adjust the selector cable.

- Using an additional wrench, restrain the clamping bush and loosen the locknut.
- Move the selector lever on the transmission fully forward and release it. The lever will return to the "P" position.
- Make sure the selector lever within the vehicle is in the "P" position.



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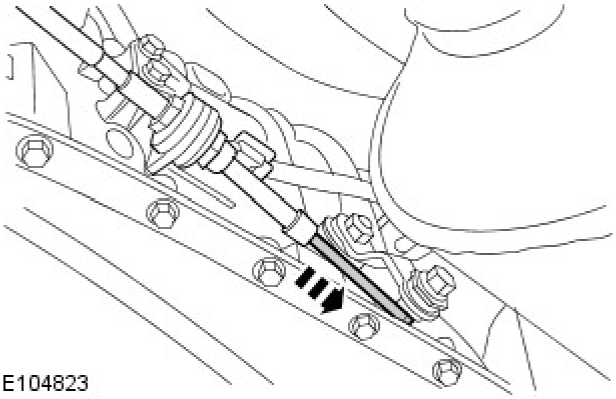
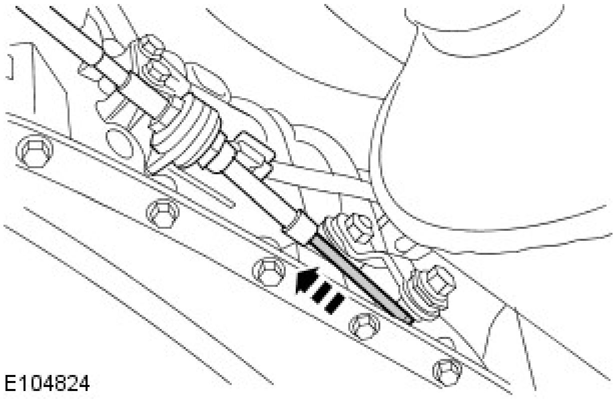


5. NOTE: Vehicles built up to VIN:284081.

Secure the cable.

- Pull the inner cable forward then release it.
- Tighten the locknut to 10 Nm (7 lb.ft).



6. NOTE: Vehicles built from VIN:284082.

Secure the cable.

- Push the inner cable rearrward then release it.
- Tighten the locknut to 10 Nm (7 lb.ft).

7. NOTE: Vehicles with diesel particulate filter (DPF).

Install the RH heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

8. ⚠ WARNING: The park brake and foot brake MUST BE applied.

• NOTE: All vehicles.

Check for correct cable adjustment.

- Move the selector lever from 'P' position, check engagement in each position and return to 'P'.
- Check that the engine will start in 'P' and 'N' positions and that the engine start is inhibited when drive positions are selected.

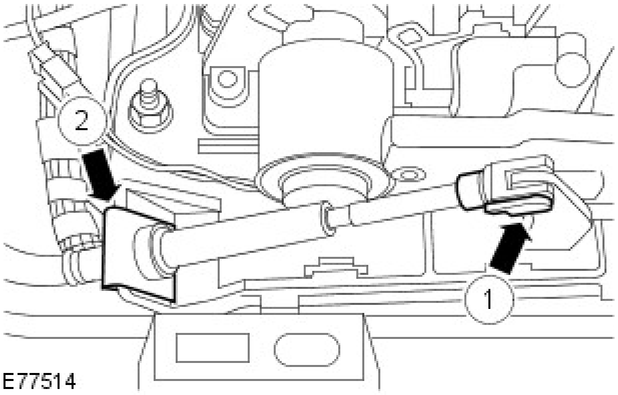
Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel - Selector Lever Assembly

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

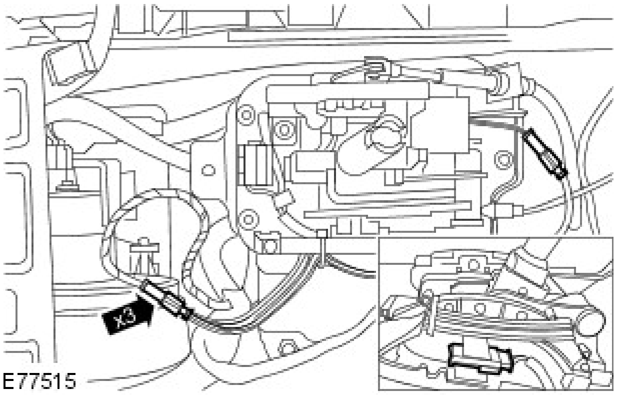
2. Remove the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).



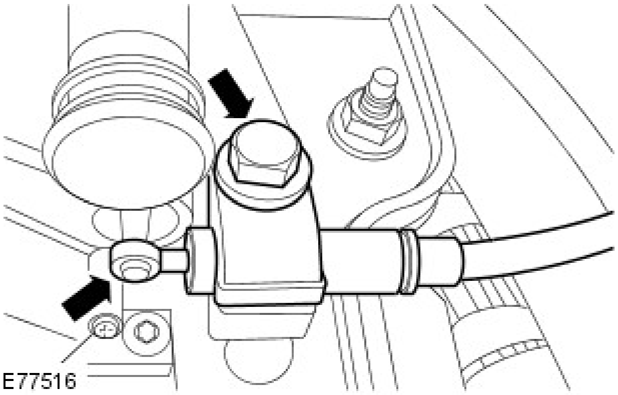
3. NOTE: Collect the plastic spacer from the selector lever cable.

Release the selector lever cable.

1. Remove the selector lever clip from the selector lever inner cable .
2. Remove the selector lever housing clip from the selector cable.

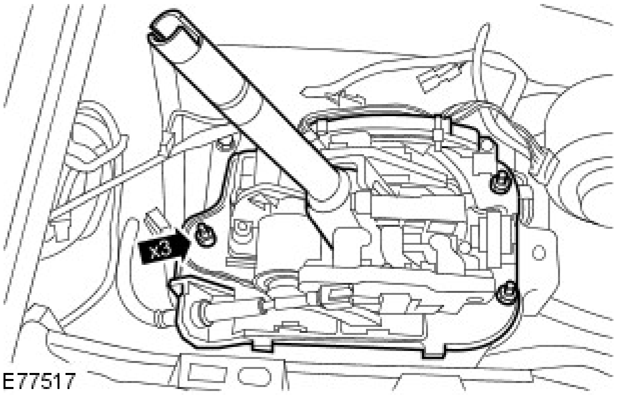


4. Disconnect the 3 electrical connectors.



5. Release the ignition switch interlock cable.

- Remove the bolt.
- Remove the clamp.



6. Remove the selector lever assembly.

- Remove the 3 nuts.

Installation

1. Install the selector lever assembly.

- Tighten the 3 nuts to 9 Nm (7 lb.ft).

2. Install the ignition switch interlock cable.

- Install the clamp.
- Install the bolt.

3. Connect the 3 electrical connectors.

4. Install the selector lever cable.

- Install the selector lever housing clip to the selector lever cable.
- Install the plastic spacer to the selector lever cable.
- Install the selector lever clip to the selector lever inner cable.

5. Install the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

6. Install the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel - Selector Lever Cable

Removal and Installation

Removal

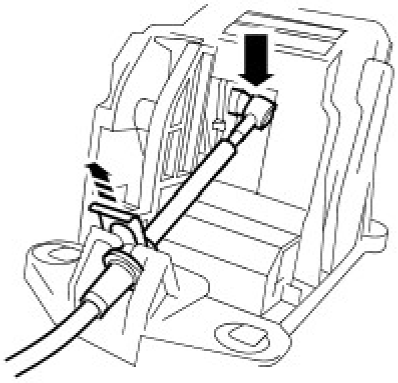
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the transmission selector lever.
   For additional information, refer to: Shift Selector (307-01, In-vehicle Repair).

3. Remove the selector lever cable.

   - Remove the clip.
   - Release the cable.



E44788

Installation

1. Install the selector lever cable.

   - Clean the components.
   - Secure the cable.
   - Install the clip.

2. Install the transmission selector lever.
   For additional information, refer to: Shift Selector (307-01, In-vehicle Repair).

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel - Selector Lever Gate Finish Panel

Removal and Installation

Removal

- NOTE: The process for removing and installing the selector lever gate finish panel is shown in the Ride and Handling Optimization Switch procedure. These two components cannot be serviced separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the selector lever gate finish panel.
For additional information, refer to: Ride and Handling Optimization Switch (204-06 Ride and Handling Optimization, Removal and Installation).

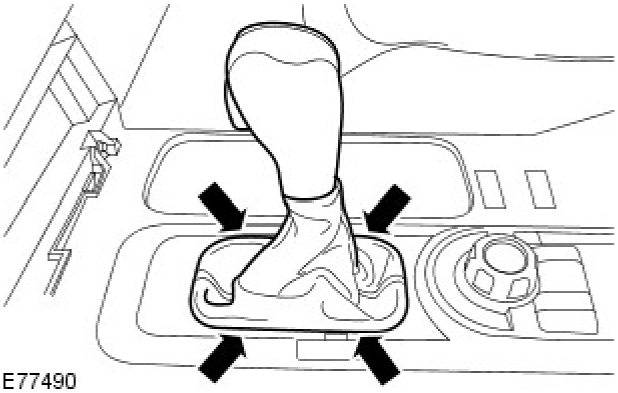
Installation

1. To install, reverse the removal procedure.

Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel - Selector Lever Knob

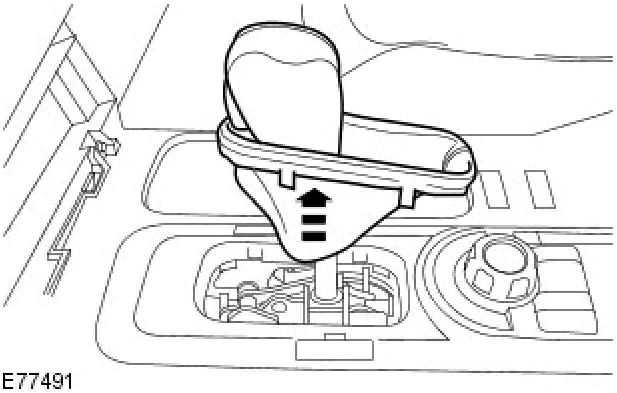
Removal and Installation

Removal



E77490

1. Release the selector lever knob gaiter.



E77491

2. ⚠ WARNING: The selector lever knob will be released suddenly, keep face clear during removal.

Remove the selector lever knob.

- Release the selector lever knob upwards.

Installation

1. CAUTIONS:

⚠ Only fit the selector lever knob when the selector lever is in the 'P' position.

⚠ Make sure the selector lever knob is correctly installed.

Install the selector lever knob.

- Correctly align the selector lever knob with the selector lever.

2. Attach the selector lever knob gaiter.

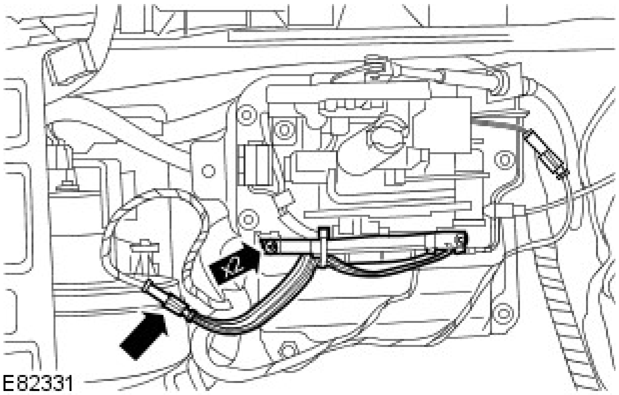
Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - TDV8 3.6L Diesel - Selector Lever Position Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the floor console upper panel.
   For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).
3. Remove the selector lever position sensor.
   - Disconnect the electrical connector.
   - Remove the 2 screws.



Installation

1. Install the selector lever position sensor.
   - Install the 2 screws.
   - Connect the electrical connector.
2. Install the floor console upper panel.
   For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Four-Wheel Drive Systems -

Torque Specifications

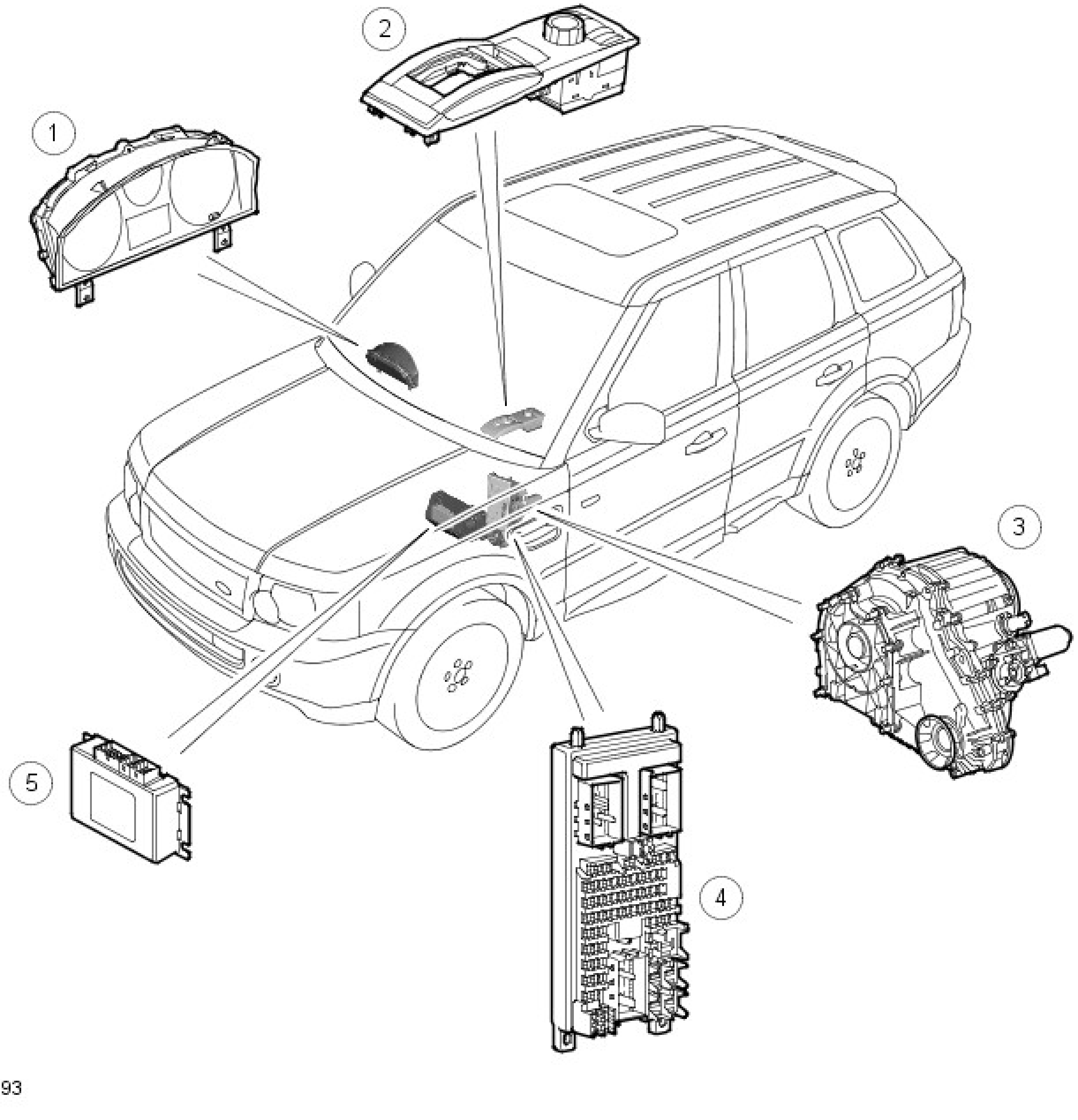
Description	Nm	lb-ft
Transfer case shift motor Torx bolts	38	28
Transfer case clutch control solenoid Torx bolts	5	4
High/Low range sensor Torx bolts	7	5

Published: 11-May-2011

Four-Wheel Drive Systems - Four-Wheel Drive Systems

Description and Operation

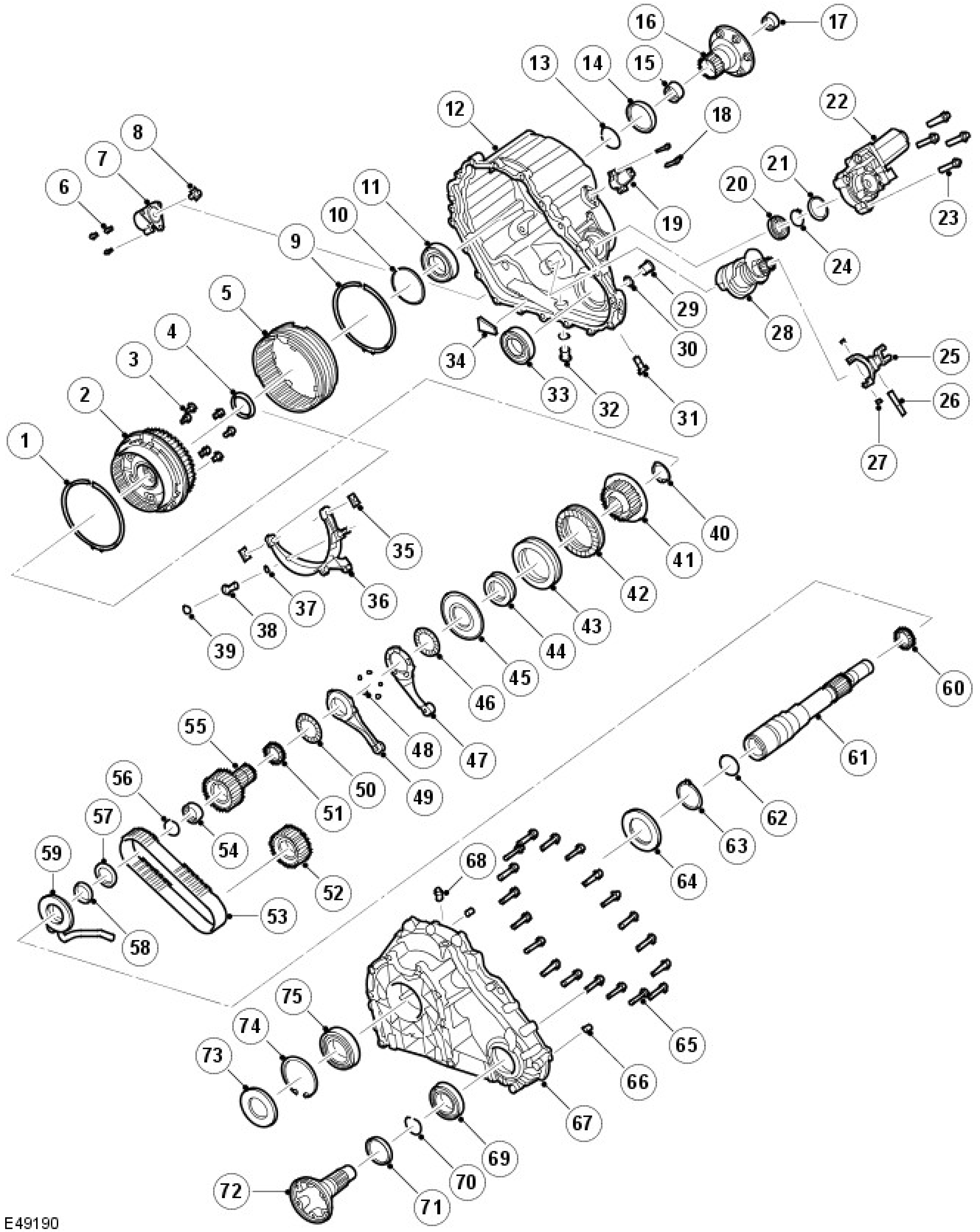
Transfer Box Component Location



E56593

Item	Part Number	Description
1	-	Instrument cluster
2	-	Range change selection switch
3	-	Transfer box
4	-	Central junction box (CJB)
5	-	Transfer box control module

Transfer Box Exploded View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E49190

Item	Part Number	Description
1	-	Synchronisation spring
2	-	Differential assembly
3	-	Bolt, 6 off
4	-	Spacer ring
5	-	Shifting sleeve

6	-	Bolt, 3 off
7	-	Solenoid
8	-	Shifting element
9	-	Synchronisation spring
10	-	Circlip
11	-	Ball bearing
12	-	Rear housing
13	-	Circlip
14	-	Seal ring
15	-	Needle roller bearing
16	-	Rear output flange
17	-	Needle roller bearing
18	-	Bolt, 2 off
19	-	Selector fork position sensor
20	-	Bearing
21	-	Circlip
22	-	Transfer box motor assembly
23	-	Bolt, 4 off
24	-	Circlip
25	-	Shifting fork
26	-	Fork pin
27	-	Sliding block
28	-	Actuator assembly
29	-	Fill plug
30	-	Seal ring
31	-	Ball retention
32	-	Drain plug
33	-	Seal ring
34	-	Particle collector magnet
35	-	Sliding blocks, 2 of
36	-	High/low shifting fork
37	-	O-ring
38	-	High/low fork pin
39	-	Circlip
40	-	Circlip
41	-	Clutch hub
42	-	Clutch friction plate, 10 off
43	-	Clutch steel plate, 10 off
44	-	Disc spring, 6 off
45	-	Clutch piston
46	-	Axial needle roller bearing
47	-	Transfer box motor lever assembly
48	-	Ball, 5 off
49	-	Transfer box motor lever assembly
50	-	Axial needle roller bearing
51	-	Needle roller bearing
52	-	Front output sprocket
53	-	Chain
54	-	Needle roller bearing
55	-	Sprocket
56	-	Circlip
57	-	Thrust washer
58	-	Spacer ring
59	-	Oil pump assembly
60	-	Needle roller bearing
61	-	Input shaft
62	-	O-ring
63	-	Circlip
64	-	Disc spring, 2 off
65	-	Bolt, 19 off
66	-	Dowel pin (2 off)
67	-	Front housing

68	-	Breather cartridge
69	-	Bearing
70	-	Circlip
71	-	Seal ring
72	-	Front output flange
73	-	Seal ring
74	-	Circlip
75	-	Bearing

GENERAL

The DD295 transfer box is full time, permanent four-wheel-drive unit, with 50/50 torque distribution to the front and rear driveshafts. Magna Steyr Powertrain manufactures the unit, which is identical for all engine derivatives and supports the following features:

- Permanent four-wheel-drive with a bevel gear centre differential, providing a 50:50 torque split
- Selectable high and low range for optimum on-road and off-road performance
- Two-speed, fully synchronized 'shift-on-the-move' system allows the driver to change the range without having to stop the vehicle
- Electronically controlled multi-plate clutch providing a centre differential lock and torque biasing function to give improved traction performance and vehicle dynamic stability.

A strategy, to electronically control the centre differential multi plate clutch assembly, has been developed to provide;

- a pre-loading function, increasing locking torque with increased driving torque
- a slip controller to increase locking torque under off-road conditions and decrease locking torque for optimum comfort, e.g. parking.

The unit is located under the vehicle and is mounted on the cross-member, behind the transmission.

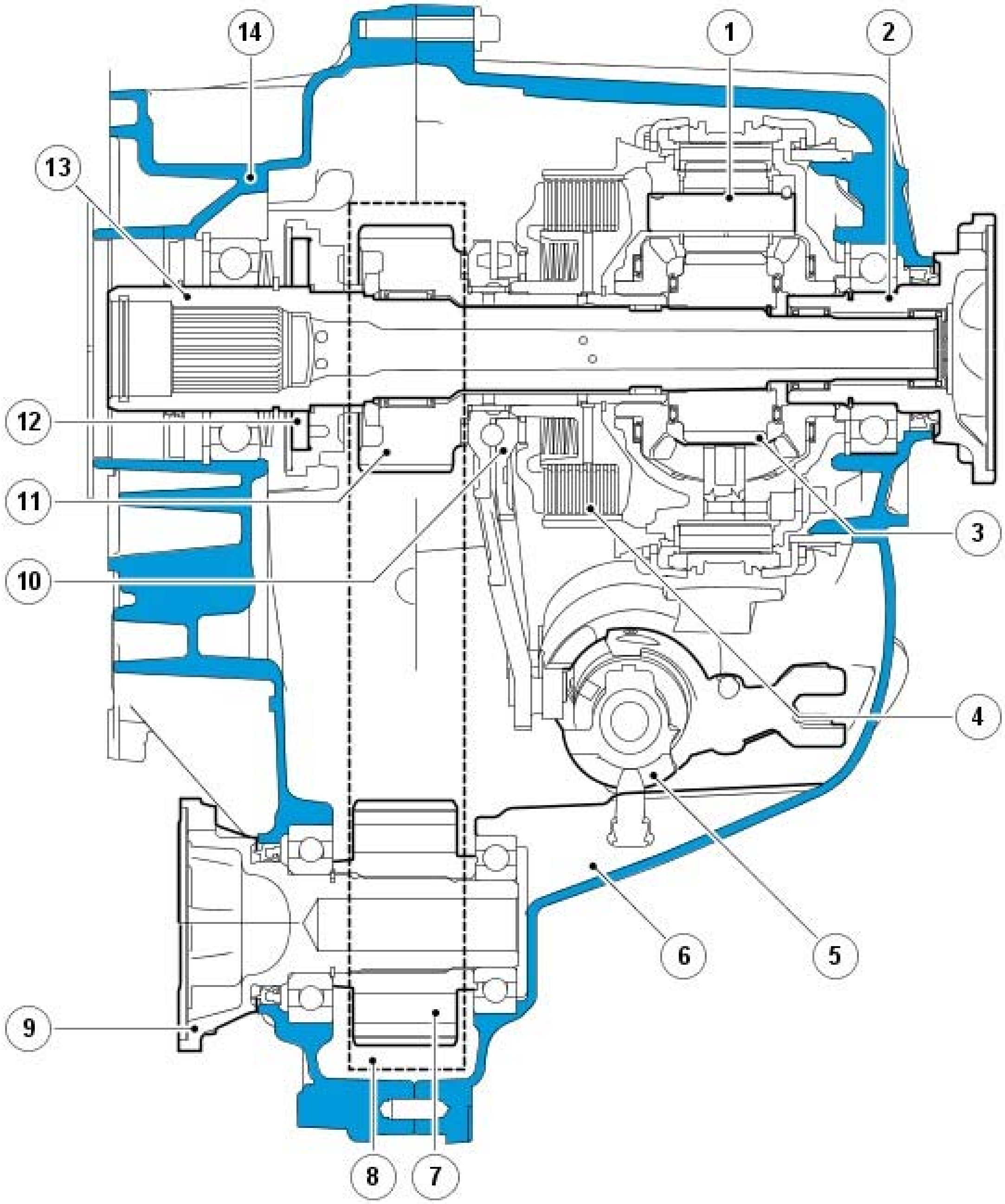
The transfer box receives a torque input from the transmission output shaft, which is passed through the unit to two outputs for the front and rear drive shafts.

The input torque is equally distributed via a bevel gear type differential. In order to provide an optimal torque distribution to each wheel in all driving conditions, the unit is equipped with an electronically controlled locking and torque-biasing device. This device detects wheel slip via various vehicle system inputs to the transfer box control module and locks the differential accordingly. The locking torque is applied through a multi-plate clutch assembly.

A planetary gear set, located in the differential assembly, allows the driver to select high or low range whilst driving, this is known as 'shift on the move'. When in low range, the planetary gear set provides a ratio of 2.93:1, which gives the vehicle an extremely low crawl speed for off road driving and trailer towing. High range is a direct drive from the transmission output shaft and provides a 1:1 ratio.

Both the centre differential locking and biasing and the 'shift on the move' features are actuated via a DC transfer box motor, which is controlled by the transfer box control module, via a Pulse Width Modulation (PWM) signal.

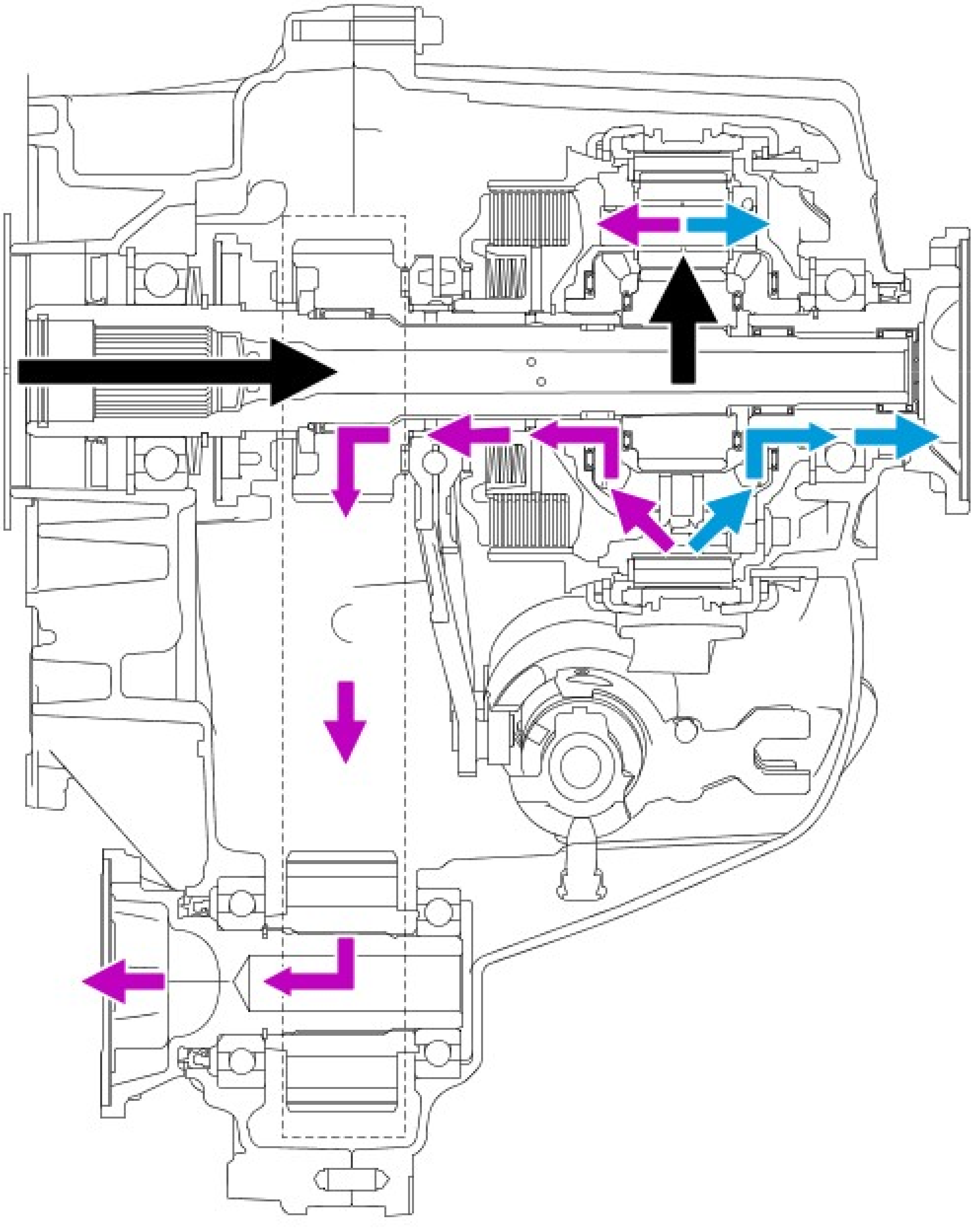
Transfer Box - Sectional View



E49191

Item	Part Number	Description
1	-	Planetary gear set
2	-	Rear output flange
3	-	Centre differential assembly
4	-	Multi-plate clutch
5	-	Transfer box motor module
6	-	Rear housing assembly
7	-	Front output sprocket
8	-	Chain drive
9	-	Front output flange
10	-	Transfer box motor levers
11	-	Sprocket
12	-	Oil pump assembly
13	-	Input shaft
14	-	Front housing assembly

Transfer Box Power Flow



E49192

Input torque from the transmission is transferred to the input shaft of the transfer box and then onto the planetary sun gear and planetary pinion gears. The planetary pinion gears are held in place by the planet pinion shafts, which are connected to the differential carrier, and drive the differential pinion gears. The torque is then distributed to both the front and rear carriers, which are connected to the outputs of the transfer box. The rear carrier is connected directly to the rear output flange; the front carrier is connected to the sprocket and therefore to the chain drive, which provides front output flange rotation.

TRANSFER BOX CASINGS

The front and rear casing assemblies are manufactured from cast aluminium.

Front Casing Assembly

The front casing assembly provides the location for the input shaft bearing, the front output flange bearing and the oil pump. It is also equipped with threaded holes to mount the chassis mounting bush, two lifting eyes and a breather cartridge for the transfer box breather pipe. The breather pipe allows an equalisation between atmospheric and internal transfer box pressure.

Rear Casing Assembly

The rear casing assembly provides the location for the rear output flange bearing, the transfer box motor and the oil fill and drain plug. Fins are cast into the rear casing assembly to improve heat dissipation. The unit number is also stamped into the rear housing.

OIL PUMP

An oil pump assembly is located in the front casing to provide lubrication for the bearings and rotary components through cross-drillings in the input shaft. A flat-sectioned coupling on the input shaft drives the rotor of the pump; the stator is fixed to the front housing assembly. A tube is attached to the pump, which leads into a calm suction area at the bottom of the two casing assemblies. The collector magnet in the suction area of the pump collects any metallic debris.

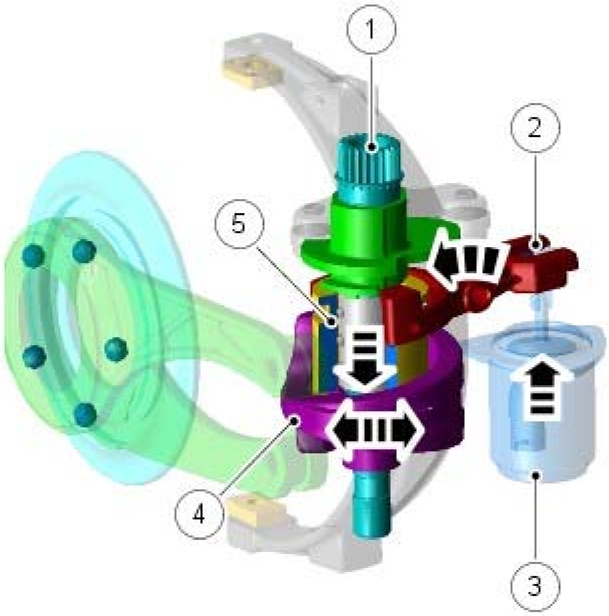
CHAIN DRIVE

The chain-drive transfers drive from the centre differential to the front output flange. A 3/8" pitch chain connects the sprocket on the transfer box input shaft with the sprocket on the front output flange. As both sprockets have the same number of teeth, the rotational speed of both sprockets is identical.

TRANSFER BOX MOTOR

One motor operates both the high/low range change and the differential locking and torque-biasing device (multi-plate clutch). The motor solenoid switches between the two functions, while the motor provides the rotational movement for both operations.

Transfer Box Motor Position For Clutch Control Mode



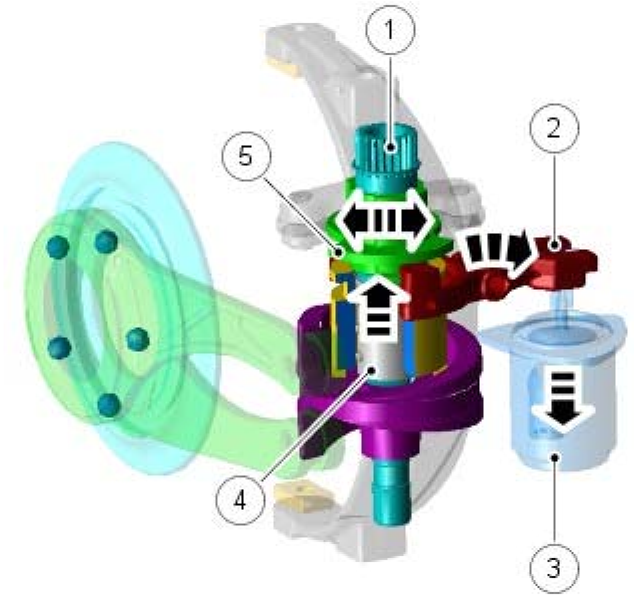
E49193

Item	Part Number	Description
1	-	Motor shaft
2	-	Solenoid shift fork
3	-	Solenoid
4	-	Clutch control disc
5	-	Shifting sleeve

To actuate the multi-plate clutch, the transfer box control module energizes the solenoid (3). The solenoid pin pivots the solenoid shift fork (2), which engages the shifting sleeve (5) into the dogteeth on the clutch control disc (4). The rotational movement of the motor shaft (1) is then linked to the clutch control disc via the shifting sleeve.

This is the normal operating mode of the transfer box. In this position, the range change function is disengaged and mechanically locked.

Transfer Box Motor Position For High/Low Range Mode



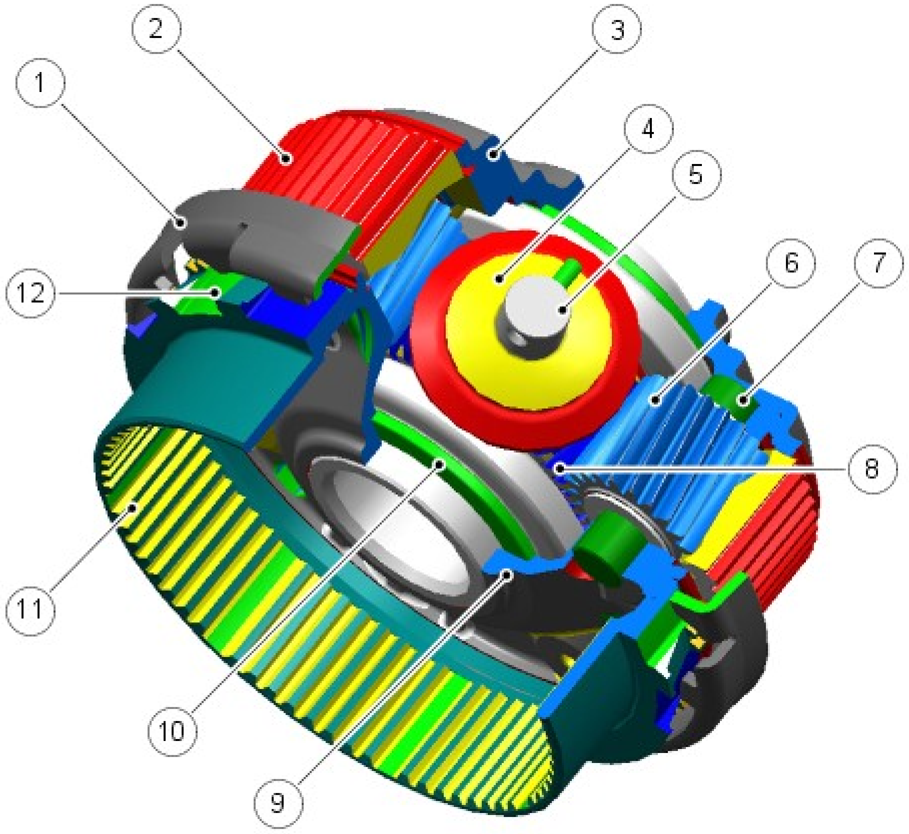
E49194

Item	Part Number	Description
1	-	Motor shaft
2	-	Solenoid shift fork
3	-	Solenoid
4	-	Shifting sleeve
5	-	Actuation cam

To actuate the high/low range change, the transfer box control module de-energizes the solenoid (3). A spring in the solenoid retracts the solenoid pin and rotates the solenoid shift fork (2). This engages the shifting sleeve (4) to the dogteeth on the high/low actuation cam (5). The rotational movement of the motor shaft (1) is then linked to the cam.

In this position, the multi-plate clutch is open, the differential cannot be locked and torque cannot be biased. Once the range change is complete the system returns to clutch control mode. In the event of an electrical failure, the motor will default to this position.

CENTER DIFFERENTIAL ASSEMBLY



E49195

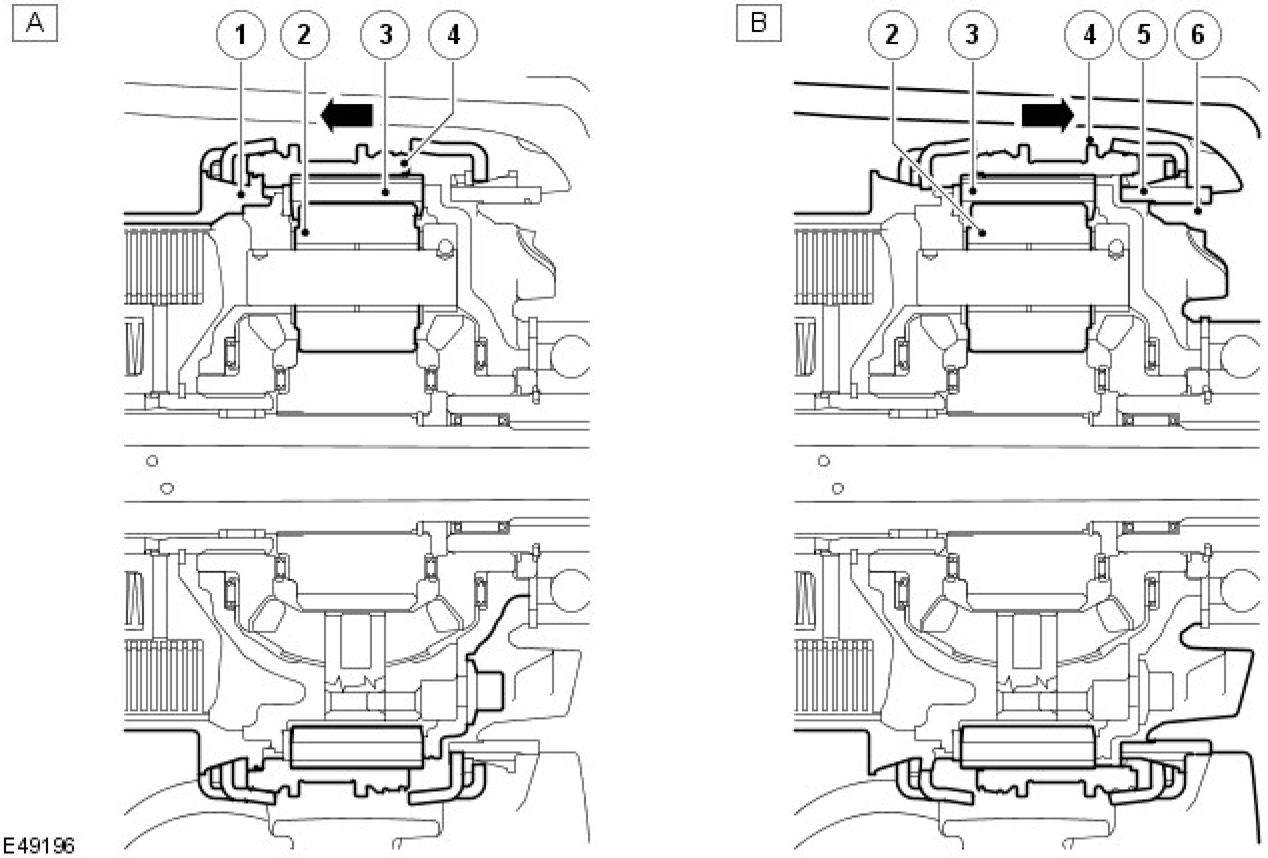
Item	Part Number	Description
1	-	Synchronisation cup and spring
2	-	Planetary ring gear
3	-	Differential carrier
4	-	Pinion gears
5	-	Pinion gear shafts
6	-	Planetary pinion gears
7	-	Planetary pinion gear shafts
8	-	Planetary sun gear
9	-	Differential cover
10	-	Differential side gears
11	-	Multi-plate clutch basket
12	-	Dogteeth

The center differential assembly is the primary feature of the transfer box. Torque is transmitted through the center differential carrier and distributed to the differential gears and the front and rear output flanges. The planetary gear set, for the high/low range change function, is also an integral part of the centre differential assembly.

The assembly comprises 3 differential pinion gears (4) and shafts (5), which are equally spaced within the centre differential carrier (3). The differential shafts have a rigid connection to the differential carrier. Located between the pinion gears are 3 planetary pinion gears (6) and shafts (7). The planetary sun gear (8) and two differential side gears (10) are located in the centre line of the carrier.

The planetary ring gear (2) is supported in both directions by the differential casing and the differential cover (9). The planetary ring gear is connected to a shifting sleeve, which is engaged in either high or low range.

The multi-plate clutch basket (11), which is welded to the differential casing, supports the friction plates, the dogteeth (12) for high range engagement and the synchronisation cup and spring (1) for the 'shift-on-the-move' function.

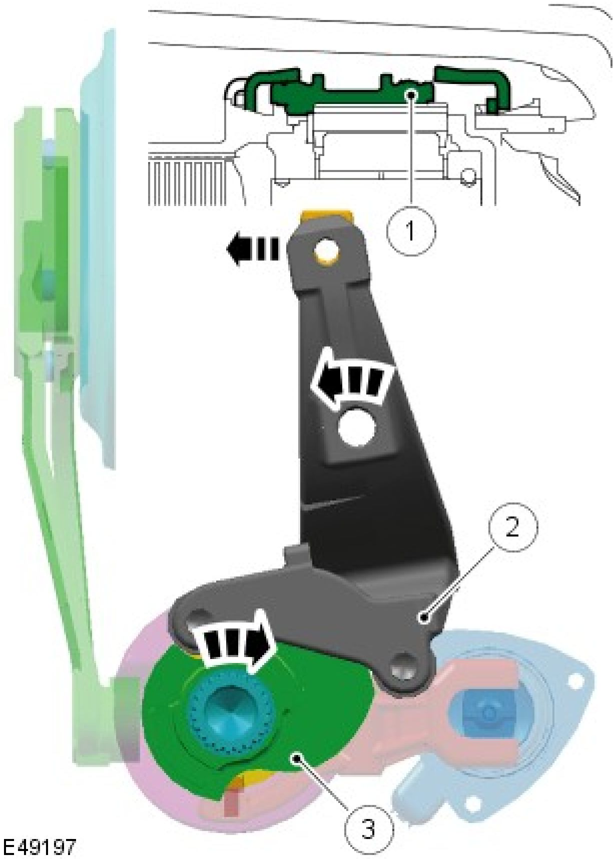


Item	Part Number	Description
A	-	High range position
B	-	Low range position
1	-	Dogteeth
2	-	Planetary pinion gears
3	-	Planetary ring gear
4	-	Shifting sleeve
5	-	Low range dogteeth
6	-	Rear carrier assembly

When high range is engaged, the shifting sleeve (4) connects to the differential carrier via dogteeth (1). The planetary ring gear (3), via the shifting sleeve, and the planetary pinion gears (5), via the planetary shafts, which are also attached to the differential carrier. The planetary gear set rotates as one unit and therefore turns the differential side gear with a 1:1 ratio.

In low range the motor moves the shifting sleeve (4) in the direction of the low range dogteeth (5). The low range dogteeth, with the synchronisation cup and spring, are fixed to the rear carrier assembly (6). When the shifting sleeve is engaged with the low range dogteeth, the planetary ring gear (3), via the shifting sleeve, is stationary and the planetary pinion gears (2), via the planetary bolts, turn the differential side gears with 2.93: 1 ratio.

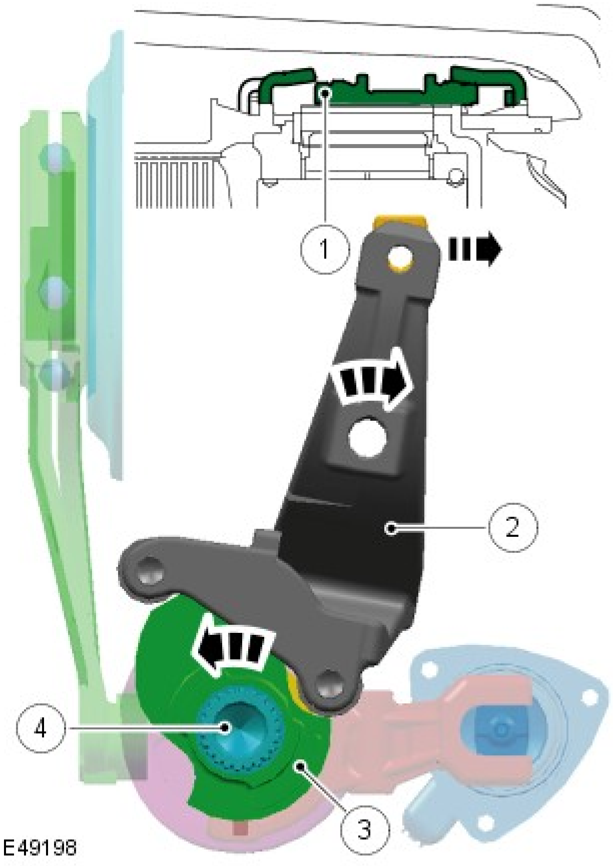
High range actuation sequence



Item	Part Number	Description
1	-	Shifting sleeve
2	-	High/low shifting fork
3	-	Shifting cam

The rotational movement of the motor shaft turns the shifting cam (3) to high range position. The shifting cam then moves the shifting sleeve (1), via the high/low shifting fork (2), into the high range position. After the synchronisation sequence, the planetary ring gear is connected to the high range dogteeth, via the shifting sleeve, on the differential carrier. In this position, the input speed equals the output speed, which equates to a high range ratio of 1:1.

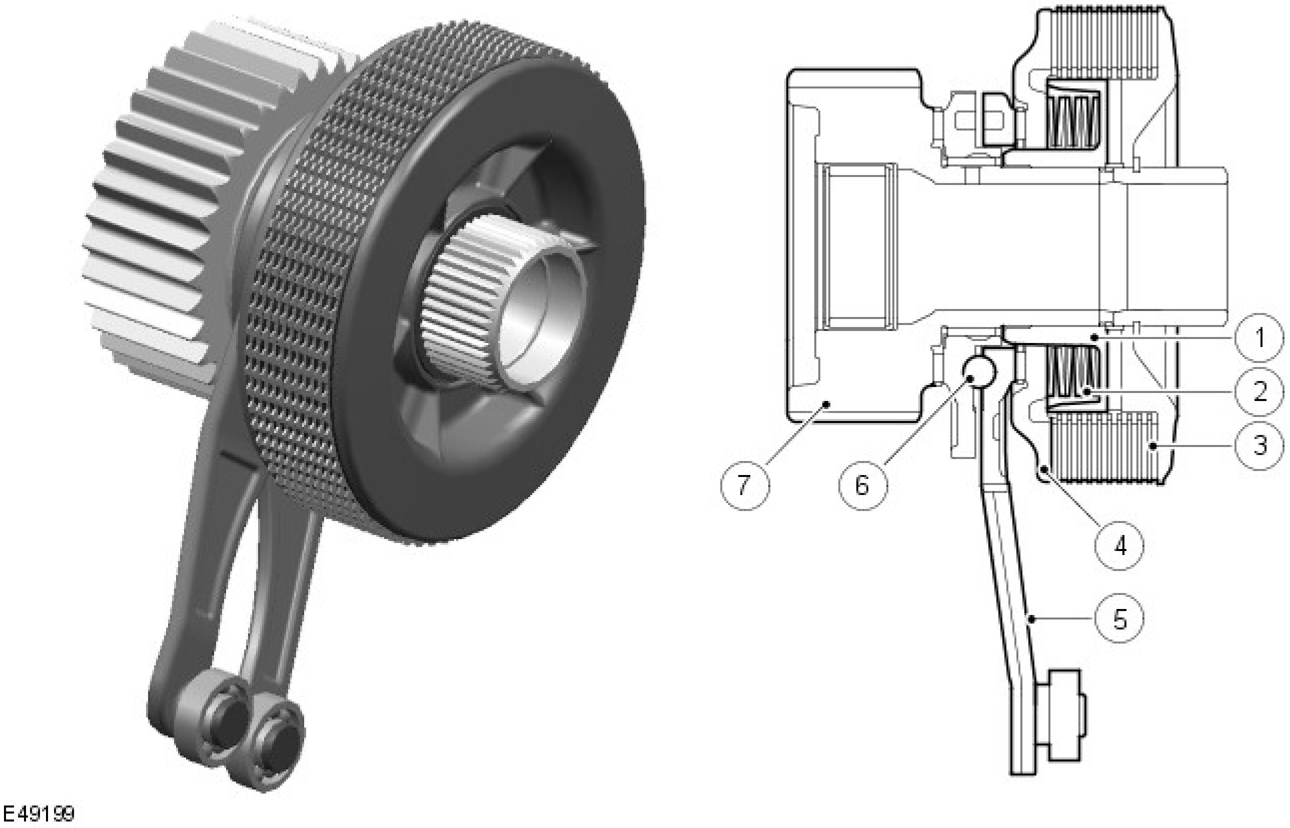
Low range actuation sequence



Item	Part Number	Description
1	-	Shifting sleeve
2	-	High/low shifting fork
3	-	Shifting cam
4	-	Motor shaft

The rotational movement of the motor shaft (4) turns the shifting cam (3) into low range position. The shifting cam then moves the shifting sleeve (1) of the centre differential assembly via the high/low shifting fork (2) into low range position. After the synchronisation sequence, the planetary ring gear is connected to the low range dogteeth, via the shifting sleeve, on the rear carrier assembly. The output speed is then reduced to a ratio of 2.93:1.

MULTI-PLATE CLUTCH ASSEMBLY



Item	Part Number	Description
1	-	Clutch hub
2	-	Cup springs
3	-	Clutch plates
4	-	Clutch piston
5	-	Motor levers
6	-	Ball ramp mechanism
7	-	Sprocket

The multi-plate clutch assembly for both centre and rear differentials act in a similar way. The aim of the multi-plate clutch assembly is to prevent excessive differential slip and therefore maximise the traction performance of the vehicle. This is fundamentally different from the 'braked' traction control, which can only counteract differential slip when it occurs.

A certain amount of differential slip is required to allow the vehicle to turn corners and to remain stable under control of the Anti-lock Braking System (ABS). The transfer box control module monitors the driver's demands through primary vehicle controls and automatically sets the slip torque at the differentials. The system is completely automatic and does not require any special driver input.

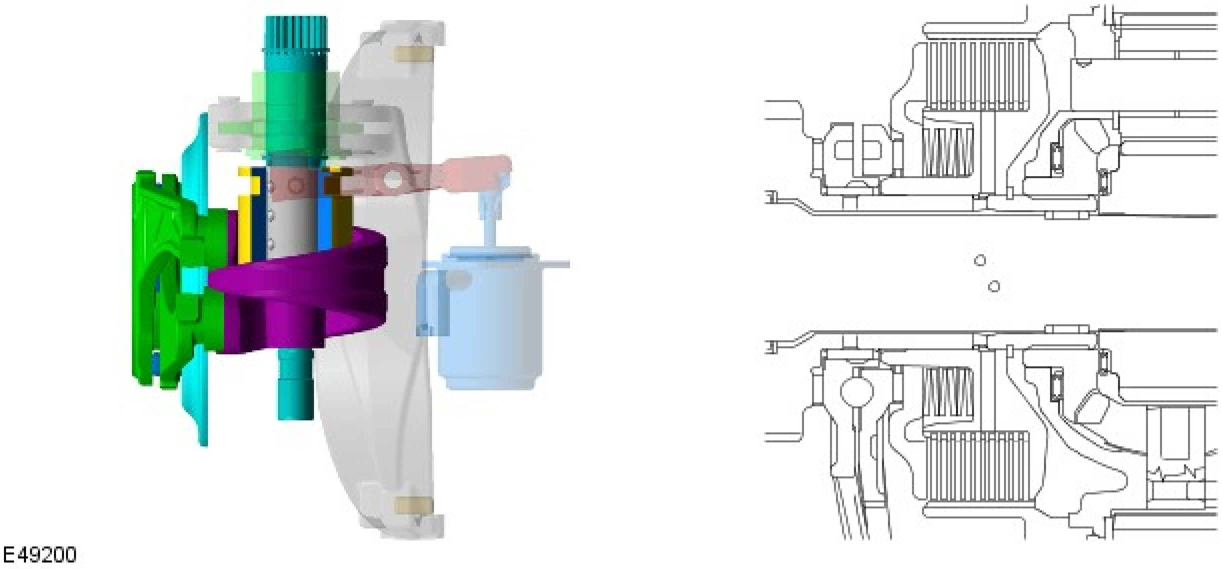
The multi-plate clutch assembly actively controls the torque flow through the centre differential and optimises the torque distribution in the driveline. The clutch assembly biases the torque from the transmission to the axle and wheels with the higher grip and prevents the wheels with the lower grip from spinning.

The multi-plate clutch assembly comprises the sprocket (7), which is connected to the front differential side gear, the motor levers (5) with the ball ramp mechanism (6), the clutch hub (1) as support for the clutch plates (3), the clutch piston (4) to generate friction between the clutch plates, and a pack of cup springs (2) to return the clutch piston into its original position.

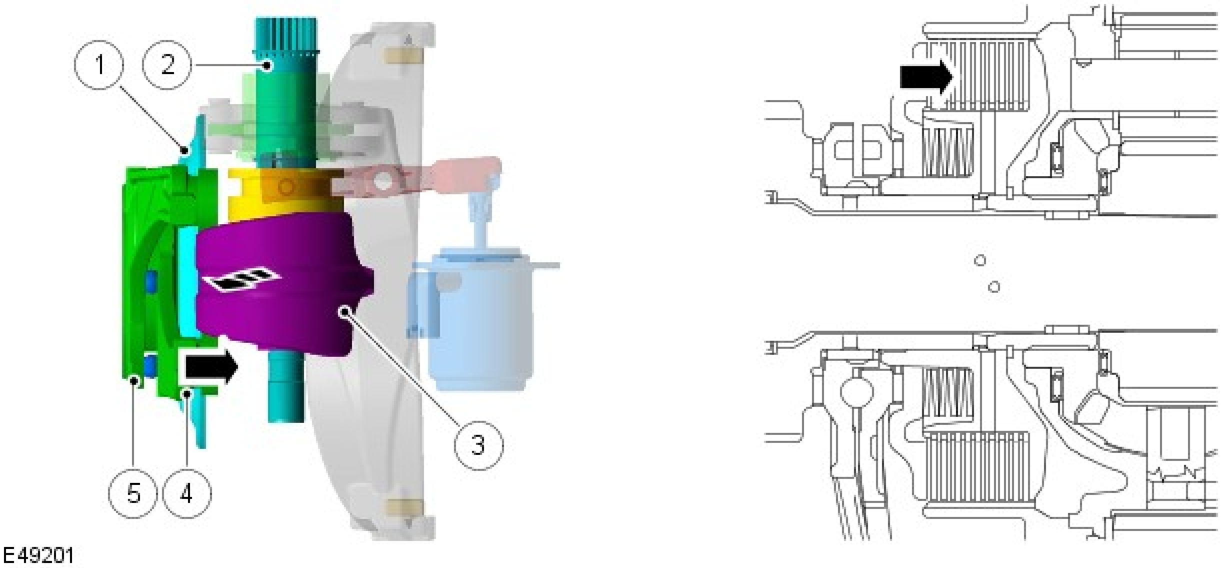
One set of friction plates are connected to the clutch hub; the other set of friction plates are connected to the multi-plate clutch basket, which is welded to the centre differential housing.

Multi-plate Clutch Actuation

Transfer box motor levers in initial position, multi-plate clutch open condition


E49200

Transfer box motor in end position, multi-plate clutch closed condition

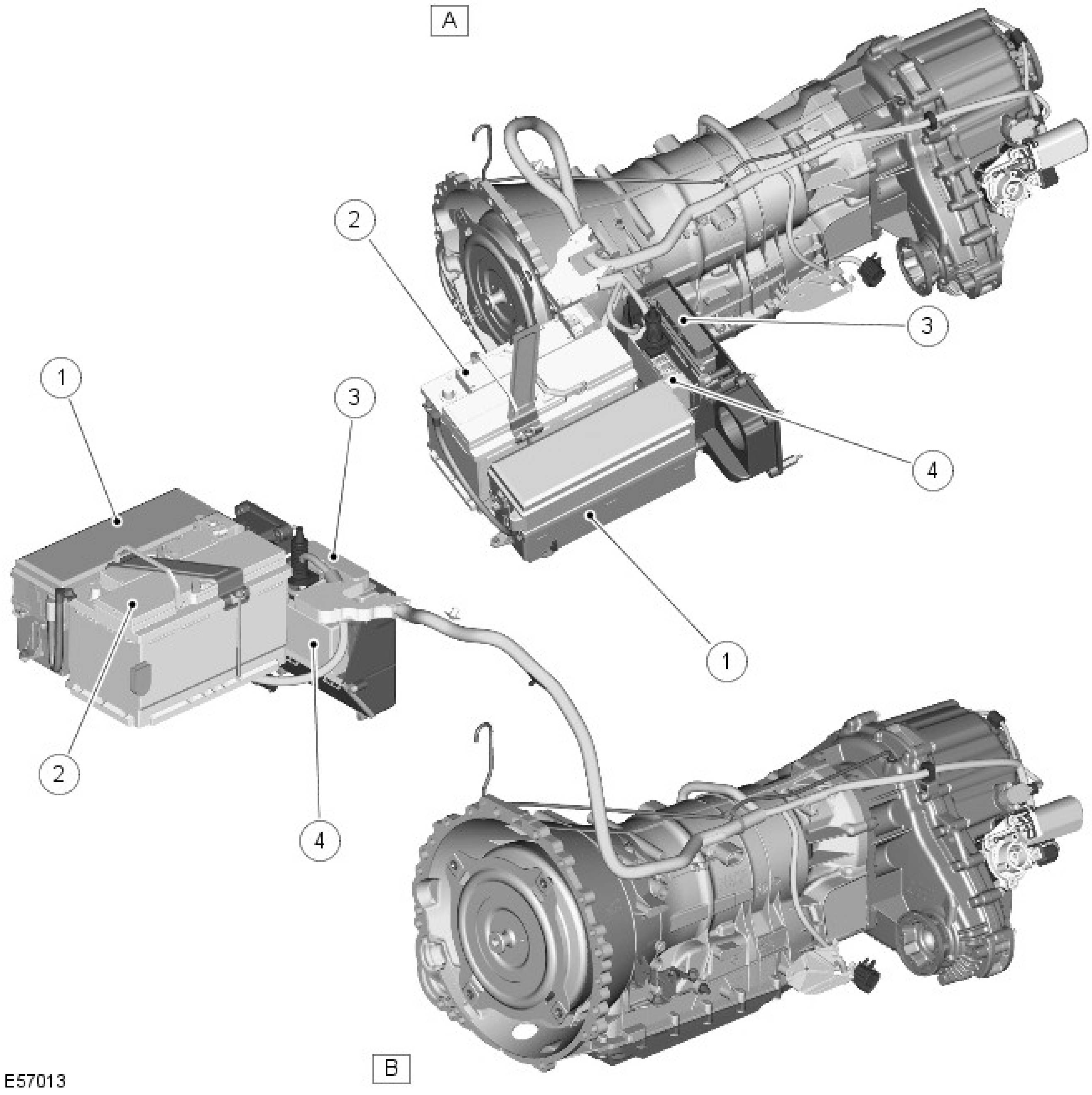

E49201

Item	Part Number	Description
1	-	Clutch piston
2	-	Motor shaft
3	-	Clutch control disc
4	-	Motor levers
5	-	Ramp mechanism balls

By turning the clutch control disc (3), via the motor shaft (2), the motor levers (4) are rotated relative to each other. This relative movement acts on 5 balls (5) in a ramp mechanism between the two levers and give a defined axial movement. The movement forces the clutch piston (1) to induce friction between the plates supported by the clutch hub and the plates supported by the clutch basket on the differential carrier. This frictional force inhibits the differential rotation; the differential carrier and front differential side gear are locked together.

TRANSFER BOX CONTROL MODULE

The transfer box control module controls the high/low 'shift-on-the-move' actuation and the multi-plate clutch actuation. The control module is located in the E-box, next to the Engine Control Module (ECM), behind the battery in the engine compartment. The position of the control module changes with LH and RH drive vehicles.



Item	Part Number	Description
A	-	RH drive
B	-	LH drive
1	-	Battery Junction Box (BJB)
2	-	Battery
3	-	Engine Control Module (ECM)
4	-	Transfer box control module

The control module is connected to the Controller Area Network (CAN) bus and controls transfer box operation using CAN messages from other control modules on the network.

The control module memorises the position of the transfer box motor when the ignition is switched off.

The transfer box control module uses the same actuator to control both range change function and application of centre differential locking torque. The module uses position feed back from the actuator to provide smooth range changing capability and graduated application of locking torque appropriate for the current driving conditions. Range change can be carried out while moving providing the transmission is in neutral and the vehicle is below the speed necessary for the requested range change.

The control module uses three connectors for all inputs and outputs. It receives a permanent power supply via a 30A fusible link located in the Battery Junction Box (BJB), and an ignition supply via fuse 24 in the Central Junction Box (CJB).

The control module uses a series of programmed shift maps to control the synchronisation speed and ensure that a maximum shift time of approximately one second is achieved.

If the control module is replaced, T4 must be connected to the vehicle and the transfer box control module self-calibration procedure must be performed. This procedure must also be performed if the transfer box motor assembly is replaced.

Default/Limp-home Strategy

If a fault occurs with the transfer box, the transfer box control module or one of the required input signals i.e. road speed signal, the control module records an error code and will respond appropriately to provide the highest level of system capability under the specific fault conditions. The following fault states are possible:

Fault state	System response	Driver warning
No reduction in capability	Diagnostic Trouble Code (DTC) will be recorded but no effect on performance	None
Clutch control not possible. Temporary over temperature condition	The tractive capability of the vehicle, off road, is reduced	Driveline over temperature warning lamp or "TRANSMISSION OVERHEAT SLOW DOWN" on message centre
Clutch control not possible. Permanent fault	The tractive capability of the vehicle, off road, is reduced	Driveline fault warning lamp or "TRANSMISSION FAULT TRACTION REDUCED" on message centre
Range change not possible	The system inhibits the driver from making a range change	Driveline fault warning lamp or "TRANSMISSION RANGE CHANGE INOPERATIVE" on message centre
Stuck in Transfer box neutral	The transfer box is stuck between high and low range resulting in no drive to wheels	Flash low range indicator plus "PARK LOCK FAILURE APPLY HAND/PARKBRAKE" message on message centre

If a driveline over temperature condition has occurred, after the driveline has been allowed to cool, clutch control will be re-enabled and the warnings will disappear. There is no need to seek service assistance following an over temperature event.

If clutch control or range change is not possible due to a permanent fault the driver must seek service assistance at the earliest opportunity.

If the system suffers a fault, which causes the transfer box to fail in neutral, the control module is designed to continue attempting to engage the requested range or return to its original range for a fixed number of attempts. If this has not been successful and the low range lamp is still flashing the driver should bring the vehicle to a halt and attempt the range change again while stationary. If this does not work after a number of attempts, key off for 30 seconds, restart engine and request range change again while stationary. The driver must seek service assistance at the earliest opportunity.

Transfer Box Control Module Pin Out Details

Connector C1319

Pin No.	Description	Input/output
1	Not used	-
2	Not used	-
3	CAN bus low	Data (input and output)
4	Range change selection switch - High	Input
5	Range change selection switch - Low	Input
6	CAN bus high	Data (input and output)
7	Key interlock solenoid	Output
8	LED-high	Output
9	LED-low	Output

Connector C1854

Pin No.	Description	Input/output
1	CAN bus low	Data (input and output)
2	Not used	-
3	Ignition power supply	Input
4	CAN bus high	Data (input and output)
5	Ground	-
6	Permanent battery power supply	Input

Connector C1855

Pin No.	Description	Input/output
1	Hall sensor signal-A	Input
2	Ground	-
3	Hall sensors supply	Output
4	Not used	-
5	Temperature sensor	Input
6	Hall sensor signal-B	Input

Pin No.	Description	Input/output
7	Selector position ground	-
8	5V position sensor supply	Output
9	Selector mode solenoid ground	-
10	Selector position sensor signal	Input
11	Not Used	-
12	Selector mode solenoid power supply	Output
13	Not Used	-
14	Not Used	-
15	Motor supply/ground	Input/output
16	Not Used	-
17	Not Used	-
18	Motor supply/ground	Input/output

TRANSFER BOX CONTROL MODULE INPUTS

The transfer box control module receives the following inputs:

- Range change selection switch
- High/low position sensor
- Transfer box actuator motor temperature
- Transfer box actuator motor position sensor
- CAN bus messages.

CAN Bus Messages

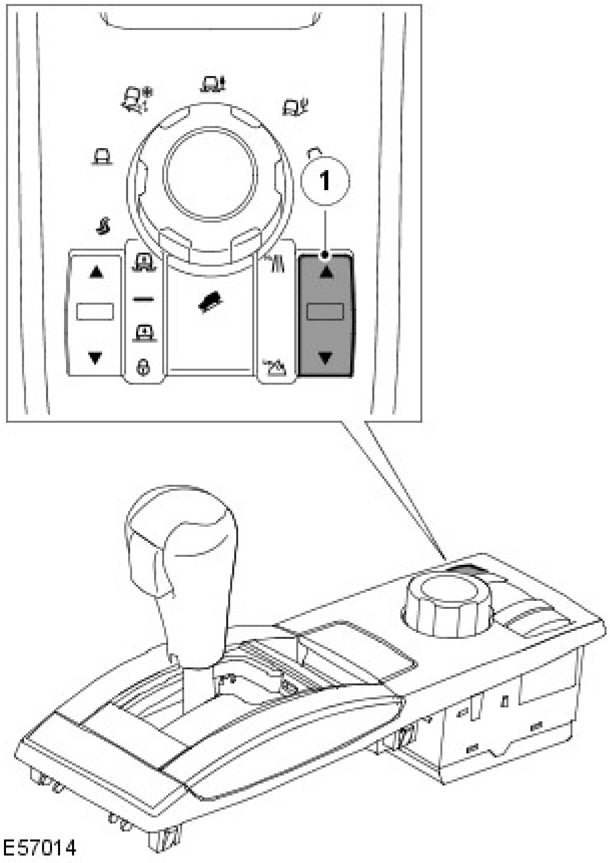
The CAN bus is a high speed broadcast network connected between various vehicle control modules. The CAN network carries an extensive list of messages between the different control modules enabling more sophisticated control with reduced complexity. Data on the network is packaged for efficient communication and prioritised according the urgency and importance of the messages. The bus comprises two wires, which are twisted together to minimise electromagnetic interference (noise) produced by the CAN messages.
For additional information, refer to: Communications Network (418-00 Module Communications Network, Description and Operation).

The transfer box control module is connected on the CAN bus and controls transfer box operation using CAN messages from other control units on the network. Wheel speed, vehicle acceleration, engine torque and speed, gear information, from the transmission, temperature information, car configuration, axle ratios and Terrain Response mode inputs, are some of the main signals received by the control module.

In the event of a CAN bus failure the following symptoms may be observed:

- Shift from high to low or low to high inoperative
- Instrument cluster low range warning lamp inoperative
- Warning messages or lamps displayed in instrument cluster.

Range Change Selection Switch



Item	Part Number	Description
1	-	Range change selection switch

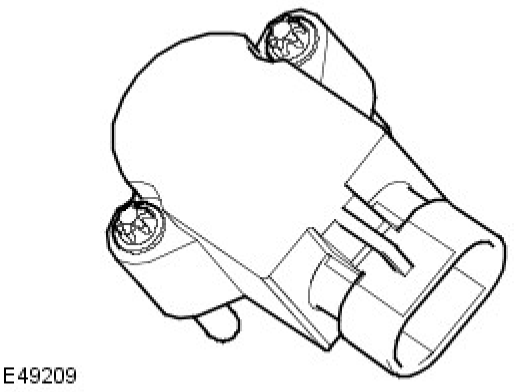
The range change selection switch is located behind the main transmission selection lever, in the centre console. The switch is a 3-position momentary action centre sprung device. The driver pushes the lever forward to select high range and back to select low range.

The switch comprises a housing, which provides the location for a sliding contact. When the switch is moved to the high or low position, it completes a momentary connection to 12V with one of two micro-switches located at each end of the range change selection switch. These micro-switches correspond to the high or low range positions.

The transfer box control module receives this momentary signal and selects the requested range.

In this position, a spring will move the selector lever to the centre position when released.

High/Low Position Sensor



The high/low position sensor converts the pivotal movement of the high/low fork into a PWM signal on the input. The PWM signal of the position sensor differs between high range and low range. The control module checks this signal and informs the driver, via the instrument cluster and the range change selection switch LED's, if a range change is in progress or has been completed.

The high/low position sensor is connected to the transfer box control module via a three-pin connector.

TRANSFER BOX CONTROL MODULE OUTPUTS

The transfer box control module sends the following outputs:

- CAN bus messages
- Key interlock solenoid
- High/low range change LED
- Transfer box motor
- Solenoid.

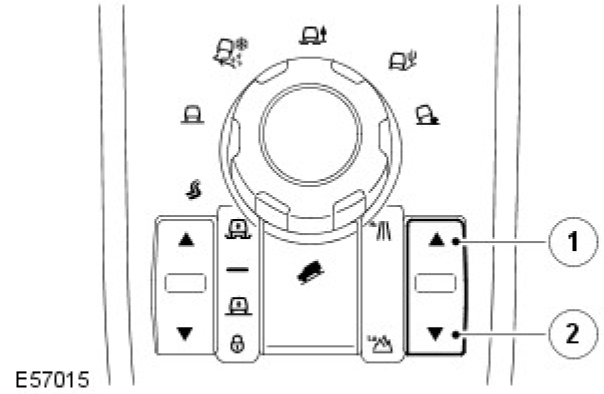
CAN Bus Messages

The control module also sends messages via the CAN bus to tell other control modules on the network, the status of the transfer box. The high/low status, clutch torque and default mode status are some of the main signals sent out by the transfer box control module.

Key Interlock Solenoid

The transfer box control module is able to send a signal to the key interlock solenoid. This signal locks the key in the ignition barrel to prevent it from being removed if the transmission is not in the 'Park' position.

High/Low Range Change LED



Item	Part Number	Description
1	-	High range LED
2	-	Low range LED

The control module is responsible for illuminating the 2 'high/low' range change LED's adjacent to the range change lever. One LED indicates high range and the other indicates low range.

One LED will be on continuously when in the corresponding range.

When changing range, the current range LED will remain on until the new range status has been achieved.

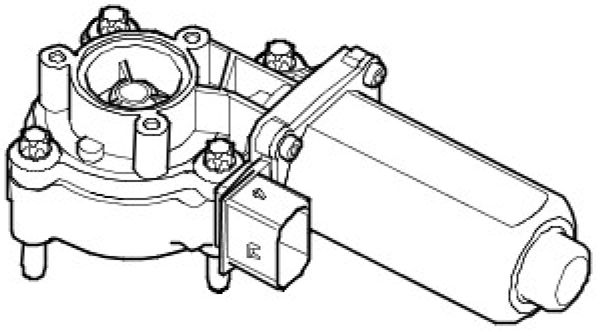
The new range LED will start flashing only when the range change has commenced (i.e. speed and neutral conditions have been met). The new range LED will be illuminated continuously at the same instant that the current range (now the old range) LED turns off.

The flash rate is 2 Hz with a 50% duty cycle.

The LED's have 2 levels of intensity, high when the vehicle lights are switch off and low when they are switched on.

If both lights are flashing at 0.5 Hz, this would indicate a transfer box fault or that the transfer box is in undefined range and may require calibration.

Transfer Box Motor



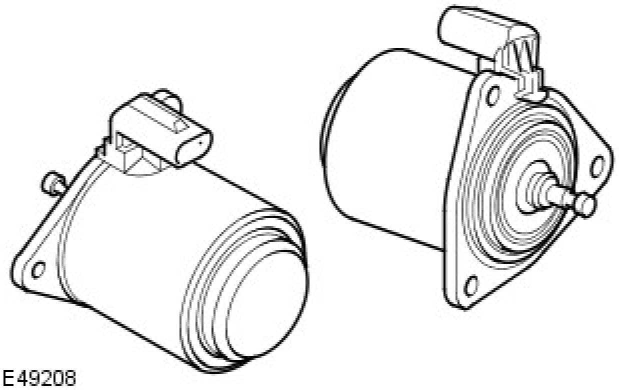
E49207

The transfer box motor provides the necessary movement to perform the high/low range change and the multi-plate clutch actuation. The motor is located on the rear casing assembly and secured with four bolts.

The motor is a PWM controlled, DC motor with an integrated worm gear reduction drive. It is connected to the transfer box control module with an eight-pin connector; the power supply of the motor is maintained through two large diameter cables on the motor connector. An internal position sensor checks the rotational movement of the motor.

There is a temperature sensor located within the motor housing.

Solenoid



E49208

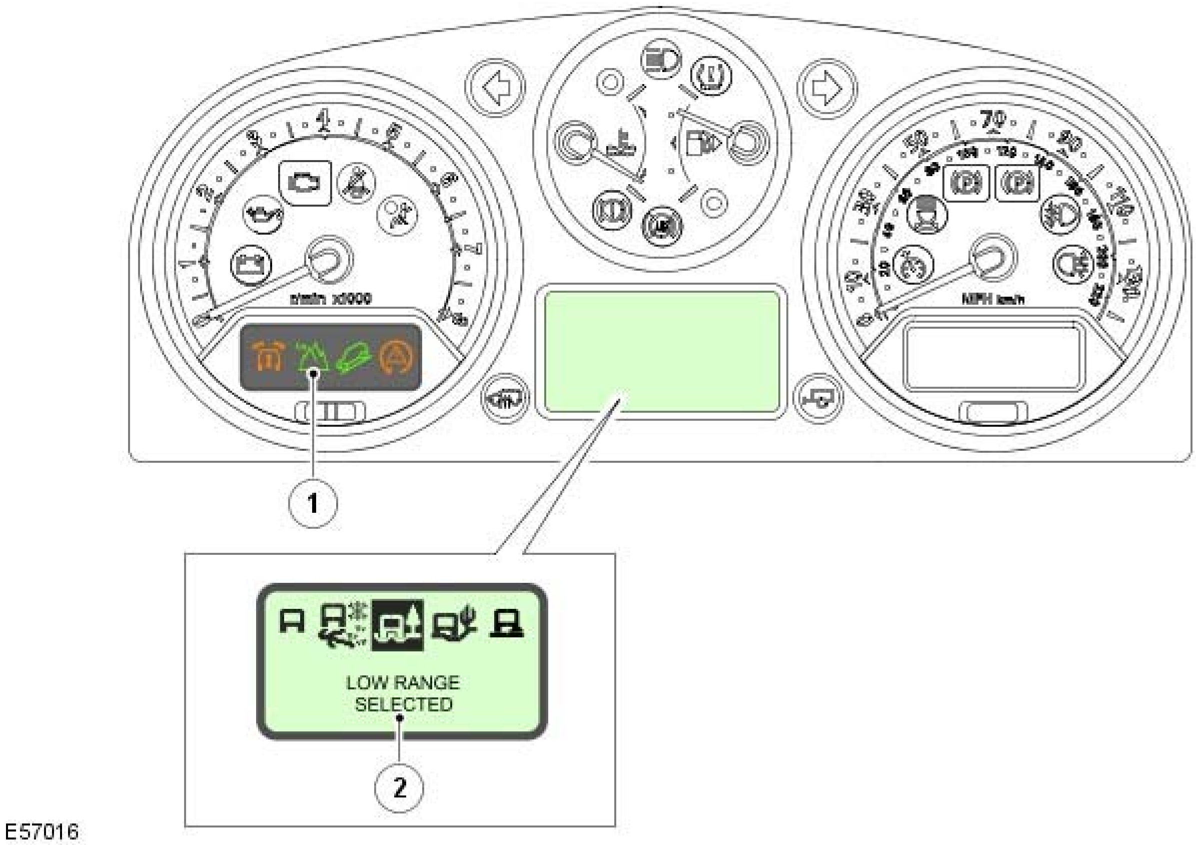
The solenoid switches the power flow on the actuation system between high/low range change mode and clutch control mode. When the solenoid is energized, the solenoid pin deploys and activates the clutch control mode. When the solenoid is de-energized, the internal spring rejects the solenoid pin and activates the high/low range change mode.

- NOTE: In order to replace the solenoid in service, the solenoid must be energized using T4.

The solenoid is connected to the transfer box control module with a two-pin connector.

Status Indication

Instrument Cluster



Item	Part Number	Description
1	-	Low-range status indicator
2	-	Message centre text

The low range status indicator will take the form of a mountain symbol and has the following logic:

- Lamp on = low range
- Lamp off = high range
- Lamp flashing = range change in progress/range undefined/range fault.

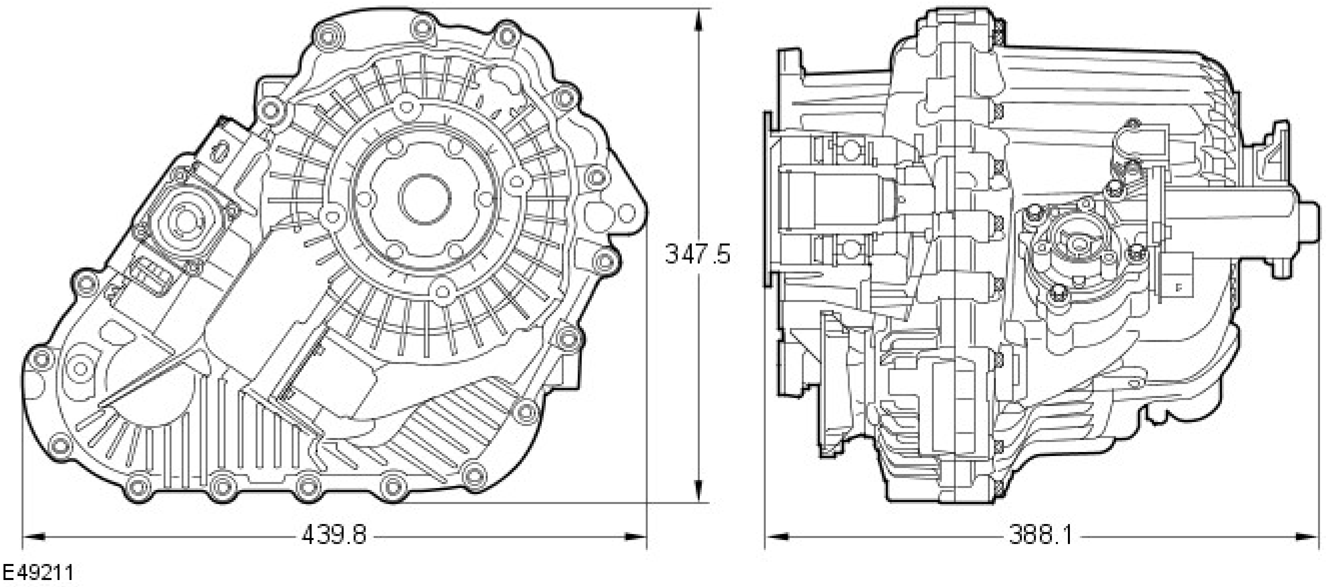
There will also be a message displayed in the message centre, which will inform the driver of any faults with the transfer box.

The following table shows the messages that can be displayed in the message centre relating to the transfer box:

Message	Description	Chime
'LOW RANGE ENGAGED'	Transfer case has engaged low range after a range change request	Single
'HIGH RANGE ENGAGED'	Transfer case has engaged high range after a range change request	Single
'SPEED TOO HIGH FOR RANGE CHANGE'	Range change request when vehicle speed too high	Single
'SELECT NEUTRAL FOR RANGE CHANGE'	Range change request when lever not in neutral	Single
'PARK LOCK FAILURE APPLY HANDBRAKE' (PARKBRAKE US/CAN)	This alerts the driver that the transmission park lock function is inoperative due to transfer box out of high or low range. Transfer box control module has stopped transmitting on the CAN bus during a range change or while in neutral mode and as a result the transmission park lock function is inoperative	One per second for three seconds
'TRANSMISSION RANGE CHANGE INOPERATIVE'	Transfer box has detected a fault inhibiting a new range change. Control unit has shut down due to thermal overload	Single
'TRANSMISSION OVER HEAT SLOW DOWN'	Centre differential temperature is approaching the over heated threshold	Single
'TRANSMISSION FAULT – TRACTION REDUCED'	Centre differential has failed - operating as an open differential	Single
'TRANSMISSION FAULT – TRACTION REDUCED'	Transfer box control module has stopped transmitting on the CAN bus and defaults to open centre differential	Single

SERVICE

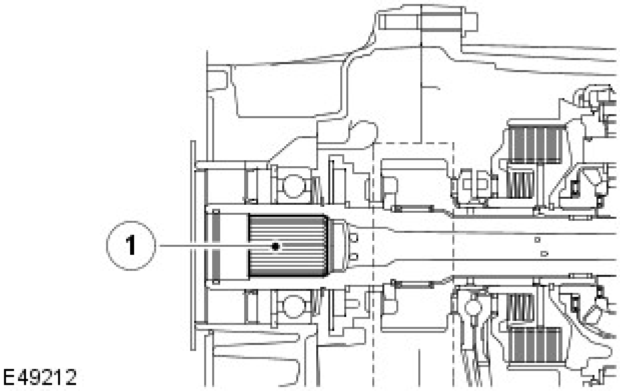
Basic Dimensions (Millimetres)



The transfer box weighs 40.30 kg without oil and 41.55 kg with oil. The unit requires 1500 ml ± 2% of oil from empty (dry).

The oil used in the transfer box is Shell TF 0753, which has been specially developed by Magna Steyr and Shell. The oil contains unique additives, which enhance the transfer box operation. No other oil must be used in the transfer box.

There is a unique type of grease, Weicon anti-seize montagepaste grau TL 7391, that needs to be applied to the units input shaft spline when installing or reinstalling the transfer box.



Item	Part Number	Description
1	-	Input shaft spline

DIAGNOSTICS

The transfer box control module can store fault codes, which can be retrieved using T4 or a diagnostic tool using KW2000* protocol.

The information is communicated via a diagnostic socket.

The diagnostic socket allows the exchange of information between the various control modules on the bus systems and T4 or another suitable diagnostic tool. The information is communicated to the socket via the CAN bus. This allows the retrieval of diagnostic information and programming of certain functions using T4 or another suitable diagnostic tool.

The transfer box control module uses Diagnostic Trouble Codes (DTC), which relate to transfer box electrical faults.

Clutch and Range Change Mechanism Calibration

In order for the range change mechanism to function correctly, the transfer box control module must be calibrated to the mechanical dimensions of the transfer box that it is connected to.

This procedure will need to be followed if one of the following occurs:

- The vehicle is first assembled
- The switch is changed
- The transfer box control module is changed
- The transfer box or range position sensor is changed
- Vehicle or transfer box control module fault has caused the transfer box to revert to an undefined range.

Calibration can be carried out using the service tool or by following this procedure:

- Switch ignition to position II without the engine running
- Select neutral
- Depress the throttle pedal fully
- Press and hold the range change switch for 5 or more seconds to allow calibration to start
- When the calibration is heard to start, the switch and throttle pedal can be released
- Upon adopting high range, start the engine and wait 30 seconds while the first calibration of the clutch in high range is done. While this calibration process is in progress, no shifting is accepted
- Switch ignition off and wait 15 seconds
- Start engine
- Perform a range change to low range. Wait 30 seconds while the first calibration of the clutch in low range is done. While this calibration process is in progress, no shifting is accepted
- Switch ignition off and wait 15 seconds
- Range and clutch calibration is now complete.

SYSTEM OPERATION

The selection of high/low range is achieved by using a switch located behind the main transmission selection lever in the centre console. A range change can only be performed when the transmission selector lever is in neutral (position 'N'). The accelerator pedal must not be depressed when a range change is in progress.

If high or low range is requested and the transmission selector lever is in a position other than 'N' or 'P', the instrument cluster message center will display 'SELECT NEUTRAL'.

• NOTE: If the transmission selector lever is in the 'P' position, the range change will not take place and the 'SELECT NEUTRAL' message will not be displayed in the message centre.

When low range is selected, the low range 'mountain' symbol will flash when the range change is taking place and then remain illuminated when the range change is complete. The instrument cluster message centre will display 'LOW RANGE' for approximately 3 seconds followed by a chime from the instrument cluster to confirm that the range change has been completed. Only 'D' and 'Manual mode' are available, the 'Sport mode' selection is not available.

When high range is selected, the low range 'mountain' symbol will flash when the range change is taking place and then extinguish when the range change is complete. The instrument cluster message centre will display 'HIGH RANGE' for approximately 3 seconds followed by a chime from the instrument cluster to confirm that the range change has been completed.

The design of the transfer box allows range changes when the vehicle is moving, within set limitations as follows:

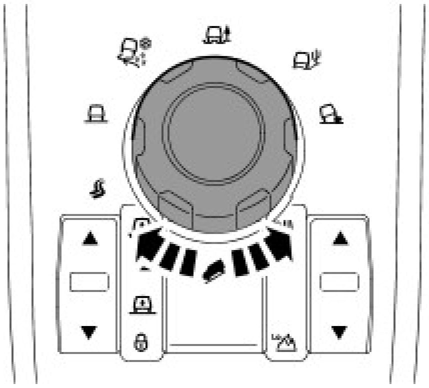
- High to Low – at speeds not exceeding 25 mph (40 km/h)
- Low to High – at speeds not exceeding 37 mph (60 km/h).

If the vehicle speed is higher than the parameters given, the instrument cluster message centre will display 'SLOW DOWN'. When the correct speed range is reached, the message will be deleted and the range change will commence.

The transfer box control module interprets a road speed of less than 2 mph (3 km/h) as a static shift (vehicle not moving). In this instance, the driver must use the shift lock procedure of operating the brake pedal to allow the selector lever to be moved from 'N' to 'D' after the range change has been performed.

High range should be used for all normal road driving and also for off-road driving across dry, level terrain. Low range should only be required where low speed manoeuvring is necessary, such as reversing a trailer, negotiating steep slippery surfaces or boulder-strewn terrain. Low range should also be used for extreme off-road conditions where progress in high range cannot be maintained. Low range should never be used for normal road driving.

Terrain Response



E57017

The Terrain Response system allows the driver to select a program, which will provide the optimum settings for traction and performance for the prevailing terrain conditions.

The system is controlled by a rotary control located on the centre console. The rotary control allows the selection of one of the following five programs:

- Special programs off (general driving conditions)
- Grass/Gravel/Snow
- Mud/Ruts
- Sand
- Rock crawl.

The Terrain Response system uses a combination of vehicle subsystems to achieve the required vehicle characteristics for the terrain selected. The following subsystems form the Terrain Response system:

- Engine management system
- Transmission
- Transfer box
- Rear locking differential (if fitted)
- Brake system
- Air suspension.

Each subsystem control module provides a feedback for the selected program so that the Terrain Response control module can check that all systems are controlling the system correctly.
For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

HIGH RANGE OPERATION

In high range, the torque input from the transmission is passed to the transfer box input shaft. The position of the synchronizer sleeve couples the shaft directly to the differential housing. The differential splits the torque between the two side gears. One side gear is connected by splines and passes the torque to the rear output flange. The second side gear is connected to the chain drive sprocket and passes the torque, via the chain, to the front output flange.

LOW RANGE OPERATION

In low range, the torque input from the transmission is passed to the transfer box input shaft. The synchroniser sleeve is moved and connects the planetary carrier to the differential housing. The torque from the transmission is now directed through the sun gear of the epicyclic gearset and, via the pinion gears and pinion gear shafts, into the planetary carrier. The annulus gear of the epicyclic gearset is secured inside the casing and generates the low range ratio of 2.93:1. The torque is then passed, via the synchroniser sleeve, to the differential housing where it is split between the two side gears. One side gear is connected by splines and passes the torque to the rear output flange. The second side gear is connected to the chain drive sprocket and passes the torque, via the chain, to the front output flange.

HIGH/LOW RANGE GEARS WITH SHIFT-ON-THE-MOVE

The driver is able to change between high and low range gears while the vehicle is moving, or if the vehicle is stationary.

Pushing the range change lever makes a range change requests. This lever is located on the centre console behind and to one side of the main transmission lever.

The driver requests a high to low range change by pushing the range change lever towards the rear of the vehicle and, conversely, a low to high request by pushing the lever towards the front of the vehicle. The range change lever is centre sprung and therefore does not latch in the forward or rear positions.

The driver is informed of the range status via a green lamp (mountain symbol) in the instrument cluster and LED's next to the range change lever. The lamp will not be illuminated in high range, illuminated in low range and flashes during a range change. There are two LED's on the range change lever one for high and one for low. During a range change the new range LED will flash.

The vehicle will remain in the selected range unless the driver requests a change, i.e. it will not automatically revert to high range following a key off/key on sequence.

RANGE CHANGE PROCEDURE

Neutral must be selected on the main transmission before requesting a range change and then select the appropriate gear following completion of the range change. During the range change the main transmission will be locked in neutral.

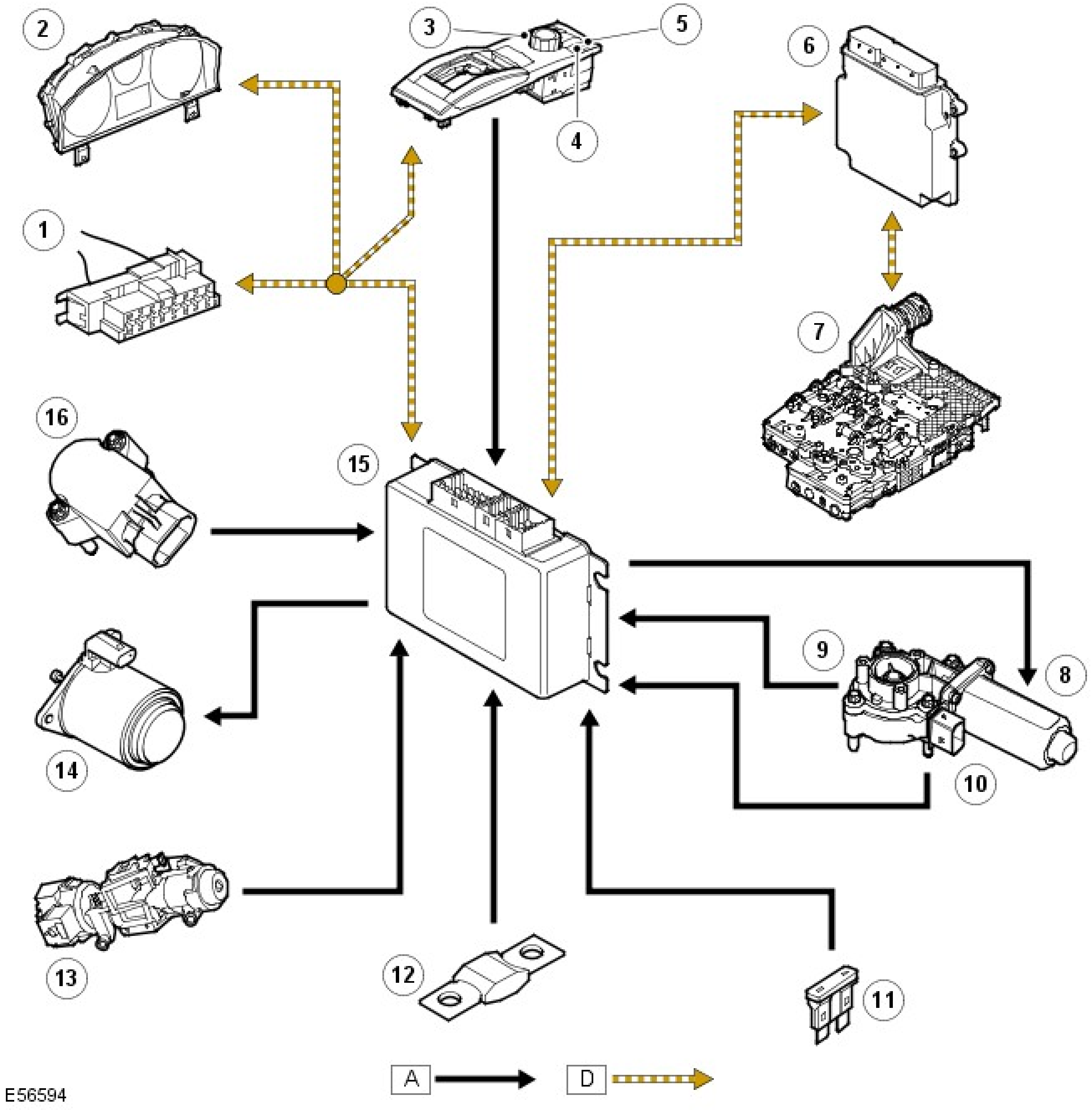
If neutral is not selected when a range change is requested then the request is denied and the driver will be advised to select neutral via the instrument cluster message centre.

The range change process can take up to one second to complete following a request being accepted.

There is a limit set on the maximum speed at which a range change can be achieved. The maximum speed for a high to low range change is 25 mph (40 km/h). The maximum speed for a low to high range change is 37 mph (60 km/h). If the vehicle speed is over the limit when a range change is selected then the request is denied and the instrument cluster message centre will display a 'SLOW DOWN' message.

TRANSFER BOX CONTROL DIAGRAM

- NOTE: A = Hardwired; D = CAN bus



Item	Part Number	Description
1	-	Diagnostic socket
2	-	Instrument cluster
3	-	Terrain Response rotary control
4	-	High/Low range selection switch
5	-	High/Low range LED
6	-	Engine Control Module (ECM)
7	-	Transmission Control Module (TCM)
8	-	Transfer box motor
9	-	Temperature sensor
10	-	Hall sensors (speed and direction)
11	-	Fuse 24 ignition feed
12	-	Fusible link permanent battery feed
13	-	Ignition switch
14	-	Solenoid
15	-	Transfer box control module
16	-	High/low position sensor

Published: 27-Oct-2011

Four-Wheel Drive Systems - Four-Wheel Drive Systems

Diagnosis and Testing

Overview

The DD295 transfer box is a permanent four-wheel-drive unit, with 50/50 torque distribution to the front and rear driveshafts and is identical for all engine derivatives. For additional information, refer to section 308-07 - Four-Wheel Drive Systems in the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Confirm which, if any, warning lights and/or messages were displayed on the instrument cluster. For a list of messages, refer to the relevant section of the workshop manual.
3. **3.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Transfer box ● Oil leaks ● Driveshafts ● Halfshafts ● Constant velocity (CV) joints	● Fuse(s) ● Wiring harness/electrical connectors ● Controller area network (CAN) circuits ● Instrument cluster ● Range change selection switch ● Transfer box control module

4. **4.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. **5.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Message	Possible causes	Action
Loss of drive due to transfer box stuck in neutral and transmission park lock function is inoperative	'PARK LOCK FAILURE APPLY HANDBRAKE'	● Transfer box control module CAN bus - off bus during range change ● Transfer box changeover solenoid fault ● Transfer box motor fault ● Transfer box internal obstruction	Refer to the Network Communications section of the workshop manual.
Loss of drive	-	● Half shaft failure ● Driveshaft failure ● Front or rear axle: differential failure ● Transfer box center differential failure	Check the condition of the driveshafts, half shafts and CV joints.
Range change inhibited	'TRANSMISSION RANGE CHANGE INOPERATIVE'	● Transfer box control module has shut down due to thermal overload ● Transfer box internal obstruction ● Transfer box changeover solenoid fault ● Transfer box motor fault ● Transfer box control module failure	Check for transfer box control module DTCs.
Off road traction reduced	'TRANSMISSION OVER HEAT SLOW DOWN'	● Center differential temperature is approaching the over heated threshold	Check for over-temperature DTCs.

Symptom	Message	Possible causes	Action
	'TRANSMISSION FAULT – TRACTION REDUCED'	• Center differential has failed - operating as an open differential • Transfer box control module has stopped transmitting on the CAN bus and defaults to open center differential	Check for lost communication and bus off DTCs.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

Power latch

There are references to "power latch" within the DTC index. This is where the module must be reset by means of a complete power down and power up.

DTC	Description	Possible Causes	Action
P0560-00	System Voltage - No sub type information	• Power or ground supply circuit fault • Battery or charging system fault	• NOTE: This DTC may be logged due to battery voltage, suspect battery or charging system fault • Check the battery condition and state of charge. Check the battery connections, power and ground cables. Refer to the relevant workshop manual section • Using the manufacturer approved diagnostic system, check other modules, for related diagnostic trouble codes and refer to the relevant diagnostic trouble code index • Clear the DTC and retest • Using the manufacturer approved diagnostic system monitor supply voltage - Datalogger / section 308 manual transmission / transaxle and clutch /control module supply voltage = Pid D111 • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0561-00	System Voltage Unstable - No sub type information	• Battery disconnected and reconnected • Battery connections loose/corroded • Battery ground cable intermittent high resistance • Battery positive cable intermittent: high resistance	• Check the battery condition and state of charge. Check the battery connections, power and ground cables. Refer to the relevant section of the workshop manual • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0562-00	System Voltage Low - No sub type information	• Battery voltage low • Battery ground cable high resistance • Battery connections loose/corroded • Battery current drain	• Check the battery condition and state of charge. Check the battery connections, power and ground cables. Check the ignition power supply circuit connections and wiring. Refer to the relevant workshop manual section • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0563-00	System Voltage High - No sub type information	• Vehicle battery boosted from high voltage starting aid • Battery voltage high • Generator over charge condition	• Check if the vehicle has been jump-started. Check the battery condition and state of charge. Check the battery connections, power and ground cables. Refer to the relevant workshop manual section • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0607-00	Control Module Performance - No sub type information	• Transfer box control module - event information - CPU watch	• Check the transfer box control module circuits and connectors. Refer to the electrical circuit diagrams. Clear the DTC. Cycle the ignition, allow power latch and retest. If the DTC resets, suspect the transfer

DTC	Description	Possible Causes	Action
		dog	box control module. Refer to the warranty policy and procedures manual if a module is suspect
P0634-00	PCM / ECM / TCM Internal Temperature A Too High - No sub type information	● Transfer box motor, driver stage over-temperature deactivation ● Transfer box internal sensor error	● Consider atmospheric and customer driving conditions before carrying out any other action. Refer to the electrical circuit diagrams and check the transfer box control module circuits, especially the transfer box actuator hall effect sensor wiring. Refer to the warranty policy and procedures manual if a module is suspect
P0641-00	Sensor Reference Voltage A Circuit - No sub type information	● Transfer box motor hall effect sensor supply circuit high resistance ● Transfer box motor hall effect sensor ground circuit high resistance ● Transfer box motor hall effect sensor failure ● Transfer box control module failure	● Refer to the electrical circuit diagrams and check the transfer box control module circuits, especially the transfer box actuator hall effect sensor wiring. Refer to the warranty policy and procedures manual if a module is suspect ● Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0642-00	Sensor Reference Voltage A Circuit Low - No sub type information	● Transfer box motor hall effect sensor supply circuit short circuit to ground ● Transfer box motor hall effect sensor supply circuit high resistance ● Transfer box motor hall effect sensor failure ● Transfer box control module failure	● Refer to the electrical circuit diagrams and check the transfer box control module circuits, especially the transfer box actuator hall effect sensor wiring. Refer to the warranty policy and procedures manual if a module is suspect ● Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0643-00	Sensor Reference Voltage A Circuit High - No sub type information	● Transfer box motor hall effect sensor supply circuit short circuit to power ● Transfer box motor hall effect sensor failure ● Transfer box control module failure	● Refer to the electrical circuit diagrams and check the transfer box control module circuits, especially the transfer box actuator hall effect sensor wiring. Refer to the warranty policy and procedures manual if a module is suspect ● Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0652-00	Sensor Reference Voltage B Circuit Low - No sub type information	● Gear shift position sensor supply circuit short circuit to ground ● Gear shift position sensor supply circuit high resistance ● Gear shift position sensor failure	● Refer to the electrical circuit diagrams and check the transfer box control module circuits, especially the transfer box position sensor wiring (manual transmission x-sensor and manual transmission y-sensor). Renew the sensor ● Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0653-00	Sensor Reference Voltage B Circuit High - No sub type information	● Gear shift position sensor supply circuit short circuit to power ● Gear shift position sensor failure	● Refer to the electrical circuit diagrams and check the transfer box control module circuits, especially the transfer box position sensor wiring (manual transmission x-sensor and manual transmission y-sensor). Renew the sensor ● Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0666-00	PCM/ECM/TCM Internal Temperature Sensor 'A' Circuit - No sub type information	● Changeover solenoid, driver stage over-temperature deactivation	● Consider atmospheric and customer driving conditions before carrying out any other action. Refer to the electrical circuit diagrams and check the transfer box mode change solenoid wiring. Check for over-temperature DTCs in other modules
P0698-00	Sensor Reference Voltage C Circuit Low - No sub type information	● Manual transmission output shaft speed sensor circuit short circuit to ground	● Refer to the electrical circuit diagrams and check the transmission circuits, especially the transmission output speed sensor wiring. Renew the sensor

DTC	Description	Possible Causes	Action
		• Manual transmission output shaft speed sensor circuit high resistance • Manual transmission output shaft speed sensor failure	
P0699-00	Sensor Reference Voltage C Circuit High - No sub type information	• Manual transmission output shaft speed sensor circuit short circuit to power • Manual transmission output shaft speed sensor failure	• Refer to the electrical circuit diagrams and check the transmission circuits, especially the transmission output speed sensor wiring. Renew the sensor
P0702-00	Transmission Control System Electrical - No sub type information	• Unexpected reset • Battery short circuit to ground • Generator circuit short circuit to ground • Transfer box control module supply short to ground	• Refer to the electrical circuit diagrams and check for intermittent loss of power or ground of the main power supply circuits to the module. Check the battery connections, power and ground cables. Check the ignition power supply circuit connections and wiring
P0712-00	Transmission Fluid Temperature Sensor 'A' Circuit Low - No sub type information	• Transfer box motor temperature sensor circuit short circuit to ground • Transfer box motor temperature sensor failure	• Refer to the electrical circuit diagrams and check the transfer box motor temperature sensor and circuits • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0713-00	Transfer box Motor Temperature Sensor A Circuit - No sub type information	• Transfer box motor temperature sensor circuit short circuit to power • Transfer box motor temperature sensor circuit high resistance • Transfer box motor temperature sensor failure	• Refer to the electrical circuit diagrams and check the transfer box motor temperature sensor and circuits • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0715-00	Turbine/Input Shaft Speed Sensor A Circuit - no sub type information	• Clutch slip - transmission input and output speeds incorrect for selected gear ratio	• NOTE: This DTC may be induced by the driver • Confirm that the DTC has not been induced by the driving style of the driver (riding the clutch). Refer to the electrical circuit diagrams and check the circuit between gearbox secondary speed sensor and the transfer box control module. Check the gear selector mechanism for correct operation
P0716-00	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - no sub type information	• Clutch slip - transmission input and output speeds incorrect for selected gear ratio	• NOTE: This DTC may be induced by the driver • Confirm that the DTC has not been induced by the driving style of the driver (riding the clutch). Refer to the electrical circuit diagrams and check the circuit between gearbox secondary speed sensor and the transfer box control module. Check the gear selector mechanism for correct operation
P0717-00	Turbine/Input Shaft Speed Sensor A Circuit No Signal - no sub type information	• Clutch slip - transmission input and output speeds incorrect for selected gear ratio	• NOTE: This DTC may be induced by the driver • Confirm that the DTC has not been induced by the driving style of the driver (riding the clutch). Refer to the electrical circuit diagrams and check the circuit between gearbox secondary speed sensor and the transfer box control module. Check the gear selector mechanism for correct operation

DTC	Description	Possible Causes	Action
P0780-00	Shift Malfunction - No sub type information	- Gear shifting blocked (the transfer box motor movement and position does not correspond to the expected values)	- Refer to the electrical circuit diagrams and check transfer box motor wiring and transfer box motor hall effect sensor wiring. Check transfer box motor
P0806-00	Clutch Position Sensor Circuit Range/Performance - No sub type information	- Clutch and range change mechanism calibration failure	- Calibrate the clutch and range change mechanism using the manufacturer approved diagnostic system. If fault is still present check the transfer box wiring, especially the transfer box motor wiring, transfer box motor hall effect sensor wiring and transfer box range position sensor wiring. In box of manual transmission variant also check x-sensor, y-sensor and manual transmission output speed sensor wiring
P0807-00	Clutch Position Sensor Circuit Low - No sub type information	- Transfer box motor hall effect sensor signal circuit short circuit to ground - Transfer box motor hall effect sensor failure	- Refer to the electrical circuit diagrams and check the transfer box circuits, especially the transmission output speed sensor wiring. Repair/renew as necessary
P0808-00	Clutch Position Sensor Circuit High - No sub type information	- Transfer box motor hall effect sensor signal circuit short circuit to power - Transfer box motor hall effect sensor signal circuit high resistance - Transfer box motor hall effect sensor failure	- Refer to the electrical circuit diagrams and check the transfer box circuits, especially the transmission output speed sensor wiring. Repair/renew as necessary - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0820-00	Gear Lever X-Y Position Sensor Circuit - no sub type information	- High force at gear select lever puts sensor outside of boundary parameters - gear ratio not specified - Clutch slip - transmission input and output speeds incorrect for selected gear ratio - Gear position sensor circuit fault - Gear position sensor fault (gear not specified)	• NOTE: This DTC may be induced by the driver - Confirm that the DTC has not been induced by the driving style of the driver (riding the clutch or holding the gear select lever while driving) - Refer to the electrical circuit diagrams and check the circuit between gearbox secondary speed sensor and the transfer box control module - Check the gear selector mechanism for correct operation
P0826-00	Up and Down Switch Circuit - No sub type information	- Transmission High/Low switch activation too long or high and low switches activated at the same time - Transmission High/Low switch pressed for more than 255 seconds - Switch pack harness circuit short circuit to ground, short circuit to power, high resistance - Transmission High/Low switch failure	• NOTE: This DTC may be induced by the driver - Clear the DTC - Check the center console switch pack operation - Clear the DTC and retest - If the DTC returns - Using the manufacturer approved diagnostic system monitor supply voltage - Datalogger / section 308 manual transmission / transaxle and clutch / transfer box control module input status = Pid 1983 - Refer to the electrical circuit diagrams and check the center console switch pack circuit. Repair/renew as necessary - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0900-00	Clutch Actuator Circuit/Open - No sub type information	- Transfer box motor circuit fault - Transfer box motor failure	- Clear the DTC and retest - If the DTC returns - Refer to the electrical circuit diagrams and check the transfer box motor circuit. Repair/renew as necessary - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine

DTC	Description	Possible Causes	Action
P0902-00	Clutch Actuator Circuit - No sub type information	- Transfer box motor circuit short circuit to ground - Transfer box motor circuit high resistance - Transfer box motor failure	- Refer to the electrical circuit diagrams and check the transfer box motor circuit. Repair/renew as necessary - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0903-00	Clutch Actuator Circuit - No sub type information	- Transfer box motor circuit short circuit to power - Transfer box motor failure	- Refer to the electrical circuit diagrams and check the transfer box motor circuit. Repair/renew as necessary - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0915-00	Gear Shift Position Circuit Range/Performance - No sub type information	- Gear shift position sensor circuit fault - Gear shift position sensor failure	- Refer to the electrical circuit diagrams and check the selector position sensor circuit - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0916-00	Gear Shift Position Circuit Low - No sub type information	- Gear shift position sensor circuit short circuit to ground - Gear shift position sensor failure	- Refer to the electrical circuit diagrams and check the selector position sensor circuit - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P0917-00	Gear Shift Position Circuit High - No sub type information	- Gear shift position sensor circuit short circuit to power - Gear shift position sensor failure	- Refer to the electrical circuit diagrams and check the selector position sensor circuit - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P173A-00	Clutch Actuator Position Sensor Circuit Range/Performance - No sub type information	- Clutch Actuator position sensor - A - circuit fault - Clutch Actuator position sensor - B - circuit fault - Clutch Actuator position sensor failure - Transfer box internal failure	- Refer to the electrical circuit diagrams and check the transfer box motor hall effect sensor - **A** - and - **B** - circuits for short circuit to ground, short circuit to power, open circuit, high resistance, short circuit to another circuit - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P173B-00	Clutch Actuator Position Sensor Circuit Low - No sub type information	- Transfer box motor hall effect sensor signal circuit short circuit to ground - Transfer box motor hall effect sensor signal circuit high resistance - Transfer box motor hall effect sensor failure	- Refer to the electrical circuit diagrams and check the transfer box motor hall effect sensor circuit - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P173C-00	Clutch Actuator Position Sensor Circuit High - No sub type information	- Transfer box motor hall effect sensor signal circuit short circuit to power - Transfer box motor hall effect sensor signal circuit high resistance - Transfer box motor hall effect sensor failure	- Refer to the electrical circuit diagrams and check the transfer box motor hall effect sensor circuit - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P173E-00	Ignition Key Lock Solenoid Circuit Low - No sub type information	- Key-lock solenoid circuit short circuit to ground - Key-lock solenoid circuit high resistance - Key-lock solenoid failure	- Using the manufacturer approved diagnostic system carry out the guided diagnostic routine - Refer to the electrical guides and check the Key-lock solenoid circuit
P173F-00	Ignition Key Lock Solenoid Circuit High - No sub type information	- Key-lock solenoid circuit short circuit to power - Key-lock solenoid failure	- Using the manufacturer approved diagnostic system carry out the guided diagnostic routine - Refer to the electrical guides and check the key-lock solenoid circuit

DTC	Description	Possible Causes	Action
P174A-00	Gear Lever X Position Sensor Circuit Low - no sub type information	• Gearbox X position sensor circuit fault • Gearbox position sensor internal failure	• Refer to the electrical circuit diagrams and check the gearbox position sensor circuit for fault
P174B-00	Gear Lever X Position Sensor Circuit High - no sub type information	• Gearbox X position sensor circuit fault • Gearbox position sensor internal failure	• Refer to the electrical circuit diagrams and check the gearbox position sensor circuit for fault
P174C-00	Gear Lever Y Position Sensor Circuit Low - no sub type information	• Gearbox Y position sensor circuit fault • Gearbox position sensor internal failure	• Refer to the electrical circuit diagrams and check the gearbox position sensor circuit for fault
P174D-00	Gear Lever Y Position Sensor Circuit High - no sub type information	• Gearbox X position sensor circuit fault • Gearbox position sensor internal failure	• Refer to the electrical circuit diagrams and check the gearbox position sensor circuit for fault
P1806-00	4-Wheel Drive High Indicator Short Circuit To Battery - No sub type information	• LED circuit short circuit to power • Switch pack LED failure	• Refer to the electrical circuit diagrams and check the LED circuit • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P1807-00	4-Wheel Drive High Indicator Short Circuit To Ground - No sub type information	• LED circuit short circuit to ground • LED circuit high resistance • Switch pack LED failure • Transfer box control module failure	• Refer to the electrical guides and check the LED circuit • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P1808-00	4-Wheel Drive Low Indicator Circuit failure- No sub type information	• LED circuit short circuit to power • Switch pack LED failure	• Refer to the electrical circuit diagrams and check the LED circuit • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P1810-00	4-Wheel Drive Low Indicator Short Circuit To Power - No sub type information	• LED circuit short circuit to power • Switch pack LED failure	• Refer to the electrical circuit diagrams and check the LED circuit
P181B-00	Clutch Actuator Changeover Solenoid Low - no sub type information	• Clutch actuator changeover solenoid circuit short circuit to ground • Clutch actuator changeover solenoid circuit high resistance • Clutch actuator changeover solenoid failure	• Refer to the electrical circuit diagrams and check the transfer box mode selector solenoid circuit • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P181C-00	Clutch Actuator Changeover Solenoid High - No sub type information	• Clutch actuator changeover solenoid circuit short circuit to power • Clutch actuator changeover solenoid failure	• Refer to the electrical circuit diagrams and check the transfer box mode selector solenoid circuit • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
P181D-00	Clutch Actuator Changeover Solenoid Range/Performance - No sub type information	• Mode selector solenoid circuit short circuit to ground or power • Mode selector solenoid hall effect sensor circuit short circuit to ground or power • Mode selector solenoid	• NOTE: Check for DTC P0916-00 if logged investigate first • Refer to the electrical circuit diagrams and check the mode selector solenoid circuit. Repair/renew as necessary • Using the manufacturer approved diagnostic system carry out the guided diagnostic routine

DTC	Description	Possible Causes	Action
		failure	
P181E-00	Clutch Actuator Range/Performance - No sub type information	- Transfer box motor current plausibility error - Transfer box motor wiring circuit short to ground or power - Transfer box motor hall effect sensor wiring circuit short to ground or power - Transfer box motor or solenoid failure	- Refer to the electrical circuit diagrams and check the transfer box motor wiring and transfer box motor hall effect sensor wiring. Check the transfer box motor and transfer box mode selector solenoid
P181F-00	Clutch Control System Performance - No sub type information	- Transfer box motor wiring circuit fault - Transfer box motor hall effect sensor circuit fault - Transfer box motor or solenoid failure	• NOTE: Check for DTC P0900, P0902, P0903 if logged investigate first - Refer to the electrical circuit diagrams and check the transfer box motor wiring and transfer box motor hall effect sensor wiring. Check the transfer box motor and transfer box mode selector solenoid
P183A-00	Range Change Mechanism failure- No sub type information	- Transfer box input and output speed do not change as necessary for a range change - Synchronizer lock defect	- Refer to the electrical circuit diagrams and check the transfer box motor wiring and transfer box motor hall effect sensor wiring. Check the transfer box motor
P186D-00	Clutch Actuator Stuck - No sub type information	- Power or ground supply circuit fault - Transfer box motor fault - Transfer box internal fault	- Clear the DTC and retest - Refer to the electrical circuit diagrams and check the transfer box motor wiring and transfer box motor hall effect sensor circuit - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine - Using the manufacturer approved diagnostic system check and install latest relevant level of software to the transfer box control module
P2711-00	Unexpected Mechanical Gear Disengagement - no sub type information	- Transfer box motor control circuit fault - Transfer box motor internal fault	- Refer to the electrical circuit diagrams and check the control circuit between the transfer box control module and the transfer box motor for fault. Check the operation of the transfer box motor
P2785-00	Clutch Actuator Temperature Too High - No sub type information	- Actuator internal temperature sensor value above 150°C - Extensive prolonged off-road use - Insufficient oil quantity - Incorrect oil specification - Internal Differential problem	- Confirm the customer complaint and vehicle usage at the time of DTC event. Check the operation of the rear differential. Check the rear differential oil quantity, specification and for signs of over-heating. Refer to the relevant section of the workshop manual. If necessary, allow the differential to cool, renew the oil, clear the DTC and retest. If the problem persists, renew the rear differential assembly. Refer to the warranty policy and procedures manual if a differential is suspect
P2787-00	Clutch Temperature Too High - No sub type information	- Event information - Clutch plate high temperature reached	- This DTC is for information only, consider the customer usage conditions that may have logged this DTC (i.e. prolonged off-road use). Clear/ignore this DTC
P2789-00	Clutch Adaptive Learning at Limit - No sub type information	- Clutch not calibrated - Error occurred during clutch calibration	- Check the clutch condition. Calibrate as necessary using the manufacturer approved diagnostic system. If fault is still present check transfer box wiring. Especially check transfer box motor wiring and transfer box motor hall effect sensor wiring
P2806-00	Transmission Range Sensor Alignment - no sub type information	- Gear position select X Y sensor (gearbox position sensor) not calibrated	- Using the manufacturer approved diagnostic system carry out the routine (Setup and calibration / transfer box / X Y sensor replacement) then carry

DTC	Description	Possible Causes	Action
		- Clutch position not calibrated	out the routine (Setup and calibration / parking brake / clutch sensor calibration routine). Clear the DTC and retest if the DTC returns suspect the transfer box control module. Refer to the warranty policy and procedures manual if a module/component is suspect
U0073-88	Control Module Communication - Bus "A" Off	- Bus off: Traction control module (TCCM) - Bus off: Body control module (BCM) - Bus off: Park aid module (PAM). - Bus off: Electric parking brake module (EPB) - Bus off: Dynamic suspension module	- Using the manufacturer approved diagnostic system carry out the guided diagnostic routine - Check the control module installation/configuration. Refer to the lost communication statement at the start of the Network Communications section in the workshop manual
U0100-87	Lost Communication With ECM/PCM "A" - Missing message	- CAN Link transfer box control module/ECM missing message	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the engine control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0101-87	Lost Communication with TCM - No sub type information	- Power or ground circuit fault - CAN Bus circuit fault	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the transmission control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0104-86	Lost Communication With Cruise Control Module - signal invalid	- Invalid signal from the TCCM - ACC timed out, signal out of range or signal invalid	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the cruise control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0122-87	Lost communication with vehicle dynamics control module - Missing message	- CAN Link transfer box control module/ABS module missing message	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the vehicle dynamics module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0126-87	Lost communication with steering angle sensor module (SASM) - Missing message	- CAN bus fault - SASM disconnected - SASM not configured/calibrated - SASM failure	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the steering angle module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine

DTC	Description	Possible Causes	Action
U0128-87	Lost communication with park brake control module - Missing message	- CAN bus fault - Park brake module disconnected - Park brake module not configured - Park brake module failure	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the park brake control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0132-86	Lost Communication With Suspension Control Module "A" - Signal invalid	- Air suspension timed out, signal out of range or signal invalid	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the all suspension control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0136-87	Lost Communication With Differential Control Module - Rear - Missing message	- CAN Link transfer box control module/electronic rear differential control module missing message - CAN bus fault - ATCM disconnected - ATCM not configured - ATCM failure - Harness/connector issue	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the differential control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0138-86	Lost Communication with All Terrain Control Module - Signal invalid	- CAN Link transfer box control module/terrain response control module signal invalid - CAN bus fault - ATCM disconnected - ATCM not configured - ATCM failure - Harness/connector issue	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the all terrain control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U0155-87	Lost Communication With Instrument Panel Cluster (IPC) Control Module - Missing message	- CAN Link transfer box control module/instrument cluster missing message - CAN bus fault - IPC disconnected - IPC not configured - IPC failure - Harness/connector issue	- Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the instrument panel cluster (IPC) control module and transfer box control module - Using the manufacturer approved diagnostic system carry out the guided diagnostic routine
U1A03-87	Car Config Parameter - Missing message	- Lost communication with the BCM/RCM - Missing message - Car configuration not received	- Configure the module using the approved diagnostic system. Refer to the lost communication statement in the Network Communications section in the workshop manual
U1A35-4A	Lost Communication With Differential Control Module - Front - Incorrect component installed - VIN data	- VIN Data mismatch - Lost communication with differential control module - front - incorrect component installed	- Replace the original control module or configure the module using the approved diagnostic system. Refer to the Network Communications section in the workshop manual
U3003-62	Battery Voltage - Signal compare failure	- Signal compare failure	- Check the battery condition and state of charge. Check the battery connections, power and ground cables. Refer to the relevant section of the workshop manual

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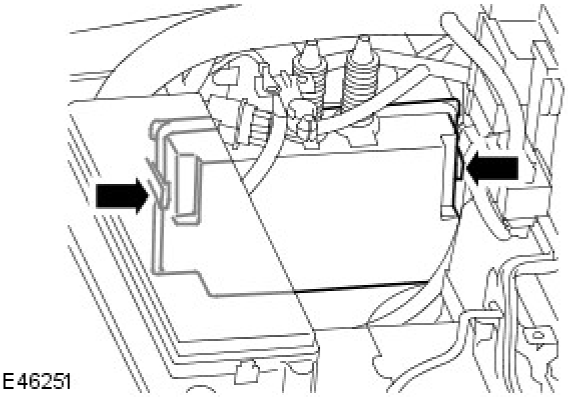
Four-Wheel Drive Systems - Four-Wheel Drive (4WD) Control Module

Removal and Installation

Removal

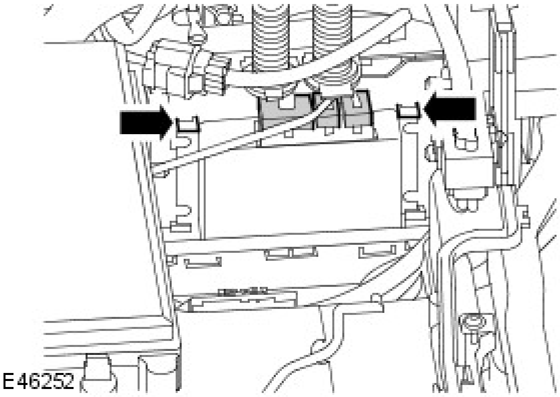
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the battery.
For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).



3. Remove the four wheel drive control module cover.

- Depress the 2 clips.
- Release the cover.



4. Release and remove the four wheel drive control module.

- Depress the 2 clips.
- Disconnect the 3 electrical connectors.

Installation

1. To install, reverse the removal procedure.

2. Program a new control module using T4.

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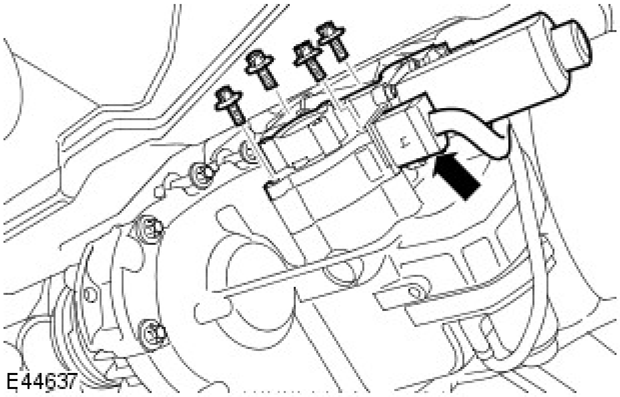
Four-Wheel Drive Systems - Transfer Case Shift Motor

Removal and Installation

Removal



1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. ⚠ CAUTION: To avoid damage to the joints or gaiters, do not allow the transmission to hang on the driveshafts.

   Remove the shift motor.

   - Lower the rear of the transmission for access.
   - Disconnect the electrical connector.
   - Remove the 4 Torx bolts.

Installation

1. Install the shift motor.
   - Clean the components.
   - Tighten the Torx bolts to 25 Nm (18 lb.ft).
   - Connect the electrical connector.

2. Install the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. Use T4 to re-calibrate a new transfer case shift motor.

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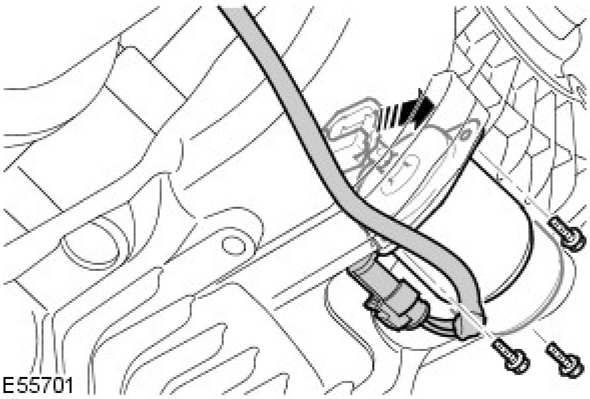
Four-Wheel Drive Systems - Transfer Case Clutch Solenoid

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. ⚠ CAUTION: Connect T4, prior to removal of the solenoid.

• NOTE: Some fluid spillage is inevitable during this operation.

Remove the transfer case clutch control solenoid.

- Position a container to collect the fluid spillage.
- Remove the 3 Torx screws.
- Use T4 to energise the solenoid.
- Detach from the selector lever.
- Disconnect the electrical connector.

Installation

1. ⚠ CAUTION: Make sure the seal is installed correctly.

Install the transfer case clutch control solenoid.

- Clean the components.
- Connect the electrical connector.
- Use T4 to energise the solenoid.
- Install to the selector lever.
- Tighten the Torx screws to 10 Nm (7 lb.ft).

2. Check and top-up the transfer case fluid level.

3. Using T4, calibrate a new transfer case control solenoid.

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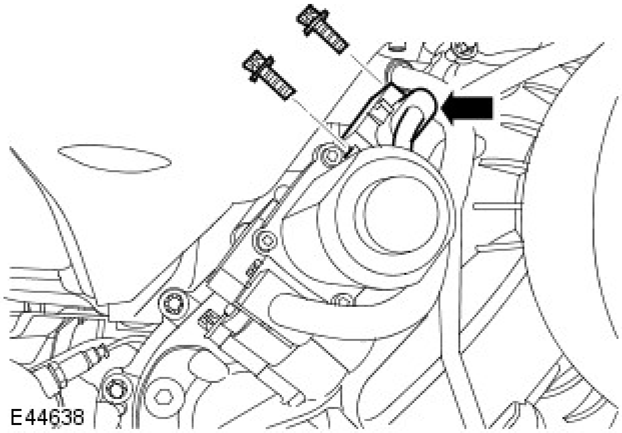
Four-Wheel Drive Systems - High/Low Range Sensor

Removal and Installation

Removal



1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. ⚠ CAUTION: To avoid damage to the joints or gaiters, do not allow the transmission to hang on the driveshafts.

Remove the mode sensor.

- Lower the rear of the transmission for access.
- Disconnect the electrical connector.
- Remove the 2 Torx bolts.

Installation

1. To install, reverse the removal procedure.

- Clean the components.
- Tighten the Torx bolts to 10 Nm (7 lb.ft).

2. Install the crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. Use T4 to re-calibrate a new mode sensor.

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Transfer Case -

Sealers and Lubricants

Item	Specification
* Recommended oil	Shell TF 0753
Capacity - Wet and dry fill	1.5 litres, (2.6 pints) (1.5 US quarts)
Input shaft splines grease	Weicon TL7391
Sealant	STC 50550 or Loctite 5900

*** CAUTION:** Do not use any lubricant other than that specified

General Specification

Item	Specification
Make	Magna Steyr
Model	DD295
Type	Two speed, permanent four wheel drive transfer case having synchronised shift on the move facility with an actively controlled wet clutch and 50/50 torque split across the centre differential
Clutch type	Wet, multi-plate
Maximum torque capacity	2500 Nm (1842.5 lb-ft)
Ratios:	
High	1:1
Low	2.93:1
Maximum shift speeds:	
High to low ratio	40 km/h (24.8 mph)
Low to high ratio	60 km/h (37.2 mph)

Torque Specifications

Description	Nm	lb-ft
Transfer case fluid drain plug	22	16
Transfer case fluid level/filler plug	22	16
Fuel tank heat shield nuts/bolts	10	7
Drive shaft Torx screws	55	40
Drive shaft centre bearing bolts	30	22
Transmission support insulator	60	44
Wiring harness securing bolts	10	7
Fuel line support bracket bolts	10	7
Transfer case retaining bolts	45	33

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Transfer Case - Transfer Case

Description and Operation

For additional information, refer to: Four-Wheel Drive Systems (308-07A Four-Wheel Drive Systems, Description and Operation).

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Transfer Case - Transfer Case

Diagnosis and Testing

For additional information, refer to section 308-07 - Four Wheel Drive Systems in the workshop manual.

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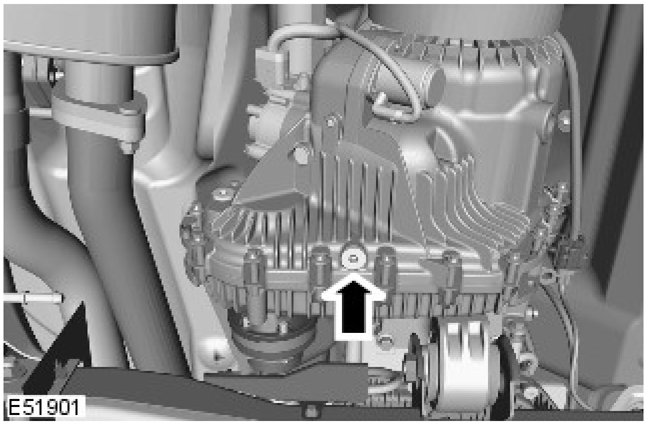
Transfer Case - Transfer Case Draining and Filling

General Procedures

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Position a container to collect the fluid.



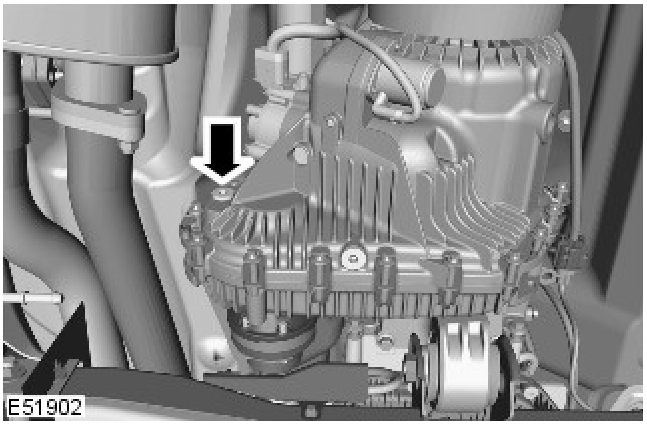
3. Remove the fluid drain plug.

- Clean the immediate area.
- Remove and discard the sealing washer.

4. Allow the fluid to drain.

5. Install the drain plug and tighten it to 22 Nm (16 lb.ft).

- Clean the component mating faces.
- Install a new sealing washer.



6. Remove the fluid filler/level plug.

- Clean the immediate area.
- Remove and discard the sealing washer.

7. Refill transfer case with the recommended fluid, until the fluid is level with bottom of filler/level plug hole.
For additional information, refer to: Specifications (308-07B Transfer Case, Specifications).

8. Install the fluid filler/level plug and tighten to 22 Nm (16 lb.ft).

- Clean the component mating faces.
- Install a new sealing washer.

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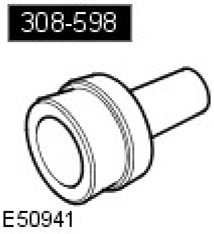
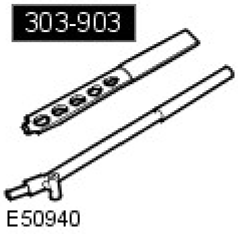
Transfer Case - Transfer Case Input Shaft SealV8 S/C 4.2L Petrol

In-vehicle Repair

Special Tool(s)	
	Oil seal installer 308-598
	Oil seal remover 303-903 (LRT-12-092)

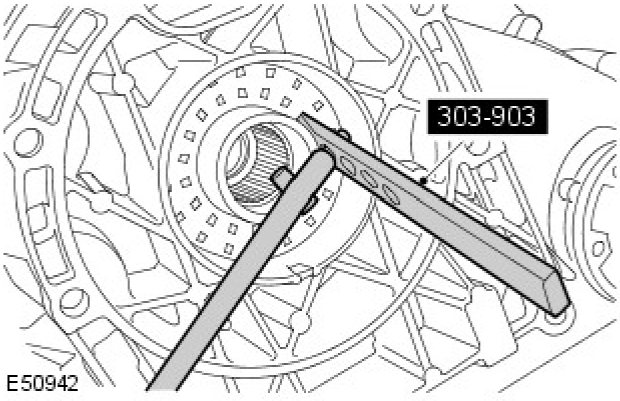
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transfer case.
For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

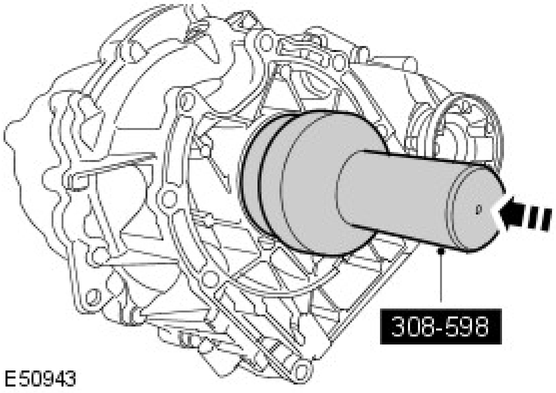


4. CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Carefully remove and discard the oil seal.

- Use the special tool.

Installation



1. ⚠ CAUTION: Oil seals must be fitted dry.

   Install a new seal.

   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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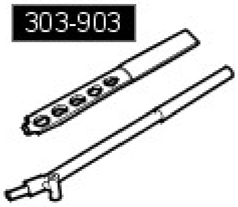
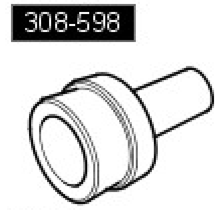
Transfer Case - Transfer Case Input Shaft SealV8 4.4L Petrol

In-vehicle Repair

Special Tool(s)	
 E50940	Oil seal remover 303-903 (LRT-12-092)
 E50941	Oil seal installer 308-598

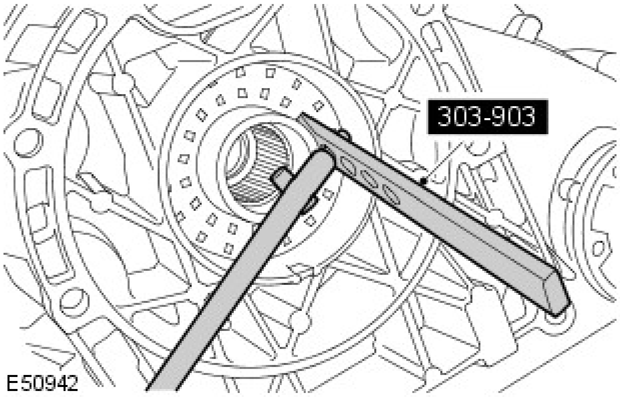
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transfer case.

For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).



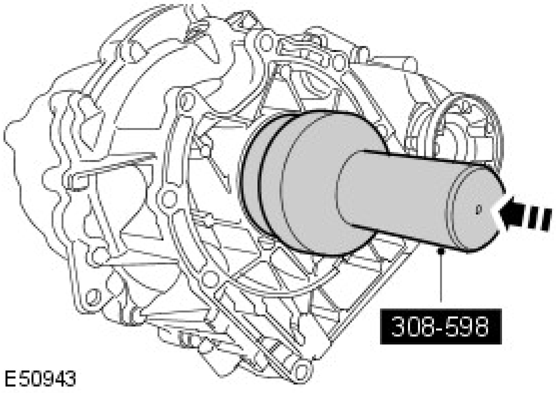
E50942

3. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Carefully remove and discard the oil seal.

- Use the special tool.

Installation



1. ⚠CAUTION: Oil seals must be fitted dry.

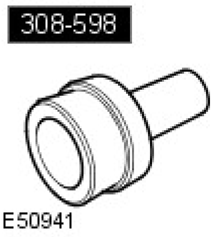
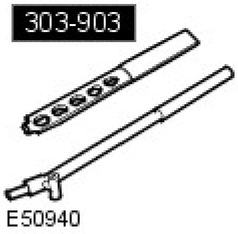
   Install a new seal.

   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).

Transfer Case - Transfer Case Input Shaft SealTDV8 3.6L Diesel

In-vehicle Repair

Special Tool(s)	
	Oil seal installer 308-598
	Oil seal remover 303-903(LRT-12-092)

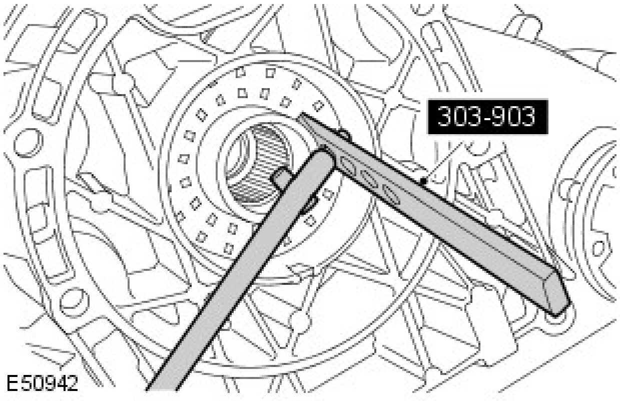
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transfer case.
For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).

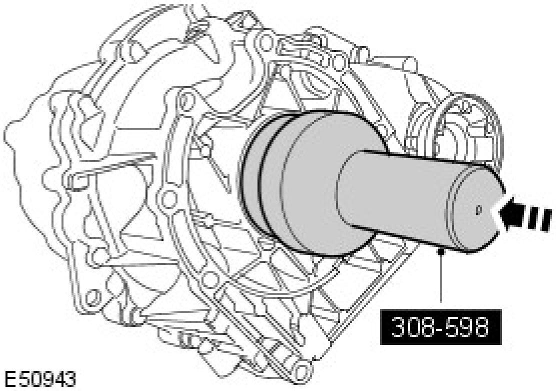


4. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Carefully remove and discard the oil seal.

- Use the special tool.

Installation



1. ⚠CAUTION: Oil seals must be fitted dry.

   Install a new seal.

   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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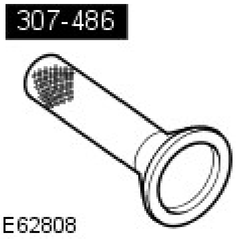
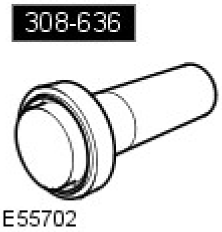
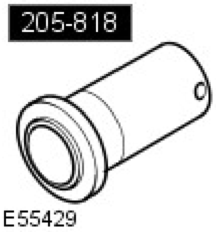
Transfer Case - Transfer Case Front Output Shaft SealV8 S/C 4.2L Petrol

In-vehicle Repair

Special Tool(s)	
	Installer (LRT-41-019) 307-486
	Installer 308-636
	Installer 205-818

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

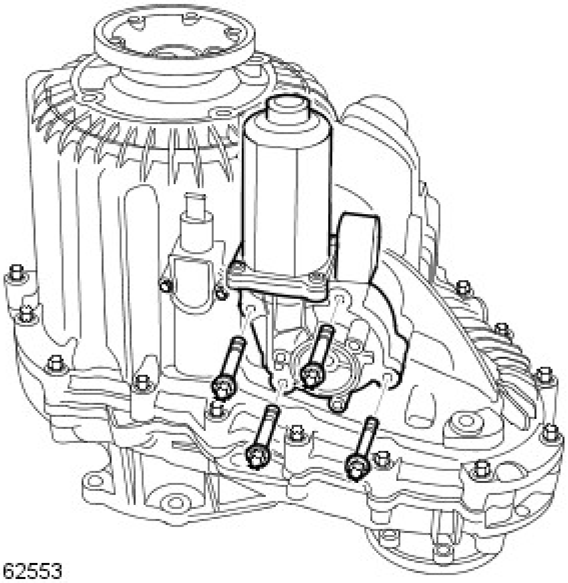
Raise and support the vehicle.

3. Drain the transfer case fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

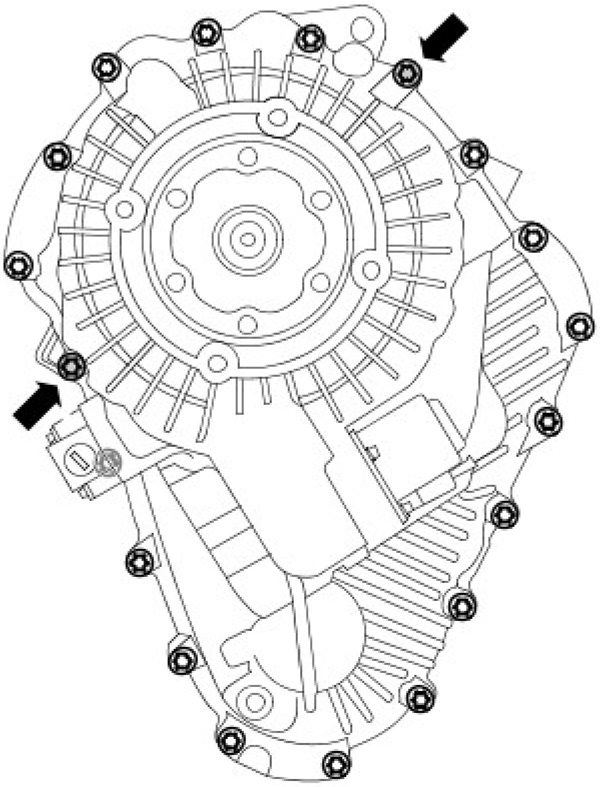
- Secure with 2 bolts.


E62553

6. ⚠ WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.

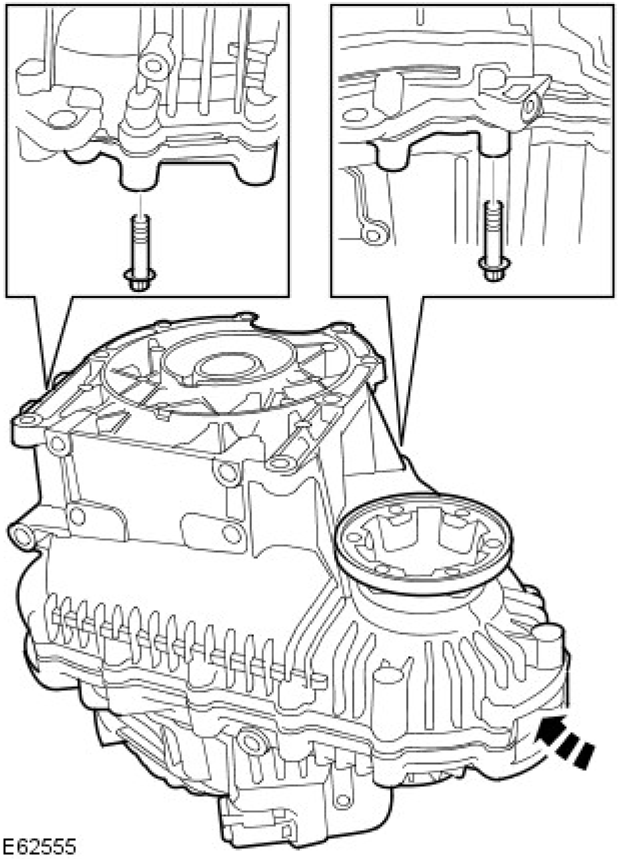

E62554

7. ⚠ WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.

8. With assistance, release the transfer case and secure with the rear face of the transfer case facing down on a flat surface.

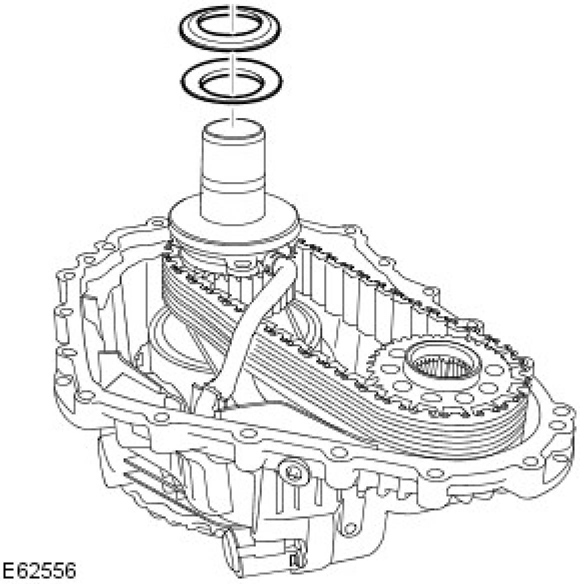

E62555

9. WARNING: Eye protection must be worn.

CAUTION: Care must be taken to avoid damage to the mating surfaces.

Remove the front half of the transfer case.

- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.

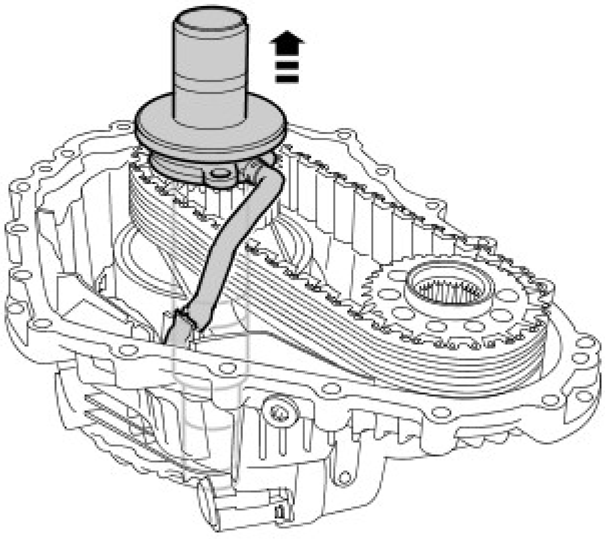

E62556

10. CAUTION: Note the fitted position of the special washers.

Remove the 2 special washers.

11. Remove the input shaft and oil pump assembly.

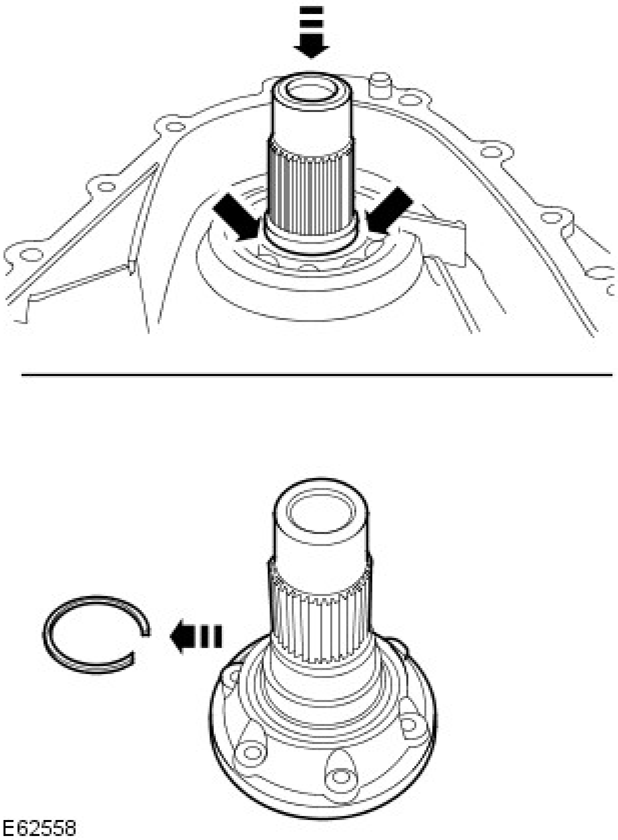
- Release the fluid pump pickup line.



E62557

12. Remove the front output flange.

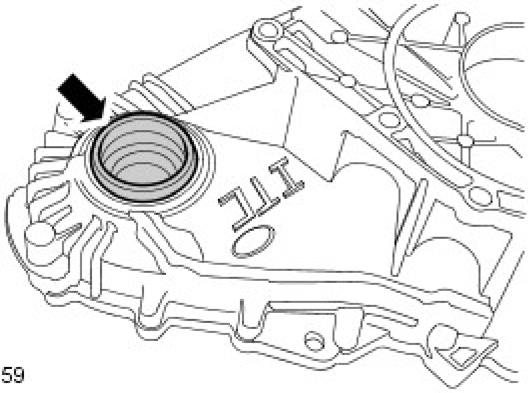
- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.



E62558

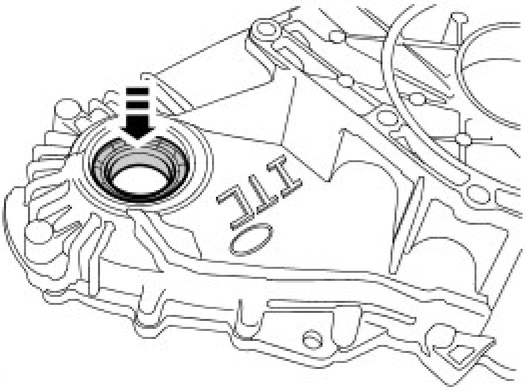
13. CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the output flange seal.



E62559

14. Remove the output flange bearing.



E62560

Installation

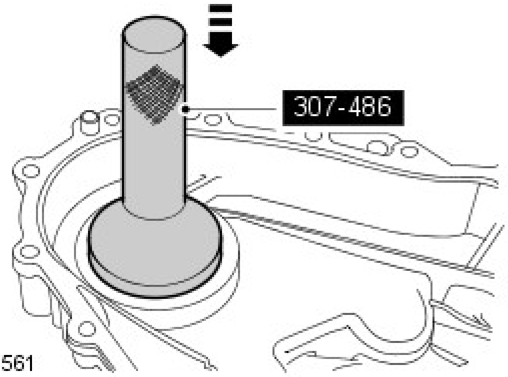
1. Remove the sealant from the transfer case mating faces.

2. Clean the magnetic filter.

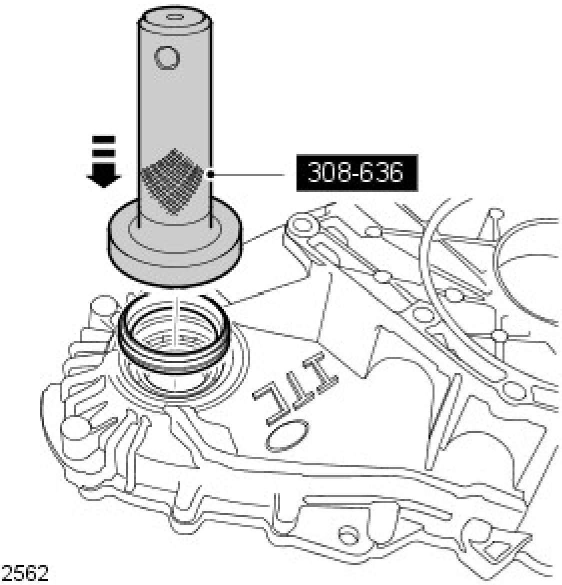
3. CAUTION: The chamfer on the bearing inner track must face the seal.

Using the special tool, install the output flange bearing.

- Clean the components mating faces.

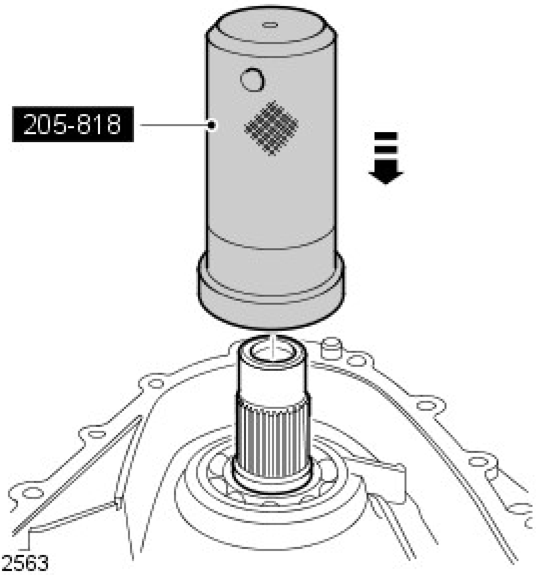


E62561



4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



5. CAUTIONS:

⚠ Centralise the snap ring in the snap ring groove before installing the output flange.

⚠ Extreme care is necessary to make sure the snap ring enters the bearing squarely.

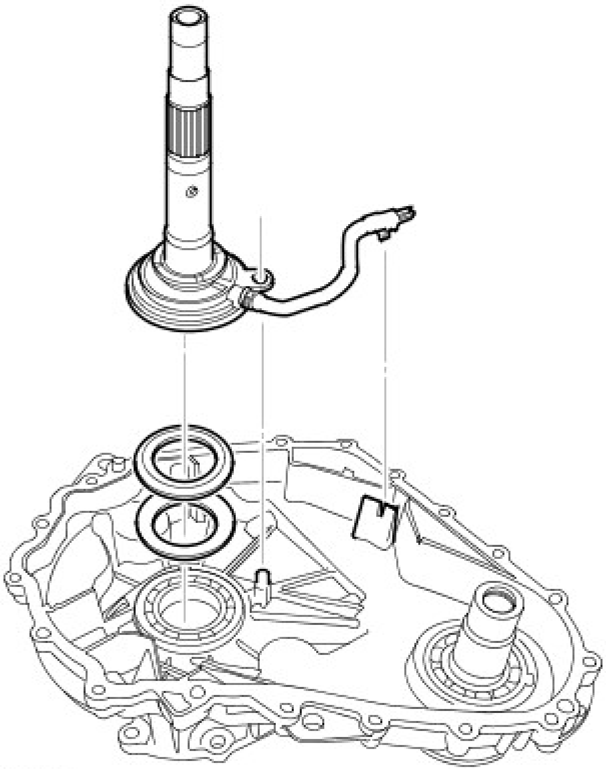
Using the special tool and with assistance, install the drive flange.

- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.

6. ⚠ CAUTION: Make sure the washers are installed correctly.

Install the 2 special washers.

- Clean the components.

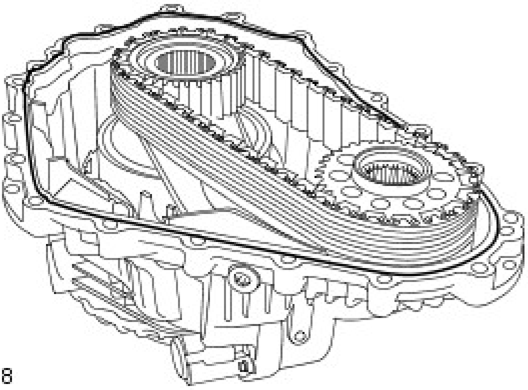


E62564

7. CAUTION: Make sure the oil pump is installed over its location peg.

Install the input shaft and oil pump assembly.

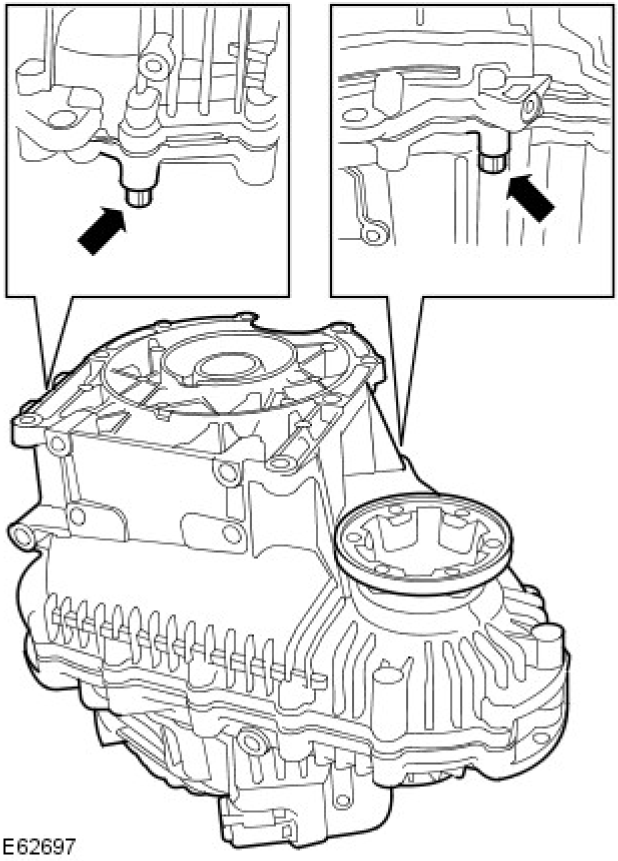
- Clean the components.
- Secure the fluid pickup line.



E62568

8. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.



9. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).

10. With assistance, release the transfer case and secure with its transmission mating face down on a flat surface.

11. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

12. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

13. With assistance, release the transfer case.

- Remove the 2 bolts.

14. Install the transfer case.
For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

15. Refill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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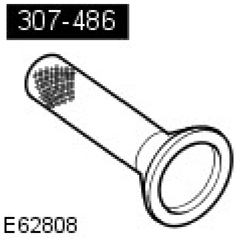
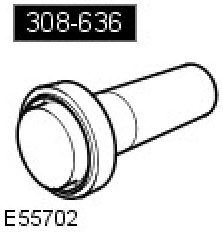
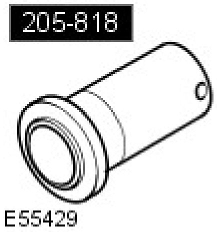
Transfer Case - Transfer Case Front Output Shaft SealV8 4.4L Petrol

In-vehicle Repair

Special Tool(s)	
	Installer (LRT-41-019) 307-486
	Installer 308-636
	Installer 205-818

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

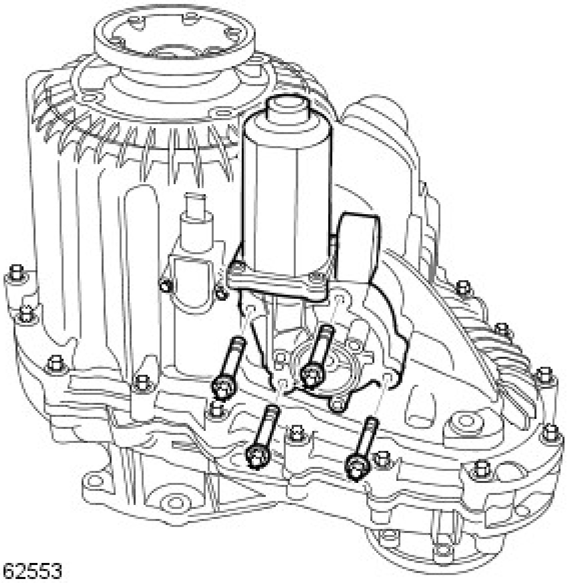
   Raise and support the vehicle.

3. Drain the transfer case fluid.
   For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
   For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

   - Secure with 2 bolts.

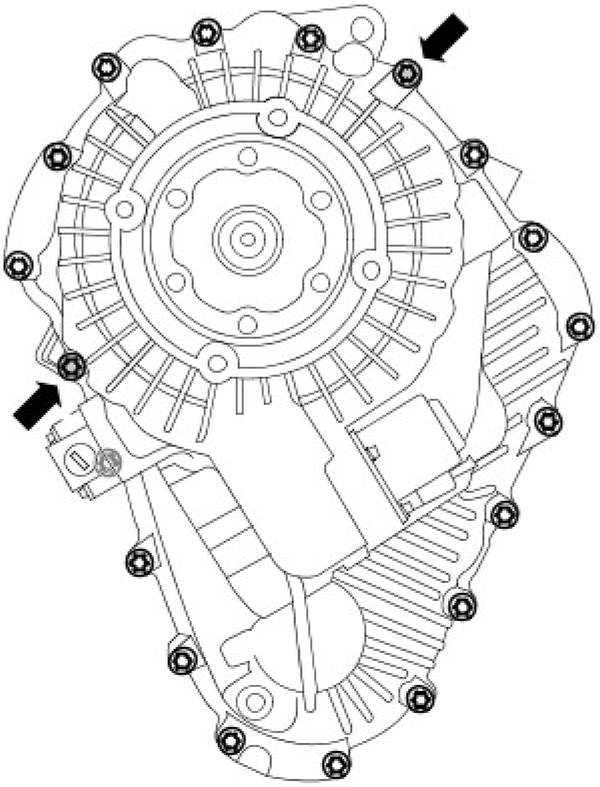


E62553

6. ⚠ WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.



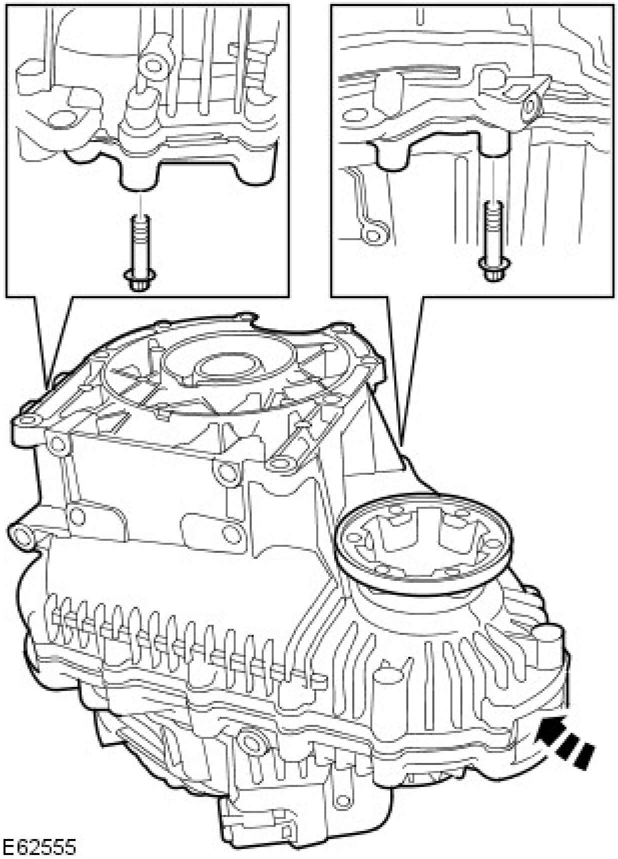
E62554

7. ⚠ WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.

8. With assistance, release the transfer case and secure with the rear face of the transfer case facing down on a flat surface.



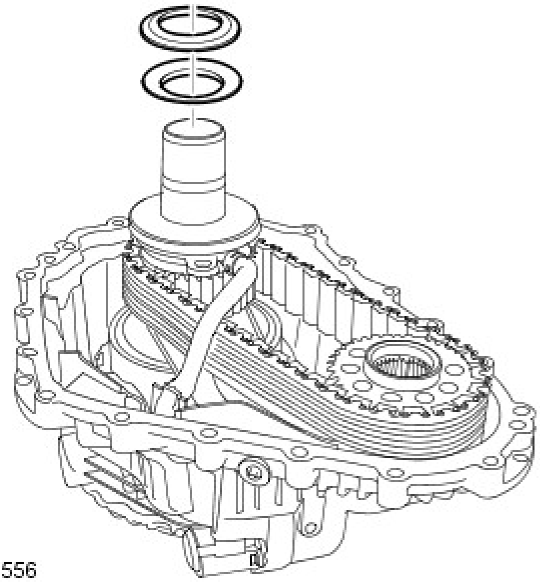
E62555

9. WARNING: Eye protection must be worn.

CAUTION: Care must be taken to avoid damage to the mating surfaces.

Remove the front half of the transfer case.

- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.



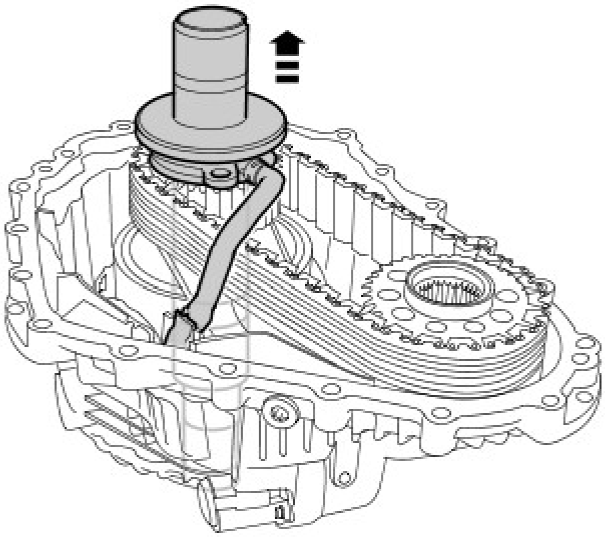
E62556

10. CAUTION: Note the fitted position of the special washers.

Remove the 2 special washers.

11. Remove the input shaft and oil pump assembly.

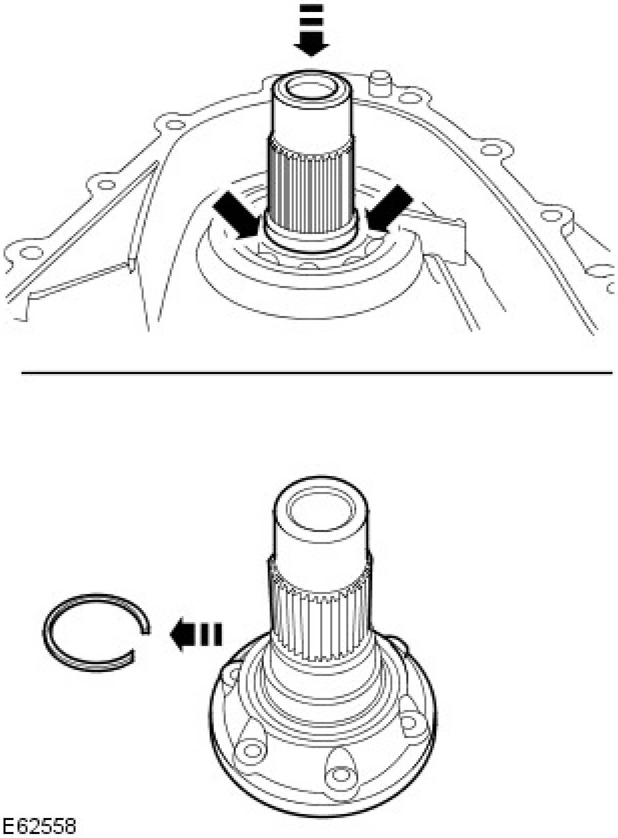
- Release the fluid pump pickup line.



E62557

12. Remove the front output flange.

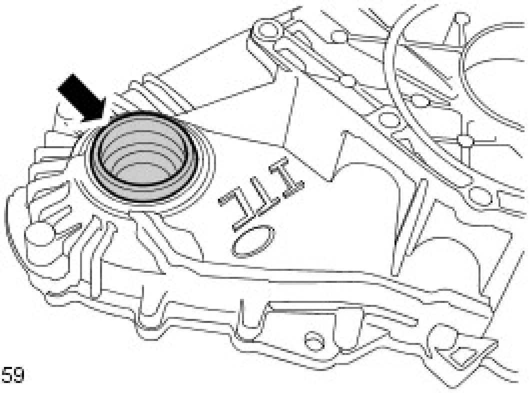
- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.



E62558

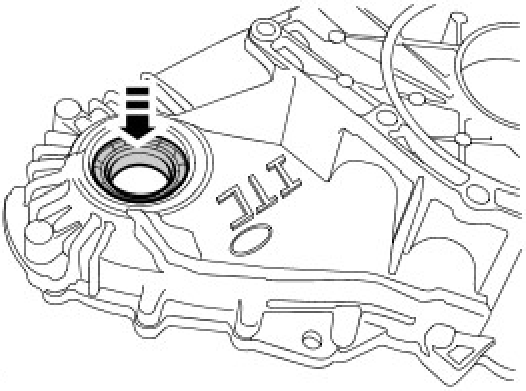
13. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the output flange seal.



E62559

14. Remove the output flange bearing.



E62560

Installation

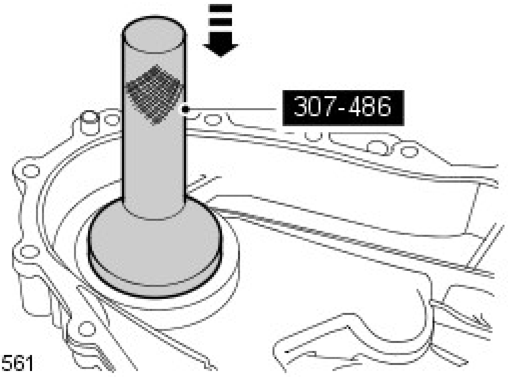
1. Remove the sealant from the transfer case mating faces.

2. Clean the magnetic filter.

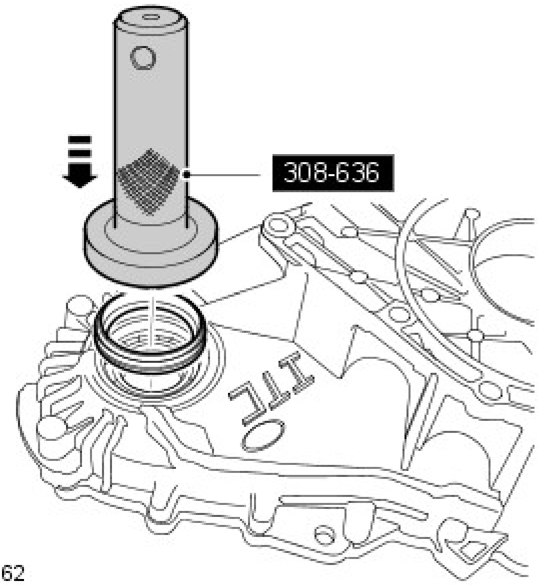
3. ⚠ CAUTION: The chamfer on the bearing inner track must face the seal.

Using the special tool, install the output flange bearing.

- Clean the components mating faces.



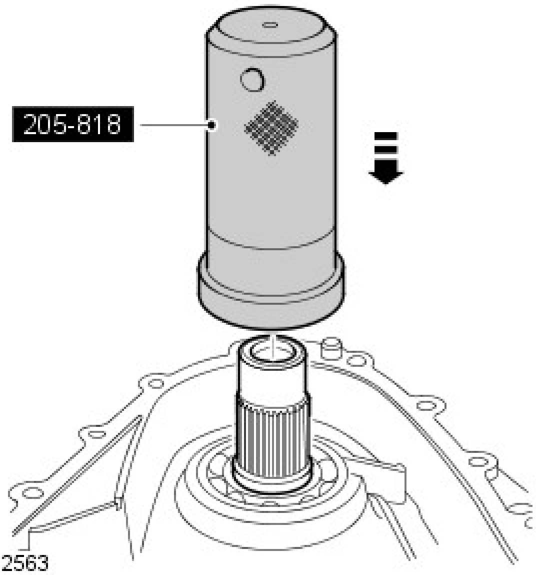
E62561



E62562

4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



E62563

5. CAUTIONS:

⚠ Centralise the snap ring in the snap ring groove before installing the output flange.

⚠ Extreme care is necessary to make sure the snap ring enters the bearing squarely.

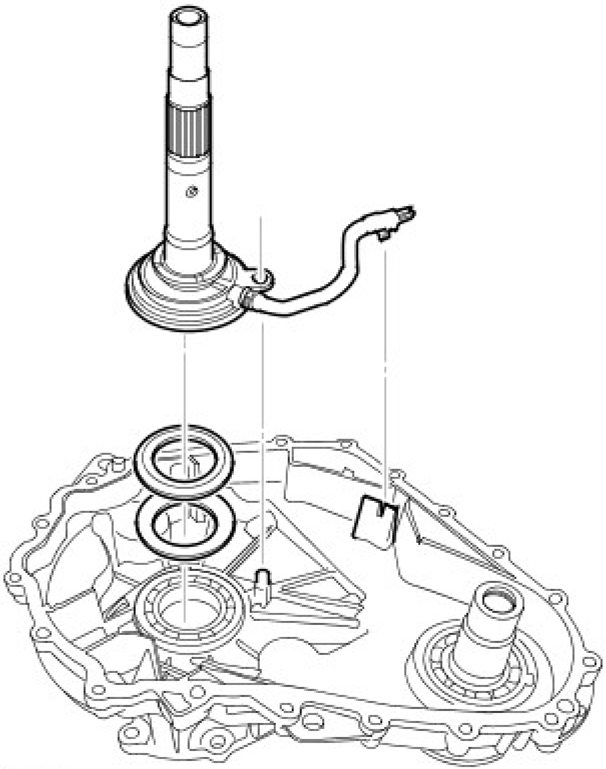
Using the special tool and with assistance, install the drive flange.

- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.

6. ⚠ CAUTION: Make sure the washers are installed correctly.

Install the 2 special washers.

- Clean the components.

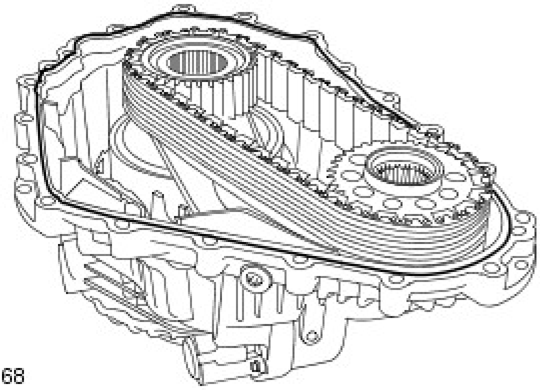


E62564

7. ⚠ CAUTION: Make sure the oil pump is installed over its location peg.

Install the input shaft and oil pump assembly.

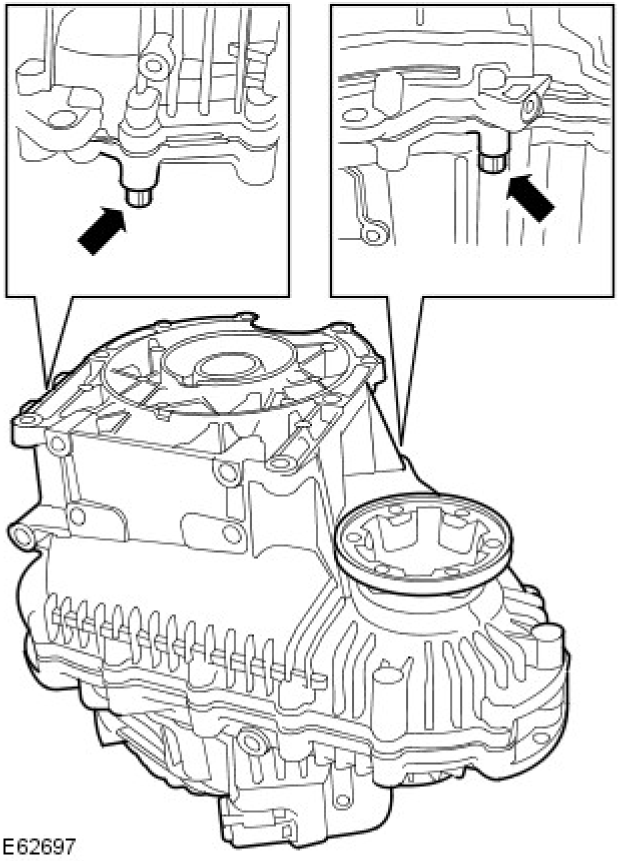
- Clean the components.
- Secure the fluid pickup line.



E62568

8. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.



9. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).

10. With assistance, release the transfer case and secure with its transmission mating face down on a flat surface.

11. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

12. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

13. With assistance, release the transfer case.

- Remove the 2 bolts.

14. Install the transfer case.
For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).

15. Refill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Transfer Case - Transfer Case Front Output Shaft SealTDV8 3.6L Diesel

In-vehicle Repair

Special Tool(s)	
307-486 E62808	Installer 307-486(LRT-41-019)
308-636 E55702	Installer 308-636
205-818 E55429	Installer 205-818

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

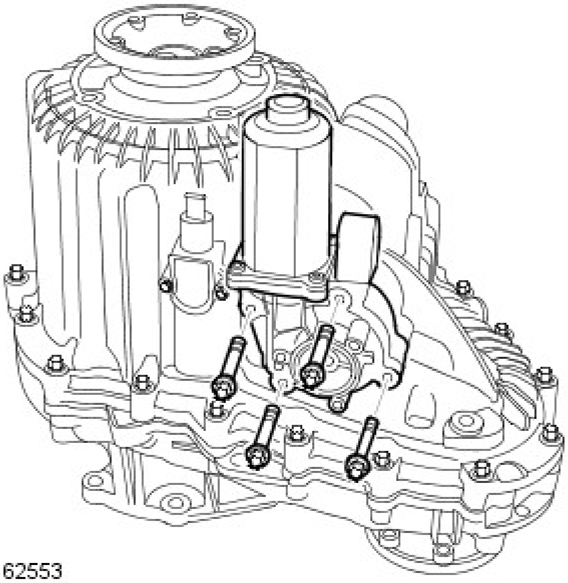
Raise and support the vehicle.

3. Drain the transfer case fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

- Secure with 2 bolts.

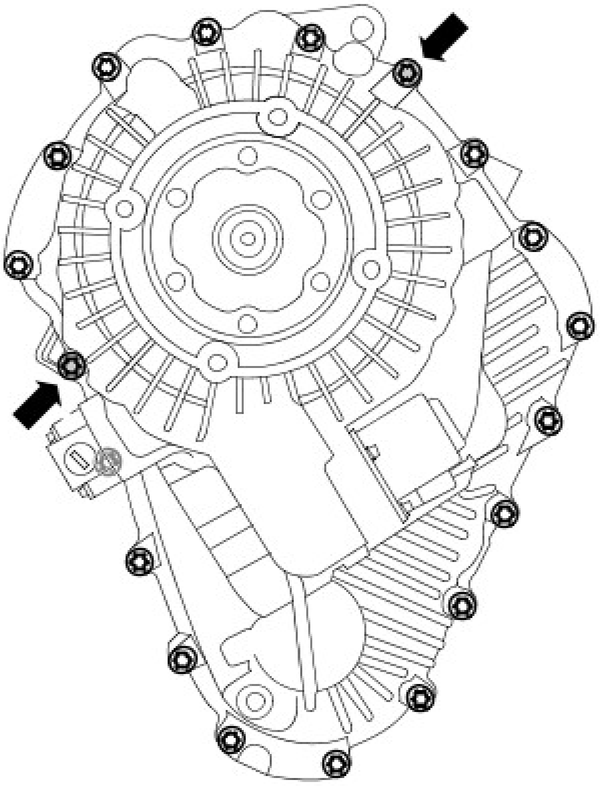


E62553

6. ⚠ WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.



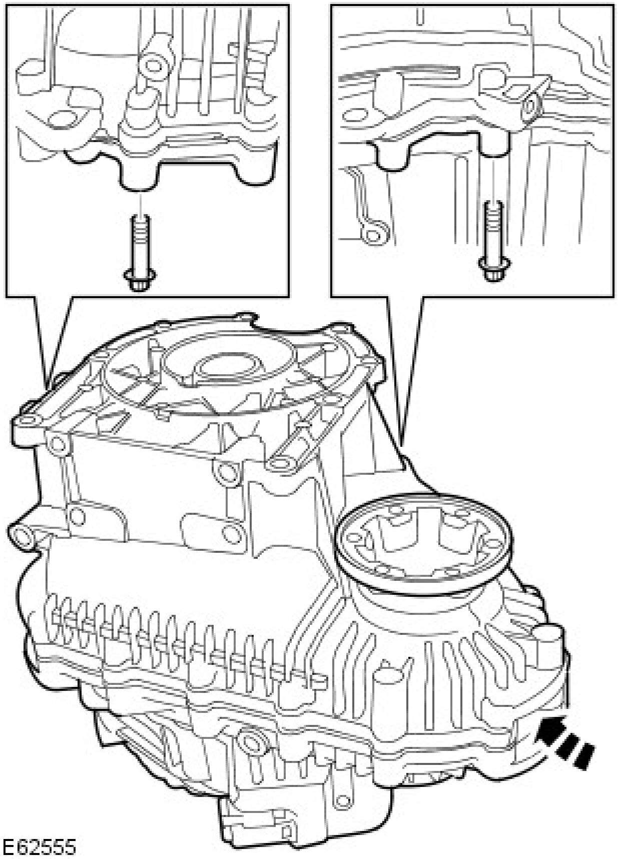
E62554

7. ⚠ WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.

8. With assistance, release the transfer case and secure with the rear face of the transfer case facing down on a flat surface.



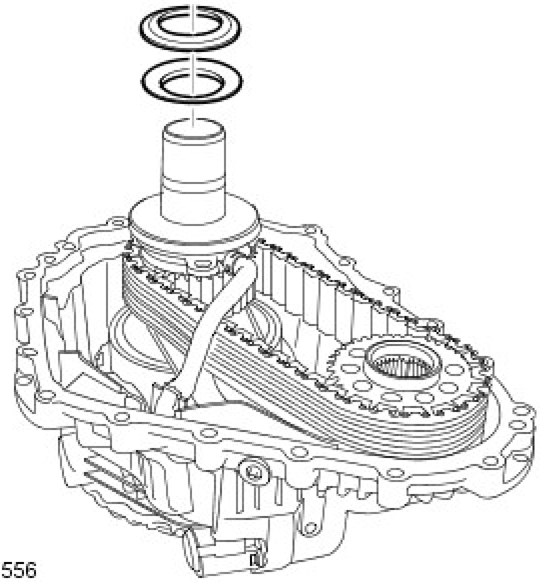
E62555

9. WARNING: Eye protection must be worn.

CAUTION: Care must be taken to avoid damage to the mating surfaces.

Remove the front half of the transfer case.

- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.



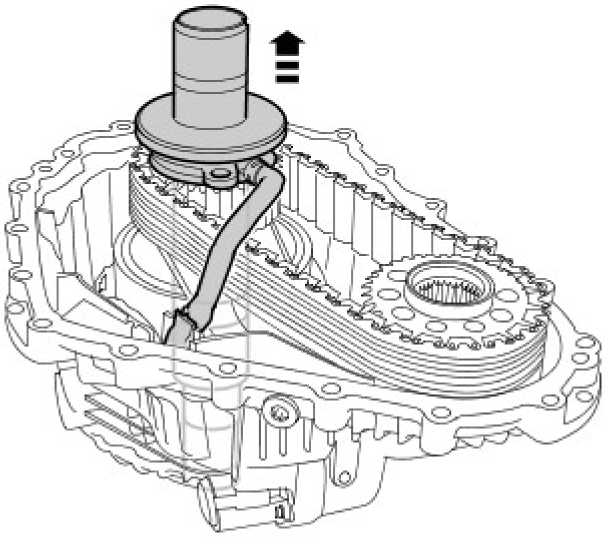
E62556

10. CAUTION: Note the fitted position of the special washers.

Remove the 2 special washers.

11. Remove the input shaft and oil pump assembly.

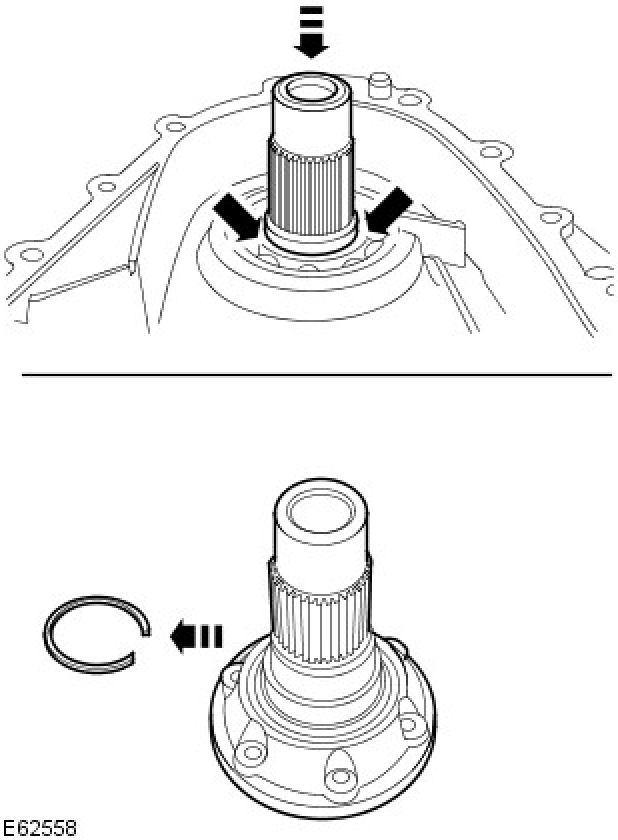
- Release the fluid pump pickup line.



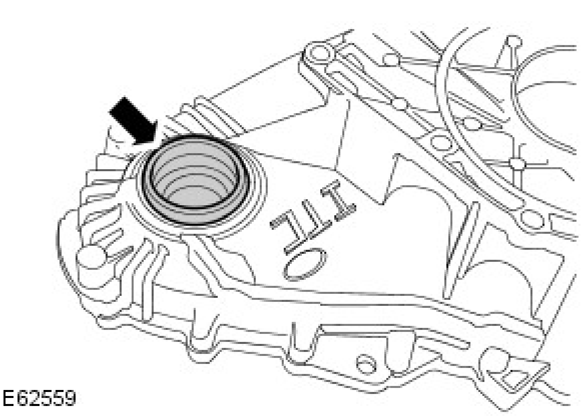
E62557

12. Remove the front output flange.

- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.

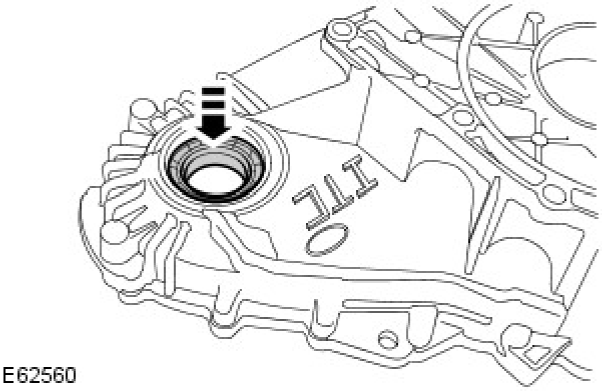


E62558


E62559

13. ⚠CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the output flange seal.

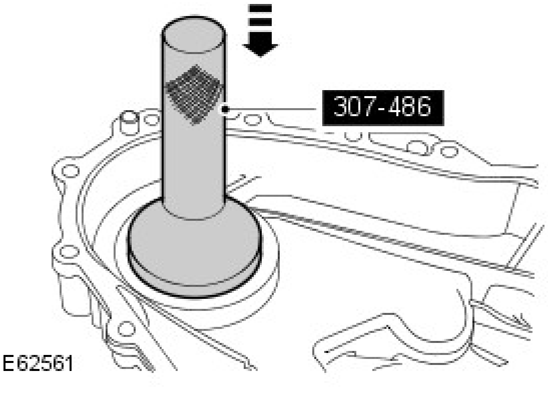

E62560

14. Remove the output flange bearing.

Installation

1. Remove the sealant from the transfer case mating faces.

2. Clean the magnetic filter.

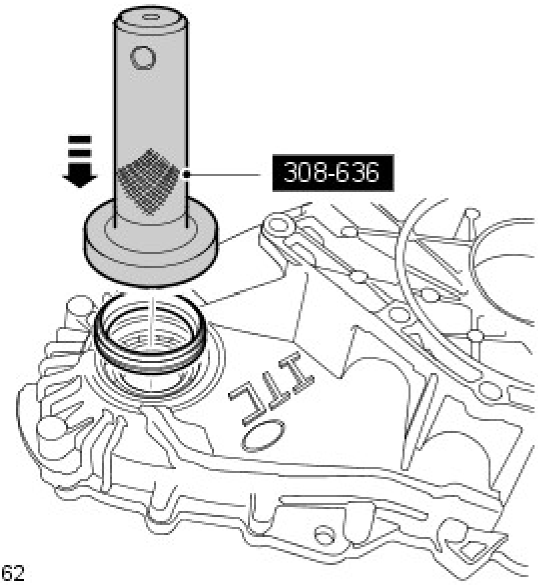


E62561

3. ⚠CAUTION: The chamfer on the bearing inner track must face the seal.

Using the special tool, install the output flange bearing.

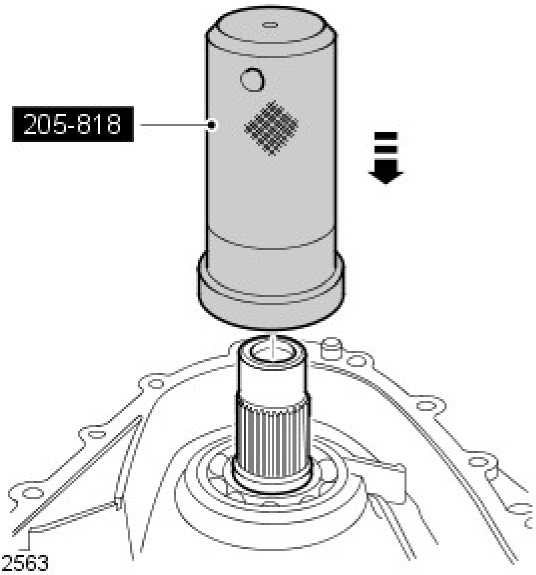
- Clean the components mating faces.



E62562

4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



E62563

5. CAUTIONS:

⚠ Centralize the snap ring in the snap ring groove before installing the output flange.

⚠ Extreme care is necessary to make sure the snap ring enters the bearing squarely.

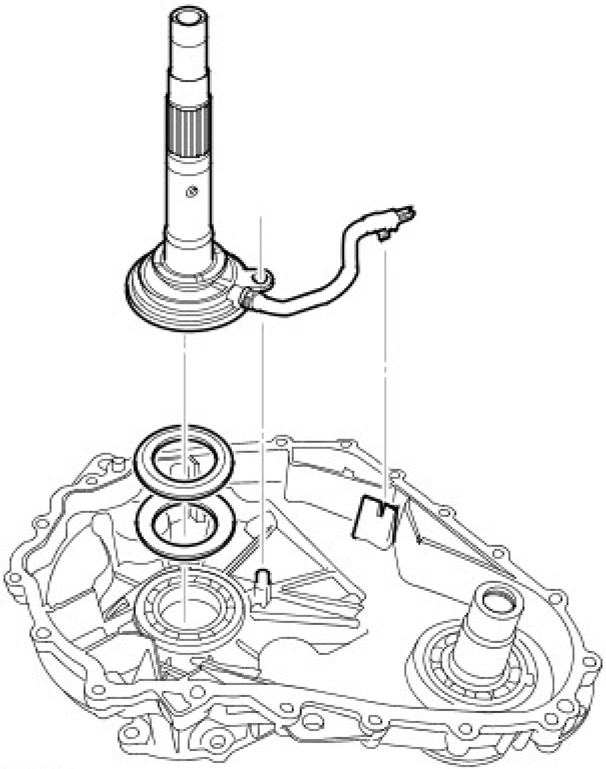
Using the special tool and with assistance, install the drive flange.

- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.

6. ⚠ CAUTION: Make sure the washers are installed correctly.

Install the 2 special washers.

- Clean the components.

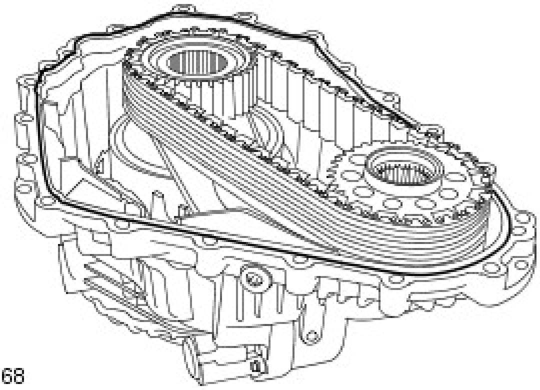


E62564

7. ⚠ CAUTION: Make sure the oil pump is installed over its location peg.

Install the input shaft and oil pump assembly.

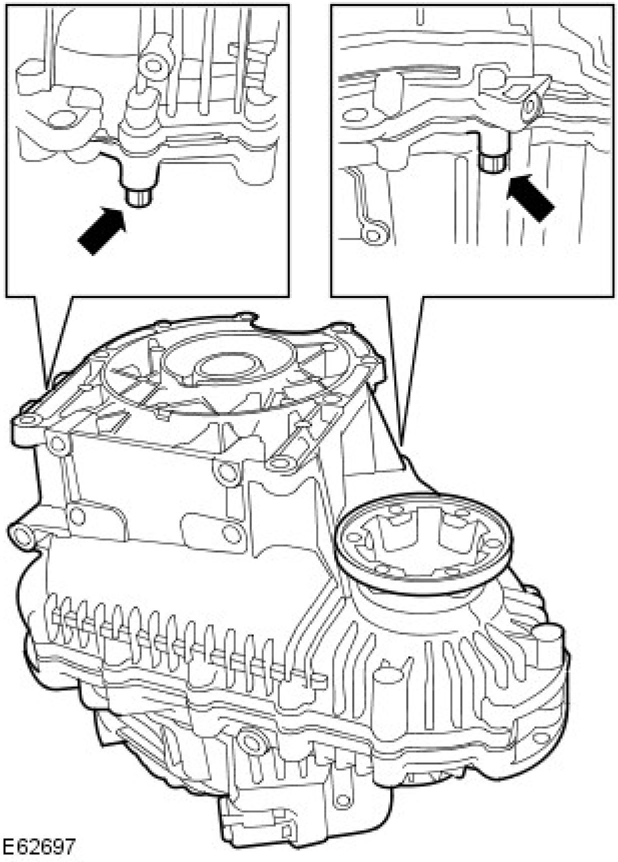
- Clean the components.
- Secure the fluid pickup line.



E62568

8. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.



9. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).

10. With assistance, release the transfer case and secure with its transmission mating face down on a flat surface.

11. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

12. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

13. With assistance, release the transfer case.

- Remove the 2 bolts.

14. Install the transfer case.
For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).

15. Fill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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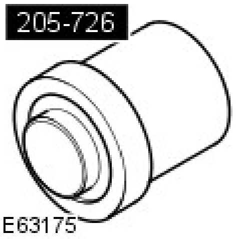
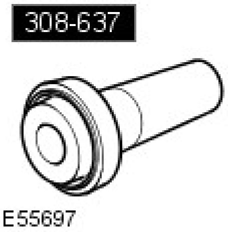
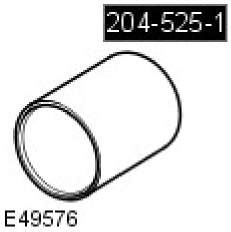
Transfer Case - Transfer Case Rear Output Shaft SealV8 S/C 4.2L Petrol

In-vehicle Repair

Special Tool(s)	
	Remover/installer (LRT-54-015) 205-726
	Seal installer 308-637
	Installer 204-525/1

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

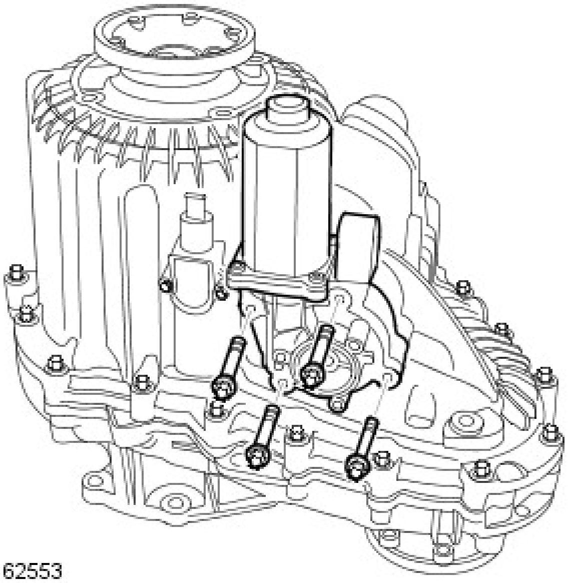
Raise and support the vehicle.

3. Drain the transfer case fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

- Secure with 2 bolts.

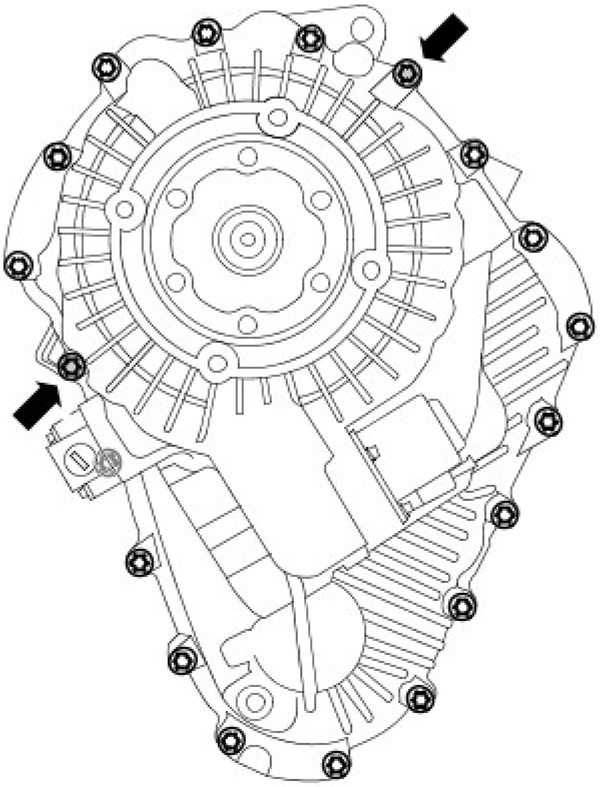


E62553

6. ⚠ WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.

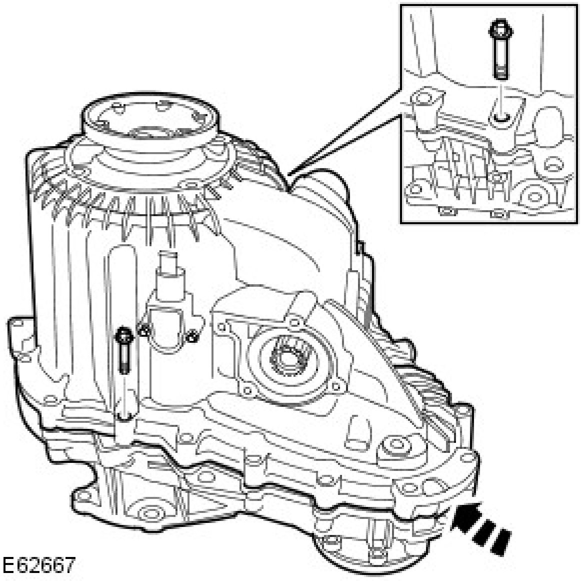


E62554

7. ⚠ WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.

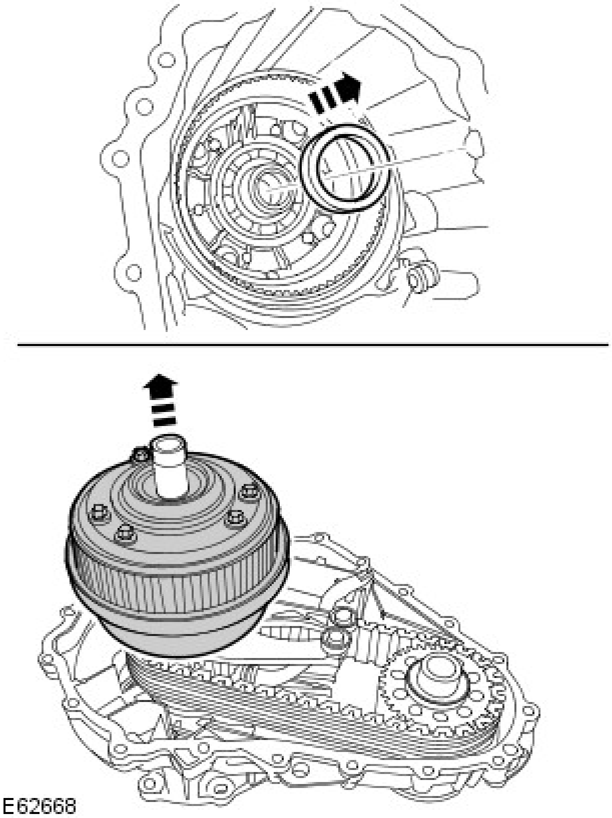


8. ⚠ WARNING: Eye protection must be worn.

⚠ CAUTION: Care must be taken to avoid damage to the mating surfaces.

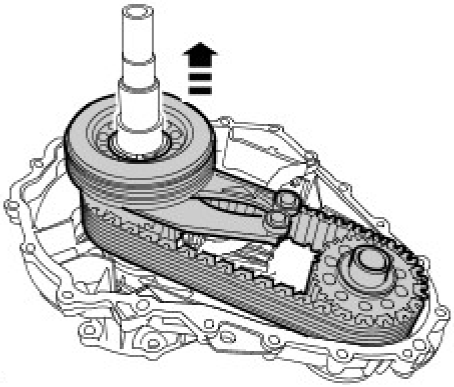
Remove the rear half of the transfer case.

- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.



9. Remove the differential module.

- Remove the spacer.



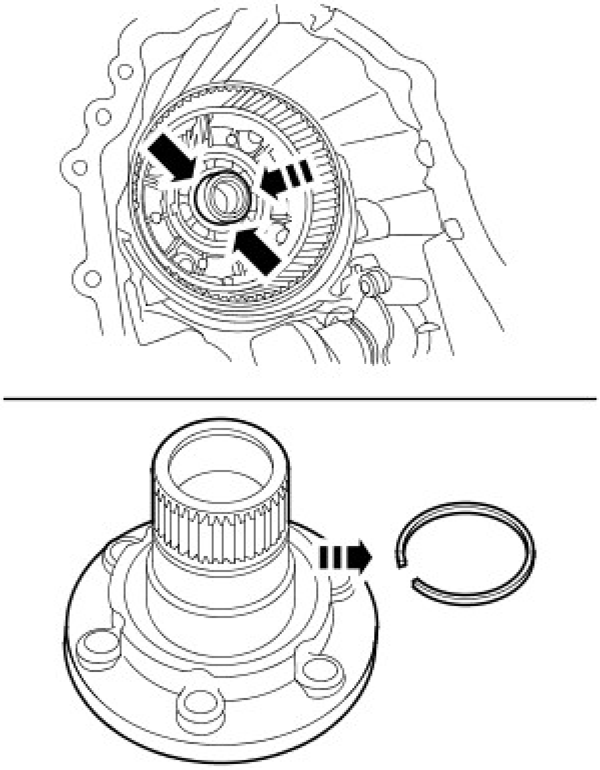
E62669

10. NOTE: Remove as an assembly.

Remove the clutch, chain and sprocket.

11. Remove the rear output flange.

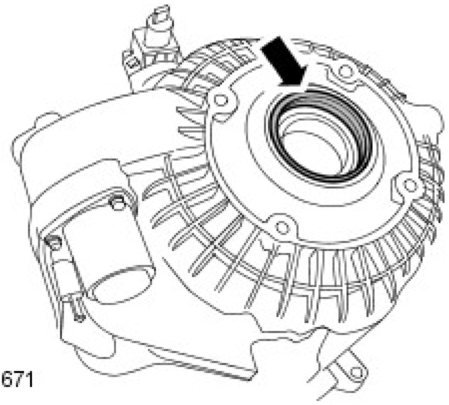
- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.



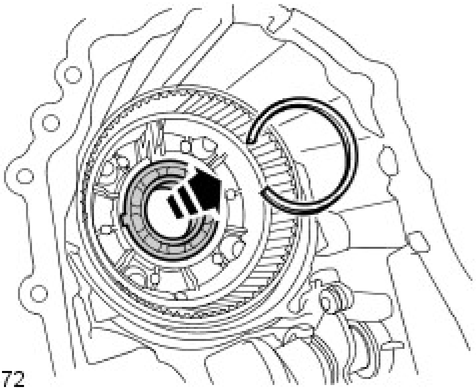
E62670

12. CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the output flange seal.



E62671


E62672

13. Remove the output flange bearing.

- Remove the circlip.

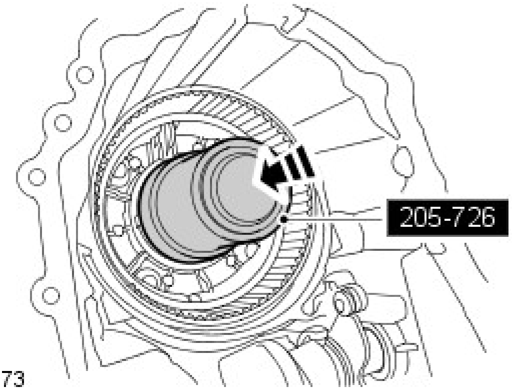
14. Release the front half of the transfer case from the flat surface.

- Remove the 2 bolts.

Installation

1. Remove the sealant from the transfer case mating faces.

2. Clean the magnetic filter.

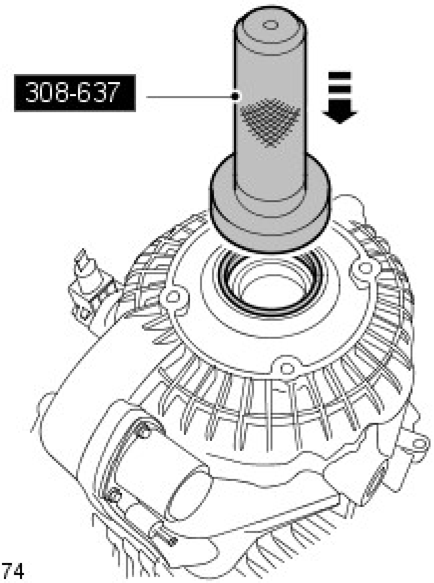


E62673

3. ⚠CAUTION: The chamfer on the bearing inner track must face the seal.

Using the special tool, install the output flange bearing.

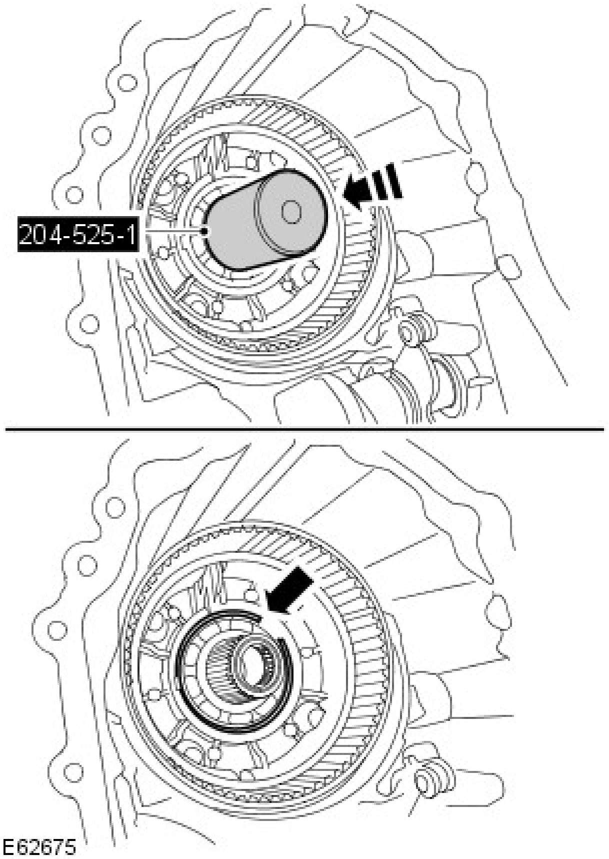
- Clean the components mating faces.
- Install the circlip.



E62674

4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



E62675

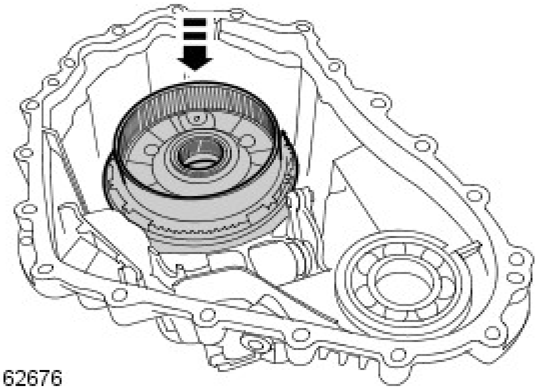
5. CAUTIONS:

⚠ Centralise the snap ring in the snap ring groove before installing the output flange.

⚠ Extreme care is necessary to make sure the snap ring enters the bearing squarely.

Using the special tool and with assistance, install the drive flange.

- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.



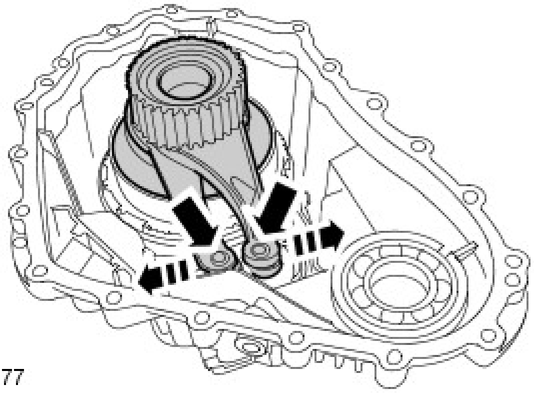
E62676

6. Secure the rear half of the transfer case with its rear face down on a flat surface.

7. NOTE: Rotate the differential to engage the splines.

Install the differential module.

- Clean the components.
- Install the spacer.



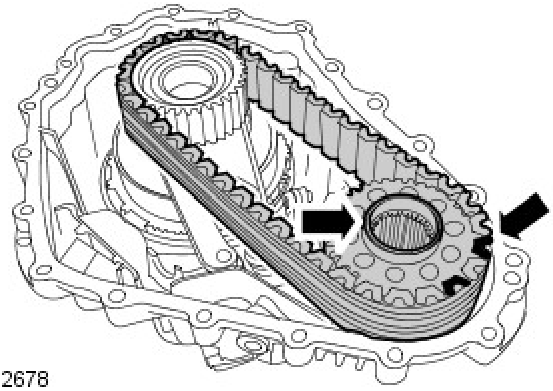
E62677

8. NOTE: Rotate the assembly to engage the clutch plates.

• NOTE: Use circlip pliers to open the actuator levers.

Install the clutch.

- Clean the components.
- Engage the actuator levers.



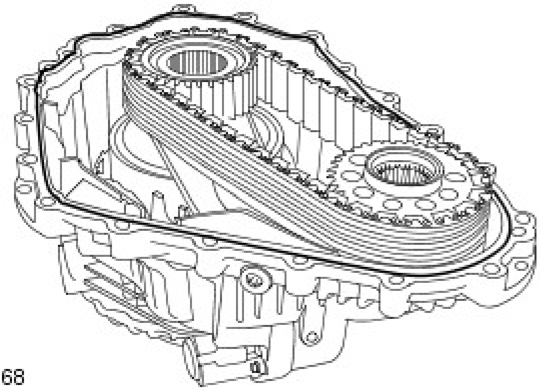
E62678

9. ⚠ CAUTION: The dark links in the chain face up as shown.

• NOTE: The relieved splined inner diameter of the sprocket must face up as shown.

Install the chain and sprocket.

- Clean the components.



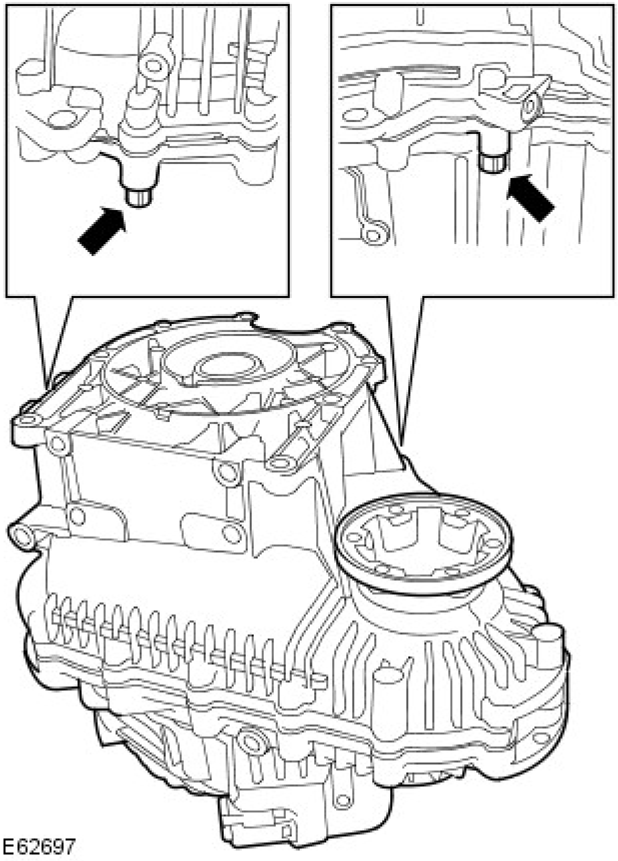
E62568

10. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.
- Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

11. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).



12. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

13. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

14. With assistance, release the transfer case from the flat surface.

- Remove the 2 bolts.

15. Install the transfer case.
For additional information, refer to: Transfer Case - V8 S/C 4.2L Petrol (308-07B Transfer Case, Removal).

16. Refill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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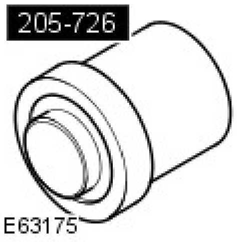
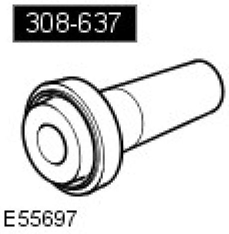
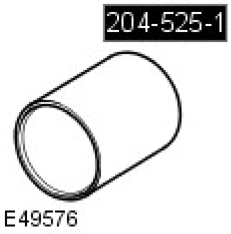
Transfer Case - Transfer Case Rear Output Shaft SealV8 4.4L Petrol

In-vehicle Repair

Special Tool(s)	
	Remover/installer (LRT-54-015) 205-726
	Seal installer 308-637
	Installer 204-525/1

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

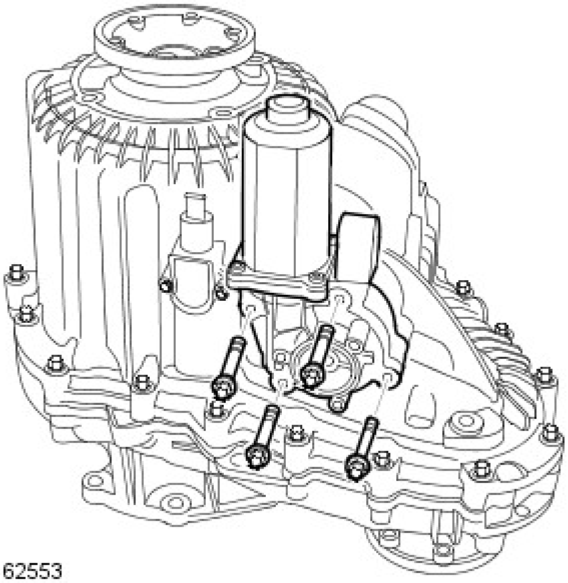
Raise and support the vehicle.

3. Drain the transfer case fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

- Secure with 2 bolts.

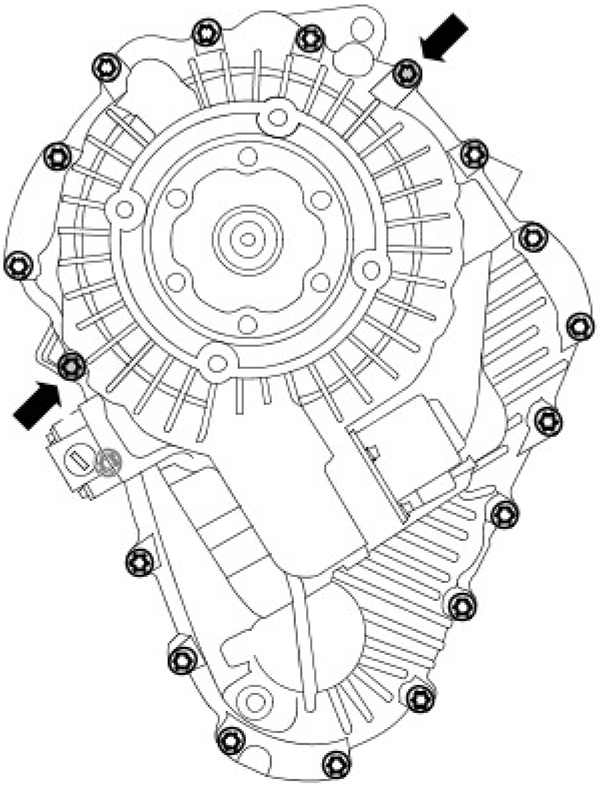


E62553

6. ⚠ WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.

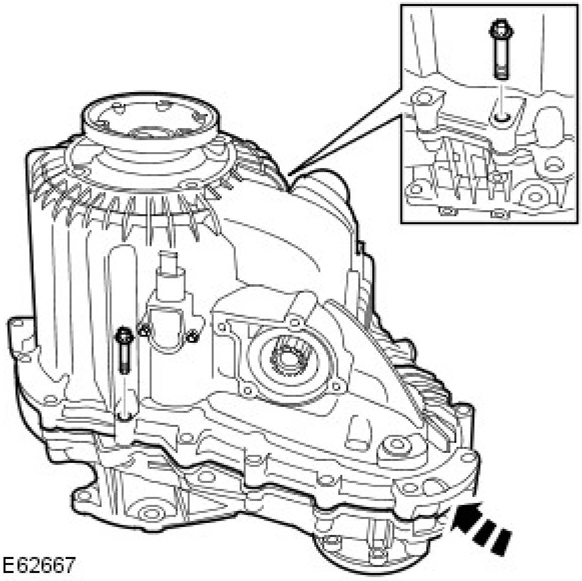


E62554

7. ⚠ WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.

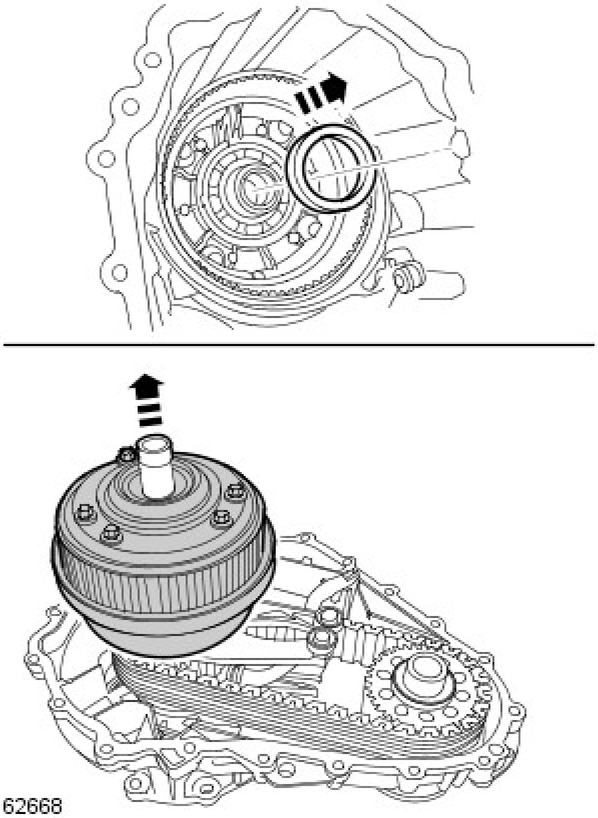

E62667

8. WARNING: Eye protection must be worn.

CAUTION: Care must be taken to avoid damage to the mating surfaces.

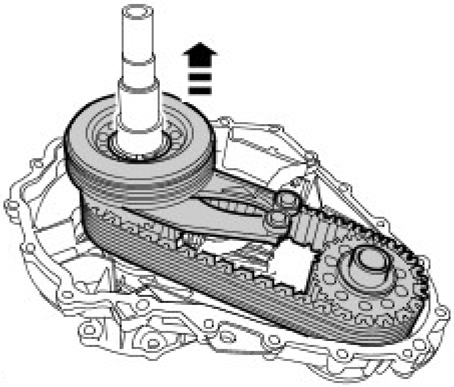
Remove the rear half of the transfer case.

- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.


E62668

9. Remove the differential module.

- Remove the spacer.



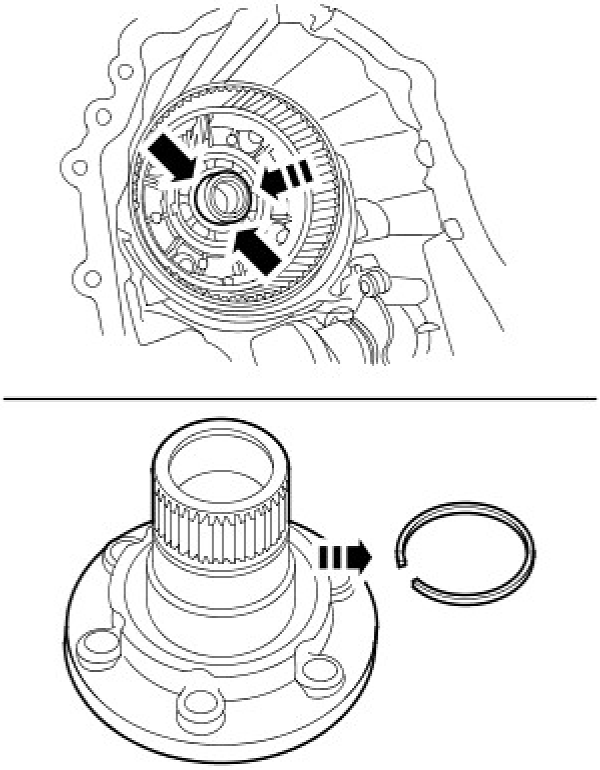
E62669

10. NOTE: Remove as an assembly.

Remove the clutch, chain and sprocket.

11. Remove the rear output flange.

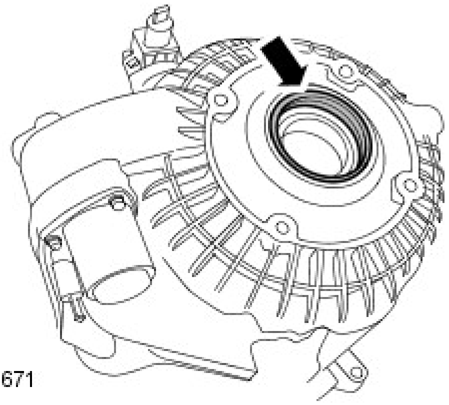
- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.



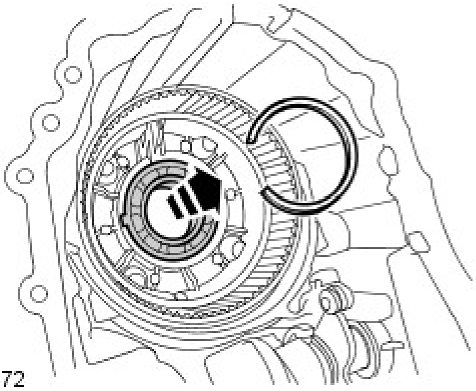
E62670

12. CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the output flange seal.



E62671



E62672

13. Remove the output flange bearing.

- Remove the circlip.

14. Release the front half of the transfer case from the flat surface.

- Remove the 2 bolts.

Installation

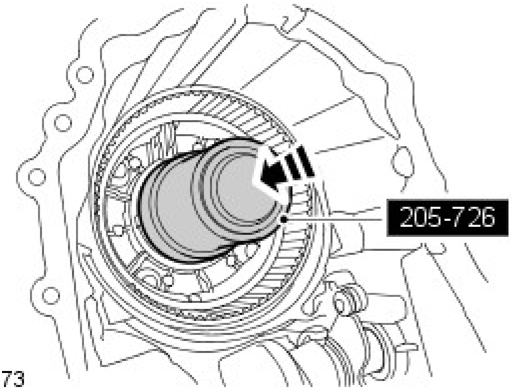
1. Remove the sealant from the transfer case mating faces.

2. Clean the magnetic filter.

3. ⚠ CAUTION: The chamfer on the bearing inner track must face the seal.

Using the special tool, install the output flange bearing.

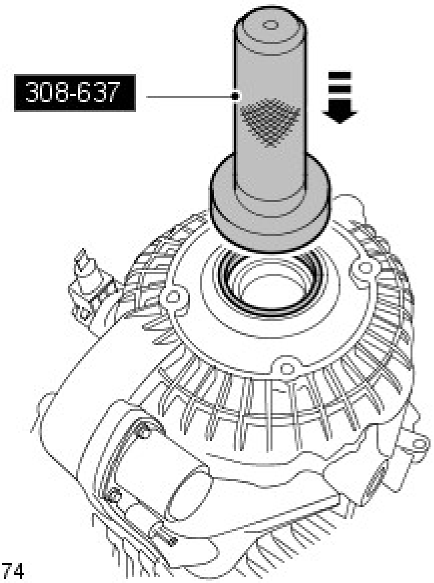
- Clean the components mating faces.
- Install the circlip.



E62673

4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



E62674

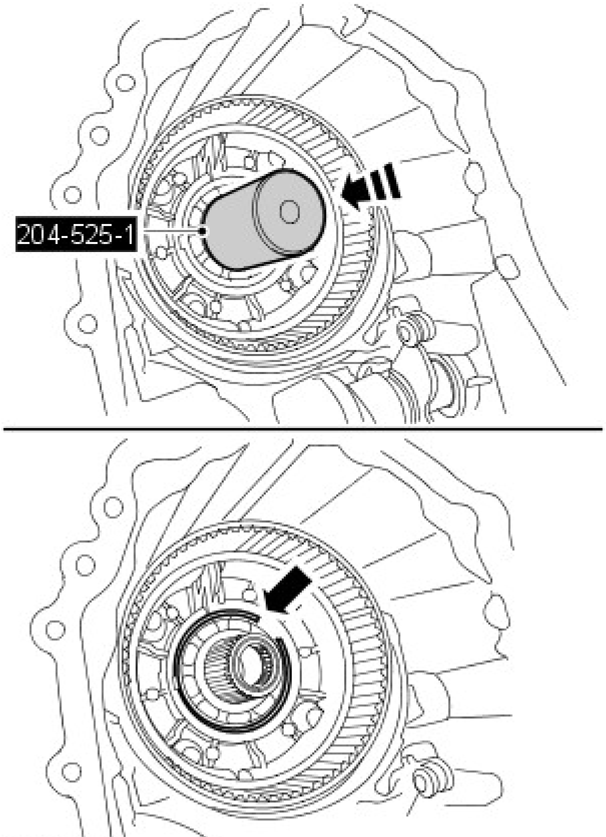
5. CAUTIONS:

Centralise the snap ring in the snap ring groove before installing the output flange.

Extreme care is necessary to make sure the snap ring enters the bearing squarely.

Using the special tool and with assistance, install the drive flange.

- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.



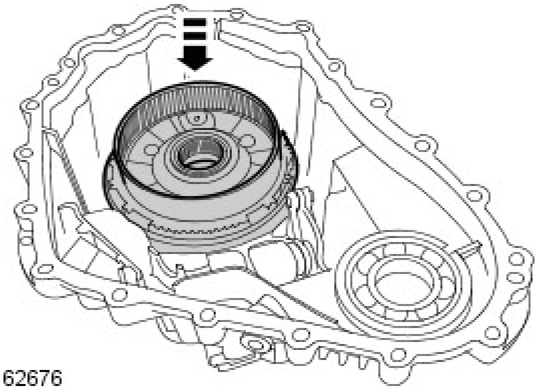
E62675

6. Secure the rear half of the transfer case with its rear face down on a flat surface.

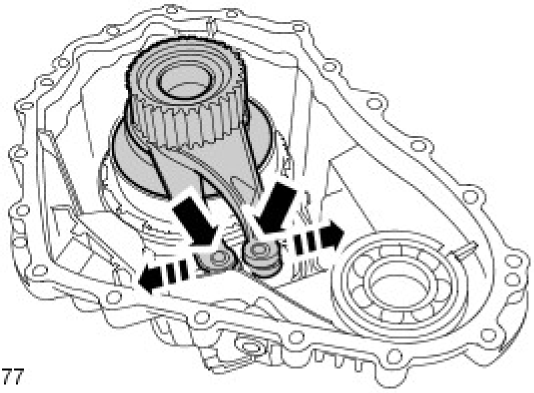
7. NOTE: Rotate the differential to engage the splines.

Install the differential module.

- Clean the components.
- Install the spacer.



E62676



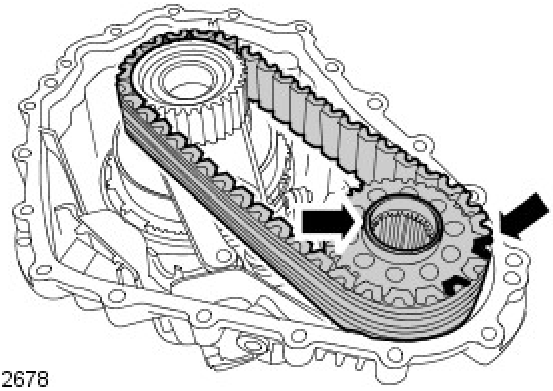
E62677

8. NOTE: Rotate the assembly to engage the clutch plates.

• NOTE: Use circlip pliers to open the actuator levers.

Install the clutch.

- Clean the components.
- Engage the actuator levers.



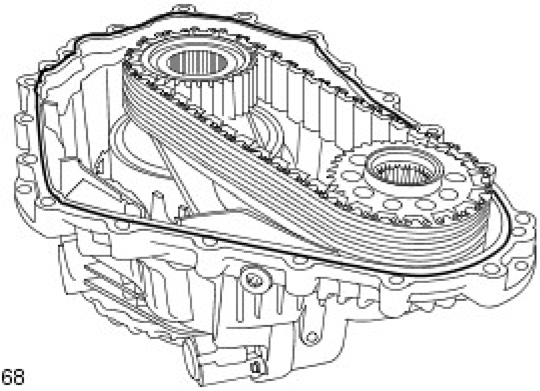
E62678

9. ⚠ CAUTION: The dark links in the chain face up as shown.

• NOTE: The relieved splined inner diameter of the sprocket must face up as shown.

Install the chain and sprocket.

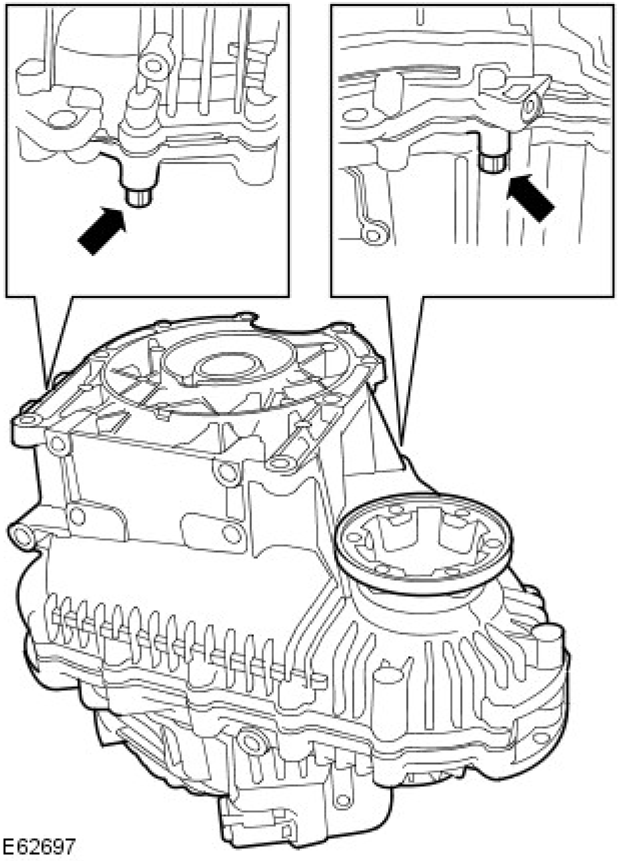
- Clean the components.



E62568

10. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.
- Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.



11. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).

12. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

13. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

14. With assistance, release the transfer case from the flat surface.

- Remove the 2 bolts.

15. Install the transfer case.
For additional information, refer to: Transfer Case - V8 4.4L Petrol (308-07B Transfer Case, Removal).

16. Refill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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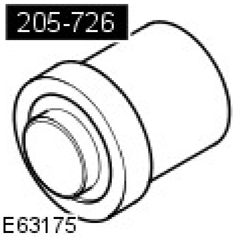
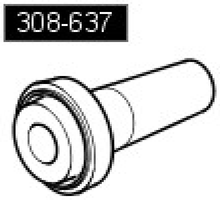
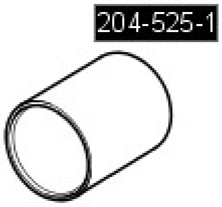
Transfer Case - Transfer Case Rear Output Shaft SealTDV8 3.6L Diesel

In-vehicle Repair

Special Tool(s)	
 E63175	Remover/installer 205-726(LRT-54-015)
 E55697	Seal installer 308-637
 E49576	Installer 204-525/1

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

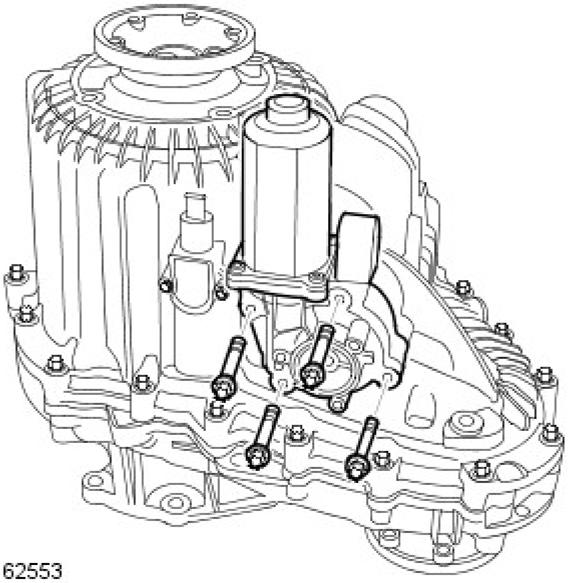
Raise and support the vehicle.

3. Drain the transfer case fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

- Secure with 2 bolts.

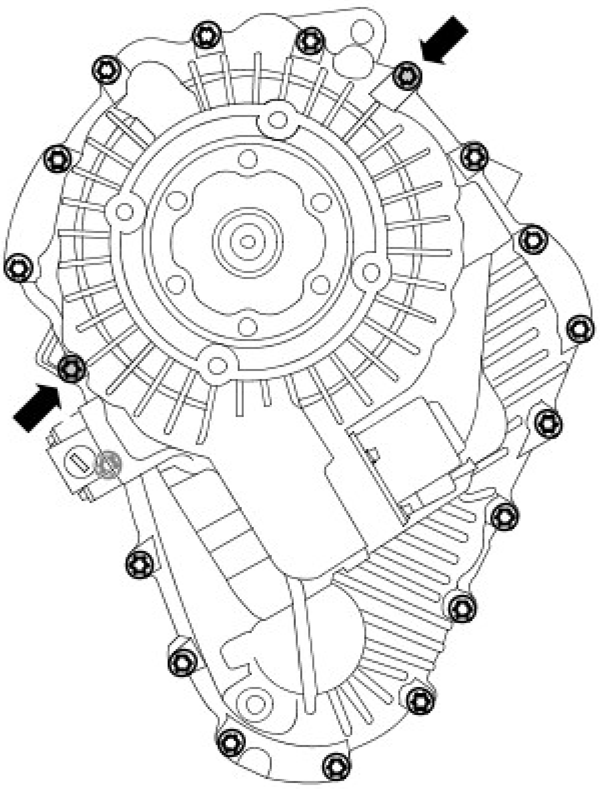


E62553

6. WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.

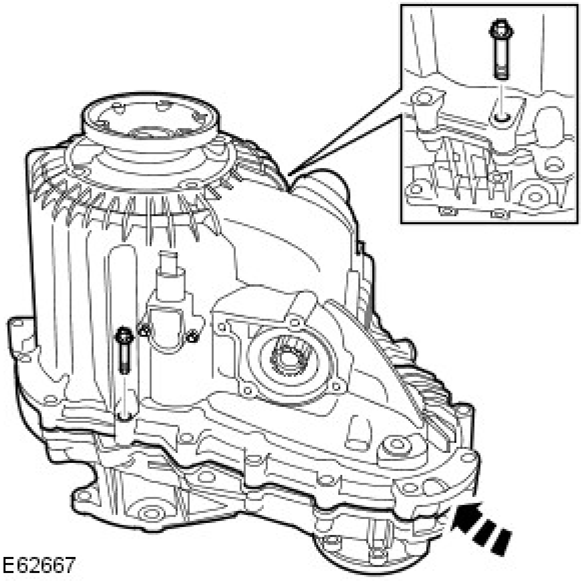


E62554

7. WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.



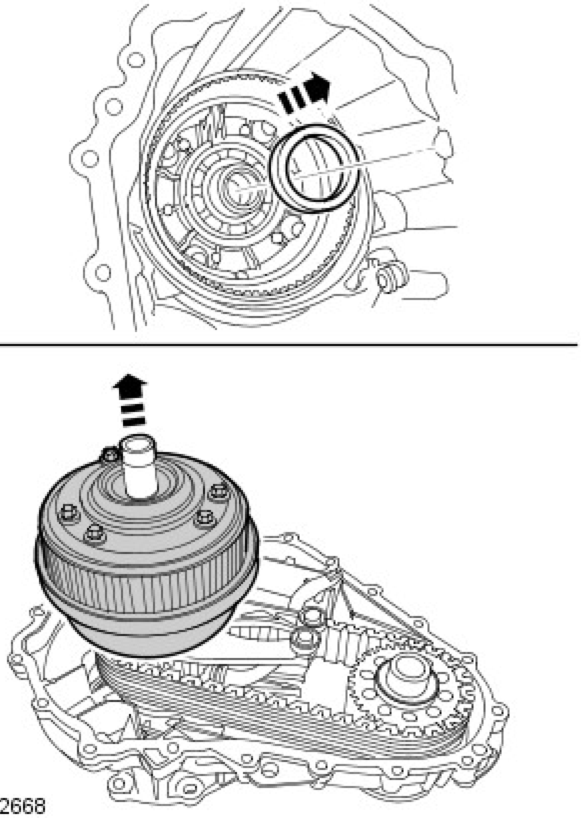
E62667

8. WARNING: Eye protection must be worn.

CAUTION: Care must be taken to avoid damage to the mating surfaces.

Remove the rear half of the transfer case.

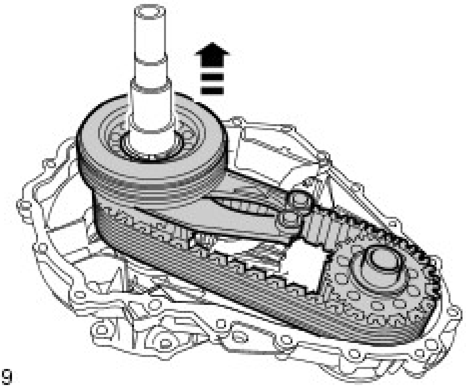
- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.



E62668

9. Remove the differential module.

- Remove the spacer.



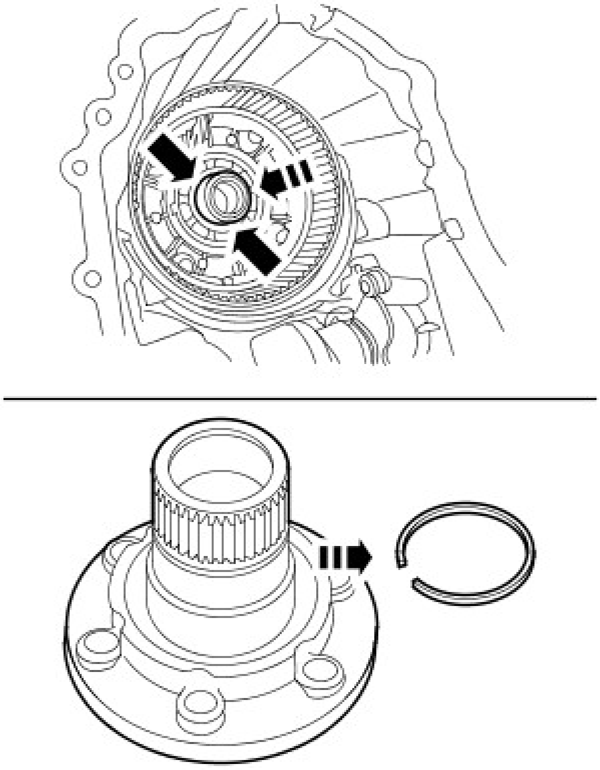
E62669

10. NOTE: Remove as an assembly.

Remove the clutch, chain and sprocket.

11. Remove the rear output flange.

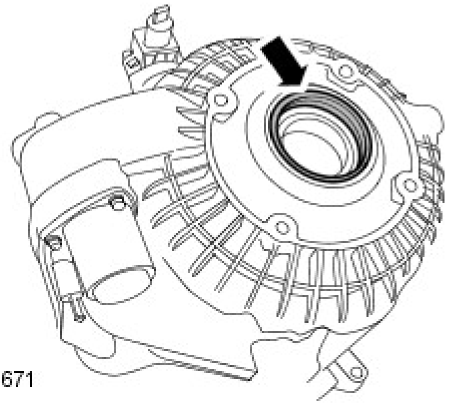
- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.



E62670

12. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

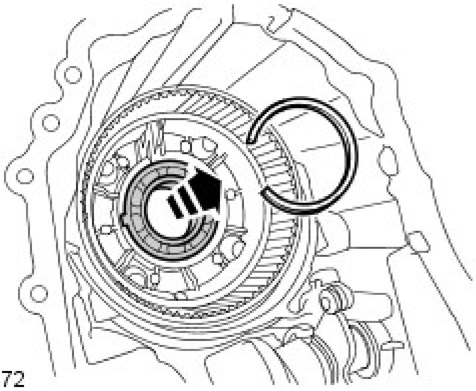
Remove the output flange seal.



E62671

13. Remove the output flange bearing.

- Remove the circlip.



E62672

14. Release the front half of the transfer case from the flat surface.

- Remove the 2 bolts.

Installation

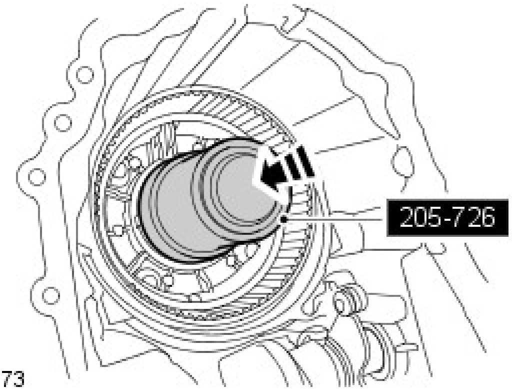
1. Remove the sealant from the transfer case mating faces.

2. Clean the magnetic filter.

3. ⚠ CAUTION: The chamfer on the bearing inner track must face the seal.

Using the special tool, install the output flange bearing.

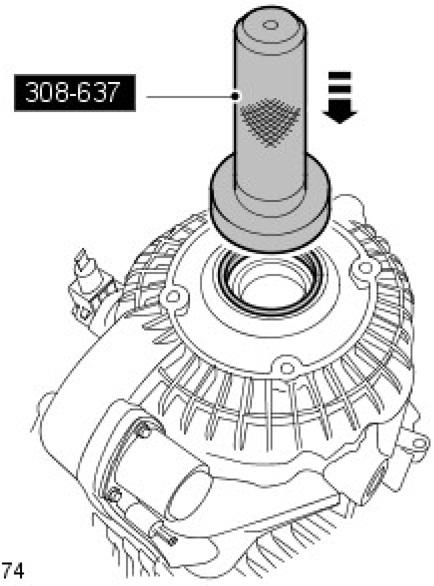
- Clean the components mating faces.
- Install the circlip.



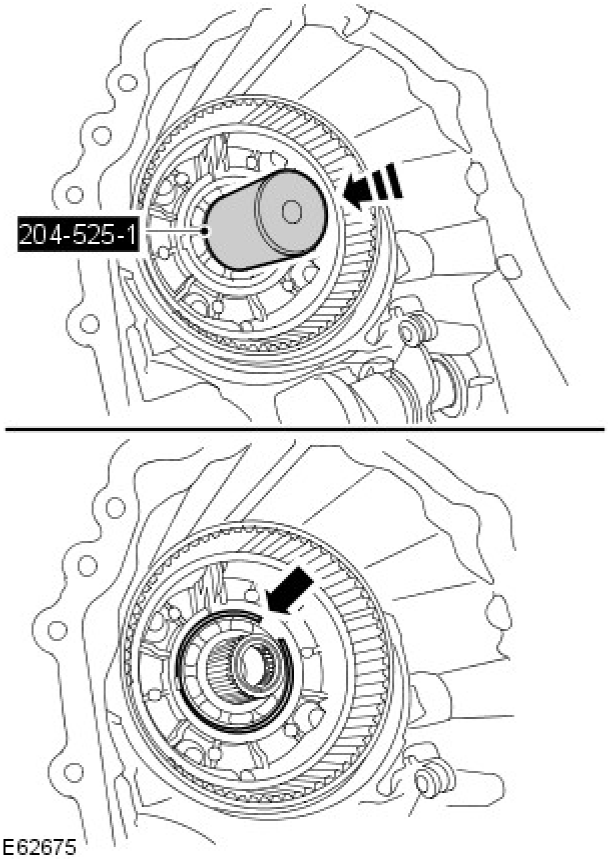
E62673

4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



E62674



E62675

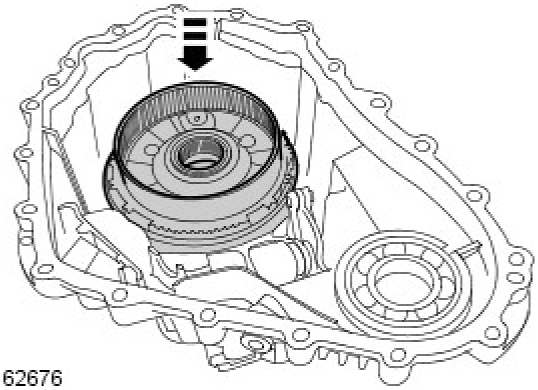
5. CAUTIONS:

⚠ Centralize the snap ring in the snap ring groove before installing the output flange.

⚠ Extreme care is necessary to make sure the snap ring enters the bearing squarely.

Using the special tool and with assistance, install the drive flange.

- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.



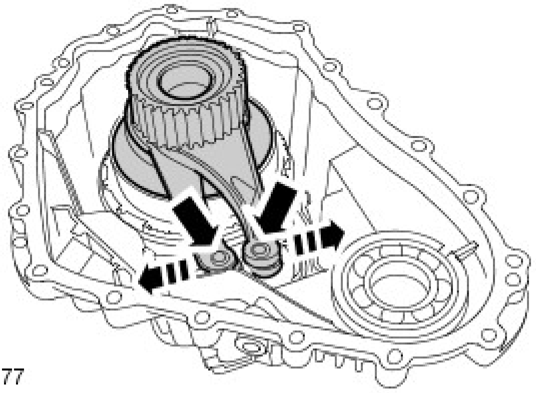
E62676

6. Secure the rear half of the transfer case with its rear face down on a flat surface.

7. NOTE: Rotate the differential to engage the splines.

Install the differential module.

- Clean the components.
- Install the spacer.



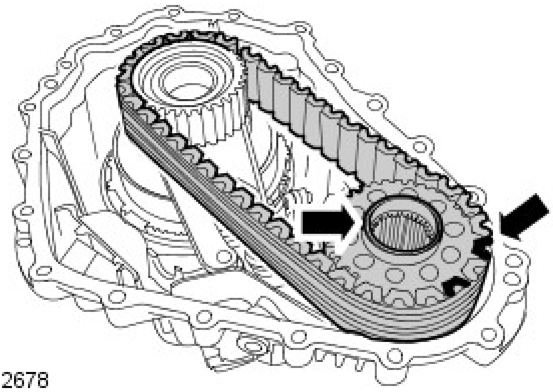
E62677

8. NOTE: Rotate the assembly to engage the clutch plates.

• NOTE: Use circlip pliers to open the actuator levers.

Install the clutch.

- Clean the components.
- Engage the actuator levers.



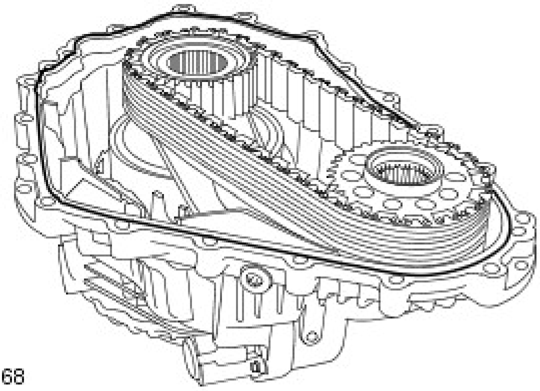
E62678

9. ⚠ CAUTION: The dark links in the chain face up as shown.

• NOTE: The relieved splined inner diameter of the sprocket must face up as shown.

Install the chain and sprocket.

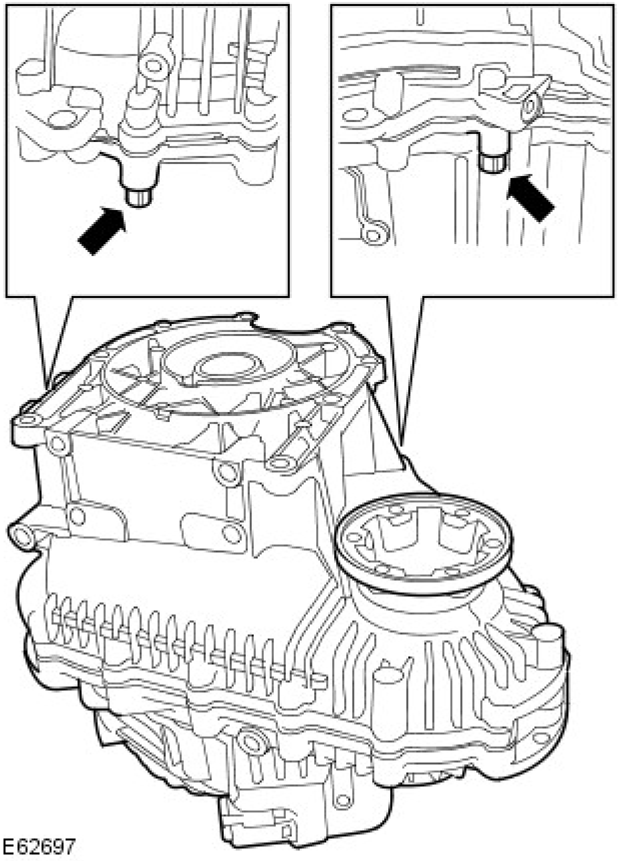
- Clean the components.



E62568

10. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.
- Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.



11. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).

12. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

13. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

14. With assistance, release the transfer case from the flat surface.

- Remove the 2 bolts.

15. Install the transfer case.
For additional information, refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).

16. Refill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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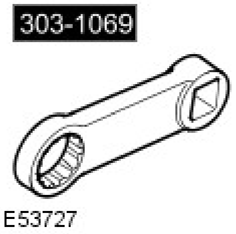
Transfer Case - Transfer CaseV8 S/C 4.2L Petrol

Removal

Special Tool(s)	
	Wrench adaptor 303-1069

Removal

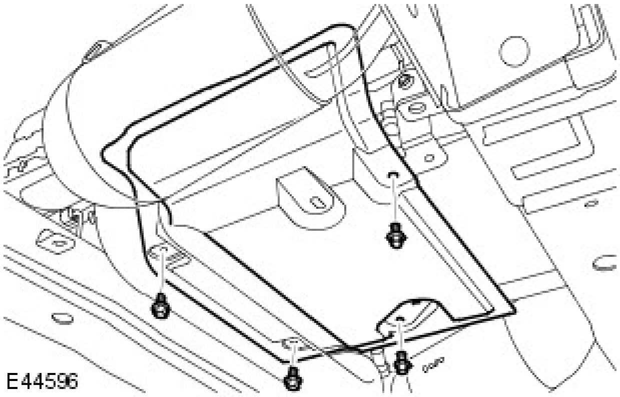
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transmission heat shield.

- Remove the 4 bolts.



4. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

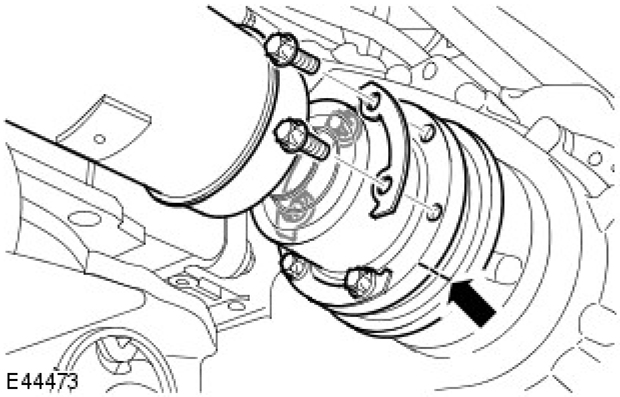
5. CAUTIONS:

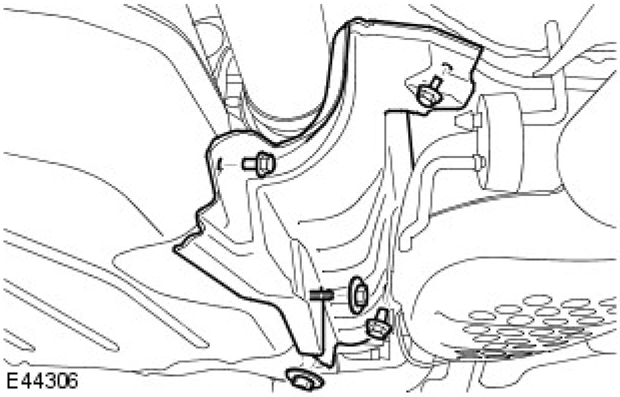
Mark the position of the driveshaft flange in relation to the drive pinion flange.

To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the front driveshaft from the transfer case drive flange.

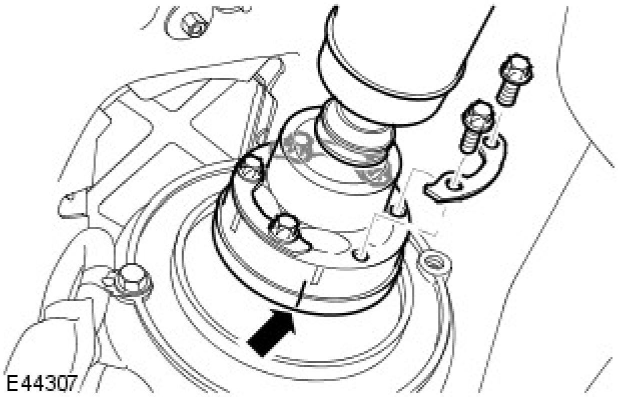
- Remove the 6 Torx bolts and washers, discard the bolts.
- Using a suitable tie strap, reposition and secure the driveshaft to the exhaust system.





6. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.



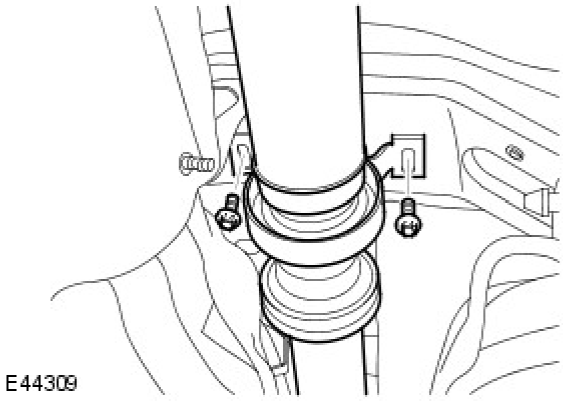
7. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the rear driveshaft from the transfer case drive flange.

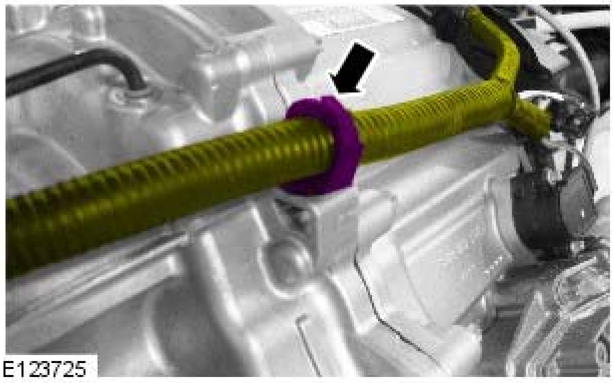
- Remove the 6 Torx bolts and washers.



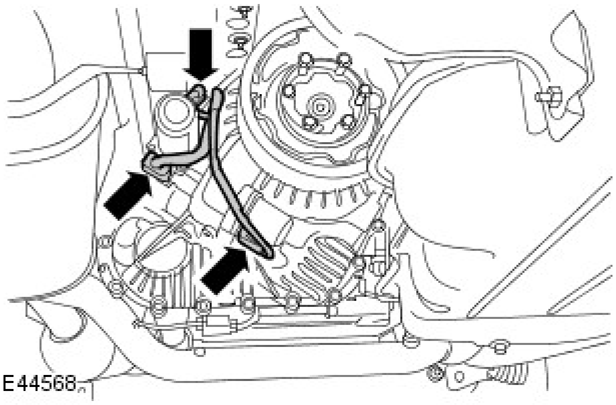
8. ⚠ CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft center bearing mount.

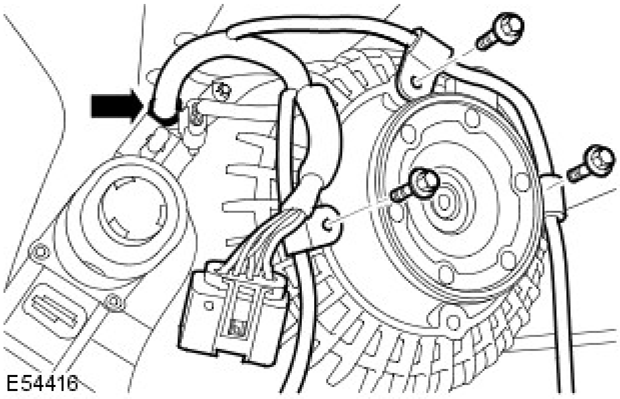
- Remove the 2 driveshaft center bearing mount bolts.
- Using suitable securing strap, reposition and support the driveshaft.



9. Release the transmission wiring harness retaining clip.

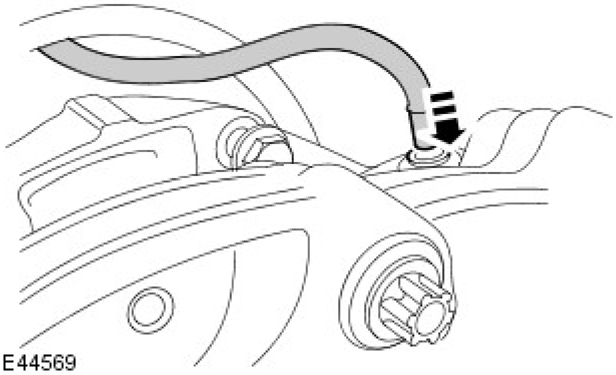


10. Disconnect the transfer case 3 electrical connectors.



11. Release the wiring harness from the transfer case.

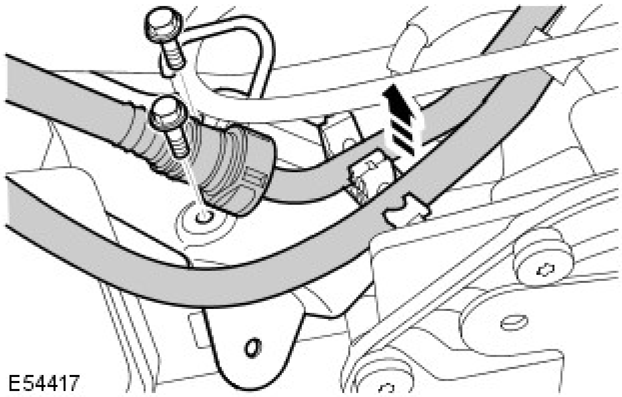
- Remove the 3 bolts.
- Release the clip.



12. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the breather line.

- Depress the locking ring.



13. Release the fuel line support bracket.

- Release the fuel lines.
- Remove the 2 bolts.

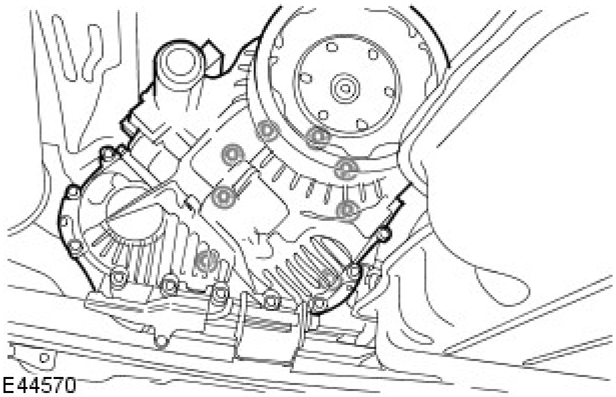
14. Support the transmission on a jack.

15. ⚠ WARNING: Secure the component to the transmission jack.

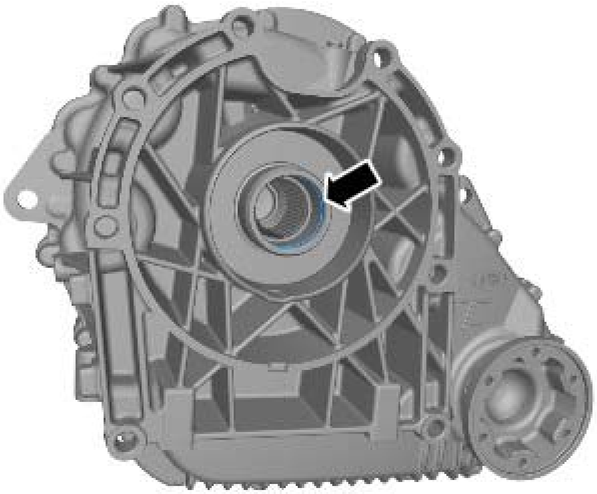
Using a transmission jack, support the transfer case.

16. With assistance, remove the transfer case.

- Remove the 8 bolts.
- Move the fuel hose support bracket aside.



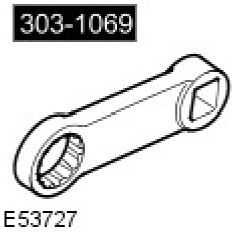
17. Remove and discard the O-ring seal.



Published: 11-May-2011

Transfer Case - Transfer CaseV8 4.4L Petrol

Removal

Special Tool(s)	
 E53727	Wrench adaptor 303-1069

Removal

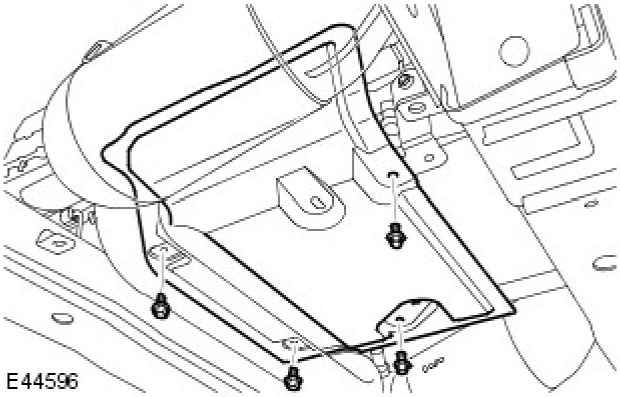
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the transmission heat shield.

- Remove the 4 bolts.


E44596

4. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

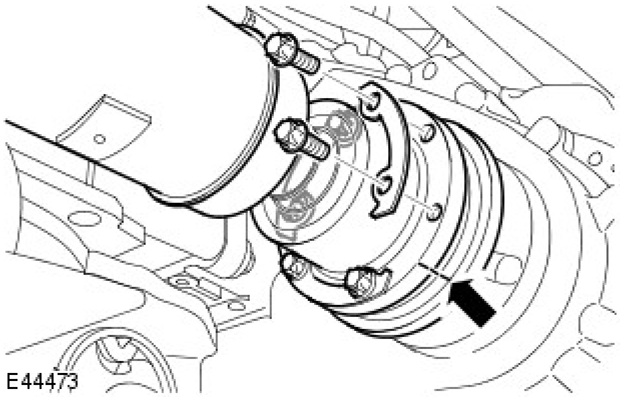
5. CAUTIONS:

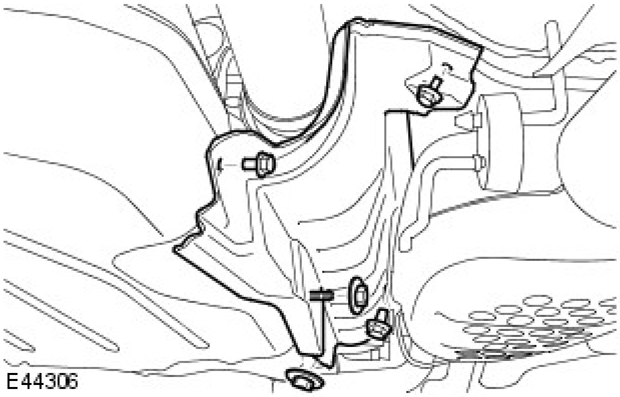
⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the front driveshaft from the transfer case drive flange.

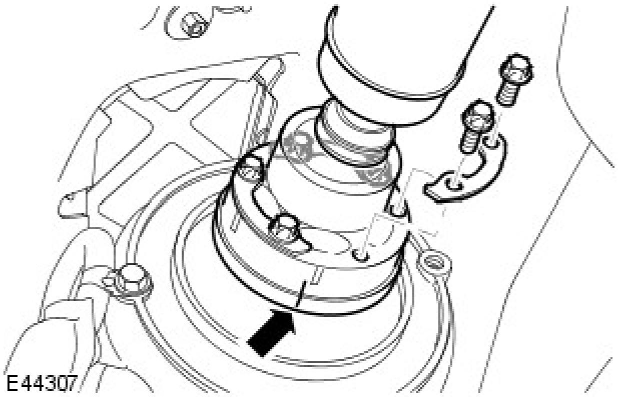
- Remove the 6 Torx bolts and washers, discard the bolts.
- Using a suitable tie strap, reposition and secure the driveshaft to the exhaust system.


E44473



6. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.



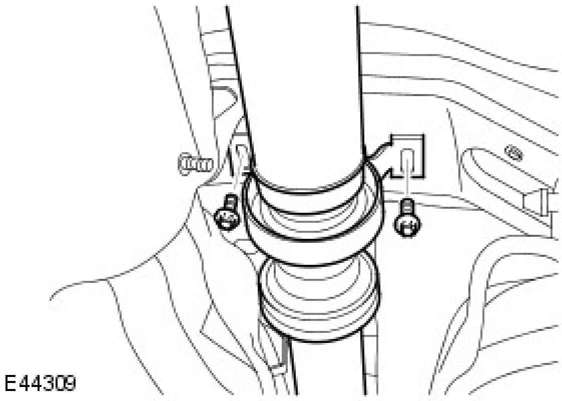
7. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the rear driveshaft from the transfer case drive flange.

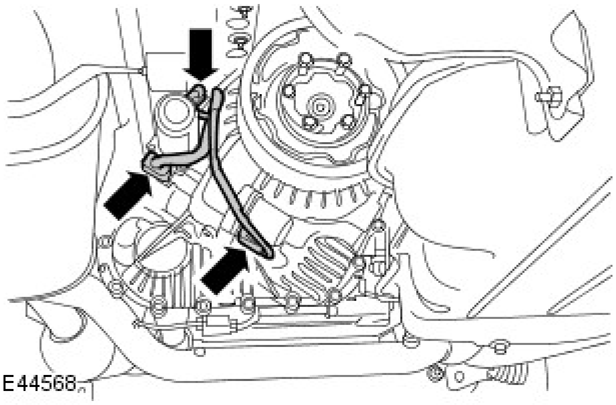
- Remove the 6 Torx bolts and washers.



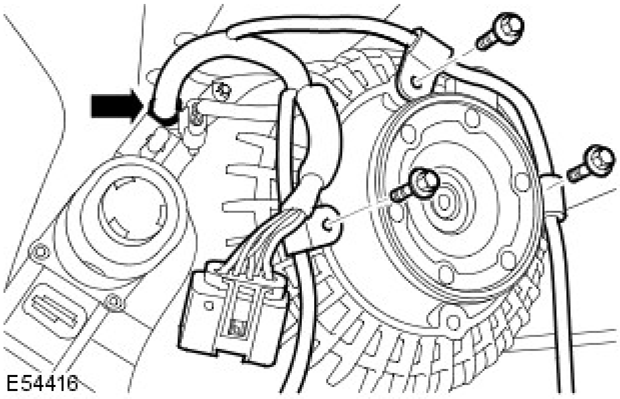
8. ⚠ CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the driveshaft center bearing mount.

- Remove the 2 driveshaft center bearing mount bolts.
- Using suitable securing strap, reposition and support the driveshaft.

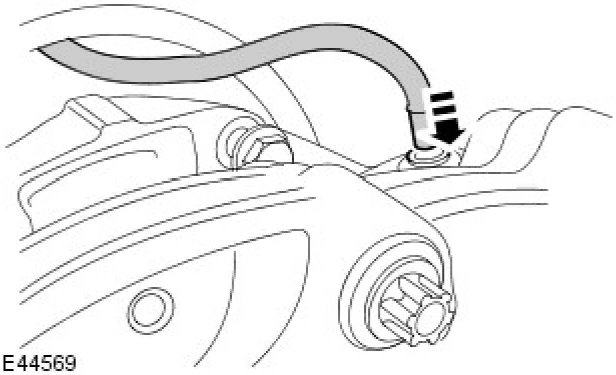


9. Disconnect the transfer case 3 electrical connectors.


E54416

10. Release the wiring harness from the transfer case.

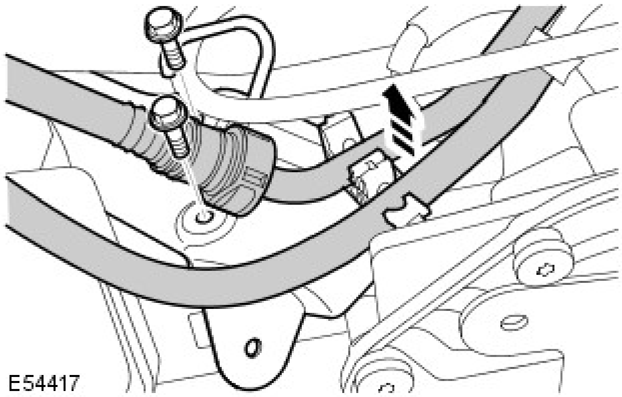
- Remove the 3 bolts.
- Release the clip.


E44569

11. ⚠CAUTION: Always plug any open connections to prevent contamination.

Disconnect the breather line.

- Depress the locking ring.


E54417

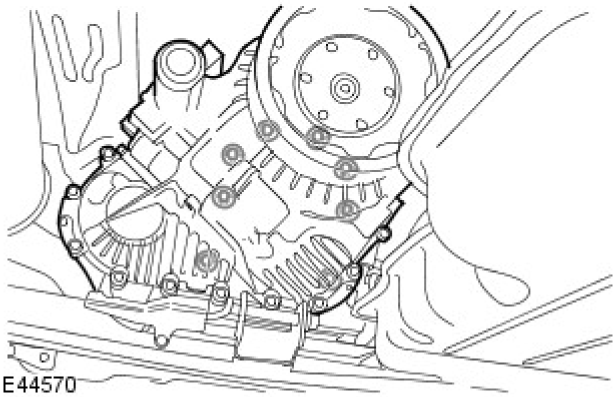
12. Release the fuel line support bracket.

- Release the fuel lines.
- Remove the 2 bolts.

13. Support the transmission on a jack.

14. ⚠WARNING: Secure the component to the transmission jack.

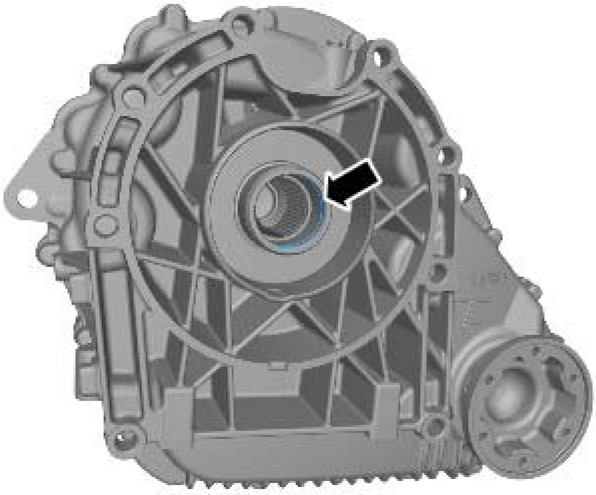
Using a transmission jack, support the transfer case.


E44570

15. With assistance, remove the transfer case.

- Remove the 8 bolts.
- Move the fuel hose support bracket aside.

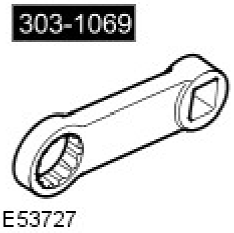
16. Remove and discard the O-ring seal.


E127507

Published: 11-May-2011

Transfer Case - Transfer CaseTDV8 3.6L Diesel

Removal

Special Tool(s)	
 E53727	Wrench adaptor 303-1069

Removal

All vehicles

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

Vehicles with diesel particulate filter (DPF)

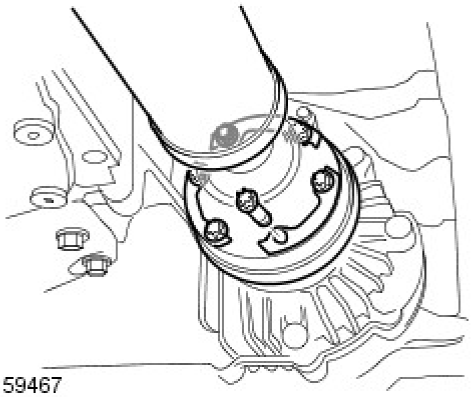
2. Remove the diesel particulate filter (DPF). For additional information, refer to: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

Vehicles without diesel particulate filter (DPF)

3. Remove the front muffler.
   For additional information, refer to: Muffler - Vehicles Without: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

All vehicles

4. Remove the transmission crossmember. For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).



E59467

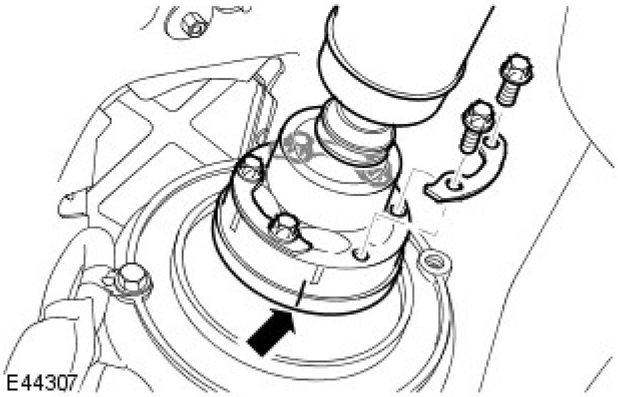
5. CAUTIONS:

   Mark the position of the driveshaft flange in relation to the drive pinion flange.

   To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

   Release the front driveshaft from the transfer case drive flange.

   - Remove and discard the 6 bolts.
   - Remove the 3 washers.
   - Using a suitable tie strap, secure the driveshaft.



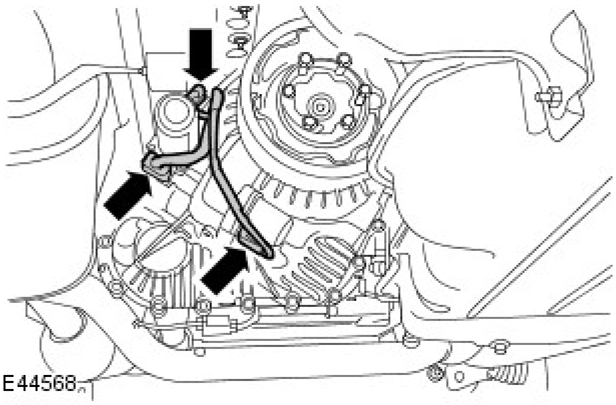
6. CAUTIONS:

⚠ Mark the position of the driveshaft flange in relation to the drive pinion flange.

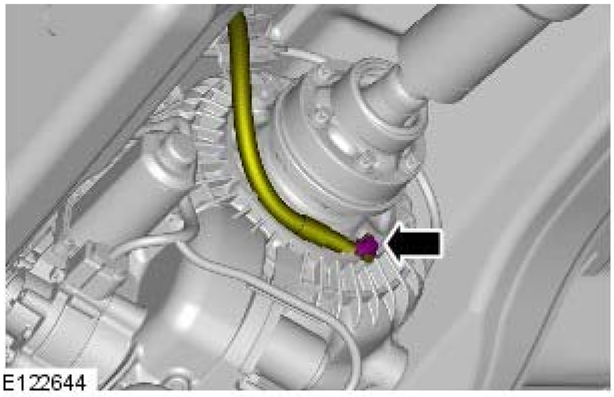
⚠ To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

Release the rear driveshaft from the transfer case drive flange.

- Remove the 6 Torx bolts and washers.
- Using a suitable tie strap, secure the driveshaft.

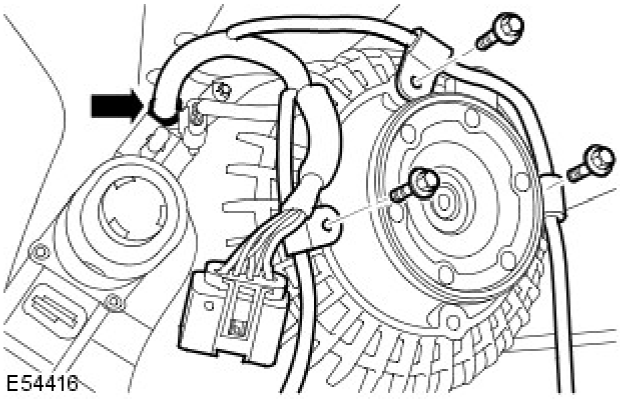


7. Disconnect the 3 electrical connectors from the transfer case.



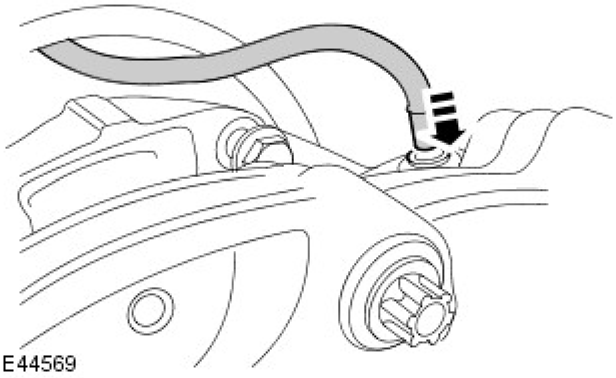
8. Remove the ground cable from the transfer box.

- Remove the bolt.



9. Release the wiring harness from the transfer case.

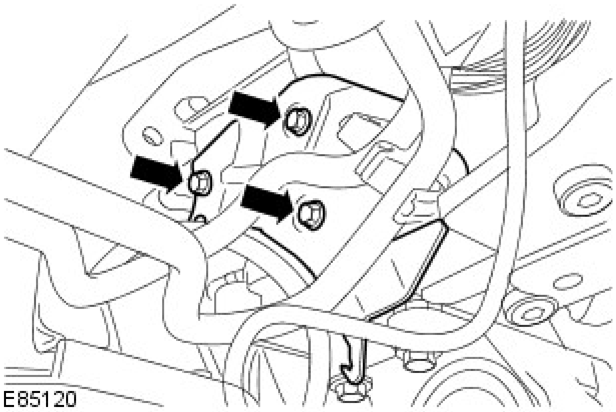
- Remove the 3 bolts.
- Release the clip.



10. CAUTION: Always plug any open connections to prevent contamination.

Disconnect the breather line.

- Release the locking ring.



11. Release the fuel line support bracket.

- Remove the 3 bolts.

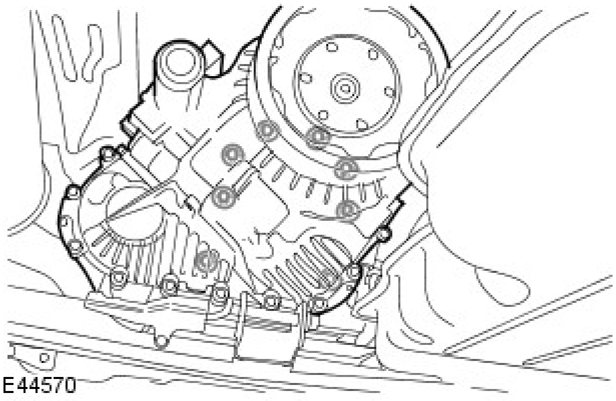
12. Support the transmission.

13. WARNING: Secure the component to the transmission jack.

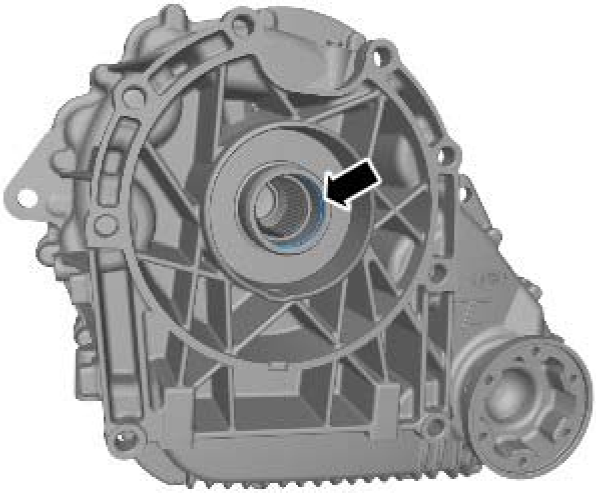
Using a transmission jack, support the transfer case.

14. With assistance, remove the transfer case.

- Remove the 8 bolts.
- Move the fuel hose support bracket aside.



15. Remove and discard the O-ring seal.

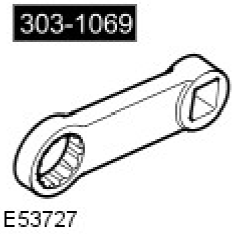


E127507

Published: 11-May-2011

Transfer Case - Transfer CaseV8 S/C 4.2L Petrol

Installation

Special Tool(s)	
 303-1069 E53727	Wrench adaptor 303-1069

Installation

1. With assistance, install the transfer case.

- Clean the component mating faces.
- Lubricate input shaft splines with 'Weicon TL7391' grease.
- Install the O-ring seal.
- Using the special tool, tighten the bolts to 45 Nm (33 lb.ft).

2. Connect the breather line.

3. Position the fuel line support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the fuel lines.

4. Connect the electrical connectors.

5. Secure the wiring harness to the transfer case.

- Secure with the clip.
- Tighten the bolts to 25 Nm (18 lb.ft).

6. Secure the front driveshaft to the transfer case drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

7. Secure the rear driveshaft to the transfer case drive flange.

- Clean the component mating faces.
- Tighten the Torx bolts to 55 Nm (40 lb.ft).

8. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

9. CAUTIONS:

⚠ Align the driveshaft center bearing mount by moving the floating front section of the shaft backward or forwards until the bolt holes in the mount align with the holes in the chassis.

⚠ Make sure the center bearing mount is not under tension.

Install the driveshaft center bearing mount bolts.

- Align the center bearing mount.
- Tighten the driveshaft center bearing retaining bolts to 30 Nm (22 lb.ft).

10. Install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

11. Install the transmission crossmember.

For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

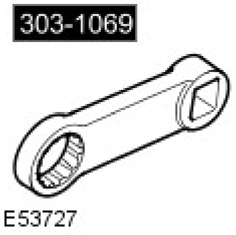
13. Check and top-up the transfer case fluid level.

14. Using the diagnostic tool, re-calibrate the transfer case.

Published: 11-May-2011

Transfer Case - Transfer CaseV8 4.4L Petrol

Installation

Special Tool(s)	
 303-1069 E53727	Wrench adaptor 303-1069

Installation

1. With assistance, install the transfer case.

- Clean the component mating faces.
- Lubricate input shaft splines with 'Weicon TL7391' grease.
- Install the O-ring seal.
- Using the special tool, tighten the bolts to 45 Nm (33 lb.ft).

2. Connect the breather line.

3. Position the fuel line support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the fuel lines.

4. Connect the electrical connectors.

5. Secure the wiring harness to the transfer case.

- Secure with the clip.
- Tighten the bolts to 25 Nm (18 lb.ft).

6. Secure the front driveshaft to the transfer case drive flange.

- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

7. Secure the rear driveshaft to the transfer case drive flange.

- Clean the component mating faces.
- Tighten the Torx bolts to 55 Nm (40 lb.ft).

8. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

9. CAUTIONS

⚠ Align the driveshaft center bearing mount by moving the floating front section of the shaft backward or forwards until the bolt holes in the mount align with the holes in the chassis.

⚠ Make sure the center bearing mount is not under tension.

Install the driveshaft center bearing mount bolts.

- Align the center bearing mount.
- Tighten the driveshaft center bearing retaining bolts to 30 Nm (22 lb.ft).

10. Install the transmission heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

11. Install the transmission crossmember.

For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

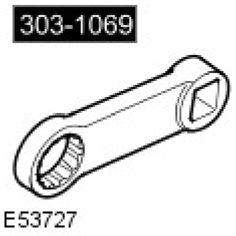
13. Check and top-up the transfer case fluid level.

14. Using the diagnostic tool, re-calibrate the transfer case.

Published: 11-May-2011

Transfer Case - Transfer CaseTDV8 3.6L Diesel

Installation

Special Tool(s)	
	Wrench adaptor 303-1069

Installation

All vehicles

1. With assistance, install the transfer case.

- Clean the components mating faces.
- Lubricate the input shaft splines with the recomended grease.
- Install a new O-ring seal.
- Tighten the bolts to 45 Nm (33 lb.ft).

2. Secure the fuel line support bracket.

- Tighten the bolts to 10 Nm (7 lb.ft).

3. Connect the breather line.

4. Install the ground cable to the transfer box.

- Tighten the bolt to 15Nm (11 lb.ft).

5. Secure the wiring harness to the transfer case.

- Secure with the clip.
- Tighten the bolts to 25 Nm (18 lb.ft).

6. Connect the electrical connectors.

7. NOTE: A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

Secure the rear driveshaft to the transfer case drive flange.

- Tighten the Torx bolts to 55 Nm (40 lb.ft).

8. Secure the front driveshaft to the transfer case drive flange.

- Install the washers.
- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

9. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

Vehicles with diesel particulate filter (DPF)

10. Install the DPF. For additional information, refer to: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

Vehicles without diesel particulate filter (DPF)

11. Install the front muffler.For additional information, refer to: Muffler - Vehicles Without: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

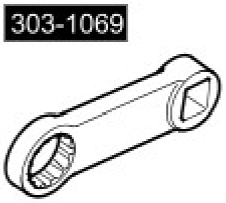
All vehicles

12. Check and top-up the transfer case fluid level.
13. Using the diagnostic tool, re-calibrate the transfer case.

Published: 11-May-2011

Transfer Case - Transfer CaseTDV6 2.7L Diesel

Removal

Special Tool(s)	
 E53727	Wrench adaptor 303-1069

Removal

All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

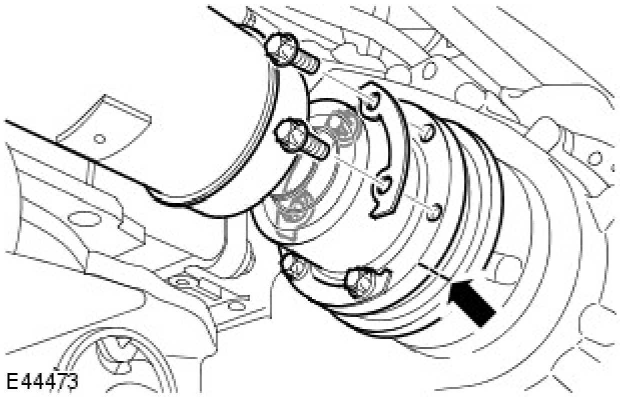
Raise and support the vehicle.

Vehicles with diesel particulate filter (DPF)

3. Remove the diesel particulate filter (DPF).For additional information, refer to: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

All vehicles

4. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).



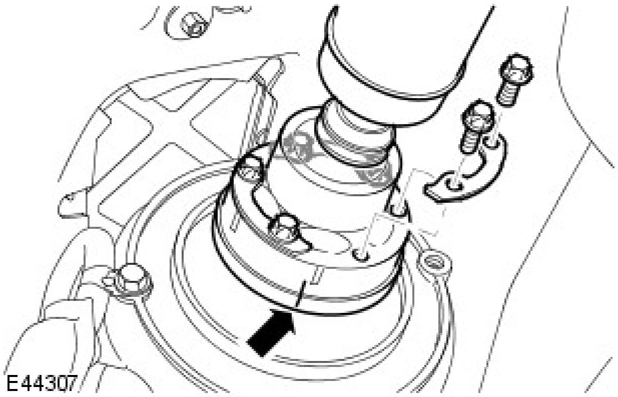
E44473

5. ⚠ CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

• NOTE: Mark the position of the driveshaft on the transmission flange.

Release the front driveshaft from the transfer case drive flange.

- Remove the 6 Torx bolts and washers, discard the bolts.
- Using a suitable tie strap, reposition and secure the driveshaft to the exhaust system.

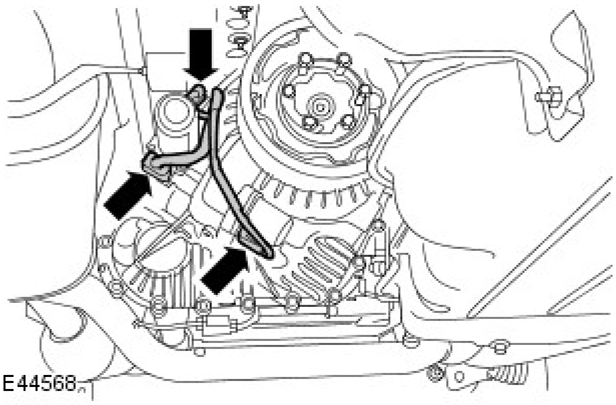


6. ⚠CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

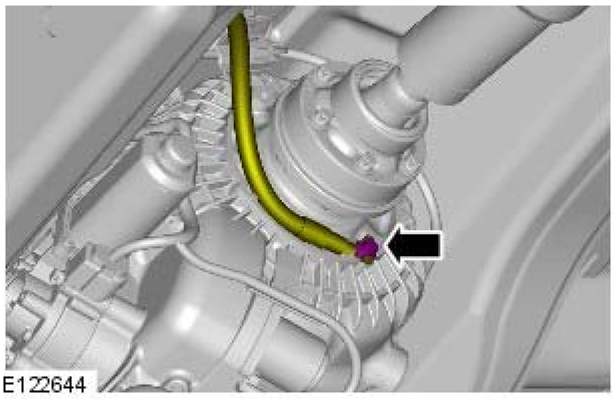
• NOTE: Mark the position of the driveshaft on the transmission flange.

Release the rear driveshaft from the transfer case drive flange.

- Remove the 6 Torx bolts and washers.
- Using a suitable tie strap, secure the driveshaft.

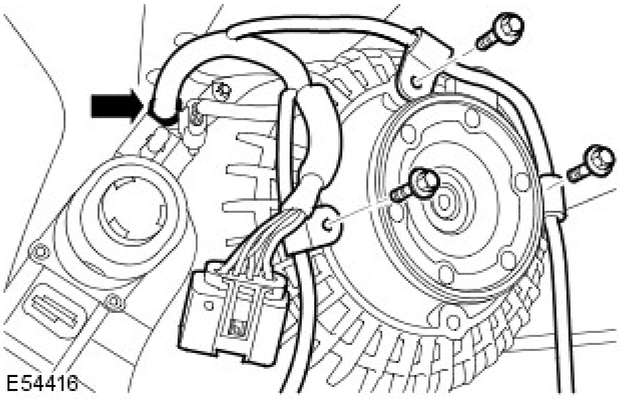


7. Disconnect the transfer case 3 electrical connectors.



8. Remove the ground cable from the transfer box.

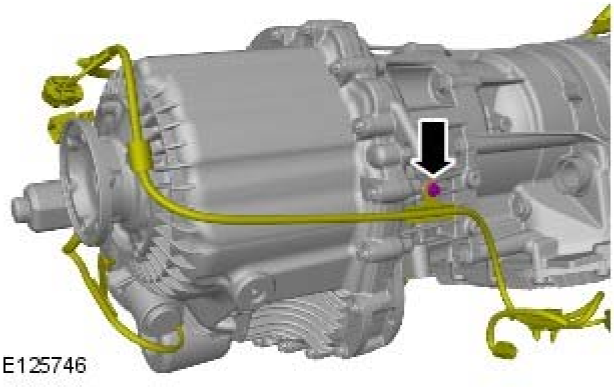
- Remove the bolt.



9. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Release the wiring harness from the transfer case.

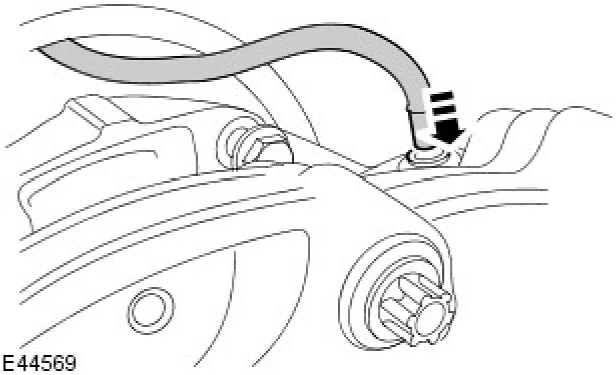
- Release the clip.
- Remove the 3 bolts.



E125746

10. Release the wiring harness from the transfer case.

- Remove the bolt.

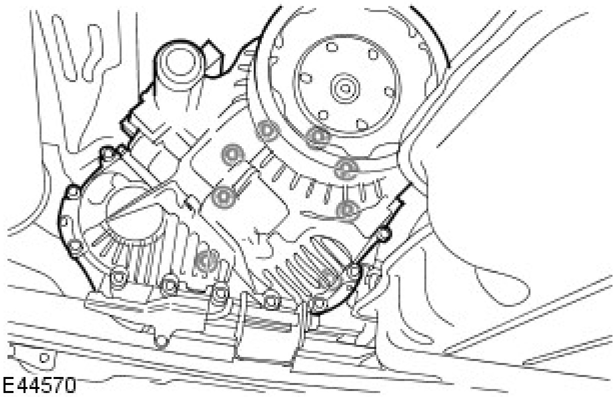


E44569

11. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the breather line.

- Depress the locking ring.



E44570

12. ⚠ WARNING: Secure the component to the transmission jack.

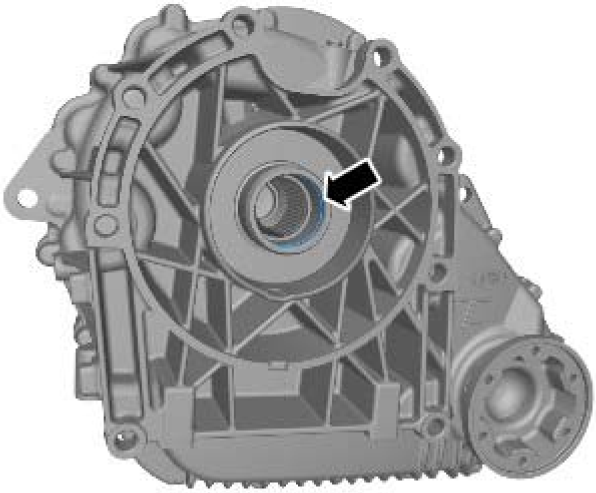
Using a transmission jack, support the transfer case.

13. ⚠ CAUTION: Take extra care not to damage the wiring harnesses.

With assistance, remove the transfer case.

- Remove the 8 bolts.

14. Remove and discard the O-ring seal.

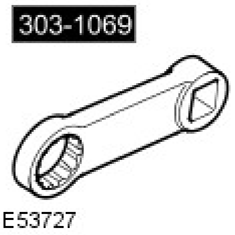


E127507

Published: 11-May-2011

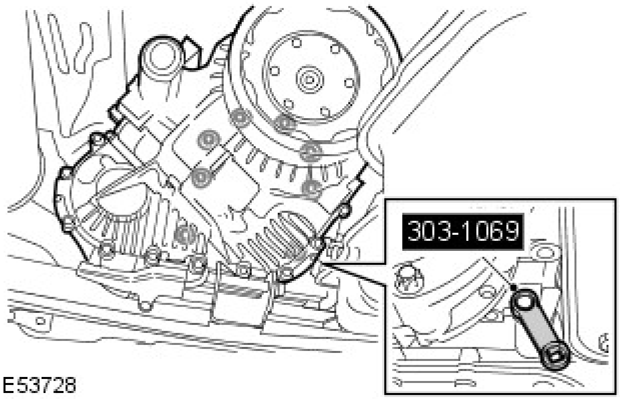
Transfer Case - Transfer CaseTDV6 2.7L Diesel

Installation

Special Tool(s)	
 E53727	Wrench adaptor 303-1069

Installation

All vehicles

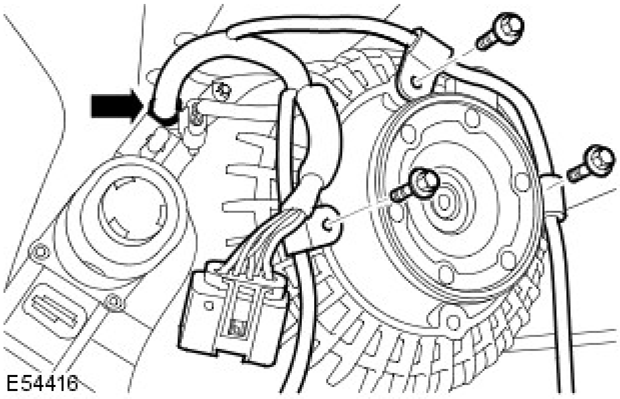


E53728

1. ⚠CAUTION: Take extra care not to damage the wiring harnesses.

With assistance, install the transfer case.

- Clean the component mating faces.
- Lubricate input shaft splines with 'Weicon TL7391' grease.
- Install the O-ring seal.
- Using the special tool, tighten the bolts to 45 Nm (33 lb.ft).



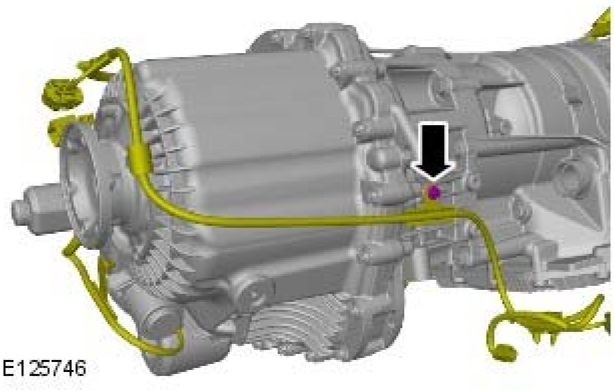
E54416

2. Connect the breather line.

3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Secure the wiring harness to the transfer case.

- Tighten the bolts to 25 Nm (18 lb.ft).
- Secure the clip.



4. Secure the wiring harness to the transfer case.

- Tighten bolt to 10Nm (7 lb.ft)

5. Connect the electrical connectors.

6. Install the ground cable to the transfer box.

- Tighten the bolt to 15Nm (11 lb.ft).

7. Secure the rear driveshaft to the transfer case drive flange.

- Install the washers.
- Tighten the Torx bolts to 55 Nm (40 lb.ft).

8. Secure the front driveshaft to the transfer case drive flange.

- Install the washers.
- Stage 1: Tighten the bolts to 45 Nm (33 lb.ft).
- Stage 2: Tighten the bolts a further 90 degrees.

9. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

Vehicles with diesel particulate filter (DPF)

10. Install the diesel particulate filter (DPF).For additional information, refer to: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

All vehicles

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

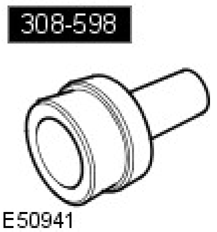
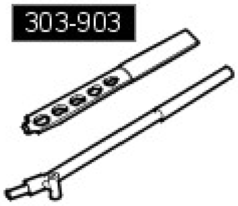
12. Check and top-up the transfer case fluid level.

13. Using the diagnostic tool, re-calibrate the transfer case.

Published: 11-May-2011

Transfer Case - Transfer Case Input Shaft SealTDV6 2.7L Diesel

In-vehicle Repair

Special Tool(s)	
 E50941	Oil seal installer 308-598
 E50940	Oil seal remover 303-903 (LRT-12-092)

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

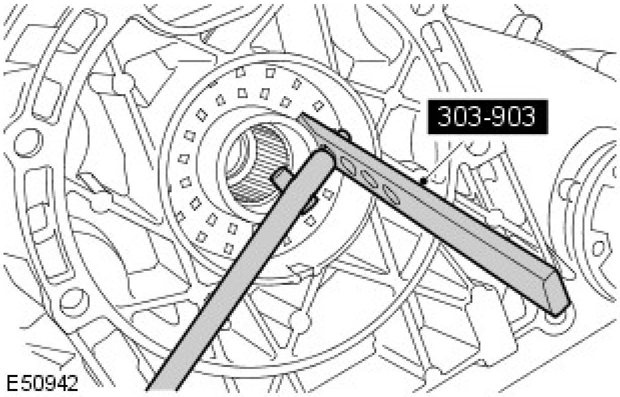
Raise and support the vehicle.

2. Remove the transfer case.
For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

3. ⚠ CAUTION: Care must be taken to avoid damage to the seal register and running surface.

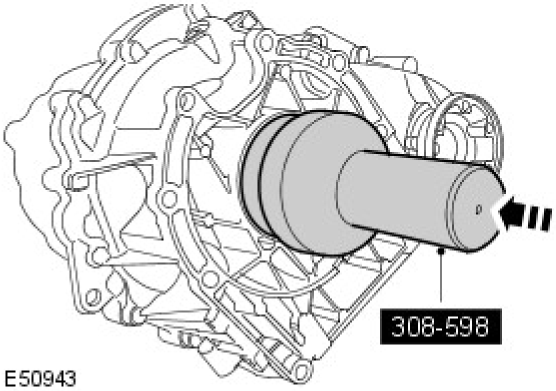
Carefully remove and discard the oil seal.

- Use the special tool.



E50942

Installation



1. ⚠ CAUTION: Oil seals must be fitted dry.

   Install a new seal.

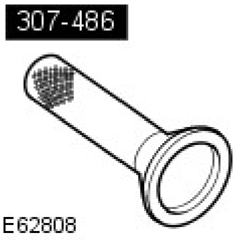
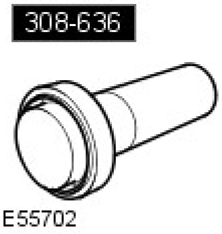
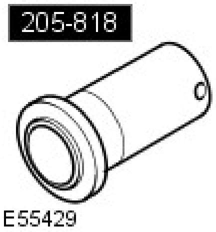
   - Clean the seal register.
   - Use the special tool.

2. Install the transfer case.
   For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

Published: 11-May-2011

Transfer Case - Transfer Case Front Output Shaft SealTDV6 2.7L Diesel

In-vehicle Repair

Special Tool(s)	
	Installer (LRT-41-019) 307-486
	Installer 308-636
	Installer 205-818

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

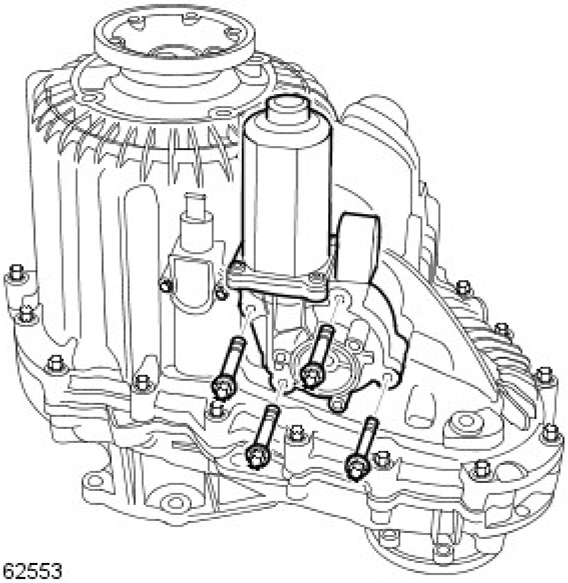
Raise and support the vehicle.

3. Drain the transfer case fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

- Secure with 2 bolts.

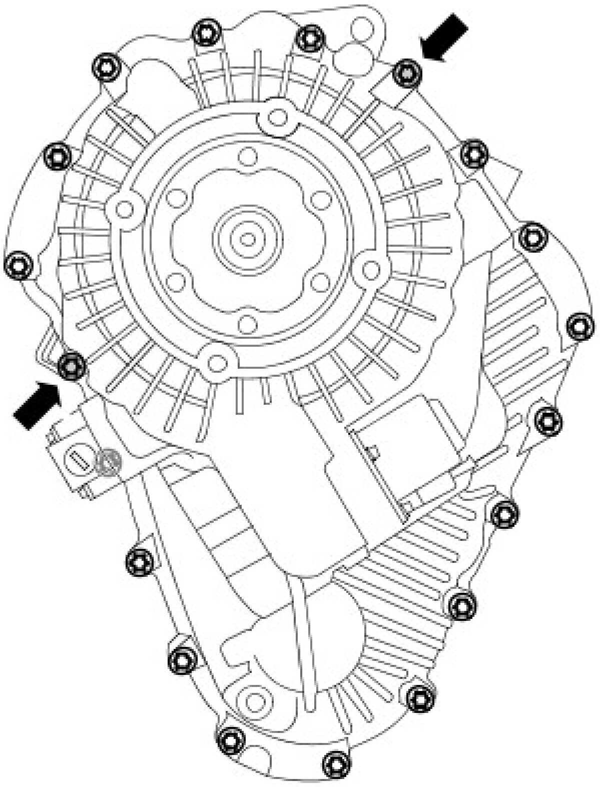


E62553

6. ⚠ WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.



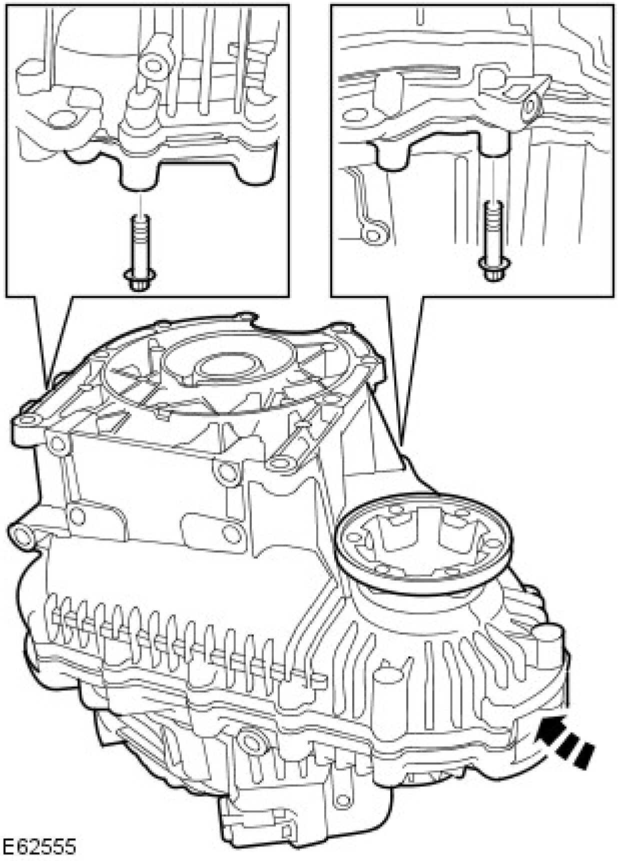
E62554

7. ⚠ WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.

8. With assistance, release the transfer case and secure with the rear face of the transfer case facing down on a flat surface.

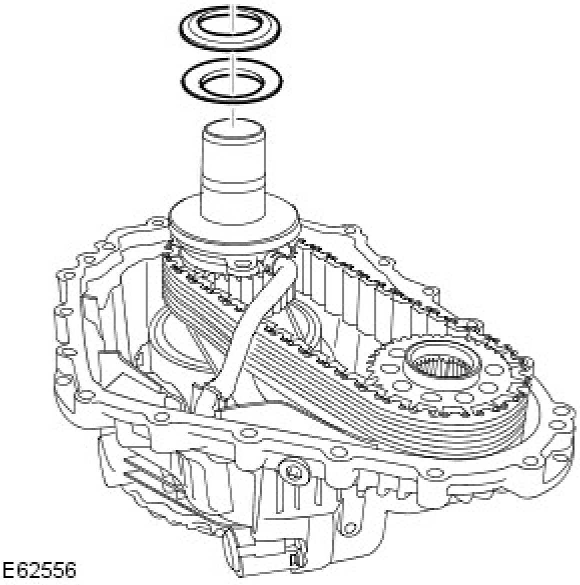

E62555

9. ⚠ WARNING: Eye protection must be worn.

⚠ CAUTION: Care must be taken to avoid damage to the mating surfaces.

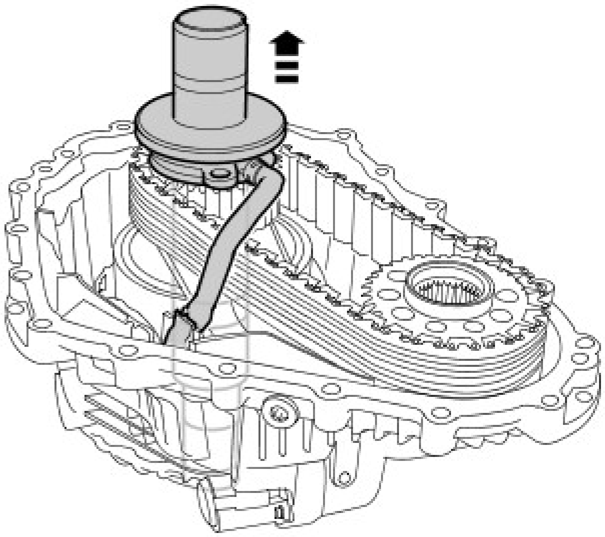
Remove the front half of the transfer case.

- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.


E62556

10. ⚠ CAUTION: Note the fitted position of the special washers.

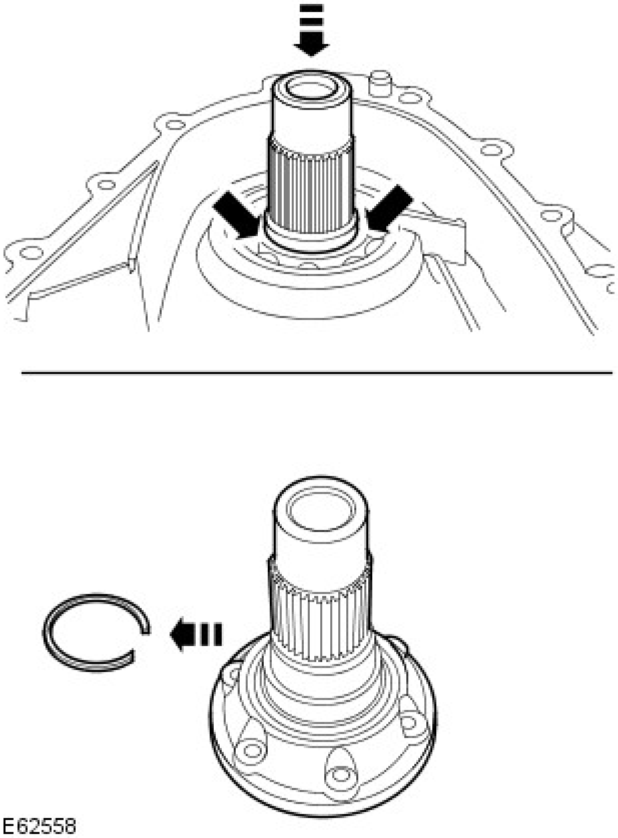
Remove the 2 special washers.



E62557

11. Remove the input shaft and oil pump assembly.

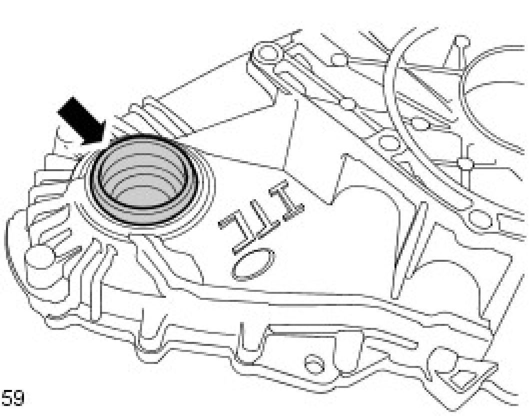
- Release the fluid pump pickup line.



E62558

12. Remove the front output flange.

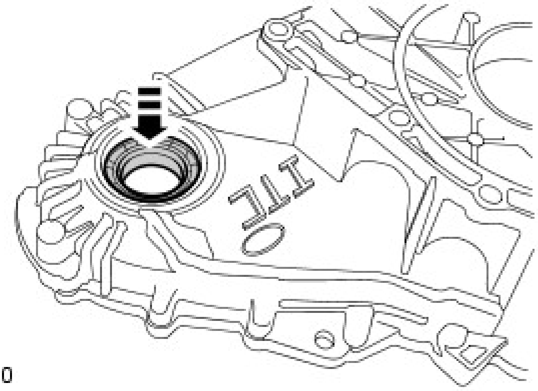
- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.



E62559

13. ⚠CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the output flange seal.



E62560

14. Remove the output flange bearing.

Installation

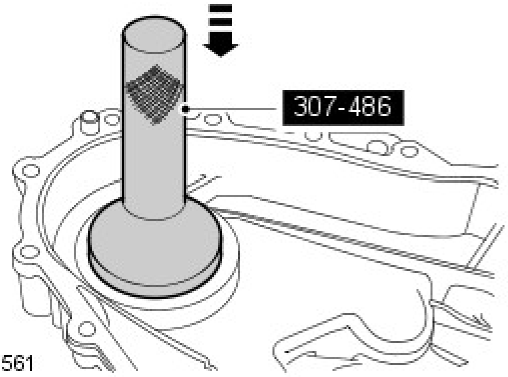
1. Remove the sealant from the transfer case mating faces.

2. Clean the magnetic filter.

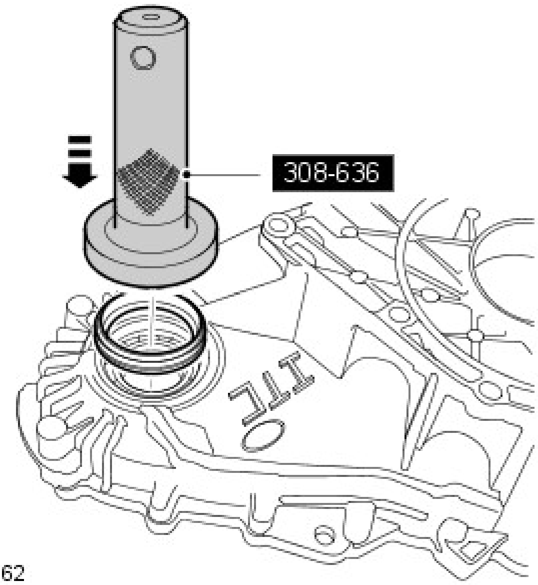
3. ⚠CAUTION: The chamfer on the bearing inner track must face the seal.

Using the special tool, install the output flange bearing.

- Clean the components mating faces.



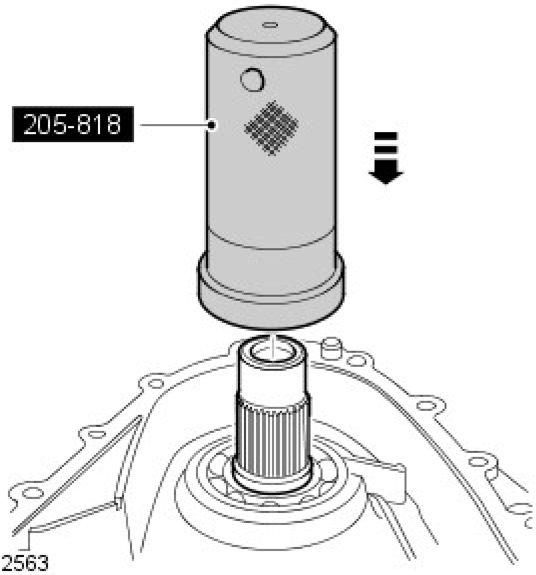
E62561



E62562

4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



E62563

5. CAUTIONS:

⚠ Centralise the snap ring in the snap ring groove before installing the output flange.

⚠ Extreme care is necessary to make sure the snap ring enters the bearing squarely.

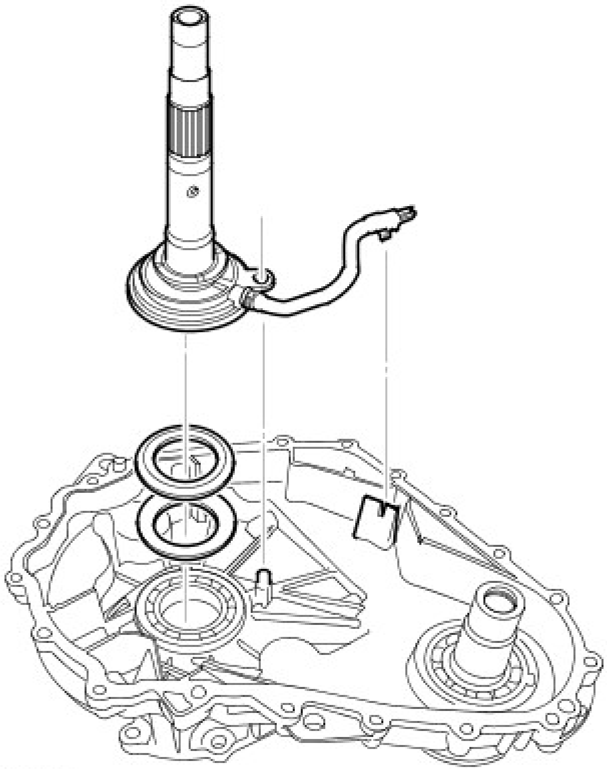
Using the special tool and with assistance, install the drive flange.

- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.

6. ⚠ CAUTION: Make sure the washers are installed correctly.

Install the 2 special washers.

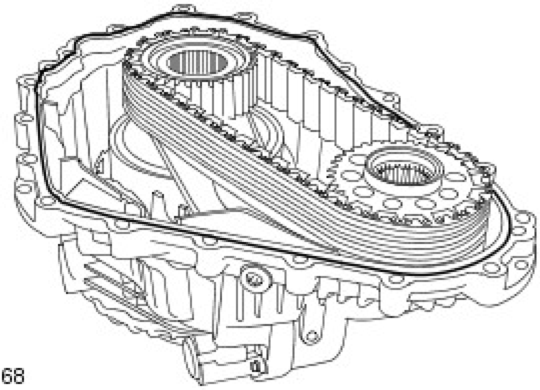
- Clean the components.


E62564

7. ⚠ CAUTION: Make sure the oil pump is installed over its location peg.

Install the input shaft and oil pump assembly.

- Clean the components.
- Secure the fluid pickup line.

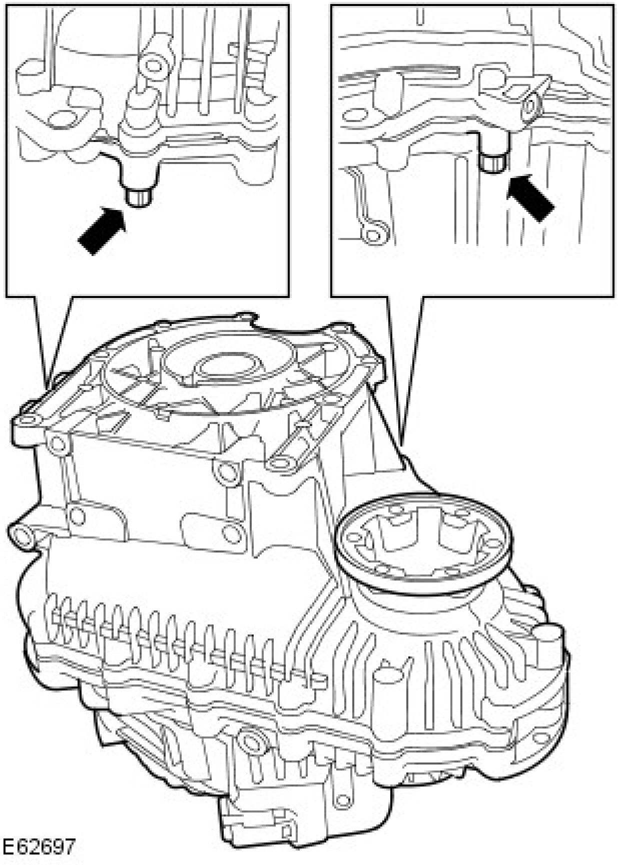

E62568

8. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.

9. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).



10. With assistance, release the transfer case and secure with its transmission mating face down on a flat surface.

11. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

12. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

13. With assistance, release the transfer case.

- Remove the 2 bolts.

14. Install the transfer case.
For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

15. Refill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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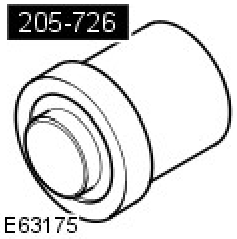
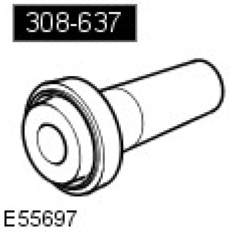
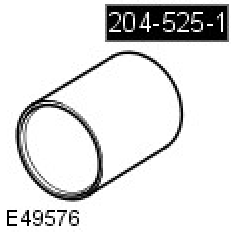
Transfer Case - Transfer Case Rear Output Shaft SealTDV6 2.7L Diesel

In-vehicle Repair

Special Tool(s)	
	Remover/installer (LRT-54-015) 205-726
	Seal installer 308-637
	Installer 204-525/1

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

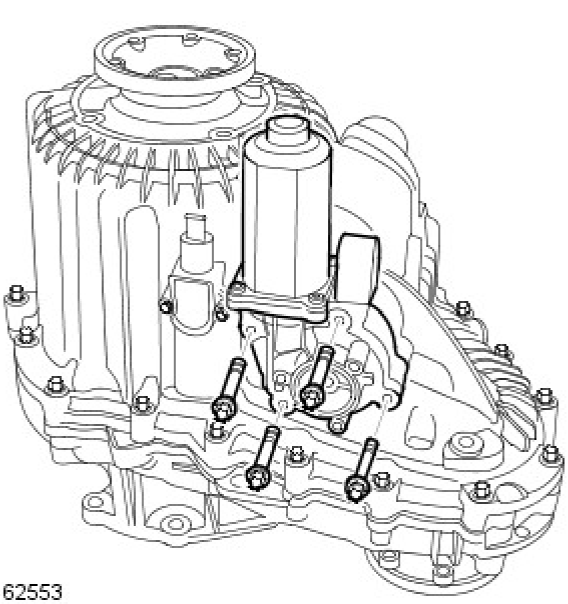
Raise and support the vehicle.

3. Drain the transfer case fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Remove the transfer case.
For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

5. With assistance, secure the transfer case with its transmission mating face down on a flat surface.

- Secure with 2 bolts.

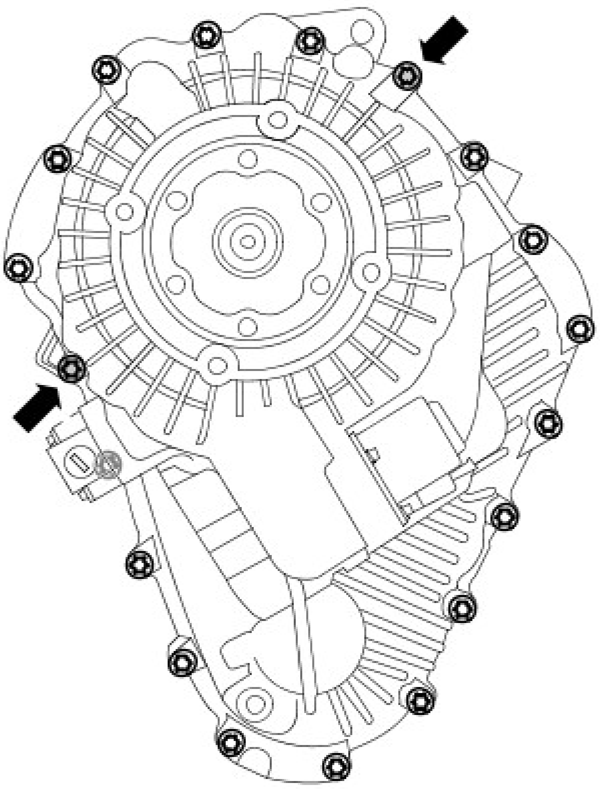


E62553

6. ⚠ WARNING: Eye protection must be worn.

Remove the shift motor.

- Remove the 4 bolts.
- Remove any debris from the bolt holes.

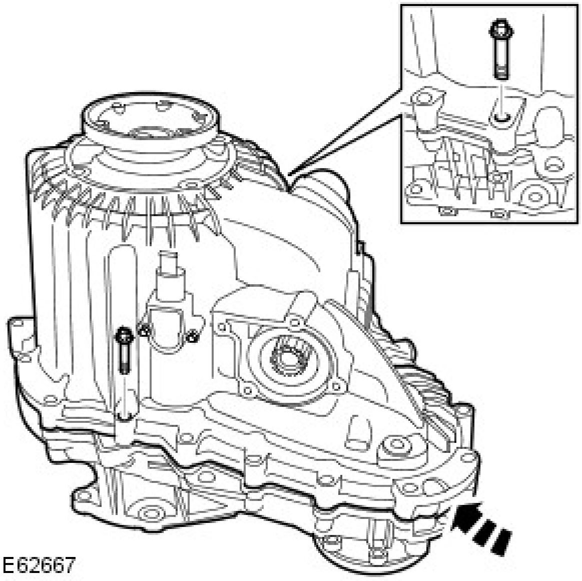


E62554

7. ⚠ WARNING: Eye protection must be worn.

Remove 17 Torx bolts securing the transfer casings.

- The two bolts indicated remain fully tightened.
- Remove any debris from the bolt holes.



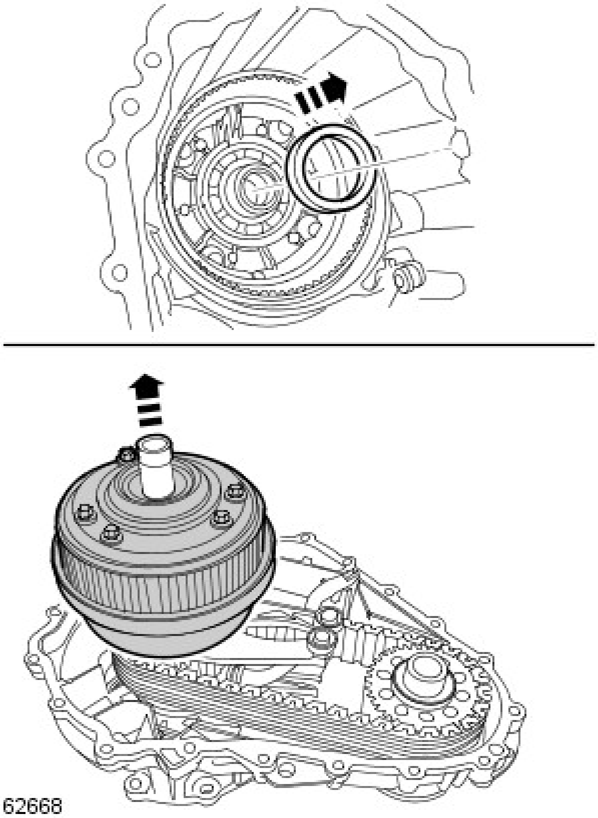
E62667

8. WARNING: Eye protection must be worn.

CAUTION: Care must be taken to avoid damage to the mating surfaces.

Remove the rear half of the transfer case.

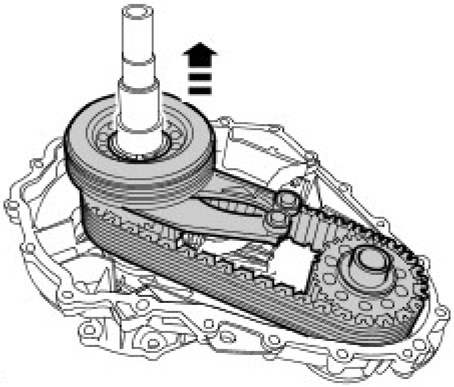
- Remove the remaining 2 Torx bolts.
- Remove any debris from the bolt holes.
- Use a soft faced mallet.



E62668

9. Remove the differential module.

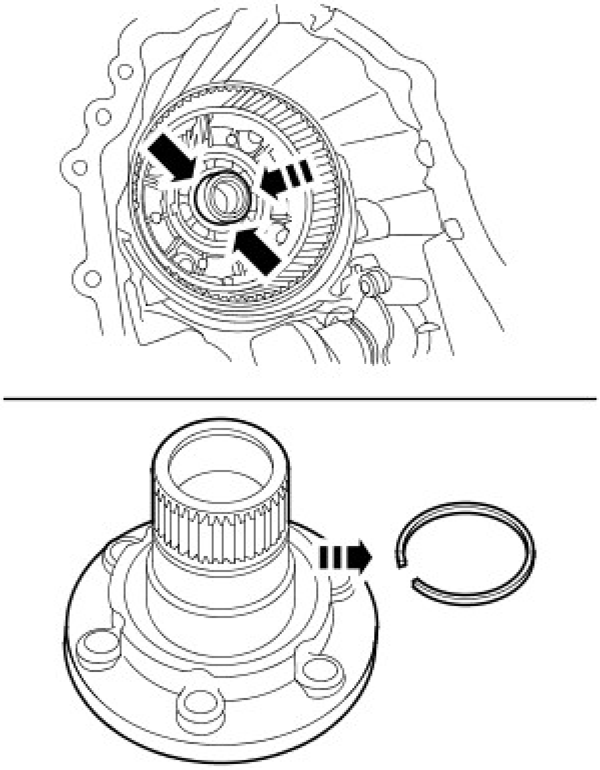
- Remove the spacer.



E62669

10. NOTE: Remove as an assembly.

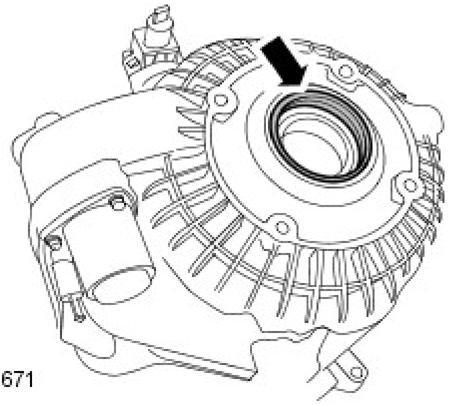
Remove the clutch, chain and sprocket.



E62670

11. Remove the rear output flange.

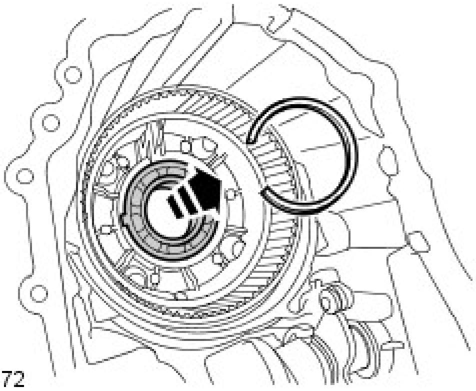
- Compress the snap ring.
- Press the flange through the bearing.
- Remove and discard the snap ring.



E62671

12. ⚠CAUTION: Care must be taken to avoid damage to the seal register and running surface.

Remove the output flange seal.



13. Remove the output flange bearing.

- Remove the circlip.

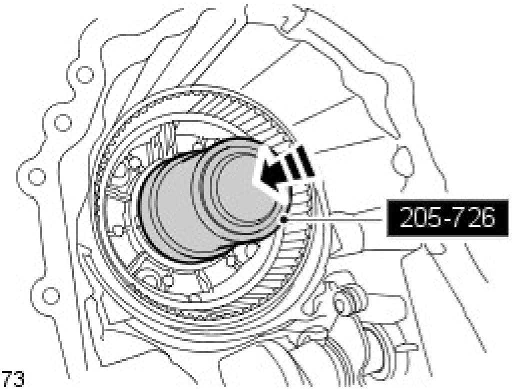
14. Release the front half of the transfer case from the flat surface.

- Remove the 2 bolts.

Installation

1. Remove the sealant from the transfer case mating faces.

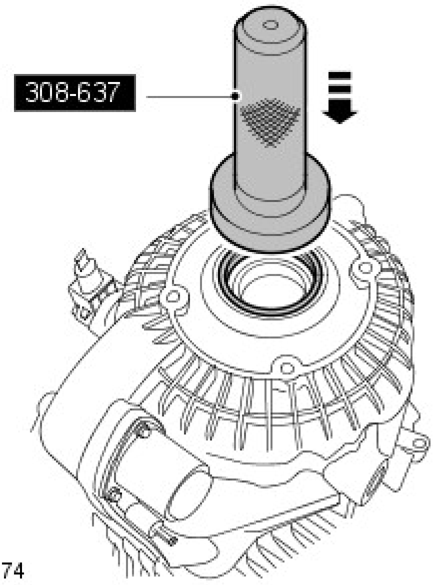
2. Clean the magnetic filter.



3. ⚠CAUTION: The chamfer on the bearing inner track must face the seal.

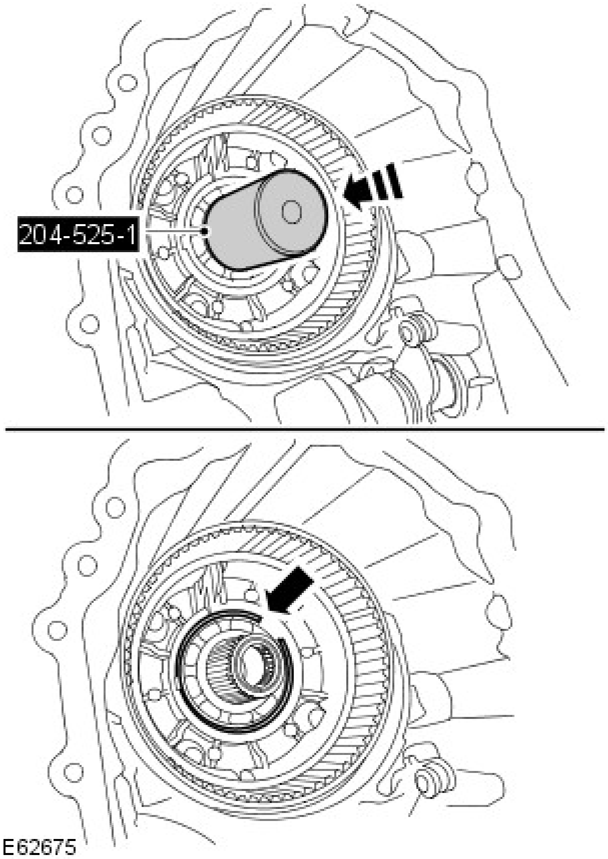
Using the special tool, install the output flange bearing.

- Clean the components mating faces.
- Install the circlip.



4. Using the special tool, install a new oil seal.

- Clean the component mating faces.
- Grease the new seal.



E62675

5. CAUTIONS:

⚠ Centralise the snap ring in the snap ring groove before installing the output flange.

⚠ Extreme care is necessary to make sure the snap ring enters the bearing squarely.

Using the special tool and with assistance, install the drive flange.

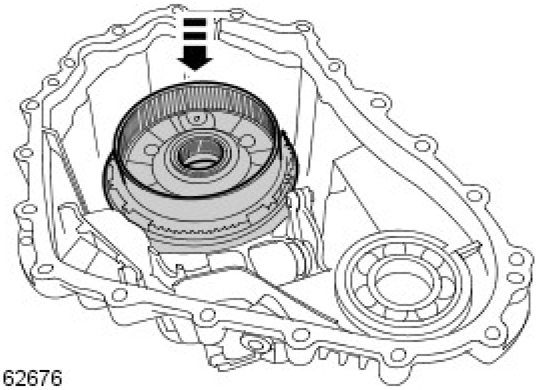
- Clean the component mating faces.
- Install a new snap ring.
- Make sure the snap ring is fully engaged and retains the drive flange.

6. Secure the rear half of the transfer case with its rear face down on a flat surface.

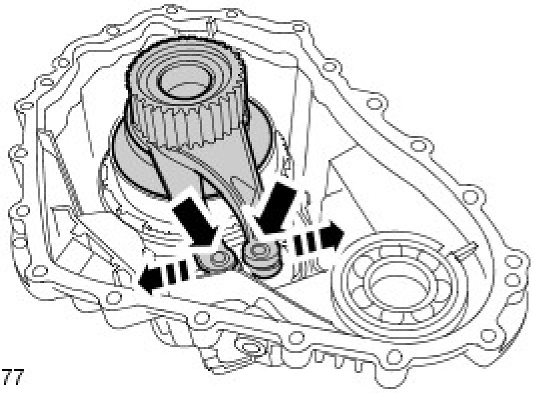
7. NOTE: Rotate the differential to engage the splines.

Install the differential module.

- Clean the components.
- Install the spacer.



E62676



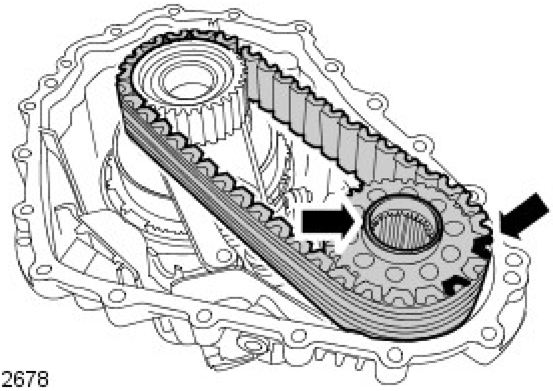
E62677

8. NOTE: Rotate the assembly to engage the clutch plates.

• NOTE: Use circlip pliers to open the actuator levers.

Install the clutch.

- Clean the components.
- Engage the actuator levers.



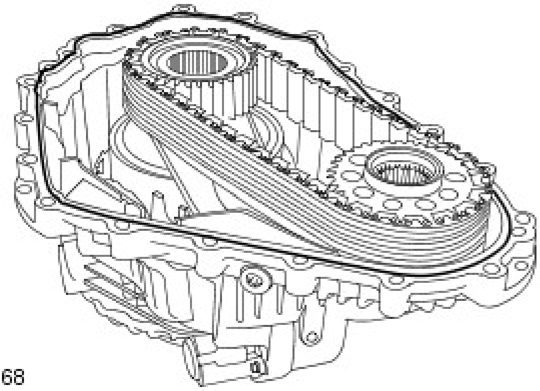
E62678

9. ⚠ CAUTION: The dark links in the chain face up as shown.

• NOTE: The relieved splined inner diameter of the sprocket must face up as shown.

Install the chain and sprocket.

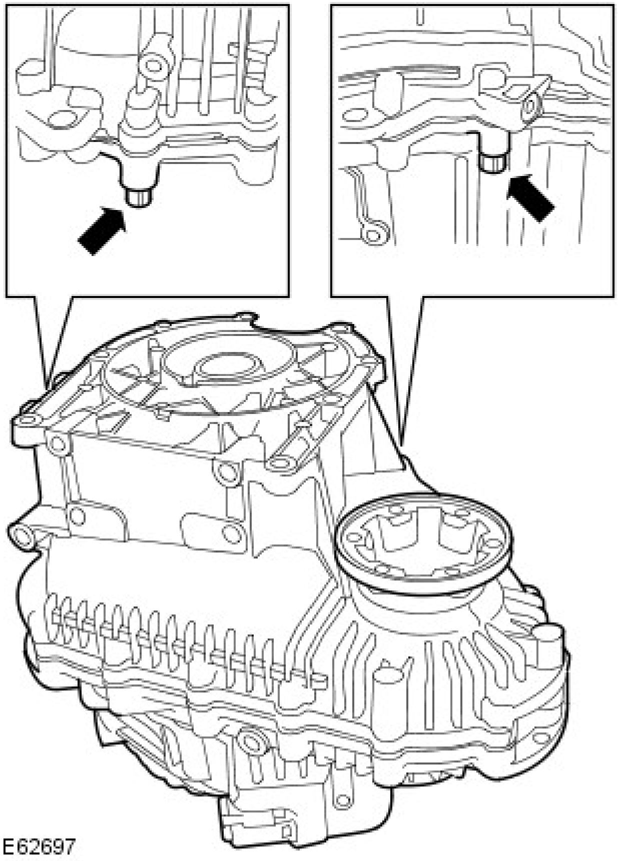
- Clean the components.



E62568

10. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

- Clean the component mating faces.
- Clean the dowels and dowel holes.
- Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.



11. Install the front half of the transfer case.

- Evenly tighten the 2 Torx bolts shown to 35 Nm (26 lb.ft).

12. Tighten the remaining Torx bolts to 35 Nm (26 lb.ft).

13. Install the shift motor.

- Clean the components.
- Tighten the Torx bolts to 25 Nm (18 lb.ft).

14. With assistance, release the transfer case from the flat surface.

- Remove the 2 bolts.

15. Install the transfer case.
For additional information, refer to: Transfer Case - TDV6 2.7L Diesel (308-07B Transfer Case, Removal).

16. Refill the transfer case with the recommended fluid.
For additional information, refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Exhaust System - V8 S/C 4.2L Petrol -

Recommended Lubricant

Item	Specification
HO2S threads	Use a high temperature resistant anti-seize compound

General Specifications

Item	Specification
Exhaust manifolds	Fabricated, air gapped with exhaust gas recirculation (EGR) tapping on left hand manifold
Exhaust system	Twin, stainless steel pipes throughout with stainless steel mufflers
Catalytic converters - type/location	Close coupled cascade - located in each down pipe with pre and post catalyst sensors in both pipes

Torque Specifications

Description	Nm	lb-ft
** HO2S	45	33
Catalytic converter retaining clamp	55	40
Catalytic converter to muffler nuts and retaining clamp	48	35
Tailpipe clamps	55	40
* Catalytic converter to exhaust manifold bolts	22	16

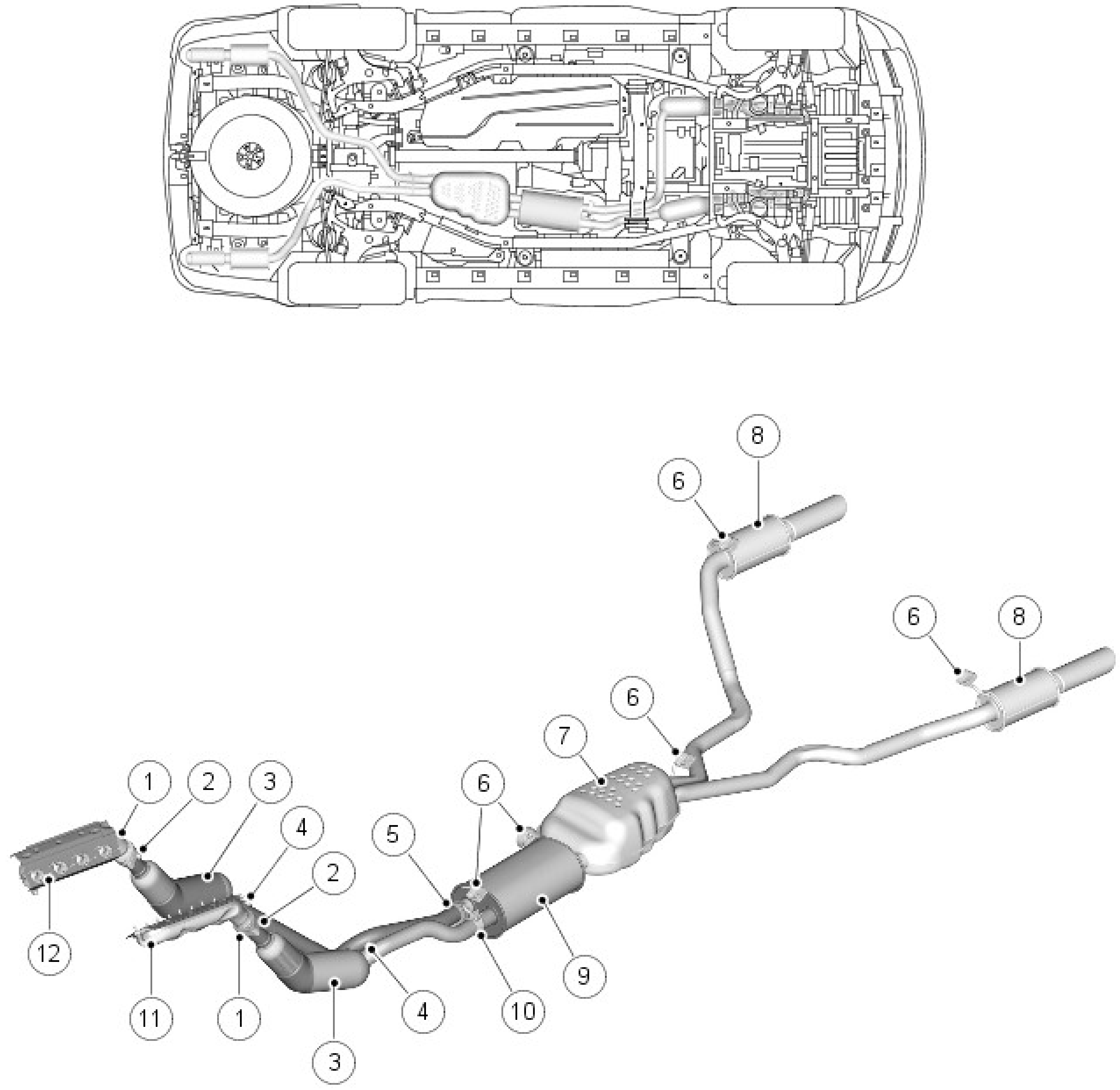
*** New bolts must be installed**

**** Apply suitable high temperature resistant anti-seize compound**

Exhaust System - V8 S/C 4.2L Petrol - Exhaust System

Description and Operation

4.2L V8 SC COMPONENT LOCATION



E57339

Item	Part Number	Description
1	-	Flange - manifold to front section
2	-	Pre catalyst heated oxygen sensor location
3	-	Catalyst
4	-	Post catalyst heated oxygen sensor location
5	-	Flange - RH front section to rear section
6	-	Mounting rubber (5 off)
7	-	Silencer - Centre
8	-	Silencer - Rear
9	-	Silencer - Front
10	-	Clamp - LH front section to rear section

11	-	LH exhaust manifold
12	-	RH exhaust manifold

OVERVIEW

The 4.2L V8 Supercharged exhaust system is fabricated from stainless steel and is supplied as three separate assemblies; a LH front section incorporating a catalytic converter, a RH front section incorporating a catalytic converter and a rear section incorporating a front silencer, a centre silencer and two rear silencers.

The system is attached to the underside of the body with five mounting rubbers which are located on mild steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded to the underside of the vehicle body. The system is routed mainly on the inside of the LH chassis longitudinal before splitting near the rear differential to exit at each side of the rear of the vehicle.

The system has service repair items available. Indentations in the rear section, between the center and the rear silencers, show the cut points for the service replacement rear silencers or front section. When a service repair section is used, the joint is connected using a sleeve and two clamps to connect the pipes at the cut points.

FRONT SECTION

Both front sections have a welded flange with two holes which provide for the attachment with two bolts onto the LH and RH exhaust manifolds. The flange is sealed by a tapered seat in the flange and a machined cone on the manifold.

The flange is welded to a short, straight pipe, which in turn is welded to the body of the catalytic converter. The pipe has a threaded boss which is welded over a hole in the pipe to provide location for the pre catalyst heated oxygen sensor (HO2S).

- NOTE: On NAS vehicles from 2007MY, the HO2S is located in a boss on the catalytic converter.

On the LH front section, the converter outlet pipe is a 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the outlet pipe is inserted into the flared end of the rear section. A clamp is used to compress and secure the joint.

On the RH front section, the converter outlet pipe is a 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the pipe curves left, under the transmission and then curves again to run parallel to the LH pipe. The end of the pipe has a welded flange with two holes which locate on two studs on the rear section and is secured with nuts. A metal gasket is used to seal the joint between the front and rear section flanges.

Both the LH and RH converter outlet pipes have a threaded boss which is welded over a hole in the pipe to provide location for the post catalyst HO2S.

REAR SECTION

The rear section has a short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is flared to an inside diameter of 55 mm (2.16 in) to locate the LH front section. The tube is welded to the front silencer assembly. A second short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, has a welded flange with captive studs to provide attachment for the flange on the RH front section. This tube is also welded to the front silencer assembly.

The front silencer comprises a single skin and two end plates which are welded together to give a capacity of 11.0 liters (671.2 in^3). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. A hanger bar is welded to the front of the silencer and provides for the location of a mounting rubber.

The silencer has two short 55 mm (2.16 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which connect to the center silencer.

The center silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 liters (1538 in^3). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gasses pass through the silencer. A hanger bar is welded to the front right hand side of the silencer and provides location for a mounting rubber.

The silencer has two 55 mm (2.16 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components. The outlet pipe diameter increases to 60 mm (2.36 in) diameter mid-way between the center silencer and the tail silencers.

Each outlet pipe terminates in a welded joint with the tail silencers. The outlet pipes have a hanger bar which provides for the location of a mounting rubber.

A hanger bar is welded to the front face of each tail silencer and provides for the location of a mounting rubber. The silencer is a circular fabrication with a baffle tube which is surrounded with glass fibre to provide further noise suppression. Each silencer has a capacity of 2.7 liters (165 in^3).

The silencers each have an outlet pipe which is 65 mm (2.5 in) diameter, with a wall thickness of 1.2 mm (0.05 in). Each outlet pipe is straight with an integral, oval, polished acoustic finisher.

CATALYTIC CONVERTER

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter is integrated into the front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing metals, which are the active constituent for converting harmful emissions into inert by-products. The metals add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

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Exhaust System - V8 S/C 4.2L Petrol - Exhaust System

Diagnosis and Testing

Overview

For additional information, refer to the relevant section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Leaks ● Metal fatigue ● Pipes ● Catalytic converter ● Muffler(s) ● Joints ● Mountings ● Clearance around components	● Fuses ● Wiring harness ● Electrical connector(s) ● Sensor(s) ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Noisy or leaking exhaust	● Exhaust system/components	Install new components as necessary. Refer to the relevant section of the workshop manual.
Lack of power	● Air intake system fault ● Supercharger fault ● Restricted exhaust system ● Low fuel pressure ● Exhaust gas recirculation (EGR) valve(s) fault	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. For EGR and turbocharger tests, refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls section of the workshop manual.

DTC	Description	Possible causes	Action
P003100	HO2S Heater Control Circuit Low (Bank 1, Sensor 1)	● Heated 0^2 sensor heater power supply circuit high resistance ● Heated 0^2 sensor heater control circuit high resistance ● Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P003200	HO2S Heater Control Circuit High (Bank 1, Sensor 1)	● Heated 0^2 sensor heater power supply circuit high resistance ● Heated 0^2 sensor heater control circuit high resistance ● Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P003600	HO2S Heater Control Circuit (Bank 1, Sensor 2)	• Catalyst monitor sensor heater control circuit short circuit to ground • Catalyst monitor sensor heater control circuit high resistance • Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005100	HO2S Heater Control Circuit Low (Bank 2, Sensor 1)	• Heated 0^2 sensor heater power supply circuit high resistance • Heated 0^2 sensor heater control circuit high resistance • Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005200	HO2S Heater Control Circuit High (Bank 2, Sensor 1)	• Heated 0^2 sensor heater power supply circuit high resistance • Heated 0^2 sensor heater control circuit high resistance • Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005600	HO2S Heater Control Circuit (Bank 2, Sensor 2)	• Catalyst monitor sensor (left-hand bank) heater control circuit short circuit to ground • Catalyst monitor sensor heater control circuit high resistance • Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01301A	O2 Circuit (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) element impedance low • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01301B	O2 Circuit (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) element impedance high • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013100	O2 Circuit Low Voltage (Bank 1, Sensor 1)	• Heated 0^2 sensor signal circuit high resistance • Heated 0^2 sensor signal circuit short circuit to ground • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013200	O2 Circuit High Voltage (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) signal circuit short circuit to power • Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013300	O2 Circuit Slow Response (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) to ECM wiring high resistance • Exhaust leak • HO2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013400	O2 Circuit No Activity Detected (Bank 1, Sensor 1)	• Heated 0^2 sensor (right-hand bank) slow activation	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013700	O2 Circuit Low Voltage (Bank 1, Sensor 2)	• Catalyst monitor sensor (right-hand bank) to ECM wiring high resistance • Catalyst monitor sensor short circuit to ground • Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013800	O2 Circuit High Voltage (Bank 1, Sensor 2)	• Catalyst monitor sensor (right-hand bank) sensing circuit short circuit to power • Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013900	O2 Circuit Slow Response (Bank 1, Sensor 2)	• Catalyst monitor sensor (right-hand bank) slow response	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P014000	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	- Catalyst monitor (right-hand bank) to ECM wiring high resistance - Catalyst monitor sensing circuit short circuit to power - Catalyst monitor short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P014100	O2 Heater Circuit (Bank 1, Sensor 2)	- Catalyst monitor sensor (right-hand bank) heater control circuit high resistance - Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01501A	O2 Circuit (Bank 2, Sensor 1)	- Circuit (left-hand bank) resistance below threshold - Element impedance low - Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01501B	O2 Circuit (Bank 2, Sensor 1)	- Circuit (left-hand bank) resistance above threshold - Element impedance high - Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015100	O2 Circuit Low Voltage (Bank 2, Sensor 1)	- Heated 0² sensor (left-hand bank) signal circuit high resistance - Heated 0² sensor signal circuit short circuit to ground - Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015200	O2 Circuit High Voltage (Bank 2, Sensor 1)	- Heated 0² sensor (left-hand bank) signal circuit short circuit to power - Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015300	O2 Circuit Slow Response (Bank 2, Sensor 1)	- Heated 0² sensor (left-hand bank) to ECM wiring high resistance - Exhaust leak - Heated 0² sensor failure	Check the exhaust system for leaks. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015400	O2 Circuit No Activity Detected (Bank 2, Sensor 1)	- Heated 0² sensor (left-hand bank) slow activation	Check the HO2S and circuits. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015700	O2 Circuit Low Voltage (Bank 2, Sensor 2)	- Catalyst monitor sensor (left-hand bank) to ECM wiring high resistance - Catalyst monitor sensor short circuit to ground - Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015800	O2 Circuit High Voltage (Bank 2, Sensor 2)	- Catalyst monitor sensor (left-hand bank) sensing circuit short circuit to power - Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015900	O2 Circuit Slow Response (Bank 2, Sensor 2)	- Catalyst monitor sensor (left-hand bank) slow response	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P016000	O2 Circuit No Activity Detected (Bank 2, Sensor 2)	- Catalyst monitor (left-hand bank) to ECM wiring high resistance - Catalyst monitor sensing (left-hand bank) circuit short circuit to power - Catalyst monitor short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P016100	O2 Heater Circuit (Bank 2, Sensor 2)	- Catalyst monitor sensor (left-hand bank) heater control circuit malfunction	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P042000	Catalyst System Efficiency Below Threshold (Bank 1)	● Catalyst failure due to overheating damage caused by misfire and/or lean combustion ● Catalyst failure due to poisoning caused by excessive oil consumption and/or contaminated fuel	Check the catalyst condition.
P043000	Catalyst System Efficiency Below Threshold (Bank 2)	● Catalyst failure due to overheating damage caused by misfire and/or lean combustion ● Catalyst failure due to poisoning caused by excessive oil consumption and/or contaminated fuel	Check the catalyst condition.

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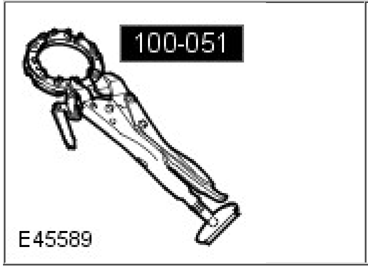
Exhaust System - V8 S/C 4.2L Petrol - Tailpipe

Removal and Installation

Special Tool(s)	
	Pipe cutter-exhaust 100-051 (LRT-99-027)

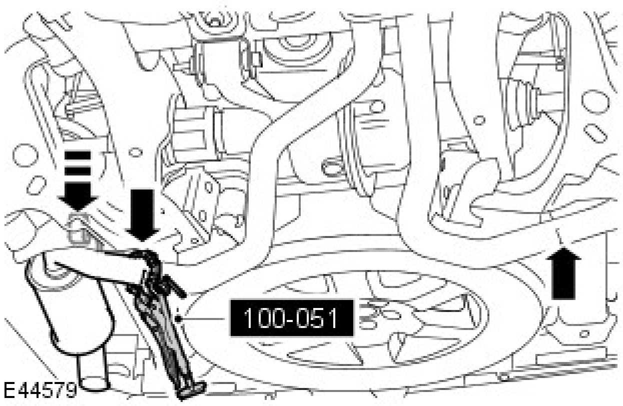
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.
- Disconnect from the exhaust hanger.



Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Install the tail pipe.

- Clean the components.
- Install the retaining clamp.

2. Align the tail pipe and tighten the retaining clamp to 55 Nm (40 lb.ft).

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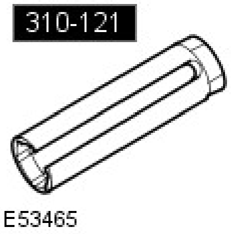
Exhaust System - V8 S/C 4.2L Petrol - Catalytic Converter LH

Removal and Installation

Special Tool(s)	
 310-121 E53465	Wrench, HO2S 310-121(LRT-19-014)

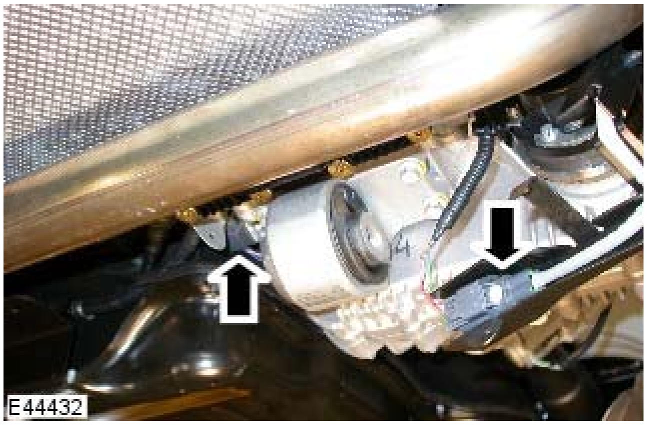
Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

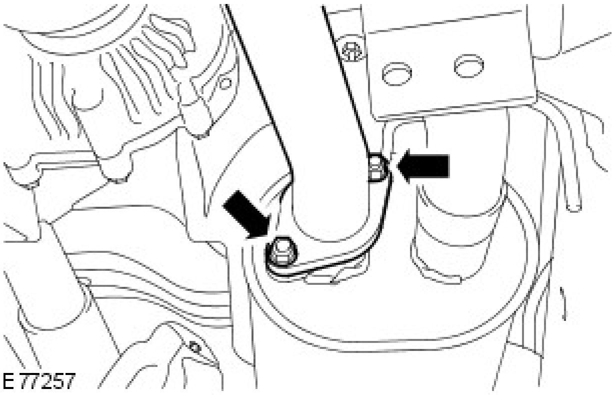
   Raise and support the vehicle.

2. Remove the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

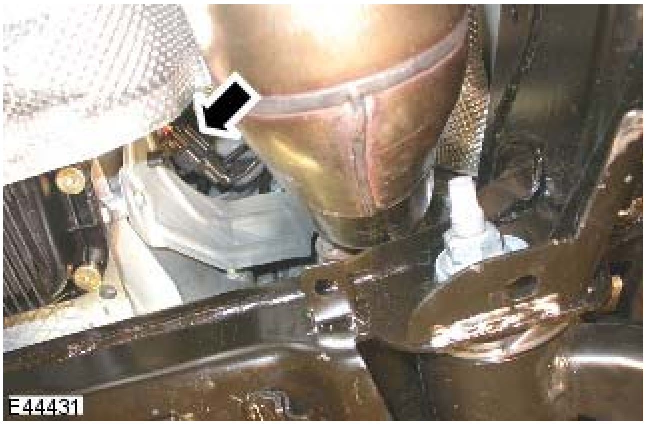
3. Release the LH rear HO2S wiring harness.
   - Disconnect the electrical connector.



4. Release the RH rear HO2S wiring harness.
   - Disconnect the electrical connector.

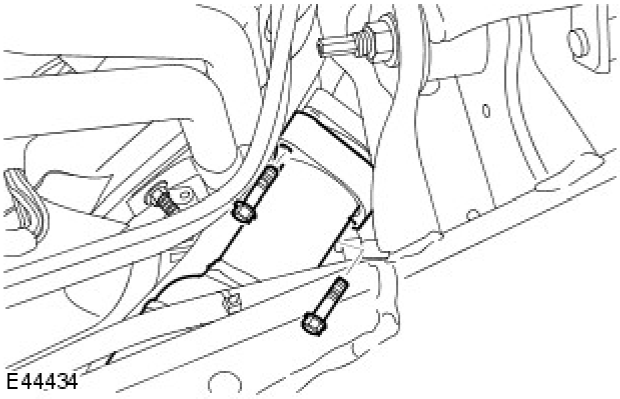


5. Disconnect the RH catalytic converter from the muffler assembly.
   - Remove the 2 nuts.
   - Discard the gasket.



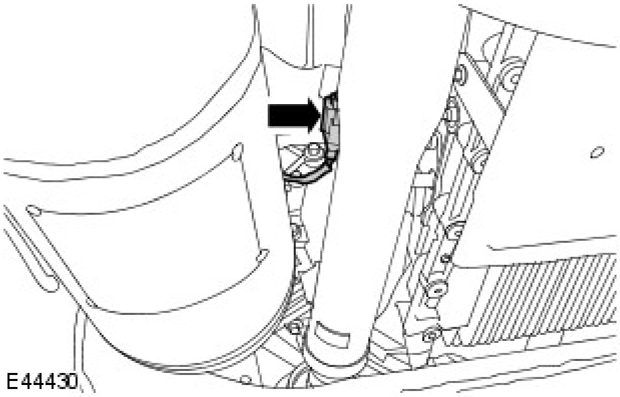
6. Release the RH front HO2S wiring harness.

- Disconnect the electrical connector.



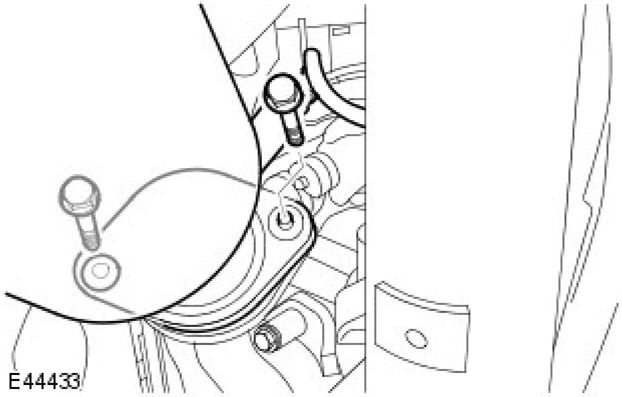
7. Remove the RH catalytic converter.

- Remove and discard the 2 bolts.



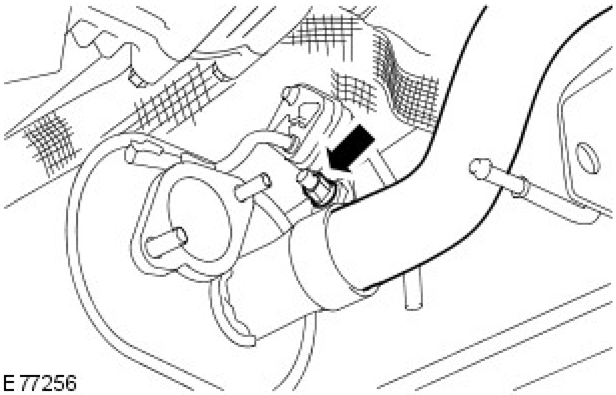
8. Release the LH front HO2S wiring harness.

- Disconnect the electrical connector.



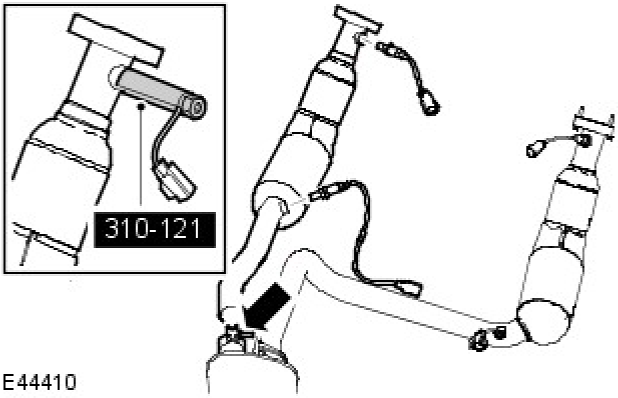
9. Disconnect the LH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.



10. Remove the LH catalytic converter.

- Loosen the nut and release the retaining clamp.



11. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove both HO2S from the catalytic converter.

Installation

1. ⚠CAUTION: Make sure the anti-seize compound does not contact the HO2S tip.

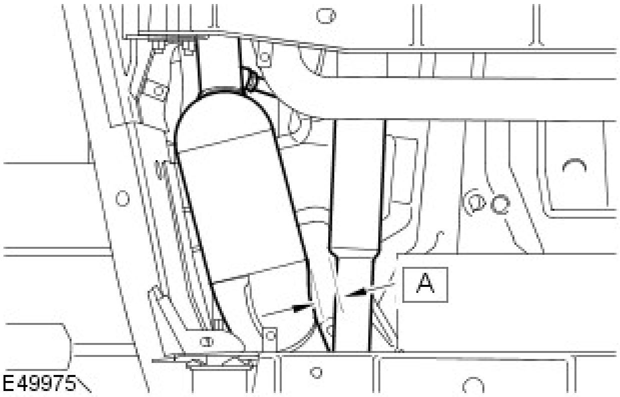
Using the special tool, install the HO2S to the catalytic converter and tighten to 45 Nm (33 lb.ft).

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.

2. NOTE: Do not tighten the retaining clamp at this stage.

Position the LH catalytic converter to the front muffler.

- Clean the components.



3. ⚠CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Position the LH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

4. ⚠ CAUTION: Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the LH front HO2S electrical connector.

- Attach the HO2S wiring harness.

5. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

6. ⚠ CAUTION: Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the RH front HO2S electrical connector.

- Attach the HO2S wiring harness.

7. Position the RH catalytic converter to the front muffler.

- Clean the components.
- Install a new gasket.
- Tighten the nuts to 55 Nm (40 lb.ft).

8. Tighten the LH catalytic converter retaining clamp to 55 Nm (40 lb.ft).

9. ⚠ CAUTION: Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the rear HO2S electrical connectors.

- Attach the HO2S wiring harnesses.

10. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

11. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

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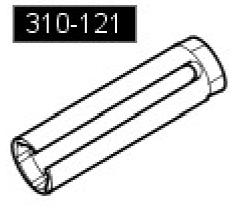
Exhaust System - V8 S/C 4.2L Petrol - Catalytic Converter RH

Removal and Installation

Special Tool(s)	
 E53465	Wrench, HO2S 310-121(LRT-19-014)

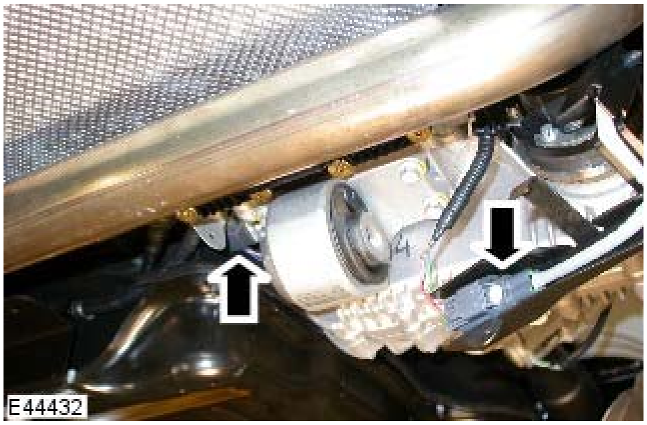
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

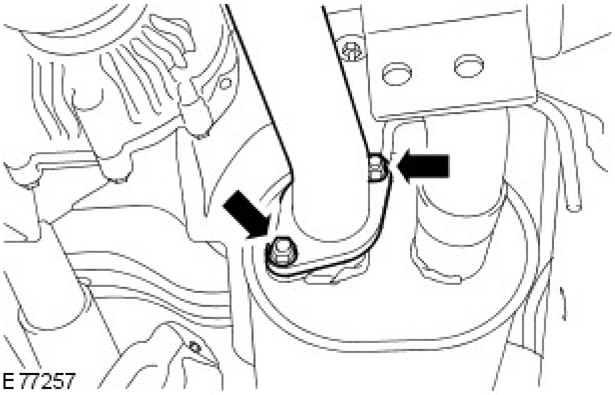
2. Remove the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. Release the LH rear HO2S wiring harness.
   - Disconnect the electrical connector.



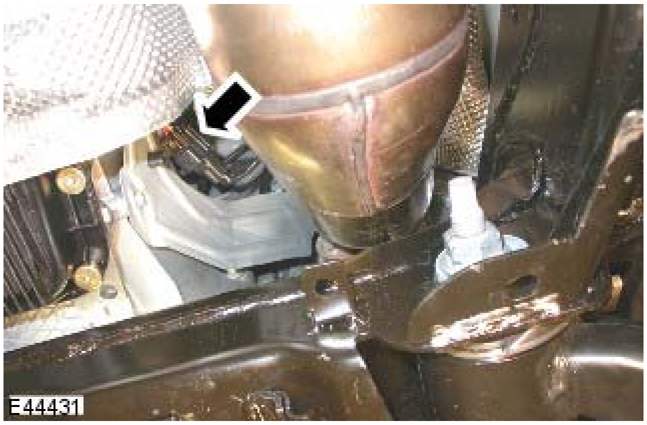
E44432

4. Release the RH rear HO2S wiring harness.
   - Disconnect the electrical connector.



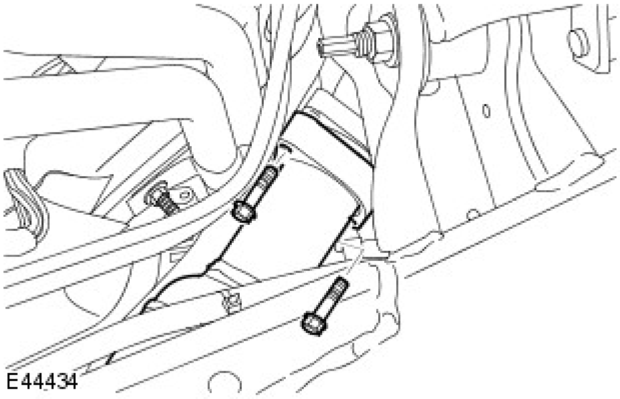
E77257

5. Disconnect the RH catalytic converter from the muffler assembly.
   - Remove the 2 nuts.
   - Discard the gasket.



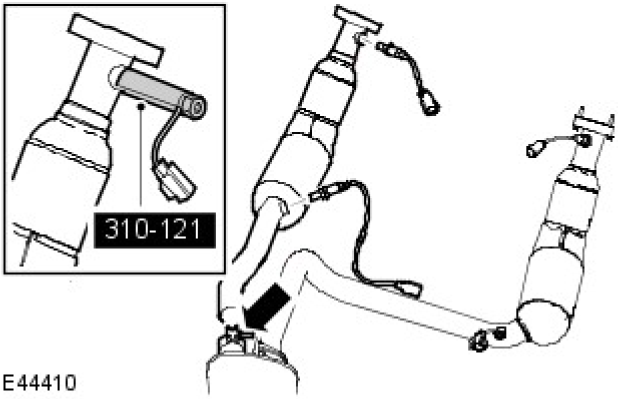
6. Release the RH front HO2S wiring harness.

- Disconnect the electrical connector.



7. Remove the RH catalytic converter.

- Remove and discard the 2 bolts.



8. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove both HO2S from the catalytic converter.

Installation

1. ⚠ CAUTION: Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S to the catalytic converter and tighten to 45 Nm (33 lb.ft).

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.

2. on the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

3. ⚠ CAUTION: Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the RH front HO2S electrical connector.

- Attach the HO2S wiring harness.

4. Position the RH catalytic converter to the front muffler.

- Clean the components.
- Install a new gasket.
- Tighten the nuts to 55 Nm (40 lb.ft).

5. Tighten the LH catalytic converter retaining clamp to 55 Nm (40 lb.ft).

6. ⚠CAUTION: Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the rear HO2S electrical connectors.

- Attach the HO2S wiring harnesses.

7. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

8. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures).

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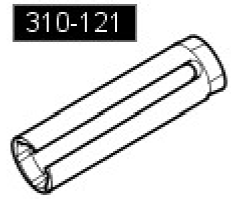
Exhaust System - V8 S/C 4.2L Petrol - Exhaust System

Removal and Installation

Special Tool(s)	
 E53465	Wrench, HO2S 310-121 (LRT-19-014)

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

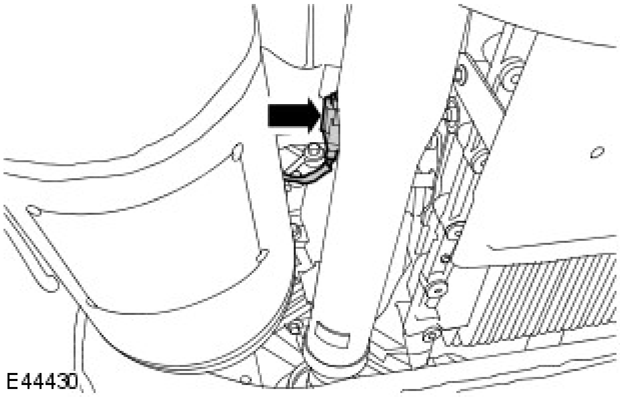
Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

4. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

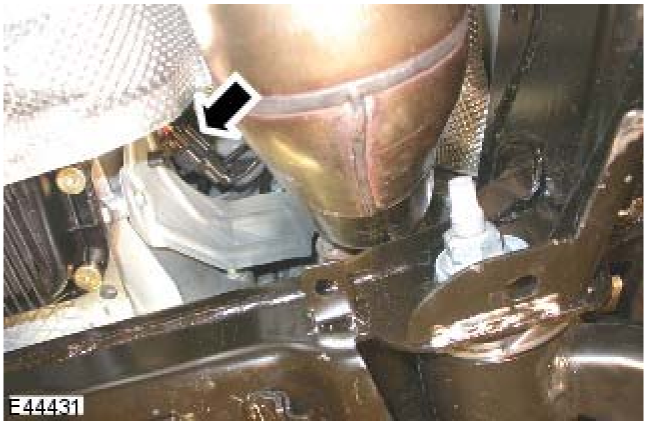
5. Release the LH front HO2S wiring harness.

- Disconnect the electrical connector.


E44430

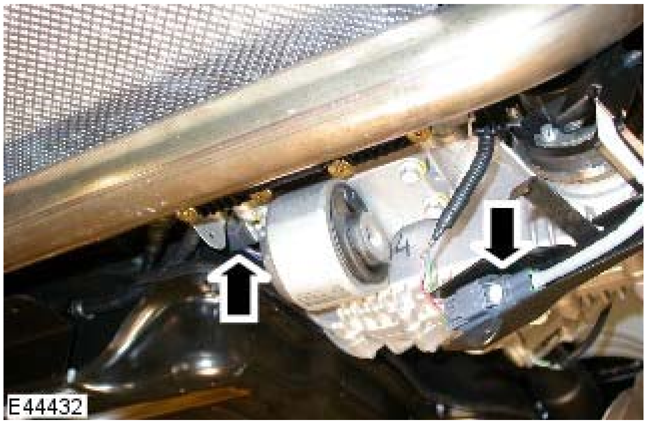
6. Release the RH front HO2S wiring harness.

- Disconnect the electrical connector.


E44431

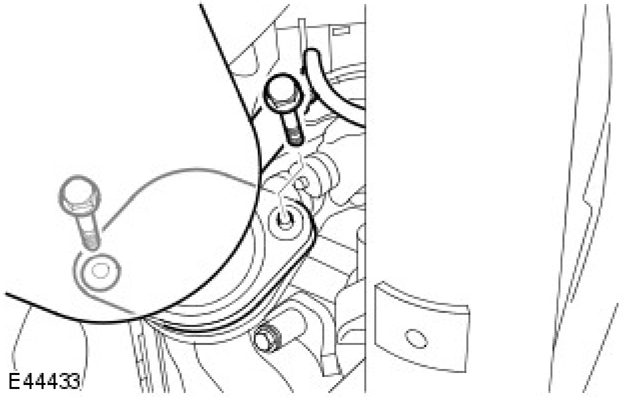
7. Release the LH rear HO2S wiring harness.

- Disconnect the electrical connector.



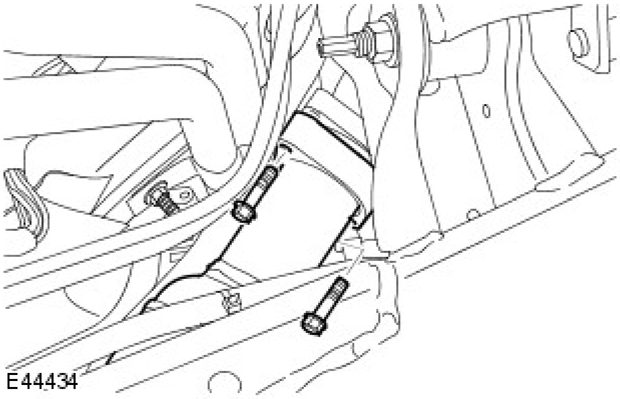
8. Release the RH rear HO2S wiring harness.

- Disconnect the electrical connector.



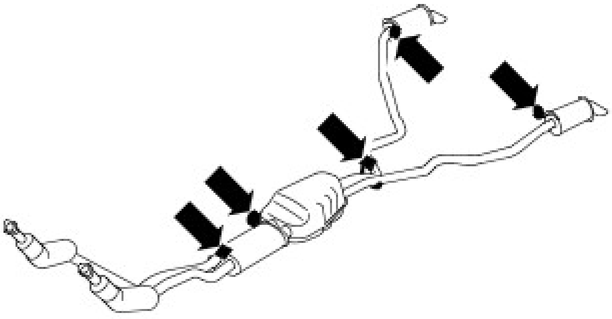
9. Disconnect the LH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.



10. Disconnect the RH catalytic converter from the exhaust manifold.

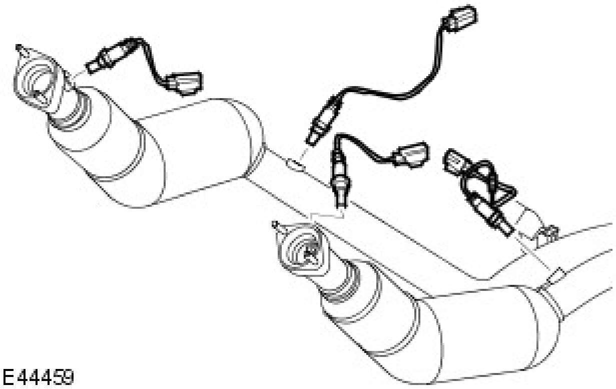
- Remove and discard the 2 bolts.



E44435

11. With assistance, remove the exhaust system.

- Disconnect the 5 exhaust hangers.



E44459

12. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove the 4 HO2S from the catalytic converters.

Installation

1. ⚠ CAUTION: Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S to the catalytic converters and tighten to 45 Nm (33 lb.ft).

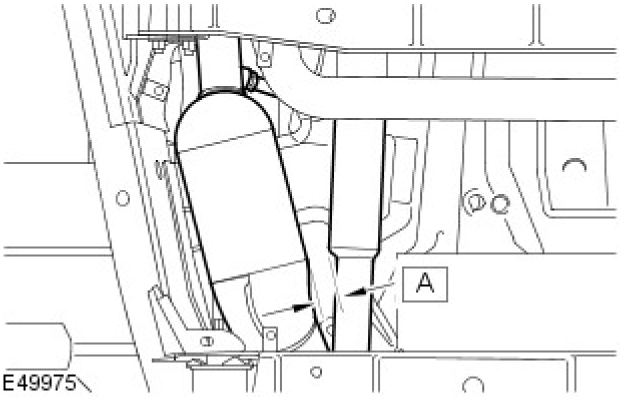
- Clean the components.
- Apply an anti-seize compound to the thread of the HO2S.

2. With assistance, install the exhaust system.

- Attach the exhaust hangers.

3. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).



4. ⚠ CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Position the LH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

5. ⚠ CAUTION: Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the HO2S electrical connectors.

- Attach the HO2S wiring harnesses.

6. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

7. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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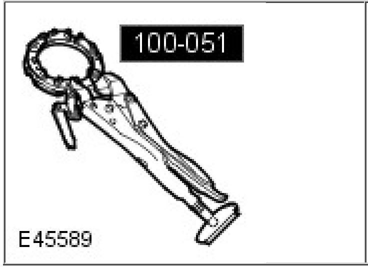
Exhaust System - V8 S/C 4.2L Petrol - Muffler

Removal and Installation

Special Tool(s)	
	Pipe cutter-exhaust 100-051 (LRT-99-027)

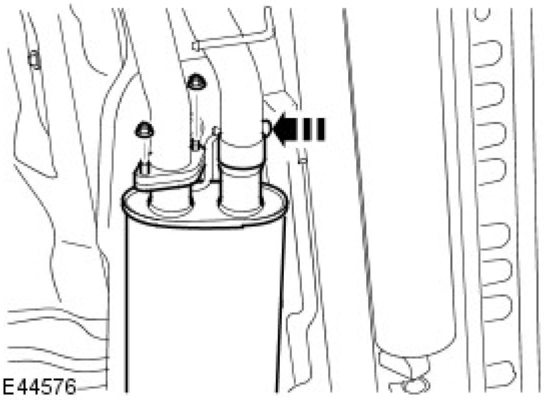
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

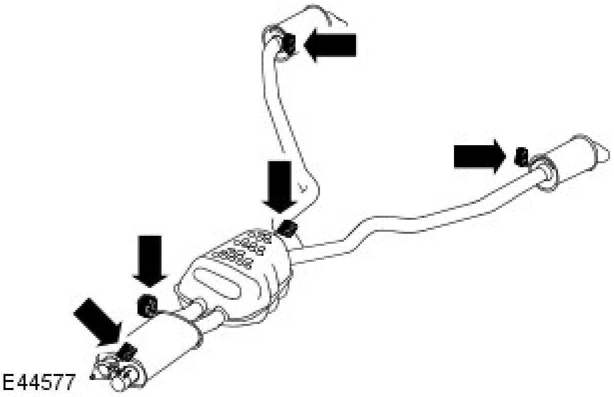
2. Disconnect the RH catalytic converter from the muffler assembly.

- Remove the 2 nuts.



3. Disconnect the LH catalytic converter from the muffler assembly.

- Remove the nut and release the retaining clamp.



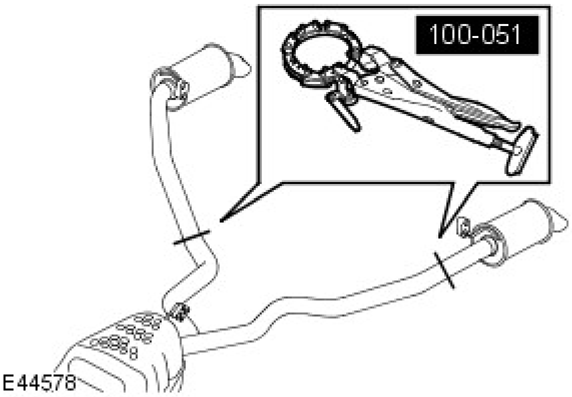
4. With assistance, remove the muffler assembly.

- Disconnect the 5 exhaust hangers.

5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the LH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.



6. Remove the RH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.

Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Position the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

2. NOTE: Do not tighten the retaining clamp at this stage.

Position the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

3. With assistance, install the muffler assembly.

- Attach the exhaust hangers.
- Tighten the catalytic converter nuts and clamp to 48 Nm (35 lb.ft).

4. Align both tail pipes and tighten the retaining clamps to 55 Nm (40 lb.ft).

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Exhaust System - V8 4.4L Petrol -

Recommended Lubricant

Item	Specification
HO2S	Use a high temperature resistant anti-seize compound

General Specifications

Item	Specification
Exhaust manifolds	Fabricated, air gapped with exhaust gas recirculation (EGR) tapping on left hand manifold
Exhaust system	Twin, stainless steel pipes throughout with stainless steel mufflers
Catalytic converters - type/location	Close coupled cascade - located in each down pipe with pre and post catalyst sensors in both pipes

Torque Specifications

Description	Nm	lb-ft
** HO2S	45	33
Catalytic converter to muffler retaining clamp	55	40
Catalytic converter to muffler nuts	55	40
* Catalytic converter to exhaust manifold bolts	22	16
Tail pipe clamps	55	40

*** New bolts must be installed**

**** Apply suitable high temperature resistant anti-seize compound**

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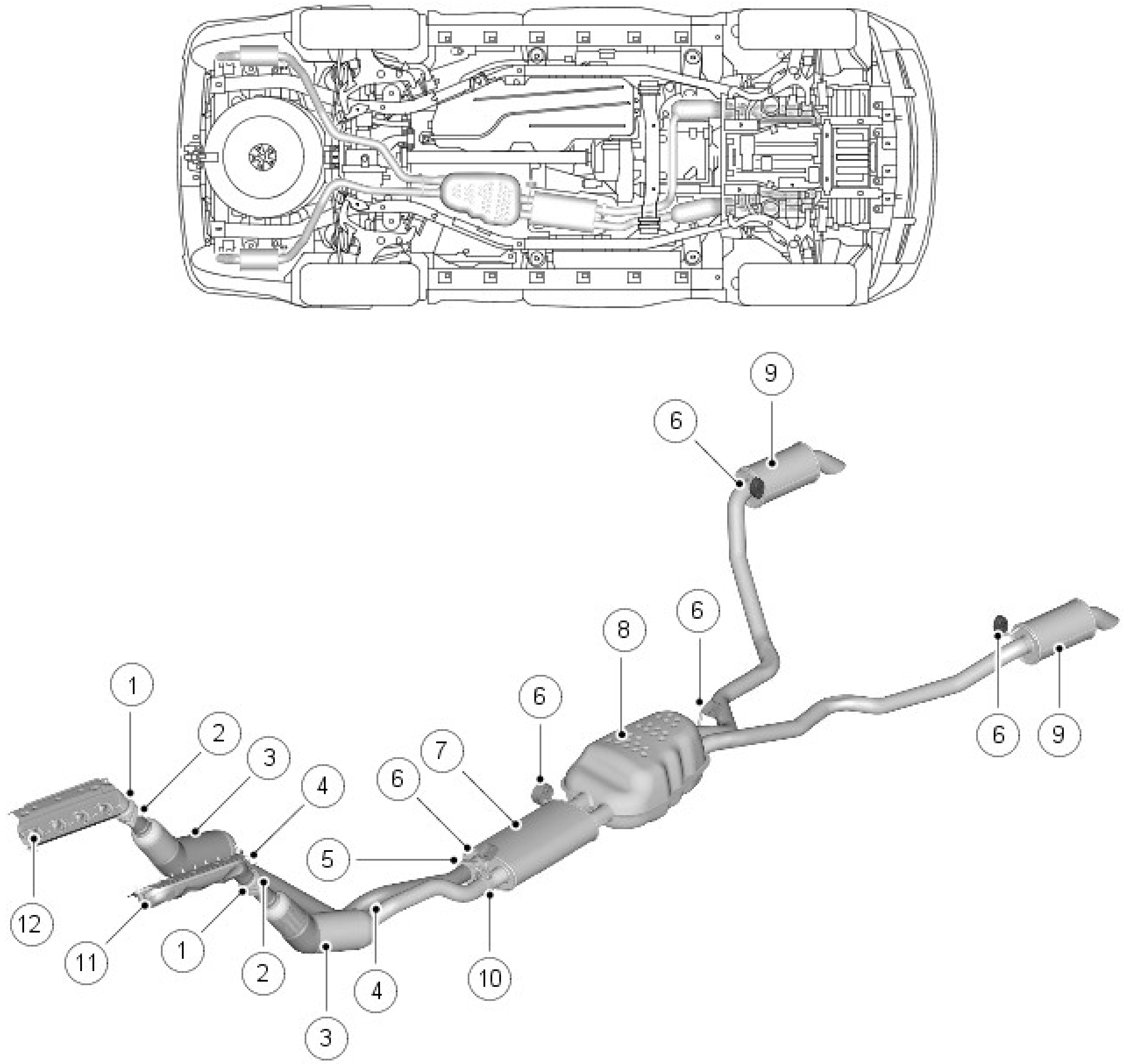
Exhaust System - V8 4.4L Petrol - Exhaust System

Description and Operation

4.4L V8 COMPONENT LOCATION



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Item	Part Number	Description
1	-	Flange - manifold to front section
2	-	Pre catalyst heated oxygen sensor location
3	-	Catalyst
4	-	Post catalyst heated oxygen sensor location
5	-	Flange - RH front section to rear section
6	-	Mounting rubber (5 off)
7	-	Silencer - Front
8	-	Silencer - Centre
9	-	Silencer - Rear
10	-	Clamp - LH front section to rear section

11	-	LH exhaust manifold
12	-	RH exhaust manifold

OVERVIEW

The 4.4L V8 exhaust system is fabricated from stainless steel and is supplied as three separate assemblies; a LH front section incorporating a catalytic converter, a RH front section incorporating a catalytic converter and a rear section incorporating a front silencer, a centre silencer and two rear silencers.

The system is attached to the underside of the body with five mounting rubbers which are located on mild steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded to the underside of the vehicle body. The system is routed mainly on the inside of the LH chassis longitudinal before splitting near the rear differential to exit at each side of the rear of the vehicle.

The system has service repair items available. Indentations in the rear section, between the center and the rear silencers, show the cut points for the service replacement rear silencers or front section. When a service repair section is used, the joint is connected using a sleeve and two clamps to connect the pipes at the cut points.

FRONT SECTION

Both front sections have a welded flange with two holes which provide for the attachment with two bolts onto the LH and RH exhaust manifolds. The flange is sealed by a tapered seat in the flange and a machined cone on the manifold.

The flange is welded to a short, straight pipe, which in turn is welded to the body of the catalytic converter. The pipe has a threaded boss which is welded over a hole in the pipe to provide location for the pre catalyst heated oxygen sensor (HO2S).

- NOTE: On NAS vehicles from 2007MY, the HO2S is located in a boss on the catalytic converter.

On the LH front section, the converter outlet pipe is a 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the outlet pipe is inserted into the flared end of the rear section. A clamp is used to compress and secure the joint.

On the RH front section, the converter outlet pipe is a 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is welded to the converter body. The rear of the pipe curves left, under the transmission and then curves again to run parallel to the LH pipe. The end of the pipe has a welded flange with two holes which locate on two studs on the rear section and is secured with nuts. A metal gasket is used to seal the joint between the front and rear section flanges.

Both the LH and RH converter outlet pipes have a threaded boss which is welded over a hole in the pipe to provide location for the post catalyst HO2S.

REAR SECTION

The rear section has a short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which is flared to an inside diameter of 55 mm (2.16 in) to locate the LH front section. The tube is welded to the front silencer assembly. A second short 55 mm (2.16 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, has a welded flange with captive studs to provide attachment for the flange on the RH front section. This tube is also welded to the front silencer assembly.

The front silencer comprises a single skin and two end plates which are welded together to give a capacity of 6.4 liters (390.5 in^3). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. A hanger bar is welded to the front of the silencer and provides for the location of a mounting rubber.

The silencer has two short 55 mm (2.16 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which connect to the center silencer.

The center silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 liters (1538 in^3). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gasses pass through the silencer. A hanger bar is welded to the front right hand side of the silencer and provides location for a mounting rubber.

The silencer has two 55 mm (2.17 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components.

Each outlet pipe terminates in a welded joint with the tail silencers. The outlet pipes have a hanger bar which provides for the location of a mounting rubber.

A hanger bar is welded to the front face of each rear silencer and provides for the location of a mounting rubber. The silencer is a circular fabrication with a baffle tube which is surrounded with glass fibre to provide further noise suppression. Each silencer has a capacity of 2.7 liters (165 in^3).

The silencers each have an outlet pipe which is 60 mm (2.4 in) diameter, with a wall thickness of 1.2 mm (0.05 in). Each outlet pipe is curved downwards to direct exhaust gasses away from the rear of the vehicle.

CATALYTIC CONVERTER

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter is integrated into the front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing metals, which are the active constituent for converting harmful emissions into inert by-products. The metals add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

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Exhaust System - V8 4.4L Petrol - Exhaust System

Diagnosis and Testing

Overview

For additional information, refer to the relevant section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical damage.

Visual inspection

Mechanical
● Leaks ● Metal fatigue ● Pipes ● Catalytic converter ● Muffler(s) ● Joints ● Mountings ● Clearance around components

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

Symptom Chart

Symptom	Possible causes	Action
Noisy or leaking exhaust	● Exhaust system/components	Install new components as necessary. Refer to the relevant section of the workshop manual.
Lack of power	● Air intake system fault ● Restricted exhaust system ● Low fuel pressure ● Exhaust gas recirculation (EGR) valve(s) fault ● Turbocharger fault	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. For EGR and turbocharger tests, refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls section of the workshop manual.

DTC	Description	Possible causes	Action
P003100	HO2S Heater Control Circuit Low (Bank 1, Sensor 1)	● Heated 0^2 sensor heater power supply circuit high resistance ● Heated 0^2 sensor heater control circuit high resistance ● Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P003200	HO2S Heater Control Circuit High (Bank 1, Sensor 1)	● Heated 0^2 sensor heater power supply circuit high resistance ● Heated 0^2 sensor heater control circuit high resistance ● Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P003600	HO2S Heater Control Circuit (Bank 1, Sensor 2)	● Catalyst monitor sensor heater control circuit short circuit to ground ● Catalyst monitor sensor heater control circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		● Catalyst monitor sensor heater failure	
P005100	HO2S Heater Control Circuit Low (Bank 2, Sensor 1)	● Heated 0^2 sensor heater power supply circuit high resistance ● Heated 0^2 sensor heater control circuit high resistance ● Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005200	HO2S Heater Control Circuit High (Bank 2, Sensor 1)	● Heated 0^2 sensor heater power supply circuit high resistance ● Heated 0^2 sensor heater control circuit high resistance ● Heated 0^2 sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P005600	HO2S Heater Control Circuit (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) heater control circuit short circuit to ground ● Catalyst monitor sensor heater control circuit high resistance ● Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01301A	O2 Circuit (Bank 1, Sensor 1)	● Heated 0^2 sensor (right-hand bank) element impedance low ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01301B	O2 Circuit (Bank 1, Sensor 1)	● Heated 0^2 sensor (right-hand bank) element impedance high ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013100	O2 Circuit Low Voltage (Bank 1, Sensor 1)	● Heated 0^2 sensor signal circuit high resistance ● Heated 0^2 sensor signal circuit short circuit to ground ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013200	O2 Circuit High Voltage (Bank 1, Sensor 1)	● Heated 0^2 sensor (right-hand bank) signal circuit short circuit to power ● Heated 0^2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013300	O2 Circuit Slow Response (Bank 1, Sensor 1)	● Heated 0^2 sensor (right-hand bank) to ECM wiring high resistance ● Exhaust leak ● HO2 sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013400	O2 Circuit No Activity Detected (Bank 1, Sensor 1)	● Heated 0^2 sensor (right-hand bank) slow activation	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013700	O2 Circuit Low Voltage (Bank 1, Sensor 2)	● Catalyst monitor sensor (right-hand bank) to ECM wiring high resistance ● Catalyst monitor sensor short circuit to ground ● Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013800	O2 Circuit High Voltage (Bank 1, Sensor 2)	● Catalyst monitor sensor (right-hand bank) sensing circuit short circuit to power ● Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P013900	O2 Circuit Slow Response (Bank 1, Sensor 2)	● Catalyst monitor sensor (right-hand bank) slow response	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P014000	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	● Catalyst monitor (right-hand bank) to ECM wiring high resistance ● Catalyst monitor sensing circuit short circuit to power ● Catalyst monitor short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
P014100	O2 Heater Circuit (Bank 1, Sensor 2)	● Catalyst monitor sensor (right-hand bank) heater control circuit high resistance ● Catalyst monitor sensor heater failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01501A	O2 Circuit (Bank 2, Sensor 1)	● Circuit (left-hand bank) resistance below threshold ● Element impedance low ● Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P01501B	O2 Circuit (Bank 2, Sensor 1)	● Circuit (left-hand bank) resistance above threshold ● Element impedance high ● Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015100	O2 Circuit Low Voltage (Bank 2, Sensor 1)	● Heated 0² sensor (left-hand bank) signal circuit high resistance ● Heated 0² sensor signal circuit short circuit to ground ● Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015200	O2 Circuit High Voltage (Bank 2, Sensor 1)	● Heated 0² sensor (left-hand bank) signal circuit short circuit to power ● Heated 0² sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015300	O2 Circuit Slow Response (Bank 2, Sensor 1)	● Heated 0² sensor (left-hand bank) to ECM wiring high resistance ● Exhaust leak ● Heated 0² sensor failure	Check the exhaust system for leaks. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015400	O2 Circuit No Activity Detected (Bank 2, Sensor 1)	● Heated 0² sensor (left-hand bank) slow activation	Check the HO2S and circuits. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015700	O2 Circuit Low Voltage (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) to ECM wiring high resistance ● Catalyst monitor sensor short circuit to ground ● Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015800	O2 Circuit High Voltage (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) sensing circuit short circuit to power ● Catalyst monitor sensor failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P015900	O2 Circuit Slow Response (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) slow response	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P016000	O2 Circuit No Activity Detected (Bank 2, Sensor 2)	● Catalyst monitor (left-hand bank) to ECM wiring high resistance ● Catalyst monitor sensing (left-hand bank) circuit short circuit to power ● Catalyst monitor short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P016100	O2 Heater Circuit (Bank 2, Sensor 2)	● Catalyst monitor sensor (left-hand bank) heater control circuit malfunction	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
P042000	Catalyst System Efficiency Below Threshold (Bank 1)	● Catalyst failure due to overheating damage caused by misfire and/or lean combustion ● Catalyst failure due to poisoning caused by excessive oil consumption and/or contaminated fuel	Check the catalyst condition.

DTC	Description	Possible causes	Action
P043000	Catalyst System Efficiency Below Threshold (Bank 2)	- Catalyst failure due to overheating damage caused by misfire and/or lean combustion - Catalyst failure due to poisoning caused by excessive oil consumption and/or contaminated fuel	Check the catalyst condition.

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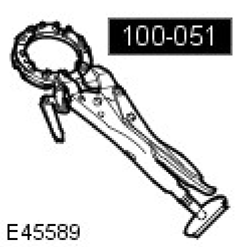
Exhaust System - V8 4.4L Petrol - Tailpipe

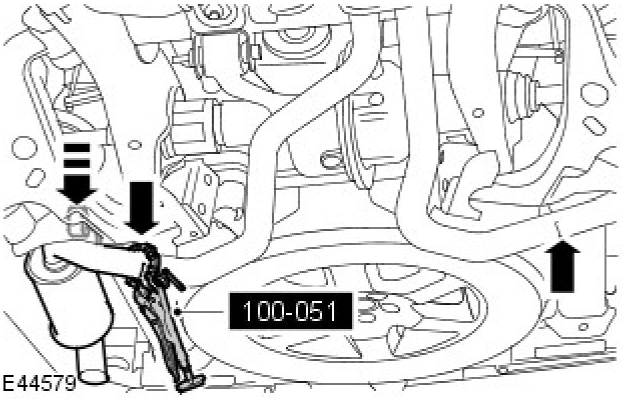
Removal and Installation

Special Tool(s)	
	Pipe cutter-exhaust 100-051 (LRT-99-027)

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2. Remove the tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.
- Disconnect from the exhaust hanger.

Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Install the tail pipe.

- Clean the components.
- Install the retaining clamp.

2. Align the tail pipe and tighten the retaining clamp to 55 Nm (40 lb.ft).

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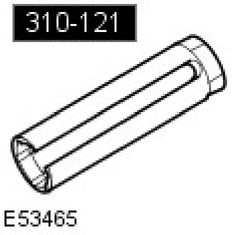
Exhaust System - V8 4.4L Petrol - Catalytic Converter LH

Removal and Installation

Special Tool(s)	
	Wrench, HO2S 310-121 (LRT-19-014)

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

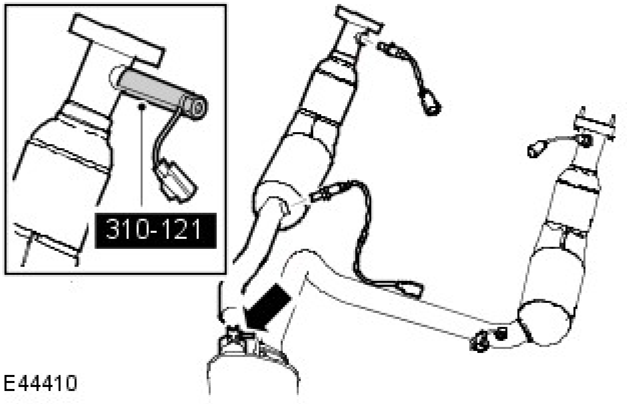
3. Remove the exhaust system.
   For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

4. Remove the catalytic converter.

   - Remove the nut and release the retaining clamp.

5. NOTE: Do not disassemble further if the component is removed for access only.

   Using the special tool, remove both HO2S from the catalytic converter.



Installation

1. ⚠ CAUTION: Make sure the anti-seize compound does not contact the HO2S tip.

   Using the special tool, install the HO2S to the catalytic converter and tighten to 45 Nm (33 lb.ft).

   - Clean the components.
   - Apply an anti-seize compound to the thread of the HO2S.

2. NOTE: Do not tighten the retaining clamp at this stage.

   Position the catalytic converter to the front muffler.

   - Clean the components.

- Install the nut.

3. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

4. Tighten the catalytic converter retaining clamp to 55 Nm (40 lb.ft).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

6. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A, General Procedures).

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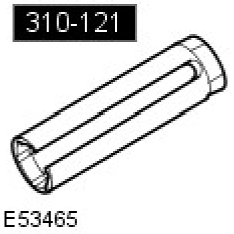
Exhaust System - V8 4.4L Petrol - Catalytic Converter RH

Removal and Installation

Special Tool(s)	
 310-121 E53465	Wrench, HO2S 310-121 (LRT-19-014)

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

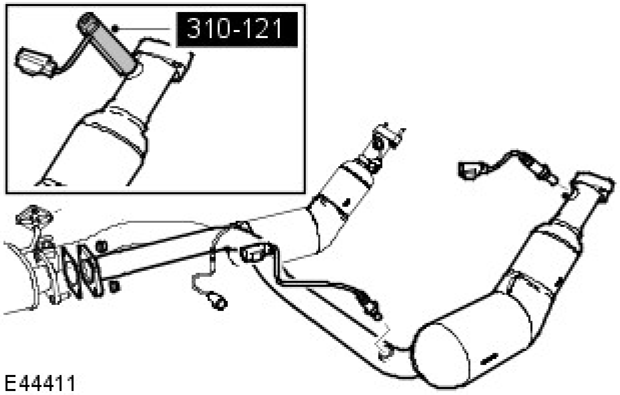
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

4. Remove the catalytic converter.

- Remove the 2 nuts.
- Discard the gasket.



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5. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove both HO2S from the catalytic converter.

Installation

1. ⚠ CAUTION: Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S to the catalytic converter and tighten to 45 Nm (33 lb.ft).

- Clean the components.
- Apply an anti-seize compound to the thread of the HO2S.

2. Position the catalytic converter to the front muffler.

- Clean the components.

- Install a new gasket.
- Tighten the nuts to 55 Nm (40 lb.ft).

3. Install the exhaust system.
For additional information, refer to: Exhaust System (309-00B Exhaust System - V8 4.4L Petrol, Removal and Installation).

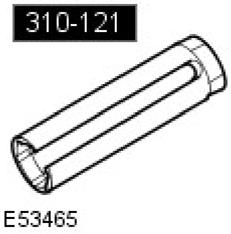
4. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

5. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.
For additional information, refer to: Powertrain Control Module (PCM) Long Drive Cycle Self-Test (303-14A, General Procedures).

Exhaust System - V8 4.4L Petrol - Exhaust System

Removal and Installation

Special Tool(s)	
	Wrench, HO2S 310-121 (LRT-19-014)

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

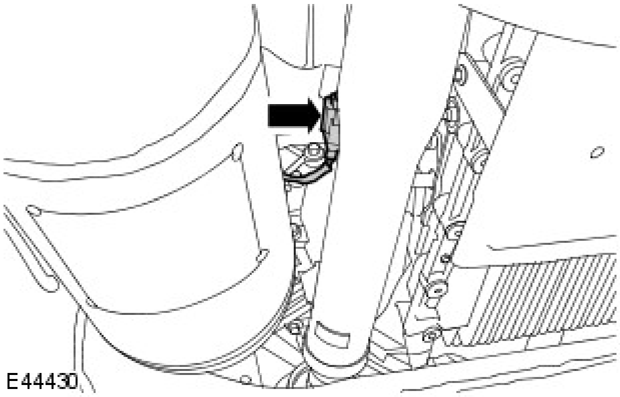
Raise and support the vehicle.

3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

4. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

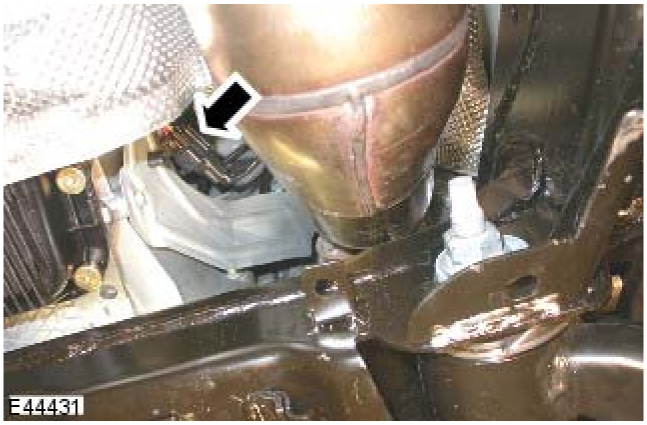
5. Release the LH front HO2S wiring harness.

- Disconnect the electrical connector.



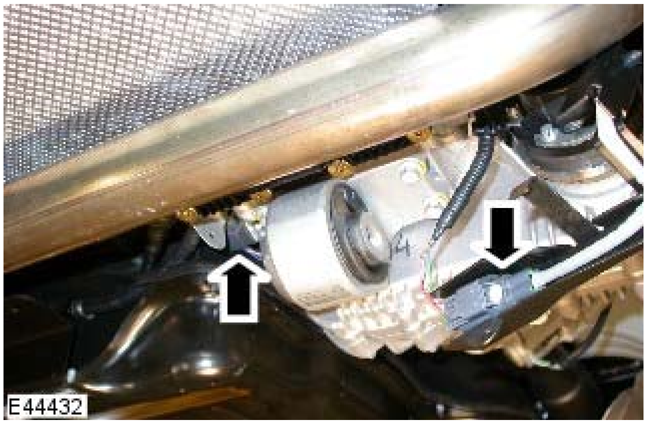
6. Release the RH front HO2S wiring harness.

- Disconnect the electrical connector.



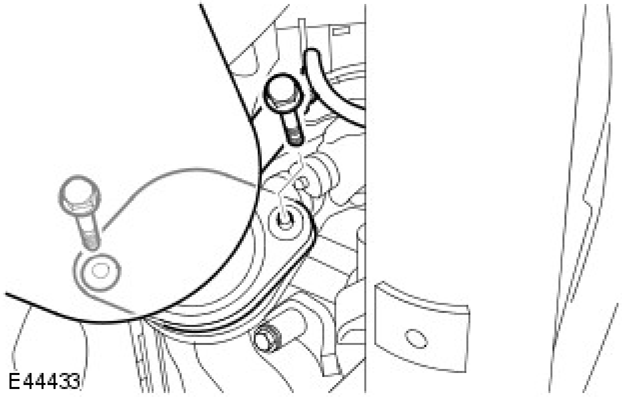
7. Release the LH rear HO2S wiring harness.

- Disconnect the electrical connector.



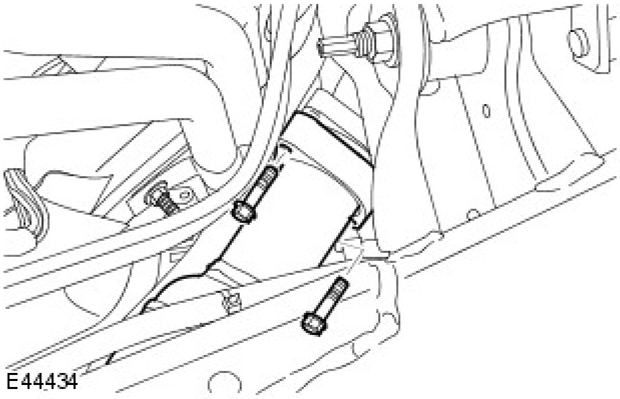
8. Release the RH rear HO2S wiring harness.

- Disconnect the electrical connector.



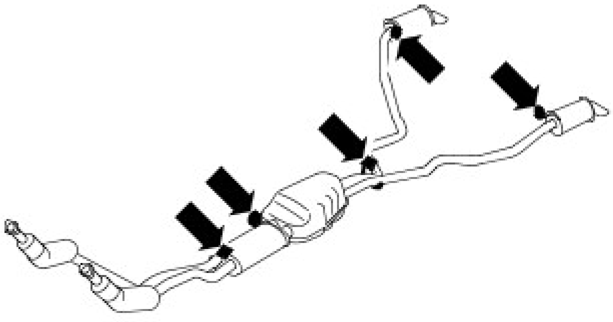
9. Disconnect the LH catalytic converter from the exhaust manifold.

- Remove and discard the 2 bolts.



10. Disconnect the RH catalytic converter from the exhaust manifold.

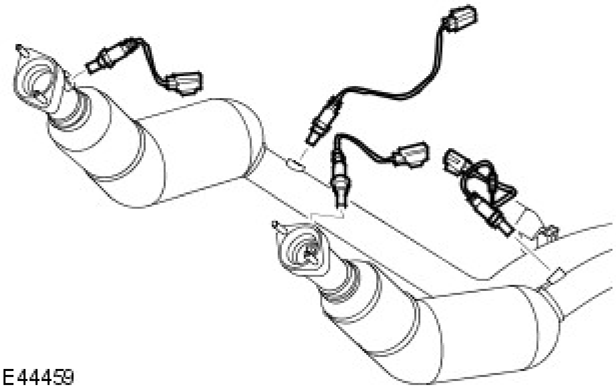
- Remove and discard the 2 bolts.



E44435

11. With assistance, remove the exhaust system.

- Disconnect the 5 exhaust hangers.



E44459

12. NOTE: Do not disassemble further if the component is removed for access only.

Using the special tool, remove the 4 HO2S from the catalytic converters.

Installation

1. ⚠CAUTION: Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S to the catalytic converters and tighten to 45 Nm (33 lb.ft).

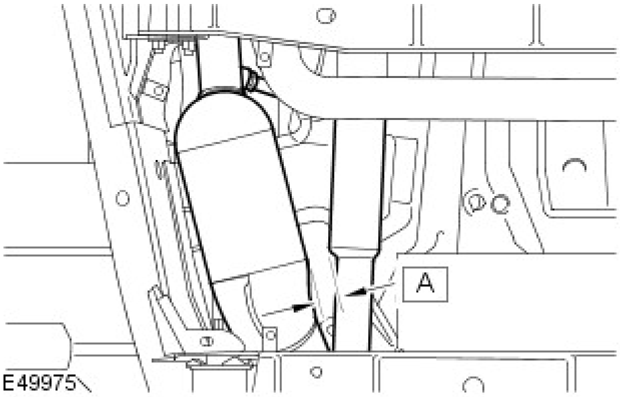
- Clean the components.
- Apply an anti-seize compound to the thread of the HO2S.

2. With assistance, install the exhaust system.

- Attach the exhaust hangers.

3. Position the RH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).



4. ⚠ CAUTION: Make sure there is a clearance (A) of 25 mm to 30 mm between the closest points of the LH catalytic converter and the front driveshaft.

Position the LH catalytic converter to the exhaust manifold.

- Clean the components.
- Tighten the new bolts to 22 Nm (16 lb.ft).

5. ⚠ CAUTION: Make sure the H02S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Connect the HO2S electrical connectors.

- Attach the HO2S wiring harnesses.

6. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

7. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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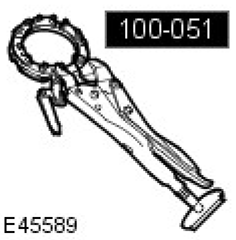
Exhaust System - V8 4.4L Petrol - Muffler

Removal and Installation

Special Tool(s)	
	Pipe cutter-exhaust 100-051 (LRT-99-027)

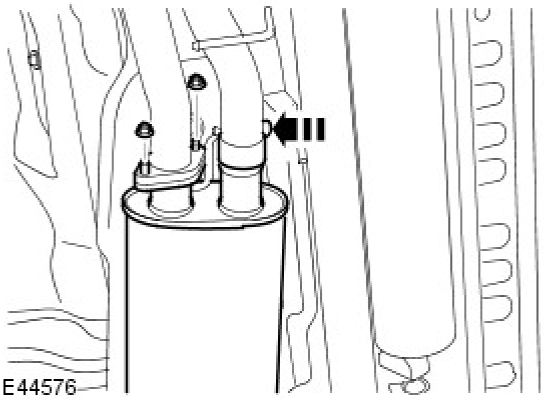
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

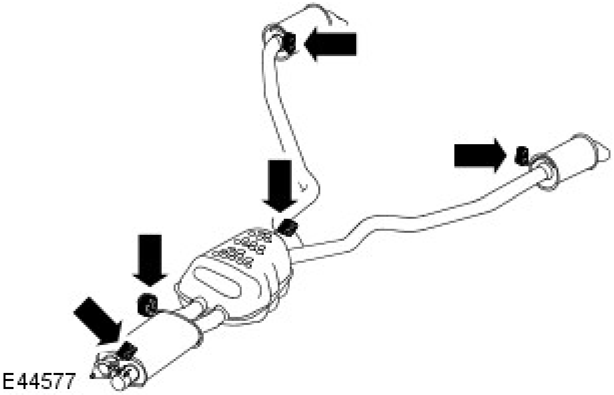
2. Disconnect the RH catalytic converter from the muffler assembly.

- Remove the 2 nuts.



3. Disconnect the LH catalytic converter from the muffler assembly.

- Remove the nut and release the retaining clamp.



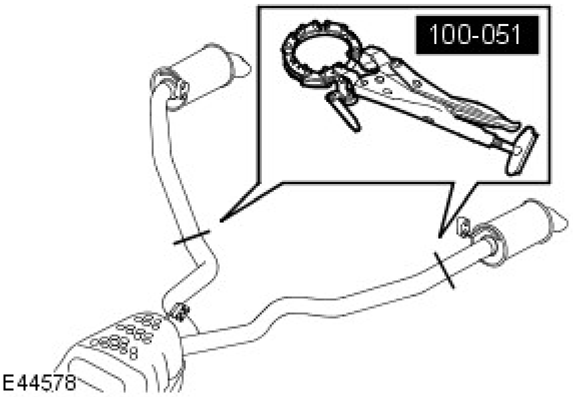
4. With assistance, remove the muffler assembly.

- Disconnect the 5 exhaust hangers.

5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the LH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.



6. Remove the RH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.

Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Position the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

2. NOTE: Do not tighten the retaining clamp at this stage.

Position the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

3. With assistance, install the muffler assembly.

- Attach the exhaust hangers.
- Tighten the catalytic converter nuts and clamp to 48 Nm (35 lb.ft).

4. Align both tail pipes and tighten the retaining clamps to 55 Nm (40 lb.ft).

Exhaust System - TDV6 2.7L Diesel -

General Specifications

Item	Specification
Exhaust manifolds	Cast with cross over pipe from right to left hand manifold exiting into single turbocharger
Exhaust system	Single, stainless steel downpipe with twin stainless steel intermediate and tail pipes and stainless steel mufflers
Catalytic converter - type/location	Near coupled cascade - located in the down pipe

Torque Specifications

Description	Nm	lb-ft
Catalytic converter clamp without diesel particulate filter (DPF)	55	40
Catalytic converter clamp with DPF	48	35
Catalytic converter to muffler nuts	48	35
DPF to muffler nuts	48	35
* Catalytic converter to exhaust manifold nuts	48	35
Service clamp	48	35
Differential pressure sensor pipe unions	35	26
** Exhaust gas temperature sensors	35	26
DPF heat shield bolts	10	7

*** New nuts must be installed**

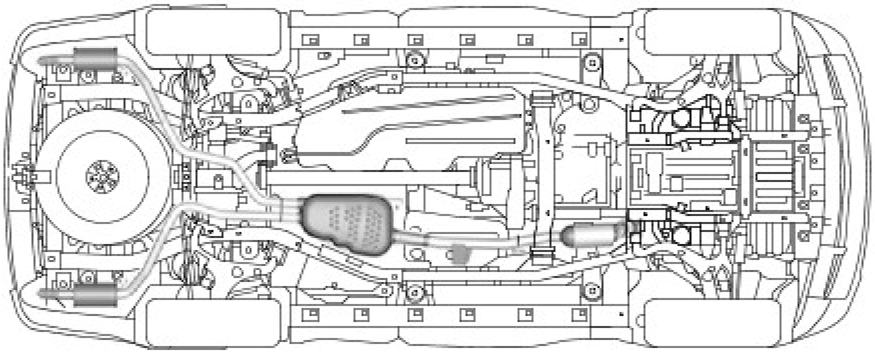
*** Apply suitable high temperature resistant anti-seize compound**

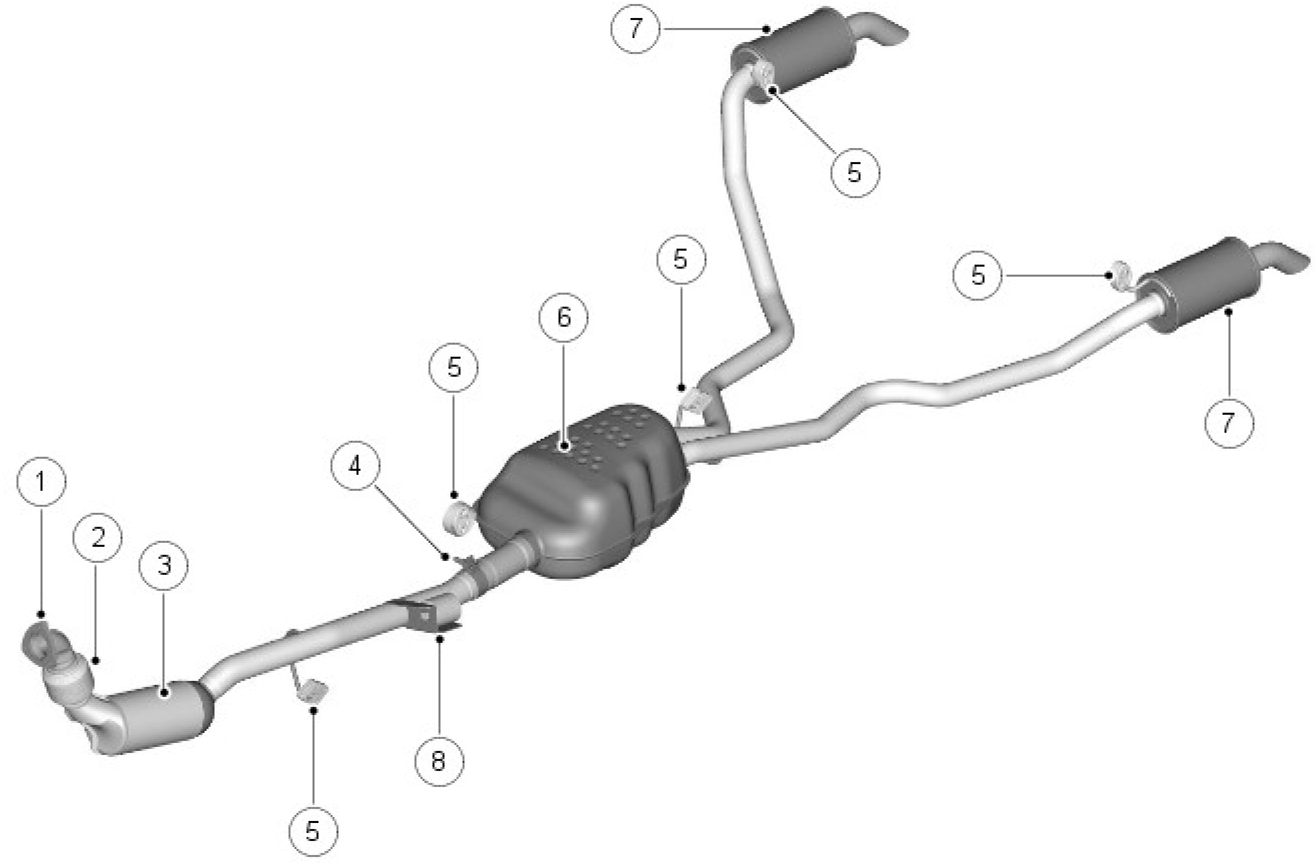
Published: 11-May-2011

Exhaust System - TDV6 2.7L Diesel - Exhaust System

Description and Operation

TdV6 EXHAUST SYSTEM COMPONENT LOCATION - WITHOUT DIESEL PARTICULATE FILTER

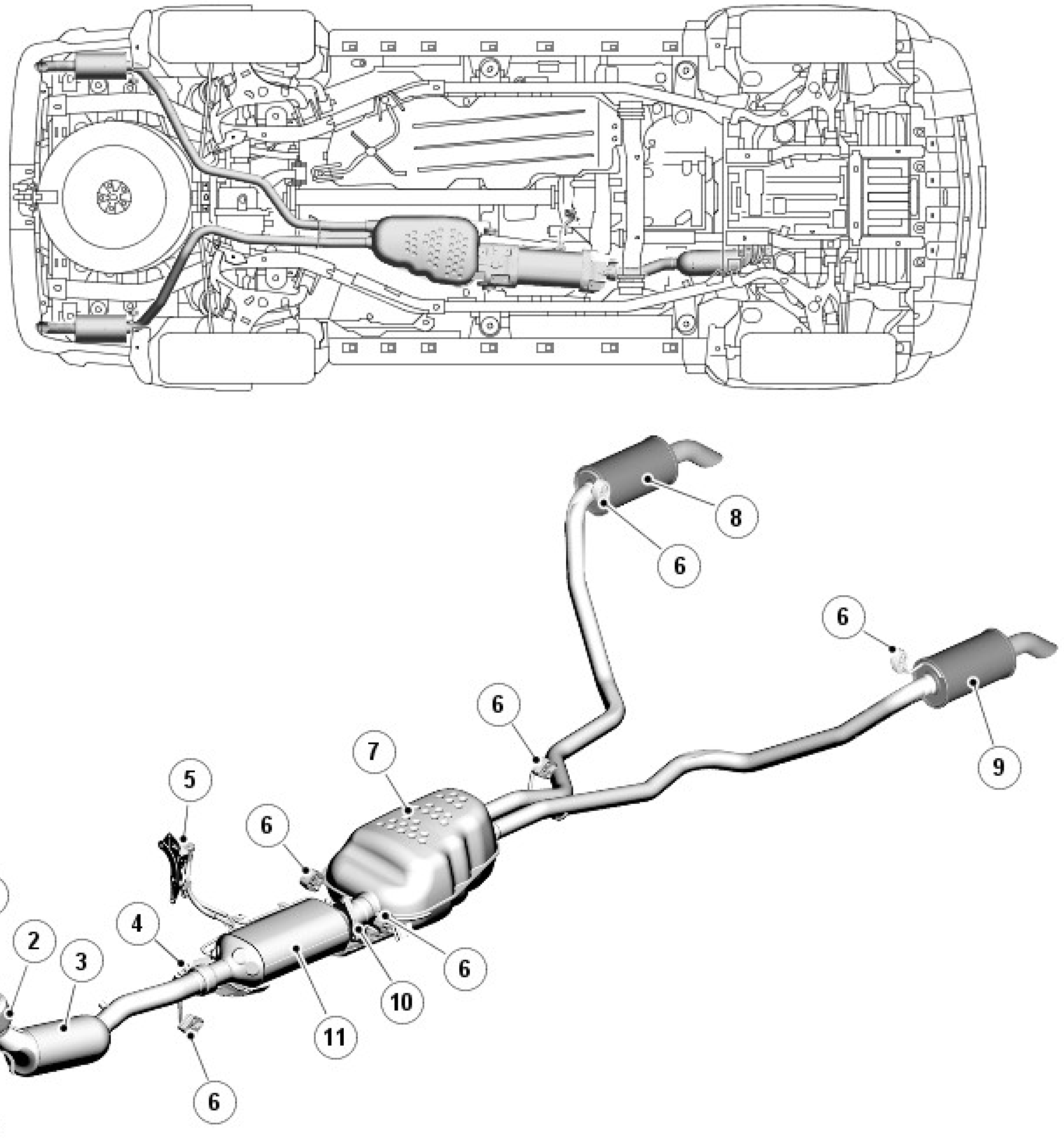




Item	Part Number	Description
1	-	Inlet flange
2	-	Flexible de-coupler
3	-	Catalytic converter
4	-	Clamp
5	-	Mounting rubber (5 off)
6	-	Silencer - Centre
7	-	Silencer - Rear
8	-	Mass damper (Not fitted to vehicles from 2007MY)

TdV6 EXHAUST SYSTEM COMPONENT LOCATION - WITH OPTIONAL DIESEL PARTICULATE

FILTER - FROM 2008 MY (WHERE FITTED)



Item	Part Number	Description
1	-	Inlet flange
2	-	Flexible de-coupler
3	-	Catalytic converter
4	-	Clamp
5	-	Differential pressure sensor
6	-	Mounting rubber (6 off)
7	-	Silencer - Centre
8	-	Silencer - Rear Left Hand (LH)
9	-	Silencer - Rear Right Hand (RH)
10	-	Flange joint and gasket
11	-	DPF

OVERVIEW

The TdV6 exhaust system is fabricated from stainless steel and is supplied as two separate assemblies; a front section incorporating a catalytic converter and a rear section incorporating a centre silencer and two rear silencers.

The system is attached to the underside of the body with five mounting rubbers which are located on mild steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded to the underside of the vehicle body.

The system has service repair items available. Indentations in the rear section between the center and the rear silencers show the cut points for the service replacement rear silencers or front section. When a service repair section is used, the joint is connected using a sleeve and two clamps to connect the pipes at the cut points.

On vehicles from 2008MY, an optional Diesel Particulate Filter (DPF) is available. The non-DPF exhaust system is also available on vehicles from 2008MY as the DPF is not required to comply with EU4 emission regulations.

- CAUTIONS:

⚠ The use of bio-fuels can seriously contaminate and destroy the coatings used on the catalytic converter. The DPF and the catalytic converter can become irreversibly contaminated if non-specified oils or fuels are used. This will result in the vehicle being unable to regenerate the DPF, becoming non-compliant with tailpipe emission regulations and replacement of the catalytic converter and DPF will be required.

⚠ If the vehicle is waded in deep water and the engine is stopped with the tailpipes submerged, the water, which can enter the system, can also contaminate both the DPF and the catalytic converter. This again can result in catalytic converter damage and damaging the ability for the DPF to regenerate therefore requiring both components to be replaced.

FRONT SECTION

The front section has a welded flange with three holes which provide for the attachment to three studs on the turbocharger. The flange is sealed with a metal gasket. This is secured to the turbocharger studs with three nuts.

The flange is welded to a fabricated elbow which in turn is welded to the de-coupler. Fabricated pressings are welded between the de-coupler and the body of the catalytic converter. The converter outlet pipe is a 60 mm (2.2 in) diameter tube, with a 2.0 mm (0.079 in) wall thickness, which is welded to the converter body. The outlet pipe has hanger bar which provides for the location of a mounting rubber.

Vehicles without DPF

The rear of the outlet pipe from the catalytic converter locates into the rear section. When the front section is inserted into the flared end, a clamp is used to compress and secure the joint.

Vehicles with Optional DPF - From 2008MY

The rear outlet pipe from the catalytic converter has a flared end which slides onto the DPF inlet pipe and is secured with a clamp. The outlet pipe of the DPF has a triangular shaped flange which mates with a similar flange on the rear section of the exhaust. The 2 flanges are sealed with a metal gasket and are secured using 3 locknuts screwed onto captive studs located in the DPF flange.

REAR SECTION

Vehicles without DPF

On vehicles without DPF, the rear section has a short 70 mm (2.75 in) diameter tube, with a 1.5 mm (0.06 in) wall thickness, which provides location for the front section as previously mentioned. The tube is welded to the centre silencer assembly.

Vehicles with Optional DPF - From 2008MY

On vehicles from 2008MY fitted with the optional DPF, the rear section has a short 70 mm (2.75 in) with a triangular flange which mates with a similar flange on the front section as previously mentioned.

All Vehicles

The centre silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 liters (1537 in^3). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. Hanger bars are welded to the front right hand side and left hand side of the silencer and provide for the location of mounting rubbers.

The silencer has two 50 mm (2.0 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components.

Each outlet pipe terminates in a welded joint with the rear silencers. The outlet pipes have a hanger bar which provides for the location of a mounting rubber.

A hanger bar is welded to the front face of each rear silencer and provides for the location of a mounting rubber. The silencer is a circular fabrication with a baffle tube which is surrounded with glass fiber to provide further noise suppression. Each silencer has a capacity of 2.7 liters (165 in^3).

The silencers each have an outlet pipe which is 55 mm (2.16 in) diameter, with a wall thickness of 1.2 mm (0.05 in). Each outlet pipe is curved downwards to direct exhaust gasses away from the rear of the vehicle.

CATALYTIC CONVERTER

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter (Diesel Oxidation Catalyst) is integrated into the front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing platinum on vehicles without a DPF or platinum and palladium on vehicles with a DPF, which are the active constituents for converting harmful emissions into inert by-products. The platinum and palladium adds oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water.

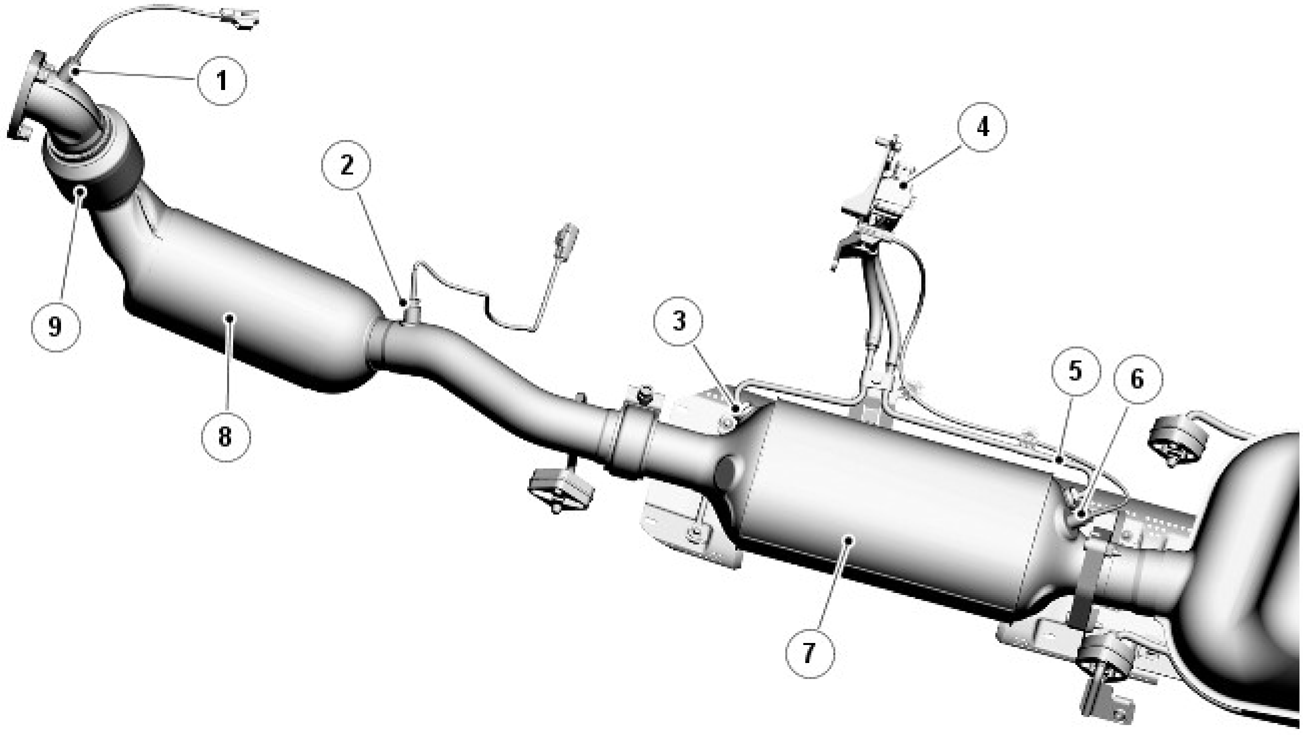
DIESEL PARTICULATE FILTER (DPF) - VEHICLES FROM 2008MY (WHERE FITTED)

On vehicles from 2008MY, an optional Diesel Particulate Filter (DPF) is available.

- NOTE: The non-DPF exhaust system is also available on vehicles from 2008MY.

The DPF system reduces diesel particulate emissions to negligible levels.

DPF System Components



E91610

Item	Part Number	Description
1	-	Exhaust gas temperature sensor (pre catalyst)
2	-	Exhaust gas temperature sensor (post catalyst)
3	-	High pressure sensor pipe
4	-	Differential pressure sensor
5	-	Low pressure sensor pipe

6	-	Exhaust gas temperature sensor (Post DPF)
7	-	Diesel particulate filter
8	-	Catalytic converter

The particulate emissions are the black fumes emitted from the diesel engine under certain load conditions. The emissions are a complex mixture of solid and liquid components with the majority of the particulates being carbon microspheres on which hydrocarbons from the engine's fuel and lubricant condense.

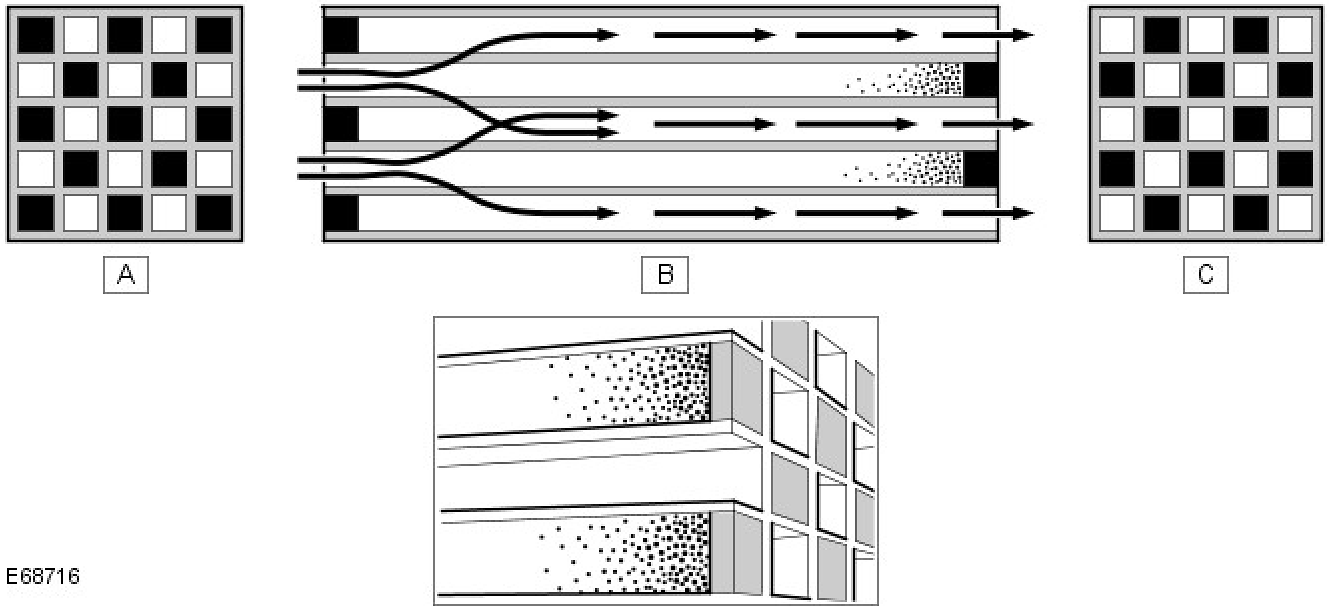
The DPF system comprises the following components:

- Diesel particulate filter
- DPF control software incorporated into the Engine Control Module (ECM)
- Differential pressure sensor.

Diesel Particulate Filter

The DPF is located in the exhaust system, downstream of the catalytic converter. A major feature of the DPF is its ability for regeneration. Regeneration is the burning of particulates trapped by the filter to prevent obstruction to the free flow of exhaust gasses. The regeneration process takes place at calculated intervals and is not noticeable by the driver of the vehicle.

Regeneration is most important, since an overfilled filter can damage the engine through excessive exhaust back pressure and can itself be damaged or destroyed. The material trapped in the filter is in the most part carbon particles with some absorbed hydrocarbons.



Item	Part Number	Description
A	-	Front face showing alternate closed cells
B	-	Side view showing exhaust gas flow through the filter and particulate build up
C	-	Rear face showing alternate closed cells

The DPF uses a filter technology based on a filter with a catalytic coating. The DPF is made from silicon carbide housed in a steel container and has excellent thermal shock resistance and thermal conductivity properties. The DPF is designed for the engine's operating requirements to maintain the optimum back pressure requirements.

The porous surface of the filter consists of a number of small parallel channels positioned in the longitudinal direction of the exhaust system. Adjacent channels in the filter are alternately plugged at the end. This design forces the exhaust gasses to flow through the porous filter walls, which act as the filter medium. Particulate matter which are too big to pass through the porous surface are collected and stored in the channels.

The collected particulate matter, if not removed, can create an obstruction to exhaust gas flow. The particles are removed by a regeneration process which oxidizes the particles.

DPF regeneration is controlled by the temperature of the exhaust gasses and the DPF. The DPF includes a wash coat to the filter surface which comprises platinum and other active components and is similar to the catalytic converter. At certain exhaust gas and DPF temperatures the wash coat promotes combustion of the particles in addition to oxidizing carbon monoxide and hydrocarbon emissions.

The exhaust gas and DPF temperatures are controlled by the DPF software located in the ECM. The DPF software monitors the load status of the DPF based on driving style, distance travelled and signals from the differential pressure sensor and temperature sensors. When the particulate loading of the DPF reaches predetermined levels, the DPF is actively regenerated by adjusting, in conjunction with the ECM, various engine control functions such as:

- fuel injection
- intake air throttle
- exhaust gas recirculation
- turbocharger boost pressure control.

The regeneration process is possible because of the flexibility of the common-rail fuel injection engine which provides precise control of fuel flow, fuel pressure and injection timing which are essential requirements to promote the efficient regeneration process.

Two processes are used to regenerate the DPF; passive and active.

Passive Regeneration

Passive regeneration requires no special engine management intervention and occurs during normal engine operation. The passive regeneration involves a slow conversion of the particulate matter deposited in the DPF into carbon dioxide. This process is active when the DPF temperature reaches 250°C (482°F) and is a continuous process when the vehicle is being driven at higher engine loads and speeds.

During passive regeneration, only a portion of the particulate matter is converted into carbon dioxide. This is due to the chemical reaction process which is only effective within the normal operating temperature range of 250°C to 500°C (482°F to 932°F).

Above this temperature range the conversion efficiency of the particulates into carbon dioxide increases as the DPF temperature is raised. These temperatures can only be achieved using the active regeneration process.

Active Regeneration

Active regeneration starts when the particulate loading of the DPF reaches a threshold as monitored or determined by the DPF control software. The threshold calculation is based on driving style, distance travelled and back pressure signals from the differential pressure sensor.

Active regeneration generally occurs every 450 miles (725 km) although this is highly dependant on how the vehicle is driven. For example, if the vehicle is driven at low loads in urban traffic regularly, active regeneration will occur more often. This is due to the rapid build-up of particulates in the DPF than if the vehicle is driven at high speeds when passive regeneration will have occurred.

The DPF software incorporates a mileage trigger which is used as back-up for active regeneration. If active regeneration has not been initiated by a back pressure signal from the differential pressure sensor, regeneration is requested based on distance travelled.

Active regeneration of the DPF is commenced when the temperature of the DPF is increased to the combustion temperature of the particles. The DPF temperature is raised by increasing the exhaust gas temperature. This is achieved by introducing post-injection of fuel after the pilot and main fuel injections have occurred.

This is determined by the DPF software monitoring the signals from the two DPF temperature sensors to establish the temperature of the DPF. Depending on the DPF temperature, the DPF software requests the ECM to perform either one or two post-injections of fuel:

- The first post-injection of fuel retards combustion inside the cylinder which increases the temperature of the exhaust gas.
- The second post-injection of fuel is injected late in the power stroke cycle. The fuel partly combusts in the cylinder, but some unburnt fuel also passes into the exhaust where it creates an exothermic event within the catalytic converter, further increasing the temperature of the DPF.

The active regeneration process takes approximately 20 minutes to complete. The first phase increases the DPF temperature to 500°C (932°F). The second phase further increases the DPF temperature to 600°C (1112°F) which is the optimum temperature for particle combustion. This temperature is then maintained for 15-20 minutes to ensure complete incineration of the particles within the DPF. The incineration process converts the carbon particles to carbon dioxide and water.

The active regeneration temperature of the DPF is closely monitored by the DPF software to maintain a target temperature of 600°C (1112°F) at the DPF inlet. The temperature control ensures that the temperatures do not exceed the operational limits of the turbocharger and the catalytic converter. The turbocharger inlet temperature must not exceed 830°C (1526°F) and the catalytic converter brick temperature must not exceed 800°C (1472°F) and the exit temperature must remain below 750°C (1382°F).

During the active regeneration process the following ECM controlled events occur:

- The turbocharger is maintained in the fully open position. This minimizes heat transmission from the exhaust gas to the turbocharger and reduces the rate of exhaust gas flow allowing optimum heating of the DPF. If the driver demands an increase in engine torque, the turbocharger will respond by closing the vanes as necessary.
- The throttle is closed as this assists in increasing the exhaust gas temperature and reduces the rate of exhaust gas flow which has the effect of reducing the time for the DPF to reach the optimum temperature.
- The Exhaust Gas Recirculation (EGR) valve is closed. The use of EGR decreases the exhaust gas temperature and therefore

prevents the optimum DPF temperature being achieved.

If, due to vehicle usage and/or driving style, the active regeneration process cannot take place or is unable to regenerate the DPF, the dealer can force regenerate the DPF. This is achieved by either driving the vehicle until the engine is at its normal operating temperature and then driving for a further 20 minutes at speeds of not less than 30 mph (48 km/h) or by connecting a Land Rover approved diagnostic system to the vehicle which will guide the technician through an automated regeneration procedure to clean the DPF.

Diesel Particulate Filter Control

The DPF requires constant monitoring to ensure that it is operating at its optimum efficiency and does not become blocked. The ECM contains DPF software which controls the monitoring and operation of the DPF system and also monitors other vehicle data to determine regeneration periods and service intervals.

The DPF software can be divided into three separate control software modules; a DPF supervisor module, a DPF fuel management module and a DPF air management module.

These three modules are controlled by a fourth software module known as the DPF co-ordinator module. The co-ordinator module manages the operation of the other modules when an active regeneration is requested. The DPF supervisor module is a sub-system of the DPF co-ordinator module.

DPF Fuel Management Module

The DPF fuel management module controls the following functions:

- Timing and quantity of the four split injections per stroke (pilot, main and two post injections).
- Injection pressure and the transition between the three different calibration levels of injection.

The above functions are dependant on the condition of the catalytic converter and the DPF.

The controlled injection determines the required injection level in addition to measuring the activity of the catalytic converter and the DPF. The fuel management calculates the quantity and timing for the four split injections, for each of the three calibration levels for injection pressure, and also manages the transition between the levels.

The two post injections are required to separate the functionality of increasing in-cylinder gas temperatures and the production of hydrocarbons. The first post injection is used to generate the higher in-cylinder gas temperature while simultaneously retaining the same engine torque output produced during normal (non-regeneration) engine operation. The second post injection is used to generate hydrocarbons by allowing unburnt fuel into the catalytic converter without producing increased engine torque.

DPF Air Management Module

The DPF air management module controls the following functions:

- EGR control
- Turbocharger boost pressure control
- Intake air temperature and pressure control.

During active regeneration, the EGR operation is disabled and the closed-loop activation of the turbocharger boost controller is calculated. The air management module controls the air in the intake manifold to a predetermined level of pressure and temperature. This control is required to achieve the correct in-cylinder conditions for stable and robust combustion of the post injected fuel.

The module controls the intake air temperature by actuating the EGR throttle and by adjustment of the turbocharger boost pressure control.

DPF Co-ordinator Module

The DPF co-ordinator module reacts to a regeneration request from the supervisor module by initiating and co-ordinating the following DPF regeneration requests:

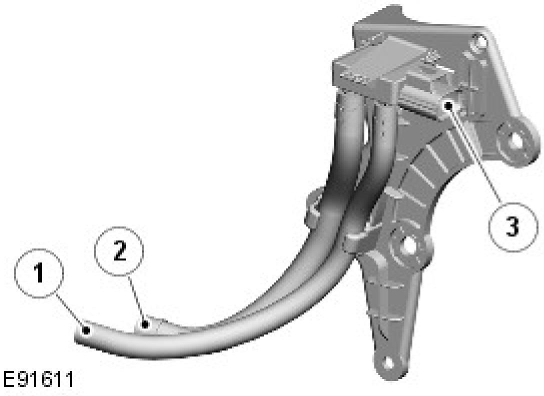
- EGR cut-off
- Turbocharger boost pressure control
- Engine load increase
- Control of air pressure and temperature in the intake manifold
- Fuel injection control.

When the supervisor module issues a regeneration request, the co-ordinator module requests EGR cut-off and a regeneration specific turbocharger boost pressure control. It then waits for a feedback signal from the EGR system confirming that the EGR valve is closed.

When the EGR valve is closed, the co-ordinator module initiates requests to increase engine load by controlling the intake air temperature and pressure.

Once confirmation is received that intake conditions are controlled or a calibration time has expired, the co-ordinator module then changes to a state awaiting an accelerator pedal release manoeuvre from the driver. If this occurs or a calibration time has expired, the co-ordinator module generates a request to control fuel injections to increase exhaust gas temperature.

Differential Pressure Sensor



Item	Part Number	Description
1	-	Low pressure connection
2	-	High pressure connection
3	-	Electrical connector

The differential pressure sensor is located on a bracket which is attached to the transfer case.

The differential pressure sensor is used by the DPF software to monitor the condition of the DPF. Two pipe connections on the sensor are connected by pipes to the inlet and outlet ends of the DPF. The pipes allow the sensor to measure the inlet and outlet pressures of the DPF

As the amount of particulates trapped by the DPF increases, the pressure at the inlet side of the DPF increases in comparison to the DPF outlet. The DPF software uses this comparison, in conjunction with other data, to calculate the accumulated amount of trapped particulates.

By measuring the pressure difference between the DPF inlet and outlet and the DPF temperature, the DPF software can determine if the DPF is becoming blocked and requires regeneration.

Differential Particulate Filter Temperature Sensors

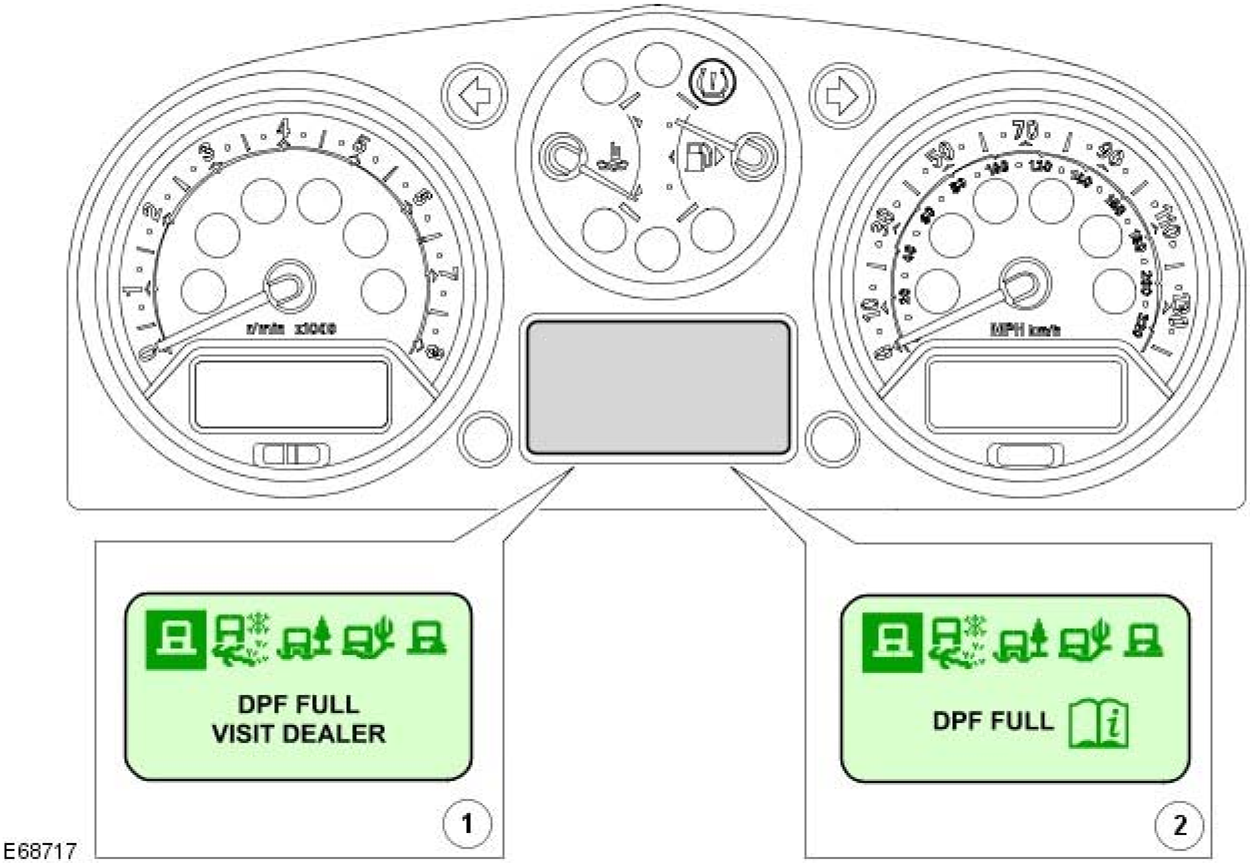
Three temperature sensors are used in the DPF system. The first is located just after the turbocharger in the catalytic converter inlet pipe, the second located in the catalytic converter outlet pipe and the third in the DPF outlet cone pipe work.

The sensors measure the temperature of exhaust gas exiting the turbocharger, after the catalyst and after it passes through the DPF to provide the information needed to calculate the DPF temperature.

The information is used, in conjunction with other data, to estimate the amount of accumulated particulates and to control the DPF temperature.

Instrument Cluster Indications

For drivers who make regular short journeys at low speeds, it may not be possible to efficiently regenerate the DPF. In this case, the DPF software will detect a blockage of the DPF from signals from the differential pressure sensor and will alert the driver as follows.



Item	Part Number	Description
1	-	'DPF FULL VISIT DEALER' message
2	-	'DPF FULL' message

Vehicles with DPF use a high-line instrument cluster to alert the driver to the condition of the DPF via messages in the message centre.

When the DPF becomes full the driver will be alerted to this condition by a message 'DPF FULL' accompanied by a handbook symbol. As detailed in the Owners Handbook, the driver should drive the vehicle until the engine is at its normal operating temperature and then drive for a further 20 minutes at speeds of not less than 30 mph (48 km/h). Successful regeneration of the DPF is indicated to the driver by the 'DPF FULL' message no longer being displayed.

If the DPF software detects that the DPF is still blocked, the message will change to 'DPF FULL VISIT DEALER', the driver should take the vehicle to an authorized dealer to have the DPF force regenerated.

Diesel Particulate Filter Side Effects

The following section details some side effects caused by the active regeneration process.

Engine Oil Dilution

Engine oil dilution can occur due to small amounts of fuel entering the engine crankcase during the post-injection phases. This has made it necessary to introduce a calculation based on driving style to reduce oil service intervals if necessary. The driver is alerted to the oil service by a message in the instrument cluster.

The DPF software monitors the driving style, the frequency of the active regeneration and duration. Using this information a calculation can be made on the engine oil dilution. When the DPF software calculates the engine oil dilution has reached a predetermined threshold (fuel being 7% of engine oil volume) a service message is displayed in the instrument cluster.

Depending on driving style, some vehicles may require an oil service before the designated interval. If an service message is displayed, the vehicle will be required have a full service and the service interval counter will be reset.

Fuel Consumption

During the active regeneration process of the DPF, there will be an increase in fuel consumption. However, because active regeneration occurs infrequently and for limited periods of time, the overall effect on fuel consumption is approximately 2%. The additional fuel used during the active regeneration process is accounted for in the instantaneous and average fuel consumption displays in the instrument cluster.

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Exhaust System - TDV6 2.7L Diesel - Exhaust System

Diagnosis and Testing

Overview

For additional information, refer to the relevant section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
- Leaks - Metal fatigue - Pipes - Catalytic converter - Muffler(s) - Joints - Mountings - Clearance around components	- Fuses - Wiring harness - Electrical connector(s) - Sensor(s) - Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Noisy or leaking exhaust	- Exhaust system/components	Install new components as necessary. Refer to the relevant section of the workshop manual.
Lack of power	- Air intake system fault - Restricted exhaust system - Low fuel pressure	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. Refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls section of the workshop manual.

DTC	Description	Possible causes	Action
P042562	Catalyst Temperature Sensor Circuit (Bank 1, Sensor Circuit 1)	- Pre-catalytic converter temperature sensor signal compare failure (right hand bank sensor 1) - Pre-catalytic converter temperature sensor correlation compare with at least two other sensors - Pre-catalytic converter temperature sensor failure - Pre-catalytic converter	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Check pre-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace pre-catalytic converter temperature sensor

DTC	Description	Possible causes	Action
		temperature sensor circuit - short to ground, power or open circuit	
P042600	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor gradient check (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor failure ● Pre-catalytic converter temperature sensor circuit - short to ground, power or open circuit ● Pre-catalytic converter temperature sensor circuit high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required
P04261A	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor circuit resistance below threshold (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor plausibility at cold start, temperature difference too high ● Pre-catalytic converter temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for low resistance, short to ground. Replace pre-catalytic converter temperature sensor
P04261B	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor circuit resistance above threshold (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor plausibility at cold start, temperature difference too low ● Pre-catalytic converter temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for high resistance, open circuit. Replace pre-catalytic converter temperature sensor
P04261E	Catalyst Temperature Sensor Circuit Range/Performance (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor circuit resistance out of range (right hand bank sensor 1) ● Pre-catalytic converter temperature sensor plausibility at engine running, temperature too low ● Pre-catalytic converter temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Check pre-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace pre-catalytic converter temperature sensor
P042700	Catalyst Temperature Sensor Circuit Low (Bank 1, Sensor Circuit 1)	● Pre-catalytic converter temperature sensor signal below minimum threshold voltage (right	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check pre-catalytic converter temperature sensor circuit for short to ground. Install a new

DTC	Description	Possible causes	Action
		hand bank sensor 1) - Pre-catalytic converter temperature sensor failure - Pre-catalytic converter temperature sensor circuit - short to ground	sensor as required
P042800	Catalyst Temperature Sensor Circuit High (Bank 1, Sensor Circuit 1)	- Pre-catalytic converter temperature sensor signal above maximum threshold voltage (right hand bank sensor 1) - Pre-catalytic converter temperature sensor failure - Pre-catalytic converter temperature sensor circuit - short power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check Pre-catalytic converter temperature sensor circuit for short to power, open circuit. Install a new sensor as required
P042A62	Catalyst Temperature Sensor Circuit (Bank 1, Sensor Circuit 2)	- Post-catalytic converter temperature sensor signal compare failure (right hand bank sensor 2) - Post-catalytic converter temperature sensor correlation compare with at least two other sensors - Post-catalytic converter temperature sensor failure - Post-catalytic converter temperature sensor circuit - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. check post-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post-catalytic converter temperature sensor
P042B00	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	- Post-catalytic converter temperature sensor gradient check (right hand bank sensor 2) - Post-catalytic converter temperature sensor failure - Post-catalytic converter temperature sensor circuit - short to ground, power or open circuit - Post-catalytic converter temperature sensor circuit - high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor as required
P042B1A	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	- Post-catalytic converter temperature sensor circuit resistance below threshold (right hand bank sensor 2) - Post-catalytic converter temperature sensor plausibility at cold start, temperature difference too high - Post-catalytic converter temperature sensor stuck at high	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for low resistance, short to ground. Replace post-catalytic converter temperature sensor

DTC	Description	Possible causes	Action
		temperature value	
P042B1B	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor circuit resistance above threshold (right hand bank sensor 2) ● Post-catalytic converter temperature sensor plausibility at cold start, temperature difference too low ● Post-catalytic converter temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for high resistance, open circuit. Replace post-catalytic converter temperature sensor
P042B1E	Catalyst Temperature Sensor Circuit Range/Performance (Bank1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor circuit resistance out of range (right hand bank sensor 2) ● Post-catalytic converter temperature sensor plausibility at engine running, temperature too low ● Post-catalytic converter temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for open circuit, short to ground, short to power. check post-catalytic converter temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post-catalytic converter temperature sensor
P042C00	Catalyst Temperature Sensor Circuit Low (Bank 1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor signal below minimum threshold voltage (right hand bank sensor 2) ● Post-catalytic converter temperature sensor failure ● Post-catalytic converter temperature sensor circuit - short to ground	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for short to ground. Install a new sensor as required
P042D00	Catalyst Temperature Sensor Circuit High (Bank 1, Sensor Circuit 2)	● Post-catalytic converter temperature sensor signal above maximum threshold voltage (right hand bank sensor 2) ● Post-catalytic converter temperature sensor failure ● Post-catalytic converter temperature sensor circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post-catalytic converter temperature sensor circuit for short to power, open circuit. Install a new sensor as required
P242A62	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 3	● Post DPF temperature sensor signal compare failure (right hand bank sensor 3) ● Post DPF temperature sensor correlation compare with at least two other sensors ● Post DPF temperature sensor failure	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for open circuit, short to ground, short to power. Check post DPF temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post DPF temperature sensor

DTC	Description	Possible causes	Action
P242B1A	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 3	● Post DPF temperature sensor circuit resistance below threshold (right hand bank sensor 3) ● Post DPF temperature sensor plausibility at cold start, temperature difference too high ● Post DPF temperature sensor failure ● Post DPF temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for low resistance, short to ground. Replace post DPF temperature sensor
P242B1B	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 3	● Post DPF temperature sensor circuit resistance above threshold (right hand bank sensor 3) ● Post DPF temperature sensor plausibility at cold start, temperature difference too low ● Post DPF temperature sensor failure ● Post DPF temperature sensor stuck at high temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for high resistance, open circuit. Replace post DPF temperature sensor
P242B1E	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 3	● Post DPF temperature sensor circuit resistance out of range (right hand bank sensor 3) ● Post DPF temperature sensor plausibility at engine running, temperature too low ● Post DPF temperature sensor failure ● Post DPF temperature sensor stuck at low temperature value	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for open circuit, short to ground, short to power. Check post DPF temperature sensor for dirt contamination, corrosion, water ingress damage. Replace post DPF temperature sensor
P242C00	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 3	● Post DPF temperature sensor signal below minimum threshold voltage (right hand bank sensor 3) ● Post DPF temperature sensor failure ● Post DPF temperature sensor circuit -short to ground, high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for short to ground, high resistance. Install a new sensor as required
P242D00	Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 3	● Post DPF temperature sensor signal above max threshold voltage (right hand bank sensor 3) ● Post DPF temperature sensor failure ● Post DPF temperature sensor circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for short to power, open circuit. Install a new sensor as required
P242E00	Exhaust Gas Temperature Sensor Circuit Intermittent/Erratic Bank 1 Sensor 3	● Post DPF temperature sensor gradient check (right hand bank sensor 3) ● Post DPF temperature	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check post DPF temperature sensor circuit for open circuit, short to ground, short to power. Intermittent poor or dirty connections. Install a new sensor

DTC	Description	Possible causes	Action
		sensor failure ● Post DPF temperature sensor circuit - short to ground, power or open circuit	as required
P242F68	Diesel Particulate Filter Restriction - Ash Accumulation	● DPF event information ● DPF partially blocked ● DPF circuit internal to ECM	DPF regeneration required. Refer to driver handbook.
P244A00	Diesel Particulate Filter Differential Pressure Too Low(Bank1)	● Differential pressure on particulate filter too low right hand bank	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Check DPS system external pipework for breakage or leakage. Check DPF internal filter brick for failure. Install DPF as required
P244B00	Diesel Particulate Filter Differential Pressure Too High (Bank 1)	● Differential pressure on particulate filter too high right hand bank ● Diesel particulate filter internal failure	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Contact Dealer Technical Support
P245300	Diesel Particulate Filter Pressure Sensor A Circuit Range/Performance	● Differential pressure on particulate filter sensor plausibility before start ● DPS system contaminated or blocked ● DPS stuck ● DPS - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Check DPS system for contamination or blockage. Check DPS for sticking. Install sensor as required
P245329	Diesel Particulate Filter Pressure Sensor A Circuit Range/Performance	● DPS signal invalid ● Differential pressure on particulate filter sensor plausibility check at engine running ● DPS system contaminated or blocked ● DPS stuck ● DPS - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Check DPS system for contamination or blockage. Check DPS system external pipework for breakage or leakage. Check DPS for sticking. Install sensor as required
P245400	Diesel Particulate Filter Pressure Sensor A Circuit Low	● DPS signal below minimum threshold ● DPS failure ● DPS circuit - short to ground, high resistance	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for short to ground, high resistance. Install sensor as required
P245500	Diesel Particulate Filter Pressure Sensor A Circuit High	● DPS signal above maximum threshold ● DPS failure ● DPS circuit - short to power, open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to power. Install sensor as required
P245600	Diesel Particulate Filter Pressure Sensor A Circuit Intermittent/Erratic	● DPS signal gradient not plausible ● DPS failure ● DPS circuit - short to ground, power or open circuit	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check DPS circuit for open circuit, short to ground, short to power. Install sensor as required
P245800	Diesel Particulate Filter Regeneration Duration	● Delay timer for regeneration exceeds threshold ● DPF circuit internal to ECM	Contact Dealer Technical Support

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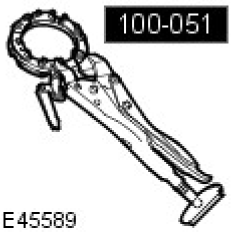
Exhaust System - TDV6 2.7L Diesel - Tailpipe

Removal and Installation

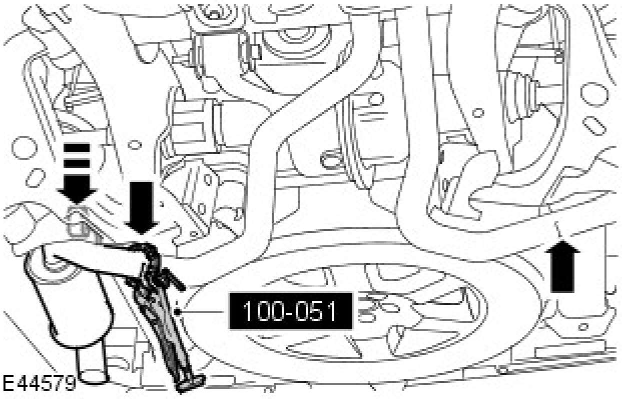
Special Tool(s)	
	Pipe cutter-exhaust 100-051 (LRT-99-027)

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the tail pipe.
   - Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.
   - Disconnect from the exhaust hanger.



Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

   Install the tail pipe.
   - Clean the components.
   - Install the retaining clamp.

2. Align the tail pipe and tighten the retaining clamp to 55 Nm (40 lb.ft).

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Exhaust System - TDV6 2.7L Diesel - Exhaust SystemVehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

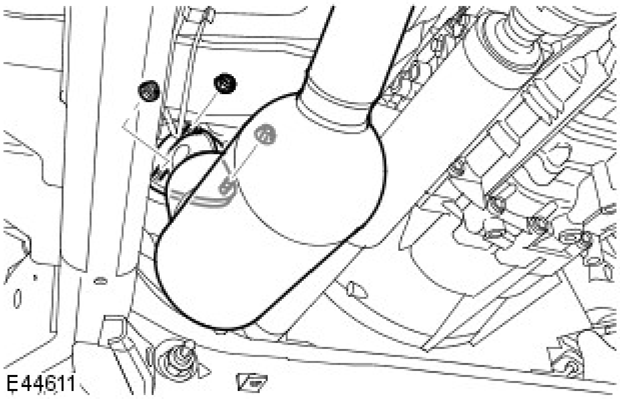
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

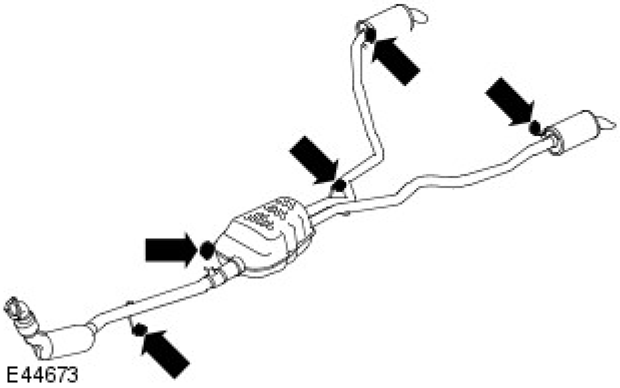
3. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

4. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).



5. Disconnect the catalytic converter from the exhaust manifold.

- Remove the 3 nuts.
- Discard the gasket.



6. With assistance, remove the exhaust system.

- Disconnect the 5 exhaust hangers.

Installation

1. With assistance, install the exhaust system.

- Attach the exhaust hangers.

2. Position the catalytic converter to the exhaust manifold.

- Clean the components.

- Install a new gasket.
- Tighten the nuts to 48 Nm (35 lb.ft).

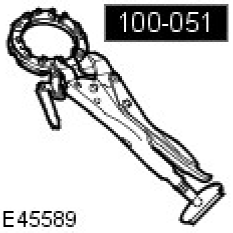
3. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

4. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Exhaust System - TDV6 2.7L Diesel - MufflerVehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

Special Tool(s)	
	Pipe cutter-exhaust 100-051 (LRT-99-027)

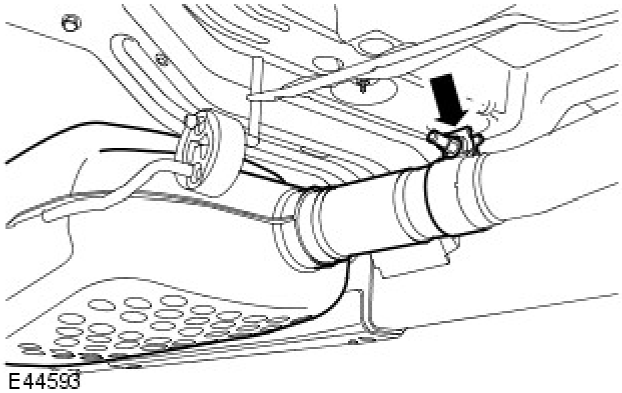
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

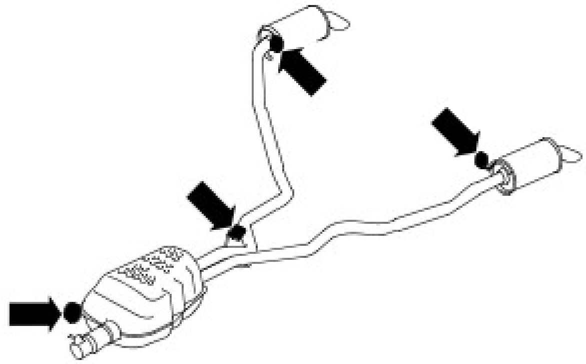
2. Disconnect the catalytic converter from the muffler assembly.

- Remove the nut and release the retaining clamp.



3. With assistance, remove the muffler assembly.

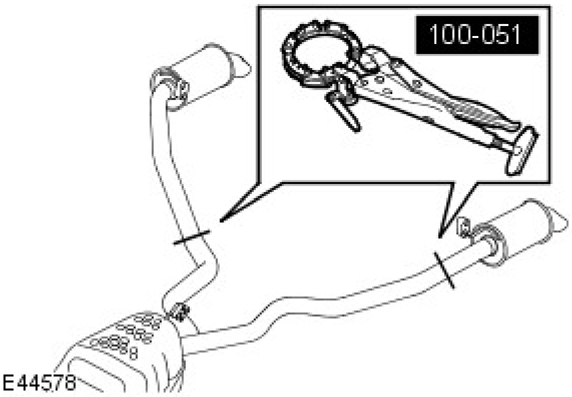
- Disconnect the 4 exhaust hangers.



4. NOTE: Do not disassemble further if the component is removed for access only.

Remove the LH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.



5. Remove the RH tail pipe.

- Using 100-051, cut the tail pipe at the point indicated by a depression in the pipe.

Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Position the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

2. NOTE: Do not tighten the retaining clamp at this stage.

Position the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the retaining clamp.

3. With assistance, install the muffler assembly.

- Attach the exhaust hangers.
- Tighten the catalytic converter nuts and clamp to 48 Nm (35 lb.ft).

4. Align both tail pipes and tighten the retaining clamps to 55 Nm (40 lb.ft).

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Exhaust System - TDV6 2.7L Diesel - Catalytic ConverterVehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

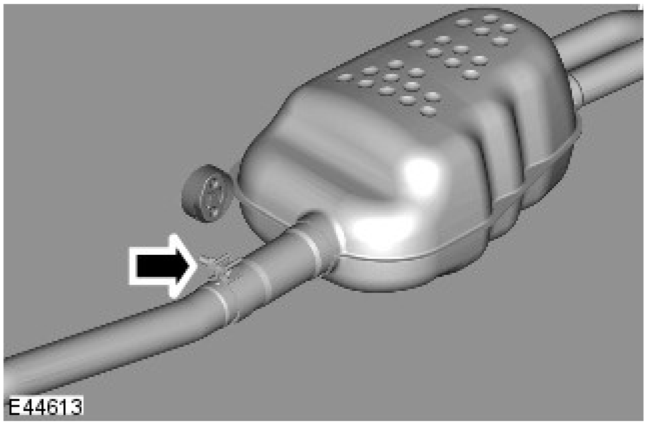
2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the exhaust system.
For additional information, refer to: Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

4. Remove the catalytic converter.

- Remove the nut and release the retaining clamp.



Installation

1. NOTE: Do not tighten the retaining clamp at this stage.

Position the catalytic converter to the front muffler.

- Clean the components.
- Install the nut.

2. Install the exhaust system.
For additional information, refer to: Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

3. Tighten the catalytic converter retaining clamp to 55 Nm (40 lb.ft).

4. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Exhaust System - TDV6 2.7L Diesel - MufflerVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

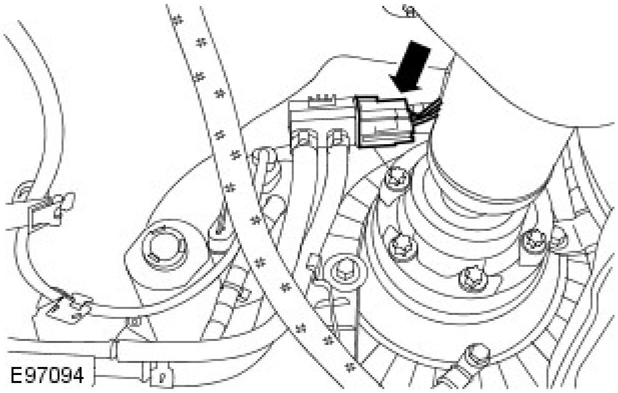
Removal

WARNING: Observe due care when working near a hot exhaust system.

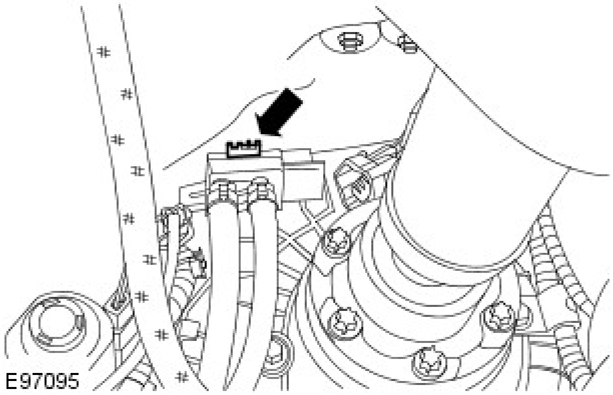
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

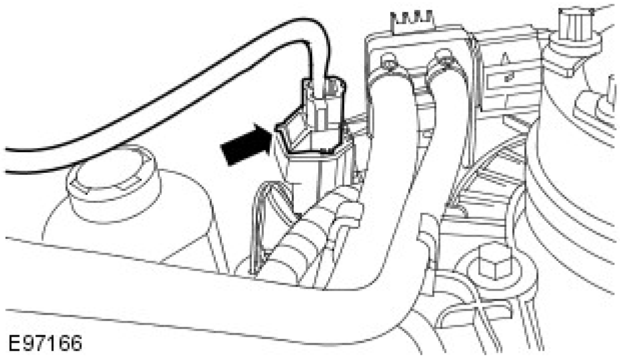
2. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.

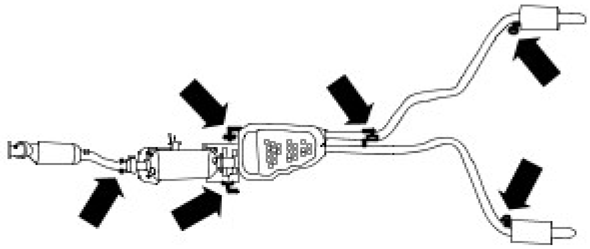


3. Release the DPF differential pressure sensor.
   - Release the clip.



4. Disconnect the DPF exhaust gas temperature sensor electrical connector.

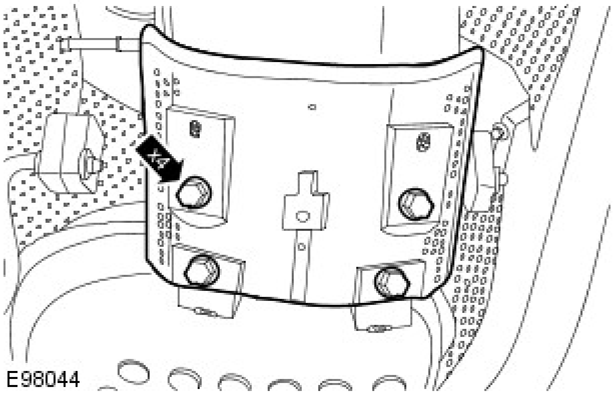




E98050

5. CAUTION: Make sure that the exhaust system is supported with a suitable transmission stand.

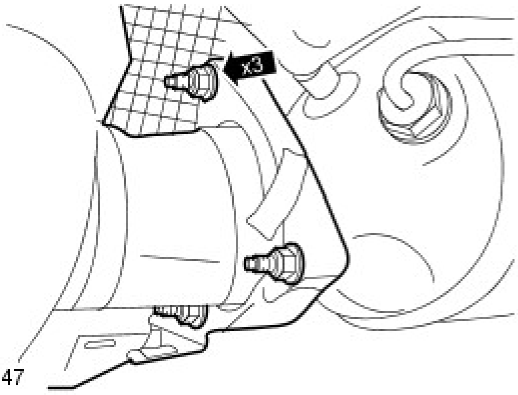
Release the 6 exhaust hangers.



E98044

6. Remove the DPF rear heat shield.

- Remove the 4 bolts.

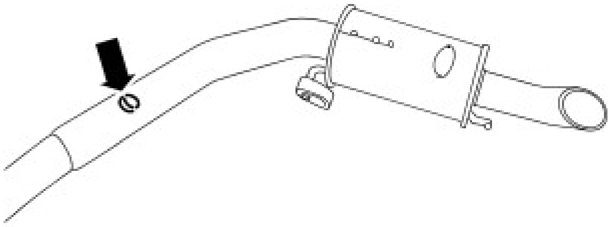


E98047

7. NOTE: Discard the gasket.

With assistance, remove the muffler and tailpipe assembly.

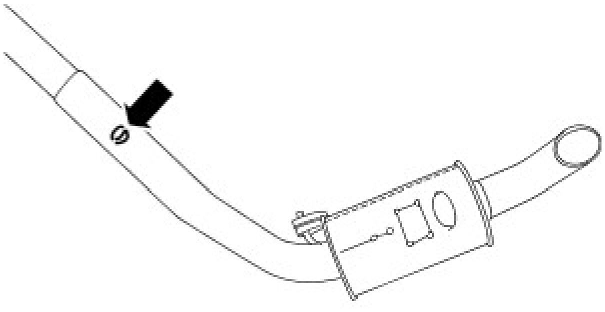
- Remove the 3 nuts.
- Remove the bracket.



E87326

8. Remove the LH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.



E87327

9. Remove the RH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.

Installation

1. NOTE: Do not tighten the clamp at this stage.

Install the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the clamp.

2. NOTE: Do not tighten the clamp at this stage.

Install the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the clamp.

3. NOTE: Install a new gasket.

With assistance, install the muffler and tailpipe assembly.

- Install the bracket.
- Tighten the nuts to 48 Nm (35 lb.ft).
- Secure the exhaust hangers.

4. Align both of the tail pipes and tighten the clamps to 48 Nm (35 lb.ft).

5. Install the DPF rear heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

6. Connect the DPF exhaust gas temperature sensor electrical connector.

7. Secure the DPF differential pressure sensor.

8. Connect the DPF differential pressure sensor electrical connector.

Published: 11-May-2011

Exhaust System - TDV6 2.7L Diesel - Diesel Particulate Filter (DPF)

Removal and Installation

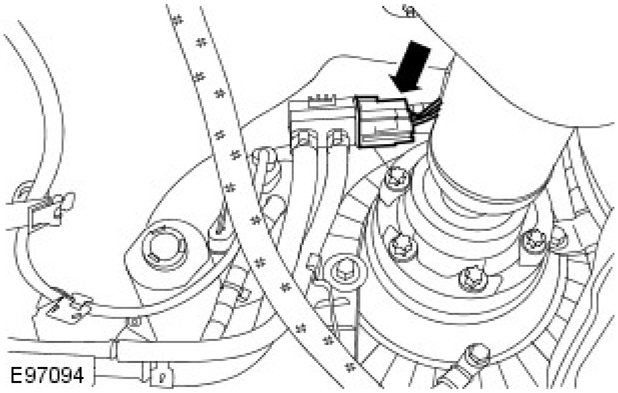
Removal

⚠ WARNING: Observe due care when working near a hot exhaust system.

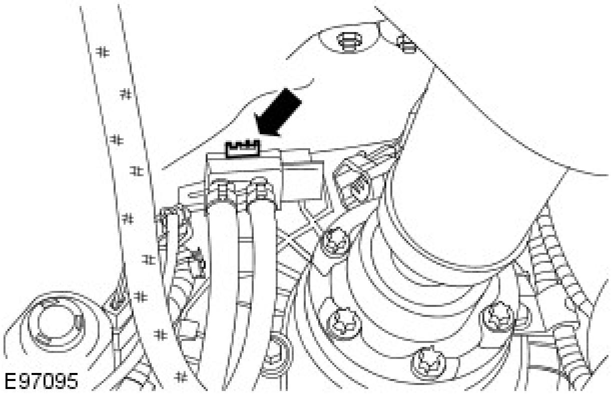
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

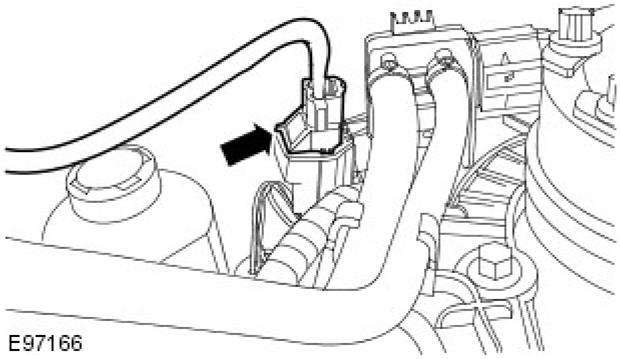
2. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.

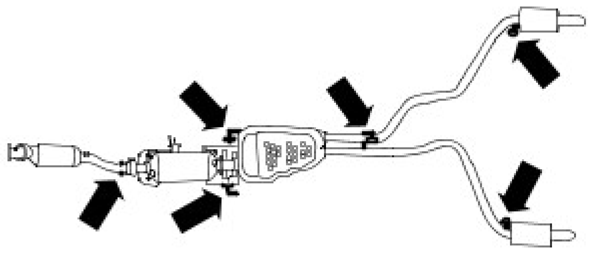


3. Release the DPF differential pressure sensor.
   - Release the clip.



4. Disconnect the DPF exhaust gas temperature sensor electrical connector.

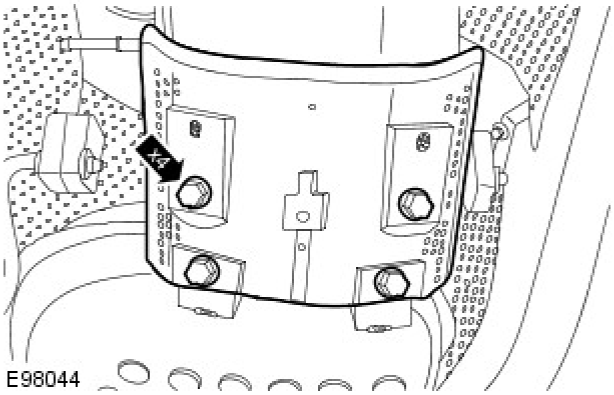




E98050

5. ⚠ CAUTION: Make sure that the exhaust system is supported with a suitable stand.

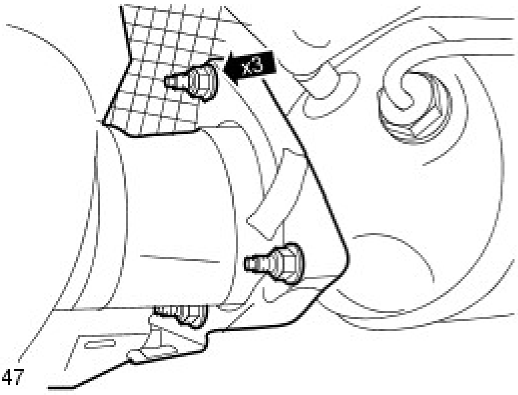
Release the 6 exhaust hangers.



E98044

6. Remove the DPF rear heat shield.

- Remove the 4 bolts.

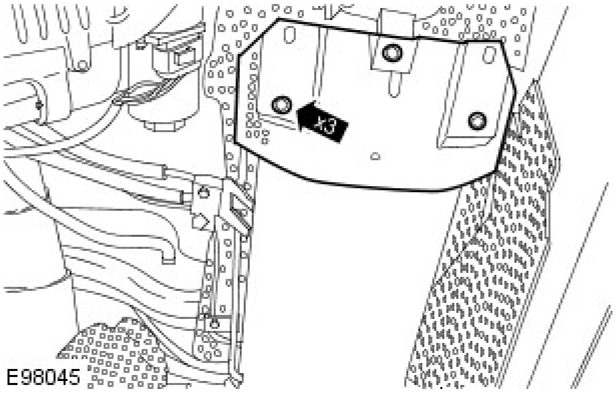


E98047

7. NOTE: Discard the gasket.

Reposition the muffler and tailpipe assembly.

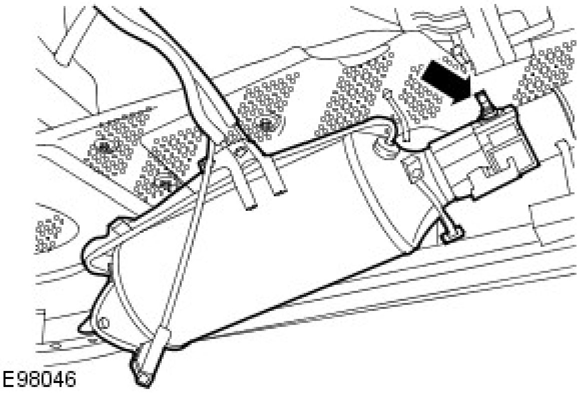
- Remove the 3 nuts.
- Remove the bracket.



E98045

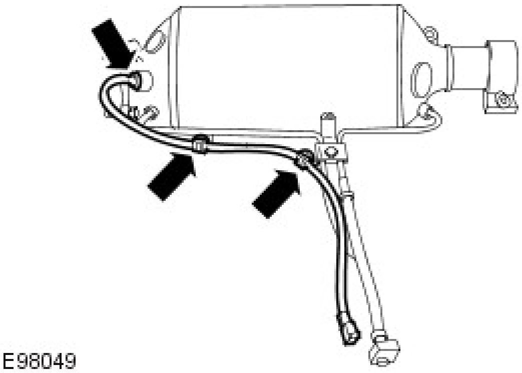
8. Remove the DPF front heat shield.

- Remove the 3 bolts.


E98046

9. Remove the DPF.

- Remove the nut.


E98049

10. NOTE: Do not disassemble further if the component is removed for access only.

Remove the DPF exhaust gas temperature sensor.

- Release the wiring harness from the 2 clips.

Installation

1. Install the DPF exhaust gas temperature sensor.

- Tighten to 35 Nm (26 lb.ft).
- Secure the wiring harness in the clips.

2. NOTE: Do not fully tighten the clamp at this stage.

Install the DPF.

3. NOTE: Install a new gasket.

Secure the muffler and tailpipe assembly.

- Install the bracket.
- Tighten the nuts to 48 Nm (35 lb.ft).
- Secure the exhaust hangers.

4. Tighten the catalytic converter to DPF clamp.

- Tighten the nut to 48 Nm (35 lb.ft).

5. Install the DPF heat shields.

- Tighten the bolts to 10 Nm (7 lb.ft).

6. Secure the DPF differential pressure sensor.

7. Connect the DPF differential pressure sensor electrical connector.

8. Connect the DPF exhaust gas temperature sensor electrical connector.

Published: 11-May-2011

Exhaust System - TDV6 2.7L Diesel - Diesel Particulate Filter (DPF) Differential Pressure Sensor

Removal and Installation

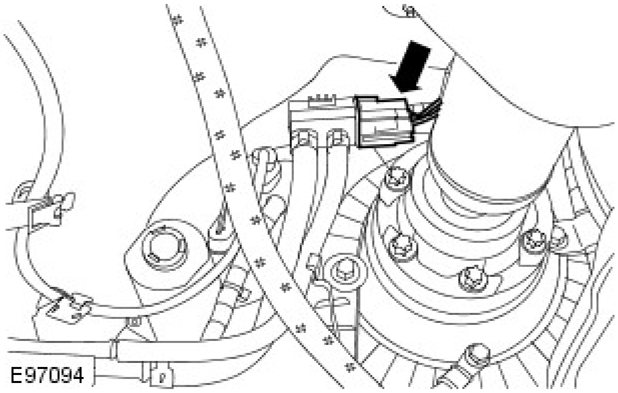
Removal

⚠ WARNING: Observe due care when working near a hot exhaust system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

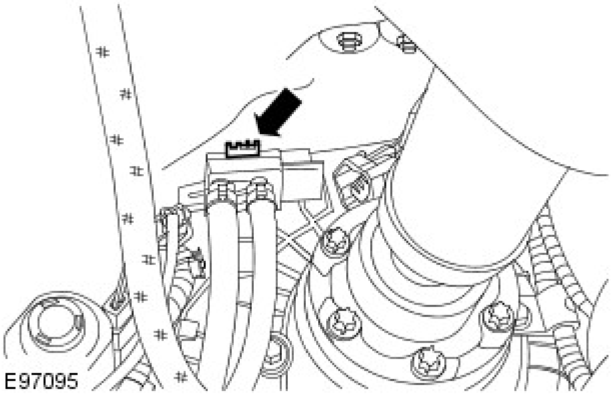
Raise and support the vehicle.

2. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.



3. Release the DPF differential pressure sensor.

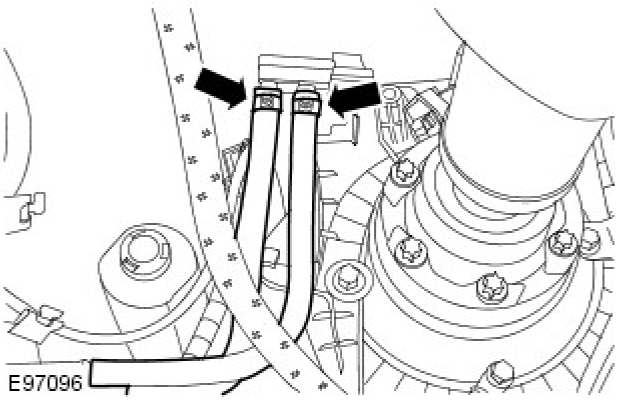
- Release the clip.



4. ⚠ CAUTION: Make a note of the connection orientation of the high and low pressure hoses to the sensor ports. Make sure the hoses are located to the correct sensor port when installed. Failure to follow these instructions may result in damage to the vehicle.

Disconnect the high and low pressure hoses from the DPF differential pressure sensor.

- Release the 2 clips.



Installation

1. Connect the high and low pressure hoses to the DPF differential pressure sensor.
    - Secure the clips.
2. Secure the DPF differential pressure sensor.
    - Secure with the clip.
3. Connect the DPF differential pressure sensor electrical connector.

Published: 11-May-2011

Exhaust System - TDV6 2.7L Diesel - Catalytic ConverterVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

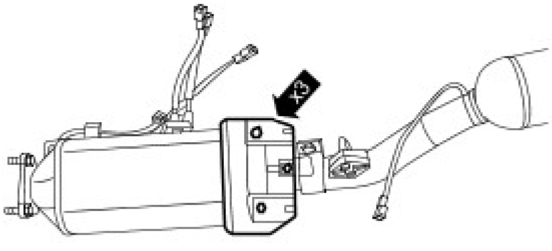
Removal

WARNING: Observe due care when working near a hot exhaust system.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

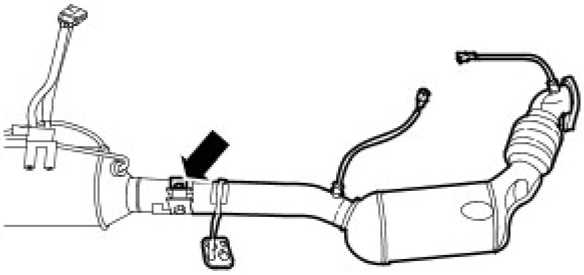
2. Remove the exhaust system.
For additional information, refer to: Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).



E98041

3. Remove the diesel particulate filter (DPF) heat shield.

- Remove the 3 bolts.



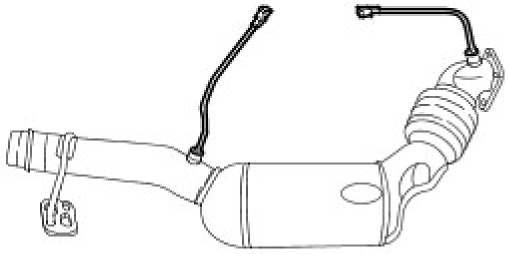
E98042

4. Remove the catalytic converter.

- Remove the nut.
- Remove and discard the clamp.

5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the catalytic converter temperature sensors.



E98043

Installation

1. Install the catalytic converter temperature sensors.

- Tighten to 35 Nm (26 lb.ft).

2. ⚠CAUTION: Make sure that the mating faces are clean and free of foreign material.

• NOTE: Do not fully tighten the clamp at this stage.

Install the catalytic converter.

- Install a new clamp.

3. Install the exhaust system.
For additional information, refer to: Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (309-00C Exhaust System - TDV6 2.7L Diesel, Removal and Installation).

4. Install the DPF heat shield.

- Tighten the 2 bolts to 10 Nm (7 lb.ft).

Published: 11-May-2011

Exhaust System - TDV6 2.7L Diesel - Exhaust SystemVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

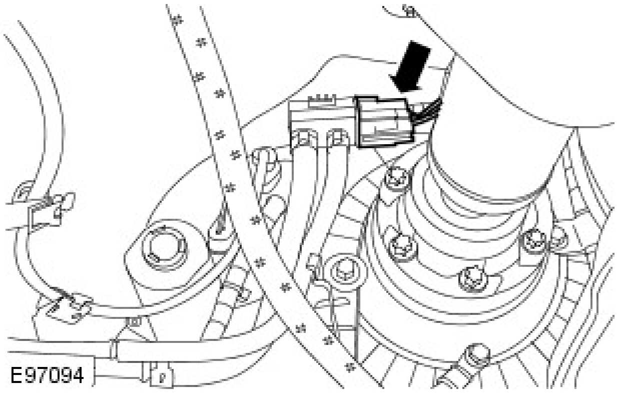
WARNING: Observe due care when working near a hot exhaust system.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.



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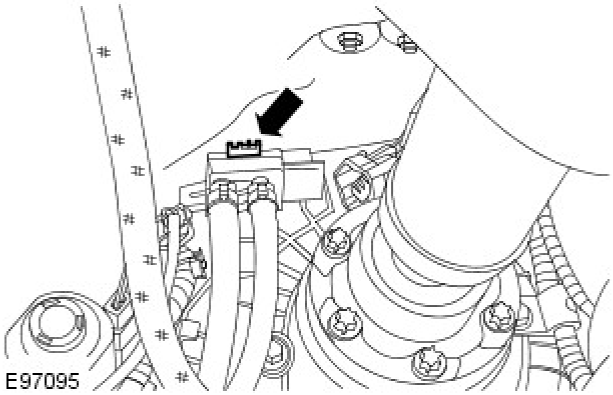
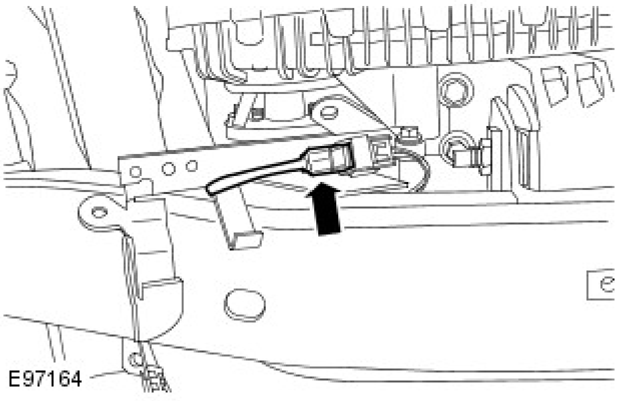
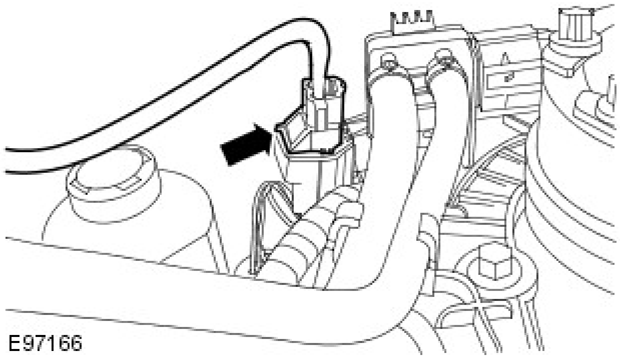


5. Release the DPF differential pressure sensor.
   - Release the clip.

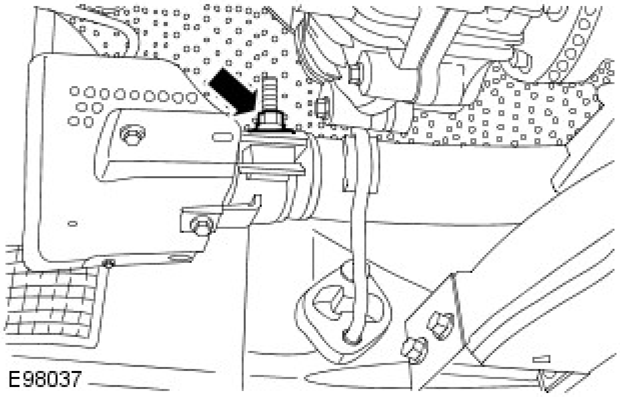


6. Disconnect the post-catalytic converter exhaust gas temperature sensor electrical connector.

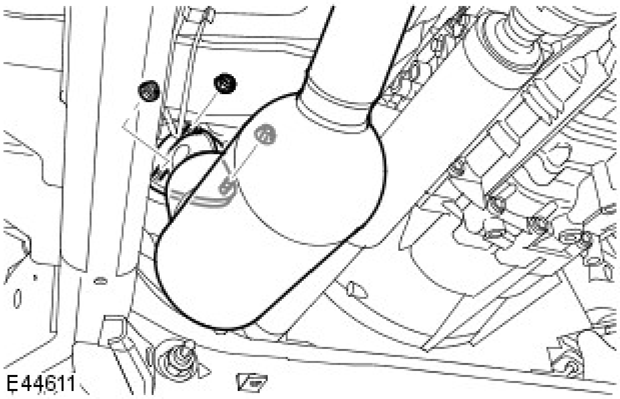
- Release the 2 clips.



7. Disconnect the DPF exhaust gas temperature sensor electrical connector.



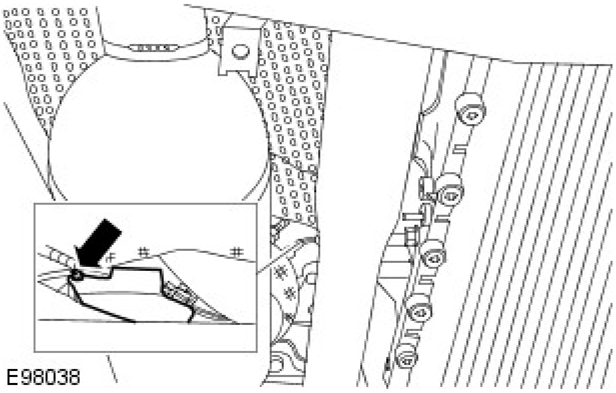
8. Loosen the catalytic converter to DPF clamp.



9. NOTE: Discard the gasket.

Release the catalytic converter from the turbocharger.

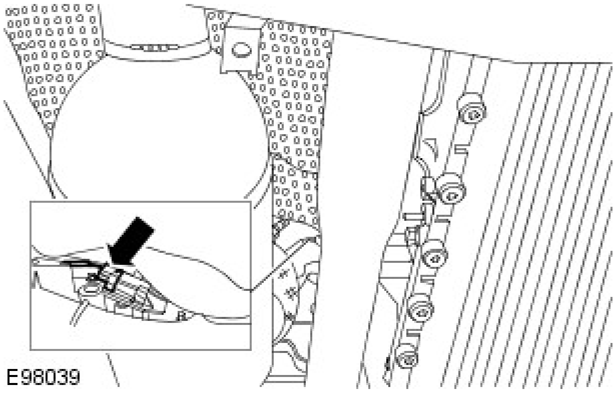
- Remove and discard the 3 nuts.



E98038

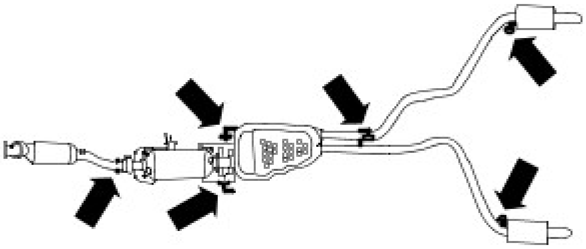
10. Remove the exhaust gas temperature sensor electrical connector heat shield.

- Remove the bolt.



E98039

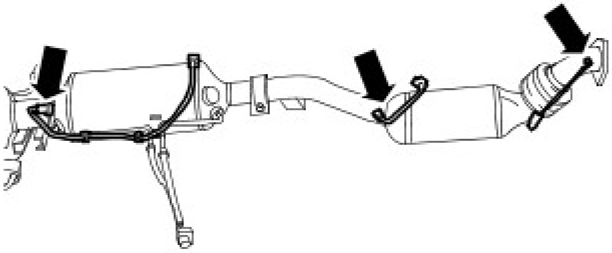
11. Disconnect the pre-catalytic converter exhaust gas temperature sensor electrical connector.



E98050

12. With assistance, remove the exhaust system.

- Release the 6 exhaust hangers.



E98051

13. NOTE: Do not disassemble further if the component is removed for access only.

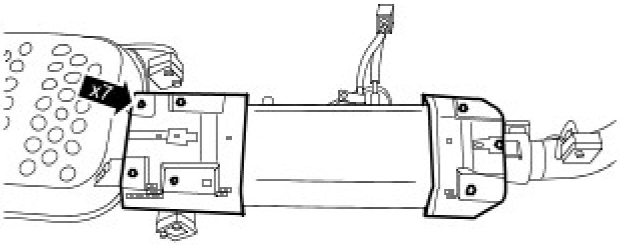
• NOTE: Make a note of the fitted positions of the sensors before removal.

Remove the 3 exhaust gas temperature sensors.

14. Remove the 6 exhaust hangers.

15. Remove the 2 DPF heat shields.

- Remove the bolts.



E98053

Installation

1. Install the 2 DPF heat shields.

- Tighten to 10 Nm (7 lb.ft).

2. Install the exhaust hangers.

3. Install the exhaust gas temperature sensors.

- Tighten to 35 Nm (26 lb.ft).

4. With assistance, install the exhaust system.

- Secure the exhaust hangers.

5. Connect the pre-catalytic converter exhaust gas temperature sensor electrical connector.

6. Install the exhaust gas temperature sensor electrical connector heat shield.

- Tighten to 10 Nm (7 lb.ft).

7. ⚠ CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

• NOTE: Install a new gasket.

Secure the catalytic converter to the turbocharger.

- Tighten the nuts to 48 Nm (35 lb.ft).

8. Secure the catalytic converter to DPF clamp.

- Tighten to 48 Nm (35 lb.ft).

9. Connect the DPF exhaust gas temperature sensor electrical connector.

10. Connect the post-catalytic converter exhaust gas temperature sensor electrical connector.

11. Secure the DPF differential pressure sensor.

12. Connect the DPF differential pressure sensor electrical connector.

13. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

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Exhaust System - TDV8 3.6L Diesel -

Torque Specifications

Description	Nm	lb-ft
Catalytic converter to turbocharger bolts	23	17
LH catalytic converter to exhaust system clamp	48	35
* RH catalytic converter to exhaust system nuts	48	35
Service clamp	48	35
Differential pressure sensor pipe unions	35	26
** Exhaust gas temperature sensors	35	26
Diesel particulate filter heat shield bolts	10	7

*** New nuts must be installed**

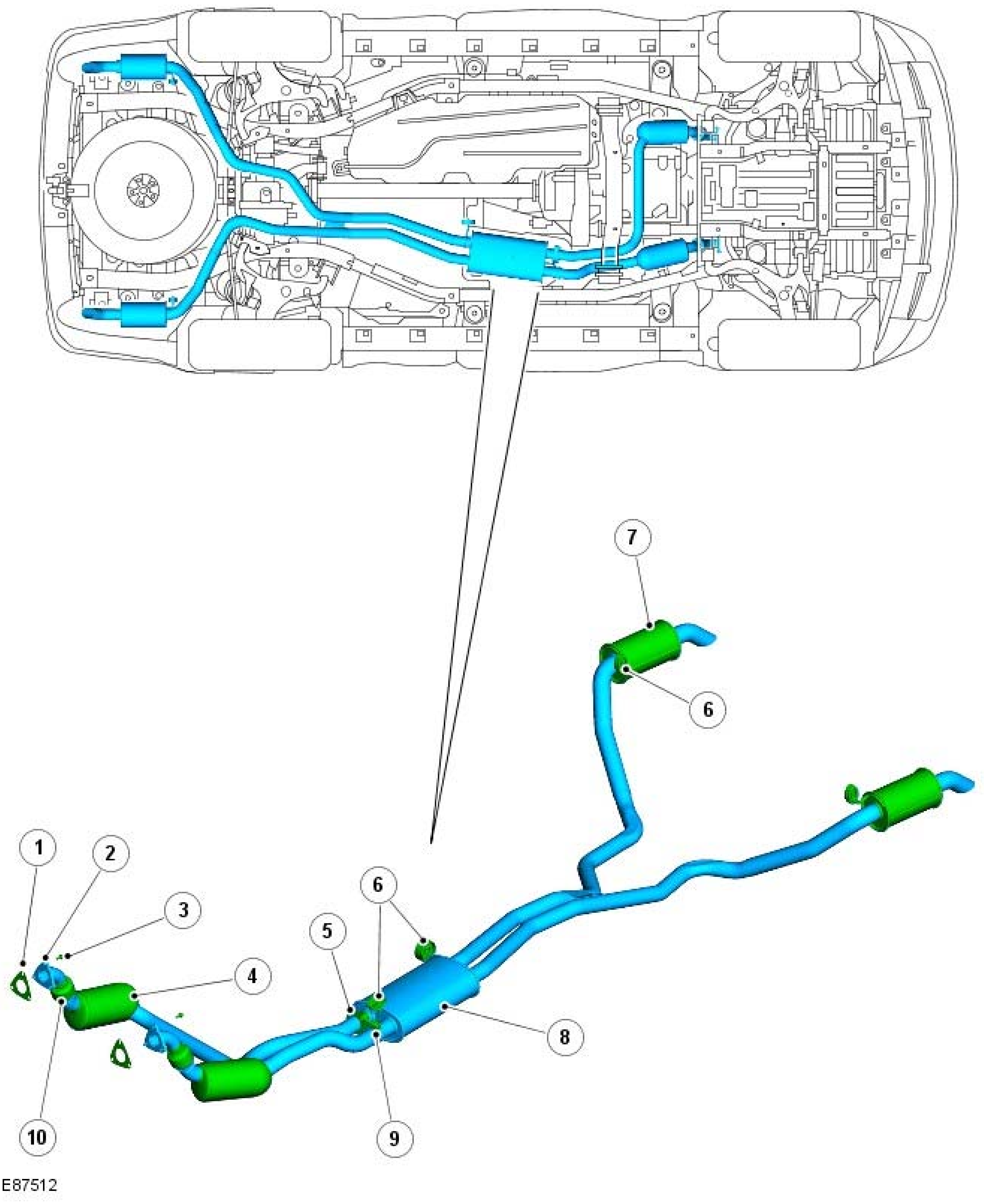
**** Apply suitable high temperature resistant anti-seize compound**

Published: 11-May-2011

Exhaust System - TDV8 3.6L Diesel - Exhaust System

Description and Operation

TDV8 EXHAUST SYSTEM COMPONENT LOCATION - WITHOUT DIESEL PARTICULATE FILTER


7
6
1
2
3
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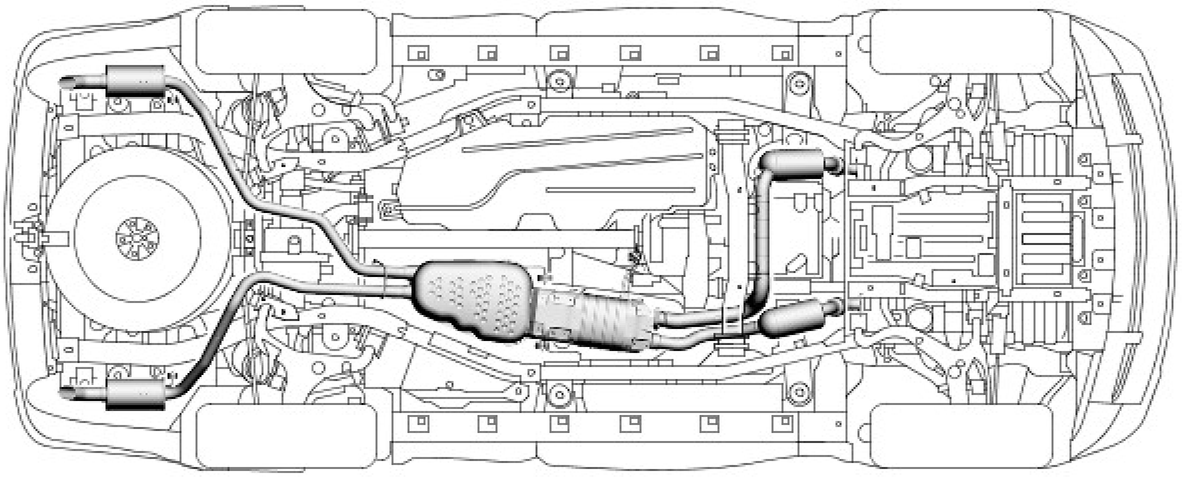
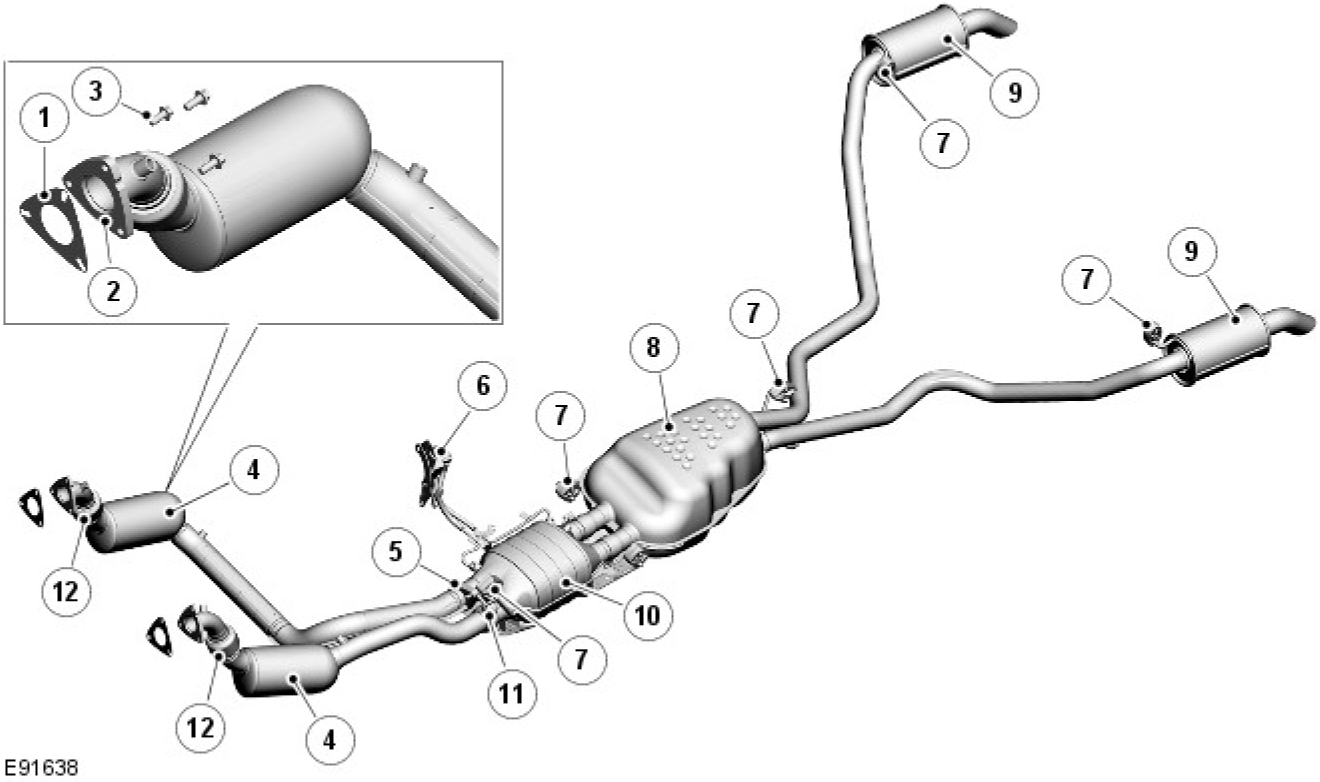
10
E87512

Item	Part Number	Description
1	-	Gasket - Turbocharger to exhaust flange (2 Off)
2	-	Exhaust flange (2 Off)
3	-	Mounting bolt (6 off)
4	-	Catalytic converter (2 off)
5	-	Flange - right-hand (RH) front section to rear section
6	-	Mounting rubber
7	-	Silencer - rear
8	-	Silencer - front
9	-	Clamp - left-hand (LH) front section to rear section
10	-	Flexible decoupler (2 off)

TDV8 EXHAUST SYSTEM COMPONENT LOCATION - WITH OPTIONAL DIESEL PARTICULATE FILTER - FROM 2008 MY (WHERE FITTED)





Item	Part Number	Description
1	-	Gasket - Turbocharger to exhaust flange (2 off)
2	-	Exhaust flange (2 off)

3	-	Mounting bolt (6 off)
4	-	Catalytic converter
5	-	Flange and gasket - RH front section to Diesel Particulate Filter (DPF)
6	-	Differential pressure sensor
7	-	Mounting rubber
8	-	Silencer - front
9	-	Silencer - rear
10	-	Diesel Particulate Filter (DPF)
11	-	Clamp - LH front section to DPF
12	-	Flexible decoupler

OVERVIEW

The TDV8 exhaust system is fabricated from stainless steel and is supplied as three separate assemblies; a LH front section incorporating a catalytic converter, a RH front section incorporating a catalytic converter and a rear section incorporating a centre silencer and two rear silencers. In service sections of the system can be replaced individually. Service joints are identified by indentations on the pipes which show where the exhaust pipes can be cut to accommodate replacement sections.

After the replacement sections are positioned, the system integrity is restored by sealing the service joints with one piece sleeves and two clamps to connect the pipes at the cut points.

The system is attached to the underside of the body with four rubber mountings which are located on mild steel hanger bars that are welded to the system. The rubber mountings locate on adjacent hanger brackets which are bolted to the underside of the vehicle body.

On vehicles from 2008MY, an optional Diesel Particulate Filter (DPF) is available. The non-DPF exhaust system is also available on vehicles from 2008MY as the DPF is not required to comply with EU4 emission regulations.

- CAUTIONS:

⚠ The use of bio-fuels can seriously contaminate and destroy the coatings used on the catalytic converter. The DPF and the catalytic converter can become irreversibly contaminated if non-specified oils or fuels are used. This will result in the vehicle being unable to regenerate the DPF, becoming non-compliant with tailpipe emission regulations and replacement of the catalytic converter and DPF will be required.

⚠ If the vehicle is waded in deep water and the engine is stopped with the tailpipes submerged, the water, which can enter the system, can also contaminate both the DPF and the catalytic converter. This again can result in catalytic converter damage and damaging the ability for the DPF to regenerate therefore requiring both components to be replaced.

FRONT SECTION

The front down pipes have a welded flange with three holes which provide for the attachment to the turbocharger using three bolts. The flange is sealed with a metal gasket.

The flange is welded to a fabricated elbow which feeds into a decoupler which in turn is connected to the 2.2 liter (134 in^3) catalytic converter.

Vehicles without DPF

On the LH front section, the converter outlet pipe is welded to the converter body. The rear of the outlet pipe is inserted into the flared end of the rear section. A clamp is used to compress and secure the joint.

On the RH front section, the converter outlet pipe is welded to the converter body. The rear of the pipe curves left, under the transmission and then curves again to run parallel to the LH pipe. The end of the pipe has a welded flange with two holes which locate on two studs on the rear section and is secured with nuts. A metal gasket is used to seal the joint between the front and rear section flanges.

Vehicles with DPF - From 2008MY

On the LH front section, the converter outlet pipe is welded to the converter body. The rear of the outlet pipe is inserted into the flared end of the DPF. A clamp is used to compress and secure the joint.

On the RH front section, the converter outlet pipe is welded to the converter body. The rear of the pipe curves left, under the transmission and then curves again to run parallel to the LH pipe. The end of the pipe has a welded flange with two holes which locate on two studs on the DPF and is secured with nuts. A metal gasket is used to seal the joint between the front and rear section flanges.

REAR SECTION

Vehicles without DPF

The rear section has a short tube welded to the front silencer assembly which is flared to locate the LH front section. A second short tube, also welded to the front silencer assembly, has a welded flange with captive studs to provide attachment for the flange on the RH front section.

Vehicles with Optional DPF - From 2008MY

The rear section has a short tube welded to the DPF which is flared to locate the LH front section. A second short tube, also welded to the DPF, has a welded flange with captive studs to provide attachment for the flange on the RH front section.

Vehicles without DPF

The front silencer comprises rolled stainless steel casing which is clenched via a lockseam giving a capacity of 6.4 liters (391 in^3). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. A hanger bar is welded to the front right hand side of the silencer and provides for the location of a mounting rubber.

Vehicles with Optional DPF - From 2008MY

The front silencer is connected to the DPF with two welded tubes. The front silencer comprises two pressed stainless steel shells which are welded together to give a capacity of 25.2 liters (1537 in^3). The silencer contains baffles and perforated tubes which reduce noise as the exhaust gases pass through the silencer. A hanger bar is welded to the front right hand side of the silencer and provides for the location of a mounting rubber. The change in silencer design for 08MY with DPF was introduced to address sound quality is during regeneration under light load driving conditions.

All Models

The front silencer has two 50 mm (1.96 in) diameter outlet pipes, with a 1.5 mm (0.06 in) wall thickness, which are curved to pass around the rear suspension components. Each outlet pipe terminates in a welded joint with the rear silencers.

A hanger bar is welded to the front face of each rear silencer and provides for the location of a mounting rubber. The silencer is a circular fabrication with a baffle tube which is surrounded with glass fibre to provide further noise suppression. Each rear silencer has a capacity of 2.7 liters (164 in^3).

The rear silencers each have an outlet pipe which is curved downwards to distribute exhaust gasses away from the rear of the vehicle.

CATALYTIC CONVERTERS

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions. To further reduce the carbon monoxide and hydrocarbons content of the exhaust gasses, catalytic converters are integrated into the front sections of the exhaust system.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter (Diesel Oxidation Catalyst) is integrated into the front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing platinum on vehicles without a DPF or platinum and palladium on vehicles with a DPF, which are the active constituents for converting harmful emissions into inert by-products. The platinum and palladium adds oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water.

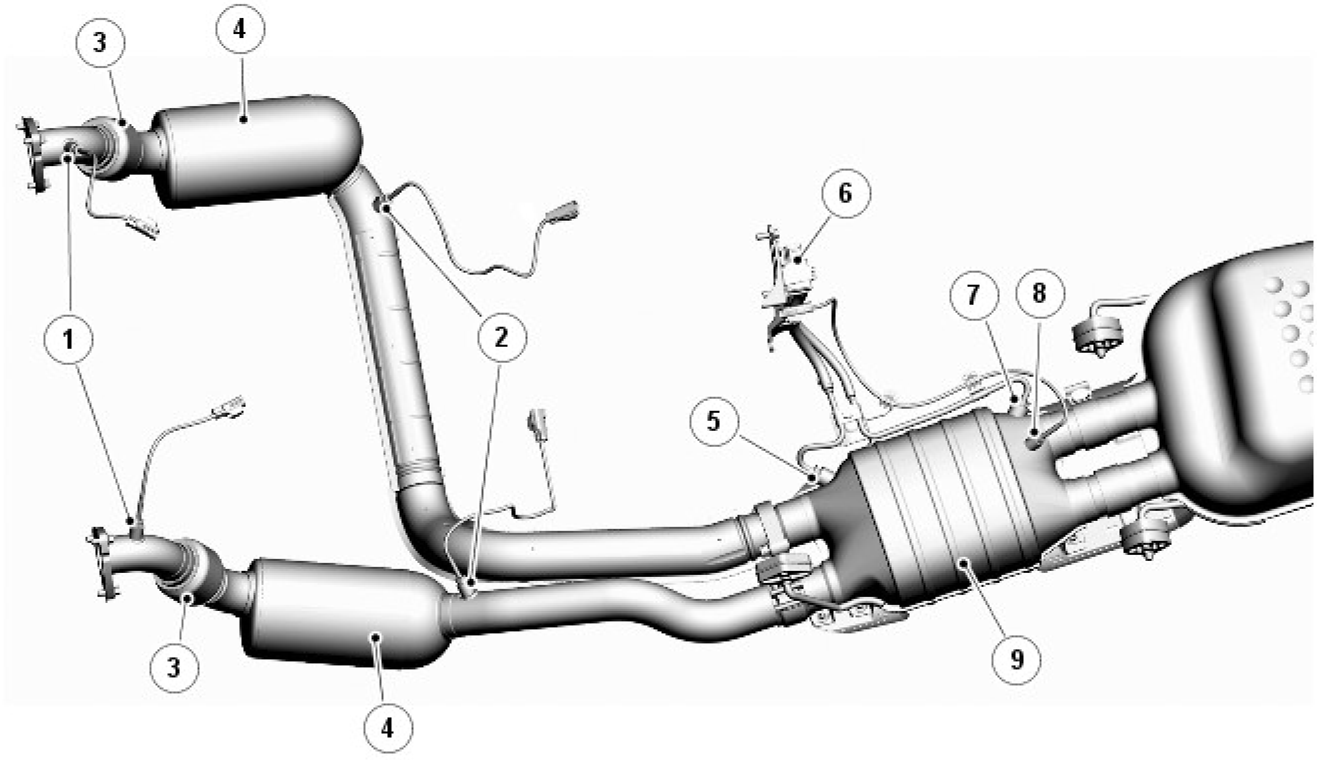
DIESEL PARTICULATE FILTER (DPF) - VEHICLES FROM 2008MY (WHERE FITTED)

On vehicles from 2008MY, an optional Diesel Particulate Filter (DPF) is available.

- NOTE: The non-DPF exhaust system is also available on vehicles from 2008MY.

The DPF system reduces diesel particulate emissions to negligible levels.

DPF System Components



E91639

Item	Part Number	Description
1	-	Exhaust gas temperature sensor (pre catalyst)
2	-	Exhaust gas temperature sensor (post catalyst)
3	-	Flexible decoupler
4	-	Catalytic converter
5	-	High pressure sensor pipe
6	-	Differential pressure sensor
7	-	Low pressure sensor pipe
8	-	Exhaust gas temperature sensor (Post DPF)
9	-	Diesel particulate filter

The particulate emissions are the black fumes emitted from the diesel engine under certain load conditions. The emissions are a complex mixture of solid and liquid components with the majority of the particulates being carbon microspheres on which hydrocarbons from the engine's fuel and lubricant condense.

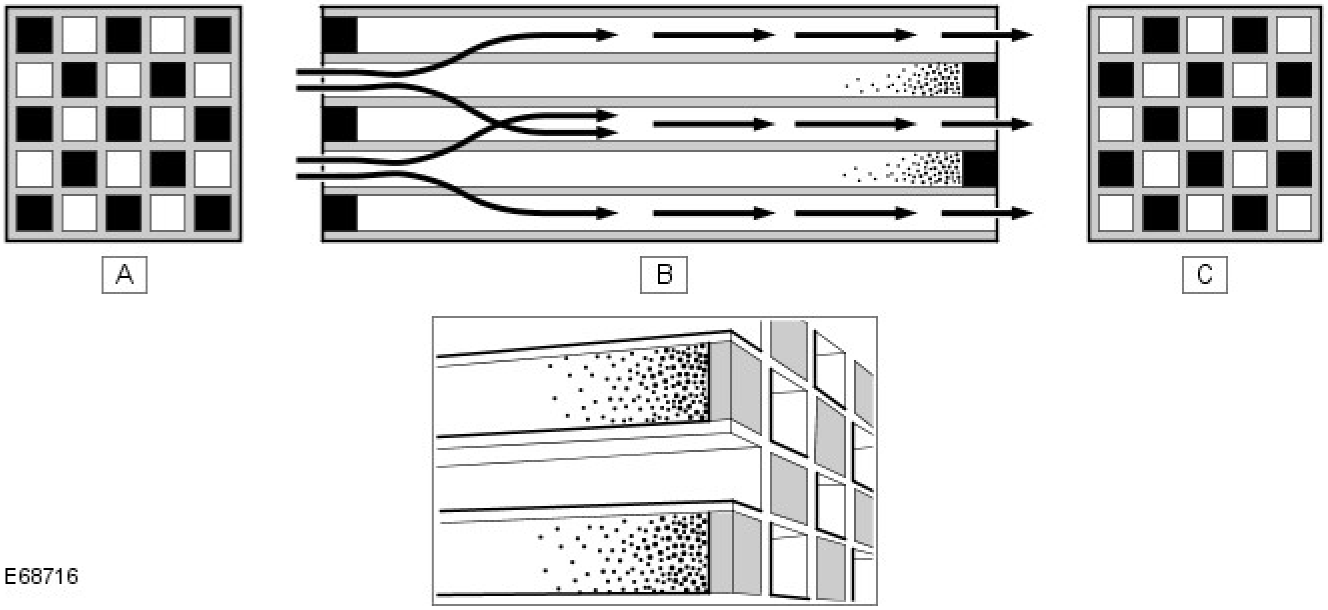
The DPF system comprises the following components:

- Diesel particulate filter
- DPF control software incorporated into the Engine Control Module (ECM)
- Differential pressure sensor.

Diesel Particulate Filter

The DPF is located in the exhaust system, downstream of the catalytic converter. A major feature of the DPF is its ability for regeneration. Regeneration is the burning of particulates trapped by the filter to prevent obstruction to the free flow of exhaust gasses. The regeneration process takes place at calculated intervals and is not noticeable by the driver of the vehicle.

Regeneration is most important, since an overfilled filter can damage the engine through excessive exhaust back pressure and can itself be damaged or destroyed. The material trapped in the filter is in the most part carbon particles with some absorbed hydrocarbons.



Item	Part Number	Description
A	-	Front face showing alternate closed cells
B	-	Side view showing exhaust gas flow through the filter and particulate build up
C	-	Rear face showing alternate closed cells

The DPF uses a filter technology based on a filter with a catalytic coating. The DPF is made from silicon carbide housed in a steel container and has excellent thermal shock resistance and thermal conductivity properties. The DPF is designed for the engine's operating requirements to maintain the optimum back pressure requirements.

The porous surface of the filter consists of a number of small parallel channels positioned in the longitudinal direction of the exhaust system. Adjacent channels in the filter are alternately plugged at the end. This design forces the exhaust gasses to flow through the porous filter walls, which act as the filter medium. Particulate matter which are too big to pass through the porous surface are collected and stored in the channels.

The collected particulate matter, if not removed, can create an obstruction to exhaust gas flow. The particles are removed by a regeneration process which oxidizes the particles.

DPF regeneration is controlled by the temperature of the exhaust gasses and the DPF. The DPF includes a wash coat to the filter surface which comprises platinum and other active components and is similar to the catalytic converter. At certain exhaust gas and DPF temperatures the wash coat promotes combustion of the particles in addition to oxidizing carbon monoxide and hydrocarbon emissions.

The exhaust gas and DPF temperatures are controlled by the DPF software located in the ECM. The DPF software monitors the load status of the DPF based on driving style, distance travelled and signals from the differential pressure sensor and temperature sensors. When the particulate loading of the DPF reaches predetermined levels, the DPF is actively regenerated by adjusting, in conjunction with the ECM, various engine control functions such as:

- fuel injection
- intake air throttle
- exhaust gas recirculation
- turbocharger boost pressure control.

The regeneration process is possible because of the flexibility of the common-rail fuel injection engine which provides precise control of fuel flow, fuel pressure and injection timing which are essential requirements to promote the efficient regeneration process.

Two processes are used to regenerate the DPF; passive and active.

Passive Regeneration

Passive regeneration requires no special engine management intervention and occurs during normal engine operation. The passive regeneration involves a slow conversion of the particulate matter deposited in the DPF into carbon dioxide. This process is active when the DPF temperature reaches 250°C (482°F) and is a continuous process when the vehicle is being driven at higher engine loads and speeds.

During passive regeneration, only a portion of the particulate matter is converted into carbon dioxide. This is due to the chemical reaction process which is only effective within the normal operating temperature range of 250°C to 500°C (482°F to 932°F).

Above this temperature range the conversion efficiency of the particulates into carbon dioxide increases as the DPF temperature is raised. These temperatures can only be achieved using the active regeneration process.

Active Regeneration

Active regeneration starts when the particulate loading of the DPF reaches a threshold as monitored or determined by the DPF control software. The threshold calculation is based on driving style, distance travelled and back pressure signals from the differential pressure sensor.

Active regeneration generally occurs every 450 miles (725 km) although this is highly dependant on how the vehicle is driven. For example, if the vehicle is driven at low loads in urban traffic regularly, active regeneration will occur more often. This is due to the rapid build-up of particulates in the DPF than if the vehicle is driven at high speeds when passive regeneration will have occurred.

The DPF software incorporates a mileage trigger which is used as back-up for active regeneration. If active regeneration has not been initiated by a back pressure signal from the differential pressure sensor, regeneration is requested based on distance travelled.

Active regeneration of the DPF is commenced when the temperature of the DPF is increased to the combustion temperature of the particles. The DPF temperature is raised by increasing the exhaust gas temperature. This is achieved by introducing post-injection of fuel after the pilot and main fuel injections have occurred.

This is determined by the DPF software monitoring the signals from the two DPF temperature sensors to establish the temperature of the DPF. Depending on the DPF temperature, the DPF software requests the ECM to perform either one or two post-injections of fuel:

- The first post-injection of fuel retards combustion inside the cylinder which increases the temperature of the exhaust gas.
- The second post-injection of fuel is injected late in the power stroke cycle. The fuel partly combusts in the cylinder, but some unburnt fuel also passes into the exhaust where it creates an exothermic event within the catalytic converter, further increasing the temperature of the DPF.

The active regeneration process takes approximately 20 minutes to complete. The first phase increases the DPF temperature to 500°C (932°F). The second phase further increases the DPF temperature to 600°C (1112°F) which is the optimum temperature for particle combustion. This temperature is then maintained for 15-20 minutes to ensure complete incineration of the particles within the DPF. The incineration process converts the carbon particles to carbon dioxide and water.

The active regeneration temperature of the DPF is closely monitored by the DPF software to maintain a target temperature of 600°C (1112°F) at the DPF inlet. The temperature control ensures that the temperatures do not exceed the operational limits of the turbocharger and the catalytic converter. The turbocharger inlet temperature must not exceed 830°C (1526°F) and the catalytic converter brick temperature must not exceed 800°C (1472°F) and the exit temperature must remain below 750°C (1382°F).

During the active regeneration process the following ECM controlled events occur:

- The turbocharger is maintained in the fully open position. This minimizes heat transmission from the exhaust gas to the turbocharger and reduces the rate of exhaust gas flow allowing optimum heating of the DPF. If the driver demands an increase in engine torque, the turbocharger will respond by closing the vanes as necessary.
- The throttle is closed as this assists in increasing the exhaust gas temperature and reduces the rate of exhaust gas flow which has the effect of reducing the time for the DPF to reach the optimum temperature.
- The Exhaust Gas Recirculation (EGR) valve is closed. The use of EGR decreases the exhaust gas temperature and therefore prevents the optimum DPF temperature being achieved.

If, due to vehicle usage and/or driving style, the active regeneration process cannot take place or is unable to regenerate the DPF, the dealer can force regenerate the DPF. This is achieved by either driving the vehicle until the engine is at its normal operating temperature and then driving for a further 20 minutes at speeds of not less than 30 mph (48 km/h) or by connecting a Land Rover approved diagnostic system to the vehicle which will guide the technician through an automated regeneration procedure to clean the DPF.

Diesel Particulate Filter Control

The DPF requires constant monitoring to ensure that it is operating at its optimum efficiency and does not become blocked. The ECM contains DPF software which controls the monitoring and operation of the DPF system and also monitors other vehicle data to determine regeneration periods and service intervals.

The DPF software can be divided into three separate control software modules; a DPF supervisor module, a DPF fuel management module and a DPF air management module.

These three modules are controlled by a fourth software module known as the DPF co-ordinator module. The co-ordinator module manages the operation of the other modules when an active regeneration is requested. The DPF supervisor module is a sub-system of the DPF co-ordinator module.

DPF Fuel Management Module

The DPF fuel management module controls the following functions:

- Timing and quantity of the four split injections per stroke (pilot, main and two post injections).
- Injection pressure and the transition between the three different calibration levels of injection.

The above functions are dependant on the condition of the catalytic converter and the DPF.

The controlled injection determines the required injection level in addition to measuring the activity of the catalytic converter and the DPF. The fuel management calculates the quantity and timing for the four split injections, for each of the three calibration levels for injection pressure, and also manages the transition between the levels.

The two post injections are required to separate the functionality of increasing in-cylinder gas temperatures and the production of hydrocarbons. The first post injection is used to generate the higher in-cylinder gas temperature while simultaneously retaining the same engine torque output produced during normal (non-regeneration) engine operation. The second post injection is used to generate hydrocarbons by allowing unburnt fuel into the catalytic converter without producing increased engine torque.

DPF Air Management Module

The DPF air management module controls the following functions:

- EGR control
- Turbocharger boost pressure control
- Intake air temperature and pressure control.

During active regeneration, the EGR operation is disabled and the closed-loop activation of the turbocharger boost controller is calculated. The air management module controls the air in the intake manifold to a predetermined level of pressure and temperature. This control is required to achieve the correct in-cylinder conditions for stable and robust combustion of the post injected fuel.

The module controls the intake air temperature by actuating the EGR throttle and by adjustment of the turbocharger boost pressure control.

DPF Co-ordinator Module

The DPF co-ordinator module reacts to a regeneration request from the supervisor module by initiating and co-ordinating the following DPF regeneration requests:

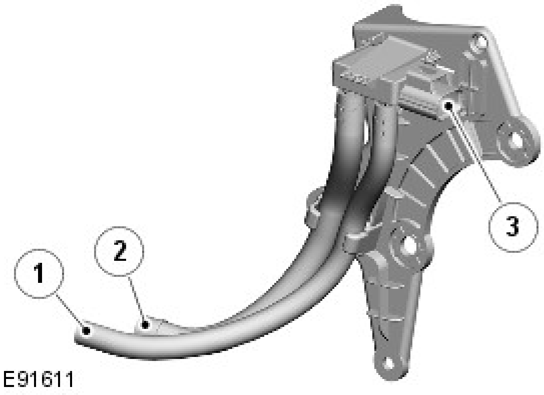
- EGR cut-off
- Turbocharger boost pressure control
- Engine load increase
- Control of air pressure and temperature in the intake manifold
- Fuel injection control.

When the supervisor module issues a regeneration request, the co-ordinator module requests EGR cut-off and a regeneration specific turbocharger boost pressure control. It then waits for a feedback signal from the EGR system confirming that the EGR valve is closed.

When the EGR valve is closed, the co-ordinator module initiates requests to increase engine load by controlling the intake air temperature and pressure.

Once confirmation is received that intake conditions are controlled or a calibration time has expired, the co-ordinator module then changes to a state awaiting an accelerator pedal release manoeuvre from the driver. If this occurs or a calibration time has expired, the co-ordinator module generates a request to control fuel injections to increase exhaust gas temperature.

Differential Pressure Sensor



Item	Part Number	Description
1	-	Low pressure connection
2	-	High pressure connection
3	-	Electrical connector

The differential pressure sensor is located on a bracket which is attached to the transfer case.

The differential pressure sensor is used by the DPF software to monitor the condition of the DPF. Two pipe connections on the sensor are connected by pipes to the inlet and outlet ends of the DPF. The pipes allow the sensor to measure the inlet and outlet pressures of the DPF

As the amount of particulates trapped by the DPF increases, the pressure at the inlet side of the DPF increases in comparison to the DPF outlet. The DPF software uses this comparison, in conjunction with other data, to calculate the accumulated amount of trapped particulates.

By measuring the pressure difference between the DPF inlet and outlet and the DPF temperature, the DPF software can determine if the DPF is becoming blocked and requires regeneration.

Differential Particulate Filter Temperature Sensors

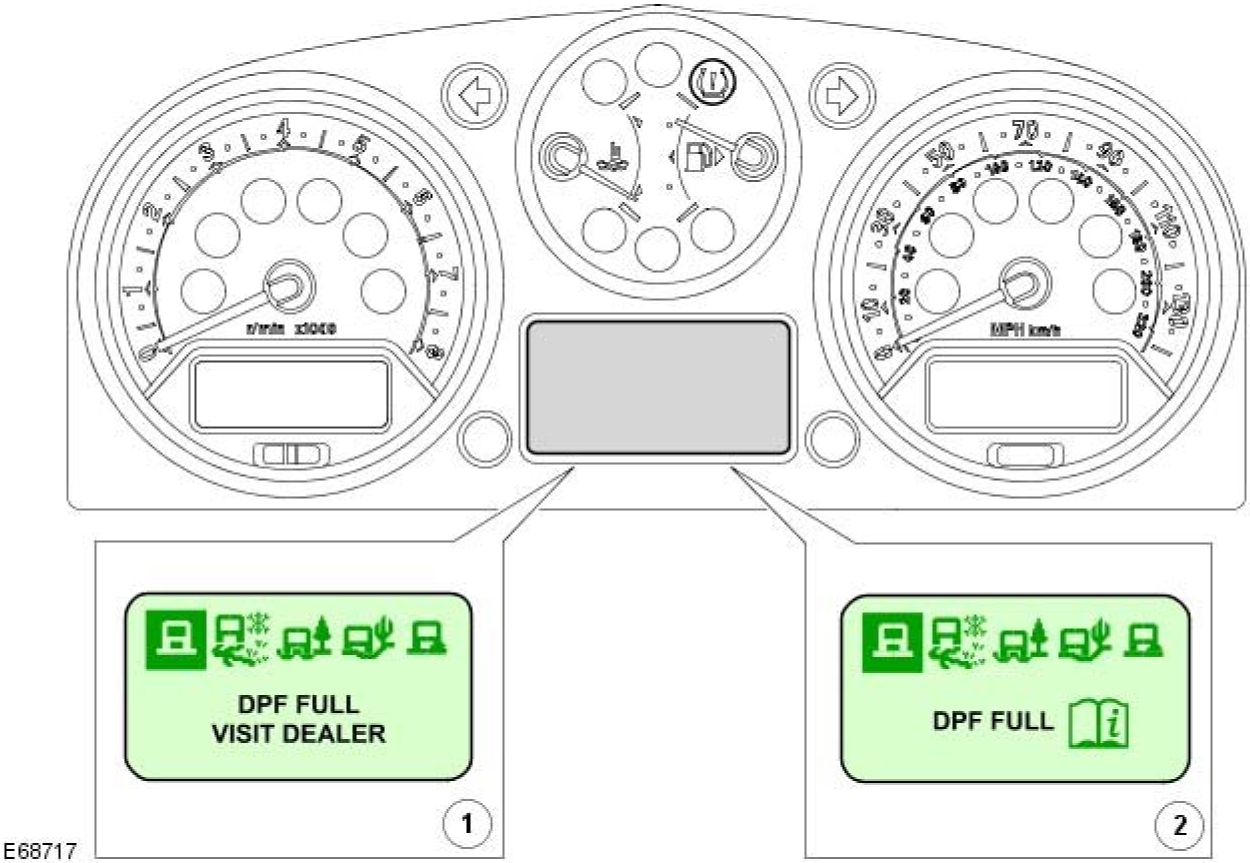
Three temperature sensors are used in the DPF system. The first is located just after the turbocharger in the catalytic converter inlet pipe, the second located in the catalytic converter outlet pipe and the third in the DPF outlet cone pipe work.

The sensors measure the temperature of exhaust gas exiting the turbocharger, after the catalyst and after it passes through the DPF to provide the information needed to calculate the DPF temperature.

The information is used, in conjunction with other data, to estimate the amount of accumulated particulates and to control the DPF temperature.

Instrument Cluster Indications

For drivers who make regular short journeys at low speeds, it may not be possible to efficiently regenerate the DPF. In this case, the DPF software will detect a blockage of the DPF from signals from the differential pressure sensor and will alert the driver as follows.



Item	Part Number	Description
1	-	'DPF FULL VISIT DEALER' message
2	-	'DPF FULL' message

Vehicles with DPF use a high-line instrument cluster to alert the driver to the condition of the DPF via messages in the message centre.

When the DPF becomes full the driver will be alerted to this condition by a message 'DPF FULL' accompanied by a handbook symbol. As detailed in the Owners Handbook, the driver should drive the vehicle until the engine is at its normal operating temperature and then drive for a further 20 minutes at speeds of not less than 30 mph (48 km/h). Successful regeneration of the DPF is indicated to the driver by the 'DPF FULL' message no longer being displayed.

If the DPF software detects that the DPF is still blocked, the message will change to 'DPF FULL VISIT DEALER', the driver should take the vehicle to an authorized dealer to have the DPF force regenerated.

Diesel Particulate Filter Side Effects

The following section details some side effects caused by the active regeneration process.

Engine Oil Dilution

Engine oil dilution can occur due to small amounts of fuel entering the engine crankcase during the post-injection phases. This has made it necessary to introduce a calculation based on driving style to reduce oil service intervals if necessary. The driver is alerted to the oil service by a message in the instrument cluster.

The DPF software monitors the driving style, the frequency of the active regeneration and duration. Using this information a calculation can be made on the engine oil dilution. When the DPF software calculates the engine oil dilution has reached a predetermined threshold (fuel being 7% of engine oil volume) a service message is displayed in the instrument cluster.

Depending on driving style, some vehicles may require an oil service before the designated interval. If an service message is displayed, the vehicle will be required have a full service and the service interval counter will be reset.

Fuel Consumption

During the active regeneration process of the DPF, there will be an increase in fuel consumption. However, because active regeneration occurs infrequently and for limited periods of time, the overall effect on fuel consumption is approximately 2%. The additional fuel used during the active regeneration process is accounted for in the instantaneous and average fuel consumption displays in the instrument cluster.

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Exhaust System - TDV8 3.6L Diesel - Catalytic Converter LHVehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

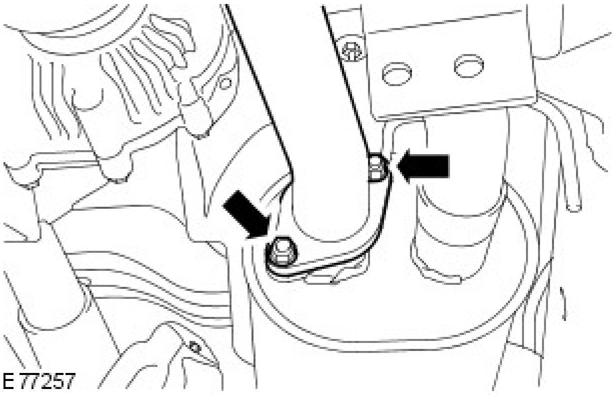
Removal

⚠ WARNING: Observe due care when working near a hot exhaust system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

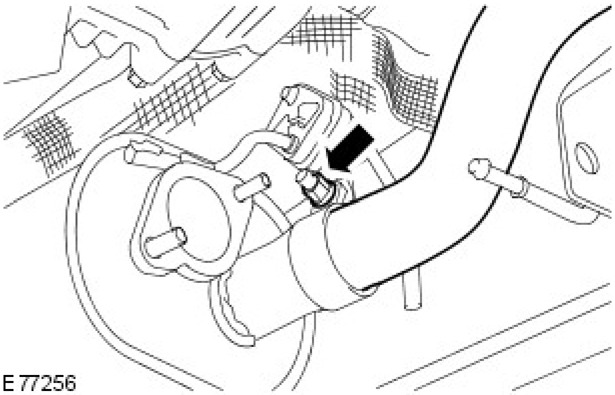
Raise and support the vehicle.

2. Remove the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).


E77257

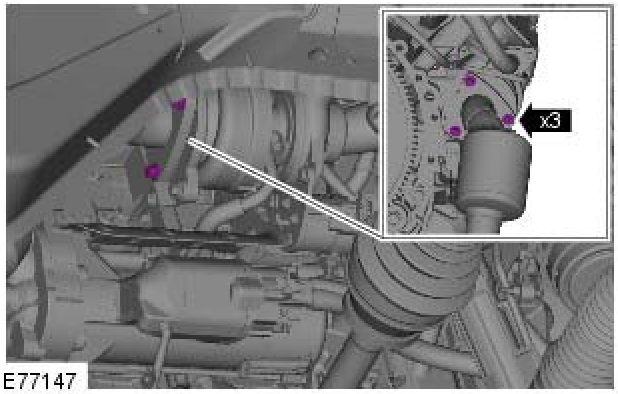
3. Release the RH catalytic converter from the exhaust system.

- Remove the 2 nuts.


E77256

4. Release the LH catalytic converter.

- Release the exhaust clamp.



E77147

5. NOTE: RH illustration shown, LH is similar.

Remove the LH catalytic converter.

- Remove the 3 bolts.
- Remove and discard the gasket.

Installation

1. NOTE: Do not tighten the clamp at this stage.

Install the LH catalytic converter.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 25 Nm (18 lb.ft).

2. Secure the RH catalytic converter.

- Clean the components mating faces.
- Tighten the nuts to 50 Nm (37 lb.ft).

3. Secure the LH catalytic converter.

- Tighten the nut to 50 Nm (37 lb.ft).

4. Install the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

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Exhaust System - TDV8 3.6L Diesel - Catalytic Converter RHVehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

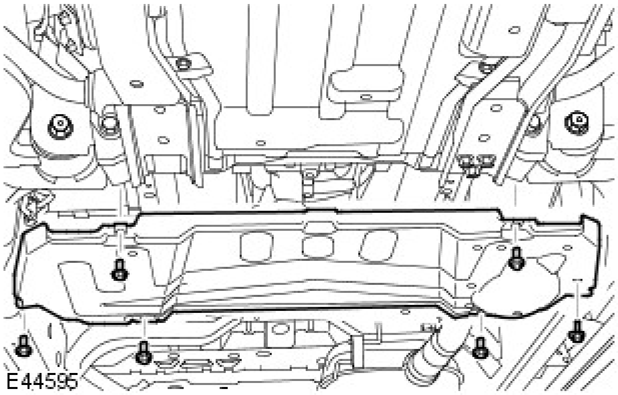
WARNING: Observe due care when working near a hot exhaust system.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

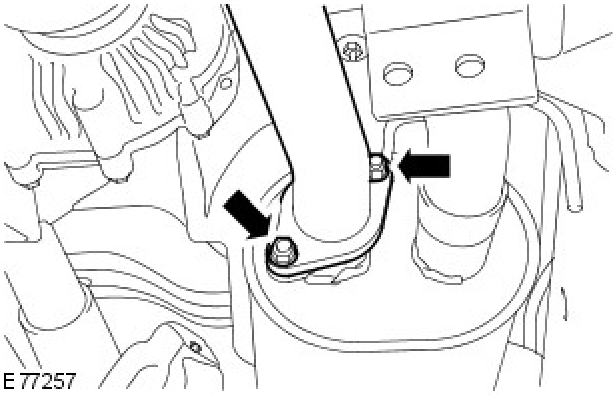
2. Remove the transmission undershield.

- Remove the 6 bolts.



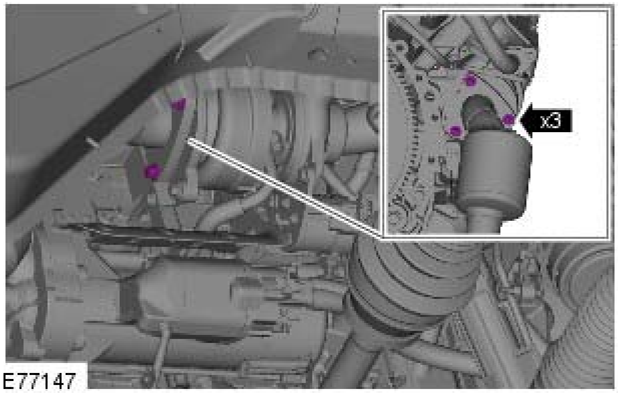
3. Release the RH catalytic converter.

- Remove the 2 nuts.



4. Remove the RH catalytic converter.

- Remove the 3 bolts.
- Discard the gasket.



Installation

1. Install the RH catalytic converter.

- Clean the component mating faces.
- Install a new gasket.
- Tighten the bolts to 25 Nm (18 lb.ft).

2. Secure the RH catalytic converter.

- Clean the component mating faces.
- Tighten the nuts to 50 Nm (37 lb.ft).

3. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

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Exhaust System - TDV8 3.6L Diesel - Exhaust SystemVehicles Without: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

WARNING: Observe due care when working near a hot exhaust system.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

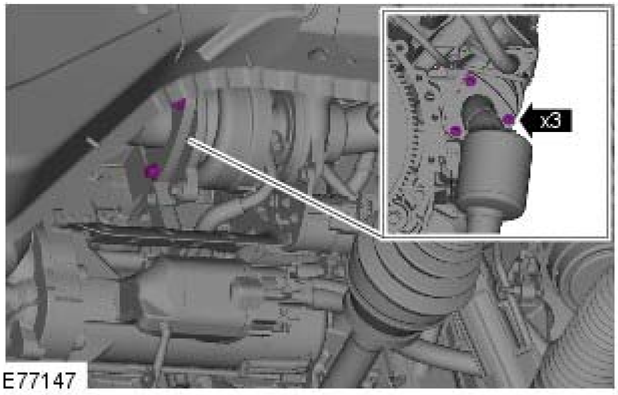
Raise and support the vehicle.

2. Remove the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

3. NOTE: Right-hand shown, left-hand similar.

Release the exhaust system from the turbochargers.

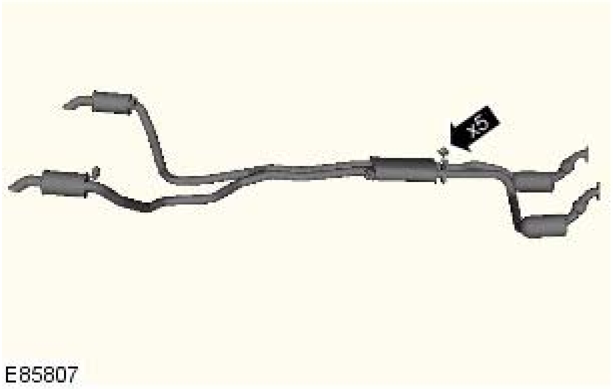
- Remove the 6 bolts.
- Remove and discard the 2 gaskets.



E77147

4. With assistance, remove the exhaust system.

- Release the 5 exhaust hangers.



E85807

Installation

1. With assistance, install the exhaust system.

- Secure the exhaust hangers.

2. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

Secure the LH and RH catalytic converters to the turbochargers.

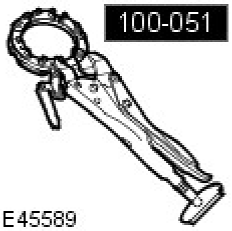
- Install new gaskets.
- Tighten the bolts to 21 Nm (15 lb.ft).

3. Install the transmission support crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

Published: 11-May-2011

Exhaust System - TDV8 3.6L Diesel - MufflerVehicles Without: Diesel Particulate Filter (DPF)

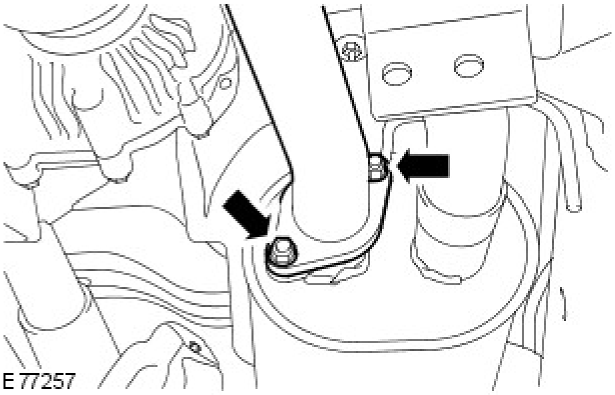
Removal and Installation

Special Tool(s)	
 E45589	Pipe cutter-exhaust 100-051(LRT-99-027)

Removal

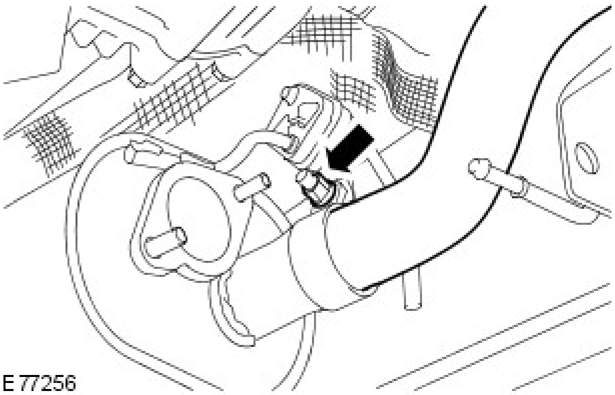
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.



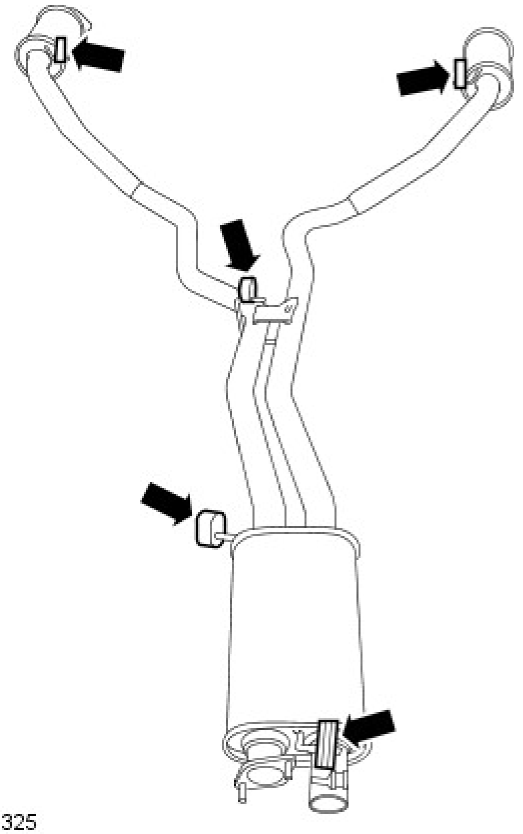
E77257

2. Release the RH catalytic converter from the exhaust system.
   - Remove the 2 nuts.



E77256

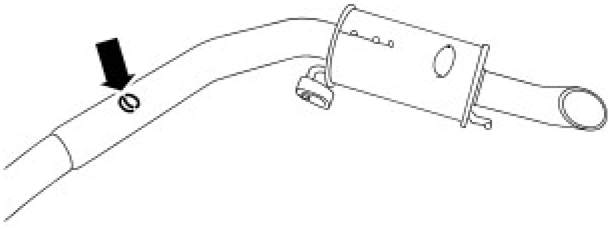
3. Release the LH catalytic converter from the exhaust system.
   - Release the exhaust clamp.



E87325

4. With assistance, remove the muffler and tailpipe assembly.

- Disconnect the 5 exhaust hangers.

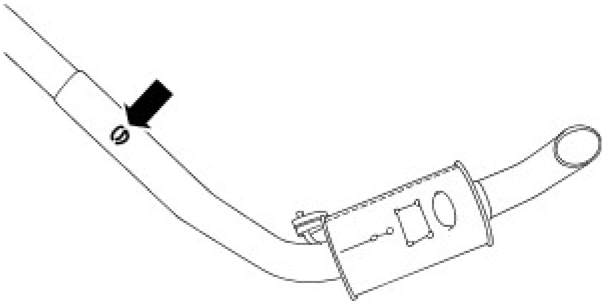


E87326

5. NOTE: Do not disassemble further if the component is removed for access only.

Remove the LH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.



E87327

6. Remove the RH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.

Installation

1. NOTE: Do not tighten the clamp at this stage.

Install the RH tail pipe to the muffler assembly.

- Clean the components.
- Install the clamp.

2. NOTE: Do not tighten the clamp at this stage.

Install the LH tail pipe to the muffler assembly.

- Clean the components.
- Install the clamp.

3. With assistance, install the muffler and tailpipe assembly.

- Connect the exhaust hangers.

4. Secure the LH catalytic converter to the exhaust system.

- Tighten the nut to 50 Nm (37 lb.ft).

5. Secure the RH catalytic converter to the exhaust system.

- Clean the components mating faces.
- Tighten the nuts to 50 Nm (37 lb.ft).

6. Align both of the tail pipes and tighten the clamps to 50 Nm (37 lb.ft).

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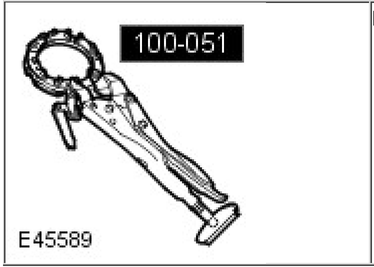
Exhaust System - TDV8 3.6L Diesel - Tailpipe

Removal and Installation

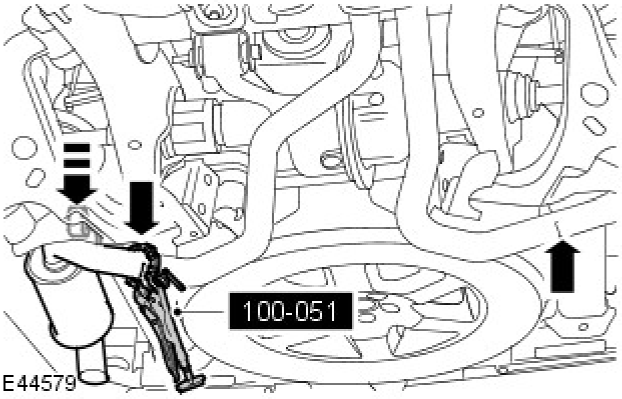
Special Tool(s)	
	Pipe cutter-exhaust 100-051(LRT-99-027)

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the tail pipe.
   - Release the exhaust hanger.
   - Using the special tool, cut the exhaust pipe at the marked position.



Installation

1. NOTE: Do not tighten the clamp at this stage.

   Install the tail pipe.
   - Clean the components.
   - Install the clamp.

2. Align the tail pipe and tighten the clamp to 50 Nm (37 lb.ft).
   - Secure the exhaust hanger.

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Exhaust System - TDV8 3.6L Diesel - Catalytic Converter LHVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

Removal

WARNING: Observe due care when working near a hot exhaust system.

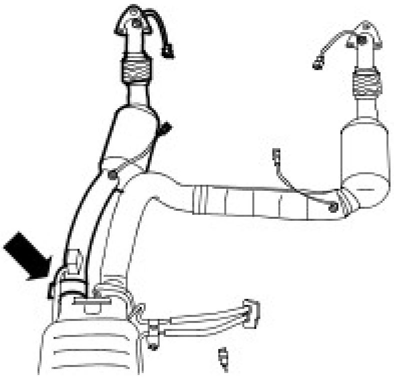
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the exhaust system.
For additional information, refer to: Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

3. Remove the LH catalytic converter.

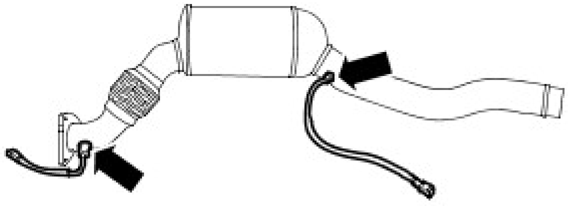
- Remove the nut.
- Remove and discard the clamp.



E97143

4. NOTE: Do not disassemble further if the component is removed for access only.

Remove the catalytic converter temperature sensors.



E97144

Installation

1. Install the catalytic converter temperature sensors.

- Tighten to 35 Nm (26 lb.ft).

2. CAUTION: Make sure that the mating faces are clean and free of foreign material.

- NOTE: Do not fully tighten the nut at this stage.

3. Install the exhaust system.
For additional information, refer to: Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (309-00D Exhaust System - TDV8 3.6L Diesel, Removal and Installation).

Install the LH catalytic converter.

- Install a new clamp.

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Exhaust System - TDV8 3.6L Diesel - Catalytic Converter RHVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

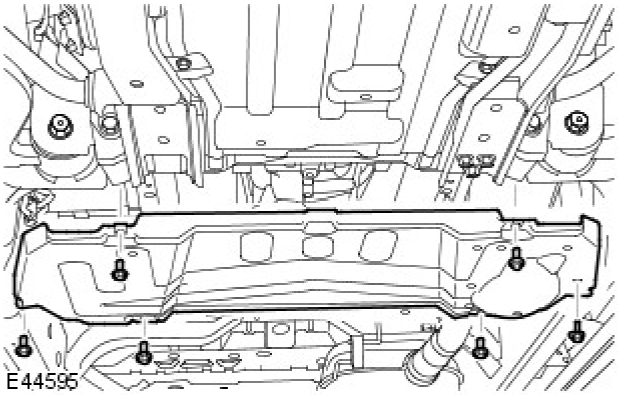
Removal

WARNING: Observe due care when working near a hot exhaust system.

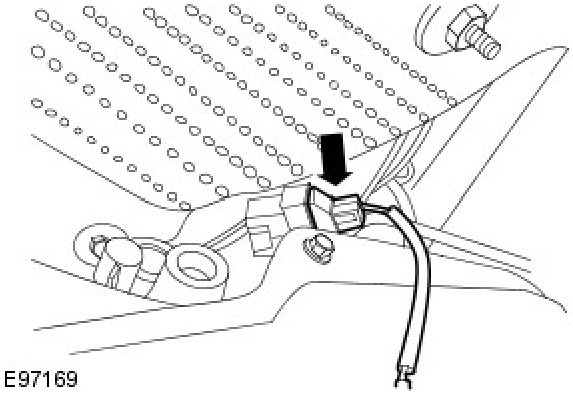
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

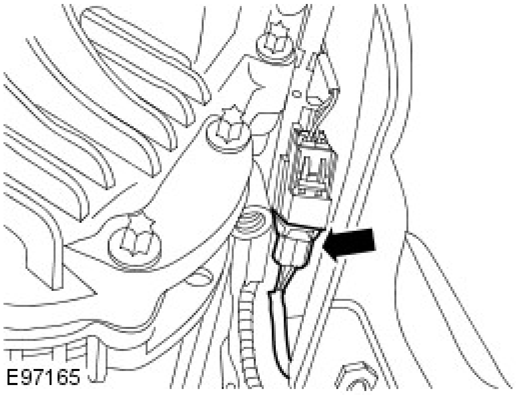
2. Remove the transmission undershield.
   - Remove the 6 bolts.

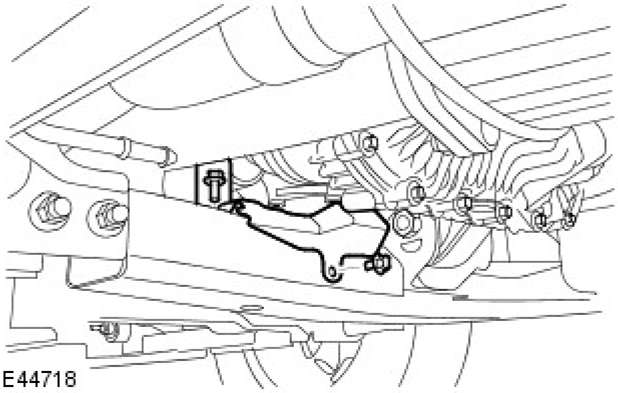


3. Disconnect the RH pre-catalytic converter temperature sensor electrical connector.



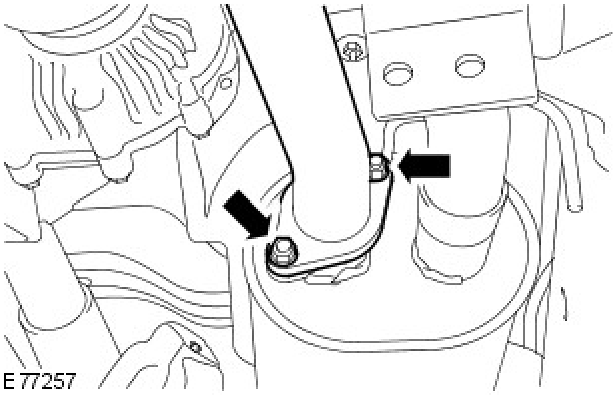
4. Disconnect the RH post catalytic converter temperature sensor electrical connector.





5. Release the electrical connector bracket.

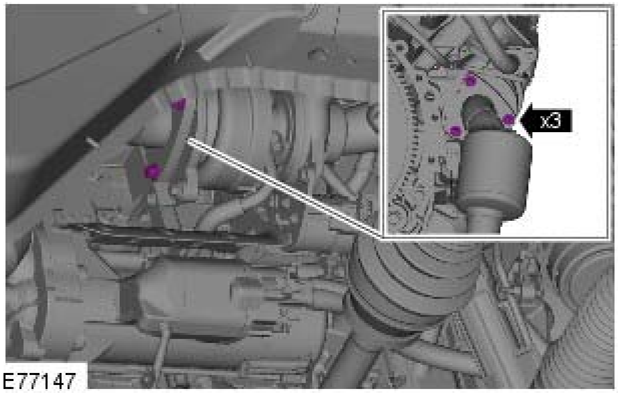
- Remove the 2 bolts.



6. NOTE: Discard the gasket.

Release the RH catalytic converter.

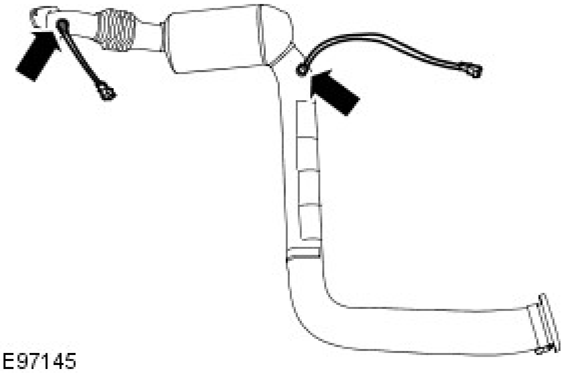
- Remove the 2 nuts.



7. NOTE: Discard the gasket.

Remove the RH catalytic converter.

- Remove the 3 bolts.



8. NOTE: Do not disassemble further if the component is removed for access only.

Remove the catalytic converter temperature sensors.

Installation

1. Install the catalytic converter temperature sensors.
   - Tighten to 35 Nm (26 lb.ft).
2. NOTE: Install a new gasket.

   Install the RH catalytic converter.
   - Clean the component mating faces.
   - Tighten the bolts to 25 Nm (18 lb.ft).
3. NOTE: Install a new gasket.

   Secure the RH catalytic converter.
   - Clean the component mating faces.
   - Tighten the nuts to 48 Nm (35 lb.ft).
4. Secure the electrical connector bracket.
   - Tighten the bolts to 10 Nm (7 lb.ft).
5. Connect both catalytic converter temperature sensor electrical connectors.
6. Install the transmission undershield.
   - Tighten the bolts to 10 Nm (7 lb.ft).

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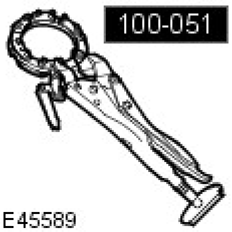
Exhaust System - TDV8 3.6L Diesel - Diesel Particulate Filter (DPF)

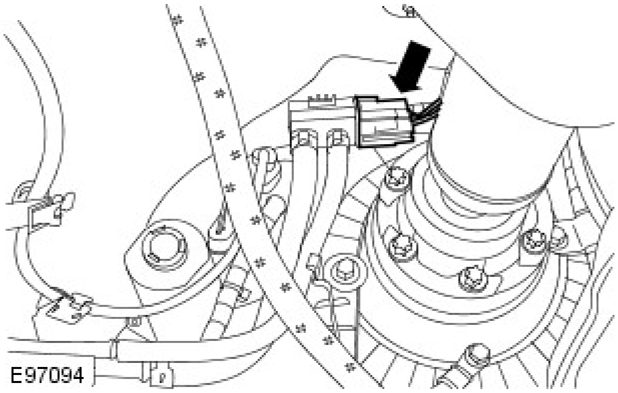
Removal and Installation

Special Tool(s)	
 E45589	Pipe cutter-exhaust 100-051(LRT-99-027)

Removal

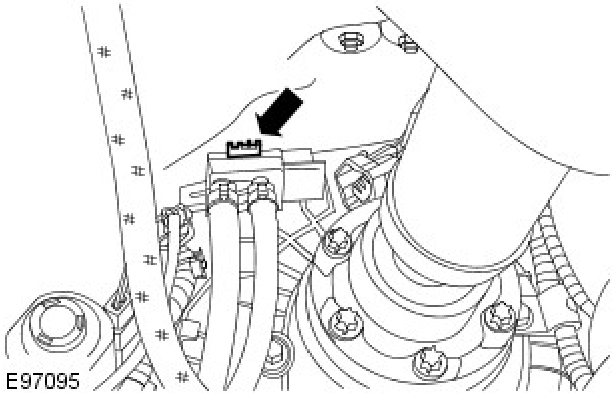
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.



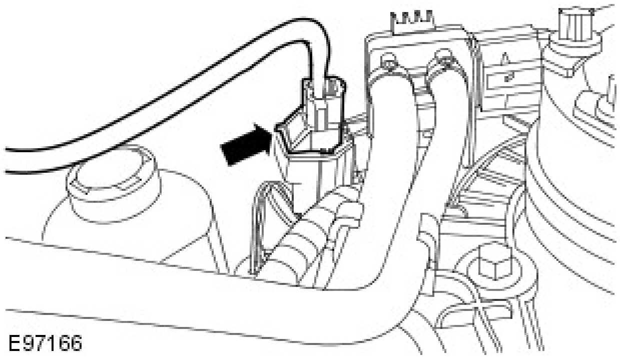
E97094

2. Disconnect the diesel particulate filter (DPF) differential pressure sensor electrical connector.

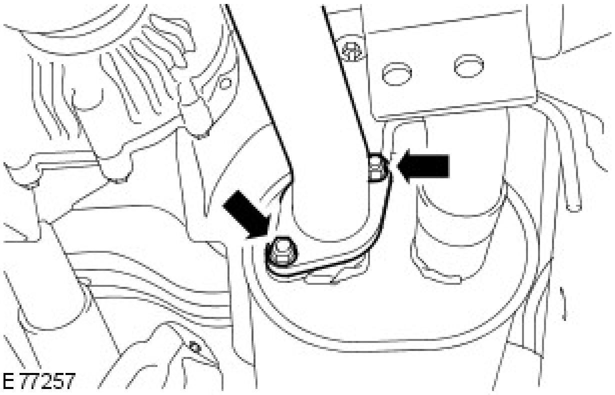


E97095

3. Release the DPF differential pressure sensor.
   - Release the clip.



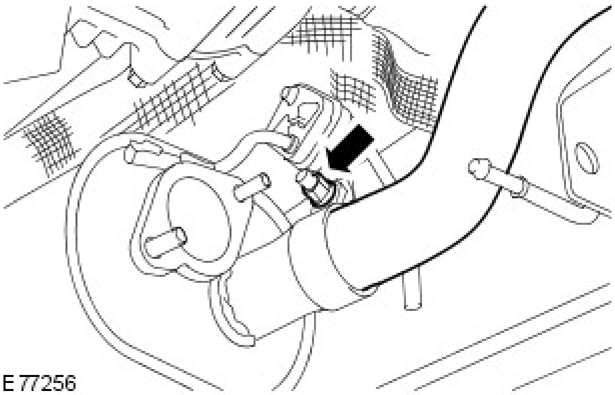
4. Disconnect the DPF exhaust gas temperature sensor electrical connector.



5. NOTE: Discard the gasket.

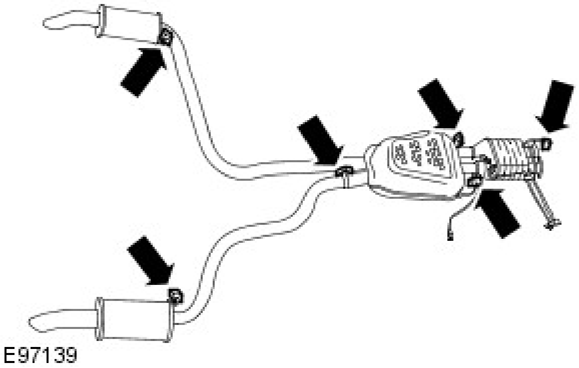
Release the RH catalytic converter from the exhaust system.

- Remove the 2 nuts.



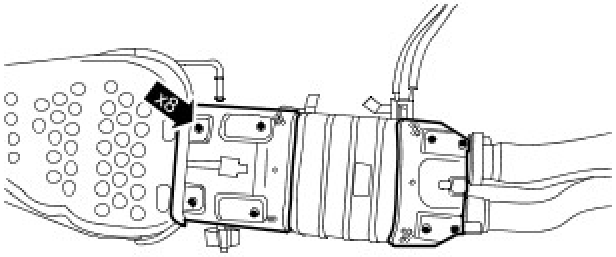
6. Release the LH catalytic converter from the exhaust system.

- Release the exhaust clamp.



7. With assistance, remove the DPF and tailpipe assembly.

- Using a suitable stand, support the exhaust.
- Disconnect the 6 exhaust hangers.

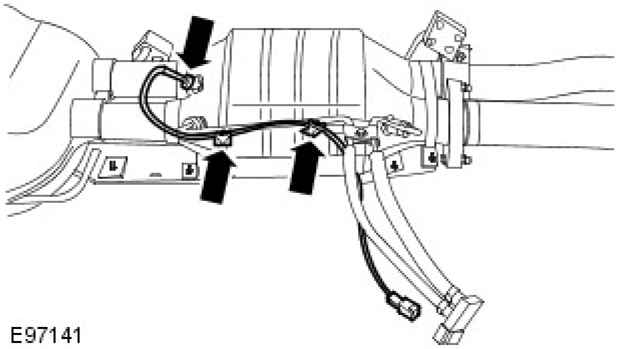


E97140

8. NOTE: Do not disassemble further if the component is removed for access only.

Remove the 2 DPF heat shields.

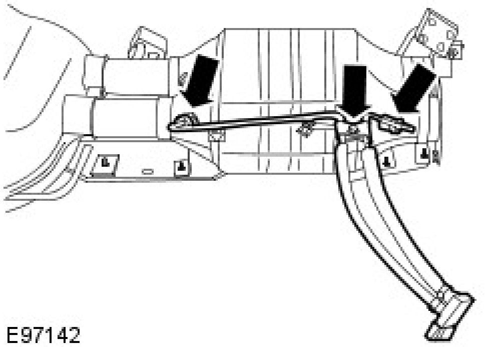
- Remove the 8 bolts.



E97141

9. Remove the DPF exhaust gas temperature sensor.

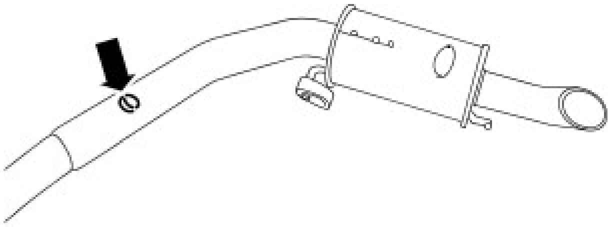
- Release the wiring harness from the 2 clips.



E97142

10. Remove the DPF differential pressure sensor high-pressure and low-pressure pipes.

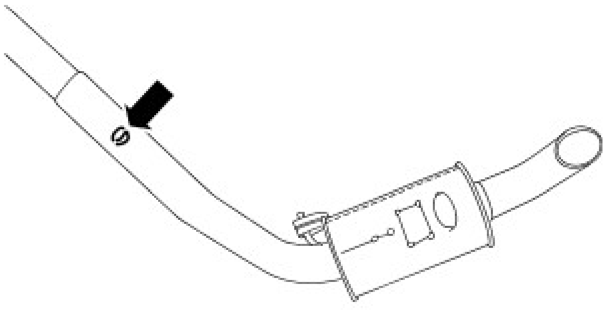
- Remove the bolt.



E87326

11. Remove the LH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.



E87327

12. Remove the RH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.

Installation

1. NOTE: Do not tighten the clamp at this stage.

• NOTE: Clean the components.

Install the RH tail pipe to the muffler assembly.

- Install the clamp.

2. NOTE: Do not tighten the clamp at this stage.

• NOTE: Clean the components.

Install the LH tail pipe to the muffler assembly.

- Install the clamp.

3. Install the DPF differential pressure sensor high-pressure and low-pressure pipes.

- Tighten to 35 Nm (26 lb.ft).
- Tighten the bolts to 10 Nm (7 lb.ft).

4. Install the DPF exhaust gas temperature sensor.

- Tighten to 35 Nm (26 lb.ft).
- Secure the wiring harness in the clips.

5. Install the DPF heat shields.

- Tighten the bolts to 10 Nm (7 lb.ft).

6. With assistance, install the DPF and tailpipe assembly.

- Connect the exhaust hangers.

7. NOTE: Clean the components mating faces.

• NOTE: Install a new gasket.

Secure the RH catalytic converter to the exhaust system.

- Tighten the nuts to 48 Nm (35 lb.ft).

8. Secure the LH catalytic converter to the exhaust system.

- Tighten the nut to 48 Nm (35 lb.ft).

9. Align both of the tail pipes and tighten the clamps to 48 Nm (35 lb.ft).

10. Secure the DPF differential pressure sensor.

11. Connect the DPF differential pressure sensor electrical connector.

12. Connect the DPF exhaust gas temperature sensor electrical connector.

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Exhaust System - TDV8 3.6L Diesel - Exhaust SystemVehicles With: Diesel Particulate Filter (DPF)

Removal and Installation

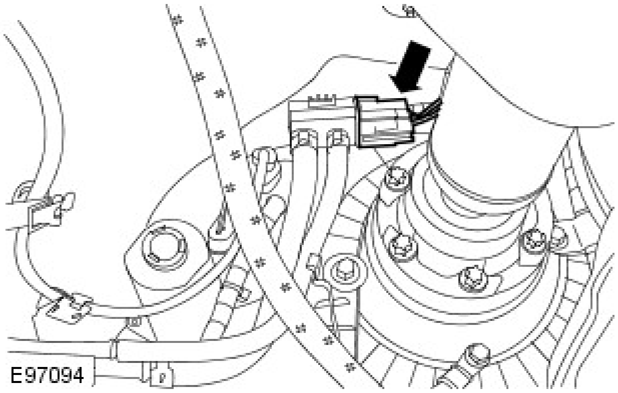
Removal

⚠ WARNING: Observe due care when working near a hot exhaust system.

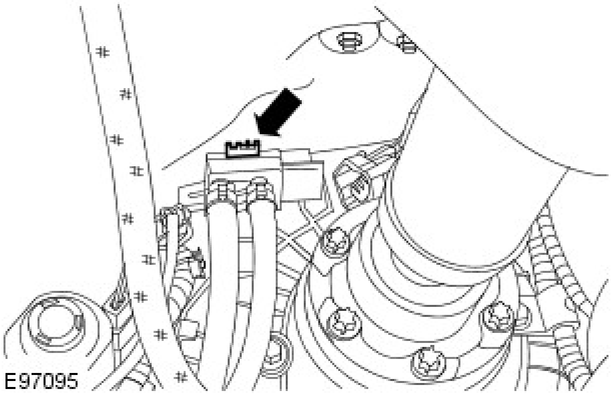
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

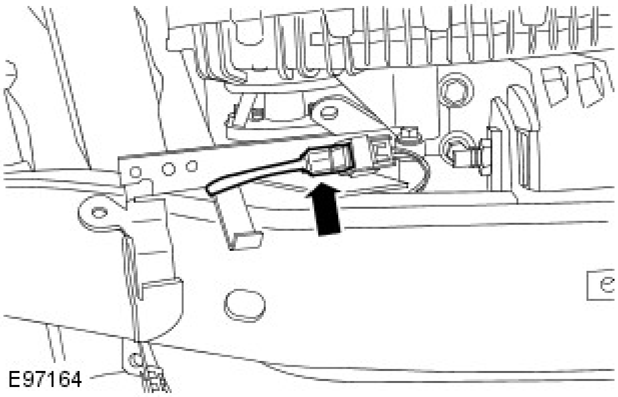


3. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.



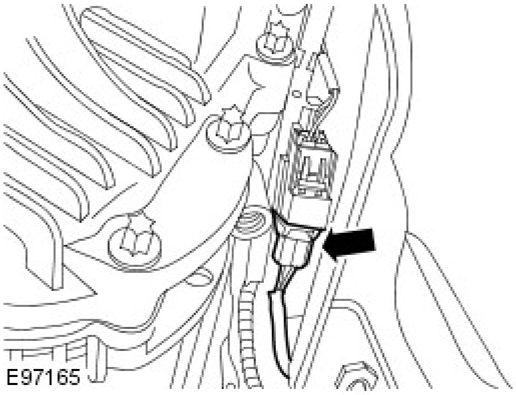
4. Release the DPF differential pressure sensor.

- Release the clip.

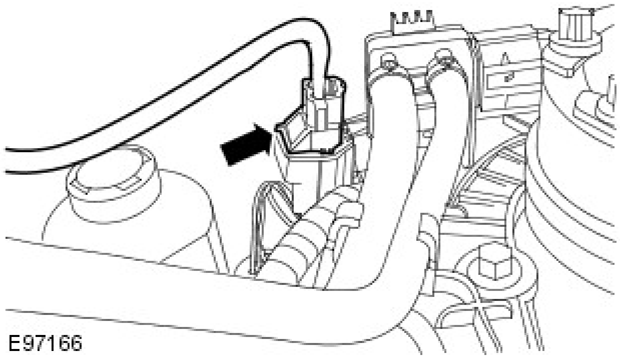


5. NOTE: LH shown, RH is similar.

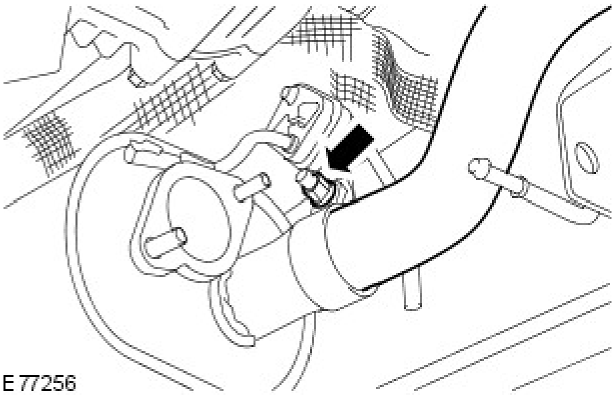
Disconnect the LH post-catalytic converter exhaust gas temperature sensor electrical connector.



6. Disconnect the RH post-catalytic converter exhaust gas temperature sensor electrical connector.

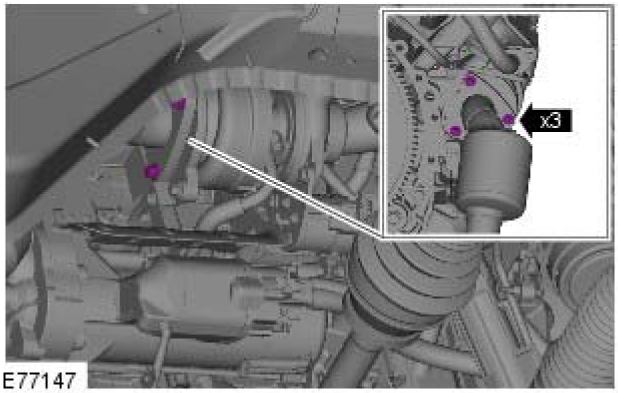


7. Disconnect the DPF exhaust gas temperature sensor electrical connector.



8. NOTE: RH catalytic converter shown removed for clarity.

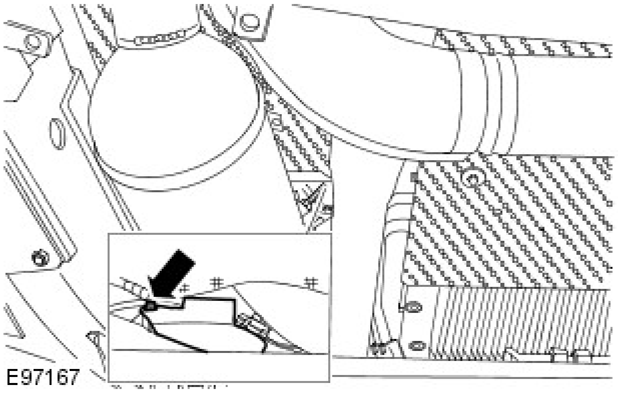
Loosen the LH catalytic converter to DPF retaining clamp.



9. NOTE: RH shown, LH is similar.

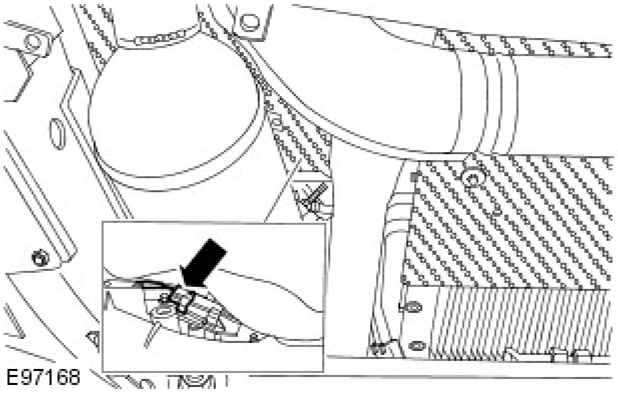
Release the LH and RH catalytic converters from the turbochargers.

- Remove the 6 bolts.
- Remove and discard the 2 gaskets.

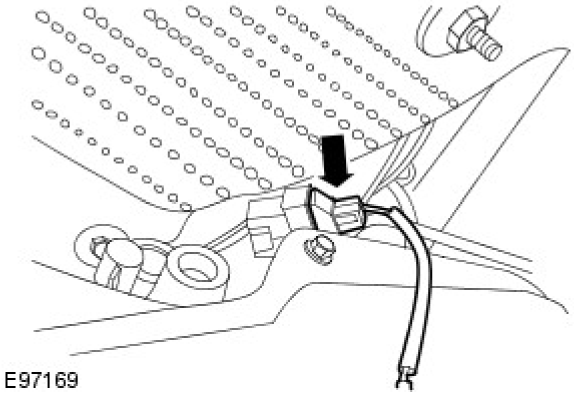


10. Remove the LH side exhaust gas temperature sensor electrical connector heat shield.

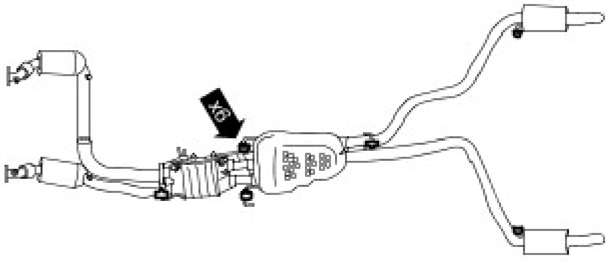
- Remove the bolt.



11. Disconnect the LH pre-catalytic converter exhaust gas temperature sensor electrical connector.



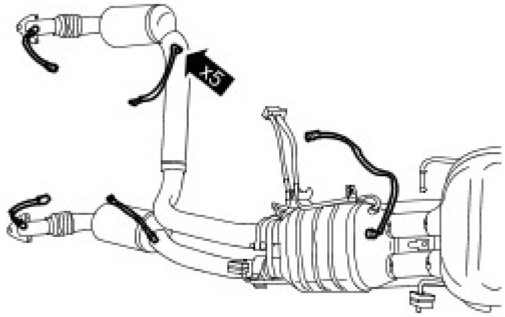
12. Disconnect the RH pre-catalytic converter exhaust gas temperature sensor electrical connector.



E97170

13. With assistance, remove the exhaust system.

- Release the 6 exhaust hangers.

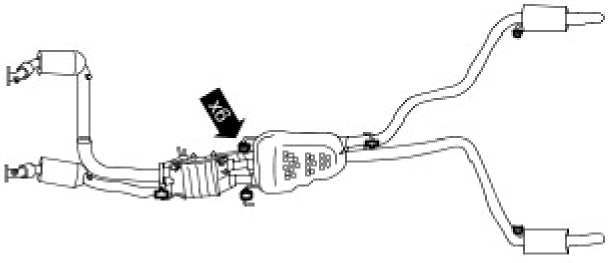


E97171

14. NOTE: Do not disassemble further if the component is removed for access only.

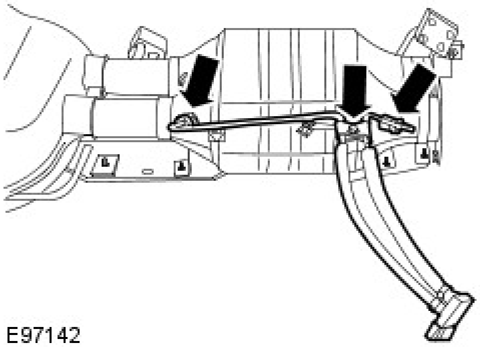
• NOTE: Make a note of the fitted positions of the sensors before removal.

Remove the 5 exhaust gas temperature sensors.



E97170

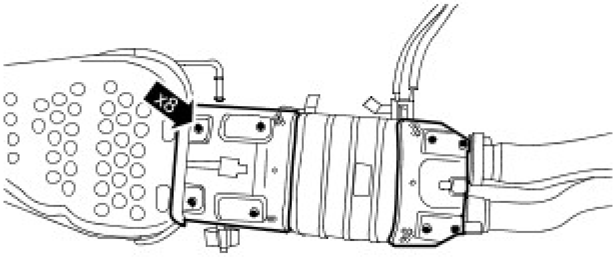
15. Remove the 6 exhaust hangers.



E97142

16. Remove the DPF differential pressure sensor, high and low pressure pipes.

- Release the clamp.
- Release the high and low pressure pipes.



E97140

17. Remove the 2 DPF heat shields.

- Remove the bolts.

Installation

1. Install the 2 DPF heat shields.

- Tighten to 10 Nm (7 lb.ft).

2. Install the DPF differential pressure sensor, high and low pressure pipes.

- Tighten the pipes to 35 Nm (26 lb.ft).
- Tighten the clamp to 10 Nm (7 lb.ft).

3. Install the exhaust hangers.

4. Install the exhaust gas temperature sensors.

- Tighten to 35 Nm (26 lb.ft).

5. With assistance, install the exhaust system.

- Secure the exhaust hangers.

6. Connect the RH pre-catalytic converter exhaust gas temperature sensor electrical connector.

7. Connect the LH side, pre-catalytic converter exhaust gas temperature sensor electrical connector.

8. Install the LH side exhaust gas temperature sensor electrical connector heat shield.

- Tighten to 10 Nm (7 lb.ft).

9. ⚠ CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

Secure the LH and RH catalytic converters to the turbochargers.

- Install new gaskets.
- Tighten the bolts to 21 Nm (15 lb.ft).

10. NOTE: RH catalytic converter shown removed for clarity.

Secure the LH catalytic converter to DPF retaining clamp.

- Tighten to 48 Nm (35 lb.ft).

11. Connect the DPF exhaust gas temperature sensor electrical connector.

12. Connect the RH side post-catalytic converter exhaust gas temperature sensor electrical connector.

13. Connect the LH side post-catalytic converter exhaust gas temperature sensor electrical connector.

14. Secure the DPF differential pressure sensor.

15. Connect the DPF differential pressure sensor electrical connector.

16. Install the transmission crossmember.
For additional information, refer to: Transmission Support Crossmember (502-02 Full Frame and Body Mounting, Removal and Installation).

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Exhaust System - TDV8 3.6L Diesel - Diesel Particulate Filter (DPF) Differential Pressure Sensor

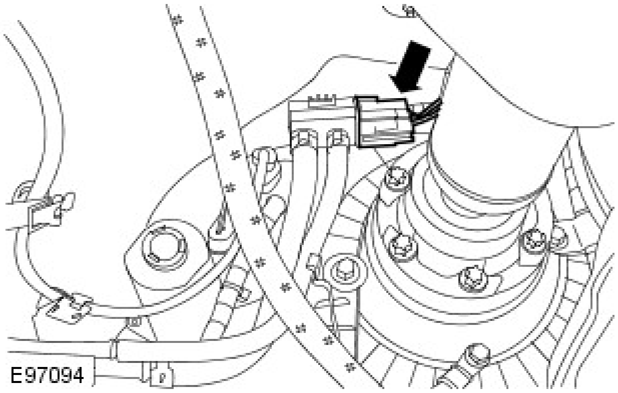
Removal and Installation

Removal

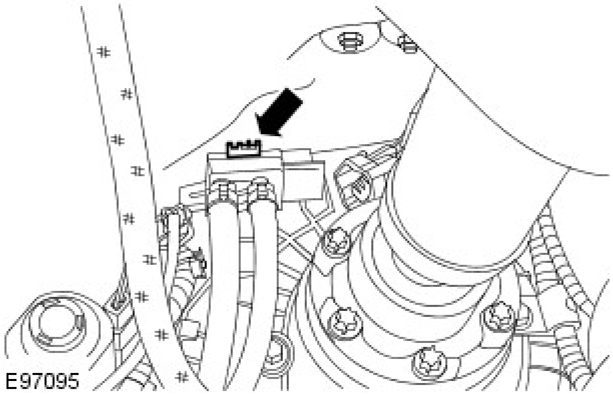
⚠ WARNING: Observe due care when working near a hot exhaust system.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

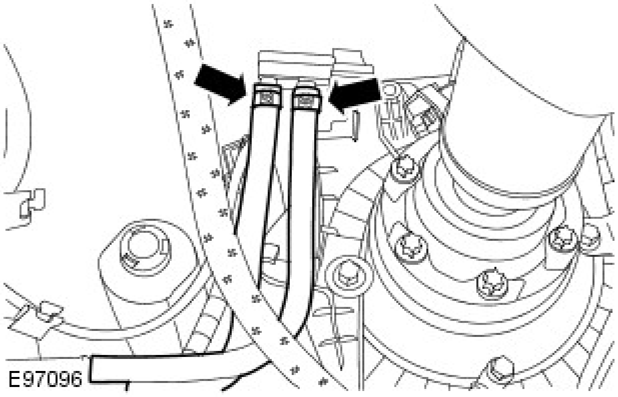


2. Disconnect the diesel particulate filter (DPF), differential pressure sensor electrical connector.



3. Release the DPF differential pressure sensor.

- Release the clip.



4. ⚠ CAUTION: Make a note of the connection orientation of the high and low pressure hoses to the sensor ports. Make sure the hoses are located to the correct sensor port when installed. Failure to follow these instructions may result in damage to the vehicle.

Disconnect the high and low pressure hoses from the DPF differential pressure sensor.

- Release the 2 clips.

Installation

1. Connect the high and low pressure hoses to the DPF differential pressure sensor.

- Secure the clips.

2. Secure the DPF differential pressure sensor.

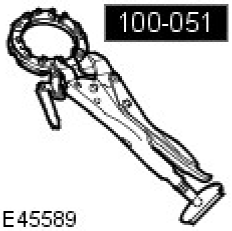
- Secure with the clip.

3. Connect the DPF differential pressure sensor electrical connector.

Published: 11-May-2011

Exhaust System - TDV8 3.6L Diesel - MufflerVehicles With: Diesel Particulate Filter (DPF)

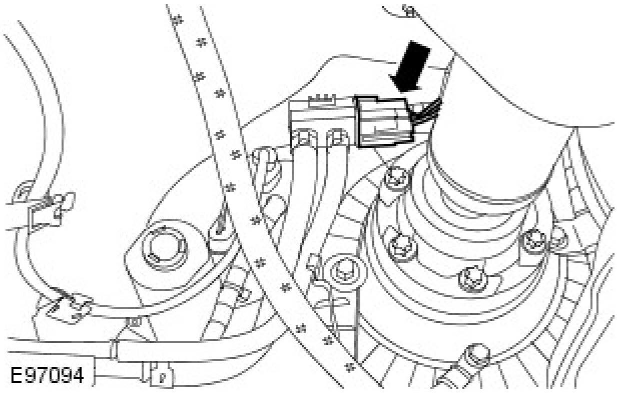
Removal and Installation

Special Tool(s)	
	Pipe cutter-exhaust 100-051(LRT-99-027)

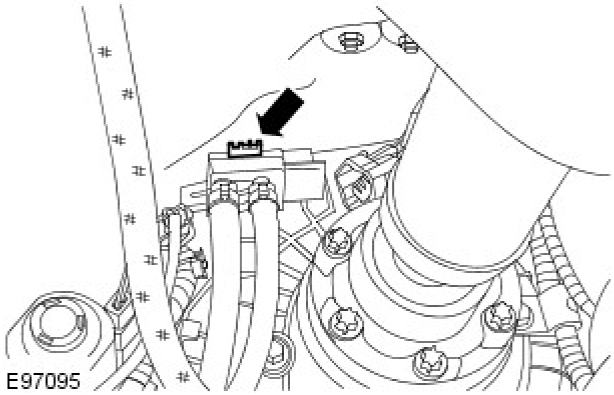
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

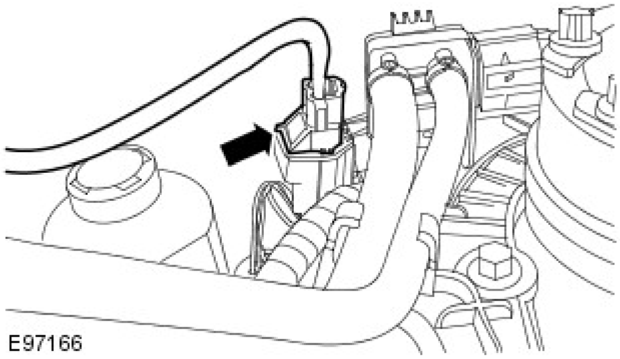


2. Disconnect the diesel particulate filter (DPF) differential pressure sensor electrical connector.

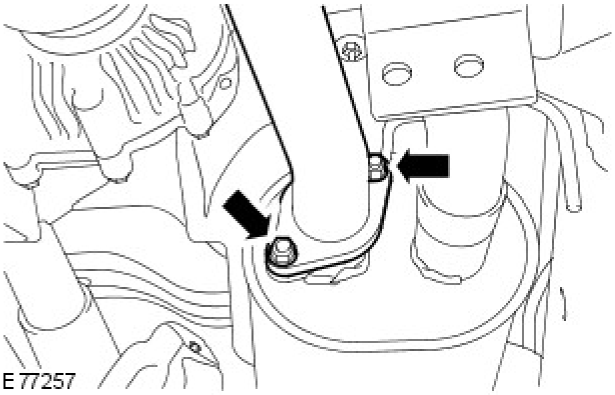


3. Release the DPF differential pressure sensor.

- Release the clip.



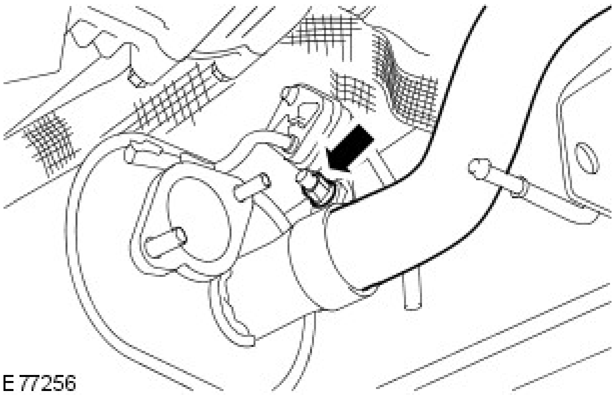
4. Disconnect the DPF exhaust gas temperature sensor electrical connector.



5. NOTE: Discard the gasket.

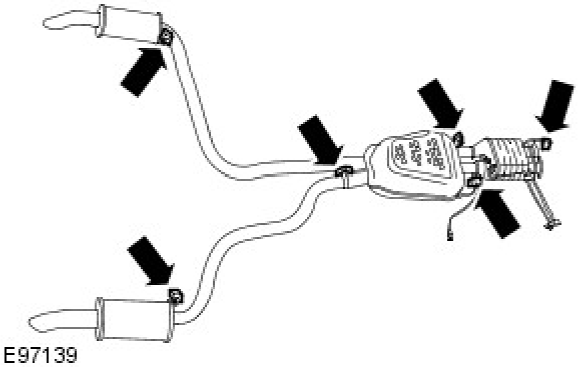
Release the RH catalytic converter from the exhaust system.

- Remove the 2 nuts.



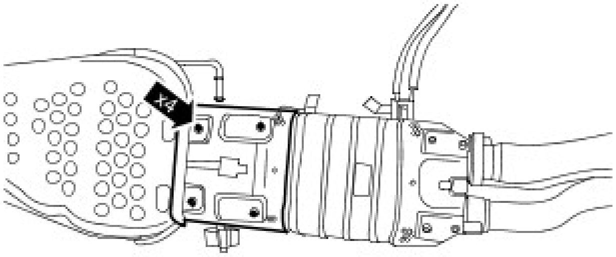
6. Release the LH catalytic converter from the exhaust system.

- Release the exhaust clamp.
- Remove and discard the clamp.



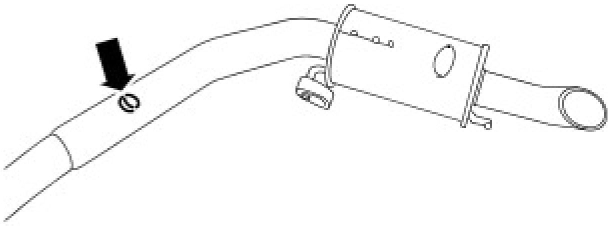
7. With assistance, remove the DPF and tailpipe assembly.

- Using a suitable stand, support the exhaust.
- Disconnect the 6 exhaust hangers.



E97387

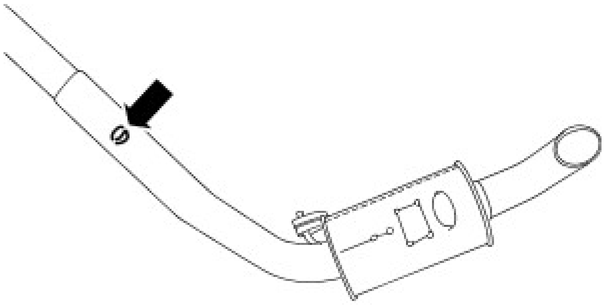
8. Remove the DPF rear heat shield.



E87326

9. Remove the LH tail pipe.

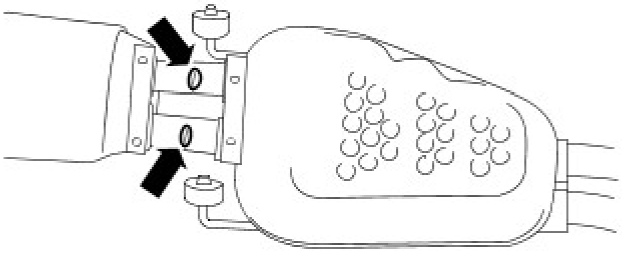
- Using the special tool, cut the exhaust pipe at the marked position.



E87327

10. Remove the RH tail pipe.

- Using the special tool, cut the exhaust pipe at the marked position.



E97386

11. Remove the muffler.

- Using the special tool, cut the exhaust pipes at the marked positions.

Installation

1. NOTE: Do not fully tighten the clamps at this stage.

• NOTE: Clean the component mating faces.

Install the muffler to the DPF.

- Install the 2 clamps.

2. NOTE: Do not fully tighten the clamp at this stage.

• NOTE: Clean the component mating faces.

Install the RH tail pipe to the muffler assembly.

- Install the clamp.

3. NOTE: Do not fully tighten the clamp at this stage.

• NOTE: Clean the component mating faces.

Install the LH tail pipe to the muffler assembly.

- Install the clamp.

4. NOTE: Install a new LH catalytic converter clamp.

With assistance, install the DPF and tailpipe assembly.

- Connect the exhaust hangers.

5. NOTE: Clean the component mating faces.

• NOTE: Install a new gasket.

Secure the RH catalytic converter to the exhaust system.

- Tighten the nuts to 48 Nm (35 lb.ft).

6. Secure the LH catalytic converter to the exhaust system.

- Tighten the nut to 48 Nm (35 lb.ft).

7. Secure the muffler to the DPF.

- Tighten the clamps to 48 Nm (35 lb.ft).

8. Install the DPF rear heat shield.

- Tighten the bolts to 10 Nm (7 lb.ft).

9. Align both of the tail pipes and tighten the clamps to 48 Nm (35 lb.ft).

10. Secure the DPF differential pressure sensor.

11. Connect the DPF differential pressure sensor electrical connector.

12. Connect the DPF exhaust gas temperature sensor electrical connector.

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Fuel System - General Information - Fuel System

Diagnosis and Testing

Fuel tank and lines

For further information, refer to the relevant section in the workshop manual - 310-01 Fuel Tank and Lines.

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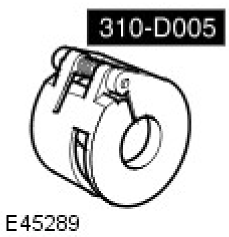
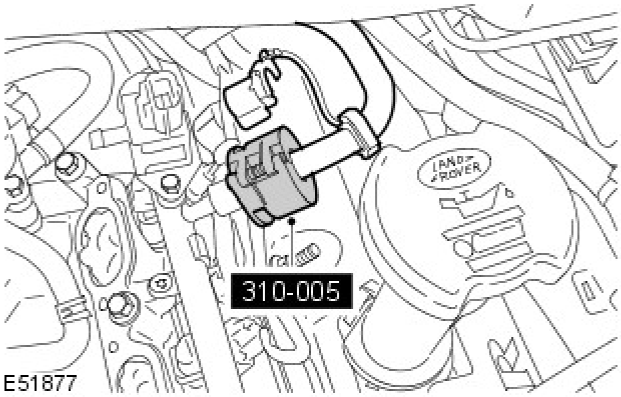
Fuel System - General Information - Fuel System Pressure ReleaseV8 S/C 4.2L Petrol

General Procedures

Special Tool(s)	
	Fuel spring lock decoupling tool 310-005

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. WARNINGS:

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

   Disconnect fuel line from the fuel rail.

   - Position an absorbent cloth to collect fluid spillage.

4. Connect the fuel line to the fuel rail.

   - Clean the component mating faces.

5. Install the engine cover.
   For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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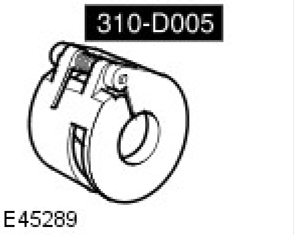
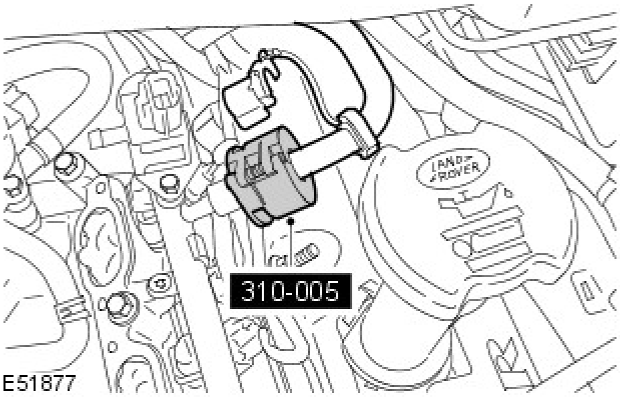
Fuel System - General Information - Fuel System Pressure ReleaseV8 4.4L Petrol

General Procedures

Special Tool(s)	
	Fuel spring lock decoupling tool 310-005

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Using the special tool, disconnect the fuel line.

- Release the clip.
- Position an absorbent cloth to collect fluid spillage.

4. Connect the fuel line to the fuel rail.

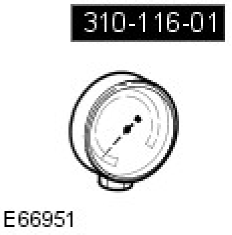
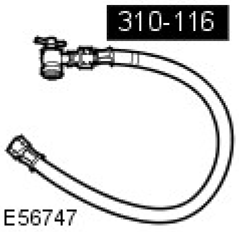
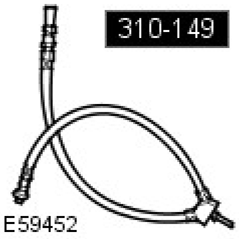
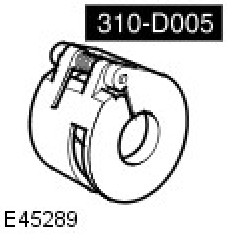
- Clean the component mating faces.
- Secure the clip.

5. Install the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Fuel System - General Information - Fuel System Pressure CheckV8 4.4L Petrol/V8 S/C 4.2L Petrol

General Procedures

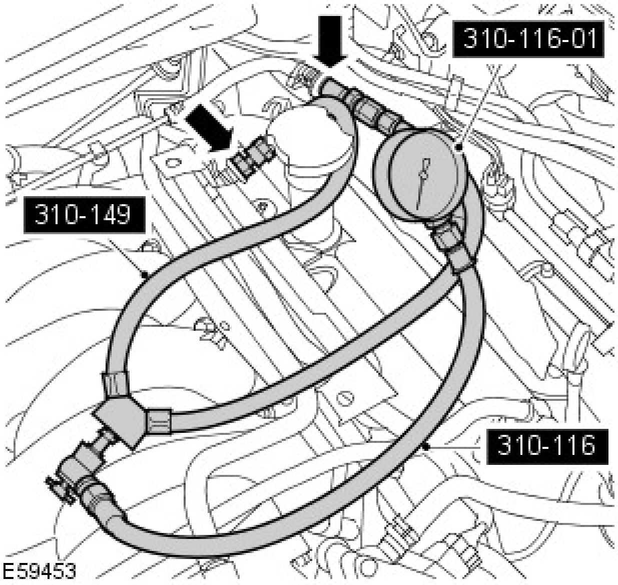
Special Tool(s)	
	Gauge fuel pressure 310-116-01
	Adapter - fuel pressure check 310-116(LRT-19-006A)
	Adapter fuel schraeder valve and hose 310-149
	Fuel spring lock decoupling tool 310-D005

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Depressurize the fuel rail.
For additional information, refer to: Fuel System Pressure Release - V8 S/C 4.2L Petrol (310-00 Fuel System - General Information, General Procedures).

3. Connect the special tool.

- Connect to the fuel rail.
- Connect to the fuel line.
- Remove the schraeder valve dust cap.



4. NOTE: Naturally aspirated graphic shown.

Connect the special tool.

- Connect the schraeder valve and gauge.

5. WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Start and run the engine.

- Open the valve on the special tool.
- Note the fuel pressure readings.

6. For fuel pressure data, refer to specifications.
For additional information, refer to: Specifications (303-01A Engine - V8 S/C 4.2L Petrol, Specifications).

7. Close the special tool valve.

8. WARNINGS:

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

Remove the special tool.

- Position an absorbent cloth to collect fluid spillage.
- Disconnect the special tool from the Schraeder valve.

9. Remove the special tool.

- Position an absorbent cloth to collect fluid spillage.
- Disconnect the special tool from the fuel rail.
- Use the special tool.
- Disconnect the special tool from the fuel line.
- Use the special tool.

10. Install the schraeder valve dust cap to the special tool.

11. Connect the fuel line.
For additional information, refer to: Fuel System Pressure Release - V8 S/C 4.2L Petrol (310-00 Fuel System - General Information, General Procedures).

12. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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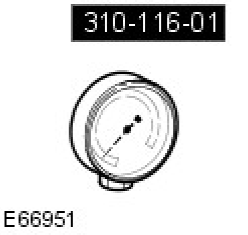
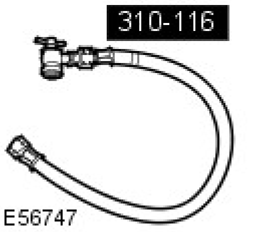
Fuel System - General Information - Fuel System Pressure CheckTDV6 2.7L Diesel

General Procedures

Special Tool(s)	
	Gauge fuel pressure 310-116-01
	Adapter - fuel pressure check 310-116(LRT-19-006A)

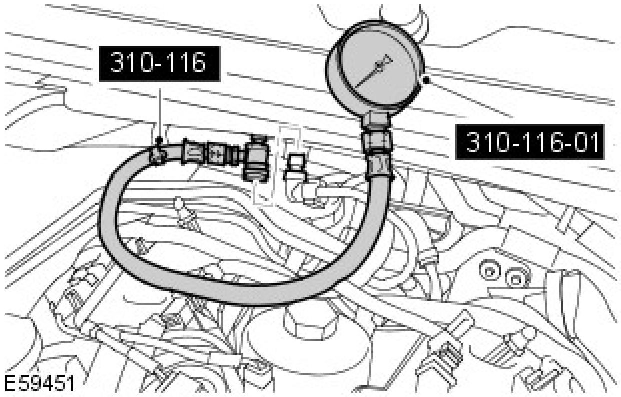
- NOTE: This procedure only checks the supply pressure to the high pressure pump.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Remove the fuel rail Schraeder valve cap.

4. Install the special tool to the fuel rail Schraeder valve.



5. WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

Start and run the engine.

- Open the valve on the special tool.
- Note the fuel pressure readings.

6. For fuel pressure data, refer to specifications.
For additional information, refer to: Specifications (303-01C Engine - TDV6 2.7L Diesel, Specifications).

7. Close the special tool valve.

8. Disconnect the special tool from the Schraeder valve.

9. Install the Schraeder valve cap.

10. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Fuel System - General Information - Fuel Tank Draining

General Procedures

- WARNINGS:

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

1. Open the fuel filler door and remove the cap.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Connect the fuel tank drain equipment ground cable to the vehicle.

4. Remove the fuel from the fuel tank, via the filler neck, using the fuel tank draining equipment. Follow the manufacturer's operating instructions.

5. To install, reverse the removal procedure.

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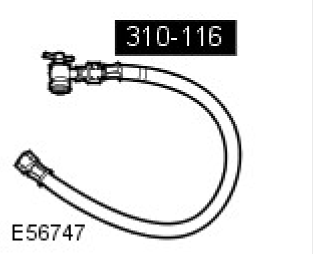
Fuel System - General Information - Low-Pressure Fuel System BleedingTDV8 3.6L Diesel

General Procedures

Special Tool(s)	
	Adapter - fuel pressure check 310-116(LRT-19-006A)

- WARNINGS:

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

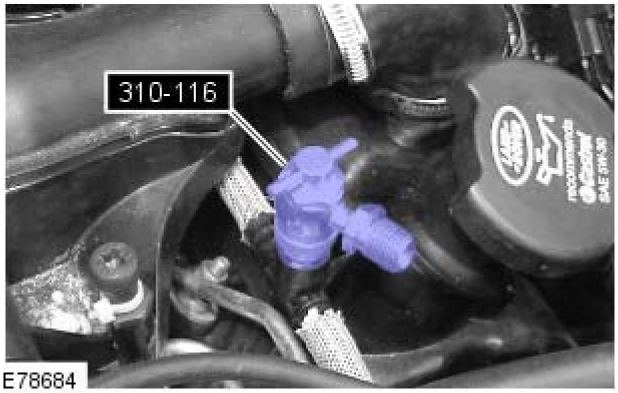
⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

- CAUTIONS:

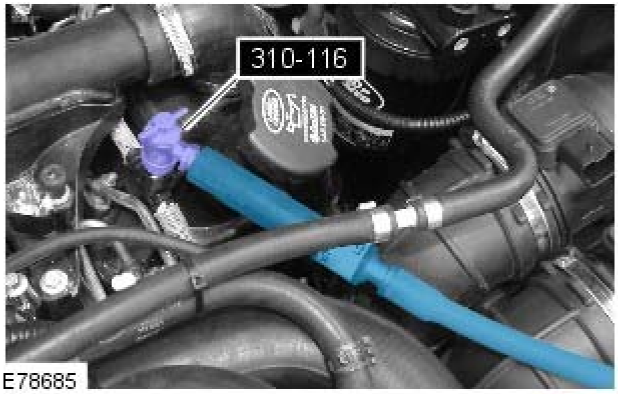
⚠ Make sure that any protective clothing worn is clean and made from lint-free non-flocking material.

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

1. Remove the engine cover.
2. Remove the Schraeder valve cap.



3. Install the special tool union to the Schraeder valve.



4. Connect a suitable clean piece of clear tube to the special tool.

- Position the piece of clear tube in a suitable fluid container.
- Open the valve on the special tool.

5. Turn the ignition key to position II to operate the fuel pump.

6. NOTE: The fuel pump will only operate for a set time and will switch off if it does not see a crank signal.

Repeat the above procedure until air-free fuel flows from the piece of clear tube.

7. Disconnect the piece of clear tube from the special tool.

- Remove the container.
- Close the valve on the special tool.

8. Remove the special tool.

9. Install the Schraeder valve cap.

10. Install the engine cover.

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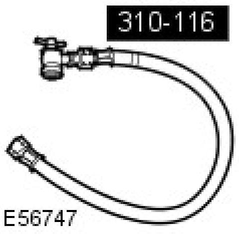
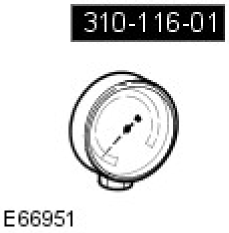
Fuel System - General Information - Fuel System Pressure CheckTDV8 3.6L Diesel

General Procedures

Special Tool(s)	
	Adapter - fuel pressure check 310-116(LRT-19-006A)
	Gauge fuel pressure 310-116-01

- WARNINGS:

⚠ Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 1650 bar (23,931 lb-sq-in). Failure to follow this instruction may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

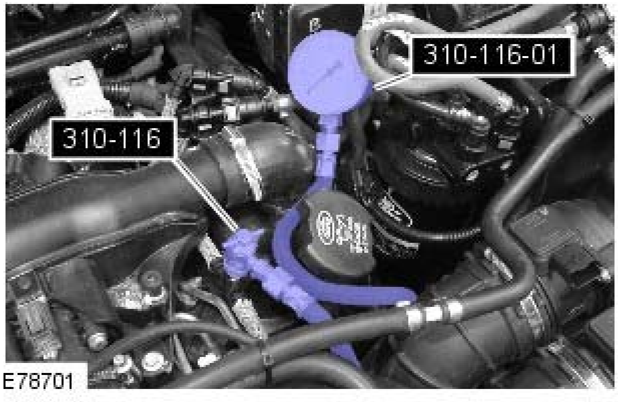
- CAUTIONS:

⚠ Make sure that any protective clothing worn is clean and made from lint-free non-flocking material.

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

1. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Remove the Schraeder valve cap.

3. Install the special tool union to the Schraeder valve.



4. Start and run the engine.

- Open the valve on the special tool.
- Note the fuel pressure readings.

5. Switch the engine off.

6. Close the valve on the special tool.

7. Remove the special tool.

8. Install the Schraeder valve cap.

9. Install the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

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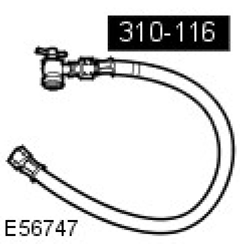
Fuel System - General Information - Low-Pressure Fuel System BleedingTDV6 2.7L Diesel

General Procedures

Special Tool(s)	
	Adaptor fuel rail pressure check 310-116 (LRT-19-006A)

- WARNINGS:

Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

Before any work is carried out on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow this instruction may result in personal injury.

If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

- CAUTIONS:

Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

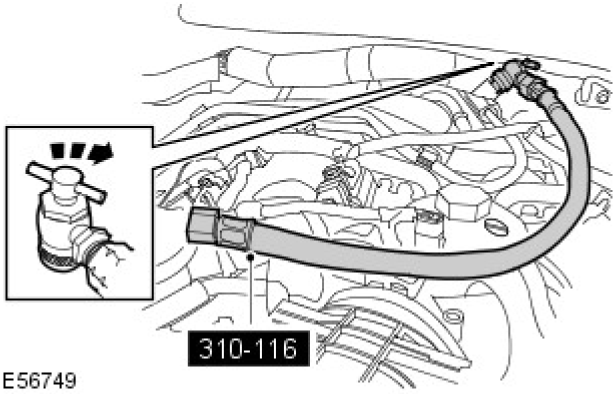
This procedure must be carried out before the engine is attempted to be started, following removal or replacement of any fuel system component involving fuel line intrusion. Failure to follow this instruction will result in damage to the fuel injection pump.

1. This procedure is necessary if any of the following fuel system components are removed, disconnected or replaced: Fuel tank, fuel lines, fuel filter element, fuel coolers, fuel injection pump or fuel rail pressure sensor.
2. Remove the engine cover. For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Install the special tool to the fuel rail Schraeder valve.

- Remove the fuel rail Schraeder valve cap.

4. Position a container to collect spillage.

- Open the valve on the special tool.



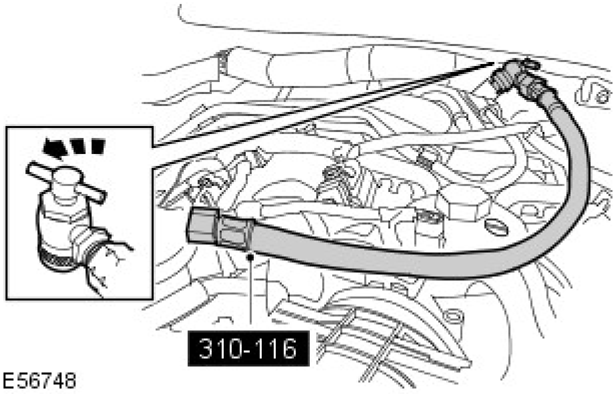
5. Turn the ignition switch to the ON position for 25 seconds. The fuel pump in the fuel tank will be audible.

6. Repeat the above procedure until clean, air free fuel is seen escaping from the special tool.

- While the pump is still running, close the valve on the special tool to prevent air entering the fuel system.

7. Remove the special tool from the Schraeder valve.

- Install the Schraeder valve protective cap.



8. Remove the container.

9. ⚠CAUTION: If a new fuel injection pump is fitted, the following step must be carried out to make sure the fuel injection pump is fully primed. Failure to follow this instruction may result in damage to the vehicle.

Repeat Step 5 four times.

10. NOTE: The engine must be allowed to idle for two minutes to allow air in the fuel injection supply manifolds and fuel injectors to purge.

Start the engine and allow to idle.

11. Install the engine cover. For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

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Fuel System - General Information - Diesel Filter Water Drain-Off

General Procedures

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

⚠ The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

- CAUTIONS:

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

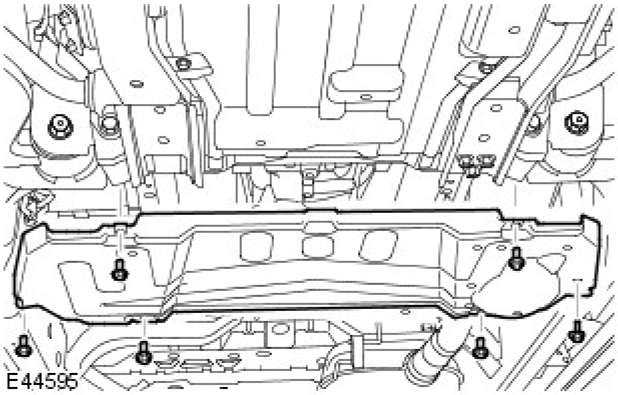
⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

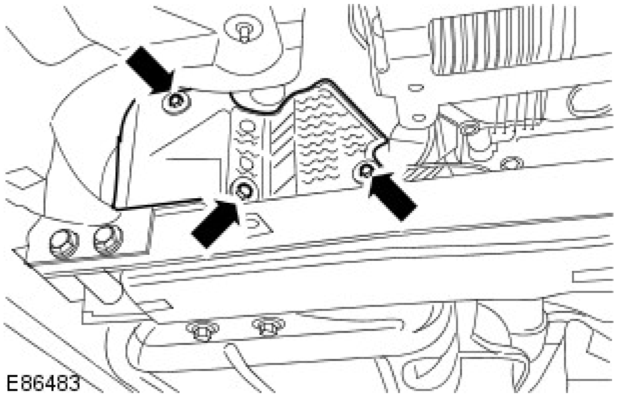
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transmission undershield.

- Remove the 6 bolts.

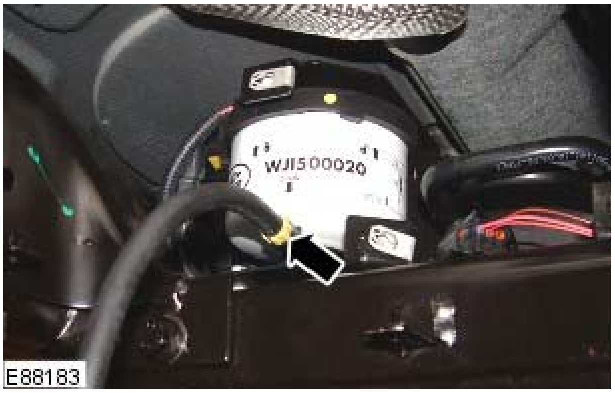




3. ⚠ WARNING: Observe due care when working near a hot exhaust system.

Remove the fuel filter heat shield.

- Remove the 3 bolts.



4. Drain the fuel filter element.

- Attach a suitable drain tube to the water-in-fuel drain port.
- Loosen the water-in-fuel drain port 2 complete turns and allow the fluid to drain into a container.
- Turn the ignition to position 2 until 100ml of fluid is drained, then turn to position O.
- Remove the drain tube.

5. Tighten the water-in-fuel drain port.

6. Install the fuel filter heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).

7. Install the transmission undershield.

- Tighten the bolts to 10 Nm (7 lb.ft).

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Fuel Tank and Lines - V8 S/C 4.2L Petrol -

Capacity

Fuel tank	88.1 litres (19.4 gallons) (23.2 US gallons)

General Specification

Item	**Specification**
System type	Electronic - returnless
Fuel delivery module	Located in the fuel tank
Fuel pump:	
Type/location	Electric - submersible - located in the fuel tank
Operating pressure	500 kPa (5.0 bar) (72.5 lb/in²)
Maximum output @12.3 volts	180 litres/hour (39.6 gallons/hour) (47.5 US gallons/hour)
Fuel filter	Located in the fuel delivery module - fitted with a renewable element
Fuel tank sender units	Two - Front and rear - Front unit is located remotely within the fuel tank, rear is mounted on the body of the fuel pump

Torque Specifications

Description	Nm	lb-ft
Fuel tank bracket bolts	10	7
Fuel tank bolts	45	33
Fuel tank heat shield, bolts	5	4
Fuel tank heat shield, nuts	3	2
Fuel pump module clamp screw	4	3
Fuel tank fuel filler pipe	10	7
Road wheel nuts	140	103

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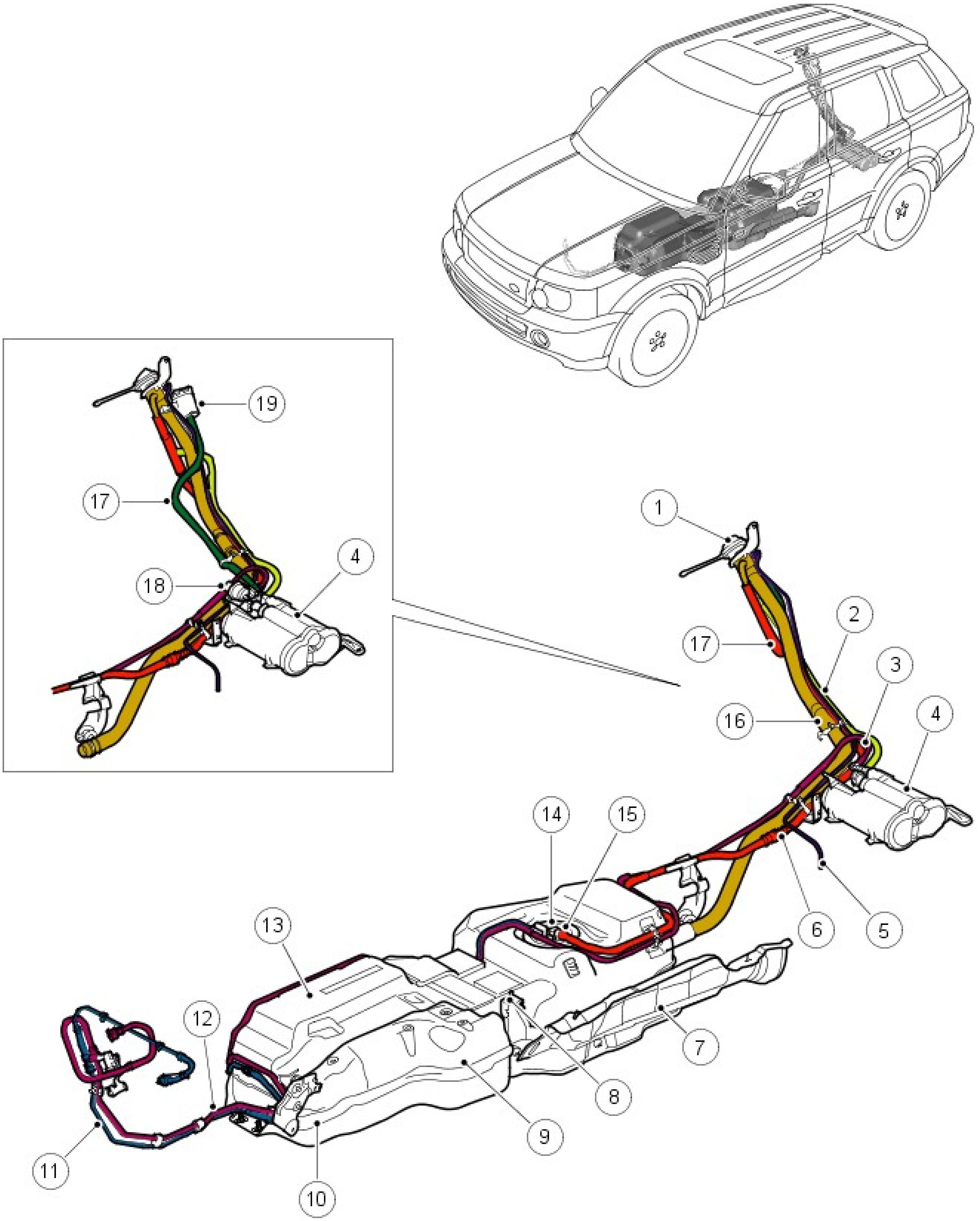
Fuel Tank and Lines - V8 S/C 4.2L Petrol - Fuel Tank and Lines

Description and Operation

Fuel Delivery System Component Location - 4.2L V8 Supercharged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Item	Part Number	Description
1	-	Filler cap and lanyard
2	-	Breather line 'Y' piece to charcoal canister
3	-	Charcoal canister purge line
4	-	Charcoal canister
5	-	Rear differential breather pipe
6	-	Tank breather pipe
7	-	Heat shield
8	-	Mounting screws (6 off) and washers (7 off)
9	-	Cover
10	-	Cradle
11	-	Pipe - Fuel pump to engine (feed)
12	-	Pipe - EVAP purge valve to charcoal canister
13	-	Fuel tank
14	-	Fuel pump module assembly
15	-	Tank breather pipe
16	-	Fuel filler pipe
17	-	Charcoal canister vent pipe
18	-	DMTL pump (NAS only)
19	-	DMTL filter (NAS only)

GENERAL

The major components of the 4.2L V8 supercharged fuel system comprise a fuel tank, a fuel pump, a fuel filler assembly and two fuel level sensors.

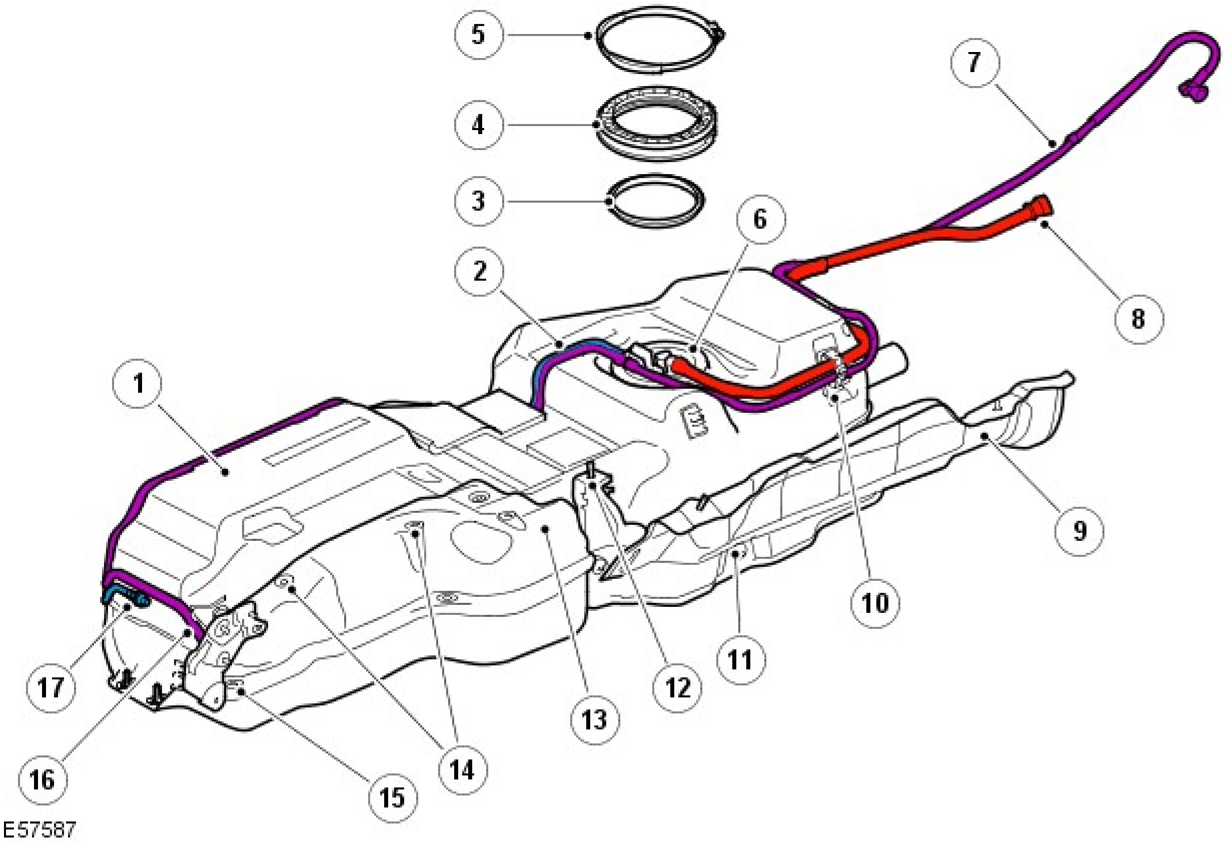
The 4.2L V8 supercharged fuel system uses an electronic returnless fuel system which comprises a pump module mounted in the fuel tank to deliver fuel at variable flow and pressure to the fuel rails which supply fuel to all fuel injectors. The fuel pump operation is regulated by a fuel pump control module which is controlled by the engine management system. The control module regulates the flow and pressure supplied by controlling the operation of the fuel pump using a Pulse Width Modulation (PWM) output.

The fuel rails and the injectors are described in Fuel Charging and Controls – 4.4L V8.
For additional information, refer to: Fuel Charging and Controls (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Description and Operation).

Fuel system emission control is described in Engine Emission Control - 4.2L V8
For additional information, refer to: Evaporative Emissions (303-13A Evaporative Emissions - V8 S/C 4.2L Petrol, Description and Operation).

The fuel pump control module is described in the Electronic Engine Controls 4.2L V8
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation).

FUEL TANK ASSEMBLY



Item	Part Number	Description
1	-	Fuel tank
2	-	Pipe - fuel feed
3	-	Pump module seal
4	-	Pump module collar
5	-	Pump module clamp
6	-	Fuel pump module flange
7	-	Pipe - purge valve to charcoal canister
8	-	Tank breather pipe
9	-	Heat shield
10	-	Clip (2 off)
11	-	Cradle
12	-	Mounting screws (6 off) and washers (7 off)
13	-	Cover
14	-	Scrivet (2 off)
15	-	Screw M6 (2 off)
16	-	Pipe connection - purge valve
17	-	Pipe connection - fuel feed

The fuel tank is located on the right hand side of the vehicle, between the transmission and the right hand chassis longitudinal. The tank is located on a mounting cradle which secures the whole fuel tank assembly to the vehicle. The tank has a useable capacity of 88.1 liters (23.2 US gallons).

The cradle is attached to the chassis with six screws. When the cradle is attached to the chassis, the tank is positively secured via foam pads which bear against the central chassis cross beam. A protective cover is fitted to the front right hand corner of the tank and provides additional protection.

The fuel tank is manufactured from moulded plastic which is a minimum of 3 mm thick. The tank is a sealed unit with the only internal access being via the pump module flange aperture on the top of the tank.

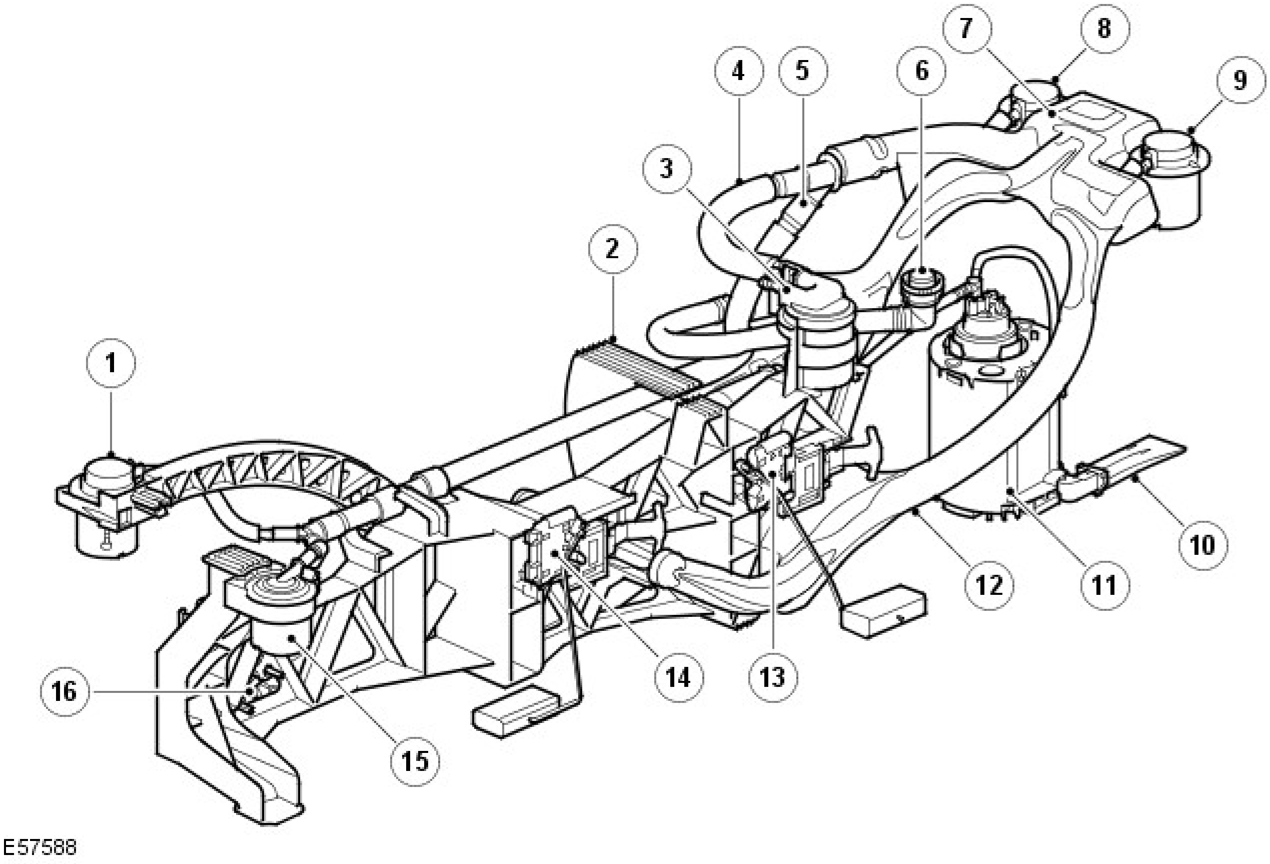
The flange assembly comprises a pump module flange which contains all external pipe and electrical connections for the tank internal components, a collar and a clamp. The flange is fitted with a seal which locates in the tank aperture. An arrow on the flange must be aligned between two moulded lines on the tank, adjacent to the pump module flange aperture, to obtain the correct orientation. The collar is located over the flange and is secured with the clamp. The flange, seal, collar and clamp arrangement meets the sealing requirements of LEV2 emissions.

The flange has a five pin external connector which provides for electrical connections for the level sensors, a common ground for the sensors and the fuel pump. This connector is wired to three push fit connectors on the underside of the flange. A quick release connector provides for the connection of the fuel feed pipe and breather.

A tank carrier assembly is attached inside the tank and is used to locate the internal tank components. The carrier provides location for the front and rear level sensors, the Roll Over Valves (ROVs) and the front jet pump.

The fuel pump module is mounted on a bayonet fitting at the base of the fuel tank. The module locks into position by rotating the module clockwise into the bayonet. The module comprises the fuel pump, the rear jet pump, the pump inlet filter, a second fine mesh filter which mounts into the carrier and an over pressure valve (PRV). The pump module, fuel filter and level sensors are available as serviceable components, the individual assembly components are not available separately.

Fuel Tank Internal Components



Item	Part Number	Description
1	-	Front right hand Roll Over Valve (ROV)
2	-	Carrier assembly
3	-	Fuel Level Vent Valve (FLVV)
4	-	Fuel Level Vent Valve (FLVV) breather corrugated tube to LVS
5	-	Front ROV corrugated tube to LVS
6	-	Connector to underside of fuel pump module flange
7	-	Liquid Vapor Separator (LVS)
8	-	Rear right hand ROV
9	-	Rear left hand ROV
10	-	Filter
11	-	Fuel pump module
12	-	LVS carrier
13	-	Rear fuel level sensor
14	-	Front fuel level sensor
15	-	Front left hand ROV
16	-	Front jet pump (hidden)

The 4.2L V8 supercharged vent system comprises:

- Four Roll Over Valves (ROV)
- One Fuel Level Vent Valve (FLVV)

- One Liquid Vapor Separator (LVS)

The vent system is mounted on the fuel tank internal carrier which is assembled outside of the tank and inserted into the tank during the blow moulding process. None of the internal tank venting components are serviceable.

The two rear ROVs are mounted directly onto the LVS with rubber grommets and secured with clips.

The two front ROVs are located in the front of the tank and are attached to the main beam of the carrier by a moulded clip. Both ROVs are connected to the LVS with a plastic corrugated tube.

The four ROVs vent directly into the LVS. Any liquid fuel is separated from the vapor in the LVS and drains back into the tank via the FLVV. The LVS is connected by a corrugated tube to the fuel pump module flange. This allows fuel vapor to exit the tank.

The main purpose of the FLVV is to control the fill volume of the tank. During filling, vapor is passed via the FLVV to the LVS. The vapor then passes from the LVS to the fuel pump module flange vent connection via a corrugated tube. The flange vent connection is connected to the charcoal canister which stores the fuel vapor. During filling, when the tank reaches its full level, the FLVV closes and prevents fuel vapor passing through to the LVS. This causes the pressure in the tank to rise which in turn causes the pump filling nozzle to turn off.

Fuel Pump Module

The fuel pump module is attached to the base of the fuel tank by the bayonet fitting. The pump module flange has three electrical connectors; one for the fuel pump motor and one for each of the fuel level sensors. All are connected to the external electrical connector via the connectors on the underside of the fuel pump module flange.

The pump module has a maximum rated flow of 180 liters/hour (47.55 US gallons/hour) and an output pressure of 5.0 bar (72.5 lbf/in^2).

The fuel pump is energised by the fuel pump relay which is located in the Battery Junction Box (BJB) and the fuel pump control module which is located in the left hand side of the luggage compartment. The relay and control module are controlled by the engine control module The relay is energized at all times when the ignition switch is in ignition position II.

A 60 micron fine mesh, pump inlet filter is attached to the pump inlet port at the bottom of the pump. The filter is located vertically at the side of the pump to ensure that a portion of the filter is off the base of the swirl pot to prevent premature blocking of the filter.

A second, serviceable fine mesh filter is located in-line. This provides additional filtration to the fuel before it is passed to the fuel rail. The filter has an electrical connection which is attached to ground to prevent electrostatic build-up.

The PRV, which is located in-line before the fuel filter, incorporates a non-return valve which prevents fuel returning to the pump when the engine is not running. This ensures that system pressure is maintained in the fuel feed line to the fuel rail when the engine is not running. It also incorporates an over pressure valve which relieves pressure at between 5.6 and 6.4 bar (81.2 to 92.8 lbf/in^2) during 'hot-soak' conditions when the vehicle is switched off.

Fuel Level Sensors

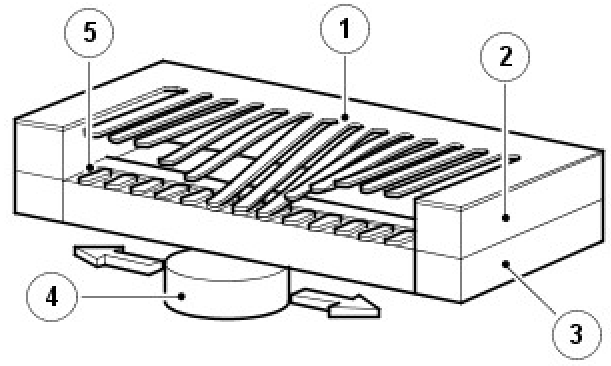
The sensor is a MAgnetic Passive Position Sensor (MAPPS) which provides a variable resistance to ground for the output from the fuel gage. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The front and rear fuel level sensors are connected to the external electrical connector on the flange via the connectors on the underside of the fuel pump module flange.

The front and rear sensors are attached to the carrier and are accessible via the fuel pump flange aperture.

• NOTE: When a service replacement tank is ordered the tank is supplied with the front and rear level sensors fitted

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves, the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.

Sensor Operating Principle



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Item	Part Number	Description
1	-	Magnetic foil
2	-	Spacer
3	-	Ceramic surface
4	-	Magnet
5	-	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal is output proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gage pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning lamp is incorporated in the instrument cluster and illuminates when the fuel level is at or below 10 liters (2.64 US gallons).

The fuel level sender signal is converted into a CAN message by the instrument cluster as a direct interpretation of the fuel tank contents in liters. The ECM uses the CAN message to store additional OBD P Codes for misfire detection when the fuel level is below a predetermined capacity.

Front Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
51	Empty
84	Low fuel level illumination (12.5L)
375	Half full
911	Full

Rear Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
86	Empty
160	Low fuel level illumination (12.5L)
441	Half full
944	Full

Swirl Pot

The swirl pot is located at the rear of the fuel tank and provides for the attachment or location of most of the fuel pump assembly components.

The swirl pot acts as a fuel reserve, providing a constant supply of fuel to the fuel pump irrespective of fuel quantity or vehicle attitude. When the vehicle is level the swirl pot contains approximately 400 cm^3 (24.4 in^3) of fuel when the engine is running. The two jet pumps ensure that fuel is constantly supplied to the swirl pot to provide a sufficient fuel supply for the pump.

A one way valve is located in the base of the swirl pot. The valve allows fuel from the tank to enter the swirl pot, but prevents it from escaping.

Jet Pumps

The fuel system incorporates two jet pumps. The front jet pump is located on the carrier near the front of the fuel tank. The rear jet pump is located in the swirl pot below the fuel pump. Both jet pumps operate on a venturi effect created by the fuel at pump output pressure passing through the jet pump. This draws additional fuel from the tank through ports in the jet pump body, delivering additional fuel to the swirl pot.

The front jet pump is mainly used when the vehicle is driving downhill. The jet pump is connected via a pipe from a three-way connection in the fuel pump. The front jet pump collects fuel from the front of the tank and transfers it into the swirl pot, ensuring a constant supply of fuel to the pump. The jet pump has a jet nozzle of 0.5 mm diameter.

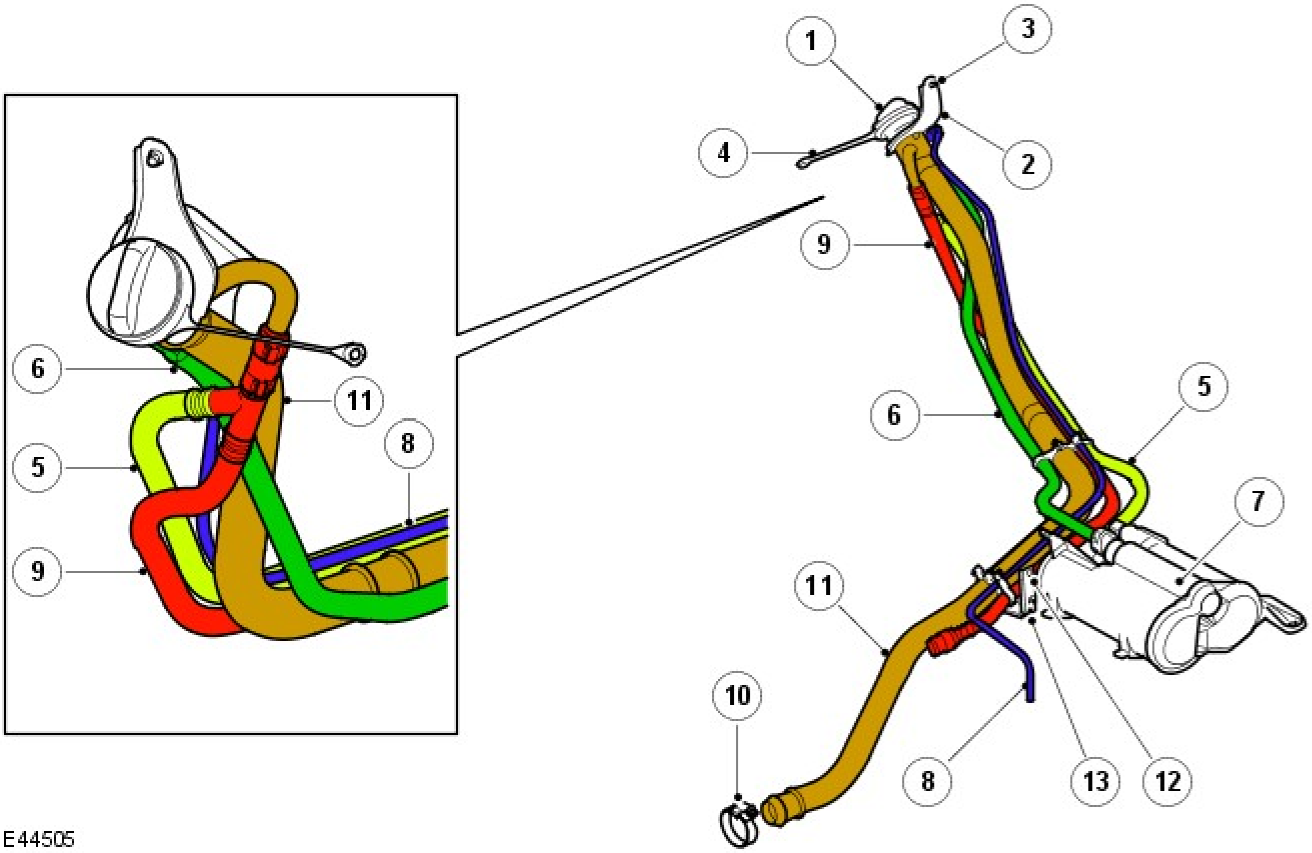
The rear jet pump operates at pump output pressure and delivers some of the fuel at pump pressure from the rear of the tank. The jet pump has a jet nozzle of 0.5 mm diameter.

Roll Over Valves (ROVs)

Four ROVs are located on the carrier and are connected via pipes to a liquid vapour separator. The separator, which is also attached to the carrier, is connected via a pipe to the tank breather outlet in the pump module flange. The ROVs contain non-return valves which close in the event of the vehicle overturning, preventing liquid fuel escaping from the tank via the breather pipe.

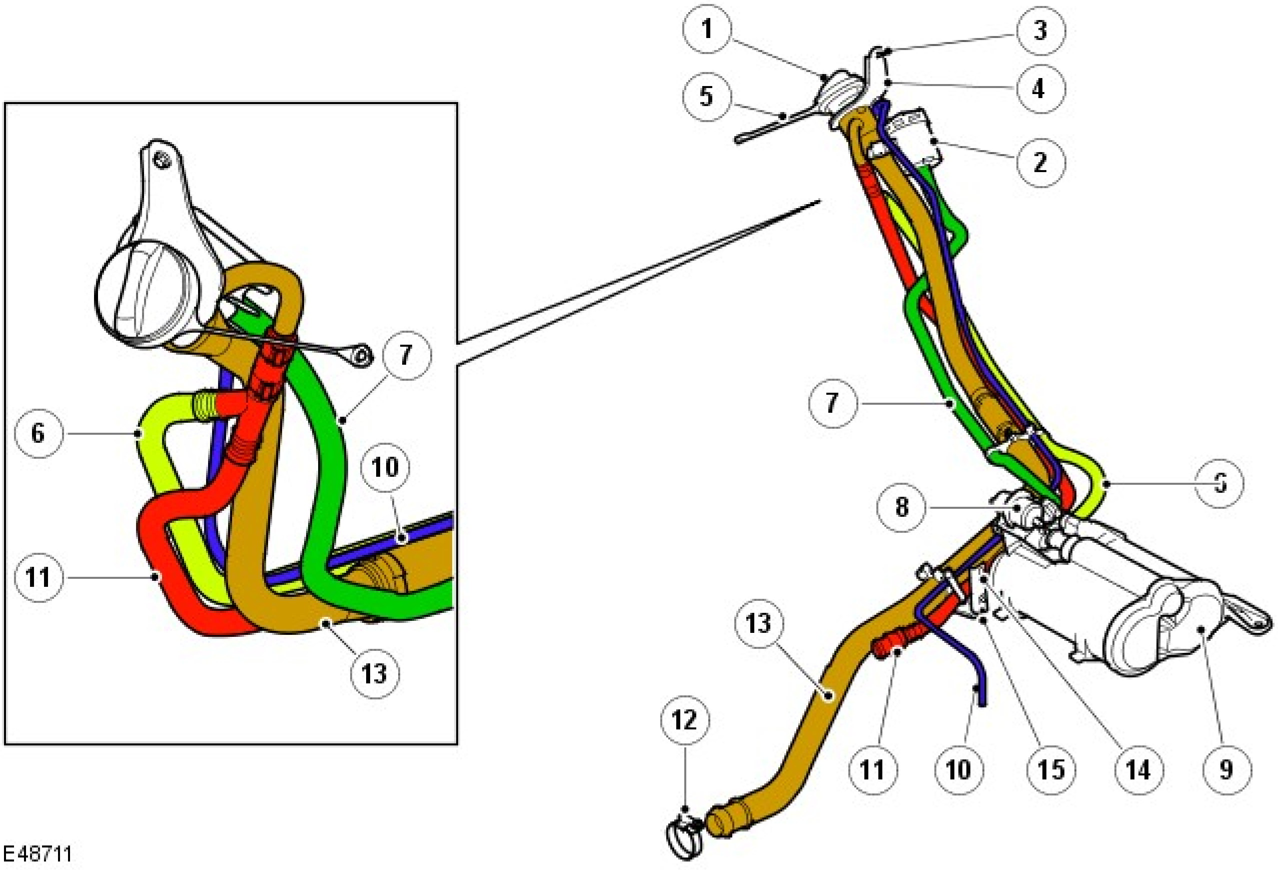
FUEL FILLER PIPE ASSEMBLY

Fuel Filler - ROW



Item	Part Number	Description
1	-	Filler cap
2	-	Bracket
3	-	Screw M6
4	-	Filler cap lanyard
5	-	Charcoal canister breather hose
6	-	Charcoal canister vent hose to atmosphere
7	-	Charcoal canister (ROW)
8	-	Rear differential breather pipe
9	-	Tank breather pipe
10	-	Clamp - filler hose
11	-	Fuel filler pipe
12	-	Screw M8
13	-	Lower mounting bracket to EPB bracket

Fuel Filler - NAS



Item	Part Number	Description
1	-	Filler cap
2	-	DMTL pump filter
3	-	Screw M6
4	-	Bracket
5	-	Filler cap lanyard
6	-	Charcoal canister breather hose
7	-	DMTL pump vent hose to filter
8	-	DMTL pump
9	-	Charcoal canister (NAS)
10	-	Rear differential breather pipe
11	-	Tank breather pipe
12	-	Clamp - filler hose
13	-	Fuel filler pipe
14	-	Screw M8
15	-	Lower mounting bracket to EPB bracket

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head is covered by a moulded plastic cover which is electrically locked when the vehicle is locked. The filler cap is a conventional screw in type which is secured to the vehicle with a lanyard.

- NOTE: The fuel filler head plastic cover does not lock on NAS vehicles.

The filler head is a stainless steel fabrication. Two brackets provide for the attachment of the filler head to the vehicle body and the chassis electronic park brake bracket.

Connections on the rear of the filler head allow for the connection of the fuel tank breather pipe from the fuel tank flange, the fuel filler pipe to the tank and the charcoal canister breather pipe.

The fuel tank breather pipe has a quick release fitting and connects to the breather pipe from the fuel tank flange.

The fuel filler pipe locates in a short flexible hose attached to the tank and is secured with worm drive clamps. The canister breather pipe is routed alongside the fuel filler pipe and attaches to the canister with a quick release coupling.

A fourth pipe is also routed alongside the fuel filler pipe and provides air ventilation for the charcoal canister. On all petrol vehicles, except NAS vehicles, the pipe is connected to the air pump port on the charcoal canister with a quick release coupling and connects to an insect trap at the fuel filler head. On NAS vehicles fitted with a DMTL pump, the pipe connects to the pump vent port and is also connected to a filter which is attached to the filler head.

A smaller pipe, which is not associated with the fuel system, is attached to the side of the fuel filler pipe. This pipe connects to the rear differential and provides breathing for the differential case. The pipe terminates near the fuel filler head.

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Fuel Tank and Lines - V8 S/C 4.2L Petrol - Fuel Tank and Lines

Diagnosis and Testing

Overview

For information on the system operation, refer to section 310-01 - Fuel Tank and Lines in the workshop manual.

Inspection and Verification

- WARNINGS:

⚠ Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.

⚠ If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

⚠ It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Fuel level ● Fuel contamination/grade/quality ● Fuel filter ● Fuel leaks ● Damaged fuel lines ● Damaged push connect fittings ● Fuel filler cap ● Fuel tank filler pipe ● Roll over valves (ROVs)	● Battery charge and condition ● Fuse(s) ● Inertia fuel shutoff (IFS) switch ● Loose or corroded electrical connectors ● Harnesses ● Fuel pump relay ● Fuel pump module ● Fuel pump driver module (FPDM) ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - ○ Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action

Symptom	Possible causes	Action
Engine cranks, but does not fire	● Inertia fuel shutoff (IFS) switch ● Low/Contaminated fuel ● Engine breather system disconnected/restricted ● Ignition system ● Fuel leak ● Blocked fuel filter ● Fuel pump module fault ● Crankshaft position (CKP) sensor ● ECM fault	Check that the inertia switch has not tripped. Check the fuel level/condition. Check the engine breather system. Check for ignition system DTCs. Check the fuel system for leaks/damage. Check the fuel filter for a blockage/restriction. Check the fuel pump module operation. Check the CKP sensor. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Low fuel pressure ● Fuel leak ● Blocked fuel filter ● Fuel pump module fault ● Spark plugs ● HT short to ground (tracking) check rubber boots for cracks/damage ● Ignition coil failure(s) ● Harness	Check the evaporative emissions purge valve. Check the fuel pressure. Check the fuel system for leaks/damage. Check the fuel filter for a blockage/restriction. Check the fuel pump module operation. Check the spark plugs and ignition coils. Refer to the relevant section of the workshop manual.
Difficult to start after hot soak (vehicle standing after engine has reached operating temperature)	● Injector leak ● Fuel temperature sensor ● Intake air temperature (IAT) sensor ● Mass air flow (MAF) sensor ● Evaporative emissions purge valve ● Fuel pump module fault ● Ignition system	Check the fuel injectors. Check the fuel temperature sensor, check the IAT and MAF sensor circuits. Check the evaporative emissions purge valve. Check the operation of the fuel pump module. Check the spark plugs and ignition coil circuits. Refer to the relevant section of the workshop manual.
Engine stalls soon after start	● Breather system disconnected/restricted ● ECM relay ● Harness ● MAF sensor ● Ignition system ● Air cleaner restricted ● Air leakage ● Fuel lines ● Fuel rail pressure (FRP) sensor	Check the engine breather system. Check the ECM relay and circuits. Check the MAF sensor circuits. Check the spark plugs and ignition coil circuits. Check for a restricted air cleaner. Check the intake air system for leaks. Check the fuel lines for leaks/damage. Check the FRP sensor circuits. Refer to the relevant section of the workshop manual.
Engine hesitates/poor acceleration	● Restricted pedal travel (carpet, etc) ● Ignition system ● Air leakage ● Heated oxygen (HO2) sensors ● Fuel pressure ● Blocked fuel filter ● Fuel lines ● Fuel pump module fault ● Injector leak ● Throttle position (TP) sensors ● Throttle motor ● Transmission malfunction ● Accelerator pedal position (APP) sensor	Check the accelerator pedal travel. Check the spark plugs and ignition coil circuits. Check the intake air system for leaks. Check the HO2 sensor circuits. Check the fuel pressure. Check the fuel filter for a blockage/restriction. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the fuel injectors. Check the TP sensor, throttle motor and APP sensor circuits. Refer to the relevant section of the workshop manual.

Symptom	Possible causes	Action
Engine backfires	• Ignition system • Air leakage • Fuel lines • Fuel pump module fault • MAF sensor • HO2 sensors • APP sensor	Check the spark plugs and ignition coil circuits. Check the intake air system for leaks. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the MAF, HO2 and APP sensor circuits. Refer to the relevant section of the workshop manual.
Engine surges	• Fuel lines • Fuel pump module fault • MAF sensor • Harness • TP sensors • Throttle motor • Ignition system • ECM fault	Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the MAF sensor, TP sensor and throttle motor circuits. Check the ignition coil circuits. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Engine detonates/knocks	• Fuel quality • Fuel lines • Fuel pump module fault • Air leakage • FRP sensor • Knock sensor (KS)/circuit malfunction • MAF sensor • HO2 sensors • BARO sensor malfunction (internal ECM fault)	Check the fuel for contamination/grade/quality. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the intake air system for leaks. Check the FRP, KS, MAF and HO2 sensor circuits. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls in the workshop manual.

DTC	Description	Possible causes	Action
P008700	Fuel Rail/System Pressure - Too Low	• Fuel rail pressure (FRP) sensor disconnected • FRP sensor to ECM sensing circuit short circuit to ground • FRP sensor supply circuit high resistance • FRP sensor failure • Fuel line leak • Restricted fuel line • Fuel pump module circuit high resistance • Fuel pump module circuit short circuit to ground • Fuel pump module failure	Check the FRP sensor circuits Check the fuel lines, check the fuel pressure. Refer to the relevant section of the workshop manual. Check the fuel pump module circuits. Refer to the electrical guides.
P008800	Fuel Rail/System Pressure - Too High	• Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense) short circuit to each other • FRP sensor to ECM sense circuit short circuit to power • FRP sensor failure • Fuel pressure control valve (FPCV) fault • Fuel pump module circuit short circuit to power • Fuel pump module failure	Check the FRP sensor circuits, check the FPCV. Refer to the relevant section of the workshop manual. Check the fuel pump module circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
P017100	System Too Lean (Bank 1)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Low fuel pressure ● Fuel filter/system restriction ● Fuel pump module fault ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks. Check the MAF sensor condition and circuits. Check the fuel pressure. Check the fuel filter for a blockage/restriction. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the fuel injectors. Check the exhaust system for leaks, etc. Refer to the relevant section of the workshop manual. Check for evaporative emission DTCs.
P017200	System Too Rich (Bank 1)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions. Check the fuel system for leaks and check the fuel pressure. Check the fuel injectors. Check for fuel system DTCs. Check the oil for contamination/grade/quality. Refer to the relevant section of the workshop manual. Check for MAF sensor and evaporative emission DTCs.
P017400	System Too Lean (Bank 2)	● Air intake leak between MAF sensor and cylinder head ● MAF sensor fault (low intake air flow) ● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Refer to the relevant section of the workshop manual. Check for evaporative emission DTCS.
P017500	System Too Rich (Bank 2)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Refer to the relevant section of the workshop manual. Check for MAF sensor and evaporative emission DTCs.
P030000	Random Misfire Detected	● ECM to ignition coil primary circuit faults (cylinder misfire detected DTCs also logged) ● Ignition coil failure ● Spark plug failure/fouled /incorrect gap ● Fuel delivery pressure (low/high) ● Fuel injector circuit fault(s) (injector DTCs also logged) ● Fuel injectors restricted/leaking ● Fuel injectors continuously open ● Fuel contamination ● Cylinder compression low ● Valve clearance adjustment	Check for ignition coil DTCs. Check the condition of the spark plugs and the gaps. Check the fuel pressure. Check for fuel injector DTCs. Check the fuel for contamination/grade /quality. Check the cylinder compressions, check the valve clearances, check the condition of the camshaft and valve springs. Refer to the relevant section of the workshop manual.

DTC	Description	Possible causes	Action
		- Worn camshaft/broken valve springs	
P046129	Fuel Level Sensor A Circuit Range/Performance	- Fuel level sensor circuits intermittent short circuit or high resistance - Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P04612F	Fuel Level Sensor A Circuit Range/Performance	- Fuel level sensor circuits intermittent short circuit or high resistance - Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P046200	Fuel Level Sensor A Circuit Low	- Fuel level sensor circuits intermittent short circuit to ground or high resistance - Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P046300	Fuel Level Sensor A Circuit High	- Fuel level sensor circuits intermittent short circuit to power - Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P062800	Fuel Pump A Control Circuit Low	- Fuel pump control circuit short circuit to ground - Fuel pump control circuit high resistance - Fuel pump relay fault	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062900	Fuel Pump A Control Circuit High	- Fuel pump control circuit short circuit to power - Fuel pump relay fault	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P131500	Persistent Misfire	- ECM to ignition coil primary circuit fault (cylinder misfire detected DTC also flagged) - Ignition coil failure - Spark plug failure/fouled /incorrect gap - Fuel delivery pressure low - Fuel injector circuit fault(s) (injector DTCs also flagged) - Fuel contamination - Cylinder compression low	Check for ignition coil DTCs. Check the condition of the spark plugs and the gaps. Check the fuel pressure. Check for fuel injector DTCs. Check the fuel for contamination/grade /quality. Check the cylinder compressions. Refer to the relevant section of the workshop manual.

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Fuel Tank and Lines - V8 S/C 4.2L Petrol - Fuel Pump Module

Removal and Installation

Removal

- WARNINGS:

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

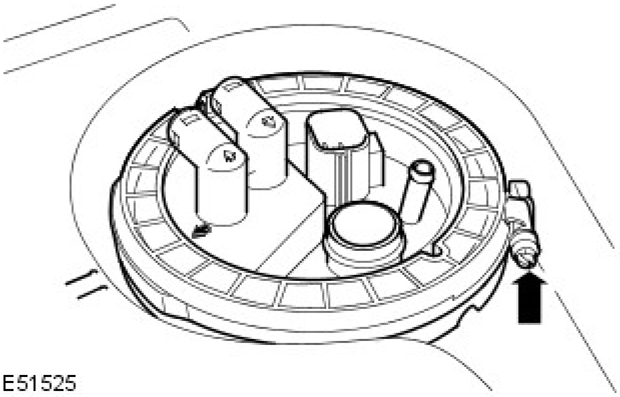
- NOTE: The fuel pump module comprises of a rear fuel level sender, filter and a fuel pressure regulator. These components cannot be serviced separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the fuel tank.
For additional information, refer to: Fuel Tank (310-01B Fuel Tank and Lines - V8 4.4L Petrol, Removal and Installation).

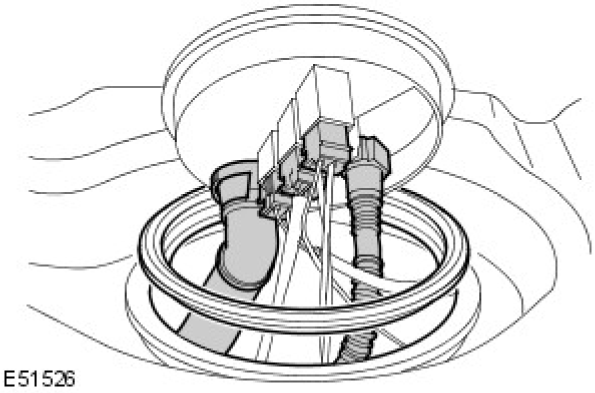


4. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

- NOTE: Note the fitted position.

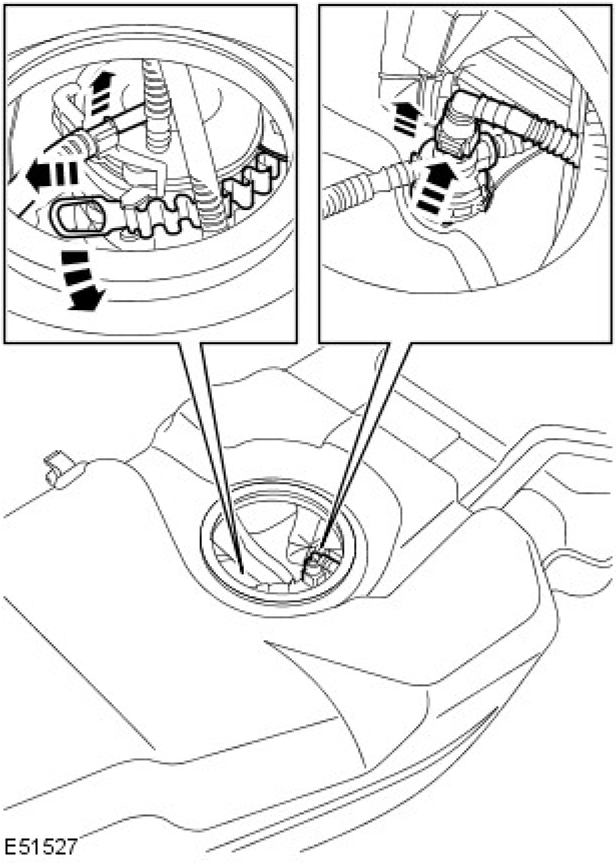
Release the fuel pump module access flange.

- Loosen the screw.
- Remove the clamp.



5. Remove the fuel pump module access flange.

- Disconnect the vent line.
- Disconnect the fuel supply line.
- Disconnect the 3 electrical connectors.
- Remove and discard the seal.



6. Remove the fuel pump module.

- Release the strap.
- Release the fuel pressure regulator.
- Disconnect the 2 fuel lines.

Installation

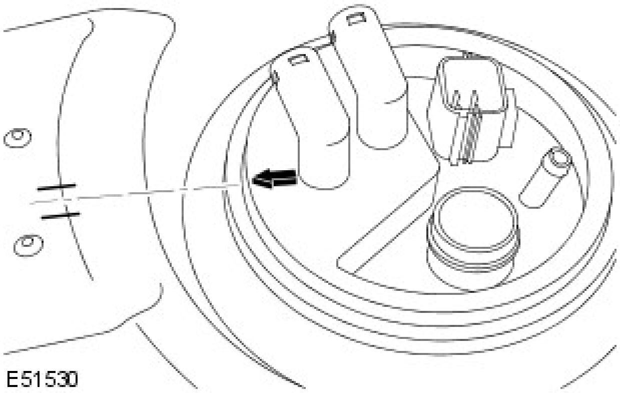
1. Install the fuel pump module.

- Connect the fuel lines.
- Secure with the strap.
- Secure the fuel pressure regulator.

2. Install the fuel pump module access flange.

- Clean the component mating faces.
- Install a new seal.
- Connect the 3 electrical connectors.

- Connect the fuel supply line.
- Connect the vent line.



3. ⚠ CAUTION: Make sure the seal is correctly fitted.

• NOTE: Align to the position noted on removal.

Secure the fuel pump module access flange.

- Install the clamp.
- Tighten the screw to 4 Nm (3 lb.ft).

4. Install the fuel tank.
For additional information, refer to: Fuel Tank (310-01B Fuel Tank and Lines - V8 4.4L Petrol, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Fuel Tank and Lines - V8 S/C 4.2L Petrol - Fuel Tank

Removal and Installation

Removal

• WARNINGS:

Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

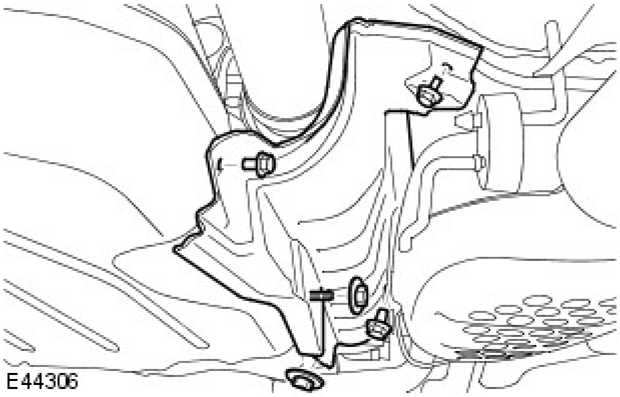
2. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

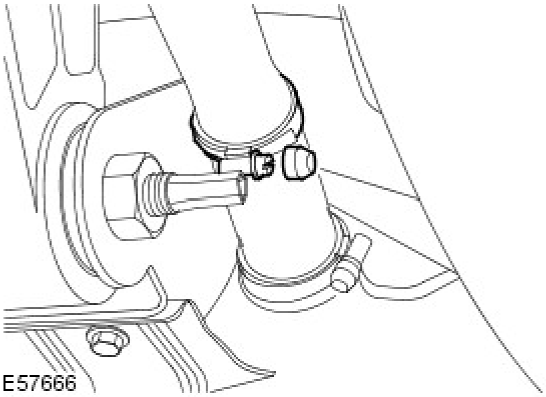
3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.

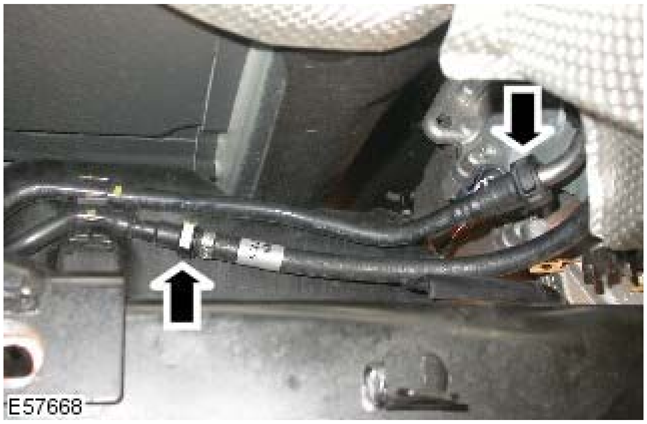




5. ⚠CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

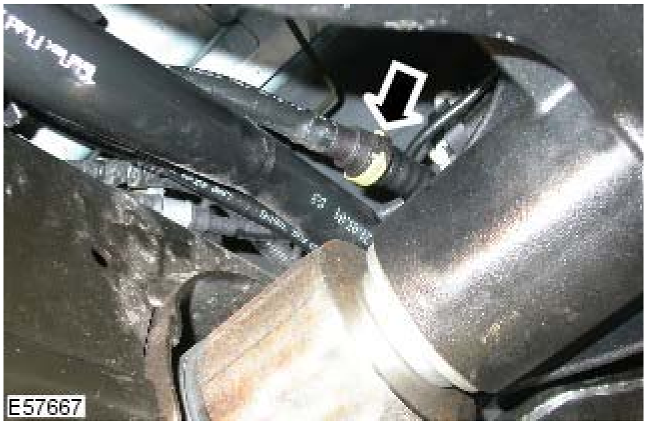
Disconnect the fuel filler neck from the filler neck hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



6. ⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel supply and purge lines quick release connections at the front of the fuel tank.



7. ⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

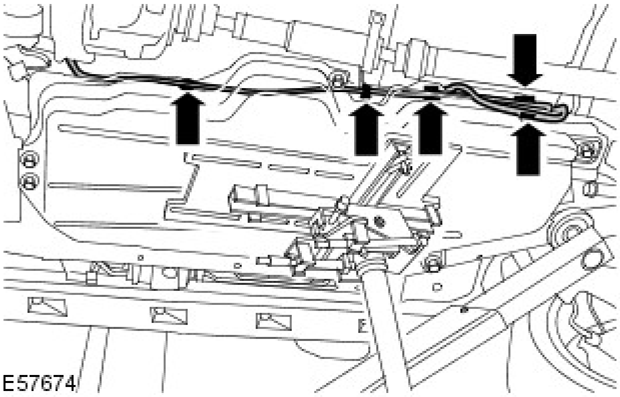
Disconnect the fuel tank vent line.

8. Release the fuel tank harness.

9. Release the parking brake emergency release cable.

- Release from the 4 clips.

10. Remove the 2 emergency release cable clips.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11. ⚠ WARNING: Secure the component to the transmission jack.

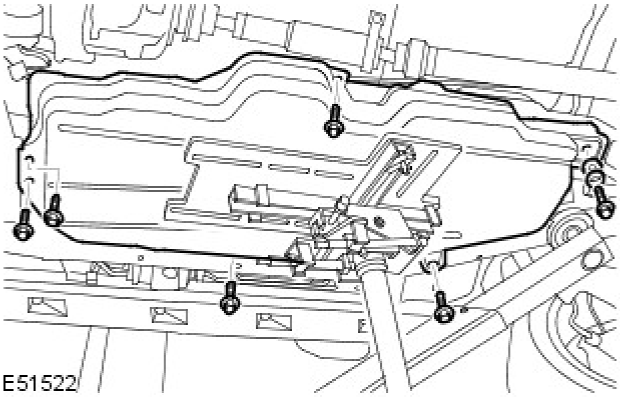
• CAUTIONS:

⚠ Do not lower the fuel tank more than 250 mm (9.75 in)

⚠ Note the rear bolt is fitted with 2 washers.

Using a transmission jack, lower the fuel tank sufficiently only to access the top of the fuel tank.

- Remove the 6 bolts.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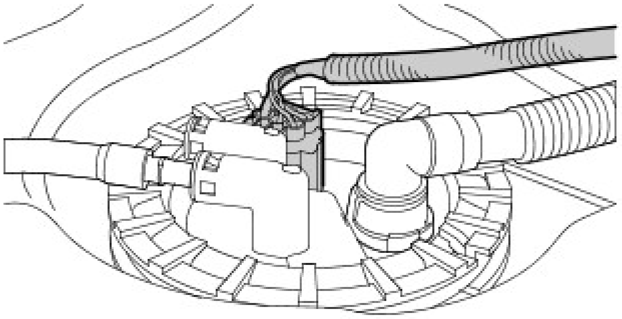
12. Disconnect the fuel pump module electrical connector.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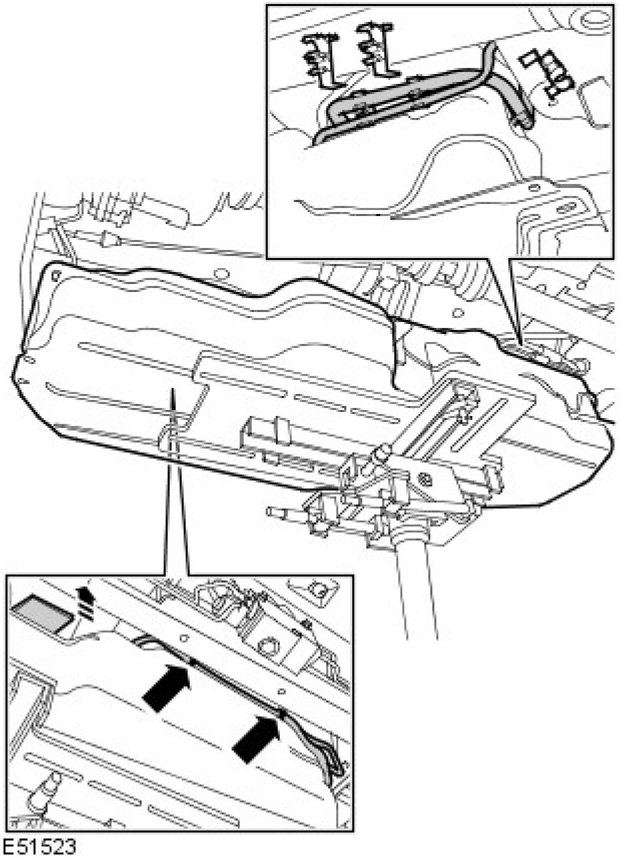


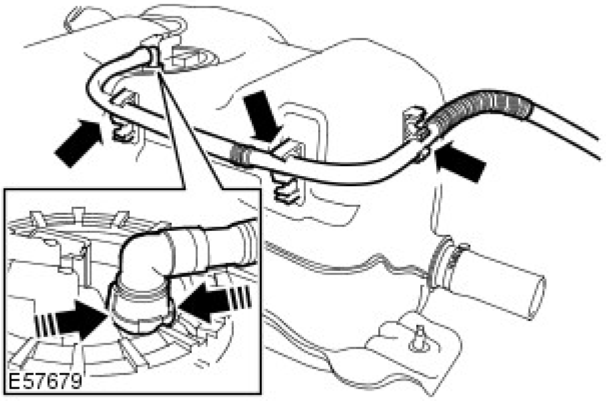
13. Release the purge line from the top of the fuel tank.

- Remove the adhesive pad.
- Release from the 5 clips.

14. Remove the fuel tank.

15. NOTE: Do not disassemble further if the component is removed for access only.

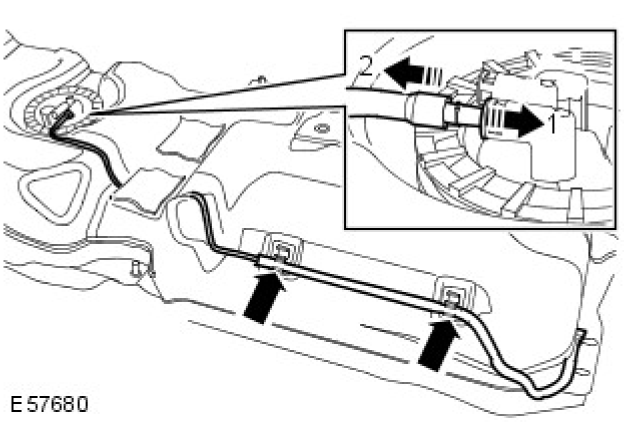
With assistance, remove the fuel tank from the transmission jack.



16. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the fuel tank vent line.

- Disconnect the quick release connector.
- Remove from the 3 clips.

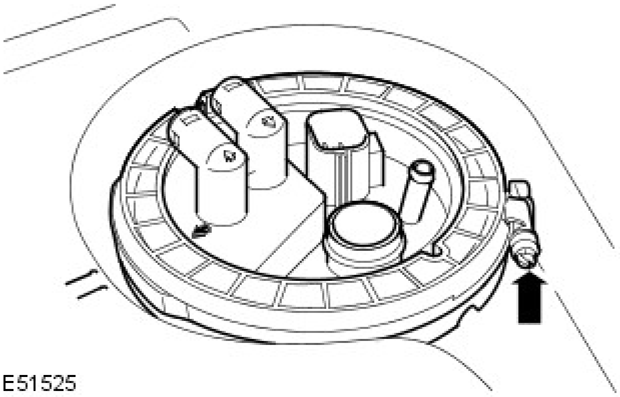


E57680

17. ⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the fuel supply line.

- Disconnect the quick release connector.
- Release from the 2 clips.



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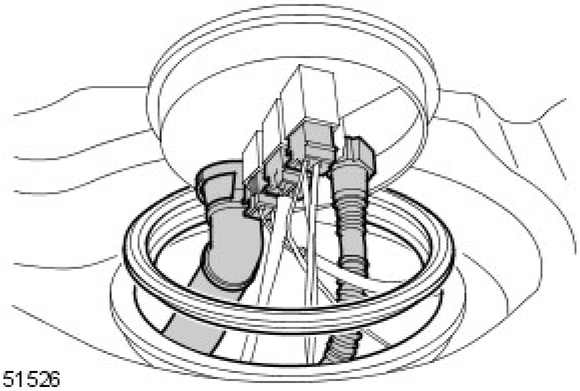
18. ⚠CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Note the fitted position.

Release the fuel pump module access flange.

- Loosen the screw.
- Remove the clamp.

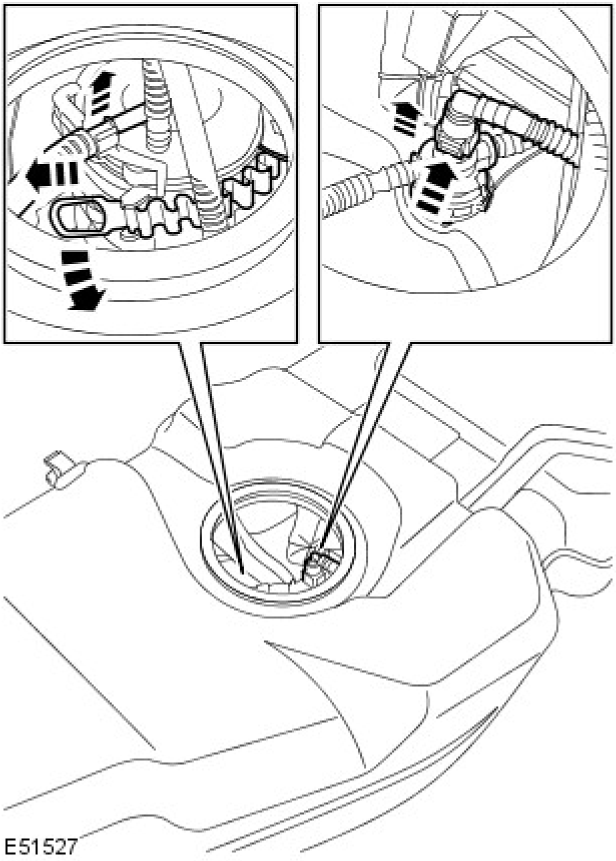


E51526

19. ⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

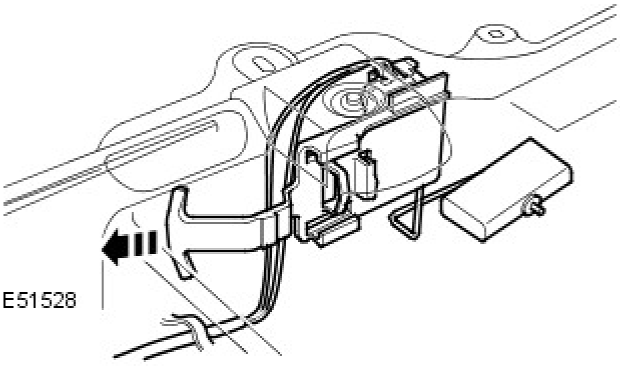
Remove the fuel pump module access flange.

- Disconnect the vent line.
- Disconnect the fuel supply line.
- Disconnect the 3 electrical connectors.
- Remove and discard the seal.



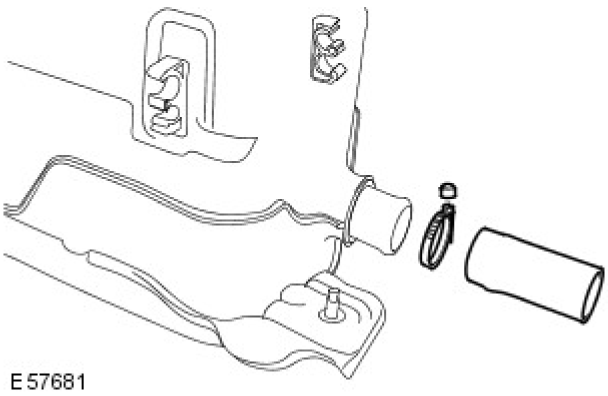
20. Remove the fuel pump module.

- Release the strap.
- Release the fuel pressure regulator.
- Disconnect the 2 fuel lines.



21. Remove the fuel tank front fuel level sender unit.

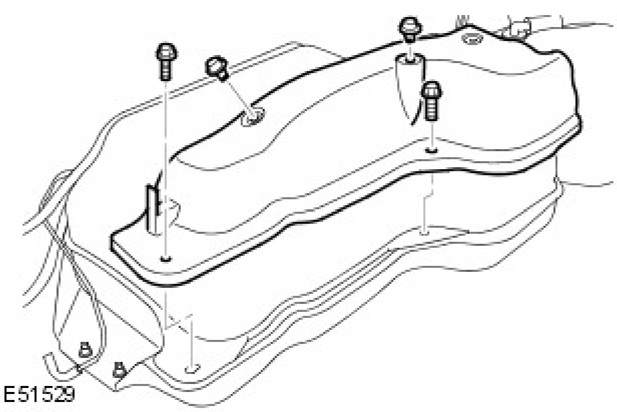
- Release the lead.
- Release the clip.



22. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the fuel filler hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



23. Remove the fuel tank bracket.

- Remove the 2 clips.
- Remove the 2 bolts.
- Remove the retaining plate.

Installation

1. Install the fuel tank bracket.

- Install the retaining plate.
- Install the clips.
- Tighten the bolts to 3.5 Nm (2.5 lb.ft).

2. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Install the fuel filler hose.

- Install a new retaining clip.

3. Install the fuel tank front fuel level sender unit.

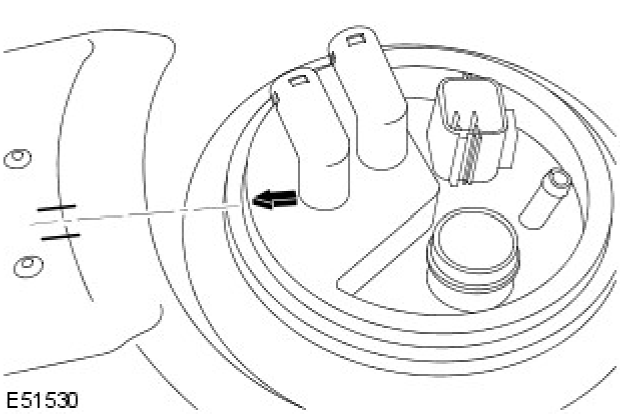
- Secure the clip.
- Secure the lead.

4. Install the fuel pump module.

- Connect the fuel lines.
- Secure with the strap.
- Secure the fuel pressure regulator.

5. Install the fuel pump module access flange.

- Clean the component mating faces.
- Install a new seal.
- Connect the 3 electrical connectors.
- Connect the fuel supply line.
- Connect the vent line.



6. ⚠CAUTION: Make sure the seal is installed correctly.

Secure the fuel pump module access flange.

- Install the clamp.
- Tighten the screw to 4 Nm (3 lb.ft).

7. Install the fuel supply line.

- Connect the quick release connector.
- Secure in the 2 clips.

8. Install the vent line.

- Connect the quick release connector.
- Secure in the 3 clips.

9. With assistance, install the fuel tank to the transmission jack.

10. Position the fuel tank to the vehicle.

11. Secure the purge line to the fuel tank.

- Secure with the clips.
- Install the adhesive pad.

12. Connect the electrical connector.

13. ⚠CAUTION: Note the rear bolt is fitted with 2 washers.

Install the fuel tank.

- Tighten the bolts to 45 Nm (33 lb.ft).

14. Install the 2 emergency release cable clips.

15. Secure the parking brake emergency release cable.

- Secure in the 4 clips.

16. Secure the fuel tank harness.

17. Connect the vent line.

18. Connect the fuel supply and purge lines.

19. ⚠CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

20. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

21. Refill the fuel tank.

For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

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Fuel Tank and Lines - V8 S/C 4.2L Petrol - Fuel Tank Filler Pipe

Removal and Installation

Removal

- WARNINGS:

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Position the vehicle on a lift.

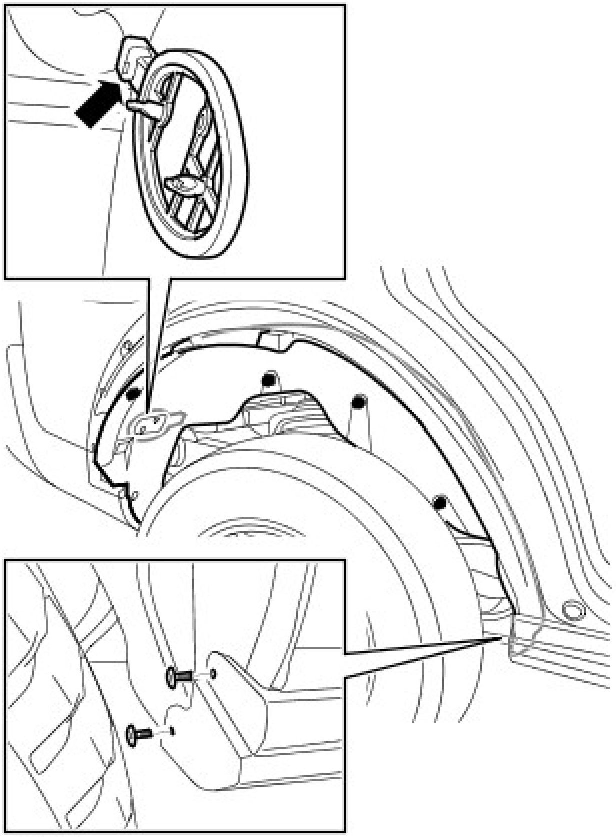
2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

4. Remove the RH rear wheel and tire.

5. Remove the fender splash shield.

- Remove the 2 screws.
- Remove the 6 retainers.
- Disconnect the electrical connector.



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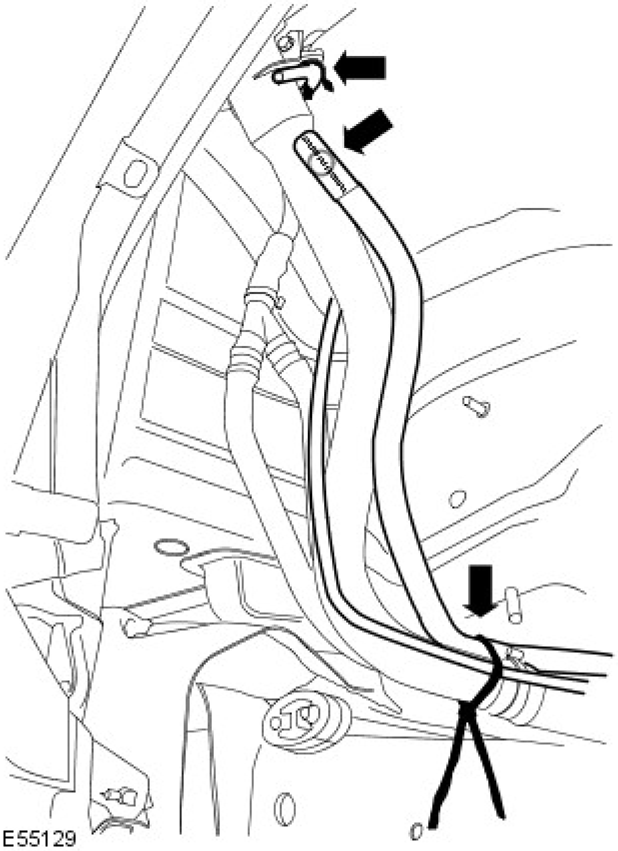
6. Remove the fuel filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

7. Remove the spare wheel and tire.



8. Disconnect the breather pipes.

- Remove the clip.
- Release the 2 clips.
- Remove and discard the cable tie.

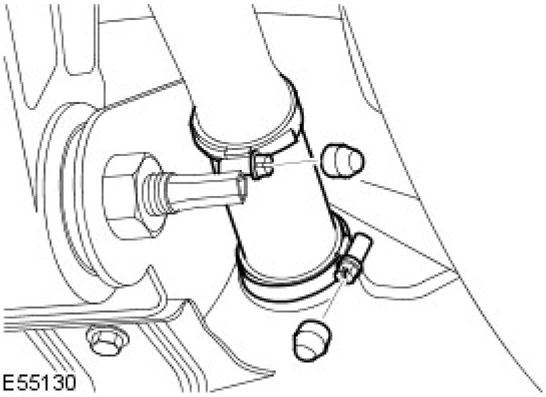
9. ⚠CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

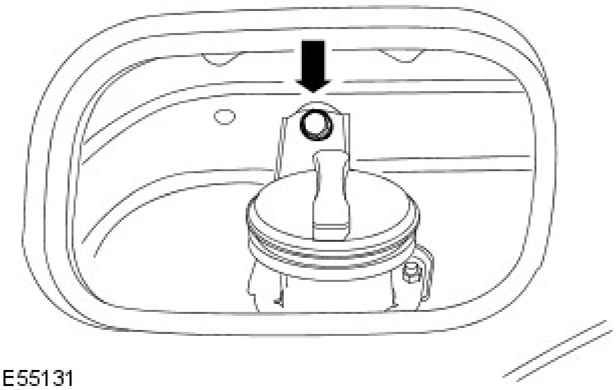
Disconnect the fuel filler neck from the fuel tank.

- Remove the tamper proof cover.
- Remove and discard the hose clip.

10. Remove the fuel tank filler pipe connector hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.





11. NOTE: Note the fitted position.

Remove the fuel tank filler pipe.

- Remove the bolt.

Installation

1. Install the filler pipe connector hose.

- Install the new tamper proof clip.

2. NOTE: Align to the position noted on removal.

Install the fuel tank filler pipe.

- Install the bolt and tighten to 10 Nm (7 lb.ft).

3. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

4. Connect the breather pipes.

- Secure the clips.

5. Install the filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

6. Install the fender splash shield.

7. Install the wheel and tire.

8. Install the spare wheel and tire.

9. Refill the fuel tank.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Fuel Tank and Lines - V8 4.4L Petrol -

Capacity

Fuel tank	86.3 litres (18.9 gallons) (22.7 US gallons)

General Specification

Item	Specification
System type	Mechanical - returnless
Fuel delivery module	Located in the fuel tank
Fuel pump:	
Type/location	Electric - submersible - located in the fuel tank
Operating pressure	450 kPa (4.5 bar) (65.25 lb/in²)
Maximum output @12.3 volts	122 litres/hour (26.8 gallons/hour) (32.2 US gallons/hour)
Fuel pressure regulator:	
Type/location	In-line, within fuel tank
Operating pressure	450 kPa (4.5 bar) (65.25 lbf/in²)
Fuel filter	Located in the fuel delivery module - fitted with a renewable element
Fuel tank sender units	Two - Front and rear - Front unit is located remotely within the fuel tank, rear is mounted on the body of the fuel pump

Torque Specifications

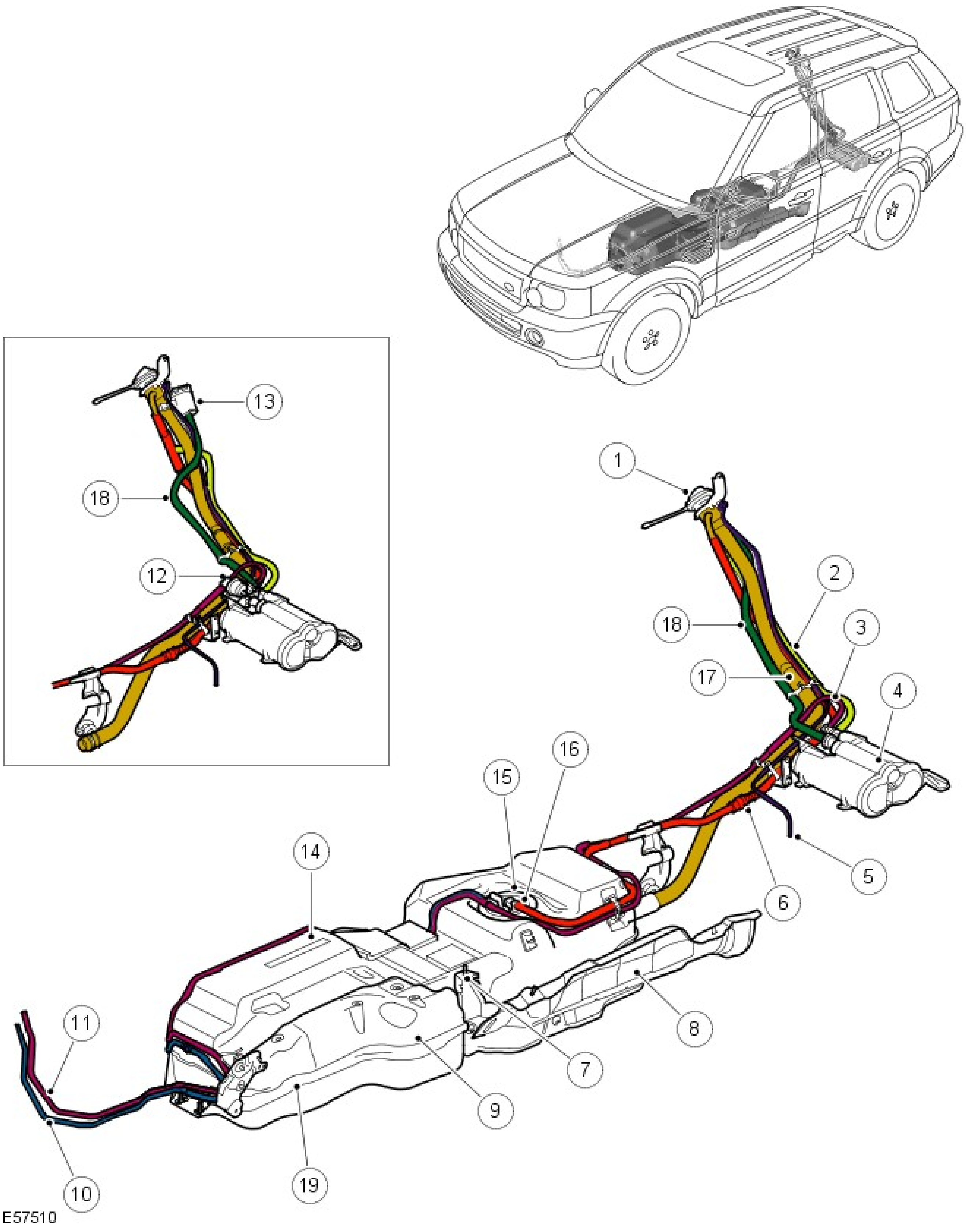
Description	Nm	lb-ft
Fuel tank bracket bolts	10	7
Fuel tank bolts	45	33
Fuel tank heat shield, bolts	5	4
Fuel tank heat shield, nuts	3	2
Fuel pump module clamp screw	4	3
Fuel tank fuel filler pipe	10	7
Road wheel nuts	140	103

Published: 11-May-2011

Fuel Tank and Lines - V8 4.4L Petrol - Fuel Tank and Lines

Description and Operation

Fuel Delivery System Component Location - 4.4L V8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Item	Part Number	Description
1	-	Filler cap and lanyard
2	-	Breather line 'Y' piece to charcoal canister
3	-	Charcoal canister purge line
4	-	Charcoal canister
5	-	Rear differential breather pipe
6	-	Tank breather pipe
7	-	Mounting screw (6 off) and washers (7 off)
8	-	Heat shield
9	-	Cover
10	-	Pipe - Fuel pump to engine (feed)
11	-	Pipe - EVAP purge valve to charcoal canister
12	-	DMTL pump (NAS only)
13	-	DMTL filter (NAS only)
14	-	Fuel tank
15	-	Fuel pump module assembly
16	-	Tank breather pipe
17	-	Fuel filler pipe
18	-	Charcoal canister vent pipe
19	-	Cradle

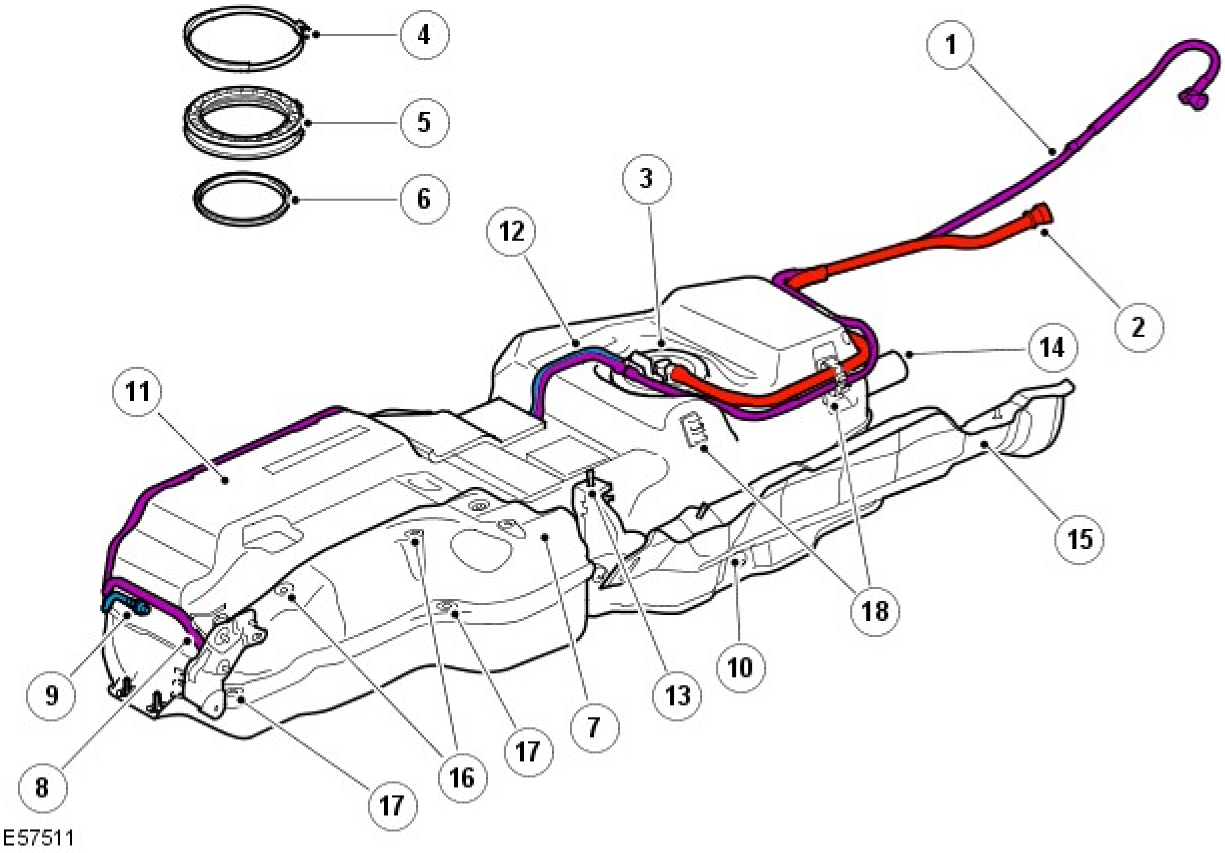
GENERAL

The major components of the 4.4L V8 fuel system comprise a fuel tank, a fuel pump, a fuel filler assembly and two fuel level sensors.

The 4.4L V8 fuel system uses a fuel pump mounted in the fuel tank to deliver a uniform level of pressure to the fuel rails which supply fuel to all fuel injectors. The fuel rails and the injectors are described in Fuel Charging and Controls – 4.4L V8.
For additional information, refer to: Fuel Charging and Controls (303-04B Fuel Charging and Controls - V8 4.4L Petrol, Description and Operation).

Fuel system emission control is described in Engine Emission Control - 4.4L V8
For additional information, refer to: Engine Cooling (303-03B Engine Cooling - V8 4.4L Petrol, Description and Operation).

FUEL TANK ASSEMBLY



Item	Part Number	Description
1	-	Pipe - purge valve to charcoal canister
2	-	Tank breather pipe
3	-	Fuel pump module flange
4	-	Pump module clamp
5	-	Pump module collar
6	-	Pump module seal
7	-	Cover
8	-	Pipe connection - purge valve
9	-	Pipe connection - fuel feed
10	-	Cradle
11	-	Fuel tank
12	-	Pipe - fuel feed
13	-	Mounting screws (6 off) and washers (7 off)
14	-	Fuel filler hose
15	-	Heat shield
16	-	Scrivet (2 off)
17	-	Screw M6 (2 off)
18	-	Clip cover (2 off)

The fuel tank is located on the right hand side of the vehicle, between the transmission and the right hand chassis longitudinal. The tank is located on a mounting cradle which secures the whole fuel tank assembly to the vehicle. The tank has a useable capacity of 88.1 liters (23.2 US gallons).

The cradle is attached to the chassis with six screws. When the cradle is attached to the chassis, the tank is positively secured via foam pads which bear against the central chassis cross beam. A protective cover is fitted to the front right hand corner of the tank and provides additional protection.

The fuel tank is manufactured from moulded plastic which is a minimum of 3 mm thick. The tank is a sealed unit with the only internal access being via the pump module flange aperture on the top of the tank.

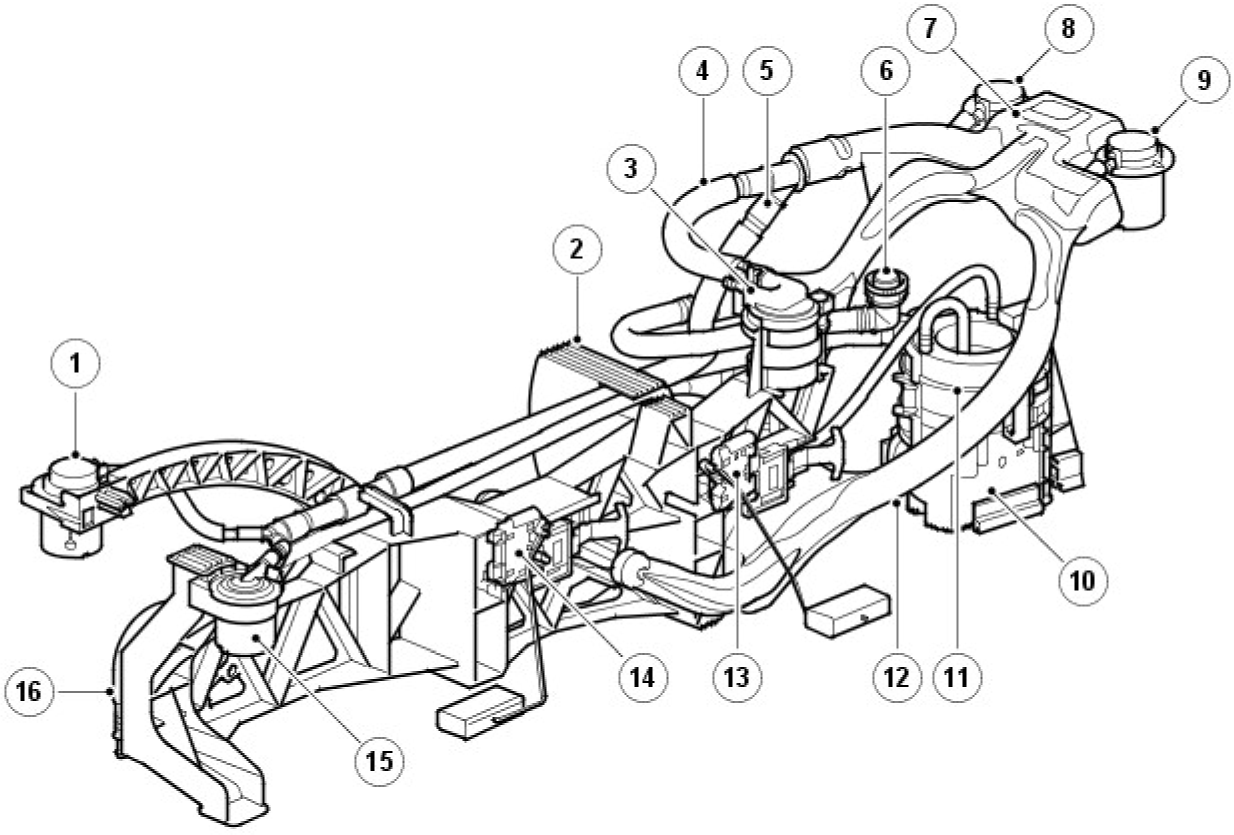
The flange assembly comprises a pump module flange which contains all external pipe and electrical connections for the tank internal components, a collar and a clamp. The flange is fitted with a seal which locates in the tank aperture. An arrow on the flange must be aligned between two moulded lines on the tank, adjacent to the pump module flange aperture, to obtain the correct orientation. The collar is located over the flange and is secured with the clamp. The flange, seal, collar and clamp arrangement meets the sealing requirements of LEV2 emissions.

The flange has a five pin external connector which provides for electrical connections for the level sensors, level sensors common ground and the fuel pump. This connector is wired to three push fit connectors on the underside of the flange. A quick release connector provides for the connection of the fuel feed pipe and breather.

A tank carrier assembly is attached inside the tank and is used to locate the internal tank components. The carrier provides location for the fuel pump module, the front and rear level sensors, the Roll Over Valves (ROVs), the Fuel Level Vent Valve (FLVV) and the front jet pump.

The fuel pump module comprises the fuel pump, the rear jet pump, the pump inlet filter, a second fine mesh filter and the fuel pressure regulator. The fuel pressure regulator is housed in a manifold attached to the carrier assembly. Only the pump module assembly and level sensors are available as serviceable components, the individual assembly components are not available separately.

Fuel Tank Internal Components



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Item	Part Number	Description
1	-	Front right hand Roll Over Valve (ROV)
2	-	Carrier assembly
3	-	Fuel Level Vent Valve (FLVV)
4	-	Fuel Level Vent Valve (FLVV) breather corrugated tube to LVS
5	-	Front ROV corrugated tube to LVS
6	-	Tank breather connector to underside of fuel pump module flange
7	-	Liquid Vapor Separator (LVS)
8	-	Rear right hand ROV
9	-	Rear left hand ROV
10	-	Swirl pot
11	-	Fuel pump module
12	-	LVS carrier
13	-	Rear fuel level sensor
14	-	Front fuel level sensor
15	-	Front left hand ROV
16	-	Front jet pump

The 4.4L V8 vent system comprises:

- Four Roll Over Valves (ROV)
- One Fuel Level Vent Valve (FLVV)
- One Liquid Vapor Separator (LVS)

The vent system is mounted on the fuel tank internal carrier which is assembled outside of the tank and inserted into the tank during the blow moulding process. None of the internal tank venting components are serviceable.

The two rear ROVs are mounted directly onto the LVS with rubber grommets and secured with clamps.

The two front ROVs are located in the front of the tank and are attached to the main beam of the carrier by a moulded clip. Both ROVs are connected to the LVS with a plastic corrugated tube.

The four ROVs vent directly into the LVS. Any liquid fuel is separated from the vapor in the LVS and drains back into the tank via the FLVV. The LVS is connected by a corrugated tube to the fuel pump module flange. This allows fuel vapor to exit the tank during refuelling.

The main purpose of the FLVV is to control the fill volume of the tank. During filling, excess vapor is passed via the FLVV to the LVS. The vapor then passes from the LVS to the fuel pump module flange vent connection via a corrugated tube. The flange vent connection is connected to the charcoal canister which stores the fuel vapor. During filling, when the tank reaches its full level, the FLVV closes and prevents fuel vapor passing through to the LVS. This causes the pressure in the tank to rise which in turn causes the pump filling nozzle to turn off.

Fuel Pump Module

The fuel pump module is attached to the carrier and is located at the bottom of the swirl pot. The pump module flange has three electrical connectors; one for the fuel pump motor and one for each of the fuel level sensors. All are connected to the external electrical connector via the connectors on the underside of the fuel pump module flange.

The pump module has a rated flow of 122 liters/hour (32.2 US gallons/hour) at a voltage of 12.3V and an output pressure of 4.5 bar (65.2 lbf/in^2).

The fuel pump is energised by the fuel pump relay which is located in the Battery Junction Box (BJB). The relay is controlled by the engine control module and energises the relay at all times when the ignition switch is in ignition position II.

A pump inlet filter is attached to the pump inlet port at the bottom of the pump. The filter has a 'winged' section which is located vertically at the side of the pump to ensure that a portion of the filter is off the base of the swirl pot, to prevent premature blocking of the filter. The filter has a 31 micron fine mesh filter with a surface area of 70 cm^2 (10.8 in^2).

A second fine mesh filter is located around the top of the fuel pump. This provides additional filtration to the fuel before it is passed into the manifold and onto the fuel rail. The filter has an electrical connection which is attached to ground to prevent electrostatic build-up.

The fuel filter outlet also incorporates a non-return valve which prevents fuel returning to the pump when the engine is not running. This ensures that system pressure is maintained in the fuel feed line to the fuel rail when the engine is not running.

Fuel Level Sensors

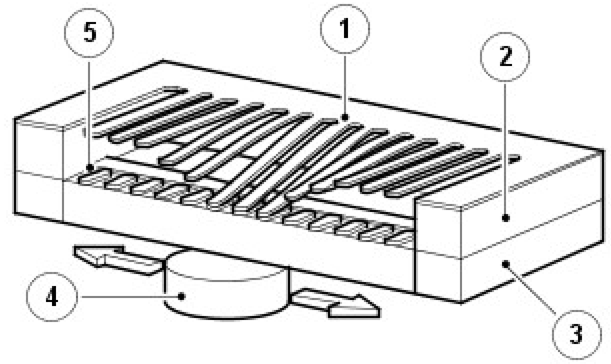
The sensor is a MAgnetic Passive Position Sensor (MAPPS) which provides a variable resistance to ground for the output from the fuel gage. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The front and rear fuel level sensors are connected to the external electrical connector on the flange via the connectors on the underside of the fuel pump module flange.

The front and rear sensors are attached to the carrier and are accessible via the fuel pump flange aperture.

• NOTE: When a service replacement tank is ordered the tank is supplied with the front and rear level sensors fitted

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.

Sensor Operating Principle



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Item	Part Number	Description
1	-	Magnetic foil
2	-	Spacer
3	-	Ceramic surface
4	-	Magnet
5	-	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal is output proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gage pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning lamp is incorporated in the instrument cluster and illuminates when the fuel level is at or below 12.5 liters (3.30 US gallons).

The fuel level sender signal is converted into a CAN message by the instrument cluster as a direct interpretation of the fuel tank contents in liters. The ECM uses the CAN message to store additional OBD P Codes for misfire detection when the fuel level is below a predetermined capacity.

Front Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
51	Empty
84	Low fuel level illumination (12.5L)
375	Half full
911	Full

Rear Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
86	Empty
160	Low fuel level illumination (12.5L)
441	Half full
944	Full

Fuel Pressure Regulator

The fuel pressure regulator is located in the manifold inside the fuel tank. The regulator controls the fuel pressure in the feed pipe to the fuel rail by allowing some fuel to be diverted to the front jet pump.

The regulator is subject to pump output pressure. The regulator maintains the pressure of the fuel delivered to the fuel rail to 4.5 bar (65.2 lbf/in^2). The regulator is required to maintain the fuel pressure at the optimum pressure for correct fuel injection.

Swirl Pot

The swirl pot is located at the rear of the fuel tank and provides for the attachment or location of most of the fuel pump assembly components.

The swirl pot acts as a fuel reserve, providing a constant supply of fuel to the fuel pump irrespective of fuel quantity or vehicle attitude. When the vehicle is level the swirl pot contains approximately 400 cm^3 (24.4 in^3) of fuel when the engine is running. The two jet pumps ensure that fuel is constantly supplied to the swirl pot to provide a sufficient fuel supply for the pump.

A one way valve is located in the base of the swirl pot. The valve allows fuel from the tank to enter the swirl pot, but prevents it from escaping.

Jet Pumps

The fuel system incorporates two jet pumps. The front jet pump is located on the carrier near the front of the fuel tank. The front jet pump is mainly used when the vehicle is driving downhill. The jet pump is connected via a pipe from the fuel manifold and receives fuel diverted from the fuel feed pipe by the pressure regulator. The front jet pump collects fuel from the front of the tank and transfers it into the swirl pot, ensuring a constant supply of fuel to the pump. The front jet pump has a jet nozzle of 2.1 mm diameter.

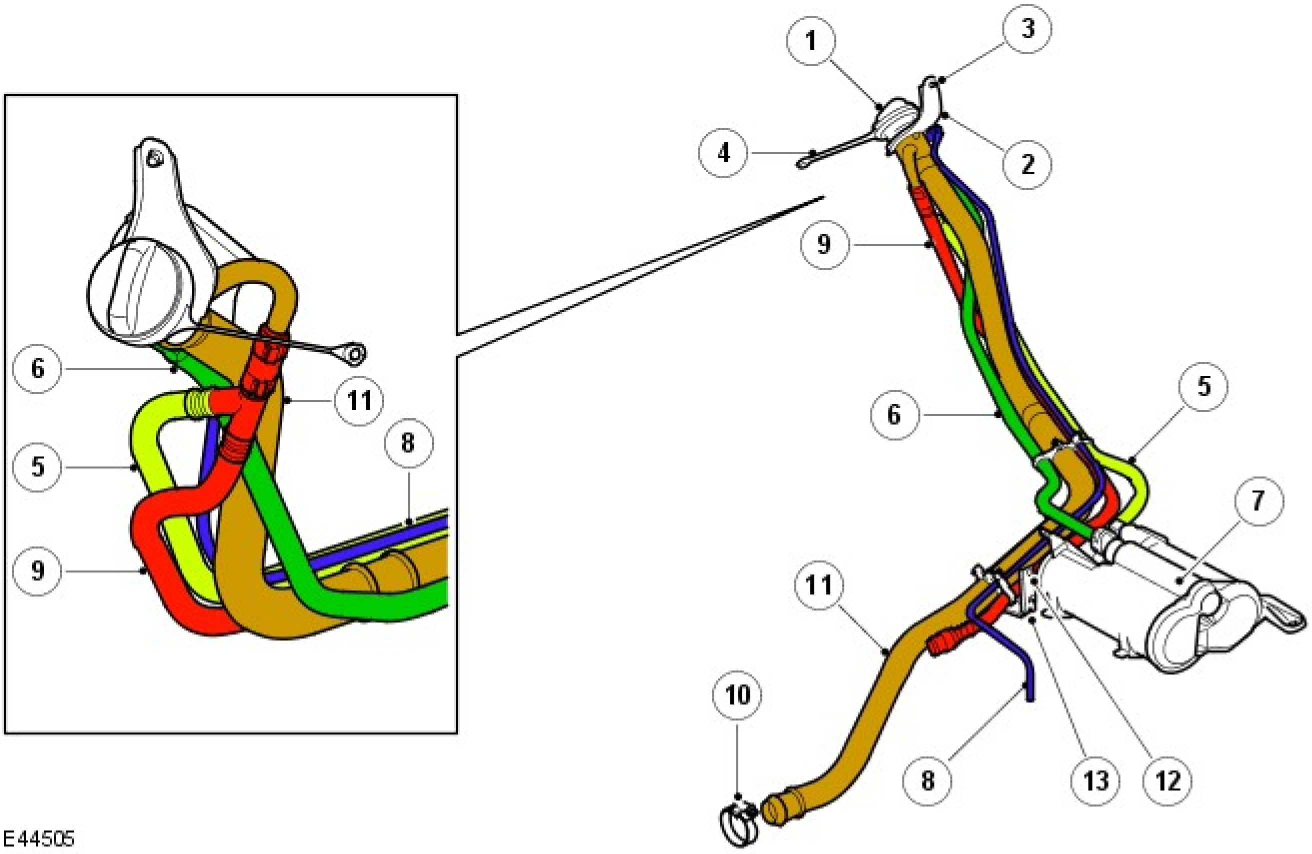
The rear jet pump is located in the swirl pot below the fuel pump and picks up fuel at the rear of the tank. The jet pump operates on a venturi effect created by the fuel at pump output pressure passing through the jet pump. This draws additional fuel from the tank through ports in the jet pump body, delivering additional fuel to the swirl pot. The rear jet pump has a jet nozzle diameter of 0.47 mm.

Roll Over Valves (ROVs)

Four ROVs are located on the carrier and are connected via pipes to a liquid vapour separator. The separator, which is also attached to the carrier, is connected via a pipe to the tank breather outlet in the pump module flange. The ROVs contain non-return valves which close in the event of the vehicle overturning, preventing liquid fuel escaping from the tank via the breather pipe.

FUEL FILLER PIPE ASSEMBLY

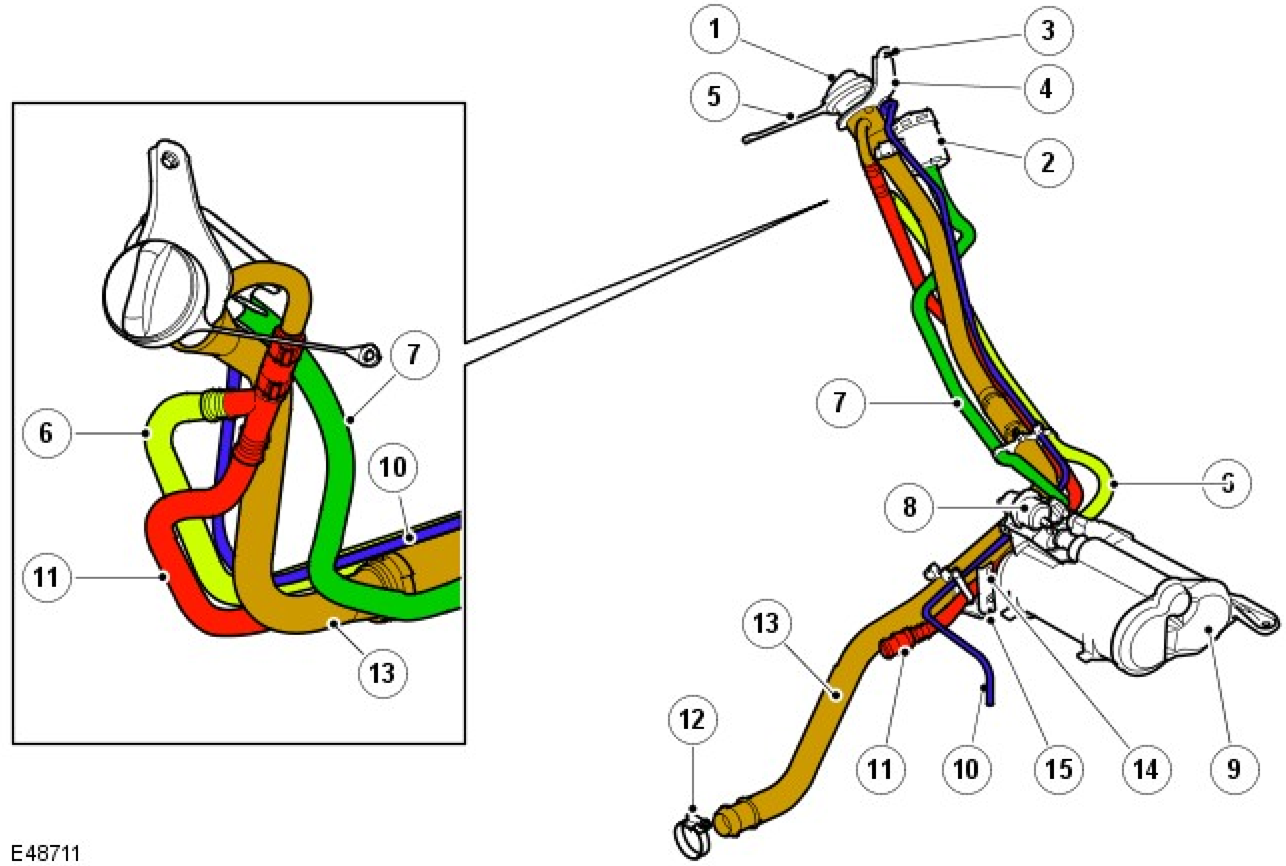
Fuel Filler - ROW



Item	Part Number	Description
1	-	Filler cap
2	-	Bracket
3	-	Screw M6
4	-	Filler cap lanyard
5	-	Charcoal canister breather hose
6	-	Charcoal canister vent hose to atmosphere
7	-	Charcoal canister (ROW)
8	-	Rear differential breather pipe
9	-	Tank breather pipe

10	-	Clamp - filler hose
11	-	Fuel filler pipe
12	-	Screw M8
13	-	Lower mounting bracket to EPB bracket

Fuel Filler - NAS



Item	Part Number	Description
1	-	Filler cap
2	-	DMTL pump filter
3	-	Screw M6
4	-	Bracket
5	-	Filler cap lanyard
6	-	Charcoal canister breather hose
7	-	DMTL pump vent hose to filter
8	-	DMTL pump
9	-	Charcoal canister (NAS)
10	-	Rear differential breather pipe
11	-	Tank breather pipe
12	-	Clamp - filler hose
13	-	Fuel filler pipe
14	-	Screw M8
15	-	Lower mounting bracket to EPB bracket

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head is covered by a moulded plastic cover which is electrically locked when the vehicle is locked. The filler cap is a conventional screw in type which is secured to the vehicle with a lanyard.

• NOTE: The fuel filler head plastic cover does not lock on NAS vehicles.

The filler head is a stainless steel fabrication. Two brackets provide for the attachment of the filler head to the vehicle body and the chassis electronic parking brake bracket.

Connections on the rear of the filler head allow for the connection of the fuel tank breather pipe from the fuel tank flange, the fuel filler pipe to the tank and the charcoal canister breather pipe.

The fuel tank breather pipe has a quick release fitting and connects to the breather pipe from the fuel tank flange.

The fuel filler pipe locates in a short flexible hose attached to the tank and is secured with worm drive clamps. The canister breather pipe is routed alongside the fuel filler pipe and attaches to the canister with a quick release coupling.

A fourth pipe is also routed alongside the fuel filler pipe and provides air ventilation for the charcoal canister. On all petrol vehicles, except NAS vehicles, the pipe is connected to the air pump port on the charcoal canister with a quick release coupling and connects to an insect trap at the fuel filler head. On NAS vehicles fitted with a DMTL pump, the pipe connects to the pump vent port and is also connected to a filter which is attached to the filler head.

A smaller pipe, which is not associated with the fuel system, is attached to the side of the fuel filler pipe. This pipe connects to the rear differential and provides breathing for the differential case. The pipe terminates near the fuel filler head.

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Fuel Tank and Lines - V8 4.4L Petrol - Fuel Tank and Lines

Diagnosis and Testing

Overview

For information on the system operation, refer to section 310-01 - Fuel Tank and Lines in the workshop manual.

Inspection and Verification

- WARNINGS:

⚠ Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.

⚠ If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

⚠ It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Fuel level ● Fuel contamination/grade/quality ● Fuel filter ● Fuel leaks ● Damaged fuel lines ● Damaged push connect fittings ● Fuel filler cap ● Fuel tank filler pipe ● Roll over valves (ROVs)	● Battery charge and condition ● Fuse(s) ● Inertia fuel shutoff (IFS) switch ● Loose or corroded electrical connectors ● Harnesses ● Fuel pump relay ● Fuel pump module ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - ○ Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action

Symptom	Possible causes	Action
Engine cranks, but does not fire	● Inertia fuel shutoff (IFS) switch ● Low/Contaminated fuel ● Engine breather system disconnected/restricted ● Ignition system ● Fuel leak ● Blocked fuel filter ● Fuel pump module fault ● Crankshaft position (CKP) sensor ● ECM fault	Check that the inertia switch has not tripped. Check the fuel level/condition. Check the engine breather system. Check for ignition system DTCs. Check the fuel system for leaks/damage. Check the fuel filter for a blockage/restriction. Check the fuel pump module operation. Check the CKP sensor. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Engine cranks and fires, but will not start	● Evaporative emissions purge valve ● Low fuel pressure ● Fuel leak ● Blocked fuel filter ● Fuel pump module fault ● Spark plugs ● HT short to ground (tracking) check rubber boots for cracks/damage ● Ignition coil failure(s) ● Harness	Check the evaporative emissions purge valve. Check the fuel pressure. Check the fuel system for leaks/damage. Check the fuel filter for a blockage/restriction. Check the fuel pump module operation. Check the spark plugs and ignition coils. Refer to the relevant section of the workshop manual.
Difficult to start after hot soak (vehicle standing after engine has reached operating temperature)	● Injector leak ● Fuel temperature sensor ● Intake air temperature (IAT) sensor ● Mass air flow (MAF) sensor ● Evaporative emissions purge valve ● Fuel pump module fault ● Ignition system	Check the fuel injectors. Check the fuel temperature sensor, check the IAT and MAF sensor circuits. Check the evaporative emissions purge valve. Check the operation of the fuel pump module. Check the spark plugs and ignition coil circuits. Refer to the relevant section of the workshop manual.
Engine stalls soon after start	● Breather system disconnected/restricted ● ECM relay ● Harness ● MAF sensor ● Ignition system ● Air cleaner restricted ● Air leakage ● Fuel lines ● Fuel rail pressure (FRP) sensor	Check the engine breather system. Check the ECM relay and circuits. Check the MAF sensor circuits. Check the spark plugs and ignition coil circuits. Check for a restricted air cleaner. Check the intake air system for leaks. Check the fuel lines for leaks/damage. Check the FRP sensor circuits. Refer to the relevant section of the workshop manual.
Engine hesitates/poor acceleration	● Restricted pedal travel (carpet, etc) ● Exhaust gas recirculation (EGR) valve stuck open ● Ignition system ● Air leakage ● Heated oxygen (HO2) sensors ● Fuel pressure ● Blocked fuel filter ● Fuel lines ● Fuel pump module fault ● Injector leak ● Throttle position (TP) sensors ● Throttle motor ● Accelerator pedal position (APP) sensor ● Transmission malfunction	Check the accelerator pedal travel. Check the spark plugs and ignition coil circuits. Check the intake air system for leaks. Check the HO2 sensor circuits. Check the fuel pressure. Check the fuel filter for a blockage/restriction. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the fuel injectors. Check the TP sensor, throttle motor and APP sensor circuits. Refer to the relevant section of the workshop manual.

Symptom	Possible causes	Action
Engine backfires	- Ignition system - Air leakage - Fuel lines - Fuel pump module fault - MAF sensor - HO2 sensors - APP sensor	Check the spark plugs and ignition coil circuits. Check the intake air system for leaks. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the MAF, HO2 and APP sensor circuits. Refer to the relevant section of the workshop manual.
Engine surges	- Fuel lines - Fuel pump module fault - MAF sensor - Harness - TP sensors - Throttle motor - Ignition system - ECM fault	Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the MAF sensor, TP sensor and throttle motor circuits. Check the ignition coil circuits. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Engine detonates/knocks	- Fuel quality - Fuel lines - Fuel pump module fault - Air leakage - FRP sensor - Knock sensor (KS)/circuit malfunction - MAF sensor - HO2 sensors - BARO sensor malfunction (internal ECM fault)	Check the fuel for contamination/grade/quality. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the intake air system for leaks. Check the FRP, KS, MAF and HO2 sensor circuits. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls in the workshop manual.

DTC	Description	Possible causes	Action
P017100	System Too Lean (Bank 1)	- Air intake leak between MAF sensor and cylinder head - MAF sensor fault (low intake air flow) - Low fuel pressure - Fuel filter/system restriction - Fuel pump module fault - Fuel injector restriction - Exhaust leak (before catalyst) - Evaporative emission system fault	Check the intake air system for leaks. Check the MAF sensor condition and circuits. Check the fuel pressure. Check the fuel filter for a blockage/restriction. Check the fuel system for leaks/damage. Check the fuel pump module operation. Check the fuel injectors. Check the exhaust system for leaks, etc. Refer to the relevant section of the workshop manual. Check for evaporative emission DTCs.
P017200	System Too Rich (Bank 1)	- Restricted air filter - High fuel pressure - Leaking fuel injector(s) - Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) - MAF sensor fault - Evaporative emission system fault	Check the intake air system for restrictions. Check the fuel system for leaks and check the fuel pressure. Check the fuel injectors. Check for fuel system DTCs. Check the oil for contamination/grade/quality. Refer to the relevant section of the workshop manual. Check for MAF sensor and evaporative emission DTCs.
P017400	System Too Lean (Bank 2)	- Air intake leak between MAF sensor and cylinder head - MAF sensor fault (low intake air flow)	Check the intake air system for leaks, etc. Check the fuel system for restrictions, DTCs, etc. Check the exhaust system for leaks, etc. Refer to the relevant section of the workshop manual. Check for evaporative emission DTCS.

DTC	Description	Possible causes	Action
		● Fuel filter/system restriction ● Low fuel pressure ● Fuel injector restriction ● Exhaust leak (before catalyst) ● Evaporative emission system fault	
P017500	System Too Rich (Bank 2)	● Restricted air filter ● High fuel pressure ● Leaking fuel injector(s) ● Oil contaminated with fuel (too many cold starts with vehicle subsequently not getting hot enough for long enough) ● MAF sensor fault ● Evaporative emission system fault	Check the intake air system for restrictions, etc. Check the fuel system for leaks, DTCs, etc. Check the oil condition. Refer to the relevant section of the workshop manual. Check for MAF sensor and evaporative emission DTCs.
P030000	Random Misfire Detected	● ECM to ignition coil primary circuit faults (cylinder misfire detected DTCs also logged) ● Ignition coil failure ● Spark plug failure/fouled /incorrect gap ● Fuel delivery pressure (low/high) ● Fuel injector circuit fault(s) (injector DTCs also logged) ● Fuel injectors restricted/leaking ● Fuel injectors continuously open ● Fuel contamination ● Cylinder compression low ● Valve clearance adjustment ● Worn camshaft/broken valve springs	Check for ignition coil DTCs. Check the condition of the spark plugs and the gaps. Check the fuel pressure. Check for fuel injector DTCs. Check the fuel for contamination/grade /quality. Check the cylinder compressions, check the valve clearances, check the condition of the camshaft and valve springs. Refer to the relevant section of the workshop manual.
P046129	Fuel Level Sensor A Circuit Range/Performance	● Fuel level sensor circuits intermittent short circuit or high resistance ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P04612F	Fuel Level Sensor A Circuit Range/Performance	● Fuel level sensor circuits intermittent short circuit or high resistance ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P046200	Fuel Level Sensor A Circuit Low	● Fuel level sensor circuits intermittent short circuit to ground or high resistance ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P046300	Fuel Level Sensor A Circuit High	● Fuel level sensor circuits intermittent short circuit to power ● Fuel level sensor failure	Refer to the electrical guides and check the fuel gauge sender unit circuit. Repair/renew as necessary.
P062800	Fuel Pump A Control Circuit Low	● Fuel pump control circuit short circuit to ground ● Fuel pump control circuit high resistance ● Fuel pump relay fault	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
P062900	Fuel Pump A Control Circuit High	- Fuel pump control circuit short circuit to power - Fuel pump relay fault	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P131500	Persistent Misfire	- ECM to ignition coil primary circuit fault (cylinder misfire detected DTC also flagged) - Ignition coil failure - Spark plug failure/fouled /incorrect gap - Fuel delivery pressure low - Fuel injector circuit fault(s) (injector DTCs also flagged) - Fuel contamination - Cylinder compression low	Check for ignition coil DTCs. Check the condition of the spark plugs and the gaps. Check the fuel pressure. Check for fuel injector DTCs. Check the fuel for contamination/grade /quality. Check the cylinder compressions. Refer to the relevant section of the workshop manual.

Published: 11-May-2011

Fuel Tank and Lines - V8 4.4L Petrol - Fuel Pump Module

Removal and Installation

Removal

- WARNINGS:

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

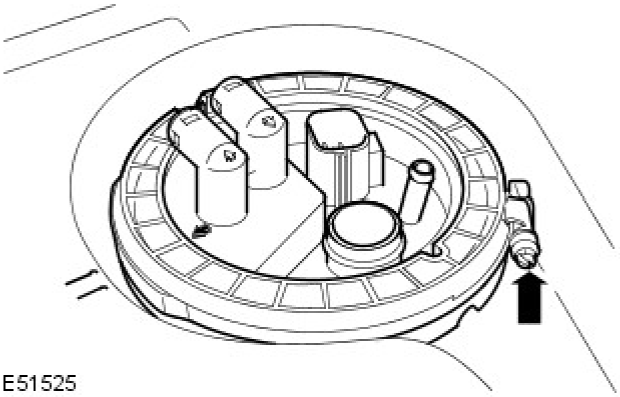
- NOTE: The fuel pump module comprises of a rear fuel level sender, filter and a fuel pressure regulator. These components cannot be serviced separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the fuel tank.
For additional information, refer to: Fuel Tank (310-01B Fuel Tank and Lines - V8 4.4L Petrol, Removal and Installation).

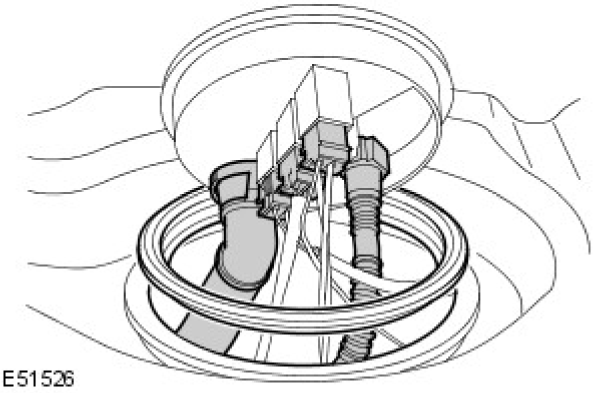

E51525

4. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

- NOTE: Note the fitted position.

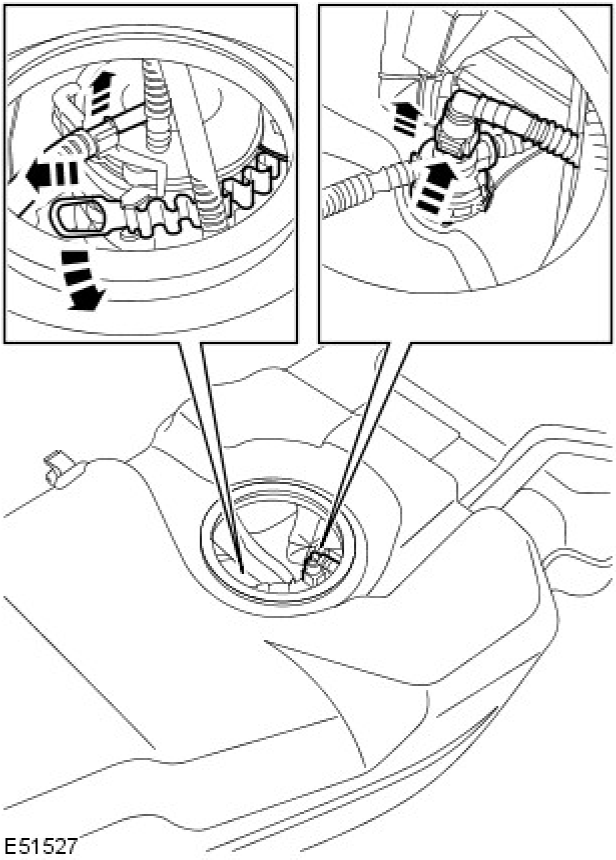
Release the fuel pump module access flange.

- Loosen the screw.
- Remove the clamp.



5. Remove the fuel pump module access flange.

- Disconnect the vent line.
- Disconnect the fuel supply line.
- Disconnect the 3 electrical connectors.
- Remove and discard the seal.



6. Remove the fuel pump module.

- Release the strap.
- Release the fuel pressure regulator.
- Disconnect the 2 fuel lines.

Installation

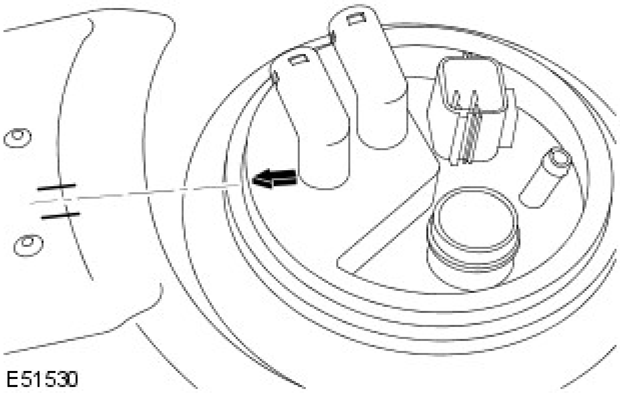
1. Install the fuel pump module.

- Connect the fuel lines.
- Secure with the strap.
- Secure the fuel pressure regulator.

2. Install the fuel pump module access flange.

- Clean the component mating faces.
- Install a new seal.
- Connect the 3 electrical connectors.

- Connect the fuel supply line.
- Connect the vent line.


E51530

3. ⚠ CAUTION: Make sure the seal is correctly fitted.

• NOTE: Align to the position noted on removal.

Secure the fuel pump module access flange.

- Install the clamp.
- Tighten the screw to 4 Nm (3 lb.ft).

4. Install the fuel tank.
For additional information, refer to: Fuel Tank (310-01B Fuel Tank and Lines - V8 4.4L Petrol, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Fuel Tank and Lines - V8 4.4L Petrol - Fuel Tank

Removal and Installation

Removal

- WARNINGS:

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

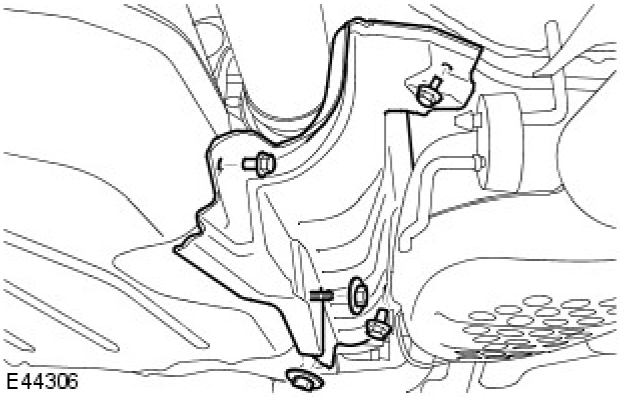
2. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

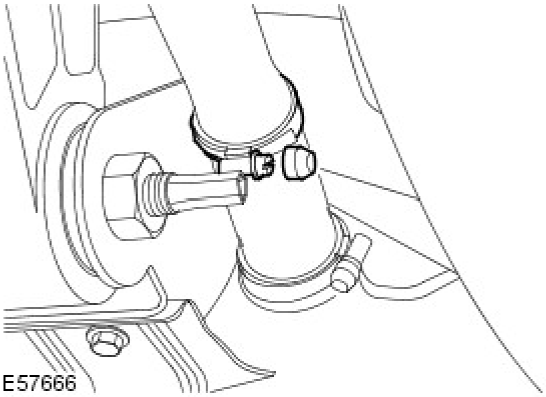
3. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.

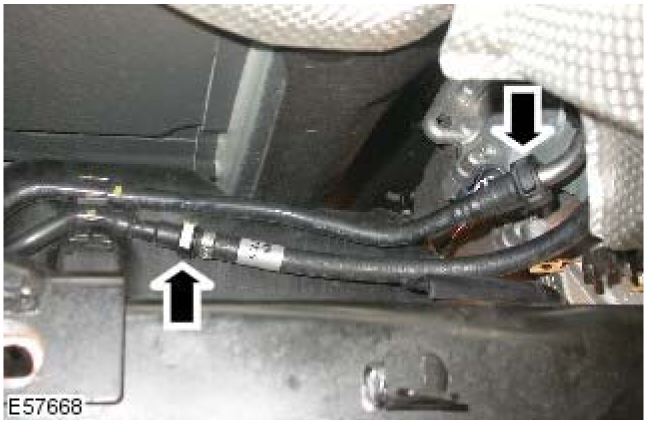




5. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

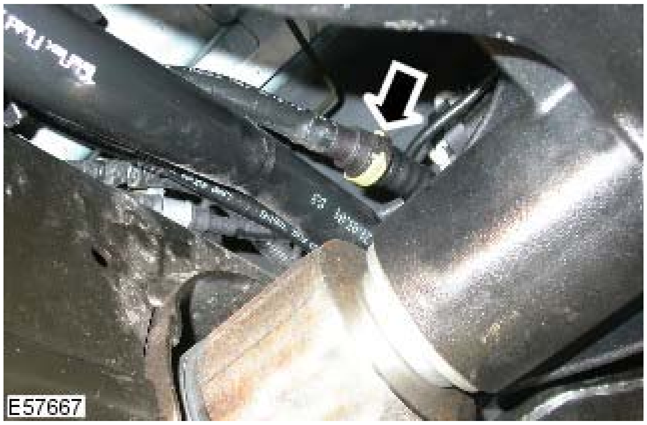
Disconnect the fuel filler neck from the filler neck hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



6. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel supply and purge lines quick release connections at the front of the fuel tank.



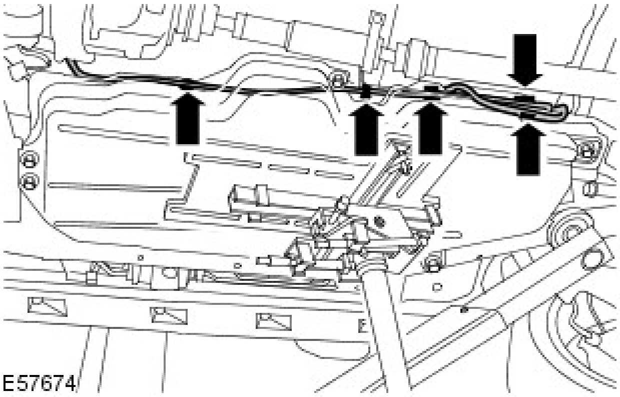
7. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel tank vent line.

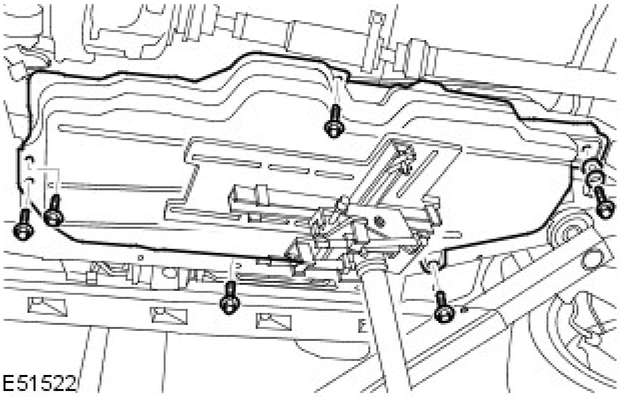
8. Release the fuel tank harness.

9. Release the parking brake emergency release cable.

- Release from the 4 clips.


E57674

10. Remove the 2 emergency release cable clips.


E51522

11. ⚠ WARNING: Secure the component to the transmission jack.

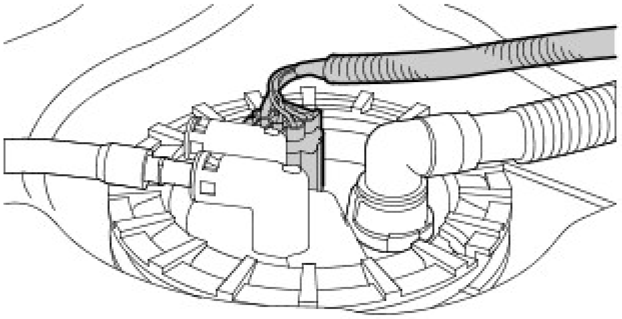
• CAUTIONS:

⚠ Do not lower the fuel tank more than 250 mm (9.75 in)

⚠ Note the rear bolt is fitted with 2 washers.

Using a transmission jack, lower the fuel tank sufficiently only to access the top of the fuel tank.

- Remove the 6 bolts.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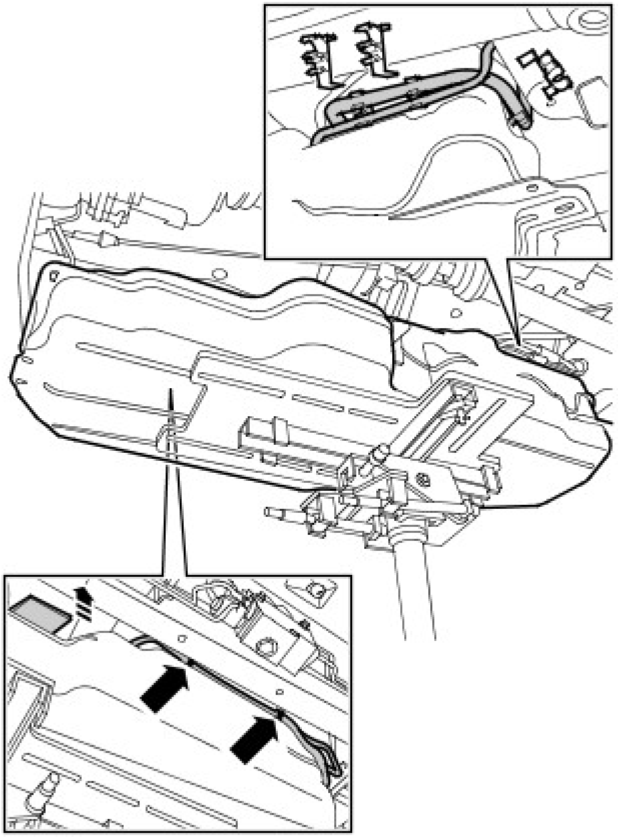
12. Disconnect the fuel pump module electrical connector.



13. Release the purge line from the top of the fuel tank.

- Remove the adhesive pad.
- Release from the 5 clips.

14. Remove the fuel tank.

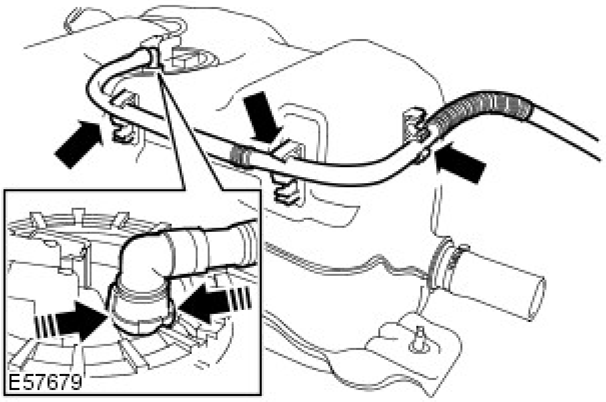
15. NOTE: Do not disassemble further if the component is removed for access only.

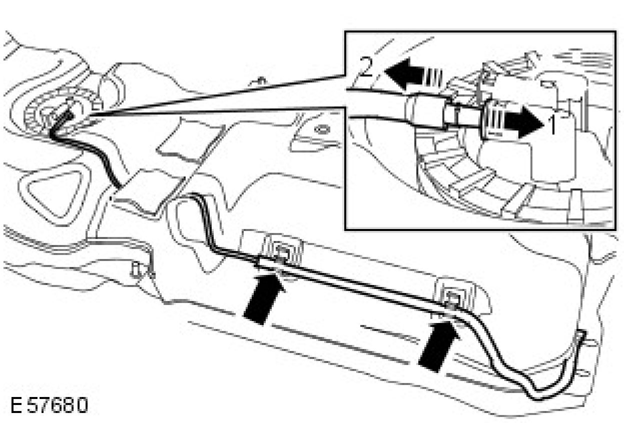
With assistance, remove the fuel tank from the transmission jack.

16. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the fuel tank vent line.

- Disconnect the quick release connector.
- Remove from the 3 clips.



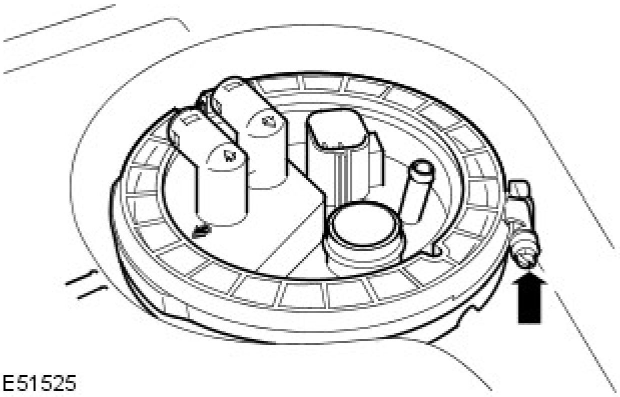


E57680

17. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the fuel supply line.

- Disconnect the quick release connector.
- Release from the 2 clips.



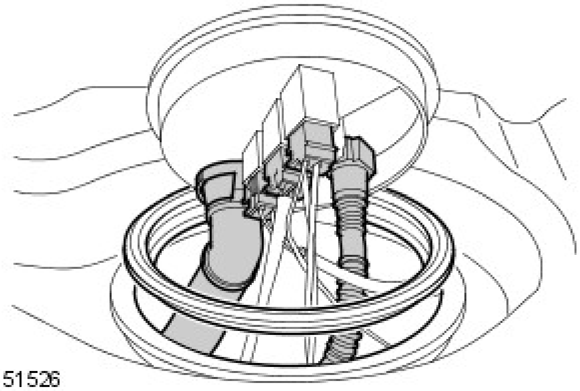
E51525

18. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Note the fitted position.

Release the fuel pump module access flange.

- Loosen the screw.
- Remove the clamp.

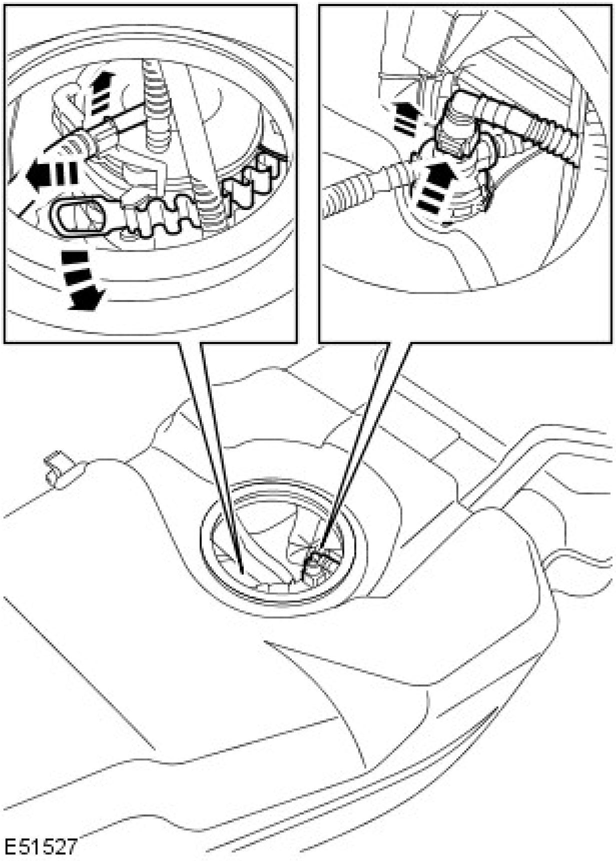


E51526

19. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

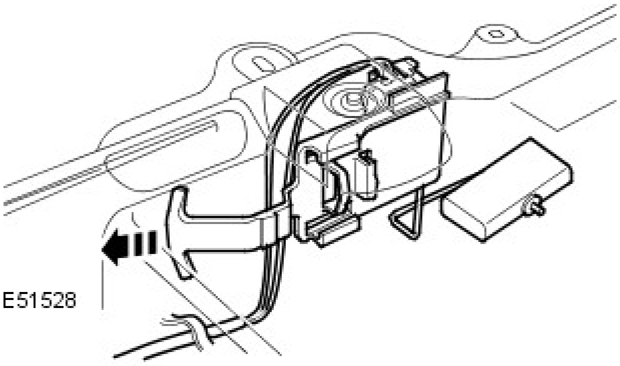
Remove the fuel pump module access flange.

- Disconnect the vent line.
- Disconnect the fuel supply line.
- Disconnect the 3 electrical connectors.
- Remove and discard the seal.



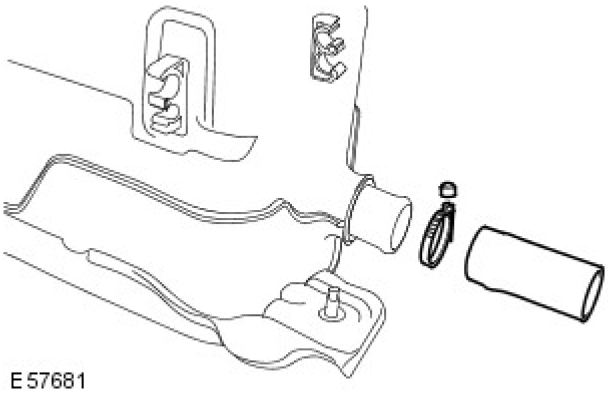
20. Remove the fuel pump module.

- Release the strap.
- Release the fuel pressure regulator.
- Disconnect the 2 fuel lines.



21. Remove the fuel tank front fuel level sender unit.

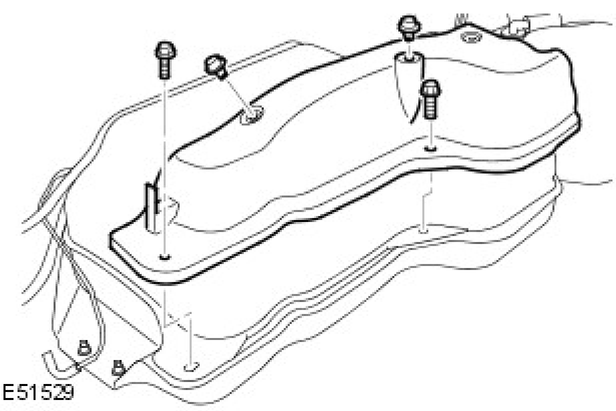
- Release the lead.
- Release the clip.



22. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the fuel filler hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



23. Remove the fuel tank bracket.

- Remove the 2 clips.
- Remove the 2 bolts.
- Remove the retaining plate.

Installation

1. Install the fuel tank bracket.

- Install the retaining plate.
- Install the clips.
- Tighten the bolts to 3.5 Nm (2.5 lb.ft).

2. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Install the fuel filler hose.

- Install a new retaining clip.

3. Install the fuel tank front fuel level sender unit.

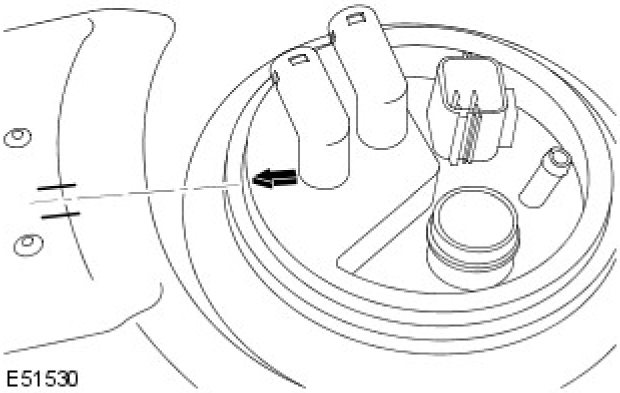
- Secure the clip.
- Secure the lead.

4. Install the fuel pump module.

- Connect the fuel lines.
- Secure with the strap.
- Secure the fuel pressure regulator.

5. Install the fuel pump module access flange.

- Clean the component mating faces.
- Install a new seal.
- Connect the 3 electrical connectors.
- Connect the fuel supply line.
- Connect the vent line.



6. ⚠ CAUTION: Make sure the seal is installed correctly.

Secure the fuel pump module access flange.

- Install the clamp.
- Tighten the screw to 4 Nm (3 lb.ft).

7. Install the fuel supply line.

- Connect the quick release connector.
- Secure in the 2 clips.

8. Install the vent line.

- Connect the quick release connector.
- Secure in the 3 clips.

9. With assistance, install the fuel tank to the transmission jack.

10. Position the fuel tank to the vehicle.

11. Secure the purge line to the fuel tank.

- Secure with the clips.
- Install the adhesive pad.

12. Connect the electrical connector.

13. ⚠ CAUTION: Note the rear bolt is fitted with 2 washers.

Install the fuel tank.

- Tighten the bolts to 45 Nm (33 lb.ft).

14. Install the 2 emergency release cable clips.

15. Secure the parking brake emergency release cable.

- Secure in the 4 clips.

16. Secure the fuel tank harness.

17. Connect the vent line.

18. Connect the fuel supply and purge lines.

19. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

20. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

21. Refill the fuel tank.

For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - V8 4.4L Petrol - Fuel Tank Filler Pipe

Removal and Installation

Removal

- WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

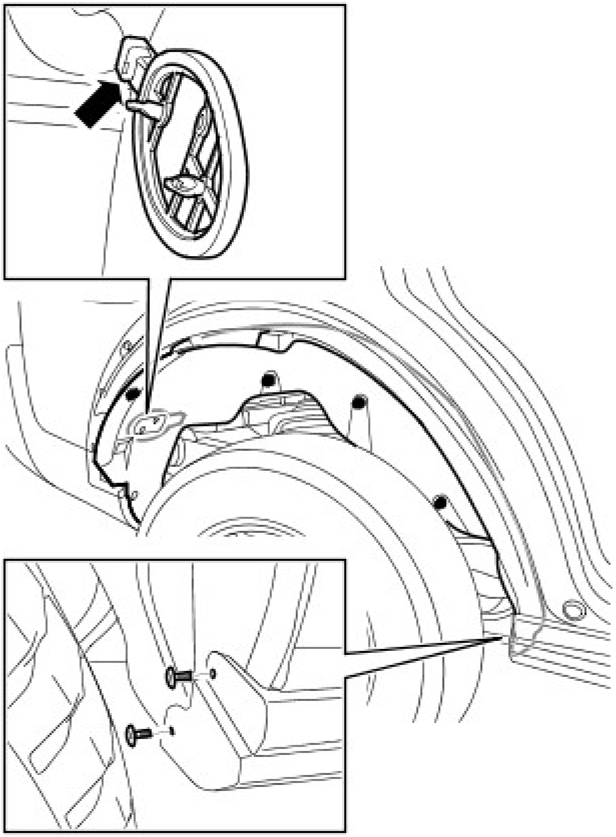
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Position the vehicle on a lift.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

4. Remove the RH rear wheel and tire.

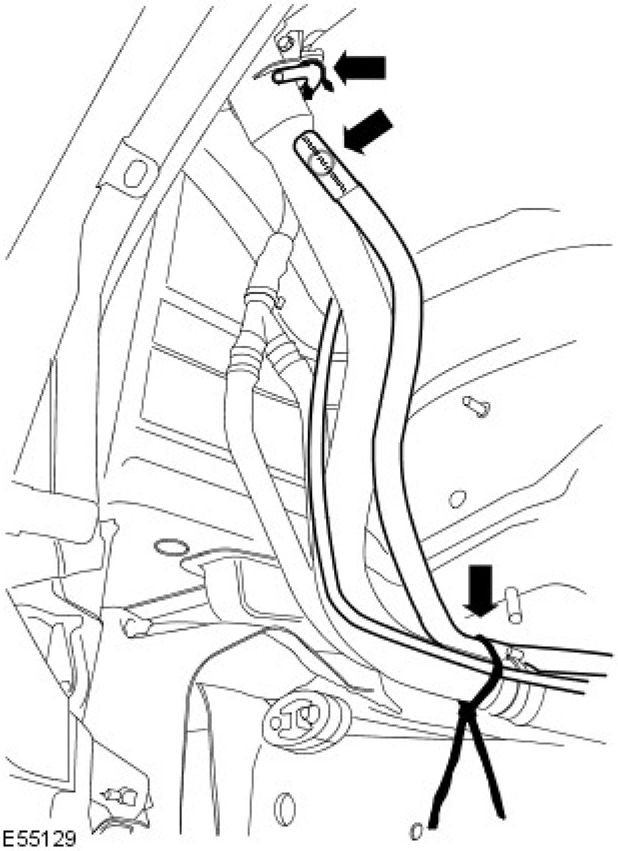

E48478

5. Remove the fender splash shield.

- Remove the 2 screws.
- Remove the 6 retainers.
- Disconnect the electrical connector.

6. Remove the fuel filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

7. Remove the spare wheel and tire.



E55129

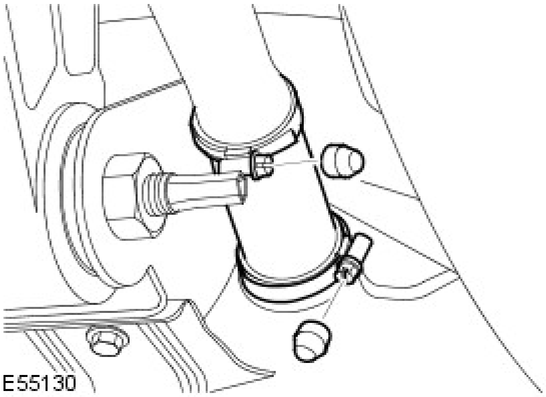
8. Disconnect the breather pipes.

- Remove the clip.
- Release the 2 clips.
- Remove and discard the cable tie.

9. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the fuel filler neck from the fuel tank.

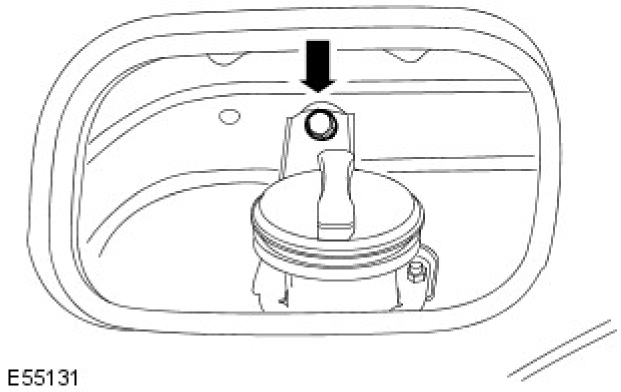
- Remove the tamper proof cover.
- Remove and discard the hose clip.



E55130

10. Remove the fuel tank filler pipe connector hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



11. NOTE: Note the fitted position.

Remove the fuel tank filler pipe.

- Remove the bolt.

Installation

1. Install the filler pipe connector hose.

- Install the new tamper proof clip.

2. NOTE: Align to the position noted on removal.

Install the fuel tank filler pipe.

- Install the bolt and tighten to 10 Nm (7 lb.ft).

3. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

4. Connect the breather pipes.

- Secure the clips.

5. Install the filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

6. Install the fender splash shield.

7. Install the wheel and tire.

8. Install the spare wheel and tire.

9. Refill the fuel tank.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 2.7L Diesel -

Capacity

Fuel tank	84.0 litres (18.5 gallons) (22.19 US gallons)

General Specification

Item	Specification
System type	Mechanical - returnless
Fuel delivery module	Located in the fuel tank
High pressure fuel pump:	
Location	Located at rear of engine between the cylinder heads, belt driven from the camshafts
Maximum operating pressure	165000 kPa (1650 bar) (23925 lb/in²)
Advance delivery fuel pump:	
Location	Located in the fuel tank
Operating pressure	50 kPa (0.5 bar) (7.35 lb/in²)
Maximum output @12.3 volts	70 litres/hour (15.4 gallons/hour) (18.4 US gallons/hour)
Fuel pressure regulator:	
Type/location	In-line, within fuel tank
Operating pressure	50 kPa (0.5 bar) (7.25) lb/in²
Fuel filter	Remotely mounted on the inside of the longitudinal member - fitted with a renewable element and having a 178 cc (6 fl-oz) water separation capacity
Fuel tank sender units	Two - Front and rear - Front unit is mounted remotely within the fuel tank, rear is mounted on the body of the advance delivery fuel pump

Torque Specifications

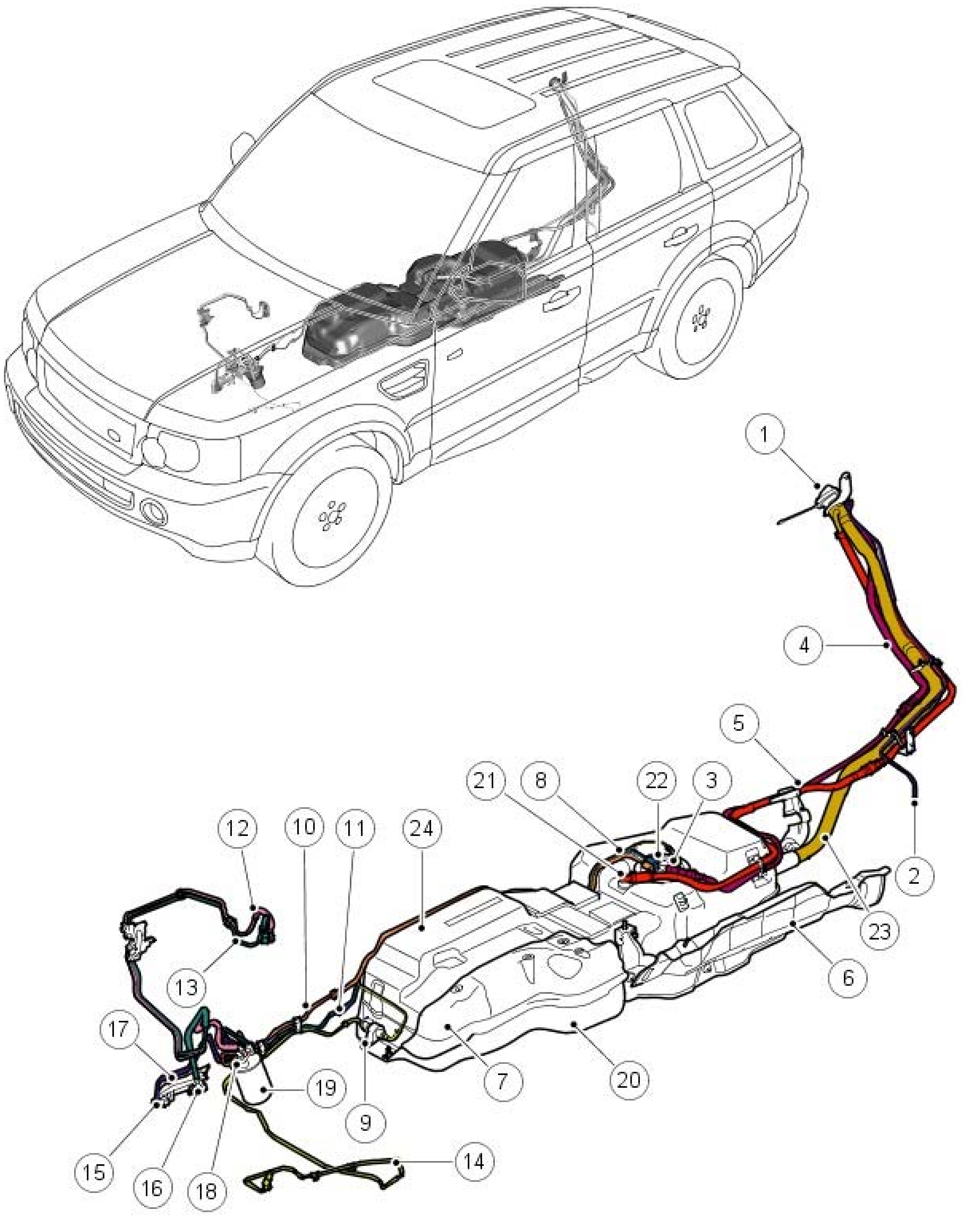
Description	Nm	lb-ft
Fuel tank bracket bolts	10	7
Fuel pump module access flange clamp screw	4	3
Fuel tank bolts	45	33
Fuel tank heat shield, bolts	5	4
Fuel tank heat shield, nuts	3	2
Fuel filter to retaining bracket bolt	10	7
Transmission undershield bolts	10	7

Published: 11-May-2011

Fuel Tank and Lines - TDV6 2.7L Diesel - Fuel Tank and Lines

Description and Operation

FUEL DELIVERY SYSTEM COMPONENT LOCATION - 2.7L V6 (TdV6) - UP TO 2007MY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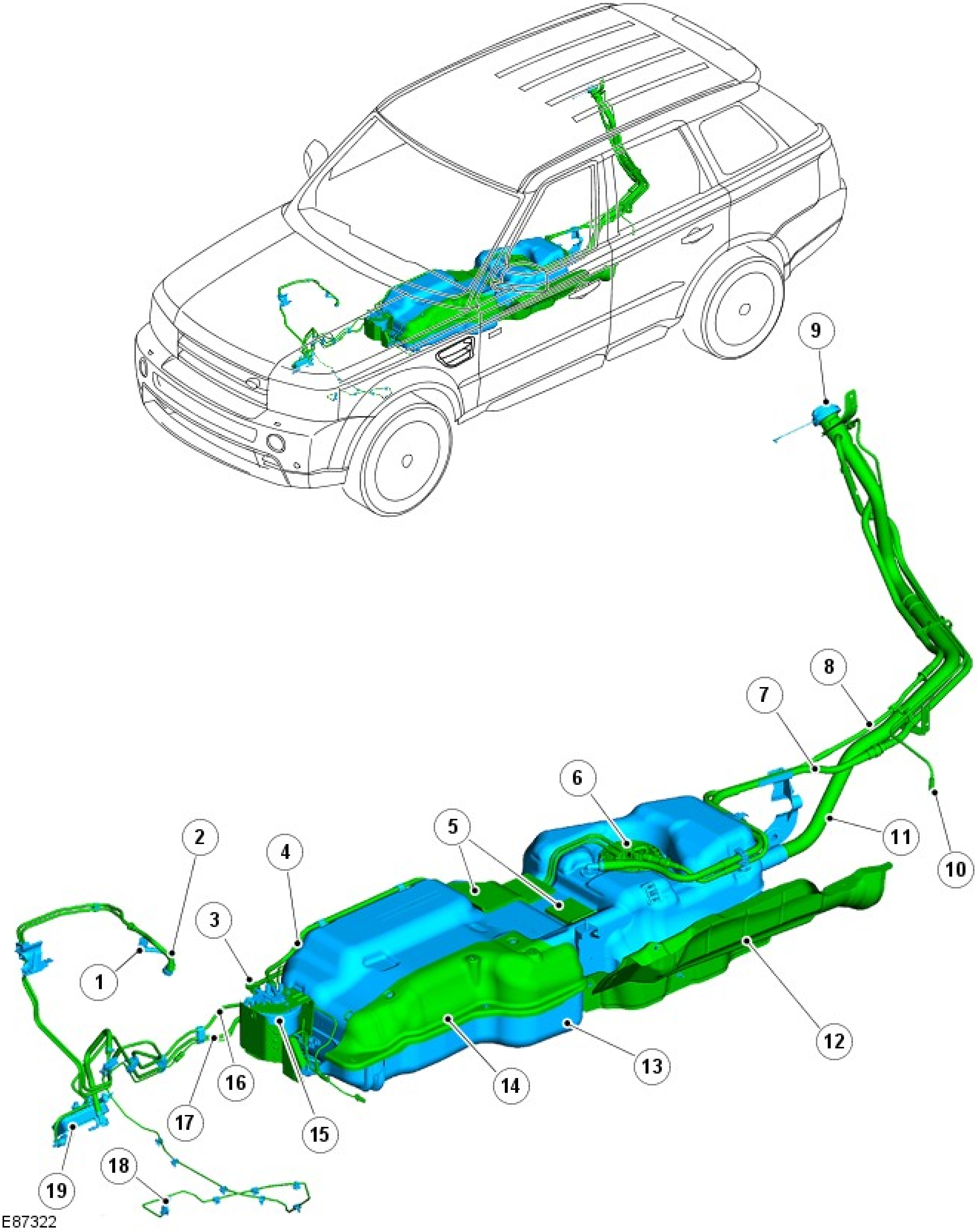
E57566

Item	Part Number	Description
1	-	Filler cap and lanyard
2	-	Rear differential breather pipe
3	-	Fuel pump module assembly
4	-	Fuel tank vent pipe
5	-	Tank breather pipe
6	-	Heat shield
7	-	Cover
8	-	Pipe - Fuel Fired Booster Heater (FFBH) pump feed (if fitted)
9	-	FFBH pump (if fitted)
10	-	Pipe - Pump to filter (fuel feed)
11	-	Pipe - Filter to pump module (fuel return)
12	-	Pipe - Filter to engine (fuel feed)
13	-	Pipe - Engine to fuel cooler (fuel return)
14	-	Pipe - FFBH pump to FFBH (if fitted)
15	-	Pipe - Fuel cooler to filter (fuel return)
16	-	Pipe - HP pump to fuel cooler (fuel return)
17	-	Fuel cooler
18	-	Fuel filter bracket
19	-	Fuel filter assembly
20	-	Cradle
21	-	Pipe - Fuel pump to filter (fuel feed)
22	-	Pipe - Filter to pump module (fuel return)
23	-	Fuel filler pipe
24	-	Fuel tank

FUEL DELIVERY SYSTEM COMPONENT LOCATION - 2.7L V6 (TdV6) - FROM 2007MY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E87322

Item	Part Number	Description
1	-	Fuel supply to High Pressure (HP) fuel pump
2	-	Fuel return from HP fuel pump to fuel cooler
3	-	Fuel return to tank/air bleed
4	-	Fuel supply to filter from pump module assembly
5	-	Foam pads

6	-	Fuel pump module assembly
7	-	Tank breather pipe
8	-	Fuel tank vent pipe
9	-	Filler cap and lanyard
10	-	Rear differential breather pipe
11	-	
12	-	Heat shield
13	-	Cradle
14	-	Cover
15	-	Fuel filter assembly
16	-	Fuel supply from filter to HP pump
17	-	Fuel return from fuel cooler to fuel filter
18	-	FFBH supply from pump module assembly
19	-	Fuel cooler

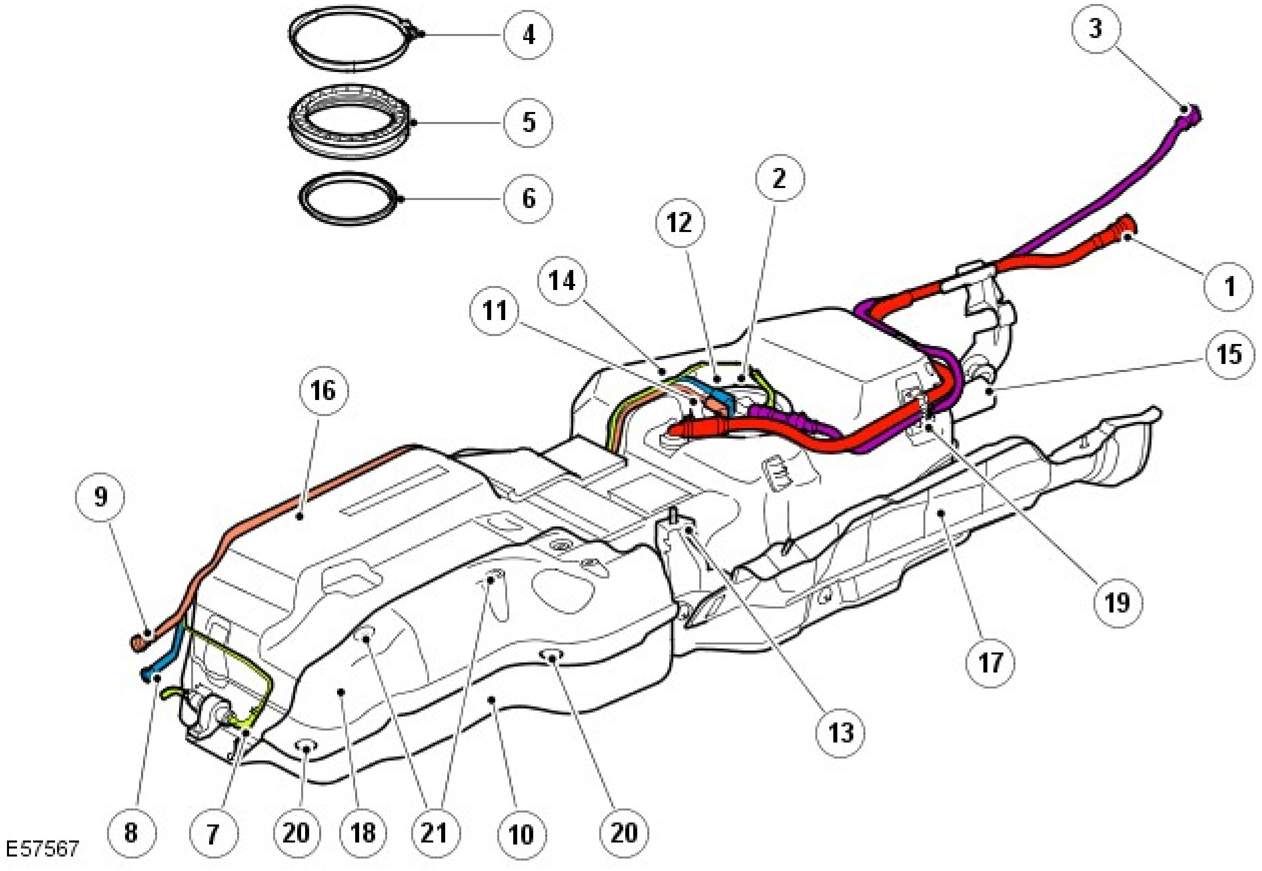
OVERVIEW

The major components of the TdV6 fuel system comprise a fuel tank, a fuel pump module, a fuel filter, a fuel cooler, a fuel filler pipe and cap assembly and two fuel level sensors.

On vehicles from 2007MY a new fuel filter assembly is fitted. This filter is the same as used on the TdV8 fuel system.

The TdV6 fuel system is a high pressure common rail system. This system uses an engine mounted and driven high pressure pump to deliver a uniform level of pressure to the common fuel rail which supplies all fuel injectors.
For additional information, refer to: Fuel Charging and Controls (303-04C Fuel Charging and Controls - TDV6 2.7L Diesel, Description and Operation).

FUEL TANK ASSEMBLY



Item	Part Number	Description
1	-	Tank breather pipe
2	-	Fuel pump module assembly
3	-	Vent pipe
4	-	Pump module clamp

5	-	Pump module collar
6	-	Pump module seal
7	-	FFBH pump feed pipe (if fitted)
8	-	Pipe - Fuel return
9	-	Pipe - Fuel feed
10	-	Cradle
11	-	Fuel feed pipe connection
12	-	Fuel return pipe connection
13	-	Mounting bolt (6 off) and washer (7 off)
14	-	FFBH feed pipe connection (if fitted)
15	-	Fuel filler hose
16	-	Fuel tank
17	-	Heat shield
18	-	Cover
19	-	Clip (2 off)
20	-	Screw M6 (2 off)
21	-	Scrivet (2 off)

The fuel tank is located on the right hand side of the vehicle, between the transmission and the right hand chassis longitudinal. The tank is located on a mounting cradle which secures the whole fuel tank assembly to the vehicle. The tank has a useable capacity of 84.0 liters (22.19 US gallons).

The cradle is attached to the chassis with six screws. When the cradle is attached to the chassis, the tank is positively secured via foam pads which bear against the central chassis cross beam. A protective cover is fitted to the front right hand corner of the tank and provides additional protection.

The fuel tank is manufactured from moulded plastic which is a minimum of 3 mm thick. The tank is a sealed unit with the only internal access being via the pump module flange aperture on the top of the tank.

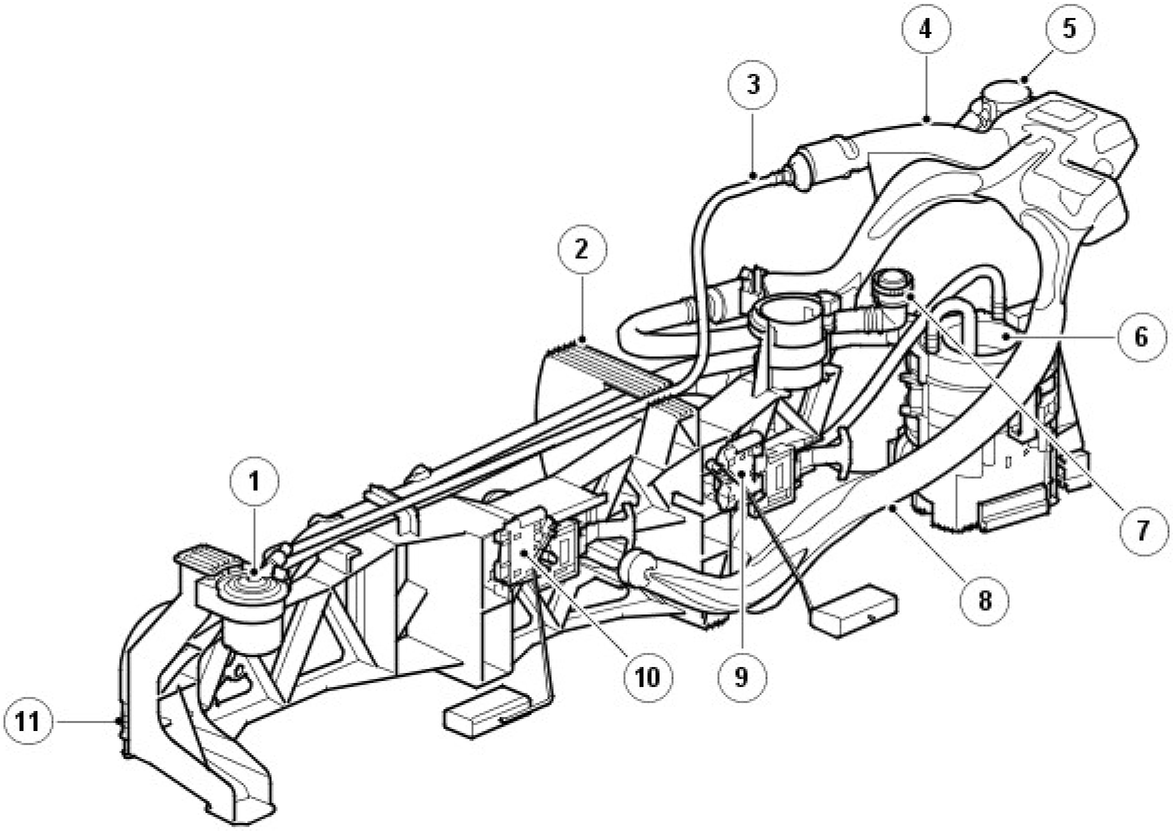
The flange assembly comprises a pump module flange which contains all external pipe and electrical connections for the tank internal components, a collar and a clamp. The flange is fitted with a seal which locates in the tank aperture. An arrow on the flange must be aligned centre of the fuel tank breather connection with the tank, to obtain the correct orientation. The collar is located over the flange and is secured with the clamp.

The flange has a five pin external connector which provides for electrical connections for the level sensors, the level sensors common ground and the fuel pump. This connector is wired to three push fit connectors on the underside of the flange. Two quick release connectors provide for the connection of the fuel feed and return pipes and the vent pipes. The fuel return connection contains a non return valve which prevents fuel escaping from the connection in the event of a vehicle roll over and the pipe becoming detached. On vehicles with a fuel burning heater, a third connection provides the connection for the fuel feed supply to the fuel burning heater.

A tank carrier assembly is attached inside the tank and is used to locate the internal tank components. The carrier provides location for the fuel pump module, the front and rear level sensors, the Roll Over Valves (ROVs) and the front jet pump.

The fuel pump module comprises the fuel pump, the rear jet pump, the pump inlet filter and the fuel pressure regulator which is mounted in a manifold on the carrier. Only the pump module assembly and the fuel level sensors are available as serviceable components, the individual assembly components are not available separately.

Fuel Tank Internal Components



E58415

Item	Part Number	Description
1	-	Front ROV
2	-	Carrier assembly
3	-	Front ROV corrugated tube to Liquid Vapor Separator (LVS)
4	-	Liquid Vapor Separator (LVS)
5	-	Rear Roll Over Valve (ROV)
6	-	Fuel pump module
7	-	Tank breather connector to underside of fuel pump module flange
8	-	LVS carrier
9	-	Rear fuel level sensor
10	-	Front fuel level sensor
11	-	Front jet pump

The TdV6 vent system is different to the system used on the petrol models. The TdV6 vent system comprises:

- Two Roll Over Valves (ROV)
- One Liquid Vapor Separator (LVS)
- Breather spout.

The vent system is mounted on the fuel tank internal carrier which is assembled outside of the tank and inserted into the tank during the blow moulding process. None of the internal tank venting components are serviceable.

The rear ROV is mounted in the rear right hand corner of the fuel tank. It is mounted directly onto the LVS with a rubber grommet and secured with a clip.

The front ROV is located in the front left hand corner of the tank. It is attached by a moulded clip to the main beam of the carrier. The ROV is connected to the LVS by a corrugated tube.

Both ROVs vent directly into the LVS. Any liquid fuel is separated from the vapor in the LVS and drains back into the tank via the front ROV.

The LVS vent outlet is connected to the underside of the tank flange. The vent line is then routed from the flange to atmosphere at the top of the filler neck. This line allows for pressure and vacuum relief during normal tank operation. It also allows air to enter the tank as fuel is used.

The main purpose of the tank breather connection is to control the fill volume of the tank. During filling, vapor exits the fuel tank via the breather connection and the breather tube to the filler neck. When the tank reaches its full level, the liquid fuel closes off the breather connection by filling it with fuel. The closure of the breather connection causes the back pressure in the tank to increase, which in turn causes the pump filling nozzle to turn off.

Fuel Pump Module

The fuel pump is attached to the carrier and is located at the bottom of the swirl pot. The pump and the fuel level sensors are connected to the external electrical connector via the connectors on the underside of the fuel pump module flange.

The pump module has a rated flow of 70 liters/hour (18.5 US gallons/hour) at a voltage of 12.3V and an output pressure of 0.5 bar (7.25 lbf/in^2).

The fuel pump is energised by the fuel pump relay which is located in the Battery Junction Box (BJB). The relay is controlled by the engine control module (ECM) and energises the relay at all times when the ignition switch is in ignition position II.

A filter is attached to the pump inlet port at the bottom of the pump. The filter has a 'winged' section which is located vertically at the side of the pump to ensure that a portion of the filter is off the base of the swirl pot, to prevent premature blocking of the filter. The filter has two sections, a normal filter and a by-pass filter. The normal filter is a 31 micron fine mesh filter with a surface area of 70 cm^2 (10.8 in^2). The by-pass filter is a 300 micron coarse mesh filter which is closed in normal conditions and has a surface area of 4 cm^2 (0.62 in^2). In cold conditions, 'waxing' of the fuel can occur which can restrict fuel passing through the fine mesh filter. If this occurs, the by-pass opens allowing fuel to pass through the coarse mesh filter.

The top face of the fuel pump module has three pipe connections. One connection is the fuel pump outlet connection which feeds into the manifold. A second connection allows fuel at pump outlet pressure to flow back through the pump module housing from the manifold to the rear jet pump. The third connection allows fuel from the pressure regulator to return to the swirlpot when the regulator has opened due to excessive pump output pressure.

Fuel Level Sensors

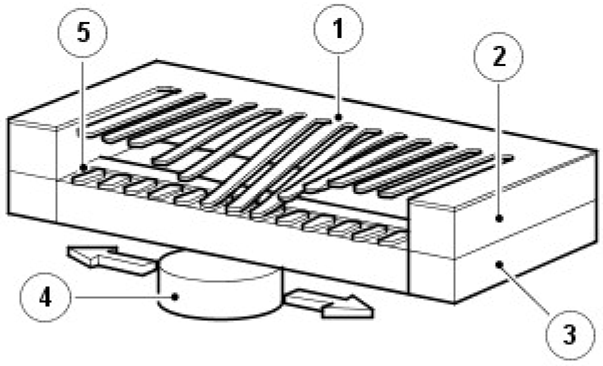
The sensor is a MAgnetic Passive Position Sensor (MAPPS) which provides a variable resistance to earth for the output from the fuel gage. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The front and rear fuel level sensors are connected to the external electrical connector on the flange via the connectors on the underside of the fuel pump module flange.

The front and rear sensors are attached to the front of the carrier and are accessible via the fuel pump flange aperture.

- NOTE: When a service replacement tank is ordered the tank is supplied with the front and rear level sensors fitted

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.

Sensor Operating Principle



E44417

Item	Part Number	Description
1	-	Magnetic foil
2	-	Spacer
3	-	Ceramic surface
4	-	Magnet
5	-	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal is output proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gage pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning lamp is incorporated in the instrument cluster and illuminates when the fuel level is at or below 14 liters (3.69 US gallons).

The fuel level sender signal is converted into a CAN message by the instrument cluster as a direct interpretation of the fuel tank contents in liters.

Front Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
51	Empty
101	Low fuel level illumination (14L)
375	Half full
911	Full

Rear Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
86	Empty
171	Low fuel level illumination (14L)
441	Half full
944	Full

Fuel Pressure Regulator

The fuel pressure regulator is located in the manifold inside the fuel tank. The regulator controls the fuel pressure in the feed pipe to the High Pressure (HP) injection pump. If the pump outlet pressure becomes too high, the regulator controls the fuel pressure in the feed pipe by allowing some fuel to return to the swirl pot.

The regulator is subject to pump output pressure and constantly controls the pressure of the fuel delivered to the HP injection pump to 0.5 bar (7.25 lbf/in^2). The primary reason for the regulator is to protect the HP fuel injection pump from high fuel pressures.

Swirl Pot

The swirl pot is located at the rear of the fuel tank and provides for the attachment or location of most of the fuel pump assembly components.

The swirl pot acts as a fuel reserve, providing a constant supply of fuel to the fuel pump irrespective of fuel quantity or vehicle attitude. When the vehicle is level the swirl pot contains approximately 400 cm^3 (24.4 in^3) of fuel when the engine is running. The two jet pumps ensure that fuel is constantly supplied to the swirl pot to provide a sufficient fuel supply for the pump.

A one way valve is located in the base of the swirl pot. The valve allows fuel from the tank to enter the swirl pot, but prevents it from escaping.

Jet Pumps

The fuel system incorporates two jet pumps. The front jet pump is located on the carrier near the front of the fuel tank. The rear jet pump is located in the swirl pot below the fuel pump. Both jet pumps operate on a venturi effect created by fuel at pump output pressure passing through the jet pump. This draws additional fuel from the tank through ports in the jet pump body, delivering additional fuel to the swirl pot.

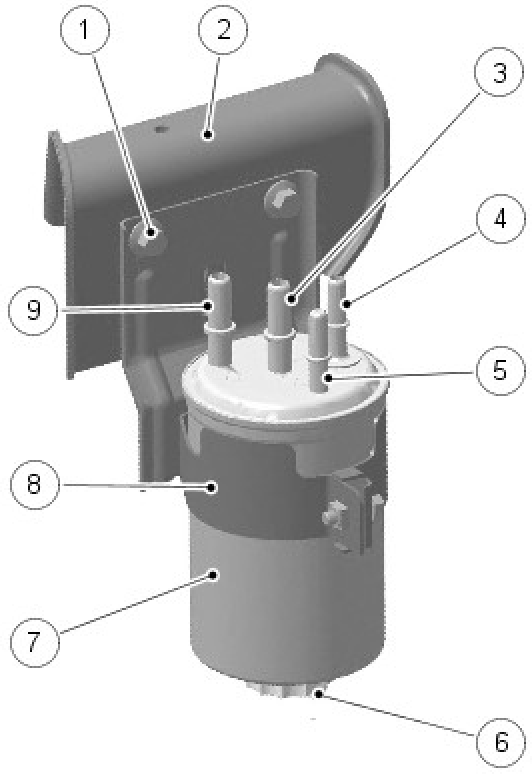
The front jet pump is mainly used when the vehicle is driving downhill. The jet pump is connected via a pipe from the fuel manifold and receives fuel at pump output pressure. Because of its location at the front of the tank, it collects fuel from the front of the tank and transfers it into the swirl pot, ensuring a constant supply of fuel to the pump. The jet pump has a jet nozzle of 1 mm diameter.

The rear jet pump operates at pump output pressure and delivers some of the fuel from the rear of the tank back into the swirl pot.

Roll Over Valves (ROVs)

Two ROVs are located on the carrier and are connected via pipes to a Liquid Vapor Separator (LVS). The separator, which is also attached to the carrier, is connected via a pipe to the tank breather outlet in the pump module flange. The ROVs contain non-return valves which close in the event of the vehicle overturning, preventing liquid fuel escaping from the tank via the breather pipe.

FUEL FILTER - UP TO 2007MY



E44418

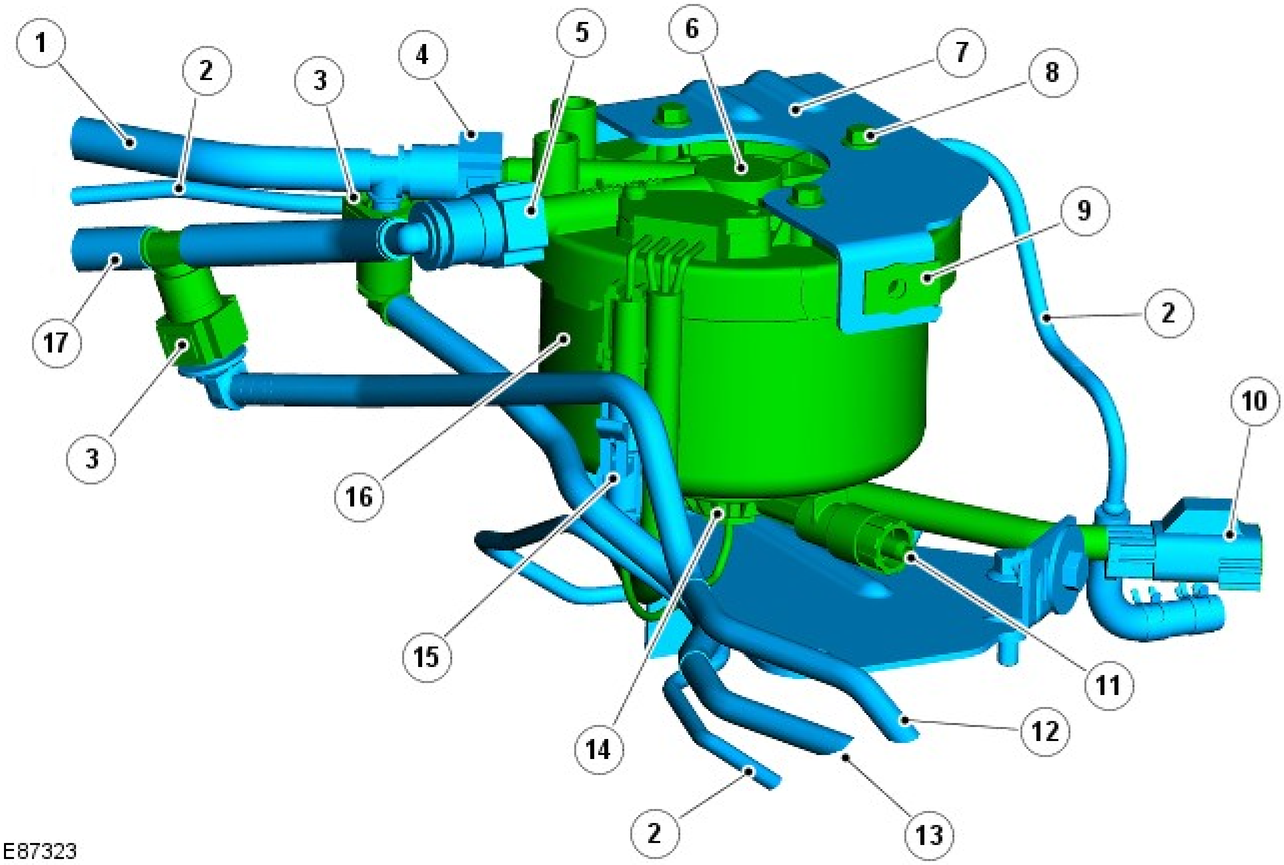
Item	Part Number	Description
1	-	Screw M8 (2 off)
2	-	Bracket
3	-	Fuel feed to engine (HP injection pump)
4	-	Fuel return from cooler
5	-	Fuel return/air bleed to tank
6	-	Water drain valve
7	-	Filter canister
8	-	Clamp bracket
9	-	Fuel feed from pump module

The fuel filter is located behind the fuel cooler, at the rear of the engine and is protected by the engine undertray. The fuel filter assembly comprises a bracket and the filtration element which is contained within a canister.

The filter canister is attached to a circular bracket which is clamped around the filter canister with a bolt and nut. The bracket is attached on the inside of the right hand chassis rail with two screws. Removal of the fuel filter requires loosening of the bolt and nut and removing the filter canister from the circular bracket.

The filter element has a capacity of 500 cm^3 (30.5 in^3). The filtration element can filter particulate matter larger than 2 microns. A water drain plug is located on the base of the filter. The filter can be purged of water by partially unscrewing the filter element plug and allowing fuel to drain into a suitable container. The plug must tightened to a torque specified in the Service Repair Manual.

FUEL FILTER - FROM 2007MY



Item	Part Number	Description
1	-	Fuel feed supply to filter from pump module
2	-	FFBH supply from pump module
3	-	Quick release connector
4	-	Fuel filter inlet
5	-	Fuel filter outlet
6	-	Filter housing
7	-	Mounting bracket
8	-	Filter attachment bolt (3 off)
9	-	Heat shield attachment (2 off)
10	-	Electrical connector
11	-	Water drain valve
12	-	Fuel feed to HP pump
13	-	Fuel return from HP pump and fuel cooler
14	-	Water sensor
15	-	Water sensor electrical connector
16	-	Filter element
17	-	Fuel return/air bleed to tank

The fuel filter assembly is located in front of the fuel tank and is mounted on a bracket which is attached to the top face of the transfer box chassis cross member. The fuel filter assembly comprises a bracket, filter housing and the filtration element. The filter housing is secured to the bracket with 3 bolts. The bracket is secured to the cross member with 2 bolts which are screwed into threaded holes in the cross member.

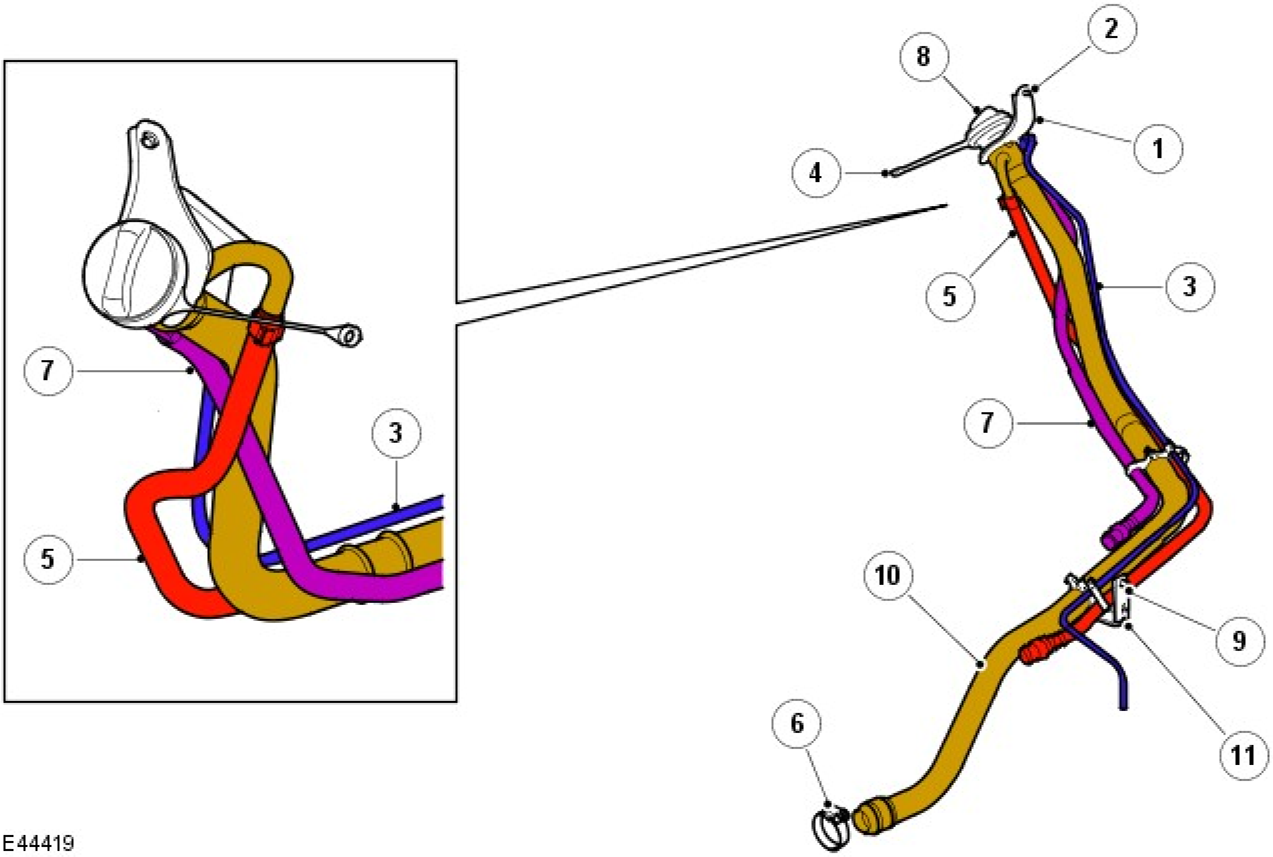
The filter housing has an inlet and outlet which allow for the attachment of hoses using quick release connectors. The filter element is located on the underside of the housing and can be removed by rotating one quarter turn to release from the housing.

The filter element has a capacity of 200 cm^3 (12.2 in^3). The filtration element can filter particulate matter larger than 2 microns. A water drain valve is located on the base of the filter. The filter can be purged of water by partially unscrewing the drain valve and allowing at least 84 cm^3 (5.12 in^3) of fuel to drain into a suitable container. The drain plug has a centre outlet which allows for the attachment of a drain hose.

The filter element also has a water sensor located in its base. The sensor is screwed into a threaded hole in the base of the element. When the filter is replaced at service, the sensor can be unscrewed from the element and installed in the new element. The sensor has an electrical connector located at the side of the element which can be disconnected to assist element removal.

The water sensor is connected to the ECM. When the water in the element reaches 64 cm^3 (3.9 in^3) the ECM issues a high speed controller area network (CAN) bus message to the instrument cluster to display a 'WATER IN FUEL' message in the message centre.

FUEL FILLER



Item	Part Number	Description
1	-	Bracket
2	-	Screw M6
3	-	Rear differential breather pipe (Ref. only)
4	-	Filler cap lanyard
5	-	Tank breather pipe
6	-	Clamp - filler hose
7	-	Vent pipe
8	-	Filler cap
9	-	Screw M8
10	-	Filler pipe
11	-	Lower mounting bracket to Electric Park Brake (EPB) bracket

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head is covered by a moulded plastic cover which is electrically locked when the vehicle is locked. The filler cap is a conventional screw in type which is secured to the vehicle with a lanyard.

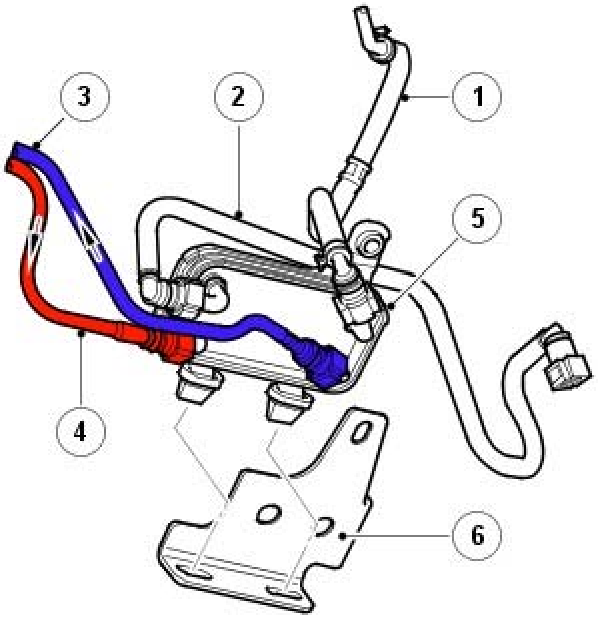
- NOTE: The fuel filler head plastic cover does not lock on North American Specification (NAS) vehicles.

The filler head is a stainless steel fabrication. Two brackets provide for the attachment of the filler head to the vehicle body and the chassis electronic park brake bracket.

A connection on the rear of the filler head allows for the connection of the fuel tank breather pipe from the fuel tank breather stub. The fuel tank breather pipe has a quick release fitting and connects to the breather pipe from the fuel tank breather stub. The fuel filler vent pipe from the tank is vented to atmosphere. The vent pipe incorporates an insect trap at its termination near the filler head. The fuel filler pipe locates in a short flexible hose attached to the tank and is secured with a worm drive clamp.

A smaller pipe, which is not associated with the fuel system, is attached to the side of the fuel filler pipe. This pipe connects to the rear differential and provides breathing for the differential case. The pipe terminates near the fuel filler head.

FUEL COOLER



E44420

Item	Part Number	Description
1	-	Pipe - HP pump to cooler
2	-	Pipe - cooler to fuel filter
3	-	Coolant outlet
4	-	Coolant inlet
5	-	Fuel cooler
6	-	Bracket

The fuel cooler uses engine coolant, direct from the lower part of the radiator, to cool fuel returning to the tank from the HP injection pump.

The fuel cooler is located on the right hand side of the chassis, at the rear of the engine, near to the starter motor. A bracket, which is attached to the right hand chassis rail, provides for the attachment of the cooler. The bracket has two slots which accept two plastic pegs which are attached to the cooler. A bolt is inserted through a hole in the bracket and screws into a captive nut on the cooler to positively secure the cooler to the bracket.

The cooler has four quick fit connector pipes which provide for the attachment of the fuel inlet hose from the HP injection pump, the fuel outlet hose to the fuel filter, the coolant inlet hose from the radiator and the coolant outlet hose to the coolant thermostat housing. The coolant pipes can be identified by their smaller diameter.

Published: 11-May-2011

Fuel Tank and Lines - TDV6 2.7L Diesel - Fuel Tank and Lines

Diagnosis and Testing

Overview

For information on the system operation, refer to section 310-01 - Fuel Tank and Lines in the workshop manual.

Inspection and Verification

- WARNINGS:

⚠ Do **NOT** carry out any work on the fuel system with the engine running. The fuel pressure within the system can be as high as 1600 bar (23,206 lb/in²). Failure to follow this instruction may result in personal injury.

⚠ Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.

⚠ After carrying out repairs, the fuel system must be checked visually for leaks. This should be done after the engine has been run, but with the engine switched **OFF**. Failure to follow this instruction may result in personal injury.

⚠ If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.

⚠ Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

- CAUTIONS:

⚠ Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

⚠ The fuel pipes between the injectors and the rail must be discarded after each use, and new pipes installed. Failure to follow this instruction may result in damage to the vehicle.

⚠ It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that the workshop area in which the vehicle is being worked on is as clean and dust-free as possible. Areas in which work on clutches, brakes or where welding or machining are carried out are not suitable in view of the risk of contamination to the fuel system. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that any protective clothing worn is clean and made from lint-free non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that any protective gloves worn are new and are of the non-powdered latex type. Failure to follow this instruction may result in damage to the vehicle.

⚠ Make sure that clean, non-plated tools are used. Clean tools using a new brush that will not lose it's bristles and fresh cleaning fluid prior to starting work on the vehicle. Failure to follow this instruction may result in damage to the vehicle.

⚠ Use a steel-topped work bench and cover it with clean, lint-free, non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

1. **1.** Verify the customer concern.

2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Fuel level ● Contaminated fuel ● Fuel supply line(s) ● Fuel return line(s) ● High-pressure fuel supply line(s) ● Fuel tank filler pipe ● Fuel leak(s) ● Fuel tank ● Fuel filler cap ● Fuel filter ● Push connect fittings ● Fuel rail ● Fuel injection pump ● Exhaust gas recirculation (EGR) system	● Battery charge and condition ● Fuse(s) ● Inertia fuel shutoff (IFS) switch ● Fuel pump module relay ● Fuel pump module ● Electrical connector(s) ● Damaged or corroded wiring harness ● Fuel volume control valve (FVCV) ● Fuel pressure control valve (FPCV) ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Engine cranks, but does not start	● Inertia fuel shutoff (IFS) switch ● Low/Contaminated fuel ● Fuel pump module fault ● Low pressure fuel system fault ● Air leakage ● Blocked fuel filter ● Fuel volume control valve (FVCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Fuel injection pump fault ● Crankshaft position (CKP) sensor ● ECM fault	Check that the inertia switch has not tripped. Check the fuel level/condition. Check the fuel pump module operation, check the low pressure fuel system for leaks/damage. Check the intake air system for leaks. Check the fuel filter, check the FVCV and FPCV. Check the fuel injection pump. Check the CKP sensor. Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Difficult to start	● Glow plug system fault (very cold conditions) ● Low/Contaminated fuel ● Fuel pump module fault ● Low pressure fuel system fault ● Air leakage ● Blocked fuel filter ● Fuel volume control valve (FVCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated	Check the glow plug circuits. Check the fuel level/condition. Check the fuel pump module operation, check the low pressure fuel system for leaks/damage. Check the intake air system for leaks. Check the fuel filter, check the FVCV and FPCV. Check the EGR valves. Refer to the relevant section of the workshop manual.

Symptom	Possible causes	Action
	● Exhaust gas recirculation (EGR) valve fault	
Rough idle	● Low/Contaminated fuel ● Low pressure fuel system fault ● Air leakage ● Blocked fuel filter ● Fuel volume control valve (FVCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Exhaust gas recirculation (EGR) valve fault	Check the fuel level/condition. Check the low pressure fuel system for leaks/damage. Check the intake air system for leaks. Check the fuel filter, check the FVCV and FPCV. Check the EGR valves. Refer to the relevant section of the workshop manual.
Lack of power when accelerating	● Air intake system fault ● Catalytic converter blocked ● Low fuel pressure ● Exhaust gas recirculation (EGR) valve fault ● Turbocharger fault	Check the intake air system. Check for a blockage/restriction in the exhaust system, install new components as necessary. Check the fuel pressure. Check the EGR valves. Check the turbocharger condition and actuator operation. Refer to the relevant section of the workshop manual.
Engine stops/stalls	● Low/Contaminated fuel ● Fuel pump module fault ● Low pressure fuel system fault ● High pressure fuel leak ● Air leakage ● Fuel volume control valve (FVCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Exhaust gas recirculation (EGR) valve fault	Check the fuel level/condition. Check the fuel pump module operation, check the fuel system for leaks/damage. Check the intake air system for leaks. Check the FVCV and FPCV. Check the EGR valves.
Engine judders	● Low/Contaminated fuel ● Low pressure fuel system fault ● High pressure fuel leak ● Air leakage ● Fuel volume control valve (FVCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Fuel injection pump fault	Check the fuel level/condition. Check the fuel system for leaks/damage. Check the intake air system for leaks. Check the FVCV and FPCV. Check the fuel injection pump. Refer to the relevant section of the workshop manual.
Excessive fuel consumption	● Low pressure fuel system fault ● High pressure fuel leak ● Fuel temperature sensor leak ● Fuel volume control valve (FVCV) blocked/contaminated ● Fuel pressure control valve (FPCV) blocked/contaminated ● Fuel injector failure ● Exhaust gas recirculation (EGR) valve fault	Check the fuel system for leaks/damage. Check the FVCV and FPCV. Check for injector DTCs. Check the EGR valves. Refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs, refer to section 303-14 - Electronic Engine Controls in the workshop manual.

DTC	Description	Possible causes	Action
P008700	Fuel Rail/System Pressure - Too Low	● Fuel rail pressure (FRP) sensor disconnected ● FRP sensor to ECM sensing circuit short circuit to ground ● FRP sensor supply circuit high resistance ● FRP sensor failure ● Fuel line leak ● Restricted fuel line ● Fuel pump module circuit high resistance ● Fuel pump module circuit short circuit to ground ● Fuel pump module failure ● Volume control valve fault ● Pressure control valve fault	Refer to the electrical guides and check the FRP sensor circuits. For FRP sensor tests, refer to the relevant workshop manual section. Check the low pressure fuel lines for damage or restrictions. Check the fuel pressure. Check the low pressure fuel pump module circuits and operation. Check for fuel rail and high pressure fuel line leaks. Check for VCV and PCV DTCs and rectify as necessary.
P008800	Fuel Rail/System Pressure - Too High	● Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense): short circuit to each other ● FRP sensor to ECM sense circuit short circuit to power ● FRP sensor failure ● Fuel pressure control valve (FPCV) fault ● Fuel pump module circuit short circuit to power ● Fuel pump module failure	Check the FRP sensor circuits, check the FPCV. Refer to the relevant section of the workshop manual. Check the fuel pump module circuits. Refer to the electrical guides.
P062700	Fuel Pump A Control Circuit / Open	● Fuel pump module relay control circuit short circuit to power ● Fuel pump module relay failure	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Refer to the relevant workshop manual section. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062800	Fuel Pump A Control Circuit Low	● Fuel pump module relay control circuit high resistance ● Fuel pump module relay control circuit short circuit to ground ● Fuel pump module relay failure	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062900	Fuel Pump A Control Circuit High	● Fuel pump module relay control circuit high resistance ● Fuel pump module relay failure	Refer to the electrical guides and check the fuel pump circuits. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P226900	Water in Fuel Condition	● Water in fuel condition ● Water in fuel sensor circuit short circuit to ground ● Water in fuel sensor fault	Drain the water from the fuel filter. Clear the DTC and retest. If the DTC resets, check the sensor circuit. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor.

Published: 11-May-2011

Fuel Tank and Lines - TDV6 2.7L Diesel - Fuel Tank

Removal and Installation

Removal

- WARNINGS:

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

⚠CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

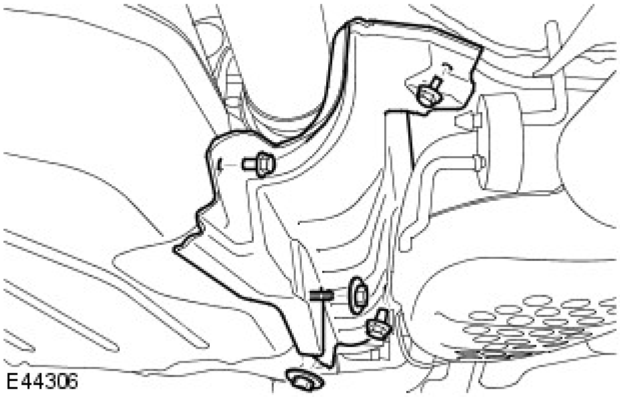
2. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

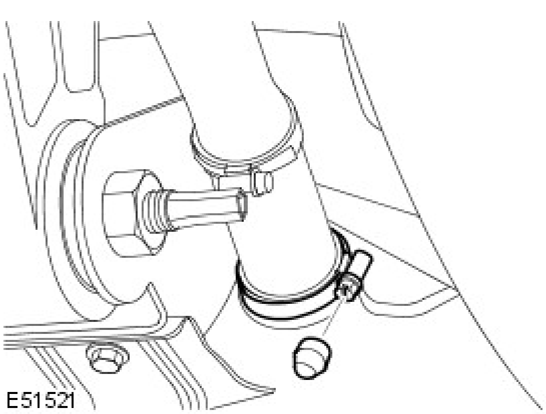
3. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the fuel tank heat shield.

- Remove the 3 bolts and 2 nuts.

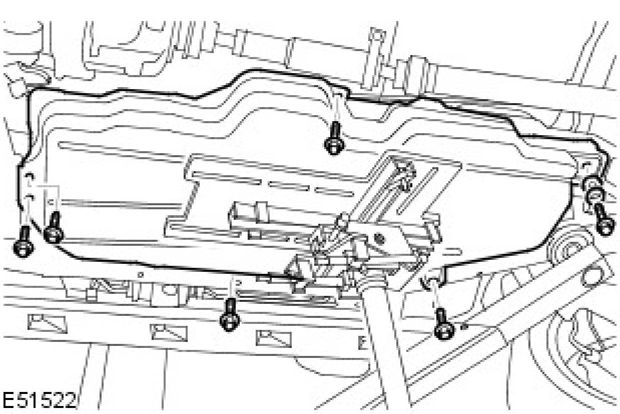




5. ⚠ CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Disconnect the fuel filler neck from the fuel tank.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



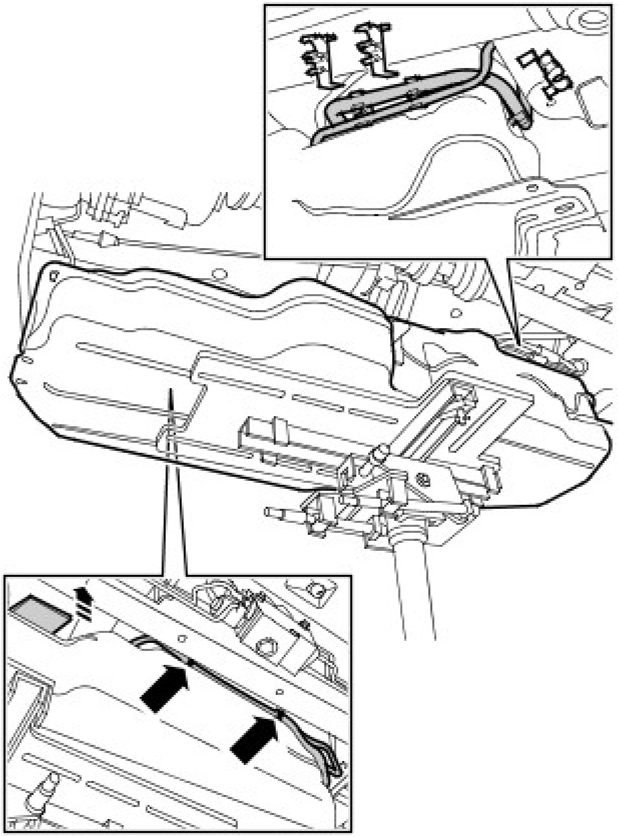
6. ⚠ WARNING: Secure the component to the transmission jack.

Using a transmission jack, lower the fuel tank.

- Remove the 5 bolts.

7. Release the parking brake emergency release cable.

- Release it from the 4 clips



E51523

8. NOTE: Note the fitted position.

Release the fuel tank vent and fuel lines.

- Remove the retainers.
- Release from the clips.
- Remove the adhesive pad.

9. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the 2 fuel tank vent lines.

- Release the clip.

Vehicles with fuel fired heater

10. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel fired booster heater fuel line.

- Release the clip.

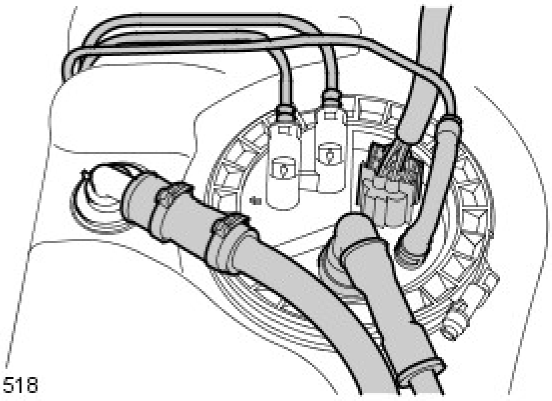
All vehicles

11. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the 2 fuel lines.

- Release the 2 clips.

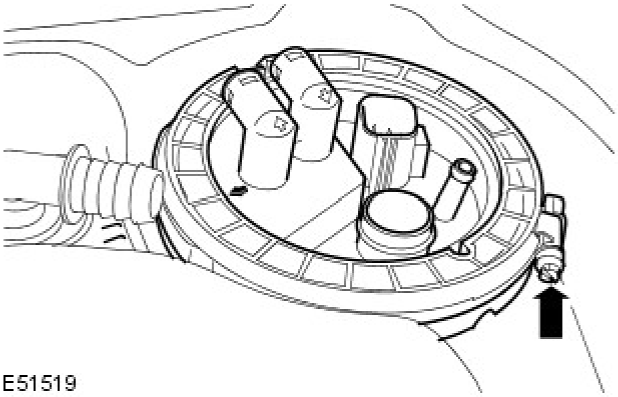
12. Disconnect the fuel pump module electrical connector.


E51518

13. Remove the fuel tank.

14. NOTE: Do not disassemble further if the component is removed for access only.

With assistance, remove the fuel tank from the transmission jack.

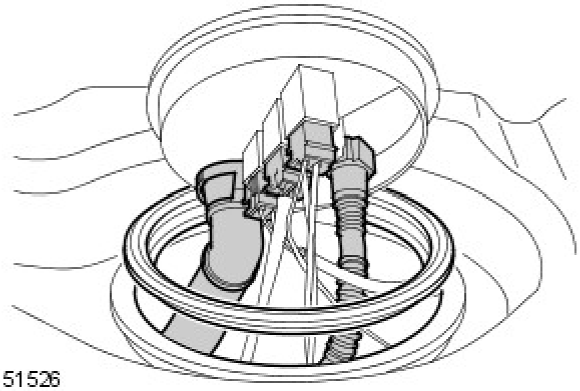

E51519

15. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Note the fitted position.

Release the fuel pump module access flange.

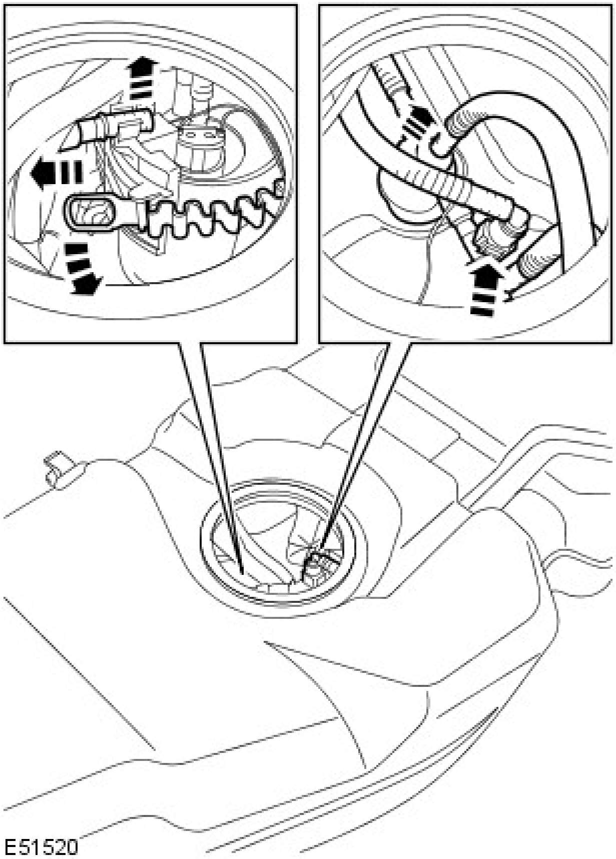
- Loosen the screw.
- Remove the clamp.


E51526

16. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

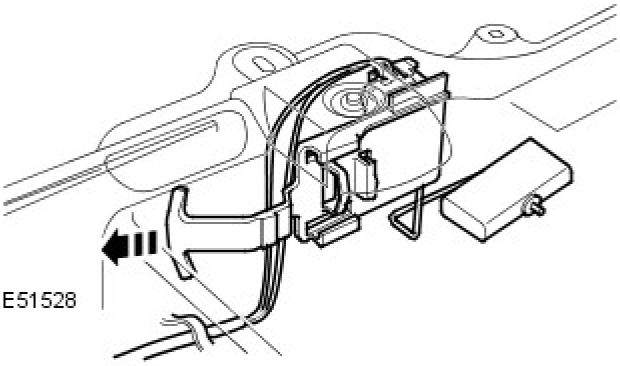
Remove the fuel pump module access flange.

- Disconnect the vent line.
- Disconnect the fuel supply line.
- Disconnect the 3 electrical connectors.
- Remove and discard the seal.



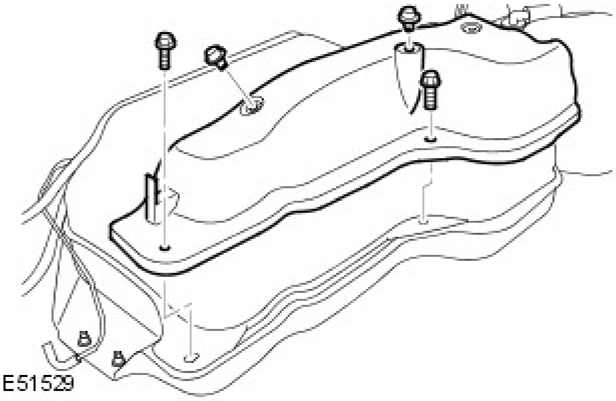
17. Remove the fuel pump module.

- Release the strap.
- Release the fuel pressure regulator.
- Disconnect the 2 fuel lines.



18. Remove the fuel tank front fuel level sender unit.

- Release the lead.
- Release the clip.



19. Remove the fuel tank bracket.

- Remove the 2 clips.
- Remove the 2 bolts.
- Remove the retaining plate.

Installation

All vehicles

1. Install the fuel tank bracket.

- Install the retaining plate.
- Install the clips.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the fuel tank front fuel level sender unit.

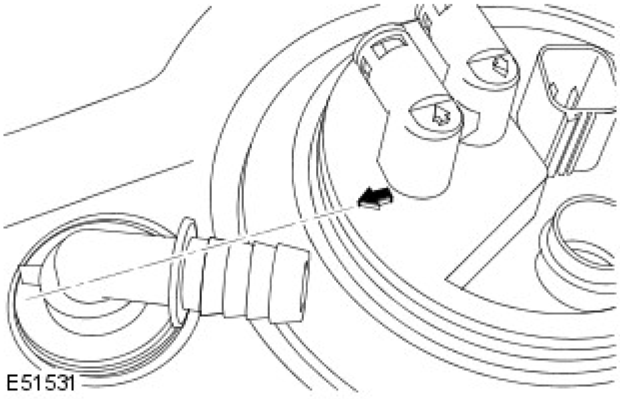
- Secure the clip.
- Secure the lead.

3. Install the fuel pump module.

- Connect the fuel lines.
- Secure with the strap.
- Secure the fuel pressure regulator.

4. Install the fuel pump module access flange.

- Clean the component mating faces.
- Install a new seal.
- Connect the 3 electrical connectors.
- Connect the fuel supply line.
- Connect the vent line.



5. ⚠ CAUTION: Make sure the seal is installed correctly.

• NOTE: Align to the position noted on removal.

Secure the fuel pump module access flange.

- Install the clamp.
- Tighten the screw to 4 Nm (3 lb.ft).

6. With assistance, install the fuel tank to the transmission jack.

7. Position the fuel tank to the vehicle.

8. Connect the fuel lines.

- Secure with the clip.

Vehicles with fuel fired heater

9. Connect the fuel fired booster heater fuel line.

- Secure with the clip.

All vehicles

10. Connect the vent lines.

- Secure with the clip.

11. Connect the electrical connector.

12. Secure the fuel and vent lines.

- Secure in the clips.
- Install the retainers.
- Install the adhesive pad.

13. Secure the parking brake emergency release cable.

- Secure in the 4 clips.

14. Install the fuel tank.

- Tighten the bolts to 45 Nm (33 lb.ft).

15. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

16. Install the fuel tank heat shield.

- Tighten the bolts to 5 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

17. Refill the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

18. Bleed the fuel system.
For additional information, refer to: Low-Pressure Fuel System Bleeding - TDV6 2.7L Diesel (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 2.7L Diesel - Fuel Filter ElementVIN Range: SALLS900302->END OF 06MY

Removal and Installation

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

- CAUTIONS:

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

⚠ Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

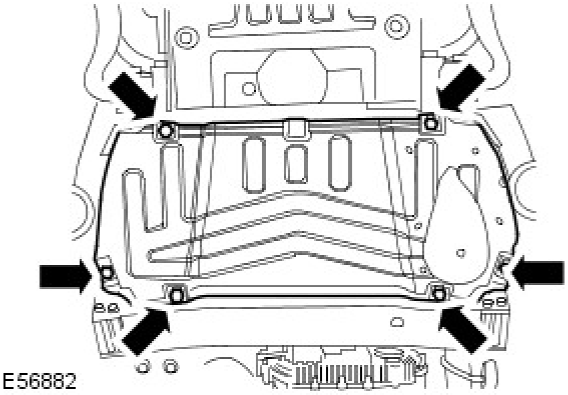
⚠ Make sure the fuel lines are connected to the correct fuel line connector on the fuel filter. Failure to follow these instructions may result in damage to the engine or fuel injection system.

- NOTE: Before disconnecting the battery, make sure all text and cautions in the battery disconnect section are observed.

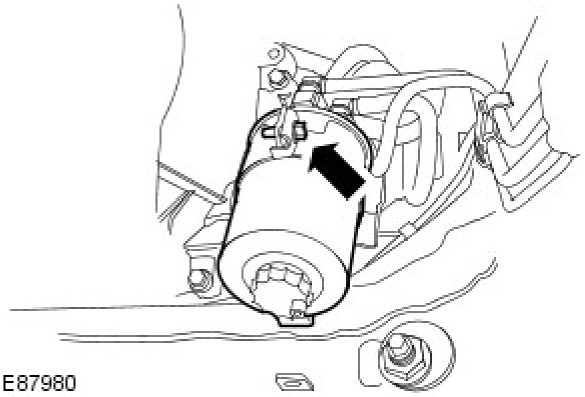
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

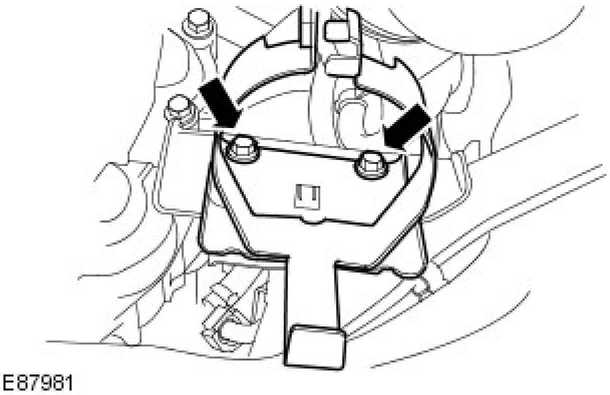
Raise and support the vehicle.



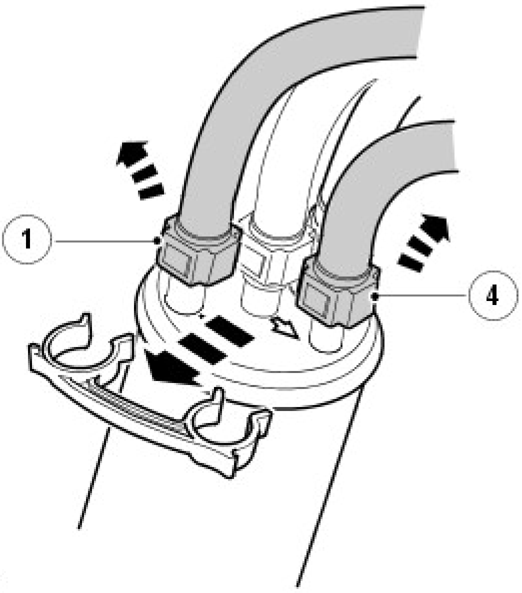
3. Remove the transmission undershield.
   - Remove the 6 bolts.



4. Release the fuel filter from its bracket.
   - Remove the bolt.



5. Remove the fuel filter bracket.
   - Remove the 2 bolts.



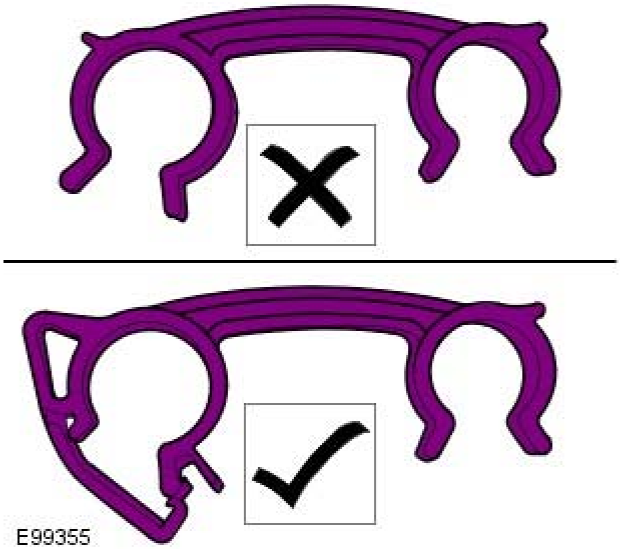
E87982

6. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Note the fitted position of the fuel lines to the fuel filter connections.

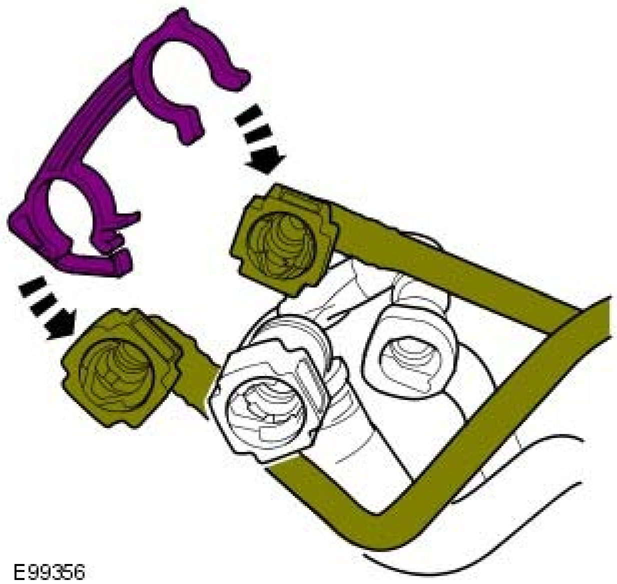
Release and disconnect the fuel supply line from the tank, (yellow connector number 1) and the fuel tank vent line, (small blue connector number 4) from the fuel filter.

- Position a container to collect the fuel spillage.

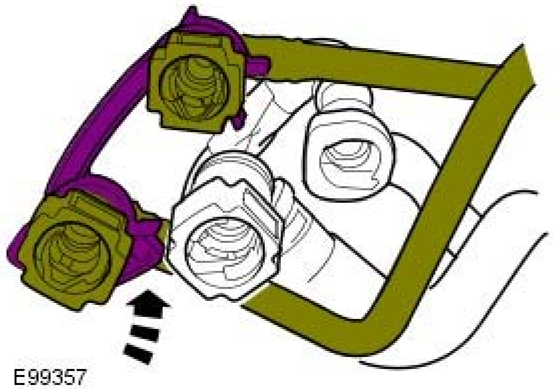


E99355

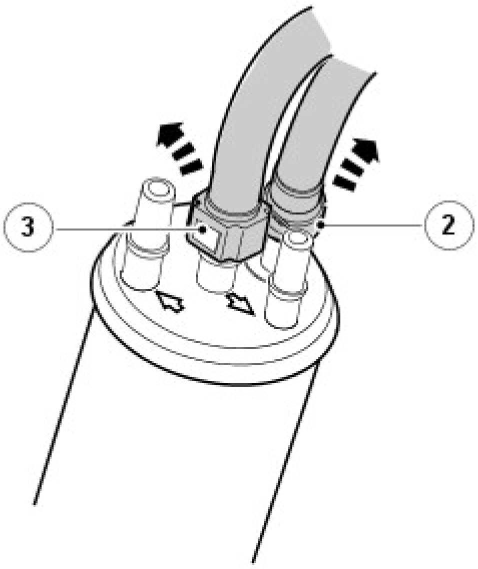
7. Remove and discard the clip.


E99356

8. Install the new clip to fuel lines 1 and 4.


E99357

9. Secure the clip.



E87984

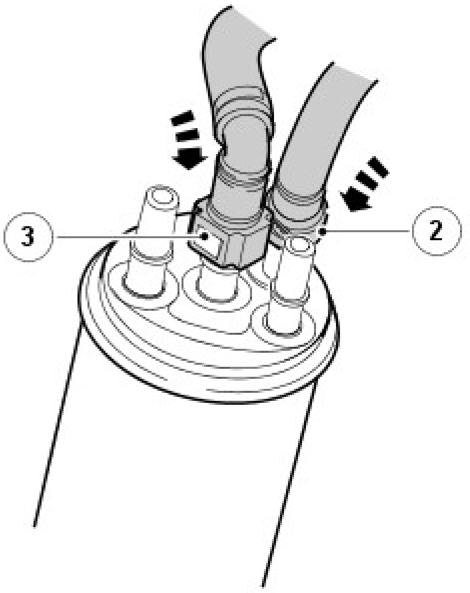
10. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Note the fitted position of the fuel lines to the fuel filter connections.

Remove the fuel filter.

- Release and disconnect the high-pressure fuel pump supply line. (Large blue connector number 3).
- Release and disconnect the fuel cooler return line. (White connector number 2).

Installation

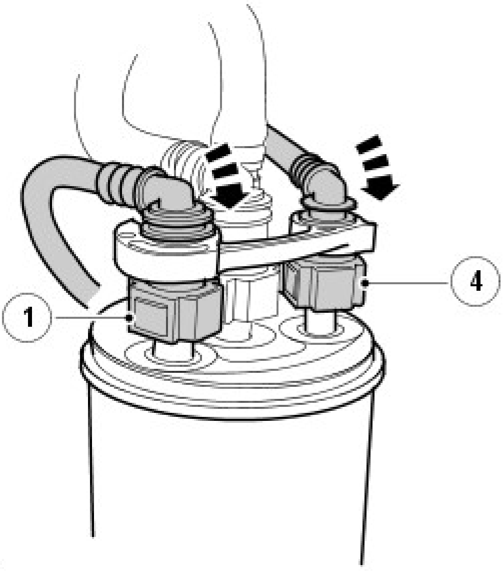


E99538

1. CAUTION: Make sure that the colors of the connectors match the colors on the disc supplied with the new fuel filter.

Install the fuel filter.

- Connect the fuel cooler return line. (White connector number 2).
- Connect the high-pressure fuel pump supply line. (Large blue connector number 3).



E99539

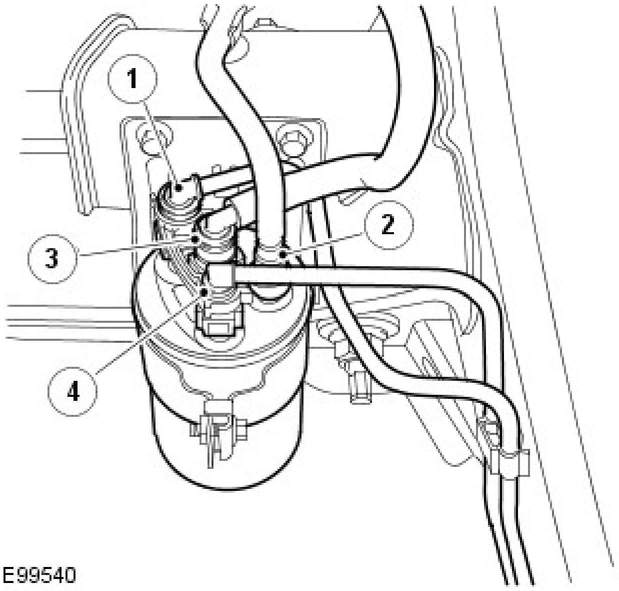
2. CAUTIONS:

Make sure that the colors of the connectors match the colors on the disc supplied with the new fuel filter.

Make sure that the clip is correctly fitted.

Connect the 2 remaining lines to the fuel filter.

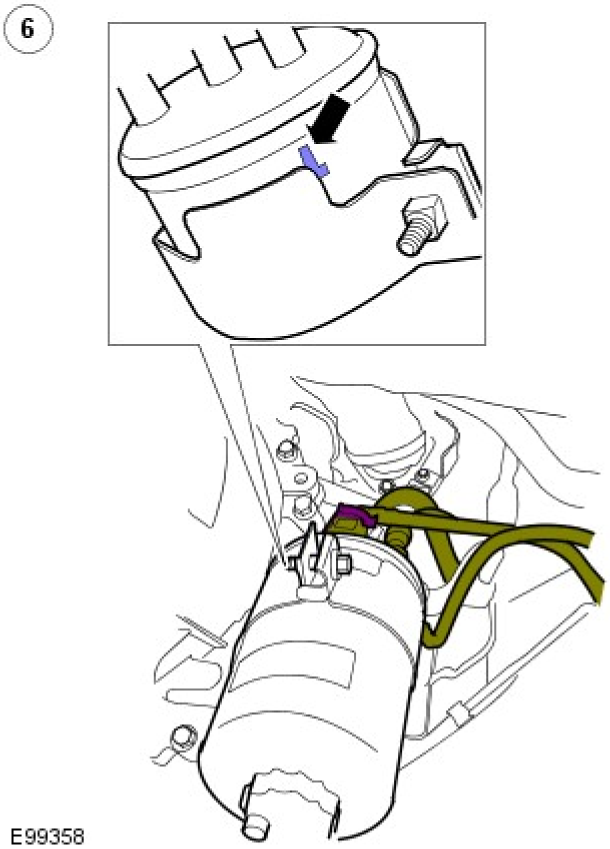
- Connect the fuel supply line from the fuel tank. (Yellow connector number 1).
- Connect the vent line from the fuel tank. (Small blue connector number 4).



3. Correct connector and line installation shown.

4. Install the fuel filter bracket.
   - Install the 2 bolts and tighten to 10 Nm (7 lb.ft).

5. Secure the fuel filter in its bracket.
   - Align the fuel filter to the bracket.
   - Install the bolt and tighten to 10 Nm (7 lb.ft).
   - Remove the container.



6. Install the transmission undershield.
   - Install the 6 bolts and tighten to 10 Nm (7 lb.ft).

7. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery

and Charging System - General Information, Specifications).

8. Bleed the fuel system.
For additional information, refer to: Low-Pressure Fuel System Bleeding - TDV6 2.7L Diesel (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 2.7L Diesel - Fuel Tank Filler Pipe

Removal and Installation

Removal

- WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Position the vehicle on a lift.

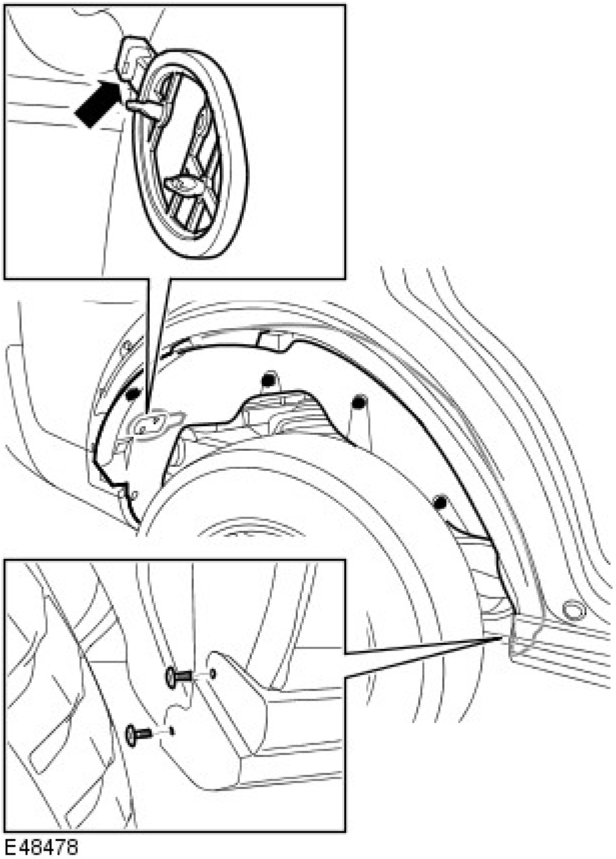
2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

4. Remove the RH rear wheel and tire.

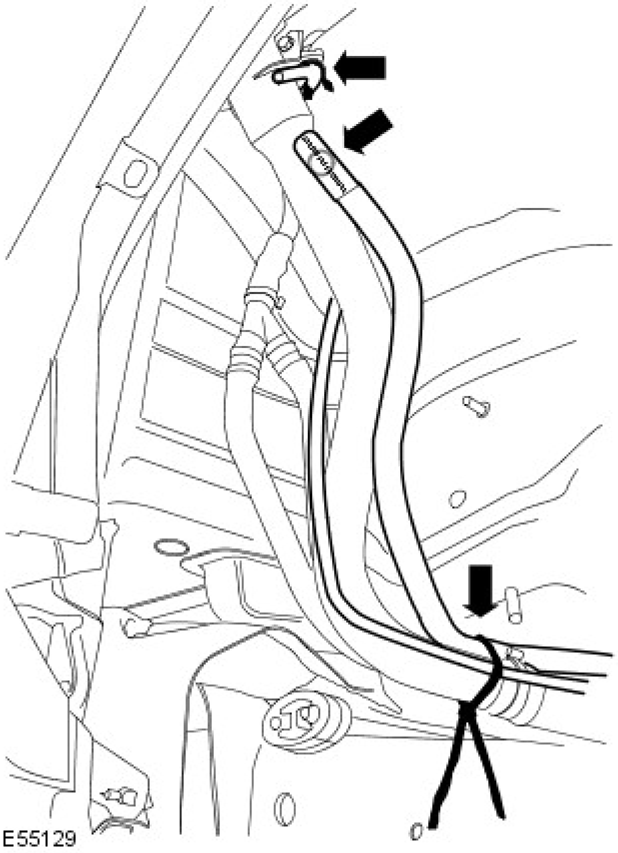
5. Remove the fender splash shield.

- Remove the 2 screws.
- Remove the 6 retainers.
- Disconnect the electrical connector.



6. Remove the fuel filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

7. Remove the spare wheel and tire.



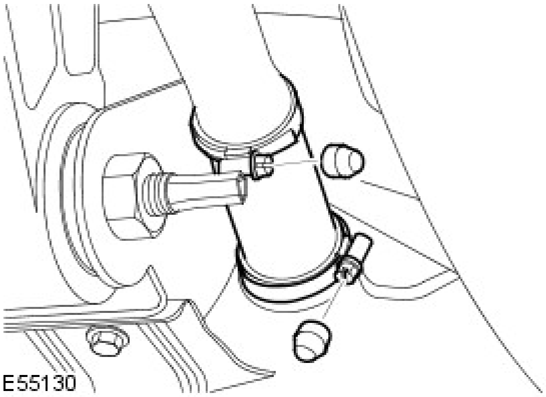
8. Disconnect the breather pipes.

- Remove the clip.
- Release the 2 clips.
- Remove and discard the cable tie.

9. ⚠CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

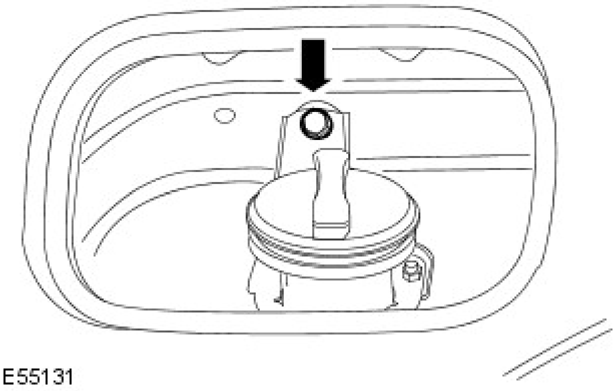
Disconnect the fuel filler neck from the fuel tank.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



10. Remove the fuel tank filler pipe connector hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



11. NOTE: Note the fitted position.

Remove the fuel tank filler pipe.

- Remove the bolt.

Installation

1. Install the filler pipe connector hose.

- Install the new tamper proof clip.

2. NOTE: Align to the position noted on removal.

Install the fuel tank filler pipe.

- Install the bolt and tighten to 10 Nm (7 lb.ft).

3. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

4. Connect the breather pipes.

- Secure the clips.

5. Install the filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

6. Install the fender splash shield.

7. Install the wheel and tire.

8. Install the spare wheel and tire.

9. Refill the fuel tank.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 12-Oct-2011

Fuel Tank and Lines - TDV6 2.7L Diesel - Fuel Filter ElementVIN Range: 07 MODEL YEAR->CURRENT

Removal and Installation

Removal

- WARNINGS:

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

⚠ The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

- CAUTIONS:

⚠ Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

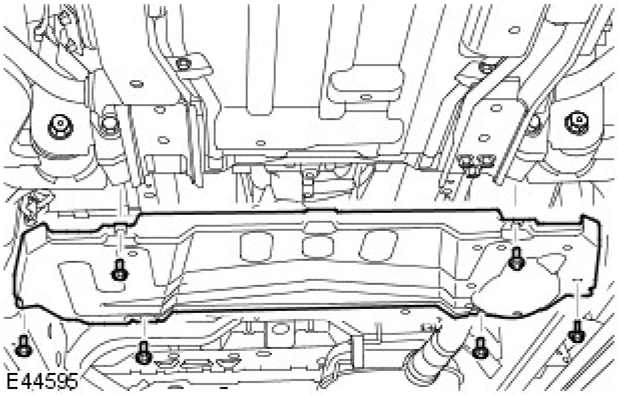
⚠ Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

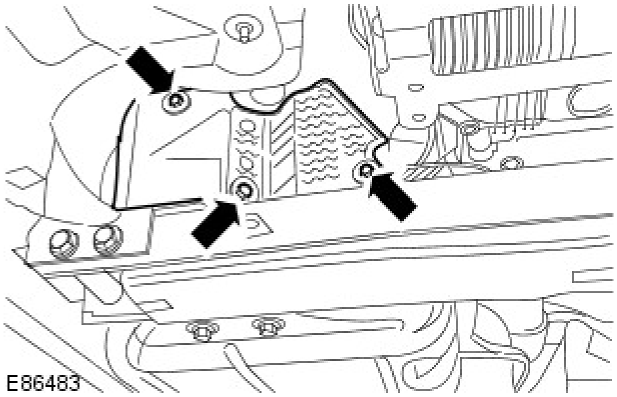
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transmission undershield.

- Remove the 6 bolts.

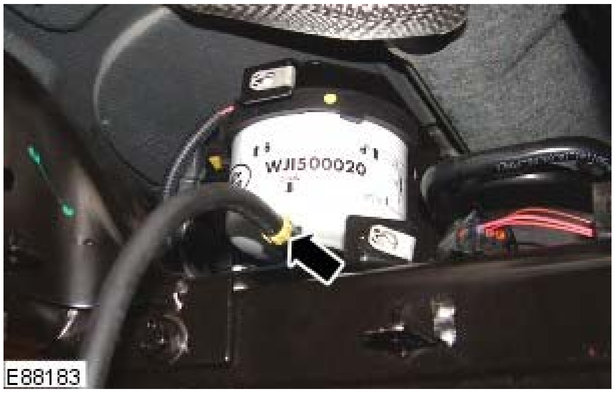




3. ⚠ WARNING: Observe due care when working near a hot exhaust system.

Remove the fuel filter heat shield.

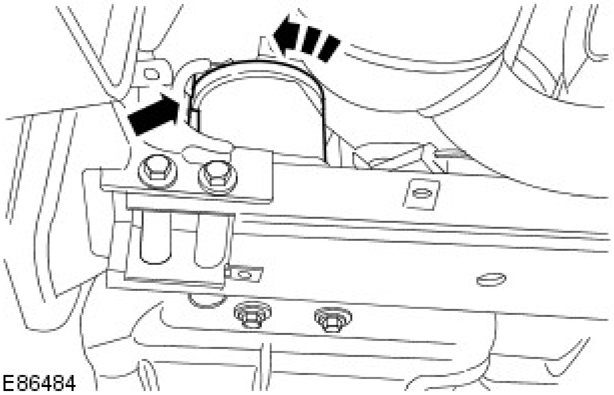
- Remove the 3 bolts.



4. ⚠ CAUTION: Make sure the water-in-fuel sensor remains in the aligned position.

Drain the fuel filter element.

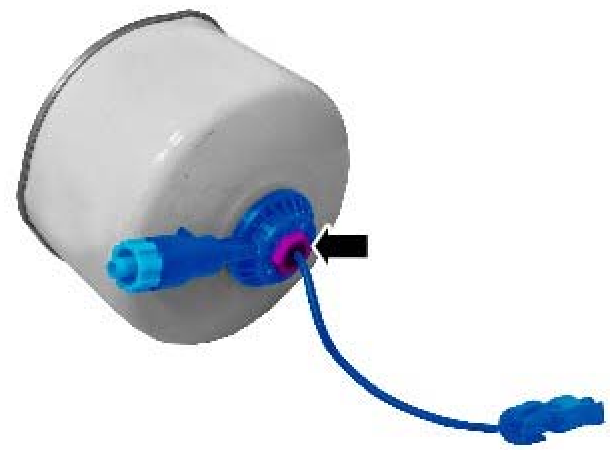
- Position a container to collect the fluid spillage.
- Loosen the nut.
- Attach a suitable drain tube to the water-in-fuel sensor drain port.
- Remove the drain tube.
- Tighten the nut.



5. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

Remove the fuel filter element.

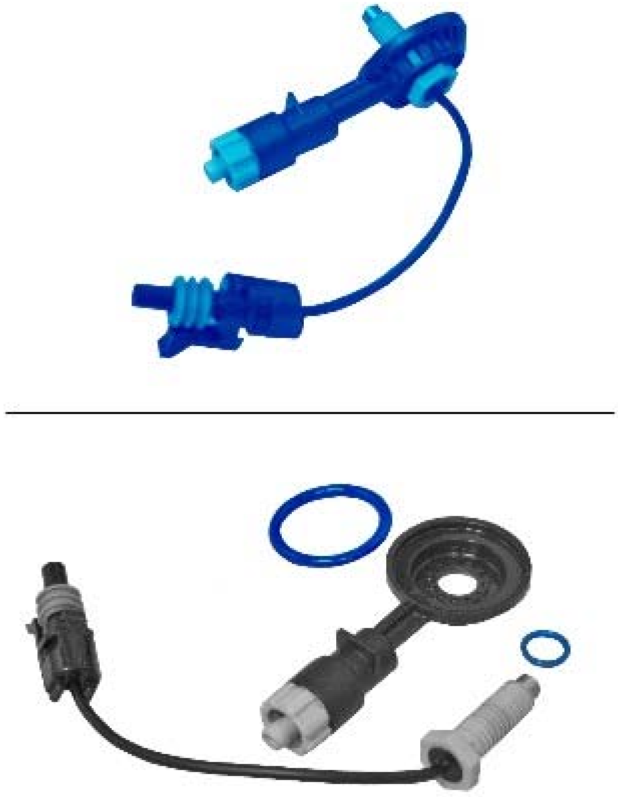
- Disconnect the water-in-fuel sensor electrical connector.



E138939

6. Remove the water-in-fuel sensor.

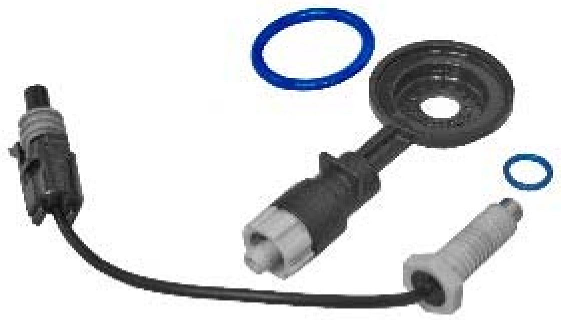
- Discard the fuel filter element.

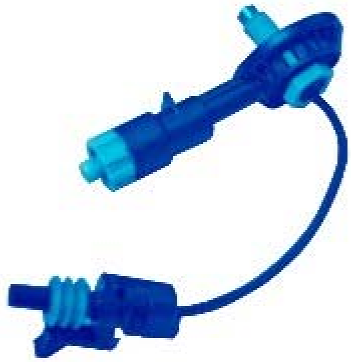


E138941

7. Remove and discard the O ring seals.

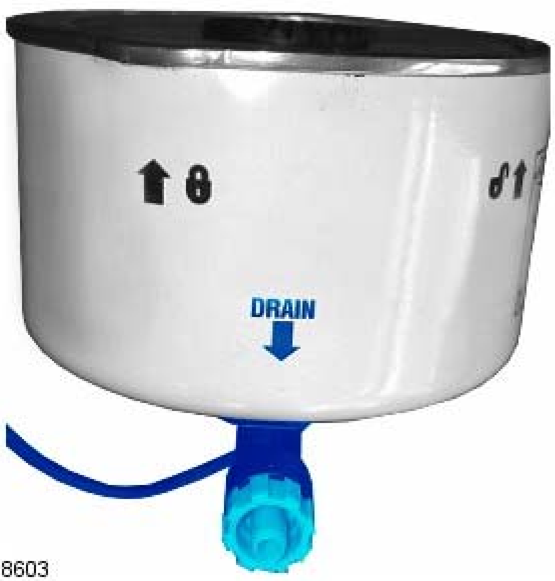
Installation





E138940

1. Install new O ring seals.



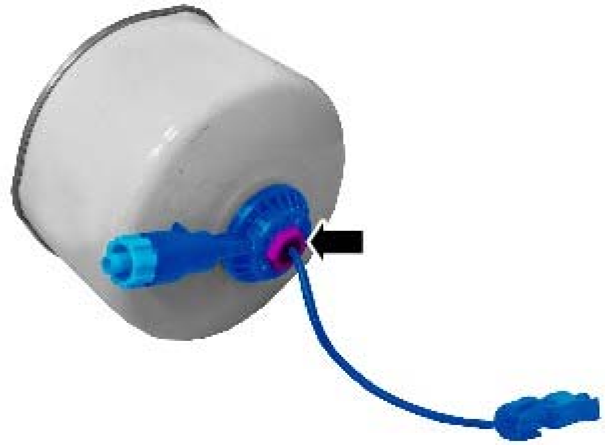
E138603

2. ⚠CAUTION: Make sure that the mating faces are clean and free of foreign material.

• NOTE: Make sure that the water-in-fuel sensor is aligned with the drain arrow.

Install the water-in-fuel sensor.

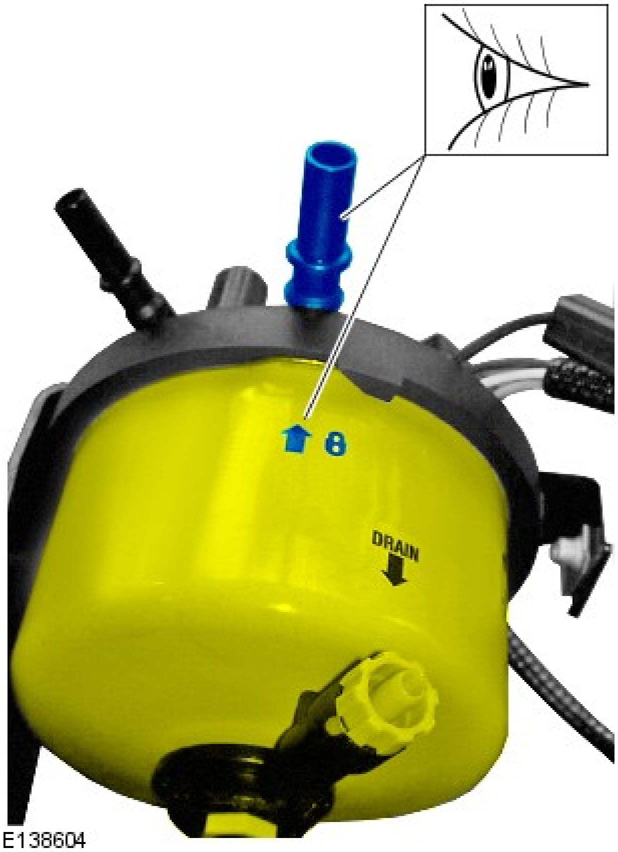
- Remove and discard the water-in-fuel drain plug from the new fuel filter element.



E138939

3. ⚠CAUTION: Make sure the water-in-fuel sensor remains in the aligned position.

Tighten the plastic nut to 1.6 Nm.

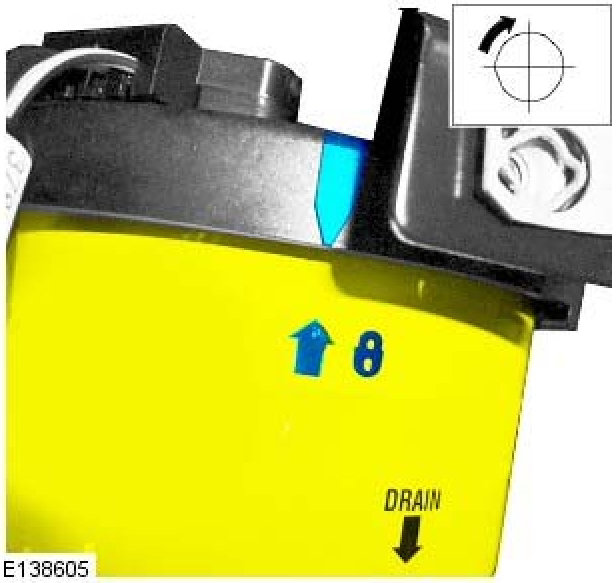


E138604

4. NOTE: Make sure that the fuel filter element is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.

Install the fuel filter element.

1. Insert the fuel filter with the the lock symbol arrow aligned with the inlet pipe on the fuel filter housing.



5. NOTE: Make sure that the fuel filter element is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.

Rotate to tighten and seal the fuel filter element.

1. When tightened correctly, the lock symbol arrow should be aligned with the arrow symbol on the fuel filter housing.

- Connect the water-in-fuel sensor electrical connector.
- Remove the container.

6. Install the fuel filter heat shield.

- Tighten the bolts to 6 Nm.

7. Install the transmission undershield.

- Tighten the bolts to 10 Nm.

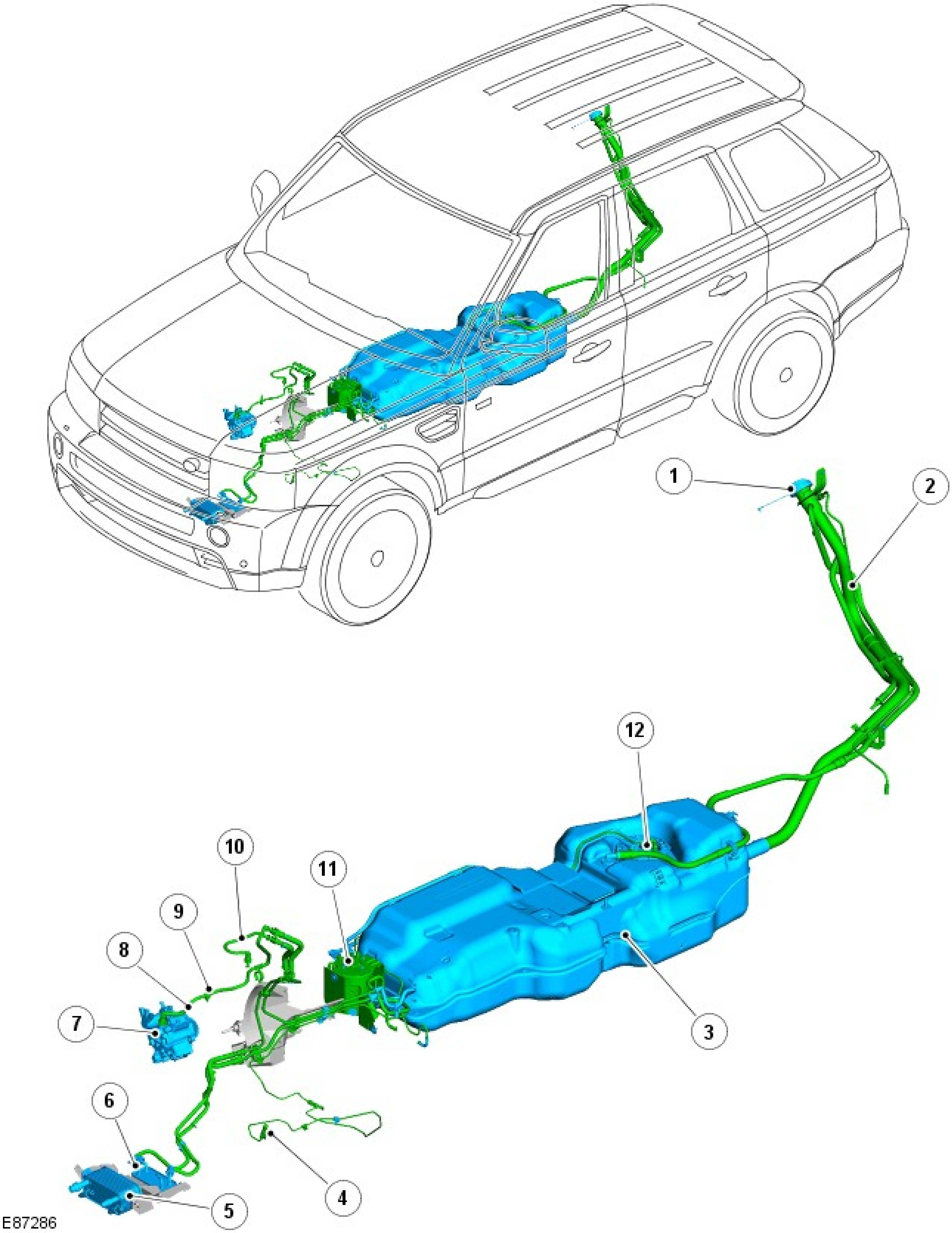
8. Carry out the low-pressure fuel system bleeding.

Published: 11-May-2011

Fuel Tank and Lines - TDV8 3.6L Diesel - Fuel Tank and Lines

Description and Operation

FUEL DELIVERY SYSTEM COMPONENT LOCATION - 3.6L V8 (TdV8)


1
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E87286

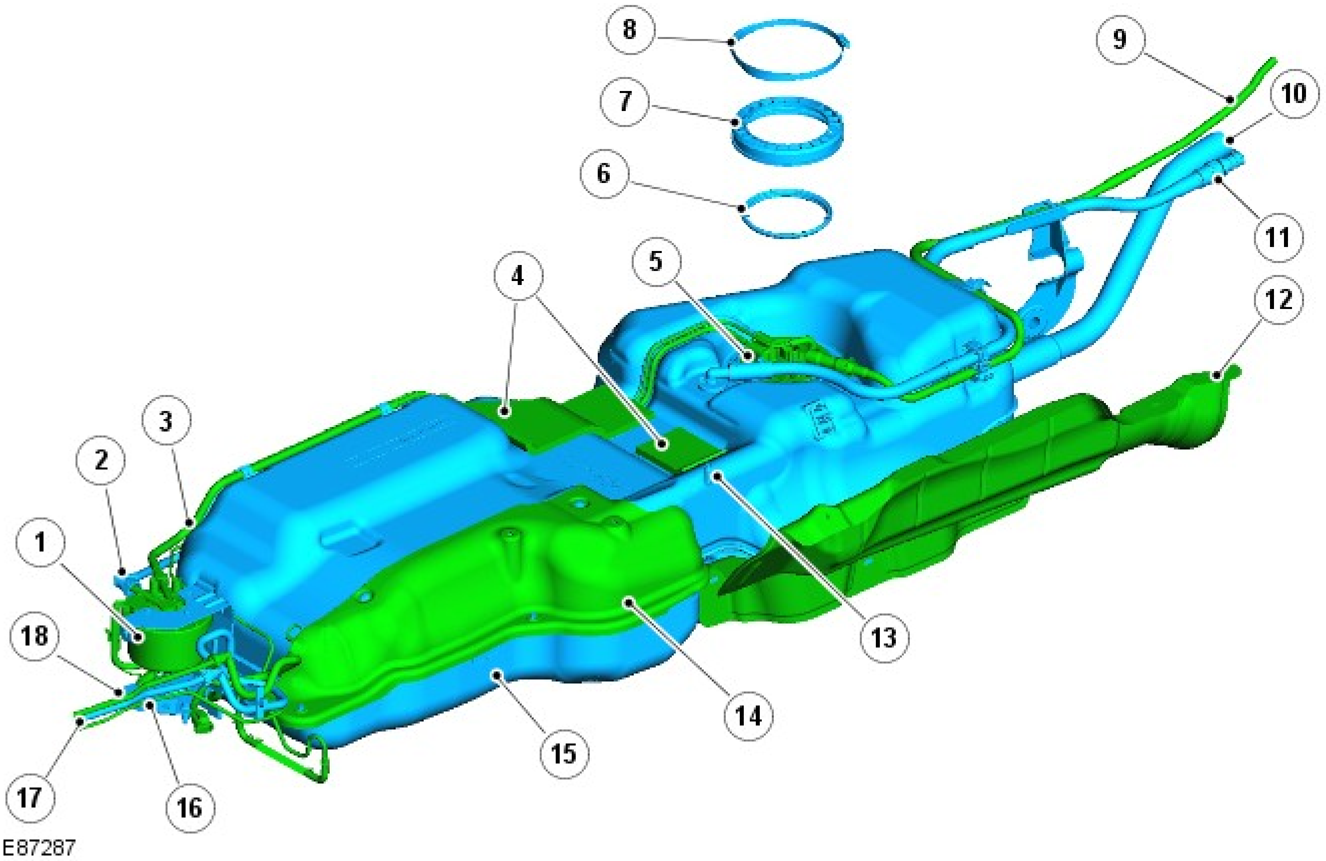
Item	Part Number	Description
1	-	Filler cap and lanyard
2	-	Fuel filler pipe
3	-	Fuel tank
4	-	Pipe - Fuel fired Booster Heater (FFBH) supply (if fitted)
5	-	Transmission cooler
6	-	Fuel cooler
7	-	High Pressure (HP) fuel pump
8	-	Pipe - Filter to HP fuel pump (fuel feed)
9	-	Schraeder valve
10	-	Pipe - HP pump to fuel cooler (fuel return)
11	-	Fuel filter assembly
12	-	Fuel pump module assembly

OVERVIEW

The major components of the TdV8 fuel system comprise a fuel tank, a fuel pump module, a fuel filter, a fuel cooler, a fuel filler pipe and cap assembly and two fuel level sensors.

The TdV8 fuel system is a high pressure common rail system. This system uses an engine mounted and driven high pressure pump to deliver a uniform level of pressure to the common fuel rail which supplies all fuel injectors.
For additional information, refer to: Fuel Charging and Controls (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Description and Operation).

FUEL TANK ASSEMBLY



Item	Part Number	Description
1	-	Fuel filter assembly
2	-	Pipe - Fuel/air bleed return
3	-	Pipe - Fuel feed from Low Pressure (LP) pump
4	-	Foam pads
5	-	Fuel pump module assembly
6	-	Pump module seal
7	-	Pump module collar

8	-	Pump module clamp
9	-	Vent pipe
10	-	Fuel filler pipe
11	-	Tank breather pipe
12	-	Heat shield
13	-	Mounting bolt (6 off)
14	-	Fuel tank cover
15	-	Cradle
16	-	FFBH feed pipe
17	-	Hose - fuel return
18	-	Hose - fuel supply

The fuel tank is located on the right hand side of the vehicle, between the transmission and the right hand chassis longitudinal. The tank is located on a mounting cradle which secures the whole fuel tank assembly to the vehicle. The tank has a useable capacity of 84.0 liters (22.19 US gallons).

The cradle is attached to the chassis with six screws. When the cradle is attached to the chassis, the tank is positively secured via foam pads which bear against the central chassis cross beam. A protective cover is fitted to the front right hand corner of the tank and provides additional protection.

The fuel tank is manufactured from moulded plastic which is a minimum of 3 mm thick. The tank is a sealed unit with the only internal access being via the pump module flange aperture on the top of the tank.

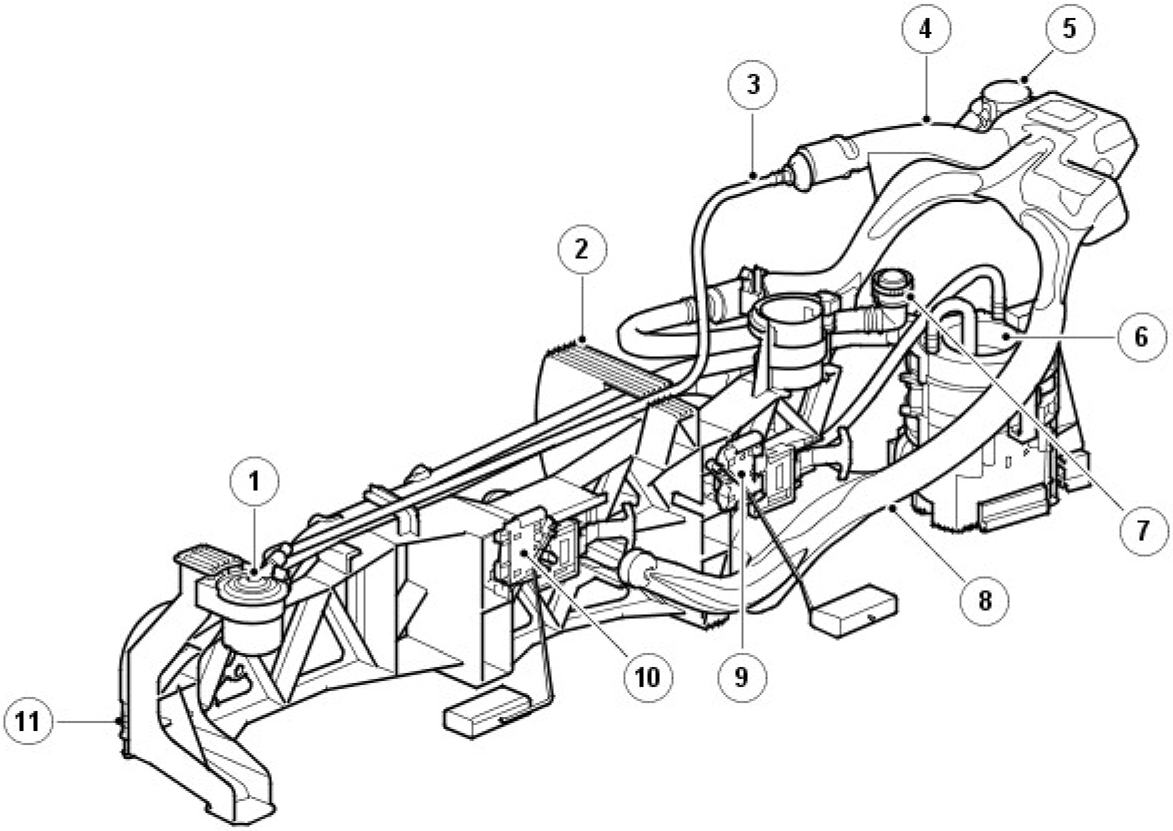
The flange assembly comprises a pump module flange which contains all external pipe and electrical connections for the tank internal components, a collar and a clamp. The flange is fitted with a seal which locates in the tank aperture. An arrow on the flange must be aligned centre of the fuel tank breather connection with the tank, to obtain the correct orientation. The collar is located over the flange and is secured with the clamp.

The flange has a five pin external connector which provides for electrical connections for the level sensors, the level sensors common ground and the fuel pump. This connector is wired to three push fit connectors on the underside of the flange. Two quick release connectors provide for the connection of the fuel feed and return pipes and the vent pipes. The fuel return connection contains a non return valve which prevents fuel escaping from the connection in the event of a vehicle roll over and the pipe becoming detached. On vehicles with a fuel burning heater, a third connection provides the connection for the fuel feed supply to the fuel burning heater.

A tank carrier assembly is attached inside the tank and is used to locate the internal tank components. The carrier provides location for the fuel pump module, the front and rear level sensors, the Roll Over Valves (ROVs) and the front jet pump.

The fuel pump module comprises the fuel pump, the rear jet pump, the pump inlet filter and the fuel pressure regulator which is mounted in a manifold on the carrier. Only the pump module assembly and the fuel level sensors are available as serviceable components, the individual assembly components are not available separately.

Fuel Tank Internal Components



E58415

Item	Part Number	Description
1	-	Front ROV
2	-	Carrier assembly
3	-	Front ROV corrugated tube to Liquid Vapor Separator (LVS)
4	-	Liquid Vapor Separator (LVS)
5	-	Rear Roll Over Valve (ROV)
6	-	Fuel pump module
7	-	Tank breather connector to underside of fuel pump module flange
8	-	LVS carrier
9	-	Rear fuel level sensor
10	-	Front fuel level sensor
11	-	Front jet pump

The TdV8 vent system is different to the system used on the petrol models. The TdV8 vent system comprises:

- Two Roll Over Valves (ROV)
- One Liquid Vapor Separator (LVS)
- Breather spout.

The vent system is mounted on the fuel tank internal carrier which is assembled outside of the tank and inserted into the tank during the blow moulding process. None of the internal tank venting components are serviceable.

The rear ROV is mounted in the rear right hand corner of the fuel tank. It is mounted directly onto the LVS with a rubber grommet and secured with a clip.

The front ROV is located in the front left hand corner of the tank. It is attached by a moulded clip to the main beam of the carrier. The ROV is connected to the LVS by a corrugated tube.

Both ROVs vent directly into the LVS. Any liquid fuel is separated from the vapor in the LVS and drains back into the tank via the front ROV.

The LVS vent outlet is connected to the underside of the tank flange. The vent line is then routed from the flange to atmosphere at the top of the filler neck. This line allows for pressure and vacuum relief during normal tank operation. It also allows air to enter the tank as fuel is used.

The main purpose of the tank breather connection is to control the fill volume of the tank. During filling, vapor exits the fuel tank via the breather connection and the breather tube to the filler neck. When the tank reaches its full level, the liquid fuel closes off the breather connection by filling it with fuel. The closure of the breather connection causes the back pressure in the tank to increase, which in turn causes the pump filling nozzle to turn off.

Fuel Pump Module

The fuel pump is attached to the carrier and is located at the bottom of the swirl pot. The pump and the fuel level sensors are connected to the external electrical connector via the connectors on the underside of the fuel pump module flange.

The pump module has a rated flow of 70 liters/hour (18.5 US gallons/hour) at a voltage of 12.3V and an output pressure of 0.5 bar (7.25 lbf/in^2).

The fuel pump is energised by the fuel pump relay which is located in the Battery Junction Box (BJB). The relay is controlled by the engine control module and energises the relay at all times when the ignition switch is in ignition position II.

A filter is attached to the pump inlet port at the bottom of the pump. The filter has a 'winged' section which is located vertically at the side of the pump to ensure that a portion of the filter is off the base of the swirl pot, to prevent premature blocking of the filter. The filter has two sections, a normal filter and a by-pass filter. The normal filter is a 31 micron fine mesh filter with a surface area of 70 cm^2 (10.8 in^2). The by-pass filter is a 300 micron coarse mesh filter which is closed in normal conditions and has a surface area of 4 cm^2 (0.62 in^2). In cold conditions, 'waxing' of the fuel can occur which can restrict fuel passing through the fine mesh filter. If this occurs, the by-pass opens allowing fuel to pass through the coarse mesh filter.

The top face of the fuel pump module has three pipe connections. One connection is the fuel pump outlet connection which feeds into the manifold. A second connection allows fuel at pump outlet pressure to flow back through the pump module housing from the manifold to the rear jet pump. The third connection allows fuel from the pressure regulator to return to the swirlpot when the regulator has opened due to excessive pump output pressure.

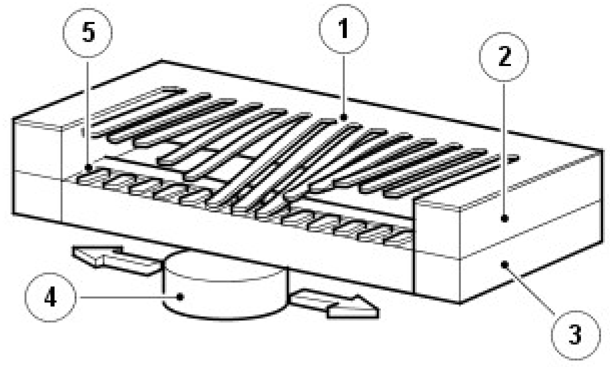
Fuel Level Sensors

The sensor is a MAgnetic Passive Position Sensor (MAPPS) which provides a variable resistance to earth for the output from the fuel gage. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The front and rear fuel level sensors are connected to the external electrical connector on the flange via the connectors on the underside of the fuel pump module flange.

The front and rear sensors are attached to the front of the carrier and are accessible via the fuel pump flange aperture.

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.

Sensor Operating Principle



E44417

Item	Part Number	Description
1	-	Magnetic foil
2	-	Spacer
3	-	Ceramic surface
4	-	Magnet
5	-	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal is output proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gage pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning lamp is incorporated in the instrument cluster and illuminates when the fuel level is at or below 14 liters (3.69 US gallons).

The fuel level sender signal is converted into a CAN message by the instrument cluster as a direct interpretation of the fuel tank contents in liters.

Front Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
51	Empty
101	Low fuel level illumination (14L)
375	Half full
911	Full

Rear Fuel Level Sensor Resistance / Fuel Gage Read out Table

- NOTE: These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

Sender Unit Resistance, Ohms	Nominal Gage Reading
86	Empty
171	Low fuel level illumination (14L)
441	Half full
944	Full

Fuel Pressure Regulator

The fuel pressure regulator is located in the manifold inside the fuel tank. The regulator controls the fuel pressure in the feed pipe to the High Pressure (HP) injection pump. If the pump outlet pressure becomes too high, the regulator controls the fuel pressure in the feed pipe by allowing some fuel to return to the swirl pot.

The regulator is subject to pump output pressure and constantly controls the pressure of the fuel delivered to the HP injection pump to 0.5 bar (7.25 lbf/in^2). The primary reason for the regulator is to protect the HP fuel injection pump from high fuel pressures.

Swirl Pot

The swirl pot is located at the rear of the fuel tank and provides for the attachment or location of most of the fuel pump assembly components.

The swirl pot acts as a fuel reserve, providing a constant supply of fuel to the fuel pump irrespective of fuel quantity or vehicle attitude. When the vehicle is level the swirl pot contains approximately 400 cm^3 (24.4 in^3) of fuel when the engine is running. The two jet pumps ensure that fuel is constantly supplied to the swirl pot to provide a sufficient fuel supply for the pump.

A one way valve is located in the base of the swirl pot. The valve allows fuel from the tank to enter the swirl pot, but prevents it from escaping.

Jet Pumps

The fuel system incorporates two jet pumps. The front jet pump is located on the carrier near the front of the fuel tank. The rear jet pump is located in the swirl pot below the fuel pump. Both jet pumps operate on a venturi effect created by fuel at pump output pressure passing through the jet pump. This draws additional fuel from the tank through ports in the jet pump body, delivering additional fuel to the swirl pot.

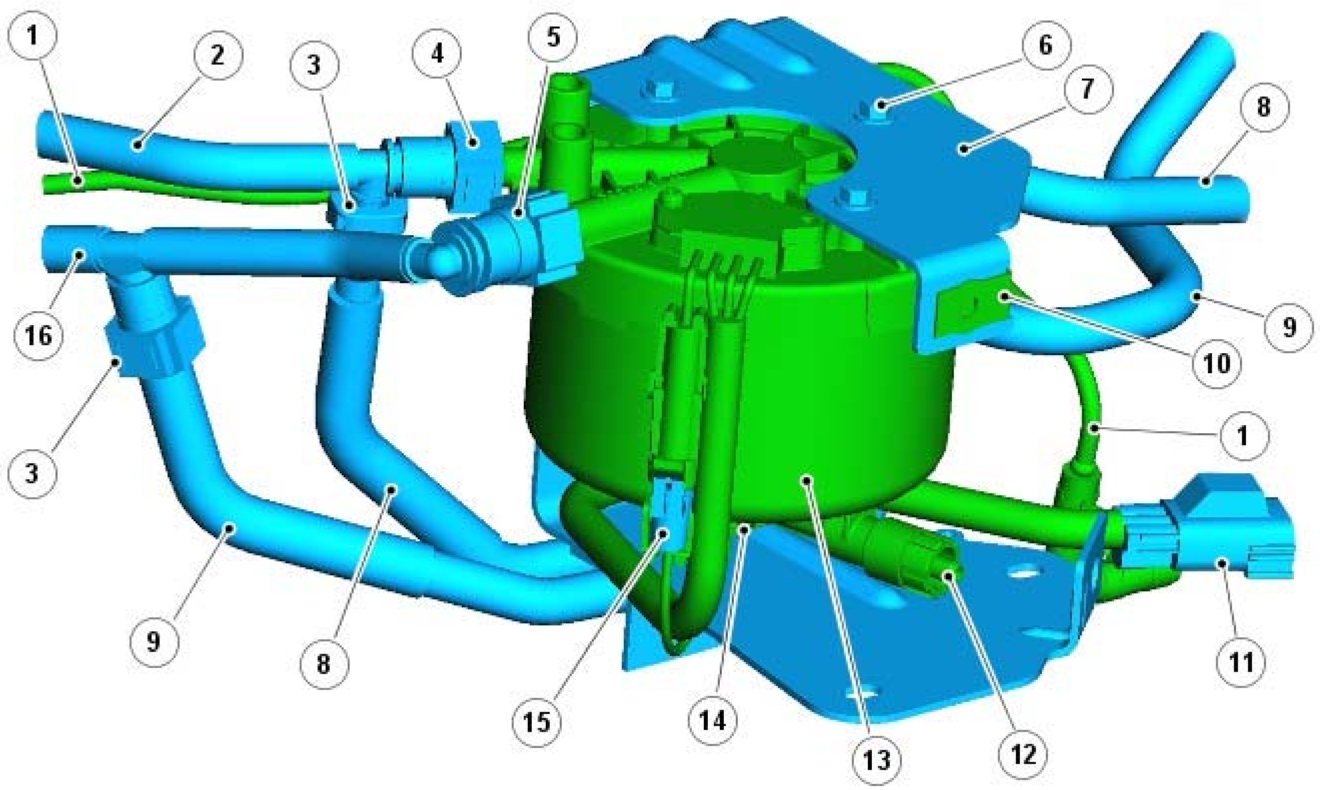
The front jet pump is mainly used when the vehicle is driving downhill. The jet pump is connected via a pipe from the fuel manifold and receives fuel at pump output pressure. Because of its location at the front of the tank, it collects fuel from the front of the tank and transfers it into the swirl pot, ensuring a constant supply of fuel to the pump. The jet pump has a jet nozzle of 1 mm diameter.

The rear jet pump operates at pump output pressure and delivers some of the fuel from the rear of the tank back into the swirl pot.

Roll Over Valves (ROVs)

Two ROVs are located on the carrier and are connected via pipes to a Liquid Vapor Separator (LVS). The LVS, which is also attached to the carrier, is connected via a pipe to the tank breather outlet in the pump module flange. The ROVs contain non-return valves which close in the event of the vehicle overturning, preventing liquid fuel escaping from the tank via the breather pipe.

FUEL FILTER



E87288

Item	Part Number	Description
1	-	FFBH supply from pump module
2	-	Fuel feed supply to filter from pump module
3	-	Quick release connector
4	-	Fuel filter inlet
5	-	Fuel filter outlet
6	-	Filter attachment bolt (3 off)
7	-	Mounting bracket
8	-	Fuel return from HP pump and fuel cooler
9	-	Fuel supply to HP pump
10	-	Heatshield attachment (2 off)
11	-	Electrical connector
12	-	Water drain valve
13	-	Filter element
14	-	Water sensor
15	-	Water sensor electrical connector
16	-	Fuel return/air bleed to tank

The fuel filter assembly is located in front of the fuel tank and is mounted on a bracket which is attached to the top face of the transfer box chassis cross member. The fuel filter assembly comprises a bracket, filter housing and the filtration element. The filter housing is secured to the bracket with 3 bolts. The bracket is secured to the cross member with 2 bolts which are screwed into threaded holes in the cross member.

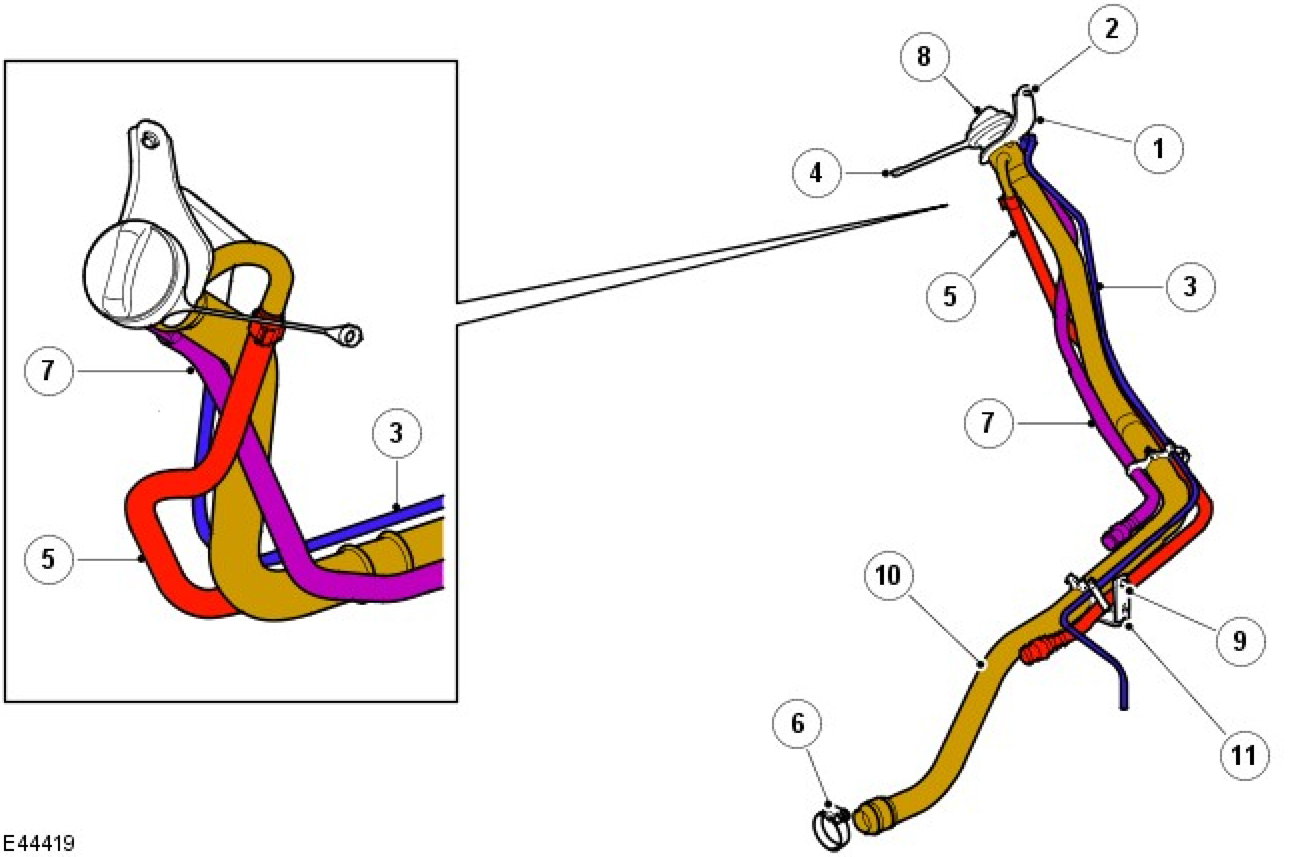
The filter housing has an inlet and outlet which allow for the attachment of hoses using quick release connectors. The filter element is located on the underside of the housing and can be removed by rotating one quarter turn to release from the housing.

The filter element has a capacity of 200 cm^3 (12.2 in^3). The filtration element can filter particulate matter larger than 2 microns. A water drain valve is located on the base of the filter. The filter can be purged of water by partially unscrewing the drain valve and allowing at least 84 cm^3 (5.12 in^3) of fuel to drain into a suitable container. The drain plug has a centre outlet which allows for the attachment of a drain hose.

The filter element also has a water sensor located in its base. The sensor is screwed into a threaded hole in the base of the element. When the filter is replaced at service, the sensor can be unscrewed from the element and installed in the new element. The sensor has an electrical connector located at the side of the element which can be disconnected to assist element removal.

The water sensor is connected to the engine control module (ECM). When the water in the element reaches 64 cm^3 (3.9 in^3) the ECM issues a high speed controller area network (CAN) bus message to the instrument cluster to display a 'WATER IN FUEL' message in the message centre.

FUEL FILLER



Item	Part Number	Description
1	-	Bracket
2	-	Screw M6
3	-	Rear differential breather pipe (Ref. only)
4	-	Filler cap lanyard
5	-	Tank breather pipe
6	-	Clamp - filler hose
7	-	Vent pipe
8	-	Filler cap
9	-	Screw M8
10	-	Filler pipe
11	-	Lower mounting bracket to Electric Park Brake (EPB) bracket

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head is covered by a moulded plastic cover which is electrically locked when the vehicle is locked. The filler cap is a conventional screw in type which is secured to the vehicle with a lanyard.

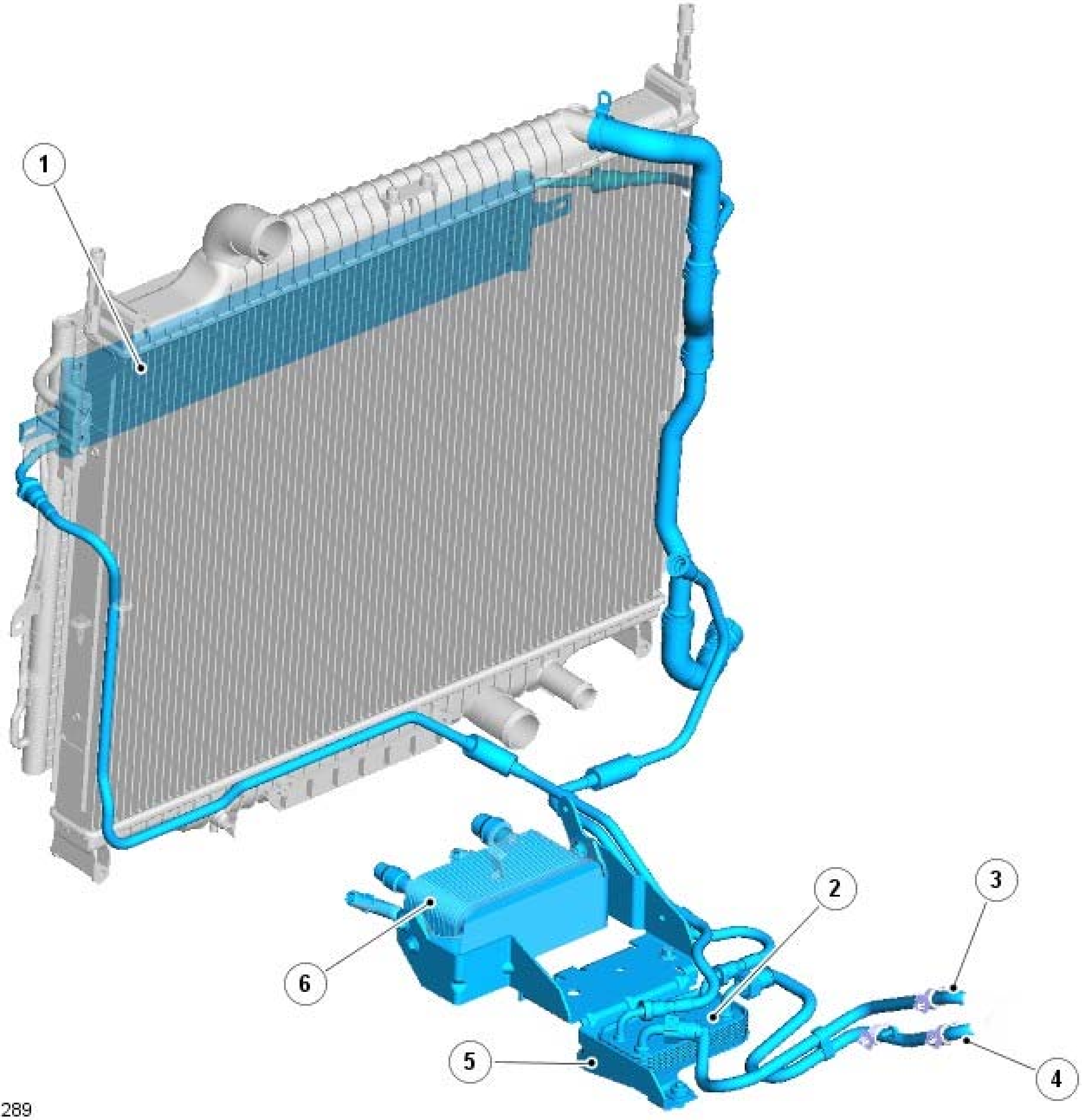
- NOTE: The fuel filler head plastic cover does not lock on NAS vehicles.

The filler head is a stainless steel fabrication. Two brackets provide for the attachment of the filler head to the vehicle body and the chassis electronic park brake bracket.

A connection on the rear of the filler head allows for the connection of the fuel tank breather pipe from the fuel tank breather stub. The fuel tank breather pipe has a quick release fitting and connects to the breather pipe from the fuel tank breather stub. The fuel filler vent pipe from the tank is vented to atmosphere. The vent pipe incorporates an insect trap at its termination near the filler head. The fuel filler pipe locates in a short flexible hose attached to the tank and is secured with a worm drive clamp.

A smaller pipe, which is not associated with the fuel system, is attached to the side of the fuel filler pipe. This pipe connects to the rear differential and provides breathing for the differential case. The pipe terminates near the fuel filler head.

FUEL COOLER



Item	Part Number	Description
1	-	Fuel cooler engine coolant radiator
2	-	Fuel cooler
3	-	Fuel return from HP pump
4	-	Fuel return from cooler to fuel filter
5	-	Bracket
6	-	Transmission fluid cooler (ref)

The fuel cooler uses engine coolant, direct from a dedicated additional engine coolant radiator located in front of the main radiator. This passes the cold coolant through the fuel cooler to cool fuel returning to the fuel filter from the HP injection pump.

The fuel cooler is located below the engine and shares a common mounting bracket with the transmission fluid cooler. The bracket has two slots which accept two plastic pegs which are attached to the cooler. A bolt is inserted through a hole in the bracket and screws into a captive nut on the cooler to positively secure the cooler to the bracket.

The cooler has four quick fit connector pipes which provide for the attachment of the fuel inlet hose from the HP injection pump, the fuel outlet hose to the fuel filter, the coolant inlet hose from the radiator and the coolant outlet hose to the coolant thermostat housing. The coolant pipes can be identified by their smaller diameter.

Published: 11-May-2011

Fuel Tank and Lines - TDV8 3.6L Diesel - Fuel Tank and Lines

Diagnosis and Testing

Overview

For information on the fuel system description and operation:
REFER to: Fuel Tank and Lines (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Description and Operation).

Inspection and Verification

WARNING: Make sure that all suitable safety precautions are observed when carrying out any work on the fuel system. Failure to observe this warning may result in personal injury.

CAUTION: Make sure that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
● Fuel level ● Contaminated fuel ● Fuel supply line(s) ● Fuel return line(s) ● High-pressure fuel supply line(s) ● Fuel tank filler pipe ● Fuel leak(s) ● Fuel tank ● Fuel filler cap ● Fuel filter ● Push connect fittings ● Fuel rail ● Fuel injection pump ● Exhaust gas recirculation (EGR) system	● Battery charge and condition ● Fuse(s) ● Inertia fuel shutoff (IFS) switch ● Fuel pump module (lift pump) ● Fuel pump module relay ● Electrical connector(s) ● Damaged or corroded wiring harness ● Fuel volume control valve ● Fuel pressure control valve ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible causes	Action
Engine cranks, but does not start	● Inertia fuel shutoff (ISF) switch ● Low/Contaminated fuel ● Air leakage ● Low-pressure fuel system fault ● Fuel pump module (lift pump) fault ● Blocked fuel filter ● Fuel volume regulator blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● Fuel pump fault ● Crankshaft position (CKP) sensor	Check that the ISF switch has not tripped. Check the fuel level and condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check for DTCs. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check the fuel volume and pressure control valves and circuits. Refer to the electrical guides. Check the fuel pump: REFER to: Fuel Charging and Controls (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Diagnosis and Testing). Check the CKP sensor circuits. Refer to the electrical guides.

DTC Index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: For a full list of ECM DTCs:
REFER to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

DTC	Description	Possible causes	Action
P008700	Fuel rail/system pressure too low	● Fuel rail pressure (FRP) sensor disconnected ● FRP sensor to ECM sensing circuit short circuit to ground	Refer to the electrical guides and check the FRP sensor circuits. For FRP sensor tests, refer to the relevant workshop manual section. Check the low pressure fuel lines for damage or restrictions. Check the fuel pressure. Check the low pressure fuel pump module circuits and operation. Check for fuel rail and high pressure fuel line leaks. Check for VCV and PCV DTCs and rectify as necessary.

DTC	Description	Possible causes	Action
		● FRP sensor supply circuit high resistance ● FRP sensor failure ● Fuel line leak ● Restricted fuel line ● Fuel pump module circuit high resistance ● Fuel pump module circuit short circuit to ground ● Fuel pump module failure ● Volume control valve fault ● Pressure control valve fault	
P008800	Fuel rail/system pressure too high	● Fuel rail pressure (FRP) sensor to ECM wiring (supply/sense) short circuit to each other ● FRP sensor to ECM sense circuit short circuit to power ● FRP sensor failure ● Fuel pressure control valve (FPCV) fault ● Fuel pump module circuit short circuit to power ● Fuel pump module failure	Check the FRP sensor circuits. Refer to the electrical guides. For FRP sensor tests, refer to the relevant workshop manual section. Check the fuel lines, check the fuel pressure and the fuel pump module circuits.
P062712	Fuel Pump A Control Circuit / Open	● Fuel pump relay control circuit short circuit to power ● Fuel pump relay fault	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Refer to the relevant workshop manual section. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062811	Fuel Pump A Control Circuit Low	● Fuel pump relay control circuit short circuit to ground ● Fuel pump relay fault	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P062913	Fuel Pump A Control Circuit High	● Fuel pump relay control circuit high resistance ● Fuel pump relay control circuit open circuit ● Fuel pump relay fault	Check the fuel pump and circuits. Refer to the electrical guides. Activate the relay and listen for an audible 'click'. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P115A68	Low Fuel Level - Forced Limited Power	● Low fuel level - forced limited power - event information (anti air suction intervention occurred) ● Low fuel ● Fuel level sensor circuit short circuit	Check that there is sufficient fuel in the tank. Check the fuel level sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new fuel level sensor. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Action
		to ground ● Fuel level sensor circuit high resistance ● Fuel level sensor fault	
P115B68	Low Fuel Level - Forced Engine Shutdown	● Low fuel level - forced engine shutdown - event information (anti air suction intervention occurred) ● Low fuel ● Fuel level sensor circuit short circuit to ground ● Fuel level sensor circuit high resistance ● Fuel level sensor fault	Check that there is sufficient fuel in the tank. Check the fuel level sensor and circuits. Refer to the electrical guides. If no fault is found in the circuits, install a new fuel level sensor. Clear the DTCs and test for normal operation.
P213F07	Fuel Injection System Fault Forced Engine Shutdown	● Engine stop by hydraulic	Check for associated DTCs and Repair/renew as necessary. If this DTC resets, contact the technical help desk.
P226413	Water in Fuel Sensor Circuit	● Sensor circuit high resistance	Check the sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P226532	Water in Fuel Sensor Circuit Range/Performance	● Water in fuel sensor connector fault - signal low time less than minimum - Initialization error, edge too short ● Water in fuel sensor circuit fault	Check the sensor and circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
P226533	Water in Fuel Sensor Circuit Range/Performance	● Water in fuel sensor connector fault - signal low time greater than maximum ● Water in fuel sensor circuit fault	Check the sensor and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P226611	Water in Fuel Sensor Circuit Low	● Sensor circuit short circuit to ground	Check the sensor and circuits. Refer to the electrical guides. Rectify as necessary. Clear the DTCs and test for normal operation.
P226968	Water in Fuel Condition	● Water in fuel condition ● Water in fuel sensor circuit short circuit to ground ● Water in fuel sensor fault	Drain the water from the fuel filter. Clear the DTC and retest. If the DTC resets, check the sensor circuit. Refer to the electrical guides. If no fault is found in the circuits, install a new sensor.
P229000	Injector Control Pressure Too Low	● Fuel leak (high or low-pressure system) ● Fuel filter/line fault ● Air lock in injection pump ● Fuel pump fault	There are different approaches to this depending on whether or not the vehicle runs. If the vehicle does **not** run: remove the lift pump fuse (fuse 1E of the engine compartment junction box). Disconnect the volume control valve connector from the rear of the injection pump. Disconnect the fuel spill lines and direct into a suitable container through a length of clear pipe. Crank the engine to at least 250 rpm for a minimum of 15 seconds. The pump spill flow should be at least 160 ml/min. If the spill flow is greater than this, install a new injection pump. REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8

DTC	Description	Possible causes	Action
			3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If the spill flow is less than 160 ml/min, carry out the low-pressure bleeding procedure. REFER to: Low-Pressure Fuel System Bleeding - TDV6 2.7L Diesel (310-00 Fuel System - General Information, General Procedures). Recheck the spill flow, if it is still less than 160 ml/min, install a new fuel pump. REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation. If the vehicle **does** run, install a new fuel filter and run the engine at 3,000 rpm for 3 minutes. During this, monitor the fuel pressure using a data logger function. If there is an airlock in the pump, the fuel pressure will be low and unstable, but a high-speed run should clear this. If the fault does not clear, check the low-pressure system to the injection pump. Insert a length of clear pipe into the fuel line and check for a steady flow of fuel with no air bubbles. If the low-pressure system checks out, disconnect the fuel injector electrical connectors and check connections. Direct the lines into a suitable container and crank the engine. Compare the flow from the injectors and if there is one or more with low flow, install a new injector to that cylinder. REFER to: (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel) Fuel Injectors LH (Removal and Installation), Fuel Injectors RH (Removal and Installation). Clear the DTCs and test for normal operation. If the fault does not clear, install a new injection pump. REFER to: Fuel Pump (303-04D Fuel Charging and Controls - TDV8 3.6L Diesel, Removal and Installation). Clear the DTCs and test for normal operation.

Published: 11-May-2011

Fuel Tank and Lines - TDV8 3.6L Diesel - Fuel Cooler

Removal and Installation

Removal

- WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

⚠ Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

⚠ Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

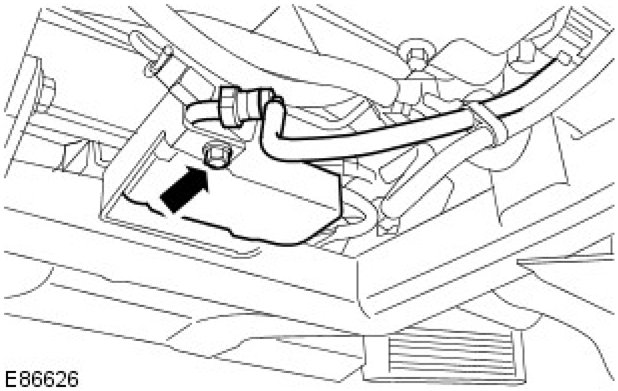
⚠CAUTION: Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

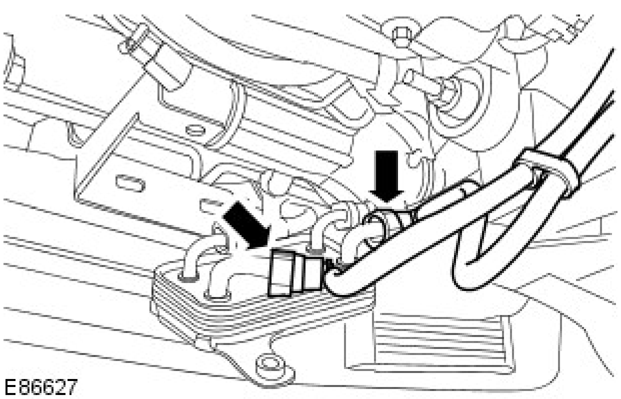
1. Raise and support the vehicle.

2. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

3. Release the fuel cooler.

- Remove the bolt.

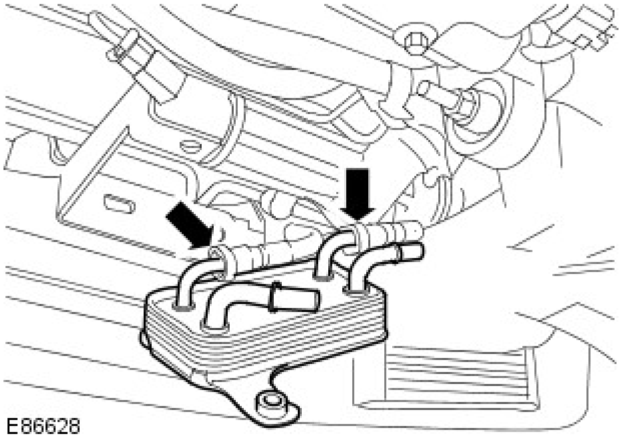




4. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 fuel lines.

- Position a container to collect the fluid spillage.



5. CAUTIONS:

⚠ Make sure that all openings are sealed. Use new blanking caps.

⚠ Make sure that the area around the component is clean and free of foreign material.

Remove the fuel cooler.

- Disconnect the 2 coolant lines.

Installation

1. NOTE: Remove and discard the blanking caps.

Install the fuel cooler.

- Connect the coolant lines.

2. NOTE: Remove and discard the blanking caps.

Connect the fuel lines.

- Remove the container.

3. Secure the fuel cooler.

- Tighten the bolt to 23 Nm (17 lb.ft).

4. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. Carry out the low-pressure fuel system bleeding.
For additional information, refer to: Low-Pressure Fuel System Bleeding - TDV6 2.7L Diesel (310-00 Fuel System - General Information, General Procedures).

6. Check and top-up the coolant.

Published: 12-Oct-2011

Fuel Tank and Lines - TDV8 3.6L Diesel - Fuel Filter Element

Removal and Installation

Removal

- WARNINGS:

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

- CAUTIONS:

Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

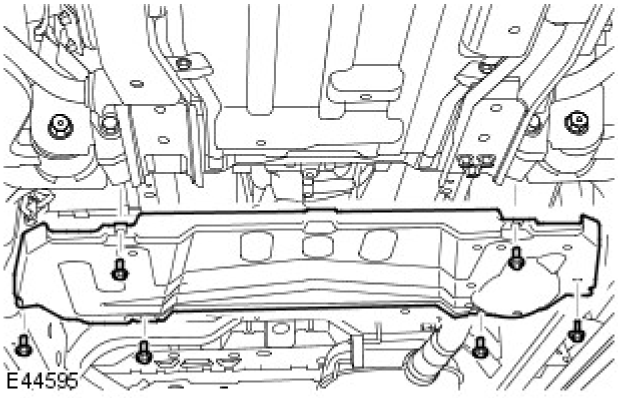
Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

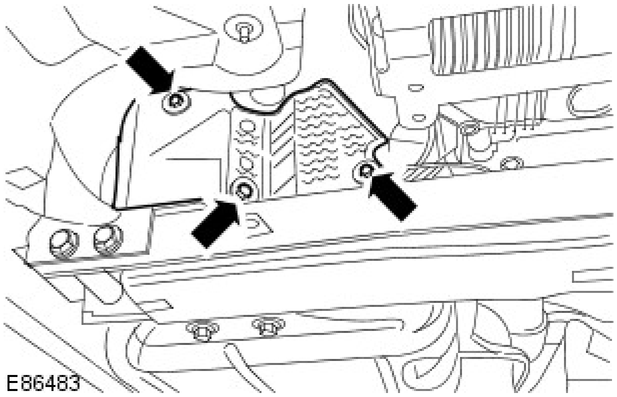
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transmission undershield.

- Remove the 6 bolts.

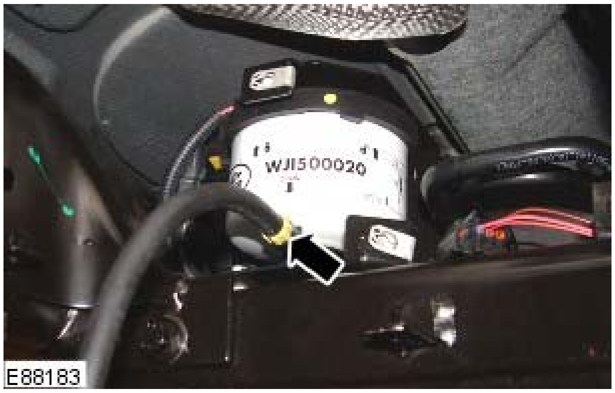



E86483

3. ⚠ WARNING: Observe due care when working near a hot exhaust system.

Remove the fuel filter heat shield.

- Remove the 3 bolts.

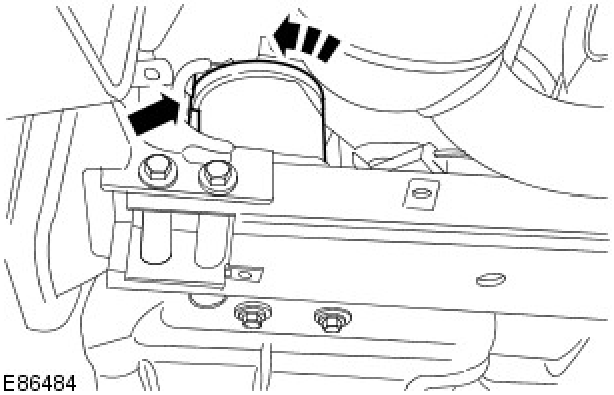


E88183

4. ⚠ CAUTION: Make sure the water-in-fuel sensor remains in the aligned position.

Drain the fuel filter element.

- Position a container to collect the fluid spillage.
- Loosen the nut.
- Attach a suitable drain tube to the water-in-fuel sensor drain port.
- Remove the drain tube.
- Tighten the nut.


E86484

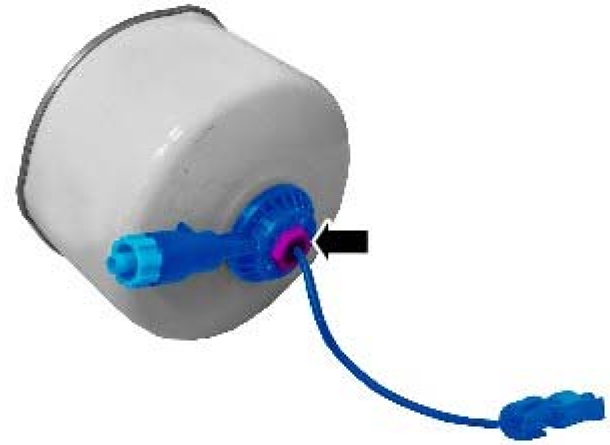
5. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

Remove the fuel filter element.

- Disconnect the water-in-fuel sensor electrical connector.

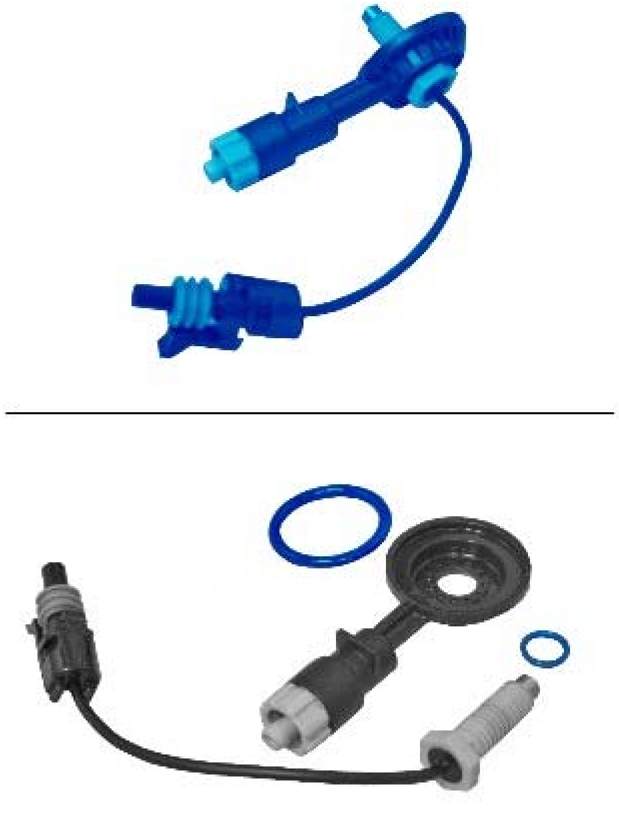
6. Remove the water-in-fuel sensor.

- Discard the fuel filter element.



E138939

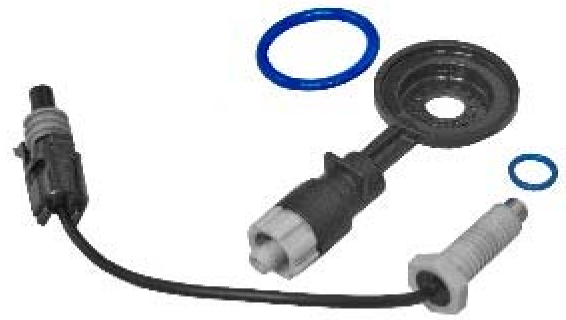
7. Remove and discard the O ring seals.

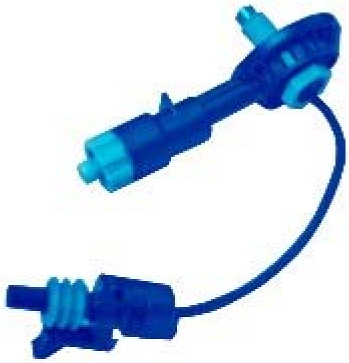


E138941

Installation

1. Install new O ring seals.





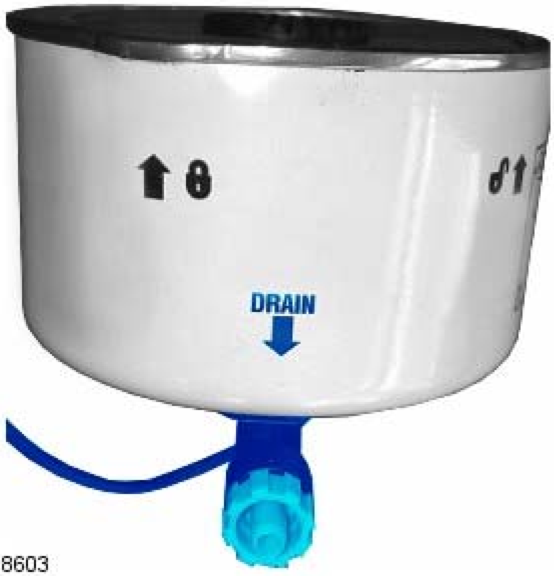
E138940

2. ⚠CAUTION: Make sure that the mating faces are clean and free of foreign material.

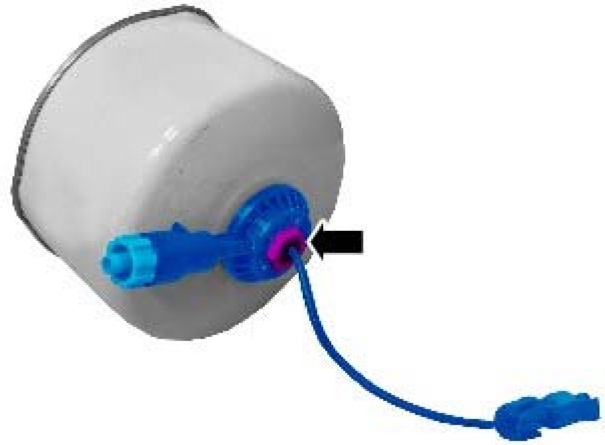
• NOTE: Make sure that the water-in-fuel sensor is aligned with the drain arrow.

Install the water-in-fuel sensor.

- Remove and discard the water-in-fuel drain plug from the new fuel filter element.



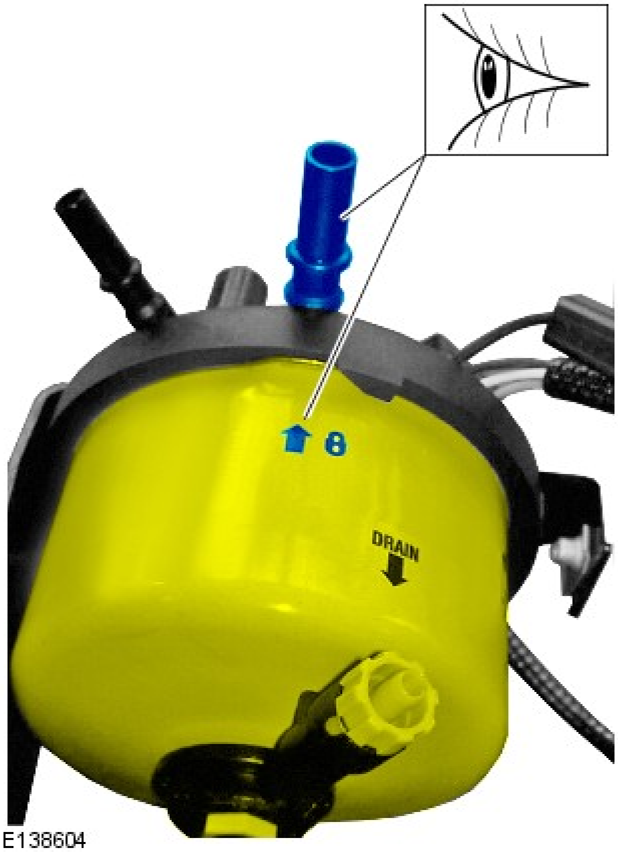
E138603



E138939

3. CAUTION: Make sure the water-in-fuel sensor remains in the aligned position.

Tighten the plastic nut to 1.6 Nm.

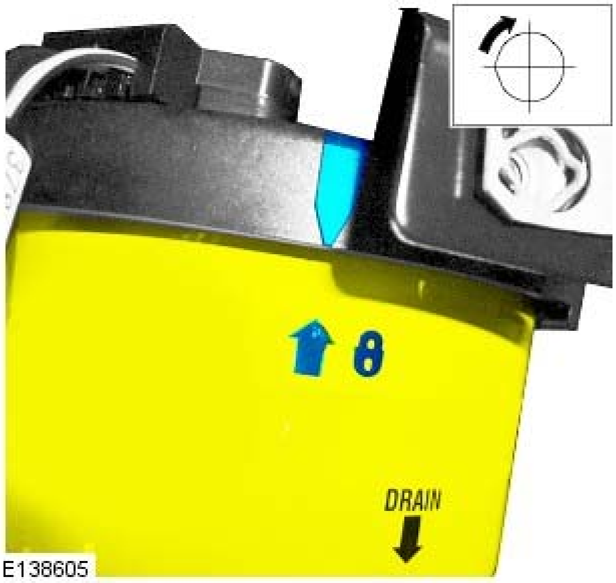


E138604

4. NOTE: Make sure that the fuel filter element is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.

Install the fuel filter element.

1. Insert the fuel filter with the the lock symbol arrow aligned with the inlet pipe on the fuel filter housing.



5. NOTE: Make sure that the fuel filter element is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.

Rotate to tighten and seal the fuel filter element.

1. When tightened correctly, the lock symbol arrow should be aligned with the arrow symbol on the fuel filter housing.

- Connect the water-in-fuel sensor electrical connector.
- Remove the container.

6. Install the fuel filter heat shield.

- Tighten the bolts to 6 Nm.

7. Install the transmission undershield.

- Tighten the bolts to 10 Nm.

8. Carry out the low-pressure fuel system bleeding.

Published: 11-May-2011

Fuel Tank and Lines - TDV8 3.6L Diesel - Fuel Pump Module

Removal and Installation

Removal

- WARNINGS:

Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

- NOTE: The fuel pump module comprises of a rear fuel level sender and a fuel pressure regulator. These components cannot be serviced separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

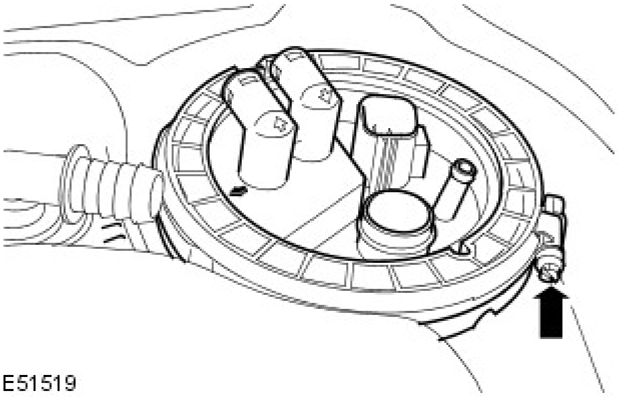
3. Remove the fuel tank.
For additional information, refer to: Fuel Tank (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Removal and Installation).

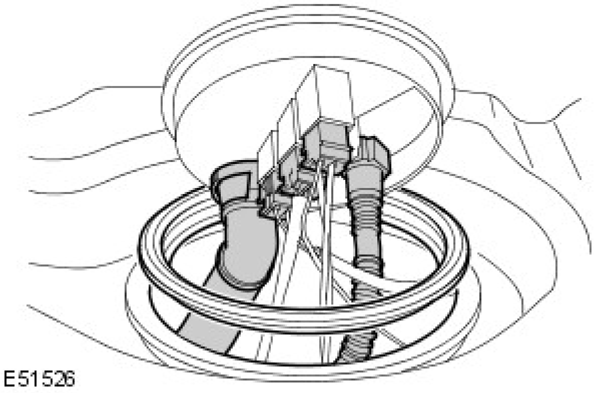
4. CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

- NOTE: Note the fitted position.

Release the fuel pump module access flange.

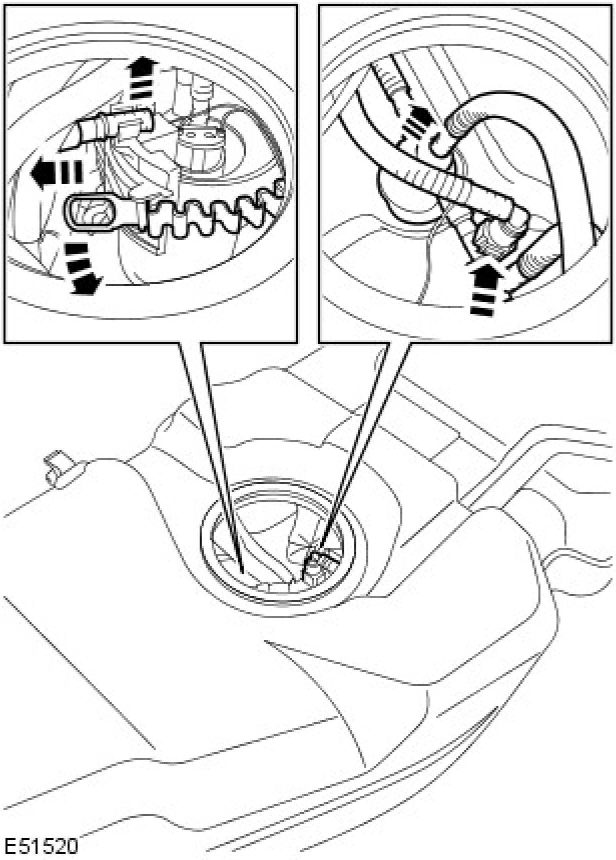
- Loosen the screw.
- Remove the clamp.





5. Remove the fuel pump module access flange.

- Disconnect the vent line.
- Disconnect the fuel supply line.
- Disconnect the 3 electrical connectors.
- Remove and discard the seal.



6. Remove the fuel pump module.

- Release the strap.
- Release the fuel pressure regulator.
- Disconnect the 2 fuel lines.

Installation

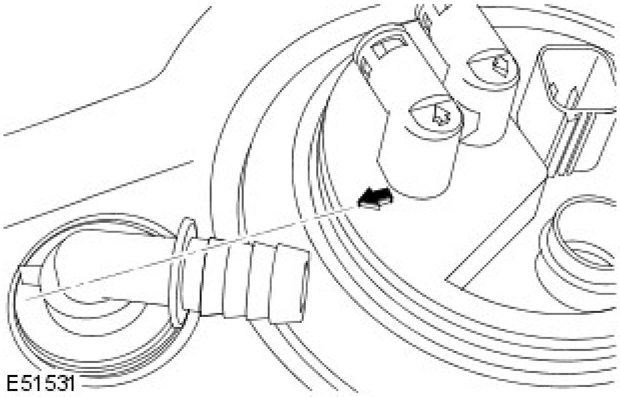
1. Install the fuel pump module.

- Connect the fuel lines.
- Secure with the strap.
- Secure the fuel pressure regulator.

2. Install the fuel pump module access flange.

- Clean the component mating faces.
- Install a new seal.
- Connect the 3 electrical connectors.

- Connect the fuel supply line.
- Connect the vent line.



3. ⚠ CAUTION: Make sure the seal is correctly fitted.

• NOTE: Align to the position noted on removal.

Secure the fuel pump module access flange.

- Install the clamp.
- Tighten the screw to 4 Nm (3 lb.ft).

4. Install the fuel tank.
For additional information, refer to: Fuel Tank (310-01D Fuel Tank and Lines - TDV8 3.6L Diesel, Removal and Installation).

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Fuel Tank and Lines - TDV8 3.6L Diesel - Fuel Tank

Removal and Installation

Removal

- WARNINGS:

⚠ Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

⚠CAUTION: Before disconnecting or removing components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

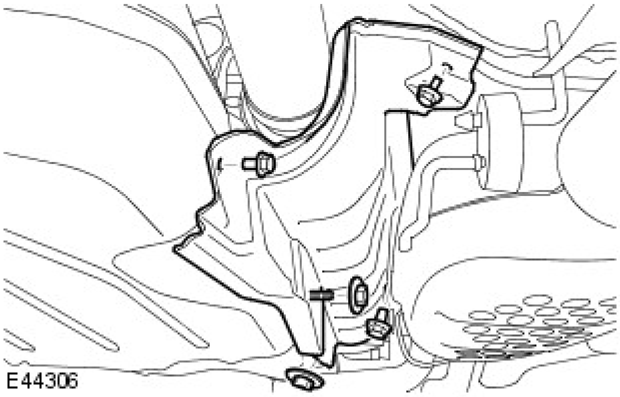
All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

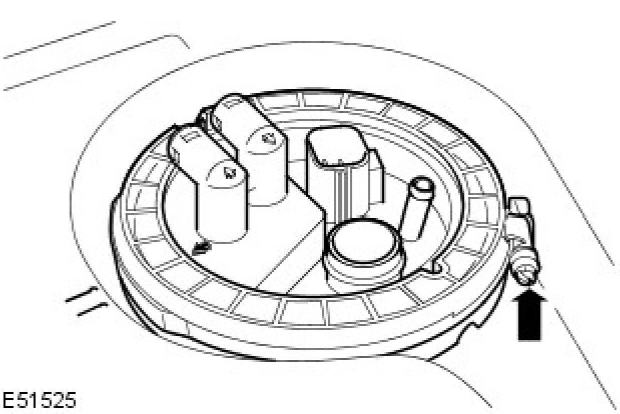
3. ⚠WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



4. Remove the fuel tank heat shield.

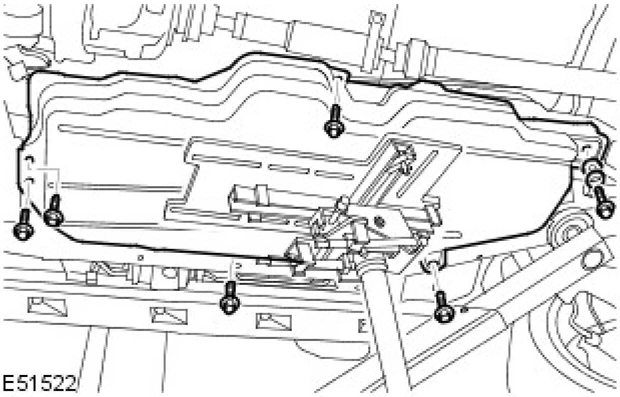
- Remove the 3 bolts.
- Remove the 2 nuts.


E51525

5. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel filler neck from the fuel tank.

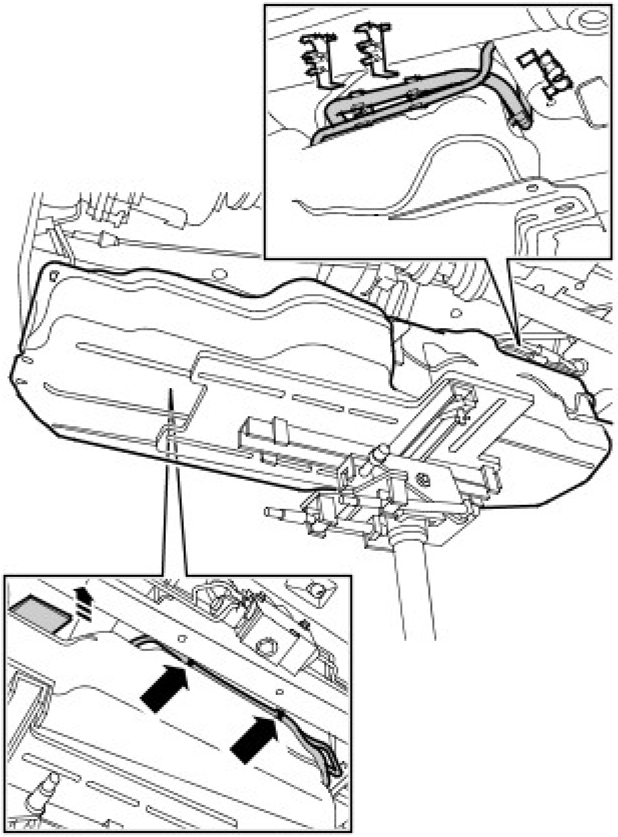
- Remove the tamper proof cover.
- Remove and discard the hose clip.


E51522

6. ⚠ WARNING: Secure the component to the transmission jack.

Using a transmission jack, lower the fuel tank.

- Remove the 6 bolts.


E51523

7. NOTE: Note the fitted position.

Release the fuel tank vent and fuel lines.

- Remove the retainers.
- Release from the clips.
- Remove the adhesive pad.

8. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel tank vent lines.

- Release the clip.

Vehicles with fuel fired heater

9. Release the fuel fired booster heater fuel line.

- Release from the 2 clips.

Vehicles with fuel fired heater

10. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel fired booster heater fuel line.

- Release the clip.

All vehicles

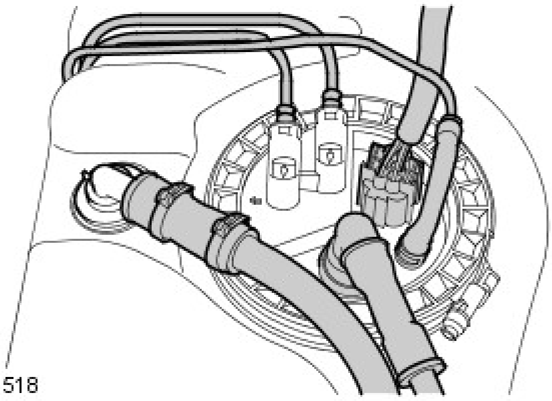
11. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the 2 fuel lines.

- Release the 2 clips.

12. Disconnect the fuel pump module electrical connector.

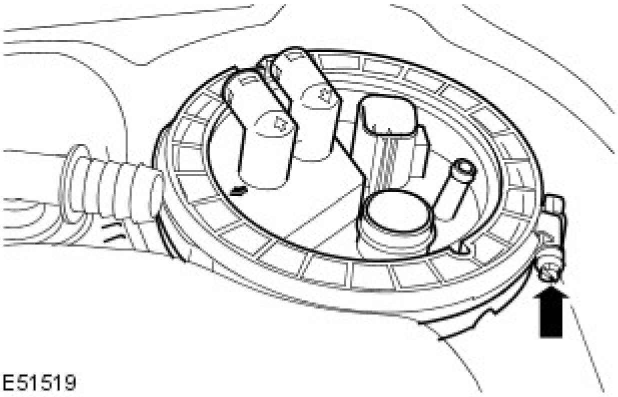
13. Remove the fuel tank.



E51518

14. NOTE: Do not disassemble further if the component is removed for access only.

With assistance, remove the fuel tank from the transmission jack.



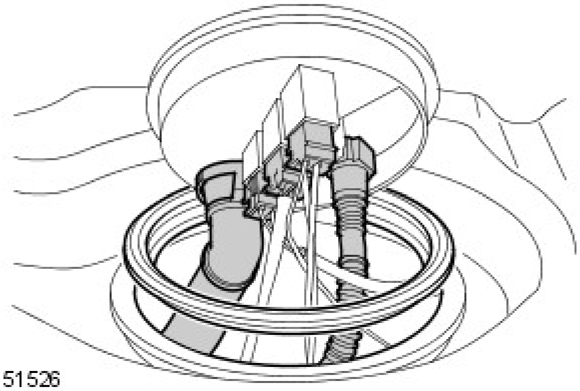
E51519

15. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

• NOTE: Note the fitted position.

Release the fuel pump module access flange.

- Loosen the screw.
- Remove the clamp.

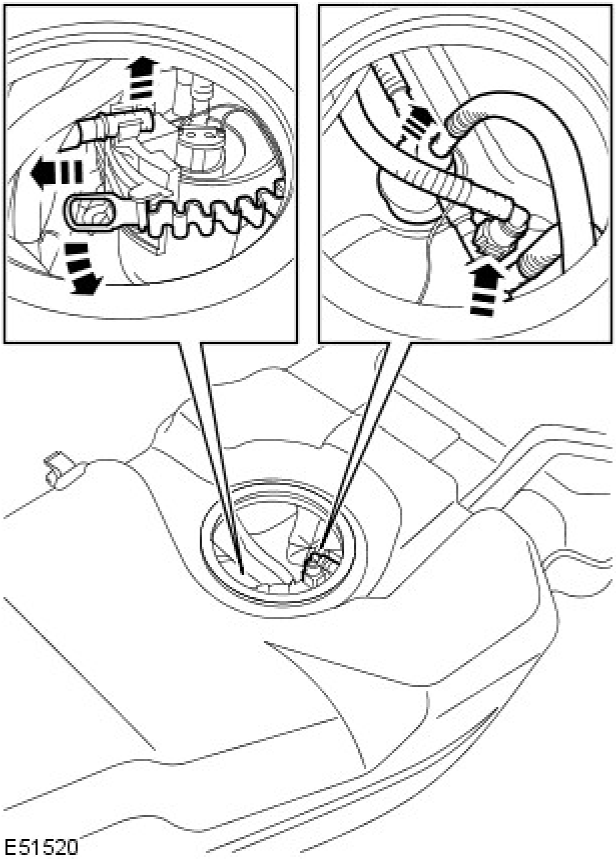


E51526

16. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the fuel pump module access flange.

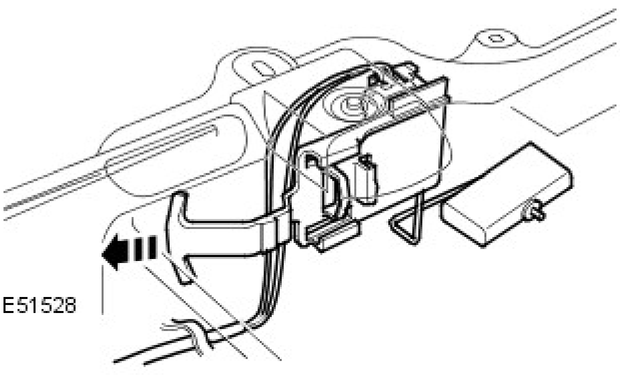
- Disconnect the vent line.
- Disconnect the fuel supply line.
- Disconnect the 3 electrical connectors.
- Remove and discard the seal.



E51520

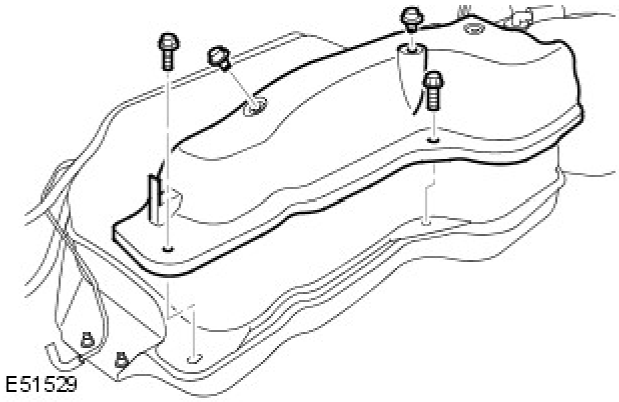
17. Remove the fuel pump module.

- Release the strap.
- Release the fuel pressure regulator.
- Disconnect the 2 fuel lines.



18. Remove the fuel tank front fuel level sender unit.

- Release the lead.
- Release the clip.



19. Remove the fuel tank bracket.

- Remove the 2 clips.
- Remove the 2 bolts.
- Remove the retaining plate.

Installation

All vehicles

1. Install the fuel tank bracket.

- Install the retaining plate.
- Install the clips.
- Tighten the bolts to 10 Nm (7 lb.ft).

2. Install the fuel tank front fuel level sender unit.

- Secure the clip.
- Secure the lead.

3. Install the fuel pump module.

- Connect the fuel lines.
- Secure with the strap.
- Secure the fuel pressure regulator.

4. Install the fuel pump module access flange.

- Clean the component mating faces.
- Install a new seal.
- Connect the 3 electrical connectors.
- Connect the fuel supply line.

- Connect the vent line.

5. ⚠ CAUTION: Make sure the seal is installed correctly.

• NOTE: Align to the position noted on removal.

Secure the fuel pump module access flange.

- Install the clamp.
- Tighten the screw to 4 Nm (3 lb.ft).

6. With assistance, install the fuel tank to the transmission jack.

7. Position the fuel tank to the vehicle.

8. Connect the fuel lines.

- Secure with the clip.

Vehicles with fuel fired heater

9. Connect the fuel fired booster heater fuel line.

- Secure with the clip.

10. Connect the vent lines.

- Secure with the clip.

11. Connect the electrical connector.

12. Secure the fuel and vent lines.

- Secure in the clips.
- Install the retainers.
- Install the adhesive pad.

13. Install the fuel tank.

- Tighten the bolts to 45 Nm (33 lb.ft).

14. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

15. Install the fuel tank heat shield.

- Tighten the bolts to 6 Nm (4 lb.ft).
- Tighten the nuts to 3 Nm (2 lb.ft).

16. Refill the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - TDV8 3.6L Diesel - Fuel Tank Filler Pipe

Removal and Installation

Removal

- WARNINGS:

⚠ Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

⚠ The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Position the vehicle on a lift.

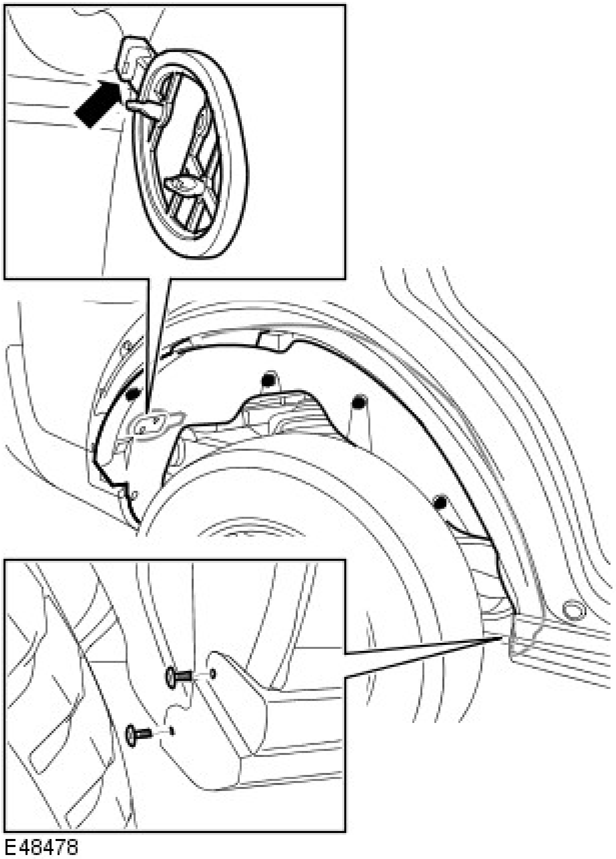
2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Drain the fuel tank.
For additional information, refer to: Fuel Tank Draining (310-00 Fuel System - General Information, General Procedures).

4. Remove the RH rear wheel and tire.

5. Remove the fender splash shield.

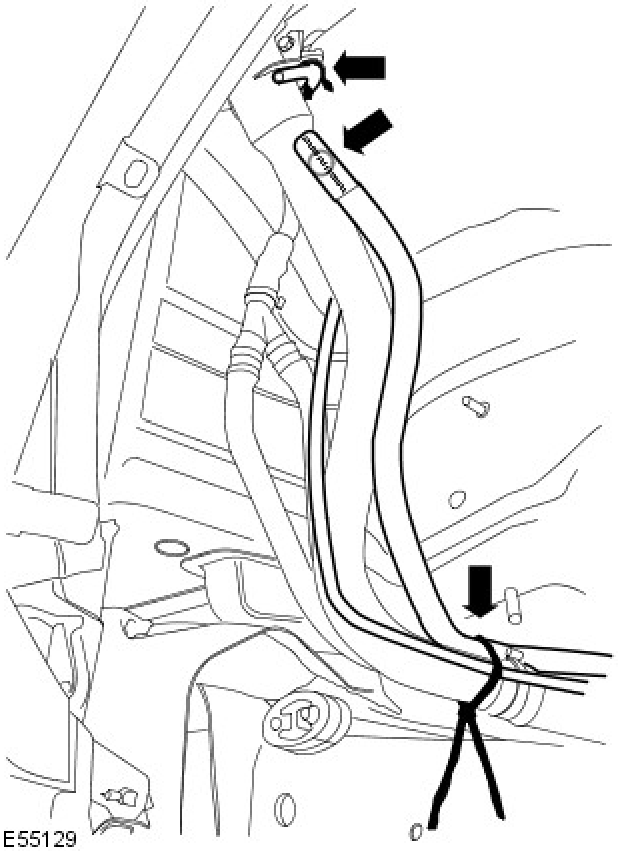
- Remove the 2 screws.
- Remove the 6 retainers.
- Disconnect the electrical connector.



E48478

6. Remove the fuel filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

7. Remove the spare wheel and tire.



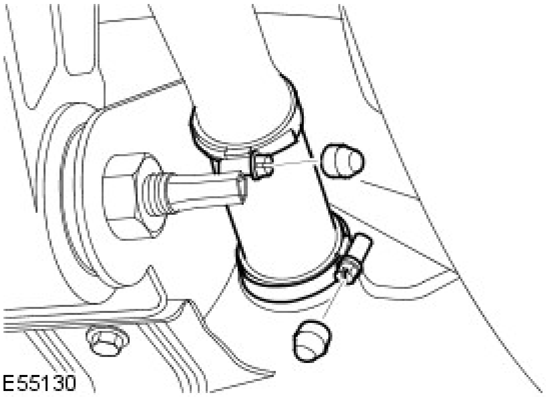
8. Disconnect the breather pipes.

- Remove the clip.
- Release the 2 clips.
- Remove and discard the cable tie.

9. ⚠CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

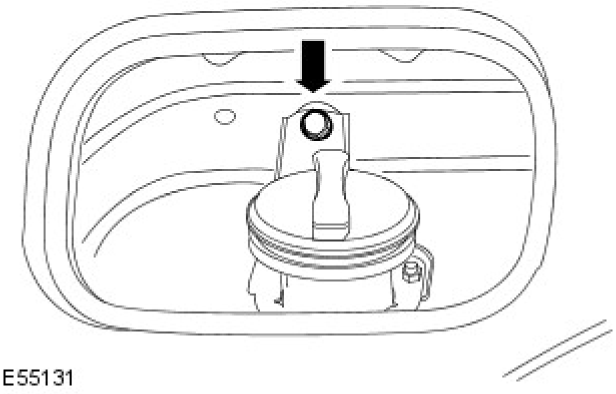
Disconnect the fuel filler neck from the fuel tank.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



10. Remove the fuel tank filler pipe connector hose.

- Remove the tamper proof cover.
- Remove and discard the hose clip.



11. NOTE: Note the fitted position.

Remove the fuel tank filler pipe.

- Remove the bolt.

Installation

1. Install the filler pipe connector hose.

- Install the new tamper proof clip.

2. NOTE: Align to the position noted on removal.

Install the fuel tank filler pipe.

- Install the bolt and tighten to 10 Nm (7 lb.ft).

3. ⚠ CAUTION: Tighten the new tamper proof clip until the hexagon shears.

Connect the fuel filler neck.

- Install a new retaining clip.

4. Connect the breather pipes.

- Secure the clips.

5. Install the filler door.
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

6. Install the fender splash shield.

7. Install the wheel and tire.

8. Install the spare wheel and tire.

9. Refill the fuel tank.

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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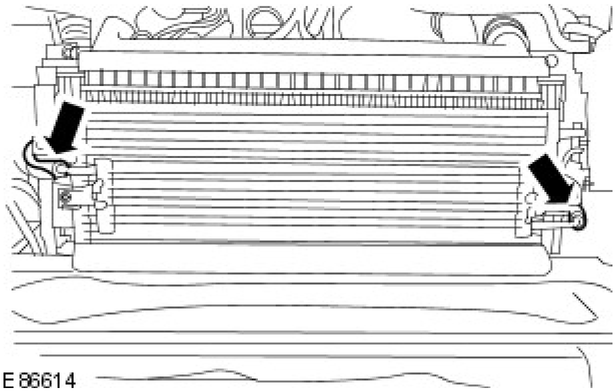
Fuel Tank and Lines - TDV8 3.6L Diesel - Auxiliary Fuel Cooler

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

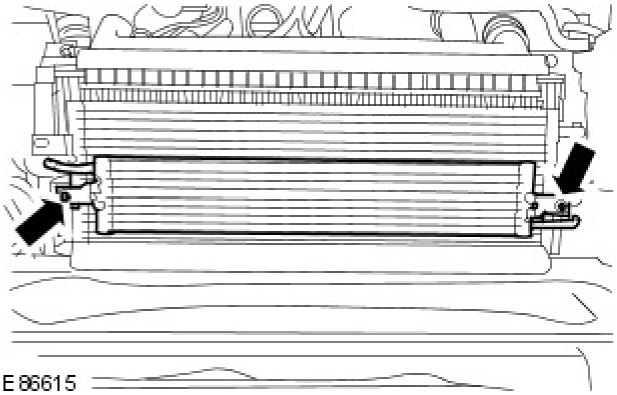
2. Remove the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).



3. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 coolant pipes from the auxiliary fuel cooler.

- Release the 2 quick release connectors.



4. Remove the auxiliary fuel cooler.

- Remove the 2 bolts.

Installation

1. Install the auxiliary fuel cooler.

- Tighten the bolts to 5 Nm (4 lb.ft).

2. NOTE: Remove and discard the blanking caps.

Connect the coolant pipes to the auxiliary fuel cooler.

3. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

4. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

5. Check and top-up the coolant.

Fuel Tank and Lines - TDV8 3.6L Diesel -

Capacity

Usable fuel tank capacity	84.0 liters (18.5 gallons) (22.19 US gallons)

General Specification

Item	Specification
System type	Mechanical - returnless
Fuel delivery module	Located in the fuel tank
High pressure fuel pump:	
Location	Located at the front of the engine on the LH cylinder head, gear driven from the camshaft
Maximum operating pressure	165000 kPa (1650 bar) (23925 lb/in²)
Advance delivery fuel pump:	
Location	Located in the fuel tank
Operating pressure	50 kPa (0.5 bar) (7.35 lb/in²)
Maximum output @12.3 volts	70 liters/hour (15.4 gallons/hour) (18.4 US gallons/hour)
Fuel pressure regulator:	
Type/location	In-line, within fuel tank
Operating pressure	50 kPa (0.5 bar) (7.25) lb/in²
Fuel filter	Remotely mounted on the inside of the longitudinal member - fitted with a renewable element and having a 84cc (3 fl-oz) water separation capacity
Fuel tank sender units	Two - both mounted remotely in the fuel tank, with only the rear serviceable.

Torque Specifications

Description	Nm	lb-ft
Fuel tank bracket bolts	10	7
Fuel pump module access flange clamp screw	4	3
Fuel tank bolts	45	33
Fuel tank heat shield, bolts	5	4
Fuel tank heat shield, nuts	3	2
Fuel filter bracket bolt	9	7
Transmission undershield bolts	10	7

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Acceleration Control - V8 S/C 4.2L Petrol -

Torque Specifications

Description	Nm	lb-ft
Accelerator pedal bracket nuts and bolts	10	7
Accelerator pedal assembly nuts	25	18

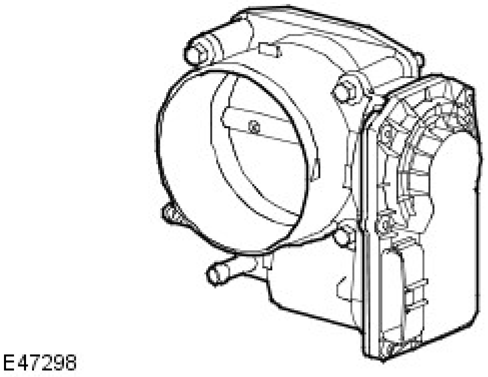
Acceleration Control - V8 S/C 4.2L Petrol - Acceleration Control

Description and Operation

Acceleration control for the 4.2 Liter supercharged petrol engine is achieved via an electronic throttle drive by wire system. The throttle is electronically connected to the engine control module (ECM). The ECM then controls the fuelling in accordance to signals recieved from the accelerator pedal position (APP) sensor.
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation).

ELECTRONIC THROTTLE

Electronic Throttle Body



The electronic throttle controls the air flow into the engine. In addition to the normal engine power control function, the electric throttle allows the speed control, idle speed control and engine speed limiting functions to be performed without the need for additional hardware.

The electronic throttle consists of a throttle body which incorporates a throttle plate driven by a direct current (DC) motor via reduction gears. A return spring biases the throttle plate in the closed direction.

Operation of the DC motor is controlled by the ECM, which outputs two pulse width modulation (PWM) signals to an H bridge drive circuit in the motor. The ECM varies the speed and direction of the motor by varying the duty cycle of the PWM signals.

To enable closed loop control, the position of the throttle plate is supplied to the ECM by two feedback Hall effect sensors in the throttle body. The feedback sensors have a common 5 volt supply and a common ground connection from the ECM. The sensors produce separate linear signal voltages to the ECM proportional to the position of the throttle plate. The ECM uses the signal from feedback sensor 1 as the primary signal of throttle plate position, and the signal from feedback sensor 2 for plausibility checks.

- The signal from feedback sensor 1 varies between 0.5 volt (0% throttle open) and 4.5 volts (100% throttle open)
- The signal from feedback sensor 2 varies between 4.5 volts (0% throttle open) and 0.5 volt (100% throttle open)

While the ignition is on, the ECM continuously monitors the two feedback sensors for short and open circuits. The ECM checks the feedback sensor signals, against each other and the inputs from the APP sensor, for plausibility. If a fault is detected in the feedback sensor signals or the DC motor, the ECM:

- Stores a related fault code in memory
- Illuminates the SERVICE ENGINE warning lamp in the instrument cluster
- Adopts a throttle limp home mode or disables throttle control, depending on the nature of the fault.

The throttle limp home mode adopted depends on the nature of the fault:

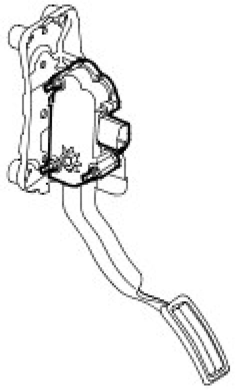
- If there is a fault with one feedback sensor, or the throttle position controller in the ECM, the ECM limits vehicle acceleration by limiting throttle plate opening.
- If there is a fault with both feedback sensors, the ECM uses fuel injection cut-off to limit engine speed to 1300 rev/min maximum.

C0175 Electronic Throttle Pinout Details

Pin No	Description	Input/ Output
1	Throttle +	Input
2	Throttle -	Input
3	Sensor Ground	-
4	Throttle position 2	Input

Pin No	Description	Input/ Output
5	5 Volt reference voltage	Input
6	Throttle position 1	Input

ACCELERATOR PEDAL POSITION SENSOR


E46901

The APP is integral to the accelerator pedal assembly.

The APP sensor enables the ECM to determine the throttle position requested by the driver on the accelerator pedal.

The APP sensor is installed on the pedal box and consists of a twin track potentiometer with wipers driven by a linkage connected to the accelerator pedal. Each potentiometer track has a 5 volt supply and ground connection from the ECM, and produces a linear signal voltage to the ECM proportional to the position of the accelerator pedal. The signal voltage from track 1 of the potentiometer is approximately double that of the signal voltage from track 2.

From the sensor signals, the ECM determines driver demand as a percentage of pedal travel, where 0% is with the pedal released and 100% is with the pedal fully depressed. Driver demand is then used to calculate throttle angle, fuel quantity and ignition timing. The ECM also outputs driver demand on the controller area network (CAN) system, for use by the brake and gearbox control systems.

The ECM stores the signal values that correspond with closed and wide open throttle, and adapts to new values to accommodate component wear or replacement.

The signals from the APP sensor are monitored by the ECM for short and open circuits and plausibility. If a fault is detected, the ECM:

- Stores a related fault code in memory
- Illuminates the SERVICE ENGINE warning lamp in the instrument cluster
- Inhibits the driver demand message on the CAN bus, which disables the Hill Descent Control (HDC) function of the anti-lock brake system (ABS) control module and reduces the performance of the automatic gearbox (harsh gear changes and loss of kickdown).
- Adopts a throttle limp home mode.

The throttle limp home mode adopted depends on the nature of the fault:

- If a fault is detected with one potentiometer track, the ECM limits vehicle acceleration by limiting throttle plate opening.
- If a fault is detected with both potentiometer tracks, the ECM uses the throttle plate to run the engine at a fixed speed of 1472 rev/min while the brake pedal is released, and idle speed (750 rev/min) while the brake pedal is pressed or if there is a brake pedal sensor fault.
- If there is a process fault in the ECM, the ECM either uses fuel injection cut-off to limit engine speed to 1300 rev/ min or disables fuel injection to stop the engine.

C0787 Accelerator Pedal Position Sensor Pin Out Table

Pin No	Description	Input/Output
1	APP 1 ground	-
2	APP 1 demand	Output
3	APP 2 demand	Output
4	N/C	-
5	APP 2 ground	-
6	Reference voltage 2	Input
7	Reference voltage 1	Input

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Acceleration Control - V8 S/C 4.2L Petrol - Acceleration Control

Diagnosis and Testing

Principles of Operation

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.
3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
	*	*

Pinpoint Tests

PINPOINT TEST A :	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1:	
	1 Disconnect the diagnostic tool.
	Yes GO to A1. **No** GO to A1.

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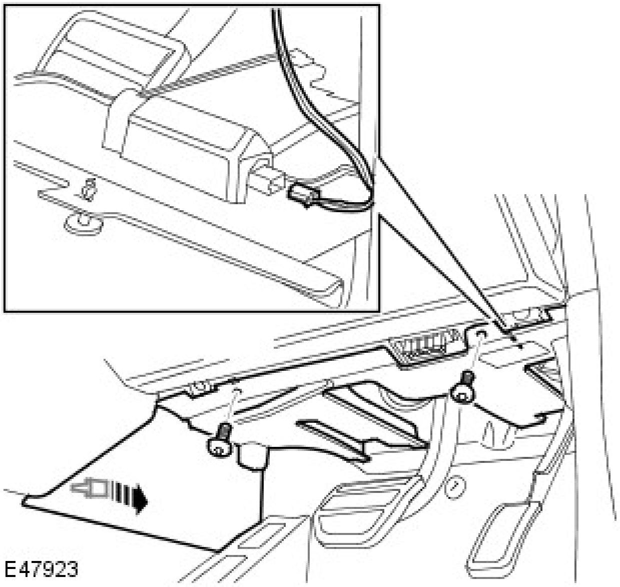
Acceleration Control - V8 S/C 4.2L Petrol - Accelerator Pedal

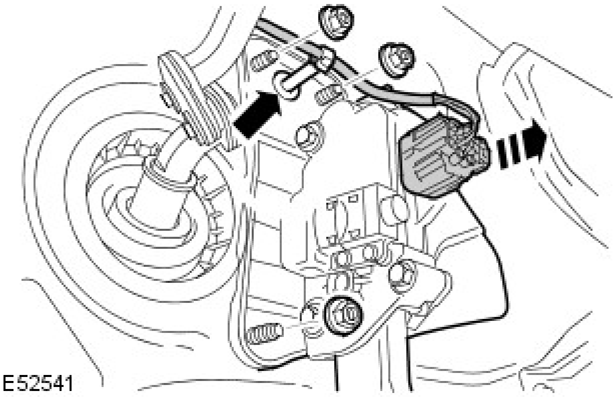
Removal and Installation

Removal



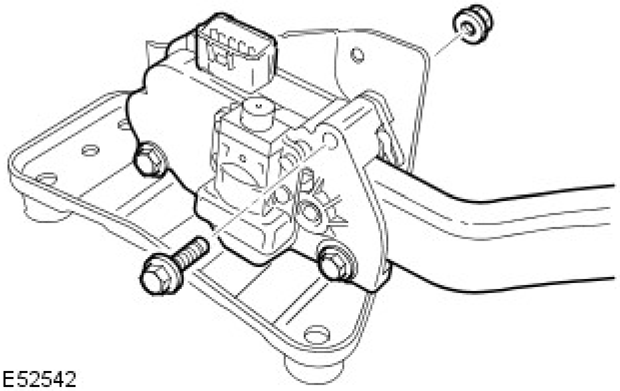
1. Remove the driver side closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



2. Remove the accelerator pedal assembly.

- Release the wiring harness.
- Remove the 3 nuts.
- Disconnect the electrical connector.



3. NOTE: Do not disassemble further if the component is removed for access only.

Remove the accelerator pedal bracket.

- Remove the 3 nuts and bolts.

Installation

All vehicles

1. Attach the accelerator pedal bracket.
   - Tighten the nuts and bolts to 10 Nm (7 lb.ft).
2. NOTE: Make sure the electrical connector is securely connected.

   Install the accelerator pedal assembly.
   - Connect the electrical connector.
   - Tighten the nuts to 25 Nm (18 lb.ft).
   - Secure the wiring harness.
3. Install the closing trim panel.
   - Connect the electrical connector.
   - Secure the clip.
   - Tighten the screws.

Vehicles with petrol engine

4. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

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Acceleration Control - V8 4.4L Petrol -

Torque Specifications

Description	Nm	lb-ft
Accelerator pedal bracket nuts and bolts	10	7
Accelerator pedal assembly nuts	25	18

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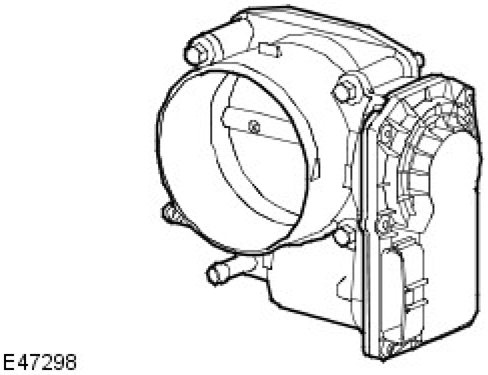
Acceleration Control - V8 4.4L Petrol - Acceleration Control

Description and Operation

Acceleration control for the 4.4 Liter petrol engine is achieved via an electronic throttle drive by wire system. The throttle is electronically connected to the engine control module (ECM) and the ECM then controls the fuelling for the relevant throttle demand signal from the accelerator pedal position (APP).
For additional information, refer to: Electronic Engine Controls (303-14B Electronic Engine Controls - 4.4L, Description and Operation).

ELECTRONIC THROTTLE

Electronic Throttle Body



The electric throttle controls the air flow into the engine. In addition to the normal engine power control function, the electric throttle allows the cruise control, idle speed control and engine speed limiting functions to be performed without the need for additional hardware.

The electric throttle consists of a throttle body which incorporates a throttle plate driven by a direct current (DC) motor via reduction gears. A return spring biases the throttle plate in the closed direction.

Operation of the DC motor is controlled by the ECM, which outputs two pulse width modulation (PWM) signals to an H bridge drive circuit in the motor. The ECM varies the speed and direction of the motor by varying the duty cycle of the PWM signals.

To enable closed loop control, the position of the throttle plate is supplied to the ECM by two feedback Hall effect sensors in the throttle body. The feedback sensors have a common 5 volt supply and a common ground connection from the ECM, and produce separate linear signal voltages to the ECM proportional to the position of the throttle plate. The ECM uses the signal from feedback sensor 1 as the primary signal of throttle plate position, and the signal from feedback sensor 2 for plausibility checks.

- The signal from feedback sensor 1 varies between 0.5 volt (0% throttle open) and 4.5 volts (100% throttle open)
- The signal from feedback sensor 2 varies between 4.5 volts (0% throttle open) and 0.5 volt (100% throttle open)

While the ignition is on, the ECM continuously monitors the two feedback sensors for short and open circuits and checks the feedback sensor signals, against each other and the inputs from the APP sensor, for plausibility. If a fault is detected in the feedback sensor signals or the DC motor, the ECM:

- Stores a related fault code in memory.
- Illuminates the SERVICE ENGINE warning lamp in the instrument pack.
- Adopts a throttle limp home mode or disables throttle control, depending on the nature of the fault.

The throttle limp home mode adopted depends on the nature of the fault:

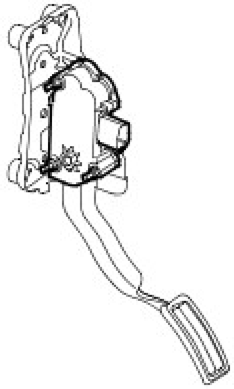
- If there is a fault with one feedback sensor, or the throttle position controller in the ECM, the ECM limits vehicle acceleration by limiting throttle plate opening.
- If there is a fault with both feedback sensors, the ECM uses fuel injection cut-off to limit engine speed to 1300 rev/min maximum.

C0175 Electronic Throttle Pinout Details

Pin No	Description	Input/ Output
1	Throttle +	Input
2	Throttle -	Input
3	Sensor Ground	-
4	Throttle position 2	Input

Pin No	Description	Input/ Output
5	5 Volt reference voltage	Input
6	Throttle position 1	Input

ACCELERATOR PEDAL POSITION SENSOR



E46901

The APP is integral to the accelerator pedal assembly.

The APP sensor enables the ECM to determine the throttle position requested by the driver on the accelerator pedal.

The APP sensor is installed on the pedal box and consists of a twin track potentiometer with wipers driven by a linkage connected to the accelerator pedal. Each potentiometer track has a 5 volt supply and ground connection from the ECM, and produces a linear signal voltage to the ECM proportional to the position of the accelerator pedal. The signal voltage from track 1 of the potentiometer is approximately double that of the signal voltage from track 2.

From the sensor signals, the ECM determines driver demand as a percentage of pedal travel, where 0% is with the pedal released and 100% is with the pedal fully depressed. Driver demand is then used to calculate throttle angle, fuel quantity and ignition timing. The ECM also outputs driver demand on the controller area network (CAN) system, for use by the brake and gearbox control systems.

The ECM stores the signal values that correspond with closed and wide open throttle, and adapts to new values to accommodate component wear or replacement.

The signals from the APP sensor are monitored by the ECM for short and open circuits and plausibility. If a fault is detected, the ECM:

- Stores a related fault code in memory.
- Illuminates the SERVICE ENGINE warning lamp in the instrument pack.
- Inhibits the driver demand message on the CAN bus, which disables the Hill Descent Control (HDC) function of the anti-lock brake system (ABS) modulator and reduces the performance of the automatic gearbox (harsh gear changes and loss of kickdown).
- Adopts a throttle limp home mode.

The throttle limp home mode adopted depends on the nature of the fault:

- If a fault is detected with one potentiometer track, the ECM limits vehicle acceleration by limiting throttle plate opening.
- If a fault is detected with both potentiometer tracks, the ECM uses the throttle plate to run the engine at a fixed speed of 1472 rev/min while the brake pedal is released, and idle speed (750 rev/min) while the brake pedal is pressed or if there is a brake pedal sensor fault.
- If there is a process fault in the ECM, the ECM either uses fuel injection cut-off to limit engine speed to 1300 rev/ min or disables fuel injection to stop the engine.

C0787 Accelerator Pedal Position Sensor Pin Out Table

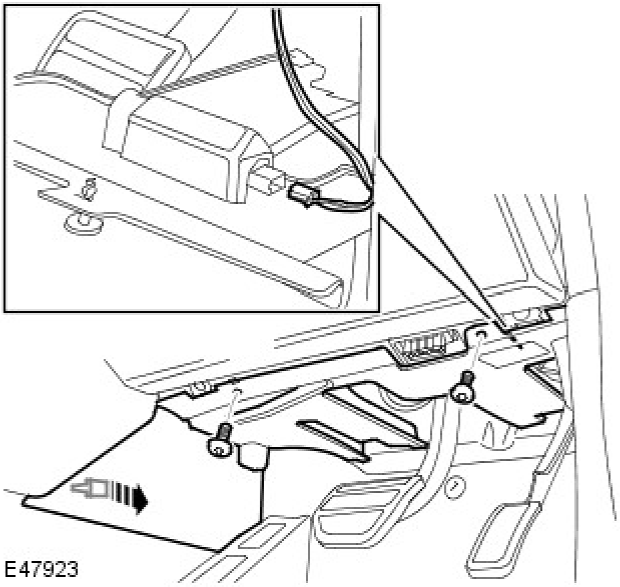
Pin No	Description	Input/Output
1	APP 1 ground	-
2	APP 1 demand	Output
3	APP 2 demand	Output
4	N/C	-
5	APP 2 ground	-
6	Reference voltage 2	Input
7	Reference voltage 1	Input

Published: 11-May-2011

Acceleration Control - V8 4.4L Petrol - Accelerator Pedal

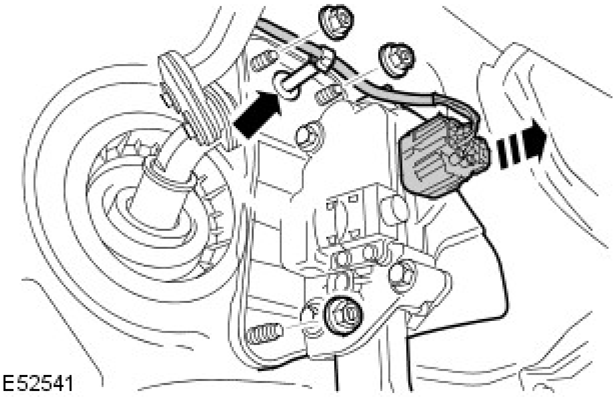
Removal and Installation

Removal


E47923

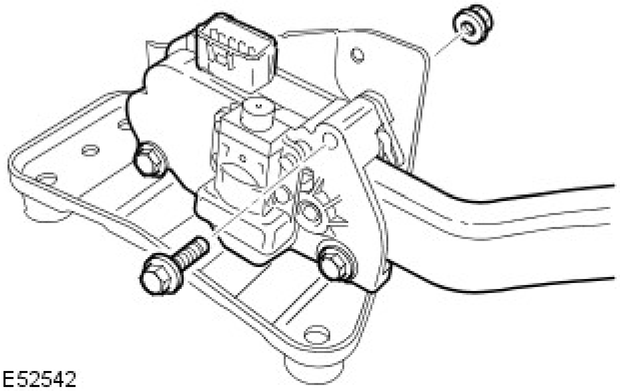
1. Remove the driver side closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.


E52541

2. Remove the accelerator pedal assembly.

- Release the wiring harness.
- Remove the 3 nuts.
- Disconnect the electrical connector.


E52542

3. NOTE: Do not disassemble further if the component is removed for access only.

Remove the accelerator pedal bracket.

- Remove the 3 nuts and bolts.

Installation

All vehicles

1. Attach the accelerator pedal bracket.

- Tighten the nuts and bolts to 10 Nm (7 lb.ft).

2. NOTE: Make sure the electrical connector is securely connected.

Install the accelerator pedal assembly.

- Connect the electrical connector.
- Tighten the nuts to 25 Nm (18 lb.ft).
- Secure the wiring harness.

3. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

Vehicles with petrol engine

4. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Acceleration Control - TDV6 2.7L Diesel -

Torque Specification

Description	Nm	lb-ft
Accelerator pedal bracket nuts and bolts	10	7
Accelerator pedal assembly retaining bolts	25	18

Published: 11-May-2011

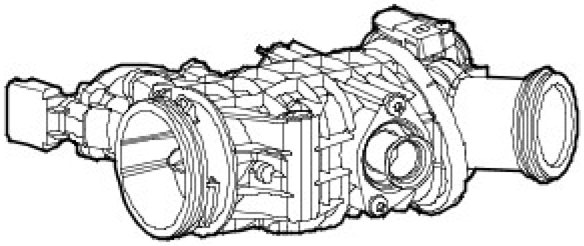
Acceleration Control - TDV6 2.7L Diesel - Acceleration Control

Description and Operation

Acceleration control for the TdV6 diesel engine is achieved via an electronic throttle drive by wire system. The throttle is electronically connected to the engine control module (ECM) and the ECM then controls the fuelling for the relevant throttle demand signal from the accelerator pedal position (APP).
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

ELECTRONIC THROTTLE

Electronic Throttle



E46900

The electric throttle controls the air flow into the engine. In addition to the normal engine power control function, the electric throttle allows the cruise control, idle speed control and engine speed limiting functions to be performed without the need for additional hardware.

The electric throttle consists of a throttle body which incorporates a throttle plate driven by a direct current (DC) motor via reduction gears. A return spring biases the throttle plate in the closed direction.

Operation of the DC motor is controlled by the ECM, which outputs two pulse width modulation (PWM) signals to an H bridge drive circuit in the motor. The ECM varies the speed and direction of the motor by varying the duty cycle of the PWM signals.

To enable closed loop control, the position of the throttle plate is supplied to the ECM by two feedback Hall effect sensors in the throttle body. The feedback sensors have a common 5 volt supply and a common ground connection from the ECM, and produce separate linear signal voltages to the ECM proportional to the position of the throttle plate. The ECM uses the signal from feedback sensor 1 as the primary signal of throttle plate position, and the signal from feedback sensor 2 for plausibility checks.

- The signal from feedback sensor 1 varies between 0.5 volt (0% throttle open) and 4.5 volts (100% throttle open)
- The signal from feedback sensor 2 varies between 4.5 volts (0% throttle open) and 0.5 volt (100% throttle open)

While the ignition is on, the ECM continuously monitors the two feedback sensors for short and open circuits and checks the feedback sensor signals, against each other and the inputs from the APP sensor, for plausibility. If a fault is detected in the feedback sensor signals or the DC motor, the ECM:

- Stores a related fault code in memory.
- Illuminates the SERVICE ENGINE warning lamp in the instrument pack.
- Adopts a throttle limp home mode or disables throttle control, depending on the nature of the fault.

The throttle limp home mode adopted depends on the nature of the fault:

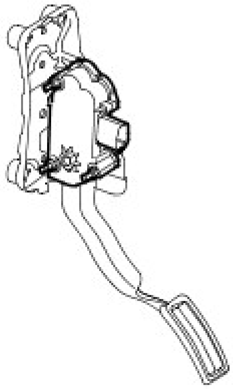
- If there is a fault with one feedback sensor, or the throttle position controller in the ECM, the ECM limits vehicle acceleration by limiting throttle plate opening.
- If there is a fault with both feedback sensors, the ECM uses fuel injection cut-off to limit engine speed to 1300 rev/min maximum.

C0272 Electronic Throttle Pinout Details

Pin No	Description	Input/Output
1	Supply voltage	Input
2	Throttle position	Output
3	Throttle position +	Input
4	Throttle position -	Input

Pin No	Description	Input/ Output
5	Not used	-
6	Signal ground	-

ACCELERATOR PEDAL POSITION SENSOR


E46901

The APP is integral to the accelerator pedal assembly.

The APP sensor enables the ECM to determine the throttle position requested by the driver on the accelerator pedal.

The APP sensor is installed on the pedal box and consists of a twin track potentiometer with wipers driven by a linkage connected to the accelerator pedal. Each potentiometer track has a 5 volt supply and ground connection from the ECM, and produces a linear signal voltage to the ECM proportional to the position of the accelerator pedal. The signal voltage from track 1 of the potentiometer is approximately double that of the signal voltage from track 2.

From the sensor signals, the ECM determines driver demand as a percentage of pedal travel, where 0% is with the pedal released and 100% is with the pedal fully depressed. Driver demand is then used to calculate throttle angle, fuel quantity and ignition timing. The ECM also outputs driver demand on the controller area network (CAN) system, for use by the brake and gearbox control systems.

The ECM stores the signal values that correspond with closed and wide open throttle, and adapts to new values to accommodate component wear or replacement.

The signals from the APP sensor are monitored by the ECM for short and open circuits and plausibility. If a fault is detected, the ECM:

- Stores a related fault code in memory.
- Illuminates the SERVICE ENGINE warning lamp in the instrument pack.
- Inhibits the driver demand message on the CAN bus, which disables the Hill Descent Control (HDC) function of the anti-lock brake system (ABS) modulator and reduces the performance of the automatic gearbox (harsh gear changes and loss of kick down).
- Adopts a throttle limp home mode.

The throttle limp home mode adopted depends on the nature of the fault:

- If a fault is detected with one potentiometer track, the ECM limits vehicle acceleration by limiting throttle plate opening.
- If a fault is detected with both potentiometer tracks, the ECM uses the throttle plate to run the engine at a fixed speed of 1472 rev/min while the brake pedal is released, and idle speed (750 rev/min) while the brake pedal is pressed or if there is a brake pedal sensor fault.
- If there is a process fault in the ECM, the ECM either uses fuel injection cut-off to limit engine speed to 1300 rev/ min or disables fuel injection to stop the engine.

Accelerator Pedal Position Sensor Pin Out Table

Pin No	Description	Input/Output
1	APP 1 ground	-
2	APP 1 signal	Output
3	APP 2 ground	-
4	N/C	-
5	APP2 Signal	Output
6	APPS 2 reference voltage	Input
7	APP 1 reference voltage	Input
8	N/C	-

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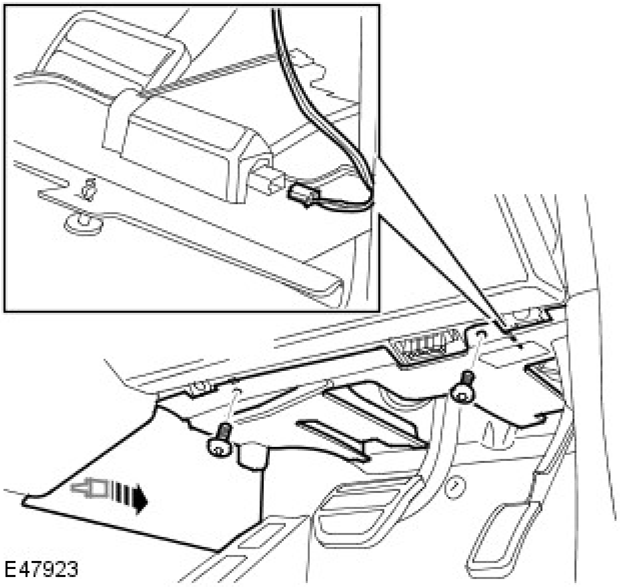
Acceleration Control - TDV6 2.7L Diesel - Accelerator Pedal

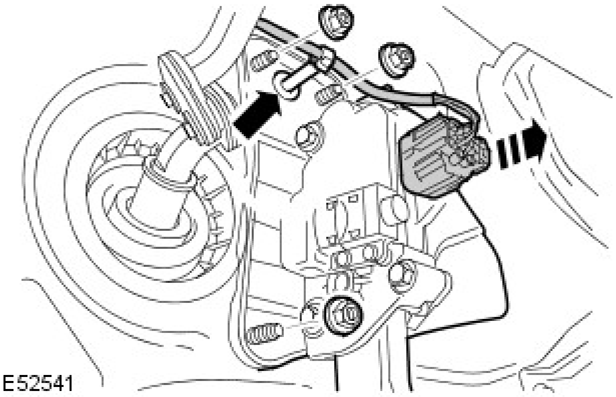
Removal and Installation

Removal



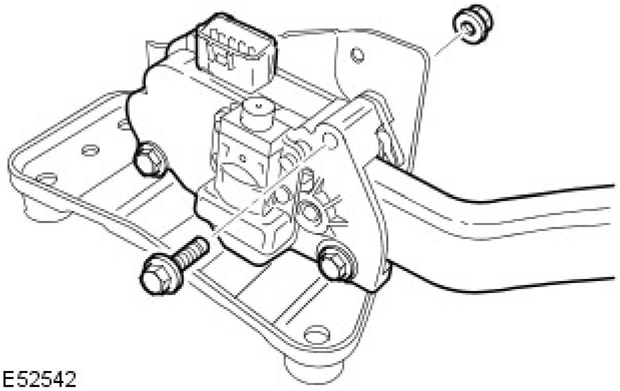
1. Remove the driver side closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



2. Remove the accelerator pedal assembly.

- Release the wiring harness.
- Remove the 3 nuts.
- Disconnect the electrical connector.



3. NOTE: Do not disassemble further if the component is removed for access only.

Remove the accelerator pedal bracket.

- Remove the 3 nuts and bolts.

Installation

All vehicles

1. Attach the accelerator pedal bracket.

- Tighten the nuts and bolts to 10 Nm (7 lb.ft).

2. NOTE: Make sure the electrical connector is securely connected.

Install the accelerator pedal assembly.

- Connect the electrical connector.
- Tighten the nuts to 25 Nm (18 lb.ft).
- Secure the wiring harness.

3. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

Vehicles with petrol engine

4. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

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Acceleration Control - TDV8 3.6L Diesel -

Torque Specifications

Description	Nm	lb-ft
Accelerator pedal bracket nuts and bolts	10	7
Accelerator pedal assembly nuts	25	18

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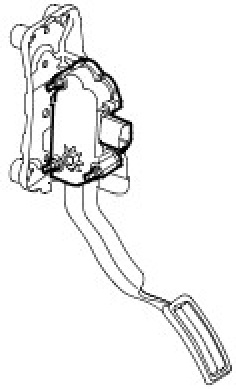
Acceleration Control - TDV8 3.6L Diesel - Acceleration Control

Description and Operation

Accelerator Pedal Position (APP) Sensor



E46901

The APP is integral to the accelerator pedal assembly. The APP sensor enables the ECM to determine the throttle position requested by the driver on the accelerator pedal.

The APP sensor is installed on the pedal box and consists of a twin track potentiometer with wipers driven by a linkage connected to the accelerator pedal. Each potentiometer track has a 5 volt supply and ground connection from the ECM, and produces a linear signal voltage to the ECM proportional to the position of the accelerator pedal. The signal voltage from track 1 of the potentiometer is approximately double that of the signal voltage from track 2.

From the sensor signals, the ECM determines driver demand as a percentage of pedal travel, where 0% is with the pedal released and 100% is with the pedal fully depressed. Driver demand is then used to calculate throttle angle, fuel quantity and ignition timing. The ECM also outputs driver demand on the controller area network (CAN) system, for use by the brake and gearbox control systems.

The ECM stores the signal values that correspond with closed and wide open throttle, and adapts to new values to accommodate component wear or replacement.

The signals from the APP sensor are monitored by the ECM for short and open circuits and plausibility. If a fault is detected, the ECM:

- Stores a related fault code in memory.
- Illuminates the SERVICE ENGINE warning lamp in the instrument pack.
- Inhibits the driver demand message on the CAN bus, which disables the Hill Descent Control (HDC) function of the anti-lock brake system (ABS) modulator and reduces the performance of the automatic gearbox (harsh gear changes and loss of kick down).
- Adopts a throttle limp home mode.

The throttle limp home mode adopted depends on the nature of the fault:

- If a fault is detected with one potentiometer track, the ECM limits vehicle acceleration by limiting throttle plate opening.
- If a fault is detected with both potentiometer tracks, the ECM uses the throttle plate to run the engine at a fixed speed of 1472 rev/min while the brake pedal is released, and idle speed (750 rev/min) while the brake pedal is pressed or if there is a brake pedal sensor fault.
- If there is a process fault in the ECM, the ECM either uses fuel injection cut-off to limit engine speed to 1300 rev/ min or disables fuel injection to stop the engine.

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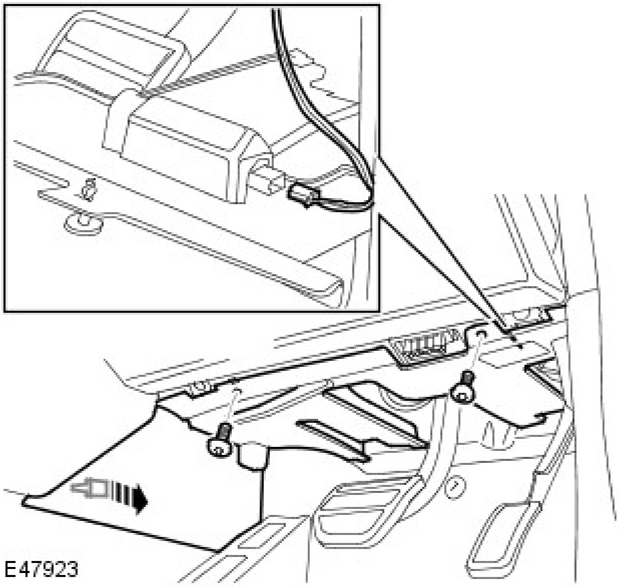
Acceleration Control - TDV8 3.6L Diesel - Accelerator Pedal

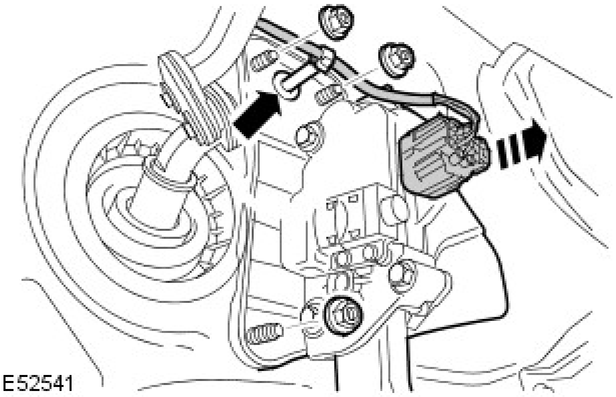
Removal and Installation

Removal



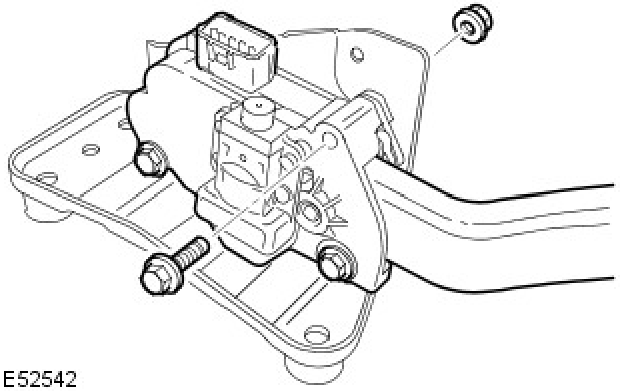
1. Remove the driver side closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



2. Remove the accelerator pedal assembly.

- Release the wiring harness.
- Remove the 3 nuts.
- Disconnect the electrical connector.



3. NOTE: Do not disassemble further if the component is removed for access only.

Remove the accelerator pedal bracket.

- Remove the 3 nuts and bolts.

Installation

All vehicles

1. Attach the accelerator pedal bracket.
    - Tighten the nuts and bolts to 10 Nm (7 lb.ft).
2. NOTE: Make sure the electrical connector is securely connected.

    Install the accelerator pedal assembly.
    - Connect the electrical connector.
    - Tighten the nuts to 25 Nm (18 lb.ft).
    - Secure the wiring harness.
3. Install the closing trim panel.
    - Connect the electrical connector.
    - Secure the clip.
    - Tighten the screws.

Vehicles with petrol engine

4. Using the approved diagnostic equipment, clear the powertrain control module (PCM) adaptions.

Published: 11-May-2011

Speed Control - V8 S/C 4.2L Petrol -

Torque Specifications

Description	Nm	lb-ft
Speed control sensor locknut	10	7
Speed control module retaining bolt	10	7
speed control sensor bolts	10	7

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Speed Control - V8 S/C 4.2L Petrol - Speed Control

Description and Operation

Speed Control

For additional information, refer to: Speed Control (310-03B Speed Control - V8 4.4L Petrol, Description and Operation).

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Speed Control - V8 S/C 4.2L Petrol - Speed Control

Diagnosis and Testing

Overview

For information on the description and operation of the speed control systems, refer to section 310-03 - Speed Control in the workshop manual.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
• Speed control sensor condition and installation • Speed control switches • Forward alert switch • Brake switches • Tire size and condition	• Fuses • Speed control sensor • Speed control switches • Forward alert switch • Brake switches • Adaptive speed control module • Engine control module (ECM) • ABS control module • Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification.

Forward looking sensor

The correct function of the system depends on the operation of the Forward Looking sensor, this requires correct alignment and an unobstructed field of view.

Customer complaints of poor system performance, late vehicle detection, late system braking, heavier than expected braking when gaining on the vehicle in front or system is detecting vehicles in adjacent lanes, may be due to the sensor pointing up or down (it should be set to level).

Check that there are no obstructions to the sensor

Check for signs of damage to the front bumper/sensor mounting area that could indicate that the sensor has been disturbed.

Check the sensor vertical alignment. For detailed instructions on sensor adjustment, refer to section 310-03 - Speed Control - Speed Control Sensor Adjustment in the workshop manual. If the sensor is adjusted up or down then carry out the diagnostic service alignment procedure using the approved diagnostic system.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Actions
C1A0041	Control module	• Cruise control module power supply circuit voltage out of range • General checksum failure (module internal failure)	A momentary low voltage occurred, check vehicle battery and charging circuit. Refer to the relevant section in the workshop manual. Refer to the electrical guides and check the power supply circuits to the module. Clear the DTC and retest. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Actions
C1A6511	Front Alert Switch Circuit	- Switch stuck - Switch circuit: short circuit to ground	Check the forward alert switch and circuits. Refer to the electrical guides.
C1A6515	Front Alert Switch Circuit	- Switch circuit: short circuit to power - Switch circuit: high resistance	Check the forward alert switch and circuits. Refer to the electrical guides.
C1A6611	Front Alert LED Circuit	- LED circuit: short circuit to ground	Check the forward alert LED and circuits. Refer to the electrical guides.
C1A6615	Front Alert LED Circuit	- LED circuit: short circuit to power - LED circuit: high resistance	Check the forward alert LED and circuits. Refer to the electrical guides.
C1A6754	Forward Looking Sensor	- Missing calibration	Calibrate the sensor using the approved diagnostic system.
C1A6787	Forward Looking Sensor	- Missing message	Check the speed control sensor and circuits. Refer to the electrical guides.
C1A6796	Forward Looking Sensor	- Component internal failure	Check the speed control sensor and circuits. Refer to the electrical guides.
C1A6797	Forward Looking Sensor	- Sensor obstructed or blocked	Check and clear any obstructions from the sensor, clear the DTC and retest.
C1A6798	Forward Looking Sensor	- Sensor over-temperature	Clear the DTC, allow vehicle to cool down and retest. Consider the atmospheric conditions before condemning a module.
P050429	Brake Switch A / B Correlation	- Brake switch malfunction - sub-processor	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P050464	Brake Switch A / B Correlation	- Brake switch malfunction	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P052500	Cruise Control Servo Control Circuit Range/Performance	- Internal control module corruption	Check the ECM and speed control modules and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P057400	Cruise Control System - Vehicle Speed Too High	- Vehicle speed too high	Check for ABS DTCs. Refer to the relevant workshop manual section.
P057600	Cruise Control Input Circuit Low	- Speed control switch short circuit to ground - Speed control switch high resistance	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057700	Cruise Control Input Circuit High	- Speed control switch short circuit to power	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
U007388	Control Module Communication Bus "A" Off	- Bus off	The module setting this code has disabled CAN transmission. Ensure that the latest patch file is installed (available on GTR). Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Clear all DTCs and a road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue.
U010087	Lost Communication With ECM/PCM "A"	- CAN module status signals not received from the engine/powertrain control module (E/PCM) in the specified time	Refer to the lost communication statement at the start of the Network Communications section of the workshop manual.
U010187	Lost Communication with TCM	- CAN module status signals not received from the transmission control module TCM in the specified time	Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Actions
U012287	Lost Communication With Vehicle Dynamics Control Module	● CAN module status signals not received from the VDM in the specified time	Refer to the Network Communications section of the workshop manual.
U015587	Lost Communication With Instrument Panel Cluster (IPC) Control Module	● CAN Link transfer case control module/instrument cluster missing message ● CAN bus fault ● IPC disconnected ● IPC not configured ● IPC failure ● Harness/connector issue	Check the control module installation/configuration. Refer to the lost communication statement at the start of the Network Communications section in the workshop manual.
U023500	Lost Communication With Cruise Control Front Distance Range Sensor	● Lost communication ● Fault status transmitted	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U030055	Internal Control Module Software Incompatibility	● Software incompatibility - Not configured	Configure the module using the approved diagnostic system.
U1A0088	Private Communication Network	● Bus off	The module setting this code has disabled CAN transmission. Ensure that the latest patch file is installed (available on GTR). Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Clear all DTCs and a road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue.
U1A1449	CAN Initialisation Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect.

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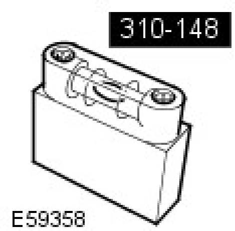
Speed Control - V8 S/C 4.2L Petrol - Speed Control Sensor Adjustment

General Procedures

Special Tool(s)	
	Speed control aligner 310-148

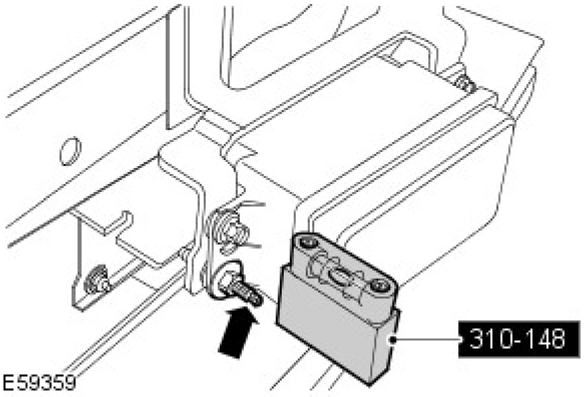
- NOTE: Special tool 310-148 is graduated in 0.5 degree increments.
- NOTE: This procedure details how to adjust the speed control sensor vertically. There is no horizontal adjustment required.

1. Remove the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

2. ⚠ CAUTION: Drive the vehicle on to a flat, level surface.

Set the air suspension ride height to the STANDARD setting.

3. Using the special tool, check the speed sensor is level, (+/- 0.5 degree).



4. NOTE: The speed sensor has no mechanical horizontal adjustment.

- NOTE: Do not release the securing nut.

Using the special tool, set the speed control sensor.

- Rotate the vertical adjuster.

5. Install the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

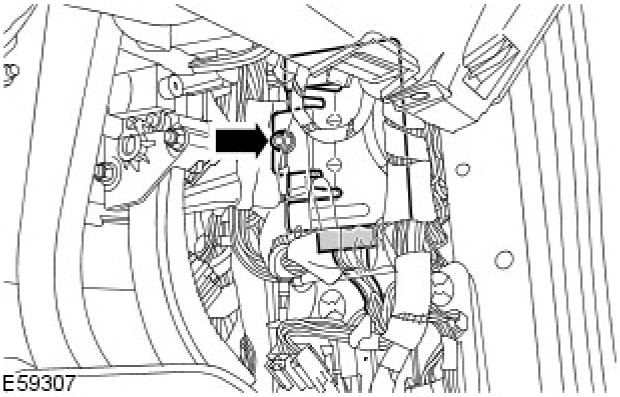
Published: 11-May-2011

Speed Control - V8 S/C 4.2L Petrol - Speed Control Module

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the Dynamic Response module.
   For additional information, refer to: Dynamic Response Module (204-06 Ride and Handling Optimization, Removal and Installation).
3. Remove the speed control module.
   - Loosen the bolt.
   - Release and disconnect the electrical connector.



Installation

1. Install the speed control module.
   - Connect and secure the electrical connector.
   - Tighten the bolt to 10 Nm (7 lb.ft).
2. Install the Dynamic Response module.
   For additional information, refer to: Dynamic Response Module (204-06 Ride and Handling Optimization, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
4. Program a new control module using T4.

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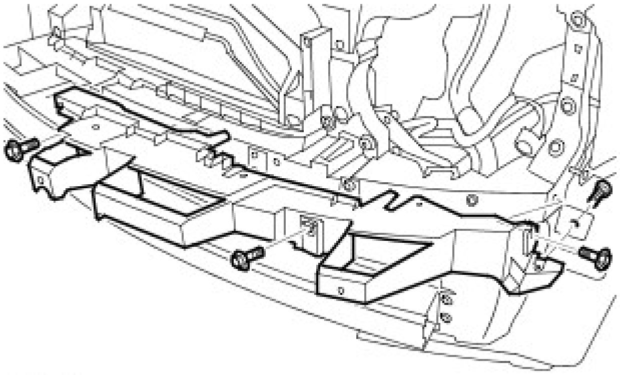
Speed Control - V8 S/C 4.2L Petrol - Speed Control Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

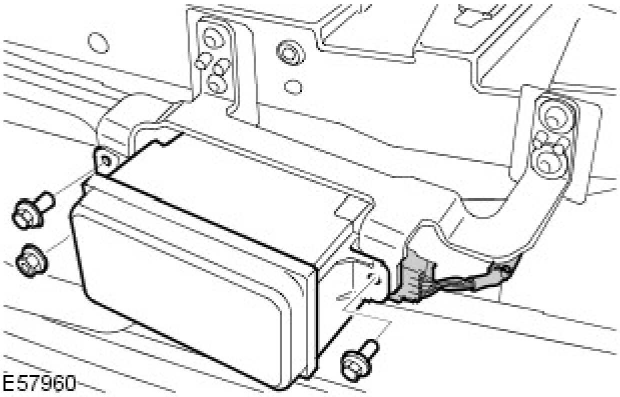
2. Remove the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).



E57926

3. Remove the LH bumper support bracket.

- Remove the 3 Torx screws.
- Remove the screw.



E57960

4. Remove the speed control sensor.

- Remove the 2 bolts.
- Remove the nut.
- Release and disconnect the electrical connector.

Installation

1. Install the speed control sensor.

- Tighten the nuts and bolts to 10 Nm (7 lb.ft).
- Connect and secure the electrical connector.

2. Install the bumper support bracket.

- Tighten the screws.

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Adjust the speed control sensor.
For additional information, refer to: Speed Control Sensor Adjustment (310-03C Speed Control - TDV6 2.7L Diesel, General Procedures).

5. Install the front bumper cover.

For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

6. Using T4, configure a new speed control sensor.

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Speed Control - V8 4.4L Petrol -

Torque Specifications

Description	Nm	lb-ft
Speed control sensor adjuster locknut	10	7
Speed control module retaining bolt	10	7
Speed control sensor bolts	10	7

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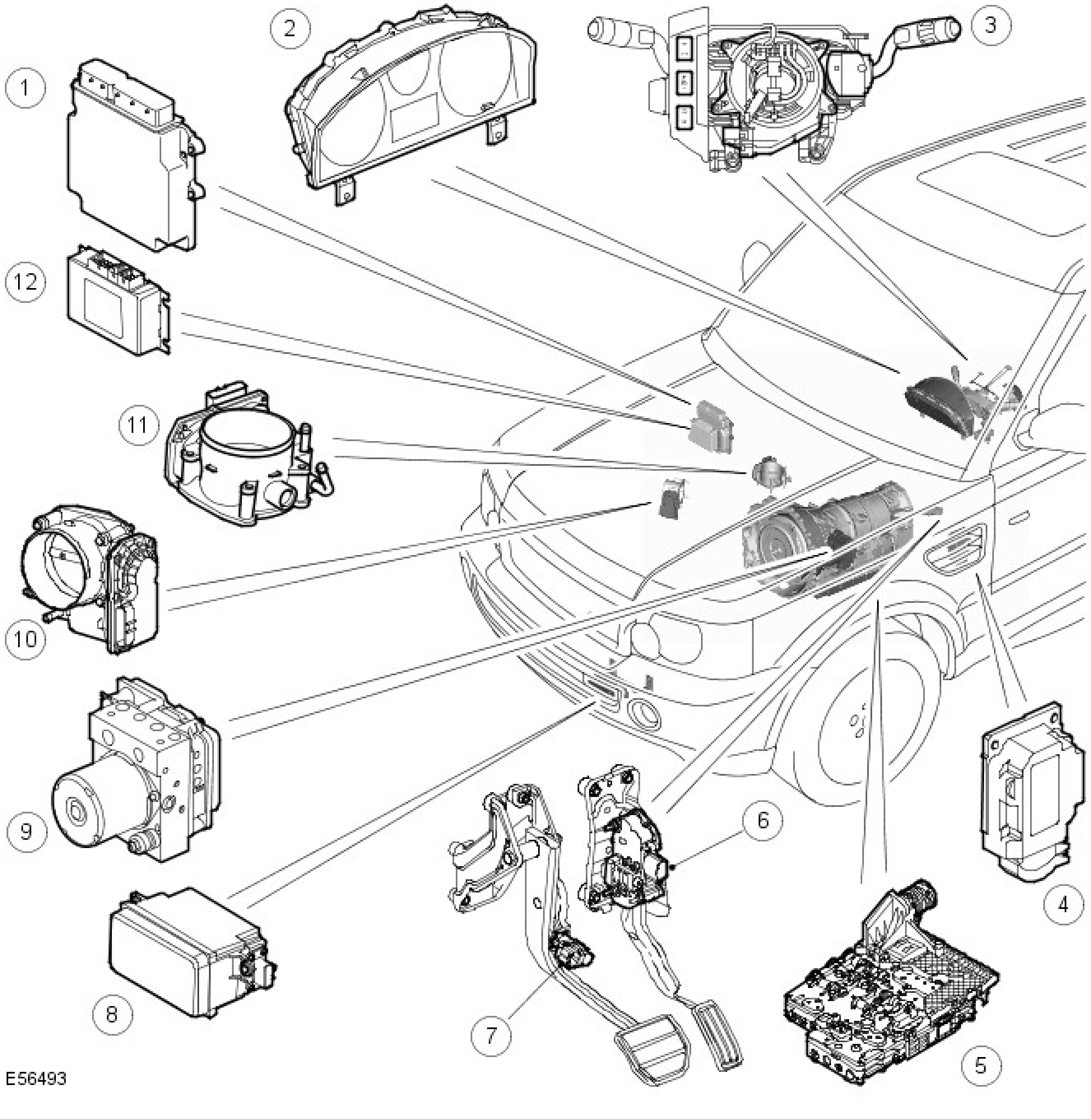
Speed Control - V8 4.4L Petrol - Speed Control

Description and Operation

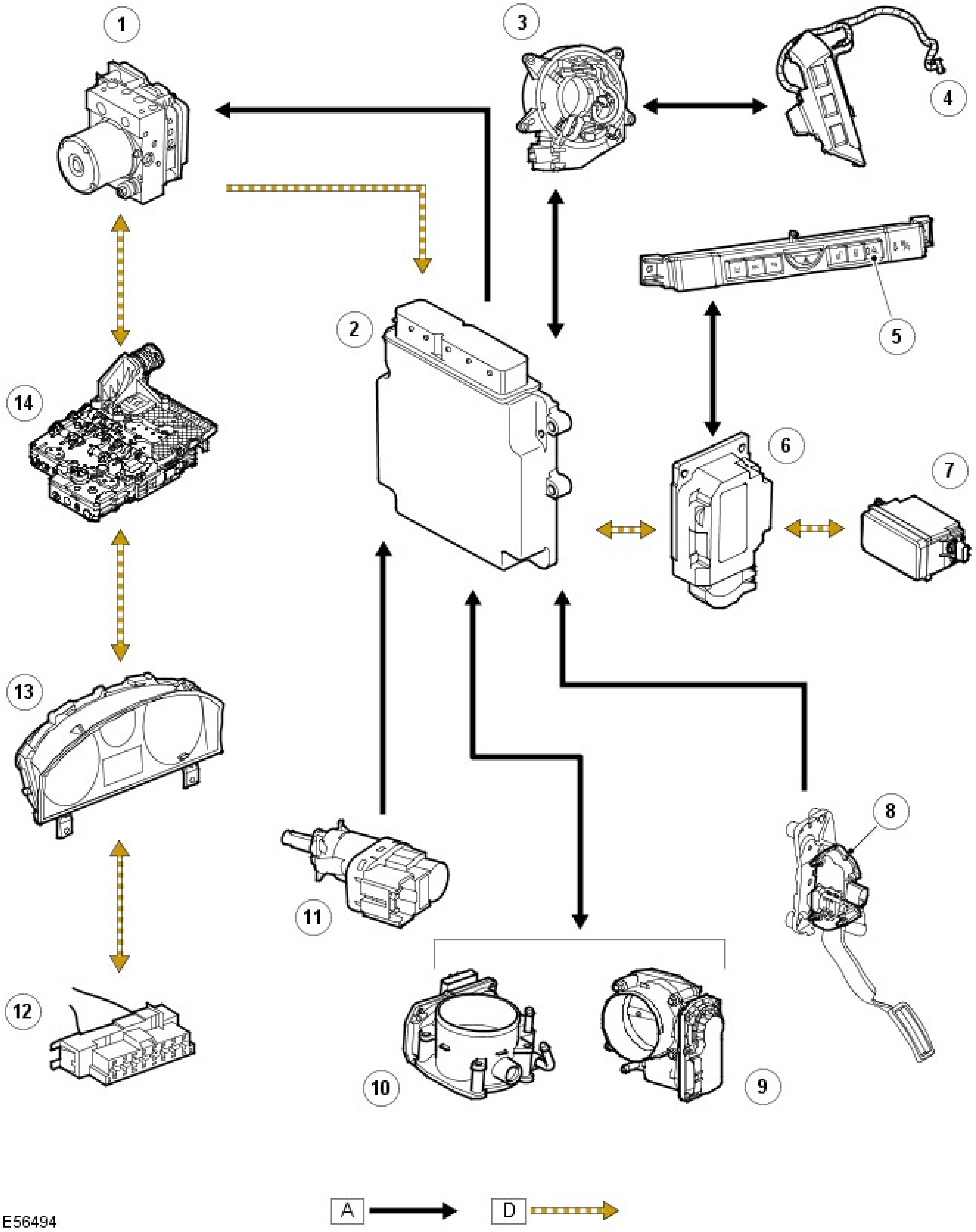
Petrol Engine Speed Control Component Location



Item	Part Number	Description
1	-	engine control module (ECM)
2	-	Instrument cluster
3	-	Speed control switches
4	-	Adaptive speed control module
5	-	transmission control module (TCM)
6	-	accelerator pedal position (APP)
7	-	brake pedal position (BPP) switch
8	-	Adaptive speed control radar sensor
9	-	anti-lock brake system (ABS) module
10	-	Electric throttle 4.4 Liter engine

11	-	Electric throttle 4.2 Liter engine
12	-	Transfer box control module

Petrol Engine Speed Control, Control Diagram


1
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E56494
A
D

Item	Part Number	Description
1	-	ABS module

2	-	ECM
3	-	Clock spring
4	-	Speed control switches
5	-	Forward alert ON/OFF switch
6	-	Adaptive speed control module
7	-	Adaptive speed control radar sensor
8	-	APP
9	-	Electric throttle 4.4 Liter
10	-	Electric throttle 4.2 Liter Supercharged
11	-	BPP switch
12	-	Diagnostic socket
13	-	Instrument cluster
14	-	TCM
A	-	Hardwired
D	-	High speed controller area network (CAN)

SPEED CONTROL

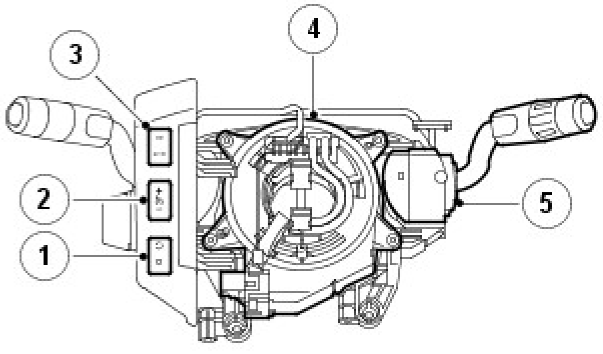
The speed control system is integrated with the engine management system and uses fueling intervention to automatically maintain a set vehicle speed. Once engaged, the system can also be used to accelerate the vehicle without using the accelerator pedal. The speed control system comprises the following components:

- Resume/Suspend switch
- '+' and '–' (set/accelerate and decelerate)
- Clock spring
- Speed control warning lamp (in the instrument cluster)

The speed control system also uses inputs from the brake pedal switch, the APP sensor, the ECM and the ABS Control Module.

The speed control is operated by the driver using only the steering wheel switches. When speed control is active, the ECM controls the electronic throttle to adjust the fuel supply as required to maintain the set speed.

CONTROL SWITCHES



E47030

Item	Part Number	Description
1	-	Suspend/Resume switch
2	-	Set speed/adjust speed (+/–) Switches
3	-	Adaptive speed control time gap adjustment switches
4	-	Clock spring
5	-	Wiper control column switch

The speed control switches are located on the left-hand (LH) side of the steering wheel. The switches are connected via fly leads directly to the clock spring. All of the speed control switches are non-latching momentary rocker switches. The minimum set speed for speed control is 18 mph (30 (km/h). Speed control is automatically suspended if the vehicle speed falls below 15 mph (24 km/h).

The speed control switches are resistive ladder type switches. There are three rocker switches associated with speed control, two of which are for adaptive speed control (where specified). The switches vary the resistance of a signal voltage sent to the ECM. The switches receive a 5 volt reference supply which is varied in response to which switches are pressed.

Suspend/Resume Switch

The suspend/resume switch controls the selection of speed control. When the ignition is in position II, a press of the suspend switch will activate the suspend mode which temporarily switches off the speed control system, but retains the previously set speed in the ECM memory.

Accelerate/Decelerate (+/–) Switches

When the speed control system is active, pressing the '+' switch set the controlled speed to the current road speed of the vehicle. Subsequent momentary presses of the switch increase the set road speed by 1 mph (2 km/h) with each press. If the switch is pressed and held the road speed will continue to increase until the switch is released. Momentarily pressing the '–' switch, decreases the set speed by 1 mph (2 km/h) with each press. If the switch is pressed and held, the set speed is decreased until the switch is released.

Time Gap Adjustment Switches

The time gap adjustment switches allows the driver to adjust the length of time gap between the vehicle and the vehicle in front. The maximum time gap is 2.4 seconds and the minimum time gap is 1 second.

ADAPTIVE SPEED CONTROL

General

The adaptive speed control system comprises the following components:

- Adaptive Speed Control Sensor
- Adaptive Speed Control module
- Steering wheel control switches
- ECM
- Electric throttle
- ABS module and pump

The adaptive speed control system uses a forward looking radar sensor to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between it and the target vehicle. When that gap falls below a set driver selected level (4 seconds) the adaptive speed control system will intervene slowing the vehicle by backing off the throttle and/ or applying the brakes, until the correct gap is attained.

The system will detect but not react to the following:

- Vehicles in the oncoming lane
- Stationary vehicles
- Pedestrians
- Vehicles not in the same lane.

Adaptive speed control is active when the vehicle is moving. Adaptive Speed Control only functions when a set speed is entered in normal speed control mode. The adaptive speed control system only intervenes with the set speed when it detects a target vehicle, and then only if the minimum time gap is breached.

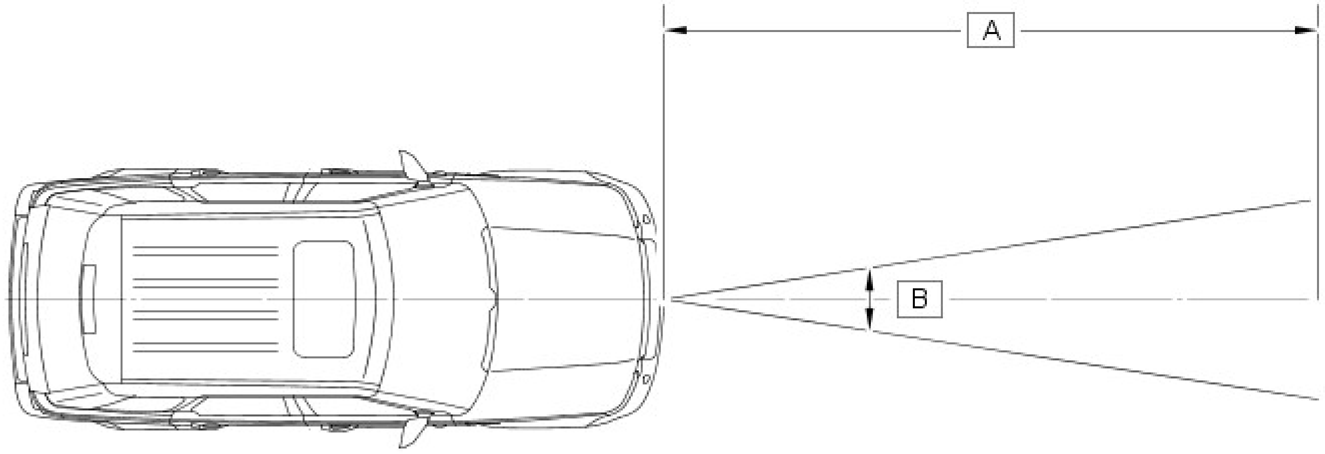
It is important to note that the system is intended for use in limited driving situations, does not remove control and responsibility from the driver, and at all times can be quickly overridden. The adaptive speed control system is not a collision warning system and will not react to stationary objects. The system does not operate below a minimum speed of approximately 30 km/h (20 mph) since it is unsuitable for use in cities or congested traffic. The system is best suited to main roads/ highways with gradual bends.

The ECM, throttle body and throttle control are unchanged from those used for non Adaptive Speed Control variants.

Radar Sensing

The adaptive speed control system is based on the use of a front mounted radar sensor. The sensor transmits a 1.5° wide beam forward of the vehicle and detects the returning signals reflected off other vehicles and objects ahead. The 1.5° wide radar beam is mechanically scanned at a rate of 10 sweeps/second across a total arc of 15° centered on the longitudinal axis of the vehicle. The radar operates at millimetric wavelengths (76 - 77 GHz) and transmits a frequency modulated continuous wave signal at a relatively low power level (no high power pulses).

Radar Viewing Angle/Range



E56519

Item	Part Number	Description
A	-	Sensor range 130 meters
B	-	Sensor scan angle 15 degrees

With the ignition switched ON, the adaptive speed control module is powered up but no radar transmissions are emitted until the vehicle is in motion.

The radar sensor detects three primary parameters of objects within the scanned arc. These are:

- Range
- Relative velocity
- Angle

- Range- the radar sensor detects the presence and ranges of different vehicles and objects within the scanned arc up to a distance of approximately 130 meters. The transmitted signal frequency changes continuously in a cyclic pattern (modulation). This means that, in the time taken for the signal wave front, to travel to and from a target vehicle (or other object), the transmission frequency will have changed. The difference between the received signal frequency and the new transmission frequency is proportional to the distance between the transmitting vehicle and the target vehicle.
- Relative speed - when the signal is reflected off a vehicle moving at a different speed (opening or closing gap) an effect known as the Doppler shift causes an extra frequency modulation to be imposed on the signal. This Doppler frequency varies with the relative speed of the vehicle being followed, enabling the system to differentiate between vehicles traveling at different speeds and also between moving vehicles and stationary objects.
- Angle of target - using a narrow angle beam to scan horizontally enables the system to distinguish between vehicles in different lanes and between vehicles and roadside objects.

Follow Mode

A set speed is selected in the normal speed control manner and this speed is maintained until a slower vehicle is encountered in the lane ahead. When the vehicle ahead comes within the effective range of the radar sensor, the system identifies it as a target vehicle and an icon is illuminated on the instrument cluster to indicate that the system is in "follow mode". When the distance between the two vehicles closes to a set time gap, the adaptive speed control system closes the throttle and if necessary applies the brakes to maintain the set time gap. Follow mode is effectively a closed loop system. If several vehicles are ahead, the closest vehicle is chosen as the target to follow. If the target vehicle moves out of radar range, or if either vehicle changes lane or drops below the minimum operating speed, the system exits follow mode and the follow mode icon is extinguished. The adaptive speed control system will only raise its speed to the originally set speed, it will not accelerate past this speed to maintain a time gap.

Driver operation of the foot brake or control switches will immediately cancel adaptive speed control.

System Restrictions

The adaptive speed control system is only intended to provide enhanced speed control as described above in certain restricted conditions. The following points should be noted:

Automatic braking is limited to approximately 20% of full pressure (0.2G) and is intended to provide a smooth, gradual deceleration in follow mode conditions. Harsh braking by the target vehicle or following the target vehicle down to very low speeds or to a halt will require driver override of the brakes.

While the radar sensor detects moving and stationary targets for assessment of the environment ahead, the system does not

react to or provide any control in situations other than follow mode conditions. Stationary or slow moving vehicles (below 10 km/h), pedestrians, objects on the road and oncoming vehicles in the same lane are not recognized.

WARNING: It must be emphasized that the adaptive speed control system is not a collision warning or avoidance system and that, other than the limited conditions of follow mode, driver intervention will be necessary to control the vehicle speed.

In follow mode, some situations may cause target ambiguities for the detection system. These situations include:

- The nearby presence of a third vehicle when driving on a line slightly offset to the target vehicle
- Vehicles edging into the lane ahead which are not detected by the system until they have moved into the radar beam.

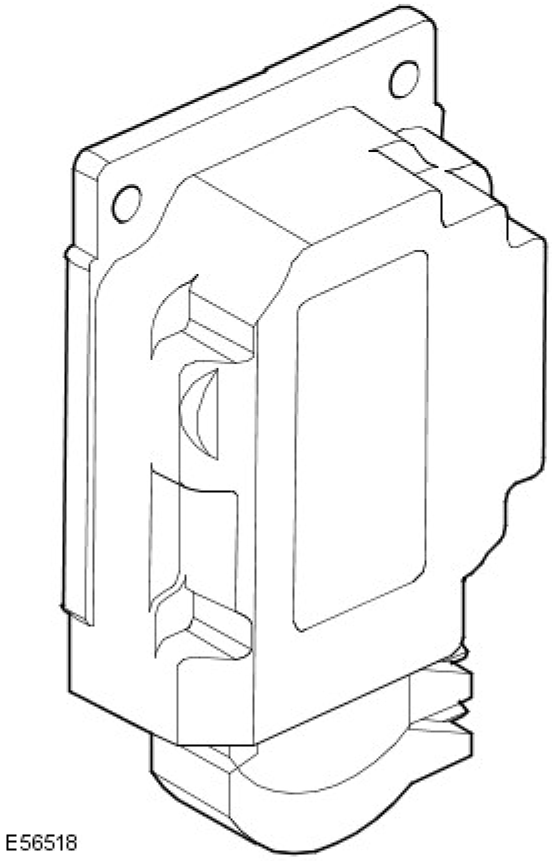
On the approach to, or exit from a bend, a target vehicle may be lost or a new target acquired as vehicles ahead change their angular position with respect to the radar sensor. On a straight road, if the sensing vehicle is in follow mode below its selected set speed, losing the target vehicle will cause the sensing vehicle to accelerate to this set speed. This acceleration is undesirable either on, or entering a bend when the target is suddenly lost, and in this situation the system inhibits the resumption of the set speed.

The speed control system compares vehicle speed data from the ABS system with the relative speed of an external object as detected by the radar sensor to ascertain whether the object is stationary or not.

• NOTE: If tires are fitted which are different in diameter from those specified for the vehicle, the vehicle speed calculated by the ABS will not be the true road speed. This situation may cause stationary objects to be falsely identified as moving vehicles and result in automatic deceleration on a clear road.

COMPONENTS

Adaptive Speed Control Module



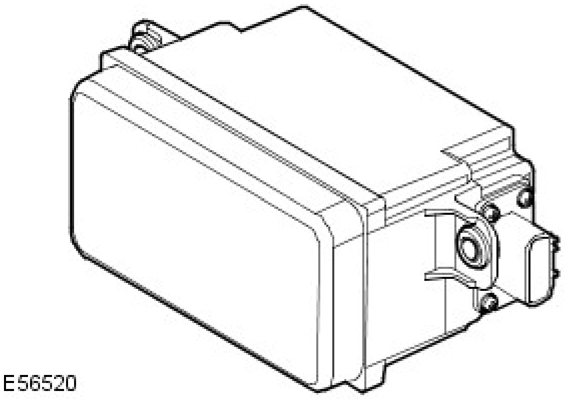
The Adaptive Speed Control module, located on the drivers side at the bottom of the A post. The control module is connected to The other vehicle systems via The high speed CAN bus. Signals from The Adaptive Speed Control forward looking radar sensor are received on a dedicated CAN bus between The two modules.

Adaptive Speed Control, Control Module Harness Connector C2145

Pin No	Description	Input/Output
1	Not used	-
2	Private radar sensor CAN low	Input/Output

Pin No	Description	Input/Output
3	Private radar sensor CAN high	Input/Output
4	Not used	-
5	Forward alert switch light emitting diode (LED)	Output
6	Not used	-
7	Not used	-
8	Not used	-
9	Not used	-
10	Not used	-
11	Not used	-
12	ground (GND)	-
13	Not used	-
14	Ignition voltage	Input
15	battery positive voltage (B+)	Input
16	Not used	-
17	Not used	-
18	Not used	-
19	Not used	-
20	Forward alert switch	Input
21	Not used	-
22	Not used	-
23	CAN Low	Input/Output
24	CAN High	Input/Output
25	Not used	-
26	Not used	-
27	Not used	-
28	Not used	-
29	Not used	-
30	Not used	-

Adaptive Speed Control Sensor



Adaptive Speed Control Sensor Harness Connector C2025

Pin No	Description	Input/Output
1	Ignition	Input
2	GND	-
3	CAN -	Input/Output
4	CAN+	Input/Output
5	B+	Input

The adaptive speed control radar sensor is located in the front bumper, on the LH side adjacent to the front fog light (where fitted) behind the bumper cover. The sensor is connected to the Adaptive Speed Control, module via a private CAN bus. If the unit is replaced in service the unit must be re-aligned verticallyFor additional information, refer to: Speed Control Sensor (310-03C Speed Control - TDV6 2.7L Diesel, Removal and Installation).
For additional information, refer to: Speed Control Sensor Adjustment (310-03C Speed Control - TDV6 2.7L Diesel, General Procedures).
.

Horizontal alignment is achieved by putting the sensor in service mode via T4. The vehicle is then driven for a short period while the sensor calibrates itself. Calibration is complete when the 'follow' icon in the instrument cluster stops flashing.

Forward Alert

The forward alert system utilizes the Adaptive Speed Control system components. Forward alert is turned on and off independently of Adaptive Speed Control, via a switch mounted in the instrument panel above the Integrated Head Unit. Forward alert will notify the driver by means of a chime, and icon in the instrument cluster and indication in the message center, when a target vehicle comes into range. The system will **NOT** use throttle or brake intervention to slow the vehicle.

- NOTE: This system is intended as a driver aid and should be used as such. The system is not a collision warning or avoidance device.

Published: 11-May-2011

Speed Control - V8 4.4L Petrol - Speed Control

Diagnosis and Testing

Overview

For information on the description and operation of the speed control systems, refer to section 310-03 - Speed Control in the workshop manual.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
• Forward looking sensor condition and installation • Speed control switches • Forward alert switch • Brake switches • Tire size and condition	• Fuses • Forward looking sensor • Speed control switches • Forward alert switch • Brake switches • Adaptive speed control module • Engine control module (ECM) • ABS control module • Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification.

Forward looking sensor

The correct function of the system depends on the operation of the Forward Looking sensor, this requires correct alignment and an unobstructed field of view.

Customer complaints of poor system performance, late vehicle detection, late system braking, heavier than expected braking when gaining on the vehicle in front or system is detecting vehicles in adjacent lanes, may be due to the sensor pointing up or down (it should be set to level).

Check that there are no obstructions to the sensor

Check for signs of damage to the front bumper/sensor mounting area that could indicate that the sensor has been disturbed.

Check the sensor vertical alignment. For detailed instructions on sensor adjustment, refer to section 310-03 - Speed Control - Speed Control Sensor Adjustment in the workshop manual. If the sensor is adjusted up or down then carry out the diagnostic service alignment procedure using the approved diagnostic system.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Actions
C1A0041	Control Module	• Cruise control module power supply circuit voltage out of range • General checksum failure (module internal failure)	A momentary low voltage occurred, check vehicle battery and charging circuit. Refer to the relevant section in the workshop manual. Refer to the electrical guides and check the power supply circuits to the module. Clear the DTC and retest. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Actions
C1A6511	Front Alert Switch Circuit	● Switch stuck ● Switch circuit: short circuit to ground	Check the forward alert switch and circuits. Refer to the electrical guides.
C1A6515	Front Alert Switch Circuit	● Switch circuit: short circuit to power ● Switch circuit: high resistance	Check the forward alert switch and circuits. Refer to the electrical guides.
C1A6611	Front Alert LED Circuit	● LED circuit: short circuit to ground	Check the forward alert LED and circuits. Refer to the electrical guides.
C1A6615	Front Alert LED Circuit	● LED circuit: short circuit to power ● LED circuit: high resistance	Check the forward alert LED and circuits. Refer to the electrical guides.
C1A6754	Forward Looking Sensor	● Missing calibration	Calibrate the sensor using the approved diagnostic system.
C1A6787	Forward Looking Sensor	● Missing message	Check the forward looking sensor and circuits. Refer to the electrical guides.
C1A6796	Forward Looking Sensor	● Component internal failure	Check the forward looking sensor and circuits. Refer to the electrical guides.
C1A6797	Forward Looking Sensor	● Sensor obstructed or blocked	Check and clear any obstructions from the sensor, clear the DTC and retest.
C1A6798	Forward Looking Sensor	● Sensor over-temperature	Clear the DTC, allow vehicle to cool down and retest. Consider the atmospheric conditions before condemning a module.
P050429	Brake Switch A / B Correlation	● Brake switch malfunction - sub-processor	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P050464	Brake Switch A / B Correlation	● Brake switch malfunction	Check for ABS DTCs, check the brake switch and circuits (refer to the electrical guides). Clear the DTCs and test for normal operation.
P052500	Cruise Control Servo Control Circuit Range/Performance	● Internal control module corruption	Check the ECM and speed control modules and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P057400	Cruise Control System - Vehicle Speed Too High	● Vehicle speed too high	Check for ABS DTCs. Refer to the relevant workshop manual section.
P057600	Cruise Control Input Circuit Low	● Speed control switch short circuit to ground ● Speed control switch high resistance	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
P057700	Cruise Control Input Circuit High	● Speed control switch short circuit to power	Refer to the electrical guides and check the cruise control circuit between the ECM and switch. Check the switch operation and renew/renew as necessary.
U007388	Control Module Communication Bus "A" Off	● Bus off	The module setting this code has disabled CAN transmission. Ensure that the latest patch file is installed (available on GTR). Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Clear all DTCs and a road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue.
U010087	Lost Communication With ECM/PCM "A"	● CAN module status signals not received from the engine/powertrain control module (E/PCM) in the specified time	Refer to the lost communication statement at the start of the Network Communications section of the workshop manual.
U010187	Lost Communication with TCM	● CAN module status signals not received from the transmission control module TCM in the specified time	Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Actions
U012287	Lost Communication With Vehicle Dynamics Control Module	● CAN module status signals not received from the VDM in the specified time	Refer to the Network Communications section of the workshop manual.
U015587	Lost Communication With Instrument Panel Cluster (IPC) Control Module	● CAN Link transfer case control module/instrument cluster missing message ● CAN bus fault ● IPC disconnected ● IPC not configured ● IPC failure ● Harness/connector issue	Check the control module installation/configuration. Refer to the lost communication statement at the start of the Network Communications section in the workshop manual.
U023500	Lost Communication With Cruise Control Front Distance Range Sensor	● Lost communication ● Fault status transmitted	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U030055	Internal Control Module Software Incompatibility	● Software incompatibility - Not configured	Configure the module using the approved diagnostic system.
U1A0088	Private Communication Network	● Bus off	The module setting this code has disabled CAN transmission. Ensure that the latest patch file is installed (available on GTR). Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Clear all DTCs and a road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue.
U1A1449	CAN Initialisation Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect.

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Speed Control - V8 4.4L Petrol - Speed Control Sensor Adjustment

General Procedures

Special Tool(s)	
310-148 E59358	Speed control aligner 310-148

- NOTE: Special tool 310-148 is graduated in 0.5 degree increments.

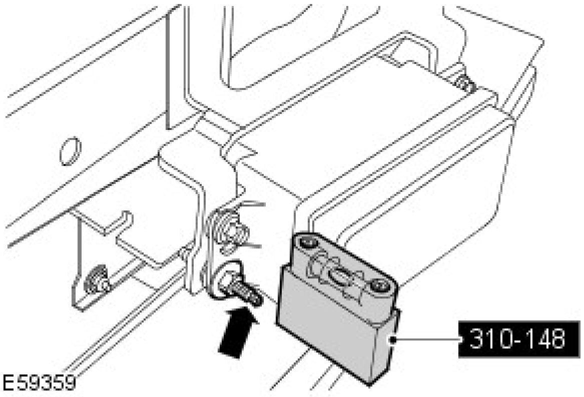
- NOTE: This procedure details how to adjust the speed control sensor vertically. There is no horizontal adjustment required.

1. Remove the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

2. ⚠ CAUTION: Drive the vehicle on to a flat, level surface.

Set the air suspension ride height to the STANDARD setting.

3. Using the special tool, check the speed sensor is level, (+/- 0.5 degree).



4. NOTE: The speed sensor has no mechanical horizontal adjustment.

- NOTE: Do not release the securing nut.

Using the special tool, set the speed control sensor.

- Rotate the vertical adjuster.

5. Install the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

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Speed Control - V8 4.4L Petrol - Speed Control Module

Removal and Installation

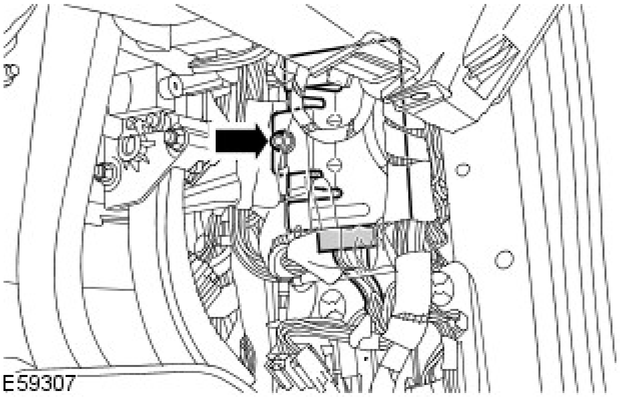
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the Dynamic Response module.
For additional information, refer to: Dynamic Response Module (204-06 Ride and Handling Optimization, Removal and Installation).

3. Remove the speed control module.

- Loosen the bolt.
- Release and disconnect the electrical connector.



Installation

1. Install the speed control module.

- Connect and secure the electrical connector.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. Install the Dynamic Response module.
For additional information, refer to: Dynamic Response Module (204-06 Ride and Handling Optimization, Removal and Installation).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Program a new control module using T4.

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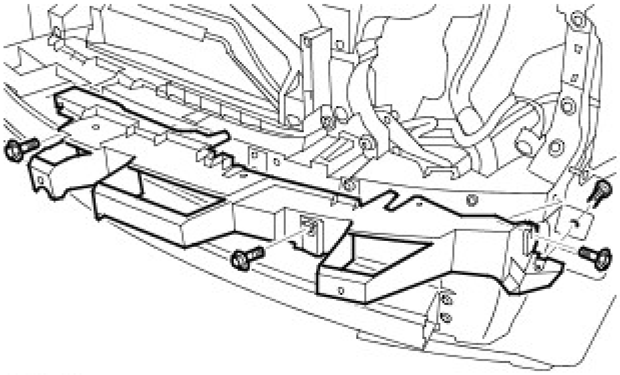
Speed Control - V8 4.4L Petrol - Speed Control Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

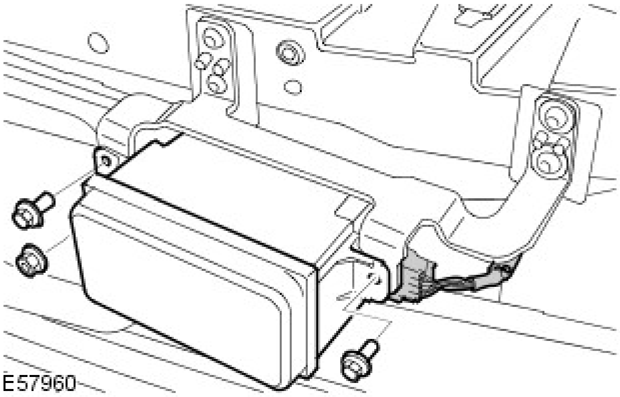
2. Remove the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).



E57926

3. Remove the LH bumper support bracket.

- Remove the 3 Torx screws.
- Remove the screw.



E57960

4. Remove the speed control sensor.

- Remove the 2 bolts.
- Remove the nut.
- Release and disconnect the electrical connector.

Installation

1. Install the speed control sensor.

- Tighten the nuts and bolts to 10 Nm (7 lb.ft).
- Connect and secure the electrical connector.

2. Install the bumper support bracket.

- Tighten the screws.

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

4. Adjust the speed control sensor.
For additional information, refer to: Speed Control Sensor Adjustment (310-03C Speed Control - TDV6 2.7L Diesel, General Procedures).

5. Install the front bumper cover.

For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

6. Using T4, configure a new speed control sensor.

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Speed Control - TDV6 2.7L Diesel -

Torque Specifications

Description	Nm	lb-ft
Speed control sensor locknut	10	7
Speed control module retaining bolt	10	7
speed control sensor bolts	10	7

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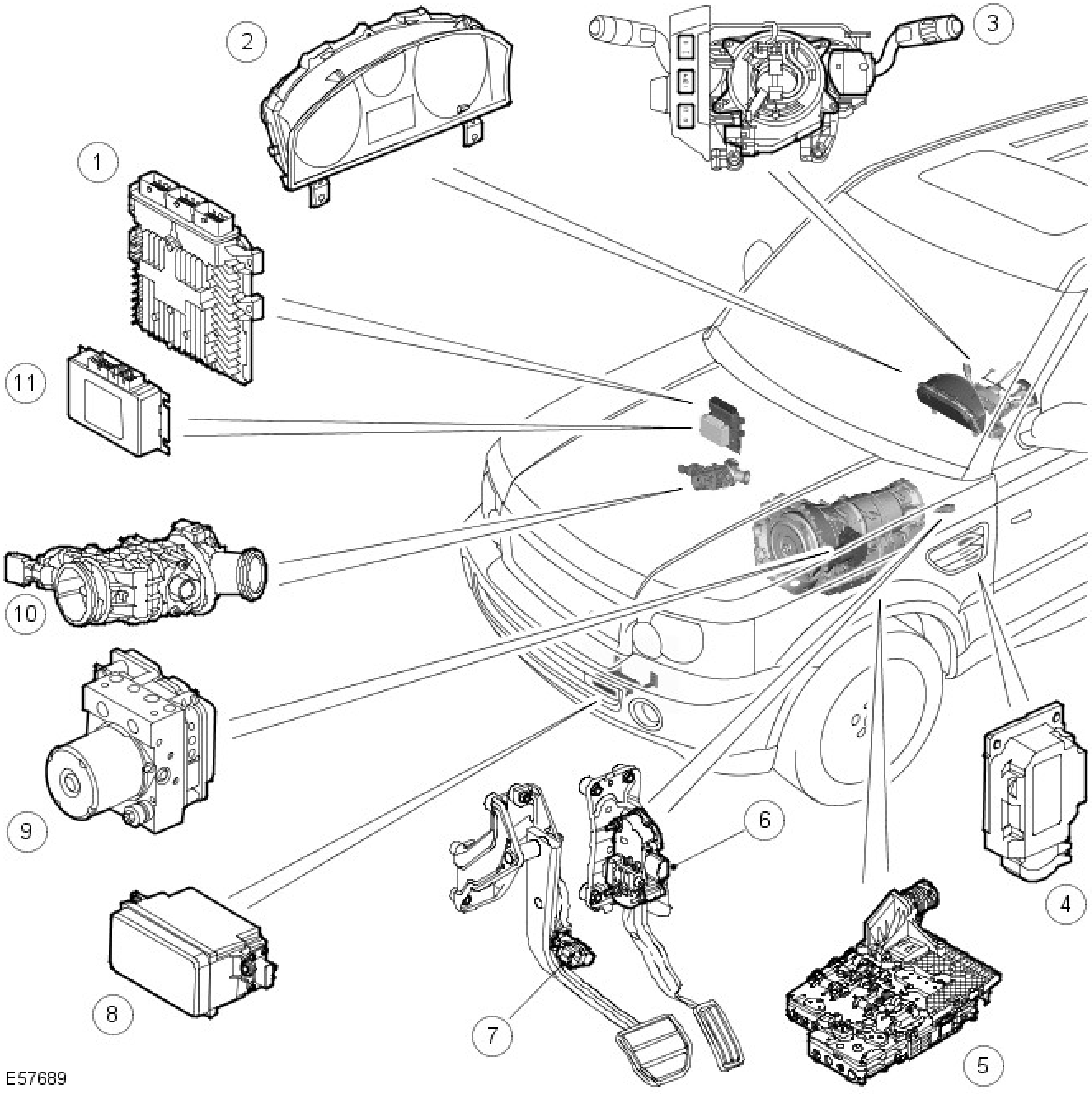
Speed Control - TDV6 2.7L Diesel - Speed Control

Description and Operation

Speed Control Component Location

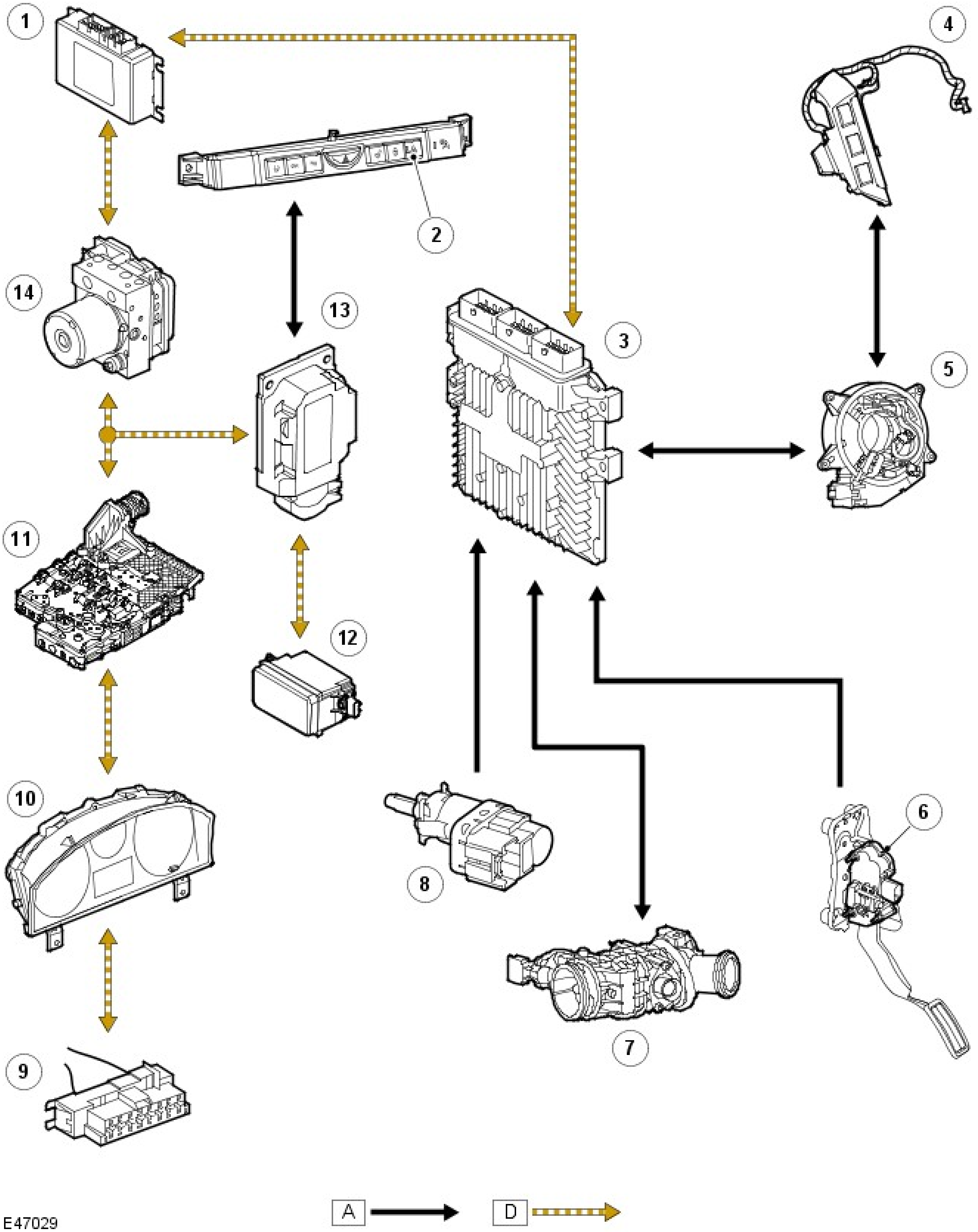


Item	Part Number	Description
1	-	engine control module (ECM)
2	-	Instrument cluster
3	-	Speed control switches
4	-	Adaptive speed control module
5	-	transmission control module (TCM)
6	-	accelerator pedal position (APP)
7	-	brake pedal position (BPP) switch
8	-	Adaptive speed control radar sensor
9	-	anti-lock brake system (ABS) module
10	-	Electric throttle

11	-	Transfer box control module

Speed Control, Control Diagram

- NOTE: A= Hardwired D= CAN


1
4
2
14
13
3
5
11
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6
7
9
E47029
A
D

Item	Part Number	Description
1	-	Transfer box control module

2	-	Forward alert ON/OFF switch
3	-	ECM
4	-	Speed control switches
5	-	Clock spring
6	-	APP
7	-	Electric throttle
8	-	BPP switch
9	-	Diagnostic socket
10	-	Instrument cluster
11	-	TCM
12	-	Adaptive speed control radar sensor
13	-	Adaptive speed control module
14	-	ABS module

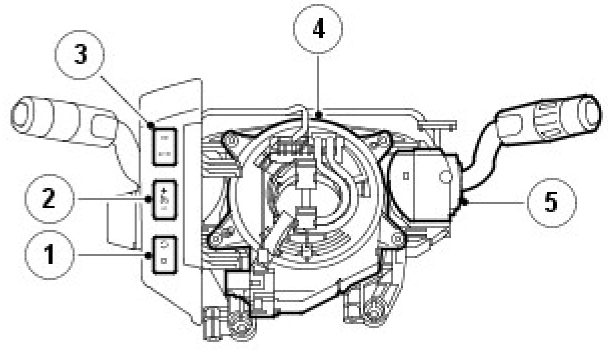
The speed control system is integrated with the engine management system and uses fueling intervention to automatically maintain a set vehicle speed. Once engaged, the system can also be used to accelerate the vehicle without using the accelerator pedal. The speed control system comprises the following components:

- On/Off/Suspend switch
- '+' and '–' (set/accelerate and decelerate)
- Resume switch
- Clock spring
- Speed control warning lamp (in the instrument cluster)

The speed control system also uses inputs from the brake pedal switch, the APP sensor, the ECM and the ABS Control Module.

The speed control is operated by the driver using only the steering wheel switches. When speed is active, the ECM regulates the pulse width modulation (PWM) signals to the fuel injectors to adjust the fuel supply as required to maintain the set speed.

CONTROL SWITCHES



E47030

Item	Part Number	Description
1	-	Suspend/Resume switch
2	-	Accelerate/Decelerate (+/–) Switches
3	-	Adaptive speed control time gap switches
4	-	Clock spring
5	-	Wiper control column switch

The speed control switches are located on the left-hand (LH) side of the steering wheel. The switches are connected via fly leads directly to the clock spring. All the speed control switches are non-latching momentary rocker switches. The minimum set speed is 18 mph (30 (km/h). Speed control is automatically suspended if the vehicle speed falls below 15 mph (24 km/h).

The speed control switches are resistive ladder type switches. There are three rocker switches associated with speed control, two of which are for adaptive speed control (where specified). The switches vary the resistance of a signal voltage sent to the ECM. The switches receive a 5 volt reference supply. The ECM measures the returned voltage to determine which switch has been pressed.

Suspend/Resume Switch

The suspend/resume switch controls the selection of speed control. When the ignition is in position II, a single press of the suspend switch will activate the suspend mode. This temporarily switches off the speed control system, but retains the previously set speed in the ECM memory.

Resume Switch

A second press of the switch re-activates the previously set speed after the speed control has been suspended by pressing the suspend switch or by depressing the brake pedal.

Accelerate / Decelerate (+ / –) Switches

When the speed control system is active, pressing the '+' switch sets the controlled speed to the current road speed of the vehicle. Subsequent momentary presses of the switch increases the set road speed by 0.6 mph (1 km/h). If the switch is pressed and held the road speed will continue to increase until the switch is released. Momentarily pressing the '–' switch, decreases the set speed by 0.6 mph (1 km/h). If the switch is pressed and held, the set speed is decreased until the switch is released

Time Gap Adjustment Switches

The time gap adjustment switches allows the driver to adjust the length of time gap between the vehicle and the vehicle in front. The maximum time gap is 2.4 seconds and the minimum time gap is 1 second.

ADAPTIVE SPEED CONTROL

General

The adaptive speed control system comprises the following components:

- Adaptive Speed Control Sensor
- Adaptive Speed Control module
- Steering wheel control switches
- ECM
- Electric throttle
- ABS module and pump

The adaptive speed control system uses a forward looking radar sensor to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between it and the target vehicle. When that gap falls below a set driver selected level (4 seconds) the adaptive speed control system will intervene slowing the vehicle by backing off the throttle and/ or applying the brakes, until the correct gap is attained.

The system will detect but not react to the following:

- Vehicles in the oncoming lane
- Stationary vehicles
- Pedestrians
- Vehicles not in the same lane.

Adaptive speed control is active when the vehicle is moving. Adaptive Speed Control only functions when a set speed is entered in normal speed control mode. The adaptive speed control system only intervenes with the set speed when it detects a target vehicle, and then only if the minimum time gap is breached.

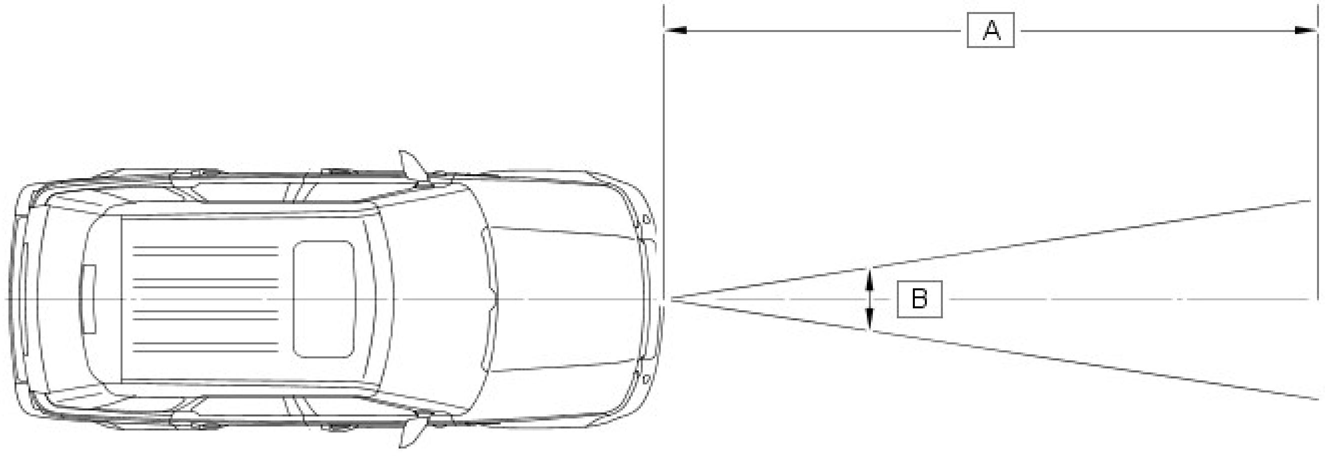
It is important to note that the system is intended for use in limited driving situations, does not remove control and responsibility from the driver, and at all times can be quickly overridden. The adaptive speed control system is not a collision warning system and will not react to stationary objects. The system does not operate below a minimum speed of approximately 30 km/h (20 mph) since it is unsuitable for use in cities or congested traffic. The system is best suited to main roads/ highways with gradual bends.

The ECM, throttle body and throttle control are unchanged from those used for non Adaptive Speed Control variants.

Radar Sensing

The adaptive speed control system is based on the use of a front mounted radar sensor. The sensor transmits a 1.5° wide beam forward of the vehicle and detects the returning signals reflected off other vehicles and objects ahead. The 1.5° wide radar beam is mechanically scanned at a rate of 10 sweeps/second across a total arc of 15° centered on the longitudinal axis of the vehicle. The radar operates at millimetric wavelengths (76 - 77 GHz) and transmits a frequency modulated continuous wave signal at a relatively low power level (no high power pulses).

Radar Viewing Angle/Range



E56519

Item	Part Number	Description
A	-	Sensor range 130 meters
B	-	Sensor scan angle 15 degrees

With the ignition switched ON, the adaptive speed control module is powered up but no radar transmissions are emitted until the vehicle is in motion.

The radar sensor detects three primary parameters of objects within the scanned arc. These are:

- Range
- Relative velocity
- Angle

- Range- the radar sensor detects the presence and ranges of different vehicles and objects within the scanned arc up to a distance of approximately 130 meters. The transmitted signal frequency changes continuously in a cyclic pattern (modulation). This means that, in the time taken for the signal wave front, to travel to and from a target vehicle (or other object), the transmission frequency will have changed. The difference between the received signal frequency and the new transmission frequency is proportional to the distance between the transmitting vehicle and the target vehicle.
- Relative speed - when the signal is reflected off a vehicle moving at a different speed (opening or closing gap) an effect known as the Doppler shift causes an extra frequency modulation to be imposed on the signal. This Doppler frequency varies with the relative speed of the vehicle being followed, enabling the system to differentiate between vehicles traveling at different speeds and also between moving vehicles and stationary objects.
- Angle of target - using a narrow angle beam to scan horizontally enables the system to distinguish between vehicles in different lanes and between vehicles and roadside objects.

Follow Mode

A set speed is selected in the normal speed control manner and this speed is maintained until a slower vehicle is encountered in the lane ahead. When the vehicle ahead comes within the effective range of the radar sensor, the system identifies it as a target vehicle and an icon is illuminated on the instrument cluster to indicate that the system is in "follow mode". When the distance between the two vehicles closes to a set time gap, the adaptive speed control system closes the throttle and if necessary applies the brakes to maintain the set time gap. Follow mode is effectively a closed loop system. If several vehicles are ahead, the closest vehicle is chosen as the target to follow. If the target vehicle moves out of radar range, or if either vehicle changes lane or drops below the minimum operating speed, the system exits follow mode and the follow mode icon is extinguished. The adaptive speed control system will only raise its speed to the originally set speed, it will not accelerate past this speed to maintain a time gap.

Driver operation of the foot brake or control switches will immediately cancel adaptive speed control.

System Restrictions

The adaptive speed control system is only intended to provide enhanced speed control as described above in certain restricted conditions. The following points should be noted:

Automatic braking is limited to approximately 20% of full pressure (0.2G) and is intended to provide a smooth, gradual deceleration in follow mode conditions. Harsh braking by the target vehicle or following the target vehicle down to very low speeds or to a halt will require driver override of the brakes.

While the radar sensor detects moving and stationary targets for assessment of the environment ahead, the system does not

react to or provide any control in situations other than follow mode conditions. Stationary or slow moving vehicles (below 10 km/h), pedestrians, objects on the road and oncoming vehicles in the same lane are not recognized.

⚠ WARNING: It must be emphasized that the adaptive speed control system is not a collision warning or avoidance system and that, other than the limited conditions of follow mode, driver intervention will be necessary to control the vehicle speed.

In follow mode, some situations may cause target ambiguities for the detection system. These situations include:

- The nearby presence of a third vehicle when driving on a line slightly offset to the target vehicle
- Vehicles edging into the lane ahead which are not detected by the system until they have moved into the radar beam.

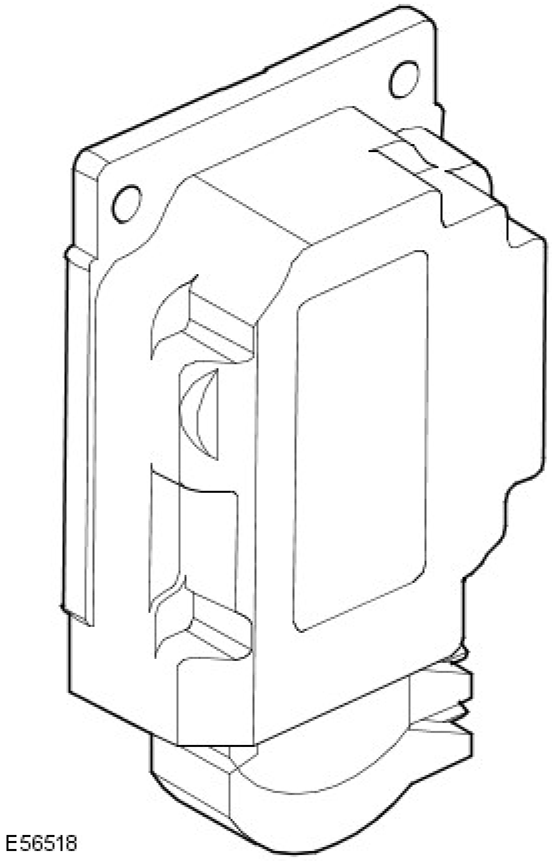
On the approach to, or exit from a bend, a target vehicle may be lost or a new target acquired as vehicles ahead change their angular position with respect to the radar sensor. On a straight road, if the sensing vehicle is in follow mode below its selected set speed, losing the target vehicle will cause the sensing vehicle to accelerate to this set speed. This acceleration is undesirable either on, or entering a bend when the target is suddenly lost, and in this situation the system inhibits the resumption of the set speed.

The speed control system compares vehicle speed data from the ABS system with the relative speed of an external object as detected by the radar sensor to ascertain whether the object is stationary or not.

• NOTE: If tires are fitted which are different in diameter from those specified for the vehicle, the vehicle speed calculated by the ABS will not be the true road speed. This situation may cause stationary objects to be falsely identified as moving vehicles and result in automatic deceleration on a clear road.

COMPONENTS

Adaptive Speed Control Module



E56518

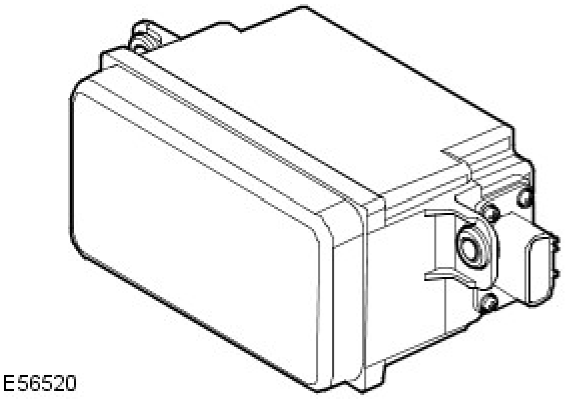
The Adaptive Speed Control module, located on the drivers side at the bottom of the A post. The control module is connected to The other vehicle systems via The high speed controller area network (CAN) bus. Signals from The Adaptive Speed Control forward looking radar sensor are received on a dedicated CAN bus between The two modules.

Adaptive Speed Control, Control Module Harness Connector C2145

Pin No	Description	Input/Output
1	Not used	-
2	Private radar sensor CAN low	Input/Output

Pin No	Description	Input/Output
3	Private radar sensor CAN high	Input/Output
4	Not used	-
5	Forward alert switch light emitting diode (LED)	Output
6	Not used	-
7	Not used	-
8	Not used	-
9	Not used	-
10	Not used	-
11	Not used	-
12	ground (GND)	-
13	Not used	-
14	Ignition voltage	Input
15	battery positive voltage (B+)	Input
16	Not used	-
17	Not used	-
18	Not used	-
19	Not used	-
20	Forward alert switch	Input
21	Not used	-
22	Not used	-
23	CAN Low	Input/Output
24	CAN High	Input/Output
25	Not used	-
26	Not used	-
27	Not used	-
28	Not used	-
29	Not used	-
30	Not used	-

Adaptive Speed Control Sensor



Adaptive Speed Control Sensor Harness Connector C2025

Pin No	Description	Input/Output
1	Ignition	Input
2	GND	-
3	CAN -	Input/Output
4	CAN+	Input/Output
5	B+	Input

The adaptive speed control radar sensor is located in the front bumper, on the LH side adjacent to the front fog light (where fitted) behind the bumper cover. The sensor is connected to the Adaptive Speed Control, module via a private CAN bus. If the unit is replaced in service the unit must be re-aligned verticallyFor additional information, refer to: Speed Control Sensor (310-03C Speed Control - TDV6 2.7L Diesel, Removal and Installation).
For additional information, refer to: Speed Control Sensor Adjustment (310-03C Speed Control - TDV6 2.7L Diesel, General Procedures).
.

Horizontal alignment is achieved by putting the sensor in service mode via T4. The vehicle is then driven for a short period while the sensor calibrates itself. Calibration is complete when the 'follow' icon in the instrument cluster stops flashing.

Forward Alert

The forward alert system utilizes the Adaptive Speed Control system components. Forward alert is turned on and off independently of Adaptive Speed Control, via a switch mounted in the instrument panel above the Integrated Head Unit. Forward alert will notify the driver by means of a chime, and icon in the instrument cluster and indication in the message center, when a target vehicle comes into range. The system will **NOT** use throttle or brake intervention to slow the vehicle.

- NOTE: This system is intended as a driver aid and should be used as such. The system is not a collision warning or avoidance device.

Published: 11-May-2011

Speed Control - TDV6 2.7L Diesel - Speed Control

Diagnosis and Testing

Overview

For information on the description and operation of the speed control systems, refer to section 310-03 - Speed Control in the workshop manual.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
- Forward looking sensor condition and installation - Speed control switches - Forward alert switch - Brake switches - Tire size and condition	- Fuses - Forward looking sensor - Speed control switches - Forward alert switch - Brake switches - Adaptive speed control module - Engine control module (ECM) - ABS control module - Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the DTC index.
   - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
   - Make sure that all DTCs are cleared following rectification.

Forward looking sensor

The correct function of the system depends on the operation of the Forward Looking sensor, this requires correct alignment and an unobstructed field of view.

Customer complaints of poor system performance, late vehicle detection, late system braking, heavier than expected braking when gaining on the vehicle in front or system is detecting vehicles in adjacent lanes, may be due to the sensor pointing up or down (it should be set to level).

Check that there are no obstructions to the sensor

Check for signs of damage to the front bumper/sensor mounting area that could indicate that the sensor has been disturbed.

Check the sensor vertical alignment. For detailed instructions on sensor adjustment, refer to section 310-03 - Speed Control - Speed Control Sensor Adjustment in the workshop manual. If the sensor is adjusted up or down then carry out the diagnostic service alignment procedure using the approved diagnostic system.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Actions
C1A0041	Control Module	- Cruise control module power supply circuit voltage out of range - General checksum failure (module internal failure)	A momentary low voltage occurred, check vehicle battery and charging circuit. Refer to the relevant section in the workshop manual. Refer to the electrical guides and check the power supply circuits to the module. Clear the DTC and retest. Refer to the warranty policy and procedures manual if a module is suspect.

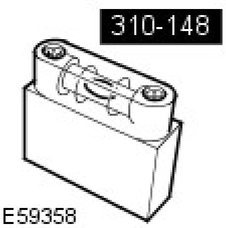
DTC	Description	Possible causes	Actions
C1A6511	Front Alert Switch Circuit	● Switch stuck ● Switch circuit: short circuit to ground	Check the forward alert switch and circuits. Refer to the electrical guides.
C1A6515	Front Alert Switch Circuit	● Switch circuit: short circuit to power ● Switch circuit: high resistance	Check the forward alert switch and circuits. Refer to the electrical guides.
C1A6611	Front Alert LED Circuit	● LED circuit: short circuit to ground	Check the forward alert LED and circuits. Refer to the electrical guides.
C1A6615	Front Alert LED Circuit	● LED circuit: short circuit to power ● LED circuit: high resistance	Check the forward alert LED and circuits. Refer to the electrical guides.
C1A6754	Forward Looking Sensor	● Missing calibration	Calibrate the sensor using the approved diagnostic system.
C1A6787	Forward Looking Sensor	● Missing message	Check the forward looking sensor and circuits. Refer to the electrical guides.
C1A6796	Forward Looking Sensor	● Component internal failure	Check the forward looking sensor and circuits. Refer to the electrical guides.
C1A6797	Forward Looking Sensor	● Sensor obstructed or blocked	Check and clear any obstructions from the sensor, clear the DTC and retest.
C1A6798	Forward Looking Sensor	● Sensor over-temperature	Clear the DTC, allow vehicle to cool down and retest. Consider the atmospheric conditions before condemning a module.
P050400	Brake Switch A / B Correlation	● The brake pressure reading does not agree with the brake lamp switch value ● Brake switch failure ● ECM failure	Check the brake switch and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P057100	Brake Switch A Circuit	● The brake pressure reading does not agree with the brake lamp switch value ● Brake switch failure ● ECM failure	Check the brake switch and circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
P229900	Brake Pedal Position/Accelerator Pedal Position Incompatible	Event information (this code indicates unexpected simultaneous operation of the accelerator and brake pedals) ● Brake lamp switch fault ● Accelerator pedal position (APP) sensor fault ● APP sensor circuits short circuit to ground ● APP sensor circuits short circuit to power ● APP sensor circuits high resistance ● Brake lamp switch circuits short circuit to ground ● Brake lamp switch circuits short circuit to power ● Brake lamp switch	Check the brake lamp function. If the brake lights function correctly, check the APP sensor using a datalogger function. Check both APP sensor tracks with the pedal in the rest position. Recheck the values with the pedal in the wide-open position. Both tracks should range between 0% at idle to 99% at wide open throttle. If the values are correct, check the APP sensor and brake lamp switch circuits. Refer to the electrical guides. Also note that the driver may have been left-foot-braking. If the values are incorrect, install a new pedal. Refer to the relevant workshop manual section. Clear the DTCs and test for normal operation.

DTC	Description	Possible causes	Actions
		circuits high resistance	
U007388	Control Module Communication Bus "A" Off	● Bus off	The module setting this code has disabled CAN transmission. Ensure that the latest patch file is installed (available on GTR). Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Clear all DTCs and a road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue.
U010087	Lost Communication With ECM/PCM "A"	● CAN module status signals not received from the engine/powertrain control module (E/PCM) in the specified time	Refer to the lost communication statement at the start of the Network Communications section of the workshop manual.
U010187	Lost Communication with TCM	● CAN module status signals not received from the transmission control module TCM in the specified time	Refer to the Network Communications section of the workshop manual.
U012287	Lost Communication With Vehicle Dynamics Control Module	● CAN module status signals not received from the VDM in the specified time	Refer to the Network Communications section of the workshop manual.
U015587	Lost Communication With Instrument Panel Cluster (IPC) Control Module	● CAN Link transfer case control module/instrument cluster missing message ● CAN bus fault ● IPC disconnected ● IPC not configured ● IPC failure ● Harness/connector issue	Check the control module installation/configuration. Refer to the lost communication statement at the start of the Network Communications section in the workshop manual.
U023500	Lost Communication With Cruise Control Front Distance Range Sensor	● Lost communication ● Fault status transmitted	Check for other CAN DTCs or apparently unrelated customer complaints. Carry out a complete vehicle DTC read. Check the CAN and module power and ground circuits. Refer to the electrical guides. Repair/renew as necessary. Clear the DTCs and test for normal operation.
U030055	Internal Control Module Software Incompatibility	● Software incompatibility - Not configured	Configure the module using the approved diagnostic system.
U1A0088	Private Communication Network	● Bus off	The module setting this code has disabled CAN transmission. Ensure that the latest patch file is installed (available on GTR). Check for other bus off codes. Check the module and circuits. Refer to the electrical guides. Clear all DTCs and a road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue.
U1A1449	CAN Initialization Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual if a module is suspect.

Published: 11-May-2011

Speed Control - TDV6 2.7L Diesel - Speed Control Sensor Adjustment

General Procedures

Special Tool(s)	
	Speed control aligner 310-148

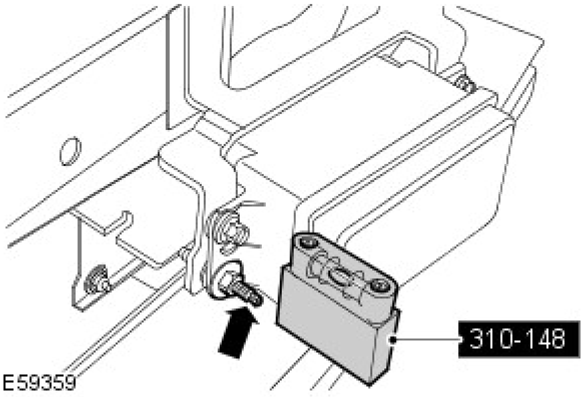
- NOTE: Special tool 310-148 is graduated in 0.5 degree increments.
- NOTE: This procedure details how to adjust the speed control sensor vertically. There is no horizontal adjustment required.

1. Remove the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

2. ⚠ CAUTION: Drive the vehicle on to a flat, level surface.

Set the air suspension ride height to the STANDARD setting.

3. Using the special tool, check the speed sensor is level, (+/- 0.5 degree).



4. NOTE: The speed sensor has no mechanical horizontal adjustment.

- NOTE: Do not release the securing nut.

Using the special tool, set the speed control sensor.

- Rotate the vertical adjuster.

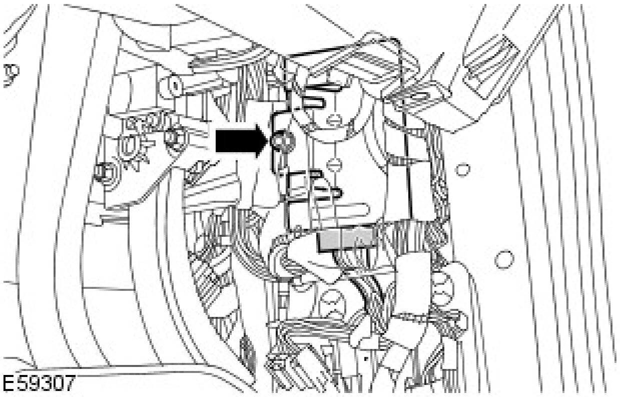
5. Install the front bumper cover.
For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

Speed Control - TDV6 2.7L Diesel - Speed Control Module

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the Dynamic Response module.
   For additional information, refer to: Dynamic Response Module (204-06 Ride and Handling Optimization, Removal and Installation).
3. Remove the speed control module.
   - Loosen the bolt.
   - Release and disconnect the electrical connector.



Installation

1. Install the speed control module.
   - Connect and secure the electrical connector.
   - Tighten the bolt to 10 Nm (7 lb.ft).
2. Install the Dynamic Response module.
   For additional information, refer to: Dynamic Response Module (204-06 Ride and Handling Optimization, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
4. Program a new control module using T4.

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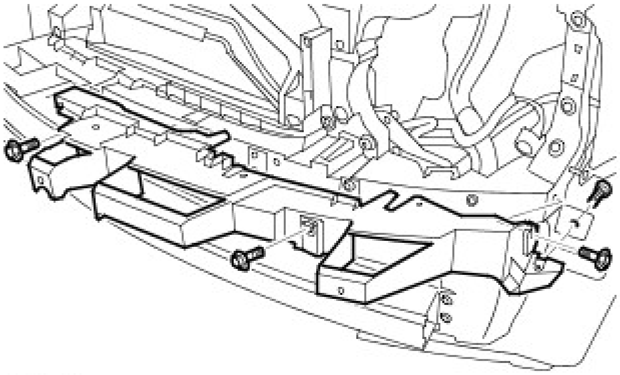
Speed Control - TDV6 2.7L Diesel - Speed Control Sensor

Removal and Installation

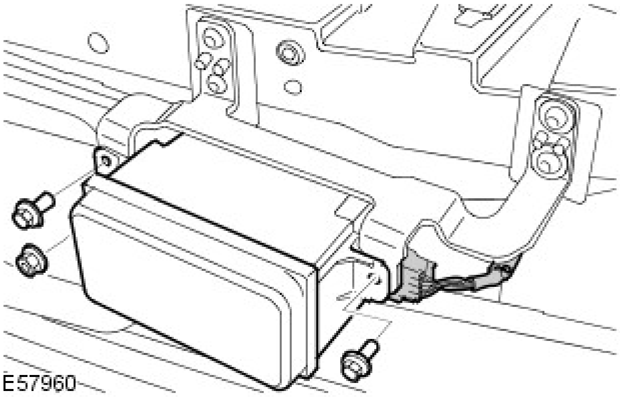
Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the front bumper cover.
   For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).
3. Remove the LH bumper support bracket.
   - Remove the 3 Torx screws.
   - Remove the screw.



E57926

4. Remove the speed control sensor.
   - Remove the 2 bolts.
   - Remove the nut.
   - Release and disconnect the electrical connector.



E57960

Installation

1. Install the speed control sensor.
   - Tighten the nuts and bolts to 10 Nm (7 lb.ft).
   - Connect and secure the electrical connector.
2. Install the bumper support bracket.
   - Tighten the screws.
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
4. Adjust the speed control sensor.
   For additional information, refer to: Speed Control Sensor Adjustment (310-03C Speed Control - TDV6 2.7L Diesel, General Procedures).
5. Install the front bumper cover.

For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

6. Using T4, configure a new speed control sensor.

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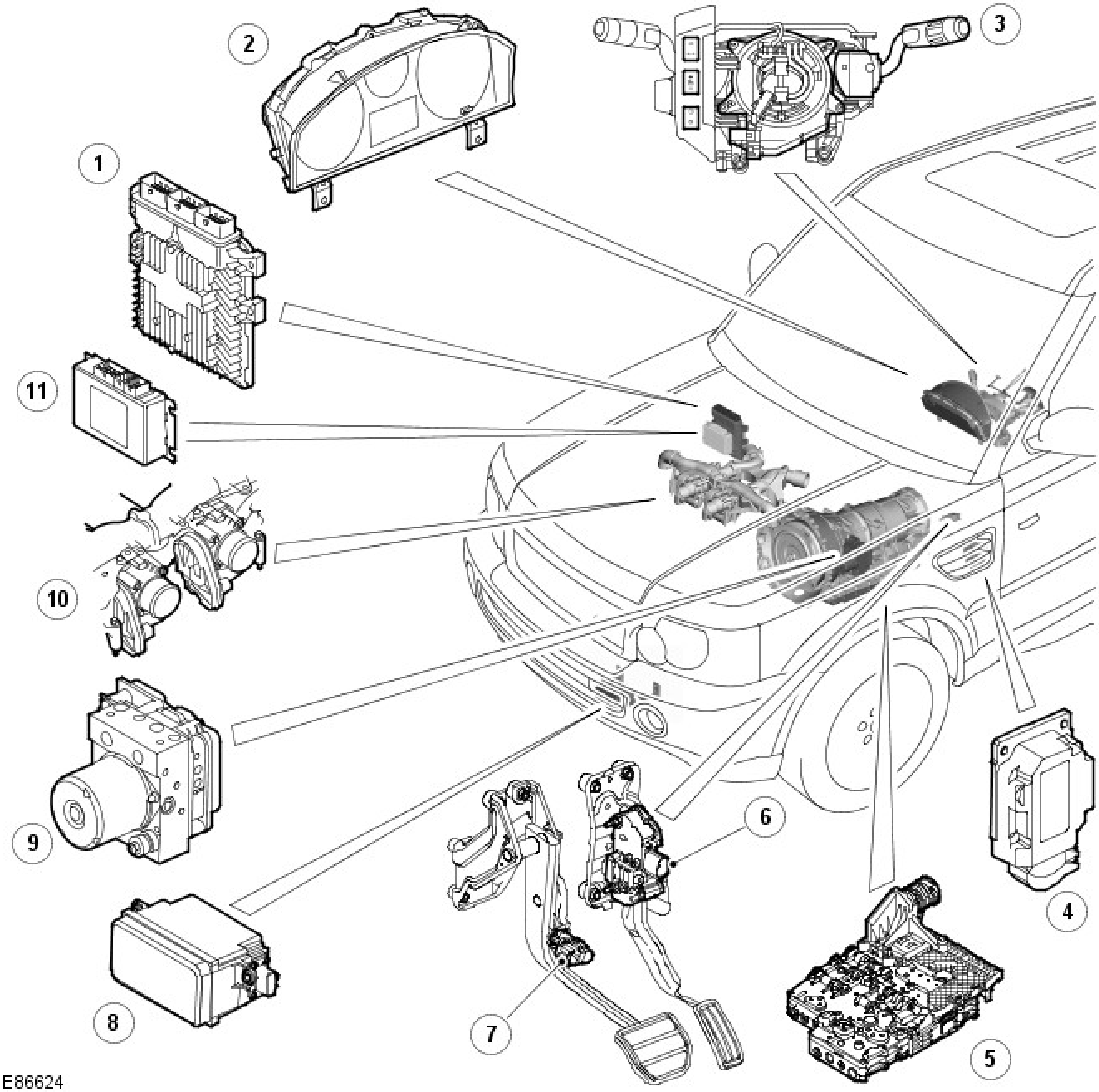
Speed Control - TDV8 3.6L Diesel - Speed Control

Description and Operation

COMPONENT LOCATION

Speed Control Component Location



Item	Part Number	Description
1	-	engine control module (ECM)
2	-	Instrument cluster
3	-	Speed control switches
4	-	Adaptive speed control module
5	-	transmission control module (TCM)
6	-	accelerator pedal position (APP)
7	-	brake pedal position (BPP) switch
8	-	Adaptive speed control radar sensor

9	-	anti-lock brake system (ABS) module
10	-	Electric throttle
11	-	Transfer box control module

OVERVIEW

The speed control system is integrated with the engine management system and uses fuelling intervention to automatically maintain a set vehicle speed. Once engaged, the system can also be used to accelerate the vehicle without using the accelerator pedal. The speed control system comprises the following components:

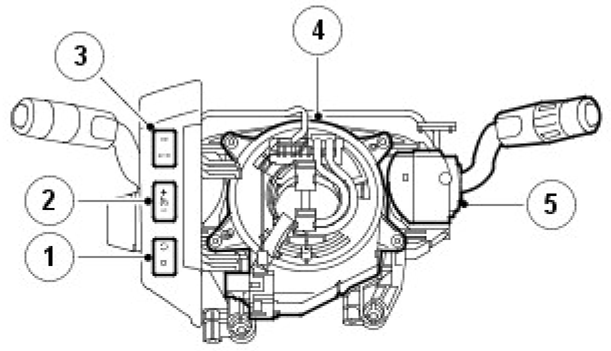
- On/Off/Suspend switch
- '+' and '-' (set/accelerate and decelerate) steering wheel switches
- Resume switch
- Clock spring
- Speed control warning lamp.

The speed control system also uses inputs from the brake pedal switch, the APP sensor, the ECM and the ABS control module.

The speed control is operated by the driver using only the steering wheel switches. When speed is active, the ECM regulates the pulse width modulation (PWM) signals to the fuel injectors to adjust the fuel supply as required to maintain the set speed.

During speed control operation, the ECM controls vehicle speed by adjusting fuel injection duration and timing. When the accelerator pedal is pressed with speed control active, the ECM outputs a calculated throttle angle signal in place of the actual throttle angle signals produced by the APP sensor. The calculated throttle angle is derived from fuel demand.

CONTROL SWITCHES



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Item	Part Number	Description
1	-	Suspend/Resume switch
2	-	Accelerate/Decelerate (+/–) Switches
3	-	Adaptive speed control time gap switches
4	-	Clock spring
5	-	Wiper control column switch

The speed control switches are located on the left-hand (LH) side of the steering wheel. The switches are connected via fly leads directly to the clock spring. All the speed control switches are non-latching momentary rocker switches. The minimum set speed is 18 mph (30 (km/h). Speed control is automatically suspended if the vehicle speed falls below 15 mph (24 km/h).

The speed control switches are resistive ladder type switches. There are three rocker switches associated with speed control, two of which are for adaptive speed control (where specified). The switches vary the resistance of a signal voltage sent to the ECM. The switches receive a 5 volt reference supply. The ECM measures the returned voltage to determine which switch has been pressed.

Suspend/Resume Switch

The suspend/resume switch controls the selection of speed control. When the ignition is in position II, a single press of the suspend switch will activate the suspend mode. This temporarily switches off the speed control system, but retains the previously set speed in the ECM memory.

Resume Switch

A second press of the switch re-activates the previously set speed after the speed control has been suspended by pressing the suspend switch or by depressing the brake pedal.

Accelerate / Decelerate (+ / –) Switches

When the speed control system is active, pressing the '+' switch sets the controlled speed to the current road speed of the vehicle. Subsequent momentary presses of the switch increases the set road speed by 0.6 mph (1 km/h). If the switch is pressed and held the road speed will continue to increase until the switch is released. Momentarily pressing the '–' switch, decreases the set speed by 0.6 mph (1 km/h). If the switch is pressed and held, the set speed is decreased until the switch is released

Time Gap Adjustment Switches

The time gap adjustment switches allows the driver to adjust the length of time gap between the vehicle and the vehicle in front. The maximum time gap is 2.4 seconds and the minimum time gap is 1 second.

ADAPTIVE SPEED CONTROL

General

The adaptive speed control system comprises the following components:

- Adaptive Speed Control Sensor
- Adaptive Speed Control module
- Steering wheel control switches
- ECM
- Electric throttle
- ABS module and pump

The adaptive speed control system uses a forward looking radar sensor to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between it and the target vehicle. When that gap falls below a set driver selected level (4 seconds) the adaptive speed control system will intervene slowing the vehicle by backing off the throttle and/ or applying the brakes, until the correct gap is attained.

The system will detect but not react to the following:

- Vehicles in the oncoming lane
- Stationary vehicles
- Pedestrians
- Vehicles not in the same lane.

Adaptive speed control is active when the vehicle is moving. Adaptive Speed Control only functions when a set speed is entered in normal speed control mode. The adaptive speed control system only intervenes with the set speed when it detects a target vehicle, and then only if the minimum time gap is breached.

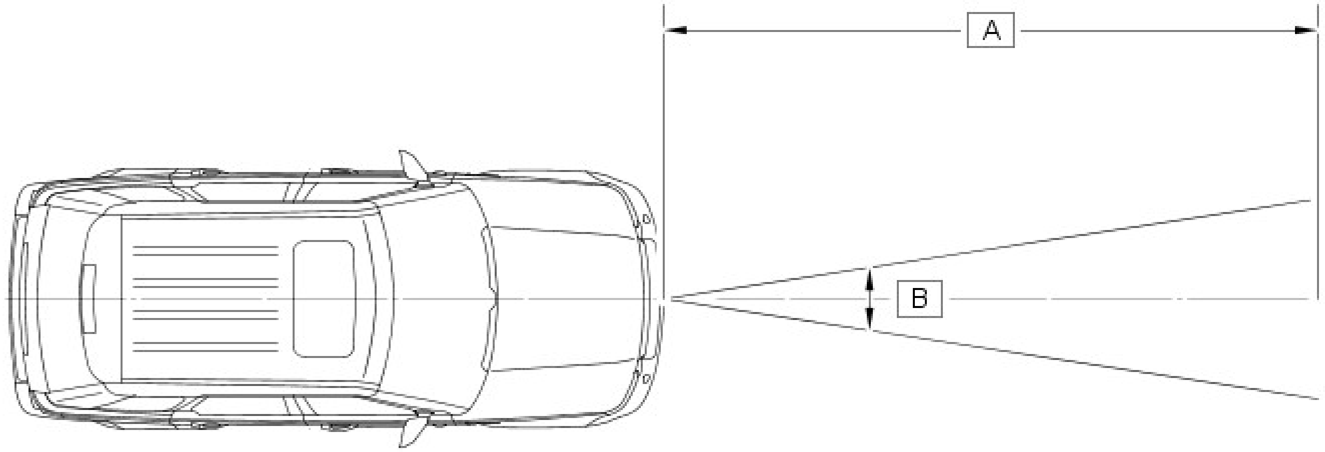
It is important to note that the system is intended for use in limited driving situations, does not remove control and responsibility from the driver, and at all times can be quickly overridden. The adaptive speed control system is not a collision warning system and will not react to stationary objects. The system does not operate below a minimum speed of approximately 30 km/h (20 mph) since it is unsuitable for use in cities or congested traffic. The system is best suited to main roads/ highways with gradual bends.

The ECM, throttle body and throttle control are unchanged from those used for non Adaptive Speed Control variants.

Radar Sensing

The adaptive speed control system is based on the use of a front mounted radar sensor. The sensor transmits a 1.5° wide beam forward of the vehicle and detects the returning signals reflected off other vehicles and objects ahead. The 1.5° wide radar beam is mechanically scanned at a rate of 10 sweeps/second across a total arc of 15° centered on the longitudinal axis of the vehicle. The radar operates at millimetric wavelengths (76 - 77 GHz) and transmits a frequency modulated continuous wave signal at a relatively low power level (no high power pulses).

Radar Viewing Angle/Range



E56519

Item	Part Number	Description
A	-	Sensor range 130 meters
B	-	Sensor scan angle 15 degrees

With the ignition switched ON, the adaptive speed control module is powered up but no radar transmissions are emitted until the vehicle is in motion.

The radar sensor detects three primary parameters of objects within the scanned arc. These are:

- Range
- Relative velocity
- Angle

- Range- the radar sensor detects the presence and ranges of different vehicles and objects within the scanned arc up to a distance of approximately 130 meters. The transmitted signal frequency changes continuously in a cyclic pattern (modulation). This means that, in the time taken for the signal wave front, to travel to and from a target vehicle (or other object), the transmission frequency will have changed. The difference between the received signal frequency and the new transmission frequency is proportional to the distance between the transmitting vehicle and the target vehicle.
- Relative speed - when the signal is reflected off a vehicle moving at a different speed (opening or closing gap) an effect known as the Doppler shift causes an extra frequency modulation to be imposed on the signal. This Doppler frequency varies with the relative speed of the vehicle being followed, enabling the system to differentiate between vehicles traveling at different speeds and also between moving vehicles and stationary objects.
- Angle of target - using a narrow angle beam to scan horizontally enables the system to distinguish between vehicles in different lanes and between vehicles and roadside objects.

Follow Mode

A set speed is selected in the normal speed control manner and this speed is maintained until a slower vehicle is encountered in the lane ahead. When the vehicle ahead comes within the effective range of the radar sensor, the system identifies it as a target vehicle and an icon is illuminated on the instrument cluster to indicate that the system is in "follow mode". When the distance between the two vehicles closes to a set time gap, the adaptive speed control system closes the throttle and if necessary applies the brakes to maintain the set time gap. Follow mode is effectively a closed loop system. If several vehicles are ahead, the closest vehicle is chosen as the target to follow. If the target vehicle moves out of radar range, or if either vehicle changes lane or drops below the minimum operating speed, the system exits follow mode and the follow mode icon is extinguished. The adaptive speed control system will only raise its speed to the originally set speed, it will not accelerate past this speed to maintain a time gap.

Driver operation of the foot brake or control switches will immediately cancel adaptive speed control.

System Restrictions

The adaptive speed control system is only intended to provide enhanced speed control as described above in certain restricted conditions. The following points should be noted:

Automatic braking is limited to approximately 20% of full pressure (0.2G) and is intended to provide a smooth, gradual deceleration in follow mode conditions. Harsh braking by the target vehicle or following the target vehicle down to very low speeds or to a halt will require driver override of the brakes.

While the radar sensor detects moving and stationary targets for assessment of the environment ahead, the system does not

react to or provide any control in situations other than follow mode conditions. Stationary or slow moving vehicles (below 10 km/h), pedestrians, objects on the road and oncoming vehicles in the same lane are not recognized.

WARNING: It must be emphasized that the adaptive speed control system is not a collision warning or avoidance system and that, other than the limited conditions of follow mode, driver intervention will be necessary to control the vehicle speed.

In follow mode, some situations may cause target ambiguities for the detection system. These situations include:

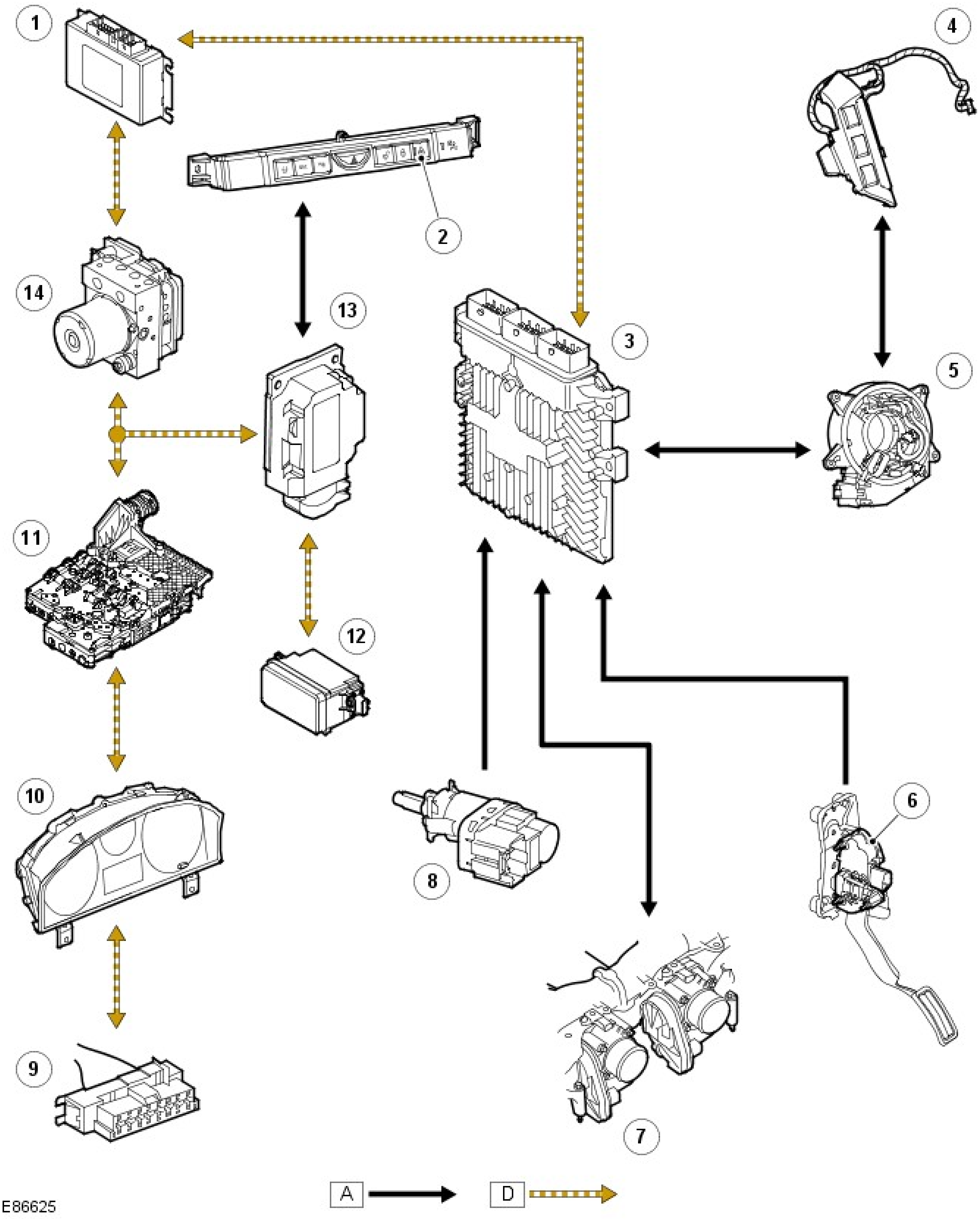
- The nearby presence of a third vehicle when driving on a line slightly offset to the target vehicle
- Vehicles edging into the lane ahead which are not detected by the system until they have moved into the radar beam.

On the approach to, or exit from a bend, a target vehicle may be lost or a new target acquired as vehicles ahead change their angular position with respect to the radar sensor. On a straight road, if the sensing vehicle is in follow mode below its selected set speed, losing the target vehicle will cause the sensing vehicle to accelerate to this set speed. This acceleration is undesirable either on, or entering a bend when the target is suddenly lost, and in this situation the system inhibits the resumption of the set speed.

The speed control system compares vehicle speed data from the ABS system with the relative speed of an external object as detected by the radar sensor to ascertain whether the object is stationary or not.

• NOTE: If tires are fitted which are different in diameter from those specified for the vehicle, the vehicle speed calculated by the ABS will not be the true road speed. This situation may cause stationary objects to be falsely identified as moving vehicles and result in automatic deceleration on a clear road.

CONTROL DIAGRAM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Item	Part Number	Description
1	-	Fuse 30A
2	-	Speed control switches
3	-	Clock spring
4	-	Instrument cluster
5	-	TCM

6	-	ABS control module
7	-	Brake switch
8	-	Diagnostic socket
9	-	Fuel injectors
10	-	APP sensor
11	-	ECM
12	-	Fuse 5A
13	-	Ignition switch

Published: 11-May-2011

Speed Control - TDV8 3.6L Diesel - Speed Control Switch

Removal and Installation

Removal

- WARNINGS:

⚠ Persons working on the supplemental restraint system (SRS) must be fully trained and have been issued with the safety guidelines.

⚠ Allow a period of 10 minutes to elapse after disconnecting the battery before undertaking any work on the SRS.

⚠ The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

⚠ The correct procedures must always be used when working on SRS components.

⚠ It is imperative that before any work is undertaken on the SRS system, the appropriate information is read thoroughly.

⚠ Always disconnect both battery cables before beginning work on the SRS system. Disconnect the ground cable first. Never reverse connect the battery.

⚠ Take extra care when handling SRS components.

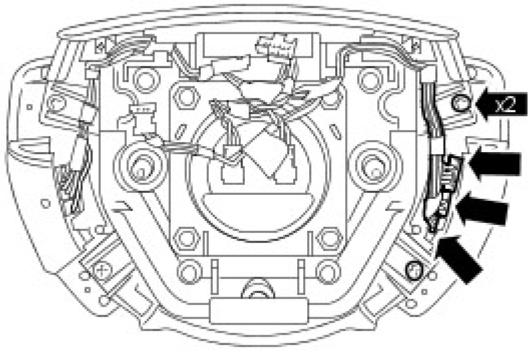
1. Make the air bag supplemental restraint system (SRS) safe.
For additional information, refer to: Standard Workshop Practices (100-00 General Information, Description and Operation).

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the driver air bag module.
For additional information, refer to: Driver Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).

4. Remove the speed control switch.

- Disconnect the 3 electrical connectors.
- Remove the 2 screws.



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Installation

1. Install the speed control switch.

- Connect the 3 electrical connectors.
- Install the 2 screws and tighten to 3 Nm (2 lb.ft).

2. Install the driver air bag module.
For additional information, refer to: Driver Air Bag Module (501-20B Supplemental Restraint System, Removal and

Installation).

3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Climate Control System - General Information -

General Specification

Type	Description
Automatic Temperature Control (ATC) heating, ventilation and air conditioning unit:	Dual zone with side to side temperature control
Compressor	Clutchless, belt driven from engine with electronically controlled outputs.

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Climate Control System - General Information - Climate Control System

Diagnosis and Testing

Overview

The complexity of the system is such that it is broken down into sub-sections.

For a detailed description of climate control operation, refer to the relevant section of the workshop manual.

Distribution motor self-test

The motor and flap operation can be checked using the on-board distribution motor self-test function.

The self-test can be initiated by pressing and holding the **ECON** and **RECIRC** buttons while turning the ignition switch to the **ON** position.

The control module will then compare the current motor position with the values stored in the module and will indicate an error by flashing the **ECON** LED (light emitting diode).

If there are no errors, the LED will go out and the system will function normally.

To confirm that there are no errors, turn the ignition switch to the **OFF** position, then back to the **ON** position.

Observe the operation of the **programmed defrost** LED.

If there are errors present, the **programmed defrost** LED will flash and the system will attempt to calibrate itself.

For additional information on the function of the system, refer to the relevant section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Coolant level ● Air vents (contaminated/blocked) ● Auxiliary drive belt condition and tension ● Air conditioning compressor	● Fuses ● Harnesses ● Electrical connector(s) ● Relays ● Control module(s) ● Control panel(s) ● Air conditioning compressor

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom chart

Symptom	Possible causes	Action
No climate control function, flashing LED at start-up	● The system is in calibration mode	Check the motors and levers at the heating and ventilation assembly for damage/foreign objects jamming the movement of the flaps. For additional information on the self-calibration process, see the distribution motor self-test above.
Poor or no cooling	● Air conditioning function	Carry out the checks from the visual inspection, refer to the relevant section of the workshop manual.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to

the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1A5911	Sensor 5 Volt Supply	● Ambient air temperature sensor 5 volt supply short circuit to ground	Refer to the electrical guide and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A5913	Sensor 5 Volt Supply	● Ambient air temperature sensor 5 volt supply high resistance	Refer to the electrical guide and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6111	Cabin Temperature Sensor	● Ambient air temperature sensor signal short circuit to ground	Refer to the electrical guide and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6115	In-Vehicle Temperature Sensor Signal	● Ambient air temperature sensor signal high resistance ● In-vehicle temperature sensor signal short circuit to power	Refer to the electrical guide and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6211	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to ground	Refer to the electrical guide and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6215	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to power	Refer to the electrical guide and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6312	Right Solar Sensor	● Right-hand solar sensor signal short circuit to 5 volts	Refer to the electrical guides and check the right-hand sunlight sensor sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6412	Left Solar Sensor	● Left-hand solar sensor signal short circuit to 5 volts	Refer to the electrical guides and check the left-hand sunlight sensor sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6713	Sensor Ground	● Sensor ground circuit high resistance	Refer to the electrical guide and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6811	Ambient Temperature Sensor	● Ambient air temperature sensor signal short circuit to ground	Refer to the electrical guide and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6815	Ambient Temperature Sensor	● Ambient air temperature sensor signal high resistance ● Ambient air temperature sensor signal short circuit to 5 volts	Refer to the electrical guides and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6911	Humidity Sensor	● Humidity sensor signal short circuit to ground	Refer to the electrical guides and check the humidity/temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6915	Humidity Sensor	● Humidity sensor signal high resistance ● Humidity sensor signal short circuit to power	Refer to the electrical guides and check the humidity/temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A7001	Compressor Solenoid +ve Supply	● Refrigerant solenoid valve power circuit short circuit to ground ● Refrigerant solenoid valve power circuit short circuit to power ● Refrigerant solenoid valve	Refer to the electrical guides and check the refrigerant solenoid circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		over temperature	
B1A7111	Air Off Temperature Sensor	- Air off temperature sensor circuit short circuit to ground	Check the air off sensor and circuit. Refer to the electrical guides.
B1A7115	Air off temperature sensor	- Air off temperature sensor circuit short circuit to power - Air off temperature sensor circuit high resistance	Check the air off sensor and circuit. Refer to the electrical guides.
B1A7318	Left Hand Seat Heater	- Left-hand seat heater power supply high resistance - Left-hand seat heater power supply short circuit to ground	Check the left-hand seat heater switch and circuit. Refer to the electrical guides.
B1A7418	Right Hand Seat Heater	- Right-hand seat heater power supply current below threshold	Check the right-hand seat heater switch and circuit. Refer to the electrical guides.
B1A9815	LIN Bus Circuit #1	- LIN bus high resistance - LIN bus short circuit to power	Check the LIN circuits. Refer to the electrical guides.
B1B6013	Feedback Potentiometer Circuit	- Air intake stuck in one position - Feedback potentiometer circuit high resistance	Check the feedback potentiometer/air temperature mode motor circuits. Refer to the electrical guides.
B1B6111	Pollution Sensor HC Input Circuit	- Pollution sensor HC/CO signal short circuit to ground	Check the pollution sensor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6211	Pollution Sensor - NOx	- Pollution sensor Nox signal short circuit to ground	Check the pollution sensor NOx circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6313	Feedback Potentiometer Ground Circuit	- Sensor ground high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6511	Left Hand Seat Heater Temperature Sensor	- Left-hand seat heater temperature signal short circuit to ground	Check the seat heater temperature signal circuit. Refer to the electrical guides. Refer to the relevant section of the workshop manual.
B1B6515	Left Hand Seat Heater Temperature Sensor	- Left-hand seat heater temperature signal high resistance - Left-hand seat heater temperature signal short circuit to power	Check the seat heater temperature signal circuit. Refer to the electrical guides. Refer to the relevant section of the workshop manual.
B1B6611	Right Hand Seat Heater Temperature Sensor	- Right-hand seat heater temperature signal short circuit to ground	Check the seat heater temperature signal circuit. Refer to the electrical guides. Refer to the relevant section of the workshop manual.
B1B6615	Right Hand Seat Heater Temperature Sensor	- Right-hand seat heater temperature signal high resistance - Right-hand seat heater temperature signal short circuit to power - Right-hand seat heater power supply high resistance - Right-hand seat heater power supply short circuit	Check the seat heater temperature signal circuit. Refer to the electrical guides. Refer to the relevant section of the workshop manual.

DTC	Description	Possible causes	Action
		to ground	
B1B6711	Air Intake Servo Potentiometer Circuit	- Recirculation motor signal short circuit to ground	Check the intake air motor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6715	Air Intake Servo Potentiometer Circuit	- Recirculation motor signal high resistance - Recirculation motor signal short circuit to power	Check the intake air motor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6801	Air Intake Servo Motor	- Recirculation motor fault	Check the intake air motor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7015	LIN Bus Circuit	- Rear control panel non functional - LIN bus high resistance - LIN bus short circuit to power	Check the LIN circuits. Refer to the electrical guides.
B1B7088	LIN Bus Circuit	- LIN bus high resistance - LIN bus short circuit to ground - Pollution sensor supply short circuit to power - Rear air conditioning control panel ground high resistance - Rear air conditioning control panel ground short circuit to power	Check the LIN circuits. Refer to the electrical guides.
B1B7111	Evaporator Temperature Sensor	- Evaporator temperature sensor circuit short circuit to ground	Check the evaporator temperature sensor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7115	Evaporator Temperature Sensor	- Evaporator temperature sensor circuit short circuit to power - Evaporator temperature sensor circuit high resistance	Check the evaporator temperature sensor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7211	LIN Bus #1 Power Supply Circuit	- LIN bus power supply circuit short circuit to ground	Check the LIN circuits. Refer to the electrical guides.
B1B7311	LIN Bus #2 Power Supply Circuit	- LIN bus power supply circuit short circuit to ground	Check the LIN circuits. Refer to the electrical guides.
B1B7400	Foot/Defrost Damper Actuator	- Actuator mechanical fault - Actuator overheating - Actuator circuit high resistance - Actuator circuit short circuit - Actuator power failure	Check for mechanical faults with the face/feet distribution motor (see visual inspection). Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7449	Foot/Defrost Damper Actuator	- Actuator internal fault	Check the face/feet distribution motor operation. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7700	Front Right Air Blend Stepper Actuator	- Actuator mechanical fault - Actuator overheating - Actuator circuit high resistance - Actuator circuit short circuit - Actuator power failure	Check for the right-hand air temperature motor mechanical faults (see visual inspection). Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
B1B7749	Front Right Air Blend Stepper Actuator	● Actuator internal fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7884	System Pressure	● Pressure signal below allowable range ● Refrigerant leak	Check the air conditioning system. Refer to the relevant section of the workshop manual.
B1B7885	System Pressure	● Pressure signal above allowable range ● Condenser fault ● Cooling fan fault	Check the air conditioning system and the cooling fan operation. Refer to the relevant section of the workshop manual.
U007388	Control Module Communication Bus 'A' Off	● CAN bus connections short circuit to each other	Refer to the Network Communications section of the workshop manual.
U030055	Internal Control Module Software Incompatibility	● CAN bus configuration failure ● CAN bus short circuit to ground	Configure the module using the approved diagnostic system. Check the CAN circuits. Refer to the electrical guides.
U1A1449	CAN Initialization Failure	● CAN bus initialization failure ● CAN bus high resistance	Configure the module using the approved diagnostic system. Check the CAN circuits. Refer to the electrical guides.

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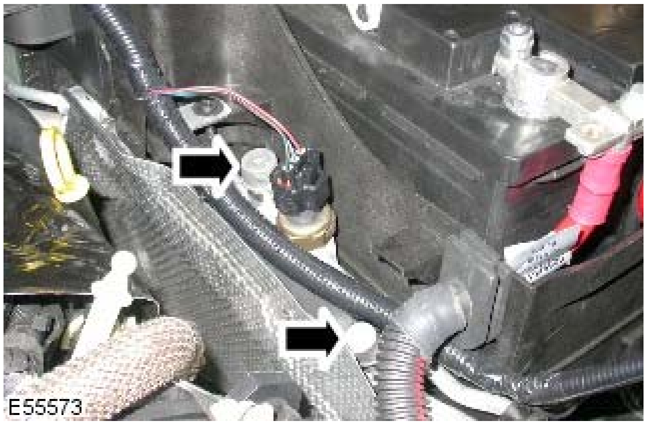
Climate Control System - General Information - Air Conditioning (A/C) System Recovery, Evacuation and Charging

General Procedures

⚠ WARNING: Servicing must be carried out by personnel familliar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.

- NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure); the system is leaking and refrigerant has been lost to atmosphere; refrigerant circuit has been open more than 24 hours due to repair.



1. **Refrigerant recovery:** Remove the dust covers from the high and low pressure connections.
2. Connect the high and low pressure lines to the appropriate connections.
3. Open the valves on the connections.
4. Turn the valves on the station to the correct positions.
5. Turn the process switch to the correct position.
6. Turn the main switch to 'ON'.
7. ⚠ WARNING: Refrigerant must always be recycled before re-use to ensure that the purity of the refrigerants high enough for safe use in the air conditioning system. Recycling should always be carried out with equipment which is design certified by Underwriter Laboratory Inc. for compliance with SEA J1991. Other equipment may not recycle refrigerant to the required level of purity. R143a Refrigerant Recover Recycling Recharging station must not be used with any other type of refrigerant. Refrigerant R134a from domestic and commercial sources must not be used in motor vehicles air conditioning systems.

   Allow the system to recover the refrigerant from the system.
8. Close the valves on the refrigerant station.
9. Turn the main switch 'OFF'.
10. Close the valves on the connections.
11. Disconnect the high and low pressure connections.
12. Install the dust covers to the connectors.
13. Open the tap at the rear of the station to drain the refrigerant oil.
14. Measure and record the quantity of refrigerant oil recovered from the system.
15. Close the tap at the rear of the station.
16. **Evacuation:** Remove the dust covers from the high and low pressure connections.

17. Connect the high and low pressure lines to the appropriate connections.

18. Open the valves on the connections.

19. Turn the valves on the station to the correct positions.

20. Turn the process switch to the correct position.

21. Turn the main switch to 'ON'.

22. Allow the station to evacuate the A/C system.

23. ⚠ CAUTION: The system must be evacuated immediatley before recharging commences. Delay between evacuation and recharging is not permitted

Recharging: Close the valves on the refrigerant station.

24. Close the valve on the oil charger.

25. Disconnect the yellow line from the refrigerant station.

26. Remove the cover from the oil charger.

27. Pour the correct quantity of refrigerant oil into the oil charger.

28. Install the cover to the oil charger.

29. Connect the yellow line to the refrigerant station.

30. Open the valve on the oil charger.

31. Move the pointer on the refrigerant gauge to mark the position of the refrigerant drop.

32. Slowly open the correct valve on the refrigerant to allow the vacuum to pull the refrigerant into the system.

33. Close the valve on the refrigerant station when the correct amount of refrigerant has been drawn into the air conditioning system.

34. Turn the main switch 'OFF'.

35. Close the valves on the connections.

36. Disconnect the high and low pressure connections.

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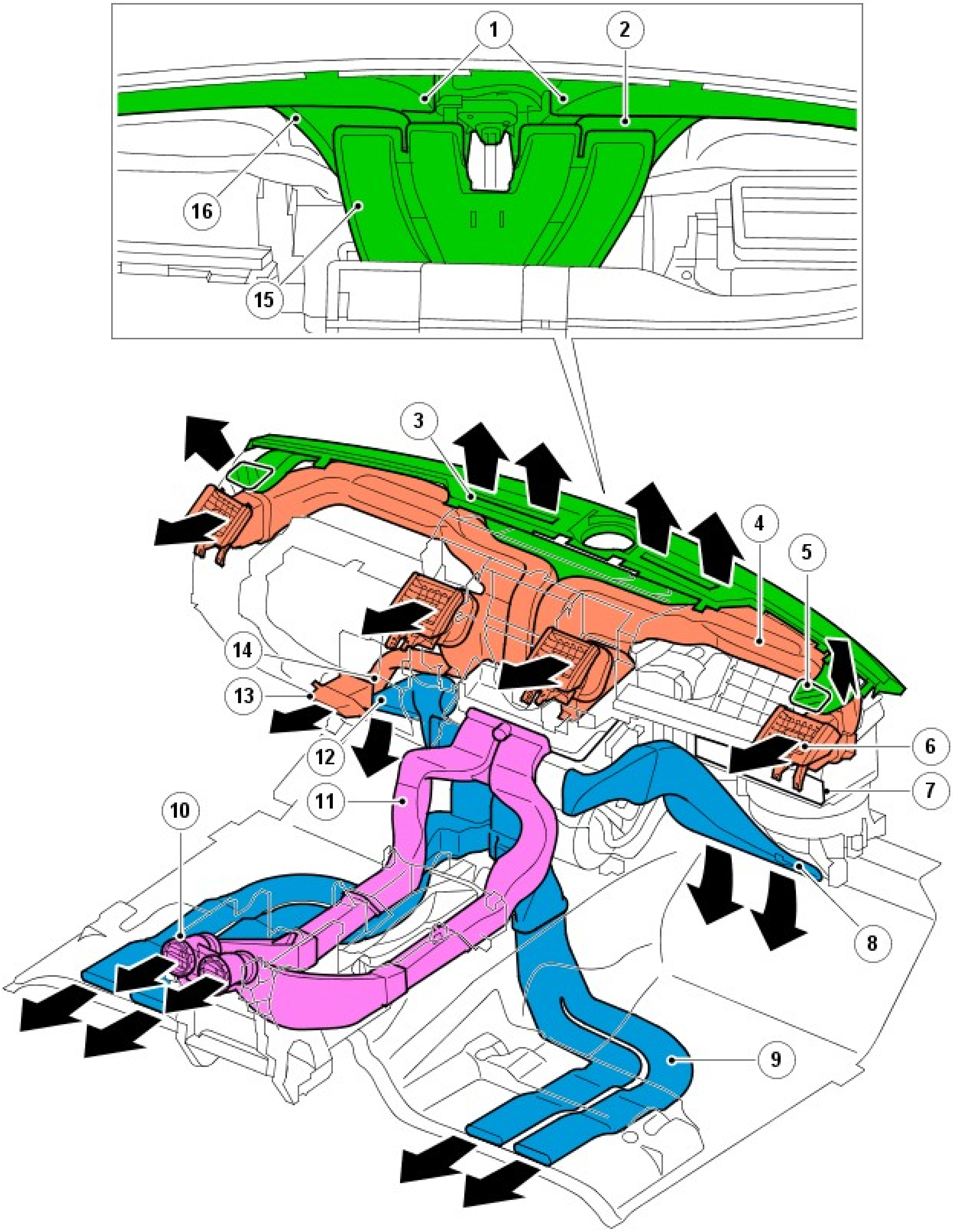
Air Distribution and Filtering - Air Distribution and Filtering

Description and Operation

COMPONENT LOCATIONS

- NOTE: left-hand drive (LHD) installation shown, right-hand drive (RHD) similar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E54969

Item	Part Number	Description
1	-	Side window ducts
2	-	Windshield duct
3	-	Windshield vent
4	-	Instrument panel register duct
5	-	Side window vent

6	-	Instrument panel register
7	-	Cabin air filter
8	-	Front passenger footwell duct
9	-	Second row footwell duct
10	-	Second row register
11	-	Second row register duct
12	-	Driver footwell duct
13	-	Driver lap register
14	-	Driver lap register duct
15	-	Heater outlet manifold
16	-	Windshield duct

GENERAL

The air distribution and filtering system controls the distribution and quality of air supplied to the vehicle interior. The system consists of:

- Air ducts.
- Air registers and vents.
- A cabin air filter.

AIR DUCTS

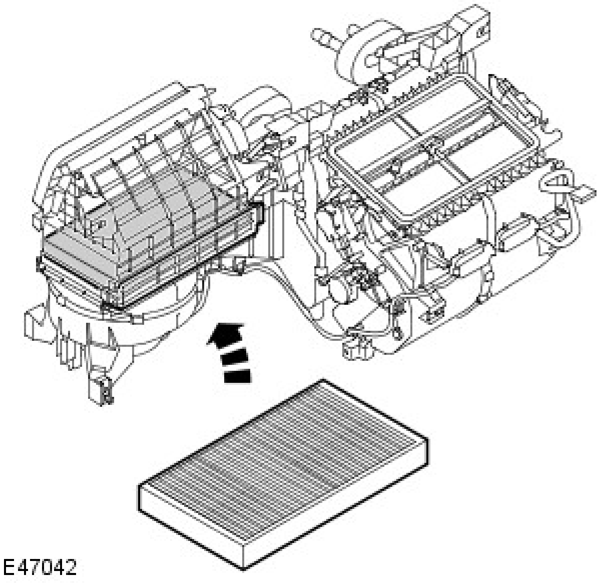
The air ducts distribute the air from the heater to the various registers and air vents around the vehicle interior. The air ducts for the instrument panel registers, the driver lap register and the second row registers are connected to the heater outlet manifold on top of the heater. The air ducts for the front and second row footwells are connected direct to outlet ports on the heater. The air ducts for the windshield vents and the side window vents form part of the structure of the instrument panel.

AIR REGISTERS AND VENTS

The air registers allow occupants to control the flow and direction of air from the air ducts. The driver lap register has moveable vanes to regulate the flow and direction of the air. The instrument panel and second row registers each have a thumbwheel to regulate flow, and moveable vanes to control direction.

The air vents are fixed outlets either integrated into the end of the air duct or installed in the trim panel connected to the air duct.

CABIN AIR FILTER



The cabin air filter is a combined pollen and odor filter installed in the air inlet duct. The filter removes particulates and unpleasant odors from the fresh and recirculated air entering the blower.

Air Distribution and Filtering - Air Distribution and Filtering

Diagnosis and Testing

Overview

The air distribution and filtering system is a fairly straightforward design requiring no specialized techniques for diagnosis.

For information on the description and operation of the system:
REFER to: Air Distribution and Filtering (412-01 Air Distribution and Filtering, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical faults.

Mechanical
● Air ducts ● Air registers/vents ● Pollen filter (blocked/contaminated)

For the most part, faults will be confined to blocked or damaged registers or blocked vents.

Check for foreign objects finding their way into vents and registers and rectify as necessary. There is a self-test procedure for the motors and flaps controlling the air flow to the registers:
REFER to: Climate Control System (412-00 Climate Control System - General Information, Diagnosis and Testing).

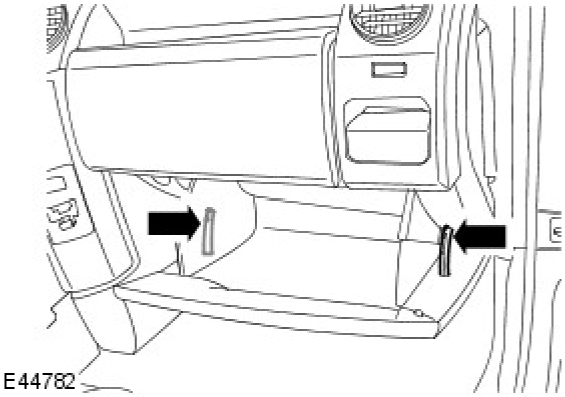
3. **3.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) which may have been set as a result of a blocked or damaged flap.
    - For a list of DTCs relating to the climate control system:
      REFER to: Climate Control System (412-00 Climate Control System - General Information, Diagnosis and Testing).
    - Make sure that all DTCs are cleared following rectification.

The pollen filter must be replaced at the specified intervals to make sure the operation of the system is not affected.
REFER to: Pollen Filter (412-01 Air Distribution and Filtering, Removal and Installation).

Air Distribution and Filtering - Pollen Filter

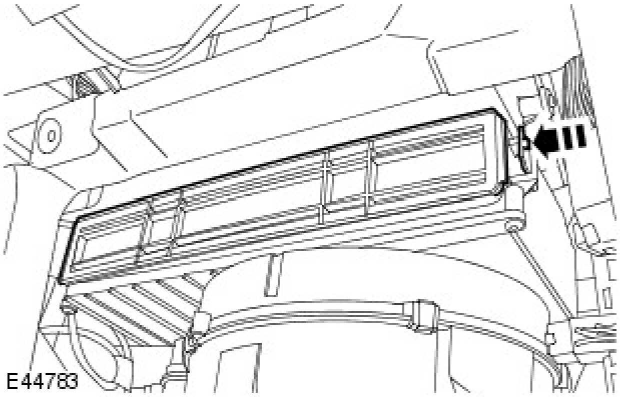
Removal and Installation

Removal



1. Open the glove compartment to the service condition.

- Release the glove compartment latch stops.



2. Remove the pollen filter housing cover.

3. Remove the pollen filter.

Installation

1. To install, reverse the removal procedure.

- Clean the component mating faces.

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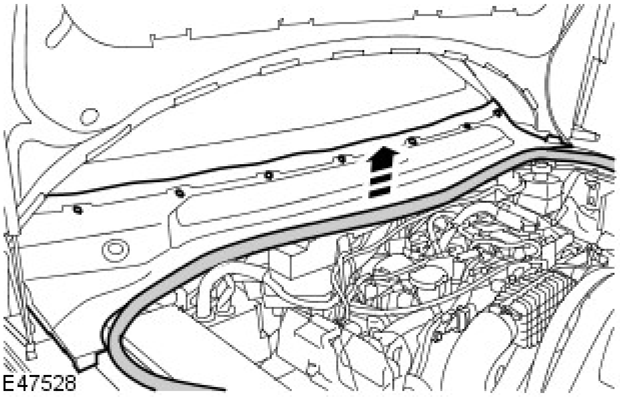
Air Distribution and Filtering - Plenum Chamber

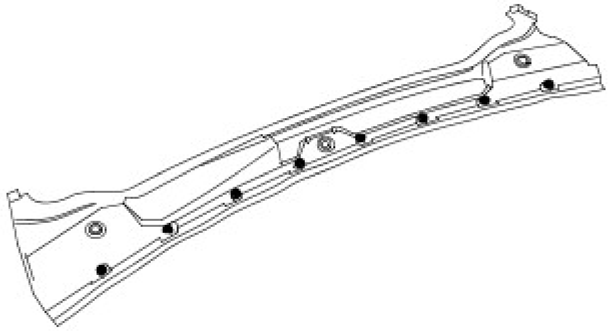
Removal and Installation

Removal

1. Remove the A-pillar mouldings.
   For additional information, refer to: A-Pillar Moulding LH (501-08 Exterior Trim and Ornamentation, Removal and Installation).
2. Remove the windshield wiper arms.
   For additional information, refer to: Front Wiper Pivot Arm (501-16 Wipers and Washers, Removal and Installation).
3. Release the hood seal from the plenum chamber.



4. Remove the plenum chamber panel.
   - Release the 8 clips.



5. NOTE: Do not disassemble further if the component is removed for access only.

   Remove the clips from the plenum chamber panel.

Installation

1. To install, reverse the removal procedure.

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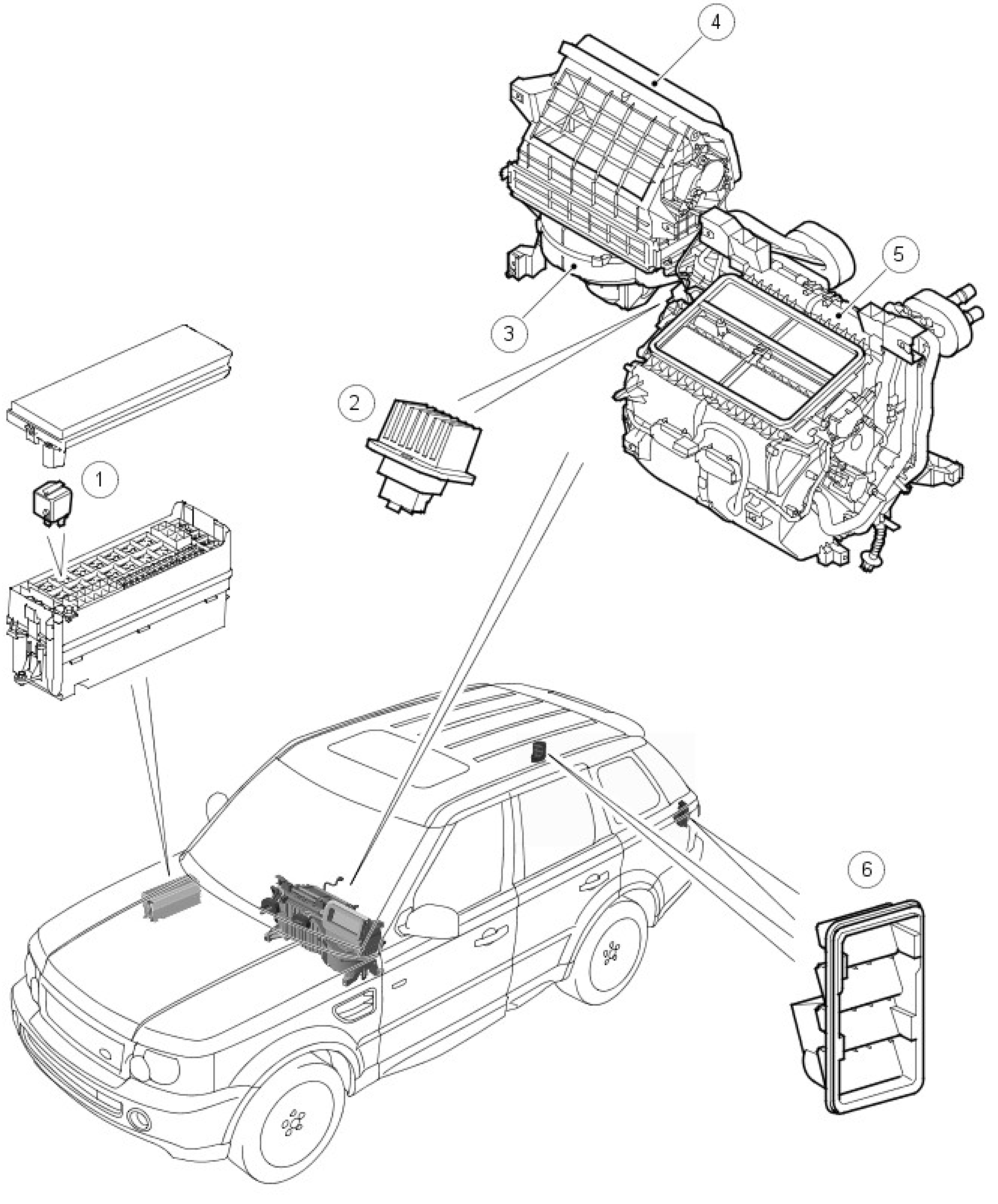
Heating and Ventilation - Heating and Ventilation

Description and Operation

COMPONENT LOCATIONS

- NOTE: right-hand drive (RHD) installation shown, left-hand drive (LHD) similar



E54966

Item	Part Number	Description
1	-	Blower relay
2	-	Blower control module
3	-	Blower
4	-	Air inlet duct
5	-	Heater

6	-	Ventilation outlets

GENERAL

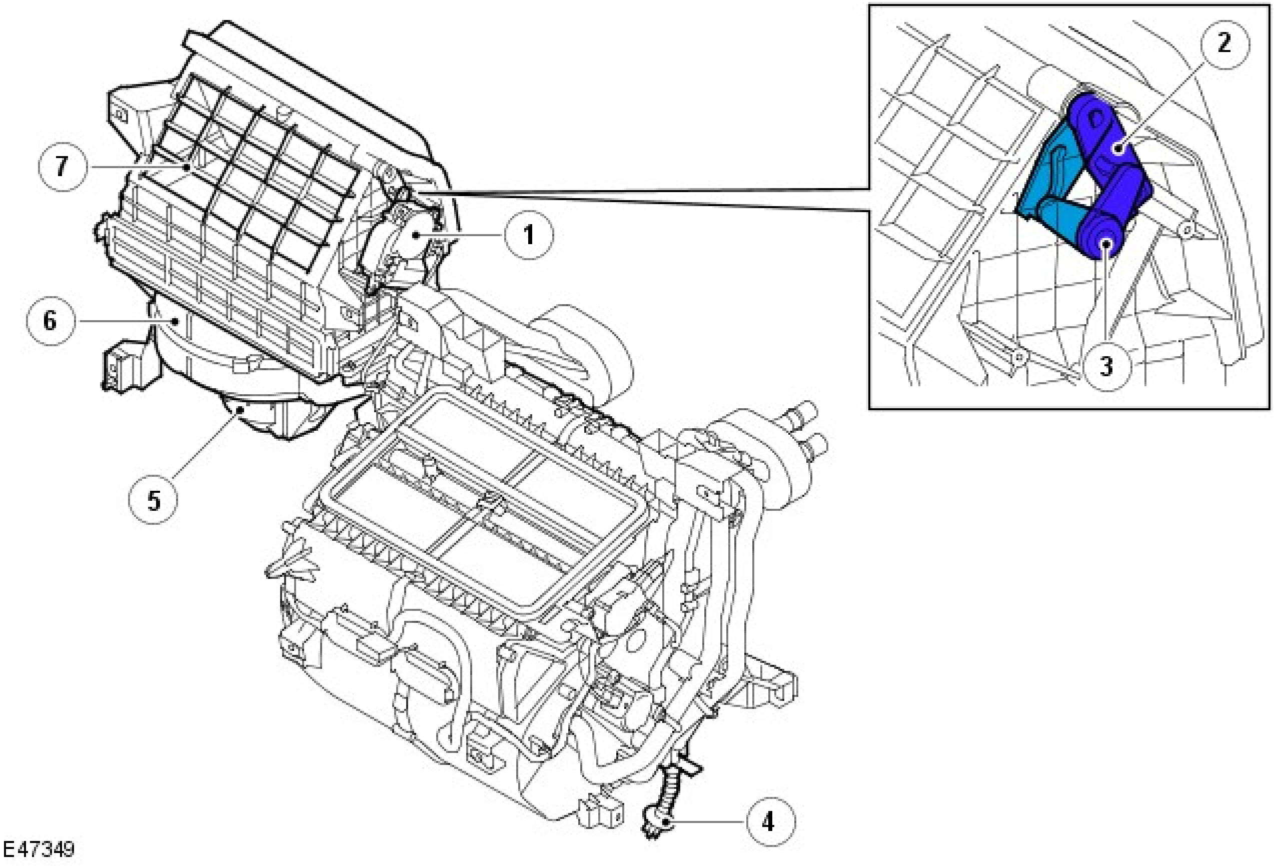
The heating and ventilation system controls the temperature and flow of air supplied to the vehicle interior. The system consists of:

- An air inlet duct.
- A blower.
- A blower control module.
- A blower relay.
- A heater.
- Two ventilation outlets.

Fresh or recirculated air flows into the heater assembly from the inlet duct. The blower, and ram effect when the vehicle is moving, forces the air through the heater assembly. Air from the cabin exhausts through the ventilation outlets.

AIR INLET DUCT

• NOTE: RHD version shown, LHD mirror image



Item	Part Number	Description
1	-	Recirculation door motor
2	-	Recirculation door arm
3	-	Recirculation motor arm
4	-	Evaporator drain tube
5	-	Blower
6	-	Air inlet duct
7	-	Recirculation air inlet

The air inlet duct is installed behind the instrument panel, on the front passenger side, and connected between the plenum chamber below the windshield and the heater.

The plenum chamber is formed by the upper and lower cowl and a plenum molding. Grilles in the plenum molding allow fresh air into the plenum chamber. From the plenum chamber, the air passes through a water separator and into the fresh air inlet of the air inlet duct.

The air inlet duct incorporates a grille to provide the inlet for recirculated air from the vehicle interior. The air inlet duct also accommodates:

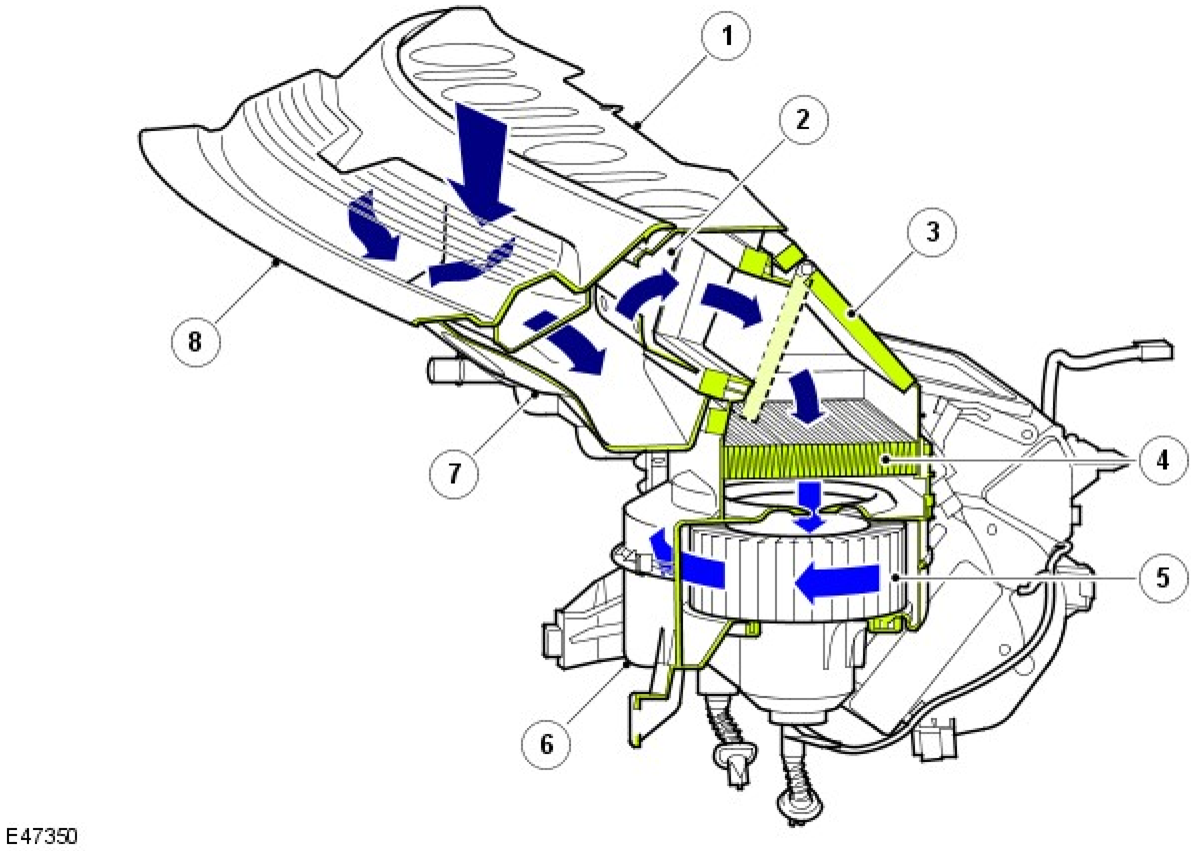
- The cabin air filter.
  For additional information, refer to: Air Distribution and Filtering (412-01 Air Distribution and Filtering, Description and Operation).
- The blower.
- The blower control module.

The outlet from the air inlet duct forms the rear wall of the heater, enclosing the evaporator and incorporating the two evaporator drain outlets. Drain tubes connect the evaporator drain outlets to the transmission tunnel, to direct the water that condenses on the evaporator overboard.

A recirculation door is installed between the fresh and recirculated air inlets, to control the source of incoming air. A lever on the recirculation door is driven by the recirculation door motor. Operation of the recirculation door motor is automatically controlled by the automatic temperature control (ATC) module and manually controlled by a switch on the ATC module control panel.
For additional information, refer to: Control Components (412-04 Control Components, Description and Operation).

Fresh or recirculated air enters the air inlet duct and passes through the cabin air filter to the hub of the blower. From the blower, the air flows to the outlet of the air inlet duct and into the heater. The blower, and ram effect from the forward motion of the vehicle, forces the air through the air inlet duct.

Air Flow Through Air Inlet Duct



Item	Part Number	Description
1	-	Upper cowl
2	-	Water separator
3	-	Recirculation door
4	-	Cabin air filter
5	-	Blower
6	-	Air inlet duct casing
7	-	Lower cowl
8	-	Plenum molding

BLOWER

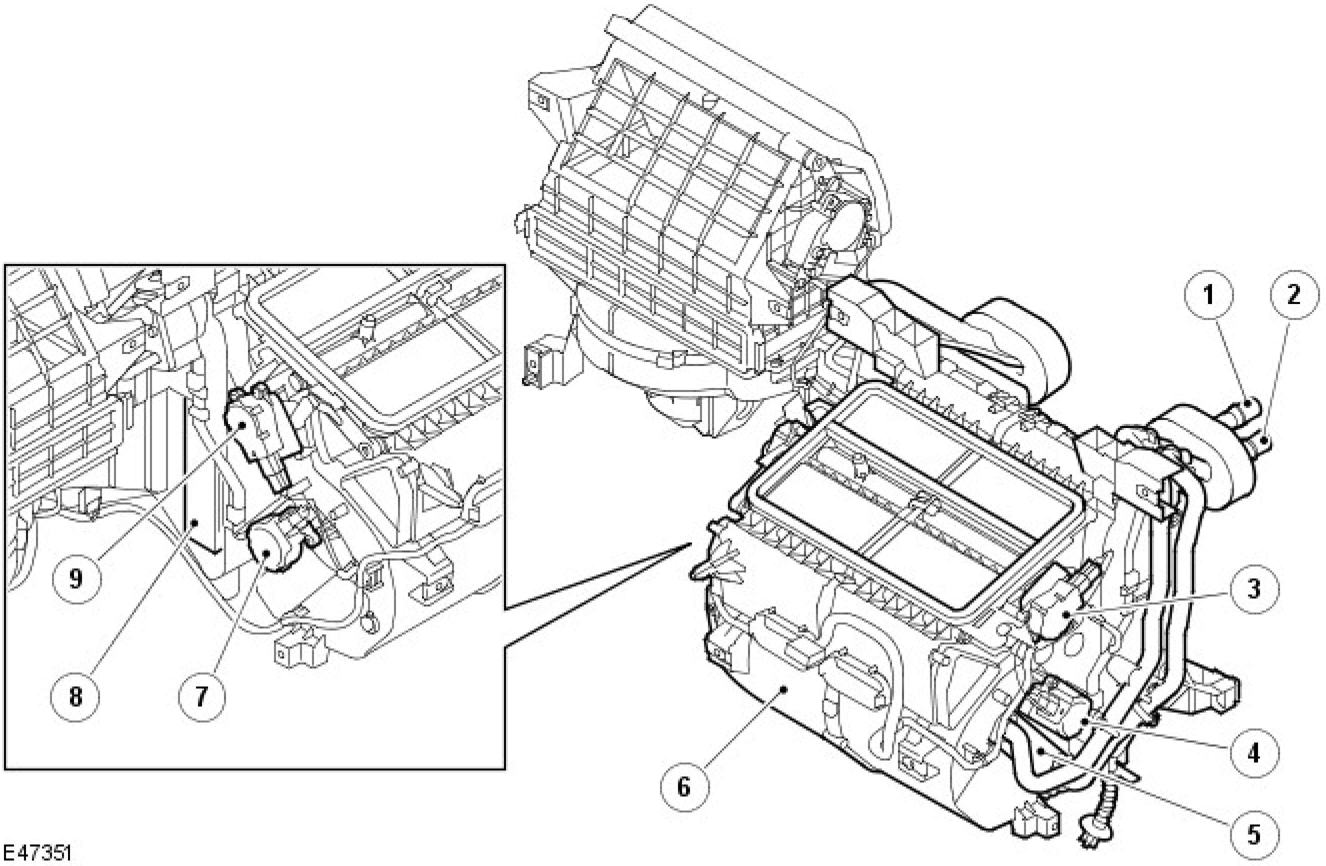
The blower is installed in the air inlet duct, below the cabin air filter, and consists of an open hub, centrifugal fan powered by an electric motor. Operation of the blower is controlled by the ATC module, using the blower relay in the battery junction box (BJB) and the blower control module. The blower control module is installed in the air inlet duct downstream of the blower, where any heat generated during operation is dissipated by the air flow. A wiring harness on the air inlet duct connects the recirculation door motor, blower and blower control module to the vehicle wiring.

When the blower is required, the ATC module energizes the coil of the blower relay. The energized blower relay supplies battery power to the blower motor, which is connected to ground through the blower control module. The speed of the blower is controlled by the blower control module, which regulates the blower motor voltage in response to a pulse width modulation (PWM) signal from the ATC module. To vary the blower motor voltage the ATC module varies the duty cycle of the PWM signal.

When the blower is in the automatic mode the ATC module determines the blower speed required from the comfort algorithms. When the blower is in the manual mode, the ATC module operates the blower at one of seven fixed speeds as selected on the control panel.
For additional information, refer to: Control Components (412-04 Control Components, Description and Operation).

HEATER

- NOTE: RHD unit shown, LHD units similar



Item	Part Number	Description
1	-	Coolant outlet pipe
2	-	Coolant inlet pipe
3	-	Windshield distribution door motor
4	-	right-hand (RH) temperature blend motor
5	-	Heater core
6	-	Heater casing
7	-	left-hand (LH) temperature blend motor
8	-	Evaporator
9	-	Face and feet distribution door motor

The heater controls the temperature of the air supplied to the distribution ducts, as directed by the ATC module. The heater is installed on the vehicle center-line, between the instrument panel and the engine bulkhead. The heater consists of a casing, formed from plastic moldings, which contains an evaporator, heater core and control doors. Internal passages integrated into the casing guide the air through the casing and separate it into two flows, one for the LH outlets and one for the RH outlets.

When the air conditioning (A/C) system is operating, the evaporator cools the air entering the heater.

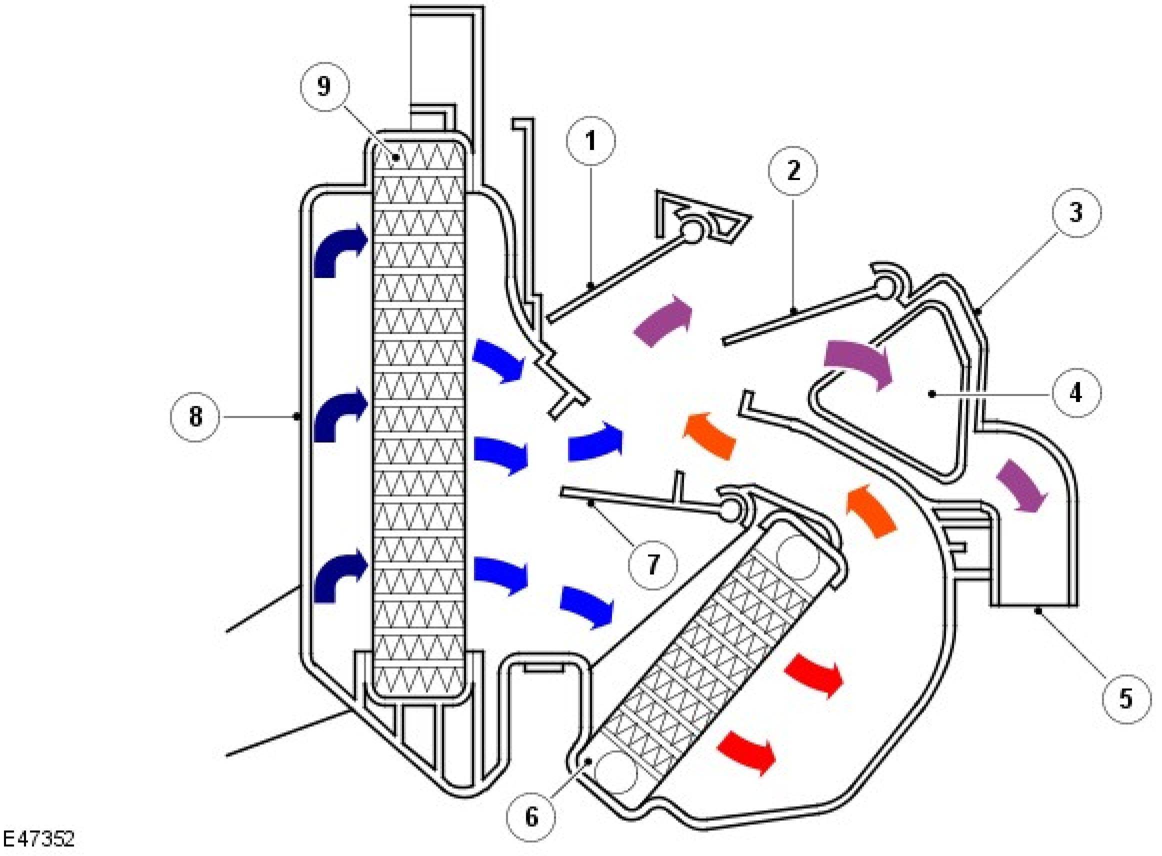
The heater core provides the heat source to warm the air being supplied to the distribution ducts. The heater core is an aluminum two pass, fin and tube heat exchanger, installed across the width of the heater housing. Two aluminum tubes attached to the heater core extend through the engine bulkhead to connect with the engine cooling system. When the engine is running, coolant is constantly circulated through the heater matrix by the coolant pump. On vehicles with a FFBH (fuel fired booster heater), when the FFBH is active the coolant flow is assisted by an electric circulation pump.
For additional information, refer to: Auxiliary Heater (412-02B Auxiliary Heating, Description and Operation).

Two temperature blend doors, one LH and one RH, regulate the flow of air through the heater core to control the temperature of the air leaving the heater. The two temperature blend doors operate independently to allow different temperatures to be set for the LH and RH outlets. Each temperature blend door is driven by a separate stepper motor.

A drive arm is attached to the drive spindle of each temperature blend door stepper motor. The end of the stepper motor drive arm engages with a slot in the drive arm of the related temperature blend door.

Operation of the temperature blend door stepper motors is controlled by the ATC module.
For additional information, refer to: Control Components (412-04 Control Components, Description and Operation).

Air Flow Through Heater



Item	Part Number	Description
1	-	Windshield distribution door
2	-	Face and feet distribution door
3	-	Heater casing
4	-	Front footwell outlet
5	-	Rear footwell outlet
6	-	Heater core
7	-	Temperature blend door
8	-	Air inlet duct casing
9	-	Evaporator

VENTILATION OUTLETS

The ventilation outlets promote the free flow of air through the passenger compartment. The outlets are installed in the LH and RH rear quarter body panels, behind the tail lamps.

Each ventilation outlet consists of a grille covered by soft rubber flaps and is effectively a non-return valve. The flaps open and close automatically depending on the differential between cabin and outside air pressures.

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Heating and Ventilation - Heating and Ventilation

Diagnosis and Testing

Overview

The heating and ventilation system is a fairly straightforward design requiring no specialized techniques for diagnosis.

Follow the visual inspection below and refer to the diagnostic trouble code (DTC) index for electrical faults.

For information on the description and operation of the system, refer to the relevant section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Intake ducts blocked/restricted ● Coolant level ● Air in cooling system ● Distribution motors and flaps	● Fuses ● Harnesses and connectors ● Blower relay ● Blower control module ● Blower assembly ● Automatic temperature control module

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible causes	Action
Air intake stuck in one position	● Sensor fault ● Distribution motor fault	Check for DTCs indicating a sensor fault (refer to the DTC index below). Carry out the distribution motor self-test. Refer to the relevant section of the workshop manual.
Excessive blower noise	● Blower mechanical fault ● Debris drawn into the blower ● Solar sensor fault	Check for mechanical faults/debris in the blower motor or fixings. Check for DTCs indicating a sensor fault.
Unable to control the air flow or temperature	● Distribution motor fault(s) ● Control module fault	Carry out the distribution motor self-test. Refer to the relevant section of the workshop manual. Check for DTCs indicating a module fault (refer to the DTC index below).
No hot air	● Cooling system fault ● Viscous fan locked ● Distribution motor fault(s) ● Control module fault	Check the coolant level, viscous fan operation, etc. Carry out the distribution motor self-test. Refer to the relevant section of the workshop manual. Check for DTCs indicating a module fault (refer to the DTC index below).

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

- NOTE: For a full list of climate control DTCs, refer to the Control Components section of the workshop manual.

DTC	Description	Possible causes	Action
B1A5911	Sensor 5 Volt Supply	● Ambient air temperature sensor 5 volt supply short circuit to ground	Refer to the electrical guide and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6312	Right Solar Sensor	● Right-hand solar sensor signal short circuit to 5 volts	Refer to the electrical guides and check the right-hand sunlight sensor sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6412	Left Solar Sensor	● Left-hand solar sensor signal short circuit to 5 volts	Refer to the electrical guides and check the left-hand sunlight sensor sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6013	Feedback Potentiometer Circuit	● Air intake stuck in one position ● Feedback potentiometer circuit high resistance	Check the feedback potentiometer/air temperature mode motor circuits. Refer to the electrical guides.
B1B6711	Air Intake Servo Potentiometer Circuit	● Recirculation motor signal short circuit to ground	Check the intake air motor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6715	Air Intake Servo Potentiometer Circuit	● Recirculation motor signal high resistance ● Recirculation motor signal short circuit to power	Check the intake air motor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B6801	Air Intake Servo Motor	● Recirculation motor fault	Check the intake air motor circuit. Refer to the electrical guides. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7400	Foot/Defrost Damper Actuator	● Actuator mechanical fault ● Actuator overheating ● Actuator circuit high resistance ● Actuator circuit short circuit ● Actuator power failure	Check for mechanical faults with the face/feet distribution motor (see visual inspection). Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7449	Foot/Defrost Damper Actuator	● Actuator internal fault	Check the face/feet distribution motor operation. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7700	Front Right Air Blend Stepper Actuator	● Actuator mechanical fault ● Actuator overheating ● Actuator circuit high resistance ● Actuator circuit short circuit ● Actuator power failure	Check for the right-hand air temperature motor mechanical faults (see visual inspection). Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7749	Front Right Air Blend Stepper Actuator	● Actuator internal fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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Heating and Ventilation - Blower Motor

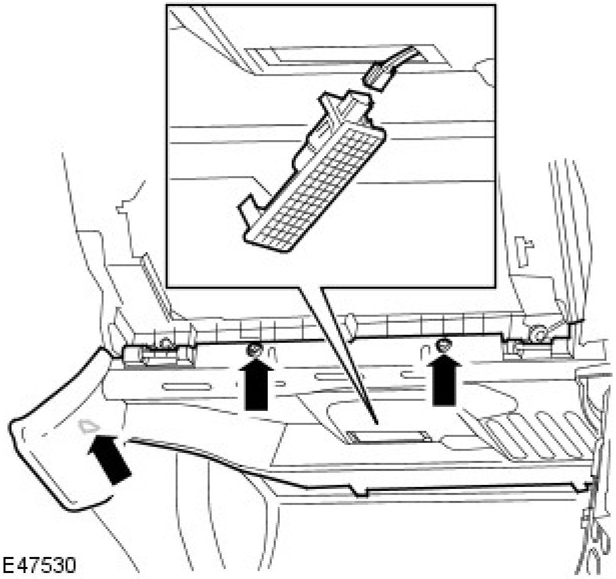
Removal and Installation

Removal

1. Remove the glove compartment.
For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

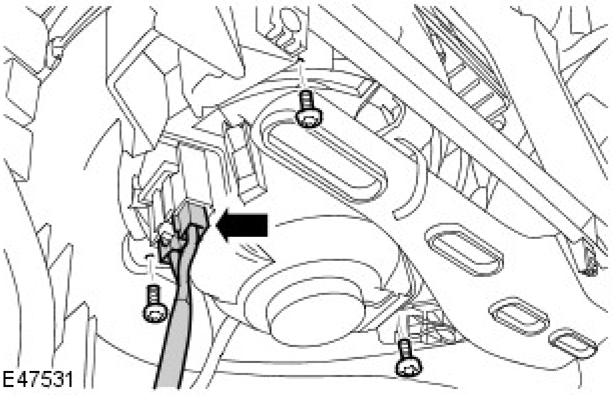
2. Remove the passenger side closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



3. Position the footwell duct aside for access.

- Release the clip.



4. Remove the blower motor.

- Disconnect the electrical connector.
- Remove the 3 screws.

Installation

1. ⚠ CAUTION: Fixings must be started by hand to avoid damaging threads.

Install the blower motor.

- Tighten the screws.
- Connect the electrical connector.

2. Secure the footwell duct.

- Install the clip.

3. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

4. Install the glove compartment.
For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

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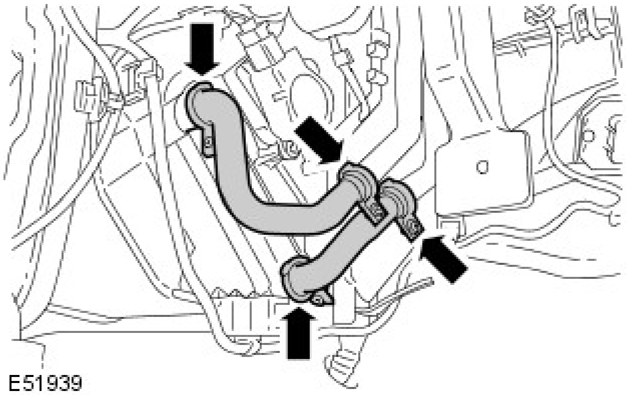
Heating and Ventilation - Heater CoreLHD AWD

Removal and Installation

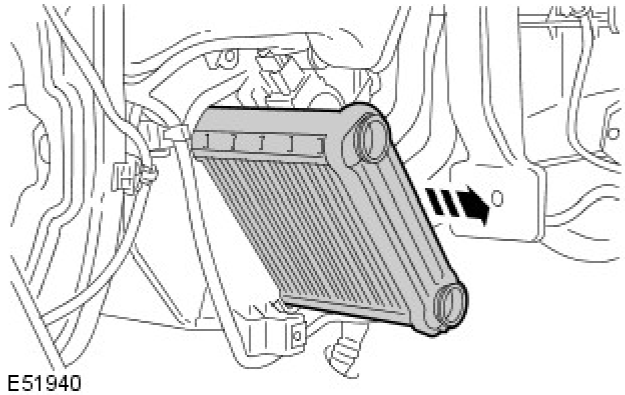
Removal

1. Drain the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).
2. Remove the instrument panel passenger side reinforcement.
   For additional information, refer to: Instrument Panel Passenger Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).
3. Remove the heater core upper and lower pipes.
   - Position a container to collect the fluid.
   - Loosen the 4 screws and remove the clips.
   - Remove and discard the 4 O-ring seals.



E51939

4. Remove the heater core.



E51940

Installation

1. Install the heater core.
2. Install the heater core upper and lower pipes.
   - Clean the components.
   - Install the new O-ring seals.
   - Install the clips and tighten the screws.
   - Remove the container.
3. Install the instrument panel passenger side reinforcement.
   For additional information, refer to: Instrument Panel Passenger Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).
4. Refill the cooling system.

For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

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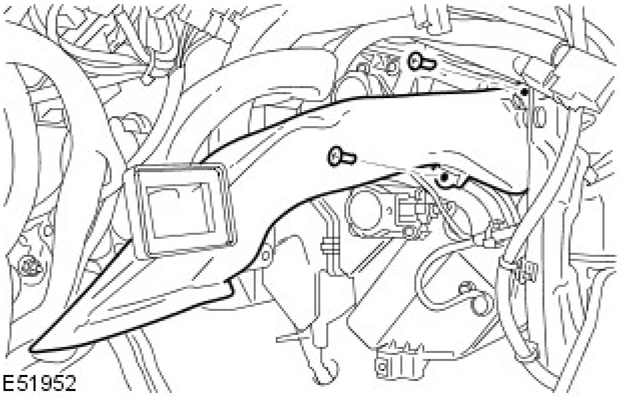
Heating and Ventilation - Heater CoreRHD AWD

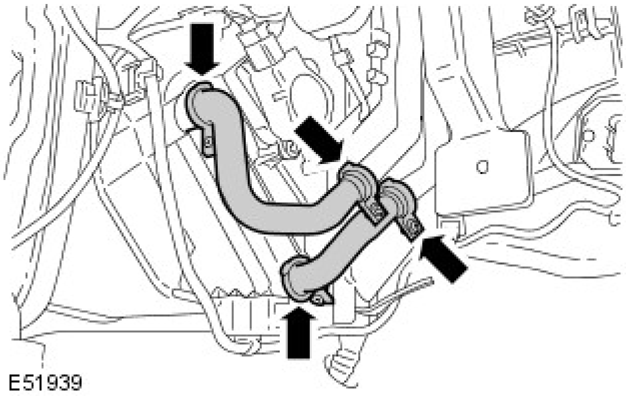
Removal and Installation

Removal

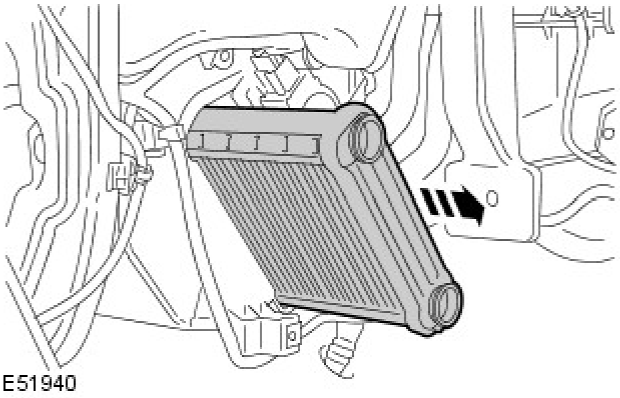
1. Drain the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).
2. Remove the instrument panel driver side reinforcement.
   For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).
3. Remove the driver side footwell duct.
   - Remove the 2 Torx screws.



4. Remove the heater core upper and lower pipes.
   - Position a container to collect the fluid.
   - Loosen the 4 screws and remove the clips.
   - Remove and discard the 4 O-ring seals.



5. Remove the heater core.



Installation

1. Install the heater core.
2. Install the heater core upper and lower pipes.
    - Clean the components.
    - Install the new O-ring seals.
    - Install the clips and tighten the screws.
    - Remove the container.
3. Install the driver side footwell duct.
    - Tighten the screws.
4. Install the instrument panel driver side reinforcement.
   For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).
5. Refill the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

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Auxiliary Heating -

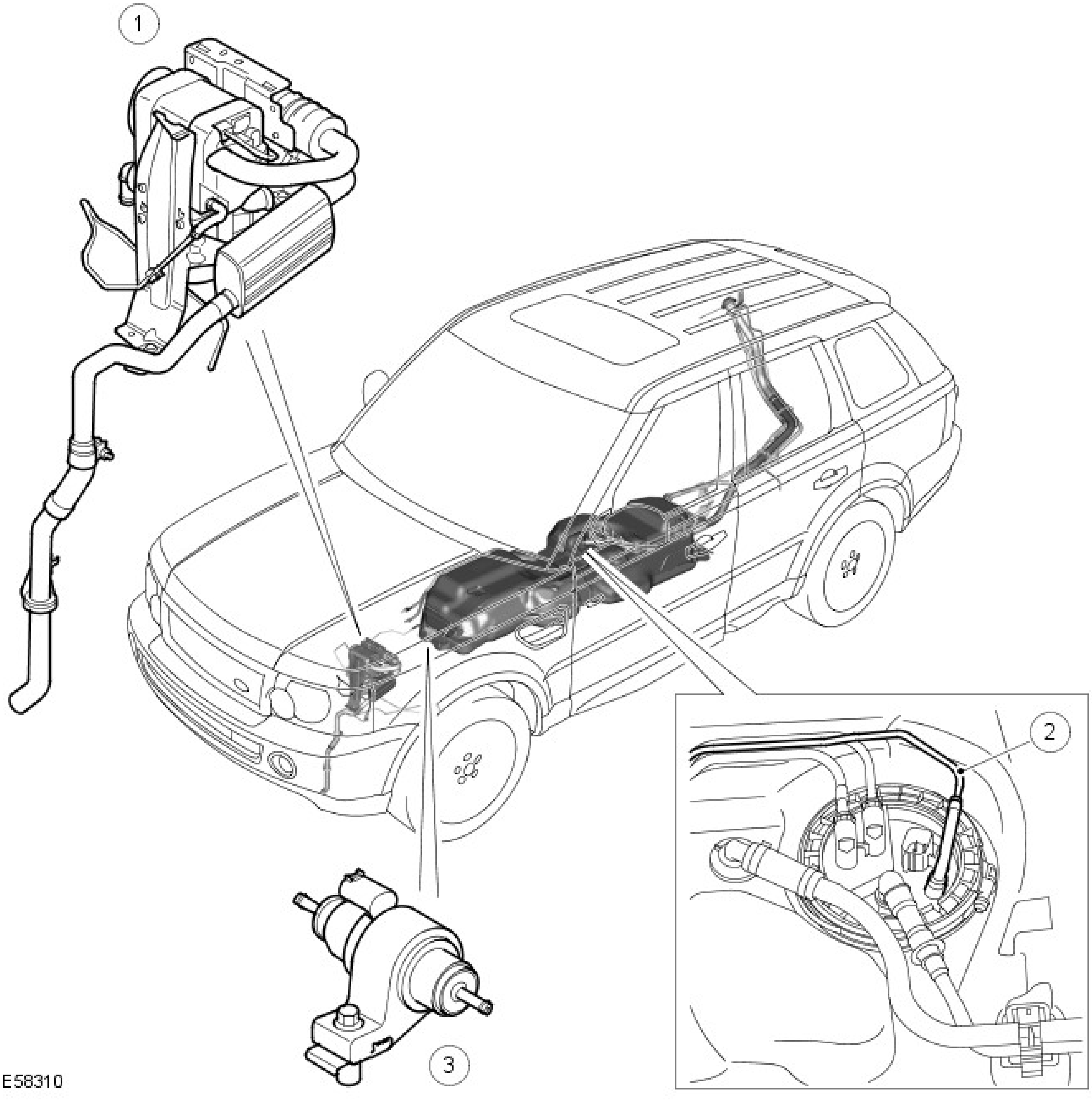
Torque Specifications

Description	Nm	lb-ft
Fuel fired booster heater exhaust bracket bolt	10	7
Fuel fired booster heater	10	7

Auxiliary Heating - Auxiliary Heater

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	FFBH (fuel fired booster heater)
2	-	Fuel line connection with fuel tank
3	-	Auxiliary fuel pump

GENERAL

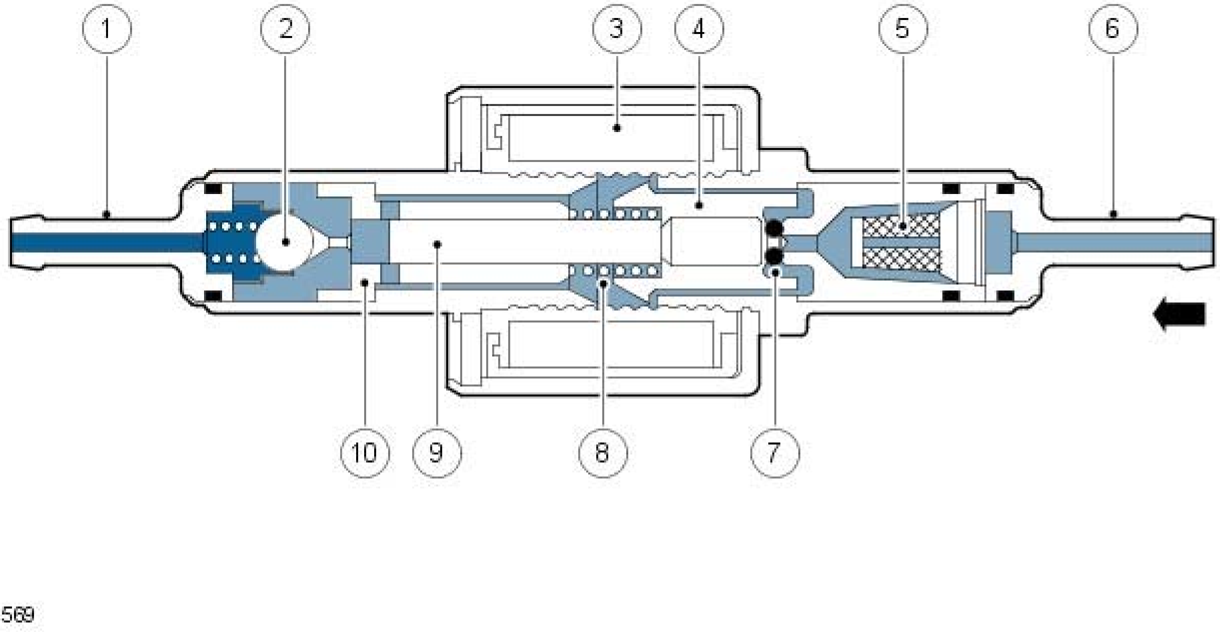
In some markets diesel models have auxiliary heating provided by a FFBH, which boosts the temperature of the engine coolant supplied to the vehicle heater assembly. Fuel for the FFBH is taken from the vehicle fuel tank, through a fuel line attached to the fuel pump module. In the FFBH, the fuel is burned and the resultant heat output is used to heat the engine coolant. The FFBH system supplements vehicle heater performance while the engine is running, and is transparent to the driver.

Operation of the FFBH is controlled by the automatic temperature control (ATC) module and a control module in the FFBH. Operation is automatic when the engine is running, depending on the ambient air temperature and the engine coolant temperature (ECT).

AUXILIARY FUEL PUMP

The auxiliary fuel pump regulates the fuel supply to the FFBH. The pump is installed in a rubber mounting attached to the chassis, immediately in front of the fuel tank. The pump is a self priming, solenoid operated plunger pump, controlled by a pulse width modulation (PWM) signal from the control module in the FFBH. When the pump is de-energized, it provides a positive shut-off of the fuel supply.

Sectioned View of Auxiliary Fuel Pump



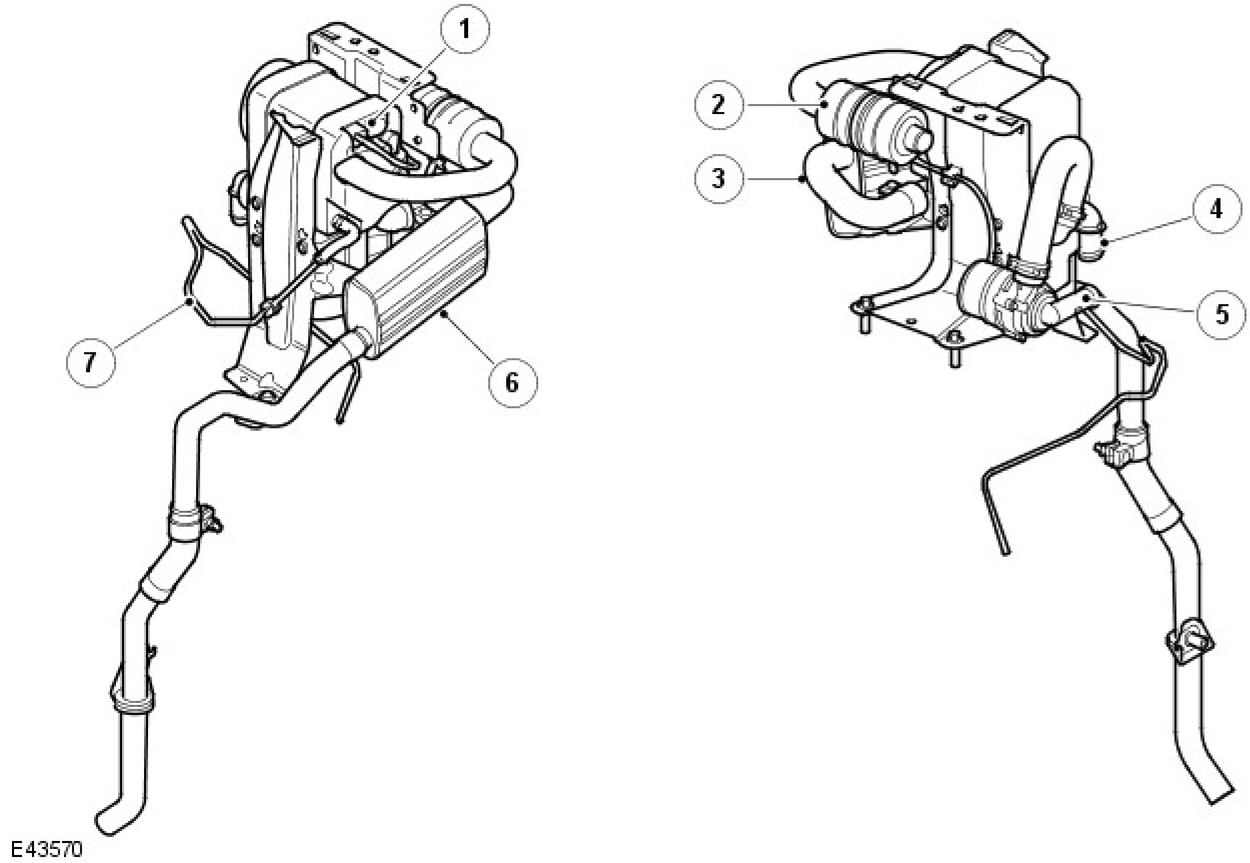
Item	Part Number	Description
1	-	Fuel line connector
2	-	Non return valve
3	-	Solenoid coil
4	-	Plunger
5	-	Filter insert
6	-	Fuel line connector
7	-	O-ring seal
8	-	Spring
9	-	Piston
10	-	Bush

The solenoid coil of the auxiliary fuel pump is installed around a housing which contains a plunger and piston. The piston locates in a bush, and a spring is installed on the piston between the bush and the plunger. A filter insert and a fuel line connector are installed in the inlet end of the housing. A non return valve and a fuel line connector are installed in the fuel outlet end of the housing.

While the solenoid coil is de-energized, the spring holds the piston and plunger in the closed position at the inlet end of the housing. An O-ring seal on the plunger provides a fuel tight seal between the plunger and the filter insert, preventing any flow through the pump. When the solenoid coil is energized, the piston and plunger move towards the outlet end of the housing, until the plunger contacts the bush; fuel is then drawn in through the inlet connection and filter. The initial movement of the piston also closes transverse drillings in the bush and isolates the pumping chamber at the outlet end of the housing. Subsequent movement of the piston then forces fuel from the pumping chamber through the non return valve and into the line to the FFBH.

When the solenoid de-energizes, the spring moves the piston and plunger back towards the closed position. As the piston and plunger move towards the closed position, fuel flows past the plunger and through the annular gaps and transverse holes in the bush to replenish the pumping chamber.

FFBH



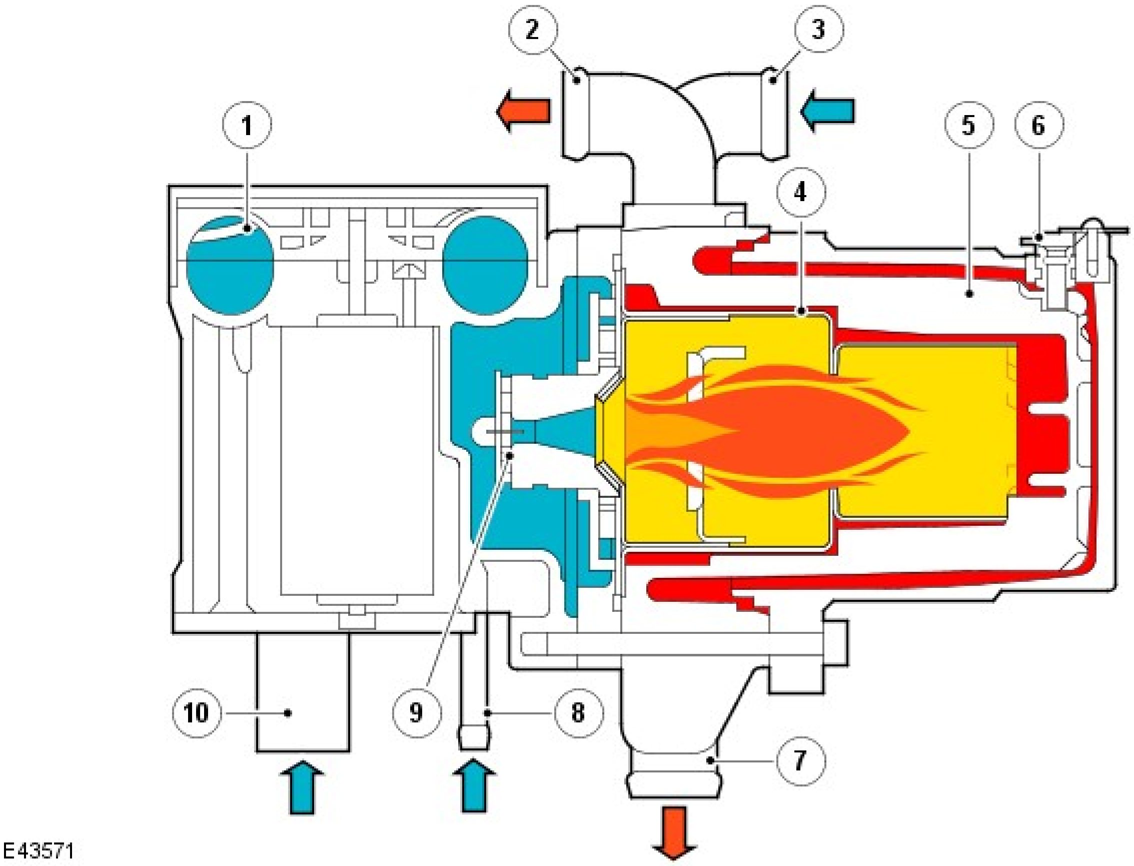
Item	Part Number	Description
1	-	Electrical connectors and control module
2	-	Air inlet muffler
3	-	Exhaust pipe
4	-	FFBH coolant outlet connection
5	-	Circulation pump coolant inlet connection
6	-	Exhaust muffler
7	-	Fuel supply line

The FFBH is installed in the coolant supply line to the heater assembly. The FFBH is located in the front left corner of the engine compartment, on two mounting brackets attached to the wheelarch. Two electrical connectors connect the FFBH to the vehicle wiring.

The FFBH unit consists of:

- A circulation pump.
- A combustion air fan.
- A burner housing.
- A heat exchanger.
- An air inlet hose and muffler.
- An exhaust pipe and muffler.
- A control module.

Sectioned View of FFBH



Item	Part Number	Description
1	-	Combustion air fan
2	-	Coolant outlet
3	-	Coolant inlet
4	-	Burner insert
5	-	Heat exchanger
6	-	Temperature sensor
7	-	Exhaust
8	-	Fuel inlet
9	-	Evaporator
10	-	Air inlet

Circulation Pump

The circulation pump is installed in the coolant inlet line of the FFBH to assist the coolant flow through the FFBH and the vehicle heater core. The circulation pump is attached to the rear mounting bracket of the FFBH.

The circulation pump runs continuously while the FFBH is active. While the FFBH is inactive, coolant flow is reliant on the engine coolant pump. Operation of the circulation pump is controlled by a power feed direct from the control module within the FFBH.

Combustion Air Fan

The combustion air fan regulates the flow of air into the FFBH to support combustion of the fuel supplied by the auxiliary fuel pump and to purge and cool the FFBH.

Burner Housing

The burner housing contains the burner insert and also incorporates connections for the exhaust pipe, the coolant inlet from the circulation pump and the coolant outlet to the vehicle heater.

The burner insert incorporates the fuel combustion chamber, an evaporator and a glow pin and flame sensor. Fuel from the auxiliary fuel pump is supplied to a venturi, where it evaporates and enters the combustion chamber to mix with air from the combustion air fan. The glow pin and flame sensor provides the ignition source of the fuel:air mixture and, once combustion is established, monitors the flame.

Heat Exchanger

The heat exchanger transfers heat generated by combustion to the coolant. Two sensors are installed in the heat exchanger casing to provide the control module with inputs of coolant temperature. The control module uses the temperature inputs to control system operation.

Air Inlet Hose and Muffler

A canister type muffler is included in the air inlet supply line. The muffler reduces the noise caused by induction roar.

Exhaust Pipe and Muffler

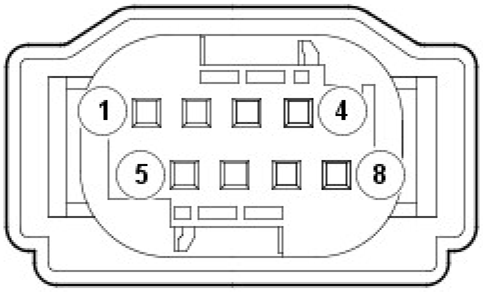
The exhaust pipe and muffler directs exhaust combustion gases to atmosphere below the front left corner of the engine. Exhaust vapor may be visible when the FFBH is running, depending on atmospheric conditions.

Control Module

The control module controls and monitors operation of the FFBH system. An internal flow of air from the combustion air fan ventilates the control module to prevent it overheating.

The control module is powered by a permanent feed from the battery junction box (BJB), and communicates with other systems on the vehicle over the medium speed controller area network (CAN) bus.

FFBH Control Module Harness Connector C0925

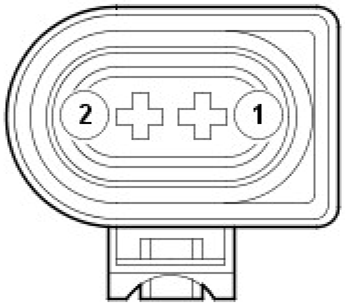


E50045

FFBH Control Module Harness Connector C0925 Pin Details

Pin No.	Description	Input/Output
1 to 3	Not used	-
4	Medium speed CAN bus low	Input/Output
5	Auxiliary fuel pump power feed	Output
6	Not used	-
7	Medium speed CAN bus high	Input/Output
8	Not used	-

FFBH Control Module Harness Connector C0926



E50046

FFBH Control Module Harness Connector C0926 Pin Details

Pin No.	Description	Input/Output
1	Permanent battery power supply	Input
2	Ground	Output

Operation of the FFBH is controlled by a status message from the ATC module to the control module. A similar status message, from the control module to the ATC module, advises the ATC module of the current operating status of the FFBH.

While the engine is running, if the ambient air temperature is less than 9 °C (48 °F) and the ECT is less than 75 °C (167 °F) the ATC module changes the status message from 'heater off' to 'supplemental heat'. The control module then changes the status message it sends the ATC module to 'supplemental heat' and starts the FFBH. The control module will not start the FFBH, or will discontinue operation, if any of the following occur:

- The control module is in the error lockout mode (see **Diagnostics**, below).
- A crash message is received from the restraints control module (RCM).
  For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).
- A low fuel level message is received from the instrument cluster.
  For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).
- The engine is not running, or stops running for approximately 4 seconds. The time delay is included for stall protection.

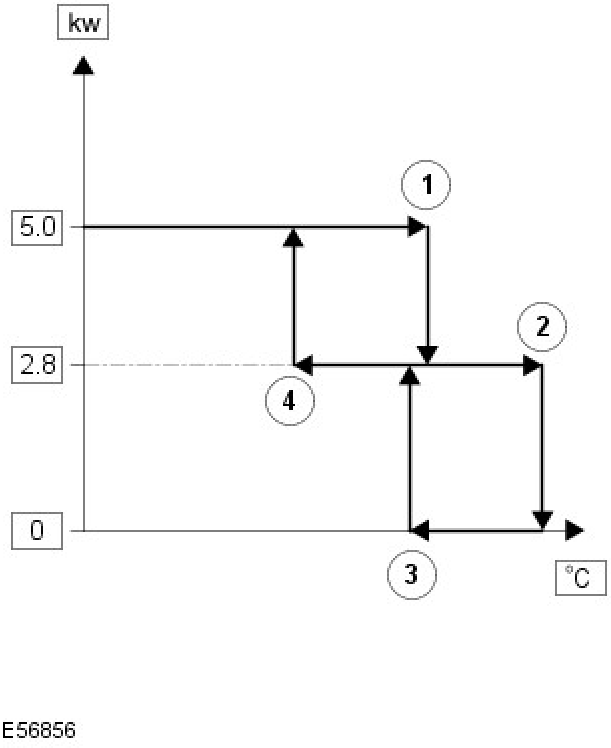
If the control module does not start the FFBH, or discontinues operation, the status message to the ATC module remains at, or changes to, 'heater off'. If the ambient air temperature increases to 9 °C (48 °F), or the ECT increases to 75 °C (167 °F), the ATC module cancels supplementary heating, by changing the status message to the control module back to 'heater off'. The control module then cancels FFBH operation and changes the status message to the ATC module to 'heater off'.

The FFBH is controlled at one of two heat output levels, 2.8 kW at part load combustion and 5 kW at full load combustion. The control module transmits the amount of fuel used by the FFBH to the instrument cluster, and the FFBH coolant temperature to the ATC module.

Start Sequence: At the beginning of a start sequence, the control module energizes the glow pin function of the glow pin and flame sensor, to pre heat the combustion chamber, starts the combustion air fan at slow speed and energizes the coolant circulation pump. After approximately 30 seconds, the control module energizes the auxiliary fuel pump at the starting sequence speed. The fuel delivered by the auxiliary fuel pump evaporates in the combustion chamber, mixes with air from the combustion air fan and is ignited by the glow pin and flame sensor. The control module then progressively increases the speed of the auxiliary fuel pump and the combustion air fan. Once combustion is established the control module switches the glow pin and flame sensor from the glow pin function to the flame sensing function to monitor combustion. From the beginning of the start sequence to stable combustion at full load takes approximately 150 seconds.

Coolant Temperature Control: While the FFBH is running, the control module cycles the FFBH between full load combustion, part load combustion and a control idle phase of operation, depending on the temperature of the coolant in the heat exchanger.

Switching Point Diagram



Switching Point Temperatures

Switching Point		Temperature, °C (°F)
Figure Item No.	Description	
1	Full load to part load	87 (188)
2	Part load to control idle	90 (194)
3	Control idle to part load	79 (174)
4	Part load to full load	76 (168)

After the start sequence, the control module maintains full load combustion until the coolant temperature reaches switching point temperature 1. At this temperature, the control module decreases the speed of the auxiliary fuel pump and the combustion air fan to half speed, to produce part load combustion. The control module maintains part load combustion while the coolant temperature remains between switching point temperatures 2 and 4. At part load combustion the temperature of the coolant will increase or decrease depending on the amount of heat required to heat the vehicle interior. If the coolant temperature decreases to switching point temperature 4, the control module increases the speed of the auxiliary fuel pump and the combustion air fan to full speed, to return to full load combustion. If the coolant temperature increases to switching point temperature 2, the control module enters a control idle phase of operation.

On entering the control idle phase, the control module immediately switches the auxiliary fuel pump off, to stop combustion, and starts a timer for the combustion air fan. After a 2 minute cool down period, the control module switches the combustion air fan off and then remains in the control idle phase while the coolant temperature remains above switching point temperature 3. If the coolant temperature decreases to switching point temperature 3, the control module initiates a start to part load combustion. A start to part load combustion takes approximately 90 seconds.

In order to limit the build up of carbon deposits on the glow pin and flame sensor, the control module also enters the control idle phase if continuous combustion time exceeds 72 minutes (at part load, full load or a combination of both). After the cool down period, if the coolant is still in the temperature range that requires additional heat, the control module restarts the FFBH.

Shutdown: To stop the FFBH, the control module de-energizes the auxiliary fuel pump to stop combustion, but continues operation of the combustion air fan and the circulation pump for a time, to cool down the FFBH. The cool down time is 100 seconds if the FFBH was operating at part load combustion and 175 seconds if the FFBH was operating at full load combustion.

Diagnostics

The control module monitors the FFBH system for faults. Any faults detected are stored in a volatile memory in the control module, which can be interrogated by T4 via the medium speed CAN bus. A maximum of three faults and associated freeze frame data can be stored at any one time. If a further fault is detected, the oldest fault is overwritten by the new fault.

The control module also incorporates an error lockout mode of operation that inhibits operation to prevent serious faults from causing further damage to the system. In the error lockout mode, the control module immediately stops the auxiliary fuel pump, and stops the combustion air fan and circulation pump after a cool down time of approximately 2 minutes. Error lockout occurs for start sequence failures, combustion flameouts, heat exchanger casing overheat and if battery voltage is out of limits. The error lockout mode can be cleared using T4, or by disconnecting the battery power supply (connector C0926) for a minimum of 10 seconds.

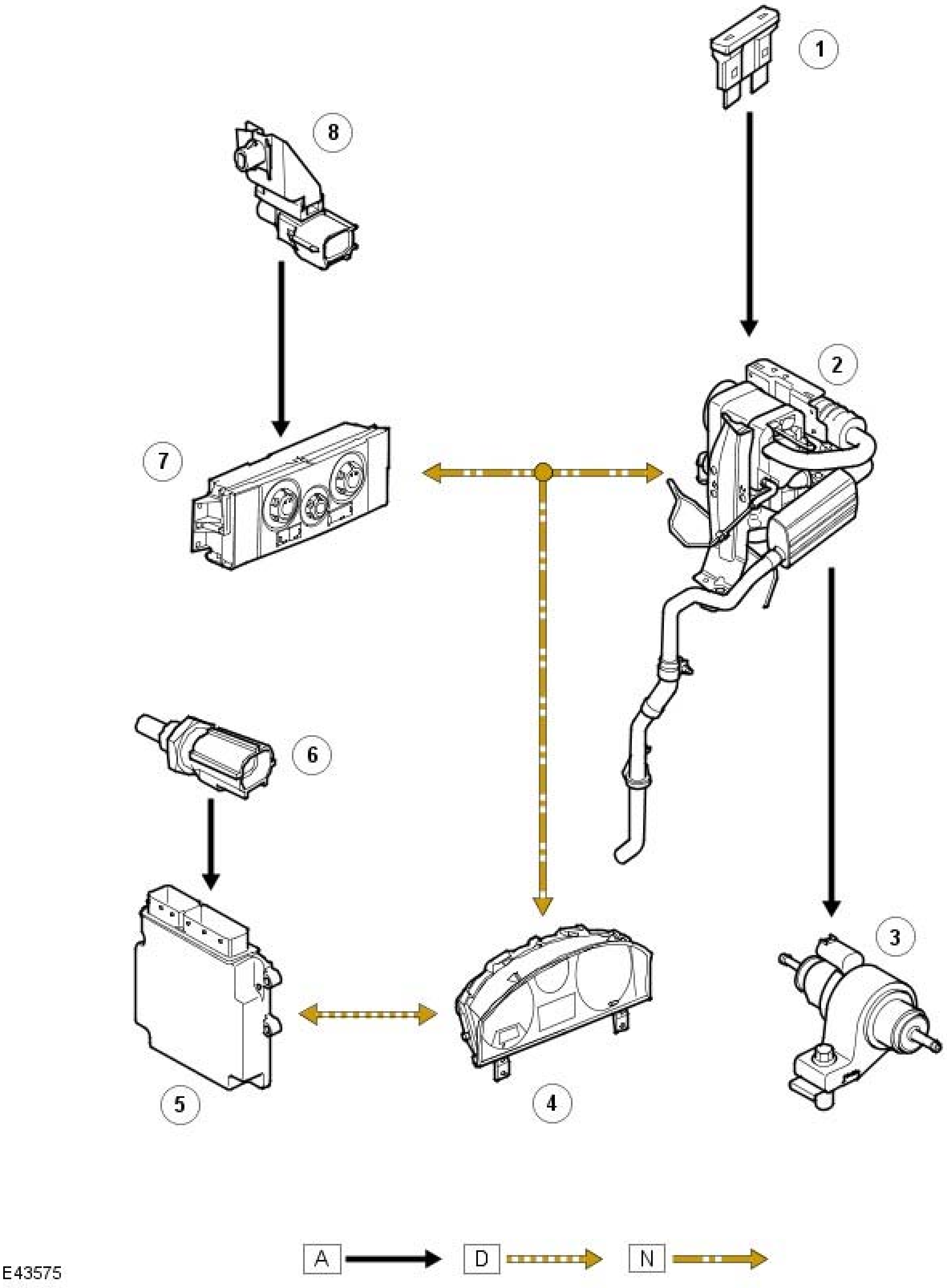
Start Failure and Flameout: If a start sequence fails to establish combustion, or a flameout occurs after combustion is established, the control module immediately initiates another start sequence. The start failure or flameout is also recorded by an event timer in the control module. The event timer is increased by one after each start failure or flameout, and decreased by one if a subsequent start is successful. If the event timer increases to three (over any number of drive cycles), the control module enters the error lockout mode.

Heat Exchanger Casing Overheat: To protect the system from excessive temperatures, the control module enters the error lockout mode if the heat exchanger coolant temperature exceeds 125 °C (257 °F).

Battery Voltage Limits: 10.25 - 15.5 volts.

AUXILIARY HEATING CONTROL DIAGRAM

- NOTE: A = Hardwired connections; D = High speed CAN bus; N = Medium speed CAN bus


1
2
3
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A
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Item	Part Number	Description
1	-	Fuse 28E, BJB
2	-	FFBH
3	-	Auxiliary fuel pump
4	-	Instrument cluster
5	-	engine control module (ECM)

6	-	ECT sensor
7	-	ATC module
8	-	Ambient air temperature sensor

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Auxiliary Heating - Fuel Fired Booster Heater

Diagnosis and Testing

Overview

For information on the description and operation of the system, refer to section 412-02 -REFER to: (412-02B Auxiliary Heating)

> Auxiliary Heater (Description and Operation),
> Fuel Fired Booster Heater - TDV6 2.7L Diesel (Removal and Installation),
> Fuel Fired Booster Heater Glow Plug And Burner Assembly - TDV6 2.7L Diesel (Removal and Installation).

Auxiliary Heating in the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Fuel fired heater assembly - Combustion air fan - Coolant inlet/outlet - Heat exchanger - Temperature sensor - Exhaust - Fuel inlet - Air inlet - Evaporator ● Auxiliary fuel pump and lines ● Auxiliary coolant pump	● Fuses ● Harnesses ● Electrical connector(s) ● Controller area network (CAN) circuits ● Control module(s)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.

⚠CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

• NOTE: Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

• NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Fuel Fired Booster Heater Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.

DTC index

• NOTE: Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

DTC	Description	Possible Causes	Action
B1A00-16	Control Module - circuit voltage below threshold	● Fuel fired booster heater module power	● Check other modules for related diagnostic trouble codes ● If other modules contain low voltage related diagnostic

DTC	Description	Possible Causes	Action
		circuit fault - Battery/charging system fault	trouble codes, suspect a common cause (battery/charging system fault) - If not, refer to the electrical circuit diagrams and check the power and ground circuits to the fuel fired booster heater module - Check for stored diagnostic trouble codes - Check for correct operation
B1A00-17	Control Module - circuit voltage above threshold	- Charging system fault - Fuel fired booster heater module failure	- Check other modules for related diagnostic trouble codes - If other modules contain high voltage related diagnostic trouble codes, suspect a common cause (battery/charging system fault) - If not, refer to the electrical circuit diagrams and check the power and ground circuits to the fuel fired booster heater module - Check for stored diagnostic trouble codes - Check for correct operation
B1A00-43	Control Module - special memory failure	- Fuel fired booster heater module failure	- Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for reoccurrence of the diagnostic trouble code - If the diagnostic trouble code returns - Install a new fuel fired booster heater module as required - Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1A00-49	Control Module - internal electronic failure	- Fuel fired booster heater module failure	- Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for reoccurrence of the diagnostic trouble code - If the diagnostic trouble code returns - Install a new fuel fired booster heater module as required - Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1D22-11	Coolant Temperature Sensor - circuit short to ground	- Fuel fired booster heater coolant temperature sensor internal fault	- Check and install a new fuel fired booster heater **coolant temperature sensor** - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D22-15	Coolant Temperature Sensor - circuit short to battery or open	- Fuel fired booster heater coolant temperature sensor internal fault	- Check and install a new fuel fired booster heater **coolant temperature sensor** - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation

DTC	Description	Possible Causes	Action
B1D23-13	Overheat Sensor - circuit open	- Fuel fired booster heater coolant temperature sensor internal fault	- Check and install a new fuel fired booster heater **coolant temperature sensor** - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D24-11	Glow Plug - circuit short to ground	- Fuel fired booster heater glow plug internal fault	- Carry out circuit checks, inspect the glow plug cables and connector. Repair the circuit or check and install a new fuel fired booster heater **glow plug** as required REFER to: Fuel Fired Booster Heater Glow Plug And Burner Assembly - TDV6 2.7L Diesel (412-02B Auxiliary Heating, Removal and Installation). - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D24-15	Glow Plug - circuit short to battery or open	- Fuel fired booster heater glow plug internal fault	- Carry out circuit checks, inspect the glow plug cables and connector. Repair the circuit or check and install a new fuel fired booster heater **glow plug** as required REFER to: Fuel Fired Booster Heater Glow Plug And Burner Assembly - TDV6 2.7L Diesel (412-02B Auxiliary Heating, Removal and Installation). - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D25-11	Heater Fuel Pump - circuit short to ground	- Heater fuel pump circuit short to ground - Heater fuel pump failure	- Refer to the electrical circuit diagrams and check the fuel fired booster heater fuel pump and circuit for short to ground - Repair the circuit or check and install a new fuel fired booster heater **fuel pump** as required - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D25-15	Heater Fuel Pump - circuit short to battery or open	- Heater fuel pump circuit short to power, open circuit - Heater fuel pump failure	- Refer to the electrical circuit diagrams and check the fuel fired booster heater fuel pump and circuit for short to power, open circuit - Repair the circuit or check and install a new fuel fired booster heater **fuel pump** as required - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D26-11	Combustion Air Blower - circuit short to ground	- Fuel fired booster heater module failure	- Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation

DTC	Description	Possible Causes	Action
			test) - If the diagnostic trouble code reoccurs check and install a new fuel fired booster heater module - Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1D26-15	Combustion Air Blower - circuit short to battery or open	- Fuel fired booster heater module failure	- Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - If the diagnostic trouble code reoccurs check and install a new fuel fired booster heater module - Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1D26-92	Combustion Air Blower - performance or incorrect operation	- Fuel fired booster heater module failure	- Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for reoccurrence of the diagnostic trouble code - If the diagnostic trouble code reoccurs check and install a new fuel fired booster heater module - Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1D26-93	Combustion Air Blower - no operation	- Fuel fired booster heater module failure	- Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for reoccurrence of the diagnostic trouble code - If the diagnostic trouble code reoccurs check and install a new fuel fired booster heater module - Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1D27-11	Heater Coolant Pump - circuit short to ground	- Heater coolant pump circuit short to ground - Heater coolant pump failure	- Refer to the electrical circuit diagrams and check the fuel fired booster heater water pump and circuit for short to ground - Repair the circuit or check and install a new fuel fired booster heater **water pump** as required - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D27-15	Heater Coolant Pump - circuit short to battery or open	- Heater coolant pump circuit short to power, open circuit - Heater coolant pump failure	- Refer to the electrical circuit diagrams and check the fuel fired booster heater water pump and circuit for short to power, open circuit - Repair the circuit or check and install a new fuel fired booster heater **water pump** as required - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation

DTC	Description	Possible Causes	Action
			test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D29-93	No Start, Even After Restart Attempt - no operation	- No fuel present at fuel fired booster heater module - Exhaust system blocked - Air intake blocked	- Check vehicle fuel level - Check fuel lines to fuel fired booster heater module for blockage, kinking or damage - Check exhaust system and air intake for blockage, kinking or damage - Check fuel for aeration and correct fuel delivery - Check vehicle is not parked on an incline when parking heater is operated - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D30-93	No Start In Test Mode - no operation	- No fuel present at fuel fired booster heater module - Exhaust system blocked - Air intake blocked	- Check vehicle fuel level - Check fuel lines to fuel fired booster heater module for blockage, kinking or damage - Check exhaust system and air intake for blockage, kinking or damage - Check fuel for aeration and correct fuel delivery - Check vehicle is not parked on an incline when parking heater is operated - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D31-94	Flame Detected Prior to Normal Operation - unexpected operation	• NOTE: The glow plug and flame sensor are a combined unit - Glow plug circuit fault	- Check exhaust system and air intake for blockage, kinking or damage - Carry out circuit checks, inspect the glow plug cables and connector. Repair the circuit or check and install a new fuel fired booster heater glow plug as required REFER to: Fuel Fired Booster Heater Glow Plug And Burner Assembly - TDV6 2.7L Diesel (412-02B Auxiliary Heating, Removal and Installation). - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D32-92	Multiple Flame Interruption During Heating Cycle - performance or incorrect operation	- No fuel present at fuel fired booster heater module - Exhaust system blocked - Air intake blocked	- Check vehicle fuel level - Check fuel lines to Fuel fired booster heater module for blockage, kinking or damage - Check exhaust system and air intake for blockage, kinking or damage - Check fuel for aeration and correct fuel delivery - Check vehicle is not parked on an incline when parking heater is operated - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation

DTC	Description	Possible Causes	Action
B1D33-92	Flame Interruption During Normal Operation - performance or incorrect operation	- No fuel present at fuel fired booster heater module - Exhaust system blocked - Air intake blocked	- Check vehicle fuel level - Check fuel lines to fuel fired booster heater module for blockage, kinking or damage - Check exhaust system and air intake for blockage, kinking or damage - Check fuel for aeration and correct fuel delivery - Check vehicle is not parked on an incline when parking heater is operated - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
B1D34-68	Heater In Lock Out Mode - event information	- Fuel fired booster heater system fault	• NOTE: For information only, rectify other stored fuel fired booster heater diagnostic trouble codes prior to this diagnostic trouble code - Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation test** (Setup and configuration/auxiliary heater/operation test) - Check for stored diagnostic trouble codes - Check for correct operation
U0073-08	Vehicle Communication Bus A - Bus Signal / Message Failures	- Medium speed CAN communication bus off - Fuel fired booster heater module failure	- Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U0164-87	Lost Communication With HVAC Control Module - Missing message	- CAN bus circuit fault - Module internal fault	- Check other modules for related diagnostic trouble codes - Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U1A00-08	Private Bus Circuit	• NOTE: Telestart vehicles only - Signal/Message failure/error occurred in W-Bus communication	Refer to the electrical circuit diagrams and check the circuit between the fuel fired booster heater module and the fuel fired booster heater receiver
U1A03-95	Car Config Parameter - Incorrect assembly	- Fuel fired booster heater module not configured or incorrectly configured	- Re-configure the fuel fired booster heater module using the manufacturer approved diagnostic system (Module programming/Configure existing module/Auxiliary heater control module)
U1A37-87	Crash Status Telegram Bus Signal / Message Failures Missing message	- Crash signal received over CAN network	• NOTE: Event information - the restraints control module has recorded a crash event - Using the manufacturer approved diagnostic system, check other modules for related diagnostic trouble codes
U1A44-6C	Low fuel warning	- Fuel level below threshold	- Auxiliary heater has used the low fuel warning lamp signal CAN message, to turn itself off, and save the remaining fuel for the engine - After the fuel tank is refilled, and the warning lamp goes off, it will operate as normal - Advise customer of this feature, and recommend that they keep the fuel level higher, to ensure auxiliary heater stays on
U3000-55	Control Module - Not configured	- Fuel fired booster heater module not configured or	- Using the manufacturer approved diagnostic system, record then clear any stored diagnostic trouble codes then conduct the fuel fired booster heater **operation**

DTC	Description	Possible Causes	Action
		incorrectly configured ● Central junction box not configured correctly	**test** (Setup and configuration/auxiliary heater/operation test) ● Check for reoccurrence of the diagnostic trouble code ● If the diagnostic trouble code returns ● Using the manufacturer approved diagnostic system check and up-date the car configuration file as required ● Re-configure the fuel fired booster heater module using the manufacturer approved diagnostic system ● Check for stored diagnostic trouble codes ● Check for correct operation

For a complete list of all Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index (100-00, Description and Operation).

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Auxiliary Heating - Fuel Fired Booster HeaterTDV8 3.6L Diesel

Removal and Installation

Removal

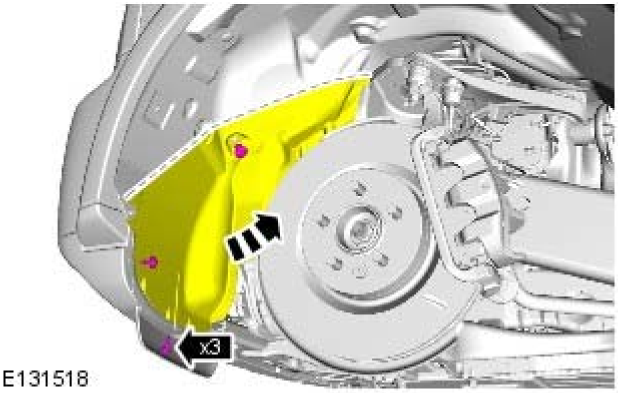
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Raise and support the vehicle.

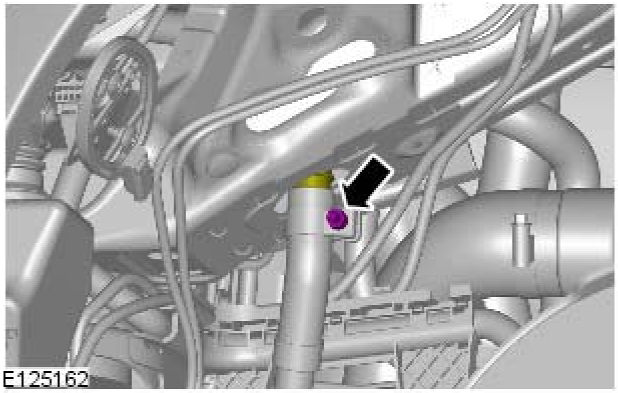
3. NOTE: Wheel shown removed for clarity.

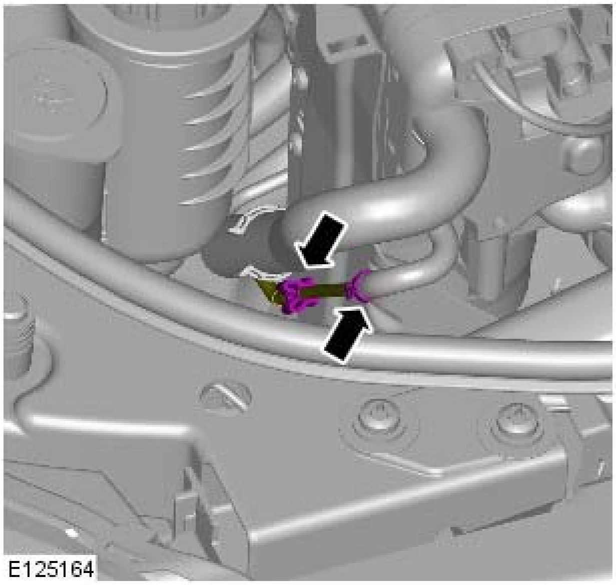
Carefully release the wheel arch liner, to allow access to the fuel fired burner heater (FFBH) exhaust clamp retaining bolt.



4. NOTE: Components removed for clarity.

Release the exhaust clamp.





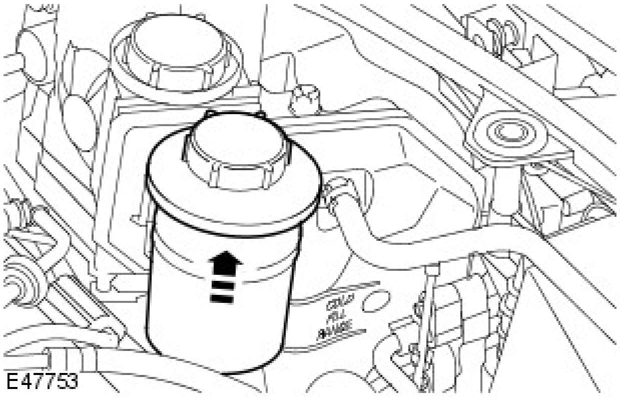
5. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel fired booster heater fuel line.

- Release the clip.

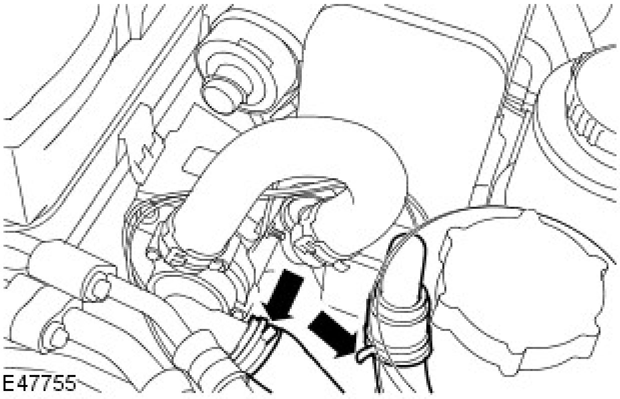
6. Lower the vehicle.

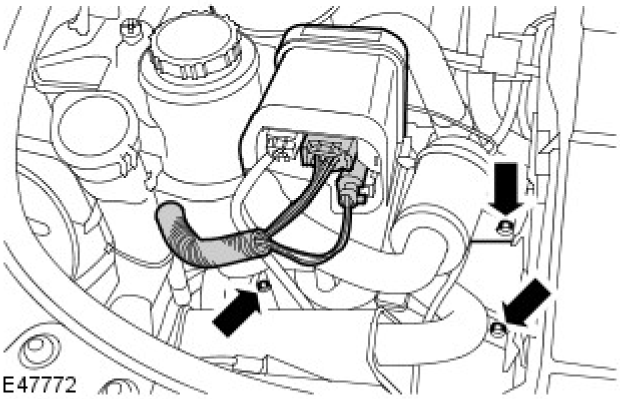
7. Release the power steering fluid reservoir.



8. Disconnect the fuel fired booster heater inlet and outlet coolant hoses.

- Clamp the hoses to minimise coolant loss.
- Release the 2 clips.





9. Remove the fuel fired booster heater.

- Disconnect the 2 electrical connectors.
- Remove the 3 bolts.
- Release the fuel pipe from the clip.

Installation

1. Install the fuel fired booster heater.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Connect the electrical connectors.
- Secure the fuel pipe in the clip.

2. Connect the fuel fired booster heater coolant hoses.

- Secure with the clips.
- Remove the clamps.

3. Connect the fuel fired booster heater fuel hose.

- Secure with the clip.

4. Raise the vehicle.

5. Tighten the exhaust clamp.

- Tighten to 10 Nm (7 lb.ft).

6. Secure the wheel arch liner.

- Install the two retaining screws.
- Install the clip.

7. Lower the vehicle.

8. Install the power steering fluid reservoir.

9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

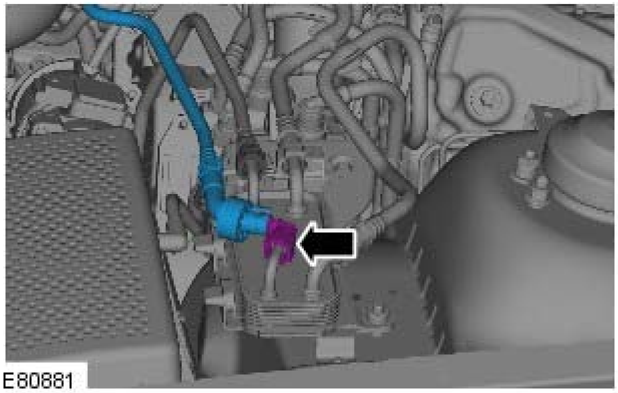
10. Connect exhaust extraction hoses to the tail pipes.

11. ⚠CAUTION: Anti-freeze concentration must be maintained at 50%.

Fill the cooling system expansion tank until the coolant level becomes static with in the "COLD FILL RANGE".

12. ⚠CAUTION: Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.

Start the engine and allow to idle.



13. WARNING: Eye protection must be worn.

- CAUTIONS:

Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure

Disconnect the fuel cooler coolant return line.

- Allow any trapped air to escape.

14. Connect the fuel cooler coolant return line.

15. When coolant runs from the expansion tank bleed point bubble-free, tighten the bleed screw.

16. Add coolant to the expansion tank until the coolant level is 25 mm (0.98 inch) above the "COLD FILL RANGE" upper mark.

17. Hold the engine speed at 2,000 RPM for 25 seconds.

18. Allow the engine to idle for 30 seconds.

19. CAUTIONS:

Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle

Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.

Repeat the above 2 steps 3 times or until hot air is emitted from the heater.

20. Allow the engine to idle for 30 seconds.

21. Add coolant to the expansion tank until the coolant level is 25 mm (0.98 inch) above the "COLD FILL RANGE" upper mark.

- Install the coolant expansion tank cap.

22. CAUTION: Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle

Start and run the engine until the thermostat opens.

- Switch the engine off and allow to cool.

23. WARNING: Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.

CAUTION: If topping up the cooling system when HOT, the HOT fill level with the coolant expansion tank cap removed is significantly higher, 50 mm (2 inches) than the COLD fill level. Failure to compensate for this may lead to significant under filling of the cooling system and may lead to incorrect diagnosis and coolant loss.

Check and top-up the coolant if required.

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Auxiliary Heating - Fuel Fired Booster HeaterTDV6 2.7L Diesel

Removal and Installation

Removal

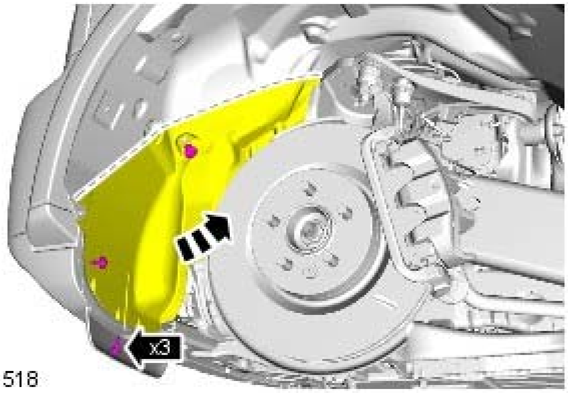
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

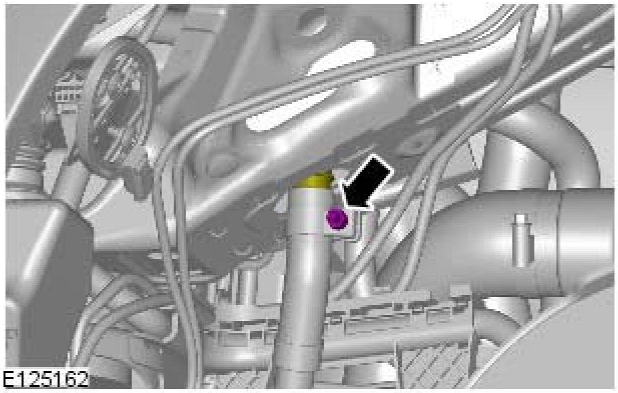
3. NOTE: Wheel shown removed for clarity.



E131518

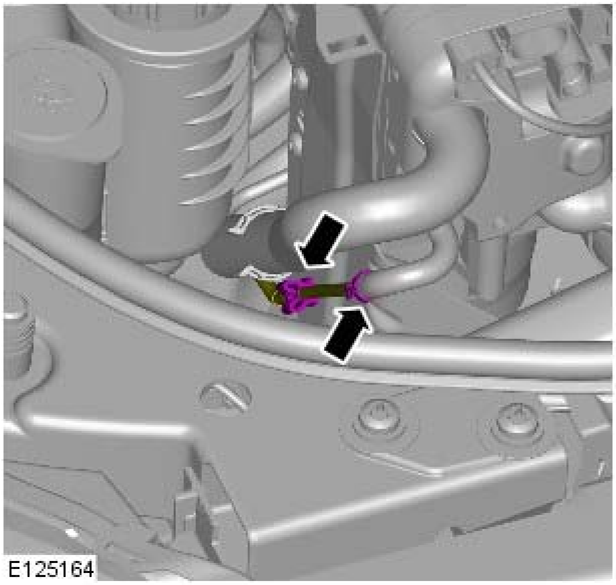
Carefully release the wheel arch liner, to allow access to the fuel fired burner heater (FFBH) exhaust clamp retaining bolt.

4. NOTE: Components removed for clarity.



E125162

Release the exhaust clamp.



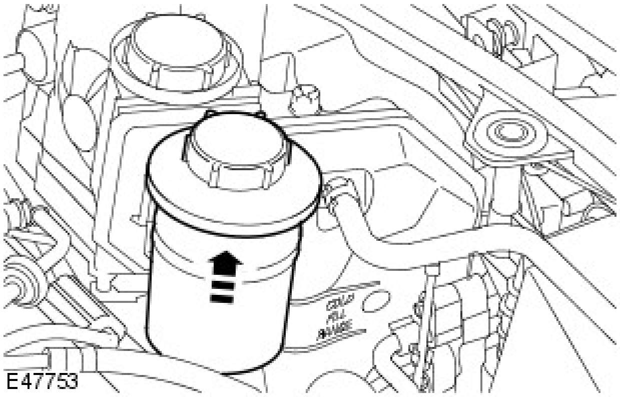
5. ⚠ CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel fired booster heater fuel line.

- Release the clip.

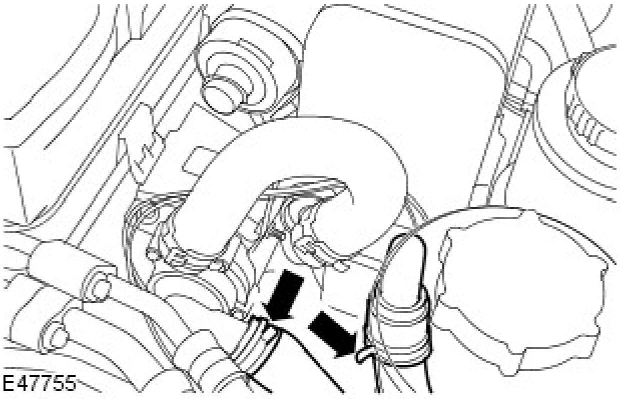
6. Lower the vehicle.

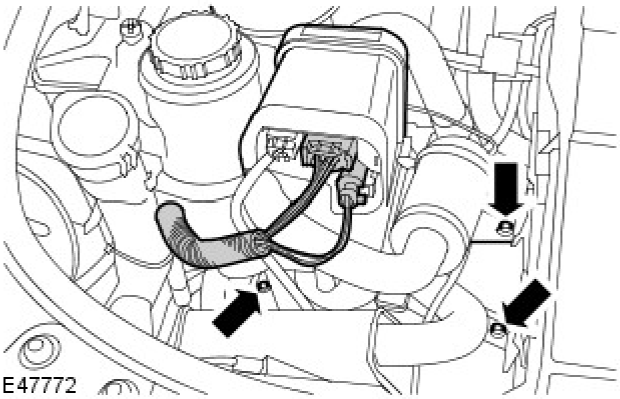
7. Release the power steering fluid reservoir.



8. Disconnect the fuel fired booster heater inlet and outlet coolant hoses.

- Clamp the hoses to minimise coolant loss.
- Release the 2 clips.





9. Remove the fuel fired booster heater.

- Disconnect the 2 electrical connectors.
- Remove the 3 bolts.
- Release the fuel pipe from the clip.

Installation

1. Install the fuel fired booster heater.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Connect the electrical connectors.
- Secure the fuel pipe in the clip.

2. Connect the fuel fired booster heater coolant hoses.

- Secure with the clips.
- Remove the clamps.

3. Connect the fuel fired booster heater fuel hose.

- Secure with the clip.

4. Raise the vehicle.

5. Tighten the exhaust clamp.

- Tighten to 10 Nm (7 lb.ft).

6. Secure the wheel arch liner.

- Install the two retaining screws.
- Install the clip.

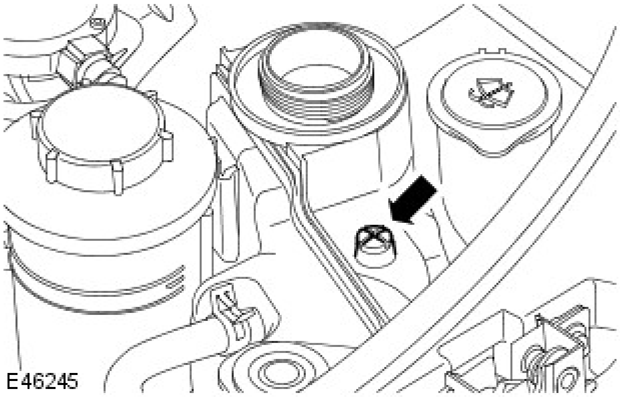
7. Lower the vehicle.

8. Install the power steering fluid reservoir.

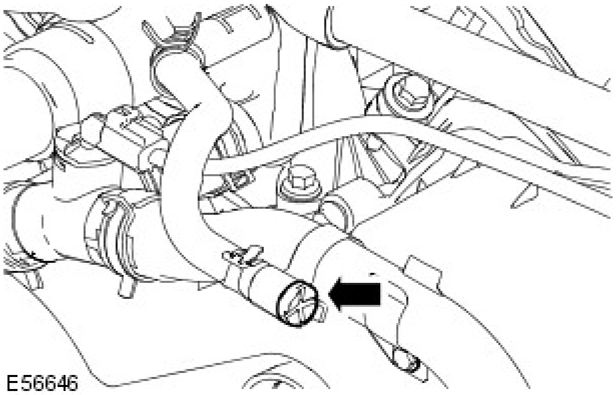
9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

10. Connect exhaust extraction hoses to the tail pipes.

11. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



12. Loosen the coolant expansion tank bleed screw.



13. Loosen the cylinder head bleed hose bleed screw.

14. Refill the cooling system.

15. Tighten the bleed screws to 14 Nm (10 lb.ft).

16. Fill the cooling system, keeping coolant to the upper level mark of the expansion tank, until a steady stream of coolant is seen returning to the tank.

17. NOTE: When the coolant bleed is complete and prior to installing the expansion tank cap, top up the expansion tank to 30mm above the maximum level.

Install the coolant expansion tank cap.

18. ⚠ WARNING: Release the cooling system pressure by slowly turning the expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

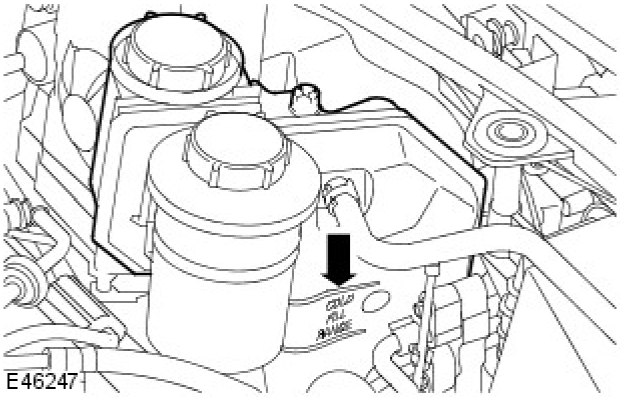
Start and run the engine.

- Hold the engine speed at 3,000 RPM for one minute.
- Return the engine to idle for five minutes.
- Hold the engine speed at 3,000 RPM for one minute.
- Run the engine until the thermostat opens.
- Remove coolant expansion tank cap, allow float to settle and top-up coolant if required. Install cap.

19. Switch the engine off and allow to cool.

20. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L

Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).


COLD
FILL
RANGE
E46247

21. Check and top-up the coolant if required.

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Auxiliary Heating - Fuel Fired Booster Heater Glow Plug And Burner AssemblyTDV6 2.7L Diesel

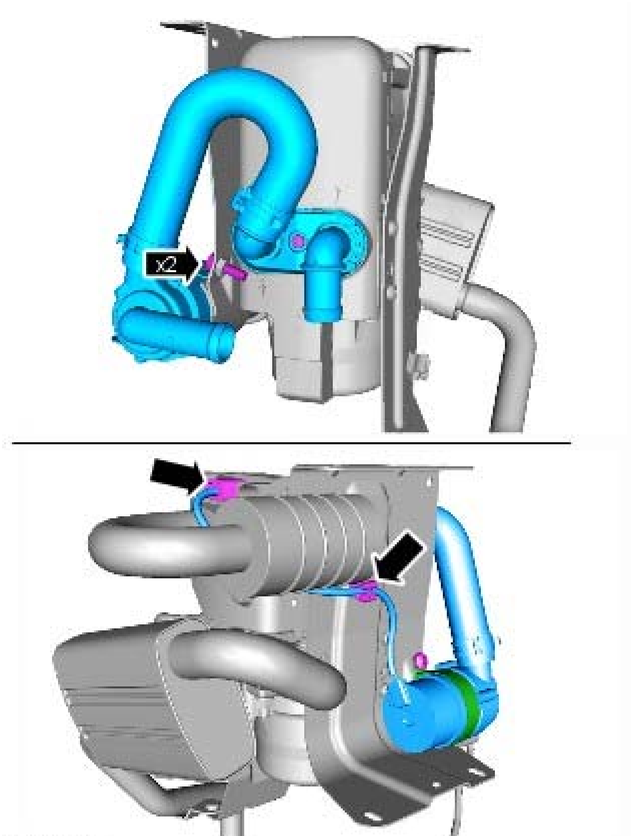
Removal and Installation

Removal

- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

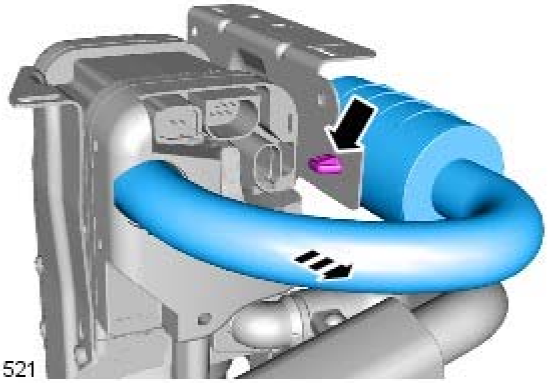
1. Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. **2.** ⚠ WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. Refer to: Fuel Fired Booster Heater - TDV6 2.7L Diesel (412-02B Auxiliary Heating, Removal and Installation).

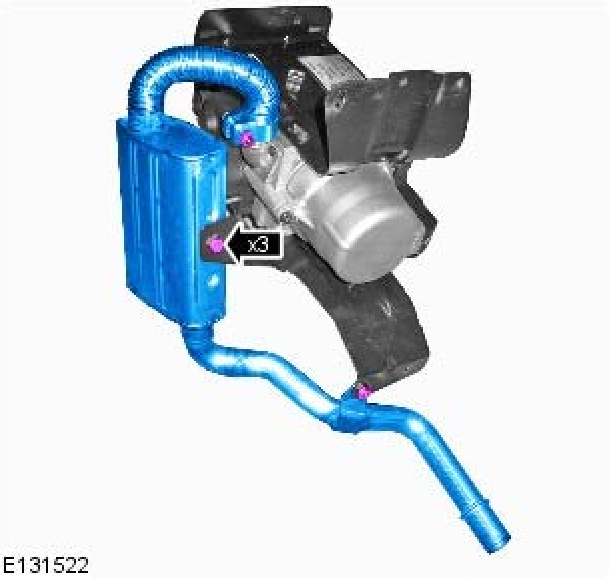


E131520

4. 7.5 Nm

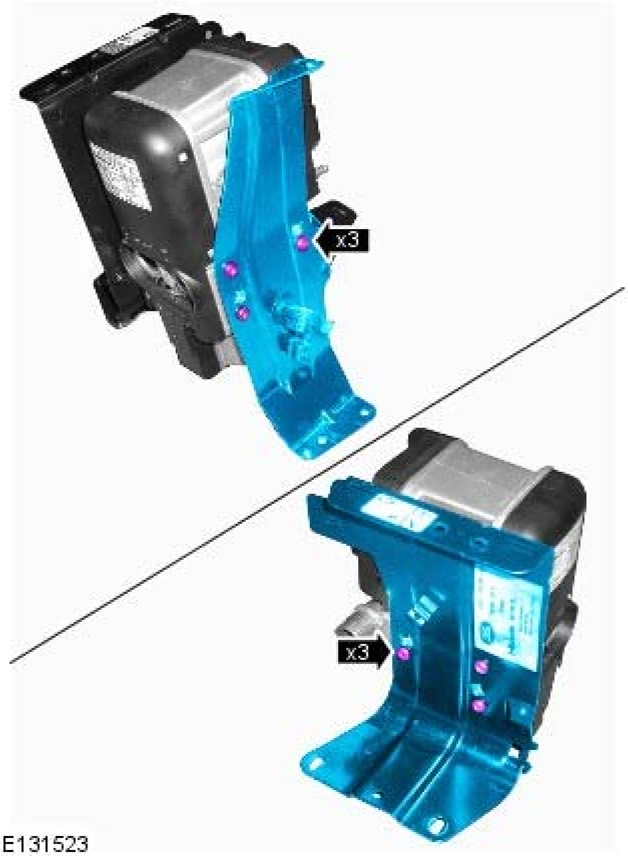

E131521

5.



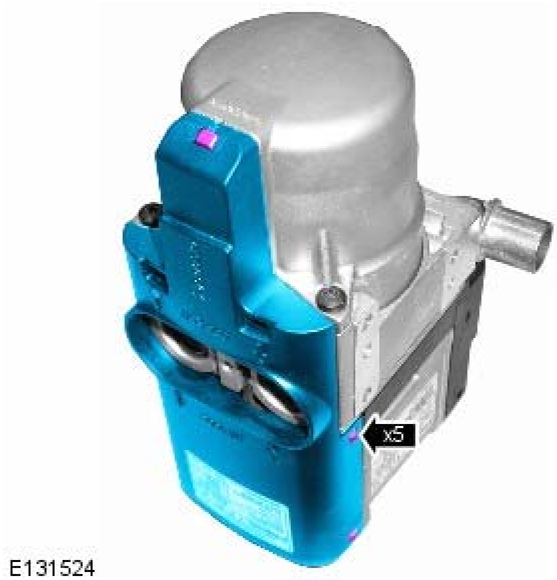
E131522

6. 10 Nm



E131523

7. 10 Nm



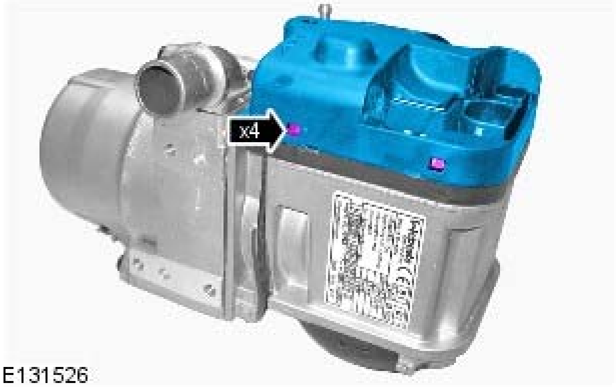
E131524

8.

9.

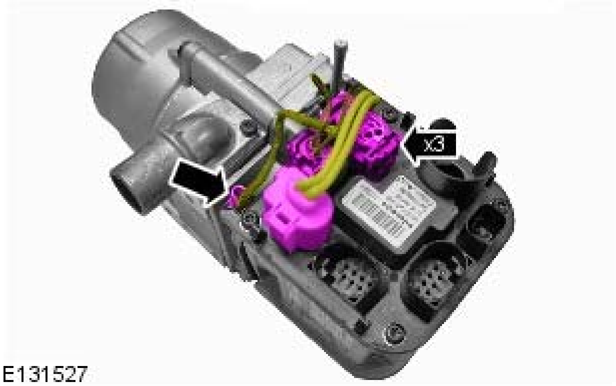
E131525

10.



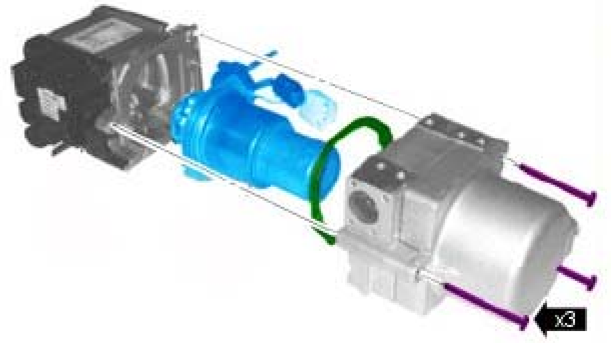
E131526

11.



E131527

12. 7 Nm



E131528

Installation

1. To install, reverse the removal procedure.

2. Refer to: Fuel Fired Booster Heater - TDV6 2.7L Diesel (412-02B Auxiliary Heating, Removal and Installation).

Published: 11-May-2011

Auxiliary Heating - Fuel Fired Booster Heater Glow Plug And Burner AssemblyTDV8 3.6L Diesel

Removal and Installation

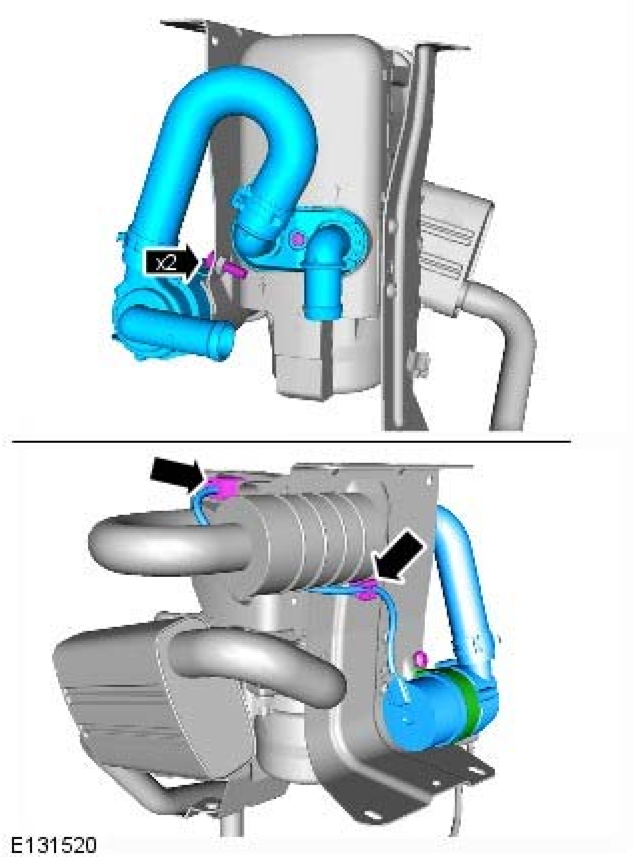
Removal

1. Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

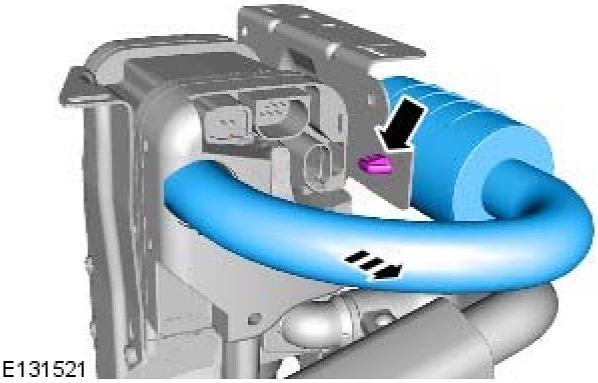
2. **2.** ⚠ WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Fuel Fired Booster Heater - TDV8 3.6L Diesel (412-02B Auxiliary Heating, Removal and Installation).



4. 7.5 Nm



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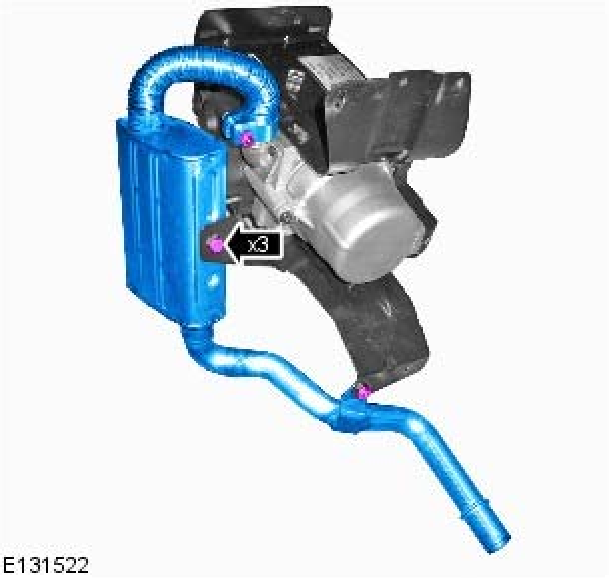
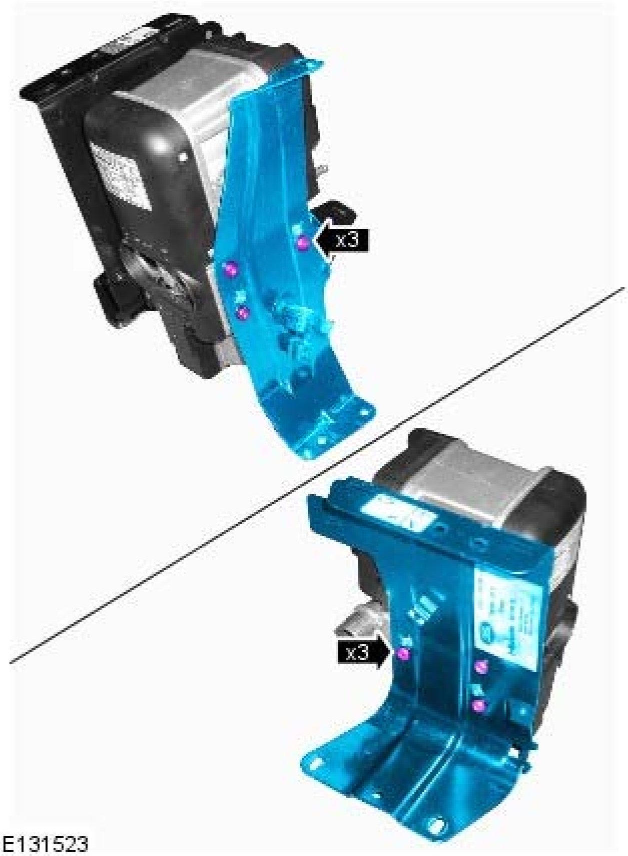
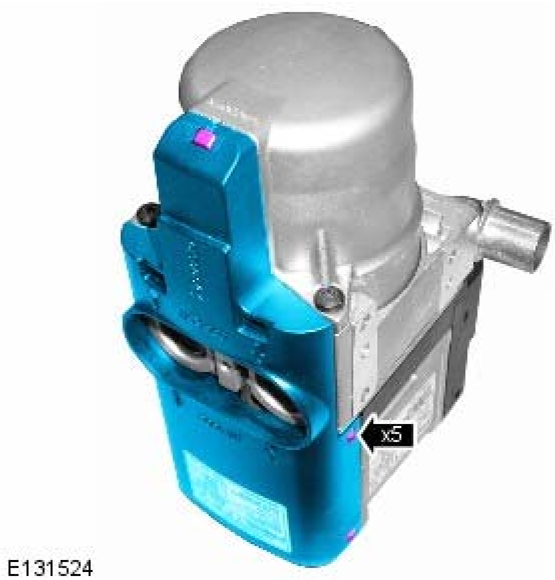


6. 10 Nm



E131523

7. 10 Nm



E131524

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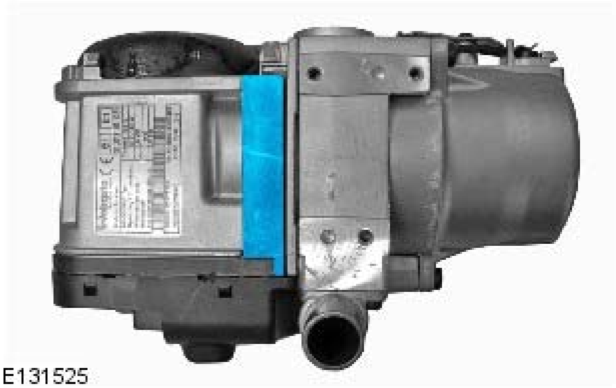
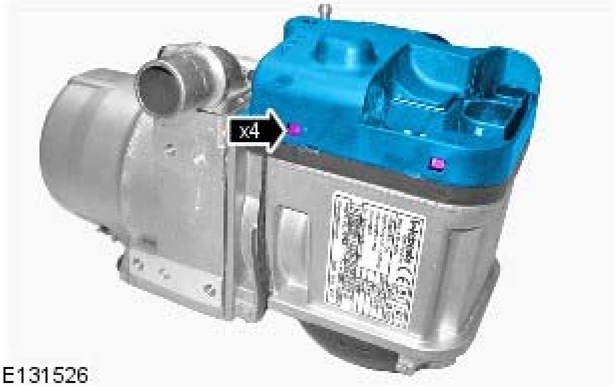

E131525

9.



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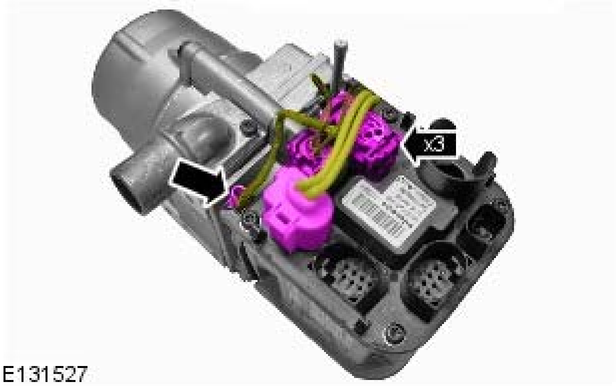

E131527

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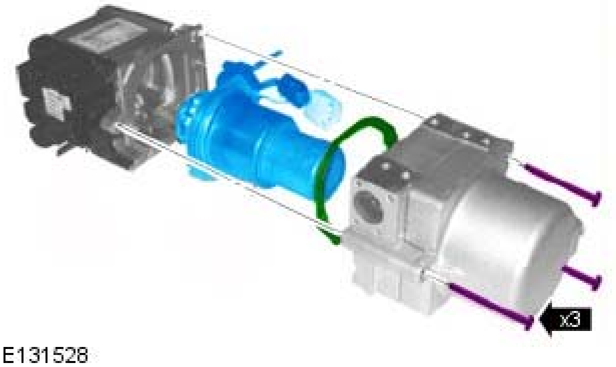

E131528

12. 7 Nm

Installation

1. To install, reverse the removal procedure.
2. Refer to: Fuel Fired Booster Heater - TDV8 3.6L Diesel (412-02B Auxiliary Heating, Removal and Installation).

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Air Conditioning - V8 S/C 4.2L Petrol -

Lubricant

Item	Specification
Compressor oil	Denso ND-8 PAG oil
Total system capacity	130 cm³ (4.5 fluid ounces)
Additional amount of oil to be added to system if a component is replaced:	
Condenser	40 cm³ (1.4 fluid ounces)
Evaporator	40 cm³ (1.4 fluid ounces)
Pipe or hose	10 cm³ (0.35 fluid ounces)

System Refrigerant Specification / Capacity

Item	Specification
Refrigerant type	R134A
Total system capacity	600 grammes (21.16 ounces)

General Specification

Item	Description
Compressor:	
Make	Denso
Type	7SEU17
Sensor locations:	
Ambient temperature sensor	At the front of the vehicle
Smog sensor	At the front of the vehicle adjacent to the ambient temperature sensor
ICS/humidity sensor	On the instrument panel adjacent to the steering column
Solar sensor	On the vehicle centre line on top of the instrument panel
Pressure transducer	In A/C line - LH side of engine compartment

Torque Specifications

Description	Nm	lb-ft
Compressor mounting bolts	25	18
Receiver/drier mounting bolts	10	7
Refrigerant line bolts	6	4
Condenser core bolts	6	4
A/C pipe to condenser bolts	6	4
Coolant expansion tank bolts	10	7
Heater housing to bulkhead Torx bolts	6	4
Adaptor panel nuts	6	4
Air conditioning lines to bulkhead bolt	6	4
Air conditioning lines to body nut	6	4
Instrument panel Torx bolts	25	18
Instrument panel carrier to bulkhead Torx bolt	25	18
* Steering column intermediate shaft nut	22	16
Ground cables to passenger side lower A-pillar nuts	10	7
Ground cables to driver side lower A-pillar nuts	10	7
Pressure transducer	10	7
Power steering pump mounting bracket bolts	25	18
Supercharger radiator bolts	10	7
Thermostatic expansion valve	5	4

*** New nut must be installed**

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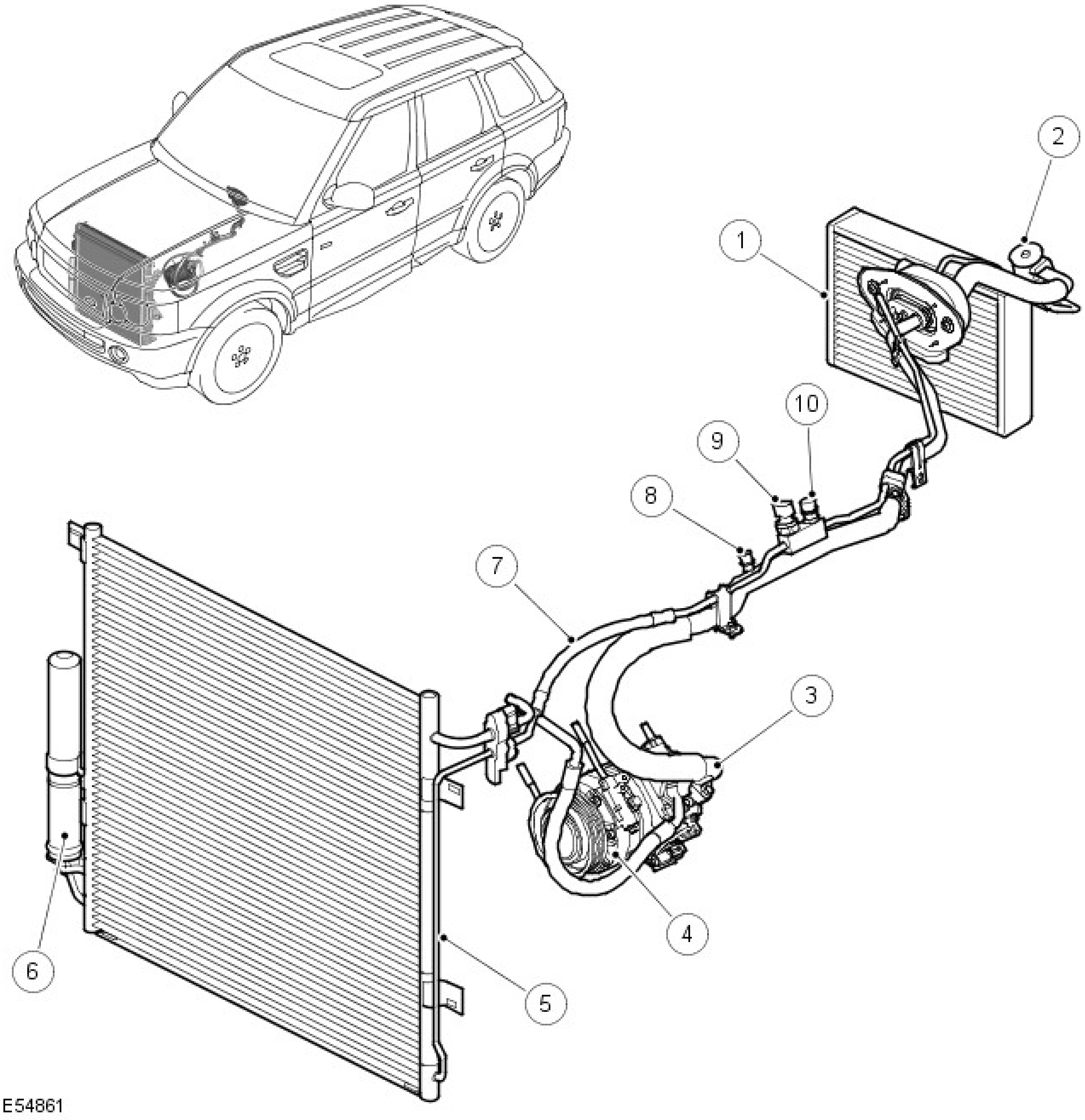
Air Conditioning - V8 S/C 4.2L Petrol - Air Conditioning

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	Evaporator
2	-	Thermostatic expansion valve
3	-	Low pressure line
4	-	air conditioning (A/C) compressor
5	-	Condenser
6	-	Receiver drier
7	-	High pressure line
8	-	Low pressure servicing connection
9	-	Refrigerant pressure sensor (reference)
10	-	High pressure servicing connection

GENERAL

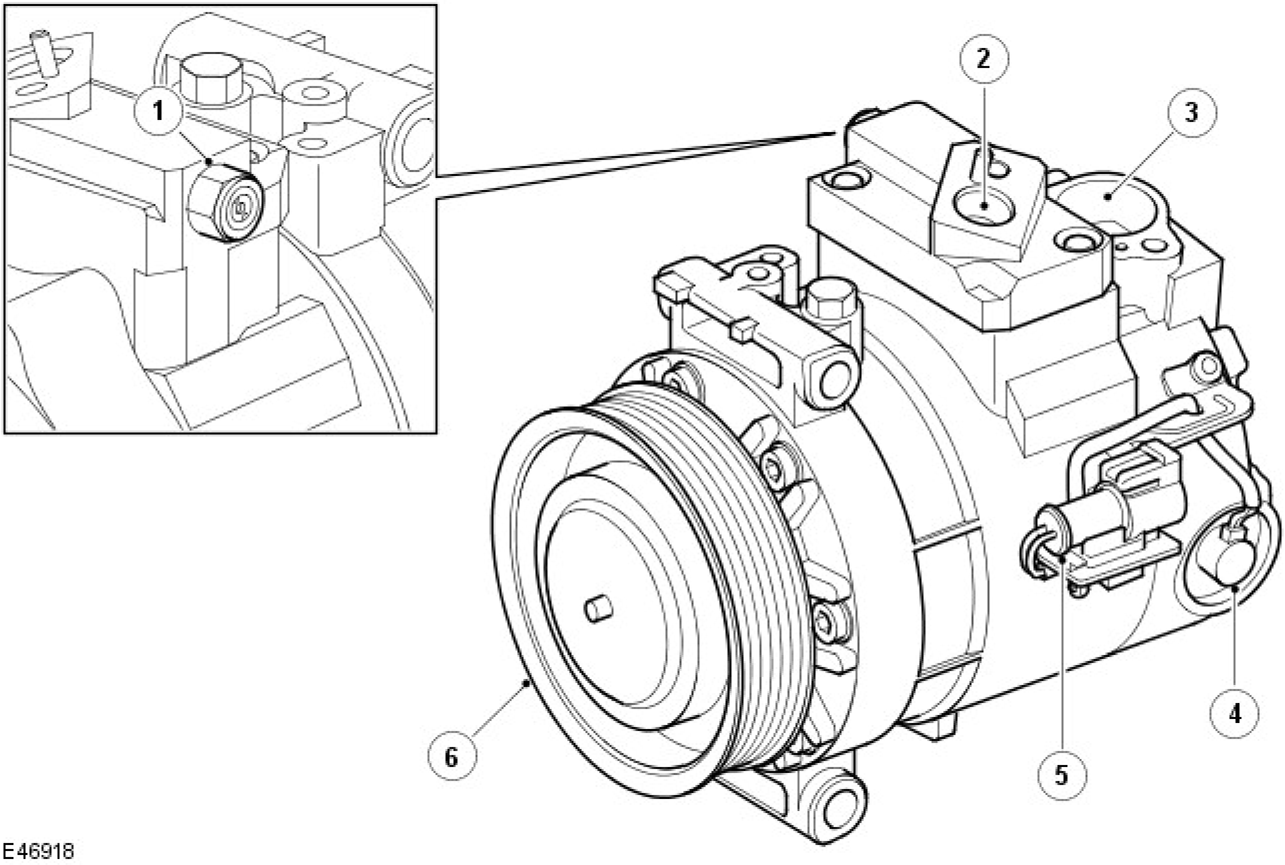
The A/C system transfers heat from the vehicle interior to the outside atmosphere to provide the heater assembly with dehumidified cool air. The system consists of:

- A compressor.
- A condenser.
- A receiver drier.
- A thermostatic expansion valve.
- An evaporator.
- Low and high pressure refrigerant lines.

The system is a sealed, closed loop, filled with a charge weight of R134a refrigerant as the heat transfer medium. Oil is added to the refrigerant to lubricate the internal components of the compressor.

Operation of the air conditioning system is controlled by the automatic temperature control (ATC) module.
For additional information, refer to: Control Components (412-04 Control Components, Description and Operation).

A/C COMPRESSOR

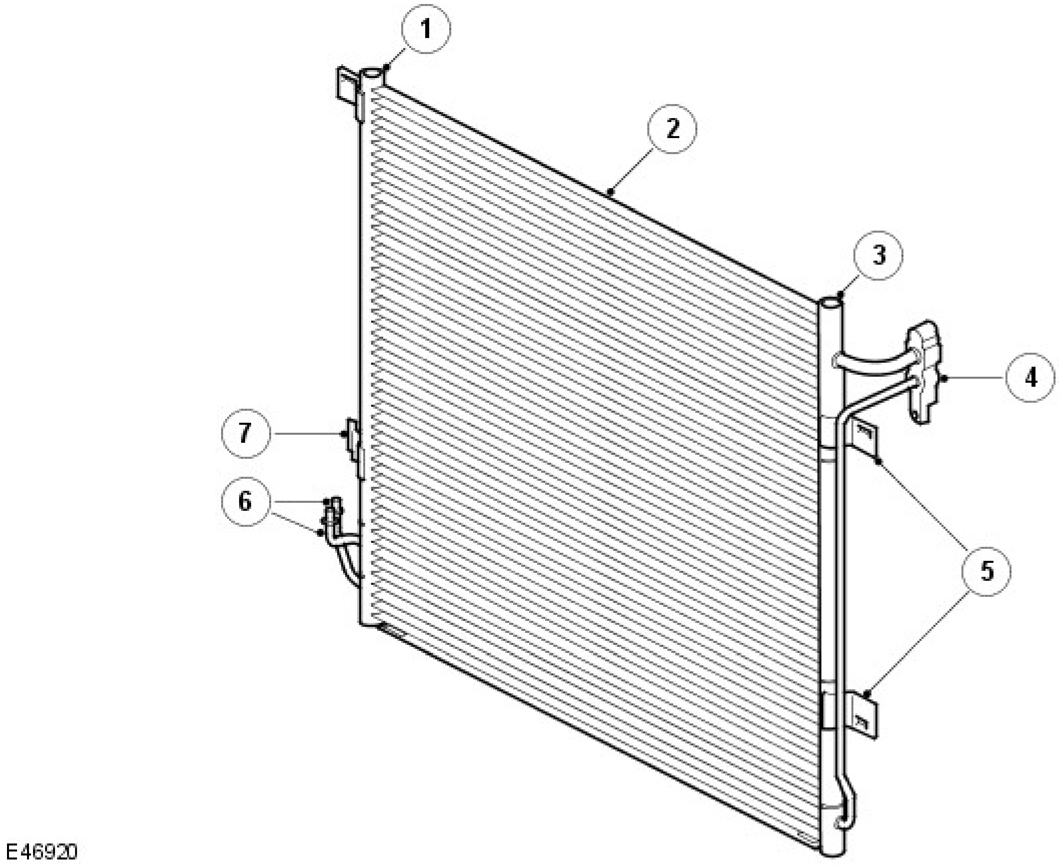


Item	Part Number	Description
1	-	Pressure relief valve
2	-	Outlet port
3	-	Inlet port
4	-	Solenoid valve
5	-	Electrical connector
6	-	Pulley

The A/C compressor circulates the refrigerant around the system by compressing low pressure, low temperature vapor from the evaporator and discharging the resultant high pressure, high temperature vapor to the condenser. The A/C compressors for the different engine types differ due to their individual installation requirements, but are otherwise the same.

The A/C compressor is a permanently engaged, variable displacement unit which is driven by the engine accessory drive belt. To protect the refrigerant system from excessive pressure, a pressure relief valve is installed in the outlet side of the A/C compressor. The pressure relief valve vents excess pressure into the engine compartment.

CONDENSER

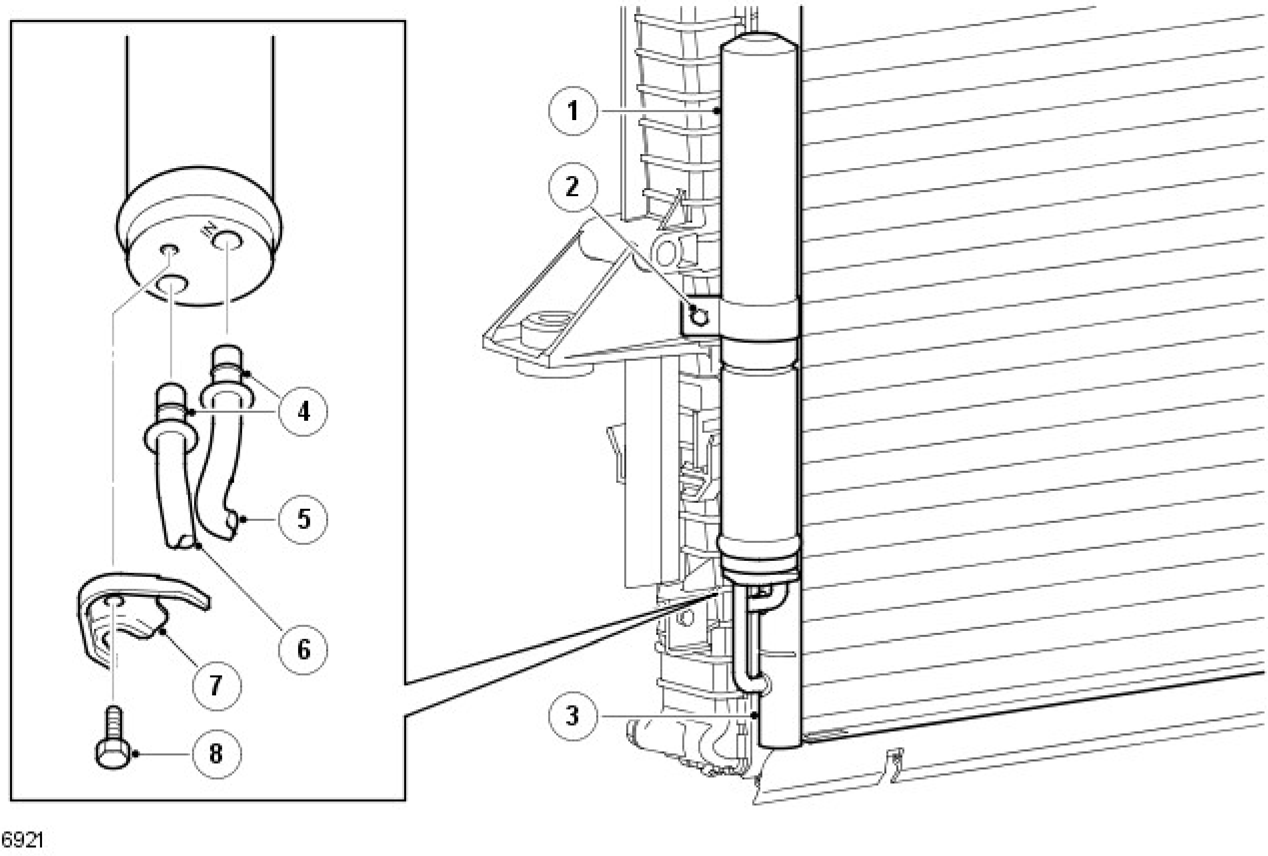


Item	Part Number	Description
1	-	right-hand (RH) end tank
2	-	Condenser core
3	-	left-hand (LH) end tank
4	-	High pressure line connector block
5	-	Condenser attachment brackets
6	-	Receiver drier pipes
7	-	Receiver drier attachment bracket

The condenser transfers heat from the refrigerant to the surrounding air to convert the high pressure vapor from the compressor into a liquid. The condenser is installed immediately in front of the radiator. Two brackets on each end tank of the condenser attach the condenser to clips on the end tanks of the radiator.

The condenser is classified as a sub-cooling condenser and consists of a fin and tube heat exchanger core installed between two end tanks. Divisions in the end tanks separate the heat exchanger into a four pass upper (condenser) section and a two pass lower (sub-cooler) section. A connector block on the left end tank of the condenser provides connections for the high pressure lines from the A/C compressor and the evaporator. Two pipes at the bottom of the right end tank of the condenser provide connections for the receiver drier.

RECEIVER DRIER



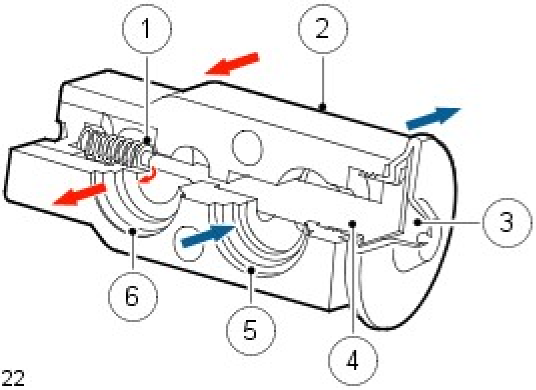
Item	Part Number	Description
1	-	Receiver drier
2	-	Clamp
3	-	Condenser RH end tank
4	-	O-ring seals
5	-	Inlet pipe
6	-	Outlet pipe
7	-	Collar
8	-	Bolt

The receiver drier removes solid impurities and moisture from the refrigerant, and provides a reservoir for liquid refrigerant to accommodate changes of heat load at the evaporator.

The receiver drier is attached to the two stub pipes on the right end tank of the condenser. A collar, located on lands on the stub pipes and secured with a bolt, attaches the stub pipes to the receiver drier. A clamp secures the body of the receiver drier to a bracket welded to the right end tank of the condenser. The inlet and outlet ports of the receiver drier are the same size, so care must be taken to install the receiver drier the correct way round on the stub pipes; to assist with installation, the inlet port is identified with the word IN etched into the receiver drier.

Refrigerant entering the receiver drier passes through a filter and a desiccant pack, then collects in the base of the unit before flowing through the outlet stub pipe back to the condenser. The desiccant and the filter are non-serviceable; the complete unit must be replaced when a change of desiccant is required.

THERMOSTATIC EXPANSION VALVE



E46922

Item	Part Number	Description
1	-	Metering valve
2	-	Housing
3	-	Diaphragm
4	-	Temperature sensitive tube
5	-	Outlet passage from evaporator
6	-	Inlet passage to evaporator

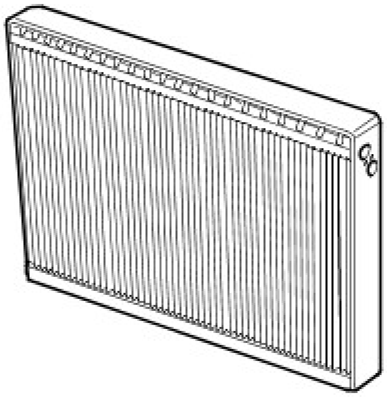
The thermostatic expansion valve meters the flow of refrigerant into the evaporator, to match the refrigerant flow with the heat load of the air passing through the evaporator.

The thermostatic expansion valve is a block type valve located behind the heater assembly, and attached to the inlet and outlet ports of the evaporator. The thermostatic expansion valve consists of an aluminum housing containing inlet and outlet passages. A ball and spring metering valve is installed in the inlet passage and a temperature sensor is installed in the outlet passage. The temperature sensor consists of a temperature sensitive tube connected to a diaphragm. The bottom end of the temperature sensitive tube acts on the ball of the metering valve. Pressure on top of the diaphragm is controlled by evaporator outlet temperature conducted through the temperature sensitive tube. The bottom of the diaphragm senses evaporator outlet pressure.

Liquid refrigerant flows through the metering valve into the evaporator. The restriction across the metering valve reduces the pressure and temperature of the refrigerant. The restriction also changes the liquid stream of refrigerant into a fine spray, to improve the evaporation process. As the refrigerant passes through the evaporator, it absorbs heat from the air flowing through the evaporator. The increase in temperature causes the refrigerant to vaporize and increase in pressure.

The temperature and pressure of the refrigerant leaving the evaporator act on the diaphragm and temperature sensitive tube, which regulate the metering valve opening and so control the volume of refrigerant flowing through the evaporator. The warmer the air flowing through the evaporator, the more heat available to evaporate refrigerant and thus the greater the volume of refrigerant allowed through the metering valve.

EVAPORATOR



E46923

The evaporator is installed in the heater assembly between the blower and the heater matrix, to absorb heat from the exterior or recirculated air. Low pressure, low temperature refrigerant changes from liquid to vapor in the evaporator, absorbing large quantities of heat as it changes state.

Most of the moisture in the air passing through the evaporator condenses into water, which drains out of the heater and through the floorpan, to the underside of the vehicle, through two drain tubes.

REFRIGERANT LINES

To maintain similar flow velocities around the system, the diameter of the refrigerant lines varies to suit the two pressure/temperature regimes. The larger diameters are installed in the low pressure/temperature regime and the smaller diameters are installed in the high pressure/temperature regime.

Low and high pressure charging connections are incorporated into the refrigerant lines for system servicing.

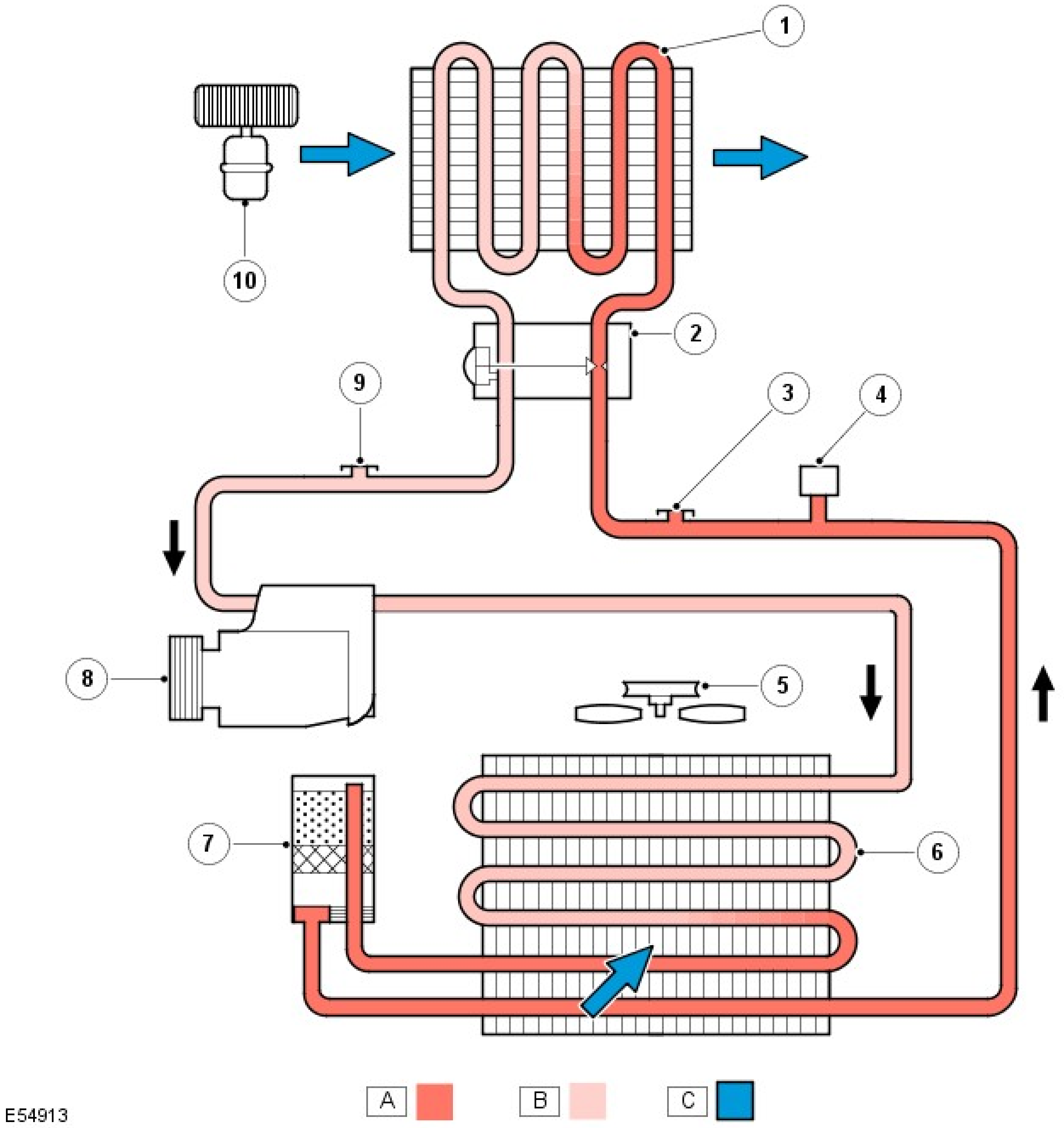
Under normal operating conditions, the smaller diameter pipes (A/C compressor discharge, liquid refrigerant) are hot to the touch and the larger diameter pipes (A/C compressor suction, gaseous refrigerant) are cold to the touch.

SYSTEM OPERATION

To accomplish the transfer of heat, the refrigerant is circulated around the system, where it passes through two pressure/temperature regimes. In each of the pressure/temperature regimes, the refrigerant changes state, during which process maximum heat absorption or release occurs. The low pressure/temperature regime is from the thermostatic expansion valve, through the evaporator to the compressor; the refrigerant decreases in pressure and temperature at the thermostatic expansion valve, then changes state from liquid to vapor in the evaporator, to absorb heat. The high pressure/temperature regime is from the compressor, through the condenser and receiver drier to the thermostatic expansion valve; the refrigerant increases in pressure and temperature as it passes through the compressor, then releases heat and changes state from vapor to liquid in the condenser.

A/C SYSTEM SCHEMATIC

- NOTE: A = Refrigerant liquid; B = Refrigerant vapor; C = Air flow



Item	Part Number	Description
1	-	Evaporator
2	-	Thermostatic expansion valve
3	-	High pressure servicing connection
4	-	Refrigerant pressure sensor
5	-	Cooling fan
6	-	Condenser
7	-	Receiver drier
8	-	A/C compressor
9	-	Low pressure servicing connection
10	-	Blower

Published: 11-May-2011

Air Conditioning - V8 S/C 4.2L Petrol - Air Conditioning

Diagnosis and Testing

Overview

Due to the different equipment available in dealers, there are no specifics as to the connection of gauge sets or charging and recovery stations. Refer to the instructions for the equipment in use in your own workshop.

For information on the description and operation of the system, refer to section 412-03 - Air Conditioning in the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Auxiliary drive belt condition and tension ● Compressor condition and installation ● Condenser condition and installation/blockage ● Air conditioning hoses and pipes ● Receiver/drier condition and installation ● Cooling fan	● Fuses ● Harnesses ● Electrical connector(s) ● Relays ● Sensors ● Control panel(s) ● Air conditioning compressor

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom chart

Symptom	Possible causes	Action
Poor or no cooling	● Drive belt fault ● Compressor fault ● Distribution motor/flap fault ● Refrigerant leak ● In-vehicle temperature sensor fault ● Refrigerant pressure sensor fault	Check the drive belt condition and tension (see visual inspection). Check the compressor operation (observe the compressor as the engine is idling with the air conditioning switched on. If the compressor runs erratically or does not run. Carry out the distribution motor self test. Refer to the relevant workshop manual section. Check for sensor DTCs. Refer to the DTC index. Check the refrigerant system using your charging station.
Noise	● Drive belt fault ● Compressor fault ● Compressor pulley fouling ● Refrigerant overcharged	Confirm the air conditioning as the source of the noise by listening for the noise with the air conditioning switched off. Refer to the relevant workshop manual section. Check the refrigerant system using your charging station.
Water entry into cabin	● Heater matrix leak ● Blocked evaporator drain tubes	Check for coolant loss. Pressure test the cooling system as necessary. Check and clear the evaporator drain tubes as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible cause	Action
B1A6111	Cabin Temperature Sensor	● Ambient air temperature sensor signal short circuit to ground	Refer to the electrical guides and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6115	In-Vehicle Temperature Sensor Signal	● Ambient air temperature sensor signal high resistance ● In-vehicle temperature sensor signal short circuit to power	Refer to the electrical guides and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6211	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to ground	Refer to the electrical guides and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6215	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to power	Refer to the electrical guides and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A7001	Compressor Solenoid +ve Supply	● Refrigerant solenoid valve power circuit short circuit to ground ● Refrigerant solenoid valve power circuit short circuit to power ● Refrigerant solenoid valve over temperature	Refer to the electrical guides and check the refrigerant solenoid circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7884	System Pressure	● Pressure signal below allowable range ● Refrigerant leak	Check for pressure sensor DTcs. Check the refrigerant system using a suitable charging station.
B1B7885	System Pressure	● Pressure signal above allowable range ● Condenser fault ● Cooling fan fault	Check for pressure sensor DTcs. Check the condenser for damage/restriction and the cooling fan operation. Check the refrigerant system using a suitable charging station.

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Air Conditioning - V8 S/C 4.2L Petrol - Air Conditioning (A/C) Compressor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Recover the A/C refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the LH front wheel.

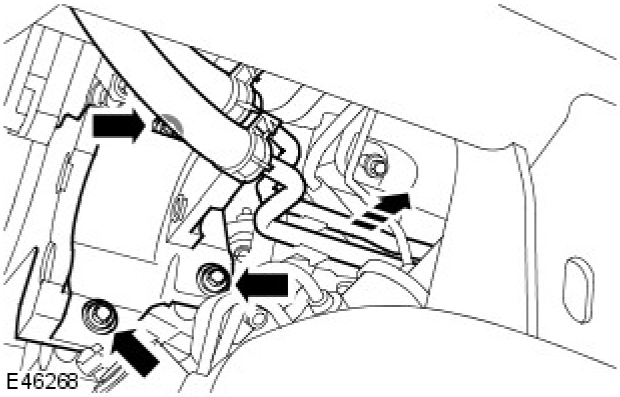
5. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

6. Remove the power steering pump.
For additional information, refer to: Power Steering Pump - V8 S/C 4.2L Petrol (211-02 Power Steering, Removal and Installation).

7. Release the transmission cooler pipe clips.

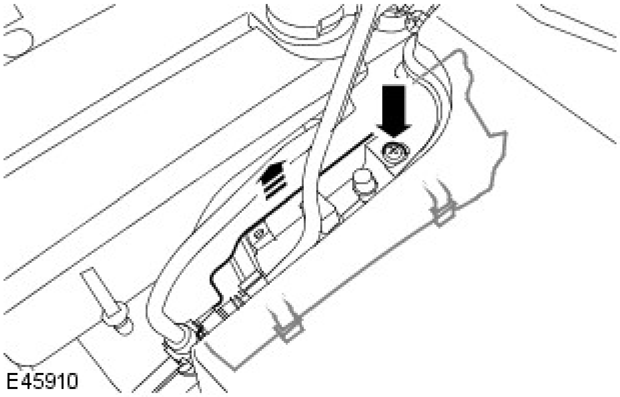
8. Remove the power steering pump mounting bracket.

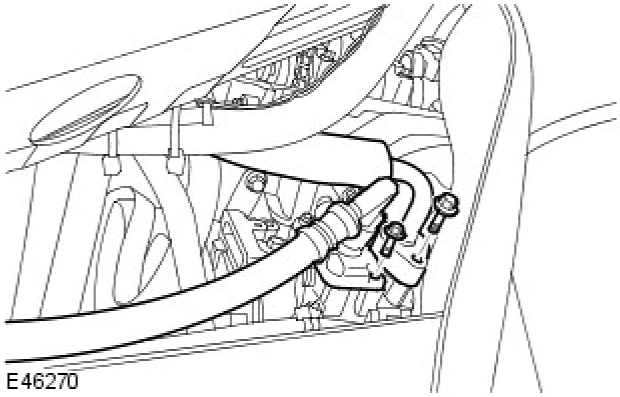
- Remove the 3 bolts.



9. Remove the engine compartment LH upper heat shield.

- Remove the screw.
- Release the 2 mounting clips.



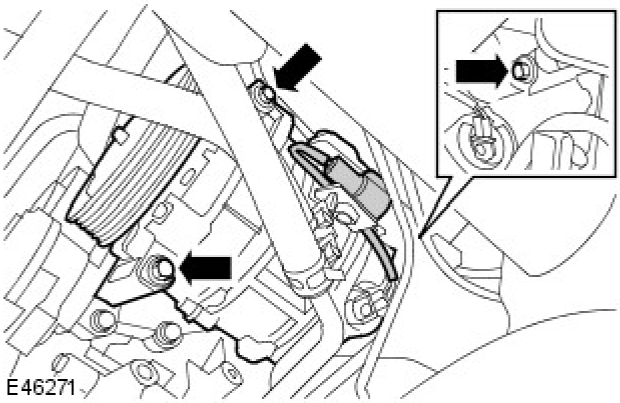


10. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Disconnect the refrigerant lines from the A/C compressor.

- Remove the 2 bolts.
- Remove and discard the O-ring seal.

11. Disconnect the A/C clutch electrical connector.



12. ⚠ CAUTION: Always plug any open connections to prevent contamination.

Remove the A/C compressor.

- Remove the 3 bolts.

Installation

1. Install the A/C compressor.

- If a new compressor is being installed, the required amount of refrigerant oil must be drained from it.
- Tighten the bolts to 25 Nm (18 lb.ft).

2. Connect the A/C clutch electrical connector.

3. Connect the refrigerant lines.

- Clean the component mating faces.
- Install the new O-ring seals.

4. Install the engine compartment upper LH heat shield.

5. Install the power steering pump mounting bracket.

- Tighten the bolts to 25 Nm (18 lb.ft).

6. Install the power steering pump.
For additional information, refer to: Power Steering Pump - V8 S/C 4.2L Petrol (211-02 Power Steering, Removal and Installation).

7. Secure the transmission cooler pipes into clips.

8. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

9. Install the front wheel.

- Tighten the nuts to 115 Nm (85 lb.ft).

10. Fill the A/C system.
For additional information, refer to: Air Conditioning (A/C) System

Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

11. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Air Conditioning - V8 S/C 4.2L Petrol - Evaporator Core

Removal and Installation

Removal

1. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Evacuate the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

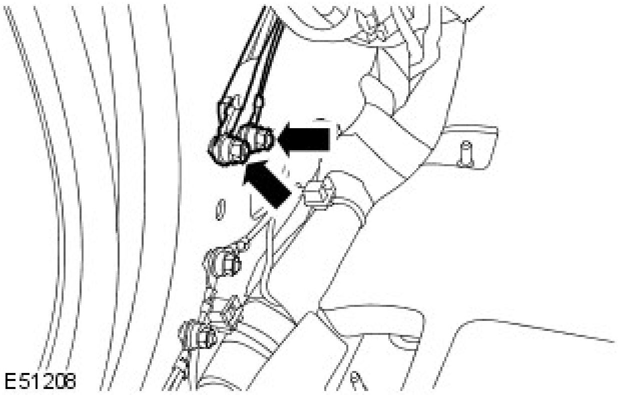
4. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

5. Remove the driver side front seat.
For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

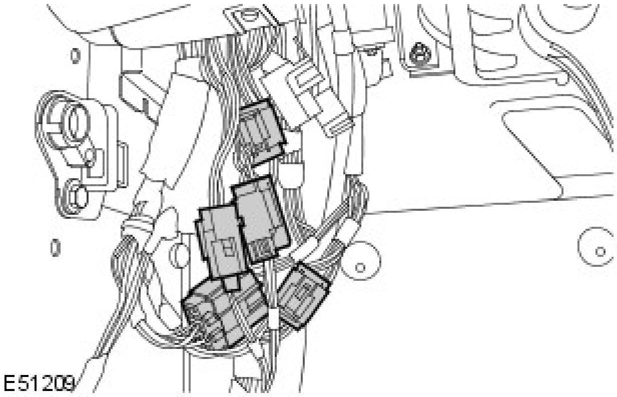
6. Remove the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

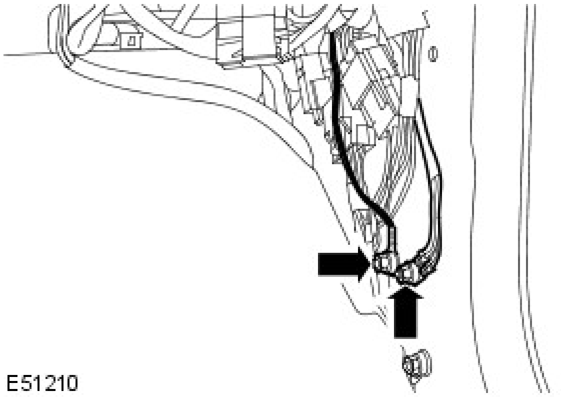
7. Release the 3 ground cables from the driver side lower A-pillar.

- Remove the 2 nuts.



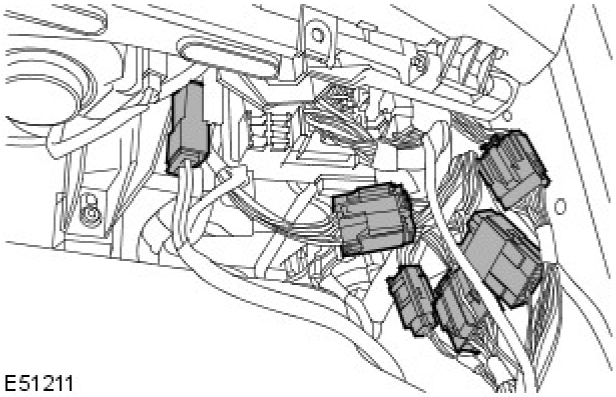
8. Disconnect the 5 electrical connectors from the driver side lower A-pillar.



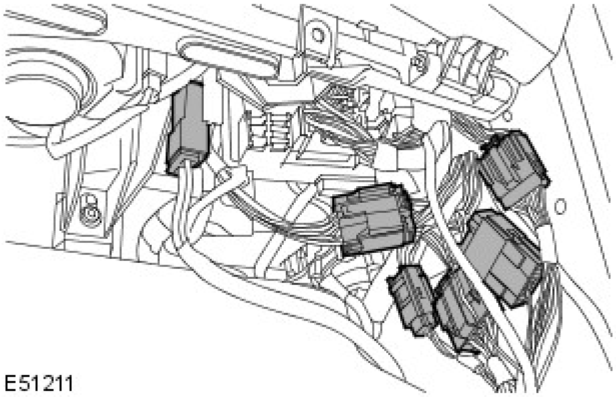


9. Release the 3 ground cables from the passenger side lower A-pillar.

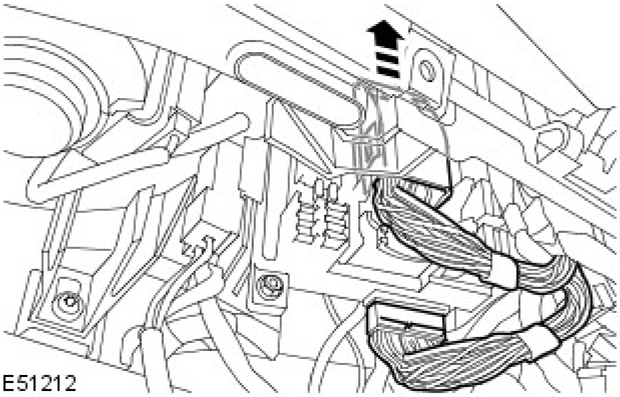
- Remove the 2 nuts.



10. Disconnect the 5 electrical connectors from the passenger side lower A-pillar.

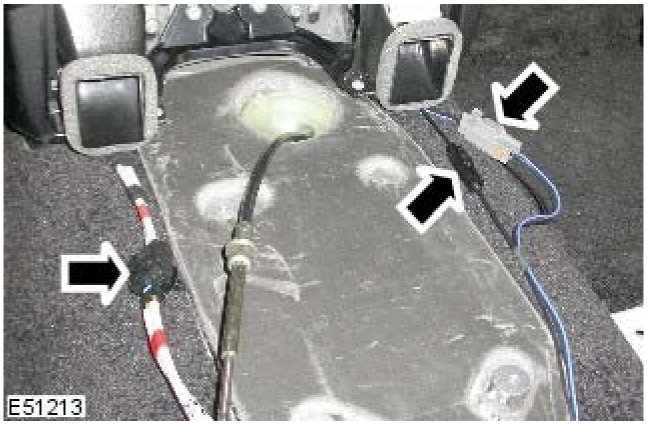


11. Disconnect the heater motor electrical connector.



12. Disconnect 2 central junction box (CJB) electrical connectors.

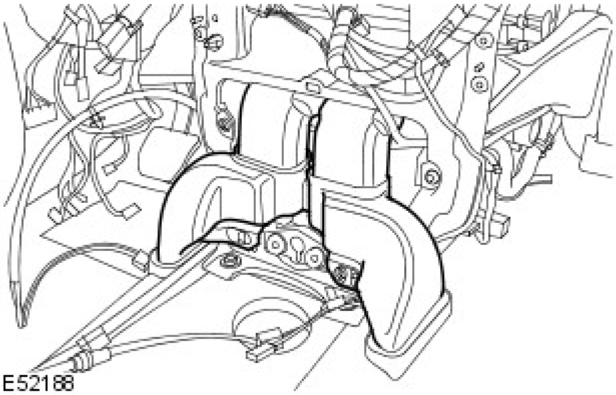
13. Disconnect 2 electrical connectors from the instrument panel center reinforcement.



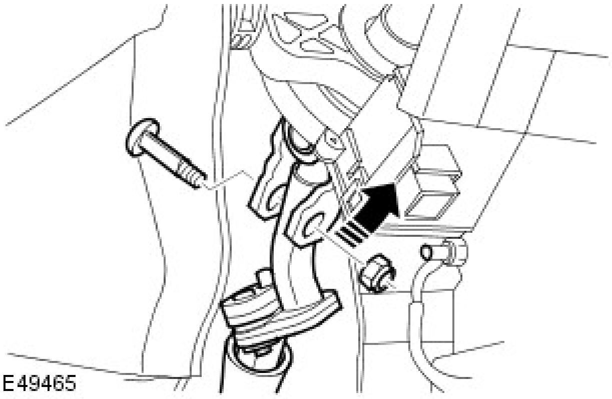
14. ⚠ CAUTION: Cover fibre optic cable connectors to minimise dust ingress and avoid bending the cables in a radius of less than 30 mm.

If installed, disconnect the instrument panel center reinforcement fibre optic cables.

- Disconnect the electrical connector.

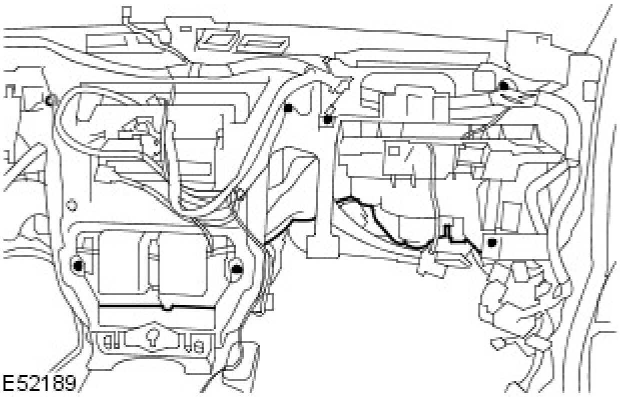


15. Remove the heater housing center ducts.



16. Disconnect the steering column intermediate shaft from the steering column.

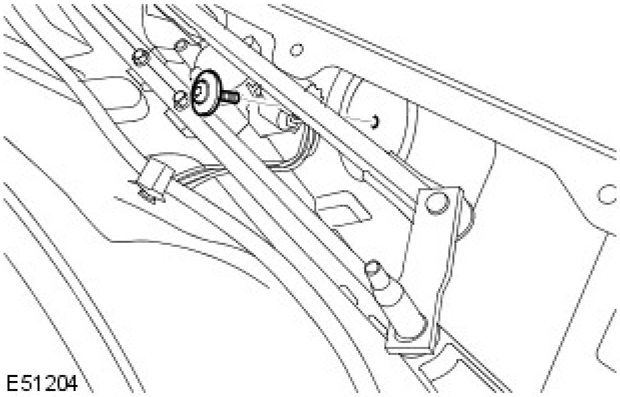
- Note the fitted position.
- Remove the special bolt and discard the nut.



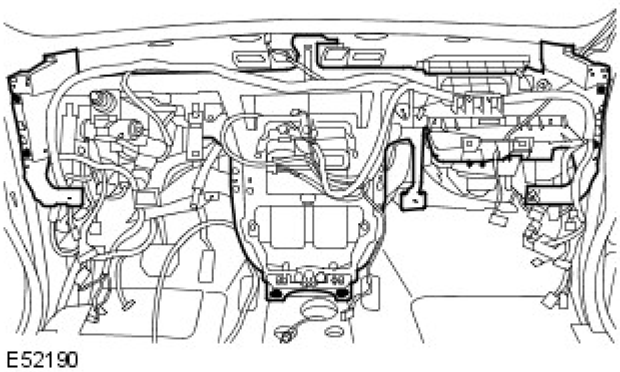
17. Release the heater housing from the instrument panel carrier.

- Remove the 7 Torx screws.

18. Remove the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

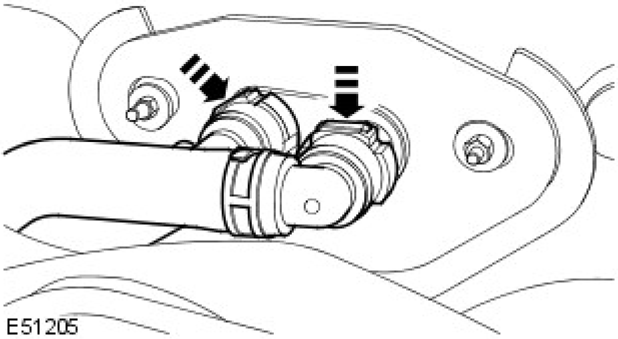


19. Remove the instrument panel carrier to bulkhead Torx bolt.



20. With assistance, remove the instrument panel.

- Remove the 6 Torx bolts.



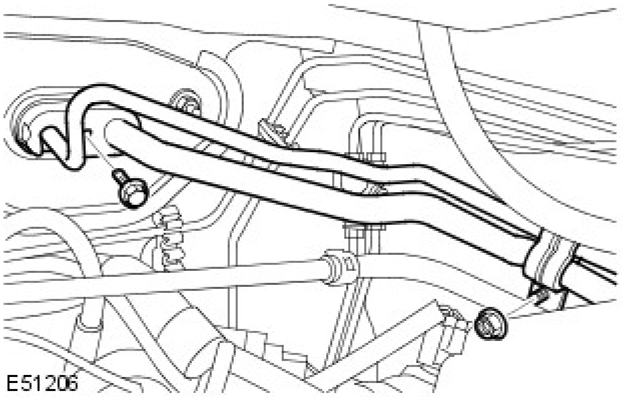
21. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect 2 heater hoses from the bulkhead.

- Release the clips.

22. Release 2 A/C lines from the body.

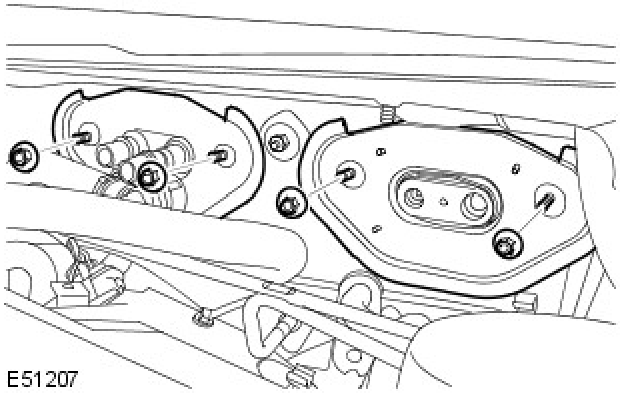
- Remove the nut.



23. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

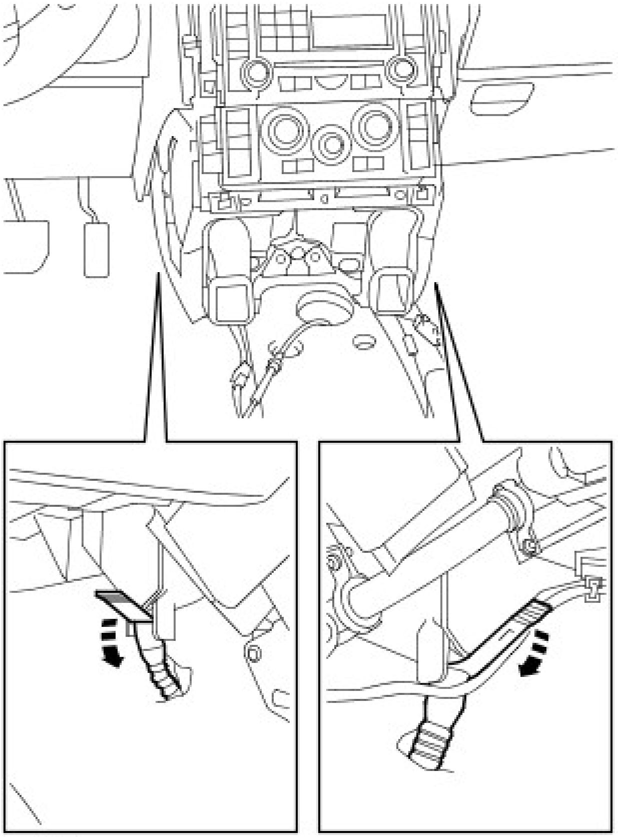
Release 2 A/C lines from the bulkhead.

- Remove the bolt.
- Remove and discard the O-ring seals.



24. Remove the 2 adaptor panels.

- Remove the 4 nuts.



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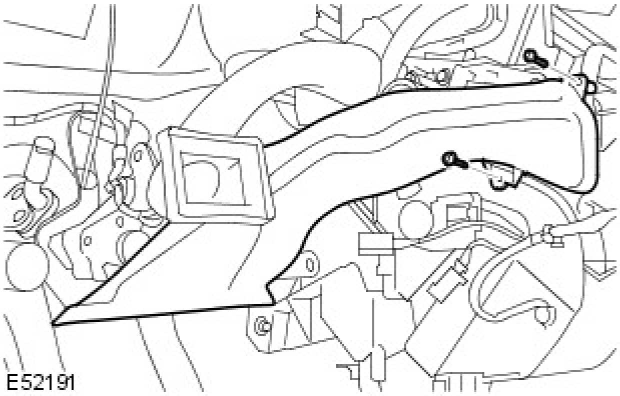
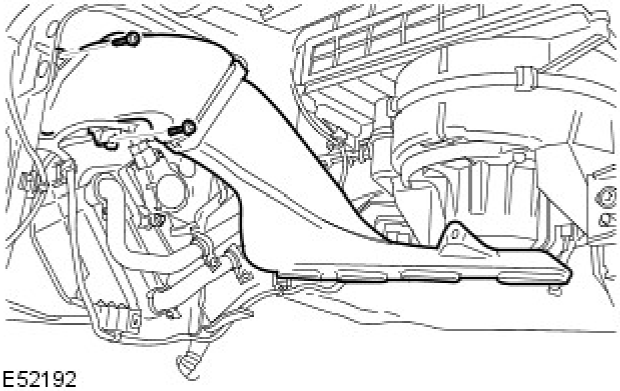
25. Disconnect 2 drain tubes from the heater housing.



E52191

26. Remove the driver side footwell duct.

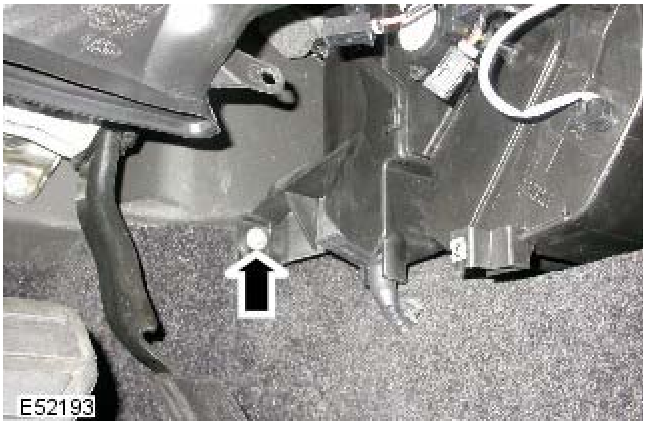
- Remove the 2 Torx screws.



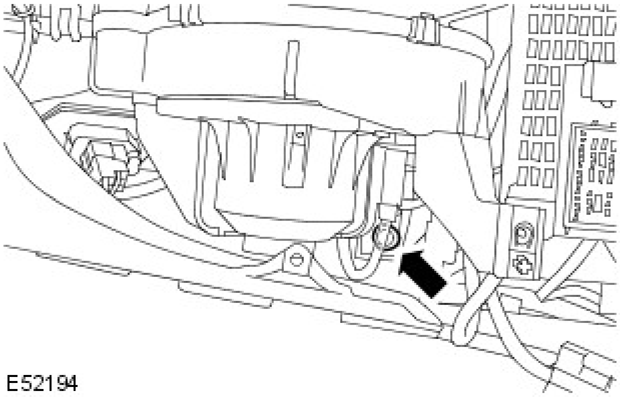
E52192

27. Remove the passenger side footwell duct.

- Remove the 2 Torx screws.



28. Driver side: Remove the heater housing to bulkhead Torx bolt.

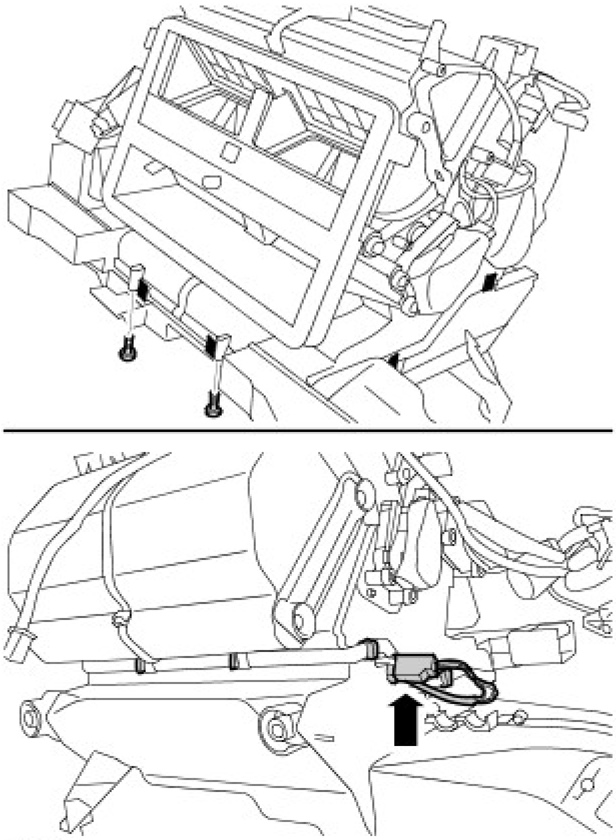


29. Passenger side: Remove the heater housing to bulkhead Torx bolt.

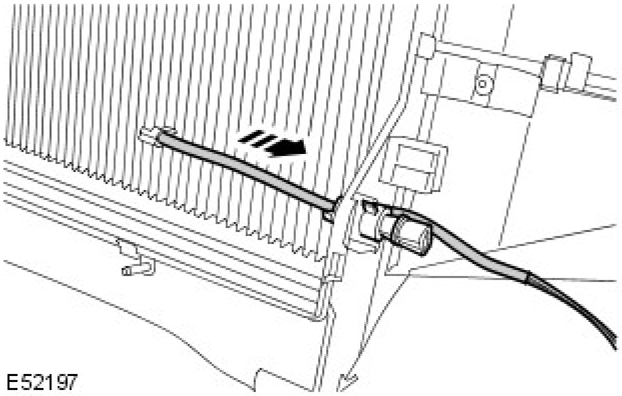
30. Remove the heater housing.

31. Disconnect the evaporator core temperature sensor electrical connector.

32. Release the heater core housing.
  - Remove the 2 screws.
  - Remove the 8 clips.


E52196

33. Remove the evaporator core.
  - Release the temperature sensor.


E52197

Installation

1. Install the evaporator core.
  - Secure the temperature sensor.
2. Secure the heater core housing.
  - Install the clips.
  - Tighten the screws.
3. Connect the temperature sensor electrical connector.
4. Install the heater housing.
5. Passenger side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

6. Driver side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

7. Install the footwell ducts.

- Tighten the Torx screws.

8. Connect the drain tubes to the heater housing.

9. Install the adaptor panels.

- Tighten the nuts to 6 Nm (4 lb.ft).

10. Secure the A/C lines to the bulkhead.

- Clean the components.
- Install new O-ring seals.
- Tighten the bolt to 6 Nm (4 lb.ft).

11. Secure the A/C lines to the body.

- Tighten the nut to 6 Nm (4 lb.ft).

12. Connect the bulkhead heater hoses.

13. With assistance, install the instrument panel.

- Tighten the Torx bolts to 25 Nm (18 lb.ft).

14. Install the instrument panel carrier to bulkhead Torx bolt and tighten to 25 Nm (18 lb.ft).

15. Install the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

16. Secure the heater housing.

- Tighten the screws.

17. Connect the steering column intermediate shaft.

- Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).

18. Install the heater housing center ducts.

19. Connect the instrument panel center reinforcement fibre optic cables.

20. Connect the instrument panel center reinforcement electrical connectors.

21. Connect the CJB electrical connectors.

22. Connect the heater motor electrical connector.

23. Connect the electrical connectors to the passenger side lower A-pillar.

24. Connect the ground cables to the passenger side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

25. Connect the electrical connectors to the driver side lower A-pillar.

26. Connect the ground cables to the driver side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

27. Install the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper

Section (501-12 Instrument Panel and Console, Removal and Installation).

28. Install the front seat.
For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

29. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

30. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - V8 S/C 4.2L Petrol, General Procedures).

31. Install the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

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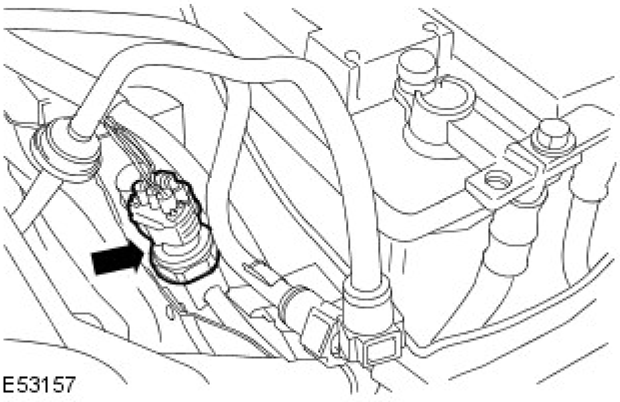
Air Conditioning - V8 S/C 4.2L Petrol - Air Conditioning (A/C) Pressure Transducer

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Recover the A/C refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).



3. CAUTIONS:

⚠ Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

⚠ To prevent damage to components, use an additional wrench when loosening or tightening unions.

Remove the A/C pressure transducer.

- Disconnect the electrical connector.
- Remove and discard the seal.

Installation

1. Install the A/C pressure transducer.

- Clean the component mating faces.
- Install a new seal.
- Tighten the transducer to 10 Nm (7 lb.ft).
- Connect the electrical connector.

2. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Air Conditioning - V8 S/C 4.2L Petrol - Condenser Core

Removal and Installation

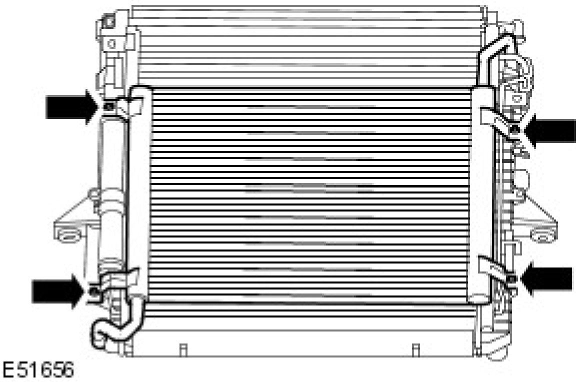
Removal

• NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

• NOTE: Always protect the cooling pack elements to prevent accidental damage.

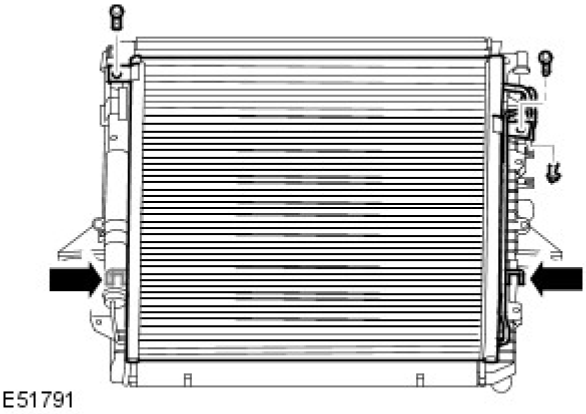
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the radiator assembly.
For additional information, refer to: Radiator (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).



3. Remove the supercharger radiator.

- Remove the 4 bolts.



4. NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

Remove the condenser core.

- Remove the 2 screws.
- Release the 2 clips.
- Remove the bolt.

Installation

1. Install the condenser core.

- Align the condenser core.
- Secure the clips.
- Install the screws.
- Tighten the bolt to 6 Nm (4 lb.ft).

2. Install the supercharger radiator.

- Install the 4 bolts and tighten to 10 Nm (7 lb.ft).

3. Install the radiator assembly.
For additional information, refer to: Radiator (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

4. Install the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Air Conditioning - V8 S/C 4.2L Petrol - Receiver Drier

Removal and Installation

Removal

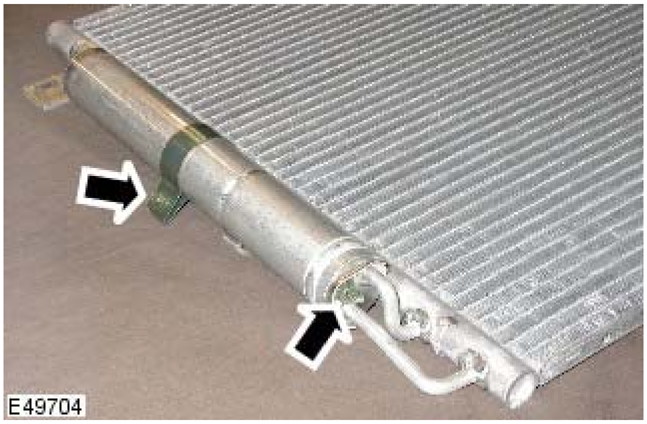
• NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

1. Disconnect the battery ground cable.

2. Remove the condenser core.
For additional information, refer to: Condenser Core (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Removal and Installation).

3. Remove the receiver drier support bracket clamp.

- Loosen the screw.


E49704

4. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Remove the receiver drier.

- Remove the bolt.
- Remove the clamp.
- Remove and discard the 2 O-ring seals.

Installation

1. Install the receiver drier.

- Clean the component mating faces.
- Install new O-ring seals.
- Install the clamp.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. Install the condenser core.
For additional information, refer to: Condenser Core (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Removal and Installation).

3. Connect the battery ground cable.

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Air Conditioning - V8 S/C 4.2L Petrol - Thermostatic Expansion Valve

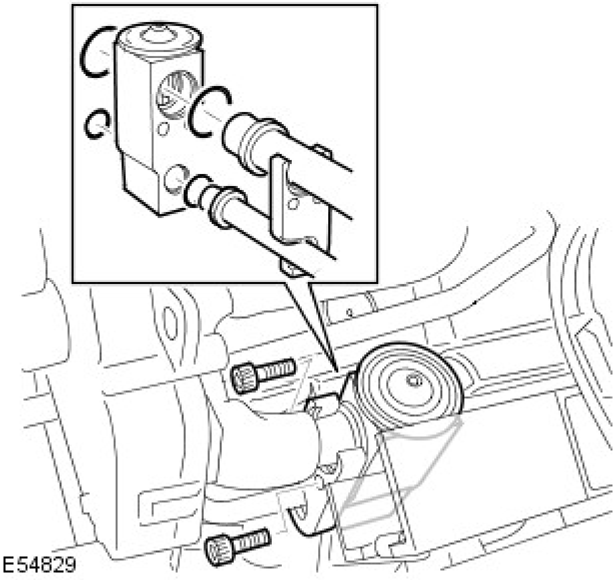
Removal and Installation

Removal

1. Evacuate the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

2. Remove the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

3. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.



Remove the thermostatic expansion valve.

- Remove the cover.
- Remove the 2 Allen bolts.
- Remove and discard the 4 O-ring seals.

Installation

1. Install the thermostatic expansion valve.

- Clean the components.
- Install the new O-ring seals.
- Tighten the Allen bolts to 5 Nm (4 lb.ft).
- Install the cover.

2. Install the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

3. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

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Air Conditioning - V8 S/C 4.2L Petrol - Air Conditioning (A/C) Compressor Pulley

Removal and Installation

Removal

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

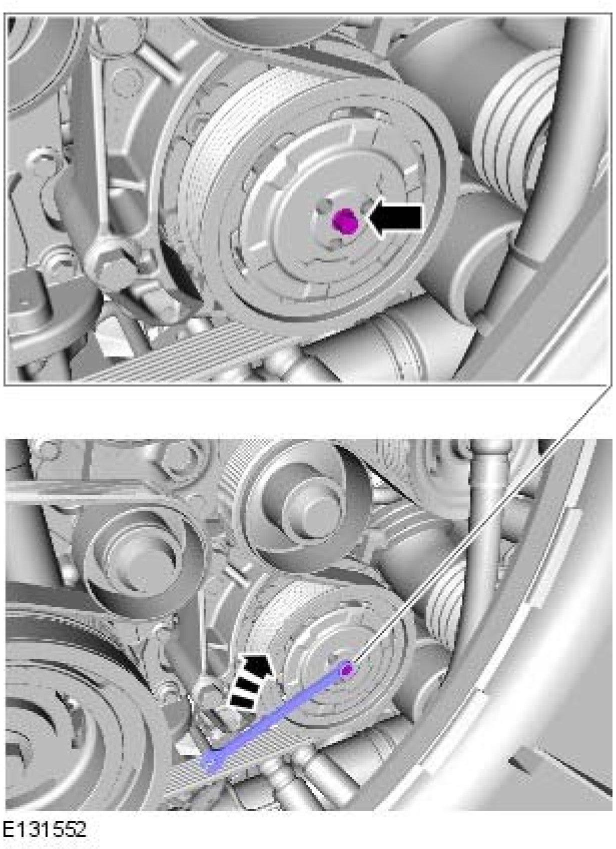
- NOTE: Components removed for clarity.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the cooling fan.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

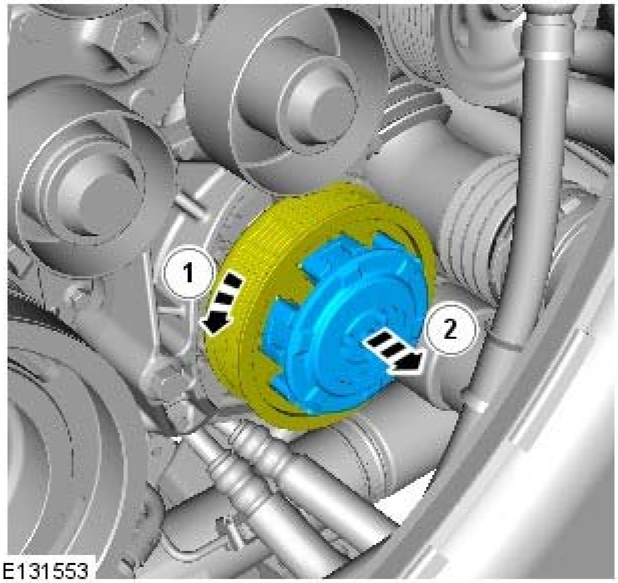
3. Using a suitable tool, release the hub locking stud.

- Rotate the fixing clockwise to release the hub.
- If required, use a suitable tool to prevent the hub from rotating.



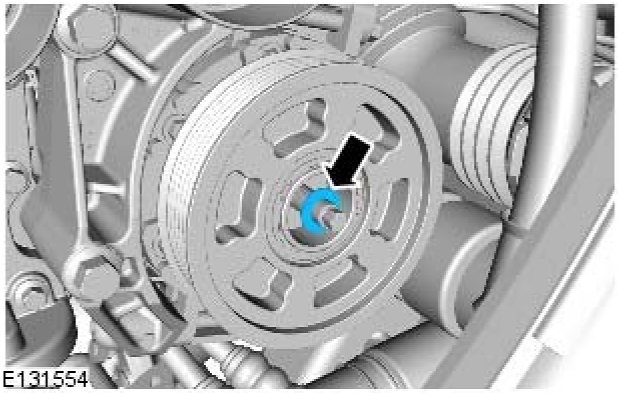
4. NOTE: Using a 3/8 square drive wrench, rotate the tensioner counter clockwise.

Release the accessory drive belt from the A/C compressor pulley.

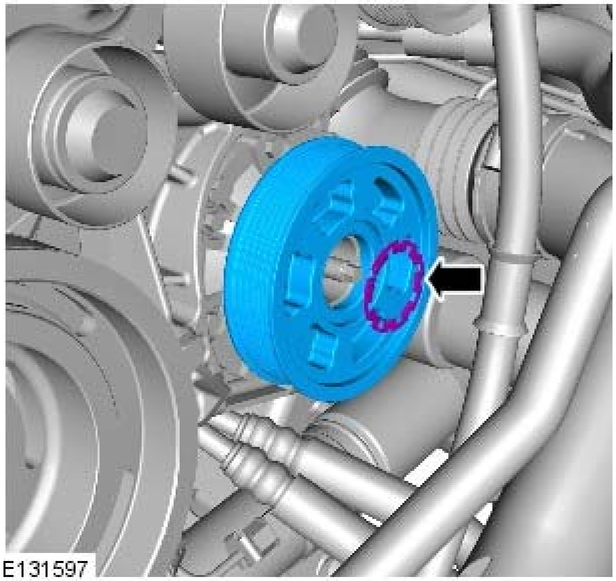


5. Remove and discard the hub assembly.

- Rotate the pulley counter-clockwise, until the hub is released from the pulley.
- Discard the rubber dampers.



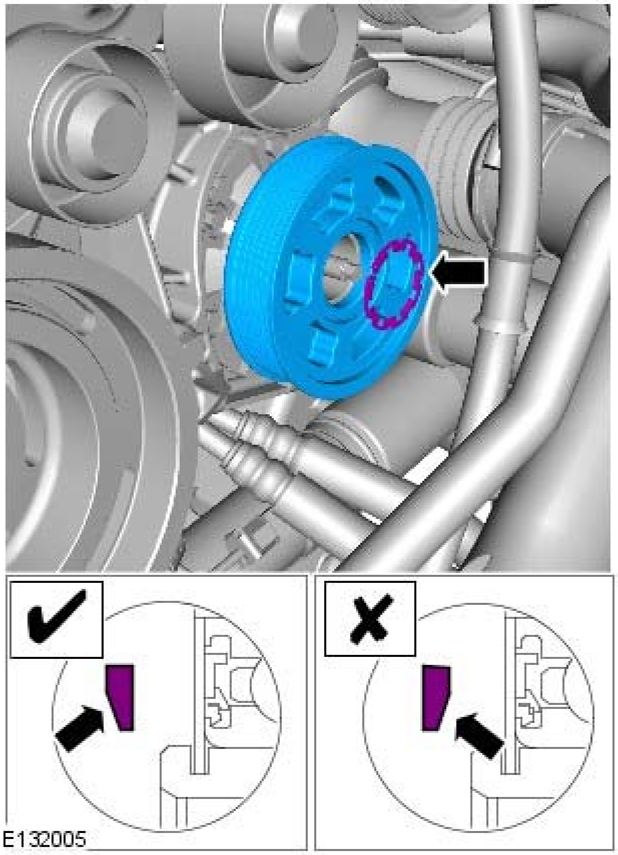
6. Remove and discard the spacer.



7. Remove and discard the drive pulley.

- Remove and discard the circlip.
- Clean the compressor mating surface.

Installation


E132005

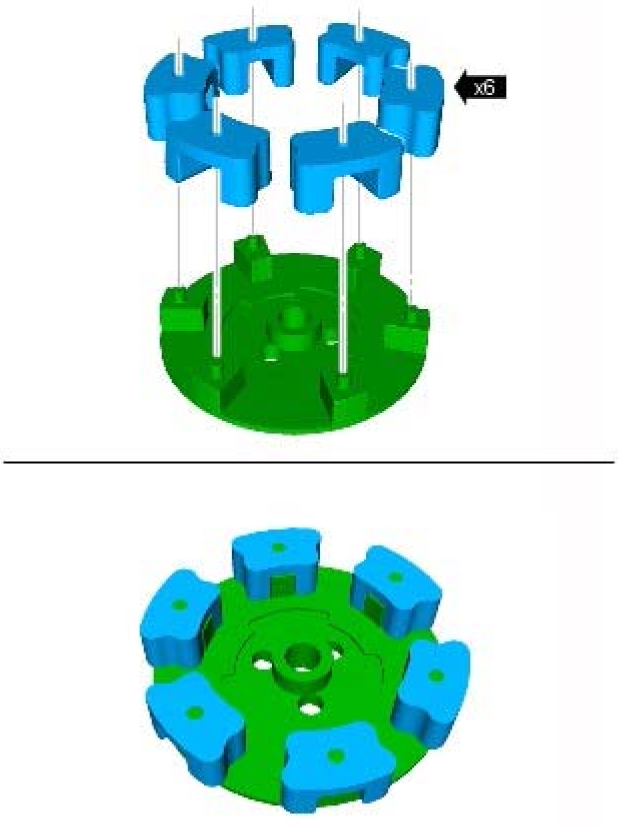
1. ⚠CAUTION: Make sure the circlip is fitted in the correct orientation.

Install the drive pulley.

- Install the circlip.

2. Install the spacer.

- Make sure the spacer is fully seated.



E131556

3. Install the 6 rubber dampers to the hub assembly.

- Make sure the dampers are installed in the correct orientation.

4. NOTE: Apply a suitable water based lubricant to the rubber dampers and to the mating surfaces on pulley.

Install the hub assembly.

- Push the hub assembly onto the pulley, and rotate clockwise to screw it onto the compressor shaft.

5. NOTE: Tighten counterclockwise.

Using a suitable tool, tighten the hub locking stud.

- Prevent the pulley rotating by hand.
- Tighten to 3.5 Nm (2.6 lb.ft)

6. Install the auxiliary drive belt.

7. Install the cooling fan.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Air Conditioning - V8 4.4L Petrol -

Lubricant

Item	Specification
Compressor oil	Denso ND-8 PAG oil
Total system capacity	130 cm³ (4.5 fluid ounces)
Additional amount of oil to be added to system if a component is replaced:	
Condenser	40 cm³ (1.4 fluid ounces)
Evaporator	40 cm³ (1.4 fluid ounces)
Pipe or hose	10 cm³ (0.35 fluid ounces)

System Refrigerant Specification / Capacity

Item	Specification
Refrigerant type	R134A
Total system capacity	600 grammes (21.16 ounces)

General Specification

Item	Description
Compressor:	
Make	Denso
Type	7SEU17
Sensor locations:	
Ambient temperature sensor	At the front of the vehicle
Smog sensor	At the front of the vehicle adjacent to the ambient temperature sensor
ICS/humidity sensor	On the instrument panel adjacent to the steering column
Solar sensor	On the vehicle centre line on top of the instrument panel
Pressure transducer	In A/C line - LH side of engine compartment

Torque Specifications

Description	Nm	lb-ft
Compressor mounting bolts	25	18
Receiver/drier mounting bolts	10	7
Refrigerant line bolts	6	4
Condenser core bolts	6	4
A/C pipe to condenser bolts	6	4
Coolant expansion tank bolts	10	7
Heater housing to bulkhead Torx bolts	6	4
Adaptor panel nuts	6	4
Air conditioning lines to bulkhead bolt	6	4
Air conditioning lines to body nut	6	4
Instrument panel Torx bolts	25	18
Instrument panel carrier to bulkhead Torx bolt	25	18
* Steering column intermediate shaft nut	22	16
Ground cables to passenger side lower A-pillar nuts	10	7
Ground cables to driver side lower A-pillar nuts	10	7
Pressure transducer	10	7
Power steering pump mounting bracket bolts	25	18
Supercharger radiator bolts	10	7
Thermostatic expansion valve	5	4

*** New nut must be installed**

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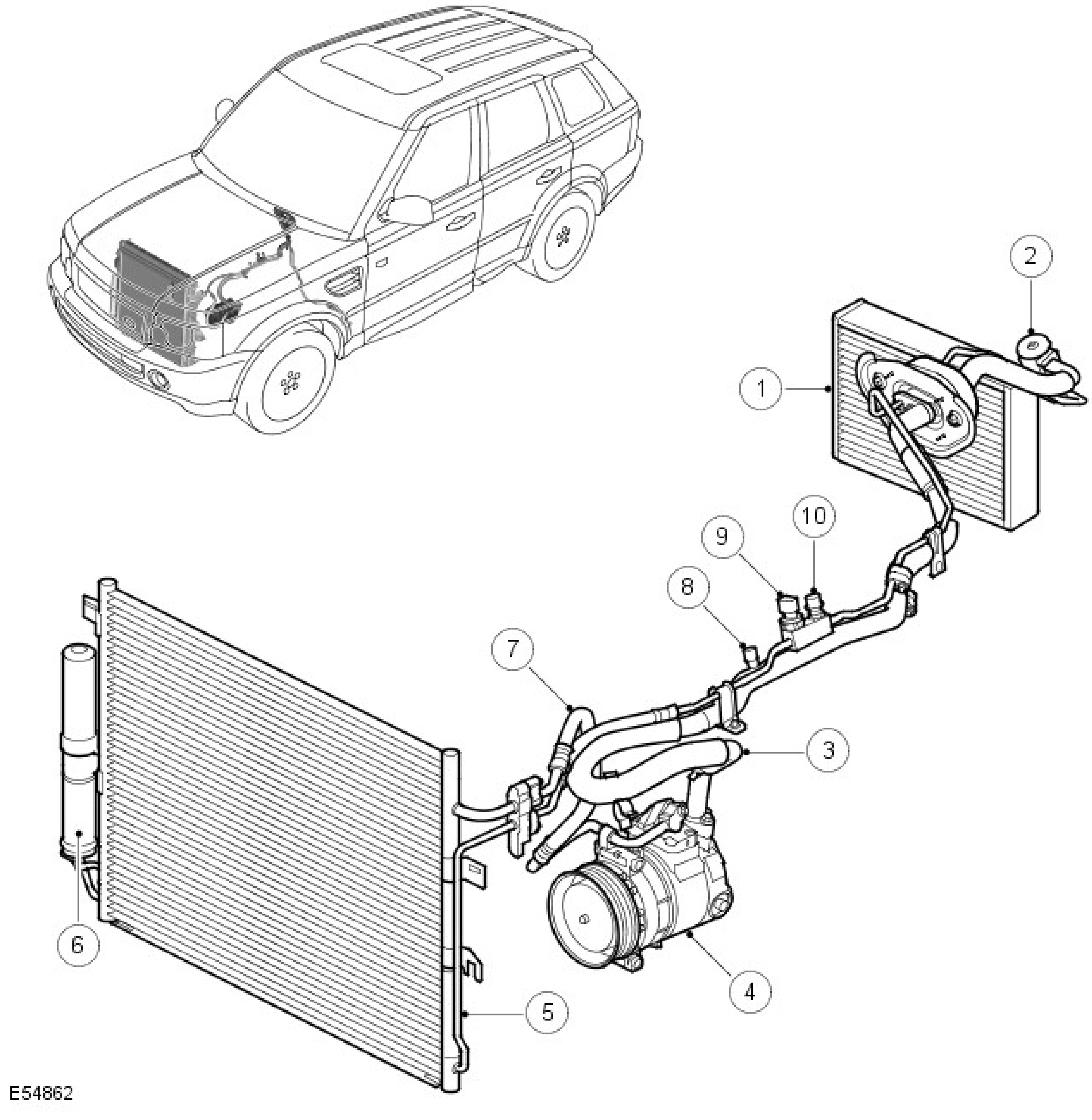
Air Conditioning - V8 4.4L Petrol - Air Conditioning

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	Evaporator
2	-	Thermostatic expansion valve
3	-	Low pressure line
4	-	air conditioning (A/C) compressor
5	-	Condenser
6	-	Receiver drier
7	-	High pressure line
8	-	Low pressure servicing connection
9	-	Refrigerant pressure sensor (reference)
10	-	High pressure servicing connection

For additional information, refer to: Air Conditioning (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Description and Operation).

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Air Conditioning - V8 4.4L Petrol - Air Conditioning

Diagnosis and Testing

Overview

Due to the different equipment available in dealers, there are no specifics as to the connection of gauge sets or charging and recovery stations. Refer to the instructions for the equipment in use in your own workshop.

For information on the description and operation of the system, refer to section 412-03 - Air Conditioning in the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
Auxiliary drive belt condition and tension Compressor condition and installation Condenser condition and installation/blockage Air conditioning hoses and pipes Receiver/Drier condition and installation Cooling fan	Fuses Harnesses Electrical connector(s) Relays Sensors Control panel(s) Air conditioning compressor

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom chart

Symptom	Possible causes	Action
Poor or no cooling	Drive belt fault Compressor fault Distribution motor/flap fault Refrigerant leak In-vehicle temperature sensor fault Refrigerant pressure sensor fault	Check the drive belt condition and tension (see visual inspection). Check the compressor operation (observe the compressor as the engine is idling with the air conditioning switched on. If the compressor runs erratically or does not run. Carry out the distribution motor self test. Refer to the relevant workshop manual section. Check for sensor DTCs. Refer to the DTC index. Check the refrigerant system using your charging station.
Noise	Drive belt fault Compressor fault Compressor pulley fouling Refrigerant overcharged	Confirm the air conditioning as the source of the noise by listening for the noise with the air conditioning switched off. Refer to the relevant workshop manual section. Check the refrigerant system using your charging station.
Water entry into cabin	Heater matrix leak Blocked evaporator drain tubes	Check for coolant loss. Pressure test the cooling system as necessary. Check and clear the evaporator drain tubes as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible cause	Action
B1A6111	Cabin Temperature Sensor	● Ambient air temperature sensor signal short circuit to ground	Refer to the electrical guides and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6115	In-Vehicle Temperature Sensor Signal	● Ambient air temperature sensor signal high resistance ● In-vehicle temperature sensor signal short circuit to power	Refer to the electrical guides and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6211	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to ground	Refer to the electrical guides and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6215	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to power	Refer to the electrical guides and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A7001	Compressor Solenoid +ve Supply	● Refrigerant solenoid valve power circuit short circuit to ground ● Refrigerant solenoid valve power circuit short circuit to power ● Refrigerant solenoid valve over temperature	Refer to the electrical guides and check the refrigerant solenoid circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7884	System Pressure	● Pressure signal below allowable range ● Refrigerant leak	Check for pressure sensor DTcs. Check the refrigerant system using a suitable charging station.
B1B7885	System Pressure	● Pressure signal above allowable range ● Condenser fault ● Cooling fan fault	Check for pressure sensor DTcs. Check the condenser for damage/restriction and the cooling fan operation. Check the refrigerant system using a suitable charging station.

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Air Conditioning - V8 4.4L Petrol - Air Conditioning (A/C) Compressor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

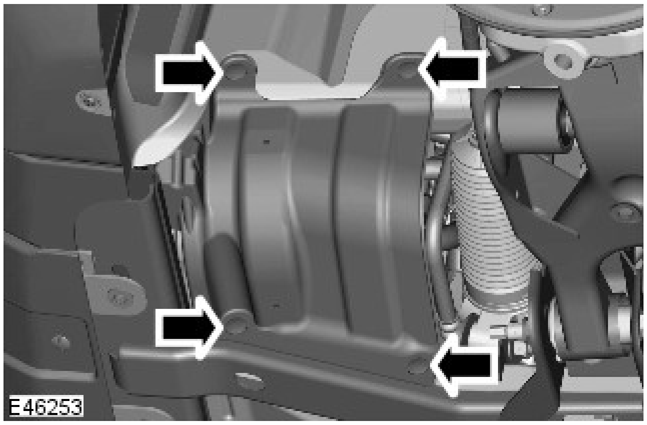
2. Recover the A/C refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

4. Remove the front wheel.

5. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

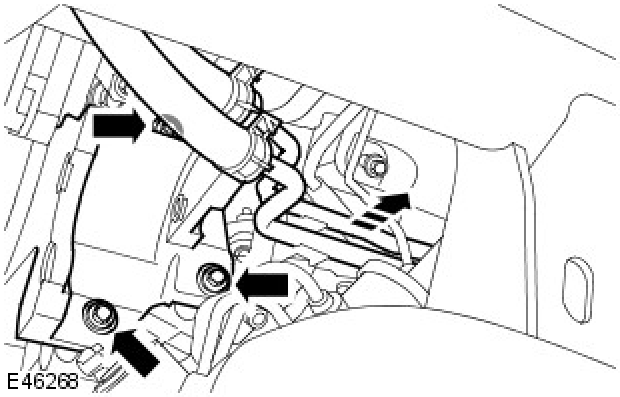


6. Remove the splash shield.

- Remove the 4 screws.

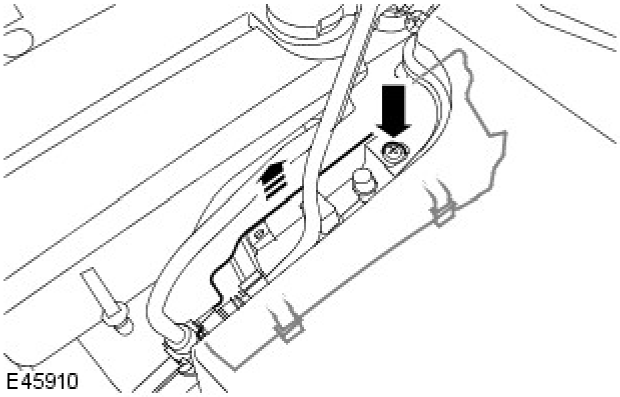
7. Remove the power steering pump.
For additional information, refer to: Power Steering Pump - V8 4.4L Petrol (211-02 Power Steering, Removal and Installation).

8. Release the transmission cooler pipe clips.

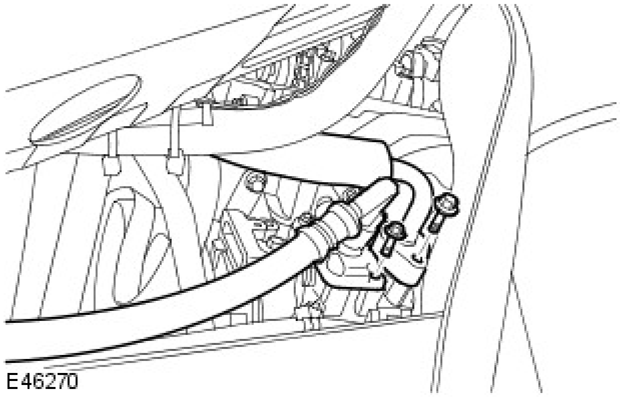


9. Remove the power steering pump mounting bracket.

- Remove the 3 bolts.



10. Remove the engine compartment LH upper heat shield.

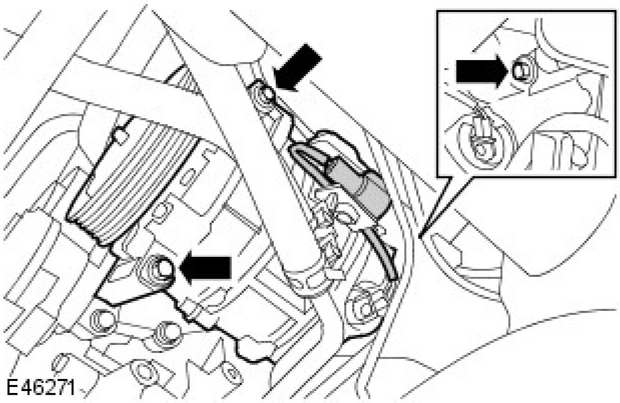


11. ⚠CAUTION: Always plug any open connections to prevent contamination.

Disconnect the refrigerant lines from the A/C compressor.

- Remove the 2 bolts.
- Remove and discard the O-ring seal.

12. Disconnect the A/C clutch electrical connector.



13. ⚠CAUTION: Always plug any open connections to prevent contamination.

Remove the A/C compressor.

- Remove the 3 bolts.

Installation

1. Install the new A/C compressor.

- If a new compressor is being installed, drain the required amount of refigerant oil from the new compressor.
- Tighten the bolts to 25 Nm (18 lb.ft).

2. Connect the A/C clutch electrical connector.

3. Connect the refrigerant lines.

- Clean the component mating faces.
- Install the new O-ring seals.

- Tighten the bolts to 10 Nm (7 lb.ft).

4. Install the engine compartment upper LH heat shield.

5. Install the power steering pump mounting bracket.

- Clean the component mating faces.
- Tighten the bolts to 25 Nm (18 lb.ft).

6. Install the power steering pump.
For additional information, refer to: Power Steering Pump - V8 4.4L Petrol (211-02 Power Steering, Removal and Installation).

7. Secure the transmission cooler pipes into clips.

8. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

9. Install the splash shield.

10. Install the front wheel.

- Tighten the nuts to 115 Nm (85 lb.ft).

11. Lower the vehicle.

12. Fill the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

13. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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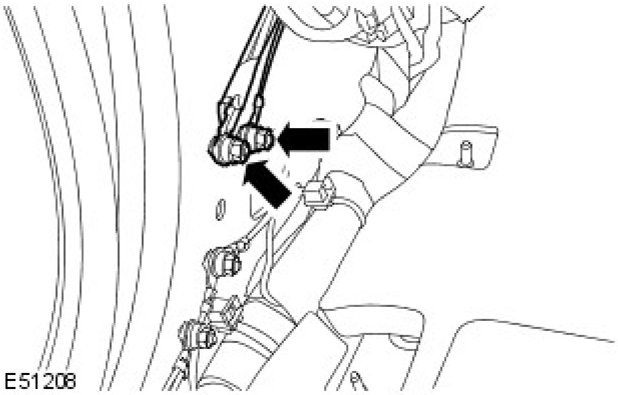
Air Conditioning - V8 4.4L Petrol - Evaporator Core Orifice

Removal and Installation

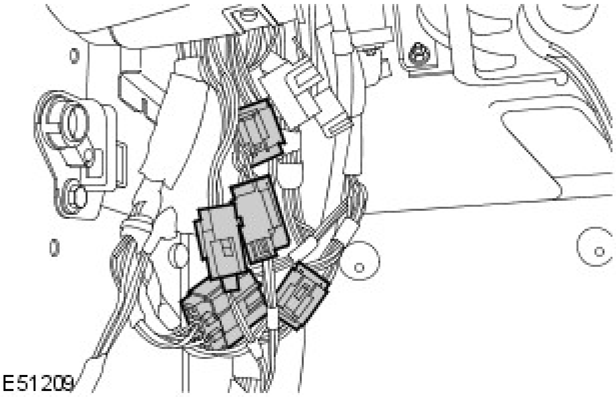
Removal

1. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Evacuate the A/C system.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.
4. Drain the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).
5. Remove the driver side front seat.
   For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).
6. Remove the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).
7. Release the 3 ground cables from the driver side lower A-pillar.
   - Remove the 2 nuts.

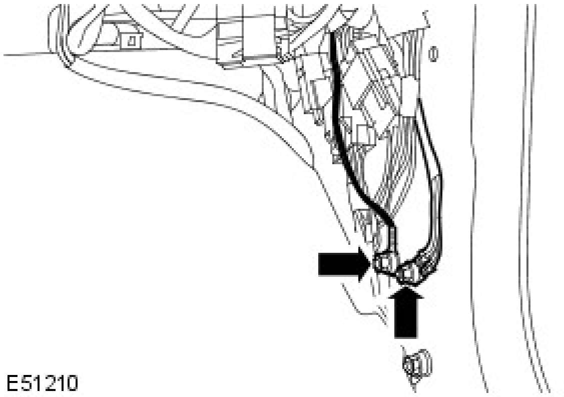


8. Disconnect the 5 electrical connectors from the driver side lower A-pillar.



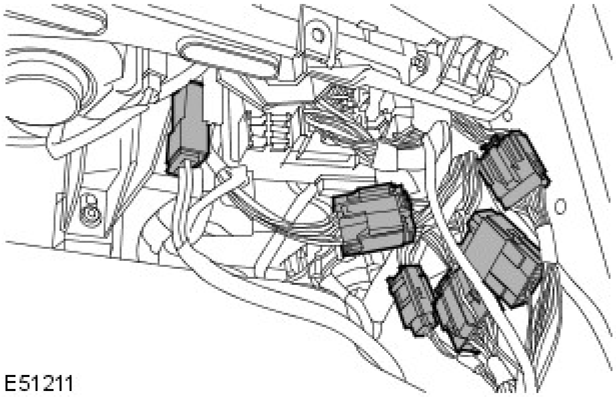
9. Release the 3 ground cables from the passenger side lower A-pillar.

   - Remove the 2 nuts.

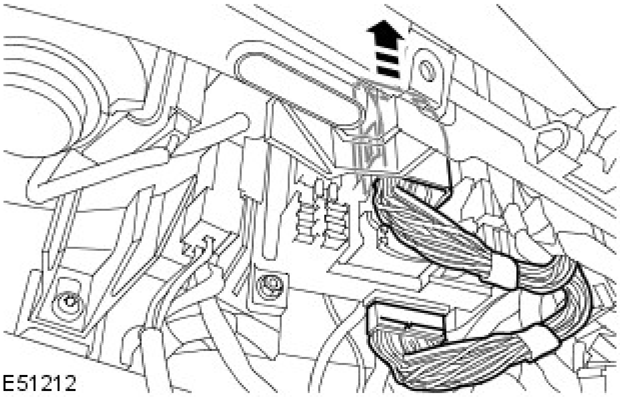


10. Disconnect the 5 electrical connectors from the passenger side lower A-pillar.

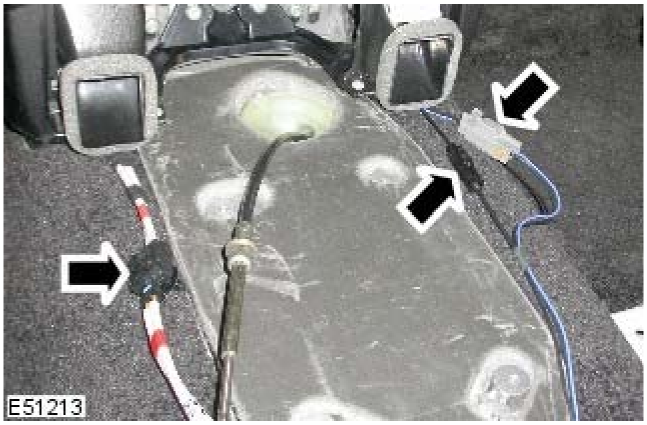
11. Disconnect the heater motor electrical connector.



12. Disconnect 2 central junction box (CJB) electrical connectors.



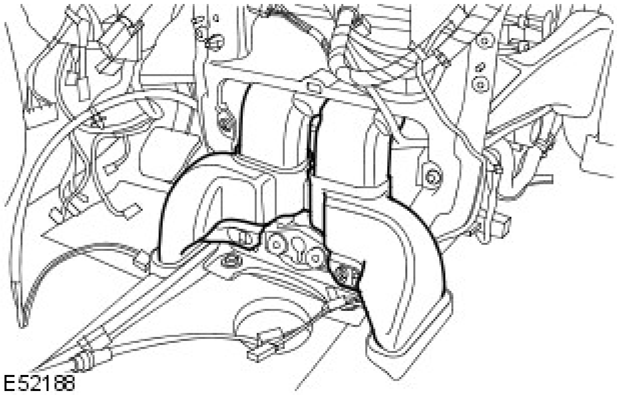
13. Disconnect 2 electrical connectors from the instrument panel center reinforcement.



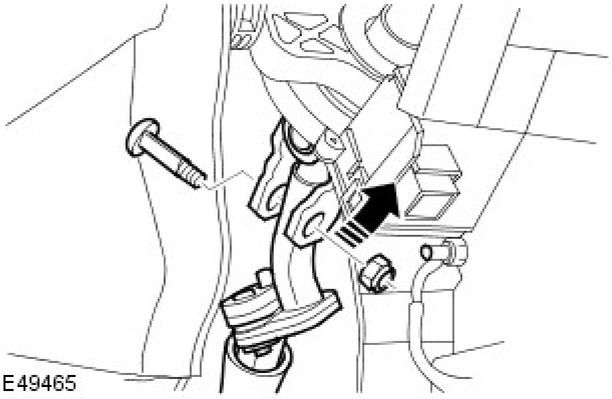
14. ⚠ CAUTION: Cover fibre optic cable connectors to minimise dust ingress and avoid bending the cables in a radius of less than 30 mm.

If installed, disconnect the instrument panel center reinforcement fibre optic cables.

- Disconnect the electrical connector.

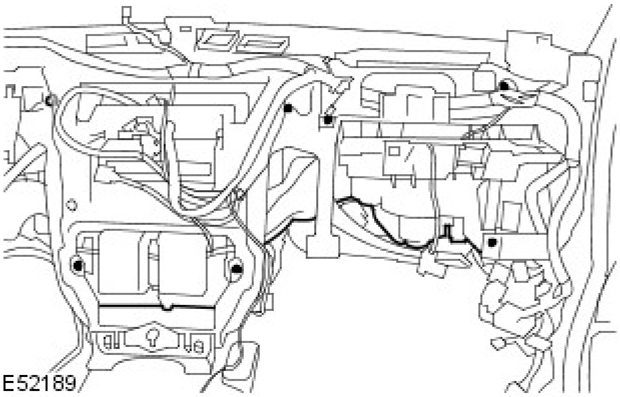


15. Remove the heater housing center ducts.



16. Disconnect the steering column intermediate shaft from the steering column.

- Note the fitted position.
- Remove the special bolt and discard the nut.



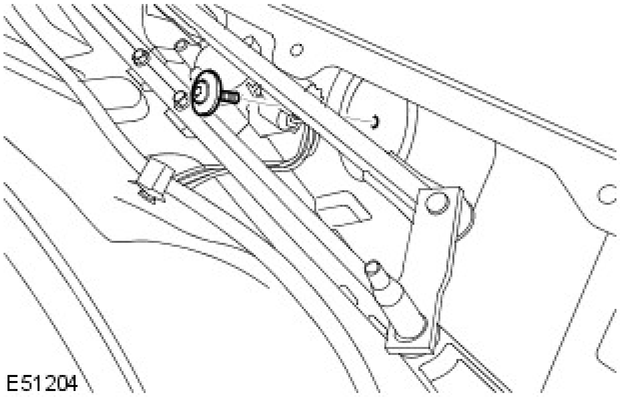
17. Release the heater housing from the instrument panel carrier.

- Remove the 7 Torx screws.

18. Remove the plenum chamber panel.

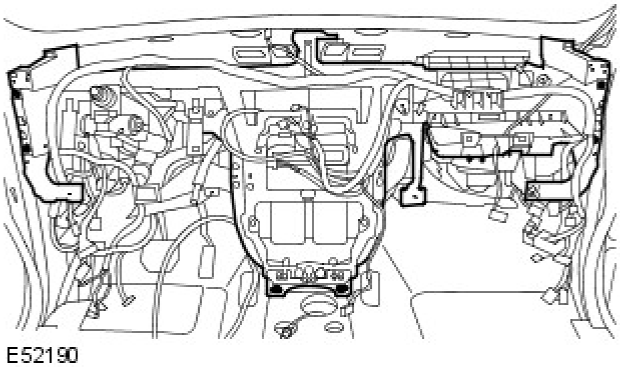
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

19. Remove the instrument panel carrier to bulkhead Torx bolt.



20. With assistance, remove the instrument panel.

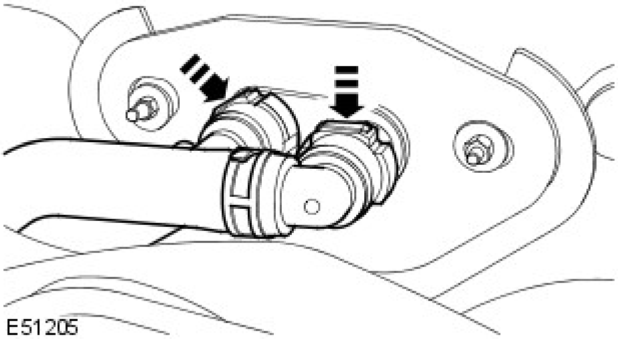
- Remove the 6 Torx bolts.



21. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

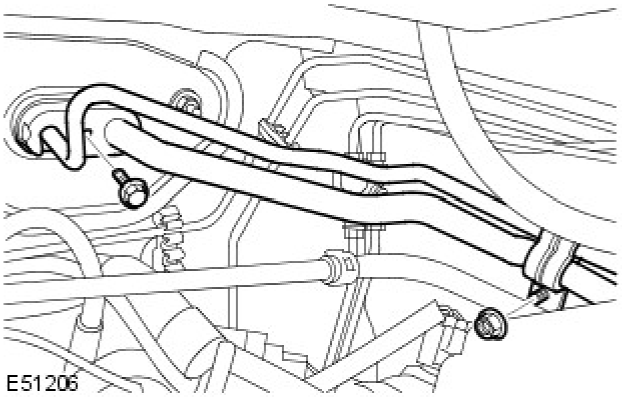
Disconnect 2 heater hoses from the bulkhead.

- Release the 2 clips.



22. Release 2 A/C lines from the body.

- Remove the nut.

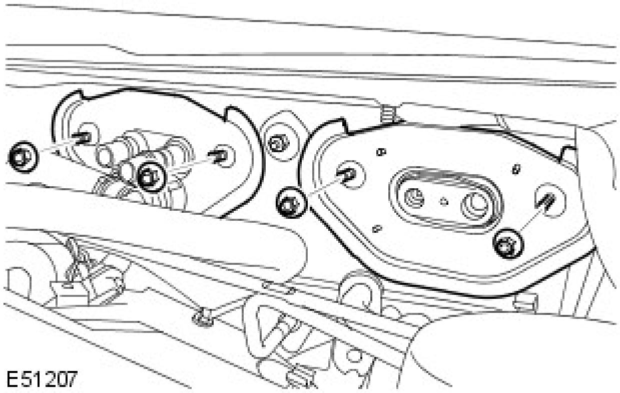


E51206

23. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Release 2 A/C lines from the bulkhead.

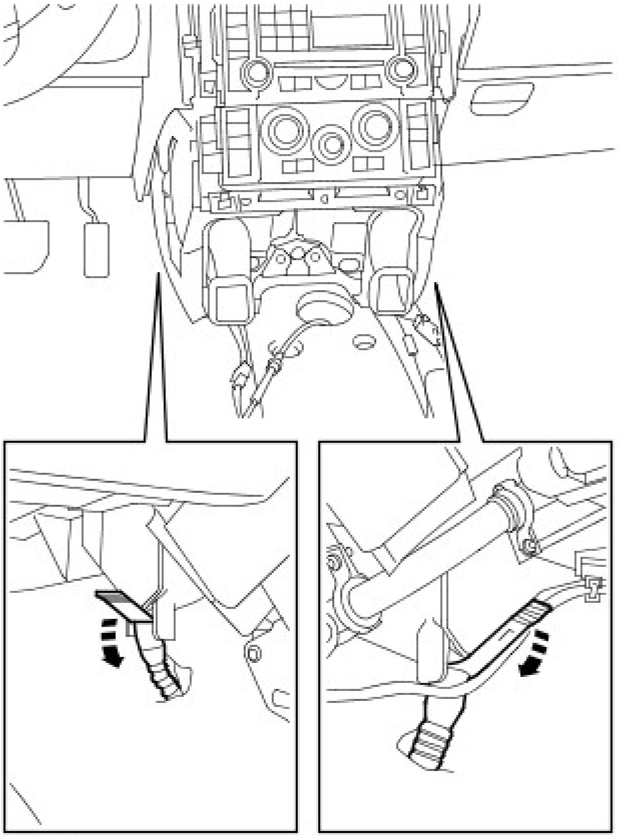
- Remove the bolt.
- Remove and discard the O-ring seals.



E51207

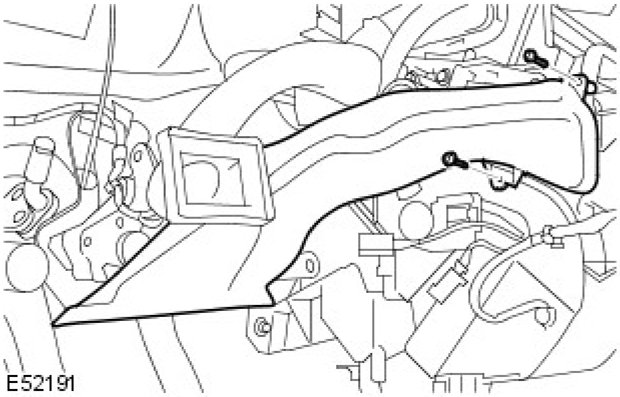
24. Remove the 2 adapter panels.

- Remove the 4 nuts.



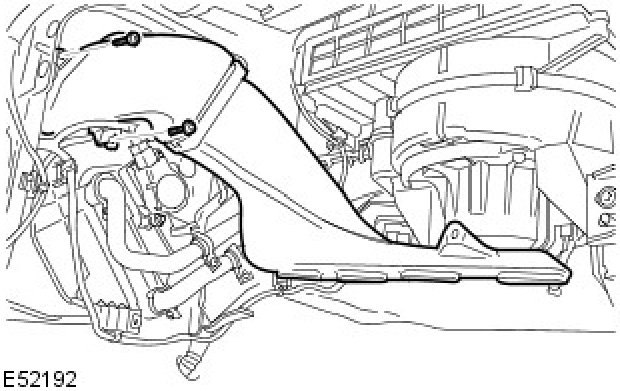
E51199

25. Disconnect 2 drain tubes from the heater housing.


E52191

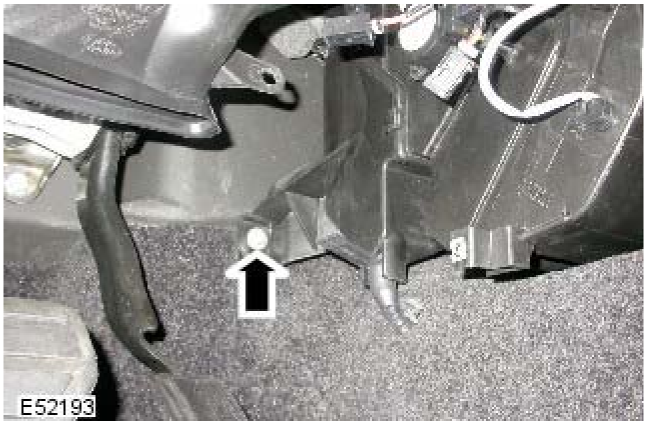
26. Remove the driver side footwell duct.

- Remove the 2 Torx screws.

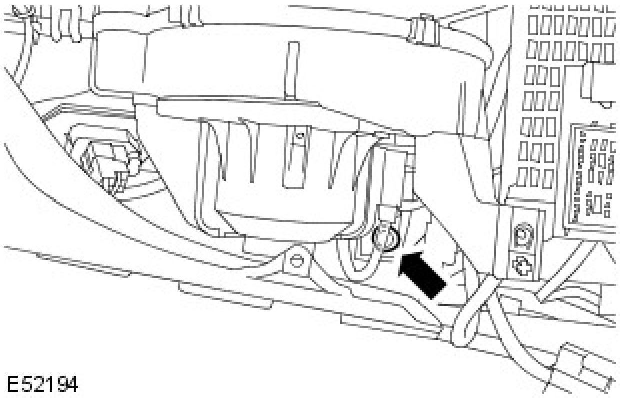

E52192

27. Remove the passenger side footwell duct.

- Remove the 2 Torx screws.


E52193

28. Driver side: Remove the heater housing to bulkhead Torx bolt.


E52194

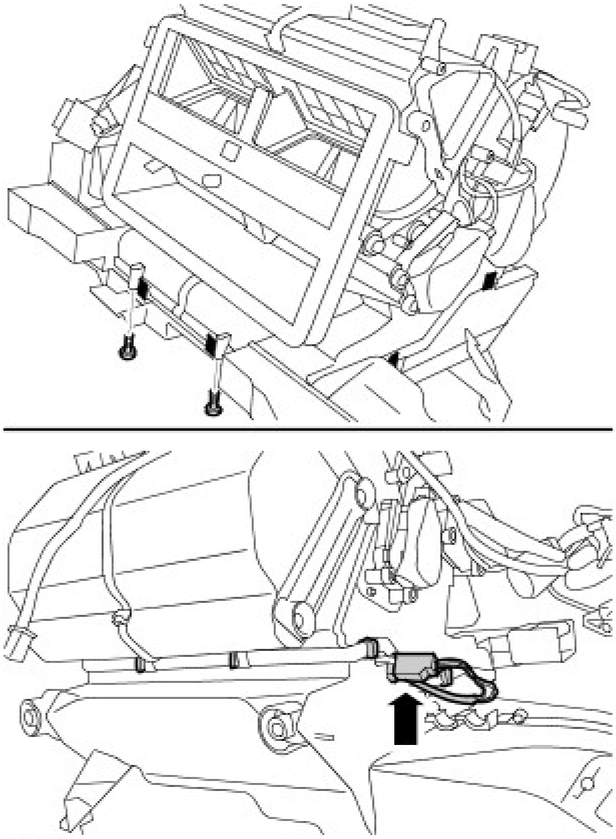
29. Passenger side: Remove the heater housing to bulkhead Torx bolt.

30. Remove the heater housing.

31. Disconnect the evaporator core temperature sensor electrical connector.

32. Release the heater core housing.

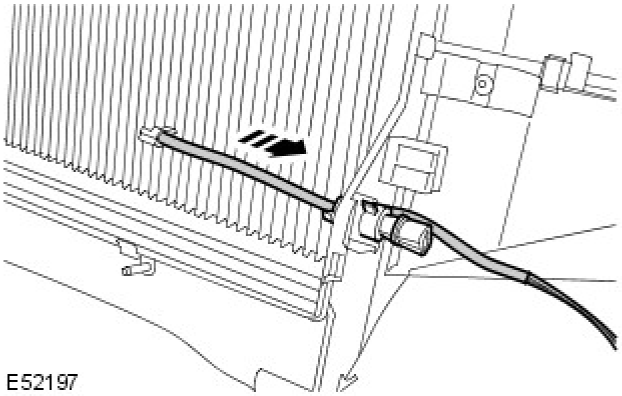
- Remove the 2 screws.
- Remove the 8 clips.



E52196

33. Remove the evaporator core.

- Release the temperature sensor.



E52197

Installation

1. Install the evaporator core.

- Secure the temperature sensor.

2. Secure the heater core housing.

- Install the clips.
- Tighten the screws.

3. Connect the temperature sensor electrical connector.

4. Install the heater housing.

5. Passenger side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

6. Driver side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

7. Install the footwell ducts.

- Tighten the Torx screws.

8. Connect the drain tubes to the heater housing.

9. Install the adapter panels.

- Tighten the nuts to 6 Nm (4 lb.ft).

10. Secure the A/C lines to the bulkhead.

- Clean the components.
- Install new O-ring seals.
- Tighten the bolt to 6 Nm (4 lb.ft).

11. Secure the A/C lines to the body.

- Tighten the nut to 6 Nm (4 lb.ft).

12. Connect the bulkhead heater hoses.

13. With assistance, install the instrument panel.

- Tighten the Torx bolts to 25 Nm (18 lb.ft).

14. Install the instrument panel carrier to bulkhead Torx bolt and tighten to 25 Nm (18 lb.ft).

15. Install the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

16. Secure the heater housing.

- Tighten the screws.

17. Connect the steering column intermediate shaft.

- Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).

18. Install the heater housing center ducts.

19. Connect the instrument panel center reinforcement fibre optic cables.

20. Connect the instrument panel center reinforcement electrical connectors.

21. Connect the CJB electrical connectors.

22. Connect the heater motor electrical connector.

23. Connect the electrical connectors to the passenger side lower A-pillar.

24. Connect the ground cables to the passenger side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

25. Connect the electrical connectors to the driver side lower A-pillar.

26. Connect the ground cables to the driver side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

27. Install the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper

Section (501-12 Instrument Panel and Console, Removal and Installation).

28. Install the front seat.
For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

29. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

30. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

31. Install the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-May-2011

Air Conditioning - V8 4.4L Petrol - Condenser Core

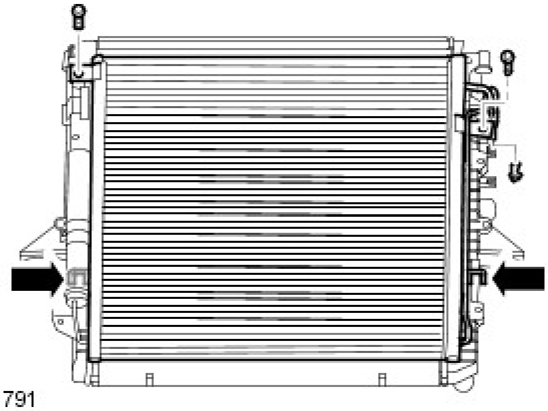
Removal and Installation

Removal

• NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the radiator assembly.
For additional information, refer to: Radiator (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).


E51791

3. NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

Remove the condenser core.

- Remove the 2 screws.
- Release the 2 clips.
- Remove the bolt.

Installation

1. Install the condenser core.

- Align the condenser core.
- Secure the clips.
- Install the screws.
- Tighten the bolt to 6 Nm (4 lb.ft).

2. Install the radiator assembly.
For additional information, refer to: Radiator (303-03B Engine Cooling - V8 4.4L Petrol, Removal and Installation).

3. Install the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Air Conditioning - V8 4.4L Petrol - Receiver Drier

Removal and Installation

Removal

• NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

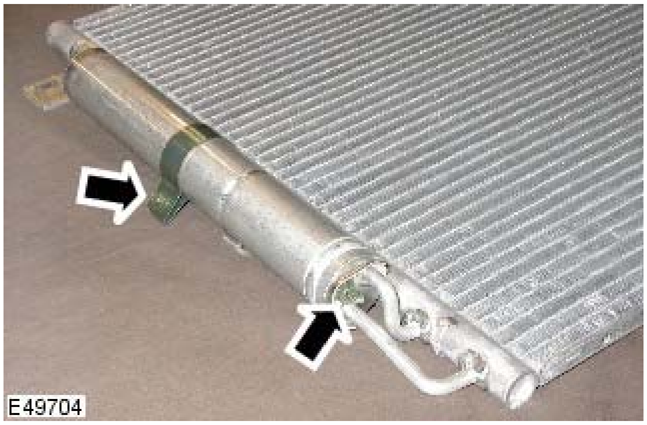
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the condenser core.
For additional information, refer to: Condenser Core (412-03B Air Conditioning - V8 4.4L Petrol, Removal and Installation).

3. Remove the receiver drier support bracket clamp.

- Loosen the screw.



4. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Remove the receiver drier.

- Remove the bolt.
- Remove the clamp.
- Remove and discard the 2 O-ring seals.

Installation

1. Install the receiver drier.

- Clean the component mating faces.
- Install new O-ring seals.
- Install the clamp.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. Install the condenser core.
For additional information, refer to: Condenser Core (412-03B Air Conditioning - V8 4.4L Petrol, Removal and Installation).

3. Connect the battery ground cable.

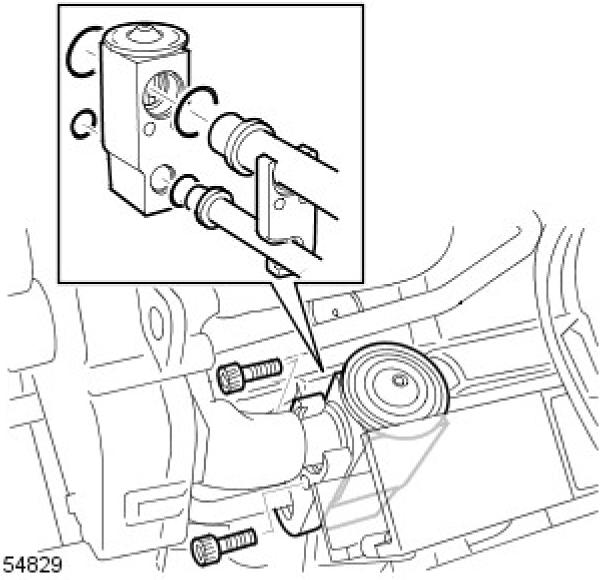
Published: 11-May-2011

Air Conditioning - V8 4.4L Petrol - Thermostatic Expansion Valve

Removal and Installation

Removal

1. Evacuate the A/C system.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).
2. Remove the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).


E54829

3. CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Remove the thermostatic expansion valve.

- Remove the cover.
- Remove the 2 Allen bolts.
- Remove and discard the 4 O-ring seals.

Installation

1. Install the thermostatic expansion valve.
   - Clean the components.
   - Install the new O-ring seals.
   - Tighten the Allen bolts to 5 Nm (4 lb.ft).
   - Install the cover.
2. Install the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).
3. Recharge the A/C system.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

Published: 11-May-2011

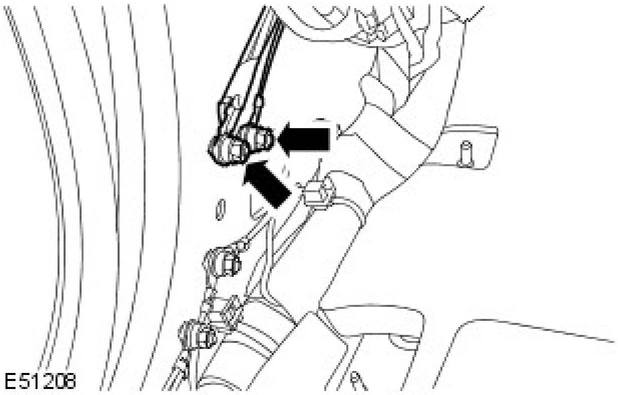
Air Conditioning - V8 4.4L Petrol - Evaporator Core

Removal and Installation

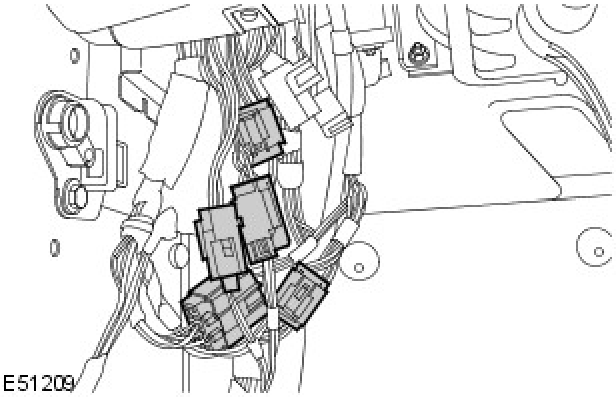
Removal

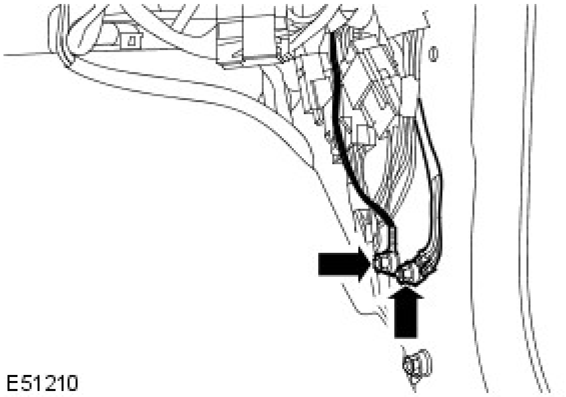
1. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Evacuate the A/C system.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).
3. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.
4. Drain the cooling system.
   For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).
5. Remove the driver side front seat.
   For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).
6. Remove the instrument panel upper section.
7. Release the 3 ground cables from the driver side lower A-pillar.
   - Remove the 2 nuts.



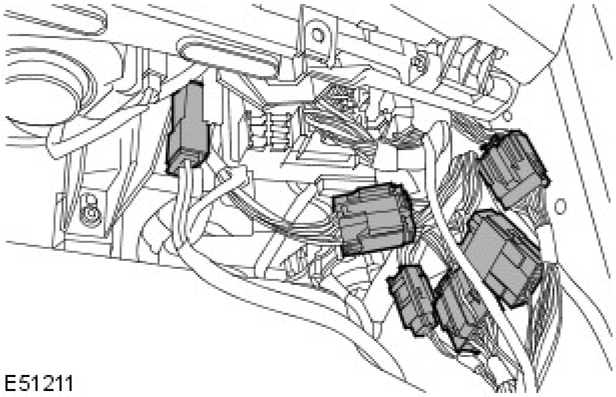
8. Disconnect the 5 electrical connectors from the driver side lower A-pillar.



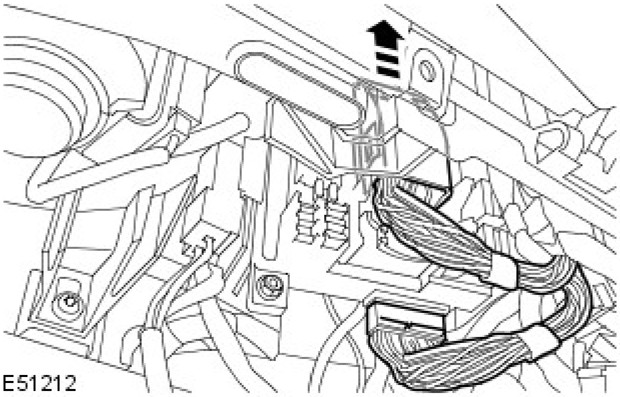


9. Release the 3 ground cables from the passenger side lower A-pillar.
    - Remove the 2 nuts.

10. Disconnect the heater motor electrical connector.

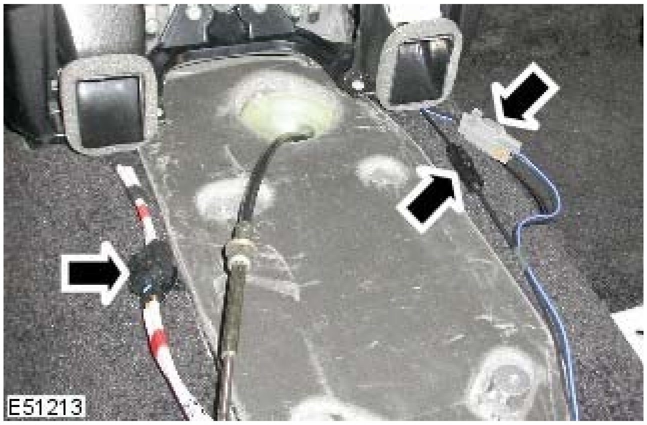


11. Disconnect the 5 electrical connectors from the passenger side lower A-pillar.



12. Disconnect 2 central junction box (CJB) electrical connectors.

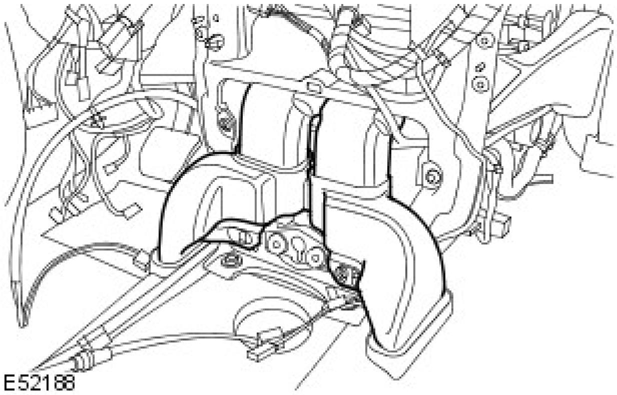
13. Disconnect 2 electrical connectors from the instrument panel center reinforcement.



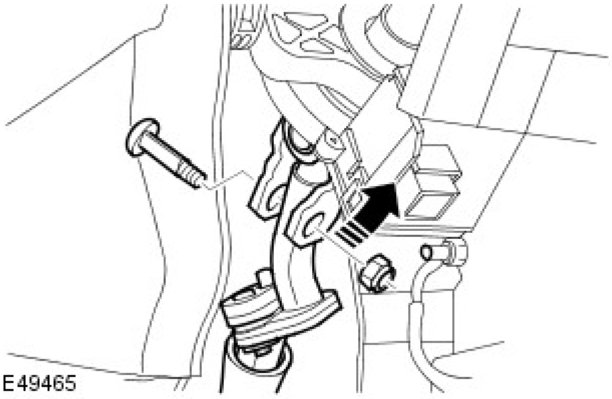
14. ⚠ CAUTION: Cover fibre optic cable connectors to minimise dust ingress and avoid bending the cables in a radius of less than 30 mm.

If installed, disconnect the instrument panel center reinforcement fibre optic cables.

- Disconnect the electrical connector.

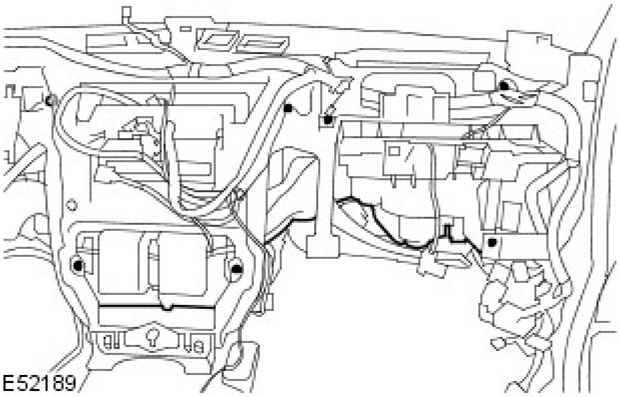


15. Remove the heater housing center ducts.



16. Disconnect the steering column intermediate shaft from the steering column.

- Note the fitted position.
- Remove the special bolt and discard the nut.

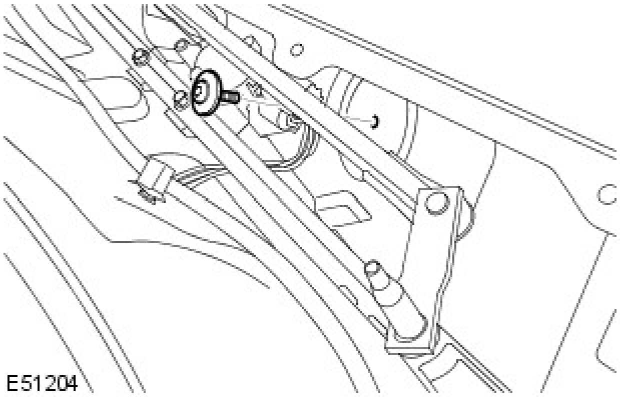


17. Release the heater housing from the instrument panel carrier.

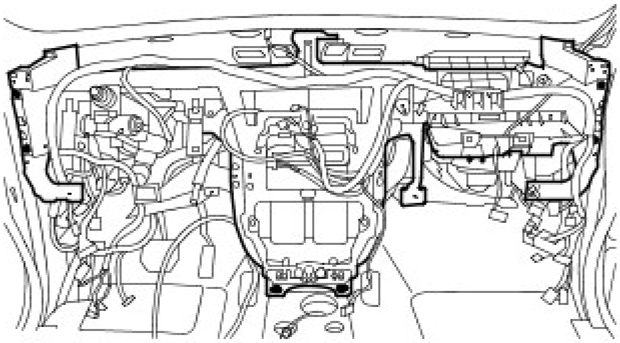
- Remove the 7 Torx screws.

18. Remove the plenum chamber panel.

For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

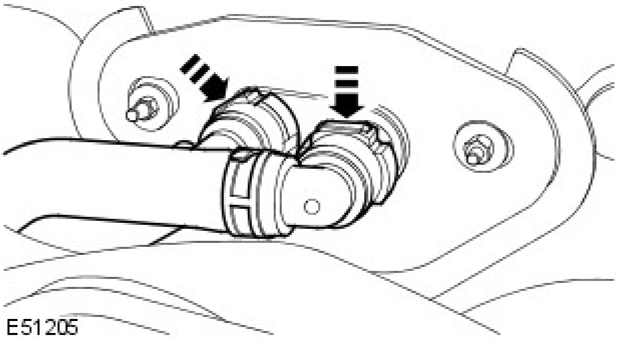


19. Remove the instrument panel carrier to bulkhead Torx bolt.



20. With assistance, remove the instrument panel.

- Remove the 6 Torx bolts.



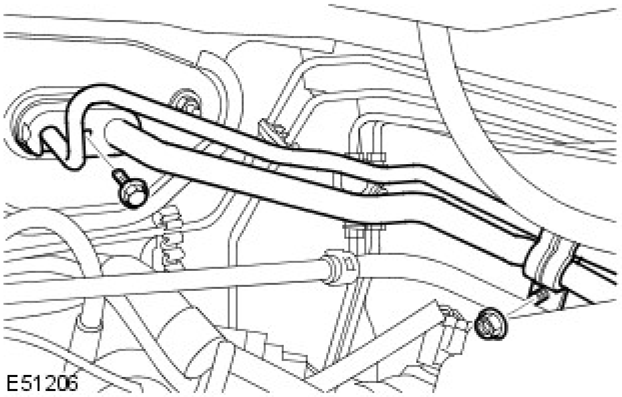
21. ⚠ CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect 2 heater hoses from the bulkhead.

- Release the 2 clips.

22. Release 2 A/C lines from the body.

- Remove the nut.

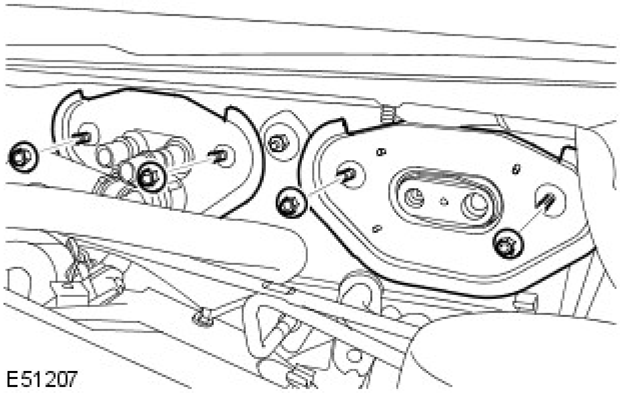


E51206

23. ⚠CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Release 2 A/C lines from the bulkhead.

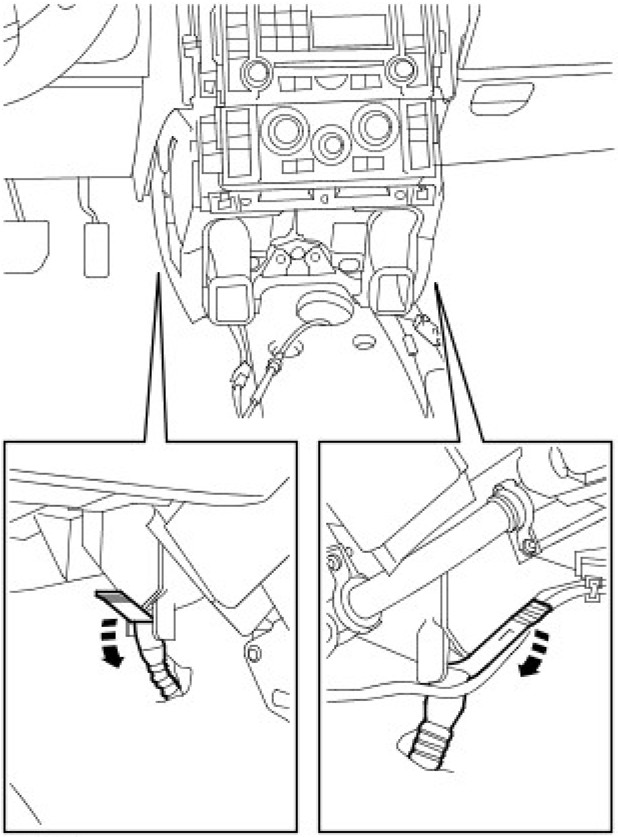
- Remove the bolt.
- Remove and discard the O-ring seals.



E51207

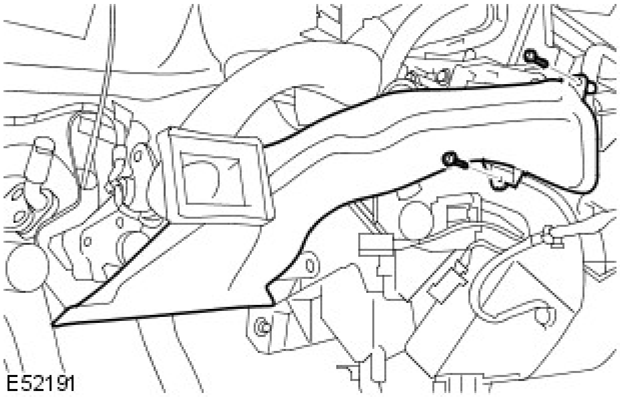
24. Remove the 2 adaptor panels.

- Remove the 4 nuts.



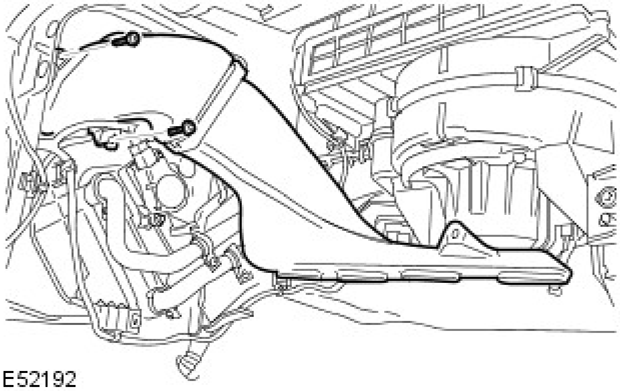
E51199

25. Disconnect 2 drain tubes from the heater housing.


E52191

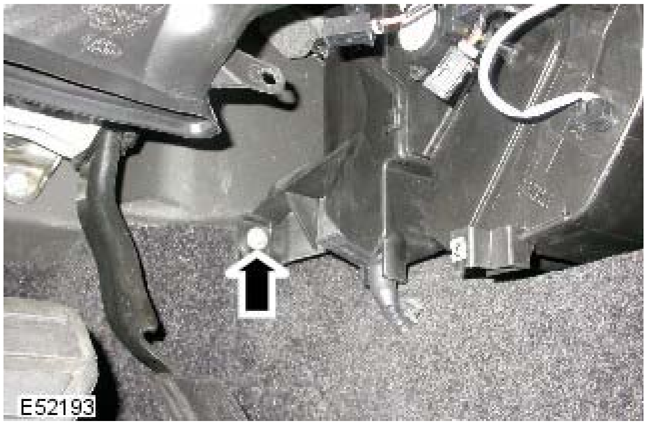
26. Remove the driver side footwell duct.

- Remove the 2 Torx screws.

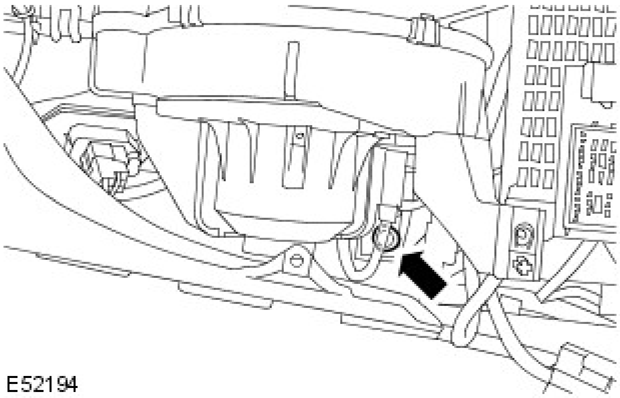

E52192

27. Remove the passenger side footwell duct.

- Remove the 2 Torx screws.


E52193

28. Driver side: Remove the heater housing to bulkhead Torx bolt.


E52194

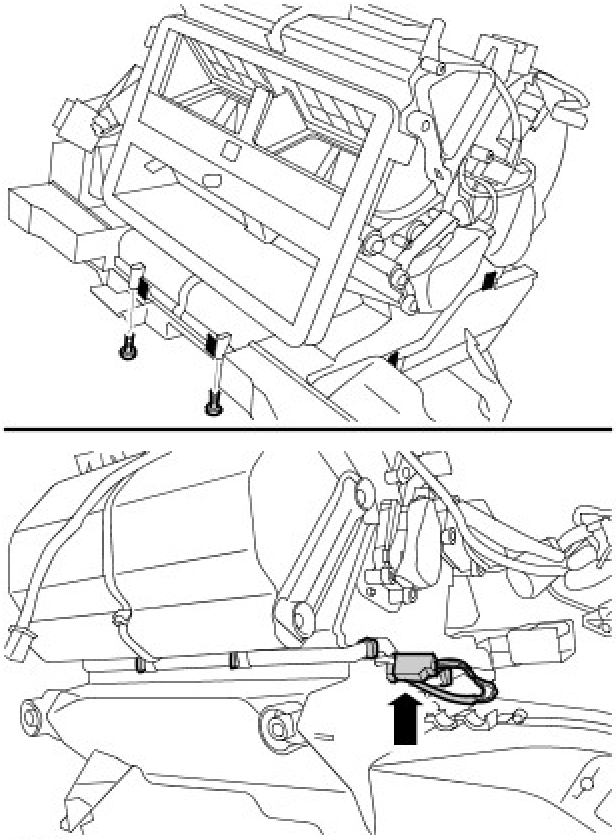
29. Passenger side: Remove the heater housing to bulkhead Torx bolt.

30. Remove the heater housing.

31. Disconnect the evaporator core temperature sensor electrical connector.

32. Release the heater core housing.

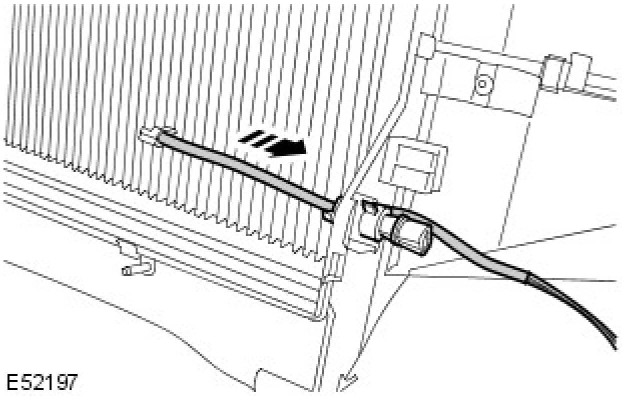
- Remove the 2 screws.
- Remove the 8 clips.



E52196

33. Remove the evaporator core.

- Release the temperature sensor.



E52197

Installation

1. Install the evaporator core.

- Secure the temperature sensor.

2. Secure the heater core housing.

- Install the clips.
- Tighten the screws.

3. Connect the temperature sensor electrical connector.

4. Install the heater housing.

5. Passenger side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

6. Driver side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

7. Install the footwell ducts.

- Tighten the Torx screws.

8. Connect the drain tubes to the heater housing.

9. Install the adaptor panels.

- Tighten the nuts to 6 Nm (4 lb.ft).

10. Secure the A/C lines to the bulkhead.

- Clean the components.
- Install new O-ring seals.
- Tighten the bolt to 6 Nm (4 lb.ft).

11. Secure the A/C lines to the body.

- Tighten the nut to 6 Nm (4 lb.ft).

12. Connect the bulkhead heater hoses.

13. With assistance, install the instrument panel.

- Tighten the Torx bolts to 25 Nm (18 lb.ft).

14. Install the instrument panel carrier to bulkhead Torx bolt and tighten to 25 Nm (18 lb.ft).

15. Install the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

16. Secure the heater housing.

- Tighten the screws.

17. Connect the steering column intermediate shaft.

- Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).

18. Install the heater housing center ducts.

19. Connect the instrument panel center reinforcement fibre optic cables.

20. Connect the instrument panel center reinforcement electrical connectors.

21. Connect the CJB electrical connectors.

22. Connect the heater motor electrical connector.

23. Connect the electrical connectors to the passenger side lower A-pillar.

24. Connect the ground cables to the passenger side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

25. Connect the electrical connectors to the driver side lower A-pillar.

26. Connect the ground cables to the driver side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

27. Install the instrument panel upper section.

28. Install the front seat.

For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

29. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

30. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03B Engine Cooling - V8 4.4L Petrol, General Procedures).

31. Install the engine cover.
For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 22-Jun-2011

Air Conditioning - V8 4.4L Petrol - Air Conditioning (A/C) Compressor Pulley

Removal and Installation

Removal

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

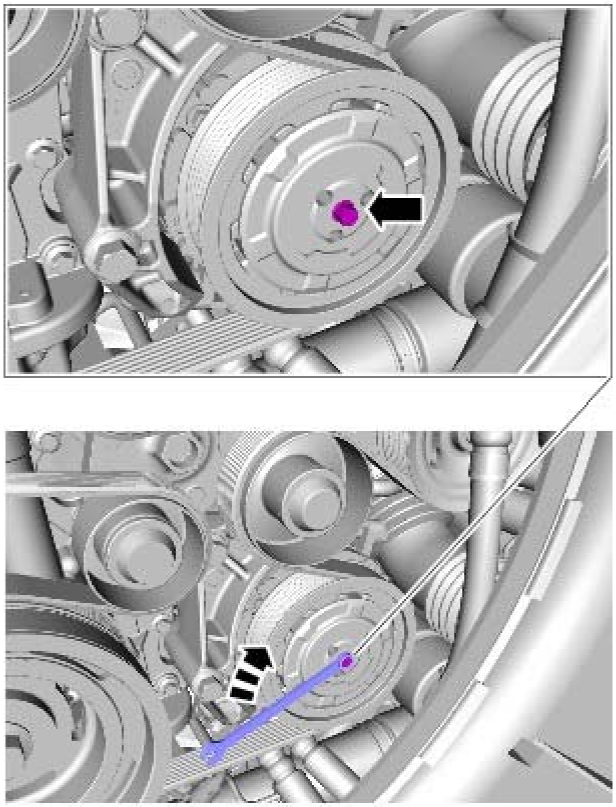
- NOTE: Components removed for clarity.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the cooling fan.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

3. Using a suitable tool, release the hub locking stud.

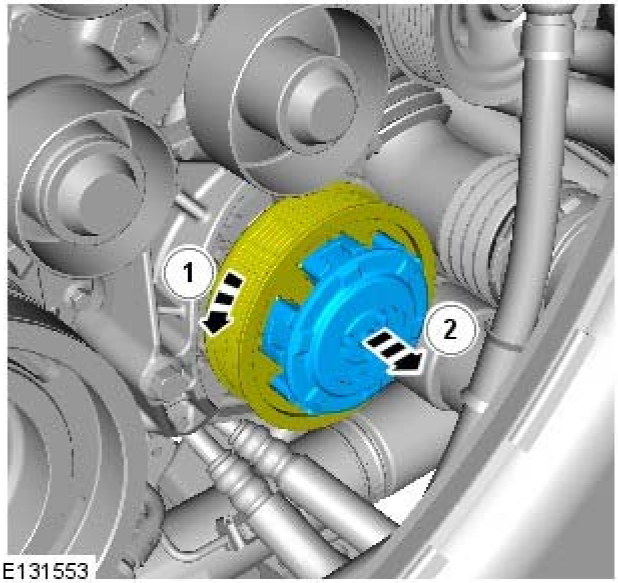
- Rotate the fixing clockwise to release the hub.
- If required, use a suitable tool to prevent the hub from rotating.



E131552

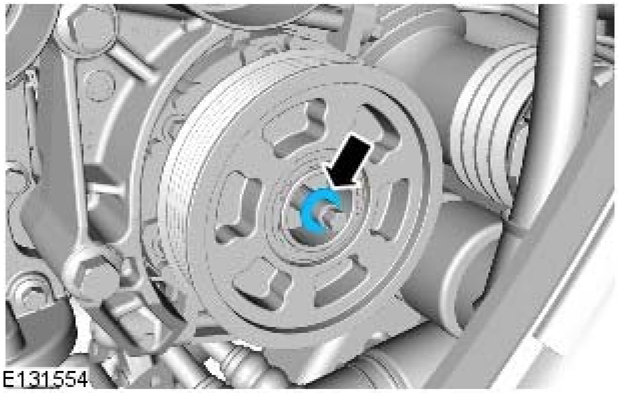
4. NOTE: Using a 3/8 square drive wrench, rotate the tensioner counter clockwise.

Release the accessory drive belt from the A/C compressor pulley.

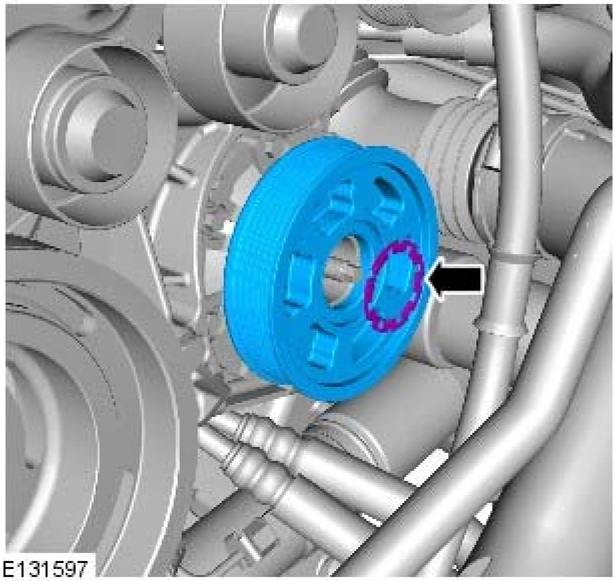


5. Remove and discard the hub assembly.

- Rotate the pulley counter-clockwise, until the hub is released from the pulley.
- Discard the rubber dampers.



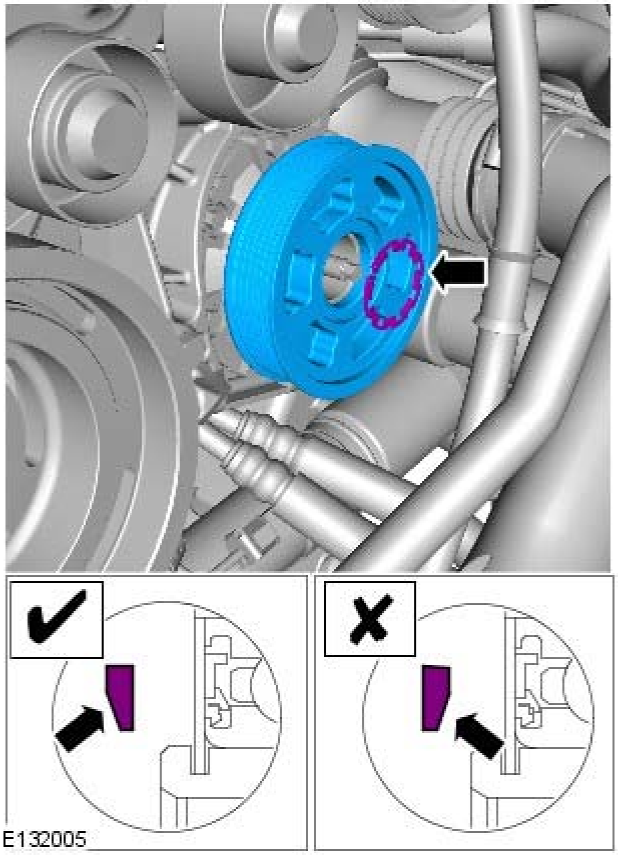
6. Remove and discard the spacer.



7. Remove and discard the drive pulley.

- Remove and discard the circlip.
- Clean the compressor mating surface.

Installation



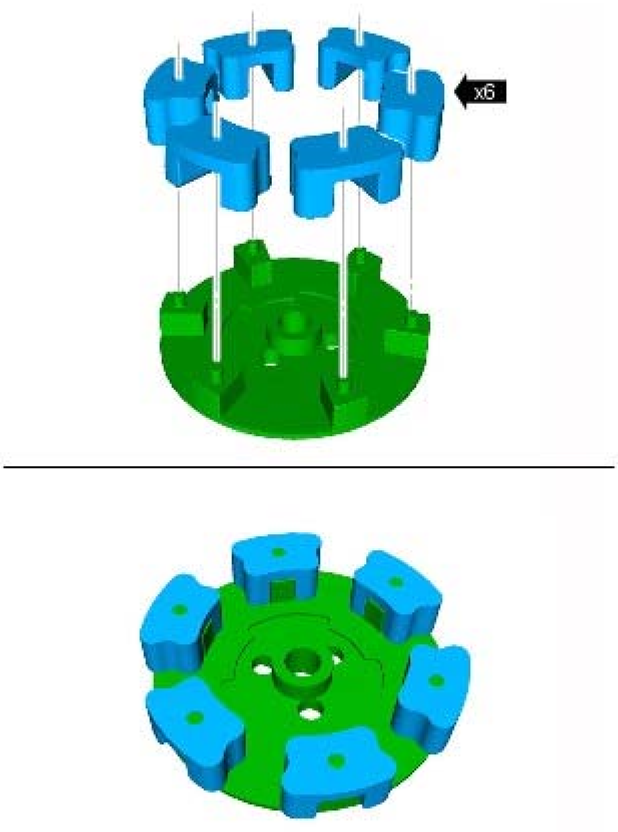
1. ⚠CAUTION: Make sure the circlip is fitted in the correct orientation.

   Install the drive pulley.

   - Install the circlip.

2. Install the spacer.

   - Make sure the spacer is fully seated.



E131556

3. Install the 6 rubber dampers to the hub assembly.

- Make sure the dampers are installed in the correct orientation.

4. NOTE: Apply a suitable water based lubricant to the rubber dampers and to the mating surfaces on pulley.

Install the hub assembly.

- Push the hub assembly onto the pulley, and rotate clockwise to screw it onto the compressor shaft.

5. NOTE: Tighten counterclockwise.

Using a suitable tool, tighten the hub locking stud.

- Prevent the pulley rotating by hand.
- Tighten to 3.5 Nm (2.6 lb.ft)

6. Install the auxiliary drive belt.

7. Install the cooling fan.
For additional information, refer to: Cooling Fan (303-03A Engine Cooling - V8 S/C 4.2L Petrol, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Air Conditioning - TDV6 2.7L Diesel -

Lubricant

Item	Specification
Compressor oil	Denso ND-8 PAG oil
Total system capacity	130 cm³ (4.5 fluid ounces)
Additional amount of oil to be added to system if a component is replaced:	
Condenser	40 cm³ (1.4 fluid ounces)
Evaporator	40 cm³ (1.4 fluid ounces)
Pipe or hose	10 cm³ (0.35 fluid ounces)

System Refrigerant Specification / Capacity

Item	Specification
Refrigerant type	R134A
Total system capacity	550 grammes (19.4 ounces)

General Specification

Item	Description
Compressor:	
Make	Denso
Type	7SEU17
Sensor locations:	
Ambient temperature sensor	At the front of the vehicle
Smog sensor	At the front of the vehicle adjacent to the ambient temperature sensor
ICS/humidity sensor	On the instrument panel adjacent to the steering column
Solar sensor	On the vehicle centre line on top of the instrument panel
Pressure transducer	In A/C line - LH side of engine compartment

Torque Specifications

Description	Nm	lb-ft
Compressor mounting bolts	23	17
Receiver/drier mounting bolts	10	7
Refrigerant line bolts	6	4
Radiator bolts	25	18
A/C pipe to condenser bolts	6	4
Coolant expansion tank bolts	10	7
Heater housing to bulkhead Torx bolts	6	4
Adaptor panel nuts	6	4
Air conditioning lines to bulkhead bolt	6	4
Air conditioning lines to body nut	6	4
Instrument panel Torx bolts	25	18
Instrument panel carrier to bulkhead Torx bolt	25	18
* Steering column intermediate shaft nut	22	16
Ground cables to passenger side lower A-pillar nuts	10	7
Ground cables to driver side lower A-pillar nuts	10	7
Pressure transducer	10	7
Power steering pump mounting bracket bolts	25	18
Supercharger radiator bolts	10	7
Thermostatic expansion valve	5	4
High pressure pipe to compressor bolt	9	7
Low pressure pipe to compressor	9	7

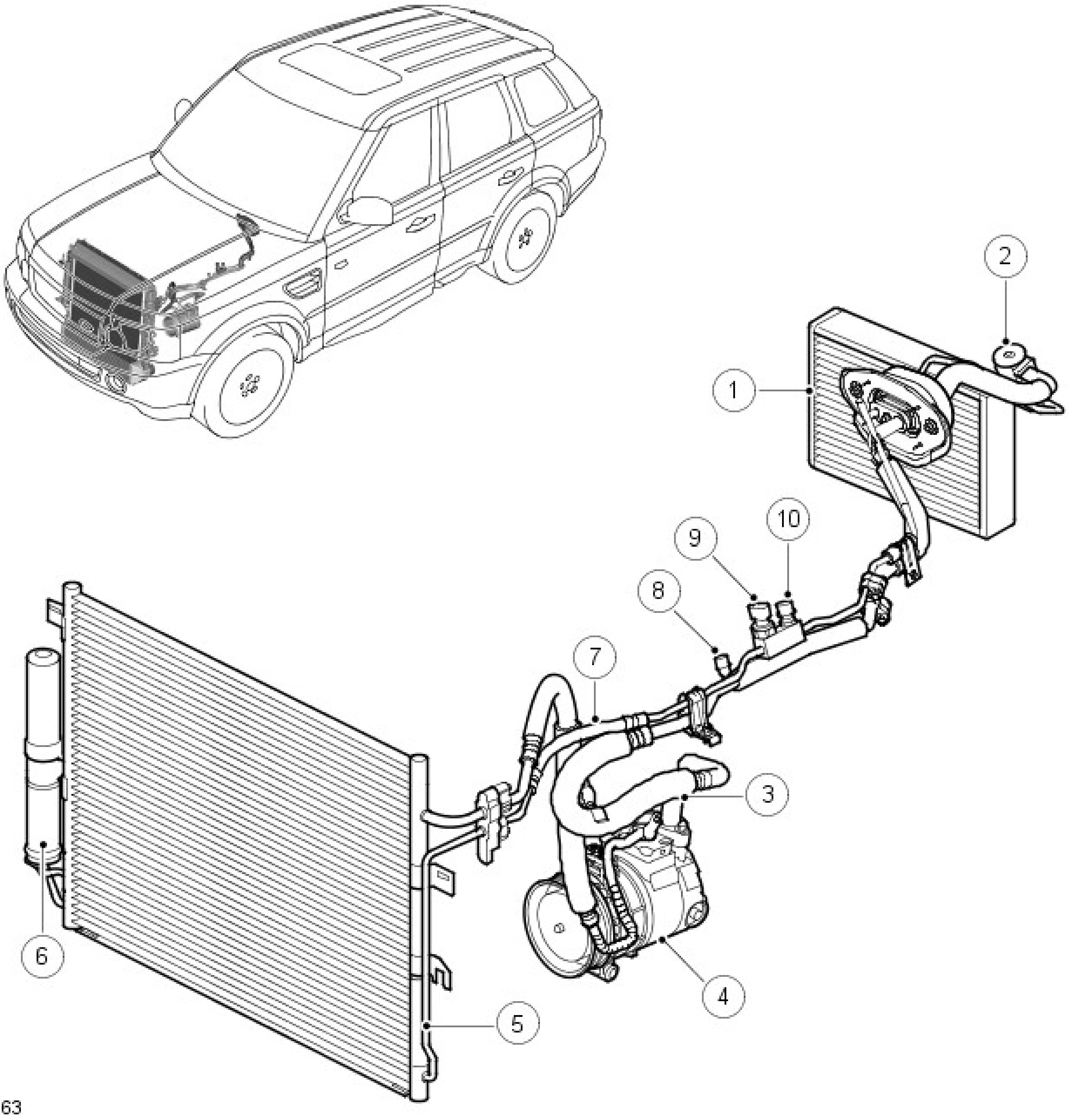
*** New nut must be installed**

Published: 11-May-2011

Air Conditioning - TDV6 2.7L Diesel - Air Conditioning

Description and Operation

COMPONENT LOCATIONS



Item	Part Number	Description
1	-	Evaporator
2	-	Thermostatic expansion valve
3	-	Low pressure line
4	-	air conditioning (A/C) compressor
5	-	Condenser
6	-	Receiver drier
7	-	High pressure line
8	-	Low pressure servicing connection
9	-	Refrigerant pressure sensor (reference)
10	-	High pressure servicing connection

For additional information, refer to: Air Conditioning (412-03A Air Conditioning - V8 S/C 4.2L Petrol, Description and Operation).

Published: 11-May-2011

Air Conditioning - TDV6 2.7L Diesel - Air Conditioning

Diagnosis and Testing

Overview

Due to the different equipment available in dealers, there are no specifics as to the connection of gauge sets or charging and recovery stations. Refer to the instructions for the equipment in use in your own workshop.

For information on the description and operation of the system, refer to section 412-03 - Air Conditioning in the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
• Auxiliary drive belt condition and tension • Compressor condition and installation • Condenser condition and installation/blockage • Air conditioning hoses and pipes • Receiver/drier condition and installation • Cooling fan	• Fuses • Harnesses • Electrical connector(s) • Relays • Sensors • Control panel(s) • Air conditioning compressor

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom chart

Symptom	Possible causes	Action
Poor or no cooling	• Drive belt fault • Compressor fault • Distribution motor/flap fault • Refrigerant leak • In-vehicle temperature sensor fault • Refrigerant pressure sensor fault	Check the drive belt condition and tension (see visual inspection). Check the compressor operation (observe the compressor as the engine is idling with the air conditioning switched on. If the compressor runs erratically or does not run. Carry out the distribution motor self test. Refer to the relevant workshop manual section. Check for sensor DTCs. Refer to the DTC index. Check the refrigerant system using your charging station.
Noise	• Drive belt fault • Compressor fault • Compressor pulley fouling • Refrigerant overcharged	Confirm the air conditioning as the source of the noise by listening for the noise with the air conditioning switched off. Refer to the relevant workshop manual section. Check the refrigerant system using your charging station.
Water entry into cabin	• Heater matrix leak • Blocked evaporator drain tubes	Check for coolant loss. Pressure test the cooling system as necessary. Check and clear the evaporator drain tubes as necessary.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible cause	Action
B1A6111	Cabin Temperature Sensor	● Ambient air temperature sensor signal short circuit to ground	Refer to the electrical guides and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6115	In-vehicle Temperature Sensor Signal	● Ambient air temperature sensor signal high resistance ● In-vehicle temperature sensor signal short circuit to power	Refer to the electrical guides and check the ambient air temperature sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6211	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to ground	Refer to the electrical guides and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A6215	Pressure Sensor	● A/C refrigerant pressure sensor signal short circuit to power	Refer to the electrical guides and check the pressure sensor circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A7001	Compressor Solenoid +ve Supply	● Refrigerant solenoid valve power circuit short circuit to ground ● Refrigerant solenoid valve power circuit short circuit to power ● Refrigerant solenoid valve over temperature	Refer to the electrical guides and check the refrigerant solenoid circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B7884	System Pressure	● Pressure signal below allowable range ● Refrigerant leak	Check for pressure sensor DTcs. Check the refrigerant system using a suitable charging station.
B1B7885	System Pressure	● Pressure signal above allowable range ● Condenser fault ● Cooling fan fault	Check for pressure sensor DTcs. Check the condenser for damage/restriction and the cooling fan operation. Check the refrigerant system using a suitable charging station.

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Air Conditioning - TDV6 2.7L Diesel - Air Conditioning (A/C) Compressor

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.
   For additional information, refer to: Jacking (100-02, Description and Operation).

2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the engine cover.
   For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

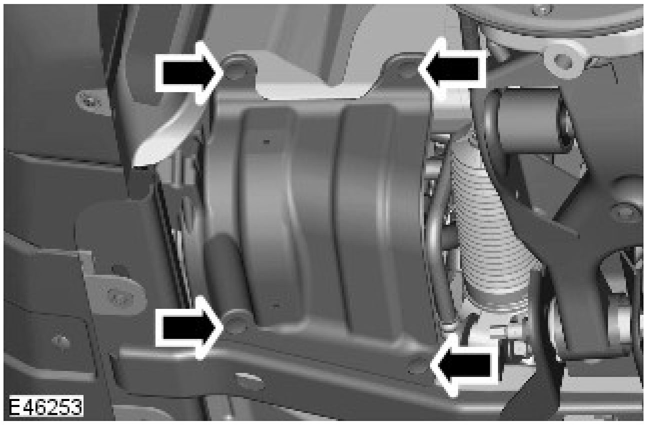
4. Recover the air conditioning (A/C) refrigerant.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

5. Remove the auxiliary battery tray.
   For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

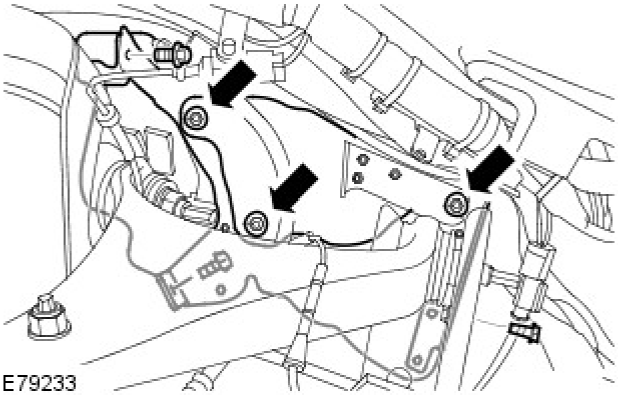
6. Remove the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

7. Remove the LH front wheel and tire.

8. Remove the front LH fender splash shield.
   For additional information, refer to: Fender Splash Shield (501-02, Removal and Installation).

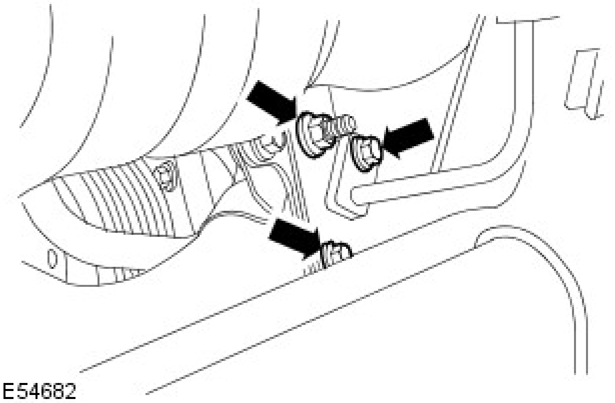


9. Remove the fender splash shield lower trim panel.
   - Remove the 4 clips.


E79233

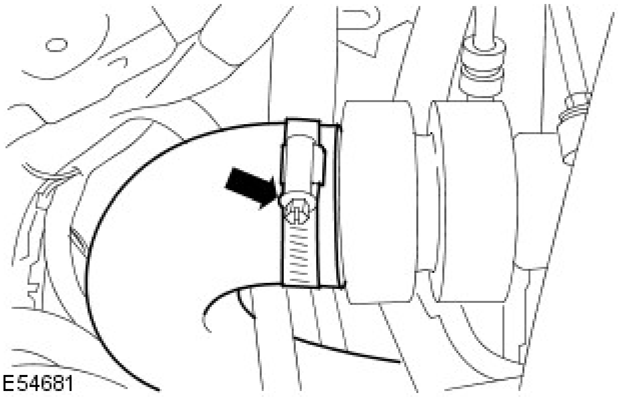
10. Remove the upper arm and brake line heat shields for access.

- Remove the 3 nuts.
- Remove the 3 bolts.


E54682

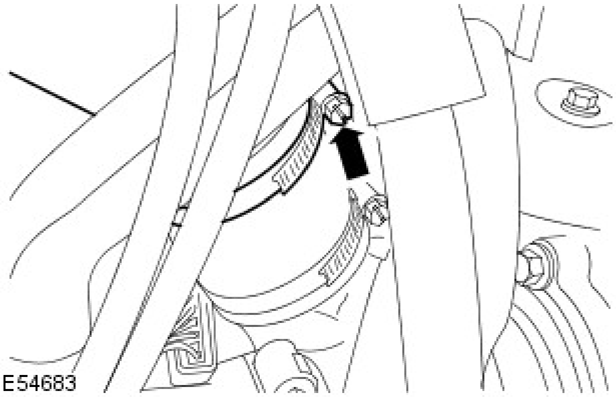
11. Release the charge air cooler inlet pipe.

- Remove the two retaining bolts.
- Remove the retaining nut.


E54681

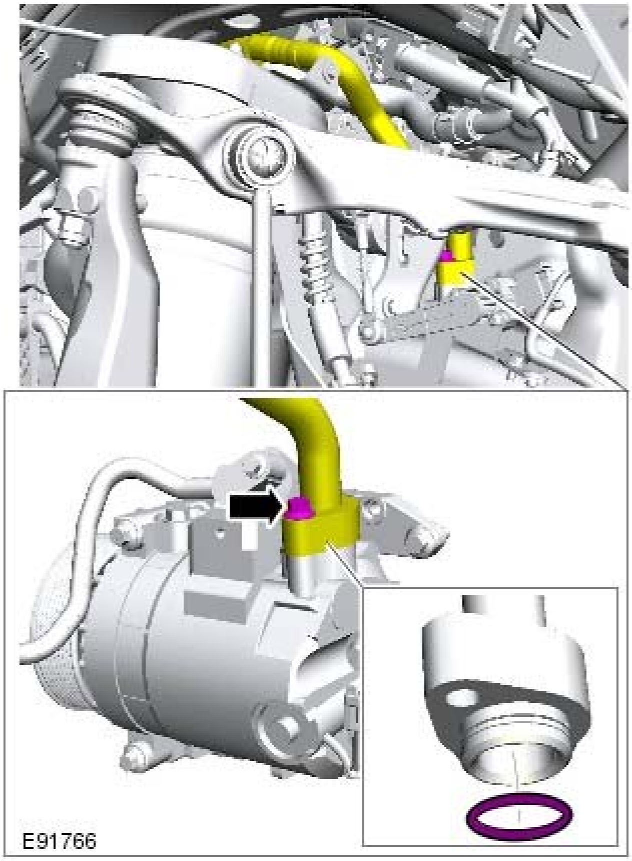
12. Disconnect the charge air cooler inlet hose.

- Loosen the clip.


E54683

13. Disconnect the charge air cooler inlet hose.

- Loosen the clip.



E91766

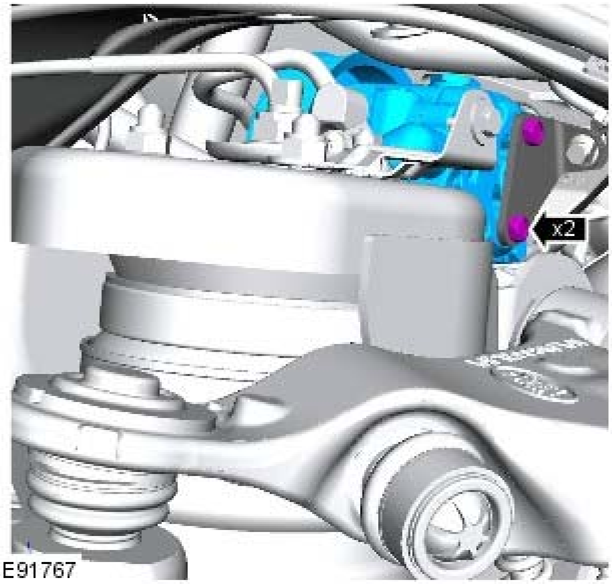
14. CAUTIONS:

⚠ Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

⚠ Care must be taken to avoid damage to the mating surfaces.

Release the A/C low-pressure pipe from the compressor.

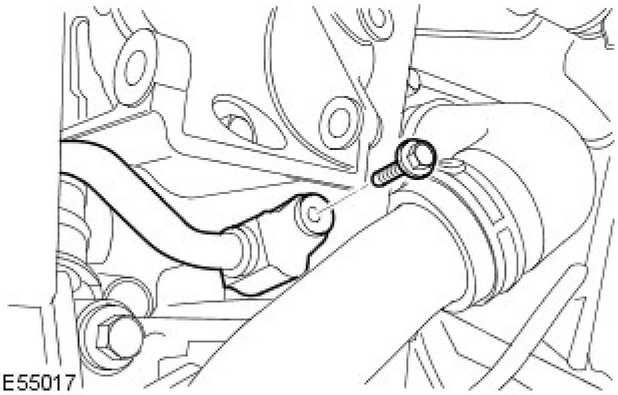
- Remove and discard the O-ring seal.
- Using a suitable tie strap, secure the A/C low-pressure pipe aside.



E91767

15. Release the power steering pump support bracket.

- Reposition the charge air cooler inlet pipe to gain access to the power steering pump retaining bolts.
- Remove the 2 bolts.



16. CAUTIONS:

⚠ Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

⚠ Care must be taken to avoid damage to the mating surfaces.

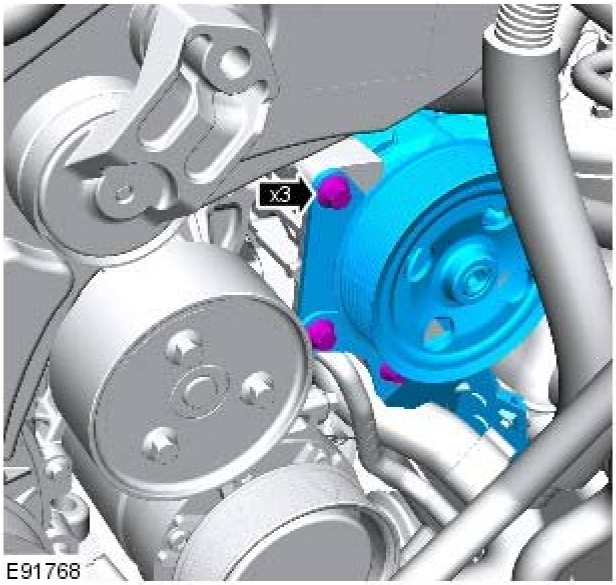
Disconnect the A/C compressor high-pressure pipe.

- Remove the LH retaining bolt.
- Remove and discard the O-ring seal.

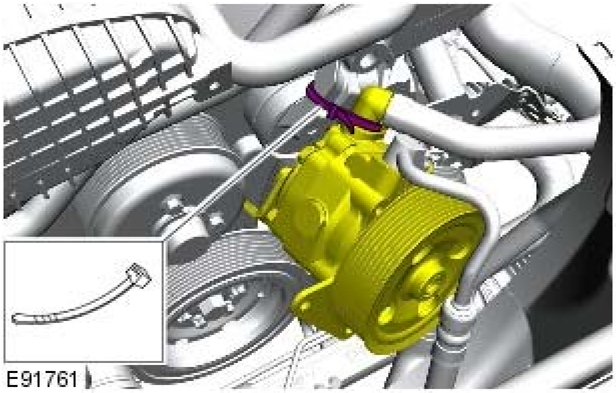
17. Reposition the A/C compressor high-pressure pipe.

18. Release the power steering pump.

- Collect the support bracket.

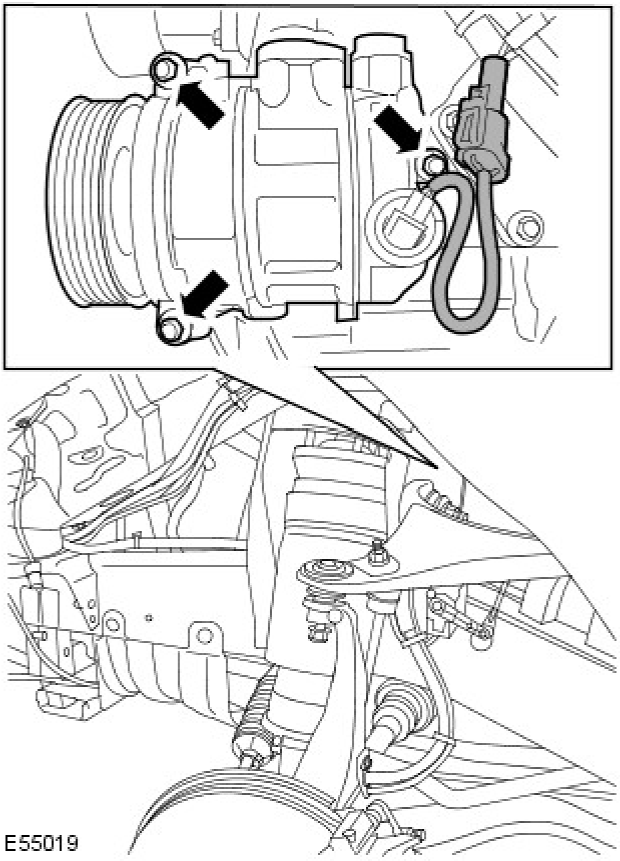


19. Using a suitable tie strap, secure the power steering pump.



20. Remove the A/C compressor.

- Disconnect the A/C compressor electrical connector.
- Remove the three retaining bolts.



Installation

1. ⚠ CAUTION: Lubricate the new seals with clean refrigerant oil.

Install the A/C compressor.

- Install the three retaining bolts.
- Tighten the bolts to 23 Nm (17 lb.ft).
- Connect the A/C compressor electrical connector.

2. Secure the power steering pump.

- Remove and discard the tie strap.
- Install the support bracket.

3. Reposition the A/C compressor high-pressure pipe.

4. Connect the A/C compressor high-pressure pipe.

- Remove the blanking caps from the ports.
- Install a new O-ring seal.
- Tighten the retaining bolt to 9 Nm (7 lb.ft).

5. Install the power steering pump rear bolts.

- Reposition the charge air cooler inlet pipe to gain access to the power steering pump retaining bolts.
- Tighten the bolts to 22 Nm (16 lb.ft).

6. Connect the A/C compressor low-pressure pipe.

- Remove the blanking caps from the ports.
- Install a new O-ring seal.
- Tighten the retaining bolt to 9 Nm (7 lb.ft).

7. Connect the charge air cooler inlet hose.

- Tighten the clips.

8. Secure the charge air cooler inlet pipe.

- Install the two retaining bolts.
- Install the retaining nut.
- Tighten to 10 Nm (7 lb.ft).

9. Install the upper arm and brake line heat shields.

- Install the 3 bolts.
- Install the 3 nuts.

10. Install the fender splash shield lower trim panel.

- Install the 4 clips.

11. Install the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02, Removal and Installation).

12. Install the wheel and tire.

- Tighten nuts to 140 Nm (103 lb.ft).

13. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05C Accessory Drive - TDV6 2.7L Diesel, Removal and Installation).

14. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

15. Recharge the A/C system
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

16. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

17. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Air Conditioning - TDV6 2.7L Diesel - Evaporator Core

Removal and Installation

Removal

1. Evacuate the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

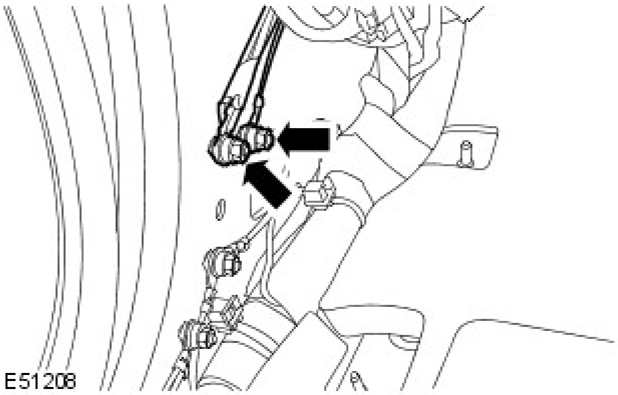
3. Drain the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

4. Remove the driver side front seat.
For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

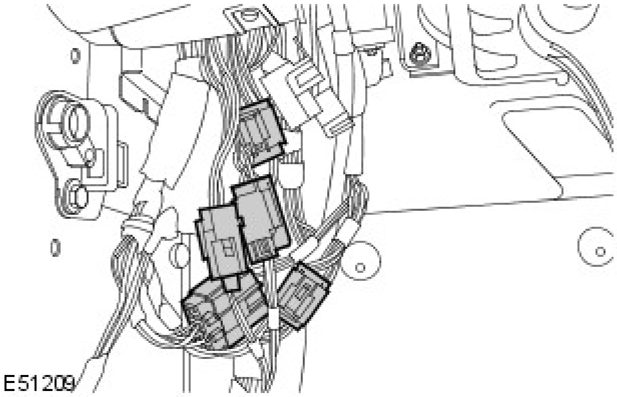
5. Remove the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

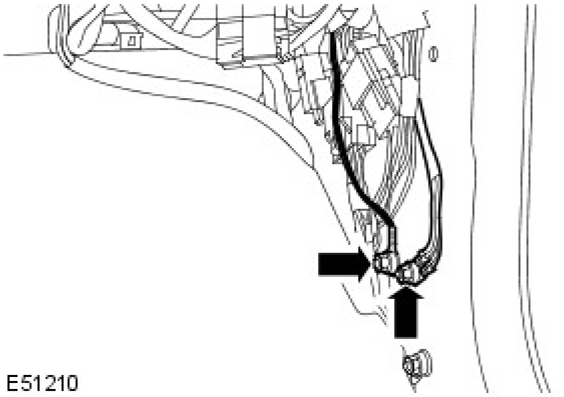
6. Release the 3 ground cables from the driver side lower A-pillar.

- Remove the 2 nuts.



7. Disconnect the 5 electrical connectors from the driver side lower A-pillar.



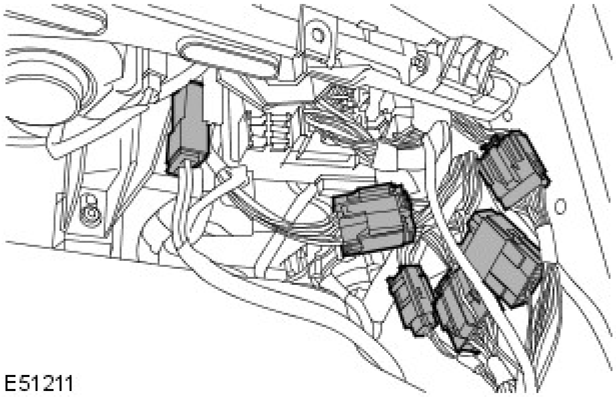


E51210

8. Release the 3 ground cables from the passenger side lower A-pillar.

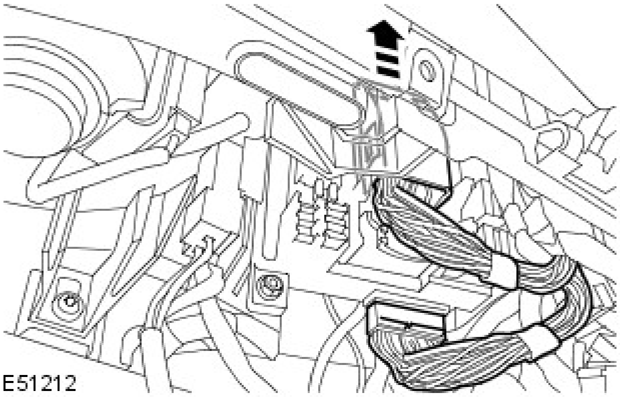
- Remove the 2 nuts.

9. Disconnect the heater motor electrical connector.



E51211

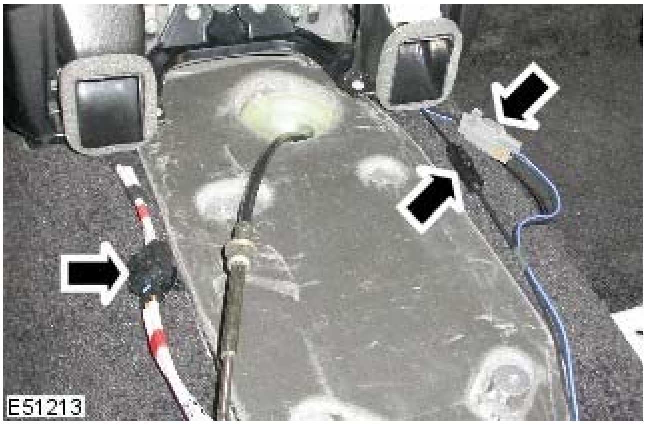
10. Disconnect the 5 electrical connectors from the passenger side lower A-pillar.



E51212

11. Disconnect 2 central junction box (CJB) electrical connectors.

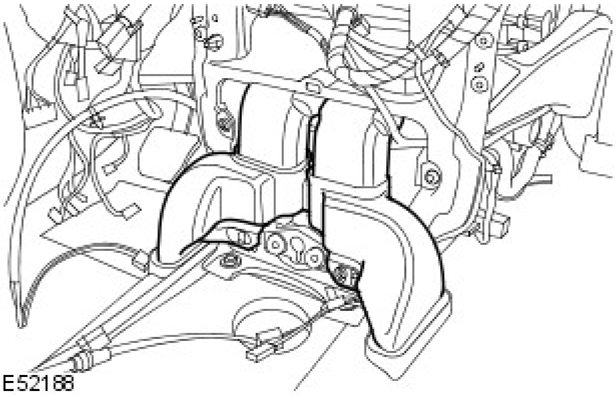
12. Disconnect 2 electrical connectors from the instrument panel center reinforcement.



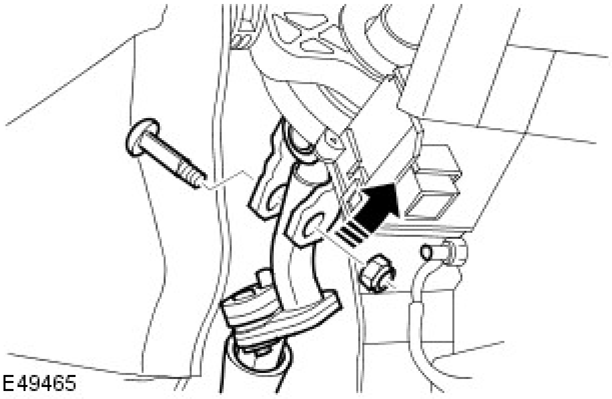
13. ⚠CAUTION: Cover fibre optic cable connectors to minimise dust ingress and avoid bending the cables in a radius of less than 30 mm.

If installed, disconnect the instrument panel center reinforcement fibre optic cables.

- Disconnect the electrical connector.

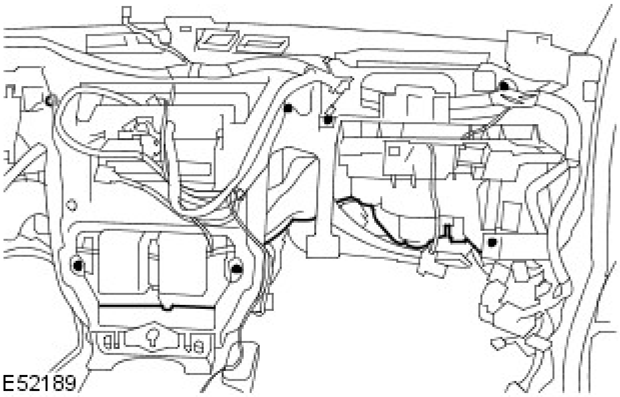


14. Remove the heater housing center ducts.



15. Disconnect the steering column intermediate shaft from the steering column.

- Note the fitted position.
- Remove the special bolt and discard the nut.

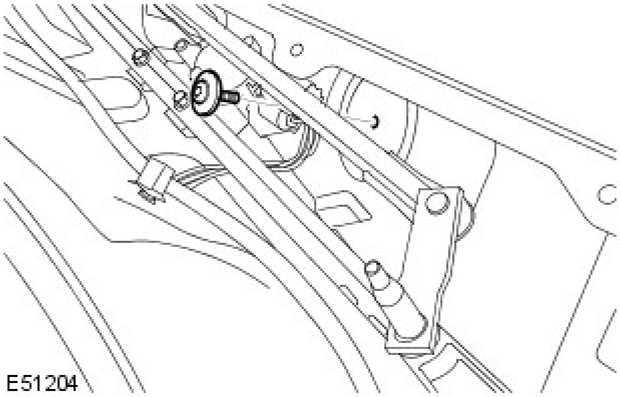


16. Release the heater housing from the instrument panel carrier.

- Remove the 7 Torx screws.

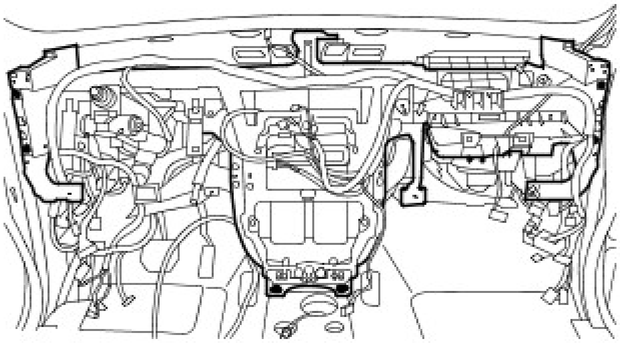
17. Remove the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

18. Remove the instrument panel carrier to bulkhead Torx bolt.



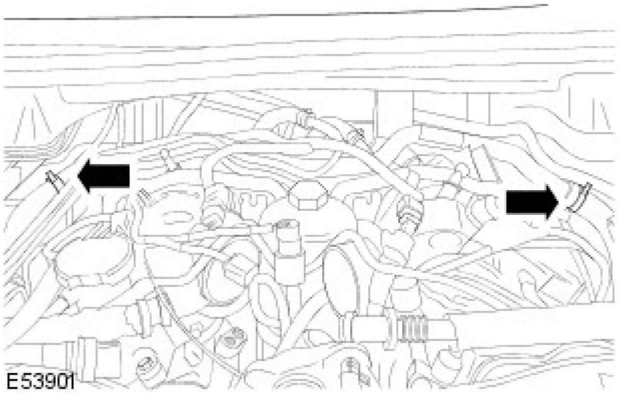
19. With assistance, remove the instrument panel.

- Remove the 6 Torx bolts.



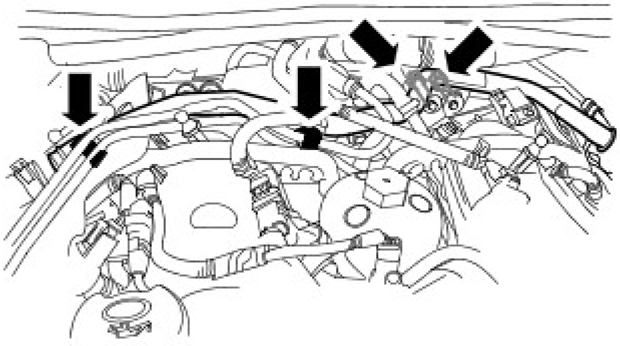
20. Disconnect both exhaust gas recirculation (EGR) coolant cross-over pipe hoses.

- Release the 2 clips.



21. Remove the EGR coolant cross-over pipe.

- Remove the 2 bolts.
- Release the 2 clips.

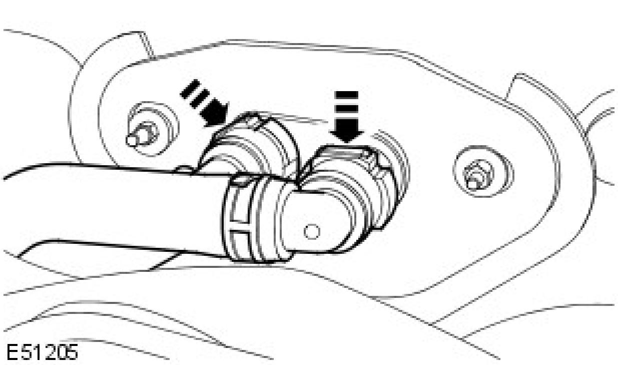


E55561

22. CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect 2 heater hoses from the bulkhead.

- Release the 2 clips.



E51205

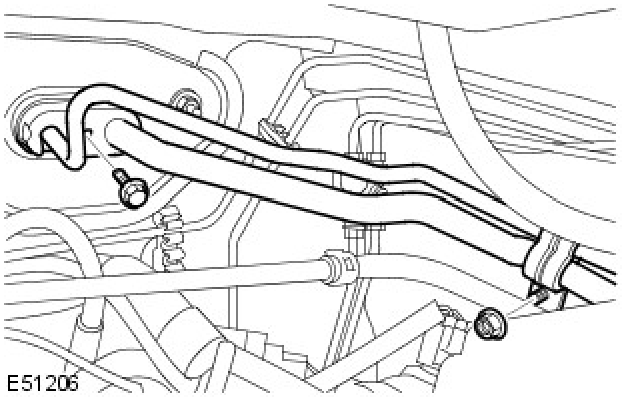
23. Release 2 A/C lines from the body.

- Remove the nut.

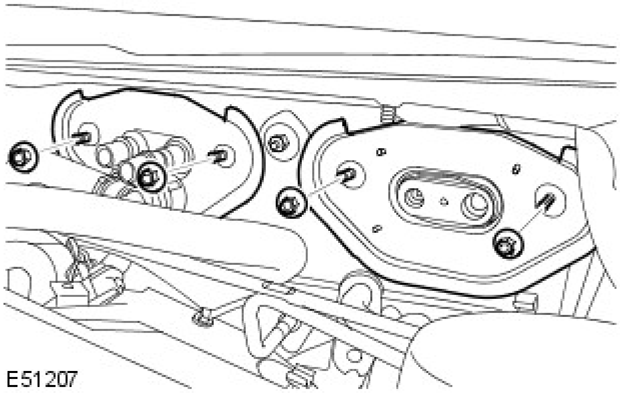
24. CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Release 2 A/C lines from the bulkhead.

- Remove the bolt.
- Remove and discard the O-ring seals.

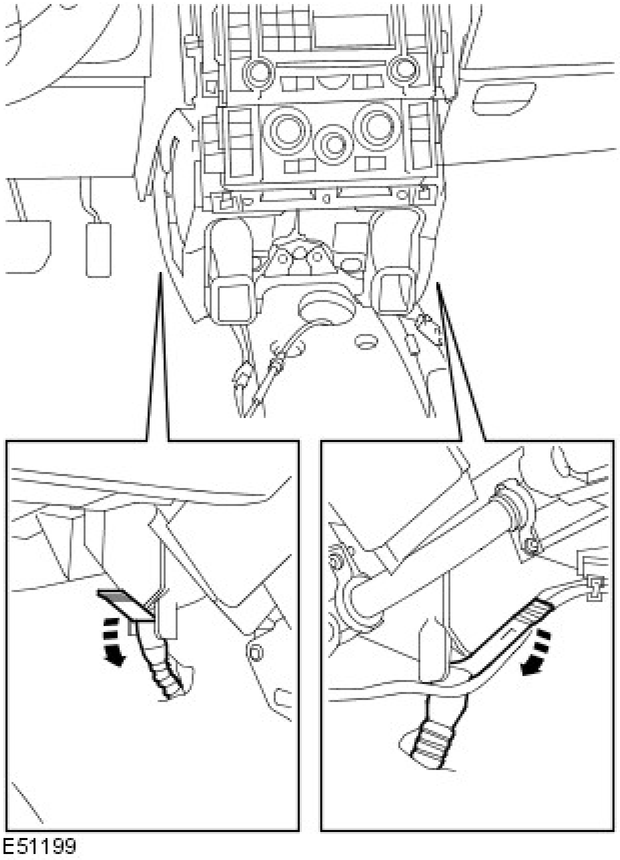


E51206

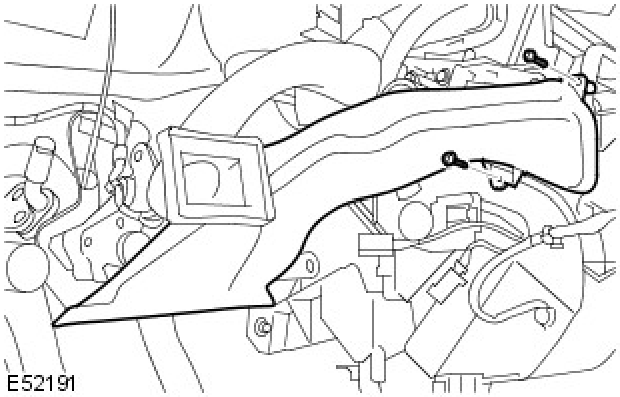


25. Remove the 2 adapter panels.

- Remove the 4 nuts.

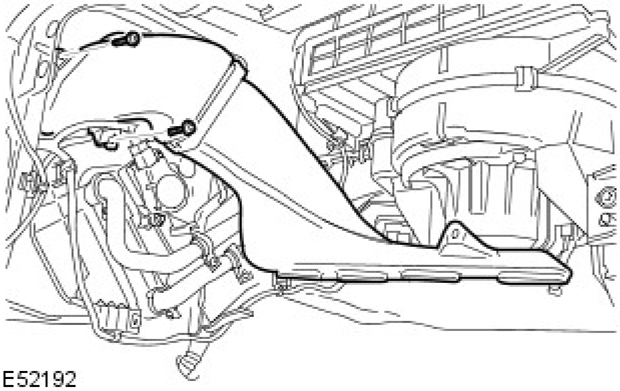


26. Disconnect 2 drain tubes from the heater housing.



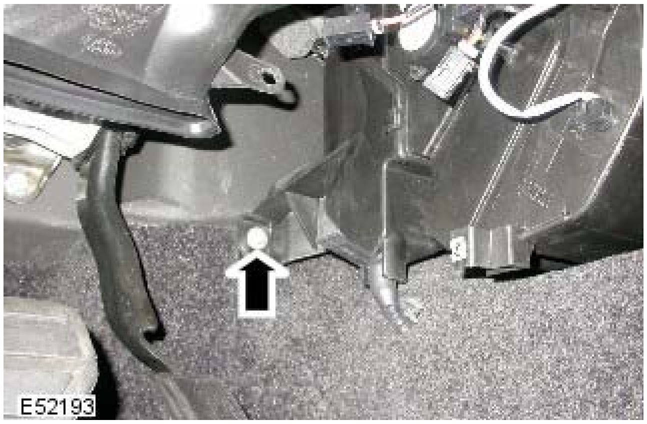
27. Remove the driver side footwell duct.

- Remove the 2 Torx screws.

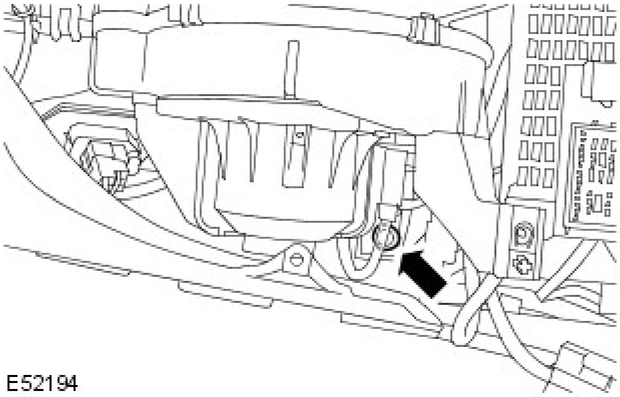

E52192

28. Remove the passenger side footwell duct.

- Remove the 2 Torx screws.


E52193

29. Driver side: Remove the heater housing to bulkhead Torx bolt.


E52194

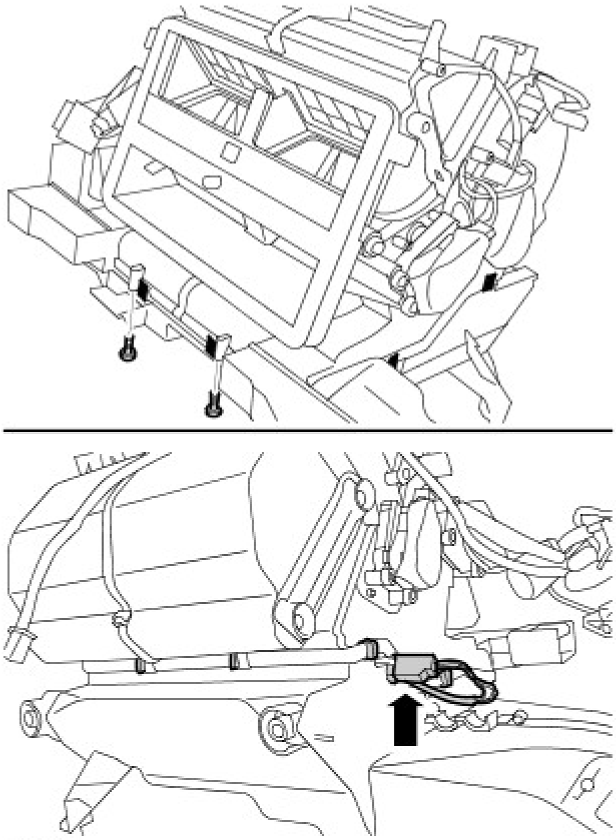
30. Passenger side: Remove the heater housing to bulkhead Torx bolt.

31. Remove the heater housing.

32. Disconnect the evaporator core temperature sensor electrical connector.

33. Release the heater core housing.

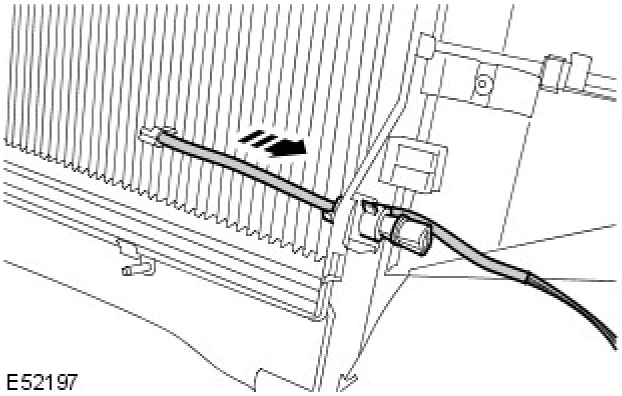
- Remove the 2 screws.
- Remove the 8 clips.



E52196

34. Remove the evaporator core.

- Release the temperature sensor.



E52197

Installation

1. Install the evaporator core.
    - Secure the temperature sensor.
2. Secure the heater core housing.
    - Install the clips.
    - Tighten the screws.
3. Connect the temperature sensor electrical connector.
4. Install the heater housing.
5. Passenger side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

6. Driver side: Install the heater housing to bulkhead Torx bolt and tighten to 6 Nm (4 lb.ft).

7. Install the footwell ducts.

- Tighten the Torx screws.

8. Connect the drain tubes to the heater housing.

9. Install the adapter panels.

- Tighten the nuts to 6 Nm (4 lb.ft).

10. Secure the A/C lines to the bulkhead.

- Clean the components.
- Install new O-ring seals.
- Tighten the bolt to 6 Nm (4 lb.ft).

11. Secure the A/C lines to the body.

- Tighten the nut to 6 Nm (4 lb.ft).

12. Connect the bulkhead heater hoses.

13. Install the EGR coolant cross-over pipe.

- Tighten the bolts to 10 Nm (7 lb.ft).
- Secure the clips.
- Connect the hoses and secure with the clips.

14. With assistance, install the instrument panel.

- Tighten the Torx bolts to 25 Nm (18 lb.ft).

15. Install the instrument panel carrier to bulkhead Torx bolt and tighten to 25 Nm (18 lb.ft).

16. Install the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

17. Secure the heater housing.

- Tighten the screws.

18. Connect the steering column intermediate shaft.

- Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).

19. Install the heater housing center ducts.

20. Connect the instrument panel center reinforcement fibre optic cables.

21. Connect the instrument panel center reinforcement electrical connectors.

22. Connect the CJB electrical connectors.

23. Connect the heater motor electrical connector.

24. Connect the electrical connectors to the passenger side lower A-pillar.

25. Connect the ground cables to the passenger side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

26. Connect the electrical connectors to the driver side lower

A-pillar.

27. Connect the ground cables to the driver side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

28. Install the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

29. Install the front seat.
For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

30. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

31. Refill the cooling system.
For additional information, refer to: Cooling System Draining, Filling and Bleeding (303-03C Engine Cooling - TDV6 2.7L Diesel, General Procedures).

Published: 11-May-2011

Air Conditioning - TDV6 2.7L Diesel - Condenser Core

Removal and Installation

Removal

• NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

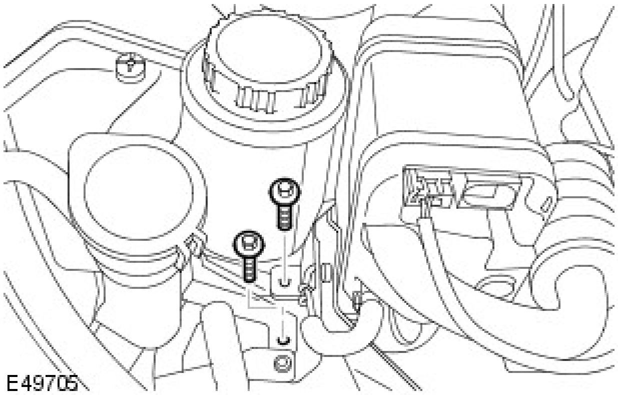
Raise and support the vehicle.

2. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Recover the A/C refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

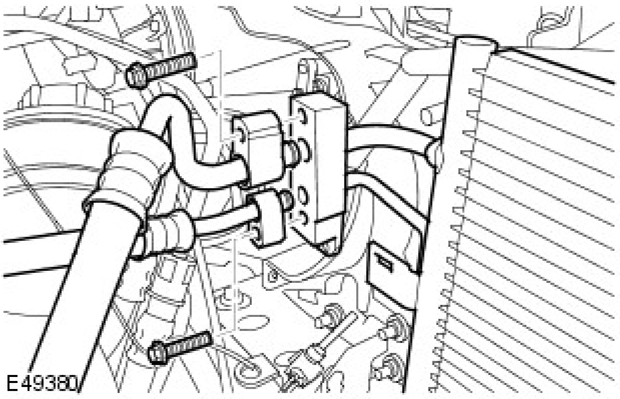
4. Remove the cooling fan lower shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

5. Remove the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).



6. Release the coolant expansion tank.

- Remove the 2 bolts.



7. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

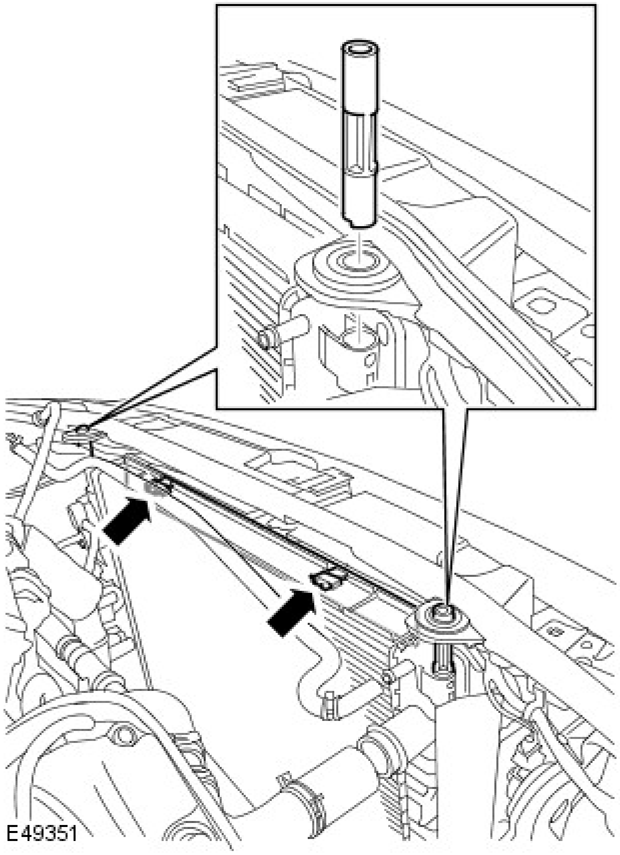
Disconnect the A/C condenser refrigerant lines.

- Remove the 2 bolts.
- Discard the O-ring seals.

8. Remove the radiator securing pegs.

9. Remove the radiator upper deflector.

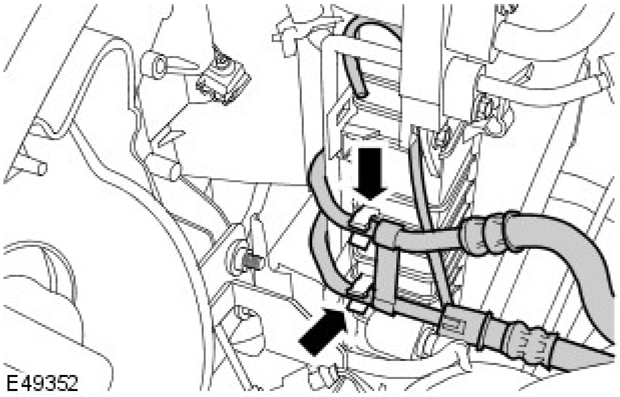
- Release the 2 clips.



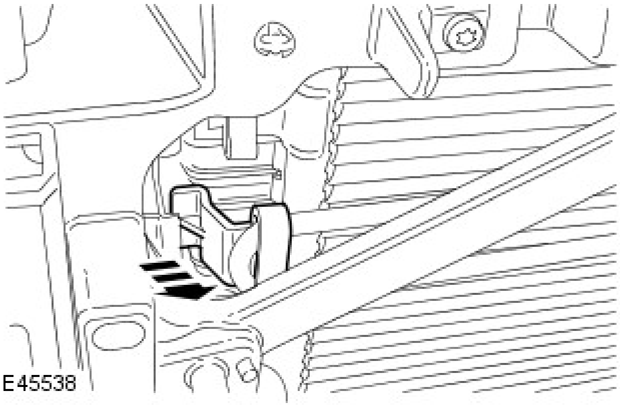
10. Release the power steering fluid cooler.

- Release it from 3 clips.

11. Release the front differential breather line.



12. Remove the power steering fluid cooler line clip.

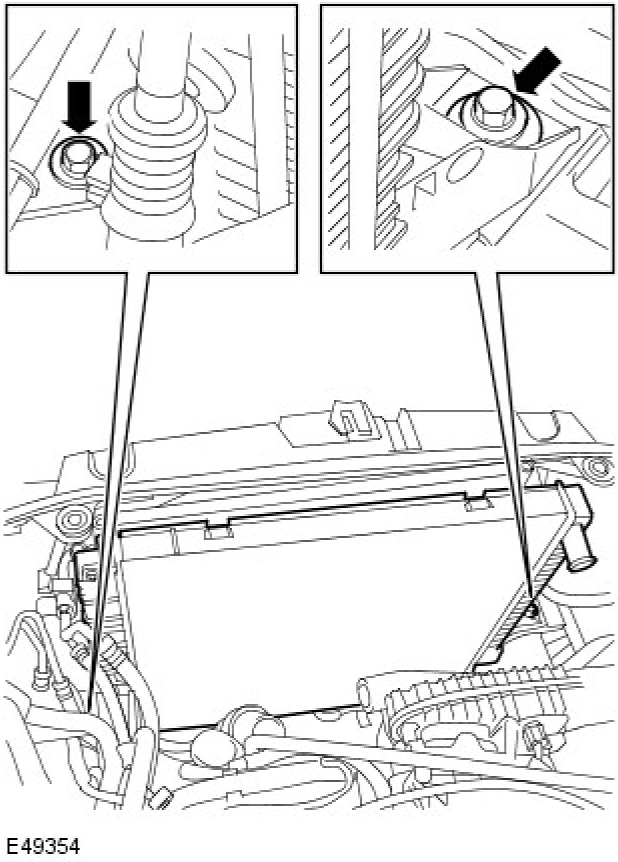


13. Tie the engine air intake duct towards the engine.

14. Tie the fuel fired booster heater coolant lines towards the engine.

15. Move the radiator towards the engine.

- Remove the 2 bolts.
- Lift it clear of its mountings.
- Tie the radiator towards the engine.



16. Remove the A/C condenser.

- Remove the bolt.
- Release it from the 4 clips

Installation

1. Install the A/C condenser.

2. Position the radiator.

- Lift the radiator onto its mountings.

- Tighten the bolts to 25 Nm (18 lb.ft).

3. Position the front differential breather line.

4. Install the power steering fluid cooler line clip.

5. Secure the power steering fluid cooler line.

- Secure in the 3 clips.

6. Install the radiator upper deflector.

7. Install the radiator securing pegs.

8. Secure the coolant expansion tank.

- Tighten the 2 bolts to 10 Nm (7 lb.ft).

9. Connect the A/C condenser refrigerant lines.

- Clean the component mating faces.
- Install new O-ring seals.
- Tighten the bolts to 25 Nm (18 lb.ft).

10. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

11. Install the cooling fan lower shroud.
For additional information, refer to: Cooling Fan Shroud (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

12. Fill the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

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Air Conditioning - TDV6 2.7L Diesel - Receiver Drier

Removal and Installation

Removal

• NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure). The system is leaking and refrigerant has been lost to atmosphere. Refrigerant circuit has been open more than 24 hours due to repair.

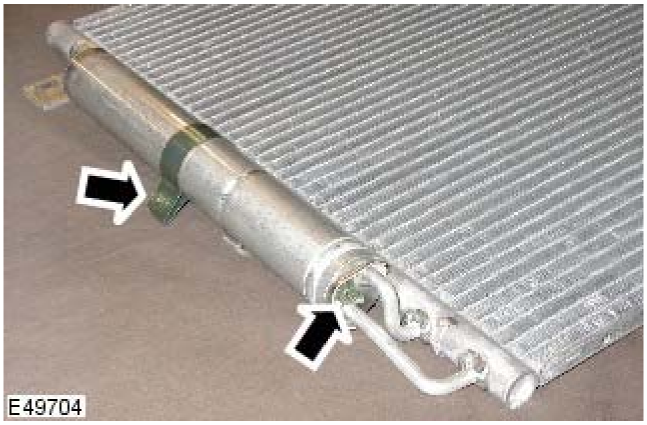
1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the A/C condenser.
For additional information, refer to: Condenser Core (412-03C Air Conditioning - TDV6 2.7L Diesel, Removal and Installation).

3. Remove the receiver drier support bracket clamp.

- Loosen the screw.


E49704

4. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Remove the receiver drier.

- Remove the bolt.
- Remove the clamp.
- Remove and discard the 2 O-ring seals.

Installation

1. Install the receiver drier.

- Clean the component mating faces.
- Install new O-ring seals.
- Install the clamp.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. Install the receiver drier support bracket clamp.

- Tighten the screw.

3. Install the A/C condenser.
For additional information, refer to: Condenser Core (412-03C Air Conditioning - TDV6 2.7L Diesel, Removal and Installation).

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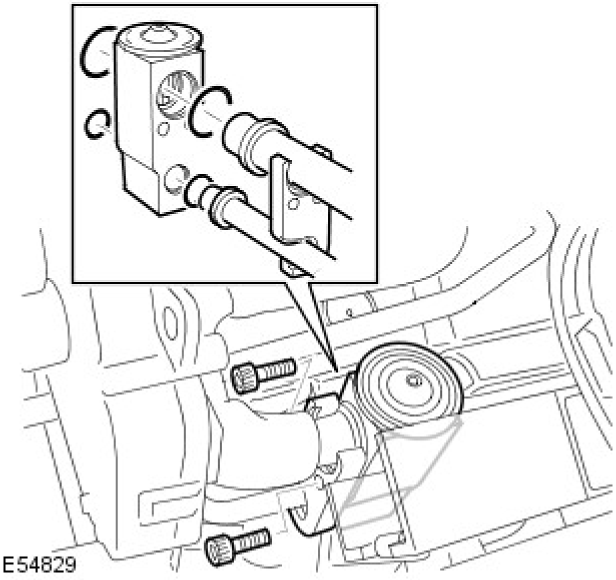
Air Conditioning - TDV6 2.7L Diesel - Thermostatic Expansion Valve

Removal and Installation

Removal

1. Evacuate the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

2. Remove the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).



3. ⚠ CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Remove the thermostatic expansion valve.

- Remove the cover.
- Remove the 2 Allen bolts.
- Remove and discard the 4 O-ring seals.

Installation

1. Install the thermostatic expansion valve.

- Clean the components.
- Install the new O-ring seals.
- Tighten the Allen bolts to 5 Nm (4 lb.ft).
- Install the cover.

2. Install the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

3. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

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Air Conditioning - TDV6 2.7L Diesel - Air Conditioning (A/C) Compressor Pulley

Removal and Installation

Removal

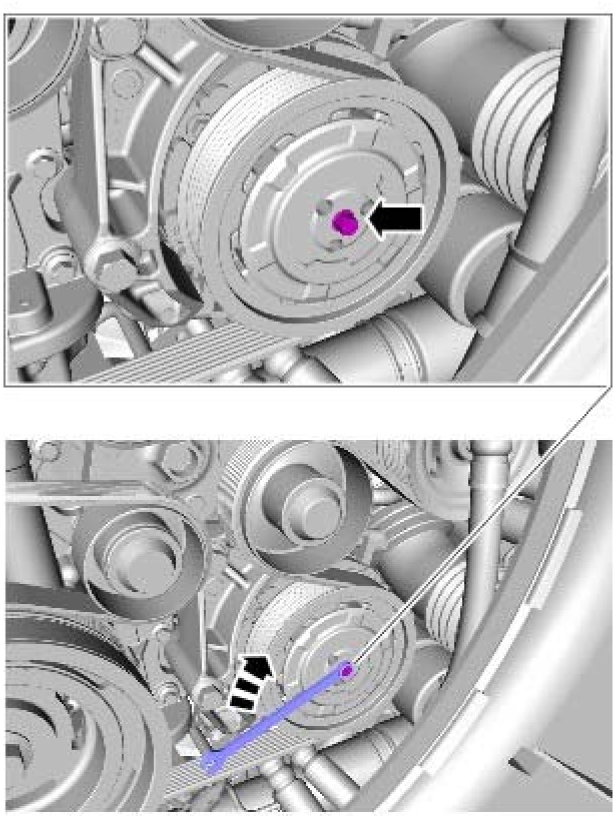
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.
- NOTE: Components removed for clarity.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the cooling fan.
For additional information, refer to: Cooling Fan (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

3. Using a suitable tool, release the hub locking stud.

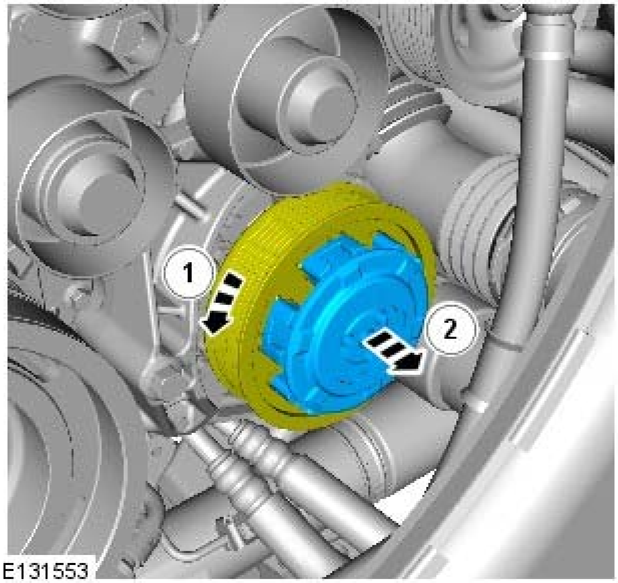
- Rotate the fixing clockwise to release the hub.
- If required, use a suitable tool to prevent the hub from rotating.



E131552

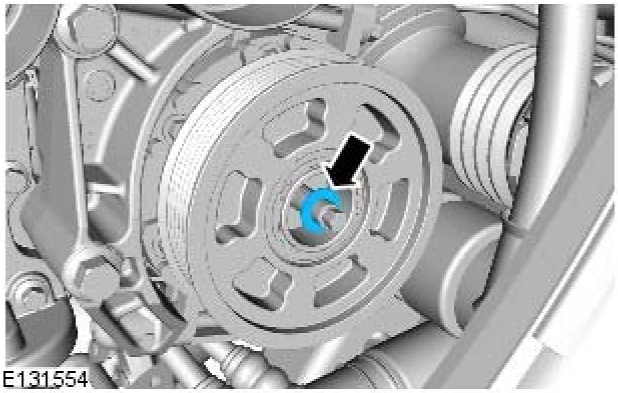
4. NOTE: Using a 3/8 square drive wrench, rotate the tensioner counter clockwise.

Release the accessory drive belt from the A/C compressor pulley.

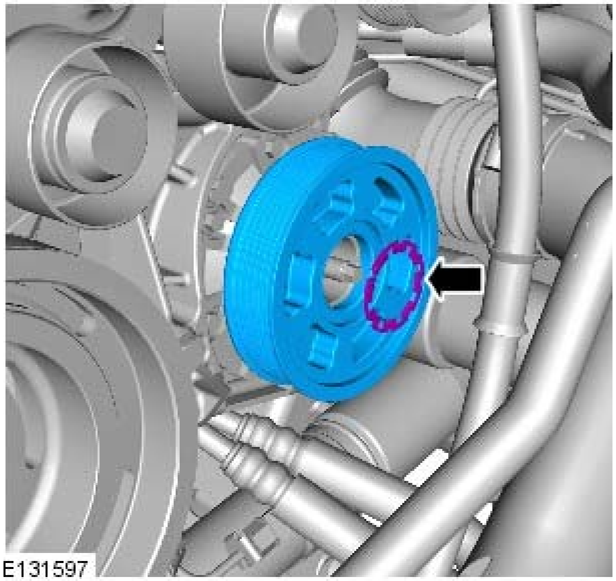


5. Remove and discard the hub assembly.

- Rotate the pulley counter-clockwise, until the hub is released from the pulley.
- Discard the rubber dampers.



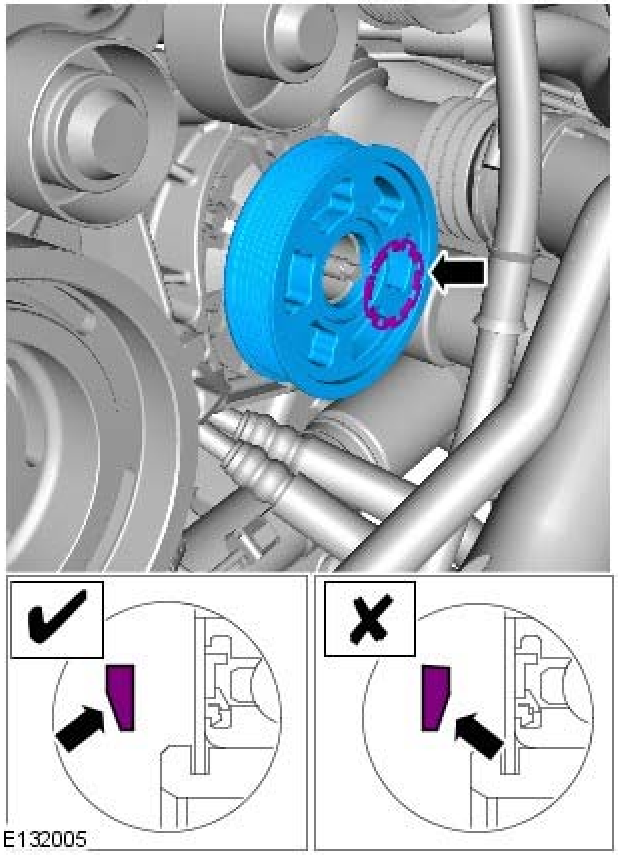
6. Remove and discard the spacer.



7. Remove and discard the drive pulley.

- Remove and discard the circlip.
- Clean the compressor mating surface.

Installation



1. ⚠CAUTION: Make sure the circlip is fitted in the correct orientation.

Install the drive pulley.

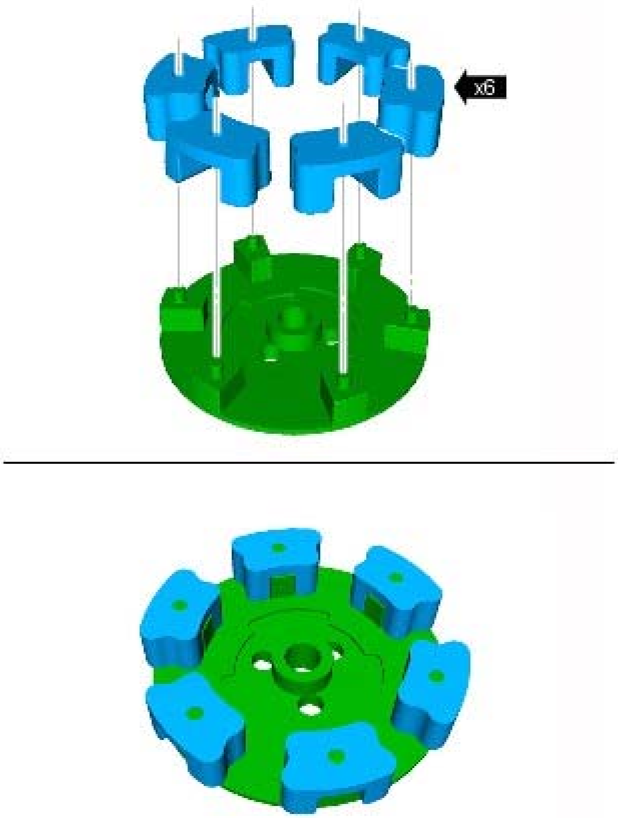
- Install the circlip.

2. Install the spacer.

- Make sure the spacer is fully seated.

3. Install the 6 rubber dampers to the hub assembly.

- Make sure the dampers are installed in the correct orientation.



E131556

4. NOTE: Apply a suitable water based lubricant to the rubber dampers and to the mating surfaces on pulley.

Install the hub assembly.

- Push the hub assembly onto the pulley, and rotate clockwise to screw it onto the compressor shaft.

5. NOTE: Tighten counterclockwise.

Using a suitable tool, tighten the hub locking stud.

- Prevent the pulley rotating by hand.
- Tighten to 3.5 Nm (2.6 lb.ft)

6. Install the auxiliary drive belt.

7. Install the cooling fan.
For additional information, refer to: Cooling Fan (303-03C Engine Cooling - TDV6 2.7L Diesel, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Air Conditioning - TDV8 3.6L Diesel -

Lubricant

Item	Specification
Compressor oil	Sanden SP-10 PAG oil

Lubricant

Item	Specification
Compressor oil	Denso ND-8 PAG oil
Total system capacity	130 cm³ (4.5 fluid ounces)
Additional amount of oil to be added to system if a component is replaced:	
Condenser	40 cm³ (1.4 fluid ounces)
Evaporator	40 cm³ (1.4 fluid ounces)
Pipe or hose	10 cm³ (0.35 fluid ounces)

System Refrigerant Specification / Capacity

Item	Specification
Refrigerant type	R134A
Total system capacity	650 grammes (22.9 ounces)

General Specification

Item	Description
Compressor:	
Make	Denso
Type	7SEU17
Sensor locations:	
Ambient temperature sensor	At the front of the vehicle
Smog sensor	At the front of the vehicle adjacent to the ambient temperature sensor
ICS/humidity sensor	On the instrument panel adjacent to the steering column
Solar sensor	On the vehicle centre line on top of the instrument panel
Pressure transducer	In A/C line - LH side of engine compartment

Torque Specifications

Description	Nm	lb-ft
A/C compressor support bracket to cylinder block bolts	45	33
A/C compressor to A/C compressor support bracket bolts	23	17
A/C compressor to cylinder block bolt	45	33
A/C compressor low-pressure refrigerant line bolt	10	7
A/C compressor high-pressure refrigerant line bolt	9	7
Refrigerant line to condenser	10	7
TXV to refrigerant line clamp bolts	6	4.4
Refrigerant line to bulkhead bolt	6	4.4
A/C line clamp to body bolt	6	4.4
Accessory drive belt tensioner bolt	25	18

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Air Conditioning - TDV8 3.6L Diesel - Air Conditioning (A/C) Compressor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Recover the air conditioning (A/C) refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. Remove the cooling fan belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

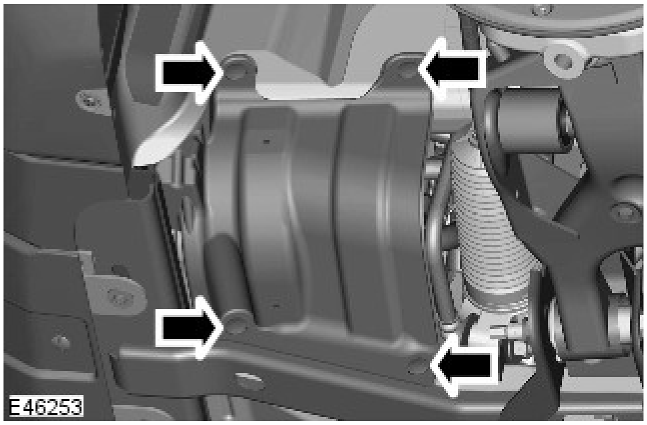
Raise and support the vehicle.

5. Remove the LH front wheel and tire.

6. Remove the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

7. Remove the front LH splash shield.

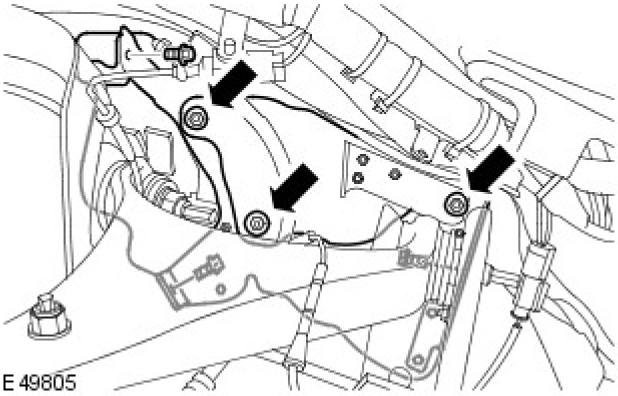
- Remove the 4 clips.

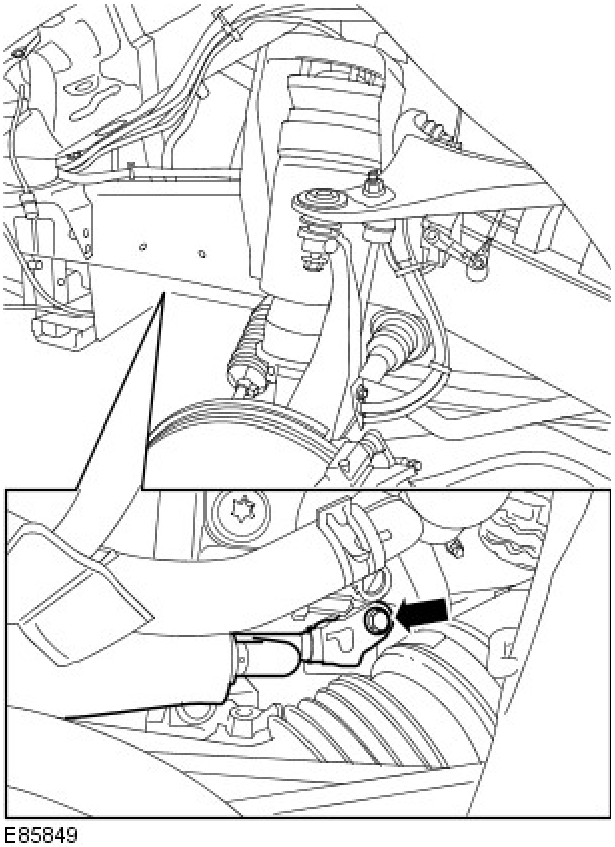


8. NOTE: The heat shield consists of 3 parts.

Remove the LH upper suspension arm and brake line heat shields.

- Remove the 3 nuts.
- Remove the 3 bolts.

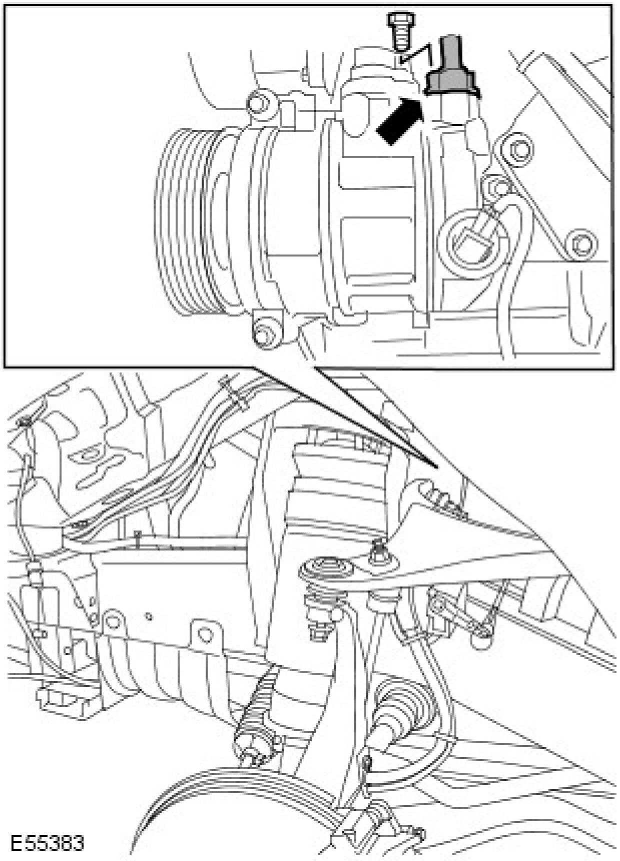




9. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the A/C compressor high-pressure refrigerant line.

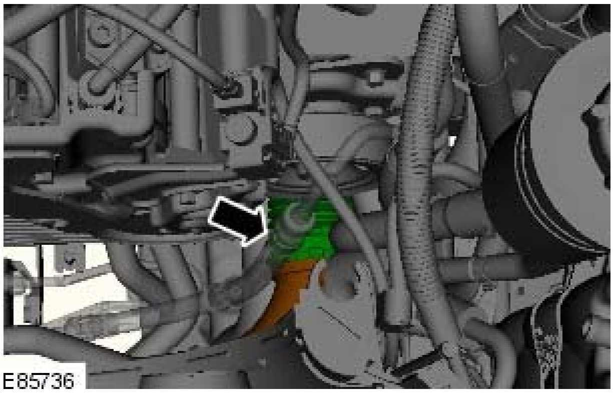
- Remove the bolt.
- Remove and discard the O-ring seal.



10. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

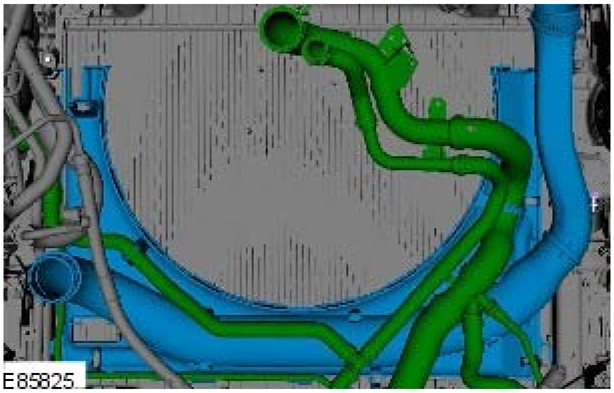
Disconnect the A/C compressor low-pressure refrigerant line.

- Remove the bolt.
- Remove and discard the O-ring seal.


E85736

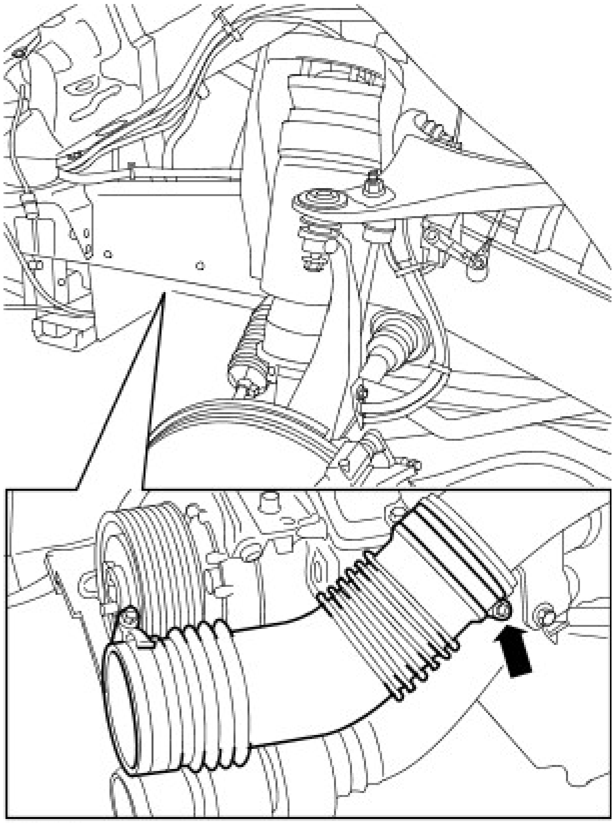
11. Release the LH turbocharger intake tube.

- Loosen the clip.


E85825

12. Remove the cooling fan lower shroud.

- Release the coolant pipes and hoses from the cooling fan lower shroud.
- Release the turbocharger intake tube.

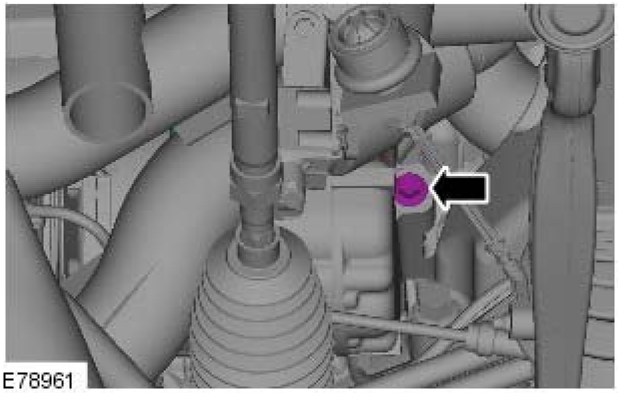

E85850

13. Remove the turbo intake connecting tube.

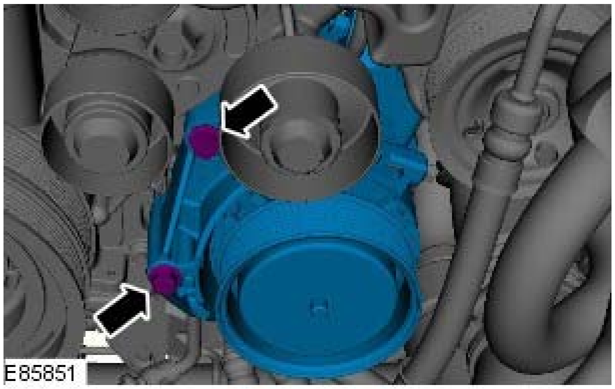
- Release the clip.

14. Disconnect the A/C compressor electrical connector.

- Release the A/C compressor electrical connector from the bracket.



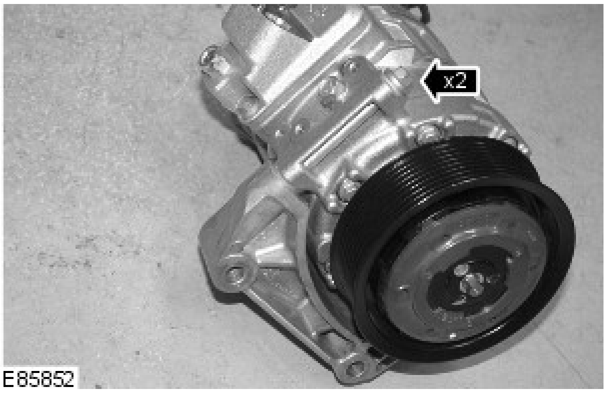
15. Remove the A/C compressor rear bolt.



16. ⚠ CAUTION: Protect the radiator during this operation.

Remove the A/C compressor and support bracket.

- Remove the 2 bolts.



17. NOTE: Do not disassemble further if the component is removed for access only.

Remove the A/C compressor support bracket.

- Remove the 2 bolts.

Installation

1. Install the A/C compressor support bracket.

- Tighten the bolts to 23 Nm (17 lb.ft).

2. ⚠ CAUTION: Protect the radiator during this operation.

Install the A/C compressor and support bracket.

- Tighten the bolts to 48 Nm (35 lb.ft).

3. Install the A/C compressor rear bolt.

- Tighten the bolt to 23 Nm (17 lb.ft).

4. Connect the A/C compressor electrical connector.

- Secure the A/C compressor electrical connector to the bracket.

5. Install the turbo intake connecting tube.

- Secure the clip.

6. Install the cooling fan lower shroud.

- Secure the RH turbocharger intake tube.
- Secure the coolant pipes and hoses to the cooling fan lower shroud.

7. Secure the LH turbocharger inlet tube.

- Tighten the clip.

8. NOTE: Remove and discard the blanking caps.

Connect the A/C compressor low-pressure refrigerant line.

- Install a new O-ring seal.
- Tighten the bolt to 10 Nm (7 lb.ft).

9. NOTE: Remove and discard the blanking caps.

Connect the A/C compressor high-pressure refrigerant line.

- Install a new O-ring seal.
- Tighten the bolt to 10 Nm (7 lb.ft).

10. Install the LH upper suspension arm and brake line heat shields.

- Tighten the nuts.
- Tighten the bolts.

11. Install the front LH splash shield.

- Install the clips.

12. Install the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

13. Install the LH front wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

14. Install the cooling fan belt.
For additional information, refer to: Cooling Fan Belt (303-05D Accessory Drive - TDV8 3.6L Diesel, Removal and Installation).

15. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

16. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Air Conditioning - TDV8 3.6L Diesel - Condenser Core

Removal and Installation

Removal

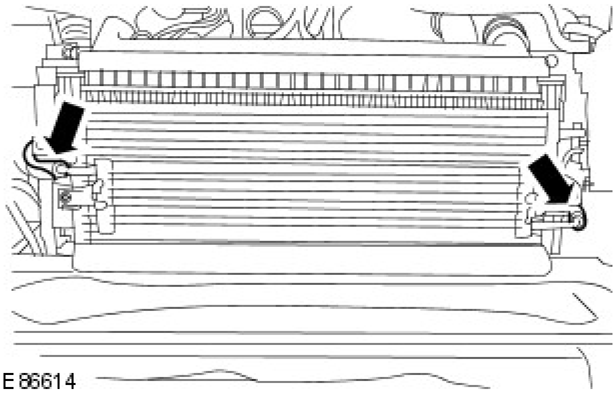
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Recover the air conditioning (A/C) refrigerant.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

4. Remove the hood latch panel.
For additional information, refer to: Hood Latch Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

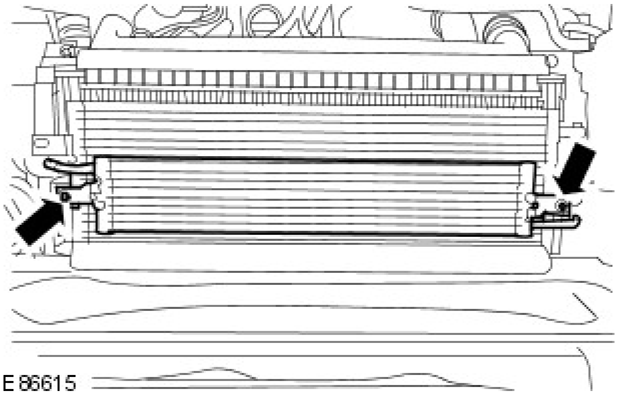


E86614

5. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 coolant pipes from the auxiliary radiator.

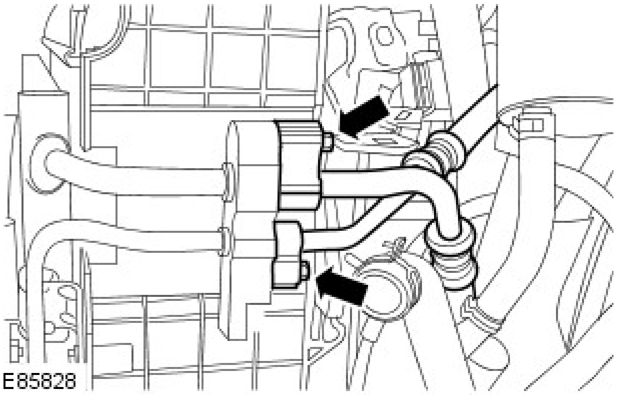
- Release the 2 quick release connectors.



E86615

6. Remove the auxiliary radiator.

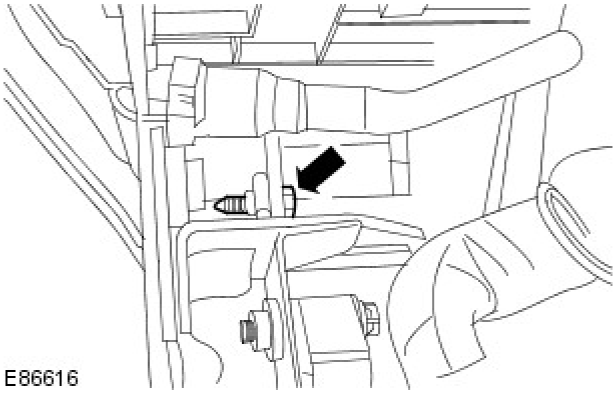
- Remove the 2 bolts.



7. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Disconnect the 2 A/C refrigerant lines.

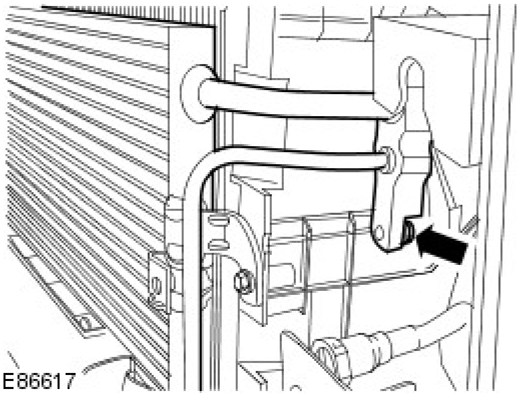
- Remove the 2 bolts.
- Remove and discard the 2 O-ring seals.



8. NOTE: LH illustration shown, RH is similar.

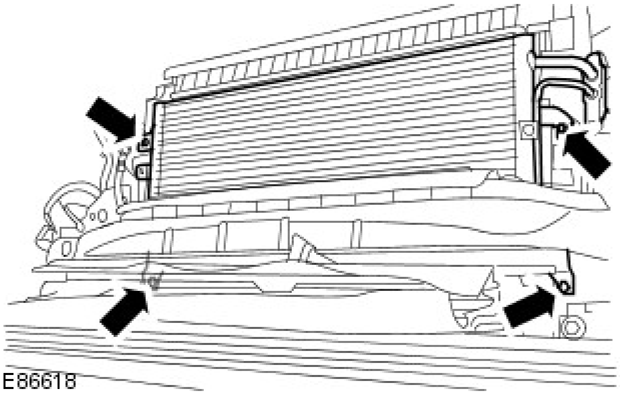
Release the air duct from the cooling module.

- Remove the 2 screws.



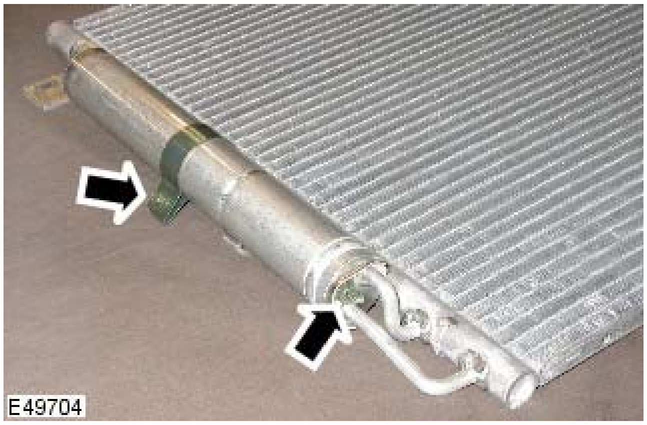
9. Release the A/C refrigerant lines bracket.

- Remove the bolt.



10. Remove the condenser core.

- Remove the 4 bolts.



11. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

• NOTE: Do not disassemble further if the component is removed for access only.

Remove the receiver drier.

- Remove the receiver drier support bracket clamp.
- Remove the bolt.
- Remove the clamp.
- Remove and discard the 2 O-ring seals.

Installation

1. NOTE: Lubricate the O-ring seals with clean refrigerant oil.

• NOTE: Remove and discard the blanking caps.

Install the receiver drier.

- Install new O-ring seals.
- Install the clamps.
- Tighten the bolt to 10 Nm (7 lb.ft).

2. Install the condenser core.

- Tighten the bolts to 8 Nm (6 lb.ft).

3. Secure the A/C refrigerant lines bracket.

- Tighten the bolt to 8 Nm (6 lb.ft)

4. Secure the air duct to the cooling module.

- Tighten the screws.

5. NOTE: Remove and discard the blanking caps.

• NOTE: Lubricate the O-ring seals with clean refrigerant oil.

Connect the A/C condenser refrigerant lines.

- Install new O-ring seals.
- Tighten the bolts to 10 Nm (7 lb.ft).

6. Install the auxiliary radiator.

- Tighten the bolts to 10 Nm (7 lb.ft).

7. NOTE: Remove and discard the blanking caps.

Connect the coolant pipes to the auxiliary radiator.

8. Install the hood latch panel.
For additional information, refer to: Hood Latch Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

9. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

10. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

11. Check and top up the coolant.

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Air Conditioning - TDV8 3.6L Diesel - Evaporator Core

Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the engine cover.

3. Evacuate the air conditioning (A/C) system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

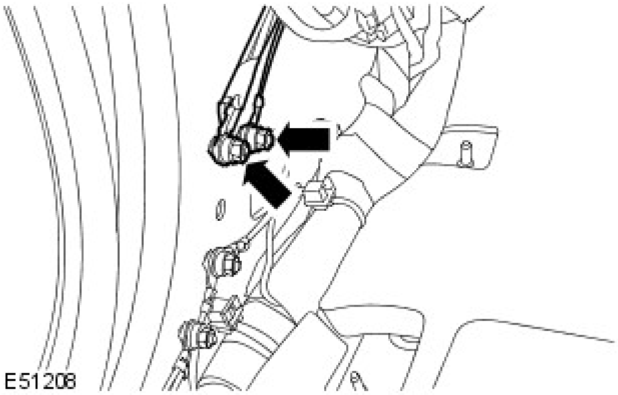
4. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

5. Partially drain the cooling system.
For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).

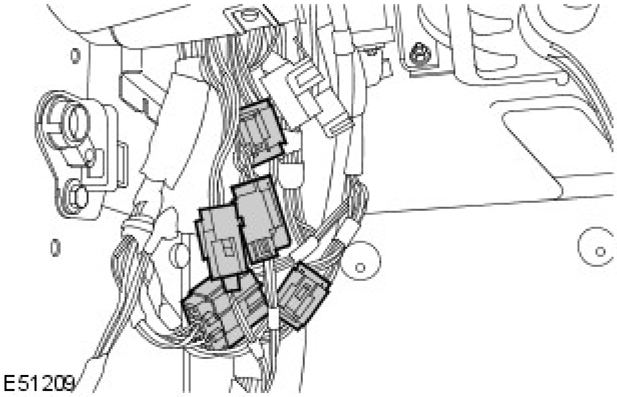
6. Remove the driver side front seat.
For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

7. Remove the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

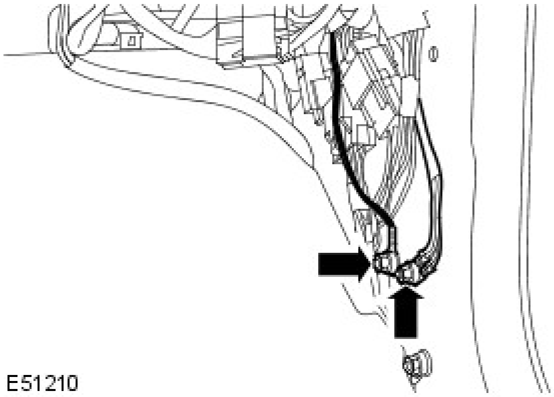


8. Release the 3 ground cables from the driver side lower A-pillar.

- Remove the 2 nuts.



9. Disconnect the 5 electrical connectors from the driver side lower A-pillar.

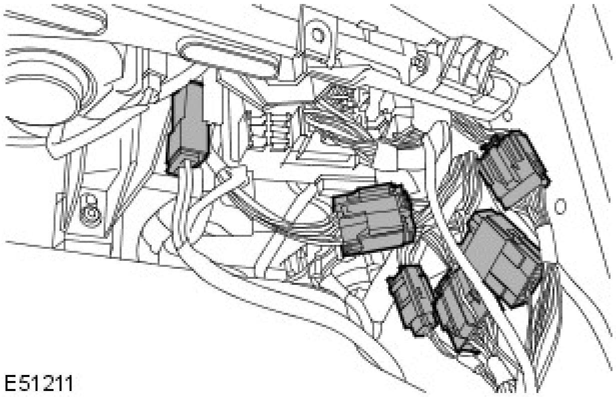


10. Release the 3 ground cables from the passenger side lower A-pillar.

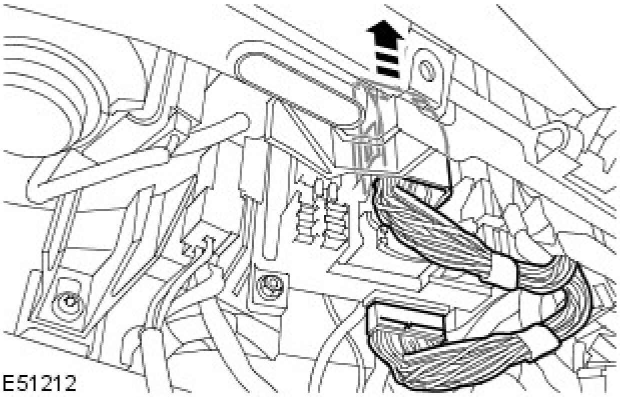
- Remove the 2 nuts.

11. Disconnect the heater motor electrical connector.

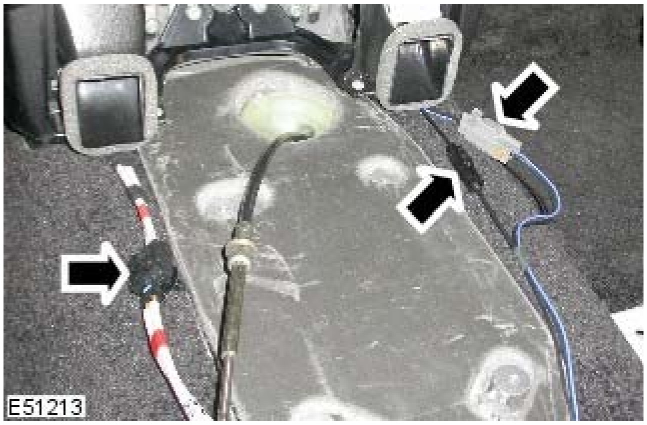
12. Disconnect the 5 electrical connectors from the passenger side lower A-pillar.



13. Disconnect the 2 central junction box (CJB) electrical connectors.



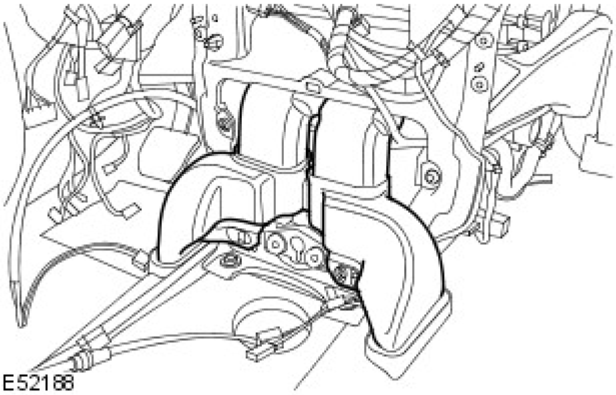
14. Disconnect the 2 electrical connectors from the instrument panel center reinforcement.



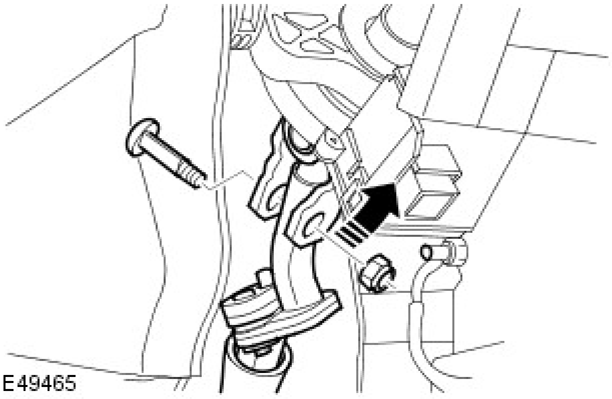
15. ⚠ CAUTION: Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.

If installed, disconnect the instrument panel center reinforcement fibre optic cables.

- Disconnect the electrical connector.

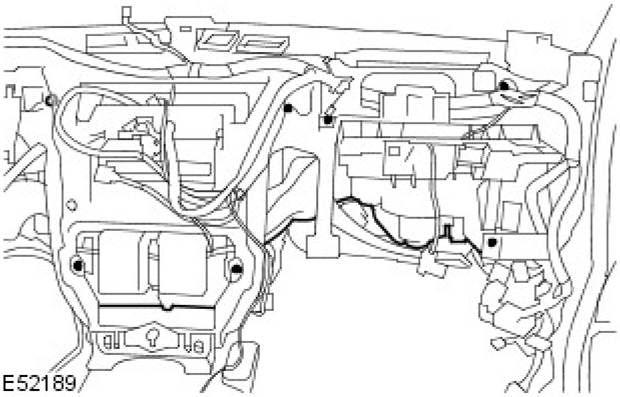


16. Remove the heater housing center ducts.



17. Disconnect the steering column intermediate shaft from the steering column.

- Note the fitted position.
- Remove the special bolt and discard the nut.

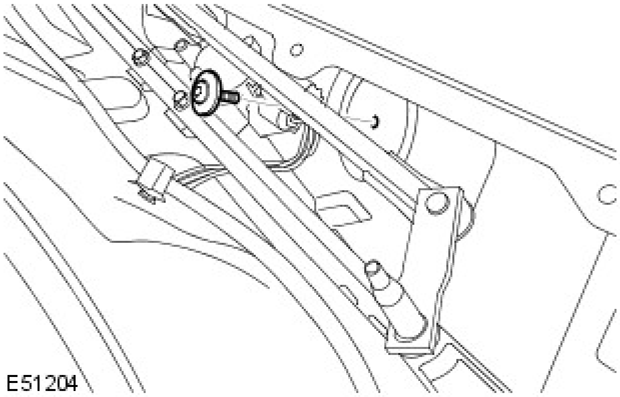


18. Release the heater housing from the instrument panel carrier.

- Remove the 7 screws.

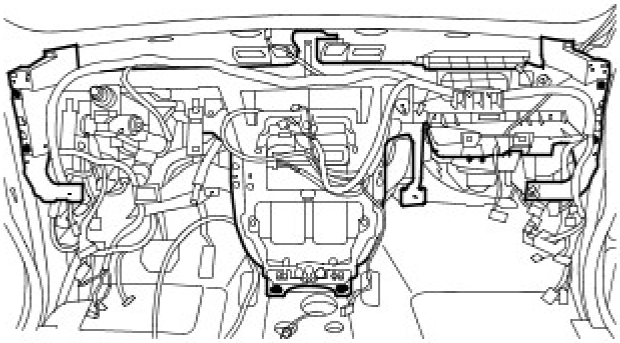
19. Remove the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

20. Remove the instrument panel carrier to bulkhead bolt.



21. With assistance, remove the instrument panel.

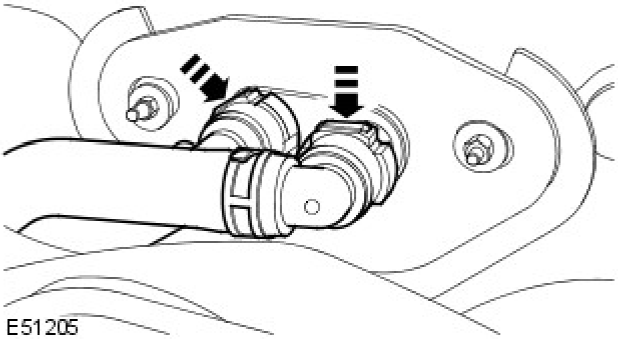
- Remove the 6 bolts.



22. ⚠ CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

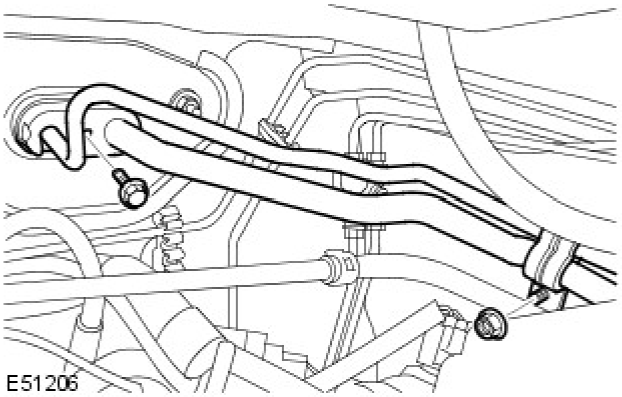
Disconnect 2 heater hoses from the bulkhead.

- Release the 2 clips.



23. Release the 2 A/C lines from the body.

- Remove the nut.

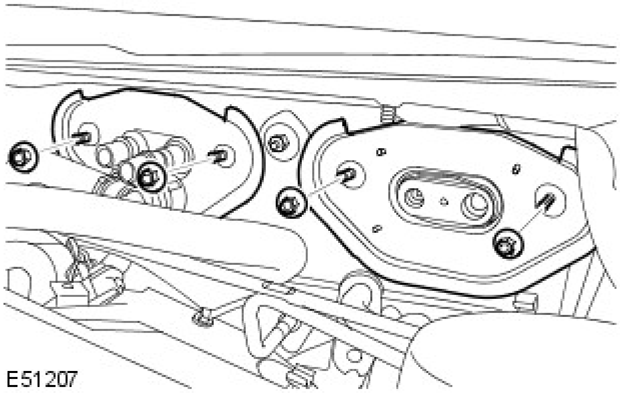


E51206

24. CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Release the 2 A/C lines from the bulkhead.

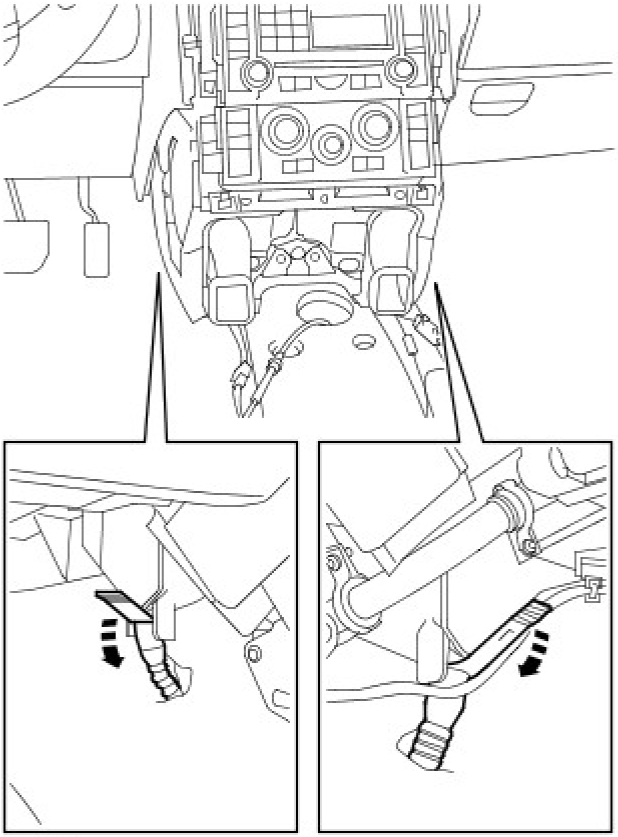
- Remove the bolt.
- Remove and discard the O-ring seals.



E51207

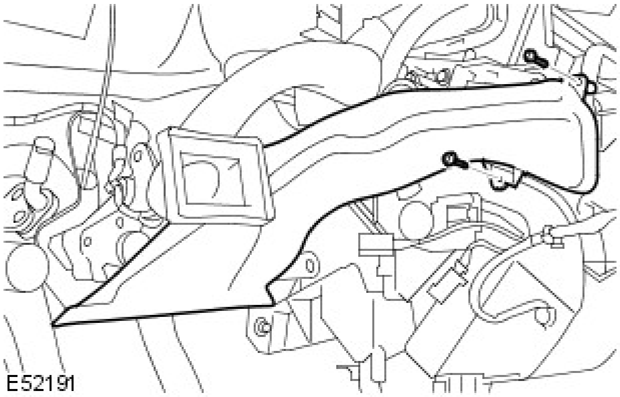
25. Remove the 2 adapter panels.

- Remove the 4 nuts.



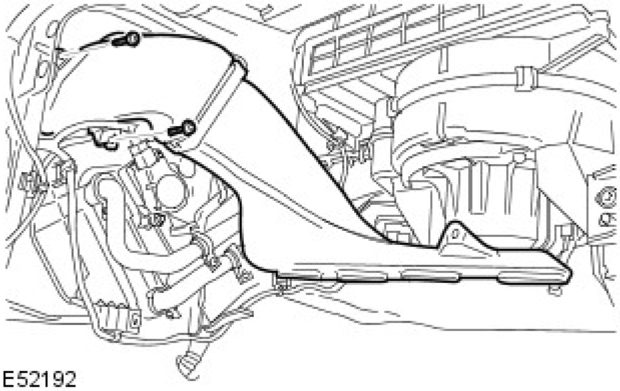
E51199

26. Disconnect the 2 drain tubes from the heater housing.


E52191

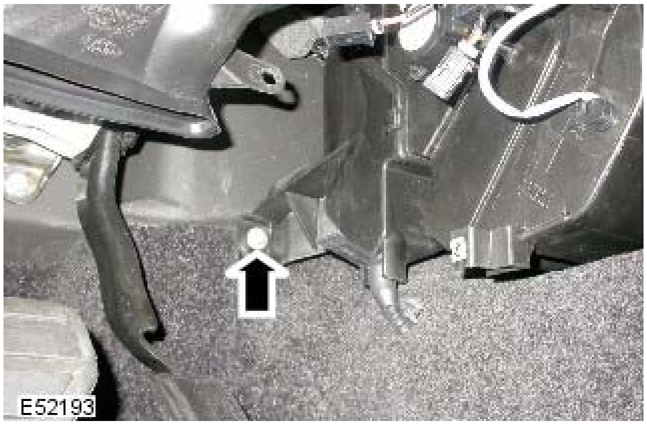
27. Remove the driver side footwell duct.

- Remove the 2 Torx screws.

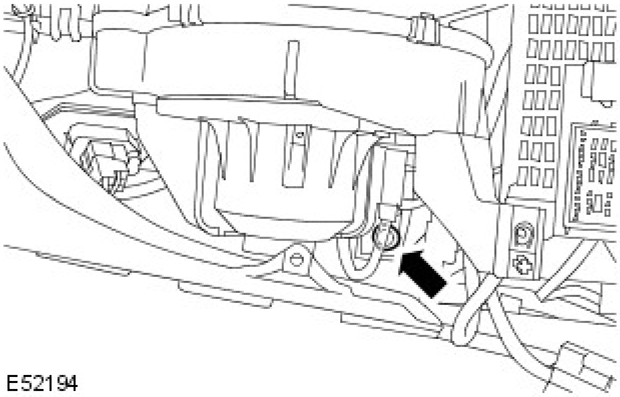

E52192

28. Remove the passenger side footwell duct.

- Remove the 2 Torx screws.


E52193

29. Driver side: Remove the heater housing to bulkhead Torx bolt.


E52194

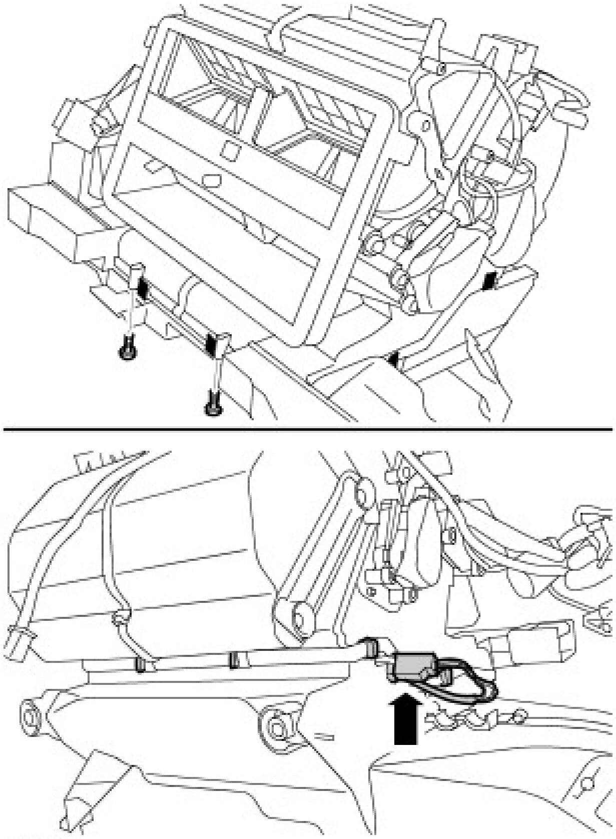
30. Passenger side: Remove the heater housing to bulkhead Torx bolt.

31. Remove the heater housing.

32. Disconnect the evaporator core temperature sensor electrical connector.

33. Release the heater core housing.

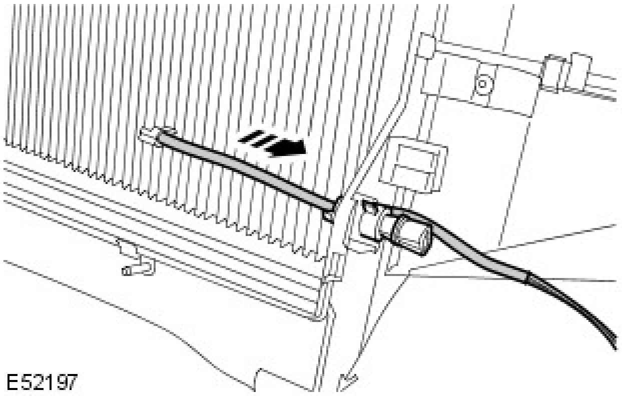
- Remove the 2 screws.
- Remove the 8 clips.



E52196

34. Remove the evaporator core.

- Release the temperature sensor.



E52197

Installation

1. Install the evaporator core.

- Secure the temperature sensor.

2. Secure the heater core housing.

- Install the clips.
- Tighten the screws.

3. Connect the temperature sensor electrical connector.

4. Install the heater housing.

5. Passenger side: Install the heater housing to bulkhead bolt and tighten to 6 Nm (4 lb.ft).

6. Driver side: Install the heater housing to bulkhead bolt and tighten to 6 Nm (4 lb.ft).

7. Install the footwell ducts.

- Tighten the screws.

8. Connect the drain tubes to the heater housing.

9. Install the adapter panels.

- Tighten the nuts to 6 Nm (4 lb.ft).

10. Secure the A/C lines to the bulkhead.

- Clean the components.
- Install new O-ring seals.
- Tighten the bolt to 6 Nm (4 lb.ft).

11. Secure the A/C lines to the body.

- Tighten the nut to 6 Nm (4 lb.ft).

12. Connect the bulkhead heater hoses.

13. With assistance, install the instrument panel.

- Tighten the bolts to 25 Nm (18 lb.ft).

14. Install the instrument panel carrier to bulkhead bolt and tighten to 25 Nm (18 lb.ft).

15. Install the plenum chamber panel.
For additional information, refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

16. Secure the heater housing.

- Tighten the screws.

17. Connect the steering column intermediate shaft.

- Install the special bolt and tighten the new nut to 22 Nm (16 lb.ft).

18. Install the heater housing center ducts.

19. Connect the instrument panel center reinforcement fibre optic cables.

20. Connect the instrument panel center reinforcement electrical connectors.

21. Connect the CJB electrical connectors.

22. Connect the heater motor electrical connector.

23. Connect the electrical connectors to the passenger side lower A-pillar.

24. Connect the ground cables to the passenger side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

25. Connect the electrical connectors to the driver side lower A-pillar.

26. Connect the ground cables to the driver side lower A-pillar.

- Tighten the nuts to 10 Nm (7 lb.ft).

27. Install the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper

Section (501-12 Instrument Panel and Console, Removal and Installation).

28. Install the front seat.
For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).

29. Recharge the A/C system.
For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

30. Install the engine cover.

31. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

32. Fill and bleed the cooling system.
For additional information, refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E Engine Cooling - TDV8 3.6L Diesel, General Procedures).

Published: 11-May-2011

Air Conditioning - TDV8 3.6L Diesel - Receiver Drier

Removal and Installation

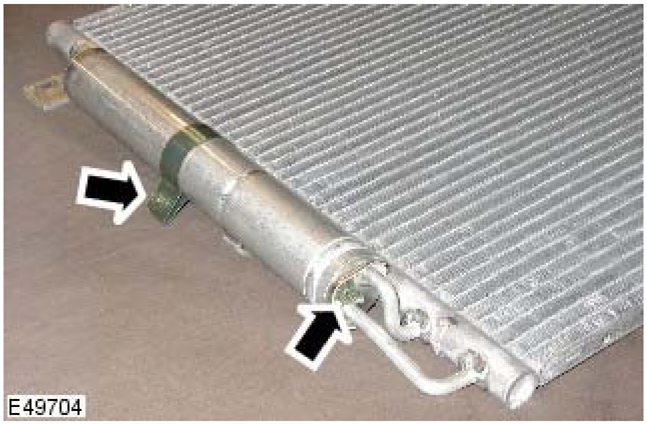
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Remove the condenser core.
For additional information, refer to: Condenser Core (412-03D Air Conditioning - TDV8 3.6L Diesel, Removal and Installation).



4. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the receiver drier.

- Remove the receiver drier support bracket clamp.
- Remove the bolt.
- Remove the clamp.
- Remove and discard the 2 O-ring seals.

Installation

1. NOTE: Lubricate the O-ring seals with clean refrigerant oil.

• NOTE: Remove and discard the blanking caps.

To install, reverse the removal procedure.

- Tighten the bolt to 10 Nm (7 lb.ft).

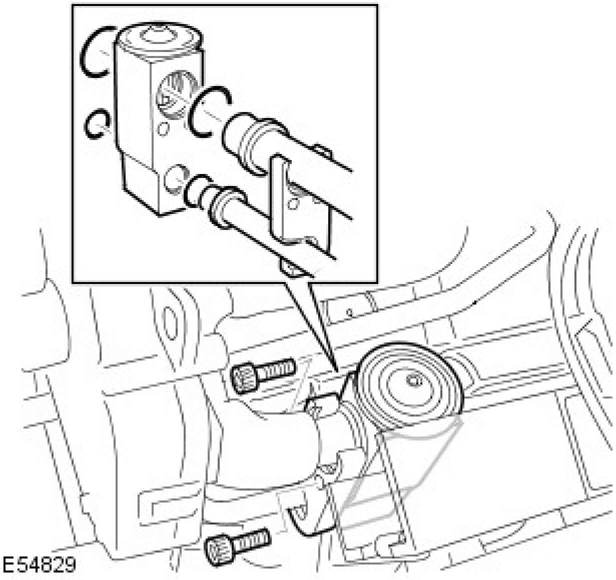
Published: 11-May-2011

Air Conditioning - TDV8 3.6L Diesel - Thermostatic Expansion Valve

Removal and Installation

Removal

1. Evacuate the A/C system.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).
2. Remove the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).



3. ⚠CAUTION: Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Remove the thermostatic expansion valve.

- Remove the cover.
- Remove the 2 Allen bolts.
- Remove and discard the 4 O-ring seals.

Installation

1. Install the thermostatic expansion valve.
   - Clean the components.
   - Install the new O-ring seals.
   - Tighten the Allen bolts to 5 Nm (4 lb.ft).
   - Install the cover.
2. Install the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).
3. Recharge the A/C system.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

Published: 11-May-2011

Air Conditioning - TDV8 3.6L Diesel - Air Conditioning (A/C) Compressor Pulley

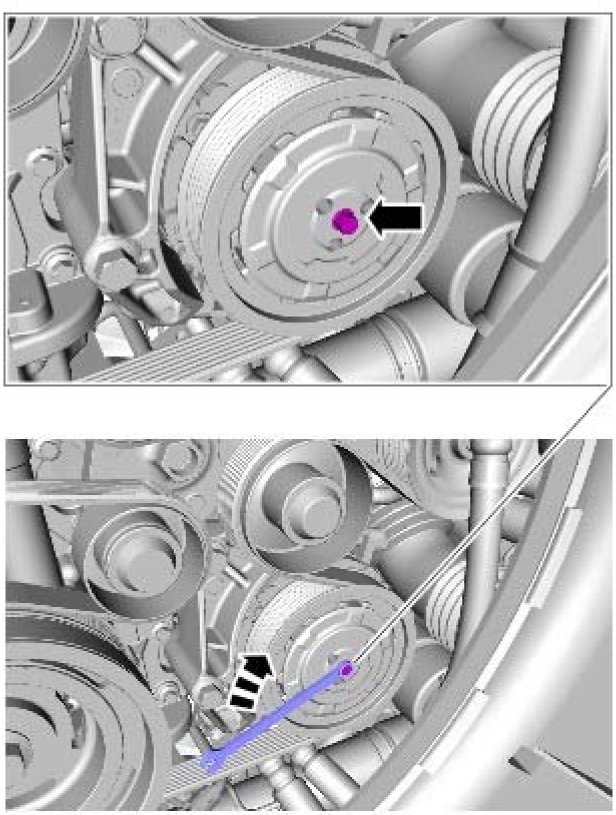
Removal and Installation

Removal

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

- NOTE: Components removed for clarity.

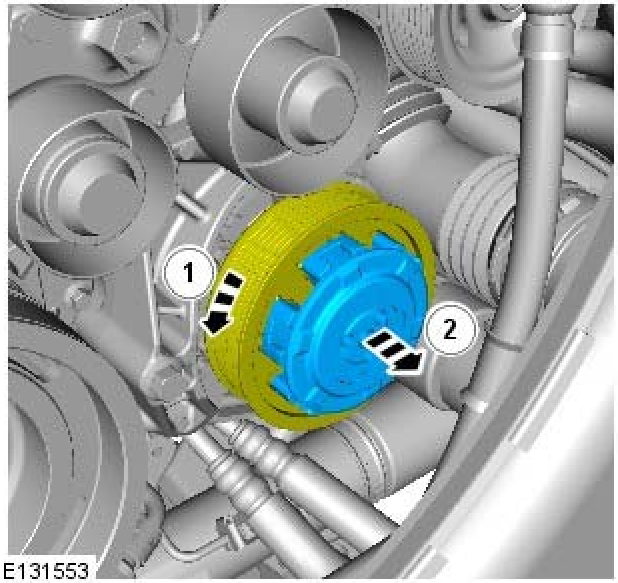
1. Disconnect the battery ground cable. For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the cooling fan. For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).
3. Using a suitable tool, release the hub locking stud.
   - Rotate the fixing clockwise to release the hub.
   - If required, use a suitable tool to prevent the hub from rotating.



E131552

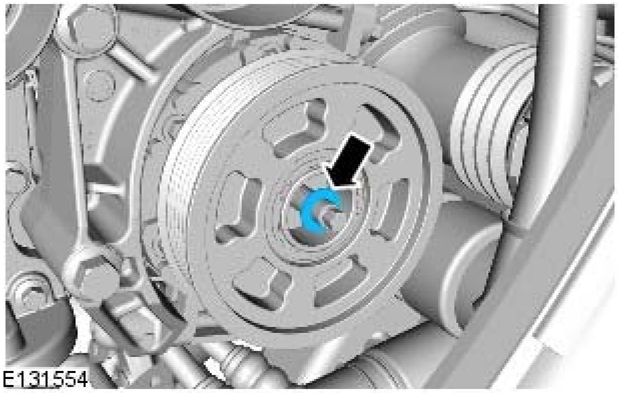
4. NOTE: Using a 3/8 square drive wrench, rotate the tensioner counter clockwise.

Release the accessory drive belt from the A/C compressor pulley.

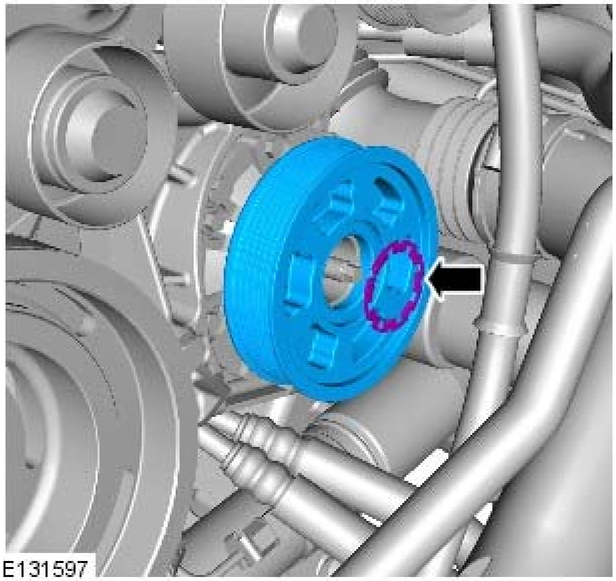


5. Remove and discard the hub assembly.

- Rotate the pulley counter-clockwise, until the hub is released from the pulley.
- Discard the rubber dampers.



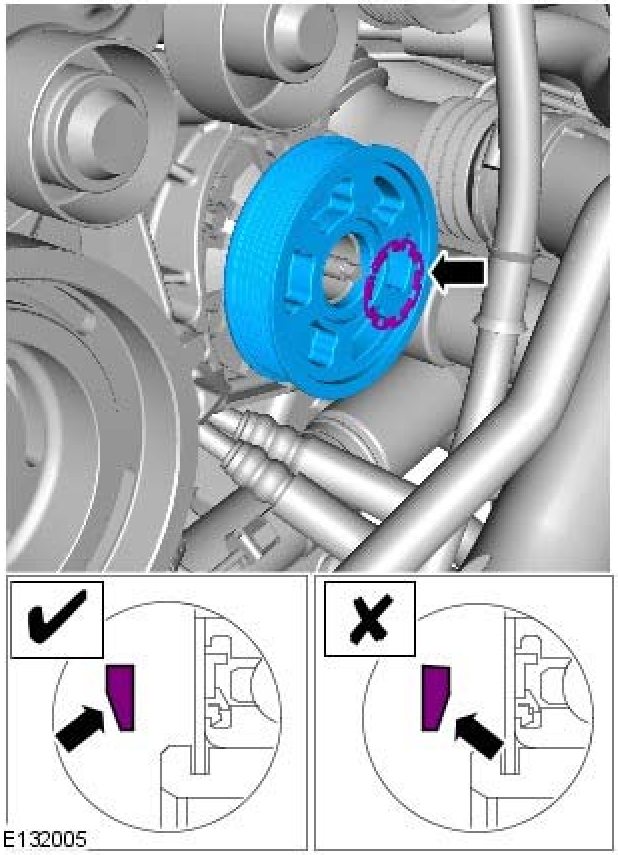
6. Remove and discard the spacer.



7. Remove and discard the drive pulley.

- Remove and discard the circlip.
- Clean the compressor mating surface.

Installation


E132005

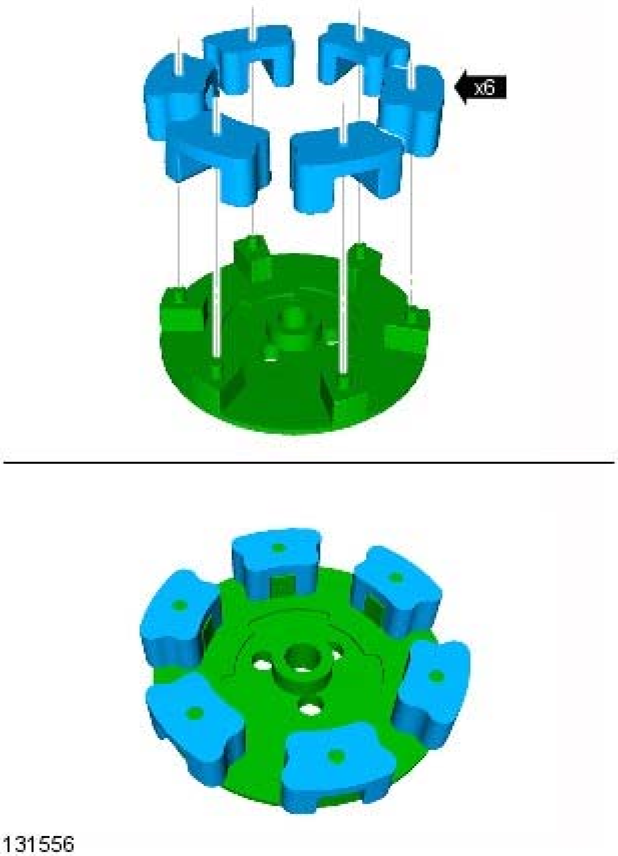
1. ⚠CAUTION: Make sure the circlip is fitted in the correct orientation.

Install the drive pulley.

- Install the circlip.

2. Install the spacer.

- Make sure the spacer is fully seated.



E131556

3. Install the 6 rubber dampers to the hub assembly.

- Make sure the dampers are installed in the correct orientation.

4. NOTE: Apply a suitable water based lubricant to the rubber dampers and to the mating surfaces on pulley.

Install the hub assembly.

- Push the hub assembly onto the pulley, and rotate clockwise to screw it onto the compressor shaft.

5. NOTE: Tighten counterclockwise.

Using a suitable tool, tighten the hub locking stud.

- Prevent the pulley rotating by hand.
- Tighten to 3.5 Nm (2.6 lb.ft)

6. Install the auxiliary drive belt.

7. Install the cooling fan.For additional information, refer to: Cooling Fan (303-03E Engine Cooling - TDV8 3.6L Diesel, Removal and Installation).

8. Connect the battery ground cable. For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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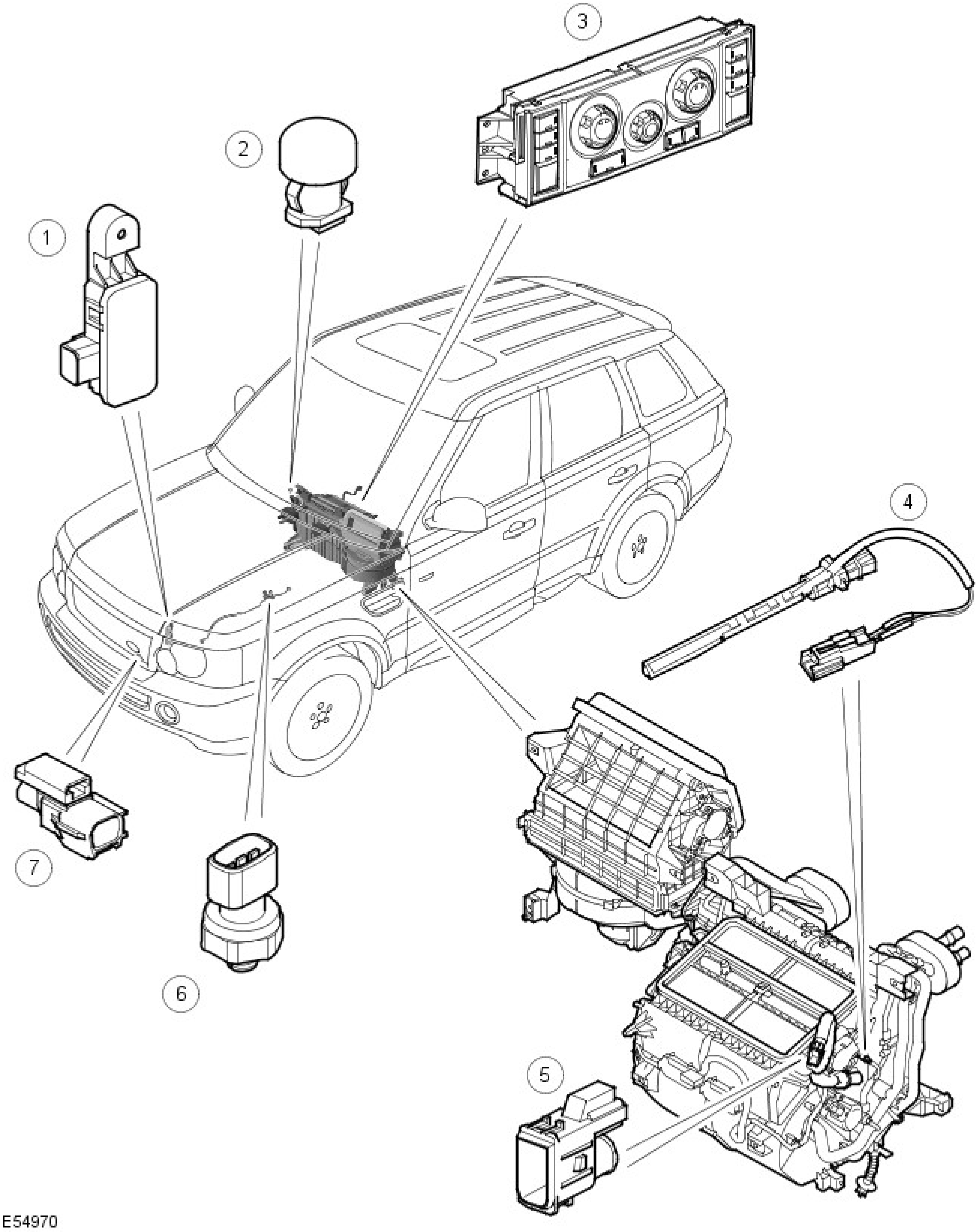
Control Components - Control Components

Description and Operation

COMPONENT LOCATIONS

- NOTE: right-hand drive (RHD) installation shown; left-hand drive (LHD) installation similar



Item	Part Number	Description
1	-	Pollution sensor (Japan only)
2	-	Sunlight sensor
3	-	automatic temperature control (ATC) module
4	-	Evaporator temperature sensor

5	-	In-vehicle temperature sensor (all except Japan), or in-vehicle temperature and humidity sensor (Japan only)
6	-	Refrigerant pressure sensor
7	-	Ambient air temperature sensor

GENERAL

The control system operates the air conditioning (A/C) system and the heating and ventilation system to control the temperature, volume and distribution of air from the heater.

The system is a dual zone system that automatically adjusts the temperature, volume and distribution of the air from the heater to maintain the individual temperature levels selected for the left-hand (LH) and right-hand (RH) sides of the passenger compartment. The system also has manual overrides for the intake air source, blower speed and air distribution. The system includes:

- An ATC module.
- An ambient temperature sensor.
- A refrigerant pressure sensor.
- An evaporator temperature sensor.
- An in-vehicle temperature sensor.
- A sunlight sensor.

Vehicles in the Japan market also incorporate:

- A pollution sensor.
- A humidity sensor.

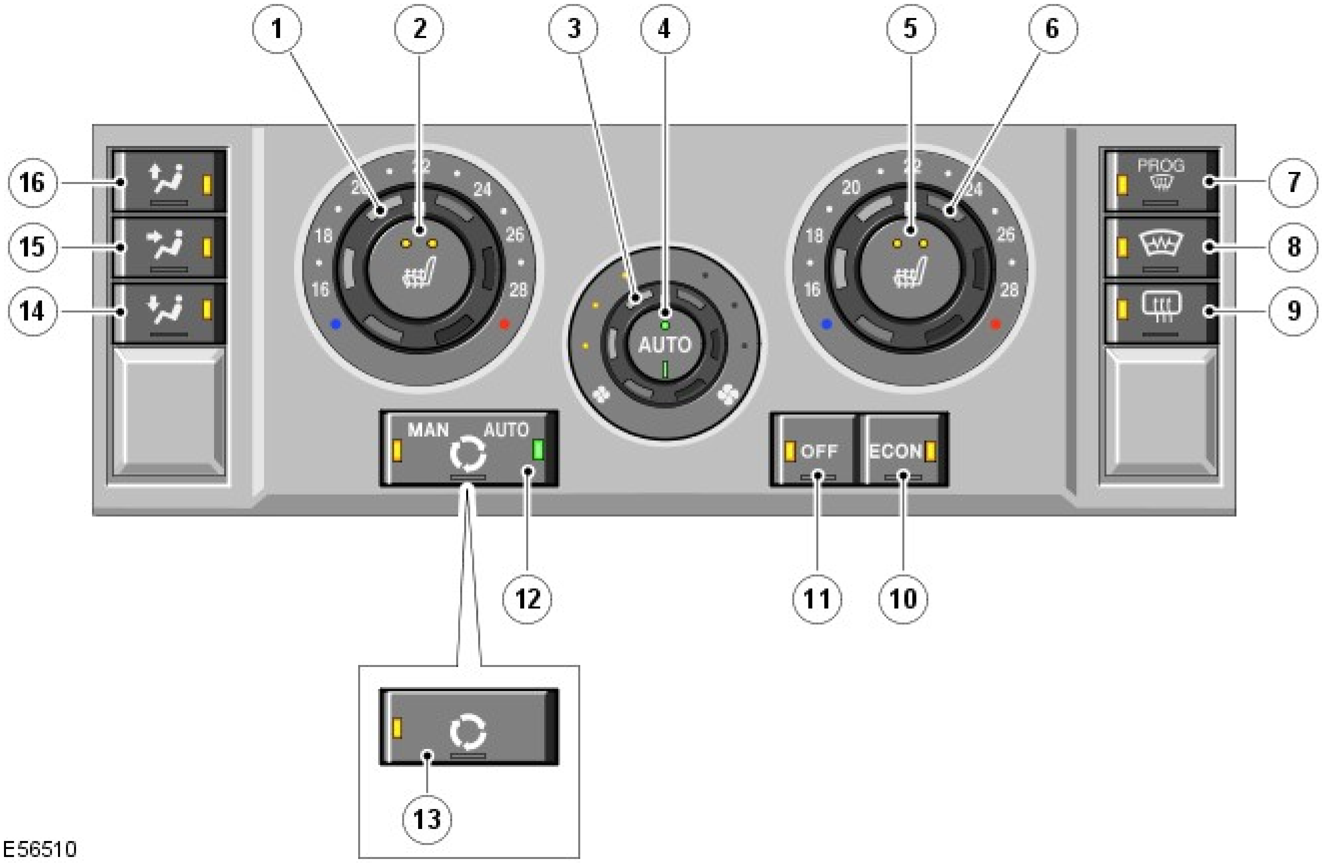
ATC MODULE

The ATC module is installed in the center console. An integral control panel contains push switches and rotary switches for system control inputs. light emitting diode (LED) in the switches and switch surrounds illuminate to indicate the current settings of the system. Switch symbols are illuminated when the side lamps or headlamps are on.

The ATC module processes inputs from the control panel switches, system sensors and the medium speed controller area network (CAN) bus, then outputs the appropriate control signals to the A/C system and the heating and ventilation system. In addition to controlling the A/C system and the heating and ventilation system, the ATC module also controls the following:

- The front seat heaters.
  For additional information, refer to: Seats (501-10 Seating, Description and Operation).
- The rear window heater.
  For additional information, refer to: Glass, Frames and Mechanisms (501-11 Glass, Frames and Mechanisms, Description and Operation).
- The windshield heater.
  For additional information, refer to: Glass, Frames and Mechanisms (501-11 Glass, Frames and Mechanisms, Description and Operation).
- The windshield washer jets and exterior mirror heaters.
  For additional information, refer to: Rear View Mirrors (501-09 Rear View Mirrors, Description and Operation).

Control Panel



Item	Part Number	Description
1	-	LH temperature switch
2	-	LH front seat heater switch
3	-	Blower switch
4	-	Automatic mode switch
5	-	RH front seat heater switch
6	-	RH temperature switch
7	-	Programmed defrost switch
8	-	Windshield heater switch
9	-	Rear window heater switch
10	-	Economy switch
11	-	System off switch
12	-	Recirculation switch (models with pollution sensing)
13	-	Recirculation switch (models without pollution sensing)
14	-	Distribution switch - feet
15	-	Distribution switch - face
16	-	Distribution switch - windshield

The switches on the ATC module control panel have the following functions:

- **LH and RH Temperature Switches:** Adjusts the nominal temperature settings of the LH and RH sides of the passenger compartment. The switch can rotate through 270°, between full cold and full hot. The switch surrounds are graduated in 2° increments between 16 and 28 °C. Minor detents define 1 °C steps over the range of the switch. Amber LEDs in the switch surround illuminate to indicate the temperature setting. When maximum cold is selected, the ATC module also automatically sets the air source to recirculated air, blower speed to maximum and distribution to face. When maximum hot is selected, the ATC module also automatically sets the air source to fresh air, blower speed to maximum and distribution to footwell.
- **LH and RH Seat Heater Switches:** Activates the heater elements in the seat cushion and seat back at one of two heat levels. The first press of the switch energizes the heater elements at the higher heat setting and illuminates two LEDs in the switch. A second press of the switch sets the heater elements to the lower heat setting and extinguishes one of the LEDs. A further press of the switch de-energizes the heater elements and extinguishes the second LED. The seat heaters remain on until selected off or the ignition is switched off.
- **Blower Switch:** For manual adjustment of blower speed. The switch can rotate through 240°, from off to maximum speed. Eight primary detents define the off position and seven blower speeds. Minor detents define small steps between the primary detents. When blower speed is manually adjusted, amber LEDs in the switch surround illuminate to indicate

the selected blower speed. The LEDs remain off when blower speed is under automatic control.

- **Automatic Mode Switch:** Activates the automatic modes for the A/C system, blower speed and distribution. Separate amber LEDs in the automatic mode switch illuminate to show when the blower and the distribution are in automatic mode. Manually selecting the blower speed or a distribution switch extinguishes the related LED.
- **Programmed Defrost Switch:** Activates a program that automatically selects: inlet air to fresh air; distribution to screen only; blower to speed 5; rear screen heater on; windshield heater on (where fitted), A/C system to automatic mode. An amber LED in the switch is illuminated while the defrost program is active.
- **Windshield Heater Switch:** Energizes the windshield heater for a set time period, until the switch is pressed again or until the engine stops, whichever occurs first. An amber LED in the switch is illuminated while the heater is on.
- **Rear Window Heater Switch:** Enabled only with the engine running. Pressing the switch energizes the rear window heater for a set time period, until the switch is pressed again or until the engine stops, whichever occurs first. An amber LED in the switch is illuminated while the heater is on.
- **Off Switch:** Switches off all of the functions controlled by the ATC module (all tell-tale LEDs are extinguished). The temperature blend door is set to the full cold position (if the A/C system is in the automatic mode, if the A/C system is in the economy mode the current door position is retained); the air source is set to recirculation; the current distribution settings are retained; the blower speed is set to zero. Where fitted, the seat heater switches can still be operated without re-activating the ATC module. The ATC module is re-activated, with all functions in the previous operating state, by a second press of the off switch or by pressing the economy switch. The ATC module can also be re-activated, with the associated effect, by the following switches:
    - The automatic mode switch.
    - Any air distribution switch.
    - The blower switch.
    - The programmed defrost switch.
    - The recirculation switch.
- **Economy Switch:** Reduces the A/C compressor output to a minimum displacement condition x 5%, reducing the engine load required to operate the A/C compressor. An amber LED in the switch is illuminated when the economy mode is selected on.
- **Recirculation Switch:** For selection of fresh or recirculated air. On models without pollution sensing, an amber LED in the switch is illuminated when recirculated air is selected. On models with pollution sensing, the recirculation switch incorporates two amber LED. The first press of the switch sets the recirculation flaps to automatic mode and illuminates one LED. A second press of the switch manually selects recirculated air and illuminates the second LED. A further press of the switch manually selects fresh air and extinguishes the two LEDs.
- **Distribution Switches (Windshield, Face and Footwell):** For manual selection of air distribution in any combination of windshield, face and footwell outlets. Each switch has a LED which illuminates when the related distribution mode is selected.

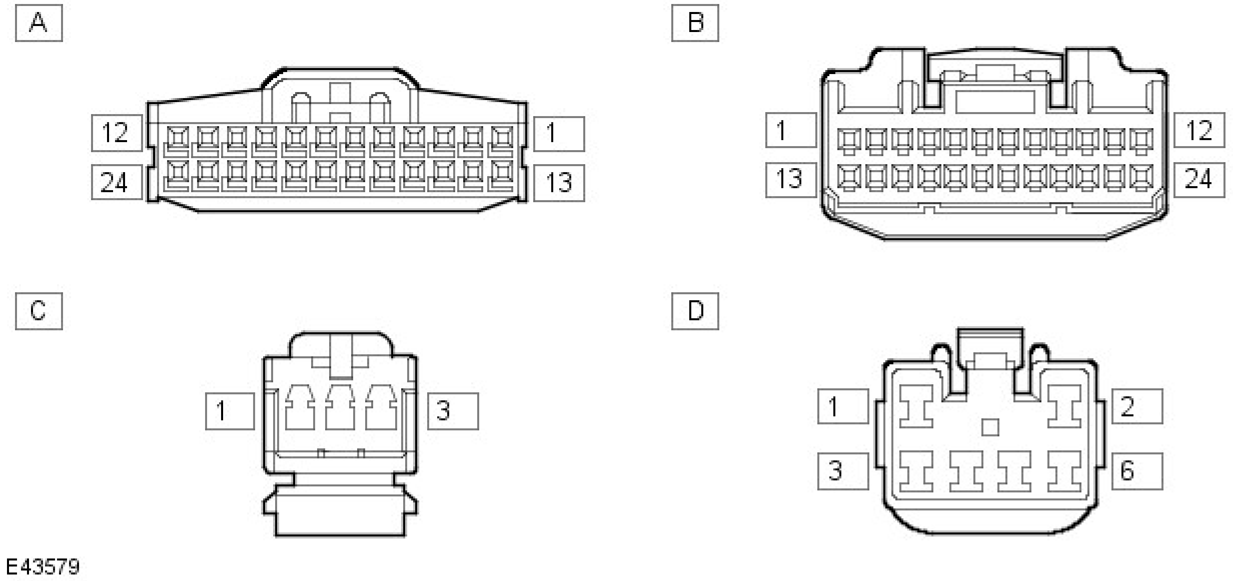
Inputs and Outputs

Four electrical connectors provide the interface between the ATC module and the vehicle wiring.

The control system sensors provide hardwired inputs to the ATC module. The ATC module also uses the LIN (local interconnect network) bus to communicate with the door motors in the heater assembly, and the medium speed CAN bus to communicate with other control modules on the vehicle.
For additional information, refer to: Communications Network (418-00 Module Communications Network, Description and Operation).

ATC Module Harness Connectors

• NOTE: A = C1629; B = C1630; C = C2655; D = C2295



ATC Module Harness Connector C1629 Pin Details

Pin No.	Description	Input/Output
1	Sensor 5V reference voltage (refrigerant pressure and sunlight)	Output
2	Pollution sensor oxides of nitrogen (NOX) signal (where fitted)	Input
3	In-vehicle temperature/humidity and in-vehicle temperature sensor signal	Input
4	Refrigerant pressure sensor signal	Input
5	Sunlight sensor RH signal	Input
6	Not used	-
7	Blower relay coil	Output
8	Not used	-
9	Medium speed CAN bus low	Input/Output
10	Medium speed CAN bus high	Input/Output
11	Pollution sensor power supply (where fitted)	Output
12	Not used	-
13	Sensor ground (refrigerant pressure, ambient air temperature, pollution, in-vehicle temperature/ humidity and in-vehicle temperature, and front seat temperature, as applicable)	Input
14	Pollution sensor hydrocarbon (HC)/carbon monoxide (CO) signal (where fitted)	Input
15	Ambient air temperature sensor signal	Input
16	Not used	-
17	Sunlight sensor LH signal	Input
18	Windshield heater relay	Input
19	Washer jets/exterior mirrors heater relay	Input
20	Not used	-
21	Medium speed CAN bus low	Input/Output
22	Medium speed CAN bus high	Input/Output
23	Compressor solenoid valve -	Input
24	Compressor solenoid valve +	Output

ATC Module Harness Connector C1630 Pin Details

Pin No.	Description	Input/Output
1	Sensor power supply (evaporator temperature, recirculation motor feedback, heater temperature)	Output
2	Distribution and temperature blend motor ground	Input
3	Not used	-
4	Recirculation motor feedback potentiometer signal	Input
5 to 8	Not used	-
9	Recirculation motor power supply/ground	Input/Output
10	Recirculation motor power supply/ground	Input/Output
11 and 12	Not used	-
13	Recirculation motor feedback potentiometer ground	Input
14 and 15	Not used	-
16	Heater temperature sensor signal	Input

Pin No.	Description	Input/Output
17	Evaporator temperature sensor signal	Input
18	Not used	-
19	Blower motor voltage sense	Input
20	Blower module power drive	Output
21 to 22	Not used	-
23	Distribution and temperature blend motor LIN bus	Input/Output
24	Distribution and temperature blend motor power	Output

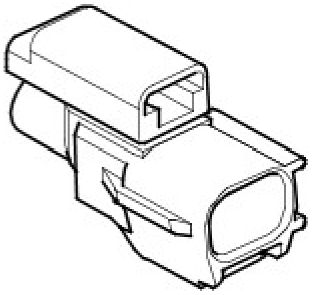
ATC Module Harness Connector C2295 Pin Details

Pin No.	Description	Input/Output
1	Power supply for right front seat heaters	Input
2	Power supply for left front seat heaters	Input
3	Power supply to left front seat heaters	Output
4	Left front seat temperature sensor signal	Input
5	Right front seat temperature sensor signal	Input
6	Power supply to right front seat heaters	Output

ATC Module Harness Connector C2655 Pin Details

Pin No.	Description	Input/Output
1	Permanent battery power supply	Input
2	Not used	-
3	Ground	Output

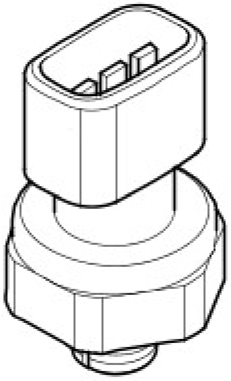
AMBIENT AIR TEMPERATURE SENSOR



E43580

The ambient air temperature sensor is a negative temperature coefficient (NTC) thermistor that provides the ATC module with an input of external air temperature. The sensor is attached to a bracket on the rear of the bumper beam, on the vehicle center-line.

REFRIGERANT PRESSURE SENSOR



E43581

The refrigerant pressure sensor provides the ATC module with a pressure input from the high pressure side of the refrigerant system. The refrigerant pressure sensor is located in the refrigerant line between the condenser and the thermostatic expansion valve.

The ATC module supplies a 5 V reference voltage to the refrigerant pressure sensor and receives a return signal voltage, between

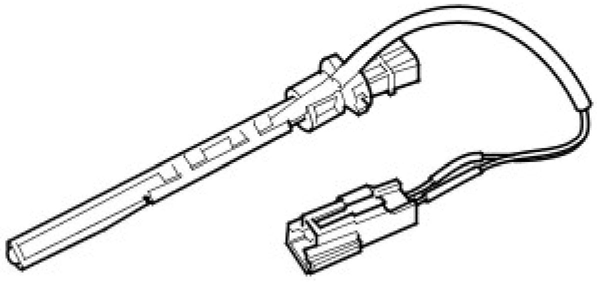
0 and 5 V, related to system pressure.

The ATC module uses the signal from the refrigerant pressure sensor to protect the refrigerant system from extremes of pressure and to calculate A/C compressor load on the engine. The ATC module also transmits the A/C compressor load value to the engine control module (ECM), via the medium speed CAN bus, instrument cluster and high speed CAN bus, for use in controlling the speed of the engine cooling fan.

To protect the system from extremes of pressure, the ATC module sets the A/C compressor to the minimum flow position if the pressure:

- Decreases to 1.9 ± 0.2 bar (27.5 ± 3 lbf/in^2); the ATC module loads the A/C compressor again when the pressure increases to 2.8 ± 0.2 bar (40.5 ± 3 lbf/in^2).
- Increases to 33 ± 1 bar (479 ± 14.5 lbf/in^2); the ATC module loads the A/C compressor again when the pressure decreases to 23.5 ± 1 bar (341 ± 14.5 lbf/in^2).

EVAPORATOR TEMPERATURE SENSOR

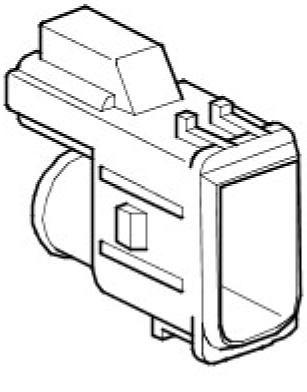


E43582

The evaporator temperature sensor is a NTC thermistor that provides the ATC module with a temperature signal from the downstream side of the evaporator. The evaporator temperature sensor is installed in the right side of the heater assembly casing.

The ATC module uses the input from the evaporator temperature sensor to control the load of the A/C compressor and thus the operating temperature of the evaporator.

IN-VEHICLE TEMPERATURE SENSOR



E43583

The in-vehicle temperature sensor is a NTC thermistor installed behind a grill in the instrument panel, on the inboard side of the steering column. The sensor is connected to a tube, the other end of which is connected to a venturi on the side casing of the heater. An air bleed from the heater, through the venturi, induces a flow of air down the tube, which draws cabin air through the grill and over the sensor.

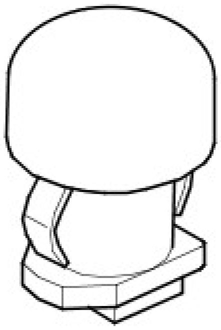
HUMIDITY SENSOR (WHERE FITTED)

The humidity sensor is a capacitive device integrated into the in-vehicle temperature sensor (see above).

The humidity sensor element is constructed from film capacitors on different substrates. The dielectric is a polymer which absorbs or releases water proportional to the relative humidity of the air being drawn through the sensor, and thus changes the capacitance of the capacitor. For protection, the sensor element is contained in a nylon mesh cover.

The humidity sensor and the in-vehicle temperature sensor are connected to a PCB (printed circuit board) inside the sensor housing. The PCB is powered by a 5V feed from the ATC module. Separate signals of temperature and relative humidity are transmitted from the PCB to the ATC module.

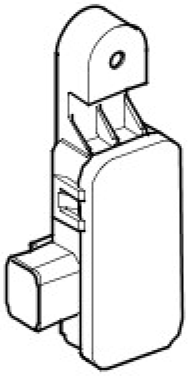
SUNLIGHT SENSOR



E43585

The sunlight sensor consists of two photoelectric cells that provide the ATC module with inputs of light intensity, one as sensed coming from the left of the vehicle and one as sensed coming from the right. The inputs are a measure of the solar heating effect on vehicle occupants, and are used by the ATC module to adjust blower speed, temperature and distribution to improve comfort. The sensor is installed in the center of the instrument panel upper surface and is powered by a 5V feed from the ATC module.

POLLUTION SENSOR (WHERE FITTED)



E43588

The pollution sensor allows the ATC module to monitor the ambient air for the level of hydrocarbons and oxidized gases such as nitrous oxides, sulphur oxides and carbon monoxide. The sensor is attached to a bracket on the front-end carrier, at the top left corner of the condenser.

The pollution sensor is powered by a battery voltage feed from the ATC module, and returns separate signals of hydrocarbon and oxidized gases.

If there is a fault with the pollution sensor, the ATC module disables the automatic operation of the recirculation door.

SYSTEM OPERATION

A/C Compressor Control

The variable displacement A/C compressor is permanently driven by the engine. The flow of refrigerant through the A/C compressor, and the resultant system pressure and evaporator operating temperature, is regulated by the refrigerant solenoid valve. Operation of the refrigerant solenoid valve is controlled by the ATC module using a 400 Hz pulse width modulation (PWM) signal. The duty cycle of the PWM signal is calculated using the following parameters:

- A/C compressor torque.
- A/C compressor torque maximum.
- A/C cooling status.
- A/C demand.
- A/C refrigerant pressure.

- Ambient air temperature.
- Blower speed.
- Engine cranking status.
- Evaporator temperature.
- Transmission gear status.

When A/C is selected, the ATC module maintains the evaporator at an operating temperature that varies with the in-vehicle cooling requirement. The ATC module increases the evaporator operating temperature, by reducing the refrigerant flow, as the requirement for air cooling decreases, and vice versa. During an increase of evaporator operating temperature, to avoid compromising the dehumidification function, the ATC module controls the rate of temperature increase, which keeps the cabin humidity at a comfortable level.

When the economy mode is selected, the PWM signal holds the refrigerant solenoid valve in the minimum flow position, effectively switching off the A/C function.

The ATC module incorporates limits for the operating pressure of the refrigerant system. When the system approaches the high pressure limit, the duty cycle of the PWM signal is progressively reduced until the system pressure decreases. When the system pressure falls below the low pressure limit, the duty cycle of the PWM signal is held at its lowest setting, so that the A/C compressor is maintained at the minimum stroke, to avoid depletion of lubricant from the A/C compressor. The protection algorithm is calculated at a high rate, to enable early detection of the rapid pressure changes possible if a system fault develops.

A/C Compressor Torque

The ATC module uses refrigerant pressure, evaporator temperature and engine speed to calculate the torque being used to drive the A/C compressor. The calculated value is broadcast on the medium speed CAN bus for the ECM, which uses the calculated value for idle speed control and fueling control. The ATC module also compares the calculated value with a maximum A/C compressor torque value received from the ECM over the medium speed CAN bus. If the calculated value exceeds the maximum value, the ATC module signals the refrigerant solenoid valve to reduce the refrigerant flow and so reduce the torque being used to drive the A/C compressor. By reducing the maximum A/C compressor torque value, the ECM is able to reduce the load on the engine when it needs to maintain vehicle performance or cooling system integrity.

Idle Speed Control

In order to maintain A/C cooling performance, the ATC module requests an increase in engine idle speed if the evaporator temperature starts to rise while the refrigerant solenoid valve is already set to the maximum flow rate. The increase in engine idle speed is requested in three stages, using a medium speed CAN bus message to the ECM. For additional information, refer to:

Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation),
Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation),
Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

The need for a change in idle speed is determined as follows:

- If the evaporator temperature increases by 3 °C (5.4 °F), or to 6 °C (10.8 °F) above the target operating temperature, over a 10 seconds period, the first stage of idle speed increase is requested.
- When the first stage of idle speed increase is set, if the evaporator temperature increases by 3 °C (5.4 °F), or increases to 12 °C (21.6 °F) above the target operating temperature, over a 9 seconds period, the second stage of idle speed increase is requested.
- When the second stage of idle speed increase is set, if the evaporator temperature increases by 3 °C (5.4 °F), or increases to 15 °C (27 °F) above the target operating temperature, over a 10 seconds period, the third stage of idle speed increase is requested.
- When an idle speed increase is set, if the evaporator temperature decreases by 3 °C (5.4 °F) over a 10 seconds period, the next stage down of idle speed increase is requested.

Electrical Load Management

The ATC module manages the vehicle electrical loads to:

- Maintain the vehicle battery in a healthy state of charge.
- Ensure adequate power is available for defrost demisting during engine warm-up.
- Ensure adequate power is available for A/C during extended periods with the engine at idle speed.
- To maintain system voltage within acceptable limits.
- To provide adequate power to meet customer expectations.

Electrical load management is achieved by increasing the engine idle speed and controlling the electrical load of systems that do not affect the driveability or safety of the vehicle.

During the engine warm-up period, the ATC module manages the electrical load to make sure that the battery voltage is maintained above a pre-determined level. The battery voltage level that is maintained and the duration of the start period varies with ambient air temperature and engine coolant temperature (ECT). After the engine warm-up period, the ATC module manages the electrical load to make sure that the requested electrical load does not exceed the generator output.

The duration of the engine warm-up period depends on the ambient air temperature and the ECT when the ignition is switched on, as detailed in the following table:

Engine Warm-up Times

Ambient Air Temperature, °C (°F)	ECT, °C (°F)			
	<10 (<50)	>10 to <30 (>50 to <86)	>30 to <60 (>86 to <140)	>60 (>140)
		Warm-up Period, Minutes		
>10 (>50)	15	15	15	15
>5 to <10 (>41 to <50)	15	15	15	15
>0 to <5 (>32 to <41)	10	15	15	15
>-10 to <0 (>14 to <32)	10	10	15	15
<-10 (<14)	5	5	10	15

The ATC module calculates the electrical load from the battery voltage and generator output voltage, and compares the result against the maximum load available from the generator. The calculation is averaged across the first 20 seconds after the engine starts, and subsequently averaged every 60 seconds. When the ignition is turned off, the ATC module stores the status of the electrical load management for 20 seconds. If the engine is re-started within the 20 seconds, the ATC module resumes electrical load management using the stored status. If the engine is re-started after the 20 seconds, the timers are reset and the ATC module re-calculates the status.

If the electrical load is more than the maximum load available, the ATC module requests an increase of engine idle speed using the medium speed CAN bus message to the ECM. If an electrical load imbalance remains after an increase in engine idle speed, or if the electrical load is more than the capacity of the charging system, the ATC module reduces the electrical load by reducing the power of some vehicle systems or inhibiting their operation. The number of systems controlled depends on the electrical load reduction required. The systems controlled, and the order in which their power is reduced or they are inhibited, are contained in three priority tables. The table used depends on the ambient air temperature, battery temperature and ECT:

- The cold start table is used when the ambient air temperature is less than 5 °C (41 °F) and the ECT is less than 30 °C (86 °F).
- The hot start table is used when the ambient air temperature is 5 °C (41 °F) or more and the ECT is less than 30 °C (86 °F).
- The continuous table is used when battery temperature is more than 5 °C (41 °F) and the ECT is more than 50 °C (122 °F).
- If none of above conditions are met, the ATC module adopts the last used table.

Cold Start Electrical Load Management

Priority		System
Power Reduction	Inhibited	
1	-	Air suspension
2	-	Front seat heaters
3	-	Entertainment system
-	4	Front seat heaters
5	-	Rear window heater
6	-	Windshield washer jet and exterior mirror heaters
-	7	Windshield washer jet and exterior mirror heaters
8	-	Windshield heater
9	-	Climate control blower
-	10	Rear window heater
-	11	Windshield heater

Hot Start Electrical Load Management

Priority		System
Power Reduction	Inhibited	
-	1	Front seat heaters; windshield washer jet and exterior mirror heaters
2	-	Windshield heater
3	-	Rear window heater
4	-	Air suspension
5	-	Entertainment system
-	6	Windshield heater
-	7	Rear window heater

Continuous Electrical Load Management

Priority		System
Power Reduction	Inhibited	
-	1	Front seat heaters
2	-	Windshield heater
3	-	Rear window heater
4	-	Air suspension

Priority		System
Power Reduction	Inhibited	
5	-	Entertainment system

Engine idle speed changes, and electrical load changes of systems not under direct control of the ATC module (air suspension and entertainment), are initiated using the appropriate medium speed CAN bus message. When partial operation is requested:

- The air suspension system still performs height changes but reduces air compressor operation by not replenishing the reservoir.
- The entertainment system restricts the maximum volume level and reduces the output frequency bandwidth.

Cooling Fan Control

The ATC module determines the amount of condenser cooling required from the refrigerant pressure, since there is a direct relationship between the temperature and pressure of the refrigerant. The cooling requirement is transmitted to the ECM in a medium speed CAN bus message. The ECM controls the condenser cooling using the cooling fan. For additional information, refer to:

> Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation),
> Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation),
> Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

Air Temperature Control

Air from the evaporator enters the heater assembly, where temperature blend doors direct a proportion of the air through the heater core to produce the required discharge air temperature. The two temperature blend doors operate independently to enable independent temperature selection for the left and right sides of the vehicle interior. The temperature blend doors are operated by stepper motors. The stepper motors are controlled by the ATC module using LIN bus messages.

The ATC module calculates the stepper motor position required to achieve the selected temperature and compares it against the current position, which is stored in memory. If there is any difference, the ATC module signals the stepper motor to adopt the new position.

Air temperature is controlled automatically unless maximum heating or maximum cooling is selected. The required air temperature may be adjusted between 16 °C (61 °F) and 28 °C (82 °F) using the air temperature control switches. The control algorithms then attempt to maintain the desired set temperature.

Turning the temperature switches fully counterclockwise gives maximum available cooling. Turning the temperature switches fully clockwise gives maximum available heating. When maximum cooling or maximum heating is selected, the comfort algorithm adopts an appropriate strategy for the air distribution, blower speed,

A/C and air source functions, except where a function is under manual control.

The temperature control of one zone can be compromised by the other zone being set to maximum heating or maximum cooling. True maximum heating or maximum cooling can only be obtained with both controls set to the same maximum state.

When the economy mode is selected, the automatic temperature control function still operates, but with no cooling capability the minimum discharge temperature achievable will be ambient air temperature plus any heat pick up in the air intake path.

Air Distribution Control

When the A/C is in the automatic mode, the ATC module automatically controls air distribution according to a comfort strategy. Automatic control is overridden when one of the manual modes is selected. Air distribution remains manually controlled until the automatic mode is selected again. The distribution doors are operated by two stepper motors, which are controlled by the ATC module using LIN bus messages.

Blower Control

When A/C is selected or the blower speed is manually selected, the ATC module energizes the coil of the blower relay in the battery junction box (BJB). The energized blower relay supplies battery power to the blower motor, which is grounded through the blower control module. The speed of the blower is controlled by a PWM signal from the ATC module to the blower control module. The blower control module regulates the blower motor voltage in relation to the PWM signal.

When the blower is in the automatic mode the ATC module determines the blower speed required from the comfort algorithms. When the blower is in the manual mode, the ATC module operates the blower at one of seven fixed speeds as selected on the control panel.

Programmed Defrost

The programmed defrost function automatically provides the maximum defrosting of the vehicle. When the programmed defrost function is selected, the ATC module configures the control system as follows:

- Automatic mode off.

- Air inlet to fresh air, manual control.
- Selected temperature unchanged, automatic control.
- Air distribution set to screen mode, manual control.
- Blower speed set to speed 5, manual control.
- Rear screen heater and windshield heater (if applicable) selected on.
- A/C mode in automatic.

The programmed defrost function is cancelled by one of the following:

- Selecting any distribution switch. The system response will be identical to the normal manual distribution control operation.
- Selecting the automatic switch. This will restore the system to fully automatic operation.
- Selecting the programmed defrost switch again. This returns the system to the state in use immediately before the programmed defrost function was first selected.
- Turning the ignition off.

The blower speed can be adjusted manually without terminating the programmed defrost function.

Intake Air Control

The source of intake air is automatically controlled unless overridden by manual selection of recirculation. Under automatic control the ATC module determines the required position of the recirculation door from the comfort strategy and the input from the pollution sensor (if fitted). The recirculation door is operated by an electric motor, which is controlled by hardwired analogue signals from the ATC module. A potentiometer in the motor supplies the ATC module with a position feedback signal for closed loop control.

Provided the intake air has not been manually selected to recirculation, the ATC module adjusts the recirculation door to reduce the ram effect produced by the forward motion of the vehicle.

When the ignition switch is turned off, the ATC module evaluates the ambient air temperature. If the ambient air temperature is less than a pre-determined value, the intake air source is set to recirculation, to prevent the ingress of damp air while the vehicle is parked.

When the vehicle is in the transportation mode, the ATC module sets the intake door to recirculation every time the ignition is turned off, regardless of the ambient air temperature.

Pollution Sensing

With a pollution sensor fitted to the vehicle, the ATC module controls the intake air source to reduce contamination of the intake air by external pollutants. This function is fully automatic, but can be overridden by manual selection of the intake air source.

Humidity Sensing

With a humidity sensor fitted, the ATC module controls the moisture content of the air in the vehicle. This is achieved by raising the evaporator temperature to increase the humidity of the air entering the vehicle, and reducing the evaporator temperature to reduce the humidity of the air entering the vehicle.

Front Seat Heaters

The front seat heaters are enabled when the ignition switch is position II, and operate at one of two temperature settings. With the first press of a front seat heater switch the ATC module adopts the higher temperature setting, supplies a power feed to the related front seat heater elements and illuminates two amber LEDs in the switch. At the second press of the switch the ATC module adopts the lower temperature setting and extinguishes one of the LEDs. At the third press of the switch the ATC module de-energizes the heater elements and extinguishes the second LED. The seat heaters remain on until selected off or the ignition is turned off.

The ATC module receives an input from a temperature sensor in each front seat, and regulates the power feed of the heater elements to control the seat temperature at the appropriate temperature setting between 35 and 45 °C (95 and 113 °F). The actual temperature settings vary with the type of seat covering, to allow for the different heat conduction properties of the different materials.

When the front seat heaters are activated at the higher temperature setting, the ATC module automatically resets them to the lower temperature after a time delay. The length of the time delay depends on the in-vehicle temperature.

Temperature Reset Time Delay

In-vehicle Temperature, °C (°F)	<-15 (5)	-15 to -10 (5 to 14)	-10 to 0 (14 to 32)	0 to 15 (32 to 59)	15 to 25 (59 to 77)	>25 (77)
Time Delay, minutes	Remains at higher temperature until manually de-selected	20	15	10	5	3

To protect the heater elements, the ATC module disables front seat heating if battery voltage exceeds 16.5 ± 0.3 V for more than 5 seconds. Front seat heating is re-enabled when battery voltage decreases to 16.2 ± 0.3 V.

The ATC module monitors the power feeds to the heater elements and disables the applicable front seat heating if a short or open circuit is detected. The ATC module also disables seat heating if the seat temperature rises significantly above the target temperature setting.

The plausibility of the temperature sensor inputs is also monitored by the ATC module. When seat heating is selected, if one of the temperature sensor inputs is within 5 °C (9 °F) below the target temperature, the ATC module monitors the sensor input for a temperature increase and checks that it is between the minimum and maximum working temperatures. If a temperature sensor input is at the high end of the working range, while the ambient air temperature and the engine temperature are within 10 °C (18 °F) of each other, the ATC module disables front seat heating until the input decreases below the target temperature setting. The ATC module interprets a temperature sensor input value of -45 °C (-49 °F) or below as an open circuit, and temperature sensor input value of 100 °C (212 °F) or more as a short circuit.

Rear Window Heater

The ATC module controls operation of the rear window heater using medium speed CAN messages to operate the rear window heater relay in the central junction box (CJB). The control module in the CJB interprets the CAN messages and switches the ground connection of the relay coil to operate the rear window heater. While the rear window heater relay is energized, a battery power feed is connected to the rear window heater elements. Rear window heater operation is only enabled when the engine is running.

The ATC module operates the rear window heater in heating cycles of varying power and time. The heating cycle used depends on the ambient air temperature and whether it is the initial or subsequent operation during the current ignition cycle.

When the rear window heater switch is pressed, the ATC module illuminates an LED in the switch and initiates the appropriate heating cycle. The LED remains illuminated until the rear window heater is selected off, the heating cycle is completed or the engine stops. If the engine stalls or the ignition is turned off, rear window heating resumes if the engine is re-started within 20 seconds.

On the initial selection of rear window heating, the ATC module uses a short or long defrost phase at full power, followed by a low power phase. The defrost phase used depends on the ambient temperature. During the low power phase, the rear window heater relay is cycled off for 80 seconds and on for 40 seconds.

On subsequent operations, during the same ignition cycle, the ATC module operates the rear window heater at full power for a fixed time period.

Rear Window Heating Phases

Phase	Time, minutes
Short defrost (-5°C (23°F) and above)	10
Long defrost (less than -5°C (23°F))	15
Low power	20
Subsequent operation	10

Windshield Heater

The ATC module controls operation of the windshield heater using the windshield heater relay in the BJB. The ATC module switches the ground connection of the relay coil to operate the windshield heater. While the windshield heater relay is energized, a battery power feed is connected to each of the two windshield heater elements. Windshield heater operation is only enabled when the engine is running.

The ATC module operates the windshield heater in heating cycles of varying power and time. The heating cycle used depends on the ambient air temperature and whether it is the initial or subsequent operation during the current ignition cycle.

When the windshield heater switch is pressed, the ATC module illuminates a LED in the switch and initiates the appropriate heating cycle. The LED remains illuminated until the windshield heater is selected off, the heating cycle is completed or the engine stops. If the engine stalls or the ignition is turned off, windshield heating resumes if the engine is re-started within 20 seconds.

On the initial selection of the windshield heater, the ATC module uses a short or long defrost phase at full power, followed by a low power phase. The defrost phase used depends on the ambient temperature. During the low power phase, the windshield heater relay is cycled off for 80 seconds and on for 40 seconds.

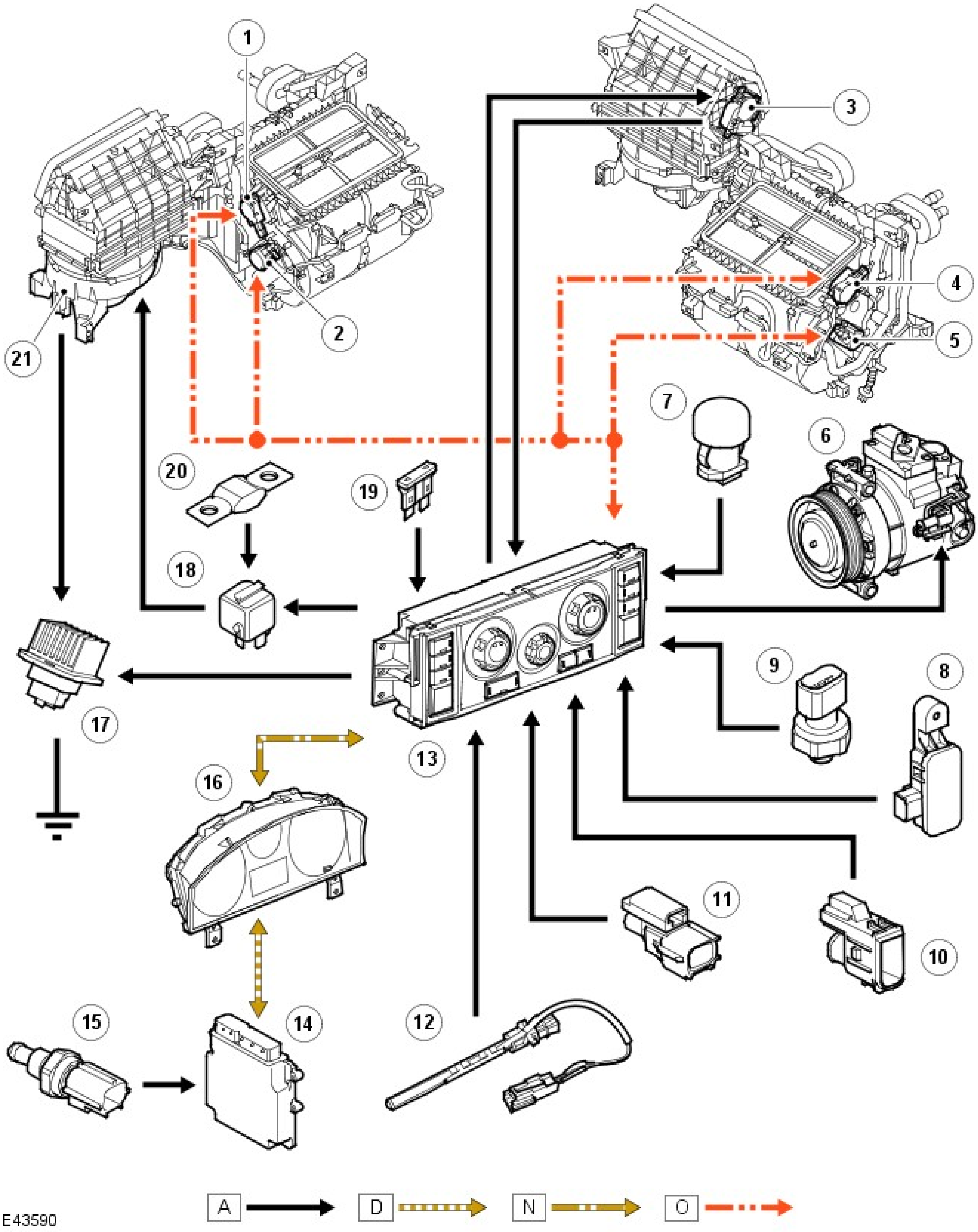
On subsequent operations, during the same ignition cycle, the ATC module operates the windshield heater at full power for a fixed time period.

Windshield Heating Phases

Phase	Time, minutes
Short defrost (-5 °C (23 °F) and above)	3
Long defrost (less than -5 °C (23 °F))	5
Low power	10
Subsequent operation	3

CONTROL DIAGRAM

- NOTE: A = Hardwired connections; D = High speed CAN bus; N = Medium speed CAN bus; O = LIN bus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E43590
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O

Item	Part Number	Description
1	-	Face and feet distribution motor
2	-	LH temperature blend motor

3	-	Recirculation motor
4	-	Windshield distribution motor
5	-	RH temperature blend motor
6	-	A/C compressor solenoid valve
7	-	Sunlight sensor
8	-	Pollution sensor
9	-	Refrigerant pressure sensor
10	-	In-vehicle temperature sensor (all except Japan) or in-vehicle temperature and humidity sensor (Japan only)
11	-	Ambient air temperature sensor
12	-	Evaporator temperature sensor
13	-	ATC module
14	-	ECM
15	-	ECT sensor
16	-	Instrument cluster
17	-	Blower control module
18	-	Blower relay
19	-	Fuse 51P, CJB
20	-	Fusible link 12E, BJB
21	-	Blower

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Control Components - Control Components

Diagnosis and Testing

For information on testing the climate control system, the air conditioning systems, the heating and ventilation system, the air distribution and filtering system and the fuel fired booster heater, refer to section 412-00 Climate Control System in the workshop manual.

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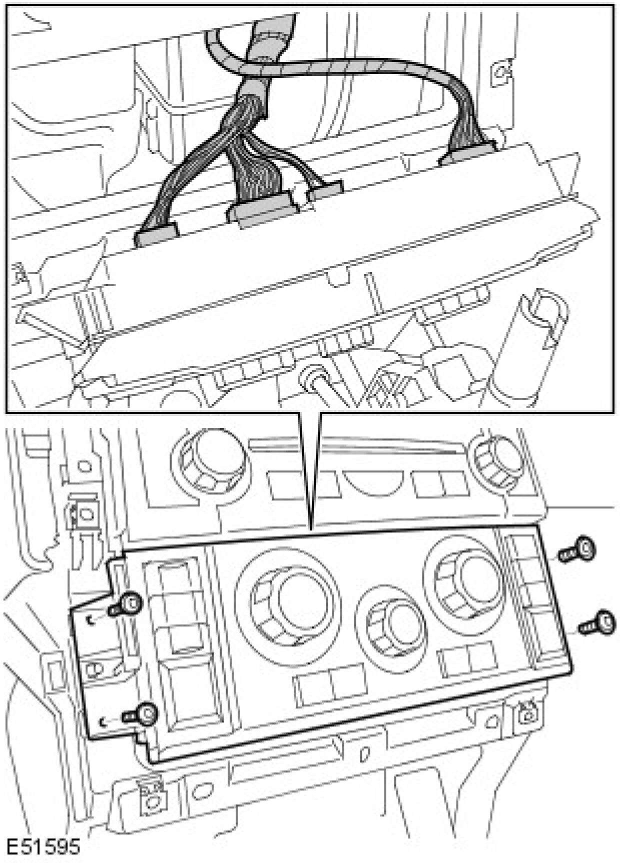
Control Components - Climate Control Assembly

Removal and Installation

Removal

1. Remove the floor console.
   For additional information, refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).
2. Remove the climate control assembly.
   - Remove the 4 Torx screws.
   - Disconnect the 4 electrical connectors.



Installation

1. Install the climate control assembly.
   - Connect the electrical connectors.
   - Tighten the Torx screws.
2. Install the floor console.
   For additional information, refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).

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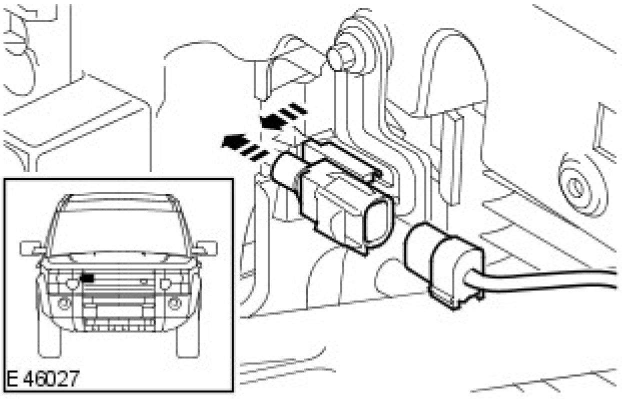
Control Components - Ambient Air Temperature Sensor

Removal and Installation

Removal

1. Remove the radiator grille.
   For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).



2. Remove the ambient air temperature sensor.
   - Disconnect the electrical connector.
   - Release the clip.

Installation

1. To install, reverse the removal procedure.

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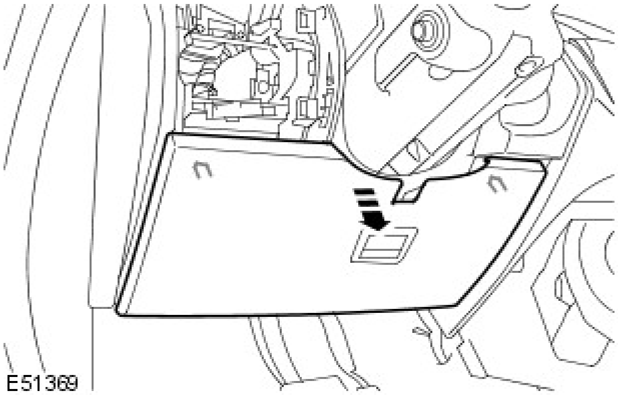
Control Components - In-Vehicle Temperature Sensor

Removal and Installation

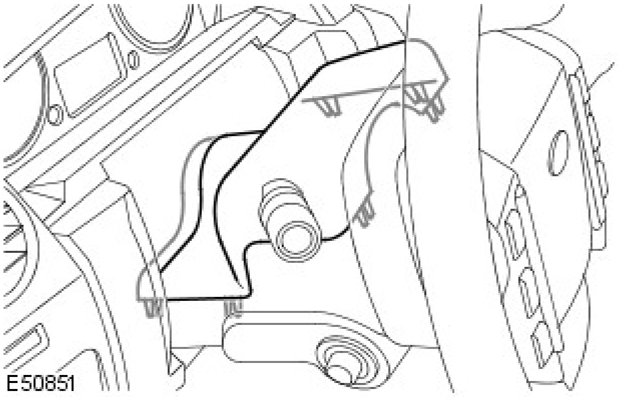
Removal

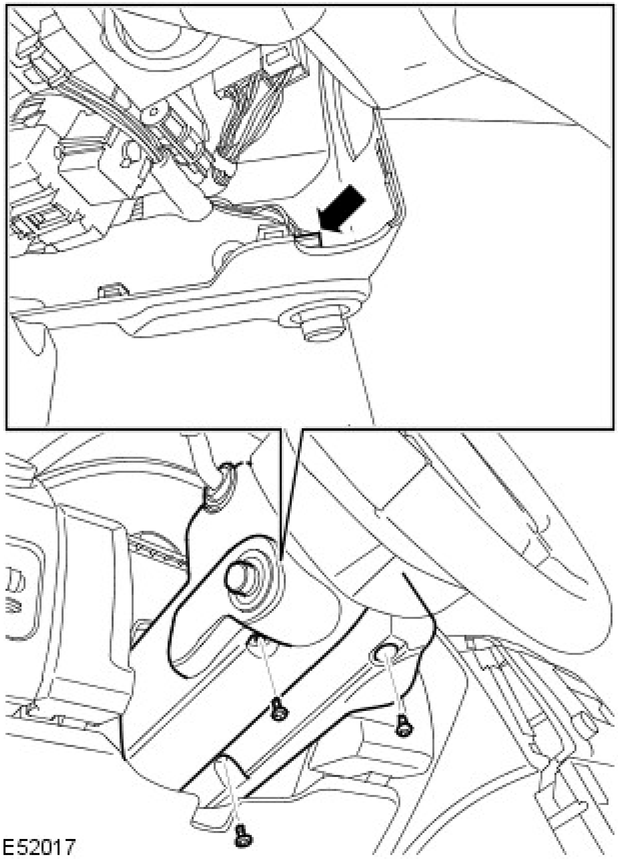
1. Fully extend the steering column for access.

2. Remove the instrument panel access panel.
   - Release the 2 clips.



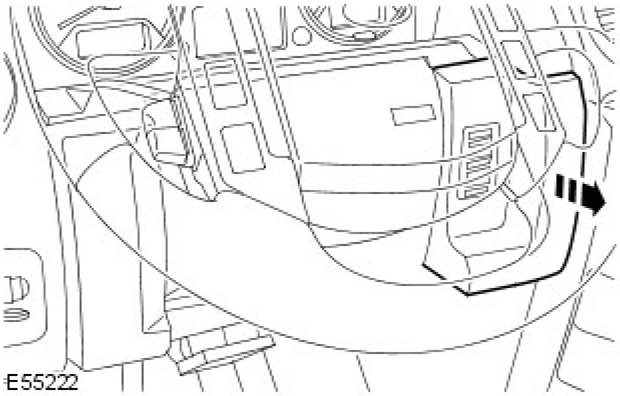
3. Remove the steering column upper shroud.
   - Release the 6 clips.





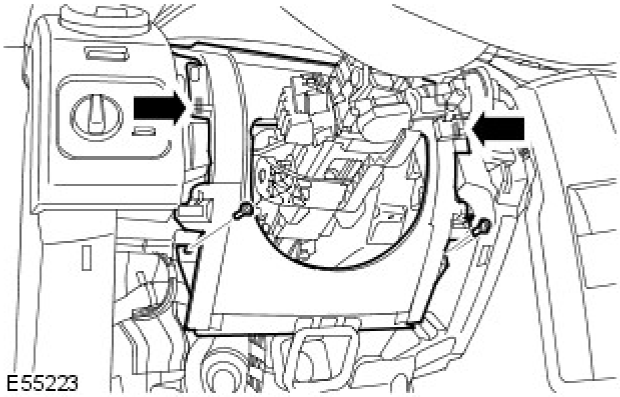
4. Remove the steering column lower shroud.

- Remove the 3 Torx screws.
- Disconnect the electrical connector.



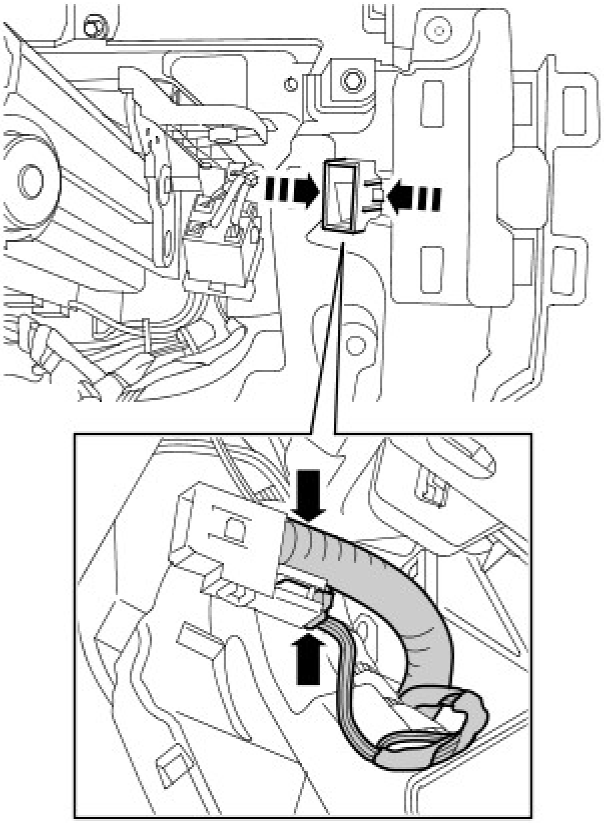
5. Remove the steering column side trim panel.

- Release the clips.
- Repeat the above procedure for the other side.



6. Release the steering column gaiter panel.

- Remove the 2 Torx screws.
- Release the 2 clips.



E55224

7. Remove the in-vehicle temperature sensor.

- Release the 2 clips.
- Disconnect the electrical connector.
- Disconnect the hose.

Installation

1. Install the in-vehicle temperature sensor.

- Connect the hose.
- Connect the electrical connector.
- Secure with the clips.

2. Install the steering column gaiter panel.

- Secure with the clips.
- Tighten the Torx screws.

3. Install the steering column side trim panels.

- Secure with the clips.

4. Install the steering column shrouds.

- Tighten the screws.
- Secure with the clips.

5. Install the instrument panel access panel.

- Secure with the clips.

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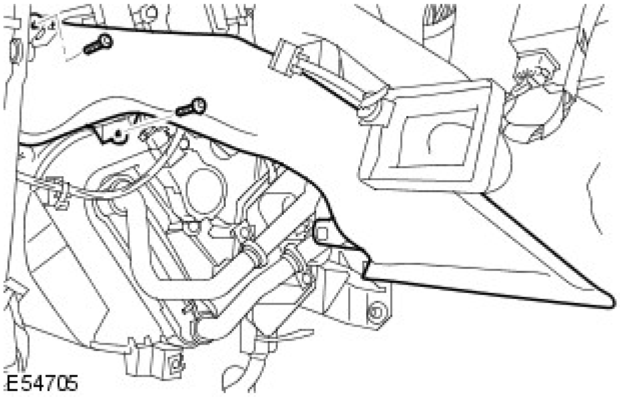
Control Components - Driver Side Temperature Blend Door ActuatorRHD AWD

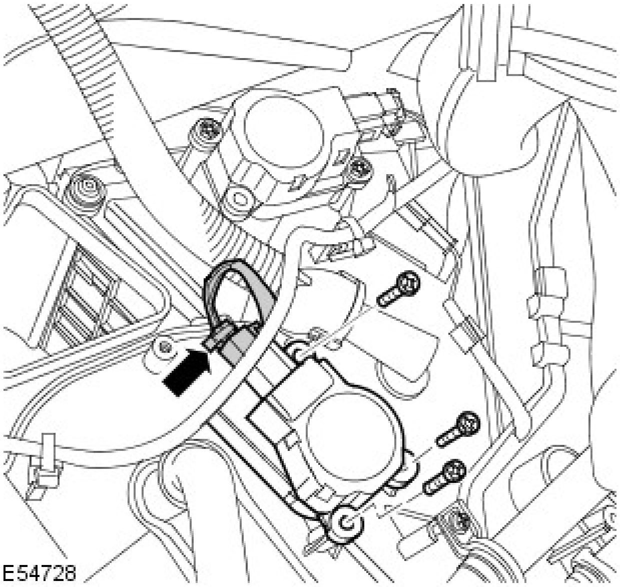
Removal and Installation

Removal

1. Remove the instrument panel driver side reinforcement.
   For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).



2. Remove the driver side footwell duct.
   - Remove the 2 Torx screws.



3. Remove the temperature blend door actuator.
   - Disconnect the electrical connector.
   - Remove the 2 screws.

Installation

1. Install the temperature blend door actuator.
   - Tighten the screws.
   - Connect the electrical connector.
2. Install the driver side footwell duct.
   - Tighten the screws.
3. Install the instrument panel driver side reinforcement.
   For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

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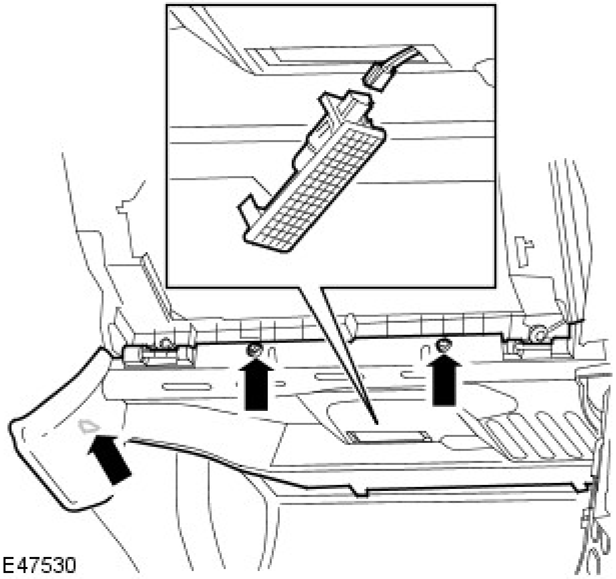
Control Components - Passenger Side Temperature Blend Door ActuatorRHD AWD

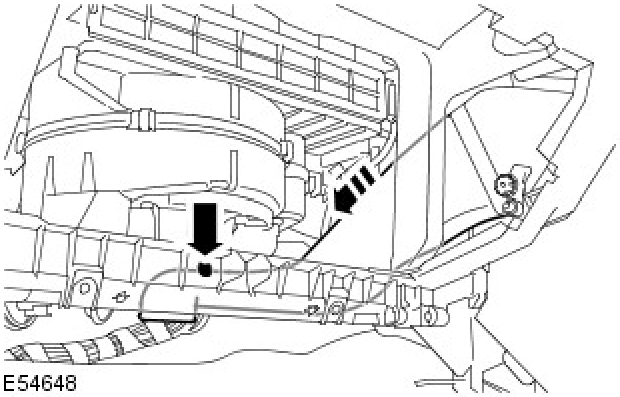
Removal and Installation

Removal

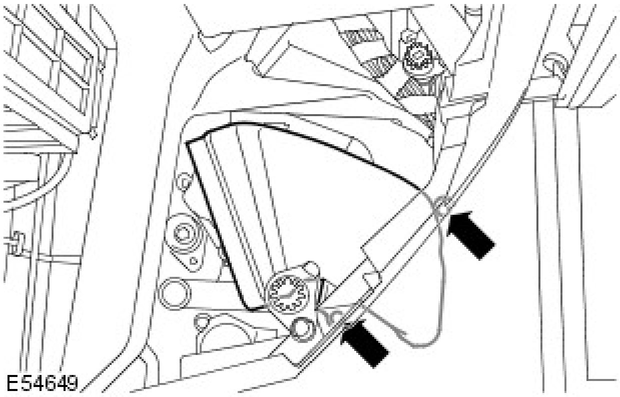
1. Remove the glove compartment.
   For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).



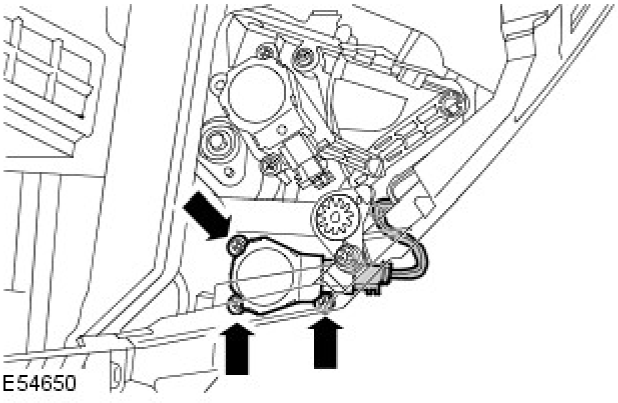
2. Remove the passenger side closing trim panel.
   - Release the clip.
   - Remove the 2 screws.
   - Disconnect the electrical connector.



3. Remove the passenger side footwell duct.
   - Remove the clip.



4. Remove the passenger side footwell duct elbow.
   - Remove the 2 Torx screws.



5. Remove the temperature blend door actuator.

- Disconnect the electrical connector.
- Remove the 2 screws.

Installation

1. Install the temperature blend door actuator.

- Tighten the screws.
- Connect the electrical connector.

2. Install the passenger side footwell duct elbow.

- Tighten the screws.

3. Install the passenger side footwell duct.

- Install the clip.

4. Install the passenger side closing trim panel.

- Connect the electrical connector.
- Tighten the screws.
- Secure the clip.

5. Install the glove compartment.
For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

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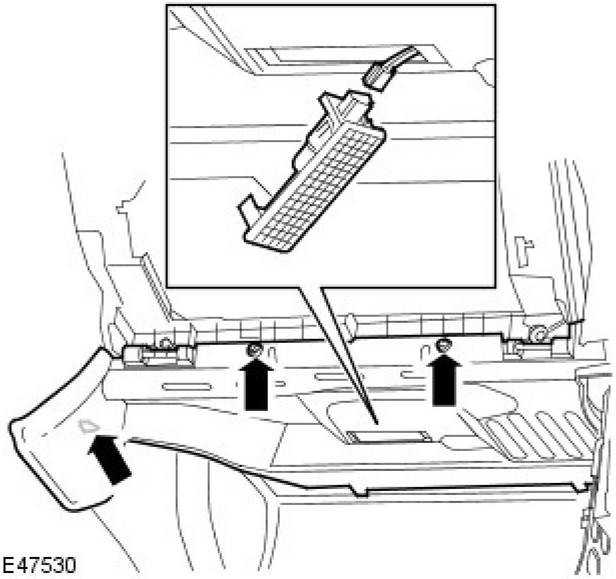
Control Components - Defrost Vent/Register Blend Door ActuatorLHD AWD

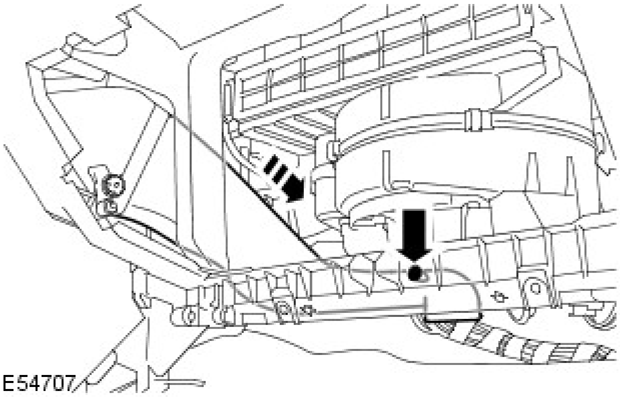
Removal and Installation

Removal

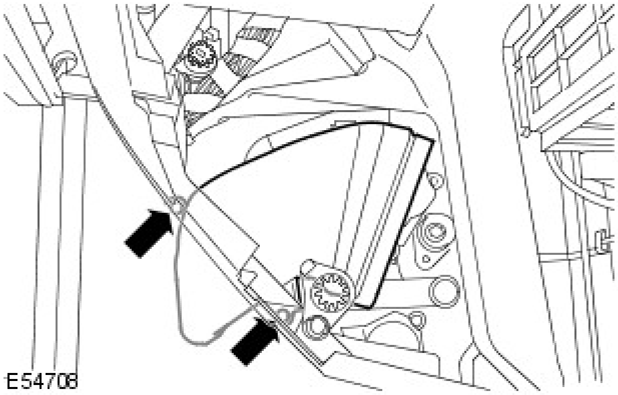
1. Remove the glove compartment.
   For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).



2. Remove the passenger side closing trim panel.
   - Release the clip.
   - Remove the 2 screws.
   - Disconnect the electrical connector.



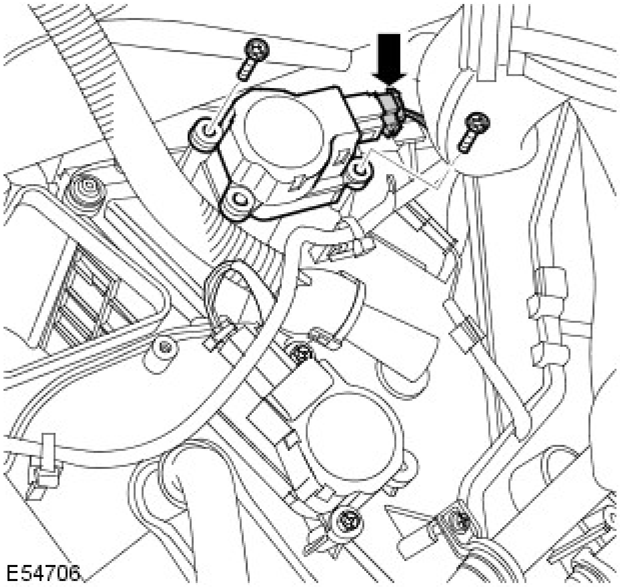
3. Remove the passenger side footwell duct.
   - Remove the clip.



4. Remove the passenger side footwell duct elbow.
   - Remove the 2 Torx screws.

5. Remove the defrost vent/register blend door actuator.

- Disconnect the electrical connector.
- Remove the 2 screws.



Installation

1. Install the defrost vent/register blend door actuator.
   - Tighten the screws to 1 Nm.
   - Connect the electrical connector.
2. Install the passenger side footwell duct elbow.
   - Tighten the screws.
3. Install the passenger side footwell duct.
   - Install the clip.
4. Install the passenger side closing trim panel.
   - Install the interior lamp.
   - Connect the electrical connector.
   - Secure the clip.
5. Install the glove compartment.
   For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

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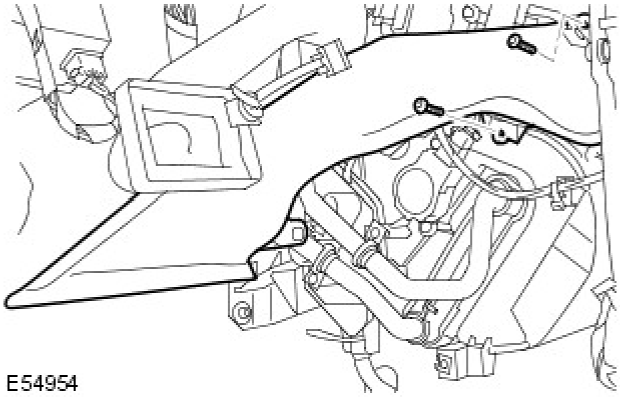
Control Components - Instrument Panel Blend Door ActuatorLHD AWD

Removal and Installation

Removal

1. Remove the instrument panel driver side reinforcement.
For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

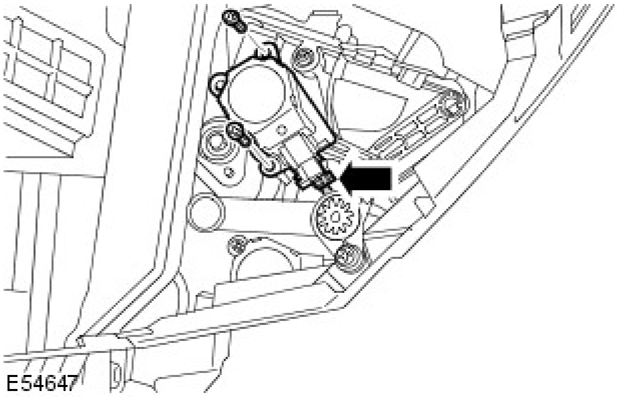


E54954

2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove the driver side footwell duct.

- Remove the 2 Torx screws.



E54647

3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove the instrument panel blend door actuator.

- Disconnect the electrical connector.
- Remove the 2 screws.

Installation

1. Install the instrument panel blend door actuator.

- Tighten the screws to 1 Nm.
- Connect the electrical connector.

2. Install the driver side footwell duct.

- Tighten the screws.

3. Install the instrument panel driver side reinforcement.
For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

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Control Components - Defrost Vent/Register Blend Door ActuatorRHD AWD

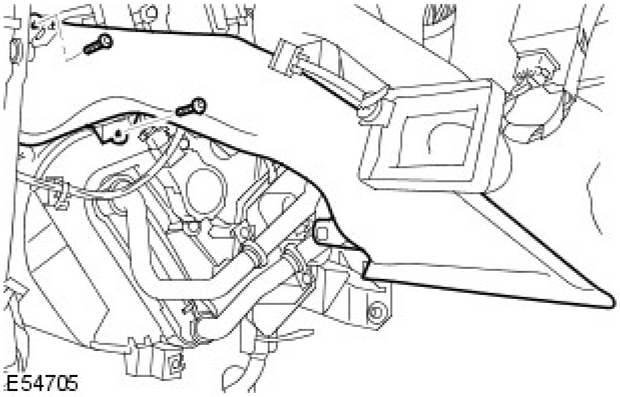
Removal and Installation

Removal

1. Remove the instrument panel driver side reinforcement.
For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

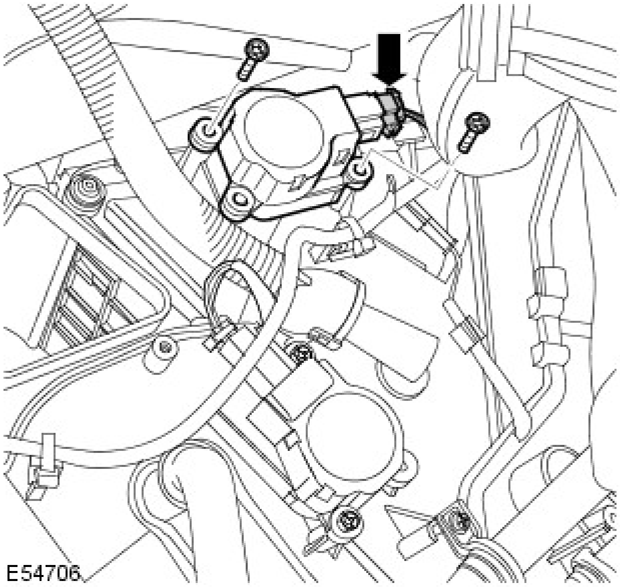
2. Remove the driver side footwell duct.

- Remove the 2 Torx screws.



3. Remove the defrost door actuator.

- Disconnect the electrical connector.
- Remove the 2 screws.



Installation

1. Install the defrost door actuator.

- Tighten the screws.
- Connect the electrical connector.

2. Install the driver side footwell duct.

- Tighten the screws.

3. Install the instrument panel driver side reinforcement.
For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

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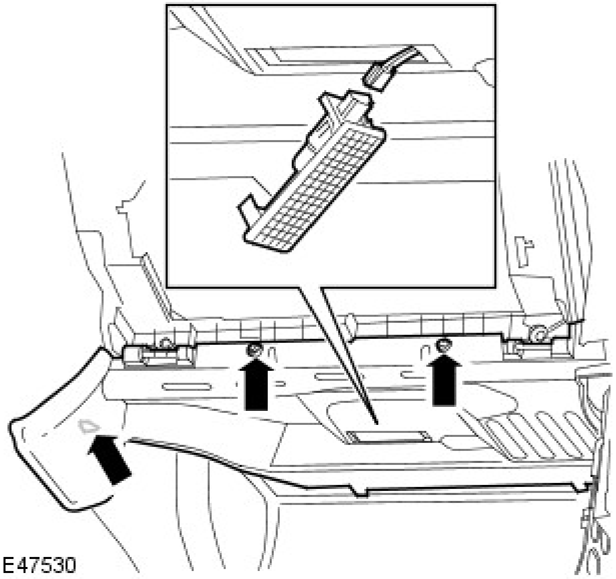
Control Components - Instrument Panel Blend Door ActuatorRHD AWD

Removal and Installation

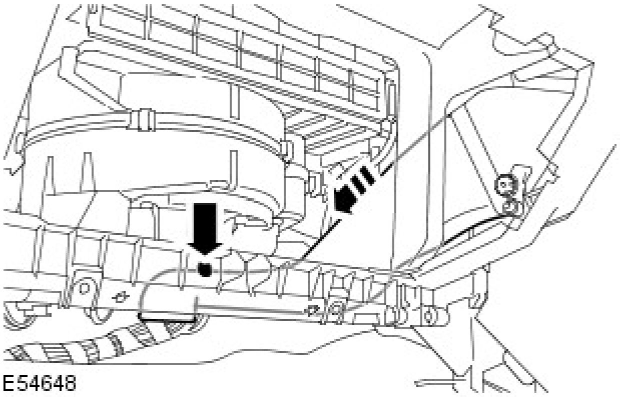
Removal

1. Remove the glove compartment.
   For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

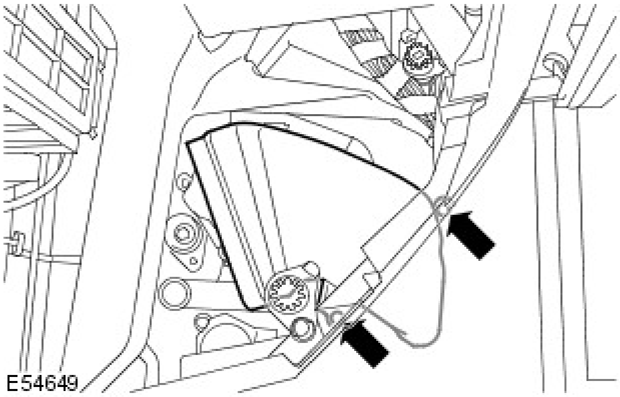
2. Remove the passenger side closing trim panel.
   - Release the clip.
   - Remove the 2 screws.
   - Disconnect the electrical connector.

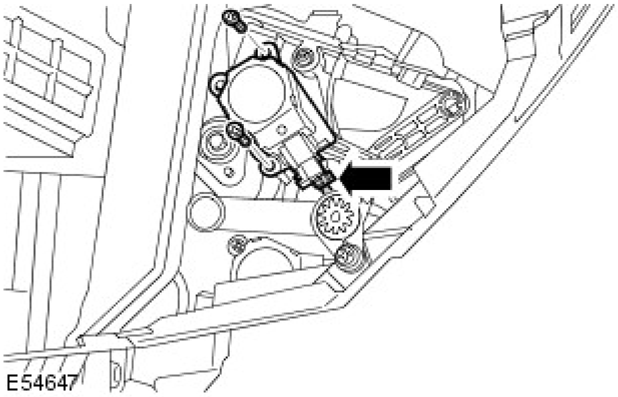


3. Remove the passenger side footwell duct.
   - Remove the clip.



4. Remove the passenger side footwell duct elbow.
   - Remove the 2 Torx screws.





5. Remove the instrument panel blend door actuator.

- Disconnect the electrical connector.
- Remove the 2 screws.

Installation

1. Install the instrument panel blend door actuator.

- Tighten the screws.
- Connect the electrical connector.

2. Install the passenger side footwell duct elbow.

- Tighten the screws.

3. Install the passenger side footwell duct.

- Install the clip.

4. Install the passenger side closing trim panel.

- Install the interior lamp.
- Connect the electrical connector.
- Secure the clip.

5. Install the glove compartment.
For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

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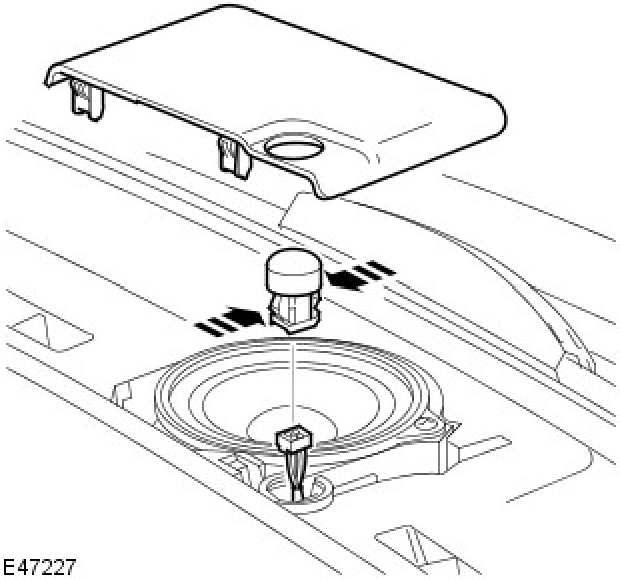
Control Components - Sunload Sensor

Removal and Installation

Removal

1. Remove the instrument panel upper section speaker grille.
    - Release the 4 clips.
2. Remove the sunload sensor.
    - Release the 2 clips.
    - Disconnect the electrical connector.



Installation

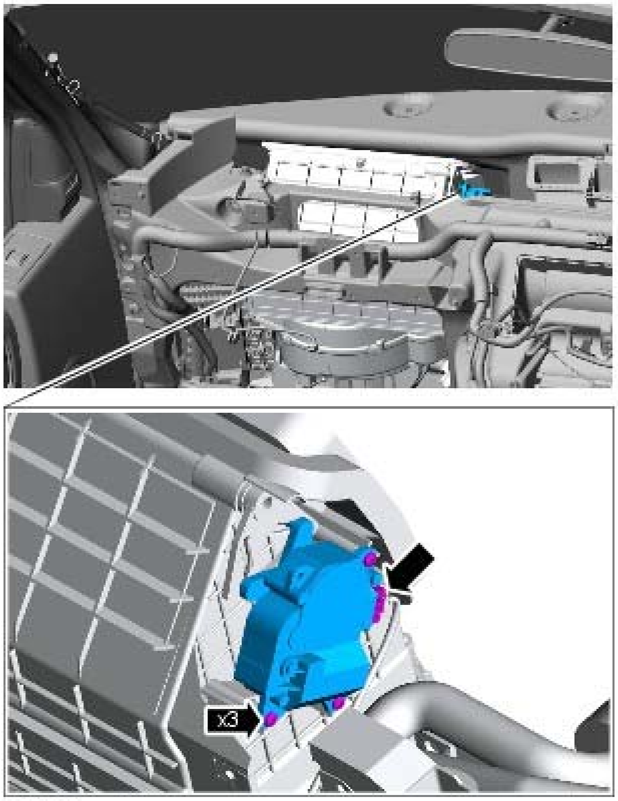
1. To install, reverse the removal procedure.

Control Components - Recirculation Blend Door ActuatorLHD AWD

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Make the SRS system safe.
   For additional information, refer to: Standard Workshop Practices (100-00 General Information, Description and Operation).
3. Remove the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).
4. NOTE: RHD illustration shown, LHD is similar.

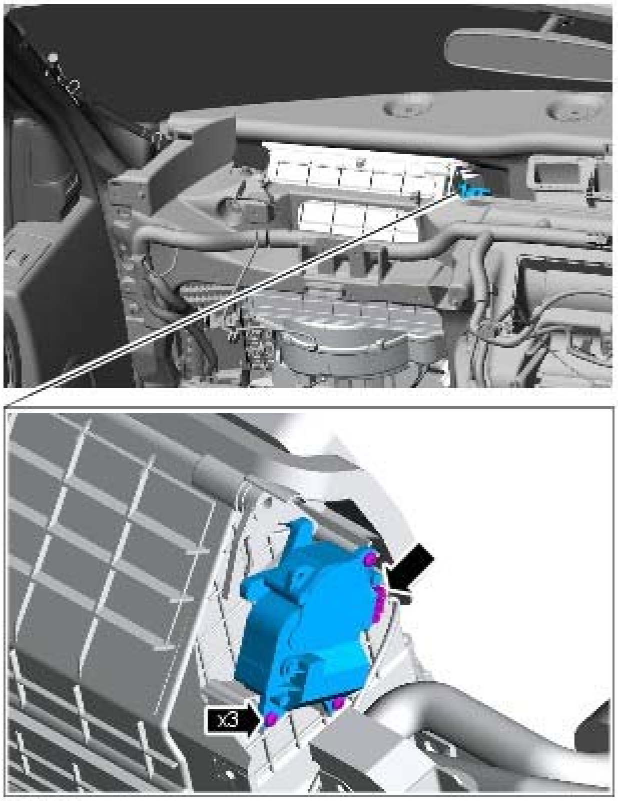


E91604

Remove the recirculation blend door actuator.

- Disconnect the electrical connector.
- Remove the 3 screws.

Installation



E91604

1. NOTE: RHD illustration shown, LHD is similar.

   Install the recirculation blend door actuator.

   - Align the control arm to the recirculation blend door.
   - Install the 3 screws.
   - Connect the electrical connector.

2. Install the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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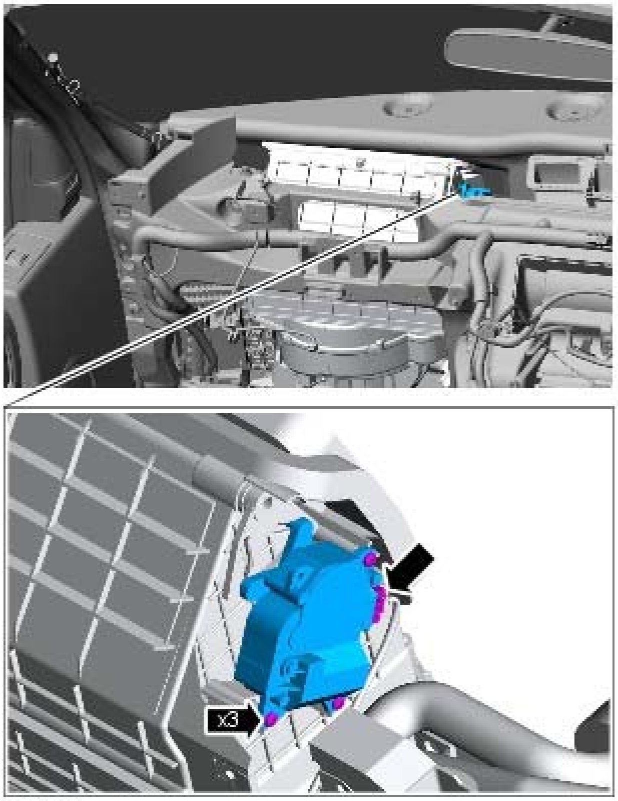
Control Components - Recirculation Blend Door ActuatorRHD AWD

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Make the SRS system safe.
   For additional information, refer to: Standard Workshop Practices (100-00, Description and Operation).
3. Remove the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12, Removal and Installation).
4. Remove the recirculation blend door actuator.
   - Disconnect the electrical connector.
   - Remove the 3 screws.



E91604

Installation

1. Install the recirculation blend door actuator.
   - Align the control arm to the recirculation blend door.
   - Install the 3 screws.
   - Connect the electrical connector.
2. Install the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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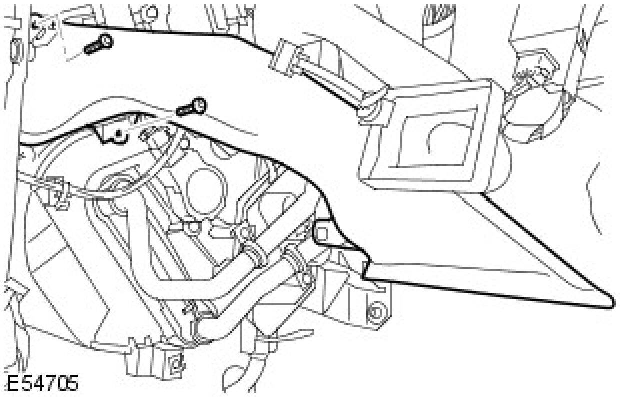
Control Components - Driver Side Temperature Blend Door ActuatorLHD AWD

Removal and Installation

Removal

1. Remove the instrument panel driver side reinforcement.
For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

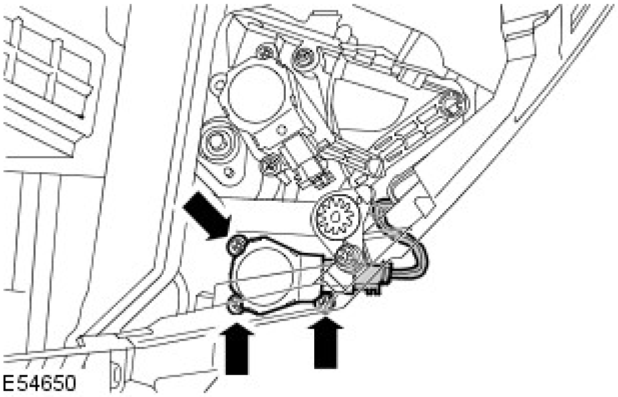
2. NOTE: RHD illustration shown, LHD is similar.



Remove the driver side footwell duct.

- Remove the 2 Torx screws.

3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



Remove the temperature blend door actuator.

- Disconnect the electrical connector.
- Remove the 3 screws.

Installation

1. Install the temperature blend door actuator.

- Tighten the screws to 1 Nm.
- Connect the electrical connector.

2. Install the driver side footwell duct.

- Tighten the screws.

3. Install the instrument panel driver side reinforcement.
For additional information, refer to: Instrument Panel Driver Side Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

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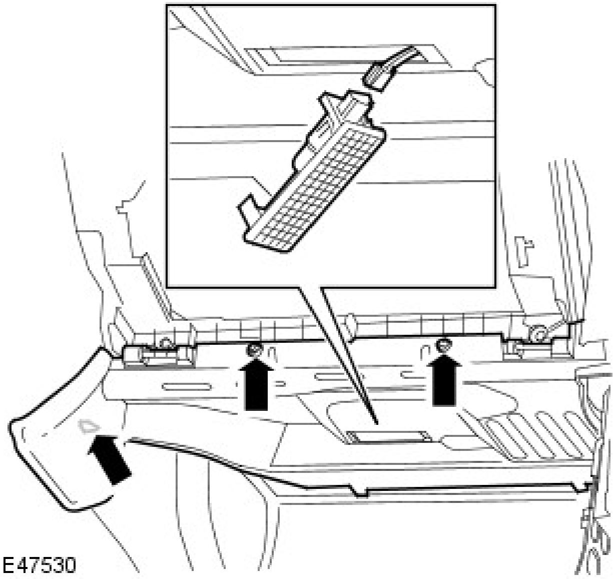
Control Components - Passenger Side Temperature Blend Door ActuatorLHD AWD

Removal and Installation

Removal

1. Remove the glove compartment.
For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

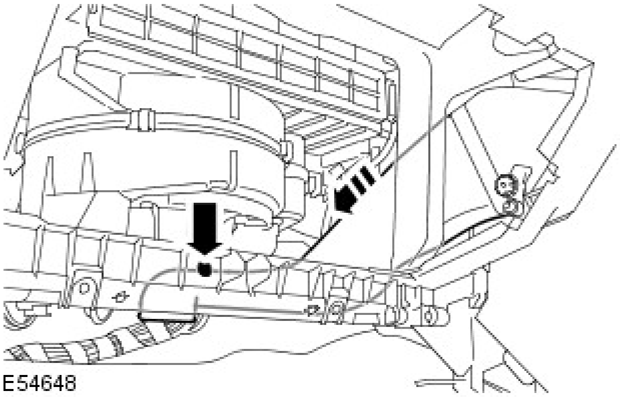
2. NOTE: RHD illustration shown, LHD is similar.



Remove the passenger side closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.

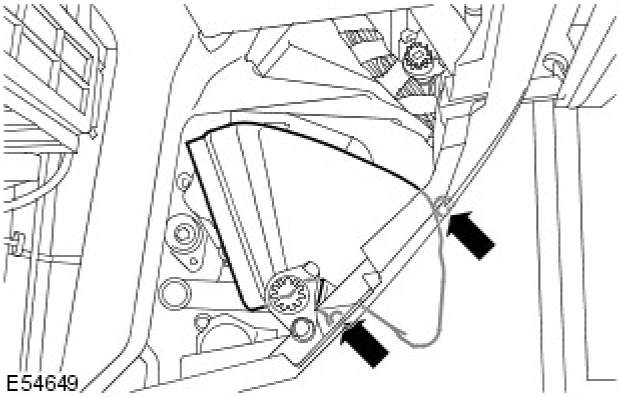
3. NOTE: RHD illustration shown, LHD is similar.



Remove the passenger side footwell duct.

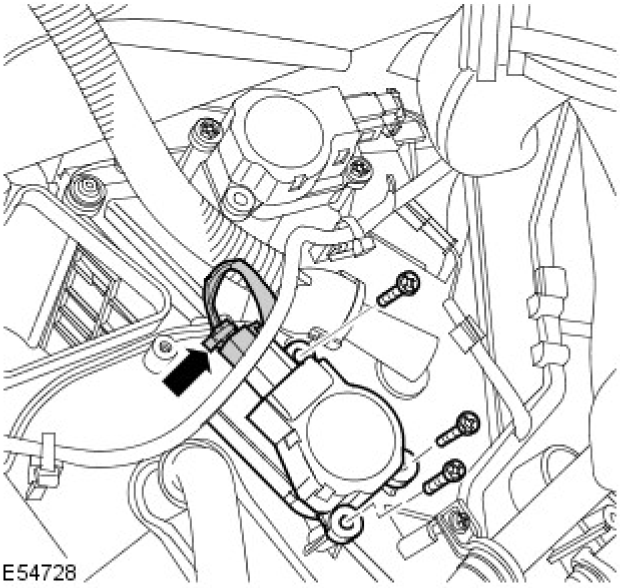
- Remove the clip.

4. NOTE: RHD illustration shown, LHD is similar.



Remove the passenger side footwell duct elbow.

- Remove the 2 Torx screws.



5. Remove the temperature blend door actuator.

- Disconnect the electrical connector.
- Remove the 3 screws.

Installation

1. Install the temperature blend door actuator.

- Tighten the screws to 1 Nm.
- Connect the electrical connector.

2. Install the passenger side footwell duct elbow.

- Tighten the screws.

3. Install the passenger side footwell duct.

- Install the clip.

4. Install the passenger side closing trim panel.

- Connect the electrical connector.
- Tighten the screws.
- Secure the clip.

5. Install the glove compartment.
For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

Published: 11-May-2011

Instrument Cluster -

Description	Nm	lb-ft
Steering column switch assembly	3	2

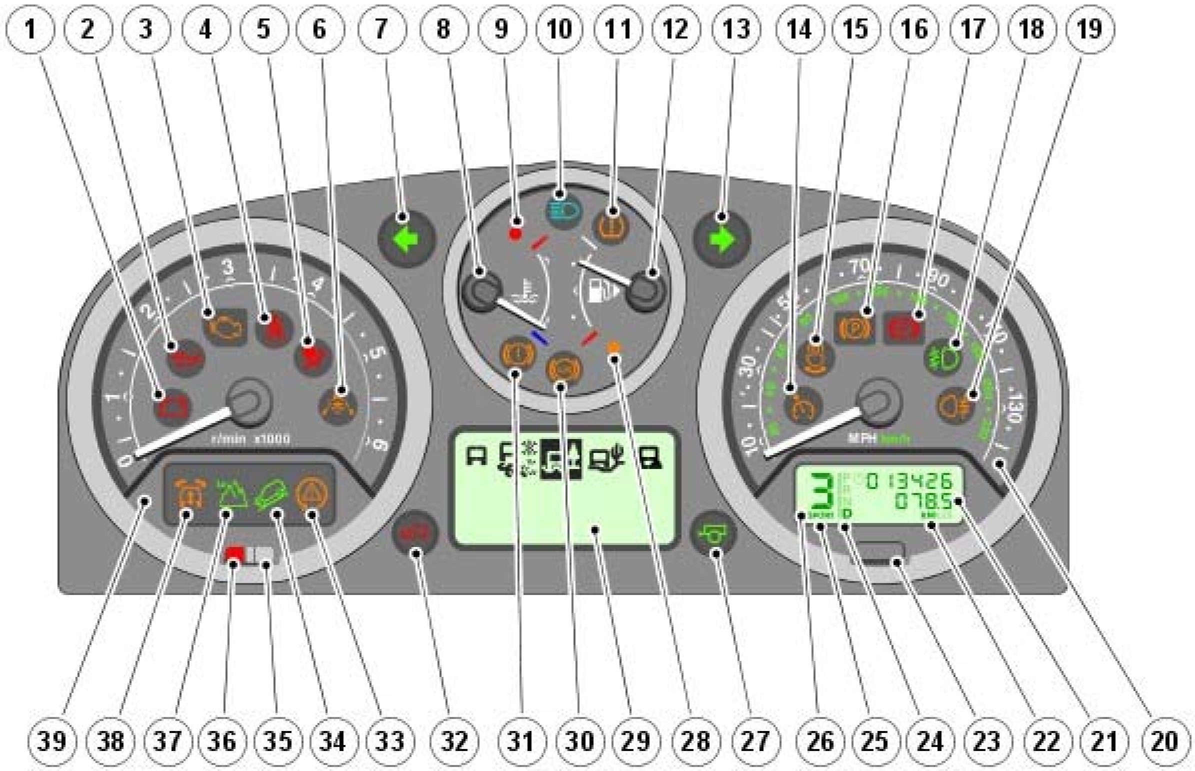
Published: 11-May-2011

Instrument Cluster - Instrument Cluster

Description and Operation

INSTRUMENT CLUSTER

- NOTE: UK Right hand drive petrol shown

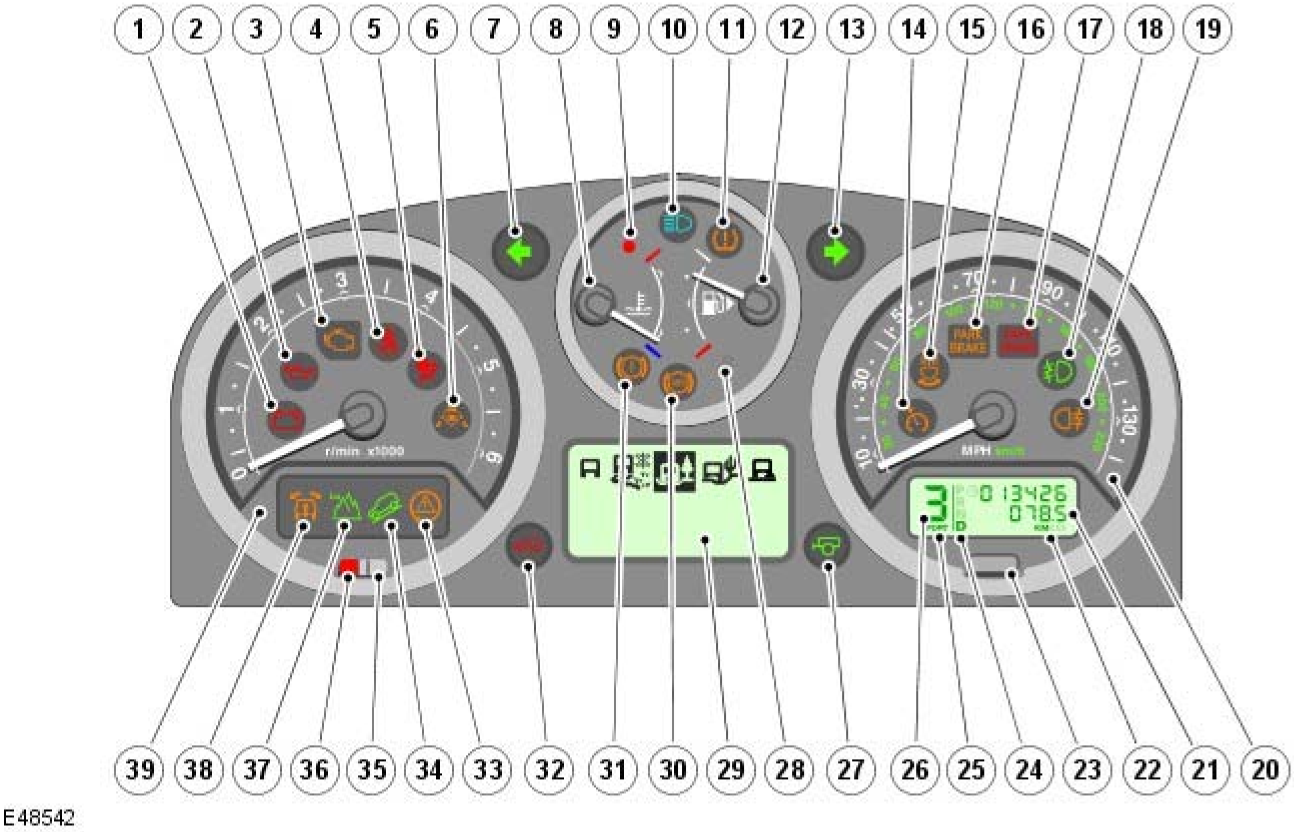


E48540

Item	Part Number	Description
1	-	Ignition/No charge warning indicator
2	-	Low oil pressure warning indicator
3	-	Malfunction Indicator Lamp (MIL)
4	-	Seat belt warning indicator
5	-	SRS warning indicator
6	-	Adaptive Speed Control indicator (if fitted)
7	-	Left turn signal indicator
8	-	Coolant temperature gage
9	-	High coolant temperature warning indicator
10	-	High beam indicator
11	-	Tyre pressure monitoring system indicator (if fitted)
12	-	Fuel level gage
13	-	Right turn signal indicator
14	-	Speed control indicator
15	-	Adaptive front lighting system indicator (if fitted)
16	-	Park brake fault indicator
17	-	Park brake warning indicator
18	-	Front fog lamp indicator
19	-	Rear fog lamp indicator
20	-	Speedometer
21	-	Odometer
22	-	Trip meter display
23	-	Trip reset button

24	-	Selector lever position
25	-	CommandShift™/Sport mode indicator
26	-	CommandShift™ gear position
27	-	Trailer indicator
28	-	Low fuel indicator
29	-	Message center
30	-	ABS indicator
31	-	Brake warning indicator (pad wear/low fluid/EBA/EBD)
32	-	Auxiliary heating indicator - Non-functional bulb check only
33	-	DSC/Traction control indicator
34	-	HDC active indicator
35	-	Ambient light sensor
36	-	Alarm indicator
37	-	Transfer box low range indicator
38	-	Air suspension/Dynamic Response warning indicator
39	-	Tachometer

INSTRUMENT CLUSTER - NAS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E48542

Item	Part Number	Description
1	-	Ignition/No charge warning indicator
2	-	Low oil pressure warning indicator
3	-	Malfunction Indicator Lamp (MIL)
4	-	Seat belt warning indicator
5	-	SRS warning indicator
6	-	Adaptive Speed Control indicator (if fitted)
7	-	Left turn signal indicator
8	-	Coolant temperature gage
9	-	High coolant temperature warning indicator
10	-	High beam indicator
11	-	Tyre pressure monitoring system indicator (if fitted)
12	-	Fuel level gage
13	-	Right turn signal indicator

14	-	Speed control indicator
15	-	Adaptive front lighting system indicator (if fitted)
16	-	Park brake fault indicator
17	-	Park brake warning indicator
18	-	Front fog lamp indicator
19	-	Rear fog lamp indicator
20	-	Speedometer
21	-	Odometer
22	-	Trip meter display
23	-	Trip reset button
24	-	Selector lever position
25	-	CommandShift™/Sport mode indicator
26	-	CommandShift™ gear position
27	-	Trailer indicator
28	-	Low fuel indicator
29	-	Message center
30	-	ABS indicator
31	-	Brake warning indicator (pad wear/low fluid/EBA/EBD)
32	-	Auxiliary heating indicator - Non-functional bulb check only
33	-	DSC/traction control indicator
34	-	HDC active indicator
35	-	Ambient light sensor
36	-	Alarm indicator
37	-	Transfer box low range indicator
38	-	Air suspension/Dynamic Response warning indicator
39	-	Tachometer

WARNING INDICATORS

The warning indicators are located in various positions in the instrument cluster. The warning indicators can be split into two groups; self controlled and externally controlled.

Self controlled warning indicators are dependent on software logic within the instrument pack for activation. The pack software controls the indicator check illumination at ignition on and all indicators whose operation is controlled by the instrument cluster, the low fuel level warning indicator for example.

Externally controlled indicators are supplied with current from another system controlling module or illuminated by the instrument cluster on receipt of a bus message from another subsystem module.

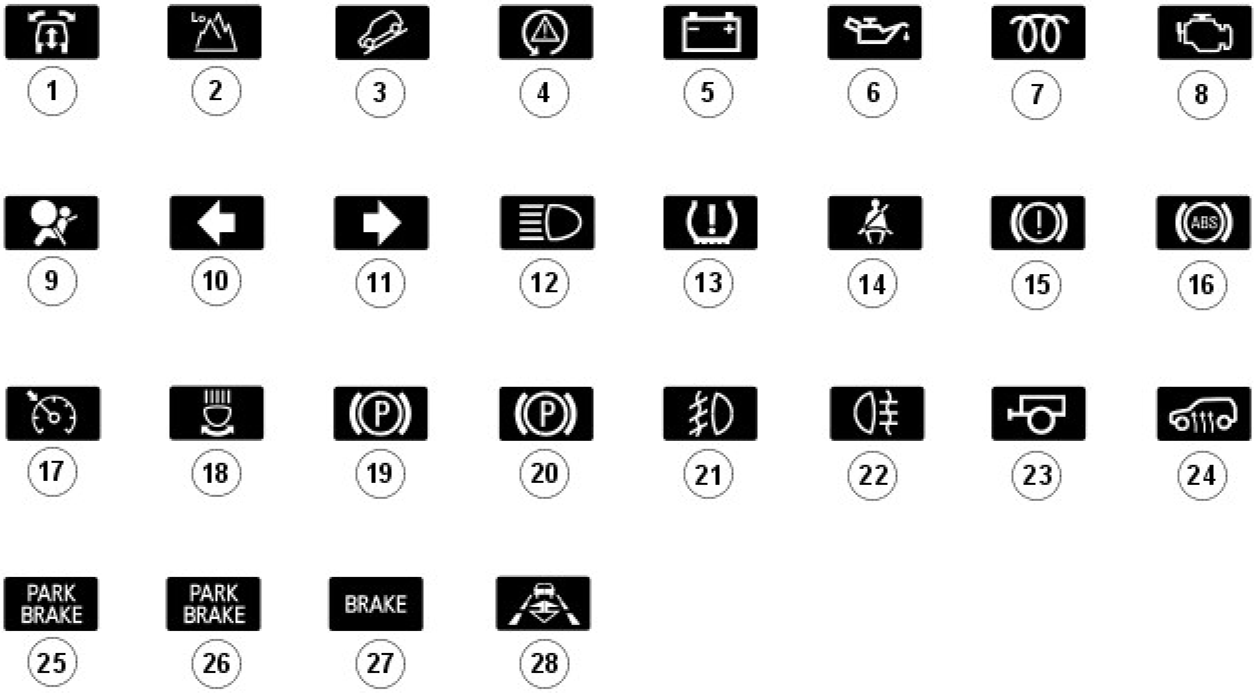
Some indicators are activated by an external subsystem module but the instrument cluster contains the control logic. These indicators are shown in the following table as being both self and externally controlled.

The following table shows the available indicators and indicates if they are subject to an indicator check at ignition on and if they are self or externally controlled.

Indicator	**Illumination Color**	**Bulb Check**	**Self Controlled (S) /Externally Controlled (E)**
Ignition/No charge	Red	No	E
Low oil pressure	Red	No	E
Glow plug active	Amber	* No (will illuminate at ignition on to show glow plugs active)	E
MIL	Amber	* Yes	E
Seat belt	Red	No	E
SRS	Red	* Yes	E
Adaptive speed control (if fitted)	Amber	No	E
Transfer box low range	Green	No	E
Air suspension/Dynamic Response	Amber / Red	Yes	E
HDC active	Green	No	E
DSC / Traction control	Amber	Yes	E
Left turn signal	Green	No	E
Right turn signal	Green	No	E
Trailer	Green	No	E
High engine coolant temperature	RED	Yes	S
High beam	Blue	No	E
ABS failure	Amber	* Yes	E

Indicator	Illumination Color	Bulb Check	Self Controlled (S) / Externally Controlled (E)
Low fuel level	Amber	Yes	S
Speed control	Amber	No	E
Park Brake City mode	Non-functional	-	-
Park brake fault	Amber	Yes	E
Park brake warning	Red	No	E
Front fog lamps	Green	No	E
Rear fog lamps	Amber	No	E
Alarm	Red	No	E
Driveline fault	Amber / Red	Yes	E
Auxiliary heater active - Non-functional bulb check only	Red	Yes	E
Tyre pressure monitoring	Amber	Yes	E
Brake warning	Amber / Red	Yes	E
Adaptive front lighting	Amber	Yes	E
*** = Bulb check performed by subsystem module, not instrument cluster**			

Warning Indicator Functionality



E57122

Item	Part Number	Description
1	-	Air suspension
2	-	Transfer box low range
3	-	HDC active
4	-	DSC/Traction control
5	-	Ignition/No charge
6	-	Low oil pressure
7	-	Glow plugs active (diesel models only)
8	-	Malfunction Indicator Lamp (petrol models only)
9	-	SRS warning
10	-	Left turn indicator
11	-	Right turn indicator
12	-	High beam
13	-	Tyre pressure monitoring system

14	-	Seat belt warning
15	-	Brake warning
16	-	ABS
17	-	Cruise control
18	-	Adaptive front lighting system
19	-	Park brake fault (all except NAS)
20	-	Park brake warning (all except NAS)
21	-	Front fog lamps
22	-	Rear fog lamps
23	-	Trailer
24	-	Auxiliary heating - Non-functional bulb check only
25	-	Park brake fault (NAS only)
26	-	Park brake warning (NAS only)
27	-	Brake warning (NAS only)
28	-	Adaptive Speed Control (if fitted)

The functionality for each of the above warning indicators is described below. Some warning indicators are accompanied by a chime from the instrument pack when they are illuminated and a message in the message center.

1. Air Suspension Indicator

The air suspension indicator is illuminated by the instrument cluster software on receipt of a CAN signal from the air suspension control module. The air suspension control module outputs a number of different signals relating to the air suspension system operation. The instrument cluster interprets the signals and can illuminate the indicator in either an amber or red colour as appropriate. Some signals also include requests for chimes from the instrument cluster to alert the driver.

2. Transfer Box Low Range Indicator

The transfer box low range indicator is illuminated by the instrument cluster software on receipt of CAN signals from the transfer box control module. When a range change from high to low range is in progress, the low range indicator flashes in an green color. When the range change is complete, the low range indicator remains permanently illuminated until high range is selected.

The transfer box control module also requests a single chime from the instrument cluster to alert the driver that the requested range change is complete. On high line instrument clusters, the range change information is also displayed in the message center.

3. Hill Descent Control (HDC) Active Indicator

The HDC active indicator is illuminated by the instrument cluster software on receipt of CAN signals from the ABS module. The indicator is illuminated in a green color when HDC is active and the vehicle speed is below a predetermined threshold. If the vehicle speed is faster than the threshold limit, the HDC indicator will flash until the vehicle speed is reduced. On high line instrument clusters a supporting message will also be displayed in the message center.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

If the use of HDC causes the brake discs to exceed their pre-determined temperature, the HDC system initiates a 'fade out'. The HDC indicator flashes during 'fade out' and on high line instrument clusters a supporting message is displayed in the message center. When the brake discs have cooled sufficiently, HDC is reactivated and the HDC indicator is permanently illuminated.

4. Dynamic Stability Control (DSC)/Traction Control Indicator

The DSC/traction control indicator is illuminated by the instrument cluster software on receipt of CAN signals from the ABS module. The indicator is illuminated in an amber color for 3 seconds for a bulb check when the ignition is switched on. If no faults exist, the indicator is extinguished after the bulb check period.

When DSC is active, the indicator flashes to inform the driver that the system is regulating engine output and braking forces. If the indicator remains illuminated after the bulb check period or illuminates when driving, the DSC system has a fault or DSC has been deselected by the driver using the DSC switch on the fascia.

5. Ignition/No Charge Indicator

The ignition/no charge indicator is controlled by the instrument cluster software and illuminated by CAN signals from the Engine Control Module (ECM). The indicator illuminates in a red color when the ignition is moved to position II and is extinguished when the engine is started.

If the indicator remains illuminated after the engine has started or illuminates when driving, the alternator charge output has failed.

6. Low Oil Pressure Indicator

The low oil pressure indicator is hardwired directly to the instrument cluster. The indicator is illuminated in a red color when the ignition is moved to position II. When the engine is started and the oil pressure increases the low oil pressure indicator should extinguish. If the indicator remains illuminated or illuminates when driving the vehicle should be stopped at the earliest opportunity and the engine switched off until the fault is rectified.

7. Glow Plugs Active Indicator (Diesel models only)

The glow plugs active indicator is illuminated by the instrument cluster software on receipt of a CAN message from the Engine Control Module (ECM). The indicator is located in the same position as the MIL on petrol models. The indicator illuminates in an amber color when the ignition is moved to position II. The indicator illumination period varies with engine temperature and is some cases will not illuminate when the engine temperature is high. The indicator is controlled by CAN signals from the ECM which equate to the time which the glow plugs are energised to pre-heat the combustion chambers.
For additional information, refer to: Glow Plug System (303-07C Glow Plug System - TDV6 2.7L Diesel, Description and Operation).
When the glow plug heating time is complete, the indicator is extinguished indicating to the driver that the engine can now be started.

8. Malfunction Indicator Lamp (MIL)

The MIL is controlled by the instrument cluster software on receipt of CAN signals from the ECM. The indicator is illuminated for a bulb check by the ECM when the ignition is moved to position II. The lamp is extinguished when the engine starts.

If the MIL remains illuminated after the engine is started or illuminates while driving, a fault is present and must investigated at the earliest opportunity. Illumination of the MIL indicates that there is an On-Board Diagnostic (OBD) fault which will cause excessive emissions output. This may relate to either an engine management system fault or a transmission fault.

9. Supplementary Restraint System (SRS) Warning Indicator

The SRS warning indicator is controlled by the restraints control module which transmits CAN signals to the instrument cluster. The warning indicator is illuminated for 6 seconds for a bulb check by the restraints control module when the ignition is moved to position II. If a fault is detected in the SRS the restraints control module illuminates the warning indicator in a red color until the fault is rectified.

The instrument cluster also performs a check of the indicator LED functionality. Failure of the indicator LED is transmitted to the driver in the form of a '5R5' (SRS) message which is displayed in the trip meter display.

10 and 11. Left and Right Turn Indicators

The turn indicators are controlled by the instrument cluster software on receipt of CAN signals on the medium speed CAN bus from the Central Junction Box (CJB). When the turn signal indicator switch is operated, the CJB transmits a signal to the instrument cluster to operate the applicable turn indicator. The instrument cluster software controls the flash rate of the indicator which flashes in a green color. During normal turn signal indicator operation the indicator flashes slowly, accompanied simultaneously by a sound from the instrument cluster sounder. If a fault exists, the instrument cluster responds to a fault message from the CJB and flashes the indicator at double speed.

The hazard warning indicators are also controlled by the CJB and the instrument cluster software and operate in the same manner as the turn signal indicators. The hazard warning indicators can operate with the ignition switched off, therefore, the CAN signal from the CJB to the instrument cluster to operate the left and right hand turn signal indicators will also 'wake-up' the instrument cluster.

12. High Beam Indicator

The high beam indicator is controlled by the instrument cluster software on receipt of CAN signals on the medium speed CAN bus from the Central Junction Box (CJB). When the high beam switch is moved to the high beam or headlight flash position, the CJB transmits a CAN message to the instrument cluster to illuminate the high beam indicator in a blue color.

13. Tyre Pressure Monitoring System (TPMS) Indicator

The Tyre Pressure Monitoring System (TPMS) indicator is controlled by the instrument cluster software on receipt of CAN signals from the TPMS module. The indicator is illuminated in an amber color for a 3 second bulb check by the TPMS module when the ignition is moved to position II. If the indicator remains illuminated after the engine is started or illuminates when driving, the TPMS has developed a fault. The tyre pressures should be monitored manually until the fault is rectified.

14. Safety Belt Warning Indicator

The safety belt warning indicator is controlled by the restraints control module and the instrument cluster software on receipt of CAN signals from the restraints control module.

The indicator is illuminated in a red color when the ignition is moved to position II. The illumination will remain on until the safety belt buckle is latched in position. If the safety belt of an occupied front seat is not fastened, when the vehicle speed exceeds 8 km/h (5 mph) the indicator will flash and repetitive chime will emit for 10 seconds from the instrument cluster. This will be repeated every 30 seconds until the safety belt is fastened, the vehicle speed is reduced below 5 km/h (3 mph) or the ignition switch is moved to the off position.

On NAS vehicles, the indicator will remain permanently illuminated until the safety belt is fastened, the vehicle speed is reduced below 5 km/h (3 mph) or the ignition switch is moved to the off position.

15 and 27. Brake Warning Indicator

This indicator is controlled by CAN signals from the ABS module for Electronic Brake Assist (EBA) and Electronic Brake Distribution (EBD) faults. Brake pad wear or low brake fluid indications are controlled by the instrument cluster with the pad wear sensors and the fluid level sensor hard wired into the instrument cluster.

The indicator can be illuminated in an amber or red colour depending on the fault. The indicator is illuminated for a bulb check when the ignition is switched on. The indicator is illuminated in an amber colour for 1.5 seconds and red colour for a further 1.5 seconds. If no faults exist, the indicator is extinguished after the bulb check period.

The brake warning indicator functions are assigned priority. Fault conditions which require a red illumination have priority over amber illuminated faults.

Brake Pad Wear

- The front left hand inboard brake pad and the rear right hand inboard brake pad are fitted with wear sensors. The pads are wired in series to the instrument cluster which continuously monitors the circuit. When one or both pads wear to their allowed limit (approximately 75% worn) the sensor circuit is broken and is detected by the instrument cluster software. The instrument cluster illuminates the brake warning indicator in a red colour and a message 'CHECK BRAKE PADS' is displayed in the message center. When the pad(s) are replaced, the instrument cluster senses the completed circuit and withdraws the indicator illumination and message display when the ignition is switched on to position II.

EBA/EBD Warning

- If a failure of the EBA or EBD functions occur, the ABS module transmits a CAN signal which is received by the instrument cluster. The instrument cluster software illuminates the brake warning indicator in an amber color for minor EBA/EBD faults and in a red color for major EBA/EBD faults. The indicator will remain illuminated for as long as the fault exists.

Low Brake Fluid

- The brake fluid reservoir is fitted with a sensor which is connected directly to the instrument cluster. When the ignition is switched on to position II the fluid level is checked. To prevent incorrect warnings when the vehicle is moving, the sensor is monitored once every 25 seconds. If a low fluid situation occurs, the instrument cluster illuminates the brake warning indicator in a red color and on high line instrument clusters also displays the message 'CHECK BRAKE FLUID' in the message center. Illumination of the indicator for low fluid level is also accompanied by a chime from the instrument cluster.

16. Anti-lock Brake System (ABS) Indicator

The ABS indicator is controlled by the ABS module which transmits a CAN signal to the instrument cluster. The indicator is illuminated in an amber color for 3 seconds for a bulb check by the ABS module when the ignition is moved to position II. If the indicator remains illuminated or illuminates when driving, an ABS fault has occurred an the ABS function will not be available.

During the bulb check, if the indicator comes on for 0.5 second, then goes off for 0.5 second and is then illuminated for the remaining 2 seconds of the bulb check, this indicates that faults are stored in the ABS module memory.

If the indicator was illuminated due to a sensor fault, the indicator will remain illuminated at the next ignition cycle, even if the fault is rectified. When the vehicle is driven above a speed of 20 km/h (12.5 mph) the indicator will be extinguished. This allows the ABS module to perform a thorough check of the system and to establish that the output from the replaced sensor is correct.

17. Cruise Control Indicator

The cruise control indicator is controlled by the ECM and the instrument cluster on receipt of CAN signals from the ECM. When the cruise control is selected on, the indicator is illuminated providing that cruise has been resumed and is not within 8 km/h (5 mph) of the set speed or cruise is on and the vehicle speed is within 8 km/h (5 mph).

18. Adaptive Front Lighting System (AFS) Indicator

The AFS indicator is controlled by the AFS control module and the instrument cluster software on receipt of CAN signals from the control module. The indicator is illuminated in an amber color for a 3 second bulb check when the ignition is moved to position II.

The AFS indicator displays AFS system failures to the driver. If a failure occurs, the indicator will flash continuously until the fault is rectified.

19 and 25. Park Brake Fault Indicator

The park brake fault indicator is controlled by the instrument cluster software on receipt of CAN signals from the Electronic Park Brake (EPB) control module. The indicator is illuminated in an amber color for 3 second for a bulb check when the ignition is moved to position II. If a fault occurs in the EPB system occurs, the EPB control module requests illumination of the indicator which remains illuminated until the fault is rectified.

20 and 26. Park Brake Warning Indicator

The park brake warning indicator is controlled by the instrument cluster software on receipt of CAN signals from the Electronic Park Brake (EPB) control module. The indicator is illuminated in a red color when the park brake is applied. If the ignition is moved to the off position, the indicator remains illuminated for 3 minutes. If a fault occurs which prevents park brake application the indicator flashes and the park brake fault indicator is also illuminated.

21. Front Fog Lamps Indicator

The front fog lamp indicator is controlled by the CJB which illuminates the indicator via a hardwired connection to the instrument cluster. The lamp is illuminated in a green color at all times when the front fog lamps are selected on and the ignition is in position II.

22. Rear Fog Lamps Indicator

The rear fog lamp indicator is controlled by the CJB which illuminates the indicator via a hardwired connection to the instrument cluster. The lamp is illuminated in an amber color at all times when the rear fog lamps are selected on and the ignition is in position II.

23. Trailer Indicator

The trailer indicator is controlled by the instrument cluster software on receipt of CAN signals on the medium speed CAN bus from the Central Junction Box (CJB). When a trailer is connected to the vehicle electrical system and the turn signal indicator switch is operated, the CJB transmits a signal to the instrument cluster to operate the trailer indicator. The instrument cluster software controls the flash rate of the indicator which flashes in a green color. The trailer indicator flashes slowly, accompanied simultaneously by a sound from the instrument cluster sounder, at the same rate as the turn signal indicators.

24. Auxiliary Heating Indicator

The auxiliary heating indicator is illuminated in an amber color for a 3 seconds bulb check when the ignition is moved to position II. The indicator is for later fitment of the auxiliary heating system and therefore is only illuminated for the bulb check.

28. Adaptive Speed Control Indicator (if fitted)

The adaptive speed control indicator is controlled by the adaptive speed control module and the instrument cluster software. The indicator is illuminated when cruise control is active and another vehicle is detected by the radar system in front of the vehicle. The indicator is illuminated in an amber color to alert the driver that the adaptive speed control system is active and will automatically control the vehicle speed to maintain a set distance from the vehicle in front.

ANALOGUE INSTRUMENTS

The analogue instruments located in the instrument cluster are as follows:

- Speedometer
- Tachometer
- Fuel level gage
- Engine coolant temperature gage.

The speedometer, tachometer, fuel gauge and engine temperature gauge are each driven by an electronic stepper motor. The characteristics of this type of motor produce damping of the pointer needle. All of the gages return to their respective zero positions when the ignition is switched off.

Speedometer

The speedometer is driven by square wave signals derived from the wheel speed sensors and the ABS module. The wheel speeds are measured by the wheel speed sensors reading the rotational speed of the wheels from toothed targets on the hubs. The wheel speeds are passed from the sensors to the ABS module in the form of pulsed signals. The ABS module converts these signals into a speed output on the high speed CAN to the instrument cluster.

Three versions of the speedometer display are used. The three versions show the speed in kilometres per hour, the speed in miles per hour as the main display and kilometres per hour as a secondary display and Canadian variants show the kilometres per hour as the main display and miles per hours as the secondary display.

Tachometer

The tachometer is driven by an engine speed signal transmitted on the high speed CAN from the ECM. The signal is derived from the Crankshaft Position (CKP) sensor. The signal is received by the instrument cluster microprocessor and the output from the microprocessor drives the tachometer.

Two versions of the tachometer are used for petrol and diesel engine variants. The petrol engine variants use a display which has a maximum engine speed reading of 8000 rev/min. The diesel engine variants use a display which has a maximum engine speed reading of 6000 rev/min.

Fuel Level Gage

The fuel level gage displays the fuel tank contents. When the ignition is off, the pointer returns to the empty position.

The instrument pack is connected to two tank level sensors. One sensor is located at the front of the fuel tank and the other is located at the rear. Each sensor uses a float operated MAgnetic Passive Position Sensor (MAPPS) for measuring the fuel tank contents. For additional information, refer to:

> Fuel Tank and Lines (310-01A Fuel Tank and Lines - V8 S/C 4.2L Petrol, Description and Operation),
> Fuel Tank and Lines (310-01B Fuel Tank and Lines - V8 4.4L Petrol, Description and Operation).

Each sensor is supplied with a reference current from the instrument cluster. The instrument cluster measures the returned output from each sensor which is proportional to the amount of fuel in the tank and the position of the float arm. The inclination of the vehicle, derived from a CAN message from the Electronic Park Brake (EPB) module, is also used to calculate the fuel tank contents. The instrument cluster uses the fuel level sensor signals and the EPB module inclination signals to accurately calculate the volume of fuel in the tank and display this on the fuel level gage. The instrument cluster monitors the signals and updates the fuel level gage pointer position at approximately 20 second intervals. This prevents the pointer moving continually due to fuel movement in the tank due to cornering or braking. When the ignition is off, the pointer needle returns to the empty position.

A warning lamp is incorporated into the fuel level gage and illuminates when the fuel tank volume is at or below 12.5 liters (2.75 Gallons) on petrol models and 14 liters (3.69 Gallons) on diesel models. This is accompanied by a chime from the instrument cluster and a message alert the driver to the low fuel condition.

The fuel tank content is converted into a CAN signal by the instrument cluster and transmitted on the CAN. This is received by Fuel Fired Booster Heater (FFBH) control module (if fitted) to suspend operation of the FFBH on diesel variants when the fuel tank content reaches 14 liters or less.

The following table shows the fuel tank fuel quantity and the respective pointer positions.

Fuel Tank Quantity (Liters)	Needle Pointer Position
4.91	Empty
12.5	Low fuel (low fuel lamp illuminated - Petrol engines)
14	Low fuel (low fuel lamp illuminated - Diesel engine)
25.6	Quarter full
45.8	Half full
67	Three quarter full
81.05	Full

Engine Coolant Temperature Gage

The engine coolant temperature gage displays the engine coolant temperature to the driver. When the ignition is off the pointer needle returns to the cold position.

The engine coolant temperature sensor is connected to the ECM which monitors the sensor signals and converts the signals into a value for the engine coolant temperature. This information is transmitted on the high speed CAN for use by the instrument cluster and other systems. For additional information, refer to:

> Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Description and Operation),
> Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Description and Operation),
> Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Description and Operation).

The engine coolant temperature gage is the same on all pack variants. The gage has a blue segment for low temperatures and a red segment for excessively high temperatures. For normal operating temperatures the gage needle pointer is positioned centrally in the gage display zone. The needle pointer position translates to the following approximate temperatures.

Engine Coolant Temperature °C (°F)	Needle Pointer Position
Ignition off	Park position
40 (104)	Cold (Blue segment)
75 - 115 (167 - 239)	Normal
120 (248)	Start of hot (Red segment)
125 (257)	End of hot

AMBIENT LIGHT SENSOR

An ambient light sensor is located in the instrument cluster, adjacent to the alarm indicator. The ambient light sensor is a phototransistor which measures the available ambient light.

The phototransistor measures the ambient light (lux) level and passes a signal value for the available light level to the instrument cluster microprocessor. The instrument cluster software adjusts the display brightness of the message center and information display LCD's accordingly to ensure that the displays are clearly visible during day and night time driving.

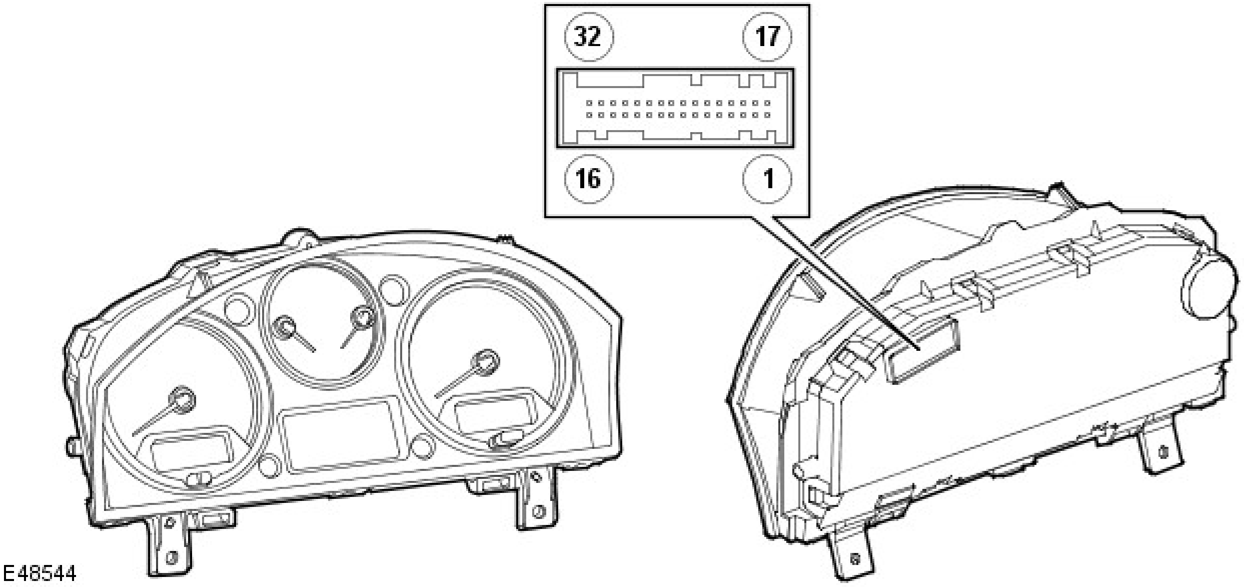
MESSAGE CENTER

Refer to Information and Message Center section for details.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

INPUTS AND OUTPUTS

A single electrical harness connector provides all inputs and outputs to and from the instrument cluster.

Instrument cluster Harness Connector C0230



Pin No.	Description	Input/Output
1	High Speed CAN + Positive	Input/Output
2	High Speed CAN - Negative	Input/Output
3	Low oil pressure sensor	Input
4	Low washer fluid level sensor	Input
5	Dimmer switch input - PWM illumination control	Input
6	Seat occupancy status (Europe/Japan only)	Input
7	Alarm LED indicator	Input
8	Park brake - direct drive to indicator	Input
9	Brake pad wear sensors	Input
10	Not used	-
11	Not used	-
12	Fuel tank level sensor 1	Input
13	Fuel tank level sensor ground	Input
14	Ground	Input
15	Power supply - Ignition switch position II	Input
16	Power supply - 12V Permanent	Input
17	Medium Speed CAN + Positive	Input/Output
18	Medium Speed CAN - Negative	Input/Output
19	Low engine coolant level sensor	Input
20	Rear fog lamp active	Input
21	Brake fluid level sensor	Input
22	Trip computer button	Input
23	Not used	Input
24	Front fog lamp active	Input
25	Not used	-
26	Not used	-
27	Fuel tank level sensor 2	Input
28	Not used	-
29	Not used	-
30	Not used	-

Pin No.	Description	Input/Output
31	Power supply - Ground	Input
32	Power supply - Ground	Input

DIAGNOSTICS

Car Configuration File

The Car Configuration File (CCF) contains all relevant data about the specification and market condition of the applicable vehicle, immobilisation codes and driver personal settings. This information is retained in the Central Junction Box (CJB), the Engine Control Module (ECM) and the instrument cluster enabling each system module to detect which systems and components are fitted to the vehicle. The information is continuously transferred between the three system modules to ensure that the data is constantly backed-up between the modules.

⚠ CAUTION: When a new instrument cluster is to be installed, an approved Land Rover diagnostic system must be connected to the vehicle and the instrument cluster renewal procedure followed to replace the cluster. This will ensure that vehicle coding data is correctly installed in the new instrument cluster. An approved Land Rover diagnostic system will also record the current service interval data and restore the settings in the new instrument cluster.

When a new instrument cluster is installed, an approved Land Rover diagnostic system is used to transfer the CCF data from the CJB to the replacement cluster. Vehicle coding data such as engine type, market etc is retrieved and used to update the replacement instrument cluster.

The CCF will also need to be updated using an approved Land Rover diagnostic system if the vehicle is modified in service from its original factory specification. This can include fitting non-standard wheels and/or tyres, optional accessory dealer fit components with an electrical interface, i.e. park distance control.

CUSTOMER PERSONALISATION

Refer to Information and Message Center section for details.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

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Instrument Cluster - Instrument Cluster

Diagnosis and Testing

Overview

Data is provided to the instrument cluster from other subsystem modules in the form of controller area network (CAN) messages. The instrument cluster identifies the signals and displays the appropriate message in the message center. Most messages are accompanied by a chime or series of chimes which are requested by the module generating the message. The driver can view system status messages which are current within the instrument cluster software by pressing and holding the trip reset button for more than three seconds, the information display will then display the current messages in priority order. For more information, refer to the relevant workshop manual section.

Car configuration file (CCF)

⚠ CAUTION: If a new instrument cluster is to be installed, the instrument cluster renewal procedure must be carried out using the approved diagnostic system. This will ensure that the CCF data is correctly transferred from the central junction box (CJB) to the replacement cluster. The CCF will also need to be updated using the approved diagnostic system if the vehicle is modified in service from its original factory specification. This can include the fitting of non-standard wheels and/or tires and optional accessory dealer install components with an electrical interface, such as park distance control.

The CCF contains all relevant data about the specification and market condition of the applicable vehicle, immobilization codes and driver personal settings. This information is retained in the CJB, the engine control module (ECM) and the instrument cluster enabling each system module to detect which systems and components are installed to the vehicle. The information is continuously transferred between these three system modules to ensure that the data is constantly backed-up between the modules.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Confirm which, if any, warning lights and/or messages were displayed on the instrument cluster. For a list of messages, refer to workshop manual section 413-08 - Information and Message Center.
3. **3.** Visually inspect for obvious electrical faults.

Visual inspection

Electrical
• Battery • Fuses - Central and battery junction boxes - Megafuses • Wiring harness • Damaged, loose or corroded connectors • Controller area network (CAN) circuits • Instrument cluster • Central junction box (CJB) • Engine control module (ECM)

4. **4.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. **5.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the DTC index.
    - Make sure that all DTCs are cleared following rectification.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible cause(s)	Action
B1A0016	Control Module	• Battery voltage low • Battery ground cable high resistance • Battery connections loose/corroded • Battery current drain	Check the battery condition and state of charge. Refer to the relevant section of the workshop manual. Check the module power and ground circuits. Refer to the electrical guides.

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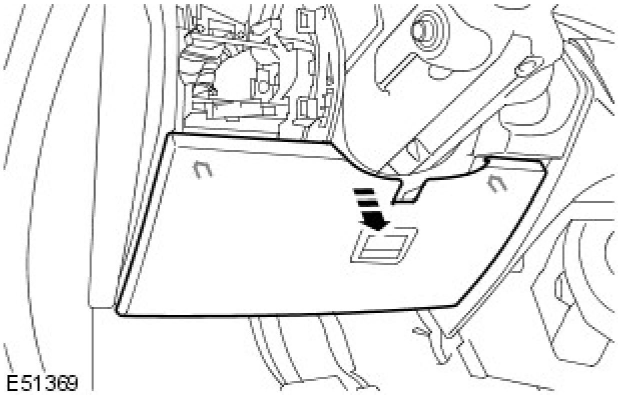
Instrument Cluster - Instrument Cluster

Removal and Installation

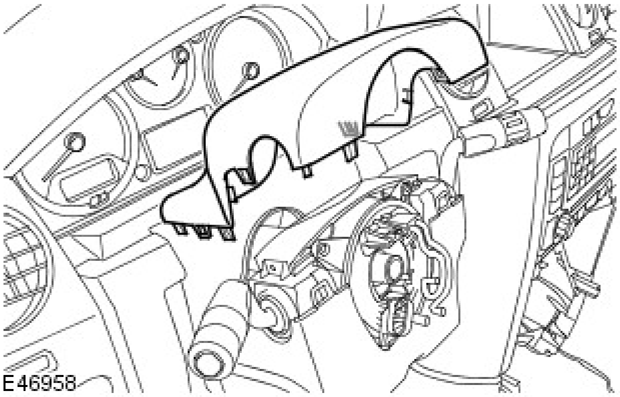
Removal

1. Fully extend the steering column for access.
2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
3. Remove the steering wheel.
   For additional information, refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).
4. Remove the headlamp switch trim panel.
   For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).
5. Remove the instrument panel access panel.



   - Release the 2 clips.

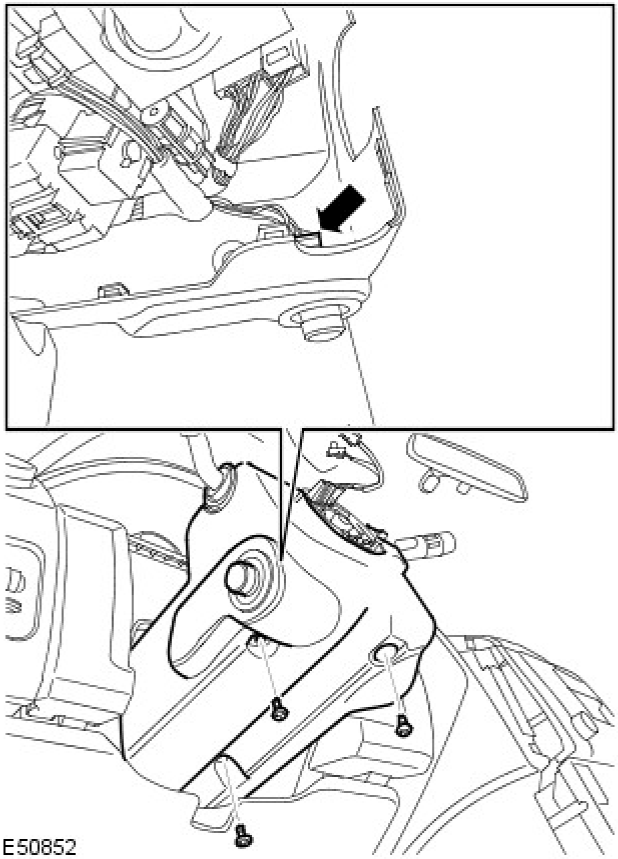
6. Remove the steering column upper shroud.



   - Release the 6 clips.

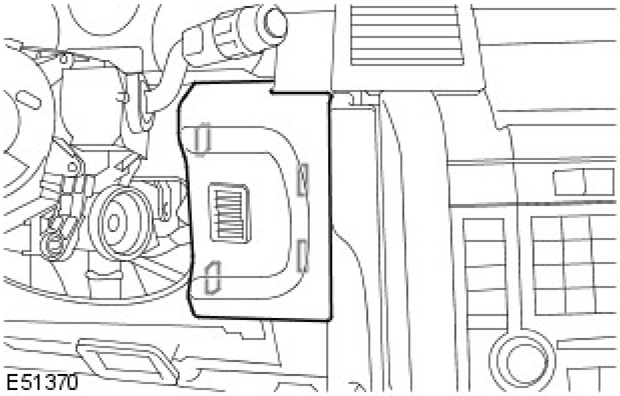
7. Remove the steering column lower shroud.

- Remove the 3 Torx screws.
- Disconnect the electrical connector.

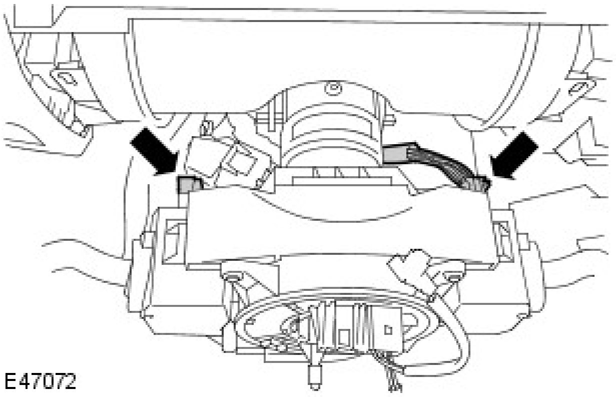


8. Remove the steering column side trim panel.

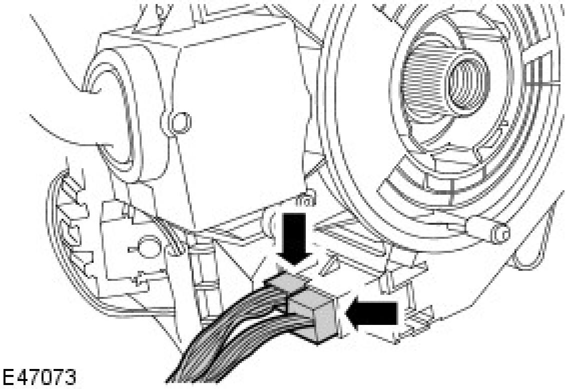
- Release the 4 clips.



9. Disconnect the 2 electrical connectors from the steering column multifunction switches.

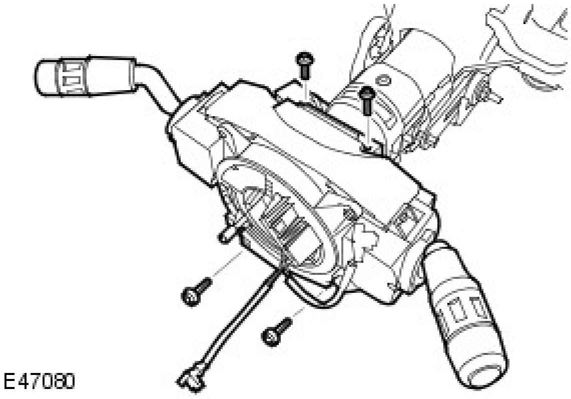


10. Disconnect the 2 electrical connectors from the clockspring.



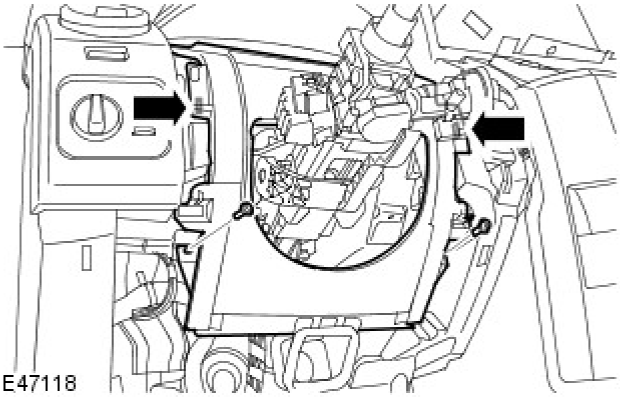
11. Remove the steering column switch assembly.

- Remove the 4 Torx bolts.



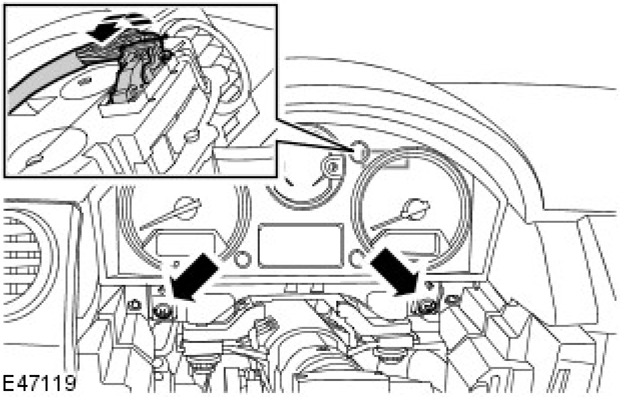
12. Remove the steering column gaiter panel.

- Remove the 2 Torx screws.
- Release the 2 clips.



13. Remove the instrument cluster.

- Remove the 2 Torx screws.
- Disconnect the electrical connector.

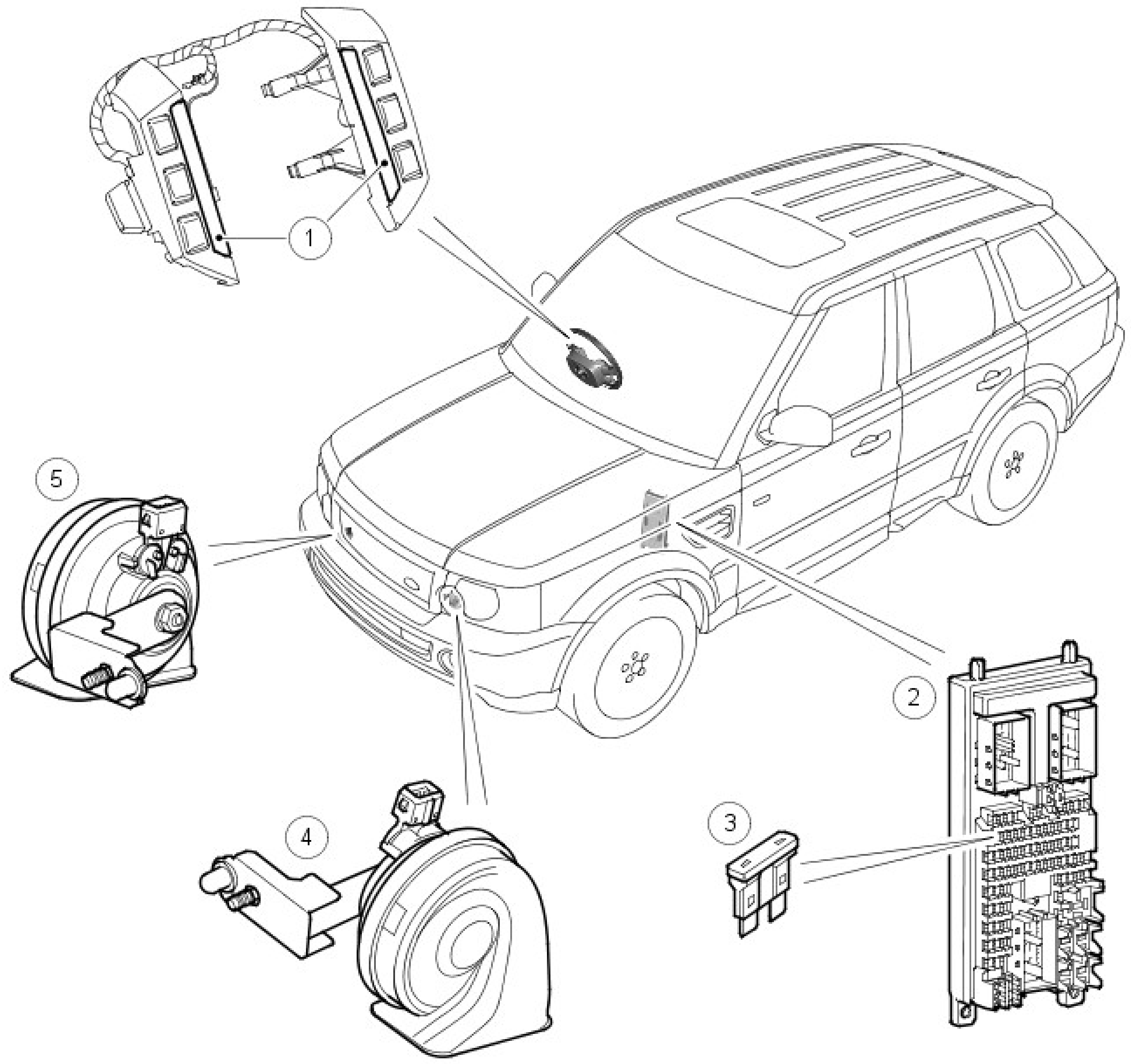


Installation

1. Install the instrument cluster.
    - Connect the electrical connector.
    - Tighten the Torx screws.
2. Install the steering column gaiter panel.
    - Secure with the clips.
    - Tighten the Torx screws.
3. Install the steering column switch assembly.
    - Tighten the Torx bolts to 3 Nm (2 lb.ft).
4. Connect the clockspring and multifunction switch electrical connectors.
5. Install the steering column side trim panel.
    - Secure with the clips.
6. Install the steering column shrouds.
    - Connect the electrical connector.
    - Tighten the Torx screws.
    - Secure the clips.
7. Install the instrument panel access panel.
    - Secure with the clips.
8. Install the headlamp switch trim panel.
   For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).
9. Install the steering wheel.
   For additional information, refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).
10. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Horn - Horn

Description and Operation



E57351

Item	Part Number	Description
1	-	Steering wheel horn switches
2	-	Central Junction Box (CJB)
3	-	Fuse 12
4	-	Horn - Low tone
5	-	Horn - High tone

GENERAL

Two horns are fitted to the vehicle; a high tone and a low tone. The horns are mounted on brackets, which are attached to the front end carrier assembly, on each side of the radiator.

The horns are operated by pressing one of the two horn switches, located on each side of the driver airbag, on the steering wheel.

The horns are also used by the vehicle alarm system. When the alarm system requires the horns to operate, the Central Junction Box (CJB) provides a ground to the horn relay solenoid, closing the relay contact which in turn supplies battery voltage to operate the horns.
For additional information, refer to: Anti-Theft - Active (419-01A Anti-Theft - Active, Description and Operation).

The horn circuit is permanently connected to battery voltage and therefore the horns can be operated at any time, irrespective of ignition switch position.

The horns are controlled by a relay which is an integral part of the CJB. The relay contact and solenoid is connected to the vehicle battery via a fusible link (Link 17E) in the battery junction box and a fuse (F12P) in the CJB. The horn switches, when pressed, complete a ground to the relay which energises the solenoid. The energised solenoid closes the relay contact and battery voltage is supplied to each of the horns. When the horn switch is released, the ground for the solenoid is broken, the solenoid is de-energised and the relay contact opens, cutting the voltage supply to the horns.

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Horn - Horn

Diagnosis and Testing

Overview

Two horns are fitted to the vehicle, a high tone and a low tone. The horns are mounted on each side of the radiator and are operated by the two horn switches on the steering wheel. The horns are also used by the vehicle alarm system.

For information on the description and operation of the system:
REFER to: Horn (413-06 Horn, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
- Horns condition and fitment	- Battery condition and state of charge - Fuses - Battery junction box (BJB) - fusible link 17E - Central junction box (CJB) - fuse 12P - Relay - Central junction box (CJB) - horn relay - Electrical connections - Horn switches - Clock spring - Central junction box (CJB) - Battery junction box (BJB)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible causes	Action
Horn/s operate with a muffled tone	- Low battery voltage - Horn circuit fault - Horn switch fault - Horn/s faulty	Check the battery condition and state of charge. Check the horn circuit. Check for DTCs indicating a horn circuit fault.
Horn/s inoperative		

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1C5512	Horn relay	- Horn relay circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1C5514	Horn relay	- Horn relay circuit: high resistance - Horn relay circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
B1C5612	Horn relay output circuit	● Horn relay output circuit: short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1C5614	Horn relay output circuit	● Horn relay output circuit: high resistance ● Horn relay circuit: short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

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Clock - Clock

Description and Operation

The clock is an integral part of the audio head unit.
For additional information, refer to: Audio System (415-01 Audio Unit, Description and Operation).

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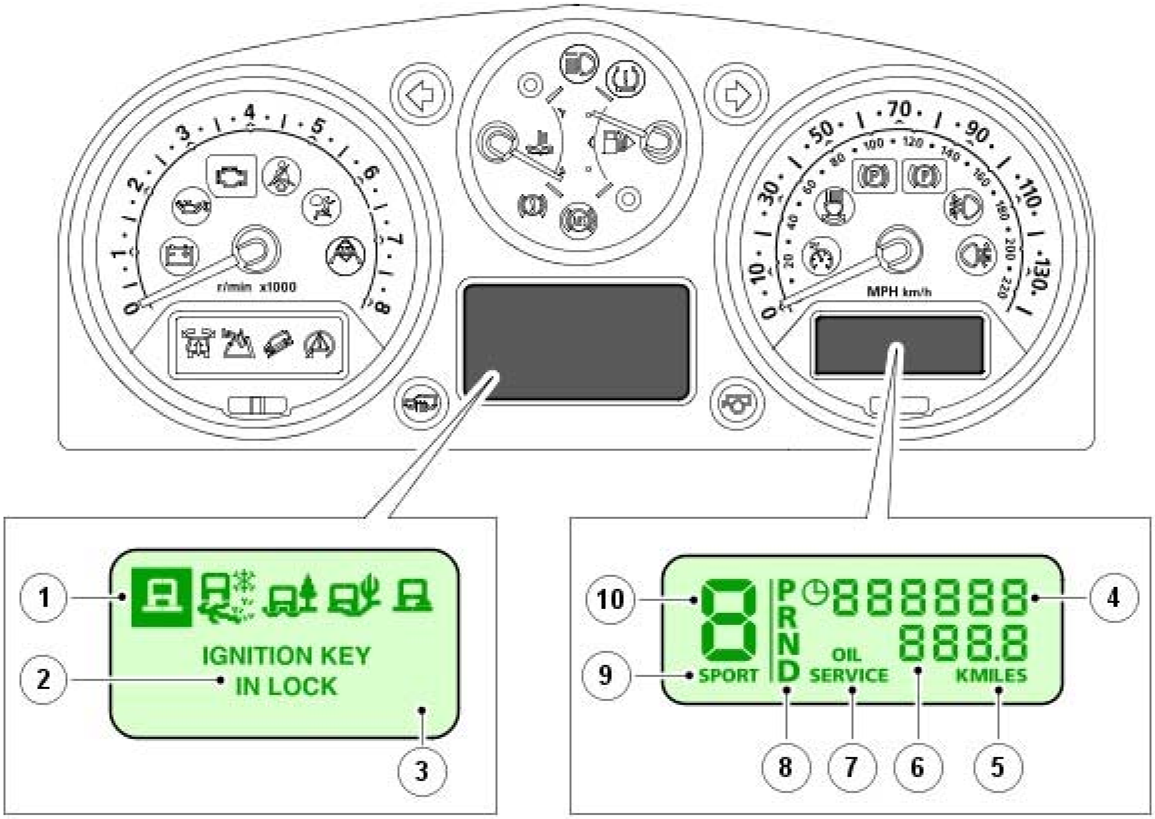
Information and Message Center - Information and Message Center

Description and Operation

INFORMATION AND MESSAGE DISPLAYS



E47674

Item	Part Number	Description
1	-	Terrain Response™ icons
2	-	Message display
3	-	LCD Message centre
4	-	Odometer display
5	-	Miles or KM display
6	-	Trip meter display
7	-	LCD Information display
8	-	Gear position display
9	-	Transmission mode display
10	-	Selected gear position display

The instrument cluster is an electronic device which receives digital or analog signals via hardwired or bus systems for instrumentation operation.

OVERVIEW

Two variants of the instrument cluster are used; high line and low line. Both variants also differ depending on market specification, engine fitments and features fitted to the vehicle.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

The instrument cluster is an electronic device which receives digital or analog signals via hardwired or bus systems for instrumentation operation.

The information display, which shows odometer, trip, gear position and mode data, is applicable to both high and low line instrument clusters. The message centre is only available on high line instrument clusters.

MESSAGE CENTRE

The message centre is an Liquid Crystal Display (LCD) located in a central position at the bottom of the instrument cluster. The LCD has a viewable area of 71 mm X 36 mm with a pixel size of 0.54 mm X 0.54 mm. When active, the message centre is illuminated as follows:

- At ignition on
- At ignition off when all current messages are being displayed to the driver
- At ignition off for a period of 20 seconds after the last message is displayed, e.g. 'KEY IN' or 'LIGHTS ON' warnings. At ignition off, each current message is displayed in turn for 3 seconds

When the ignition is switched on and the lights are off, the message centre will illuminate at full, normal brightness. If the lights are switched on, the intensity of illumination is reduced to a level determined by the PWM dimmer control located on the lighting control switch.

The majority of messages are generated by the vehicle subsystem modules on receipt of CAN bus message signals. The instrument cluster identifies the signals and displays the appropriate message in the message centre.

Most messages are accompanied by a chime or series of chimes which is requested by the module generating the message. The chime is emitted by a sounder located within the instrument cluster.

The driver can view current system status messages by scrolling through the trip computer functions to replay mode. This is achieved by pressing the **'I'** button on the LH column multifunction switch until the messages are displayed. If messages are current an **'I'** is displayed in the message centre.

Message Centre Display Arbitration

When the ignition is switched on, the message centre displays the system check message for 3 seconds. If the ignition is switched off during this period, the display goes off.

After the system check, the message centre shows the normal display (display mode 3E, see following section for mode descriptions). The display shows the ambient temperature, adaptive cruise information (if applicable) and trip computer information. This display format is changed if the driver switches the ignition off or the instrument cluster detects a condition which needs to be relayed to the driver, low washer fluid for example. Driver intervention has the highest priority. If a driver request and a warning condition become active at the same time, the driver request will be displayed first.

If an adaptive cruise set-up message is received, the display will change to display mode 3 D or E (see following section for mode descriptions). This will display for 3 seconds when the display changes back to the normal display.

If a Terrain Response™ message is received, the display will change to a mode 3 display, appropriate for the additional information to be displayed. The instrument cluster reviews the information required to be displayed and shows the appropriate format.

Display Modes

The message centre has five different display modes. Each mode is displayed depending on vehicle operating conditions and driver requests. The display modes are detailed in the following table:

Display Mode	Description	Format
0	Blank	No display in this mode
1	Information	Customer settings display
2	Pre-check	System precheck at ignition on
3	Normal	Seven different formats available (A, B, C, D, E, F or G) depending on vehicle specification and active functions
4	Diagnostic	Test images displayed to check LCD function

Display Mode 0

This mode is entered when the ignition is off and the CAN bus system is 'asleep' and no characters or symbols are displayed. This mode is exited by switching the ignition on or if the driver selects the 'Customer Settings' mode.

Display Mode 1

This mode displays information to the driver and provides the driver with the option to change certain settings for the vehicle. The display is a full screen format. A number of displays are available to allow the driver to customise various vehicle functions. Refer to 'Customer Settings' in this section for further details.

Display Mode 2 - System Start-up

When the ignition is switched on, the LCD shows the 'SYSTEM CHECK IN PROGRESS' message. This message is displayed during the indicator lamp test period for 3 seconds after the ignition on is sensed. When the ignition is switched off, the LCD returns to the display mode 0.

Display Mode 3

Display mode 3 is the normal operating mode for the message centre. There are seven different display formats (A to G) which cover all possible display formats. The seven displays are described below:

- **A** = Display shows: Terrain Response™ Mode icon; Steering Wheel Direction Icons; Trip computer/Warning Messages
- **B** = Display shows: Terrain Response™ Modes (Active mode in reverse image); Terrain Response™ description message
- **C** = Display shows: Active Terrain Response™ Mode icon; Terrain Response ™ Description message; Trip Computer/Warning Messages
- **D** = Display shows: Active Terrain Response™ Mode icon; Ambient Temperature; Text/Information/Advice/Warnings; Adaptive Cruise Control (if applicable)
- **E** = Display shows: Ambient Temperature; Adaptive Cruise Control (if applicable); Text/Information/Advice/Warnings
- **F** = Display shows: Ambient Temperature; Warnings/Information
- **G** = Display shows: Active Terrain Response™ Mode icon; Ambient Temperature; Text/Information/Advice/Warnings

Display Mode 4

Display mode 4 is a diagnostic mode used to check for the correct function of the LCD. The mode is entered using an approved Land Rover diagnostic system and displays four differing patterns in the LCD to check that all areas of the LCD are functional.

Message Priority

The messages are assigned priorities which are defined by the effect on driving safety and functional ability of the vehicle. New messages are displayed and accompanied by a chime from the sounder. Messages are divided into three priority groups; 1, 2, and 3 as follows:

Priority Group 1

- This group of messages have a direct effect on the driving ability and safety of the vehicle, 'ENGINE SYSTEM FAULT' for example. This message would require an immediate reaction from the driver in response to the message. Priority 1 messages will also be accompanied by the appropriate warning indicator flashing and a continuous chime from the instrument cluster. If more than one priority 1 message is present, each message is displayed in turn at 3 second intervals.

Priority Group 2

- This group of messages do not directly affect the driving ability or safety of the vehicle, 'CHECK BRAKE PADS' for example. This message must be noted by the driver and the cause rectified as soon as possible. Each of these messages is displayed once at ignition on or when the fault occurs for a predetermined time period. These messages can be recalled by the driver by pressing the trip reset button for more than 3 seconds.

Priority Group 3

- This group of messages relate to low priority messages, 'WASHER FLUID LOW' for example. Depending on the message, some messages are only shown at the end of a journey to avoid annoyance to the driver. The messages will be accompanied by a chime when the ignition is switched off to alert the driver to their presence.

The messages are displayed in a language applicable to the market configuration of the vehicle and can be changed using an approved Land Rover diagnostic system. The following list shows the possible messages which can be displayed, other visual or audible warnings and a description of the message.

Message	Other Warnings	Reason	Action
SYSTEM CHECK IN PROGRESS	None	Instrument cluster internal diagnostic routine	None
SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE	Single chime, general program icon illuminated in message centre	Terrain Response special programs not available due to system fault. Drive off-road with care.	Connect an approved Land Rover diagnostic system to diagnose fault
RECOMMEND LOW RANGE IS SELECTED FOR MUD-RUTS PROGRAM	Mud-ruts program icon illuminated in message centre	Advisory message for Terrain Response special program displayed once every ignition cycle	Select low range if required
SPECIAL PROGRAMS OFF	General program icon illuminated in message centre	Advisory message to inform driver that system is in special programs off	None
RECOMMEND STARTING IN 2ND GEAR FOR SLIPPERY CONDITIONS	Grass Gravel Snow program icon illuminated in message centre	Advisory message for Terrain Response special program (Only displayed on vehicles with manual transmission in low range, once every ignition cycle)	Select 2nd gear if required

Message	Other Warnings	Reason	Action
RECOMMEND STARTING IN 3RD GEAR FOR SLIPPERY CONDITIONS	Grass Gravel Snow program icon illuminated in message centre	Advisory message for Terrain Response special program (Only displayed on vehicles with manual transmission in low range, once every ignition cycle)	Select 3rd gear if required
RECOMMEND RAISING SUSPENSION TO OFF ROAD HEIGHT IN DEEP MUD-RUTS	Mud-ruts program icon illuminated in message centre	Advisory message for Terrain Response mud/ruts special program when in high range, displayed once every ignition cycle (Suspension raised automatically when in low range)	Raise suspension manually to off-road height if required
Terrain Response SPECIAL PROGRAMS OFF	All five program icons illuminated in message centre	Advisory message to inform driver that Terrain Response special programs are off	None
SPECIAL PROGRAMS OFF	General program icon illuminated in message centre	Advisory message to inform driver that current special program has been switched off and general program is active	None
CAUTION! RISK OF GROUNDING WITH SUSPENSION AT NORMAL HEIGHT	The active special program icon will be illuminated in message centre	Only displayed when system would have normally provided off-road height, but driver has manually lowered the suspension (or the suspension system is unable to raise the vehicle)	Raise suspension manually to off-road height if possible and where appropriate
TRAILER CONNECTED OFF ROAD HEIGHT NOT SELECTED AUTOMATICALLY	The active special program icon will be illuminated in message centre	Advisory message displayed when Terrain Response system would normally have provided off-road height automatically, but system has detected an electrical load on trailer socket	If trailer or light board is connected, manually raise suspension to off-road height if safe to do so If nothing is connected to trailer socket, investigate trailer socket and/or Terrain Response system for fault
SELECT LOW RANGE TO ACTIVATE ROCK CRAWL	Rock crawl program icon illuminated in message centre	Terrain Response Rock Crawl special program has been requested but transfer box is in high range	Change transfer box to low range
SAND PROGRAM SELECTED	Sand program icon illuminated in message centre	Advisory message. Terrain Response Sand special program has been selected for more than 2 seconds and is currently active	None
ROCK CRAWL PROGRAM SELECTED	Rock crawl program icon illuminated in message centre	Advisory message. Terrain Response Rock Crawl special program has been selected for more than 2 seconds and is currently active	None
GRASS GRAVEL SNOW PROGRAM SELECTED	Grass gravel snow program icon illuminated in message centre	Advisory message. Terrain Response Grass Gravel Snow special program has been selected for more than 2 seconds and is currently active	None
MUD RUTS PROGRAM SELECTED	Mud-ruts program icon illuminated in message centre	Advisory message. Terrain Response Mud/Ruts special program has been selected for more than 2 seconds and is currently active	None
GRASS GRAVEL SNOW	Grass gravel snow program icon illuminated in message centre	Advisory message. Terrain Response rotary control has been moved to the Grass Gravel Snow position. Program will be selected after 2 seconds	None
MUD-RUTS	Mud-ruts program icon illuminated in message centre	Advisory message. Terrain Response rotary control has been moved to the Mud/Ruts position. Program will be selected after 2 seconds	None
SAND	Sand program icon illuminated in message centre	Advisory message. Terrain Response rotary control has been moved to the Sand position. Program will be selected after 2 seconds	None
ROCK CRAWL	Rock crawl program icon illuminated in message centre	Advisory message. Terrain Response rotary control has been moved to the Rock Crawl position. Program will be selected after 2 seconds	None

Message	Other Warnings	Reason	Action
PROGRAM CHANGE IN PROGRESS	Selected special program icon illuminated in message centre	Vehicle operating conditions prevent selection of program. This may be caused by ABS or DSC activity or electronically controlled differential(s)	If operating conditions change within 60 seconds, selected program will be activated. If message caused by electronically controlled differential(s) overheat, allow differential(s) to cool and attempt to reselect program.
SUSPENSION FAULT NORMAL HEIGHT ONLY	Two chimes, amber indicator permanently illuminated.	A fault has been detected in the air suspension system. Only normal height is available.	Connect an approved Land Rover diagnostic system to diagnose fault
SUSPENSION FAULT MAX SPEED 40 km/h or 25 MPH	Two chimes repeated regularly. Red indicator permanently illuminated.	A major fault detected in air suspension system. Height cannot be controlled correctly.	Connect an approved Land Rover diagnostic system to diagnose fault
SLOW DOWN OR VEHICLE WILL RAISE	Two chimes	Vehicle will rise automatically to normal height from crawl (locked access) height if vehicle speed increases.	Ensure the vehicle speed does not exceed 18.6 mph (30 km/h)
SLOW DOWN OR VEHICLE WILL LOWER	Two chimes	Vehicle will automatically lower to normal height from off road height if vehicle speed increases.	Ensure the vehicle speed does not exceed 18.6 mph (30 km/h)
SUSPENSION WILL RAISE WHEN SYSTEM COOLED	One chime	Air suspension compressor is cooling. Lifting will resume when compressor has cooled.	None
SUSPENSION VEHICLE RAISING SLOWLY	None	Vehicle is lifting slowly because reservoir is empty. Only displayed if lift time exceeds 12 seconds. This is not a system fault	None
SUSPENSION IN EXTENDED MODE	One chime	Vehicle body has become trapped on an obstacle. Alternates with next message. Do not jack the vehicle with the engine running. The suspension will enter extended mode and the message will appear.	None
RESET SUSPENSION HEIGHT IF CLEAR OF OBSTACLE	None	Reselect height if door is open or press switch to exit extended mode.	None
SUSPENSION LOCKED AT ACCESS HEIGHT	None	Crawl (locked access) mode selected.	None
SUSPENSION ACCESS HEIGHT SELECTED	None	Access height selected.	None
SUSPENSION NORMAL HEIGHT SELECTED	None	Normal height selected.	None
SUSPENSION OFF ROAD HEIGHT SELECTED	None	Off road height selected.	None
SUSPENSION REMOTE KEY OPERATION	Continuous chime while height is changing.	Air suspension remote control function is being operated.	None
SUSPENSION CLOSE DOOR TO CHANGE HEIGHT	One chime	Air suspension height change is prevented because a door is open.	Close all doors
SUSPENSION SPEED TOO HIGH TO CHANGE HEIGHT	One chime	A height change has been requested but is prevented because speed is too high.	None
SUSPENSION FAULT	Two chimes, amber indicator permanently illuminated.	A fault has been detected in the air suspension system. System may still operate normally.	Connect an approved Land Rover diagnostic system
SUSPENSION START ENGINE TO RAISE VEHICLE	One chime	Vehicle height can only be raised with the engine running.	Start engine
KEY BATTERY LOW PLACE IN IGNITION TO CHARGE	None	Handset battery low	Place key in ignition to charge

Message	Other Warnings	Reason	Action
SUSPENSION FAULT VEHICLE LEAN WHEN CORNERING	Amber indicator lamp will be permanently illuminated	Dynamic Response system (if fitted) no longer available. Vehicle is still driveable.	Connect an approved Land Rover diagnostic system to diagnose fault
SUSPENSION FAULT STOP SAFELY STOP ENGINE	The red indicator lamp will flash accompanied by a chime	Major Dynamic Response system (if fitted) component failure, stop vehicle immediately.	Connect an approved Land Rover diagnostic system to diagnose fault
MEMORY 1 SELECTED	Double chime when selection complete	Memory system - confirmation that selection is completed	None
MEMORY 2 SELECTED	Double chime when selection complete	Memory system - confirmation that selection is completed	None
MEMORY 3 SELECTED	Double chime when selection complete	Memory system - confirmation that selection is completed	None
MEMORY 1 STORED	Single chime	Memory system - confirmation that memory has stored driver information	None
MEMORY 2 STORED	Single chime	Memory system - confirmation that memory has stored driver information	None
MEMORY 3 STORED	Single chime	Memory system - confirmation that memory has stored driver information	None
DOOR MIRROR DIP STORED	Single chime	Memory system - confirmation that memory has stored driver information	None
DSC SWITCHED OFF	Amber indicator permanently illuminated	System not available due to DSC switched off by driver.	To reselect press DSC switch
HDC FAULT SYSTEM NOT AVAILABLE	One chime	System fault, drive with care and do not attempt to descend steep slopes.	Connect an approved Land Rover diagnostic system to diagnose fault
HDC TEMPORARILY NOT AVAILABLE SYSTEM COOLING	Green indicator flashing	HDC switched off while brake system is cooling	Wait until message is deleted before attempting descent
HDC NOT AVAILABLE SPEED TOO HIGH	Green indicator flashing	HDC unavailable, speed threshold exceeded (Max HDC operating speed is 31 mph (50 km/h), max speed for HDC selection is 50 mph (80 km/h)).	None
HDC NOT AVAILABLE IN THIS GEAR	Green indicator flashing	HDC inoperative because of incorrect gear selection. (HDC operates in 1st and reverse on manual transmissions and CommandShift™ 1st, R and D on automatic transmissions in high range. (In low range, HDC operates in all gears for manual and automatic transmissions).	None
HDC SWITCHED OFF	One chime (if deselected by Terrain Response system or 50 mph (80 km/h) speed threshold exceeded)	HDC switched off by driver, Terrain Response system or speed threshold.	None
FUEL TANK CAP LOOSE OR MISSING	None	NAS Only - DMTL pump unable to pressurise system	Tighten or replace cap. Check system for leaks
ENGINE SYSTEM FAULT	MIL illuminated	ECM has detected a fault in the engine management system	Connect an approved Land Rover diagnostic system to diagnose fault
HIGH ENGINE SPEED FOR COOLING	None	Idle speed increased to assist engine cooling	None
TRANSMISSION FAULT LIMITED GEARS AVAILABLE	None	Advises driver that automatic transmission has a fault and performance may be affected	Connect an approved Land Rover diagnostic system to diagnose fault
TRANSMISSION FAULT	None	Advises driver that automatic transmission has a fault	Connect an approved Land Rover diagnostic system to diagnose fault
TRANSMISSION FAULT AND OVERHEAT	None	Advises driver that fault has occurred and transmission temperature is too high.	Connect an approved Land Rover diagnostic system to diagnose fault
TRANSMISSION OVERHEAT SLOW DOWN	None	Advises driver that transmission temperature is too high. slow down or stop to assist cooling.	Check transmission for faults
REVERSE GEAR SELECTED	None	Advises driver that reverse gear has been selected	None

Message	Other Warnings	Reason	Action
LOW RANGE SELECTED	One chime. Low range indicator flashes when range change is in progress. Indicator is permanently illuminated when range change is complete	Advises driver that transfer box is in low range.	None
TRANSMISSION NEUTRAL SELECTED	None	Advises driver that neutral has been selected	None
HIGH RANGE SELECTED	One chime. Low range indicator lamp is extinguished.	Advises driver that transfer box has engaged high range.	None
SPEED TOO HIGH FOR RANGE CHANGE	One chime	Driver has requested range change when vehicle speed is too high.	Reduce speed to 40 km/h on automatic transmission and 20 km/h on manual transmission
SELECT NEUTRAL FOR RANGE CHANGE	One chime	Alerts driver that range change will not occur until neutral is selected on the transmission.	None
PARK LOCK FAILURE APPLY HANDBRAKE (PARK BRAKE - NAS models only)	One chime per second for 3 seconds.	Automatic transmission park lock function ineffective due to transfer box being out of high or low range. Transfer box control module stopped transmitting on the CAN bus or while in neutral mode.	Connect an approved Land Rover diagnostic system to diagnose fault
TRANSMISSION OVERHEAT SLOW DOWN	One chime	Rear differential temperature has reached or is approaching the overheat threshold.	None
TRANSMISSION RANGE CHANGE INOPERATIVE	None	Fault has occurred which is preventing transfer box range change	Connect an approved Land Rover diagnostic system to diagnose fault
TRANSMISSION FAULT TRACTION REDUCED	One chime	Transfer box control module has stopped transmitting CAN bus messages. Defaults to open centre differential. Message also displayed when fault occurs with electronic rear differential	Connect an approved Land Rover diagnostic system to diagnose fault
TRANSMISSION FAULT STOP SAFELY	None	Fault has occurred with electronic rear differential. Stop vehicle at earliest opportunity	Connect an approved Land Rover diagnostic system to diagnose fault
AUTOMATIC MODE	None	Headlamp control switch has been moved to the 'AUTO' position	None
DRIVER INTERVENE	None	Driver should take control from the adaptive cruise control system	None
CRUISE CANCELLED	None	Driver has disabled the adaptive speed control system	None
SET SPEED XXX KM/H	None	Speed control speed set to displayed figure	None
SET SPEED XXX MPH	None	Speed control speed set to displayed figure	None
CRUISE OVERRIDE	None	Driver has overridden the adaptive speed control system	None
ACC SENSOR BLOCKED	None	Obstruction at front of vehicle preventing correct operation of adaptive speed control sensor	Check that sensor and grill is clear of obstructions
CRUISE NOT AVAILABLE	None	System fault or vehicle operating parameters outside threshold for cruise operation	Connect an approved Land Rover diagnostic system to diagnose fault
FORWARD ALERT OFF	None	Adaptive speed control advisory message	None
FORWARD ALERT ON	None	Adaptive speed control advisory message	None
CRUISE GAP <---->	None	Indication of adaptive speed 'Gap' setting	None
CRUISE GAP <--->	None	Indication of adaptive speed 'Gap' setting	None
CRUISE GAP <-->	None	Indication of adaptive speed 'Gap' setting	None

Message	Other Warnings	Reason	Action
CRUISE GAP <->	None	Indication of adaptive speed 'Gap' setting	None
FWD ALERT <---->	None	Indication of adaptive speed forward alert 'Gap' setting	None
FWD ALERT <--->	None	Indication of adaptive speed forward alert 'Gap' setting	None
FWD ALERT <-->	None	Indication of adaptive speed forward alert 'Gap' setting	None
FWD ALERT <->	None	Indication of adaptive speed forward alert 'Gap' setting	None
CHECK ALL TYRE PRESSURES	None	Advisory message, pressure in a running tire decreased to first warning threshold.	None
TYRE PRESSURES TOO HIGH	Chimes emitted for a short time, amber indicator illuminated	Check tyre pressures	Inflate tyres to correct pressure
TYRE PRESSURE MONITORING SYSTEM FAULT	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	TPMS fault has occurred. Use diagnostics to check for correct system functionality.	Connect an approved Land Rover diagnostic system to diagnose fault
TYRE PRESSURE MONITORING SET FOR HEAVY LOAD	No instrument cluster indicator illumination. TPMS switch status LED illuminated.	TPMS system set by driver for heavy load operation.	None
TYRE PRESSURE MONITORING SET FOR LIGHT LOAD	None	Normal setting for TPMS.	None
CHECK SPARE TYRE PRESSURE	None	Pressure in spare tire decreased to warning threshold.	Inflate tires to correct pressure
FRONT LEFT TYRE PRESSURE NOT MONITORED	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	Possible loss of RF transmission or defective sensor battery.	Connect an approved Land Rover diagnostic system to diagnose fault
FRONT RIGHT TYRE PRESSURE NOT MONITORED	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	Possible loss of RF transmission or defective sensor battery.	Connect an approved Land Rover diagnostic system to diagnose fault
REAR LEFT TYRE PRESSURE NOT MONITORED	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	Possible loss of RF transmission or defective sensor battery.	Connect an approved Land Rover diagnostic system to diagnose fault
REAR RIGHT TYRE PRESSURE NOT MONITORED	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	Possible loss of RF transmission or defective sensor battery.	Connect an approved Land Rover diagnostic system to diagnose fault
PARK BRAKE FAULT TO HOLD VEHICLE REMOVE KEY THEN APPLY PARK BRAKE	Park brake amber indicator illuminates and red indicator flashes	Loss of CAN or vehicle speed signal is missing	The vehicle cannot be parked by the park brake system in the normal way until the ignition key is removed and a park brake switch apply request is made

Message	Other Warnings	Reason	Action
PARK BRAKE FAULT SYSTEM NOT FUNCTIONAL	Park brake red indicator flashes	Possible motor fault when driver requested a switch application	Connect an approved Land Rover diagnostic system to diagnose fault
PARK BRAKE BEDDING CYCLE ACTIVE	Park brake red indicator flashes	The park brake bedding cycle has been initiated by the dealer technician	Follow bedding-in procedure in Service Procedures manual
CAUTION! PARK BRAKE APPLIED	Park brake red lamp permanently illuminated	The park brake is applied when the vehicle is moving	Do not use the park brake system when the vehicle is moving, except in an emergency
PARK BRAKE FAULT	Park brake amber indicator permanently illuminates	Possible system malfunction detected	Follow message instruction
PRESS FOOT BRAKE AND PARK BRAKE SWITCH TO RELEASE	None	Park brake system release is inhibited until footbrake is pressed	Follow message instruction
PRESS FOOT BRAKE OR CLUTCH AND PARK BRAKE SWITCH TO RELEASE	None	Park brake system release is prevented until foot brake or clutch pedal is pressed	Follow message instruction
PARK BRAKE FAULT AUTO RELEASE NOT FUNCTIONAL	Park brake amber indicator permanently illuminated	Drive away release function is not operating	Use park brake switch and foot brake to release
PARK BRAKE OFF LIFT SWITCH TO APPLY	Park brake red indicator flashes	An emergency release operation has been detected	Pull park brake switch to re-engage emergency release
LOW WASHER FLUID	Single chime at ignition on.	Washer fluid quantity below 1 litre	Add water and additive mixture to washer bottle
FOLLOW ME HOME LIGHTS ON	None	Driver has selected headlamp feature by turning ignition off before turning off headlamps	None
LOW COOLANT LEVEL	None	Coolant level in header tank below recommended level	Check coolant system for leaks and top up to correct levels
DRIVER'S DOOR OPEN	None	Driver's door open or not fully closed	None
LEFT REAR DOOR OPEN	None	Left rear door open or not fully closed	None
FRONT PASSENGER DOOR OPEN	None	Front passenger door open or not fully closed	None
RIGHT REAR DOOR OPEN	None	Right rear door open or not fully closed	None
TAILGATE OPEN	None	Tailgate open or not fully closed	None
BONNET OPEN	None	Bonnet open or not fully closed	None
AAA.A M BBB.B M CC Mph D.D Mpg		Trip computer information	None
Trip Dist Range Ave Sp Ave Cons		Trip computer information	None
Trip Distance Reset Miles km		Trip computer information	None
Range Miles km		Trip computer information	None
Average Speed Reset Miles km		Trip computer information	None
Average Cons Reset mpg l/100k		Trip computer information	None
Driver Overspeed Set Clear		Trip computer information	None
SETTINGS	None	Driver has accessed the 'Customer Settings menu	Use the steering wheel switches to view and change the settings menus or press the trip computer button to exit the setting menu

Message	Other Warnings	Reason	Action
INTERIOR LIGHTS AUTOMATIC	None	Driver has enabled the interior lamps	None
WATER IN FUEL - Diesel engine models only (From 2007MY)	chime	Water content in fuel filter has exceeded 64 cm^3 (3.9 in^3)	Drain fuel filter
DPF FULL	None	The Diesel Particulate Filter (DPF) control software has detected the DPF is full.	Driver should use instructions in owners handbook to regenerate the DPF.
DPF FULL VISIT DEALER	None	The DPF software has detected the DPF is still blocked after the driver has performed the regeneration drive cycle.	Dealer should use a Land Rover approved diagnostic system and perform a diagnostic routine to regenerate the DPF.

Some messages are accompanied by graphic icons in addition to the message text.

Ambient Temperature

The external ambient air temperature is measured by a sensor located on the right hand side of the bonnet locking platform, behind the front grill. The sensor is connected to the HEVAC module. The HEVAC module outputs temperature messages on the CAN bus which are used by the instrument cluster to display the current ambient temperature.

The message centre displays the ambient temperature in the top right hand corner of the LCD display. The temperature is displayed until the message centre is required to display system information. When system information has been displayed, the ambient temperature will reappear. The temperature is displayed in ºF or ºC depending the market configuration of the vehicle. The driver can also change the temperature reading using the 'Customer Settings' function.

Cold Warning Indication

When the ambient temperature is being displayed, if the temperature falls to 3ºC (37.4ºF) or below, the cold warning symbol will display. The cold warning symbol is in the form of a snow flake and will flash on and off, five times at a frequency of 2Hz. An audible warning will also be emitted by the instrument cluster to alert the driver. After the fifth flash of the symbol, the display will change back to the current ambient temperature.

The cold warning will only be displayed once during an ignition cycle. If the ambient temperature rises to 6ºC (42.8ºF) or above and then subsequently falls to 3ºC (37.4ºF) or below during the same ignition cycle, the warning will be repeated.

If the display mode changes to a mode which does not display the ambient temperature during the warning period, the cold warning will be cancelled.

INFORMATION DISPLAY

The information display is an Liquid Crystal display (LCD) located on the right hand side at the bottom of the instrument cluster. The LCD has a viewable area of 43 mm X 20 mm with a pixel size of 0.54 mm X 0.54 mm. When active, the information display is illuminated as follows:

- Pressing of the Trip button will cause the odometer to illuminate and the odometer and trip distance only will be displayed for a period of 20 seconds
- Ignition on will cause the odometer to illuminate with the full functions displayed

When the ignition is switched on and the lights are off, the information display will illuminate at full, normal brightness, controlled by the ambient light sensor. If the lights are switched on, the intensity of illumination is reduced to a level determined by the PWM dimmer control located on the lighting control switch.

The data shown in the information display is provided to the instrument cluster from other subsystem modules in the form of CAN bus messages. The odometer and trip meter information is derived from the ABS module, the transmission information is supplied from the transmission control module for automatic transmission vehicles or from the transfer box control module for manual transmission.

Odometer

The odometer displays the total distance which the vehicle has travelled. This is calculated by a microprocessor in the instrument cluster using wheel speed messages from the ABS module.

The odometer display can show 6 characters and distances up to 999,999 miles or kilometres. When the ignition is switched off, the odometer reading can be displayed by pressing the trip rest button. The reading will illuminate for a short time before extinguishing.

The total distance travelled is recorded in the instrument cluster Electronically Erasable Programmable Read Only Memory (EEPROM) and the Random Access Memory (RAM). This ensures that the total distance is not lost if the battery is disconnected. The distance is read and stored every 2 kilometres or miles travelled.

Trip Meter

The trip meter displays the total distance which the vehicle has travelled since the last trip meter reset. The trip meter display can show four characters, with a decimal point separating the fourth character which displays 1/10th mile or kilometre. The trip meter can display up to 999.9 miles or kilometres. When this figure is exceeded, the trip display starts again from 000.0 miles or kilometres.

The trip meter can be reset by pressing the trip reset button on the instrument cluster for more than one second. The trip data is stored in the instrument cluster RAM but not in the EEPROM, therefore, if the battery is disconnected, the trip data will be lost and the display will show 000.0 when the battery is reconnected.

Gear Position Indicator

Automatic Transmission

The gear position indicator shows the current selector lever position for the automatic transmission. During normal operation the display will show 'P' for Park, 'R' for reverse, 'N' for Neutral and 'D' for Drive.

When the transmission is operated in 'CommandShift™' mode, the display shows the currently selected manual gear; 1, 2, 3, 4, 5 or 6.

The gear position indicator can also display automatic transmission fault information. The following letters are displayed to relay the fault type to the driver:

- 'F' - Transmission Control Module (TCM) has a fault and is using the default limp home mode
- 'H' - TCM has a fault, the default limp home mode is active and the transmission has reached an overheat temperature of more than 137ºC (278ºF)
- 'E' - TCM has disabled CAN bus transmission because of a CAN bus failure or because of a transmission overheat temperature of more than 140ºC (284ºF).

PRND and Sport Display

The PRND display is only active on vehicles with automatic transmission. The instrument cluster receives CAN bus messages from the TCM for the current selector lever position. This information is used by the instrument cluster to display the current selector lever position.

If the transmission selector lever is moved to the SPORT position, the term 'Sport' is displayed in the LCD. If the selector lever is subsequently moved forward or backwards the transmission operates in 'CommandShift™' mode, the 'Sport' display goes off and the gear position indicator displays the current selected manual gear.

Service Interval Indicator (SII)

The service interval indicator is displayed in the information display. This provides information to the driver warning of an impending service requirement.

The service interval is displayed for 3 seconds when the ignition is switched on providing the service interval threshold has been reached. The service interval is reset by the dealer using an approved Land Rover diagnostic system or a manual reset procedure and, once set, counts down the mileage and time in days to the next service.

The service interval varies depending on market and vehicle engine fitment. In some Eastern European countries, South American countries, Middle East and African countries and some Asia Pacific countries the SII is disabled.

Two levels of service warning are provided; remaining distance and periodic inspection.

Remaining Distance

The remaining distance is calculated by the instrument cluster by using the current odometer value and the last service reset odometer value. The instrument cluster uses these two values to calculate the distance remaining to the next service. The remaining distance value is used to display the oil service requirement.

The mileage is displayed to the nearest 50 Km or 25 miles depending on the market configuration of the vehicle. If the service interval passes zero without being reset, the instrument pack will continue counting down and the remaining distance display will show a negative (-) value.

The trigger point for displaying the remaining distance is 600 miles (1000 km) or 30 days or less depending on the market configuration of the vehicle and is contained within the Car Configuration File (CCF).

Driver Alert

When an ignition on signal is received by the instrument cluster, the cluster software performs a check to establish if any or both of the driver service alert thresholds have been reached. If a driver alert threshold has been enabled, the applicable service information will be displayed in the information display for 5 seconds. After the 5 second display has elapsed, the information display shows the normal odometer and trip information.

Reset Procedure

There are two ways of resetting the service interval indicator. An approved Land Rover diagnostic system can be connected to the vehicle and a diagnostic routine performed or a manual reset procedure can be performed using the trip reset button on the instrument cluster.

Manual Reset Procedure

- Press and hold the trip reset button.
- Turn the ignition switch on to the ignition position II.
- C. If the SII function is enabled the information display will flash 'SERVICE' for 5 seconds and then display 'SERVICE' constantly. If the SII function is not enabled the information display will show the normal odometer and trip information.
- D. If the trip reset button is released within 10 seconds of entering the reset mode, the information display will show 'DIST'.
    1. If the trip reset button is not released after 10 seconds the instrument cluster will exit the manual reset procedure.
- E. If the oil service value is to be reset, press the trip reset button within 10 seconds of releasing it and hold for more than 5 seconds. The information display will show 'RST' for 5 seconds and then reset the oil service value, the display will then show ‘END’.
- F. If the trip reset button is pressed for 5 seconds the display will exit the reset routine.
- G. If the trip reset button is not pressed for more than 10 seconds, then the information display will exit the reset routine.

CUSTOMER SETTINGS

The customer settings procedure allows the driver to adjust certain vehicle settings to change the functionality of selected vehicle functions.

The settings are stored in the instrument cluster EEPROM. Each vehicle has a factory set car configuration file which defines the settings for selected vehicle functions. The factory settings are retained and the system can be changed back to the factory default settings by either the dealer or the driver at any time.

• NOTE: The factory default settings may differ between market configuration of the vehicle.

The customer settings system is controlled by CAN bus message inputs and outputs from the instrument cluster, the Central Junction Box (CJB), the ABS Module and the Integrated Head Unit (IHU). The following table details the modules and their associated function within the settings system.

Module	Output Information
Central Junction Box (CJB)	Remote handset identity
	Ignition key position
ABS Module	Vehicle moving
Instrument Cluster	Settings Status
	Car configuration parameters
	Driver identity
Integrated Head Unit (IHU)	Scan UP button pressed
	Scan DOWN button pressed
	Volume + button pressed
	Volume - button pressed
	Distance unit request
	Consumption unit request
	Language request

The following systems/functions support the customer settings system.

- Central Junction Box (CJB)
- Instrument cluster
- Memory control module
- Navigation control module
- Interior lights (CJB function)
- Exterior lights (CJB function)
- Central door locking (CJB function).

Customer Settings Functionality

The customer settings menu is entered by pressing and holding the trip computer button on the left hand multifunction switch stalk for more than 3 seconds. For reasons of safety, the settings menu will only be displayed if the vehicle is stationary (vehicle speed signal must be below 1.8 mph (3 km/h)). This is to prevent driver distraction when operating the system. At speeds above 1.8 mph (3 km/h) the settings screen is not displayed.

Once the instrument cluster has entered the settings mode, the selections can be scrolled through in turn using the ICE radio control switches located on the steering wheel. The radio search up and down buttons |<< >>| allow for selection through the menus. The radio volume switches +/- select the values for the current menu displayed.

When the settings menu is entered, the message centre shows the 'SETTINGS' welcome message.

This display allows the driver the option of scrolling through the settings menus or exiting the settings function.

The driver can select the first settings menu by pressing the radio search button >>| or the last settings menu by pressing the radio search button |<<. After a selection is made, the setting will be saved by either proceeding to the next menu or exiting the customer settings menu. Pressing the trip computer button at any time will exit the customer settings system.

If a menu parameter is changed, it will be automatically saved when the next menu is selected or the customer settings menu is exited.

TRIP DISTANCE UNITS

The 'TRIP DISTANCE UNITS' menu allows the driver to adjust the units in which the trip distance is displayed in the trip computer display. The units can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following units:

- MILES (mph) (default)
- KM (Km/h)

FUEL USAGE UNITS

The 'FUEL USAGE UNITS' menu allows the driver to change the units in which the fuel consumption is displayed in the trip computer. The units can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following units:

- MPG (default)
- LITRE/100KM
- KM/LITRE

TEMPERATURE DISPLAY UNITS

The 'TEMP. DISPLAY UNITS' menu allows the driver to change the units in which the external temperature is displayed in the message centre. The units can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following units:

- Degrees C (default)
- Degrees F

PROGRAMMABLE OVERSPEED WARNING

The 'OVERSPEED WARNING' menu allows the driver to set the overspeed warning threshold. The threshold can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- KM/H - 10 to 250 Km/h in increments of 5 Km/h. The default value is OFF.
- MPH - 10 to 140 mph in increments of 5 mph. The default value is OFF.

If the units are changed from miles to kilometres or visa versa, the overspeed warning value will go to the default OFF value.

HEADLAMP TIMER

The 'HEADLAMP OFF DELAY' menu allows the driver to adjust the delay period for the headlamp delay after the ignition is switched off function. The delay period can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following delay periods (in seconds):

- 30 (default)
- 60
- 120
- 240

DOORS LOCK ON DRIVEAWAY

The 'DRIVE AWAY DOOR LOCKING' menu allows the driver to disable or enable the door automatic lock function. The feature can be changed to on or off using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- OFF
- ON (default)

MIRROR DIP IN REVERSE (if fitted)

The 'REVERSE MIRROR DIP' menu allows the driver to disable or enable the automatic exterior mirror dip in reverse function. The feature can be changed to on or off using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- OFF
- ON (default)

LAZY ENTRY (if memory module fitted)

The 'LAZY ENTRY' menu allows the driver to disable or enable the lazy entry function which moves the exterior door mirror and the seat position to that set by the driver. The memory positions are stored in the memory module and the individual settings are recognised from the ignition key identification. The feature can be changed to on or off using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- OFF (default)
- ON

RESTORE FACTORY SETTINGS

The 'RESTORE DEFAULT SETTINGS' menu allows the driver to change all customer settings menus to the factory default settings. The settings are programmed into the Car Configuration File (CCF) and cannot be overwritten. The defaults can be reset by selecting 'Yes' using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- YES
- NO (default)

AUDIBLE WARNINGS

The instrument cluster can generate audible warnings to alert the driver to a displayed message and change of vehicle operating condition. The audible warning is generated by a sounder located within the instrument cluster. The audible warnings are categorised into one of three types; warning message \ indicator lamp alert tones, system status tones and turn signal indicator status tones. The following warning chimes are produced by various vehicle subsystems:

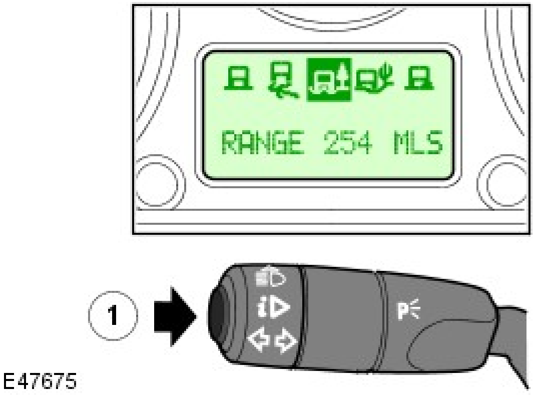
- Lights on warning
- Seat belt warning
- Turn signal indicator/hazard warning indicator warning
- Overspeed warning
- Seat memory warning
- Front parking aid warning
- Alarm system warning
- Key in warning
- Engine coolant over temperature warning
- Air suspension warning
- Tyre pressure monitoring warning
- Adaptive cruise warning
- Electronic park brake warning
- Automatic transmission warning
- Transfer box warning
- Rear differential warning
- Brake pad wear warning
- Low washer fluid warning
- ABS system fault warning
- Brake system fault warning
- Dynamic Response fault warning
- Hill descent control fault warning
- Hill descent control active warning
- Hill descent control information warning
- Supplementary restraint system warning
- Engine management system warning
- Low engine oil pressure
- Trip computer overspeed
- Water in fuel warning.

The audible warning takes the form of either a single chime, a double chime or a repeating chime. The audible warnings are initiated by a CAN bus message from the requesting subsystem control module or by the instrument cluster software.

TRIP COMPUTER

General

The instrument cluster contains software which enables the use of an on-board trip computer. The computer allows the driver to access information for current fuel usage, current journey length, average speed and estimated distance on fuel remaining. The information is displayed in the lower part of the message centre, providing no other high priority messages are being displayed. If no messages are being displayed or the displayed message is of a low priority, the trip computer will be permitted use of the message centre.



Item	Part Number	Description
1	-	Trip computer button

The driver is able to access the computer and change some parameters which control the information display using the trip computer button on the left hand multifunction switch stalk.

Trip Computer Functionality

When the engine is started the instrument cluster enters a diagnostic mode and displays a 'System Check in Progress' message in the message centre. Once complete, the instrument cluster then displays any warning messages, i.e.; DRIVER'S DOOR OPEN, in priority order.

When any applicable messages have been displayed the message centre displays information in mode 3E. Pressing the trip computer button once will display the customer settings menu, if the vehicle is stationary. If the vehicle is moving this display will be ignored and the trip computer information will be displayed in the following order:

- Trip Distance
  - The trip distance since the last reset is displayed.
  - Pressing the trip computer button for more than 2 seconds will reset the trip distance. The display will show dashes for 3 seconds and then change to zeros.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Range
  - The range is displayed showing the distance which can be travelled using the fuel remaining in the fuel tank.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Average Fuel Consumption
  - The average fuel Consumption is displayed.
  - Pressing the trip computer button for more than 2 seconds will reset the average fuel Consumption. The display will show dashes for 3 seconds and then change to zeros.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Average Speed
  - The average speed is displayed.
  - Pressing the trip computer button for more than 2 seconds will reset the average speed. The display will show dashes for 3 seconds and then change to zeros.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Overspeed Warning
  - The overspeed warning is only displayed if enabled in the customer settings.
  - Pressing the trip computer button for more than 2 seconds will turn the overspeed warning off. A second press of the trip computer button for more than 2 seconds will enable the overspeed warning.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Warning Messages
  - Any warning messages are now displayed. If more than one message is present, each message will be shown for 3

seconds. When all messages have been shown, the display will go blank momentarily, before the display reverts to the mode 3E.

- Pressing the trip computer button for less than 2 seconds during the warning message display will cancel the trip computer and the message centre will display the mode 3E.

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Warning Devices -

Torque Specifications

Description	Nm	lb-ft
Low tire pressure module bolts	1.5	1.1

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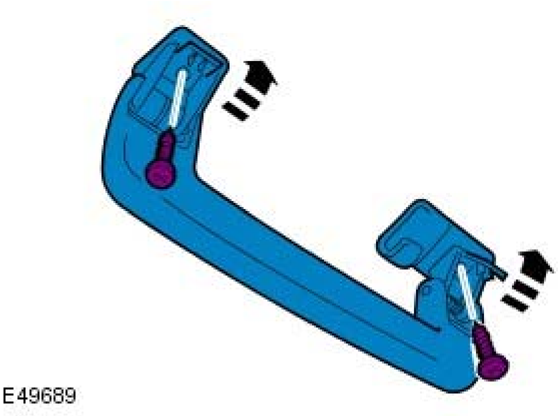
Warning Devices - Low Tire Pressure Module

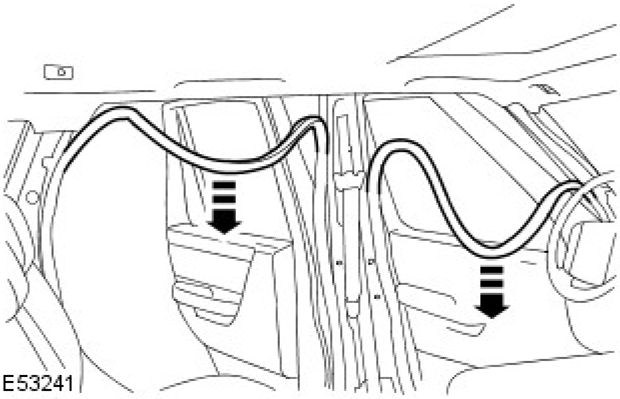
Removal and Installation

Removal

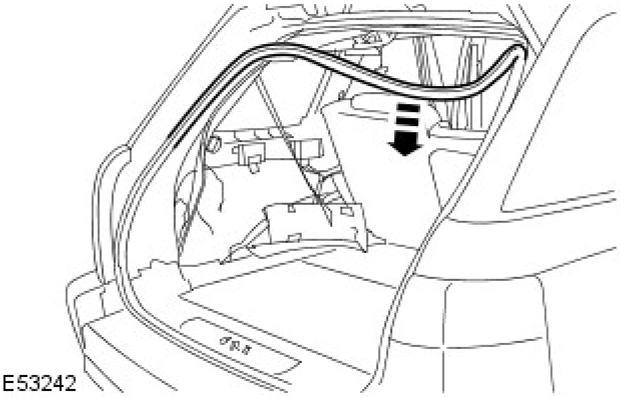
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the LH B-pillar upper trim panel.
   For additional information, refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the LH C-pillar upper trim panel.
   For additional information, refer to: C-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Remove the LH D-pillar upper trim panel.
   For additional information, refer to: D-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



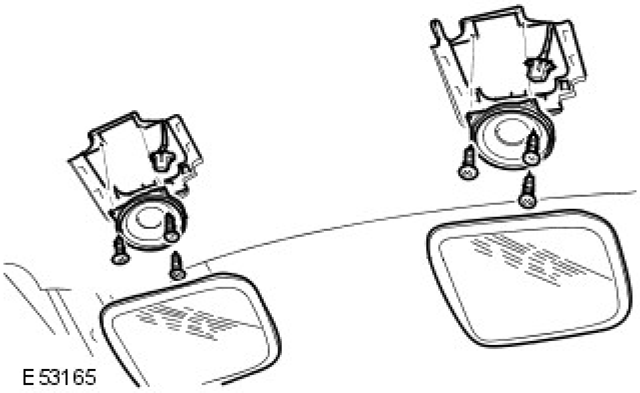
5. Remove the passenger assist handle.
   - Release the 2 screw covers.
   - Remove the 2 screws.
   - Repeat the above procedure for the other handle.



6. Release the front and rear door weatherstrips for access.

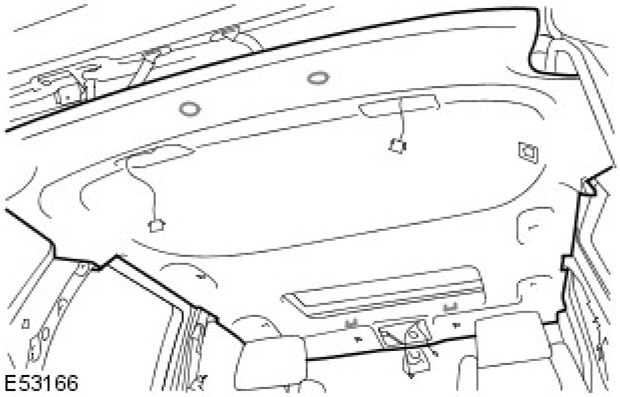

E53242

7. Release the liftgate weatherstrip


E53165

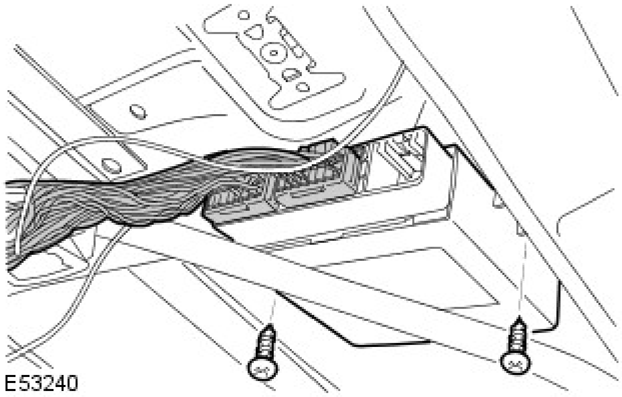
8. Remove the rear speakers.

- Remove the speaker grilles.
- Remove the 6 screws.
- Disconnect the 2 electrical connectors.


E53166

9. Release the headliner for access.

- Remove the 4 screws.
- Release the 2 clips.


E53240

10. Remove the low tire pressure module.

- Release and disconnect the 2 electrical connectors.
- Remove the 2 screws.

Installation

1. Install the low tire pressure module.
   - Install the screws.
   - Connect and secure the electrical connectors.
2. Attach the headliner.
   - Install the screws.
3. Attach the door weatherstrips.
4. Install the passenger assist handles.
   - Install the screws.
   - Secure the screw covers.
5. Install the rear speakers.
   - Connect and secure the electrical connectors.
   - Install the screws.
   - Install the speaker grilles.
6. Install the D-pillar upper trim panel.
   For additional information, refer to: D-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
7. Install the C-pillar upper trim panel.
   For additional information, refer to: C-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
8. Install the B-pillar upper trim panel.
   For additional information, refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
9. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
10. Program a new control module using T4.

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Engine Protection System -

Torque Specifications

Description	Nm	lb-ft
Passive anti-theft system (PATS) module bolts	10	7

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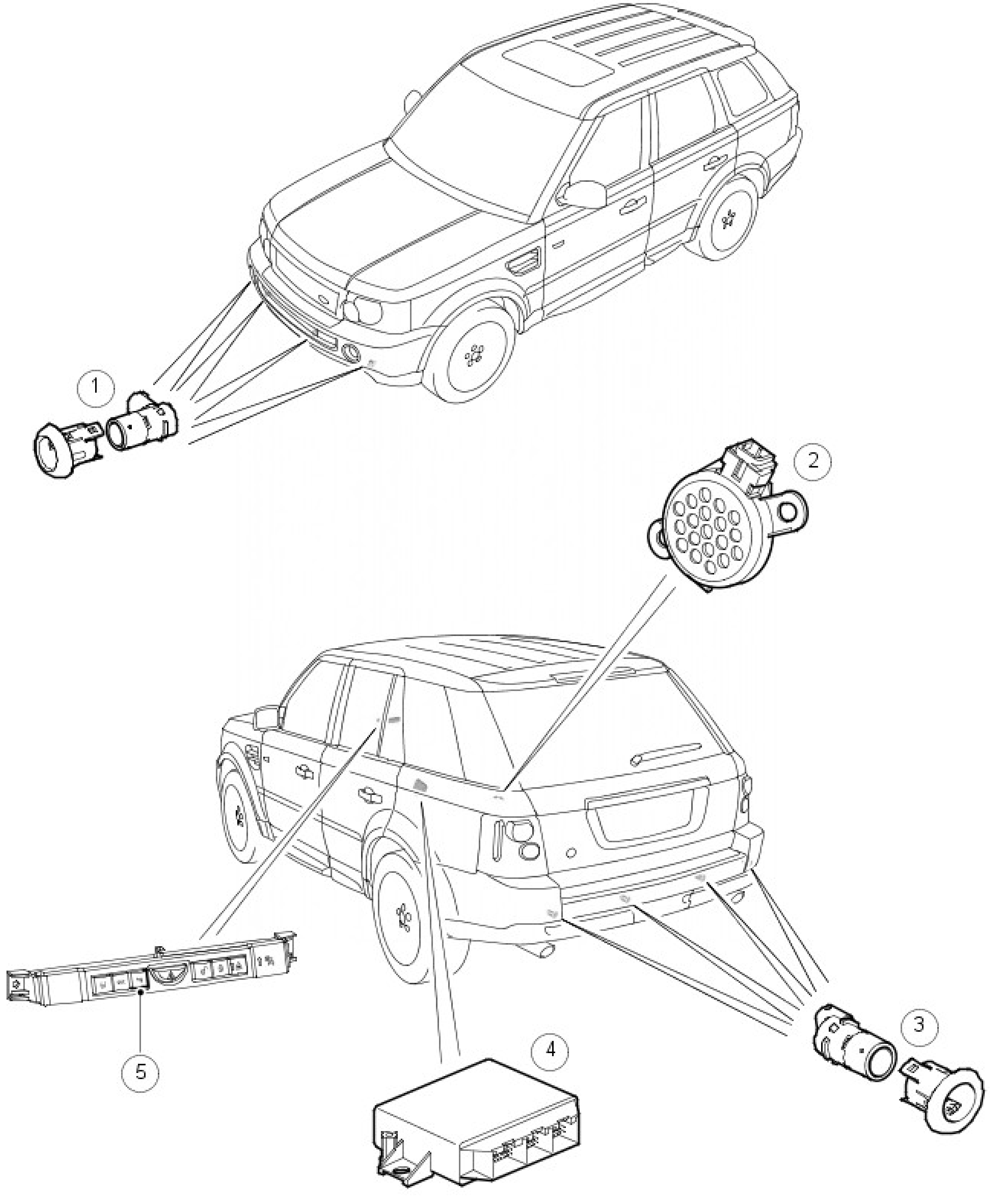
Parking Aid - Parking Aid

Description and Operation

Parking Aid Component Location



E57202

Item	Part Number	Description
1	-	Front sensors
2	-	Parking aid sounder
3	-	Rear sensors
4	-	Parking aid module
5	-	Parking aid switch

OVERVIEW

The parking aid provides an audible warning to the driver when any obstacles are in the path of the vehicle during a forward (if front sensors fitted) or reversing manoeuvre. The purpose of the system is to assist the driver when parking or manoeuvring in restricted space. It is not designed as a crash avoidance system or a replacement for visual interpretation by the driver.

The parking aid system is not standard on all vehicles and some vehicles may be fitted with rear sensors only. Higher specification vehicles may be fitted with both front and rear sensors.

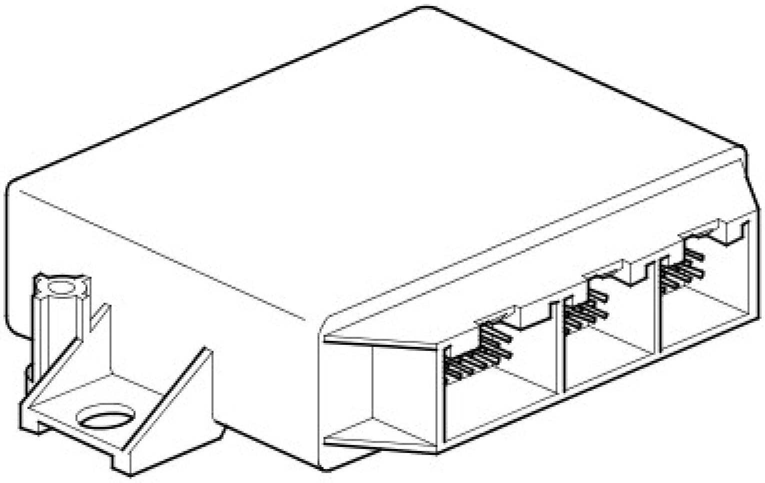
The system comprises 4 ultrasonic sensors in the rear bumper, 4 ultrasonic sensors in the front bumper (if fitted), a control module, a fascia mounted control switch, a rear sounder unit and a front sounder unit (integral with instrument cluster).

The system operates using ultrasonic signals which are transmitted by the sensors. The reflected echo from this output is received by the sensors and used by the parking aid module to calculate the distance from an object.

The fascia mounted switch allows the driver to deactivate the rear and front (if fitted) parking aid system, if operation is not required.

PARKING AID MODULE

The parking aid module is located in the rear left hand side of the luggage compartment, behind the side trim panel.

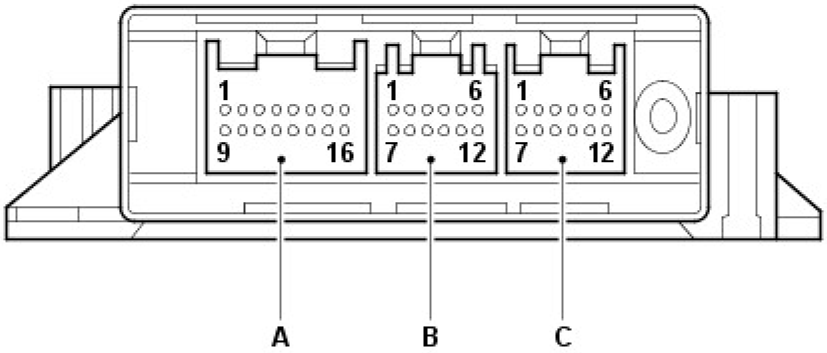


E44157

The parking aid module uses a single microprocessor to perform the following tasks:

- Control of the ultrasonic sensors
- Monitoring of the sensors
- Evaluation of received echo signals from the sensors
- Noise and disturbance suppression
- Control of the parking aid sounders
- Monitoring of the sounders and associated wiring
- Control and monitoring of the switch status LED and associated wiring
- Evaluation and monitoring of the control inputs
- Management of diagnostic and test functions
- Monitoring of power supply
- Communication via diagnostic link.

Parking Aid connector Pin Details



E44158

Item	Part Number	Description
A	-	Connector C0957
B	-	Connector C1457 (Front sensors only)
C	-	Connector C0958 (Rear sensors only)

Connector C0957

Pin No.	Description	Input/Output
1	Ignition supply	Input
2	Rear sounder	Output
3	Not used	-
4	Switch (ground)	Input
5 and 6	Not used	-
7	CAN low	Input/Output
8 and 9	Not used	-
10	Rear sounder 12V supply	Input
11 and 12	Not used	-
13	Switch LED	Output
14	CAN high	Input/Output
15	Not used	-
16	Ground	Input

Connector C01457

Pin No.	Description	Input/Output
1	Ground - Front sensors	Input
2	12V power supply - front sensors	Output
3 and 4	Not used	-
5	Sensor signal - front left outer	Input
6	Sensor signal - front left inner	Input
7	Sensor signal - front inner right	Input
8	Sensor signal - front outer right	Input
9 to 12	Not used	-

Connector C0958

Pin No.	Description	Input/Output
1	Not used	-
2	Sensor signal - rear inner right	Input
3	Sensor signal - rear inner left	Input
4	Sensor signal - rear outer right	Input
5	Sensor signal - rear outer left	Input
6 and 7	Not used	-
8	Ground - rear sensors	Input
9 and 10	Not used	-
11	12V power supply - rear sensors	Output

Pin No.	Description	Input/Output
12	Not used	-

Inputs and Outputs

Three connectors on vehicles with front and rear sensors and two connectors on vehicles with rear sensors only provide the interface between the parking aid module and the external parking aid components.

The module receives inputs from the following:

- Reverse selected - CAN message from transmission control module (automatic transmission) or transfer box control module (manual transmission)
- Forward gear selected (not in reverse or neutral) - CAN message from transmission control module (automatic transmission) or transfer box control module (manual transmission)
- Parking aid switch
- Parking brake applied - CAN message
- Trailer fitted - CAN message for Central Junction Box (CJB)
- Ignition switch - Power supply

The module outputs signals to the following:

- Sensors - power and ground connections
- Sensors - digital signal - transmit and receive signals
- Rear sounder - varying frequency output
- Front sounder - CAN message to instrument cluster
- Parking aid switch - power supply for switch LED operation

Controller Area Network (CAN) Signals

The parking aid module sends and receives a number of digital signals via the medium speed CAN. The received signals are used for operation of the parking aid system.

The parking aid module receives the messages shown in the following table which are used to control the parking aid system.

Message	Transmitted by
Vehicle speed	ABS module
Selected gear position - Automatic transmission	Transmission control module
Selected gear position - Manual transmission	Transfer case control module
Electric park brake on/off	Electric park brake module
Vehicle movement status	ABS module
Trailer connected	CJB
Ambient temperature	Automatic Temperature Control (ATC) module
Engine running status	Diesel engine control module
Stored odometer reading	Instrument cluster
Vehicle voltage level	Instrument cluster
Minute counter	Instrument cluster
Car configuration	Instrument cluster
Diagnostic physical request	A Land Rover approved diagnostic system via diagnostic socket
Diagnostic functional request	A Land Rover approved diagnostic system via diagnostic socket
Master configuration identification	Instrument cluster

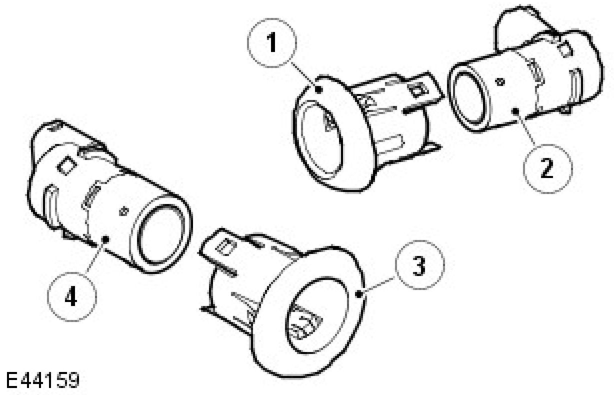
Diagnostics

The parking aid module has a diagnostic connection via the medium speed CAN to enable faults to be retrieved using a Land Rover approved diagnostic system. Additionally, an on-board diagnostic routine within the parking aid module constantly monitors the system and alerts the driver to a system fault by emitting a tone from the front or rear sounder, depending on the fault.

If a parking aid system fault has occurred, the parking aid module will relay the occurrence of the fault to the driver in the following ways:

- The status LED will flash at a frequency of 2Hz if the system is active and fault is detected in the sensors, sounders, related wiring or the module.
- The front sounder will emit an error tone for 3 seconds at a frequency of 1500Hz if a fault is detected with the front sensors or the rear sounder develops a fault.
- The rear sounder will emit an error tone for 3 seconds at a frequency of 1500Hz if a fault is detected with the rear sensors, the switch, the LED in the switch or if there is a CAN bus error.

SENSORS



Item	Part Number	Description
1	-	Front sensor housing
2	-	Front sensor
3	-	Rear sensor housing
4	-	Rear sensor

Four sensors are positioned in the rear bumper and the front bumper (if fitted). Each sensor housing has two raised location keys which locate in corresponding grooves in the bumper mounting hole and sets the correct orientation for the sensor bodies. The housings are clipped into the bumper from the front. The sensors are then clipped into the housings from the rear.

Each sensor has a three pin connector which connects into a common harness linking all four sensors. This harness is connected to the main vehicle body harness for the rear sensors or the engine compartment harness for the front sensors. The three pins are for sensor negative and positive feeds and a signal line.

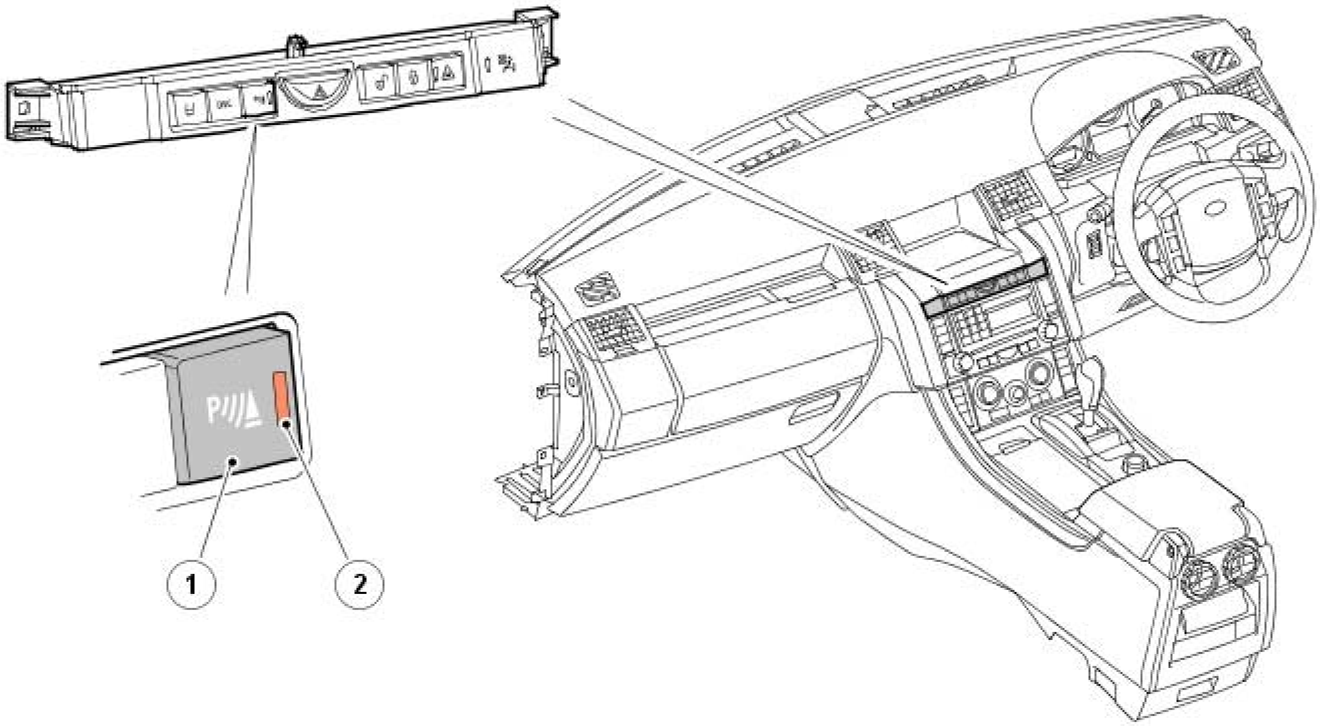
Each sensor comprises a plastic housing which contains a piezoelectric disc. The disc resonates at a frequency of 38.4 kHz, producing an ultrasonic signal output. The disc also receives the reflected echo signal.

The parking aid module controls the operating mode of each sensor by the output of a digital signal on the signal line. Each sensor has two modes of operation; combined transmitter and receiver mode or receiver mode only.

In the combined mode, the sensor emits a series of ultrasonic impulses and then switches to receiver mode to receive the echo reflected by an obstacle in the detection range. These echo signals are amplified and converted from an analogue signal to a digital signal by the sensor. The digital signal is then transmitted to the parking aid module and compared with preprogrammed data stored in an EEPROM within the module. The module receives this data via the signal line from the sensor and calculates the distance to the obstacle according to the elapsed time between the transmitted and received impulse. The duration of the impulse transmission is determined by the module. The frequency of the impulse is determined by the sensor.

In the receiver mode, the sensor will receive impulses that were emitted by adjacent sensors. The module uses this information to precisely determine position and distance of the obstacle.

PARKING AID SWITCH

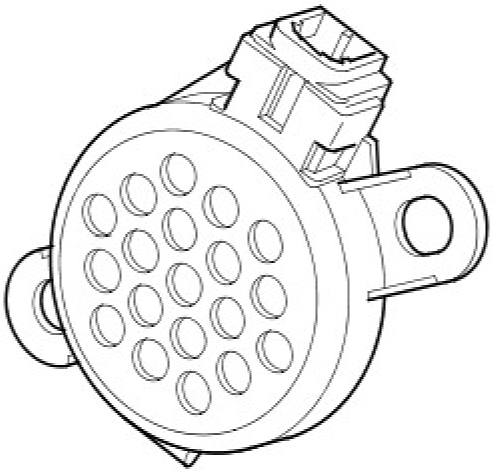


E57203

Item	Part Number	Description
1	-	Switch
2	-	LED

The parking aid switch is located in the centre console, above the IHU, to the left of the hazard warning flasher switch. The switch is a non-latching switch with an integral LED. The switch receives a 12V output to drive the LED when required. The switch is also connected to ground. When the switch is operated, the momentary completion of the ground is interpreted by the parking aid module as a signal to enable or disable the parking aid system.

PARKING AID SOUNDER



E44161

The parking aid sounder is controlled by the parking aid module and emits a series of tones of varying frequency to inform the driver of the distance between the vehicle and a detected object.

The rear parking aid sounder is located in the LH side of the luggage compartment, behind the side trim panel, below the window. The sounder is secured with two, self tapping screws into the body. The sounder is connected to the parking aid module via a harness connector.

The front parking aid uses the instrument cluster sounder and is activated by CAN messages from the parking aid module to the instrument cluster.

PARKING AID OPERATION AND DISTANCE CALCULATION

On vehicles with rear only parking aid sensors, when the ignition switch is in position II and reverse gear is selected, the parking aid sensors are automatically activated. The parking aid module only activates the system if reverse is selected for more than 1 second. This avoids nuisance audible warnings when the gear selector lever is being moved between Drive and Park.

When the rear system is activated, the parking aid module illuminates the indicator LED in the parking aid switch, switches on the ultrasonic sensors and generates a single chime on the parking aid sounder to indicate the system is active. If an object is in the range of the sensors when the system is activated, a series of audible warnings are emitted by the parking aid sounder immediately.

If parking aid operation is not required, it can be suspended temporarily by pressing the parking aid switch. On vehicles with rear only parking aid sensors, the system can be enabled again by pressing the switch again or switching the ignition off then on. The parking aid will then automatically become active again in reverse gear. The system also remains on when going from reverse gear to neutral. The assumption being that the driver may still want to manoeuvre the vehicle going backwards in neutral.

The parking aid module receives a signal on the CAN from the CJB when a trailer is fitted. When this signal is detected, the parking aid module suspends operation of the rear parking aid sensors.

On vehicles with front and rear systems, the front system is activated when the ignition switch is in position II, the vehicle is out of Park and the Electric Park Brake (EPB) is off. If the vehicle speed subsequently goes above approximately 10 mph (16 km/h), the front system will switch off. When the speed drops below approximately 6 mph (16 km/h), the front system activates again. If the EPB is applied or Park is selected, the Parking Aid system is deactivated.

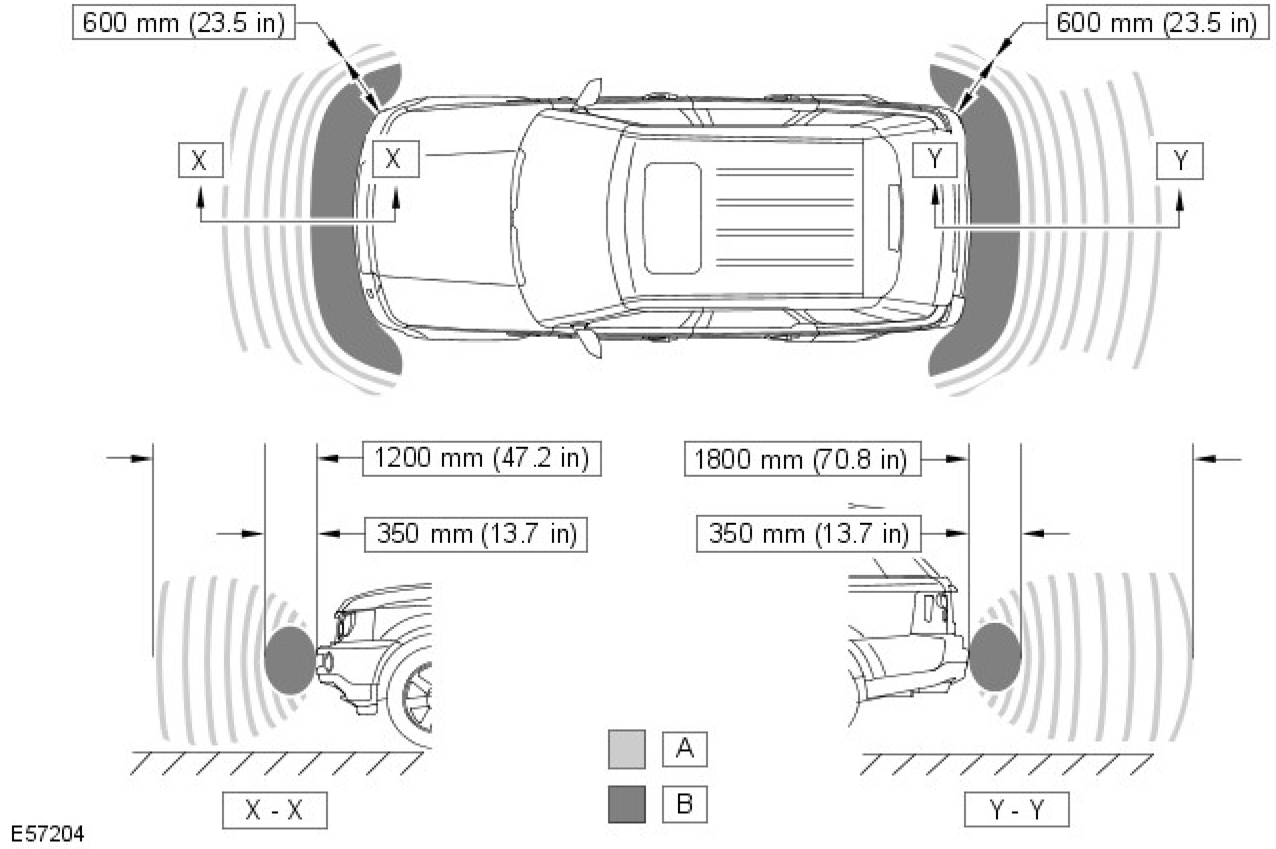
Sensor Operation

The parking aid module processes the distance readings from the ultrasonic sensors to determine if there are any objects within the detection areas. If there are no objects in the detection areas, there are no further audible warnings. If an object is detected, repeated audible warnings are produced on the parking aid sounder.

The maximum detection range is 1800 mm (70 in). When an object is detected, the time delay between the audible warning tones decreases as the distance between the detected object and the vehicle decreases until, at approximately 350 mm (13.7 in), the audible warning tone is continuous.

After the initial detection of an object, if there is no decrease in the distance between an object and the central sensors, the time delay between the audible warnings remains constant. If an object is detected by one of the corner sensors only, the audible warnings stop after about 5 seconds if there is no change in the distance between the object and the corner sensor.

Detection Area



Item	Part Number	Description
A	-	Intermittent Warning Tone
B	-	Continuous Warning Tone

Detection Calculation

When operating in the combined transmitter and receiver mode, the sensor outputs a number of ultrasonic pulses and receives the reflected echo signal. The parking aid module amplifies the received echo signals and compares them with a preprogrammed threshold to calculate the distance to the object. This is achieved by determining the elapsed time between the transmission and reception of the ultrasonic signal.

When operating in receiver mode, the sensor receives echo signals transmitted by an adjacent sensor. This mode is used to improve the accuracy of the system.

The detection cycle consists of the parking aid module operating one sensor in the combined transmitter and receiver mode and transmitting a number of ultrasonic pulses. The module then switches the transmitting sensor and the adjacent sensor(s) to receiver mode. After a short time delay, this sequence is repeated using a different sensor to transmit the ultrasonic pulse and continues until all four sensors have output an ultrasonic signal. This sequence is completed in 100ms. The module uses several measurements of the same sensors to remove errors from the calculation.

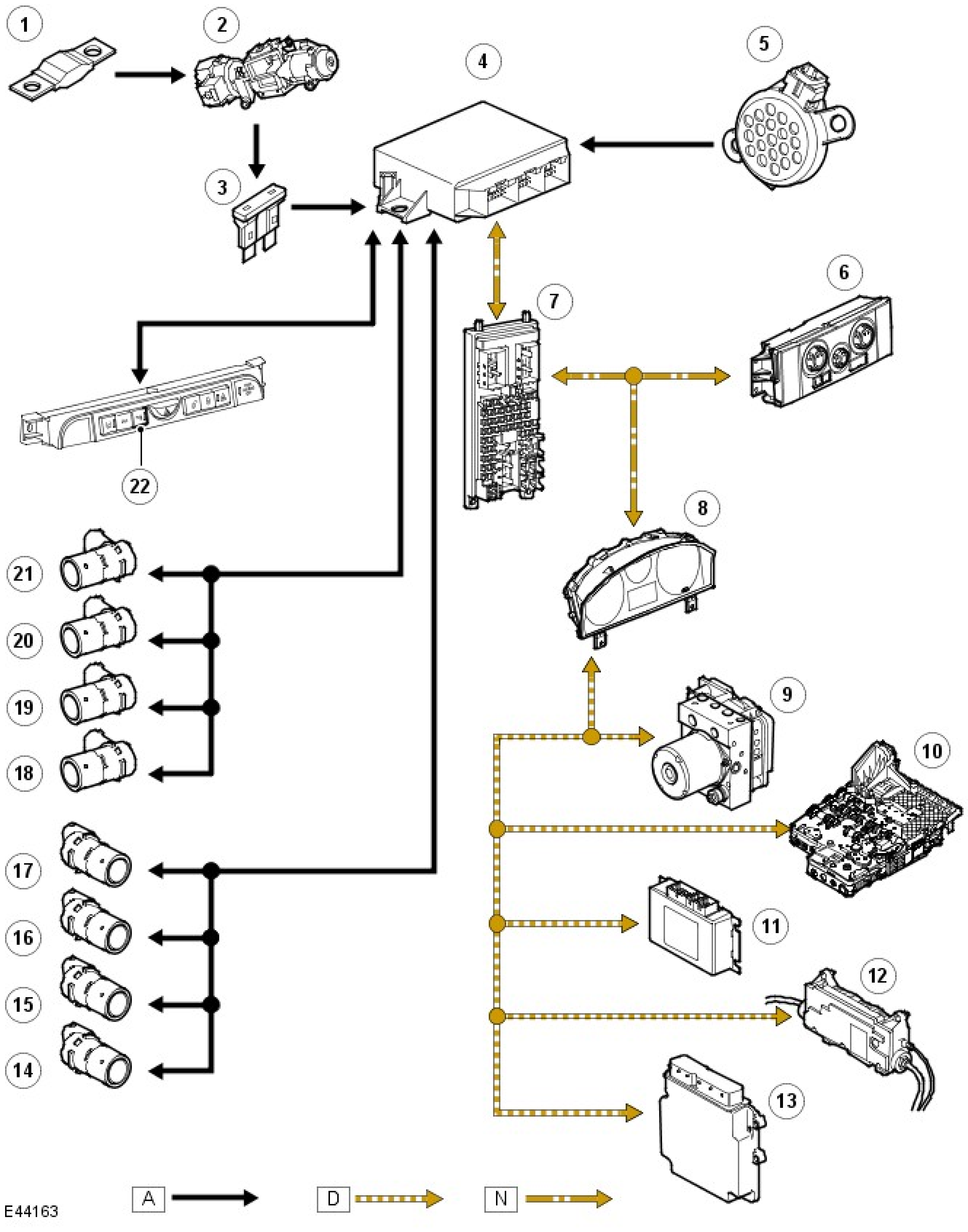
If the object is directly behind a sensor, the distance is calculated using the time between the transmission and reception of the signal. If the object is positioned between two sensors, the parking aid module uses both signals to determine the correct distance using triangulation.

To perform the triangulation calculation, the parking aid module must know the distance between the individual sensors in the bumper. This information is stored in the module memory. From the received distance from each sensor and using the known distance between adjacent sensors, the module can calculate the minimum distance from the vehicle to the object.

When approaching several objects, the module recognises the distance from the vehicle to the nearest object.

CONTROL DIAGRAM

- NOTE: **A** = Hardwired; **D** = High Speed CAN Bus: **N** = Medium Speed CAN Bus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Item	Part Number	Description
1	-	Fusible link 11E (30A)
2	-	Ignition switch
3	-	Fuse 36P (5A)
4	-	Rear parking aid sounder
5	-	Parking aid module

6	-	ATC module
7	-	Central Junction Box (CJB)
8	-	Instrument cluster
9	-	ABS module
10	-	Transmission control module
11	-	Transfer box control module
12	-	Electric park brake module
13	-	Engine control module
14	-	Left outer front sensor
15	-	Left inner front sensor
16	-	Right inner front sensor
17	-	Right outer front sensor
18	-	Left outer rear sensor
19	-	Left inner rear sensor
20	-	Right inner rear sensor
21	-	Right outer rear sensor
22	-	Parking aid switch

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Parking Aid - Parking Aid

Diagnosis and Testing

Overview

Parking aid is installed to the rear of all vehicles and the front and rear on higher specification vehicles.

For information on the description and operation of the system, refer to the relevant workshop manual section.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.
3. **3.** Ensure that the sensor face is clear of contamination that could effect the performance of the sensor.

Visual inspection

Mechanical	Electrical
● Sensor condition and installation ● Sounder(s) ● Switch	● Fuses - Central junction box (CJB) - fuse 36P - Battery junction box (BJB) - link 11E ● Harnesses and connectors ● Sensors ● Parking aid switch ● Parking aid module

4. **4.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. **5.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the self-test or DTC index.
    - Make sure that all DTCs are cleared following rectification.

On-Board self-test

As part of the strategy of the system, the self-test will inform the driver of any faults by a combination of the LED and tones:

- The status LED will flash if the system is active and a fault is detected in the sensors, sounders, wiring or module
- The front sounder will emit an error tone for 3 seconds if a fault is detected with the front sensors or if the rear sounder develops a fault
- The rear sounder will emit an error tone for 3 seconds if a fault is detected with the rear sensors, the switch, or the LED in the switch, or if there is a controller area network (CAN) bus error

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1A0049	Control module	● Internal electronic failure	Check the power and ground supplies to the module. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
B1B3601	Front Right Outer Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B3696	Front Right Outer Sensor	● Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
B1B3801	Front Right Inner Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B3896	Front Right Inner Sensor	● Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4001	Front Left Outer Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4096	Front Left Outer Sensor	● Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4201	Front Left Inner Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4296	Front Left Inner Sensor	● Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4401	Rear Right Outer Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4496	Rear Right Outer Sensor	● Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4601	Rear Right Inner Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4696	Rear Right Inner Sensor	● Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4801	Rear Left Outer Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B4896	Rear Left Outer Sensor	● Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B5001	Rear Left Inner Sensor	● Signal circuit: short circuit to ground ● Signal circuit: high resistance ● Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
B1B5096	Rear Left Inner Sensor	- Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B5212	Rear sounder	- Rear sounder circuit: short circuit to power - Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B5296	Rear sounder	- Component internal failure	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B5401	Function LED	- LED circuit: short circuit to power - Connecter/harness problem	Refer to the electrical guides and check the LED circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B5711	Front Sensors Power Circuit	- Front sensor power circuit: short circuit to ground - Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B5811	Rear Sensors Power Circuit	- Rear sensor power circuit: short circuit to ground - Connecter/harness problem	Refer to the electrical guides and check the sensor circuit. Check the connecter for integrity and damage. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1C3073	Disable Switch	- Actuator stuck closed	Check the switch function. Refer to the electrical guides.
U007388	Control Module Communication Bus "A" Off	- Bus off	Check the CAN circuits. Refer to the electrical guides.
U014087	Lost Communication With Body Control Module	- Missing message	Refer to the Network Communications section of the workshop manual.
U015587	Lost Communication With Instrument Panel Cluster (IPC) Control Module	- Missing message	Refer to the Network Communications section of the workshop manual.
U030055	Internal Control Module Software Incompatibility	- Not configured	Configure the module using the approved diagnostic system.

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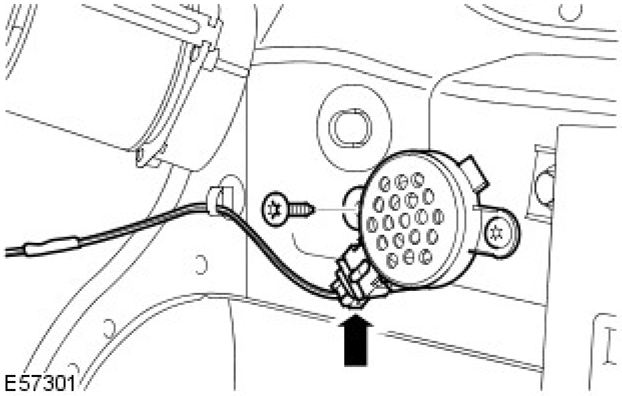
Parking Aid - Parking Aid Speaker

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the LH lower rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the parking aid sounder.
   - Remove the 2 screws.
   - Disconnect the electrical connector.



Installation

1. Install the parking aid sounder.
   - Tighten the screws.
   - Connect and secure the electrical connector.
2. Install the rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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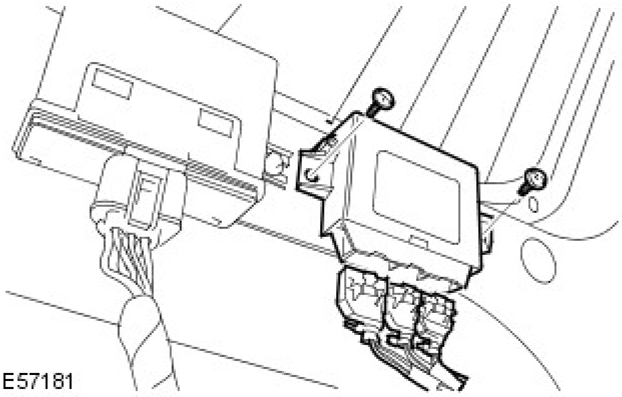
Parking Aid - Parking Aid Module

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the LH rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the parking aid module.



   - Remove the 2 screws.
   - Disconnect the 3 electrical connectors.

Installation

1. Install the parking aid module.
   - Connect and secure the electrical connectors.
   - Tighten the screws.
2. Install the rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

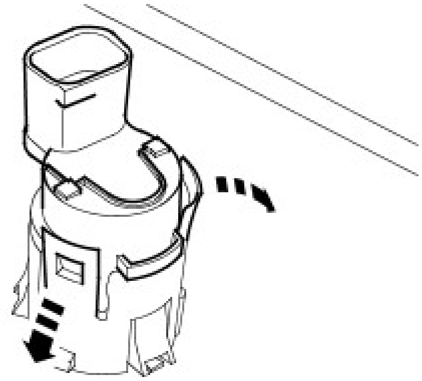
Published: 11-May-2011

Parking Aid - Front Outer Parking Aid Sensor

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the front bumper cover.
   For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).
3. Remove the parking aid sensor.
   - Release from the 2 clips.



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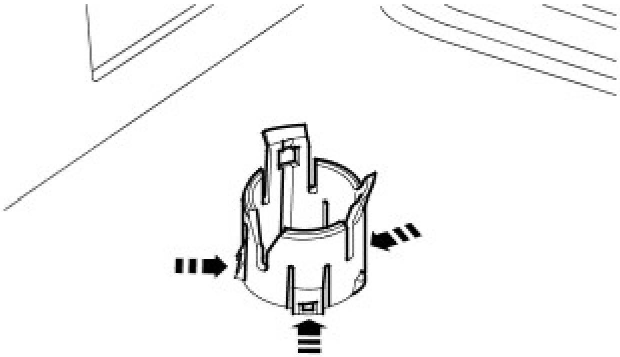
4. Remove the parking aid sensor trim panel.
   - Release the 3 clips.



E45117

Installation

1. Install the parking aid sensor trim panel.
2. Install the parking aid sensor.
3. Install the front bumper cover.
   For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).
4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Parking Aid - Rear Outer Parking Aid Sensor

Removal and Installation

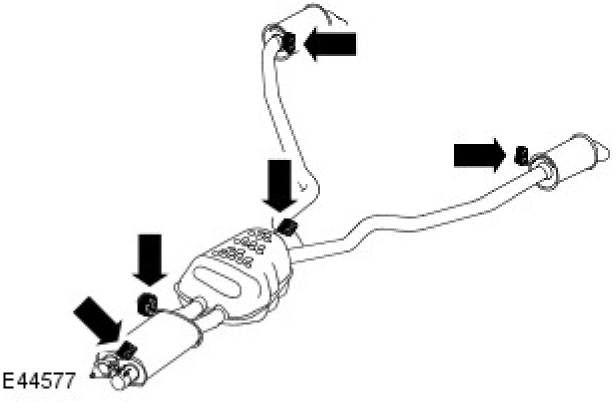
Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

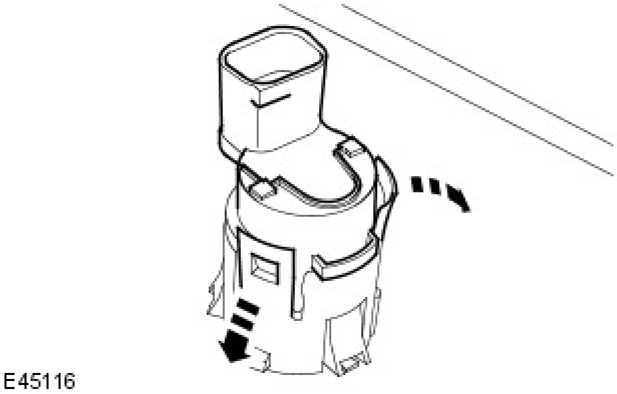
2. Release the 5 exhaust hangers.

- Support the exhaust assembly.



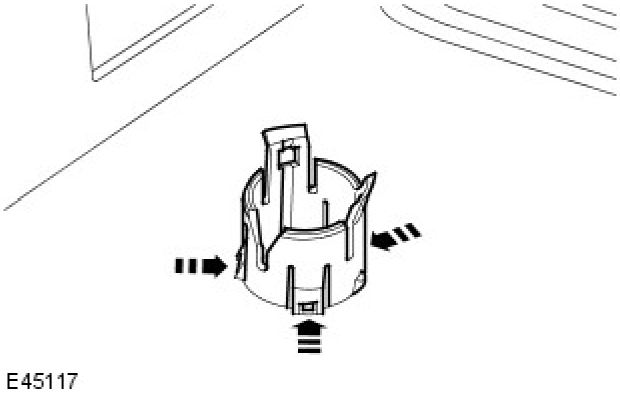
3. Remove the parking aid sensor.

- Disconnect the electrical connector.
- Release the 2 clips.



4. Remove the parking aid sensor trim panel.

- Release the 3 clips.



Installation

1. To install, reverse the removal procedure.

Published: 14-Jun-2011

Battery and Charging System - General Information -

Battery

Item	Specifications
All Gasoline (Petrol) Models:	
Type	Maintenance free lead-calcium
Capacity	690 amps - 75 amp/hour
Reserve capacity	150 minutes @ 25 amps
Diesel Models:	
Type	Maintenance free lead-calcium
Capacity	825 amps - 90 amp/hour
Reserve capacity	190 minutes @ 25 amps

Battery Disconnect/Connect

⚠ CAUTION: The vehicle status and battery condition must be established before attempting battery disconnect/connect. Reference must be then made to the following table to establish the relevant procedure to be followed.

Vehicle status	**Battery charged**	**Battery discharged**
	Procedure	**Procedure**
Engine running	1	
Vehicle powered down, locked and alarmed	2	3
Vehicle unlocked	4	5

Procedure 1

Disconnect battery	**Connect battery**
1. If possible, apply parking brake or alternatively, chock wheels	**1.** Ensure that all electrical loads are switched **OFF**
2. Switch off ignition	**2.** Connect battery leads - GROUND lead last
3. Wait 2 minutes for engine management system to 'power down'	**3.** Switch on ignition
4. Open the hood	**4.** Operate parking brake switch several times until parking brake warning lamp is extinguished
5. Disconnect battery - GROUND lead first	

Procedure 2

Disconnect battery	**Connect battery**
1. Unlock the vehicle and disarm the alarm using the 'plip' button	**1.** Ensure that all electrical loads are switched **OFF**
2. Enter the vehicle, turn the ignition key to position II, apply the parking brake or chock the wheels and then turn the ignition key to position 0. Remove the key to 'power down' the ICE system	**2.** Connect battery leads - GROUND lead last
3. Wait 2 minutes for engine management system to 'power down'	**3.** Switch on ignition
4. Open the hood	**4.** Operate parking brake switch several times until parking brake warning lamp is extinguished
5. Disconnect battery - GROUND lead first	

- NOTE: **1. Disconnect battery -** The door unlock process initialises the ICE system.

Procedure 3

Disconnect battery	**Connect battery**
1. Unlock the vehicle from the left hand front door using the key	**1.** Ensure that all electrical loads are switched **OFF**
2. Enter the vehicle, turn the ignition key to position II, apply the parking brake or chock the wheels and then turn the ignition key to position 0. Remove the key to 'power down' the ICE system	**2.** Connect battery leads - GROUND lead last
3. Wait 2 minutes for engine management system to 'power down'	**3.** Switch on ignition
4. Open the hood	**4.** Operate parking brake switch several times until parking brake warning lamp is extinguished
5. Disconnect battery - GROUND lead first	

- NOTE: **1. - Disconnect battery -** The door unlock process initialises the ICE system

- NOTE: **1. Connect battery -** If there is insufficient capacity in the battery to disarm the alarm, the alarm may sound on reconnection of the battery - Step 3 will disarm the alarm

Procedure 4

Disconnect battery	Connect battery
1. Enter the vehicle, turn the ignition key to position II, apply the parking brake or chock the wheels and then turn the ignition key to position 0. Remove the key to 'power down' the ICE system	**1.** Ensure that all electrical loads are switched **OFF**
2. Wait 2 minutes for engine management system to 'power down'	**2.** Connect battery leads - GROUND lead last
3. Open the hood	**3.** Switch on ignition
4. Disconnect battery - GROUND lead first	**4.** Operate parking brake switch several times until parking brake warning lamp is extinguished

Procedure 5

Disconnect battery	Connect battery
1. Enter the vehicle, turn the ignition key to position II, apply the parking brake or chock the wheels and then turn the ignition key to position 0. Remove the key to 'power down' the ICE system	**1.** Ensure that all electrical loads are switched **OFF**
2. Wait 2 minutes for engine management system to 'power down'	**2.** Connect battery leads - GROUND lead last
3. Open the hood	**3.** Switch on ignition
4. Disconnect battery - GROUND lead first	**4.** Operate parking brake switch several times until parking brake warning lamp is extinguished

- NOTE: **1. Disconnect battery -** If the remote control module (RCM) is not functioning, it will be necessary to manually unlock the vehicle using the key.

Vehicle Jump (Emergency) Starting - Using Another Vehicle

Carry out the following operations in the sequence given
1. Connect one end of the BLACK (-) booster cable to the GROUND (-) battery terminal of the **DONOR** vehicle
2. Connect the other end of the BLACK (-) booster cable to a good earth point e.g. unpainted metal surface or engine mounting at least 0.5 m (20.0 in) from the battery or fuel lines on the **DISABLED** vehicle
3. Connect one end of the RED (+) booster cable to the positive (+) battery terminal of the **DONOR** vehicle
4. Connect the other end of the RED (+) booster cable to the positive (+) battery terminal of the **DISABLED** vehicle
5. Start the engine of the **DONOR** vehicle and allow it to idle for a few minutes
6. Start the engine of the **DISABLED** vehicle
7. Allow engines of both vehicles to idle for a few minutes then switch off the engine of the **DONOR** vehicle
8. Disconnect the RED (+) booster cable from the battery of the **PREVIOUSLY DISABLED** vehicle
9. Disconnect the RED (+) booster cable from the battery of the **DONOR** vehicle
10. Disconnect the BLACK (-) booster cable from the earth point of the **PREVIOUSLY DISABLED** vehicle
11. Disconnect the BLACK (-) booster cable from the battery of the **DONOR** vehicle

- WARNINGS:

⚠ During normal use, batteries emit explosive hydrogen gas sufficient to cause severe explosions and capable of causing serious injury - keep sparks and naked lights away from the engine compartment.

⚠ DO NOT attempt to start the disabled vehicle if it is suspected that the electrolyte in the battery is frozen.

⚠ Suitable eye protection must be worn when working in the vicinity of the battery.

⚠ Take care when working near rotating parts of the engine.

⚠ Prior to attempting to start the disabled vehicle, ensure that the parking brake is applied or suitably chock the wheels. Ensure that 'P' - PARK - Automatic Gearbox or NEUTRAL - Manual Gearbox is selected.

- CAUTIONS:

⚠ Ensure that all electrical loads are switched OFF prior to connecting booster cables and disconnect booster cables prior to using any electrical equipment.

⚠ Ensure that the battery of the DONOR vehicle is of 12 volt capacity and that all electrical loads on the disabled vehicle are switched OFF prior to connecting booster cables.

⚠ Ensure that there is no physical contact between the donor and disabled vehicles other than the booster cables.

Vehicle Jump (Emergency) Starting - Using a Slave Battery/Starting Aid

Carry out the following operations in the sequence given
1. Connect the end of the BLACK (-) booster cable to the ground (-) battery terminal of the vehicle
2. Connect the end of the RED (+) booster cable to the positive (+) battery terminal of the vehicle
3. Start the engine of the vehicle and allow it to idle
4. Disconnect the RED (+) booster cable from the battery terminal of the vehicle
5. Disconnect the BLACK (-) booster cable from the battery terminal of the vehicle

- WARNINGS:

⚠ During normal use, batteries emit explosive hydrogen gas sufficient to cause severe explosions and capable of causing serious injury - keep sparks and naked lights away from the engine compartment.

⚠ DO NOT attempt to start the disabled vehicle if it is suspected that the electrolyte in the battery is frozen.

⚠ Suitable eye protection must be worn when working in the vicinity of the battery.

⚠ Take care when working near rotating parts of the engine.

⚠ Prior to attempting to start the disabled vehicle, ensure that the parking brake is applied or suitably chock the wheels. Ensure that 'P' - PARK - Automatic Gearbox or NEUTRAL - Manual Gearbox is selected.

- CAUTIONS:

⚠ Ensure that all electrical loads are switched OFF prior to connecting booster cables and disconnect booster cables prior to using any electrical equipment.

⚠ Ensure that the slave battery/starting aid are of 12 volt capacity and that all electrical loads on the disabled vehicle are switched OFF prior to connecting booster cables.

Published: 15-Dec-2011

Battery and Charging System - General Information - Charging System

Diagnosis and Testing

Overview

For battery condition indicator information:
REFER to: Battery and Cables (414-01 Battery, Mounting and Cables, Description and Operation).
For battery charging and testing, refer to the instructions for the equipment in use in your own workshop.

The generator operates within a "smart" system, able to allow for temperature variations and optimize battery charging.

For information on the description and operation of the system: REFER to:

Generator (414-02A Generator and Regulator - V8 S/C 4.2L Petrol, Diagnosis and Testing),
Generator (414-02B Generator and Regulator - V8 4.4L Petrol, Description and Operation),
Generator (414-02C Generator and Regulator - TDV6 2.7L Diesel, Description and Operation),
Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Generator ● Drive belt ● Drive belt tensioner ● Generator pulley ● Check the security of the generator fittings	● Generator ● Battery ● Starter motor ● Harnesses and connectors ● Fuses - Battery junction box (BJB) - fuse 20E - Starter motor megafuse ● Charge warning light function ● Controller area network (CAN) circuits ● Engine control module (ECM)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

Symptom chart

Symptom	Possible Cause	Action
Charge warning lamp does not illuminate	● Warning lamp/circuit - fault ● Generator - internal fault ● CAN Bus - circuit fault ● Engine control module - internal fault	● Check the warning lamp function with the ignition on and the engine off ● Repair the circuit as necessary ● Check for DTCs indicating a generator, CAN or engine control module fault
Charge warning lamp stays on/battery discharges	● Accessory drive belt - fault ● Generator pulley slipping on shaft ● Generator - internal fault ● Battery cable - fault ● CAN Bus - circuit fault ● Engine control module - internal fault ● Central junction box	● Check the battery and generator cables ● Refer to the electrical guides ● Check for DTCs indicating a generator fault ● Check the accessory drive belt condition and tension ● Check that the pulley does not rotate independently of the generator ● Check for DTCs indicating a CAN, central junction box or engine control module fault

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

For a full list of Engine control module (ECM) DTCs: REFER to:

Electronic Engine Controls (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, Diagnosis and Testing),
Electronic Engine Controls (303-14B Electronic Engine Controls - V8 4.4L Petrol, Diagnosis and Testing),
Electronic Engine Controls (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, Diagnosis and Testing),

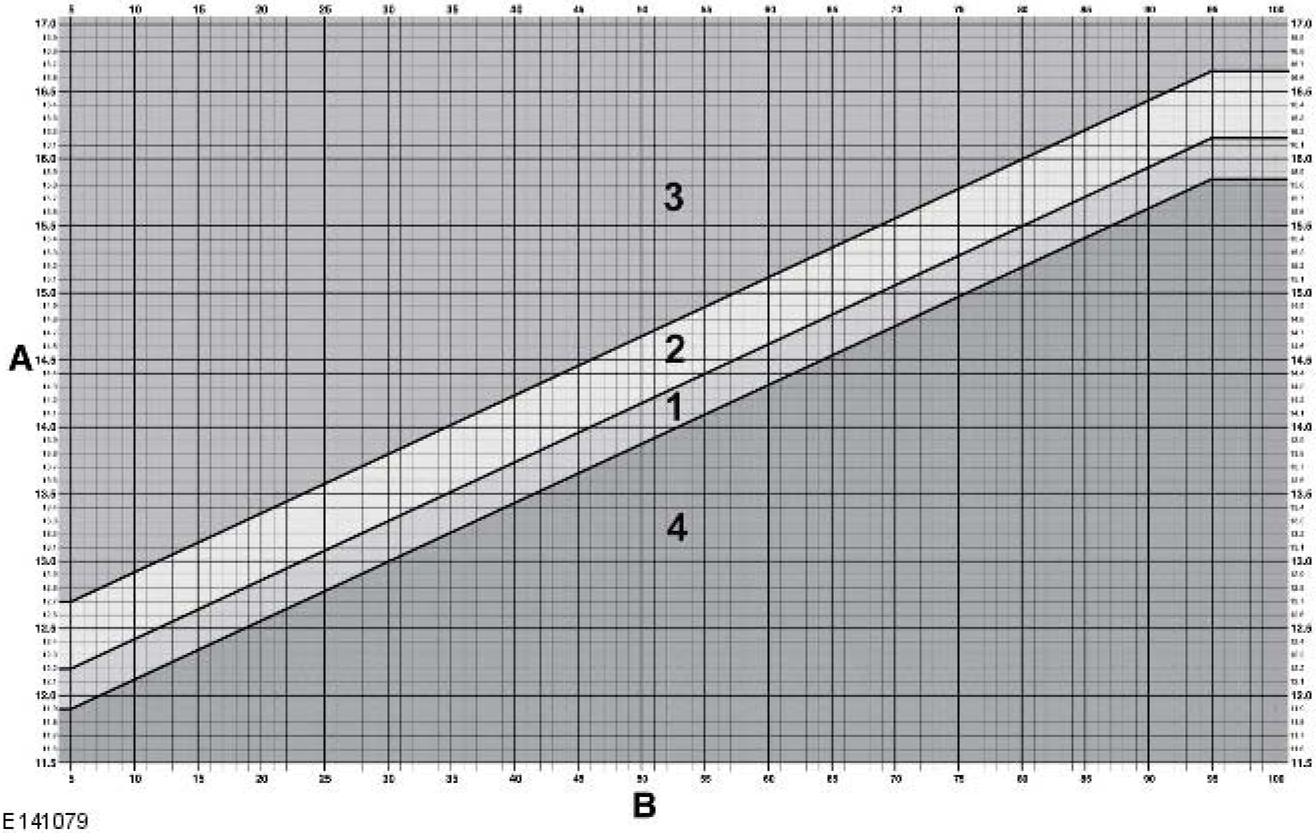
Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

PINPOINT TEST A : DENSO NON-BMS GENERATOR DIAGNOSTIC FLOW CHART	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: MIDTRONICS BATTERY TEST	
• NOTE: The battery must be fully charged and any battery defects rectified before continuing with generator diagnosis	
• NOTE: The voltmeter must display readings to three decimal places (i.e. 0.001V)	
• NOTE: **Ignition on** is position 2 on a keyed ignition system	
	1 Using a Midtronics hand held tester or the Midtronics GR-1 diagnostic charger, carry out the "Midtronics battery test" as detailed in the battery care manual. REFER to: Battery Care (414-00 Battery and Charging System - General Information, Description and Operation).
	2 Record battery diagnostic result on the provided form
	Does the battery pass the "Midtronics battery test"? **Yes** GO to Pinpoint Test B. **No** Rectify any battery defects before continuing with generator diagnosis GO to Pinpoint Test B.

PINPOINT TEST B : DENSO NON-BMS GENERATOR DIAGNOSTIC FLOW CHART	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: GENERATOR DUTY CYCLE	
• NOTE: The heated rear screen is timed to operate for 10 minutes, then cycle on and off dependent on external conditions. This test requires completion within this 10 minute period	
	1 Using the manufacturer approved diagnostic system, select **Measurement Application**. Select **Complete Vehicle Data-logger**. Select **303-00 Engine System**. Select the data-logger parameter "Generator Command" to view the PWM duty %
	2 Connect a voltmeter to the vehicle battery
	3 Switch ignition state to on (engine off)
	4 Turn off all electrical loads e.g. (blower, radio, interior lights etc.)
	5 Start the engine, switch on the heated rear screen • Ensure the heated rear screen is **on** (see note above) and that the air conditioning system is **off**. • Wait 90 seconds
	6 Record battery voltage **(V1)** and generator regulator control **PWM Duty %.**. Using the graph, plot the battery voltage from your multi-meter (V1) and duty cycle readings from the manufacturer approved diagnostic system
	7 Switch off engine
	Does the generator regulator control PWM duty alternate between 40.1% and 3% in 5 sec intervals? **Yes** GO to Pinpoint Test C. **No** Use the comparison graph and instructions (below) to diagnose battery voltage **(V1)**

PINPOINT TEST C : CIRCUIT CHECK	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: CIRCUIT CHECK	
	1 Refer to the electrical circuit diagrams and check **ALT MON** and **ALT COM** circuit for short circuit to ground, short circuit to power, open circuit, high resistance
	Did the circuit check pass? **Yes** Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component **No** Repair the circuit as required REFER to: Wiring Harness (418-02 Wiring Harnesses, Description and Operation). GO to Pinpoint Test B.

Battery Voltage V1 Graph Comparison



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Plot on the graph the band to which battery voltage reading **(V1)** relates

To which band did the battery voltage **(V1)** apply?

Use the table below to continue diagnosis

Voltage	Graph Band	Link to Test Procedure
Voltage (V1) plotted during pinpoint test B1	Area **1** of the graph	GO to Pinpoint Test D.
Voltage (V1) plotted during pinpoint test B1	Area **2** of the graph	GO to Pinpoint Test E.
Voltage (V1) plotted during pinpoint test B1	Area **3** of the graph	GO to Pinpoint Test F.
Voltage (V1) plotted during pinpoint test B1	Area **4** of the graph	GO to Pinpoint Test G.

PINPOINT TEST D : GRAPH COMPARISON AREA 1	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: GRAPH COMPARISON AREA 1	
	1 When the voltage **(V1)** was compared to the graph above
	Did the voltage (V1) = area 1 of the graph? **Yes** The output is within the expected range. **Do not replace the alternator**. If customer concern is still evident contact dealer technical support **No** No further action required

PINPOINT TEST E : CIRCUIT CHECKS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: CIRCUIT CHECKS	
	1 Refer to the electrical circuit diagrams and check **BATT SENSE** circuit for short circuit to ground, short circuit to power, open circuit, high resistance between: ● RR Sport & Discovery = generator connector C0053 and the engine junction box ● Range Rover = generator connector C0053 and central junction box

	Did the circuit check pass? **Yes** Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component **No** Repair the circuit as required REFER to: Wiring Harness (418-02 Wiring Harnesses, Description and Operation). GO to Pinpoint Test B.

PINPOINT TEST F : GRAPH COMPARISON AREA 3

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: GRAPH COMPARISON AREA 3	
	1 When the voltage **(V1)** was compared to the graph above
	Did the voltage (V1) = area 3 of the graph? **Yes** Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component **No** No further action required

PINPOINT TEST G : GRAPH COMPARISON AREA 4

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: GRAPH COMPARISON AREA 4	
	1 When the voltage **(V1)** was compared to the graph above
	Did the voltage (V1) = area 4 of the graph? **Yes** GO to Pinpoint Test H. **No** Carry out the diagnostic once more GO to Pinpoint Test B. . If customer concern is still evident contact dealer technical support

PINPOINT TEST H : REGULATOR CONTROL DUTY CYCLE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: REGULATOR CONTROL DUTY CYCLE	
	1 Using the generator regulator control duty cycle reading **PWM Duty %**
	Is the generator regulator control **PWM** duty cycle stuck at 100%? **Yes** GO to Pinpoint Test I. **No** GO to Pinpoint Test J.

PINPOINT TEST I : CIRCUIT CHECKS 1

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: CIRCUIT CHECKS 1	
	1 Refer to the electrical circuit diagrams and check **ALT MON** and **ALT COM** circuits for short circuit to ground, short circuit to power, open circuit, high resistance
	Did the circuit checks pass? **Yes** Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component **No** Repair the circuit as required REFER to: Wiring Harness (418-02 Wiring Harnesses, Description and Operation). GO to Pinpoint Test B.

PINPOINT TEST J : CIRCUIT CHECKS 2

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: CIRCUIT CHECKS 2	
• NOTE: The heated rear screen is timed to operate for 10 minutes, then cycle on and off dependent on external conditions. This test requires completion within this 10 minute period	
	1 Connect a voltmeter to the vehicle battery

	2 Switch ignition state to on (engine off) **3** Turn off all electrical loads e.g. (blower, radio, interior lights etc.) **4** Start the engine, switch on the heated rear screen ● Ensure the heated rear screen is **on** (see note above) and that the air conditioning system is **off**. **5** Voltage measurement ● Measure the voltage drop between the generator body and battery negative terminal and record the value **(V2)** **6** Voltage measurement ● Refer to the electrical circuit diagrams and measure the voltage drop between the **generator B+** and battery positive terminal and record the value **(V3)**
	Does the voltage drop value **(V2) or (V3) = less than 0.3 Volts ?** **Yes** Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component **No** Switch off Engine. Refer to the electrical circuit diagrams and check the generator, battery and engine, power and ground circuits for loose or corroded connections. Repair the circuit as required REFER to: Wiring Harness (418-02 Wiring Harnesses, Description and Operation). GO to Pinpoint Test B.

Published: 14-Jul-2011

Battery and Charging System - General Information - Battery Care

Description and Operation

12V LEAD ACID BATTERY CARE MANUAL FOR DEALER / RETAILER USE

1. INTRODUCTION

2. GENERAL RULES FOR BATTERY CARE

3. EQUIPMENT (MINIMUM STANDARD)

4. HEALTH AND SAFETY PRECAUTIONS

5. DETERMINING BATTERY CONDITION

6. BATTERY CHARGING AND MAINTENANCE

7. CHARGING SYSTEM TEST AND DIAGNOSIS

8. VEHICLE QUIESCENT CURRENT TESTING

APPENDIX A: BATTERY TEST PROCESS

APPENDIX B: BATTERY REPORT FORM - IN SERVICE BATTERIES ONLY

1. INTRODUCTION

This publication sets out, for the benefit of dealers / retailers worldwide, requirements for the care and maintenance of batteries, from the vehicles hand-over to the dealer / retailer to the handover to the customer or in the case of a spare part battery from is delivery to the dealer / retailer to its fitment to a customer vehicle.

It applies to all types of 12 volt Lead Acid Batteries used, whether they are conventional flooded technology or Absorbed Glass Mat (AGM) technology and also applies to both Primary and Secondary or Auxiliary Batteries.

The clearly laid out and illustrated sections guide dealers / retailers through each stage of the vehicles or spare parts receipt, storage, pre-delivery and customer hand-over. This publication can be used as a guide to the handling and care of batteries in service. It is vital to appreciate that unless each process is rigorously applied on all vehicles, the customer will receive a vehicle with a battery or a spare part battery which will not provide a satisfactory service life.

It is very important that all tests quoted throughout this publication are adhered to. If they are applied incorrectly batteries could be scrapped unnecessarily. Refer to the battery testing section for detailed information.

It is equally important therefore to note the following key points:

- Most new vehicles leave the factory with either a transit relay installed and/or have a transit mode programmed into the vehicle control modules. The transit relay must be removed and the transit mode disabled (where applicable) using an approved diagnostic system, **NOT MORE THAN 24 HOURS** before the customer takes delivery.
- 12 Volt Lead Acid Batteries rely on internal chemical processes to create a voltage and deliver current. These processes and the internal chemical structure of the battery can be damaged if the battery is allowed to discharge over a number of weeks / months, or is left in a discharged state for a lengthy time period. For this reason the battery must be tested / re-charged if necessary every month, and **MUST BE** re-charged after every three month period of storage. Refer to the vehicle storage manual and update the vehicle history sheet.
- Under no circumstances should the battery be disconnected with the engine running because under these conditions the alternator can give a very high output voltage. This high transient voltage will damage the electronic components in the vehicle. Loose or incomplete battery connections may also cause high transient voltage.
- On vehicles with conventional ignition keys, these must not be left in the ignition lock barrel when the transit relay has been removed, otherwise quiescent current will increase and the battery will discharge more rapidly.
- Two types of Lead acid batteries are used; standard Flooded type and AGM (Absorbed Glass Mat) or VRLA (Valve regulated Lead Acid) types. AGM batteries offer improved resistance to cycling as seen in stop start applications. AGM Batteries are fully sealed and cannot have the electrolyte level topped up.

Dealers and retailers involved in the storage, handling of vehicles and spare parts batteries have a responsibility to ensure that only vehicles and spare parts having a fully satisfactory battery may be processed further through the distribution selling chain.

• NOTE: It is very important that test processes quoted throughout this publication are adhered to.

If they are not adhered to correctly batteries could be scrapped unnecessarily or a battery with an issue remains in use. Refer to the battery testing section for detailed information.

2. GENERAL RULES FOR BATTERY CARE

Frequency of Battery Condition Checks.

Any battery in storage whether it is in a vehicle or in spare parts inventory must have its charge status checked every 30 days as described in Appendix A, and must be recharged every 90 days as described in the "Battery Charging and Maintenance" section of this manual.

Dealer Demonstration Vehicles

Due to the high depth of discharge a dealer demonstration vehicle battery may experience, batteries that are fitted to vehicles used as dealer demonstration vehicles must be connected to a power supply / charger capable of delivering 50 Amps or more whilst the vehicle is being demonstrated and the engine is not running. This will prevent the battery from being damaged from "energy throughput " wear out during a demonstration.

Software Reflash, SDD work or Ignition On related Workshop Activities.

Due to the high electrical current demand and high depth of Discharge that can occur during vehicle software re-flash activities, SDD work or ignition on related work in the workshop, vehicles that are undergoing such activities MUST have the electrical system on the vehicle supported with a power supply / charger / vehicle maintainer capable of delivering 50 Amps or more.

Jump Starting New vehicles Before They Have Been Delivered to the Customer.

- It is the dealer / retailers responsibility to ensure the battery is not allowed to go flat by following the instructions and processes defined in this manual.
- However if circumstances dictate that a new vehicle must be jump started due to a flat battery whilst the vehicle is in the dealer / retailers care, the battery on this vehicle must be replaced with a new one prior to delivery to the customer at the dealer / retailers liability.
- The vehicle should also undergo investigation as to why the battery went flat.
- Do not connect the jump starting cable to the negative (-) terminal of the battery. Always connect to the recommended earthing point. As defined in the owners handbook or service documentation for that vehicle.

Jump Starting or Boost Charging Vehicles in Service

Do not connect the jump starting cable to the negative (-) terminal of the battery. Always connect to the recommended earthing point. As defined in the owners handbook or service documentation for that vehicle.

Charging AGM Batteries

AGM batteries must not be charged with voltages above 14.8 Volts. Doing so will damage them.

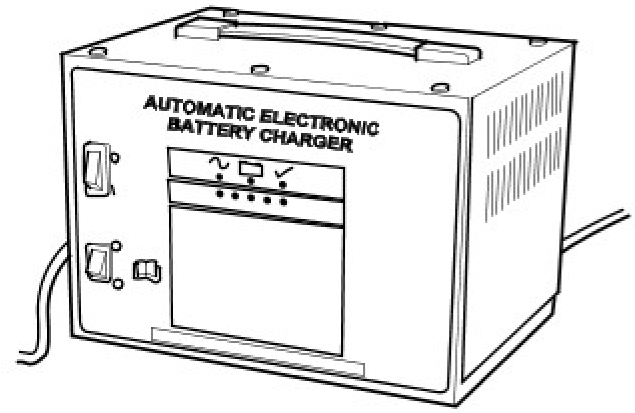
Testing AGM Batteries

Midtronics 393, 394, 493 and 494 testers are not capable of testing AGM batteries. Doing so can give an incorrect result.

When it is necessary to test an AGM battery use the Midtronics EXP1080 tester or the GR1 Diagnostics Charger.

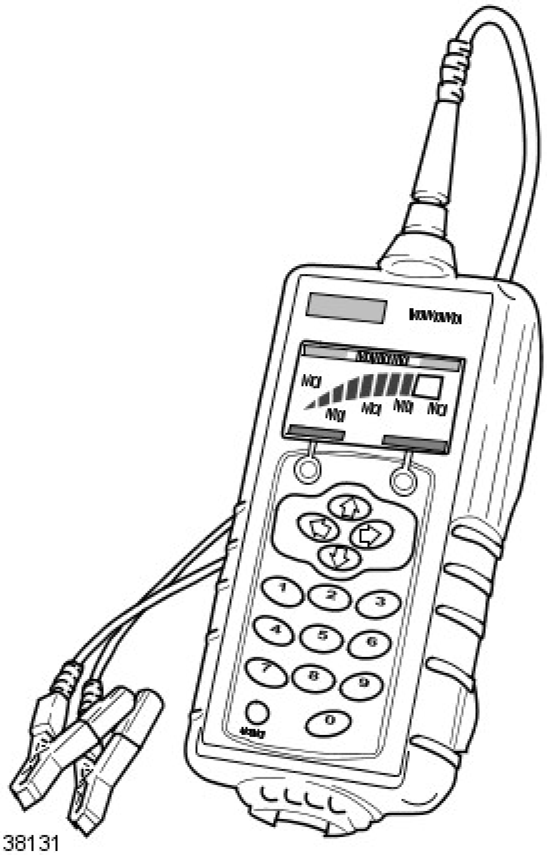
3. EQUIPMENT (MINIMUM STANDARD) (pictures are for illustration only)

Traction Battery Charger (or similar stand-alone charger)


AUTOMATIC ELECTRONIC
BATTERY CHARGER

E138126

Midtronics EXP1080 Hand-Held Tester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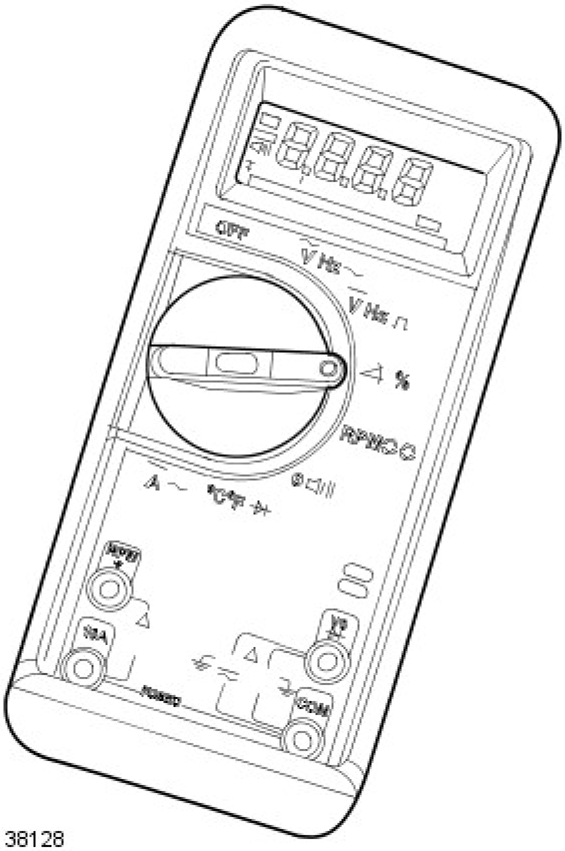
E138131

Digital Multi-Meter or Digital Volt-Ohm Meter (DVOM)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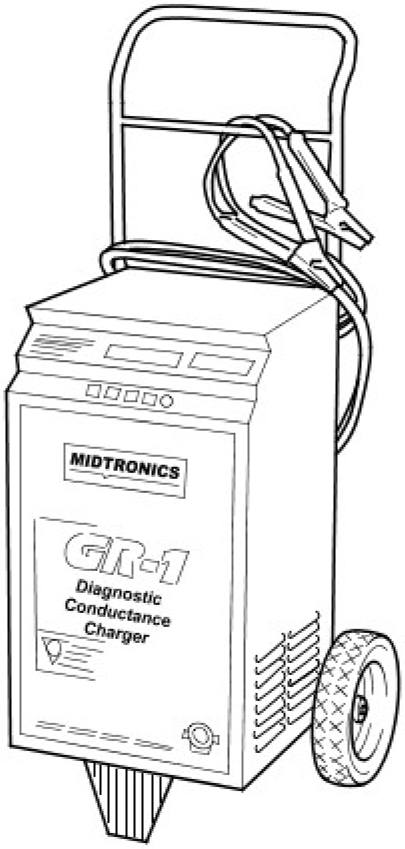
E138128

Midtronics GR-1 Diagnostic Charger


MIDTRONICS
GR-1
Diagnostic
Conductance
Charger

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4. HEALTH AND SAFETY PRECAUTIONS

• WARNINGS:

BATTERY CELLS CONTAIN SULPHURIC ACID AND EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN GASES. IT IS THEREFORE ESSENTIAL THAT THE FOLLOWING SAFETY PRECAUTIONS ARE OBSERVED.

Batteries emit highly explosive hydrogen at all times, particularly during charging. To prevent any potential form of ignition occurring when working in the vicinity of a battery:

- Do not smoke when working near batteries.
- Avoid sparks, short circuits or other sources of ignition in the battery vicinity.
- Switch off current before making or breaking electrical connections.
- Ensure battery charging area is well ventilated.
- Ensure the charger is switched off when: a) connecting to a battery; b) disconnecting from the battery.
- Always disconnect the ground cable from the battery terminal first and reconnect it last.

Batteries contain poisonous and highly corrosive acid. To prevent personal injury, or damage to clothing or the vehicle, the following working practices should be followed when topping up, checking electrolyte specific gravity, removal, refitting or carrying batteries:

- Always wear suitable protective clothing (an apron or similar), safety glasses, a face mask and suitable gloves.
- If acid is spilled or splashed onto clothing or the body, it must be neutralized immediately and then rinsed with clean water. A solution of baking soda or household ammonia and water may be used as a neutralizer.
- In the event of contact with the skin, drench the affected area with water. In the case of contact with the eyes, bathe the affected area with cool clean water for approximately 15 minutes and seek urgent medical attention.
- If battery acid is spilled or splashed on any surface of a vehicle, it should be neutralized and rinsed with clean water.
- Heat is generated when acid is mixed with water. If it becomes necessary to prepare electrolyte of a desired specific gravity, SLOWLY pour the concentrated acid into water (not water into acid), adding small amounts of acid while stirring. Allow the electrolyte to cool if noticeable heat develops. With the exception of lead or lead-lined containers, always use non-metallic receptacles or funnels. Do not store acid in excessively warm locations or in direct sunlight.

Due to their hazardous contents, the disposal of batteries is strictly controlled. When a battery is scrapped, ensure it is disposed of safely, complying with local environmental regulations. If in doubt, contact your local authority for advice on disposal facilities.

5. DETERMINING BATTERY CONDITION

The tools used for determining the condition of the battery will depend upon whether it is installed in a vehicle or in spare parts inventory. Concerning an installed battery, procedures will vary if the vehicle is new, or already in service with a customer.

• NOTE: The term `New Vehicle' refers to a vehicle at any part of the delivery process from leaving the factory to arriving at a port of entry, dealership, retailer, including any storage facilities en route or a vehicle being stored prior to sale at dealership / retailer.

• NOTE: Midtronics 393, 394. 493 and 494 testers must not be used to test AGM batteries as these testers are not capable of correctly testing AGM batteries and can give an incorrect result. For AGM battery testing use the EXP1080 tester or the GR1 Diagnostics charger.

NEW VEHICLES

A Midtronics tester should be used to assess the condition of the battery for new vehicles. The test results should be recorded on the Storage History Sheet (see Vehicle Storage manual).

Scenario 1 - Dealership / Retailer (Responsibility: Dealer / Retailer)

1. Within 24 hours of arrival at the dealer / retailer proceed as follows:

- Perform a Midtronics battery test (See Appendix A.)
- Carry out the recommended actions accordingly.

2. If the Midtronics result is "Good Battery" the vehicle may be stored.

- For all new vehicles in storage the transit relay MUST be fitted, or the Transit Mode enabled where used. For vehicles without a transit relay or a Transit Mode, the battery negative cable MUST BE DISCONNECTED from the battery.

3. The battery must be tested and/or re-charged every month and MUST be re-charged after every three month period.

4. Record your test results on the Storage History Sheet (see Vehicle Storage Manual) to indicate when a re-charge will be necessary.

Scenario 2 - Delivery to the Customer (Responsibility: Dealer / Retailer)

• NOTE: It is essential that the following actions are conducted in the 24 hours prior to the agreed hand over time:

1. Perform a Midtronics Battery test (See Appendix A).

2. Carry out the recommended actions accordingly.

3. The vehicle should only be released to the customer if Midtronics has tested the battery as "Good Battery"

Spare Part Batteries

Lead acid batteries will, as a result of natural chemical processes, slowly self discharge themselves over a period of time (even when open circuit and no electrical load applied).

In the case of spare parts batteries, a Midtronics tester should be used to assess the condition of new spare parts batteries.

The batteries must be stored such that they cannot get wet and are not in direct sunlight.

Any batteries which are dropped must be scrapped. This applies even if no external damage is apparent.

Scenario 1 - Spare Part Batteries Within Dealer Stock But Not Yet Fitted To A Vehicle (Responsibility: Dealer / Retailer)

1. For a battery in the Dealer parts or in ready to use stock but not yet fitted to a vehicle the following rules must be followed:

- Check the battery condition on receipt by performing a Midtronics battery test (See Appendix A).
- Batteries should only be returned to storage if the Midtronics tester indicates "Good Battery".
- The battery condition should be rechecked every 30 days by performing a Midtronics battery test (See Appendix A).
- If required batteries should be recharged as described in the "Battery Charging and Maintenance" section of this manual.

2. 2 All batteries must be controlled via a FIFO (First In First Out) process to ensure aged batteries are not held and the batteries are not allowed to age unnecessarily.

VEHICLES IN SERVICE

The Midtronics hand-held tester or the Midtronics Diagnostic Charger are the preferred tools to assess battery condition for vehicles in service. The test results should be recorded on the In-Service Battery Report Form (See Appendix B).

Midtronics Testing - In-Service Testing Only

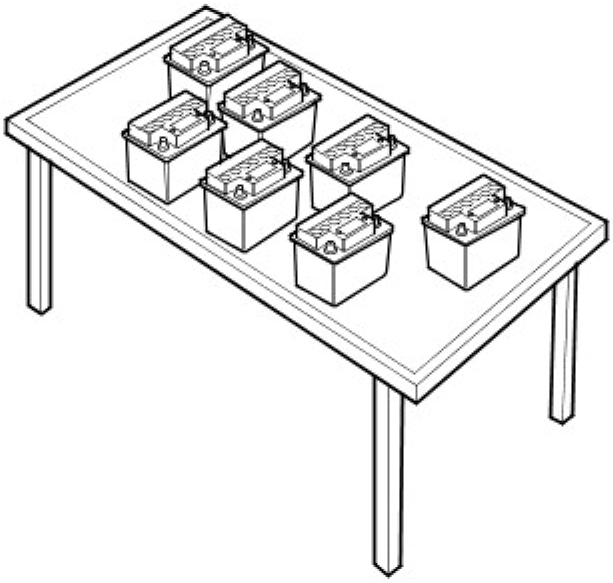
• NOTE: The battery surface charge must be removed before this test in accordance with the procedure in Appendix A. Ensure that the battery terminal connectors are clean. When connecting the Midtronics testing equipment, connect the RED clip to the positive (+) battery terminal first, and then connect the BLACK clip to the negative (-) battery terminal. Rock the clips backward and forward to ensure a good connection to the battery.

1. Perform a Midtronics battery test (See Appendix A).

2. Carry out the recommended actions accordingly.

6. BATTERY CHARGING AND MAINTENANCE

BATTERY CHARGING



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It is essential that a suitably ventilated defined area exists in each dealership / retailer for battery charging. Likewise, an area should be allotted for scrap batteries, and clearly indicated as such. It is recommended that dealers / retailers always have fully charged batteries ready for use. However the battery MUST BE tested and charged if necessary every month, and charged after three months irrespective of any test.

• CAUTIONS:

⚠ Batteries must be re-charged after a maximum of 3 months storage (see Storage History sheet in the New Vehicle Storage Manual).

⚠ It is very important that when charging batteries using the traction charger or other stand-alone chargers that the charger is set for the correct type of battery before charging commences. If the wrong switch is selected the result would be a battery that is not charged fully and / or overheating can occur. Follow the manufacturers operating instructions.

⚠ Do not charge AGM batteries with voltages over 14.8 volts as this will damage the battery.

To bring a serviceable but discharged battery back to a fully charged condition proceed as follows:

- Check and if necessary top-up the battery electrolyte level.
- Charge the battery using the Midtronics Diagnostic Charger (USA) or Traction Charger (all other markets) following the manufacturers operating instructions.

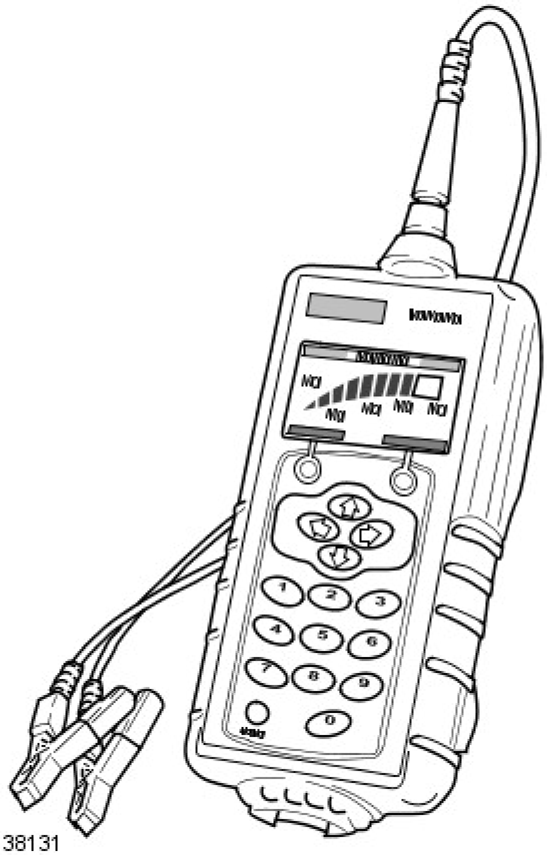
• NOTE: When using the Midtronics Diagnostic Charger, automatic mode must always be used. After charging and analysis, the charger may display ‘Top-Off Charging’, press STOP to end. Do not stop charging until the current falls to 5A or less, otherwise the battery will not be fully charged.

POST-CHARGE TEST METHODS

New Batteries, Batteries in Storage and In-Service Batteries

The purpose of this test is to ensure that the charging process has fully charged the battery.

• NOTE: IT IS RECOMMENDED THAT THIS TEST IS CONDUCTED AT LEAST 24 HOURS AFTER THE CHARGE CYCLE IS COMPLETED.



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⚠ CAUTION: DO NOT connect the tester to any other circuit or chassis point.

1. Attach the Midtronics Tester to the battery.

2. Follow the instructions on the tester to test the battery. Ensure the correct battery type and size is selected.

3. Perform the action based on the tester results (see the tester results chart in the Vehicles in Service sub -section of Determining Battery Condition Section).

4. Enter the readings and test code obtained on the In Service Battery Report Form.

- NOTE: Midtronics 393, 394. 493 and 494 testers must not be used to test AGM batteries as these testers are not capable of correctly testing AGM batteries and can give an incorrect result. For AGM battery testing use the EXP1080 tester or the GR1 Diagnostics charger.

BATTERY REPLACEMENT

If it is determined that a battery requires replacement, always refer to the appropriate section of the workshop manual for instructions on removing and installing the battery from the vehicle.

On in service vehicles fitted with a Battery Monitoring System (BMS), the BMS module must be reset following the installation of a new battery. The BMS module reset procedure must be performed using an approved diagnostic system.

CHECK / TOP-UP BATTERY ELECTROLYTE – Only Applicable to certain Flooded Types of Battery.

- WARNINGS:

⚠ AGM TECHNOLOGY BATTERIES ARE FULLY SEALED FOR LIFE AND NO ATTEMPT SHOULD BE MADE TO CHECK OR TOP UP THE ELECTROLYTE LEVEL.

⚠ BEFORE CHECKING AND TOPPING-UP THE BATTERY ELECTROLYTE, REFER TO THE HEALTH AND SAFETY PRECAUTIONS SECTION.

Check to ensure the battery is of a type suitable for topping up. These types of batteries will have cell plugs visible on the top face of the battery or a removable access panel to allow access to the cells.

On batteries with a clear or opaque case and level marks, check the electrolyte level by visual inspection of the maximum level indicator mark on the battery casing indicating adequate level above the battery separators.

On batteries with black cases, remove the cell plugs or access panel and ensure the electrolyte level is level with the indicator in the cell hole. A flashlight may be required to see the electrolyte level on this type of battery.

⚠ CAUTION: **DO NOT** overfill.

If the electrolyte level is low, top-up using distilled water.

Maintenance free and Valve Regulated (AGM) batteries are sealed and therefore cannot be topped up.

CHARGING SYSTEM TEST AND DIAGNOSIS

For all vehicles, refer to the Charging System - Diagnosis and Testing in section 414-00 of the Workshop Manual.

VEHICLE QUIESCENT CURRENT TESTING

- NOTE: On vehicles fitted with a Battery Monitoring System (BMS), the diagnostic routine for quiescent drain testing in the approved diagnostic system should be utilized.

- NOTE: If a customer complains of a vehicle battery that discharges continuously or when left for a prolonged period of time, it is recommended that a quiescent drain test is performed as described below.

- NOTE: The battery drain should be measured using an approved diagnostic system or a Digital Multi-Meter (DVOM).

The vehicle should be in the locked/armed state (for example vehicle alarm fully armed), all doors, engine and luggage compartment lids are open and latched (so as to appear closed from an electrical point of view). The test should take place after the vehicle has entered shutdown mode. The time taken for this to occur after the ignition is switched off varies according to model - Refer to Quiescent Drain in section 414-00 of the Workshop Manual.

- NOTE: When the vehicle is armed, the effect of the security system Light Emitting Diode (LED) flashing is to cause a pulsation in the measured current drain. In this case, either the average current should be taken (using a Digital Multi- Meter (DVOM) with an averaging system) or the current reading taken, ignoring the brief high current peaks.

EQUIPMENT

Approved diagnostic system with current probe or Digital Multi-Meter (DVOM) with current probe.

METHOD OF MEASUREMENT

Using an Approved Diagnostic System

1. Switch off all electrical loads and ensure that the ignition is off.

2. Connect the current probe to the approved diagnostic system.

3. Calibrate the probe.

4. Install a clamp around the battery lead/junction box lead.

5. Go to the Quiescent Current Testing section.

Using a Digital Multi-Meter (DVOM)

- NOTE: Do not use an in-line DVOM to measure the quiescent drain on vehicles fitted with an electronic throttle. The current exceeds the maximum amount the fuse in the DVOM is capable of handling.

1. Switch off all electrical loads and ensure that the ignition is off.

2. Connect the current probe to the DVOM.

3. Calibrate the probe.

4. Install a clamp around the battery lead/junction box lead.

5. Go to the following Quiescent Current Testing section.

QUIESCENT CURRENT TESTING

1. Switch ignition to ‘on’ or select ignition mode in keyless vehicles and switch to ‘off’ (do not crank).

2. Remove key from ignition switch (where applicable).

3. Open and latch all doors, hood and luggage compartment lid.

4. Lock the vehicle using the remote function on the remote handset. (Single lock only to avoid volumetric alarm arming).

5. Remove any other potential electrical drains such as accessories plugged into accessory sockets.

6. Record the amperage readings after the shutdown period. The model specific Amperage readings for quiescent drain are referenced in Quiescent Drain in section 414-00 of the Workshop Manual

7. Record the final reading on the battery report form Appendix B.

• NOTE: The preferred method of testing following an excessive current consumption figure is to use a current probe around individual junction box leads to the various suspected circuits to identify a potential cause. This is in preference to the old method of removing fuses for the following reasons:

- Many modules take a considerable time to power down. Each time a fuse is removed and re-fitted, the quiescent drain current may take an extended period of time to return to normal (typically up to 45 minutes).
- The drain may be caused by a module remaining active and preventing the quiescent drain from reducing to normal levels.
- The drain may be caused by a relay winding that is activated. Pulling the fuse can allow this to ‘reset’ and the drain will be lost and go un-diagnosed.

APPENDIX A BATTERY TEST PROCESS

It is recommended that this test is conducted at least 24 hours after the vehicle engine has been run or the battery charged to avoid the need of surface charge removal or if this time constraint is unacceptable due to circumstances, then conduct the charge strip removal process.

Part 1 - Surface Charge Removal

• NOTE: Before carrying out a battery test you must ensure that there is no battery surface charge present.

• NOTE: The battery may be tested either on a bench or on the vehicle.

- In the case of on-vehicle testing, the battery must be isolated from the vehicle by removal of the battery negative (-) cable from the battery terminal before the measurement is taken unless the vehicle has a transit relay fitted or is in transit mode.

A vehicle which has had its battery charged or been driven in a 24 hour period before the test, must have its surface charge removed using one of the following methods:

1. If 24 hours have passed since the last time the engine was run or the battery charged, proceed to `Part 2 - Battery Test'.

2. Turn on the ignition. Switch on the headlamps on high beam for a minimum 3 minutes.

3. Switch off the headlamps. For vehicles tested after the transit relay has been removed, disconnect the battery by removal of the negative (-) cable. Vehicles with a transit relay fitted or with a low current transport mode enabled do not need to have the battery disconnected.

4. Wait a maximum of 5 minutes before recording test results for any battery measurements.

Part 2 - Battery Test

• NOTE: The battery surface charge must be removed before this test in accordance with the procedure in Part 1 above. Ensure that the battery terminal connectors are clean. When connecting the Midtronics testing equipment, connect the RED clip to the positive (+) battery terminal first, and then connect the BLACK clip to the negative (-) battery terminal. Rock the clips backward and forward to ensure a good connection to the battery.

• NOTE: Midtronics 393, 394. 493 and 494 testers must not be used to test AGM batteries as these testers are not capable of correctly testing AGM batteries and can give an incorrect result. For AGM battery testing use the EXP1080 tester or the GR1 Diagnostics charger.

⚠ CAUTION: **DO NOT** connect the tester to any other circuit or chassis point other than the battery negative terminal.

1. Attach the Midtronics tester to the battery.

2. Follow the instructions on the tester to test the battery. Ensure the correct battery type and size is selected.

3. Perform the action based on the tester results (see table below).

4. Enter the readings and test code obtained on the Battery Report Form (Appendix B) or equivalent which records as a minimum the technician's name, Vehicle Identification Number (VIN), Date of check, Midtronics code and Battery Voltage from the Midtronics tester.

At the end of the test, the battery negative (-) cable should be re-attached to the battery terminal.

TESTER RESULTS	**ACTION**
GOOD BATTERY	Return to service.
GOOD RE-CHARGE	Fully charge battery and return to service.
CHARGE AND RE-TEST	Fully charge battery. Remove surface charge. Re-test battery. If same result replace battery.
REPLACE BATTERY OR BAD CELL BATTERY	Verify surface charge removed. Disconnect battery from vehicle and re-test. If result repeats after surface charge removal, replace battery. **DO NOT RECHARGE**.
UNABLE TO DO TEST	Disconnect battery from vehicle and re-test.

APPENDIX B : BATTERY REPORT FORM - IN SERVICE BATTERIES ONLY

- NOTE: Fields marked with * are mandatory and must be completed.

General Information	**YES / NO**		**YES / NO**	
Customer Name:		Dealer/Retailer Code:	*	
Repair Order Number:	*	Battery Date Code:	*	
Repair Order Date:	*	Number of Times Battery Charged:	*	
Repair Order Date:		Technicians Name:	*	
Vehicle Identification Number (VIN):	*	Technicians Signature:	*	
Give a detailed description of the symptoms experienced by the customer (attach a separate sheet if necessary)				
-				
-				
-				
-				
-				
-				
Diagnostics (Battery Testing)				
1: Loose battery clamps	Yes	*	No	*
2: Loose hold down clamps	Yes		No	
3: Corroded terminal posts	Yes	*	No	*
4: Physical damage/leaks	Yes		No	
5: Low electrolyte	Yes	*	No	*
6: FEAD belt tension	OK	*	Not OK	*
7: Surface charge removed	Yes	*	No	*
8: Voltage (appendix A)	Yes	*	No	*
9: Quiescent Drain	mA	*		
10: Vent tube correctly installed	Yes		No	
11: Midtronics test				
Code before charging	*			
If Midtronics indicates that the battery needs re-charging, charge the battery for 24 hours				
Code after charge	*			
Result after charge	*			
If "good and re-charge" charge the battery for an additional 24 hours.				
If "charge and re-test" for both before and after 24 hours charge renew the battery				
Only renew the battery if "renew battery", "bad cell" or charge and re-test has been displayed twice.				
Comments				
-				
-				
-				
-				
-				

Published: 20-Oct-2011

Battery and Charging System - General Information - Quiescent Drain

Description and Operation

QUIESCENT DRAIN - TYPICAL VALUES

• NOTE: The quiescent drain after the initial shutdown period should not exceed the value shown in the table.

Land Rover Quiescent Drain Values

MODEL	SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
Range Rover (LM) - Up to 2009MY	30	16.0 - 18.0
Range Rover (LM) - From 2010MY	20 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
Range Rover Sport (LS) - Up to 2007MY	20	<22
Range Rover Sport (LS) - From 2007MY to 2010MY	30	<25
Range Rover Sport (LS) - From 2010MY	3 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
Range Rover Evoque (LV) - From 2012MY	20 (after lock and arm condition)	<20
Discovery 3/LR3 (LA) - Up to 2007MY	20	<22
Discovery 3/LR3 (LA) - From 2007MY to 2010MY	30	<25
Discovery 4/LR4 (LA) - From 2010MY	3 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
Freelander 2/LR2 (LF) - From 2007MY	35 (single locked or unlocked)	<23.6
	12 (double locked)	<23.6
Freelander (LN) - Up to 2007MY	10	24-25 - without Becker Navigation system
	10	27-28 - with Becker Navigation system
Defender (LD) - 1998MY to 2007MY	30	<21
Defender (LD) - from 2007MY	<30	<30
Discovery Series 2 (LT)	30	<30

• NOTE:

1. The total current drain will be higher if certain approved accessories are fitted (for example: tracker, trailer module, etc.)

2. Applies to vehicles without Tire Pressure Monitoring System (TPMS). Vehicle shut-down period with TPMS is approximately 15 minutes.

Published: 11-May-2011

Battery, Mounting and Cables -

General Specification

Item	Specification	Land Rover Part No.
Battery - 4.2 and 4.4 litre petrol engines:		
● Voltage ● Capacity ● Reserve capacity	● 12 ● 75 amp/hour, 690 amps ● 150 minutes	YGD500030
Battery - 2.7 litre diesel engine:		
● Voltage ● Capacity ● Reserve capacity	● 12 ● 90amp/hour, 825 amps ● 190 minutes	YGD500040

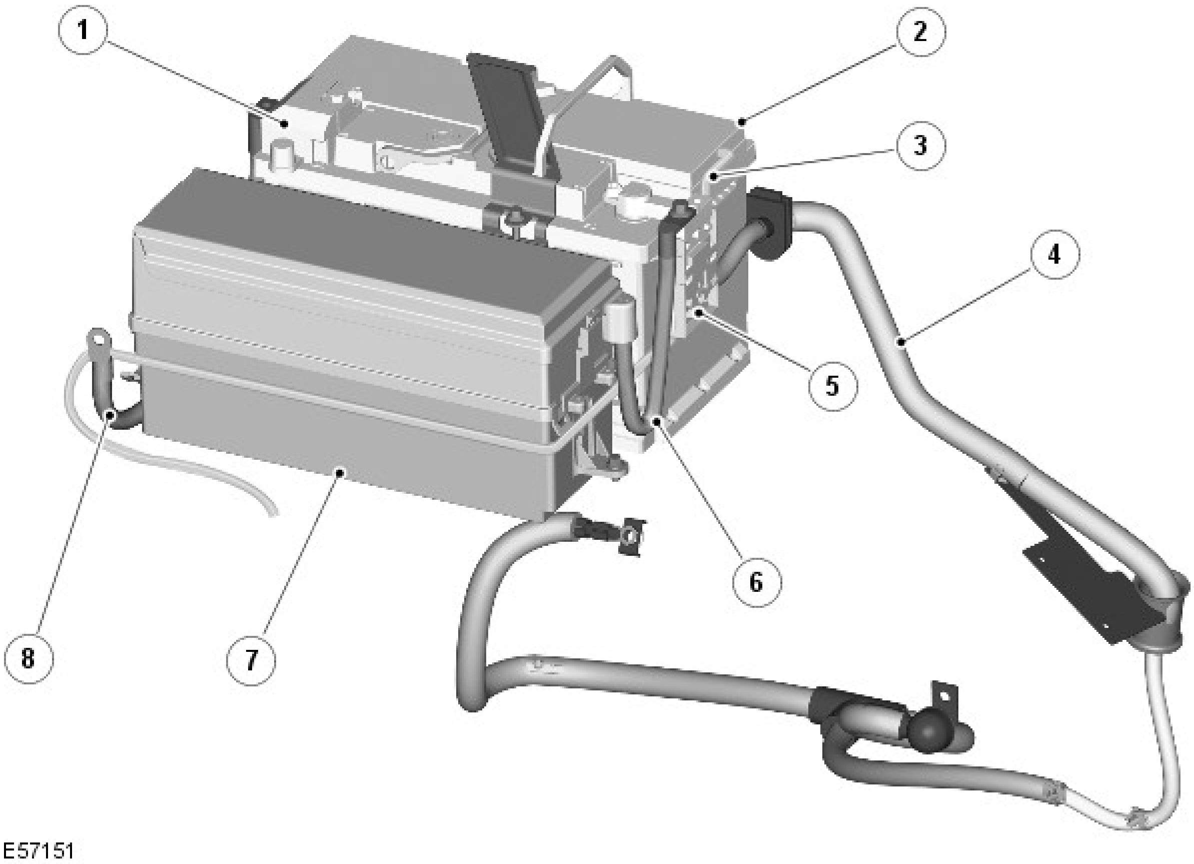
Torque Specifications

Description	Nm	lb-ft
Battery clamp bolts	5	4
Battery terminal nuts	5	4
Battery tray nuts	12	9
Auxiliary battery tray nuts	12	9

Published: 11-May-2011

Battery, Mounting and Cables - Battery and Cables

Description and Operation



Item	Part Number	Description
1	-	Transit relay
2	-	Battery
3	-	Vent pipe
4	-	Positive (+VE) battery cable
5	-	Megafuse
6	-	Power feed to the Battery Junction Box (BJB)
7	-	BJB
8	-	Negative (-VE) battery cable

OVERVIEW

The battery is mounted in a protective box, located in the engine compartment, on the passenger side. It sits in a tray and is secured with clamp plates and bolts.

The battery terminal posts allow for the battery cables to be connected with clamp type connections.

The battery positive terminal is fitted with a mega fuse, which is a 400 Amp device housed in a black fuse carrier, integral to the battery clamp. Power feed to the BJB is taken from a tap on the battery clamp before the mega fuse.

In the event of a crash the mega fuse is designed to blow, this isolates the power from the generator and starter motor, but allows power to be delivered, via the CJB, to the rest of the vehicle.

There are two different battery sizes:

- H7 - All petrol variants
- H8 - All diesel variants

The battery has a vent pipe to allow for thermal expansion and to vent oxygen and hydrogen gases, which are produced under certain charging conditions.

When removing the battery, ensure the alarm is disarmed and the ignition is switched off. Always disconnect the negative terminal first and then the positive. When refitting the battery, always fit the positive terminal first followed by the negative.

If the battery requires recharging, always use an approved constant current charger, designed for lead-calcium batteries. DO NOT use a fast charger, as permanent damage to the battery may occur.

Delivery Mode

The vehicle is fitted with a transit relay which must be removed before delivery of the vehicle to the customer. This is a disposable device and **NOT** for use by the customer. This relay fits in series with the battery and ground; it disconnects the battery from the vehicle's ground and thus eliminates quiescent current during delivery. The relay must be removed before delivery to the customer. The connector to the relay has a permanent live feed and therefore must be stowed on the given stowage point.

Published: 11-May-2011

Battery, Mounting and Cables - Battery

Diagnosis and Testing

For additional information, refer to section 414-00 - Charging System of the workshop manual.

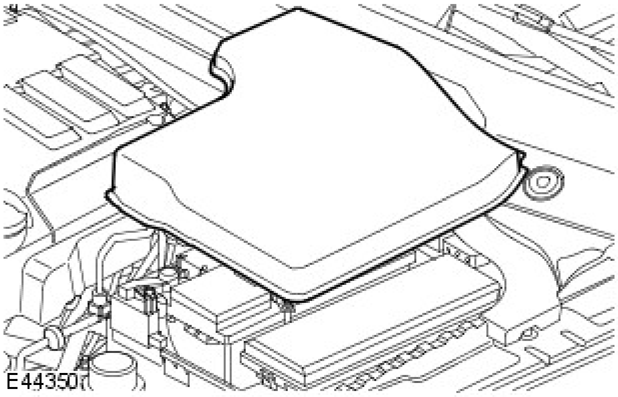
Published: 11-May-2011

Battery, Mounting and Cables - Battery

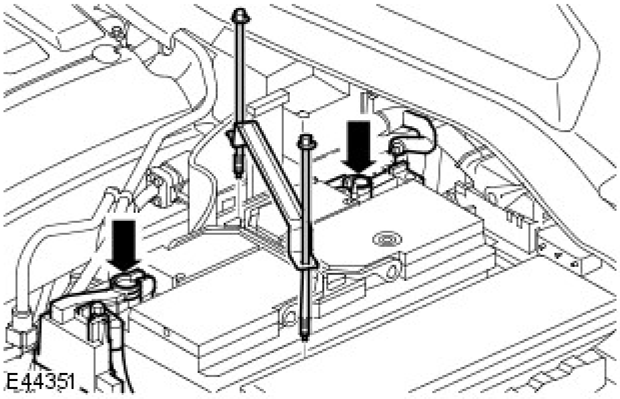
Removal and Installation

Removal

1. Secure the hood in the service position.
   - Release the support struts.
2. Remove the battery cover.



3. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
4. Disconnect the battery positive cable.
5. Remove 2 bolts securing the battery clamp and remove the clamp.



6. Remove the battery.

Installation

1. NOTE: Apply petroleum jelly to the battery terminals.

   To install, reverse the removal procedure.
   - Tighten the battery clamp bolts to 5 Nm (4 lb.ft).
   - Tighten the battery terminals to 5 Nm (4 lb.ft).

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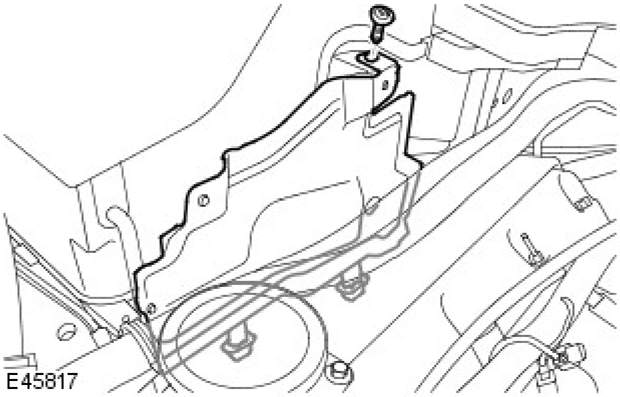
Battery, Mounting and Cables - Battery Tray

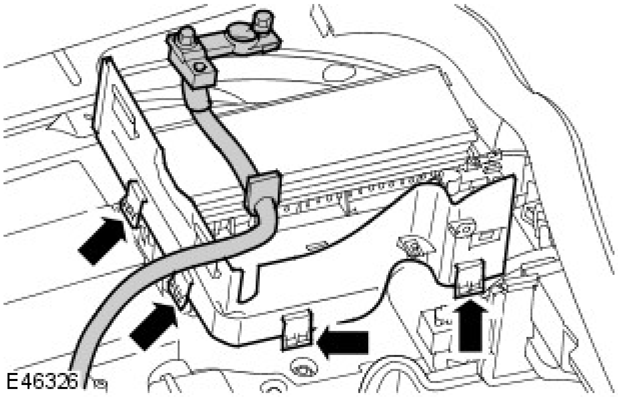
Removal and Installation

Removal

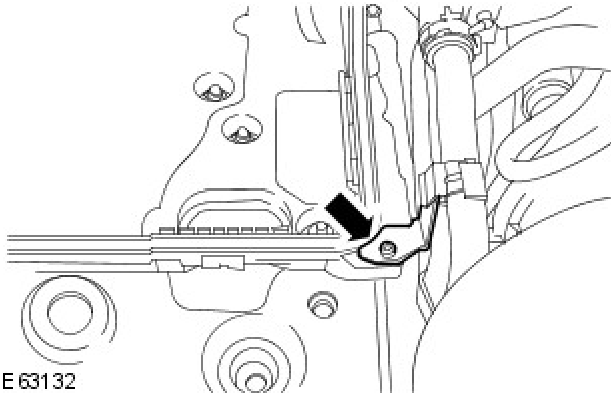
1. Remove the battery.
For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).



2. Remove the engine compartment upper heat shield.
   - Remove the screw.
   - Release the 2 clips.



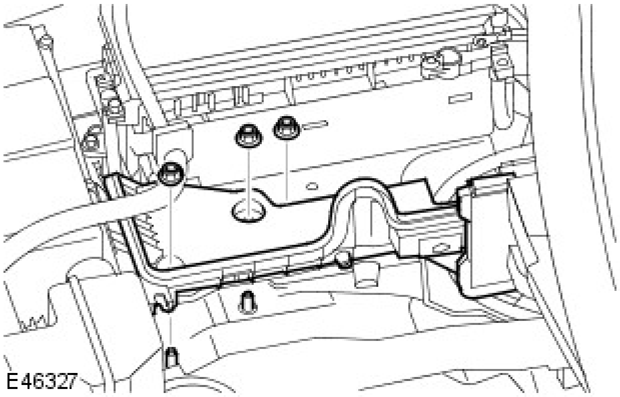
3. Remove the battery compartment side wall.
   - Release the battery positive cable and grommet.
   - Release the four clips.



4. Release the heater pipes.
   - Remove the retaining screw.

5. Remove the battery tray.

- Remove the three retaining nuts.



Installation

1. To install, reverse the removal procedure.

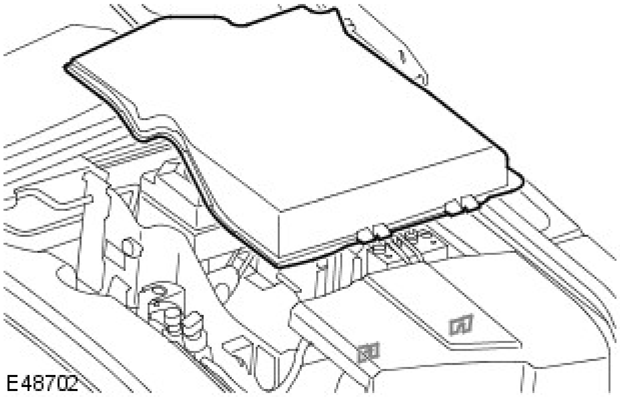
- Tighten the nuts to 12 Nm (9 lb.ft).

Published: 11-May-2011

Battery, Mounting and Cables - Auxiliary Battery Tray

Removal and Installation

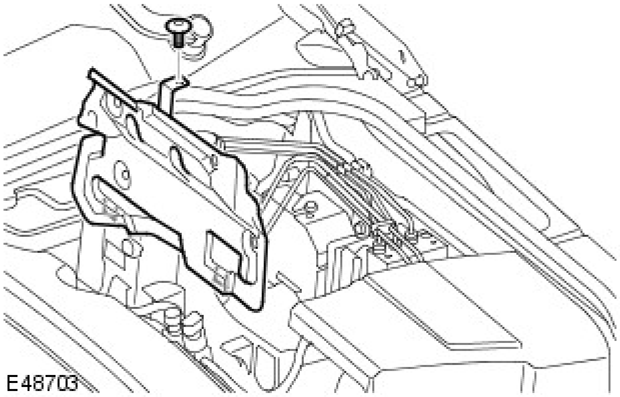
Removal



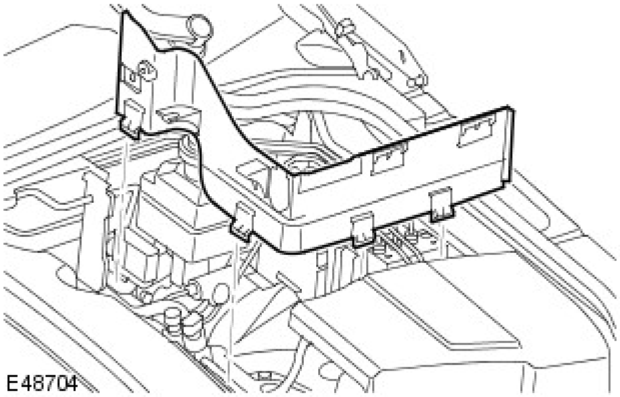
1. Remove the battery cover.
   - Release the 2 clips.

2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

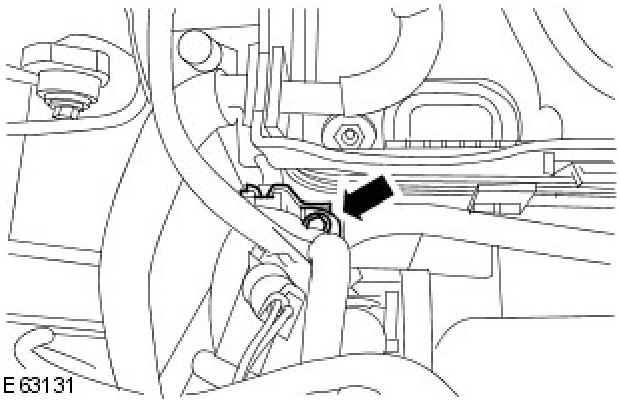
3. If installed, remove the auxiliary battery.



4. Remove the engine compartment upper heat shield.
   - Remove the screw.
   - Release the 2 clips.

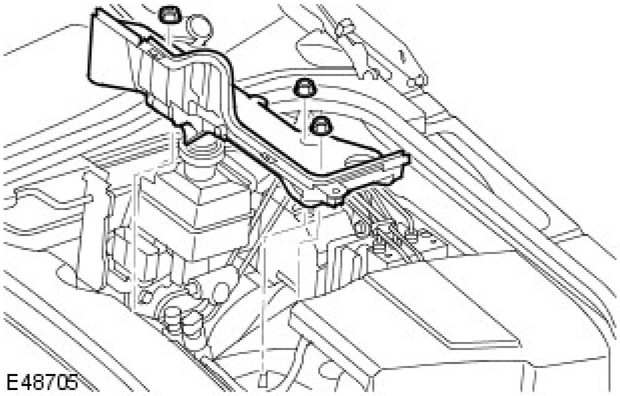


5. Remove the auxiliary battery compartment side wall.
   - Release the battery positive cable and grommet.
   - Release the four clips.



6. Release the A/C pipes.

- Remove the retaining screw.



7. Remove the auxiliary battery tray.

- Remove the three retaining nuts.

Installation

1. To install, reverse the removal procedure.

- Tighten the nuts to 12 Nm (9 lb.ft).

Published: 11-May-2011

Generator and Regulator - V8 S/C 4.2L Petrol -

General Specification

Item	Specification
Generator:	
Make/Type	Denso SC2
Output	90/150 amps @ 25º C
Voltage control	By Power Control Module (PCM)
Voltage setpoint regulation	Controlled by Engine Management System (EMS)

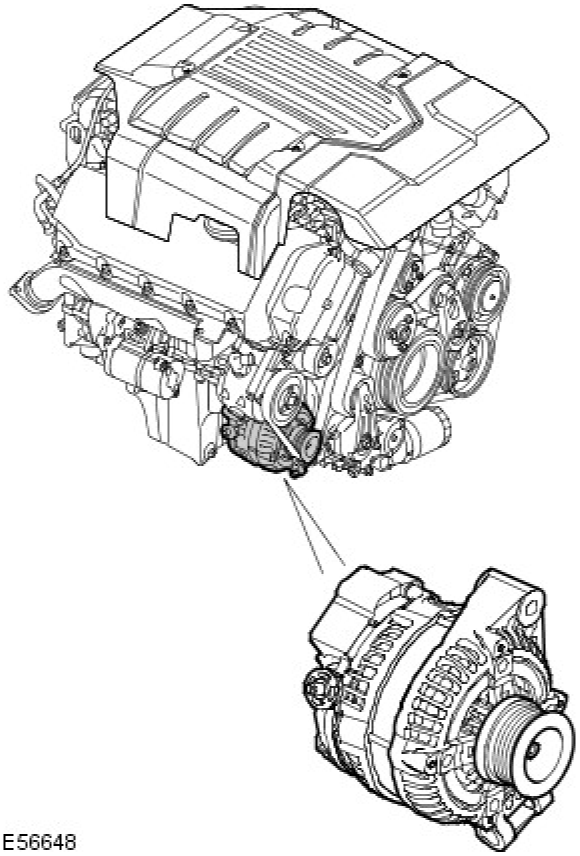
Torque Specifications

Description	Nm	lb-ft
* Battery harness connection nut	10	7

⚠ CAUTION: * Damage to the internal connections will result if this torque is exceeded

Generator and Regulator - V8 S/C 4.2L Petrol - Generator

Description and Operation



E56648

GENERAL

The generator is located at the front RH side of the engine, on the cylinder block. The generator has an output of 85/150 Amps and is manufactured by Denso. A six-ribbed polyvee belt drives the generator pulley, which in turn is driven from the engine crankshaft pulley.

The generator comprises a stator, a rotor, a rectifier pack and a regulator. There is a three-pin connector (C0053) on the generator:

Pin Number	Description
Pin 1	Voltage reference line to the battery via the Battery Junction Box (BJB), this runs through a fuse in the BJB. If the fuse is blown, the ignition/no charge warning indicator will illuminate.
Pin 2	Pulse Width Modulated (PWM) signal from the Engine Control Module (ECM) to the generator (generator control)
Pin 3	PWM signal from the generator to the ECM (generator monitoring)

The generator is connected to ground via its mountings.

The rotor comprises a field winding, wound around an iron core and mounted on a shaft. The iron core has extensions at each end, which form North and South poles as current flows through the field winding. The rotor is located inside the stator and is mounted on bearings for smooth running and to support the rotor due to the high side loading applied by the drive belt tension.

The stator has three sets of coils made from copper wire. The three coil windings are connected in a 'star' connection, where one end of the winding is connected to the other two windings. The output current is supplied from the opposite end of each winding. Rotation of the rotor causes ac current to be produced in the coils.

The rectifier converts the ac current produced in the stator coils into dc (rectified) current required by the vehicle electrical system. The rectifier comprises semi-conductor diodes mounted on a heatsink to dissipate heat. An equal number of the diodes are on the negative and positive side. An additional diode in the regulator controls feedback through the battery voltage signal line. The rectifier also prevents current flow from the battery to the generator when the output voltage is less than the battery voltage.

The 'smart' regulator controls the output voltage from the generator to protect the battery; at low temperatures battery charge acceptance is very poor so the voltage needs to be high to maximise any re-chargeability, but at high temperatures the charge voltage must be restricted to prevent excessive gassing with consequent water loss. The Engine Management System (EMS), which controls the regulator, will calculate the voltage set point required for the ensuing conditions. The 'traditional' regulator controls voltage against generator temperature, which means the battery temperature will lag a long way behind so there will be significant periods of operation when battery charging is compromised. With this system, the EMS can set the voltage by inferring the battery temperature from information received from it's various sensors, hence voltage will acurately follow the battery's needs.

The regulator has transistors, which rapidly switch on and off to regulate the voltage output according to the voltage sensed internally. The regulator also provides a PWM signal output to the ECM, which uses the signal to adjust the idle speed under varying electrical loads.

Initially, the ignition switch supply provides an excitation current to the rotor at low generator speeds via brushes, which contact slip rings at the end of the rotor shaft. As the generator speed increases the generator becomes self-exciting.

The charge warning lamp function is transmitted to the EMS and then on to the Controller Area Network (CAN) bus to the instrument cluster.

LOAD MANAGEMENT SYSTEM

The load management system comprises software resident in the Automatic Temperature Control (ATC) module . Its purpose is to protect battery state-of-charge during abnormal usage of the vehicle. The system will request the Media Orientated System Transport (MOST) ring and the air suspension to go into 'power save' mode, and will modulate features such as seat heating and screen heating to prevent the battery being dragged down to a point where the car becomes un-operational. A 'WARNING - LOW BATTERY' message will be displayed in the message center.

Published: 11-May-2011

Generator and Regulator - V8 S/C 4.2L Petrol - Generator

Diagnosis and Testing

For additional information, refer to section 414-00 - Charging System in the owrkshop manual.

Published: 11-May-2011

Generator and Regulator - V8 S/C 4.2L Petrol - Generator

Removal and Installation

Removal

1. ⚠ WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

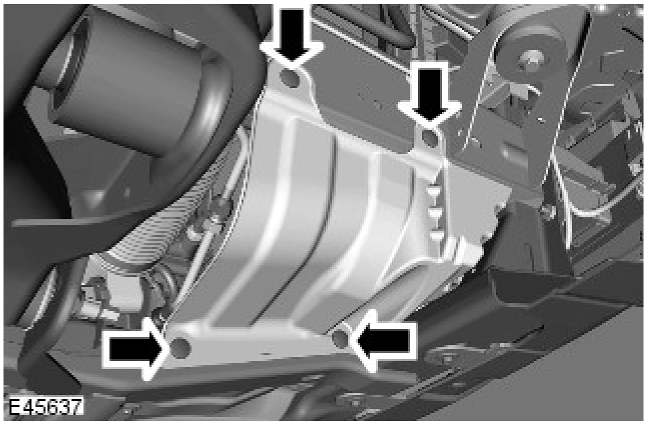
2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

4. Remove the front wheel.

5. Remove the front RH splash shield.

   - Remove the 4 clips.

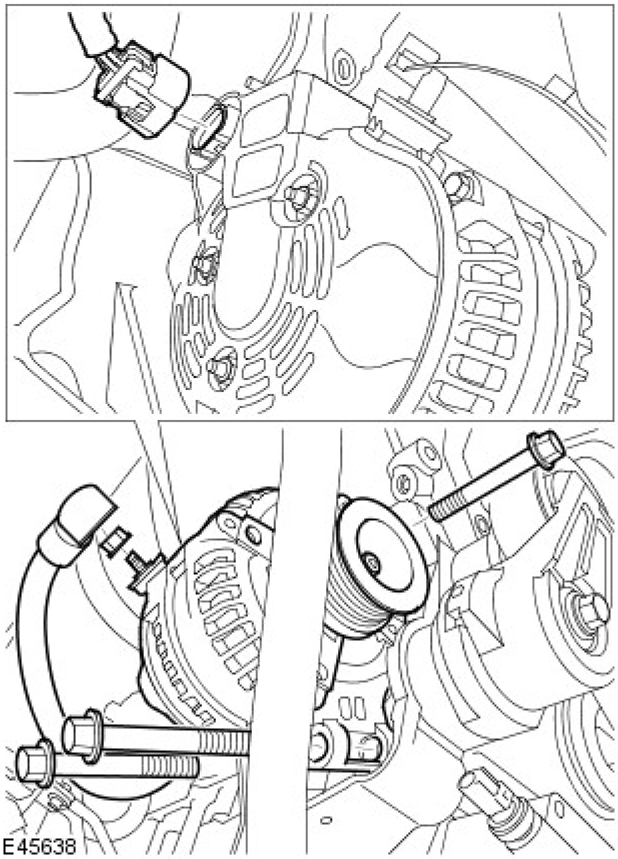


6. Remove the battery positive cable.

   - Release the battery positive cable cover.
   - Remove the retaining nut.
   - Disconnect the generator electrical connectors.

7. Remove the generator.

- Remove the 3 bolts.



Installation

1. Install the battery positive cable.

- Connect the battery positive cable.
- Tighten the retaining nut to 12 Nm (9 lb.ft).
- Connect the generator electrical connector.

2. Install the generator.

- Install and tighten the generator upper fixing bolt, before the lower bolts.
- Tighten the 3 bolts to 48 Nm (35 lb.ft).

3. Install the front RH splash shield.

- Carefully secure the clips.

4. Install the front wheel.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

5. Install the accessory drive belt.
For additional information, refer to: Accessory Drive Belt (303-05A Accessory Drive - V8 S/C 4.2L Petrol, Removal and Installation).

6. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

7. Lower the vehicle.

Published: 11-May-2011

Generator and Regulator - V8 4.4L Petrol -

General Specification

Item	Specification
Generator:	
Make/Type	Denso SC2
Output	90/150 amps @ 25º C
Voltage control	By Power Control Module (PCM)
Voltage setpoint regulation	Controlled by Engine Management System (EMS)

Torque Specifications

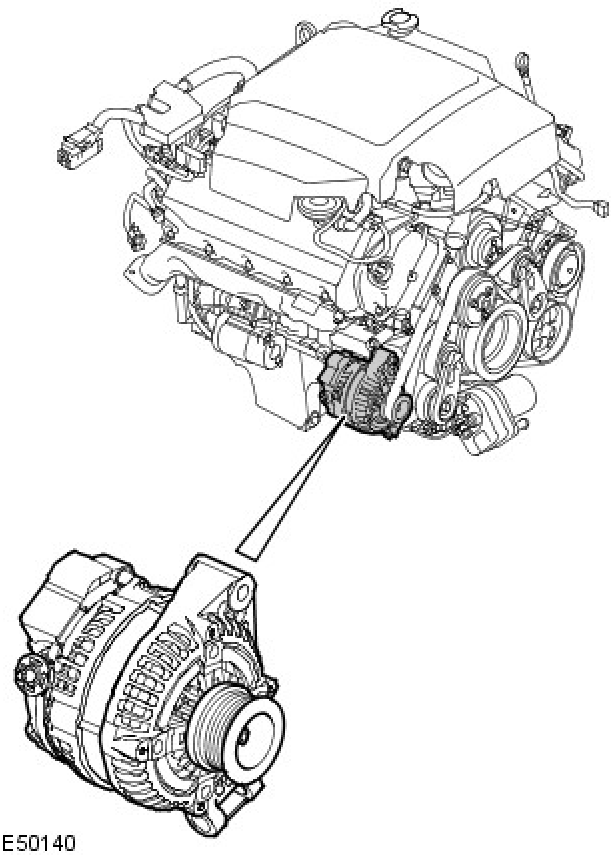
Description	Nm	lb-ft
* Battery harness connection nut	10	7

⚠ CAUTION: * Damage to the internal connections will result if this torque is exceeded

Published: 11-May-2011

Generator and Regulator - V8 4.4L Petrol - Generator

Description and Operation



E50140

The generator is located at the front RH side of the engine, on the cylinder block. The generator has an output of 85/150 Amps and is manufactured by Denso. A six-ribbed polyvee belt drives the generator pulley, which in turn is driven from the engine crankshaft pulley.

The generator comprises a stator, a rotor, a rectifier pack and a regulator. There is a three-pin connector (C0053) on the generator:

Pin Number	Description
Pin 1	Voltage reference line to the battery via the Battery Junction Box (BJB), this runs through a fuse in the BJB. If the fuse is blown, the ignition/no charge warning indicator will illuminate.
Pin 2	Pulse Width Modulated (PWM) signal from the Engine Control Module (ECM) to the generator (generator control)
Pin 3	PWM signal from the generator to the ECM (generator monitoring)

The generator is connected to ground via its mountings.

The rotor comprises a field winding, wound around an iron core and mounted on a shaft. The iron core has extensions at each end, which form North and South poles as current flows through the field winding. The rotor is located inside the stator and is mounted on bearings for smooth running and to support the rotor due to the high side loading applied by the drive belt tension.

The stator has three sets of coils made from copper wire. The three coil windings are connected in a 'star' connection, where one end of the winding is connected to the other two windings. The output current is supplied from the opposite end of each winding. Rotation of the rotor causes ac current to be produced in the coils.

The rectifier converts the ac current produced in the stator coils into dc (rectified) current required by the vehicle electrical system. The rectifier comprises semi-conductor diodes mounted on a heatsink to dissipate heat. An equal number of the diodes are on the negative and positive side. An additional diode in the regulator controls feedback through the battery voltage signal line. The rectifier also prevents current flow from the battery to the generator when the output voltage is less than the battery voltage.

The 'smart' regulator controls the output voltage from the generator to protect the battery; at low temperatures battery charge acceptance is very poor so the voltage needs to be high to maximise any re-chargeability, but at high temperatures the charge voltage must be restricted to prevent excessive gassing with consequent water loss. The Engine Management System (EMS), which controls the regulator, will calculate the voltage set point required for the ensuing conditions. The 'traditional' regulator controls voltage against generator temperature, which means the battery temperature will lag a long way behind so there will be significant periods of operation when battery charging is compromised. With this system, the EMS can set the voltage by inferring the battery temperature from information received from it's various sensors, hence voltage will accurately follow the battery's needs.

The regulator has transistors, which rapidly switch on and off to regulate the voltage output according to the voltage sensed internally. The regulator also provides a PWM signal output to the ECM, which uses the signal to adjust the idle speed under varying electrical loads.

Initially, the ignition switch supply provides an excitation current to the rotor at low generator speeds via brushes, which contact slip rings at the end of the rotor shaft. As the generator speed increases the generator becomes self-exciting.

The charge warning lamp function is transmitted to the EMS and then on to the Controller Area Network (CAN) bus to the instrument cluster.

LOAD MANAGEMENT SYSTEM

The load management system comprises software resident in the Automatic Temperature Control (ATC) module.
For additional information, refer to: Control Components (412-04 Control Components, Description and Operation).
Its purpose is to protect battery state-of-charge during abnormal usage of the vehicle. The system will request the Media Orientated System Transport (MOST) ring and the air suspension to go into 'power save' mode, and will modulate features such as seat heating and screen heating to prevent the battery being dragged down to a point where the car becomes un-operational. A 'WARNING - LOW BATTERY' message will be displayed in the message center.

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Generator and Regulator - V8 4.4L Petrol - Generator

Diagnosis and Testing

For additional information, refer to section 414-00 - Charging System in the owrkshop manual.

Published: 11-May-2011

Generator and Regulator - V8 4.4L Petrol - Generator

Removal and Installation

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

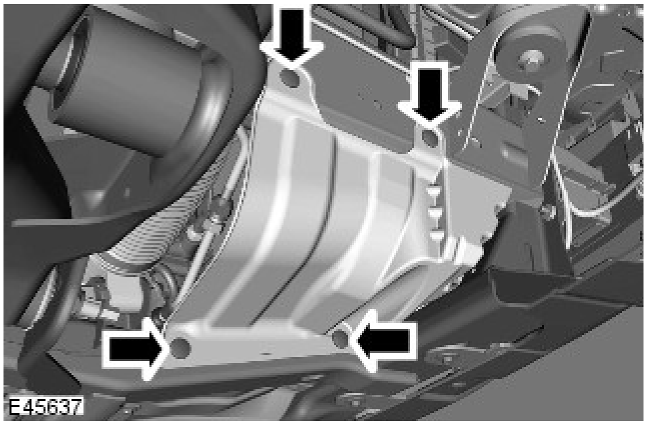
   Raise and support the vehicle.

2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Remove the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).

4. Remove the front wheel.

5. Remove the splash shield.
   For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

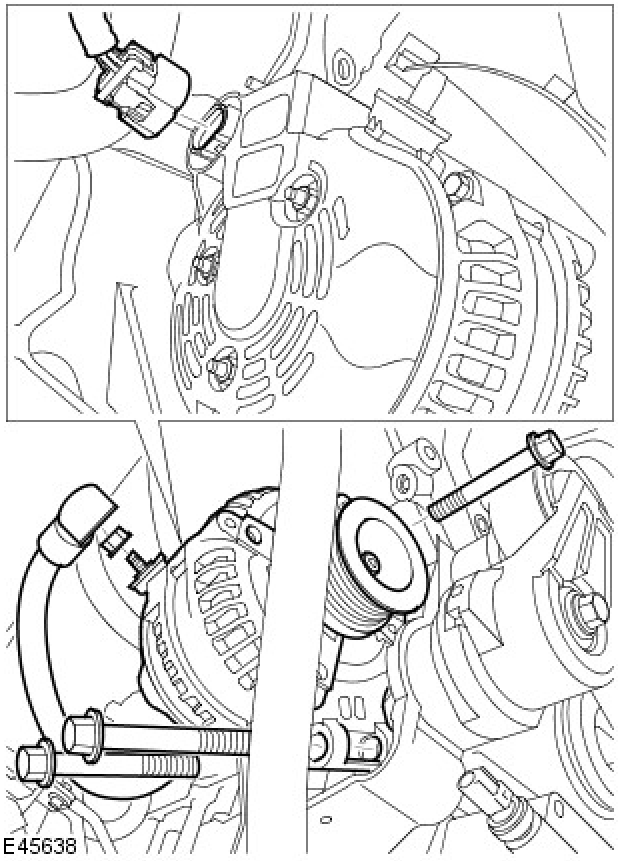


6. Remove the generator splash shield.
   - Remove the 4 clips.

7. Remove the battery positive cable.
   - Release the battery positive cable cover.
   - Remove the retaining nut.
   - Disconnect the generator electrical connectors.

8. Remove the generator.

- Remove the 3 bolts.



Installation

1. Install the battery positive cable.

   - Connect the battery positive cable.
   - Tighten the retaining nut to 10 Nm (7 lb.ft).
   - Connect the generator electrical connector.

2. Install the generator.

   - Tighten the 3 bolts to 48 Nm (35 lb.ft).

3. Install the generator splash shield.
4. Install the splash shield.
   For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).
5. Install the front wheel.

   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

6. Install the accessory drive belt.
   For additional information, refer to: Accessory Drive Belt (303-05B Accessory Drive - V8 4.4L Petrol, Removal and Installation).
7. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
8. Lower the vehicle.

Published: 11-May-2011

Generator and Regulator - TDV6 2.7L Diesel -

General Specification

Item	Specification
Generator:	
Make/Type	Denso SC2
Output	90/150 amps @ 25º C
Voltage control	By Power Control Module (PCM)
Voltage setpoint regulation	Controlled by Engine Management System (EMS)

Torque Specifications

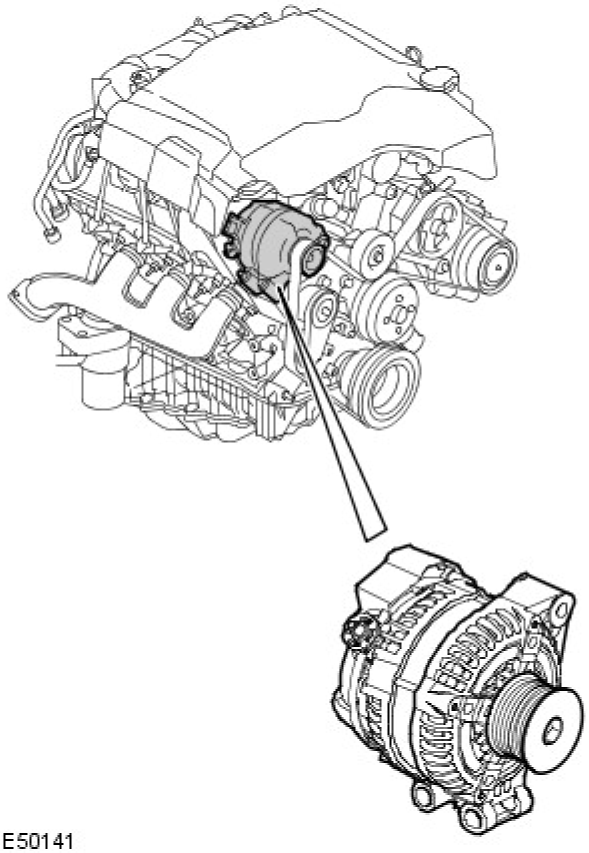
Description	Nm	lb-ft
* Battery harness connection nut	10	7

⚠ CAUTION: * Damage to the internal connections will result if this torque is exceeded

Published: 11-May-2011

Generator and Regulator - TDV6 2.7L Diesel - Generator

Description and Operation



E50141

GENERAL

The generator is located at the front RH side of the engine, in front of the RH cylinder head. The generator has an output of 85/150 Amps and is manufactured by Denso. An eight-ribbed polyvee belt drives the generator pulley, which in turn is driven from the engine crankshaft pulley.

The generator pulley incorporates a one-way clutch mechanism, which allows the pulley to free wheel, reducing the amount of inertia applied to the engine during deceleration (coast).

The generator comprises a stator, a rotor, a rectifier pack and a regulator. There is a three-pin connector (C0053) on the generator:

Pin Number	Description
Pin 1	Voltage reference line to the battery via the Battery Junction Box (BJB), this runs through a fuse in the BJB. If the fuse is blown, the ignition/no charge warning indicator will illuminate.
Pin 2	Pulse Width Modulated (PWM) signal from the Engine Control Module (ECM) to the generator (generator control)
Pin 3	PWM signal from the generator to the ECM (generator monitoring)

The generator is connected to ground via its mountings.

The rotor comprises a field winding, wound around an iron core and mounted on a shaft. The iron core has extensions at each end, which form North and South poles as current flows through the field winding. The rotor is located inside the stator and is mounted on bearings for smooth running and to support the rotor due to the high side loading applied by the drive belt tension.

The stator has three sets of coils made from copper wire. The three coil windings are connected in a 'star' connection, where one end of the winding is connected to the other two windings. The output current is supplied from the opposite end of each winding. Rotation of the rotor causes ac current to be produced in the coils.

The rectifier converts the ac current produced in the stator coils into dc (rectified) current required by the vehicle electrical system. The rectifier comprises semi-conductor diodes mounted on a heatsink to dissipate heat. An equal number of the diodes are on the negative and positive side. An additional diode in the regulator controls feedback through the battery voltage signal line. The rectifier also prevents current flow from the battery to the generator when the output voltage is less than the battery voltage.

The 'smart' regulator controls the output voltage from the generator to protect the battery; at low temperatures battery charge acceptance is very poor so the voltage needs to be high to maximise any re-chargeability, but at high temperatures the charge voltage must be restricted to prevent excessive gassing with consequent water loss. The Engine Management System (EMS), which controls the regulator, will calculate the voltage set point required for the ensuing conditions. The 'traditional' regulator controls voltage against generator temperature, which means the battery temperature will lag a long way behind so there will be significant periods of operation when battery charging is compromised. With this system, the EMS can set the voltage by inferring the battery temperature from information received from it's various sensors, hence voltage will accurately follow the battery's needs.

The regulator has transistors, which rapidly switch on and off to regulate the voltage output according to the voltage sensed internally. The regulator also provides a PWM signal output to the ECM, which uses the signal to adjust the idle speed under varying electrical loads.

Initially, the ignition switch supply provides an excitation current to the rotor at low generator speeds via brushes, which contact slip rings at the end of the rotor shaft. As the generator speed increases the generator becomes self-exciting.

The charge warning lamp function is transmitted to the EMS and then on to the Controller Area Network (CAN) bus to the instrument cluster.

LOAD MANAGEMENT SYSTEM

The load management system comprises software resident in the Automatic Temperature Control (ATC) module .
For additional information, refer to: Control Components (412-04 Control Components, Description and Operation).
Its purpose is to protect battery state-of-charge during abnormal usage of the vehicle. The system will request the Media Orientated System Transport (MOST) ring and the air suspension to go into 'power save' mode, and will modulate features such as seat heating and screen heating to prevent the battery being dragged down to a point where the car becomes un-operational. A 'WARNING - LOW BATTERY' message will be displayed in the message center.

Published: 11-May-2011

Generator and Regulator - TDV6 2.7L Diesel - Generator

Diagnosis and Testing

For additional information.
REFER to: Charging System (414-00 Battery and Charging System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Information and Entertainment System - General Information - Audio System

Diagnosis and Testing

Overview

The audio system combines a number of the networks and modules on the vehicle to provide a full entertainment package to the passengers.

Because of the complexity of the system, there are different techniques involved in diagnosing the system, as the networks used include controller area network (CAN) and media oriented system transport (MOST).

For information on the description and operation of the audio system, refer to the relevant section of the workshop manual. For information on diagnosis of the networks, refer to the Network Communications section of the workshop manual.

Inspection and verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Audio unit condition and installation ● Speaker condition and installation ● Amplifier condition and installation ● Satellite digital audio radio service system (SDARS) condition and installation ● Remote control condition and installation ● SDARS /global positioning system (GPS)/telephone antenna ● Side and rear screen antennae ● Antenna amplifiers ● Audio/Video Input/Output (AVIO) panel	● Fuses - CJB - fuse 42P - CJB - fuse 52P - CJB - fuse 53P - CJB - fuse 57P - CJB - fuse 58P - BJB - fuse 18E ● Electrical harnesses ● Fibre optic cable harnesses ● Harness connectors ● Infotainment relay ● CAN circuits ● MOST circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the symptom chart or DTC index.
    - ○ Because the DTCs are stored in more than one module, a complete vehicle read is recommended.
    - ○ Make sure that all DTCs are cleared following rectification.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

Audio Amplifier Module (AAM)

DTC	Description	Possible causes	Action
B1A004B	Control Module	● Amplifier shutdown requested (over-temperature)	Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1A0113	Speaker #1	● Left-hand rear door speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A011A	Speaker #1	● Left-hand rear door speaker circuit short circuit to ground ● Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0213	Speaker #2	● Right-hand rear door speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
B1A021A	Speaker #2	- Right-hand rear door speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0313	Speaker #3	- Left-hand front mid/high range speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A031A	Speaker #3	- Left-hand front mid/high range speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0413	Speaker #4	- Right-hand front mid/high range speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A041A	Speaker #4	- Right-hand front mid/high range speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0513	Speaker #5	- Left-hand bass speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A051A	Speaker #5	- Left-hand bass speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0613	Speaker #6	- Right-hand bass speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A061A	Speaker #6	- Right-hand bass speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0713	Speaker #7	- Left-hand front bass speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A071A	Speaker #7	- Left-hand front bass speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0813	Speaker #8	- Right-hand front bass speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A081A	Speaker #8	- Right-hand front bass speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A0913	Speaker #9	- Left-hand rear surround speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A091A	Speaker #9	- Left-hand rear surround speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A1013	Speaker #10	- Right-hand rear surround speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
B1A101A	Speaker #10	- Right-hand rear surround speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A1113	Speaker #11	- Front center fill speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A111A	Speaker #11	- Front center fill speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A1213	Speaker #12	- Bass speaker circuit high resistance	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A121A	Speaker #12	- Bass speaker circuit short circuit to ground - Speaker circuit short circuit to power	Refer to the electrical guides and check the speaker circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A9668	Bus Still Active After Shut-Down Request	- Light still active 2 seconds after shut-down request	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
B1D8413	Headphone Panel 1	- Headphone panel 1 circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D8513	Headphone Panel 2	- Headphone panel 2 circuit high resistance	Check the power and ground circuits to the component. Refer to the electrical guides.
B1D8613	Headphone Panel 3	- Headphone panel 3 circuit high resistance	Check the power and ground circuits to the component. Refer to the electrical guides.
B1D8713	Headphone Panel 4	- Headphone panel 4 circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

Audio Control Module (ACM)

• NOTE: Integrated Head Unit (IHU)

DTC	Description	Possible causes	Action
B1A5601	Antenna	- Antenna connection is broken	Refer to the electrical guides and check the antenna circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D2101	Remote Control Switch	- General electrical failure	Check the power and ground circuits to the component. Refer to the electrical guides.
B1D2115	Remote Control Switch	- Remote control switch circuit short circuit to power - Remote control switch circuit high resistance	Refer to the electrical guides and check the remote control circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D7901	Microphone Input	- Microphone circuit open circuit, short circuit to ground or short circuit to power - Microphone configuration mismatched with CCF	Refer to the electrical guides and check the microphone input circuit. Configure the system using the approved diagnostic system. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
U001087	Medium Speed CAN Communication Bus	- Missing message from audio unit	Check the CAN circuits. Refer to the electrical guides. Refer to the Network Communications section of the workshop manual.
U007388	Control Module Communication Bus "A" Off	- Bus off	Check for other DTCs. Clear all DTCs and a road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue. Refer to the Network Communications section of the workshop manual.
U018487	Lost Communication With Radio	- Missing message	Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Action
U01874A	Lost communication with the disc player/changer module	● Lost communication with the disc player/changer module ● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Configure the network to accept the module using the approved diagnostic system.
U030055	Software incompatibility	● Audio unit not configured	Configure the module using the approved diagnostic system.
U1A1448	CAN Initialization Failure	● ACM supervision software failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
U1A1449	CAN Initialization Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
U1A254A	Lost Communication With ICM	● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U1A264A	Lost Communication With TEL	● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U1A274A	Lost Communication With REM	● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U1A284A	Lost Communication With SRM	● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U1A294A	Lost Communication With AAM	● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U1A304A	Lost Communication With TVM	● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U1A314A	Lost Communication With TMC	● Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U200325	Fibre Optic Communication Bus	● Signal shape/waveform error	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U200331	Fibre Optic Communication Bus	● MOST ring break - no data received	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U200381	Fibre Optic Communication Bus	● Invalid serial data received	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.

DTC	Description	Possible causes	Action
U200386	Fibre Optic Communication Bus	- Signal invalid	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U200388	Fibre Optic Communication Bus	- Bus off	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual.
U300044	Control Module	- Audio unit data memory failure	Check the power and ground circuits to the component. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
U300048	Control Module	- Audio unit supervision software failure (internal error)	Check the power and ground circuits to the component. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
U300049	Control Module	- Audio unit internal electronic failure (internal error)	Check the power and ground circuits to the component. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
U300055	Control Module	- Audio unit not configured - Can also be set by a harness fault - EQ Setting not equal to car information of IHU	Configure the module using the approved diagnostic system.

Front Entertainment Module (FEM)

DTC	Description	Possible causes	Action
B100E25	Video Input "A"	- Television/Rear seat entertainment video input disconnected - TV/DVD malfunction	Check that the input is connected and that the system is transmitting.
B101025	Video Input "C"	- Rear camera video input disconnected - Camera malfunction	Check that the input is connected and that the system is transmitting.
B1B0049	Sub-Module 'A'	- Navigation module internal electrical failure	Check for excessive temperature and for the correct installation of the navigation module. Install a new navigation module as required, refer to the new module/component installation note at the top of this DTC Index
B1D6249	Sub-Module 'B'	- Vehicle information and communication system (VICS) module internal electrical failure	Check the power and ground circuits to the module. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
B1D6287	Sub-Module 'B'	- Vehicle information and communication system (VICS) module circuit - short to ground - VICS module circuit - short to power - VICS module circuit - high resistance - VICS module disconnected - VICS module failure	Refer to the electrical circuit diagrams and check VICS module circuits for short to ground, power, open circuit. Check and install a new VICS module as required. Configure the system using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
U1A0087	Private Bus Circuit	- Missing message from front entertainment module (FEM) - No Connector on multi media module - Communications network fault	Refer to the lost communication statement at the start Network Communication sections of the workshop manual.
U1A0131	Communication Link	• NOTE: 'NO NAVIGATION AVAILABLE' message is displayed - Navigation module - touch screen display (TSD), gigabit video interface (GVIF) fault - GVIF disconnected - GVIF - short to ground,	Check for correct connection of GVIF circuit connectors. Refer to the electrical circuit diagrams and check the multi-media module GVIF circuits for short to ground, power, open circuit

DTC	Description	Possible causes	Action
		power, open circuit	

Rear Entertainment Module (REM)

DTC	Description	Possible causes	Action
B1A0044	Control Module	● Rear entertainment control module - data memory failure	Refer to the warranty policy and procedures manual if a module is suspect.
B1A0098	Control Module	● Rear entertainment control module, component or system over-temperature	Check the module and circuits. Refer to the electrical guides. Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1D5079	Digital Disk Player	● Digital versatile disc (DVD) changer mechanical fault - Error report from AiNet	Check for a mechanical fault (jammed magazine, etc). Rectify as necessary.
B1D5093	Digital Disk Player	● Digital versatile disc (DVD) changer is not responding ● Communication error between the main and DVD microprocessors - No response from AiNet	Refer to the electrical guides and check the AiNet circuits. Rectify as necessary.
B1D5098	Digital Disk Player	● A high temperature condition has been detected	Check the installation of the DVD module. Make sure there is sufficient airflow. Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1D8193	Rear Left Display Module	● Left hand rear display is not responding ● Communication error between the main and left hand display microprocessors ● No response from the IS bus	Check the IS bus circuits. Refer to the electrical guides.
B1D8198	Rear Left Display Module	● A high temperature condition has been detected	Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1D8293	Rear Right Display Module	● Right hand rear display is not responding ● Communication error between the main and right hand display microprocessors ● No response from the IS bus	Check the IS bus circuits. Refer to the electrical guides.
B1D8298	Rear Right Display Module	● A high temperature condition has been detected	Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1D8393	Rear Centre Display Module	● Center rear display is not responding ● Communication error between the main and right hand display microprocessors ● No response from the IS bus	Check the IS bus circuits. Refer to the electrical guides.
B1D8398	Rear Centre Display Module	● A high temperature condition has been detected	Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
U1A0355	Car Config Parameter	● Rear entertainment module (REM) not configured	Configure the module using the approved diagnostic system.
U1A1731	Incomplete MOST Ring Reported By REM	● No signal from the rear entertainment module (REM) ● Fibre optic ring break condition reported	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual and in the approved diagnostic system.
U1A334A	Lost Communication With ACM	● Lost communication with the audio front control module (ACM) - incorrect component installed - The security of the MOST network prevents the unauthorized addition of a	Configure the network to accept the module using the approved diagnostic system.

DTC	Description	Possible causes	Action
		module to the system	

Traffic Message Channel (TMC)

DTC	Description	Possible causes	Action
B1A004A	Control Module	● Traffic message channel (TMC) module - incorrect component installed (possibly wrong region)	Configure the system using the approved diagnostic system.
B1A5618	Antenna	● Traffic message channel (TMC) antenna circuit current below threshold	Refer to the electrical guides and check the antenna circuit. Refer to the electrical guides. Rectify as necessary.
B1A5619	Antenna	● Traffic message channel (TMC) antenna circuit current above threshold	Refer to the electrical guides and check the antenna circuit. Rectify as necessary.

Television Module (TVM)

DTC	Description	Possible causes	Action
B1A0016	Control Module	● Control module circuit voltage below threshold: - Voltage less than (master control module voltage - 2V) for > 10 seconds ● Battery voltage low ● Control module circuit High resistance	Check the battery condition and state of charge. Refer to the relevant section of the workshop manual. Check the module power and ground circuits. Refer to the electrical guides.
B1A0017	Control Module	● Control module circuit voltage above threshold ● Battery voltage high (overcharging) ● Control module circuit short circuit to power	Check the battery condition and state of charge. Refer to the relevant section of the workshop manual. Check the module power and ground circuits. Refer to the electrical guides.
B1A0048	Control Module	● Control module supervision software fault	Configure the module using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
B1A5611	Antenna	● Antenna circuit short circuit to ground	Refer to the electrical guides and check the antenna circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A5612	Antenna	● Antenna circuit short circuit to power	Refer to the electrical guides and check the antenna circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A5613	Antenna	● Antenna circuit high resistance	Refer to the electrical guides and check the antenna circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D5511	Antenna #2	● Antenna 2 circuit short circuit to ground	Check the antenna and circuits. Refer to the electrical guides.
B1D5512	Antenna #2	● Antenna 2 circuit short circuit to power	Check the antenna and circuits. Refer to the electrical guides.
B1D5513	Antenna #2	● Antenna 2 circuit High resistance	Check the antenna and circuits. Refer to the electrical guides.
B1D5611	Antenna #3 Circuit	● Antenna 3 circuit short circuit to ground	Check the antenna and circuits. Refer to the electrical guides.
B1D5612	Antenna #3 Circuit	● Antenna 3 circuit short circuit to power	Check the antenna and circuits. Refer to the electrical guides.
B1D5613	Antenna #3 Circuit	● Antenna 3 circuit High resistance	Check the antenna and circuits. Refer to the electrical guides.
B1D5711	Antenna #4 Circuit	● Antenna 4 circuit short circuit to ground	Check the antenna and circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
B1D5712	Antenna #4 Circuit	- Antenna 4 circuit short circuit to power	Check the antenna and circuits. Refer to the electrical guides.
B1D5713	Antenna #4 Circuit	- Antenna 4 circuit High resistance	Check the antenna and circuits. Refer to the electrical guides.
B1D5811	Television Output	- Television output circuit short circuit to ground	Check the television output circuits. Refer to the electrical guides.
B1D5812	Television Output	- Television output circuit short circuit to power	Check the television output circuits. Refer to the electrical guides.
B1D5813	Television Output	- Television output circuit High resistance	Check the television output circuits. Refer to the electrical guides.
U1A2087	Incomplete MOST Ring Reported By TVM	- No signal from the TV module (TVM) - Fibre optic ring break condition reported	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual and in the approved diagnostic system.

Common DTCs

DTC	Description	Possible causes	Action
B1A0049	Control Module	- Amplifier internal electrical failure (can be set in more than one module) - Touch screen display (TSD) internal electrical failure (can be set in more than one module)	Check the power and ground circuits to the module. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
U1A0362	Car Config Parameter	- Signal compare failure	Configure the module using the approved diagnostic system.
U300004	Control Module	- Audio unit internal failure - no communications with CD module	Check the power and ground circuits to the component. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
U30004A	Control Module	- Audio unit control module: Incorrect component installed - The security of the MOST network prevents the unauthorized addition of a module to the system. Car Configuration file does not have the 'SRM Installed' parameter set, but the module is installed to vehicle.	Configure the network to accept the module using the approved diagnostic system.
U300055	Control Module	- Audio unit not configured - Can also be set by a harness fault - EQ Setting not equal to car information of IHU	Configure the module using the approved diagnostic system.
U300068	Control Module	- Audio unit event information - MOST transceiver overheating	Refer to the electrical guides and check the power and ground circuits to the component. Check the MOST circuit. Carry out the general MOST test. Refer to the Network Communications section of the workshop manual and in the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

Satellite Digital Audio Radio Service (SDARS) diagnosis

Overview

The following information is intended to aid in the diagnosis of basic faults with the satellite radio system.

The diagnostic trouble codes are the main source of information in diagnosing other than basic faults.

There are five conditions which may affect the available channels:

A: No signal available

The signal is not reaching the module.

The vehicle must have clear line of sight to a satellite, which means being outside and having no blockages between the vehicle and the satellite.

• NOTE: If the vehicle is outside America, this is the only condition which will be possible.

B: More than 6 months without subscribing

There is a 6 month free period of channel 184 being broadcast to allow testing of the system.

After this period, no channels can be received, and an **unsubscribed** message will be displayed.

C: Less than 6 months without subscribing

This will allow the vehicle to receive channel 184 only, all other channels will display **unsubscribed**.

D: Subscribed to the family package

All channels should be audible, but adult content channels will be blocked, and the message **unsubscribed** will be shown on these channels.

E: Subscribed to the full package

All channels should be available, with the exception of some pay channels.

In this case, the message **unsubscribed** will be shown on these channels.

System testing

Tune to channel 184 (this is usually the default channel for all presets).

Select the direct channel input feature by pressing the "#" key.

This will allow the audio to be routed to the speakers if condition C, D or E exist.

If condition B exists, a subscription will have to be made.

1. **1.** Are other systems affected?
    - The most common symptom would be the loss of audio from other entertainment features, although the display sticking on the logo screen is a good indicator of a MOST issue.
    - If other systems **are** affected, check the entertainment circuits for loose or broken connectors, etc. Refer to the electrical guides.
2. **2.** If only the satellite radio system is affected, retrieve the DTCs from the module using the approved diagnostic system or a scan tool.
    - Refer to the DTC index above

Quick guide

Display	Symptom	Possible causes	Notes/Action
No signal or **Acquiring signal**	No channels available	• Antenna connections	Check for DTCs. Check the connections from the module to the antenna and the antenna to the harness. Rectify as necessary.
	No audio	• MOST connection	Check for DTCs. Check the function of other audio system components. Check the connections to other MOST components.
Unsubscribed	No channels available	• The free period has expired	Carry out the checks above.
Weather/Emergency	No audio on CD or other component	• Other audio component may be faulty	Check for DTCs. Check the function of other audio system components.

Satellite Radio Module (SDARS)

DTC	Description	Possible Cause	Action
B1A5614	Antenna	• Terrestrial radio antenna circuit short circuit to ground • Antenna circuit high resistance	Refer to the electrical guides and check the antenna circuit. Check the co-axial cable and connectors for damage, etc. Rectify as necessary.
B1A8911	Satellite antenna	• Circuit short to ground. The SDARS module has detected a ground measurement for a period longer than expected or	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check SDARS antenna cable for short to ground. Install SDARS antenna harness as required. Suspect the

DTC	Description	Possible Cause	Action
		has detected a ground measurement when another value was expected - SDARS antenna cable short to ground - Internal failure SDARS module - Internal failure SDARS antenna	SDARS module, check and install a new SDARS module as required. Suspect the SDARS antenna, check and install a new SDARS antenna as required. Refer to the new module/component installation note at the top of the DTC Index.
B1A8912	Satellite antenna	- Circuit short to battery. The SDARS module has detected a vehicle power measurement for a period longer than expected, or has detected a vehicle power measurement when another value was expected - SDARS antenna cable short to power - Internal failure SDARS module - Internal failure SDARS antenna	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check SDARS antenna cable for short to power. Install SDARS antenna harness as required. Suspect the SDARS module, check and install a new SDARS module as required. Suspect the SDARS antenna, check and install a new SDARS antenna as required. Refer to the new module/component installation note at the top of the DTC Index.
B1A8913	Satellite antenna	- Circuit open. The SDARS module has determined an open circuit via lack of bias voltage, low current flow, no change in the state of an input in response to an output - SDARS antenna cable open circuit - Internal failure SDARS module - Internal failure SDARS antenna	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check SDARS antenna cable for open circuit. Install SDARS antenna harness as required. Suspect the SDARS module, check and install a new SDARS module as required. Suspect the SDARS antenna, check and install a new SDARS antenna as required. Refer to the new module/component installation note at the top of the DTC Index.
U300004	Control module	- SDARS module. System internal failure	Suspect the SDARS module, check and install a new SDARS module as required, refer to the new module/component installation note at the top of the DTC Index.
U30004A	Control module	- SDARS module. Incorrect component installed - Car configuration mismatch	Using the manufacturer approved diagnostic system select the vehicle configuration Main Menu, vehicle configuration, display and or modify the vehicle configuration file data. Check update as required.
U300055	Control module	- SDARS module, not configured - Incorrect car configuration file data received	Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and programme the SDARS module.

High Definition Tuner Module (HDR)

DTC	Description	Possible Cause	Action
B1A8902	Satellite antenna	- General signal failure - HD coax antenna cable short to ground, short to power, open circuit - Internal failure high definition tuner module - Internal failure AM/FM diversity antenna amplifier	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check HD coax antenna cable for short to ground, short to power, open circuit. Install HD coax cable as required. Suspect the high definition tuner module, check and install a new high definition tuner module as required. Suspect the high AM/FM diversity antenna amplifier, check and install a new AM/FM diversity antenna amplifier as required. Refer to the new module/component installation note at the top of the DTC Index.
B1A8911	Satellite antenna	- Circuit short to ground. The high definition tuner module has detected a ground measurement for a period longer than expected or has detected a ground measurement when another value was expected - HD coax antenna cable short to ground - Internal failure high definition tuner module - Internal failure AM/FM	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check HD coax antenna cable for short to ground. Install HD coax cable as required. Suspect the high definition tuner module, check and install a new high definition tuner module as required. Suspect the high AM/FM diversity antenna amplifier, check and install a new AM/FM diversity antenna amplifier as required. Refer to the new module/component installation note at the top of the DTC Index.

DTC	Description	Possible Cause	Action
		diversity antenna amplifier	
B1A8912	Satellite antenna	● Circuit short to battery. The high definition tuner module has detected a vehicle power measurement for a period longer than expected, or has detected a vehicle power measurement when another value was expected ● HD coax antenna cable short to power ● Internal failure high definition tuner module ● Internal failure AM/FM diversity antenna amplifier	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check HD coax antenna cable for short to power. Install HD coax cable as required. Suspect the high definition tuner module, check and install a new high definition tuner module as required. Suspect the high AM/FM diversity antenna amplifier, check and install a new AM/FM diversity antenna amplifier as required. Refer to the new module/component installation note at the top of the DTC Index.
B1A8913	Satellite antenna	● Circuit open. The high definition tuner module has determined an open circuit via lack of bias voltage, low current flow, no change in the state of an input in response to an output ● HD coax antenna cable open circuit ● Internal failure high definition tuner module ● Internal failure AM/FM diversity antenna amplifier	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check HD coax antenna cable for open circuit. Install HD coax cable as required. Suspect the high definition tuner module, check and install a new high definition tuner module as required. Suspect the high AM/FM diversity antenna amplifier, check and install a new AM/FM diversity antenna amplifier as required. Refer to the new module/component installation note at the top of the DTC Index.
U200D14	Control module output power A	● Circuit short to ground or open ● Div power circuit short to ground, open circuit ● Internal failure high definition tuner module ● Internal failure AM/FM diversity antenna amplifier	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical guides and check div power circuit for short to ground, open circuit. Repair as required. Suspect the high definition tuner module, check and install a new high definition tuner module as required. Suspect the high AM/FM diversity antenna amplifier, check and install a new AM/FM diversity antenna amplifier as required. Refer to the new module/component installation note at the top of the DTC Index.
U300004	Control module	● High definition tuner module. System internal failure	Suspect the high definition tuner module, check and install a new high definition tuner module as required, refer to the new module/component installation note at the top of the DTC Index.
U30004A	Control module	● High definition tuner module. Incorrect component installed ● Car configuration mismatch	Using the manufacturer approved diagnostic system select the vehicle configuration Main Menu, vehicle configuration, display and or modify the vehicle configuration file data. Check update as required.
U300055	Control module	● High definition tuner module, not configured ● Incorrect car configuration file data received	Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and programme the high definition tuner module.
U300087	Control module	● Missing message. The high definition tuner module has not received one or more expected messages. ● Local configuration file incorrect ● Local configuration file parameter is missing, out of range or invalid checksum ● Internal failure high definition tuner module	Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure new modules menu and programme the high definition tuner module. Refer to the new module/component installation note at the top of the DTC Index.
U300098	Control module	● High definition tuner module component or system over temperature	Check high definition tuner module and location for causes of excessive temperature, rectify as required. Suspect the high definition tuner module, check and install a new high definition

DTC	Description	Possible Cause	Action
		- Internal failure high definition tuner module	tuner module as required. Refer to the new module/component installation note at the top of the DTC Index.

Published: 11-May-2011

Audio Unit -

Torque Specifications

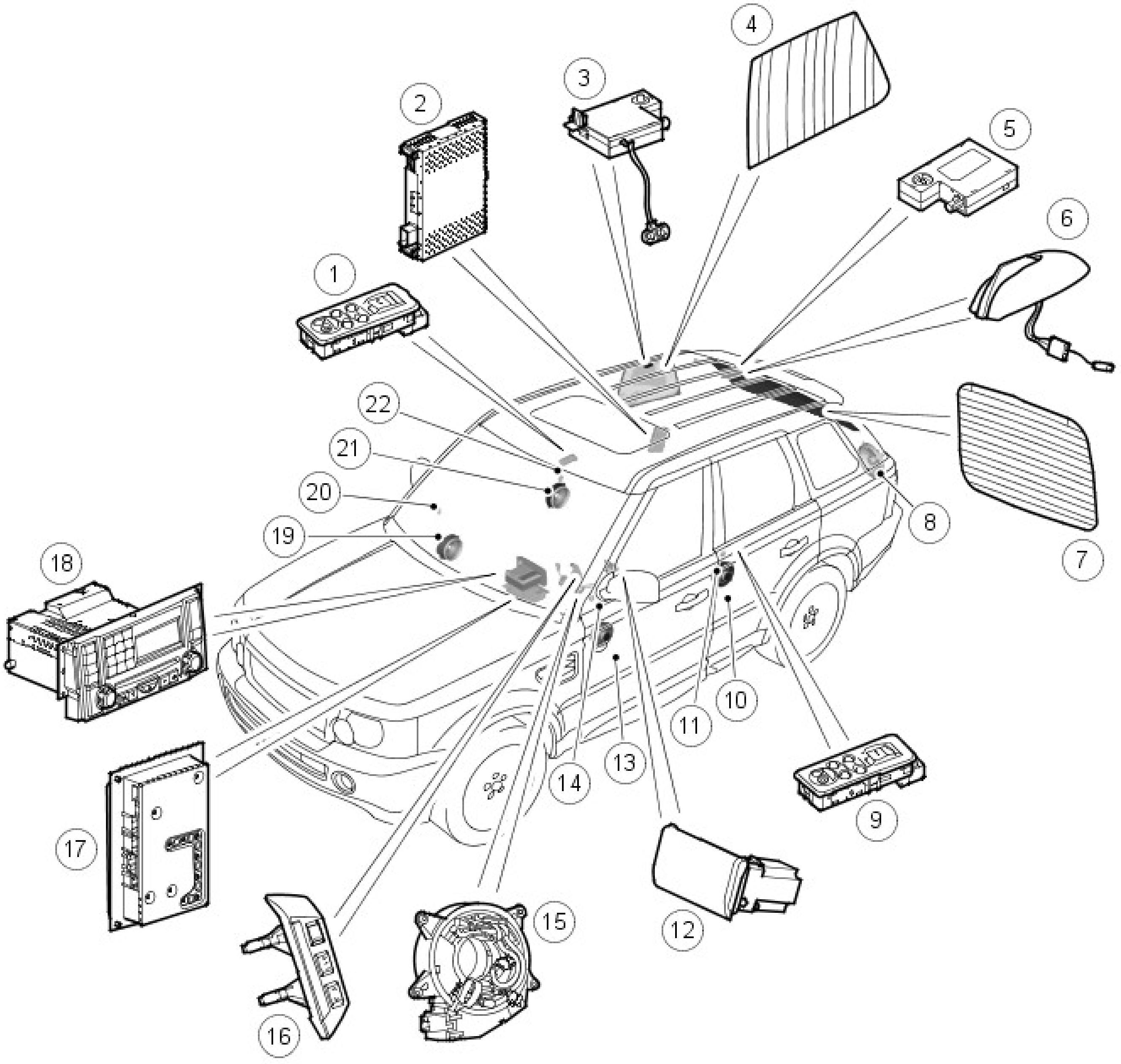
Description	Nm	lb-ft
Audio amplifier bolts	10	7

Published: 11-May-2011

Audio Unit - Audio System

Description and Operation

INTEGRATED HEAD UNIT (IHU) - AUDIO SYSTEM COMPONENT LOCATION

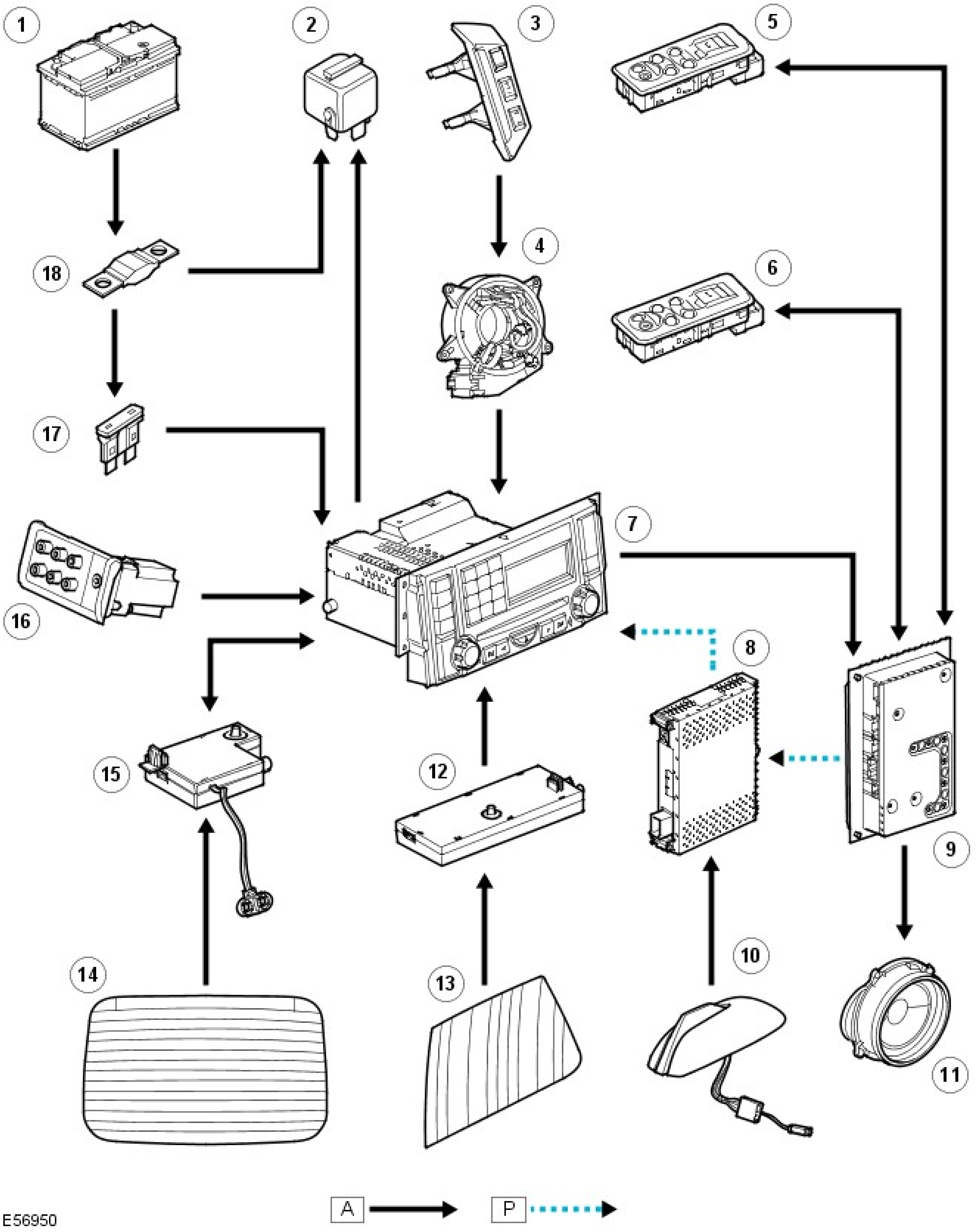


E56949

Item	Part Number	Description
1	-	Row two remote audio controls
2	-	SDARS tuner
3	-	Antenna amplifier
4	-	Side screen amplitude modulation (AM)/frequency modulation (FM) antenna
5	-	Diversity antenna amplifier
6	-	SDARS/ Telephone/global positioning system (GPS) antenna roof mounted pod
7	-	Rear screen antennas
8	-	Subwoofer
9	-	Row two audio remote controls
10	-	Mid range speaker

11	-	Tweeter
12	-	Audio Video Input/Output panel
13	-	Mid range speaker
14	-	Tweeter
15	-	Clock spring
16	-	Audio remote controls
17	-	Audio amplifier
18	-	Integrated Head Unit (IHU)
19	-	Mid range speaker
20	-	Tweeter
21	-	Mid range speaker
22	-	Tweeter

INTEGRATED HEAD UNIT (IHU) - AUDIO CONTROL DIAGRAM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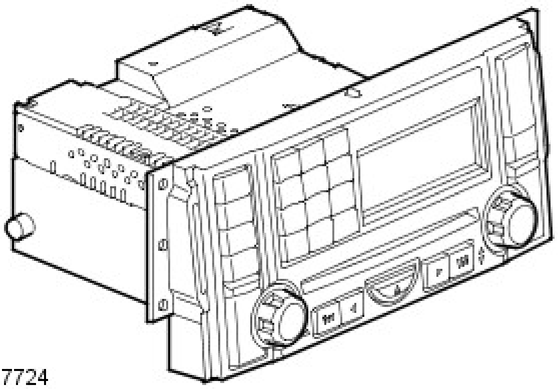
Item	Part Number	Description
1	-	Battery
2	-	Infotainment main relay
3	-	Audio remote controls
4	-	Clock spring
5	-	Row two audio remote controls

6	-	Row two audio remote controls
7	-	Integrated Head Unit (IHU)
8	-	SDARS tuner
9	-	Audio amplifier
10	-	SDARS/GPS/telephone antenna roof mounted pod
11	-	Speakers
12	-	Side screen antenna diversity amplifier
13	-	Side screen AM/FM antenna
14	-	Rear screen antennas
15	-	Rear screen antenna amplifier
16	-	Audio/video input/output panel (AVIO)
17	-	Fuse 53p
18	-	Fuseable link 18E
A	-	Hardwired
P	-	MOST

INTEGRATED HEAD UNIT



E47724

• NOTE: The base level audio system IHU comprises a single disc compact disc (CD) player and an integral amplifier, all other functions of the unit are comparable with the 6 disc unit.

The audio system is based around an Integrated Head Unit (IHU) which communicates on the Media Orientated System Transport (MOST) ring and the medium speed controller area network (CAN) bus.

The IHU contains the following functionality:

- Radio tuner.
- CD player (Six disc in dash changer).
- Integrated telephone control.
- Auxiliary input (for any device featuring a 3.5mm jack plug output).

The IHU (Integrated Head Unit) unit also integrates with the navigation system, this requires the addition of a navigation computer, touch screen display and GPS antenna.

The IHU is woken up by CAN bus activity and is not woken up from the ignition aux position.

The IHU is the Bus Master for the MOST system and contains the timing master for the MOST system.

Connector C1354 Pinout Table For High Line Audio

Pin No	Description	Input/Output
1	ground (GND)	-
2	Not used	-
3	Rear left-hand (LH) door speakers +	Output +
4	Rear LH door speakers -	Output -
5	Rear right-hand (RH) door speakers +	Output +
6	Rear RH door speakers -	Output -
7	Steering wheel switch ground	Output -
8	Infotainment relay switch	Output
9	CAN high	Input/Output
10	CAN low	Input/Output
11	battery positive voltage (B+)	Input
12	Antenna power	Output

Pin No	Description	Input/Output
13	Front LH door speakers -	Output -
14	Front LH door speakers +	Output +
15	Front RH door speakers +	Output +
16	Front RH door speakers -	Output -
17	Not used	-
18	Steering wheel switch reference voltage	Output
19	CAN high	Input/Output
20	CAN low	Input/Output

Connector C2115 Pinout Table

Pin No	Description	Input/Output
1	Not used	-
2	Not used	-
3	Phone +	Output +
4	Not used	-
5	Phone -	Output -
6	Aux Screen	-
7	Right aux Jack plug input	Input +
8	Left aux Jack plug input	Input +
9	Not used	-
10	Not used	-
11	Not used	-
12	Audio GND	-

Tuner

The IHU incorporates a AM/FM tuner which allows for 18 FMpre-sets and 18 AM (9 MW and 9 LW) pre-set stations to be stored in the IHU memory. The radio tuner also incorporates the following radio functions:

- Auto tune
- Traffic announcements (TA)
- radio data system (RDS) EON function
- Seek station
- Tune up/down
- Scan
- PTY

CD Player

The CD player is a 6 disc in dash mounted device. The CD multi changer is capable of playing commercial CDs, CDRs, CDRWs and MP3 discs.

Random Play

The Random feature only works on the CD, which has been selected. The Random feature plays all the tracks on the selected CD in a random order. All the tracks on that disc will be played before a new random sequence is played. If a new CD is selected while in random mode, the random mode will be cancelled and play will commence from track 1.

Repeat

The Repeat feature allows the current track to be repeated in an endless loop, when selected by the user.

MP3

The CD player has the capability to play MP3 files. The MP3 discs follow a format of folders and files within the folder. It is also possible to place all the files in the root directory on the CD.

The random and repeat features follow the normal CD random and repeat feature functions.

Scan

Scan allows the user to play the first 10 seconds of each track on the CD in the unit.

Automatic Volume Control - AVC

The AVC feature is designed to adjust output volume to compensate for the rising level noise of the vehicle as the vehicle travels faster.

There are 10 settings for AVC, where 0 = off, 1 is the lowest setting (minimum volume change with speed and 9 the maximum).

The vehicle speed signal is used to enable the IHU to calculate the volume adjustment required. The vehicle speed signal is received over the CAN. The signal is an average of the four wheel speed sensor signals.

Control of the AVC is carried out by the audio amplifier.

Should an invalid speed signal be received the AVC will not alter the output volume.

CLOCK

The IHU contains the master clock functionality. The IHU contains and displays the clock in one unit. Other vehicle modules that require clock functionality use the time supplied from the IHU.

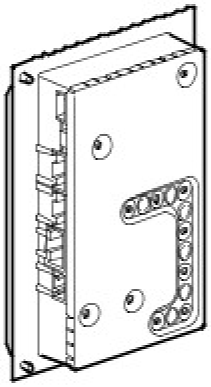
The clock is available to any control module that is connected to an interconnecting bus i.e. either of the CAN busses or the MOST ring.

The clock display configurable to show in AM / PM or 24 hour format. Midnight is shown as 12:00AM or 0:00 respectively. The default condition, if not specified, after power on or delivery, should default to 1:00PM or 13:00. Depending upon the market set the clock will default to either 12 or 24 hour format.

The time is adjusted from the IHU. Under conditions when any bus could be asleep or shut down, the HMI does not allow clock adjustments.

AMPLIFIERS

Harman Kardon High Line/Logic 7 Amplifier



E47726

The audio system has three amplification options dependant on the audio system specified:

- Internal amplifier
- Harman kardon
- Harman kardon LOGIC 7

The amplifier is located under the RH front seat and is connected to the audio system via the MOST bus. Speaker connections are hardwired.

Speaker Connector C0491 for Harman Kardon Amplifier

Pin No	Description	Input/Output
1	LH rear door speaker -	-
2	RH rear door speaker -	-
3	Not used	-
4	Not used	-
5	LH front door speaker -	-
6	RH front door speaker -	-
7	Subwoofer left -	-
8	Subwoofer right -	-
9	LH rear door speaker +	Output
10	RH rear door speaker +	Output
11	Not used	-
12	Not used	-
13	LH front door speaker +	Output
14	RH front door speaker +	Output
15	Subwoofer left +	Output
16	Subwoofer right +	Output

Speaker Connector C0491 for Harman Kardon Logic 7 Amplifier

Pin No	Description	Input/Output
1	LH rear door speaker -	-
2	RH rear door speaker -	-
3	LH front bass speaker -	-
4	RH front bass speaker -	-
5	Rear surround left -	-
6	Rear surround right -	-
7	Subwoofer left -	-
8	Subwoofer right -	-
9	LH rear door speaker +	Output
10	RH rear door speaker +	Output
11	LH front bass speaker +	Output
12	RH front bass speaker +	Output
13	Rear surround left +	Output
14	Rear surround right +	Output
15	Subwoofer left +	Output
16	Subwoofer right +	Output

Speaker Connector C0492 for Harman Kardon Amplifier

Pin No	Description	Input/Output
1	Not used	
2	Not used	
3	Not used	
4	Not used	
5	Headphone module 1 left channel	Output
6	Headphone module 1 right channel	Output
7	Headphone module 2 right channel	Output
8	Headphone module 2 left channel	Output
9	Not used	-
10	Not used	-
11	Not used	-
12	Not used	-
13	Not used	-
14	Not used	-
15	Headphone module 1 left ground	-
16	Headphone module 1 right ground	-
17	Headphone module 2 left ground	-
18	Headphone module 2 right ground	-
19	Not used	-
20	Not used	-

Speaker Connector C0493 for Harman Kardon Amplifier

Pin No	Description	Input/Output
1	Headphone module 3 left channel	Output
2	Headphone module 3 right channel	Output
3	Headphone module 4 left channel	Output
4	Headphone module 4 right channel	Output
5	Headphone module 1 control signal	Output
6	Headphone module 2 control signal	Output
7	Headphone module 3 control signal	Output
8	Headphone module 4 control signal	Output
9	Not used	-
10	Not used	-
11	Headphone module 3 left ground	-
12	Headphone module 3 right ground	-
13	Headphone module 4 left ground	-
14	Headphone module 4 right ground	-
15	Headphone module 1 control ground	-
16	Headphone module 2 control ground	-
17	Headphone module 3 control ground	-
18	Headphone module 4 control ground	-
19	Not used	-
20	Not used	-

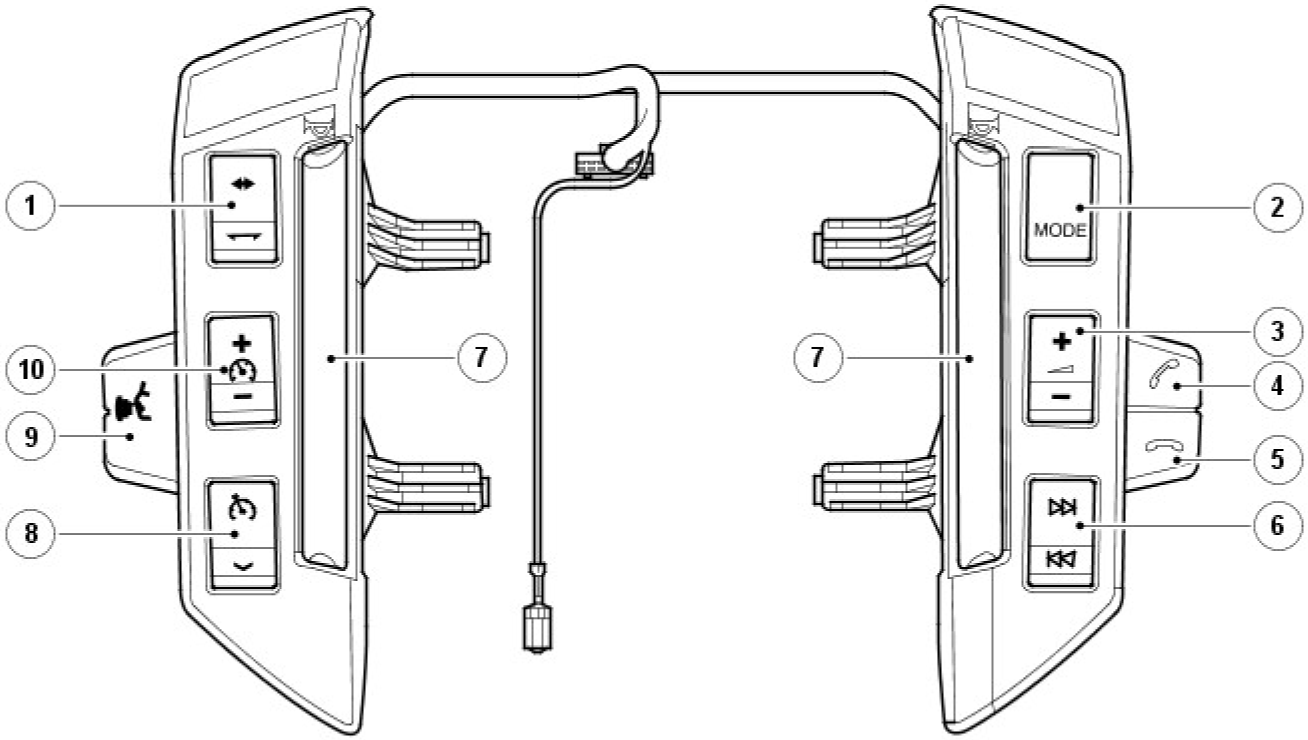
Speaker Connector C0492 for Harman Kardon Logic 7 Amplifier

Pin No	Description	Input/Output
1	LH front mid/ high range speaker -	-
2	RH front mid/ high range speaker -	-
3	Center fill speaker -	-
4	Not used	-
5	Headphone module 1 left channel	Output
6	Headphone module 1 right channel	Output
7	Headphone module 2 left channel	Output
8	Headphone module 2 right channel	Output
9	Not used	-
10	Not used	-
11	LH front mid/ high range speaker +	Output
12	RH front mid/ high range speaker +	Output
13	Center fill speaker +	Output
14	Not used	-
15	Headphone module 1 left channel ground	-
16	Headphone module 1 right ground	-
17	Headphone module 2 left ground	-
18	Headphone module 2 right ground	-
19	Not used	-
20	Not used	-

Speaker Connector C0493 for Harman Kardon Logic 7 Amplifier

Pin No	Description	Input/Output
1	Headphone module 3 left channel	Output
2	Headphone module 3 right channel	Output
3	Headphone module 4 left channel	Output
4	Headphone module 4 right channel	Output
5	Headphone module 1 control signal	Output
6	Headphone module 2 control signal	Output
7	Headphone module 3 control signal	Output
8	Headphone module 4 control signal	Output
9	Not used	-
10	Not used	-
11	Headphone module 3 left channel ground	-
12	Headphone module 3 right channel ground	-
13	Headphone module 4 left channel ground	-
14	Headphone module 4 right channel	-
15	Headphone module 1 control ground	-
16	Headphone module 2 control ground	-
17	Headphone module 3 control ground	-
18	Headphone module 4 control ground	-
19	Not used	-
20	Not used	-

Steering Wheel Control Switches



E58417

Item	Part Number	Description
1	-	Adaptive speed control gap adjustment switches
2	-	Audio mode change switch
3	-	Audio volume control
4	-	Send key
5	-	End key
6	-	Audio system up/down
7	-	Horn
8	-	Speed control ON/OFF/ set speed
9	-	Push to talk voice recognition switch
10	-	Speed control set speed adjust

The IHU can be remotely controlled via steering wheel mounted controls. The audio steering wheel controls are mounted to the RH side of the steering wheel with the voice recognition system control (push to talk switch) located on the LH side of the steering wheel behind the speed control switches.

The Steering wheel control switches allow the driver to:

- Change audio system mode
- Adjust audio volume
- Change CD tracks
- Activate the voice recognition system
- Change radio pre-sets
- Tune up/down
- Answer and end a phone call (where a phone is fitted)
- Use the voice recognition system.

The switches operate on a resistive ladder principle. A voltage is supplied to the switches and dependant upon which button is pressed a reduced voltage is returned to the head unit.

SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS NAS only)

The SDARS systems operate in the S-Band frequency range (2.3 GHz) and, as a result of the use of satellite transmission have the ability to provide CD quality audio broadcasts over very large areas (typically continents). SDARS service providers transmit a signal from their up-link facility (which is the original point of transmission of data, voice or other information through an antenna system) to a satellite where the signal is then down linked to both the terrestrial repeater network and the individual SDARS car radios. The radio switches between the satellite signal and the repeater signal depending on the strength of the signal at any given time.

Land Rover will be using the Sirius Satellite Radio service provider in the USA.

The Sirius SDARS systems comprise:

- Satellites
- Ground repeaters
- Up-link ground stations
- Radio receiver systems

The Sirius SDARS system uses three satellites on an inclined elliptical orbit. This ensures that each satellite spends approximately 16 hours a day over the continent of the USA, with at least one satellite over the country at any one time.

The satellites beam their signals down to the ground where the signal is picked up by receivers or is transmitted to repeater stations to cover built up areas where the signal is obscured.

TRAFFIC MESSAGE CHANNEL (TMC)

The TMC system is a European only system whereby traffic information is received by the TMC tuner and used by the navigation computer to recalculate the route being used to avoid the traffic disruption. This system information is broadcast on the RDS data carriers.

The information is used by the navigation system to avoid traffic disruptions on a planned route
For additional information, refer to: Navigation System (419-07 Navigation System, Description and Operation).
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Published: 11-May-2011

Audio Unit - Audio System

Diagnosis and Testing

For additional information.
REFER to: Audio System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Audio Unit - Audio Unit

Removal and Installation

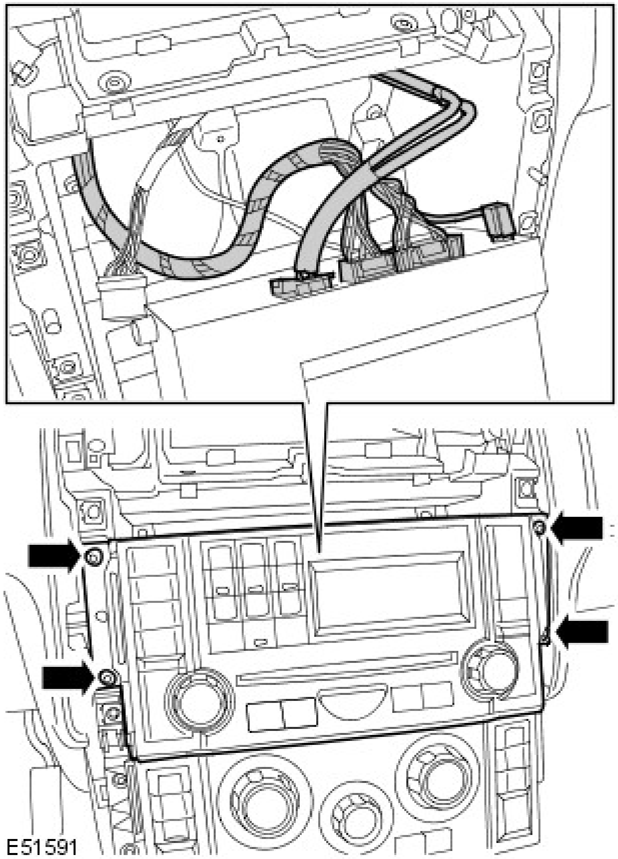
Removal

⚠ CAUTION: A new audio unit is supplied with a transit plate installed. The transit plate must be removed, before installing the audio unit.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the floor console upper panel.
For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).

3. Remove the instrument panel console switch pack.
For additional information, refer to: Instrument Panel Console Switch Assembly (501-12 Instrument Panel and Console, Removal and Installation).



4. Remove the audio unit.

- Remove the 4 Torx screws.
- Disconnect the 2 electrical connectors.
- Disconnect the fibre optic connector.
- Disconnect the antenna cable.

Installation

1. ⚠ CAUTION: A new audio unit is supplied with a transit plate installed. The transit plate must be removed, before installing the audio unit.

• NOTE: This unit does not require configuring using diagnostic equipment.

Install the audio unit.

- Attach the antenna cable.

- Connect the fibre optic connector.
- Connect the electrical connectors.
- Tighten the Torx screws.

2. Install the instrument panel console switch assembly.
   For additional information, refer to: Instrument Panel Console Switch Assembly (501-12 Instrument Panel and Console, Removal and Installation).
3. Install the floor console upper panel.
   For additional information, refer to: Floor Console Upper Panel (501-12 Instrument Panel and Console, Removal and Installation).
4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

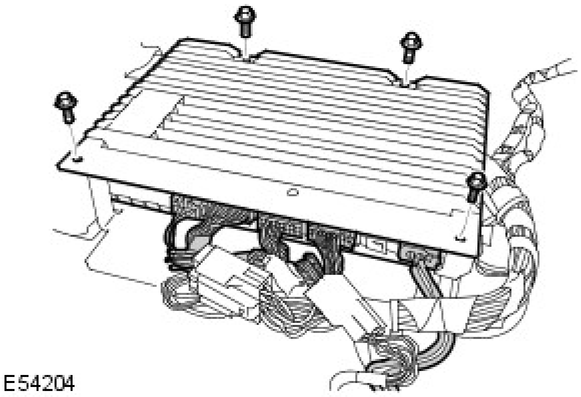
Published: 11-May-2011

Audio Unit - Audio Amplifier

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the RH front seat.
   For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).
3. ⚠ CAUTION: Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.



Remove the amplifier.

- Remove the 4 bolts.
- Disconnect the 5 electrical connectors.

Installation

1. Install the amplifier.
   - Install the bolts and tighten to 10 Nm (7 lb.ft).
   - Connect and secure the electrical connectors.
2. Install the front seat.
   For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
4. Using the Land Rover approved diagnostic equipment, follow the on-screen instructions and configure the audio unit amplifier.

Audio Unit - Audio Unit Fascia

Removal and Installation

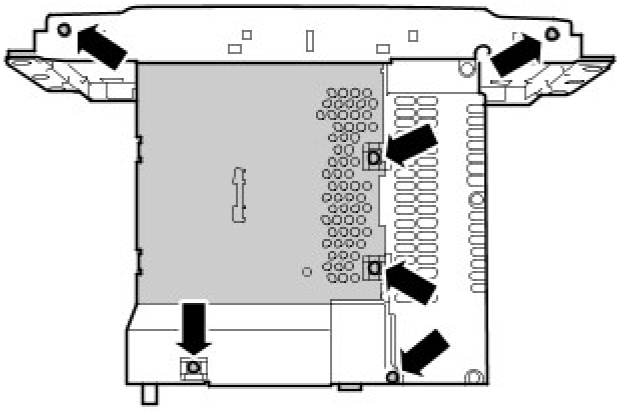
Removal

1. Remove the audio unit (integrated head unit) assembly.
For additional information, refer to: Audio Unit (415-01 Audio Unit, Removal and Installation).

2. ⚠ CAUTION: Make sure that the area around the component is clean and free of foreign material.

Remove the audio unit upper trim panel.

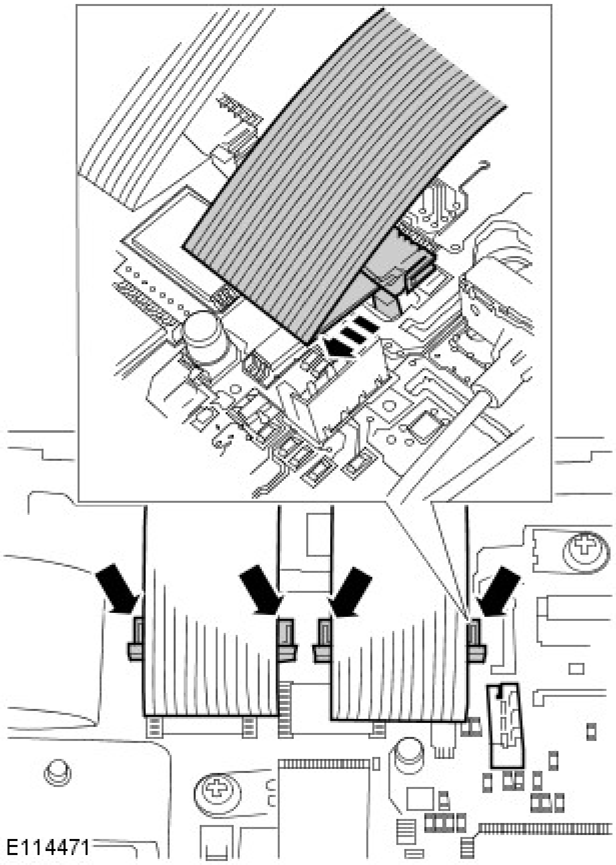
- Remove the 6 screws.



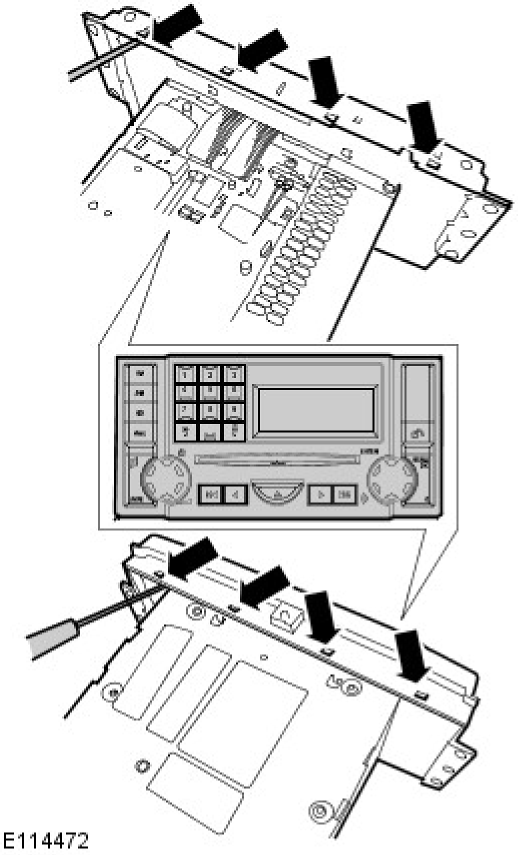
E114470

3. Remove the 2 PCB (printed circuit board) ribbons from the main PCB.

- Using a suitable plastic tool, carefully release the 4 clips from each side of the 2 connectors.

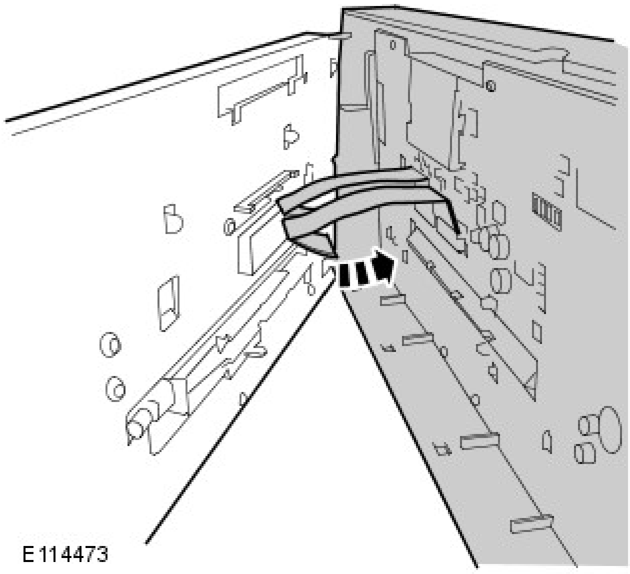


E114471



4. Displace the audio unit fascia.

- Using a suitable tool, carefully release the 8 clips.



5. CAUTIONS:

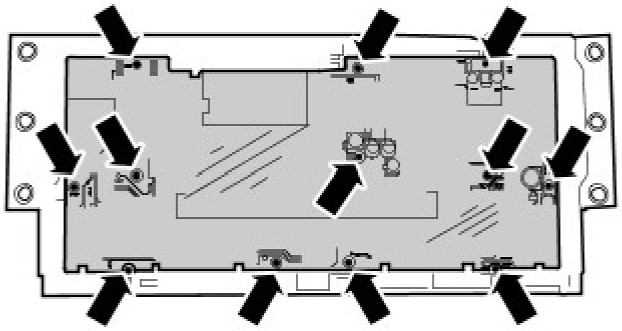
⚠ Make sure ribbons are not damaged when removing the fascia panel.

⚠ Care should be taken to prevent damage to fascia panel front face.

Remove the audio unit fascia from the main IHU body.

6. Remove the PCB from the audio unit fascia.

- Remove the 12 screws.



E114474

Installation

1. ⚠CAUTION: Care should be taken to prevent damage to fascia panel front face.

Install the PCB to the new audio unit fascia.

- Install the 12 screws.

2. ⚠CAUTION: Make sure ribbons are not damaged when installing the fascia panel.

Install the audio unit fascia.

- Carefully feed the ribbons through the audio unit casing.
- Push the audio unit fascia to the IHU main body and make sure the audio unit fascia is secured with the 8 clips.

3. ⚠CAUTION: make sure the ribbon cables are correctly inserted or the IHU will not function properly.

Install the 2 PCB ribbons to the main PCB.

- Insert the 2 ribbons to the connectors on the main PCB.
- Using a suitable plastic tool, carefully secure the 4 clips.

4. Install the audio unit upper trim panel.

- Install the 6 screws.

5. Install the audio unit (integrated head unit) assembly.
For additional information, refer to: Audio Unit (415-01 Audio Unit, Removal and Installation).

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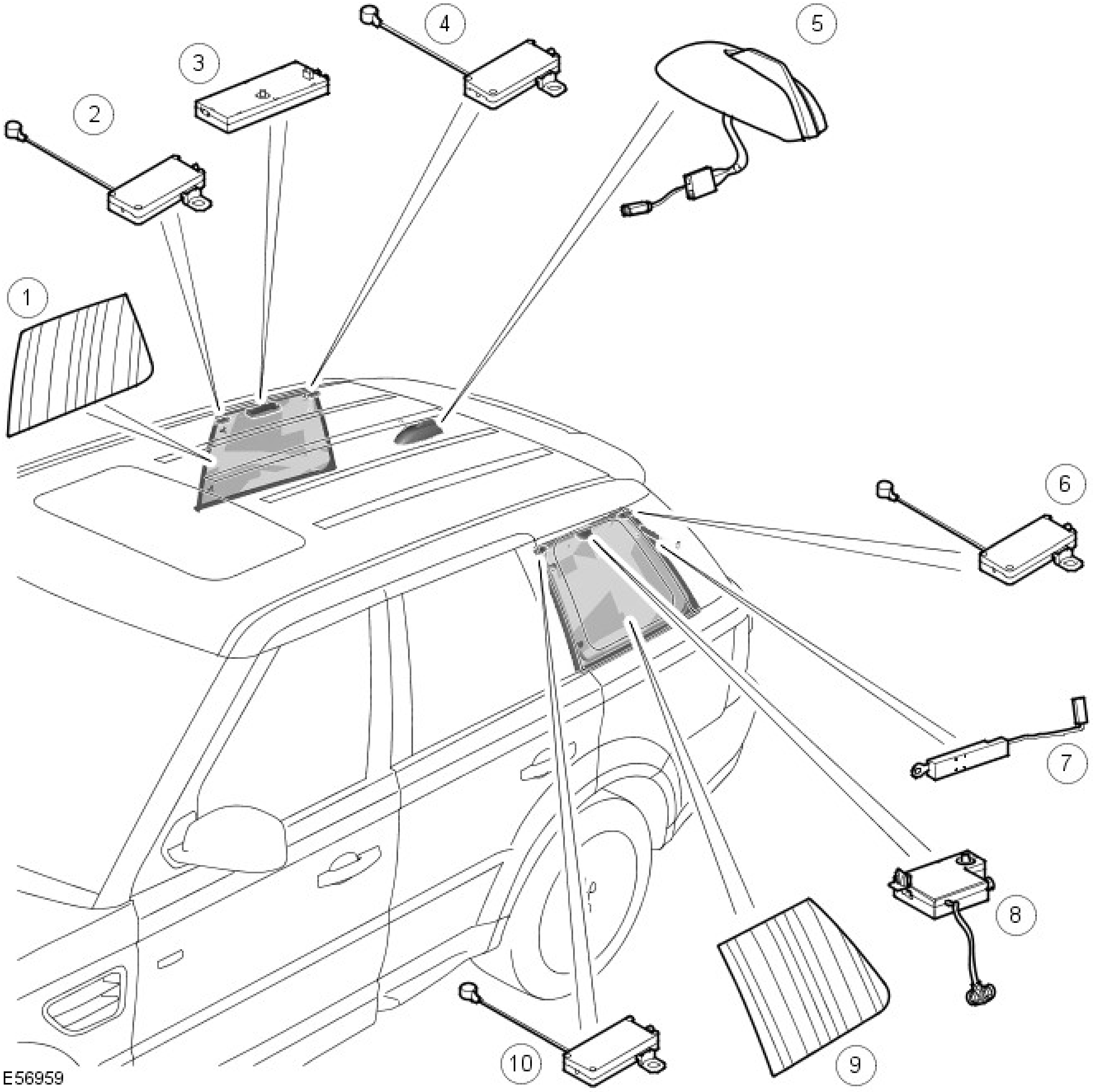
Antenna - Antenna

Description and Operation

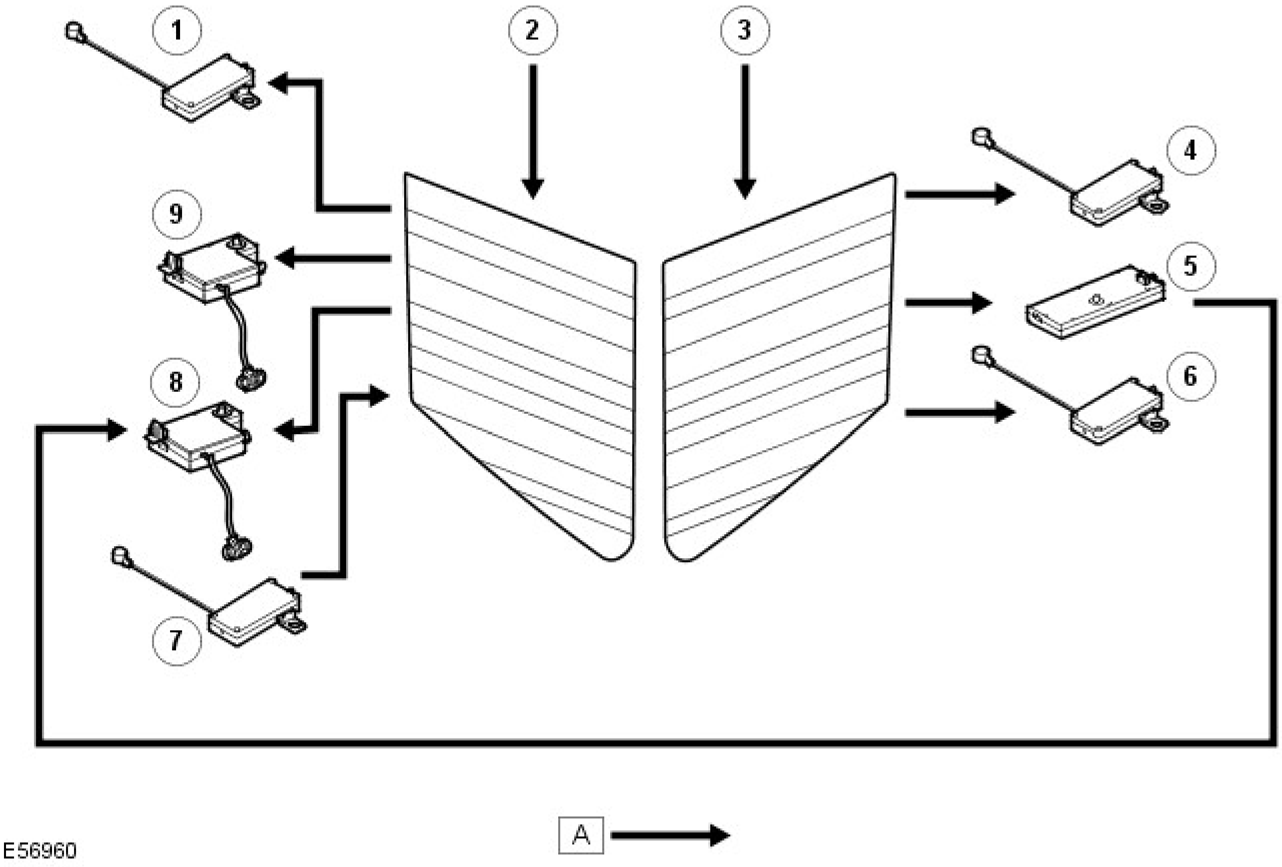
Antenna Amplifier Component Location



Item	Part Number	Description
1		Side window frequency modulation (FM) diversity antenna
2		TV antenna amplifier
3		FM diversity antenna amplifier
4	-	TV antenna amplifier
5		Global positioning system GPS (global positioning system) telephone and SDARS antennas
6	-	TV antenna amplifier
7	-	FM antenna amplifier
8	-	VICS/ TMC antenna amplifier
9	-	Side screen antennas
10	-	TV antenna amplifier

Screen Antenna Layout

- NOTE: A=Hardwired



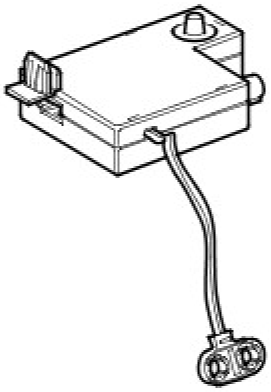
Item	Part Number	Description
1		TV antenna amplifier
2		left-hand (LH) Side screen antennas
3		right-hand (RH) Side screen antennas
4	-	TV antenna amplifier
5	-	FM diversity antenna amplifier
6	-	TV antenna amplifier
7	-	TV antenna amplifier
8	-	FM antenna amplifier
9	-	VICS/TMC antenna amplifier

The antenna systems fitted to the vehicle comprise:

- amplitude modulation (AM) (glass mounted)
- FM (glass mounted)
- FM diversity (glass mounted, where fitted)
- TV (glass mounted, where fitted)
- Multiband telephone antenna (roof mounted, where fitted)
- global positioning system (GPS) antenna (roof mounted, where fitted)
- SDARS (roof mounted NAS only)
- VICS antenna and beacon antenna (Japan only where fitted)

FM ANTENNAS

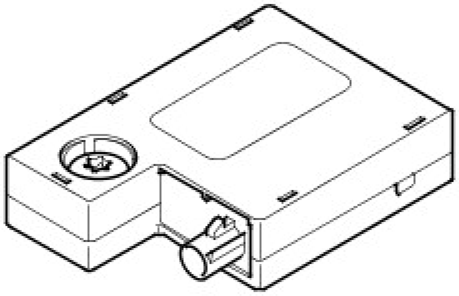
FM Antenna Amplifier



E48084

The AM/FM antennas are located in the rear side widows. On vehicles with the low line audio system the AM/FM antenna is located in the LH side screen. On vehicles with a high line audio system the audio system will be equipped with FM diversity tuning. This system ensures that the strongest of two signals is used by the radio system to ensure the best possible FM reception. The standard AM/FM antenna is screen mounted in the LH rear side window and is connected to an antenna amplifier located above the screen. The diversity system uses the same side window antenna and amplifier but also uses RH side screen.

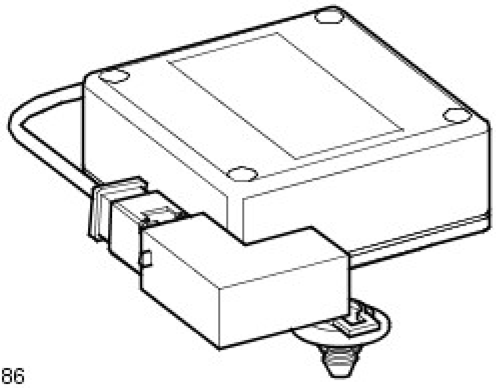
TMC ANTENNA AMPLIFIER



E48087

The Traffic Message Channel (TMC) signals are received through the normal radio signals via the RDS network. The signals are routed separately form the radio signals via a separate antenna amplifier located on the LH rear side window.
For additional information, refer to: Navigation System (419-07 Navigation System, Description and Operation).

GPS ANTENNA

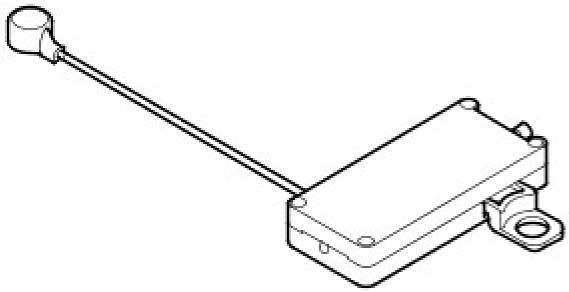


E48086

The GPS antenna is located in the roof mounted pod, which is located in the center of the roof at the rear of the vehicle. The GPS antenna is connected to the navigation computer by a coaxial cable.
For additional information, refer to: Navigation System (419-07 Navigation System, Description and Operation).

TV ANTENNA

TV Antenna Amplifier



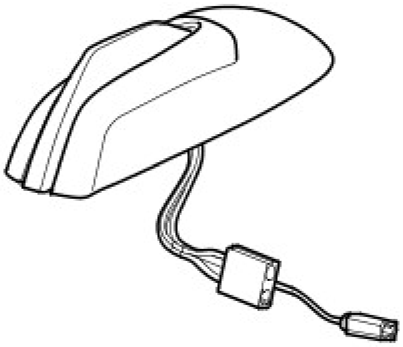
E48088

Where a television system is specified there are four TV antenna elements two in each of the rear side windows. Each element has an antenna amplifier which is connected to the TV tuner module by a coaxial cable.
For additional information, refer to: Video System (415-07 Video System, Description and Operation).

The TV RF antenna amplifiers are located just above the rear quarter light, behind the trim. The four TV antenna amplifiers boost the received RF signal before it is collected and processed by the TV tuner. The TV antennae can receive RF signals of between 48 and 860 MHz.

MULTIBAND TELEPHONE ANTENNA

Multiband Telephone Antenna

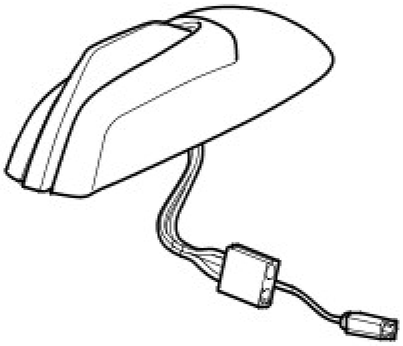


E48085

The multiband telephone antenna is located in the roof mounted pod, which is located in the center of the roof at the rear of the vehicle and is connected directly to the Telephone Control Module (TCM) via a single coaxial cable.
For additional information, refer to: Cellular Phone (419-08 Cellular Phone, Description and Operation).

SATELLITE DIGITAL AUDIO RADIO SYSTEM (SDARS) ANTENNA (NAS ONLY)

SDARS antenna



E48085

The SDARS antenna is located in the roof mounted pod, which is located in the center of the roof at the rear of the vehicle. The SDARS antenna has two connections to the SDARS tuner, one for satellite transmissions the other for terrestrial transmissions from repeater stations.

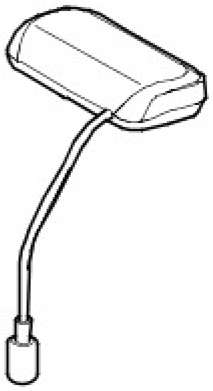
The antenna comprises two antenna elements:

- A printed dipole antenna for receiving satellite signals
- A printed monopole antenna for receiving terrestrial signals

The two antennas allow the system to receive SDARS transmissions in built up areas where signals form satellites would normally be blocked.
For additional information, refer to: Audio System (415-01 Audio Unit, Description and Operation).

VICS ANTENNAS (Japan only)

VICS Beacon Antenna



E48091

The VICS control module uses the rear RH side window antenna to receive VICS information. The Control module also uses an infra red beacon antenna located in the middle on top of the instrument panel adjacent to the sunlight sensor.

Published: 11-May-2011

Antenna - Antenna

Diagnosis and Testing

For additional information.
REFER to: Audio System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Speakers -

Torque Specifications

Description	Nm	lb-ft
Tailgate speaker to casing bolts	10	7
Tailgate speaker to tailgate Torx screws	10	7

Published: 11-May-2011

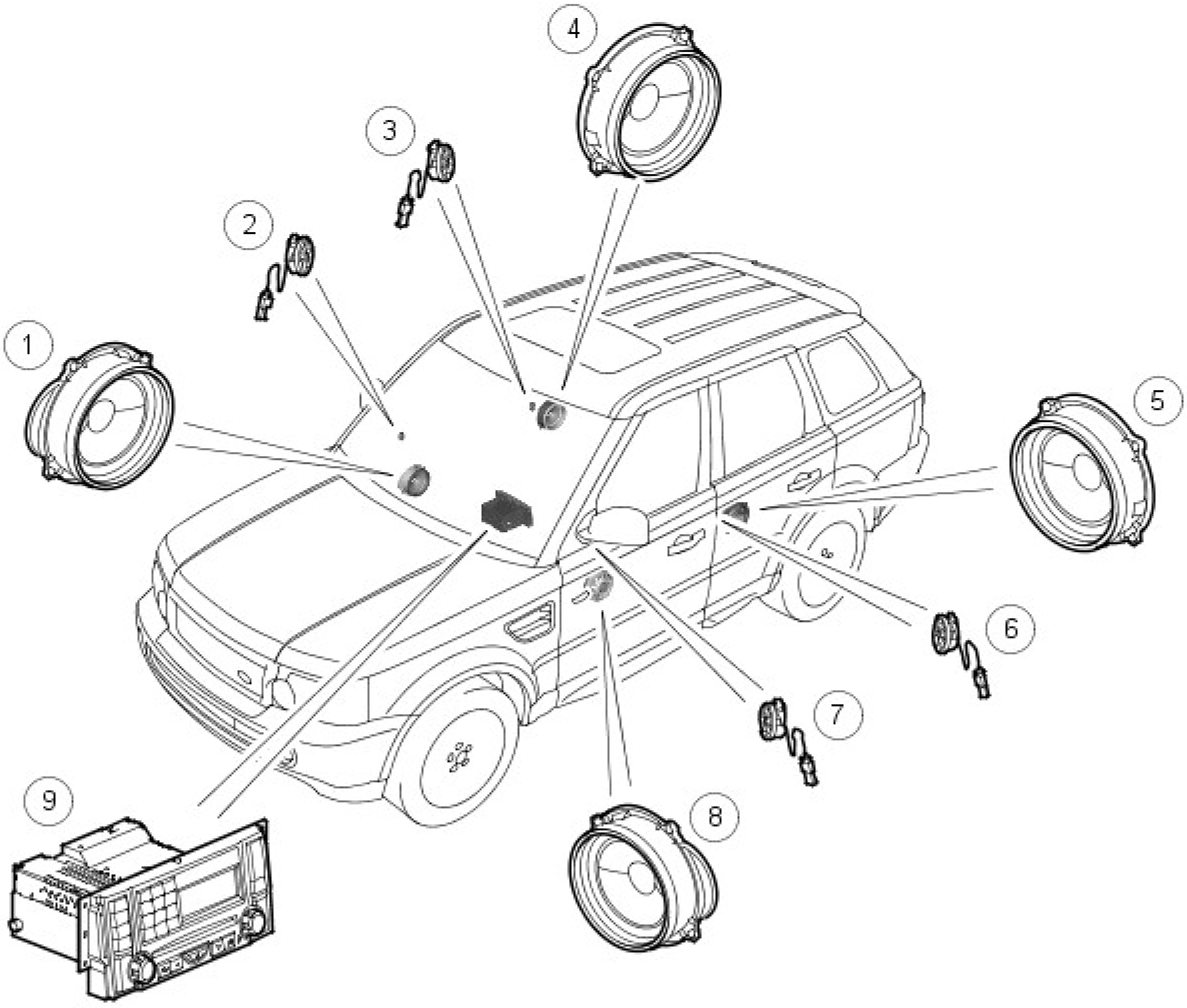
Speakers - Speakers

Description and Operation

The speaker configuration depends on the level of audio and head unit fitted to the vehicle. The following details the speaker configuration and control for each system.

LOW LINE AUDIO SYSTEM

Low Line Audio System Speaker Component Location



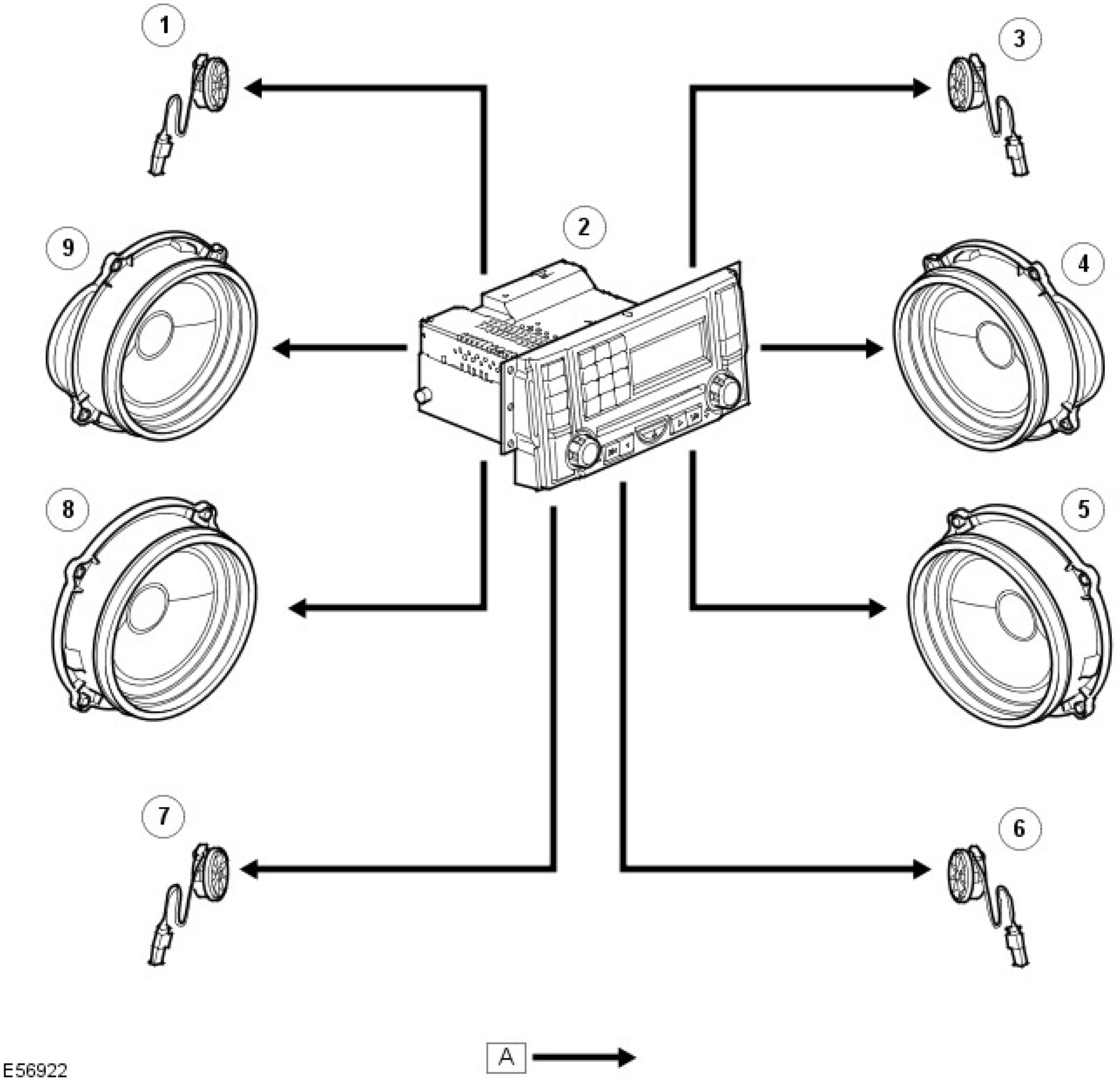
E56921

Item	Part Number	Description
1	-	Front right-hand (RH) door mid/bass speaker
2	-	Front RH door tweeter
3	-	Rear RH door tweeter
4	-	Rear RH door full range speaker
5	-	Rear left-hand (LH) door full range speaker
6	-	Rear LH door tweeter

7	-	Front LH door tweeter
8	-	Front LH door mid/bass speaker
9	-	Integrated Head unit (IHU)

Low Line Audio System Speaker Control Diagram

- NOTE: A= Hardwired



Item	Part Number	Description
1	-	Front LH tweeter
2	-	Integrated Head Unit (IHU)
3	-	Front RH tweeter
4	-	Front RH mid/bass speaker
5	-	Rear RH full range speaker
6	-	Rear RH tweeter
7	-	Rear LH tweeter
8	-	Rear LH full range speaker
9	-	Front LH mid/bass speaker

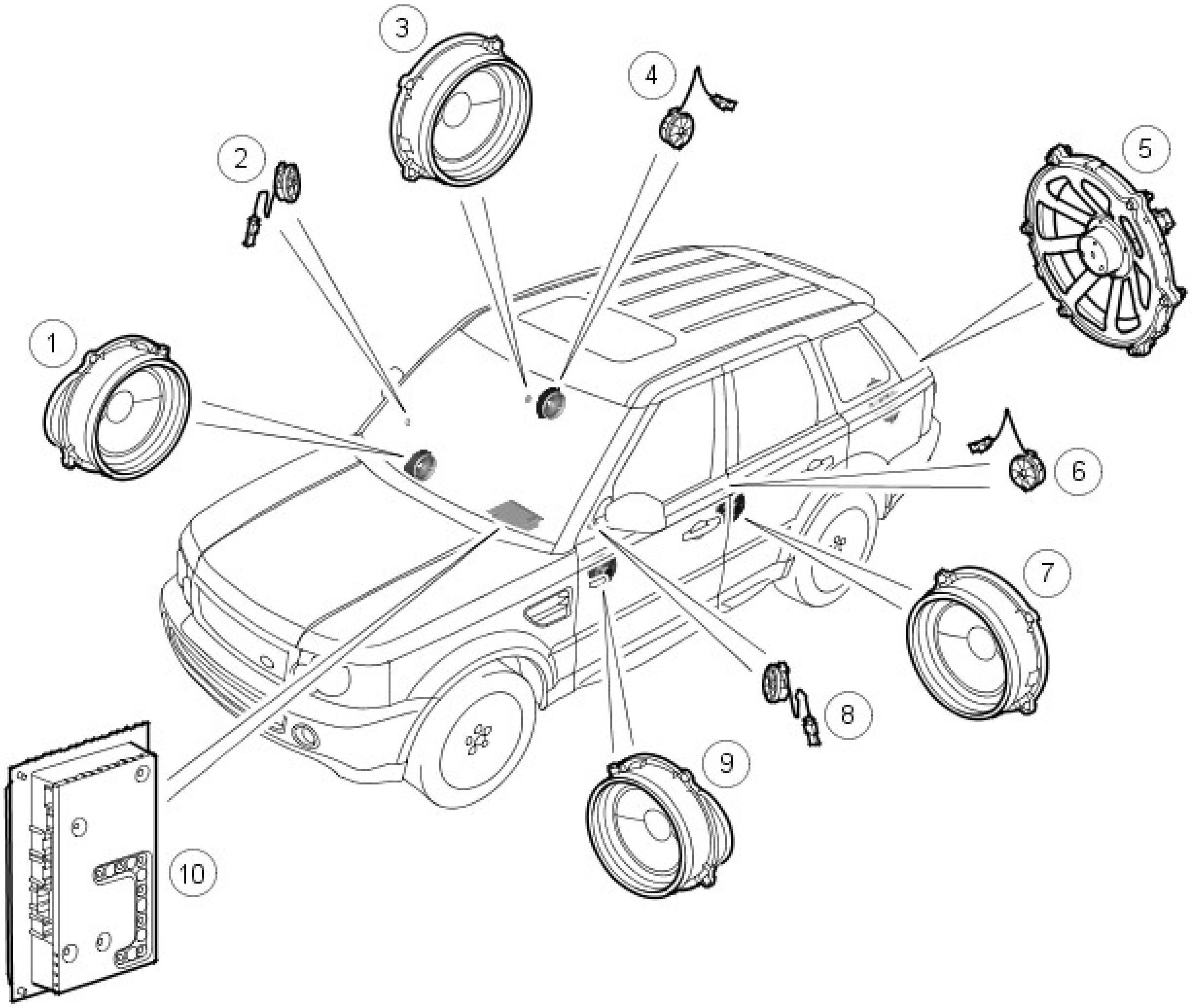
The low line audio speaker system is driven directly from the Integrated Head Unit (IHU)

For additional information, refer to: Audio System (415-01 Audio Unit, Description and Operation).
.The system comprises:

- Head unit
- Two front door mounted mid/bass speakers (one per side)
- Two front door mounted tweeters (one per side)
- Two rear door mounted full range speakers (one per side).

HIGH LINE-HARMAN/KARDON AUDIO SYSTEM

High line-Harman/Kardon Audio System Speaker Component Location



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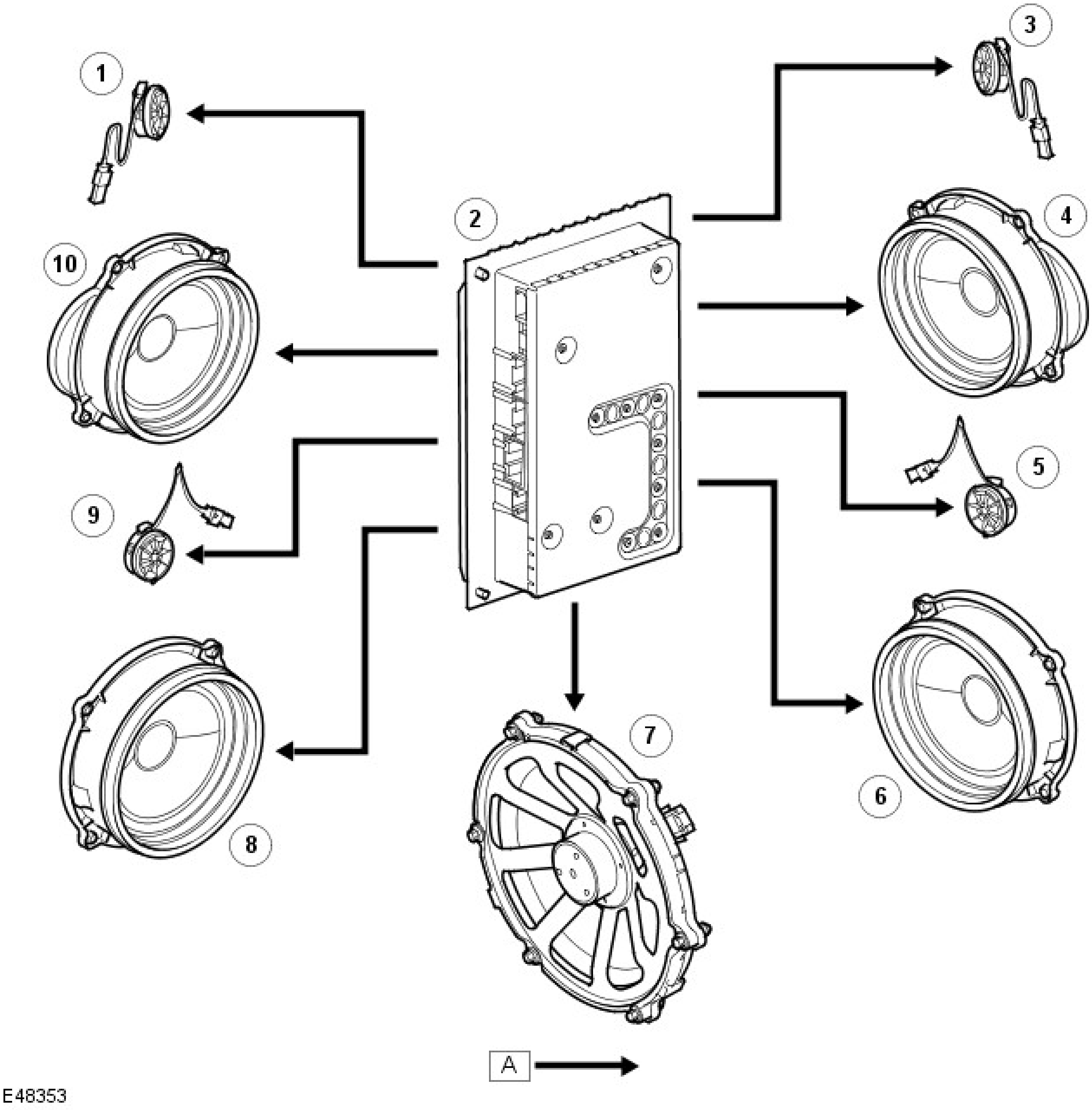
Item	Part Number	Description
1	-	Front RH mid/bass speaker
2	-	Front RH tweeter
3	-	Rear RH mid/bass range
4	-	Rear RH tweeter
5	-	Sub-woofer
6	-	Rear LH tweeter

7	-	Rear LH mid/bass range
8	-	Front LH tweeter
9	-	Front LH mid/bass speaker
10	-	High line amplifier

High line-Harman/Kardon Audio System Speaker Control Diagram

- NOTE: A= Hardwired



Item	Part Number	Description
1	-	Front LH tweeter
2	-	High line amplifier
3	-	Front RH tweeter
4	-	Front RH mid/bass speaker
5	-	Rear RH tweeter
6	-	Rear RH mid/bass speaker
7	-	Sub-woofer
8	-	Rear LH mid/bass speaker
9	-	Rear LH tweeter

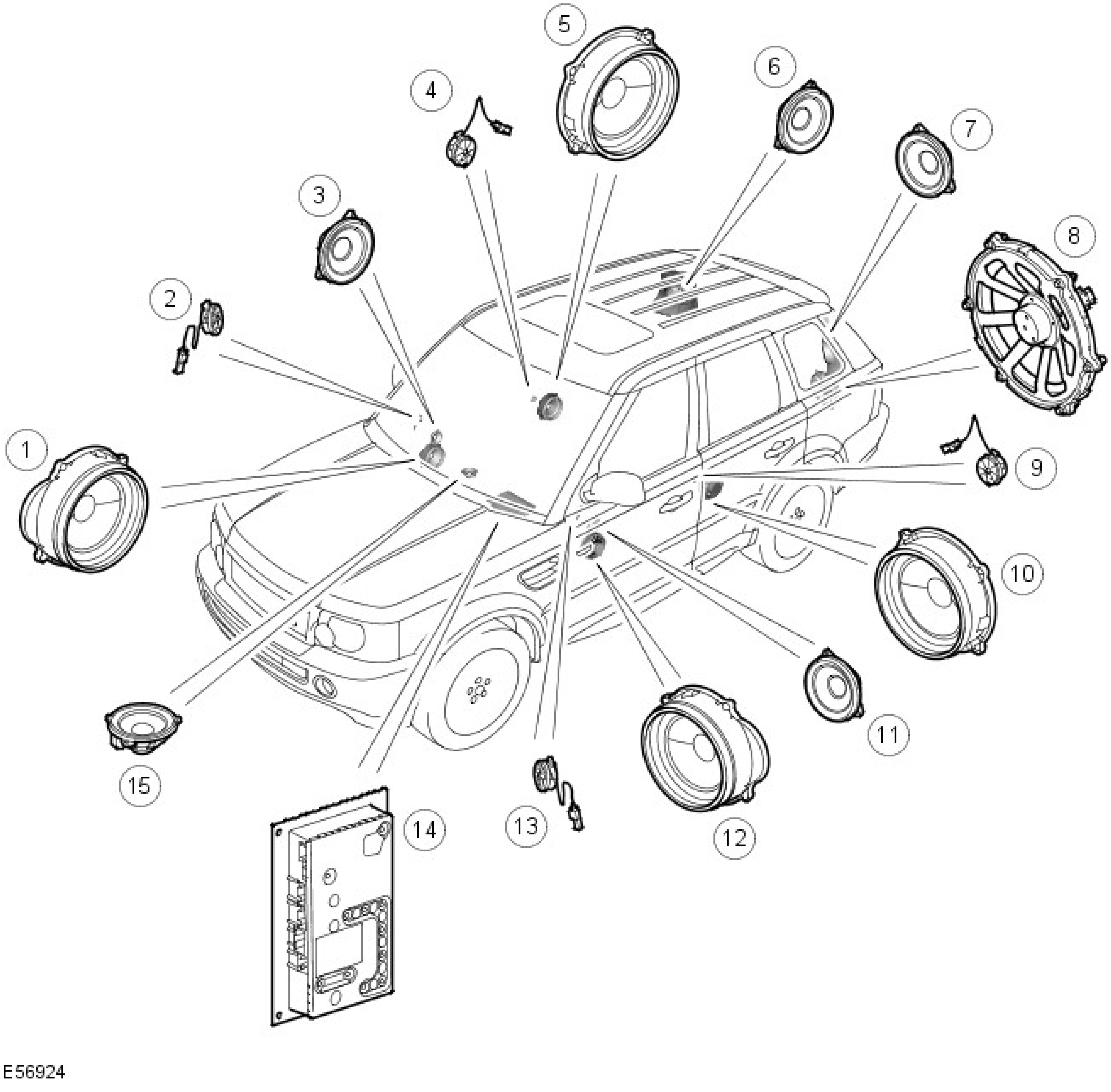
10	-	Front LH mid/bass speaker

The High line-Harman/Kardon audio speaker system is driven by an amplifier located under the RH front seat. The amplifier is controlled by the Integrated Head Unit (IHU) on the MOST bus and supplies 6x50 Watts output, giving a total system power rating of 300 Watts
For additional information, refer to: Audio System (415-01 Audio Unit, Description and Operation).
. The system comprises:

- Integrated Head Unit (IHU) Head unit
- Two front door mounted mid/bass range speakers (one per side)
- Two front door mounted tweeters (one per side)
- Two rear door mounted mid/bass range speakers (one per side)
- Two rear door mounted tweeters (one per side)
- A sub-woofer located in the lower tailgate
- An audio amplifier located under the front RH seat.

PREMIUM AUDIO SYSTEM - HARMAN/KARDON LOGIC7

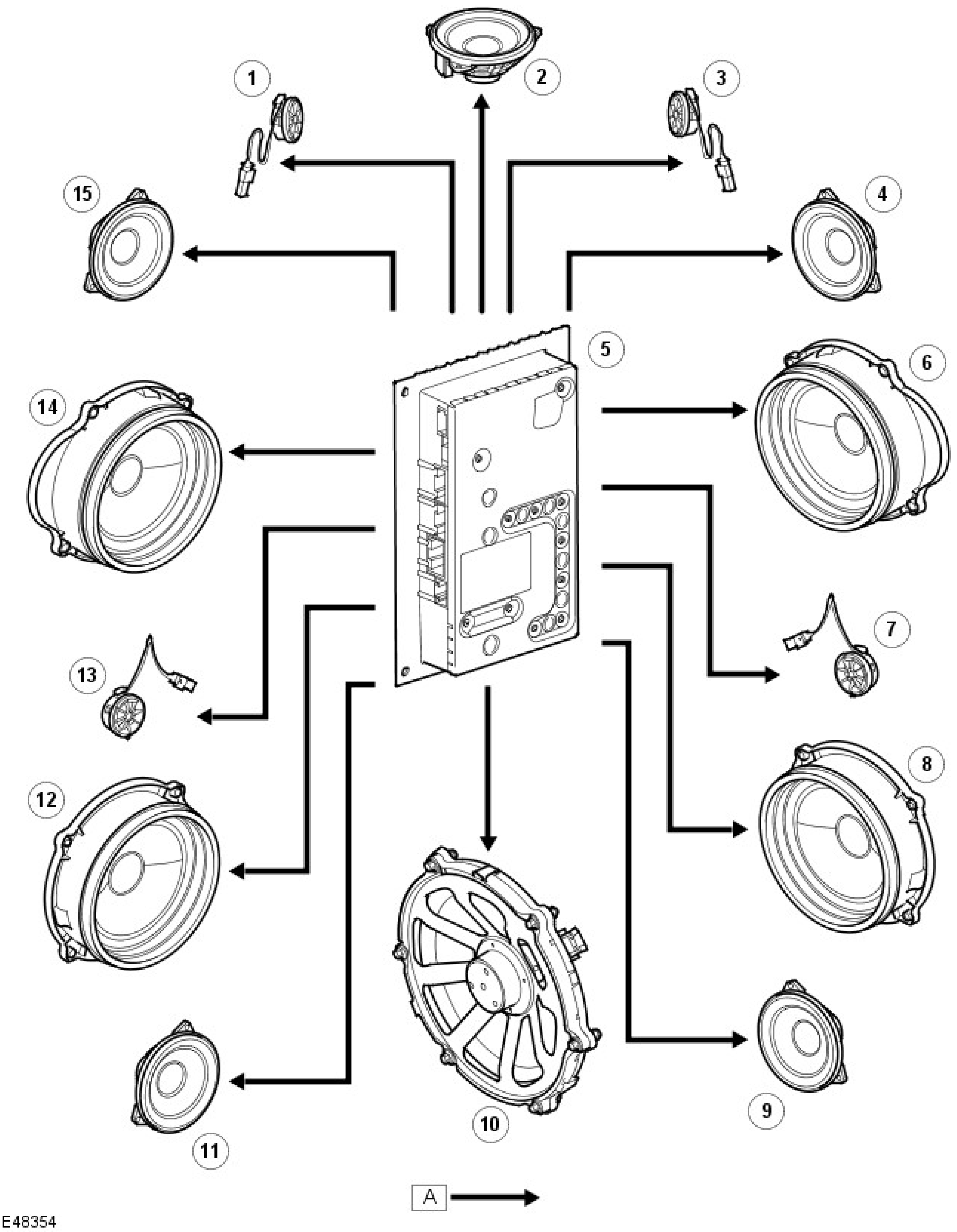
Premium Audio - Harman/Kardon LOGIC7 Audio System Speaker Component Location



Item	**Part Number**	**Description**
1	-	Front RH bass speaker
2	-	Front RH tweeter
3	-	Front RH mid range speaker
4	-	Rear RH tweeter
5	-	Rear RH mid/bass speaker
6	-	Rear RH surround speaker
7	-	Rear LH surround speaker
8	-	Sub-woofer
9	-	Rear LH tweeter
10	-	Rear LH mid/bass speaker
11	-	Front LH mid range speaker
12	-	Front LH bass speaker
13	-	Front LH tweeter
14	-	Premium amplifier
15	-	Front center fill speaker

Premium Audio - Harman/Kardon LOGIC7 Audio System Speaker Control Diagram

- NOTE: A= Hardwired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Item	Part Number	Description
1	-	Front LH tweeter
2	-	Front center fill speaker
3	-	Front RH tweeter
4	-	Front RH mid range speaker
5	-	Premium amplifier

6	-	Front RH bass speaker
7	-	Rear RH tweeter
8	-	Rear RH mid/bass range speaker
9	-	Rear RH surround speaker
10	-	Sub-woofer
11	-	Rear LH surround speaker
12	-	Rear LH mid/bass range speaker
13	-	Rear LH tweeter
14	-	Front LH bass speaker
15	-	Front LH mid range speaker

The Premium Audio - Harman/Kardon LOGIC7 audio speaker system is driven by an amplifier located under the RH front seat. The amplifier is controlled by the Integrated Head Unit (IHU) on the MOST bus and supplies 12x50 Watts output, giving a total system power rating of 600 Watts. The system comprises:

- Integrated Head Unit (IHU) Head unit
- Two front door mounted mid range speakers (one per side)
- Two front door mounted bass speakers (one per side)
- Two front door mounted tweeters (one per side)
- Two rear door mounted mid/bass range speakers (one per side)
- Two rear door mounted tweeters (one per side)
- A sub-woofer located in the lower tailgate
- Two rear surround speakers
- One center fill speaker located in the center of the instrument panel
- Premium amplifier.

Published: 11-May-2011

Speakers - Speakers

Diagnosis and Testing

For additional information.
REFER to: Audio System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

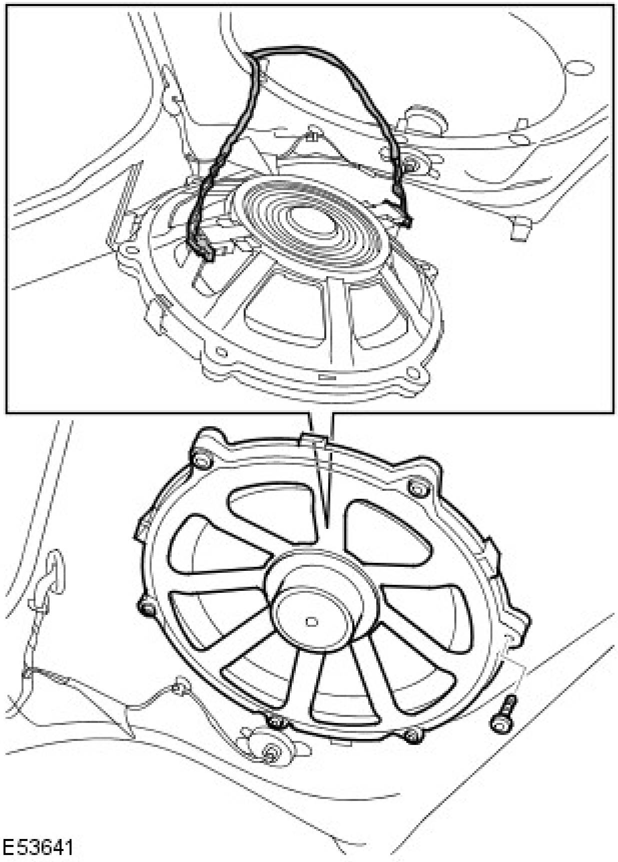
Published: 11-May-2011

Speakers - Subwoofer Speaker

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the liftgate lower trim panel.
   For additional information, refer to: Liftgate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the subwoofer.
   - Remove the 6 screws.
   - Disconnect the 2 electrical connectors.



Installation

1. Install the subwoofer.
   - Connect and secure the electrical connectors.
   - Install the screws.
2. Install the liftgate lower trim panel.
   For additional information, refer to: Liftgate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

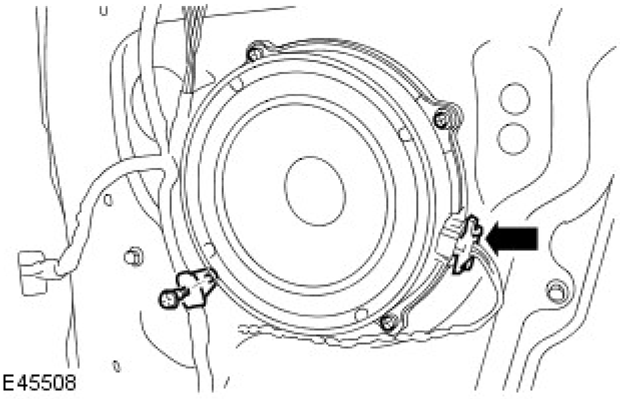
Published: 11-May-2011

Speakers - Front Door Speaker

Removal and Installation

Removal

1. Remove the front door trim panel.
   For additional information, refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. Remove the speaker.
   - Disconnect the electrical connector.
   - Remove the 4 screws.

Installation

1. Install the speaker
   - Align the door wiring harness clip.
   - Tighten the screws.
   - Connect the electrical connector.

2. Install the front door trim panel.
   For additional information, refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

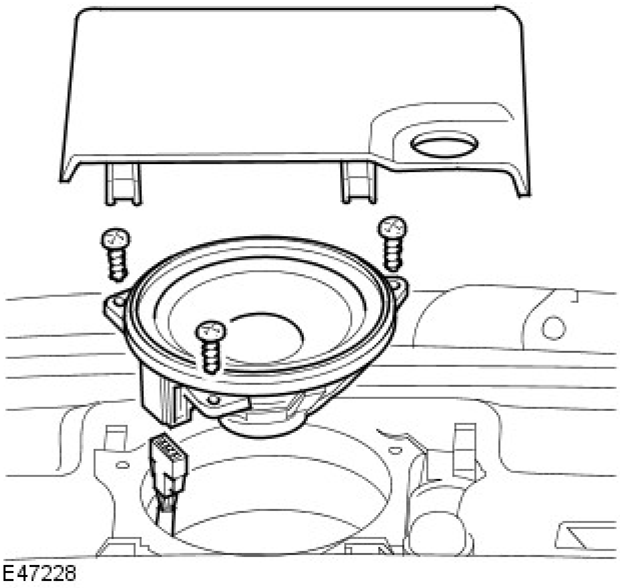
Published: 11-May-2011

Speakers - Instrument Panel Speaker

Removal and Installation

Removal

1. Remove the instrument panel speaker.
    - Remove the speaker grille.
    - Remove the 3 screws.
    - Disconnect the electrical connector.



Installation

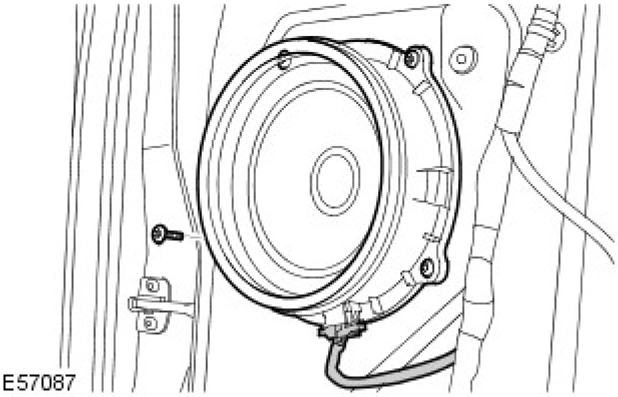
1. To install, reverse the removal procedure.

Published: 11-May-2011

Speakers - Rear Door Speaker

Removal and Installation

Removal



1. Remove the rear door trim panel.
   For additional information, refer to: Rear Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Remove the speaker.
   - Disconnect the electrical connector.
   - Remove the 4 screws.

Installation

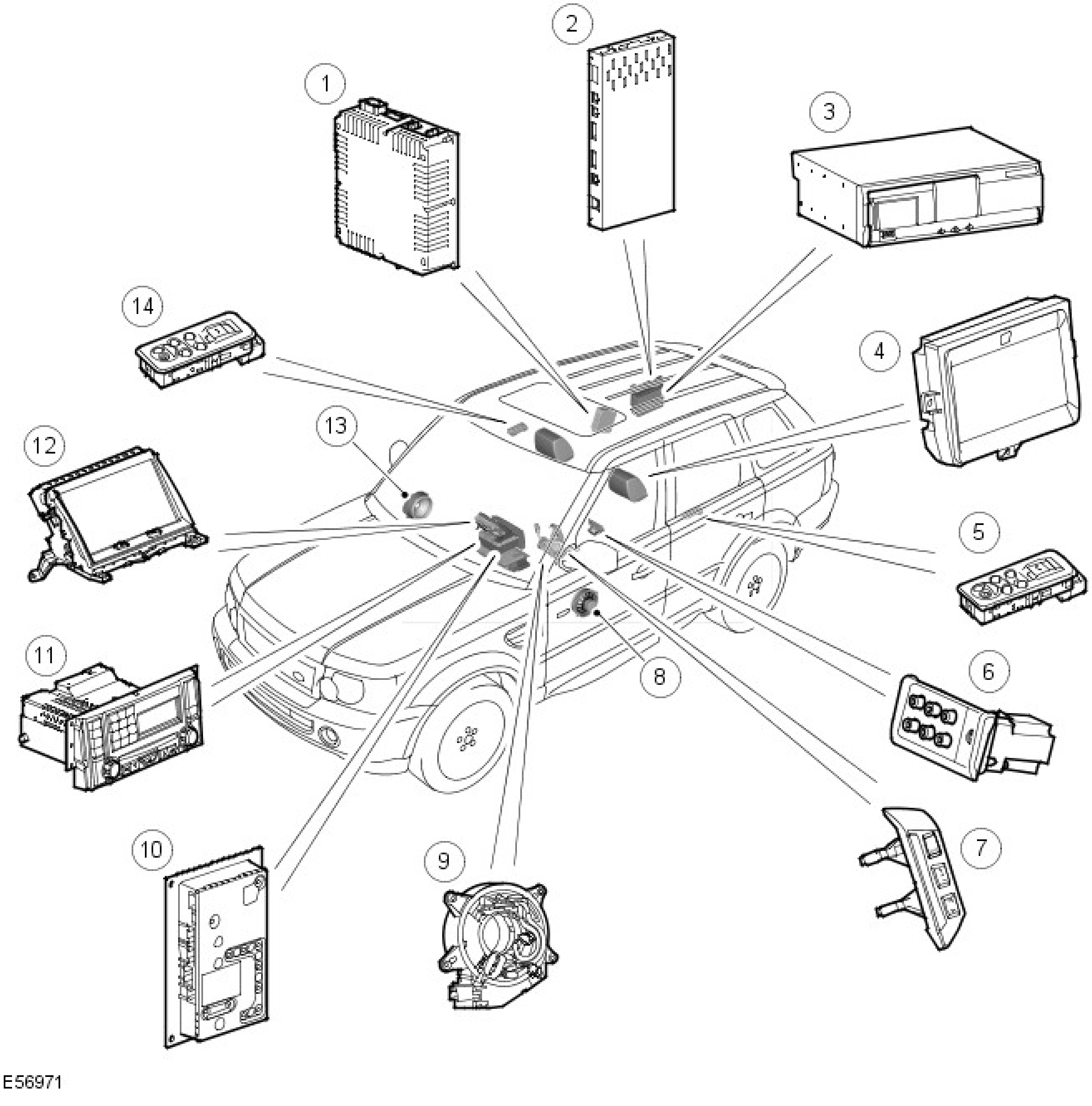
1. Install the speaker
   - Tighten the screws.
   - Connect the electrical connector.
2. Install the rear door trim panel.
   For additional information, refer to: Rear Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-May-2011

Video System - Video System

Description and Operation

Video System Component Location

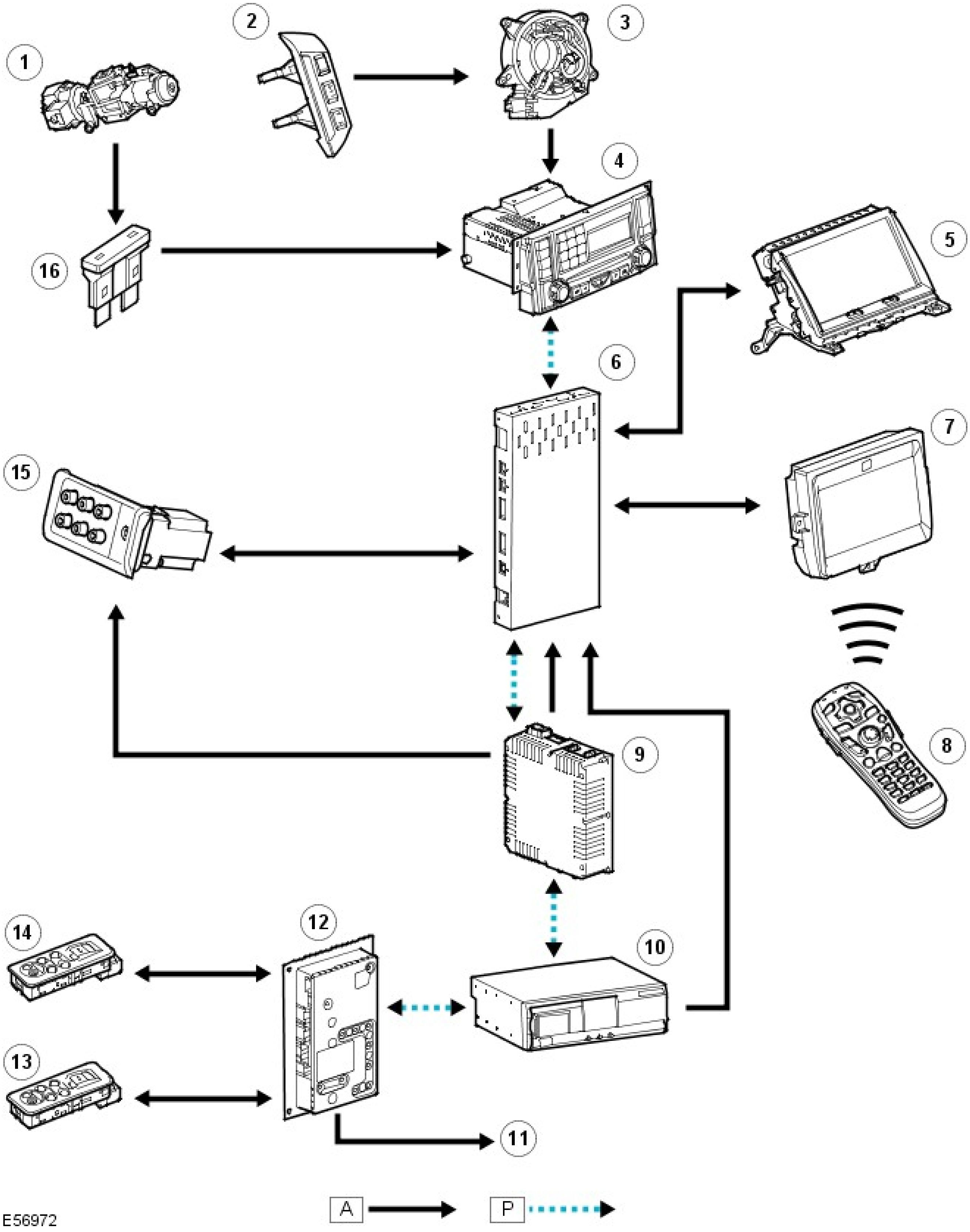


Item	Part Number	Description
1	-	Television tuner module
2	-	Rear Seat Entertainment (RSE) module
3	-	digital versatile disc (DVD) autochanger
4	-	Rear Seat Entertainment (RSE) screen
5	-	left-hand (LH) remote audio controls and window switch
6	-	Audio/Video input/output panel
7	-	Steering wheel controls
8	-	Speakers
9	-	Clock spring
10	-	Audio amplifier

11	-	IHU
12	-	Touch Screen Display (TAD)
13	-	Speakers
14	-	right-hand (RH) remote audio controls and window switch

Video System Component Location

- NOTE: **A** = Hardwired; **P** = MOST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Item	Part Number	Description
1	-	Ignition switch
2	-	Steering wheel controls
3	-	Clock spring
4	-	Integrated Head Unit (IHU)
5	-	Touch Screen Display (TAD)

6	-	Rear Seat Entertainment (RSE) module
7	-	RSE screen
8	-	RSE remote control
9	-	Television tuner
10	-	DVD autochanger
11	-	Speakers
12	-	Amplifier
13	-	Rear door remote audio controls/headphone socket and window switch
14	-	Rear door remote audio controls/headphone socket and window switch
17	-	AVIO panel
18	-	Fuse

The Video system comprises:

- Front screen (TAD)
- Television tuner module
- Television antennas
- Rear remote control headphone modules

The Rear Seat Entertainment (RSE) system comprises:

- RSE control module
- RSE infrared remote control
- RSE roof mounted screen
- DVD multi changer
- AV input panel.

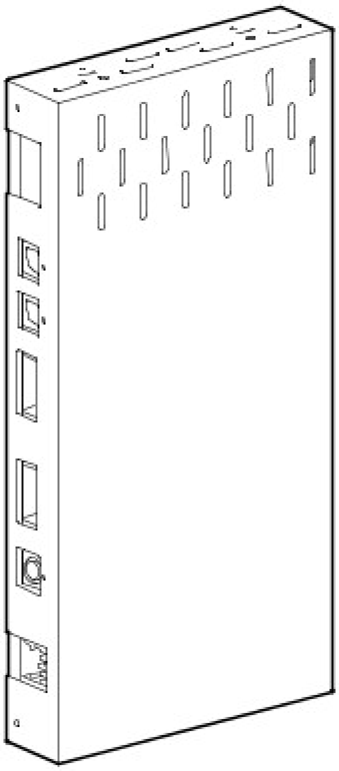
The rear multimedia system provides video and audio entertainment for the rear seat occupants. The system allows rear seat occupants to:

- Play video DVD, video compact disc (CD) and audio CD's stored in the DVD player.
- View the Television (TV) output selected on the Touch Screen Display (TAD) unit (with the vehicle moving up to 5 kph).

Video and TV pictures are viewed on liquid crystal display (LCD) screens located in the back of the front seat head restraints. The audio output can be played through headphones or over the vehicle audio system speakers.

REAR SEAT ENTERTAINMENT MODULE

RSE Module



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The Rear Seat Entertainment (RSE) module is located in the rear RH side of the luggage compartment. The RSE module interfaces between the audio and video inputs from other systems components and the video display and audio outputs.

The RSE module communicates with the audio systems via a MOST connection. Audio output from the DVD autochanger and the AVIO panel is processed by the module and passed on the MOST ring to the audio amplifier to allow audio output to be played on the vehicle speakers or on the cordless headphones.

Video input from the TV tuner, DVD autochanger and the AVIO panel is also processed by the module and passed to the two RSE LCD screens and the TAD on separate video connections. The RSE module also controls the power supplies to the RSE LCD screens and relays the infrared remote control signals received by the RSE LCD screen infrared sensors to the DVD autochanger. The infrared signals are passed from the RSE LCD screens to the RSE module on a bus system known as the IS bus.

The DVD autochanger outputs some of its information to the RSE module on an Alpine proprietary bus known as the Ai Net.

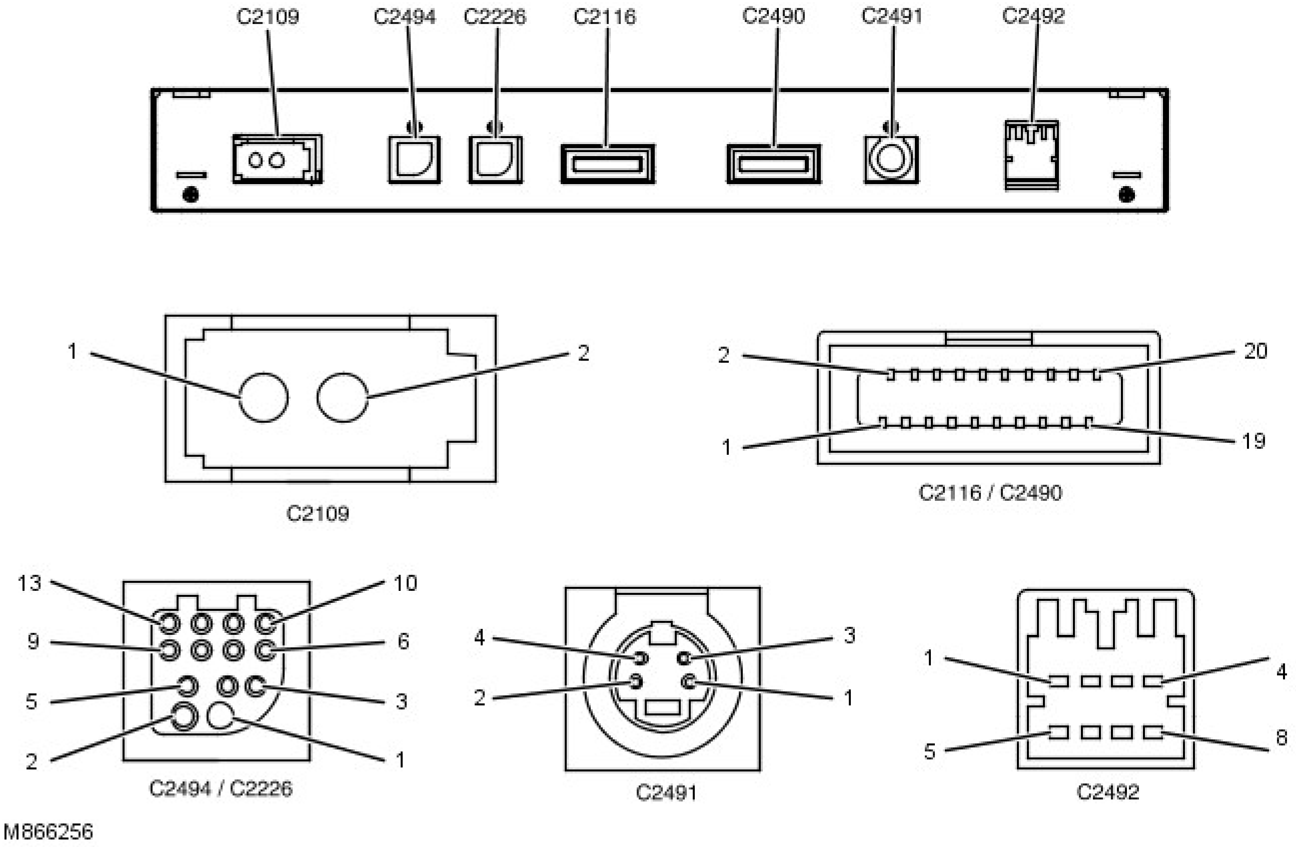
The RSE module has two modes of operation; engine running mode and reduced operation mode. With the engine running the RSE module has full functionality. When the engine is not running the RSE module has reduced functionality to prevent excessive drain on the vehicle battery. The reduced functionality comprises a reduced audio volume and time limit on system operation.

The reduced audio volume is only active when the engine is not running. The audio volume is limited to a maximum setting of 12 to reduce battery consumption. If the volume was set at a higher level than this when the engine was running, when the engine is subsequently started, the volume level will gradually increase to the previously selected setting. This prevents the user being distracted by a sudden increase in volume.

The time limit operation is active when the key is removed from the ignition and the system is manually switched on using the TAD. The system will operate for a maximum of one hour. The battery voltage is continually monitored by the IHU. If the IHU detects that the battery voltage has fallen below a predetermined level, the IHU will shut the infotainment system down to prevent further battery drain. Once the system has shut down due to low battery voltage, it can only be restarted when the engine is running and the battery voltage has risen above the threshold level for more than one minute.

The module is connected into the infotainment system with five harness connectors.

RSE Module Connector Details


C2109
C2494
C2226
C2116
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C2116 / C2490
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C2492
M866256

RSE Module Harness Connector C2109 (MOST)

Pin No	Description	Input/Output
1	MOST Rx- optical signal receive	Input
2	MOST Tx- optical signal transmit	Output

- Tx = transmit
- Rx = Receive

RSE Module Harness Connector C2116 and C2490 (Rear screens)

Pin No	Description	Input/Output
1	LCD screen backlight ground (GND)	Input
2	LCD screen backlight supply	Output
3	Not used	-
4	LCD power supply +13V	Output
5	Not used	-
6	LCD power supply +6V	Output
7	Not used	-
8	LCD power supply -16V	Input
9	Composite video GND	Input
10	Composite video output	Output
11	IS Bus signal +	Output
12	IS Bus signal -	Output
13	IS Bus signal frame +	Output
14	IS Bus signal frame -	Output
15-17	Not used	-
18	Power supply +12V	Output
19	Not used	-
20	Power GND	Input

RSE Module Harness Connector C2491 (TV tuner and TAD)

Pin No	Description	Input/Output
1	TV tuner composite input	Input
2	TV tuner GND	Input
3	DVD/TV tuner composite output to TAD	Output

Pin No	Description	Input/Output
4	DVD/TV tuner GND to TAD	Output

RSE Module Harness Connector C2492 (Power Supply)

Pin No	Description	Input/Output
1	12V battery supply from infotainment relay	Input
2	Not used	-
3	Battery GND	Input
4-8	Not used	-

RSE Module Harness Connector C2770 (AVIO Panel)

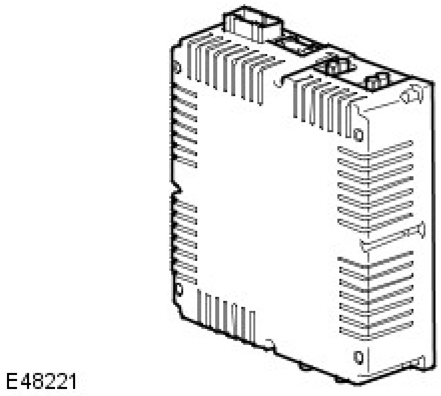
Pin No	Description	Input/Output
1	AUX 1 Video composite input +	Input
2	AUX 1 Video composite input -	Input
3	AUX 1 Audio RH channel input +	Input
4	AUX 1 Audio RH channel input -	Input
5	AUX 1 LH channel input +	Input
6	AUX 1 LH channel input -	Input
7	AUX 2 Video composite input +	Input
8	AUX 2 Video composite input -	Input
9	AUX 2 Audio RH channel input +	Input
10	AUX 2 Audio RH channel input -	Input
11	AUX 1 LH channel input +	Input
12	AUX 1 LH channel GND input -	Input
13	Shield	Input

RSE Module Harness Connector C2771 (DVD changer)

Pin No	Description	Input/Output
1	Remote control GND	Input
2	Remote control signal	Input
3	Start-up	Input
4	Ai net shield GND	Input
5	Ai net +	Input
6	DVD video shield GND	Input
7	Audio shield GND	Input
8	Audio GND	Input
9	Ai net -	Input
10	DVD video GND	Input
11	Video composite input	Input
12	DVD audio RH channel	Input
13	DVD audio LH channel	Input

TELEVISION

Television Tuner Module



The television tuner module is located in the rear RH side of the luggage compartment. The television tuner is connected to the rest of the entertainment system on the MOST bus. Audio and control signals are passed on the MOST bus while video is transmitted via a coaxial cable to the Touch Screen Display (TAD).
For additional information, refer to: Communications Network (418-00 Module Communications Network, Description and Operation).

Television audio can be heard through the vehicle speakers and the remote control rear headphone modules. The audio will continue to be heard whilst the vehicle is moving, however the television picture will stop displaying once the vehicle starts moving.

Televison Tuner Module Harness Connector C2117

Pin No	Description	Input/Output
1	12V battery supply from infotainment relay	Input
2	GND	Input
3	Not used	
4	TV video signal	Output
5	TV video signal GND	Input
6-20	Not used	-

Televison Tuner Module Harness Connector C2106

Pin No	Description	Input/Output
1	MOST Rx- optical signal receive	Input
2	MOST Tx- optical signal transmit	Output

Televison Tuner Module Harness Connector C2228

Pin No	Description	Input/Output
1	LH rearward TV antenna amplifier	Input
2	LH forward TV antenna amplifier	Input

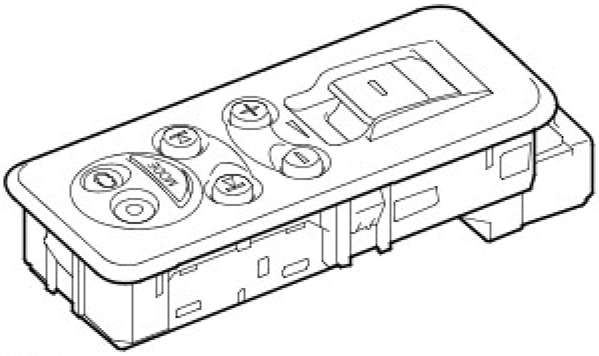
Televison Tuner Module Harness Connector C2227

Pin No	Description	Input/Output
1	RH rearward TV antenna	Input
2	RH forward TV antenna amplifier	Input

Two TV antennae are located in each rear side quarter window. The forward antenna is a high frequency antenna and the rearward antenna is a low frequency antenna. Each antenna is connected directly to a TV RF antenna amplifier which is located just above the rear quarter light, behind the trim.
For additional information, refer to: Antenna (415-02 Antenna, Description and Operation).

REMOTE AUDIO CONTROLS

Rear Seat Remote Audio Controls



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The rear seat passengers can use standard headphones to listen to audio from any of the sources fitted to the vehicle. These include:

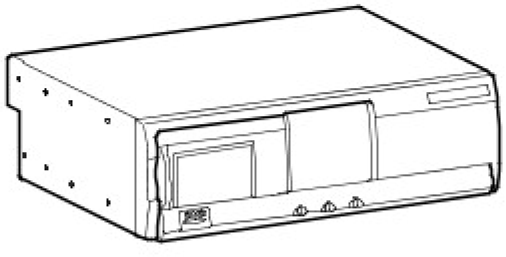
- Television
- CD
- Radio
- DVD

The remote audio control modules are located in the rear doors, incorporated into the rear window switches.

The remote audio control modules allow the user to select which source to listen to. The remote controls cannot override what the driver has selected. If the driver is listening to a CD the rear passenger cannot control the CD player.

The remote audio control modules allow the user to alter the volume in the head phones, change track/disc up/down or repeat on a CD, change pre-set radio stations or tune up/down on the radio and television.

DVD AUTOCHANGER



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The DVD autochanger is located in the RH rear corner of the luggage compartment. The DVD player is a six disc design which will accept DVD movies, video CD's (VCD) and music CD's on CD-R or CD-RW. The discs are housed in a magazine to allow six discs to be stored in the unit. Additional magazines can be purchased to allow greater flexibility. The magazine is accessible via a sliding door on the front of the unit. An eject button, located behind the door, when pressed, automatically ejects the magazine from the unit.

The DVD autochanger is operated using a remote control unit supplied with the vehicle. The remote control is an infrared unit which transmits the infrared signal to receivers in each RSE LCD screen.

The DVD autochanger receives the remote control information from the RSE LCD screens on a bus system known as the IS bus to the RSE module. The information is then passed from the RSE module on an Alpine proprietary bus known as the Ai Net to the DVD autochanger. The Ai Net is a bus system used to communicate between the RSE module and the DVD autochanger.

A Sony Philips Digital Interface Format (SPDIF) is used to output the audio from the DVD autochanger to the audio amplifier. The SPDIF is an optical system connected between the DVD autochanger and the audio amplifier. SPDIF is a standard audio file transfer format which allows the transfer of digital audio signals from one device to another without having to be converted first to an analog format which maintains the viability of the digital audio signal.

DVD Autochanger Harness Connector C2494 (RSE)

Pin No.	Description	Input/Output
1	Remote control GND	Output
2	Remote control signal	Output
3	Start-up	Output
4	Ai net shield GND	Input
5	Ai net +	Input
6	DVD video shield GND	Output
7	Audio shield GND	Output
8	Audio GND	Output
9	Ai net -	Input
10	DVD video GND	Output
11	Video composite input	Output
12	DVD audio RH channel	Output
13	DVD audio LH channel	Output

DVD Autochanger Harness Connector C2832 (power supply)

Pin No.	Description	Input/Output
1	Not used	-
2	GND	Input
3	Not used	-
4	12V battery supply from infotainment relay	Input

DVD Autochanger Harness Connector C2614 (SPDIF)

Pin No.	Description	Input/Output
1	SPDIF digital audio output to audio amplifier	Output

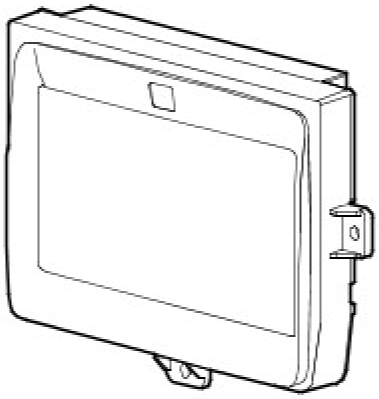
Fault Finding

If the operation of the DVD freezes or the screens do not display, turning the power to the unit off and then back on may clear the fault. Alternatively, change the source from DVD and back to DVD, turn the ignition switch to off and then on again to position II. The following table gives possible faults, their causes and remedies.

Symptom	Cause	Remedy
DVD unit does not	Fuse blown	Check and replace with fuse of correct rating

Symptom	Cause	Remedy
operate.		
	RSE LCD screen monitor power off	Ensure power is supplied to monitors
	Condensation	Wait for at least one hour for condensation to dry out
Operation is unstable	Remote control handset batteries low	Replace batteries
	Remote control receiver sensor or transmitter is dirty	Clean the receiver sensor and/or the transmitter
No picture	Monitor mode is switched to an incorrect mode	Use switch on back of handset to select the correct mode
Playback does not start	Disc is loaded upside down	Check disc is correctly loaded
	An incorrect format of disc is loaded	Check disc format is compatible
	Parental lock is set	Cancel parental lock or check rating of disc
	Setup menu is displayed	Press 'Set' for at least 2 seconds to turn the menu off
Picture is unclear or noisy	Disc is being fast forwarded or reversed	The picture may be slightly disturbed in this mode
	Vehicle battery power low	Check the vehicle battery condition
Image freezes	Disc is scratched	Replace with an undamaged disc
'NO MAG' displayed	No magazine is loaded	Load a magazine
'NO DISC' displayed	No disc is loaded	Load disc into magazine
	Disc is dirty	Clean disc
Ø	Remote control operation is not possible	For some discs and playing modes certain operations are not possible. This is not a malfunction.
'REGIONAL CODE VIOLATION' displayed	Disc does not match regional code number	Load a disc which matches the regional code number
'VIDEO SIGNAL IS NOT CORRECT' displayed	NTSC disc is loaded in a PAL system or PAL disc is loaded in an NTSC system	Load a PAL disc
'HI-TEMP' displayed	Protective circuit is activated to high temperature	Turn the power OFF on the unit and then back on again. If the display does not disappear leave the power off until the temperature decreases and turn the power ON again.
Handset does not operate DVD	Battery power in handset low	Replace batteries
	Direct sunlight in handset transmitter or RSE LCD screen receiver	Protect infrared sensors from direct sunlight
	Universal handset mode switch incorrectly set	Looking at the rear face of the handset, ensure that the mode switch is in the LH position
	Batteries incorrectly installed	Check batteries or correctly fitted
	Handset not pointed at RSE LCD screen	Point the handset directly at the screen

REAR SCREENS



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The RSE LCD screens are located in the rear of the front seat head restraints. The screen is secured in the head restraint with three screws which are covered by a removable surround. The screen is a 6.5 inch, auto dimming, high resolution LCD monitor, manufactured by Alpine

An ambient light sensor, in the bottom left edge of the screen, allows the system to automatically adjust the brightness of the screen to compensate for changes in ambient light levels.

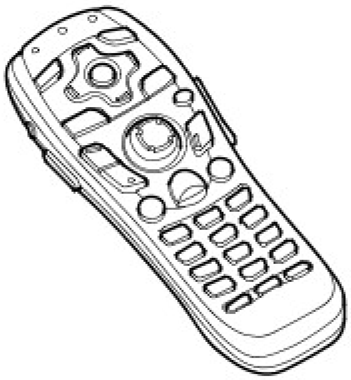
An infrared receiver sensor is located centrally in the upper screen surround. The sensor receives infrared transmissions from the DVD remote control and passes them to the DVD autochanger, via the RSE module on a bus system known as the IS bus. All screen settings can be changed using the RSE remote control.

The screen should be cleaned with a lightly, water moistened cloth. Do not use chemical agents or domestic products to clean the screen or any part of the surround.

Each RSE LCD screen is connected to the infotainment system using a 20 pin harness connector.

Pin No.	Description	Input/Output
1	Backlight GND	Input
2	Backlight power supply	Input
3	Not used	-
4	12V LCD power supply	Input
5	Not used	-
6	6V LCD power supply	Input
7	Not used	-
8	-16V LCD power supply	Input
9	Composite video GND	Input
10	Composite video input	Input
1	IS bus signal +	Input
12	IS bus signal -	Input
13	IS bus signal frame +	Input
14	IS bus signal frame -	Input
15-17	Not used	-
18	Power supply +12V	Input
19	Not used	-
20	Power GND	Output

REMOTE CONTROL



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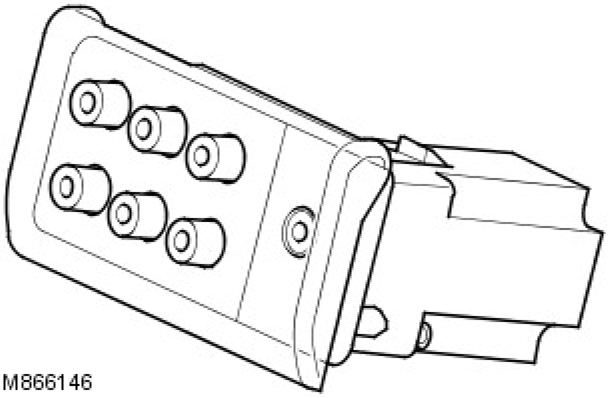
The remote control for operation of the DVD autochanger is a universal infrared type. A switch on the rear of the control selects either the left hand or right hand screens and allows the individual settings for each screen to be changed as required. The switch has a central position which disables the remote control and prevents battery drain.

The remote control transmits an infrared signal in response to operation of a button. The signal is received by a sensor located on each RSE LCD screen and is passed, via an IS bus to the RSE module. From the RSE module the signal is passed on an Alpine proprietary bus known as the Ai Net, to the DVD autochanger. The remote control also allows selection of an auxiliary input from the AVIO panel (video or games console) or selection of audio (radio or CD).

The remote control is powered by two 'AAA' batteries located in the rear of the control and are accessible by removing a sliding cover. When inserting the batteries it is important that the battery polarity is observed as marked in the battery compartment. light emitting diode (LED)'s at the top left and right hand corner of the control indicates that the remote control is operating when a button is pressed. Only one LED will illuminate depending on which screen is selected. If the LED's fail to illuminate when a button is pressed, the battery voltage may be low or the switch on the rear of the control may be set in the central 'off' position.

AUDIO VIDEO INPUT OUTPUT PANEL



The AVIO panel is located at the rear of the centre console. The panel provides for the connection of auxiliary audio and video inputs from an external source, such as a games console, via seven plugs on the panel. The plugs are covered by a lift up panel.

Two sets of video and audio phono plugs are provided and are designated as AV1 and AV2. The plugs are connected to the RSE module and allow the auxiliary input video to be played on the RSE LCD screens and the audio to be played on the vehicle speakers or via the rear headphone modules. The auxiliary input video cannot be displayed on the TAD.

An additional single, 3.5mm jack plug allows for the attachment of an auxiliary audio input, such as a personal stereo or MP3 player. This plug is connected directly to the IHU and allows audio to be played on the vehicle speakers.

The AVIO panel is connected to the infotainment system using two harness connectors.

AVIO Panel Harness Connector C2226

Pin No.	Description	Input/Output
1	Not used	-
2	GND	Input
3	Left auxiliary audio input	Input
4	Right auxiliary audio input	Input
5	Auxiliary GND	Input
6	Not used	-

AVIO Panel Harness Connector C2988

Pin No.	Description	Input/Output
1	AV 1 Video +	Input
2	AV 1 Video -	Input
3	AV 1 Audio right +	Input
4	AV 1 Audio right -	Input
5	AV 1 Audio left +	Input
6	AV 1 Audio left -	Input
7	AV 2 Video +	Input
8	AV 2 Video -	Input
9	AV 2 Audio right +	Input
10	AV 2 Audio right -	Input
11	AV 2 Audio left +	Input
12	AV 2 Audio left -	Input
13	Shield GND	Input

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Video System - Video System

Diagnosis and Testing

Overview

The video system combines a number of the networks and modules on the vehicle to provide a full entertainment package to the passengers.

Because of the complexity of the system, there are a variety of different techniques involved in diagnosing the system, as the networks used include medium speed controller area network (CAN), media oriented system transport (MOST), and other system-specific methods.

For information on the description and operation of the video system, refer to the relevant section of the workshop manual.

For information on the description and operation of the networks, refer to the Network Communications section of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Front touch screen display (TSD) installation and condition ● Rear seat entertainment (RSE) screen installation and condition ● Digital versatile disc (DVD) multi-changer installation and condition ● Television antennae (two in each rear side window)	● Fuses - CJB - fuse 42P - CJB - fuse 52P - CJB - fuse 53P - CJB - fuse 57P - CJB - fuse 58P ● Electrical harnesses ● Fibre optic cable harnesses ● Infotainment relay ● Display screens ● DVD multi-changer ● Television tuner module ● RSE module ● Television antenna amplifiers (4) ● Remote control and batteries

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended.
    - Make sure that all DTCs are cleared following rectification

Symptom chart

Symptom	Possible causes	Action
The DVD does not operate	● DVD multi-changer fuse blown ● No power to display screens ● Condensation	Check the DVD circuits for a short circuit causing fuse failure and rectify as necessary. Refer to the electrical guides. Check for power to the display screens, rectify as necessary. Refer to the electrical guides. Wait at least one hour for the condensation to dry out.
Remote control operation is unstable	● Handset batteries low on power ● Remote control receiver sensor or transmitter is dirty	Check and renew the batteries as necessary. Check and clean the receiver and transmitter as necessary.
There is no picture	● The display screen is set to an incorrect mode	Use the switch on the back of the handset to select the correct mode.

Symptom	Possible causes	Action
Playback does not start	- Disc is loaded upside-down - An incorrect format of disc is loaded - Parental lock is set - The setup menu is displayed	Check that the disc is correctly loaded. Check that the disc format is compatible. Cancel parental lock or check the rating of the disc. Press **SET** for at least 2 seconds to turn the setup menu off.
The picture is unclear or noisy	- The disc is being fast forwarded or rewound - The vehicle battery power is low	The picture may be slightly distorted in fast forward or rewind modes. Check the vehicle battery condition and state of charge.
The image "freezes"	- The disc is scratched	Load an undamaged disc.
NO MAG is displayed	- There is no magazine loaded into the DVD multi-changer	Load a magazine.
NO DISC is displayed	- There is no disc loaded into the magazine - The disc is dirty	Load a disc into the magazine. Clean the disc as necessary.
REGIONAL CODE VIOLATION is displayed	- The disc loaded does not match the regional code number	Load a disc which matches the regional code number.
VIDEO SIGNAL IS NOT CORRECT is displayed	- An NTSC disc is loaded into a PAL system, or vice versa	Load a disc of the correct format.
HI TEMP is displayed	- The system protective circuit is activated as it has detected a high temperature	Turn the power **OFF** on the unit and then back on again. If the display does not clear, leave the power off until the temperature decreases and turn the power **ON** again.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B100E25	Video Input "A"	- Television/Rear seat entertainment video input disconnected - TV/DVD malfunction	Check that the input is connected and that the system is transmitting.
B101025	Video Input "C"	- Rear camera video input disconnected - Camera malfunction	Check that the input is connected and that the system is transmitting.
B1A0016	Control module	- Control module circuit voltage below threshold: - Voltage less than (master control module voltage - 2V) for > 10 seconds - Battery voltage low - Control module circuit High resistance	Check the battery condition and state of charge. Refer to the relevant section of the workshop manual. Check the module power and ground circuits. Refer to the electrical guides.
B1A0017	Control module	- Control module circuit voltage above threshold - Battery voltage high (overcharging) - Control module circuit short circuit to power	Check the battery condition and state of charge. Refer to the relevant section of the workshop manual. Check the module power and ground circuits. Refer to the electrical guides.
B1A0044	Control module	- Rear entertainment control module - data memory failure	Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible causes	Action
B1A0048	Control module	● Control module supervision software fault	Configure the module using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.
B1A0049	Control module	● Amplifier internal electrical failure (can be set in more than one module) ● Touch screen display (TSD) internal electrical failure (can be set in more than one module)	Check the power and ground circuits to the module. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
B1A0098	Control module	● Rear entertainment control module, component or system over-temperature	Check the module and circuits. Refer to the electrical guides. Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1A5611	Antenna	● Antenna circuit short circuit to ground	Refer to the electrical guides and check the antenna circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A5612	Antenna	● Antenna circuit short circuit to power	Refer to the electrical guides and check the antenna circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1A5613	Antenna	● Antenna circuit high resistance	Refer to the electrical guides and check the antenna circuit. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D5079	Digital Disk Player	● Digital versatile disc (DVD) changer mechanical fault - Error report from AiNet	Check for a mechanical fault (jammed magazine, etc). Rectify as necessary.
B1D5093	Digital Disk Player	● Digital versatile disc (DVD) changer is not responding ● Communication error between the main and DVD microprocessors - No response from AiNet	Refer to the electrical guides and check the AiNet circuits. Rectify as necessary.
B1D5098	Digital Disk Player	● A high temperature condition has been detected	Check the installation of the DVD module. Make sure there is sufficient airflow. Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1D5511	Antenna #2	● Antenna 2 circuit short circuit to ground	Check the antenna and circuits. Refer to the electrical guides.
B1D5512	Antenna #2	● Antenna 2 circuit short circuit to power	Check the antenna and circuits. Refer to the electrical guides.
B1D5513	Antenna #2	● Antenna 2 circuit High resistance	Check the antenna and circuits. Refer to the electrical guides.
B1D5611	Antenna #3 circuit	● Antenna 3 circuit short circuit to ground	Check the antenna and circuits. Refer to the electrical guides.
B1D5612	Antenna #3 circuit	● Antenna 3 circuit short circuit to power	Check the antenna and circuits. Refer to the electrical guides.
B1D5613	Antenna #3 circuit	● Antenna 3 circuit High resistance	Check the antenna and circuits. Refer to the electrical guides.
B1D5711	Antenna #4 circuit	● Antenna 4 circuit short circuit to ground	Check the antenna and circuits. Refer to the electrical guides.
B1D5712	Antenna #4 circuit	● Antenna 4 circuit short circuit to power	Check the antenna and circuits. Refer to the electrical guides.
B1D5713	Antenna #4 circuit	● Antenna 4 circuit High resistance	Check the antenna and circuits. Refer to the electrical guides.

DTC	Description	Possible causes	Action
B1D5811	Television Output	- Television output circuit short circuit to ground	Check the television output circuits. Refer to the electrical guides.
B1D5812	Television Output	- Television output circuit short circuit to power	Check the television output circuits. Refer to the electrical guides.
B1D5813	Television Output	- Television output circuit High resistance	Check the television output circuits. Refer to the electrical guides.
B1D8193	Rear Left Display Module	- Left hand rear display is not responding - Communication error between the main and left hand display microprocessors - No response from the IS bus	Check the IS bus circuits. Refer to the electrical guides.
B1D8198	Rear Left Display Module	- A high temperature condition has been detected	Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
B1D8293	Rear Right Display Module	- Right hand rear display is not responding - Communication error between the main and right hand display microprocessors - No response from the IS bus	Check the IS bus circuits. Refer to the electrical guides.
B1D8298	Rear Right Display Module	- A high temperature condition has been detected	Clear the DTC and retest. Consider the atmospheric conditions before condemning a module.
U1A0131	Communication Link	• NOTE: 'NO NAVIGATION AVAILABLE' message is displayed - Navigation module - touch screen display (TSD), gigabit video interface (GVIF) fault - GVIF disconnected - GVIF - short to ground, power, open circuit	Check for correct connection of GVIF circuit connectors. Refer to the electrical circuit diagrams and check the multi-media module GVIF circuits for short to ground, power, open circuit
U1A1731	Incomplete MOST Ring Reported By REM	- No signal from the rear entertainment module (REM) - Fibre optic ring break condition reported	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual and in the approved diagnostic system.
U1A2087	Incomplete MOST Ring Reported By TVM	- No signal from the TV module (TVM) - Fibre optic ring break condition reported	Carry out the general MOST test. Refer to the Network Communications section of the workshop manual and in the approved diagnostic system.
U300068	Control Module	- Audio unit event information - MOST transceiver overheating	Refer to the electrical guides and check the power and ground circuits to the component. Check the MOST circuit. Carry out the general MOST test. Refer to the Network Communications section of the workshop manual and in the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Video System - Digital Versatile Disc (DVD) Player

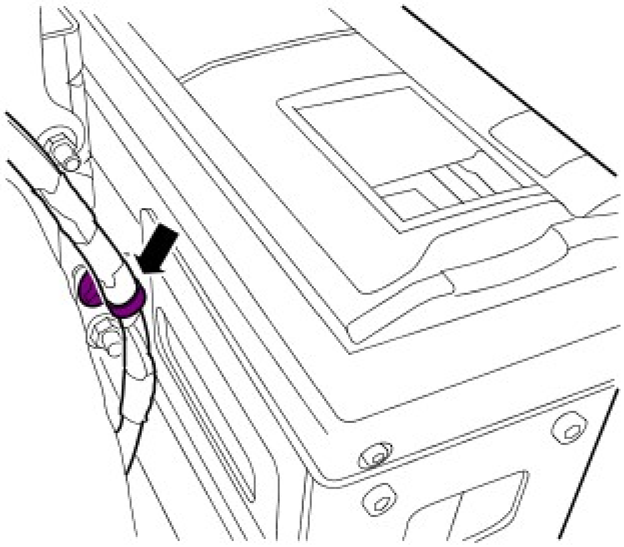
Removal and Installation

Removal

1. Remove the RH lower rear quarter trim panel.
For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Release the DVD player harness.

- Release the clip.



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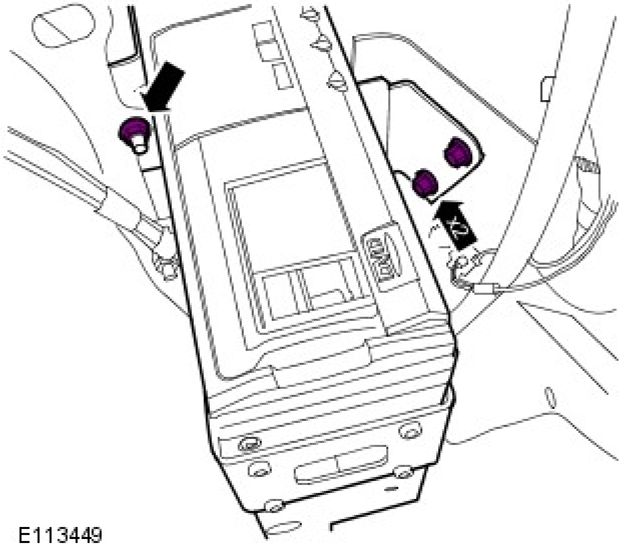
3. Release the DVD player from the body.

- Remove the 2 bolts.
- Remove the nut.



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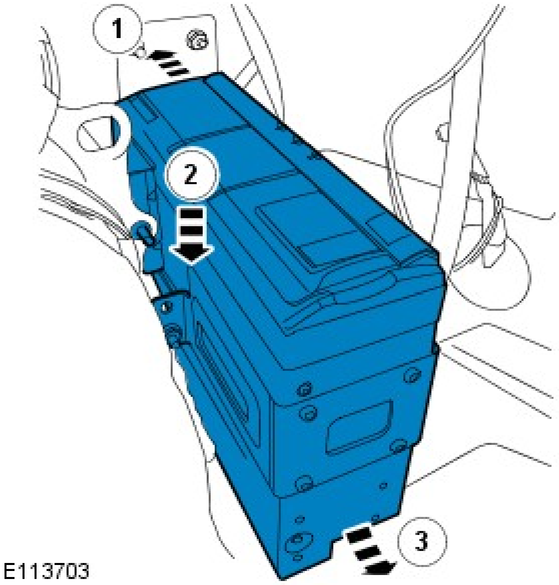

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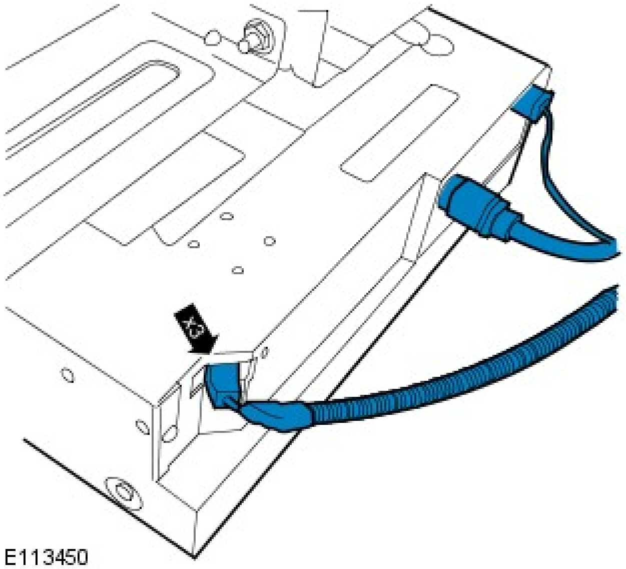
4. Detach the DVD player from the body.



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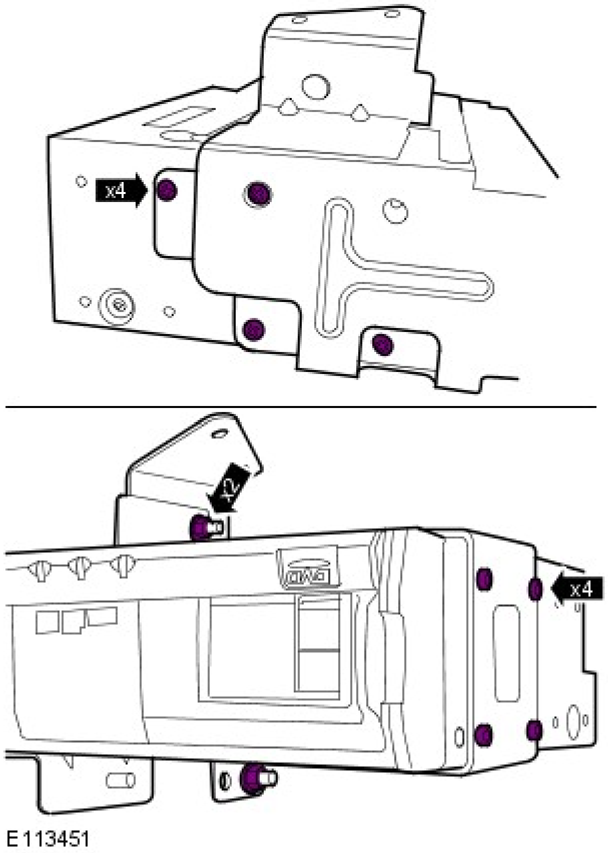
5. CAUTIONS:

⚠ Make sure that the fiber optic cables are not bent to a radius of less than 25 mm.

⚠ Make sure that the optical connectors are clean and free of foreign material.

Remove the DVD player.

- Disconnect the 3 electrical connectors.


x4
x2
x4
E113451

6. Remove the DVD player mounting bracket.

- Remove the 8 screws.
- Loosen the 2 nuts.

Installation

1. To install, reverse the removal procedure.

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Exterior Lighting -

Bulb	Type	Rating
* Halogen headlamps - Low beam	Halogen H7	55W
* Halogen headlamps - High beam	Halogen H7	55W
+* Xenon headlamps - Low/High beam	Xenon D2S	35W
Front fog lamps	Halogen H11	55W
Rear fog lamps	Bayonet P21	21W
Turn signal indicators - Front - NAS vehicles	Wedge S8W 3457 K	27/7W
Turn signal indicators - Front - ROW vehicles	Bayonet PY21W	21W
Turn signal indicators - Rear	Bayonet P21	21W
Turn signal indicators - Side Repeaters	Capless W5W	5W
Side lamps - Front	Capless W5W	5W
** Stop/Tail lamps	Bayonet - Twin filament P21/5	21W/5W
High mounted stop lamp (HMSL)	LED's	-
License plate lamps	Capless W5W	5W
Reverse lamps	Bayonet P21	21W
Cornering lamp/Static bending lamp	Halogen H8	35W
NAS - Side marker lamps - front/rear	Capless W3W	3W

⚠ WARNING: + Refer to the General Information - Electrical Precautions section of this manual prior to carrying out any procedures on the Xenon headlamp system fitted to certain vehicles.

- NOTE: * NAS vehicles - Cornering lamps are not fitted to these vehicles.

- NOTE: ** Note: 21W filament is not functional on lower tail lamp.

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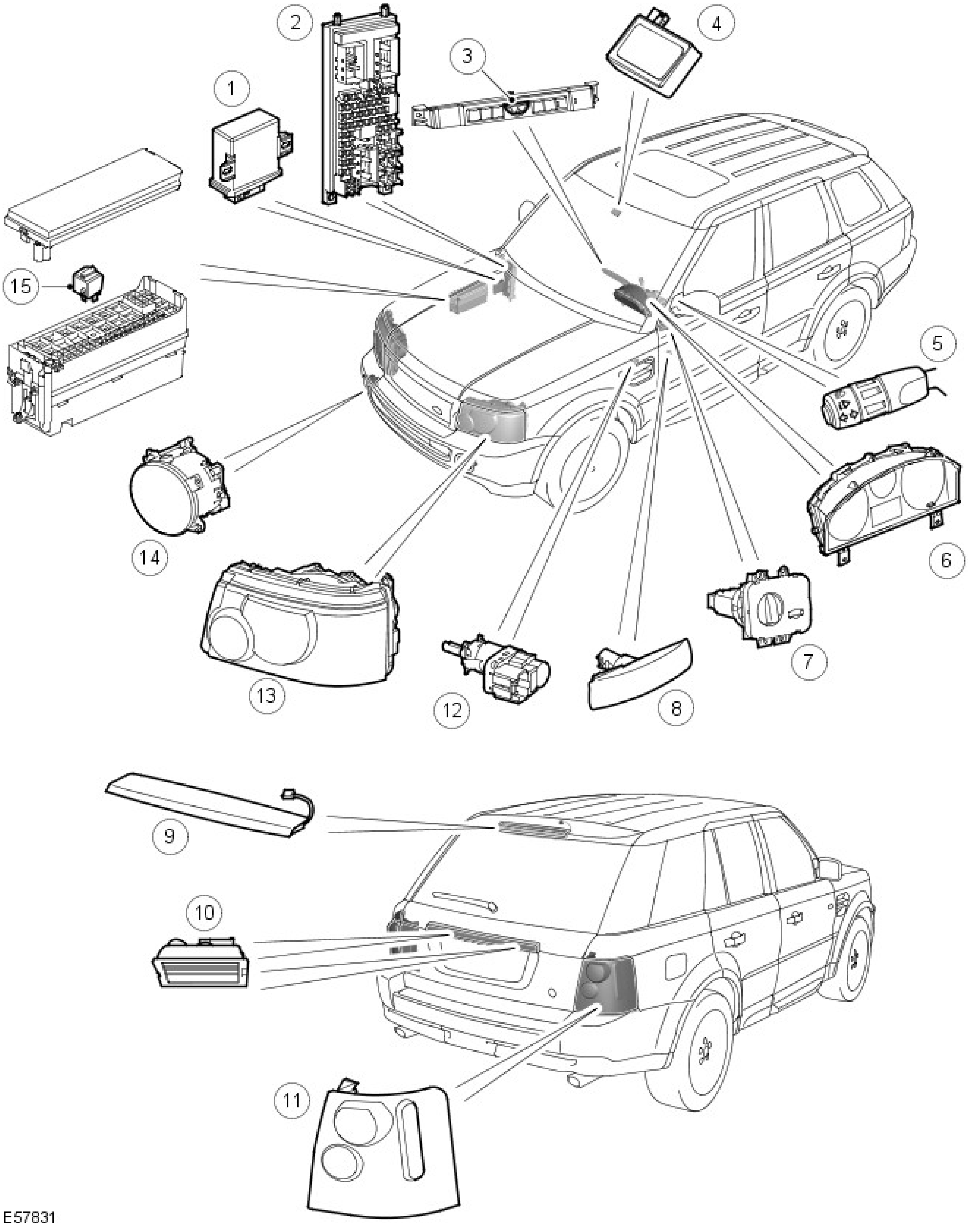
Exterior Lighting - Exterior Lighting

Description and Operation

Exterior Lighting Component Location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E57831

Item	Part Number	Description
1	-	Adaptive Front lighting System (AFS) control module
2	-	Central Junction Box (CJB)
3	-	Hazard flasher switch
4	-	Rain/light sensor
5	-	LH steering column multifunction switch
6	-	Instrument cluster
7	-	Lighting control switch
8	-	Turn signal indicator repeater lamp
9	-	High mounted stop lamp
10	-	License plate lamps
11	-	Rear lamp assembly
12	-	Stop lamp switch
13	-	Headlamp assembly
14	-	Front fog lamp
15	-	Front fog lamp relay (if fitted)

GENERAL

The exterior lighting system comprises the following exterior lamps:

- Front and rear side lamps
- License plate lamps
- Side marker lamps (if fitted)
- Front and rear turn signal indicator lamps
- Turn signal indicator repeater lamps
- Stop lamps and high mounted stop lamp
- Reversing lamps
- Rear fog lamps
- Front fog lamps (if fitted)
- Cornering/Static bending lamps (if fitted) - All except NAS
- Low and high beam headlamps
- Adaptive Front lighting System (AFS) (if fitted).

Exterior Bulb Type/Rating

The following table shows the bulbs used for the exterior lighting system and their type and specification.

Bulb	Type	Rating
Halogen Headlamps - Low/High beam	Halogen H7	55W
Xenon headlamps - Low/High Beam	Xenon D2S	35W
Headlamps - High Beam	Halogen H7	55W
Front fog lamps	Halogen H11	55W
Rear fog lamps	Bayonet P21	21W
Turn signal indicator lamps - Front - ROW	Bayonet PY21W	21W
Turn signal indicator lamps - Front - NAS	Wedge S8W 3457K	27/7W
Turn signal indicator repeater lamps	Capless W5W	5W
Turn signal indicator lamps - Rear	Bayonet P21	21W
Side lamps - Front	Capless W5W	5W
Stop/Tail lamps	Bayonet - Twin filament P21/5	21W/5W Note: 21W filament not functional on lower tail lamp
High mounted stop lamp	LED's	-
License plate lamps	Capless W5W	5W
Reverse lamps	Bayonet P21	21W
Cornering lamp/Static bending lamp	Halogen H8	35W
NAS - Side marker lamp (front/rear)	Capless W3W	3W

CENTRAL JUNCTION BOX

The Central Junction Box (CJB) is an integrated unit located behind the instrument panel on the passenger side of the bulkhead. The CJB contains fuses, relays and a number of microprocessors which control the power supply and functionality of the lighting system and other vehicle systems.

Input Signals

The CJB receives inputs from the following switches:

- Lighting control switch
    - Side lamp position
    - Headlamp position
    - Automatic (AUTO) position (if fitted)
- Brake switch
- Left hand steering column multifunction switch for turn signal indicators and high beam/headlamp flash
- Hazard flasher switch
- Rain/light sensor (LIN signal)

Circuit Protection

The CJB provides circuit protection for all exterior lighting circuits. Most exterior lighting circuits are protected by conventional fuses, however, the following circuits are protected by Field Effect Transistors (FETs).

- Low beam
- High beam
- Cornering/static bending lamps
- Turn signal indicator lamps
- Trailer turn signal indicator lamps.

Operation of the above listed circuits is protected by FETs which can detect overloads and short circuits. The FETs respond to heat generated by increased current flow caused by a short circuit. On a normal circuit this would cause the fuse to blow. The FETs respond to the heat increase and disconnect the supply to the affected circuit. When the fault is rectified or the FET has cooled, the FET will reset and operate the circuit normally. If the fault persists the FET will cycle, disconnecting and reconnecting the power supply.

The CJB stores fault codes which can be retrieved using T4. The fault code will identify that there is fault on a particular output which will assist with fault detection.

Alarm Indications

The exterior lighting system is used for alarm arm and disarm requests.

When the driver locks the vehicle, a visual indication of a successful lock request is displayed to the driver by the hazard flashers operating three times with a pattern of 500ms on and 500ms off.

When the driver unlocks the vehicle, a visual indication of a successful unlock request is displayed to the driver by the hazard flashers operating once for 3 seconds.

If the alarm is triggered, the hazard flashers are operated for ten 30 second cycles of on for 380ms and off 380ms with a 5 second off delay between each cycle.
For additional information, refer to: Anti-Theft - Active (419-01A Anti-Theft - Active, Description and Operation).

Lights on Warning Chime

When the ignition switch is in the off (0) or auxiliary (I) position and the lighting control switch is in the side lamp or headlamp position, a warning chime will sound if the driver's door is opened. This indicates to the driver that the exterior lights have been left on.

The chime is generated from the instrument cluster sounder on receipt of a lights on signal, a door open signal and an ignition switch off signal from the CJB on the CAN bus.

Crash Signal Activation

When a crash signal is transmitted from the restraints control module, the CJB activates the hazard flashers and the turn signal indicators in the instrument cluster.

The hazard flashers will continue to operate until the ignition switch is moved to the auxiliary position I or the off position O or the restraints control module no longer transmits the crash signal.
For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).

Headlamp Timer

The CJB controls a headlamp timer function which allows the headlamps to remain on for a period of time after leaving the vehicle. This is a driver convenience feature which illuminates the driveway after leaving the vehicle.

To select this feature, the lighting control switch must be in the headlamp or side lamp position when the ignition switch is moved from the ignition position II to the off position. The lighting control switch must be moved to the off position or AUTO position (if fitted) to activate the timer. The timer function will then be initiated and low beam headlamps will be illuminated for the selected timer period.

The timer period is selectable by the driver and can range from 10 to 60 seconds in 10 second increments. The default timer period is set at 20 seconds.

The default setting can be changed by a Land Rover or authorised dealer or by the driver using the vehicle's customer personalisation options.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

With the vehicle stationary and the ignition switch in any position, pressing the trip computer button on the end of the left hand steering column multifunction switch gives access to the options. The options can be scrolled through using the audio search buttons on the steering wheel. The options are displayed in the message center. When the headlamp timer option is reached, the settings can be changed using the audio search buttons on the steering wheel. When the selection has been made confirmation is performed by pressing the trip computer button.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

• NOTE: The headlamp timer feature will be cancelled under the following conditions:

- The ignition switch is moved from auxiliary (I) to ignition (II)
- The lighting control switch is moved from off to side lamps.

The headlamp timer can also be operated using the ignition key personal button, if this feature has been set by the driver.
For additional information, refer to: Handles, Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

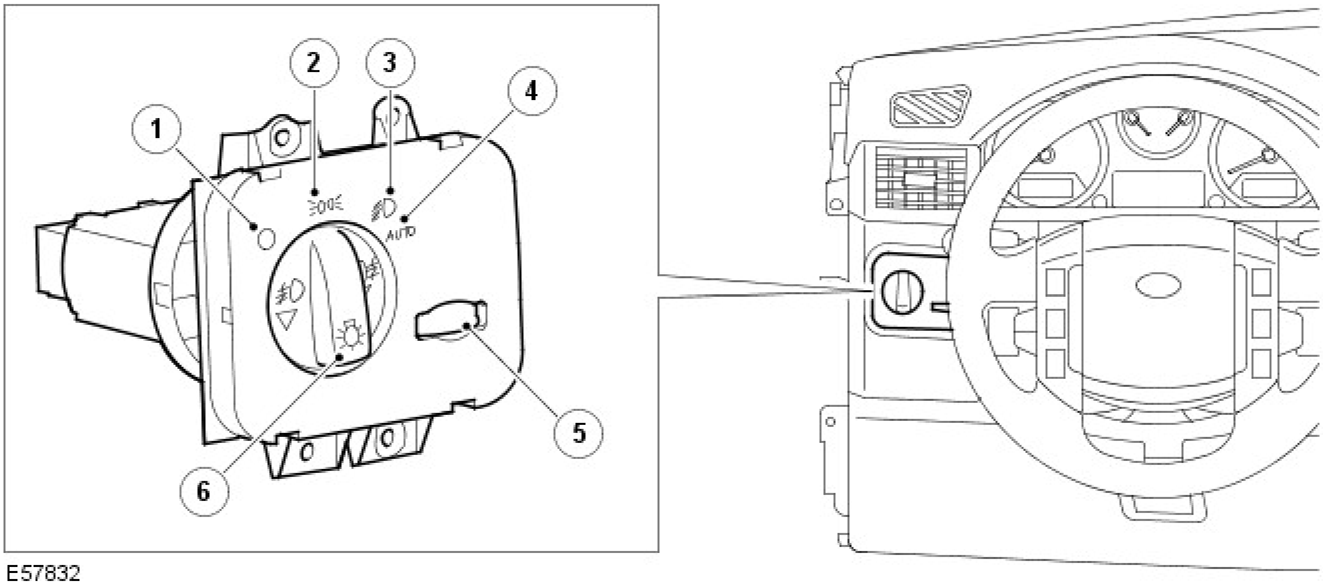
• NOTE: In certain markets the headlamp timer function using the ignition key personal button also activates the reversing lamps to provide additional illumination at the rear of the vehicle.

LIGHTING CONTROL SWITCH

The lighting control switch is located in the driver's side of the instrument panel, below the outer fresh air vent. The switch contains a rotary switch for selecting the vehicle exterior lighting functions and an instrument illumination dimmer rheostat.

Two variants of the switch are available to cover the different vehicle specifications and market variations.

• NOTE: Lighting control switch with AUTO function shown



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Item	Part Number	Description
1	-	OFF position
2	-	Side lamps position
3	-	Headlamps position
4	-	Automatic headlamps position (if fitted)
5	-	Instrument illumination dimmer control
6	-	Rotary control switch

All outputs from the lighting control switch, with the exception of the dimmer control output, are subject to a voltage drop through the switch of approximately 200mV. Therefore, assuming that the input voltage to the switch is 12V, then the voltage measured at the switch output pins will be 11.8V.

Rotary Control

The rotary control can be turned to select one of four positions; off, side lamps, headlamps and automatic (AUTO). On vehicles without the automatic feature the switch only has three positions.

Three additional positions for fog lamps are available by pulling the rotary control; all fog lamps off, front fog lamps on only and front and rear fog lamps on. On vehicles without front fog lamps the switch can only be pulled once to activate the rear fog lamps.

On vehicles fitted with front fog lamps, the rotary control can be pulled to select fog lamps when it is in the side lamps or headlamps positions.

The rotary control can only be pulled to select rear fog lamps when it is in the headlamps position.

The fog lamps will be switched off automatically when the rotary control is turned to the off position or pushed in to the fog lamps off position.

Dimmer Control

The dimmer control provides a Pulse Width Modulated (PWM) output to control the illumination brightness of the instrument panel and other illumination. The dimmer switch operates using a rotary thumbwheel which is connected to a rheostat and a high side switch.

The rheostat is a variable resistor which provides a high or low resistance according to its set position. This output is passed to a switchable capacitor or a high side switch. The high side switch uses the output from the rheostat to determine the switching frequency of the capacitor which provides the PWM output of between 8 and 12V to determine the brightness of the illumination.

Automatic Headlamps

Refer to Automatic Headlamps in this section.

HEADLAMP ASSEMBLY

Three types of headlamp are available; Halogen, Bi-Xenon or Adaptive Front lighting System (AFS). The headlamps share a common, clear lens.

The headlamps are located on the front carrier assembly. Each headlamp is secured to the front carrier assembly with two locking plates. The locking plate slides in grooves in the rear of the headlamp and two holes in each plate locate on pins on the carrier. Each locking plate is pressed down to lock the pins in the locking plate holes. The locking plates allow removal of the headlamp from the carrier for bulb changing without the requirement for special tools. Removal of a headlamp requires the removal of the radiator grille.

The rear of the headlamp unit has removable access panels which allow access to the bulbs for replacement. A large cover, which is rotated anti-clockwise to remove, allows access to the low/high beam bulb on both halogen and xenon headlamps. Another removable cover provides access to the high beam only halogen bulb which is retained with a spring clip. A smaller cover, which is located behind the outer locking plate, can also be rotated anti-clockwise to provide access to the turn signal lamp bulb. Another cover located on the underside of the headlamp assembly provides access to the side lamp bulb, the cornering lamp/static bending lamp bulb and the side marker lamp bulb on NAS models.

The headlamps have two adjustment screws on the rear which allow for the manual setting of the vertical and horizontal alignment.

On NAS vehicles the headlamp is regarded as 'Visual Optically Left' (VOL) aiming. These have to be moved in the same direction and by the same amount to create vertical movement of the beam pattern. There is no horizontal adjustment. Refer to the Service Repair Procedures manual for headlamp alignment data and procedures.

Each headlamp has an integral sixteen pin connector which provides inputs and outputs for the various functions of the headlamp assembly. The usage of the pins differs between model variants, refer to the Electrical Reference Library (ERL) for pin details.

The low beam headlamps are switched on when the ignition switch is in the ignition position (II) and:

- the lighting control switch is in the headlamp position
- the lighting control switch is in the AUTO position and a 'lights on' signal is received by the CJB from the rain/light sensor.

The low beam headlamps can also be operated by the headlamp delay feature.

The high beam headlamps are switched on when the ignition switch is in position (II) and:

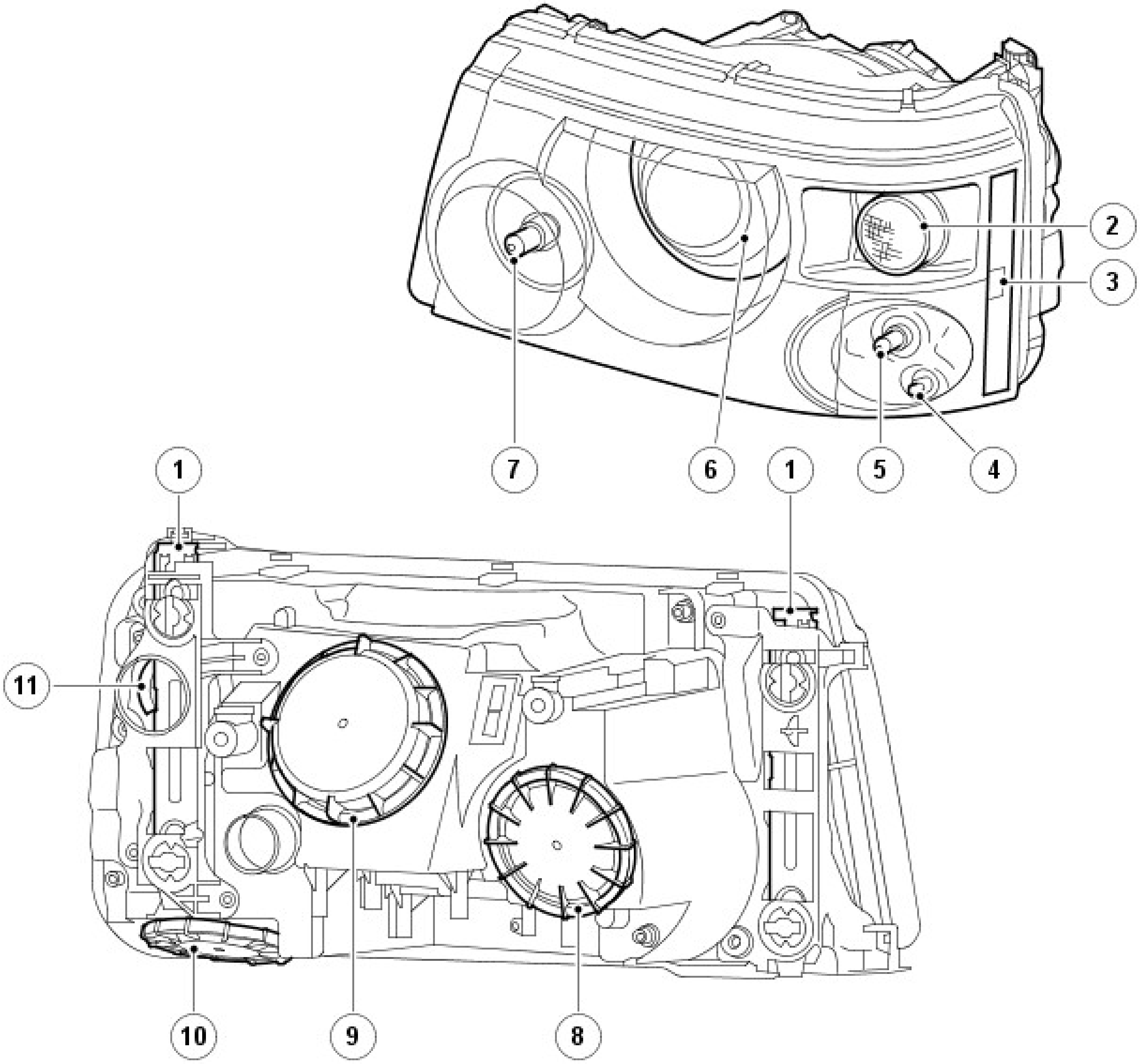
- The low beam headlamps are selected on in the headlamp position or activated via the AUTO feature
- The left hand steering column multifunction switch is pushed forward away from the driver.

The high beam headlamps will be switched off when:

- The left hand steering column multifunction switch is moved rearward towards the driver

- The low beam headlamps are switched off
- The ignition switch is moved to the auxiliary position (I) or off position (0).

Halogen Headlamps



E57833

Item	Part Number	Description
1	-	Locking plate
2	-	Turn signal indicator lamp
3	-	Side marker lamp (NAS only)
4	-	Side lamp
5	-	Cornering lamp (if fitted)
6	-	Bi-halogen low/high beam headlamp
7	-	High beam headlamp
8	-	High beam lamp access cover
9	-	Low/high beam lamp access cover
10	-	Side lamp/cornering lamp/side marker lamp access cover
11	-	Turn signal indicator lamp bulb holder (hidden)

The mono-halogen low beam only headlamp uses a projector lens, similar to the xenon headlamp. The projector module comprises an ellipsoidal lens and a reflector. The projector reflector collects the light produced by the halogen bulb and projects the light into a focal plane containing a shield. The contour of the shield is projected onto the road by the lens.

A complex surface reflector is used for the halogen fill in high beam lamp. This type of reflector is divided into separate parabolic segments, with each segment having a different focal length.

The low and high beam bulbs are quartz halogen H7, with a rating of 55W. The bulbs are retained in the headlamp unit with conventional wire retaining clips.

A tourist lever mechanism is located on the inboard side of the projector module. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens. The beam is changed by removing the access cover at the rear of the lamp assembly and moving a small lever located near the bulb holder, at the side of the projector. The tourist function is operated by pushing the lever upwards on LH headlamps and downwards on RH headlamps.

Cornering Lamp

- NOTE: The cornering lamps are not fitted to NAS vehicles

The cornering lamps are an optional feature designed to illuminate the direction of travel when cornering at low speeds. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis.

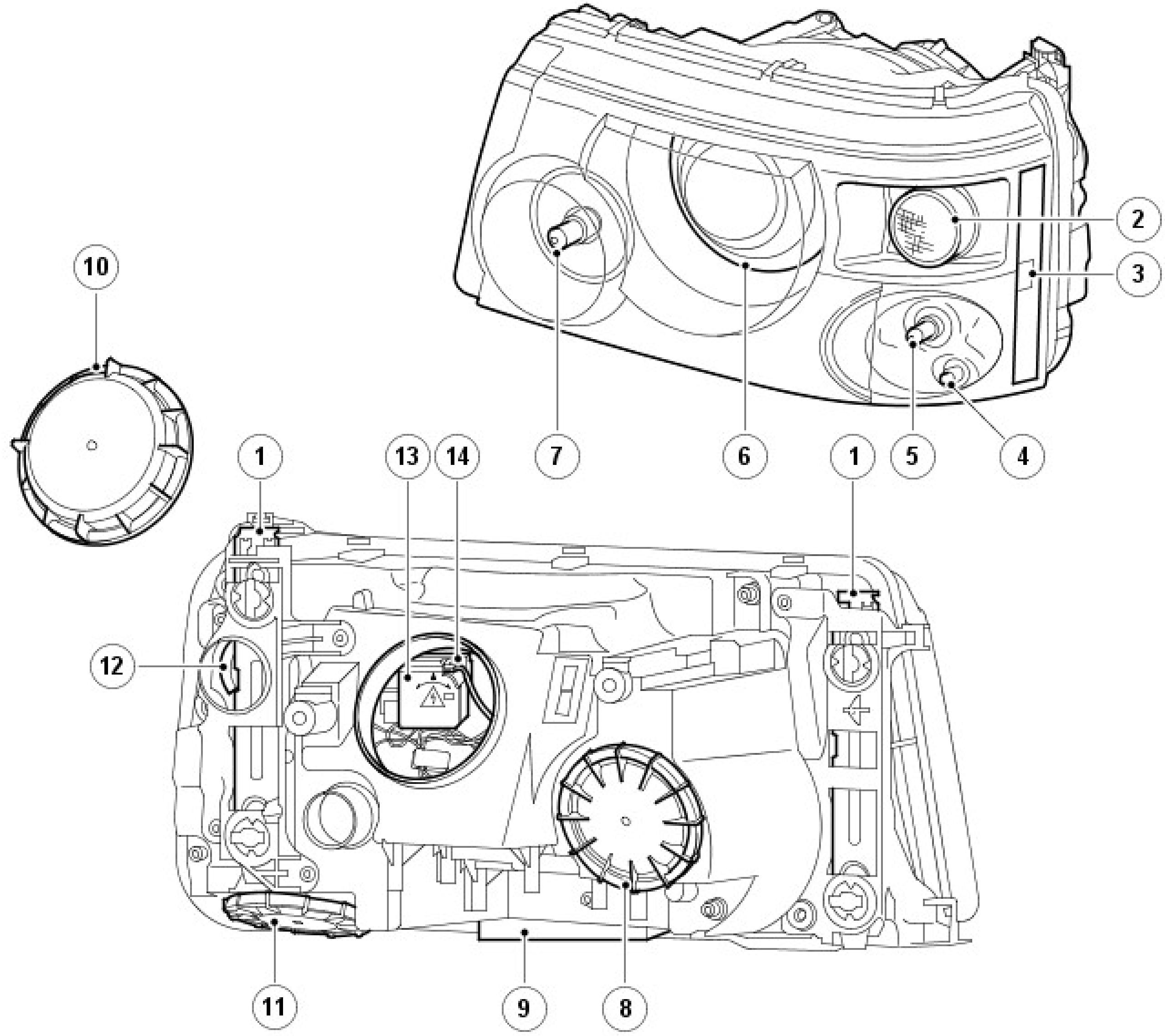
The cornering lamp is incorporated into the outer part of the headlamp assembly and shares the same housing and reflector as the side lamp.

The cornering lamp uses a 35W Halogen H8 bulb which is permanently located in an integral holder which is connected on the headlamp housing. The holder is located in an aperture in the headlamp housing and rotated to lock. The bulb is accessible via a removable cover on the base of the headlamp housing.

The cornering lamps are controlled by the left hand steering column multifunction switch with the lighting control switch in the headlamp position and the ignition switch in position II. The cornering lamps are supplied power via the ignition switch to ensure that they do not function with the headlamp delay feature. The cornering lamps are deactivated if the vehicle speed exceeds 25 mph (40 km/h).

Only one cornering lamp will illuminate at any one time. If the left hand turn signal indicators are selected on, the left hand cornering lamp will be illuminated and visa versa, providing the vehicle speed and lighting control switch positions are correct.

Xenon Headlamps



E57834

Item	Part Number	Description
1	-	Locking plate
2	-	Turn signal indicator lamp
3	-	Side marker lamp (NAS only)
4	-	Side lamps
5	-	Cornering lamp (if fitted)
6	-	Bi-Xenon low/high beam lamp
7	-	Halogen high beam lamp
8	-	High beam lamp access cover
9	-	Xenon control module
10	-	Low/high beam lamp access cover
11	-	Side lamp/cornering lamp/side marker lamp access cover
12	-	Turn signal indicator lamp bulb holder (hidden)
13	-	Igniter
14	-	Igniter connector

Safety Precautions

⚠ WARNING: The Xenon system generates up to 28000 volts and contact with this voltage could lead to fatality. Make sure that the headlamps are switched off before working on the system.

The following safety precautions must be followed when working on the xenon headlamp system:

- **DO NOT** attempt any procedures on the xenon headlamps when the lights are switched on.
- Handling of the D2S Xenon bulb must be performed using suitable protective equipment, e.g. gloves and goggles. The glass part of the bulb must not be touched.
- Xenon bulbs must be disposed of as hazardous waste.
- Only operate the lamp in a mounted condition in the reflector.

The xenon headlamps use a complex surface reflector for the Halogen fill in high beam lamp only lighting unit, which is of the same design as the high beam unit used on the Halogen headlamps. This type of reflector has the reflector divided into separate parabolic segments, with each segment having a different focal length.

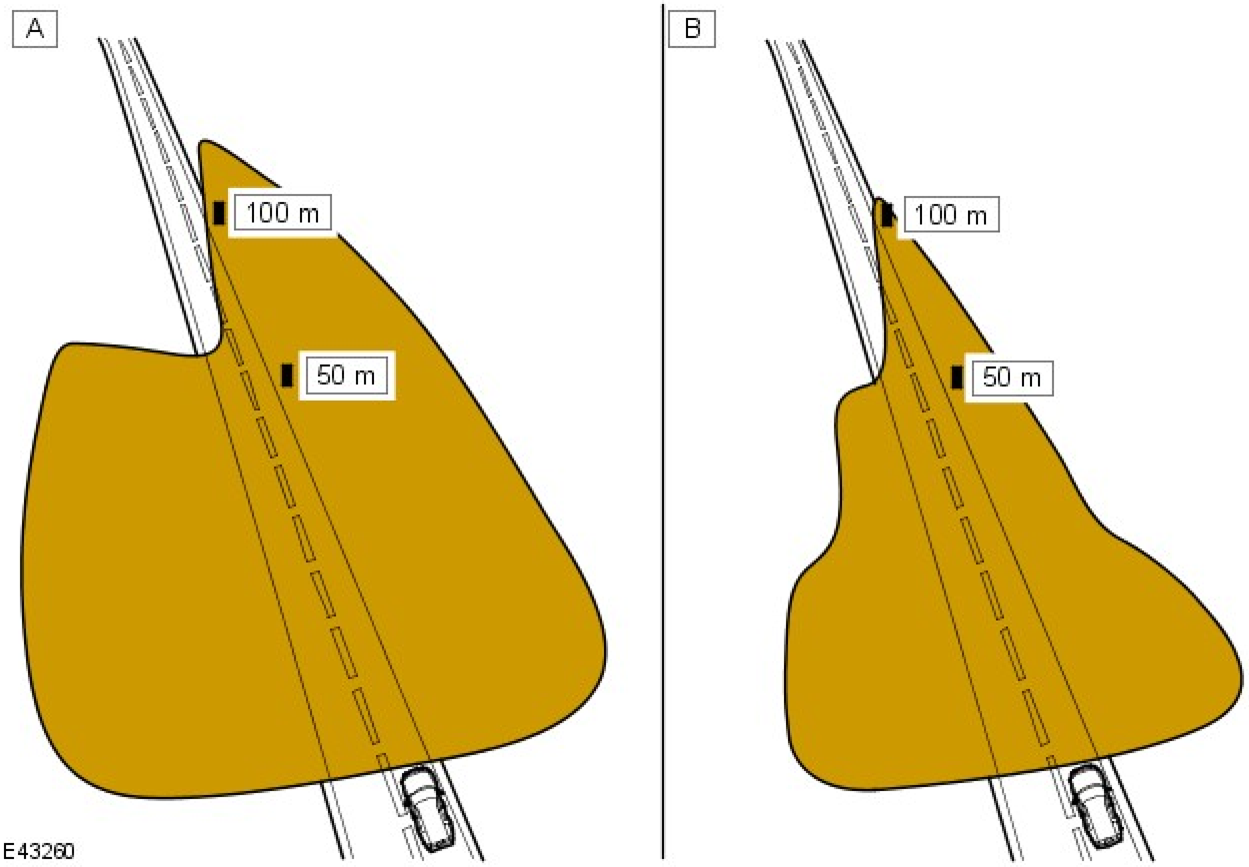
The high beam bulbs are quartz halogen H7, with a rating of 55W. The bulbs are retained in the headlamp unit with conventional wire retaining clips.

The xenon headlamp is known as bi-xenon and operates as both low beam and high beam headlamp unit. The xenon lamp or High Intensity Discharge (HID) lamp as they are sometimes called, comprises an ellipsoidal lens with a solenoid controlled shutter to change the beam output from low to high beam.

• NOTE: If the lighting control switch is in the OFF position, the xenon lamps do not operate when the high beam 'flash' function is operated. If the lighting switch is in the headlamps position or AUTO position with the low beam lamps active, the xenon low beam will remain on when the high beam 'flash' function is operated.

The xenon headlamp system is controlled by the CJB using a control module for each headlamp and an igniter. The control modules and the igniters provide the regulated power supply required to illuminate the xenon bulbs through their start-up phases of operation.

Xenon/Halogen Headlamp Beam Comparison



Item	Part Number	Description
A	-	Bi-Xenon
B	-	Halogen

The xenon low/high beam headlamps use ellipsoidal technology for the lens and reflector providing improved night time visibility compared to conventional halogen headlamps. The xenon headlamps provide the following benefits when compared to halogen headlamps:

- Longer bulb life - Approximately 3 to 5 times longer than a halogen bulb
- Increased light output - xenon headlamps output 3 to 4 times more light on the road surface than halogen headlamps
- Blue/White light which is closer to natural daylight - compared to a yellow light produced by a halogen bulb
- Improved night time driving visibility - xenon lamps produce a wider and brighter beam in front of the vehicle than conventional halogen bulbs
- Lower running temperatures
- Lower power consumption.

The xenon headlamp is a self contained unit located within the headlamp assembly. The unit comprises a reflector, an adaptor ring, the lens, a shutter controller and the xenon bulb, which as an assembly is known as the projector module.

The reflector is curved and provides the mounting for the xenon bulb. The bulb locates in a keyway to ensure correct alignment in the reflector and is secured by two wire locking tabs. The bulb has a centrally mounted single pin and an outer ring which each connect with the contacts in the igniter.

The igniter is located on the rear of the bulb and is secured by pushing onto the bulb and rotating clockwise. The igniter has an electrical connector which can only be installed in the igniter socket once the igniter unit is attached to the bulb and is automatically ejected when the igniter is removed.

The shutter controller is a solenoid which operates the shutter mechanism via a lever. The shutter is used to change the beam projection from low beam to high beam and visa versa.

A tourist lever mechanism is located different sides of the projector module depending on market. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens. The tourist function is operated by removing the access cover at the rear of the lamp assembly and pushing the tourist lever downwards.

⚠ WARNING: Make sure that the headlamps are off before removing the access cover.

The xenon bulbs illuminate when an arc of electrical current is established between two electrodes within the bulb. The xenon gas sealed in the bulb reacts to the electrical excitation and the heat generated by the current flow to produce the blue/white light.

To operate at full efficiency, the xenon bulb goes through three stages of operation before full output for continuous operation is achieved. The three phases are; start-up phase, warm-up phase and continuous phase.

In the start-up phase, the bulb requires an initial high voltage starting pulse of up to 30000 volts to establish the arc. This is produced by the igniters. The warm-up phase begins once the arc is established. The xenon control modules regulate the supply to the bulbs to 2.6A which gives a lamp output of 75W. During this phase, the xenon gas begins to illuminate brightly and the environment within the bulb stabilises ensuring a continual current flow between the electrodes. When the warm-up phase is complete, the xenon control modules change to continuous phase. The supply voltage to the bulb is reduced and the operating power required for continual operation is reduced to 35W. The process from start-up to continuous phase is completed in a very short time.

The xenon system is controlled by the CJB, the two xenon control modules and the two igniters. The xenon control modules (one per headlamp) receive an operating voltage from the CJB when the headlamps are switched on. The modules regulate the power supply required through the phases of start-up.

The igniters (one per headlamp) generate the initial high voltage required to establish the arc. The igniters have integral coils which generate high voltage pulses required for start-up. Once the xenon bulbs are operating, the igniters provide a closed circuit for regulated power supply from the control modules.

Turn Signal Indicator Lamp

The turn signal indicator lamp is incorporated into the outer part of the headlamp assembly. The lamp is located above the side lamp/cornering lamp. The turn signal indicator lamp uses a PY21W bayonet orange colored bulb in ROW markets, a S8W 27/7W wedge bulb is used in NAS markets.

The bulb is fitted into a holder which connects with contacts in the headlamp housing. The holder is fitted into an aperture in the headlamp housing and rotated to lock into position. The cover is secured in the housing by rotating in a clockwise direction until locked. Access to the cover requires removal of the headlamp from the front carrier assembly and removal of the outer locking plate from the headlamp.

The turn signal lamps are operated by the left hand steering column multifunction switch or by the hazard flasher switch. The steering column multifunction switch is only active with the ignition switch in the ignition position (II), the hazard flasher switch is active at all times. When active, the turn signal lamps will flash at a frequency cycle of 380ms on and 380ms off.

If a bulb fails, the remaining turn signal lamps bulbs continue to flash at normal speed. The turn signal indicators in the instrument cluster will flash at double speed to indicate the bulb failure to the driver.

Side Lamp

The side lamp is incorporated into the outer part of the headlamp assembly and is located below the turn signal indicator lamp. The side lamp shares the same housing and reflector as the cornering lamp and static bending lamp (when fitted).

The side lamp uses a W5W wedge fitting bulb which locates into a holder which is connected via wires to the main connector on the headlamp housing. The holder is a push fit into a receptacle in the headlamp housing. The bulb is accessible via a removable cover on the base of the headlamp housing. Access to the cover requires removal of the headlamp from the front carrier assembly.

The side lamps are operated by selecting side lamps or headlamps on the lighting control switch. The side lamps are operational at all times and are not dependant on the ignition switch position. The side lamps will also be illuminated when the lighting control switch is in the AUTO position and a 'lights on' signal is received by the CJB from the rain/light sensor.

Cornering Lamp

- NOTE: The cornering lamps are not fitted to NAS vehicles

The cornering lamps are an optional feature designed to illuminate the direction of travel when cornering at low speeds. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis.

The cornering lamp is incorporated into the outer part of the headlamp assembly and shares the same housing and reflector as the side lamp.

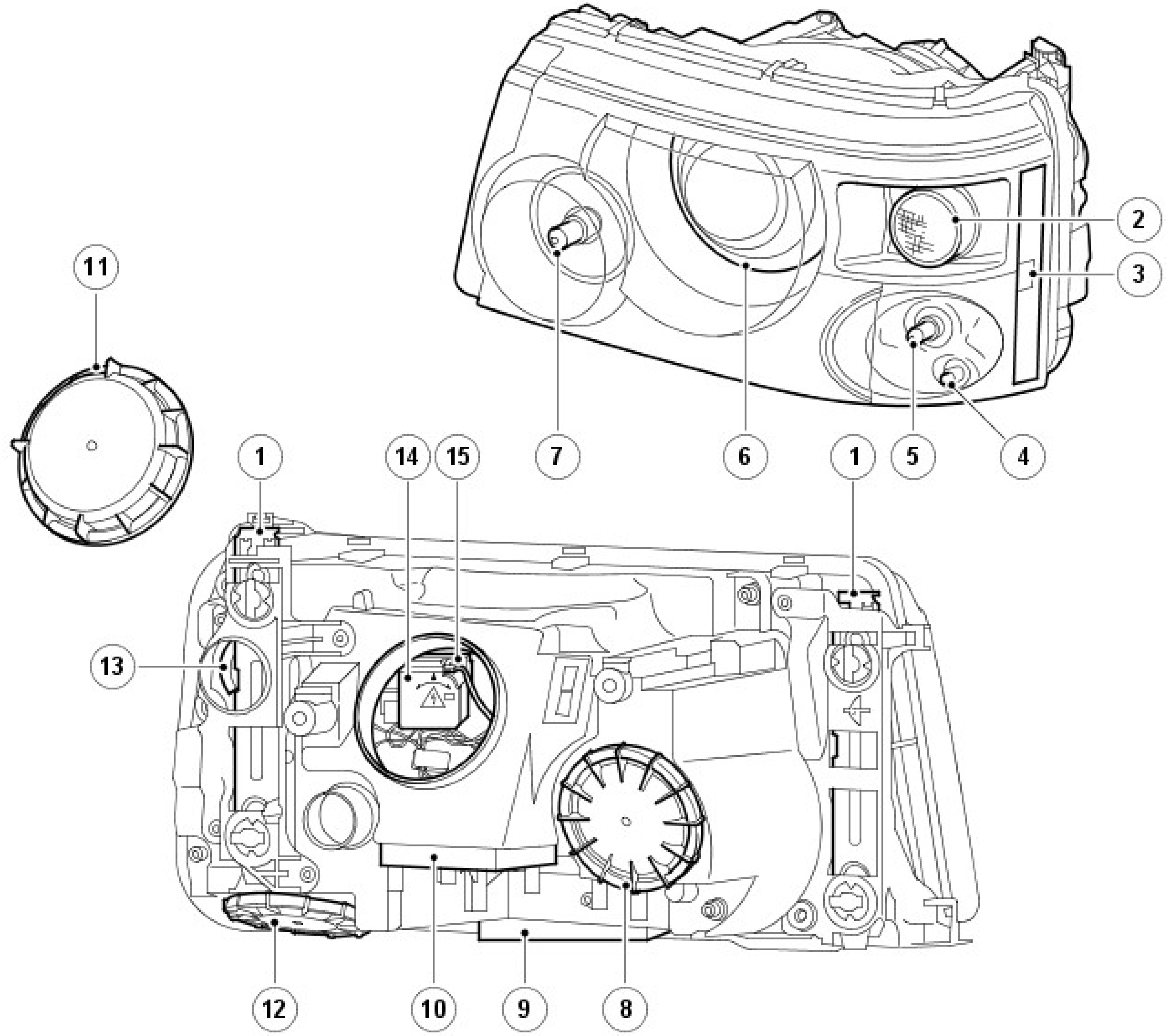
The cornering lamp uses a 35W Halogen H8 bulb which is permanently located in an integral holder which is connected on the headlamp housing. The holder is located in an aperture in the headlamp housing and rotated to lock. The bulb is accessible via a removable cover on the base of the headlamp housing.

The cornering lamps are controlled by the left hand steering column multifunction switch with the lighting control switch in the headlamp position and the ignition switch in position II. The cornering lamps are supplied power via the ignition switch to ensure that they do not function with the headlamp delay feature. The cornering lamps are deactivated if the vehicle speed exceeds 25 mph (40 km/h).

Only one cornering lamp will illuminate at any one time. If the left hand turn signal indicators are selected on, the left hand cornering lamp will be illuminated and visa versa, providing the vehicle speed and lighting control switch positions are correct.

ADAPTIVE FRONT LIGHTING SYSTEM (AFS)

Xenon Headlamp Assembly with AFS



E57835

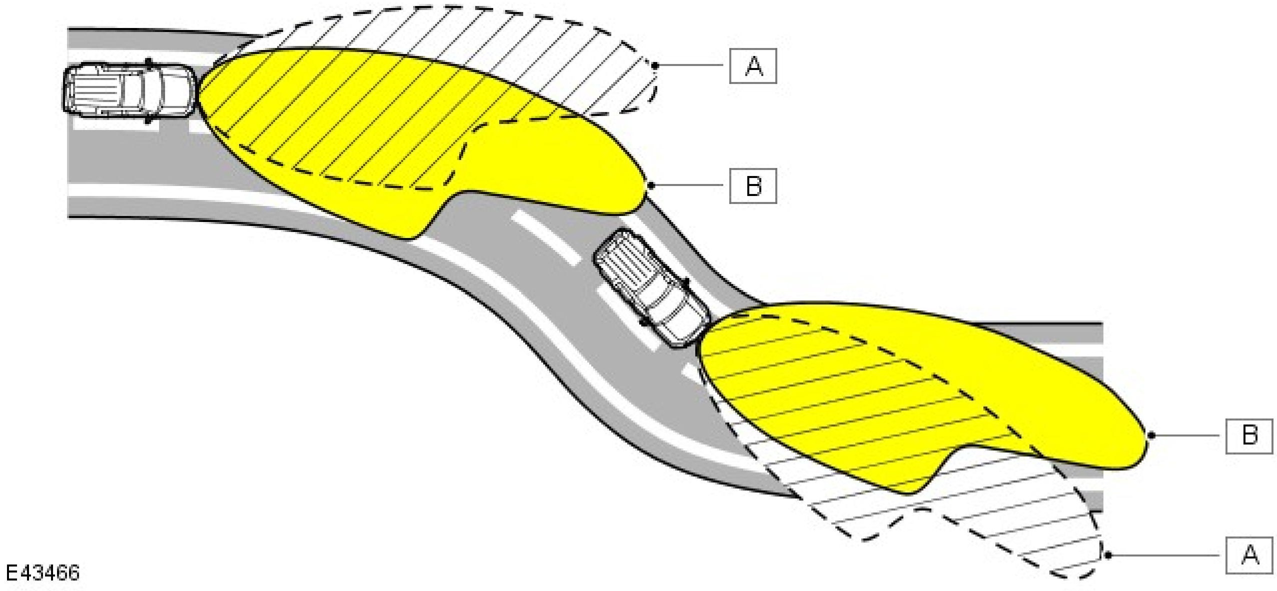
Item	Part Number	Description
1	-	Locking plate
2	-	Turn signal indicator lamp
3	-	Side marker lamp (NAS only)
4	-	Side lamp
5	-	Static bending lamp (All except NAS)
6	-	Xenon low/high beam AFS lamp
7	-	Halogen high beam lamp
8	-	High beam lamp access cover
9	-	Xenon control module
10	-	AFS power control module
11	-	Low/high beam lamp access cover
12	-	Side lamp and static bending lamp access cover (hidden)
13	-	Turn signal indicator lamp access cover (hidden)
14	-	Igniter
15	-	Igniter connector

The AFS is a system to improve driver visibility under differing driving conditions. AFS provides a larger visible area which is illuminated when cornering by adjusting the position of the beam distribution on the road. Horizontal adjustment is made automatically to the most suitable orientation for the driving conditions using steering angle and information from other vehicle sensors.

AFS is only available with xenon headlamps and also includes the dynamic headlamp leveling system described in the 'Headlamp Leveling' section of this document. The bi-xenon module within the headlamp is controlled by actuator motors which rotate the projector module on its vertical and horizontal axes to adjust the beam output to suit the cornering conditions and vehicle inclination. Only the bi-xenon lamp projector module swivels, the halogen high beam lamp unit remains static.

The AFS is controlled by an AFS control module which is located at the bottom of the 'A' pillar, behind the CJB. The AFS control module is connected to and controls an AFS power module located on the base of each headlamp. Signals from the AFS control module are processed by the AFS power module which powers stepper motors to adjust the vertical and horizontal alignment of the xenon projector module. The AFS power module also controls and regulates the operation of the static bending lamp (if fitted) which is requested by the AFS control module but controlled by the CJB.

AFS Concept



A	Conventional headlamp beam distribution
B	AFS swivel headlamp beam distribution

AFS Control Module

The AFS control module is a dual functionality unit which also incorporates software to control the dynamic headlamp leveling. The AFS control module is connected to the high speed CAN bus and receives inputs from other vehicle systems on the status of the following parameters:

- Steering angle
- Vehicle speed
- Headlamp status
- Engine running
- Reverse gear selected
- Automatic lighting on.

The AFS will only operate when the AFS control module receives an engine running signal on the CAN bus. When the engine running signal is received the AFS control module performs an initialisation routine.

The AFS will also function when the lighting control switch is in the AUTO position and the AFS control module receives a lights on signal from the rain/light sensor and an engine running signal.

The AFS control module then monitors the inputs from the other vehicle systems to control the AFS functionality according to cornering angles and vehicle speed.

The AFS control module is connected to each AFS power module on a private LIN bus. The power modules read operating values supplied from the AFS control module and control the output drivers for the stepper motor actuators inside the headlamp assembly.

AFS Control Module Connector C2193 Pin Details

Pin No.	Description	Input/Output
1	Not used	-

Pin No.	Description	Input/Output
2	CAN high	Input/Output
3	CAN low	Input/Output
4	Shield ground	Input
5	Private LIN bus serial interface to AFS power modules	Input/Output
6 to 22	Not used	-
23	Ignition power supply	Input
24	Ground	Input
25	Not used	-

AFS Operation

The AFS controls the swiveling angle of each projector module using speed and steering angle signals. The angles of each projector module differ to give the correct spread of light, e.g. when turning left, the left hand projector module will have a greater swiveling angle than the right hand projector module.

Xenon Headlamp Assembly with AFS Construction

The AFS xenon headlamp construction is similar to the non-AFS xenon headlamp assembly. The AFS assembly contains an additional carrier frame which provides the location for the AFS actuators. The remaining lamps are as described previously for the xenon headlamp assembly. The functionality of the static bending lamp on the AFS headlamp is different from the functionality of the cornering lamp on the xenon headlamp.

The carrier frame is attached to the AFS vertical actuator. The projector module has a central pivot point which allows the module to move horizontally in response to operation of the AFS horizontal actuator.

The AFS actuators are bi-polar (2 phase) dc stepper motors which are driven by a power output from the AFS power module. Each stepper motor receives its position information from the AFS control module via the applicable AFS power module. When the actuators are powered to their requested positions, a holding current is applied to maintain the actuator position.

The actuators do not supply a positional feedback signal to the AFS control module. Each stepper motor requires referencing each time the AFS system becomes active. When the AFS system is active, each vertical actuator is driven in the low beam position and each horizontal actuator is driven to an inboard position until a mechanical stop in the actuator is reached. Once the stop is reached a step counter in the AFS control module is set to zero and the actuator is then powered to the operating position as determined by the AFS control module software.

The AFS control module receives front and rear suspension height data to provide dynamic headlamp leveling adjustment via the vertical actuator motor. The AFS control module also receives vehicle speed signals from the ABS module to adjust the projector module vertically to increase the beam range as the vehicle speed increases.

Initialisation Procedure

When the AFS control module receives an ignition on signal, the control module performs the initialisation procedure which ensures that the headlamps are correctly aligned on both their vertical and horizontal axes.

The headlamp leveling initialisation takes less than 3 seconds to complete. The headlamp leveling motors are powered from their current position, which can be either the upper or lower limit or somewhere in between, to their lower position and then back to the 0 degrees position.

The AFS swivel initialisation starts less than 1 second after the headlamp leveling initialisation is activated to ensure that the headlamps are at or below the 0 degree position in the vertical axis, thus preventing glare to oncoming vehicles. The AFS swivel initialisation is completed in less than 2.5 seconds. The LH and RH AFS actuator motors are powered from the 0 degree position to their fully inboard position, then to their fully outboard position and then back to the 0 degree position.

Failure Mode

In the event of a failure of the AFS system, a warning indicator in the instrument cluster is illuminated to warn the driver. The AFS warning indicator illuminates when the ignition switch is in position (II) and will flash continuously until the fault is rectified. The AFS warning indicator will also be illuminated if a failure of the steering angle sensor or the vehicle speed signal is detected.

Illumination of the AFS warning indicator does not necessarily mean that there is a fault with the AFS system. The fault may be caused by a failure of another system preventing the AFS system operating correctly.

The AFS control module performs a diagnostic routine every time AFS is requested. If any fault is found, the AFS control module will suspend the operation of the AFS function.

If the AFS leveling system has failed with the xenon projector module in a position other than the correct straight ahead position, the AFS control module will attempt to drive the projector module to a position a small amount lower than the standard position. If the swivel function has failed, the AFS control module will lower the projector module using the leveling actuator motors to a position much lower than standard to prevent excess glare to oncoming vehicles.

The AFS control module software can detect an internal failure of the control module control circuits. The control module will power the projector modules to the zero position and prevent further operation.

Faults can be investigated by interrogating the AFS control module using T4 to check for fault codes.

Static Bending Lamps

• NOTE: The static bending lamps are not fitted to NAS vehicles

The static bending lamps, which are a standard feature on AFS headlamps, are designed to illuminate the direction of travel when cornering at low speeds. The static bending lamp functionality, which controlled by the CJB, is unique to vehicles with AFS headlamps and operates using inputs from the steering angle sensor.

The static bending lamp is incorporated into the outer part of the headlamp assembly and shares the same housing and reflector as the side lamp. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis.

The static bending lamp uses a 35W Halogen H8 bulb which locates in a holder which is connected via wires to the main connector on the headlamp housing. The holder is located in an aperture in the headlamp housing and rotated to lock. The bulb is accessible via a removable cover at the rear of the headlamp housing.

AFS Control

The static bending lamps operate with a steering angle sensor CAN signal which is received by the AFS control module and the CJB. The AFS control module sends a static bending lamp on request to the CJB which activates the static bending lamp bulb.

When the operation parameters of the lamp are reached, the CJB fades the static bending lamp bulb on using a PWM voltage over a period of approximately 2 seconds. When the lamp is switched off, the CJB fades the bulb off by decreasing the PWM voltage in a linear manner depending on steering angle and vehicle speed.

AUTOMATIC HEADLAMP OPERATION

The automatic headlamp function is a driver assistance system. The driver can override the system operation by selection of side lamp or headlamp on if the ambient light conditions require front and rear lighting to be active. The automatic headlamp system uses a light sensor and the CJB, which are connected via the LIN bus to control the headlamp functionality.

A light sensor is incorporated in the rain/light sensor located on the inside of the windshield, below the rear view mirror. The wiper system also uses the rain/light sensor for automatic wiper operation.
For additional information, refer to: Wipers and Washers (501-16 Wipers and Washers, Description and Operation).
The light sensor measures the ambient light around the vehicle in a vertical direction and also the angular light level from the front of the vehicle. The rain/light sensor uses vehicle speed signals, wiper switch position and the park position of the front wipers to control the system.

The automatic headlamp operation uses ambient light levels which are monitored by photodiode incorporated in the rain/light sensor. The rain/light sensor sends a lights on/off request to the CJB on the LIN bus, which responds by switching on the low beam headlamps, front side lamps and rear tail lamps.

The automatic headlamps are activated under the following conditions:

- Twilight
- Darkness
- Rain
- Snow
- Tunnels
- Underground or multistoried car parks.

Operation of the automatic headlamps requires the ignition switch to be in position II, the lighting control switch to be in the 'AUTO' position and a lights on request signal from the light sensor. If the rain sensor signal activates the wipers fast speed wipers, the low beam headlamps are activated, providing the lighting control switch is in the 'AUTO' position.

HEADLAMP LEVELING

Headlamp leveling provides for the adjustment of the vertical aim of the headlamps. The leveling system is primarily required to minimise glare to other road users when a heavy load is in the rear of the vehicle.

Two systems of headlamp leveling are available; static and dynamic.

Static Vehicle Headlamp Leveling

Static vehicle headlamp leveling is performed by the air suspension system and the air suspension control module. The suspension system constantly monitors the vehicle attitude and adjusts the height of the front and/or rear of the vehicle accordingly. This maintains the correct vehicle attitude and consequently maintains the correct headlamp beam alignment.

The vehicle leveling system is fully automatic, therefore the lighting control switch does not have a manual leveling rotary control.

Dynamic Headlamp Leveling (Air Suspension)

Dynamic headlamp leveling is only available on vehicles with the AFS.

The dynamic headlamp leveling adjusts the vertical alignment of the headlamps as a rapid response to changes in vehicle attitude due to acceleration or braking.

The dynamic system is fully automatic, therefore the lighting control switch does not have a manual leveling rotary control.

• NOTE: The AFS system also operates in conjunction with the vehicle leveling system as described previously.

The dynamic system comprises the following components:

- Two headlamp leveling motors
- AFS control module
- Engine running signal from engine control module
- Vehicle speed information from ABS module
- Vehicle height information from air suspension control module.

When the ignition switch is in position (II), power is supplied to the lighting control switch via the ignition relay in the Battery Junction Box (BJB) and to the AFS control module. When the lighting control rotary switch is moved to the side lamp or headlamp position, the supply from the ignition relay is passed to the AFS control module.

• NOTE: When the AFS control module receives an ignition on signal, the control module performs an initialisation procedure for both the AFS and headlamp leveling motors. Refer to the previous AFS section for details of the initialisation procedure.

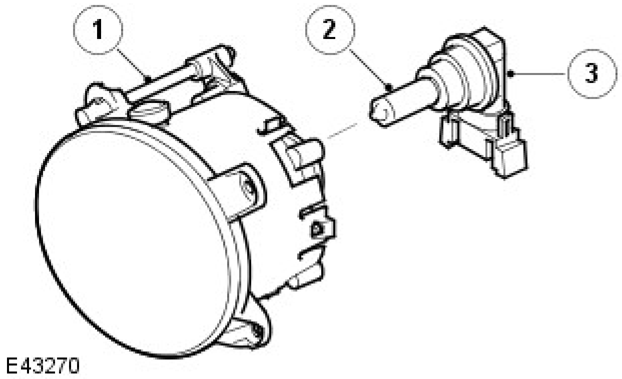
The system operates by the AFS control module receiving inputs on the CAN from the air suspension control module for front and rear vehicle height, from the engine control module for engine running signal and from the ABS module for stop lamp switch active (brakes applied) and vehicle speed. The AFS control module processes these signals and provides an output to the headlamp leveling motors to adjust the headlamp vertical aim according to vehicle speed and attitude.

• NOTE: In markets with Daytime Running Lamps (DRL), the dynamic headlamp leveling system will not operate when the DRL are active.

DAYTIME RUNNING LAMPS (DRL)

Refer to the Daytime Running Lamps section for details.
For additional information, refer to: Daytime Running Lamps (DRL) (417-04 Daytime Running Lamps (DRL), Description and Operation).

FRONT FOG LAMP (If Fitted)



Item	Part Number	Description
1	-	Adjuster screw
2	-	Halogen bulb
3	-	Bulb holder

Front fog lamps are an optional fitment on low specification vehicles and a standard fitment on high specification vehicles.

Two front fog lamps are located in apertures in the front bumper. Each lamp is secured in the bumper with three screws which are covered with a finisher. The fog lamp has an adjuster screw which is accessible by removal of the lamp surround and is used to set the fog lamp to the correct alignment.

The fog lamp uses a 55W halogen H11 bulb which is located in a holder. The holder is located in a hole in the rear of the fog lamp housing and is turned to lock in position.

The front fog lamps are controlled by the lighting control switch. When the ignition switch is in the ignition position (II) and the lighting control switch is in the side lamp or headlamp position, the lighting control switch can be pulled to the first position to activate the front fog lamps.

If the switch is pulled to the second position, the front and rear fog lamps are activated. A front fog lamp warning indicator is illuminated in the instrument cluster when the front fog lamps are active.

Front Fog Lamps Functionality (NAS and Canadian Markets Only)

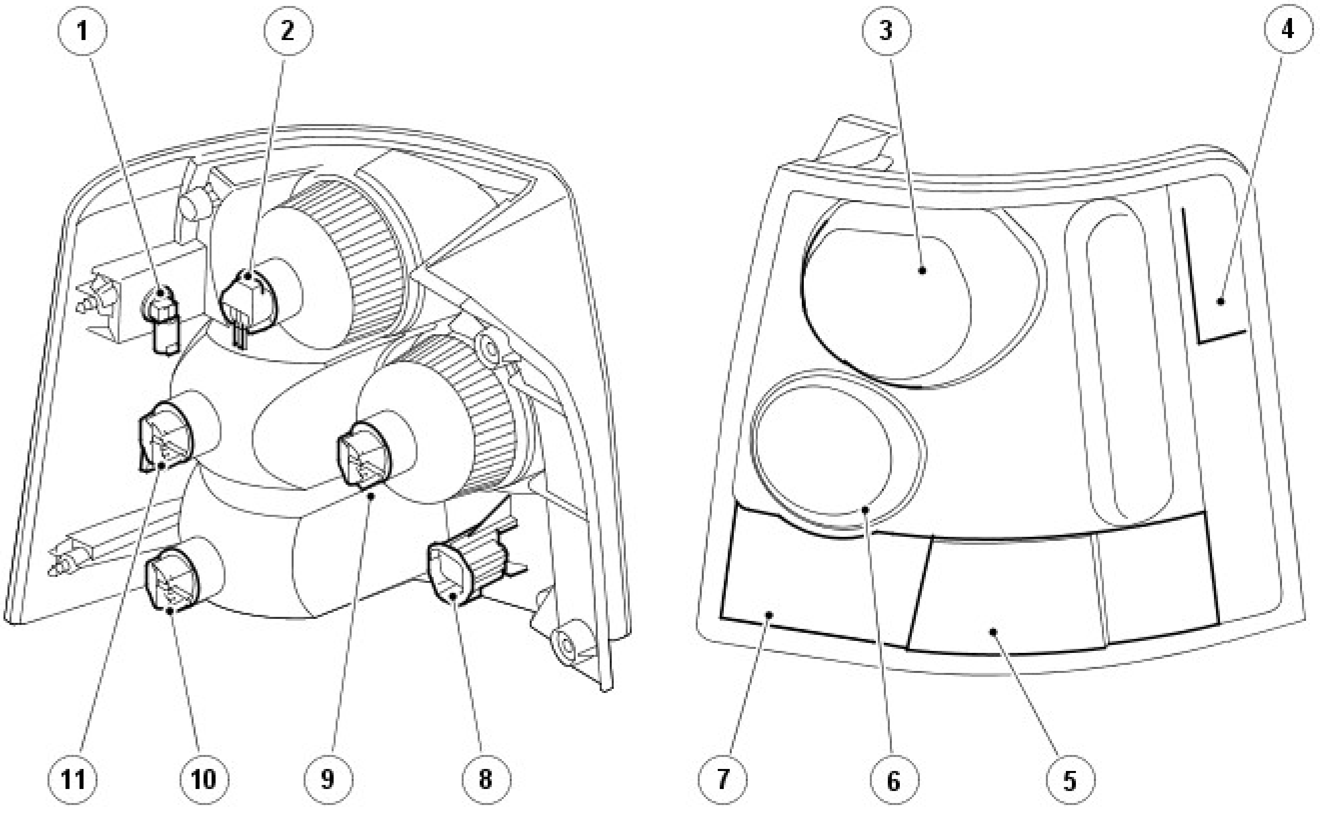
The front fog lamps are powered by an additional relay (relay 5) which is located in the BJB in the engine compartment.

The front fog lamps operate as described previously but with the following differences which cover local laws governing lamp usage.

If the low beam headlamps and the front fog lamps are on at the same time, when the high beam headlamps are switched on, the front fog lamps will be automatically switched off. When the high beam headlamps are switched off, the front fog lamps will be switched back on automatically.

- NOTE: The front fog lamps will also be switched off if the headlamp high beam flash function is operated.

REAR LAMP ASSEMBLY



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Item	Part Number	Description
1	-	Side marker lamp bulb (NAS only)
2	-	Stop/side lamp bulb
3	-	Stop/side lamp
4	-	Side marker lamp (NAS only)
5	-	Fog lamp
6	-	Reverse lamp
7	-	Reflector
8	-	Electrical connector
9	-	Reverse lamp bulb
10	-	Fog lamp bulb
11	-	Turn signal indicator lamp bulb

The rear lamp assembly is a one piece unit which contains a stop/tail lamp, a turn signal lamp, a reversing lamp and a fog lamp. Five bayonet fitting bulbs are used (six on NAS vehicles with the addition of a side marker lamp). These are located in holders which fit into the applicable hole in the lamp housing and are locked by rotating. Each bulb holder is connected by wires to a connector on the rear of the lamp housing.

The rear lamp assembly is located in a recess in the vehicle body. Two studs on the outer edge of the lamp housing locate in the vehicle body. The lamp is secured with two screws which are located on the inner edge of the lamp housing, near the tailgate aperture.

Rear Stop and Side Lamp

The upper lamp is a combined stop and tail lamp and uses a 21W/5W bayonet fitting bulb. The stop lamp uses the 21W bulb filament and the side lamp uses the 5W bulb filament.

The stop lamp is activated when the ignition switch is in the ignition position (II) and the brake pedal switch is active (by depressing the brake pedal). The high mounted stop lamp will also be activated when the brake pedal is pressed.

The stop lamps can also be activated by the ABS when Hill Descent Control (HDC) is active. A signal from the ABS module energises a relay which supplies power to the stop lamps and high mounted stop lamp.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

The side lamps are operated by selecting side lamps or headlamps on the lighting control switch. The side lamps are operational at all times and are not dependant on the ignition switch position. The side lamps will also be illuminated when the lighting control switch is in the AUTO position and a 'lights on' signal is received by the CJB from the rain/light sensor.

Turn Signal Indicator Lamp

The turn signal indicator lamp is located below the stop/tail lamp and uses a 21W bayonet fitting bulb.

The turn signal indicator lamps are operated by the left hand steering column multifunction switch or by the hazard flasher switch. The steering column multifunction switch is only active with the ignition switch in the ignition position (II), the hazard flasher switch is active at all times. When active, the turn signal indicator lamps will flash at a frequency cycle of 380ms on and 380ms off.

If a bulb fails, the remaining turn signal indicator lamp bulbs on that side of the vehicle flash at normal speed. The applicable turn signal indicator in the instrument cluster will flash at double speed to alert the driver to the bulb failure.

Reversing Lamp

The reversing lamp is located adjacent to the turn signal lamp and uses a 21W bayonet fitting bulb.

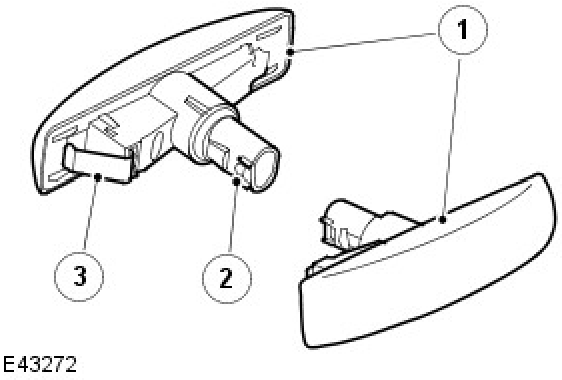
The reversing lamp is active when the ignition switch is in the ignition position (II) and the CJB receives a reverse selected signal on the CAN bus. The automatic transmission has a reverse switch which senses when reverse is selected.

Rear Fog Lamp

The rear fog lamp is located at the bottom of the rear lamp and uses a 21W bayonet fitting bulb.

The rear fog lamp is controlled by the lighting control switch. When the ignition switch is in the ignition position (II) and the lighting control switch is in the side lamp or headlamp position, the lighting control switch can be pulled to the second position (if front fog lamps fitted) to activate the front fog lamps. If front fog lamps are not fitted, the switch need only be pulled to the first position. A rear fog lamp warning indicator is illuminated in the instrument cluster when the rear fog lamps are active.

TURN SIGNAL INDICATOR REPEATER LAMP

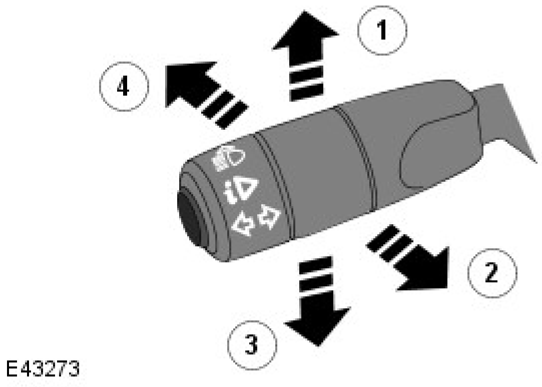


Item	Part Number	Description
1	-	Turn signal indicator repeater lamp
2	-	Bulb holder
3	-	Clip

The repeater lamps are located in the driver and passenger doors, below each door mirror. The lamps are clipped into an aperture in the door panel and can be removed by sliding rearwards and releasing the front edge of the lamp from the door. The repeater lamps use a 5W capless bulb which is located in a holder.

The repeater lamps have the same functionality as the front and rear turn signal indicator lamps and are operated by the left hand steering column multifunction switch or by the hazard flasher switch. The steering column multifunction switch is only active with the ignition switch in the ignition position (II), the hazard flasher switch is active at all times. When active, the repeater lamps will flash at a frequency cycle of 380ms on and 380ms off. If a lamp bulb fails, the remaining turn signal indicator lamp bulbs continue to flash at the normal rate.

LEFT HAND STEERING COLUMN MULTIFUNCTION SWITCH



Item	Part Number	Description
1	-	RH turn signal indicator lamp
2	-	Headlamp flash
3	-	LH turn signal indicator lamp
4	-	Headlamp high beam

The steering column multifunction switch is located on the left hand side of the steering column and controls the following functions:

- Headlamp low/high beam
- Headlamp high beam flash
- Left/right turn signal indicator lamps
- Trip computer functions.
  For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

The high beam on and flash functions are connected on separate wires to the CJB. When the switch is operated in either position a ground path is completed which is sensed by the CJB which activates the selected function.

The turn signal indicator lamps are connected and operate in a similar way with the ground path completed through a separate wire which is sensed by the CJB which activates the applicable turn signal indicator lamps.

HAZARD FLASHERS

The hazard flashers are controlled by a non-latching switch in the centre of the instrument panel. The hazard flashers operate at all times when selected and are not dependant on ignition switch position.

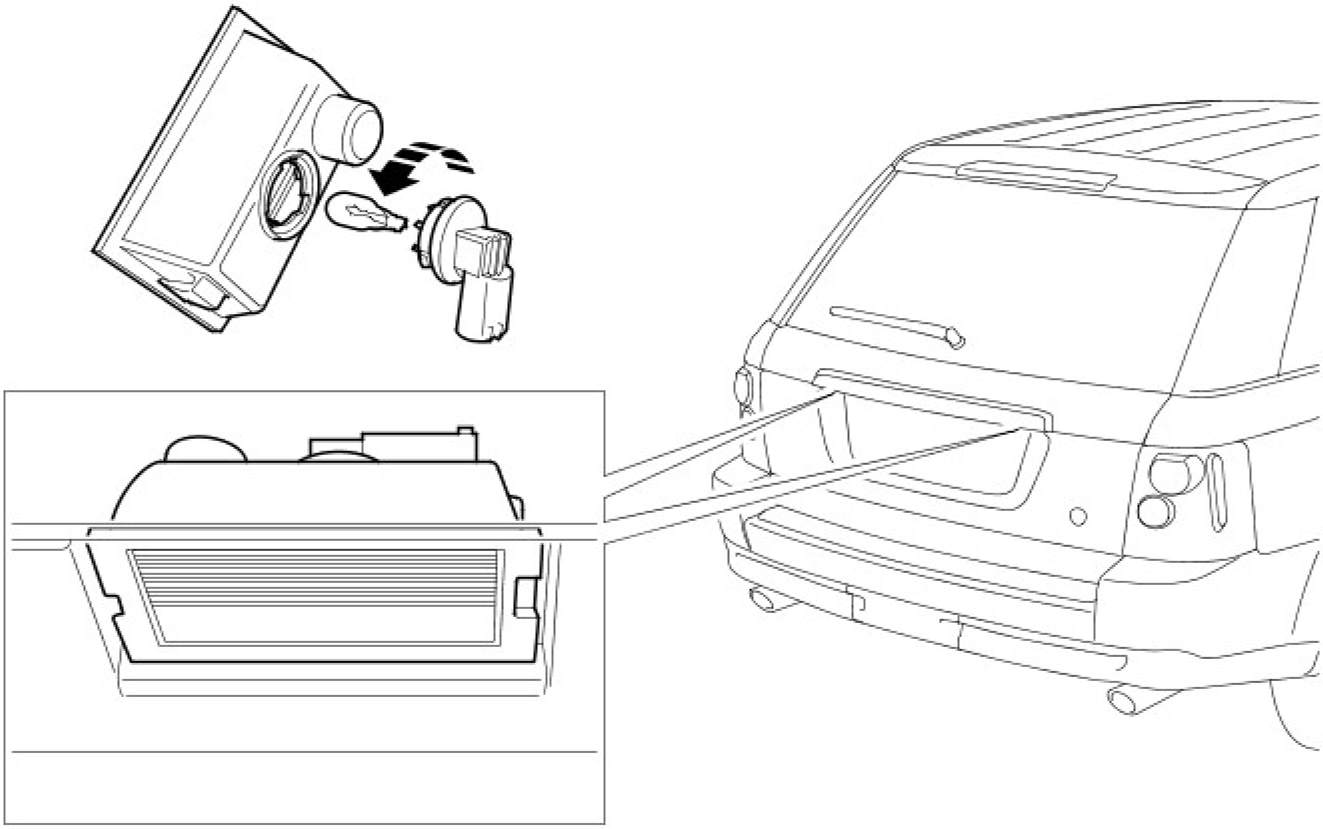
When the hazard flashers are selected on, all of the front, rear and side turn signal indicator lamps operate as previously described and both left and right turn signal indicators in the instrument cluster also flash. The hazard warning flashers flash at a rate of 380ms on and 380ms off. When the hazard flashers are active, they override any request for turn signal lamp operation.

If a trailer is fitted, the trailer turn signal lamps will flash at the same frequency as the vehicle indicators. The trailer warning indicator in the instrument cluster will also flash. If a trailer bulb is defective, the trailer warning indicator will not flash.

The hazard flashers can also be activated by a crash signal from the restraints control module. This is received by the CJB which activates the hazard flashers. The hazard flashers can be cancelled by moving the ignition switch to the auxiliary position I or the off position O or the crash mode is cancelled by the restraints control module.
For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B

Supplemental Restraint System, Description and Operation).

LICENSE PLATE LAMPS



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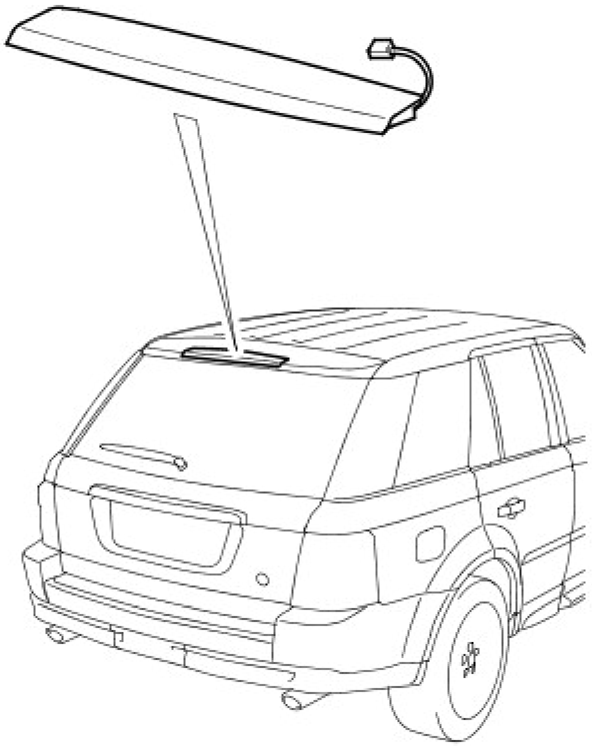
Two license plate lamps are fitted in the tailgate handle, above the license plate in the upper tailgate. Each lamp uses a 5W capless type bulb. The lamps are secured in the upper tail gate handle with integral clips. The lamps can be released from the handle using a small, flat blade screwdriver.

The license plate lamps are active at all times when the side lamps or headlamps are switched on.

HIGH MOUNTED STOP LAMP



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The high mounted stop lamp is located in the tailgate spoiler.

The lamp comprises a plastic housing with a red coloured lens. The lamp is illuminated by 24 Light Emitting Diodes (LED's).

The high mounted stop lamp is activated, along with the tail lamp stop lamps, when the ignition switch is in the ignition position (II) and the brake pedal switch is active (by depressing the brake pedal).

The high mounted stop lamp and the stop lamps can also be activated by the ABS when Hill Descent Control (HDC) is active. A signal from the ABS module energises a relay which supplies power to the stop lamps.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

TRAILER LIGHTING

Several different types of trailer socket can be fitted to the vehicle depending on market specifications. Refer to the Electrical Reference Library for specific socket details.

The CJB monitors the turn signal lamps and can detect if more than two lamps are fitted (the side turn signal lamps are not monitored). When a trailer is detected, the trailer warning indicator in the instrument cluster will flash in synchronisation with the turn signal indicators.

If one or more of the turn signal lamps on the vehicle or the trailer are defective, the trailer warning indicator will not flash to alert the driver to the bulb failure.

DIAGNOSTICS

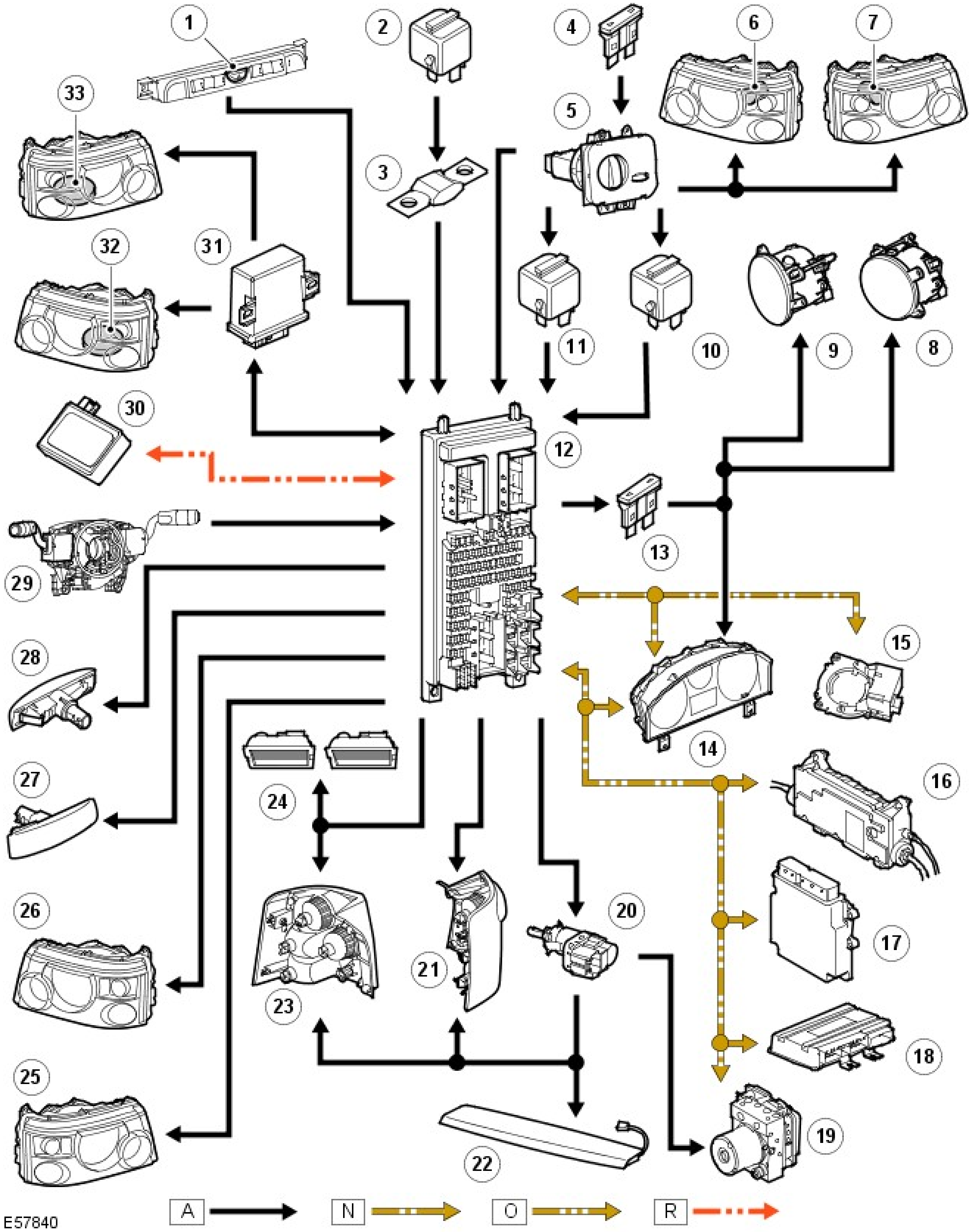
The diagnostic socket is located in the lower instrument panel closing panel, on the driver's side, below the steering column. Various lighting system functions are monitored by different systems which can store fault information. This can be retrieved using T4 or other suitable scan tool.

Central Junction Box (CJB)

The CJB monitors the status of the lighting circuits, relays and switches. If a fault occurs, the CJB stores a fault code applicable to the specific fault which can be retrieved using T4 or other suitable scan tool.

CONTROL DIAGRAM

- NOTE: **A** = Hardwired; **N** = CAN Bus; **O** = LIN Bus; **R** = SPDIF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Item	Part Number	Description
1	-	Hazard warning lamps switch
2	-	Ignition relay
3	-	Fusible link 2E (permanent 12V supply)

4	-	Fuse 25E (permanent 12V supply)
5	-	Lighting control switch
6	-	LH headlamp leveling motor (if fitted)
7	-	RH headlamp leveling motor (if fitted)
8	-	LH front fog lamp
9	-	RH front fog lamp
10	-	Front fog lamp relay (NAS only)
11	-	Daytime Running Lamps (DRL) relay (if fitted)
12	-	Central Junction Box (CJB)
13	-	Fuse 38P (NAS only)
14	-	Instrument cluster
15	-	Steering angle sensor
16	-	Parking brake module
17	-	Engine Control Module (ECM)
18	-	Air suspension control module
19	-	ABS module
20	-	Stop lamp switch
21	-	LH rear lamp assembly
22	-	High mounted stop lamp
23	-	RH rear lamp assembly
24	-	License plate lamps
25	-	RH front headlamp assembly
26	-	LH front headlamp assembly
27	-	LH side repeater lamp
28	-	RH side repeater lamp
29	-	LH steering column multifunction switch
30	-	Rain/light sensor (if fitted)
31	-	Adaptive Front lighting System (AFS) control module (if fitted)
32	-	LH AFS Actuator (if fitted)
33	-	RH AFS actuator (if fitted)

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Exterior Lighting - Headlamps

Diagnosis and Testing

Principles of Operation

For a detailed description of the exterior lighting system, refer to the Description and Operation section 417-00 - Exterior Lighting of the workshop manual.

Overview

Three types of Headlamp are available: Halogen, Bi-Xenon or Adaptive Front Lighting System (AFS).

Given the potential for personal injury, the following safety information should be followed at all times:

Safety Information

- WARNINGS:

The Xenon Headlamp system generates up to 28,000 volts. Make sure that the headlamps are switched off before working on the system. Failure to follow this instruction may lead to fatality.

The following safety precautions must be followed when working on the Xenon Headlamp System:

- DO NOT attempt any procedures on the Xenon Headlamps or circuits when the system is energized.
- Handling of the Xenon bulb must be performed using suitable protective equipment, e.g. gloves and goggles. The glass part of the bulb must not be touched.
- Only operate the lamp in a mounted condition in the reflector.
- All safety procedures and precautions must be followed to prevent personal injury.

CAUTION: Xenon bulbs must be disposed of as hazardous waste.

There are instructions on the correct procedures for Xenon Headlamp System repairs in the manual, refer to section 100-00 - General Information, Standard Workshop Practices of the workshop manual.

Inspection And Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. **1.** Verify the customer concern.
    - Note that intermittent fault reports may be due to the cycling operation of the field effect transistors (FETs)
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
Headlamp(s) condition and installation Bulb(s) and installation Bulb holder(s) and installation Lighting control switch and installation Left-hand Steering Column Multifunction Switch and installation	Fuses Relays Wiring harness Loose or corroded connector(s) Battery junction box (BJB) Central junction box (CJB) Adaptive Front Lighting System (AFS) module Headlamp Power modules Instrument Cluster (IPC) Steering Angle Sensor Module (SASM) Transmission Control Module (TCM) Engine Control Module (ECM) Air Suspension Control Module Communication BUS circuits Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to

the next step.

4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible Causes	Action
Low beam lamp(s) inoperative	Bulb failure Fuse(s) blown Circuit fault Lighting control switch fault Left-hand steering column multifunction switch fault	Check the bulb and fuse condition (see visual inspection). Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Refer to the electrical guides. Check for DTCs indicating a headlamp or related circuit fault.
High beam lamp(s) inoperative		
Low beam lamp(s) dim	Incorrect bulb rating Tourist lever set in the wrong position Circuit fault Lighting control switch fault Left-hand steering column multifunction switch fault	Check the bulb condition and rating. Check the tourist lever is set correctly. Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides.
High beam lamp(s) dim		
Low beam lamp(s) stuck on	Circuit fault Lighting control switch fault Left-hand steering column multifunction switch fault Headlamp timer function fault	Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Check the headlamp timer function. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault
High beam lamp(s) stuck on		
Headlamp low/high beam switching function inoperative	Circuit fault Left-hand steering column multifunction switch fault Xenon lamp shutter mechanism fault	Check the headlamp circuits. Check the left-hand steering column multifunction switch operation. Check the Xenon lamp shutter mechanism operation. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault
Warning lamp(s) inoperative	Fuse(s) blown Lighting control switch fault Left-hand steering column multifunction switch inoperative Circuit fault Instrument cluster fault	Check the fuse(s) (see visual inspection). Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.
Headlamp Wet - Internal	Condensation Water Ingress	Check for outstanding Technical Service Bulletins (TSBs) relating to 'Headlamp Internal Condensation'. Carry out the instructions in the service bulletin to determine if the fault is related to condensation or water ingress.

DTC Index

Adaptive Front Lighting System (AFS) Control Module

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

- NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

- NOTE: Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

- NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

- NOTE: Prior to installation/replacement of the Headlamp Assembly carry out all relevant internal visual and mechanical checks for correct cable location and termination including: checks for corroded, bent or backed out pins or terminals, incorrectly inserted connectors and harness damage due to chaffing or incorrect routing.

- NOTE: If the control module has been removed and reinstalled, carry out a DTC code clear, cycle the ignition state to off, then on. This will erase any DTCs that have been logged during the module installation procedure

DTC	Description	Possible Causes	Action
B1A57-01	Left Headlamp Leveling Motor - General Electrical Failure	● Internal Headlamp Motor Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an on demand self test (On Demand Self Test), look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). Refer to the electrical circuit diagrams and check for circuit fault between the Adaptive Front Lighting System (AFS) Control Module and the Headlamp Leveling Motor. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1A58-01	Right Headlamp Leveling Motor - General Electrical Failure	● Internal Headlamp Motor Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an On Demand Self Test, look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). Refer to the electrical circuit diagrams and check for circuit fault between the Adaptive Front Lighting System (AFS) Control Module and the Headlamp Leveling motor. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1D66-00	Left Headlamp Power Module - No Sub-Type Information	● Headlamp Power Module Internal Fault ● Power supply fault	• NOTE: The power module is a service item This DTC is logged if the Headlamp Power Module supply voltage is above 16 volts / below 9.5 volts or the module suffers an internal failure. Record then clear the stored DTC, cycle the ignition state and check headlamp operation, if the DTC returns refer to the electrical circuit diagrams and check the power, ground and signal circuit of the Power Module for circuit fault. If no circuit faults are evident suspect the Headlamp Power Module has an internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1D67-00	Right Headlamp Power Module - No Sub-Type Information	● Headlamp Power Module Internal Fault ● Power supply fault	• NOTE: The power module is a service item This DTC is logged if the Headlamp Power Module supply voltage is above 16 volts / below 9.5 volts or the module suffers an internal failure. Record then clear the stored DTC, cycle the ignition state and check headlamp operation, if the DTC returns refer to the electrical circuit diagrams and check the power, ground and signal circuit of the Power Module for circuit fault. If no circuit faults are evident suspect the Headlamp Power Module has an internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1D66-91	Left Headlamp Power Module - Parametric	● Headlamp Power Module ● The parameter set of the Power Module does not match the Adaptive Front Lighting System (AFS) Module parameter set	• NOTE: The power module is a service item Clear the DTC. Turn the Headlamp Switch on, cycle the ignition state to start the engine, check for stored DTCs, if DTC returns suspect the Headlamp Power Module has an internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1D67-91	Right Headlamp Power Module - Parametric	● Headlamp Power Module ● The parameter set of	• NOTE: The power module is a service item Clear the DTC. Turn the Headlamp Switch on, cycle the ignition

DTC	Description	Possible Causes	Action
		the Power Module does not match the Adaptive Front Lighting System (AFS) Module parameter set	state to start the engine, check for stored DTCs, if DTC returns suspect the Headlamp Power Module has an internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
U3000-16	Control Module - Circuit voltage below threshold	● The power supply to the Module has been below 9 Volts for more than 1000 milliseconds	Suspect Battery or Charging fault. Check the battery condition and state of charge. Check the vehicle charging system. Refer to the relevant workshop manual section. Clear the DTC, cycle ignition state to off then on, if DTC returns refer to the electrical circuit diagrams and check power and ground circuit to the Adaptive Front Lighting System (AFS) Control Module
U3000-17	Control Module - Circuit voltage above threshold	● The power supply to the Module has been above 16 Volts for more than 1000 milliseconds	Suspect Charging fault. Check the battery condition and state of charge. Check the vehicle charging system. Refer to the relevant workshop manual section
B1D68-01	Left Headlamp Swiveling Feedback Sensor Circuit - General Electrical Failure	● Internal Headlamp Sensor Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an On Demand Self Test, look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). If no faults are evident refer to the electrical circuit diagrams and check for circuit fault between the Headlamp Power Module and the swiveling feedback sensor. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1D69-01	Right Headlamp Swiveling Feedback Sensor Circuit - General Electrical Failure	● Internal Headlamp Sensor Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an On Demand Self Test, look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). If no faults are evident refer to the electrical circuit diagrams and check for circuit fault between the Headlamp Power Module and the swiveling feedback sensor. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1D64-00	Left Headlamp Swiveling Motor Circuit - No Sub-Type Information	● Internal Headlamp Motor Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an On Demand Self Test, look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). If no faults are evident refer to the electrical circuit diagrams and check for circuit fault between the Headlamp Power Module and the swiveling motor circuit. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B1D65-00	Right Headlamp Swiveling Motor Circuit - No Sub-Type Information	● Internal Headlamp Motor Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an On Demand Self Test, look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). If no faults are evident refer to the electrical circuit diagrams and check for circuit fault between the Headlamp Power Module and the swiveling motor circuit. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B10A3-71	Left Swivel Actuator - Actuator Stuck	● Internal Headlamp Actuator Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an On Demand Self Test, look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). If no faults are evident refer to the electrical circuit diagrams and check for circuit fault between the Headlamp Power Module and the swivel actuator. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
B10A4-71	Right Swivel Actuator - Actuator Stuck	● Internal Headlamp Actuator Fault ● Internal Headlamp Circuit Fault	Using the manufacturer approved diagnostic system perform an On Demand Self Test, look for any errors in movement (compare with other headlamp) and visually inspect the lamp for internal damage or dislocation (ball joints out). If no faults are evident

DTC	Description	Possible Causes	Action
			refer to the electrical circuit diagrams and check for circuit fault between the Headlamp Power Module and the swivel actuator. If no mechanical or circuit faults are evident, suspect headlamp internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
U0132-87	Lost Communication With Ride Level Control Module - Missing Message	● Missing message from the Air Suspension Control Module ● CAN Network fault	Check the Air Suspension Control Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Air Suspension Control Module
U0126-87	Lost Communication With Steering Angle Sensor Module - Missing Message	● Missing message from the Steering Angle Sensor Module ● CAN Network fault	Check the Steering Angle Sensor Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Steering Angle Sensor Module
U0126-86	Lost Communication With Steering Angle Sensor Module - Invalid Signal	● Invalid signal from the Steering Angle Sensor Module ● CAN Network fault	Check the Steering Angle Sensor Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Steering Angle Sensor
U0155-87	Lost Communication With Instrument Panel Cluster (IPC) Control Module - Missing Message	● Missing message from the Instrument Cluster ● CAN Network fault	Check the Instrument Cluster for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Instrument Cluster
U0102-87	Lost Communication with Transfer Case Control Module - Missing Message	● Missing message from the Transfer Box Control Module ● CAN Network fault	Check the Transfer Box Control Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Transfer Box Control Module
U0122-87	Lost Communication With Vehicle Dynamics Control Module - Missing Message	● Missing message from the Dynamic Response Module ● CAN Network fault	Check the Dynamic Response Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Dynamic Response Module
U0122-86	Lost Communication With Vehicle Dynamics Control Module - Invalid Signal	● Invalid signal from the Dynamic Response Module ● CAN Network fault	Check the Dynamic Response Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Dynamic Response Module
U1A38-87	Lost communication to LH Power Light Module - Missing Message	● Headlamp Power Module internal fault ● Communication BUS circuit, short to power, ground or open circuit ● Power or Ground supply circuit fault	• NOTE: This circuit uses shielded cable • NOTE: The power module is a service item Refer to the electrical circuit diagrams, and check the power/ground supply and Communication circuit to the Headlamp Power Module. Using the manufacturer approved diagnostic system, clear stored DTCs in the Adaptive Front Lighting System (AFS) Control Module. Cycle the ignition state to off, then return to on and check for stored DTCs. If DTCs U1A38-87 and U1A39-87 return suspect Adaptive Front Lighting System (AFS) Control Module internal fault, If only DTC U1A38-87 returns suspect Headlamp Power Module internal fault. Replace as required. Refer to the new module/component installation note at the top of the DTC Index
U1A39-87	Lost communication to RH Power Light Module - Missing Message	● Headlamp Power Module internal fault ● Communication BUS circuit, short to power, ground or open circuit ● Power or Ground supply circuit fault	• NOTE: This circuit uses shielded cable • NOTE: The power module is a service item Refer to the electrical circuit diagrams, and check the power/ground supply and Communication circuit to the Headlamp Power Module. Using the manufacturer approved diagnostic system, clear stored DTCs in the Adaptive Front Lighting System (AFS) Control Module. Cycle the ignition state to off, then return to on and check for stored DTCs. If DTCs U1A38-87 and U1A39-87

DTC	Description	Possible Causes	Action
			return suspect Adaptive Front Lighting System (AFS) Control Module internal fault, If only DTC U1A39-87 returns suspect Headlamp Power Module internal fault. Replace as required. Refer to the new module/component installation note at the top of the DTC Index
U1A14-49	CAN Initialization Failure - Internal electronic failure	● Module internal failure ● CAN Network fault	Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Check other modules for stored DTCs. Refer to the electrical circuit diagrams and check the CAN Network to the Adaptive Front Lighting System (AFS) Control Module for circuit fault. If no circuit faults are evident suspect Adaptive Front Lighting System (AFS) Control Module internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
U0300-62	Internal Control Module Software Incompatibility - Signal Compare Failure.	● The centrally broadcast module configuration data received is different to that which is stored	Check the correct Adaptive Front Lighting System (AFS) Control Module is installed to vehicle specification. Refit original or replace the module as required. Refer to the new module/component installation note at the top of the DTC Index
U3000-55	Control Module - Not Configured	● Incorrect Car Configuration File (CCF) data	• NOTE: The Car Configuration File (CCF) parameters required are (Vehicle type)(Headlamp type)(Gearbox type) and (Dayrunning light) Check the Instrument cluster for stored DTCs. Confirm the latest Strategy and Calibration software is installed in the Adaptive Front Lighting System (AFS) Control Module and the CJB, using the manufacturer approved diagnostic system update the Adaptive Front Lighting System (AFS) Control Module and CJB software as required
U3000-42	Control Module - General memory failure	● Module internal failure	Suspect Adaptive Front Lighting System (AFS) Control Module internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
U0073-00	Control Module Communication Bus Off - No Sub-Type Information	● Module internal failure ● CAN Network fault	Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Check other modules for stored DTCs. Refer to the electrical circuit diagrams and check the CAN Network to Adaptive Front Lighting System (AFS) Control Module for circuit fault. If no circuit faults are evident suspect Adaptive Front Lighting System (AFS) Control Module internal fault, replace as required. Refer to the new module/component installation note at the top of the DTC Index
U0100-87	Lost Communication With ECM/PCM “A” - Missing Message	● Missing message from the Engine Control Module ● CAN Network fault	Check the Engine Control Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN Network between the Adaptive Front Lighting System (AFS) Control Module and the Engine Control Module

Central Junction Box (CJB)

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

• NOTE: Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

• NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

• NOTE: Prior to installation/replacement of the Headlamp Assembly carry out all relevant internal visual and mechanical checks for correct cable location and termination including: checks for corroded, bent or backed out pins, terminals and incorrectly inserted connectors.

DTC	Description	Possible causes	Action
B1D0011	Left Low Beam	● Left-hand low beam circuit short	Refer to the guided diagnostic routine for this code on

DTC	Description	Possible causes	Action
		circuit to ground	the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0015	Left Low Beam	● Left-hand low beam circuit short circuit to power ● Left-hand low beam circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0111	Right Low Beam	● Right-hand low beam circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0115	Right Low Beam	● Right-hand low beam circuit short circuit to power ● Right-hand low beam circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0211	Left High Beam Circuit	● Left-hand high beam circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0215	Left High Beam Circuit	● Left-hand high beam circuit short circuit to power ● Left-hand high beam circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0311	Right High Beam Circuit	● Right-hand high beam circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0315	Right High Beam Circuit	● Right-hand high beam circuit short circuit to power ● Right-hand high beam circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D3613	Turn Indicator Switch	● Left-hand steering column multifunction switch: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D4013	Lighting Switch Connection Circuit	● Lighting control switch circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
U018287	Lost Communication With Lighting Control Module - Front	● CAN bus fault ● Adaptive Front Lighting System (AFS) Control Module disconnected ● Adaptive Front Lighting System (AFS) Control Module not configured/calibrated ● Adaptive Front Lighting System (AFS) Control Module failure	Refer to the Network Communications section of the workshop manual.
U300016	Control Module	● Circuit voltage below threshold	Check the battery condition and state of charge. Refer to section 414-00 - Charging System of the workshop manual. Check the control module circuits. Refer to the electrical guides.
U300017	Control Module	● Circuit voltage above threshold	Check the battery condition and state of charge. Refer to section 414-00 - Charging System of the workshop manual. Check the control module circuits. Refer to the electrical guides.
U300042	Control Module	● General memory failure	Refer to the warranty policy and procedures manual if a module is suspect.
U300055	Control Module	● Incorrect software loaded ● CAN wiring to Adaptive Front Lighting System (AFS) Control Module high resistance ● Incorrect Adaptive Front Lighting System (AFS) Control Module CAN configuration	Configure the modules using the approved diagnostic system. Check for CAN DTCs.

DTC	Description	Possible causes	Action
U1A1449	CAN Initialization Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Exterior Lighting - Autolamps

Diagnosis and Testing

Overview

The automatic lighting system is only operational when **Auto** is selected on the lighting control switch

For information on the description and operation of the systems, refer to section 417-01 - Exterior Lighting of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
• Lighting control switch and installation • Rain/Light sensor condition and installation • Wiper control switch and installation	• Fuses - Battery junction box (BJB) - link 15E - BJB - link 16E - BJB - link 11E - BJB - link 25E - Central junction box (CJB) - Fuse 18P - CJB - Fuse 67P - CJB - Fuse 62P • Relays - Automatic headlamps relay • Wiring harness • Loose or corroded connector(s) • Battery junction box (BJB) • Central junction box (CJB) • Rain/Light sensor control module • Local interconnect network (LIN) circuits • Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Side and headlamp(s) inoperative when the automatic headlamp switch option is selected	• Fuse(s) blown • Lighting control switch fault • Wiper control switch fault • Circuit fault • Rain/Light sensor fault • LIN circuit fault	Check the fuse(s) (see visual inspection). Check the lighting and wiper control switch functions. Check the automatic headlamp circuit. Refer to the electrical guides. Check for DTCs indicating a rain/light sensor or LIN system fault.
Automatic headlamp switch illumination inoperative	• Fuse(s) blown • Lighting control switch fault • Circuit fault • Automatic headlamp relay fault	Check the fuse(s) (see visual inspection). Check the lighting control switch function. Check the automatic headlamp relay circuit. Refer to the electrical guides. Check for DTCs indicating an automatic headlamp fault.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1A9801	LIN Bus Circuit #1	- LIN Bus short circuit to power or ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly. Refer to the lost communication statement at the start of this table.
B1A9881	LIN Bus Circuit #1	- Software error - Rain/ambient light sensor lost power during transmission	Refer to the guided diagnostic routine for this code on the approved diagnostic system. No repair action necessary unless customer complains of rain sensor, roof opening panel or memory seat not functioning correctly. The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly. Refer to the lost communication statement at the start of this table.
B1A9883	LIN Bus Circuit #1	- LIN Bus check sum error	Refer to the guided diagnostic routine for this code on the approved diagnostic system. The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly. Refer to the lost communication statement at the start of this table.
B1B551C	Rain Sensor Module	- Rain sensor module supply voltage out of range	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the power supply to the sensor module from the CJB, repair as necessary. If the power supply exists, no further action necessary, clear/ignore DTC.
B1B5546	Rain Sensor Module	- Rain sensor module calibration/parameter memory failure: - Initialization error - unable to perform optical calibration	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the cleanliness of the windscreen in the sensor location. Check for correct installation of the sensor to the optical element and the adherence of the optical element to windscreen. Clear DTC and retest. If DTC persists, renew the rain/ambient light sensor.
B1B5549	Rain Sensor Module	- Internal electronic failure	Check the rain/light sensor module and circuit. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
B1B5587	Rain Sensor Module	- Missing message	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Rain sensor is not installed to all variants (optional). Fault logging is inhibited by the CCF, but an incorrectly configured CCF could give erroneous DTC logging. Repair action only required for vehicles with sunroof installed. Where necessary refer to the lost communication statement at the start of Communications Module section.
B1B5591	Rain Sensor Module	- Rain sensor module - measured temperature outside of normal operating range	No action necessary, clear/ignore DTC.
B1D3713	Wiper Switch Connection Circuit	- Wiper switch connection circuit open circuit	Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
B1C8612	Autolights Switch Illumination Relay Output	- Autolamps switch illumination relay output circuit short to power	Where installed, refer to the electrical guides and check the autolamps switch illumination relay circuit, repair/renew as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C8614	Autolights Switch Illumination Relay Output	- Autolamps switch illumination relay output circuit short to ground or open circuit	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Where installed, refer to the electrical guides and check the autolamps switch illumination relay supply fuse and the relay output circuit, repair as necessary. Where the feature is not

DTC	Description	Possible causes	Action
			installed, check the vehicle configuration and clear/ignore this DTC.
B1D4013	Lighting Switch Connection Circuit	● Lighting switch connection circuit open circuit	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
U1A1449	CAN Initialisation Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Exterior Lighting - Stoplamps

Diagnosis and Testing

Overview

For information on the description and operation of the system, refer to section 417-01 - Exterior Lighting of the workshop manual. Note that the stoplamps will be activated automatically under certain conditions when the ride and handling optimization function is used, refer to section 204-06 - Ride and Handling Optimization of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
● Stoplamp condition and installation ● Bulbs and installation ● Bulb holders and installation ● Stoplamp switch condition and installation	● Fuses - Battery junction box (BJB) - link 16E - BJB - link 11E - Central junction box (CJB) - Fuse 15P - CJB - fuse 66P ● Wiring harness ● Loose or corroded connector(s) ● Hill descent relay ● Battery junction box (BJB) ● Central junction box (CJB) ● ABS control module ● Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended.
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Stoplamp(s) inoperative	● Bulb failure ● LED lamp failure ● Fuse(s) blown ● Circuit fault ● Stoplamp switch fault	Check the bulb, LED lamp and fuse condition (see visual inspection). Check the stoplamp circuits. Check the stoplamp switch function. Refer to the electrical guides. Check for DTCs indicating a stoplamp circuit fault.
Stoplamp(s) dim	● Incorrect bulb rating ● Circuit fault	Check the bulb condition and rating. Check the stoplamp circuits. Refer to the electrical guides.
Stoplamp(s) stuck on	● Stoplamp switch fault ● Circuit fault ● Hill descent relay circuit fault	Check the stoplamp switch function. Check the stoplamp circuits. Refer to the electrical guides. Check for DTCs indicating a stoplamp circuit fault

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action

DTC	Description	Possible causes	Action
C110501	Brake Lamp Control	● General electrical failure ● Stoplamp control short circuit to power ● Stoplamp control short circuit to ground	Check the stoplamp control circuits. Refer to the electrical guides.
C110567	Brake Lamp Control	● Signal incorrect after event	Check the stoplamp circuits. Refer to the electrical guides.
C1A9613	Brake Light Switch	● Stoplamp switch circuit short circuit to power	Check the stoplamp switch and circuits. Refer to the electrical guides.
C1A9624	Brake Light Switch	● Stoplamp switch circuit signal stuck high	Check the stoplamp switch and circuits. Refer to the electrical guides.
C1A9662	Brake Light Switch	● signal compare failure	Check the stoplamp switch and circuits. Refer to the electrical guides.
C1A9664	Brake Light Switch	● Signal plausibility failure	Check the stoplamp switch and circuits. Refer to the electrical guides.
U1A1449	CAN Initialisation Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Exterior Lighting - Turn Signal, Cornering and Hazard Lamps

Diagnosis and Testing

Overview

For information on the description and operation of the systems, refer to section 417-01 - Exterior Lighting of the workshop manual.

When diagnosing cornering/static bending lamp faults note that the operating principle differs slightly when the headlamp system is installed with the adaptive front lighting system (AFS).

Inspection and Verification

1. **1.** Verify the customer concern.
    - Note that intermittent fault reports may be due to the cycling operation of the field effect transistors (FETs)
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
• Turn signal lamp(s) condition and installation • Cornering lamp(s) condition and installation • Bulbs and installation • Bulb holders and installation • Lighting control switch and installation • Left-hand steering column multifunction switch and installation • hazard lamp switch condition and installation	• Fuses - Battery junction box (BJB) - link 16E - BJB - link 11E - Central junction box (CJB) - Fuse 61P • Wiring harness • Loose or corroded connector(s) • Battery junction box (BJB) • Central junction box (CJB) • Steering angle sensor • ABS control module • Instrument panel cluster (IPC) • Adaptive front lighting system (AFS) module • Restraints control module • Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Turn signal/hazard lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Left-hand steering column multifunction switch fault • Hazard lamp switch fault	Check the bulb and fuse condition (see visual inspection). Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault.
Turn signal/hazard lamp(s) dim	• Incorrect bulb rating • Circuit fault • Left-hand steering column multifunction switch fault • Hazard lamp switch fault	Check the bulb condition and rating. Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides.

Symptom	Possible causes	Action
Turn signal/hazard lamp(s) stuck on	- Left-hand steering column multifunction switch fault - Hazard lamp switch fault - Circuit fault	Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault
Warning lamp(s) inoperative	- Fuse(s) blown - Left-hand steering column multifunction switch inoperative - Hazard lamp switch inoperative - Circuit fault - Instrument cluster fault	Check the fuse(s) (see visual inspection). Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.
Cornering lamp(s) inoperative	- Bulb failure - Fuse(s) blown - Circuit fault - Left-hand steering column multifunction switch fault - Lighting control switch fault	Check the bulb and fuse condition (see visual inspection). Check cornering lamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides. Check for DTCs indicating a cornering lamp circuit fault.
Cornering lamp(s) dim	- Incorrect bulb rating - Circuit fault - Left-hand steering column multifunction switch fault - Lighting control switch fault	Check the bulb condition and rating. Check the cornering lamp circuits. Check the left-hand steering column multifunction switch function. Check the lighting control switch function. Refer to the electrical guides.
Cornering lamp(s) stuck on	- Left-hand steering column multifunction switch fault - Lighting control switch fault - Circuit fault	Check the cornering lamp circuits. Check the left-hand steering column multifunction switch function. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a cornering lamp circuit fault

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1C9811	Left Corner Lamp Circuit	- Left-hand corner lamp short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1C9815	Left Corner Lamp Circuit	- Left-hand corner lamp short circuit to power - Left-hand corner lamp high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1C9911	Right Corner Lamp Circuit	- Right-hand corner lamp short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1C9915	Right Corner Lamp Circuit	- Right-hand corner lamp short circuit to power - Right-hand corner lamp high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0611	Left Turn Indicator	- Left turn signal short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.

DTC	Description	Possible causes	Action
B1D0615	Left Turn Indicator	● Left turn signal short circuit to power ● Left turn signal: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0711	Right Turn Indicator	● Right turn signal short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D0715	Right Turn Indicator	● Right turn signal: short circuit to power ● Right turn signal: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D3523	Hazard Switch	● Hazard lamp switch circuit signal stuck low	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D3613	Turn Indicator Switch	● Left-hand steering column multifunction switch high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
B1D4013	Lighting Switch Connection Circuit	● Lighting control switch connection switch high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair/renew as necessary.
U1A1449	CAN Initialisation Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Exterior Lighting - Parking, Rear and License Plate Lamps

Diagnosis and Testing

Overview

For information on the description and operation of the systems, refer to section 417-01 - Exterior Lighting of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
● Rear lamp(s) condition and installation ● License lamp(s) condition and installation ● Bulbs and installation ● Bulb holders and installation ● Lighting control switch and installation ● Rain/Light sensor condition and installation	● Fuses - Battery junction box (BJB) - link 15E - BJB - link 16E - BJB - link 11E - BJB - link 25E - Central junction box (CJB) - Fuse 2P - CJB - Fuse 4P - CJB - Fuse 18P - CJB - Fuse 67P - CJB - Fuse 62P ● Relays - Rear/License lamp relay - Automatic headlamps relay ● Wiring harness ● Loose or corroded connector(s) ● Battery junction box (BJB) ● Central junction box (CJB) ● Rain/Light sensor control module ● Local interconnect network (LIN) circuits ● Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Rear/License lamp(s) inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault ● Lighting control switch fault	Check the bulb and fuse condition (see visual inspection). Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a rear/license lamp circuit fault.
Rear/License lamp(s) dim	● Incorrect bulb rating ● Circuit fault ● Lighting control switch fault	Check the bulb condition and rating. Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides.
Rear/License lamp(s) stuck on	● Circuit fault ● Lighting control switch	Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a rear/license lamp circuit fault

Symptom	Possible causes	Action
	fault	
Rear/License lamp(s) inoperative when the automatic headlamp switch option is selected	- Fuse(s) blown - Lighting control switch fault - Circuit fault - Rain/Light sensor fault - LIN circuit fault	Check the fuse(s) (see visual inspection). Check the lighting control switch function. Check the automatic headlamp circuit. Refer to the electrical guides. Check for DTCs indicating a rain/light sensor or LIN system fault.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1A9801	LIN Bus Circuit #1	- LIN Bus short circuit to power or ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly. Refer to the lost communication statement at the start of this table.
B1A9881	LIN Bus Circuit #1	- Software error - Rain/ambient light sensor lost power during transmission	Refer to the guided diagnostic routine for this code on the approved diagnostic system. No repair action necessary unless customer complains of rain sensor, roof opening panel or memory seat not functioning correctly. The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly. Refer to the lost communication statement at the start of this table.
B1A9883	LIN Bus Circuit #1	- LIN Bus check sum error	Refer to the guided diagnostic routine for this code on the approved diagnostic system. The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly. Refer to the lost communication statement at the start of this table.
B1B551C	Rain Sensor Module	- Rain sensor module supply voltage out of range	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the power supply to the sensor module from the CJB, repair as necessary. If the power supply exists, no further action necessary, clear/ignore DTC.
B1B5546	Rain Sensor Module	- Rain sensor module calibration/parameter memory failure: - Initialization error - unable to perform optical calibration	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the cleanliness of the windscreen in the sensor location. Check for correct installation of the sensor to the optical element and the adherence of the optical element to windscreen. Clear DTC and retest. If DTC persists, renew the rain/ambient light sensor.
B1B5549	Rain Sensor Module	- Internal electronic failure	Check the rain/light sensor module and circuit. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
B1B5587	Rain Sensor Module	- Missing message	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Rain sensor is not installed to all variants (optional). Fault logging is inhibited by the CCF, but an incorrectly configured CCF could give erroneous DTC logging. Repair action only required for vehicles with sunroof installed. Where necessary refer to the lost communication statement at the start of Communications Module section.

DTC	Description	Possible causes	Action
B1B5591	Rain Sensor Module	- Rain sensor module - measured temperature outside of normal operating range	No action necessary, clear/ignore DTC.
B1C6012	Sidelights Relay Output Circuit	- Side lamps relay output circuit short to power - Rear tail/brake lamp bulb incorrect spec - Rear tail/brake lamp bulb fault	A bulb fault can also cause DTC B1B0187 to be logged in the Network Communications Module and DTC C1A5564 to be logged in the Park Brake Module. A fault in this circuit causing DTC B1C6012 to log could also cause up shift issues on automatic transmission vehicles. Check the rear tail/brake lamp bulbs for correct type, installation or faults including a short circuit of the bulb filaments. Refer to the electrical guides and check side lamps relay output circuit, repair/renew as necessary.
B1C6014	Sidelights Relay Output Circuit	- Rear/License lamp relay output circuit short circuit to ground - Rear/License lamp relay output circuit high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D4013	Lighting Switch Connection Circuit	- Lighting switch connection circuit open circuit	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
U1A1449	CAN Initialisation Failure	- Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Exterior Lighting - Front Fog Lamps

Diagnosis and Testing

Overview

For information on the description and operation of the system, refer to section 417-01 - Exterior Lighting of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
● Front fog lamp condition and installation ● Bulb and installation ● Bulb holder and installation ● Adjuster screw ● Fog lamp switch condition and installation	● Fuses - Battery junction box (BJB) - link 2E - BJB - link 11E - Central junction box (CJB) - Fuse 28P - CJB - Fuse 38P ● Wiring harness ● Loose or corroded connector(s) ● Fog lamp relay ● Fog lamp warning indicator ● Fog lamp switch ● Battery junction box (BJB) ● Central junction box (CJB)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
   - Because the DTCs are stored in more than one module, a complete vehicle read is recommended.
   - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Fog lamp inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault ● Switch inoperative	Check the bulb condition. Check the fuse(s) (see visual inspection). Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Fog lamp dim	● Incorrect bulb rating ● Circuit fault ● Switch fault	Check the bulb condition and rating. Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Fog lamp lighting coverage poor	● Fog lamp alignment incorrect	Check and adjust fog lamp alignment.
Warning lamp inoperative	● Fuse(s) blown ● Switch inoperative ● Circuit fault ● Instrument panel cluster fault	Check the fuse(s) (see visual inspection). Check the switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster fault.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1A7864	Front Fog Lamp	- signal plausibility fault	Check the instrument panel cluster module and circuits. Refer to the electrical guides.
B1D4013	Lighting Switch Connection Circuit	- Lighting switch connection circuit open circuit	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the switch circuit, repair/renew as necessary.

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Exterior Lighting - Rear Fog Lamps

Diagnosis and Testing

Overview

For information on the description and operation of the system, refer to section 417-01 - Exterior Lighting of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious mechanical or electrical faults.

Visual inspection

Mechanical	Electrical
● Rear fog lamp condition and installation ● Bulb holder and installation ● Bulb and installation ● Fog lamp switch condition and installation	● Fuses - Battery junction box (BJB) - link 2E - BJB - link 11E - Central junction box (CJB) - Fuse 28P - CJB - Fuse 44P ● Wiring harness ● Loose or corroded connector(s) ● Fog lamp relay ● Fog lamp warning indicator ● Fog lamp switch ● Battery junction box (BJB) ● Central junction box (CJB)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended.
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Fog lamp inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault ● Switch inoperative	Check the bulb condition. Check the fuse(s) (see visual inspection). Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Fog lamp dim	● Incorrect bulb rating ● Circuit fault ● Switch fault	Check the bulb condition and rating. Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Warning lamp inoperative	● Fuse(s) blown ● Switch inoperative ● Circuit fault ● Instrument cluster fault	Check the fuse(s) (see visual inspection). Check the switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster fault.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action

DTC	Description	Possible causes	Action
B1A7964	Rear Fog Lamp	- signal plausibility fault	Check the instrument cluster and circuits. Refer to the electrical guides.
B1D4013	Lighting Switch Connection Circuit	- Lighting switch connection circuit open circuit	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the switch circuit, repair/renew as necessary.

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Exterior Lighting - Reversing Lamps

Diagnosis and Testing

Overview

For information on the description and operation of the system, refer to section 417-01 - Exterior Lighting of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
• Reversing lamp condition and installation • Bulb and installation • Bulb holder and installation	• Fuses - Battery junction box (BJB) - link 16E - BJB - link 11E - Central junction box (CJB) - Fuse 5P • Wiring harness • Loose or corroded connector(s) • Reversing lamp relay • Battery junction box (BJB) • Central junction box (CJB) • Transmission control module (TCM) • Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended.
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Reversing lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Missing reversing switch signal	Check the bulb and fuse condition (see visual inspection). Check the reversing lamp circuits. Refer to the electrical guides. Check for DTCs indicating a reversing lamp circuit fault.
Reversing lamp(s) dim	• Incorrect bulb rating • Circuit fault	Check the bulb condition and rating. Check the reversing lamp circuits. Refer to the electrical guides.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1C8812	Reversing Lamps Relay Coil Circuit	• Reversing lamps relay coil circuit short circuit to power	Check the reversing lamp relay coil and circuits. Refer to the electrical guides.
B1C8814	Reversing Lamps Relay Coil Circuit	• Reversing lamps relay coil circuit high resistance • Reversing lamps relay coil circuit: short circuit	Refer to the guided diagnostic routine for this code on the approved diagnostic system.

DTC	Description	Possible causes	Action
		to ground	
B1C8912	Reversing Lamps Relay Output Circuit	● Reversing lamps relay output circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1C8914	Reversing Lamps Relay Output Circuit	● Reversing lamps relay output coil circuit high resistance ● Reversing lamps relay output coil circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
U1A1449	CAN Initialization Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Exterior Lighting - Trailer Lamps

Diagnosis and Testing

Overview

For information on the description and operation of the system, refer to section 417-01 - Exterior Lighting of the workshop manual.

Prior to carrying out fault diagnosis of the trailer lamp system, verify the operation of the towing vehicle lighting system with the trailer lighting plug(s) disconnected from the vehicle socket(s).

Note that intermittent fault reports may be due to the cycling operation of the field effect transistors (FETs).

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
● Trailer lamp(s) condition and installation ● Bulbs and installation ● Bulb holders and installation ● Trailer socket(s), plug(s) and installation	● Fuses - Battery junction box (BJB) - link 18E - BJB - link 11E - Central junction box (CJB) - Fuse 22P - (CJB) - Fuse 8P - (CJB) - Fuse 6P - (CJB) - Fuse 32P - (CJB) - Fuse 14P - Trailer fuse box - Fuse to trailer socket relay - Trailer fuse box - Fuse to trailer socket battery feed - Trailer fuse box - Fuse to trailer socket brake lamp - Trailer fuse box - Fuse to trailer socket fog lamps - Trailer fuse box - Fuse to trailer socket right hand tail lamp - Trailer fuse box - Fuse to trailer socket number plate and left hand tail lamps ● Relays - Reverse lamp relay - Side lamp relay - trailer socket relay ● Stop lamp switch ● Wiring harness ● Loose or corroded connector(s) ● Trailer socket(s) ground circuit(s) ● Battery junction box (BJB) ● Central junction box (CJB) ● Trailer fuse box ● Trailer relay box ● Instrument panel cluster (IPC) ● Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended.
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Trailer brake lamp(s) inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault	Check the bulb and fuse condition (see visual inspection). Check the trailer brake lamp circuit. Check the brake lamp switch function. Refer to the electrical guides.

Symptom	Possible causes	Action
	● Brake lamp switch fault	
Trailer brake lamp(s) dim	● Incorrect bulb rating ● Circuit fault ● Brake lamp switch fault	Check the bulb condition and rating. Check the trailer brake lamp circuit. Check the brake lamp switch function. Refer to the electrical guides.
Trailer brake lamp(s) stuck on	● Circuit fault ● Brake lamp switch fault	Check the trailer brake lamp circuits. Check the brake lamp switch function. Refer to the electrical guides.
Trailer fog lamp(s) inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault	Check the bulb and fuse condition (see visual inspection). Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer fog lamp(s) dim	● Incorrect bulb rating ● Circuit fault	Check the bulb condition and rating. Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer fog lamp(s) stuck on	● Circuit fault	Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer tail and number plate lamp(s) inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault ● Trailer side lamp relay fault	Check the bulb and fuse condition (see visual inspection). Check the trailer tail and number plate lamp circuit. Check the trailer tail and number plate lamp relay function. Refer to the electrical guides.
Trailer tail and number plate lamp(s) dim	● Incorrect bulb rating ● Circuit fault ● Trailer side lamp relay fault	Check the bulb condition and rating. Check the trailer tail and number plate lamp circuit. Check the trailer side lamp relay function. Refer to the electrical guides.
Trailer tail and number plate lamp(s) stuck on	● Circuit fault ● Trailer tail and number plate lamp relay fault	Check the trailer tail and number plate lamp circuit. Check the trailer tail and number plate lamp relay function. Refer to the electrical guides.
Trailer turn signal lamp(s) inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault	Check the bulb and fuse condition (see visual inspection). Check the trailer turn signal lamp circuit. Refer to the electrical guides.
Trailer turn signal lamp(s) dim	● Incorrect bulb rating ● Circuit fault	Check the bulb condition and rating. Check the trailer turn signal lamp circuits. Refer to the electrical guides.
Trailer turn signal lamp(s) stuck on	● Circuit fault	Check the bulb and fuse condition (see visual inspection). Check the trailer turn signal lamp circuit. Refer to the electrical guides.
Trailer reverse lamp(s) inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault ● Trailer reverse lamp relay fault	Check the bulb and fuse condition (see visual inspection). Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Trailer reverse lamp(s) dim	● Circuit fault ● Trailer reverse lamp relay fault	Check the bulb condition and rating. Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Trailer reverse lamp(s) stuck on	● Circuit fault ● Trailer reverse lamp relay fault	Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Warning lamp(s) inoperative	● Fuse(s) blown ● Circuit fault ● Instrument cluster fault	Check the fuse(s) (see visual inspection). Check the warning lamp circuit. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.
Trailer socket battery feed missing	● Fuse(s) blown ● Circuit fault	Check the fuse condition (see visual inspection). Check the trailer battery feed circuit. Refer to the electrical guides.

Symptom	Possible causes	Action
Trailer socket ignition feed missing	- Fuse(s) blown - Circuit fault - Trailer socket relay faulty	Check the fuse condition (see visual inspection). Check the trailer ignition feed circuit. Check the trailer ignition feed relay operation. Refer to the electrical guides.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1D0811	Lefthand Trailer Direction Indicator Circuit	- Left trailer turn signal short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D0815	Lefthand Trailer Direction Indicator Circuit	- Left trailer turn signal short circuit to power - Left trailer turn signal: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D0911	Righthand Trailer Direction Indicator Circuit	- Right trailer turn signal short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1D0915	Righthand Trailer Direction Indicator Circuit	- Right trailer turn signal short circuit to power - Right trailer turn signal high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system.
U1A1449	CAN Initialization Failure	- Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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Exterior Lighting - Headlamp Leveling

Diagnosis and Testing

Overview

Two systems of headlamp leveling are available: static and dynamic. Prior to diagnosis, identify the headlamp leveling system installed to the vehicle. Dynamic headlamp leveling is only available on vehicles with an adaptive front lighting system (AFS).

For information on the description and operation of the systems, refer to section 417-01 - Exterior Lighting of the workshop manual.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
● Headlamp leveling motor(s) and linkage(s) condition and installation ● Lighting control switch and installation ● Left-hand steering column multifunction switch and installation	● Fuses - Battery junction box (BJB) - link 11E - Central junction box (CJB) - Fuse 61P - CJB - Fuse 56P - CJB - Fuse 27P - CJB - Fuse 62P ● Wiring harness ● Loose or corroded connector(s) ● Battery junction box (BJB) ● Central junction box (CJB) ● Adaptive front lighting system (AFS) module ● Headlamp power modules ● Engine control module (ECM) ● Anti-lock brake system (ABS) control module ● Air suspension control module ● Local interconnect network (LIN) circuits ● Controller area network (CAN) circuits

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - ○ Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - ○ Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Headlamp leveling system inoperative	● Fuse(s) blown ● Leveling motor/linkage fault ● Headlamp leveling circuit fault ● Air suspension system fault	Check the fuse(s) condition (see visual inspection). Check the headlamp leveling motor and linkage condition. Check the headlamp leveling circuit. Refer to the electrical guides. Check for DTCs indicating headlamp leveling circuit and air suspension system fault(s).
Headlamp alignment incorrect		

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1D3613	Turn Indicator Switch	● Left-hand steering column	Refer to the guided diagnostic routine for this code on the

DTC	Description	Possible causes	Action
		multifunction switch high resistance	approved diagnostic system. Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
B1D4013	Lighting Switch Connection Circuit	● Lighting control switch circuit: high resistance	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
U018287	Lost Communication With Lighting Control Module - Front	● CAN bus fault ● AFS module disconnected ● AFS module not configured/calibrated ● AFS module failure	Refer to the Network Communications section of the workshop manual.
U300016	Control Module	● Circuit voltage below threshold	Check the battery condition and state of charge. Refer to section 414-00 - Charging System of the workshop manual. Check the control module circuits. Refer to the electrical guides.
U300017	Control Module	● Circuit voltage above threshold	Check the battery condition and state of charge. Refer to section 414-00 - Charging System of the workshop manual. Check the control module circuits. Refer to the electrical guides.
U300042	Control Module	● General memory failure	Refer to the warranty policy and procedures manual if a module is suspect.
U300055	Control Module	● Incorrect software loaded ● CAN wiring to AFS module high resistance ● Incorrect AFS module CAN configuration	Configure the modules using the approved diagnostic system. Check for CAN DTCs.
U1A1449	CAN Initialization Failure	● Internal electronic failure	Check the power and ground circuits to the component. Refer to the electrical guides. Configure the module(s) using the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

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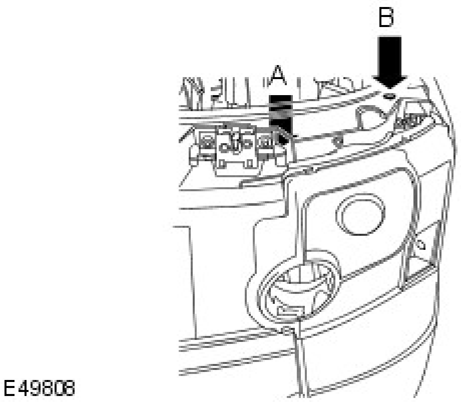
Exterior Lighting - Headlamp Adjustment

General Procedures

- NOTE: With self leveling suspension, make sure the vehicle is at the standard ride height.
- NOTE: The headlamp setting is 1.2 % below horizontal and parallel.
- NOTE: NAS vehicles have vertical adjustment only.



1. Align the headlamp beam setting equipment to one headlamp.

2. Switch the headlamps on and to dipped beam.

3. NOTE: NAS vehicles have vertical adjustment only.

Adjust the headlamps with a Philips screwdriver.

- Rotate the adjusters A and B by an equal amount for vertical alignment.
- Rotate the adjusters A or B for horizontal alignment.

4. To adjust the second headlamp, repeat the above procedure.

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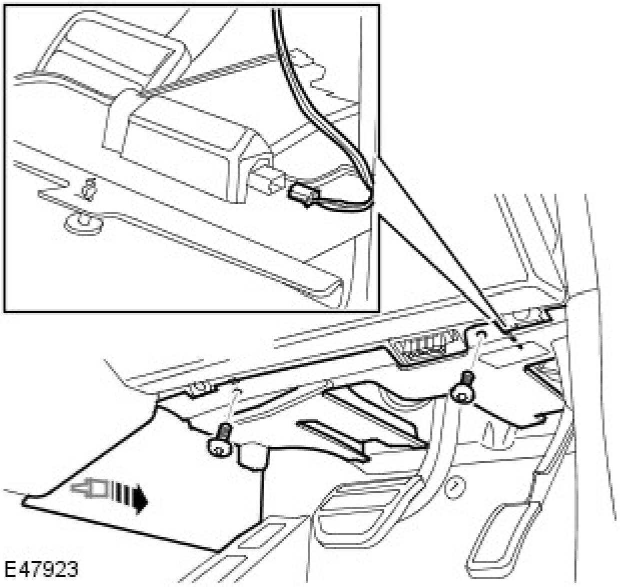
Exterior Lighting - Stoplamp Switch

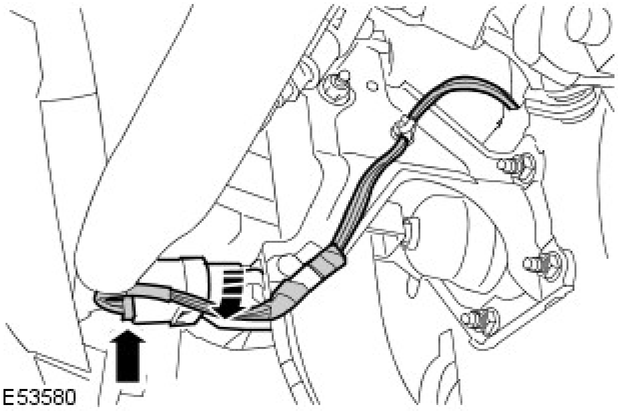
Removal and Installation

Removal



1. Remove the closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



2. ⚠ CAUTION: The brake pedal MUST NOT be depressed during this operation. Failure to comply will result in damage to the stoplamp switch.

Remove the stoplamp switch.

- Disconnect the electrical connector.
- Rotate the switch clockwise.

Installation

1. CAUTIONS:

⚠ The brake pedal MUST NOT be depressed during this operation. Failure to comply will result in damage to the stoplamp switch.

⚠ Make sure that excessive force is not used when installing the stoplamp switch. Failure to follow this instruction may result in damage to the stoplamp switch.

Install the stoplamp switch.

- Rotate the switch counterclockwise.
- Connect the electrical connector.

2. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

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Exterior Lighting - Headlamp Assembly

Removal and Installation

Removal

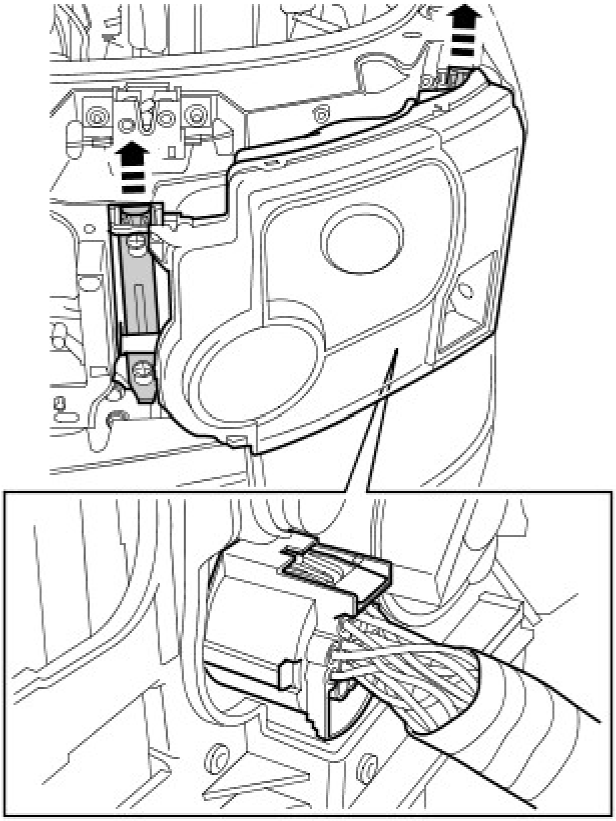
WARNING: Vehicles fitted with Xenon headlamps, the following precautions must be observed. Failure to comply may result in exposure to ultra violet rays, severe electric shock, burns or the risk of explosion. Ensure the headlamps are switched off at all times. Eye and hand protection must be worn. Never switch on the lamps or test the bulbs with the lamp holder released from the headlamp.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Remove the front radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

3. WARNING: Vehicles fitted with Xenon headlamps, the following precautions must be observed. Failure to comply may result in exposure to ultra violet rays, severe electric shock, burns or the risk of explosion. Ensure the headlamps are switched off at all times. Eye and hand protection must be worn. Never switch on the lamps or test the bulbs with the lamp holder released from the headlamp.

CAUTION: Always protect paintwork and glass when removing exterior components.



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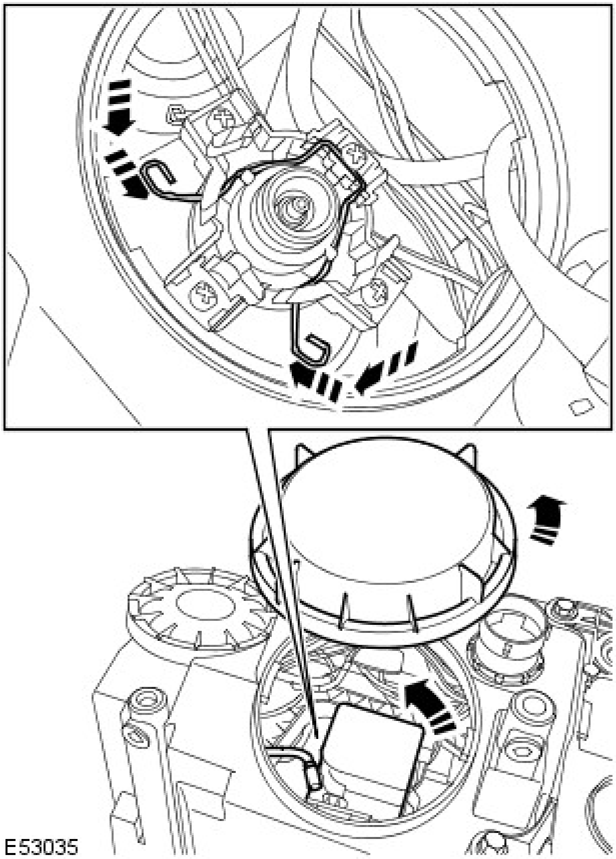
Remove the headlamp assembly.

- Release the headlamp assembly clips.
- Disconnect the electrical connector.



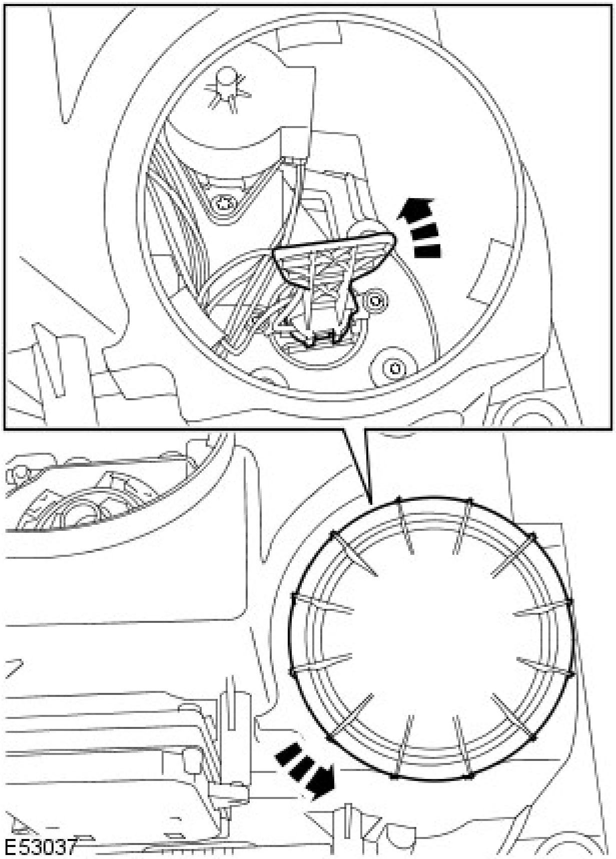
4. NOTE: Do not disassemble further if the component is removed for access only.

• NOTE: High intensity discharge lamp bulb illustrated.

• NOTE: If installed, leave the Silica Gel sachet in place.

Remove the headlamp bulb.

- Remove the cover.
- Disconnect the electrical connector.
- Release the clip.

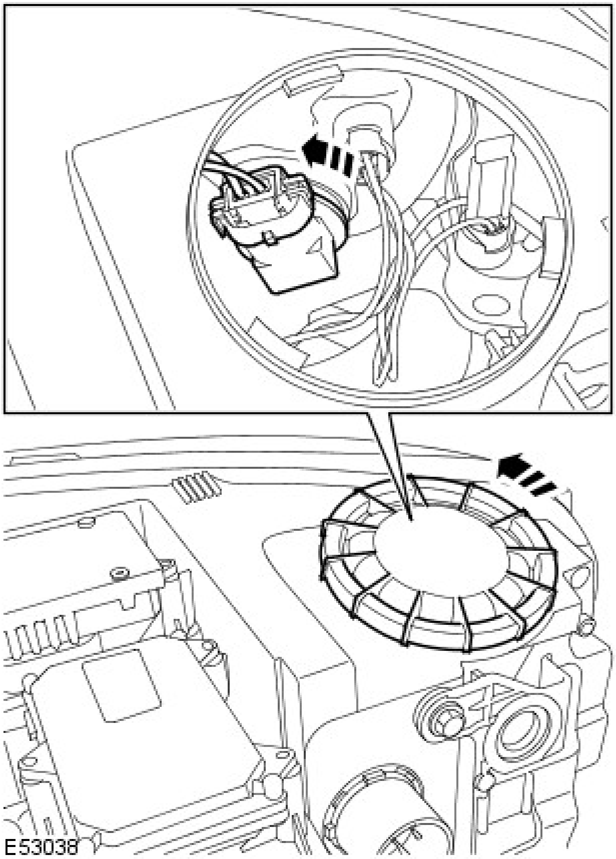


5. Remove the headlamp inner bulb.

- Remove the cover.
- Disconnect the electrical connector.
- Release the clip.

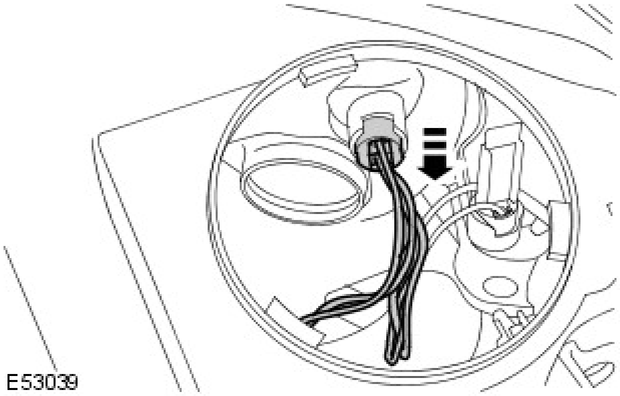
6. Remove the headlamp outer bulb.

- Remove the headlamp outer retaining clip.
- Remove the cover.
- Release the electrical connector.



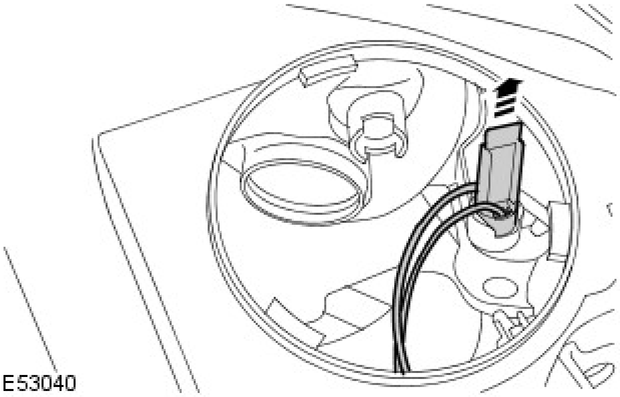
7. Remove the side lamp bulb.

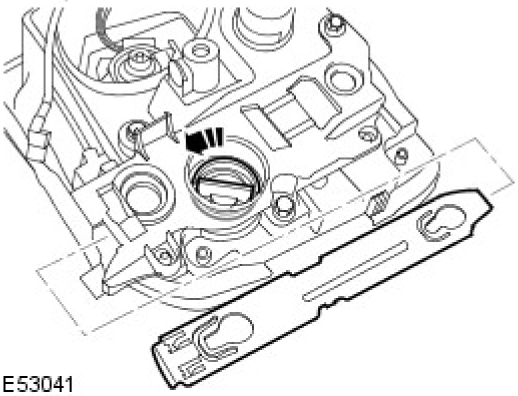
- Release the bulb holder.



8. Remove the side marker bulb.

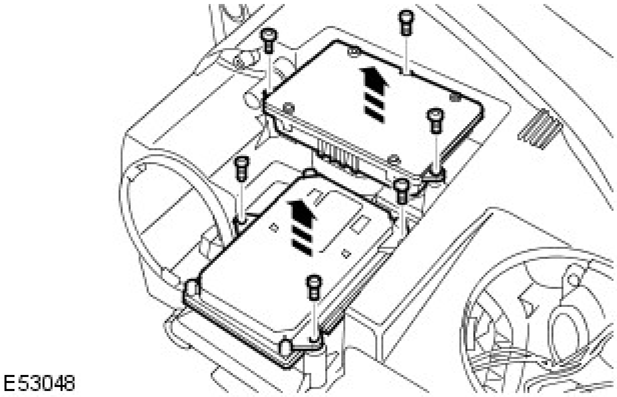
- Release the bulb holder.





9. Remove the turn signal indicator bulb.

- Remove the cover.
- Release the bulb holder.



10. Remove the gas discharge modules.

- Remove the 6 screws.

Installation

1. Install the gas discharge modules.

- Install the screws.

2. Install the turn signal indicator bulb.

- Secure the bulb holder.
- Install the cover.

3. Install the side marker bulb.

- Install the bulb holder.

4. Install the side lamp bulb.

- Install the bulb holder.

5. Install the headlamp outer bulb.

- Connect the electrical connector.
- Install the cover.
- Install the headlamp outer retaining clip.

6. ⚠ CAUTION: Make sure the seal is installed correctly.

Install the headlamp inner bulb.

- Secure with the clip.

- Connect the electrical connector.
- Install the cover.

7. ⚠ CAUTION: Make sure the seal is installed correctly.

Install the headlamp bulb.

- Secure with the clip.
- Connect the electrical connector.
- Install the cover.

8. Install the headlamp assembly.

- Connect the electrical connector.
- Secure with the 2 clips.

9. Install the front radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

10. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

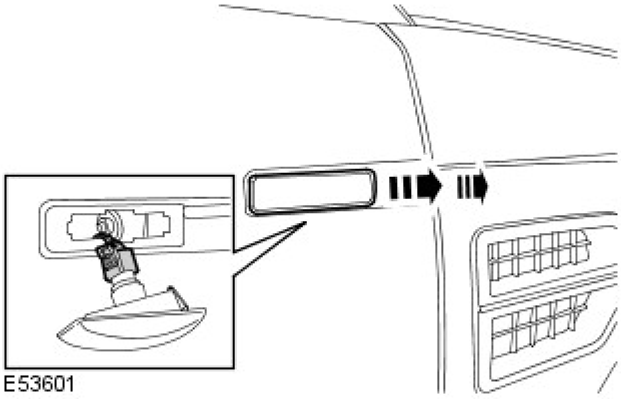
11. NOTE: The headlamp setting is 1.2 % below horizontal and parallel.

Check the headlamp beam alignment.

Exterior Lighting - Side Turn Signal Lamp

Removal and Installation

Removal



1. Remove the side turn signal lamp.
   - Push the lamp forwards to release it from the door.
   - Disconnect the electrical connector.

Installation

1. To install, reverse the removal procedure.

Exterior Lighting - Rear Lamp Assembly

Removal and Installation

Removal

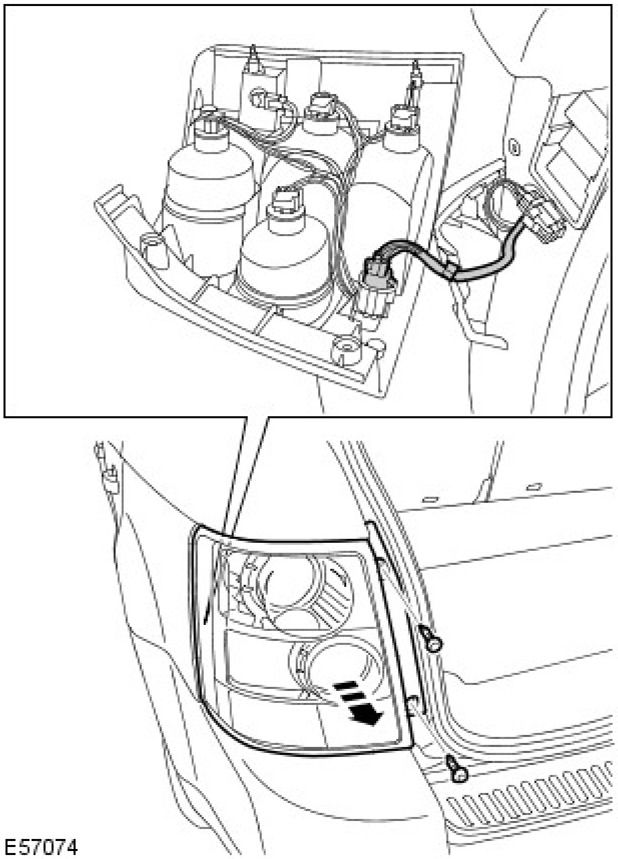
1. Open the liftgate.

2. Release the rear lamp assembly.

- Remove the 2 screws.
- Release the 2 clips.

3. Remove the rear lamp assembly.

- Disconnect the electrical connector.



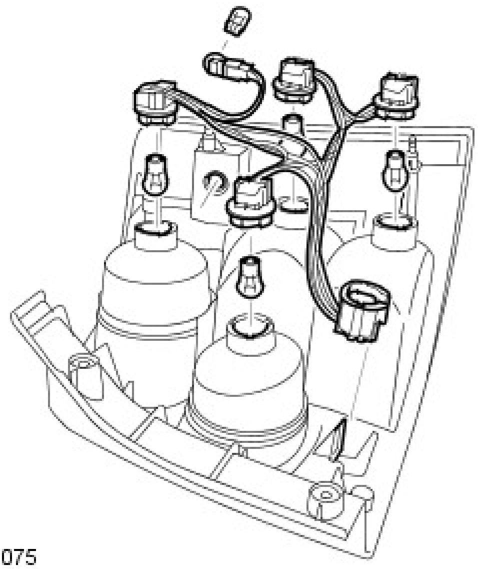
4. NOTE: Do not disassemble further if the component is removed for access only.

• NOTE: Note the fitted position.

Remove the wiring harness.

- Release the 5 bulb holders.
- Release the electrical connector.

5. Remove the 5 bulbs.



E57075

Installation

1. Install the bulbs.
2. Install the wiring harness.
   - Install the bulb holders.
   - Install the electrical connector.
3. Install the rear lamp assembly.
   - Connect and secure the electrical connector.
   - Secure the clips.
   - Tighten the screws.
4. Close the liftgate.

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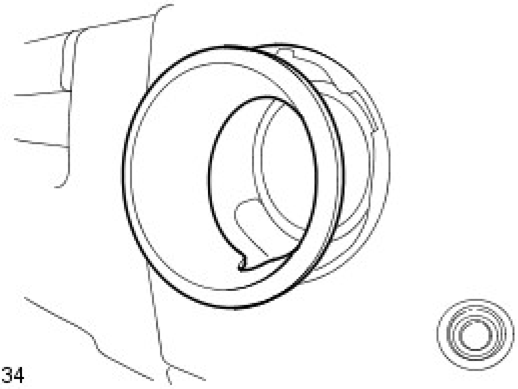
Exterior Lighting - Front Fog Lamp

Removal and Installation

Removal



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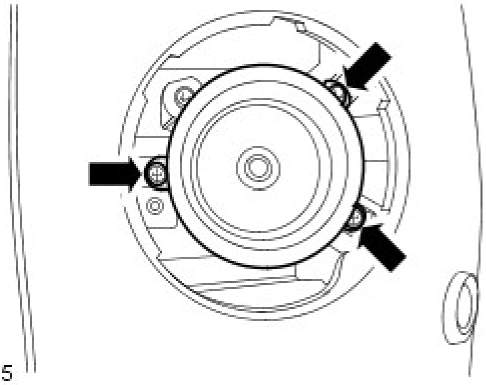
1. NOTE: Release each clip individually. Clips may fall off if care is not taken.

Remove the front fog lamp bezel.

- Release the 6 clips.



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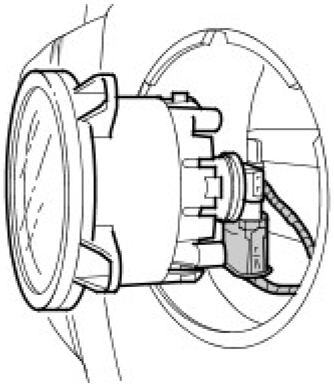
2. Release the front fog lamp.

- Remove the 3 screws.



E47036

3. Remove the front fog lamp.

- Disconnect the front fog lamp electrical connector.

Installation

1. Connect the front fog lamp electrical connector.

2. Install the front fog lamp.

- Tighten the screws.

3. Install the front fog lamp bezel.

- Secure the clips.

4. Check the fog lamp beam alignment.

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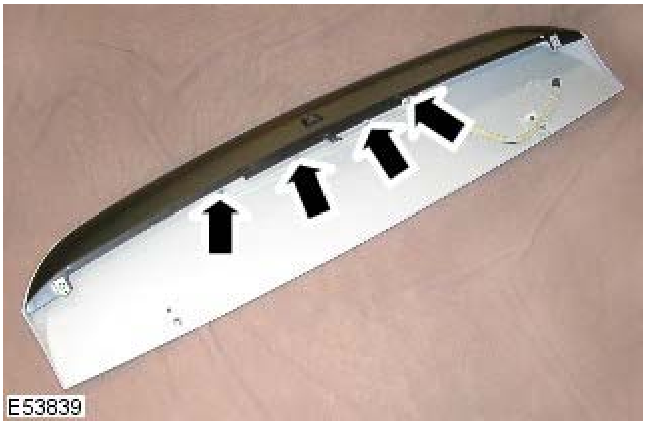
Exterior Lighting - High Mounted Stoplamp

Removal and Installation

Removal

CAUTION: Always protect paintwork and glass when removing exterior components.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the rear spoiler.
   For additional information, refer to: Rear Spoiler (501-08 Exterior Trim and Ornamentation, Removal and Installation).
3. Remove the high mounted stoplamp.
   - Remove the 4 Torx screws.



Installation

1. Install the high mounted stoplamp.
   - Install the Torx screws.
2. Install the spoiler.
   For additional information, refer to: Rear Spoiler (501-08 Exterior Trim and Ornamentation, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Exterior Lighting - Adaptive Front Lighting Module

Removal and Installation

Removal

- NOTE: The position of the adaptive front lighting module will change with hand of drive.

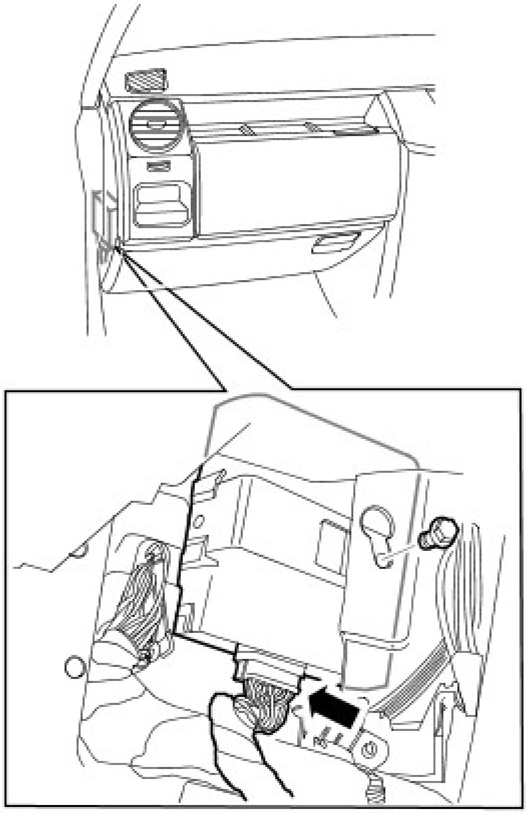
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Passenger side: Remove the cowl side trim panel.
For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Remove the CJB.
For additional information, refer to: Central Junction Box (CJB) (418-00 Module Communications Network, Removal and Installation).

4. Remove the adaptive front lighting module.

- Disconnect the electrical connector.
- Remove the bolt.



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Installation

1. Install the adaptive front lighting module.

- Tighten the bolt to 10 Nm (7 lb.ft).
- Connect the electrical connector.

2. Install the CJB.
For additional information, refer to: Central Junction Box (CJB) (418-00 Module Communications Network, Removal and Installation).

3. Install the cowl side trim panel.
For additional information, refer to: Cowl Side Trim Panel (501-05

Interior Trim and Ornamentation, Removal and Installation).

4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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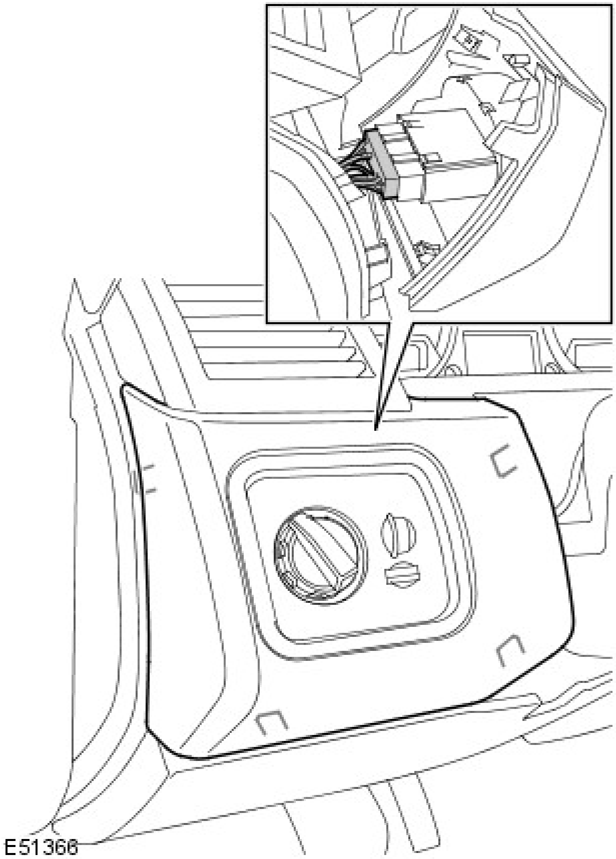
Exterior Lighting - Headlamp Switch

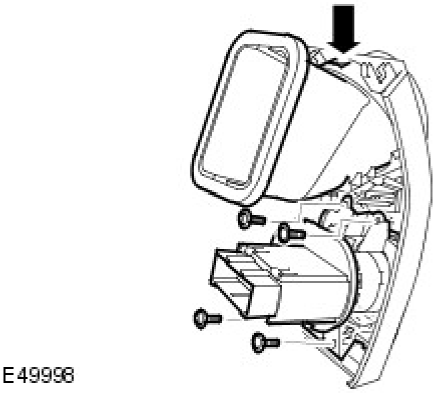
Removal and Installation

Removal

1. Remove the headlamp switch trim panel.
    - Release the 4 clips.
    - Disconnect the electrical connector.



2. Remove the headlamp switch.
    - Remove the 4 Torx screws.



Installation

1. Install the headlamp switch.
    - Tighten the Torx screws.
2. Install the headlamp switch trim panel.
    - Connect the electrical connector.
    - Secure with the clips.

Exterior Lighting - Brake Pedal Position (BPP) Switch Adjustment

General Procedures

1. Adjust the brake pedal position (BPP) switch.

- For vehicles with petrol engine,
  For additional information, refer to: Brake Pedal Position (BPP) Switch Adjustment (303-14A Electronic Engine Controls - V8 S/C 4.2L Petrol, General Procedures) / Brake Pedal Position (BPP) Switch Adjustment (303-14B Electronic Engine Controls - V8 4.4L Petrol, General Procedures).
- For vehicles with diesel engine,
  For additional information, refer to: Brake Pedal Position (BPP) Switch Adjustment (303-14C Electronic Engine Controls - TDV6 2.7L Diesel, General Procedures) / Brake Pedal Position (BPP) Switch Adjustment (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, General Procedures).

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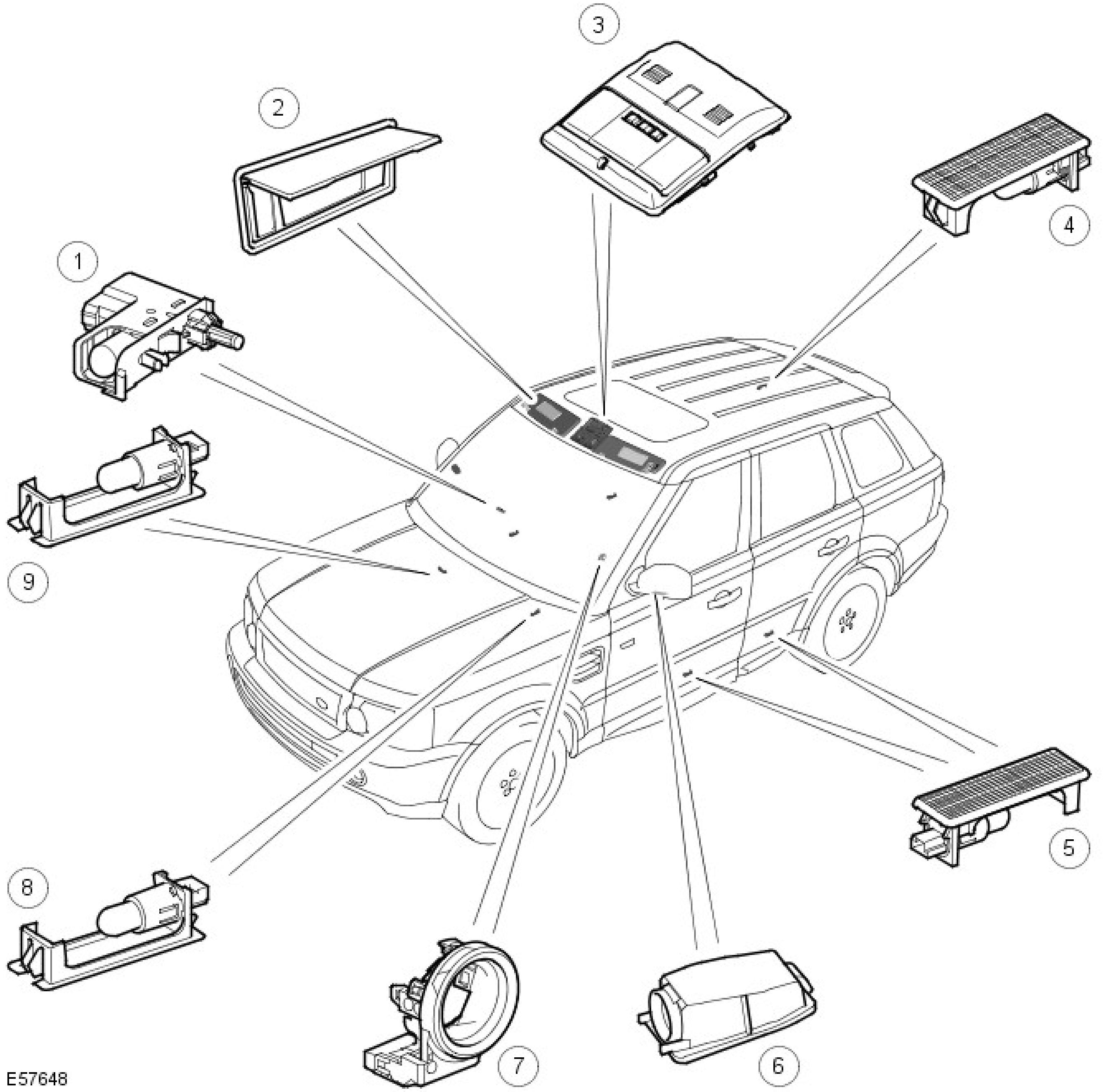
Interior Lighting - Interior Lighting

Description and Operation

Interior Lighting Component Location



Item	Part Number	Description
1	-	Glove compartment lamp and switch
2	-	Vanity mirror lamps
3	-	Main interior lamp and map reading lamps
4	-	Luggage compartment lamp
5	-	Puddle lamps
6	-	Door mirror approach lamps (if fitted)
7	-	Ignition switch glow ring
8	-	Driver footwell lamp
9	-	Passenger footwell lamp

GENERAL

The interior lighting system comprises the following interior lamps:

- Main interior lamp
- Map reading lamps
- Glove compartment lamp
- Luggage compartment lamp
- Vanity mirror lamps
- Footwell lamps
- Puddle lamps
- Ignition switch illumination
- Door mirror approach lamps (if fitted).

Interior Bulb/Type Rating

The following table shows the bulbs used for the interior lighting system and their type and specification.

Bulb	Type	Rating
Main interior lamp	Capless	5W
Map reading lamps	Capless	5W
Luggage compartment lamp	Capless	5W
Vanity mirror lamps	Festoon	14V 0.1A (0.14W)
Door puddle lamps	Capless	5W
Lower instrument panel footwell lamps	Capless	5W
Glove compartment lamp	Festoon	5W
Door mirror approach lamps (if fitted)	Capless	5W

CENTRAL JUNCTION BOX

The Central Junction Box (CJB) is an integrated unit located behind the instrument panel on the passenger side of the bulkhead. The CJB contains fuses, relays and a number of microprocessors which control the power supply and functionality of the interior lighting system and other vehicle systems.

The interior lamps are controlled by the CJB and have two modes of operation: manual and automatic. In the manual mode the interior lamps can be switched on and off using the momentary and latching switches adjacent to each lamp or disabled completely using the same switches. In the automatic mode the interior lamp functionality is controlled by the CJB on receipt of various input signals.

Input signals

The CJB receives the following inputs which affect the operation of the interior lamps:

- Ignition switch
- Door switches
- Tailgate switch
- Glove compartment lamp switch
- Unlock signal
- Main interior lamp switch
- Map reading lamp switches
- Battery saver relay
- Vanity mirror lamp switches.

Circuit Protection

The CJB provides circuit protection for all interior lamp circuits. The following interior lamp circuits are protected by Field Effect Transistors (FETs):

- Main interior lamp
- Luggage compartment lamp
- Footwell lamps
- Ignition switch glow ring
- Door mirror approach lamps (if fitted)
- Puddle lamps.

The above components are protected by FETs which can detect overloads and short circuits. The FETs respond to heat generated by increased current flow caused by a short circuit. On a normal circuit this would cause the fuse to blow, rendering that component and circuit inoperative. The FETs respond to the heat increase and disconnect the supply to the affected circuit. When the fault is rectified or the FET has cooled, the FET will reset and operate the circuit normally.

The following interior lamps circuits are protected by Fuse 1P (10A) in the CJB:

- Glove compartment lamp
- Map reading lamps
- Vanity mirror lamps.

Interior Lamp Time-out

The interior lamps are controlled by a timer within the CJB which allows a 60 second delay period for the lamps to remain on after the ignition has been switched off or when the vehicle is unlocked. The following interior lamps are subject to the delay period:

- Main interior lamp
- Footwell lamps
- Luggage compartment lamp
- Puddle lamps
- Door mirror approach lamps (if fitted)
- Ignition switch glow ring.

The delay period can be adjusted to suit the driver's requirements, refer to following section for adjustment details.

The time-out delay is activated when the CJB receives one of the following signals:

- The CJB receives an unlock signal from the remote handset
- Ignition switch is moved from the crank position (III) or the ignition position (II) or to the auxiliary position (I) to the off position (0).

If a second occurrence of one of the above actions occurs within the time-out period, the timer will be reset and the delay period will start again.

The time-out delay is deactivated when the CJB receives one of the following signals:

- The CJB receives a lock signal from the remote handset
- Ignition switch is moved from the off position (0) or the auxiliary position (I) to the ignition position (II) or the crank position (III).
- The CJB receives a door opened signal (even if door is subsequently closed)

Interior Lamp Time-out Personalisation

The vehicle's customer personalisation options allow the driver or a Land Rover authorised dealer to adjust the interior lamp switch-off delay period to suit their specific requirements. The default delay period of 60 seconds can be adjusted to the following values; OFF, 10 seconds, 20 seconds, 40 seconds, 60 seconds, 120 seconds or 240 seconds.

With the vehicle stationary and the ignition switch in any position, pressing the trip computer button on the end of the left hand steering multifunction switch gives access to the Customer Personalisation options. Using the audio search buttons on the steering wheel the options can be scrolled through. The options are displayed in the message center. When the interior lamp delay option is reached the settings can be changed using the audio search buttons on the steering wheel. When the selection has been made, confirmation is performed by pressing the trip computer button.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Battery Saver

The battery saver feature provides automatic shut-off of the interior lamps after a period of 15 minutes in order to prevent excessive drain on the battery. The lamp(s) fade off as described in the 'Interior Lighting' section that follows.

The battery saver feature is additional to the time-out delay feature and prevents battery drain when a lamp is accidentally left switched on, e.g. glove compartment left open.

When the ignition switch is moved from the ignition position (II) or the auxiliary position (I) to the off position (0), the CJB starts a timer which automatically switches off all interior lamps when the 15 minute period has expired.

Once the timer has expired and the lamps are off, any one of the following will 'wake-up' the battery saver and the interior lamps will function again. The timer will be restarted as soon as an input from one of the following is received by the CJB:

- Ignition switch position changed to auxiliary (I), ignition (II) or crank (III)
- Any door, including the tailgate is opened
- Unlock request is received
- Main interior lamp switch is pressed.

DELIVERY MODE

Delivery mode is set at the factory on vehicles to minimise battery drain. The mode enables the switching off of non-critical electrical components, including the interior lighting. The delivery mode feature can be cancelled by the dealer at pre-delivery inspection using T4.

CRASH ILLUMINATION

When a crash signal is received from the restraints control module, the CJB activates the interior lamps once the vehicle speed has reduced to 5 km/h (3.1 mph). The lamps remain on until they are switched off manually or the crash signal no longer exists. For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).

INTERIOR LIGHTING

Interior lighting is provided to enable the safe entry and departure from the vehicle for the driver and passengers in low ambient light conditions, without any manual switching of the interior lamps.

• NOTE: The term interior lamps also includes the door mirror approach lamps (where fitted).

When the interior lighting system switches the interior lamps on, the CJB ramps the lamps on up to full power over a period of 1.3 seconds. When the system switches the lamps off, after the time-out delay period has expired, the CJB fades the lamps off over a period of 2.6 seconds.

The interior lighting system will illuminate the interior lamps when one of the following events occurs:

- The CJB receives an unlock signal from the remote handset
- Any door is opened including the tailgate
- The ignition switch is turned from the ignition position (II) or the auxiliary position (I) to the off position (0).

The interior lighting system will turn off the interior lamps when one of the following events occurs:

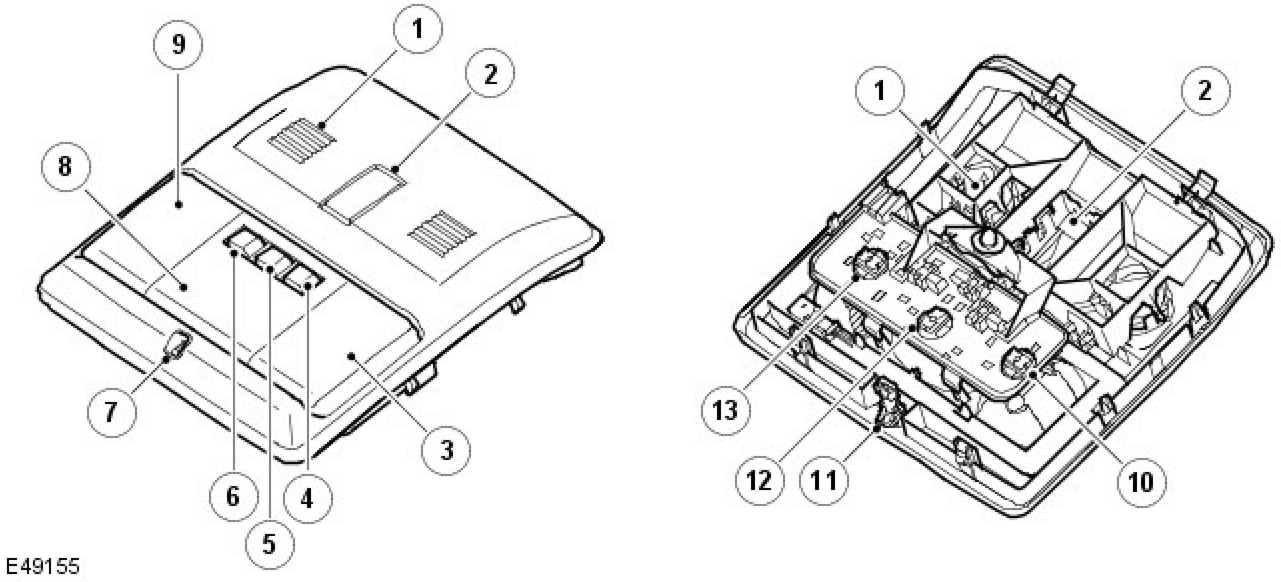
- Once the delay time-out timer has expired since the lamps were either activated or the last door is closed and the vehicle is not locked
- The ignition switch is in the off position (0) and an external lock (using the key or the remote handset) is requested with all doors closed
- The ignition switch is turned from the off position (0) or the auxiliary position (I) to the ignition position (II) with all doors closed
- The last door is closed and the vehicle is externally locked on receipt of an unlock request from the ignition key or a manual unlock using the ignition key in the drivers door lock when the time-out timer is still active
- The last door is closed when the ignition switch is in the ignition position II.

Hunting Mode

The interior lamps can be permanently switched off, preventing automatic operation when a door is opened or the vehicle is unlocked using the remote handset. This is achieved by pressing and holding the central switch of the main interior lamp for 5 seconds. All of the interior lamps, with the exception of the approach lamps, will remain off until the procedure is repeated.

MAIN INTERIOR LAMP ASSEMBLY

Main Interior Lamp



Item	Part Number	Description

1	-	Microphone
2	-	Sunroof switch
3	-	Map reading lamp
4	-	Map reading lamp switch
5	-	Main interior lamp switch
6	-	Map reading lamp switch
7	-	Waterfall lighting LED
8	-	Main interior lamp
9	-	Map reading lamp
10	-	Map reading lamp bulb holder
11	-	LED connector
12	-	Interior lamp bulb holder
13	-	Map reading lamp bulb holder

The main interior lamp assembly is common to all models. The lamp assembly has three switches; one for the main interior lamp and two for the map reading lamps.

The main interior lamp is located in a housing which can also contain the sunroof switch and/or the voice activation microphones, depending on specification.

The main interior lamp operates as part of the automatic interior lighting system. The map reading lamps only operate manually.

Both the interior and map reading lamps use 5W capless bulbs.

The main interior lamp unit also contains an LED for the waterfall lighting. Waterfall lighting is part of the lighting control switch functionality which also controls the brightness of the switch and instrument cluster display illumination. Waterfall lighting provides very limited illumination for the center of the fascia and the center console, when the vehicle is being driven, without affecting the driver's night vision.

Main Interior Lamp

The main interior lamp operates independently of the ignition switch position and can be operated automatically by one of a number of inputs to the CJB or manually by pressing the central switch on the lamp assembly. The switch is a momentary switch which is connected directly to and completes a circuit to the CJB. This completed circuit is a signal for the CJB to activate or deactivate the main interior lamp. The lamp will remain on until the switch is pressed a second time.

The interior lamps can be permanently switched off as previously described in 'Hunting Mode'.

Map Reading Lamps

The main interior lamp assembly contains map reading lamps which are located adjacent to the main interior lamp. The lamps are operated by two momentary switches on the lamp unit, which are located on either side of the main interior lamp switch.

GLOVE COMPARTMENT LAMP

The glove compartment lamp is located inside the glove compartment and contains an integral switch. The switch is operated when the glove compartment lid is opened and closed, switching the lamp on and off.

The glove compartment lamp uses a 5W festoon bulb.

PUDDLE LAMPS

Each door is fitted with a puddle lamp which illuminates the ground below the door when the door is opened. The puddle lamps are located in the bottom of the door trim panel on each front and rear door.

The puddle lamps are part of the automatic interior lighting functionality. Each lamp uses a 5W capless bulb.

FOOTWELL LAMPS

Two footwell lamps are located under the instrument panel, one on each side, to illuminate the footwell area. The footwell lamps are controlled by the CJB and operate as part of the interior lighting functionality.

The footwell lamps use a 5W capless bulb.

LUGGAGE COMPARTMENT LAMP

A luggage compartment lamp is located in the right hand 'D' post trim. The luggage compartment lamp is controlled by the CJB and operates as part of the interior lighting functionality.

The luggage compartment lamp uses a 5W capless bulb.

VANITY MIRROR LAMPS

Four vanity mirror lamps are fitted, two in each vanity mirror. The lamps are illuminated when the mirror cover is raised. The vanity mirror lamps operate independently of the ignition switch position and separately to the interior lighting functionality, although they are subject to the battery saver feature of the CJB.

The vanity mirrors use low voltage, 1.2W festoon type bulbs.

EXTERIOR DOOR MIRROR APPROACH LAMPS (if fitted)

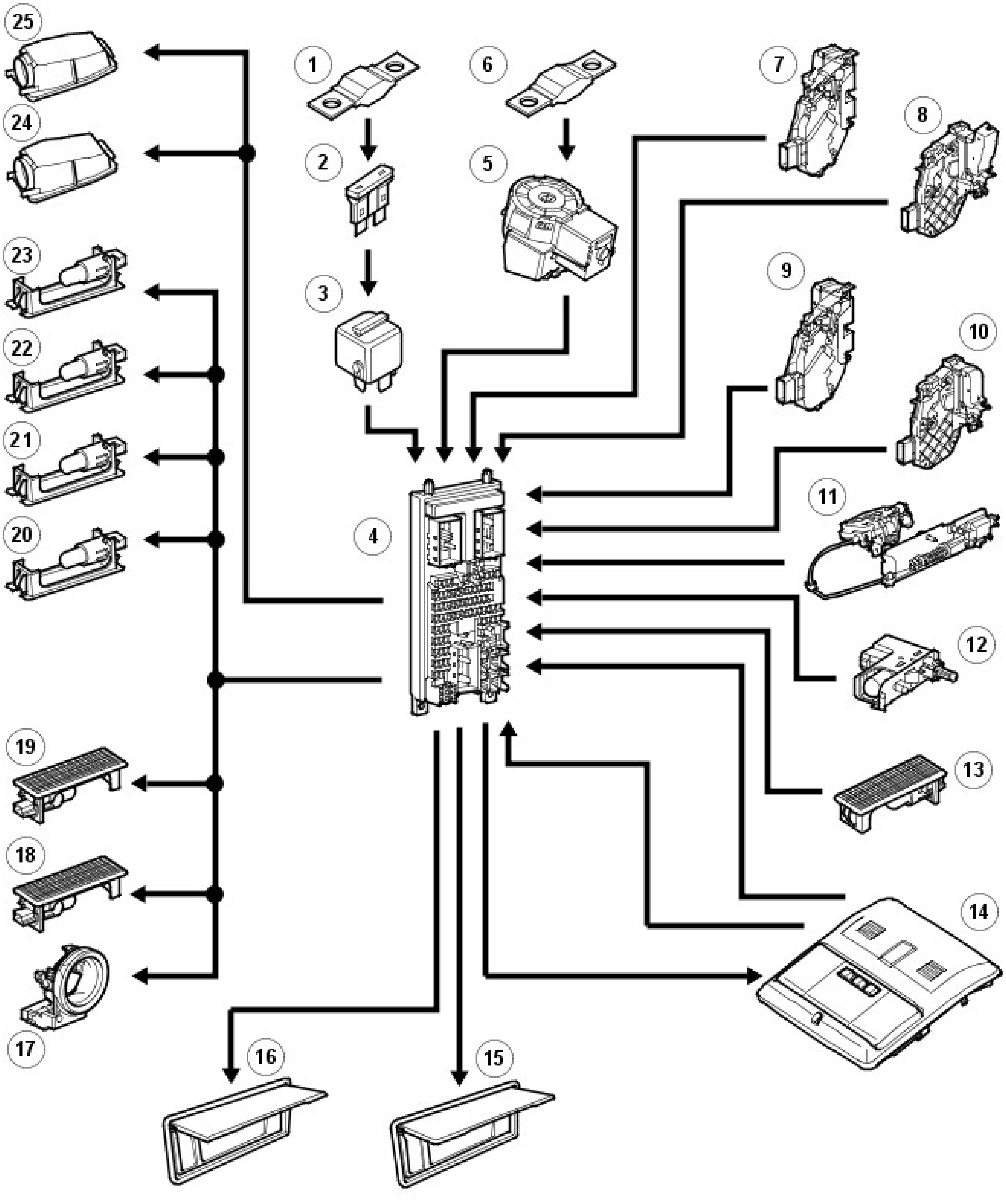
A door mirror approach lamp is located on the underside of each exterior door mirror. The approach lamps are controlled by the CJB and operate on receipt of an unlock request from the ignition key or a manual unlock using the ignition key in the drivers door lock.

The approach lamps remain illuminated for the same period as the interior lamps and are subject to the same interior lamp time-out as detailed earlier.

The approach lamps use 5W capless bulbs.

CONTROL DIAGRAM

- NOTE: **A** = Hardwired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Item	Part Number	Description
1	-	Fusible link 15E (40A) (Permanent 12V supply)
2	-	Fuse 1P (10A)
3	-	Battery saver relay (located inside CJB)
4	-	Central Junction Box (CJB)
5	-	Ignition switch

6	-	Fusible link 11E (30A)
7	-	Passenger door CDL motor
8	-	Driver's door CDL motor
9	-	RH rear door CDL motor
10	-	LH rear door CDL motor
11	-	Tailgate release motor
12	-	Glove compartment lamp
13	-	Luggage compartment lamp
14	-	Main interior lamp assembly
15	-	RH vanity mirror lamp
16	-	LH vanity mirror lamp
17	-	Ignition switch glow ring illumination
18	-	RH footwell lamp
19	-	LH footwell lamp
20	-	RH rear puddle lamp
21	-	LH rear puddle lamp
22	-	RH front puddle lamp
23	-	LH front puddle lamp
24	-	LH door mirror approach lamp
25	-	RH door mirror approach lamp

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Interior Lighting - Interior Lighting

Diagnosis and Testing

Overview

For information on the description and operation of the system:
REFER to: Interior Lighting (417-02 Interior Lighting, Description and Operation).

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection Chart

Mechanical	Electrical
● Main interior lamp condition and installation ● Map reading lamp(s) condition and installation ● Vanity mirror lamp(s) condition and installation ● Glove compartment lamp condition and installation ● Footwell lamp(s) condition and installation ● Ignition switch glow ring condition and installation ● Door mirror approach lamp(s) condition and installation ● Puddle lamp(s) condition and installation ● Luggage compartment lamp condition and installation	● Bulbs ● Fuses - Battery junction box (BJB) - link 15E - BJB - link 11E - Central junction box (CJB) - Fuse 1P ● BJB ● CJB ● Battery saver relay ● Wiring harness ● Loose or corroded connector(s) ● Main interior lamp switch ● Map reading lamp switches ● Vanity mirror lamp switches ● Glove compartment lamp switch ● Waterfall lighting LED ● Tailgate lamp switch

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification

Symptom Chart

Symptom	Possible causes	Action
Main interior lamp inoperative	● Bulb(s) failure ● Fuse(s) blown ● Circuit fault ● Switch fault	Check the bulb(s) condition. Check the fuse(s) (see visual inspection). Check the lamp circuits. Check the switch function. Refer to the electrical guides.
Waterfall lighting LED inoperative	● LED failure ● Fuse(s) blown ● Circuit fault	Check the LED condition. Check the LED connector. Check the fuse(s) (see visual inspection). Check the lamp circuits. Refer to the electrical guides.
Map reading lamp(s) inoperative	● Bulb(s) failure ● Fuse(s) blown ● Circuit fault ● Switch fault	Check the bulb(s) condition. Check the fuse(s) (see visual inspection). Check the lamp circuits. Check the switch function. Refer to the electrical guides.
Vanity mirror lamp(s) inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault ● Switch fault	Check the bulb condition. Check the fuse(s) (see visual inspection). Check the lamp circuits. Check the switch function. Refer to the electrical guides.
Glove compartment lamp inoperative	● Bulb failure ● Fuse(s) blown ● Circuit fault ● Switch fault	Check the bulb condition. Check the fuse(s) (see visual inspection). Check the lamp circuits. Check the switch function. Refer to the electrical guides.

DTC index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to

the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible causes	Action
B1C4323	Master Interior Light Switch	● Signal stuck - Switch held ● Interior lamp circuit short to ground ● Interior lamp switch fault	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the interior lamp circuit. Check the switch operation, renew as necessary.
B1C9511	Approach Lamps Circuit	● Approach lamps circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Where installed, refer to the electrical guides and check the approach lamps circuit and repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9515	Approach Lamps Circuit	● Approach lamps circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Where installed, refer to the electrical guides and check the approach lamps circuit and repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1D1311	Interior Lights Circuit "A"	● Interior lamps A circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair as necessary.
B1D1315	Interior Lights Circuit "A"	● Interior lamps A circuit short circuit to power	Refer to the guided diagnostic routine for this code on the approved diagnostic system. If no customer complaint issue exists with interior lamp operation, no action necessary, clear/ignore DTC. If interior lamp functionality is incorrect, refer to the electrical guides and check the circuit, repair as necessary.
B1D1411	Interior Lights Circuit "B"	● Interior lamps B circuit short circuit to ground	Refer to the guided diagnostic routine for this code on the approved diagnostic system. Refer to the electrical guides and check the circuit, repair as necessary.
B1D1415	Interior Lights Circuit "B"	● Footwell/puddle lamps not installed ● Bulb failure ● Fuse(s) blown ● Circuit fault	Check for installation of footwell/puddle lamps. If lamps are NOT installed, ignore this DTC. If lamps are installed, refer to the guided diagnostic routine for this code on the approved diagnostic system. Check the condition of the bulbs/fuses. Refer to the electrical circuit diagrams and check lamp circuits for short, open circuit

Daytime Running Lamps (DRL) - Daytime Running Lamps (DRL)

Description and Operation

Daytime Running Lamps (DRL) use the full intensity low beam headlamps which are permanently illuminated when the vehicle is being driven. DRL are used in a number of markets and there are two systems to cover these markets.

DRL CANADIAN MARKET

DRL for this market use full intensity low beam headlamps. The side marker lamps, tail lamps and license plate lamps will be on, but instrument cluster illumination will be off. DRL are active when the following parameters are met:

- Parking brake is off on vehicles with manual transmission or PARK is not selected on vehicles with automatic transmission
- Ignition switch is in the ignition position (II)
- The Central Junction Box (CJB) receives an engine running signal
- The lighting control switch is in the off or side lamps position.

• NOTE: If the lighting control switch is moved to the headlamp position, DRL are deactivated and normal side lamp and headlamp functionality is operational.

• NOTE: Adaptive Front lighting System (AFS) (where fitted) is non-functional when the DRL are active.

• NOTE: When DRL are active, the headlamp flash function using the left hand steering column multifunction switch will operate normally. The high beam headlamp function using the left hand steering column stalk switch will be deactivated.

When the parking brake is applied on manual transmission vehicles or the selector lever is in the PARK position on automatic transmission vehicles, DRL are turned off. This is to reduce battery discharge during long periods of engine idling in cold climate conditions. When the parking brake is released or the selector lever is moved from the PARK position, normal DRL functionality is restored.

DRL DENMARK, HOLLAND, NORWAY, SWEDEN, FINLAND & POLAND

DRL for these markets use full intensity low beam headlamps. Side lamps and license plate lamps will be on, but instrument cluster illumination will be off. DRL are active when the following parameters are met:

- Ignition switch is in the ignition position (II)
- The CJB receives an engine running signal
- The lighting control switch is in the off position.

• NOTE: When DRL are active, the headlamp flash function using the left hand steering column multifunction switch will operate normally. The high beam headlamp function using the left hand steering column stalk switch will be deactivated.

If the lighting control switch is moved to the side lamp or headlamp positions, DRL are deactivated and normal side lamp and headlamp functionality is operational.

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Module Communications Network -

Torque Specifications

Description	Nm	lb-ft
Central junction box bracket retaining nuts	10	7
Central junction box bracket retaining bolts	25	18
Engine compartment ground cable nuts	25	18
Body panel ground cable nuts	25	18
Vehicles with auxiliary heating - Heater pipes to body panel nut	10	7
Wiring harness to plenum chamber nuts	4	3
Vehicles with auxiliary climate control - A/C lines to body panel nut	10	7
Battery ground cable to body nut	25	18
Battery junction box retaining bolt	6	4
Ground cables to the lower A-pillar nut	10	7
Battery positive cable to the battery junction box (BJB) nut	25	18

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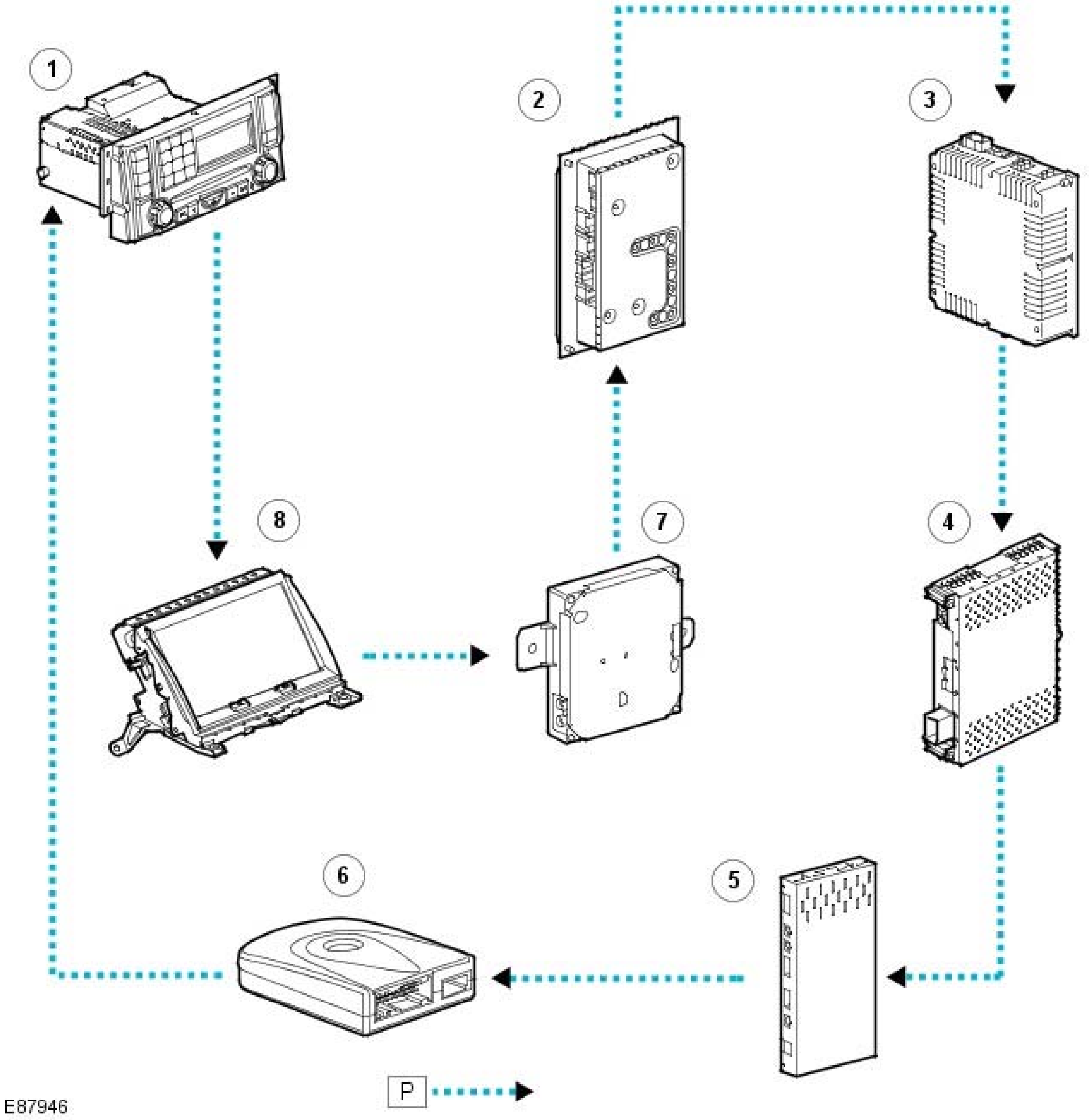
Module Communications Network - Communications Network

Description and Operation

GENERAL

Communication Network (Media Oriented System Transport MOST)Sheet 1 of 3

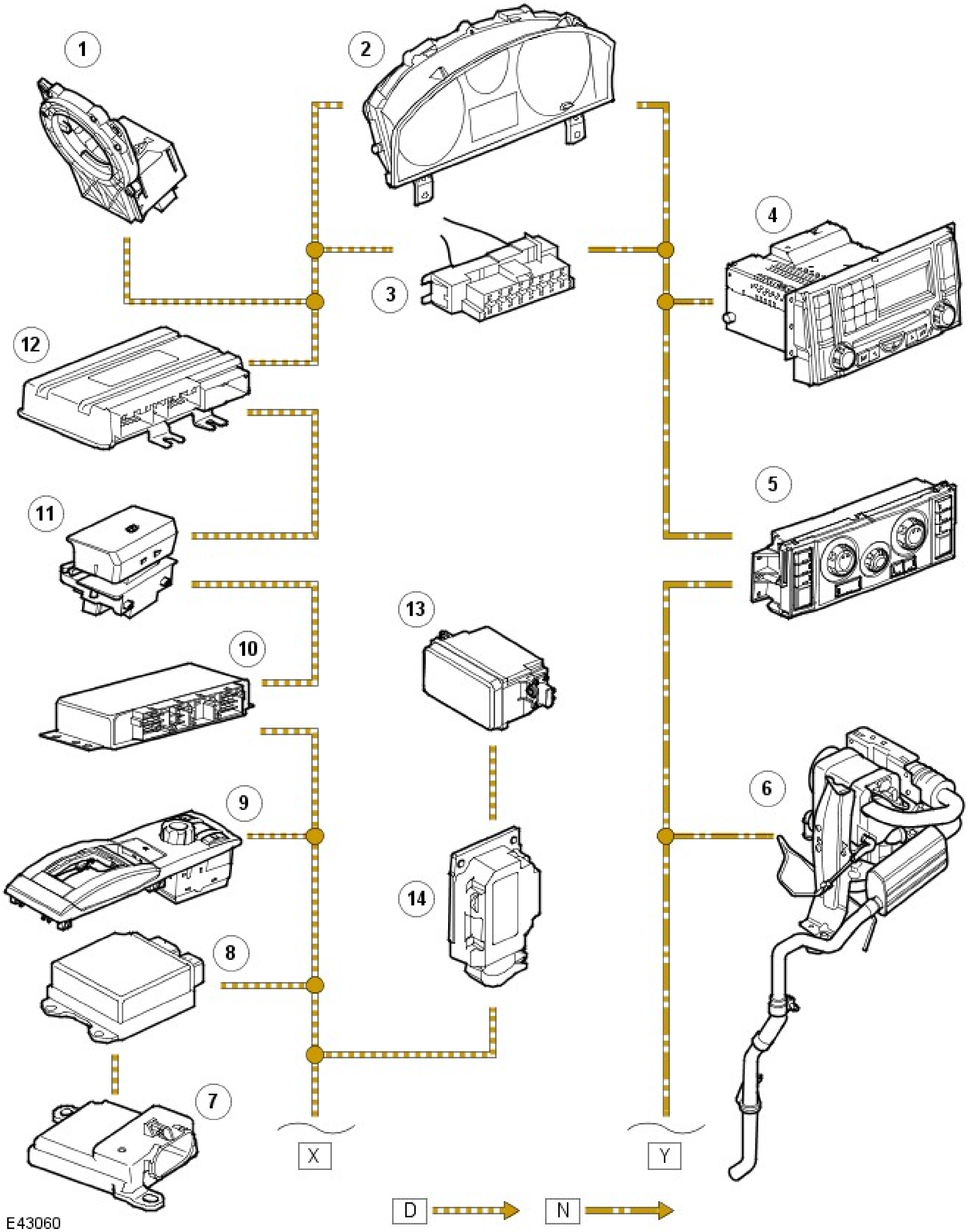
- NOTE: **P** = MOST



Item	Part Number	Description
1	-	Integrated Head Unit (IHU)
2	-	Amplifier
3	-	Television tuner module
4	-	SDARS module (NAS only)
5	-	Rear Seat Entertainment (RSE) module
6	-	Transceiver module
7	-	Traffic Message Channel (TMC)
8	-	Touch Screen Display (TAD)

Communication Network (CAN bus) Sheet 2 of 3

- NOTE: D= HS CAN Bus N= MS CAN Bus O= LIN Bus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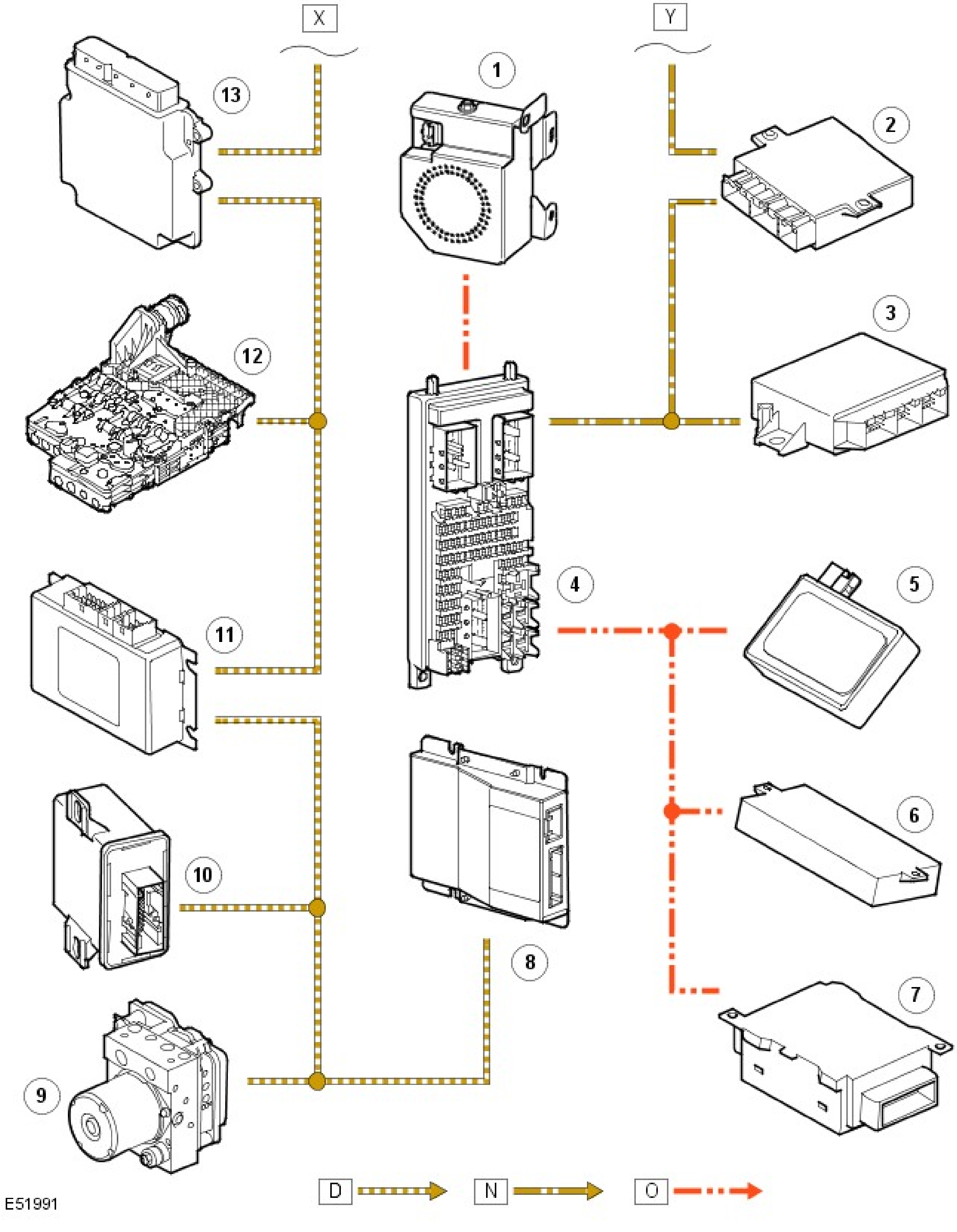
Item	Part Number	Description
1	-	Steering angle sensor
2	-	Instrument cluster
3	-	Diagnostic socket

4	-	Integrated Head Unit (IHU)
5	-	Heating and ventilation control module
6	-	Fuel Fired Booster Heater
7	-	Seat occupancy sensor (NAS only)
8	-	restraints control module (RCM)
9	-	Terrain Response™ control module
10	-	Electronic rear differential control module
11	-	Electric park brake control module
12	-	Air suspension control module
13	-	Adaptive speed control radar sensor
14	-	Adaptive speed control, control module

Communication Network (CAN bus) Sheet 3 of 3

- NOTE: D= HS CAN Bus N= MS CAN Bus O= LIN Bus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Item	Part Number	Description
1	-	Battery Back Up Sounder (BBUS)
2	-	Tire Pressure Monitoring System (TPMS) control module
3	-	Parking aid control module
4	-	central junction box (CJB)
5	-	Rain senor
6	-	Memory control module

7	-	Roof opening panel control module
8	-	Dynamic Response control module
9	-	anti-lock brake system (ABS) control module
10	-	Automatic Front Lighting System (AFS)
11	-	Transfer box control module
12	-	transmission control module (TCM)
13	-	engine control module (ECM)

A number of different types of data bus are incorporated into the vehicle wiring harnesses for the transmission of commands and information between control modules. The bus configuration installed on a particular vehicle depends on the model and equipment level.

The available types of bus systems on the vehicle are:

- High speed controller area network (CAN) bus
- Medium speed CAN bus
- Media Orientated System Transport (MOST) bus
- Gigabit Video Interface (GVIF)
- Local Interconnect Network (LIN) bus
- Security Local Interconnect (SLIN) bus
- Ai Net

Bus	Baud rate	Protocol
High speed CAN	500 kbits/s	11898
Medium speed CAN	125 kbits/s	11898
MOST	24 Mbits/s	MOST Cooperation
GVIF	1.95 Gbits/s	Sony proprietary system
LIN	9.6Kbits/s	LIN consortium
SPDIF	24 kbits/s	Sony/Phillips proprietary system
Ai Net	1200kbits/s	Alpine proprietary system

CAN

The CAN bus is a high speed broadcast network where the control modules automatically transmit information on the bus every few microseconds. The other buses are low speed networks which are mainly event driven, i.e. an electronic control module outputs a message only in response to a request message from another control module or a hard wired input from a switch or sensor.

A twisted pair of wires are used for the CAN bus and single wires are used for all of the other buses. Bus wires can be repaired using crimped connections. The unwound length of CAN bus wires must not exceed 40 mm (1.6 in).

Two CAN busses are employed on the vehicle:

- Medium speed (MS)
- High speed (HS)

The medium speed bus connects the following control modules:

- Integrated Head Unit (IHU) or low line head unit
- Heating and ventilation control module
- Fuel fired booster heater
- Parking aid control module
- TPMS control module
- CJB

The high speed bus connects the following control modules:

- Steering angle sensor
- Air suspension
- Electric Park Brake (EPB) control module
- Electronic rear differential control module
- Terrain Response™
- RCM
- ECM
- TCM
- Adaptive Front lighting System (AFS) module
- ABS module.

Both the medium and high speed CAN bus are connected to the instrument cluster and the diagnostic socket at one end. The medium speed bus terminates at the CJB, while the high speed bus terminates at the ABS control module.

Control modules are connected in either a loop , CAN in/ CAN out, or a spur configuration. Should a control module that is looped fail, the bus system will fail at that point. Should a spurred control module fail the rest of the bus system will be unaffected by the faulty control module.

Media Orientated System Transport (MOST)

The MOST bus uses a fibre optic cable to transport data and audio around the entertainment and information system. The fibre optic cable is arranged in a ring, with each unit on the bus having a MOST in and MOST out connection.

MOST is a synchronous network. A timing master supplies the clock and all other devices synchronize their operation to this clock. The timing master for the MOST network is the Integrated Head Unit (IHU).

Key features of the MOST network are:

- High data transfer rate
- Support for up to 64 devices
- Support of asynchronous and synchronous data transfer
- Reduced cabling
- Simple connectors

When handling the MOST fibre optic cables the following safety precautions should be observed:

- The cable has a minimum bend radius of 25mm.
- It is advisable not to look directly into the connector of a live cable.
- The MOST cable cannot be repaired, replacement overlay harnesses are available to replace damaged cables.

Gigabit Video Interface (GVIF)

The GVIF bus is a Sony proprietary bus for the transmission of video between a transmitter device and a display device. In this instance it is used to transmit video from the navigation computer to the Touch Screen Display (TAD) only.

Local Interconnect Network (LIN) bus

There are two LIN buses on the vehicle. One connects the rain sensor, roof opening panel and memory seats to the central junction box and the other connects the BBUS to the CJB.

The LIN bus has a master/ slave configuration. Within the master is stored a 'schedule table'. This is a list of all the LIN frames or packets in order of which one gets sent when and how many times within a particular cycle. The master sends out a header on the bus which will identify to the slaves whose turn it is to transmit a frame. The slave then fills the space after the header with the contents of the frame. The frame identifiers are all sourced from the LIN specification, and the frame identifiers are grouped by the size of the frame in bytes. All the LIN nodes are optional fit, consequently there is a different schedule table for each permutation. The bus master switches between these based on the information held within the car configuration file. The CJB also acts as a bi-directional gateway between the medium speed CAN bus and the LIN bus by passing signals between the two buses.

The LIN bus is a single wire and operates at 9.6Kbs. The protocol used on the LIN bus is defined by the LIN consortium.

Sony Philips Digital Interface Format (SPDIF)

The SPDIF is an digital optical system connected between the digital versatile disc (DVD) autochanger and the audio amplifier and is used to output the audio from the DVD autochanger to the audio amplifier.

Diagnostic Socket

The diagnostic socket allows the transfer of information between the vehicle electronic control modules and T4 on the high or medium speed CAN bus, or indirectly via the instrument cluster. The diagnostic socket is located in the lower instrument panel closing panel, on the drivers side below the steering column.

IS Bus

The IS bus is a dedicated bus system used to transfer information between the RSE module and the two RSE screens.

Ai Net

The Ai Net is an Alpine proprietary bus used to communicate between the RSE module and the DVD autochanger.

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Module Communications Network - Communications Network

Diagnosis and Testing

Principles of Operation

For a detailed description of the Communications Network, refer to the relevant Description and Operation sections in the workshop manual. REFER to:

> Communications Network (418-00 Module Communications Network, Description and Operation),
> Communications Network (418-00 Module Communications Network, Diagnosis and Testing),
> Communications Network (418-00, Diagnosis and Testing).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Electrical
● Fuses (refer to electrical guide) ● Wiring harness ● Correct engagement of electrical connectors ● Loose or corroded connections ● Routing of fibre optic harnesses ● Correct engagement of optical connectors ● Correct placement of optical connectors (ring order) ● Correct assembly of optical connectors (backout, etc) ● Damage to fibre (chafing, abrasion, kinking, cuts, etc)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

CAN Network Integrity Checks

In the event that one or more control modules are not communicating on either the Medium Speed (MS) or High Speed (HS) CAN Buses, checks can be performed to confirm the integrity of the CAN harness.

The following information is applicable to HS and MS CAN Buses accessible via the J1962 diagnostic connector.

Module Connections to the CAN Harness

Modules are connected to the CAN harness either in a 'loop' or 'spur' configuration. In the 'loop' type configuration the CAN harness loops into the module (via two connector pins) and then loops out of the module (via another two connector pins). In the 'spur' type configuration, a harness spur is spliced into the main 'backbone' of the CAN harness and the module is connected to the harness spur via two connector pins.

CAN Harness Architecture

For a detailed description of the CAN Networks and architecture, refer to the relevant Description and Operation section in the Workshop Manual. REFER to:

> Communications Network (418-00 Module Communications Network, Description and Operation),
> Communications Network (418-00 Module Communications Network, Diagnosis and Testing),
> Communications Network (418-00, Diagnosis and Testing).

IDS Vehicle Integrity Test

If a control module is suspected of non-communication, the Network Integrity test application available on the manufacturer approved diagnostic system can be used to confirm if communication is possible between the control modules on the vehicle and the manufacturer approved diagnostic system (via the J1962 diagnostic connector). The results from the test can be used to determine if either a single module or multiple modules are failing to communicate.

CAN Terminating Modules

If the Network Integrity test indicates that one or more module on one of the CAN networks (HS or MS) are failing to communicate, there are several checks that can be made. The first step is to identify if both of the CAN terminating modules on each individual CAN Bus are communicating. If both CAN terminating modules for each individual CAN Bus are communicating (identified via the Network Integrity test), then it can be confirmed that the main 'backbone' of the CAN harness is complete. The main 'backbone' of the CAN harness consists of all the modules connected to the CAN harness via a 'loop' configuration and also includes the two terminating modules.

Communication with both CAN terminating modules via the Network Integrity test confirms the physical integrity of the main 'backbone' of the CAN harness (and the harness spur to the J1962 diagnostic connector). This means that there is no requirement to check the resistance of the CAN Network. This is because the standard check for 60 ohms across the CAN High and CAN Low lines will not provide any additional information regarding the physical condition of the CAN harness, beyond what has already been determined from the Network Integrity test.

Non-Communication of a Terminating Module

If a Network Integrity test reveals a terminating module is failing to communicate it can indicate a break in the main 'backbone' of the CAN harness. The first checks should always be to confirm the power and ground supplies to the non-communicating module are correct. Providing these are correct, the resistance between the CAN High and CAN Low lines at the J1962 connector can be checked to determine the integrity of the main 'backbone' of the CAN harness. After disconnecting the battery a reading of 120 ohms would indicate an open circuit in the main 'backbone' of the CAN harness. Alternatively, a reading of 60 ohms would indicate that there is no open circuit fault with the main 'backbone' of the CAN harness.

It is worth noting that even if one of the terminating modules is disconnected from the CAN harness, communications between the modules still connected may still be possible. Therefore communication between the manufacturer approved diagnostic system and the connected modules may also be possible.

Locating CAN Harness Open Circuits

In the case where multiple modules, including a terminating module, are failing to communicate, having first confirmed the power and ground supplies are correct, the approximate location of the open circuit can be identified from analysis of the Network Integrity test results and reference to the relevant CAN network circuit diagrams. For example, if an open circuit existed in a certain position on the CAN harness, any module positioned on the Network between the J1962 connector and the open circuit should return a response during the Network Integrity test. No responses would be returned from any modules past the open circuit fault in the Network.

CAN Harness 'Spur' Type Configuration Circuits

If, after the initial checks (Network Integrity test using the manufacturer approved diagnostic system, and power and ground supplies to the module have been checked and confirmed as correct), a module that is connected to the CAN harness via a 'spur' type configuration is suspected of not communicating, then the physical integrity of the CAN harness 'spur' can be checked.

This is most easily undertaken by individually checking the continuity of the CAN High and CAN Low lines between the non-communicating module connector (with the module disconnected) and the J1962 diagnostic connector.

'Lost Communications' DTCs

As well as the methods described so far in this document, which can be used to determine the location of an open circuit in the CAN harness, 'Lost Communications' DTCs can also be used for this purpose. Lost communication DTCs mean that a module is not receiving CAN information from another module.

For example, if a global DTC read were to be carried out, only DTCs stored in the modules that the manufacturer approved diagnostic system could communicate with would be displayed. If there was an open circuit fault in a certain position on the CAN harness, the modules that could display DTCs would all be prior to the open circuit on the Network, and these modules should display 'Lost Communications' DTCs with all the modules located on the Network past the open circuit fault.

'Bus off' DTCs

The references to bus and its condition refer to the network concerned and the modules on that network.

If a module logs a 'Bus Off' DTC, it means that the module has detected CAN transmission errors and has disabled its's own CAN transmissions and disconnected itself from the network in an attempt to allow the rest of the network to function. At this point the 'Bus Off' DTC is set. A common cause of 'Bus Off' DTCs can be a short circuit in the CAN network.

Media oriented systems transport (MOST) diagnosis

Overview

The basic guidelines are covered in the description and operation section, such as not attempting to repair fibre optic cables, but additional precautions include:

- Do not touch the exposed ends of the optical fibres (grease from skin can contaminate the fibre)

- Whenever the fibre optic cable is disconnected, cover the connectors to prevent dust contamination
- Do not expose the fibre optic cable to heat
- Do not bend the fibre optic cable through less than a 25 mm (one inch) radius
- Do not use laser pens to test the fibre optic cable's ability to pass light
    - There is a dedicated tester to use with the MOST network modules and fibre optic harness to assist with diagnosis and to test the fibre optic cable's ability to pass light

MOST tester

Before connecting the tester to the network, turn on the unit and check that the red **power on** indicator is illuminated.

If not, the battery should be replaced before using the tester.

2+0 Self-test

1. **1.** Set the connector selector switch to 2+0.
2. **2.** Select **beep** or **LED** on the tester, depending on your choice of indicator.
3. **3.** Turn the tester on and check the operation of the power indicator.
4. **4.** Using the 2+0 loop-back lead from the kit, push it into the 2+0 connector housing in the tester until it clicks into place.
5. **5.** Press the red **test** button in the center of the tester.
6. **6.** Depending on your choice in step 2, the tester will give either an audible tone or a green light.
    - If the tester continues to give a tone or light after the test button is released this does not indicate a fault, only that there is a signal feed-back within the tester which will stop when the loop-back lead is removed.

2+4 Self-test

Carry out the self-test in the same way as for 2+0, but using the 2+4 loop-back lead and select 2+4 on the connector selector switch.

Vehicle diagnosis

⚠CAUTION: Make sure the tester is not connected to the MOST network when either switching the tester on or switching between 2+0 and 2+4, as the tester emits a brief pulse of light which could introduce a fault into the network.

7. **7.** Use the approved diagnostic system or a scan tool to retrieve any DTCs.
8. **8.** Set the connector selector switch to **2+0**.
9. **9.** Disconnect the intermediate fibre optic cable connector and connect the male half to the tester connector at the top of the unit using the adaptor in the kit.
10. **10.** Turn the tester on and check the operation of the power indicator.
11. **11.** Set the **LED/beep** selector to **LED**.
12. **12.** Turn the ignition switch to the **ON** position.
13. **13.** If the green LED is active, a signal has been received indicating that the first half of the optical ring is functioning.
14. **14.** If the green LED is **NOT** active, no signal has been received indicating that the first half of the optical ring is **NOT** functioning.
    - A ring break code should be set as a result of this. Use the approved diagnostic system to trace the fault and clear the code.

DTC INDEX

Central Junction Box (CJB)

⚠CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

• NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).

• NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

• NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible cause	Action
B118662	Tailgate Power Striker Signal Compare Failure	● Power striker circuit short or open circuit ● Power striker unit fault ● Internal CJB fault	Refer to the electrical guides and check the power striker circuit. Check the operation of the power striker unit. If the fault persists, suspect an internal fault with the CJB. If no other DTCs are present, ignore this fault.
B11C312	Power Striker Open Relay	● Power striker open relay circuit short circuit to power, over-temperature or open load	Refer to the electrical guides and check the circuit, repair as necessary.
B1A0016	Control Module	● Control module circuit voltage below threshold: - Voltage less than (master control module voltage - 2V) for > 10 seconds	Check the power supply and ground connections for the relevant module.
B1A9074	Sunroof Moves Too Slowly	● Roof opening panel actuator slipping (mechanical problem)	Inspect/renew the roof opening panel actuator as necessary.
B1A9131	Speed/Position Sensor A	● Roof opening panel sensor wiring circuit open or short circuit ● Roof opening panel position sensor failure	Refer to the electrical guides and check the circuit from the roof opening panel control module to the roof opening panel motor for open or short circuit. Renew the motor/roof opening panel as necessary.
B1A9231	Speed/Position Sensor B	● Roof opening panel sensor wiring circuit open or short circuit ● Roof opening panel position sensor failure	Refer to the electrical guides and check the circuit from the roof opening panel control module to the roof opening panel motor for open or short circuit. Renew the motor/roof opening panel as necessary.
B1A9393	Invalid Roof Position	● Roof opening panel position beyond expected range ● Roof opening panel sensor wiring circuit open or short circuit ● Roof opening panel position sensor failure	Clear the DTC and check the operation of the roof opening panel. Refer to the electrical guides and check the circuit from the roof opening panel control module to the roof opening panel motor for open or short circuit. Renew the motor/roof opening panel as necessary.
B1A9801	LIN Bus Circuit #1	● LIN Bus short circuit to power or ground	The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly.
B1A9881	LIN Bus Circuit #1	● Software error ● Rain/ambient light sensor lost power during transmission	No repair action necessary unless customer complains of rain sensor, roof opening panel or memory seat not functioning correctly. The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly.
B1A9883	LIN Bus Circuit #1	● LIN Bus check sum error	The LIN Bus is the serial link to the rain sensor, sunroof, memory seat modules which are optional install items, but the control of the DTC logging is determined from the car configuration file (CCF) (installed or not). Repair action only required if one or more items installed and not functioning correctly.
B1A994C	Power On Reset	● Central junction box (CJB) power supply or battery reconnected	No action necessary, clear/ignore DTC.

DTC	Description	Possible cause	Action
B1B0042	Sub-Module 'A'	- Software error - general memory failure	No action necessary, clear/ignore DTC.
B1B0044	Sub-Module 'A'	- Software error - data memory failure	No action necessary, clear/ignore DTC.
B1B0045	Sub-Module 'A'	- Software error - program memory failure	No action necessary, clear/ignore DTC.
B1B0047	Sub-Module 'A'	- Software error	No action necessary, clear/ignore DTC.
B1B014A	Key Transponder	Unknown key, key transponder communication error during cranking	No action necessary, clear/ignore DTC.
B1B014C	Key Transponder	- Incorrect transponder key/new key not coded. DTC logged at each ignition cycle until both keys have been learned during programming	Clear DTC and retest.
B1B0146	Key Transponder	- In learn mode, failed to learn key. DTC logged when a key programming operation fails	Complete the key programming procedure and clear DTC.
B1B0166	Key Transponder	- Excessive non-valid key usage - logged when successive multiple codes are used in attempt to discover transponder code	No action necessary, clear/ignore DTC.
B1B0187	Key Transponder	- No communication from key transponder during start event - Rear tail/brake lamp bulb incorrect spec - Rear tail/brake lamp bulb fault	Check for other DTCs. If this DTC is logged along with DTC B1C6012 in the Network Communications Module and DTC C1A5564 in the Park Brake Module, rectify DTC B1C6012 first, clear the DTCs and retest. Check key transponder information and clear DTC.
B1B0228	LF Coil	- Key transponder communication tolerance error	No repair for this DTC, clear and ignore.
B1B0296	LF Coil	- Ignition key transponder coil circuit open or short circuit	Refer to the electrical guides and check the transponder circuit, repair/renew as necessary.
B1B0353	Transponder Key #1	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B0392	Transponder Key #1	- Known key password invalid Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B0396	Transponder Key #1	- Ignition key transponder coil circuit open or short circuit	Refer to the electrical guides and check the transponder coil circuit, repair/renew as necessary.
B1B0453	Transponder Key #2	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B0492	Transponder Key #2	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B0553	Transponder Key #3	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B0592	Transponder Key #3	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.

DTC	Description	Possible cause	Action
B1B0653	Transponder Key #4	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B0692	Transponder Key #4	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B0753	Transponder Key #5	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B0792	Transponder Key #5	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B0853	Transponder Key #6	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B0892	Transponder Key #6	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B0953	Transponder Key #7	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B0992	Transponder Key #7	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1053	Transponder Key #8	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1092	Transponder Key #8	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1153	Transponder Key #9	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1192	Transponder Key #9	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1253	Transponder Key #10	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1292	Transponder Key #10	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1353	Transponder Key #11	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1392	Transponder Key #11	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1453	Transponder Key #12	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.

DTC	Description	Possible cause	Action
B1B1492	Transponder Key #12	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1553	Transponder Key #13	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1592	Transponder Key #13	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1653	Transponder Key #14	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1692	Transponder Key #14	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1753	Transponder Key #15	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1792	Transponder Key #15	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1853	Transponder Key #16	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1892	Transponder Key #16	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B1953	Transponder Key #17	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B1992	Transponder Key #17	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2053	Transponder Key #18	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2092	Transponder Key #18	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2153	Transponder Key #19	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2192	Transponder Key #19	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2253	Transponder Key #20	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2292	Transponder Key #20	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.

DTC	Description	Possible cause	Action
B1B2353	Transponder Key #21	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2392	Transponder Key #21	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2453	Transponder Key #22	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2492	Transponder Key #22	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2553	Transponder Key #23	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2592	Transponder Key #23	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2653	Transponder Key #24	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2692	Transponder Key #24	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2753	Transponder Key #25	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2792	Transponder Key #25	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2853	Transponder Key #26	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2892	Transponder Key #26	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B2953	Transponder Key #27	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B2992	Transponder Key #27	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B3053	Transponder Key #28	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B3092	Transponder Key #28	- Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B3153	Transponder Key #29	- Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.

DTC	Description	Possible cause	Action
B1B3192	Transponder Key #29	● Known key password invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B3253	Transponder Key #30	● Theft warning - triggered when a known disabled key is used in the ignition	No action necessary, clear/ignore DTC.
B1B3292	Transponder Key #30	● Known key password .invalid - Key transponder communication confirmation error	No action necessary, clear/ignore DTC.
B1B3386	Target ID Transfer	● Failed communication with engine management system	No action necessary, clear/ignore DTC.
B1B3387	Target ID Transfer	● Failed communication with engine management system	No action necessary, clear/ignore DTC.
B1B3486	Target ID Transfer	● Failed communication with engine management system	No action necessary, clear/ignore DTC.
B1B3487	Target ID Transfer	● Failed communication with engine management system	No action necessary, clear/ignore DTC.
B1B3501	RF Scanning Receiver	● Communications with the RF scanning receiver failed	No action necessary, clear/ignore DTC.
B1B551C	Rain Sensor Module	● Rain sensor module supply voltage out of range	Refer to the electrical guides and check the power supply to the sensor module from the CJB, repair as necessary. If the power supply exists, no further action necessary, clear/ignore DTC.
B1B5546	Rain Sensor Module	● Rain sensor module calibration/parameter memory failure: - Initialization error - unable to perform optical calibration	Check the cleanliness of the windscreen in the sensor location. Check for correct installation of the sensor to the optical element and the adherence of the optical element to windscreen. Clear DTC and retest. If DTC persists, renew the rain/ambient light sensor.
B1B5549	Rain Sensor Module	● Rain sensor module internal electronic failure	Renew the rain/ambient light sensor.
B1B5587	Rain Sensor Module	● No response from rain sensor module	Rain sensor is not installed to all variants (optional). Fault logging is inhibited by the CCF, but an incorrectly configured CCF could give erroneous DTC logging. Repair action only required for vehicles with sunroof installed.
B1B5591	Rain Sensor Module	● Rain sensor module - measured temperature outside of normal operating range	No action necessary, clear/ignore DTC.
B1B5646	Sunroof Module	● Roof opening panel control module - calibration/parameter memory failure	Clear the DTC and re-test. If the DTC resets, renew the roof opening panel control module. Refer to the guided diagnostic routine for this code on the approved diagnostic system.
B1B564B	Sunroof Module	● Roof opening panel control module - over temperature (sensor defective or not calibrated)	If no customer complaint issue exists with the roof opening panel operation, no action necessary, clear/ignore DTC. If functionality if affected, refer to the electrical guides and check the control module connector and circuit. Repair as necessary and clear the DTC. If the DTC persists and panel operation is incorrect, renew the control module.
B1B5687	Sunroof Module	● No response from sunroof module	Roof opening panel is not installed to all variants (option). Fault logging is inhibited by the CCF, but an incorrectly configured CCF could give erroneous DTC logging. Repair action only required for vehicles with sunroof installed.
B1B5916	Excessive Continuous Motor Operation	● 5V power supply failure to the seat adjustment sensors	Refer to the electrical guides and check 5V from the seat memory module to the seat motor and circuit. If no 5V supply exists, repair/renew as necessary.

DTC	Description	Possible cause	Action
B1B5968	Excessive Continuous Motor Operation	- Roof opening panel has been operated continuously resulting in a motor overheat event (panel may have stopped working during overheat period)	No action necessary, clear DTC.
B1B6916	12 Volt Supply Circuit	- Software error - Power supply failure from CJB to seat memory module	If no customer complaint issue exists with seat operation, no action necessary, clear/ignore DTC. If seat functionality if affected, refer to the electrical guides and check the memory control module power supply and circuit. Repair as necessary and clear the DTC. If a power supply to the module exists and power outputs from the module are not present, renew the memory module.
B1B7001	LIN Bus Circuit #2	- SLIN Bus short circuit to power or ground	SLIN Bus is the serial link to the battery backed-up sounder (BBUS). This is an optional item, but the control of the DTC logging is determined from the CCF (BBUS installed or not). Repair action only required if BBUS installed and not functioning correctly.
B1B7081	LIN Bus Circuit #2	- SLIN Bus header error	SLIN Bus is the serial link to the battery backed-up sounder (BBUS). This is an optional item, but the control of the DTC logging is determined from the CCF (BBUS installed or not). Repair action only required if BBUS installed and not functioning correctly.
B1B7083	LIN Bus Circuit #2	- SLIN Bus check sum error	SLIN Bus is the serial link to the battery backed-up sounder (BBUS). This is an optional item, but the control of the DTC logging is determined from the CCF (BBUS installed or not). Repair action only required if BBUS installed and not functioning correctly.
B1B8541	Memory Control Module	- Seat module error	Renew the seat memory control module. Refer to the warranty policy and procedures manual if a module is suspect.
B1B8549	Memory Control Module	- Seat module error	If no customer complaint issue exists with seat operation, no action necessary, clear/ignore DTC. If seat functionality is affected, renew module. Refer to the warranty policy and procedures manual if a module is suspect.
B1B8587	Memory Control Module	- No response from seat memory control module	Seat memory is not installed to all variants (optional). Fault logging is inhibited by the CCF, but an incorrectly configured CCF could give erroneous DTC logging. Repair action only required for vehicles with sunroof installed.
B1B8673	Seat Height Motor Relay	- Memory control module internal relay fault (stuck on)	Renew the seat memory control module. Refer to the warranty policy and procedures manual if a module is suspect.
B1B8693	Seat Height Motor Relay	- Software error - Memory control module internal relay fault (inoperative)	If no customer complaint issue exists with seat operation, no action necessary, clear/ignore DTC. If seat functionality is incorrect check/renew the control module as necessary. Refer to the warranty policy and procedures manual if a module is suspect.
B1B8731	Seat Height Motor Speed/Position Sensor	- Wiring circuit/connector issue - Seat height motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat height motor. Repair/renew as necessary. If no circuit fault is found check/renew the seat height motor.
B1B873A	Seat Height Motor Speed/Position Sensor	- Seat height moved beyond expected range - Sensor circuit open or short circuit - Seat adjustment range issue - Seat height motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat height motor. Repair/renew as necessary. Check the seat adjustment ranges to ensure correct operation. Renew the seat height motor.
B1B8873	Seat Height Motor Relay	- Memory control module internal relay fault (stuck on)	Renew the seat memory control module. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible cause	Action
B1B8893	Seat Slide Motor Relay	● Software error ● Memory control module internal relay fault (inoperative)	If no customer complaint issue exists with seat operation, no action necessary, clear/ignore DTC. If seat functionality is incorrect check/renew the control module as necessary.
B1B8931	Seat Slide Motor Speed/Position Sensor	● Wiring circuit/connector issue ● Seat slide motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat slide motor. Repair/renew as necessary. If no circuit fault is found check/renew the seat slide motor.
B1B893A	Seat Slide Motor Speed/Position Sensor	● Seat slide moved beyond expected range - Sensor circuit open or short circuit - Seat adjustment range issue - Seat slide motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat slide motor. Repair/renew as necessary. Check the seat adjustment ranges to ensure correct operation. Renew the seat slide motor.
B1B9073	Seat Tilt Motor Relay	● Memory control module internal relay fault (stuck on)	Renew the seat memory control module. Refer to the warranty policy and procedures manual if a module is suspect.
B1B9093	Seat Tilt Motor Relay	● Software error ● Memory control module internal relay fault (inoperative)	If no customer complaint issue exists with seat operation, no action necessary, clear/ignore DTC. If seat functionality is incorrect check/renew the control module as necessary.
B1B9131	Seat Tilt Motor Speed/Position Sensor	● Wiring circuit/connector issue ● Seat tilt motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat tilt motor. Repair/renew as necessary. If no circuit fault is found check/renew the seat tilt motor.
B1B913A	Seat Tilt Motor Speed/Position Sensor	● Seat tilt moved beyond expected range - Sensor circuit open or short circuit - Seat adjustment range issue - Seat tilt motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat tilt motor. Repair/renew as necessary. Check the seat adjustment ranges to ensure correct operation. Renew the seat tilt motor.
B1B9273	Seat Recline Motor Relay	● Memory control module internal relay fault (stuck on)	Renew the seat memory control module. Refer to the warranty policy and procedures manual if a module is suspect.
B1B9293	Seat Recline Motor Relay	● Software error ● Memory control module internal relay fault (inoperative)	If no customer complaint issue exists with seat operation, no action necessary, clear/ignore DTC. If seat functionality is incorrect check/renew the control module as necessary.
B1B9331	Seat Recline Motor Speed/Position Sensor	● Wiring circuit/connector issue ● Seat recline motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat recline motor. Repair/renew as necessary. If no circuit fault is found check/renew the seat recline motor.
B1B933A	Seat Recline Motor Speed/Position Sensor	● Seat recline moved beyond expected range - Sensor circuit open or short circuit - Seat adjustment range issue - Seat recline motor speed/position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the seat recline motor. Repair/renew as necessary. Check the seat adjustment ranges to ensure correct operation. Renew the seat recline motor.
B1B9473	Seat Height Up Switch	● Seat height up switch stuck ● Seat height up switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1B9573	Seat Height Down Switch	● Seat height down switch stuck ● Seat height down switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.

DTC	Description	Possible cause	Action
B1B9673	Seat Slide Forward Switch	- Seat slide forward switch stuck - Seat slide forward switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1B9773	Seat Slide Backward Switch	- Seat slide backward switch stuck - Seat slide backward switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1B9873	Seat Tilt Up Switch	- Seat tilt up switch stuck - Seat tilt up switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1B9973	Seat Tilt Down Switch	- Seat tilt down switch stuck - Seat tilt down switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1C0073	Seat Recline Up Switch	- Seat recline up switch stuck - Seat recline up switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1C0173	Seat Recline Down Switch	- Seat recline down switch stuck - Seat recline down switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1C0273	Memory Store Switch	- Seat memory store switch stuck - Seat memory store switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1C0373	Memory #1 Switch	- Seat memory #1 switch stuck - Seat memory #1 switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1C0473	Memory #2 Switch	- Seat memory #2 switch stuck - Seat memory #2 switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1C0573	Memory #3 Switch	- Seat memory #3 switch stuck - Seat memory #3 switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the seat switch pack for short to ground. Check the switch operation, renew as necessary.
B1C0601	Driver Up/Down And Common Mirror Motor Circuit	- Mirror motor up/down circuit open or short circuit - Mirror up/down motor failure	Refer to the electrical guides and check the circuit between the memory control module and the door mirror for open circuit or short to ground. Check the mirror operation, renew as necessary.
B1C0701	Driver Left/Right and Right-hand Up/Down Mirror Motor Circuit	- Mirror motor left/right circuit open or short circuit - Mirror left/right motor failure	Refer to the electrical guides and check the circuit between the memory control module and the door mirror for open circuit or short to ground. Check the mirror operation, renew as necessary.
B1C0801	Passenger Left/Right And Common Mirror Motor Circuit	- Mirror motor left/right circuit open or short circuit - Mirror left/right motor failure	Refer to the electrical guides and check the circuit between the memory control module and the door mirror for open circuit or short to ground. Check the mirror operation, renew as necessary.
B1C0973	Driver Left/Right Mirror Motor Circuit	- Software error (DTC can be logged when the mirror is moved manually) - Mirror motor left/right circuit open or short circuit - Mirror left/right motor failure	If no customer complaint issue exists with mirror operation, no action necessary, clear/ignore DTC. If mirror functionality is incorrect, refer to the electrical guides and check the circuit for open of short to ground. Renew the mirror motor/mirror as necessary.
B1C1073	Driver Up/Down Mirror Motor Circuit	- Software error (DTC can be logged when the mirror is moved manually) - Mirror motor up/down circuit open or short circuit - Mirror up/down motor failure	If no customer complaint issue exists with mirror operation, no action necessary, clear/ignore DTC. If mirror functionality is incorrect, refer to the electrical guides and check the circuit for open of short to ground. Renew the mirror motor/mirror as necessary.

DTC	Description	Possible cause	Action
B1C1173	Passenger Left/Right Mirror Motor Circuit	● Software error (DTC can be logged when the mirror is moved manually) ● Mirror motor left/right circuit open or short circuit ● Mirror left/right motor failure	If no customer complaint issue exists with mirror operation, no action necessary, clear/ignore DTC. If mirror functionality is incorrect, refer to the electrical guides and check the circuit for open of short to ground. Renew the mirror motor/mirror as necessary.
B1C1273	Passenger Up/Down Mirror Motor Circuit	● Software error (DTC can be logged when the mirror is moved manually) ● Mirror motor up/down circuit open or short circuit ● Mirror up/down motor failure	If no customer complaint issue exists with mirror operation, no action necessary, clear/ignore DTC. If mirror functionality is incorrect, refer to the electrical guides and check the circuit for open of short to ground. Renew the mirror motor/mirror as necessary.
B1C133A	Driver Up/Down Mirror Motor Feedback Circuit	● Door mirror motor moved beyond expected range - Sensor circuit open or short circuit - Door mirror motor position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the mirror. Repair/renew as necessary. Check/renew the mirror motor/assembly.
B1C143A	Driver Left/Right Mirror Motor Feedback Circuit	● Door mirror motor moved beyond expected range - Sensor circuit open or short circuit - Door mirror motor position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the mirror. Repair/renew as necessary. Check/renew the mirror motor/assembly.
B1C153A	Passenger Up/Down Mirror Motor Feedback Circuit	● Door mirror motor moved beyond expected range - Sensor circuit open or short circuit - Door mirror motor position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the mirror. Repair/renew as necessary. Check/renew the mirror motor/assembly.
B1C163A	Passenger Left/Right Mirror Motor Feedback Circuit	● Door mirror motor moved beyond expected range - Sensor circuit open or short circuit - Door mirror motor position sensor fault	Refer to the electrical guides and check the harness and connections between the seat memory module and the mirror. Repair/renew as necessary. Check/renew the mirror motor/assembly.
B1C1773	Driver Mirror Left Switch	● Mirror left switch stuck ● Mirror left switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.
B1C1873	Driver Mirror Right Switch	● Mirror right switch stuck ● Mirror right switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.
B1C1973	Driver Mirror Up Switch	● Mirror up switch stuck ● Mirror up switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.
B1C2073	Driver Mirror Down Switch	● Mirror down switch stuck ● Mirror down switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.
B1C2173	Passenger Mirror Left Switch	● Mirror left switch stuck ● Mirror left switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.
B1C2273	Passenger Mirror Right Switch	● Mirror right switch stuck ● Mirror right switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.

DTC	Description	Possible cause	Action
B1C2373	Passenger Mirror Up Switch	- Mirror up switch stuck - Mirror up switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.
B1C2473	Passenger Mirror Down Switch	- Mirror down switch stuck - Mirror down switch circuit short to ground	Refer to the electrical guides and check the wiring between the memory control module and the mirror switch pack for short to ground. Check the switch operation, renew as necessary.
B1C2593	Pedal Motor Relay	- Software error (electric column/pedals not installed) - Memory control module internal relay fault (stuck on)	Where an electric column/pedal adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column/pedal adjustment is installed, check/renew the control module as necessary.
B1C2573	Pedal Motor Relay	- Software error (electric column/pedals not installed) - Memory control module internal relay fault (inoperative)	Where an electric column/pedal adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column/pedal adjustment is installed, check/renew the control module as necessary.
B1C263A	Pedal Motor Feedback Circuit	- Software error - Door mirror motor moved beyond expected range - Sensor circuit open or short circuit - Door mirror motor position sensor fault	Where an electric column/pedal adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column/pedal adjustment is installed, refer to the electrical guides and check the harness and connections between the seat memory module and the pedal height motor. Repair/renew as necessary. If no circuit fault is found check/renew the pedal height motor.
B1C2773	Pedal In Switch	- Software error (electric column/pedals not installed) - Pedal switch fault (stuck closed)	Where an electric column/pedal adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column/pedal adjustment is installed, refer to the electrical guides and check the pedal out switch circuit for short or open circuit and check/renew the pedal in switch as necessary.
B1C2873	Pedal Out Switch	- Software error (electric column/pedals not installed) - Pedal switch fault (stuck closed)	Where an electric column/pedal adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column/pedal adjustment is installed, refer to the electrical guides and check the pedal out switch circuit for short or open circuit and check/renew the pedal out switch as necessary.
B1C3173	Steering Column Motor Relay	- Software error (electric column not installed) - Steering column motor relay fault (stuck on)	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column motor circuit for short or open circuit and check/renew the memory control module as necessary.
B1C3193	Steering Column Motor Relay	- Software error (electric column not installed) - Memory control module internal relay fault (inoperative)	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, check/renew the control module as necessary.
B1C3213	Steering Column Tilt Solenoid	- Software error (electric column not installed) - Steering column motor tilt solenoid open load	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt solenoid circuit for short or open circuit and check/renew the tilt solenoid as necessary.
B1C3296	Steering Column Tilt Solenoid	- Software error (electric column not installed) - Steering column motor tilt solenoid thermal overload	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt solenoid circuit for short or open circuit. Check for other relevant DTCs and repair as necessary. Allow the solenoid to cool, clear the DTC and check the solenoid/tilt function operation. If the DTC persists renew the tilt solenoid as necessary.
B1C333A	Steering Column Tilt Feedback Signal	- Software error (electric column not installed) - Steering column tilt motor moved beyond expected range	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt solenoid feedback circuit

DTC	Description	Possible cause	Action
		- Sensor circuit open or short circuit - Motor position sensor fault	for short or open circuit. Check the solenoid/tilt function operation and range of movement. Renew the tilt solenoid as necessary.
B1C3413	Steering Column Telescopic Solenoid	- Software error (electric column not installed) - Steering column motor telescopic solenoid open load	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column telescopic solenoid circuit for short or open circuit and check/renew the tilt solenoid as necessary.
B1C3496	Steering Column Telescopic Solenoid	- Software error (electric column not installed) - Steering column motor telescopic solenoid thermal overload	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column telescopic solenoid circuit for short or open circuit. Check for other relevant DTCs and repair as necessary. Allow the solenoid to cool, clear the DTC and check the solenoid/telescopic function operation. If the DTC persists renew the telescopic solenoid as necessary.
B1C353A	Steering Column Telescopic Feedback Signal	- Software error (electric column not installed) - Steering column telescopic motor moved beyond expected range - Sensor circuit open or short circuit - Motor position sensor fault	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column telescopic solenoid feedback circuit for short or open circuit. Check the solenoid/telescopic function operation and range of movement. Renew the telescopic solenoid as necessary.
B1C363A	Steering Column Tilt/Telescope Switch	- Software error (electric column not installed) - Steering column tilt/telescopic switch voltage beyond expected range - Sensor circuit open or short circuit - Switch fault	Where an electric column adjustment is not installed, no action necessary, clear/ignore DTC. Where an electric column adjustment is installed, refer to the electrical guides and check the column tilt/telescopic switch circuit for short or open circuit. Check the tilt/telescopic switch operation and renew the switch as necessary.
B1C3723	Master Lock Switch Stuck	- Master central lock switch signal circuit short circuit to ground - Master central lock switch stuck/jammed - Master central lock switch failure	Refer to the electrical guides and check the master switch lock circuit. Check the switch operation, renew as necessary.
B1C3823	Master Unlock Switch Stuck	- Master central unlock switch signal circuit short circuit to ground - Master central unlock switch stuck/jammed - Master central unlock switch failure	Refer to the electrical guides and check the master switch unlock circuit. Check the switch operation, renew as necessary.
B1C3923	Key Lock Switch Stuck	- Key lock switch stuck/jammed - Key lock switch circuit short to ground (where connected) - Key lock switch failure - Internal CJB fault	Refer to the electrical guides and ensure there are no wires connected to the SJB connector on the key lock switch circuit. Clear the DTC and retest. If the DTC returns, suspect an internal fault with the CJB. If no other DTCs are present, ignore this fault.
B1C4023	Key Unlock Switch Stuck	- Key unlock switch stuck/jammed - Key unlock switch failure - Key unlock switch circuit short to ground (where connected) - Internal CJB fault	Refer to the electrical guides and ensure there are no wires connected to the SJB connector on the key unlock switch circuit. Clear the DTC and retest. If the DTC returns, suspect an internal fault with the CJB. If no other DTCs are present, ignore this fault.
B1C4123	Tailgate Release Switch #1	- Tailgate SW1 (Switch-tail door open) release circuit short to ground - Tailgate release switch stuck/jammed	Refer to the electrical guides and check the tailgate SW1 unlock circuit. Check the switch operation, renew as necessary.

DTC	Description	Possible cause	Action
		● Tailgate release switch failure	
B1C4223	Tailgate Release Switch #2	● Tailgate glass release switch (SW2- number plate lamp and tail door switch) signal circuit short circuit to ground ● Tailgate glass release switch stuck/jammed ● Tailgate glass release switch failure	Refer to the electrical guides and check the tailgate SW2 unlock circuit. Check the switch operation, renew as necessary.
B1C4323	Master Interior Lamp Switch Stuck	● Interior lamp circuit short to ground ● Interior lamp switch fault	Refer to the electrical guides and check the interior lamp circuit. Check the switch operation, renew as necessary.
B1C4467	Rear Wiper Park Position Switch Stuck	● Incorrect software level (NNV502520) resulting in DTC log when engine is cranked or the tailgate is opened when the rear wiper is running ● Rear wiper park position circuit short to ground ● Rear wiper motor park switch fault	Ensure the software level is NNV502990 or later and update if necessary using the manufacturers recommended diagnostic equipment. Clear the DTC and retest. Refer to the electrical guides and check the rear wiper park position circuit. Clear the DTC and retest. If the DTC returns, suspect an internal fault with the rear wiper motor, check and renew as required.
B1C4567	Front Wiper Park Position Switch Stuck	● Incorrect software level (NNV502520)resulting in DTC log when engine is cranked or the tailgate is opened when the front wiper is running ● Front wiper park position circuit short to ground ● Front wiper motor park switch fault	Ensure the software level is NNV502990 or later and update if necessary using the manufacturers recommended diagnostic equipment. Clear the DTC and retest. Refer to the electrical guides and check the front wiper park position circuit. Clear the DTC and retest. If the DTC returns, suspect an internal fault with the front wiper motor, check and renew as required.
B1C4623	Rear Washer Switch Stuck	● Rear washer circuit short to ground ● Rear washer switch fault	Refer to the electrical guides and check the rear washer switch circuit. Check the switch operation, renew as necessary.
B1C4723	Front Washer Switch Stuck	● Front washer circuit short to ground ● Front washer switch fault	Refer to the electrical guides and check the front washer switch circuit. Check the switch operation, renew as necessary.
B1C4823	Flash To Pass Switch Stuck	● Flash to pass circuit short to ground ● Flash to pass switch fault	Refer to the electrical guides and check the flash to pass switch circuit. Check the switch operation, renew as necessary.
B1C5024	Ignition Switch Crank Position Stuck	● Ignition switch crank position short circuit ● Ignition switch fault	Refer to the electrical guides and check the ignition switch circuit. Check the switch operation, renew as necessary.
B1C5329	Front Wiper Intermittent Data	● Front wiper intermittent circuit short or open circuit ● Front wiper switch fault	Refer to the electrical guides and check the intermittent wiper switch circuit. Check the switch operation, renew as necessary.
B1C5512	Horn Relay	● Horn relay coil circuit short to power	Refer to the electrical guides and check the horn relay circuit, repair as necessary.
B1C5514	Horn Relay	● Horn relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the horn relay circuit, repair as necessary.
B1C5612	Horn Relay Output Circuit	● Horn relay output circuit short to power	Refer to the electrical guides and check the horn relay, repair/renew as necessary.
B1C5614	Horn Relay Output Circuit	● Horn relay output circuit short to ground or open circuit	Refer to the electrical guides and check the horn relay supply fuse and the horn relay circuit, repair as necessary.

DTC	Description	Possible cause	Action
B1C5712	Passive Start Ignition Relay Coil Circuit	- Passive start ignition relay coil circuit short to power	No action necessary, clear/ignore DTC.
B1C5714	Passive Start Ignition Relay Coil Circuit	- Passive start ignition relay output circuit short to ground or open circuit	No action necessary, clear/ignore DTC.
B1C5812	Power Windows Relay Coil Circuit	- Power windows relay coil circuit short to power	Refer to the electrical guides and check the power windows relay circuit, repair/renew as necessary.
B1C5814	Power Windows Relay Coil Circuit	- Power windows relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the power windows relay circuit, repair as necessary.
B1C5912	Power Windows Relay Output Circuit	- Power windows relay output circuit short to power	Refer to the electrical guides and check the power windows relay output circuit, repair/renew as necessary.
B1C5914	Power Windows Relay Output Circuit	- Power windows relay output circuit short to ground or open circuit	Refer to the electrical guides and check the power windows relay supply fuse, output circuit fuse and relay output circuit, repair as necessary.
B1C6012	Sidelights Relay Output Circuit	- Side lamps relay output circuit short to power - Rear tail/brake lamp bulb incorrect spec - Rear tail/brake lamp bulb fault	A bulb fault can also cause DTC B1B0187 to be logged in the Body Control Module and DTC C1A5564 to be logged in the Park Brake Module. A fault in this circuit causing DTC B1C6012 to log could also cause up shift issues on automatic transmission vehicles. Check the rear tail/brake lamp bulbs for correct type, installation or faults including a short circuit of the bulb filaments. Refer to the electrical guides and check side lamps relay output circuit, repair/renew as necessary.
B1C6014	Sidelights Relay Output Circuit	- Side lamps relay output circuit short to ground or open circuit	Refer to the electrical guides and check the Side lamps relay supply fuse, output circuit fuse and relay output circuit, repair as necessary.
B1C6112	Battery Saver Relay Coil Circuit	- Battery saver relay coil circuit short to power	Refer to the electrical guides and check the battery saver relay circuit, repair/renew as necessary.
B1C6114	Battery Saver Relay Coil Circuit	- Battery saver relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the power saver relay circuit, repair as necessary.
B1C6212	Battery Saver Relay Output Circuit	- Battery saver relay output circuit short to power	Refer to the electrical guides and check the battery saver relay circuit, repair/renew as necessary.
B1C6214	Battery Saver Relay Output Circuit	- Battery saver relay output circuit short to ground or open circuit	Refer to the electrical guides and check the battery saver relay supply fuse and relay output circuit, repair as necessary.
B1C6312	Driver Door Lock Relay Coil Circuit	- Driver door lock relay coil circuit short to power - Driver door lock relay failure	Refer to the electrical guides and check the driver door lock relay circuit, repair/renew as necessary.
B1C6314	Driver Door Lock Relay Coil Circuit	- Driver door lock relay coil circuit short to ground or open circuit - Driver door lock relay coil circuit high resistance - Driver door lock relay failure	Refer to the electrical guides and check the driver door lock relay circuit, repair as necessary.
B1C6412	Driver Door Lock Relay Output Circuit	- Driver door lock relay output circuit short to power - Driver door lock relay failure	Refer to the electrical guides and check the driver door lock relay circuit, repair/renew as necessary.
B1C6414	Driver Door Lock Relay Output Circuit	- Driver door lock relay output circuit short to ground or open circuit - Driver door lock relay output circuit high resistance - Driver door lock relay failure	Refer to the electrical guides and check the driver door lock relay output circuit, repair as necessary.

DTC	Description	Possible cause	Action
B1C6512	Lock Rest Relay Coil Circuit	● CDL lock relay coil circuit short to power ● Central door locking relay failure	Refer to the electrical guides and check the CDL lock relay circuit, repair/renew as necessary.
B1C6514	Lock Rest Relay Coil Circuit	● CDL lock rest relay coil circuit short to ground or open circuit ● Central door locking relay coil circuit high resistance ● Central door locking relay failure	Refer to the electrical guides and check the CDL lock relay circuit, repair as necessary.
B1C6612	Lock Rest Relay Output Circuit	● CDL lock rest relay output circuit short to power ● Central door locking relay failure	Refer to the electrical guides and check the CDL lock relay circuit, repair/renew as necessary.
B1C6614	Lock Rest Relay Output Circuit	● CDL lock rest relay output circuit short to ground or open circuit ● Central door locking relay output circuit high resistance ● Central door locking relay failure	Refer to the electrical guides and check the CDL lock relay output circuit, repair as necessary.
B1C6712	Driver Door Unlock Relay Coil Circuit	● Driver door unlock relay coil circuit short to power ● Driver door unlock relay failure	Refer to the electrical guides and check the driver door unlock relay circuit, repair/renew as necessary.
B1C6714	Driver Door Unlock Relay Coil Circuit	● Driver door unlock relay coil circuit short to ground or open circuit ● Driver door unlock relay coil circuit high resistance ● Driver door unlock relay failure	Refer to the electrical guides and check the driver door unlock relay circuit, repair as necessary.
B1C6812	Driver Door Unlock Relay Output Circuit	● Driver door unlock relay output circuit short to power ● Driver door unlock relay failure	Refer to the electrical guides and check the driver door unlock relay circuit, repair/renew as necessary.
B1C6814	Driver Door Unlock Relay Output Circuit	● Driver door unlock relay output circuit short to ground or open circuit ● Driver door unlock relay output circuit high resistance ● Driver door unlock relay failure	Refer to the electrical guides and check the driver door unlock rest relay output circuit, repair as necessary.
B1C6912	Passenger Door Unlock Relay Coil Circuit	● Passenger door unlock relay coil circuit short to power ● Central door unlock relay failure	Refer to the electrical guides and check the passenger door unlock relay circuit, repair/renew as necessary.
B1C6914	Passenger Door Unlock Relay Coil Circuit	● Central door unlock relay coil circuit short circuit to ground ● Central door unlock relay coil circuit high resistance ● Central door unlock relay failure	Refer to the electrical guides and check the passenger door unlock relay circuit, repair as necessary.
B1C7012	Passenger Door Unlock Relay Output Circuit	● Central door unlock relay output circuit short circuit to power ● Central door unlock relay failure	Refer to the electrical guides and check the passenger door unlock relay circuit, repair/renew as necessary.
B1C7014	Passenger Door Unlock Relay Output Circuit	● Central door unlock relay output circuit short circuit to ground ● Central door unlock relay output circuit high resistance ● Central door unlock relay failure	Refer to the electrical guides and check the passenger door unlock rest relay output circuit, repair as necessary.
B1C7312	Superlock Relay Coil Circuit	● Superlock relay coil circuit short circuit to power ● Superlock relay failure	Where installed, refer to the electrical guides and check the superlock relay circuit, repair/renew as necessary.

DTC	Description	Possible cause	Action
B1C7314	Superlock Relay Coil Circuit	● Superlock relay coil circuit short circuit to ground ● Superlock relay coil circuit high resistance ● Superlock relay failure	Where installed, refer to the electrical guides and check the superlock relay circuit, repair as necessary.
B1C7412	Superlock Relay Output Circuit	● Superlock relay output circuit short circuit to power ● Superlock relay failure	Where feature is installed, refer to the electrical guides and check the superlock relay circuit, repair/renew as necessary.
B1C7414	Superlock Relay Output Circuit	● Superlock relay output circuit short circuit to ground ● Superlock relay output circuit high resistance ● Superlock relay failure	Where feature is installed, refer to the electrical guides and check the superlock relay output circuit, repair as necessary.
B1C7612	Front Wiper Fast Relay Coil Circuit	● Front wiper fast relay coil circuit short to power	Refer to the electrical guides and check the front wiper fast relay circuit, repair/renew as necessary.
B1C7614	Front Wiper Fast Relay Coil Circuit	● Front wiper fast relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the front wiper fast relay circuit, repair as necessary.
B1C7712	Rear Wiper Fast Relay Coil Circuit	● Rear wiper fast relay coil circuit short to power	Refer to the electrical guides and check the rear wiper fast relay circuit, repair/renew as necessary.
B1C7714	Rear Wiper Fast Relay Coil Circuit	● Rear wiper fast relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the rear wiper fast relay circuit, repair as necessary.
B1C7812	Powerwash Relay Coil Circuit	● Front washer pump/powerwash relay coil circuit short to power	Refer to the electrical guides and check the relevant washer pump relay circuit, repair as necessary.
B1C7814	Powerwash Relay Coil Circuit	● Front washer pump/powerwash relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the relevant washer pump relay circuit, repair as necessary.
B1C7912	Front Washer Pump Relay Output Circuit	● Front washer pump relay output circuit short to power	Refer to the electrical guides and check the front washer pump relay circuit, repair/renew as necessary.
B1C7914	Front Washer Pump Relay Output Circuit	● Front washer pump relay output circuit short to ground or open circuit	Refer to the electrical guides and check the front washer pump relay supply fuse and the relay output circuit, repair as necessary.
B1C8012	Rear Washer Pump Relay Coil Circuit	● Rear washer pump relay coil circuit short to power	Refer to the electrical guides and check the rear washer pump relay circuit, repair as necessary.
B1C8014	Rear Washer Pump Relay Coil Circuit	● Rear washer pump relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the rear washer pump relay circuit, repair as necessary.
B1C8112	Rear Washer Pump Relay Output Circuit	● Rear washer pump relay output circuit short to power	Refer to the electrical guides and check the rear washer pump relay circuit, repair/renew as necessary.
B1C8114	Rear Washer Pump Relay Output Circuit	● Rear washer pump relay output circuit short to ground or open circuit	Refer to the electrical guides and check the rear washer pump relay supply fuse and the relay output circuit, repair as necessary.
B1C8212	Headlamp Washer Relay A	● Headlamp washer relay output circuit short to power	Where feature is installed, refer to the electrical guides and check the headlamp pump relay circuit, repair as necessary.
B1C8214	Headlamp Washer Relay A	● Headlamp washer relay output circuit short to power	Where feature is installed, refer to the electrical guides and check the headlamp pump relay circuit, repair/renew as necessary.
B1C8312	Heated Rear Window Relay Coil Circuit	● Heated rear window relay coil circuit short to power	Refer to the electrical guides and check the heated rear window relay circuit, repair as necessary.

DTC	Description	Possible cause	Action
B1C8314	Heated Rear Window Relay Coil Circuit	- Heated rear window relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the heated rear window relay circuit, repair as necessary.
B1C8412	Heated Rear Window Relay Output Circuit	- Heated rear window relay output circuit short to power	Refer to the electrical guides and check the heated rear window relay circuit, repair/renew as necessary.
B1C8414	Heated Rear Window Relay Output Circuit	- Heated rear window relay output circuit short to ground or open circuit	Refer to the electrical guides and check the heated rear window relay supply fuse and the relay output circuit, repair as necessary.
B1C8512	Autolamps Switch Illumination Relay Coil Circuit	- Autolamps switch illumination relay coil circuit short to power	Where installed, refer to the electrical guides and check the autolamps switch illumination relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C8514	Autolamps Switch Illumination Relay Coil Circuit	- Autolamps switch illumination relay coil circuit short to ground or open circuit	Where installed, refer to the electrical guides and check the autolamps switch illumination relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C8612	Autolamps Switch Illumination Relay Output Circuit	- Autolamps switch illumination relay output circuit short to power	Where installed, refer to the electrical guides and check the autolamps switch illumination relay circuit, repair/renew as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C8614	Autolamps Switch Illumination Relay Output Circuit	- Autolamps switch illumination relay output circuit short to ground or open circuit	Where installed, refer to the electrical guides and check the autolamps switch illumination relay supply fuse and the relay output circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C8812	Reversing Lamps Relay Coil Circuit	- Reversing lamps relay coil circuit short to power	Refer to the electrical guides and check the reversing lamps relay circuit, repair as necessary.
B1C8814	Reversing Lamps Relay Coil Circuit	- Reversing lamps relay coil circuit short to ground or open circuit	Refer to the electrical guides and check the reversing lamps relay circuit, repair as necessary.
B1C8912	Auxiliary Driving Lamps Relay Output Circuit	- Auxiliary driving lamps relay output circuit short to power	Where installed, refer to the electrical guides and check the Auxiliary driving lamps relay circuit, repair/renew as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C8914	Auxiliary Driving Lamps Relay Output Circuit	- Auxiliary driving lamps relay output circuit short to ground or open circuit	Where installed, refer to the electrical guides and check the Auxiliary driving lamps relay output circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9012	Auxiliary Driving Lamps Relay Coil Circuit	- Auxiliary driving lamps relay coil circuit short to power	Where installed, refer to the electrical guides and check the Auxiliary driving lamps relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9014	Auxiliary Driving Lamps Relay Coil Circuit	- Auxiliary driving lamps relay coil circuit short to ground or open circuit	Where installed, refer to the electrical guides and check the Auxiliary driving lamps relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9112	Fuel Flap Lock Relay Coil Circuit	- Fuel flap lock relay coil circuit short circuit to power - Fuel flap lock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door lock relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9114	Fuel Flap Lock Relay Coil Circuit	- Fuel flap lock relay coil circuit short circuit to ground - Fuel flap lock relay coil circuit high resistance - Fuel flap lock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door lock relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9212	Fuel Flap Lock Relay Output Circuit	- Fuel flap lock relay output circuit short circuit to power - Fuel flap lock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door lock relay circuit, repair/renew as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.

DTC	Description	Possible cause	Action
B1C9214	Fuel Flap Lock Relay Output Circuit	● Fuel flap lock relay output circuit short circuit to ground ● Fuel flap lock relay output circuit high resistance ● Fuel flap lock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door lock relay supply fuse and the relay output circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9312	Fuel Flap Unlock Relay Coil Circuit	● Fuel flap unlock relay coil circuit short circuit to power ● Fuel flap unlock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door unlock relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9314	Fuel Flap Unlock Relay Coil Circuit	● Fuel flap unlock relay coil circuit short circuit to ground ● Fuel flap unlock relay coil circuit high resistance ● Fuel flap unlock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door unlock relay circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9412	Fuel Flap Unlock Relay Output Circuit	● Fuel flap unlock relay output circuit short circuit to power ● Fuel flap unlock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door unlock relay circuit, repair/renew as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9414	Fuel Flap Unlock Relay Output Circuit	● Fuel flap unlock relay output circuit short circuit to ground ● Fuel flap unlock relay output circuit high resistance ● Fuel flap unlock relay failure	Where installed, refer to the electrical guides and check the fuel flap/door unlock relay supply fuse and the relay output circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9511	Approach Lamps Circuit	● Approach lamps circuit short to ground, overload or over-temperature	Where installed, refer to the electrical guides and check the approach lamps circuit and repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9515	Approach Lamps Circuit	● Approach lamps circuit short circuit to power or open load	Where installed, refer to the electrical guides and check the approach lamps circuit and repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9611	Alarm LED	● Alarm LED circuit short to ground or over-temperature	Where volumetric alarm feature is installed, refer to the electrical guides and check the alarm LED circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9615	Alarm LED	● Alarm LED circuit short circuit to power or open load	Where volumetric alarm feature is installed, refer to the electrical guides and check the alarm LED circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9811	Left Corner Lamp Circuit	● Left corner lamp circuit short to ground, overload or over-temperature	Where corner lamps are installed, refer to the electrical guides and check the left-hand circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9815	Left Corner Lamp Circuit	● Left corner lamp circuit short circuit to power or open load	Where corner lamps are installed, refer to the electrical guides and check the left-hand circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9911	Right Corner Lamp Circuit	● Right corner lamp circuit short to ground, overload or over-temperature	Where corner lamps are installed, refer to the electrical guides and check the right-hand circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1C9915	Right Corner Lamp Circuit	● Right corner lamp circuit short circuit to power or open load	Where corner lamps are installed, refer to the electrical guides and check the right-hand circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1D0011	Left Low Beam	● Left low beam lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the left-hand circuit, repair as necessary.
B1D0015	Left Low Beam	● Left low beam lamp circuit short circuit to power or open load	Refer to the electrical guides and check the left-hand circuit, repair as necessary.

DTC	Description	Possible cause	Action
B1D0111	Right Low Beam	- Right low beam lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D0115	Right Low Beam	- Right low beam lamp circuit short circuit to power or open load	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D0211	Left High Beam Circuit	- Left high beam lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the left-hand circuit, repair as necessary.
B1D0215	Left High Beam Circuit	- Left high beam lamp circuit short circuit to power or open load	Refer to the electrical guides and check the left-hand circuit, repair as necessary.
B1D0311	Right High Beam Circuit	- Right high beam lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D0315	Right High Beam Circuit	- Right high beam lamp circuit short circuit to power or open load	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D0414	Upper Tailgate Release Circuit	- Tailgate glass release actuator operated more than 10 times within 1 minute - Tailgate glass release actuator circuit high resistance - Tailgate glass release actuator failure	Refer to the electrical guides and check the tailgate release circuit, repair as necessary.
B1D0511	Lower Tailgate Release Circuit	- Tailgate release actuator operated more than 10 times within 1 minute - Tailgate release actuator circuit short circuit to ground - Tailgate release actuator failure	Refer to the electrical guides and check the tailgate circuit, repair as necessary.
B1D0515	Lower Tailgate Release Circuit	- Tailgate release actuator circuit short circuit to power - Tailgate release actuator circuit high resistance - Tailgate release actuator failure	If no customer complaint issue exists with tailgate operation, no action necessary, clear/ignore DTC. If tailgate functionality is incorrect, refer to the electrical guides and check the tailgate circuit, repair as necessary.
B1D0611	Left Turn Indicator	- Left turn indicator lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the left-hand circuit, repair as necessary.
B1D0615	Left Turn Indicator	- Left turn indicator lamp circuit short circuit to power or open load	Refer to the electrical guides and check the left-hand circuit, repair as necessary.
B1D0711	Right Turn Indicator	- Right turn indicator lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D0715	Right Turn Indicator	- Right turn indicator lamp circuit short circuit to power or open load	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D0811	Left-Hand Trailer Indicator Circuit	- Left-hand trailer indicator lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the left-hand circuit, repair as necessary.
B1D0815	Left-Hand Trailer Indicator Circuit	- Left-hand trailer indicator lamp circuit short circuit to power or open load	Refer to the electrical guides and check the left-hand circuit, repair as necessary.

DTC	Description	Possible cause	Action
B1D0911	Right-Hand Trailer Indicator Circuit	- Right-hand trailer indicator lamp circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D0915	Right-Hand Trailer Indicator Circuit	- Right-hand trailer indicator lamp circuit short circuit to power or open load	Refer to the electrical guides and check the right-hand circuit, repair as necessary.
B1D1011	Air Suspension Control Circuit	- Air suspension control circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the circuit, repair as necessary.
B1D1015	Air Suspension Control Circuit	- Air suspension control circuit short circuit to power or open load	Refer to the electrical guides and check the circuit, repair as necessary.
B1D1211	Volumetric Alarm Power Circuit	- Volumetric alarm power circuit short to ground, overload or over-temperature	Refer to the electrical guides and check the circuit, repair as necessary.
B1D1215	Volumetric Alarm Power Circuit	- Volumetric alarm power circuit short circuit to power or open load	Where volumetric alarm feature is installed, refer to the electrical guides and check the circuit, repair as necessary. Where the feature is not installed, check the vehicle configuration and clear/ignore this DTC.
B1D1311	Interior lamps circuit A	- Interior lamps circuit A short to ground, overload or over-temperature	Refer to the electrical guides and check the circuit, repair as necessary.
B1D1315	Interior Lamps Circuit A	- Software error - Interior lamps circuit A short circuit to power or open load	If no customer complaint issue exists with interior lamp operation, no action necessary, clear/ignore DTC. If interior lamp functionality is incorrect, refer to the electrical guides and check the circuit, repair as necessary.
B1D1411	Interior Lamps Circuit B	- Interior lamps circuit B short to ground, overload or over-temperature	Refer to the electrical guides and check the circuit, repair as necessary.
B1D1415	Interior Lamps Circuit B	- Software error - Interior lamps circuit B short circuit to power or open load	If no customer complaint issue exists with interior lamp operation, no action necessary, clear/ignore DTC. If interior lamp functionality is incorrect, refer to the electrical guides and check the circuit, repair as necessary.
B1D1512	Global Open/Close Circuit	- Global open/close circuit short to power	Refer to the electrical guides and check the circuit, repair as necessary.
B1D1749	Battery Backed Sounder (BBUS)	- BBUS siren communication fault	BBUS is not installed to all variants (optional). Fault logging is inhibited by the CCF, but incorrect CCF configuration could give erroneous DTC logging. Repair action only required for vehicles installed with BBUS.
B1D1787	Battery Backed Sounder (BBUS)	- Lost communication with BBUS	BBUS is not installed to all variants (optional). Fault logging is inhibited by the CCF, but incorrect CCF configuration could give erroneous DTC logging. Repair action only required for vehicles installed with BBUS.
B1D1887	Volumetric Sensor	- Volumetric Sensor failed to respond: - Response pulse not received correctly	The volumetric sensor is not installed to all variants (optional). Fault logging is inhibited by the CCF, but incorrect CCF configuration could give erroneous DTC logging. Repair action only required for vehicles installed with volumetric sensor.
B1D3523	Hazard Switch Stuck	- Hazard switch circuit short to ground - Hazard switch fault	Check the hazard switch operation, refer to the electrical guides and check the hazard switch circuit. Repair/renew as necessary.
B1D3613	Turn Indicator Switch	- Indicator switch connection open circuit	Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
B1D3713	Wiper Switch Connection Circuit	- Wiper switch connection circuit open circuit	Refer to the electrical guides and check the switch circuit, repair/renew as necessary.

DTC	Description	Possible cause	Action
B1D3813	Front Wiper Motor	● Front wiper motor circuit open circuit	Refer to the electrical guides and check the wiper circuit, repair/renew as necessary.
B1D3913	Rear Wiper Motor	● Rear wiper motor circuit open circuit	Refer to the electrical guides and check the wiper circuit, repair/renew as necessary.
B1D4013	Lighting Switch Connection Circuit	● Lighting switch connection circuit open circuit	Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
B1D4113	Bonnet Switch Connection Circuit	● Hood ajar switch circuit high resistance ● Hood ajar switch failure	Refer to the electrical guides and check the switch circuit, repair/renew as necessary.
B1D4213	Driver Door Latch Connection Circuit	● Driver door ajar switch circuit high resistance ● Driver door ajar switch failure	Refer to the electrical guides and check the latch circuit, repair/renew as necessary.
B1D4313	Passenger Door Latch Connection Circuit	● Front passenger door ajar switch circuit high resistance ● Front passenger door ajar switch failure	Refer to the electrical guides and check the latch circuit, repair/renew as necessary.
B1D4413	Rear Left Door Latch Connection Circuit	● Left-hand rear door ajar switch circuit high resistance ● Left-hand rear door ajar switch failure	Refer to the electrical guides and check the latch circuit, repair/renew as necessary.
B1D4513	Rear Right Door Latch Connection Circuit	● Right-hand rear door ajar switch circuit high resistance ● Right-hand rear door ajar switch failure	Refer to the electrical guides and check the latch circuit, repair/renew as necessary.
B1D4613	Tailgate Latch Connection Circuit	● Tailgate ajar switch circuit high resistance ● Tailgate ajar switch failure	Refer to the electrical guides and check the latch circuit, repair/renew as necessary.
B1D9749	Tilt Sensor	● Lost communication with tilt sensor	BBUS (including the tilt sensor) is not installed to all variants (optional). Fault logging is inhibited by the CCF, but incorrect CCF configuration could give erroneous DTC logging. Repair action only required for vehicles installed with BBUS that are exhibiting incorrect tilt sensor behaviour.
U007388	Control Module Communication BUS A Off	● Bus off. The CJB has detected the data bus is not available ● CAN bus open circuit ● CAN bus short circuit to ground ● CAN bus short circuit to power ● CJB module, connector damage, cavity pin damage	Refer to the electrical guides, check CAN circuit for open circuit, short to ground, short to power, repair/renew as necessary. Check the CJB for damage to the connector cavity pins, replace CJB as necessary.
U015587	Lost Communication With The IPK	● Missing message. The CJB has not received one or more expected messages from the instrument cluster ● Open circuit instrument cluster, powerfeed ● Open circuit instrument cluster, ground supply	Using the manufacturer approved diagnostic system, check instrument cluster for DTCs and refer to the relevant DTC Index. Using the manufacturer approved diagnostic system, carry out network integrity test. Refer to the electrical guides, check power feeds and ground supplies, to instrument cluster for open circuit. Check CAN harness to instrument cluster, repair as necessary.
U016487	Lost Communication With The ATC Module	● Missing message. The CJB has not received one or more expected messages from the auxiliary heater control module ● Open circuit auxiliary heater control module, powerfeed ● Open circuit auxiliary heater control module, ground supply	Using the manufacturer approved diagnostic system, check auxiliary heater control module for DTCs and refer to the relevant DTC Index. Using the manufacturer approved diagnostic system, carry out network integrity test. Refer to the electrical guides, check power feeds and ground supplies, to auxiliary heater control module for open circuit. Check CAN harness to auxiliary heater control module, repair as necessary.

DTC	Description	Possible cause	Action
U030055	Internal Control Module Software Incompatibility	● Not configured. The CJB module has failed to recognise the correct master configuration ID from the CAN data bus master, the instrument cluster ● CJB not correctly configured ● Instrument cluster not correctly configured	Using the manufacturer approved diagnostic system, check the vehicle configuration file, rectify as necessary. Check correct software version is installed to both CJB and instrument cluster, update as necessary.
U1A0387	Car Config Parameter	● Missing message. The CJB has not received one or more expected messages from the instrument cluster ● The CAN message that contains the car configuration parameters is not received by the CJB	Using the manufacturer approved diagnostic system, check the vehicle configuration file, rectify as necessary. Check correct software version is installed to both CJB and instrument cluster, update as necessary.
U1A1449	CAN Initialization Failure	● Internal electronic failure. The CJB has indicated the detection of an internal circuit failure ● The CAN controller initialisation has failed ● CJB internal failure	Using the manufacturer approved diagnostic system, check correct software version is installed to CJB. Suspect the CJB, check and install a new CJB as required, refer to the new module/component installation note at the top of the DTC Index.
U200168	Reduced System Function	● Event information. System event not caused by the CJB, but requiring the CJB to record this DTC. ● The CJB has measured a voltage greater than 16.8 volts for a time > than 30 seconds ● The CJB has measured a voltage less than 8.6 volts for a time > than 30 seconds ● Another feature of the vehicle is not working as expected ● Vehicle charging system failure ● Vehicle battery failure	Using the manufacturer approved diagnostic system, check the rest of the vehicle modules for DTC's. Check if the customer has complained of something not working as expected. Refer to the relevant section of the workshop manual and check vehicle charging system and battery.

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Module Communications Network - Battery Junction Box (BJB)V8 S/C 4.2L Petrol

Removal and Installation

Removal

• NOTE: The BJB is an integral component of the engine compartment wiring harness and cannot be removed separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Battery Disconnect (414-01, General Procedures).

2. Make the SRS system safe.
For additional information, refer to: Standard Workshop Practices (100-00 General Information, Description and Operation).

3. Remove the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

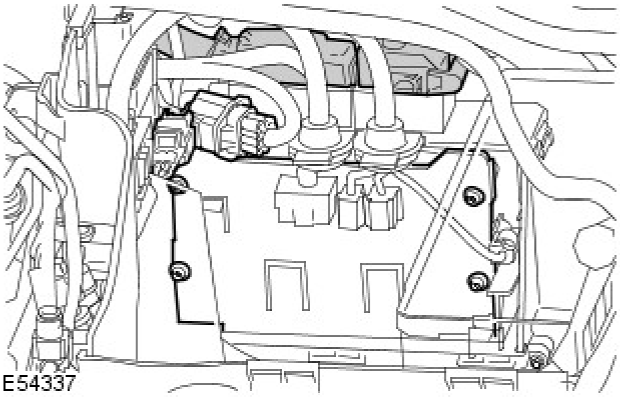
4. Remove the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

5. Remove the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

6. Remove the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

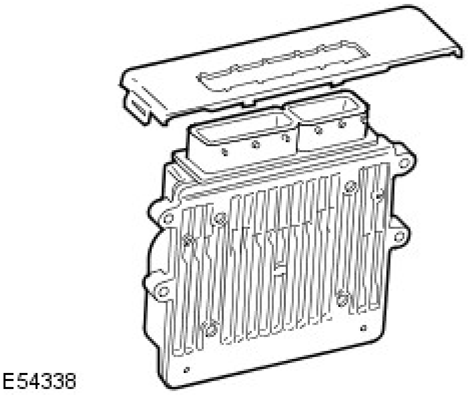
7. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

8. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).



9. Remove the ECM cover.

- Disconnect 2 electrical connectors for access.
- Disconnect the 2 ECM electrical connectors.
- Remove the 4 Torx screws.



10. Remove the ECM.

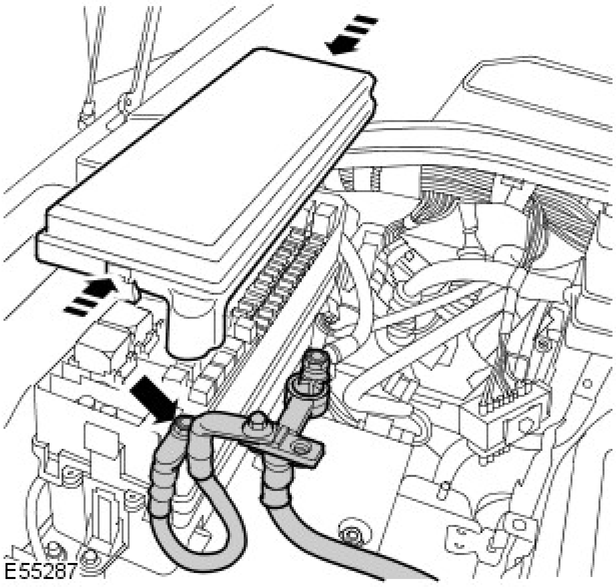
- Remove the ECM top cover.

11. Remove the BJB cover.

- Release the clip.

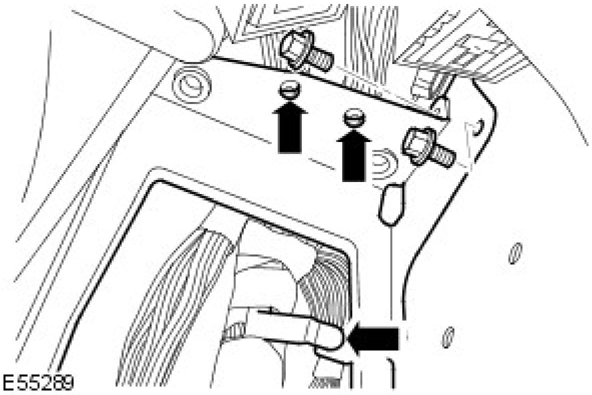
12. Disconnect the battery positive cable from the BJB.

- Remove the nut.



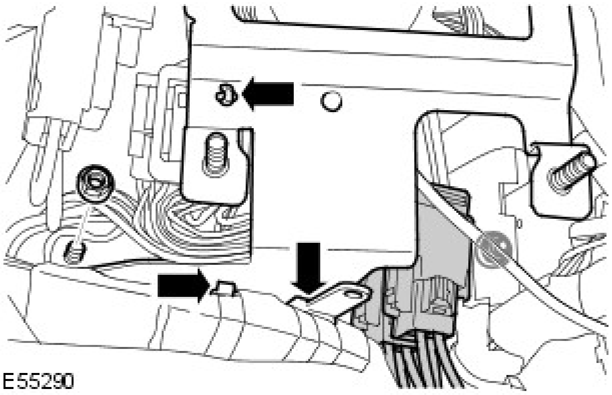
13. Remove both cowl side trim panels.
For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

14. Remove the CJB.
For additional information, refer to: Central Junction Box (CJB) (418-00 Module Communications Network, Removal and Installation).



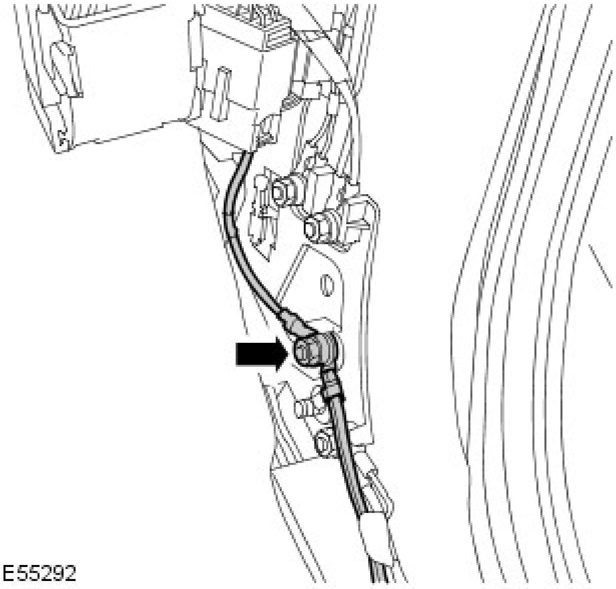
15. Release the CJB bracket.

- Release the 3 upper wiring harness clips.
- Remove the 2 bolts.



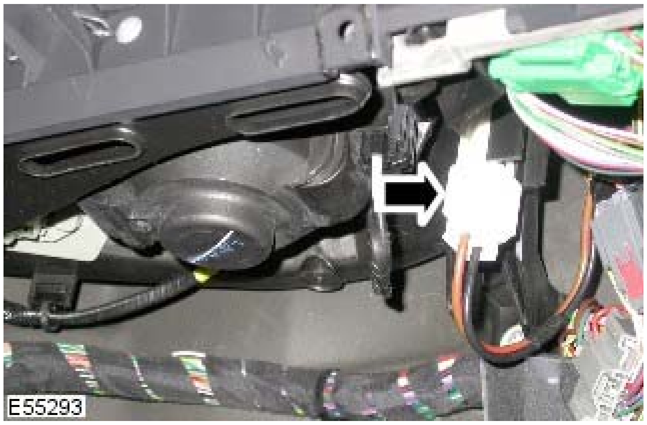
16. Remove the CJB bracket.

- Disconnect the 2 electrical connectors.
- Release the 3 lower wiring harness clips.
- Remove the 2 nuts.

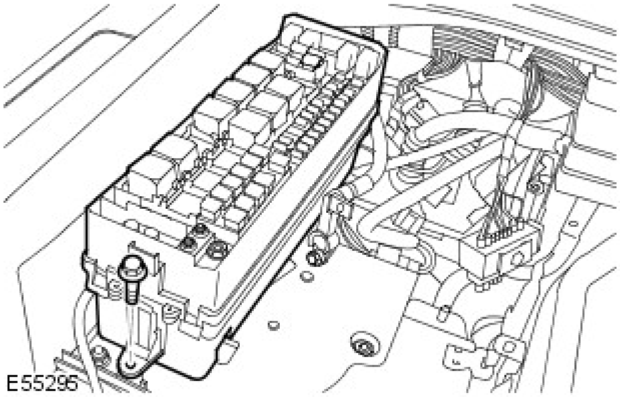


17. Release the 2 ground cables from the lower A-pillar.

- Remove the nut.

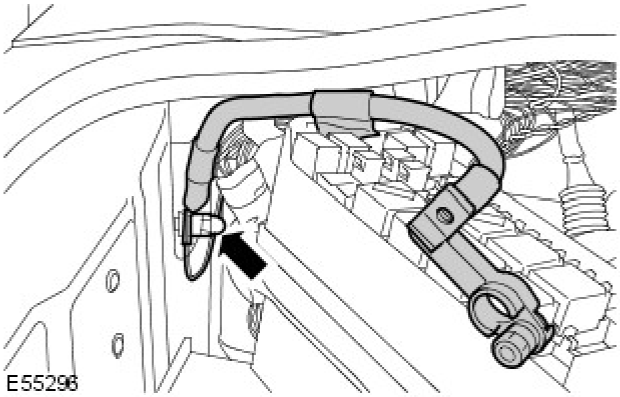


18. Disconnect the heater motor electrical connector.



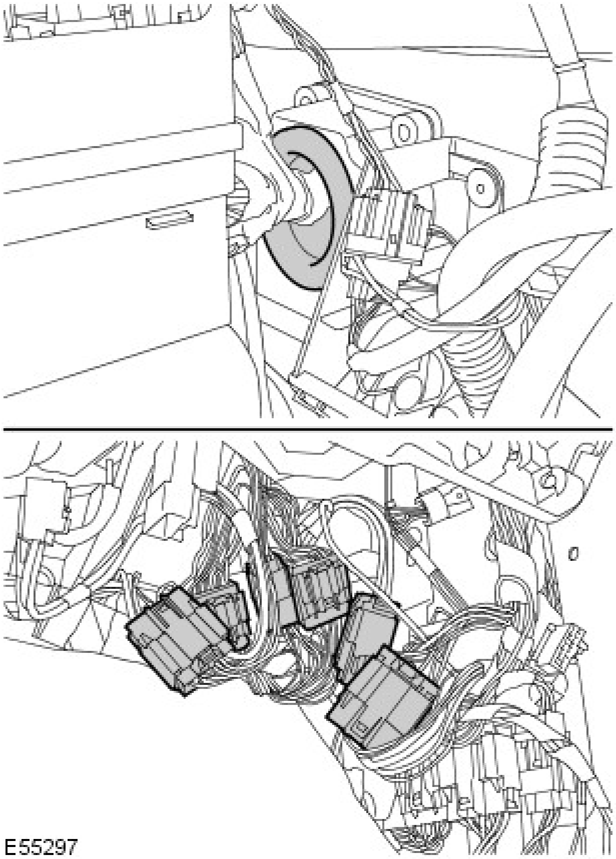
19. Release the BJB from the bracket.

- Remove the bolt.



20. Remove the battery ground cable.

- Remove the nut.
- Release the additional ground cable.


E55297

21. Release the BJB wiring harness from the bulkhead.

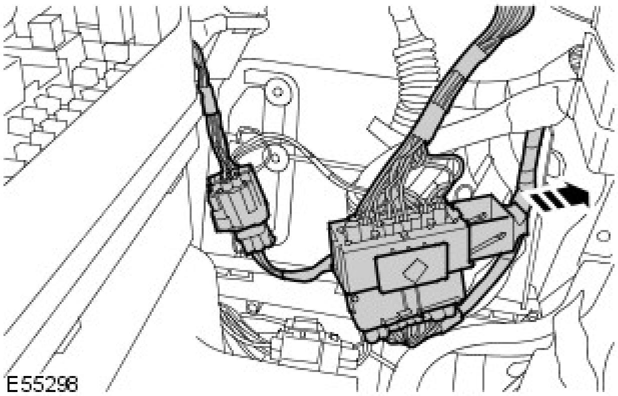
- Disconnect the 6 electrical connectors.
- Release the grommet.

22. Raise and support the vehicle.

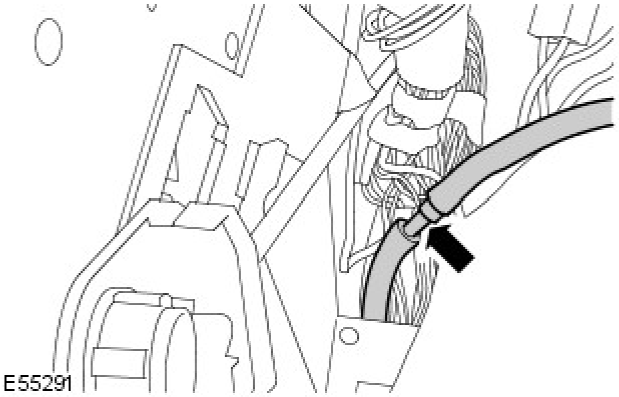
23. Remove both front fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

24. Remove both headlamps.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

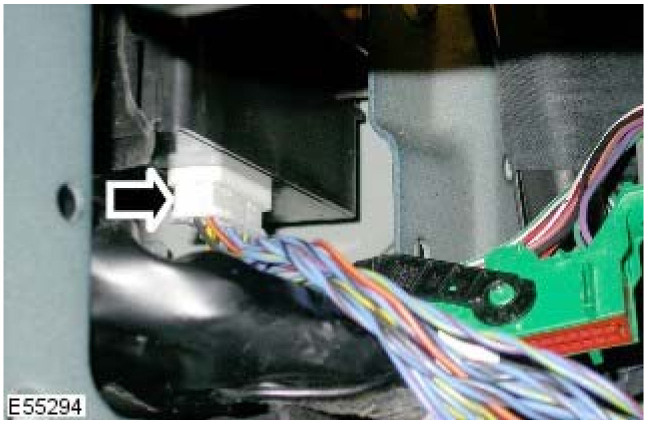
25. Passenger side: Disconnect the engine wiring harness electrical connector.


E55298

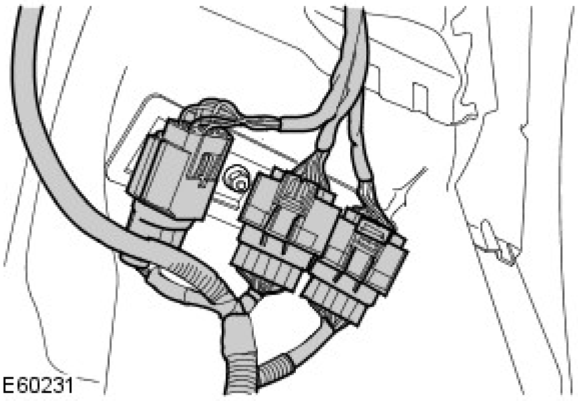
26. Passenger side: Disconnect the transfer case electrical connector.



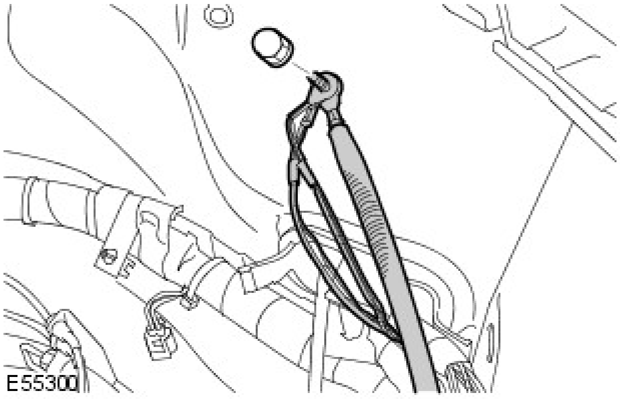
27. LH side: Disconnect the washer jet hose.



28. LH side: Disconnect the adaptive front lighting module electrical connector.



29. LH side: Disconnect the 3 body panel electrical connectors.



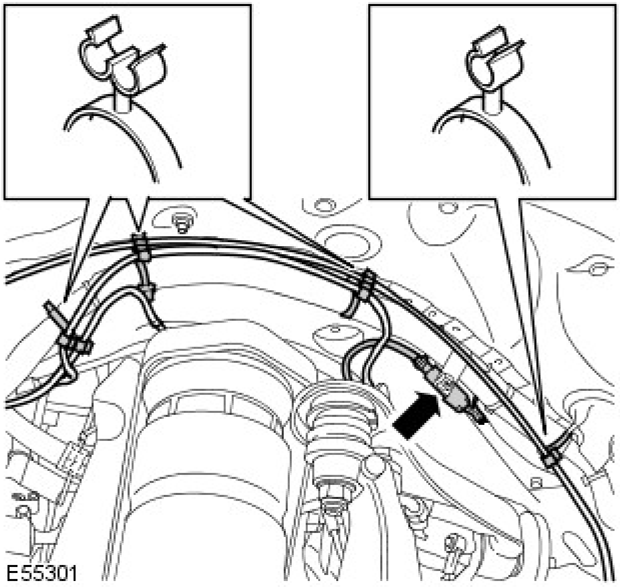
30. LH side: Release the 3 body panel ground cables.

- Remove the nut.

31. LH side: Release the 2 air suspension pipes from the wiring harness.

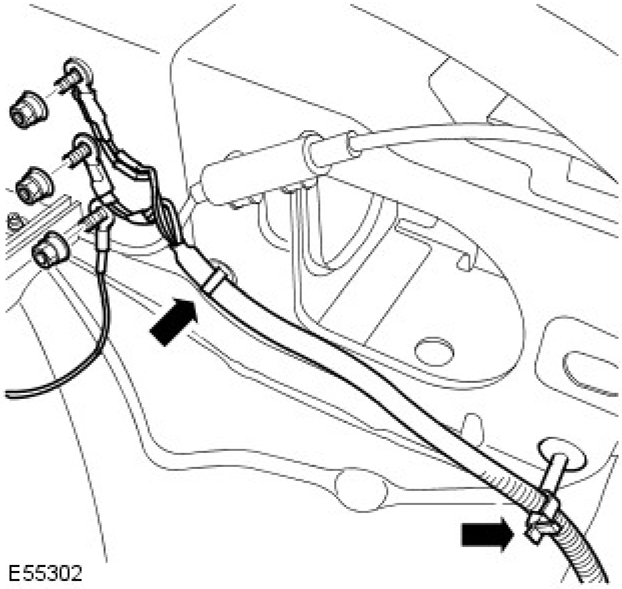
- Release the 7 clips.

32. LH side: Disconnect the ABS electrical connector.



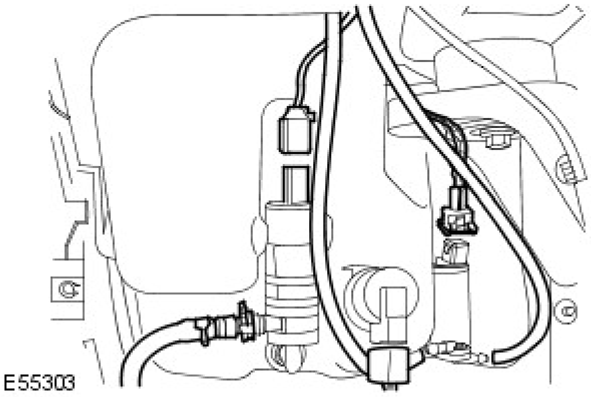
33. LH side: Release 3 engine compartment ground cables.

- Remove the 3 nuts.
- Release the 2 clips.

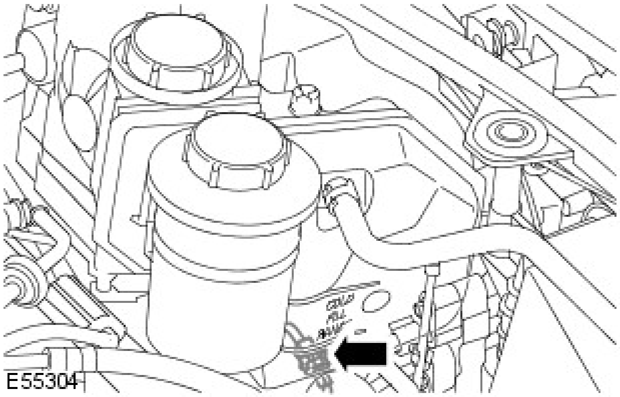


34. LH side: Release the washer reservoir wiring harness.

- Disconnect the 3 electrical connectors.
- Disconnect the 2 washer jet hoses.



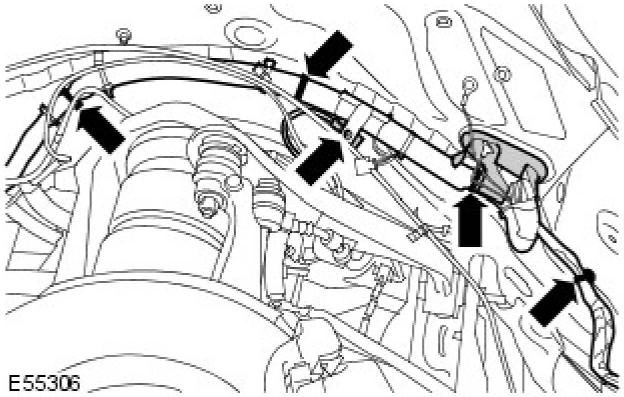
35. LH side: Disconnect the coolant expansion tank level switch electrical connector.



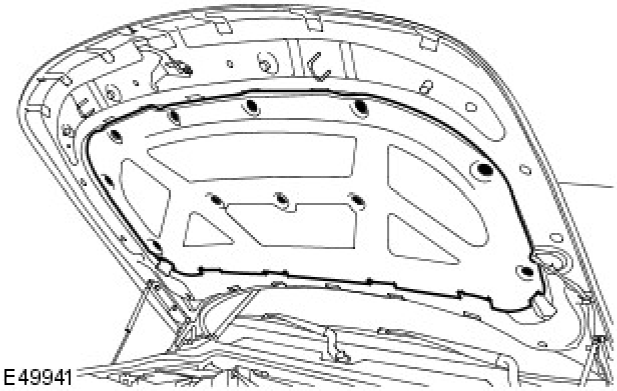
36. LH side: Disconnect the brake pad wear sensor electrical connector.

37. LH side: Release the wiring harness.

- Release the grommet.
- Release the 4 clips.

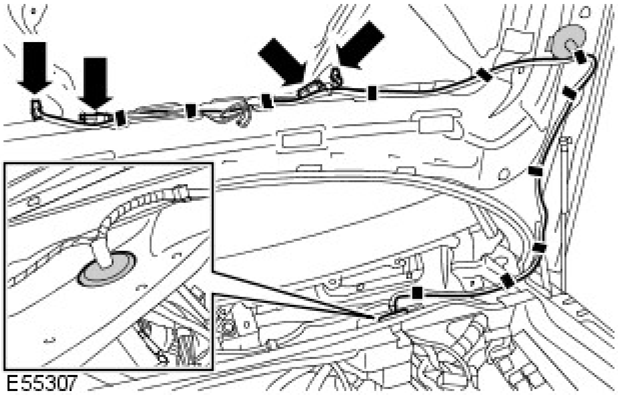


38. Remove the windshield wiper motor.
For additional information, refer to: Windshield Wiper Motor (501-16 Wipers and Washers, Removal and Installation).



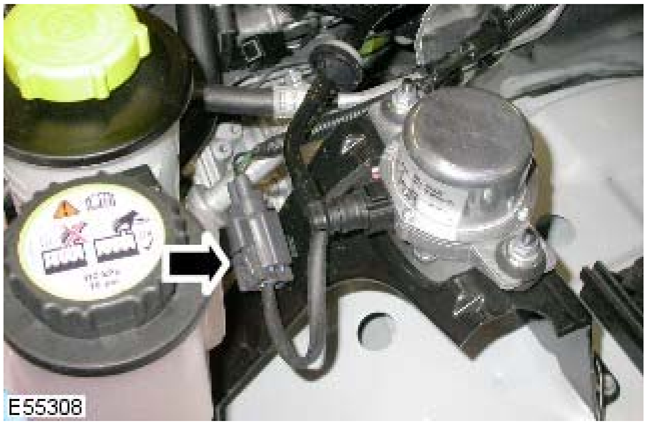
39. Remove the hood pad.

- Remove the 11 clips.

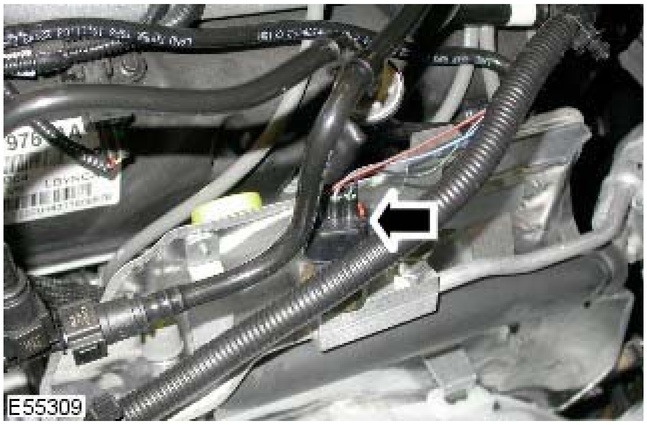


40. Release the hood wiring harness.

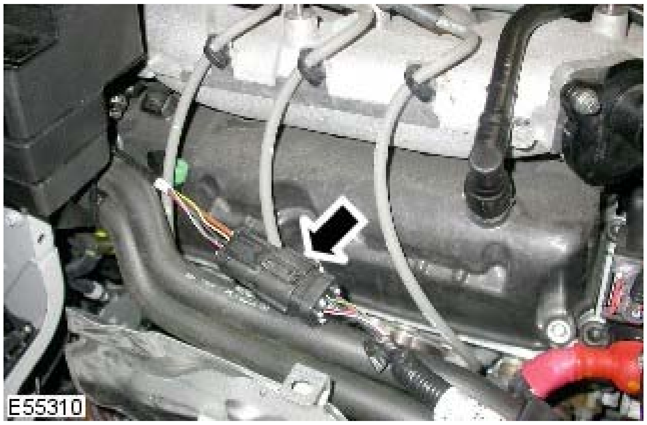
- Disconnect the 2 washer jet hoses.
- Disconnect the 2 electrical connectors.
- Release the 10 clips.
- Remove the wiring harness cover.
- Release the grommet.



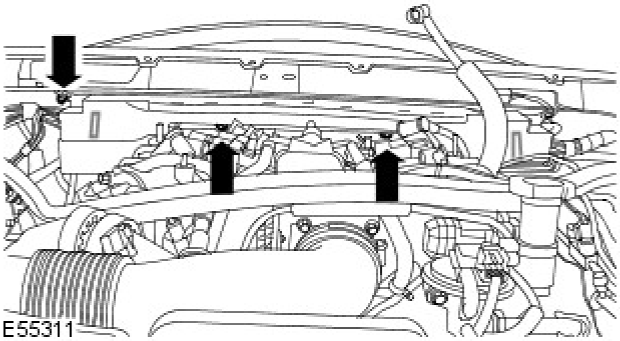
41. Disconnect the brake booster vacuum pump electrical connector.



42. Disconnect the A/C pressure transducer electrical connector.

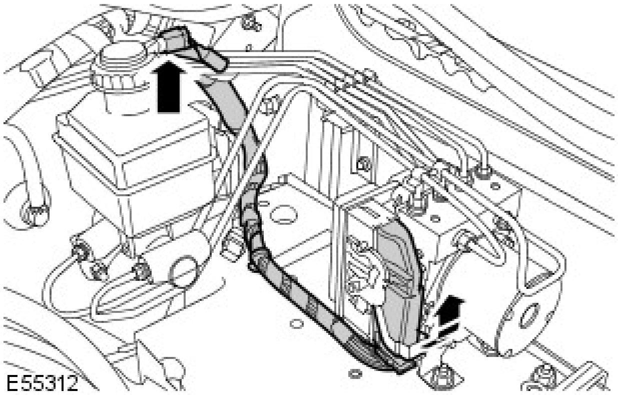


43. Disconnect the battery to engine compartment wiring harness electrical connector.



44. Release the wiring harness from the plenum.

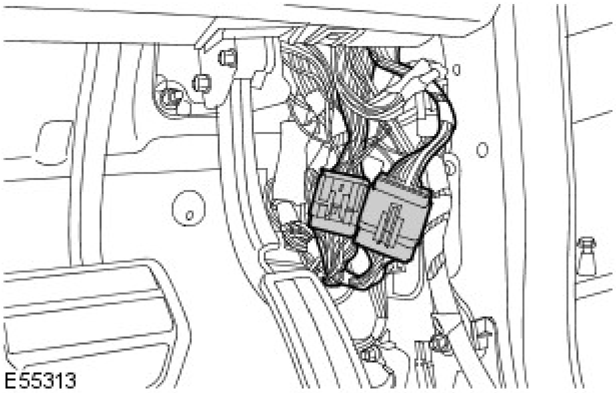
- Release the 2 clips.
- Remove the 3 nuts.



45. Disconnect the brake fluid reservoir electrical connector.

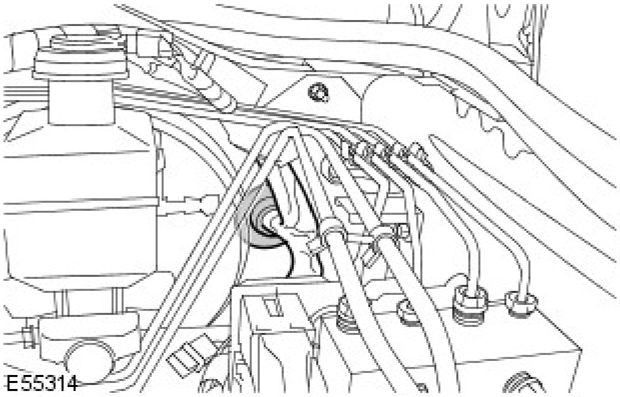
46. Disconnect the ABS module electrical connector.

47. Remove the air suspension control module.
For additional information, refer to: Air Suspension Control Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).



E55313

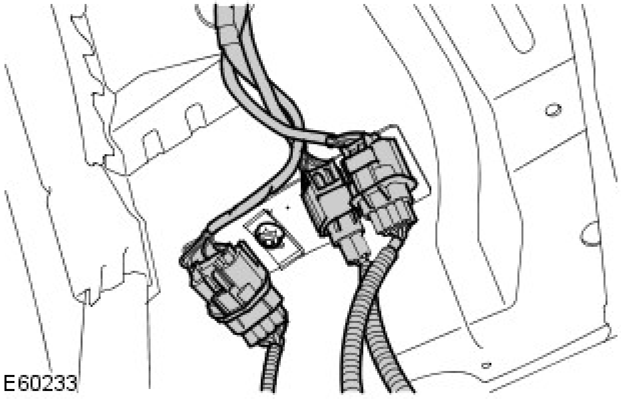
48. Driver side: Disconnect 2 electrical connectors from the lower A-pillar.



E55314

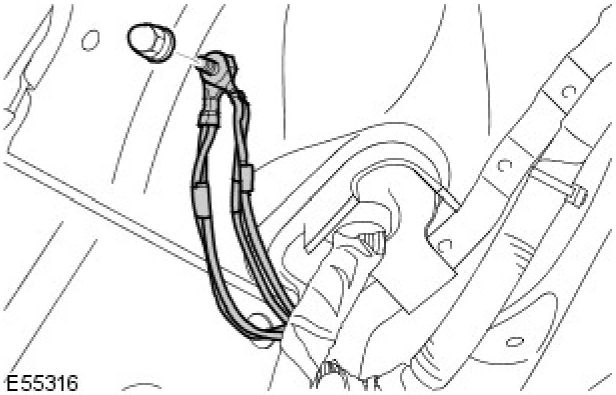
49. Driver side: Release the wiring harness from the bulkhead.

- Release the grommet.



E60233

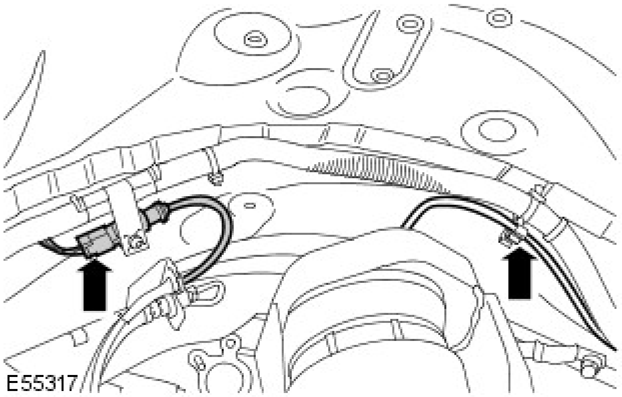
50. RH side: Disconnect the 3 body panel electrical connectors.



E55316

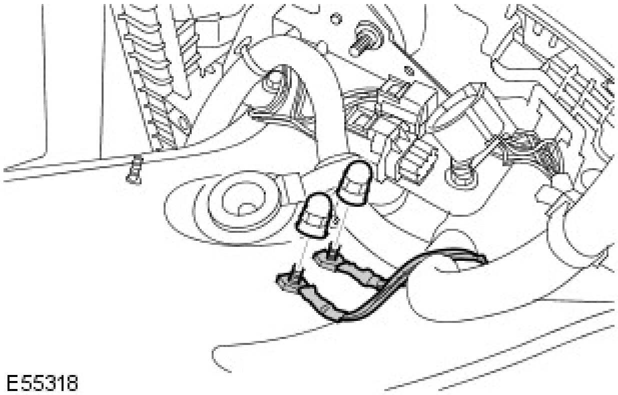
51. RH side: Release the 3 body panel ground cables.

- Remove the nut.



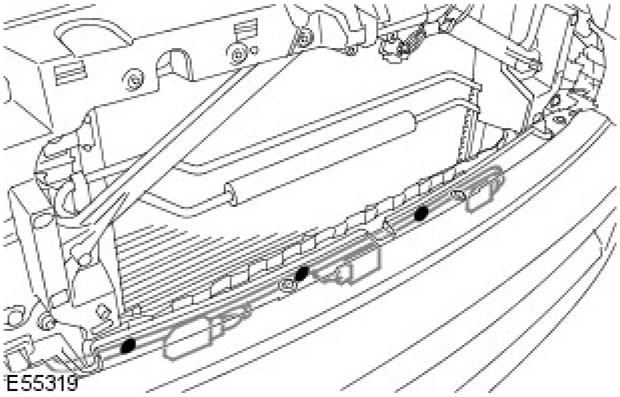
52. RH side: Disconnect the ABS electrical connector.

53. RH side front: Release the air suspension pipe from the wiring harness clip.



54. RH side: Release 2 engine compartment ground cables.

- Remove the 2 nuts.



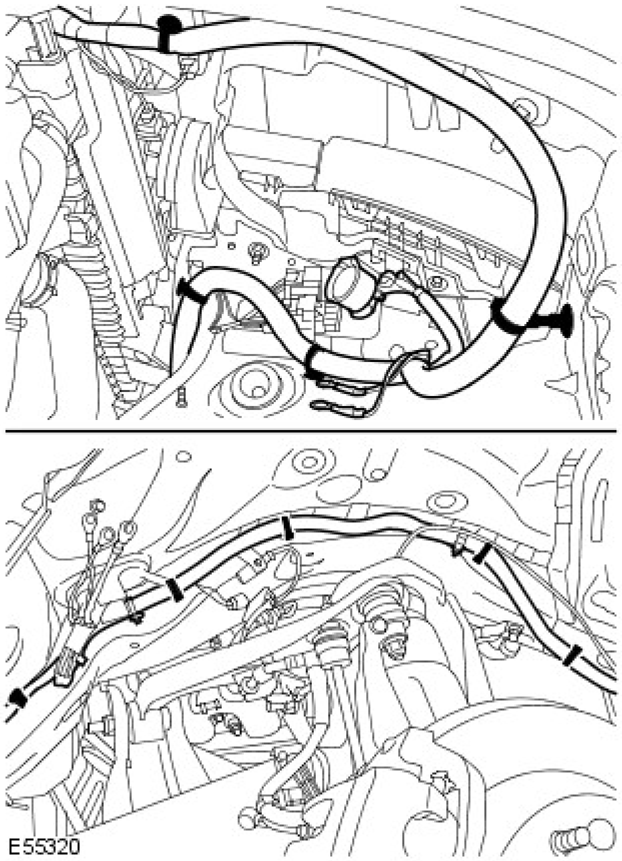
55. Disconnect the ambient air temperature sensor electrical connector.

56. Disconnect both front impact severity sensor electrical connectors.

- Release the 3 clips.

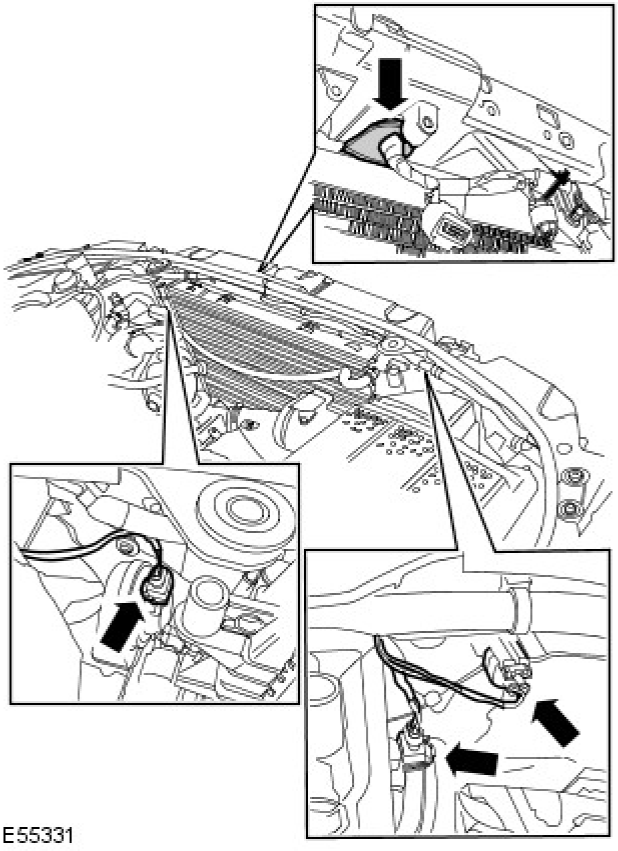
57. RH side: Release the wiring harness.

- Release the 9 clips.



58. Disconnect the hood switch electrical connector.

59. Disconnect both horn electrical connectors.



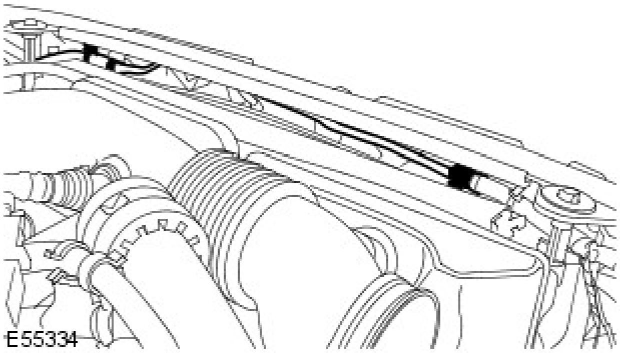
60. If installed, disconnect the speed control module electrical connector.

61. If installed, disconnect the pollution sensor electrical connector.

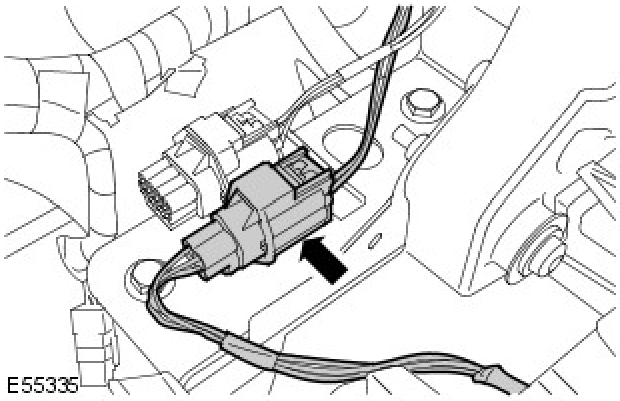
- Release the clip.
- Release the grommet.

62. Release the hood release cable.

- Release from the 3 clips.



63. Disconnect the front bumper wiring harness electrical connector.



64. With assistance, remove the BJB and wiring harness.

Installation

1. With assistance, install the BJB and wiring harness.

2. Connect the front bumper wiring harness electrical connector.

3. Attach the hood release cable.

- Secure with the clips.

4. If installed, connect the pollution sensor electrical connector.

- Install the grommet.
- Secure the clip.

5. If installed, connect the speed control module electrical connector.

6. Connect the horn electrical connectors.

7. Connect the hood switch electrical connector.

8. RH side: Secure the wiring harness.

- Secure the clips.

9. Connect both front impact electrical connectors.

- Secure the clips.

10. RH side: Attach the air suspension pipe.

11. Connect the ambient air temperature sensor electrical connector.

12. RH side: Attach the engine compartment ground cables.

- Tighten the nuts to 25 Nm (18 lb.ft).

13. RH side: Connect the ABS electrical connector.

14. RH side: Attach the body panel ground cables.

- Tighten the nut to 25 Nm (18 lb.ft).

15. RH side: Connect the body panel electrical connectors.

16. Driver side: Attach the wiring harness to the bulkhead.

- Install the grommet.

17. Driver side: Connect the lower A-pillar electrical connectors.

18. Install the air suspension control module.
For additional information, refer to: Air Suspension Control Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

19. Connect the ABS module electrical connector.

20. Connect the brake fluid reservoir electrical connector.

21. Attach the wiring harness to the plenum.

- Secure the clips.
- Tighten the nuts to 4 Nm (3 lb.ft).

22. Connect the battery to engine compartment wiring harness electrical connector.

23. Connect the A/C pressure transducer electrical connector.

24. Connect the brake booster vacuum pump electrical connector.

25. Attach the hood wiring harness.

- Install the grommet.
- Install the cover.
- Secure with the clips.
- Connect the electrical connectors.
- Connect the washer jet hoses.

26. Install the hood pad.

- Install the clips.

27. Install the windshield wiper motor.
For additional information, refer to: Windshield Wiper Motor (501-16 Wipers and Washers, Removal and Installation).

28. LH side: Attach the wiring harness.

- Install the grommet.
- Secure the clips.

29. LH side: Connect the brake pad wear sensor electrical connector.

30. LH side: Connect the coolant expansion tank level switch electrical connector.

31. LH side: Attach the washer reservoir wiring harness.

- Connect the washer jet hoses.
- Connect the electrical connectors.

32. LH side: Attach the engine compartment ground cables.

- Secure the clips.
- Tighten the nuts to 25 Nm (18 lb.ft).

33. LH side: Connect the ABS electrical connector.

34. LH side: Attach the air suspension pipes.

- Secure the clips.

35. LH side: Attach the body panel ground cables.

- Tighten the nut to 25 Nm (18 lb.ft).

36. LH side: Connect the body panel electrical connectors.

37. LH side: Connect the adaptive front lighting module electrical connector.

38. LH side: Connect the washer jet hose.

39. Passenger side: Connect the transfer case electrical connector.

40. Passenger side: Connect the engine wiring harness electrical connector.

41. Install the headlamps.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

42. Install the fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

43. Attach the BJB wiring harness to the bulkhead.

- Connect the electrical connectors.
- Install the grommet.

44. Install the battery ground cable.

- Attach the additional ground cable.
- Tighten the nut to 25 Nm (18 lb.ft).

45. Secure the BJB to the bracket.

- Tighten the bolt to 6 Nm (4 lb.ft).

46. Connect the heater motor electrical connector.

47. Connect the ground cables to the lower A-pillar.

- Tighten the nut to 10 Nm (7 lb.ft).

48. Install the CJB bracket.

- Tighten the nuts to 10 Nm (7 lb.ft).
- Secure the clips.
- Connect the electrical connectors.
- Tighten the bolts to 25 Nm (18 lb.ft).

49. Install the CJB.

For additional information, refer to: Central Junction Box (CJB) (418-00 Module Communications Network, Removal and Installation).

50. Connect the battery positive cable to the BJB.

- Tighten the nut to 25 Nm (18 lb.ft).

51. Install the BJB cover.

- Secure the clip.

52. Install the ECM.

- Install the ECM top cover.

53. Install the ECM cover.

- Tighten the Torx screws.
- Connect the electrical connectors.

54. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

55. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

56. Install the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

57. Install the air cleaner assembly.
For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - V8 S/C 4.2L Petrol, Removal and Installation).

58. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

59. Install the engine cover.
For additional information, refer to: Engine Cover - V8 S/C 4.2L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

60. Connect the battery ground cable.
For additional information, refer to: Battery Disconnect (414-01, General Procedures).

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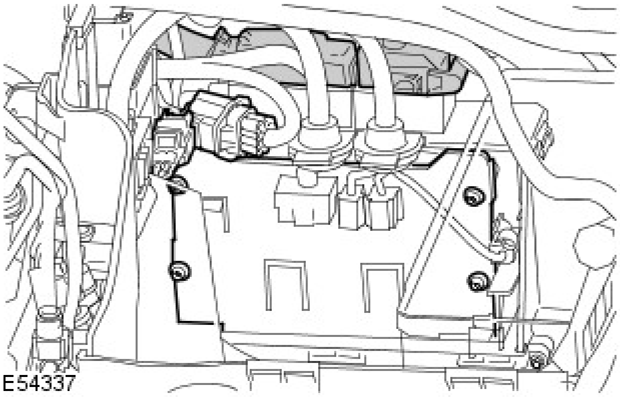
Module Communications Network - Battery Junction Box (BJB)V8 4.4L Petrol

Removal and Installation

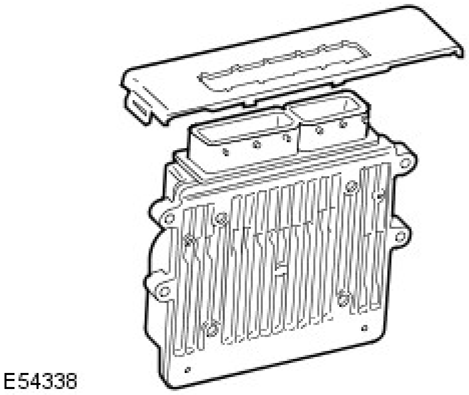
Removal

- NOTE: The BJB is an integral component of the engine compartment wiring harness and cannot be removed separately.

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Make the SRS system safe.
   For additional information, refer to: Standard Workshop Practices (100-00 General Information, Description and Operation).
3. Remove the engine cover.
   For additional information, refer to: Engine Cover - V8 4.4L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Remove the radiator grille.
   For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).
5. Remove the air cleaner assembly.
   For additional information, refer to: Air Cleaner (303-12B Intake Air Distribution and Filtering - V8 4.4L Petrol, Removal and Installation).
6. Remove the four-wheel drive control module.
   For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).
7. Remove the battery tray.
   For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).
8. Remove the auxiliary battery tray.
   For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

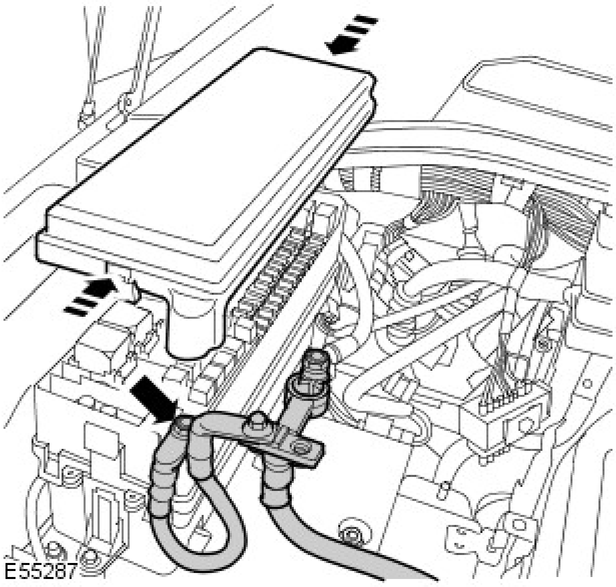


9. Remove the ECM cover.
   - Disconnect 2 electrical connectors for access.
   - Disconnect the 2 ECM electrical connectors.
   - Remove the 4 Torx screws.



10. Remove the ECM.

- Remove the ECM top cover.



11. Remove the BJB cover.

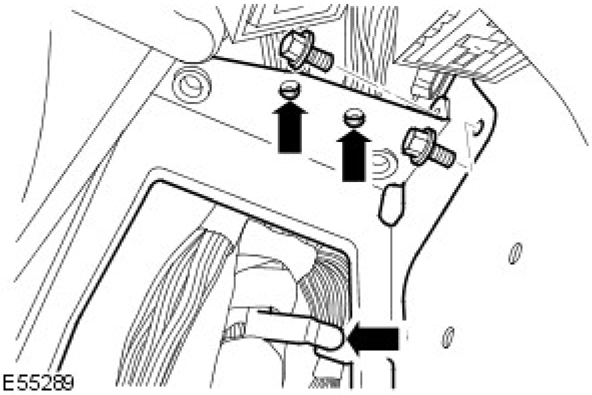
- Release the clip.

12. Disconnect the battery positive cable from the BJB.

- Remove the nut.

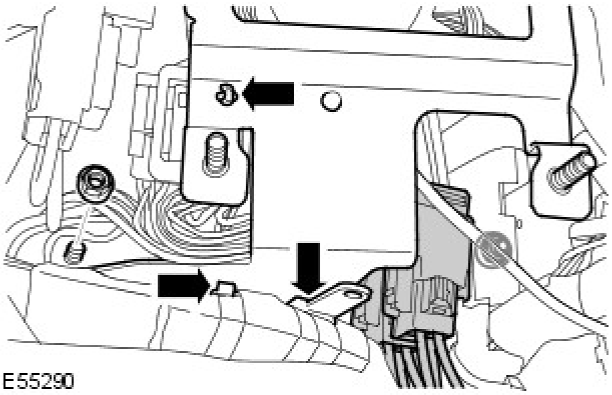
13. Remove both cowl side trim panels.
For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

14. Remove the CJB.
For additional information, refer to: Central Junction Box (CJB) (418-00 Module Communications Network, Removal and Installation).



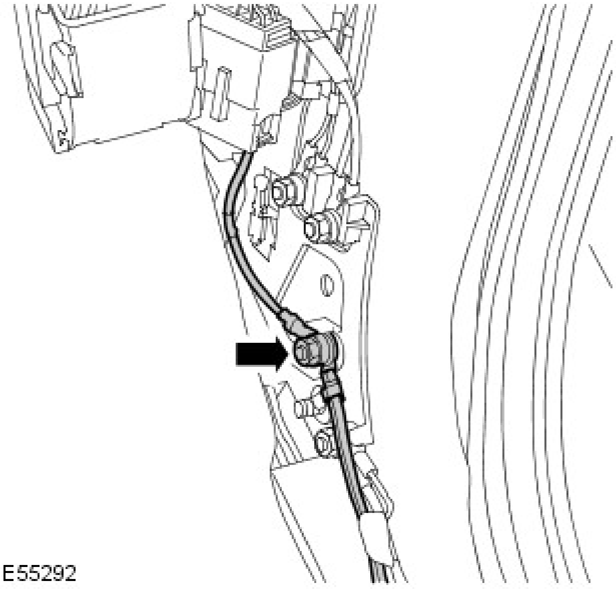
15. Release the CJB bracket.

- Release the 3 upper wiring harness clips.
- Remove the 2 bolts.



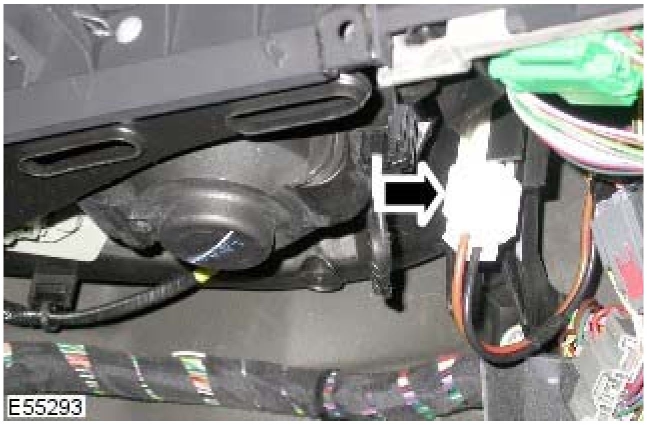
16. Remove the CJB bracket.

- Disconnect the 2 electrical connectors.
- Release the 3 lower wiring harness clips.
- Remove the 2 nuts.

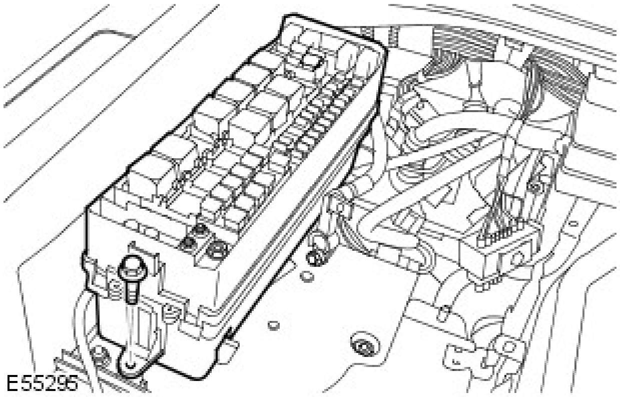


17. Release the 2 ground cables from the lower A-pillar.

- Remove the nut.

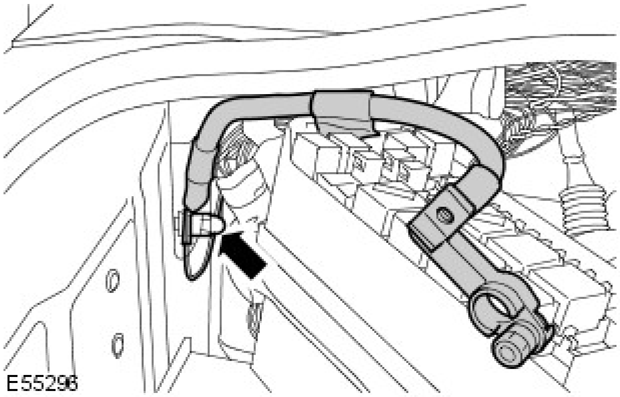


18. Disconnect the heater motor electrical connector.



19. Release the BJB from the bracket.

- Remove the bolt.

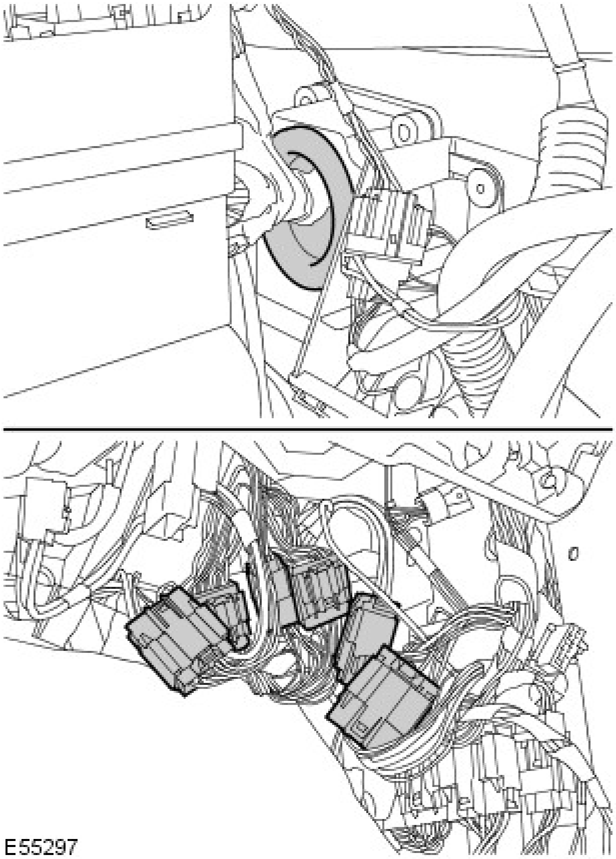


20. Remove the battery ground cable.

- Remove the nut.
- Release the additional ground cable.

21. Release the BJB wiring harness from the bulkhead.

- Disconnect the 6 electrical connectors.
- Release the grommet.



E55297

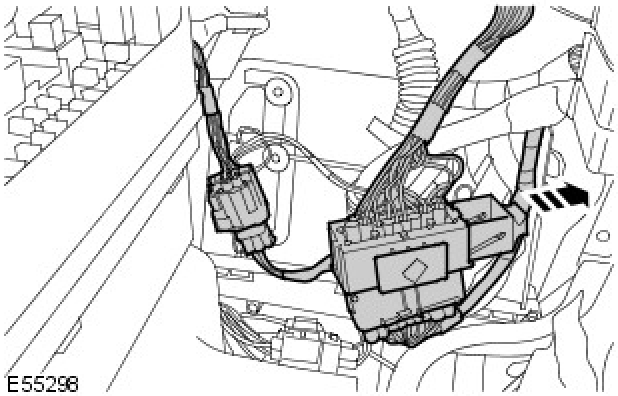
22. Raise and support the vehicle.

23. Remove both front fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

24. Remove both headlamps.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

25. Passenger side: Disconnect the engine wiring harness electrical connector.

26. Passenger side: Disconnect the transfer case electrical connector.



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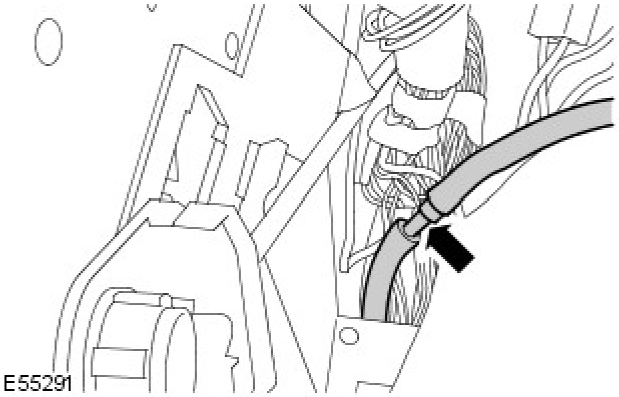
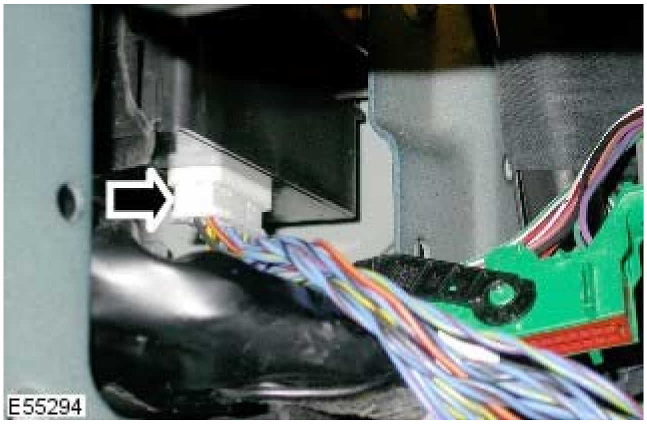
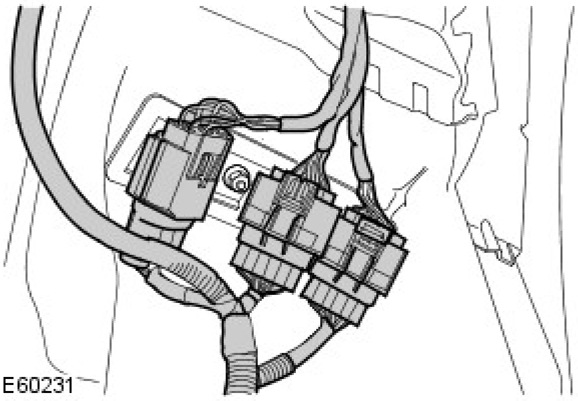


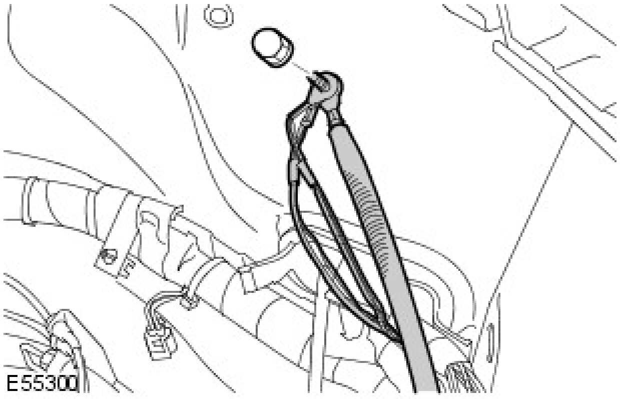
27. LH side: Disconnect the washer jet hose.



28. LH side: Disconnect the adaptive front lighting module electrical connector.



29. LH side: Disconnect the 3 body panel electrical connectors.



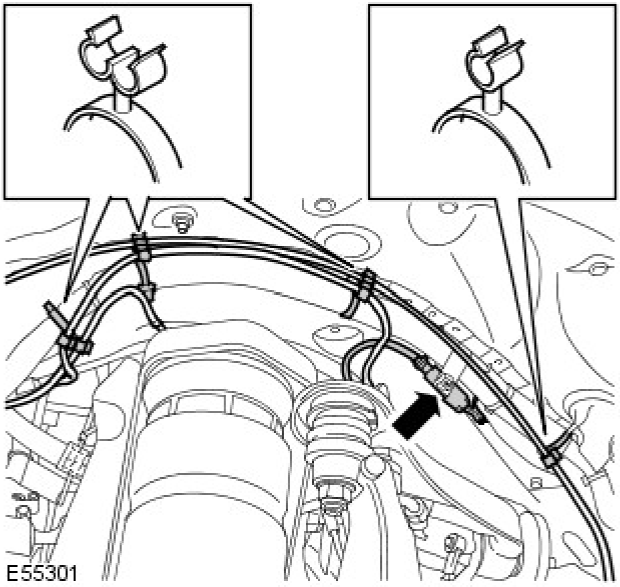
30. LH side: Release the 3 body panel ground cables.

- Remove the nut.

31. LH side: Release the 2 air suspension pipes from the wiring harness.

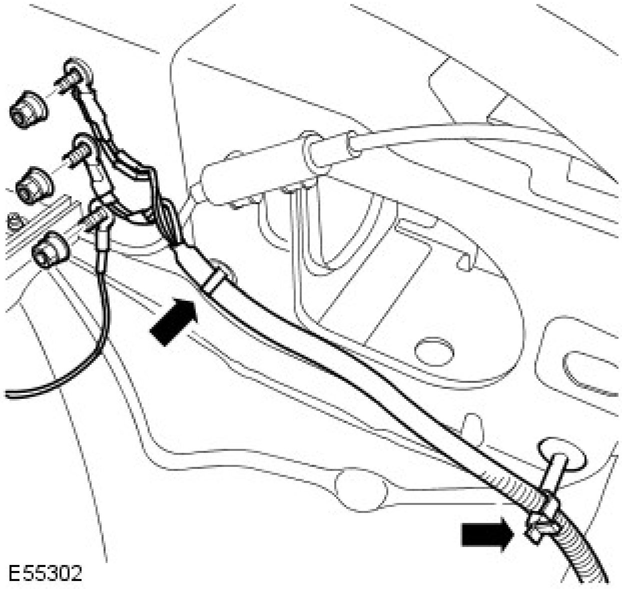
- Release the 7 clips.

32. LH side: Disconnect the ABS electrical connector.



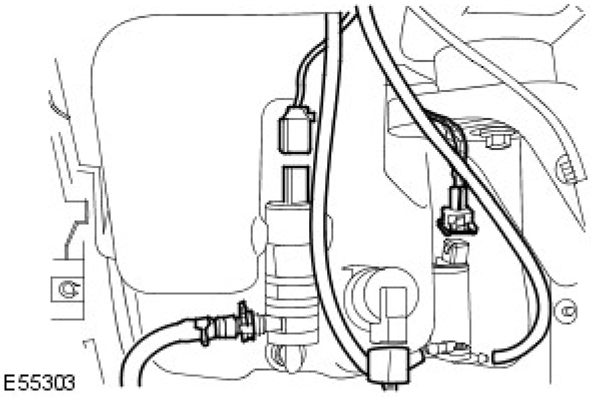
33. LH side: Release 3 engine compartment ground cables.

- Remove the 3 nuts.
- Release the 2 clips.

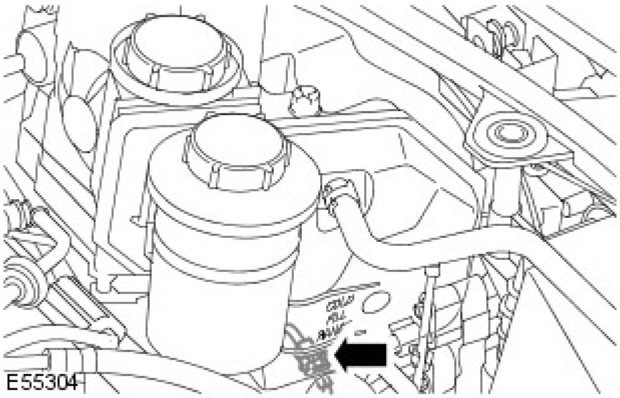


34. LH side: Release the washer reservoir wiring harness.

- Disconnect the 3 electrical connectors.
- Disconnect the 2 washer jet hoses.



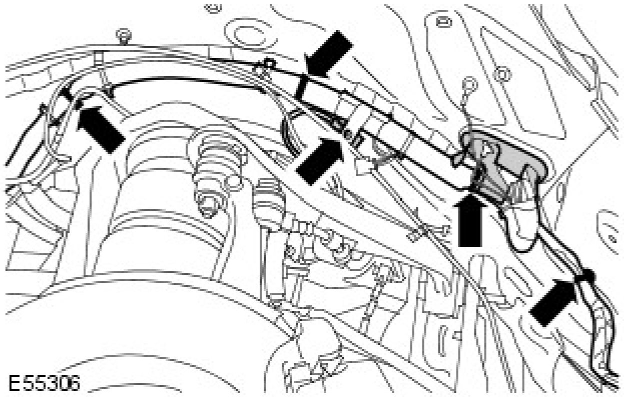
35. LH side: Disconnect the coolant expansion tank level switch electrical connector.



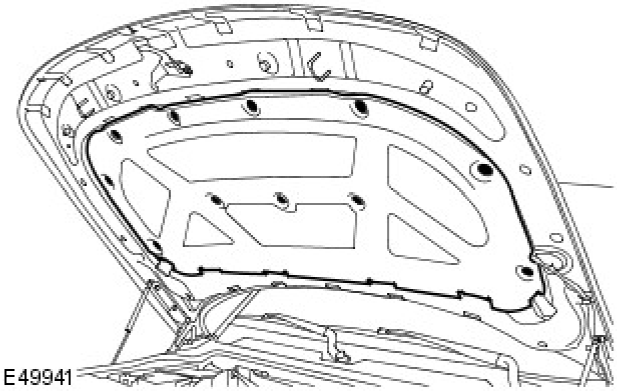
36. LH side: Disconnect the brake pad wear sensor electrical connector.

37. LH side: Release the wiring harness.

- Release the grommet.
- Release the 4 clips.

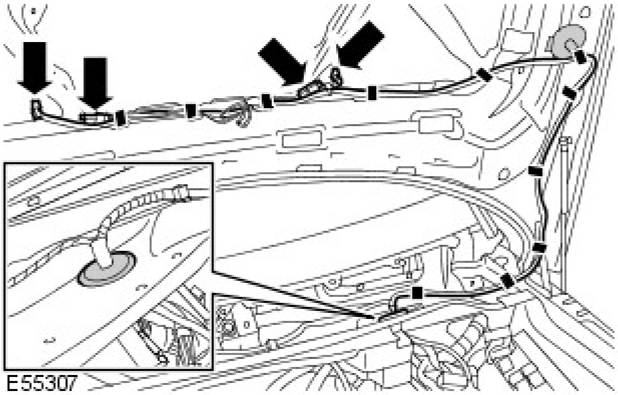


38. Remove the windshield wiper motor.
For additional information, refer to: Windshield Wiper Motor (501-16 Wipers and Washers, Removal and Installation).



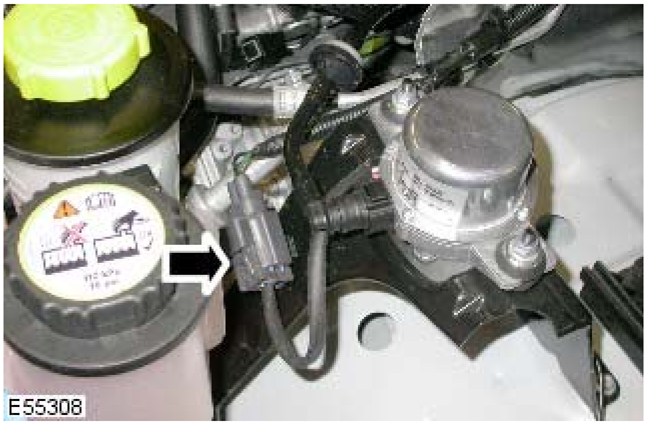
39. Remove the hood pad.

- Remove the 11 clips.

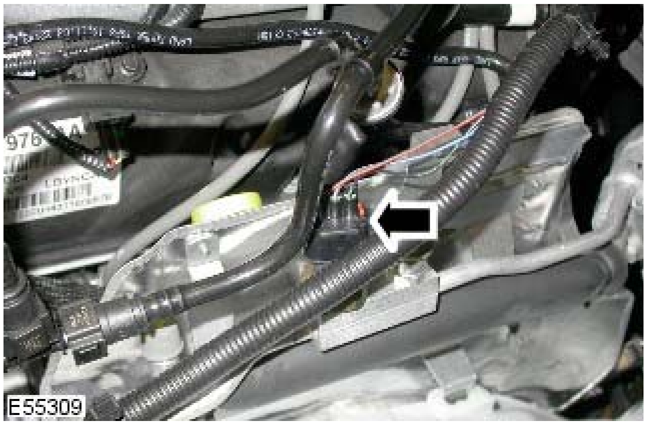


40. Release the hood wiring harness.

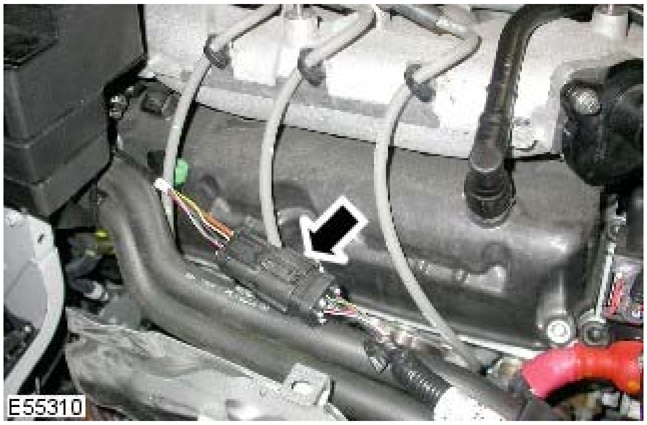
- Disconnect the 2 washer jet hoses.
- Disconnect the 2 electrical connectors.
- Release the 10 clips.
- Remove the wiring harness cover.
- Release the grommet.



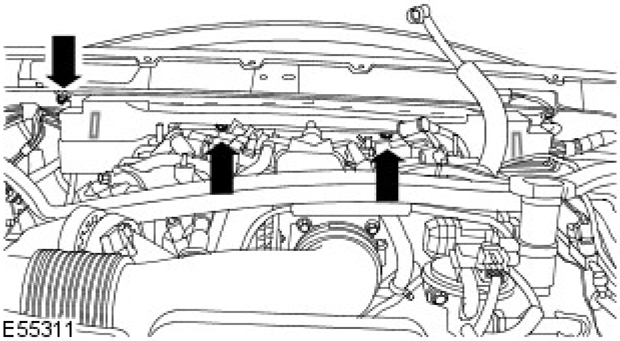
41. Disconnect the brake booster vacuum pump electrical connector.



42. Disconnect the A/C pressure transducer electrical connector.



43. Disconnect the battery to engine compartment wiring harness electrical connector.

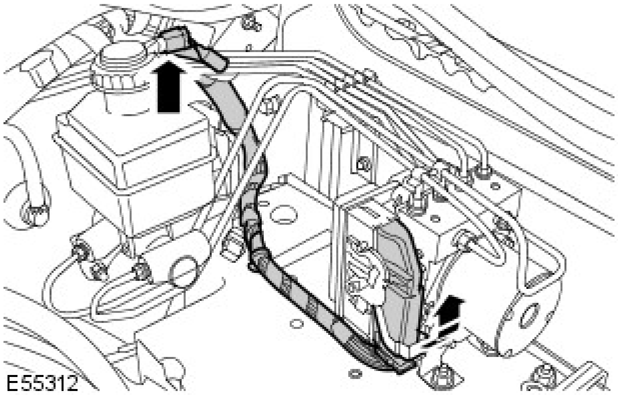


44. Release the wiring harness from the plenum.

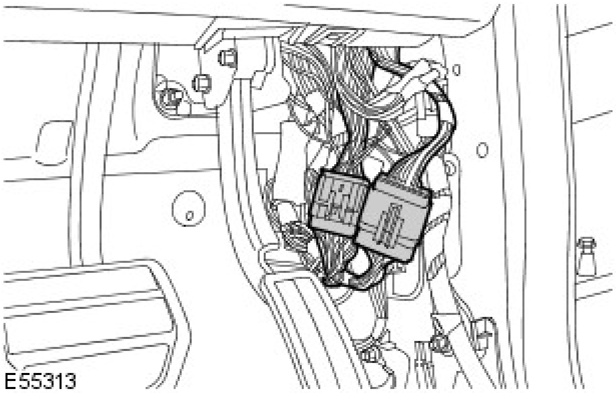
- Release the 2 clips.
- Remove the 3 nuts.

45. Disconnect the brake fluid reservoir electrical connector.

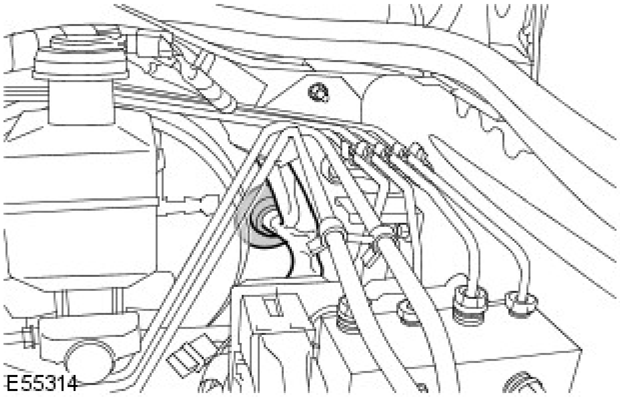
46. Disconnect the ABS module electrical connector.



47. Remove the air suspension control module.
For additional information, refer to: Air Suspension Control Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

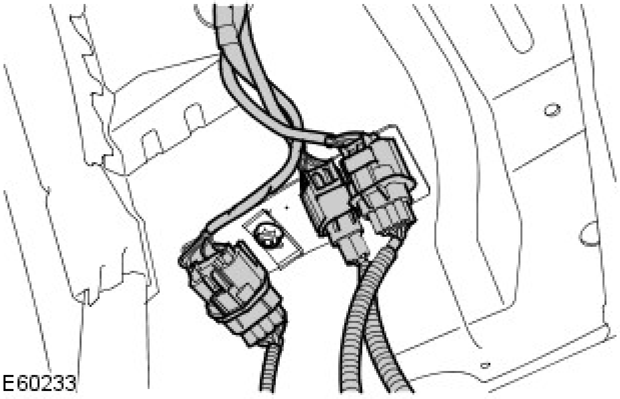


48. Driver side: Disconnect 2 electrical connectors from the lower A-pillar.

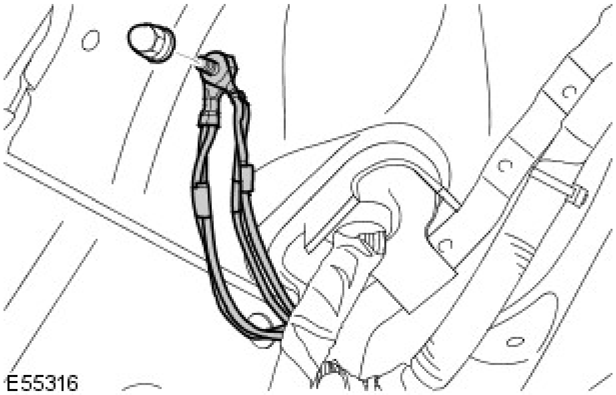


49. Driver side: Release the wiring harness from the bulkhead.

- Release the grommet.



50. RH side: Disconnect the 3 body panel electrical connectors.

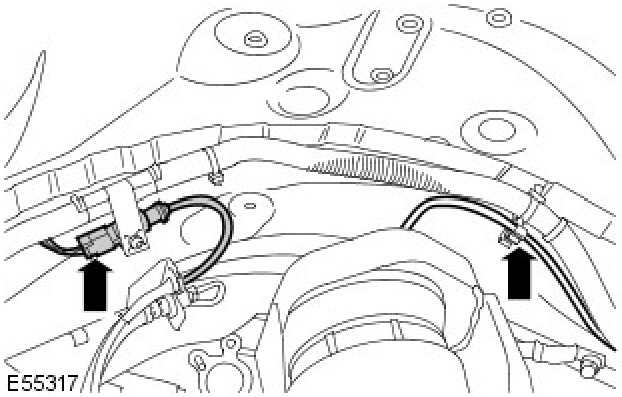


51. RH side: Release the 3 body panel ground cables.

- Remove the nut.

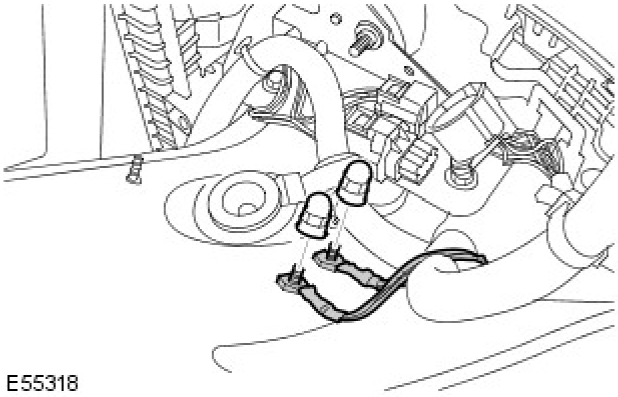
52. RH side: Disconnect the ABS electrical connector.

53. RH side front: Release the air suspension pipe from the wiring harness clip.



54. RH side: Release 2 engine compartment ground cables.

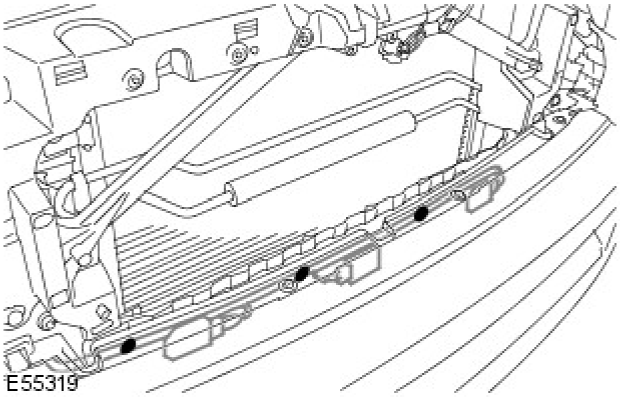
- Remove the 2 nuts.



55. Disconnect the ambient air temperature sensor electrical connector.

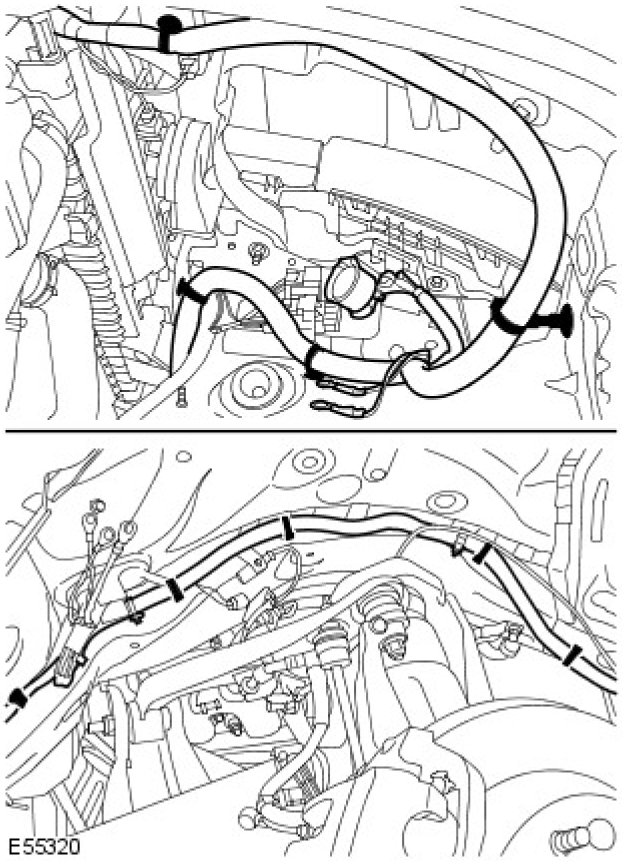
56. Disconnect both front impact severity sensor electrical connectors.

- Release the 3 clips.

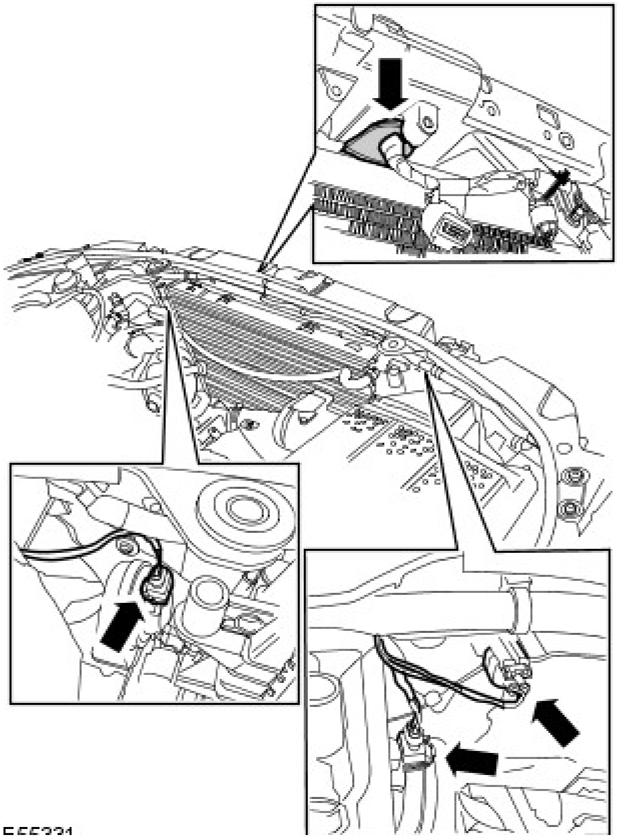


57. RH side: Release the wiring harness.

- Release the 9 clips.



58. Disconnect the hood switch electrical connector.



Published: 11-May-2011

Module Communications Network - Battery Junction Box (BJB)2.7L V6 - TdV6

Removal and Installation

Removal

• NOTE: The BJB is an integral component of the engine compartment wiring harness and cannot be removed separately.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Make the SRS system safe.
For additional information, refer to: Standard Workshop Practices (100-00 General Information, Description and Operation).

3. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

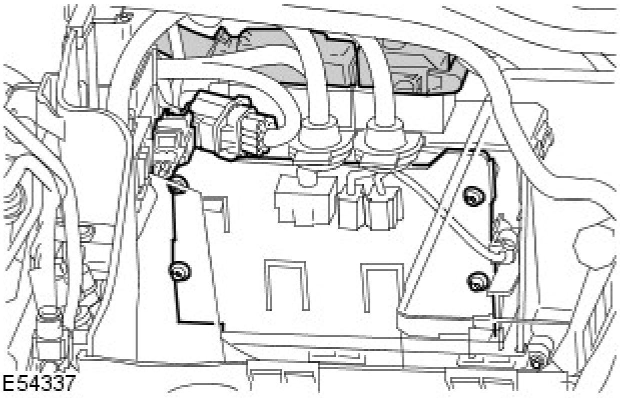
4. Remove the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

5. Remove the air cleaner assembly.

6. Remove the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

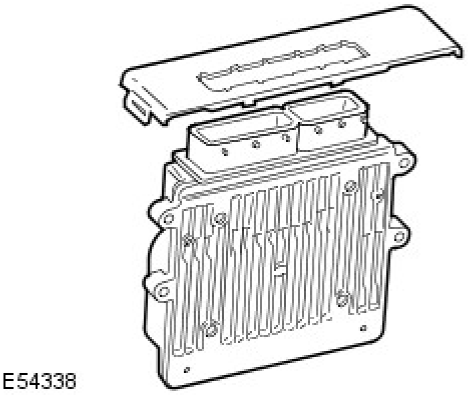
7. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

8. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).



9. Remove the ECM cover.

- Disconnect 2 electrical connectors for access.
- Disconnect the 2 ECM electrical connectors.
- Remove the 4 Torx screws.



10. Remove the ECM.

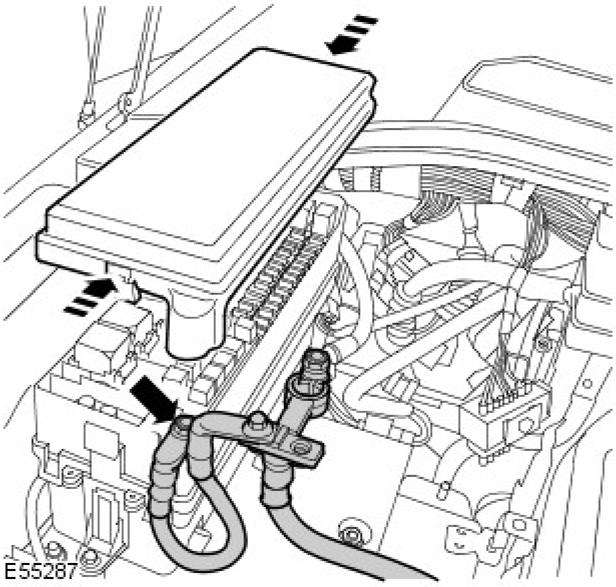
- Remove the ECM top cover.

11. Remove the BJB cover.

- Release the clip.

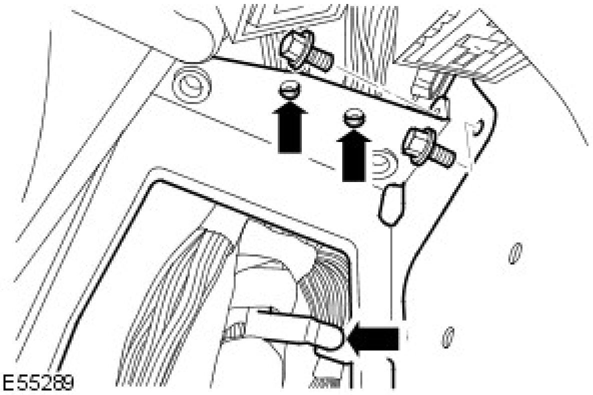
12. Disconnect the battery positive cable from the BJB.

- Remove the nut.



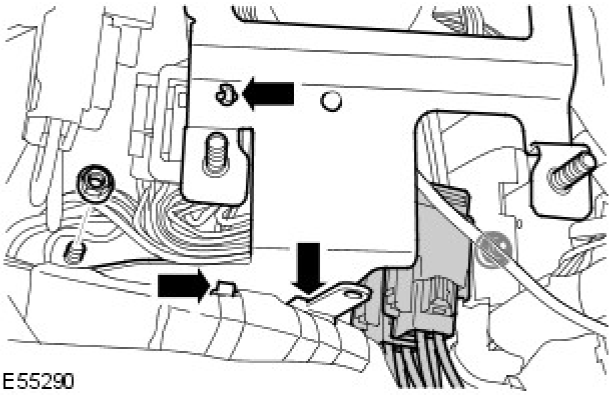
13. Remove both cowl side trim panels.
For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

14. Remove the CJB.
For additional information, refer to: Central Junction Box (CJB) (418-00 Module Communications Network, Removal and Installation).


E55289

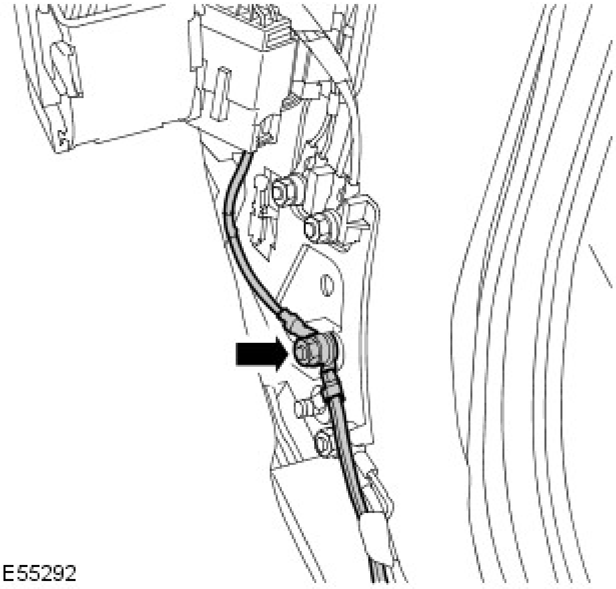
15. Release the CJB bracket.

- Release the 3 upper wiring harness clips.
- Remove the 2 bolts.


E55290

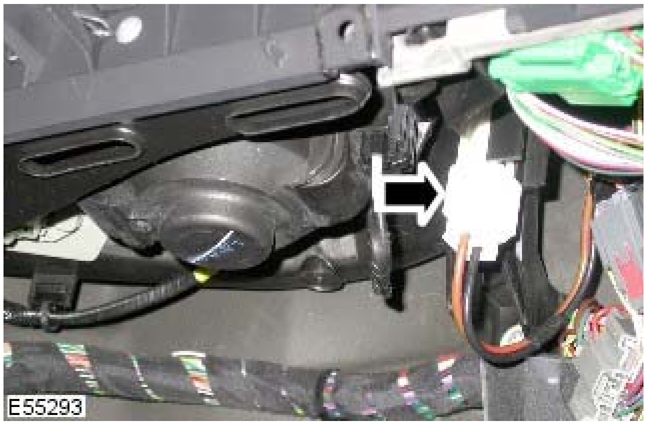
16. Remove the CJB bracket.

- Disconnect the 2 electrical connectors.
- Release the 3 lower wiring harness clips.
- Remove the 2 nuts.

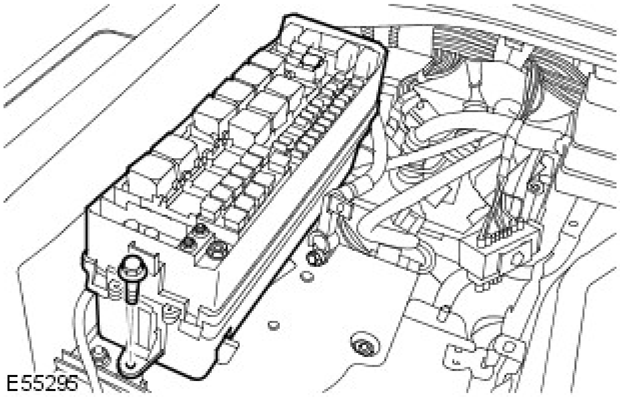

E55292

17. Release the 2 ground cables from the lower A-pillar.

- Remove the nut.

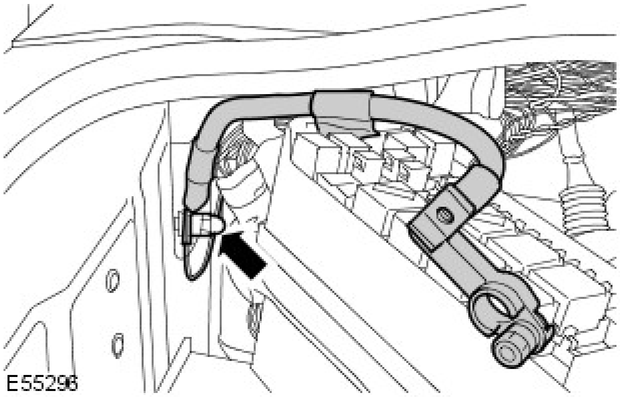


18. Disconnect the heater motor electrical connector.



19. Release the BJB from the bracket.

- Remove the bolt.

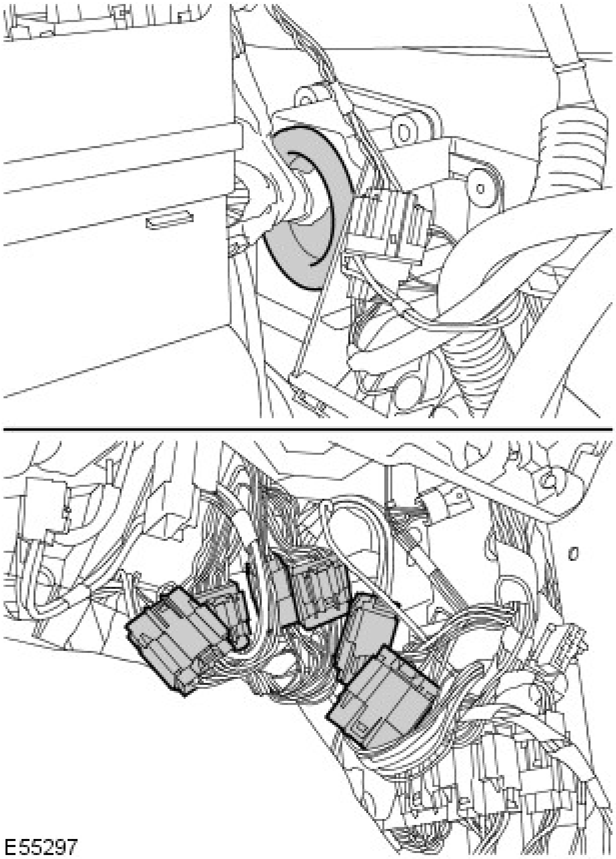


20. Remove the battery ground cable.

- Remove the nut.
- Release the additional ground cable.

21. Release the BJB wiring harness from the bulkhead.

- Disconnect the 6 electrical connectors.
- Release the grommet.



E55297

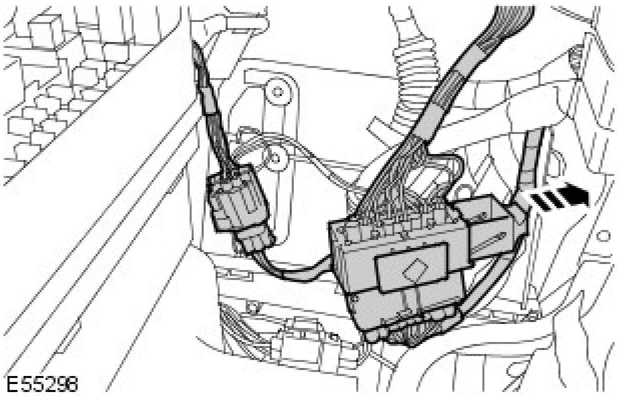
22. Raise and support the vehicle.

23. Remove both front fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

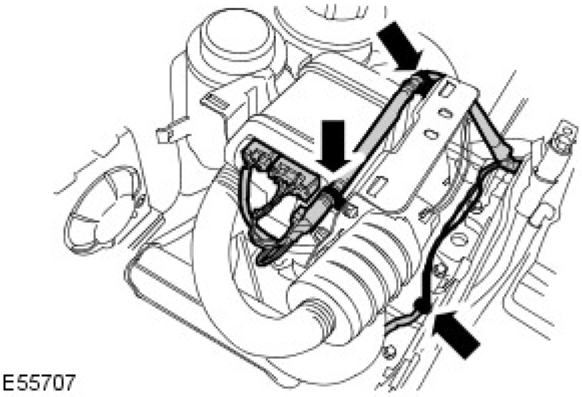
24. Remove both headlamps.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

25. Passenger side: Disconnect the engine wiring harness electrical connector.

26. Passenger side: Disconnect the transfer case electrical connector.

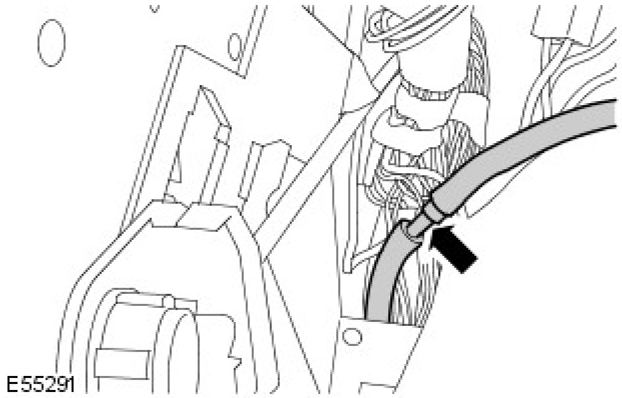


E55298

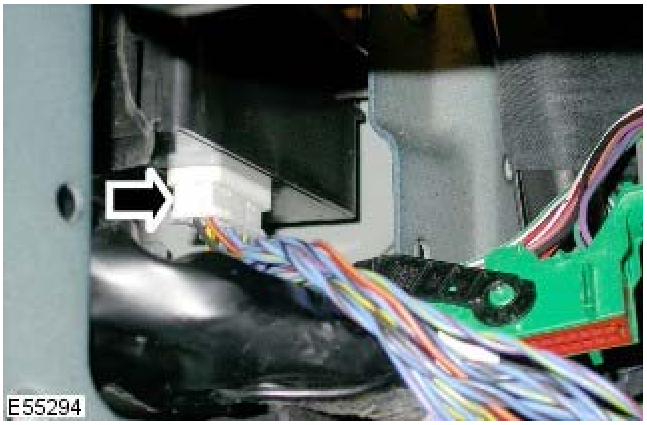


27. LH side: Release the wiring harness from the fuel fired heater.

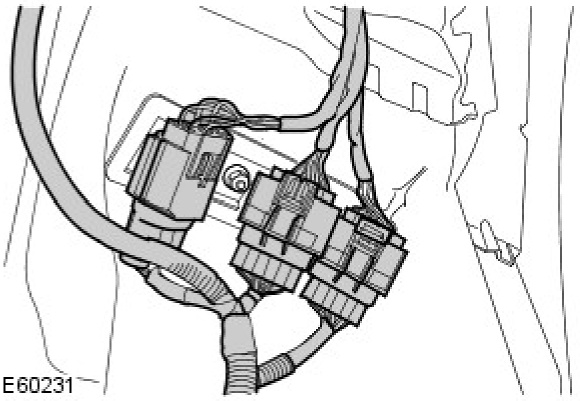
- Disconnect the 3 electrical connectors.
- Release the 3 clips.



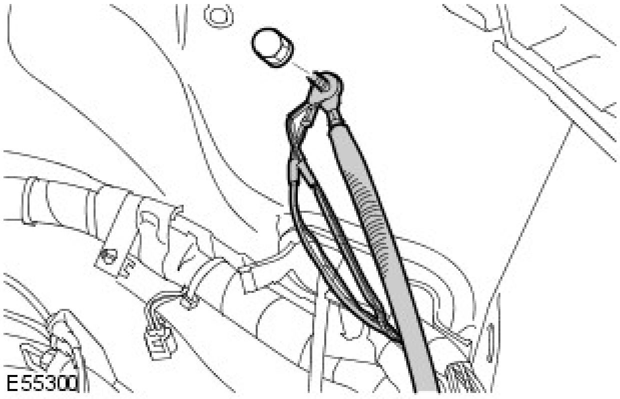
28. LH side: Disconnect the washer jet hose.



29. LH side: Disconnect the adaptive front lighting module electrical connector.



30. LH side: Disconnect the 3 body panel electrical connectors.



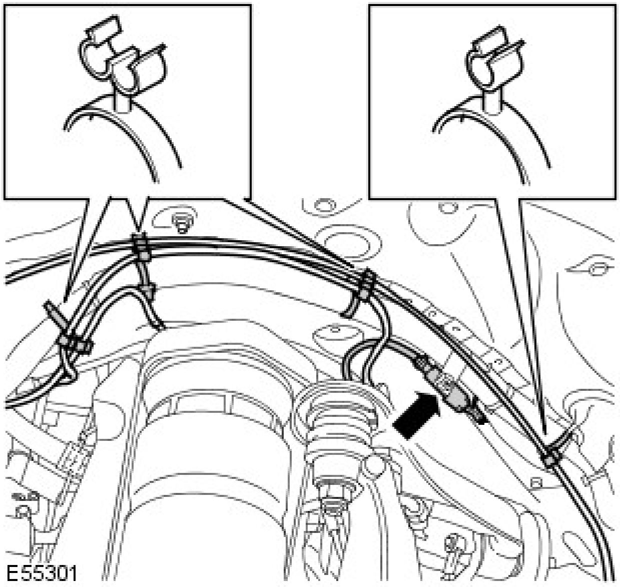
31. LH side: Release the 3 body panel ground cables.

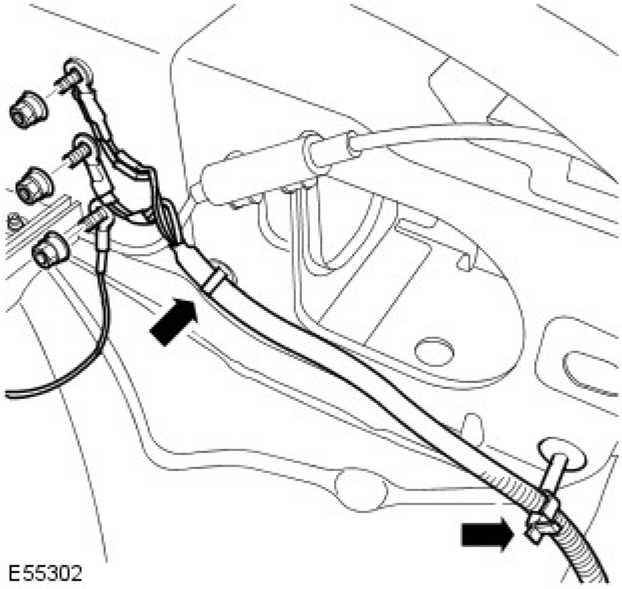
- Remove the nut.

32. LH side: Release the 2 air suspension pipes from the wiring harness.

- Release the 7 clips.

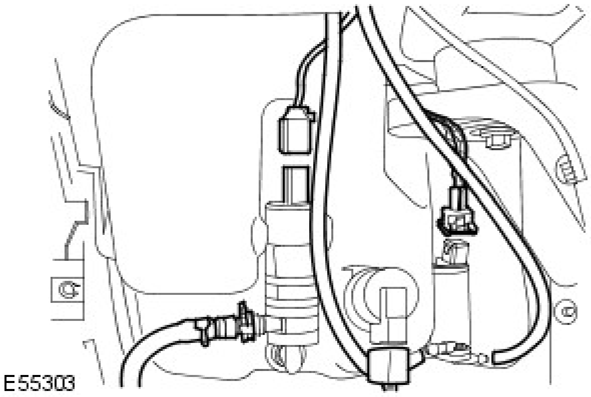
33. LH side: Disconnect the ABS electrical connector.





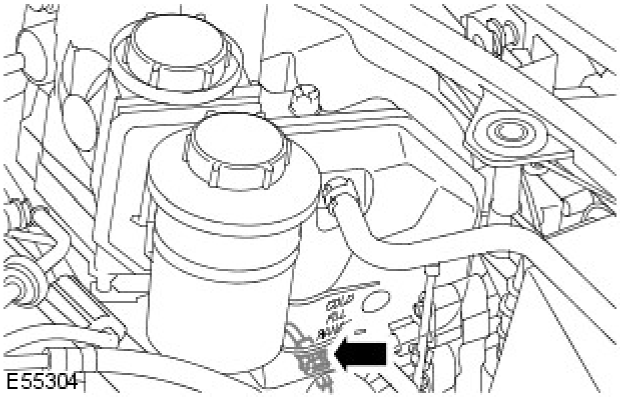
34. LH side: Release 3 engine compartment ground cables.

- Remove the 3 nuts.
- Release the 2 clips.



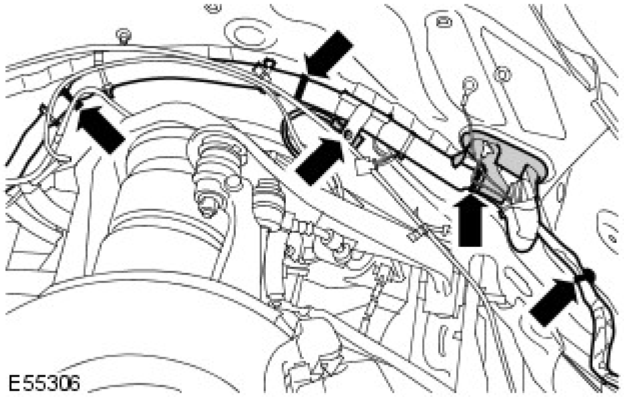
35. LH side: Release the washer reservoir wiring harness.

- Disconnect the 3 electrical connectors.
- Disconnect the 2 washer jet hoses.



36. LH side: Disconnect the coolant expansion tank level switch electrical connector.

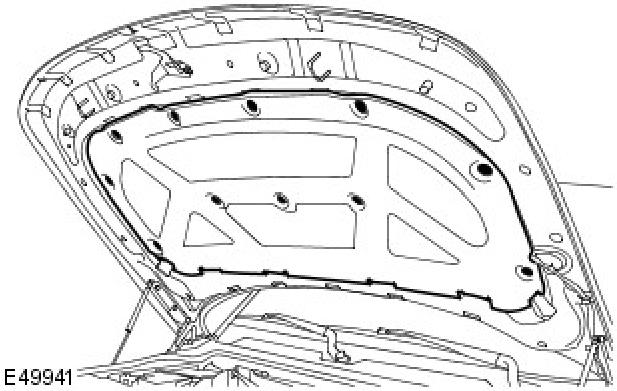
37. LH side: Disconnect the brake pad wear sensor electrical connector.



38. LH side: Release the wiring harness.

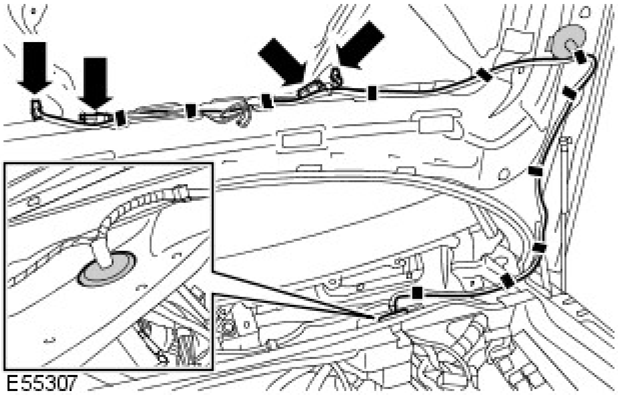
- Release the grommet.
- Release the 4 clips.

39. Remove the windshield wiper motor.
For additional information, refer to: Windshield Wiper Motor (501-16 Wipers and Washers, Removal and Installation).



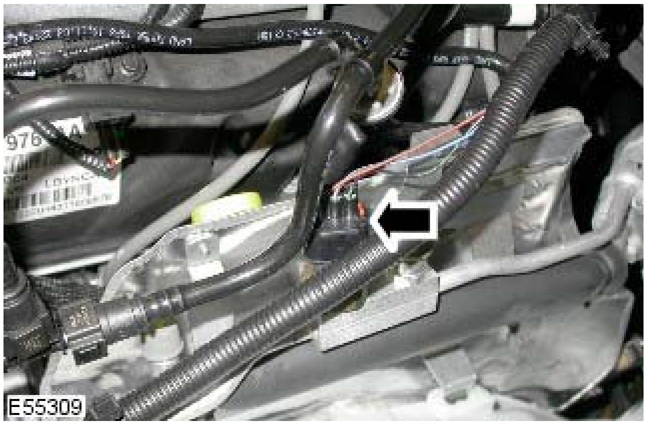
40. Remove the hood pad.

- Remove the 11 clips.

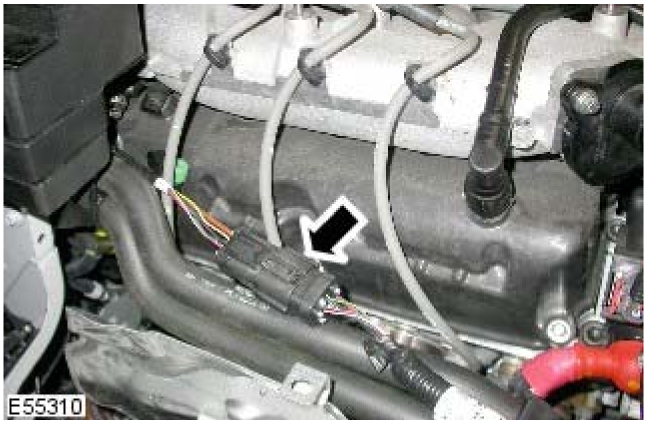


41. Release the hood wiring harness.

- Disconnect the 2 washer jet hoses.
- Disconnect the 2 electrical connectors.
- Release the 10 clips.
- Remove the wiring harness cover.
- Release the grommet.

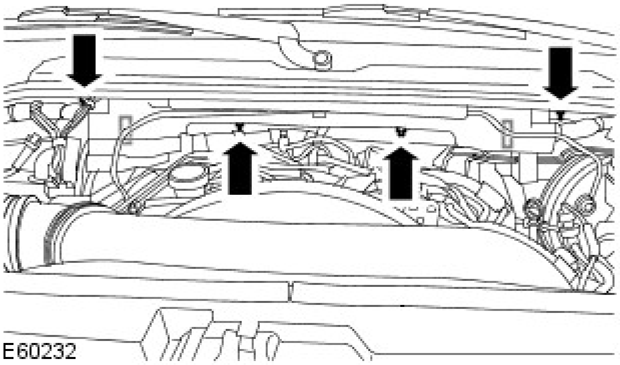


42. Disconnect the A/C pressure transducer electrical connector.



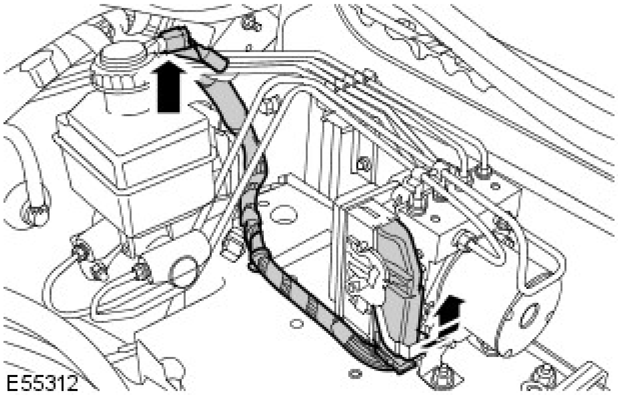
43. NOTE: 4.0L illustration shown, 2.7L Diesel is similar.

Disconnect the battery to engine compartment wiring harness electrical connector.



44. Release the wiring harness from the plenum.

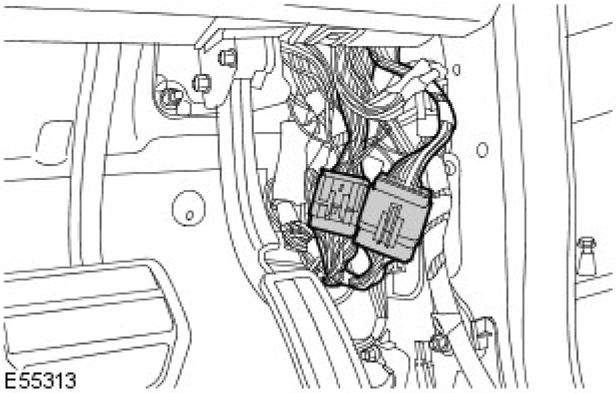
- Remove the 3 nuts.
- Release the clip.



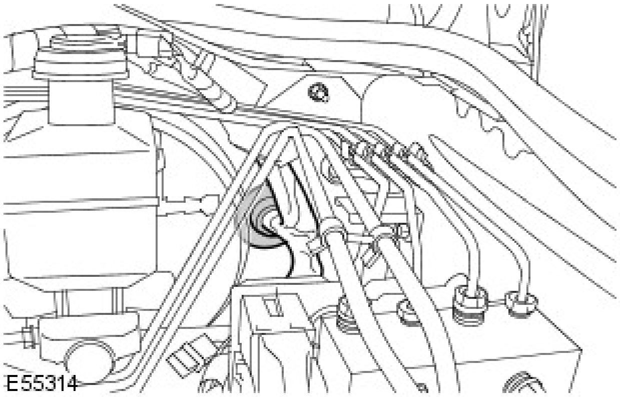
45. Disconnect the brake fluid reservoir electrical connector.

46. Disconnect the ABS module electrical connector.

47. Remove the air suspension control module.
For additional information, refer to: Air Suspension Control Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

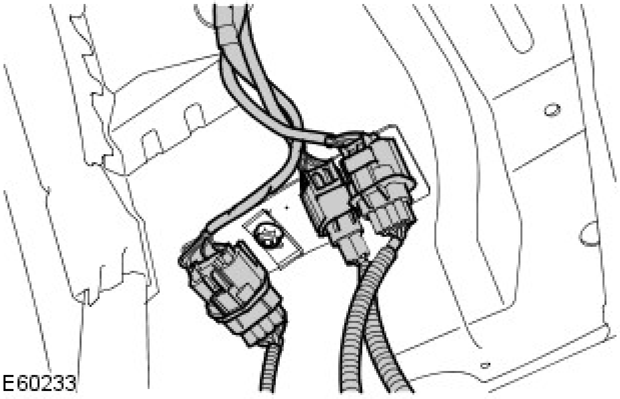


48. Driver side: Disconnect 2 electrical connectors from the lower A-pillar.

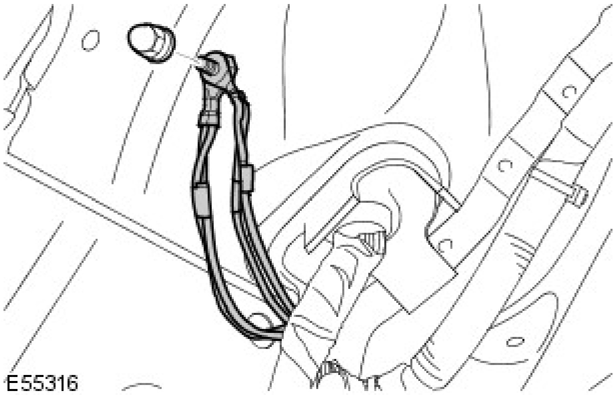


49. Driver side: Release the wiring harness from the bulkhead.

- Release the grommet.



50. RH side: Disconnect the 3 body panel electrical connectors.

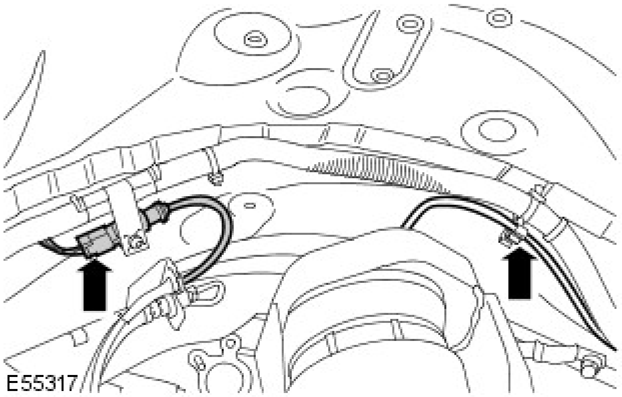

E55316

51. RH side: Release the 3 body panel ground cables.

- Remove the nut.

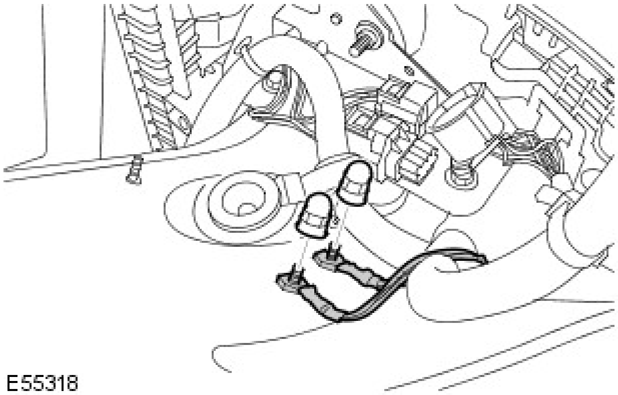
52. RH side: Disconnect the ABS electrical connector.

53. RH side front: Release the air suspension pipe from the wiring harness clip.

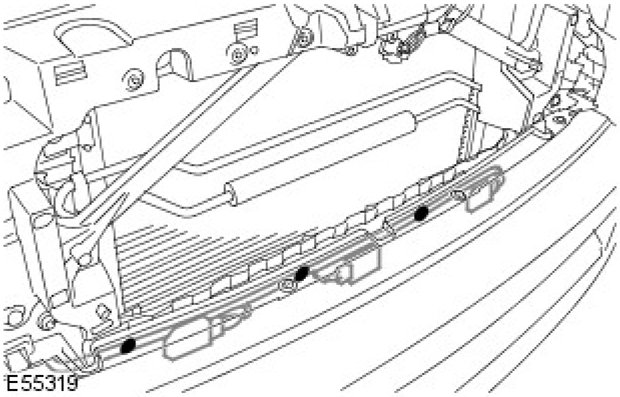

E55317

54. RH side: Release 2 engine compartment ground cables.

- Remove the 2 nuts.

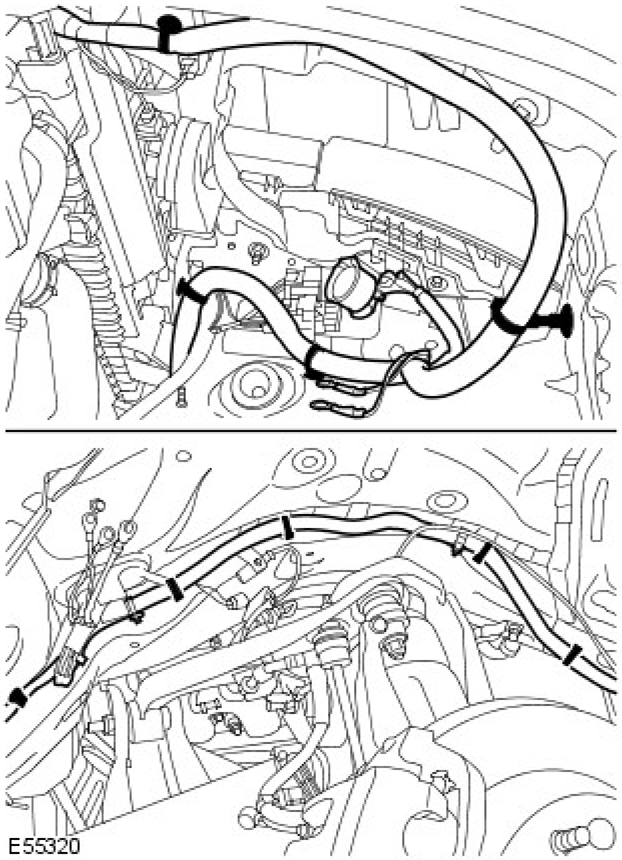

E55318

55. Disconnect the ambient air temperature sensor electrical connector.



56. Disconnect both front impact severity sensor electrical connectors.

- Release the 3 clips.

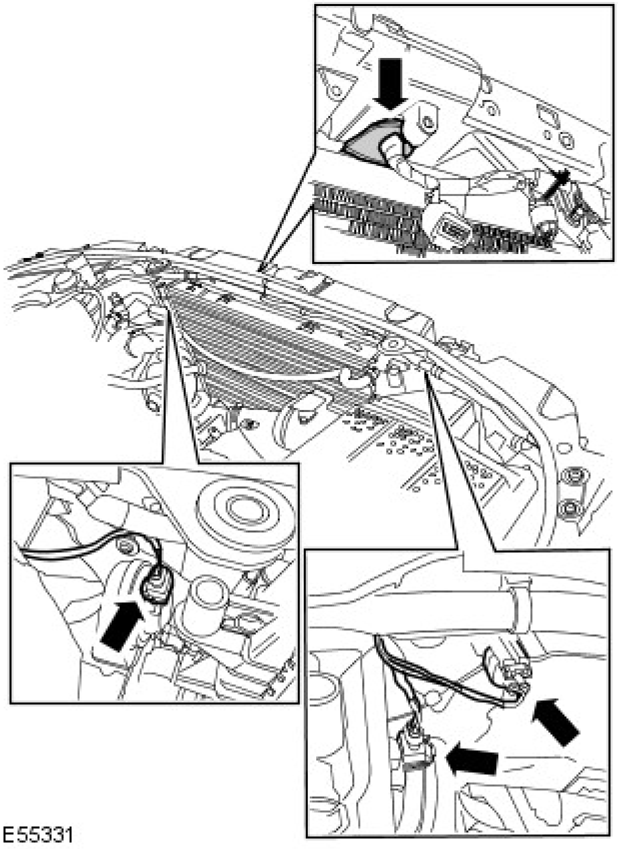


57. RH side: Release the wiring harness.

- Release the 9 clips.

58. Disconnect the hood switch electrical connector.

59. Disconnect both horn electrical connectors.



60. If installed, disconnect the speed control module electrical connector.

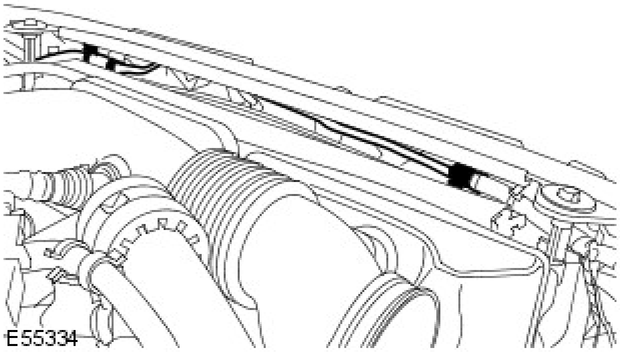
61. If installed, disconnect the pollution sensor electrical connector.

- Release the clip.
- Release the grommet.

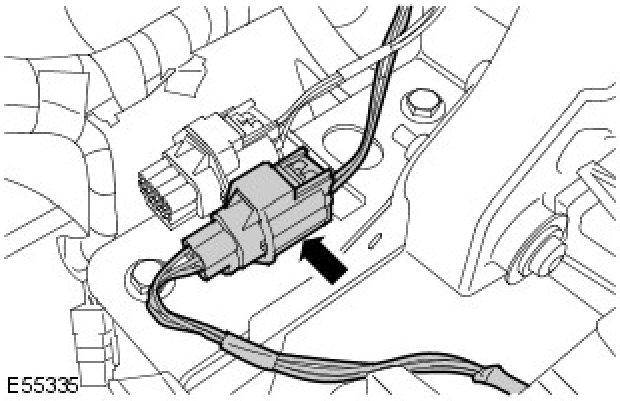
62. NOTE: 4.0L illustration shown, 2.7L Diesel is similar.

Release the hood release cable.

- Release from the 3 clips.



63. Disconnect the front bumper wiring harness electrical connector.



64. With assistance, remove the BJB and wiring harness.

Installation

1. With assistance, install the BJB and wiring harness.

2. Connect the front bumper wiring harness electrical connector.

3. Attach the hood release cable.

- Secure with the clips.

4. If installed, connect the pollution sensor electrical connector.

- Install the grommet.
- Secure the clip.

5. If installed, connect the speed control module electrical connector.

6. Connect the horn electrical connectors.

7. Connect the hood switch electrical connector.

8. RH side: Secure the wiring harness.

- Secure the clips.

9. Connect both front impact electrical connectors.

- Secure the clips.

10. RH side: Attach the air suspension pipe.

11. Connect the ambient air temperature sensor electrical connector.

12. RH side: Attach the engine compartment ground cables.

- Tighten the nuts to 25 Nm (18 lb.ft).

13. RH side: Connect the ABS electrical connector.

14. RH side: Attach the body panel ground cables.

- Tighten the nut to 25 Nm (18 lb.ft).

15. RH side: Connect the body panel electrical connectors.

16. Driver side: Attach the wiring harness to the bulkhead.

- Install the grommet.

17. Driver side: Connect the lower A-pillar electrical connectors.

18. Install the air suspension control module.
For additional information, refer to: Air Suspension Control Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

19. Connect the ABS module electrical connector.

20. Connect the brake fluid reservoir electrical connector.

21. Attach the wiring harness to the plenum.

- Secure the clips.
- Tighten the nuts to 4 Nm (3 lb.ft).

22. Connect the battery to engine compartment wiring harness electrical connector.

23. Connect the A/C pressure transducer electrical connector.

24. Attach the hood wiring harness.

- Install the grommet.
- Install the cover.
- Secure with the clips.
- Connect the electrical connectors.
- Connect the washer jet hoses.

25. Install the hood pad.

- Install the clips.

26. Install the windshield wiper motor.
For additional information, refer to: Windshield Wiper Motor (501-16 Wipers and Washers, Removal and Installation).

27. LH side: Attach the wiring harness.

- Install the grommet.
- Secure the clips.

28. LH side: Connect the brake pad wear sensor electrical connector.

29. LH side: Connect the coolant expansion tank level switch electrical connector.

30. LH side: Attach the washer reservoir wiring harness.

- Connect the washer jet hoses.
- Connect the electrical connectors.

31. LH side: Attach the engine compartment ground cables.

- Secure the clips.
- Tighten the nuts to 25 Nm (18 lb.ft).

32. LH side: Connect the ABS electrical connector.

33. LH side: Attach the air suspension pipes.

- Secure the clips.

34. LH side: Attach the body panel ground cables.

- Tighten the nut to 25 Nm (18 lb.ft).

35. LH side: Connect the body panel electrical connectors.

36. LH side: Connect the adaptive front lighting module electrical connector.

37. LH side: Connect the washer jet hose.

38. LH side: Attach the wiring harness to the fuel fired heater.

- Connect the electrical connectors.
- Secure with the clips.

39. Passenger side: Connect the transfer case electrical connector.

40. Passenger side: Connect the engine wiring harness electrical connector.

41. Install the headlamps.
For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).

42. Install the fender splash shields.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

43. Attach the BJB wiring harness to the bulkhead.

- Connect the electrical connectors.
- Install the grommet.

44. Install the battery ground cable.

- Attach the additional ground cable.
- Tighten the nut to 25 Nm (18 lb.ft).

45. Secure the BJB to the bracket.

- Tighten the bolt to 6 Nm (4 lb.ft).

46. Connect the heater motor electrical connector.

47. Connect the ground cables to the lower A-pillar.

- Tighten the nut to 10 Nm (7 lb.ft).

48. Install the CJB bracket.

- Tighten the nuts to 10 Nm (7 lb.ft).
- Secure the clips.
- Connect the electrical connectors.
- Tighten the bolts to 25 Nm (18 lb.ft).

49. Install the CJB.
For additional information, refer to: Central Junction Box (CJB) (418-00 Module Communications Network, Removal and Installation).

50. Connect the battery positive cable to the BJB.

- Tighten the nut to 25 Nm (18 lb.ft).

51. Install the BJB cover.

- Secure the clip.

52. Install the ECM.

- Install the ECM top cover.

53. Install the ECM cover.

- Tighten the Torx screws.
- Connect the electrical connectors.

54. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

55. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

56. Install the four-wheel drive control module.
For additional information, refer to: Four-Wheel Drive (4WD) Control Module (308-07A Four-Wheel Drive Systems, Removal and Installation).

57. Install the air cleaner assembly.

58. Install the radiator grille.
For additional information, refer to: Radiator Grille (501-08 Exterior Trim and Ornamentation, Removal and Installation).

59. Install the engine cover.
For additional information, refer to: Engine Cover - TDV6 2.7L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

60. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

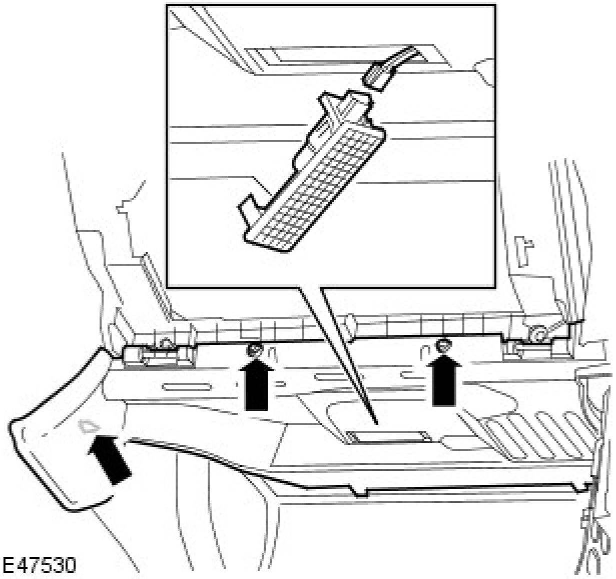
Published: 11-May-2011

Module Communications Network - Central Junction Box (CJB)

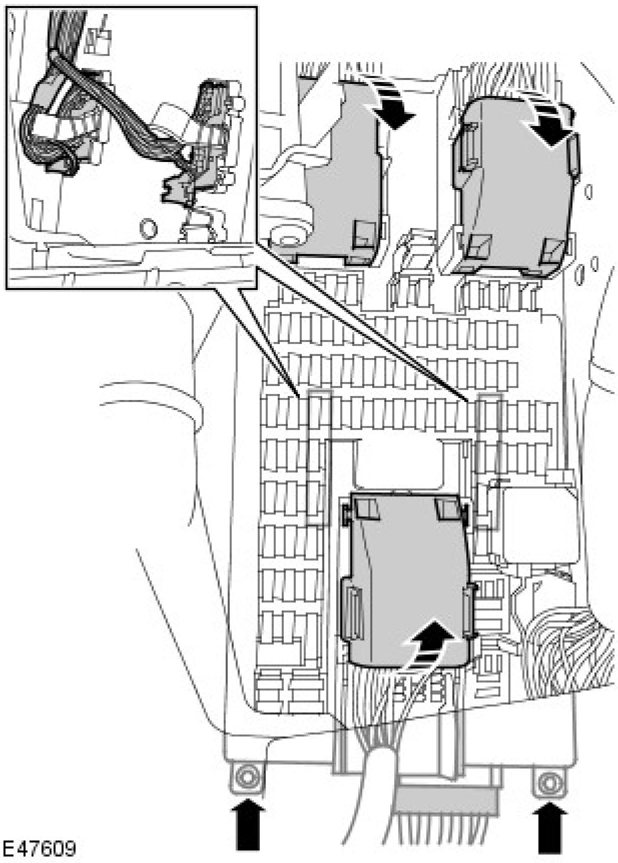
Removal and Installation

Removal

1. If the central junction box (CJB) is to be replaced, connect T4 to the vehicle.
2. Remove the glove compartment.
   For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).



3. Remove the passenger side closing trim panel.
   - Release the clip.
   - Remove the 2 screws.
   - Disconnect the electrical connector.



4. Remove the CJB.

- Remove the 2 nuts.
- Disconnect the 6 electrical connectors.

Installation

1. Install the CJB.

- Connect the electrical connectors.
- Tighten the nuts to 10 Nm (7 lb.ft).

2. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.

3. Install the glove compartment.
For additional information, refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).

4. Initiate a new CJB using T4.

Published: 11-May-2011

Wiring Harnesses - Engine Wiring HarnessTDV8 3.6L Diesel

Removal and Installation

Removal

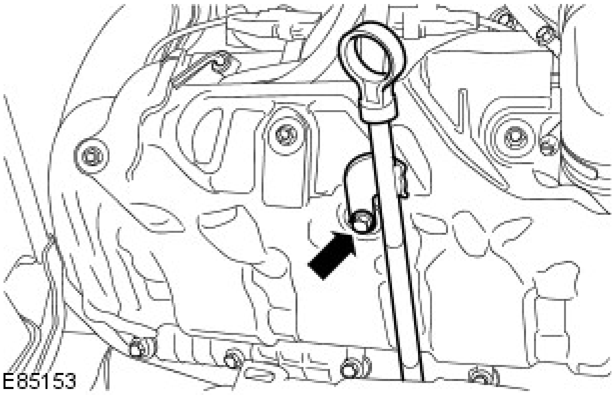
1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. ⚠ WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Remove the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

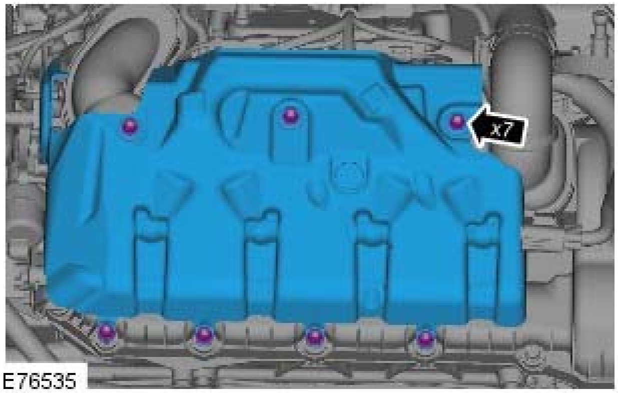
4. Remove the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).



5. ⚠ CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the oil level indicator and upper oil level indicator tube.

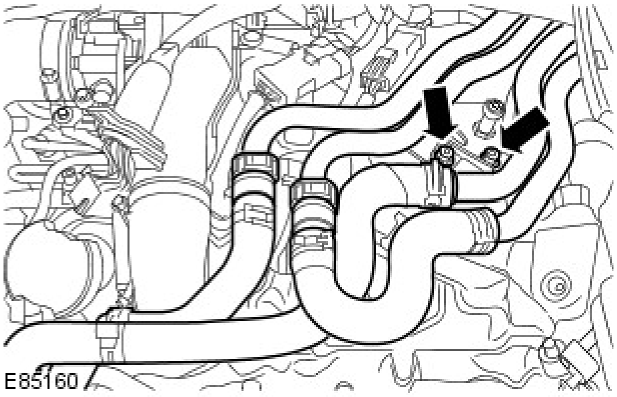
- Remove the bolt.
- Remove and discard the 2 O-ring seals.



6. Remove the RH fuel line shield.

- Remove the 7 nuts.

7. Remove the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

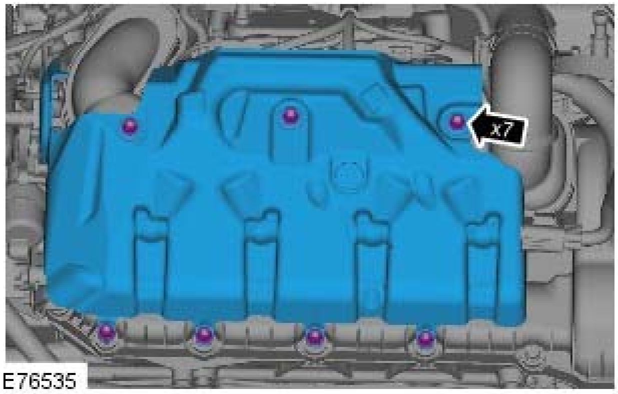


8. Release the coolant lines.

- Remove the 2 nuts.

9. Remove the oil filler cap.

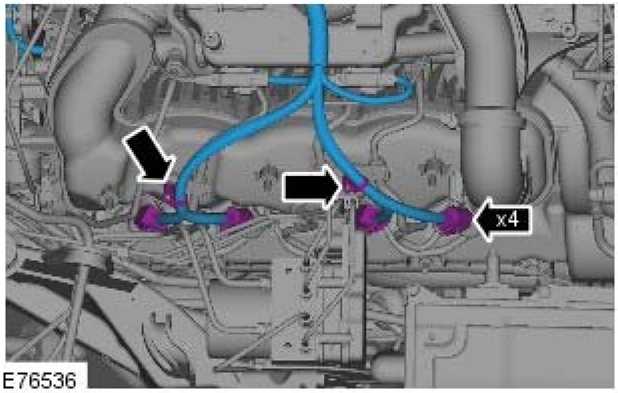
- Remove and discard the O-ring seal.



10. NOTE: RH illustration shown, LH is similar

Remove the LH fuel line shield.

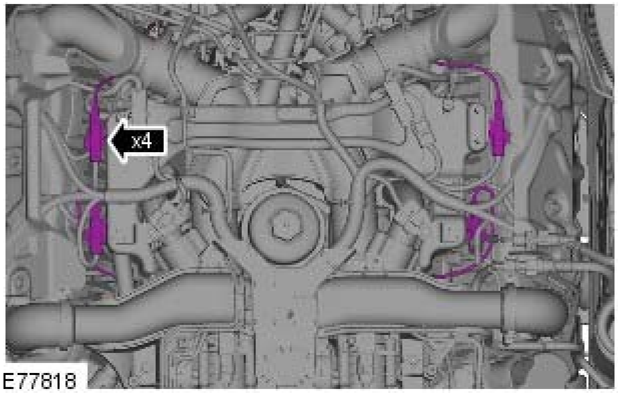
- Remove the 7 nuts.



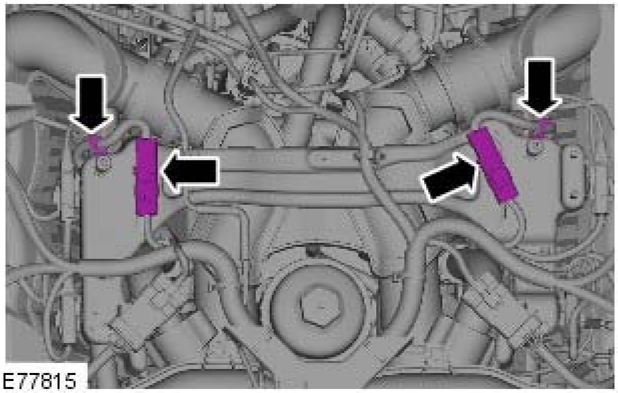
11. NOTE: RH illustration shown, LH is similar

Disconnect the 8 fuel injector electrical connectors.

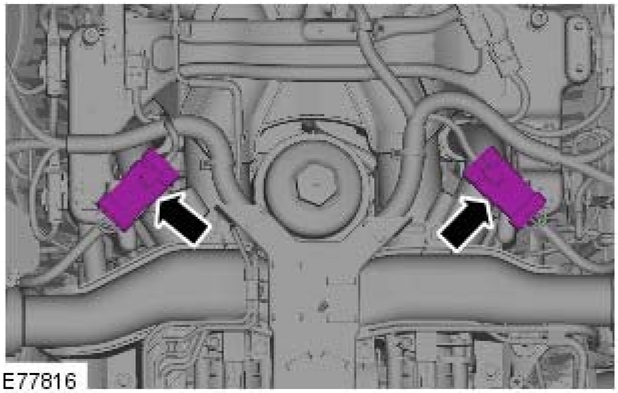
- Release the 4 wiring harness clips.



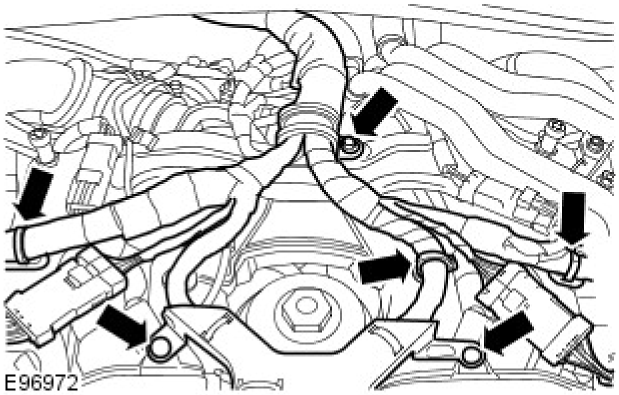
12. Disconnect the 4 knock sensor (KS) electrical connectors.



13. Disconnect both glow plug electrical connectors.



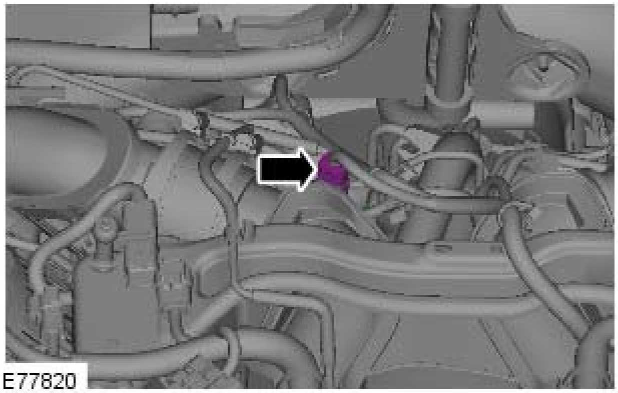
14. Disconnect both exhaust gas recirculation (EGR) valve electrical connectors.



15. Release the wiring harness.

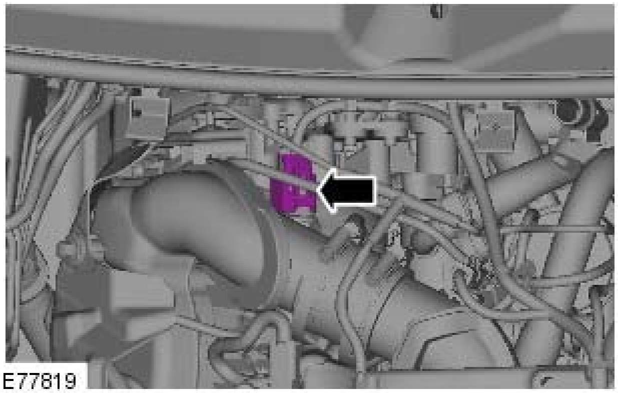
- Release the 5 clips.
- Remove the bolt.

16. Disconnect the fuel temperature sensor electrical connector.



E77820

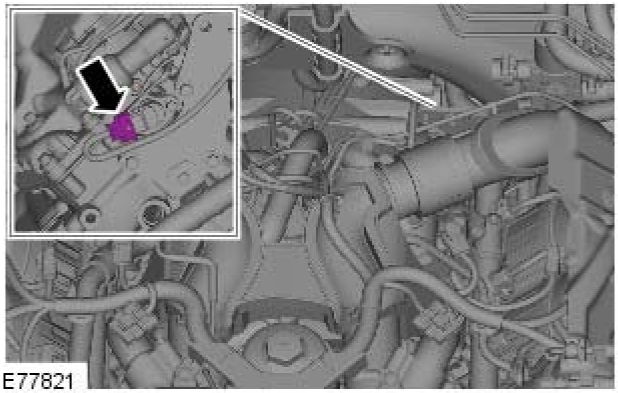
17. Disconnect the fuel rail pressure (FRP) sensor electrical connector.



E77819

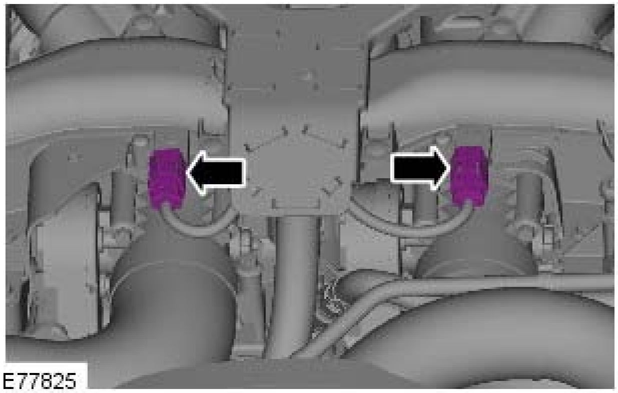
18. Disconnect the camshaft position (CMP) sensor electrical connector.

- Release the 3 wiring harness clips.



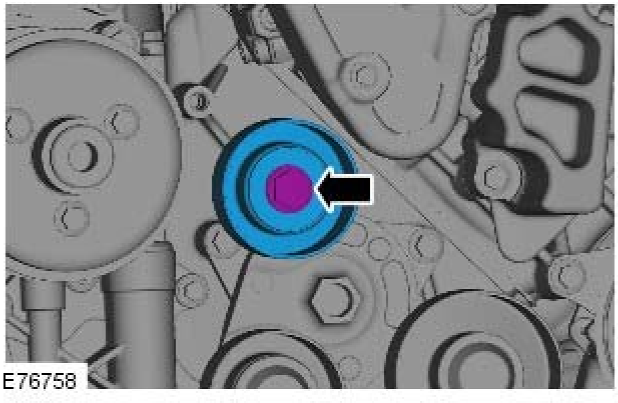
E77821

19. Disconnect both manifold absolute pressure and temperature (MAPT) sensor electrical connectors.



E77825

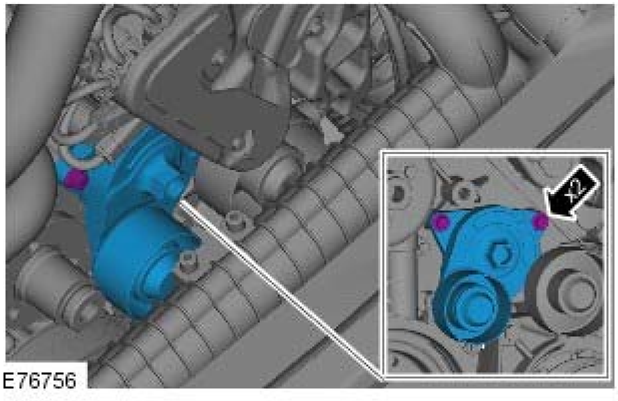
20. Remove the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and Installation).



21. NOTE: The bolt and spacer will remain captive to the accessory drive belt idler pulley.

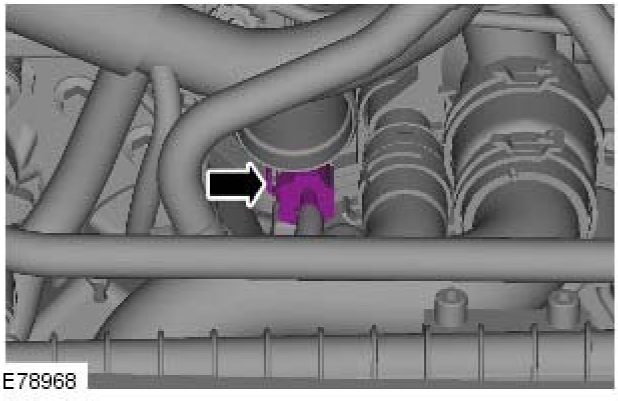
Remove the cooling fan belt idler pulley.

- Remove and discard the access cover.
- Fully loosen the bolt.



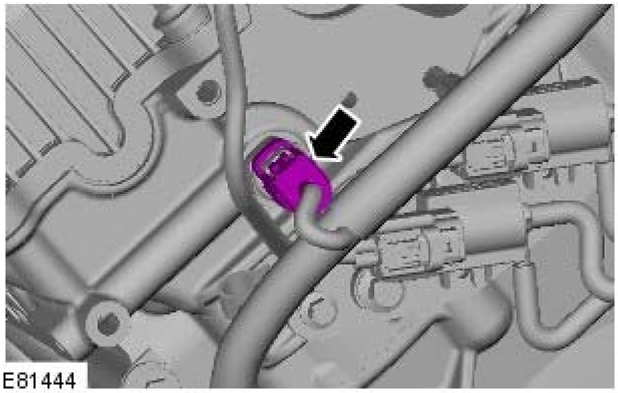
22. Remove the cooling fan belt tensioner.

- Remove the 2 bolts.

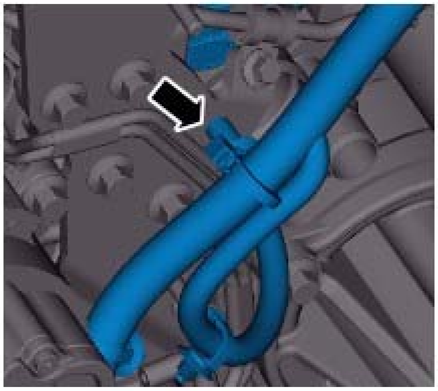


23. Disconnect the engine coolant temperature (ECT) sensor electrical connector.

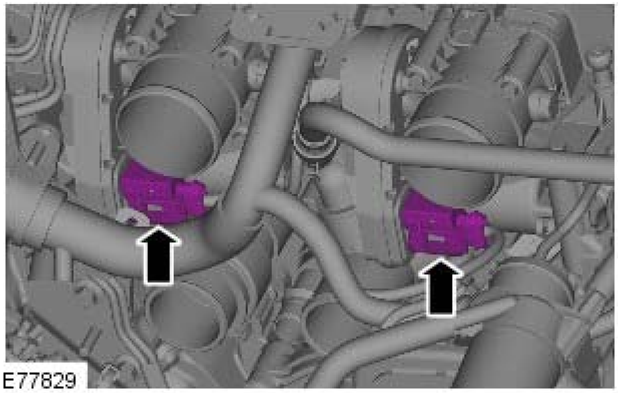
24. Disconnect the engine oil pressure (EOP) sensor electrical connector.



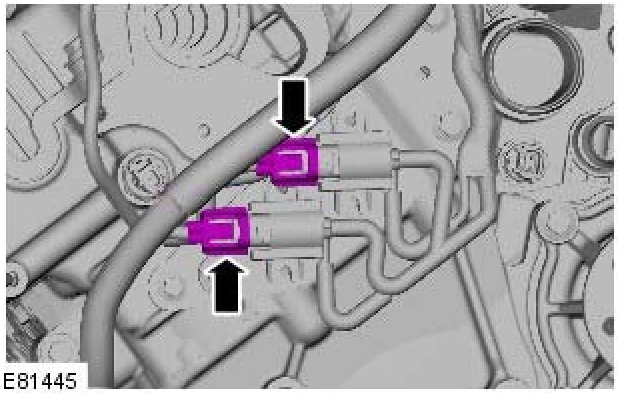
25. Release the wiring harness.



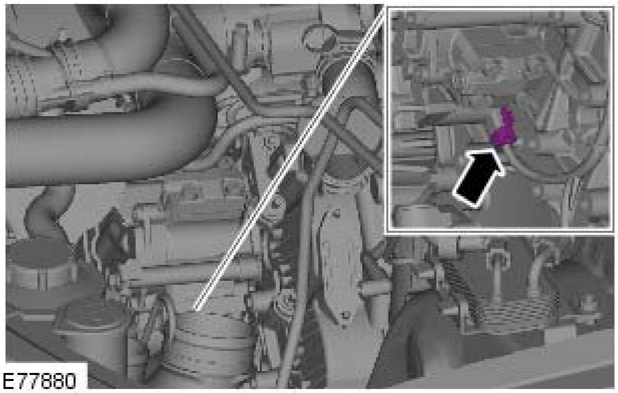
26. Disconnect both throttle body electrical connectors.



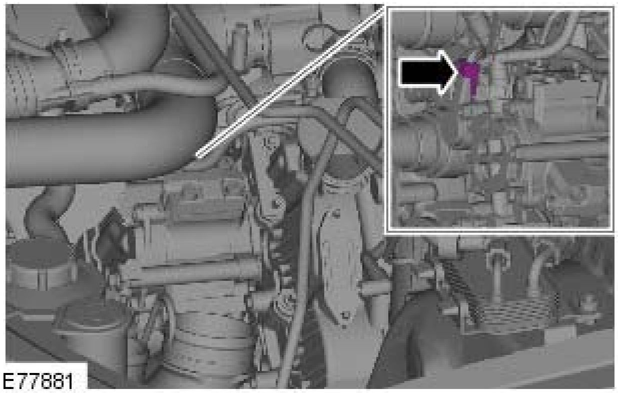
27. Disconnect both vacuum solenoid electrical connectors.



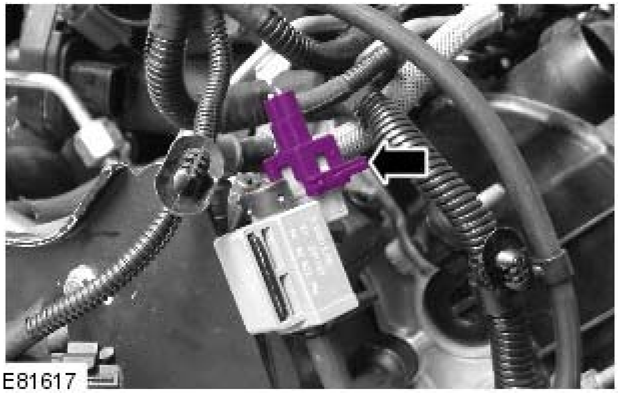
28. Disconnect the fuel metering valve electrical connector.


E77880

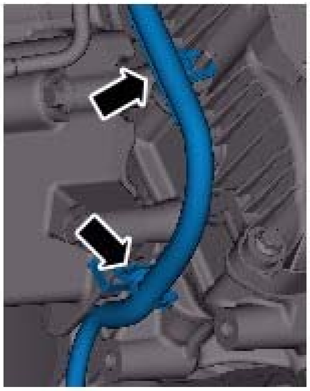
29. Disconnect the fuel injection control pressure sensor electrical connector.


E77881

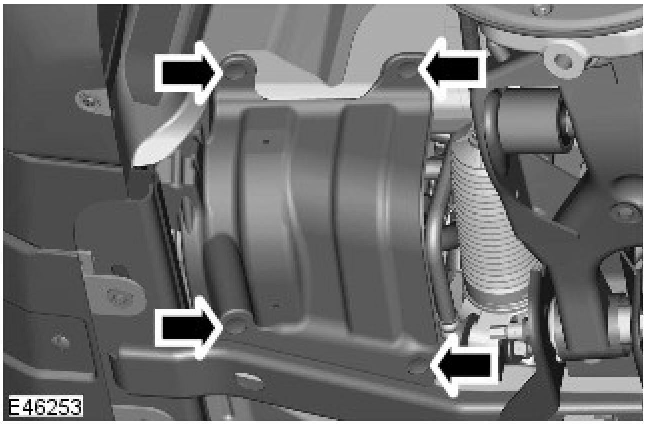
30. Disconnect the air suspension solenoid electrical connector.


E81617

31. Release the wiring harness.

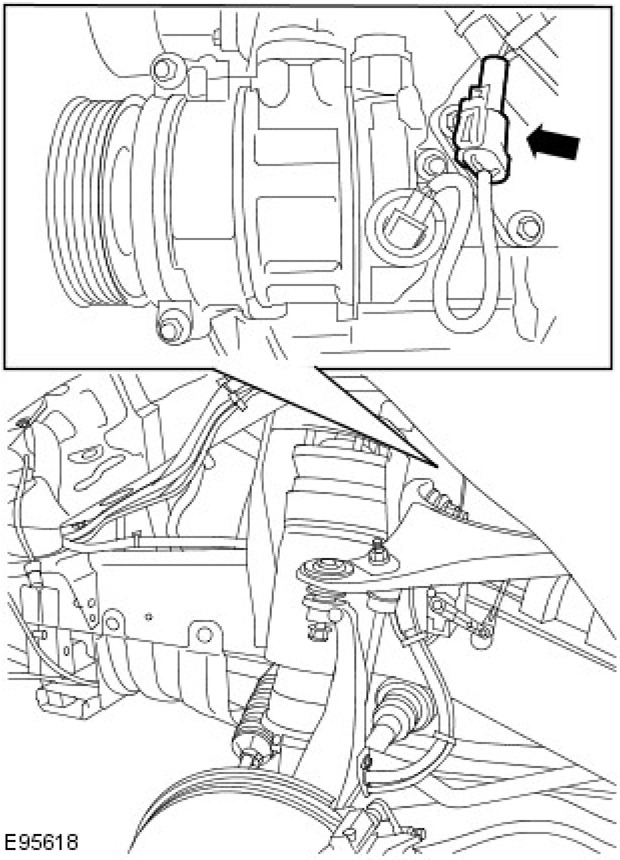

E95297

32. Remove the LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



33. Remove the front LH splash shield.

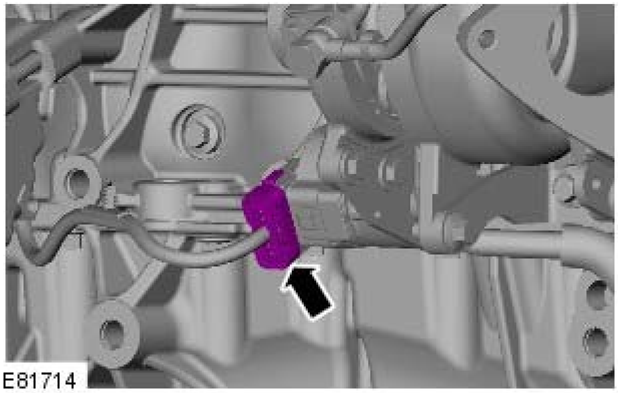
- Remove the 4 clips.



34. Disconnect the air conditioning (A/C) compressor electrical connector.

- Release the A/C compressor electrical connector from the bracket.

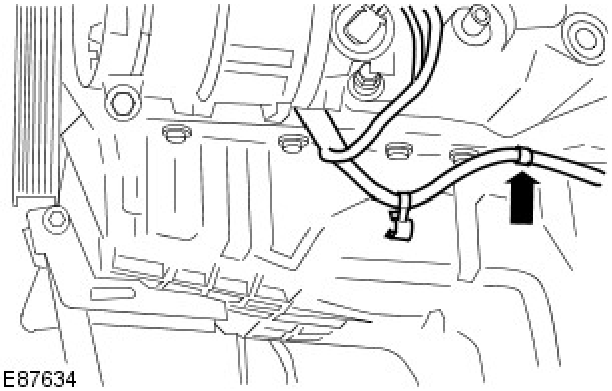
35. Disconnect the LH turbocharger electrical connector.



E81714

36. NOTE: RH illustration shown, LH is similar

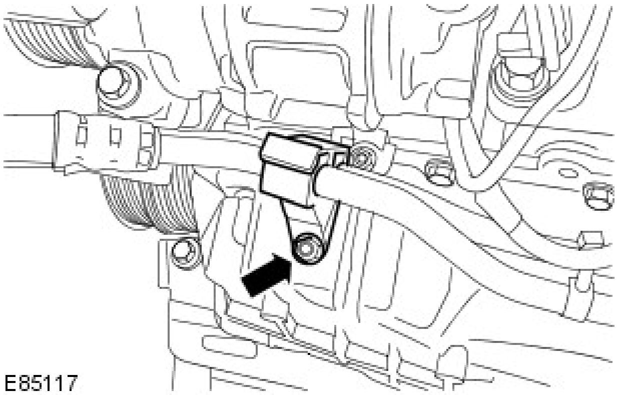
Release the wiring harness from the oil pan.



E87634

37. Release the transmission cooler line support bracket.

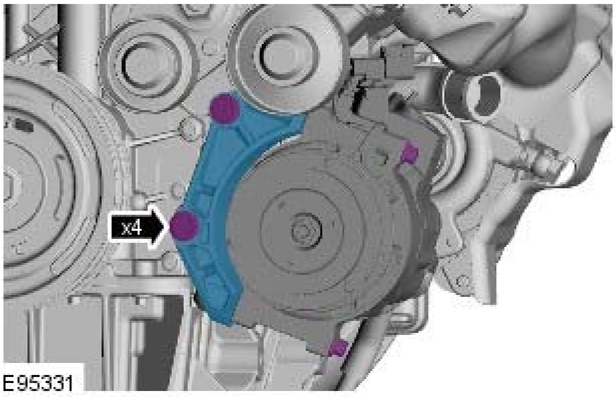
- Remove the nut.



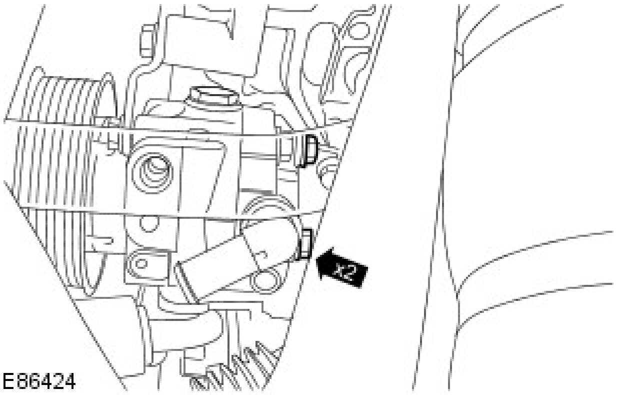
E85117

38. Remove the A/C support bracket.

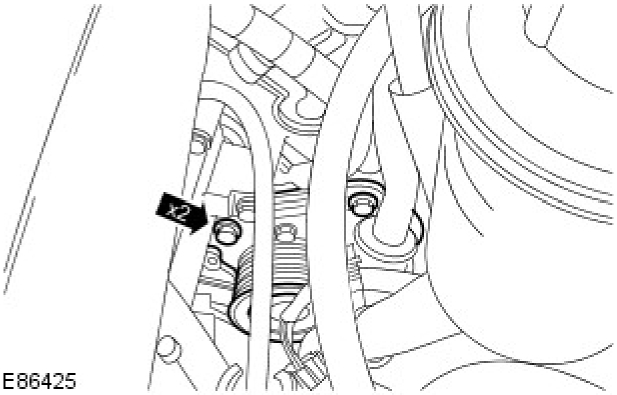
- Remove the 4 bolts.



E95331

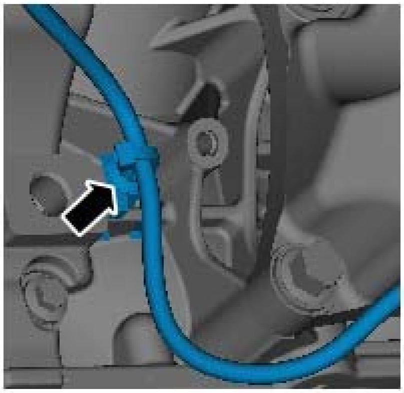


39. Remove the 2 power steering pump rear bolts.



40. Release the power steering pump.

- Remove the power steering pump 2 front bolts.



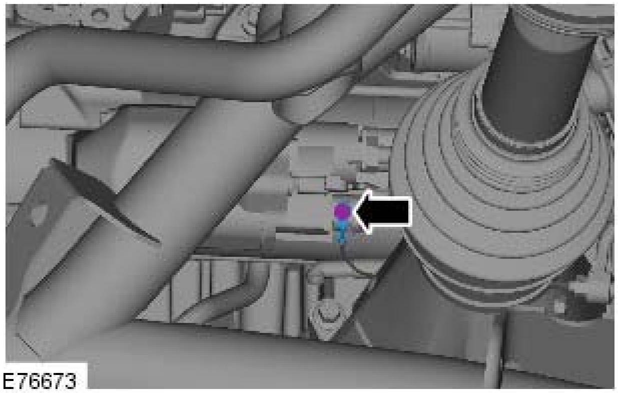
41. Release and reposition the wiring harness.

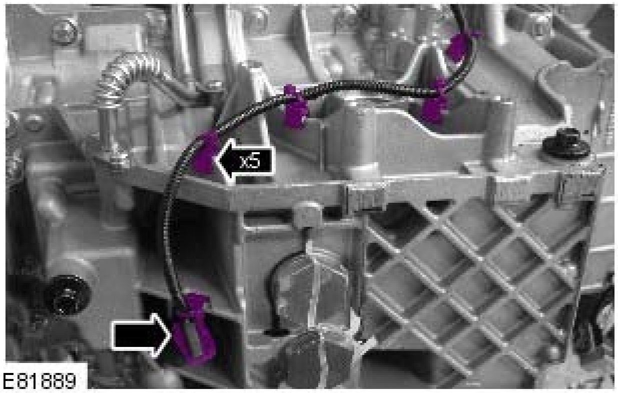
- Release the wiring harness clip.

42. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

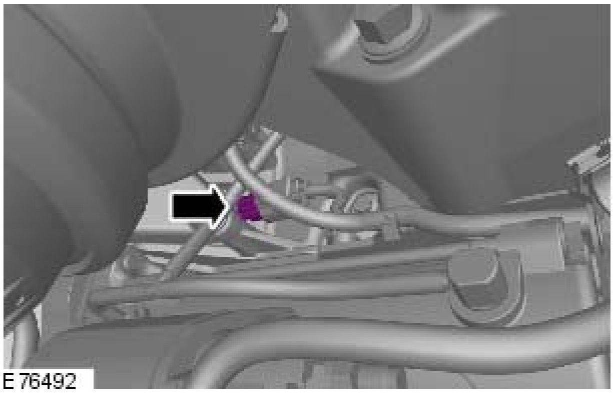
43. Disconnect the switch lead from the starter motor solenoid.

- Remove the bolt.

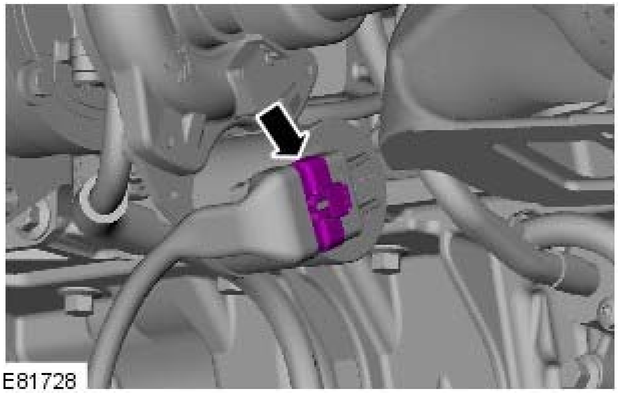




44. Disconnect the engine oil temperature sensor electrical connector.



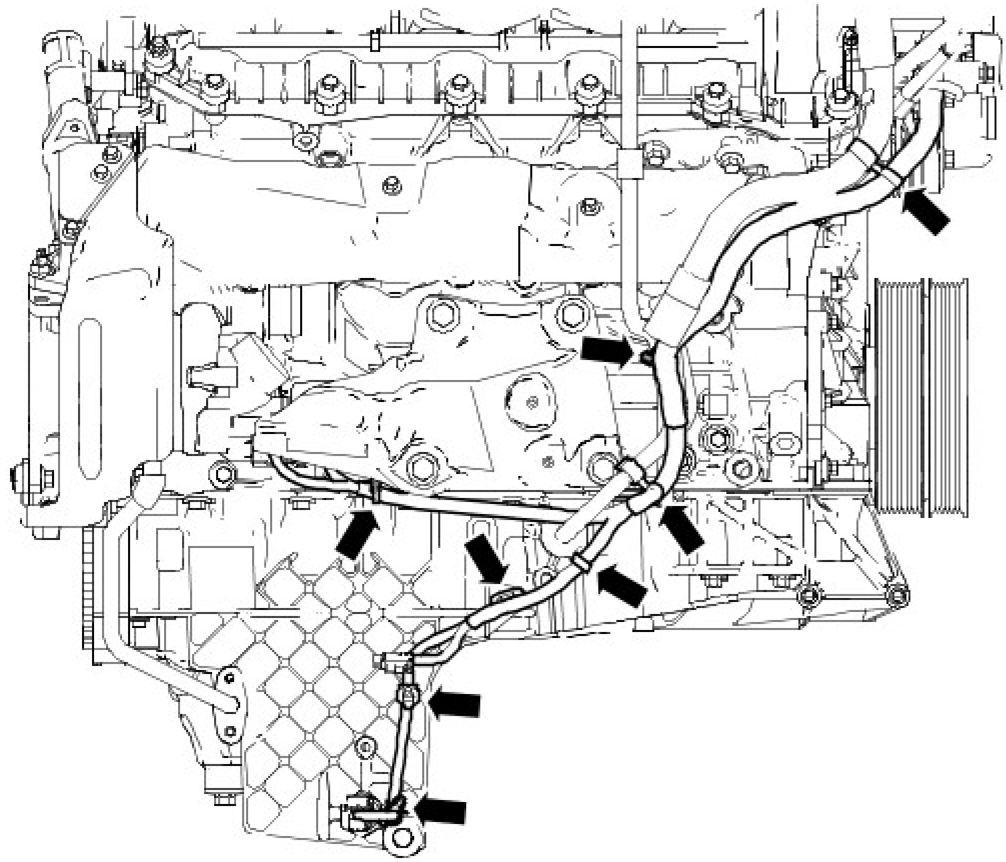
45. Disconnect the crankshaft position (CKP) sensor electrical connector.



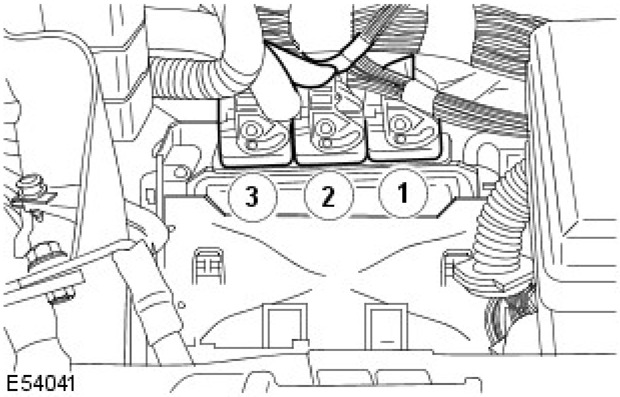
46. Disconnect the RH turbocharger electrical connector.

47. Release and reposition the wiring harness.

- Release the 8 clips.

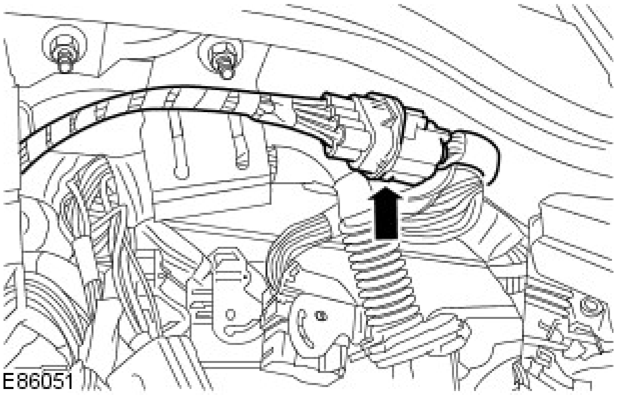


E95594



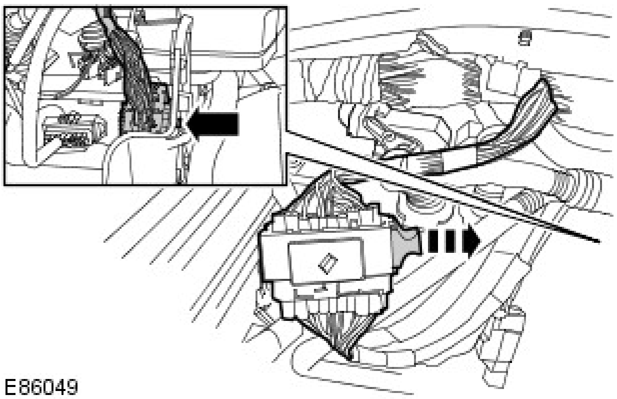
E54041

48. Disconnect the 3 electrical connectors from the engine control module (ECM).

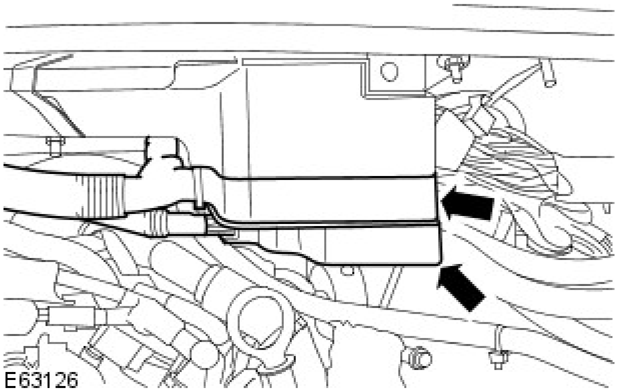


E86051

49. Disconnect the glow plug electrical connector.


E86049

50. Disconnect the engine wiring harness electrical connector.

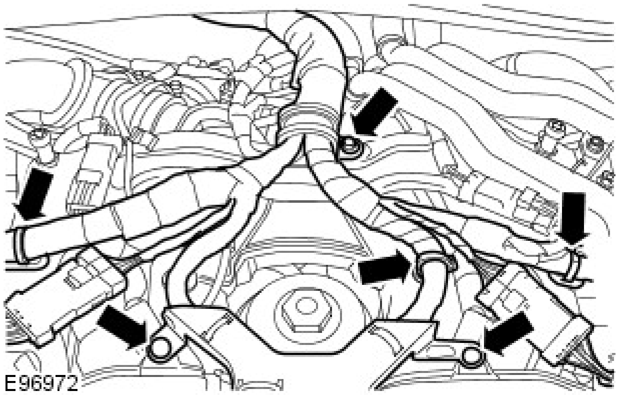

E63126

51. Release the engine wiring harness cassette and reposition the wiring harness.

- Release the 2 clips.

52. Remove the engine wiring harness.

Installation


E96972

1. Install the engine wiring harness.

- Tighten the bolt to 10 Nm (7 lb.ft).
- Secure with the clips.

2. Reposition the engine wiring harness and secure the wiring harness cassette.

- Secure the clips.

3. Connect the engine wiring harness electrical connector.

4. Connect the glow plug electrical connector.

5. Connect the ECM electrical connectors.

6. Reposition and secure the wiring harness.

- Secure the clips.

7. Connect the RH turbocharger electrical connector.

8. Connect the CKP sensor electrical connector.

9. Connect the engine oil temperature sensor electrical connector.

10. Connect the switch lead to the starter motor solenoid.

- Tighten the bolt to 4 Nm (3 lb.ft).

11. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

12. Reposition and secure the wiring harness.

- Secure the clip.

13. Secure the power steering pump.

- Tighten the bolts to 23 Nm (17 lb.ft).

14. Install the A/C compressor support bracket.

- Tighten the M10 to 45 Nm (33 lb.ft).
- Tighten the M8 to 23 Nm (17 lb.ft).

15. Secure the transmission cooler line support bracket.

- Tighten the bolt to 10 Nm (7 lb.ft).

16. Secure the wiring harness.

17. Connect the LH turbocharger electrical connector.

18. Connect the A/C compressor electrical connector.

- Secure the A/C compressor electrical connector to the bracket.

19. Install the front LH splash shield.

- Install the clips.

20. Install the front LH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

21. Secure the wiring harness.

22. Connect the air suspension solenoid electrical connector.

23. Connect the fuel injection control pressure sensor electrical connector.

24. Connect the fuel metering valve electrical connector.

25. Connect the vacuum solenoid electrical connectors.

26. Connect the throttle body electrical connectors.

27. Secure the wiring harness.

28. Connect the EOP sensor electrical connector.

29. Connect the ECT sensor electrical connector.

30. Install the cooling fan belt tensioner.

- Tighten the bolts to 25 Nm (18 lb.ft).

31. Install the cooling fan belt idler pulley.

- Tighten the bolt to 48 Nm (35 lb.ft).
- Install a new access cover.

32. Install the generator.
For additional information, refer to: Generator (414-02D Generator and Regulator - TDV8 3.6L Diesel, Removal and

Installation).

33. Connect both MAPT sensor electrical connectors.

34. Connect the CMP sensor electrical connector.

- Secure the wiring harness clips.

35. Connect the FRP sensor electrical connector.

36. Connect the fuel temperature sensor electrical connector.

37. Secure the wiring harness.

38. Connect both EGR valve electrical connectors.

39. Connect the glow plug electrical connectors.

40. Connect the KS electrical connectors.

41. Connect the fuel injector electrical connectors.

- Secure the wiring harness clips.

42. Install the LH fuel line shield.

- Tighten the nuts to 5 Nm (4 lb.ft).

43. Install the oil filler cap.

- Install a new O-ring seal.

44. Secure the coolant lines.

- Tighten the bolt to 10 Nm (7 lb.ft).
- Tighten the nuts 10 Nm (7 lb.ft).

45. Install the battery tray.
For additional information, refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

46. Install the RH fuel line shield.

- Tighten the nuts to 5 Nm (4 lb.ft).

47. NOTE: Remove and discard the blanking caps.

Install the oil level indicator and upper oil level indicator tube.

- Clean the components mating faces.
- Install new O-ring seals.
- Tighten the bolt.

48. Install the auxiliary battery tray.
For additional information, refer to: Auxiliary Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).

49. Install the engine cover.
For additional information, refer to: Engine Cover - TDV8 3.6L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

50. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

Published: 11-May-2011

Wiring Harnesses - Wiring Harness

Description and Operation

Introduction

⚠CAUTION: Do **not** use any other heat shrink sleeve other than the approved glue lined heat shrink sleeve mentioned in the repair procedure.

The purpose of this document is to promote quick and efficient minor repair to harness connectors or cables using approved methods and the wiring harness repair kit. Repairs may only be made to cables and connectors which have been mechanically, **not electrically** damaged. It also applies where the whole extent of the damage can be clearly identified and rectified.

Care and neatness are essential requirements in making a perfect repair.

Caution:

At the time of this first issue of the Harness Repair Guide, do not approve repairs to any of the following circuits:

- Any media orientated system transport network harnesses.
- Supplement restraint system (SRS) firing circuits (Air bags).
- Link lead assembles, which are unique to safety critical circuits such as anti-lock brake system (ABS) and thermocouple circuits. An example of this is the ABS wheel speed sensors with moulded connectors.
- 4. Screened cables, leads and wiring harness(s).

If any harness(s) with defective electrical connector terminals or wires from the above circuits are a concern, new components must be installed.

Repair Kit

⚠CAUTION: Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

The wiring harness repair kit has been produced which comprises:

- Pre-terminated wiring harness(s) of different sizes and types
- Three sizes of butt splice connectors
- A selection of colored cable identification sleeves
- Two sizes of glue lined heat shrink sleeves
- Crimping pliers
- A wire cutter and insulation stripper
- An electrical connector terminal extraction handle and tips

A suitable heat source, for shrinking heat shrink sleeves will be required.

The pre-insulated diamond grip range of electrical connector terminals and in-line, butt splice connectors contained within the wiring harness repair kit are the **only** acceptable product for the repairs of wiring harnesses. The butt connectors not only grip the wire but also the insulation, making a very secure joint.

If an electrical connector terminal is not included in the wiring harness repair kit then approval for the repair is **NOT** given and in these circumstances a new wiring harness must be installed.

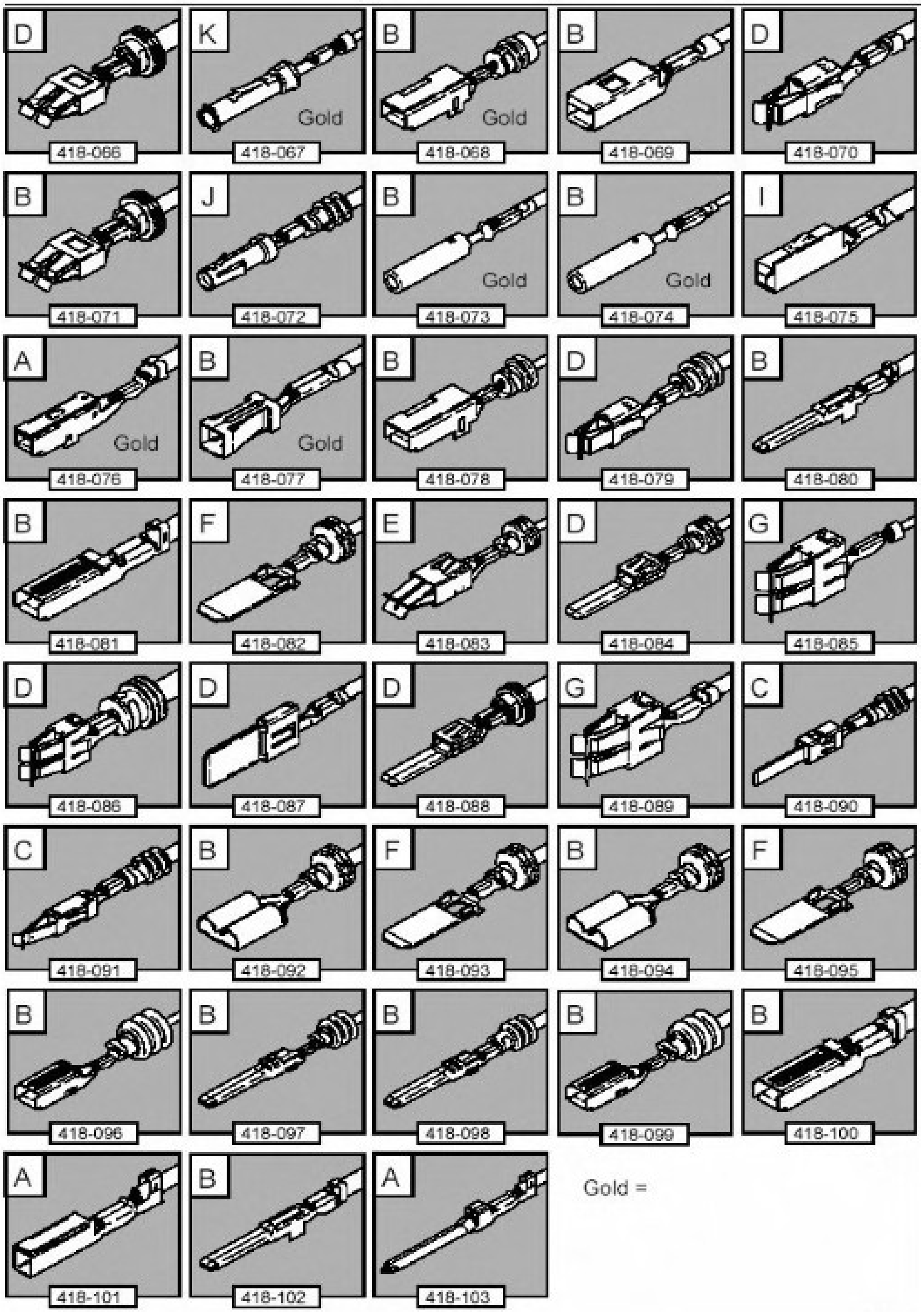
Pre-Terminated Wiring Harness(s) and Butt Splice Connectors

All pre-terminated wiring harness(s) and butt splice connectors in the wiring harness repair kit are contained in bags which can be resealed after use. Each bag is marked with the part number of the items stored within the bag. Each storage compartment in the wiring harness repair kit is identified with the corresponding part number. Make sure that pre-terminated wiring harness(s) and connectors are not mixed up it is advisable to only open one bag at a time and to reseal the bag securely before opening another bag. Also, replace the bag in its mating part number compartment within the case.

The pre-terminated wiring harness(s) are supplied with the insulation in one of three colors, red, blue or yellow. The colors do not apply to any particular circuit but to the harness wire size. See the Relationship Table in the Repair Method section.

Butt splice connectors are also supplied with red, blue or yellow coverings, which must be matched to the pre-terminated wiring harness insulation color.

Pre-Terminated Wiring Harness(s)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K
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418-067
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Gold =

E130741

The illustration shows:

- The pre-terminated wiring harness(s) which are included in the wiring harness repair kit
- The part number of the pre-terminated wiring harness
- The letter showing the extractor tip which must be used to remove this type of electrical connector terminal
- Those electrical connector terminals which are gold

Some of the pre-terminated wiring harness(s) have seals installed to the insulation for sealed connector applications. It is essential for prevention of moisture ingress that a sealed pre-terminated wiring harness must be used where a sealed terminal was removed.

⚠ CAUTION: Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

Two sizes of heat shrink sleeving are supplied in the wiring harness repair kit. Each heat shrink sleeve contains a sealant glue. These must be used when connecting wiring harness(s) or electrical connector terminal(s) at all times. The smaller diameter heat shrink sleeve is to be used with the red and blue butt splice connectors and the larger diameter sleeve with the yellow butt splice connectors.

For ease and speed, some of the pre-terminated wiring harness(s) may already have the insulation partly stripped at the splice end. If the repair requires insulation to be stripped from the cable, refer to the Relationship Table for the correct length of insulation to be stripped.

The Pre-Terminated Wiring Harness(s) illustration shows the electrical connector terminal type, the part number of the pre-terminated wiring harness and the letter of the extractor tip which must be used to extract the electrical connector terminal from the connector housing. Additionally, those electrical connector terminal(s) which are gold are identified, all others are therefore, tinned and not gold.

Wiring Harness Cable Identification Sleeves

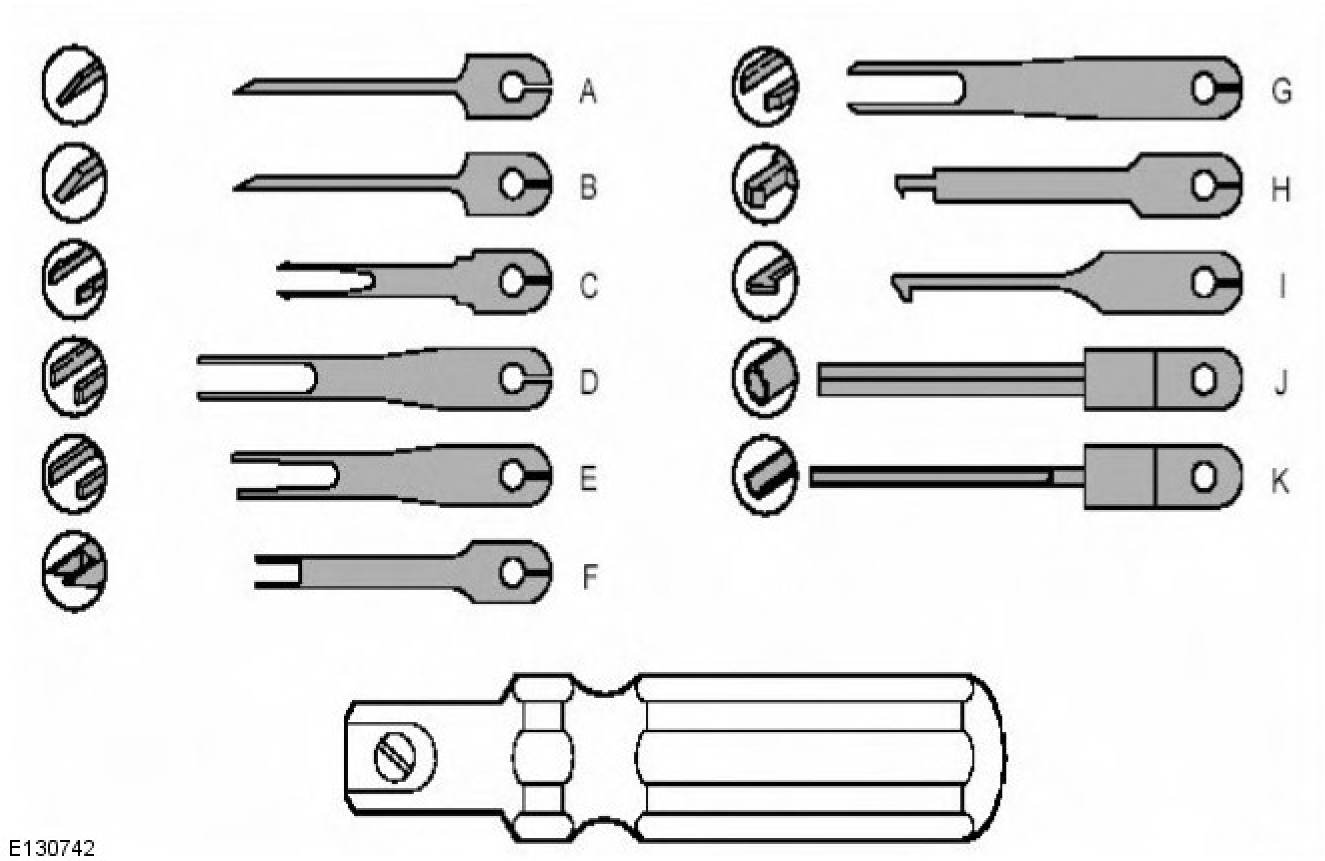
A selection of colored sleeves are contained in the wiring harness repair kit for maintaining the wiring harness cable identification on the pre-terminated wiring harness. Place the correct colored sleeve(s) over the pre-terminated wiring harness insulation as near to the electrical connector as possible with the main wiring harness cable color nearest to the electrical connector.

For example, if the original wiring harness cable color is pink with a black trace put the pink wiring harness cable identification sleeve on the pre-terminated wiring harness first followed by a black sleeve, and slide both along the wiring harness cable to the electrical connector terminal.

Extraction Handle and Tips

The extraction handle, in conjunction with the correct tip, is used to remove a terminal from an electrical connector. Each tip contained in the wiring harness repair kit is marked with an identification letter, A to K inclusive. Each tip has been specially designed to extract a particular type of electrical connector terminal. The use of any other tool is **not** recommended and is liable to cause damage to the electrical connector. The tip is fastened to the handle by a screw which holds the tip firmly yet allows it to be easily replaced.

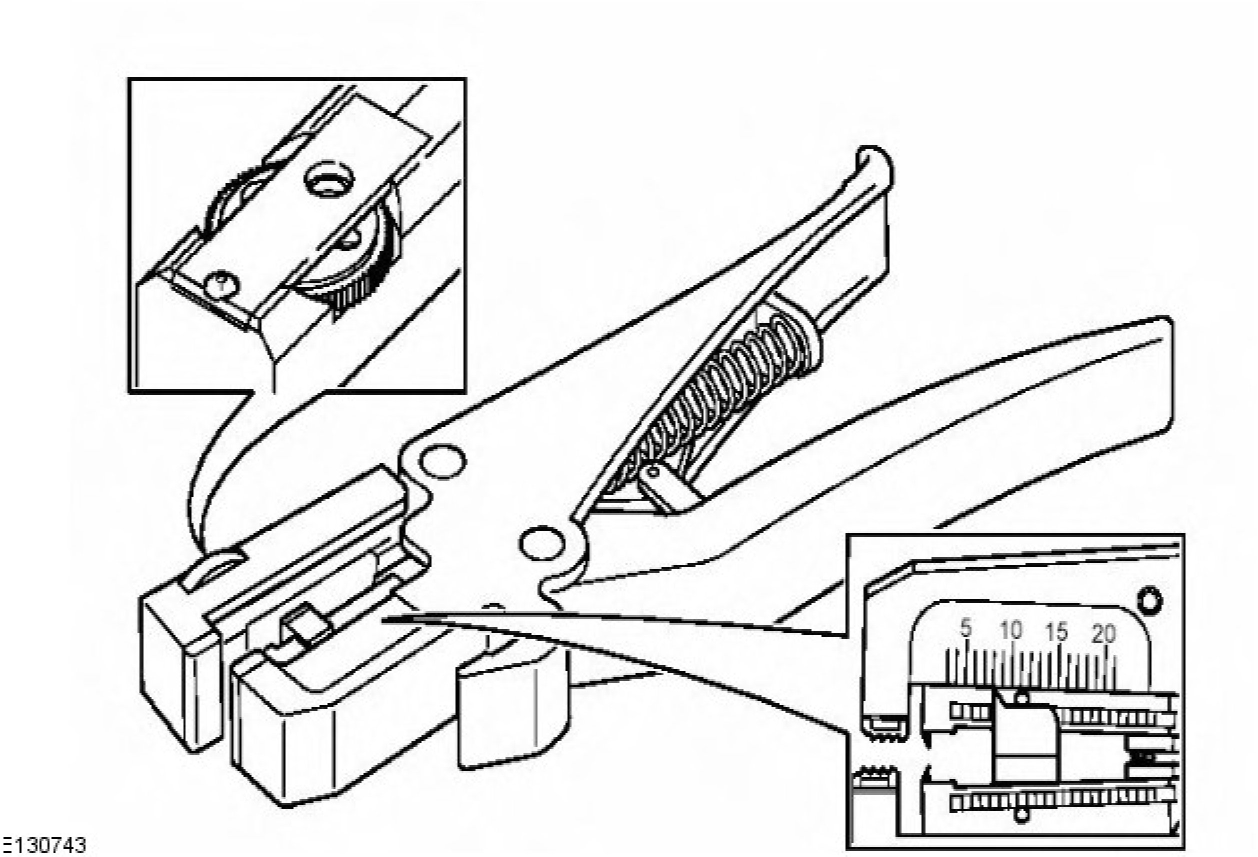
Extraction Handle and Tips



Insulation Stripper

The moving jaw has an adjuster wheel which has a series of holes in it. Turning the wheel and placing the cable in the matching size hole will automatically adjust the jaw to the correct pressure. Note that some wiring harness(s) may have a harder insulation and slight adjustment of the wheel may be needed to make a clean strip but exercise care not to damage the wire.

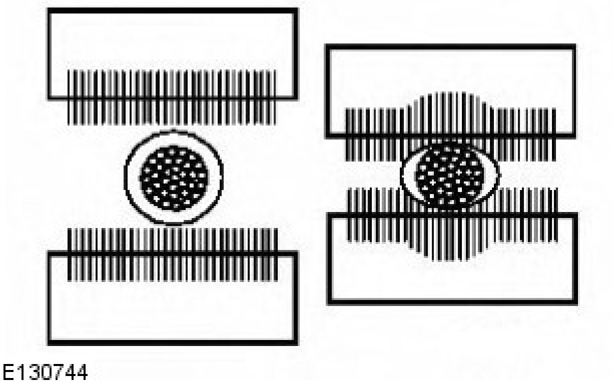
Insulation Stripper



By pressing the outer edges of the wiring harness cable length stop together the adjuster can be slid up or down the jaw. This decreases or increases the length by which the wiring harness cable insulation will be stripped from the pre-terminated wiring harness or wiring harness wire. The adjuster has a position indicator to align with a graduated scale and this sets the correct length in millimetres, of insulation to be stripped. The amount of insulation to be stripped is shown in the Relationship Table.

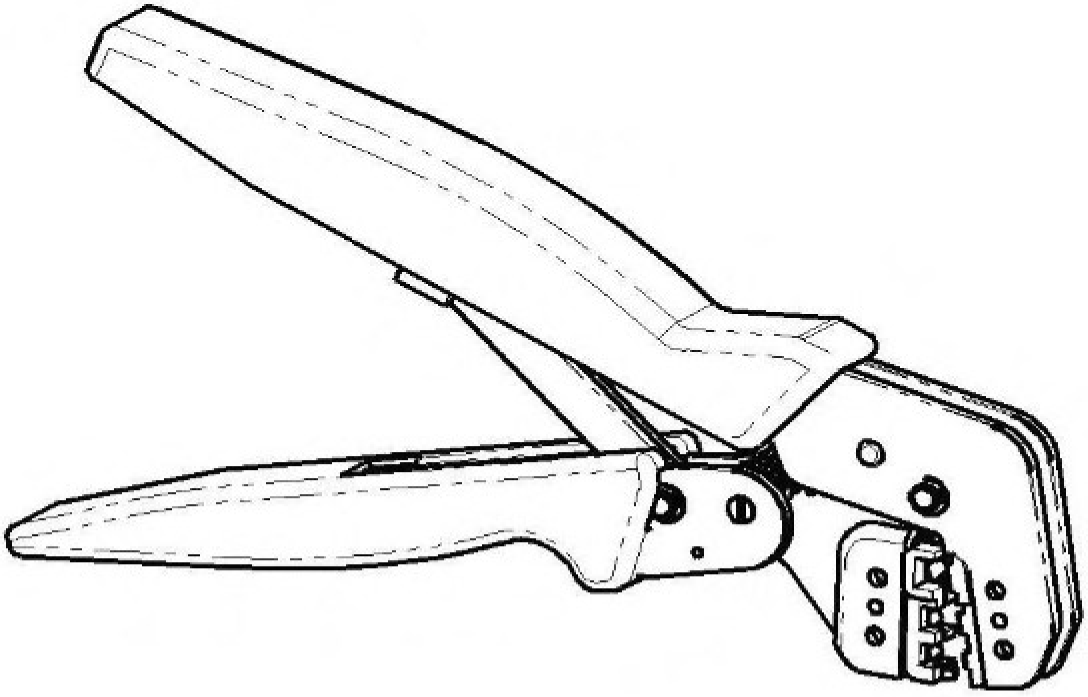
The illustration shows the insulation stripper tool and a wiring harness correctly gripped in the jaws. A wire cutter is provided on the outer side of the fixed jaw.

Cable Correctly Gripped in Stripper Blades



Crimping Pliers

Crimping Pliers



E130745

The crimping pliers have a moving jaw and a stationary jaw, with three different sized crimping enclosures. Each of the enclosures is identified by a red, blue or yellow coloured dot which corresponds to the three colours of the pre-terminated wiring harness(s) and butt splice connector colors.

List of Parts

Description	Part Number	Quantity
Wiring Harness Repair Kit	418-S065	1
Pre-Terminated Wiring Harness(s)	418-066 to 418-103 inclusive	10 each
Glue Lined Heat Shrink Pack – small diameter	418-104	25 per pack
Glue Lined Heat Shrink Pack – larger diameter	418-105	10 per pack
Case Assembly Comprising – carry case, lid, inner lid, base, insert, trays foam spacers	418-106	1
Butt Splice Connector – Red	418-107	50 per pack
Butt Splice Connector – Blue	418-108	50 per pack
Butt Splice Connector – Yellow	418-109	20 per pack
Extraction Tool Handle	418-110	1
Extraction Tip Pack consists of 2 spare screws plus	418-S111	1
Tip A	418-118	1
Tip B	418-119	1
Tip C	418-120	1
Tip D	418-121	1
Tip E	418-122	1
Tip F	418-123	1
Tip G	418-124	1
Tip H	418-125	1
Tip I	418-126	1
Tip J	418-127	1
Tip K	418-128	1
Sleeve Identification Pack – for Red insulation	418-112	500
Sleeve Identification Pack – for Blue insulation	418-113	500
Sleeve Identification Pack – for Yellow insulation	418-114	500
Instruction Manual	JTP 593	1
Crimping Pliers	YRW500010	1

Description	Part Number	Quantity
Wire Stripping Tool	418-117	1

Items can be ordered from:

SPX United Kingdom Limited

Ironstone Way

Brixworth

Northants

NN6 9UD

United Kingdom

Telephone: +44 (0) 1327 704461

Fax: +44 (0) 1327 706632

Repair Methods

⚠CAUTION: **Several different types and sizes of terminal may be found in a single electrical connector housing.**

It is necessary to identify:

- The conductor (wire) size of the affected wiring harness
- The electrical connector range from which the damaged wiring harness is to be removed
- The terminal type

Use of the approved diagnostic tool will greatly assist in the quick identification of electrical connectors and faulty pin terminal(s).

Reference can also be made to the vehicle Electrical Guides, held by Dealers, to identify wiring harness(s) and electrical connector(s).

By using the Relationship Table, the wiring harness conductor (wire) size can be related to a suitable pre-terminated wiring harness by the color of the insulation. Also, the correct length of insulation to be stripped from the wiring harness lead is identified.

Relationship Table

CABLE RANGE	SPLICE	STRIP LENGTH
0.35 mm² to 1.50 mm²	RED	6.00 to 7.00 mm
1.00 mm² to 2.50 mm²	BLUE	6.00 to 7.00 mm
4.00 mm² to 6.00 mm²	YELLOW	9.00 to 9.50 mm

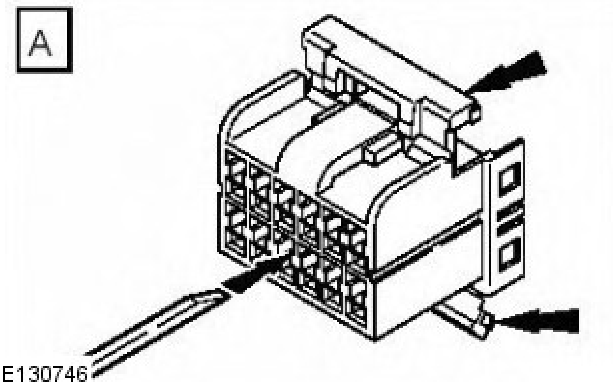
Electrical Connector Terminal Extraction

It must be noted that some electrical connector(s) have anti-backout devices which prevent the terminals from being removed from the electrical connector. Some examples of these are shown in following illustrations. The anti-backout device must be released before attempting to remove the terminal from the electrical connector. Some anti-backout devices require a special tip to release the device and these have been included in the kit. Most can be released by carefully using a suitable small screwdriver.

Various types of electrical connector have seals installed internally or externally to prevent moisture ingress. These normally do not have to be removed but make sure that they are installed when the electrical connectors are connected.

The illustrations show examples of each tip used on different types of electrical connector(s). There are a large number of different types of electrical connector used on vehicles therefore only one example using each tip is shown. Technicians experience and judgement will dictate which type of tip should be used for those electrical connector(s) which are not shown. Care should be exercised to avoid further damage when removing the terminals from the electrical connector.

• NOTE: **Examples of the extraction tips and anti-backout tips.**



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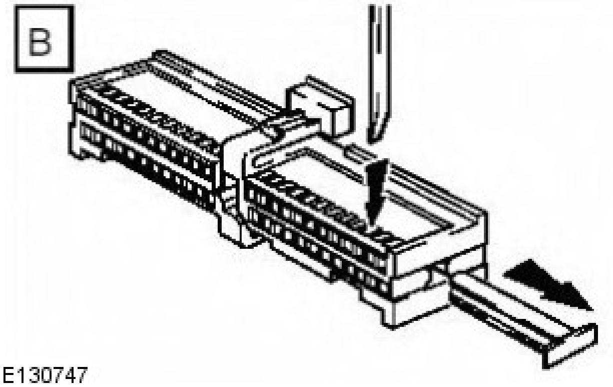

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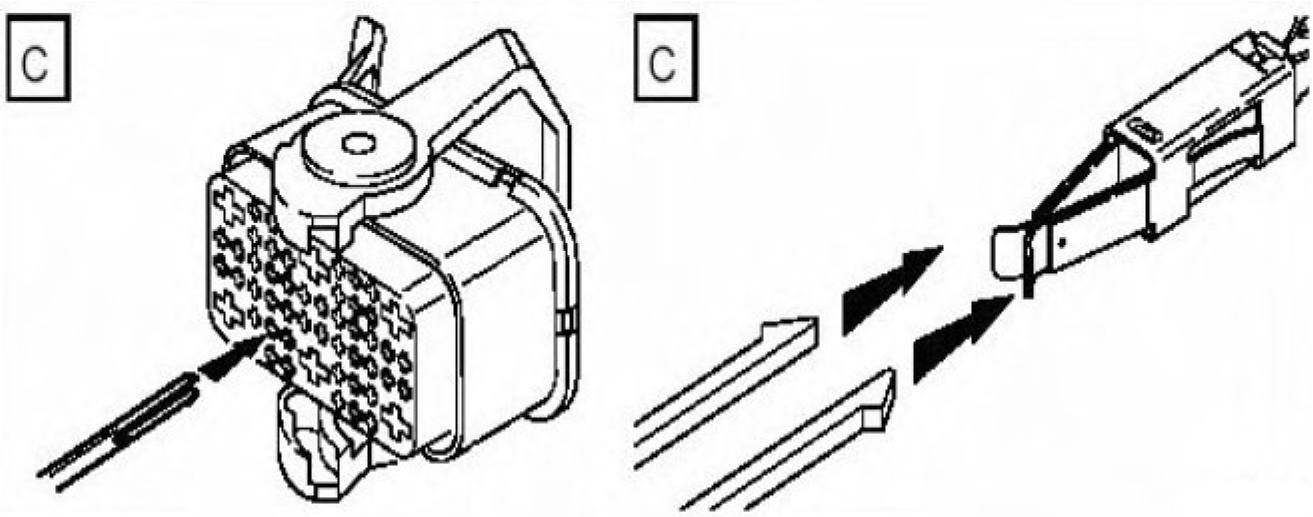

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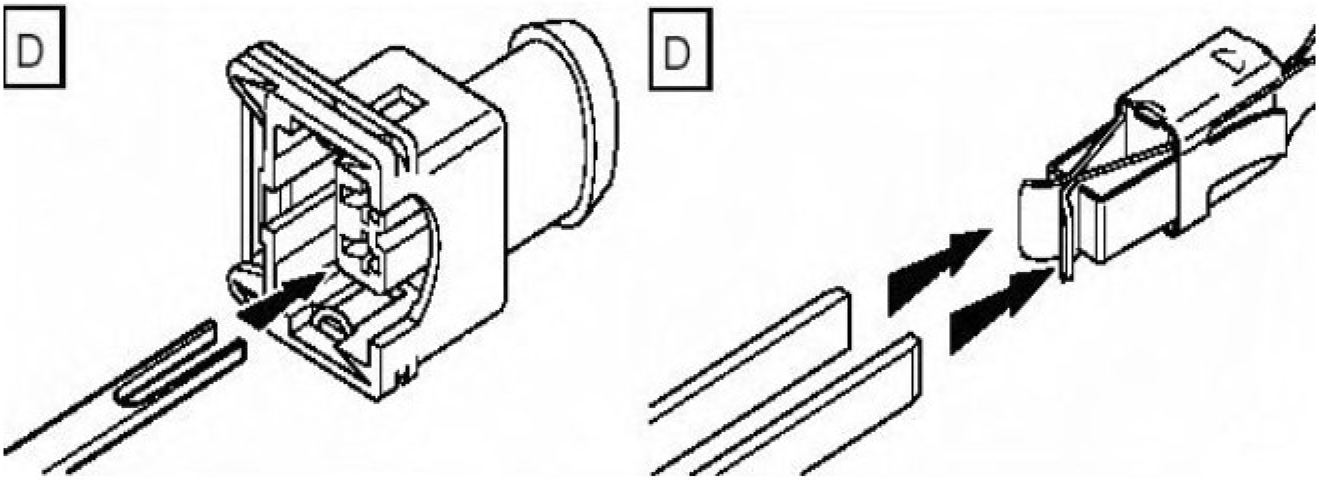

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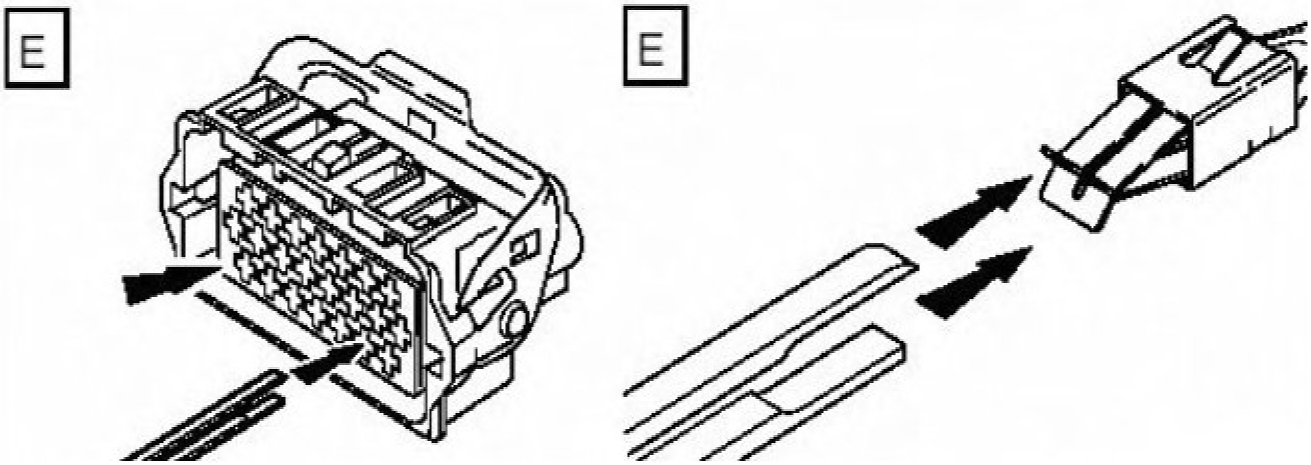

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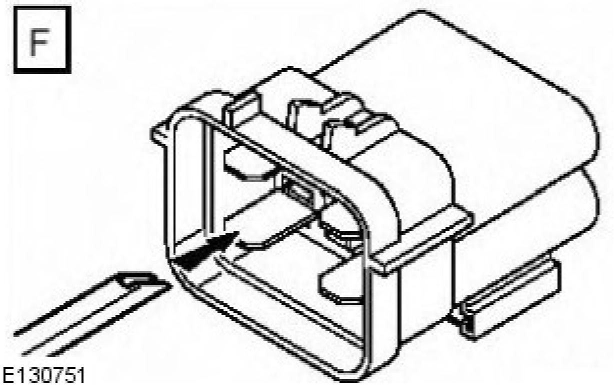

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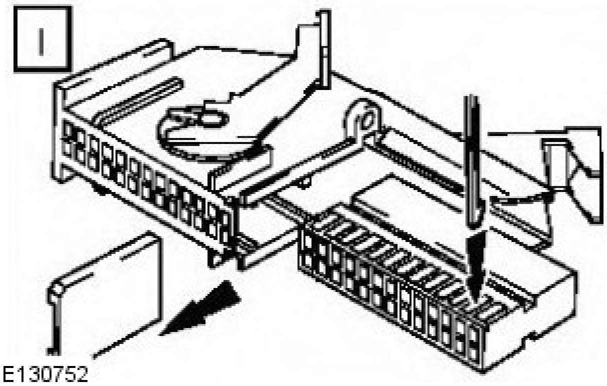

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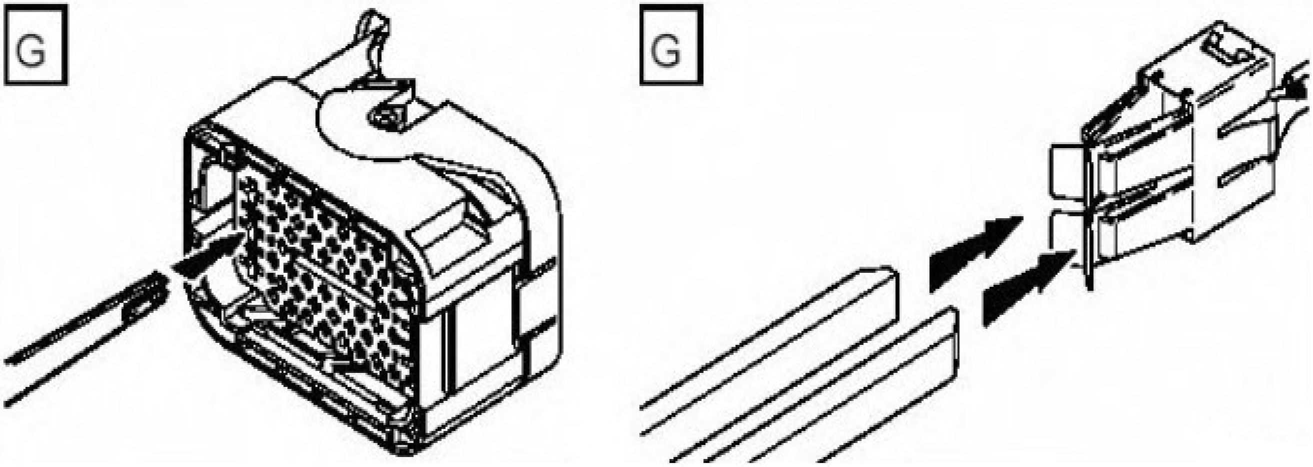

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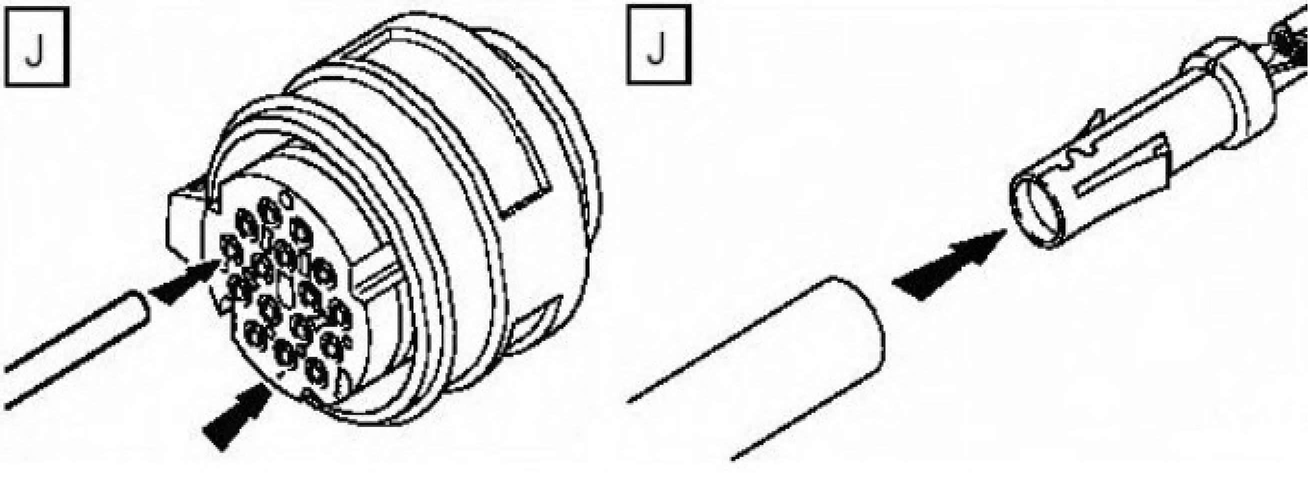

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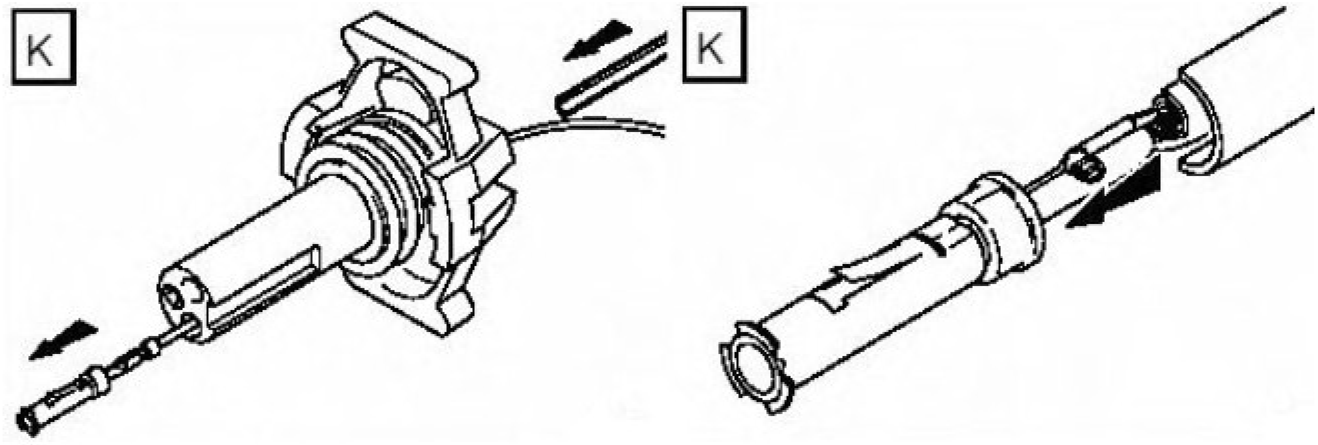


- NOTE: The chart shows the electrical connector types, terminal pins/sockets, extractor tip and anti-backout tip.

Electrical connector terminal type	Pin or socket	Extractor tip	Anti-backout tip
Mulitlock 040 series	D	A	
Mulitlock 040 series	B	A	
Mulitlock 070 series	B	B	
Mulitlock 040 series	D	B	
Econoseal III 070 series	D	B	
Econoseal III 070 series	B	B	
Econoseal III 070 series	B	B	
Econoseal III J2	D	B	
Econoseal III 250 series	B	F	
Econoseal III 250 series	D	B	
Econoseal III 250 series	B	F	
Econoseal III 250 series	D	B	
Micro-timer II 1.5mm	D	C	
Micro-timer II 1.5mm	B	C	
Std power timer 4.8 flat	D	G	
Std power timer 5.8 flat	B	D	
Std power timer 5.8 flat	B	D	
Std power timer 2.8 flat	D	D	
Std power timer 4.8 flat	D	G	
Std power timer 5.8 flat	B	D	
Ford 2.8 flat	D	E	H
Mulitlock 070 series	D	B	
Mulitlock 070 series	B	B	
Junior power timer 2.8 flat	D	D	
Sumitomo TS90 connector	B	B	H
Modu IV gold plated	D	B	
Mulitlock 040 series gold plated	D	A	
Micro qualock	D	I	
EECV	D	B	
EECV	D	B	
Kostal dia 1.50 series	D	J	
AMP 6.3 flat	D	B	
Junior power timer 2.8 flat	D	D	
2.8 series	D	B	I
Sumitomo TS90 connector	D	B	H
Ducon 0.60 gold plated	D	K	
AMP 6.3 flat	D	D	
Econoseal III 250 series	B	F	

Repair Procedure

• CAUTIONS:

⚠ Do not use crimping pliers, insulation strippers, butt splice connectors, heat shrink sleeves or pre-terminated wiring harness(s) that are not supplied with the Jaguar wiring harness repair kit. Each part has been designed to be used only with the other parts in this wiring harness repair kit.

⚠ Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

It is not correct to make more than five repair joints on the wiring harness to any electrical connector and if more damage is found at the same electrical connector then a new wiring harness must be installed.

- Remove the faulty terminal from the electrical connector using the extractor tool and correct tip. Make sure that any anti-backout device is released before trying to remove the terminal.
- ⚠CAUTION: : A number of electrical connector terminals are gold plated or gold flashed. When defective, they must be installed with a gold pre-terminated wiring harness(s) from the wiring harness repair kit. It is not always easy to identify the female as gold but the male pins are visually easier, therefore always check both male and female terminals to identify those which are gold. Under no circumstances are gold and tin terminals to be mixed as this will lead to early failure of the electrical contact.

  • NOTE: Never use a harness lead with a smaller diameter than the original harness lead.

  Select the correct size and type of pre-terminated wiring harness and butt splice connector from the wiring harness repair kit.
- Using the wire cutter on the stripping tool, cut the pre-terminated wiring harness and the harness cable to the required length.
- • NOTE: See illustration: **Stripping Insulation**

  From the Relationship Table, find the correct length of insulation to be stripped from the pre-terminated wiring harness and set the adjustable cable length stop to the correct length. Place the pre-terminated wiring harness in the wire stripper and remove the insulation.
- Put the cable identification sleeve(s) on to the wiring harness with the main cable colour nearest to the terminal.
- During this next step do not overtighten. Place the selected butt splice connector in the crimping tool, matching the aperture and the butt connector colours. Make sure that the window indentation in the butt connector is resting over the guide bar on the lower jaw. Partially close the grip until the butt connector is securely held in the aperture. This will give support to the butt connector while the pre-terminated wiring harness is inserted into it.
- • NOTE: See illustration: **Spice Correctly Located**

  Insert the pre-terminated wiring harness into the butt connector and make sure that the wire is against the wire stop. Close the grip firmly, crimping the lead to the butt connector. When the handles have been completely closed the butt connector will be freed from the tool as the handles are released. If the handles have not been completely closed then the jaws will hold the butt connector and it cannot be removed from the tool until the crimp is fully made by closing the handles completely.
- Make sure that the harness cable has been squarely cut and the correct length of insulation removed. If more than one splice is needed the butt connectors must be not be crimped to the wiring harness at the same distance from the connector. The splices must be staggered to prevent a bulk of splices in the same area of the wiring harness.
- It is preferable to cover the butt splice joint with heat shrink sleeve. This is desirable not essential, except where the electrical connector is a sealed electrical connector. Use the smaller diameter sleeve for red and blue pre-terminated wiring harness(s) and the large diameter sleeve for the yellow pre-terminated wiring harness(s). It is advisable to place the heat shrink over the completed joint but in some instances the sleeve will not pass over the terminal. Check, and if required, place the correct size sleeve onto the harness cable or pre-terminated wiring harness before crimping the butt splice to the wiring harness.
- Place the harness cable into the butt splice with the splice window over the guide bar. Make sure that the cable harness wire is against the stop in the butt splice, crimp the butt splice connector to the wiring harness.
- Gently pull the harness cables each side of the butt splice to make sure that a secure joint has been made.
- ⚠WARNING: Do not use a naked flame in areas where fuel or oil have been spilt. Clean the area of residual oil and fuel and wait until the fuel spill has fully evaporated.

  • CAUTIONS:

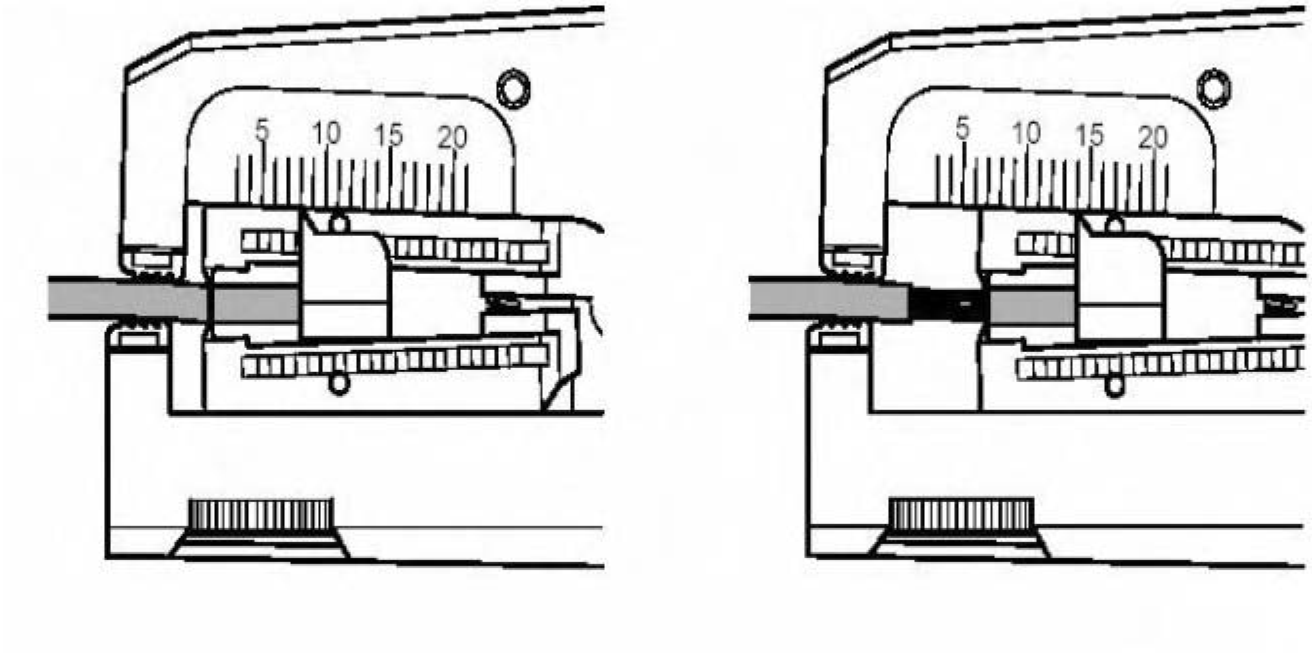
  ⚠ When using a heat source make sure that it is localised and causes no damage to surrounding materials.

Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

Using a suitable heat source, shrink the sleeve over the butt splice.

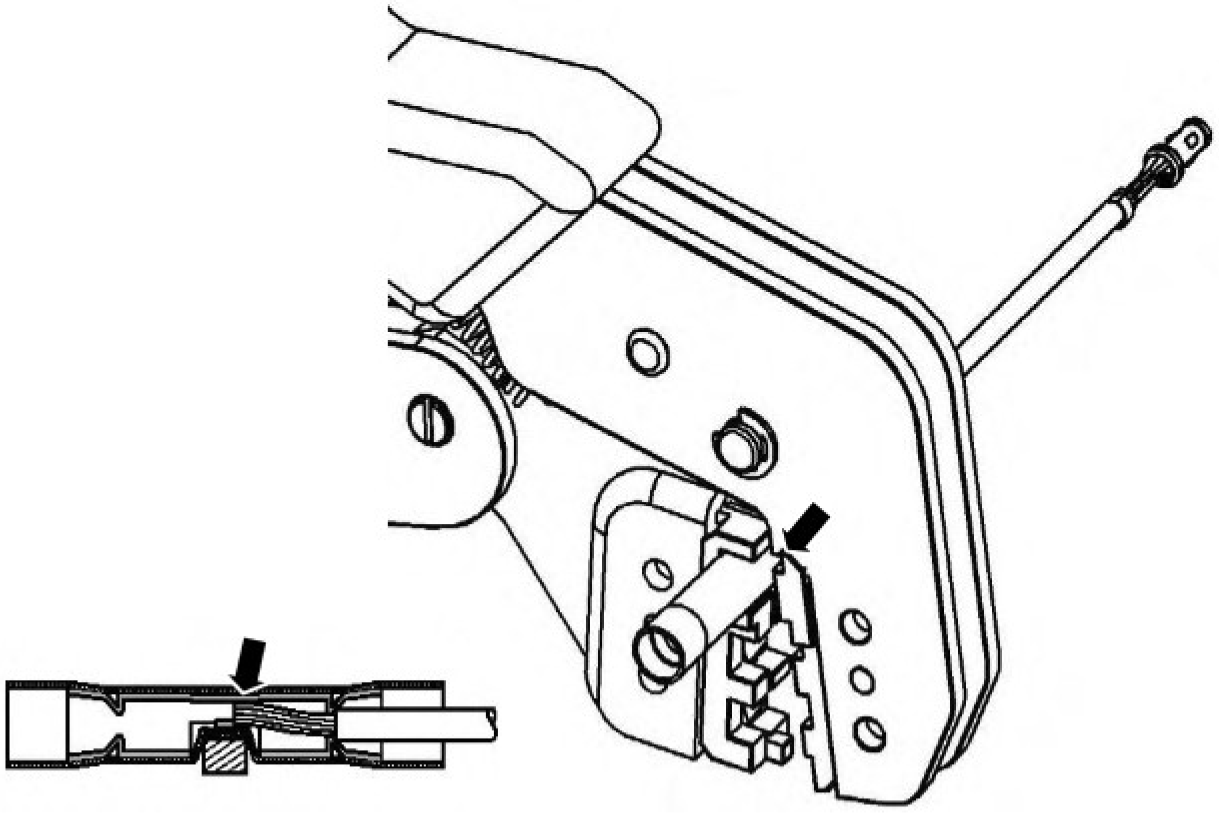
- If further pre-terminated wiring harness(s) are to be installed to the same electrical connector, make sure that the lead is cut at a different length to the previous joint. This makes sure that the splices will, where possible, be staggered on the wiring harness and prevent a bulk of splices in one area.
- When all of the splices have been made, fit the terminal(s) to the electrical connector, taking care that the terminals are correctly orientated.
- Install the wiring harness cover and secure with adhesive electrical tape. Do not cover the wiring harness right to the electrical connector as the terminals must have a little movement and not be firmly bound to the electrical connector or wiring harness. Make sure that the cable identification sleeve(s) are showing at the wiring harness electrical connector.

Stripping Insulation



E130756

Spice Correctly Located



E130757

Published: 11-May-2011

Wiring Harnesses - Wiring Harness Repair

General Procedures

1. For additional information, refer to: Wiring Harness (418-02 Wiring Harnesses, Description and Operation).

Published: 11-May-2011

Anti-Theft - Active -

Torque Specifications

Description	Nm	lb-ft
RH Hood latch Torx bolts	10	7
Security antenna	6	4

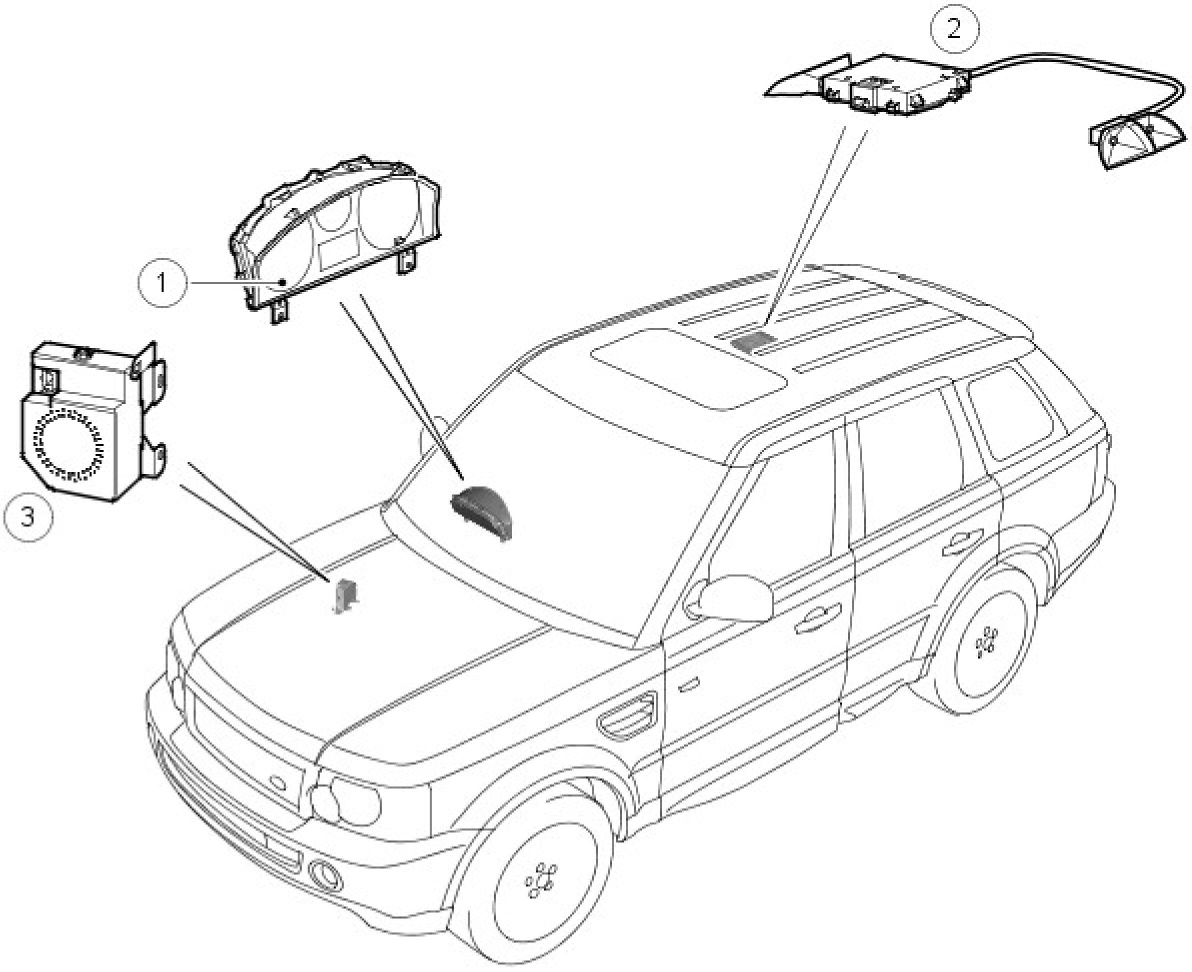
Published: 11-May-2011

Anti-Theft - Active - Anti-Theft - Active

Description and Operation

COMPONENT LOCATIONS

- NOTE: right-hand drive (RHD) model shown, left-hand drive (LHD) model similar



E55865

Item	Part Number	Description
1	-	Alarm indicator
2	-	Volumetric sensor
3	-	BBUS (battery backed-up sounder)

GENERAL

The active anti-theft system monitors the hinged panels for unauthorized opening. On some vehicles, the active anti-theft system also incorporates interior monitoring and vehicle tilt sensing functions.

Operation of the active anti-theft system is controlled by the central junction box (CJB). When an alarm is triggered, the CJB sounds the vehicle horns or the BBUS and illuminates the hazard flashers.

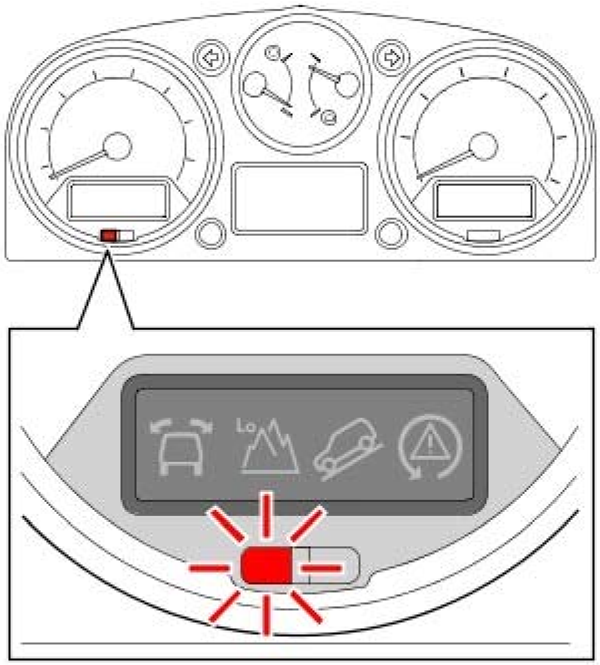
The active anti-theft system consists of:

- An alarm indicator.
- A BBUS (market dependant).
- A volumetric sensor (market dependant).

The active anti-theft system also uses:

- The CJB.
- The hood, door and tailgate ajar switches.
  For additional information, refer to: Handles, Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).
- The vehicle horns.
  For additional information, refer to: Horn (413-06 Horn, Description and Operation).

ALARM INDICATOR



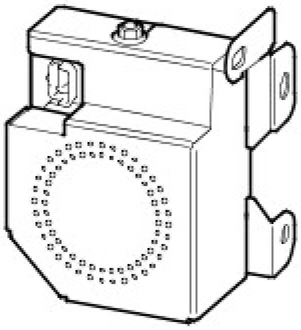
E44259

The alarm indicator is a red light emitting diode (LED) installed in the instrument cluster to provide a visual indication of the active anti-theft system status. Operation of the alarm indicator is controlled by the CJB, which varies the flash rate to indicate the active anti-theft system status.

Active Anti-theft System Status Indications

Status	Description	Alarm Indicator
0 - Disarmed	When system disarmed. Also first 10 seconds after being armed with a panel open.	Off.
1 - Armed	Entered 10 seconds after arming.	10 milliseconds flash every 2 seconds.
2 - Perimeter Arming	All panels closed. Indication delayed for 2.5 seconds to allow time to process double locking commands.	Two 10 milliseconds flashes every 2 seconds, for 10 seconds.
3 - Volumetric Arming	All panels closed and volumetric sensor armed. Indication delayed for 2.5 seconds to allow time to process double locking commands.	Three 10 milliseconds flashes every 2 seconds, for 10 seconds.

BBUS (WHERE FITTED)



E44260

The BBUS is attached to the plenum in the engine compartment, next to the brake booster. The BBUS uses an integral sounder to produce the audio warning after an alarm has been triggered. In some markets, a tilt sensor is incorporated into the BBUS. Externally, the two types of BBUS look the same.

Operation of the BBUS is controlled by the CJB. The CJB and the BBUS exchange signals over a LIN (local interconnect network) bus communications link. The BBUS is normally powered by a permanent battery power supply from the CJB. An integral rechargeable battery powers the sounder if the power feed is disrupted.

When it arms the active anti-theft system, in the perimeter mode or the volumetric mode, the CJB sends an arming signal to the sounder in the BBUS. When it arms the active anti-theft system in the volumetric mode, if a tilt sensor is fitted, the CJB also sends an arming signal to the tilt sensor. On receipt of the arming signals, the sounder and the tilt sensor respond with a status signal. If there is no response to the arming signals within 12 seconds, the CJB assumes there is a fault and sends a disarm signal to the sounder or the tilt sensor, as appropriate. The CJB also stores a related fault code.

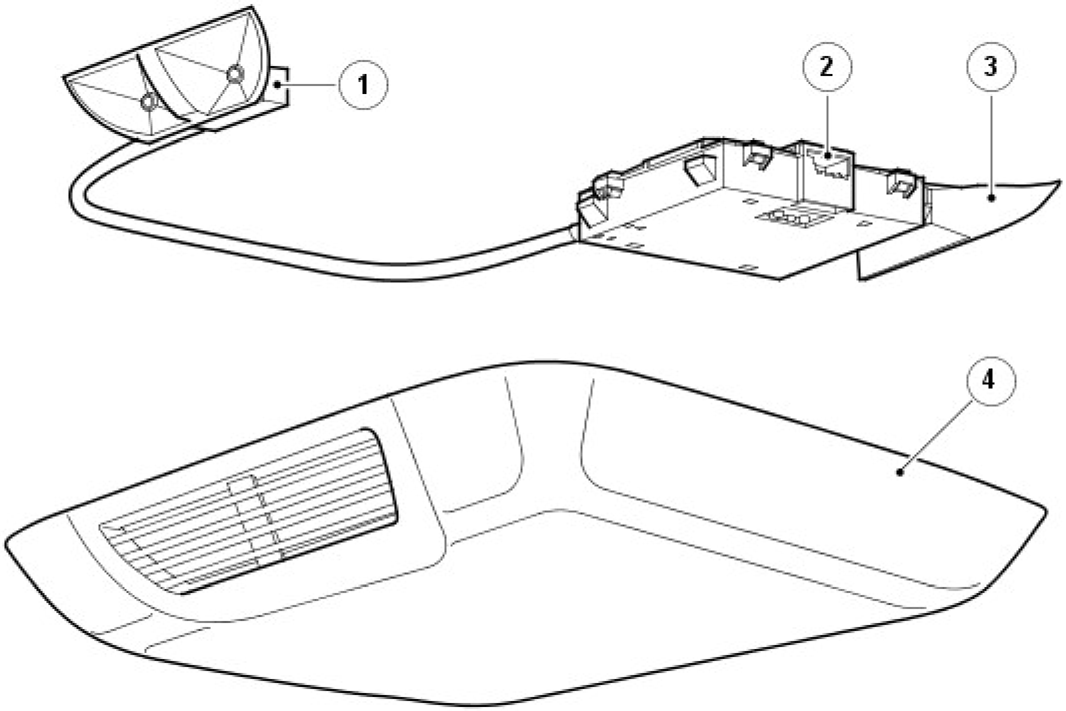
When the sounder is disarmed, while the active anti-theft system is armed, if the alarm is subsequently triggered the CJB uses the horns to sound the audio warning instead of the sounder.

While the sounder is armed, the CJB sends a periodic signal (heartbeat) to the BBUS, and the BBUS monitors the battery power supply and the communications link with the CJB. The BBUS operates the sounder if:

- It receives an alarm signal from the CJB or the tilt sensor.
- The power supply or the communications link from the CJB is disrupted.

The tilt sensor measures the longitudinal and lateral angle of the vehicle over a range of ±16° from the horizontal. When the active anti-theft system is armed in the volumetric mode, the BBUS stores the current angles in memory and monitors the tilt sensor readings. If the vehicle attitude changes in either direction by more than the alarm limit, the BBUS activates the sounder.

VOLUMETRIC SENSOR (WHERE FITTED)



E55866

Item	Part Number	Description
1	-	Rear transmitter/receiver pair
2	-	Electrical connector
3	-	Front transmitter/receiver pair
4	-	Cover

The volumetric sensor is installed in a cover attached to the center of the headliner, and monitors for intrusion into the passenger compartment when the active anti-theft system is armed.

The volumetric sensor consists of a microcontroller, two acoustic transmitters and two acoustic receivers. One transmitter and receiver pair faces forwards and one transmitter and receiver pair faces rearwards, to ensure complete coverage of the passenger compartment. The front transmitter and receiver pair are in a rubber mounting attached to the microcontroller housing. The rear transmitter and receiver pair are in a remote rubber mounting and connected to the microcontroller housing by a four wire lead.

The volumetric sensor is powered by a feed from the CJB. The CJB activates and de-activates the volumetric sensor when it arms and disarms the active anti-theft system in the volumetric mode. When the volumetric sensor is active it outputs ultrasonic pulses from the transmitters and checks the echoes picked up by the receivers for changes to the passenger compartment profile. If it detects a change of profile, indicating movement in the passenger compartment, the volumetric sensor reports the alarm to the CJB.

Each time the volumetric sensor is armed, it performs a self test. If there are no faults the volumetric sensor sends an acknowledgment signal to the CJB. If the CJB does not receive the acknowledgment signal it de-activates the volumetric sensor.

SYSTEM OPERATION

The CJB automatically arms and disarms the active anti-theft system when it operates the central locking system.
For additional information, refer to: Handles, Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

Arming

On vehicles without the volumetric sensor and the tilt sensor, the active anti-theft system is armed in the perimeter mode when the vehicle is either locked or superlocked.

On vehicles with the volumetric sensor, the active anti-theft system is armed in one of two modes:

- Perimeter mode, where only the hinged panels are monitored, is employed when the vehicle is locked with the remote handset.

- Volumetric mode, where the hinged panels, the vehicle interior and, if the tilt sensor is incorporated, the vehicle attitude, are monitored. Volumetric mode is employed when the vehicle is superlocked with the remote handset.

The CJB arms the active anti-theft system when it locks or superlocks the vehicle, provided the following conditions coexist:

- The driver door is shut.
- A valid key is not in the ignition switch.
- The active anti-theft system is not in panic alarm mode.
- The active anti-theft system is enabled.
- The CJB is not in the transportation mode.

Mislock

If the driver door is open when a lock or superlock request is received, the active anti-theft system remains disarmed and the CJB generates a mislock sound with a 100 milliseconds 'chirp' on the horns.

When the CJB arms the active anti-theft system, it enters the perimeter mode by beginning to monitor the status of the hinged panels and, where applicable, sending an arming signal to the BBUS. On a vehicle with a volumetric sensor installed, the CJB then transitions into the volumetric mode by sending arming signals to the volumetric sensor and the tilt sensor. The CJB ignores alarm signals from the volumetric sensor for 30 seconds after sending the arming signal, to allow time for the vehicle interior to settle.

If any of the hinged panels, except the driver door, is open, the CJB arms in the perimeter mode, but ignores the open hinged panel as an alarm trigger and generates a mislock sound. On a superlocked vehicle with a volumetric sensor installed, if the open hinged panel is a door or the tailgate, the CJB remains in the perimeter mode instead of transitioning into the volumetric mode. If the open hinged panel is subsequently closed, and remains closed for 1 second, the CJB then includes it as a valid alarm trigger and, where appropriate, transitions into the volumetric mode.

Disarming

The CJB disarms the active anti-theft system when it receives an unlock request from the remote handset.

When the vehicle is unlocked using the left front door lock, the CJB disarms the active anti- theft system if a valid key is installed in the ignition switch or an unlock request is received from the remote handset. The CJB detects the installation of a valid key from the transponder coil around the ignition switch. The active anti-theft system cannot be disarmed by the left front door lock.

The CJB can selectively disarm parts of the active anti-theft system, to prevent nuisance alarms being triggered, as follows:

- When the active anti-theft system is armed in the volumetric mode, if the vehicle battery voltage decreases to less than 9 volts the CJB will transition into perimeter mode by disarming the volumetric sensor and the tilt sensor. This prevents false alarms caused by the sensors not operating below 9 volts.
- Where a BBUS is installed, if the vehicle battery voltage decreases from 9.5 to 9 volts in more than 30 minutes, the CJB will disarm the BBUS and, if necessary, use the horns as the audible warning. This prevents false alarms caused by the CJB not supplying the heartbeat signal to the BBUS below 9 volts, which the BBUS would interpret as a tamper condition. If the voltage rises above 9.5 volts the CJB re-arms the BBUS.

If the vehicle is unlocked using the remote handset and, within 1 minute, a hinged panel is not opened or a valid key is not put in the ignition switch, the CJB automatically relocks the vehicle and re-arms the active anti-theft system. This prevents the vehicle being left unlocked and disarmed by accidentally pressing the remote handset unlock button.

Alarm

When the alarm is triggered, audible and visible warnings are produced by the CJB. Audible warnings are produced using the horns or the BBUS. Visible warnings are produced using the hazard flashers.

If the BBUS is used for the audible warnings, the BBUS cycles the sounder on for 30 seconds and off for 5 seconds. If the alarm trigger is still present after the 5 seconds off period, the cycle of 30 seconds on, 5 seconds off, is repeated. The BBUS operates for a maximum of 10 cycles for each alarm trigger source, or until it receives a disarm signal.

If the horns are used for the audible warning, the CJB cycles the horns on for 30 seconds and off for 5 seconds. If the alarm trigger is still present after the 5 seconds off period, the cycle of 30 seconds on, 5 seconds off, is repeated. The CJB operates the horns for a maximum of 10 cycles for each arming cycle, or until it receives a disarm signal. The 10 cycle limit prevents damage to the horns from excessive use.

During the on period, the BBUS sounder or the horns are pulsed at 380 milliseconds on, 380 milliseconds off. The hazard flashers are also pulsed at 380 milliseconds on, 380 milliseconds off, in sequence with the audible warning.

The active anti-theft system transitions from an armed mode to the alarm mode if:

- The hood, a door or the tailgate is opened.
- The volumetric sensor signals an alarm condition.
- The tilt sensor signals an alarm condition.
- A non valid key is detected in the ignition switch. There is a 0.4 second delay between recognition of a key being installed

in the ignition switch and identification of the transponder, to allow sufficient time to interrogate the key.

- The left front door is unlocked, using the door lock, then opened, and the CJB does not detect a valid key in the ignition switch, or receive an unlock request from the remote handset.
- If the personal button on the remote handset is configured to panic alarm, when the button is pressed the CJB triggers the alarm as detailed above. The panic alarm operates with the active anti-theft system either armed or disarmed. The CJB cancels the panic alarm when it receives a lock or unlock request from the remote handset, or detects a valid key in the ignition switch. On NAS (north American specification) vehicles, after 160 seconds the panic alarm times out and the active anti-theft system returns to the previous operating state.

The alarm stops immediately and the active anti-theft system is disarmed on receipt of an unlock command from the remote handset.

The alarm stops immediately and the active anti-theft system returns to the armed mode on receipt of a lock command from the remote handset. The CJB ignores the current alarm trigger(s) and only considers the remainder of the alarm trigger sources as valid inputs for a further alarm. The ignored alarm trigger(s) are reinstated as valid alarm trigger sources after they remain in an untriggered state for a minimum of 1 second. For example, the active anti-theft system is armed in the volumetric mode when a door is opened and triggers the alarm. Pressing the lock button on the remote handset returns the active anti-theft system to the alarm mode and causes the CJB to ignore the inputs from the ajar switch of the open door and the volumetric sensor. One second after the door closes, the CJB considers the ajar switch input as valid again. After a further 30 seconds settling time, the CJB also considers the volumetric sensor input as valid again.

The CJB stores the last ten alarm triggers in a trigger log, which can be accessed over the medium speed controller area network (CAN) bus using T4. The trigger log can only be cleared when the system is disarmed. Each trigger entry contains a number that corresponds to the trigger source.

Alarm Trigger Sources

Trigger No.	Description
0	No trigger stored
1	Driver door ajar switch
2	Front passenger door ajar switch
3	Rear left-hand (LH) door ajar switch
4	Rear right-hand (RH) door ajar switch
5	Tailgate or rear window ajar switch
6	Hood ajar switch
7	Ignition switch
8	External key lock turned to unlock
9	Tilt sensor
10	Volumetric sensor

If an alarm is triggered during an armed cycle, when the active anti-theft system is subsequently disarmed the CJB pulses the hazard flashers at 200 milliseconds on, 200 milliseconds off, for 3 seconds.

Transportation Mode

When the vehicle is in the transportation mode, the active anti-theft system is disabled.

Diagnostics

The CJB monitors the communication links with the BBUS, the tilt sensor and the volumetric sensor. If any of the communications links fail, the CJB stores a related fault code, which can be accessed with T4.

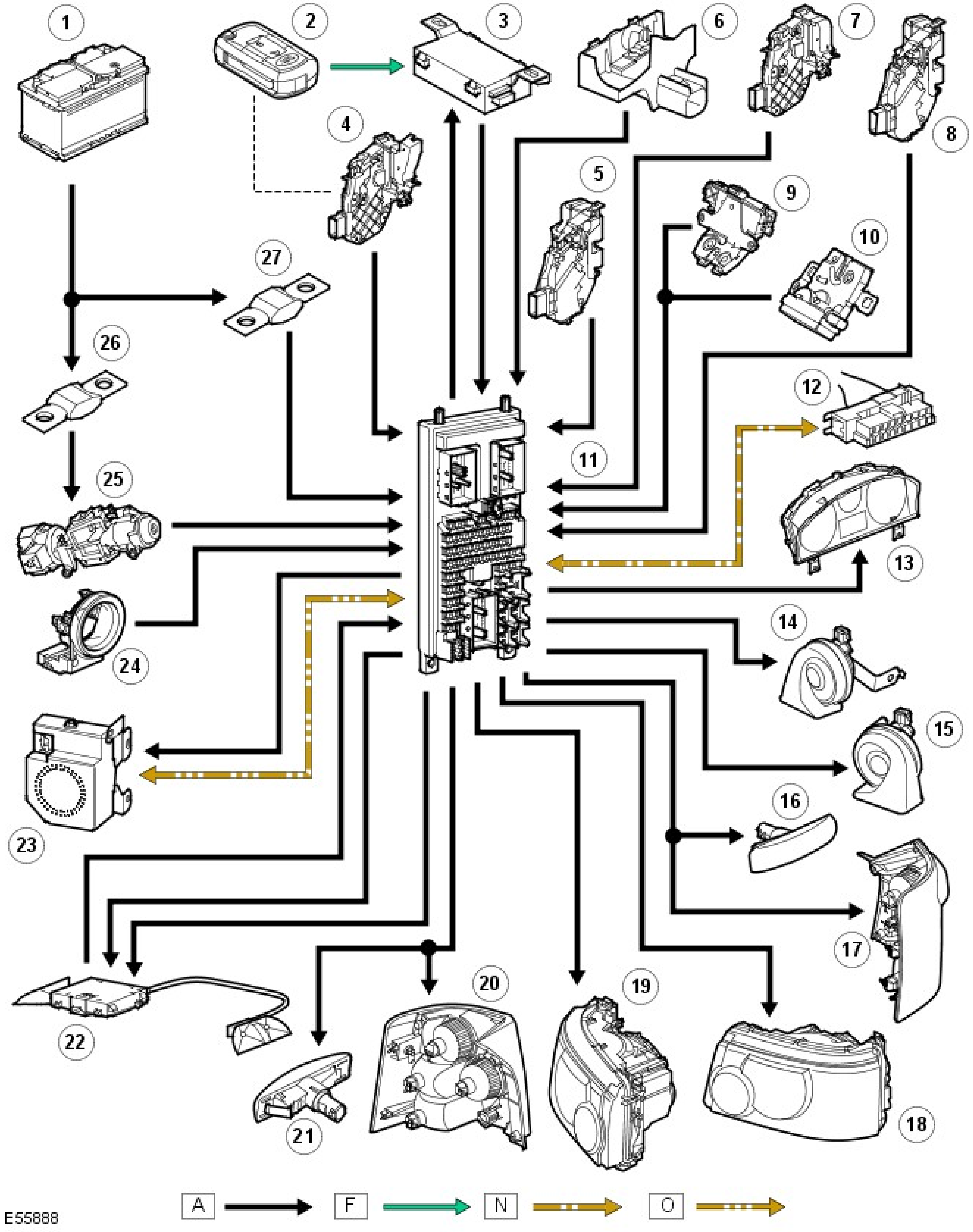
Diagnostic Fault Codes

Fault	Description
BBUS Communication Failure	If a response is not received on the BBUS LIN bus within 12 seconds of a status request from the CJB, the BBUS Communication Failure fault code is set. The CJB continues trying to communicate with the BBUS even if a communication failure has occurred.
BBUS Internal Fault	If the CJB sends a command (Arm / Disarm / Alarm / Sleep) to the BBUS, and the status from the BBUS does not show the BBUS has responded to the command within 12 seconds, the 'BBUS Internal Fault' fault code is set.
BBUS Trigger Source	The BBUS Trigger Source stores the reason for the last BBUS sound cycle. The values which can be stored are: 0 = Not triggered 1 = Due to power interruption 2 = Due to LIN communication interruption 3 = Due to an external command from the CJB
Tilt Sensor Internal Fault	If the CJB sends a command (Arm / Disarm / Sleep) to the tilt sensor in the BBUS, and the status from the BBUS does not show the BBUS has responded to the command within 12 seconds, the 'Tilt Sensor Internal Fault' fault code is set.

Fault	Description
Volumetric Communication Failure	If a 100 milliseconds pulse response is not received on the Volumetric Trigger line, within 350 milliseconds of an arm command from the CJB, the Volumetric Communication Failure fault code is set.

CONTROL DIAGRAM

- NOTE: A = Hardwired connection; F = RF (radio frequency) transmission; N = Medium speed CAN Bus; O = LIN bus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Item	Part Number	Description
1	-	Battery
2	-	Ignition key
3	-	RF receiver
4	-	Left front door ajar switch
5	-	Right front door ajar switch

6	-	Hood ajar switch
7	-	Left rear door ajar switch
8	-	Right rear door ajar switch
9	-	Tailgate ajar switch
10	-	Rear window ajar switch
11	-	CJB
12	-	Diagnostic socket
13	-	Alarm indicator
14	-	Left horn
15	-	Right horn
16	-	Right side repeater lamp
17	-	Right tail turn signal indicator lamp
18	-	Right front turn signal indicator lamp
19	-	Left front turn signal indicator lamp
20	-	Left tail turn signal indicator lamp
21	-	Left side repeater lamp
22	-	Volumetric sensor
23	-	BBUS
24	-	Transponder coil
25	-	Ignition switch
26	-	Fusible link 11E, battery junction box
27	-	Fusible link 17E, battery junction box

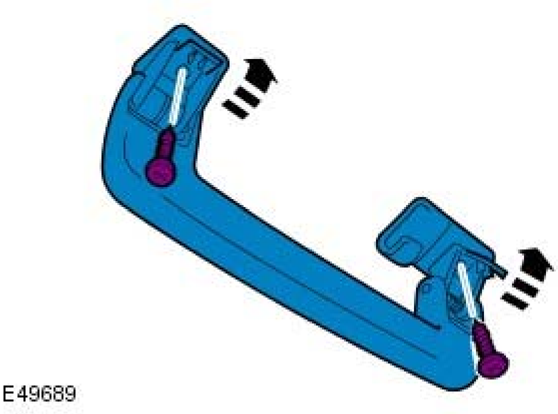
Published: 11-May-2011

Anti-Theft - Active - Antenna

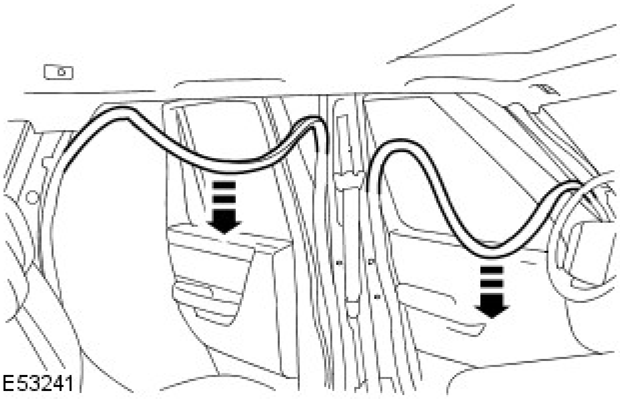
Removal and Installation

Removal

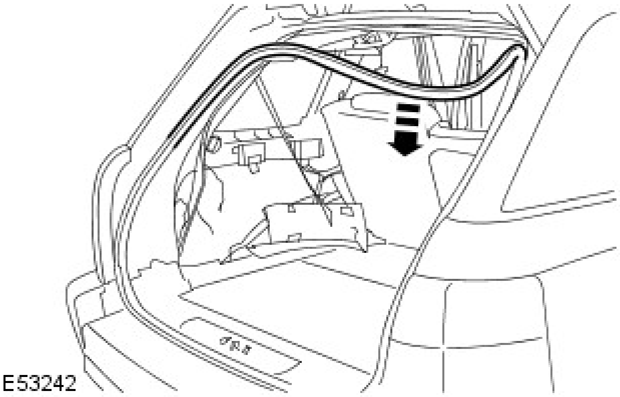
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Remove the RH B-pillar upper trim panel.
   For additional information, refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Remove the RH C-pillar upper trim panel.
   For additional information, refer to: C-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Remove the RH D-Pillar upper trim panel.
   For additional information, refer to: D-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



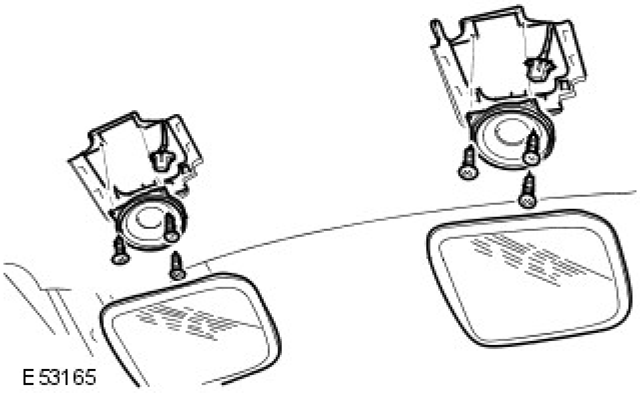
5. Remove the passenger assist handle.
   - Release the 2 screw covers.
   - Remove the 2 screws.
   - Repeat the above procedure for the other handle.



6. Release the front and rear door weatherstrips for access.

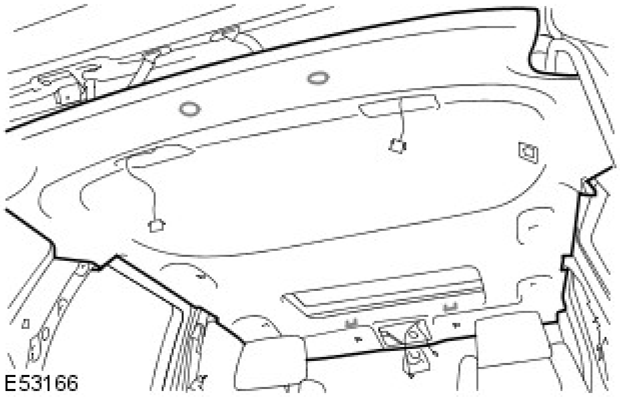


7. Release the liftgate weatherstrip



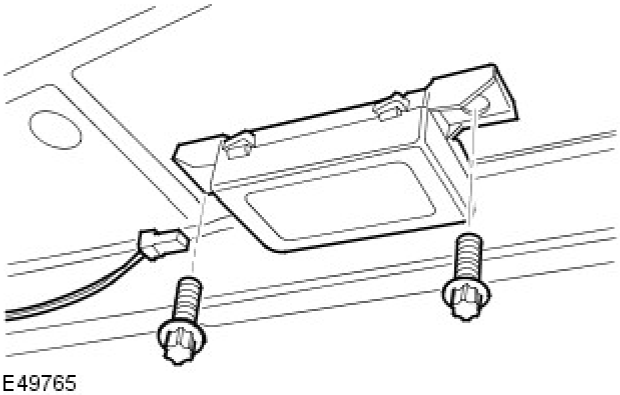
8. Remove the rear speakers.

- Remove the speaker grilles.
- Remove the 6 screws.
- Disconnect the 2 electrical connectors.



9. Release the headliner for access.

- Release the 2 clips.



10. Remove the alarm antenna.

- Release and disconnect the electrical connector.
- Remove the 2 bolts.

Installation

1. Install the alarm antenna.
    - Tighten the bolts to 6 Nm (4 lb.ft).
    - Connect and secure the electrical connector.
2. Install the headliner.
    - Secure in the clips.
3. Attach the door weatherstrips.
4. Install the passenger assist handles.
    - Install the screws.
    - Secure the screw covers.
5. Install the rear speakers.
    - Connect and secure the electrical connectors.
    - Install the screws.
    - Install the speaker grilles.
6. Install the D-pillar upper trim panel.
   For additional information, refer to: D-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
7. Install the C-pillar upper trim panel.
   For additional information, refer to: C-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
8. Install the B-pillar upper trim panel.
   For additional information, refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
9. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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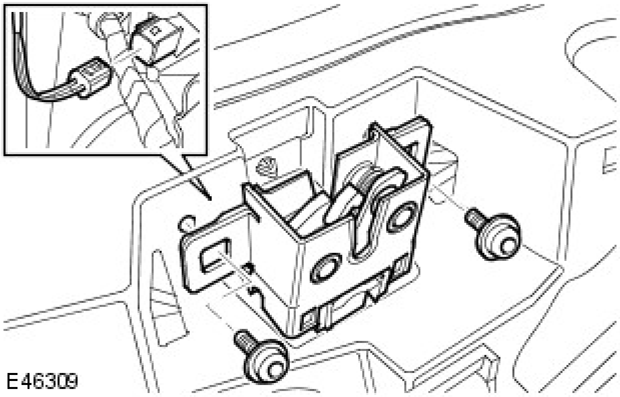
Anti-Theft - Active - Hood Switch

Removal and Installation

Removal

• NOTE: **Before installing a new hood switch, diagnose the hood switch by using a digital multimeter. Make sure that continuity through hood switch is present when the switch is pressed (hood closed condition). Repeat the test to make sure continuity IS NOT present when the switch IS NOT pressed. If the hood switch continuity is NOT present, continue with this procedure. If the continuity is present, install the original hood switch to the vehicle.**

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



2. Release the RH hood latch.

- Remove the 2 Torx bolts.
- Disconnect the electrical connector.

3. Remove the hood switch.

Installation

1. Install the hood switch.

2. Install the RH hood latch.

- Connect the electrical connector.
- Tighten the Torx bolts to 10 Nm (7 lb.ft).

3. Open and close the hood to check the hood latch operation.

4. Adjust the hood latch.

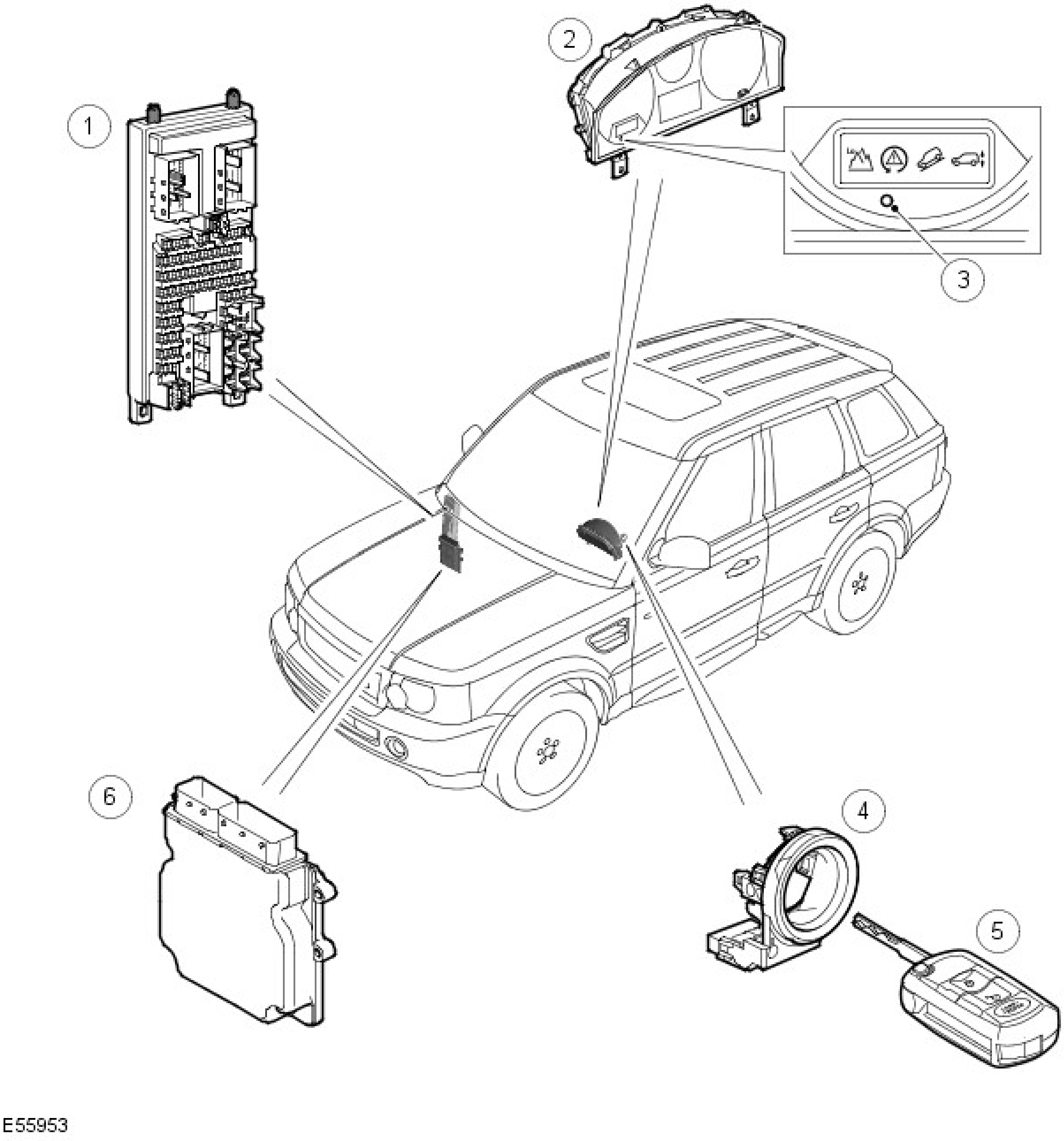
- Loosen the 2 hood latch Torx bolts.
- Lower the hood and check for alignment.
- Open the hood and tighten the Torx bolts to 10 Nm (7 lb.ft).
- Check for the correct operation of the hood safety catch.
- If necessary, repeat the above adjustment procedure.

Anti-Theft - Passive - Anti-Theft - Passive

Description and Operation

COMPONENT LOCATIONS

- NOTE: left-hand drive (LHD) installation shown, right-hand drive (RHD) installation similar



Item	Part Number	Description
1	-	central junction box (CJB)
2	-	Instrument cluster
3	-	Alarm indicator
4	-	Transponder coil
5	-	Ignition key with transponder
6	-	engine control module (ECM)

GENERAL

The passive anti-theft system provides a secure interface, between the ignition key and the ECM, to prevent unauthorized starting of the engine and immobilize the vehicle. The same system is installed for all engine variants. Each passive anti-theft system consists of the following:

- A transponder in the head of each ignition key.
- A transponder coil around the ignition switch.
- A passive anti-theft system in the CJB.

The passive anti-theft system also uses:

- The alarm indicator, to show the passive anti-theft status.
- The instrument cluster, as a gateway for communications with the ECM.

Operation of the passive anti-theft system is automatic and requires no input from the driver. The engine management system will only crank and run the engine when a valid key is in the ignition switch.

When it senses a key in the ignition switch the CJB energizes the transponder coil, which activates the transponder. The transponder transmits identification and rolling code data to the CJB. The CJB checks the data from the transponder against stored data to validate the key. When the ignition switch is turned to position II (ignition), the ECM sends a start authorization request to the CJB. If the key is valid the CJB grants the request and the ECM will subsequently crank and run the engine. If the key is invalid, the CJB refuses the request and the ECM will not crank the engine.

TRANSPONDER

The transponder is an integral part of the PCB (printed circuit board) located within the head of the ignition key.
For additional information, refer to: Handles, Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

The transponder is powered by a rechargeable battery and is contained within the processor on the PCB, which also controls the remote operation of the CLS (central locking system). A separate coil on the PCB is used by the transponder to receive the signals from the transponder coil on the ignition switch. The coil is also used to generate the current required to recharge the battery.

The transponder has a 256 byte electrically erasable programmable read only memory (EEPROM), which is programmed with vehicle identification data and a unique identification code. This information is stored in one of 30 key 'slots' within the CJB. When energized, the transponder emits the coded information which is received by the CJB. The CJB checks that the key is valid by confirming the received data before granting permission to start the engine. The information programmed into the transponder cannot be overwritten. If a key is lost or is no longer required, T4 can be used to disable the key to prevent it being used on the vehicle.

TRANSPONDER COIL

The transponder coil is located in a plastic housing which surrounds the ignition switch barrel. The transponder coil is connected via two wires to the CJB. The CJB emits electrical energy to the transponder coil which transmits data at a frequency of 125 kHz. This electrical energy excites the transponder in the ignition key when it is within 20 mm (0.78 in) of the transponder coil.

CJB

The CJB is the main component in the passive anti-theft system. The CJB contains a processor and software which controls the passive anti-theft system. The CJB is connected to the medium speed controller area network (CAN) bus, which it uses to communicate with the ECM via the instrument cluster and the high speed CAN bus.

When the ignition key is placed in the ignition switch key barrel, the passive anti-theft system wakes up. The transponder coil is activated causing the transponder to transmit its coded data. The CJB validates the data and transmits another request for the data. When this is received for a second time, the CJB confirms the key as valid.

Replacement CJBs are not stock items and can only be installed on the vehicle for which they were ordered. After replacement of a CJB:

- Car configuration information from the instrument cluster is automatically transferred to the new CJB.
- T4 must be used to ensure that only those ignition keys currently in use with the vehicle are enabled in the CJB.

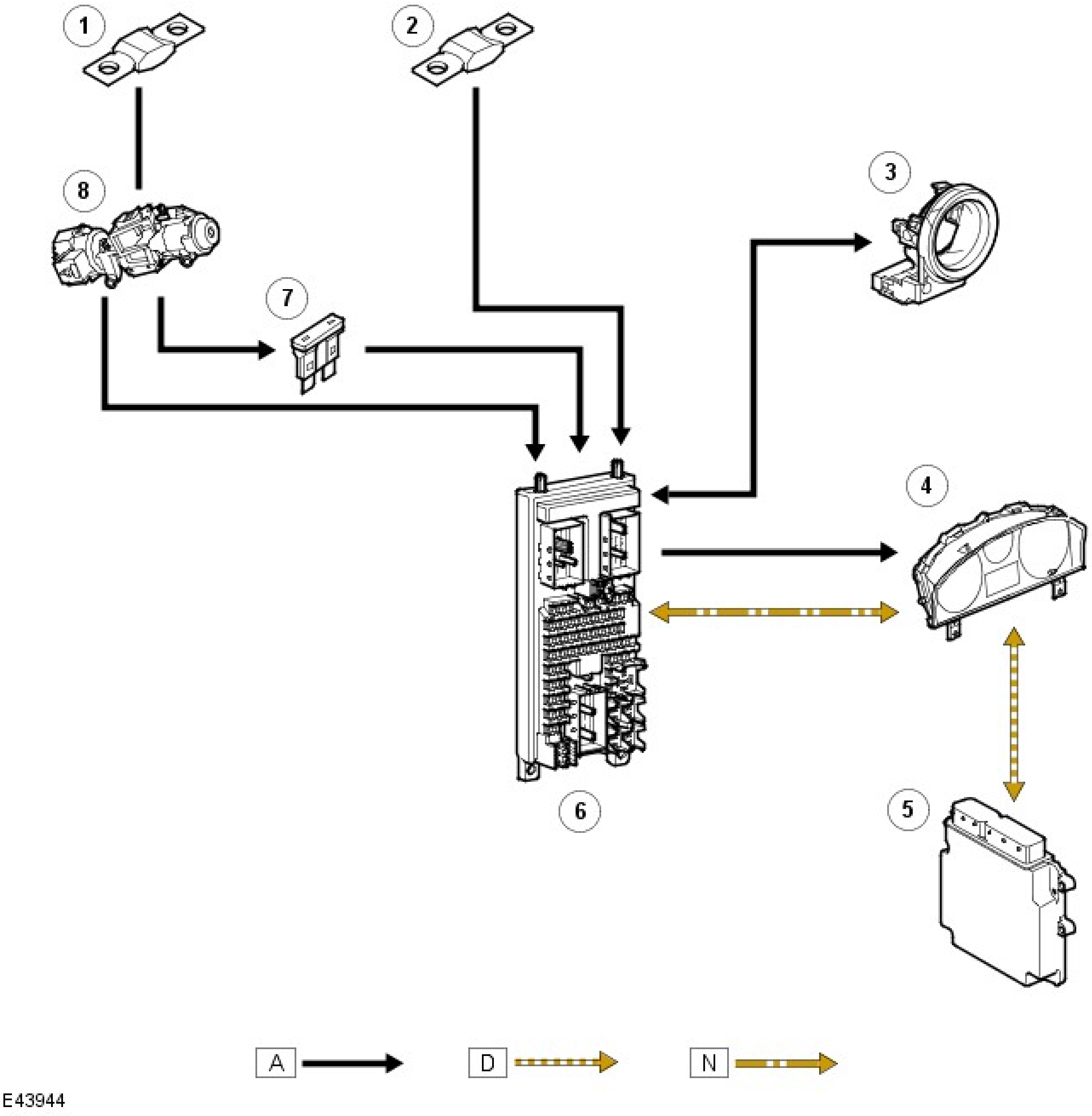
ALARM INDICATOR

The alarm indicator is located in the instrument cluster, below the tachometer. The alarm indicator provides information about the status of the active and passive anti-theft systems. Operation of the alarm indicator is controlled by the CJB using a hardwired connection with the instrument cluster.

For passive anti-theft system status, when the active anti-theft system is disarmed and the vehicle is immobilized (key out of ignition switch), the alarm indicator flashes once every 2 seconds. When the active anti-theft system is disarmed and the vehicle is mobilized, the alarm indicator performs a 1 second confirmation flash (when the ECM confirms to the CJB that it is in the mobilized state) and then remains off.

CONTROL DIAGRAM

- NOTE: A= Hardwired connection; D = High speed CAN bus; N = Medium speed CAN bus



Item	Part Number	Description
1	-	Fusible link 11E, battery junction box (BJB)
2	-	Fusible link 16E, BJB
3	-	Transponder coil
4	-	Instrument cluster (alarm indicator)
5	-	ECM
6	-	CJB
7	-	Fuse 40P, CJB (key in signal)
8	-	Ignition switch

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Navigation System - Navigation System

Description and Operation

INTRODUCTION TO THE GLOBAL POSITIONING SYSTEM (GPS)

The system used to calculate the current position of the vehicle is called the global positioning system (GPS). The system utilizes satellites which are owned by the United States Department of Defense (DoD). A total of 24 satellites orbit the earth every 12 hours at a height of 20,000 km (12500 miles), and between 5 and 11 of these satellites can be seen from a single point at any given time. The orbits are tilted to the earth's equator by 55 degrees to ensure coverage of polar regions. Each satellite transmits radio signals to provide information about the satellite position i.e. latitude, longitude, altitude, almanac data and an accurate time signal generated by an on-board atomic clock. Each satellite contains four atomic clocks.

The vehicle needs to receive data from at least four different satellites to give a three dimensional fix on its current position.

As the vehicle moves, this information is continually being updated. The computer determines which satellites are 'visible' to the system and their current position and relationship to each other. Using this information the computer can account for positional deviations of the satellites and compensate to enhance the accuracy of the navigation system.

The GPS signal is also known as the Precision Positioning Signal (PPS).

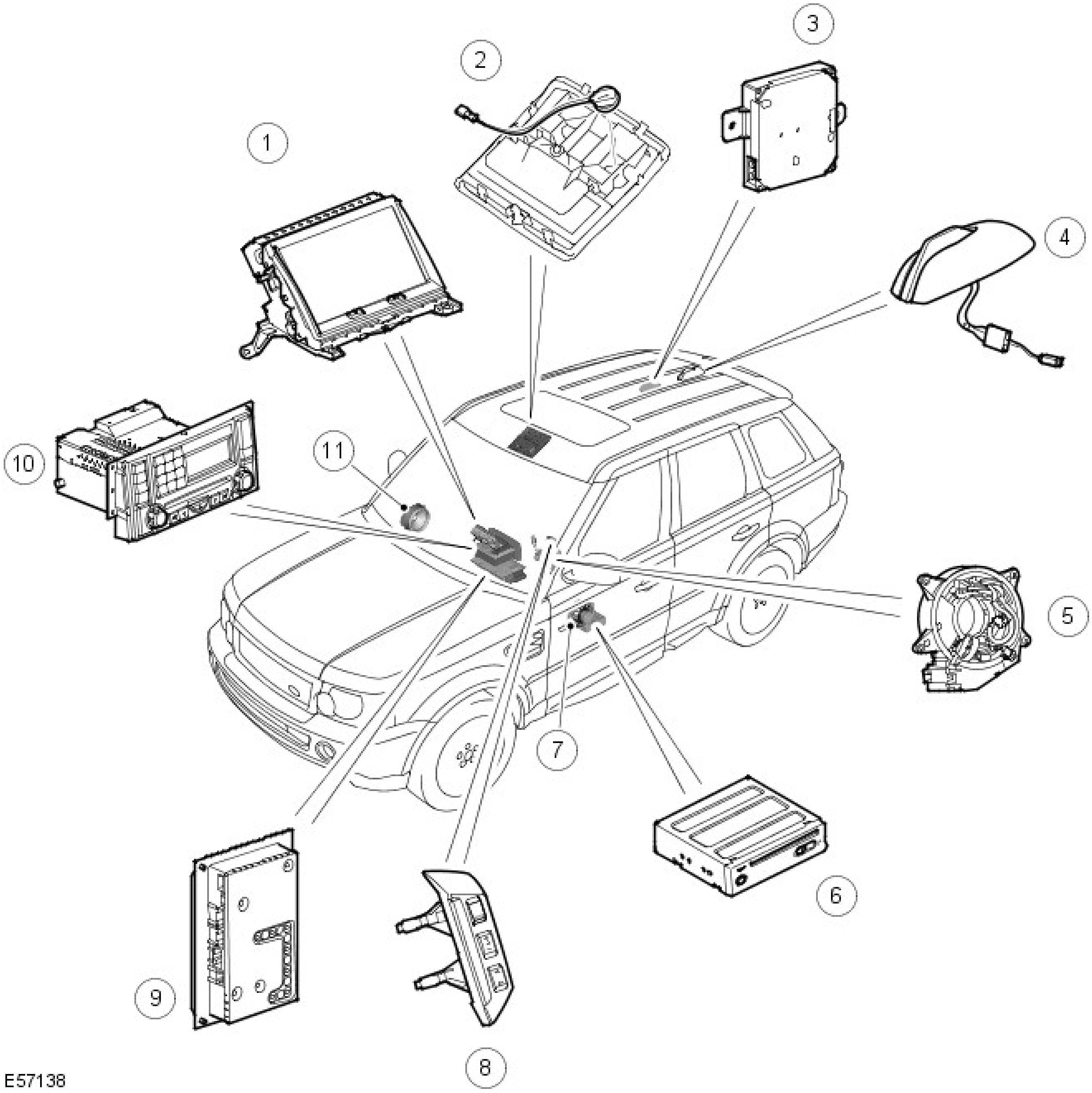
PPS predictable accuracy is:

- 22 meters horizontal accuracy
- 27.7 meters vertical accuracy
- 200 nanoseconds time accuracy.

Each navigation system provides computer generated audible and visual route guidance information to enable the driver to reach a desired destination. The system allows the driver to choose the desired route using minor or major roads or highways and the quickest or shortest route. Directions to hospitals, museums, monuments and hotels are also available. The computer uses map information stored on a compact disc (CD)-ROM to determine the best route for the journey and provide the driver with details of directions and approaching junctions.

NAVIGATION SYSTEM

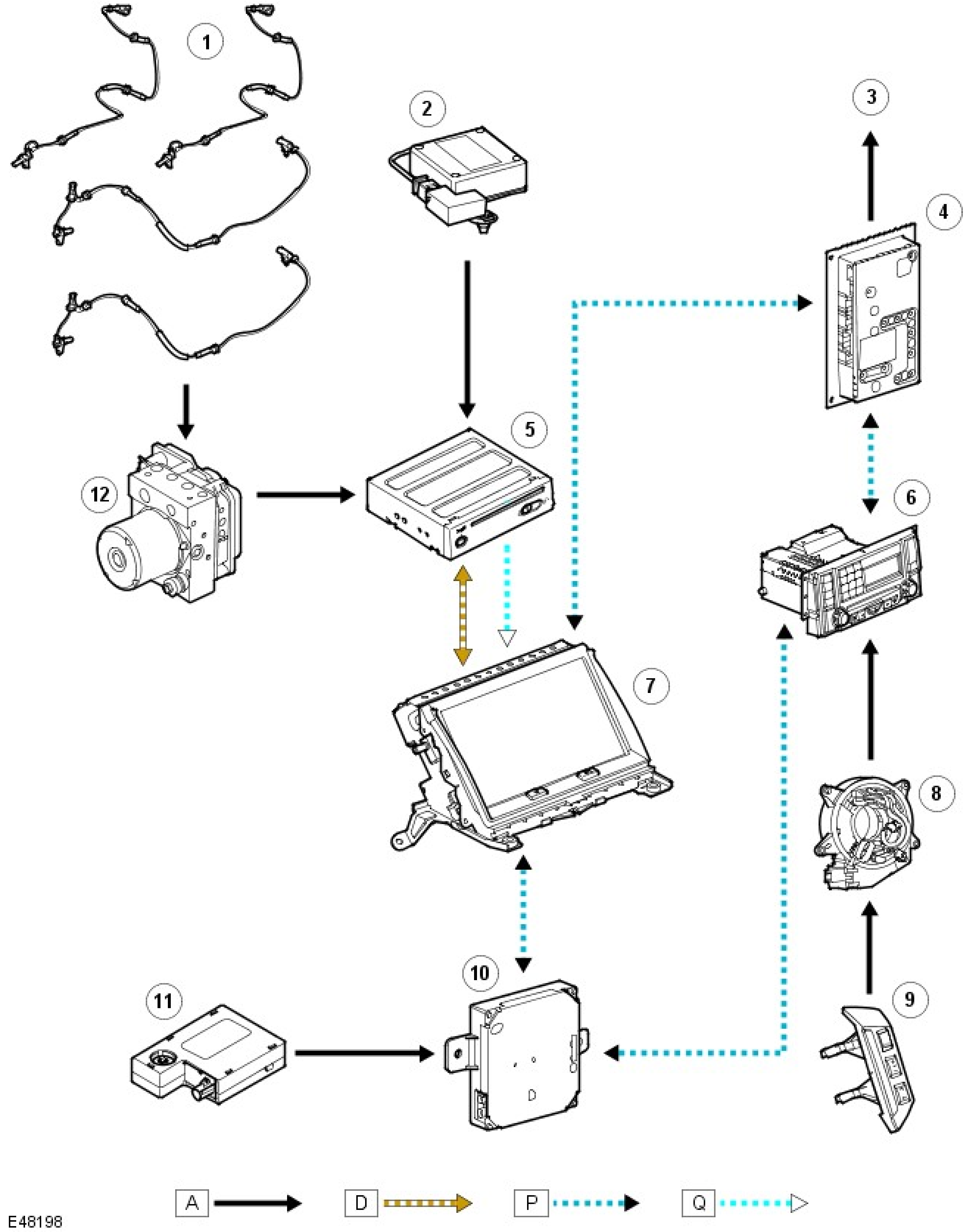
Navigation System Component Location



Item	Part Number	Description
1	-	Touch Screen Display (TSD)
2	-	Microphone
3	-	Traffic Message Channel (TMC) receiver (where fitted)
4	-	GPS antenna
5	-	Clock spring
6	-	Navigation computer
7	-	Speaker
8	-	Steering wheel controls
9	-	Audio amplifier
10	-	Integrated Head Unit (IHU)
11	-	Speaker

Navigation System Control Diagram

- NOTE: **A** = Hardwired **D**= controller area network (CAN)**P**= MOST **Q**= GVIF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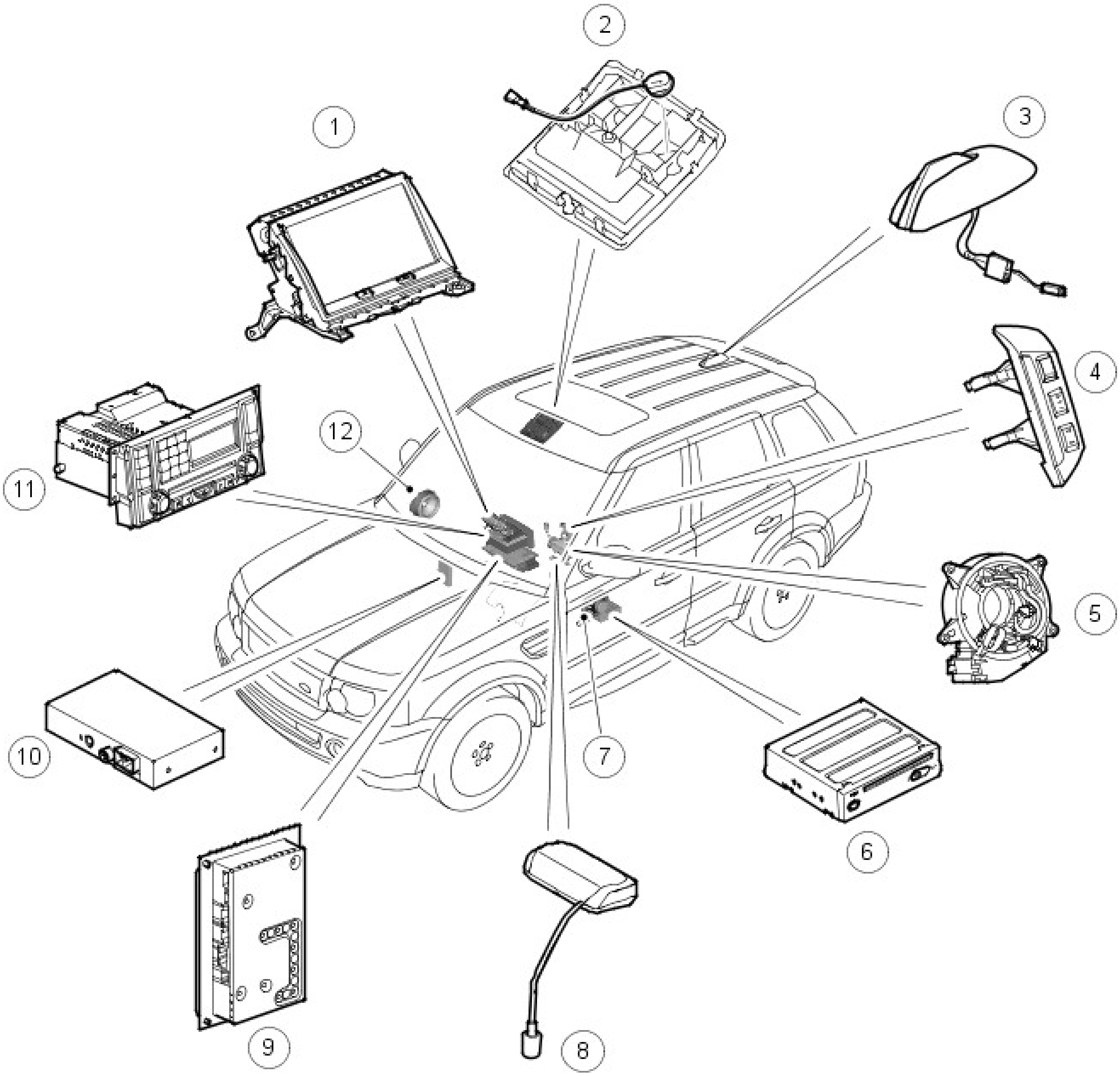
E48198

Item	Part Number	Description
1	-	Wheel speed sensors
2	-	GPS antenna
3	-	Speakers
4	-	Audio amplifier
5	-	Navigation computer

6	-	Integrated Head Unit (IHU)
7	-	Touch Screen Display (TSD)
8	-	Clock spring
9	-	Steering wheel controls
10	-	Traffic Message Channel (TMC) receiver (where fitted)
11	-	Traffic Message Channel (TMC) antenna amplifier
12	-	anti-lock brake system (ABS) module

Navigation System Component Location with VICS (Japan only)



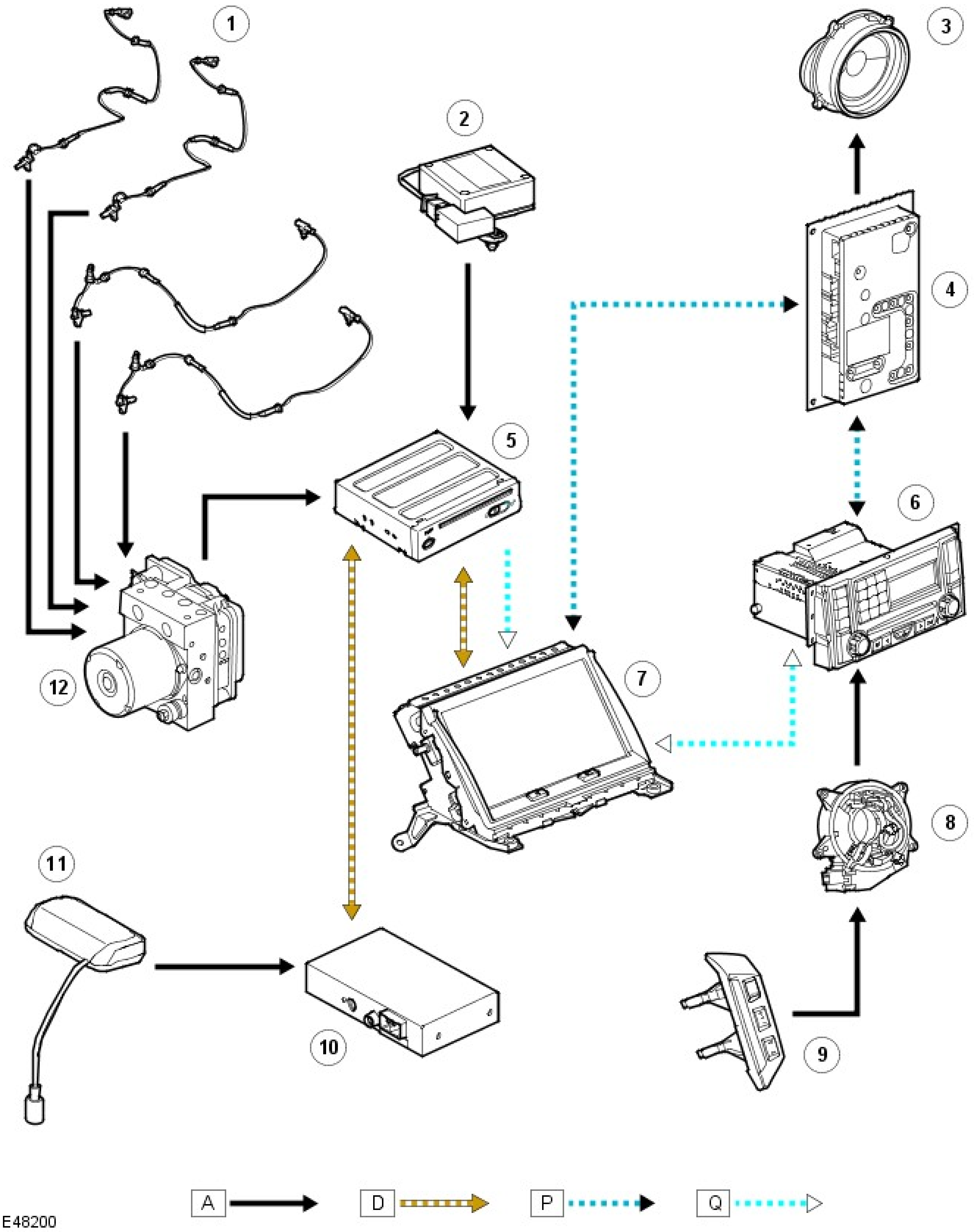
E57139

Item	Part Number	Description
1	-	Touch Screen Display (TSD)
2	-	Microphone
3	-	GPS antenna
4	-	Steering wheel controls
5	-	Clock spring
6	-	Navigation computer
7	-	Speaker
8	-	VICS beacon antenna

9	-	Audio amplifier
10	-	VICS receiver
11	-	Integrated Head Unit (IHU)
12	-	Speaker

Navigation System Control Diagram with VICS (Japan only)

- NOTE: **A** = Hardwired **D**= CAN**P**= MOST **Q**= GVIF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E48200

Item	Part Number	Description
1	-	Wheel speed sensors
2	-	GPS antenna
3	-	Speakers
4	-	Audio amplifier
5	-	Navigation computer

6	-	Integrated Head Unit (IHU)
7	-	Touch Screen Display (TSD)
8	-	Clock spring
9	-	Steering wheel controls
10	-	VICS receiver
11	-	VICS beacon antenna
12	-	ABS module

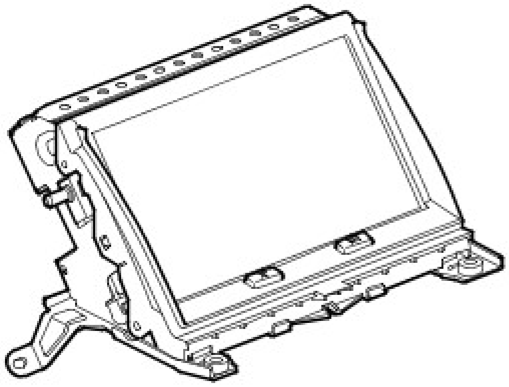
The navigation system comprises the following components:

- Touch Screen Display (TSD)
- Navigation computer
- GPS antenna

In addition to the standard navigation system it is possible in certain markets to add:

- Traffic Message Channel (TMC) system
- Vehicle Information and Communication System (VICS, Japan only)

Touch Screen Display



E48202

The Touch Screen Display (TSD) is located in the center of the instrument panel. The TSD is a touch sensitive 7 inch liquid crystal display (LCD) VGA screen containing 800 x 480 pixels in a 15:9 format. The TSD is connected to the infotainment system on the Media Oriented Systems Transport (MOST) ring. The MOST ring is a fibre optic communications data bus that allows high speed transfer of control instructions and audio around the system.

The TSD processes its own video for system operation but receives the navigation graphics from the navigation computer on a dedicated serial link called GVIF (Gigabit Video Interface).For additional information, refer to:

Communications Network (418-00 Module Communications Network, Description and Operation),
Audio System (415-01 Audio Unit, Description and Operation),
Video System (415-07 Video System, Description and Operation).

TSD Harness Connector No C2819 Pin Out Table

Pin No	Description	Input/Output
1	Battery voltage	Input
2	ground (GND)	-
3	GND	-
6	Audio screen	-
7	Audio -	-
11	ACC	Input
12	Dimming signal	Input
14	Private CAN high	-
15	Private CAN low	-
17	Audio +	Input

TSD Harness Connector No C2820 Pin Out Table

Pin No	Description	Input/Output
1	Video screen	-

TSD Harness Connector No C2823 Pin Out Table

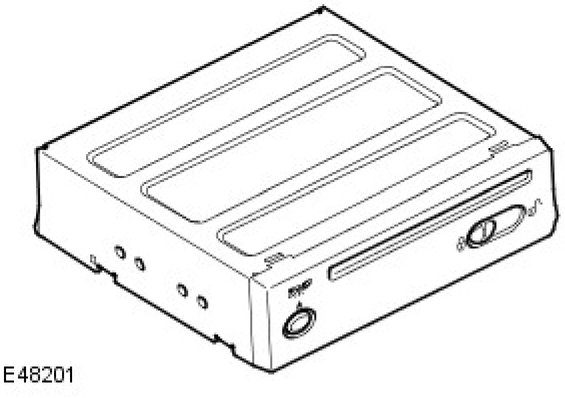
Pin No	Description	Input/Output
1	GVIF +	Input
2	GVIF -	-

Pin No	Description	Input/Output
3	GVIF Shield	-

TSD Harness Connector No C2825 Pin Out Table

Pin No	Description	Input/Output
1	MOST in	Input
2	MOST out	Output

Navigation Computer


E48201

The navigation computer is located under the front LH seat.

The navigation computer is a digital versatile disc (DVD) based system to allow for a greater capacity of data to be stored. This means that map discs can now carry far more information than the previous CD based discs. For example there is now one map disc for Europe where previous CD based systems have required different discs for each country. The navigation computer also carries the GPS receiver and the voice recognition software.

The navigation computer is connected to the TSD by a private CAN bus and a dedicated GVIF (Gigabit Video Interface). The GVIF carries all the video information to the TSD, while the CAN bus is used for data and control instructions to and from the TSD.

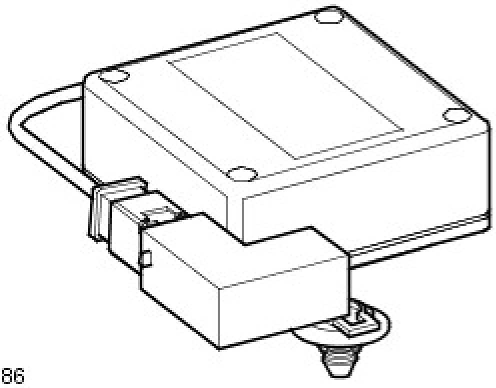
Navigation Computer Harness Connector No C2114 Pin Out Table

Pin No	Description	Input/Output
3	GND	-
6	Private CAN Low to touch screen display	-
14	Audio -	-
15	Mic screen	-
16	Mic -	-
17	Battery voltage	Input
18	Power	Input
19	GND	-
21	Vehicle speed	Input
22	Private CAN high	-
30	Audio +	Output
31	Audio screen/GND	-
32	Mic +	Output

Navigation Computer Harness Connector No C2113 Pin Out Table

Pin No	Description	Input/Output
1	GVIF +	Output
2	GVIF -	-
3	GVIF GND	-

GPS Antenna



E48086

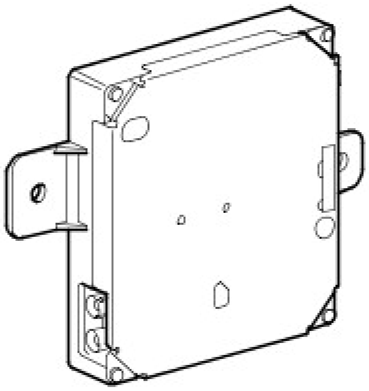
The GPS antenna is located in a pod which is located in the center of the vehicle roof at the rear. The GPS antenna is connected to the GPS computer by a single co-axial cable and passes signals from the GPS satellites to the navigation computers built in receiver for processing.

It is possible for the GPS antenna to lose the signal from the GPS satellites:

- In hilly or tree lined areas
- Built up areas with tall buildings
- In multi storey car parks
- In garages
- In tunnels
- In bridges
- During heavy rain or thunderstorms.

When the signal is lost the navigation computer will continue to give guidance using memory mapped data from the DVD map until the signal is restored.

Traffic Message Channel (TMC) Receiver



E48203

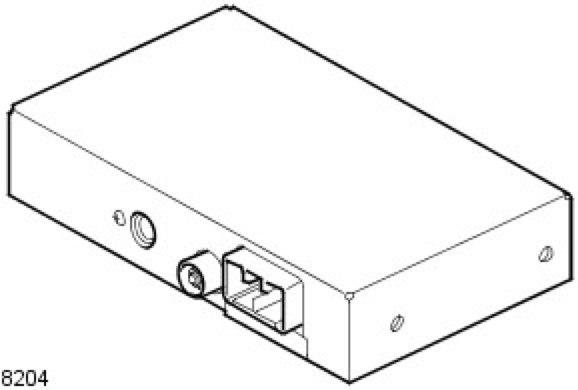
The Traffic Message Channel (TMC) receiver is located in the rear right-hand (RH) side of the luggage compartment. The TMC receiver is connected to the MOST ring and transmits TMC data to the navigation computer (via the TSD). The navigation computer then displays this information on the TSD and also re-routes the navigation guidance around any traffic hold ups. The TMC data is received via the frequency modulation (FM) antenna located in the rear screen via an antenna amplifier located above the rear tailgate spoiler.
For additional information, refer to: Antenna (415-02 Antenna, Description and Operation).

TMC is available in many European markets.

Vehicle Information and Communication System (VICS Japan only) Receiver

The VICS system comprises the following components:

- VICS receiver
- VICS beacon antenna
- VICS RF antenna

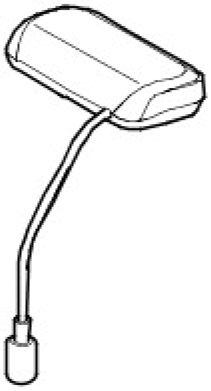


E48204

The VICS receiver is located behind the instrument panel between the heater assembly and the in-vehicle crossbeam. The VICS receiver is connected to the navigation computer via a dedicated link.

The VICS receiver, receives information from the beacon antenna in the center of the instrument panel and the VICS antenna located in the rear screen element.
For additional information, refer to: Antenna (415-02 Antenna, Description and Operation).

VICS Beacon Antenna



E48090

The VICS beacon antenna is located on top of the instrument panel. The antenna receives infra red and RF signals from road side transmitters.

NAVIGATION SYSTEM OPERATION

The navigation system receives GPS information via the GPS antenna. The GPS signals are used by the navigation computer to calculate the vehicles position. Once the driver has input a desired destination the navigation computer can calculate a route, based on the drivers pre-determined preferences or the default settings in the navigation computer.

The navigation system is accessed by pressing the navigation button at the bottom left hand side of the TSD. The driver will then have the option of on road navigation or off road navigation.

On Road Navigation

On road navigation is initiated by the driver inputting a destination. This can be achieved by:

- Entering in an address using the TSD.
- Entering a post code.
- Choosing a pre-entered address from the address book.
- Choosing a point of interest from the map disc database.

The driver is then guided to the destination by a scrolling map display and voice guidance. The display can be varied by scale and display type.

Off Road Navigation

The off road navigation route comprises a series of way points which are followed sequentially. Direct point to point guidance is given to the first way point in the route. When the vehicle arrives at the first way point guidance is given to the second way point in the route. This process continues for subsequent way points until the final way point (destination) is reached.

The routes are stored in the non-volatile memory of the navigation computer.

The routes can be entered on the TSD and comprise way points, longitude and latitude destination and previously stored routes.

The different route guidance screens give the user the information required for direct point to point direction to the selected destination (guidance mode). The same guidance screens are also available even when guidance is not being given (compass mode). Not all the destination and guidance information is shown on the guidance screens when in compass mode. I this instance the route title is ’COMPASS MODE’.

4x4 I

4x4i gives the driver additional information regarding the following vehicle systems:

- Suspension travel
- Gear selected
- Range selected
- Terrain response
- Vehicle heading
- Compass heading
- Steering wheel angle.

The 4x4i System uses inputs from other vehicle systems to display information about suspension and transmission operation along with navigational information.

TRAFFIC MESSAGE CHANNEL (TMC) SYSTEM

The Traffic Message Channel (TMC) is a function of the FM Radio Data System (RDS). The system broadcasts real-time traffic and weather information. Data messages are received and decoded by the TMC receiver and passed onto the navigation system, which then delivers them via the navigation system interface. TMC messages are filtered by the navigation computer so that only those relevant to the current journey are displayed, allowing the navigation system to offer dynamic route guidance - alerting the driver of a problem on the planned route and calculating an alternative route to avoid the incident.

TMC traffic information systems conform to a global standard that has been adopted by traffic data gatherers, information service providers, broadcasters and vehicle/receiver manufacturers. TMC information is received via the normal FM radio antenna.

All TMC receivers use the same list of event codes, while the location database (on the map disc) contains both a country-specific set of location codes for the strategic European road network

TMC traffic data is currently broadcast in many European countries.

VEHICLE INFORMATION and COMMUNICATION SYSTEM (VICS, Japan only)

The VICS system supplies the navigation computer with information to enable the navigation computer to re-route the navigation guidance or to inform the vehicle driver of traffic conditions in the vehicles vicinity. Information is provided to the system through three routes:

- RF transmission
- Infra-red transmission
- FM multiplex transmissions.

The information is passed to the navigation computer via the VICS receiver and the IHU

RF Transmission

RF transmission is generally transmitted from road side beacons mainly on expressways. The information transmitted is:

- Traffic congestion
- Travel time to next intersection
- Traffic conditions in surrounding areas and expressway turn offs
- Traffic accidents
- Speed limits
- Lane regulations
- Tire change
- Parking availability at expressway service areas and parking areas.

The RF transmissions are received by the beacon antenna mounted on the top of the instrument panel.

Infra-Red Transmission

Infra-Red transmissions are transmitted from road side beacons on major trunk roads. The information transmitted is:

- Traffic congestion and travel time

- Traffic accidents
- Breakdowns
- Road works restrictions
- Parking availability.

FM transmissions

FM transmissions are broadcast as part of the normal RDS FM transmission. Information transmitted is:

- Traffic congestion and travel time for wide areas
- Traffic accidents, road works, speed limits and lane restrictions for a wide area
- Parking availability information.

DIAGNOSTICS

The TSD and the navigation computer both have built in self tests that allow the technician to diagnose fault conditions. Fault codes and diagnostics can also be achieved via T4.

TSD Diagnostics

The TSD has in built diagnostics to aid the diagnosis of system faults. The diagnostics allow the technician to interrogate the following:

- Hard key function
- Touch screen function
- Video input
- RGB video
- Vehicle signals
- Self test
- Configurations
- Vehicle configurations
- MOST ring function.

The built in diagnostics are accessed as follows:

- Once the system is powered up enter the 'Home' menu page.
- Press and hold the TSD in the center at the top of the screen for approximately 5 seconds and then press the navigation hard key.
- A 'Diag PIN Entry' box will appear' Type in the access code 753.
- Once this code has been accepted the Diagnostic Menu screen will be displayed.

Hard Key Test Screen

The hard key test is used to determine the function of the two switches integrated into the TSD. Pressing either of the buttons will turn the corresponding icon on the screen green if it is functioning correctly.

Touch Screen Test Screen

Entering the Touch screen test screen allows the technician to test the physical side of the touch screen. The technician can choose between checking the screen integrity and re-calibrating the screen. Using the Touch Switch Check button will display a blank screen. Touching the screen in any place will give a series of co-ordinates. If a faulty area of the screen is touched the co-ordinates will not display.

Re-calibrating the screen allows the technician to align the touch screen co-ordinates to the pressing of the screen. This is achieved by pressing a series of on screen targets as they are displayed.

Vehicle Signals

The vehicle signals screen displays inputs from other vehicle systems to the TSD. These signals include:

- Battery voltage
- Lights (on or off)
- Graphic illumination dimming duty
- Output audio allocation
- PCB temp
- Speed inhibit (on or off)
- MOST Fibre Optic Transceiver (FOT) temperature
- Parking brake position (electric park brake on or off)
- Backlight pulse width modulation (PWM) duty
- Beep volume
- Beep tone.

Video Input Test

This screen will allow the testing of video inputs that are connected to the TSD. This includes TV/DVD Rear Seat Entertainment (RSE) and television.

RGB Color Test

This function allows the technician to test the colors generated by the TSD. A second screen displays six solid colors, selecting the color will fill the screen with the chosen color and pressing the TSD again will revert back to the color test screen.

Self Test

The self test function displays any fault codes that are present for the TSD. The screen also displays the current state of the ignition switch and the battery voltage.

Two additional buttons in the screen allow the technician to clear the fault codes and to test the TSD.

Configurations

The configurations screen displays information about the TSD and the navigation computer. Switching between the two components is achieved via the soft key at the top LH corner of the screen.

The information contained in the screens is as follow:

- Vehicle type
- Component serial number
- Component part number
- Component part level
- CPU/bootloader lever
- Main CPU application version
- Sub CPU software version
- Private CAN database version.

Vehicle Configurations

Selecting the vehicle configurations option allows the technician to inspect the components fitted to the vehicle entertainment system. There are four screens which can be navigated through via the next and previous buttons.

MOST Test

The MOST test screen displays information about the MOST signals being sent around the MOST ring. Using any part of the audio system will bring up the MOST message on the screen. This can be used to help diagnose MOST related faults.

Navigation Computer Diagnostics

The navigation computer has in built diagnostics to aid the diagnosis of system faults. The diagnostics allow the technician to interrogate the following:

- Navigation info
- Parts info
- Manual check
- Self check.

Each area has sub level of menus to access further information.

The built in diagnostics are accessed as follows:

- Once the system is powered up enter the navigation system via the navigation hard key.
- Agree to the disclaimer screen.
- Enter the navigation home menu.
- Press and hold the TSD in the center at the top of the screen.
- A 'Diag PIN Entry' box will appear, type in the access code 753.

Once this code has been accepted the on screen diagnostics menu will be displayed. The menu has the following options:

- Navigation info
- Manual check
- Parts info
- Self check.

Navigation Info

The navigation info menu has three sub menus:

- Vehicle signals
- GPS information
- Reset position.

Parts Info

Parts info displays information on the system component and software versions.

Manual Check

The manual check menu enables the technician to complete the following self tests:

- Navi RGB screen test
- Microphone input level test
- Voice output test.

Self Check

Self check runs an internal check on the navigation computer and displays any fault codes on the TSD.

Navigation System diagnostic trouble code (DTC)

Displayed DTC	DTC Description	Fault Condition
U1A0087	Private CAN Communications fault	No Connector on navigation computer. Comms fault.
B1B0049	Navigation computer internal fault	
B1A0049	HLDF internal fault	
B1A8911	GPS antenna short circuit to GND	GPS Comms error
B1A8913	GPS antenna open circuit	GPS Comms error
B1D6287	VICS ECU communication error	
B1D6249	VICS module error	
U1A0131	GVIF fault	GVIF not connected
U300068	MOST FOT Over-Temperature	MOST transceiver overheating
B100E25	TV/RSE Video Input Failure	Input not connected
B100F25	Companion Video Input Failure	Input not connected
B101025	Rear Camera Video Failure	Input not connected

Published: 11-May-2011

Navigation System - Navigation System

Diagnosis and Testing

Principles of Operation

The information in this section is intended to help with basic diagnosis of the navigation system.

For a detailed description of the Navigation System, refer to the relevant Description and Operation section in the Workshop Manual.

Touch Screen Display (TSD) and Navigation Diagnostics

The TSD and the navigation module both have built in self tests that allow the technician to diagnose fault conditions. Fault codes and diagnostics can also be retrieved/achieved using the manufacturer approved diagnostic system.

TSD Diagnostics

The TSD has in built diagnostics to aid the diagnosis of system faults. The diagnostics allow the technician to interrogate the following:

- Hard key function
- Touch screen function
- Video input
- RGB video
- Vehicle signals
- Self test
- Configurations
- Vehicle configurations
- MOST ring function

The built in diagnostics are accessed as follows:

- Once the system is powered up enter the 'Home' menu page
- Press and hold the TSD in the center at the top of the screen for approximately 5 seconds and then press the navigation hard key (Discovery, Bottom Left - Range Rover, Top Right)
- A 'Diag PIN Entry' box will appear' Type in the access code 753
- Once this code has been accepted the Diagnostic Menu screen will be displayed

Hard Key Test Screen

The hard key test is used to determine the function of the two switches integrated into the TSD. Pressing either of the buttons will turn the corresponding icon on the screen green if it is functioning correctly.

Touch Screen Test Screen

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- Graphic illumination dimming duty
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- PCB temp
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- MOST Fibre Optic Transceiver (FOT) temperature
- Parking brake position (electric park brake on or off)
- Backlight PWM duty
- Beep volume
- Beep tone

Video Input Test

This screen will allow the testing of video inputs that are connected to the TSD. This includes TV/DVD Rear Seat Entertainment (RSE) and television.

RGB Color Test

This function allows the technician to test the colors generated by the TSD. A second screen displays six solid colors, selecting the color will fill the screen with the chosen color and pressing the TSD again will revert back to the color test screen.

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The configurations screen displays information about the TSD and the navigation module. Switching between the two components is achieved via the soft key at the top LH corner of the screen.

The information contained in the screens is as follow:

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- Component serial number
- Component part number
- Component part level
- CPU/bootloader lever
- Main CPU application version
- Sub CPU software version
- Private CAN database version

Vehicle Configurations

Selecting the vehicle configurations option allows the technician to inspect the components installed to the vehicle entertainment system. There are four screens which can be navigated through via the next and previous buttons.

MOST Test

The MOST test screen displays information about the MOST signals being sent around the MOST ring. Using any part of the audio system will bring up the MOST message on the screen. This can be used to help diagnose MOST related faults.

Navigation Module Diagnostics

The navigation module has in built diagnostics to aid the diagnosis of system faults. The diagnostics allow the technician to interrogate the following:

- Navigation info
- Parts info
- Manual check
- Self check

Each area has a sub level of menus to access further information.

The built in diagnostics are accessed as follows:

- Once the system is powered up enter the navigation system via the navigation hard key
- Agree to the disclaimer screen
- Enter the navigation home menu
- Press and hold the TSD in the center at the top of the screen
- A 'Diag PIN Entry' box will appear, type in the access code 753

Once this code has been accepted the on screen diagnostics menu will be displayed. The menu has the following options:

- Navigation info
- Manual check
- Parts info
- Self check

Navigation Info

The navigation info menu has three sub menus:

- Vehicle signals
- GPS information
- Reset position

Parts Info

Parts info displays information on the system component and software versions.

Manual Check

The manual check menu enables the technician to complete the following self tests:

- Navigation RGB screen test
- Microphone input level test
- Voice output test

Self Check

Self check runs an internal check on the navigation module and displays any fault codes on the TSD.

Inspection and Verification

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious electrical faults.

Visual Inspection

Electrical
• Battery • Fuses - Central and Battery Junction Boxes - Megafuses • Wiring harness • Damaged, loose or corroded connectors • Touch Screen Display (TSD) • GPS antenna • Navigation module • Steering wheel controls • Clock spring • Integrated Head Unit (IHU) • Audio amplifier • Anti-lock Brake System (ABS) module • Wheel speed sensors • Vehicle Information and Communication System (VICS Japan only) receiver • VICS beacon antenna (Japan only) • Controller Area Network (CAN) circuits • Media Oriented System Transport (MOST) system • Gigabit Video Interface (GVIF) • Central Junction Box (CJB)

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the DTC index.
    - ○ Make sure that all DTCs are cleared following rectification.

Symptom Chart

Symptom	Possible Cause	Action
Lost satellite reception	• Vehicle not in clear view of satellites • GPS antenna circuit: short circuit to ground, short circuit to power, high resistance • GPS antenna failure • Navigation module failure • Antenna is disconnected	• NOTE: Time taken to lock on to satellites can be several minutes after ignition status is switched to 'ON' It is possible for the GPS antenna to lose satellite reception in hilly or tree-lined areas, built-up areas, in multi-storey car parks, tunnels or during heavy rain or thunderstorms. Check for DTCs indicating an antenna or navigation module fault.

Symptom	Possible Cause	Action
Touch screen display (TSD) displays a high temperature message and shuts down	● MOST fibre optic transceiver (FOT) over-temperature ● FOT temperature greater than 85°C	Check MOST FOT temperature in TSD diagnostics, vehicle signals. Once the temperature is reduced the system will resume normal operation. If the system does not resume normal operation, check for DTCs indicating an information and entertainment system fault.
Touch screen display (TSD) displays a low temperature message and shuts down	● TSD too cold ● TSD temperature less than -25°C	Check MOST FOT temperature in TSD diagnostics, vehicle signals. Once the temperature is increased the system will resume normal operation. If the system does not resume normal operation, check for DTCs indicating an information and entertainment system fault.
Blank screen	● Temperature in passenger compartment too low ● Condensation in passenger compartment ● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test A.
No display on navigation screen (screen does not change)	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test B.
Hard switches do not respond	● Component failure ● Switch failure	GO to Pinpoint Test C.
Radio screen will not display (Range Rover Only)	● Component failure ● Switch failure	GO to Pinpoint Test D.
CD screen will not display (Range Rover Only)	● Component failure ● Switch failure	GO to Pinpoint Test E.
TV/DVD screen will not display	● Component failure ● Switch failure	GO to Pinpoint Test F.
AUX. screen will not display (Range Rover Only)	● Component failure ● Switch failure	GO to Pinpoint Test G.
Display screen will not switch to low light	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test H.
Noise interferes on each screen and the colors are abnormal	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test I.
Disturbance on screen (synchronization abnormal)	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test J.
Screen color is abnormal	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test K.
Map disc will not insert/eject	● Electrical harness open/short circuit, dis-connected ● Component failure ● Map disc failure	GO to Pinpoint Test L.
Touch switches do not respond	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test M.
Considerable deviation between displayed vehicle position and actual position	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test N.

Symptom	Possible Cause	Action
GPS mark does not appear	● Electrical harness open/short circuit, dis-connected ● Component failure ● No reception from satellite	GO to Pinpoint Test O.
No sound	● Electrical harness open/short circuit, dis-connected ● Component failure ● Incorrect system settings	GO to Pinpoint Test P.
No voice recognition	● Electrical harness open/short circuit, dis-connected ● Component failure ● No map disc inserted	GO to Pinpoint Test Q.
Vehicle current position mark turns on its own	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test R.
Vehicle position does not update	● Map disc contaminated/damaged ● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test S.
Route calculations cannot be performed	● Map disc contaminated/damaged ● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test T.
Map display is incomplete	● Map disc contaminated/damaged ● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test U.
Vehicle position mark moves in the opposite direction to the direction of travel	● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test V.
Cannot make or receive calls with the bluetooth telephone - cannot connect to the vehicle	● Incompatible bluetooth telephone ● Incorrect initial connection settings ● Electrical harness open/short circuit, dis-connected ● Component failure	GO to Pinpoint Test W.
'NAVIGATION NOT INSTALLED' message displayed	● No power or ground to navigation module ● Private CAN failure	Refer to the electrical circuit diagrams and check navigation module power and grounds, and private CAN circuit
'NO NAVIGATION AVAILABLE' message displayed	● GVIF fault ● Electrical harness short, open circuit	Carry out GVIF checks, refer to the electrical circuit diagrams and check electrical harness for short, open circuit

DTC index

• NOTE: If the control module is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval Program is in operation, prior to the installation of a new module.

• NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).

• NOTE: When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

• NOTE: Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

• NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B100E25	Video Input "A"	● Input not connected (green connector) ● TV/DVD malfunction	Check the TV/DVD is connected (green connector). Check TV/DVD system for DTCs
B101025	Video Input "C"	● Input not connected ● Camera malfunction	Check that the camera is connected and operates correctly
B1A0049	Control module	● Touch screen display (TSD) internal electrical failure (can be set in more than one module) ● Amplifier internal electrical failure (can be set in more than one module)	Check the power and ground circuits to the module. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect. Check and install a new front touch screen display as required, refer to the new module/component installation note at the top of the DTC Index
B1A8911	Satellite Antenna	• NOTE: Navigation diagnostics Self Check code 80-3B ● GPS antenna circuit - short to ground ● GPS antenna failure ● Navigation module failure	Check for correct installation of GPS antenna. Refer to the electrical circuit diagrams and check GPS antenna circuit for short to ground. Check GPS antenna, install a new antenna as required. Check and install a new navigation module as required, refer to the new module/component installation note at the top of the DTC Index
B1A8913	Satellite Antenna	• NOTE: Navigation diagnostics Self Check code 80-3A ● Global positioning system (GPS) antenna high resistance - The co-axial connector can also set this code ● GPS antenna failure	Check for correct installation of GPS antenna. Refer to the electrical circuit diagrams and check GPS antenna circuit for open circuit. Check GPS antenna, install a new antenna as required
B1B0049	Sub-Module 'A'	• NOTE: Navigation diagnostics Self Check code 80-11, 58-02, 08-42, 08-43 ● Navigation module internal failure	Check for excessive temperature and for the correct installation of the navigation module. Install a new navigation module as required, refer to the new module/component installation note at the top of this DTC Index
B1D6249	Sub-Module 'B'	• NOTE: Navigation diagnostics Self Check code 32-4B ● Vehicle information and communication system (VICS) module internal electrical failure	Check the power and ground circuits to the module. Refer to the electrical guides. Check and install a new VICS module as required, refer to the new module/component installation note at the top of the DTC Index. Refer to the warranty policy and procedures manual if a module is suspect.
B1D6287	Sub-Module 'B'	• NOTE: Navigation diagnostics Self Check code 32-30 ● Vehicle information and communication system (VICS) module circuit - short to ground ● VICS module circuit - short to power ● VICS module circuit - high resistance ● VICS module disconnected	Refer to the electrical circuit diagrams and check VICS module circuits for short to ground, power, open circuit. Check and install a new VICS module as required, refer to the new module/component installation note at the top of the DTC Index. Configure the system using the approved diagnostic system.

DTC	Description	Possible Cause	Action
		• VICS module failure	
U1A0087	Medium Speed CAN Communication Bus	• NOTE: Navigation diagnostics Self Check code 01-50, 01-51, 30-28, 30-D2 • NOTE: 'NAVIGATION NOT INSTALLED' message is displayed • Navigation module disconnected • CAN fault between NAV module and TSD private CAN circuit • Private CAN circuit - short to ground, power, open circuit	Check the system connections at the display and the navigation module. Refer to the electrical circuit diagrams and check CAN private network for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system. Refer to the Network Communications section of the workshop manual.
U1A0131	Communication Link	• NOTE: 'NO NAVIGATION AVAILABLE' message is displayed • Navigation module - touch screen display (TSD), gigabit video interface (GVIF) fault • GVIF disconnected • GVIF - short to ground, power, open circuit	Check for correct connection of GVIF circuit connectors. Refer to the electrical circuit diagrams and check the multi-media module GVIF circuits for short to ground, power, open circuit
U200531	Vehicle Speed	• Vehicle speed signal circuit between ABS and navigation system module - short, open circuit	Check 'SPD PULSE COUNT' in navigation diagnostics, vehicle signals screen. If count remains at zero, refer to the electrical guides and check vehicle speed signal circuit between the ABS module and navigation system module for short to ground, power or open circuit.
U300068	Control Module	• NOTE: Navigation diagnostics Self Check code 30-76 • Touch screen display (TSD) MOST fibre optic transceiver, over-temperature (greater than 85°C) • MOST transceiver over-temperature	An over-temperature message is displayed on the TSD before the information and entertainment system shuts down. Once the temperature is reduced the system will resume normal operation. If the system does not resume normal operation, check for DTCs indicating an information and entertainment fault. Refer to the electrical guides and check the power and ground circuits to the component. Check the MOST circuit. Carry out the general MOST test. Refer to the Network Communications section of the workshop manual and in the approved diagnostic system. Refer to the warranty policy and procedures manual if a module is suspect.

Pinpoint Tests

• NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval Program is in operation, prior to the installation of a new module/component.

PINPOINT TEST A : BLANK SCREEN TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: BLANK SCREEN TESTS	
	1 Check screen switch is not OFF.
	Is the screen turned OFF? **Yes** Turn screen switch 'ON'. Re-test vehicle. **No** GO to A2.
A2: PASSENGER COMPARTMENT TEMPERATURE CHECK	
	1 Check the passenger compartment temperature is not below -20°C.

	Is the passenger compartment below -20°C? **Yes** Raise the temperature in the passenger compartment. Re-test vehicle. **No** GO to A3.
A3: PASSENGER COMPARTMENT CONDENSATION CHECK	
	1 Check for condensation occurring inside the passenger compartment.
	Is condensation occurring inside the passenger compartment? **Yes** Dry out the passenger compartment, re-test the vehicle. **No** GO to A4.
A4: AUDIO POWER BUTTON CHECK (RANGE ROVER ONLY)	
	1 Check the status of the audio power button LED.
	Is the audio power button flashing? **Yes** Carry out MOST Ring diagnostics to locate fault. **No** GO to A5.
A5: NAVIGATION SCREEN CHECK	
	1 Check to see if only the navigation screen is blank.
	Is only the navigation screen blank? **Yes** GO to Pinpoint Test B. **No** GO to A6.
A6: AUDIO SCREEN CHECK (RANGE ROVER ONLY)	
	1 Check to see if only the audio screen is blank.
	Is only the audio screen blank? **Yes** GO to Pinpoint Test E. **No** GO to A7.
A7: TV/DVD CHECK	
	1 Check to see if only the TV/DVD is blank.
	Is only the TV/DVD screen blank? **Yes** GO to Pinpoint Test F. **No** GO to A8.
A8: HARNESS/CONNECTOR CHECKS	
	1 Check the display and power supply harness, power, auxiliary and ground circuits, for short, open circuits and are correctly connected.
	Was a fault identified with the display and power supply harness, power auxiliary and ground connections? **Yes** Rectify the fault and re-test the vehicle. **No** Install a new display screen. **module**

PINPOINT TEST B : NO DISPLAY ON NAVIGATION SCREEN (SCREEN DOES NOT CHANGE) TESTS

• NOTE: When re-confirming the symptoms after inspecting the wiring harness/connector, turn the ignition status to OFF, wait for the Audio power button LED on the display to turn OFF, then turn the ignition status to ON and run the diagnosis again from the beginning.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: SOFT KEY TEST	
	1 Check the navigation system soft key operation.
	Is operation normal when operating the soft key test? **Yes** GO to B2. **No** GO to Pinpoint Test M.
B2: HARD KEY TEST	
	1 Check the navigation system hard key operation.

	Is operation normal when pressing the navigation hard key? **Yes** GO to B3. **No** GO to Pinpoint Test C.
B3: DISPLAYED MESSAGE CHECK	
	1 Check for displayed messages.
	Are the 'No picture signal input', 'Navigation not installed' or 'No navigation available' messages being displayed? **Yes** GO to B4. **No** GO to Pinpoint Test A.
B4: NAVIGATION MODULE POWER AND GROUND CHECKS	
	1 Refer to electrical circuit diagrams and check integrity of power and ground wiring harness and connectors to navigation module.
	Was a fault identified with the navigation module power and ground harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** GO to B5.
B5: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of navigation module to display screen private CAN and GVIF harness and connections.
	Was a fault identified with the navigation module to display screen harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** Install a new navigation module. **module**

PINPOINT TEST C : HARD SWITCHES DO NOT RESPOND

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK FOR FOREIGN OBJECTS	
	1 Check for foreign objects near to the button.
	Are there any foreign objects close to the button causing it to be pressed? **Yes** Remove foreign objects and re-test vehicle. **No** GO to C2.
C2: DISPLAY DIAGNOSTICS CHECK	
	1 Check to see if the display diagnostics can be displayed.
	Can the display diagnostics be displayed? **Yes** GO to C3. **No** GO to Pinpoint Test A. and GO to Pinpoint Test M.
C3: HARD KEY TEST	
	1 Carry out the display diagnostics hard key test.
	Is the operation normal when carrying out the display diagnostics hard key test? **Yes** System operation is normal. **No** Install a new display screen. **module**

PINPOINT TEST D : RADIO SCREEN WILL NOT DISPLAY (RANGE ROVER ONLY)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: AUDIO HARD SWITCH TEST	
	1 Check operation of audio hard switch.
	Does the audio screen display when the audio hard switch is pressed? **Yes** GO to D2. **No** Carry out hard switch tests. GO to Pinpoint Test C.
D2: AUDIO VIDEO SOFT KEY TEST	

	1 Check operation of the audio video soft key.
	Does the audio screen display when the audio video soft key on the 'Home Menu' screen is activated? **Yes** GO to D3. **No** Carry out touch switch tests. GO to Pinpoint Test M.
D3: RADIO SOFT KEY TEST	
	1 Check operation of the radio soft key.
	Does the radio soft key respond when touched? **Yes** Check the Integrated Head Unit (IHU). **No** Switch ignition status to OFF and wait thirty seconds for the display power LED to extinguish, then set ignition status to auxiliary. If fault still evident after re-test, check the Integrated Head Unit (IHU).

PINPOINT TEST E : CD SCREEN WILL NOT DISPLAY (RANGE ROVER ONLY)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: CD CHANGER CHECK	
	1 Check to see if a CD changer is installed.
	Is a CD changer installed? **Yes** GO to E2. **No** Normal operation, CD screen will not be displayed when there is no CD changer installed.
E2: AUDIO OPERATION SWITCH CHECK	
	1 Check the operation of the audio operation switch.
	Does the audio screen display when the audio operation switch is pressed? **Yes** GO to E3. **No** Carry out hard switch tests. GO to Pinpoint Test C.
E3: AUDIO VIDEO SOFT KEY TEST	
	1 Check operation of the audio video soft key.
	Does the audio screen display when the audio video soft key on the 'Home Menu' screen is activated? **Yes** GO to E4. **No** Carry out touch switch tests. GO to Pinpoint Test M.
E4: CD SOFT KEY TEST	
	1 Check operation of the CD soft key.
	Does the CD soft key respond when touched? **Yes** Check the Integrated Head Unit (IHU). **No** Switch ignition status to OFF and wait thirty seconds for the display power LED to extinguish, then set ignition status to auxiliary. If fault still evident after re-test, check the Integrated Head Unit (IHU).

PINPOINT TEST F : TV/DVD SCREEN WILL NOT DISPLAY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: TV/DVD CHECK	
	1 Check to see if TV/DVD is installed.
	Is TV/DVD installed? **Yes** GO to F2. **No** Normal operation, TV/DVD screen will not be displayed when there is no TV/DVD installed.
F2: AUDIO OPERATION HARD KEY TEST (RANGE ROVER ONLY)	
	1 Check the operation of the audio hard key.
	Does the audio screen display when the audio hard key is pressed? **Yes** GO to F3. **No** Carry out hard switch tests. GO to Pinpoint Test C.

F3: AUDIO VIDEO SOFT KEY TEST (RANGE ROVER ONLY)	
	1 Check operation of the audio video soft key.
	Does the audio screen display when the audio video soft key on the 'Home Menu' screen is activated? **Yes** GO to F4. **No** Carry out touch switch tests. GO to Pinpoint Test M.
F4: TV/DVD SOFT KEY TEST	
	1 Check operation of the TV/DVD soft key.
	Does the TV/DVD soft key respond when touched? **Yes** Check the Integrated Head Unit (IHU). **No** Switch ignition status to OFF and wait thirty seconds for the display power LED to extinguish, then set ignition status to auxiliary. If fault still evident after re-test, check the Integrated Head Unit (IHU).

PINPOINT TEST G : AUX. SCREEN WILL NOT DISPLAY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: AUDIO OPERATION SWITCH CHECK	
	1 Check the operation of the audio operation switch.
	Does the audio screen display when the audio operation switch is pressed? **Yes** GO to F3. **No** Carry out hard switch tests. GO to Pinpoint Test C.
G2: AUDIO VIDEO SOFT KEY TEST	
	1 Check operation of the audio video soft key.
	Does the audio screen display when the audio video soft key on the 'Home Menu' screen is activated? **Yes** GO to F4. **No** Carry out touch switch tests. GO to Pinpoint Test M.
G3: TV/DVD SOFT KEY TEST	
	1 Check operation of the TV/DVD soft key.
	Does the TV/DVD soft key respond when touched? **Yes** Check the Integrated Head Unit (IHU). **No** Switch ignition status to OFF and wait thirty seconds for the display power LED to extinguish, then set ignition status to auxiliary. If fault still evident after re-test, check the Integrated Head Unit (IHU).

PINPOINT TEST H : DISPLAY SCREEN WILL NOT SWITCH TO LOW LIGHT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: CHECK FOR FOREIGN OBJECTS	
	1 Check for foreign objects adhered to the display light sensor. ● Range Rover - Top right of display ● Discovery/Range Rover Sport - Instrument panel
	Are there any foreign objects adhered to the display light sensor? **Yes** Remove foreign objects and re-test vehicle. **No** GO to H2.
H2: VEHICLE LIGHT SWITCH TESTS	
	1 Check to see if display screen switches to low light when the vehicle light switch is pressed.
	Does the display screen switch to low light when the vehicle light switch is pressed? **Yes** Operation is normal. **No** GO to H3.
H3: DISPLAY LIGHT SENSOR CHECK	
	1 Check to see if display screen switches to low light when sensor is covered.

	Does the display screen switch to low light when the sensor is covered? **Yes** Operation is normal. **No** Range Rover Only - Install a new display screen. **module** Discovery/Range Rover Sport - Check CAN network between instrument cluster and display screen. If no fault evident, install a new instrument cluster. **module**

PINPOINT TEST I : NOISE INTERFERES ON EACH SCREEN AND THE COLORS ARE ABNORMAL	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
I1: DISPLAY POWER AND GROUND CHECKS	
	1 Refer to electrical circuit diagrams and check battery power and power ON relay voltage, and ground resistance.
	Is the battery power and power ON relay voltage between 10.5 and 16 volts, and continuity to ground? **Yes** GO to I2. **No** Check and rectify the vehicle wiring harness and connectors.
I2: CONTRAST CHECK	
	1 Check to see if the screen color is normal when the screen setting (contrast) is re-ret to the default values.
	Is the screen color normal with the default values? **Yes** Normal operation. **No** GO to I3.
I3: CABIN INTERNAL TEMPERATURE CHECK	
	1 Check the cabin internal temperature.
	Is the cabin internal temperature -20°C or lower? **Yes** Raise the cabin internal temperature and re-test. **No** GO to I4.
I4: ADDITIONAL SCREEN CHECKS	
	1 Check all other screens.
	Are all other screens beside the navigation display screen normal? **Yes** Go to screen color is abnormal. GO to Pinpoint Test K. **No** GO to I5.
I5: RGB COLOR TEST	
	1 Carry out the display diagnostics RGB color test.
	Are the results of the display diagnostics RGB test normal? **Yes** Normal operation. **No** GO to Pinpoint Test K.

PINPOINT TEST J : DISTURBANCE ON SCREEN (SYNCHRONIZATION ABNORMAL)	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
J1: AUDIO SCREEN SYNCHRONIZATION CHECK (RANGE ROVER ONLY)	
	1 Check the audio screen synchronization.
	Is the audio screen synchronization normal? **Yes** GO to J2. **No** Check the integrated head unit and connections.
J2: NAVIGATION SCREEN SYNCHRONIZATION CHECK	
	1 Check the navigation screen (map screen) synchronization.
	Is the navigation screen (map screen) synchronization normal? **Yes** GO to J4. **No** Check the GVIF circuits between the navigation module and display screen.

J3: WIRING HARNESS AND CONNECTOR CHECKS	
	1 Check the integrity of the display screen wiring harness and connections.
	Was a fault identified with the display screen wiring harness or connections? **Yes** Rectify the fault and re-test. **No** GO to J4.
J4: TV/DVD SCREEN SYNCHRONIZATION CHECK	
	1 Check the TV screen synchronization.
	Is the TV screen synchronization normal? **Yes** GO to J6. **No** GO to J5.
J5: CHECK TV/DVD SETTINGS	
	1 Check TV settings are to the correct TV standards for the country.
	Are the TV settings to the correct TV standards for the country? **Yes** Check TV tuner module and/or DVD module. **No** Re-set TV settings and re-test vehicle.
J6: REAR VIEW CAMERA SCREEN SYNCHRONIZATION CHECK	
	1 Check the rear view camera screen synchronization.
	Is the rear view camera screen synchronization normal? **Yes** Normal operation, re-test vehicle. **No** Check the integrity of the rear view camera.

PINPOINT TEST K : SCREEN COLOR IS ABNORMAL

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K1: NAVIGATION SYSTEM DISPLAY MODULE RGB COLOR TEST	
	1 Carry out the display diagnostics RGB color test.
	Are the results of the display diagnostics RGB test normal? **Yes** GO to Pinpoint Test I. **No** GO to K2.
K2: CONTRAST SETTING CHECKS	
	1 Re-set the contrast settings to the default values.
	Is the color normal after re-setting contrast to default values? **Yes** Normal operation, re-test vehicle. **No** Install a new display screen. **module**
K3: NAVIGATION MODULE RGB COLOR TEST	
	1 Carry out the navigation module diagnostics RGB color bar test.
	Is the color normal during the diagnostic color bar test? **Yes** Normal operation. **No** GO to K4.
K4: NAVIGATION MODULE POWER AND GROUND CHECKS	
	1 Refer to the electrical circuit diagrams and check the navigation module power and ground circuits.
	Has a fault been identified with the navigation module power or grounds? **Yes** Rectify the fault and re-test vehicle. **No** GO to K5.
K5: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of navigation module to display screen harness and connections.

	Was a fault identified with the navigation module to display screen harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** Install a new navigation module. **module**

PINPOINT TEST L : MAP DISC WILL NOT INSERT/EJECT	
• NOTE: Ensure the parking brake is applied, and ignition status is set to Auxiliary or ON.	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
L1: MAP DISC CHECK	
	1 Check to see if there is a map disc inserted into the navigation module.
	2 Check map disc for contamination, deformation, cracks, scratches or non-genuine disc.
	Has a fault been identified with the map disc? **Yes** Replace the map disc. **No** GO to L2.
L2: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of navigation module power and ground supply harness and connections.
	Has a fault been identified with the navigation module power and ground supply harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** Install a new navigation module. **module**

PINPOINT TEST M : TOUCH SWITCHES DO NOT RESPOND	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
M1: START CALIBRATION ROUTINE	
	1 Carry out the start calibration routine from the display diagnostics touch switch test.
	Is normal operation resumed after correction? **Yes** Normal operation. **No** GO to M2.
M2: TOUCH SWITCH TEST	
	1 Carry out the touch switch test in the display diagnostics.
	Are the touch switches not responding on the navigation screen only? **Yes** GO to M3. **No** Install a new display screen. **module**
M3: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of navigation module to display screen harness and connections.
	Has a fault been identified with the navigation module to display screen harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** Install a new navigation module. **module**

PINPOINT TEST N : CONSIDERABLE DEVIATION BETWEEN DISPLAYED VEHICLE POSITION AND ACTUAL POSITION	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
N1: GPS MARK DISPLAY CHECK	
	1 Check to see if GPS mark is displayed.
	Is the GPS mark displayed on the display screen? **Yes** GO to N2. **No** Refer to GPS mark does not appear diagnosis. GO to Pinpoint Test O.
N2: LOCATION CHECK	

	1 Check for symptom occurring in particular locations - parallel roads, elevated roads, loop roads, parking centers (buildings) etc.
	Does the symptom occur in a particular location? **Yes** In places where the vehicle position is hard to specify, the vehicle position may be matched incorrectly and result in position discrepancies. Additionally, a new road layout will mean the Gyro does not match the map position. **No** GO to N3.
N3: DISTANCE CORRECTION CHECK	
	1 Check to see if distance correction is being performed.
	Is distance correction being performed? **Yes** Monitor the condition until distance correction is complete (drive for over 10km/6.2 miles) **No** GO to N4.
N4: DIAGNOSTIC CODE CHECK	
	1 Check navigation diagnostic codes.
	Is logical address '80' being displayed? **Yes** Check the GPS antenna circuit for short, open circuit. Check and install GPS antenna and navigation module as required, refer to the new module/component installation note at the top of the Pinpoint Test section. **No** GO to N5.
N5: VEHICLE SIGNAL INSPECTION	
	1 Check the vehicle speed signal (SPD) during the vehicle signal inspection test.
	Is the SPD signal normal? **Yes** GO to N6. **No** Refer to the electrical circuit diagrams and check the integrity of the wiring harness and connectors to the navigation module.
N6: REVERSE SIGNAL CHECKS	
	1 Check navigation diagnostics, vehicle signals screen, to see if REV: ON is indicated when the gear shift lever is in the REV position.
	Is REV: ON indicated? **Yes** GO to N7. **No** Refer to the electrical circuit diagrams and check the integrity of the wiring harness and connectors, and CAN circuit, to the navigation module.
N7: TIRE CHECK	
	1 Check to see if new tires have recently been installed.
	Have new tires been recently installed? **Yes** Perform automatic correction by pressing 'various settings' on the menu screen, then 'navigation correction' and 'distance correction'. Drive vehicle at 10-20km/h to confirm. **No** Correct the current location, and drive for a while with GPS mark displayed to monitor conditions. If fault still apparent, GO to Pinpoint Test O.

PINPOINT TEST O : GPS MARK DOES NOT APPEAR

- NOTE: Move the vehicle to an open area, radio waves from satellites may not be received inside buildings.
- NOTE: Correct the vehicle cursor to the current location.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
O1: RETRO-INSTALL INSTALLATIONS CHECK	
	1 Check to see if there are any retro-install installations (anti-theft, radar, etc.)
	Are there any retro-install installations? **Yes** GO to O2. **No** GO to O3.
O2: RETRO-INSTALL INSTALLATIONS RF CHECK	
	1 Turn power supply (including back-up power) to OFF status.

	Is the GPS mark displayed? **Yes** GPS reception may deteriorate when devices receiving radio waves are retro-installed. Alter the position of the retro-install device, and re-test vehicle. **No** GO to O3.
O3: SATELLITE RECEPTION CHECKS	
	1 Check to see if a 'P' or 'T' is displayed in the 'ST' column of the navigation diagnostics GPS information screen after 10 minutes have passed.
	Is a 'P' or a 'T' displayed? **Yes** Wait for reception of another satellite so that position calculation can be performed. **No** GO to O4.
O4: NAVIGATION DIAGNOSTICS SELF CHECK CODES	
• NOTE: Confirm the GPS antenna is connected to the navigation module.	
	1 Perform the navigation diagnostics 'Self Check'.
	Are either of the codes 80-3A or 80-3B displayed? **Yes** GO to O5. **No** If the code 80-11 is displayed or no 80-XX code is logged, install a new navigation module. **module**
O5: GPS ANTENNA REPLACEMENT	
	1 Install a new GPS antenna.
	Is reception possible after the GPS antenna has been replaced? **Yes** Fault has been rectified. **No** Refer to the electrical circuit wiring diagrams and check the integrity of the wiring harness and connectors to the GPS antenna.

PINPOINT TEST P : NO SOUND

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
P1: SOUND OUTPUT CHECK	
	1 Check sound output across all systems.
	Is there no sound output across all systems? **Yes** GO to P2. **No** GO to P3.
P2: VOLUME LEVEL CHECK	
	1 Check the volume level is not set too low.
	Is the volume level set too low? **Yes** Increase the volume level and re-test vehicle. **No** Refer to the electrical circuit diagrams and check integrity of amplifier and speaker wiring harness and connections. Check the Integrated Head Unit (IHU).
P3: ONLY VOICE GUIDANCE DOES NOT OUTPUT	
	1 Check that only voice guidance does not output.
	Is there no output only from the voice guidance? **Yes** GO to P4. **No** GO to P7.
P4: NAVIGATION VOLUME SETTING	
	1 Check to see if the navigation system volume setting is too low.
	Is the navigation volume setting too low? **Yes** Increase the navigation volume level and re-test the vehicle. **No** GO to P5.
P5: VOICE GUIDANCE	
	1 Check to see if the voice guidance is set to 'OFF' in the navigation settings.

	Is the voice guidance set to 'OFF' in the navigation settings? **Yes** Set to 'ON' and re-test the vehicle. **No** GO to P6.
P6: ADDITIONAL ITEMS	
	1 Check to see if the following items apply. ● There is no destination set ● There is no movement along the route
	Do the two items apply? **Yes** Normal operation, confirm customer symptom and re-test vehicle. **No** Check MOST connection at the Touch Screen Display and check the Integrated Head Unit (IHU).
P7: ONLY VOICE RECOGNITION DOES NOT OUTPUT	
	1 Check to see if only voice recognition does not output.
	Is there no output only from the voice recognition? **Yes** Carry out the 'No voice recognition' diagnostics. GO to Pinpoint Test Q. **No** GO to P8.
P8: ONLY CD DOES NOT OUTPUT	
	1 Check to see if only the CD does not output.
	Does only the CD not output? **Yes** If the playtime is advancing, check the Integrated Head Unit (IHU). If the playtime is not advancing, press Start/Play. **No** GO to P9.
P9: ONLY THE RADIO DOES NOT OUTPUT	
	1 Check to see if only the radio does not output.
	Does only the radio not output? **Yes** Check the Integrated Head Unit (IHU). **No** GO to P10.
P10: ONLY TV SOUND DOES NOT OUTPUT	
	1 Check to see if only the TV sound does not output.
	Does only the TV sound not output? **Yes** Check the Integrated Head Unit (IHU). **No** GO to P11.
P11: ONLY TELEPHONE SOUND DOES NOT OUTPUT	
	1 Check to see if only the telephone sound does not output.
	Does only the telephone sound not output? **Yes** Check the Integrated Head Unit (IHU). For additional information. GO to Pinpoint Test W. **No** Check the Integrated Head Unit (IHU).

PINPOINT TEST Q : NO VOICE RECOGNITION

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
Q1: MAP DISC CHECK	
	1 Check to see if the map disc is inserted.
	Is the map disc inserted? **Yes** GO to Q2. **No** Insert the map disc.
Q2: AUDIO SOUND IS MUTED WHEN PTT SWITCH IS DEPRESSED	
	1 Check to see if the audio sound is muted when the PTT switch is depressed.

	Is the audio sound muted? **Yes** GO to Q4. **No** GO to Q3.
Q3: PTT SWITCH STATUS	
	1 Check to see if the PTT switch status is ok in the navigation diagnostics, manual check, microphone test.
	Is the PTT switch status, in navigation diagnostics, ok? **Yes** Check the Integrated Head Unit (IHU). **No** Install a new Integrated Head Unit (IHU), or Ignition Gateway Module.
Q4: TALK BACK	
	1 Check to see if there is talk back when other voice recognition demands are executed.
	Is there talk back? **Yes** System operation is normal, (advise change in manner of speech, as incorrect recognition is occurring). **No** GO to Q5.
Q5: MICROPHONE TEST	
	1 Check to see if the microphone level changes when speaking into the microphone during test in navigation diagnostics, manual checks, microphone test.
	Does the microphone level change when talking after pressing the PTT switch? **Yes** System operation is normal, (advise change in manner of speech, as incorrect recognition is occurring). **No** Refer to the electrical circuit diagrams and check integrity of microphone circuit GO to Q6. . If no fault is evident, suspect the microphone, check and install a new microphone as required.
Q6: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of navigation module to display screen harness and connections.
	Has a fault been identified with the navigation module to display screen harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** Install a new navigation module. **module**

PINPOINT TEST R : VEHICLE CURRENT POSITION MARK TURNS ON ITS OWN

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
R1: VEHICLES CURRENT POSITION MARK TURNS ON ITS OWN	
	1 Determine if the ignition status was turned to Auxiliary or On, while the vehicle was on a turntable in a parking building etc.
	Was ignition status set to Auxiliary or On? **Yes** The angular speed of the vehicle at the time of the ignition status change will be logged as the standard value. To re-set the standard value, turn ignition status to 'OFF' then to 'Auxiliary' or 'On' with the vehicle stationary. Re-test the vehicle. **No** GO to R2.
R2: VEHICLES CURRENT POSITION MARK TURNS ON ITS OWN	
	1 Check for logged fault codes in navigation diagnostics.
	Is the fault code 58-02 (Gyro system) logged? **Yes** Install a new navigation module. **module** **No** GO to R3.
R3: VEHICLES CURRENT POSITION MARK TURNS ON ITS OWN	
	1 Check for logged fault codes in navigation diagnostics.
	Is the fault code 58-03 (vehicle speed system) logged? **Yes** Take measures in accordance with navigation DTC index. **No** Install a new navigation module. **module**

PINPOINT TEST S : VEHICLE POSITION DOES NOT UPDATE	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
S1: VEHICLE POSITION DOES NOT UPDATE	
	1 Check the GPS mark display.
	Does the GPS mark display? **Yes** GO to S2. **No** Carry out the GPS mark display diagnostics. GO to Pinpoint Test O.
S2: VEHICLE POSITION DOES NOT UPDATE	
	1 Check the map screen scroll function.
	Can the map screen be touched scrolled? **Yes** GO to S3. **No** Check the condition of the map disc (scratches, contamination, deformation, cracks, non-genuine disc etc.).
S3: VEHICLE POSITION DOES NOT UPDATE	
	1 Go to vehicle signal check screen in display diagnostics.
	Is the vehicle speed input correctly? Note: MOST and navigation system module speeds are approximately the same. **Yes** Suspect the navigation module. Refer to the new module/component installation note at the top of this section. **No** GO to S4.
S4: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of navigation module harness and connections.
	Has a fault been identified with the navigation module harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** Install a new navigation module. **module**

PINPOINT TEST T : ROUTE CALCULATIONS CANNOT BE PERFORMED	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
T1: ROUTE CALCULATIONS CANNOT BE PERFORMED	
	1 Check to see if route calculations are possible when the current location is correct and a different destination is set.
	Are route calculations possible? **Yes** GO to T2. **No** Check the condition of the map disc (scratches, contamination, deformation, cracks, non-genuine disc etc.).
T2: ROUTE CALCULATIONS CANNOT BE PERFORMED	
	1 Check to see if a point of interest search can be performed.
	Can a point of interest search can be performed? **Yes** GO to T3. **No** Check the condition of the map disc (scratches, contamination, deformation, cracks, non-genuine disc etc.).
T3: ROUTE CALCULATIONS CANNOT BE PERFORMED	
	1 Check to see if the map screen can be touch scrolled.
	Can the map screen be touched scrolled? **Yes** Check the condition of the map disc (scratches, contamination, deformation, cracks etc.). If no fault is evident, suspect the navigation module. Refer to the new module/component installation note at the top of this section. **No** Check the condition of the map disc (scratches, contamination, deformation, cracks, non-genuine disc

	etc.).

PINPOINT TEST U : MAP DISPLAY IS INCOMPLETE	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
U1: MAP DISPLAY IS INCOMPLETE	
	1 Check to see if the map screen displays correctly when it is touch scrolled.
	Does the map screen display correctly when it is touch scrolled? **Yes** Check the condition of the map disc (scratches, contamination, deformation, cracks, non-genuine disc etc.). **No** GO to U2.
U2: MAP DISPLAY IS INCOMPLETE	
	1 Check to see if the map screen scale can be reduced.
	Can the map screen scale be reduced? **Yes** GO to U3. **No** Check the condition of the map disc (scratches, contamination, deformation, cracks, non-genuine disc etc.).
U3: MAP DISPLAY IS INCOMPLETE	
	1 Check to see if a point of interest search can be performed.
	Can a point of interest search be performed? **Yes** GO to U4. **No** Check the condition of the map disc (scratches, contamination, deformation, cracks, non-genuine disc etc.).
U4: MAP DISPLAY IS INCOMPLETE	
	1 Replace the map disc and re-test vehicle.
	Is the fault still apparent? **Yes** Suspect the navigation module. Refer to the new module/component installation note at the top of this section. **No** Normal operation.

PINPOINT TEST V : VEHICLE POSITION MARK MOVES IN THE OPPOSITE DIRECTION TO THE DIRECTION OF TRAVEL	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
V1: REAR VIEW CAMERA DISPLAY CHECK	
	1 Check to see if the rear view camera is operational when reverse gear is selected.
	Is the rear view camera operational when reverse gear is selected? **Yes** GO to V2. **No** Refer to the electrical circuit diagrams and check integrity of back monitor display wiring harness and connectors. Check the Integrated Head Unit (IHU).
V2: REV 'ON' SIGNAL CHECK	
	1 Carry out the vehicle signal check in navigation diagnostics.
	Is the REV 'ON' signal displayed correctly when the gear shift selector is in reverse? **Yes** GO to V3. **No** Refer to electrical circuit diagrams and check integrity of navigation system wiring harness and connectors. If fault still evident, suspect the navigation module. Refer to the new module/component installation note at the top of this section.
V3: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of navigation module harness and connections.
	Has a fault been identified with the navigation module harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No**

	Check the Integrated Head Unit (IHU).

PINPOINT TEST W : CANNOT MAKE OR RECEIVE CALLS WITH THE BLUETOOTH TELEPHONE - CANNOT CONNECT TO THE VEHICLE

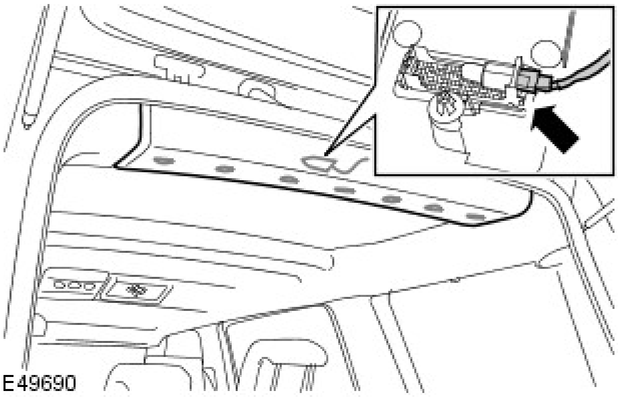
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
W1: DISPLAY CHECK (RANGE ROVER ONLY)	
	1 Press the telephone button.
	Is 'Telephone not connected' displayed on the screen? **Yes** GO to W2. **No** GO to W7.
W2: BLUETOOTH COMPATIBILITY CHECK	
	1 Check to see if the telephone handset is Bluetooth compatible.
	Is the telephone handset Bluetooth compatible? **Yes** GO to W3. **No** Use a Bluetooth compatible telephone handset.
W3: HANDSET POWER CHECK	
	1 Check to see if the handset is switched 'ON'.
	Is the telephone handset switched 'ON'? **Yes** GO to W4. **No** Switch handset 'ON' and re-test.
W4: INITIAL CONNECTION SETTINGS	
	1 Check to see if the initial connection settings to the in-vehicle system have been performed.
	Have the initial connection settings to the in-vehicle system been performed? **Yes** GO to W5. **No** Perform the initial connection settings.
W5: HANDSET COMMUNICATION CHECK	
	1 Check to see if the telephone handset recognizes the in-vehicle system.
	Does the telephone handset recognize the in-vehicle system? **Yes** GO to W6. **No** Re-test using a different Bluetooth compatible telephone handset. If the fault is still evident, suspect the telephone module. Refer to the new module/component installation note at the top of this procedure.
W6: HANDSET COMMUNICATION CHECK	
	1 Switch the Bluetooth telephone handset 'OFF' then back 'ON' again.
	Does the telephone handset recognize the in-vehicle system? **Yes** Check the Integrated Head Unit (IHU). **No** Suspect the telephone module. Refer to the new module/component installation note at the top of this procedure.
W7: HANDSET COMMUNICATION CHECK	
	1 Check to see if the telephone is within communications range.
	Is the telephone within a 10 meter range of the bluetooth telephone module? **Yes** GO to W8. **No** Move the telephone handset to within a 10 meter range of the bluetooth telephone module.
W8: HANDSET COMMUNICATION CHECK	
	1 Check to see if when transmitting, the telephone handset is also receiving.
	When transmitting, is the telephone handset also receiving? **Yes** Check the Integrated Head Unit (IHU). **No** Replace the telephone handset.

Published: 11-May-2011

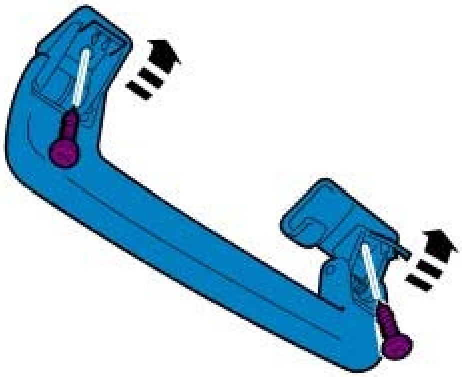
Navigation System - Navigation System Antenna

Removal and Installation

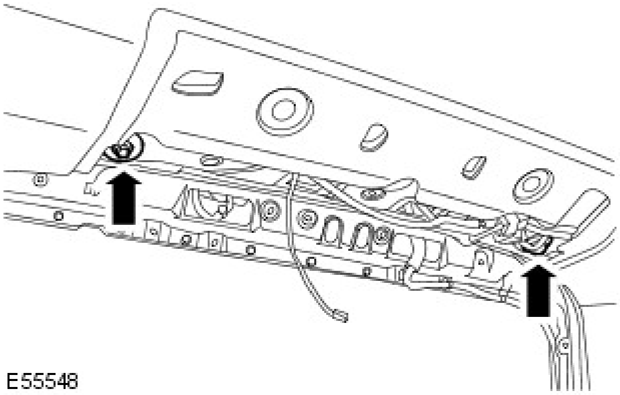
Removal



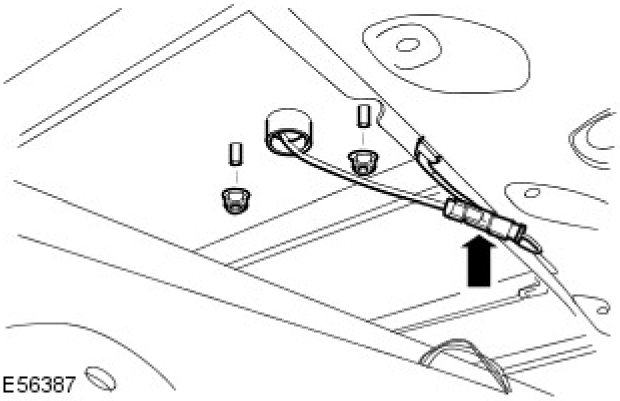
1. Remove the rear headliner trim panel.
    - Release the 7 clips.
    - Disconnect the interior light electrical connector.



2. If installed remove the LH third row seat passenger assist handle.
    - Carefully release the screw covers.
    - Remove the 2 screws.
3. If installed, remove the RH third row seat passenger assist handle.
    - Carefully release the screw covers.
    - Remove the 2 screws.



4. Release the rear of the headliner.
    - Release the 2 clips.



5. Remove the navigation system antenna.

- Disconnect the electrical connector.
- Remove the 2 nuts.

Installation

1. Install the navigation system antenna.

- Tighten the nuts to 10 Nm (7 lb.ft).
- Connect the electrical connector.

2. Attach the rear of the headliner.

- Secure with the clips.

3. Install the RH third row seat passenger assist handle, if installed.

- Tighten the screws.
- Attach the covers.

4. Install the LH third row seat passenger assist handle, if installed.

- Tighten the screws.
- Attach the covers.

5. Install the rear headliner trim panel.

- Secure in the clips.
- Connect the electrical connector.

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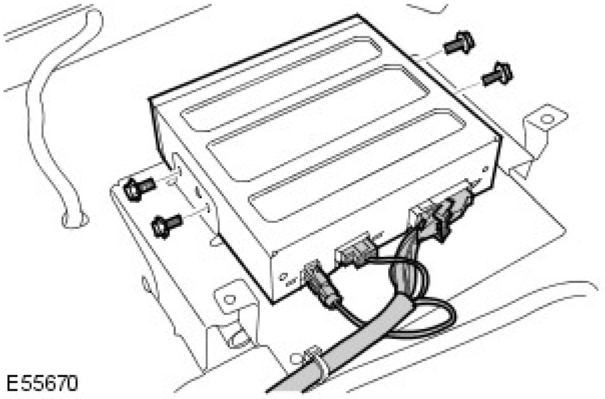
Navigation System - Navigation System Compact Disc (CD) Unit

Removal and Installation

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).
2. Make the SRS system safe.
   For additional information, refer to: Standard Workshop Practices (100-00 General Information, Description and Operation).
3. Remove the LH front seat.
   For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).
4. Remove the CD unit.



- Remove the 4 bolts.
- Disconnect the antenna cable.
- Disconnect the 2 electrical connectors.

Installation

1. Install the CD unit.
   - Tighten the bolts to 6 Nm (4 lb.ft).
   - Connect the electrical connectors.
   - Connect the antenna cable.
2. Install the LH front seat.
   For additional information, refer to: Front Seat (501-10 Seating, Removal and Installation).
3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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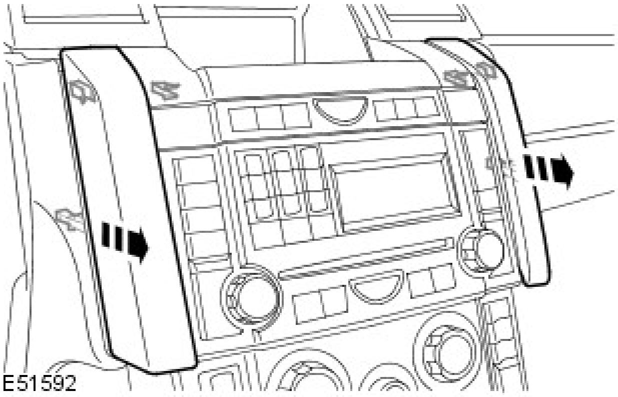
Navigation System - Navigation System Display Module

Removal and Installation

Removal

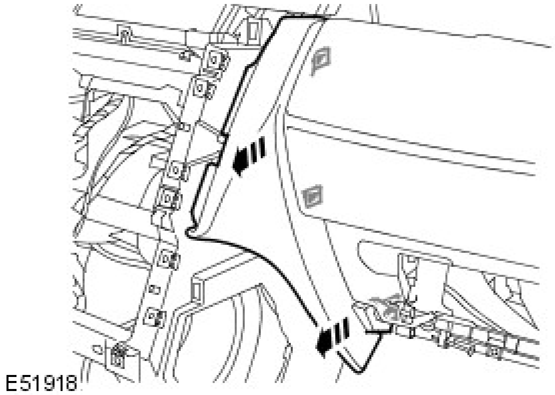
1. ⚠ CAUTION: After switching of the ignition, wait for 2 minutes before disconnecting the battery. Failure to wait for 2 minutes will damage the navigation computer.

Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).


E51592

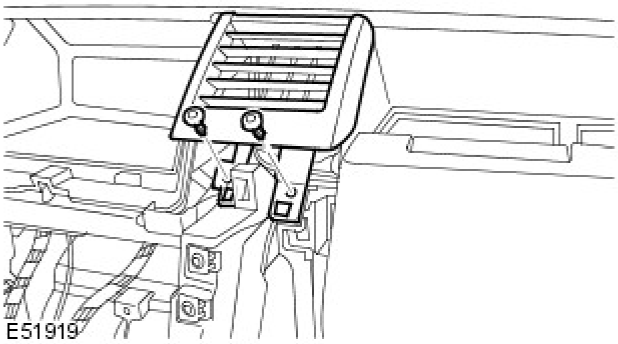
2. Remove the audio unit side trim panels.

- Release the 6 clips.


E51918

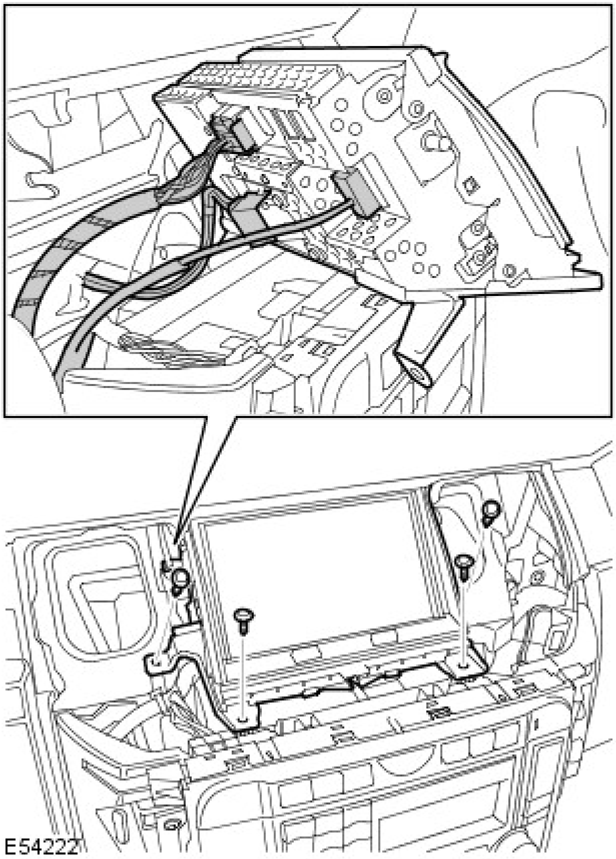
3. Remove the instrument panel center reinforcement trim panel.

- Release the 3 clips.
- Repeat the above procedure for the other side.


E51919

4. Remove the center face level vent.

- Remove the 2 Torx screws.
- Repeat the above procedure for the other side.



5. ⚠ CAUTION: Cover fibre optic cable connectors to minimise dust ingress and avoid bending the cables in a radius of less than 30 mm.

Remove the navigation system display module.

- Remove the 4 screws.
- Disconnect the fibre optic connector.
- Disconnect the 2 electrical connectors.

Installation

1. Install the navigation system display module.

- Connect the electrical connectors.
- Connect the fibre optic connector.
- Tighten the screws.

2. Install the center face level vents.

- Tighten the Torx screws.

3. Install the instrument panel center reinforcement trim panels.

- Secure the clips.

4. Install the audio unit side trim panels.

- Secure the clips.

5. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

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Cellular Phone -

Torque Specifications

Description	Nm	lb-ft
Cellular phone antenna Torx screw	10	7

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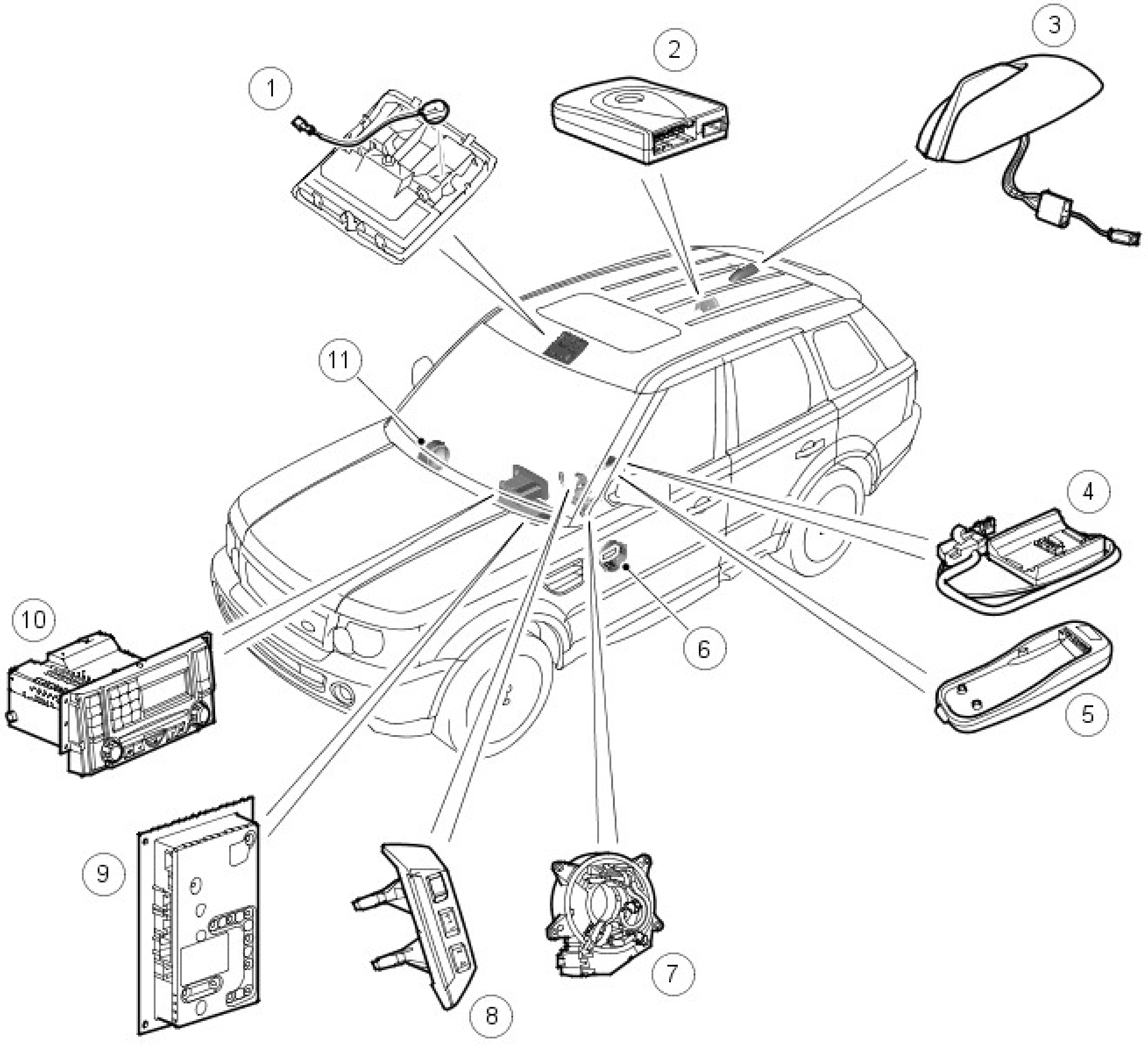
Cellular Phone - Cellular Phone

Description and Operation

CELLULAR PHONE SYSTEM (up to 2009 MY)

Cellular Phone Component Location (up to 2009 MY)



E57110

Item	Part Number	Description
1	-	Microphone
2	-	Transceiver Module (TM)
3	-	Cellular Phone Antenna
4	-	Base plate adaptor
5	-	Adaptor cradle
6	-	Speaker
7	-	Clock spring
8	-	Steering wheel switches

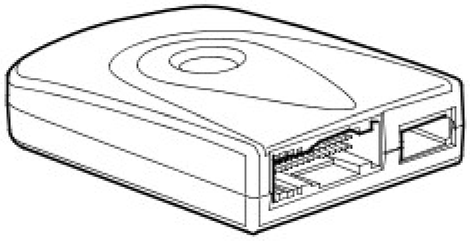
9	-	Amplifier
10	-	Integrated Head Unit (IHU)
11	-	Speakers

The cellular phone system comprises:

- Transceiver Module (TM)
- Base plate adaptor
- Telephone cradle
- Microphone
- Cellular Phone Antenna.

The telephone system fitted to the vehicle allows the driver to dock their own handset to the vehicle hands free telephone system. This is achieved using an adaptor cradle which is telephone specific. This cradle is mated to a standard baseplate which in turn is connected to the TM. The TM is connected to the MOST ring for communication with the rest of the system.
For additional information, refer to: Communications Network (418-00 Module Communications Network, Description and Operation).

Transceiver Module



E48172

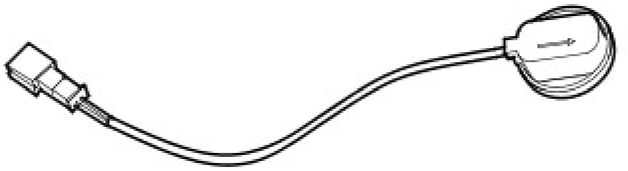
The Transceiver Module (TM) is located in the rear right-hand (RH) quarter of the luggage compartment. The TM is the interface between the telephone and the Integrated Head Unit (IHU). The TM also contains the telephone voice recognition hardware and software.

Transceiver Module Connector Pin Out C2777

Pin No	Description	Input/Output
1 to 15	Not Used	-
16	Ignition	Input
17	Battery voltage	Input
18	Battery voltage	Input
19 to 32	Not Used	-
33	ground (GND)	-
34	GND	-
35	Not Used	-
36	Not Used	-
37	Cellular phone ear piece +	Output
38	Cellular phone ear piece -	-
39	Cellular phone Mic piece +	Input
40	Cellular phone Mic. piece -	-
41	Wake up signal (non Nokia phone in cradle)	Input
42	Wake up signal (Nokia phone in cradle)	Input
43	Not Used	-
44	Not Used	-
45	Transmit/receive to phone	Input/Output
46	Shield ground	-
47	Serial transmission + (Nokia F bus)	Output
48	Serial transmission - (Nokia F bus)	-
49	Serial receive + (Nokia F bus)	Input
50	Serial receive - (Nokia F bus)	-
51	Cradle ID signal	Input
52	Cradle voltage supply	Input

Pin No	Description	Input/Output
53	Phone charge ground	-
54	Battery charging voltage	Output

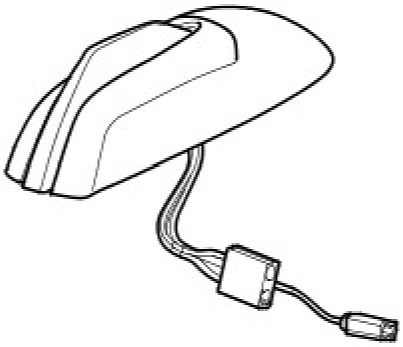
Microphone



E48173

A single microphone is used for hands-free telephone operation and for the voice recognition system. The microphone has an integrated noise suppression system for hands-free telephone use. The microphone is a standard directional type and is located in the front roof console.

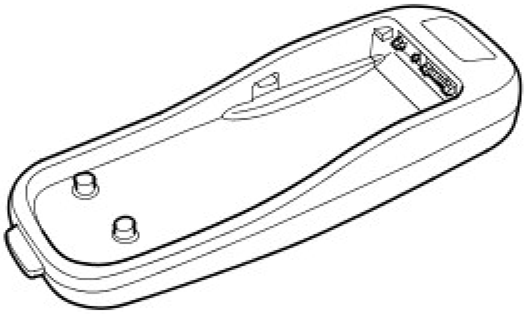
Cellular Phone Antenna



E48085

The Cellular Phone Antenna is located in the roof mounted pod and is connected via a single coaxial cable to the TM.
For additional information, refer to: Antenna (415-02 Antenna, Description and Operation).

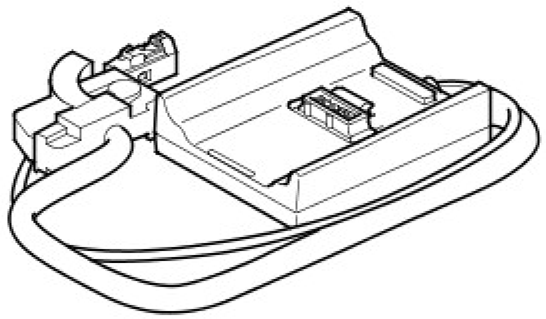
Telephone Adaptor Cradle



E48170

The telephone system allows for the use of different types/manufacturers handsets. This is achieved using a handset specific cradle which is mated to a standard base plate. The design of the adaptor cradle will vary to accommodate different types of phones.

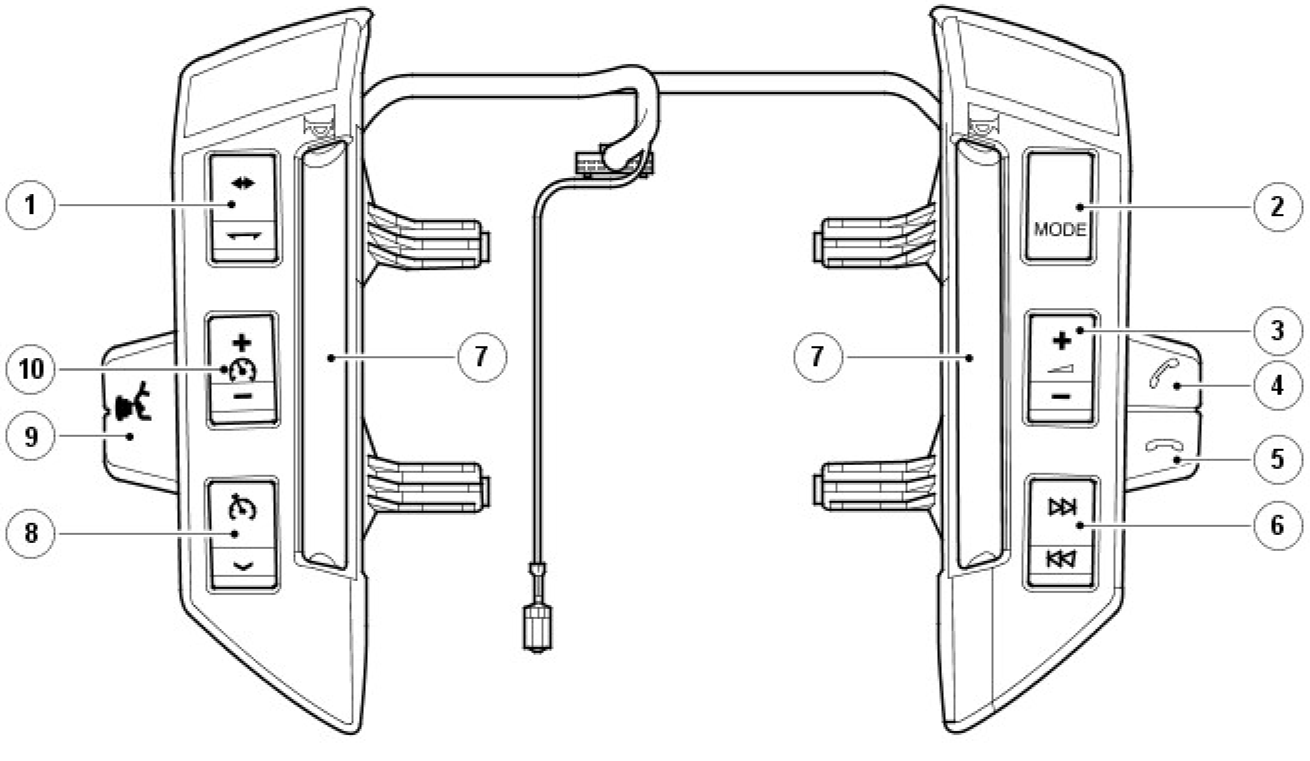
Telephone Adaptor Base Plate



E48171

The base plate is located in the center arm rest between the front seats. The base plate is connected to the TM via a dedicated serial link.

Steering Wheel Control Switches



E58417

Item	Part Number	Description
1	-	Adaptive speed control gap adjustment switches
2	-	Audio mode change switch
3	-	Audio volume control
4	-	Send key
5	-	End key
6	-	Audio system up/down
7	-	Horn
8	-	Speed control ON/OFF/ set speed
9	-	Push to talk voice recognition switch
10	-	Speed control set speed adjust

The Steering wheel control switches allow the driver to:

- Receive a phone call.

- End a phone call.
- Activate the voice recognition system.

The switches operate on a resistive ladder principle. A voltage is supplied to the switches and dependant upon which button is pressed a reduced voltage is returned to the head unit or the applicable vehicle system.

TELEPHONE SYSTEM OPERATION (up to 2009 MY)

Telephone System

The telephone system can be operated from the IHU or via voice commands. The telephone system has the following functions:

- Receive a call
- Make a call
- Phone book
- Telephone phone book download.

The telephone system is accessed via the IHU. Once the phone is docked in the cradle it is possible to read/ download the phones own phone book to find a contact or phone number. A phone number can also be dialled into the key pad on the IHU.

Calls can be received or made by pressing the push to talk button on the steering wheel mounted controls.

VOICE RECOGNITION (up to 2009 MY)

The Voice recognition system controls the following systems where fitted:

- Telephone
- Radio (inc satellite radio)
- compact disc (CD)/ MP3 Changer
- Touch Screen Display (TSD)
- Note Pad
- Navigation.

Voice control enables the driver to activate important functions of the car telephone and navigation systems without needing to operate any controls manually. This allows the driver to concentrate fully on driving the vehicle. Whenever the driver issues one of the defined voice commands with the system active, the voice control system converts the command into a control signal for the telephone or navigation system. The system recognises which system the command is directed at and routes the direction accordingly. The driver is guided through the dialogues by announcements or questions.

Voice control will not control the television or climate control systems.

Voice tags already stored in the cellular phone handset are not accessible via the vehicles voice recognition system.

Voice recognition is activated by pressing the push to talk button on the steering wheel controls.

On vehicles without navigation system fitted the voice recognition software is held in the Transceiver Module (TM) and the microphone is hardwired directly into the TM. On vehicles with navigation the voice recognition software is held in the navigation computer and the microphone is hard wired to the navigation computer as well as the TM. Vehicles with no navigation system will have a slightly reduced functionality compared with vehicles that have navigation fitted as well as the phone.

The TM only houses voice recognition software for the telephone system.

Telephone

The telephone system allows the following to be accessed and controlled by the voice recognition function.

Dial Number

This allows the user to dial a number (up to 20 digits) by digit entry with the facility to correct the number. The number that is being input is displayed on the instrument pack message center. The maximum number of recognised digits that can be entered in one go is 16.

Phonebook

The phonebook function allows the user to store phone numbers against a nametag. Nametags are user repeatable association names given to identify the numeric destination of the phone call.

This facility allows approximately 50 nametags with corresponding telephone numbers to be stored within the voice recognition phonebook. This phonebook should not be confused with the phonebook held within the SIM card or mobile phone. This facility allows editing of the nametags and phonebook and also provides audible feedback of the recorded nametag. Where nametags are part of the audible feedback the corresponding phone number will be displayed in text form on the instrument cluster message center.

It is also possible to use the add name feature to enter a telephone number onto the IHU and then by voice recognition append a nametag and store this within the voice recognition phonebook.

Radio

The radio system allows the following to be accessed and controlled by the voice recognition function.

Radio On

This allows the user to switch on the radio function. "Radio On" switches the audio system to radio with the last station played.

Radio Tune

This allows the user to tune the radio into the desired frequency and band.

Radio Presets

This allows the user to allocate frequency against a given band preset. The user must be tuned into the desired frequency and band prior to preset allocation. If a preset already has a stored frequency and band against that preset then the new frequency and band is allotted.

The Auto store feature instructs the radio to select the six strongest signals and allocate them against the auto store presets.

There are nine preset memory locations within each of the following band settings, FM, FMA, AM, AMA, MW, MWA and LW (there are only nine presets available for LW band therefore no auto store available).

Voice commands will be available to allow the user to tune the radio to a given preset within the band that is currently tuned.

Radio Directory

This function allows the user to nametag the current frequency and band including Satellite Digital Audio Radio Service(SDARS). Nametags are user repeatable association names given to identify the frequency and band information thus allowing the radio to tune into the desired signal. This facility allows 20 nametags to be stored within the voice recognition. It is also possible for the system to replay the whole of the directory with the ability to play or delete the stations announced. Individual nametags can also be deleted

Where nametags are part of the audible feedback the corresponding frequency and band is displayed in text form on the instrument cluster message center.

CD Changer

The CD changer system allows the following to be accessed and controlled by the voice recognition function.

The voice commands are standard control features with exception of controls that can be accessed on the steering wheel. Commands are available for up to 256 tracks on a CD. The track number is displayed with 3 digits, i.e. track 6 is displayed as "006".
For additional information, refer to: Audio System (415-01 Audio Unit, Description and Operation).

Display

This function allows the user to change the TSD display mode by voice command.

Voice Recognition Settings

Voice Feedback On / Off

Allows the user to choose between having audible feedback or not for functions, other than some necessary functions, which must have audible feedback to operate.

Replay

The replay command requests the voice recognition system to repeat it's last dialogue response within a list in both audible and a display in the instrument cluster message center.

Notepad

The notepad function allows the user to record a series of 10 notes for up to 5 min.

The user can replay or delete the notes in the order that they were recorded. It is also possible to delete the whole notepad.

TMC

The TMC system is part of the navigation system and provides real time traffic information to the navigation system. The voice commands are ON or OFF.

For additional information, refer to: Navigation System (419-07 Navigation System, Description and Operation).

TMC also offers dynamic route guidance. This is can also be a voice operated ON/OFF function.

BLUETOOTH® (up to 2009 MY)

The TM has Bluetooth® functionality. Bluetooth® allows the user to connect their own mobile phone (Bluetooth® enabled only) to the vehicle telephone system. Once connected the user can use the vehicle hands free functions system. The Bluetooth® system limits the functions available to those that are present in the Bluetooth® hands free profile.

Bluetooth® will not allow the following to be accessed via the IHU:

- No signal strength indication in the IHU
- Phonebook download to the IHU
- Missed calls
- Last number redial
- Calls list

Prior to the Bluetooth® equipped phone being used on the vehicle hands free system the phone must be paired to the TM. The pairing process can vary depending on the mobile handset that is being used. The following describes an example of the pairing process.

- Switch Bluetooth "ON" on the handset.
- The user initiates a search for other Bluetooth devices from the handset.
- The TM acknowledges the existence of the Bluetooth® phone.
- Land Rover appears in the handset available device list.
- The user selects Land Rover from the device list and the TM will attempt pairing.
- TM requests a PIN number from the phone.
- The user enters the TM PIN number 2121.
- If the PIN number is correct the phone is paired with the TM and its details are stored in the TM EEPROM.
- If the PIN number is correct the phone is paired with the TM and the TM details are stored in the handset.

Once paired the TM will periodically check for stored Bluetooth® devices (approximately every 20 seconds). As this occurs the user will see a connection request on the handset and either accepts or declines the request. This request will only happen once per session.

Once the pairing procedure has been completed the mobile handset will automatically connect to the vehicle system once they come into range (approximately 10 metres) and the vehicle ignition is in position II. The word Bluetooth® displays in the IHU to inform the driver that the phone is connected to the TM.

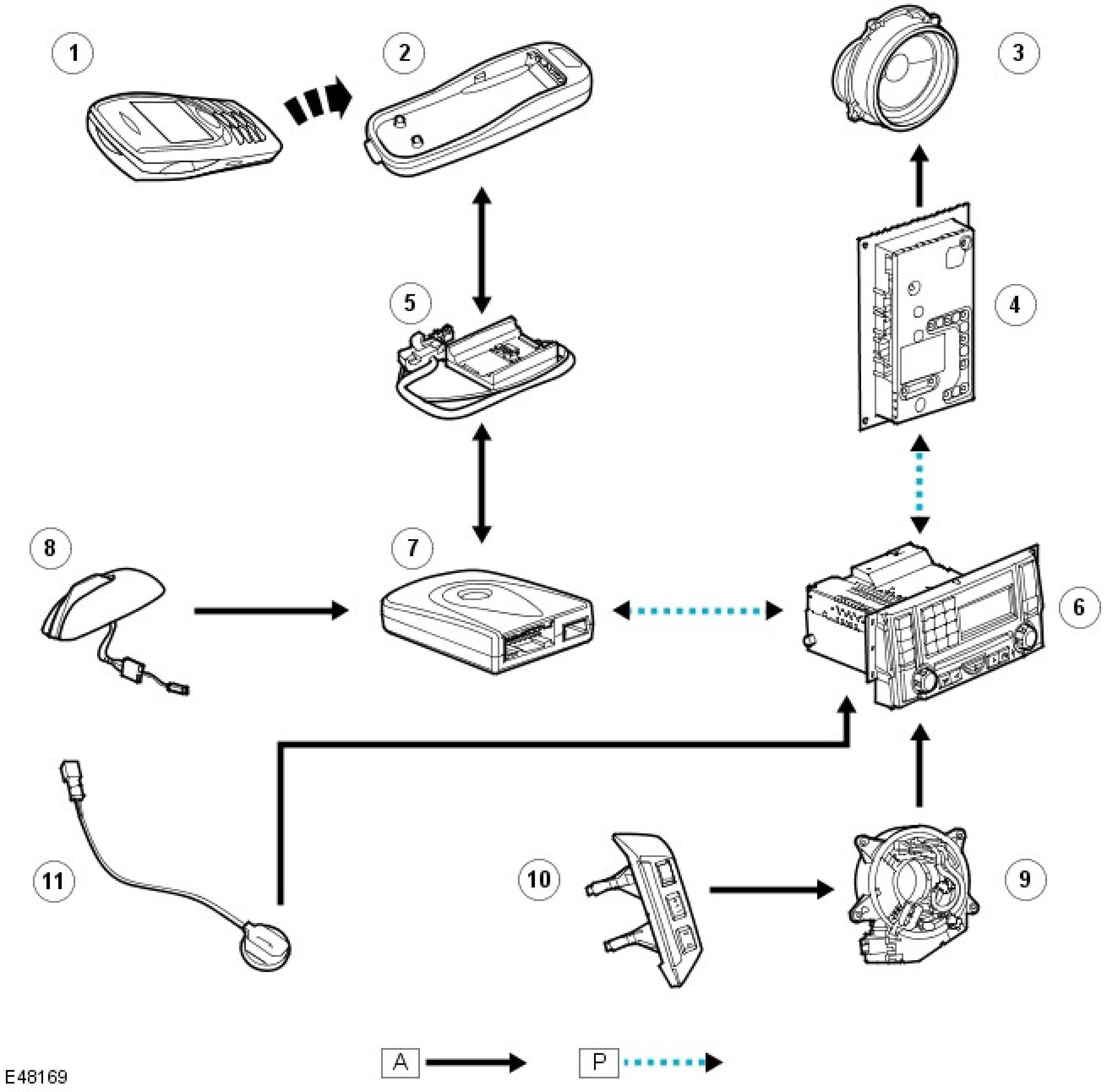
Each time a paired phone and TM come into range the TM will request connection to the phone. The user can accept or decline this request from the handset.

Up to eight Bluetooth® equipped phones can be paired with the TM. Phones can be de-registered/disconnected at any time by the user. Only one phone at a time can be used via the vehicle hands free system. If a phone is connected to the vehicle via the cradle, this phone will cancel out any Bluetooth® phone operation.

If the TM is replaced each phone that is paired with the original TM will have to be re-paired with the new TM.

Cellular Phone Control Diagram (up to 2009 MY)

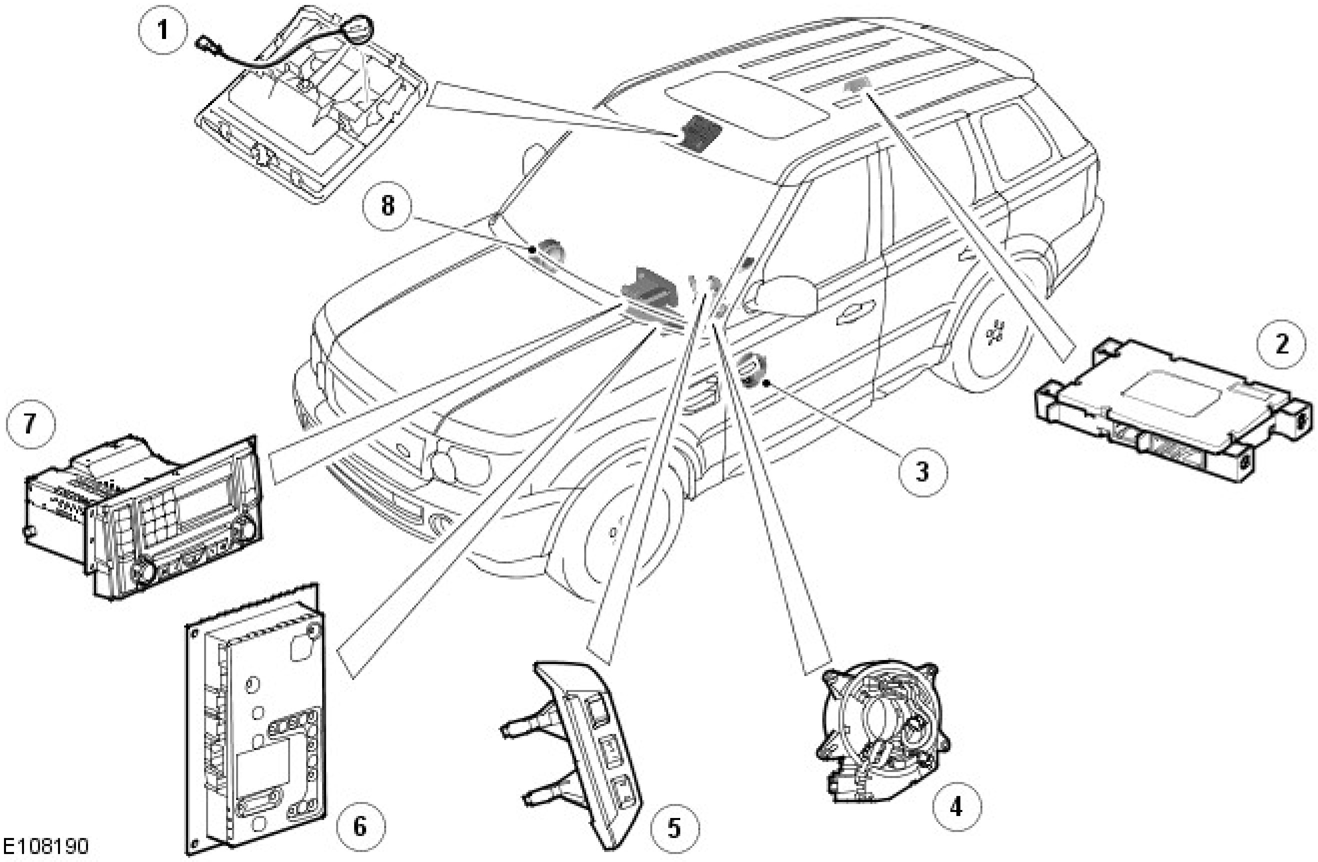
• NOTE: A= Hardwired P= MOST



Item	Part Number	Description
1	-	Mobile handset
2	-	Adaptor cradle
3	-	Speakers
4	-	Audio amplifier
5	-	Base plate adaptor
6	-	IHU
7	-	Transceiver Module (TM)
8	-	Cellular Phone Antenna
9	-	Clock spring
10	-	Steering wheel switches
11	-	Microphone

CELLULAR PHONE SYSTEM (2009 MY Onwards)

Cellular Phone Component Location (2009 MY Onwards)



Item	Part Number	Description
1	-	Microphone
2	-	Bluetooth® phone module
3	-	Speaker
4	-	Clock spring
5	-	Steering wheel switches
6	-	Amplifier
7	-	Integrated head unit
8	-	Speaker

BLUETOOTH® (2009 MY Onwards)

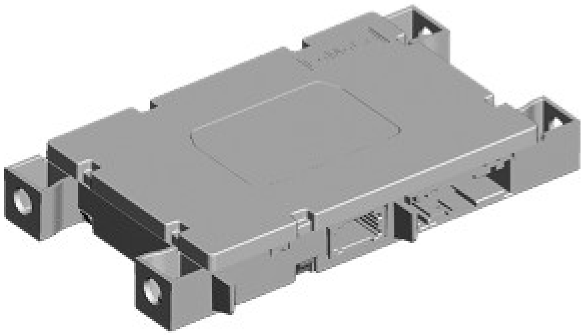
The Bluetooth® phone module allows the user to connect their own mobile phone handset (Bluetooth® enabled only) to the vehicle telephone system.

Once connected, the user can use the vehicle hands free functions although, the Bluetooth® system limits the functions to those available in the Bluetooth® hands free profile.

The available features include:

- Make/receive call
- Voice calls using the phones own voice tags (where set up)
- Signal strength indication on the Touch Screen Display (if supported by the telephone handset software)
- Phonebook download
- Missed calls
- Last number redial
- Calls list.

Bluetooth® Phone Module



E96494

The Bluetooth® phone module is connected to the MOST ring and is the interface between the telephone and the Integrated Header Unit, it processes all instructions and audio 'from and to' the phone.

TELEPHONE SYSTEM OPERATION (2009 MY Onwards)

Compatible Bluetooth® mobiles can communicate with the vehicle’s inbuilt telephone system. Connection must be made with ignition on or engine running.

Initial pairing of the phone to the vehicle

To prepare the mobile phone for pairing to the system, refer to the telephone manufacturer’s instructions, or follow the table in the vehicle handbook for generic commands.

When the handset has been successfully paired to the system, Bluetooth® will appear on the phone menu screen.

Bluetooth® selection

A maximum of 5 phones can be paired to the vehicle.

When the starter key is turned on, the vehicle searches for up to 5 previously paired phones, starting with the most recent pairing.

Before attempting a new pairing, wait for 30 seconds for this process to complete.

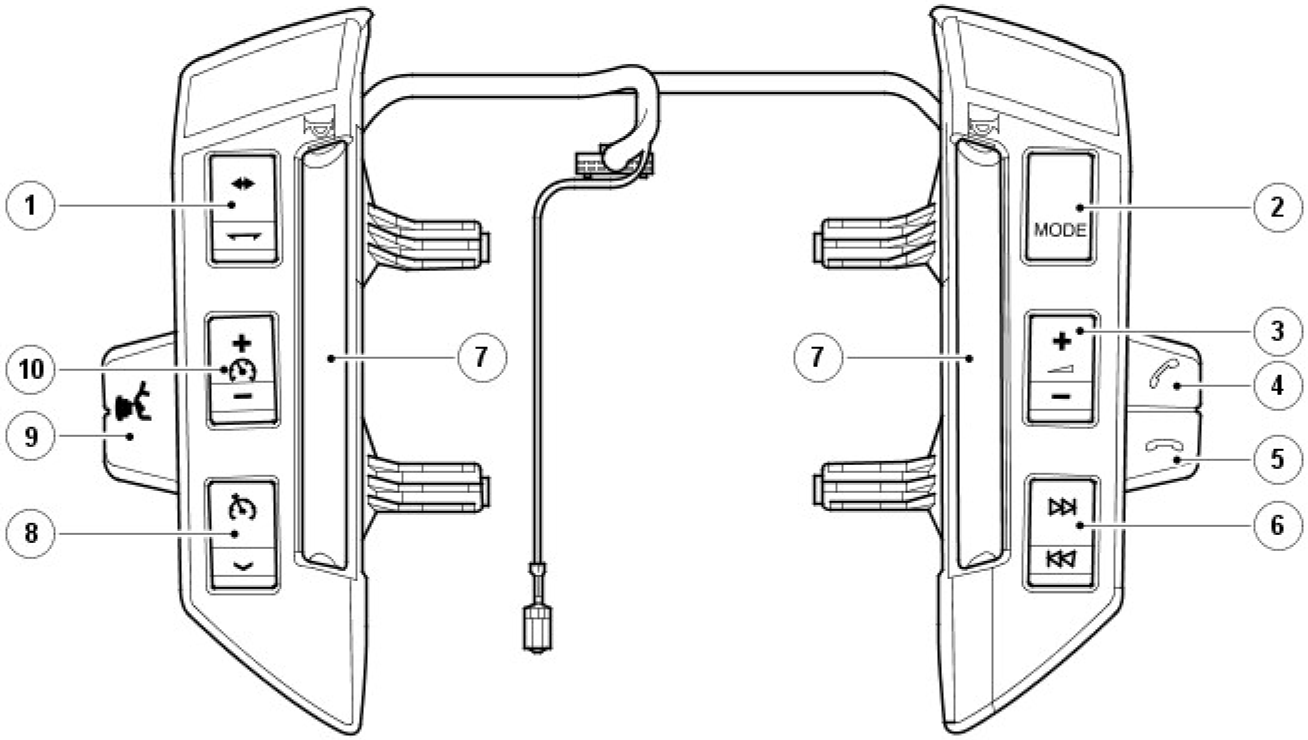
Making a call

Refer to vehicle's handbook.

Voice recognition

There is no Voice Recognition system on the Bluetooth® phone; refer to section **Voice Recognition (up to 2009 MY)**, for voice recognition information on other vehicle systems.

Steering Wheel Control Switches



E58417

Item	Part Number	Description
1	-	Adaptive speed control gap adjustment switches
2	-	Audio mode change switch
3	-	Audio volume control
4	-	Send key
5	-	End key
6	-	Audio system up/down
7	-	Horn
8	-	Speed control ON/OFF/ set speed
9	-	Push to talk voice recognition switch (Navigation System Only)
10	-	Speed control set speed adjust

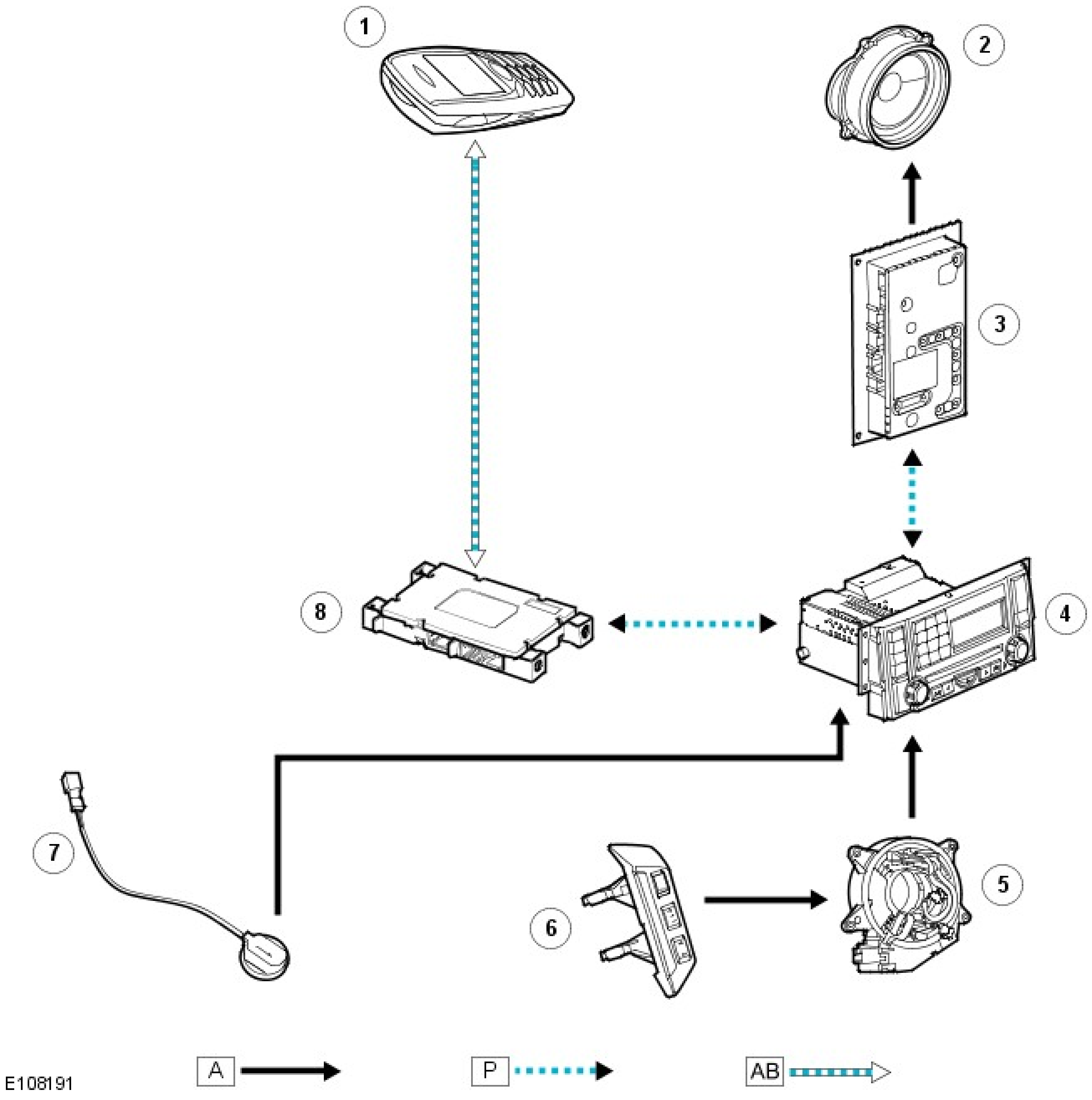
The Steering wheel control switches allow the driver to:

- Receive a phone call.
- End a phone call.

The switches operate on a resistive ladder principle. A voltage is supplied to the switches and dependant upon which button is pressed a reduced voltage is returned to the head unit or the applicable vehicle system.

Cellular Phone Control Diagram (2009 MY Onwards)

• NOTE: A = Hardwired; P = MOST; AB = Bluetooth®


1
2
3
4
5
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8
E108191
A
P
AB

Item	Part Number	Description
1	-	Bluetooth® cellular phone
2	-	Speaker
3	-	Amplifier
4	-	Integrated head unit
5	-	Clockspring
6	-	Steering wheel switches
7	-	Microphone
8	-	Bluetooth® phone module

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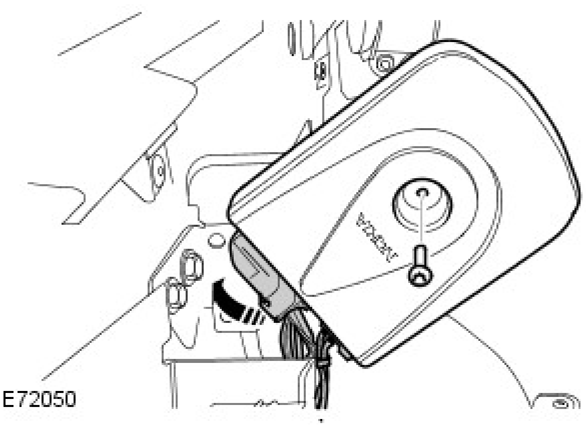
Cellular Phone - Transceiver Module

Removal and Installation

Removal



1. Remove the RH lower rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. ⚠ CAUTION: Cover fibre optic cable connectors to minimise dust ingress and avoid bending the cables in a radius of less than 30 mm.

   Remove the cellular phone module.

   - Remove the Torx bolt.
   - Disconnect the 2 electrical connectors.

Installation

1. Install the cellular phone module.

   - Connect the electrical connectors.
   - Tighten the Torx bolt to 10 Nm (7 lb.ft).

2. Install the RH lower rear quarter trim panel.
   For additional information, refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Using WDS, configure a new module.

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Cellular Phone - Cellular PhoneVIN Range: 188603->ONWARDS

Diagnosis and Testing

Principle of Operation

For a detailed description of the Cellular phone system and operation, refer to the relevant Diagnosis and Testing section of the workshop manual. REFER to: Cellular Phone (419-08 Cellular Phone, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Check all information and entertainment system modules • Speakers • Switch(s) stuck or damaged	• Fuses • Electrical harnesses • Harness connectors • Battery condition, state of charge

3. **3.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **4.** If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Action
Unable to pair	• GO to Pinpoint Test A.
Not Auto Connecting	• GO to Pinpoint Test B.
Poor Quality Audio	• GO to Pinpoint Test C.
No Audio to 3rd Party	• GO to Pinpoint Test D.
No Audio from 3rd Party	• GO to Pinpoint Test E.
No Audio	• GO to Pinpoint Test F.

DTC Index

• NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

DTC	Description	Possible Cause	Action
B101111	ECU Supplied Power Output	• Telephone base plate adaptor power supply circuit short circuit to ground • Telephone base plate adaptor power supply circuit high resistance • Telephone base plate adaptor failure • Transceiver Module (TM) failure	Check the power supply circuits to the telephone base plate. Refer to the electrical guides. Check the base plate and transceiver module. Refer to the warranty policy and procedures manual if a module is suspect.
B101112	ECU Supplied Power Output	• Telephone base plate adaptor power supply circuit short circuit to power • Telephone base plate adaptor failure • Transceiver Module (TM) failure	Check the power supply circuits to the telephone base plate. Refer to the electrical guides. Check the base plate and transceiver module. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible Cause	Action
B1A0041	Control module	- Telephone control module flash read only memory (ROM) fault, general checksum failure	Clear the DTC and retest. If the DTC resets, renew the TEL control module Refer to the warranty policy and procedures manual if a module is suspect.
B1A0044	Control module	- Telephone control module random access memory (RAM) fault, data memory failure	Clear the DTC and retest. If the DTC resets, renew the TEL control module Refer to the warranty policy and procedures manual if a module is suspect.
B1A0045	Control module	- Telephone control module read only memory (ROM) fault, program memory failure	Clear the DTC and retest. If the DTC resets, renew the TEL control module Refer to the warranty policy and procedures manual if a module is suspect.
B1A0047	Control module	- Telephone control module internal control module failure	Clear the DTC and retest. If the DTC resets, renew the TEL control module Refer to the warranty policy and procedures manual if a module is suspect.
B1D5911	Charger System	- Charger system circuit short circuit to ground - Charger system circuit high resistance	Check the charger system circuits. Refer to the electrical guides.
B1D5912	Charger System	- Charger system circuit short circuit to power	Check the charger system circuits. Refer to the electrical guides.
B1D7984	Microphone Input	- The 'Receive Audio over MOST Test' failed and means that the audio received at the microphone detection point is too low. - Microphone fault - Harness/connector fault - Integrated head unit (IHU) fault - Base-plate module (BPM) fault	Check the operation of the microphone by substituting for a known working unit. Refer to the electrical guides and check the microphone (MIC) circuits. renew/repair as necessary. Refer to the warranty policy and procedures manual if a module is suspect.
U002968	Vehicle Communication Bus A Performance	- Event information - MOST resend count exceeded - MOST system performance	Carry out the general MOST test in this section and in the approved diagnostic system. Refer to the Network Communications section of the workshop manual.
U040068	Invalid data received	- Event information - Invalid data received - An invalid error code has been set by another MOST module	Carry out the general MOST test in this section and in the approved diagnostic system. Refer to the Network Communications section of the workshop manual.
U1A0088	Private Communication Network	- Communications failure with BT chipset in base plate module	Clear the DTC and retest. If the problem persists, renew the telephone base plate module. Refer to the warranty policy and procedures manual if a module is suspect.
U200152	Reduced System Function	- Bluetooth error - System not activated	Carry out the general MOST test in this section and in the approved diagnostic system. Refer to the Network Communications section of the workshop manual.
U200168	Reduced System Function	- Event information - temperature over 70°C established - Not a fault condition. System operation suspended while system cools.	This Event is triggered if the ECU reduces the level of functionality, to prevent over heating of the system. It is a normal function of the ECU and is not a fault. Clear/ignore this DTC.
U20019A	Reduced System Function	- Event information - base plate module (BPM) temperature over 70°C established - Not a fault condition. System operation suspended while system cools.	This Event is triggered if the BPM reduces the level of functionality, to prevent over heating of the system. It is a normal function of the ECU and is not a fault. Clear/ignore this DTC.
U201A54	Control Module Main Calibration Data	- Local configuration file is missing (not loaded) in the control module	Configure the module using the approved diagnostic system.
U30004A	Control Module	- Audio unit data memory failure	Check the power and ground circuits to the component. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.

DTC	Description	Possible Cause	Action
U300044	Control module	- Base plate module (BPM) RAM fault (data memory failure leading to possible corrupt local configuration file)	Configure the module using the approved diagnostic system and download the local configuration file. Clear the DTC and retest. If the problem persists, renew the BPM. Refer to the warranty policy and procedures manual if a module is suspect.
U300045	Control module	- Base plate module (BPM) ROM fault (data memory failure leading to possible corrupt local configuration file)	Configure the module using the approved diagnostic system and download the local configuration file. Clear the DTC and retest. If the problem persists, renew the BPM. Refer to the warranty policy and procedures manual if a module is suspect.
U300054	Control module	- MOST not configured correctly - incorrect voice language installed	Configure the module using the approved diagnostic system.
U300056	Control module	- One or more of the received car configuration file (CCF) data parameters is deemed to be invalid	Configure the module using the approved diagnostic system.
U300316	Battery Voltage	- Battery voltage below threshold	Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical guides and check the power supply circuits to the module.
U300317	Battery Voltage	- Battery voltage above threshold	Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical guides and check the power supply circuits to the module.

Pinpoint Tests

PINPOINT TEST A : UNABLE TO PAIR

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: 'NO PHONE FITTED' DISPLAY	
• NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth function is activated and the telephone handset is placed within the vehicle cabin area.	
	1 Carry out checks to determine if 'No Phone Fitted' is shown on vehicle display.
	Is 'No Phone Fitted' displayed? **Yes** GO to A2. **No** Locate the connected telephone and if not Customer telephone, disconnect from the system.
A2: TELEPHONE BLUETOOTH DEVICE SEARCH	
	1 Carry out Bluetooth device search using Customer handset.
	Is 'Land Rover' identified in Bluetooth device list? **Yes** Select device from list, then continue with diagnosis.GO to A3. **No** Carry out further Bluetooth device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Land Rover' still not identified in Bluetooth device list, set ignition status to OFF, wait approximately 30 seconds and set ignition status to ON. Carry out further Bluetooth device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Land Rover' still not identified in Bluetooth device list, contact your local in market support for further assistance.
A3: TELEPHONE HANDSET ERROR	
	1 Check for any error shown on the telephone handset when 'Land Rover' is selected from the Bluetooth device list.
	Was an error immediately shown on the telephone handset? **Yes** Wait approximately 10 seconds then re-attempt selection, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If error still being displayed, contact your local in market support for assistance. **No** Enter PIN '2121' then continue with diagnosis.GO to A4.
A4: PIN ENTRY STATUS	
	1 Check for successful PIN entry.

	Was PIN entry successful? **Yes** GO to A5. **No** Wait approximately 10 seconds then re-attempt PIN entry, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If PIN entry is still un-successful, contact your local in market support for assistance.
A5: 'NO PHONE FITTED' DISPLAY	
	1 Carry out checks to determine if 'No Phone Fitted' is still shown on vehicle display.
	Is 'No Phone Fitted' still displayed? **Yes** From the telephone handset, select the connect option for the 'Land Rover' device identified in the Bluetooth device list. If 'No Phone Fitted' is still displayed, suspect a telephone handset fault. Carry out Pinpoint test again using known good telephone handset. **No** The telephone is paired and connected to the system. No further action is required for this symptom.

PINPOINT TEST B : NOT AUTOMATICALLY CONNECTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CUSTOMER TELEPHONE IN POSITION 1	
• NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth and auto connect functions are activated and the telephone handset is placed within the vehicle cabin area.	
	1 Carry out checks to determine if the Customer telephone is in position 1 in the Bluetooth Module device list.
	Is the Customer telephone in position 1? **Yes** GO to B2. **No** Advise Customer that delays in connection will occur if telephone is not listed in position 1.
B2: BLUETOOTH CONNECTION	
	1 Carry out checks to determine if Bluetooth connection to the vehicle has been achieved.
	Has Bluetooth connection to the vehicle been achieved? **Yes** No further action is required for this symptom. **No** GO to B3.
B3: 'NO PHONE FITTED' DISPLAY	
	1 Carry out checks to determine if 'Land Rover' is shown in the Customer Bluetooth telephone device display.
	Is 'Land Rover' identified in the Customer Bluetooth device list? **Yes** Select the device to connect then follow pairing instructions. **No** Carry out the 'Unable to Pair' Pinpoint Test.

PINPOINT TEST C : POOR QUALITY AUDIO

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: SIGNAL STRENGTH	
• NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.	
	1 Check the signal strength displayed on the telephone handset.
	Are at least two signal strength bars shown on the telephone handset display? **Yes** GO to C2. **No** Suspect GSM Network issue. This can explain intermittent audio and dropped calls, and the inability to initiate calls.
C2: POOR AUDIO FROM THIRD PARTY ONLY	
	1 Establish from Customer feedback/symptom if there is poor audio from the Third Party only.
	Is the poor audio from the Third Party only? **Yes** Suspect GSM Network issue. This can explain intermittent audio and dropped calls, and the inability to initiate calls.

	No GO to C3.
C3: POOR AUDIO TO THIRD PARTY ONLY	
	1 Establish from Customer feedback/symptom if there is poor audio to the Third Party only.
	Is the poor audio to the Third Party only? **Yes** Check and install a new microphone as necessary. **No** GO to C4.
C4: POOR AUDIO WITH VEHICLE STATIONARY	
	1 Establish from Customer feedback/symptom if there is poor audio when the vehicle is stationary only.
	Is the poor audio when the vehicle is stationary only? **Yes** Check and install a new microphone as necessary. **No** GO to C5.
C5: THIRD PARTY MOVING VEHICLE	
	1 Establish from Customer feedback/symptom if the Third Party is in a moving vehicle.
	Is the Third Party in a moving vehicle? **Yes** There are limitations to the way the system can improve audio, and in this situation it is not possible to determine the source of the audio degradation. **No** GO to C6.
C6: CUSTOMER HEARING ECHO	
	1 Establish from Customer feedback/symptom if the Customer is hearing an echo.
	Is the Customer hearing an echo? **Yes** Echo from the Third Party is not vehicle failure, it is the Third Party set-up. No further action is required for this symptom. **No** Contact your local in market support for assistance.

PINPOINT TEST D : NO AUDIO TO THIRD PARTY	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: MICROPHONE DIAGNOSTIC TROUBLE CODES (DTCS)	
• NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.	
	1 Using the Manufacturer approved diagnostic system, check for any logged microphone DTCs in Audio Front Control module.
	Is DTC B1D79-01 logged? **Yes** Carry out diagnosis of electrical failure as advised in Action column of DTC Index. **No** Contact your local in market support for assistance.

PINPOINT TEST E : NO AUDIO FROM THIRD PARTY	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: 'IN CALL' DISPLAY	
• NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.	
	1 Carry out checks to determine if 'In Call' is shown on the vehicle display.
	Is vehicle display showing 'In Call'? **Yes** Contact your local in market support for assistance. **No** Call has ended. No further action is required for this symptom.

PINPOINT TEST F : NO AUDIO	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
F1: AUDIO FROM THIRD PARTY	

• NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.

1 Establish from Customer feedback/symptom if there is Audio from the Third Party.

Is there Audio from the Third Party?

Yes

GO to F2.

No

Refer to the 'No Audio From Third Party' Pinpoint test.GO to E.

F2: AUDIO TO THIRD PARTY

1 Establish from Customer feedback/symptom if there is Audio to the Third Party.

Is there Audio to the Third Party?

Yes

GO to F3.

No

Refer to the 'No Audio To Third Party' Pinpoint test.GO to D.

F3: CD OR RADIO AUDIO

1 Establish from Customer feedback/symptom if there is Audio from the CD or Radio.

Is there Audio from the CD or Radio?

Yes

GO to F4.

No

Suspect MOST ring fault, refer to electrical circuit diagrams and check/rectify MOST ring as necessary.

F4: TELEPHONE HANDSET AUDIO

1 Establish from Customer feedback/symptom if there is Audio from the telephone handset.

Is there Audio from the telephone handset?

Yes

Ensure vehicle is parked. Disconnect and reconnect handset. If issue not resolved, contact your local in market support for assistance.

No

Contact you local in market support for assistance.

LAND
ROVER

Health and safety

Always follow health and safety guidelines, specifically those detailed in the Workshop Manual.

Using this publication

The information provided in this publication is for use only by competent, qualified auto-electricians. Good product knowledge is assumed, as well as the ability to access and use recommended test equipment and other reference material provided.

Test equipment and other reference material

The information in this publication should be used in conjunction with the recommended test equipment; refer to Workshop Manual. Other reference material includes: Technical Service Bulletins (TSB) and the Workshop Manual.

The Electrical Reference Library (ERL) may also prove useful since it provides detailed connector information.

Battery disconnection and reconnection

It is imperative that any information relating to battery disconnection and reconnection is followed; refer to the appropriate sections in the Workshop Manual.

Fault Diagnosis

Always use the recommended test equipment for correct and reliable fault diagnosis, refer to the Workshop Manual.

Harness Repair

Repairs should only be undertaken for connectors where a Service Repair Kit is available; refer to the appropriate Electrical Reference Library (ERL).
Note: Fibre Optic circuits cannot be repaired; refer to the Workshop Manual.

Abbreviations

Abbreviation	Description
ABS	Anti-lock braking system
AFS	Adaptive front lighting system
AUTO	Automatic transmission
CAN	Controller area network
DSC	Dynamic stability control
DV6	Diesel engine - V6
DV8	Diesel engine - V8
EGR	Exhaust gas recirculation
EU3	DV6 - Without inlet port deactivation
EU4	DV6 - With inlet port deactivation
FET	Field effect transistor
GPS	Global positioning system
PV6	Petrol engine - V6
PV8	Petrol engine - V8
PV8NA	Naturally aspirated engine - V8
PV8SC	Super charged engine - V8
LH	Left-hand
MAF/IAT	Mass air flow / intake air temperature
NAS	North American specification
PDC	Park distance control
RH	Right-hand
TPMS	Tire pressure monitoring system
TSD	Touch screen display

Section numbering

The sections in this publication are ordered to match the Global Outline numbering system as found in the current Workshop Manual. The Power and Ground distribution circuits can be found under section 414-01, BATTERY, MOUNTING AND CABLES.

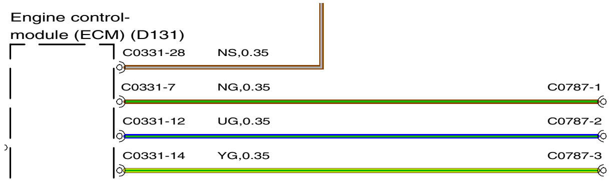
Note: Where circuit diagrams show more than one sub-system, the circuit will be located in the section that carries the first-named sub-system, for example: Starting and Charging will be located under section 303-06 Starting System, since 'Starting' is the first-named sub-system.

Circuit sheet numbering

The figures in brackets to the left of the page number indicate a circuit sheet number and the total number of sheets per circuit, for example (01 / 05) represents sheet 1 of 5.

Understanding the circuit diagrams

Components


Engine control-
module (ECM) (D131)
C0331-28
NS,0.35
C0331-7
NG,0.35
C0787-1
C0331-12
UG,0.35
C0787-2
C0331-14
YG,0.35
C0787-3

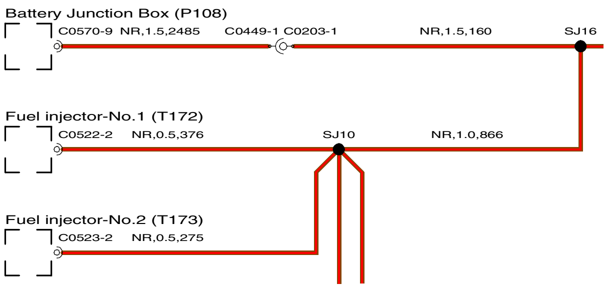
After each component description, a translation code is displayed in brackets, for example: Starter relay (R102), Engine control-module (ECM)(D131). The codes can be ignored.

Note: A dotted outline indicates that the component identified is not shown in its entirety.

Connectors

Connectors and header joints are identified by their corresponding connector number with a numbered suffix to indicate the pin-out detail of the wire, i.e. C0292-1 identifies connector 292, pin number 1. Wire insulation colours are listed in a table at the end of this section. Where wires have a predominant colour with a secondary colour tracer, the main colour is identified first, i.e. LGS - light green with a slate tracer.

Splices


Battery Junction Box (P108)
C0570-9
NR,1.5,2485
C0449-1
C0203-1
NR,1.5,160
SJ16
Fuel injector-No.1 (T172)
C0522-2
NR,0.5,376
SJ10
NR,1.0,866
Fuel injector-No.2 (T173)
C0523-2
NR,0.5,275

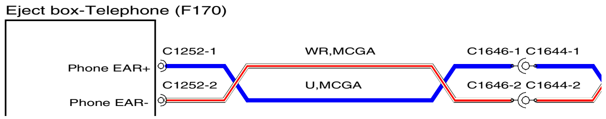
The splices (and where appropriate, the header) circuit pages show the full interconnectivity of components and systems.

Note: The splice information shown on individual system circuits is not complete. Always refer to the splices circuit pages for complete information for each splice.

Wire length (Splices, Power and Ground Distribution only)

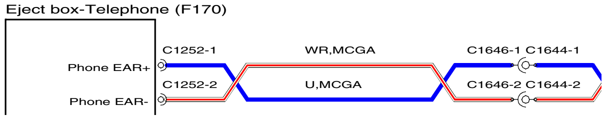
The wire length (in millimetres) is displayed after the colour and cross sectional area; for example, SR,0.35,480. In this example, the figure, 480 indicates the approximate position of the harness splice is 480mm from connector C2335.

Wire Types

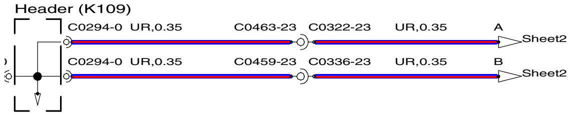

Eject box-Telephone (F170)
Phone EAR+
Phone EAR-
C1252-1
C1252-2
WR,MCGA
U,MCGA
C1646-1 C1644-1
C1646-2 C1644-2

Multicore wires are identified by the prefix M suffixed by three or four other letters, for example MCGA, MAPN. The suffix precisely defines the parameters that comprise the specification of the wire type. The specification is defined during the design process of an electrical system, therefore it is imperative that the correct specification is maintained to ensure the correct operating characteristics and continued functionality for a given system.

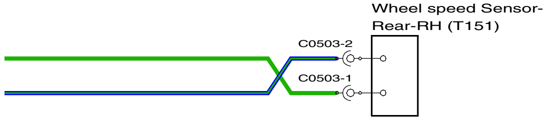
Line Types

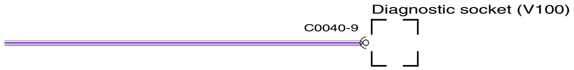

Eject box-Telephone (F170)
Phone EAR+
Phone EAR-
C1252-1
C1252-2
WR,MCGA
U,MCGA
C1646-1 C1644-1
C1646-2 C1644-2

Crossed wires as illustrated above show an example of how a twisted pair of wires may be represented on the circuits.


Header (K109)
C0294-0 UR,0.35
C0463-23 C0322-23
UR,0.35
A
Sheet2
C0294-0 UR,0.35
C0459-23 C0336-23
UR,0.35
B
Sheet2

The arrows illustrated above show an example of the page break symbols, identifying that the circuit continues at the corresponding letter on the sheet number indicated.


Wheel speed Sensor-
Rear-RH (T151)
C0503-2
C0503-1


Diagnostic socket (V100)
C0040-9

The cup and ball symbol represents the male and female halves of connector. Most connectors plug directly into a component but some are wired directly to the component using a ‘flylead’ as with C503 above.

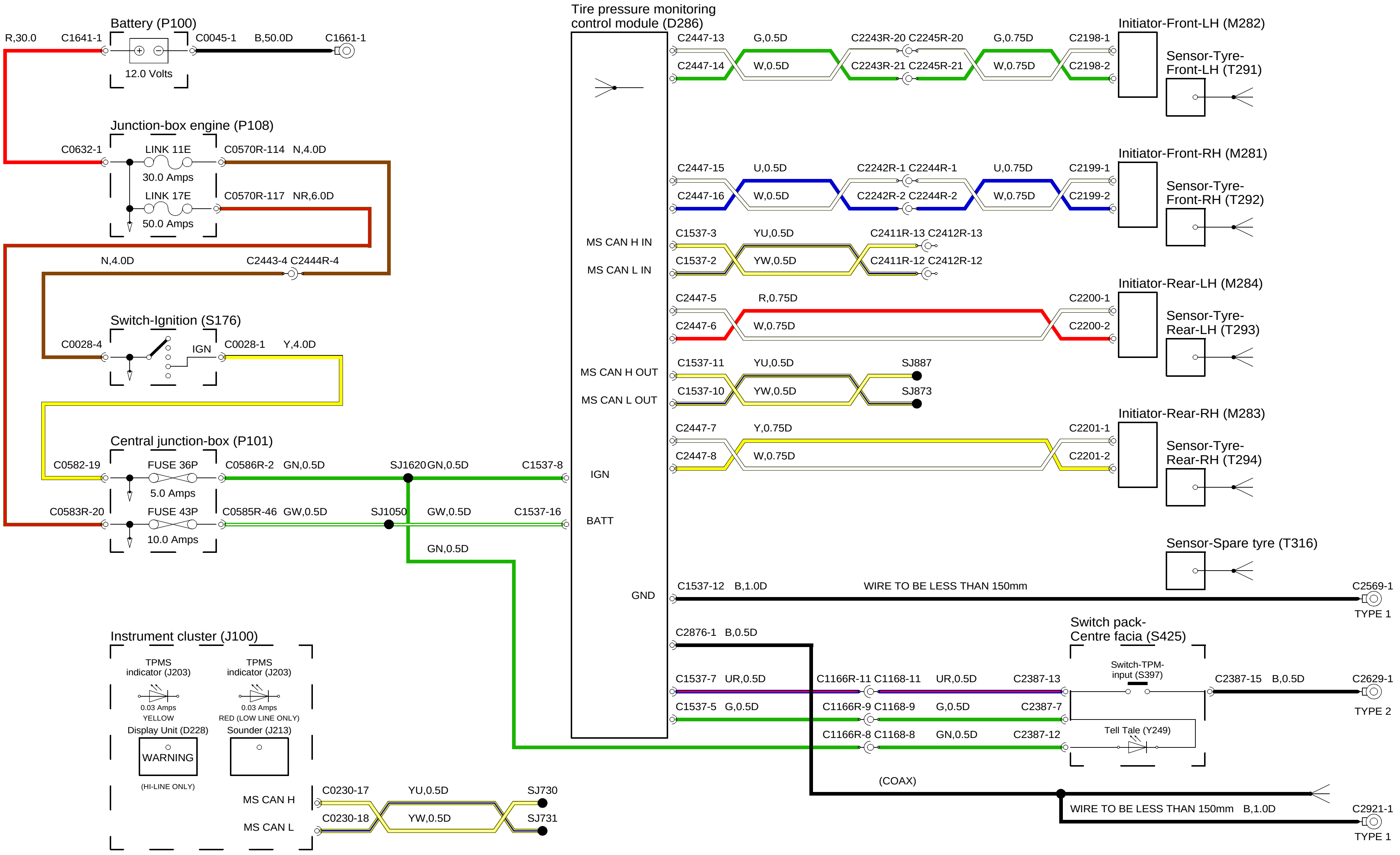
Ground points

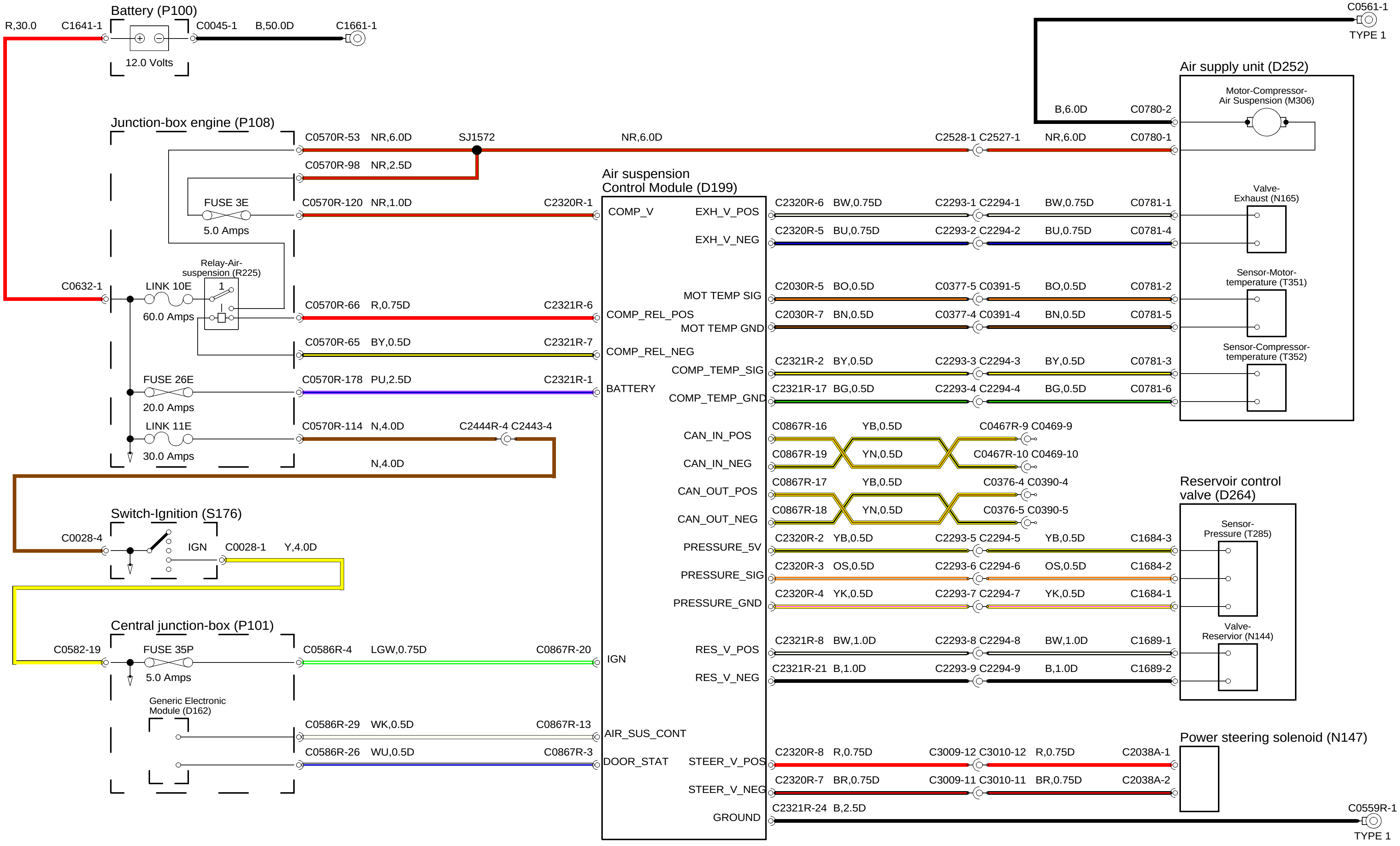
Ground points are identified with an eyelet symbol and a connector number, except where components are grounded through its fixings, when only the eyelet is shown.

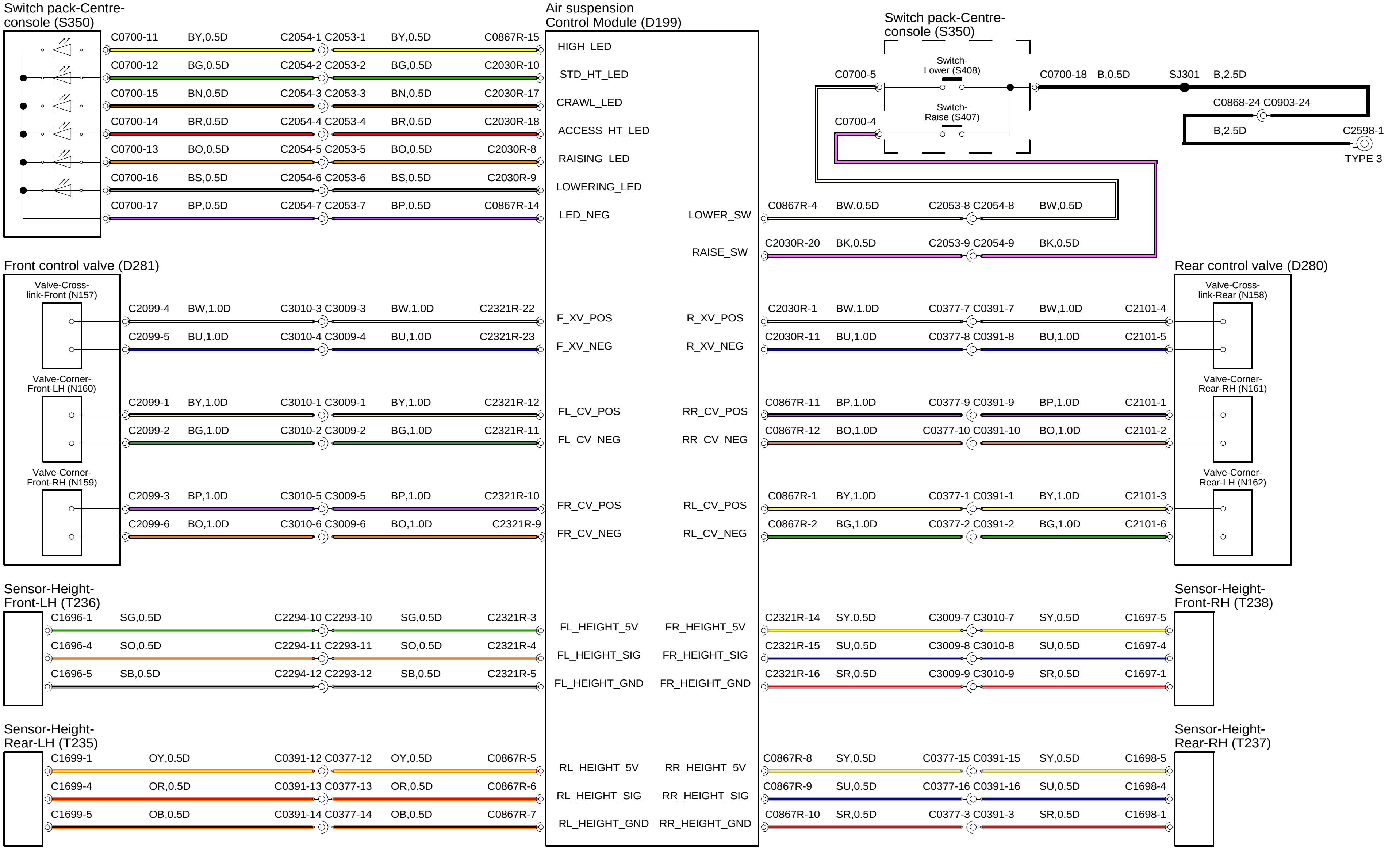
Colour Codes

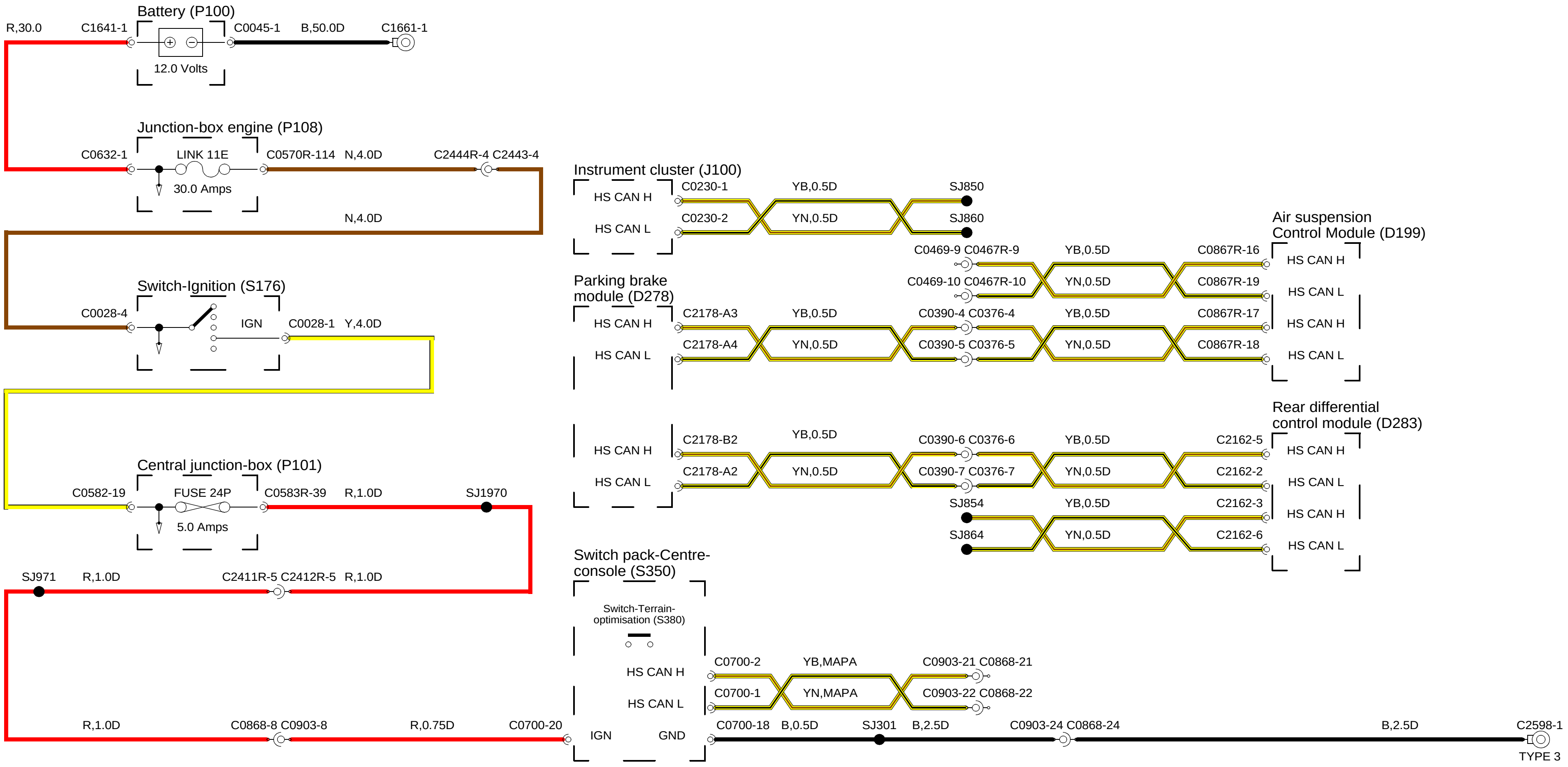
DRAADKLEURCODES	CODES DES COULEURS DES FILS	KABELFARBCODES
CODICI COLORI DEI CAVI	CODIGOS DE COLORES DE LOS CABLES	CÓDIGOS DAS CORES DOS FIOS

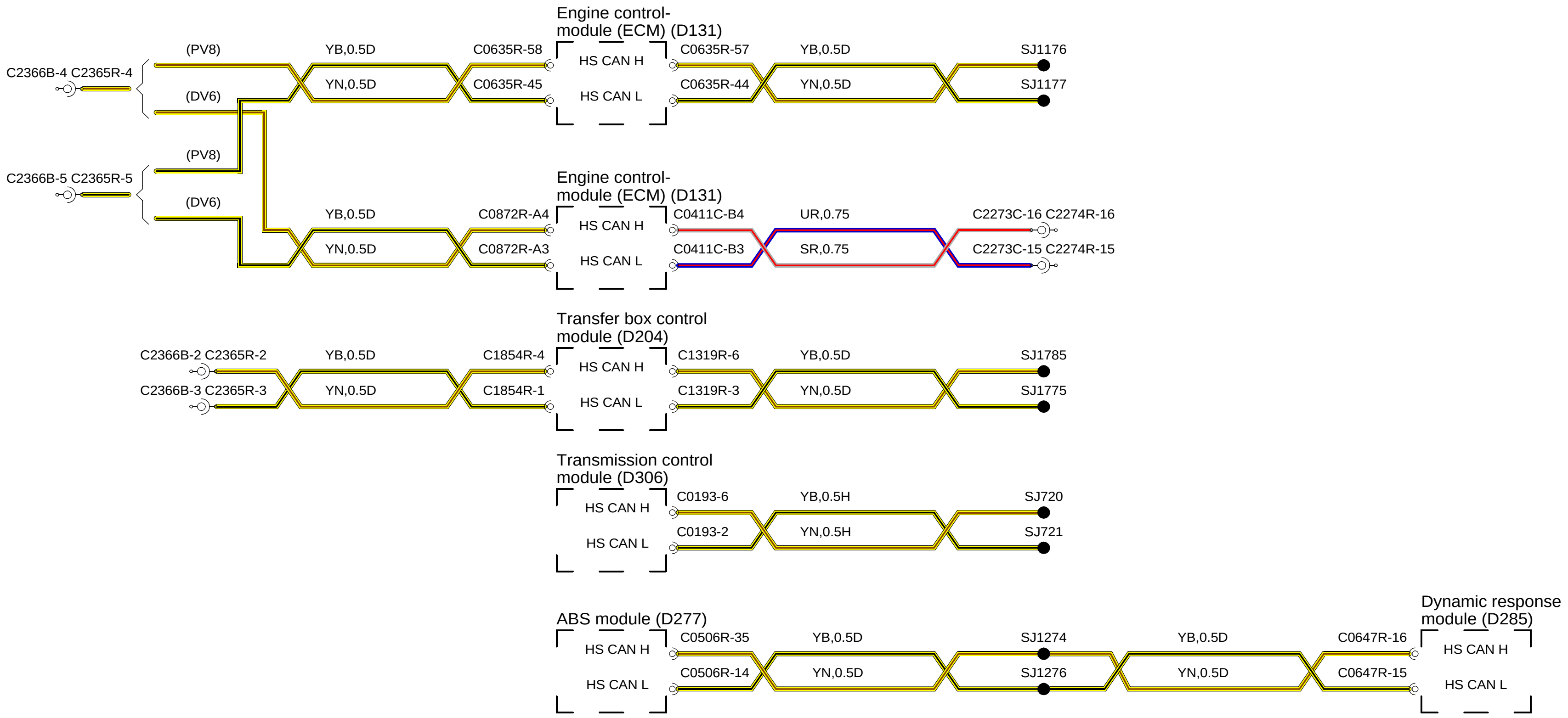
CODE	COLOUR	CODE	KLEUR	CODE	COULEUR	CODE	FARBE	CODICE	COLORE	CODIGO	COLOR	CÓDIGO	COR
B	BLACK	B	ZWART	B	NOIR	B	SCHWARZ	B	NERO	B	NEGRO	B	PRETO
G	GREEN	G	GROEN	G	VERT	G	GRÜN	G	VERDE	G	VERDE	G	VERDE
K	PINK	K	ROZE	K	ROSE	K	ROSA	K	ROSA	K	ROSA	K	ROSA
LG	LIGHT GREEN	LG	LICHTGROEN	LG	VERT CLAIR	LG	HELLGRÜN	LG	VERDE CHIARO	LG	VERDE CLARO	LG	VERDE CLARO
N	BROWN	N	BRUIN	N	BRUN	N	BRAUN	N	MARRONE	N	MARRON	N	CASTANHO
O	ORANGE	O	ORANJE	O	ORANGE	O	ORANGE	O	ARANCIONE	O	NARANJA	O	LARANJA
P	PURPLE	P	PAARS	P	VIOLET	P	LILA	P	PORPORA	P	PURPURA	P	ROXO
R	RED	R	ROOD	R	ROUGE	R	ROT	R	ROSSO	R	ROJO	R	VERMELHO
S	SLATE (grey)	S	LEIGRIJS	S	GRIS	S	GRAU	S	ARDESIA (grigio)	S	PIZARRO (gris)	S	CINZENTO
T	TRANSPARENT	T	TRANSPARANT	T	TRANSPARENT	T	TRANSPARENT	T	TRASPARENTE	T	TRANSPARENTE	T	TRANSPARENTE
U	BLUE	U	BLAUW	U	BLEU	U	BLAU	U	BLU	U	AZUL	U	AZUL
W	WHITE	W	WIT	W	BLANC	W	WEISS	W	BIANCO	W	BLANCO	W	BRANCO
Y	YELLOW	Y	GEEL	Y	JAUNE	Y	GELB	Y	GIALLO	Y	AMARILLO	Y	AMARELO

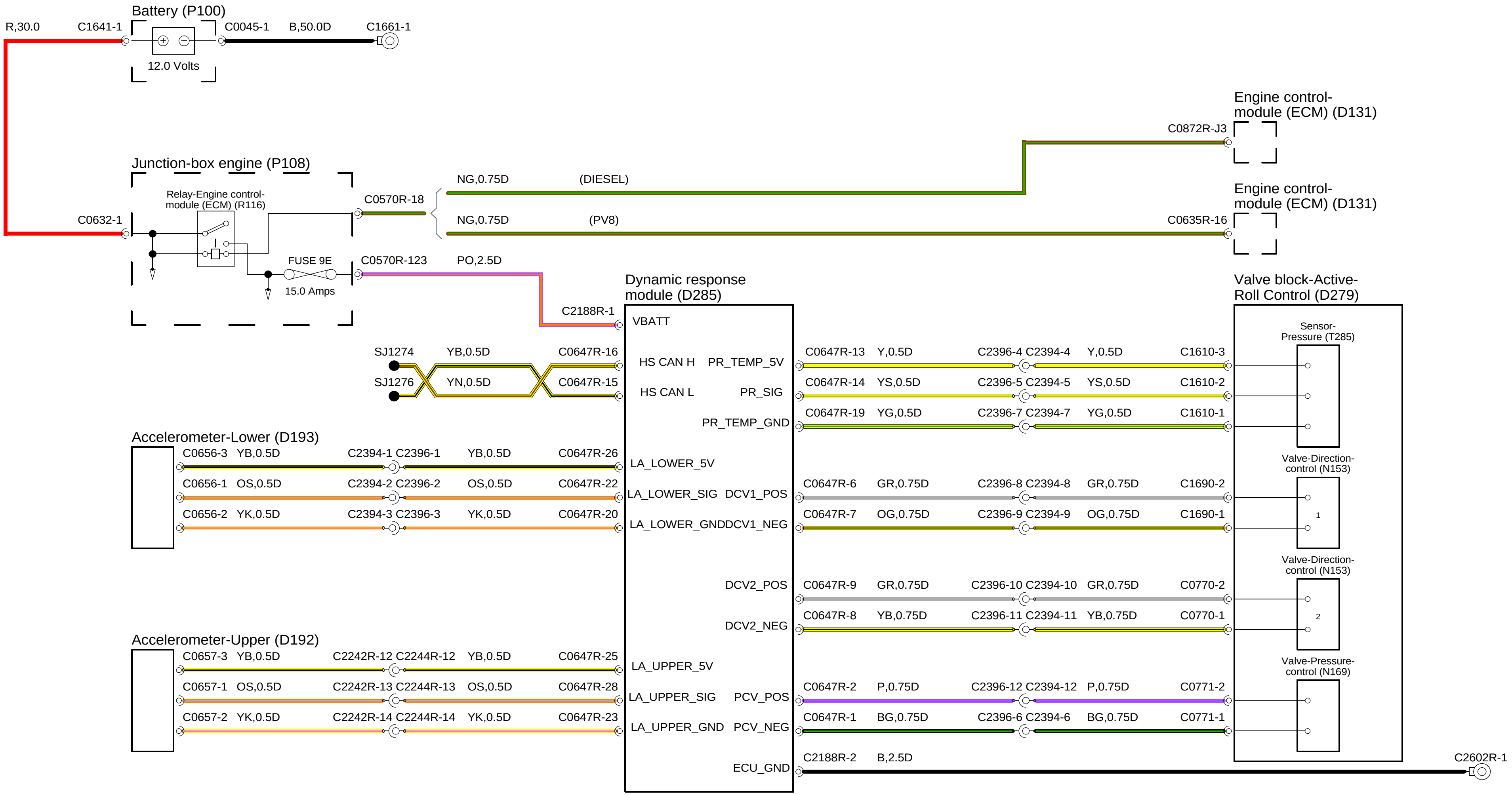

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570R-114
N,4.0D
30.0 Amps
LINK 17E
C0570R-117
NR,6.0D
50.0 Amps
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 36P
C0586R-2
GN,0.5D
SJ1620
GN,0.5D
C1537-8
5.0 Amps
C0583R-20
FUSE 43P
C0585R-46
GW,0.5D
SJ1050
GW,0.5D
C1537-16
10.0 Amps
GN,0.5D
Instrument cluster (J100)
TPMS
indicator (J203)
0.03 Amps
YELLOW
TPMS
indicator (J203)
0.03 Amps
RED (LOW LINE ONLY)
Display Unit (D228)
WARNING
(HI-LINE ONLY)
Sounder (J213)
MS CAN H
MS CAN L
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
Tire pressure monitoring
control module (D286)
MS CAN H IN
MS CAN L IN
MS CAN H OUT
MS CAN L OUT
IGN
BATT
GND
C2447-13
G,0.5D
C2243R-20 C2245R-20
G,0.75D
C2198-1
C2447-14
W,0.5D
C2243R-21 C2245R-21
W,0.75D
C2198-2
Initiator-Front-LH (M282)
Sensor-Tyre-
Front-LH (T291)
C2447-15
U,0.5D
C2242R-1 C2244R-1
U,0.75D
C2199-1
C2447-16
W,0.5D
C2242R-2 C2244R-2
W,0.75D
C2199-2
Initiator-Front-RH (M281)
Sensor-Tyre-
Front-RH (T292)
C1537-3
YU,0.5D
C2411R-13 C2412R-13
C1537-2
YW,0.5D
C2411R-12 C2412R-12
C2447-5
R,0.75D
C2200-1
C2447-6
W,0.75D
C2200-2
Initiator-Rear-LH (M284)
Sensor-Tyre-
Rear-LH (T293)
C1537-11
YU,0.5D
SJ887
C1537-10
YW,0.5D
SJ873
C2447-7
Y,0.75D
C2201-1
C2447-8
W,0.75D
C2201-2
Initiator-Rear-RH (M283)
Sensor-Tyre-
Rear-RH (T294)
Sensor-Spare tyre (T316)
C1537-12
B,1.0D
WIRE TO BE LESS THAN 150mm
C2569-1
TYPE 1
C2876-1
B,0.5D
Switch pack-
Centre facia (S425)
C1537-7
UR,0.5D
C1166R-11 C1168-11
UR,0.5D
C2387-13
Switch-TPM-
input (S397)
C2387-15
B,0.5D
C2629-1
TYPE 2
C1537-5
G,0.5D
C1166R-9 C1168-9
G,0.5D
C2387-7
Tell Tale (Y249)
C1166R-8 C1168-8
GN,0.5D
C2387-12
(COAX)
WIRE TO BE LESS THAN 150mm
B,1.0D
C2921-1
TYPE 1

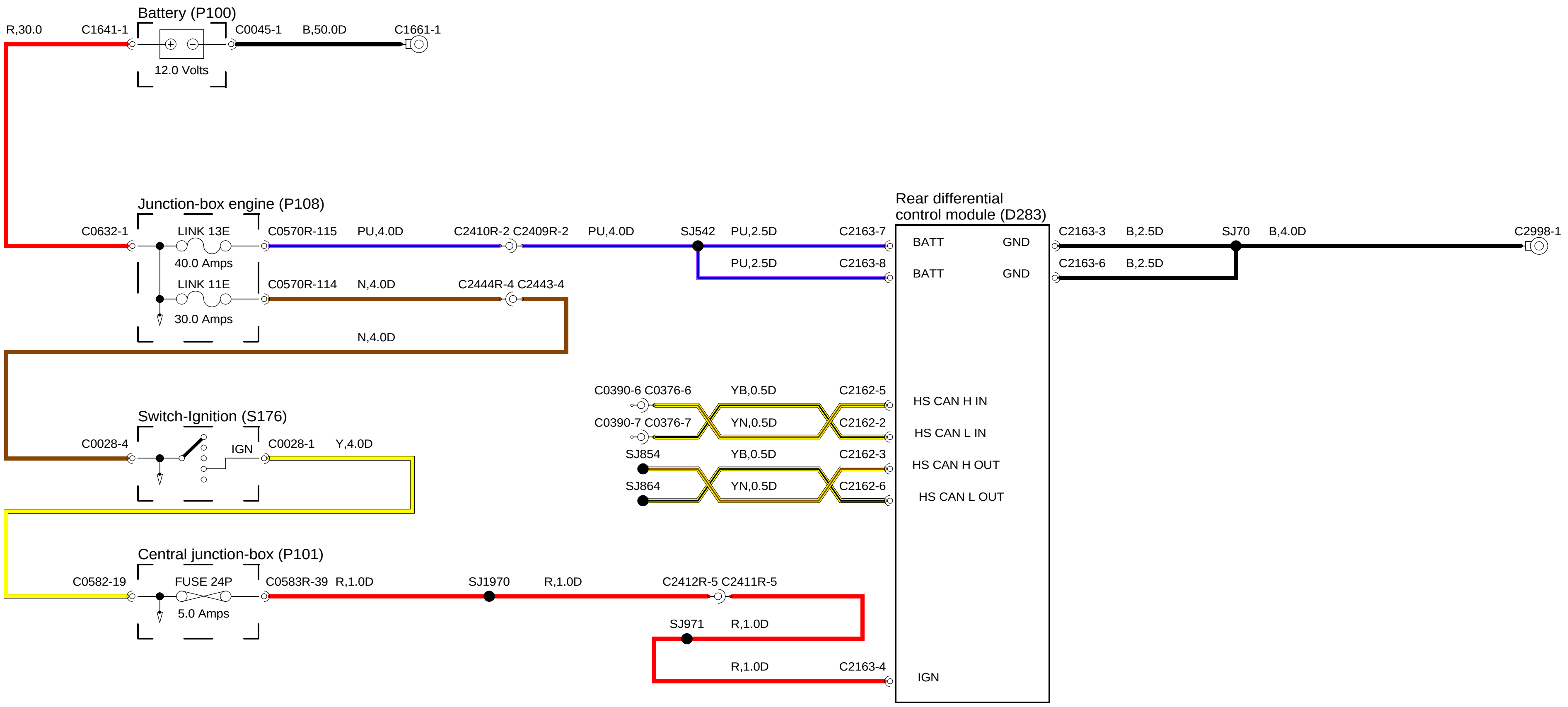

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
C0561-1
TYPE 1
Air supply unit (D252)
Motor-Compressor-Air Suspension (M306)
B,6.0D
C0780-2
Junction-box engine (P108)
C0570R-53
NR,6.0D
SJ1572
NR,6.0D
C2528-1 C2527-1
NR,6.0D
C0780-1
C0570R-98
NR,2.5D
Air suspension Control Module (D199)
FUSE 3E
5.0 Amps
C0570R-120
NR,1.0D
C2320R-1
COMP_V
EXH_V_POS
EXH_V_NEG
C2320R-6
BW,0.75D
C2293-1 C2294-1
BW,0.75D
C0781-1
Valve-Exhaust (N165)
C2320R-5
BU,0.75D
C2293-2 C2294-2
BU,0.75D
C0781-4
Relay-Air-suspension (R225)
C0632-1
LINK 10E
1
60.0 Amps
Sensor-Motor-temperature (T351)
MOT TEMP SIG
C2030R-5
BO,0.5D
C0377-5 C0391-5
BO,0.5D
C0781-2
C0570R-66
R,0.75D
C2321R-6
COMP_REL_POS
C2030R-7
BN,0.5D
C0377-4 C0391-4
BN,0.5D
C0781-5
MOT TEMP GND
C0570R-65
BY,0.5D
C2321R-7
COMP_REL_NEG
Sensor-Compressor-temperature (T352)
COMP_TEMP_SIG
C2321R-2
BY,0.5D
C2293-3 C2294-3
BY,0.5D
C0781-3
FUSE 26E
C0570R-178
PU,2.5D
C2321R-1
BATTERY
20.0 Amps
COMP_TEMP_GND
C2321R-17
BG,0.5D
C2293-4 C2294-4
BG,0.5D
C0781-6
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
30.0 Amps
N,4.0D
CAN_IN_POS
C0867R-16
YB,0.5D
C0467R-9 C0469-9
CAN_IN_NEG
C0867R-19
YN,0.5D
C0467R-10 C0469-10
CAN_OUT_POS
C0867R-17
YB,0.5D
C0376-4 C0390-4
CAN_OUT_NEG
C0867R-18
YN,0.5D
C0376-5 C0390-5
Reservoir control valve (D264)
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Sensor-Pressure (T285)
PRESSURE_5V
C2320R-2
YB,0.5D
C2293-5 C2294-5
YB,0.5D
C1684-3
PRESSURE_SIG
C2320R-3
OS,0.5D
C2293-6 C2294-6
OS,0.5D
C1684-2
PRESSURE_GND
C2320R-4
YK,0.5D
C2293-7 C2294-7
YK,0.5D
C1684-1
Central junction-box (P101)
Valve-Reservior (N144)
C0582-19
FUSE 35P
C0586R-4
LGW,0.75D
C0867R-20
IGN
RES_V_POS
C2321R-8
BW,1.0D
C2293-8 C2294-8
BW,1.0D
C1689-1
5.0 Amps
RES_V_NEG
C2321R-21
B,1.0D
C2293-9 C2294-9
B,1.0D
C1689-2
Generic Electronic Module (D162)
C0586R-29
WK,0.5D
C0867R-13
AIR_SUS_CONT
Power steering solenoid (N147)
C0586R-26
WU,0.5D
C0867R-3
DOOR_STAT
STEER_V_POS
C2320R-8
R,0.75D
C3009-12 C3010-12
R,0.75D
C2038A-1
STEER_V_NEG
C2320R-7
BR,0.75D
C3009-11 C3010-11
BR,0.75D
C2038A-2
C2321R-24
B,2.5D
C0559R-1
GROUND
TYPE 1

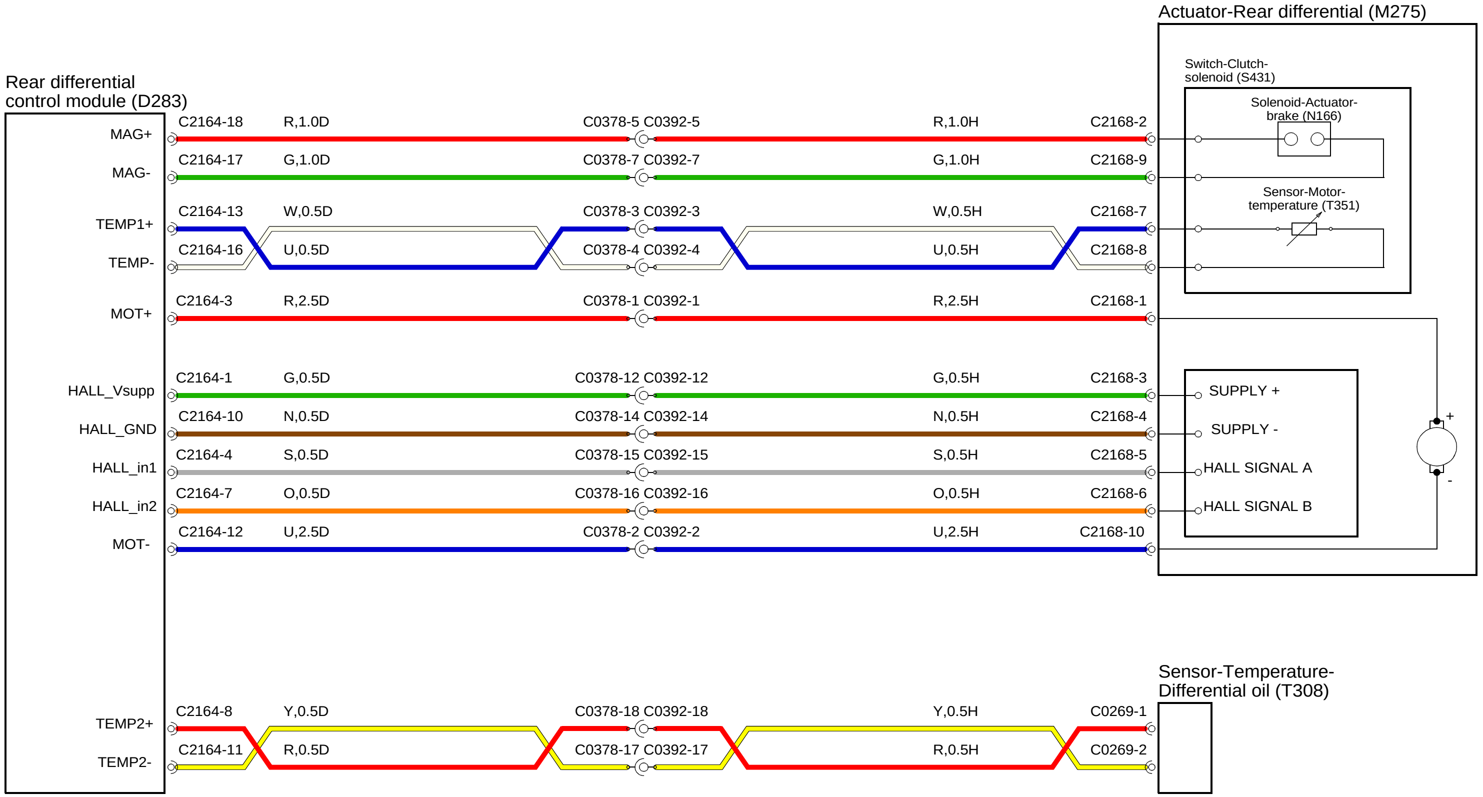

Switch pack-Centre-console (S350)
C0700-11 BY,0.5D C2054-1 C2053-1 BY,0.5D C0867R-15
C0700-12 BG,0.5D C2054-2 C2053-2 BG,0.5D C2030R-10
C0700-15 BN,0.5D C2054-3 C2053-3 BN,0.5D C2030R-17
C0700-14 BR,0.5D C2054-4 C2053-4 BR,0.5D C2030R-18
C0700-13 BO,0.5D C2054-5 C2053-5 BO,0.5D C2030R-8
C0700-16 BS,0.5D C2054-6 C2053-6 BS,0.5D C2030R-9
C0700-17 BP,0.5D C2054-7 C2053-7 BP,0.5D C0867R-14
Air suspension Control Module (D199)
HIGH_LED
STD_HT_LED
CRAWL_LED
ACCESS_HT_LED
RAISING_LED
LOWERING_LED
LED_NEG
LOWER_SW
RAISE_SW
Switch pack-Centre-console (S350)
C0700-5
Switch-Lower (S408)
Switch-Raise (S407)
C0700-4
C0700-18 B,0.5D
SJ301 B,2.5D
C0868-24 C0903-24
B,2.5D
C2598-1
TYPE 3
C0867R-4 BW,0.5D C2053-8 C2054-8 BW,0.5D
C2030R-20 BK,0.5D C2053-9 C2054-9 BK,0.5D
Front control valve (D281)
Valve-Cross-link-Front (N157)
C2099-4 BW,1.0D C3010-3 C3009-3 BW,1.0D C2321R-22
C2099-5 BU,1.0D C3010-4 C3009-4 BU,1.0D C2321R-23
Valve-Corner-Front-LH (N160)
C2099-1 BY,1.0D C3010-1 C3009-1 BY,1.0D C2321R-12
C2099-2 BG,1.0D C3010-2 C3009-2 BG,1.0D C2321R-11
Valve-Corner-Front-RH (N159)
C2099-3 BP,1.0D C3010-5 C3009-5 BP,1.0D C2321R-10
C2099-6 BO,1.0D C3010-6 C3009-6 BO,1.0D C2321R-9
F_XV_POS
F_XV_NEG
FL_CV_POS
FL_CV_NEG
FR_CV_POS
FR_CV_NEG
R_XV_POS
R_XV_NEG
RR_CV_POS
RR_CV_NEG
RL_CV_POS
RL_CV_NEG
Rear control valve (D280)
Valve-Cross-link-Rear (N158)
C2030R-1 BW,1.0D C0377-7 C0391-7 BW,1.0D C2101-4
C2030R-11 BU,1.0D C0377-8 C0391-8 BU,1.0D C2101-5
Valve-Corner-Rear-RH (N161)
C0867R-11 BP,1.0D C0377-9 C0391-9 BP,1.0D C2101-1
C0867R-12 BO,1.0D C0377-10 C0391-10 BO,1.0D C2101-2
Valve-Corner-Rear-LH (N162)
C0867R-1 BY,1.0D C0377-1 C0391-1 BY,1.0D C2101-3
C0867R-2 BG,1.0D C0377-2 C0391-2 BG,1.0D C2101-6
Sensor-Height-Front-LH (T236)
C1696-1 SG,0.5D C2294-10 C2293-10 SG,0.5D C2321R-3
C1696-4 SO,0.5D C2294-11 C2293-11 SO,0.5D C2321R-4
C1696-5 SB,0.5D C2294-12 C2293-12 SB,0.5D C2321R-5
FL_HEIGHT_5V
FL_HEIGHT_SIG
FL_HEIGHT_GND
FR_HEIGHT_5V
FR_HEIGHT_SIG
FR_HEIGHT_GND
Sensor-Height-Front-RH (T238)
C2321R-14 SY,0.5D C3009-7 C3010-7 SY,0.5D C1697-5
C2321R-15 SU,0.5D C3009-8 C3010-8 SU,0.5D C1697-4
C2321R-16 SR,0.5D C3009-9 C3010-9 SR,0.5D C1697-1
Sensor-Height-Rear-LH (T235)
C1699-1 OY,0.5D C0391-12 C0377-12 OY,0.5D C0867R-5
C1699-4 OR,0.5D C0391-13 C0377-13 OR,0.5D C0867R-6
C1699-5 OB,0.5D C0391-14 C0377-14 OB,0.5D C0867R-7
RL_HEIGHT_5V
RL_HEIGHT_SIG
RL_HEIGHT_GND
RR_HEIGHT_5V
RR_HEIGHT_SIG
RR_HEIGHT_GND
Sensor-Height-Rear-RH (T237)
C0867R-8 SY,0.5D C0377-15 C0391-15 SY,0.5D C1698-5
C0867R-9 SU,0.5D C0377-16 C0391-16 SU,0.5D C1698-4
C0867R-10 SR,0.5D C0377-3 C0391-3 SR,0.5D C1698-1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583R-39
R,1.0D
SJ1970
SJ971
R,1.0D
C2411R-5 C2412R-5
R,1.0D
R,1.0D
C0868-8 C0903-8
R,0.75D
C0700-20
Instrument cluster (J100)
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Air suspension Control Module (D199)
C0469-9 C0467R-9
YB,0.5D
C0867R-16
HS CAN H
C0469-10 C0467R-10
YN,0.5D
C0867R-19
HS CAN L
Parking brake module (D278)
HS CAN H
HS CAN L
C2178-A3
YB,0.5D
C0390-4 C0376-4
YB,0.5D
C0867R-17
HS CAN H
C2178-A4
YN,0.5D
C0390-5 C0376-5
YN,0.5D
C0867R-18
HS CAN L
Rear differential control module (D283)
HS CAN H
HS CAN L
C2178-B2
YB,0.5D
C0390-6 C0376-6
YB,0.5D
C2162-5
HS CAN H
C2178-A2
YN,0.5D
C0390-7 C0376-7
YN,0.5D
C2162-2
HS CAN L
SJ854
YB,0.5D
C2162-3
HS CAN H
SJ864
YN,0.5D
C2162-6
HS CAN L
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
HS CAN H
HS CAN L
IGN
GND
C0700-2
YB,MAPA
C0903-21 C0868-21
C0700-1
YN,MAPA
C0903-22 C0868-22
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3

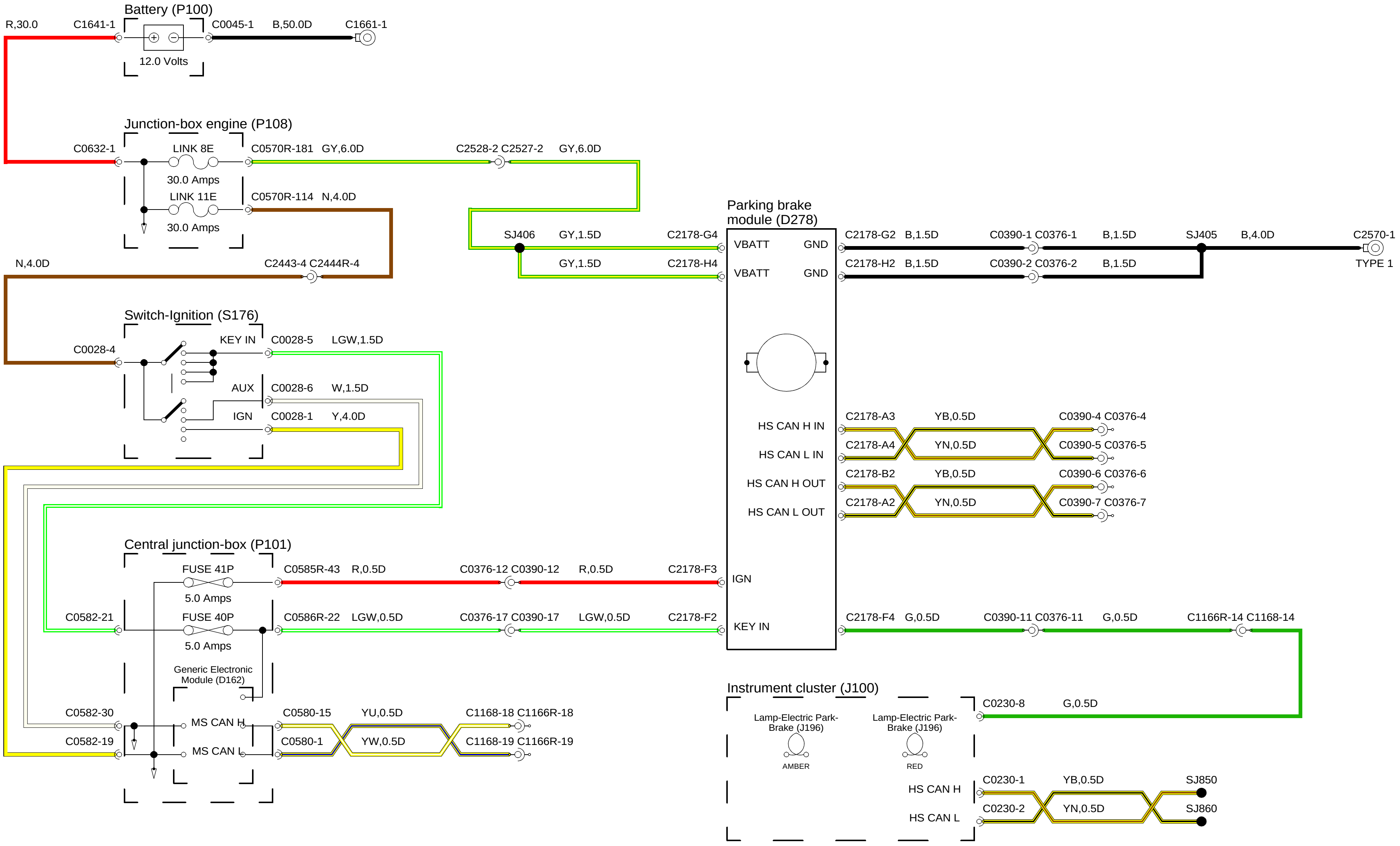

Engine control-module (ECM) (D131)
C2366B-4 C2365R-4
(PV8)
(DV6)
YB,0.5D
YN,0.5D
C0635R-58
C0635R-45
HS CAN H
HS CAN L
C0635R-57
C0635R-44
YB,0.5D
YN,0.5D
SJ1176
SJ1177
C2366B-5 C2365R-5
(PV8)
(DV6)
Engine control-module (ECM) (D131)
YB,0.5D
YN,0.5D
C0872R-A4
C0872R-A3
HS CAN H
HS CAN L
C0411C-B4
C0411C-B3
UR,0.75
SR,0.75
C2273C-16 C2274R-16
C2273C-15 C2274R-15
Transfer box control module (D204)
C2366B-2 C2365R-2
C2366B-3 C2365R-3
YB,0.5D
YN,0.5D
C1854R-4
C1854R-1
HS CAN H
HS CAN L
C1319R-6
C1319R-3
YB,0.5D
YN,0.5D
SJ1785
SJ1775
Transmission control module (D306)
HS CAN H
HS CAN L
C0193-6
C0193-2
YB,0.5H
YN,0.5H
SJ720
SJ721
ABS module (D277)
HS CAN H
HS CAN L
C0506R-35
C0506R-14
YB,0.5D
YN,0.5D
SJ1274
SJ1276
YB,0.5D
YN,0.5D
C0647R-16
C0647R-15
Dynamic response module (D285)
HS CAN H
HS CAN L

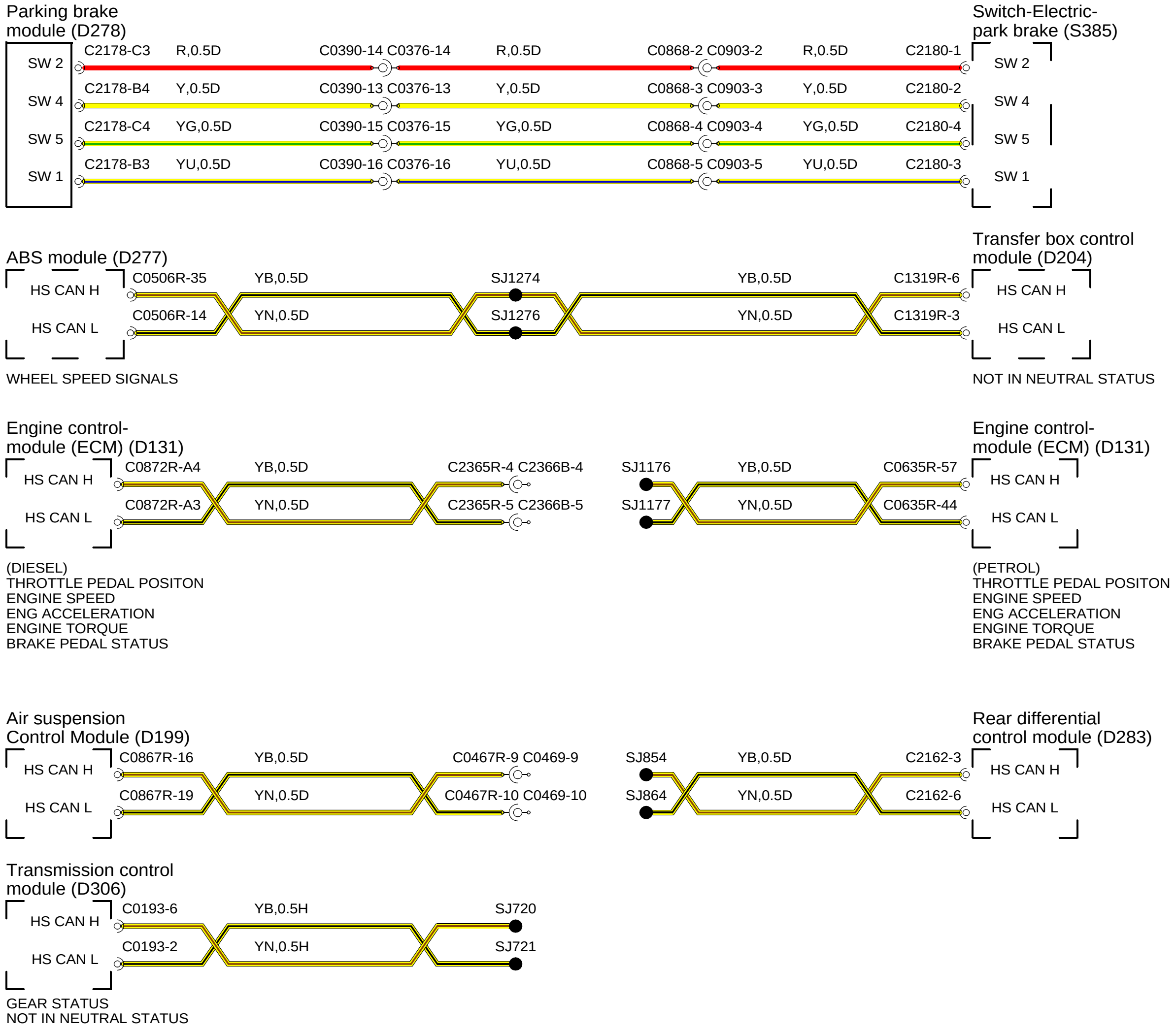

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Engine control-module (ECM) (D131)
C0872R-J3
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
C0570R-18
NG,0.75D
(DIESEL)
NG,0.75D
(PV8)
Engine control-module (ECM) (D131)
C0635R-16
FUSE 9E
15.0 Amps
C0570R-123
PO,2.5D
Dynamic response module (D285)
Valve block-Active-Roll Control (D279)
C2188R-1
VBATT
SJ1274
YB,0.5D
C0647R-16
SJ1276
YN,0.5D
C0647R-15
HS CAN H
HS CAN L
PR_TEMP_5V
PR_SIG
PR_TEMP_GND
C0647R-13
Y,0.5D
C2396-4 C2394-4
Y,0.5D
C1610-3
C0647R-14
YS,0.5D
C2396-5 C2394-5
YS,0.5D
C1610-2
C0647R-19
YG,0.5D
C2396-7 C2394-7
YG,0.5D
C1610-1
Sensor-Pressure (T285)
Accelerometer-Lower (D193)
C0656-3
YB,0.5D
C2394-1 C2396-1
YB,0.5D
C0647R-26
C0656-1
OS,0.5D
C2394-2 C2396-2
OS,0.5D
C0647R-22
C0656-2
YK,0.5D
C2394-3 C2396-3
YK,0.5D
C0647R-20
LA_LOWER_5V
LA_LOWER_SIG
LA_LOWER_GND
DCV1_POS
DCV1_NEG
C0647R-6
GR,0.75D
C2396-8 C2394-8
GR,0.75D
C1690-2
C0647R-7
OG,0.75D
C2396-9 C2394-9
OG,0.75D
C1690-1
Valve-Direction-control (N153)
1
DCV2_POS
DCV2_NEG
C0647R-9
GR,0.75D
C2396-10 C2394-10
GR,0.75D
C0770-2
C0647R-8
YB,0.75D
C2396-11 C2394-11
YB,0.75D
C0770-1
Valve-Direction-control (N153)
2
Accelerometer-Upper (D192)
C0657-3
YB,0.5D
C2242R-12 C2244R-12
YB,0.5D
C0647R-25
C0657-1
OS,0.5D
C2242R-13 C2244R-13
OS,0.5D
C0647R-28
C0657-2
YK,0.5D
C2242R-14 C2244R-14
YK,0.5D
C0647R-23
LA_UPPER_5V
LA_UPPER_SIG
LA_UPPER_GND
PCV_POS
PCV_NEG
C0647R-2
P,0.75D
C2396-12 C2394-12
P,0.75D
C0771-2
C0647R-1
BG,0.75D
C2396-6 C2394-6
BG,0.75D
C0771-1
Valve-Pressure-control (N169)
ECU_GND
C2188R-2
B,2.5D
C2602R-1

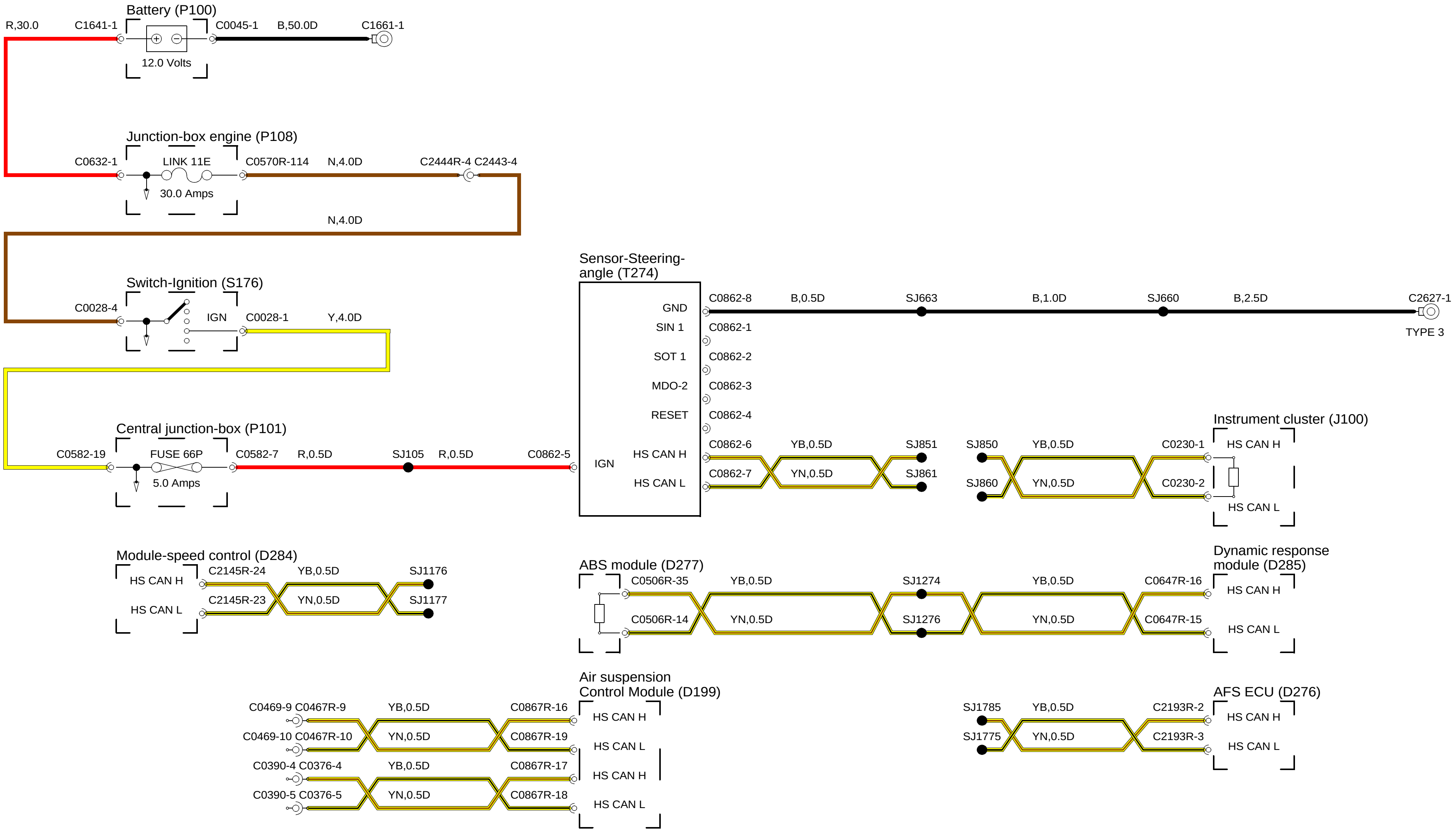

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 13E
40.0 Amps
C0570R-115
PU,4.0D
C2410R-2 C2409R-2
PU,4.0D
SJ542
PU,2.5D
C2163-7
PU,2.5D
C2163-8
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Rear differential control module (D283)
BATT
GND
BATT
GND
C2163-3
B,2.5D
SJ70
B,4.0D
C2998-1
C2163-6
B,2.5D
C0390-6 C0376-6
YB,0.5D
C2162-5
C0390-7 C0376-7
YN,0.5D
C2162-2
SJ854
YB,0.5D
C2162-3
SJ864
YN,0.5D
C2162-6
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583R-39
R,1.0D
SJ1970
R,1.0D
C2412R-5 C2411R-5
SJ971
R,1.0D
R,1.0D
C2163-4
IGN

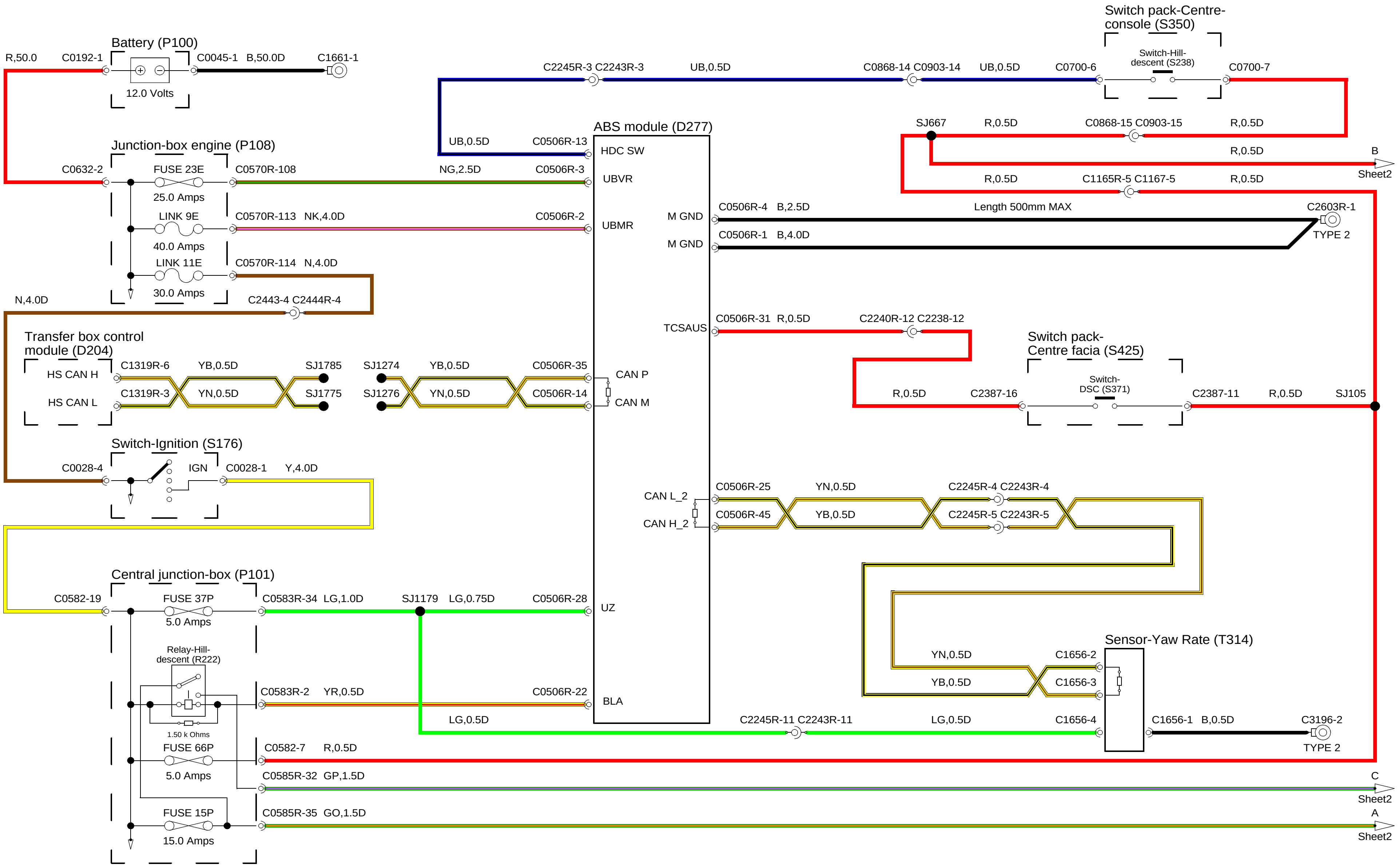

Actuator-Rear differential (M275)
Switch-Clutch-solenoid (S431)
Solenoid-Actuator-brake (N166)
Sensor-Motor-temperature (T351)
Rear differential control module (D283)
MAG+
MAG-
TEMP1+
TEMP-
MOT+
HALL_Vsupp
HALL_GND
HALL_in1
HALL_in2
MOT-
TEMP2+
TEMP2-
C2164-18 R,1.0D C0378-5 C0392-5 R,1.0H C2168-2
C2164-17 G,1.0D C0378-7 C0392-7 G,1.0H C2168-9
C2164-13 W,0.5D C0378-3 C0392-3 W,0.5H C2168-7
C2164-16 U,0.5D C0378-4 C0392-4 U,0.5H C2168-8
C2164-3 R,2.5D C0378-1 C0392-1 R,2.5H C2168-1
C2164-1 G,0.5D C0378-12 C0392-12 G,0.5H C2168-3
C2164-10 N,0.5D C0378-14 C0392-14 N,0.5H C2168-4
C2164-4 S,0.5D C0378-15 C0392-15 S,0.5H C2168-5
C2164-7 O,0.5D C0378-16 C0392-16 O,0.5H C2168-6
C2164-12 U,2.5D C0378-2 C0392-2 U,2.5H C2168-10
SUPPLY +
SUPPLY -
HALL SIGNAL A
HALL SIGNAL B
+
-
Sensor-Temperature-Differential oil (T308)
C2164-8 Y,0.5D C0378-18 C0392-18 Y,0.5H C0269-1
C2164-11 R,0.5D C0378-17 C0392-17 R,0.5H C0269-2

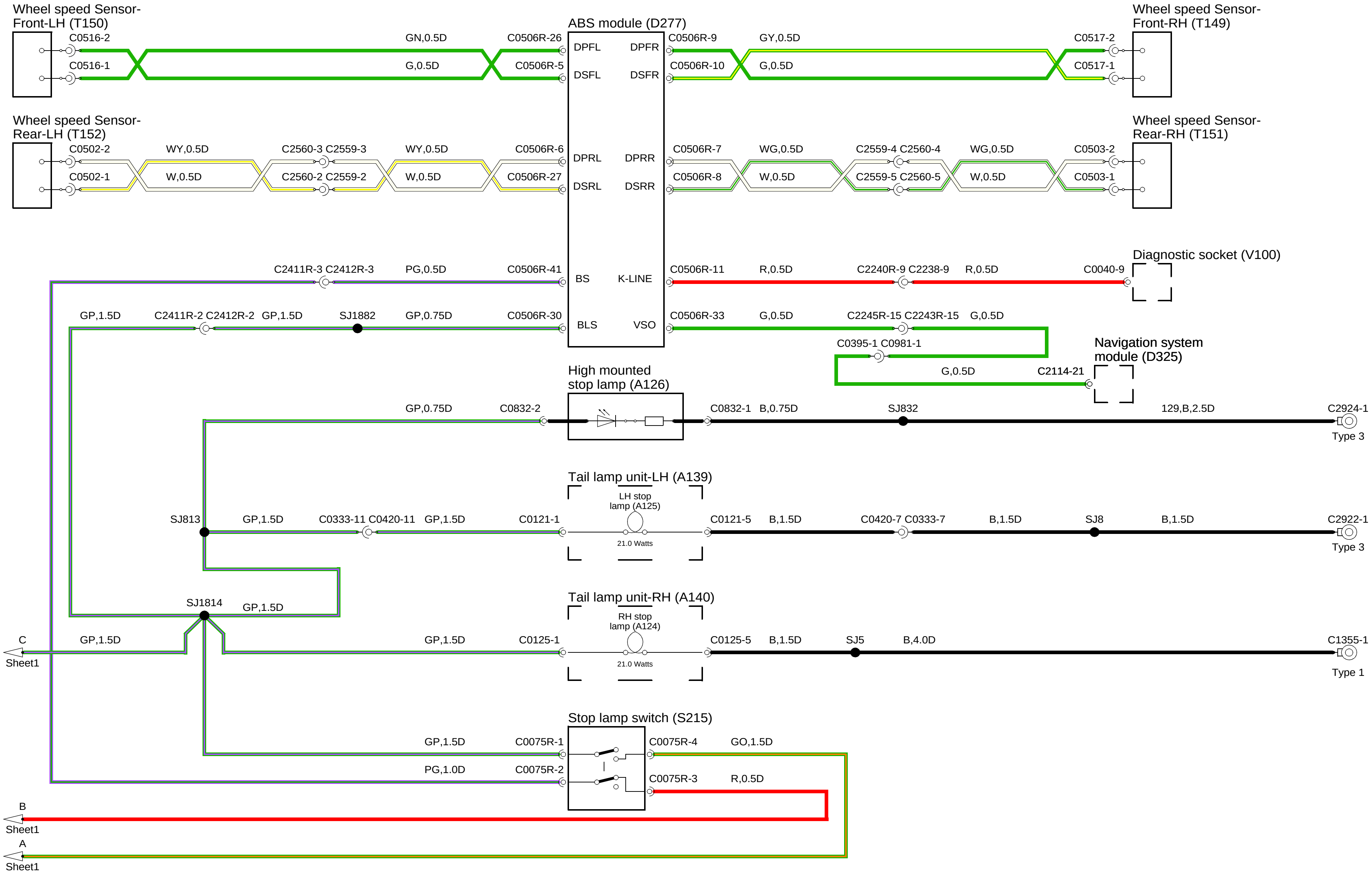
206-05 PARKING BRAKE AND ACTUATION

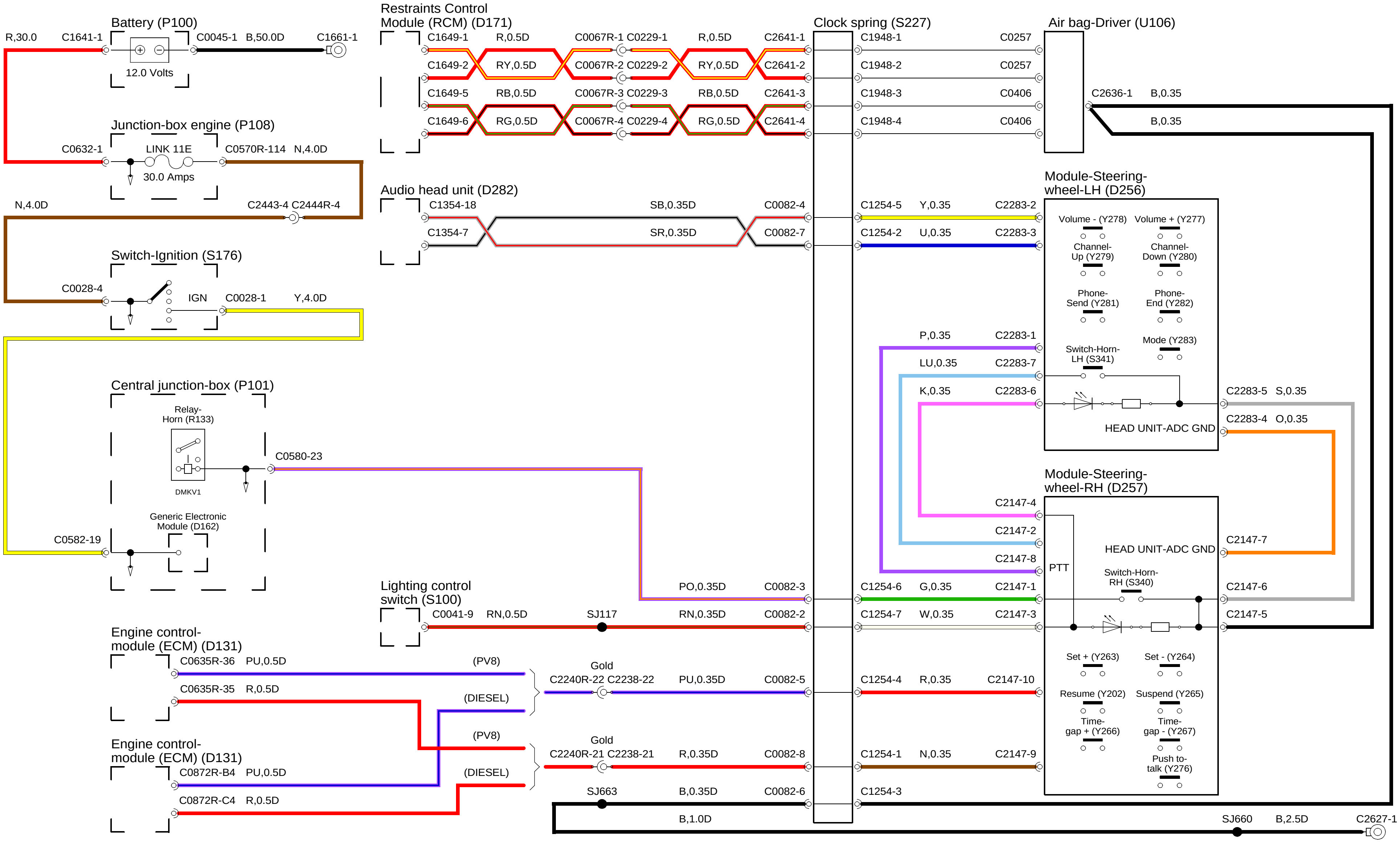

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 8E
30.0 Amps
C0570R-181
GY,6.0D
C2528-2 C2527-2
GY,6.0D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Parking brake module (D278)
SJ406
GY,1.5D
C2178-G4
GY,1.5D
C2178-H4
VBATT
VBATT
GND
GND
C2178-G2
B,1.5D
C0390-1 C0376-1
B,1.5D
SJ405
B,4.0D
C2570-1
C2178-H2
B,1.5D
C0390-2 C0376-2
B,1.5D
TYPE 1
Switch-Ignition (S176)
C0028-4
KEY IN
C0028-5
LGW,1.5D
AUX
C0028-6
W,1.5D
IGN
C0028-1
Y,4.0D
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
C2178-A3
YB,0.5D
C0390-4 C0376-4
C2178-A4
YN,0.5D
C0390-5 C0376-5
C2178-B2
YB,0.5D
C0390-6 C0376-6
C2178-A2
YN,0.5D
C0390-7 C0376-7
Central junction-box (P101)
FUSE 41P
5.0 Amps
C0585R-43
R,0.5D
C0376-12 C0390-12
R,0.5D
C2178-F3
IGN
C0582-21
FUSE 40P
5.0 Amps
C0586R-22
LGW,0.5D
C0376-17 C0390-17
LGW,0.5D
C2178-F2
KEY IN
C2178-F4
G,0.5D
C0390-11 C0376-11
G,0.5D
C1166R-14 C1168-14
Generic Electronic Module (D162)
Instrument cluster (J100)
C0230-8
G,0.5D
C0582-30
MS CAN H
C0580-15
YU,0.5D
C1168-18 C1166R-18
C0582-19
MS CAN L
C0580-1
YW,0.5D
C1168-19 C1166R-19
Lamp-Electric Park-Brake (J196)
AMBER
Lamp-Electric Park-Brake (J196)
RED
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860


Parking brake module (D278)
SW 2
SW 4
SW 5
SW 1
C2178-C3
R,0.5D
C0390-14 C0376-14
R,0.5D
C0868-2 C0903-2
R,0.5D
C2180-1
C2178-B4
Y,0.5D
C0390-13 C0376-13
Y,0.5D
C0868-3 C0903-3
Y,0.5D
C2180-2
C2178-C4
YG,0.5D
C0390-15 C0376-15
YG,0.5D
C0868-4 C0903-4
YG,0.5D
C2180-4
C2178-B3
YU,0.5D
C0390-16 C0376-16
YU,0.5D
C0868-5 C0903-5
YU,0.5D
C2180-3
Switch-Electric-park brake (S385)
SW 2
SW 4
SW 5
SW 1
ABS module (D277)
HS CAN H
HS CAN L
C0506R-35
YB,0.5D
SJ1274
YB,0.5D
C1319R-6
C0506R-14
YN,0.5D
SJ1276
YN,0.5D
C1319R-3
Transfer box control module (D204)
HS CAN H
HS CAN L
WHEEL SPEED SIGNALS
NOT IN NEUTRAL STATUS
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0872R-A4
YB,0.5D
C2365R-4 C2366B-4
SJ1176
YB,0.5D
C0635R-57
C0872R-A3
YN,0.5D
C2365R-5 C2366B-5
SJ1177
YN,0.5D
C0635R-44
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
(DIESEL)
THROTTLE PEDAL POSITON
ENGINE SPEED
ENG ACCELERATION
ENGINE TORQUE
BRAKE PEDAL STATUS
(PETROL)
THROTTLE PEDAL POSITON
ENGINE SPEED
ENG ACCELERATION
ENGINE TORQUE
BRAKE PEDAL STATUS
Air suspension Control Module (D199)
HS CAN H
HS CAN L
C0867R-16
YB,0.5D
C0467R-9 C0469-9
SJ854
YB,0.5D
C2162-3
C0867R-19
YN,0.5D
C0467R-10 C0469-10
SJ864
YN,0.5D
C2162-6
Rear differential control module (D283)
HS CAN H
HS CAN L
Transmission control module (D306)
HS CAN H
HS CAN L
C0193-6
YB,0.5H
SJ720
C0193-2
YN,0.5H
SJ721
GEAR STATUS
NOT IN NEUTRAL STATUS


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Sensor-Steering-angle (T274)
GND
SIN 1
SOT 1
MDO-2
RESET
IGN
HS CAN H
HS CAN L
C0862-8
B,0.5D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
C0862-1
C0862-2
C0862-3
C0862-4
Central junction-box (P101)
C0582-19
FUSE 66P
C0582-7
R,0.5D
SJ105
R,0.5D
C0862-5
5.0 Amps
C0862-6
YB,0.5D
SJ851
SJ850
YB,0.5D
C0230-1
C0862-7
YN,0.5D
SJ861
SJ860
YN,0.5D
C0230-2
Instrument cluster (J100)
HS CAN H
HS CAN L
Module-speed control (D284)
HS CAN H
C2145R-24
YB,0.5D
SJ1176
HS CAN L
C2145R-23
YN,0.5D
SJ1177
ABS module (D277)
C0506R-35
YB,0.5D
SJ1274
YB,0.5D
C0647R-16
C0506R-14
YN,0.5D
SJ1276
YN,0.5D
C0647R-15
Dynamic response module (D285)
HS CAN H
HS CAN L
Air suspension Control Module (D199)
C0469-9 C0467R-9
YB,0.5D
C0867R-16
HS CAN H
C0469-10 C0467R-10
YN,0.5D
C0867R-19
HS CAN L
C0390-4 C0376-4
YB,0.5D
C0867R-17
HS CAN H
C0390-5 C0376-5
YN,0.5D
C0867R-18
HS CAN L
AFS ECU (D276)
SJ1785
YB,0.5D
C2193R-2
HS CAN H
SJ1775
YN,0.5D
C2193R-3
HS CAN L


Battery (P100)
R,50.0
C0192-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Switch pack-Centre-console (S350)
Switch-Hill-descent (S238)
C2245R-3 C2243R-3
UB,0.5D
C0868-14 C0903-14
UB,0.5D
C0700-6
C0700-7
ABS module (D277)
UB,0.5D
C0506R-13
HDC SW
SJ667
R,0.5D
C0868-15 C0903-15
R,0.5D
R,0.5D
B
Sheet2
Junction-box engine (P108)
C0632-2
FUSE 23E
25.0 Amps
C0570R-108
NG,2.5D
C0506R-3
UBVR
R,0.5D
C1165R-5 C1167-5
R,0.5D
LINK 9E
40.0 Amps
C0570R-113
NK,4.0D
C0506R-2
UBMR
M GND
M GND
C0506R-4
B,2.5D
Length 500mm MAX
C2603R-1
C0506R-1
B,4.0D
TYPE 2
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
TCSAUS
C0506R-31
R,0.5D
C2240R-12 C2238-12
Transfer box control module (D204)
HS CAN H
HS CAN L
C1319R-6
YB,0.5D
SJ1785
SJ1274
YB,0.5D
C0506R-35
CAN P
C1319R-3
YN,0.5D
SJ1775
SJ1276
YN,0.5D
C0506R-14
CAN M
Switch pack-Centre facia (S425)
Switch-DSC (S371)
R,0.5D
C2387-16
C2387-11
R,0.5D
SJ105
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
CAN L_2
CAN H_2
C0506R-25
YN,0.5D
C2245R-4 C2243R-4
C0506R-45
YB,0.5D
C2245R-5 C2243R-5
Central junction-box (P101)
C0582-19
FUSE 37P
5.0 Amps
C0583R-34
LG,1.0D
SJ1179
LG,0.75D
C0506R-28
UZ
Relay-Hill-descent (R222)
Sensor-Yaw Rate (T314)
YN,0.5D
C1656-2
YB,0.5D
C1656-3
C0583R-2
YR,0.5D
C0506R-22
BLA
1.50 k Ohms
LG,0.5D
C2245R-11 C2243R-11
LG,0.5D
C1656-4
C1656-1
B,0.5D
C3196-2
FUSE 66P
5.0 Amps
C0582-7
R,0.5D
TYPE 2
C0585R-32
GP,1.5D
C
Sheet2
FUSE 15P
15.0 Amps
C0585R-35
GO,1.5D
A
Sheet2


Wheel speed Sensor-
Front-LH (T150)
C0516-2
C0516-1
GN,0.5D
G,0.5D
C0506R-26
C0506R-5
ABS module (D277)
DPFL
DSFL
DPFR
DSFR
C0506R-9
C0506R-10
GY,0.5D
G,0.5D
C0517-2
C0517-1
Wheel speed Sensor-
Front-RH (T149)
Wheel speed Sensor-
Rear-LH (T152)
C0502-2
C0502-1
WY,0.5D
W,0.5D
C2560-3 C2559-3
C2560-2 C2559-2
WY,0.5D
W,0.5D
C0506R-6
C0506R-27
DPRL
DSRL
DPRR
DSRR
C0506R-7
C0506R-8
WG,0.5D
W,0.5D
C2559-4 C2560-4
C2559-5 C2560-5
WG,0.5D
W,0.5D
C0503-2
C0503-1
Wheel speed Sensor-
Rear-RH (T151)
C2411R-3 C2412R-3
PG,0.5D
C0506R-41
BS
K-LINE
C0506R-11
R,0.5D
C2240R-9 C2238-9
R,0.5D
C0040-9
Diagnostic socket (V100)
GP,1.5D
C2411R-2 C2412R-2
GP,1.5D
SJ1882
GP,0.75D
C0506R-30
BLS
VSO
C0506R-33
G,0.5D
C2245R-15 C2243R-15
G,0.5D
C0395-1 C0981-1
G,0.5D
C2114-21
Navigation system
module (D325)
High mounted
stop lamp (A126)
GP,0.75D
C0832-2
C0832-1
B,0.75D
SJ832
129,B,2.5D
C2924-1
Type 3
Tail lamp unit-LH (A139)
LH stop
lamp (A125)
21.0 Watts
SJ813
GP,1.5D
C0333-11 C0420-11
GP,1.5D
C0121-1
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
Type 3
Tail lamp unit-RH (A140)
RH stop
lamp (A124)
21.0 Watts
SJ1814
GP,1.5D
C
Sheet1
GP,1.5D
GP,1.5D
C0125-1
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
Type 1
Stop lamp switch (S215)
GP,1.5D
C0075R-1
PG,1.0D
C0075R-2
C0075R-4
GO,1.5D
C0075R-3
R,0.5D
B
Sheet1
A
Sheet1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
Relay-
Horn (R133)
DMKV1
C0580-23
Generic Electronic
Module (D162)
C0582-19
Restraints Control
Module (RCM) (D171)
C1649-1
R,0.5D
C0067R-1 C0229-1
R,0.5D
C2641-1
C1649-2
RY,0.5D
C0067R-2 C0229-2
RY,0.5D
C2641-2
C1649-5
RB,0.5D
C0067R-3 C0229-3
RB,0.5D
C2641-3
C1649-6
RG,0.5D
C0067R-4 C0229-4
RG,0.5D
C2641-4
Audio head unit (D282)
C1354-18
SB,0.35D
C0082-4
C1354-7
SR,0.35D
C0082-7
Lighting control
switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.35D
C0082-2
PO,0.35D
C0082-3
Engine control-
module (ECM) (D131)
C0635R-36
PU,0.5D
(PV8)
C0635R-35
R,0.5D
(DIESEL)
Gold
C2240R-22 C2238-22
PU,0.35D
C0082-5
Engine control-
module (ECM) (D131)
C0872R-B4
PU,0.5D
(PV8)
C0872R-C4
R,0.5D
(DIESEL)
Gold
C2240R-21 C2238-21
R,0.35D
C0082-8
SJ663
B,0.35D
C0082-6
B,1.0D
Clock spring (S227)
C1948-1
C0257
C1948-2
C0257
C1948-3
C0406
C1948-4
C0406
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
P,0.35
C2283-1
LU,0.35
C2283-7
K,0.35
C2283-6
C2147-4
C2147-2
C2147-8
C1254-6
G,0.35
C2147-1
C1254-7
W,0.35
C2147-3
C1254-4
R,0.35
C2147-10
C1254-1
N,0.35
C2147-9
C1254-3
Air bag-Driver (U106)
C2636-1
B,0.35
B,0.35
Module-Steering-
wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-
Up (Y279)
Channel-
Down (Y280)
Phone-
Send (Y281)
Phone-
End (Y282)
Mode (Y283)
Switch-Horn-
LH (S341)
HEAD UNIT-ADC GND
C2283-5
S,0.35
C2283-4
O,0.35
Module-Steering-
wheel-RH (D257)
HEAD UNIT-ADC GND
PTT
Switch-Horn-
RH (S340)
C2147-7
C2147-6
C2147-5
Set + (Y263)
Set - (Y264)
Resume (Y202)
Suspend (Y265)
Time-
gap + (Y266)
Time-
gap - (Y267)
Push to-
talk (Y276)
SJ660
B,2.5D
C2627-1

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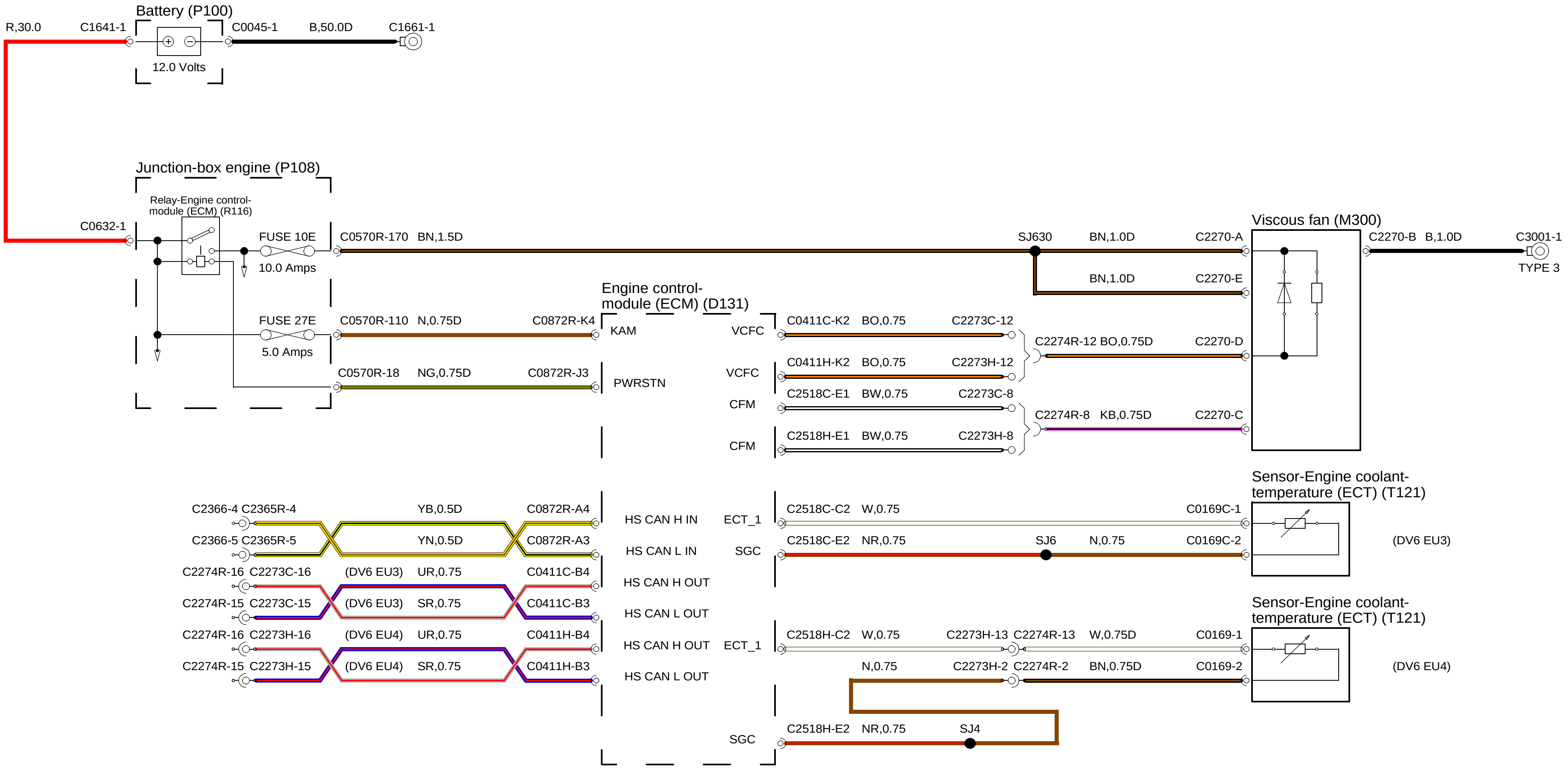
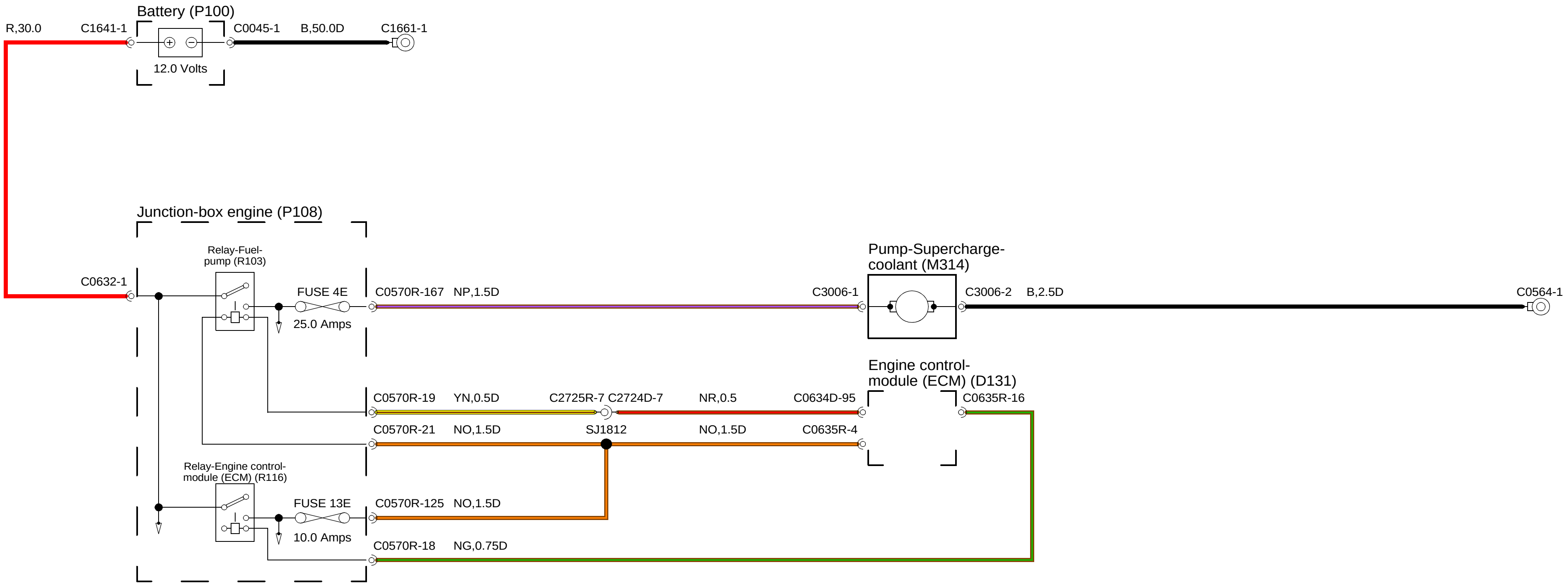
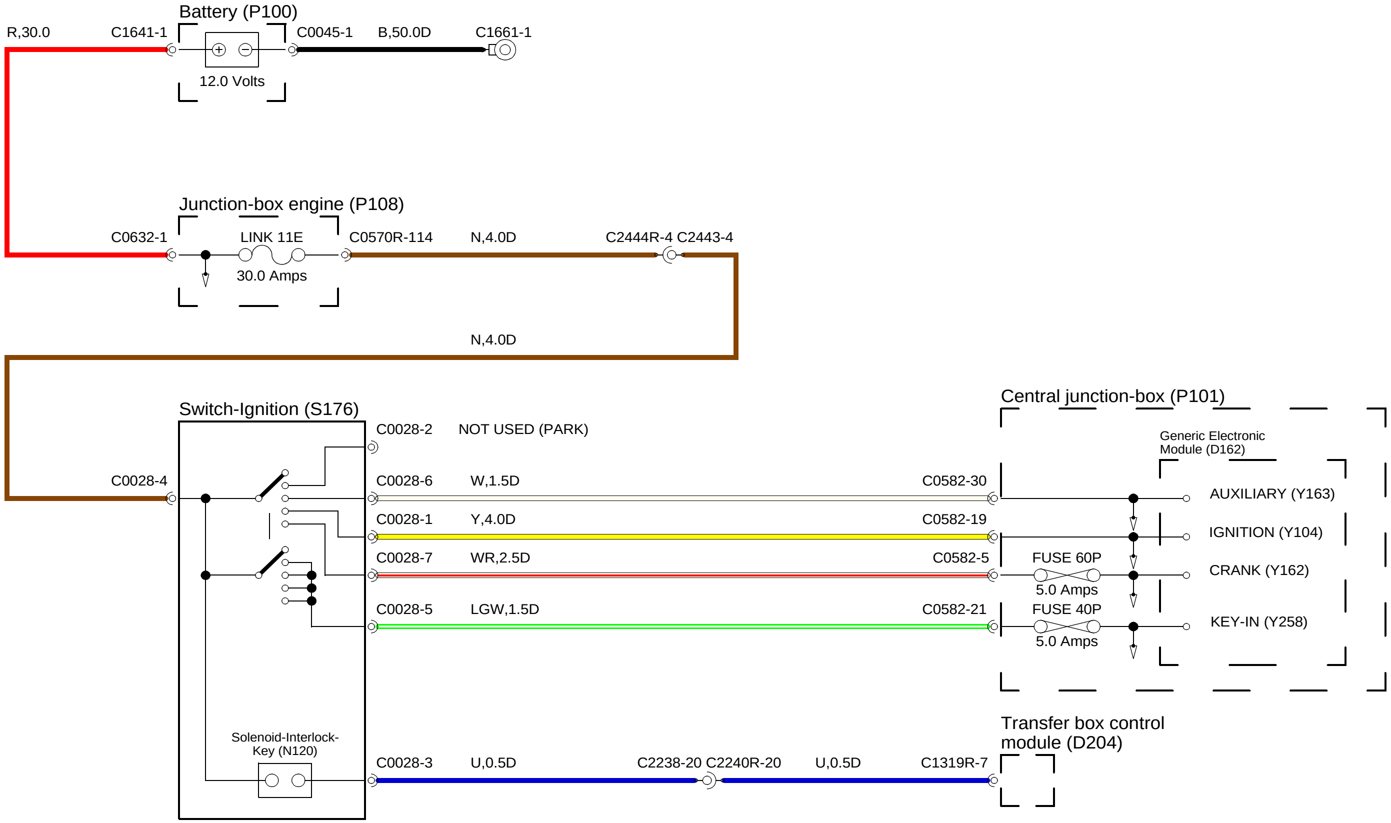
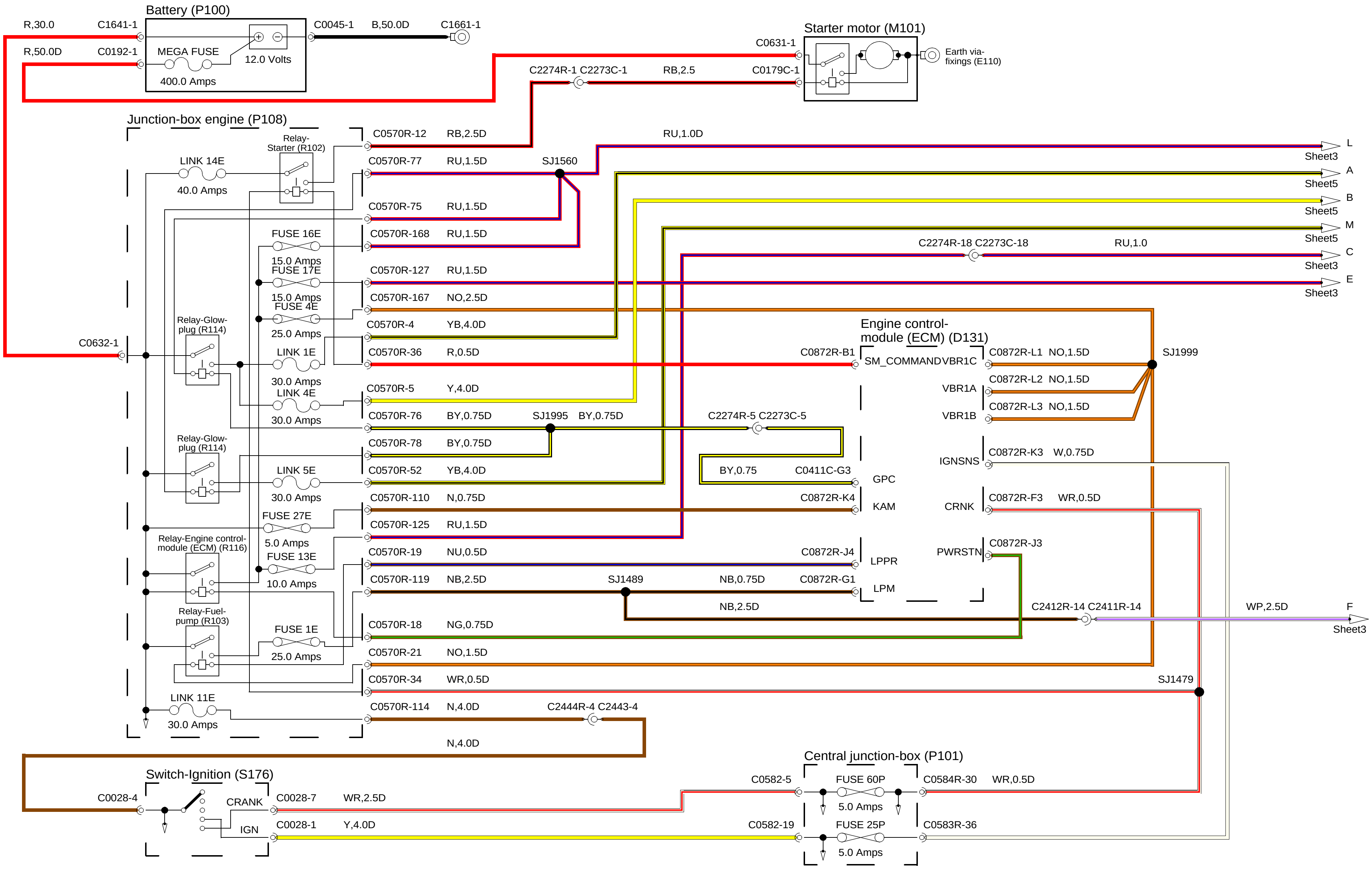
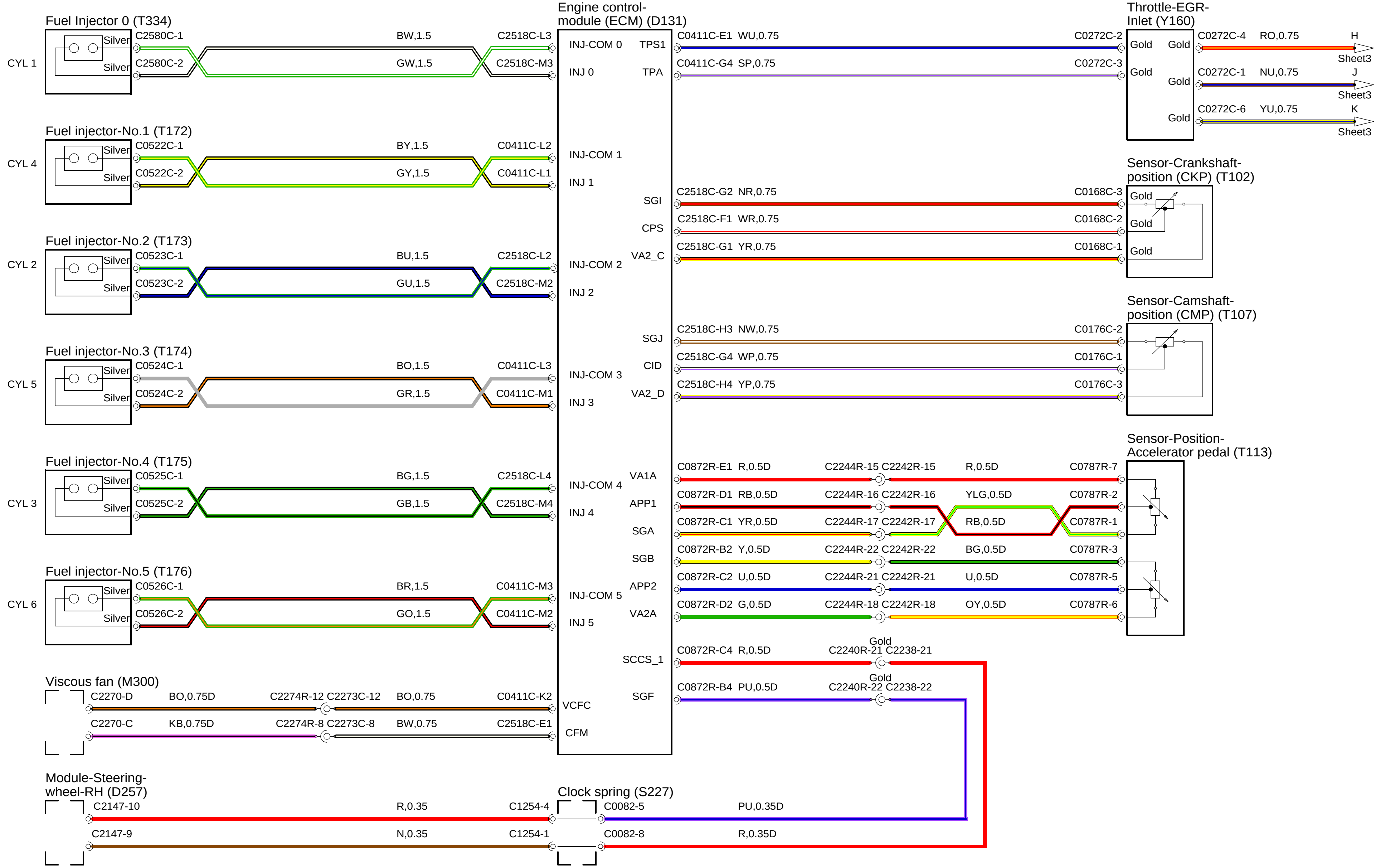
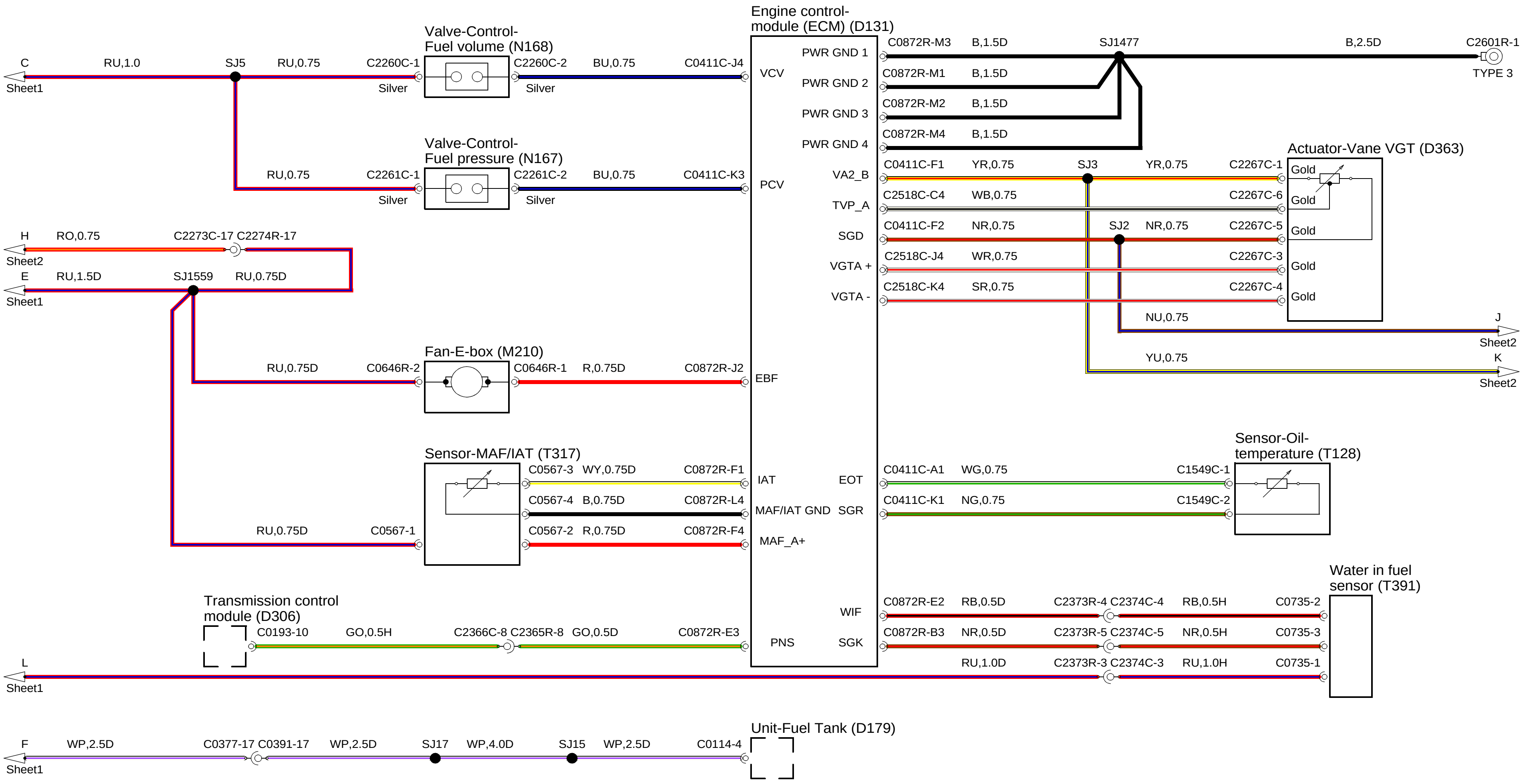

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
FUSE 10E
10.0 Amps
C0570R-170 BN,1.5D
SJ630
BN,1.0D
C2270-A
Viscous fan (M300)
C2270-B B,1.0D
C3001-1
TYPE 3
BN,1.0D
C2270-E
Engine control-module (ECM) (D131)
FUSE 27E
5.0 Amps
C0570R-110 N,0.75D
C0872R-K4
KAM
VCFC
C0411C-K2 BO,0.75
C2273C-12
C2274R-12 BO,0.75D
C2270-D
C0570R-18 NG,0.75D
C0872R-J3
PWRSTN
VCFC
C0411H-K2 BO,0.75
C2273H-12
CFM
C2518C-E1 BW,0.75
C2273C-8
C2274R-8 KB,0.75D
C2270-C
CFM
C2518H-E1 BW,0.75
C2273H-8
Sensor-Engine coolant-temperature (ECT) (T121)
C2366-4 C2365R-4
YB,0.5D
C0872R-A4
HS CAN H IN
ECT_1
C2518C-C2 W,0.75
C0169C-1
C2366-5 C2365R-5
YN,0.5D
C0872R-A3
HS CAN L IN
SGC
C2518C-E2 NR,0.75
SJ6
N,0.75
C0169C-2
(DV6 EU3)
C2274R-16 C2273C-16
(DV6 EU3) UR,0.75
C0411C-B4
HS CAN H OUT
C2274R-15 C2273C-15
(DV6 EU3) SR,0.75
C0411C-B3
HS CAN L OUT
Sensor-Engine coolant-temperature (ECT) (T121)
C2274R-16 C2273H-16
(DV6 EU4) UR,0.75
C0411H-B4
HS CAN H OUT
ECT_1
C2518H-C2 W,0.75
C2273H-13 C2274R-13
W,0.75D
C0169-1
C2274R-15 C2273H-15
(DV6 EU4) SR,0.75
C0411H-B3
HS CAN L OUT
N,0.75
C2273H-2 C2274R-2
BN,0.75D
C0169-2
(DV6 EU4)
SGC
C2518H-E2 NR,0.75
SJ4

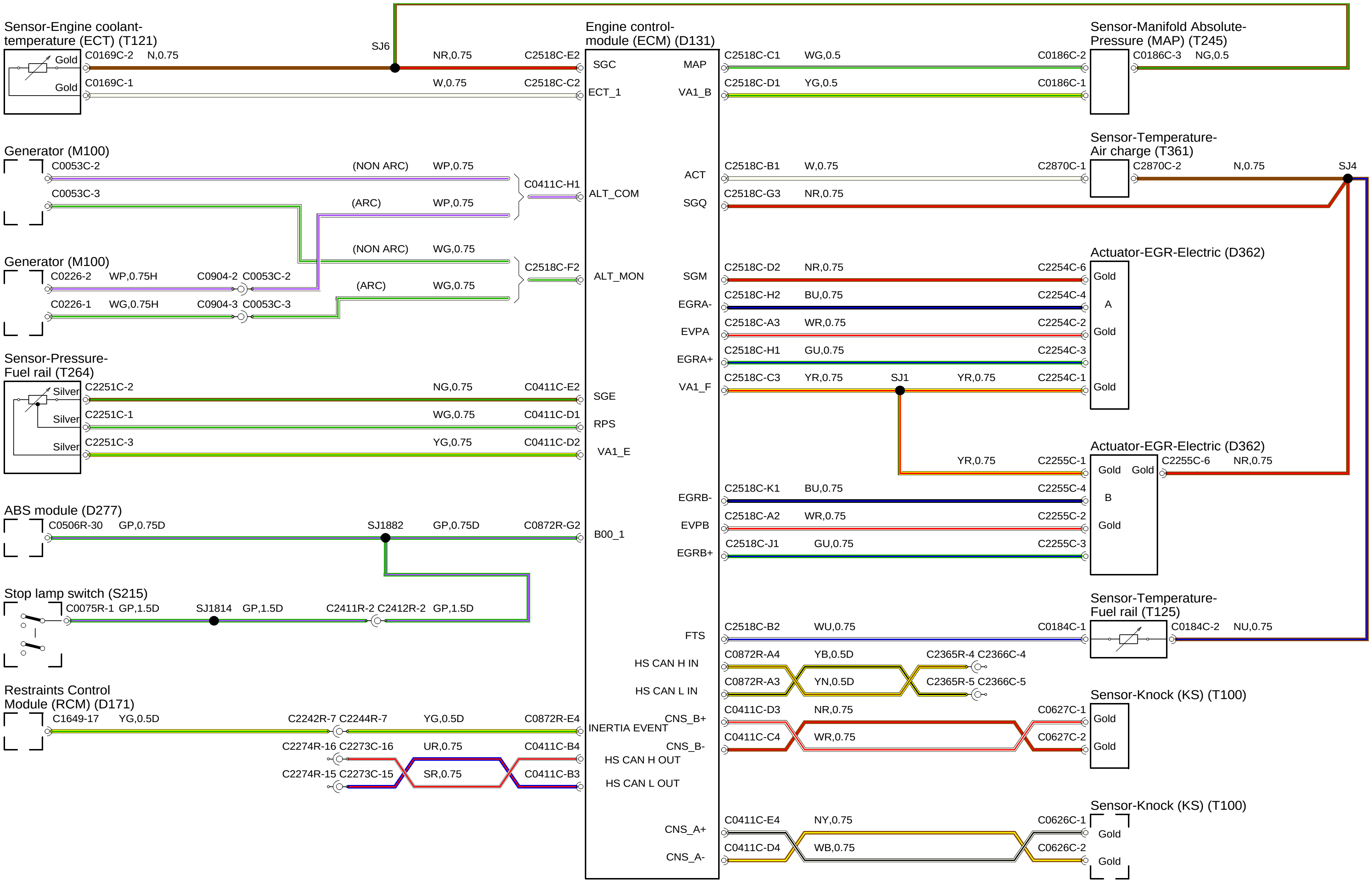

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Fuel-pump (R103)
C0632-1
FUSE 4E
25.0 Amps
C0570R-167
NP,1.5D
C3006-1
Pump-Supercharge-coolant (M314)
C3006-2
B,2.5D
C0564-1
Engine control-module (ECM) (D131)
C0570R-19
YN,0.5D
C2725R-7
C2724D-7
NR,0.5
C0634D-95
C0635R-16
C0570R-21
NO,1.5D
SJ1812
NO,1.5D
C0635R-4
Relay-Engine control-module (ECM) (R116)
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D
C0570R-18
NG,0.75D

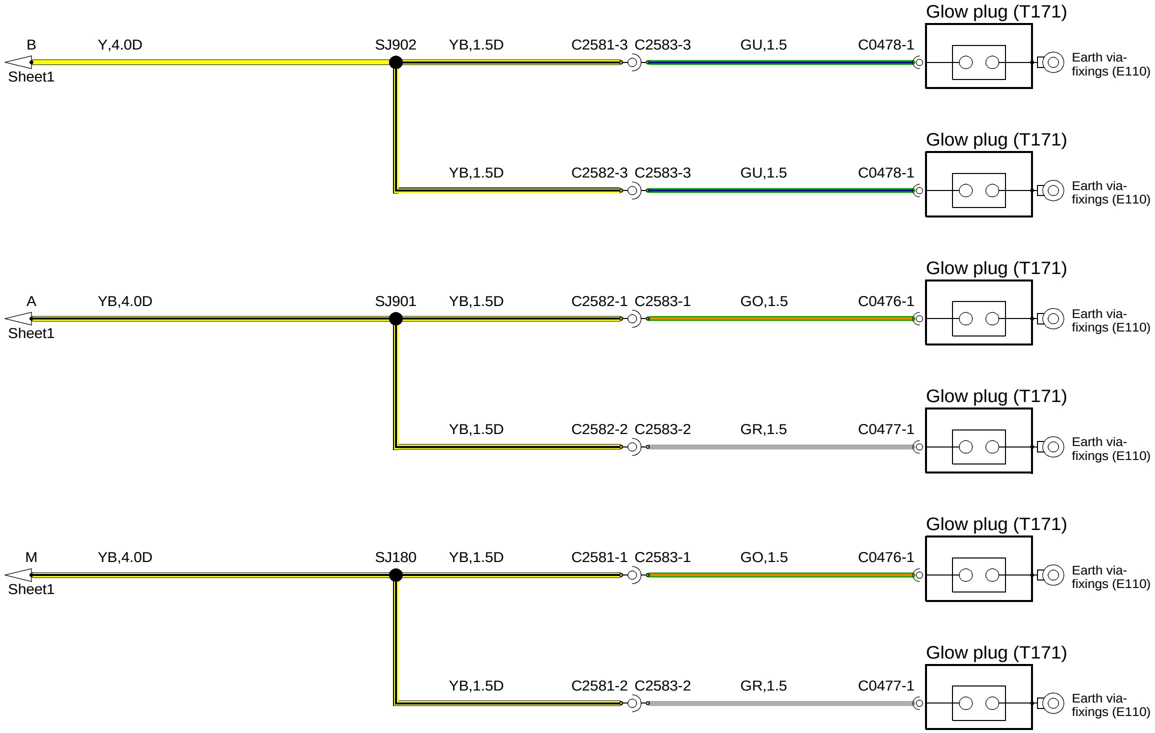

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-2
NOT USED (PARK)
C0028-4
C0028-6
W,1.5D
C0582-30
C0028-1
Y,4.0D
C0582-19
C0028-7
WR,2.5D
C0582-5
C0028-5
LGW,1.5D
C0582-21
Central junction-box (P101)
Generic Electronic Module (D162)
AUXILIARY (Y163)
IGNITION (Y104)
FUSE 60P
5.0 Amps
CRANK (Y162)
FUSE 40P
5.0 Amps
KEY-IN (Y258)
Transfer box control module (D204)
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240R-20
U,0.5D
C1319R-7

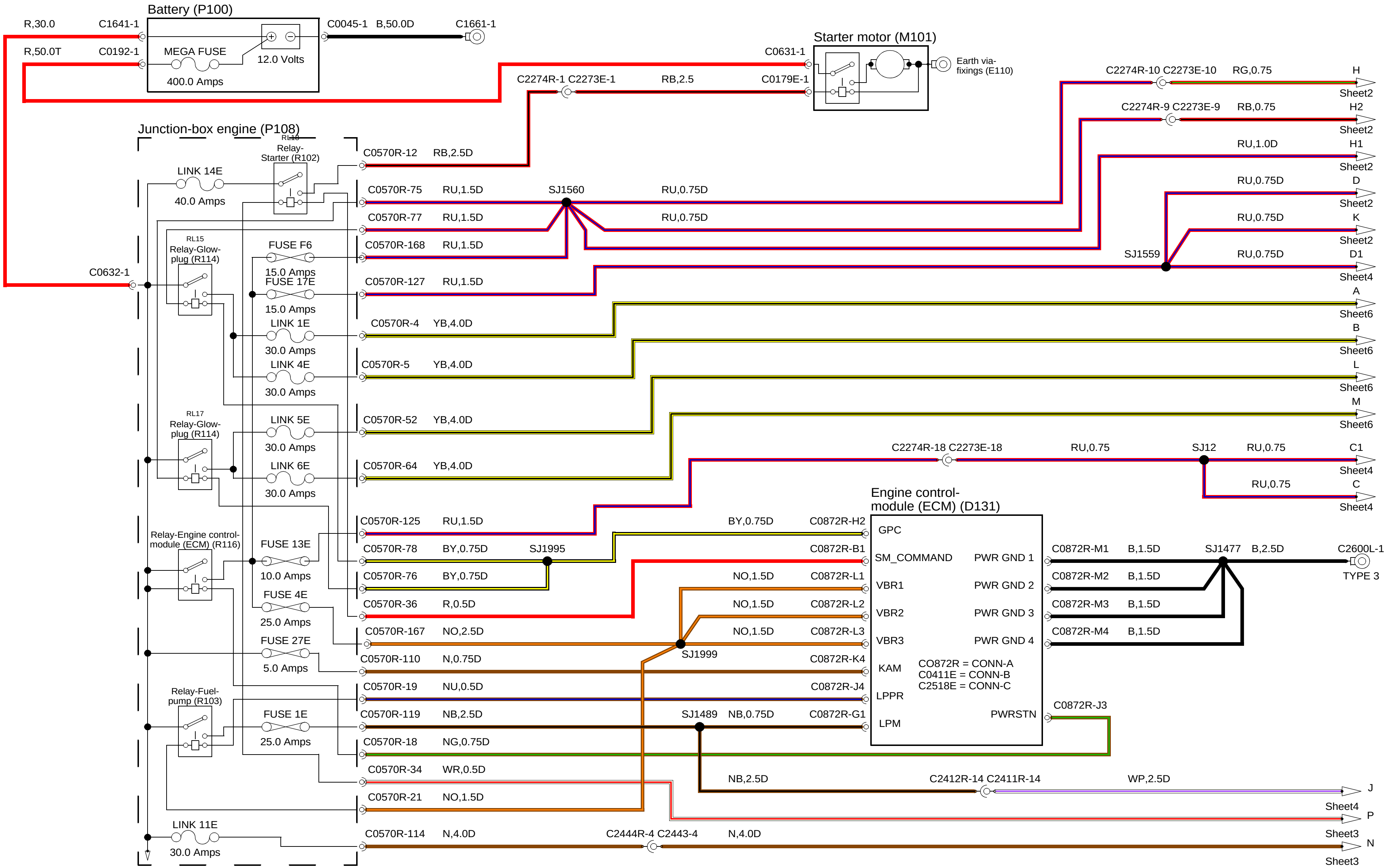

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
R,50.0D
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
Starter motor (M101)
C0631-1
Earth via-fixings (E110)
C2274R-1 C2273C-1
RB,2.5
C0179C-1
Junction-box engine (P108)
Relay-Starter (R102)
C0570R-12
RB,2.5D
RU,1.0D
LINK 14E
40.0 Amps
C0570R-77
RU,1.5D
SJ1560
L
Sheet3
A
Sheet5
B
Sheet5
M
Sheet5
C
Sheet3
E
Sheet3
C0570R-75
RU,1.5D
FUSE 16E
15.0 Amps
C0570R-168
RU,1.5D
C2274R-18 C2273C-18
RU,1.0
FUSE 17E
15.0 Amps
C0570R-127
RU,1.5D
FUSE 4E
25.0 Amps
C0570R-167
NO,2.5D
C0570R-4
YB,4.0D
Relay-Glow-plug (R114)
C0632-1
LINK 1E
30.0 Amps
C0570R-36
R,0.5D
Engine control-module (ECM) (D131)
C0872R-B1
SM_COMMAND
VBR1C
C0872R-L1
NO,1.5D
SJ1999
LINK 4E
30.0 Amps
C0570R-5
Y,4.0D
VBR1A
C0872R-L2
NO,1.5D
C0570R-76
BY,0.75D
SJ1995
BY,0.75D
C2274R-5 C2273C-5
VBR1B
C0872R-L3
NO,1.5D
Relay-Glow-plug (R114)
C0570R-78
BY,0.75D
IGNSNS
C0872R-K3
W,0.75D
LINK 5E
30.0 Amps
C0570R-52
YB,4.0D
BY,0.75
C0411C-G3
GPC
C0570R-110
N,0.75D
C0872R-K4
KAM
CRNK
C0872R-F3
WR,0.5D
FUSE 27E
5.0 Amps
C0570R-125
RU,1.5D
Relay-Engine control-module (ECM) (R116)
FUSE 13E
10.0 Amps
C0570R-19
NU,0.5D
C0872R-J4
LPPR
PWRSTN
C0872R-J3
C0570R-119
NB,2.5D
SJ1489
NB,0.75D
C0872R-G1
LPM
NB,2.5D
C2412R-14 C2411R-14
WP,2.5D
F
Sheet3
Relay-Fuel-pump (R103)
FUSE 1E
25.0 Amps
C0570R-18
NG,0.75D
C0570R-21
NO,1.5D
C0570R-34
WR,0.5D
SJ1479
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-5
FUSE 60P
5.0 Amps
C0584R-30
WR,0.5D
C0582-19
FUSE 25P
5.0 Amps
C0583R-36

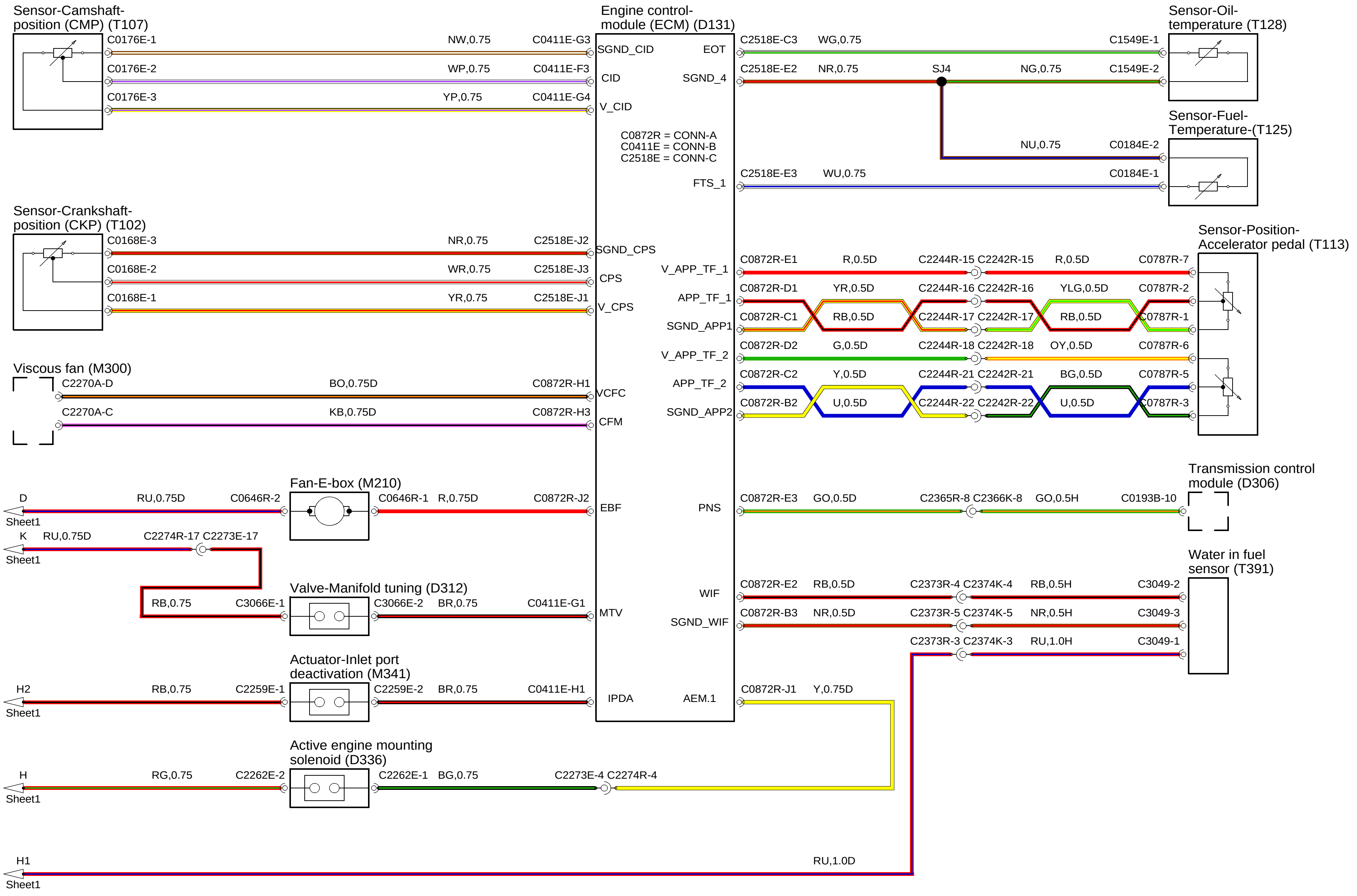

Fuel Injector 0 (T334)
CYL 1
Silver
Silver
C2580C-1
BW,1.5
C2518C-L3
C2580C-2
GW,1.5
C2518C-M3
Fuel injector-No.1 (T172)
CYL 4
C0522C-1
BY,1.5
C0411C-L2
C0522C-2
GY,1.5
C0411C-L1
Fuel injector-No.2 (T173)
CYL 2
C0523C-1
BU,1.5
C2518C-L2
C0523C-2
GU,1.5
C2518C-M2
Fuel injector-No.3 (T174)
CYL 5
C0524C-1
BO,1.5
C0411C-L3
C0524C-2
GR,1.5
C0411C-M1
Fuel injector-No.4 (T175)
CYL 3
C0525C-1
BG,1.5
C2518C-L4
C0525C-2
GB,1.5
C2518C-M4
Fuel injector-No.5 (T176)
CYL 6
C0526C-1
BR,1.5
C0411C-M3
C0526C-2
GO,1.5
C0411C-M2
Viscous fan (M300)
C2270-D
BO,0.75D
C2274R-12 C2273C-12
BO,0.75
C0411C-K2
C2270-C
KB,0.75D
C2274R-8 C2273C-8
BW,0.75
C2518C-E1
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
C2147-9
N,0.35
C1254-1
Clock spring (S227)
C0082-5
PU,0.35D
C0082-8
R,0.35D
Engine control-module (ECM) (D131)
INJ-COM 0
INJ 0
INJ-COM 1
INJ 1
INJ-COM 2
INJ 2
INJ-COM 3
INJ 3
INJ-COM 4
INJ 4
INJ-COM 5
INJ 5
VCFC
CFM
TPS1
TPA
SGI
CPS
VA2_C
SGJ
CID
VA2_D
VA1A
APP1
SGA
SGB
APP2
VA2A
SCCS_1
SGF
C0411C-E1 WU,0.75
C0272C-2
C0411C-G4 SP,0.75
C0272C-3
Throttle-EGR-Inlet (Y160)
Gold
C0272C-4
RO,0.75
H
Sheet3
C0272C-1
NU,0.75
J
Sheet3
C0272C-6
YU,0.75
K
Sheet3
Sensor-Crankshaft-position (CKP) (T102)
C2518C-G2 NR,0.75
C0168C-3
C2518C-F1 WR,0.75
C0168C-2
C2518C-G1 YR,0.75
C0168C-1
Sensor-Camshaft-position (CMP) (T107)
C2518C-H3 NW,0.75
C0176C-2
C2518C-G4 WP,0.75
C0176C-1
C2518C-H4 YP,0.75
C0176C-3
Sensor-Position-Accelerator pedal (T113)
C0872R-E1 R,0.5D
C2244R-15 C2242R-15
R,0.5D
C0787R-7
C0872R-D1 RB,0.5D
C2244R-16 C2242R-16
YLG,0.5D
C0787R-2
C0872R-C1 YR,0.5D
C2244R-17 C2242R-17
RB,0.5D
C0787R-1
C0872R-B2 Y,0.5D
C2244R-22 C2242R-22
BG,0.5D
C0787R-3
C0872R-C2 U,0.5D
C2244R-21 C2242R-21
U,0.5D
C0787R-5
C0872R-D2 G,0.5D
C2244R-18 C2242R-18
OY,0.5D
C0787R-6
C0872R-C4 R,0.5D
Gold
C2240R-21 C2238-21
C0872R-B4 PU,0.5D
Gold
C2240R-22 C2238-22

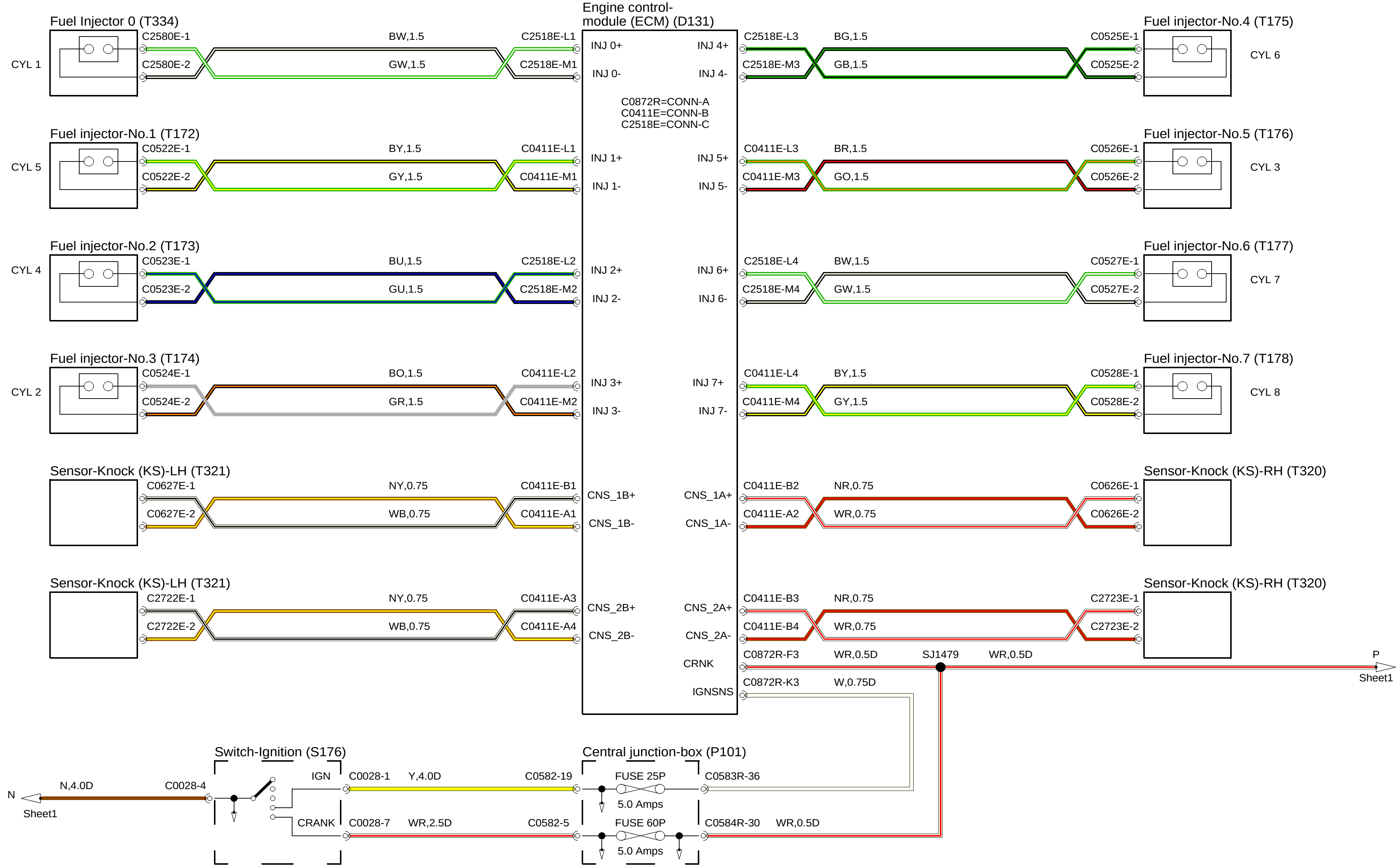

Engine control-module (ECM) (D131)
Valve-Control-Fuel volume (N168)
Valve-Control-Fuel pressure (N167)
C
Sheet1
RU,1.0
SJ5
RU,0.75
C2260C-1
Silver
C2260C-2
Silver
BU,0.75
C0411C-J4
VCV
PWR GND 1
PWR GND 2
PWR GND 3
PWR GND 4
C0872R-M3
B,1.5D
SJ1477
B,2.5D
C2601R-1
TYPE 3
C0872R-M1
B,1.5D
C0872R-M2
B,1.5D
C0872R-M4
B,1.5D
RU,0.75
C2261C-1
Silver
C2261C-2
Silver
BU,0.75
C0411C-K3
PCV
Actuator-Vane VGT (D363)
VA2_B
C0411C-F1
YR,0.75
SJ3
YR,0.75
C2267C-1
Gold
TVP_A
C2518C-C4
WB,0.75
C2267C-6
Gold
SGD
C0411C-F2
NR,0.75
SJ2
NR,0.75
C2267C-5
Gold
VGTA +
C2518C-J4
WR,0.75
C2267C-3
Gold
VGTA -
C2518C-K4
SR,0.75
C2267C-4
Gold
NU,0.75
J
Sheet2
YU,0.75
K
Sheet2
H
Sheet2
RO,0.75
C2273C-17 C2274R-17
E
Sheet1
RU,1.5D
SJ1559
RU,0.75D
Fan-E-box (M210)
RU,0.75D
C0646R-2
C0646R-1
R,0.75D
C0872R-J2
EBF
Sensor-MAF/IAT (T317)
C0567-3
WY,0.75D
C0872R-F1
IAT
C0567-4
B,0.75D
C0872R-L4
MAF/IAT GND
RU,0.75D
C0567-1
C0567-2
R,0.75D
C0872R-F4
MAF_A+
Sensor-Oil-temperature (T128)
EOT
C0411C-A1
WG,0.75
C1549C-1
SGR
C0411C-K1
NG,0.75
C1549C-2
Water in fuel sensor (T391)
WIF
C0872R-E2
RB,0.5D
C2373R-4 C2374C-4
RB,0.5H
C0735-2
Transmission control module (D306)
C0193-10
GO,0.5H
C2366C-8 C2365R-8
GO,0.5D
C0872R-E3
PNS
SGK
C0872R-B3
NR,0.5D
C2373R-5 C2374C-5
NR,0.5H
C0735-3
L
Sheet1
RU,1.0D
C2373R-3 C2374C-3
RU,1.0H
C0735-1
Unit-Fuel Tank (D179)
F
Sheet1
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4

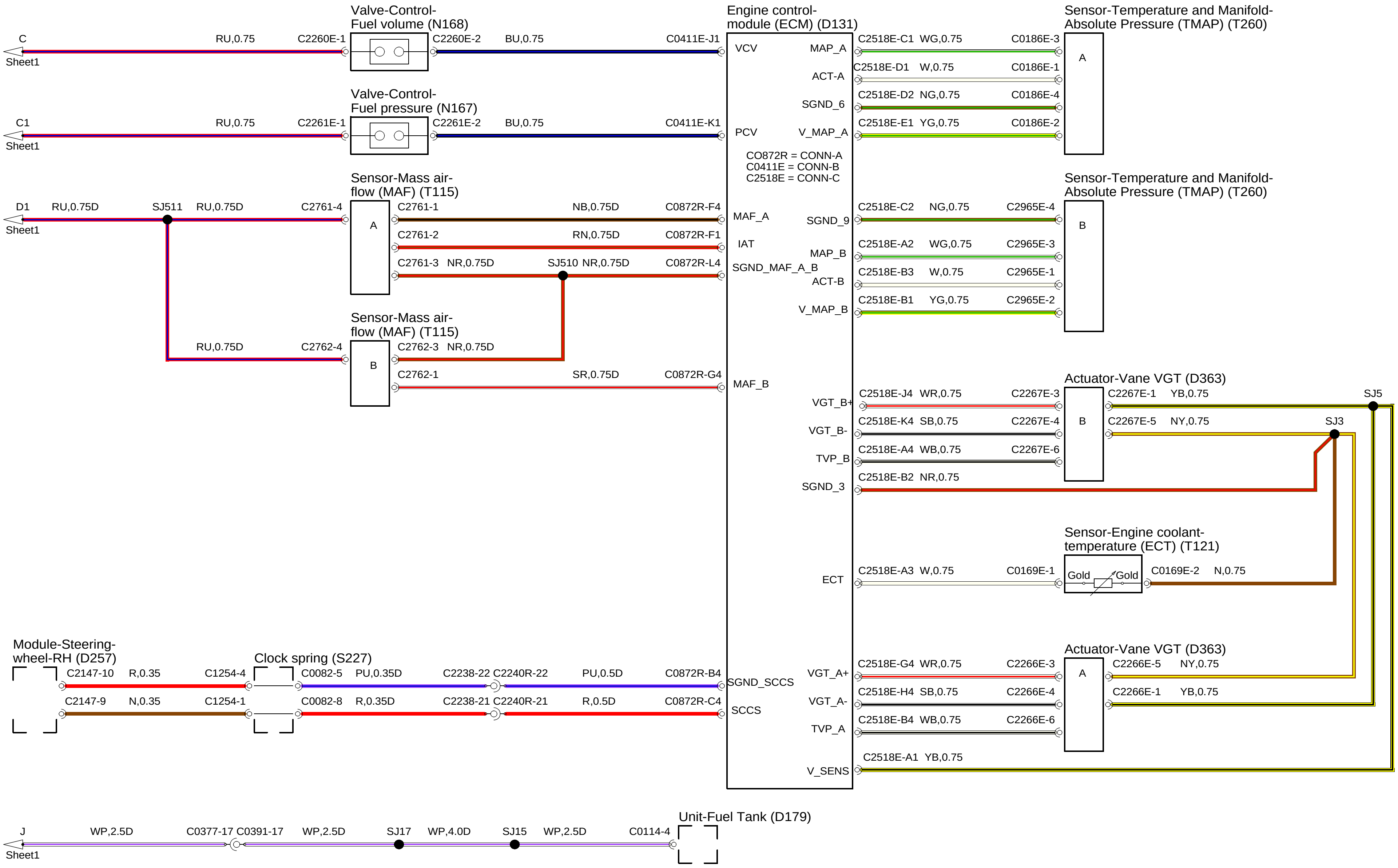

Sensor-Engine coolant-temperature (ECT) (T121)
Gold
Gold
C0169C-2
N,0.75
C0169C-1
SJ6
NR,0.75
C2518C-E2
W,0.75
C2518C-C2
Engine control-module (ECM) (D131)
SGC
ECT_1
MAP
VA1_B
C2518C-C1
WG,0.5
C0186C-2
C2518C-D1
YG,0.5
C0186C-1
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186C-3
NG,0.5
Generator (M100)
C0053C-2
(NON ARC)
WP,0.75
C0411C-H1
C0053C-3
(ARC)
WP,0.75
ALT_COM
ACT
SGQ
C2518C-B1
W,0.75
C2870C-1
C2518C-G3
NR,0.75
Sensor-Temperature-Air charge (T361)
C2870C-2
N,0.75
SJ4
Generator (M100)
C0226-2
WP,0.75H
C0904-2
C0053C-2
C0226-1
WG,0.75H
C0904-3
C0053C-3
(NON ARC)
WG,0.75
C2518C-F2
(ARC)
WG,0.75
ALT_MON
SGM
EGRA-
EVPA
EGRA+
VA1_F
C2518C-D2
NR,0.75
C2254C-6
C2518C-H2
BU,0.75
C2254C-4
C2518C-A3
WR,0.75
C2254C-2
C2518C-H1
GU,0.75
C2254C-3
C2518C-C3
YR,0.75
SJ1
YR,0.75
C2254C-1
Actuator-EGR-Electric (D362)
Gold
A
Gold
Gold
Sensor-Pressure-Fuel rail (T264)
Silver
Silver
Silver
C2251C-2
NG,0.75
C0411C-E2
C2251C-1
WG,0.75
C0411C-D1
C2251C-3
YG,0.75
C0411C-D2
SGE
RPS
VA1_E
YR,0.75
C2255C-1
Actuator-EGR-Electric (D362)
C2255C-6
NR,0.75
Gold
Gold
B
Gold
EGRB-
EVPB
EGRB+
C2518C-K1
BU,0.75
C2255C-4
C2518C-A2
WR,0.75
C2255C-2
C2518C-J1
GU,0.75
C2255C-3
ABS module (D277)
C0506R-30
GP,0.75D
SJ1882
GP,0.75D
C0872R-G2
B00_1
Stop lamp switch (S215)
C0075R-1
GP,1.5D
SJ1814
GP,1.5D
C2411R-2
C2412R-2
GP,1.5D
FTS
C2518C-B2
WU,0.75
C0184C-1
Sensor-Temperature-Fuel rail (T125)
C0184C-2
NU,0.75
HS CAN H IN
HS CAN L IN
C0872R-A4
YB,0.5D
C2365R-4
C2366C-4
C0872R-A3
YN,0.5D
C2365R-5
C2366C-5
Restraints Control Module (RCM) (D171)
C1649-17
YG,0.5D
C2242R-7
C2244R-7
YG,0.5D
C0872R-E4
INERTIA EVENT
CNS_B+
CNS_B-
HS CAN H OUT
HS CAN L OUT
C2274R-16
C2273C-16
UR,0.75
C0411C-B4
C2274R-15
C2273C-15
SR,0.75
C0411C-B3
C0411C-D3
NR,0.75
C0627C-1
C0411C-C4
WR,0.75
C0627C-2
Sensor-Knock (KS) (T100)
Gold
Gold
CNS_A+
CNS_A-
C0411C-E4
NY,0.75
C0626C-1
C0411C-D4
WB,0.75
C0626C-2
Sensor-Knock (KS) (T100)
Gold
Gold


Glow plug (T171)
B
Sheet1
Y,4.0D
SJ902
YB,1.5D
C2581-3
C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-3
C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
A
Sheet1
YB,4.0D
SJ901
YB,1.5D
C2582-1
C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-2
C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
M
Sheet1
YB,4.0D
SJ180
YB,1.5D
C2581-1
C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-2
C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)

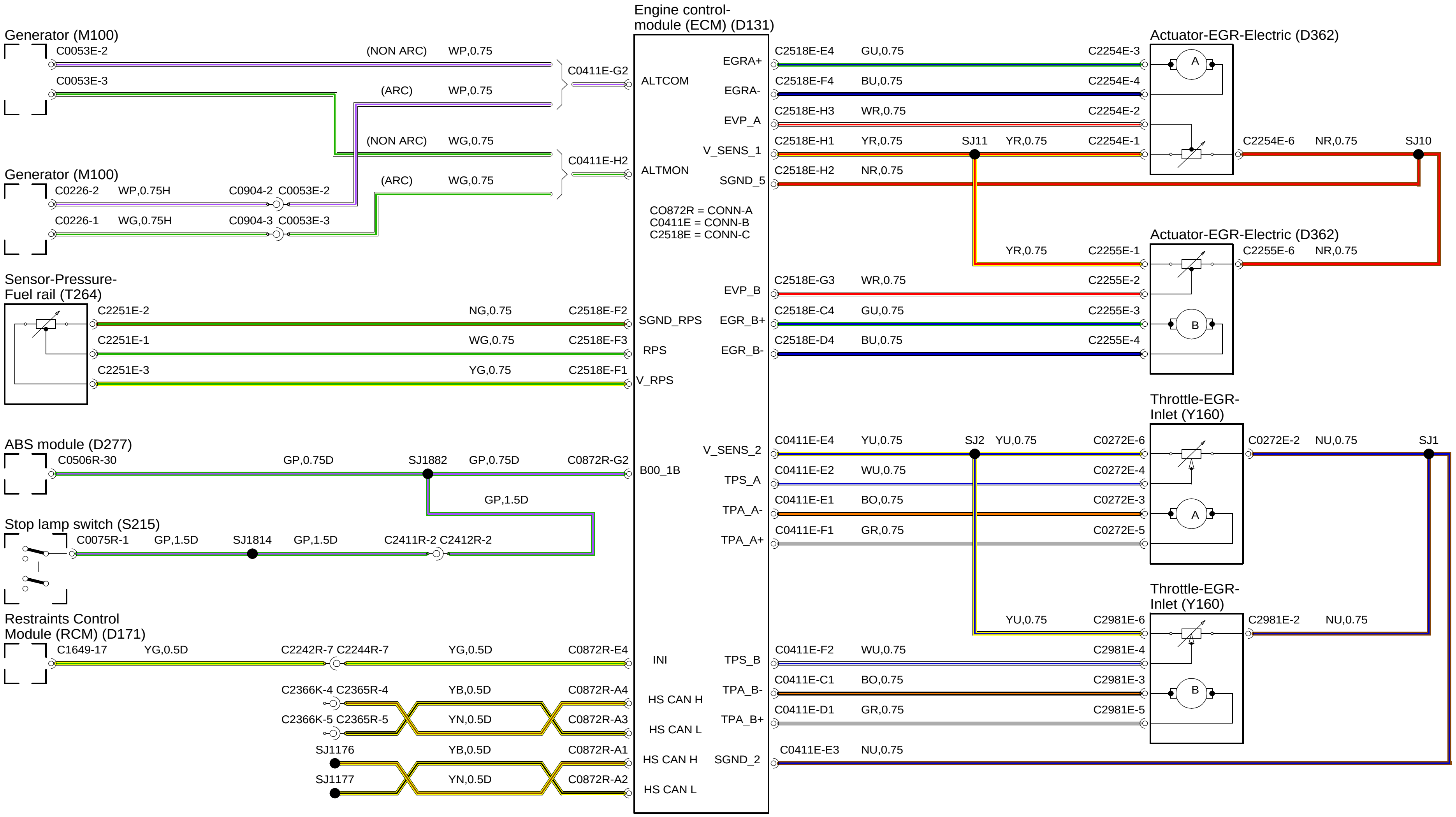

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C0179E-1
Earth via-
fixings (E110)
C2274R-1 C2273E-1
RB,2.5
C2274R-10 C2273E-10
RG,0.75
H
Sheet2
C2274R-9 C2273E-9
RB,0.75
H2
Sheet2
RU,1.0D
H1
Sheet2
RU,0.75D
D
Sheet2
RU,0.75D
K
Sheet2
SJ1559
RU,0.75D
D1
Sheet4
A
Sheet6
B
Sheet6
L
Sheet6
M
Sheet6
Junction-box engine (P108)
RL16
Relay-
Starter (R102)
LINK 14E
40.0 Amps
C0570R-12
RB,2.5D
C0570R-75
RU,1.5D
SJ1560
RU,0.75D
C0570R-77
RU,1.5D
RU,0.75D
RL15
Relay-Glow-
plug (R114)
FUSE F6
15.0 Amps
C0570R-168
RU,1.5D
C0632-1
FUSE 17E
15.0 Amps
C0570R-127
RU,1.5D
LINK 1E
30.0 Amps
C0570R-4
YB,4.0D
LINK 4E
30.0 Amps
C0570R-5
YB,4.0D
RL17
Relay-Glow-
plug (R114)
LINK 5E
30.0 Amps
C0570R-52
YB,4.0D
LINK 6E
30.0 Amps
C0570R-64
YB,4.0D
C2274R-18 C2273E-18
RU,0.75
SJ12
RU,0.75
C1
Sheet4
RU,0.75
C
Sheet4
Engine control-
module (ECM) (D131)
C0570R-125
RU,1.5D
BY,0.75D
C0872R-H2
GPC
Relay-Engine control-
module (ECM) (R116)
FUSE 13E
10.0 Amps
C0570R-78
BY,0.75D
SJ1995
C0872R-B1
SM_COMMAND
PWR GND 1
C0872R-M1
B,1.5D
SJ1477
B,2.5D
C2600L-1
TYPE 3
C0570R-76
BY,0.75D
NO,1.5D
C0872R-L1
VBR1
PWR GND 2
C0872R-M2
B,1.5D
FUSE 4E
25.0 Amps
C0570R-36
R,0.5D
NO,1.5D
C0872R-L2
VBR2
PWR GND 3
C0872R-M3
B,1.5D
C0570R-167
NO,2.5D
NO,1.5D
C0872R-L3
VBR3
PWR GND 4
C0872R-M4
B,1.5D
FUSE 27E
5.0 Amps
C0570R-110
N,0.75D
SJ1999
C0872R-K4
KAM
CO872R = CONN-A
C0411E = CONN-B
C2518E = CONN-C
Relay-Fuel-
pump (R103)
C0570R-19
NU,0.5D
C0872R-J4
LPPR
C0872R-J3
FUSE 1E
25.0 Amps
C0570R-119
NB,2.5D
SJ1489
NB,0.75D
C0872R-G1
PWRSTN
LPM
C0570R-18
NG,0.75D
C0570R-34
WR,0.5D
NB,2.5D
C2412R-14 C2411R-14
WP,2.5D
J
Sheet4
C0570R-21
NO,1.5D
P
Sheet3
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
N
Sheet3

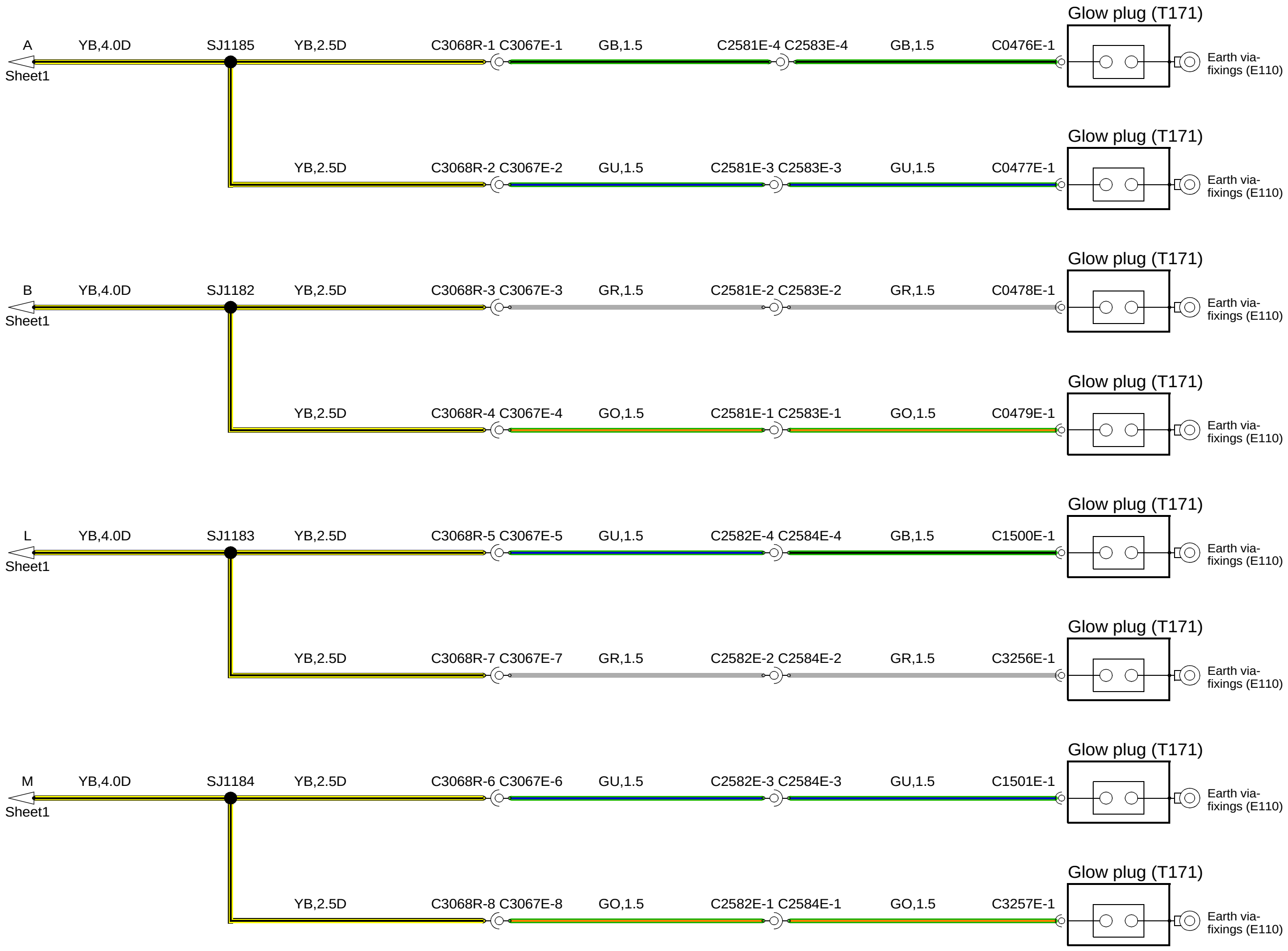

Sensor-Camshaft-position (CMP) (T107)
C0176E-1
NW,0.75
C0411E-G3
C0176E-2
WP,0.75
C0411E-F3
C0176E-3
YP,0.75
C0411E-G4
Engine control-module (ECM) (D131)
SGND_CID
CID
V_CID
EOT
SGND_4
C0872R = CONN-A
C0411E = CONN-B
C2518E = CONN-C
FTS_1
C2518E-C3
WG,0.75
C1549E-1
Sensor-Oil-temperature (T128)
C2518E-E2
NR,0.75
SJ4
NG,0.75
C1549E-2
Sensor-Fuel-Temperature-(T125)
NU,0.75
C0184E-2
C2518E-E3
WU,0.75
C0184E-1
Sensor-Crankshaft-position (CKP) (T102)
C0168E-3
NR,0.75
C2518E-J2
SGND_CPS
C0168E-2
WR,0.75
C2518E-J3
CPS
C0168E-1
YR,0.75
C2518E-J1
V_CPS
V_APP_TF_1
APP_TF_1
SGND_APP1
V_APP_TF_2
APP_TF_2
SGND_APP2
Sensor-Position-Accelerator pedal (T113)
C0872R-E1
R,0.5D
C2244R-15 C2242R-15
R,0.5D
C0787R-7
C0872R-D1
YR,0.5D
C2244R-16 C2242R-16
YLG,0.5D
C0787R-2
C0872R-C1
RB,0.5D
C2244R-17 C2242R-17
RB,0.5D
C0787R-1
C0872R-D2
G,0.5D
C2244R-18 C2242R-18
OY,0.5D
C0787R-6
C0872R-C2
Y,0.5D
C2244R-21 C2242R-21
BG,0.5D
C0787R-5
C0872R-B2
U,0.5D
C2244R-22 C2242R-22
U,0.5D
C0787R-3
Viscous fan (M300)
C2270A-D
BO,0.75D
C0872R-H1
VCFC
C2270A-C
KB,0.75D
C0872R-H3
CFM
Fan-E-box (M210)
D
RU,0.75D
C0646R-2
Sheet1
C0646R-1
R,0.75D
C0872R-J2
EBF
PNS
C0872R-E3
GO,0.5D
C2365R-8 C2366K-8
GO,0.5H
C0193B-10
Transmission control module (D306)
K
RU,0.75D
C2274R-17 C2273E-17
Sheet1
Valve-Manifold tuning (D312)
RB,0.75
C3066E-1
C3066E-2
BR,0.75
C0411E-G1
MTV
WIF
SGND_WIF
Water in fuel sensor (T391)
C0872R-E2
RB,0.5D
C2373R-4 C2374K-4
RB,0.5H
C3049-2
C0872R-B3
NR,0.5D
C2373R-5 C2374K-5
NR,0.5H
C3049-3
C2373R-3 C2374K-3
RU,1.0H
C3049-1
Actuator-Inlet port deactivation (M341)
H2
RB,0.75
C2259E-1
Sheet1
C2259E-2
BR,0.75
C0411E-H1
IPDA
AEM.1
C0872R-J1
Y,0.75D
Active engine mounting solenoid (D336)
H
RG,0.75
C2262E-2
Sheet1
C2262E-1
BG,0.75
C2273E-4 C2274R-4
H1
RU,1.0D
Sheet1

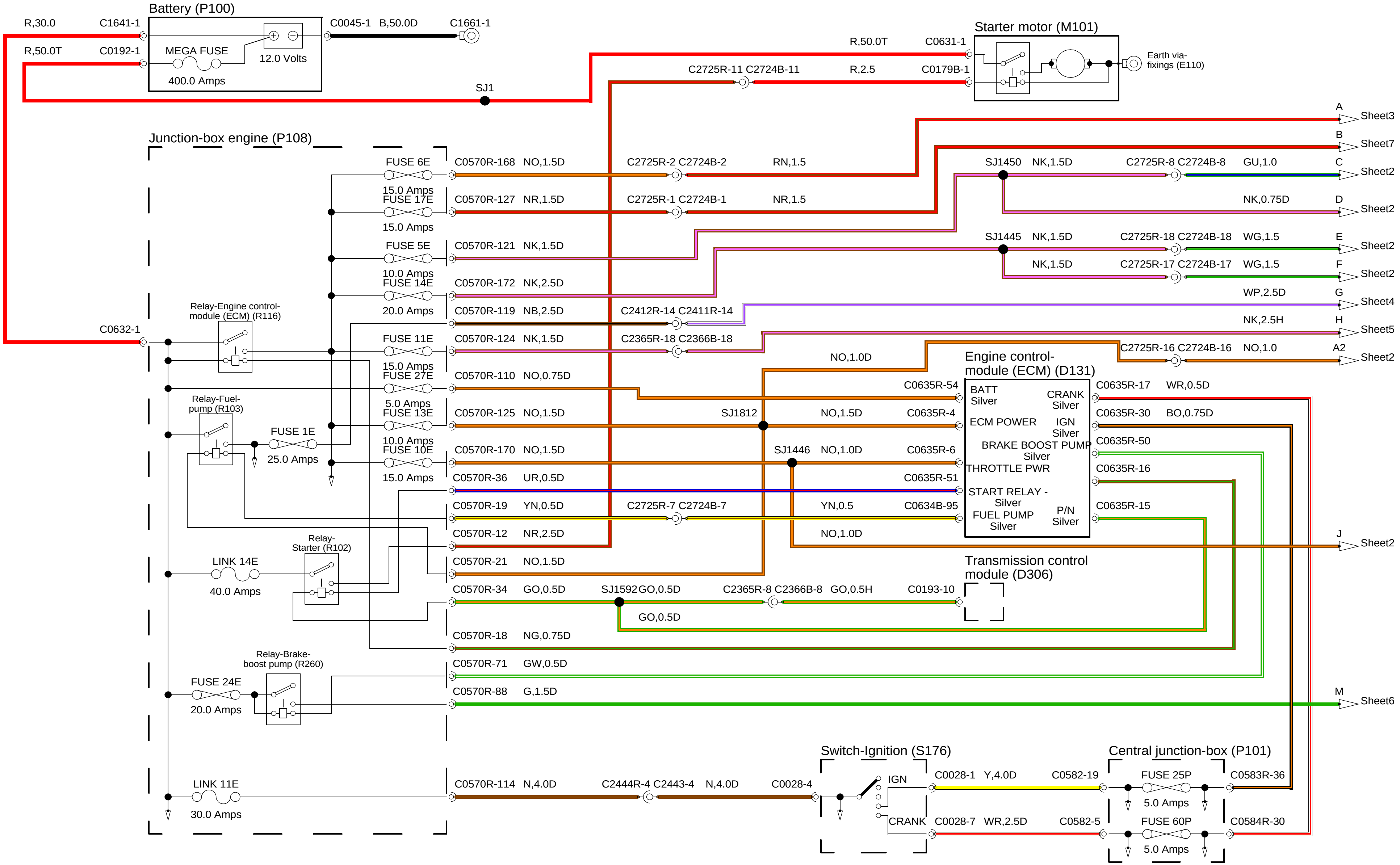

Engine control-
module (ECM) (D131)
C0872R=CONN-A
C0411E=CONN-B
C2518E=CONN-C
Fuel Injector 0 (T334)
CYL 1
C2580E-1
BW,1.5
C2518E-L1
INJ 0+
C2580E-2
GW,1.5
C2518E-M1
INJ 0-
Fuel injector-No.4 (T175)
CYL 6
C2518E-L3
BG,1.5
C0525E-1
INJ 4+
C2518E-M3
GB,1.5
C0525E-2
INJ 4-
Fuel injector-No.1 (T172)
CYL 5
C0522E-1
BY,1.5
C0411E-L1
INJ 1+
C0522E-2
GY,1.5
C0411E-M1
INJ 1-
Fuel injector-No.5 (T176)
CYL 3
C0411E-L3
BR,1.5
C0526E-1
INJ 5+
C0411E-M3
GO,1.5
C0526E-2
INJ 5-
Fuel injector-No.2 (T173)
CYL 4
C0523E-1
BU,1.5
C2518E-L2
INJ 2+
C0523E-2
GU,1.5
C2518E-M2
INJ 2-
Fuel injector-No.6 (T177)
CYL 7
C2518E-L4
BW,1.5
C0527E-1
INJ 6+
C2518E-M4
GW,1.5
C0527E-2
INJ 6-
Fuel injector-No.3 (T174)
CYL 2
C0524E-1
BO,1.5
C0411E-L2
INJ 3+
C0524E-2
GR,1.5
C0411E-M2
INJ 3-
Fuel injector-No.7 (T178)
CYL 8
C0411E-L4
BY,1.5
C0528E-1
INJ 7+
C0411E-M4
GY,1.5
C0528E-2
INJ 7-
Sensor-Knock (KS)-LH (T321)
C0627E-1
NY,0.75
C0411E-B1
CNS_1B+
C0627E-2
WB,0.75
C0411E-A1
CNS_1B-
Sensor-Knock (KS)-RH (T320)
C0411E-B2
NR,0.75
C0626E-1
CNS_1A+
C0411E-A2
WR,0.75
C0626E-2
CNS_1A-
Sensor-Knock (KS)-LH (T321)
C2722E-1
NY,0.75
C0411E-A3
CNS_2B+
C2722E-2
WB,0.75
C0411E-A4
CNS_2B-
Sensor-Knock (KS)-RH (T320)
C0411E-B3
NR,0.75
C2723E-1
CNS_2A+
C0411E-B4
WR,0.75
C2723E-2
CNS_2A-
CRNK
C0872R-F3
WR,0.5D
SJ1479
WR,0.5D
P
Sheet1
IGNSNS
C0872R-K3
W,0.75D
N
Sheet1
N,4.0D
C0028-4
Switch-Ignition (S176)
IGN
CRANK
C0028-1
Y,4.0D
C0582-19
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
FUSE 25P
5.0 Amps
C0583R-36
FUSE 60P
5.0 Amps
C0584R-30
WR,0.5D

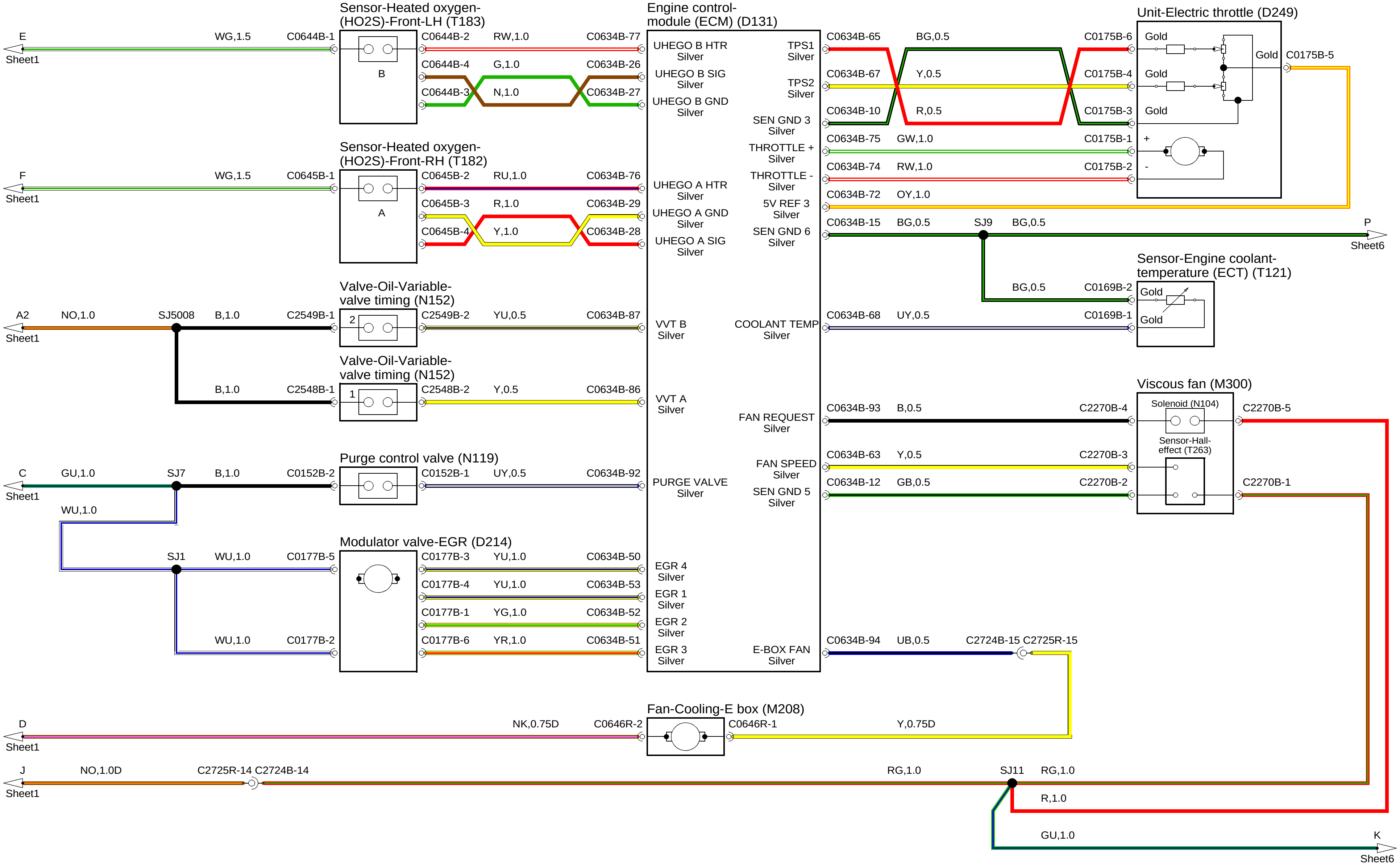


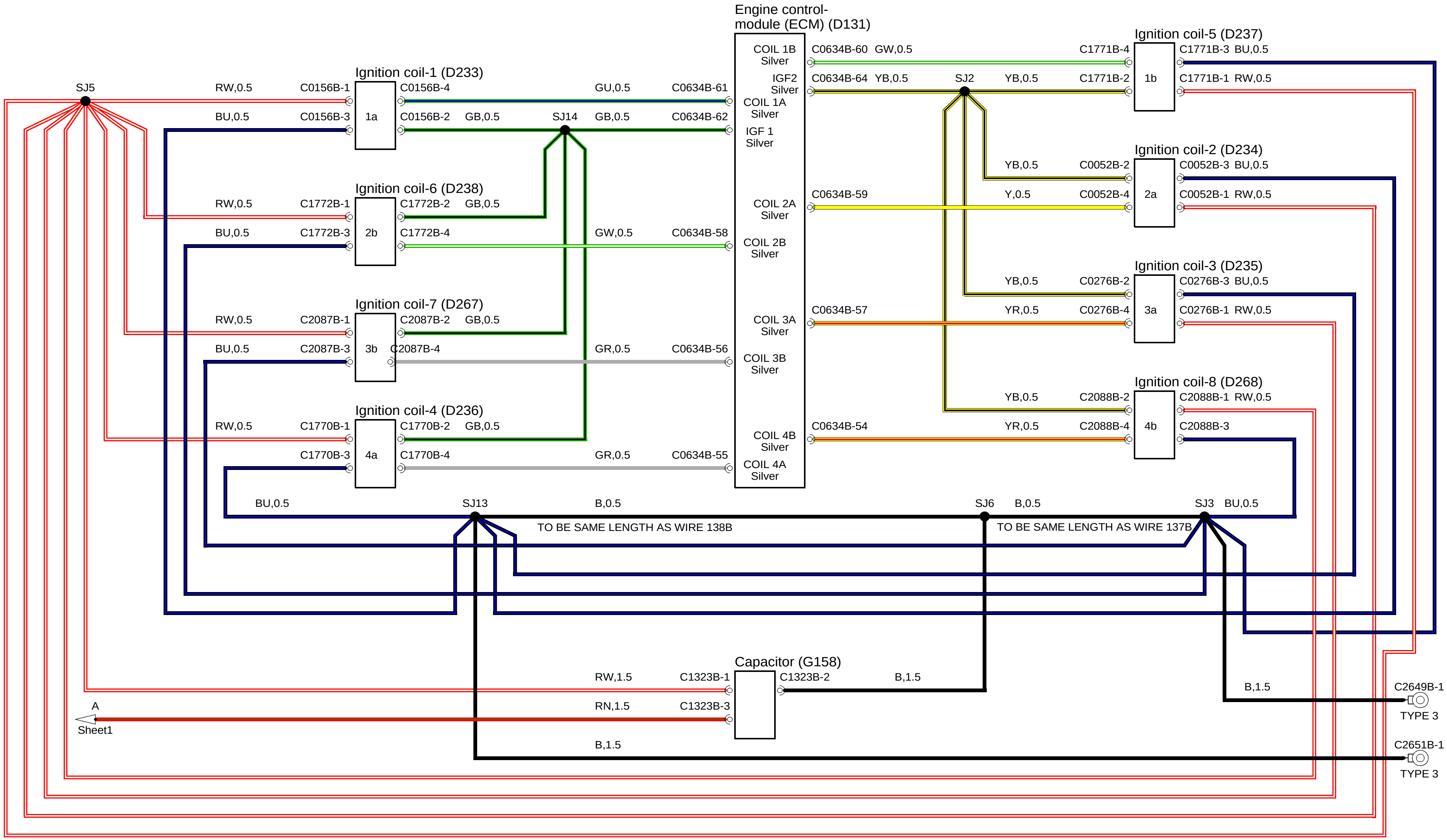
Valve-Control-Fuel volume (N168)
C
Sheet1
RU,0.75
C2260E-1
C2260E-2
BU,0.75
C0411E-J1
Valve-Control-Fuel pressure (N167)
C1
Sheet1
RU,0.75
C2261E-1
C2261E-2
BU,0.75
C0411E-K1
Sensor-Mass air-flow (MAF) (T115)
D1
Sheet1
RU,0.75D
SJ511
RU,0.75D
C2761-4
A
C2761-1
NB,0.75D
C0872R-F4
C2761-2
RN,0.75D
C0872R-F1
C2761-3
NR,0.75D
SJ510
NR,0.75D
C0872R-L4
Sensor-Mass air-flow (MAF) (T115)
RU,0.75D
C2762-4
B
C2762-3
NR,0.75D
C2762-1
SR,0.75D
C0872R-G4
Engine control-module (ECM) (D131)
VCV
PCV
CO872R = CONN-A
C0411E = CONN-B
C2518E = CONN-C
MAF_A
IAT
SGND_MAF_A_B
MAF_B
SGND_SCCS
SCCS
MAP_A
ACT-A
SGND_6
V_MAP_A
SGND_9
MAP_B
ACT-B
V_MAP_B
VGT_B+
VGT_B-
TVP_B
SGND_3
ECT
VGT_A+
VGT_A-
TVP_A
V_SENS
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
C2518E-C1
WG,0.75
C0186E-3
A
C2518E-D1
W,0.75
C0186E-1
C2518E-D2
NG,0.75
C0186E-4
C2518E-E1
YG,0.75
C0186E-2
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
C2518E-C2
NG,0.75
C2965E-4
B
C2518E-A2
WG,0.75
C2965E-3
C2518E-B3
W,0.75
C2965E-1
C2518E-B1
YG,0.75
C2965E-2
Actuator-Vane VGT (D363)
C2518E-J4
WR,0.75
C2267E-3
B
C2267E-1
YB,0.75
SJ5
C2518E-K4
SB,0.75
C2267E-4
C2267E-5
NY,0.75
SJ3
C2518E-A4
WB,0.75
C2267E-6
C2518E-B2
NR,0.75
Sensor-Engine coolant-temperature (ECT) (T121)
C2518E-A3
W,0.75
C0169E-1
Gold
Gold
C0169E-2
N,0.75
Actuator-Vane VGT (D363)
C2518E-G4
WR,0.75
C2266E-3
A
C2266E-5
NY,0.75
C2518E-H4
SB,0.75
C2266E-4
C2266E-1
YB,0.75
C2518E-B4
WB,0.75
C2266E-6
C2518E-A1
YB,0.75
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
C2147-9
N,0.35
C1254-1
Clock spring (S227)
C0082-5
PU,0.35D
C2238-22
C2240R-22
PU,0.5D
C0872R-B4
C0082-8
R,0.35D
C2238-21
C2240R-21
R,0.5D
C0872R-C4
J
Sheet1
WP,2.5D
C0377-17
C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
Unit-Fuel Tank (D179)

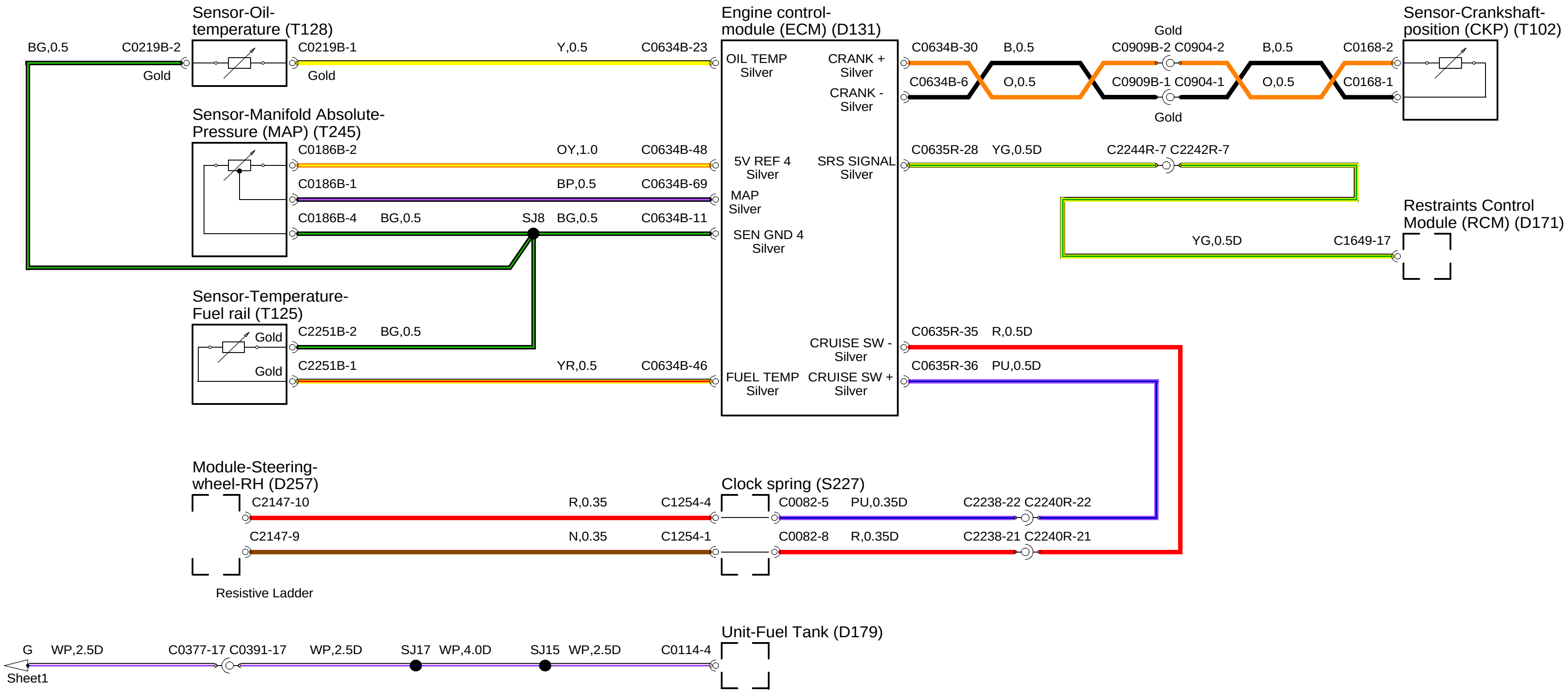

Generator (M100)
C0053E-2
(NON ARC)
WP,0.75
C0053E-3
(ARC)
WP,0.75
C0411E-G2
(NON ARC)
WG,0.75
(ARC)
WG,0.75
C0411E-H2
Generator (M100)
C0226-2
WP,0.75H
C0904-2
C0053E-2
C0226-1
WG,0.75H
C0904-3
C0053E-3
Engine control-module (ECM) (D131)
ALTCOM
ALTMON
EGRA+
EGRA-
EVP_A
V_SENS_1
SGND_5
CO872R = CONN-A
C0411E = CONN-B
C2518E = CONN-C
EVP_B
SGND_RPS
EGR_B+
RPS
EGR_B-
V_RPS
V_SENS_2
B00_1B
TPS_A
TPA_A-
TPA_A+
INI
TPS_B
TPA_B-
HS CAN H
HS CAN L
TPA_B+
HS CAN H
SGND_2
HS CAN L
Actuator-EGR-Electric (D362)
C2518E-E4
GU,0.75
C2254E-3
A
C2518E-F4
BU,0.75
C2254E-4
C2518E-H3
WR,0.75
C2254E-2
C2518E-H1
YR,0.75
SJ11
YR,0.75
C2254E-1
C2254E-6
NR,0.75
SJ10
C2518E-H2
NR,0.75
Actuator-EGR-Electric (D362)
YR,0.75
C2255E-1
C2255E-6
NR,0.75
C2518E-G3
WR,0.75
C2255E-2
C2518E-C4
GU,0.75
C2255E-3
B
C2518E-D4
BU,0.75
C2255E-4
Sensor-Pressure-Fuel rail (T264)
C2251E-2
NG,0.75
C2518E-F2
C2251E-1
WG,0.75
C2518E-F3
C2251E-3
YG,0.75
C2518E-F1
Throttle-EGR-Inlet (Y160)
C0411E-E4
YU,0.75
SJ2
YU,0.75
C0272E-6
C0272E-2
NU,0.75
SJ1
C0411E-E2
WU,0.75
C0272E-4
C0411E-E1
BO,0.75
C0272E-3
A
C0411E-F1
GR,0.75
C0272E-5
ABS module (D277)
C0506R-30
GP,0.75D
SJ1882
GP,0.75D
C0872R-G2
GP,1.5D
Stop lamp switch (S215)
C0075R-1
GP,1.5D
SJ1814
GP,1.5D
C2411R-2 C2412R-2
Throttle-EGR-Inlet (Y160)
YU,0.75
C2981E-6
C2981E-2
NU,0.75
Restraints Control Module (RCM) (D171)
C1649-17
YG,0.5D
C2242R-7 C2244R-7
YG,0.5D
C0872R-E4
C0411E-F2
WU,0.75
C2981E-4
C2366K-4 C2365R-4
YB,0.5D
C0872R-A4
C0411E-C1
BO,0.75
C2981E-3
B
C2366K-5 C2365R-5
YN,0.5D
C0872R-A3
C0411E-D1
GR,0.75
C2981E-5
SJ1176
YB,0.5D
C0872R-A1
C0411E-E3
NU,0.75
SJ1177
YN,0.5D
C0872R-A2

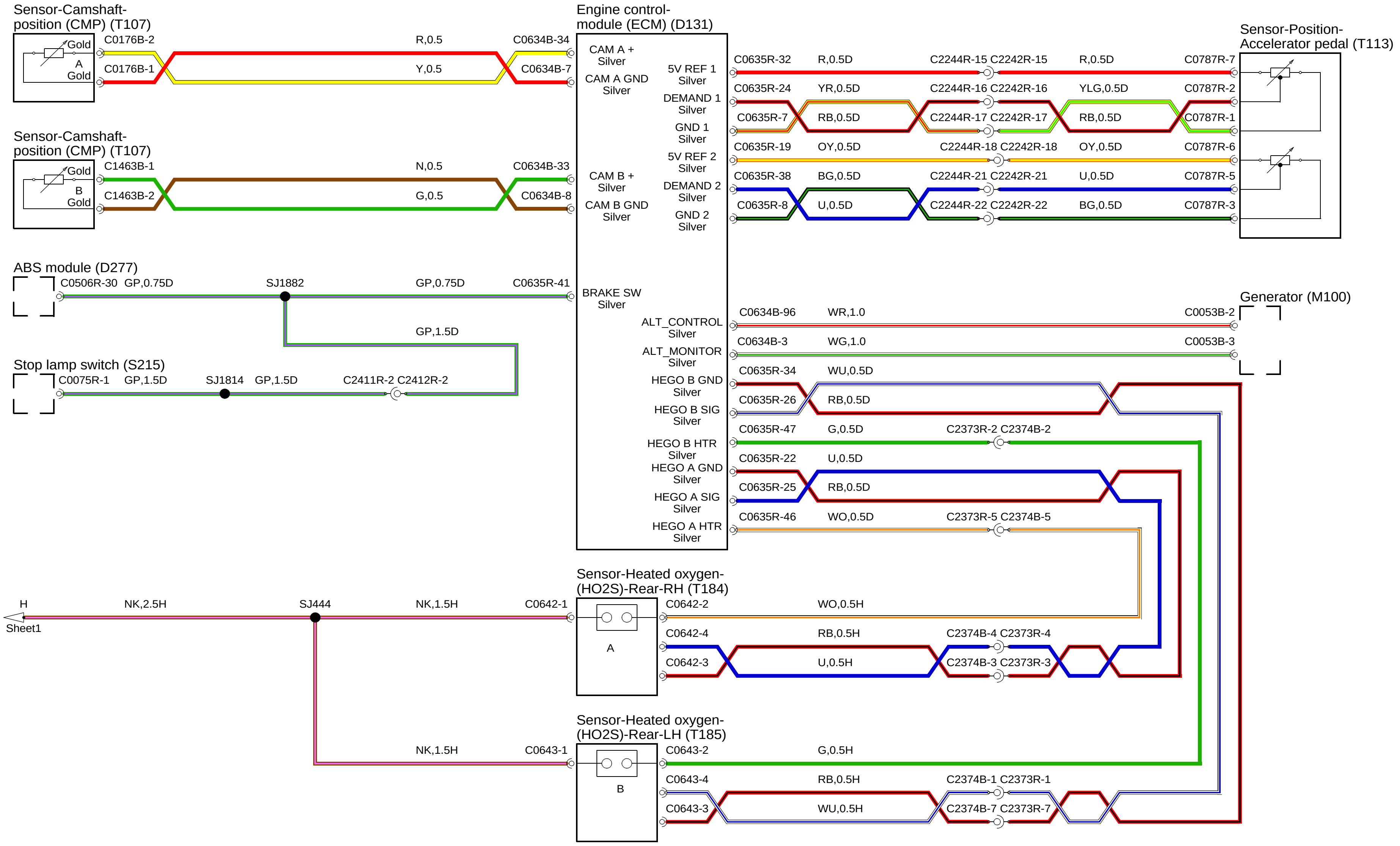

Glow plug (T171)
A
YB,4.0D
SJ1185
YB,2.5D
C3068R-1 C3067E-1
GB,1.5
C2581E-4 C2583E-4
GB,1.5
C0476E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068R-2 C3067E-2
GU,1.5
C2581E-3 C2583E-3
GU,1.5
C0477E-1
Earth via-
fixings (E110)
Glow plug (T171)
B
YB,4.0D
SJ1182
YB,2.5D
C3068R-3 C3067E-3
GR,1.5
C2581E-2 C2583E-2
GR,1.5
C0478E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068R-4 C3067E-4
GO,1.5
C2581E-1 C2583E-1
GO,1.5
C0479E-1
Earth via-
fixings (E110)
Glow plug (T171)
L
YB,4.0D
SJ1183
YB,2.5D
C3068R-5 C3067E-5
GU,1.5
C2582E-4 C2584E-4
GB,1.5
C1500E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068R-7 C3067E-7
GR,1.5
C2582E-2 C2584E-2
GR,1.5
C3256E-1
Earth via-
fixings (E110)
Glow plug (T171)
M
YB,4.0D
SJ1184
YB,2.5D
C3068R-6 C3067E-6
GU,1.5
C2582E-3 C2584E-3
GU,1.5
C1501E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068R-8 C3067E-8
GO,1.5
C2582E-1 C2584E-1
GO,1.5
C3257E-1
Earth via-
fixings (E110)

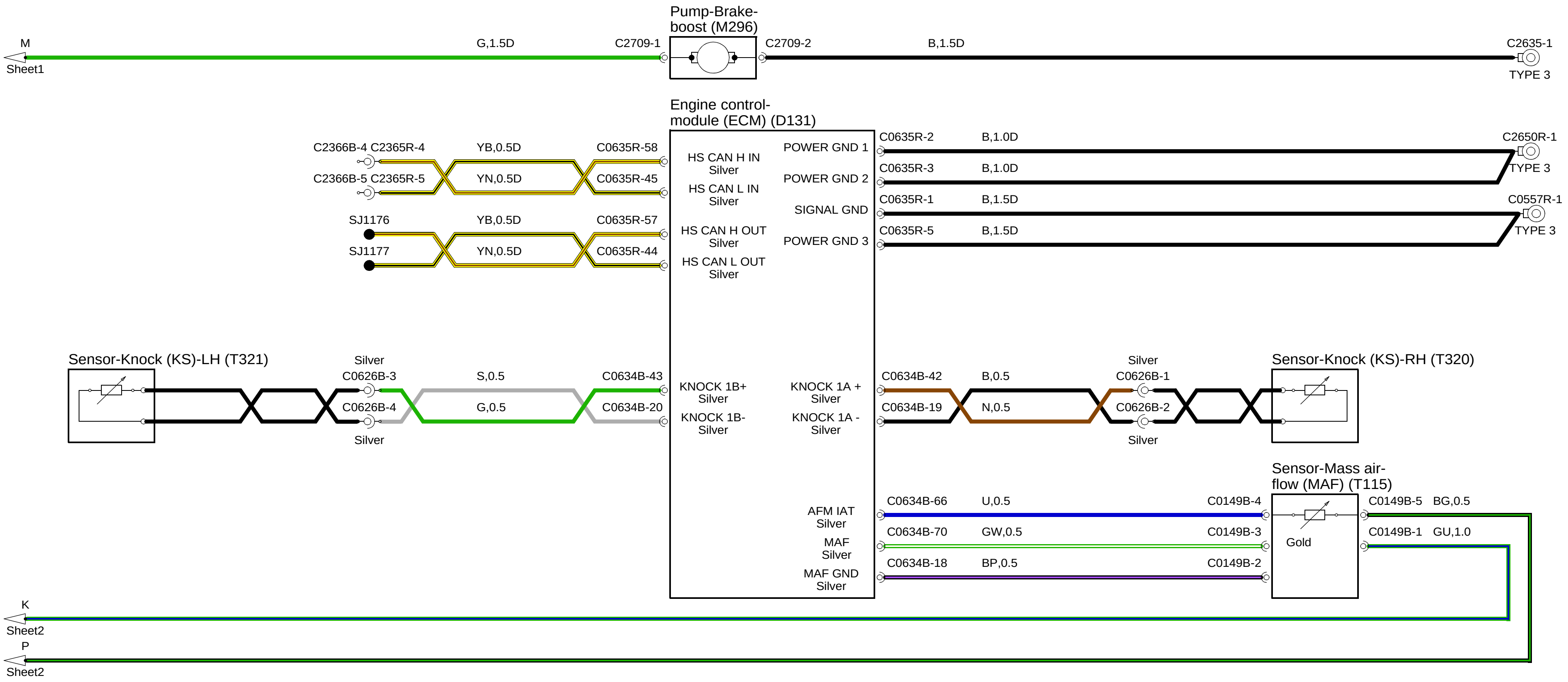

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631-1
C2725R-11 C2724B-11
R,2.5
C0179B-1
Earth via-
fixings (E110)
Junction-box engine (P108)
A
Sheet3
B
Sheet7
FUSE 6E
15.0 Amps
C0570R-168
NO,1.5D
C2725R-2 C2724B-2
RN,1.5
SJ1450
NK,1.5D
C2725R-8 C2724B-8
GU,1.0
C
Sheet2
FUSE 17E
15.0 Amps
C0570R-127
NR,1.5D
C2725R-1 C2724B-1
NR,1.5
NK,0.75D
D
Sheet2
FUSE 5E
10.0 Amps
C0570R-121
NK,1.5D
SJ1445
NK,1.5D
C2725R-18 C2724B-18
WG,1.5
E
Sheet2
FUSE 14E
20.0 Amps
C0570R-172
NK,2.5D
NK,1.5D
C2725R-17 C2724B-17
WG,1.5
F
Sheet2
WP,2.5D
G
Sheet4
Relay-Engine control-
module (ECM) (R116)
C0632-1
C0570R-119
NB,2.5D
C2412R-14 C2411R-14
NK,2.5H
H
Sheet5
FUSE 11E
15.0 Amps
C0570R-124
NK,1.5D
C2365R-18 C2366B-18
C2725R-16 C2724B-16
NO,1.0
A2
Sheet2
NO,1.0D
Engine control-
module (ECM) (D131)
FUSE 27E
5.0 Amps
C0570R-110
NO,0.75D
C0635R-54
BATT
Silver
CRANK
Silver
C0635R-17
WR,0.5D
Relay-Fuel-
pump (R103)
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D
SJ1812
NO,1.5D
C0635R-4
ECM POWER
IGN
Silver
C0635R-30
BO,0.75D
FUSE 1E
25.0 Amps
BRAKE BOOST PUMP
Silver
C0635R-50
FUSE 10E
15.0 Amps
C0570R-170
NO,1.5D
SJ1446
NO,1.0D
C0635R-6
THROTTLE PWR
C0635R-16
C0570R-36
UR,0.5D
C0635R-51
START RELAY -
Silver
C0570R-19
YN,0.5D
C2725R-7 C2724B-7
YN,0.5
C0634B-95
FUEL PUMP
Silver
P/N
Silver
C0635R-15
C0570R-12
NR,2.5D
NO,1.0D
J
Sheet2
Relay-
Starter (R102)
LINK 14E
40.0 Amps
C0570R-21
NO,1.5D
Transmission control
module (D306)
C0570R-34
GO,0.5D
SJ1592
GO,0.5D
C2365R-8 C2366B-8
GO,0.5H
C0193-10
GO,0.5D
C0570R-18
NG,0.75D
Relay-Brake-
boost pump (R260)
C0570R-71
GW,0.5D
FUSE 24E
20.0 Amps
C0570R-88
G,1.5D
M
Sheet6
Switch-Ignition (S176)
Central junction-box (P101)
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
C0028-4
IGN
CRANK
C0028-1
Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583R-36
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584R-30

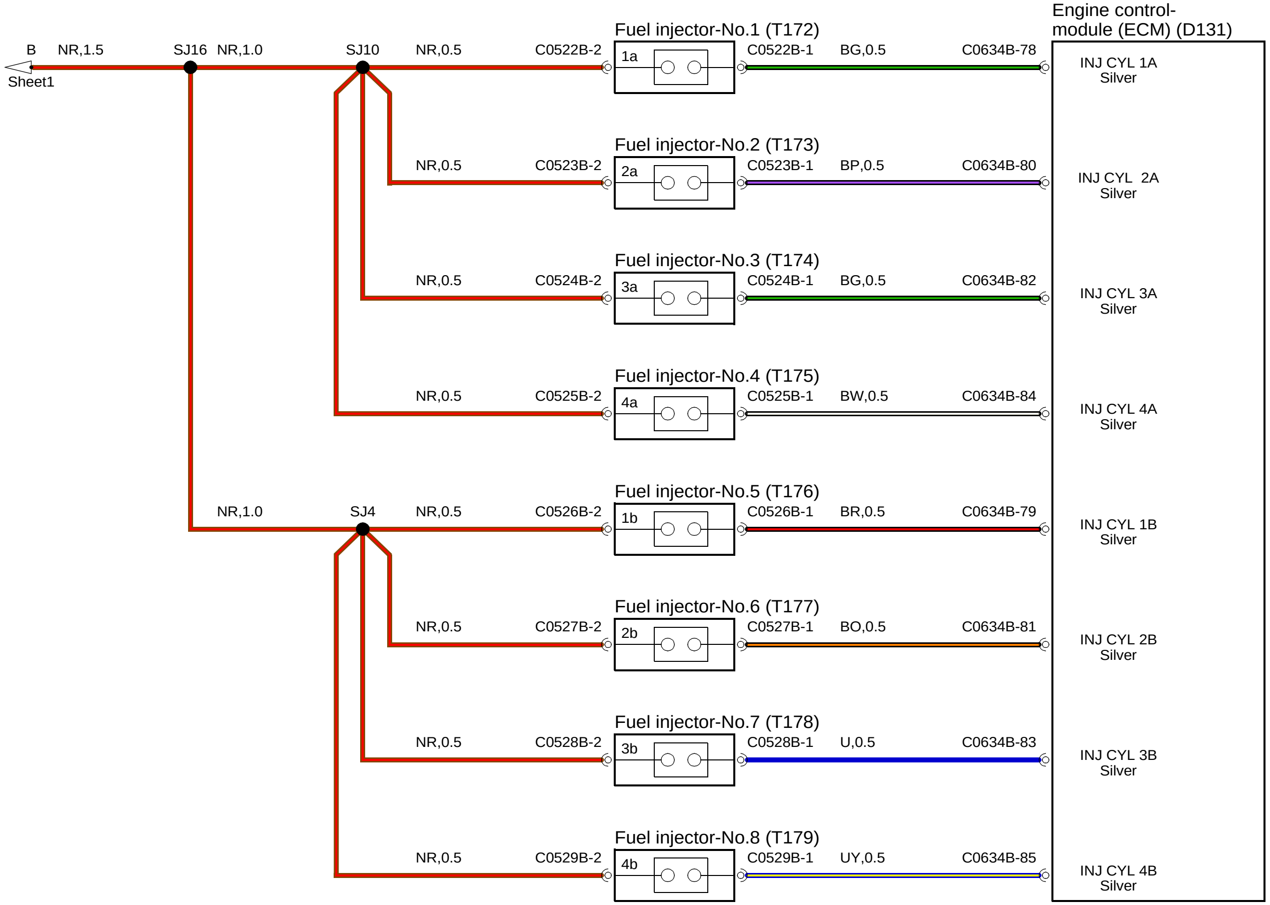

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
Engine control-module (ECM) (D131)
Unit-Electric throttle (D249)
E
Sheet1
WG,1.5
C0644B-1
C0644B-2
RW,1.0
C0634B-77
C0644B-4
G,1.0
C0634B-26
C0644B-3
N,1.0
C0634B-27
B
UHEGO B HTR Silver
UHEGO B SIG Silver
UHEGO B GND Silver
TPS1 Silver
TPS2 Silver
SEN GND 3 Silver
THROTTLE + Silver
THROTTLE - Silver
5V REF 3 Silver
SEN GND 6 Silver
C0634B-65
BG,0.5
C0175B-6
Gold
Gold
C0175B-5
C0634B-67
Y,0.5
C0175B-4
Gold
C0634B-10
R,0.5
C0175B-3
Gold
C0634B-75
GW,1.0
C0175B-1
+
C0634B-74
RW,1.0
C0175B-2
-
C0634B-72
OY,1.0
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
F
Sheet1
WG,1.5
C0645B-1
C0645B-2
RU,1.0
C0634B-76
C0645B-3
R,1.0
C0634B-29
C0645B-4
Y,1.0
C0634B-28
A
UHEGO A HTR Silver
UHEGO A GND Silver
UHEGO A SIG Silver
C0634B-15
BG,0.5
SJ9
BG,0.5
P
Sheet6
Sensor-Engine coolant-temperature (ECT) (T121)
BG,0.5
C0169B-2
Gold
Gold
C0634B-68
UY,0.5
C0169B-1
Valve-Oil-Variable-valve timing (N152)
A2
Sheet1
NO,1.0
SJ5008
B,1.0
C2549B-1
2
C2549B-2
YU,0.5
C0634B-87
VVT B Silver
COOLANT TEMP Silver
Valve-Oil-Variable-valve timing (N152)
B,1.0
C2548B-1
1
C2548B-2
Y,0.5
C0634B-86
VVT A Silver
Viscous fan (M300)
Solenoid (N104)
Sensor-Hall-effect (T263)
C0634B-93
B,0.5
C2270B-4
C2270B-5
FAN REQUEST Silver
C0634B-63
Y,0.5
C2270B-3
FAN SPEED Silver
C0634B-12
GB,0.5
C2270B-2
C2270B-1
SEN GND 5 Silver
Purge control valve (N119)
C
Sheet1
GU,1.0
SJ7
B,1.0
C0152B-2
C0152B-1
UY,0.5
C0634B-92
PURGE VALVE Silver
WU,1.0
Modulator valve-EGR (D214)
SJ1
WU,1.0
C0177B-5
C0177B-3
YU,1.0
C0634B-50
EGR 4 Silver
C0177B-4
YU,1.0
C0634B-53
EGR 1 Silver
C0177B-1
YG,1.0
C0634B-52
EGR 2 Silver
WU,1.0
C0177B-2
C0177B-6
YR,1.0
C0634B-51
EGR 3 Silver
E-BOX FAN Silver
C0634B-94
UB,0.5
C2724B-15 C2725R-15
Fan-Cooling-E box (M208)
D
Sheet1
NK,0.75D
C0646R-2
C0646R-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725R-14 C2724B-14
RG,1.0
SJ11
RG,1.0
R,1.0
GU,1.0
K
Sheet6

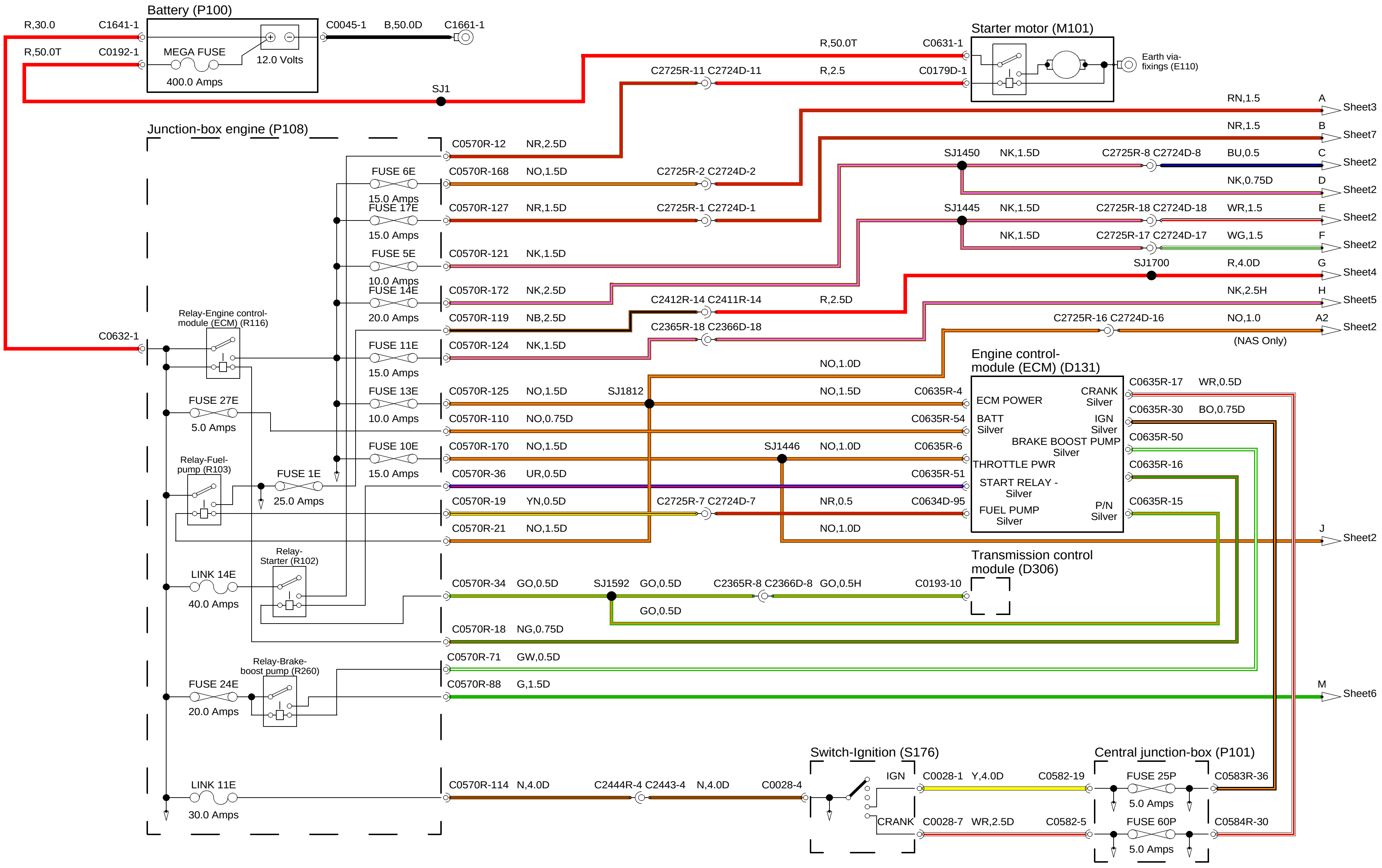

Engine control-module (ECM) (D131)
COIL 1B Silver
IGF2 Silver
COIL 1A Silver
IGF 1 Silver
COIL 2A Silver
COIL 2B Silver
COIL 3A Silver
COIL 3B Silver
COIL 4B Silver
COIL 4A Silver
SJ5
RW,0.5
C0156B-1
Ignition coil-1 (D233)
1a
C0156B-4
GU,0.5
C0634B-61
BU,0.5
C0156B-3
C0156B-2
GB,0.5
SJ14
GB,0.5
C0634B-62
Ignition coil-6 (D238)
RW,0.5
C1772B-1
2b
C1772B-2
GB,0.5
BU,0.5
C1772B-3
C1772B-4
GW,0.5
C0634B-58
Ignition coil-7 (D267)
RW,0.5
C2087B-1
3b
C2087B-2
GB,0.5
BU,0.5
C2087B-3
C2087B-4
GR,0.5
C0634B-56
Ignition coil-4 (D236)
RW,0.5
C1770B-1
4a
C1770B-2
GB,0.5
C1770B-3
C1770B-4
GR,0.5
C0634B-55
BU,0.5
SJ13
B,0.5
TO BE SAME LENGTH AS WIRE 138B
SJ6
B,0.5
TO BE SAME LENGTH AS WIRE 137B
SJ3
BU,0.5
C0634B-60
GW,0.5
C1771B-4
Ignition coil-5 (D237)
1b
C1771B-3 BU,0.5
C0634B-64
YB,0.5
SJ2
YB,0.5
C1771B-2
C1771B-1 RW,0.5
Ignition coil-2 (D234)
YB,0.5
C0052B-2
2a
C0052B-3 BU,0.5
C0634B-59
Y,0.5
C0052B-4
C0052B-1 RW,0.5
Ignition coil-3 (D235)
YB,0.5
C0276B-2
3a
C0276B-3 BU,0.5
C0634B-57
YR,0.5
C0276B-4
C0276B-1 RW,0.5
Ignition coil-8 (D268)
YB,0.5
C2088B-2
4b
C2088B-1 RW,0.5
C0634B-54
YR,0.5
C2088B-4
C2088B-3
Capacitor (G158)
RW,1.5
C1323B-1
C1323B-2
B,1.5
A
Sheet1
RN,1.5
C1323B-3
B,1.5
B,1.5
C2649B-1
TYPE 3
C2651B-1
TYPE 3

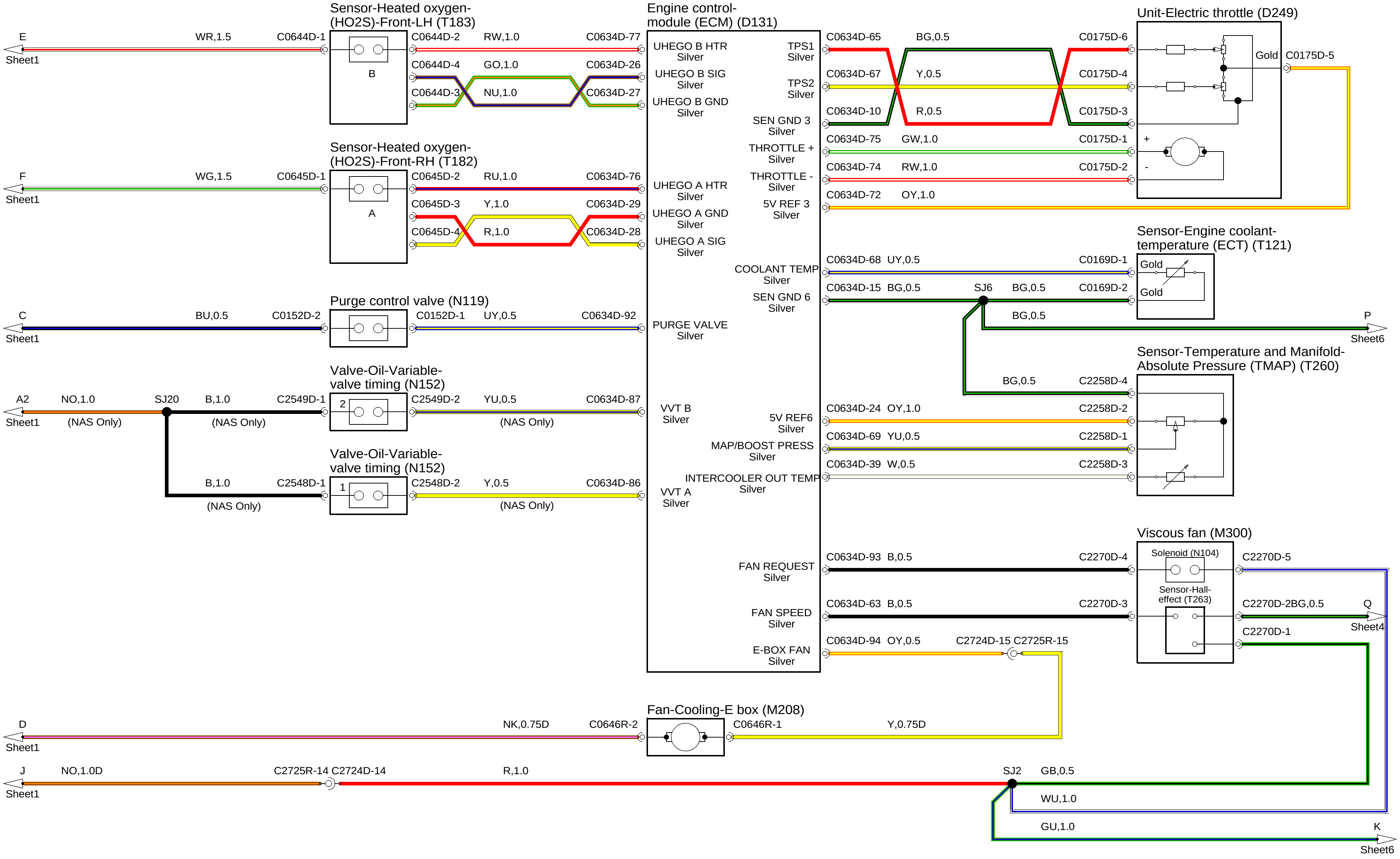

Sensor-Oil-temperature (T128)
BG,0.5
C0219B-2
Gold
C0219B-1
Gold
Y,0.5
C0634B-23
Engine control-module (ECM) (D131)
OIL TEMP Silver
CRANK + Silver
CRANK - Silver
5V REF 4 Silver
SRS SIGNAL Silver
MAP Silver
SEN GND 4 Silver
CRUISE SW - Silver
FUEL TEMP Silver
CRUISE SW + Silver
C0634B-30
B,0.5
Gold
C0909B-2 C0904-2
B,0.5
C0168-2
C0634B-6
O,0.5
C0909B-1 C0904-1
O,0.5
C0168-1
Gold
Sensor-Crankshaft-position (CKP) (T102)
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186B-2
OY,1.0
C0634B-48
C0186B-1
BP,0.5
C0634B-69
C0186B-4
BG,0.5
SJ8
BG,0.5
C0634B-11
C0635R-28
YG,0.5D
C2244R-7 C2242R-7
Restraints Control Module (RCM) (D171)
YG,0.5D
C1649-17
Sensor-Temperature-Fuel rail (T125)
Gold
C2251B-2
BG,0.5
Gold
C2251B-1
YR,0.5
C0634B-46
C0635R-35
R,0.5D
C0635R-36
PU,0.5D
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
Clock spring (S227)
C0082-5
PU,0.35D
C2238-22 C2240R-22
C2147-9
N,0.35
C1254-1
C0082-8
R,0.35D
C2238-21 C2240R-21
Resistive Ladder
Unit-Fuel Tank (D179)
G
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
Sheet1

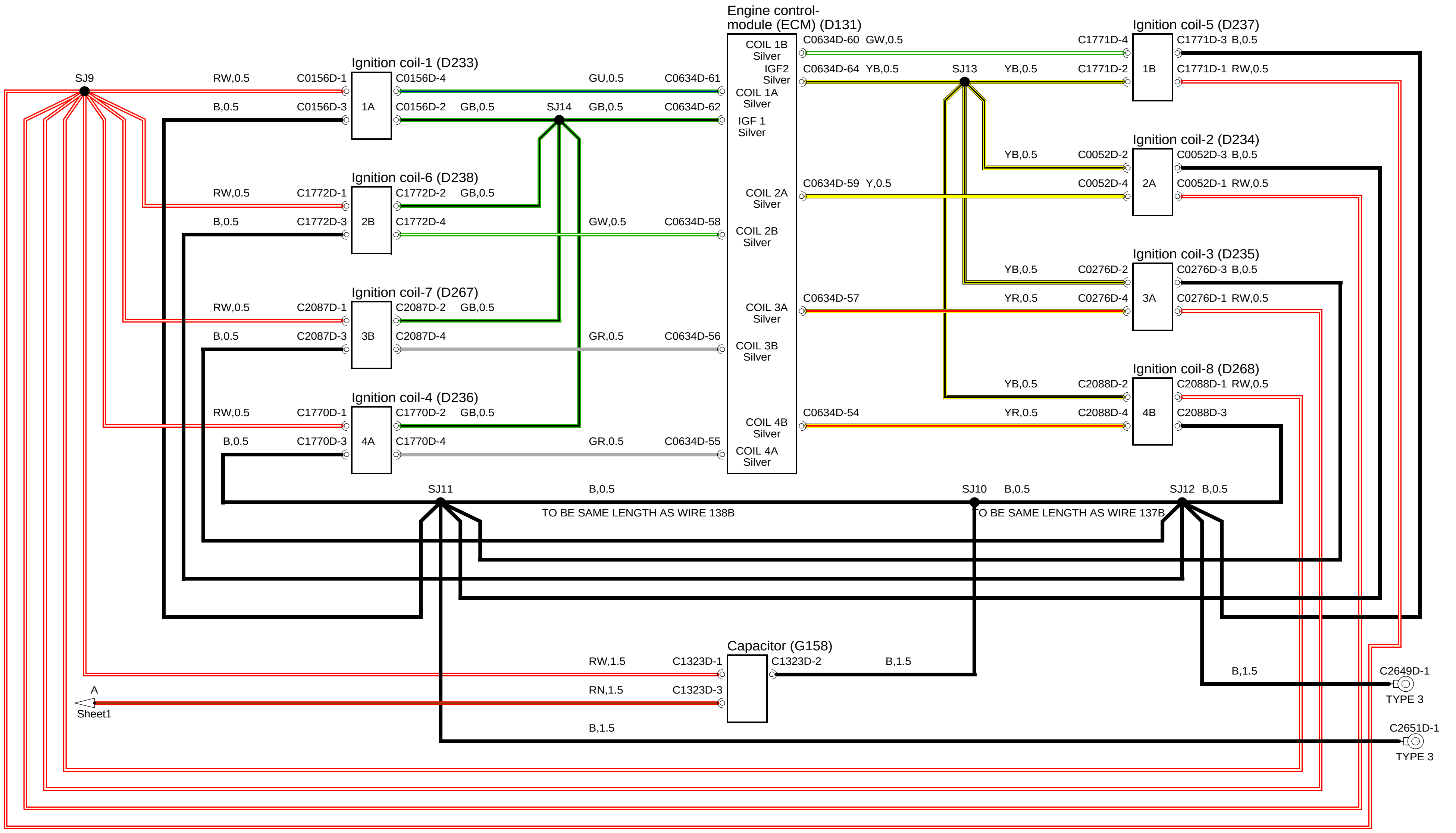

Sensor-Camshaft-position (CMP) (T107)
Gold
A
Gold
C0176B-2
C0176B-1
R,0.5
Y,0.5
C0634B-34
C0634B-7
Sensor-Camshaft-position (CMP) (T107)
Gold
B
Gold
C1463B-1
C1463B-2
N,0.5
G,0.5
C0634B-33
C0634B-8
ABS module (D277)
C0506R-30
GP,0.75D
SJ1882
GP,0.75D
C0635R-41
GP,1.5D
Stop lamp switch (S215)
C0075R-1
GP,1.5D
SJ1814
GP,1.5D
C2411R-2 C2412R-2
Engine control-module (ECM) (D131)
CAM A + Silver
CAM A GND Silver
5V REF 1 Silver
DEMAND 1 Silver
GND 1 Silver
5V REF 2 Silver
CAM B + Silver
DEMAND 2 Silver
CAM B GND Silver
GND 2 Silver
BRAKE SW Silver
ALT_CONTROL Silver
ALT_MONITOR Silver
HEGO B GND Silver
HEGO B SIG Silver
HEGO B HTR Silver
HEGO A GND Silver
HEGO A SIG Silver
HEGO A HTR Silver
C0635R-32
R,0.5D
C2244R-15 C2242R-15
R,0.5D
C0787R-7
C0635R-24
YR,0.5D
C2244R-16 C2242R-16
YLG,0.5D
C0787R-2
C0635R-7
RB,0.5D
C2244R-17 C2242R-17
RB,0.5D
C0787R-1
C0635R-19
OY,0.5D
C2244R-18 C2242R-18
OY,0.5D
C0787R-6
C0635R-38
BG,0.5D
C2244R-21 C2242R-21
U,0.5D
C0787R-5
C0635R-8
U,0.5D
C2244R-22 C2242R-22
BG,0.5D
C0787R-3
Sensor-Position-Accelerator pedal (T113)
Generator (M100)
C0634B-96
WR,1.0
C0053B-2
C0634B-3
WG,1.0
C0053B-3
C0635R-34
WU,0.5D
C0635R-26
RB,0.5D
C0635R-47
G,0.5D
C2373R-2 C2374B-2
C0635R-22
U,0.5D
C0635R-25
RB,0.5D
C0635R-46
WO,0.5D
C2373R-5 C2374B-5
H
Sheet1
NK,2.5H
SJ444
NK,1.5H
C0642-1
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
A
C0642-2
WO,0.5H
C0642-4
RB,0.5H
C2374B-4 C2373R-4
C0642-3
U,0.5H
C2374B-3 C2373R-3
NK,1.5H
C0643-1
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
B
C0643-2
G,0.5H
C0643-4
RB,0.5H
C2374B-1 C2373R-1
C0643-3
WU,0.5H
C2374B-7 C2373R-7

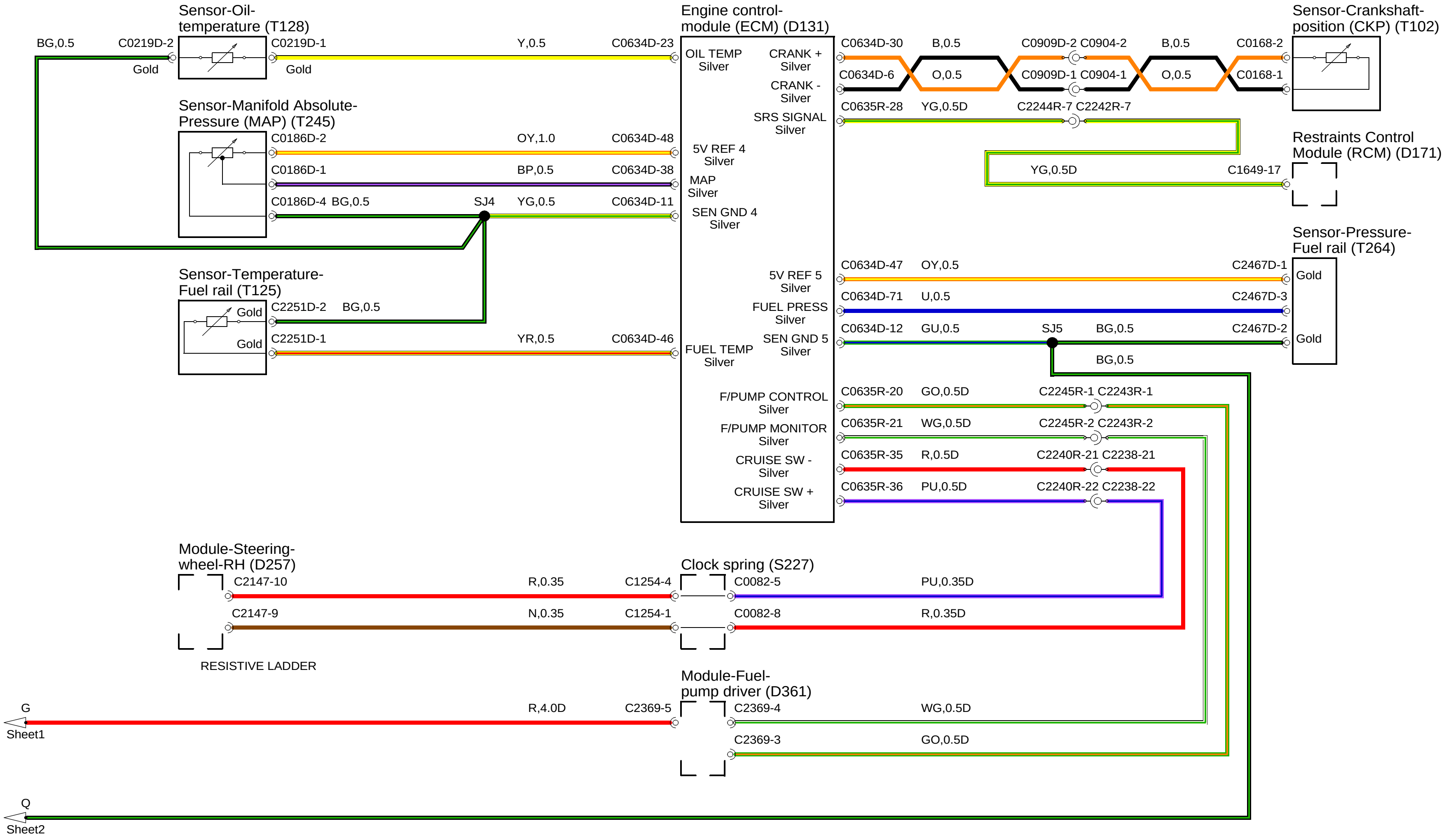

Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
C2366B-4 C2365R-4
YB,0.5D
C0635R-58
C2366B-5 C2365R-5
YN,0.5D
C0635R-45
SJ1176
YB,0.5D
C0635R-57
SJ1177
YN,0.5D
C0635R-44
HS CAN H IN Silver
HS CAN L IN Silver
HS CAN H OUT Silver
HS CAN L OUT Silver
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635R-2
B,1.0D
C2650R-1
C0635R-3
B,1.0D
TYPE 3
C0635R-1
B,1.5D
C0557R-1
C0635R-5
B,1.5D
TYPE 3
Sensor-Knock (KS)-LH (T321)
Silver
C0626B-3
S,0.5
C0634B-43
C0626B-4
G,0.5
C0634B-20
Silver
KNOCK 1B+ Silver
KNOCK 1B- Silver
KNOCK 1A + Silver
KNOCK 1A - Silver
C0634B-42
B,0.5
Silver
C0626B-1
C0634B-19
N,0.5
C0626B-2
Silver
Sensor-Knock (KS)-RH (T320)
Sensor-Mass air-flow (MAF) (T115)
AFM IAT Silver
MAF Silver
MAF GND Silver
C0634B-66
U,0.5
C0149B-4
C0634B-70
GW,0.5
C0149B-3
C0634B-18
BP,0.5
C0149B-2
Gold
C0149B-5 BG,0.5
C0149B-1 GU,1.0
K
Sheet2
P
Sheet2

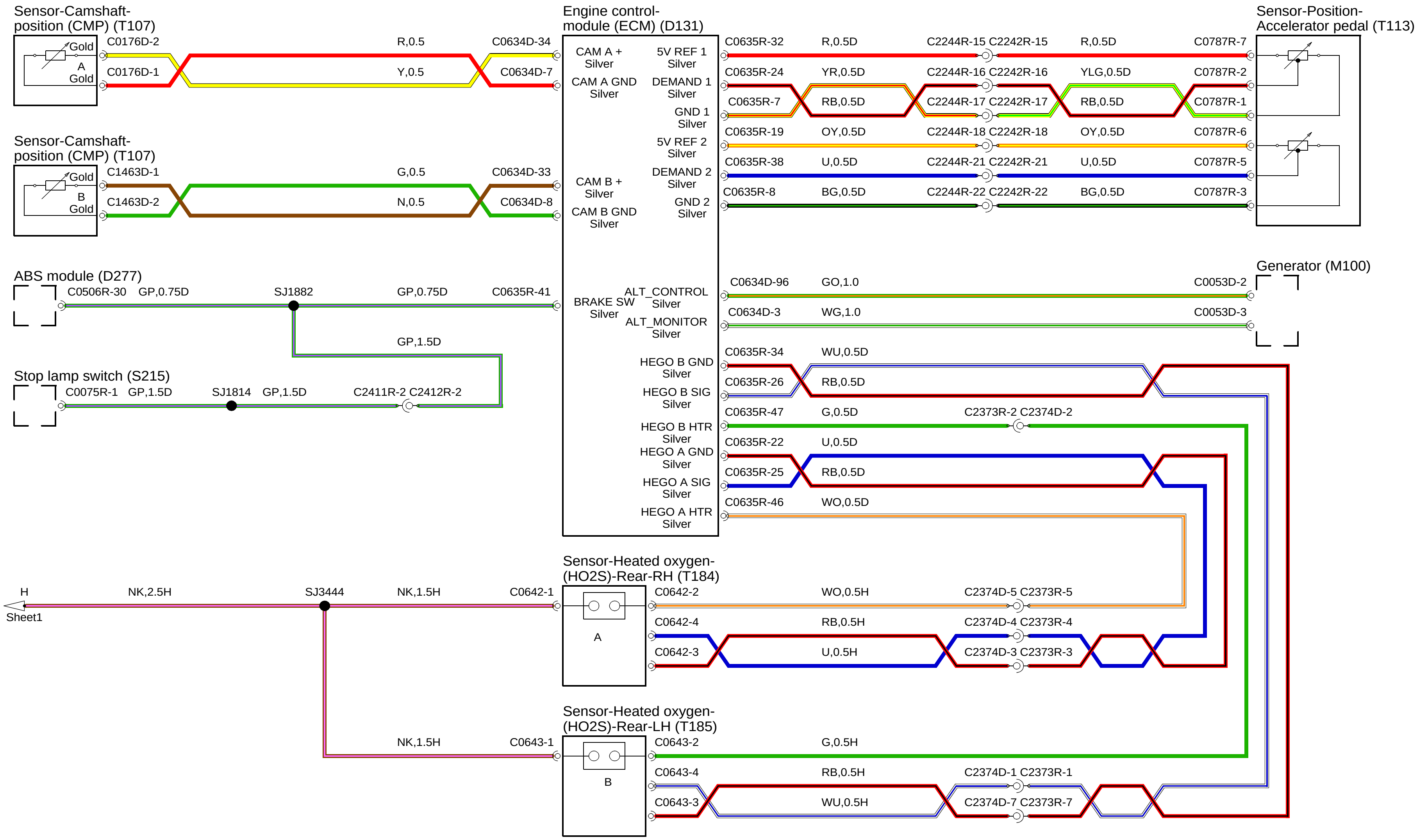

B
NR,1.5
Sheet1
SJ16
NR,1.0
SJ10
NR,0.5
C0522B-2
Fuel injector-No.1 (T172)
1a
C0522B-1
BG,0.5
C0634B-78
Engine control-module (ECM) (D131)
INJ CYL 1A
Silver
NR,0.5
C0523B-2
Fuel injector-No.2 (T173)
2a
C0523B-1
BP,0.5
C0634B-80
INJ CYL 2A
Silver
NR,0.5
C0524B-2
Fuel injector-No.3 (T174)
3a
C0524B-1
BG,0.5
C0634B-82
INJ CYL 3A
Silver
NR,0.5
C0525B-2
Fuel injector-No.4 (T175)
4a
C0525B-1
BW,0.5
C0634B-84
INJ CYL 4A
Silver
NR,1.0
SJ4
NR,0.5
C0526B-2
Fuel injector-No.5 (T176)
1b
C0526B-1
BR,0.5
C0634B-79
INJ CYL 1B
Silver
NR,0.5
C0527B-2
Fuel injector-No.6 (T177)
2b
C0527B-1
BO,0.5
C0634B-81
INJ CYL 2B
Silver
NR,0.5
C0528B-2
Fuel injector-No.7 (T178)
3b
C0528B-1
U,0.5
C0634B-83
INJ CYL 3B
Silver
NR,0.5
C0529B-2
Fuel injector-No.8 (T179)
4b
C0529B-1
UY,0.5
C0634B-85
INJ CYL 4B
Silver

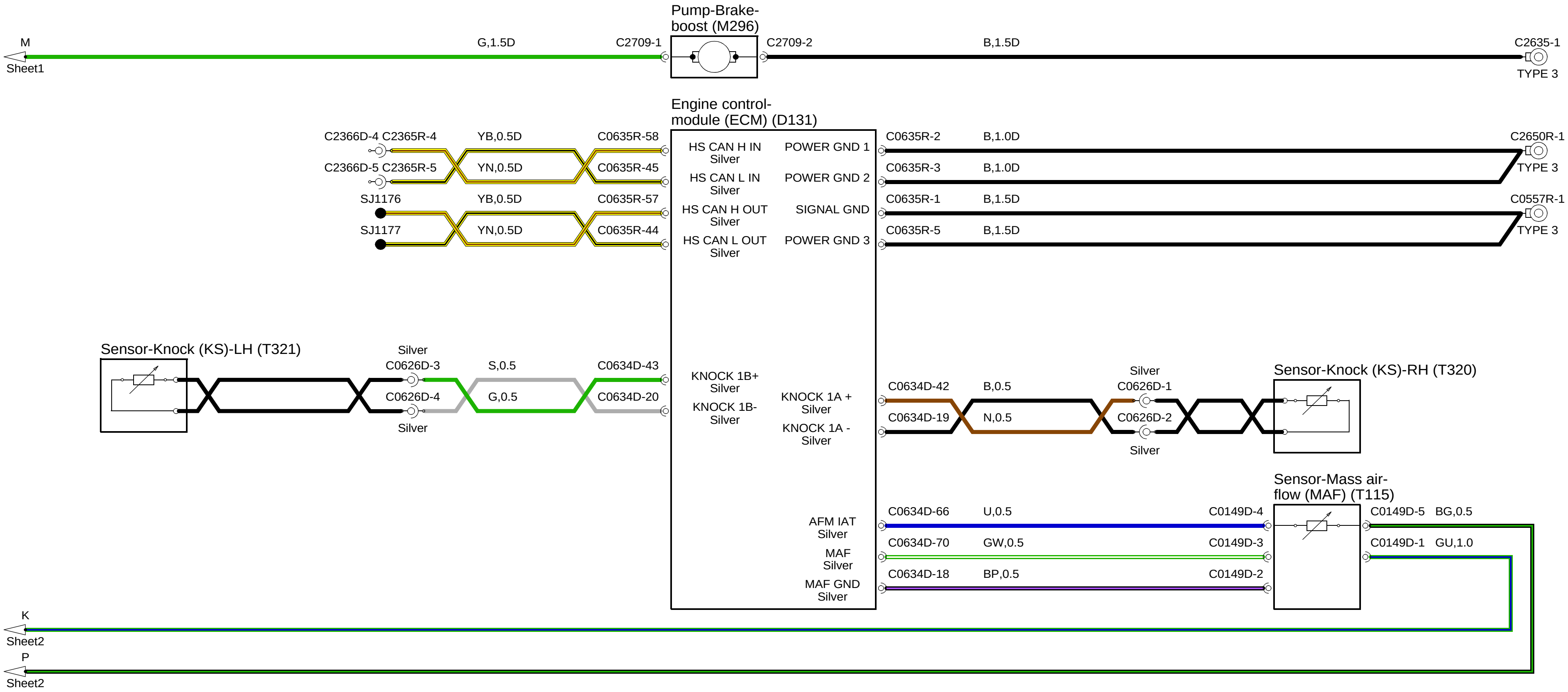

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631-1
C2725R-11 C2724D-11
R,2.5
C0179D-1
Earth via-fixings (E110)
Junction-box engine (P108)
C0570R-12
NR,2.5D
RN,1.5
A
Sheet3
NR,1.5
B
Sheet7
FUSE 6E
15.0 Amps
C0570R-168
NO,1.5D
C2725R-2 C2724D-2
SJ1450
NK,1.5D
C2725R-8 C2724D-8
BU,0.5
C
Sheet2
NK,0.75D
D
Sheet2
FUSE 17E
15.0 Amps
C0570R-127
NR,1.5D
C2725R-1 C2724D-1
SJ1445
NK,1.5D
C2725R-18 C2724D-18
WR,1.5
E
Sheet2
NK,1.5D
C2725R-17 C2724D-17
WG,1.5
F
Sheet2
FUSE 5E
10.0 Amps
C0570R-121
NK,1.5D
SJ1700
R,4.0D
G
Sheet4
FUSE 14E
20.0 Amps
C0570R-172
NK,2.5D
NK,2.5H
H
Sheet5
C2412R-14 C2411R-14
R,2.5D
Relay-Engine control-module (ECM) (R116)
C0632-1
C0570R-119
NB,2.5D
C2725R-16 C2724D-16
NO,1.0
A2
Sheet2
C2365R-18 C2366D-18
(NAS Only)
FUSE 11E
15.0 Amps
C0570R-124
NK,1.5D
Engine control-module (ECM) (D131)
NO,1.0D
FUSE 27E
5.0 Amps
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D
SJ1812
NO,1.5D
C0635R-4
C0570R-110
NO,0.75D
C0635R-54
ECM POWER
CRANK Silver
BATT Silver
IGN Silver
BRAKE BOOST PUMP Silver
THROTTLE PWR
START RELAY - Silver
FUEL PUMP Silver
P/N Silver
C0635R-17
WR,0.5D
C0635R-30
BO,0.75D
C0635R-50
C0635R-16
C0635R-15
Relay-Fuel-pump (R103)
FUSE 1E
25.0 Amps
FUSE 10E
15.0 Amps
C0570R-170
NO,1.5D
SJ1446
NO,1.0D
C0635R-6
C0570R-36
UR,0.5D
C0635R-51
C0570R-19
YN,0.5D
C2725R-7 C2724D-7
NR,0.5
C0634D-95
C0570R-21
NO,1.5D
NO,1.0D
J
Sheet2
Relay-Starter (R102)
LINK 14E
40.0 Amps
Transmission control module (D306)
C0570R-34
GO,0.5D
SJ1592
GO,0.5D
C2365R-8 C2366D-8
GO,0.5H
C0193-10
GO,0.5D
C0570R-18
NG,0.75D
Relay-Brake-boost pump (R260)
C0570R-71
GW,0.5D
FUSE 24E
20.0 Amps
C0570R-88
G,1.5D
M
Sheet6
Switch-Ignition (S176)
Central junction-box (P101)
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583R-36
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584R-30

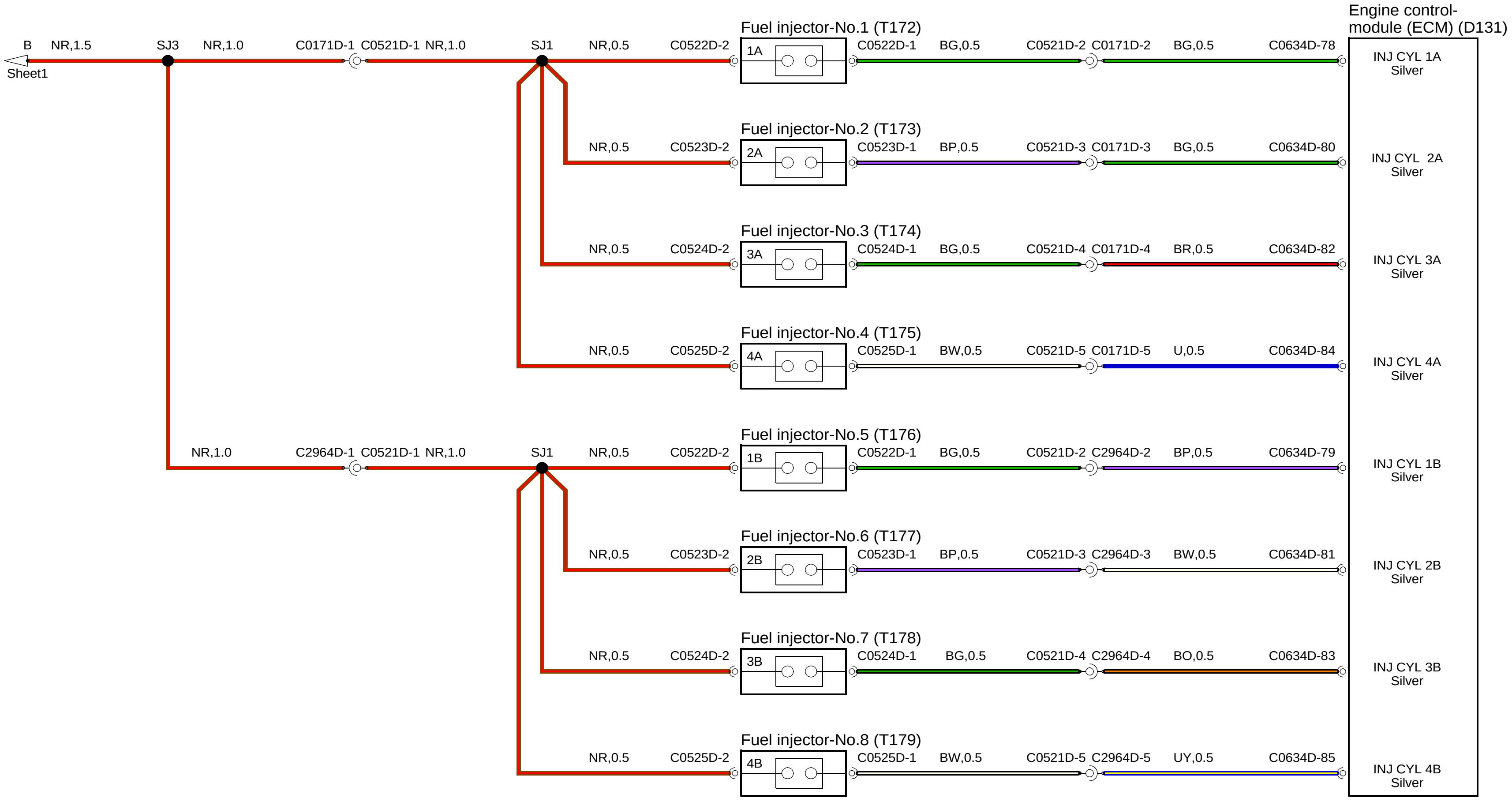

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
E
Sheet1
WR,1.5
C0644D-1
B
C0644D-2
RW,1.0
C0634D-77
C0644D-4
GO,1.0
C0634D-26
C0644D-3
NU,1.0
C0634D-27
Engine control-module (ECM) (D131)
UHEGO B HTR Silver
UHEGO B SIG Silver
UHEGO B GND Silver
TPS1 Silver
TPS2 Silver
SEN GND 3 Silver
THROTTLE + Silver
THROTTLE - Silver
5V REF 3 Silver
UHEGO A HTR Silver
UHEGO A GND Silver
UHEGO A SIG Silver
COOLANT TEMP Silver
SEN GND 6 Silver
PURGE VALVE Silver
VVT B Silver
5V REF6 Silver
MAP/BOOST PRESS Silver
INTERCOOLER OUT TEMP Silver
VVT A Silver
FAN REQUEST Silver
FAN SPEED Silver
E-BOX FAN Silver
Unit-Electric throttle (D249)
C0634D-65
BG,0.5
C0175D-6
Gold
C0175D-5
C0634D-67
Y,0.5
C0175D-4
C0634D-10
R,0.5
C0175D-3
C0634D-75
GW,1.0
C0175D-1
+
C0634D-74
RW,1.0
C0175D-2
-
C0634D-72
OY,1.0
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
F
Sheet1
WG,1.5
C0645D-1
A
C0645D-2
RU,1.0
C0634D-76
C0645D-3
Y,1.0
C0634D-29
C0645D-4
R,1.0
C0634D-28
Sensor-Engine coolant-temperature (ECT) (T121)
C0634D-68 UY,0.5
C0169D-1
Gold
C0634D-15 BG,0.5
SJ6
BG,0.5
C0169D-2
Gold
BG,0.5
P
Sheet6
Purge control valve (N119)
C
Sheet1
BU,0.5
C0152D-2
C0152D-1
UY,0.5
C0634D-92
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
BG,0.5
C2258D-4
C0634D-24 OY,1.0
C2258D-2
C0634D-69 YU,0.5
C2258D-1
C0634D-39 W,0.5
C2258D-3
Valve-Oil-Variable-valve timing (N152)
A2
NO,1.0
SJ20
B,1.0
C2549D-1
2
C2549D-2
YU,0.5
C0634D-87
Sheet1
(NAS Only)
(NAS Only)
(NAS Only)
Valve-Oil-Variable-valve timing (N152)
B,1.0
C2548D-1
1
C2548D-2
Y,0.5
C0634D-86
(NAS Only)
(NAS Only)
Viscous fan (M300)
C0634D-93 B,0.5
C2270D-4
Solenoid (N104)
C2270D-5
Sensor-Hall-effect (T263)
C0634D-63 B,0.5
C2270D-3
C2270D-2BG,0.5
Q
Sheet4
C2270D-1
C0634D-94 OY,0.5
C2724D-15 C2725R-15
Fan-Cooling-E box (M208)
D
Sheet1
NK,0.75D
C0646R-2
C0646R-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725R-14 C2724D-14
R,1.0
SJ2
GB,0.5
WU,1.0
GU,1.0
K
Sheet6


Engine control-module (ECM) (D131)
COIL 1B Silver
IGF2 Silver
COIL 1A Silver
IGF 1 Silver
COIL 2A Silver
COIL 2B Silver
COIL 3A Silver
COIL 3B Silver
COIL 4B Silver
COIL 4A Silver
C0634D-60 GW,0.5
C0634D-64 YB,0.5
SJ13
YB,0.5
C1771D-4
C1771D-2
Ignition coil-5 (D237)
1B
C1771D-3 B,0.5
C1771D-1 RW,0.5
SJ9
RW,0.5
C0156D-1
Ignition coil-1 (D233)
1A
C0156D-4
GU,0.5
C0634D-61
B,0.5
C0156D-3
C0156D-2 GB,0.5
SJ14
GB,0.5
C0634D-62
Ignition coil-2 (D234)
YB,0.5
C0052D-2
2A
C0052D-3 B,0.5
C0634D-59 Y,0.5
C0052D-4
C0052D-1 RW,0.5
Ignition coil-6 (D238)
RW,0.5
C1772D-1
2B
C1772D-2 GB,0.5
B,0.5
C1772D-3
C1772D-4
GW,0.5
C0634D-58
Ignition coil-3 (D235)
YB,0.5
C0276D-2
3A
C0276D-3 B,0.5
C0634D-57
YR,0.5
C0276D-4
C0276D-1 RW,0.5
Ignition coil-7 (D267)
RW,0.5
C2087D-1
3B
C2087D-2 GB,0.5
B,0.5
C2087D-3
C2087D-4
GR,0.5
C0634D-56
Ignition coil-8 (D268)
YB,0.5
C2088D-2
4B
C2088D-1 RW,0.5
C0634D-54
YR,0.5
C2088D-4
C2088D-3
Ignition coil-4 (D236)
RW,0.5
C1770D-1
4A
C1770D-2 GB,0.5
B,0.5
C1770D-3
C1770D-4
GR,0.5
C0634D-55
SJ11
B,0.5
TO BE SAME LENGTH AS WIRE 138B
SJ10 B,0.5
TO BE SAME LENGTH AS WIRE 137B
SJ12 B,0.5
Capacitor (G158)
RW,1.5
C1323D-1
C1323D-2
B,1.5
RN,1.5
C1323D-3
A
Sheet1
B,1.5
B,1.5
C2649D-1
TYPE 3
C2651D-1
TYPE 3


Sensor-Oil-temperature (T128)
BG,0.5
C0219D-2
Gold
C0219D-1
Gold
Y,0.5
C0634D-23
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186D-2
OY,1.0
C0634D-48
C0186D-1
BP,0.5
C0634D-38
C0186D-4
BG,0.5
SJ4
YG,0.5
C0634D-11
Sensor-Temperature-Fuel rail (T125)
Gold
C2251D-2
BG,0.5
Gold
C2251D-1
YR,0.5
C0634D-46
Engine control-module (ECM) (D131)
OIL TEMP Silver
CRANK + Silver
CRANK - Silver
SRS SIGNAL Silver
5V REF 4 Silver
MAP Silver
SEN GND 4 Silver
5V REF 5 Silver
FUEL PRESS Silver
FUEL TEMP Silver
SEN GND 5 Silver
F/PUMP CONTROL Silver
F/PUMP MONITOR Silver
CRUISE SW - Silver
CRUISE SW + Silver
C0634D-30
B,0.5
C0909D-2 C0904-2
B,0.5
C0168-2
C0634D-6
O,0.5
C0909D-1 C0904-1
O,0.5
C0168-1
Sensor-Crankshaft-position (CKP) (T102)
C0635R-28
YG,0.5D
C2244R-7 C2242R-7
Restraints Control Module (RCM) (D171)
YG,0.5D
C1649-17
Sensor-Pressure-Fuel rail (T264)
C0634D-47
OY,0.5
C2467D-1
Gold
C0634D-71
U,0.5
C2467D-3
C0634D-12
GU,0.5
SJ5
BG,0.5
C2467D-2
Gold
BG,0.5
C0635R-20
GO,0.5D
C2245R-1 C2243R-1
C0635R-21
WG,0.5D
C2245R-2 C2243R-2
C0635R-35
R,0.5D
C2240R-21 C2238-21
C0635R-36
PU,0.5D
C2240R-22 C2238-22
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
C2147-9
N,0.35
C1254-1
RESISTIVE LADDER
Clock spring (S227)
C0082-5
PU,0.35D
C0082-8
R,0.35D
Module-Fuel-pump driver (D361)
G
Sheet1
R,4.0D
C2369-5
C2369-4
WG,0.5D
C2369-3
GO,0.5D
Q
Sheet2


Sensor-Camshaft-position (CMP) (T107)
Gold
A
Gold
C0176D-2
R,0.5
C0634D-34
C0176D-1
Y,0.5
C0634D-7
Sensor-Camshaft-position (CMP) (T107)
Gold
B
Gold
C1463D-1
G,0.5
C0634D-33
C1463D-2
N,0.5
C0634D-8
Engine control-module (ECM) (D131)
CAM A +
Silver
CAM A GND
Silver
CAM B +
Silver
CAM B GND
Silver
5V REF 1
Silver
DEMAND 1
Silver
GND 1
Silver
5V REF 2
Silver
DEMAND 2
Silver
GND 2
Silver
BRAKE SW
Silver
ALT_CONTROL
Silver
ALT_MONITOR
Silver
HEGO B GND
Silver
HEGO B SIG
Silver
HEGO B HTR
Silver
HEGO A GND
Silver
HEGO A SIG
Silver
HEGO A HTR
Silver
C0635R-32
R,0.5D
C2244R-15 C2242R-15
R,0.5D
C0787R-7
C0635R-24
YR,0.5D
C2244R-16 C2242R-16
YLG,0.5D
C0787R-2
C0635R-7
RB,0.5D
C2244R-17 C2242R-17
RB,0.5D
C0787R-1
C0635R-19
OY,0.5D
C2244R-18 C2242R-18
OY,0.5D
C0787R-6
C0635R-38
U,0.5D
C2244R-21 C2242R-21
U,0.5D
C0787R-5
C0635R-8
BG,0.5D
C2244R-22 C2242R-22
BG,0.5D
C0787R-3
Sensor-Position-Accelerator pedal (T113)
ABS module (D277)
C0506R-30
GP,0.75D
SJ1882
GP,0.75D
C0635R-41
GP,1.5D
Stop lamp switch (S215)
C0075R-1
GP,1.5D
SJ1814
GP,1.5D
C2411R-2 C2412R-2
Generator (M100)
C0634D-96
GO,1.0
C0053D-2
C0634D-3
WG,1.0
C0053D-3
C0635R-34
WU,0.5D
C0635R-26
RB,0.5D
C0635R-47
G,0.5D
C2373R-2 C2374D-2
C0635R-22
U,0.5D
C0635R-25
RB,0.5D
C0635R-46
WO,0.5D
H
Sheet1
NK,2.5H
SJ3444
NK,1.5H
C0642-1
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
A
C0642-2
WO,0.5H
C2374D-5 C2373R-5
C0642-4
RB,0.5H
C2374D-4 C2373R-4
C0642-3
U,0.5H
C2374D-3 C2373R-3
NK,1.5H
C0643-1
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
B
C0643-2
G,0.5H
C0643-4
RB,0.5H
C2374D-1 C2373R-1
C0643-3
WU,0.5H
C2374D-7 C2373R-7


Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
C2366D-4 C2365R-4
YB,0.5D
C0635R-58
C2366D-5 C2365R-5
YN,0.5D
C0635R-45
SJ1176
YB,0.5D
C0635R-57
SJ1177
YN,0.5D
C0635R-44
HS CAN H IN Silver
HS CAN L IN Silver
HS CAN H OUT Silver
HS CAN L OUT Silver
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635R-2
B,1.0D
C0635R-3
B,1.0D
C0635R-1
B,1.5D
C0635R-5
B,1.5D
C2650R-1
TYPE 3
C0557R-1
TYPE 3
Sensor-Knock (KS)-LH (T321)
Silver
C0626D-3
S,0.5
C0634D-43
C0626D-4
G,0.5
C0634D-20
Silver
KNOCK 1B+ Silver
KNOCK 1B- Silver
KNOCK 1A + Silver
KNOCK 1A - Silver
C0634D-42
B,0.5
Silver
C0626D-1
C0634D-19
N,0.5
C0626D-2
Silver
Sensor-Knock (KS)-RH (T320)
Sensor-Mass air-flow (MAF) (T115)
AFM IAT Silver
MAF Silver
MAF GND Silver
C0634D-66
U,0.5
C0149D-4
C0634D-70
GW,0.5
C0149D-3
C0634D-18
BP,0.5
C0149D-2
C0149D-5
BG,0.5
C0149D-1
GU,1.0
K
Sheet2
P
Sheet2


Engine control-module (ECM) (D131)
B
NR,1.5
Sheet1
SJ3
NR,1.0
C0171D-1
C0521D-1
NR,1.0
SJ1
NR,0.5
C0522D-2
Fuel injector-No.1 (T172)
1A
C0522D-1
BG,0.5
C0521D-2
C0171D-2
BG,0.5
C0634D-78
INJ CYL 1A
Silver
NR,0.5
C0523D-2
Fuel injector-No.2 (T173)
2A
C0523D-1
BP,0.5
C0521D-3
C0171D-3
BG,0.5
C0634D-80
INJ CYL 2A
Silver
NR,0.5
C0524D-2
Fuel injector-No.3 (T174)
3A
C0524D-1
BG,0.5
C0521D-4
C0171D-4
BR,0.5
C0634D-82
INJ CYL 3A
Silver
NR,0.5
C0525D-2
Fuel injector-No.4 (T175)
4A
C0525D-1
BW,0.5
C0521D-5
C0171D-5
U,0.5
C0634D-84
INJ CYL 4A
Silver
NR,1.0
C2964D-1
C0521D-1
NR,1.0
SJ1
NR,0.5
C0522D-2
Fuel injector-No.5 (T176)
1B
C0522D-1
BG,0.5
C0521D-2
C2964D-2
BP,0.5
C0634D-79
INJ CYL 1B
Silver
NR,0.5
C0523D-2
Fuel injector-No.6 (T177)
2B
C0523D-1
BP,0.5
C0521D-3
C2964D-3
BW,0.5
C0634D-81
INJ CYL 2B
Silver
NR,0.5
C0524D-2
Fuel injector-No.7 (T178)
3B
C0524D-1
BG,0.5
C0521D-4
C2964D-4
BO,0.5
C0634D-83
INJ CYL 3B
Silver
NR,0.5
C0525D-2
Fuel injector-No.8 (T179)
4B
C0525D-1
BW,0.5
C0521D-5
C2964D-5
UY,0.5
C0634D-85
INJ CYL 4B
Silver

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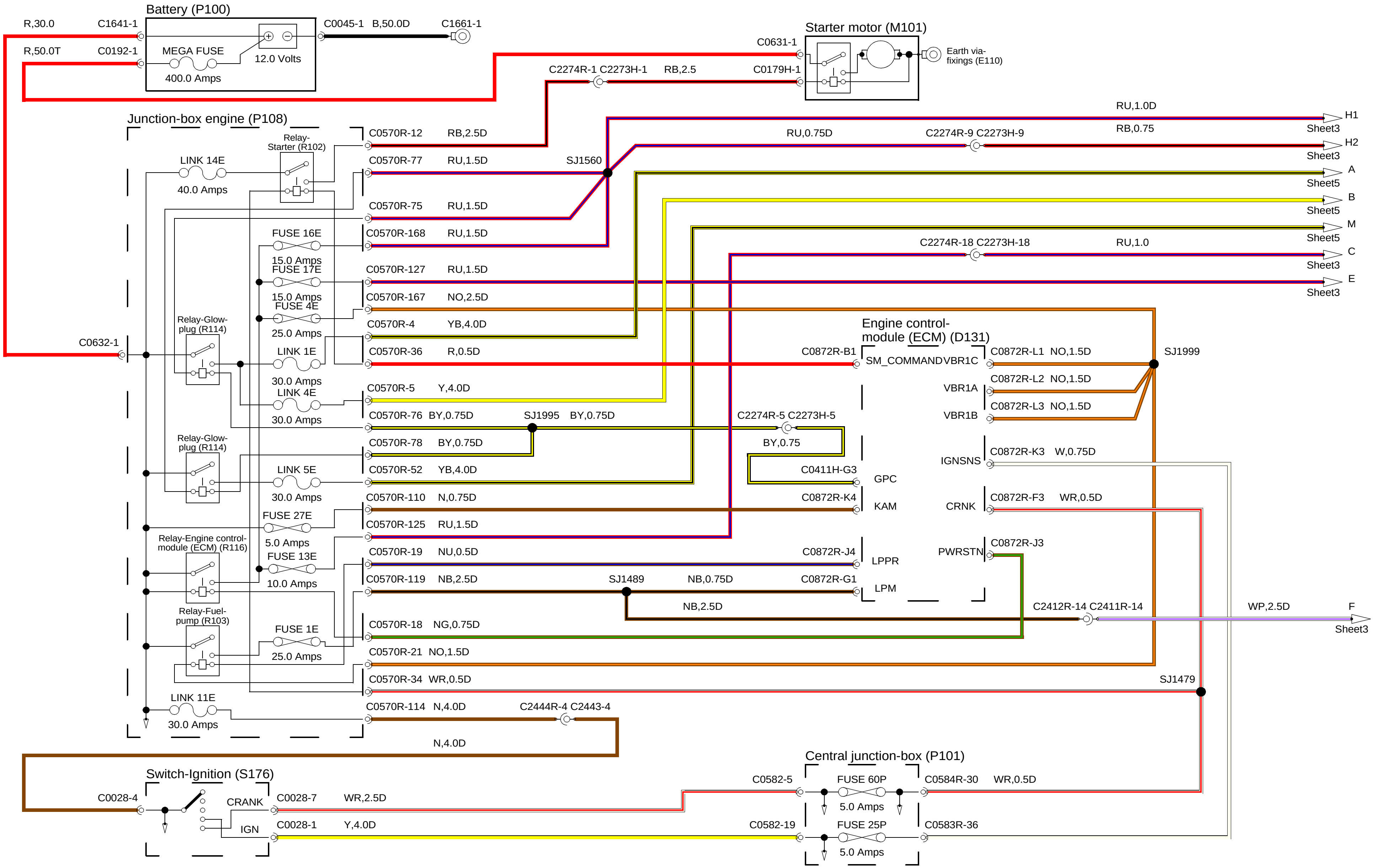
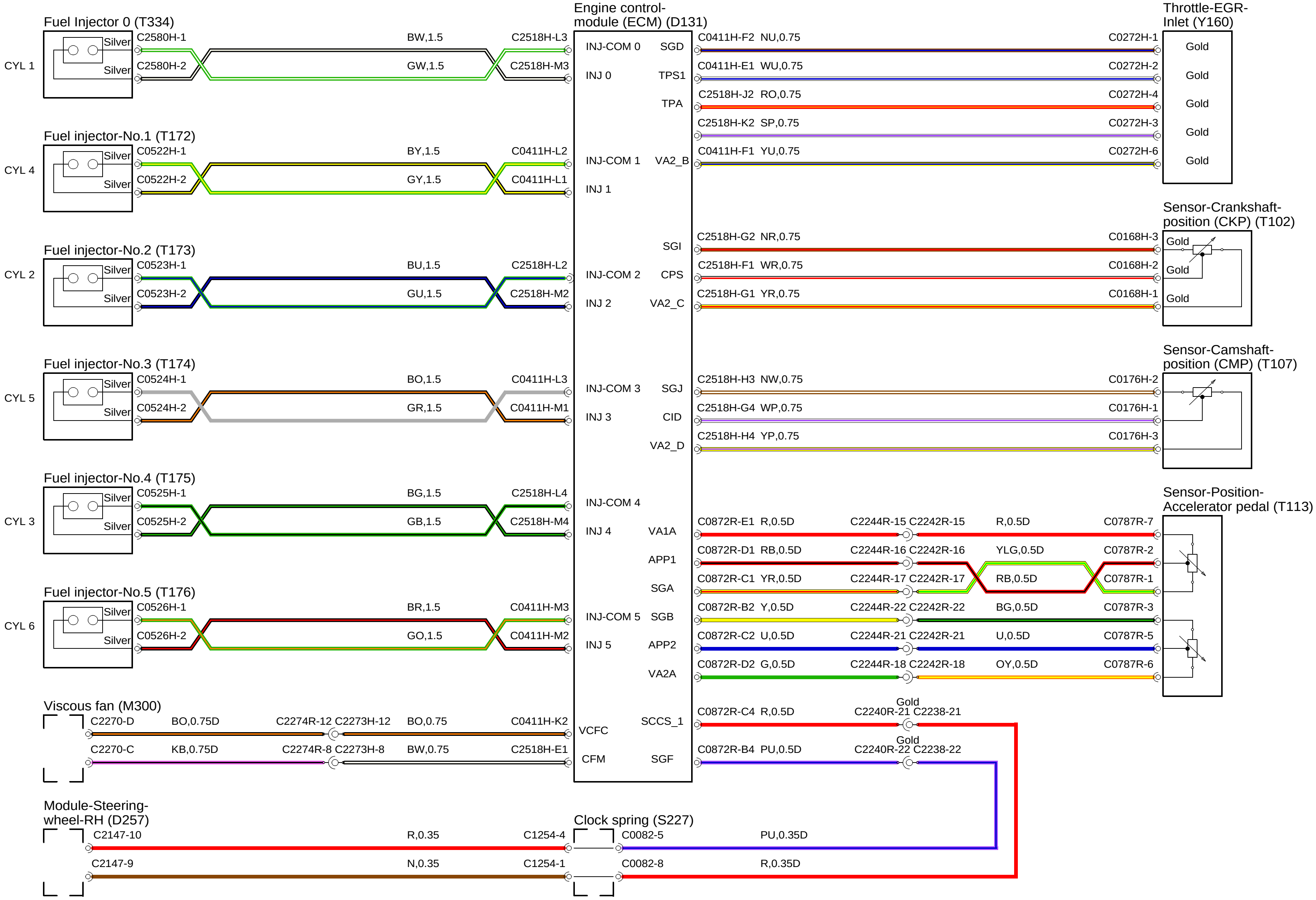
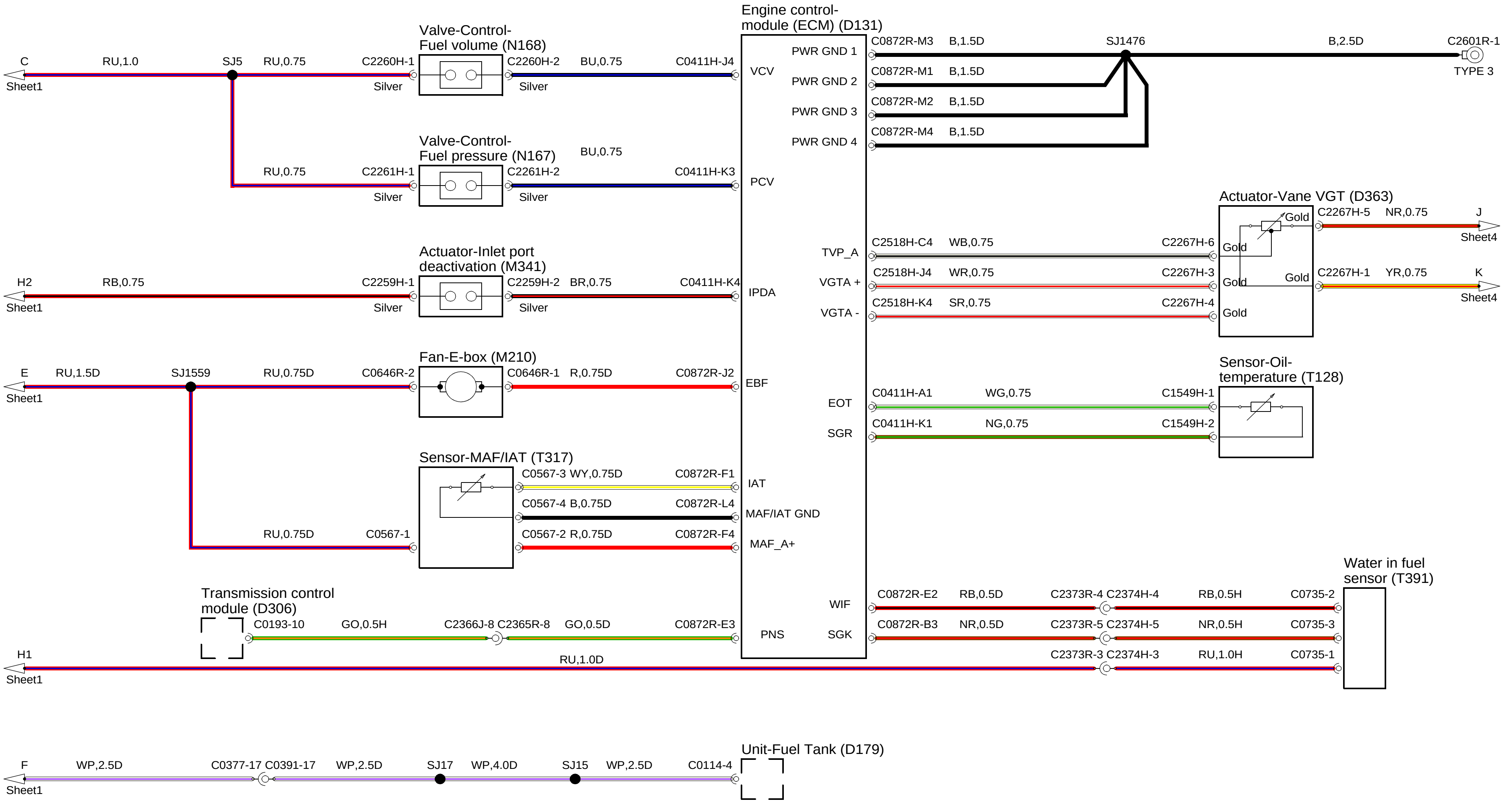
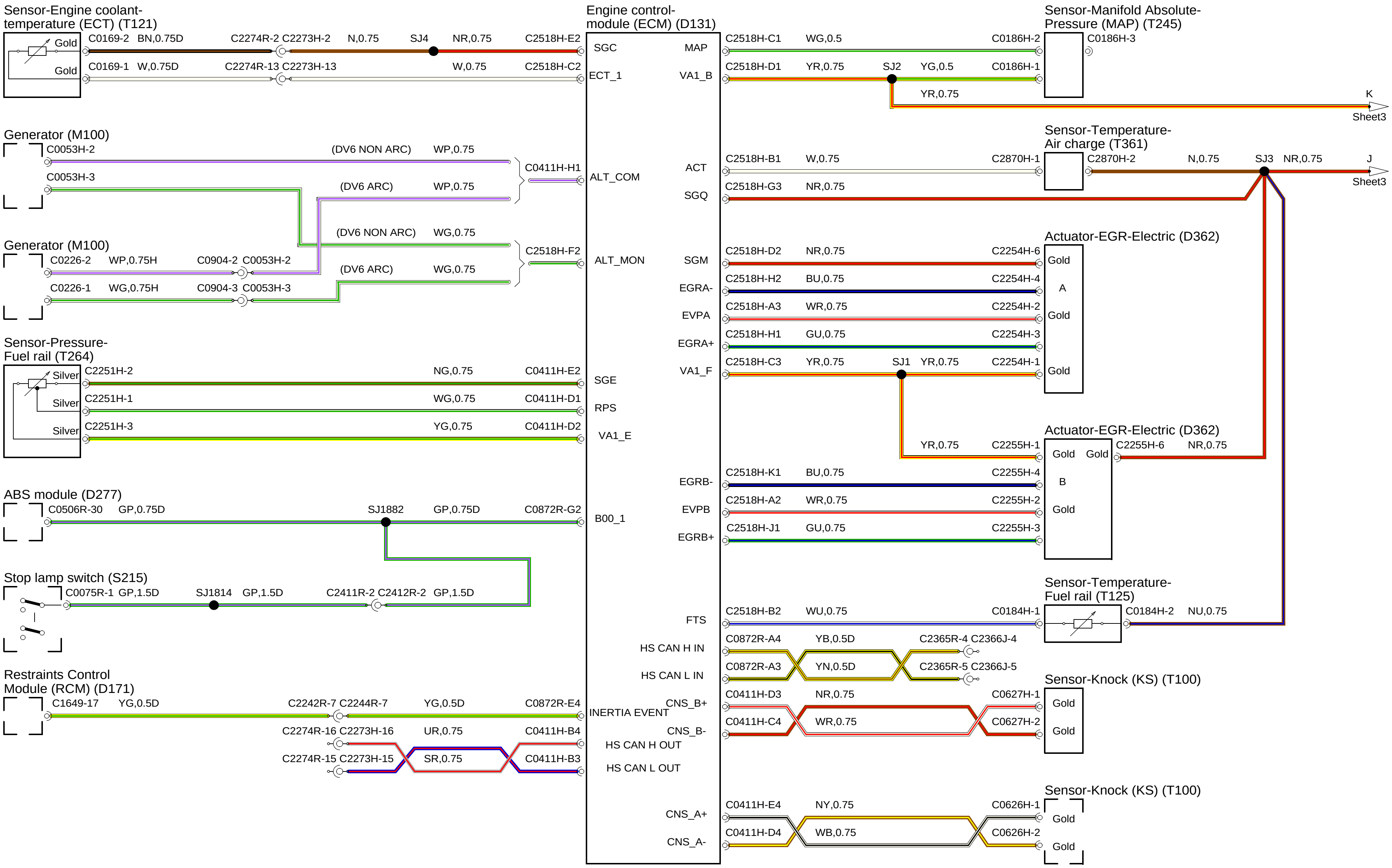
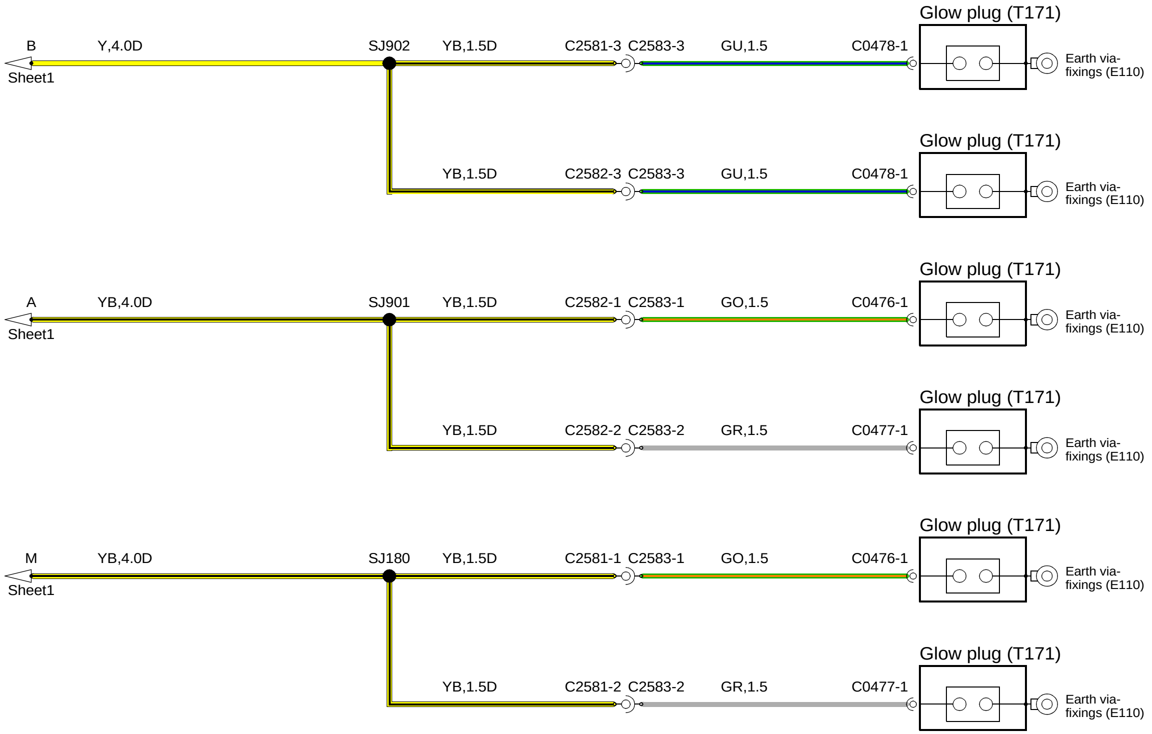
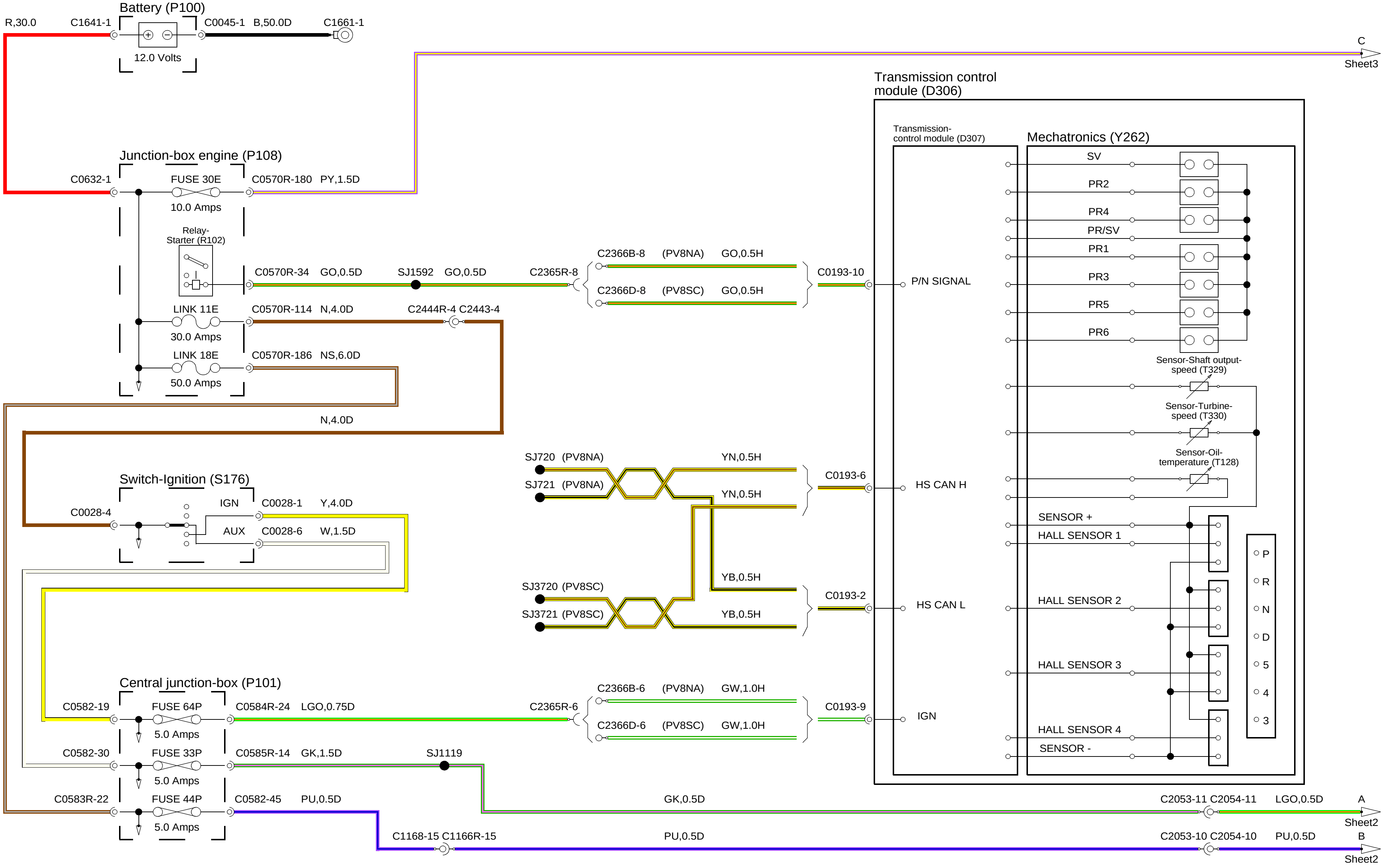

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C0179H-1
Earth via-fixings (E110)
C2274R-1 C2273H-1
RB,2.5
Junction-box engine (P108)
Relay-Starter (R102)
LINK 14E
40.0 Amps
C0570R-12
RB,2.5D
C0570R-77
RU,1.5D
SJ1560
RU,1.0D
H1
Sheet3
RU,0.75D
C2274R-9 C2273H-9
RB,0.75
H2
Sheet3
A
Sheet5
C0570R-75
RU,1.5D
B
Sheet5
FUSE 16E
15.0 Amps
C0570R-168
RU,1.5D
M
Sheet5
C2274R-18 C2273H-18
RU,1.0
C
Sheet3
FUSE 17E
15.0 Amps
C0570R-127
RU,1.5D
E
Sheet3
FUSE 4E
25.0 Amps
C0570R-167
NO,2.5D
Relay-Glow-plug (R114)
C0632-1
C0570R-4
YB,4.0D
Engine control-module (ECM) (D131)
LINK 1E
30.0 Amps
C0570R-36
R,0.5D
C0872R-B1
SM_COMMAND
VBR1C
C0872R-L1
NO,1.5D
SJ1999
C0872R-L2
NO,1.5D
LINK 4E
30.0 Amps
C0570R-5
Y,4.0D
VBR1A
C0872R-L3
NO,1.5D
C0570R-76
BY,0.75D
SJ1995
BY,0.75D
C2274R-5 C2273H-5
VBR1B
Relay-Glow-plug (R114)
C0570R-78
BY,0.75D
BY,0.75
C0872R-K3
W,0.75D
IGNSNS
LINK 5E
30.0 Amps
C0570R-52
YB,4.0D
C0411H-G3
GPC
C0570R-110
N,0.75D
C0872R-K4
KAM
CRNK
C0872R-F3
WR,0.5D
FUSE 27E
5.0 Amps
C0570R-125
RU,1.5D
Relay-Engine control-module (ECM) (R116)
C0872R-J3
PWRSTN
FUSE 13E
10.0 Amps
C0570R-19
NU,0.5D
C0872R-J4
LPPR
C0570R-119
NB,2.5D
SJ1489
NB,0.75D
C0872R-G1
LPM
NB,2.5D
C2412R-14 C2411R-14
WP,2.5D
F
Sheet3
Relay-Fuel-pump (R103)
FUSE 1E
25.0 Amps
C0570R-18
NG,0.75D
C0570R-21
NO,1.5D
C0570R-34
WR,0.5D
SJ1479
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Central junction-box (P101)
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584R-30
WR,0.5D
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583R-36

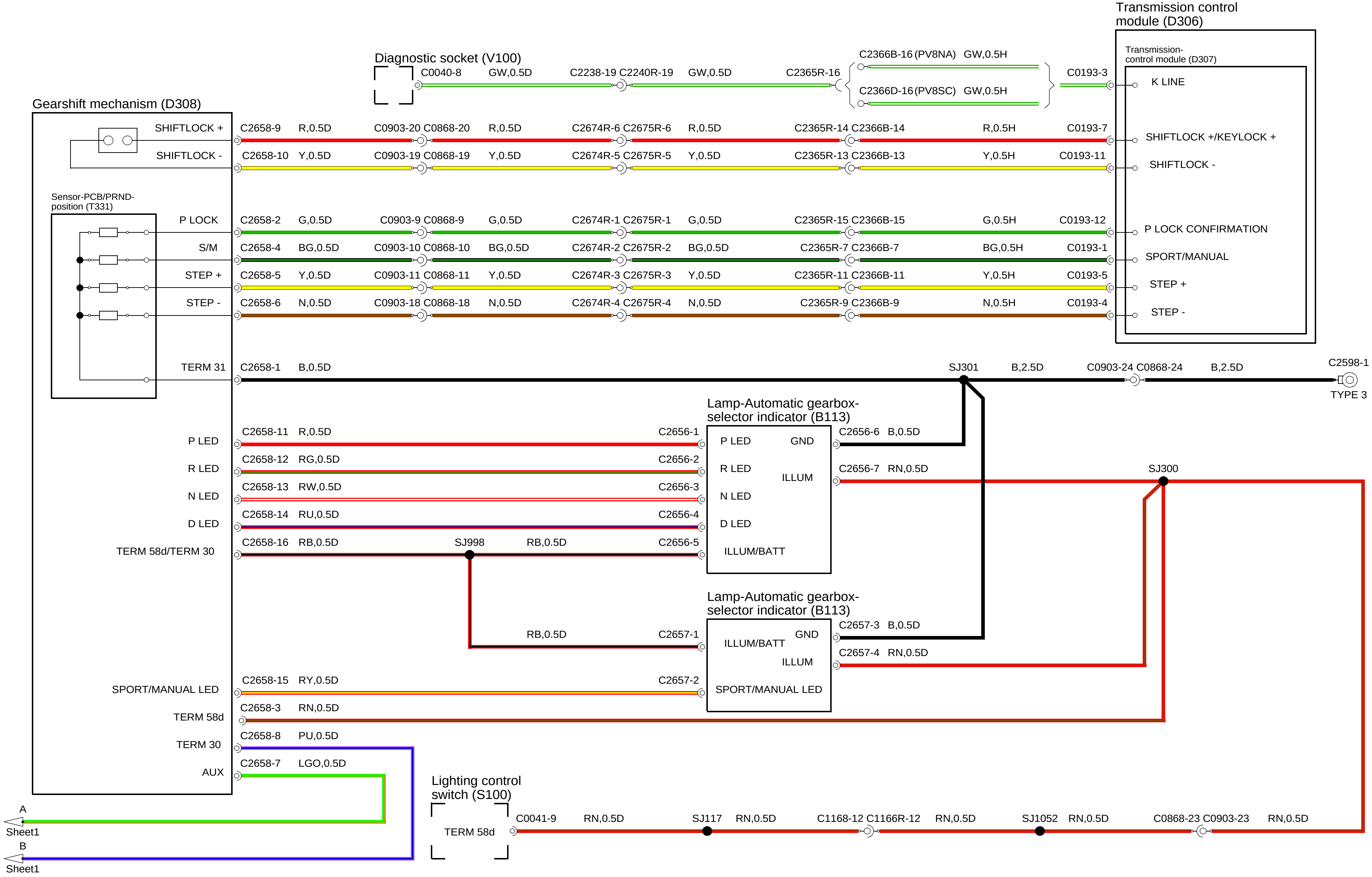

Fuel Injector 0 (T334)
CYL 1
Silver
Silver
C2580H-1
C2580H-2
BW,1.5
GW,1.5
C2518H-L3
C2518H-M3
Engine control-module (ECM) (D131)
INJ-COM 0
INJ 0
SGD
TPS1
TPA
C0411H-F2 NU,0.75
C0411H-E1 WU,0.75
C2518H-J2 RO,0.75
C2518H-K2 SP,0.75
C0411H-F1 YU,0.75
C0272H-1
C0272H-2
C0272H-4
C0272H-3
C0272H-6
Throttle-EGR-Inlet (Y160)
Gold
Gold
Gold
Gold
Gold
Fuel injector-No.1 (T172)
CYL 4
Silver
Silver
C0522H-1
C0522H-2
BY,1.5
GY,1.5
C0411H-L2
C0411H-L1
INJ-COM 1
INJ 1
VA2_B
Sensor-Crankshaft-position (CKP) (T102)
SGI
CPS
VA2_C
C2518H-G2 NR,0.75
C2518H-F1 WR,0.75
C2518H-G1 YR,0.75
C0168H-3
C0168H-2
C0168H-1
Gold
Gold
Gold
Fuel injector-No.2 (T173)
CYL 2
Silver
Silver
C0523H-1
C0523H-2
BU,1.5
GU,1.5
C2518H-L2
C2518H-M2
INJ-COM 2
INJ 2
Fuel injector-No.3 (T174)
CYL 5
Silver
Silver
C0524H-1
C0524H-2
BO,1.5
GR,1.5
C0411H-L3
C0411H-M1
INJ-COM 3
INJ 3
SGJ
CID
VA2_D
Sensor-Camshaft-position (CMP) (T107)
C2518H-H3 NW,0.75
C2518H-G4 WP,0.75
C2518H-H4 YP,0.75
C0176H-2
C0176H-1
C0176H-3
Fuel injector-No.4 (T175)
CYL 3
Silver
Silver
C0525H-1
C0525H-2
BG,1.5
GB,1.5
C2518H-L4
C2518H-M4
INJ-COM 4
INJ 4
VA1A
APP1
SGA
SGB
APP2
VA2A
Sensor-Position-Accelerator pedal (T113)
C0872R-E1 R,0.5D
C0872R-D1 RB,0.5D
C0872R-C1 YR,0.5D
C0872R-B2 Y,0.5D
C0872R-C2 U,0.5D
C0872R-D2 G,0.5D
C2244R-15 C2242R-15
C2244R-16 C2242R-16
C2244R-17 C2242R-17
C2244R-22 C2242R-22
C2244R-21 C2242R-21
C2244R-18 C2242R-18
R,0.5D
YLG,0.5D
RB,0.5D
BG,0.5D
U,0.5D
OY,0.5D
C0787R-7
C0787R-2
C0787R-1
C0787R-3
C0787R-5
C0787R-6
Fuel injector-No.5 (T176)
CYL 6
Silver
Silver
C0526H-1
C0526H-2
BR,1.5
GO,1.5
C0411H-M3
C0411H-M2
INJ-COM 5
INJ 5
Viscous fan (M300)
C2270-D
BO,0.75D
C2274R-12 C2273H-12
BO,0.75
C0411H-K2
C2270-C
KB,0.75D
C2274R-8 C2273H-8
BW,0.75
C2518H-E1
VCFC
CFM
SCCS_1
SGF
C0872R-C4 R,0.5D
C0872R-B4 PU,0.5D
Gold
C2240R-21 C2238-21
Gold
C2240R-22 C2238-22
Module-Steering-wheel-RH (D257)
C2147-10
C2147-9
R,0.35
N,0.35
C1254-4
C1254-1
Clock spring (S227)
C0082-5
C0082-8
PU,0.35D
R,0.35D

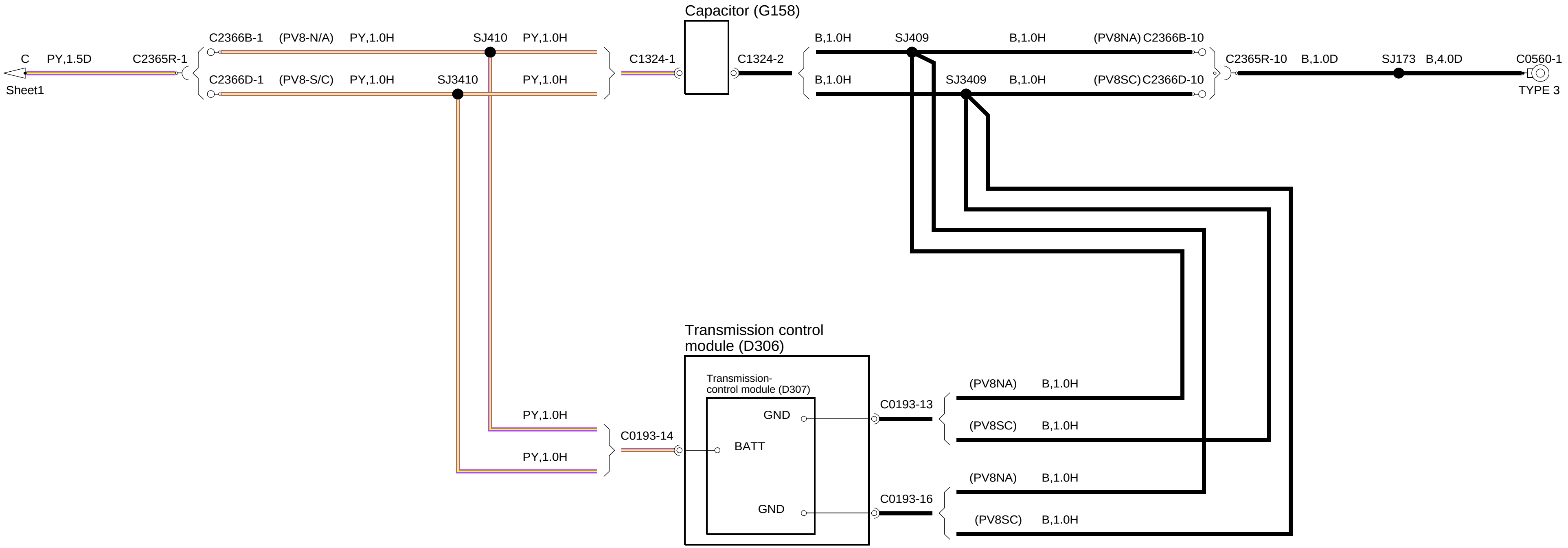

Engine control-
module (ECM) (D131)
Valve-Control-
Fuel volume (N168)
C
Sheet1
RU,1.0
SJ5
RU,0.75
C2260H-1
Silver
C2260H-2
Silver
BU,0.75
C0411H-J4
VCV
PWR GND 1
PWR GND 2
PWR GND 3
PWR GND 4
C0872R-M3
B,1.5D
C0872R-M1
B,1.5D
C0872R-M2
B,1.5D
C0872R-M4
B,1.5D
SJ1476
B,2.5D
C2601R-1
TYPE 3
Valve-Control-
Fuel pressure (N167)
RU,0.75
C2261H-1
Silver
C2261H-2
Silver
BU,0.75
C0411H-K3
PCV
Actuator-Vane VGT (D363)
C2267H-5
NR,0.75
J
Sheet4
Gold
TVP_A
C2518H-C4
WB,0.75
C2267H-6
Gold
Actuator-Inlet port
deactivation (M341)
H2
Sheet1
RB,0.75
C2259H-1
Silver
C2259H-2
Silver
BR,0.75
C0411H-K4
IPDA
VGTA +
C2518H-J4
WR,0.75
C2267H-3
Gold
Gold
C2267H-1
YR,0.75
K
Sheet4
VGTA -
C2518H-K4
SR,0.75
C2267H-4
Gold
Fan-E-box (M210)
E
Sheet1
RU,1.5D
SJ1559
RU,0.75D
C0646R-2
C0646R-1
R,0.75D
C0872R-J2
EBF
Sensor-Oil-
temperature (T128)
EOT
C0411H-A1
WG,0.75
C1549H-1
SGR
C0411H-K1
NG,0.75
C1549H-2
Sensor-MAF/IAT (T317)
C0567-3 WY,0.75D
C0872R-F1
IAT
C0567-4 B,0.75D
C0872R-L4
MAF/IAT GND
RU,0.75D
C0567-1
C0567-2 R,0.75D
C0872R-F4
MAF_A+
Water in fuel
sensor (T391)
Transmission control
module (D306)
WIF
C0872R-E2
RB,0.5D
C2373R-4 C2374H-4
RB,0.5H
C0735-2
C0193-10
GO,0.5H
C2366J-8 C2365R-8
GO,0.5D
C0872R-E3
PNS
SGK
C0872R-B3
NR,0.5D
C2373R-5 C2374H-5
NR,0.5H
C0735-3
H1
Sheet1
RU,1.0D
C2373R-3 C2374H-3
RU,1.0H
C0735-1
Unit-Fuel Tank (D179)
F
Sheet1
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4

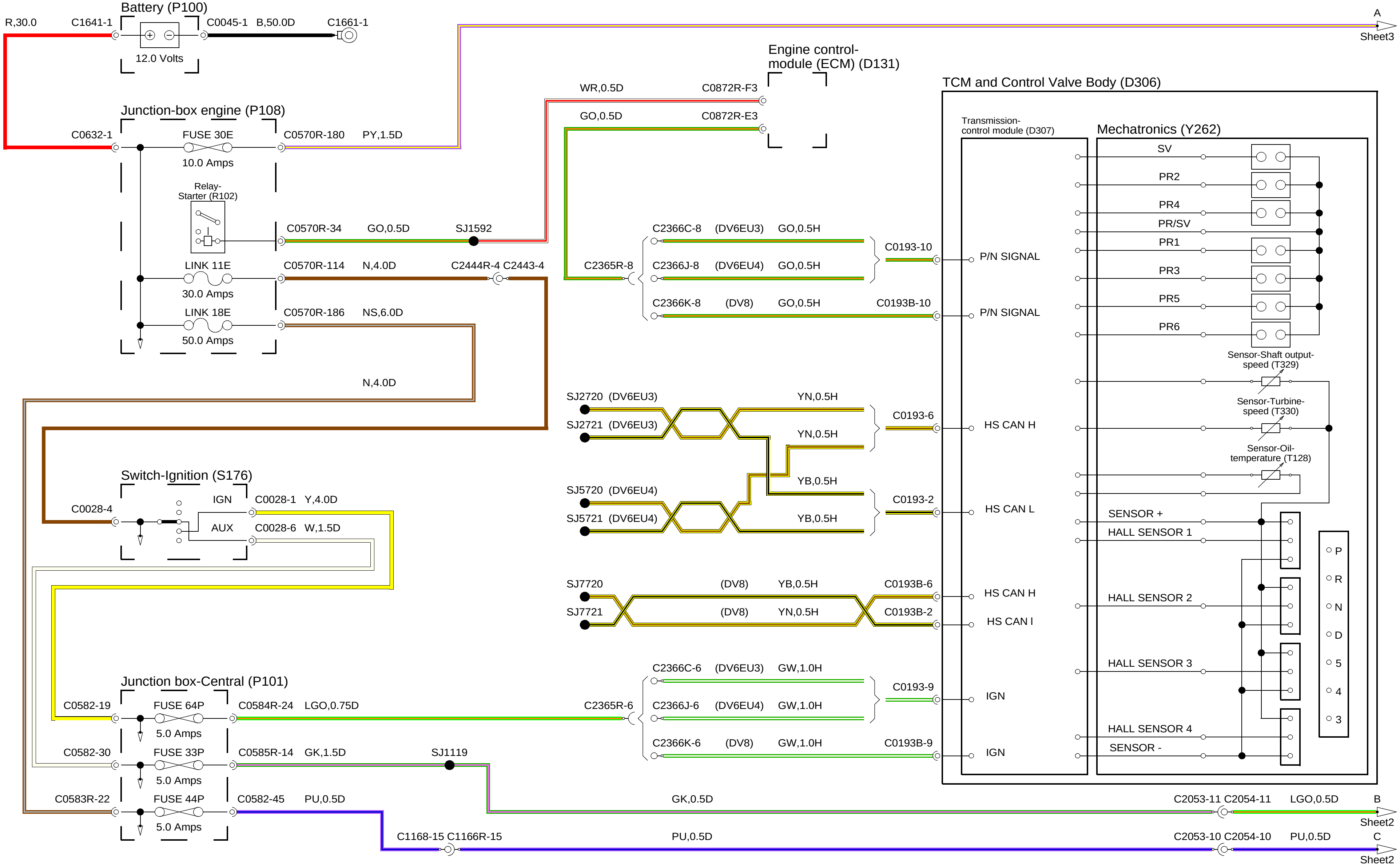

Sensor-Engine coolant-temperature (ECT) (T121)
Gold
Gold
C0169-2 BN,0.75D
C2274R-2 C2273H-2
N,0.75
SJ4
NR,0.75
C2518H-E2
C0169-1 W,0.75D
C2274R-13 C2273H-13
W,0.75
C2518H-C2
Generator (M100)
C0053H-2
(DV6 NON ARC) WP,0.75
C0053H-3
(DV6 ARC) WP,0.75
C0411H-H1
(DV6 NON ARC) WG,0.75
Generator (M100)
C0226-2 WP,0.75H
C0904-2 C0053H-2
(DV6 ARC) WG,0.75
C2518H-F2
C0226-1 WG,0.75H
C0904-3 C0053H-3
Sensor-Pressure-Fuel rail (T264)
Silver
Silver
Silver
C2251H-2 NG,0.75 C0411H-E2
C2251H-1 WG,0.75 C0411H-D1
C2251H-3 YG,0.75 C0411H-D2
ABS module (D277)
C0506R-30 GP,0.75D
SJ1882 GP,0.75D C0872R-G2
Stop lamp switch (S215)
C0075R-1 GP,1.5D
SJ1814 GP,1.5D
C2411R-2 C2412R-2 GP,1.5D
Restraints Control Module (RCM) (D171)
C1649-17 YG,0.5D
C2242R-7 C2244R-7 YG,0.5D C0872R-E4
C2274R-16 C2273H-16 UR,0.75 C0411H-B4
C2274R-15 C2273H-15 SR,0.75 C0411H-B3
Engine control-module (ECM) (D131)
SGC
ECT_1
ALT_COM
ALT_MON
SGE
RPS
VA1_E
B00_1
INERTIA EVENT
HS CAN H OUT
HS CAN L OUT
MAP
VA1_B
ACT
SGQ
SGM
EGRA-
EVPA
EGRA+
VA1_F
EGRB-
EVPB
EGRB+
FTS
HS CAN H IN
HS CAN L IN
CNS_B+
CNS_B-
CNS_A+
CNS_A-
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C2518H-C1 WG,0.5 C0186H-2
C0186H-3
C2518H-D1 YR,0.75 SJ2 YG,0.5 C0186H-1
YR,0.75
K
Sheet3
Sensor-Temperature-Air charge (T361)
C2518H-B1 W,0.75 C2870H-1
C2870H-2 N,0.75 SJ3 NR,0.75
J
Sheet3
C2518H-G3 NR,0.75
Actuator-EGR-Electric (D362)
C2518H-D2 NR,0.75 C2254H-6
Gold
C2518H-H2 BU,0.75 C2254H-4
A
C2518H-A3 WR,0.75 C2254H-2
Gold
C2518H-H1 GU,0.75 C2254H-3
C2518H-C3 YR,0.75 SJ1 YR,0.75 C2254H-1
Gold
Actuator-EGR-Electric (D362)
YR,0.75 C2255H-1
Gold Gold
C2255H-6 NR,0.75
C2518H-K1 BU,0.75 C2255H-4
B
C2518H-A2 WR,0.75 C2255H-2
Gold
C2518H-J1 GU,0.75 C2255H-3
Sensor-Temperature-Fuel rail (T125)
C2518H-B2 WU,0.75 C0184H-1
C0184H-2 NU,0.75
C0872R-A4 YB,0.5D
C2365R-4 C2366J-4
C0872R-A3 YN,0.5D
C2365R-5 C2366J-5
Sensor-Knock (KS) (T100)
C0411H-D3 NR,0.75 C0627H-1
Gold
C0411H-C4 WR,0.75 C0627H-2
Gold
Sensor-Knock (KS) (T100)
C0411H-E4 NY,0.75 C0626H-1
Gold
C0411H-D4 WB,0.75 C0626H-2
Gold

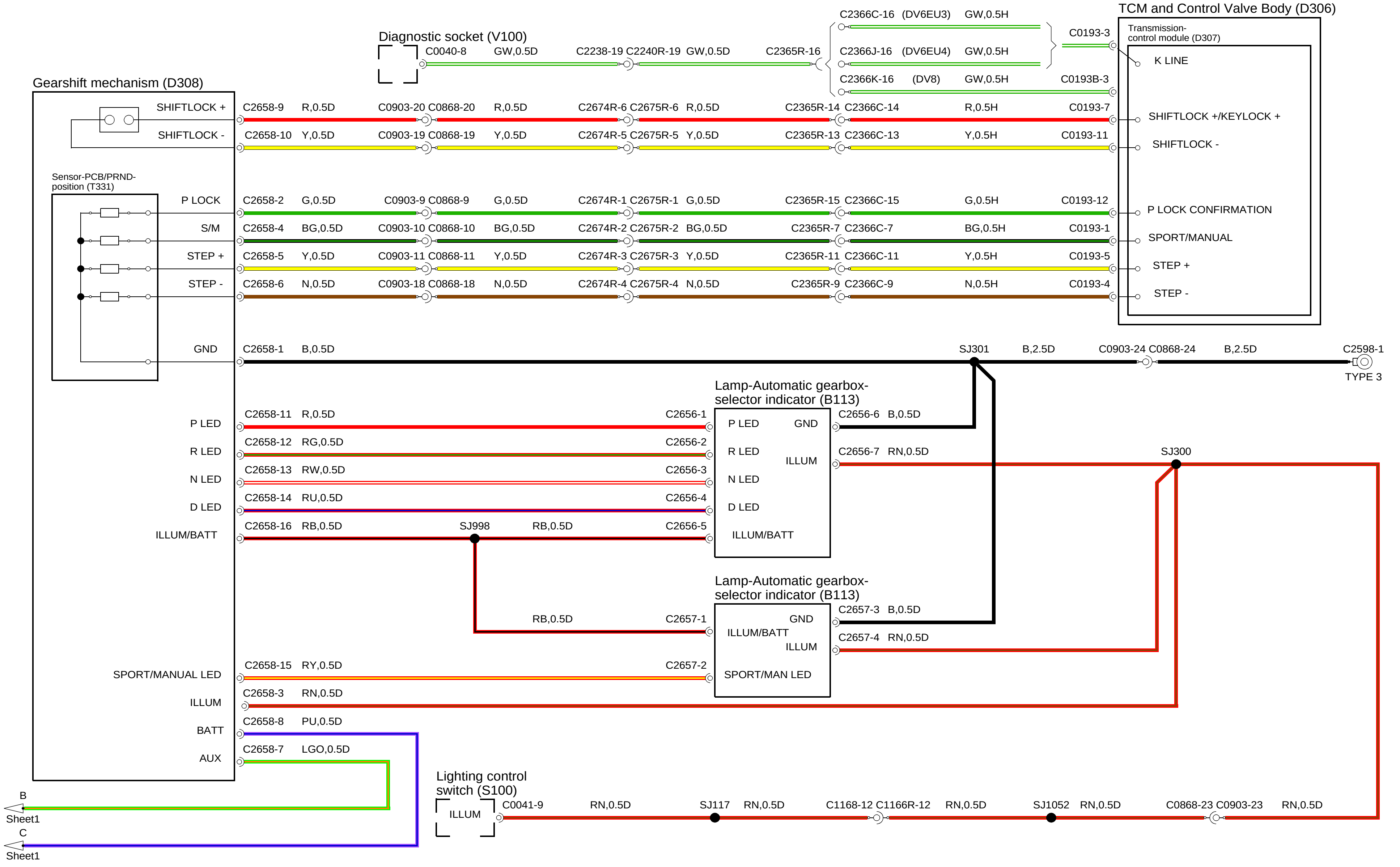

Glow plug (T171)
B
Sheet1
Y,4.0D
SJ902
YB,1.5D
C2581-3
C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-3
C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
A
Sheet1
YB,4.0D
SJ901
YB,1.5D
C2582-1
C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-2
C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
M
Sheet1
YB,4.0D
SJ180
YB,1.5D
C2581-1
C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-2
C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)

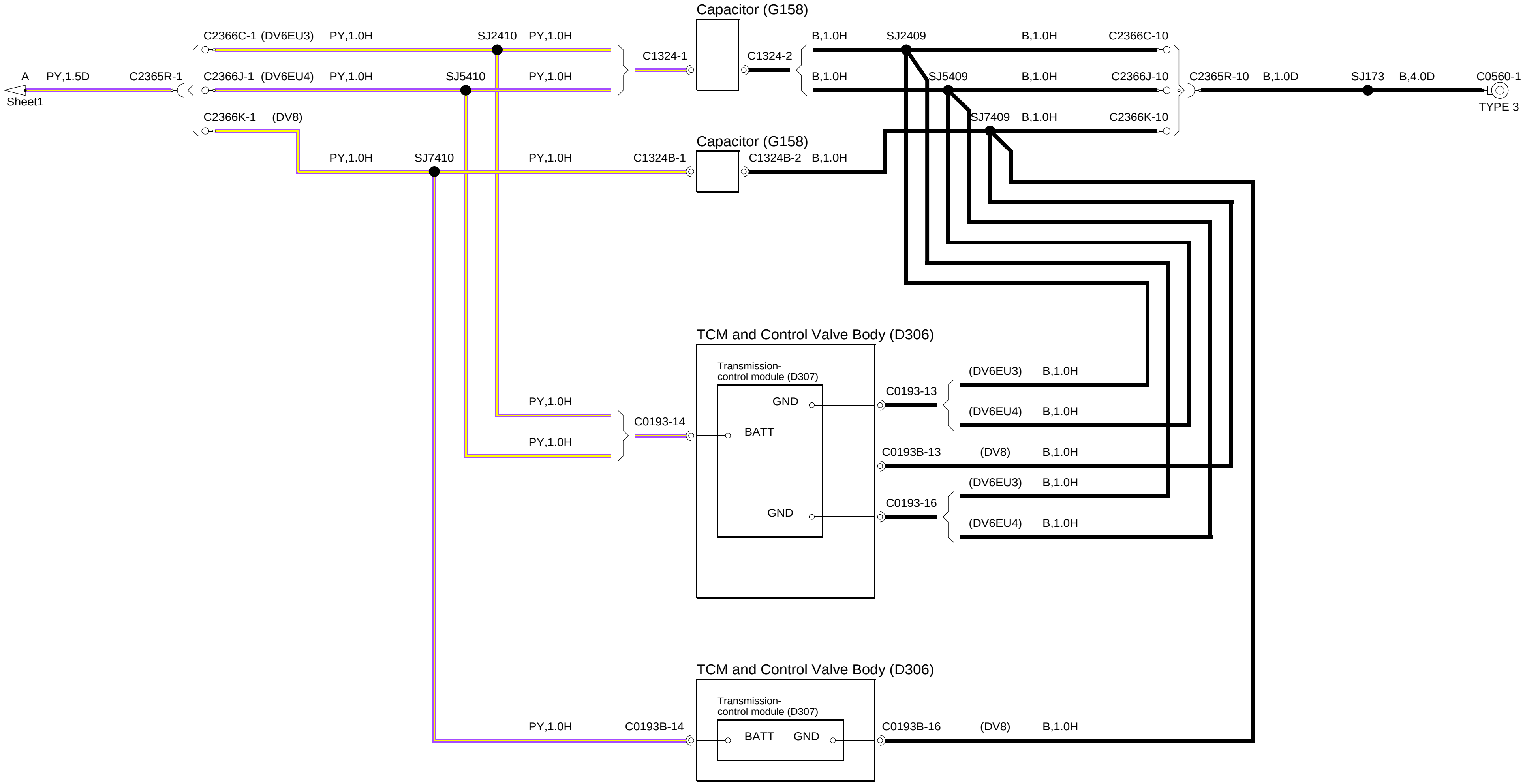

Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
12.0 Volts
C
Sheet3
Transmission control module (D306)
Transmission-control module (D307)
Mechatronics (Y262)
SV
PR2
PR4
PR/SV
PR1
PR3
PR5
PR6
Sensor-Shaft output-speed (T329)
Sensor-Turbine-speed (T330)
Sensor-Oil-temperature (T128)
Junction-box engine (P108)
C0632-1
FUSE 30E
10.0 Amps
C0570R-180 PY,1.5D
Relay-Starter (R102)
C0570R-34 GO,0.5D
SJ1592 GO,0.5D
C2365R-8
C2366B-8 (PV8NA) GO,0.5H
C2366D-8 (PV8SC) GO,0.5H
C0193-10
P/N SIGNAL
LINK 11E
30.0 Amps
C0570R-114 N,4.0D
C2444R-4 C2443-4
LINK 18E
50.0 Amps
C0570R-186 NS,6.0D
N,4.0D
SJ720 (PV8NA)
SJ721 (PV8NA)
YN,0.5H
YN,0.5H
C0193-6
HS CAN H
Switch-Ignition (S176)
C0028-4
IGN
C0028-1 Y,4.0D
AUX
C0028-6 W,1.5D
SENSOR +
HALL SENSOR 1
P
R
N
D
5
4
3
YB,0.5H
SJ3720 (PV8SC)
SJ3721 (PV8SC)
YB,0.5H
C0193-2
HS CAN L
HALL SENSOR 2
HALL SENSOR 3
Central junction-box (P101)
C0582-19
FUSE 64P
5.0 Amps
C0584R-24 LGO,0.75D
C2365R-6
C2366B-6 (PV8NA) GW,1.0H
C2366D-6 (PV8SC) GW,1.0H
C0193-9
IGN
HALL SENSOR 4
SENSOR -
C0582-30
FUSE 33P
5.0 Amps
C0585R-14 GK,1.5D
SJ1119
C0583R-22
FUSE 44P
5.0 Amps
C0582-45 PU,0.5D
GK,0.5D
C2053-11 C2054-11 LGO,0.5D
A
Sheet2
C1168-15 C1166R-15
PU,0.5D
C2053-10 C2054-10 PU,0.5D
B
Sheet2

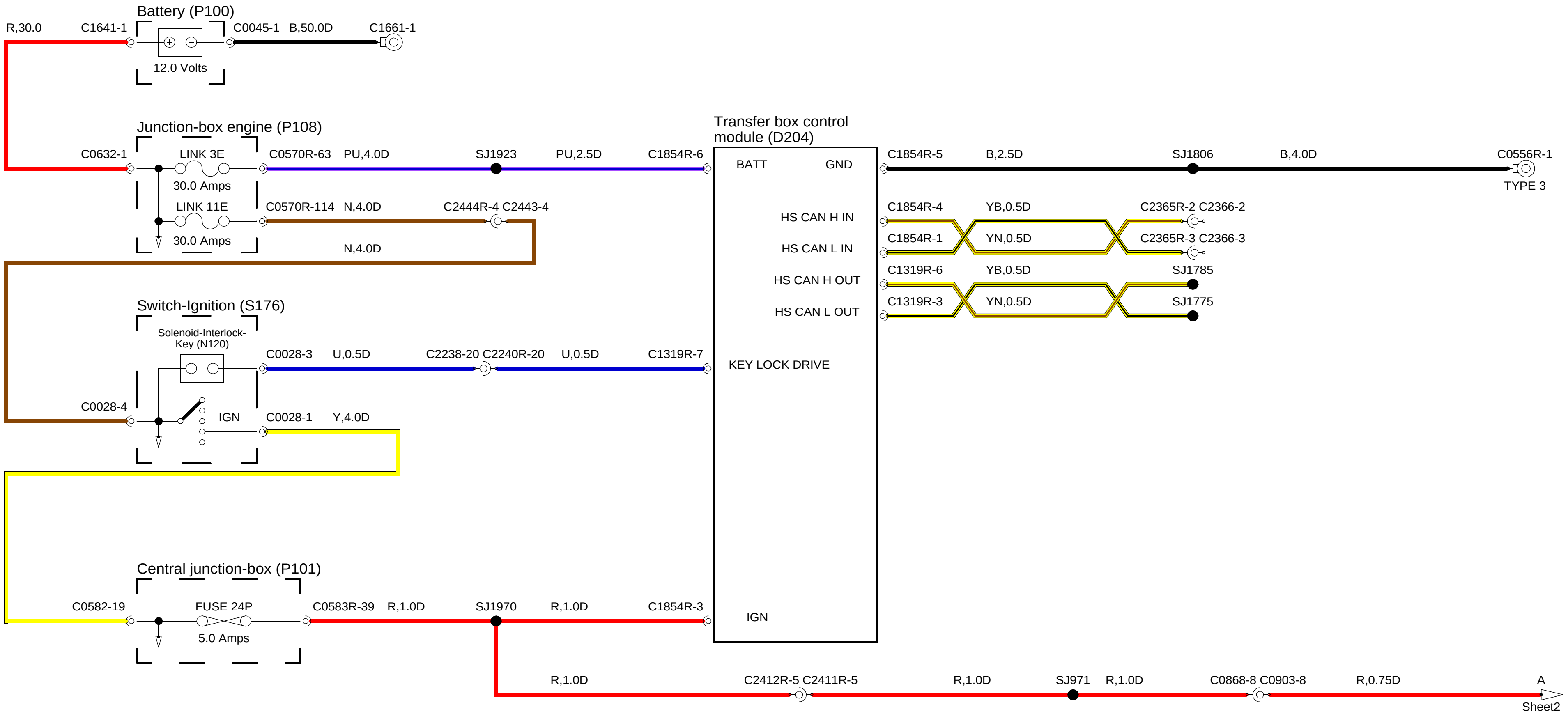

Transmission control module (D306)
Transmission-control module (D307)
K LINE
SHIFTLOCK +/KEYLOCK +
SHIFTLOCK -
P LOCK CONFIRMATION
SPORT/MANUAL
STEP +
STEP -
Diagnostic socket (V100)
C0040-8 GW,0.5D
C2238-19 C2240R-19 GW,0.5D
C2365R-16
C2366B-16 (PV8NA) GW,0.5H
C2366D-16 (PV8SC) GW,0.5H
C0193-3
Gearshift mechanism (D308)
SHIFTLOCK +
SHIFTLOCK -
Sensor-PCB/PRND-position (T331)
P LOCK
S/M
STEP +
STEP -
TERM 31
P LED
R LED
N LED
D LED
TERM 58d/TERM 30
SPORT/MANUAL LED
TERM 58d
TERM 30
AUX
C2658-9 R,0.5D C0903-20 C0868-20 R,0.5D C2674R-6 C2675R-6 R,0.5D C2365R-14 C2366B-14 R,0.5H C0193-7
C2658-10 Y,0.5D C0903-19 C0868-19 Y,0.5D C2674R-5 C2675R-5 Y,0.5D C2365R-13 C2366B-13 Y,0.5H C0193-11
C2658-2 G,0.5D C0903-9 C0868-9 G,0.5D C2674R-1 C2675R-1 G,0.5D C2365R-15 C2366B-15 G,0.5H C0193-12
C2658-4 BG,0.5D C0903-10 C0868-10 BG,0.5D C2674R-2 C2675R-2 BG,0.5D C2365R-7 C2366B-7 BG,0.5H C0193-1
C2658-5 Y,0.5D C0903-11 C0868-11 Y,0.5D C2674R-3 C2675R-3 Y,0.5D C2365R-11 C2366B-11 Y,0.5H C0193-5
C2658-6 N,0.5D C0903-18 C0868-18 N,0.5D C2674R-4 C2675R-4 N,0.5D C2365R-9 C2366B-9 N,0.5H C0193-4
C2658-1 B,0.5D SJ301 B,2.5D C0903-24 C0868-24 B,2.5D C2598-1 TYPE 3
Lamp-Automatic gearbox-selector indicator (B113)
C2658-11 R,0.5D C2656-1
C2658-12 RG,0.5D C2656-2
C2658-13 RW,0.5D C2656-3
C2658-14 RU,0.5D C2656-4
C2658-16 RB,0.5D SJ998 RB,0.5D C2656-5
P LED
GND
R LED
ILLUM
N LED
D LED
ILLUM/BATT
C2656-6 B,0.5D
C2656-7 RN,0.5D
SJ300
Lamp-Automatic gearbox-selector indicator (B113)
RB,0.5D C2657-1
ILLUM/BATT
GND
ILLUM
SPORT/MANUAL LED
C2657-3 B,0.5D
C2657-4 RN,0.5D
C2658-15 RY,0.5D C2657-2
C2658-3 RN,0.5D
C2658-8 PU,0.5D
C2658-7 LGO,0.5D
A
Sheet1
B
Sheet1
Lighting control switch (S100)
TERM 58d
C0041-9 RN,0.5D SJ117 RN,0.5D C1168-12 C1166R-12 RN,0.5D SJ1052 RN,0.5D C0868-23 C0903-23 RN,0.5D

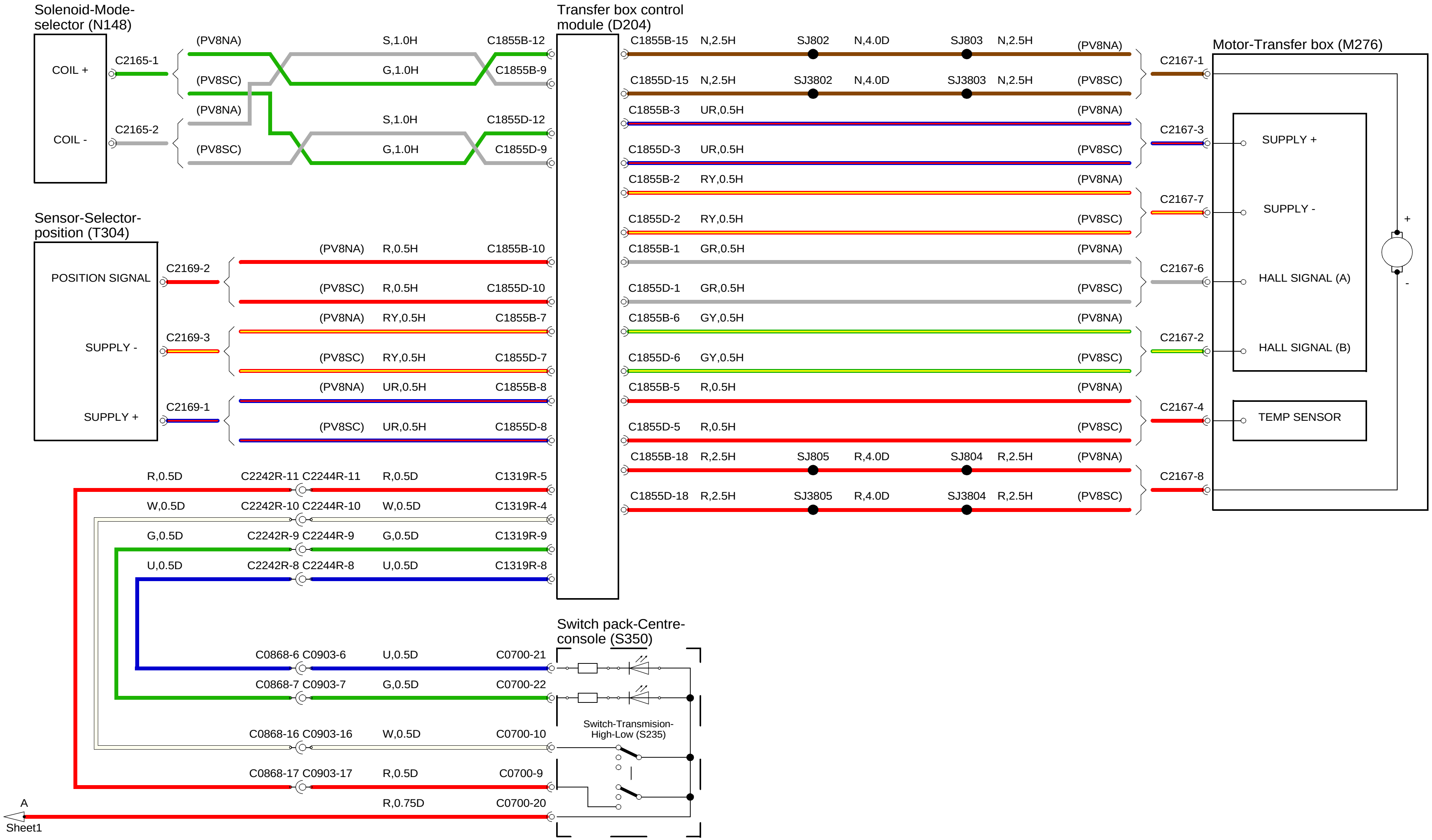

Capacitor (G158)
C PY,1.5D C2365R-1
Sheet1
C2366B-1 (PV8-N/A) PY,1.0H
SJ410 PY,1.0H
C2366D-1 (PV8-S/C) PY,1.0H
SJ3410 PY,1.0H
C1324-1
C1324-2
B,1.0H SJ409 B,1.0H (PV8NA) C2366B-10
B,1.0H SJ3409 B,1.0H (PV8SC) C2366D-10
C2365R-10 B,1.0D SJ173 B,4.0D C0560-1
TYPE 3
Transmission control module (D306)
Transmission-control module (D307)
GND
BATT
GND
PY,1.0H
C0193-14
PY,1.0H
C0193-13
(PV8NA) B,1.0H
(PV8SC) B,1.0H
C0193-16
(PV8NA) B,1.0H
(PV8SC) B,1.0H

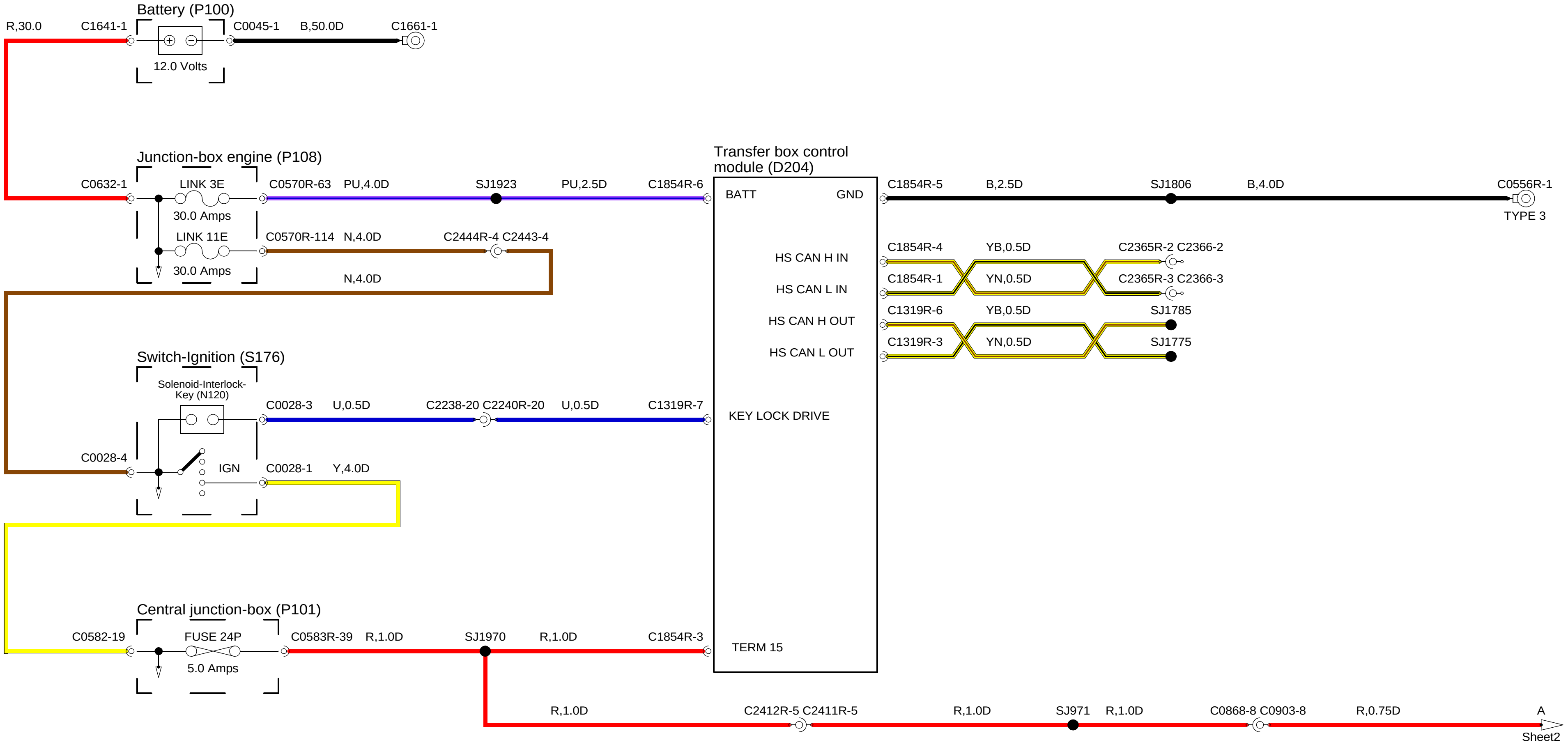

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
A
Sheet3
Engine control-module (ECM) (D131)
WR,0.5D
C0872R-F3
GO,0.5D
C0872R-E3
TCM and Control Valve Body (D306)
Transmission-control module (D307)
Mechatronics (Y262)
Junction-box engine (P108)
C0632-1
FUSE 30E
10.0 Amps
C0570R-180
PY,1.5D
Relay-Starter (R102)
C0570R-34
GO,0.5D
SJ1592
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
N,4.0D
C2365R-8
C2366C-8 (DV6EU3) GO,0.5H
C2366J-8 (DV6EU4) GO,0.5H
C2366K-8 (DV8) GO,0.5H
C0193-10
C0193B-10
P/N SIGNAL
P/N SIGNAL
SV
PR2
PR4
PR/SV
PR1
PR3
PR5
PR6
Sensor-Shaft output-speed (T329)
Sensor-Turbine-speed (T330)
Sensor-Oil-temperature (T128)
SJ2720 (DV6EU3)
SJ2721 (DV6EU3)
YN,0.5H
YN,0.5H
C0193-6
HS CAN H
SJ5720 (DV6EU4)
SJ5721 (DV6EU4)
YB,0.5H
YB,0.5H
C0193-2
HS CAN L
Switch-Ignition (S176)
C0028-4
IGN
C0028-1 Y,4.0D
AUX
C0028-6 W,1.5D
SENSOR +
HALL SENSOR 1
P
R
N
D
5
4
3
SJ7720
SJ7721
(DV8) YB,0.5H
(DV8) YN,0.5H
C0193B-6
C0193B-2
HS CAN H
HS CAN l
HALL SENSOR 2
HALL SENSOR 3
HALL SENSOR 4
SENSOR -
Junction box-Central (P101)
C0582-19
FUSE 64P
5.0 Amps
C0584R-24 LGO,0.75D
C2365R-6
C2366C-6 (DV6EU3) GW,1.0H
C2366J-6 (DV6EU4) GW,1.0H
C2366K-6 (DV8) GW,1.0H
C0193-9
C0193B-9
IGN
IGN
C0582-30
FUSE 33P
5.0 Amps
C0585R-14 GK,1.5D
SJ1119
C0583R-22
FUSE 44P
5.0 Amps
C0582-45 PU,0.5D
GK,0.5D
C2053-11 C2054-11 LGO,0.5D
B
Sheet2
C1168-15 C1166R-15
PU,0.5D
C2053-10 C2054-10 PU,0.5D
C
Sheet2

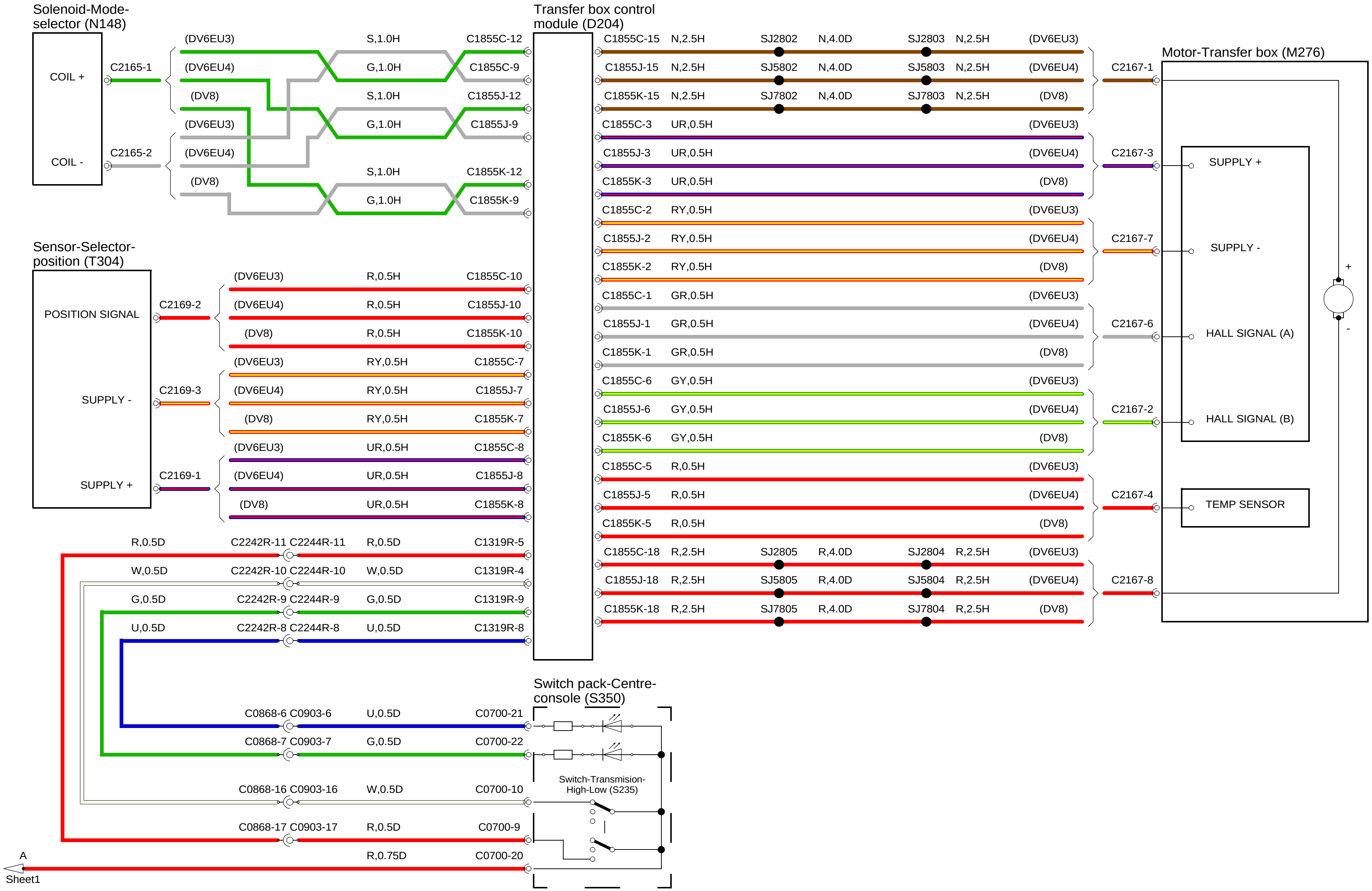

TCM and Control Valve Body (D306)
Transmission-control module (D307)
K LINE
SHIFTLOCK +/KEYLOCK +
SHIFTLOCK -
P LOCK CONFIRMATION
SPORT/MANUAL
STEP +
STEP -
Diagnostic socket (V100)
C0040-8
GW,0.5D
C2238-19 C2240R-19
GW,0.5D
C2365R-16
C2366C-16 (DV6EU3) GW,0.5H
C2366J-16 (DV6EU4) GW,0.5H
C2366K-16 (DV8) GW,0.5H
C0193-3
C0193B-3
Gearshift mechanism (D308)
SHIFTLOCK +
SHIFTLOCK -
Sensor-PCB/PRND-position (T331)
P LOCK
S/M
STEP +
STEP -
GND
C2658-9 R,0.5D
C0903-20 C0868-20 R,0.5D
C2674R-6 C2675R-6 R,0.5D
C2365R-14 C2366C-14 R,0.5H
C0193-7
C2658-10 Y,0.5D
C0903-19 C0868-19 Y,0.5D
C2674R-5 C2675R-5 Y,0.5D
C2365R-13 C2366C-13 Y,0.5H
C0193-11
C2658-2 G,0.5D
C0903-9 C0868-9 G,0.5D
C2674R-1 C2675R-1 G,0.5D
C2365R-15 C2366C-15 G,0.5H
C0193-12
C2658-4 BG,0.5D
C0903-10 C0868-10 BG,0.5D
C2674R-2 C2675R-2 BG,0.5D
C2365R-7 C2366C-7 BG,0.5H
C0193-1
C2658-5 Y,0.5D
C0903-11 C0868-11 Y,0.5D
C2674R-3 C2675R-3 Y,0.5D
C2365R-11 C2366C-11 Y,0.5H
C0193-5
C2658-6 N,0.5D
C0903-18 C0868-18 N,0.5D
C2674R-4 C2675R-4 N,0.5D
C2365R-9 C2366C-9 N,0.5H
C0193-4
C2658-1 B,0.5D
SJ301 B,2.5D
C0903-24 C0868-24 B,2.5D
C2598-1
TYPE 3
Lamp-Automatic gearbox-selector indicator (B113)
P LED
R LED
N LED
D LED
ILLUM/BATT
C2658-11 R,0.5D
C2656-1
C2658-12 RG,0.5D
C2656-2
C2658-13 RW,0.5D
C2656-3
C2658-14 RU,0.5D
C2656-4
C2658-16 RB,0.5D
SJ998 RB,0.5D
C2656-5
P LED GND
R LED ILLUM
N LED
D LED
ILLUM/BATT
C2656-6 B,0.5D
C2656-7 RN,0.5D
SJ300
Lamp-Automatic gearbox-selector indicator (B113)
RB,0.5D
C2657-1
GND
ILLUM/BATT
ILLUM
SPORT/MAN LED
C2657-3 B,0.5D
C2657-4 RN,0.5D
SPORT/MANUAL LED
ILLUM
BATT
AUX
C2658-15 RY,0.5D
C2657-2
C2658-3 RN,0.5D
C2658-8 PU,0.5D
C2658-7 LGO,0.5D
B
Sheet1
C
Sheet1
Lighting control switch (S100)
ILLUM
C0041-9 RN,0.5D
SJ117 RN,0.5D
C1168-12 C1166R-12 RN,0.5D
SJ1052 RN,0.5D
C0868-23 C0903-23 RN,0.5D


Capacitor (G158)
C2366C-1 (DV6EU3)
PY,1.0H
SJ2410
PY,1.0H
C1324-1
C1324-2
B,1.0H
SJ2409
B,1.0H
C2366C-10
A
PY,1.5D
C2365R-1
Sheet1
C2366J-1 (DV6EU4)
PY,1.0H
SJ5410
PY,1.0H
B,1.0H
SJ5409
B,1.0H
C2366J-10
C2365R-10
B,1.0D
SJ173
B,4.0D
C0560-1
TYPE 3
C2366K-1
(DV8)
SJ7409
B,1.0H
C2366K-10
Capacitor (G158)
PY,1.0H
SJ7410
PY,1.0H
C1324B-1
C1324B-2
B,1.0H
TCM and Control Valve Body (D306)
Transmission-control module (D307)
GND
BATT
GND
PY,1.0H
C0193-14
PY,1.0H
(DV6EU3)
B,1.0H
C0193-13
(DV6EU4)
B,1.0H
C0193B-13
(DV8)
B,1.0H
(DV6EU3)
B,1.0H
C0193-16
(DV6EU4)
B,1.0H
TCM and Control Valve Body (D306)
Transmission-control module (D307)
BATT
GND
PY,1.0H
C0193B-14
C0193B-16
(DV8)
B,1.0H

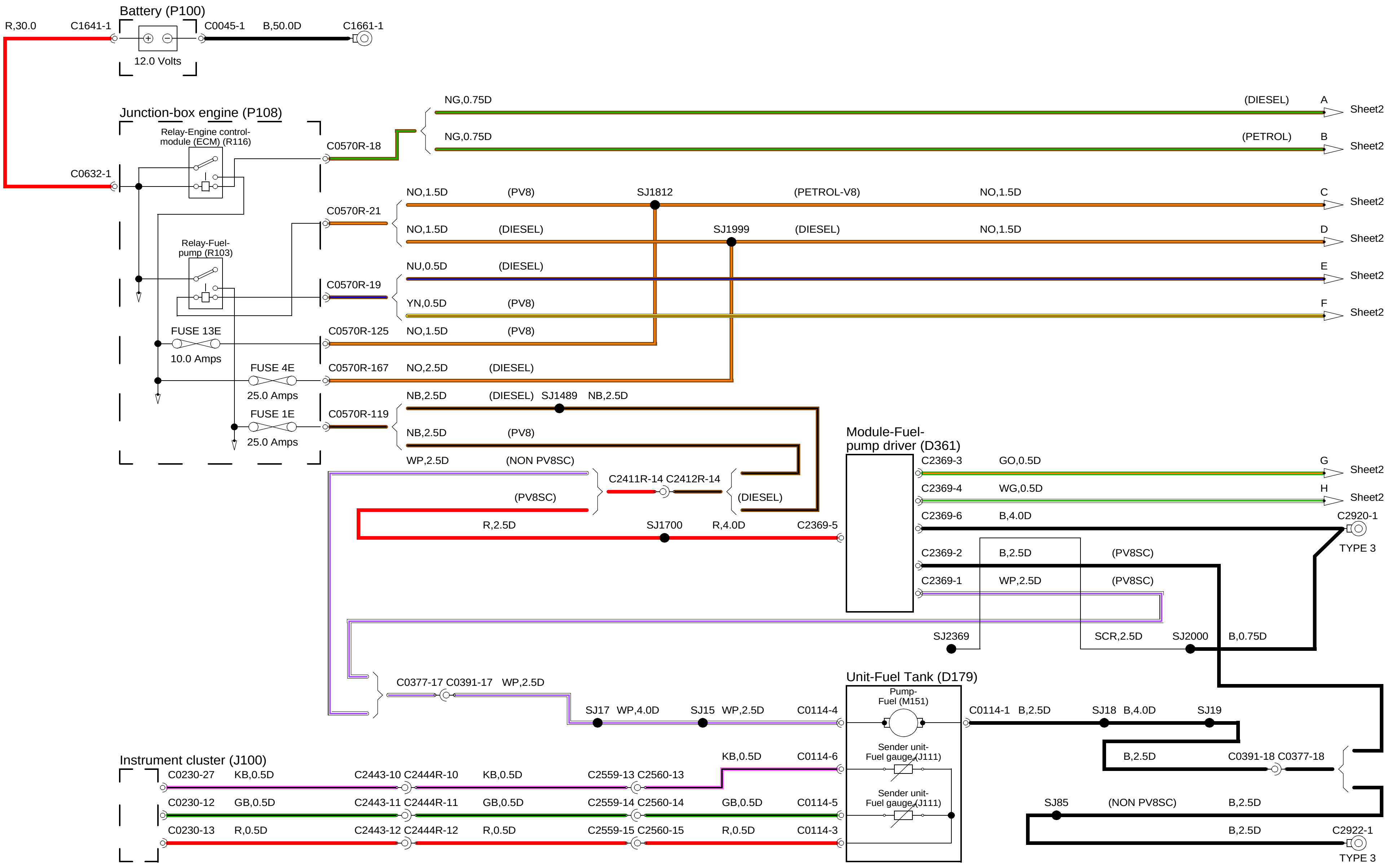

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 3E
30.0 Amps
C0570R-63
PU,4.0D
SJ1923
PU,2.5D
C1854R-6
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Transfer box control module (D204)
BATT
GND
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
KEY LOCK DRIVE
IGN
C1854R-5
B,2.5D
SJ1806
B,4.0D
C0556R-1
TYPE 3
C1854R-4
YB,0.5D
C2365R-2 C2366-2
C1854R-1
YN,0.5D
C2365R-3 C2366-3
C1319R-6
YB,0.5D
SJ1785
C1319R-3
YN,0.5D
SJ1775
Switch-Ignition (S176)
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240R-20
U,0.5D
C1319R-7
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583R-39
R,1.0D
SJ1970
R,1.0D
C1854R-3
R,1.0D
C2412R-5 C2411R-5
R,1.0D
SJ971
R,1.0D
C0868-8 C0903-8
R,0.75D
A
Sheet2

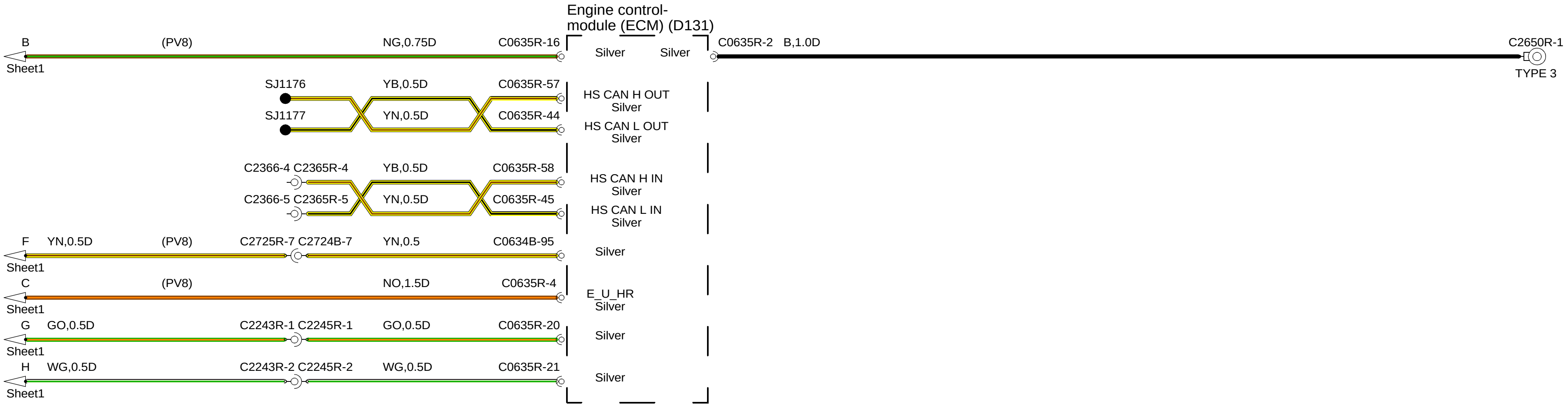

Solenoid-Mode-selector (N148)
COIL +
COIL -
C2165-1
C2165-2
(PV8NA)
(PV8SC)
(PV8NA)
(PV8SC)
S,1.0H
G,1.0H
S,1.0H
G,1.0H
C1855B-12
C1855B-9
C1855D-12
C1855D-9
Transfer box control module (D204)
C1855B-15 N,2.5H SJ802 N,4.0D SJ803 N,2.5H (PV8NA)
C1855D-15 N,2.5H SJ3802 N,4.0D SJ3803 N,2.5H (PV8SC)
C1855B-3 UR,0.5H (PV8NA)
C1855D-3 UR,0.5H (PV8SC)
C1855B-2 RY,0.5H (PV8NA)
C1855D-2 RY,0.5H (PV8SC)
C1855B-1 GR,0.5H (PV8NA)
C1855D-1 GR,0.5H (PV8SC)
C1855B-6 GY,0.5H (PV8NA)
C1855D-6 GY,0.5H (PV8SC)
C1855B-5 R,0.5H (PV8NA)
C1855D-5 R,0.5H (PV8SC)
C1855B-18 R,2.5H SJ805 R,4.0D SJ804 R,2.5H (PV8NA)
C1855D-18 R,2.5H SJ3805 R,4.0D SJ3804 R,2.5H (PV8SC)
Motor-Transfer box (M276)
C2167-1
C2167-3
C2167-7
C2167-6
C2167-2
C2167-4
C2167-8
SUPPLY +
SUPPLY -
HALL SIGNAL (A)
HALL SIGNAL (B)
TEMP SENSOR
+
-
Sensor-Selector-position (T304)
POSITION SIGNAL
SUPPLY -
SUPPLY +
C2169-2
C2169-3
C2169-1
(PV8NA) R,0.5H C1855B-10
(PV8SC) R,0.5H C1855D-10
(PV8NA) RY,0.5H C1855B-7
(PV8SC) RY,0.5H C1855D-7
(PV8NA) UR,0.5H C1855B-8
(PV8SC) UR,0.5H C1855D-8
R,0.5D C2242R-11 C2244R-11 R,0.5D C1319R-5
W,0.5D C2242R-10 C2244R-10 W,0.5D C1319R-4
G,0.5D C2242R-9 C2244R-9 G,0.5D C1319R-9
U,0.5D C2242R-8 C2244R-8 U,0.5D C1319R-8
Switch pack-Centre-console (S350)
C0868-6 C0903-6 U,0.5D C0700-21
C0868-7 C0903-7 G,0.5D C0700-22
Switch-Transmision-High-Low (S235)
C0868-16 C0903-16 W,0.5D C0700-10
C0868-17 C0903-17 R,0.5D C0700-9
A
Sheet1
R,0.75D C0700-20

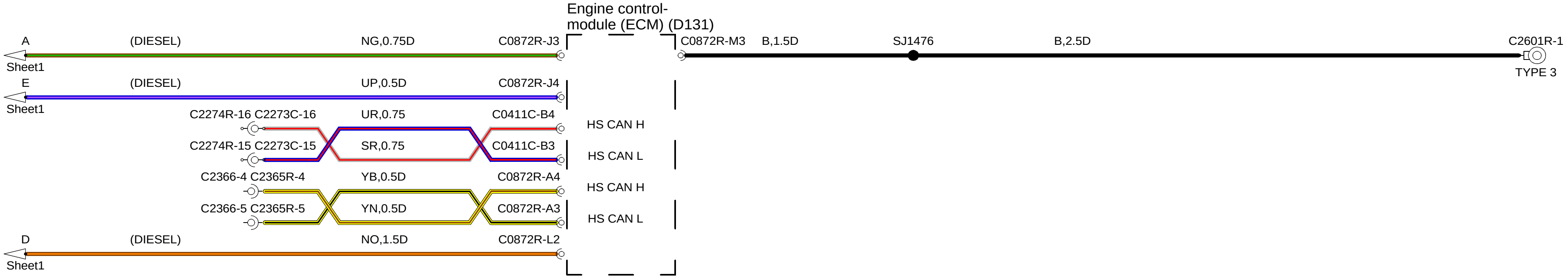

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 3E
30.0 Amps
LINK 11E
30.0 Amps
C0570R-63
PU,4.0D
SJ1923
PU,2.5D
C1854R-6
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Transfer box control module (D204)
BATT
GND
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
KEY LOCK DRIVE
TERM 15
C1854R-5
B,2.5D
SJ1806
B,4.0D
C0556R-1
TYPE 3
C1854R-4
YB,0.5D
C2365R-2 C2366-2
C1854R-1
YN,0.5D
C2365R-3 C2366-3
C1319R-6
YB,0.5D
SJ1785
C1319R-3
YN,0.5D
SJ1775
Switch-Ignition (S176)
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240R-20
U,0.5D
C1319R-7
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583R-39
R,1.0D
SJ1970
R,1.0D
C1854R-3
R,1.0D
C2412R-5 C2411R-5
R,1.0D
SJ971
R,1.0D
C0868-8 C0903-8
R,0.75D
A
Sheet2

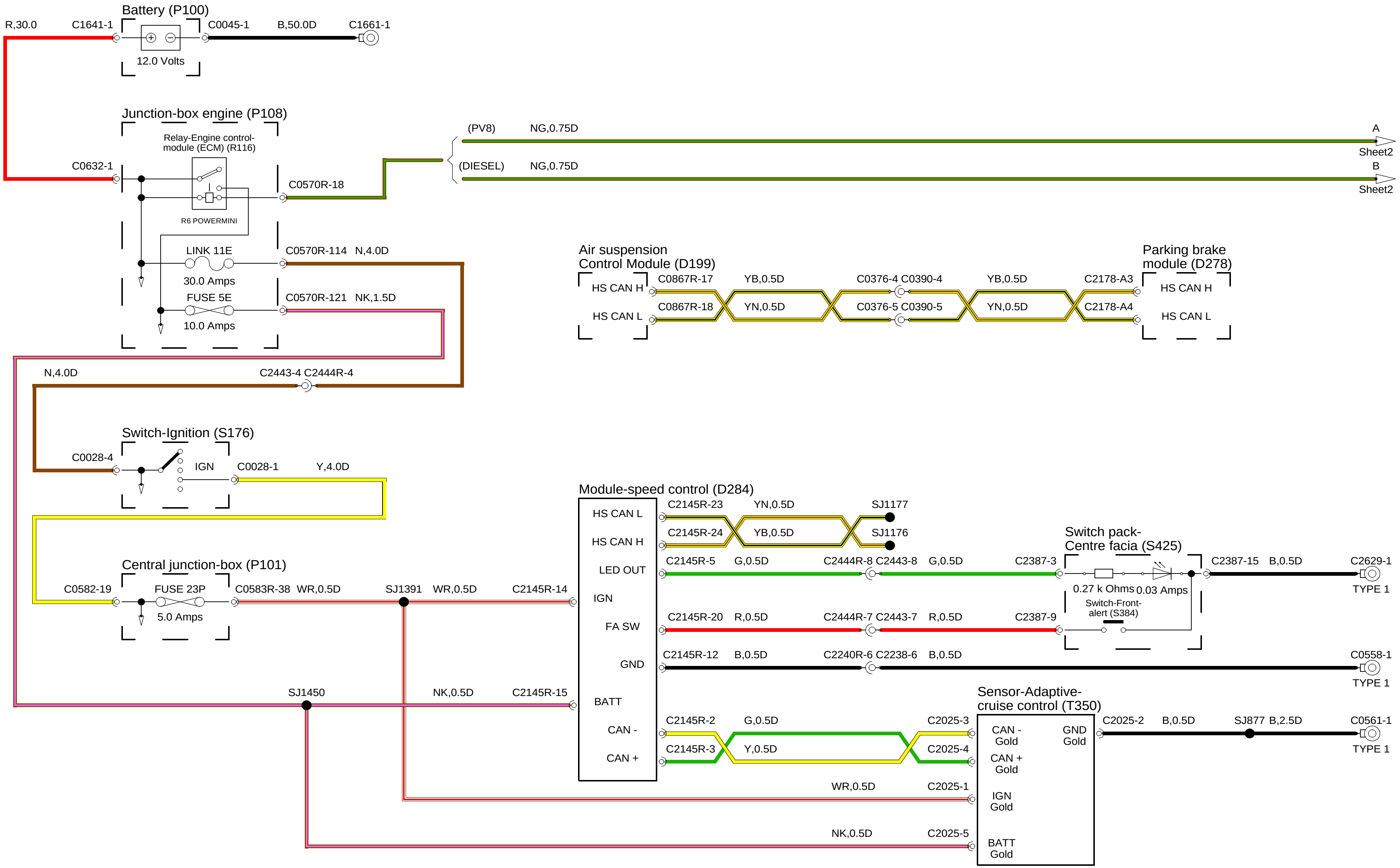

Solenoid-Mode-selector (N148)
COIL +
COIL -
C2165-1
C2165-2
Transfer box control module (D204)
Sensor-Selector-position (T304)
POSITION SIGNAL
SUPPLY -
SUPPLY +
C2169-2
C2169-3
C2169-1
Motor-Transfer box (M276)
SUPPLY +
SUPPLY -
HALL SIGNAL (A)
HALL SIGNAL (B)
TEMP SENSOR
C2167-1
C2167-3
C2167-7
C2167-6
C2167-2
C2167-4
C2167-8
C1855C-12
C1855C-9
C1855J-12
C1855J-9
C1855K-12
C1855K-9
S,1.0H
G,1.0H
(DV6EU3)
(DV6EU4)
(DV8)
C1855C-10
C1855J-10
C1855K-10
C1855C-7
C1855J-7
C1855K-7
C1855C-8
C1855J-8
C1855K-8
R,0.5H
RY,0.5H
UR,0.5H
C1855C-15
C1855J-15
C1855K-15
N,2.5H
SJ2802
SJ5802
SJ7802
N,4.0D
SJ2803
SJ5803
SJ7803
C1855C-3
C1855J-3
C1855K-3
C1855C-2
C1855J-2
C1855K-2
C1855C-1
C1855J-1
C1855K-1
GR,0.5H
C1855C-6
C1855J-6
C1855K-6
GY,0.5H
C1855C-5
C1855J-5
C1855K-5
C1855C-18
C1855J-18
C1855K-18
R,2.5H
SJ2805
SJ5805
SJ7805
R,4.0D
SJ2804
SJ5804
SJ7804
R,0.5D
C2242R-11 C2244R-11
C1319R-5
W,0.5D
C2242R-10 C2244R-10
C1319R-4
G,0.5D
C2242R-9 C2244R-9
C1319R-9
U,0.5D
C2242R-8 C2244R-8
C1319R-8
Switch pack-Centre-console (S350)
C0868-6 C0903-6
C0700-21
C0868-7 C0903-7
C0700-22
Switch-Transmision-High-Low (S235)
C0868-16 C0903-16
C0700-10
C0868-17 C0903-17
C0700-9
R,0.75D
C0700-20
A
Sheet1
+
-

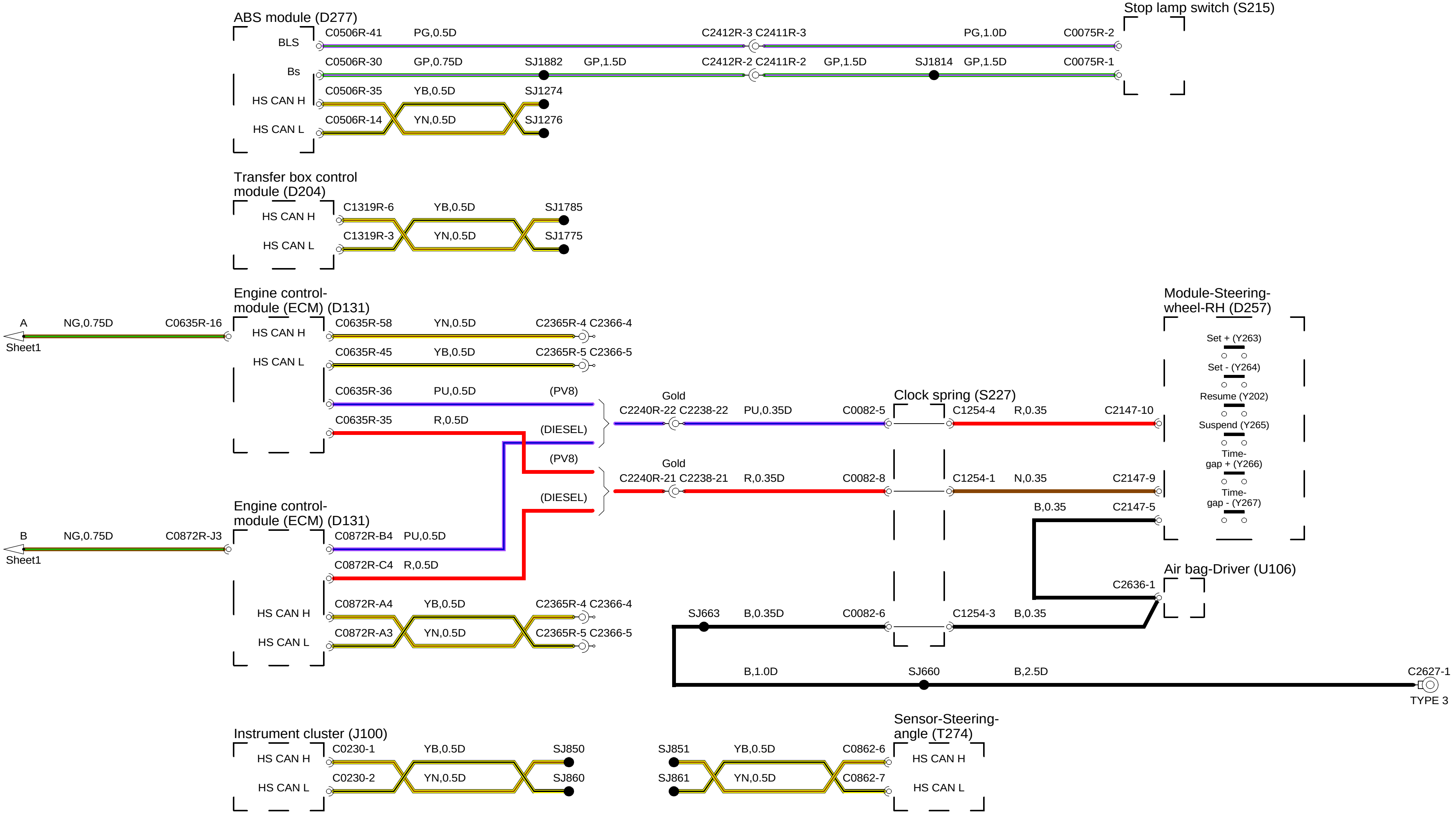
310-01 FUEL TANK AND FUEL LINES

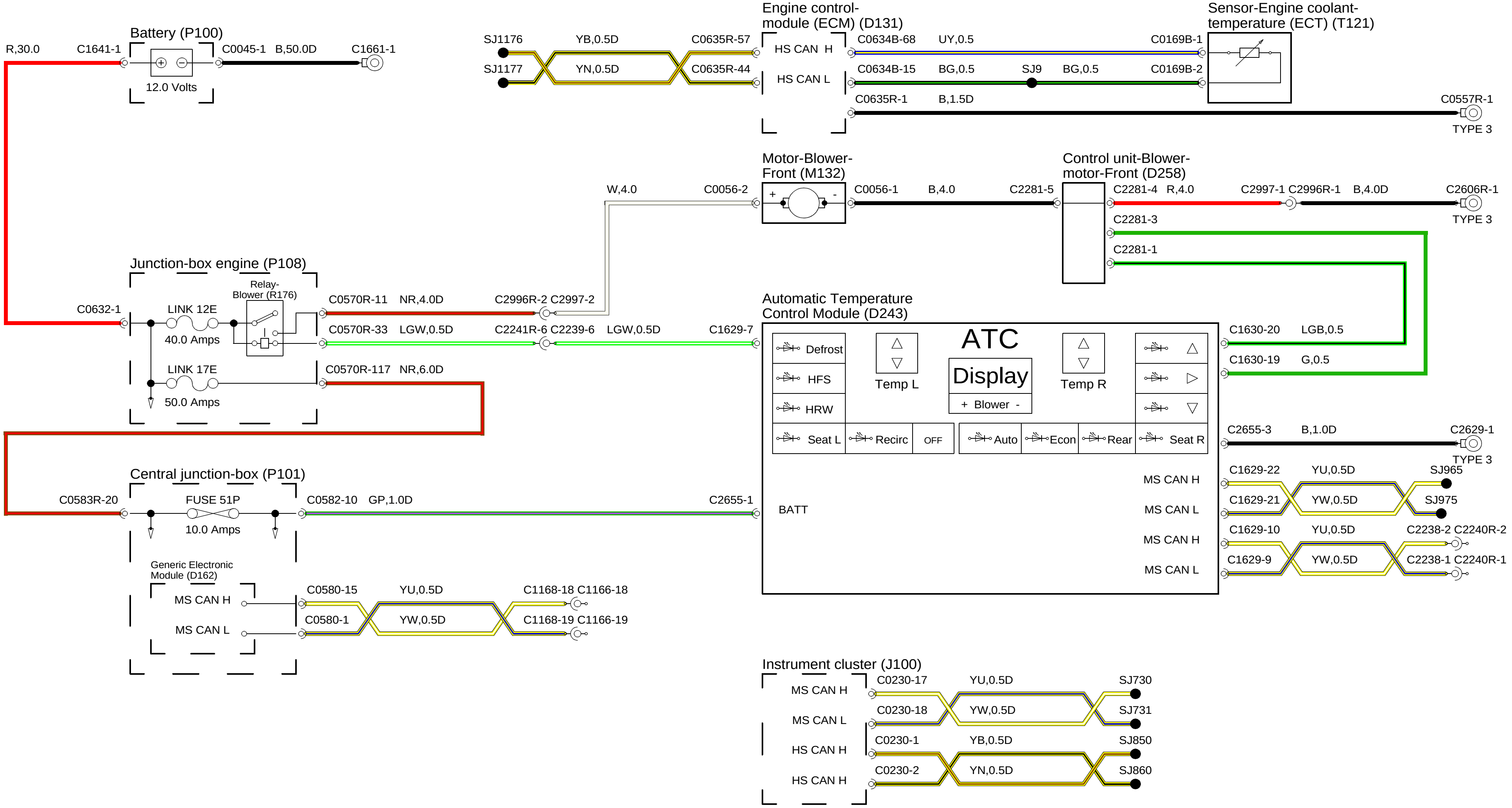

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
C0570R-18
NG,0.75D
(DIESEL)
A
Sheet2
NG,0.75D
(PETROL)
B
Sheet2
NO,1.5D
(PV8)
SJ1812
(PETROL-V8)
NO,1.5D
C
Sheet2
C0570R-21
NO,1.5D
(DIESEL)
SJ1999
(DIESEL)
NO,1.5D
D
Sheet2
Relay-Fuel-pump (R103)
NU,0.5D
(DIESEL)
E
Sheet2
C0570R-19
YN,0.5D
(PV8)
F
Sheet2
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D
(PV8)
FUSE 4E
25.0 Amps
C0570R-167
NO,2.5D
(DIESEL)
NB,2.5D
(DIESEL)
SJ1489
NB,2.5D
FUSE 1E
25.0 Amps
C0570R-119
NB,2.5D
(PV8)
Module-Fuel-pump driver (D361)
WP,2.5D
(NON PV8SC)
C2411R-14 C2412R-14
(PV8SC)
(DIESEL)
C2369-3
GO,0.5D
G
Sheet2
C2369-4
WG,0.5D
H
Sheet2
R,2.5D
SJ1700
R,4.0D
C2369-5
C2369-6
B,4.0D
C2920-1
TYPE 3
C2369-2
B,2.5D
(PV8SC)
C2369-1
WP,2.5D
(PV8SC)
SJ2369
SCR,2.5D
SJ2000
B,0.75D
Unit-Fuel Tank (D179)
C0377-17 C0391-17
WP,2.5D
Pump-Fuel (M151)
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
C0114-1
B,2.5D
SJ18
B,4.0D
SJ19
Sender unit-Fuel gauge (J111)
KB,0.5D
C0114-6
B,2.5D
C0391-18 C0377-18
Instrument cluster (J100)
C0230-27
KB,0.5D
C2443-10 C2444R-10
KB,0.5D
C2559-13 C2560-13
Sender unit-Fuel gauge (J111)
C0230-12
GB,0.5D
C2443-11 C2444R-11
GB,0.5D
C2559-14 C2560-14
GB,0.5D
C0114-5
SJ85
(NON PV8SC)
B,2.5D
C0230-13
R,0.5D
C2443-12 C2444R-12
R,0.5D
C2559-15 C2560-15
R,0.5D
C0114-3
B,2.5D
C2922-1
TYPE 3

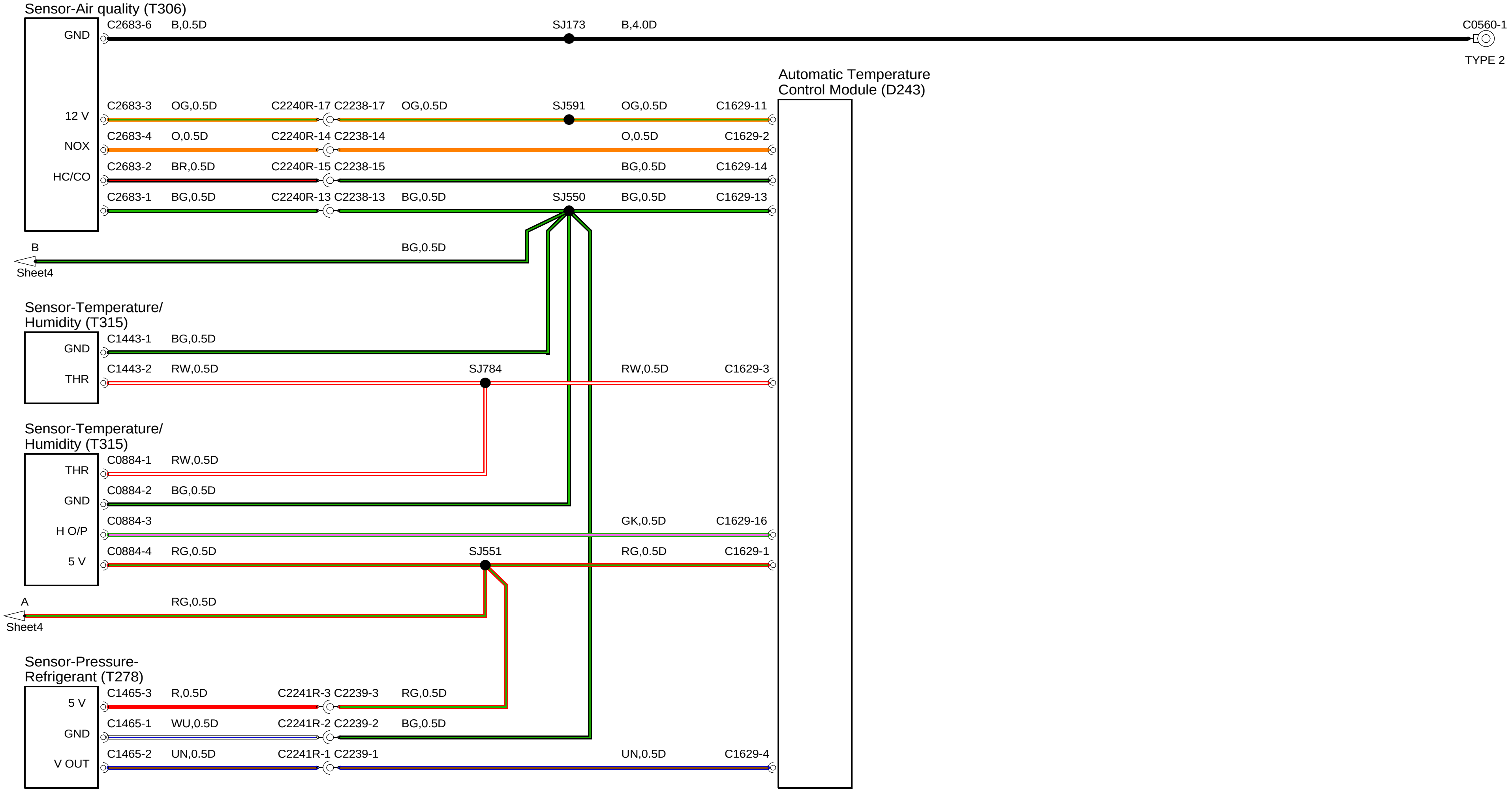

Engine control-
module (ECM) (D131)
B
(PV8)
NG,0.75D
C0635R-16
Sheet1
Silver
Silver
C0635R-2
B,1.0D
C2650R-1
TYPE 3
SJ1176
YB,0.5D
C0635R-57
HS CAN H OUT
Silver
SJ1177
YN,0.5D
C0635R-44
HS CAN L OUT
Silver
C2366-4 C2365R-4
YB,0.5D
C0635R-58
HS CAN H IN
Silver
C2366-5 C2365R-5
YN,0.5D
C0635R-45
HS CAN L IN
Silver
F
YN,0.5D
(PV8)
C2725R-7 C2724B-7
YN,0.5
C0634B-95
Sheet1
Silver
C
(PV8)
NO,1.5D
C0635R-4
Sheet1
E_U_HR
Silver
G
GO,0.5D
C2243R-1 C2245R-1
GO,0.5D
C0635R-20
Sheet1
Silver
H
WG,0.5D
C2243R-2 C2245R-2
WG,0.5D
C0635R-21
Sheet1
Silver

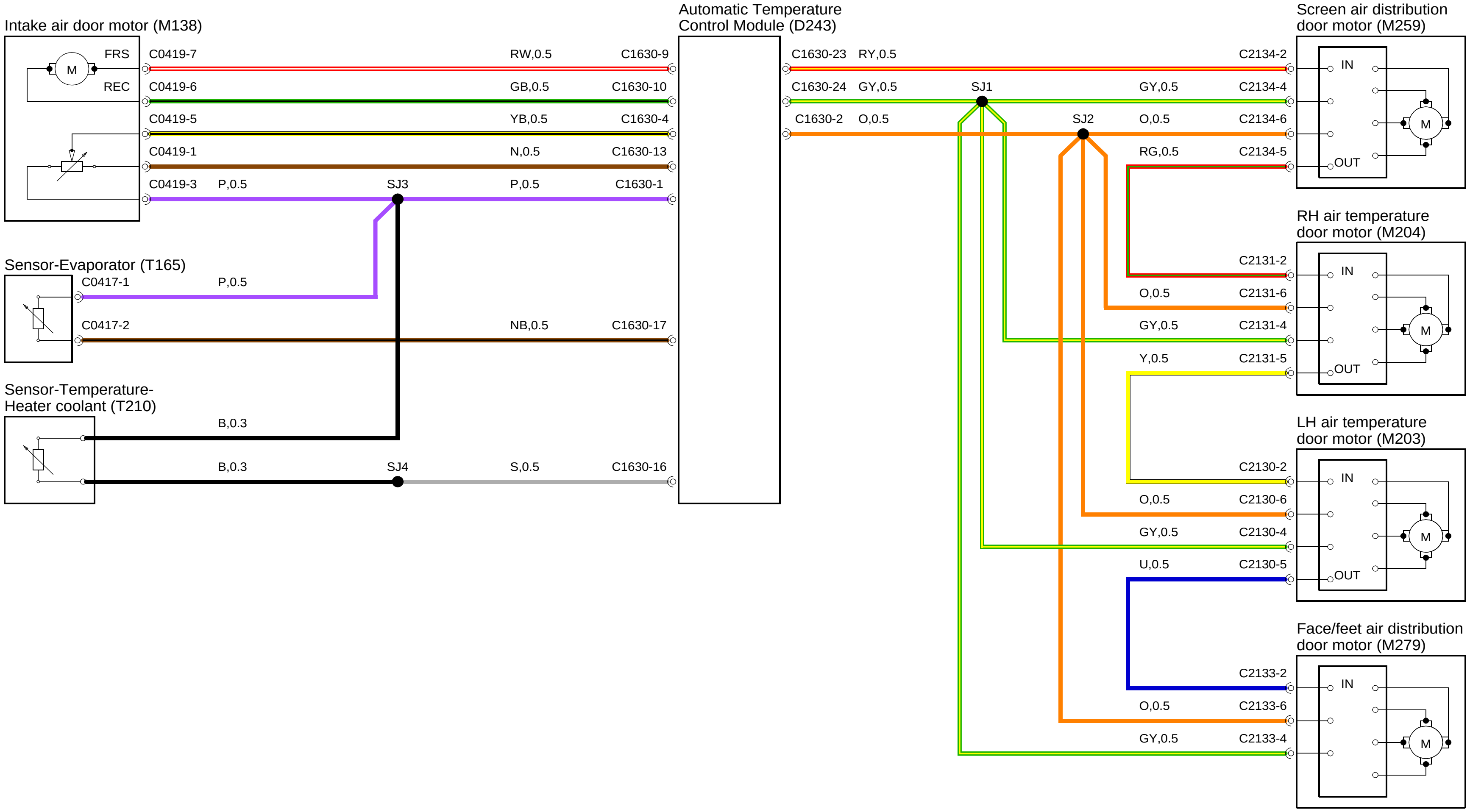

Engine control-
module (ECM) (D131)
A
(DIESEL)
NG,0.75D
C0872R-J3
Sheet1
C0872R-M3
B,1.5D
SJ1476
B,2.5D
C2601R-1
TYPE 3
E
(DIESEL)
UP,0.5D
C0872R-J4
Sheet1
C2274R-16 C2273C-16
UR,0.75
C0411C-B4
HS CAN H
C2274R-15 C2273C-15
SR,0.75
C0411C-B3
HS CAN L
C2366-4 C2365R-4
YB,0.5D
C0872R-A4
HS CAN H
C2366-5 C2365R-5
YN,0.5D
C0872R-A3
HS CAN L
D
(DIESEL)
NO,1.5D
C0872R-L2
Sheet1

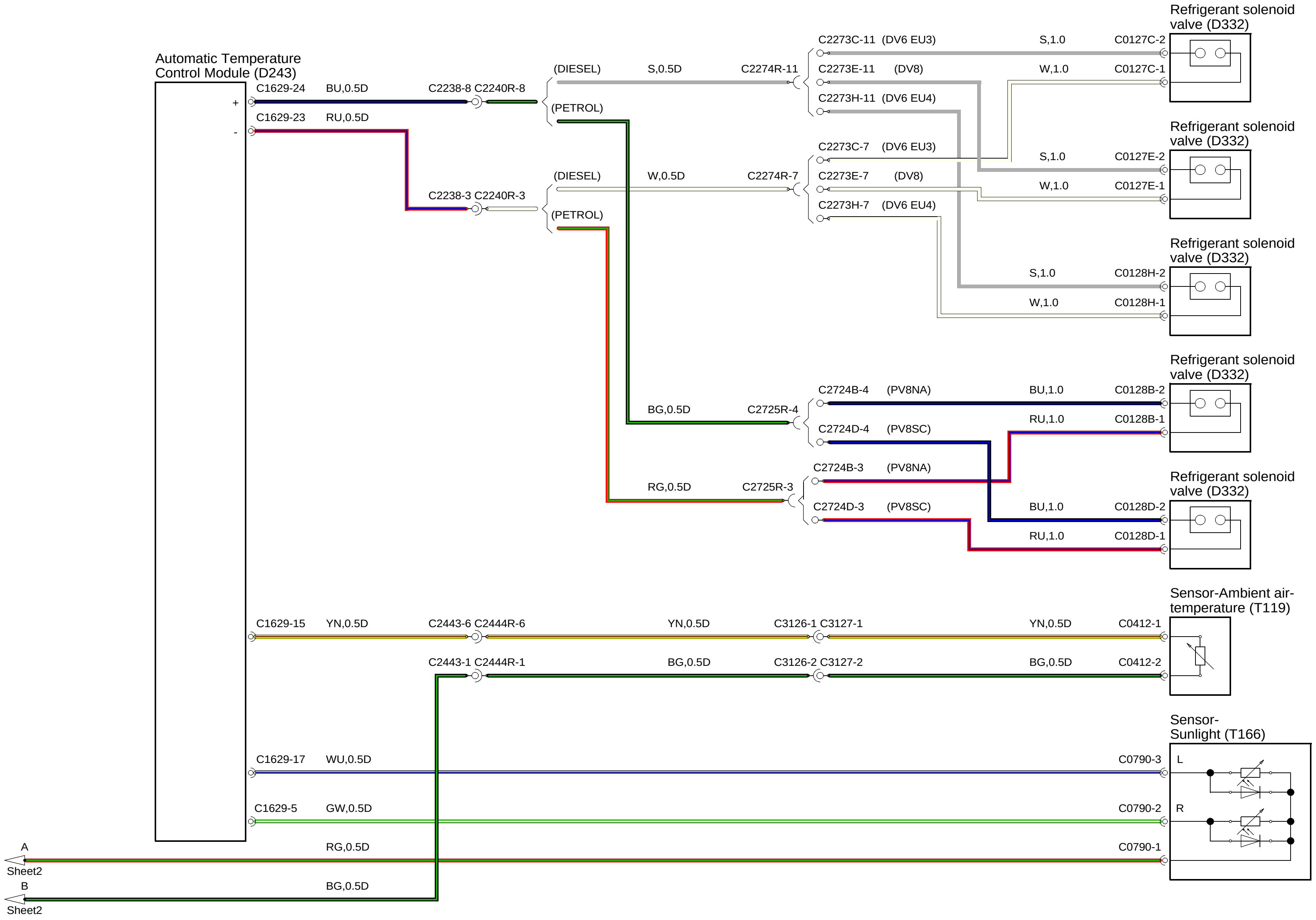

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
R6 POWERMINI
C0632-1
C0570R-18
(PV8)
NG,0.75D
A
Sheet2
(DIESEL)
NG,0.75D
B
Sheet2
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
FUSE 5E
10.0 Amps
C0570R-121
NK,1.5D
N,4.0D
C2443-4 C2444R-4
Air suspension Control Module (D199)
HS CAN H
HS CAN L
C0867R-17
C0867R-18
YB,0.5D
YN,0.5D
C0376-4 C0390-4
C0376-5 C0390-5
YB,0.5D
YN,0.5D
C2178-A3
C2178-A4
Parking brake module (D278)
HS CAN H
HS CAN L
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Module-speed control (D284)
HS CAN L
HS CAN H
LED OUT
IGN
FA SW
GND
BATT
CAN -
CAN +
C2145R-23
YN,0.5D
SJ1177
C2145R-24
YB,0.5D
SJ1176
Switch pack-Centre facia (S425)
C2145R-5
G,0.5D
C2444R-8 C2443-8
G,0.5D
C2387-3
C2387-15
B,0.5D
C2629-1
TYPE 1
0.27 k Ohms
0.03 Amps
Switch-Front-alert (S384)
Central junction-box (P101)
C0582-19
FUSE 23P
5.0 Amps
C0583R-38
WR,0.5D
SJ1391
WR,0.5D
C2145R-14
C2145R-20
R,0.5D
C2444R-7 C2443-7
R,0.5D
C2387-9
C2145R-12
B,0.5D
C2240R-6 C2238-6
B,0.5D
C0558-1
TYPE 1
SJ1450
NK,0.5D
C2145R-15
Sensor-Adaptive-cruise control (T350)
C2145R-2
G,0.5D
C2025-3
C2145R-3
Y,0.5D
C2025-4
CAN - Gold
CAN + Gold
IGN Gold
BATT Gold
GND Gold
C2025-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 1
WR,0.5D
C2025-1
NK,0.5D
C2025-5

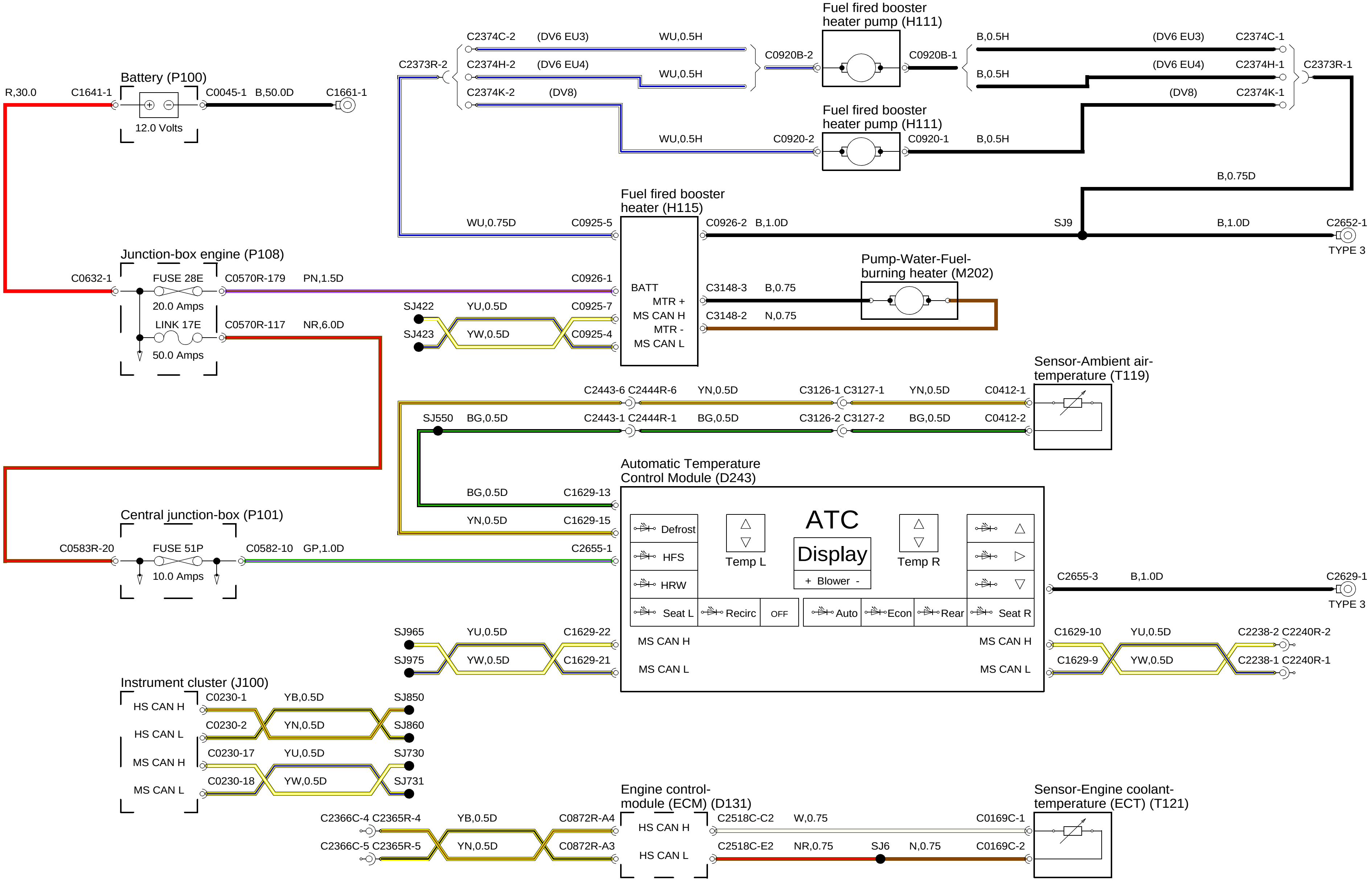

ABS module (D277)
BLS
Bs
HS CAN H
HS CAN L
C0506R-41
PG,0.5D
C2412R-3 C2411R-3
PG,1.0D
C0075R-2
Stop lamp switch (S215)
C0506R-30
GP,0.75D
SJ1882
GP,1.5D
C2412R-2 C2411R-2
GP,1.5D
SJ1814
GP,1.5D
C0075R-1
C0506R-35
YB,0.5D
SJ1274
C0506R-14
YN,0.5D
SJ1276
Transfer box control module (D204)
HS CAN H
HS CAN L
C1319R-6
YB,0.5D
SJ1785
C1319R-3
YN,0.5D
SJ1775
Engine control-module (ECM) (D131)
A
NG,0.75D
C0635R-16
Sheet1
HS CAN H
HS CAN L
C0635R-58
YN,0.5D
C2365R-4 C2366-4
C0635R-45
YB,0.5D
C2365R-5 C2366-5
C0635R-36
PU,0.5D
(PV8)
C0635R-35
R,0.5D
(DIESEL)
(PV8)
(DIESEL)
Gold
C2240R-22 C2238-22
PU,0.35D
C0082-5
Gold
C2240R-21 C2238-21
R,0.35D
C0082-8
Clock spring (S227)
C1254-4
R,0.35
C2147-10
C1254-1
N,0.35
C2147-9
B,0.35
C2147-5
Module-Steering-wheel-RH (D257)
Set + (Y263)
Set - (Y264)
Resume (Y202)
Suspend (Y265)
Time-gap + (Y266)
Time-gap - (Y267)
Engine control-module (ECM) (D131)
B
NG,0.75D
C0872R-J3
Sheet1
C0872R-B4
PU,0.5D
C0872R-C4
R,0.5D
HS CAN H
HS CAN L
C0872R-A4
YB,0.5D
C2365R-4 C2366-4
C0872R-A3
YN,0.5D
C2365R-5 C2366-5
Air bag-Driver (U106)
C2636-1
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Instrument cluster (J100)
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
SJ851
YB,0.5D
C0862-6
SJ861
YN,0.5D
C0862-7
Sensor-Steering-angle (T274)
HS CAN H
HS CAN L

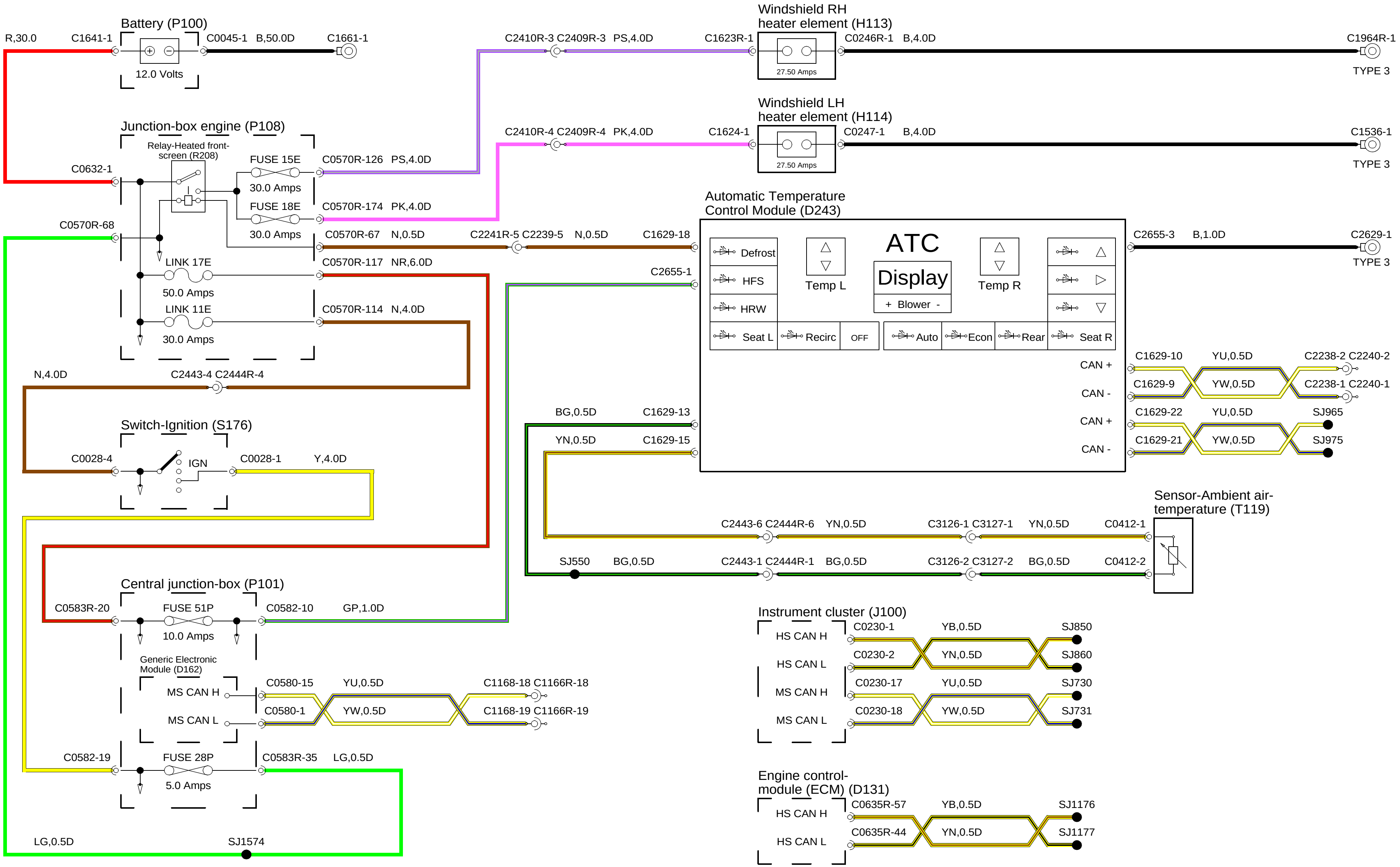

Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
12.0 Volts
SJ1176
YB,0.5D
C0635R-57
SJ1177
YN,0.5D
C0635R-44
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0634B-68 UY,0.5
C0169B-1
C0634B-15 BG,0.5
SJ9 BG,0.5
C0169B-2
C0635R-1 B,1.5D
C0557R-1
TYPE 3
Sensor-Engine coolant-temperature (ECT) (T121)
Motor-Blower-Front (M132)
W,4.0
C0056-2
C0056-1 B,4.0
C2281-5
Control unit-Blower-motor-Front (D258)
C2281-4 R,4.0
C2997-1 C2996R-1 B,4.0D
C2606R-1
TYPE 3
C2281-3
C2281-1
Junction-box engine (P108)
Relay-Blower (R176)
C0632-1
LINK 12E
40.0 Amps
LINK 17E
50.0 Amps
C0570R-11 NR,4.0D
C2996R-2 C2997-2
C0570R-33 LGW,0.5D
C2241R-6 C2239-6 LGW,0.5D
C1629-7
C0570R-117 NR,6.0D
Automatic Temperature Control Module (D243)
ATC
Display
+ Blower -
Defrost
HFS
HRW
Seat L
Temp L
Temp R
Recirc
OFF
Auto
Econ
Rear
Seat R
C1630-20 LGB,0.5
C1630-19 G,0.5
C2655-3 B,1.0D
C2629-1
TYPE 3
C1629-22 YU,0.5D
SJ965
C1629-21 YW,0.5D
SJ975
C1629-10 YU,0.5D
C2238-2 C2240R-2
C1629-9 YW,0.5D
C2238-1 C2240R-1
MS CAN H
MS CAN L
MS CAN H
MS CAN L
BATT
Central junction-box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D
C2655-1
Generic Electronic Module (D162)
MS CAN H
MS CAN L
C0580-15 YU,0.5D
C1168-18 C1166-18
C0580-1 YW,0.5D
C1168-19 C1166-19
Instrument cluster (J100)
MS CAN H
MS CAN L
HS CAN H
HS CAN H
C0230-17 YU,0.5D
SJ730
C0230-18 YW,0.5D
SJ731
C0230-1 YB,0.5D
SJ850
C0230-2 YN,0.5D
SJ860

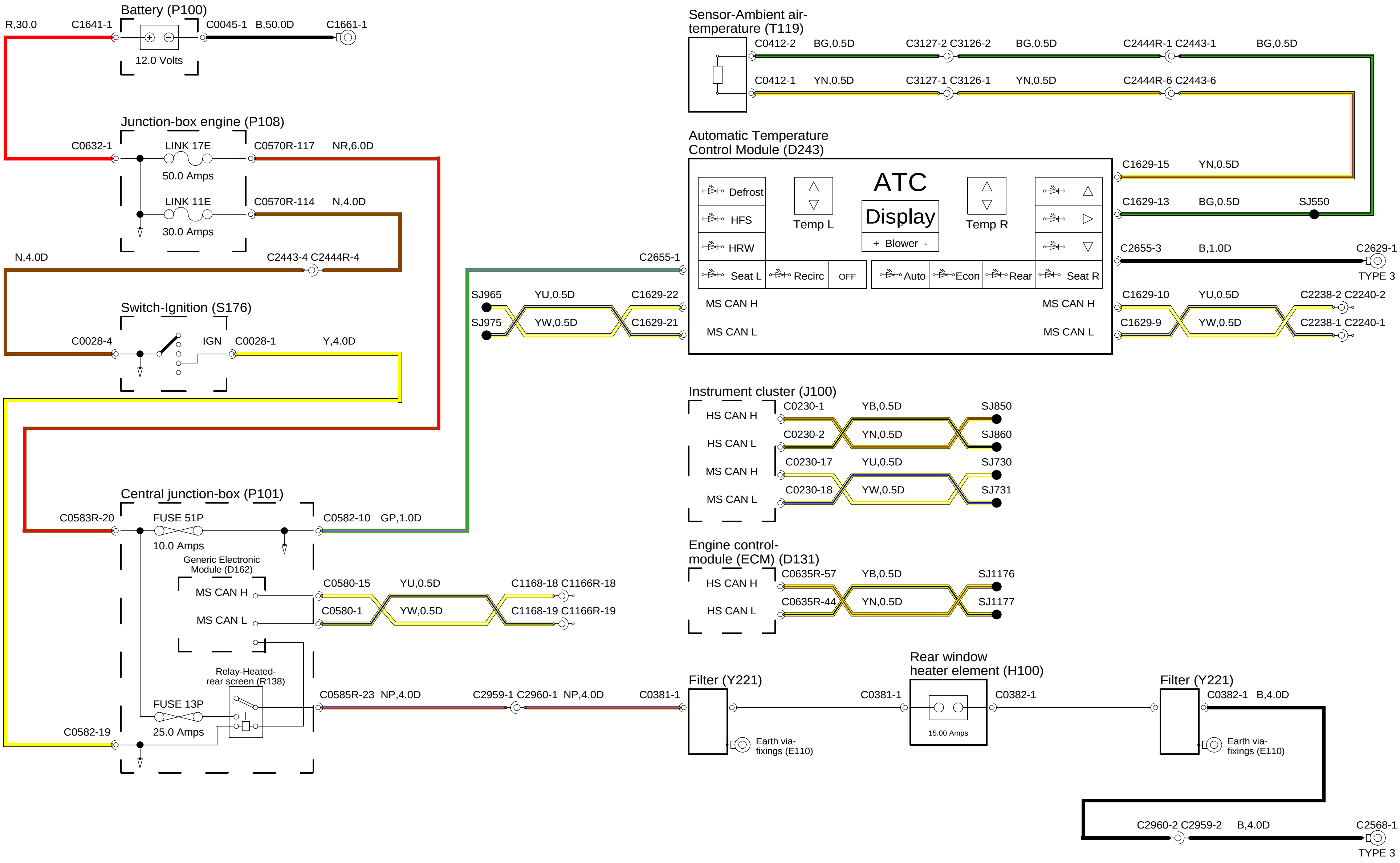

Sensor-Air quality (T306)
GND
C2683-6
B,0.5D
SJ173
B,4.0D
C0560-1
TYPE 2
Automatic Temperature Control Module (D243)
12 V
C2683-3
OG,0.5D
C2240R-17 C2238-17
OG,0.5D
SJ591
OG,0.5D
C1629-11
NOX
C2683-4
O,0.5D
C2240R-14 C2238-14
O,0.5D
C1629-2
HC/CO
C2683-2
BR,0.5D
C2240R-15 C2238-15
BG,0.5D
C1629-14
C2683-1
BG,0.5D
C2240R-13 C2238-13
BG,0.5D
SJ550
BG,0.5D
C1629-13
B
Sheet4
BG,0.5D
Sensor-Temperature/ Humidity (T315)
GND
C1443-1
BG,0.5D
THR
C1443-2
RW,0.5D
SJ784
RW,0.5D
C1629-3
Sensor-Temperature/ Humidity (T315)
THR
C0884-1
RW,0.5D
GND
C0884-2
BG,0.5D
H O/P
C0884-3
GK,0.5D
C1629-16
5 V
C0884-4
RG,0.5D
SJ551
RG,0.5D
C1629-1
A
Sheet4
RG,0.5D
Sensor-Pressure- Refrigerant (T278)
5 V
C1465-3
R,0.5D
C2241R-3 C2239-3
RG,0.5D
GND
C1465-1
WU,0.5D
C2241R-2 C2239-2
BG,0.5D
V OUT
C1465-2
UN,0.5D
C2241R-1 C2239-1
UN,0.5D
C1629-4

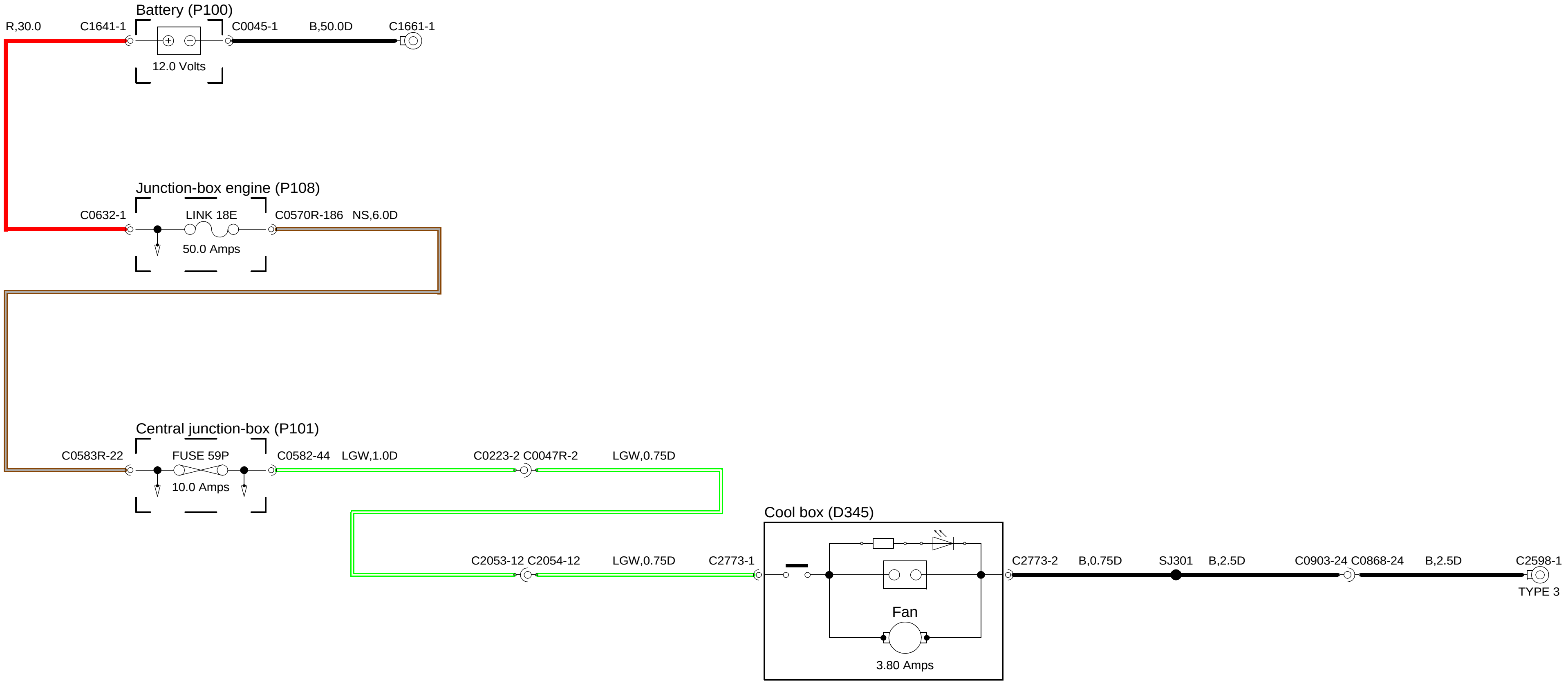

Intake air door motor (M138)
FRS
REC
M
C0419-7
RW,0.5
C1630-9
C0419-6
GB,0.5
C1630-10
C0419-5
YB,0.5
C1630-4
C0419-1
N,0.5
C1630-13
C0419-3
P,0.5
SJ3
P,0.5
C1630-1
Automatic Temperature Control Module (D243)
Sensor-Evaporator (T165)
C0417-1
P,0.5
C0417-2
NB,0.5
C1630-17
Sensor-Temperature-Heater coolant (T210)
B,0.3
B,0.3
SJ4
S,0.5
C1630-16
C1630-23
RY,0.5
C2134-2
C1630-24
GY,0.5
SJ1
GY,0.5
C2134-4
C1630-2
O,0.5
SJ2
O,0.5
C2134-6
RG,0.5
C2134-5
Screen air distribution door motor (M259)
IN
OUT
M
RH air temperature door motor (M204)
C2131-2
O,0.5
C2131-6
GY,0.5
C2131-4
Y,0.5
C2131-5
IN
OUT
M
LH air temperature door motor (M203)
C2130-2
O,0.5
C2130-6
GY,0.5
C2130-4
U,0.5
C2130-5
IN
OUT
M
Face/feet air distribution door motor (M279)
C2133-2
O,0.5
C2133-6
GY,0.5
C2133-4
IN
M


Automatic Temperature Control Module (D243)
+
-
C1629-24
BU,0.5D
C1629-23
RU,0.5D
C2238-8 C2240R-8
C2238-3 C2240R-3
(DIESEL)
(PETROL)
S,0.5D
C2274R-11
(DIESEL)
(PETROL)
W,0.5D
C2274R-7
C2273C-11 (DV6 EU3)
C2273E-11 (DV8)
C2273H-11 (DV6 EU4)
C2273C-7 (DV6 EU3)
C2273E-7 (DV8)
C2273H-7 (DV6 EU4)
Refrigerant solenoid valve (D332)
S,1.0
C0127C-2
W,1.0
C0127C-1
Refrigerant solenoid valve (D332)
S,1.0
C0127E-2
W,1.0
C0127E-1
Refrigerant solenoid valve (D332)
S,1.0
C0128H-2
W,1.0
C0128H-1
BG,0.5D
C2725R-4
C2724B-4 (PV8NA)
C2724D-4 (PV8SC)
Refrigerant solenoid valve (D332)
BU,1.0
C0128B-2
RU,1.0
C0128B-1
RG,0.5D
C2725R-3
C2724B-3 (PV8NA)
C2724D-3 (PV8SC)
Refrigerant solenoid valve (D332)
BU,1.0
C0128D-2
RU,1.0
C0128D-1
C1629-15
YN,0.5D
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Sensor-Ambient air-temperature (T119)
C1629-17
WU,0.5D
C0790-3
L
C1629-5
GW,0.5D
C0790-2
R
Sensor-Sunlight (T166)
A
Sheet2
RG,0.5D
C0790-1
B
Sheet2
BG,0.5D

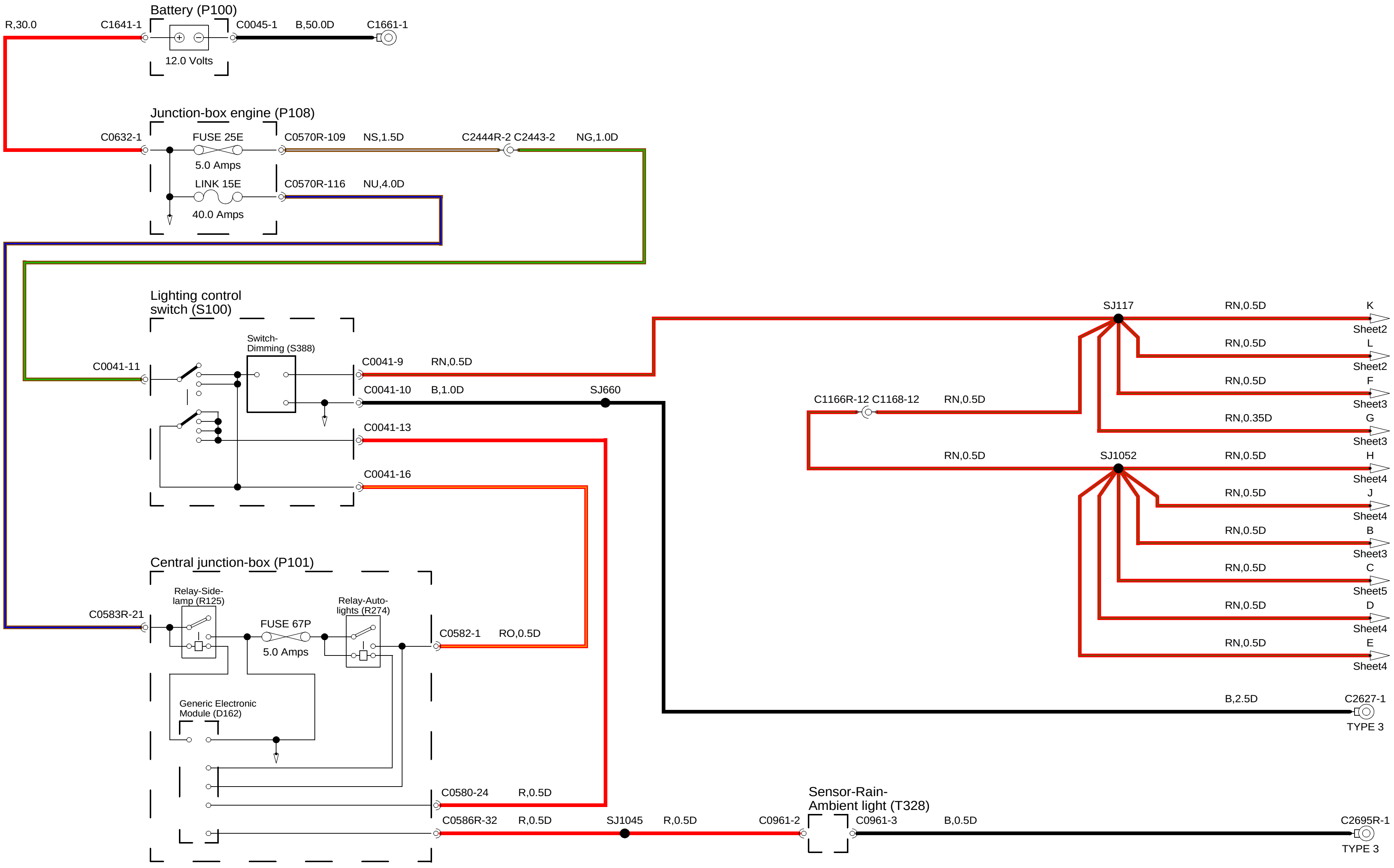

Fuel fired booster heater pump (H111)
C2374C-2
(DV6 EU3)
WU,0.5H
C2373R-2
C2374H-2
(DV6 EU4)
WU,0.5H
C2374K-2
(DV8)
C0920B-2
C0920B-1
B,0.5H
(DV6 EU3)
C2374C-1
(DV6 EU4)
C2374H-1
C2373R-1
B,0.5H
(DV8)
C2374K-1
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Fuel fired booster heater pump (H111)
WU,0.5H
C0920-2
C0920-1
B,0.5H
B,0.75D
Fuel fired booster heater (H115)
WU,0.75D
C0925-5
C0926-2
B,1.0D
SJ9
B,1.0D
C2652-1
TYPE 3
Junction-box engine (P108)
C0632-1
FUSE 28E
C0570R-179
PN,1.5D
C0926-1
20.0 Amps
LINK 17E
C0570R-117
NR,6.0D
50.0 Amps
SJ422
YU,0.5D
C0925-7
SJ423
YW,0.5D
C0925-4
BATT
MTR +
MS CAN H
MTR -
MS CAN L
Pump-Water-Fuel-burning heater (M202)
C3148-3
B,0.75
C3148-2
N,0.75
Sensor-Ambient air-temperature (T119)
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Automatic Temperature Control Module (D243)
BG,0.5D
C1629-13
YN,0.5D
C1629-15
Central junction-box (P101)
C0583R-20
FUSE 51P
C0582-10
GP,1.0D
C2655-1
10.0 Amps
Defrost
HFS
HRW
Temp L
ATC
Display
+ Blower -
Temp R
Seat L
Recirc
OFF
Auto
Econ
Rear
Seat R
C2655-3
B,1.0D
C2629-1
TYPE 3
SJ965
YU,0.5D
C1629-22
SJ975
YW,0.5D
C1629-21
MS CAN H
MS CAN L
MS CAN H
MS CAN L
C1629-10
YU,0.5D
C2238-2 C2240R-2
C1629-9
YW,0.5D
C2238-1 C2240R-1
Instrument cluster (J100)
HS CAN H
C0230-1
YB,0.5D
SJ850
HS CAN L
C0230-2
YN,0.5D
SJ860
MS CAN H
C0230-17
YU,0.5D
SJ730
MS CAN L
C0230-18
YW,0.5D
SJ731
Engine control-module (ECM) (D131)
Sensor-Engine coolant-temperature (ECT) (T121)
C2366C-4 C2365R-4
YB,0.5D
C0872R-A4
HS CAN H
C2518C-C2
W,0.75
C0169C-1
C2366C-5 C2365R-5
YN,0.5D
C0872R-A3
HS CAN L
C2518C-E2
NR,0.75
SJ6
N,0.75
C0169C-2


Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
C2410R-3 C2409R-3
PS,4.0D
C1623R-1
Windshield RH heater element (H113)
27.50 Amps
C0246R-1
B,4.0D
C1964R-1
TYPE 3
Windshield LH heater element (H114)
C2410R-4 C2409R-4
PK,4.0D
C1624-1
27.50 Amps
C0247-1
B,4.0D
C1536-1
TYPE 3
Junction-box engine (P108)
Relay-Heated front-screen (R208)
C0632-1
FUSE 15E
30.0 Amps
C0570R-126
PS,4.0D
FUSE 18E
30.0 Amps
C0570R-174
PK,4.0D
C0570R-68
C0570R-67
N,0.5D
C2241R-5 C2239-5
N,0.5D
C1629-18
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
C2655-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
Automatic Temperature Control Module (D243)
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
C2655-3
B,1.0D
C2629-1
TYPE 3
CAN +
CAN -
CAN +
CAN -
C1629-10
YU,0.5D
C2238-2 C2240-2
C1629-9
YW,0.5D
C2238-1 C2240-1
C1629-22
YU,0.5D
SJ965
C1629-21
YW,0.5D
SJ975
N,4.0D
C2443-4 C2444R-4
BG,0.5D
C1629-13
YN,0.5D
C1629-15
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Sensor-Ambient air-temperature (T119)
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Central junction-box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
MS CAN H
MS CAN L
C0580-15
YU,0.5D
C1168-18 C1166R-18
C0580-1
YW,0.5D
C1168-19 C1166R-19
Instrument cluster (J100)
HS CAN H
HS CAN L
MS CAN H
MS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0635R-57
YB,0.5D
SJ1176
C0635R-44
YN,0.5D
SJ1177
LG,0.5D
SJ1574

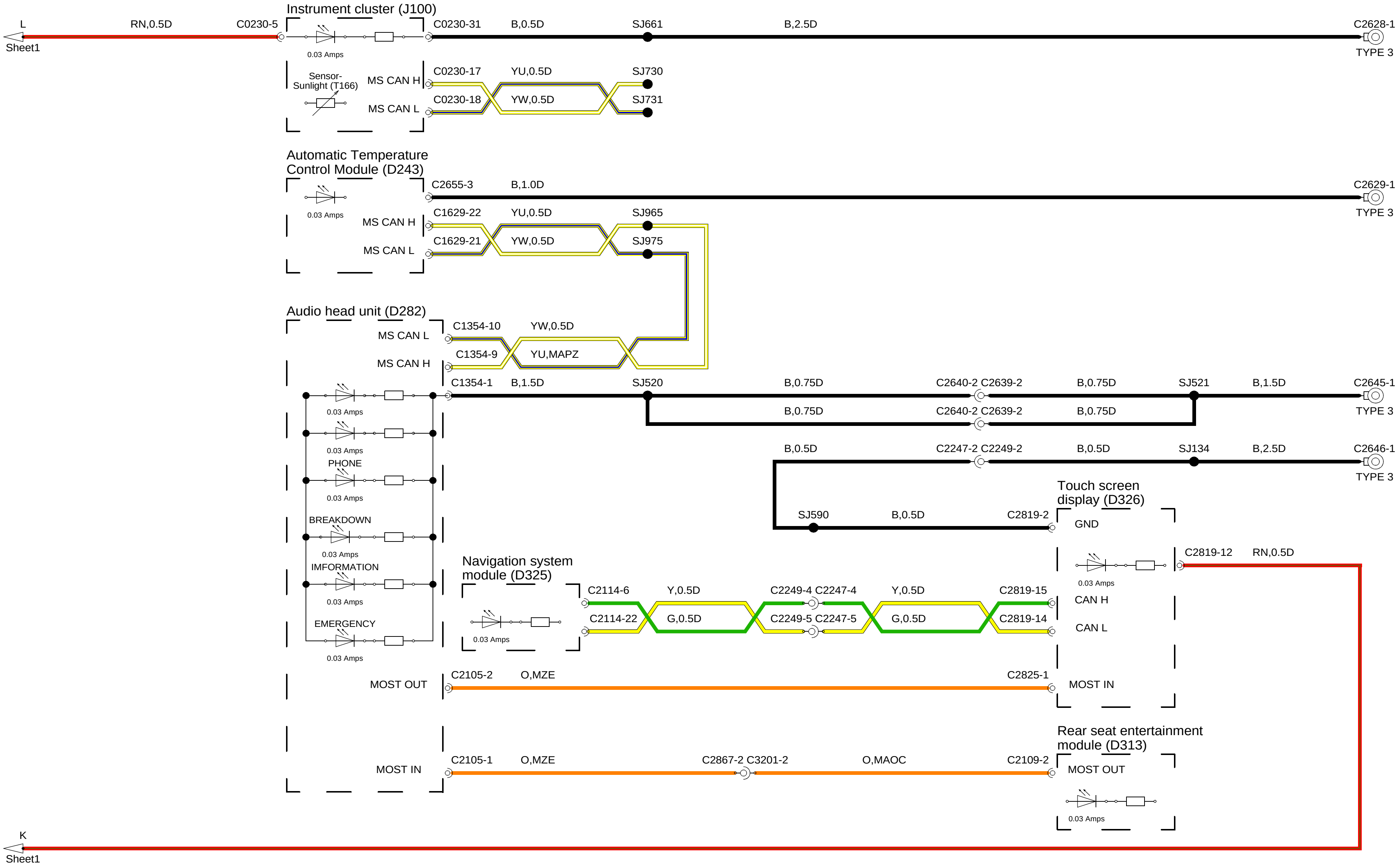

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
MS CAN H
MS CAN L
C0580-15
YU,0.5D
C1168-18 C1166R-18
C0580-1
YW,0.5D
C1168-19 C1166R-19
Relay-Heated-rear screen (R138)
FUSE 13P
25.0 Amps
C0582-19
C0585R-23
NP,4.0D
C2959-1 C2960-1
NP,4.0D
C0381-1
Sensor-Ambient air-temperature (T119)
C0412-2
BG,0.5D
C3127-2 C3126-2
BG,0.5D
C2444R-1 C2443-1
BG,0.5D
C0412-1
YN,0.5D
C3127-1 C3126-1
YN,0.5D
C2444R-6 C2443-6
Automatic Temperature Control Module (D243)
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
MS CAN H
MS CAN L
MS CAN H
MS CAN L
C1629-15
YN,0.5D
C1629-13
BG,0.5D
SJ550
C2655-3
B,1.0D
C2629-1
TYPE 3
C2655-1
SJ965
YU,0.5D
C1629-22
SJ975
YW,0.5D
C1629-21
C1629-10
YU,0.5D
C2238-2 C2240-2
C1629-9
YW,0.5D
C2238-1 C2240-1
Instrument cluster (J100)
HS CAN H
HS CAN L
MS CAN H
MS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0635R-57
YB,0.5D
SJ1176
C0635R-44
YN,0.5D
SJ1177
Filter (Y221)
Earth via-fixings (E110)
Rear window heater element (H100)
C0381-1
15.00 Amps
C0382-1
Filter (Y221)
C0382-1
B,4.0D
Earth via-fixings (E110)
C2960-2 C2959-2
B,4.0D
C2568-1
TYPE 3

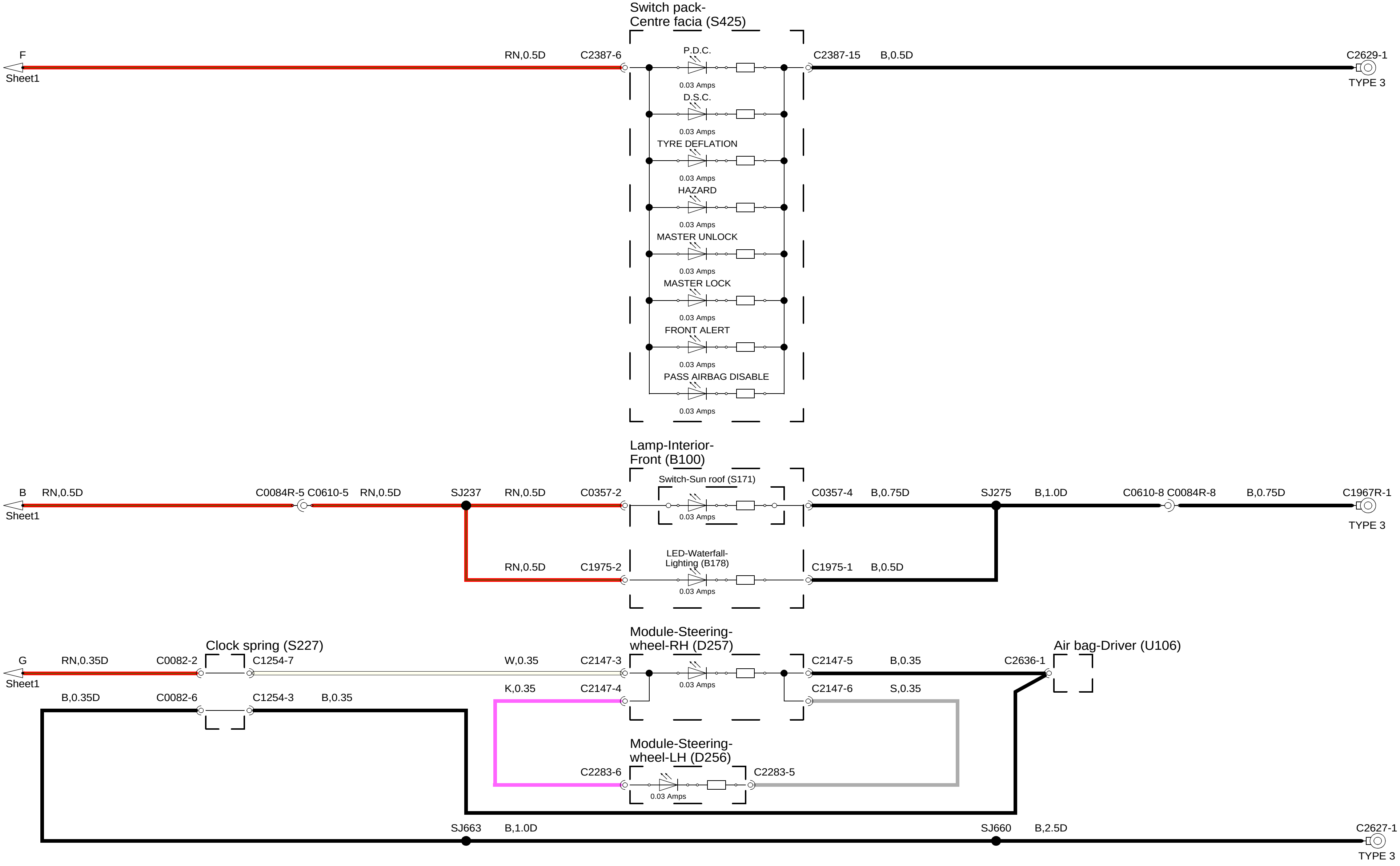

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Central junction-box (P101)
C0583R-22
FUSE 59P
C0582-44
LGW,1.0D
C0223-2 C0047R-2
LGW,0.75D
10.0 Amps
Cool box (D345)
C2053-12 C2054-12
LGW,0.75D
C2773-1
C2773-2
B,0.75D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Fan
3.80 Amps

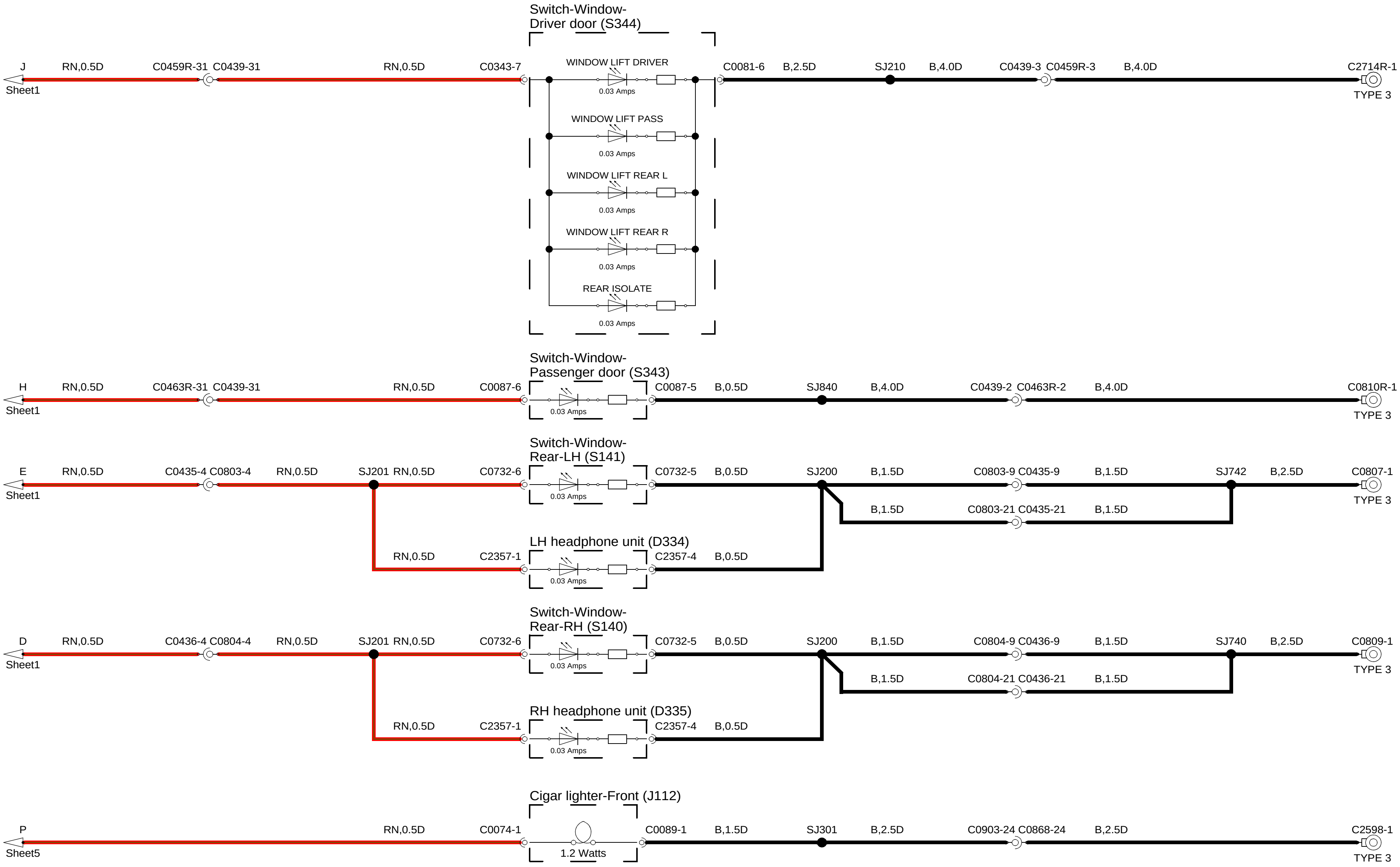
413-00 INSTRUMENT CLUSTER AND PANEL ILLUMINATION

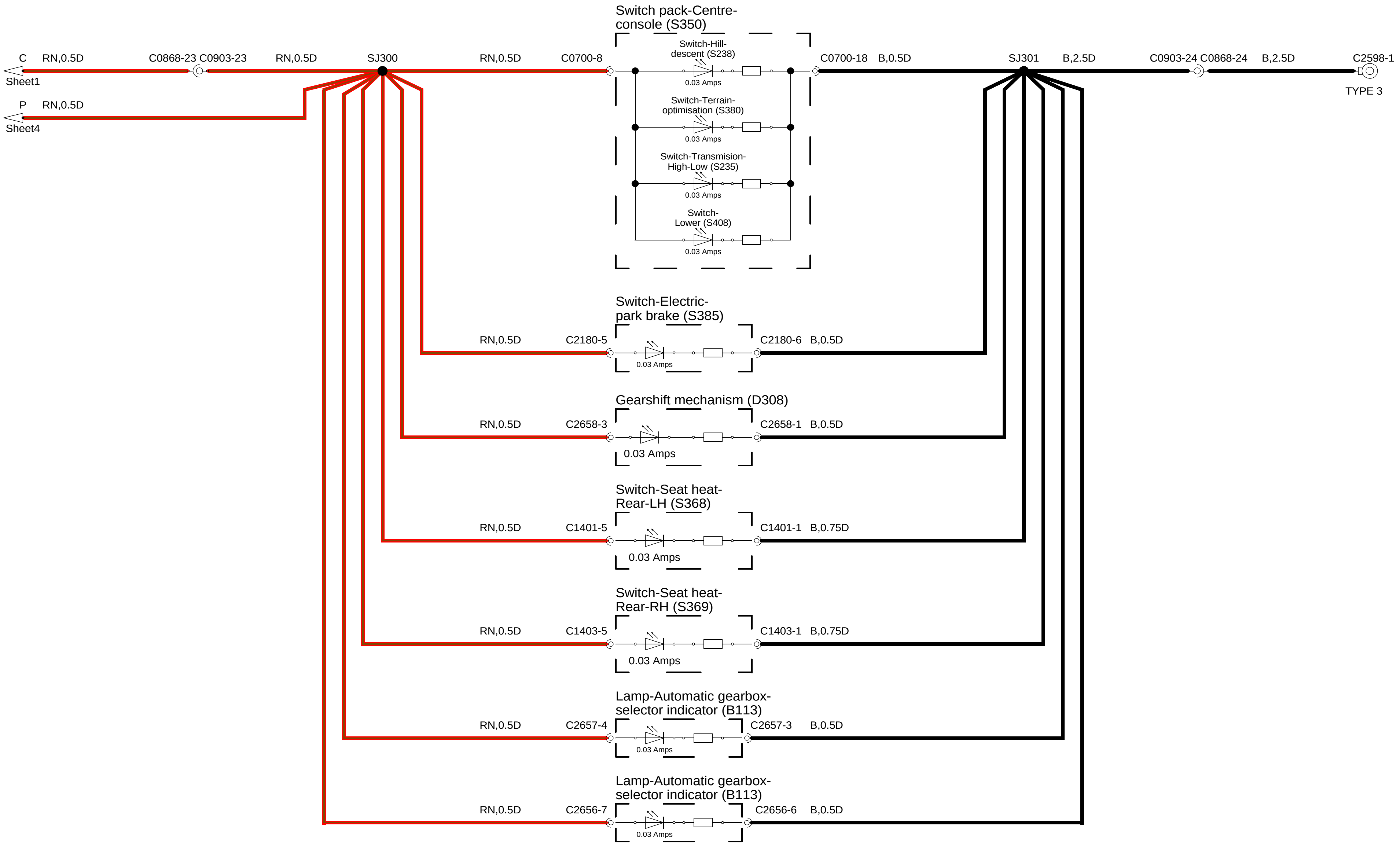


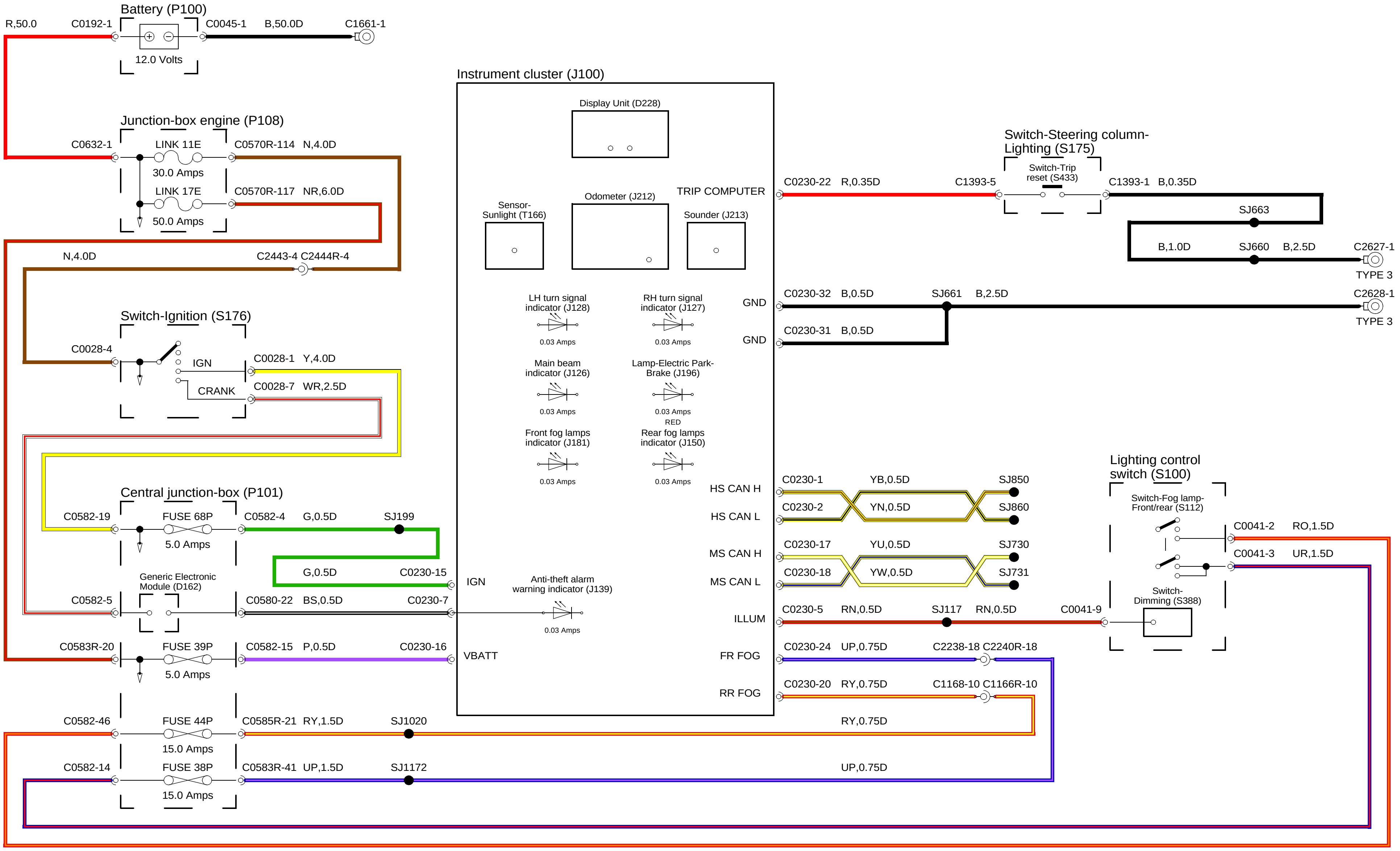
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
FUSE 25E
5.0 Amps
C0570R-109
NS,1.5D
C2444R-2 C2443-2
NG,1.0D
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
Lighting control switch (S100)
Switch-Dimming (S388)
C0041-11
C0041-9
RN,0.5D
C0041-10
B,1.0D
SJ660
C0041-13
C0041-16
SJ117
RN,0.5D
K
Sheet2
RN,0.5D
L
Sheet2
RN,0.5D
F
Sheet3
C1166R-12 C1168-12
RN,0.5D
RN,0.35D
G
Sheet3
RN,0.5D
SJ1052
RN,0.5D
H
Sheet4
RN,0.5D
J
Sheet4
RN,0.5D
B
Sheet3
RN,0.5D
C
Sheet5
RN,0.5D
D
Sheet4
RN,0.5D
E
Sheet4
Central junction-box (P101)
Relay-Side-lamp (R125)
Relay-Auto-lights (R274)
C0583R-21
FUSE 67P
5.0 Amps
C0582-1
RO,0.5D
Generic Electronic Module (D162)
B,2.5D
C2627-1
TYPE 3
C0580-24
R,0.5D
Sensor-Rain-Ambient light (T328)
C0586R-32
R,0.5D
SJ1045
R,0.5D
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 3

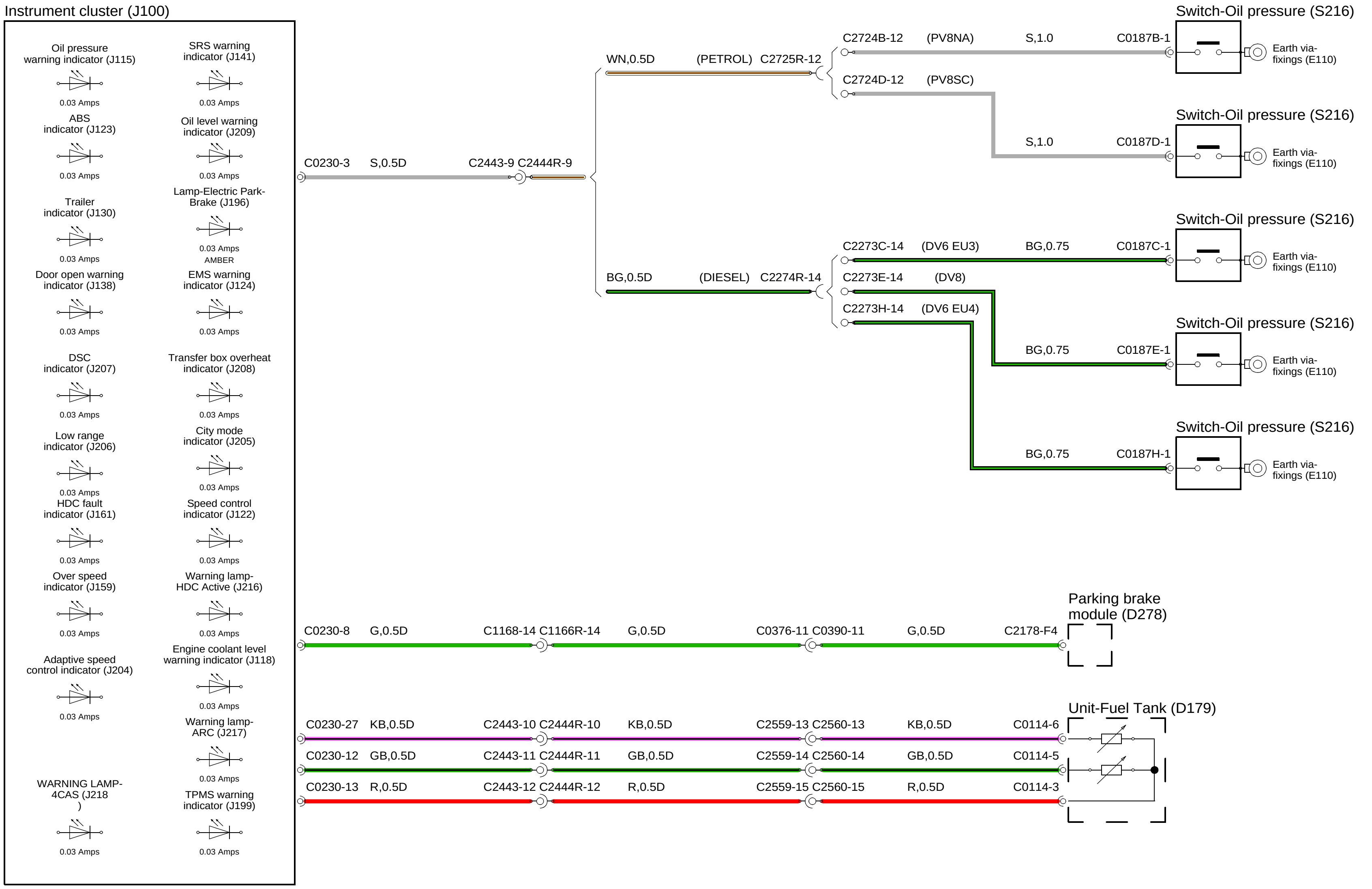

Instrument cluster (J100)
L
Sheet1
RN,0.5D
C0230-5
0.03 Amps
C0230-31
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
Sensor-
Sunlight (T166)
MS CAN H
MS CAN L
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
Automatic Temperature
Control Module (D243)
C2655-3
B,1.0D
C2629-1
TYPE 3
0.03 Amps
MS CAN H
MS CAN L
C1629-22
YU,0.5D
SJ965
C1629-21
YW,0.5D
SJ975
Audio head unit (D282)
MS CAN L
MS CAN H
C1354-10
YW,0.5D
C1354-9
YU,MAPZ
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
TYPE 3
B,0.75D
C2640-2 C2639-2
B,0.75D
0.03 Amps
0.03 Amps
PHONE
0.03 Amps
BREAKDOWN
0.03 Amps
IMFORMATION
0.03 Amps
EMERGENCY
0.03 Amps
B,0.5D
C2247-2 C2249-2
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
Touch screen
display (D326)
SJ590
B,0.5D
C2819-2
GND
C2819-12
RN,0.5D
0.03 Amps
Navigation system
module (D325)
C2114-6
Y,0.5D
C2249-4 C2247-4
Y,0.5D
C2819-15
CAN H
C2114-22
G,0.5D
C2249-5 C2247-5
G,0.5D
C2819-14
CAN L
0.03 Amps
MOST OUT
C2105-2
O,MZE
C2825-1
MOST IN
Rear seat entertainment
module (D313)
MOST IN
C2105-1
O,MZE
C2867-2 C3201-2
O,MAOC
C2109-2
MOST OUT
0.03 Amps
K
Sheet1

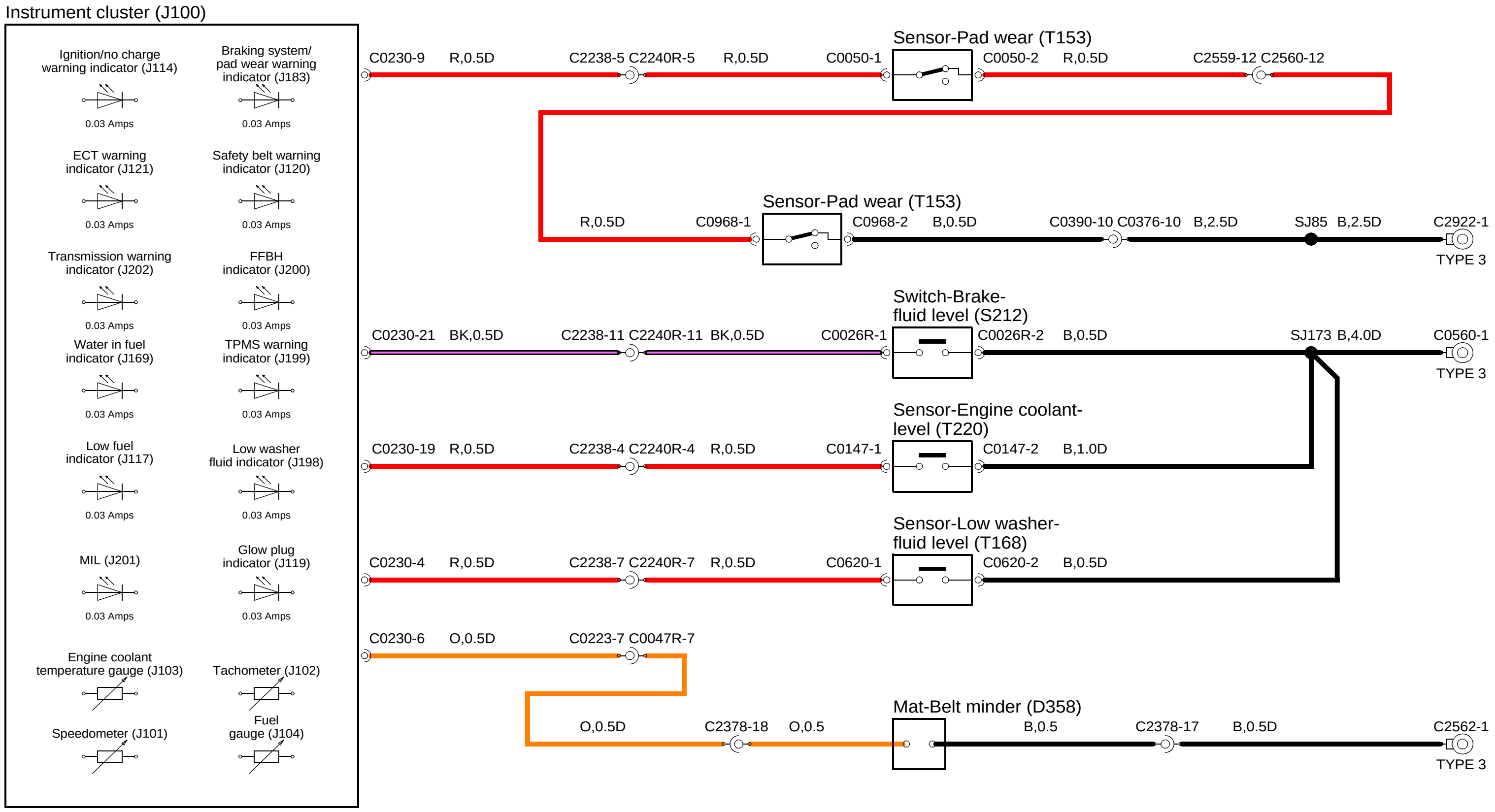

Switch pack-
Centre facia (S425)
F
Sheet1
RN,0.5D
C2387-6
P.D.C.
0.03 Amps
D.S.C.
0.03 Amps
TYRE DEFLATION
0.03 Amps
HAZARD
0.03 Amps
MASTER UNLOCK
0.03 Amps
MASTER LOCK
0.03 Amps
FRONT ALERT
0.03 Amps
PASS AIRBAG DISABLE
0.03 Amps
C2387-15
B,0.5D
C2629-1
TYPE 3
Lamp-Interior-
Front (B100)
B
Sheet1
RN,0.5D
C0084R-5 C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
Switch-Sun roof (S171)
0.03 Amps
C0357-4
B,0.75D
SJ275
B,1.0D
C0610-8 C0084R-8
B,0.75D
C1967R-1
TYPE 3
RN,0.5D
C1975-2
LED-Waterfall-
Lighting (B178)
0.03 Amps
C1975-1
B,0.5D
Clock spring (S227)
G
Sheet1
RN,0.35D
C0082-2
C1254-7
W,0.35
C2147-3
Module-Steering-
wheel-RH (D257)
0.03 Amps
C2147-5
B,0.35
C2636-1
Air bag-Driver (U106)
B,0.35D
C0082-6
C1254-3
B,0.35
K,0.35
C2147-4
C2147-6
S,0.35
Module-Steering-
wheel-LH (D256)
C2283-6
0.03 Amps
C2283-5
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

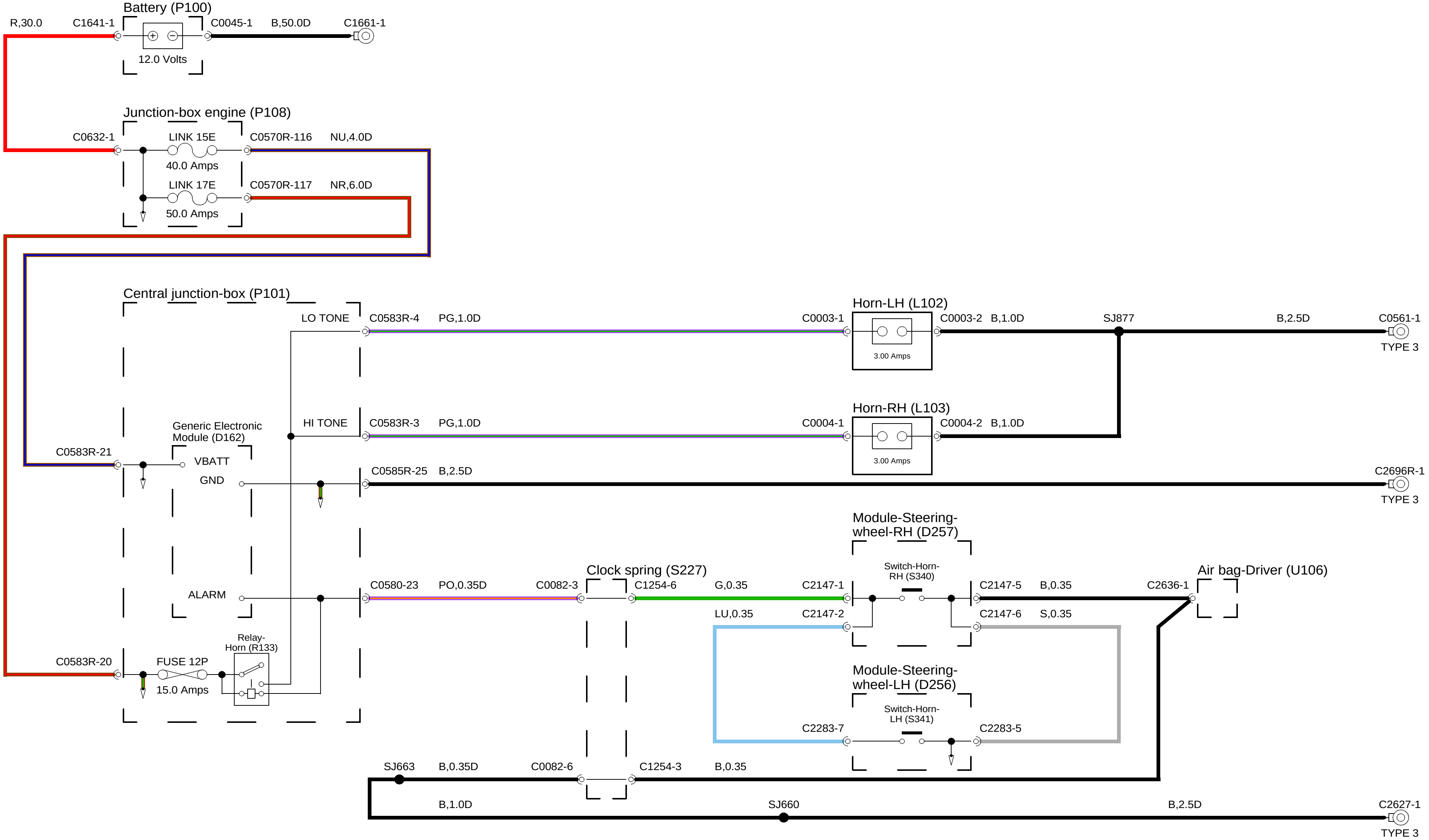

Switch-Window-
Driver door (S344)
J
Sheet1
RN,0.5D
C0459R-31 C0439-31
RN,0.5D
C0343-7
WINDOW LIFT DRIVER
0.03 Amps
WINDOW LIFT PASS
0.03 Amps
WINDOW LIFT REAR L
0.03 Amps
WINDOW LIFT REAR R
0.03 Amps
REAR ISOLATE
0.03 Amps
C0081-6
B,2.5D
SJ210
B,4.0D
C0439-3 C0459R-3
B,4.0D
C2714R-1
TYPE 3
Switch-Window-
Passenger door (S343)
H
Sheet1
RN,0.5D
C0463R-31 C0439-31
RN,0.5D
C0087-6
0.03 Amps
C0087-5
B,0.5D
SJ840
B,4.0D
C0439-2 C0463R-2
B,4.0D
C0810R-1
TYPE 3
Switch-Window-
Rear-LH (S141)
E
Sheet1
RN,0.5D
C0435-4 C0803-4
RN,0.5D
SJ201 RN,0.5D
C0732-6
0.03 Amps
C0732-5
B,0.5D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21 C0435-21
B,1.5D
LH headphone unit (D334)
RN,0.5D
C2357-1
0.03 Amps
C2357-4
B,0.5D
Switch-Window-
Rear-RH (S140)
D
Sheet1
RN,0.5D
C0436-4 C0804-4
RN,0.5D
SJ201 RN,0.5D
C0732-6
0.03 Amps
C0732-5
B,0.5D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21 C0436-21
B,1.5D
RH headphone unit (D335)
RN,0.5D
C2357-1
0.03 Amps
C2357-4
B,0.5D
Cigar lighter-Front (J112)
P
Sheet5
RN,0.5D
C0074-1
1.2 Watts
C0089-1
B,1.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3


Switch pack-Centre-console (S350)
Switch-Hill-descent (S238)
0.03 Amps
Switch-Terrain-optimisation (S380)
0.03 Amps
Switch-Transmision-High-Low (S235)
0.03 Amps
Switch-Lower (S408)
0.03 Amps
C
RN,0.5D
Sheet1
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C0700-8
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
P
RN,0.5D
Sheet4
Switch-Electric-park brake (S385)
RN,0.5D
C2180-5
0.03 Amps
C2180-6
B,0.5D
Gearshift mechanism (D308)
RN,0.5D
C2658-3
0.03 Amps
C2658-1
B,0.5D
Switch-Seat heat-Rear-LH (S368)
RN,0.5D
C1401-5
0.03 Amps
C1401-1
B,0.75D
Switch-Seat heat-Rear-RH (S369)
RN,0.5D
C1403-5
0.03 Amps
C1403-1
B,0.75D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2657-4
0.03 Amps
C2657-3
B,0.5D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2656-7
0.03 Amps
C2656-6
B,0.5D

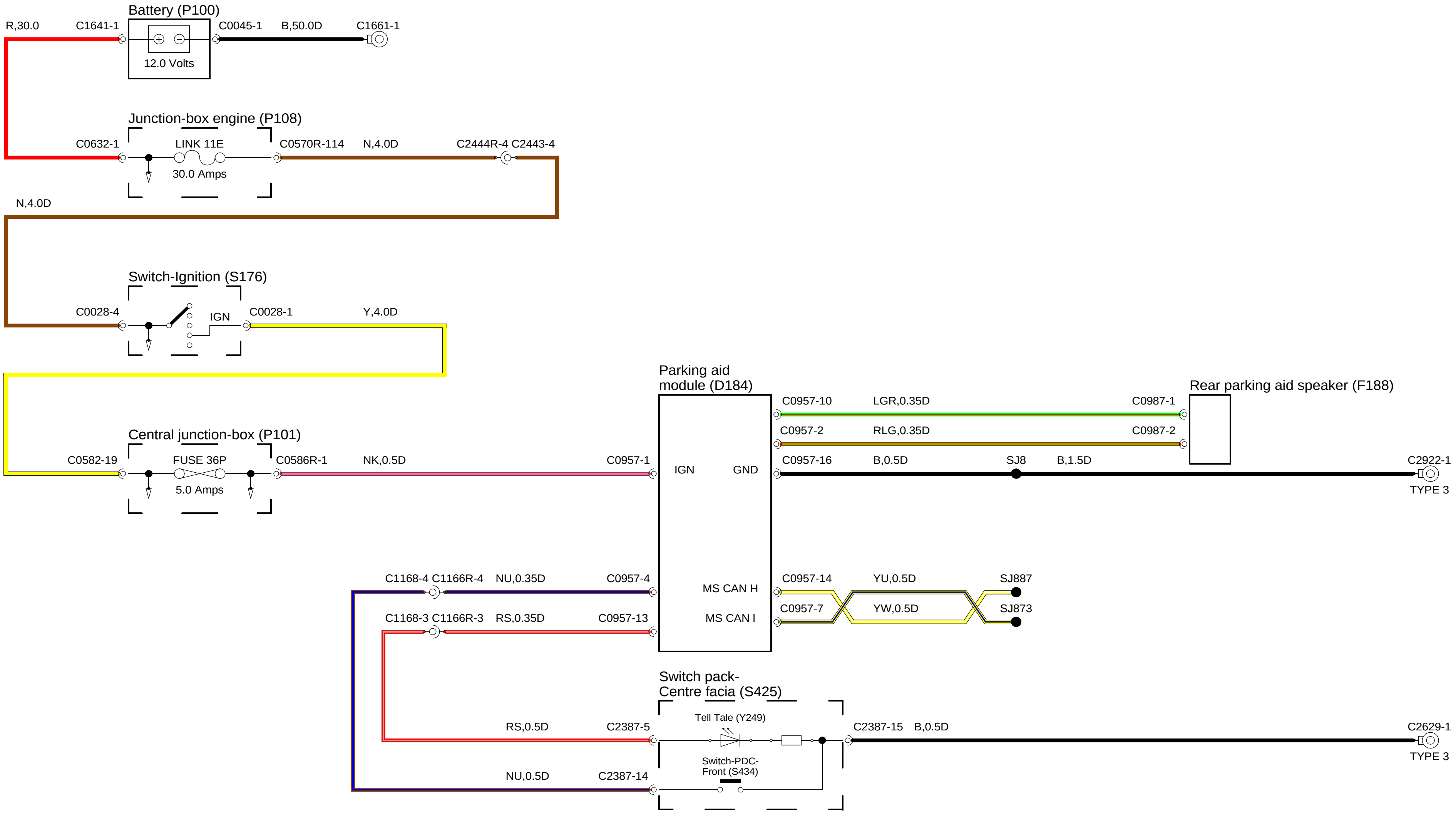

Battery (P100)
R,50.0
C0192-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 17E
50.0 Amps
C0570R-114
N,4.0D
C0570R-117
NR,6.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
CRANK
C0028-1
Y,4.0D
C0028-7
WR,2.5D
Central junction-box (P101)
C0582-19
FUSE 68P
5.0 Amps
C0582-4
G,0.5D
SJ199
G,0.5D
C0230-15
Generic Electronic Module (D162)
C0582-5
C0580-22
BS,0.5D
C0230-7
C0583R-20
FUSE 39P
5.0 Amps
C0582-15
P,0.5D
C0230-16
C0582-46
FUSE 44P
15.0 Amps
C0585R-21
RY,1.5D
SJ1020
C0582-14
FUSE 38P
15.0 Amps
C0583R-41
UP,1.5D
SJ1172
Instrument cluster (J100)
Display Unit (D228)
Sensor-Sunlight (T166)
Odometer (J212)
TRIP COMPUTER
Sounder (J213)
LH turn signal indicator (J128)
0.03 Amps
RH turn signal indicator (J127)
0.03 Amps
GND
GND
Main beam indicator (J126)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
RED
Front fog lamps indicator (J181)
0.03 Amps
Rear fog lamps indicator (J150)
0.03 Amps
HS CAN H
HS CAN L
MS CAN H
MS CAN L
IGN
Anti-theft alarm warning indicator (J139)
0.03 Amps
ILLUM
VBATT
FR FOG
RR FOG
Switch-Steering column-Lighting (S175)
Switch-Trip reset (S433)
C0230-22
R,0.35D
C1393-5
C1393-1
B,0.35D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
C0230-31
B,0.5D
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
C0230-5
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0230-24
UP,0.75D
C2238-18 C2240R-18
C0230-20
RY,0.75D
C1168-10 C1166R-10
RY,0.75D
UP,0.75D
Lighting control switch (S100)
Switch-Fog lamp-Front/rear (S112)
C0041-2
RO,1.5D
C0041-3
UR,1.5D
Switch-Dimming (S388)

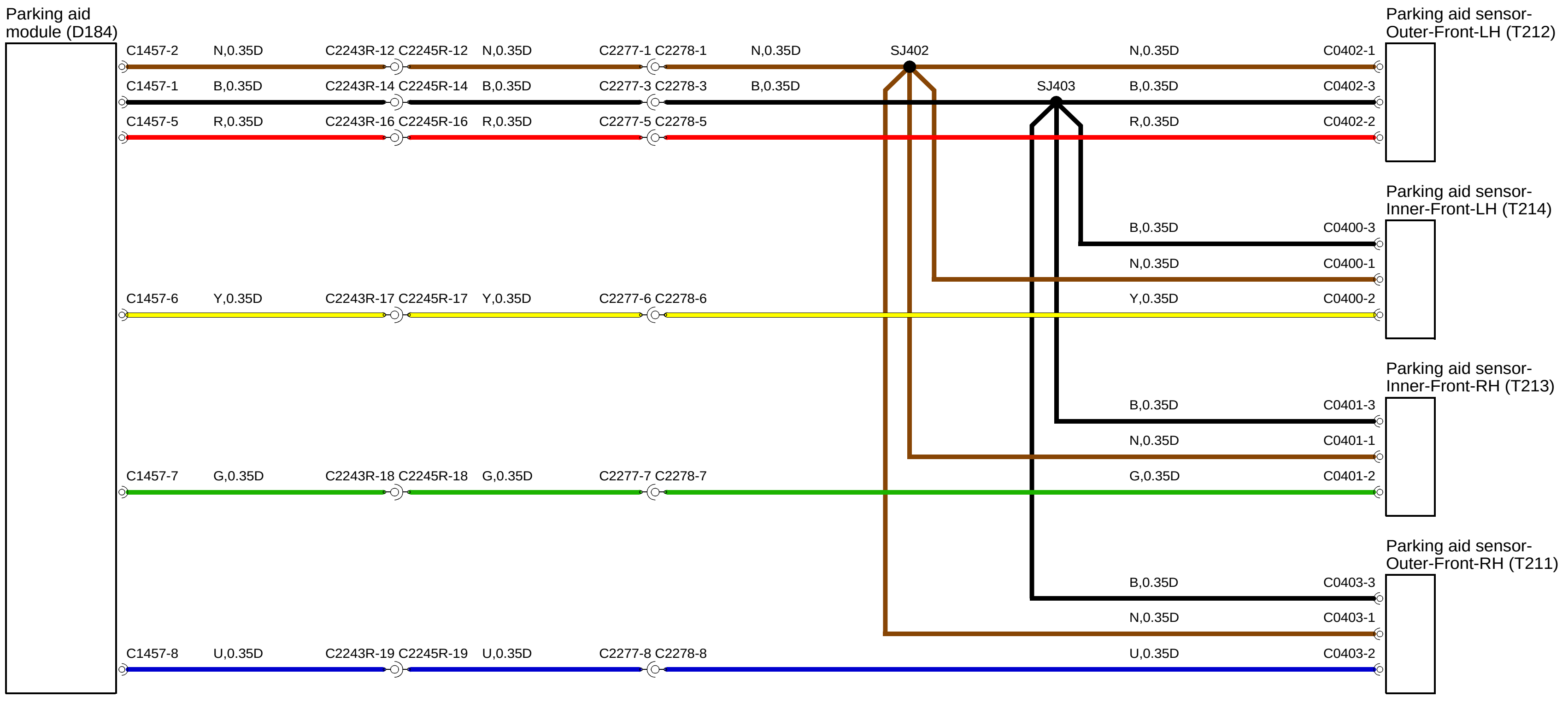

Instrument cluster (J100)
Oil pressure warning indicator (J115)
0.03 Amps
SRS warning indicator (J141)
0.03 Amps
ABS indicator (J123)
0.03 Amps
Oil level warning indicator (J209)
0.03 Amps
Trailer indicator (J130)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
AMBER
Door open warning indicator (J138)
0.03 Amps
EMS warning indicator (J124)
0.03 Amps
DSC indicator (J207)
0.03 Amps
Transfer box overheat indicator (J208)
0.03 Amps
Low range indicator (J206)
0.03 Amps
City mode indicator (J205)
0.03 Amps
HDC fault indicator (J161)
0.03 Amps
Speed control indicator (J122)
0.03 Amps
Over speed indicator (J159)
0.03 Amps
Warning lamp-HDC Active (J216)
0.03 Amps
Adaptive speed control indicator (J204)
0.03 Amps
Engine coolant level warning indicator (J118)
0.03 Amps
Warning lamp-ARC (J217)
0.03 Amps
WARNING LAMP-4CAS (J218)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
C0230-3
S,0.5D
C2443-9 C2444R-9
WN,0.5D
(PETROL)
C2725R-12
C2724B-12
(PV8NA)
S,1.0
C0187B-1
C2724D-12
(PV8SC)
S,1.0
C0187D-1
BG,0.5D
(DIESEL)
C2274R-14
C2273C-14
(DV6 EU3)
BG,0.75
C0187C-1
C2273E-14
(DV8)
C2273H-14
(DV6 EU4)
BG,0.75
C0187E-1
BG,0.75
C0187H-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
Switch-Oil pressure (S216)
Earth via-fixings (E110)
Switch-Oil pressure (S216)
Earth via-fixings (E110)
Switch-Oil pressure (S216)
Earth via-fixings (E110)
Switch-Oil pressure (S216)
Earth via-fixings (E110)
Parking brake module (D278)
C0230-8
G,0.5D
C1168-14 C1166R-14
G,0.5D
C0376-11 C0390-11
G,0.5D
C2178-F4
Unit-Fuel Tank (D179)
C0230-27
KB,0.5D
C2443-10 C2444R-10
KB,0.5D
C2559-13 C2560-13
KB,0.5D
C0114-6
C0230-12
GB,0.5D
C2443-11 C2444R-11
GB,0.5D
C2559-14 C2560-14
GB,0.5D
C0114-5
C0230-13
R,0.5D
C2443-12 C2444R-12
R,0.5D
C2559-15 C2560-15
R,0.5D
C0114-3

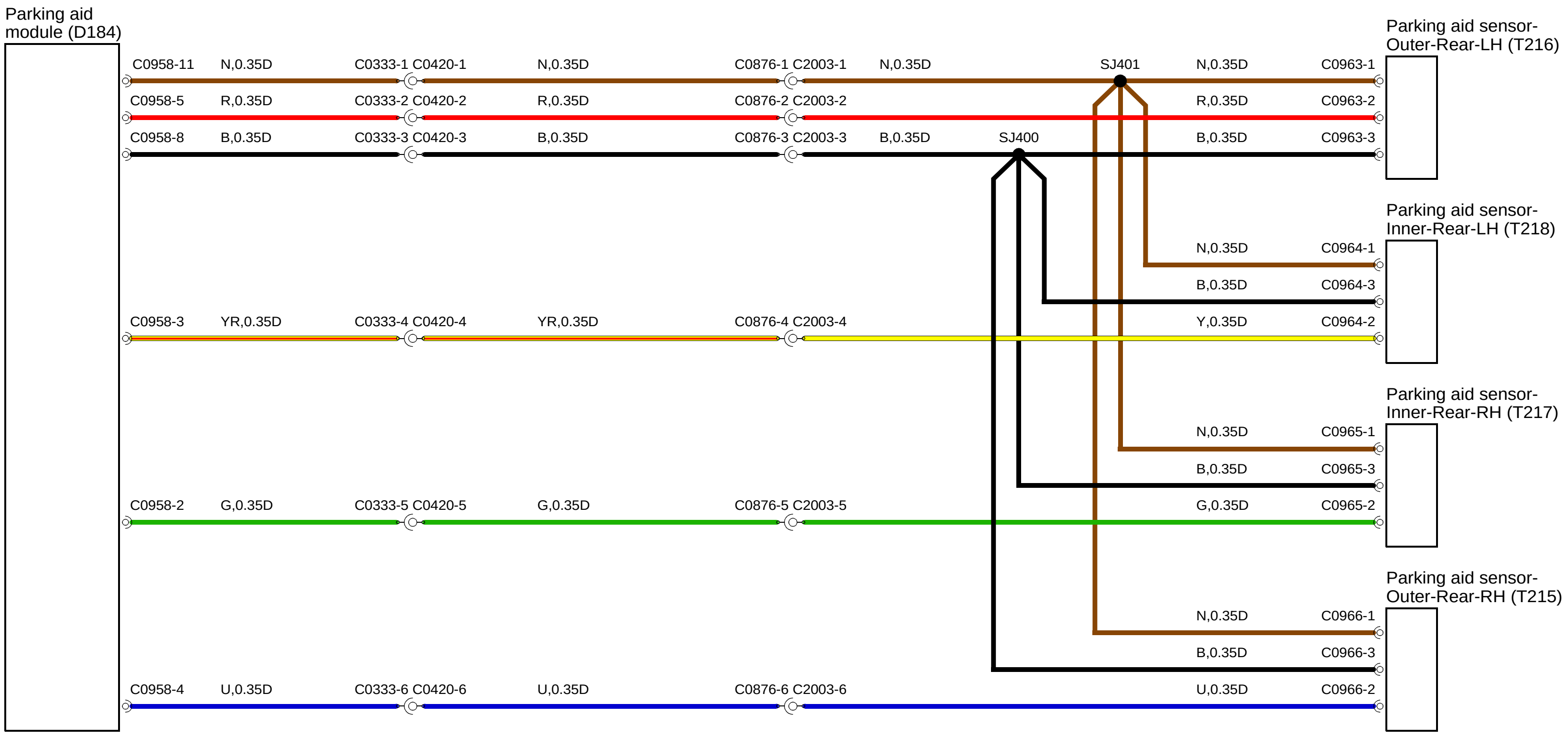

Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
0.03 Amps
Braking system/ pad wear warning indicator (J183)
0.03 Amps
ECT warning indicator (J121)
0.03 Amps
Safety belt warning indicator (J120)
0.03 Amps
Transmission warning indicator (J202)
0.03 Amps
FFBH indicator (J200)
0.03 Amps
Water in fuel indicator (J169)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
Low fuel indicator (J117)
0.03 Amps
Low washer fluid indicator (J198)
0.03 Amps
MIL (J201)
0.03 Amps
Glow plug indicator (J119)
0.03 Amps
Engine coolant temperature gauge (J103)
Tachometer (J102)
Speedometer (J101)
Fuel gauge (J104)
C0230-9
R,0.5D
C2238-5 C2240R-5
R,0.5D
C0050-1
Sensor-Pad wear (T153)
C0050-2
R,0.5D
C2559-12 C2560-12
R,0.5D
C0968-1
Sensor-Pad wear (T153)
C0968-2
B,0.5D
C0390-10 C0376-10
B,2.5D
SJ85
B,2.5D
C2922-1
TYPE 3
C0230-21
BK,0.5D
C2238-11 C2240R-11
BK,0.5D
C0026R-1
Switch-Brake-fluid level (S212)
C0026R-2
B,0.5D
SJ173
B,4.0D
C0560-1
TYPE 3
C0230-19
R,0.5D
C2238-4 C2240R-4
R,0.5D
C0147-1
Sensor-Engine coolant-level (T220)
C0147-2
B,1.0D
C0230-4
R,0.5D
C2238-7 C2240R-7
R,0.5D
C0620-1
Sensor-Low washer-fluid level (T168)
C0620-2
B,0.5D
C0230-6
O,0.5D
C0223-7 C0047R-7
O,0.5D
C2378-18
O,0.5
Mat-Belt minder (D358)
B,0.5
C2378-17
B,0.5D
C2562-1
TYPE 3

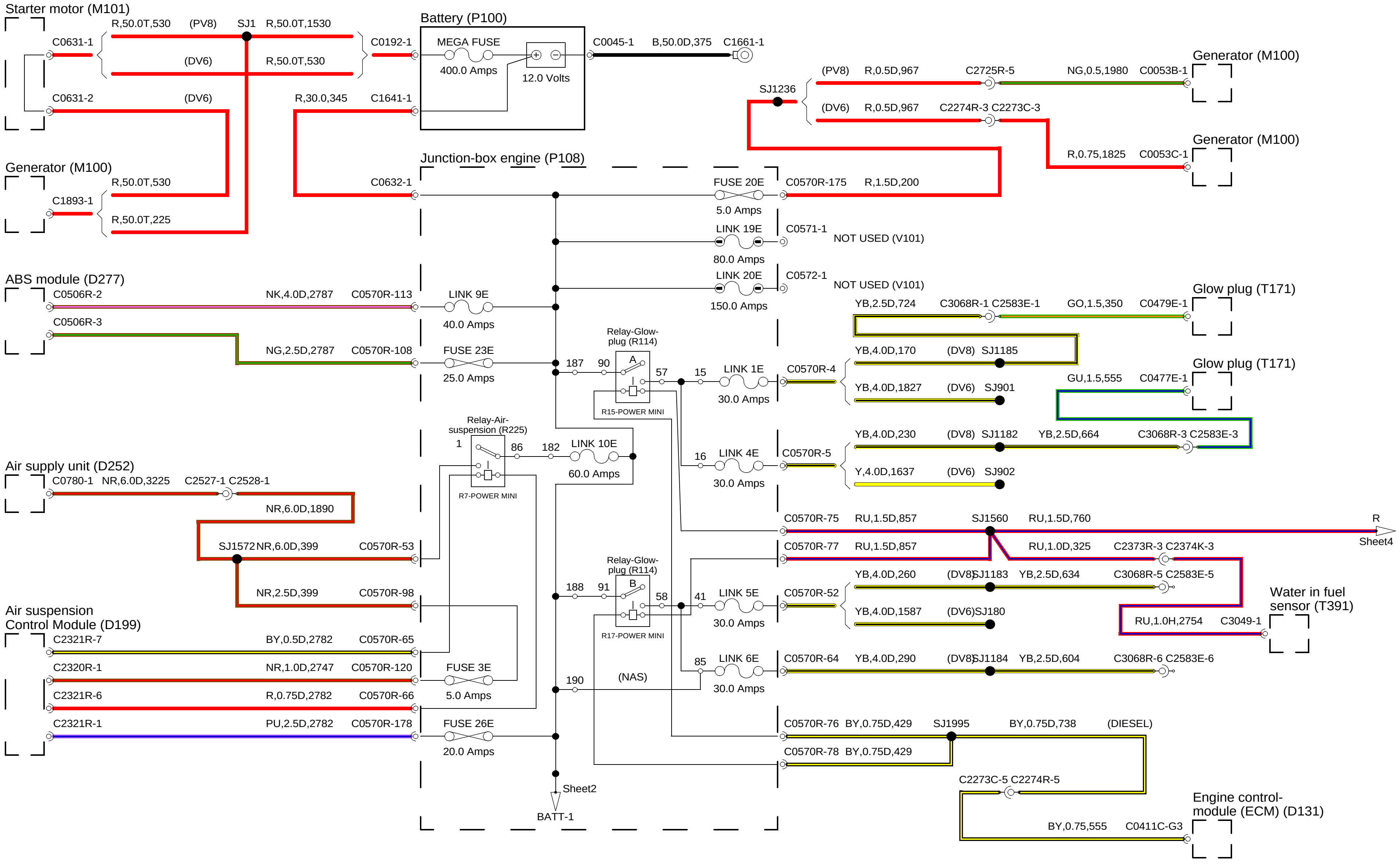

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
LINK 17E
50.0 Amps
C0570R-116
NU,4.0D
C0570R-117
NR,6.0D
Central junction-box (P101)
LO TONE
C0583R-4
PG,1.0D
HI TONE
C0583R-3
PG,1.0D
Generic Electronic Module (D162)
C0583R-21
VBATT
GND
C0585R-25
B,2.5D
ALARM
C0580-23
PO,0.35D
C0583R-20
FUSE 12P
15.0 Amps
Relay-Horn (R133)
Horn-LH (L102)
C0003-1
3.00 Amps
C0003-2
B,1.0D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
C0004-1
3.00 Amps
C0004-2
B,1.0D
C2696R-1
TYPE 3
Module-Steering-wheel-RH (D257)
Switch-Horn-RH (S340)
Clock spring (S227)
C0082-3
C1254-6
G,0.35
C2147-1
LU,0.35
C2147-2
C2147-5
B,0.35
C2147-6
S,0.35
Air bag-Driver (U106)
C2636-1
Module-Steering-wheel-LH (D256)
Switch-Horn-LH (S341)
C2283-7
C2283-5
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

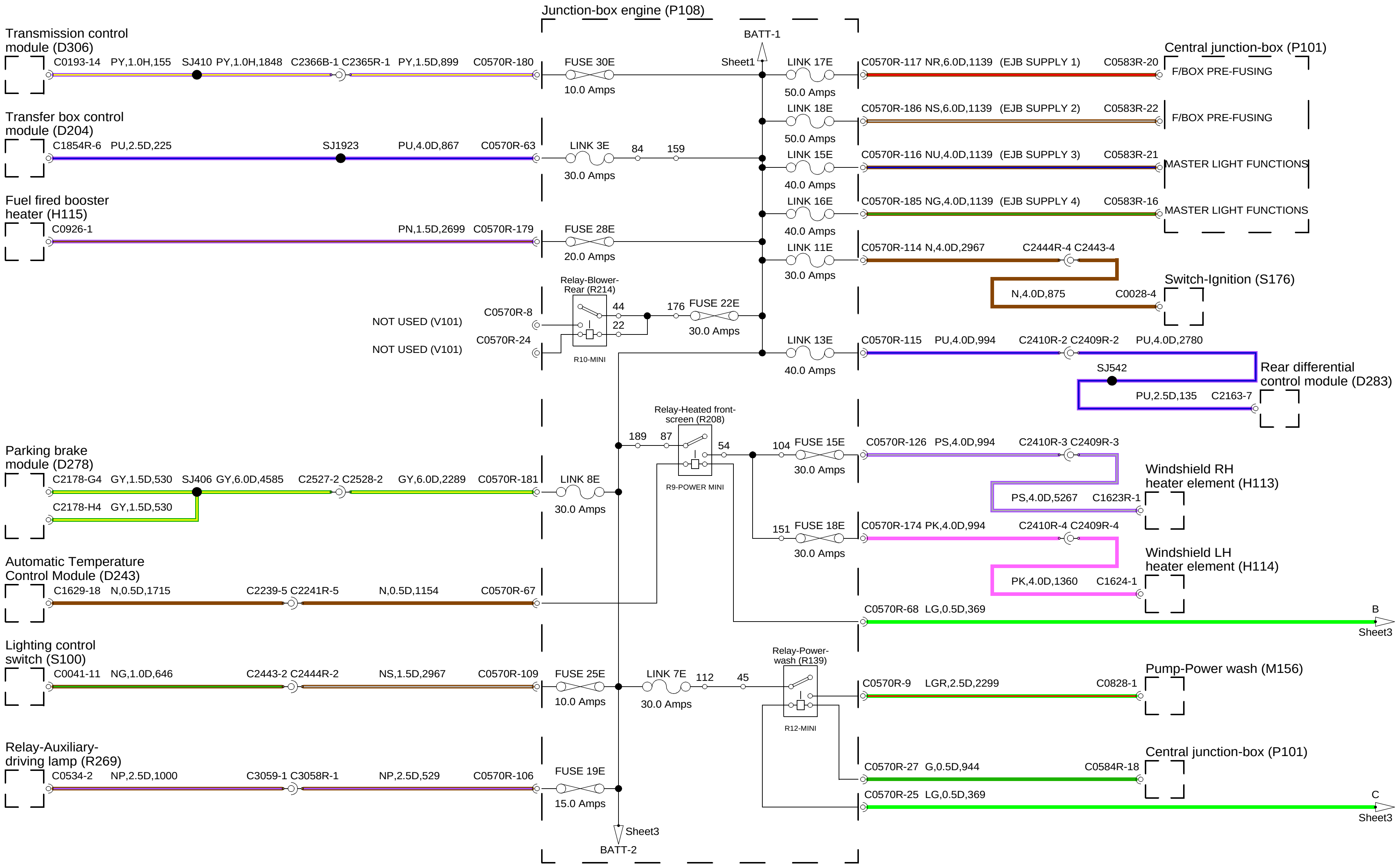
413-13 PARKING AID

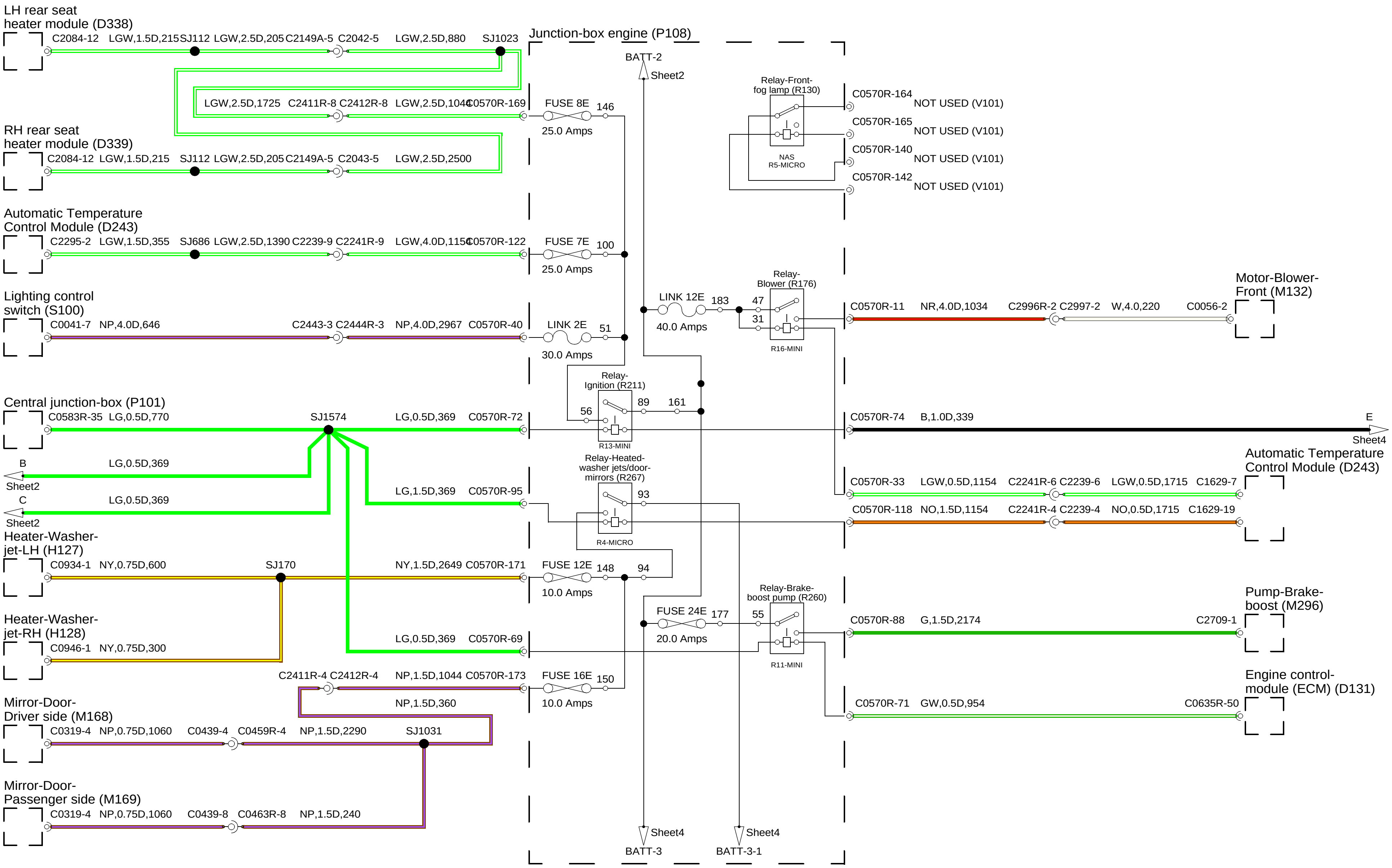

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 36P
5.0 Amps
C0586R-1
NK,0.5D
C0957-1
Parking aid module (D184)
IGN
GND
MS CAN H
MS CAN I
C0957-10
LGR,0.35D
C0987-1
C0957-2
RLG,0.35D
C0987-2
Rear parking aid speaker (F188)
C0957-16
B,0.5D
SJ8
B,1.5D
C2922-1
TYPE 3
C1168-4 C1166R-4
NU,0.35D
C0957-4
C1168-3 C1166R-3
RS,0.35D
C0957-13
C0957-14
YU,0.5D
SJ887
C0957-7
YW,0.5D
SJ873
Switch pack-Centre facia (S425)
Tell Tale (Y249)
RS,0.5D
C2387-5
C2387-15
B,0.5D
C2629-1
TYPE 3
Switch-PDC-Front (S434)
NU,0.5D
C2387-14

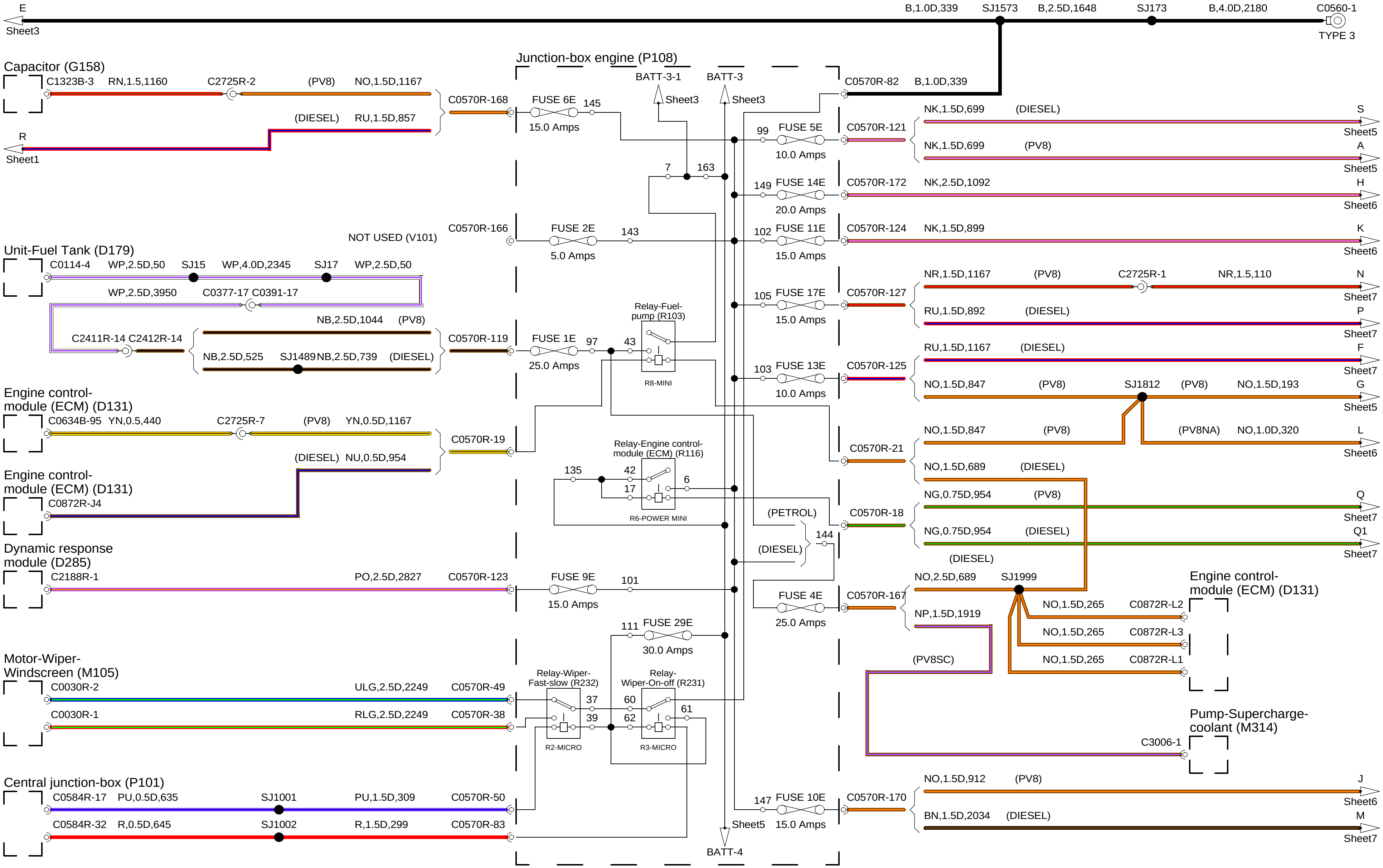

Parking aid module (D184)
C1457-2
N,0.35D
C2243R-12 C2245R-12
N,0.35D
C2277-1 C2278-1
N,0.35D
SJ402
N,0.35D
C0402-1
C1457-1
B,0.35D
C2243R-14 C2245R-14
B,0.35D
C2277-3 C2278-3
B,0.35D
SJ403
B,0.35D
C0402-3
C1457-5
R,0.35D
C2243R-16 C2245R-16
R,0.35D
C2277-5 C2278-5
R,0.35D
C0402-2
Parking aid sensor-Outer-Front-LH (T212)
Parking aid sensor-Inner-Front-LH (T214)
B,0.35D
C0400-3
N,0.35D
C0400-1
C1457-6
Y,0.35D
C2243R-17 C2245R-17
Y,0.35D
C2277-6 C2278-6
Y,0.35D
C0400-2
Parking aid sensor-Inner-Front-RH (T213)
B,0.35D
C0401-3
N,0.35D
C0401-1
C1457-7
G,0.35D
C2243R-18 C2245R-18
G,0.35D
C2277-7 C2278-7
G,0.35D
C0401-2
Parking aid sensor-Outer-Front-RH (T211)
B,0.35D
C0403-3
N,0.35D
C0403-1
C1457-8
U,0.35D
C2243R-19 C2245R-19
U,0.35D
C2277-8 C2278-8
U,0.35D
C0403-2

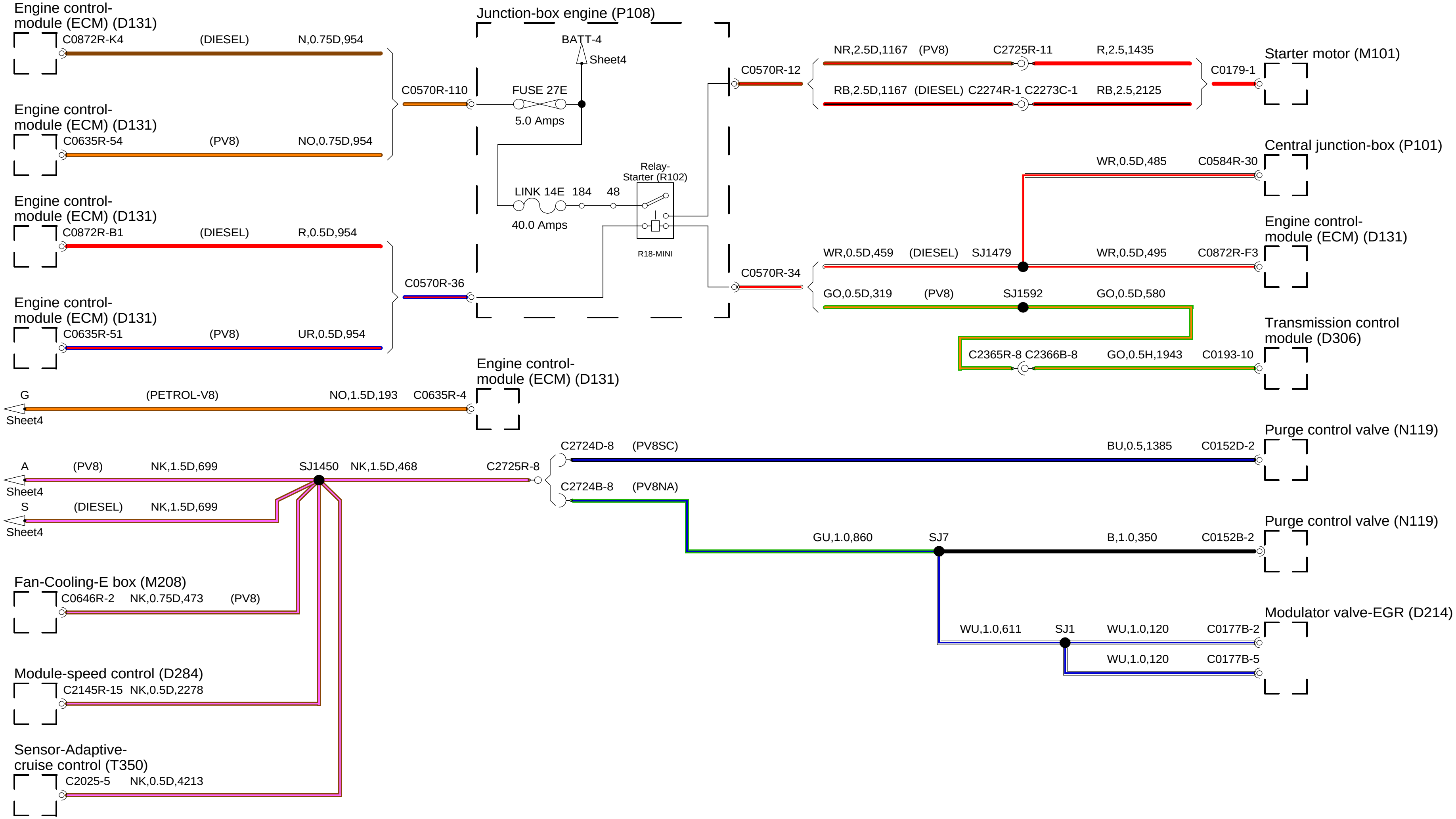

Parking aid module (D184)
C0958-11
N,0.35D
C0333-1 C0420-1
N,0.35D
C0876-1 C2003-1
N,0.35D
SJ401
N,0.35D
C0963-1
C0958-5
R,0.35D
C0333-2 C0420-2
R,0.35D
C0876-2 C2003-2
R,0.35D
C0963-2
C0958-8
B,0.35D
C0333-3 C0420-3
B,0.35D
C0876-3 C2003-3
B,0.35D
SJ400
B,0.35D
C0963-3
Parking aid sensor-Outer-Rear-LH (T216)
Parking aid sensor-Inner-Rear-LH (T218)
N,0.35D
C0964-1
B,0.35D
C0964-3
C0958-3
YR,0.35D
C0333-4 C0420-4
YR,0.35D
C0876-4 C2003-4
Y,0.35D
C0964-2
Parking aid sensor-Inner-Rear-RH (T217)
N,0.35D
C0965-1
B,0.35D
C0965-3
C0958-2
G,0.35D
C0333-5 C0420-5
G,0.35D
C0876-5 C2003-5
G,0.35D
C0965-2
Parking aid sensor-Outer-Rear-RH (T215)
N,0.35D
C0966-1
B,0.35D
C0966-3
C0958-4
U,0.35D
C0333-6 C0420-6
U,0.35D
C0876-6 C2003-6
U,0.35D
C0966-2

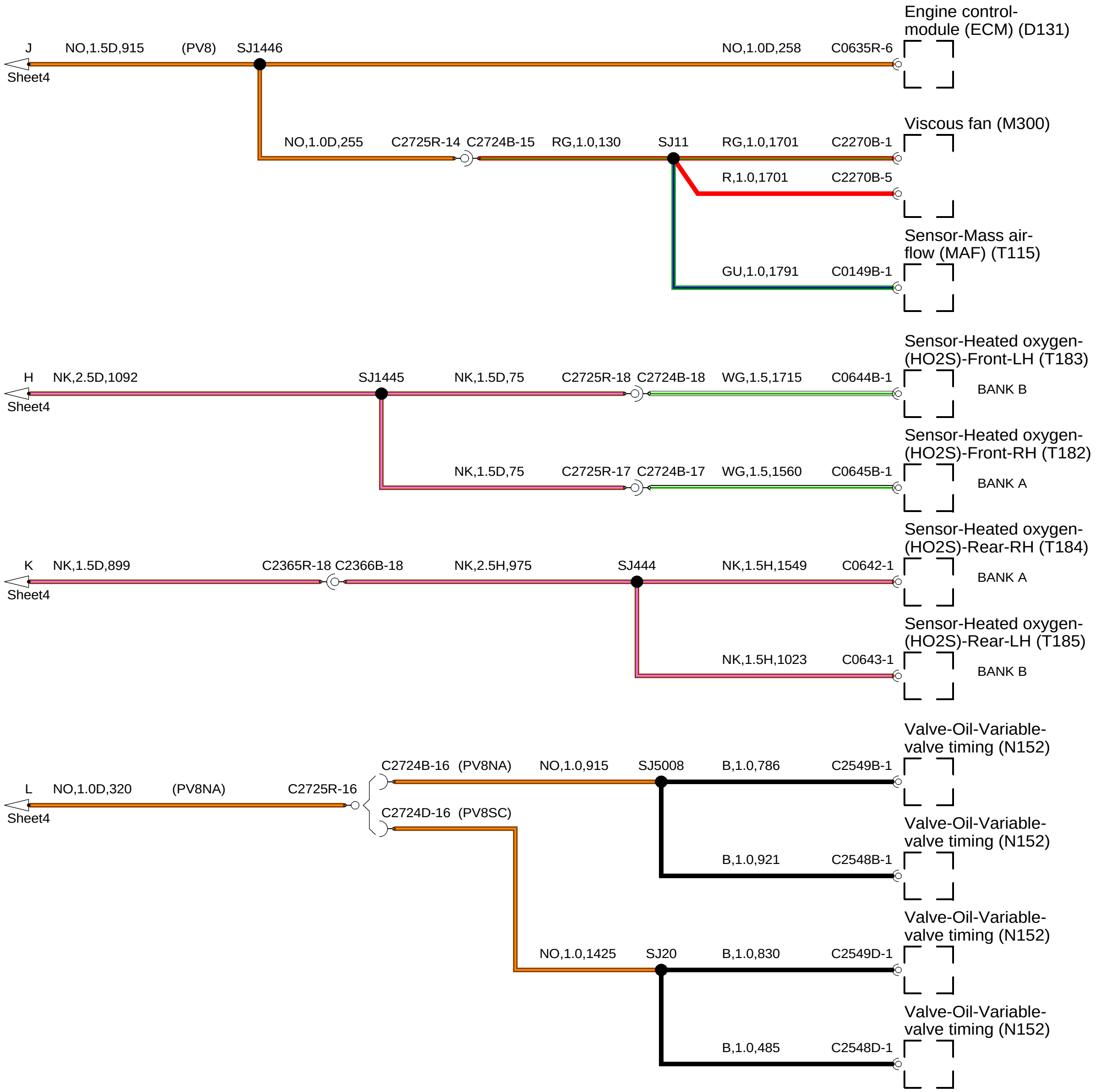

Starter motor (M101)
R,50.0T,530
(PV8)
SJ1
R,50.0T,1530
C0631-1
(DV6)
R,50.0T,530
C0192-1
C0631-2
(DV6)
R,30.0,345
C1641-1
Battery (P100)
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D,375
C1661-1
Generator (M100)
R,50.0T,530
C1893-1
R,50.0T,225
Junction-box engine (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D,200
SJ1236
(PV8)
R,0.5D,967
C2725R-5
NG,0.5,1980
C0053B-1
Generator (M100)
(DV6)
R,0.5D,967
C2274R-3 C2273C-3
R,0.75,1825
C0053C-1
Generator (M100)
LINK 19E
80.0 Amps
C0571-1
NOT USED (V101)
LINK 20E
150.0 Amps
C0572-1
NOT USED (V101)
ABS module (D277)
C0506R-2
NK,4.0D,2787
C0570R-113
LINK 9E
40.0 Amps
C0506R-3
NG,2.5D,2787
C0570R-108
FUSE 23E
25.0 Amps
Relay-Glow-plug (R114)
187
90
A
57
15
LINK 1E
30.0 Amps
C0570R-4
R15-POWER MINI
YB,2.5D,724
C3068R-1 C2583E-1
GO,1.5,350
C0479E-1
Glow plug (T171)
YB,4.0D,170
(DV8)
SJ1185
YB,4.0D,1827
(DV6)
SJ901
GU,1.5,555
C0477E-1
Glow plug (T171)
Relay-Air-suspension (R225)
1
86
182
LINK 10E
60.0 Amps
R7-POWER MINI
16
LINK 4E
30.0 Amps
C0570R-5
YB,4.0D,230
(DV8)
SJ1182
YB,2.5D,664
C3068R-3 C2583E-3
Y,4.0D,1637
(DV6)
SJ902
Air supply unit (D252)
C0780-1
NR,6.0D,3225
C2527-1 C2528-1
NR,6.0D,1890
SJ1572
NR,6.0D,399
C0570R-53
NR,2.5D,399
C0570R-98
C0570R-75
RU,1.5D,857
SJ1560
RU,1.5D,760
R
Sheet4
C0570R-77
RU,1.5D,857
RU,1.0D,325
C2373R-3 C2374K-3
Relay-Glow-plug (R114)
188
91
B
58
41
LINK 5E
30.0 Amps
C0570R-52
R17-POWER MINI
YB,4.0D,260
(DV8)
SJ1183
YB,2.5D,634
C3068R-5 C2583E-5
YB,4.0D,1587
(DV6)
SJ180
Water in fuel sensor (T391)
RU,1.0H,2754
C3049-1
Air suspension Control Module (D199)
C2321R-7
BY,0.5D,2782
C0570R-65
C2320R-1
NR,1.0D,2747
C0570R-120
FUSE 3E
5.0 Amps
C2321R-6
R,0.75D,2782
C0570R-66
190
(NAS)
85
LINK 6E
30.0 Amps
C0570R-64
YB,4.0D,290
(DV8)
SJ1184
YB,2.5D,604
C3068R-6 C2583E-6
C2321R-1
PU,2.5D,2782
C0570R-178
FUSE 26E
20.0 Amps
C0570R-76
BY,0.75D,429
SJ1995
BY,0.75D,738
(DIESEL)
C0570R-78
BY,0.75D,429
C2273C-5 C2274R-5
Sheet2
BATT-1
Engine control-module (ECM) (D131)
BY,0.75,555
C0411C-G3

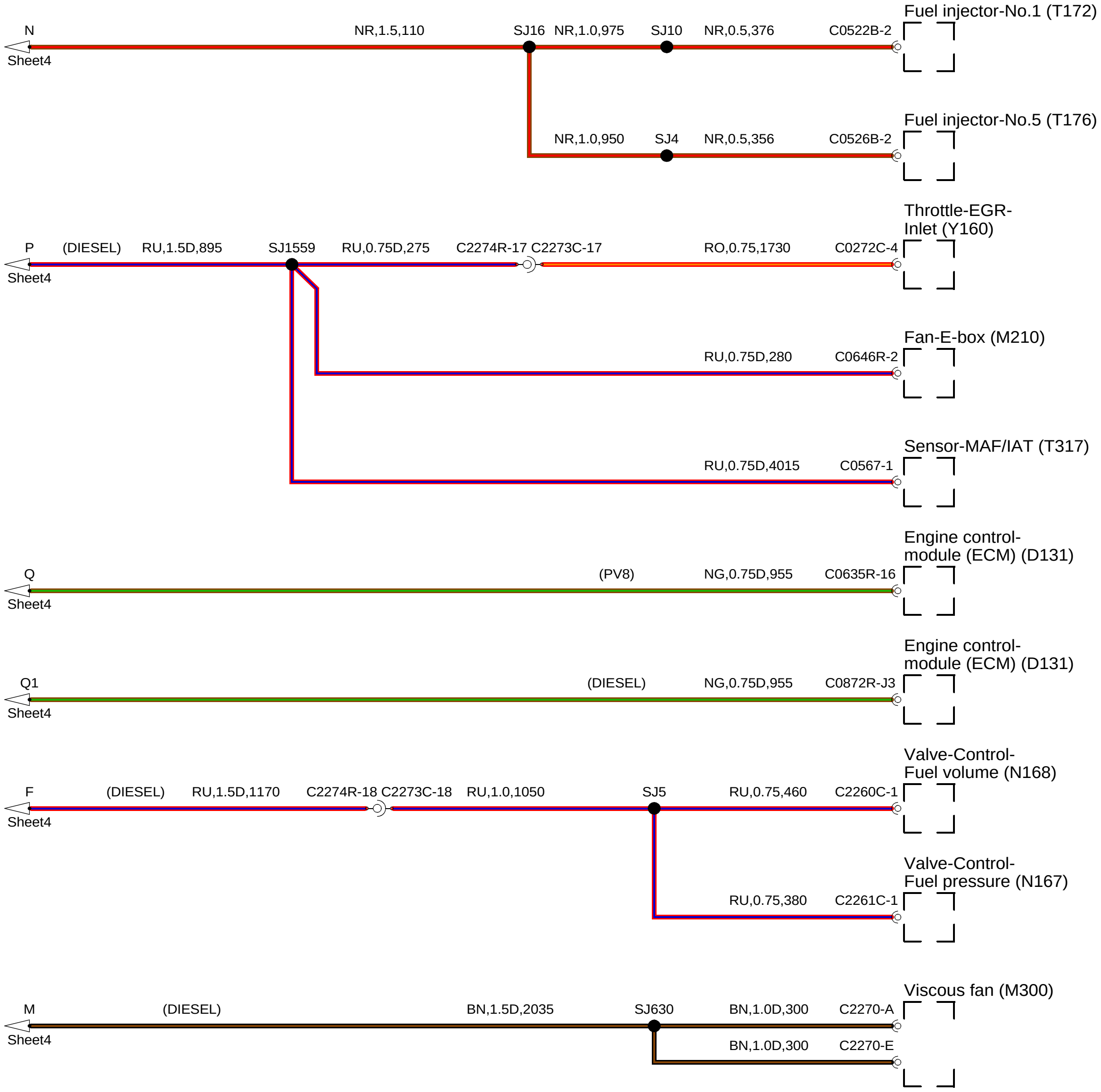

Junction-box engine (P108)
BATT-1
Sheet1
Transmission control module (D306)
C0193-14 PY,1.0H,155 SJ410 PY,1.0H,1848 C2366B-1 C2365R-1 PY,1.5D,899 C0570R-180
FUSE 30E
10.0 Amps
LINK 17E
50.0 Amps
C0570R-117 NR,6.0D,1139 (EJB SUPPLY 1) C0583R-20
Central junction-box (P101)
F/BOX PRE-FUSING
LINK 18E
50.0 Amps
C0570R-186 NS,6.0D,1139 (EJB SUPPLY 2) C0583R-22
F/BOX PRE-FUSING
Transfer box control module (D204)
C1854R-6 PU,2.5D,225 SJ1923 PU,4.0D,867 C0570R-63
LINK 3E
84
159
30.0 Amps
LINK 15E
40.0 Amps
C0570R-116 NU,4.0D,1139 (EJB SUPPLY 3) C0583R-21
MASTER LIGHT FUNCTIONS
LINK 16E
40.0 Amps
C0570R-185 NG,4.0D,1139 (EJB SUPPLY 4) C0583R-16
MASTER LIGHT FUNCTIONS
Fuel fired booster heater (H115)
C0926-1 PN,1.5D,2699 C0570R-179
FUSE 28E
20.0 Amps
LINK 11E
30.0 Amps
C0570R-114 N,4.0D,2967 C2444R-4 C2443-4
N,4.0D,875 C0028-4
Switch-Ignition (S176)
Relay-Blower-Rear (R214)
C0570R-8
NOT USED (V101)
C0570R-24
NOT USED (V101)
44
22
176 FUSE 22E
30.0 Amps
R10-MINI
LINK 13E
40.0 Amps
C0570R-115 PU,4.0D,994 C2410R-2 C2409R-2 PU,4.0D,2780
SJ542
Rear differential control module (D283)
PU,2.5D,135 C2163-7
Relay-Heated front-screen (R208)
189 87
54
R9-POWER MINI
104 FUSE 15E
30.0 Amps
C0570R-126 PS,4.0D,994 C2410R-3 C2409R-3
Windshield RH heater element (H113)
PS,4.0D,5267 C1623R-1
Parking brake module (D278)
C2178-G4 GY,1.5D,530 SJ406 GY,6.0D,4585 C2527-2 C2528-2 GY,6.0D,2289 C0570R-181
C2178-H4 GY,1.5D,530
LINK 8E
30.0 Amps
151 FUSE 18E
30.0 Amps
C0570R-174 PK,4.0D,994 C2410R-4 C2409R-4
Windshield LH heater element (H114)
PK,4.0D,1360 C1624-1
Automatic Temperature Control Module (D243)
C1629-18 N,0.5D,1715 C2239-5 C2241R-5 N,0.5D,1154 C0570R-67
C0570R-68 LG,0.5D,369
B
Sheet3
Lighting control switch (S100)
C0041-11 NG,1.0D,646 C2443-2 C2444R-2 NS,1.5D,2967 C0570R-109
FUSE 25E
10.0 Amps
LINK 7E
112
45
30.0 Amps
Relay-Power-wash (R139)
R12-MINI
C0570R-9 LGR,2.5D,2299 C0828-1
Pump-Power wash (M156)
Relay-Auxiliary-driving lamp (R269)
C0534-2 NP,2.5D,1000 C3059-1 C3058R-1 NP,2.5D,529 C0570R-106
FUSE 19E
15.0 Amps
Central junction-box (P101)
C0570R-27 G,0.5D,944 C0584R-18
C0570R-25 LG,0.5D,369
C
Sheet3
Sheet3
BATT-2

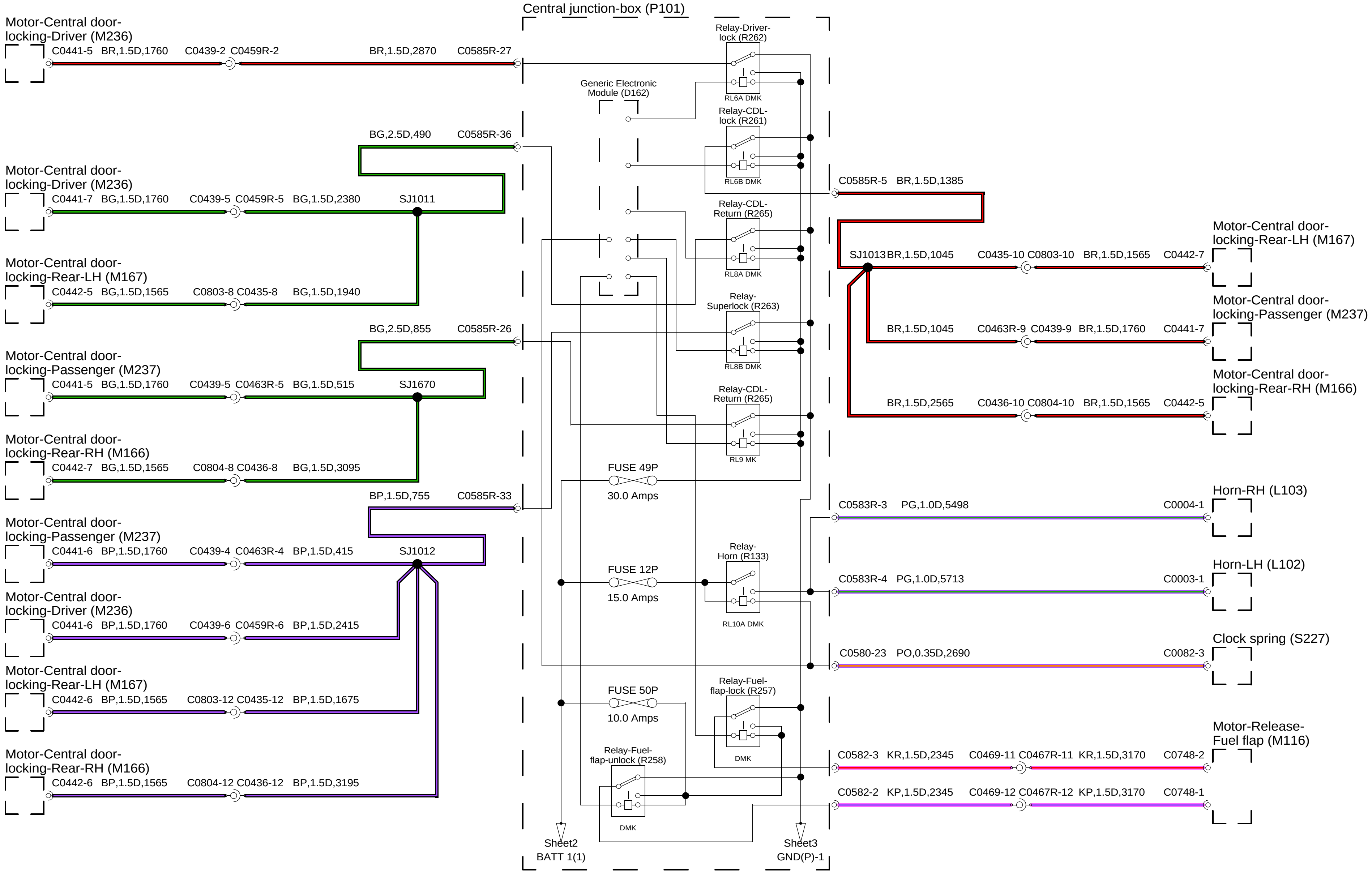

LH rear seat
heater module (D338)
C2084-12 LGW,1.5D,215 SJ112 LGW,2.5D,205 C2149A-5 C2042-5 LGW,2.5D,880 SJ1023
Junction-box engine (P108)
BATT-2
Sheet2
LGW,2.5D,1725 C2411R-8 C2412R-8 LGW,2.5D,1044 C0570R-169
FUSE 8E
146
25.0 Amps
Relay-Front-
fog lamp (R130)
NAS
R5-MICRO
C0570R-164 NOT USED (V101)
C0570R-165 NOT USED (V101)
C0570R-140 NOT USED (V101)
C0570R-142 NOT USED (V101)
RH rear seat
heater module (D339)
C2084-12 LGW,1.5D,215 SJ112 LGW,2.5D,205 C2149A-5 C2043-5 LGW,2.5D,2500
Automatic Temperature
Control Module (D243)
C2295-2 LGW,1.5D,355 SJ686 LGW,2.5D,1390 C2239-9 C2241R-9 LGW,4.0D,1154 C0570R-122
FUSE 7E
100
25.0 Amps
Relay-
Blower (R176)
LINK 12E
183
47
31
40.0 Amps
R16-MINI
Motor-Blower-
Front (M132)
C0570R-11 NR,4.0D,1034 C2996R-2 C2997-2 W,4.0,220 C0056-2
Lighting control
switch (S100)
C0041-7 NP,4.0D,646 C2443-3 C2444R-3 NP,4.0D,2967 C0570R-40
LINK 2E
51
30.0 Amps
Relay-
Ignition (R211)
56
89
161
R13-MINI
Central junction-box (P101)
C0583R-35 LG,0.5D,770 SJ1574 LG,0.5D,369 C0570R-72
C0570R-74 B,1.0D,339
E
Sheet4
B
LG,0.5D,369
Sheet2
C
LG,0.5D,369
Sheet2
Relay-Heated-
washer jets/door-
mirrors (R267)
93
R4-MICRO
LG,1.5D,369 C0570R-95
Automatic Temperature
Control Module (D243)
C0570R-33 LGW,0.5D,1154 C2241R-6 C2239-6 LGW,0.5D,1715 C1629-7
C0570R-118 NO,1.5D,1154 C2241R-4 C2239-4 NO,0.5D,1715 C1629-19
Heater-Washer-
jet-LH (H127)
C0934-1 NY,0.75D,600 SJ170 NY,1.5D,2649 C0570R-171
FUSE 12E
148
94
10.0 Amps
Relay-Brake-
boost pump (R260)
FUSE 24E
177
55
20.0 Amps
R11-MINI
Pump-Brake-
boost (M296)
C0570R-88 G,1.5D,2174 C2709-1
Heater-Washer-
jet-RH (H128)
C0946-1 NY,0.75D,300
LG,0.5D,369 C0570R-69
C2411R-4 C2412R-4 NP,1.5D,1044 C0570R-173
FUSE 16E
150
10.0 Amps
NP,1.5D,360
Engine control-
module (ECM) (D131)
C0570R-71 GW,0.5D,954 C0635R-50
Mirror-Door-
Driver side (M168)
C0319-4 NP,0.75D,1060 C0439-4 C0459R-4 NP,1.5D,2290 SJ1031
Mirror-Door-
Passenger side (M169)
C0319-4 NP,0.75D,1060 C0439-8 C0463R-8 NP,1.5D,240
Sheet4
BATT-3
Sheet4
BATT-3-1

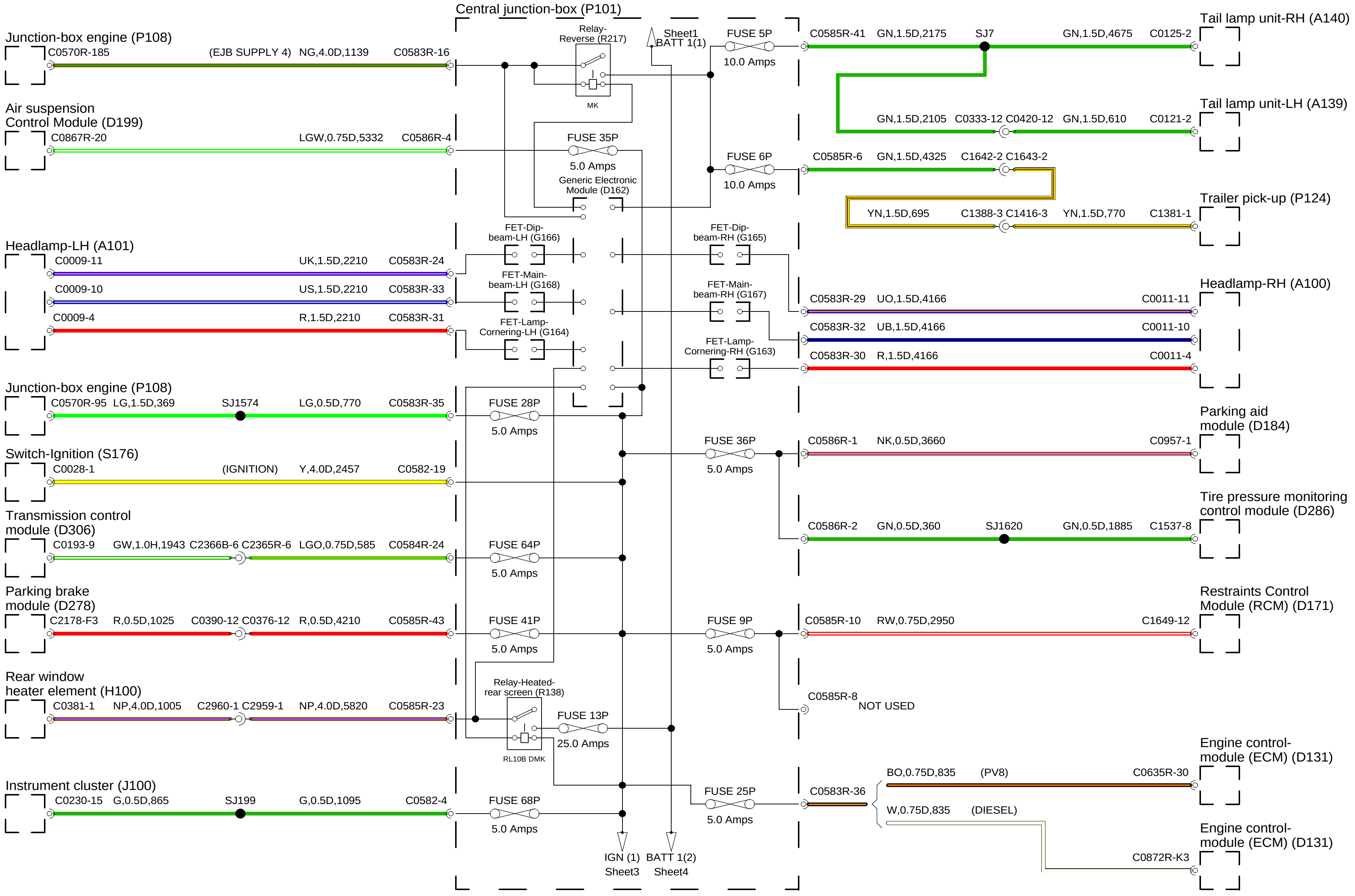

E
Sheet3
B,1.0D,339
SJ1573
B,2.5D,1648
SJ173
B,4.0D,2180
C0560-1
TYPE 3
Junction-box engine (P108)
BATT-3-1
BATT-3
Sheet3
Sheet3
Capacitor (G158)
C1323B-3
RN,1.5,1160
C2725R-2
(PV8)
NO,1.5D,1167
C0570R-168
FUSE 6E
145
15.0 Amps
C0570R-82
B,1.0D,339
(DIESEL)
RU,1.5D,857
R
Sheet1
NK,1.5D,699
(DIESEL)
S
Sheet5
99
FUSE 5E
10.0 Amps
C0570R-121
NK,1.5D,699
(PV8)
A
Sheet5
7
163
149
FUSE 14E
20.0 Amps
C0570R-172
NK,2.5D,1092
H
Sheet6
C0570R-166
NOT USED (V101)
FUSE 2E
5.0 Amps
143
102
FUSE 11E
15.0 Amps
C0570R-124
NK,1.5D,899
K
Sheet6
Unit-Fuel Tank (D179)
C0114-4
WP,2.5D,50
SJ15
WP,4.0D,2345
SJ17
WP,2.5D,50
WP,2.5D,3950
C0377-17 C0391-17
NR,1.5D,1167
(PV8)
C2725R-1
NR,1.5,110
N
Sheet7
105
FUSE 17E
15.0 Amps
C0570R-127
RU,1.5D,892
(DIESEL)
P
Sheet7
NB,2.5D,1044
(PV8)
Relay-Fuel-pump (R103)
C2411R-14 C2412R-14
C0570R-119
FUSE 1E
25.0 Amps
97
43
R8-MINI
NB,2.5D,525
SJ1489
NB,2.5D,739
(DIESEL)
RU,1.5D,1167
(DIESEL)
F
Sheet7
103
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D,847
(PV8)
SJ1812
(PV8)
NO,1.5D,193
G
Sheet5
Engine control-module (ECM) (D131)
C0634B-95
YN,0.5,440
C2725R-7
(PV8)
YN,0.5D,1167
C0570R-19
NO,1.5D,847
(PV8)
(PV8NA)
NO,1.0D,320
L
Sheet6
C0570R-21
(DIESEL)
NU,0.5D,954
Relay-Engine control-module (ECM) (R116)
135
42
17
6
R6-POWER MINI
NO,1.5D,689
(DIESEL)
Engine control-module (ECM) (D131)
C0872R-J4
(PETROL)
C0570R-18
NG,0.75D,954
(PV8)
Q
Sheet7
144
(DIESEL)
NG,0.75D,954
(DIESEL)
Q1
Sheet7
(DIESEL)
Dynamic response module (D285)
C2188R-1
PO,2.5D,2827
C0570R-123
FUSE 9E
15.0 Amps
101
NO,2.5D,689
SJ1999
Engine control-module (ECM) (D131)
FUSE 4E
25.0 Amps
C0570R-167
NP,1.5D,1919
NO,1.5D,265
C0872R-L2
111
FUSE 29E
30.0 Amps
NO,1.5D,265
C0872R-L3
(PV8SC)
NO,1.5D,265
C0872R-L1
Motor-Wiper-Windscreen (M105)
C0030R-2
ULG,2.5D,2249
C0570R-49
Relay-Wiper-Fast-slow (R232)
37
39
Relay-Wiper-On-off (R231)
60
62
61
C0030R-1
RLG,2.5D,2249
C0570R-38
R2-MICRO
R3-MICRO
Pump-Supercharge-coolant (M314)
C3006-1
Central junction-box (P101)
C0584R-17
PU,0.5D,635
SJ1001
PU,1.5D,309
C0570R-50
147
FUSE 10E
15.0 Amps
C0570R-170
NO,1.5D,912
(PV8)
J
Sheet6
C0584R-32
R,0.5D,645
SJ1002
R,1.5D,299
C0570R-83
Sheet5
BN,1.5D,2034
(DIESEL)
M
Sheet7
BATT-4

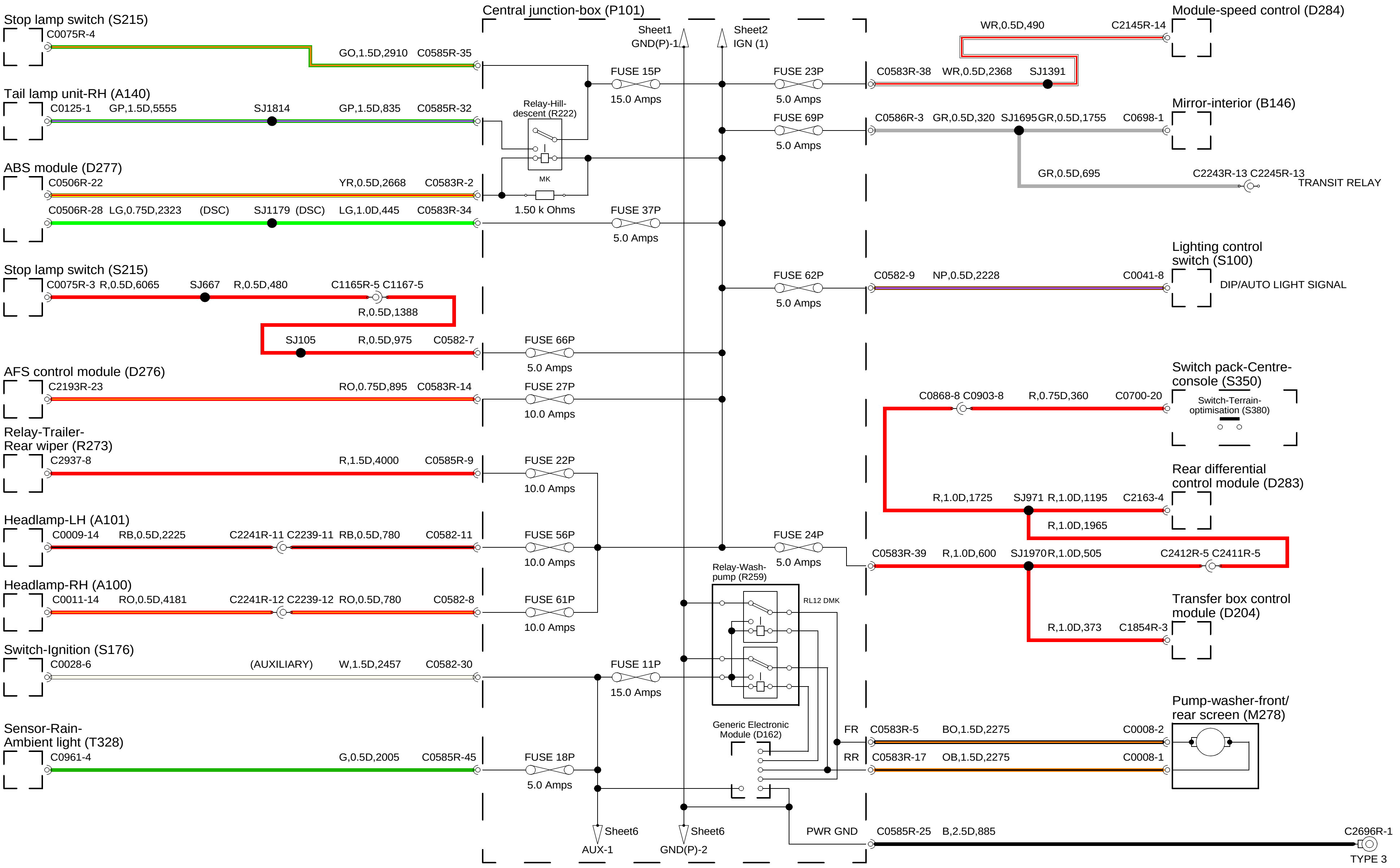

Engine control-module (ECM) (D131)
C0872R-K4
(DIESEL)
N,0.75D,954
Engine control-module (ECM) (D131)
C0635R-54
(PV8)
NO,0.75D,954
Engine control-module (ECM) (D131)
C0872R-B1
(DIESEL)
R,0.5D,954
Engine control-module (ECM) (D131)
C0635R-51
(PV8)
UR,0.5D,954
C0570R-110
C0570R-36
Junction-box engine (P108)
BATT-4
Sheet4
FUSE 27E
5.0 Amps
LINK 14E
184
48
40.0 Amps
Relay-Starter (R102)
R18-MINI
C0570R-12
C0570R-34
NR,2.5D,1167
(PV8)
C2725R-11
R,2.5,1435
RB,2.5D,1167
(DIESEL)
C2274R-1
C2273C-1
RB,2.5,2125
C0179-1
Starter motor (M101)
Central junction-box (P101)
WR,0.5D,485
C0584R-30
Engine control-module (ECM) (D131)
WR,0.5D,459
(DIESEL)
SJ1479
WR,0.5D,495
C0872R-F3
GO,0.5D,319
(PV8)
SJ1592
GO,0.5D,580
Transmission control module (D306)
C2365R-8
C2366B-8
GO,0.5H,1943
C0193-10
G
(PETROL-V8)
NO,1.5D,193
C0635R-4
Sheet4
Engine control-module (ECM) (D131)
A
(PV8)
NK,1.5D,699
SJ1450
NK,1.5D,468
C2725R-8
Sheet4
S
(DIESEL)
NK,1.5D,699
Sheet4
C2724D-8
(PV8SC)
BU,0.5,1385
C0152D-2
Purge control valve (N119)
C2724B-8
(PV8NA)
GU,1.0,860
SJ7
B,1.0,350
C0152B-2
Purge control valve (N119)
Fan-Cooling-E box (M208)
C0646R-2
NK,0.75D,473
(PV8)
Module-speed control (D284)
C2145R-15
NK,0.5D,2278
Sensor-Adaptive-cruise control (T350)
C2025-5
NK,0.5D,4213
WU,1.0,611
SJ1
WU,1.0,120
C0177B-2
WU,1.0,120
C0177B-5
Modulator valve-EGR (D214)

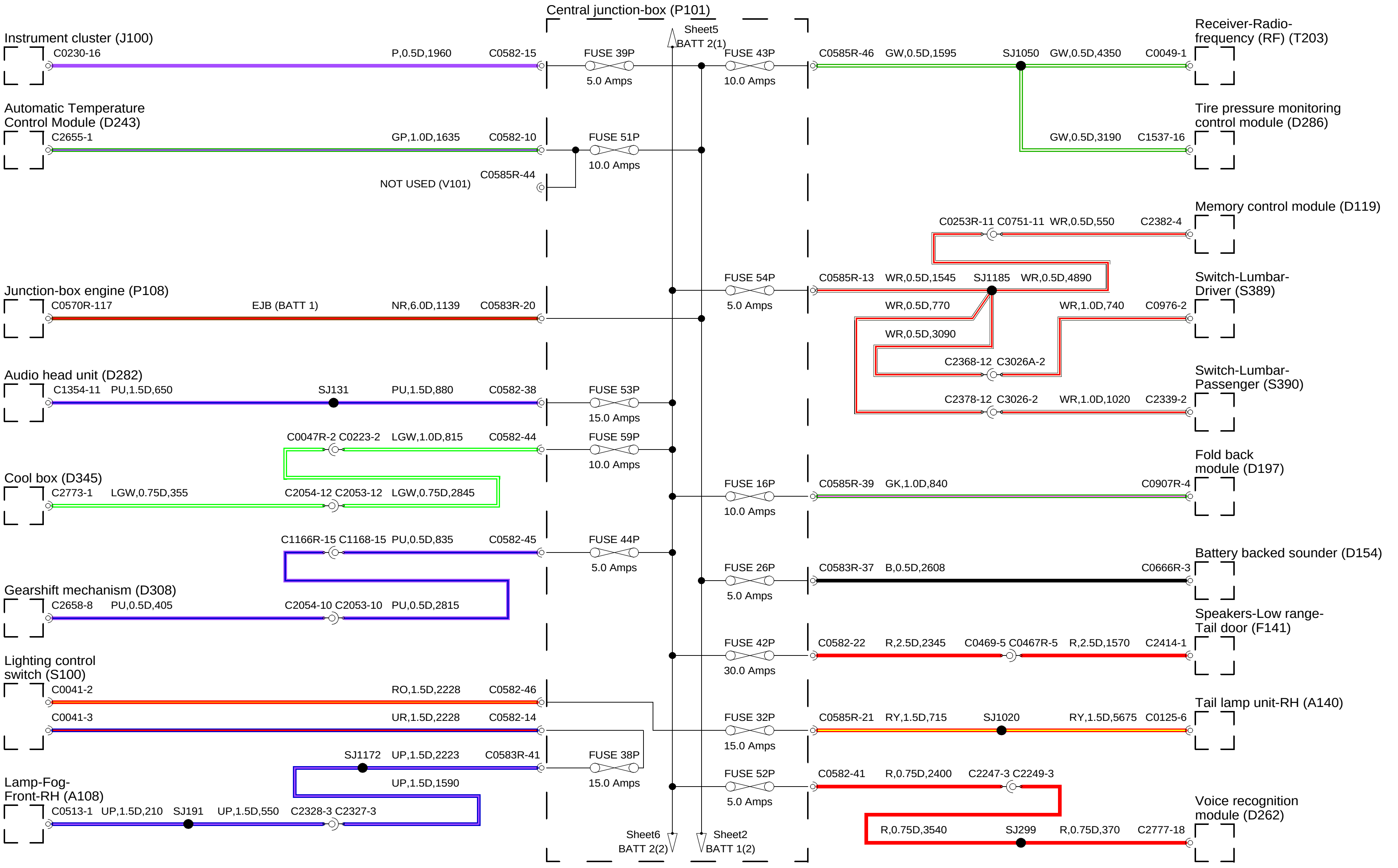

J
Sheet4
NO,1.5D,915
(PV8)
SJ1446
NO,1.0D,258
C0635R-6
Engine control-
module (ECM) (D131)
NO,1.0D,255
C2725R-14
C2724B-15
RG,1.0,130
SJ11
RG,1.0,1701
C2270B-1
Viscous fan (M300)
R,1.0,1701
C2270B-5
GU,1.0,1791
C0149B-1
Sensor-Mass air-
flow (MAF) (T115)
H
Sheet4
NK,2.5D,1092
SJ1445
NK,1.5D,75
C2725R-18
C2724B-18
WG,1.5,1715
C0644B-1
Sensor-Heated oxygen-
(HO2S)-Front-LH (T183)
BANK B
NK,1.5D,75
C2725R-17
C2724B-17
WG,1.5,1560
C0645B-1
Sensor-Heated oxygen-
(HO2S)-Front-RH (T182)
BANK A
K
Sheet4
NK,1.5D,899
C2365R-18
C2366B-18
NK,2.5H,975
SJ444
NK,1.5H,1549
C0642-1
Sensor-Heated oxygen-
(HO2S)-Rear-RH (T184)
BANK A
NK,1.5H,1023
C0643-1
Sensor-Heated oxygen-
(HO2S)-Rear-LH (T185)
BANK B
L
Sheet4
NO,1.0D,320
(PV8NA)
C2725R-16
C2724B-16
(PV8NA)
NO,1.0,915
SJ5008
B,1.0,786
C2549B-1
Valve-Oil-Variable-
valve timing (N152)
C2724D-16
(PV8SC)
B,1.0,921
C2548B-1
Valve-Oil-Variable-
valve timing (N152)
NO,1.0,1425
SJ20
B,1.0,830
C2549D-1
Valve-Oil-Variable-
valve timing (N152)
B,1.0,485
C2548D-1
Valve-Oil-Variable-
valve timing (N152)

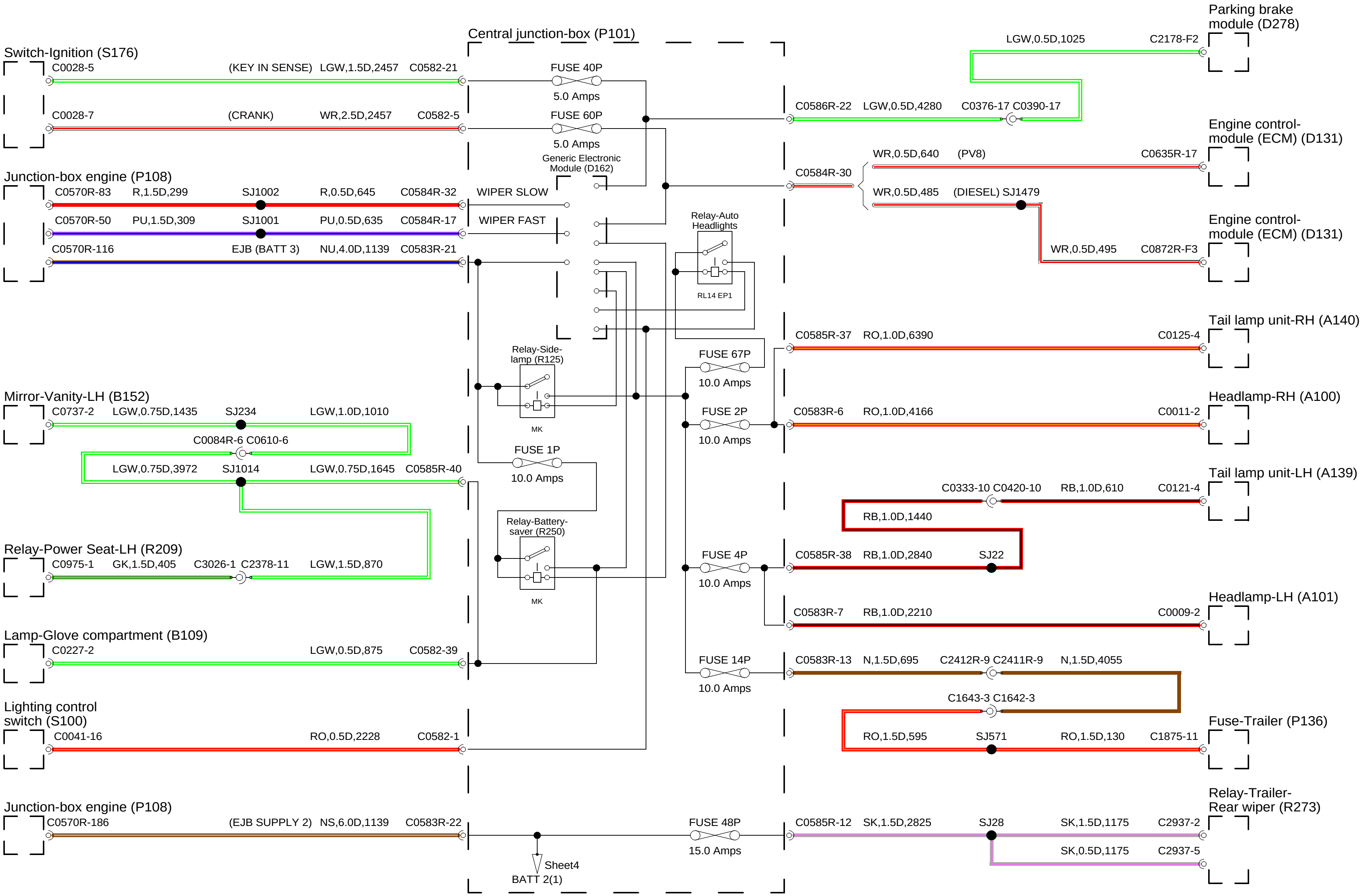

N
Sheet4
NR,1.5,110
SJ16
NR,1.0,975
SJ10
NR,0.5,376
C0522B-2
Fuel injector-No.1 (T172)
NR,1.0,950
SJ4
NR,0.5,356
C0526B-2
Fuel injector-No.5 (T176)
P
Sheet4
(DIESEL)
RU,1.5D,895
SJ1559
RU,0.75D,275
C2274R-17 C2273C-17
RO,0.75,1730
C0272C-4
Throttle-EGR-Inlet (Y160)
RU,0.75D,280
C0646R-2
Fan-E-box (M210)
RU,0.75D,4015
C0567-1
Sensor-MAF/IAT (T317)
Q
Sheet4
(PV8)
NG,0.75D,955
C0635R-16
Engine control-module (ECM) (D131)
Q1
Sheet4
(DIESEL)
NG,0.75D,955
C0872R-J3
Engine control-module (ECM) (D131)
F
Sheet4
(DIESEL)
RU,1.5D,1170
C2274R-18 C2273C-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260C-1
Valve-Control-Fuel volume (N168)
RU,0.75,380
C2261C-1
Valve-Control-Fuel pressure (N167)
M
Sheet4
(DIESEL)
BN,1.5D,2035
SJ630
BN,1.0D,300
C2270-A
BN,1.0D,300
C2270-E
Viscous fan (M300)

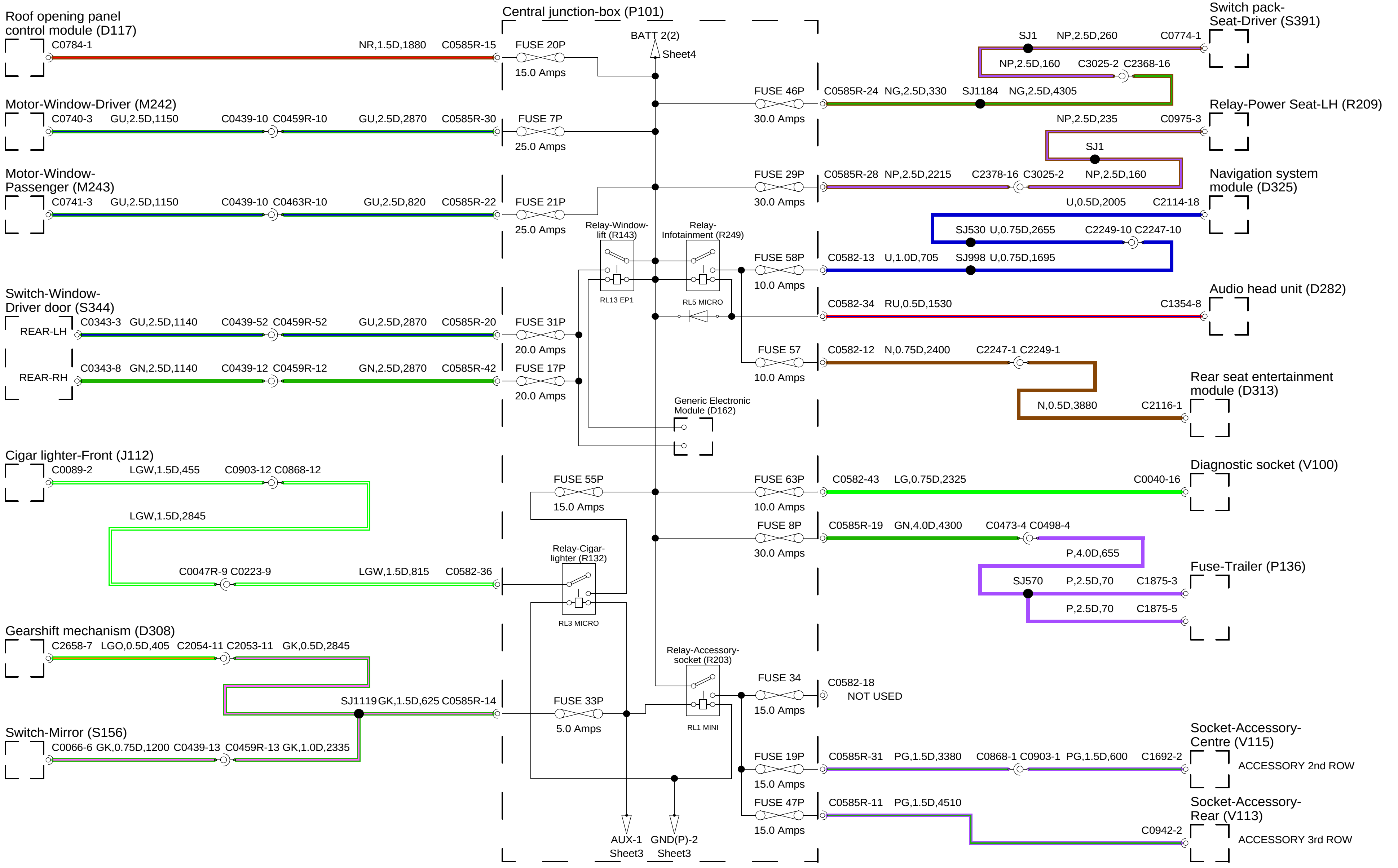

Central junction-box (P101)
Motor-Central door-locking-Driver (M236)
C0441-5 BR,1.5D,1760 C0439-2 C0459R-2 BR,1.5D,2870 C0585R-27
Relay-Driver-lock (R262)
RL6A DMK
Generic Electronic Module (D162)
Relay-CDL-lock (R261)
RL6B DMK
BG,2.5D,490 C0585R-36
Motor-Central door-locking-Driver (M236)
C0441-7 BG,1.5D,1760 C0439-5 C0459R-5 BG,1.5D,2380 SJ1011
C0585R-5 BR,1.5D,1385
Relay-CDL-Return (R265)
RL8A DMK
Motor-Central door-locking-Rear-LH (M167)
C0442-5 BG,1.5D,1565 C0803-8 C0435-8 BG,1.5D,1940
SJ1013 BR,1.5D,1045 C0435-10 C0803-10 BR,1.5D,1565 C0442-7
Motor-Central door-locking-Rear-LH (M167)
Relay-Superlock (R263)
RL8B DMK
BG,2.5D,855 C0585R-26
Motor-Central door-locking-Passenger (M237)
BR,1.5D,1045 C0463R-9 C0439-9 BR,1.5D,1760 C0441-7
Motor-Central door-locking-Passenger (M237)
C0441-5 BG,1.5D,1760 C0439-5 C0463R-5 BG,1.5D,515 SJ1670
Relay-CDL-Return (R265)
RL9 MK
Motor-Central door-locking-Rear-RH (M166)
BR,1.5D,2565 C0436-10 C0804-10 BR,1.5D,1565 C0442-5
Motor-Central door-locking-Rear-RH (M166)
C0442-7 BG,1.5D,1565 C0804-8 C0436-8 BG,1.5D,3095
FUSE 49P
30.0 Amps
BP,1.5D,755 C0585R-33
Horn-RH (L103)
C0583R-3 PG,1.0D,5498 C0004-1
Motor-Central door-locking-Passenger (M237)
C0441-6 BP,1.5D,1760 C0439-4 C0463R-4 BP,1.5D,415 SJ1012
Relay-Horn (R133)
FUSE 12P
15.0 Amps
RL10A DMK
Horn-LH (L102)
C0583R-4 PG,1.0D,5713 C0003-1
Motor-Central door-locking-Driver (M236)
C0441-6 BP,1.5D,1760 C0439-6 C0459R-6 BP,1.5D,2415
Clock spring (S227)
C0580-23 PO,0.35D,2690 C0082-3
Motor-Central door-locking-Rear-LH (M167)
C0442-6 BP,1.5D,1565 C0803-12 C0435-12 BP,1.5D,1675
FUSE 50P
10.0 Amps
Relay-Fuel-flap-lock (R257)
DMK
Motor-Release-Fuel flap (M116)
Relay-Fuel-flap-unlock (R258)
C0582-3 KR,1.5D,2345 C0469-11 C0467R-11 KR,1.5D,3170 C0748-2
Motor-Central door-locking-Rear-RH (M166)
C0442-6 BP,1.5D,1565 C0804-12 C0436-12 BP,1.5D,3195
C0582-2 KP,1.5D,2345 C0469-12 C0467R-12 KP,1.5D,3170 C0748-1
DMK
Sheet2
BATT 1(1)
Sheet3
GND(P)-1

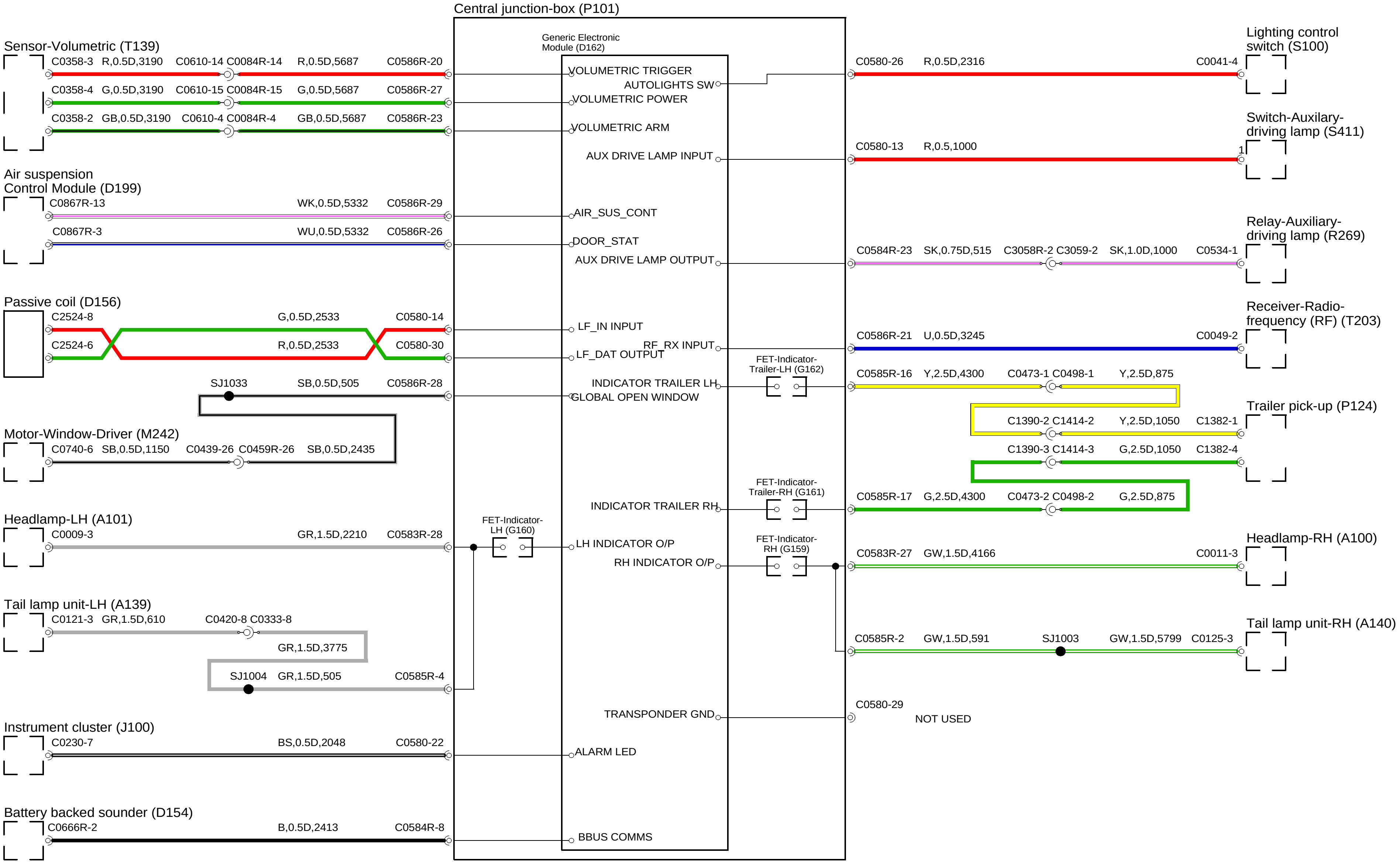

Central junction-box (P101)
Junction-box engine (P108)
C0570R-185
(EJB SUPPLY 4)
NG,4.0D,1139
C0583R-16
Relay-
Reverse (R217)
MK
Sheet1
BATT 1(1)
FUSE 5P
10.0 Amps
C0585R-41
GN,1.5D,2175
SJ7
GN,1.5D,4675
C0125-2
Tail lamp unit-RH (A140)
Air suspension
Control Module (D199)
C0867R-20
LGW,0.75D,5332
C0586R-4
FUSE 35P
5.0 Amps
GN,1.5D,2105
C0333-12 C0420-12
GN,1.5D,610
C0121-2
Tail lamp unit-LH (A139)
FUSE 6P
10.0 Amps
C0585R-6
GN,1.5D,4325
C1642-2 C1643-2
Generic Electronic
Module (D162)
Trailer pick-up (P124)
YN,1.5D,695
C1388-3 C1416-3
YN,1.5D,770
C1381-1
FET-Dip-
beam-LH (G166)
FET-Dip-
beam-RH (G165)
Headlamp-LH (A101)
C0009-11
UK,1.5D,2210
C0583R-24
FET-Main-
beam-LH (G168)
FET-Main-
beam-RH (G167)
Headlamp-RH (A100)
C0009-10
US,1.5D,2210
C0583R-33
C0583R-29
UO,1.5D,4166
C0011-11
C0009-4
R,1.5D,2210
C0583R-31
FET-Lamp-
Cornering-LH (G164)
FET-Lamp-
Cornering-RH (G163)
C0583R-32
UB,1.5D,4166
C0011-10
C0583R-30
R,1.5D,4166
C0011-4
Junction-box engine (P108)
C0570R-95
LG,1.5D,369
SJ1574
LG,0.5D,770
C0583R-35
FUSE 28P
5.0 Amps
Parking aid
module (D184)
FUSE 36P
5.0 Amps
C0586R-1
NK,0.5D,3660
C0957-1
Switch-Ignition (S176)
C0028-1
(IGNITION)
Y,4.0D,2457
C0582-19
Tire pressure monitoring
control module (D286)
Transmission control
module (D306)
C0586R-2
GN,0.5D,360
SJ1620
GN,0.5D,1885
C1537-8
C0193-9
GW,1.0H,1943
C2366B-6 C2365R-6
LGO,0.75D,585
C0584R-24
FUSE 64P
5.0 Amps
Parking brake
module (D278)
Restraints Control
Module (RCM) (D171)
C2178-F3
R,0.5D,1025
C0390-12 C0376-12
R,0.5D,4210
C0585R-43
FUSE 41P
5.0 Amps
FUSE 9P
5.0 Amps
C0585R-10
RW,0.75D,2950
C1649-12
Rear window
heater element (H100)
Relay-Heated-
rear screen (R138)
C0585R-8
NOT USED
C0381-1
NP,4.0D,1005
C2960-1 C2959-1
NP,4.0D,5820
C0585R-23
FUSE 13P
25.0 Amps
RL10B DMK
Engine control-
module (ECM) (D131)
BO,0.75D,835
(PV8)
C0635R-30
Instrument cluster (J100)
FUSE 25P
5.0 Amps
C0583R-36
C0230-15
G,0.5D,865
SJ199
G,0.5D,1095
C0582-4
FUSE 68P
5.0 Amps
W,0.75D,835
(DIESEL)
Engine control-
module (ECM) (D131)
C0872R-K3
IGN (1)
Sheet3
BATT 1(2)
Sheet4

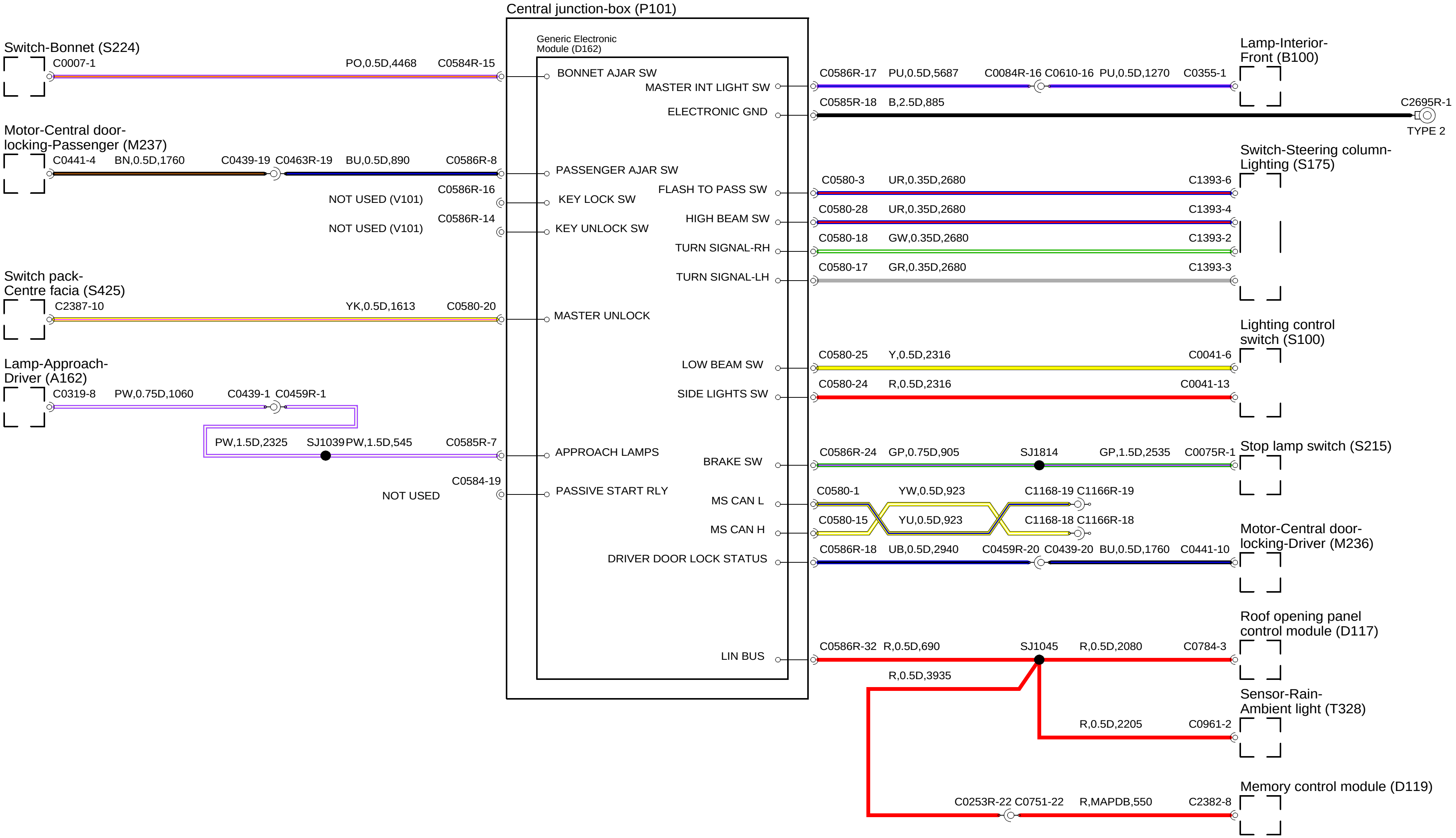

Stop lamp switch (S215)
C0075R-4
GO,1.5D,2910
C0585R-35
Tail lamp unit-RH (A140)
C0125-1
GP,1.5D,5555
SJ1814
GP,1.5D,835
C0585R-32
ABS module (D277)
C0506R-22
YR,0.5D,2668
C0583R-2
C0506R-28
LG,0.75D,2323
(DSC)
SJ1179
(DSC)
LG,1.0D,445
C0583R-34
Stop lamp switch (S215)
C0075R-3
R,0.5D,6065
SJ667
R,0.5D,480
C1165R-5 C1167-5
R,0.5D,1388
SJ105
R,0.5D,975
C0582-7
AFS control module (D276)
C2193R-23
RO,0.75D,895
C0583R-14
Relay-Trailer-Rear wiper (R273)
C2937-8
R,1.5D,4000
C0585R-9
Headlamp-LH (A101)
C0009-14
RB,0.5D,2225
C2241R-11 C2239-11
RB,0.5D,780
C0582-11
Headlamp-RH (A100)
C0011-14
RO,0.5D,4181
C2241R-12 C2239-12
RO,0.5D,780
C0582-8
Switch-Ignition (S176)
C0028-6
(AUXILIARY)
W,1.5D,2457
C0582-30
Sensor-Rain-Ambient light (T328)
C0961-4
G,0.5D,2005
C0585R-45
Central junction-box (P101)
Sheet1
GND(P)-1
Sheet2
IGN (1)
FUSE 15P
15.0 Amps
FUSE 23P
5.0 Amps
Relay-Hill-descent (R222)
MK
1.50 k Ohms
FUSE 69P
5.0 Amps
FUSE 37P
5.0 Amps
FUSE 62P
5.0 Amps
FUSE 66P
5.0 Amps
FUSE 27P
10.0 Amps
FUSE 22P
10.0 Amps
FUSE 56P
10.0 Amps
FUSE 24P
5.0 Amps
Relay-Wash-pump (R259)
RL12 DMK
FUSE 61P
10.0 Amps
FUSE 11P
15.0 Amps
Generic Electronic Module (D162)
FUSE 18P
5.0 Amps
Sheet6
AUX-1
Sheet6
GND(P)-2
PWR GND
Module-speed control (D284)
WR,0.5D,490
C2145R-14
C0583R-38
WR,0.5D,2368
SJ1391
Mirror-interior (B146)
C0586R-3
GR,0.5D,320
SJ1695
GR,0.5D,1755
C0698-1
GR,0.5D,695
C2243R-13 C2245R-13
TRANSIT RELAY
Lighting control switch (S100)
C0582-9
NP,0.5D,2228
C0041-8
DIP/AUTO LIGHT SIGNAL
Switch pack-Centre-console (S350)
C0868-8 C0903-8
R,0.75D,360
C0700-20
Switch-Terrain-optimisation (S380)
Rear differential control module (D283)
R,1.0D,1725
SJ971
R,1.0D,1195
C2163-4
R,1.0D,1965
C0583R-39
R,1.0D,600
SJ1970
R,1.0D,505
C2412R-5 C2411R-5
Transfer box control module (D204)
R,1.0D,373
C1854R-3
Pump-washer-front/rear screen (M278)
FR
C0583R-5
BO,1.5D,2275
C0008-2
RR
C0583R-17
OB,1.5D,2275
C0008-1
C0585R-25
B,2.5D,885
C2696R-1
TYPE 3

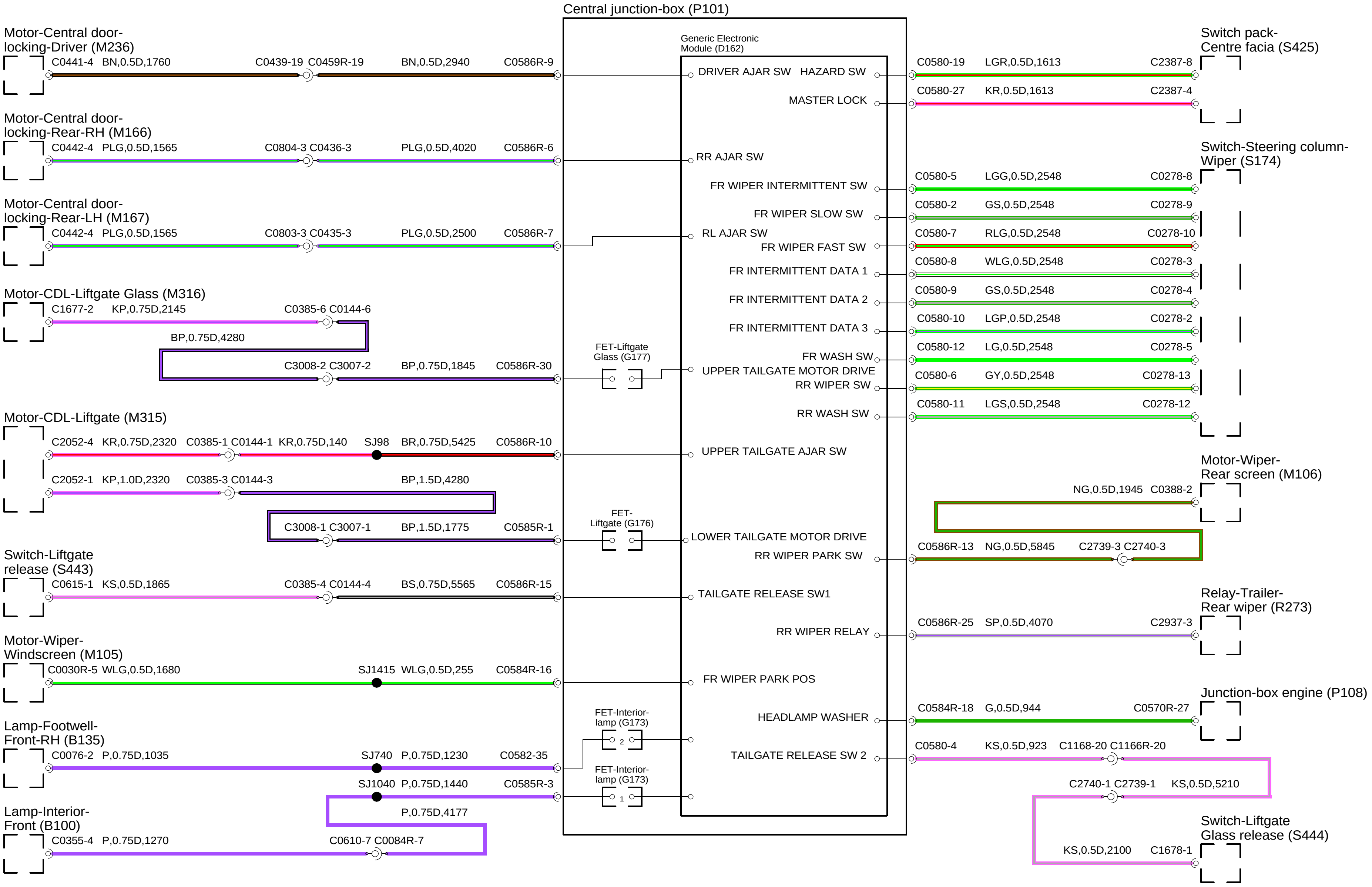

Central junction-box (P101)
Sheet5
BATT 2(1)
Instrument cluster (J100)
C0230-16
P,0.5D,1960
C0582-15
FUSE 39P
5.0 Amps
FUSE 43P
10.0 Amps
C0585R-46
GW,0.5D,1595
SJ1050
GW,0.5D,4350
C0049-1
Receiver-Radio-frequency (RF) (T203)
Automatic Temperature Control Module (D243)
C2655-1
GP,1.0D,1635
C0582-10
FUSE 51P
10.0 Amps
C0585R-44
NOT USED (V101)
Tire pressure monitoring control module (D286)
GW,0.5D,3190
C1537-16
Memory control module (D119)
C0253R-11 C0751-11
WR,0.5D,550
C2382-4
FUSE 54P
5.0 Amps
C0585R-13
WR,0.5D,1545
SJ1185
WR,0.5D,4890
Switch-Lumbar-Driver (S389)
Junction-box engine (P108)
C0570R-117
EJB (BATT 1)
NR,6.0D,1139
C0583R-20
WR,0.5D,770
WR,1.0D,740
C0976-2
WR,0.5D,3090
C2368-12 C3026A-2
Switch-Lumbar-Passenger (S390)
C2378-12 C3026-2
WR,1.0D,1020
C2339-2
Audio head unit (D282)
C1354-11
PU,1.5D,650
SJ131
PU,1.5D,880
C0582-38
FUSE 53P
15.0 Amps
C0047R-2 C0223-2
LGW,1.0D,815
C0582-44
FUSE 59P
10.0 Amps
Fold back module (D197)
Cool box (D345)
C2773-1
LGW,0.75D,355
C2054-12 C2053-12
LGW,0.75D,2845
FUSE 16P
10.0 Amps
C0585R-39
GK,1.0D,840
C0907R-4
C1166R-15 C1168-15
PU,0.5D,835
C0582-45
FUSE 44P
5.0 Amps
Battery backed sounder (D154)
FUSE 26P
5.0 Amps
C0583R-37
B,0.5D,2608
C0666R-3
Gearshift mechanism (D308)
C2658-8
PU,0.5D,405
C2054-10 C2053-10
PU,0.5D,2815
Speakers-Low range-Tail door (F141)
FUSE 42P
30.0 Amps
C0582-22
R,2.5D,2345
C0469-5 C0467R-5
R,2.5D,1570
C2414-1
Lighting control switch (S100)
C0041-2
RO,1.5D,2228
C0582-46
Tail lamp unit-RH (A140)
C0041-3
UR,1.5D,2228
C0582-14
FUSE 32P
15.0 Amps
C0585R-21
RY,1.5D,715
SJ1020
RY,1.5D,5675
C0125-6
SJ1172
UP,1.5D,2223
C0583R-41
FUSE 38P
15.0 Amps
FUSE 52P
5.0 Amps
C0582-41
R,0.75D,2400
C2247-3 C2249-3
Lamp-Fog-Front-RH (A108)
UP,1.5D,1590
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
Voice recognition module (D262)
R,0.75D,3540
SJ299
R,0.75D,370
C2777-18
Sheet6
BATT 2(2)
Sheet2
BATT 1(2)

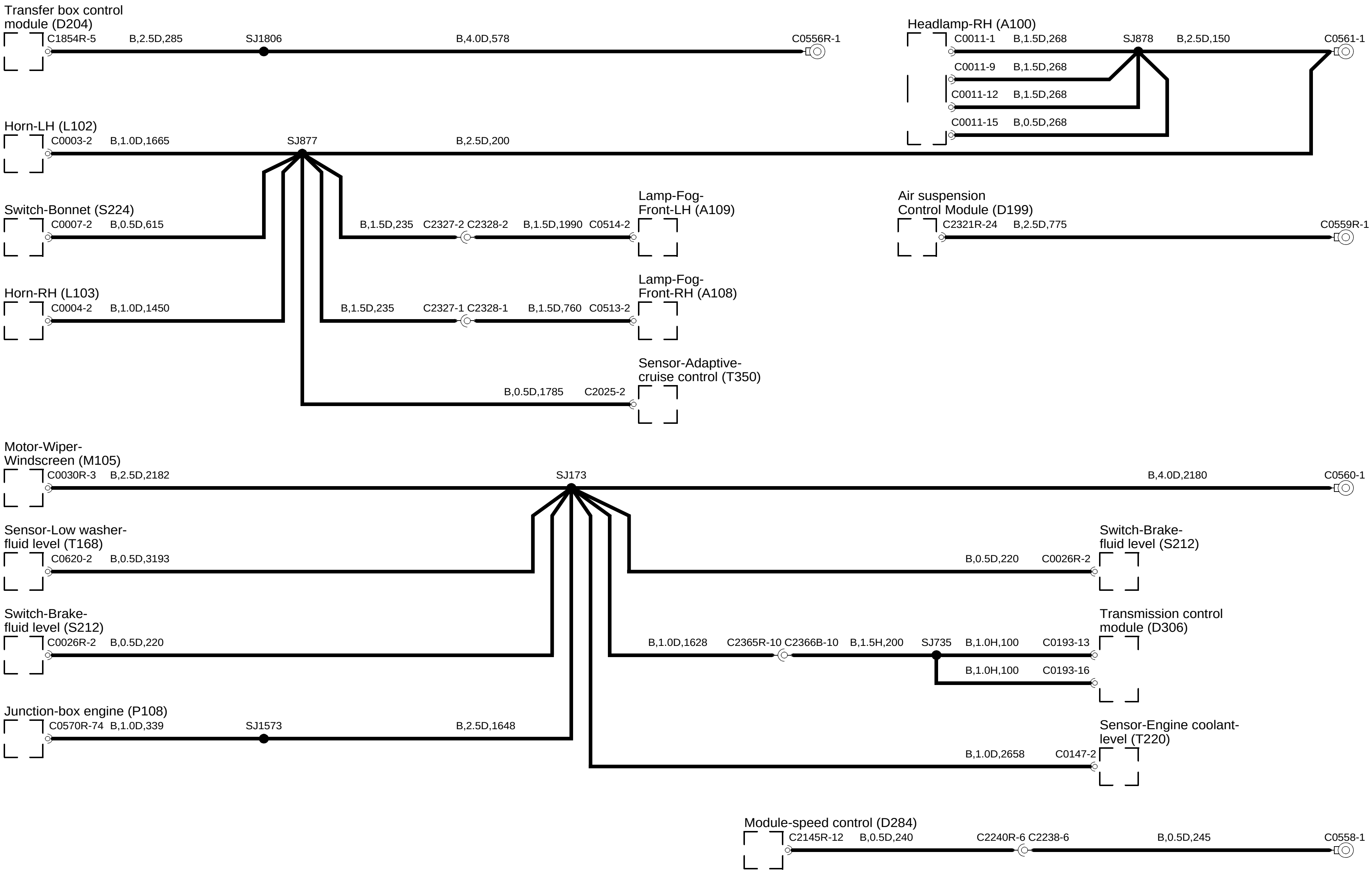

Central junction-box (P101)
Switch-Ignition (S176)
C0028-5
(KEY IN SENSE)
LGW,1.5D,2457
C0582-21
FUSE 40P
5.0 Amps
C0028-7
(CRANK)
WR,2.5D,2457
C0582-5
FUSE 60P
5.0 Amps
Generic Electronic Module (D162)
Junction-box engine (P108)
C0570R-83
R,1.5D,299
SJ1002
R,0.5D,645
C0584R-32
WIPER SLOW
C0570R-50
PU,1.5D,309
SJ1001
PU,0.5D,635
C0584R-17
WIPER FAST
C0570R-116
EJB (BATT 3)
NU,4.0D,1139
C0583R-21
Relay-Auto Headlights
RL14 EP1
Relay-Side-lamp (R125)
MK
Mirror-Vanity-LH (B152)
C0737-2
LGW,0.75D,1435
SJ234
LGW,1.0D,1010
C0084R-6 C0610-6
LGW,0.75D,3972
SJ1014
LGW,0.75D,1645
C0585R-40
FUSE 1P
10.0 Amps
Relay-Battery-saver (R250)
MK
Relay-Power Seat-LH (R209)
C0975-1
GK,1.5D,405
C3026-1 C2378-11
LGW,1.5D,870
Lamp-Glove compartment (B109)
C0227-2
LGW,0.5D,875
C0582-39
Lighting control switch (S100)
C0041-16
RO,0.5D,2228
C0582-1
Junction-box engine (P108)
C0570R-186
(EJB SUPPLY 2)
NS,6.0D,1139
C0583R-22
Sheet4
BATT 2(1)
FUSE 48P
15.0 Amps
Parking brake module (D278)
LGW,0.5D,1025
C2178-F2
C0586R-22
LGW,0.5D,4280
C0376-17 C0390-17
Engine control-module (ECM) (D131)
WR,0.5D,640
(PV8)
C0635R-17
C0584R-30
WR,0.5D,485
(DIESEL) SJ1479
Engine control-module (ECM) (D131)
WR,0.5D,495
C0872R-F3
Tail lamp unit-RH (A140)
FUSE 67P
10.0 Amps
C0585R-37
RO,1.0D,6390
C0125-4
Headlamp-RH (A100)
FUSE 2P
10.0 Amps
C0583R-6
RO,1.0D,4166
C0011-2
Tail lamp unit-LH (A139)
C0333-10 C0420-10
RB,1.0D,610
C0121-4
RB,1.0D,1440
FUSE 4P
10.0 Amps
C0585R-38
RB,1.0D,2840
SJ22
Headlamp-LH (A101)
C0583R-7
RB,1.0D,2210
C0009-2
FUSE 14P
10.0 Amps
C0583R-13
N,1.5D,695
C2412R-9 C2411R-9
N,1.5D,4055
C1643-3 C1642-3
Fuse-Trailer (P136)
RO,1.5D,595
SJ571
RO,1.5D,130
C1875-11
Relay-Trailer-Rear wiper (R273)
C0585R-12
SK,1.5D,2825
SJ28
SK,1.5D,1175
C2937-2
SK,0.5D,1175
C2937-5

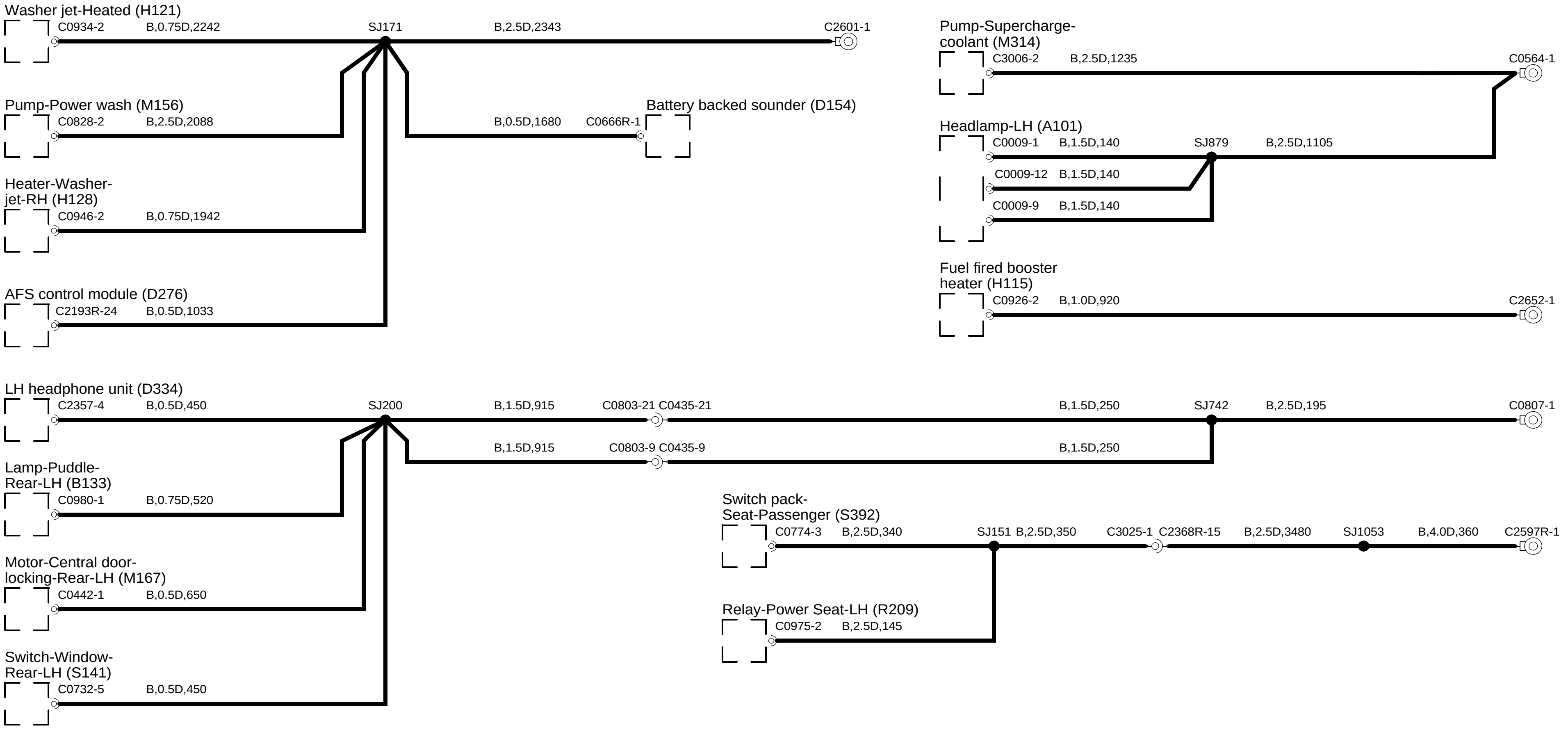

Roof opening panel control module (D117)
C0784-1
NR,1.5D,1880
C0585R-15
Central junction-box (P101)
FUSE 20P
15.0 Amps
BATT 2(2)
Sheet4
Switch pack-Seat-Driver (S391)
SJ1
NP,2.5D,260
C0774-1
NP,2.5D,160
C3025-2 C2368-16
FUSE 46P
30.0 Amps
C0585R-24
NG,2.5D,330
SJ1184
NG,2.5D,4305
Motor-Window-Driver (M242)
C0740-3
GU,2.5D,1150
C0439-10 C0459R-10
GU,2.5D,2870
C0585R-30
FUSE 7P
25.0 Amps
Relay-Power Seat-LH (R209)
NP,2.5D,235
C0975-3
SJ1
Motor-Window-Passenger (M243)
C0741-3
GU,2.5D,1150
C0439-10 C0463R-10
GU,2.5D,820
C0585R-22
FUSE 21P
25.0 Amps
FUSE 29P
30.0 Amps
C0585R-28
NP,2.5D,2215
C2378-16 C3025-2
NP,2.5D,160
Navigation system module (D325)
U,0.5D,2005
C2114-18
Relay-Window-lift (R143)
RL13 EP1
Relay-Infotainment (R249)
RL5 MICRO
SJ530
U,0.75D,2655
C2249-10 C2247-10
FUSE 58P
10.0 Amps
C0582-13
U,1.0D,705
SJ998
U,0.75D,1695
Switch-Window-Driver door (S344)
REAR-LH
C0343-3
GU,2.5D,1140
C0439-52 C0459R-52
GU,2.5D,2870
C0585R-20
FUSE 31P
20.0 Amps
Audio head unit (D282)
C0582-34
RU,0.5D,1530
C1354-8
REAR-RH
C0343-8
GN,2.5D,1140
C0439-12 C0459R-12
GN,2.5D,2870
C0585R-42
FUSE 17P
20.0 Amps
FUSE 57
10.0 Amps
C0582-12
N,0.75D,2400
C2247-1 C2249-1
Rear seat entertainment module (D313)
N,0.5D,3880
C2116-1
Generic Electronic Module (D162)
Cigar lighter-Front (J112)
C0089-2
LGW,1.5D,455
C0903-12 C0868-12
FUSE 55P
15.0 Amps
FUSE 63P
10.0 Amps
C0582-43
LG,0.75D,2325
C0040-16
Diagnostic socket (V100)
LGW,1.5D,2845
FUSE 8P
30.0 Amps
C0585R-19
GN,4.0D,4300
C0473-4 C0498-4
P,4.0D,655
Relay-Cigar-lighter (R132)
RL3 MICRO
C0047R-9 C0223-9
LGW,1.5D,815
C0582-36
Fuse-Trailer (P136)
SJ570
P,2.5D,70
C1875-3
P,2.5D,70
C1875-5
Gearshift mechanism (D308)
C2658-7
LGO,0.5D,405
C2054-11 C2053-11
GK,0.5D,2845
Relay-Accessory-socket (R203)
RL1 MINI
FUSE 34
15.0 Amps
C0582-18
NOT USED
SJ1119
GK,1.5D,625
C0585R-14
FUSE 33P
5.0 Amps
Switch-Mirror (S156)
C0066-6
GK,0.75D,1200
C0439-13 C0459R-13
GK,1.0D,2335
Socket-Accessory-Centre (V115)
FUSE 19P
15.0 Amps
C0585R-31
PG,1.5D,3380
C0868-1 C0903-1
PG,1.5D,600
C1692-2
ACCESSORY 2nd ROW
Socket-Accessory-Rear (V113)
FUSE 47P
15.0 Amps
C0585R-11
PG,1.5D,4510
C0942-2
ACCESSORY 3rd ROW
AUX-1
Sheet3
GND(P)-2
Sheet3

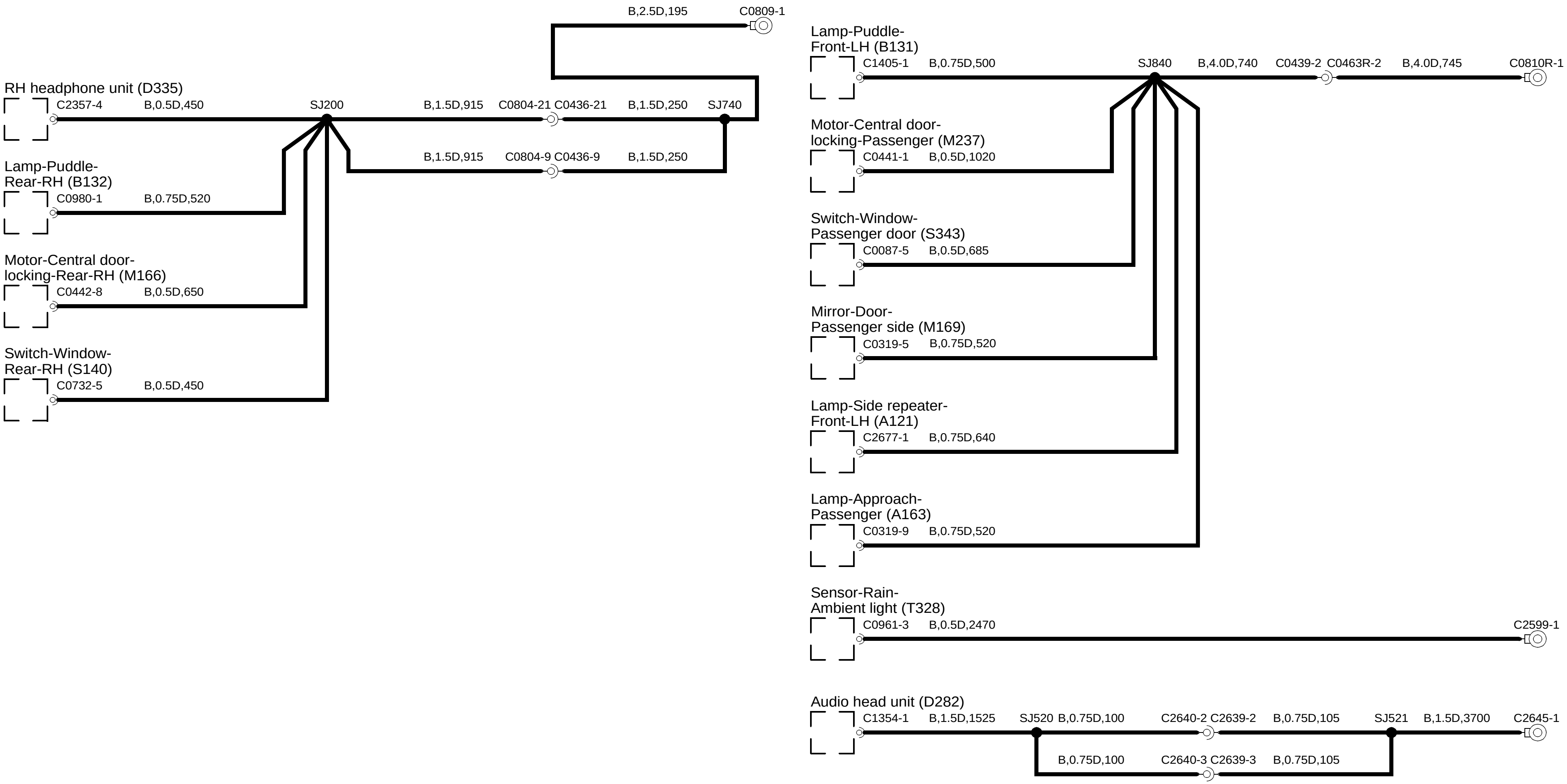

Central junction-box (P101)
Generic Electronic Module (D162)
Sensor-Volumetric (T139)
C0358-3 R,0.5D,3190 C0610-14 C0084R-14 R,0.5D,5687 C0586R-20
C0358-4 G,0.5D,3190 C0610-15 C0084R-15 G,0.5D,5687 C0586R-27
C0358-2 GB,0.5D,3190 C0610-4 C0084R-4 GB,0.5D,5687 C0586R-23
VOLUMETRIC TRIGGER
AUTOLIGHTS SW
VOLUMETRIC POWER
VOLUMETRIC ARM
AUX DRIVE LAMP INPUT
Air suspension Control Module (D199)
C0867R-13 WK,0.5D,5332 C0586R-29
C0867R-3 WU,0.5D,5332 C0586R-26
AIR_SUS_CONT
DOOR_STAT
AUX DRIVE LAMP OUTPUT
Passive coil (D156)
C2524-8 G,0.5D,2533 C0580-14
C2524-6 R,0.5D,2533 C0580-30
LF_IN INPUT
RF_RX INPUT
LF_DAT OUTPUT
SJ1033 SB,0.5D,505 C0586R-28
INDICATOR TRAILER LH
GLOBAL OPEN WINDOW
Motor-Window-Driver (M242)
C0740-6 SB,0.5D,1150 C0439-26 C0459R-26 SB,0.5D,2435
INDICATOR TRAILER RH
Headlamp-LH (A101)
C0009-3 GR,1.5D,2210 C0583R-28
FET-Indicator-LH (G160)
LH INDICATOR O/P
RH INDICATOR O/P
Tail lamp unit-LH (A139)
C0121-3 GR,1.5D,610 C0420-8 C0333-8
GR,1.5D,3775
SJ1004 GR,1.5D,505 C0585R-4
TRANSPONDER GND
Instrument cluster (J100)
C0230-7 BS,0.5D,2048 C0580-22
ALARM LED
Battery backed sounder (D154)
C0666R-2 B,0.5D,2413 C0584R-8
BBUS COMMS
Lighting control switch (S100)
C0580-26 R,0.5D,2316 C0041-4
Switch-Auxilary-driving lamp (S411)
C0580-13 R,0.5,1000
1
Relay-Auxiliary-driving lamp (R269)
C0584R-23 SK,0.75D,515 C3058R-2 C3059-2 SK,1.0D,1000 C0534-1
Receiver-Radio-frequency (RF) (T203)
C0586R-21 U,0.5D,3245 C0049-2
FET-Indicator-Trailer-LH (G162)
C0585R-16 Y,2.5D,4300 C0473-1 C0498-1 Y,2.5D,875
Trailer pick-up (P124)
C1390-2 C1414-2 Y,2.5D,1050 C1382-1
C1390-3 C1414-3 G,2.5D,1050 C1382-4
FET-Indicator-Trailer-RH (G161)
C0585R-17 G,2.5D,4300 C0473-2 C0498-2 G,2.5D,875
FET-Indicator-RH (G159)
Headlamp-RH (A100)
C0583R-27 GW,1.5D,4166 C0011-3
Tail lamp unit-RH (A140)
C0585R-2 GW,1.5D,591 SJ1003 GW,1.5D,5799 C0125-3
C0580-29
NOT USED

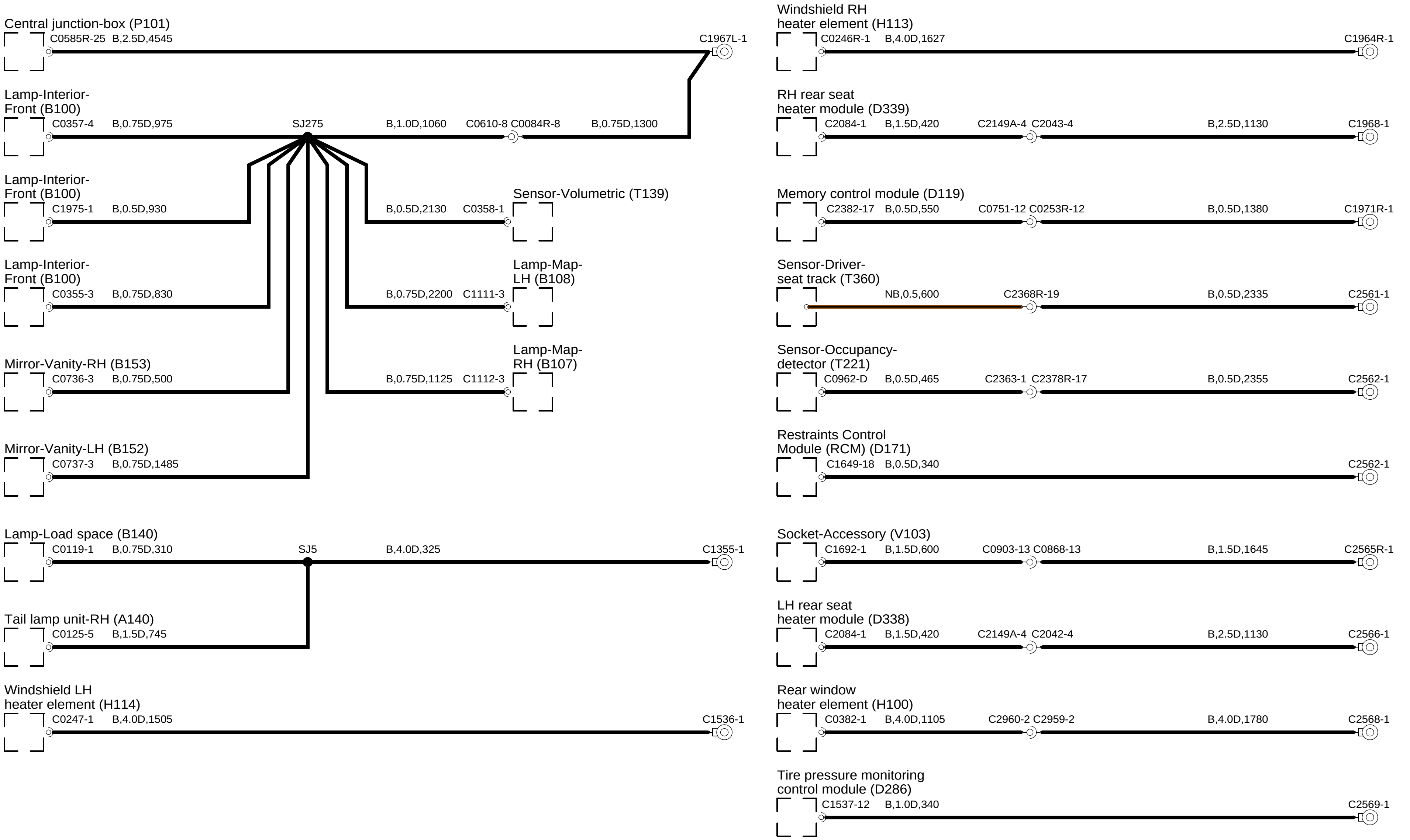

Central junction-box (P101)
Generic Electronic Module (D162)
Switch-Bonnet (S224)
C0007-1
PO,0.5D,4468
C0584R-15
BONNET AJAR SW
MASTER INT LIGHT SW
C0586R-17
PU,0.5D,5687
C0084R-16 C0610-16
PU,0.5D,1270
C0355-1
Lamp-Interior-Front (B100)
ELECTRONIC GND
C0585R-18
B,2.5D,885
C2695R-1
TYPE 2
Motor-Central door-locking-Passenger (M237)
C0441-4
BN,0.5D,1760
C0439-19 C0463R-19
BU,0.5D,890
C0586R-8
PASSENGER AJAR SW
Switch-Steering column-Lighting (S175)
C0580-3
UR,0.35D,2680
C1393-6
FLASH TO PASS SW
C0586R-16
NOT USED (V101)
KEY LOCK SW
C0580-28
UR,0.35D,2680
C1393-4
HIGH BEAM SW
C0586R-14
NOT USED (V101)
KEY UNLOCK SW
C0580-18
GW,0.35D,2680
C1393-2
TURN SIGNAL-RH
C0580-17
GR,0.35D,2680
C1393-3
TURN SIGNAL-LH
Switch pack-Centre facia (S425)
C2387-10
YK,0.5D,1613
C0580-20
MASTER UNLOCK
Lighting control switch (S100)
C0580-25
Y,0.5D,2316
C0041-6
LOW BEAM SW
Lamp-Approach-Driver (A162)
C0319-8
PW,0.75D,1060
C0439-1 C0459R-1
C0580-24
R,0.5D,2316
C0041-13
SIDE LIGHTS SW
PW,1.5D,2325
SJ1039
PW,1.5D,545
C0585R-7
APPROACH LAMPS
Stop lamp switch (S215)
C0586R-24
GP,0.75D,905
SJ1814
GP,1.5D,2535
C0075R-1
BRAKE SW
C0584-19
NOT USED
PASSIVE START RLY
C0580-1
YW,0.5D,923
C1168-19 C1166R-19
MS CAN L
C0580-15
YU,0.5D,923
C1168-18 C1166R-18
MS CAN H
Motor-Central door-locking-Driver (M236)
C0586R-18
UB,0.5D,2940
C0459R-20 C0439-20
BU,0.5D,1760
C0441-10
DRIVER DOOR LOCK STATUS
Roof opening panel control module (D117)
C0586R-32
R,0.5D,690
SJ1045
R,0.5D,2080
C0784-3
LIN BUS
R,0.5D,3935
Sensor-Rain-Ambient light (T328)
R,0.5D,2205
C0961-2
Memory control module (D119)
C0253R-22 C0751-22
R,MAPDB,550
C2382-8

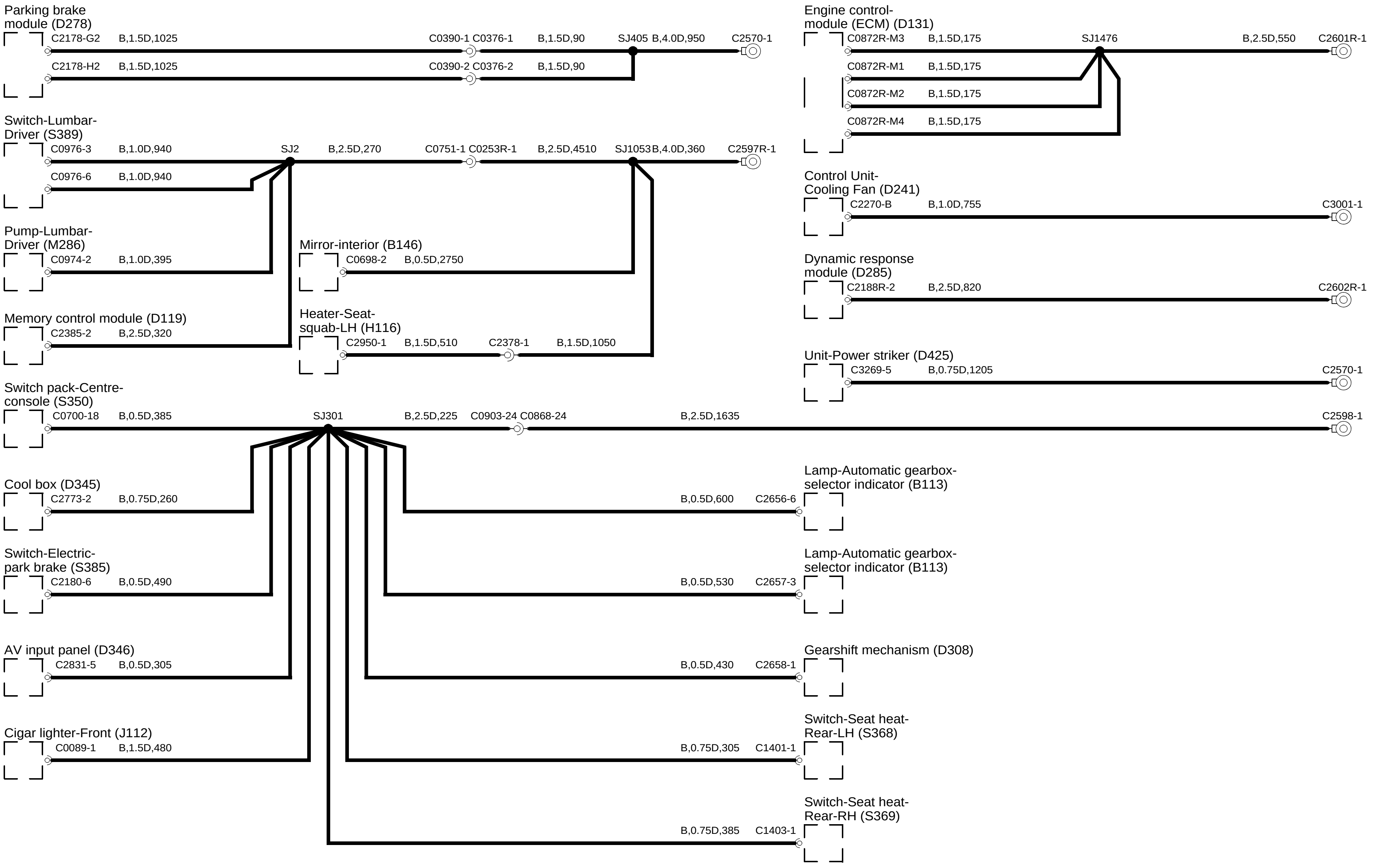

Central junction-box (P101)
Generic Electronic Module (D162)
Motor-Central door-locking-Driver (M236)
C0441-4 BN,0.5D,1760
C0439-19 C0459R-19
BN,0.5D,2940
C0586R-9
DRIVER AJAR SW
HAZARD SW
MASTER LOCK
Motor-Central door-locking-Rear-RH (M166)
C0442-4 PLG,0.5D,1565
C0804-3 C0436-3
PLG,0.5D,4020
C0586R-6
RR AJAR SW
FR WIPER INTERMITTENT SW
FR WIPER SLOW SW
Motor-Central door-locking-Rear-LH (M167)
C0442-4 PLG,0.5D,1565
C0803-3 C0435-3
PLG,0.5D,2500
C0586R-7
RL AJAR SW
FR WIPER FAST SW
FR INTERMITTENT DATA 1
FR INTERMITTENT DATA 2
FR INTERMITTENT DATA 3
Motor-CDL-Liftgate Glass (M316)
C1677-2 KP,0.75D,2145
C0385-6 C0144-6
BP,0.75D,4280
C3008-2 C3007-2
BP,0.75D,1845
C0586R-30
FET-Liftgate Glass (G177)
FR WASH SW
UPPER TAILGATE MOTOR DRIVE
RR WIPER SW
RR WASH SW
Motor-CDL-Liftgate (M315)
C2052-4 KR,0.75D,2320
C0385-1 C0144-1 KR,0.75D,140
SJ98
BR,0.75D,5425
C0586R-10
UPPER TAILGATE AJAR SW
C2052-1 KP,1.0D,2320
C0385-3 C0144-3
BP,1.5D,4280
C3008-1 C3007-1
BP,1.5D,1775
C0585R-1
FET-Liftgate (G176)
LOWER TAILGATE MOTOR DRIVE
RR WIPER PARK SW
Switch-Liftgate release (S443)
C0615-1 KS,0.5D,1865
C0385-4 C0144-4
BS,0.75D,5565
C0586R-15
TAILGATE RELEASE SW1
RR WIPER RELAY
Motor-Wiper-Windscreen (M105)
C0030R-5 WLG,0.5D,1680
SJ1415 WLG,0.5D,255
C0584R-16
FR WIPER PARK POS
HEADLAMP WASHER
Lamp-Footwell-Front-RH (B135)
C0076-2 P,0.75D,1035
SJ740 P,0.75D,1230
C0582-35
FET-Interior-lamp (G173)
2
TAILGATE RELEASE SW 2
SJ1040 P,0.75D,1440
C0585R-3
FET-Interior-lamp (G173)
1
P,0.75D,4177
Lamp-Interior-Front (B100)
C0355-4 P,0.75D,1270
C0610-7 C0084R-7
Switch pack-Centre facia (S425)
C0580-19 LGR,0.5D,1613 C2387-8
C0580-27 KR,0.5D,1613 C2387-4
Switch-Steering column-Wiper (S174)
C0580-5 LGG,0.5D,2548 C0278-8
C0580-2 GS,0.5D,2548 C0278-9
C0580-7 RLG,0.5D,2548 C0278-10
C0580-8 WLG,0.5D,2548 C0278-3
C0580-9 GS,0.5D,2548 C0278-4
C0580-10 LGP,0.5D,2548 C0278-2
C0580-12 LG,0.5D,2548 C0278-5
C0580-6 GY,0.5D,2548 C0278-13
C0580-11 LGS,0.5D,2548 C0278-12
Motor-Wiper-Rear screen (M106)
NG,0.5D,1945 C0388-2
C0586R-13 NG,0.5D,5845
C2739-3 C2740-3
Relay-Trailer-Rear wiper (R273)
C0586R-25 SP,0.5D,4070 C2937-3
Junction-box engine (P108)
C0584R-18 G,0.5D,944 C0570R-27
C0580-4 KS,0.5D,923
C1168-20 C1166R-20
C2740-1 C2739-1 KS,0.5D,5210
Switch-Liftgate Glass release (S444)
KS,0.5D,2100 C1678-1

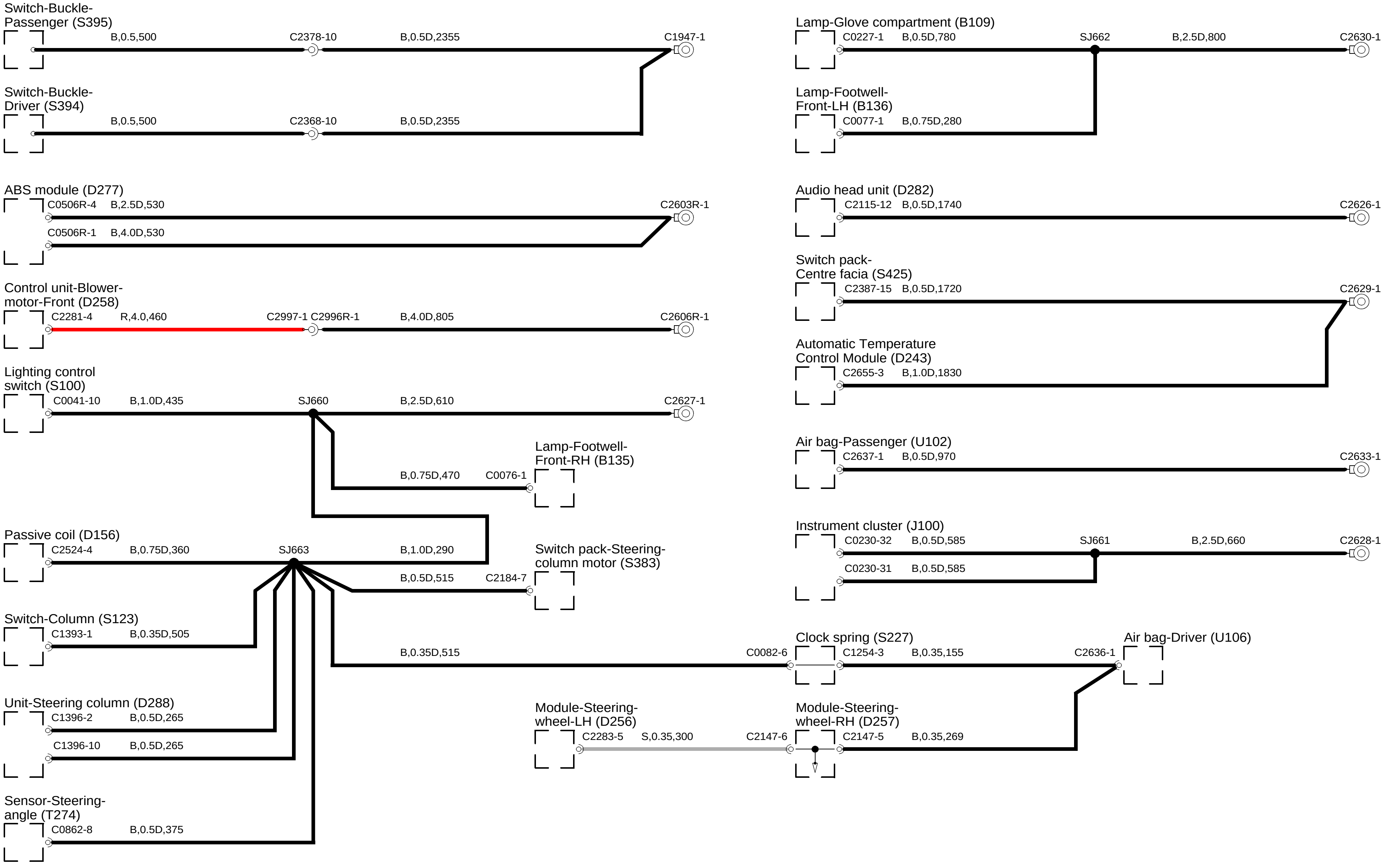

Transfer box control module (D204)
C1854R-5
B,2.5D,285
SJ1806
B,4.0D,578
C0556R-1
Headlamp-RH (A100)
C0011-1
B,1.5D,268
SJ878
B,2.5D,150
C0561-1
C0011-9
B,1.5D,268
C0011-12
B,1.5D,268
C0011-15
B,0.5D,268
Horn-LH (L102)
C0003-2
B,1.0D,1665
SJ877
B,2.5D,200
Switch-Bonnet (S224)
C0007-2
B,0.5D,615
B,1.5D,235
C2327-2
C2328-2
B,1.5D,1990
C0514-2
Lamp-Fog-Front-LH (A109)
Air suspension Control Module (D199)
C2321R-24
B,2.5D,775
C0559R-1
Horn-RH (L103)
C0004-2
B,1.0D,1450
B,1.5D,235
C2327-1
C2328-1
B,1.5D,760
C0513-2
Lamp-Fog-Front-RH (A108)
Sensor-Adaptive-cruise control (T350)
B,0.5D,1785
C2025-2
Motor-Wiper-Windscreen (M105)
C0030R-3
B,2.5D,2182
SJ173
B,4.0D,2180
C0560-1
Sensor-Low washer-fluid level (T168)
C0620-2
B,0.5D,3193
B,0.5D,220
C0026R-2
Switch-Brake-fluid level (S212)
Switch-Brake-fluid level (S212)
C0026R-2
B,0.5D,220
B,1.0D,1628
C2365R-10
C2366B-10
B,1.5H,200
SJ735
B,1.0H,100
C0193-13
Transmission control module (D306)
B,1.0H,100
C0193-16
Junction-box engine (P108)
C0570R-74
B,1.0D,339
SJ1573
B,2.5D,1648
Sensor-Engine coolant-level (T220)
B,1.0D,2658
C0147-2
Module-speed control (D284)
C2145R-12
B,0.5D,240
C2240R-6
C2238-6
B,0.5D,245
C0558-1

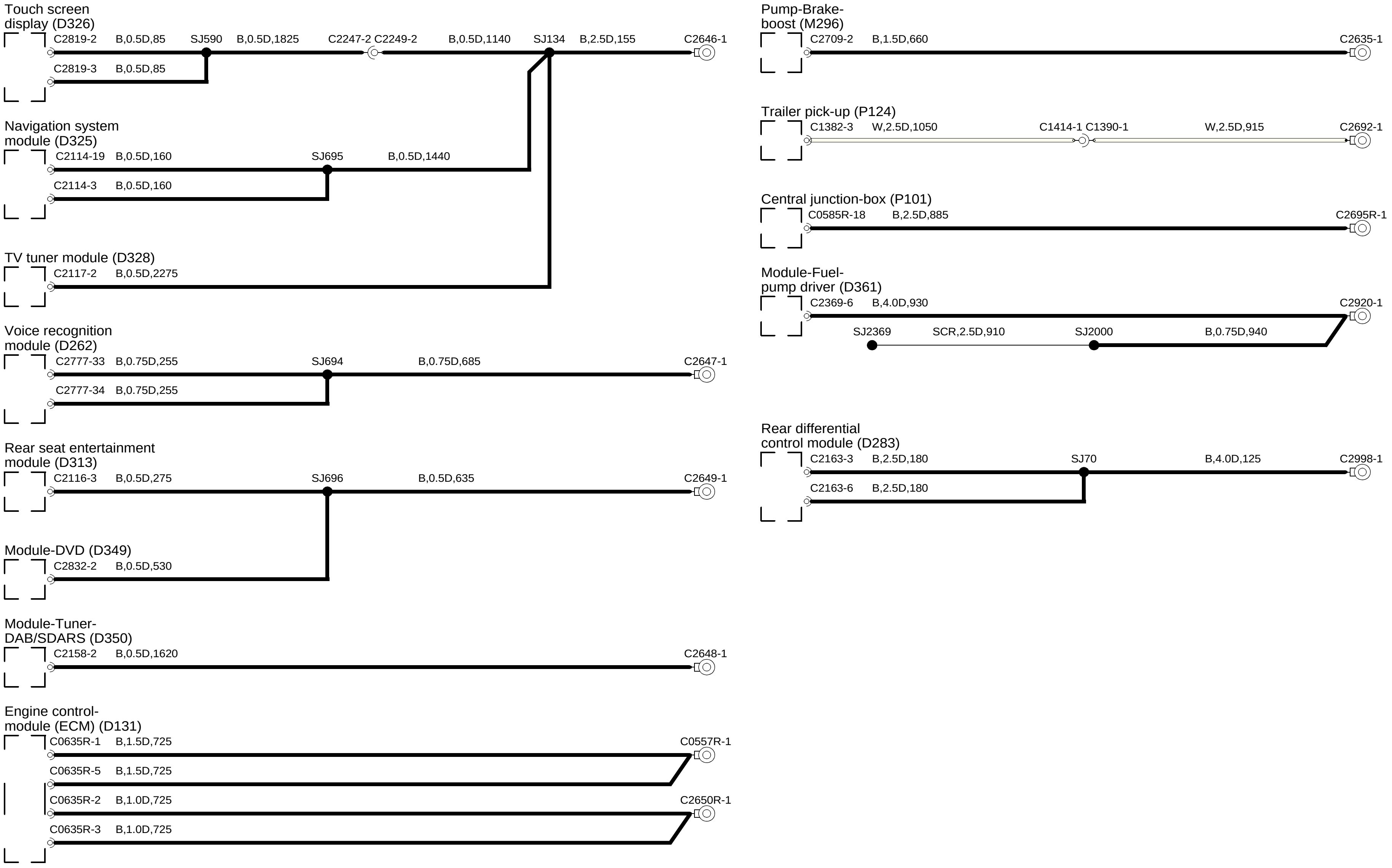

Washer jet-Heated (H121)
C0934-2
B,0.75D,2242
SJ171
B,2.5D,2343
C2601-1
Pump-Power wash (M156)
C0828-2
B,2.5D,2088
B,0.5D,1680
C0666R-1
Battery backed sounder (D154)
Heater-Washer-jet-RH (H128)
C0946-2
B,0.75D,1942
AFS control module (D276)
C2193R-24
B,0.5D,1033
Pump-Supercharge-coolant (M314)
C3006-2
B,2.5D,1235
C0564-1
Headlamp-LH (A101)
C0009-1
B,1.5D,140
SJ879
B,2.5D,1105
C0009-12
B,1.5D,140
C0009-9
B,1.5D,140
Fuel fired booster heater (H115)
C0926-2
B,1.0D,920
C2652-1
LH headphone unit (D334)
C2357-4
B,0.5D,450
SJ200
B,1.5D,915
C0803-21 C0435-21
B,1.5D,250
SJ742
B,2.5D,195
C0807-1
B,1.5D,915
C0803-9 C0435-9
B,1.5D,250
Lamp-Puddle-Rear-LH (B133)
C0980-1
B,0.75D,520
Switch pack-Seat-Passenger (S392)
C0774-3
B,2.5D,340
SJ151
B,2.5D,350
C3025-1
C2368R-15
B,2.5D,3480
SJ1053
B,4.0D,360
C2597R-1
Motor-Central door-locking-Rear-LH (M167)
C0442-1
B,0.5D,650
Relay-Power Seat-LH (R209)
C0975-2
B,2.5D,145
Switch-Window-Rear-LH (S141)
C0732-5
B,0.5D,450

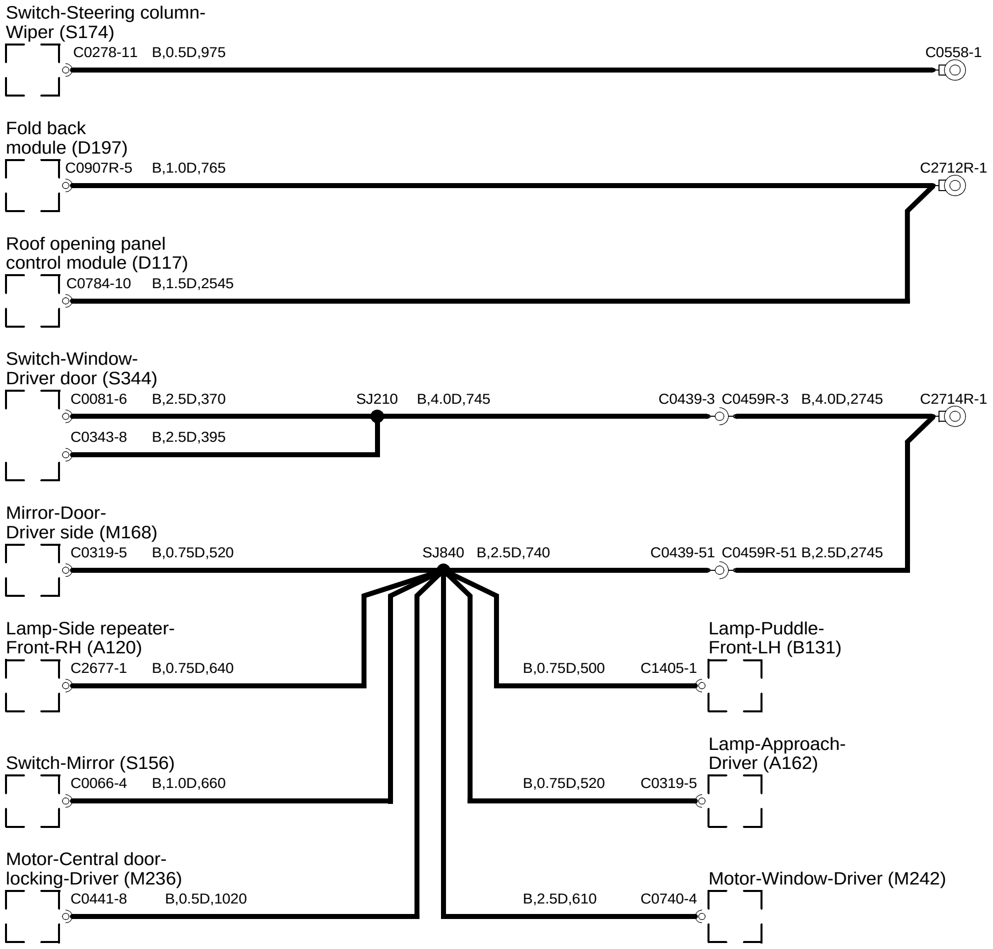

B,2.5D,195
C0809-1
RH headphone unit (D335)
C2357-4
B,0.5D,450
SJ200
B,1.5D,915
C0804-21 C0436-21
B,1.5D,250
SJ740
B,1.5D,915
C0804-9 C0436-9
B,1.5D,250
Lamp-Puddle-
Rear-RH (B132)
C0980-1
B,0.75D,520
Motor-Central door-
locking-Rear-RH (M166)
C0442-8
B,0.5D,650
Switch-Window-
Rear-RH (S140)
C0732-5
B,0.5D,450
Lamp-Puddle-
Front-LH (B131)
C1405-1
B,0.75D,500
SJ840
B,4.0D,740
C0439-2 C0463R-2
B,4.0D,745
C0810R-1
Motor-Central door-
locking-Passenger (M237)
C0441-1
B,0.5D,1020
Switch-Window-
Passenger door (S343)
C0087-5
B,0.5D,685
Mirror-Door-
Passenger side (M169)
C0319-5
B,0.75D,520
Lamp-Side repeater-
Front-LH (A121)
C2677-1
B,0.75D,640
Lamp-Approach-
Passenger (A163)
C0319-9
B,0.75D,520
Sensor-Rain-
Ambient light (T328)
C0961-3
B,0.5D,2470
C2599-1
Audio head unit (D282)
C1354-1
B,1.5D,1525
SJ520
B,0.75D,100
C2640-2 C2639-2
B,0.75D,105
SJ521
B,1.5D,3700
C2645-1
B,0.75D,100
C2640-3 C2639-3
B,0.75D,105

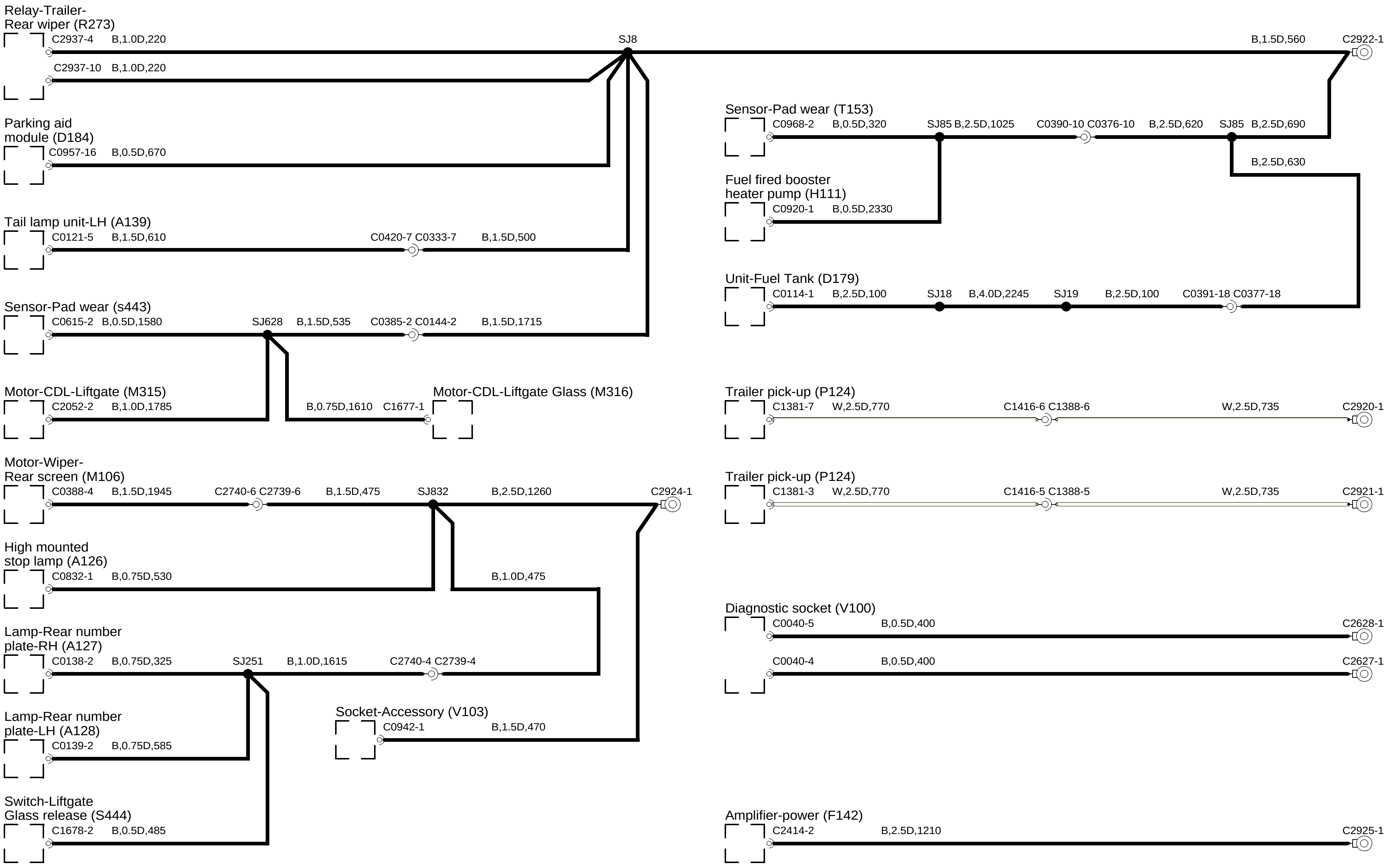

Central junction-box (P101)
C0585R-25 B,2.5D,4545
C1967L-1
Lamp-Interior-Front (B100)
C0357-4 B,0.75D,975
SJ275
B,1.0D,1060
C0610-8 C0084R-8
B,0.75D,1300
Lamp-Interior-Front (B100)
C1975-1 B,0.5D,930
B,0.5D,2130 C0358-1
Sensor-Volumetric (T139)
Lamp-Interior-Front (B100)
C0355-3 B,0.75D,830
B,0.75D,2200 C1111-3
Lamp-Map-LH (B108)
Mirror-Vanity-RH (B153)
C0736-3 B,0.75D,500
B,0.75D,1125 C1112-3
Lamp-Map-RH (B107)
Mirror-Vanity-LH (B152)
C0737-3 B,0.75D,1485
Lamp-Load space (B140)
C0119-1 B,0.75D,310
SJ5
B,4.0D,325
C1355-1
Tail lamp unit-RH (A140)
C0125-5 B,1.5D,745
Windshield LH heater element (H114)
C0247-1 B,4.0D,1505
C1536-1
Windshield RH heater element (H113)
C0246R-1 B,4.0D,1627
C1964R-1
RH rear seat heater module (D339)
C2084-1 B,1.5D,420
C2149A-4 C2043-4
B,2.5D,1130
C1968-1
Memory control module (D119)
C2382-17 B,0.5D,550
C0751-12 C0253R-12
B,0.5D,1380
C1971R-1
Sensor-Driver-seat track (T360)
NB,0.5,600
C2368R-19
B,0.5D,2335
C2561-1
Sensor-Occupancy-detector (T221)
C0962-D B,0.5D,465
C2363-1 C2378R-17
B,0.5D,2355
C2562-1
Restraints Control Module (RCM) (D171)
C1649-18 B,0.5D,340
C2562-1
Socket-Accessory (V103)
C1692-1 B,1.5D,600
C0903-13 C0868-13
B,1.5D,1645
C2565R-1
LH rear seat heater module (D338)
C2084-1 B,1.5D,420
C2149A-4 C2042-4
B,2.5D,1130
C2566-1
Rear window heater element (H100)
C0382-1 B,4.0D,1105
C2960-2 C2959-2
B,4.0D,1780
C2568-1
Tire pressure monitoring control module (D286)
C1537-12 B,1.0D,340
C2569-1


Parking brake module (D278)
C2178-G2
B,1.5D,1025
C0390-1 C0376-1
B,1.5D,90
SJ405
B,4.0D,950
C2570-1
C2178-H2
B,1.5D,1025
C0390-2 C0376-2
B,1.5D,90
Switch-Lumbar-Driver (S389)
C0976-3
B,1.0D,940
SJ2
B,2.5D,270
C0751-1 C0253R-1
B,2.5D,4510
SJ1053
B,4.0D,360
C2597R-1
C0976-6
B,1.0D,940
Pump-Lumbar-Driver (M286)
C0974-2
B,1.0D,395
Mirror-interior (B146)
C0698-2
B,0.5D,2750
Memory control module (D119)
C2385-2
B,2.5D,320
Heater-Seat-squab-LH (H116)
C2950-1
B,1.5D,510
C2378-1
B,1.5D,1050
Switch pack-Centre-console (S350)
C0700-18
B,0.5D,385
SJ301
B,2.5D,225
C0903-24 C0868-24
B,2.5D,1635
C2598-1
Cool box (D345)
C2773-2
B,0.75D,260
Switch-Electric-park brake (S385)
C2180-6
B,0.5D,490
AV input panel (D346)
C2831-5
B,0.5D,305
Cigar lighter-Front (J112)
C0089-1
B,1.5D,480
Engine control-module (ECM) (D131)
C0872R-M3
B,1.5D,175
SJ1476
B,2.5D,550
C2601R-1
C0872R-M1
B,1.5D,175
C0872R-M2
B,1.5D,175
C0872R-M4
B,1.5D,175
Control Unit-Cooling Fan (D241)
C2270-B
B,1.0D,755
C3001-1
Dynamic response module (D285)
C2188R-2
B,2.5D,820
C2602R-1
Unit-Power striker (D425)
C3269-5
B,0.75D,1205
C2570-1
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,600
C2656-6
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,530
C2657-3
Gearshift mechanism (D308)
B,0.5D,430
C2658-1
Switch-Seat heat-Rear-LH (S368)
B,0.75D,305
C1401-1
Switch-Seat heat-Rear-RH (S369)
B,0.75D,385
C1403-1

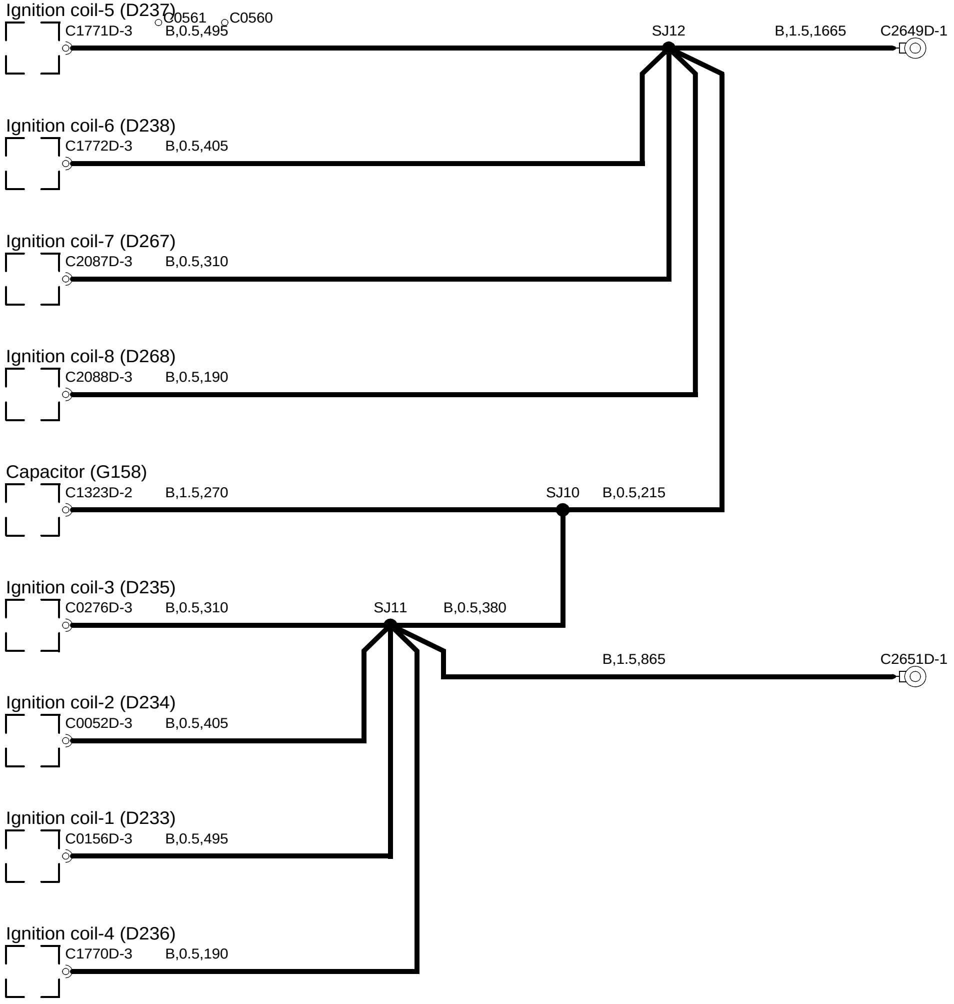

Switch-Buckle-Passenger (S395)
B,0.5,500
C2378-10
B,0.5D,2355
C1947-1
Switch-Buckle-Driver (S394)
B,0.5,500
C2368-10
B,0.5D,2355
ABS module (D277)
C0506R-4
B,2.5D,530
C2603R-1
C0506R-1
B,4.0D,530
Control unit-Blower-motor-Front (D258)
C2281-4
R,4.0,460
C2997-1 C2996R-1
B,4.0D,805
C2606R-1
Lighting control switch (S100)
C0041-10
B,1.0D,435
SJ660
B,2.5D,610
C2627-1
Lamp-Footwell-Front-RH (B135)
B,0.75D,470
C0076-1
Passive coil (D156)
C2524-4
B,0.75D,360
SJ663
B,1.0D,290
Switch pack-Steering-column motor (S383)
B,0.5D,515
C2184-7
Switch-Column (S123)
C1393-1
B,0.35D,505
B,0.35D,515
C0082-6
Unit-Steering column (D288)
C1396-2
B,0.5D,265
C1396-10
B,0.5D,265
Sensor-Steering-angle (T274)
C0862-8
B,0.5D,375
Lamp-Glove compartment (B109)
C0227-1
B,0.5D,780
SJ662
B,2.5D,800
C2630-1
Lamp-Footwell-Front-LH (B136)
C0077-1
B,0.75D,280
Audio head unit (D282)
C2115-12
B,0.5D,1740
C2626-1
Switch pack-Centre facia (S425)
C2387-15
B,0.5D,1720
C2629-1
Automatic Temperature Control Module (D243)
C2655-3
B,1.0D,1830
Air bag-Passenger (U102)
C2637-1
B,0.5D,970
C2633-1
Instrument cluster (J100)
C0230-32
B,0.5D,585
SJ661
B,2.5D,660
C2628-1
C0230-31
B,0.5D,585
Clock spring (S227)
C1254-3
B,0.35,155
C2636-1
Air bag-Driver (U106)
Module-Steering-wheel-LH (D256)
C2283-5
S,0.35,300
C2147-6
Module-Steering-wheel-RH (D257)
C2147-5
B,0.35,269


Touch screen display (D326)
C2819-2
B,0.5D,85
SJ590
B,0.5D,1825
C2247-2 C2249-2
B,0.5D,1140
SJ134
B,2.5D,155
C2646-1
C2819-3
B,0.5D,85
Navigation system module (D325)
C2114-19
B,0.5D,160
SJ695
B,0.5D,1440
C2114-3
B,0.5D,160
TV tuner module (D328)
C2117-2
B,0.5D,2275
Voice recognition module (D262)
C2777-33
B,0.75D,255
SJ694
B,0.75D,685
C2647-1
C2777-34
B,0.75D,255
Rear seat entertainment module (D313)
C2116-3
B,0.5D,275
SJ696
B,0.5D,635
C2649-1
Module-DVD (D349)
C2832-2
B,0.5D,530
Module-Tuner-DAB/SDARS (D350)
C2158-2
B,0.5D,1620
C2648-1
Engine control-module (ECM) (D131)
C0635R-1
B,1.5D,725
C0557R-1
C0635R-5
B,1.5D,725
C0635R-2
B,1.0D,725
C2650R-1
C0635R-3
B,1.0D,725
Pump-Brake-boost (M296)
C2709-2
B,1.5D,660
C2635-1
Trailer pick-up (P124)
C1382-3
W,2.5D,1050
C1414-1 C1390-1
W,2.5D,915
C2692-1
Central junction-box (P101)
C0585R-18
B,2.5D,885
C2695R-1
Module-Fuel-pump driver (D361)
C2369-6
B,4.0D,930
C2920-1
SJ2369
SCR,2.5D,910
SJ2000
B,0.75D,940
Rear differential control module (D283)
C2163-3
B,2.5D,180
SJ70
B,4.0D,125
C2998-1
C2163-6
B,2.5D,180

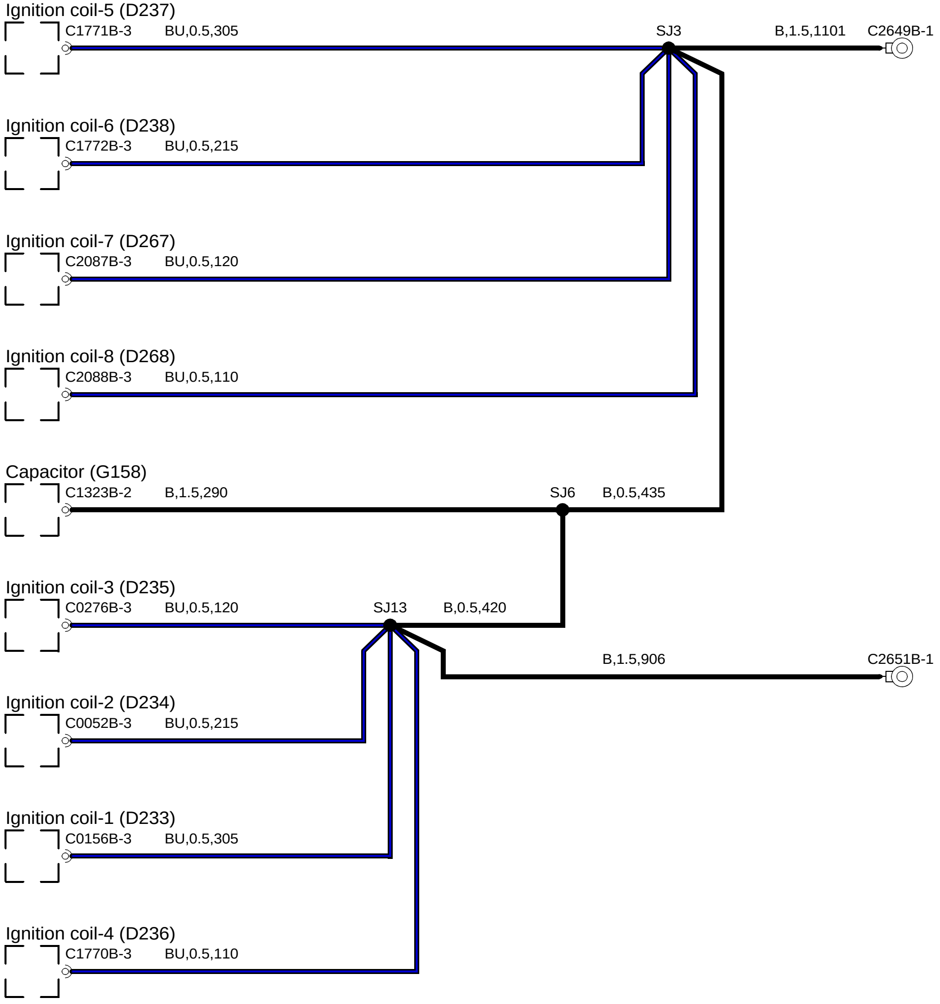

Switch-Steering column-
Wiper (S174)
C0278-11 B,0.5D,975
C0558-1
Fold back
module (D197)
C0907R-5 B,1.0D,765
C2712R-1
Roof opening panel
control module (D117)
C0784-10 B,1.5D,2545
Switch-Window-
Driver door (S344)
C0081-6 B,2.5D,370
SJ210 B,4.0D,745
C0439-3 C0459R-3 B,4.0D,2745
C2714R-1
C0343-8 B,2.5D,395
Mirror-Door-
Driver side (M168)
C0319-5 B,0.75D,520
SJ840 B,2.5D,740
C0439-51 C0459R-51 B,2.5D,2745
Lamp-Side repeater-
Front-RH (A120)
C2677-1 B,0.75D,640
Lamp-Puddle-
Front-LH (B131)
B,0.75D,500 C1405-1
Switch-Mirror (S156)
C0066-4 B,1.0D,660
Lamp-Approach-
Driver (A162)
B,0.75D,520 C0319-5
Motor-Central door-
locking-Driver (M236)
C0441-8 B,0.5D,1020
Motor-Window-Driver (M242)
B,2.5D,610 C0740-4

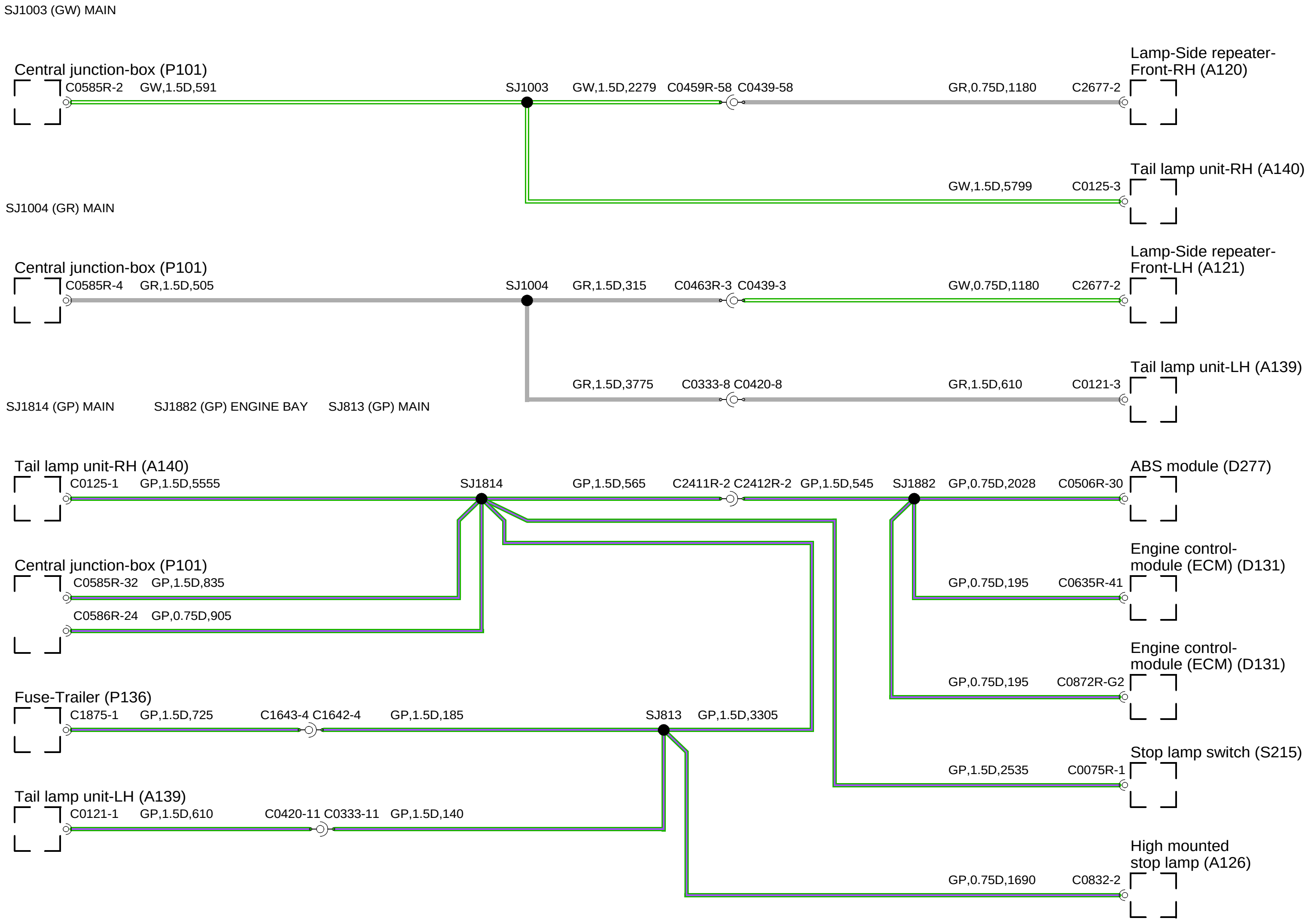

Relay-Trailer-
Rear wiper (R273)
C2937-4
B,1.0D,220
C2937-10
B,1.0D,220
SJ8
B,1.5D,560
C2922-1
Parking aid
module (D184)
C0957-16
B,0.5D,670
Tail lamp unit-LH (A139)
C0121-5
B,1.5D,610
C0420-7 C0333-7
B,1.5D,500
Sensor-Pad wear (s443)
C0615-2
B,0.5D,1580
SJ628
B,1.5D,535
C0385-2 C0144-2
B,1.5D,1715
Motor-CDL-Liftgate (M315)
C2052-2
B,1.0D,1785
B,0.75D,1610
C1677-1
Motor-CDL-Liftgate Glass (M316)
Motor-Wiper-
Rear screen (M106)
C0388-4
B,1.5D,1945
C2740-6 C2739-6
B,1.5D,475
SJ832
B,2.5D,1260
C2924-1
High mounted
stop lamp (A126)
C0832-1
B,0.75D,530
B,1.0D,475
Lamp-Rear number
plate-RH (A127)
C0138-2
B,0.75D,325
SJ251
B,1.0D,1615
C2740-4 C2739-4
Socket-Accessory (V103)
C0942-1
B,1.5D,470
Lamp-Rear number
plate-LH (A128)
C0139-2
B,0.75D,585
Switch-Liftgate
Glass release (S444)
C1678-2
B,0.5D,485
Sensor-Pad wear (T153)
C0968-2
B,0.5D,320
SJ85
B,2.5D,1025
C0390-10 C0376-10
B,2.5D,620
SJ85
B,2.5D,690
B,2.5D,630
Fuel fired booster
heater pump (H111)
C0920-1
B,0.5D,2330
Unit-Fuel Tank (D179)
C0114-1
B,2.5D,100
SJ18
B,4.0D,2245
SJ19
B,2.5D,100
C0391-18 C0377-18
Trailer pick-up (P124)
C1381-7
W,2.5D,770
C1416-6 C1388-6
W,2.5D,735
C2920-1
Trailer pick-up (P124)
C1381-3
W,2.5D,770
C1416-5 C1388-5
W,2.5D,735
C2921-1
Diagnostic socket (V100)
C0040-5
B,0.5D,400
C2628-1
C0040-4
B,0.5D,400
C2627-1
Amplifier-power (F142)
C2414-2
B,2.5D,1210
C2925-1

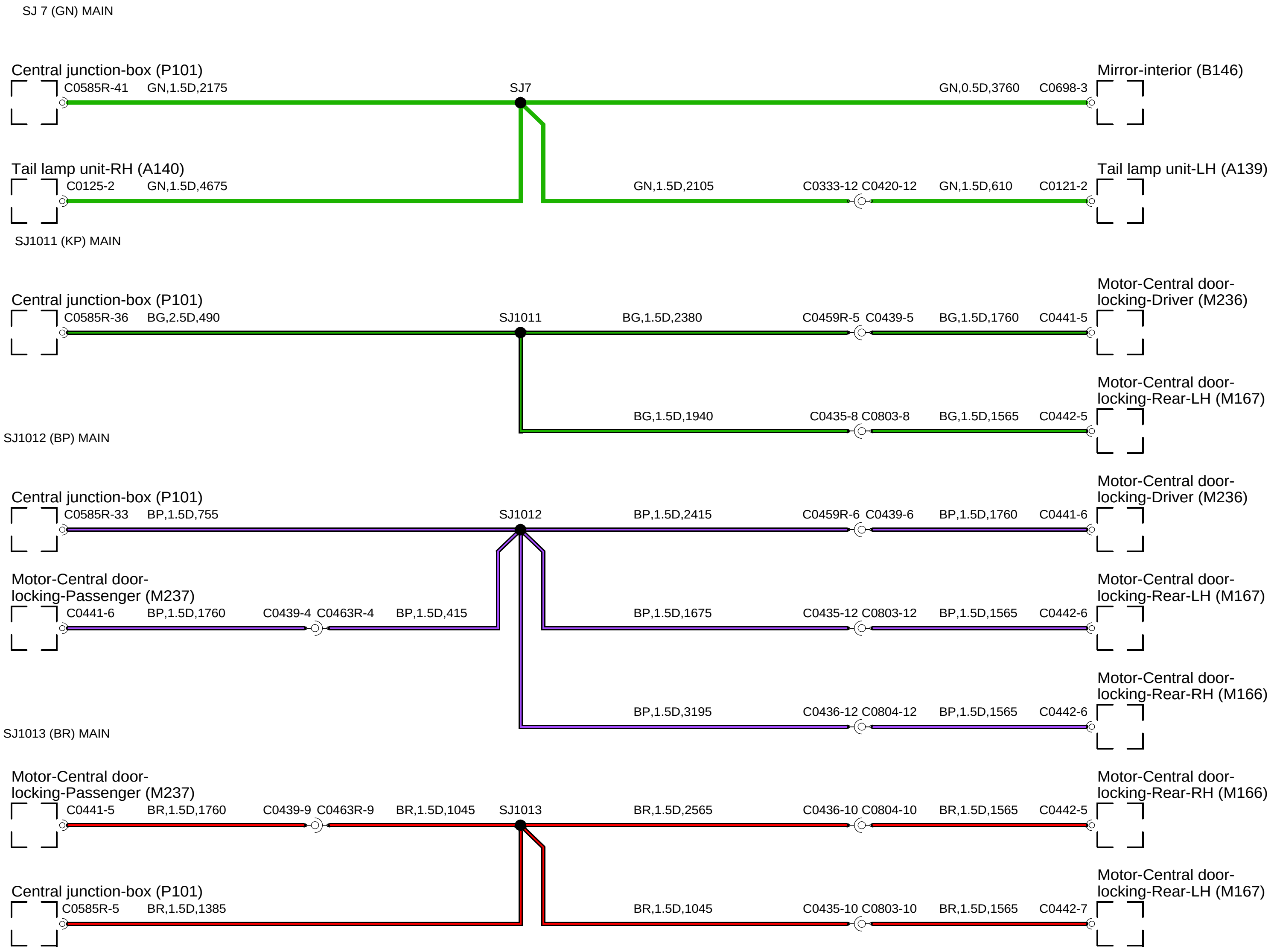
(PETROL-S/C)

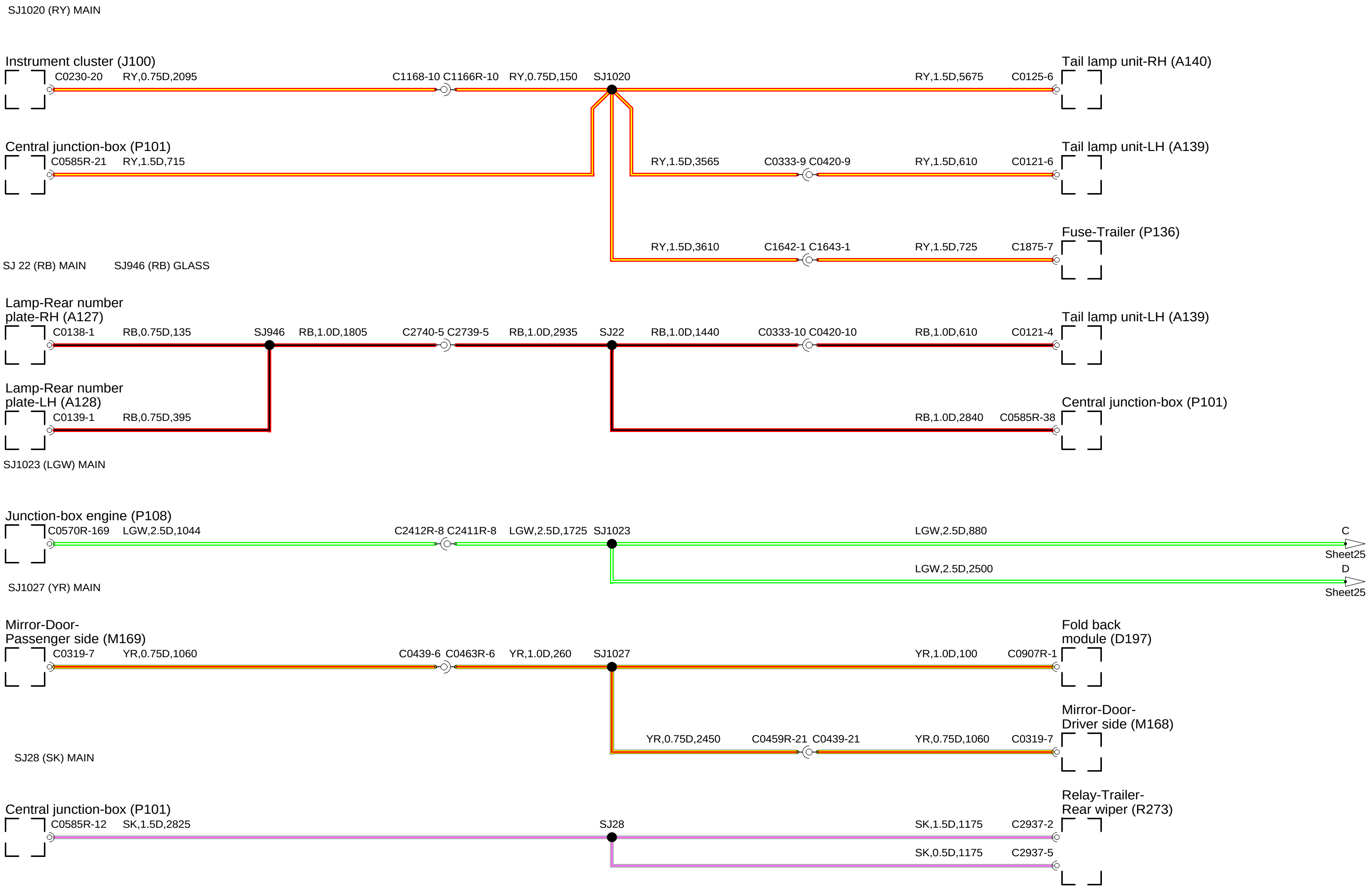

Ignition coil-5 (D237)
C0561
C0560
C1771D-3
B,0.5,495
SJ12
B,1.5,1665
C2649D-1
Ignition coil-6 (D238)
C1772D-3
B,0.5,405
Ignition coil-7 (D267)
C2087D-3
B,0.5,310
Ignition coil-8 (D268)
C2088D-3
B,0.5,190
Capacitor (G158)
C1323D-2
B,1.5,270
SJ10
B,0.5,215
Ignition coil-3 (D235)
C0276D-3
B,0.5,310
SJ11
B,0.5,380
B,1.5,865
C2651D-1
Ignition coil-2 (D234)
C0052D-3
B,0.5,405
Ignition coil-1 (D233)
C0156D-3
B,0.5,495
Ignition coil-4 (D236)
C1770D-3
B,0.5,190

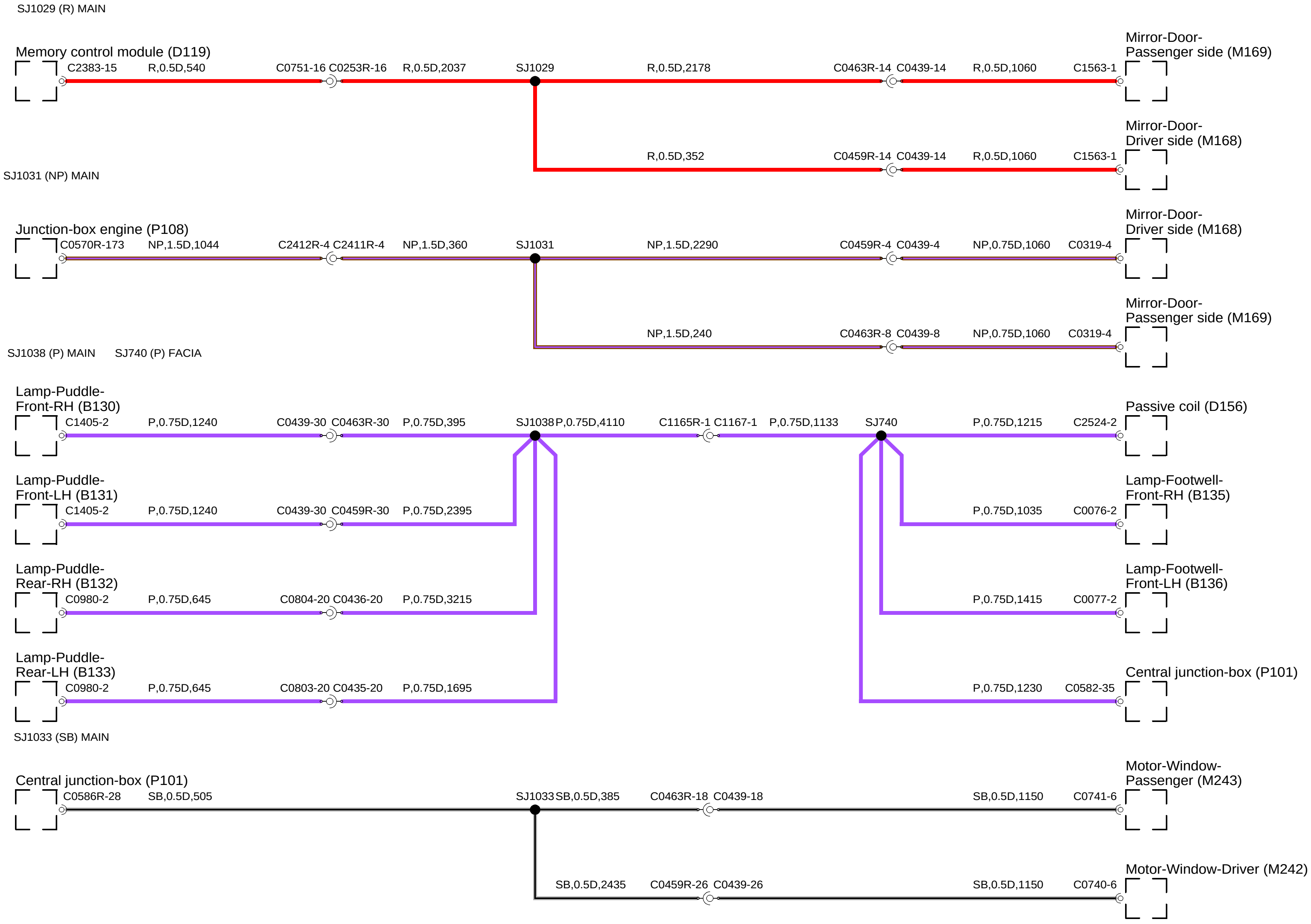
(PETROL-N/A)


Ignition coil-5 (D237)
C1771B-3
BU,0.5,305
SJ3
B,1.5,1101
C2649B-1
Ignition coil-6 (D238)
C1772B-3
BU,0.5,215
Ignition coil-7 (D267)
C2087B-3
BU,0.5,120
Ignition coil-8 (D268)
C2088B-3
BU,0.5,110
Capacitor (G158)
C1323B-2
B,1.5,290
SJ6
B,0.5,435
Ignition coil-3 (D235)
C0276B-3
BU,0.5,120
SJ13
B,0.5,420
B,1.5,906
C2651B-1
Ignition coil-2 (D234)
C0052B-3
BU,0.5,215
Ignition coil-1 (D233)
C0156B-3
BU,0.5,305
Ignition coil-4 (D236)
C1770B-3
BU,0.5,110

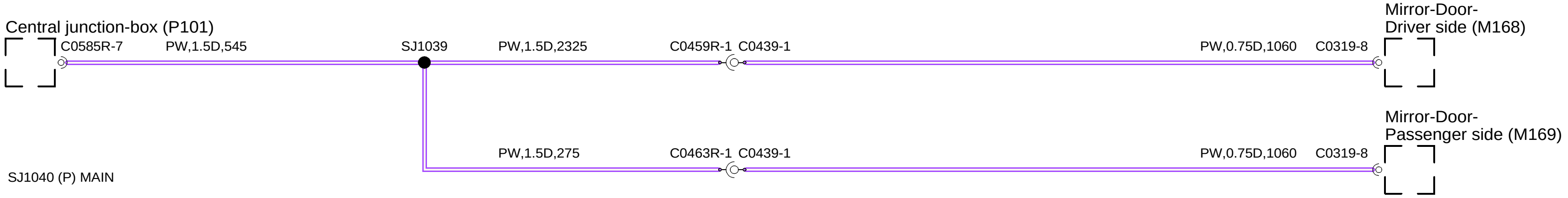

SJ1003 (GW) MAIN
Central junction-box (P101)
C0585R-2
GW,1.5D,591
SJ1003
GW,1.5D,2279
C0459R-58
C0439-58
GR,0.75D,1180
C2677-2
Lamp-Side repeater-Front-RH (A120)
GW,1.5D,5799
C0125-3
Tail lamp unit-RH (A140)
SJ1004 (GR) MAIN
Central junction-box (P101)
C0585R-4
GR,1.5D,505
SJ1004
GR,1.5D,315
C0463R-3
C0439-3
GW,0.75D,1180
C2677-2
Lamp-Side repeater-Front-LH (A121)
GR,1.5D,3775
C0333-8
C0420-8
GR,1.5D,610
C0121-3
Tail lamp unit-LH (A139)
SJ1814 (GP) MAIN
SJ1882 (GP) ENGINE BAY
SJ813 (GP) MAIN
Tail lamp unit-RH (A140)
C0125-1
GP,1.5D,5555
SJ1814
GP,1.5D,565
C2411R-2
C2412R-2
GP,1.5D,545
SJ1882
GP,0.75D,2028
C0506R-30
ABS module (D277)
Central junction-box (P101)
C0585R-32
GP,1.5D,835
C0586R-24
GP,0.75D,905
GP,0.75D,195
C0635R-41
Engine control-module (ECM) (D131)
GP,0.75D,195
C0872R-G2
Engine control-module (ECM) (D131)
Fuse-Trailer (P136)
C1875-1
GP,1.5D,725
C1643-4
C1642-4
GP,1.5D,185
SJ813
GP,1.5D,3305
GP,1.5D,2535
C0075R-1
Stop lamp switch (S215)
Tail lamp unit-LH (A139)
C0121-1
GP,1.5D,610
C0420-11
C0333-11
GP,1.5D,140
GP,0.75D,1690
C0832-2
High mounted stop lamp (A126)


SJ 7 (GN) MAIN
Central junction-box (P101)
C0585R-41
GN,1.5D,2175
SJ7
GN,0.5D,3760
C0698-3
Mirror-interior (B146)
Tail lamp unit-RH (A140)
C0125-2
GN,1.5D,4675
GN,1.5D,2105
C0333-12 C0420-12
GN,1.5D,610
C0121-2
Tail lamp unit-LH (A139)
SJ1011 (KP) MAIN
Central junction-box (P101)
C0585R-36
BG,2.5D,490
SJ1011
BG,1.5D,2380
C0459R-5 C0439-5
BG,1.5D,1760
C0441-5
Motor-Central door-locking-Driver (M236)
BG,1.5D,1940
C0435-8 C0803-8
BG,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-LH (M167)
SJ1012 (BP) MAIN
Central junction-box (P101)
C0585R-33
BP,1.5D,755
SJ1012
BP,1.5D,2415
C0459R-6 C0439-6
BP,1.5D,1760
C0441-6
Motor-Central door-locking-Driver (M236)
Motor-Central door-locking-Passenger (M237)
C0441-6
BP,1.5D,1760
C0439-4 C0463R-4
BP,1.5D,415
BP,1.5D,1675
C0435-12 C0803-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-LH (M167)
BP,1.5D,3195
C0436-12 C0804-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-RH (M166)
SJ1013 (BR) MAIN
Motor-Central door-locking-Passenger (M237)
C0441-5
BR,1.5D,1760
C0439-9 C0463R-9
BR,1.5D,1045
SJ1013
BR,1.5D,2565
C0436-10 C0804-10
BR,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-RH (M166)
Central junction-box (P101)
C0585R-5
BR,1.5D,1385
BR,1.5D,1045
C0435-10 C0803-10
BR,1.5D,1565
C0442-7
Motor-Central door-locking-Rear-LH (M167)

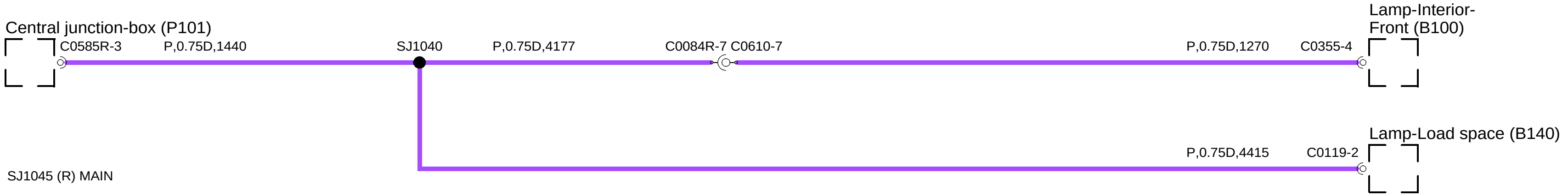

SJ1020 (RY) MAIN
Instrument cluster (J100)
C0230-20
RY,0.75D,2095
C1168-10 C1166R-10
RY,0.75D,150
SJ1020
RY,1.5D,5675
C0125-6
Tail lamp unit-RH (A140)
Central junction-box (P101)
C0585R-21
RY,1.5D,715
RY,1.5D,3565
C0333-9 C0420-9
RY,1.5D,610
C0121-6
Tail lamp unit-LH (A139)
RY,1.5D,3610
C1642-1 C1643-1
RY,1.5D,725
C1875-7
Fuse-Trailer (P136)
SJ 22 (RB) MAIN
SJ946 (RB) GLASS
Lamp-Rear number plate-RH (A127)
C0138-1
RB,0.75D,135
SJ946
RB,1.0D,1805
C2740-5 C2739-5
RB,1.0D,2935
SJ22
RB,1.0D,1440
C0333-10 C0420-10
RB,1.0D,610
C0121-4
Tail lamp unit-LH (A139)
Lamp-Rear number plate-LH (A128)
C0139-1
RB,0.75D,395
RB,1.0D,2840
C0585R-38
Central junction-box (P101)
SJ1023 (LGW) MAIN
Junction-box engine (P108)
C0570R-169
LGW,2.5D,1044
C2412R-8 C2411R-8
LGW,2.5D,1725
SJ1023
LGW,2.5D,880
C
Sheet25
LGW,2.5D,2500
D
Sheet25
SJ1027 (YR) MAIN
Mirror-Door-Passenger side (M169)
C0319-7
YR,0.75D,1060
C0439-6 C0463R-6
YR,1.0D,260
SJ1027
YR,1.0D,100
C0907R-1
Fold back module (D197)
YR,0.75D,2450
C0459R-21 C0439-21
YR,0.75D,1060
C0319-7
Mirror-Door-Driver side (M168)
SJ28 (SK) MAIN
Central junction-box (P101)
C0585R-12
SK,1.5D,2825
SJ28
SK,1.5D,1175
C2937-2
SK,0.5D,1175
C2937-5
Relay-Trailer-Rear wiper (R273)


SJ1029 (R) MAIN
Memory control module (D119)
C2383-15
R,0.5D,540
C0751-16 C0253R-16
R,0.5D,2037
SJ1029
R,0.5D,2178
C0463R-14 C0439-14
R,0.5D,1060
C1563-1
Mirror-Door-Passenger side (M169)
R,0.5D,352
C0459R-14 C0439-14
R,0.5D,1060
C1563-1
Mirror-Door-Driver side (M168)
SJ1031 (NP) MAIN
Junction-box engine (P108)
C0570R-173
NP,1.5D,1044
C2412R-4 C2411R-4
NP,1.5D,360
SJ1031
NP,1.5D,2290
C0459R-4 C0439-4
NP,0.75D,1060
C0319-4
Mirror-Door-Driver side (M168)
NP,1.5D,240
C0463R-8 C0439-8
NP,0.75D,1060
C0319-4
Mirror-Door-Passenger side (M169)
SJ1038 (P) MAIN
SJ740 (P) FACIA
Lamp-Puddle-Front-RH (B130)
C1405-2
P,0.75D,1240
C0439-30 C0463R-30
P,0.75D,395
SJ1038
P,0.75D,4110
C1165R-1 C1167-1
P,0.75D,1133
SJ740
P,0.75D,1215
C2524-2
Passive coil (D156)
Lamp-Puddle-Front-LH (B131)
C1405-2
P,0.75D,1240
C0439-30 C0459R-30
P,0.75D,2395
P,0.75D,1035
C0076-2
Lamp-Footwell-Front-RH (B135)
Lamp-Puddle-Rear-RH (B132)
C0980-2
P,0.75D,645
C0804-20 C0436-20
P,0.75D,3215
P,0.75D,1415
C0077-2
Lamp-Footwell-Front-LH (B136)
Lamp-Puddle-Rear-LH (B133)
C0980-2
P,0.75D,645
C0803-20 C0435-20
P,0.75D,1695
P,0.75D,1230
C0582-35
Central junction-box (P101)
SJ1033 (SB) MAIN
Central junction-box (P101)
C0586R-28
SB,0.5D,505
SJ1033
SB,0.5D,385
C0463R-18 C0439-18
SB,0.5D,1150
C0741-6
Motor-Window-Passenger (M243)
SB,0.5D,2435
C0459R-26 C0439-26
SB,0.5D,1150
C0740-6
Motor-Window-Driver (M242)

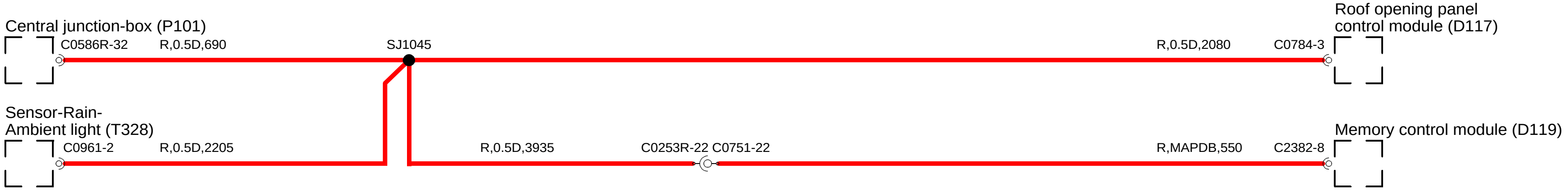
SJ1039 (PW) MAIN


Central junction-box (P101)
C0585R-7
PW,1.5D,545
SJ1039
PW,1.5D,2325
C0459R-1
C0439-1
PW,0.75D,1060
C0319-8
Mirror-Door-
Driver side (M168)
PW,1.5D,275
C0463R-1
C0439-1
PW,0.75D,1060
C0319-8
Mirror-Door-
Passenger side (M169)

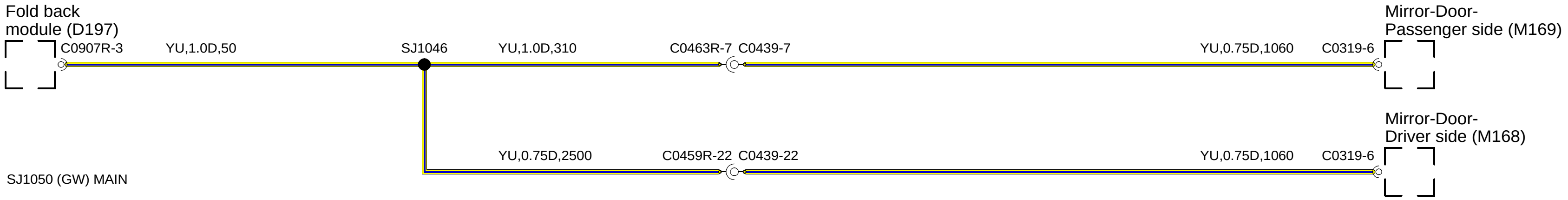
SJ1040 (P) MAIN


Central junction-box (P101)
C0585R-3
P,0.75D,1440
SJ1040
P,0.75D,4177
C0084R-7
C0610-7
P,0.75D,1270
C0355-4
Lamp-Interior-
Front (B100)
P,0.75D,4415
C0119-2
Lamp-Load space (B140)

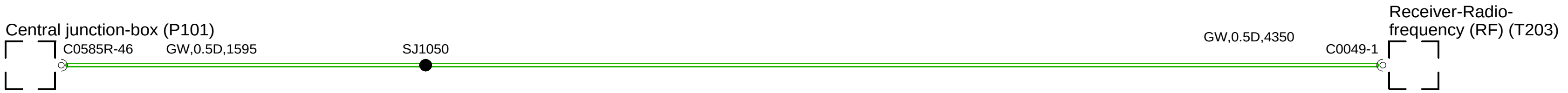
SJ1045 (R) MAIN

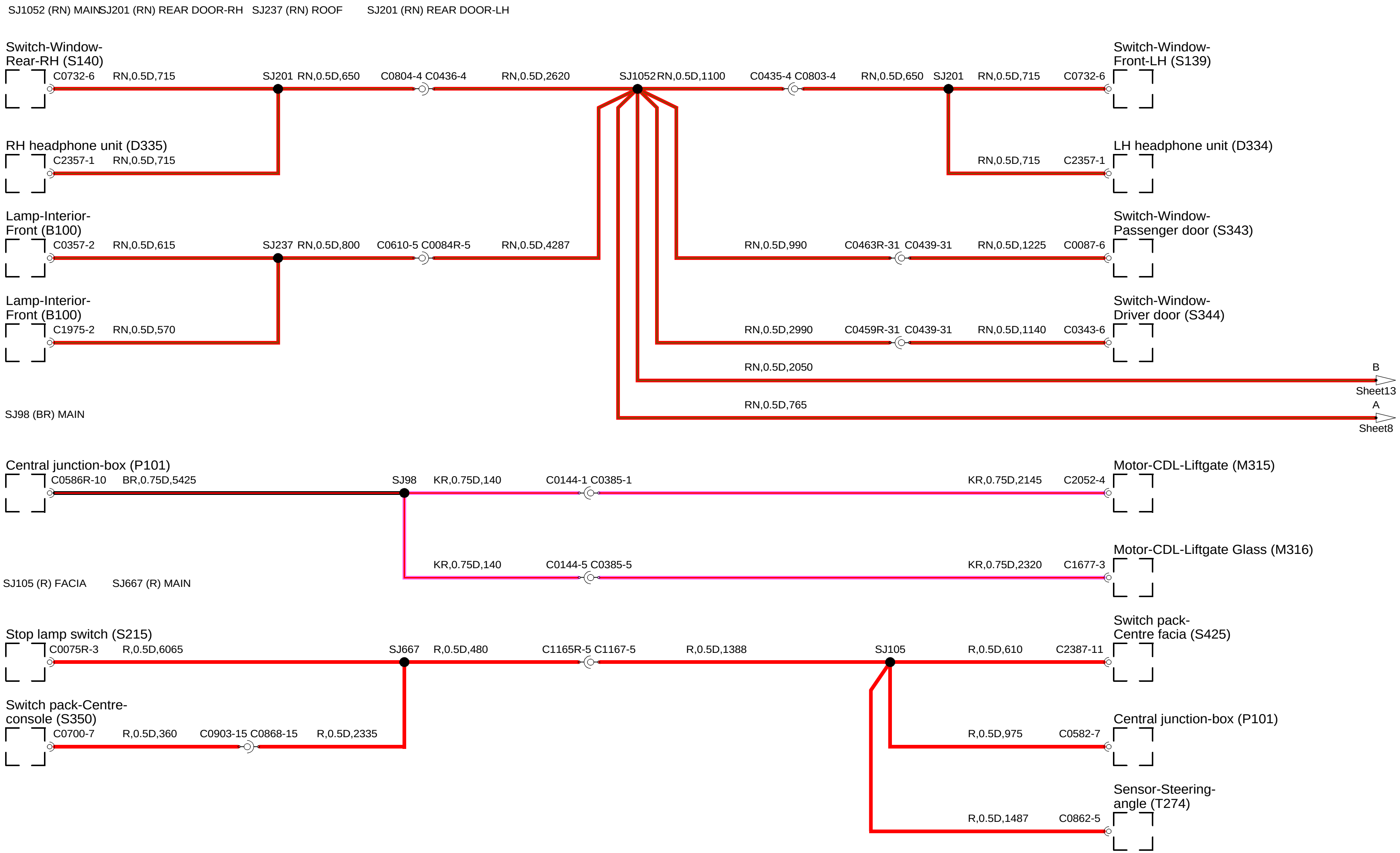

Central junction-box (P101)
C0586R-32
R,0.5D,690
SJ1045
R,0.5D,2080
C0784-3
Roof opening panel
control module (D117)
Sensor-Rain-
Ambient light (T328)
C0961-2
R,0.5D,2205
R,0.5D,3935
C0253R-22
C0751-22
R,MAPDB,550
C2382-8
Memory control module (D119)

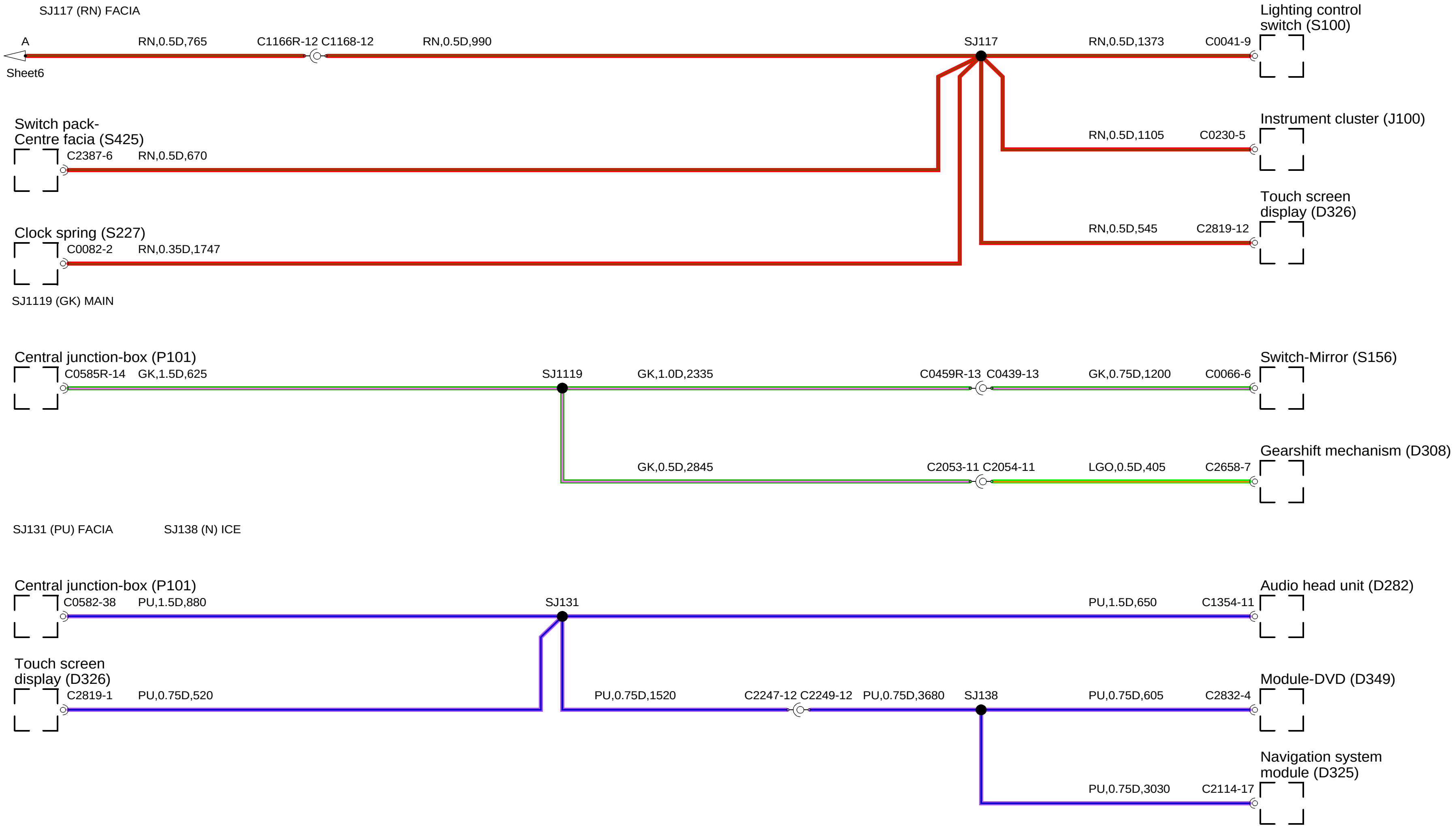
SJ1046 (Y) MAIN

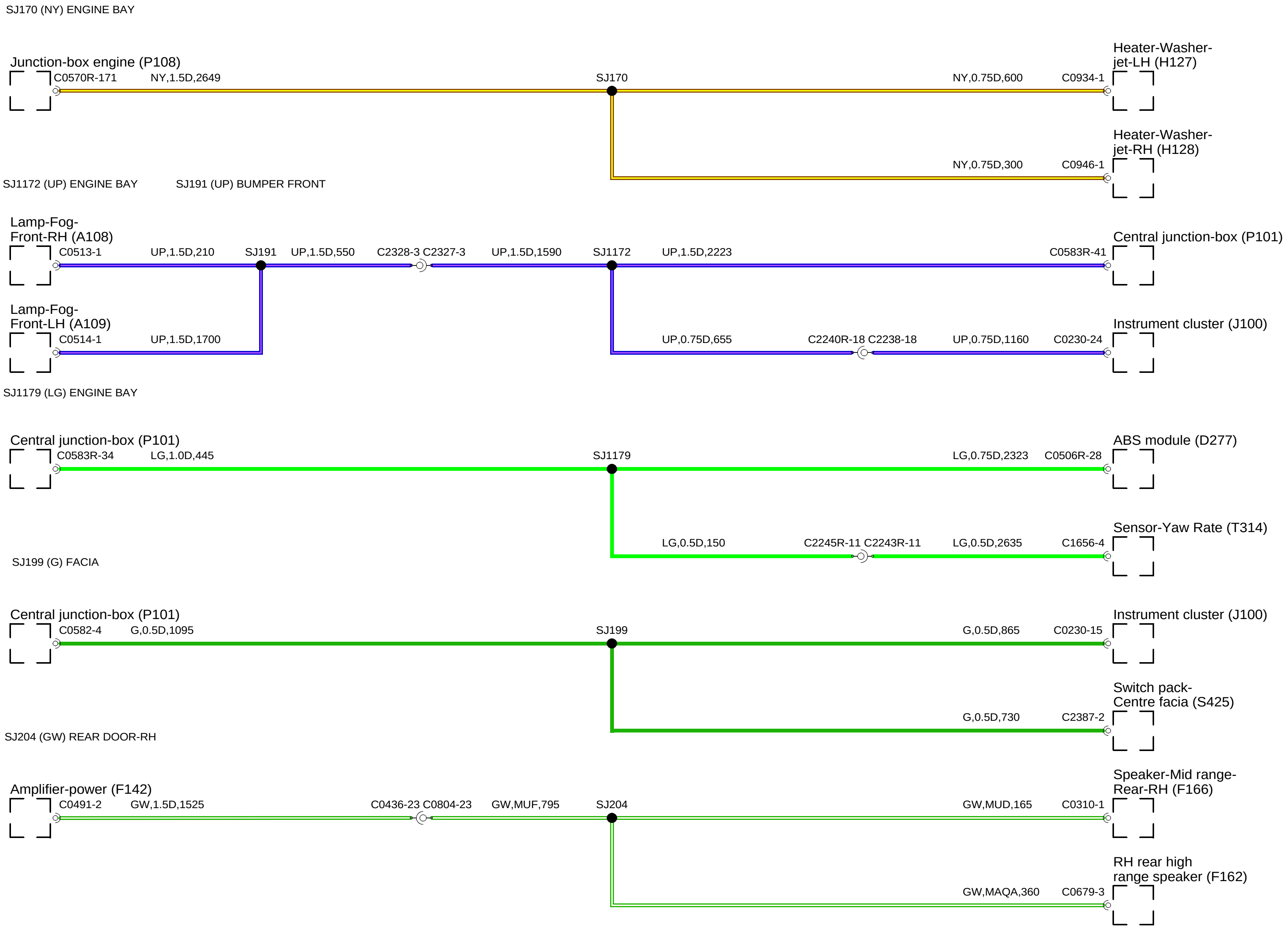

Fold back
module (D197)
C0907R-3
YU,1.0D,50
SJ1046
YU,1.0D,310
C0463R-7
C0439-7
YU,0.75D,1060
C0319-6
Mirror-Door-
Passenger side (M169)
YU,0.75D,2500
C0459R-22
C0439-22
YU,0.75D,1060
C0319-6
Mirror-Door-
Driver side (M168)

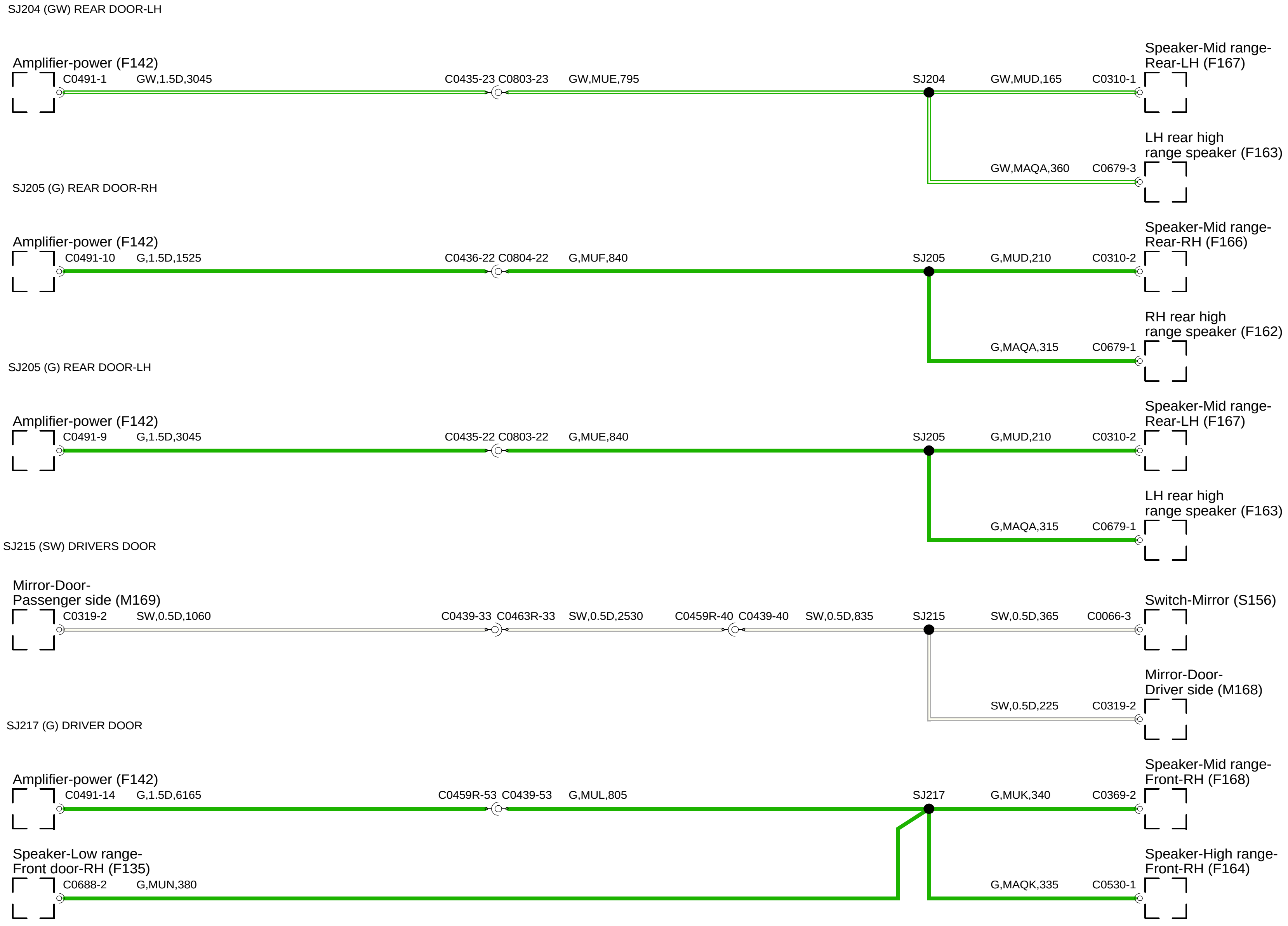
SJ1050 (GW) MAIN


Central junction-box (P101)
C0585R-46
GW,0.5D,1595
SJ1050
GW,0.5D,4350
C0049-1
Receiver-Radio-
frequency (RF) (T203)

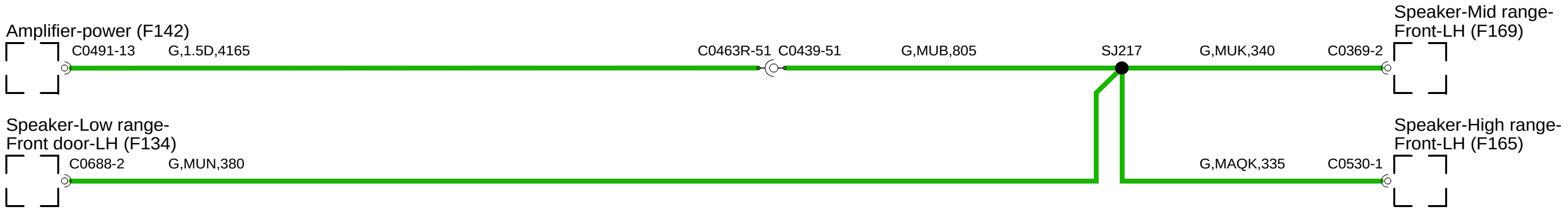

SJ1052 (RN) MAIN
SJ201 (RN) REAR DOOR-RH
SJ237 (RN) ROOF
SJ201 (RN) REAR DOOR-LH
Switch-Window-Rear-RH (S140)
C0732-6
RN,0.5D,715
SJ201
RN,0.5D,650
C0804-4 C0436-4
RN,0.5D,2620
SJ1052
RN,0.5D,1100
C0435-4 C0803-4
RN,0.5D,650
SJ201
RN,0.5D,715
C0732-6
Switch-Window-Front-LH (S139)
RH headphone unit (D335)
C2357-1
RN,0.5D,715
RN,0.5D,715
C2357-1
LH headphone unit (D334)
Lamp-Interior-Front (B100)
C0357-2
RN,0.5D,615
SJ237
RN,0.5D,800
C0610-5 C0084R-5
RN,0.5D,4287
RN,0.5D,990
C0463R-31 C0439-31
RN,0.5D,1225
C0087-6
Switch-Window-Passenger door (S343)
Lamp-Interior-Front (B100)
C1975-2
RN,0.5D,570
RN,0.5D,2990
C0459R-31 C0439-31
RN,0.5D,1140
C0343-6
Switch-Window-Driver door (S344)
RN,0.5D,2050
B
Sheet13
RN,0.5D,765
A
Sheet8
SJ98 (BR) MAIN
Central junction-box (P101)
C0586R-10
BR,0.75D,5425
SJ98
KR,0.75D,140
C0144-1 C0385-1
KR,0.75D,2145
C2052-4
Motor-CDL-Liftgate (M315)
KR,0.75D,140
C0144-5 C0385-5
KR,0.75D,2320
C1677-3
Motor-CDL-Liftgate Glass (M316)
SJ105 (R) FACIA
SJ667 (R) MAIN
Stop lamp switch (S215)
C0075R-3
R,0.5D,6065
SJ667
R,0.5D,480
C1165R-5 C1167-5
R,0.5D,1388
SJ105
R,0.5D,610
C2387-11
Switch pack-Centre facia (S425)
Switch pack-Centre-console (S350)
C0700-7
R,0.5D,360
C0903-15 C0868-15
R,0.5D,2335
R,0.5D,975
C0582-7
Central junction-box (P101)
R,0.5D,1487
C0862-5
Sensor-Steering-angle (T274)


SJ117 (RN) FACIA
A
Sheet6
RN,0.5D,765
C1166R-12 C1168-12
RN,0.5D,990
SJ117
RN,0.5D,1373
C0041-9
Lighting control switch (S100)
Switch pack-Centre facia (S425)
C2387-6
RN,0.5D,670
RN,0.5D,1105
C0230-5
Instrument cluster (J100)
Touch screen display (D326)
RN,0.5D,545
C2819-12
Clock spring (S227)
C0082-2
RN,0.35D,1747
SJ1119 (GK) MAIN
Central junction-box (P101)
C0585R-14
GK,1.5D,625
SJ1119
GK,1.0D,2335
C0459R-13 C0439-13
GK,0.75D,1200
C0066-6
Switch-Mirror (S156)
GK,0.5D,2845
C2053-11 C2054-11
LGO,0.5D,405
C2658-7
Gearshift mechanism (D308)
SJ131 (PU) FACIA
SJ138 (N) ICE
Central junction-box (P101)
C0582-38
PU,1.5D,880
SJ131
PU,1.5D,650
C1354-11
Audio head unit (D282)
Touch screen display (D326)
C2819-1
PU,0.75D,520
PU,0.75D,1520
C2247-12 C2249-12
PU,0.75D,3680
SJ138
PU,0.75D,605
C2832-4
Module-DVD (D349)
Navigation system module (D325)
PU,0.75D,3030
C2114-17

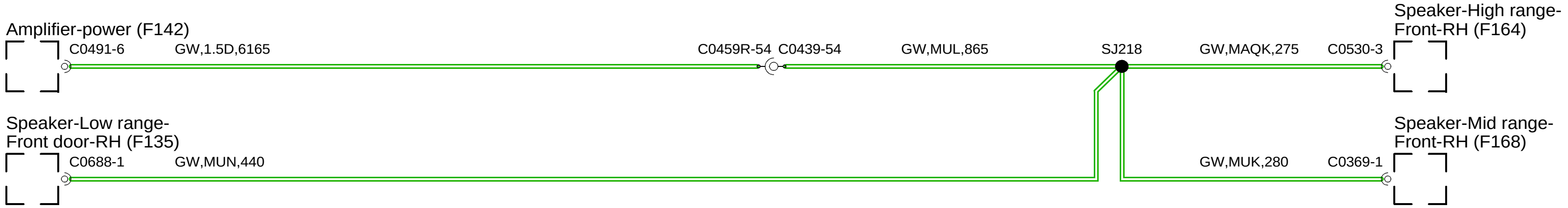

SJ170 (NY) ENGINE BAY
Junction-box engine (P108)
C0570R-171
NY,1.5D,2649
SJ170
NY,0.75D,600
C0934-1
Heater-Washer-jet-LH (H127)
NY,0.75D,300
C0946-1
Heater-Washer-jet-RH (H128)
SJ1172 (UP) ENGINE BAY
SJ191 (UP) BUMPER FRONT
Lamp-Fog-Front-RH (A108)
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
UP,1.5D,1590
SJ1172
UP,1.5D,2223
C0583R-41
Central junction-box (P101)
Lamp-Fog-Front-LH (A109)
C0514-1
UP,1.5D,1700
UP,0.75D,655
C2240R-18 C2238-18
UP,0.75D,1160
C0230-24
Instrument cluster (J100)
SJ1179 (LG) ENGINE BAY
Central junction-box (P101)
C0583R-34
LG,1.0D,445
SJ1179
LG,0.75D,2323
C0506R-28
ABS module (D277)
LG,0.5D,150
C2245R-11 C2243R-11
LG,0.5D,2635
C1656-4
Sensor-Yaw Rate (T314)
SJ199 (G) FACIA
Central junction-box (P101)
C0582-4
G,0.5D,1095
SJ199
G,0.5D,865
C0230-15
Instrument cluster (J100)
G,0.5D,730
C2387-2
Switch pack-Centre facia (S425)
SJ204 (GW) REAR DOOR-RH
Amplifier-power (F142)
C0491-2
GW,1.5D,1525
C0436-23 C0804-23
GW,MUF,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-RH (F166)
GW,MAQA,360
C0679-3
RH rear high range speaker (F162)


SJ204 (GW) REAR DOOR-LH
Amplifier-power (F142)
C0491-1
GW,1.5D,3045
C0435-23 C0803-23
GW,MUE,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-LH (F167)
LH rear high range speaker (F163)
GW,MAQA,360
C0679-3
SJ205 (G) REAR DOOR-RH
Amplifier-power (F142)
C0491-10
G,1.5D,1525
C0436-22 C0804-22
G,MUF,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
G,MAQA,315
C0679-1
SJ205 (G) REAR DOOR-LH
Amplifier-power (F142)
C0491-9
G,1.5D,3045
C0435-22 C0803-22
G,MUE,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-LH (F167)
LH rear high range speaker (F163)
G,MAQA,315
C0679-1
SJ215 (SW) DRIVERS DOOR
Mirror-Door-Passenger side (M169)
C0319-2
SW,0.5D,1060
C0439-33 C0463R-33
SW,0.5D,2530
C0459R-40 C0439-40
SW,0.5D,835
SJ215
SW,0.5D,365
C0066-3
Switch-Mirror (S156)
Mirror-Door-Driver side (M168)
SW,0.5D,225
C0319-2
SJ217 (G) DRIVER DOOR
Amplifier-power (F142)
C0491-14
G,1.5D,6165
C0459R-53 C0439-53
G,MUL,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-Front-RH (F168)
Speaker-Low range-Front door-RH (F135)
C0688-2
G,MUN,380
G,MAQK,335
C0530-1
Speaker-High range-Front-RH (F164)

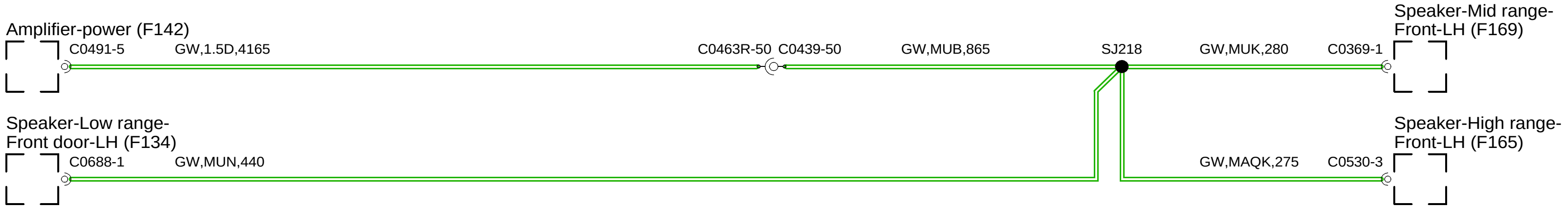
SJ217 (G) PASSENGER DOOR


Amplifier-power (F142)
C0491-13
G,1.5D,4165
C0463R-51
C0439-51
G,MUB,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-
Front-LH (F169)
Speaker-Low range-
Front door-LH (F134)
C0688-2
G,MUN,380
G,MAQK,335
C0530-1
Speaker-High range-
Front-LH (F165)

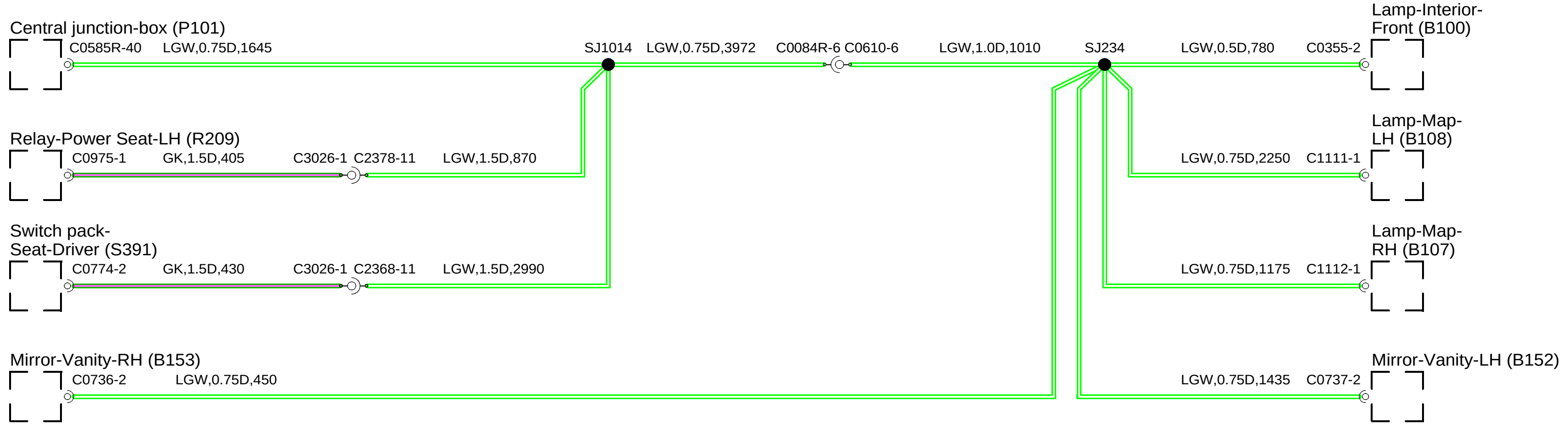
SJ218 (GW) DRIVER DOOR


Amplifier-power (F142)
C0491-6
GW,1.5D,6165
C0459R-54
C0439-54
GW,MUL,865
SJ218
GW,MAQK,275
C0530-3
Speaker-High range-
Front-RH (F164)
Speaker-Low range-
Front door-RH (F135)
C0688-1
GW,MUN,440
GW,MUK,280
C0369-1
Speaker-Mid range-
Front-RH (F168)

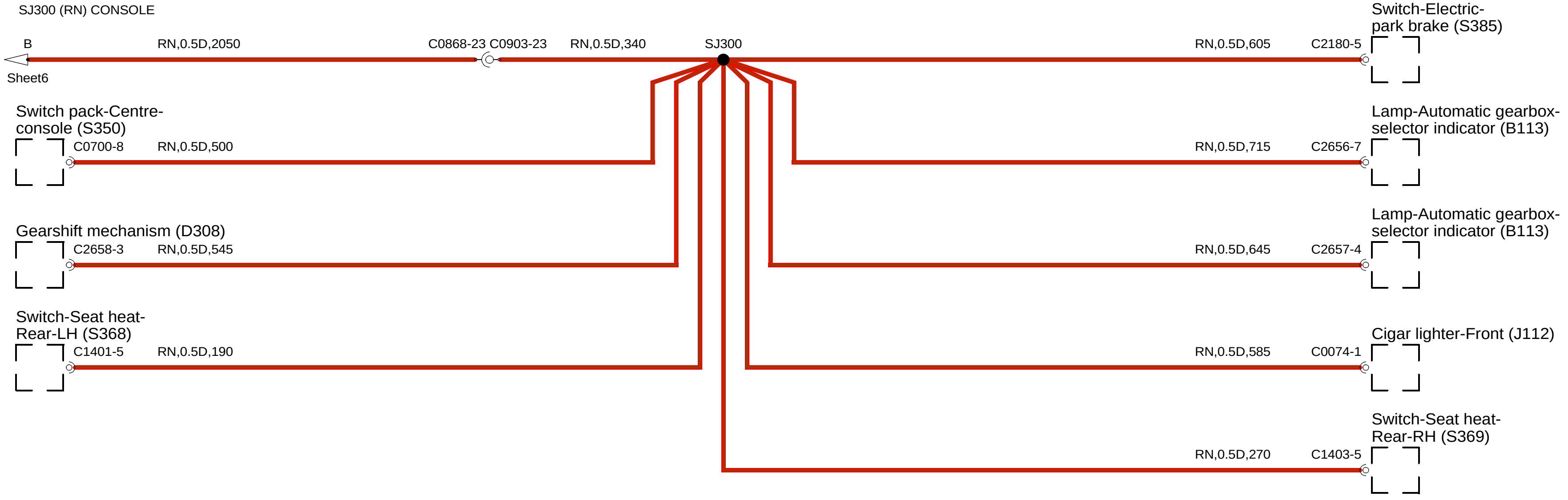
SJ218 (GW) PASSENGER DOOR

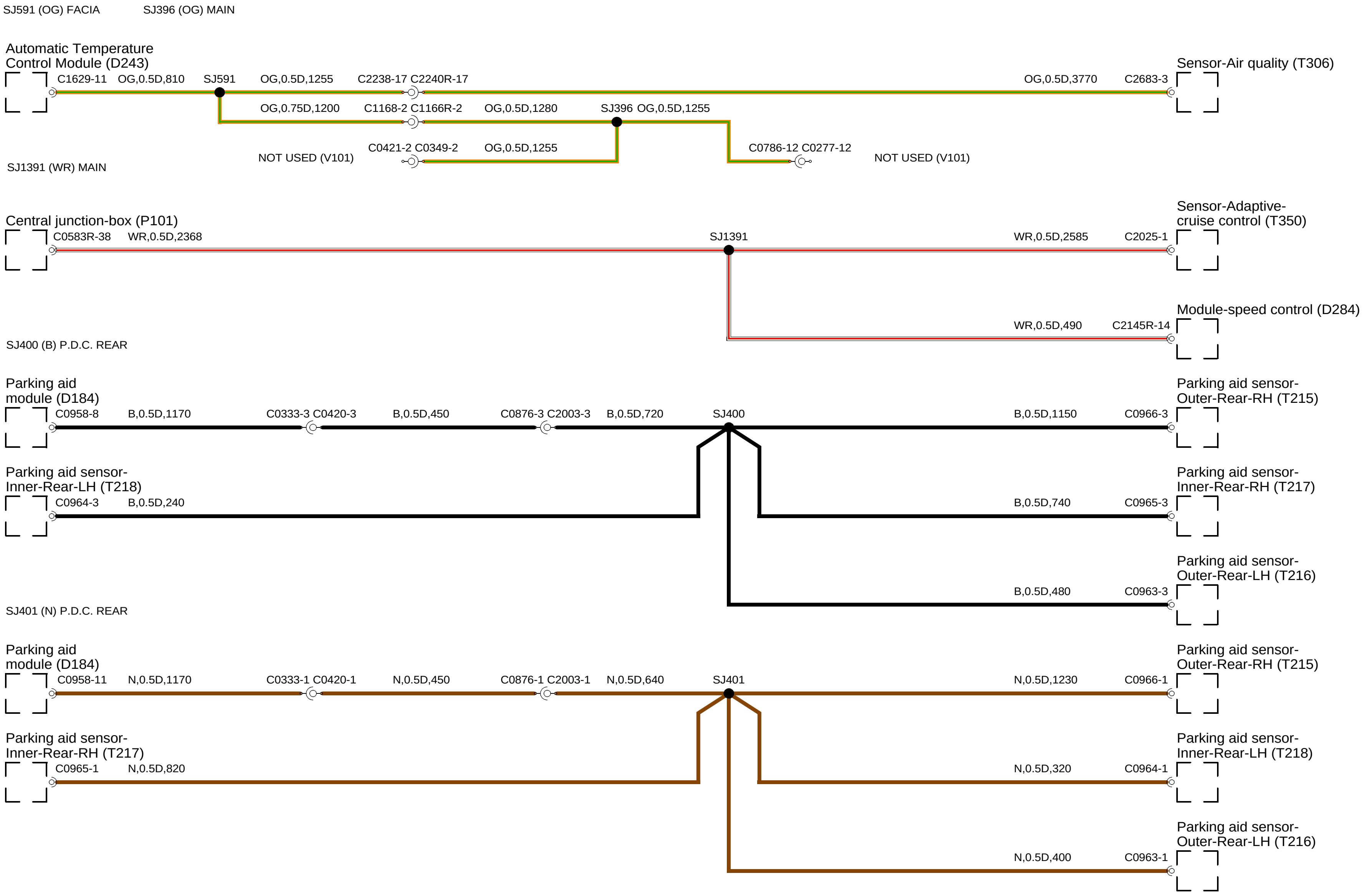

Amplifier-power (F142)
C0491-5
GW,1.5D,4165
C0463R-50
C0439-50
GW,MUB,865
SJ218
GW,MUK,280
C0369-1
Speaker-Mid range-
Front-LH (F169)
Speaker-Low range-
Front door-LH (F134)
C0688-1
GW,MUN,440
GW,MAQK,275
C0530-3
Speaker-High range-
Front-LH (F165)

SJ1014 (LGW) MAIN SJ234 (LGW) ROOF

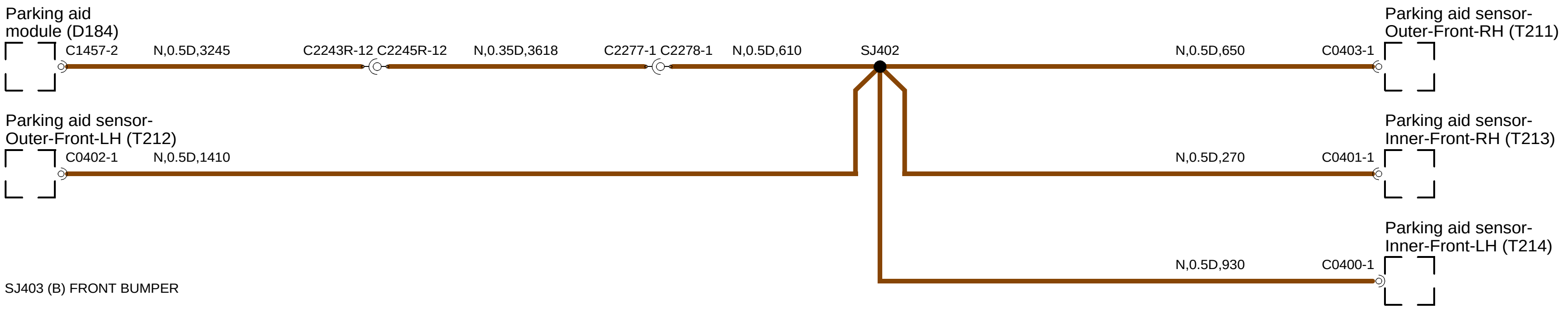

Central junction-box (P101)
C0585R-40
LGW,0.75D,1645
SJ1014
LGW,0.75D,3972
C0084R-6 C0610-6
LGW,1.0D,1010
SJ234
LGW,0.5D,780
C0355-2
Lamp-Interior-Front (B100)
Relay-Power Seat-LH (R209)
C0975-1
GK,1.5D,405
C3026-1 C2378-11
LGW,1.5D,870
LGW,0.75D,2250
C1111-1
Lamp-Map-LH (B108)
Switch pack-Seat-Driver (S391)
C0774-2
GK,1.5D,430
C3026-1 C2368-11
LGW,1.5D,2990
LGW,0.75D,1175
C1112-1
Lamp-Map-RH (B107)
Mirror-Vanity-RH (B153)
C0736-2
LGW,0.75D,450
LGW,0.75D,1435
C0737-2
Mirror-Vanity-LH (B152)

SJ300 (RN) CONSOLE

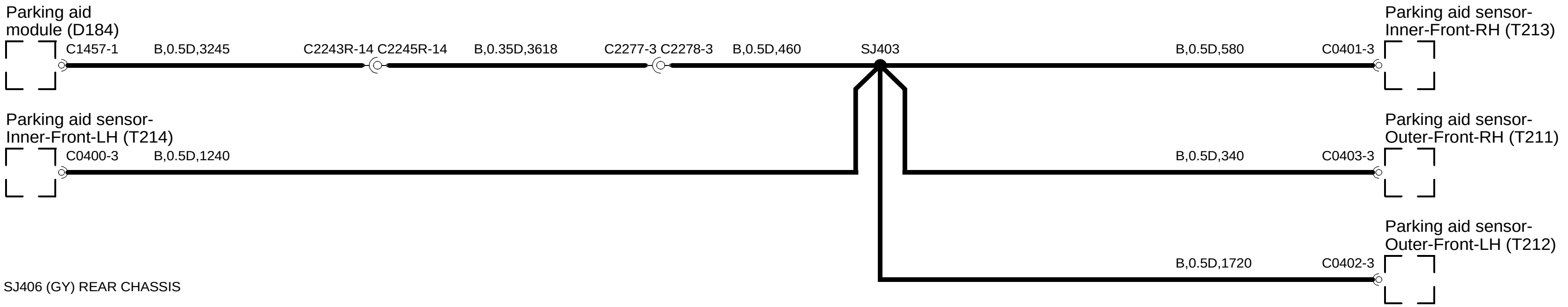

B
Sheet6
RN,0.5D,2050
C0868-23 C0903-23
RN,0.5D,340
SJ300
RN,0.5D,605
C2180-5
Switch-Electric-park brake (S385)
Switch pack-Centre-console (S350)
C0700-8
RN,0.5D,500
RN,0.5D,715
C2656-7
Lamp-Automatic gearbox-selector indicator (B113)
Gearshift mechanism (D308)
C2658-3
RN,0.5D,545
RN,0.5D,645
C2657-4
Lamp-Automatic gearbox-selector indicator (B113)
Switch-Seat heat-Rear-LH (S368)
C1401-5
RN,0.5D,190
RN,0.5D,585
C0074-1
Cigar lighter-Front (J112)
RN,0.5D,270
C1403-5
Switch-Seat heat-Rear-RH (S369)


SJ591 (OG) FACIA
SJ396 (OG) MAIN
Automatic Temperature Control Module (D243)
C1629-11
OG,0.5D,810
SJ591
OG,0.5D,1255
C2238-17 C2240R-17
OG,0.5D,3770
C2683-3
Sensor-Air quality (T306)
OG,0.75D,1200
C1168-2 C1166R-2
OG,0.5D,1280
SJ396
OG,0.5D,1255
NOT USED (V101)
C0421-2 C0349-2
OG,0.5D,1255
C0786-12 C0277-12
NOT USED (V101)
SJ1391 (WR) MAIN
Central junction-box (P101)
C0583R-38
WR,0.5D,2368
SJ1391
WR,0.5D,2585
C2025-1
Sensor-Adaptive-cruise control (T350)
Module-speed control (D284)
WR,0.5D,490
C2145R-14
SJ400 (B) P.D.C. REAR
Parking aid module (D184)
C0958-8
B,0.5D,1170
C0333-3 C0420-3
B,0.5D,450
C0876-3 C2003-3
B,0.5D,720
SJ400
B,0.5D,1150
C0966-3
Parking aid sensor-Outer-Rear-RH (T215)
Parking aid sensor-Inner-Rear-LH (T218)
C0964-3
B,0.5D,240
B,0.5D,740
C0965-3
Parking aid sensor-Inner-Rear-RH (T217)
Parking aid sensor-Outer-Rear-LH (T216)
B,0.5D,480
C0963-3
SJ401 (N) P.D.C. REAR
Parking aid module (D184)
C0958-11
N,0.5D,1170
C0333-1 C0420-1
N,0.5D,450
C0876-1 C2003-1
N,0.5D,640
SJ401
N,0.5D,1230
C0966-1
Parking aid sensor-Outer-Rear-RH (T215)
Parking aid sensor-Inner-Rear-RH (T217)
C0965-1
N,0.5D,820
N,0.5D,320
C0964-1
Parking aid sensor-Inner-Rear-LH (T218)
Parking aid sensor-Outer-Rear-LH (T216)
N,0.5D,400
C0963-1

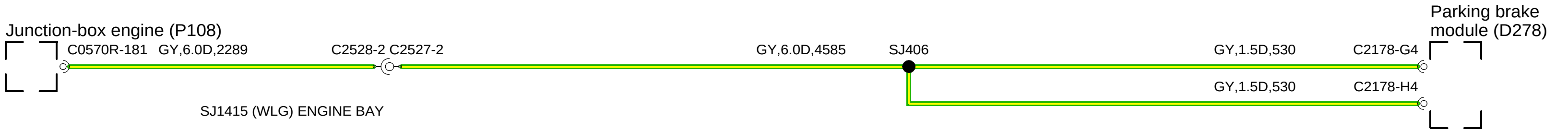
SJ402 (N) FRONT BUMPER


Parking aid module (D184)
C1457-2
N,0.5D,3245
C2243R-12 C2245R-12
N,0.35D,3618
C2277-1 C2278-1
N,0.5D,610
SJ402
N,0.5D,650
C0403-1
Parking aid sensor-Outer-Front-RH (T211)
Parking aid sensor-Outer-Front-LH (T212)
C0402-1
N,0.5D,1410
N,0.5D,270
C0401-1
Parking aid sensor-Inner-Front-RH (T213)
Parking aid sensor-Inner-Front-LH (T214)
N,0.5D,930
C0400-1

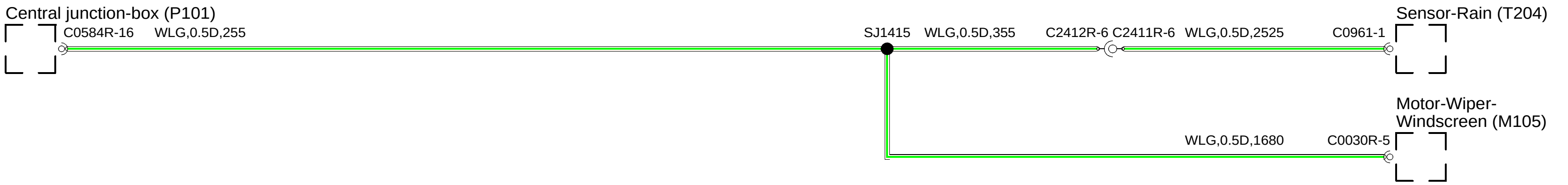
SJ403 (B) FRONT BUMPER


Parking aid module (D184)
C1457-1
B,0.5D,3245
C2243R-14 C2245R-14
B,0.35D,3618
C2277-3 C2278-3
B,0.5D,460
SJ403
B,0.5D,580
C0401-3
Parking aid sensor-Inner-Front-RH (T213)
Parking aid sensor-Inner-Front-LH (T214)
C0400-3
B,0.5D,1240
B,0.5D,340
C0403-3
Parking aid sensor-Outer-Front-RH (T211)
Parking aid sensor-Outer-Front-LH (T212)
B,0.5D,1720
C0402-3

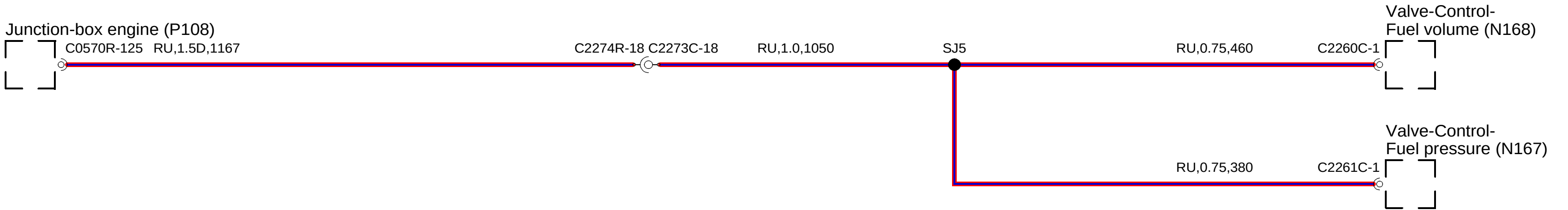
SJ406 (GY) REAR CHASSIS


Junction-box engine (P108)
C0570R-181
GY,6.0D,2289
C2528-2 C2527-2
GY,6.0D,4585
SJ406
GY,1.5D,530
C2178-G4
Parking brake module (D278)
GY,1.5D,530
C2178-H4

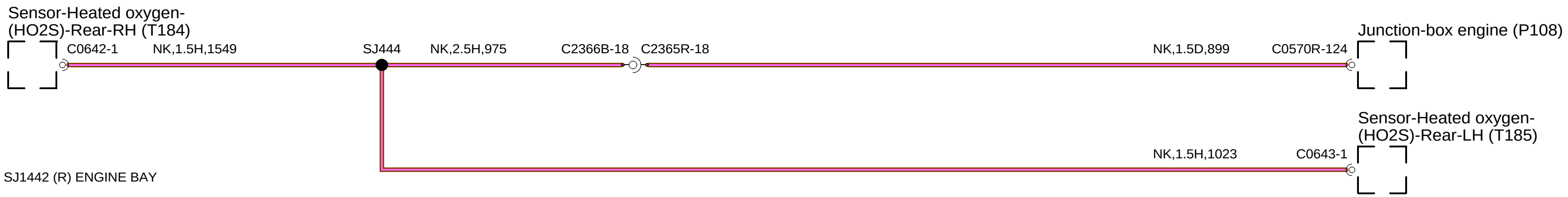
SJ1415 (WLG) ENGINE BAY


Central junction-box (P101)
C0584R-16
WLG,0.5D,255
SJ1415
WLG,0.5D,355
C2412R-6 C2411R-6
WLG,0.5D,2525
C0961-1
Sensor-Rain (T204)
Motor-Wiper-Windscreen (M105)
WLG,0.5D,1680
C0030R-5

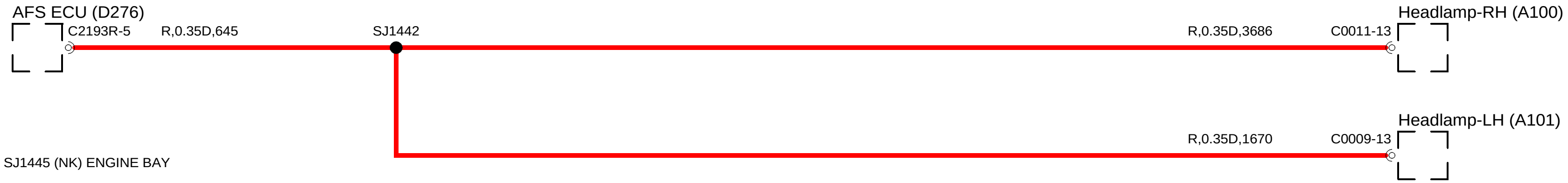
SJ5 (RU) DIESEL ENGINE


Junction-box engine (P108)
C0570R-125
RU,1.5D,1167
C2274R-18
C2273C-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260C-1
Valve-Control-
Fuel volume (N168)
Valve-Control-
Fuel pressure (N167)
RU,0.75,380
C2261C-1

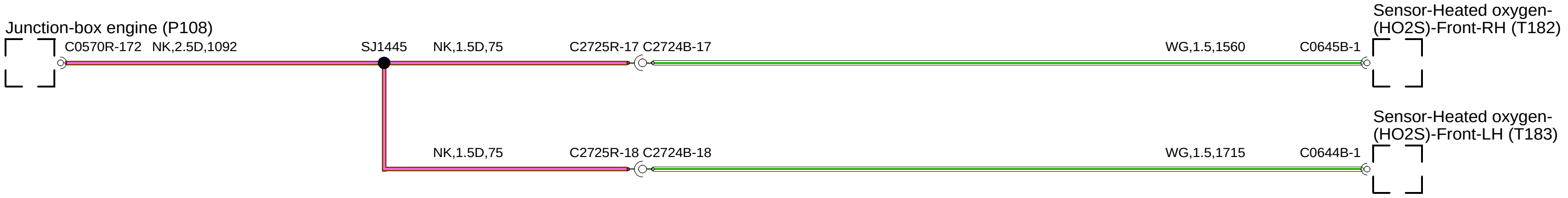
SJ 444 (NK) TRANSMISSION AUTO

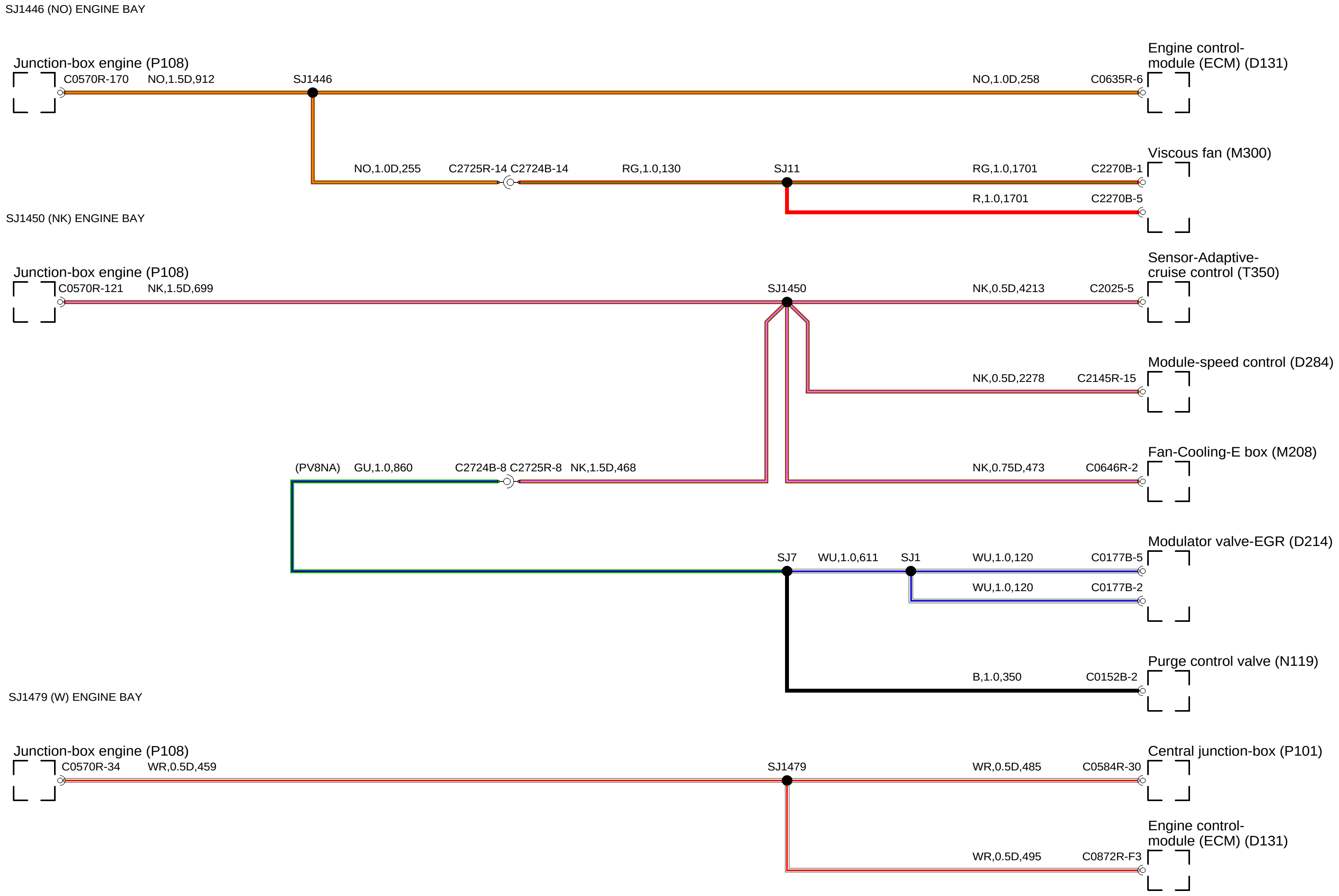

Sensor-Heated oxygen-
(HO2S)-Rear-RH (T184)
C0642-1
NK,1.5H,1549
SJ444
NK,2.5H,975
C2366B-18
C2365R-18
NK,1.5D,899
C0570R-124
Junction-box engine (P108)
Sensor-Heated oxygen-
(HO2S)-Rear-LH (T185)
NK,1.5H,1023
C0643-1

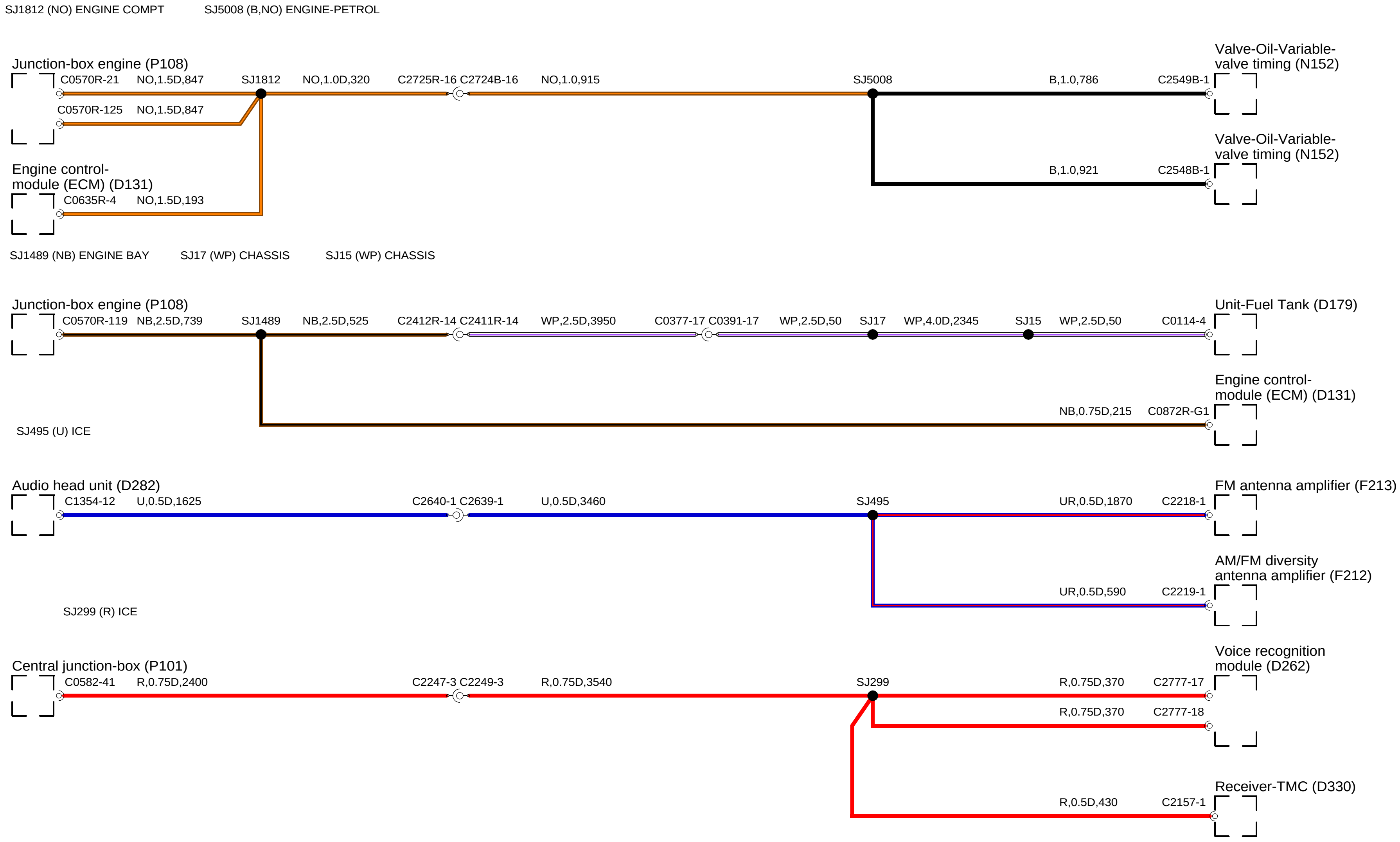
SJ1442 (R) ENGINE BAY

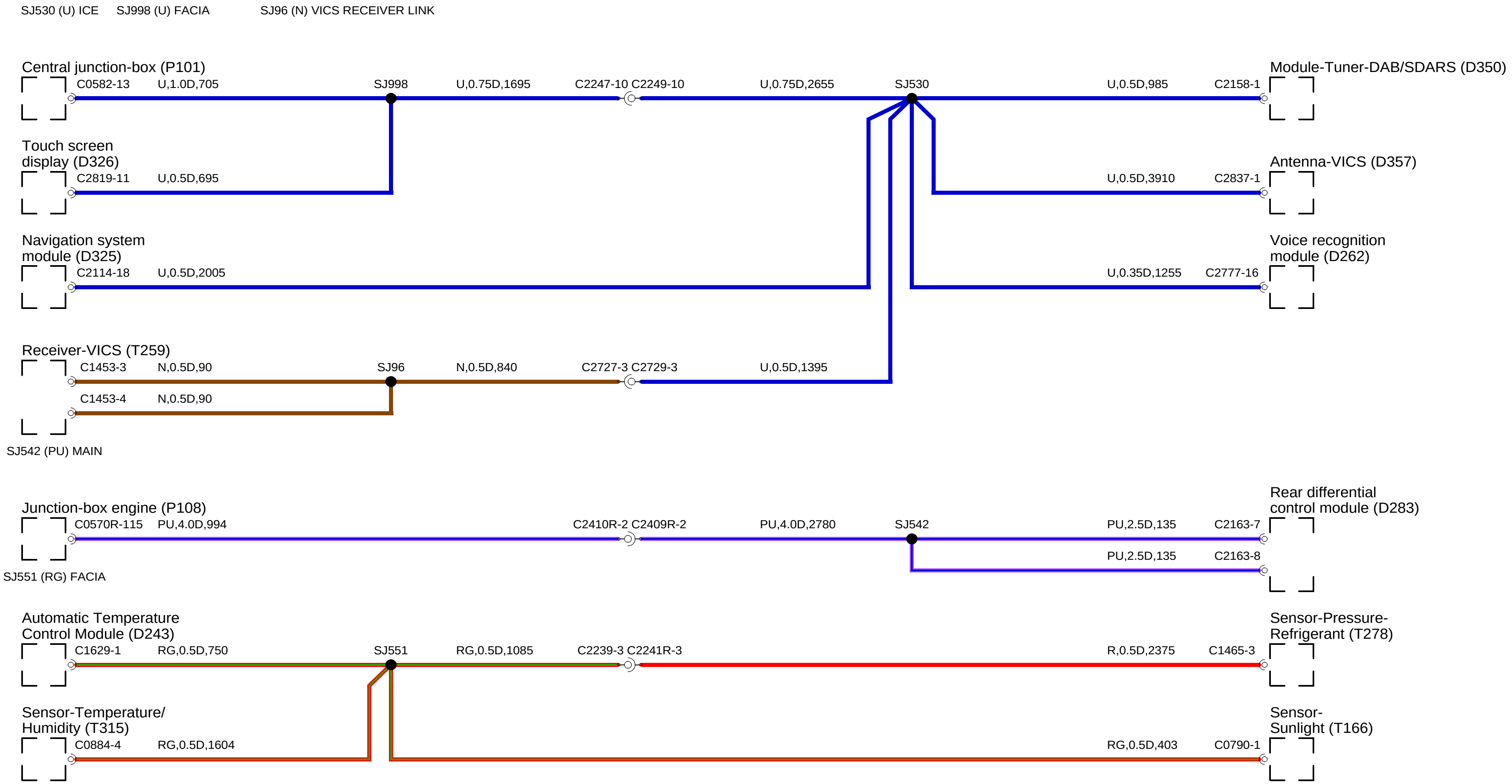

AFS ECU (D276)
C2193R-5
R,0.35D,645
SJ1442
R,0.35D,3686
C0011-13
Headlamp-RH (A100)
Headlamp-LH (A101)
R,0.35D,1670
C0009-13

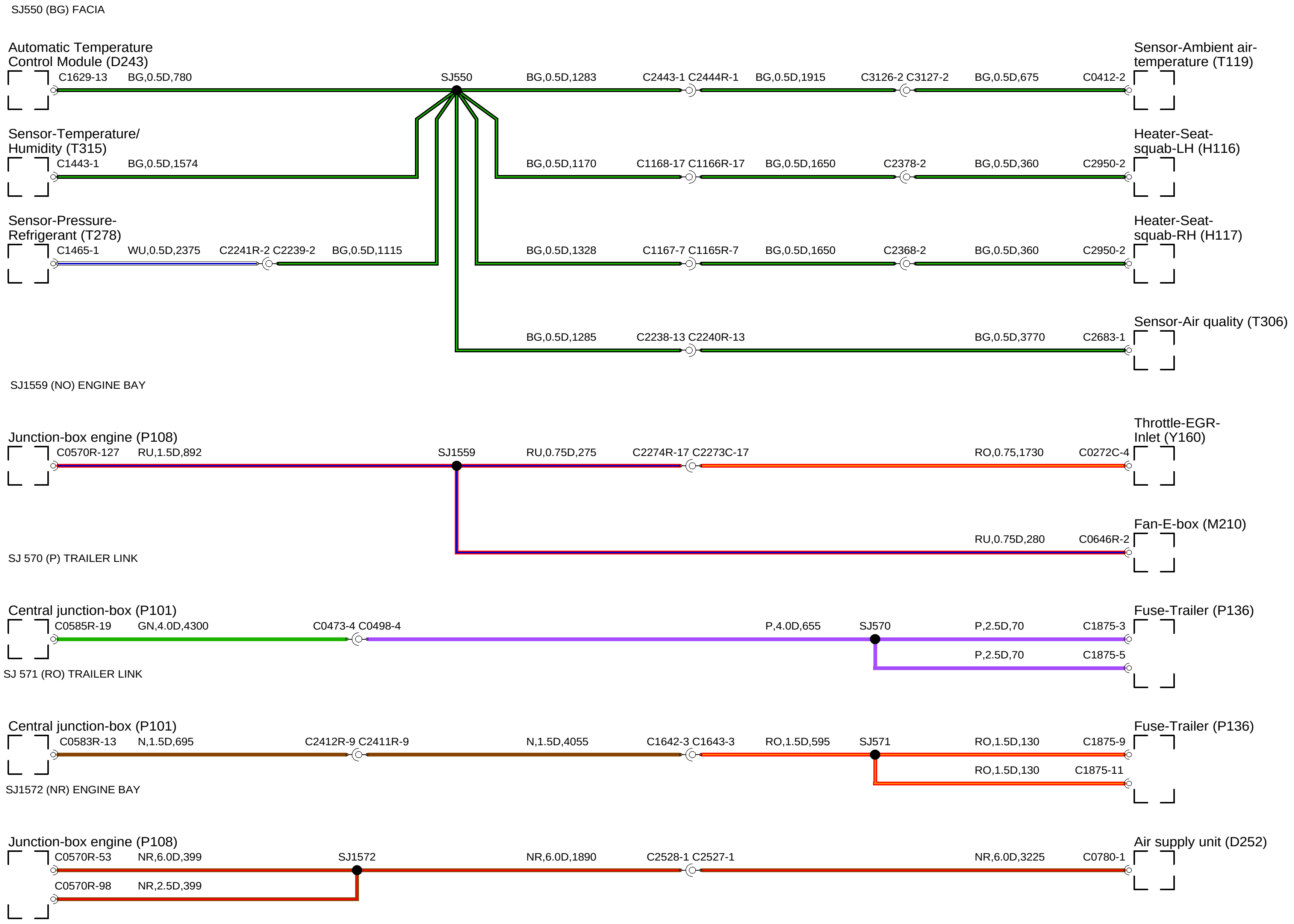
SJ1445 (NK) ENGINE BAY


Junction-box engine (P108)
C0570R-172
NK,2.5D,1092
SJ1445
NK,1.5D,75
C2725R-17
C2724B-17
WG,1.5,1560
C0645B-1
Sensor-Heated oxygen-
(HO2S)-Front-RH (T182)
NK,1.5D,75
C2725R-18
C2724B-18
WG,1.5,1715
C0644B-1
Sensor-Heated oxygen-
(HO2S)-Front-LH (T183)

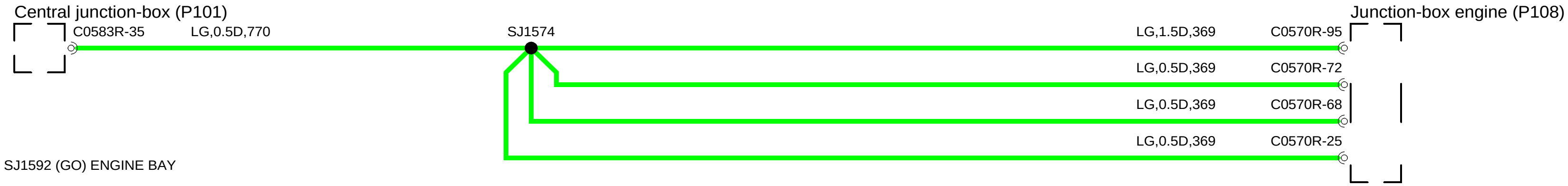

SJ1446 (NO) ENGINE BAY
Junction-box engine (P108)
C0570R-170
NO,1.5D,912
SJ1446
NO,1.0D,258
C0635R-6
Engine control-module (ECM) (D131)
NO,1.0D,255
C2725R-14 C2724B-14
RG,1.0,130
SJ11
RG,1.0,1701
C2270B-1
Viscous fan (M300)
R,1.0,1701
C2270B-5
SJ1450 (NK) ENGINE BAY
Junction-box engine (P108)
C0570R-121
NK,1.5D,699
SJ1450
NK,0.5D,4213
C2025-5
Sensor-Adaptive-cruise control (T350)
NK,0.5D,2278
C2145R-15
Module-speed control (D284)
(PV8NA)
GU,1.0,860
C2724B-8 C2725R-8
NK,1.5D,468
NK,0.75D,473
C0646R-2
Fan-Cooling-E box (M208)
SJ7
WU,1.0,611
SJ1
WU,1.0,120
C0177B-5
Modulator valve-EGR (D214)
WU,1.0,120
C0177B-2
B,1.0,350
C0152B-2
Purge control valve (N119)
SJ1479 (W) ENGINE BAY
Junction-box engine (P108)
C0570R-34
WR,0.5D,459
SJ1479
WR,0.5D,485
C0584R-30
Central junction-box (P101)
WR,0.5D,495
C0872R-F3
Engine control-module (ECM) (D131)


SJ1812 (NO) ENGINE COMPT
SJ5008 (B,NO) ENGINE-PETROL
Junction-box engine (P108)
C0570R-21
NO,1.5D,847
SJ1812
NO,1.0D,320
C2725R-16 C2724B-16
NO,1.0,915
SJ5008
B,1.0,786
C2549B-1
Valve-Oil-Variable-valve timing (N152)
C0570R-125
NO,1.5D,847
Valve-Oil-Variable-valve timing (N152)
B,1.0,921
C2548B-1
Engine control-module (ECM) (D131)
C0635R-4
NO,1.5D,193
SJ1489 (NB) ENGINE BAY
SJ17 (WP) CHASSIS
SJ15 (WP) CHASSIS
Junction-box engine (P108)
C0570R-119
NB,2.5D,739
SJ1489
NB,2.5D,525
C2412R-14 C2411R-14
WP,2.5D,3950
C0377-17 C0391-17
WP,2.5D,50
SJ17
WP,4.0D,2345
SJ15
WP,2.5D,50
C0114-4
Unit-Fuel Tank (D179)
Engine control-module (ECM) (D131)
NB,0.75D,215
C0872R-G1
SJ495 (U) ICE
Audio head unit (D282)
C1354-12
U,0.5D,1625
C2640-1 C2639-1
U,0.5D,3460
SJ495
UR,0.5D,1870
C2218-1
FM antenna amplifier (F213)
AM/FM diversity antenna amplifier (F212)
UR,0.5D,590
C2219-1
SJ299 (R) ICE
Central junction-box (P101)
C0582-41
R,0.75D,2400
C2247-3 C2249-3
R,0.75D,3540
SJ299
R,0.75D,370
C2777-17
Voice recognition module (D262)
R,0.75D,370
C2777-18
Receiver-TMC (D330)
R,0.5D,430
C2157-1

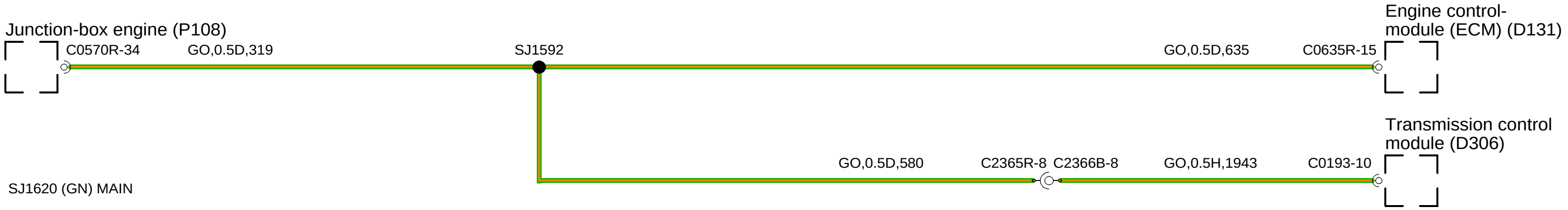

SJ530 (U) ICE
SJ998 (U) FACIA
SJ96 (N) VICS RECEIVER LINK
Central junction-box (P101)
C0582-13
U,1.0D,705
SJ998
U,0.75D,1695
C2247-10 C2249-10
U,0.75D,2655
SJ530
U,0.5D,985
C2158-1
Module-Tuner-DAB/SDARS (D350)
Touch screen display (D326)
C2819-11
U,0.5D,695
Antenna-VICS (D357)
U,0.5D,3910
C2837-1
Navigation system module (D325)
C2114-18
U,0.5D,2005
Voice recognition module (D262)
U,0.35D,1255
C2777-16
Receiver-VICS (T259)
C1453-3
N,0.5D,90
SJ96
N,0.5D,840
C2727-3 C2729-3
U,0.5D,1395
C1453-4
N,0.5D,90
SJ542 (PU) MAIN
Junction-box engine (P108)
C0570R-115
PU,4.0D,994
C2410R-2 C2409R-2
PU,4.0D,2780
SJ542
PU,2.5D,135
C2163-7
Rear differential control module (D283)
PU,2.5D,135
C2163-8
SJ551 (RG) FACIA
Automatic Temperature Control Module (D243)
C1629-1
RG,0.5D,750
SJ551
RG,0.5D,1085
C2239-3 C2241R-3
R,0.5D,2375
C1465-3
Sensor-Pressure-Refrigerant (T278)
Sensor-Temperature/ Humidity (T315)
C0884-4
RG,0.5D,1604
RG,0.5D,403
C0790-1
Sensor-Sunlight (T166)


SJ550 (BG) FACIA
Automatic Temperature Control Module (D243)
C1629-13
BG,0.5D,780
SJ550
BG,0.5D,1283
C2443-1 C2444R-1
BG,0.5D,1915
C3126-2 C3127-2
BG,0.5D,675
C0412-2
Sensor-Ambient air-temperature (T119)
Sensor-Temperature/ Humidity (T315)
C1443-1
BG,0.5D,1574
BG,0.5D,1170
C1168-17 C1166R-17
BG,0.5D,1650
C2378-2
BG,0.5D,360
C2950-2
Heater-Seat-squab-LH (H116)
Sensor-Pressure-Refrigerant (T278)
C1465-1
WU,0.5D,2375
C2241R-2 C2239-2
BG,0.5D,1115
BG,0.5D,1328
C1167-7 C1165R-7
BG,0.5D,1650
C2368-2
BG,0.5D,360
C2950-2
Heater-Seat-squab-RH (H117)
BG,0.5D,1285
C2238-13 C2240R-13
BG,0.5D,3770
C2683-1
Sensor-Air quality (T306)
SJ1559 (NO) ENGINE BAY
Junction-box engine (P108)
C0570R-127
RU,1.5D,892
SJ1559
RU,0.75D,275
C2274R-17 C2273C-17
RO,0.75,1730
C0272C-4
Throttle-EGR-Inlet (Y160)
RU,0.75D,280
C0646R-2
Fan-E-box (M210)
SJ 570 (P) TRAILER LINK
Central junction-box (P101)
C0585R-19
GN,4.0D,4300
C0473-4 C0498-4
P,4.0D,655
SJ570
P,2.5D,70
C1875-3
Fuse-Trailer (P136)
P,2.5D,70
C1875-5
SJ 571 (RO) TRAILER LINK
Central junction-box (P101)
C0583R-13
N,1.5D,695
C2412R-9 C2411R-9
N,1.5D,4055
C1642-3 C1643-3
RO,1.5D,595
SJ571
RO,1.5D,130
C1875-9
Fuse-Trailer (P136)
RO,1.5D,130
C1875-11
SJ1572 (NR) ENGINE BAY
Junction-box engine (P108)
C0570R-53
NR,6.0D,399
SJ1572
NR,6.0D,1890
C2528-1 C2527-1
NR,6.0D,3225
C0780-1
Air supply unit (D252)
C0570R-98
NR,2.5D,399

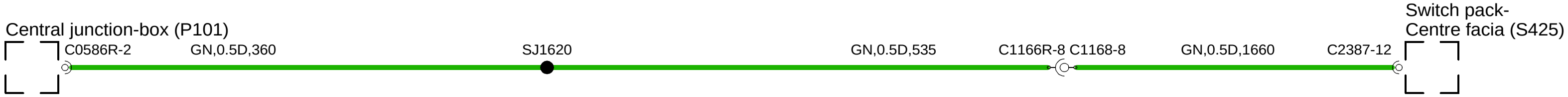
SJ1574 (LG) ENGINE BAY


Central junction-box (P101)
C0583R-35
LG,0.5D,770
SJ1574
LG,1.5D,369
C0570R-95
LG,0.5D,369
C0570R-72
LG,0.5D,369
C0570R-68
LG,0.5D,369
C0570R-25
Junction-box engine (P108)

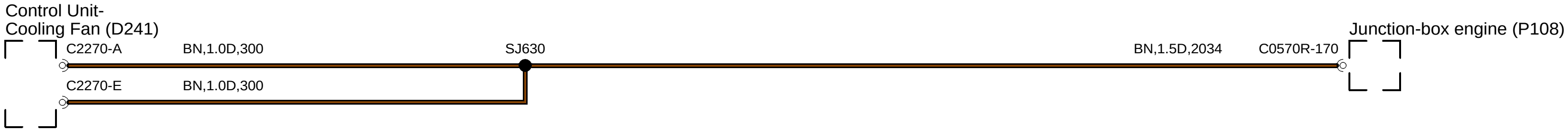
SJ1592 (GO) ENGINE BAY


Junction-box engine (P108)
C0570R-34
GO,0.5D,319
SJ1592
GO,0.5D,635
C0635R-15
Engine control-module (ECM) (D131)
GO,0.5D,580
C2365R-8
C2366B-8
GO,0.5H,1943
C0193-10
Transmission control module (D306)

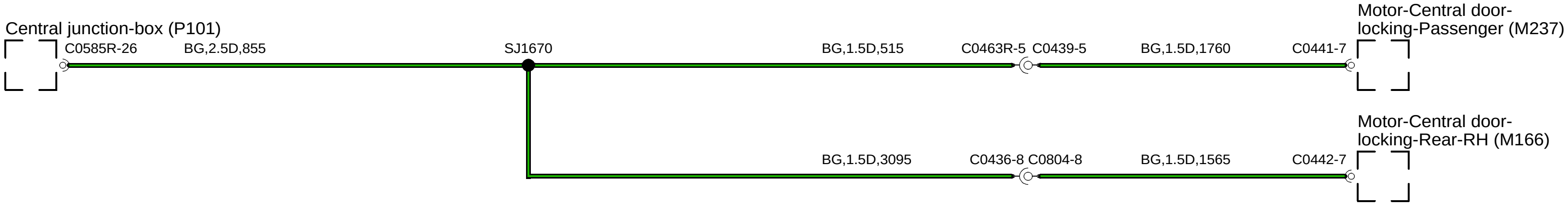
SJ1620 (GN) MAIN

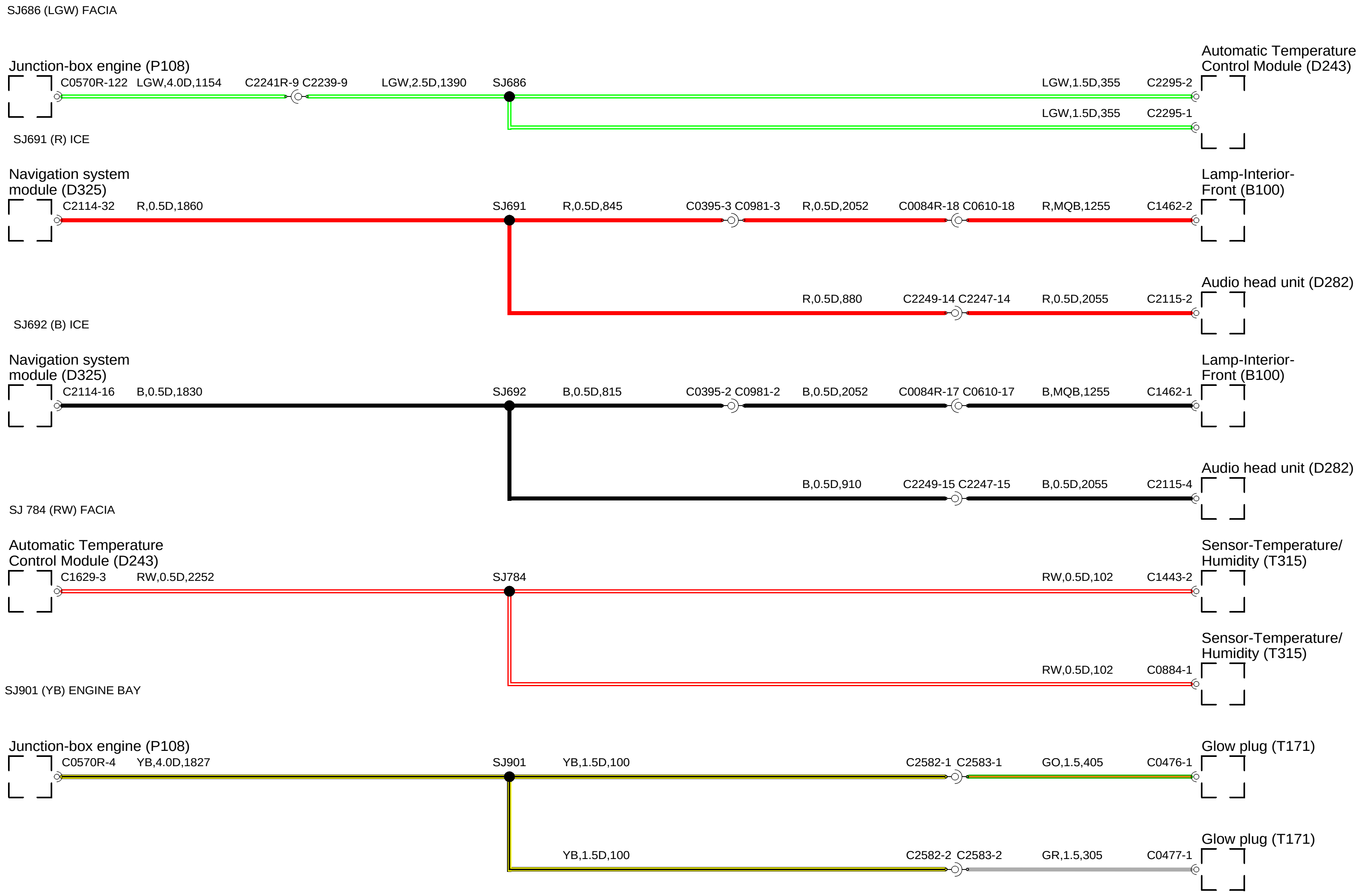

Central junction-box (P101)
C0586R-2
GN,0.5D,360
SJ1620
GN,0.5D,535
C1166R-8
C1168-8
GN,0.5D,1660
C2387-12
Switch pack-Centre facia (S425)

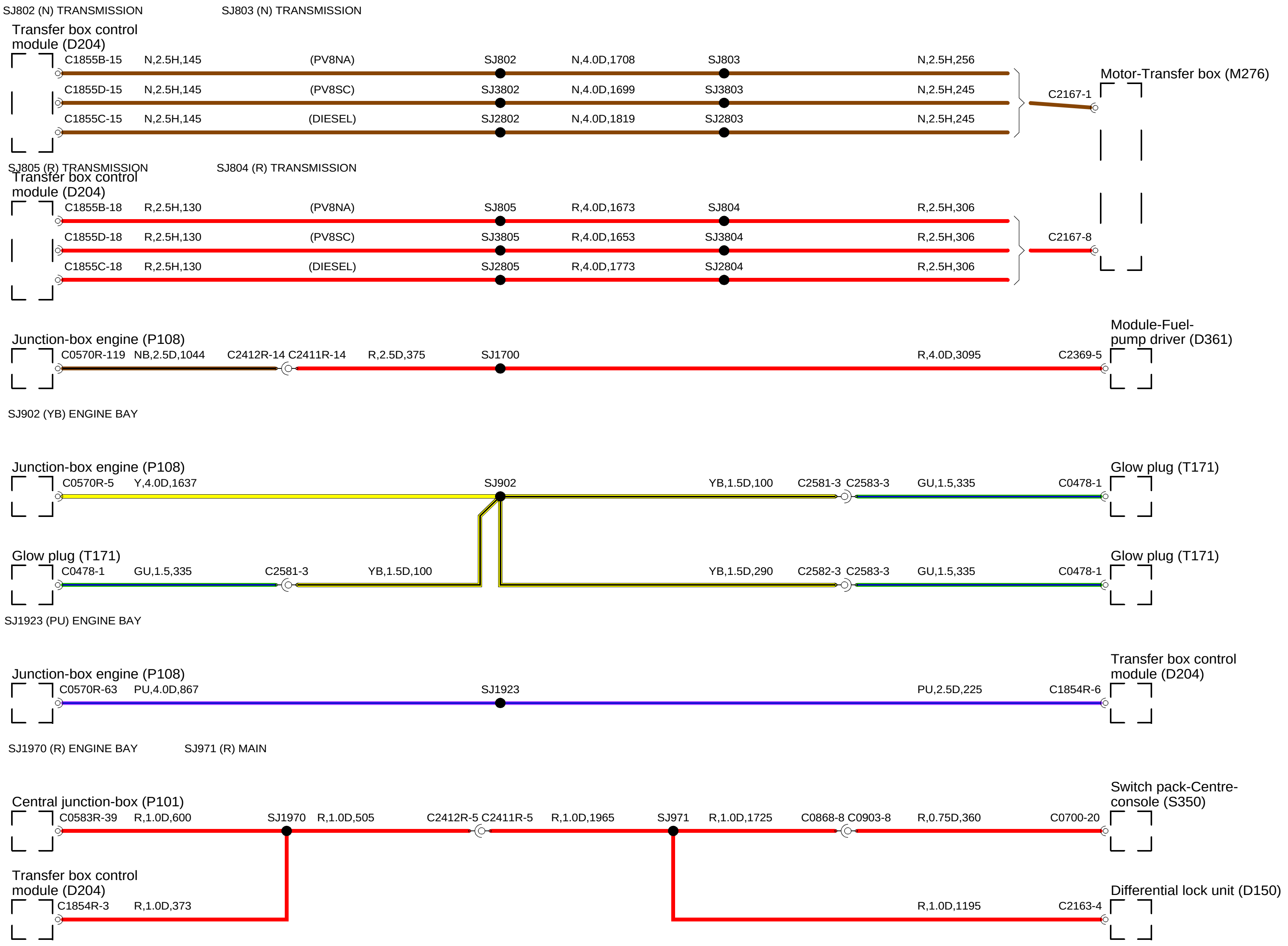
SJ630 (BN) ENGINE BAY

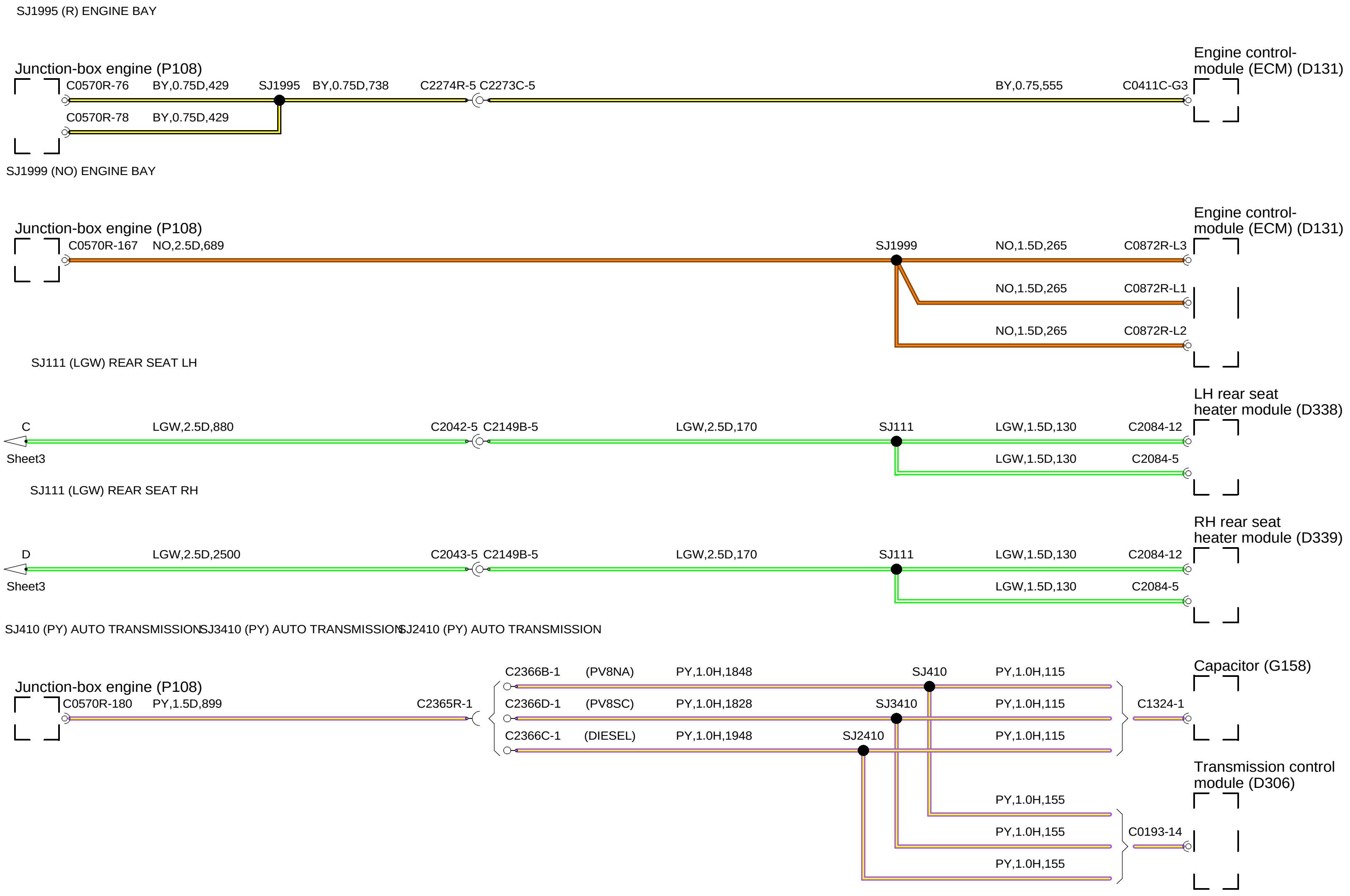

Control Unit-Cooling Fan (D241)
C2270-A
BN,1.0D,300
C2270-E
BN,1.0D,300
SJ630
BN,1.5D,2034
C0570R-170
Junction-box engine (P108)

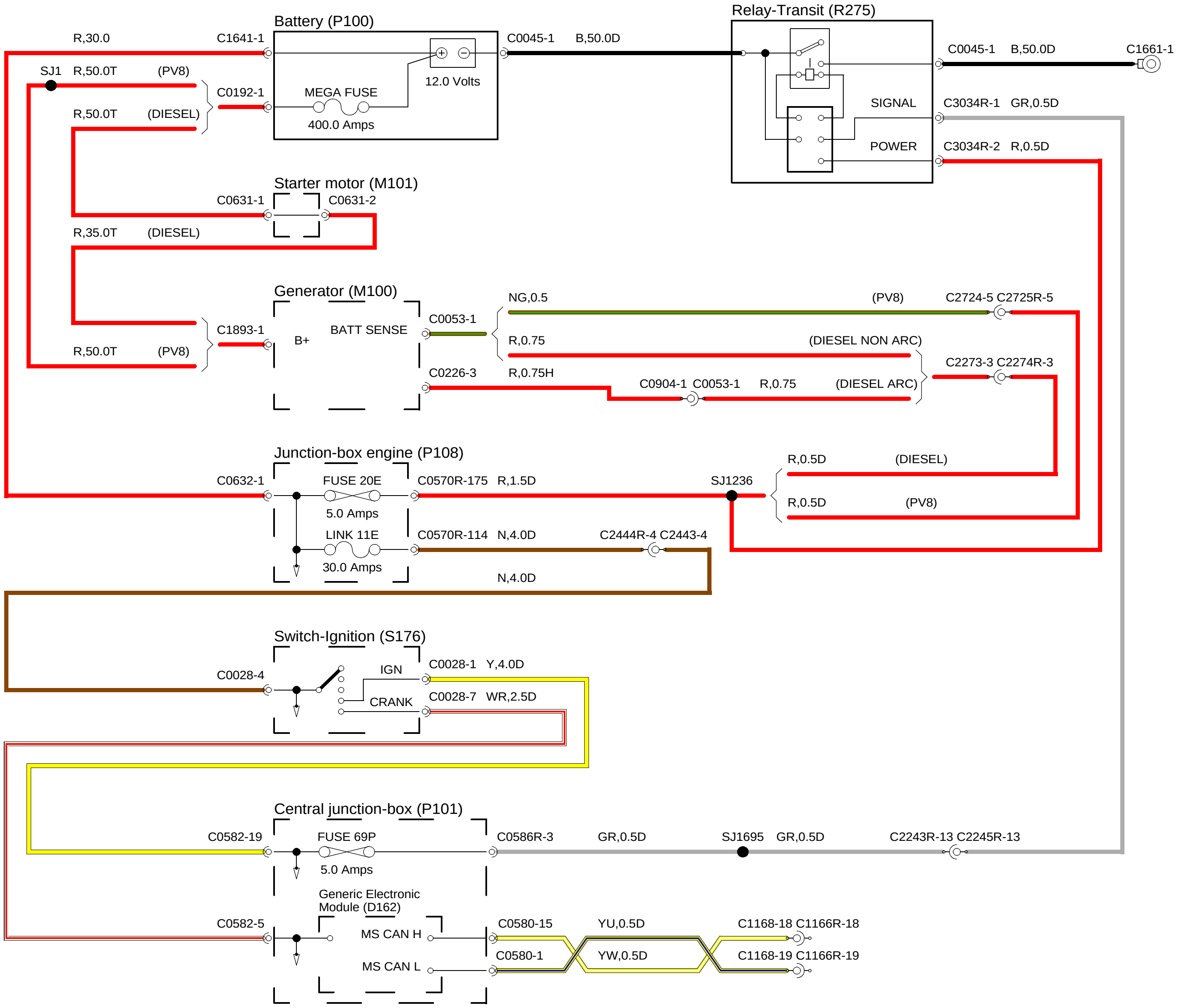
SJ1670 (KP) MAIN

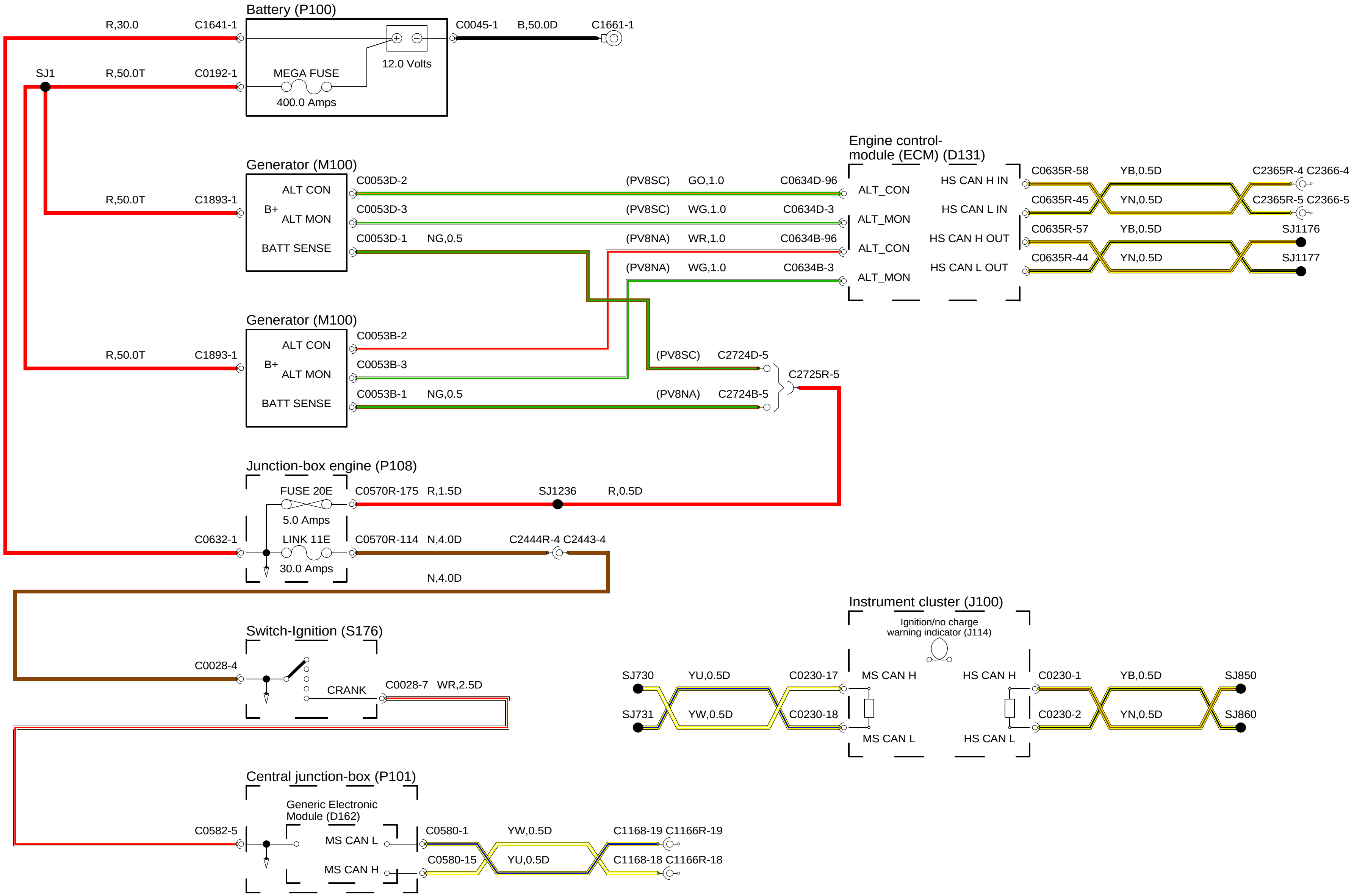

Central junction-box (P101)
C0585R-26
BG,2.5D,855
SJ1670
BG,1.5D,515
C0463R-5
C0439-5
BG,1.5D,1760
C0441-7
Motor-Central door-locking-Passenger (M237)
BG,1.5D,3095
C0436-8
C0804-8
BG,1.5D,1565
C0442-7
Motor-Central door-locking-Rear-RH (M166)

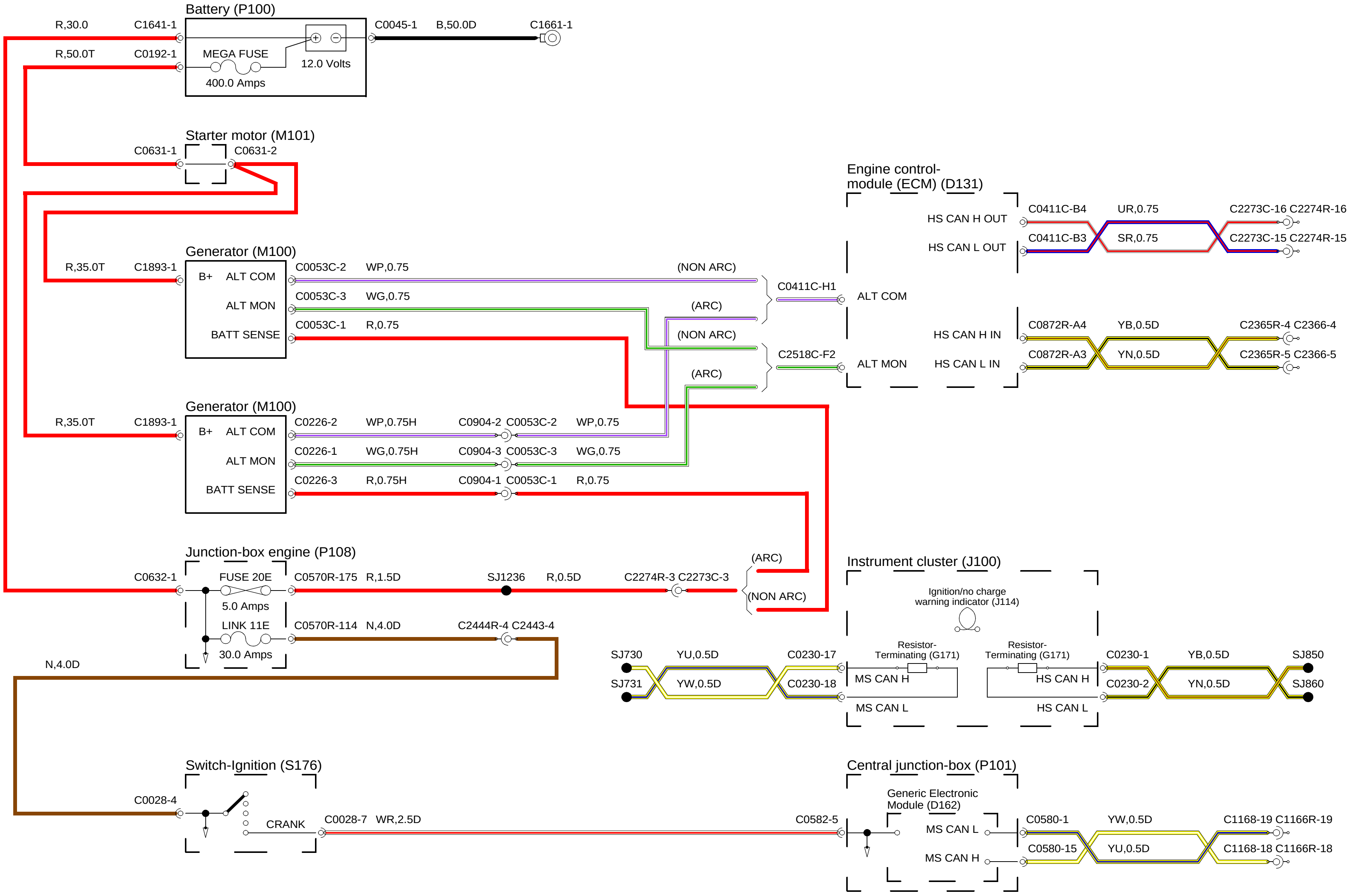

SJ686 (LGW) FACIA
Junction-box engine (P108)
C0570R-122
LGW,4.0D,1154
C2241R-9 C2239-9
LGW,2.5D,1390
SJ686
LGW,1.5D,355
C2295-2
Automatic Temperature Control Module (D243)
LGW,1.5D,355
C2295-1
SJ691 (R) ICE
Navigation system module (D325)
C2114-32
R,0.5D,1860
SJ691
R,0.5D,845
C0395-3 C0981-3
R,0.5D,2052
C0084R-18 C0610-18
R,MQB,1255
C1462-2
Lamp-Interior-Front (B100)
R,0.5D,880
C2249-14 C2247-14
R,0.5D,2055
C2115-2
Audio head unit (D282)
SJ692 (B) ICE
Navigation system module (D325)
C2114-16
B,0.5D,1830
SJ692
B,0.5D,815
C0395-2 C0981-2
B,0.5D,2052
C0084R-17 C0610-17
B,MQB,1255
C1462-1
Lamp-Interior-Front (B100)
B,0.5D,910
C2249-15 C2247-15
B,0.5D,2055
C2115-4
Audio head unit (D282)
SJ 784 (RW) FACIA
Automatic Temperature Control Module (D243)
C1629-3
RW,0.5D,2252
SJ784
RW,0.5D,102
C1443-2
Sensor-Temperature/ Humidity (T315)
RW,0.5D,102
C0884-1
Sensor-Temperature/ Humidity (T315)
SJ901 (YB) ENGINE BAY
Junction-box engine (P108)
C0570R-4
YB,4.0D,1827
SJ901
YB,1.5D,100
C2582-1 C2583-1
GO,1.5,405
C0476-1
Glow plug (T171)
YB,1.5D,100
C2582-2 C2583-2
GR,1.5,305
C0477-1
Glow plug (T171)

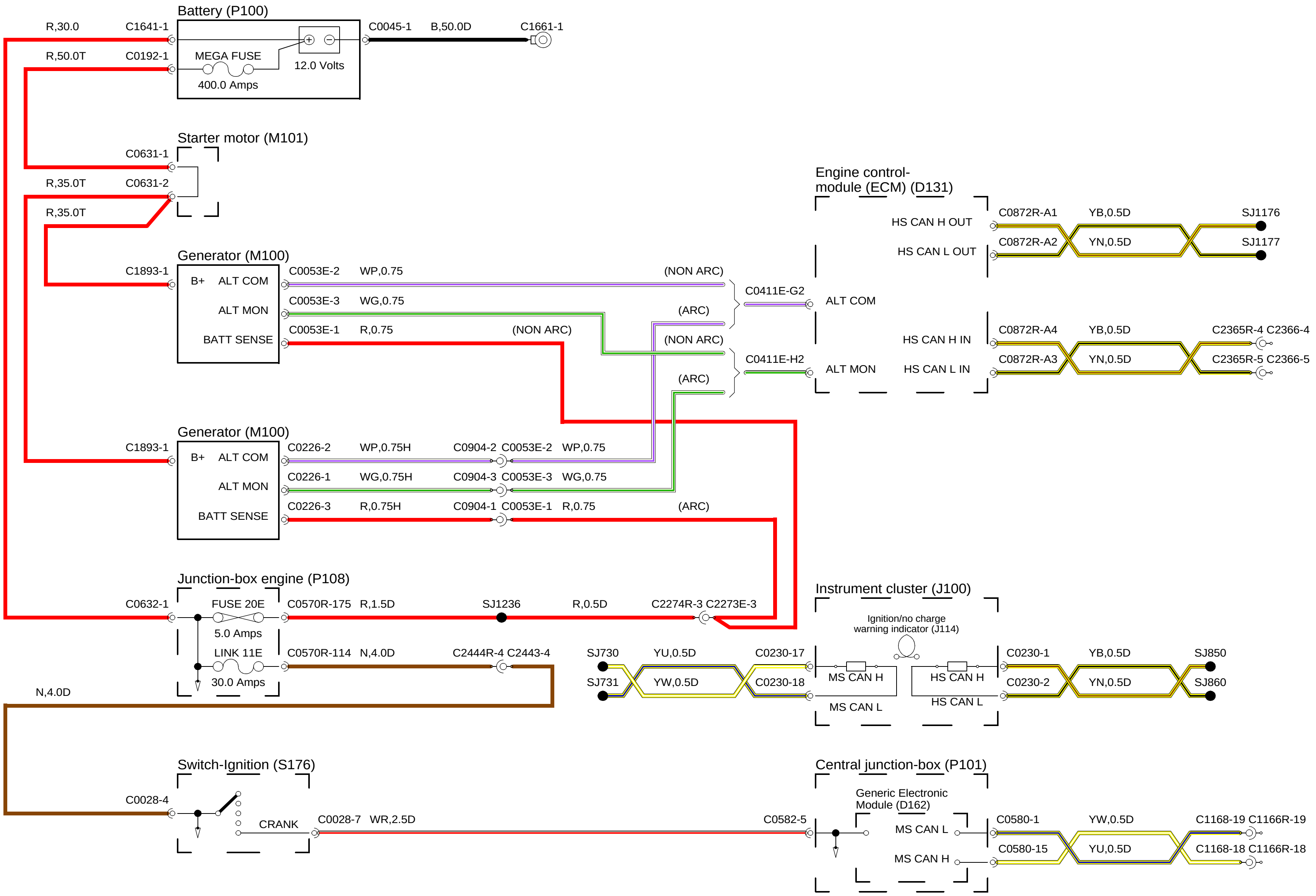

SJ802 (N) TRANSMISSION
SJ803 (N) TRANSMISSION
Transfer box control module (D204)
C1855B-15
N,2.5H,145
(PV8NA)
SJ802
N,4.0D,1708
SJ803
N,2.5H,256
C1855D-15
N,2.5H,145
(PV8SC)
SJ3802
N,4.0D,1699
SJ3803
N,2.5H,245
C1855C-15
N,2.5H,145
(DIESEL)
SJ2802
N,4.0D,1819
SJ2803
N,2.5H,245
Motor-Transfer box (M276)
C2167-1
SJ805 (R) TRANSMISSION
SJ804 (R) TRANSMISSION
Transfer box control module (D204)
C1855B-18
R,2.5H,130
(PV8NA)
SJ805
R,4.0D,1673
SJ804
R,2.5H,306
C1855D-18
R,2.5H,130
(PV8SC)
SJ3805
R,4.0D,1653
SJ3804
R,2.5H,306
C1855C-18
R,2.5H,130
(DIESEL)
SJ2805
R,4.0D,1773
SJ2804
R,2.5H,306
C2167-8
Junction-box engine (P108)
C0570R-119
NB,2.5D,1044
C2412R-14 C2411R-14
R,2.5D,375
SJ1700
R,4.0D,3095
C2369-5
Module-Fuel-pump driver (D361)
SJ902 (YB) ENGINE BAY
Junction-box engine (P108)
C0570R-5
Y,4.0D,1637
SJ902
YB,1.5D,100
C2581-3 C2583-3
GU,1.5,335
C0478-1
Glow plug (T171)
Glow plug (T171)
C0478-1
GU,1.5,335
C2581-3
YB,1.5D,100
YB,1.5D,290
C2582-3 C2583-3
GU,1.5,335
C0478-1
Glow plug (T171)
SJ1923 (PU) ENGINE BAY
Junction-box engine (P108)
C0570R-63
PU,4.0D,867
SJ1923
PU,2.5D,225
C1854R-6
Transfer box control module (D204)
SJ1970 (R) ENGINE BAY
SJ971 (R) MAIN
Central junction-box (P101)
C0583R-39
R,1.0D,600
SJ1970
R,1.0D,505
C2412R-5 C2411R-5
R,1.0D,1965
SJ971
R,1.0D,1725
C0868-8 C0903-8
R,0.75D,360
C0700-20
Switch pack-Centre-console (S350)
Transfer box control module (D204)
C1854R-3
R,1.0D,373
R,1.0D,1195
C2163-4
Differential lock unit (D150)

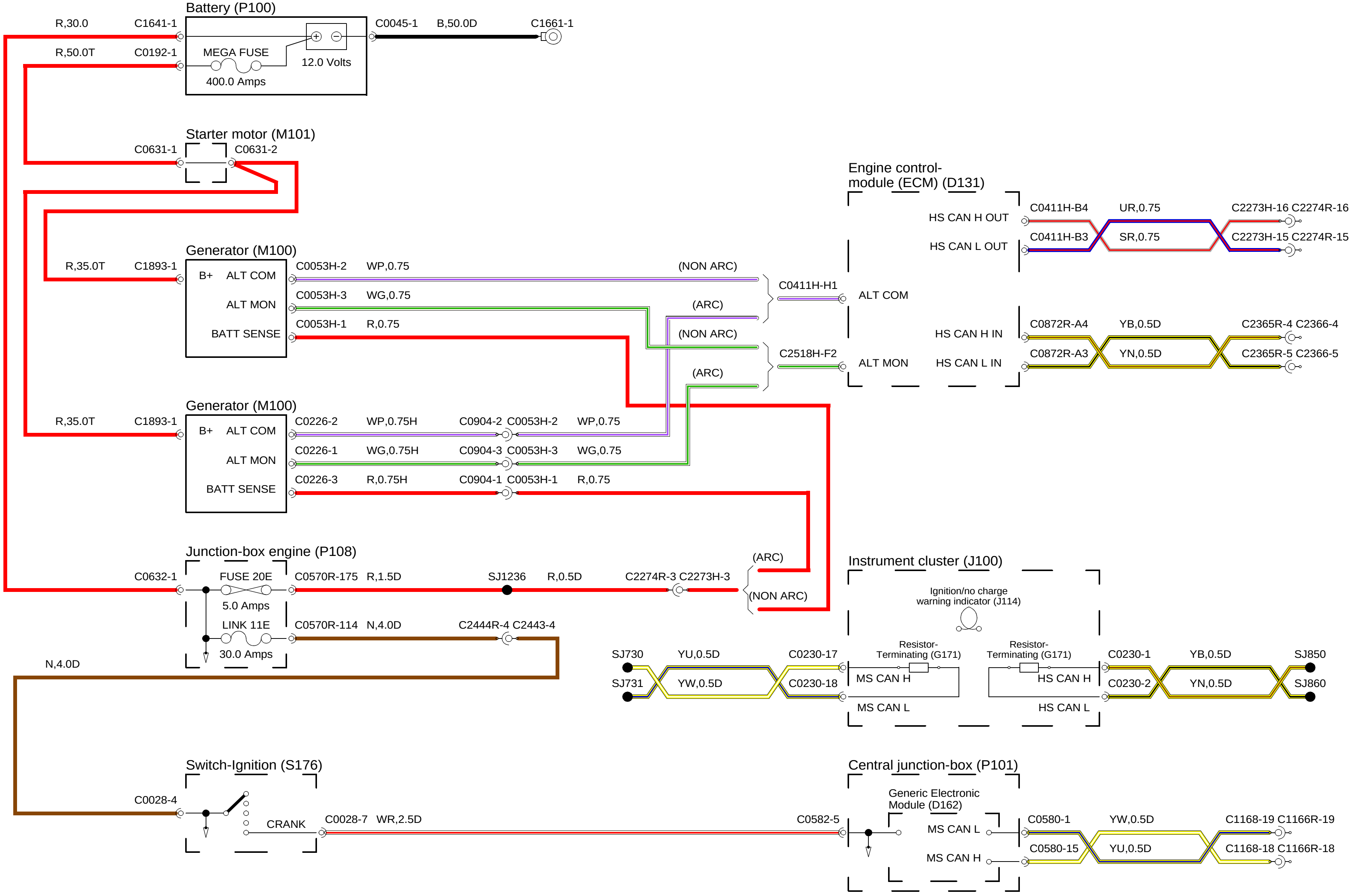

SJ1995 (R) ENGINE BAY
Junction-box engine (P108)
C0570R-76
BY,0.75D,429
SJ1995
BY,0.75D,738
C2274R-5
C2273C-5
BY,0.75,555
C0411C-G3
Engine control-module (ECM) (D131)
C0570R-78
BY,0.75D,429
SJ1999 (NO) ENGINE BAY
Junction-box engine (P108)
C0570R-167
NO,2.5D,689
SJ1999
NO,1.5D,265
C0872R-L3
Engine control-module (ECM) (D131)
NO,1.5D,265
C0872R-L1
NO,1.5D,265
C0872R-L2
SJ111 (LGW) REAR SEAT LH
C
Sheet3
LGW,2.5D,880
C2042-5
C2149B-5
LGW,2.5D,170
SJ111
LGW,1.5D,130
C2084-12
LH rear seat heater module (D338)
LGW,1.5D,130
C2084-5
SJ111 (LGW) REAR SEAT RH
D
Sheet3
LGW,2.5D,2500
C2043-5
C2149B-5
LGW,2.5D,170
SJ111
LGW,1.5D,130
C2084-12
RH rear seat heater module (D339)
LGW,1.5D,130
C2084-5
SJ410 (PY) AUTO TRANSMISSION
SJ3410 (PY) AUTO TRANSMISSION
SJ2410 (PY) AUTO TRANSMISSION
Junction-box engine (P108)
C0570R-180
PY,1.5D,899
C2365R-1
C2366B-1
(PV8NA)
PY,1.0H,1848
SJ410
PY,1.0H,115
C2366D-1
(PV8SC)
PY,1.0H,1828
SJ3410
PY,1.0H,115
C1324-1
Capacitor (G158)
C2366C-1
(DIESEL)
PY,1.0H,1948
SJ2410
PY,1.0H,115
Transmission control module (D306)
PY,1.0H,155
PY,1.0H,155
C0193-14
PY,1.0H,155

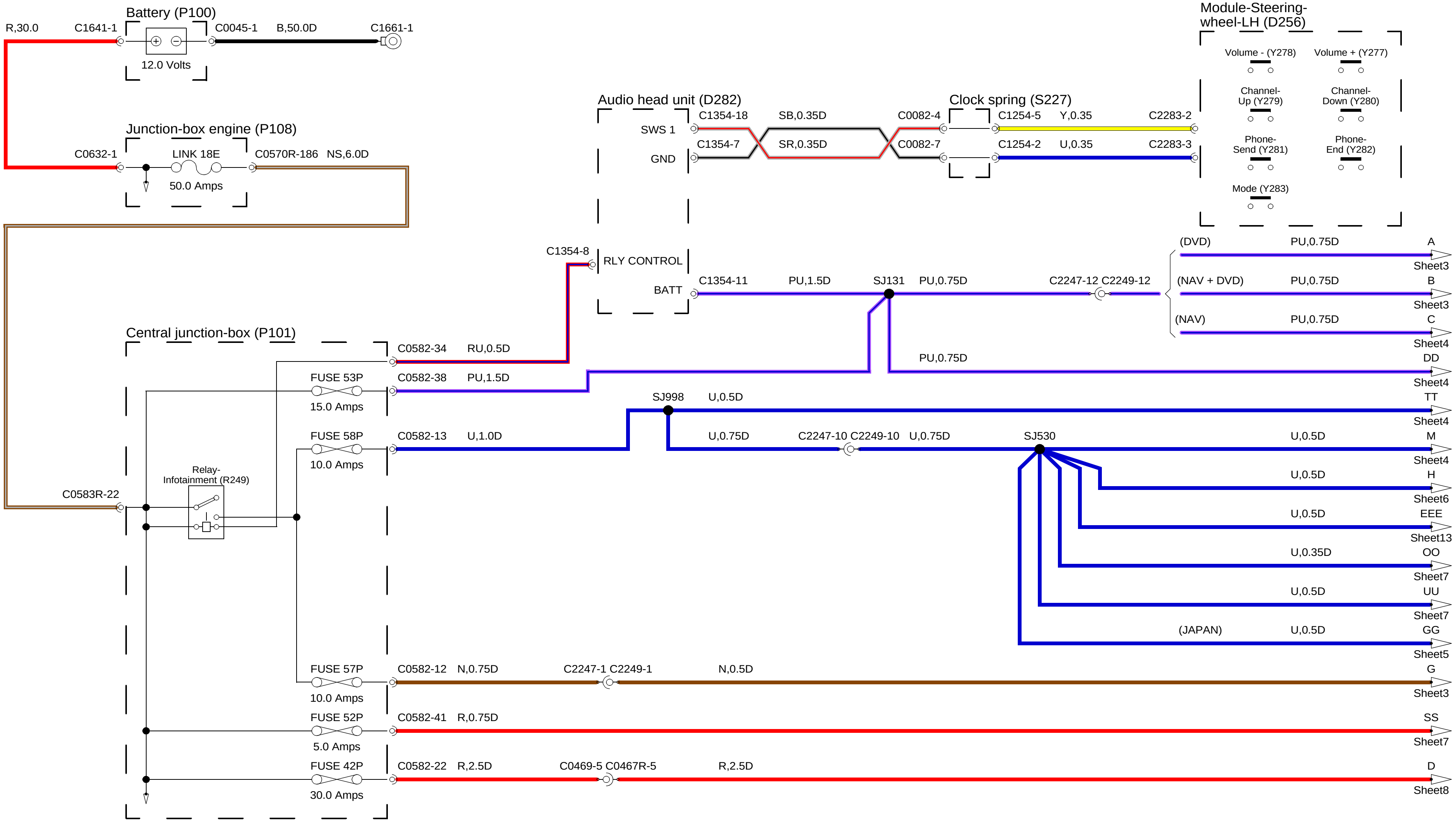

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
SJ1
R,50.0T
(PV8)
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
R,50.0T
(DIESEL)
Relay-Transit (R275)
C0045-1
B,50.0D
C1661-1
SIGNAL
C3034R-1
GR,0.5D
POWER
C3034R-2
R,0.5D
Starter motor (M101)
C0631-1
C0631-2
R,35.0T
(DIESEL)
Generator (M100)
NG,0.5
(PV8)
C2724-5 C2725R-5
C0053-1
BATT SENSE
B+
C1893-1
R,0.75
(DIESEL NON ARC)
R,50.0T
(PV8)
C0226-3
R,0.75H
C2273-3 C2274R-3
C0904-1
C0053-1
R,0.75
(DIESEL ARC)
Junction-box engine (P108)
R,0.5D
(DIESEL)
C0632-1
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
(PV8)
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
CRANK
C0028-7
WR,2.5D
Central junction-box (P101)
C0582-19
FUSE 69P
5.0 Amps
C0586R-3
GR,0.5D
SJ1695
GR,0.5D
C2243R-13 C2245R-13
Generic Electronic Module (D162)
C0582-5
MS CAN H
MS CAN L
C0580-15
YU,0.5D
C1168-18 C1166R-18
C0580-1
YW,0.5D
C1168-19 C1166R-19

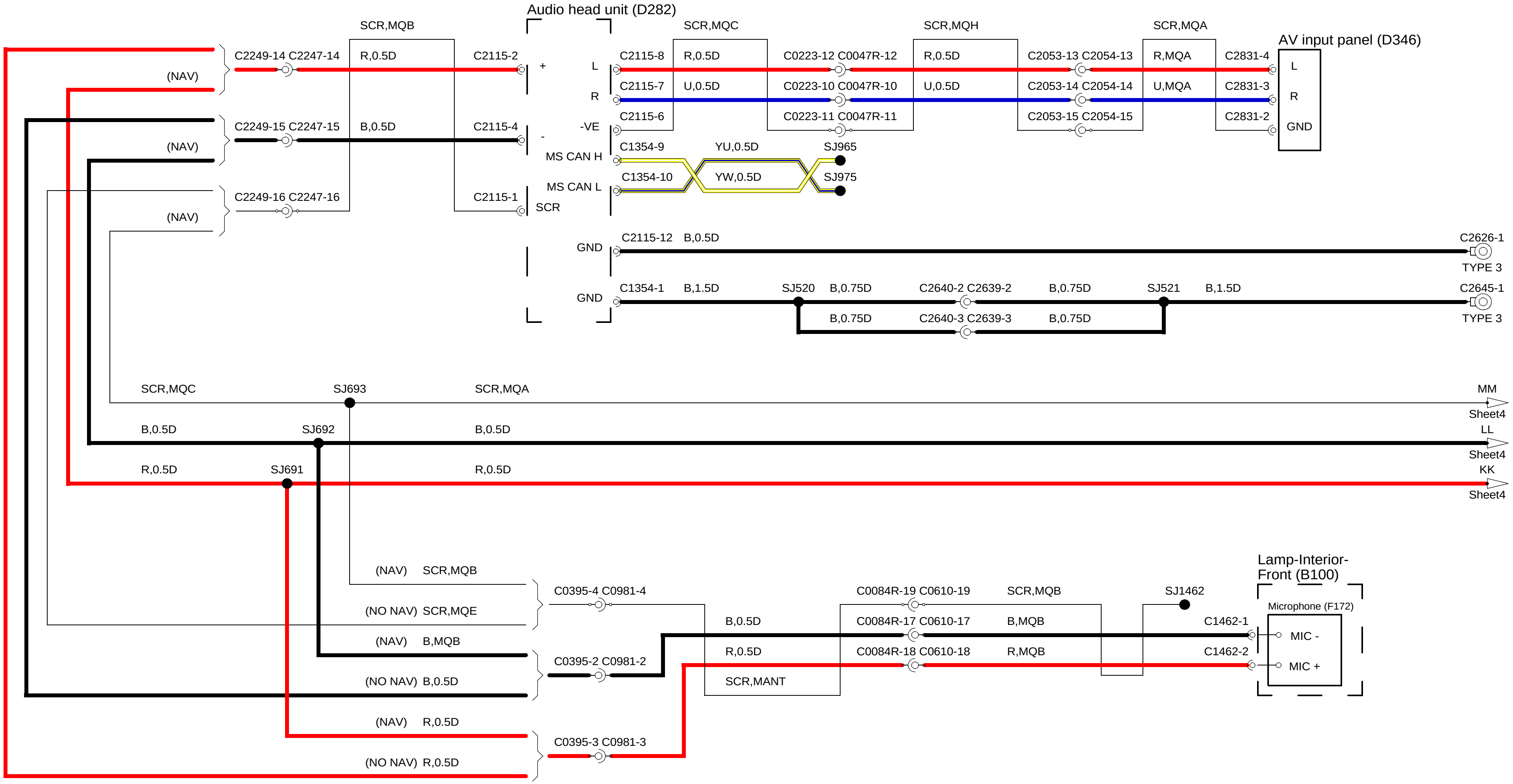

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
Engine control-module (ECM) (D131)
Generator (M100)
ALT CON
B+
ALT MON
BATT SENSE
R,50.0T
C1893-1
C0053D-2
(PV8SC)
GO,1.0
C0634D-96
C0053D-3
(PV8SC)
WG,1.0
C0634D-3
C0053D-1
NG,0.5
(PV8NA)
WR,1.0
C0634B-96
(PV8NA)
WG,1.0
C0634B-3
ALT_CON
ALT_MON
ALT_CON
ALT_MON
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
C0635R-58
YB,0.5D
C2365R-4 C2366-4
C0635R-45
YN,0.5D
C2365R-5 C2366-5
C0635R-57
YB,0.5D
SJ1176
C0635R-44
YN,0.5D
SJ1177
Generator (M100)
ALT CON
B+
ALT MON
BATT SENSE
R,50.0T
C1893-1
C0053B-2
C0053B-3
(PV8SC)
C2724D-5
C2725R-5
C0053B-1
NG,0.5
(PV8NA)
C2724B-5
Junction-box engine (P108)
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
SJ730
YU,0.5D
C0230-17
MS CAN H
HS CAN H
C0230-1
YB,0.5D
SJ850
SJ731
YW,0.5D
C0230-18
C0230-2
YN,0.5D
SJ860
MS CAN L
HS CAN L
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
Central junction-box (P101)
Generic Electronic Module (D162)
C0582-5
MS CAN L
C0580-1
YW,0.5D
C1168-19 C1166R-19
MS CAN H
C0580-15
YU,0.5D
C1168-18 C1166R-18

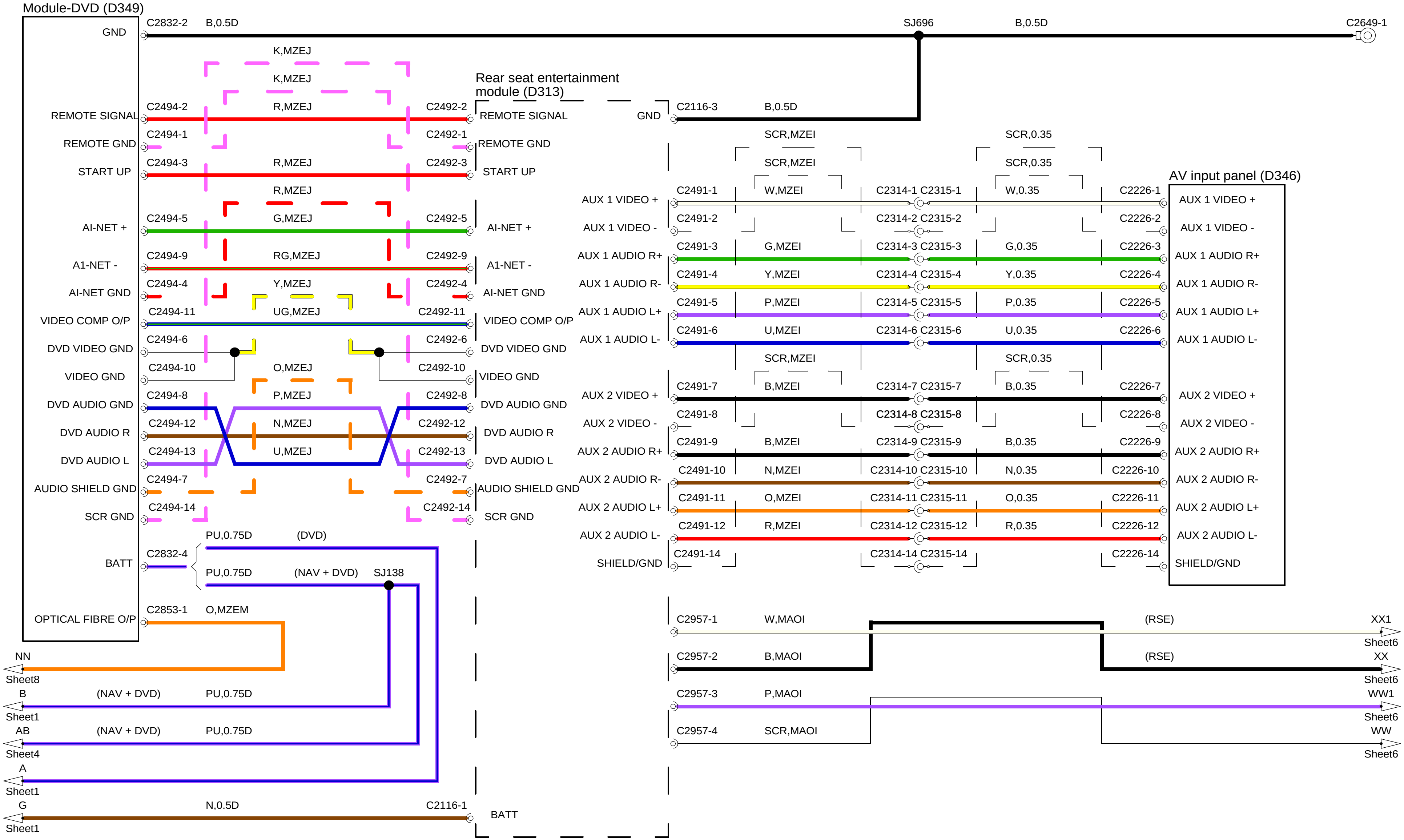

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C0631-2
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0053C-2
WP,0.75
(NON ARC)
C0053C-3
WG,0.75
(ARC)
C0053C-1
R,0.75
(NON ARC)
(ARC)
C0411C-H1
C2518C-F2
Engine control-module (ECM) (D131)
HS CAN H OUT
HS CAN L OUT
ALT COM
ALT MON
HS CAN H IN
HS CAN L IN
C0411C-B4
UR,0.75
C2273C-16 C2274R-16
C0411C-B3
SR,0.75
C2273C-15 C2274R-15
C0872R-A4
YB,0.5D
C2365R-4 C2366-4
C0872R-A3
YN,0.5D
C2365R-5 C2366-5
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0226-2
WP,0.75H
C0904-2 C0053C-2
WP,0.75
C0226-1
WG,0.75H
C0904-3 C0053C-3
WG,0.75
C0226-3
R,0.75H
C0904-1 C0053C-1
R,0.75
Junction-box engine (P108)
C0632-1
FUSE 20E
5.0 Amps
LINK 11E
30.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
C2274R-3 C2273C-3
(ARC)
(NON ARC)
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
Resistor-Terminating (G171)
Resistor-Terminating (G171)
MS CAN H
MS CAN L
HS CAN H
HS CAN L
SJ730
YU,0.5D
C0230-17
SJ731
YW,0.5D
C0230-18
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
Generic Electronic Module (D162)
MS CAN L
MS CAN H
C0580-1
YW,0.5D
C1168-19 C1166R-19
C0580-15
YU,0.5D
C1168-18 C1166R-18

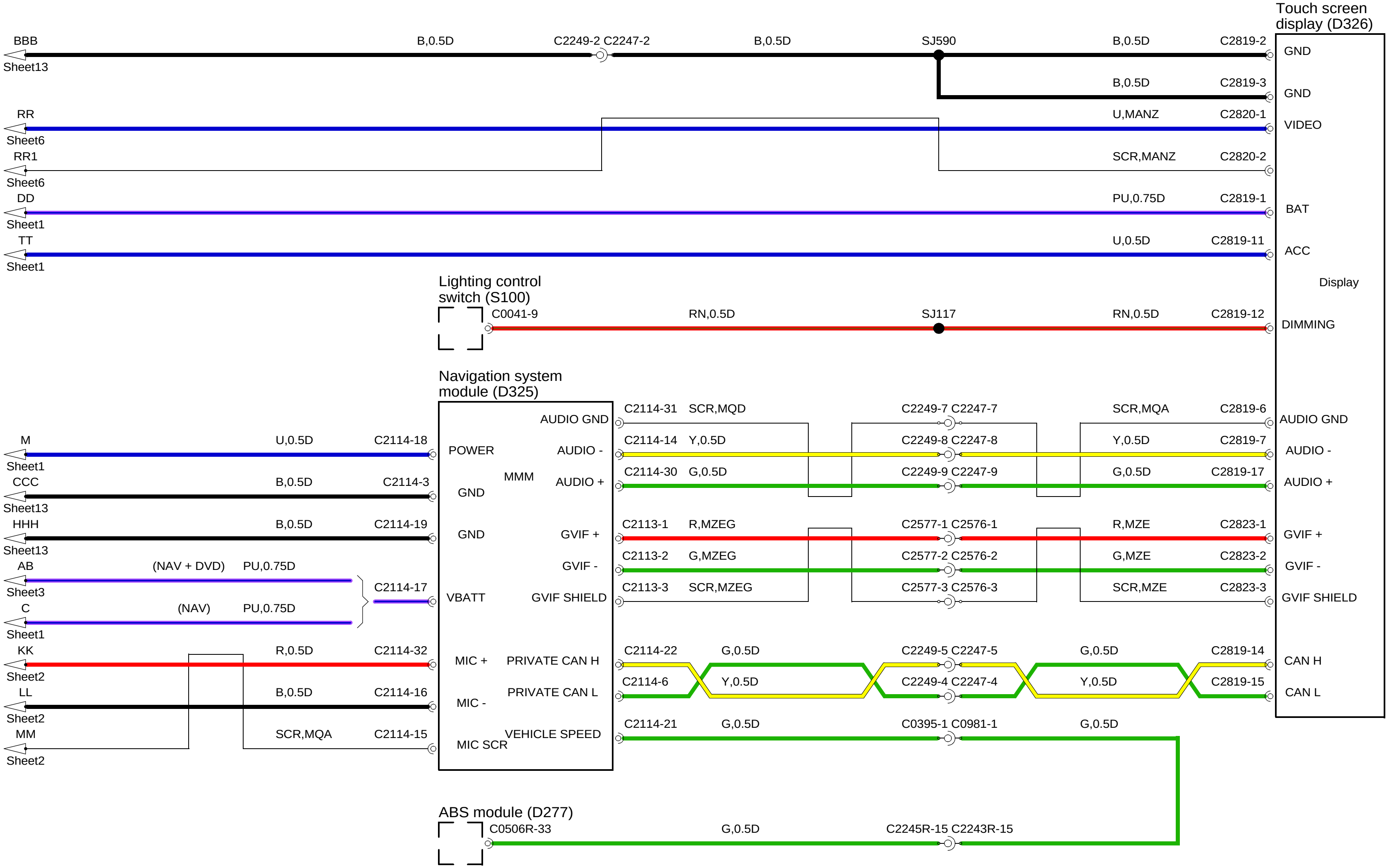

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
Starter motor (M101)
C0631-1
R,35.0T
C0631-2
R,35.0T
Engine control-module (ECM) (D131)
HS CAN H OUT
HS CAN L OUT
C0872R-A1
YB,0.5D
SJ1176
C0872R-A2
YN,0.5D
SJ1177
Generator (M100)
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0053E-2
WP,0.75
(NON ARC)
C0053E-3
WG,0.75
(ARC)
C0053E-1
R,0.75
(NON ARC)
(NON ARC)
(ARC)
C0411E-G2
ALT COM
C0411E-H2
ALT MON
HS CAN H IN
HS CAN L IN
C0872R-A4
YB,0.5D
C2365R-4 C2366-4
C0872R-A3
YN,0.5D
C2365R-5 C2366-5
Generator (M100)
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0226-2
WP,0.75H
C0904-2 C0053E-2
WP,0.75
C0226-1
WG,0.75H
C0904-3 C0053E-3
WG,0.75
C0226-3
R,0.75H
C0904-1 C0053E-1
R,0.75
(ARC)
Junction-box engine (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
C2274R-3 C2273E-3
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
SJ730
YU,0.5D
C0230-17
SJ731
YW,0.5D
C0230-18
MS CAN H
MS CAN L
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
Generic Electronic Module (D162)
MS CAN L
MS CAN H
C0580-1
YW,0.5D
C1168-19 C1166R-19
C0580-15
YU,0.5D
C1168-18 C1166R-18

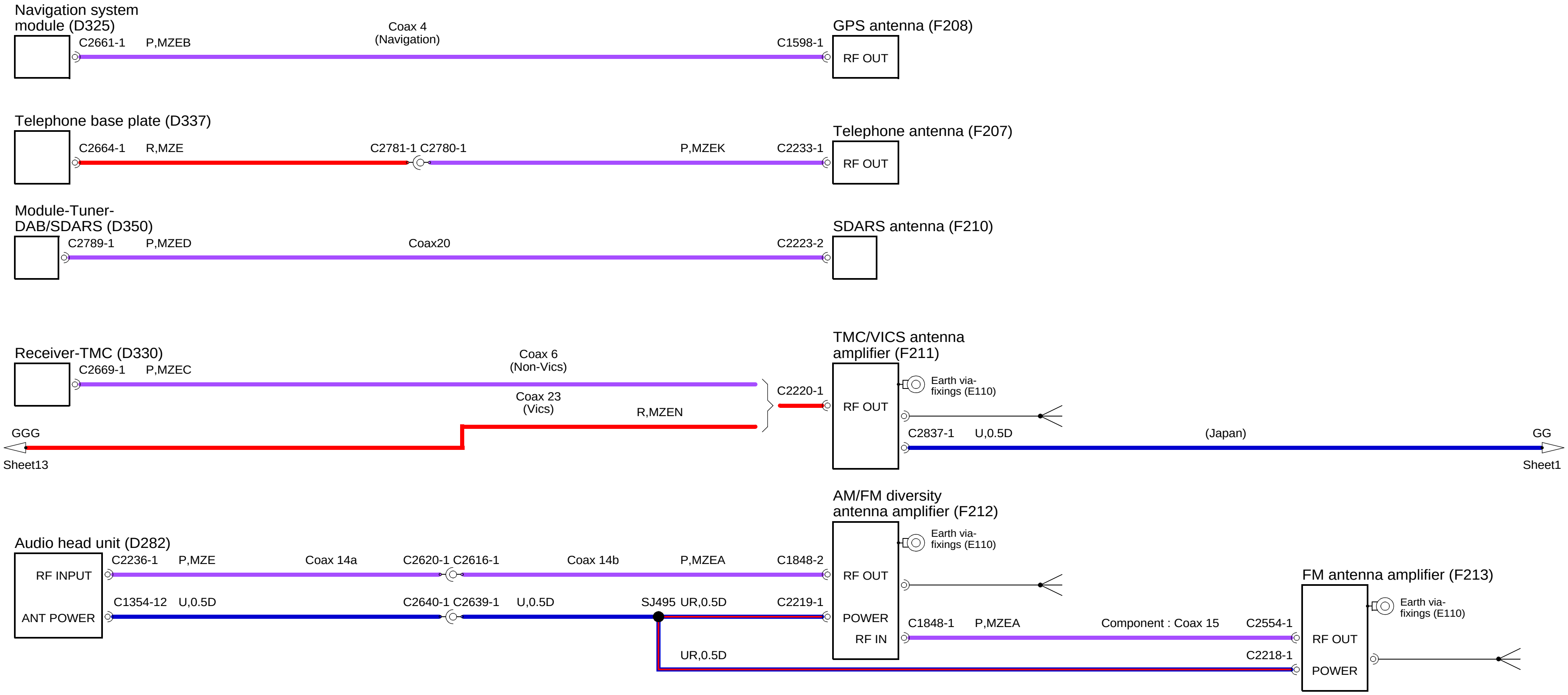

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C0631-2
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0053H-2
WP,0.75
C0053H-3
WG,0.75
C0053H-1
R,0.75
(NON ARC)
(ARC)
(NON ARC)
(ARC)
C0411H-H1
C2518H-F2
Engine control-module (ECM) (D131)
HS CAN H OUT
HS CAN L OUT
ALT COM
HS CAN H IN
ALT MON
HS CAN L IN
C0411H-B4
UR,0.75
C2273H-16 C2274R-16
C0411H-B3
SR,0.75
C2273H-15 C2274R-15
C0872R-A4
YB,0.5D
C2365R-4 C2366-4
C0872R-A3
YN,0.5D
C2365R-5 C2366-5
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0226-2
WP,0.75H
C0904-2 C0053H-2
WP,0.75
C0226-1
WG,0.75H
C0904-3 C0053H-3
WG,0.75
C0226-3
R,0.75H
C0904-1 C0053H-1
R,0.75
Junction-box engine (P108)
C0632-1
FUSE 20E
5.0 Amps
LINK 11E
30.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
C2274R-3 C2273H-3
(ARC)
(NON ARC)
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
Resistor-Terminating (G171)
Resistor-Terminating (G171)
MS CAN H
MS CAN L
HS CAN H
HS CAN L
SJ730
YU,0.5D
C0230-17
SJ731
YW,0.5D
C0230-18
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
Generic Electronic Module (D162)
MS CAN L
MS CAN H
C0580-1
YW,0.5D
C1168-19 C1166R-19
C0580-15
YU,0.5D
C1168-18 C1166R-18

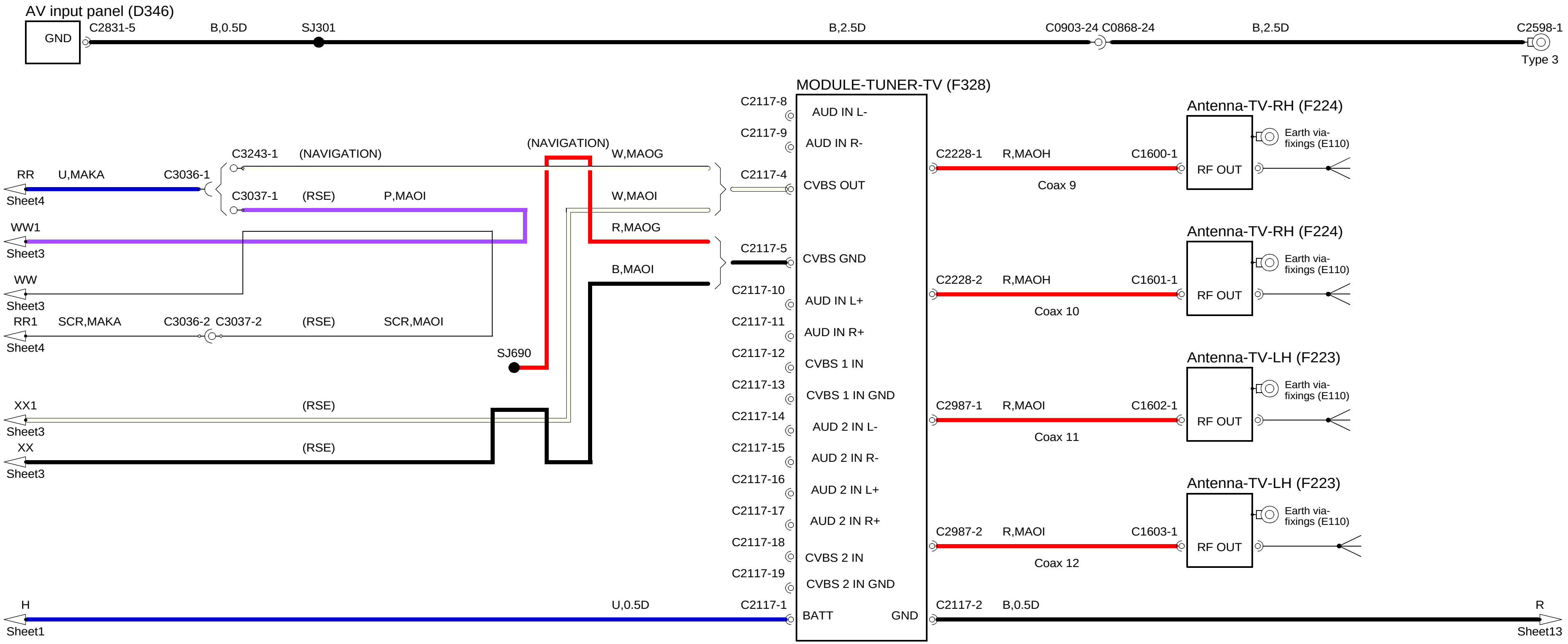

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Audio head unit (D282)
C1354-18
SWS 1
GND
C1354-7
SB,0.35D
SR,0.35D
C0082-4
C0082-7
Clock spring (S227)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone-Send (Y281)
Phone-End (Y282)
Mode (Y283)
C1354-8
RLY CONTROL
BATT
C1354-11
PU,1.5D
SJ131
PU,0.75D
C2247-12 C2249-12
(DVD)
PU,0.75D
A
Sheet3
(NAV + DVD)
PU,0.75D
B
Sheet3
(NAV)
PU,0.75D
C
Sheet4
PU,0.75D
DD
Sheet4
Central junction-box (P101)
C0582-34
RU,0.5D
FUSE 53P
15.0 Amps
C0582-38
PU,1.5D
SJ998
U,0.5D
TT
Sheet4
FUSE 58P
10.0 Amps
C0582-13
U,1.0D
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet4
Relay-Infotainment (R249)
C0583R-22
U,0.5D
H
Sheet6
U,0.5D
EEE
Sheet13
U,0.35D
OO
Sheet7
U,0.5D
UU
Sheet7
(JAPAN)
U,0.5D
GG
Sheet5
FUSE 57P
10.0 Amps
C0582-12
N,0.75D
C2247-1 C2249-1
N,0.5D
G
Sheet3
FUSE 52P
5.0 Amps
C0582-41
R,0.75D
SS
Sheet7
FUSE 42P
30.0 Amps
C0582-22
R,2.5D
C0469-5 C0467R-5
R,2.5D
D
Sheet8

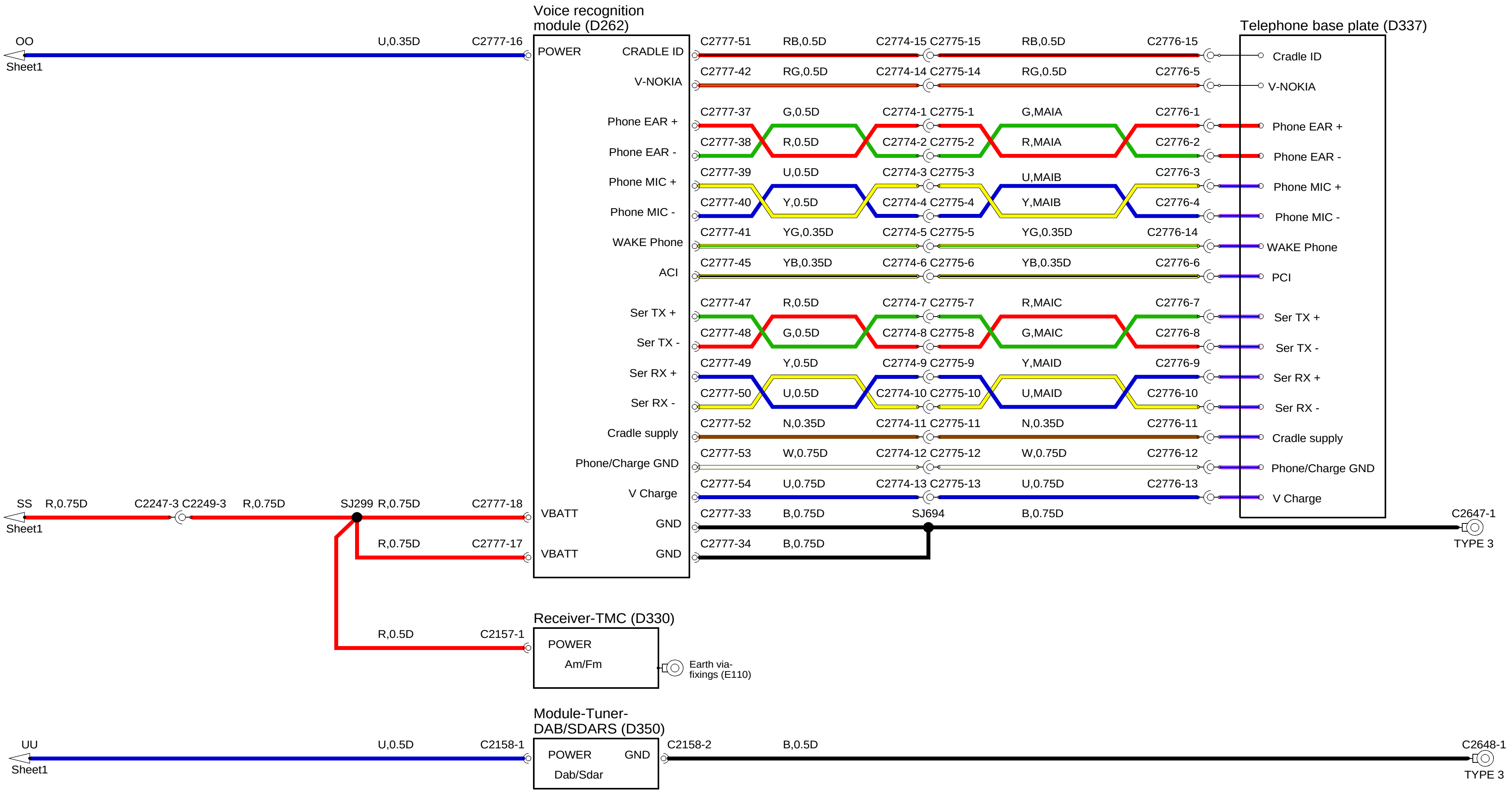

Audio head unit (D282)
SCR,MQB
SCR,MQC
SCR,MQH
SCR,MQA
AV input panel (D346)
(NAV)
C2249-14 C2247-14
R,0.5D
C2115-2
+
L
C2115-8
R,0.5D
C0223-12 C0047R-12
R,0.5D
C2053-13 C2054-13
R,MQA
C2831-4
L
R
C2115-7
U,0.5D
C0223-10 C0047R-10
U,0.5D
C2053-14 C2054-14
U,MQA
C2831-3
R
(NAV)
C2249-15 C2247-15
B,0.5D
C2115-4
-
-VE
C2115-6
C0223-11 C0047R-11
C2053-15 C2054-15
C2831-2
GND
C1354-9
YU,0.5D
SJ965
MS CAN H
C1354-10
YW,0.5D
SJ975
MS CAN L
(NAV)
C2249-16 C2247-16
C2115-1
SCR
C2115-12
B,0.5D
GND
C2626-1
TYPE 3
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
GND
TYPE 3
B,0.75D
C2640-3 C2639-3
B,0.75D
SCR,MQC
SJ693
SCR,MQA
MM
Sheet4
B,0.5D
SJ692
B,0.5D
LL
Sheet4
R,0.5D
SJ691
R,0.5D
KK
Sheet4
Lamp-Interior-
Front (B100)
(NAV) SCR,MQB
C0395-4 C0981-4
C0084R-19 C0610-19
SCR,MQB
SJ1462
Microphone (F172)
(NO NAV) SCR,MQE
B,0.5D
C0084R-17 C0610-17
B,MQB
C1462-1
MIC -
(NAV) B,MQB
C0395-2 C0981-2
R,0.5D
C0084R-18 C0610-18
R,MQB
C1462-2
MIC +
(NO NAV) B,0.5D
SCR,MANT
(NAV) R,0.5D
C0395-3 C0981-3
(NO NAV) R,0.5D

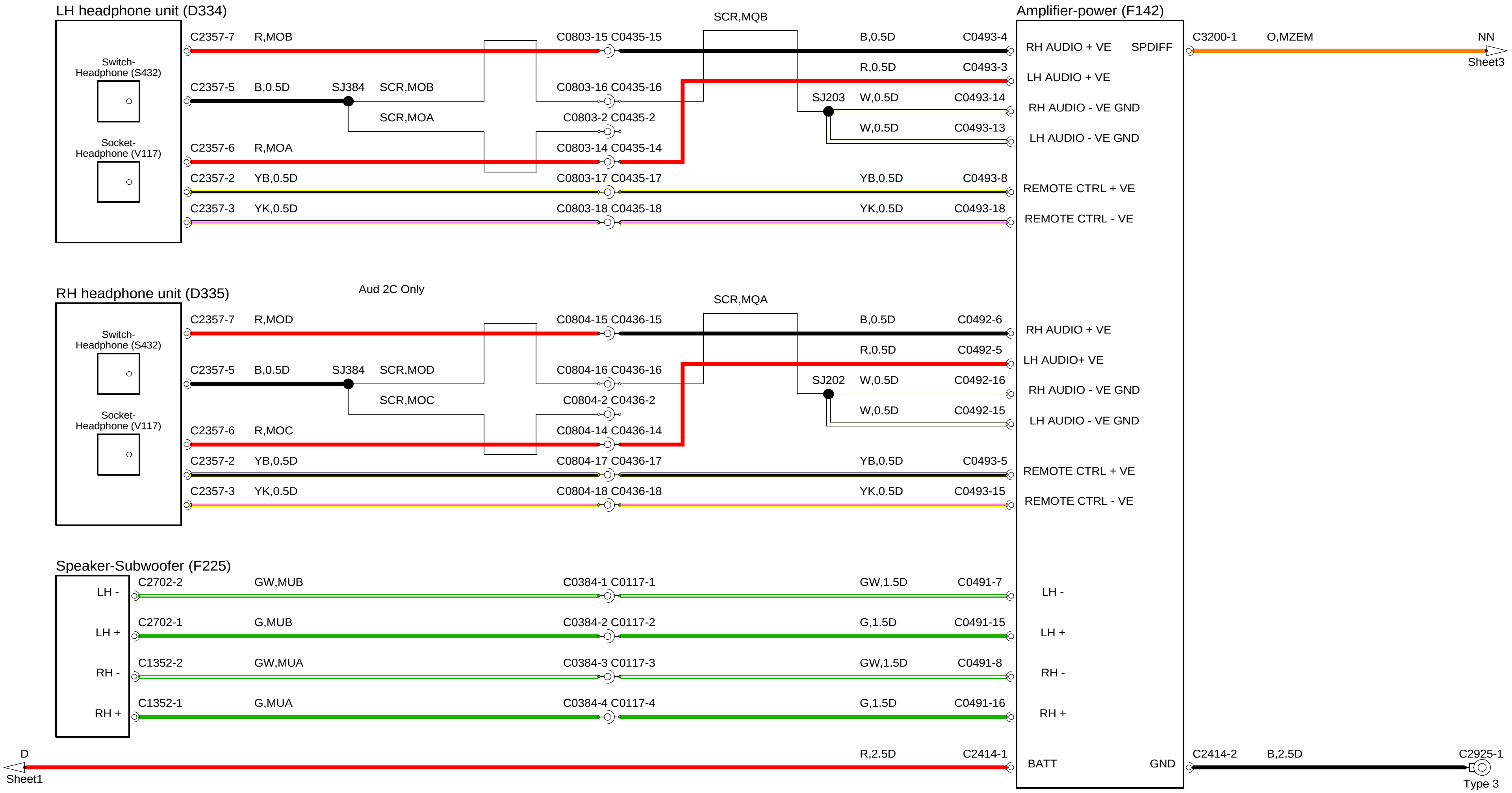

Module-DVD (D349)
GND
C2832-2
B,0.5D
SJ696
B,0.5D
C2649-1
K,MZEJ
K,MZEJ
Rear seat entertainment module (D313)
REMOTE SIGNAL
C2494-2
R,MZEJ
C2492-2
REMOTE SIGNAL
GND
C2116-3
B,0.5D
REMOTE GND
C2494-1
C2492-1
REMOTE GND
SCR,MZEI
SCR,0.35
START UP
C2494-3
R,MZEJ
C2492-3
START UP
SCR,MZEI
SCR,0.35
R,MZEJ
AV input panel (D346)
C2491-1
W,MZEI
C2314-1 C2315-1
W,0.35
C2226-1
AUX 1 VIDEO +
AUX 1 VIDEO +
AI-NET +
C2494-5
G,MZEJ
C2492-5
AI-NET +
AUX 1 VIDEO -
C2491-2
C2314-2 C2315-2
C2226-2
AUX 1 VIDEO -
A1-NET -
C2494-9
RG,MZEJ
C2492-9
A1-NET -
AUX 1 AUDIO R+
C2491-3
G,MZEI
C2314-3 C2315-3
G,0.35
C2226-3
AUX 1 AUDIO R+
AI-NET GND
C2494-4
Y,MZEJ
C2492-4
AI-NET GND
AUX 1 AUDIO R-
C2491-4
Y,MZEI
C2314-4 C2315-4
Y,0.35
C2226-4
AUX 1 AUDIO R-
VIDEO COMP O/P
C2494-11
UG,MZEJ
C2492-11
VIDEO COMP O/P
AUX 1 AUDIO L+
C2491-5
P,MZEI
C2314-5 C2315-5
P,0.35
C2226-5
AUX 1 AUDIO L+
DVD VIDEO GND
C2494-6
C2492-6
DVD VIDEO GND
AUX 1 AUDIO L-
C2491-6
U,MZEI
C2314-6 C2315-6
U,0.35
C2226-6
AUX 1 AUDIO L-
VIDEO GND
C2494-10
O,MZEJ
C2492-10
VIDEO GND
SCR,MZEI
SCR,0.35
DVD AUDIO GND
C2494-8
P,MZEJ
C2492-8
DVD AUDIO GND
AUX 2 VIDEO +
C2491-7
B,MZEI
C2314-7 C2315-7
B,0.35
C2226-7
AUX 2 VIDEO +
DVD AUDIO R
C2494-12
N,MZEJ
C2492-12
DVD AUDIO R
AUX 2 VIDEO -
C2491-8
C2314-8 C2315-8
C2226-8
AUX 2 VIDEO -
DVD AUDIO L
C2494-13
U,MZEJ
C2492-13
DVD AUDIO L
AUX 2 AUDIO R+
C2491-9
B,MZEI
C2314-9 C2315-9
B,0.35
C2226-9
AUX 2 AUDIO R+
AUDIO SHIELD GND
C2494-7
C2492-7
AUDIO SHIELD GND
AUX 2 AUDIO R-
C2491-10
N,MZEI
C2314-10 C2315-10
N,0.35
C2226-10
AUX 2 AUDIO R-
SCR GND
C2494-14
C2492-14
SCR GND
AUX 2 AUDIO L+
C2491-11
O,MZEI
C2314-11 C2315-11
O,0.35
C2226-11
AUX 2 AUDIO L+
PU,0.75D
(DVD)
AUX 2 AUDIO L-
C2491-12
R,MZEI
C2314-12 C2315-12
R,0.35
C2226-12
AUX 2 AUDIO L-
BATT
C2832-4
PU,0.75D
(NAV + DVD)
SJ138
SHIELD/GND
C2491-14
C2314-14 C2315-14
C2226-14
SHIELD/GND
OPTICAL FIBRE O/P
C2853-1
O,MZEM
C2957-1
W,MAOI
(RSE)
XX1
Sheet6
NN
Sheet8
C2957-2
B,MAOI
(RSE)
XX
Sheet6
B
(NAV + DVD)
PU,0.75D
C2957-3
P,MAOI
WW1
Sheet1
Sheet6
AB
(NAV + DVD)
PU,0.75D
C2957-4
SCR,MAOI
WW
Sheet4
Sheet6
A
Sheet1
G
N,0.5D
C2116-1
BATT
Sheet1

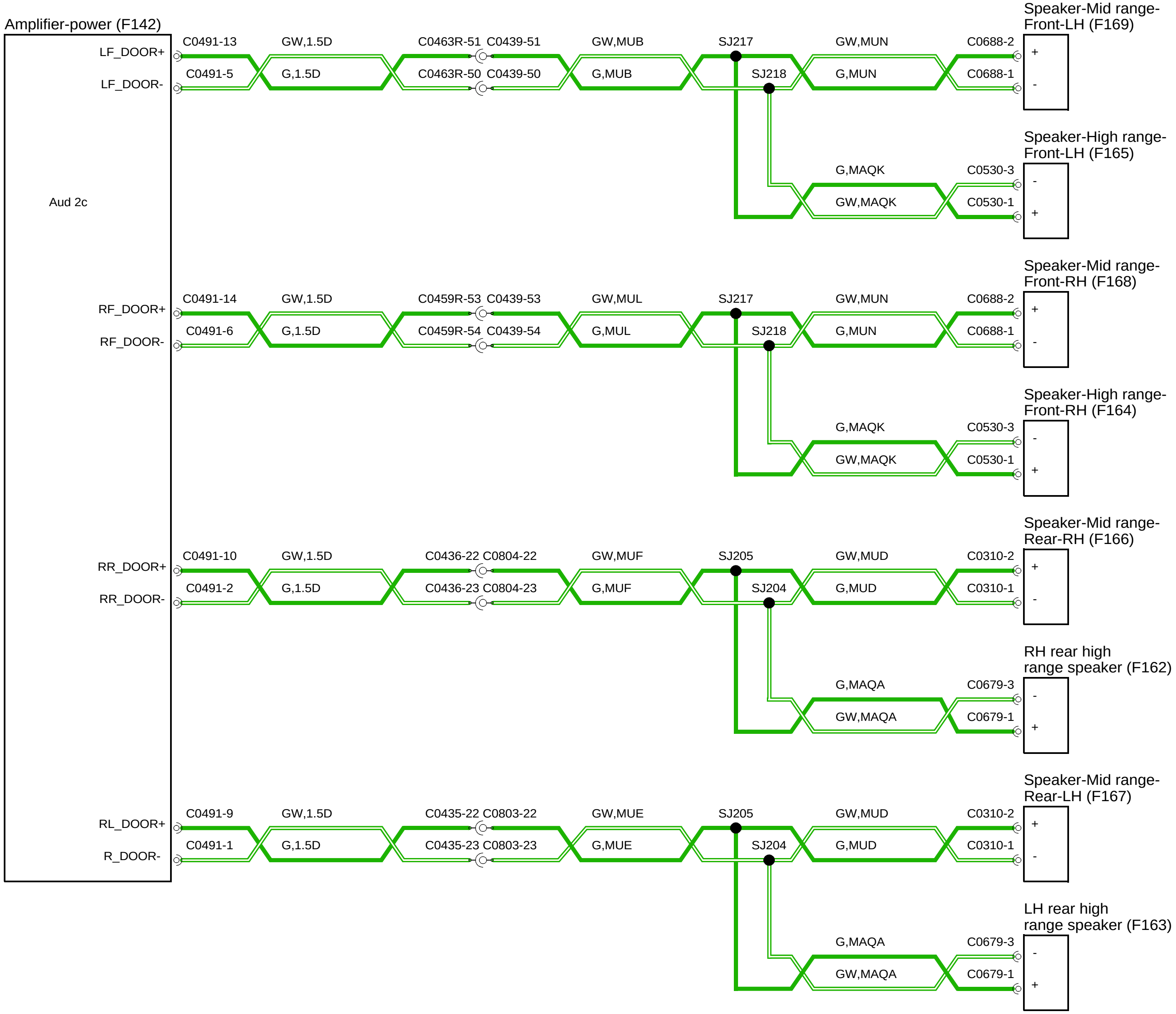

Touch screen display (D326)
BBB
Sheet13
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
RR
Sheet6
U,MANZ
C2820-1
VIDEO
RR1
Sheet6
SCR,MANZ
C2820-2
DD
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
ACC
Display
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
DIMMING
Navigation system module (D325)
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,0.5D
C2249-8 C2247-8
Y,0.5D
C2819-7
AUDIO -
MMM
CCC
Sheet13
B,0.5D
C2114-3
GND
AUDIO +
C2114-30
G,0.5D
C2249-9 C2247-9
G,0.5D
C2819-17
AUDIO +
HHH
Sheet13
B,0.5D
C2114-19
GND
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2823-1
GVIF +
AB
Sheet3
(NAV + DVD)
PU,0.75D
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2823-2
GVIF -
C2114-17
VBATT
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MZE
C2823-3
GVIF SHIELD
C
Sheet1
(NAV)
PU,0.75D
KK
Sheet2
R,0.5D
C2114-32
MIC +
PRIVATE CAN H
C2114-22
G,0.5D
C2249-5 C2247-5
G,0.5D
C2819-14
CAN H
LL
Sheet2
B,0.5D
C2114-16
MIC -
PRIVATE CAN L
C2114-6
Y,0.5D
C2249-4 C2247-4
Y,0.5D
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR
VEHICLE SPEED
C2114-21
G,0.5D
C0395-1 C0981-1
G,0.5D
ABS module (D277)
C0506R-33
G,0.5D
C2245R-15 C2243R-15

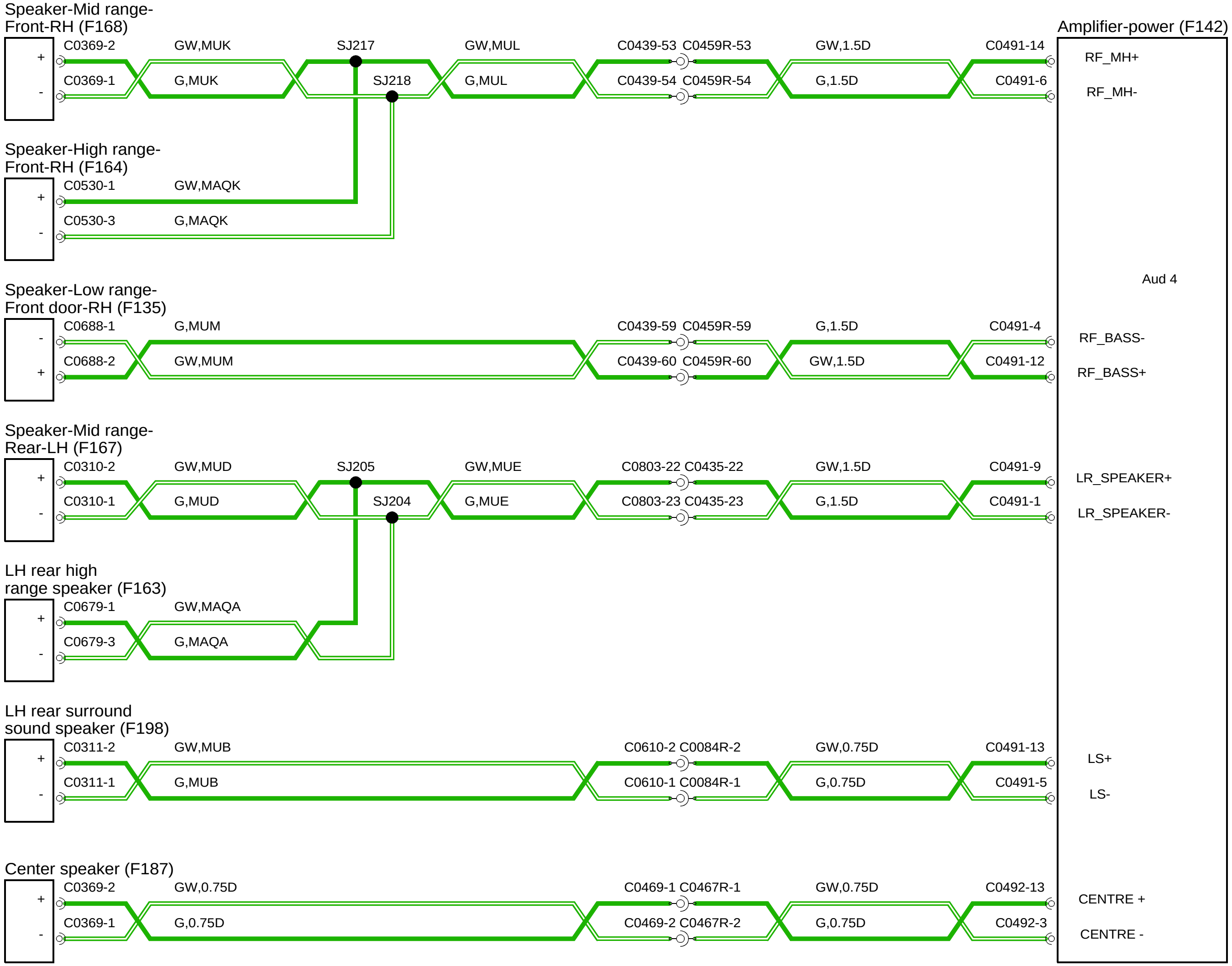

Navigation system module (D325)
C2661-1
P,MZEB
Coax 4 (Navigation)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Module-Tuner-DAB/SDARS (D350)
C2789-1
P,MZED
Coax20
C2223-2
SDARS antenna (F210)
Receiver-TMC (D330)
C2669-1
P,MZEC
Coax 6 (Non-Vics)
Coax 23 (Vics)
R,MZEN
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via-fixings (E110)
GGG
Sheet13
C2837-1
U,0.5D
(Japan)
GG
Sheet1
AM/FM diversity antenna amplifier (F212)
Earth via-fixings (E110)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
Coax 14a
C2620-1 C2616-1
Coax 14b
P,MZEA
C1848-2
RF OUT
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495 UR,0.5D
C2219-1
POWER
RF IN
C1848-1
P,MZEA
Component : Coax 15
C2554-1
FM antenna amplifier (F213)
Earth via-fixings (E110)
RF OUT
UR,0.5D
C2218-1
POWER

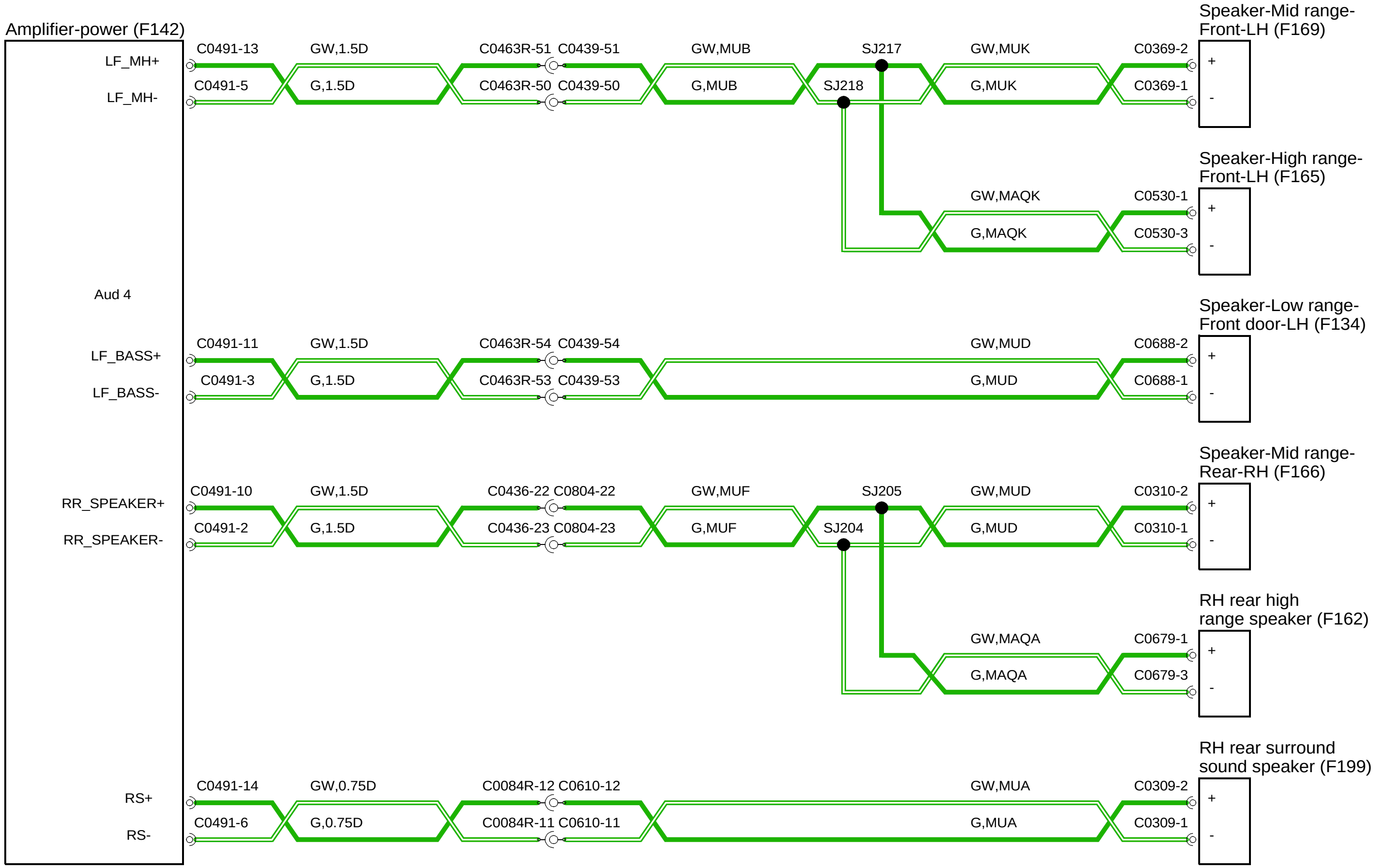

AV input panel (D346)
GND
C2831-5
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
Type 3
MODULE-TUNER-TV (F328)
C2117-8
AUD IN L-
C2117-9
AUD IN R-
C2117-4
CVBS OUT
C2117-5
CVBS GND
C2117-10
AUD IN L+
C2117-11
AUD IN R+
C2117-12
CVBS 1 IN
C2117-13
CVBS 1 IN GND
C2117-14
AUD 2 IN L-
C2117-15
AUD 2 IN R-
C2117-16
AUD 2 IN L+
C2117-17
AUD 2 IN R+
C2117-18
CVBS 2 IN
C2117-19
CVBS 2 IN GND
C2117-1
BATT
GND
C2117-2
B,0.5D
R
Sheet13
H
Sheet1
U,0.5D
RR
U,MAKA
C3036-1
Sheet4
C3243-1
(NAVIGATION)
(NAVIGATION)
W,MAOG
C3037-1
(RSE)
P,MAOI
W,MAOI
WW1
Sheet3
R,MAOG
B,MAOI
WW
Sheet3
RR1
SCR,MAKA
C3036-2 C3037-2
(RSE)
SCR,MAOI
Sheet4
SJ690
XX1
(RSE)
Sheet3
XX
(RSE)
Sheet3
C2228-1
R,MAOH
C1600-1
Coax 9
Antenna-TV-RH (F224)
RF OUT
Earth via-
fixings (E110)
C2228-2
R,MAOH
C1601-1
Coax 10
Antenna-TV-RH (F224)
RF OUT
Earth via-
fixings (E110)
C2987-1
R,MAOI
C1602-1
Coax 11
Antenna-TV-LH (F223)
RF OUT
Earth via-
fixings (E110)
C2987-2
R,MAOI
C1603-1
Coax 12
Antenna-TV-LH (F223)
RF OUT
Earth via-
fixings (E110)

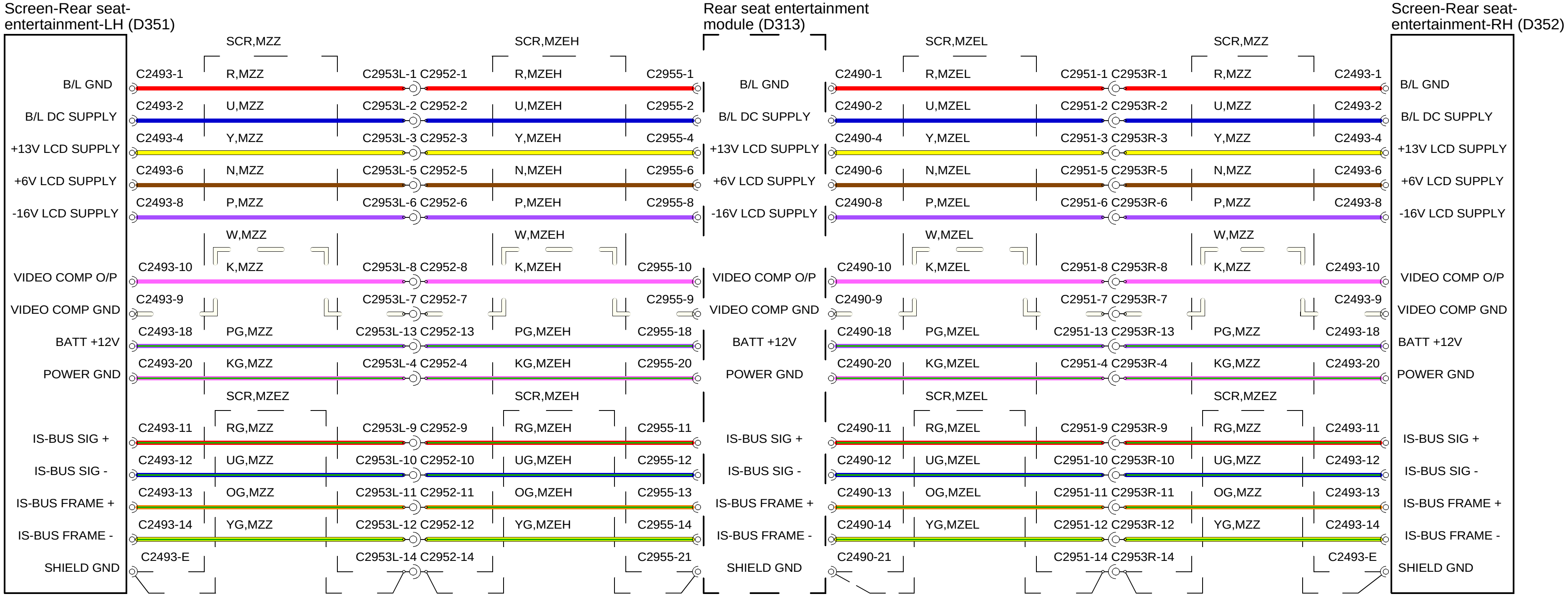

Voice recognition module (D262)
Telephone base plate (D337)
OO
Sheet1
U,0.35D
C2777-16
POWER
CRADLE ID
V-NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE Phone
ACI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
VBATT
GND
VBATT
GND
C2777-51 RB,0.5D C2774-15 C2775-15 RB,0.5D C2776-15
C2777-42 RG,0.5D C2774-14 C2775-14 RG,0.5D C2776-5
C2777-37 G,0.5D C2774-1 C2775-1 G,MAIA C2776-1
C2777-38 R,0.5D C2774-2 C2775-2 R,MAIA C2776-2
C2777-39 U,0.5D C2774-3 C2775-3 U,MAIB C2776-3
C2777-40 Y,0.5D C2774-4 C2775-4 Y,MAIB C2776-4
C2777-41 YG,0.35D C2774-5 C2775-5 YG,0.35D C2776-14
C2777-45 YB,0.35D C2774-6 C2775-6 YB,0.35D C2776-6
C2777-47 R,0.5D C2774-7 C2775-7 R,MAIC C2776-7
C2777-48 G,0.5D C2774-8 C2775-8 G,MAIC C2776-8
C2777-49 Y,0.5D C2774-9 C2775-9 Y,MAID C2776-9
C2777-50 U,0.5D C2774-10 C2775-10 U,MAID C2776-10
C2777-52 N,0.35D C2774-11 C2775-11 N,0.35D C2776-11
C2777-53 W,0.75D C2774-12 C2775-12 W,0.75D C2776-12
C2777-54 U,0.75D C2774-13 C2775-13 U,0.75D C2776-13
C2777-33 B,0.75D SJ694 B,0.75D
C2777-34 B,0.75D
C2647-1
TYPE 3
Cradle ID
V-NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE Phone
PCI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
SS
Sheet1
R,0.75D
C2247-3 C2249-3
R,0.75D
SJ299 R,0.75D
C2777-18
R,0.75D
C2777-17
R,0.5D
C2157-1
Receiver-TMC (D330)
POWER
Am/Fm
Earth via-fixings (E110)
Module-Tuner-DAB/SDARS (D350)
UU
Sheet1
U,0.5D
C2158-1
POWER
GND
Dab/Sdar
C2158-2
B,0.5D
C2648-1
TYPE 3

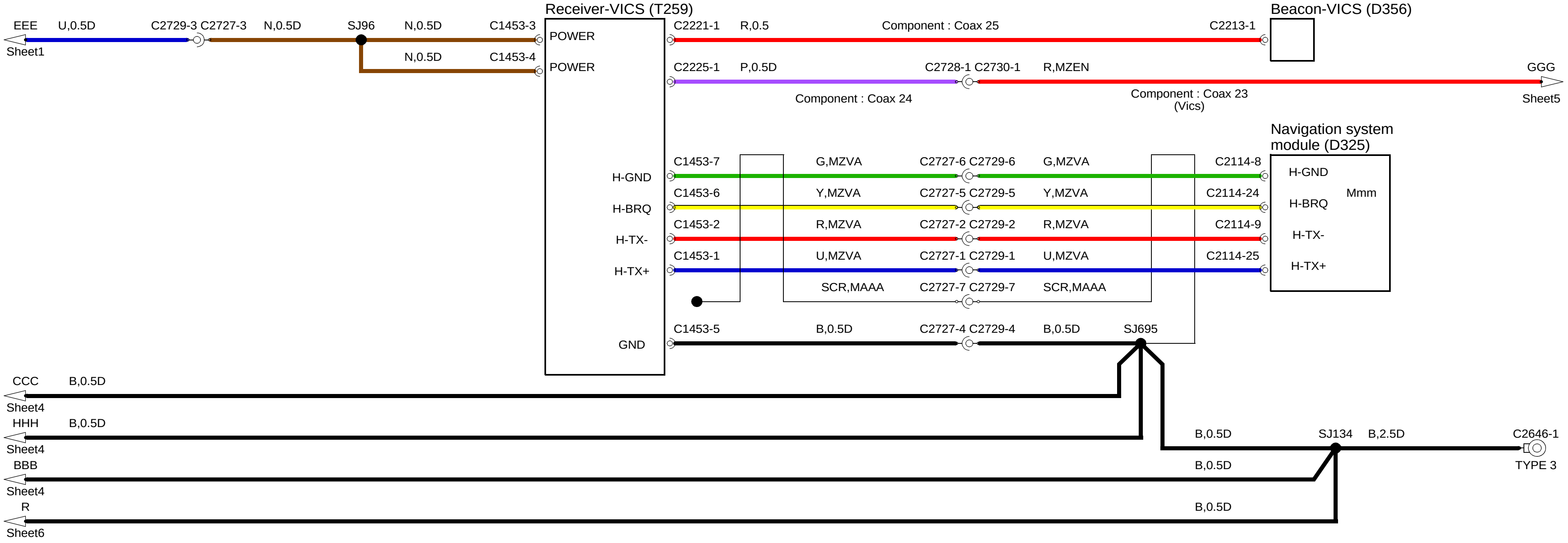

LH headphone unit (D334)
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOB
C2357-5 B,0.5D
SJ384 SCR,MOB
SCR,MOA
C2357-6 R,MOA
C2357-2 YB,0.5D
C2357-3 YK,0.5D
C0803-15 C0435-15
C0803-16 C0435-16
C0803-2 C0435-2
C0803-14 C0435-14
C0803-17 C0435-17
C0803-18 C0435-18
SCR,MQB
SJ203
B,0.5D C0493-4
R,0.5D C0493-3
W,0.5D C0493-14
W,0.5D C0493-13
YB,0.5D C0493-8
YK,0.5D C0493-18
Amplifier-power (F142)
RH AUDIO + VE
SPDIFF
LH AUDIO + VE
RH AUDIO - VE GND
LH AUDIO - VE GND
REMOTE CTRL + VE
REMOTE CTRL - VE
C3200-1 O,MZEM
NN
Sheet3
RH headphone unit (D335)
Aud 2C Only
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOD
C2357-5 B,0.5D
SJ384 SCR,MOD
SCR,MOC
C2357-6 R,MOC
C2357-2 YB,0.5D
C2357-3 YK,0.5D
C0804-15 C0436-15
C0804-16 C0436-16
C0804-2 C0436-2
C0804-14 C0436-14
C0804-17 C0436-17
C0804-18 C0436-18
SCR,MQA
SJ202
B,0.5D C0492-6
R,0.5D C0492-5
W,0.5D C0492-16
W,0.5D C0492-15
YB,0.5D C0493-5
YK,0.5D C0493-15
RH AUDIO + VE
LH AUDIO+ VE
RH AUDIO - VE GND
LH AUDIO - VE GND
REMOTE CTRL + VE
REMOTE CTRL - VE
Speaker-Subwoofer (F225)
LH -
LH +
RH -
RH +
C2702-2 GW,MUB
C2702-1 G,MUB
C1352-2 GW,MUA
C1352-1 G,MUA
C0384-1 C0117-1
C0384-2 C0117-2
C0384-3 C0117-3
C0384-4 C0117-4
GW,1.5D C0491-7
G,1.5D C0491-15
GW,1.5D C0491-8
G,1.5D C0491-16
LH -
LH +
RH -
RH +
D
Sheet1
R,2.5D C2414-1
BATT
GND
C2414-2 B,2.5D
C2925-1
Type 3

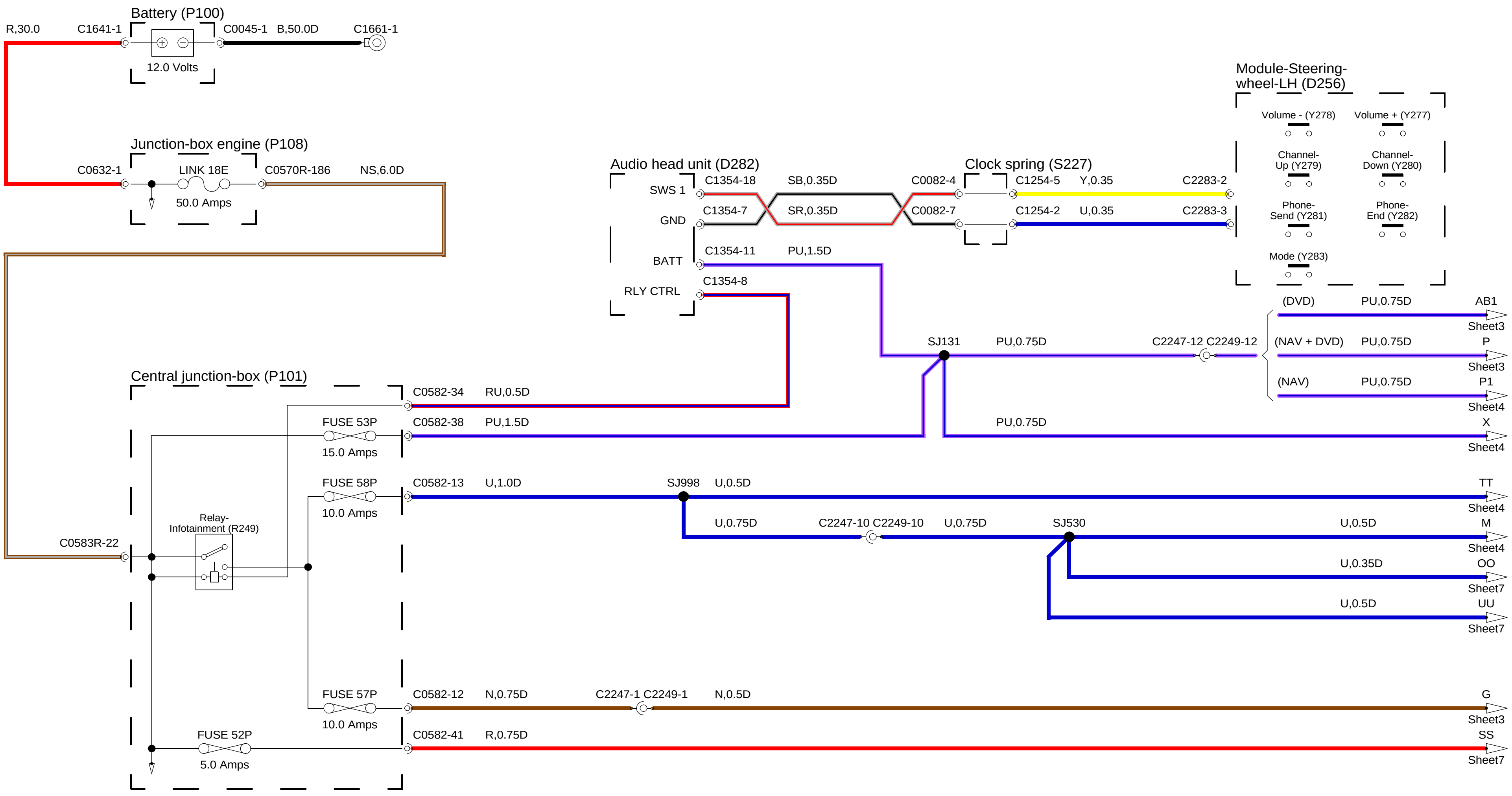

Amplifier-power (F142)
Aud 2c
LF_DOOR+
LF_DOOR-
RF_DOOR+
RF_DOOR-
RR_DOOR+
RR_DOOR-
RL_DOOR+
R_DOOR-
C0491-13
GW,1.5D
C0463R-51
C0439-51
GW,MUB
SJ217
GW,MUN
C0688-2
C0491-5
G,1.5D
C0463R-50
C0439-50
G,MUB
SJ218
G,MUN
C0688-1
Speaker-Mid range-Front-LH (F169)
+
-
G,MAQK
C0530-3
GW,MAQK
C0530-1
Speaker-High range-Front-LH (F165)
-
+
C0491-14
GW,1.5D
C0459R-53
C0439-53
GW,MUL
SJ217
GW,MUN
C0688-2
C0491-6
G,1.5D
C0459R-54
C0439-54
G,MUL
SJ218
G,MUN
C0688-1
Speaker-Mid range-Front-RH (F168)
+
-
G,MAQK
C0530-3
GW,MAQK
C0530-1
Speaker-High range-Front-RH (F164)
-
+
C0491-10
GW,1.5D
C0436-22
C0804-22
GW,MUF
SJ205
GW,MUD
C0310-2
C0491-2
G,1.5D
C0436-23
C0804-23
G,MUF
SJ204
G,MUD
C0310-1
Speaker-Mid range-Rear-RH (F166)
+
-
G,MAQA
C0679-3
GW,MAQA
C0679-1
RH rear high range speaker (F162)
-
+
C0491-9
GW,1.5D
C0435-22
C0803-22
GW,MUE
SJ205
GW,MUD
C0310-2
C0491-1
G,1.5D
C0435-23
C0803-23
G,MUE
SJ204
G,MUD
C0310-1
Speaker-Mid range-Rear-LH (F167)
+
-
G,MAQA
C0679-3
GW,MAQA
C0679-1
LH rear high range speaker (F163)
-
+

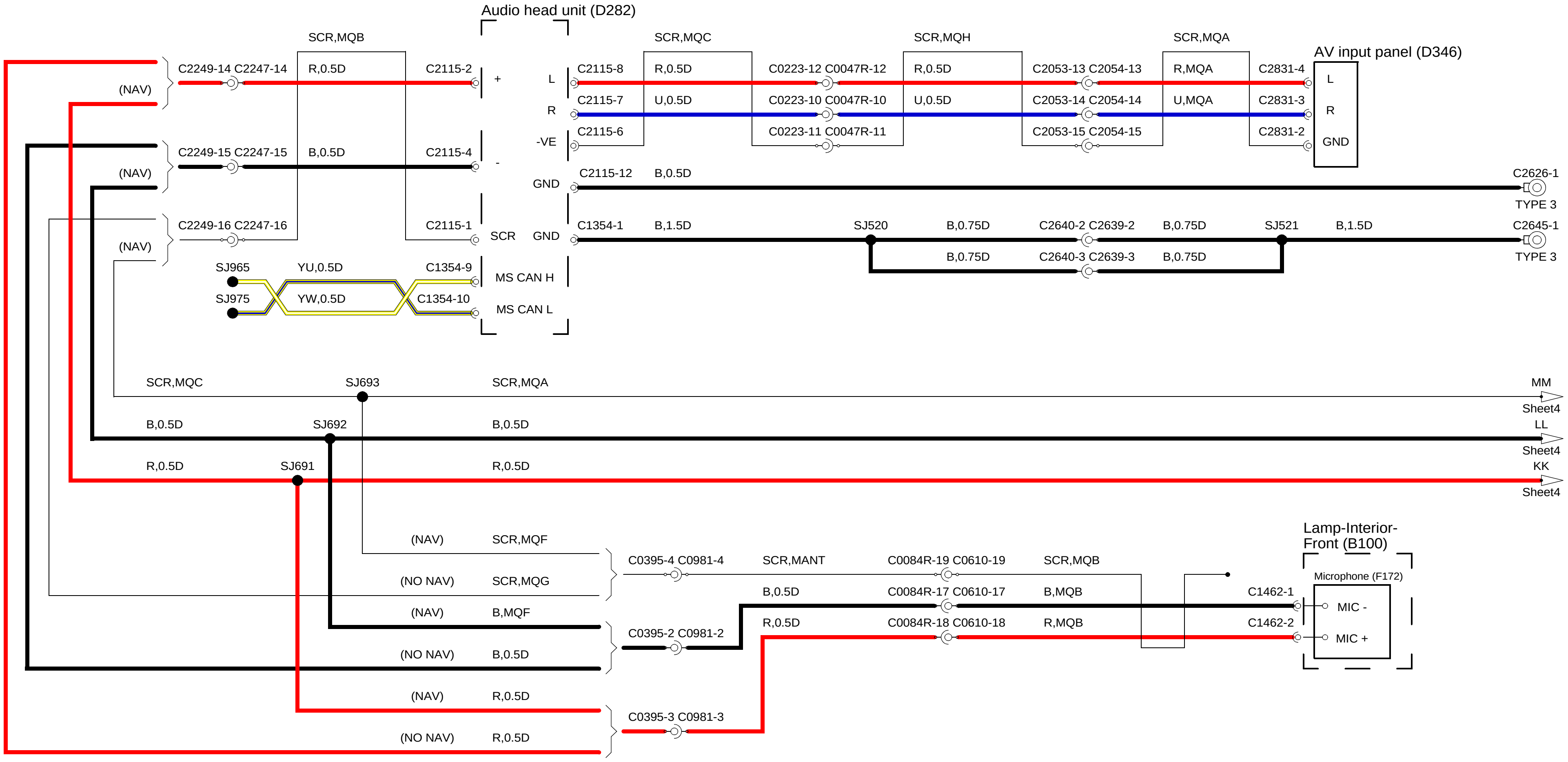

Speaker-Mid range-
Front-RH (F168)
+
-
C0369-2
C0369-1
GW,MUK
G,MUK
SJ217
SJ218
GW,MUL
G,MUL
C0439-53 C0459R-53
C0439-54 C0459R-54
GW,1.5D
G,1.5D
C0491-14
C0491-6
Amplifier-power (F142)
RF_MH+
RF_MH-
Speaker-High range-
Front-RH (F164)
C0530-1
C0530-3
GW,MAQK
G,MAQK
Aud 4
Speaker-Low range-
Front door-RH (F135)
C0688-1
C0688-2
G,MUM
GW,MUM
C0439-59 C0459R-59
C0439-60 C0459R-60
G,1.5D
GW,1.5D
C0491-4
C0491-12
RF_BASS-
RF_BASS+
Speaker-Mid range-
Rear-LH (F167)
C0310-2
C0310-1
GW,MUD
G,MUD
SJ205
SJ204
GW,MUE
G,MUE
C0803-22 C0435-22
C0803-23 C0435-23
GW,1.5D
G,1.5D
C0491-9
C0491-1
LR_SPEAKER+
LR_SPEAKER-
LH rear high
range speaker (F163)
C0679-1
C0679-3
GW,MAQA
G,MAQA
LH rear surround
sound speaker (F198)
C0311-2
C0311-1
GW,MUB
G,MUB
C0610-2 C0084R-2
C0610-1 C0084R-1
GW,0.75D
G,0.75D
C0491-13
C0491-5
LS+
LS-
Center speaker (F187)
C0369-2
C0369-1
GW,0.75D
G,0.75D
C0469-1 C0467R-1
C0469-2 C0467R-2
GW,0.75D
G,0.75D
C0492-13
C0492-3
CENTRE +
CENTRE -

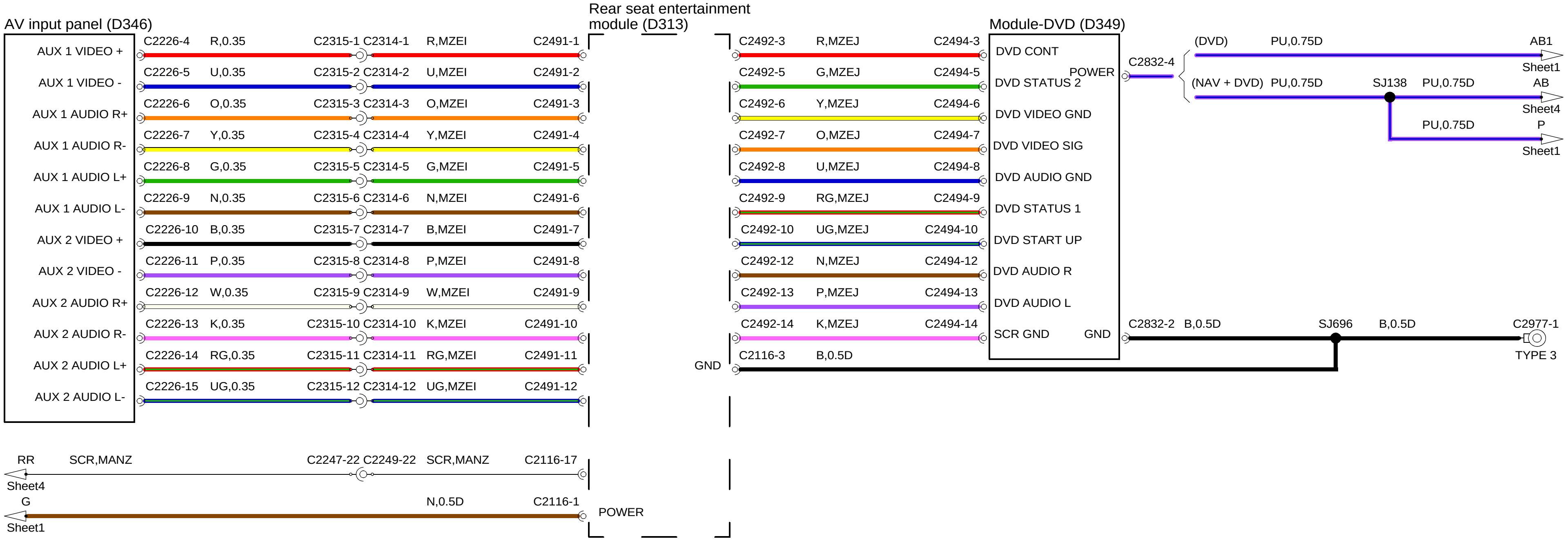

Amplifier-power (F142)
LF_MH+
LF_MH-
Aud 4
LF_BASS+
LF_BASS-
RR_SPEAKER+
RR_SPEAKER-
RS+
RS-
C0491-13
C0491-5
GW,1.5D
G,1.5D
C0463R-51 C0439-51
C0463R-50 C0439-50
GW,MUB
G,MUB
SJ217
SJ218
GW,MUK
G,MUK
C0369-2
C0369-1
Speaker-Mid range-Front-LH (F169)
+
-
GW,MAQK
G,MAQK
C0530-1
C0530-3
Speaker-High range-Front-LH (F165)
C0491-11
C0491-3
GW,1.5D
G,1.5D
C0463R-54 C0439-54
C0463R-53 C0439-53
GW,MUD
G,MUD
C0688-2
C0688-1
Speaker-Low range-Front door-LH (F134)
C0491-10
C0491-2
GW,1.5D
G,1.5D
C0436-22 C0804-22
C0436-23 C0804-23
GW,MUF
G,MUF
SJ205
SJ204
GW,MUD
G,MUD
C0310-2
C0310-1
Speaker-Mid range-Rear-RH (F166)
GW,MAQA
G,MAQA
C0679-1
C0679-3
RH rear high range speaker (F162)
C0491-14
C0491-6
GW,0.75D
G,0.75D
C0084R-12 C0610-12
C0084R-11 C0610-11
GW,MUA
G,MUA
C0309-2
C0309-1
RH rear surround sound speaker (F199)

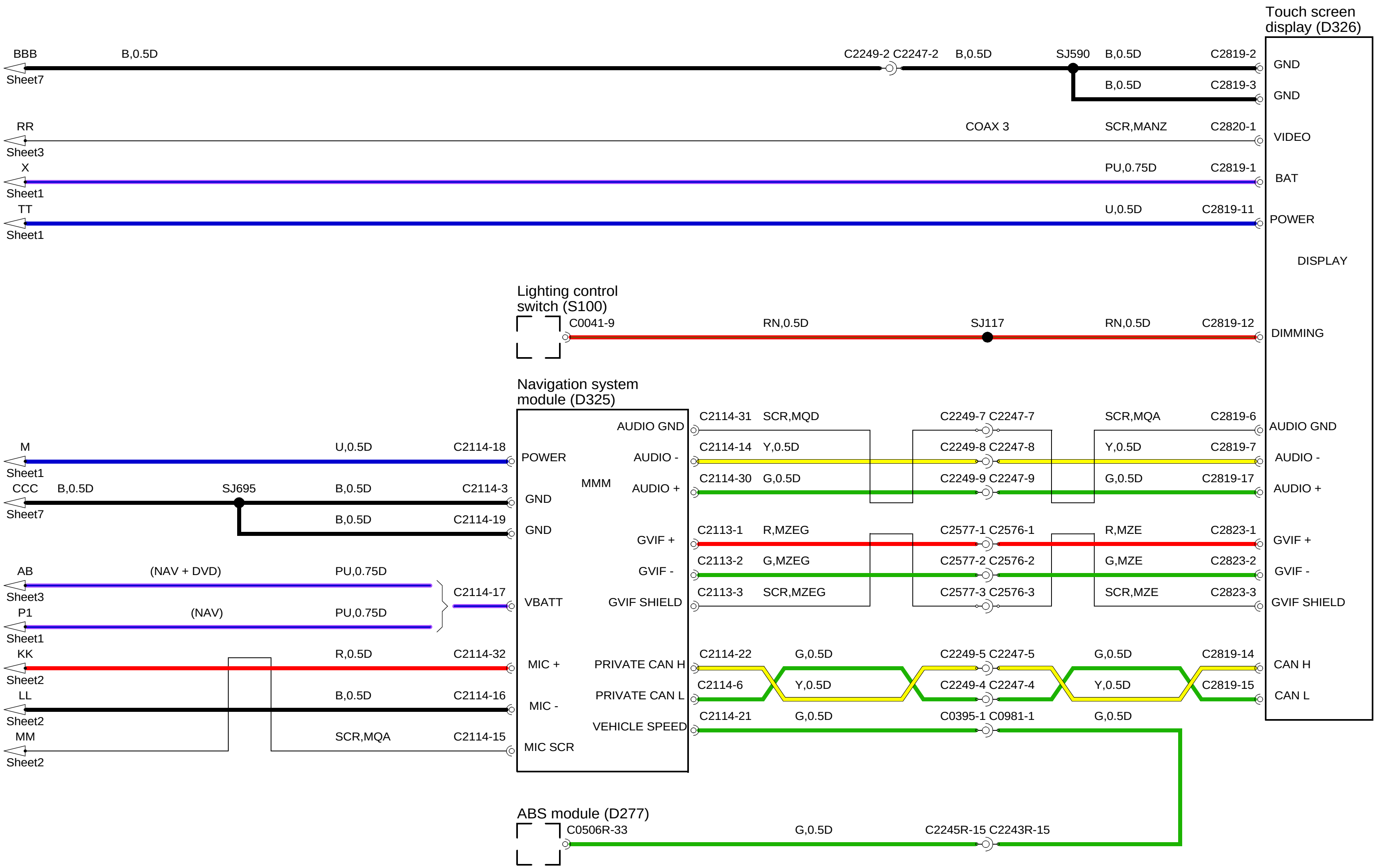

Screen-Rear seat-entertainment-LH (D351)
Rear seat entertainment module (D313)
Screen-Rear seat-entertainment-RH (D352)
SCR,MZZ
SCR,MZEH
SCR,MZEL
SCR,MZZ
B/L GND
B/L DC SUPPLY
+13V LCD SUPPLY
+6V LCD SUPPLY
-16V LCD SUPPLY
VIDEO COMP O/P
VIDEO COMP GND
BATT +12V
POWER GND
IS-BUS SIG +
IS-BUS SIG -
IS-BUS FRAME +
IS-BUS FRAME -
SHIELD GND
C2493-1 R,MZZ C2953L-1 C2952-1 R,MZEH C2955-1
C2490-1 R,MZEL C2951-1 C2953R-1 R,MZZ C2493-1
C2493-2 U,MZZ C2953L-2 C2952-2 U,MZEH C2955-2
C2490-2 U,MZEL C2951-2 C2953R-2 U,MZZ C2493-2
C2493-4 Y,MZZ C2953L-3 C2952-3 Y,MZEH C2955-4
C2490-4 Y,MZEL C2951-3 C2953R-3 Y,MZZ C2493-4
C2493-6 N,MZZ C2953L-5 C2952-5 N,MZEH C2955-6
C2490-6 N,MZEL C2951-5 C2953R-5 N,MZZ C2493-6
C2493-8 P,MZZ C2953L-6 C2952-6 P,MZEH C2955-8
C2490-8 P,MZEL C2951-6 C2953R-6 P,MZZ C2493-8
W,MZZ
W,MZEH
W,MZEL
W,MZZ
C2493-10 K,MZZ C2953L-8 C2952-8 K,MZEH C2955-10
C2490-10 K,MZEL C2951-8 C2953R-8 K,MZZ C2493-10
C2493-9 C2953L-7 C2952-7 C2955-9
C2490-9 C2951-7 C2953R-7 C2493-9
C2493-18 PG,MZZ C2953L-13 C2952-13 PG,MZEH C2955-18
C2490-18 PG,MZEL C2951-13 C2953R-13 PG,MZZ C2493-18
C2493-20 KG,MZZ C2953L-4 C2952-4 KG,MZEH C2955-20
C2490-20 KG,MZEL C2951-4 C2953R-4 KG,MZZ C2493-20
SCR,MZEZ
SCR,MZEH
SCR,MZEL
SCR,MZEZ
C2493-11 RG,MZZ C2953L-9 C2952-9 RG,MZEH C2955-11
C2490-11 RG,MZEL C2951-9 C2953R-9 RG,MZZ C2493-11
C2493-12 UG,MZZ C2953L-10 C2952-10 UG,MZEH C2955-12
C2490-12 UG,MZEL C2951-10 C2953R-10 UG,MZZ C2493-12
C2493-13 OG,MZZ C2953L-11 C2952-11 OG,MZEH C2955-13
C2490-13 OG,MZEL C2951-11 C2953R-11 OG,MZZ C2493-13
C2493-14 YG,MZZ C2953L-12 C2952-12 YG,MZEH C2955-14
C2490-14 YG,MZEL C2951-12 C2953R-12 YG,MZZ C2493-14
C2493-E C2953L-14 C2952-14 C2955-21
C2490-21 C2951-14 C2953R-14 C2493-E

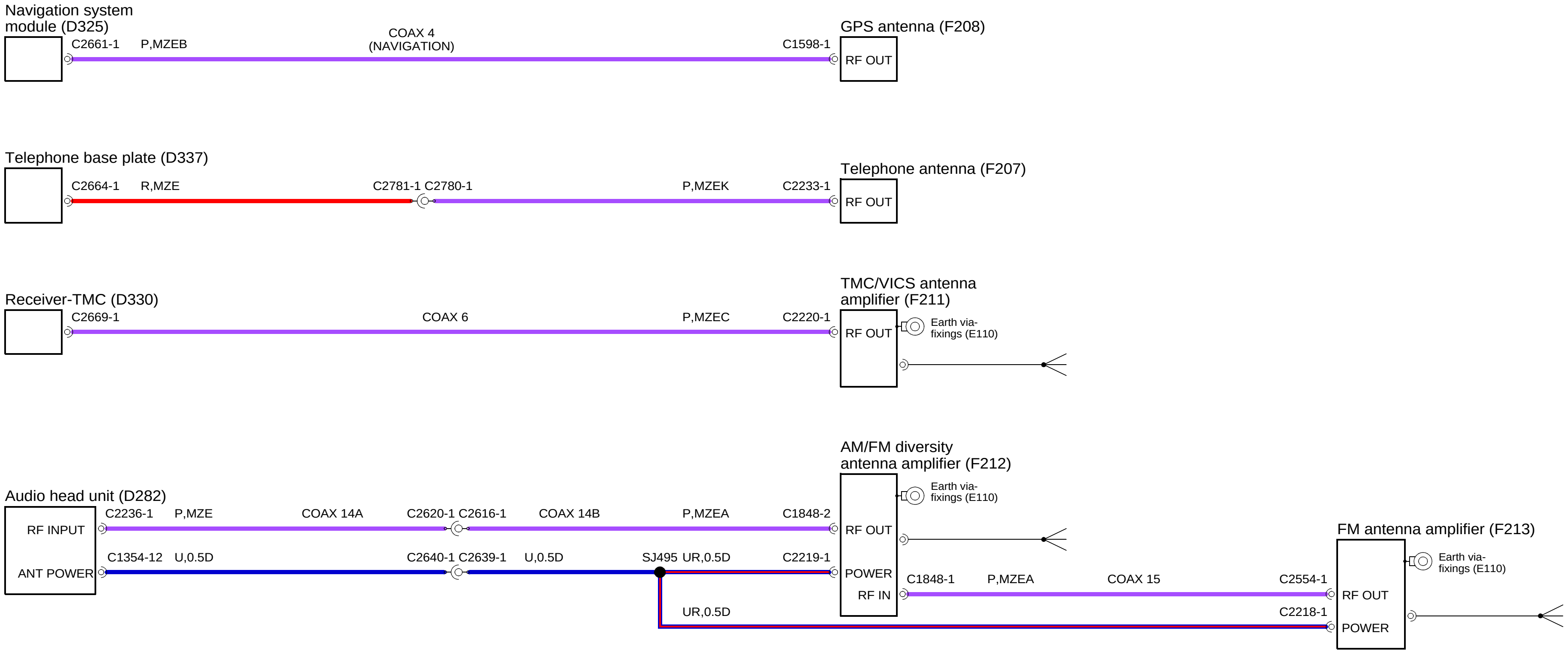

Receiver-VICS (T259)
Beacon-VICS (D356)
Navigation system module (D325)
EEE
U,0.5D
Sheet1
C2729-3 C2727-3
N,0.5D
SJ96
N,0.5D
C1453-3
POWER
N,0.5D
C1453-4
POWER
C2221-1
R,0.5
Component : Coax 25
C2213-1
C2225-1
P,0.5D
C2728-1 C2730-1
R,MZEN
GGG
Sheet5
Component : Coax 24
Component : Coax 23 (Vics)
C1453-7
G,MZVA
C2727-6 C2729-6
G,MZVA
C2114-8
H-GND
C1453-6
Y,MZVA
C2727-5 C2729-5
Y,MZVA
C2114-24
H-BRQ
C1453-2
R,MZVA
C2727-2 C2729-2
R,MZVA
C2114-9
H-TX-
C1453-1
U,MZVA
C2727-1 C2729-1
U,MZVA
C2114-25
H-TX+
SCR,MAAA
C2727-7 C2729-7
SCR,MAAA
H-GND
H-BRQ
H-TX-
H-TX+
Mmm
C1453-5
B,0.5D
C2727-4 C2729-4
B,0.5D
SJ695
GND
CCC
B,0.5D
Sheet4
HHH
B,0.5D
Sheet4
BBB
Sheet4
R
Sheet6
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
B,0.5D
B,0.5D

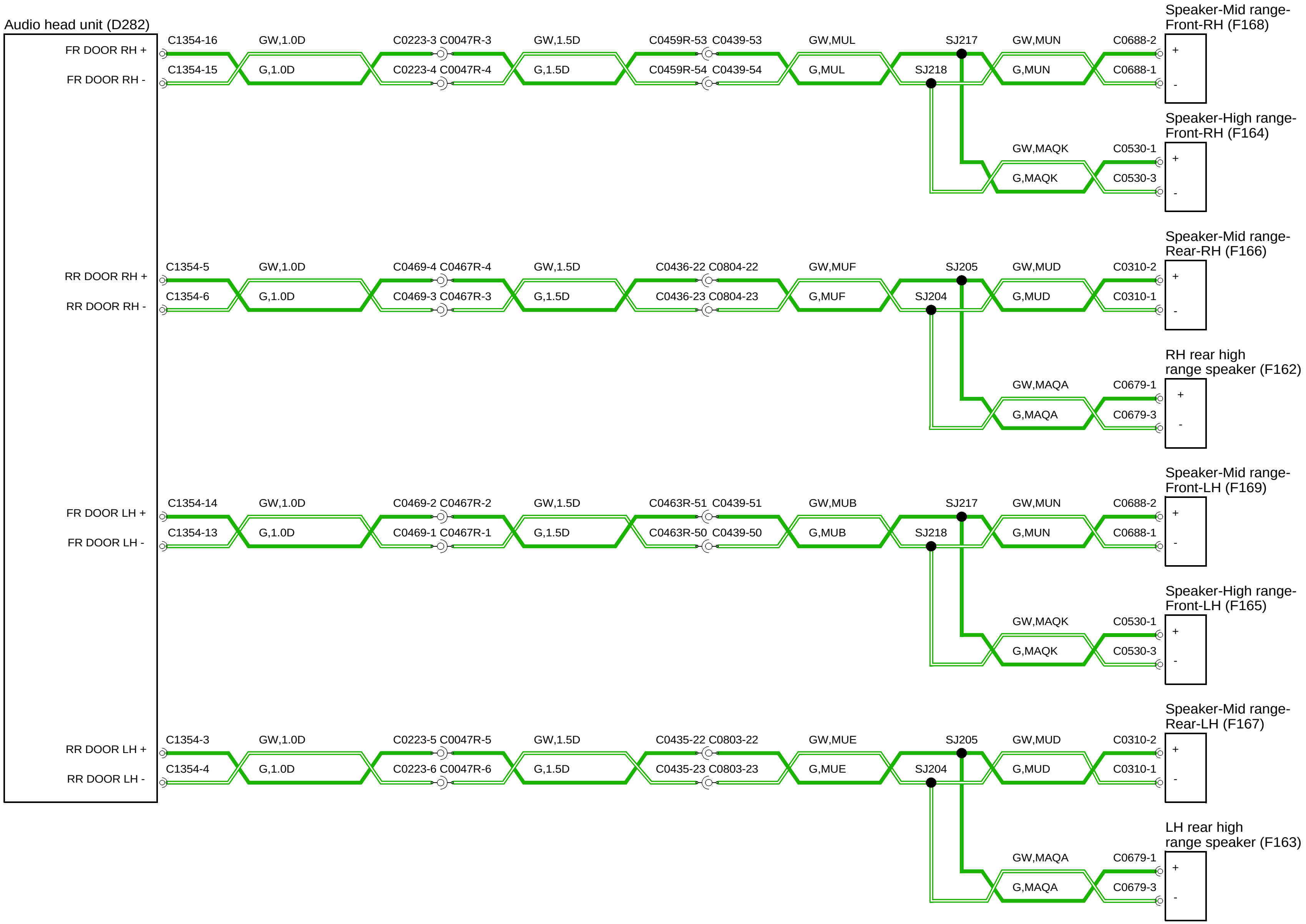

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
Audio head unit (D282)
SWS 1
GND
BATT
RLY CTRL
C1354-18
SB,0.35D
C1354-7
SR,0.35D
C1354-11
PU,1.5D
C1354-8
C0082-4
C0082-7
Clock spring (S227)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone-Send (Y281)
Phone-End (Y282)
Mode (Y283)
(DVD)
PU,0.75D
AB1
Sheet3
SJ131
PU,0.75D
C2247-12 C2249-12
(NAV + DVD)
PU,0.75D
P
Sheet3
(NAV)
PU,0.75D
P1
Sheet4
Central junction-box (P101)
C0582-34
RU,0.5D
FUSE 53P
15.0 Amps
C0582-38
PU,1.5D
PU,0.75D
X
Sheet4
FUSE 58P
10.0 Amps
C0582-13
U,1.0D
SJ998
U,0.5D
TT
Sheet4
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet4
Relay-Infotainment (R249)
C0583R-22
U,0.35D
OO
Sheet7
U,0.5D
UU
Sheet7
FUSE 57P
10.0 Amps
C0582-12
N,0.75D
C2247-1 C2249-1
N,0.5D
G
Sheet3
FUSE 52P
5.0 Amps
C0582-41
R,0.75D
SS
Sheet7

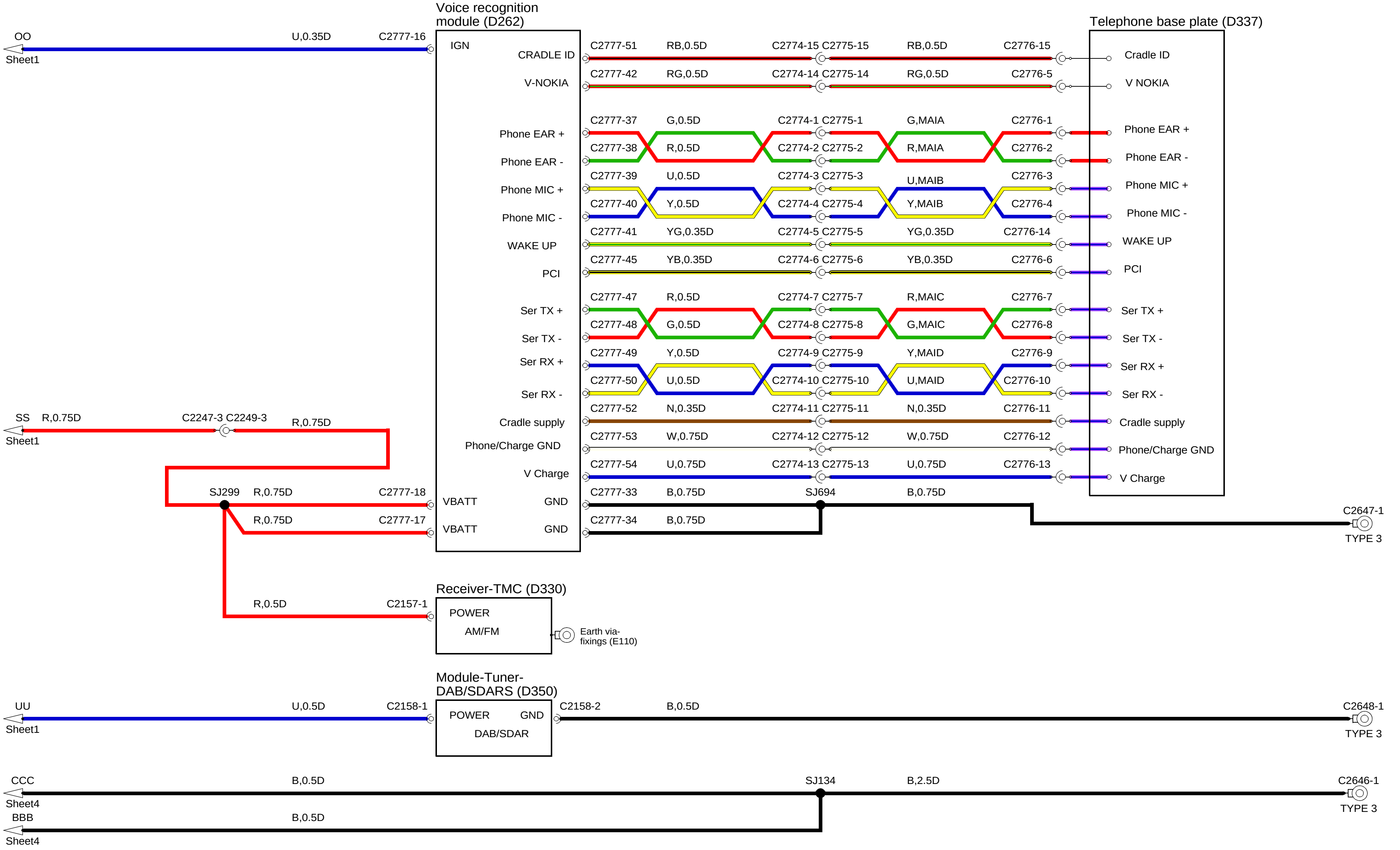

Audio head unit (D282)
SCR,MQB
SCR,MQC
SCR,MQH
SCR,MQA
AV input panel (D346)
(NAV)
C2249-14 C2247-14
R,0.5D
C2115-2
+
L
C2115-8
R,0.5D
C0223-12 C0047R-12
R,0.5D
C2053-13 C2054-13
R,MQA
C2831-4
L
R
C2115-7
U,0.5D
C0223-10 C0047R-10
U,0.5D
C2053-14 C2054-14
U,MQA
C2831-3
R
-VE
C2115-6
C0223-11 C0047R-11
C2053-15 C2054-15
C2831-2
GND
(NAV)
C2249-15 C2247-15
B,0.5D
C2115-4
-
GND
C2115-12
B,0.5D
C2626-1
TYPE 3
(NAV)
C2249-16 C2247-16
C2115-1
SCR
GND
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
B,0.75D
C2640-3 C2639-3
B,0.75D
TYPE 3
SJ965
YU,0.5D
C1354-9
MS CAN H
SJ975
YW,0.5D
C1354-10
MS CAN L
SCR,MQC
SJ693
SCR,MQA
MM
Sheet4
B,0.5D
SJ692
B,0.5D
LL
Sheet4
R,0.5D
SJ691
R,0.5D
KK
Sheet4
Lamp-Interior-Front (B100)
(NAV)
SCR,MQF
C0395-4 C0981-4
SCR,MANT
C0084R-19 C0610-19
SCR,MQB
Microphone (F172)
(NO NAV)
SCR,MQG
B,0.5D
C0084R-17 C0610-17
B,MQB
C1462-1
MIC -
(NAV)
B,MQF
C0395-2 C0981-2
R,0.5D
C0084R-18 C0610-18
R,MQB
C1462-2
MIC +
(NO NAV)
B,0.5D
(NAV)
R,0.5D
C0395-3 C0981-3
(NO NAV)
R,0.5D

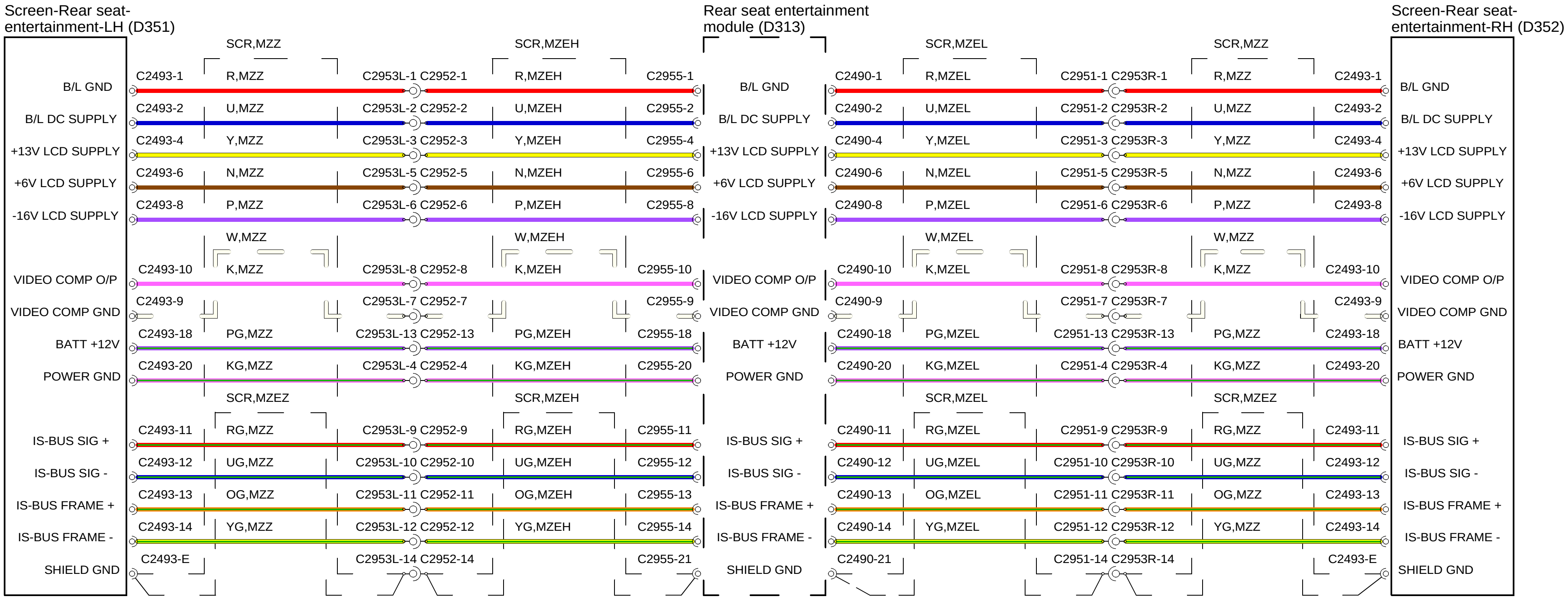

AV input panel (D346)
AUX 1 VIDEO +
AUX 1 VIDEO -
AUX 1 AUDIO R+
AUX 1 AUDIO R-
AUX 1 AUDIO L+
AUX 1 AUDIO L-
AUX 2 VIDEO +
AUX 2 VIDEO -
AUX 2 AUDIO R+
AUX 2 AUDIO R-
AUX 2 AUDIO L+
AUX 2 AUDIO L-
C2226-4 R,0.35 C2315-1 C2314-1 R,MZEI C2491-1
C2226-5 U,0.35 C2315-2 C2314-2 U,MZEI C2491-2
C2226-6 O,0.35 C2315-3 C2314-3 O,MZEI C2491-3
C2226-7 Y,0.35 C2315-4 C2314-4 Y,MZEI C2491-4
C2226-8 G,0.35 C2315-5 C2314-5 G,MZEI C2491-5
C2226-9 N,0.35 C2315-6 C2314-6 N,MZEI C2491-6
C2226-10 B,0.35 C2315-7 C2314-7 B,MZEI C2491-7
C2226-11 P,0.35 C2315-8 C2314-8 P,MZEI C2491-8
C2226-12 W,0.35 C2315-9 C2314-9 W,MZEI C2491-9
C2226-13 K,0.35 C2315-10 C2314-10 K,MZEI C2491-10
C2226-14 RG,0.35 C2315-11 C2314-11 RG,MZEI C2491-11
C2226-15 UG,0.35 C2315-12 C2314-12 UG,MZEI C2491-12
RR SCR,MANZ C2247-22 C2249-22 SCR,MANZ C2116-17
Sheet4
G N,0.5D C2116-1
Sheet1
POWER
Rear seat entertainment module (D313)
GND
C2492-3 R,MZEJ C2494-3
C2492-5 G,MZEJ C2494-5
C2492-6 Y,MZEJ C2494-6
C2492-7 O,MZEJ C2494-7
C2492-8 U,MZEJ C2494-8
C2492-9 RG,MZEJ C2494-9
C2492-10 UG,MZEJ C2494-10
C2492-12 N,MZEJ C2494-12
C2492-13 P,MZEJ C2494-13
C2492-14 K,MZEJ C2494-14
C2116-3 B,0.5D
Module-DVD (D349)
DVD CONT
DVD STATUS 2
POWER
DVD VIDEO GND
DVD VIDEO SIG
DVD AUDIO GND
DVD STATUS 1
DVD START UP
DVD AUDIO R
DVD AUDIO L
SCR GND
GND
C2832-4
(DVD) PU,0.75D AB1
Sheet1
(NAV + DVD) PU,0.75D SJ138 PU,0.75D AB
Sheet4
PU,0.75D P
Sheet1
C2832-2 B,0.5D SJ696 B,0.5D C2977-1
TYPE 3

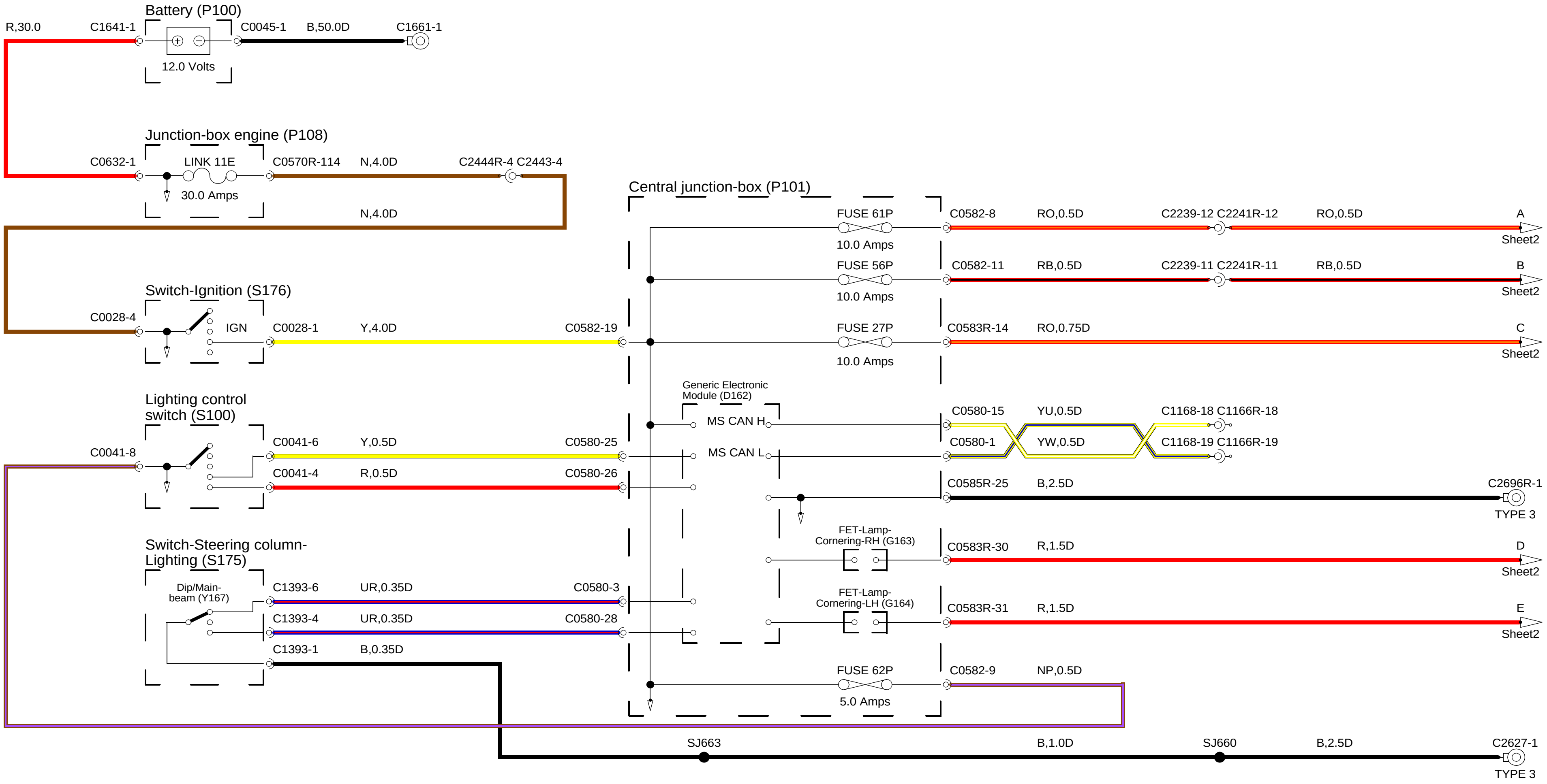

Touch screen display (D326)
BBB
Sheet7
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
RR
Sheet3
COAX 3
SCR,MANZ
C2820-1
VIDEO
X
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
POWER
DISPLAY
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
DIMMING
Navigation system module (D325)
AUDIO GND
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,0.5D
C2249-8 C2247-8
Y,0.5D
C2819-7
AUDIO -
CCC
Sheet7
B,0.5D
SJ695
B,0.5D
C2114-3
MMM
AUDIO +
C2114-30
G,0.5D
C2249-9 C2247-9
G,0.5D
C2819-17
AUDIO +
GND
B,0.5D
C2114-19
GND
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2823-1
GVIF +
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2823-2
GVIF -
AB
Sheet3
(NAV + DVD)
PU,0.75D
C2114-17
VBATT
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MZE
C2823-3
GVIF SHIELD
P1
Sheet1
(NAV)
PU,0.75D
KK
Sheet2
R,0.5D
C2114-32
MIC +
PRIVATE CAN H
C2114-22
G,0.5D
C2249-5 C2247-5
G,0.5D
C2819-14
CAN H
LL
Sheet2
B,0.5D
C2114-16
MIC -
PRIVATE CAN L
C2114-6
Y,0.5D
C2249-4 C2247-4
Y,0.5D
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR
VEHICLE SPEED
C2114-21
G,0.5D
C0395-1 C0981-1
G,0.5D
ABS module (D277)
C0506R-33
G,0.5D
C2245R-15 C2243R-15

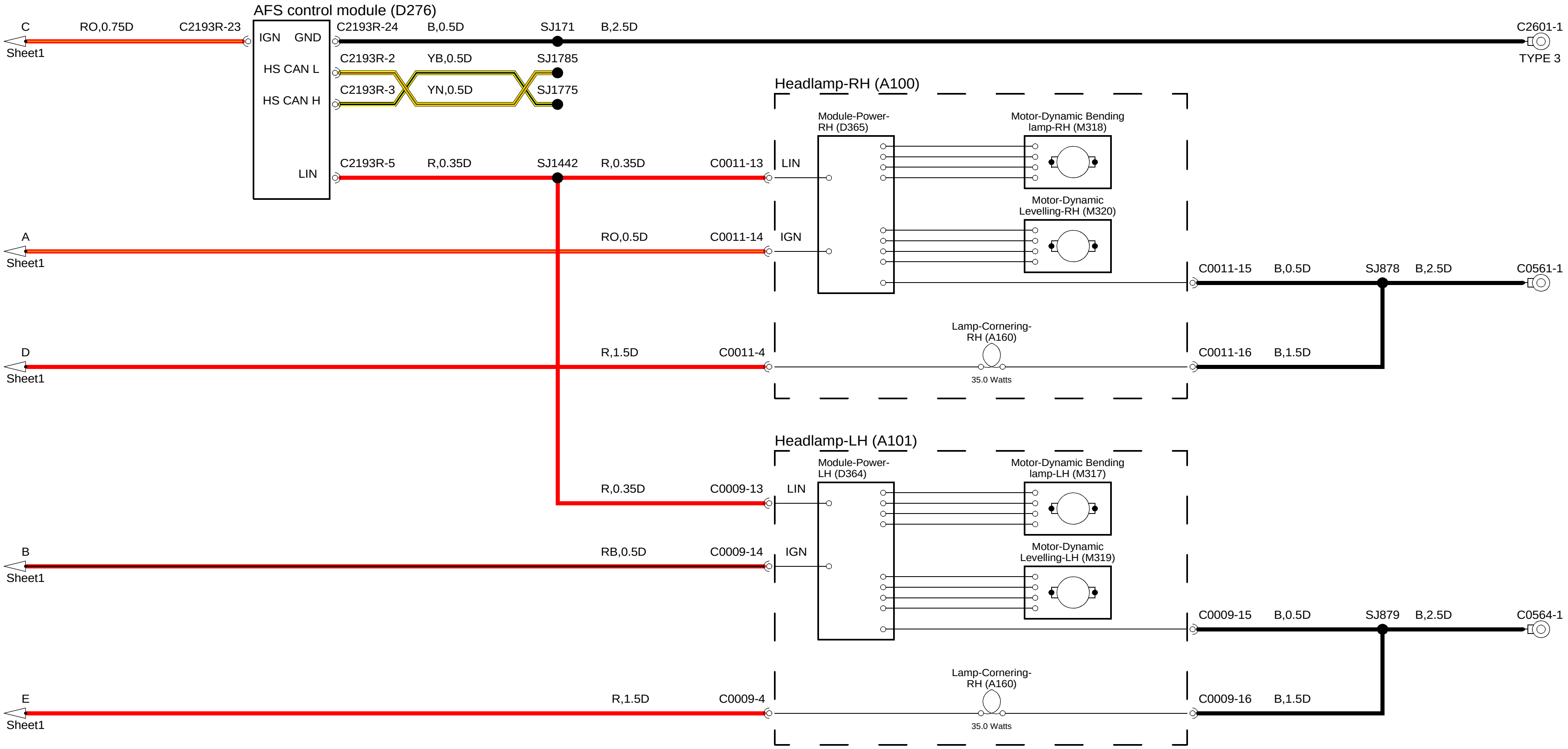

Navigation system module (D325)
C2661-1
P,MZEB
COAX 4 (NAVIGATION)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Receiver-TMC (D330)
C2669-1
COAX 6
P,MZEC
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via-fixings (E110)
AM/FM diversity antenna amplifier (F212)
Earth via-fixings (E110)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
COAX 14A
C2620-1 C2616-1
COAX 14B
P,MZEA
C1848-2
RF OUT
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495
UR,0.5D
C2219-1
POWER
RF IN
C1848-1
P,MZEA
COAX 15
C2554-1
UR,0.5D
C2218-1
FM antenna amplifier (F213)
Earth via-fixings (E110)
RF OUT
POWER

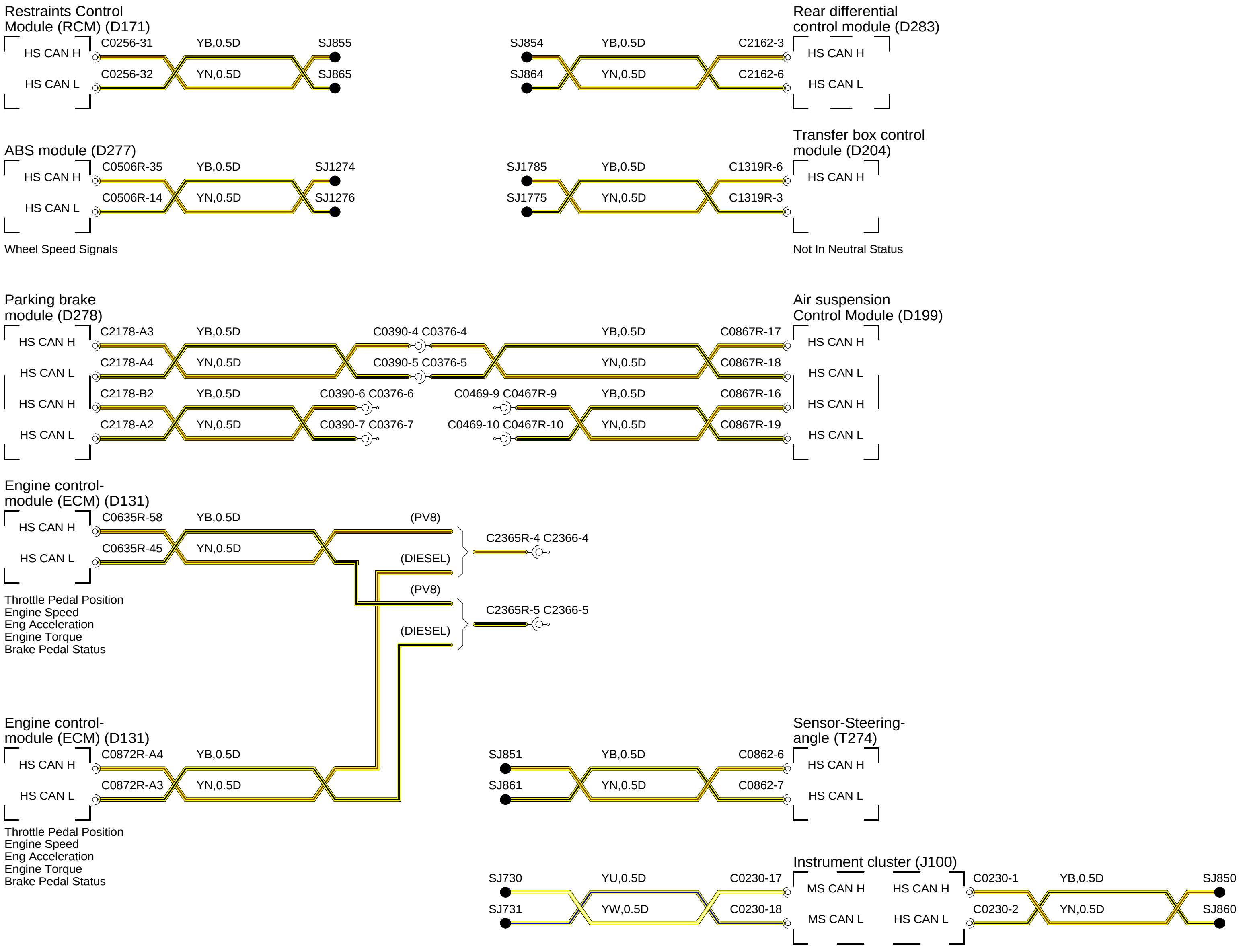

Audio head unit (D282)
FR DOOR RH +
FR DOOR RH -
RR DOOR RH +
RR DOOR RH -
FR DOOR LH +
FR DOOR LH -
RR DOOR LH +
RR DOOR LH -
C1354-16
C1354-15
GW,1.0D
G,1.0D
C0223-3 C0047R-3
C0223-4 C0047R-4
GW,1.5D
G,1.5D
C0459R-53 C0439-53
C0459R-54 C0439-54
GW,MUL
G,MUL
SJ217
SJ218
GW,MUN
G,MUN
C0688-2
C0688-1
Speaker-Mid range-Front-RH (F168)
GW,MAQK
G,MAQK
C0530-1
C0530-3
Speaker-High range-Front-RH (F164)
C1354-5
C1354-6
C0469-4 C0467R-4
C0469-3 C0467R-3
C0436-22 C0804-22
C0436-23 C0804-23
GW,MUF
G,MUF
SJ205
SJ204
GW,MUD
G,MUD
C0310-2
C0310-1
Speaker-Mid range-Rear-RH (F166)
GW,MAQA
G,MAQA
C0679-1
C0679-3
RH rear high range speaker (F162)
C1354-14
C1354-13
C0469-2 C0467R-2
C0469-1 C0467R-1
C0463R-51 C0439-51
C0463R-50 C0439-50
GW,MUB
G,MUB
Speaker-Mid range-Front-LH (F169)
Speaker-High range-Front-LH (F165)
C1354-3
C1354-4
C0223-5 C0047R-5
C0223-6 C0047R-6
C0435-22 C0803-22
C0435-23 C0803-23
GW,MUE
G,MUE
Speaker-Mid range-Rear-LH (F167)
LH rear high range speaker (F163)
+
-

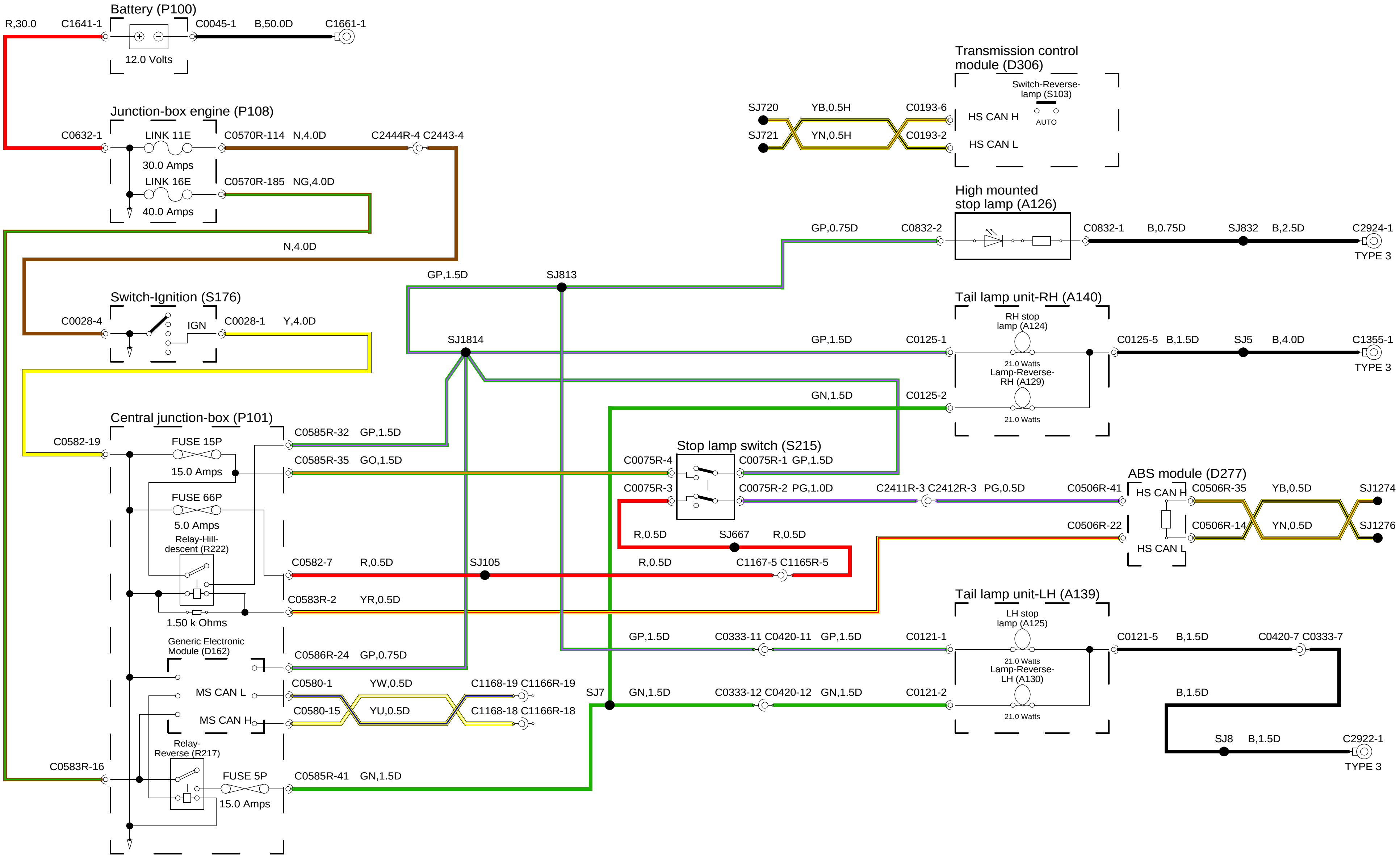

Voice recognition module (D262)
Telephone base plate (D337)
OO
Sheet1
U,0.35D
C2777-16
IGN
CRADLE ID
V-NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE UP
PCI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
VBATT
GND
VBATT
GND
C2777-51
RB,0.5D
C2774-15 C2775-15
RB,0.5D
C2776-15
C2777-42
RG,0.5D
C2774-14 C2775-14
RG,0.5D
C2776-5
C2777-37
G,0.5D
C2774-1 C2775-1
G,MAIA
C2776-1
C2777-38
R,0.5D
C2774-2 C2775-2
R,MAIA
C2776-2
C2777-39
U,0.5D
C2774-3 C2775-3
U,MAIB
C2776-3
C2777-40
Y,0.5D
C2774-4 C2775-4
Y,MAIB
C2776-4
C2777-41
YG,0.35D
C2774-5 C2775-5
YG,0.35D
C2776-14
C2777-45
YB,0.35D
C2774-6 C2775-6
YB,0.35D
C2776-6
C2777-47
R,0.5D
C2774-7 C2775-7
R,MAIC
C2776-7
C2777-48
G,0.5D
C2774-8 C2775-8
G,MAIC
C2776-8
C2777-49
Y,0.5D
C2774-9 C2775-9
Y,MAID
C2776-9
C2777-50
U,0.5D
C2774-10 C2775-10
U,MAID
C2776-10
C2777-52
N,0.35D
C2774-11 C2775-11
N,0.35D
C2776-11
C2777-53
W,0.75D
C2774-12 C2775-12
W,0.75D
C2776-12
C2777-54
U,0.75D
C2774-13 C2775-13
U,0.75D
C2776-13
C2777-33
B,0.75D
SJ694
B,0.75D
C2777-34
B,0.75D
C2647-1
TYPE 3
Cradle ID
V NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE UP
PCI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
SS
R,0.75D
Sheet1
C2247-3 C2249-3
R,0.75D
SJ299
R,0.75D
C2777-18
R,0.75D
C2777-17
Receiver-TMC (D330)
R,0.5D
C2157-1
POWER
AM/FM
Earth via-fixings (E110)
Module-Tuner-DAB/SDARS (D350)
UU
Sheet1
U,0.5D
C2158-1
POWER
GND
DAB/SDAR
C2158-2
B,0.5D
C2648-1
TYPE 3
CCC
Sheet4
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
BBB
Sheet4
B,0.5D

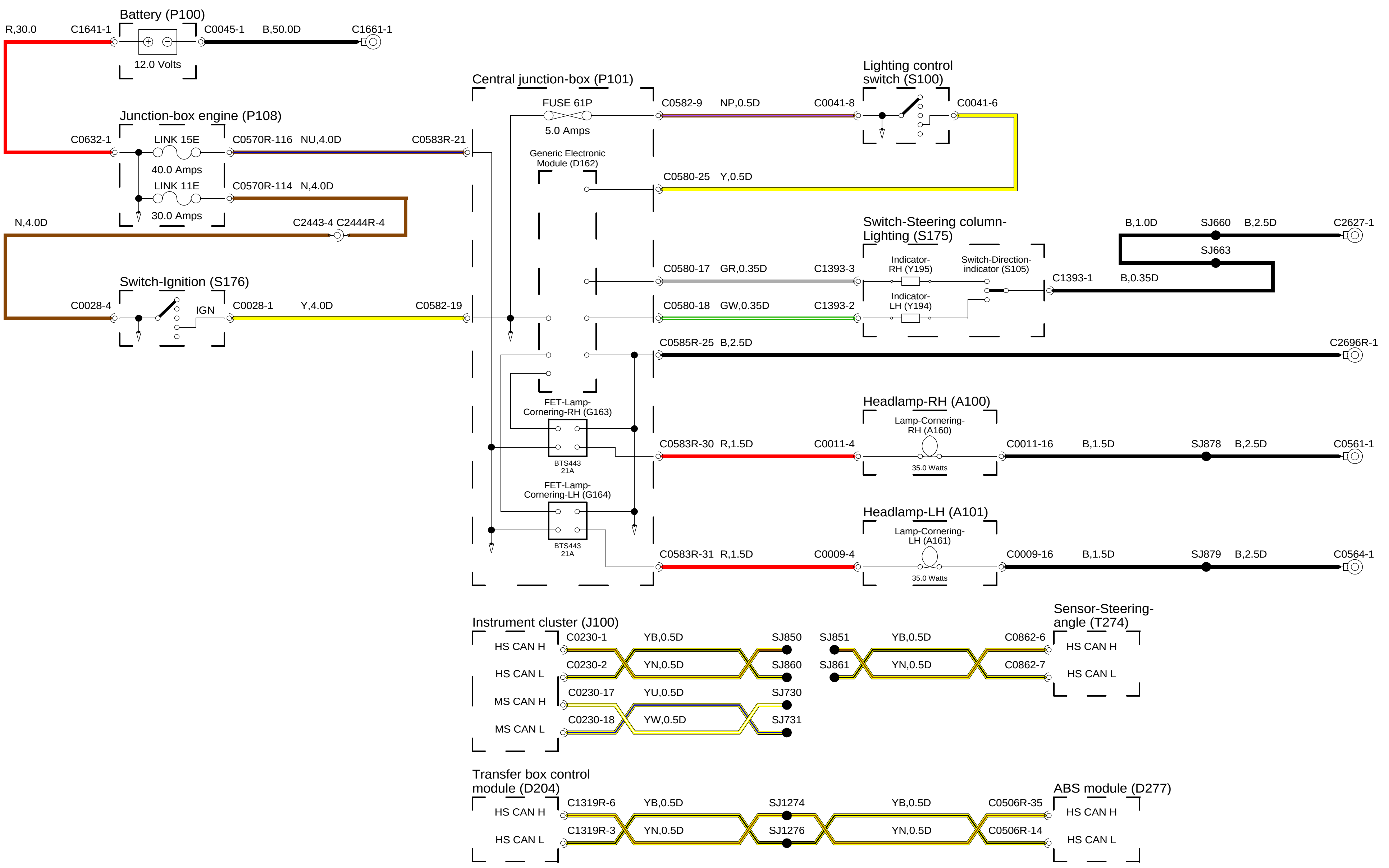

Screen-Rear seat-entertainment-LH (D351)
Rear seat entertainment module (D313)
Screen-Rear seat-entertainment-RH (D352)
SCR,MZZ
SCR,MZEH
SCR,MZEL
SCR,MZZ
B/L GND
C2493-1
R,MZZ
C2953L-1 C2952-1
R,MZEH
C2955-1
B/L GND
C2490-1
R,MZEL
C2951-1 C2953R-1
R,MZZ
C2493-1
B/L GND
B/L DC SUPPLY
C2493-2
U,MZZ
C2953L-2 C2952-2
U,MZEH
C2955-2
B/L DC SUPPLY
C2490-2
U,MZEL
C2951-2 C2953R-2
U,MZZ
C2493-2
B/L DC SUPPLY
+13V LCD SUPPLY
C2493-4
Y,MZZ
C2953L-3 C2952-3
Y,MZEH
C2955-4
+13V LCD SUPPLY
C2490-4
Y,MZEL
C2951-3 C2953R-3
Y,MZZ
C2493-4
+13V LCD SUPPLY
+6V LCD SUPPLY
C2493-6
N,MZZ
C2953L-5 C2952-5
N,MZEH
C2955-6
+6V LCD SUPPLY
C2490-6
N,MZEL
C2951-5 C2953R-5
N,MZZ
C2493-6
+6V LCD SUPPLY
-16V LCD SUPPLY
C2493-8
P,MZZ
C2953L-6 C2952-6
P,MZEH
C2955-8
-16V LCD SUPPLY
C2490-8
P,MZEL
C2951-6 C2953R-6
P,MZZ
C2493-8
-16V LCD SUPPLY
W,MZZ
W,MZEH
W,MZEL
W,MZZ
VIDEO COMP O/P
C2493-10
K,MZZ
C2953L-8 C2952-8
K,MZEH
C2955-10
VIDEO COMP O/P
C2490-10
K,MZEL
C2951-8 C2953R-8
K,MZZ
C2493-10
VIDEO COMP O/P
VIDEO COMP GND
C2493-9
C2953L-7 C2952-7
C2955-9
VIDEO COMP GND
C2490-9
C2951-7 C2953R-7
C2493-9
VIDEO COMP GND
BATT +12V
C2493-18
PG,MZZ
C2953L-13 C2952-13
PG,MZEH
C2955-18
BATT +12V
C2490-18
PG,MZEL
C2951-13 C2953R-13
PG,MZZ
C2493-18
BATT +12V
POWER GND
C2493-20
KG,MZZ
C2953L-4 C2952-4
KG,MZEH
C2955-20
POWER GND
C2490-20
KG,MZEL
C2951-4 C2953R-4
KG,MZZ
C2493-20
POWER GND
SCR,MZEZ
SCR,MZEH
SCR,MZEL
SCR,MZEZ
IS-BUS SIG +
C2493-11
RG,MZZ
C2953L-9 C2952-9
RG,MZEH
C2955-11
IS-BUS SIG +
C2490-11
RG,MZEL
C2951-9 C2953R-9
RG,MZZ
C2493-11
IS-BUS SIG +
IS-BUS SIG -
C2493-12
UG,MZZ
C2953L-10 C2952-10
UG,MZEH
C2955-12
IS-BUS SIG -
C2490-12
UG,MZEL
C2951-10 C2953R-10
UG,MZZ
C2493-12
IS-BUS SIG -
IS-BUS FRAME +
C2493-13
OG,MZZ
C2953L-11 C2952-11
OG,MZEH
C2955-13
IS-BUS FRAME +
C2490-13
OG,MZEL
C2951-11 C2953R-11
OG,MZZ
C2493-13
IS-BUS FRAME +
IS-BUS FRAME -
C2493-14
YG,MZZ
C2953L-12 C2952-12
YG,MZEH
C2955-14
IS-BUS FRAME -
C2490-14
YG,MZEL
C2951-12 C2953R-12
YG,MZZ
C2493-14
IS-BUS FRAME -
SHIELD GND
C2493-E
C2953L-14 C2952-14
C2955-21
SHIELD GND
C2490-21
C2951-14 C2953R-14
C2493-E
SHIELD GND

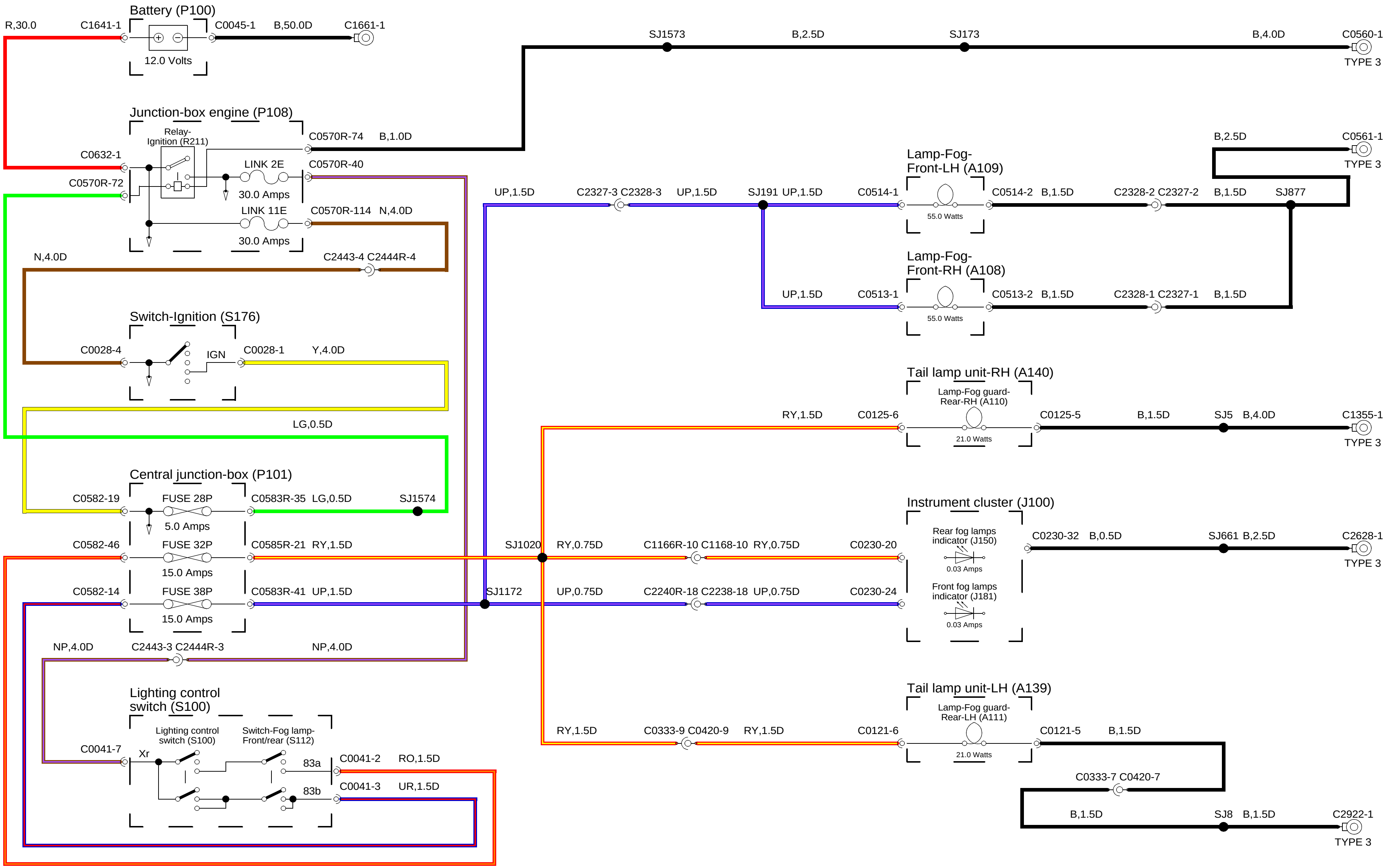

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Central junction-box (P101)
FUSE 61P
10.0 Amps
C0582-8
RO,0.5D
C2239-12 C2241R-12
RO,0.5D
A
Sheet2
FUSE 56P
10.0 Amps
C0582-11
RB,0.5D
C2239-11 C2241R-11
RB,0.5D
B
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 27P
10.0 Amps
C0583R-14
RO,0.75D
C
Sheet2
Generic Electronic Module (D162)
MS CAN H
MS CAN L
Lighting control switch (S100)
C0041-8
C0041-6
Y,0.5D
C0580-25
C0041-4
R,0.5D
C0580-26
C0580-15
YU,0.5D
C1168-18 C1166R-18
C0580-1
YW,0.5D
C1168-19 C1166R-19
C0585R-25
B,2.5D
C2696R-1
TYPE 3
FET-Lamp-Cornering-RH (G163)
C0583R-30
R,1.5D
D
Sheet2
Switch-Steering column-Lighting (S175)
Dip/Main-beam (Y167)
C1393-6
UR,0.35D
C0580-3
C1393-4
UR,0.35D
C0580-28
FET-Lamp-Cornering-LH (G164)
C0583R-31
R,1.5D
E
Sheet2
C1393-1
B,0.35D
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

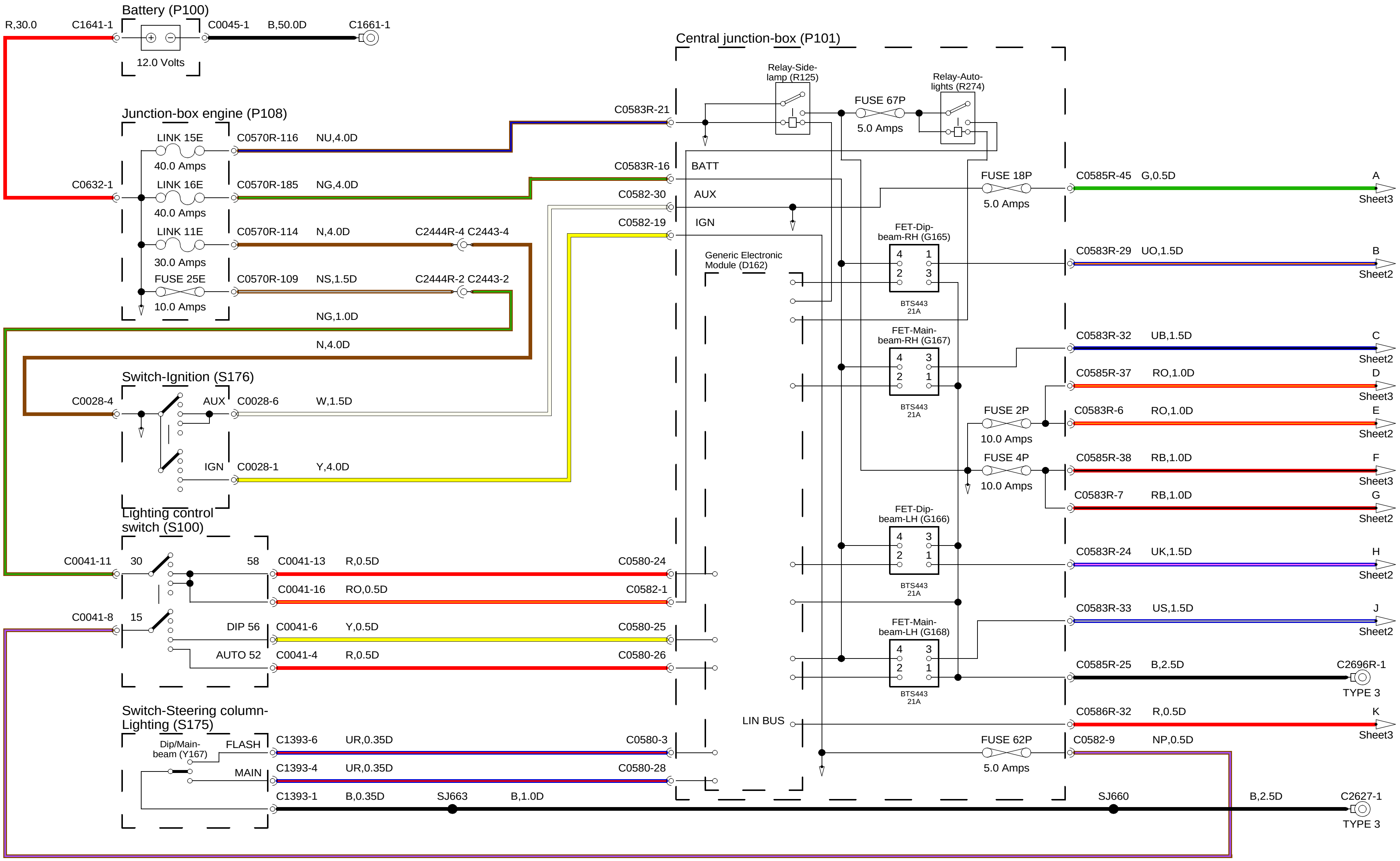

C
Sheet1
RO,0.75D
C2193R-23
AFS control module (D276)
IGN
GND
C2193R-24
B,0.5D
SJ171
B,2.5D
C2601-1
TYPE 3
HS CAN L
C2193R-2
YB,0.5D
SJ1785
HS CAN H
C2193R-3
YN,0.5D
SJ1775
LIN
C2193R-5
R,0.35D
SJ1442
R,0.35D
C0011-13
Headlamp-RH (A100)
Module-Power-RH (D365)
Motor-Dynamic Bending lamp-RH (M318)
LIN
Motor-Dynamic Levelling-RH (M320)
A
Sheet1
RO,0.5D
C0011-14
IGN
C0011-15
B,0.5D
SJ878
B,2.5D
C0561-1
Lamp-Cornering-RH (A160)
35.0 Watts
D
Sheet1
R,1.5D
C0011-4
C0011-16
B,1.5D
Headlamp-LH (A101)
Module-Power-LH (D364)
Motor-Dynamic Bending lamp-LH (M317)
R,0.35D
C0009-13
LIN
Motor-Dynamic Levelling-LH (M319)
B
Sheet1
RB,0.5D
C0009-14
IGN
C0009-15
B,0.5D
SJ879
B,2.5D
C0564-1
Lamp-Cornering-RH (A160)
35.0 Watts
E
Sheet1
R,1.5D
C0009-4
C0009-16
B,1.5D

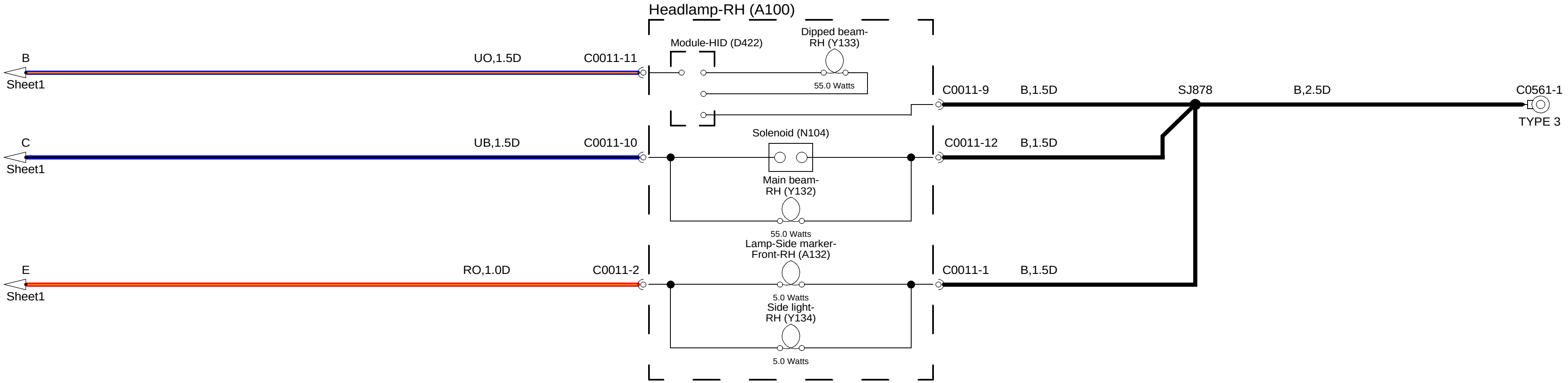

Restraints Control Module (RCM) (D171)
HS CAN H
HS CAN L
C0256-31
C0256-32
YB,0.5D
YN,0.5D
SJ855
SJ865
SJ854
SJ864
YB,0.5D
YN,0.5D
C2162-3
C2162-6
Rear differential control module (D283)
HS CAN H
HS CAN L
ABS module (D277)
HS CAN H
HS CAN L
C0506R-35
C0506R-14
YB,0.5D
YN,0.5D
SJ1274
SJ1276
Wheel Speed Signals
SJ1785
SJ1775
YB,0.5D
YN,0.5D
C1319R-6
C1319R-3
Transfer box control module (D204)
HS CAN H
Not In Neutral Status
Parking brake module (D278)
HS CAN H
HS CAN L
HS CAN H
HS CAN L
C2178-A3
C2178-A4
C2178-B2
C2178-A2
YB,0.5D
YN,0.5D
YB,0.5D
YN,0.5D
C0390-4 C0376-4
C0390-5 C0376-5
C0390-6 C0376-6
C0390-7 C0376-7
C0469-9 C0467R-9
C0469-10 C0467R-10
YB,0.5D
YN,0.5D
YB,0.5D
YN,0.5D
C0867R-17
C0867R-18
C0867R-16
C0867R-19
Air suspension Control Module (D199)
HS CAN H
HS CAN L
HS CAN H
HS CAN L
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0635R-58
C0635R-45
YB,0.5D
YN,0.5D
(PV8)
(DIESEL)
(PV8)
(DIESEL)
C2365R-4 C2366-4
C2365R-5 C2366-5
Throttle Pedal Position
Engine Speed
Eng Acceleration
Engine Torque
Brake Pedal Status
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0872R-A4
C0872R-A3
YB,0.5D
YN,0.5D
Throttle Pedal Position
Engine Speed
Eng Acceleration
Engine Torque
Brake Pedal Status
SJ851
SJ861
YB,0.5D
YN,0.5D
C0862-6
C0862-7
Sensor-Steering-angle (T274)
HS CAN H
HS CAN L
SJ730
SJ731
YU,0.5D
YW,0.5D
C0230-17
C0230-18
Instrument cluster (J100)
MS CAN H
MS CAN L
HS CAN H
HS CAN L
C0230-1
C0230-2
YB,0.5D
YN,0.5D
SJ850
SJ860

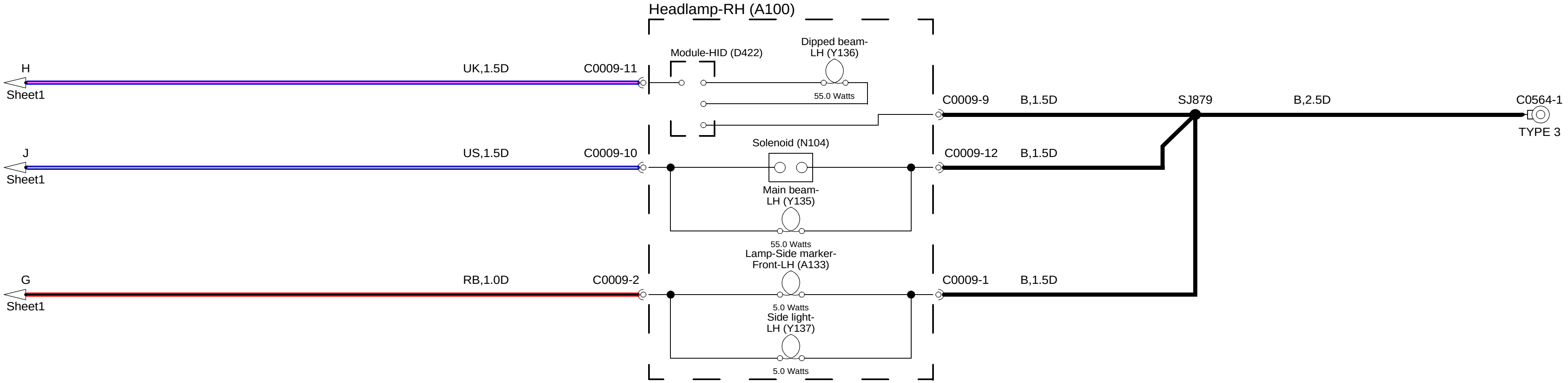

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
LINK 16E
40.0 Amps
C0570R-185
NG,4.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 15P
15.0 Amps
FUSE 66P
5.0 Amps
Relay-Hill-descent (R222)
1.50 k Ohms
Generic Electronic Module (D162)
MS CAN L
MS CAN H
Relay-Reverse (R217)
FUSE 5P
15.0 Amps
C0583R-16
C0585R-32
GP,1.5D
C0585R-35
GO,1.5D
C0582-7
R,0.5D
SJ105
C0583R-2
YR,0.5D
C0586R-24
GP,0.75D
C0580-1
YW,0.5D
C1168-19 C1166R-19
C0580-15
YU,0.5D
C1168-18 C1166R-18
C0585R-41
GN,1.5D
SJ7
GP,1.5D
SJ813
SJ1814
Transmission control module (D306)
Switch-Reverse-lamp (S103)
AUTO
SJ720
YB,0.5H
C0193-6
HS CAN H
SJ721
YN,0.5H
C0193-2
HS CAN L
High mounted stop lamp (A126)
GP,0.75D
C0832-2
C0832-1
B,0.75D
SJ832
B,2.5D
C2924-1
TYPE 3
Tail lamp unit-RH (A140)
RH stop lamp (A124)
GP,1.5D
C0125-1
21.0 Watts
Lamp-Reverse-RH (A129)
GN,1.5D
C0125-2
21.0 Watts
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Stop lamp switch (S215)
C0075R-4
C0075R-3
C0075R-1
GP,1.5D
C0075R-2
PG,1.0D
C2411R-3 C2412R-3
PG,0.5D
R,0.5D
SJ667
R,0.5D
R,0.5D
C1167-5 C1165R-5
ABS module (D277)
C0506R-41
HS CAN H
C0506R-35
YB,0.5D
SJ1274
C0506R-22
C0506R-14
YN,0.5D
SJ1276
HS CAN L
Tail lamp unit-LH (A139)
LH stop lamp (A125)
GP,1.5D
C0333-11 C0420-11
GP,1.5D
C0121-1
21.0 Watts
Lamp-Reverse-LH (A130)
GN,1.5D
C0333-12 C0420-12
GN,1.5D
C0121-2
21.0 Watts
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3

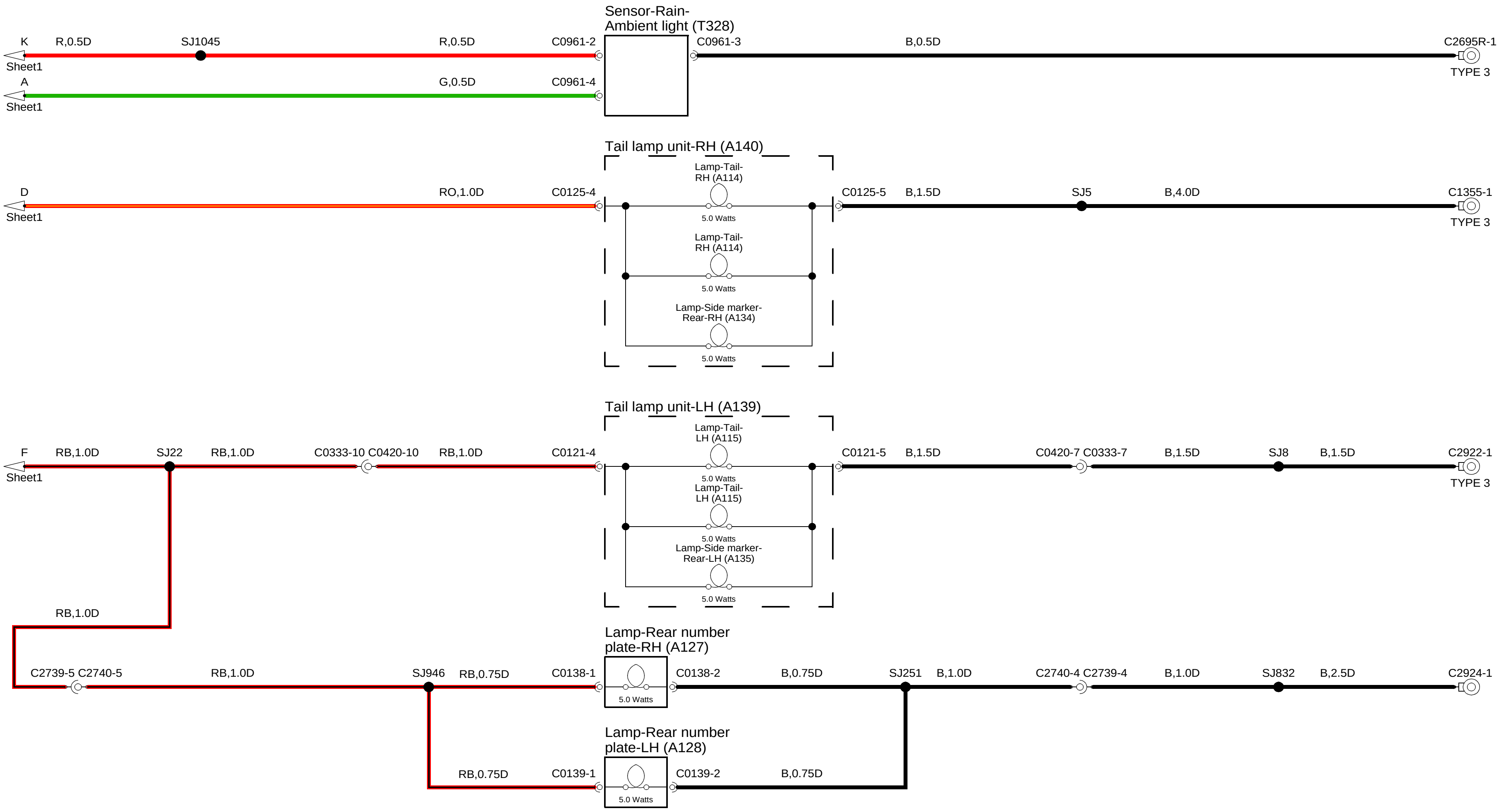

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
LINK 11E
30.0 Amps
C0570R-116
NU,4.0D
C0583R-21
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
Central junction-box (P101)
FUSE 61P
5.0 Amps
Generic Electronic Module (D162)
FET-Lamp-Cornering-RH (G163)
BTS443 21A
FET-Lamp-Cornering-LH (G164)
BTS443 21A
C0582-9
NP,0.5D
C0041-8
Lighting control switch (S100)
C0041-6
C0580-25
Y,0.5D
Switch-Steering column-Lighting (S175)
Indicator-RH (Y195)
Switch-Direction-indicator (S105)
Indicator-LH (Y194)
C0580-17
GR,0.35D
C1393-3
C0580-18
GW,0.35D
C1393-2
C1393-1
B,0.35D
B,1.0D
SJ660
B,2.5D
C2627-1
SJ663
C0585R-25
B,2.5D
C2696R-1
Headlamp-RH (A100)
Lamp-Cornering-RH (A160)
35.0 Watts
C0583R-30
R,1.5D
C0011-4
C0011-16
B,1.5D
SJ878
B,2.5D
C0561-1
Headlamp-LH (A101)
Lamp-Cornering-LH (A161)
35.0 Watts
C0583R-31
R,1.5D
C0009-4
C0009-16
B,1.5D
SJ879
B,2.5D
C0564-1
Instrument cluster (J100)
HS CAN H
HS CAN L
MS CAN H
MS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
SJ851
YB,0.5D
C0862-6
SJ861
YN,0.5D
C0862-7
Sensor-Steering-angle (T274)
HS CAN H
HS CAN L
Transfer box control module (D204)
HS CAN H
HS CAN L
C1319R-6
YB,0.5D
SJ1274
C1319R-3
YN,0.5D
SJ1276
YB,0.5D
C0506R-35
YN,0.5D
C0506R-14
ABS module (D277)
HS CAN H
HS CAN L

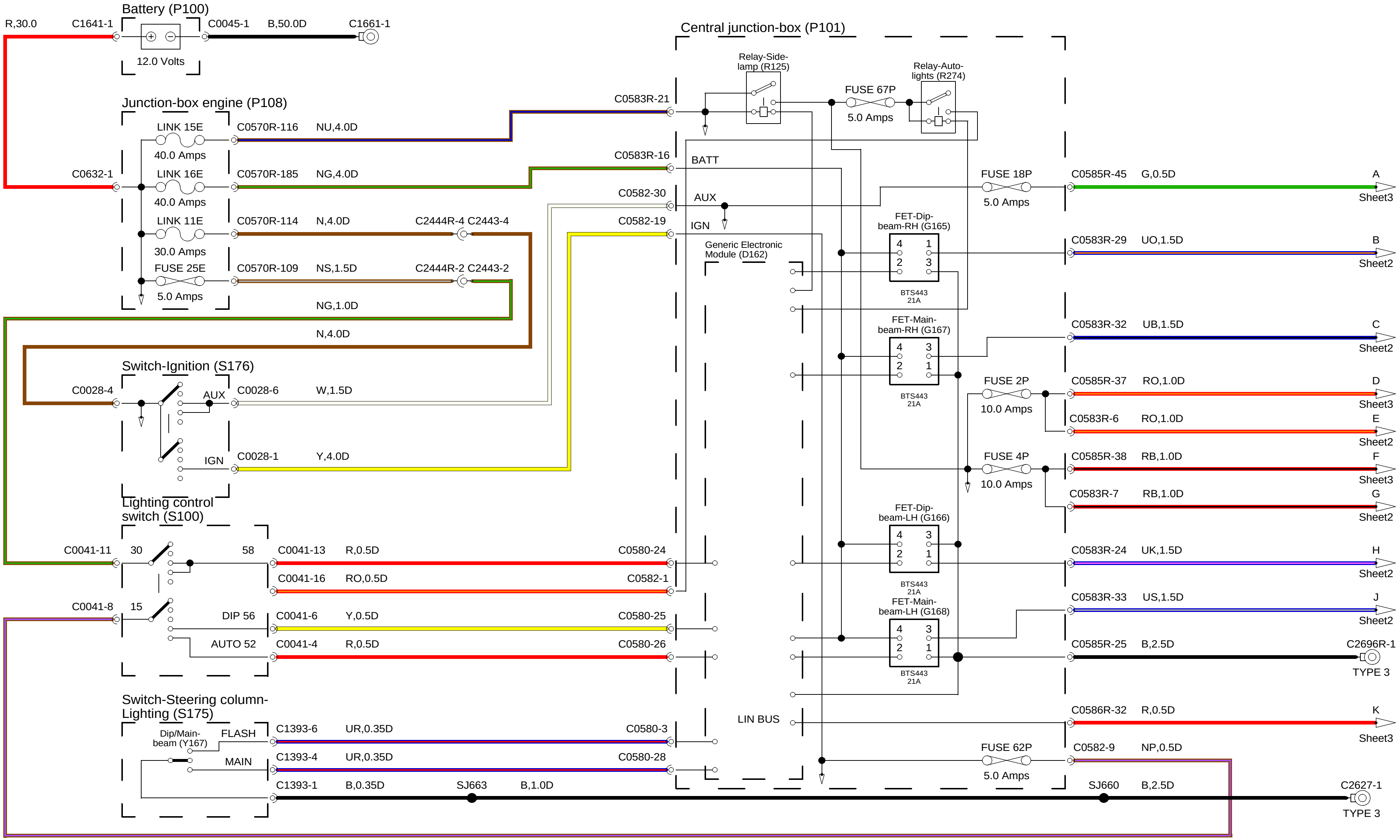

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ1573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Junction-box engine (P108)
Relay-
Ignition (R211)
C0570R-74
B,1.0D
C0632-1
LINK 2E
C0570R-40
C0570R-72
30.0 Amps
LINK 11E
C0570R-114
N,4.0D
30.0 Amps
N,4.0D
C2443-4 C2444R-4
B,2.5D
C0561-1
TYPE 3
Lamp-Fog-
Front-LH (A109)
UP,1.5D
C2327-3 C2328-3
UP,1.5D
SJ191
UP,1.5D
C0514-1
C0514-2
B,1.5D
C2328-2 C2327-2
B,1.5D
SJ877
55.0 Watts
Lamp-Fog-
Front-RH (A108)
UP,1.5D
C0513-1
C0513-2
B,1.5D
C2328-1 C2327-1
B,1.5D
55.0 Watts
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Tail lamp unit-RH (A140)
Lamp-Fog guard-
Rear-RH (A110)
RY,1.5D
C0125-6
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
21.0 Watts
LG,0.5D
Central junction-box (P101)
C0582-19
FUSE 28P
C0583R-35
LG,0.5D
SJ1574
5.0 Amps
Instrument cluster (J100)
Rear fog lamps
indicator (J150)
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
0.03 Amps
C0582-46
FUSE 32P
C0585R-21
RY,1.5D
SJ1020
RY,0.75D
C1166R-10 C1168-10
RY,0.75D
C0230-20
15.0 Amps
Front fog lamps
indicator (J181)
C0582-14
FUSE 38P
C0583R-41
UP,1.5D
SJ1172
UP,0.75D
C2240R-18 C2238-18
UP,0.75D
C0230-24
15.0 Amps
0.03 Amps
NP,4.0D
C2443-3 C2444R-3
NP,4.0D
Tail lamp unit-LH (A139)
Lamp-Fog guard-
Rear-LH (A111)
Lighting control
switch (S100)
RY,1.5D
C0333-9 C0420-9
RY,1.5D
C0121-6
C0121-5
B,1.5D
21.0 Watts
Lighting control
switch (S100)
Switch-Fog lamp-
Front/rear (S112)
C0041-7
Xr
83a
C0041-2
RO,1.5D
C0333-7 C0420-7
83b
C0041-3
UR,1.5D
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3

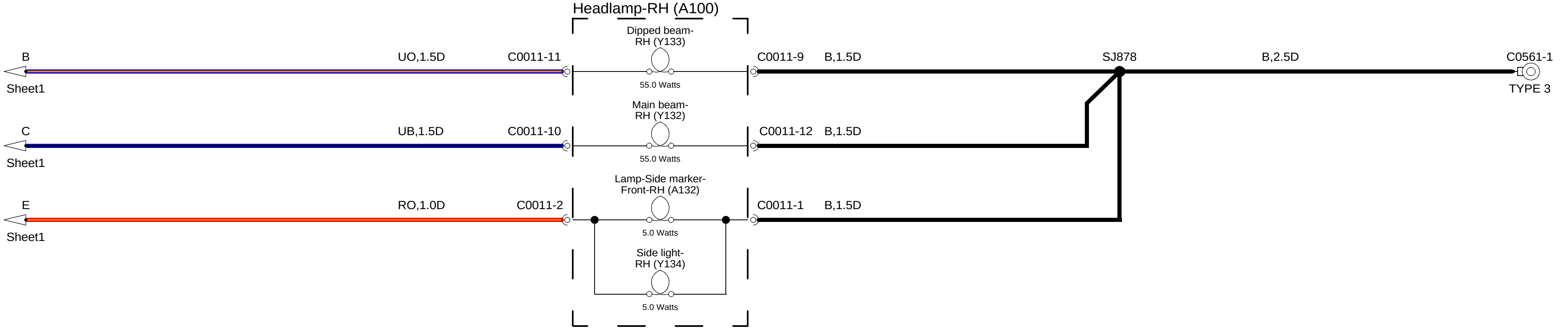

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Relay-Side-lamp (R125)
Relay-Auto-lights (R274)
FUSE 67P
5.0 Amps
Junction-box engine (P108)
C0583R-21
LINK 15E
C0570R-116
NU,4.0D
40.0 Amps
C0583R-16
BATT
C0632-1
LINK 16E
C0570R-185
NG,4.0D
FUSE 18P
C0585R-45
G,0.5D
A
Sheet3
40.0 Amps
C0582-30
AUX
5.0 Amps
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
C0582-19
IGN
FET-Dip-beam-RH (G165)
Generic Electronic Module (D162)
C0583R-29
UO,1.5D
B
Sheet2
30.0 Amps
FUSE 25E
C0570R-109
NS,1.5D
C2444R-2 C2443-2
4
1
2
3
10.0 Amps
BTS443 21A
NG,1.0D
FET-Main-beam-RH (G167)
C0583R-32
UB,1.5D
C
Sheet2
N,4.0D
4
3
2
1
Switch-Ignition (S176)
C0585R-37
RO,1.0D
D
Sheet3
C0028-4
AUX
C0028-6
W,1.5D
BTS443 21A
FUSE 2P
C0583R-6
RO,1.0D
E
10.0 Amps
Sheet2
FUSE 4P
C0585R-38
RB,1.0D
F
IGN
C0028-1
Y,4.0D
10.0 Amps
Sheet3
C0583R-7
RB,1.0D
G
Lighting control switch (S100)
FET-Dip-beam-LH (G166)
Sheet2
4
3
C0041-11
30
58
C0041-13
R,0.5D
C0580-24
2
1
C0583R-24
UK,1.5D
H
Sheet2
BTS443 21A
C0041-16
RO,0.5D
C0582-1
C0041-8
15
C0583R-33
US,1.5D
J
Sheet2
DIP 56
C0041-6
Y,0.5D
C0580-25
FET-Main-beam-LH (G168)
4
3
AUTO 52
C0041-4
R,0.5D
C0580-26
2
1
C0585R-25
B,2.5D
C2696R-1
TYPE 3
BTS443 21A
Switch-Steering column-Lighting (S175)
LIN BUS
C0586R-32
R,0.5D
K
Sheet3
Dip/Main-beam (Y167)
FLASH
C1393-6
UR,0.35D
C0580-3
FUSE 62P
C0582-9
NP,0.5D
MAIN
C1393-4
UR,0.35D
C0580-28
5.0 Amps
C1393-1
B,0.35D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

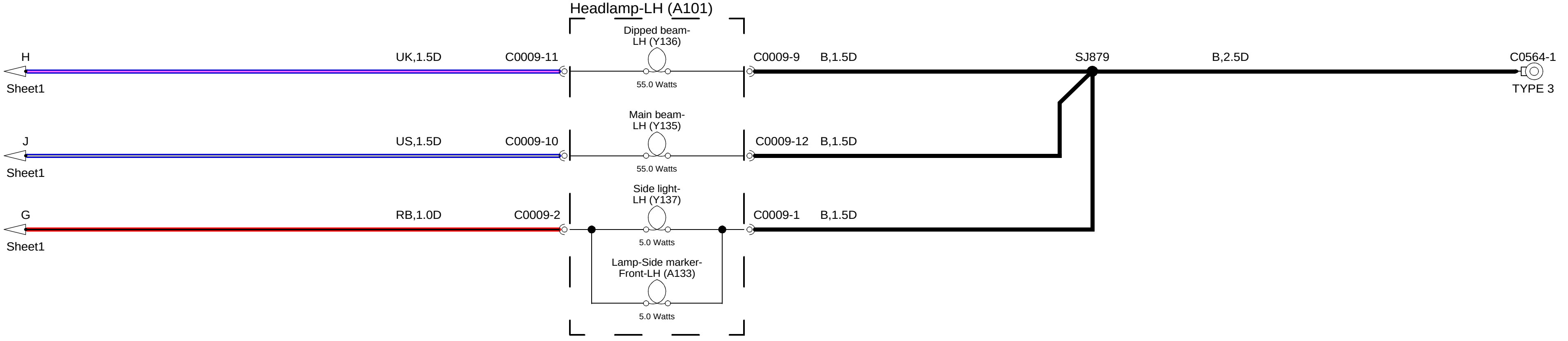

Headlamp-RH (A100)
Module-HID (D422)
Dipped beam-
RH (Y133)
55.0 Watts
B
Sheet1
UO,1.5D
C0011-11
C0011-9
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
C
Sheet1
UB,1.5D
C0011-10
Solenoid (N104)
C0011-12
B,1.5D
Main beam-
RH (Y132)
55.0 Watts
Lamp-Side marker-
Front-RH (A132)
E
Sheet1
RO,1.0D
C0011-2
C0011-1
B,1.5D
5.0 Watts
Side light-
RH (Y134)
5.0 Watts

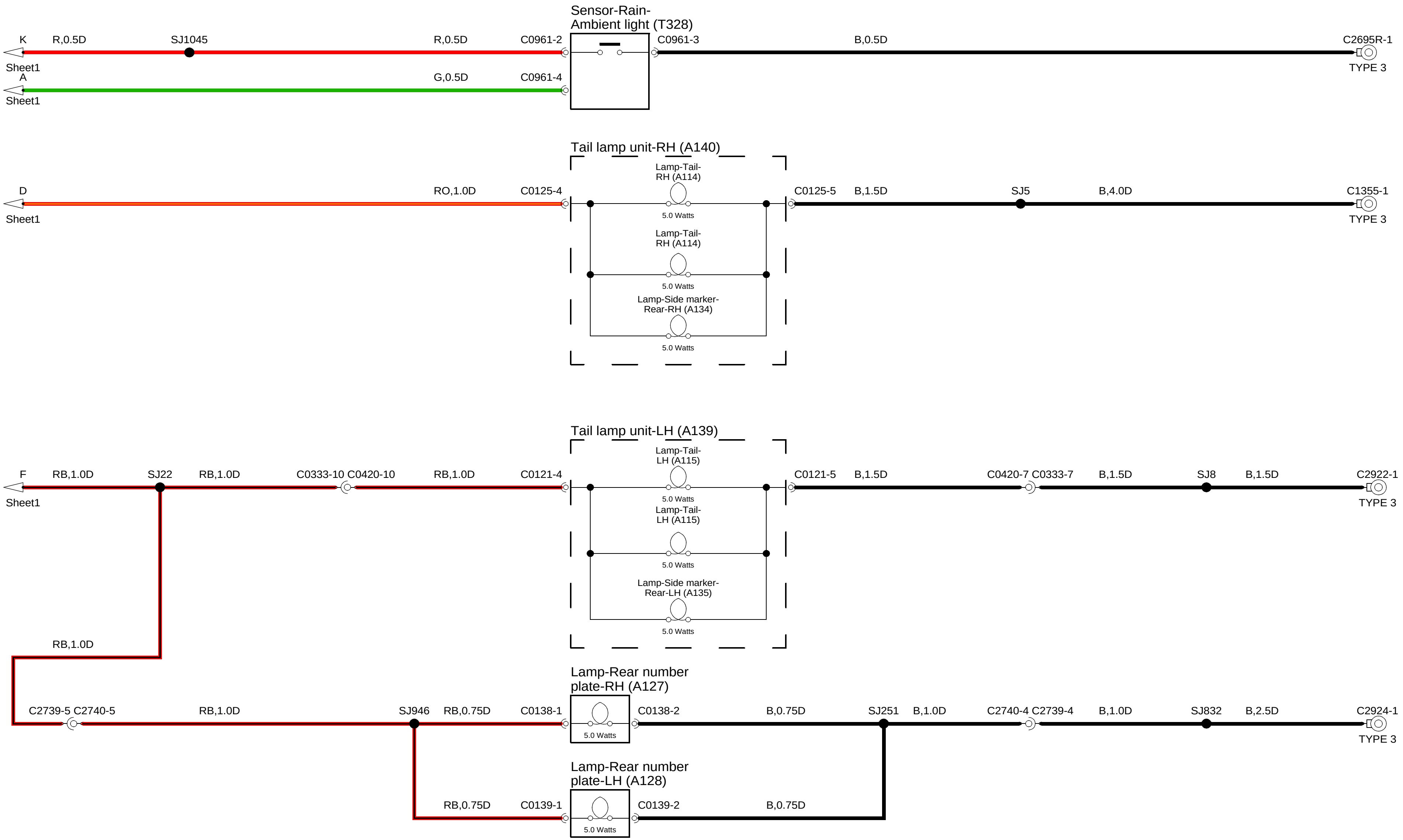

Headlamp-RH (A100)
Module-HID (D422)
Dipped beam-
LH (Y136)
55.0 Watts
H
Sheet1
UK,1.5D
C0009-11
C0009-9
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
J
Sheet1
US,1.5D
C0009-10
Solenoid (N104)
C0009-12
B,1.5D
Main beam-
LH (Y135)
55.0 Watts
Lamp-Side marker-
Front-LH (A133)
G
Sheet1
RB,1.0D
C0009-2
C0009-1
B,1.5D
5.0 Watts
Side light-
LH (Y137)
5.0 Watts

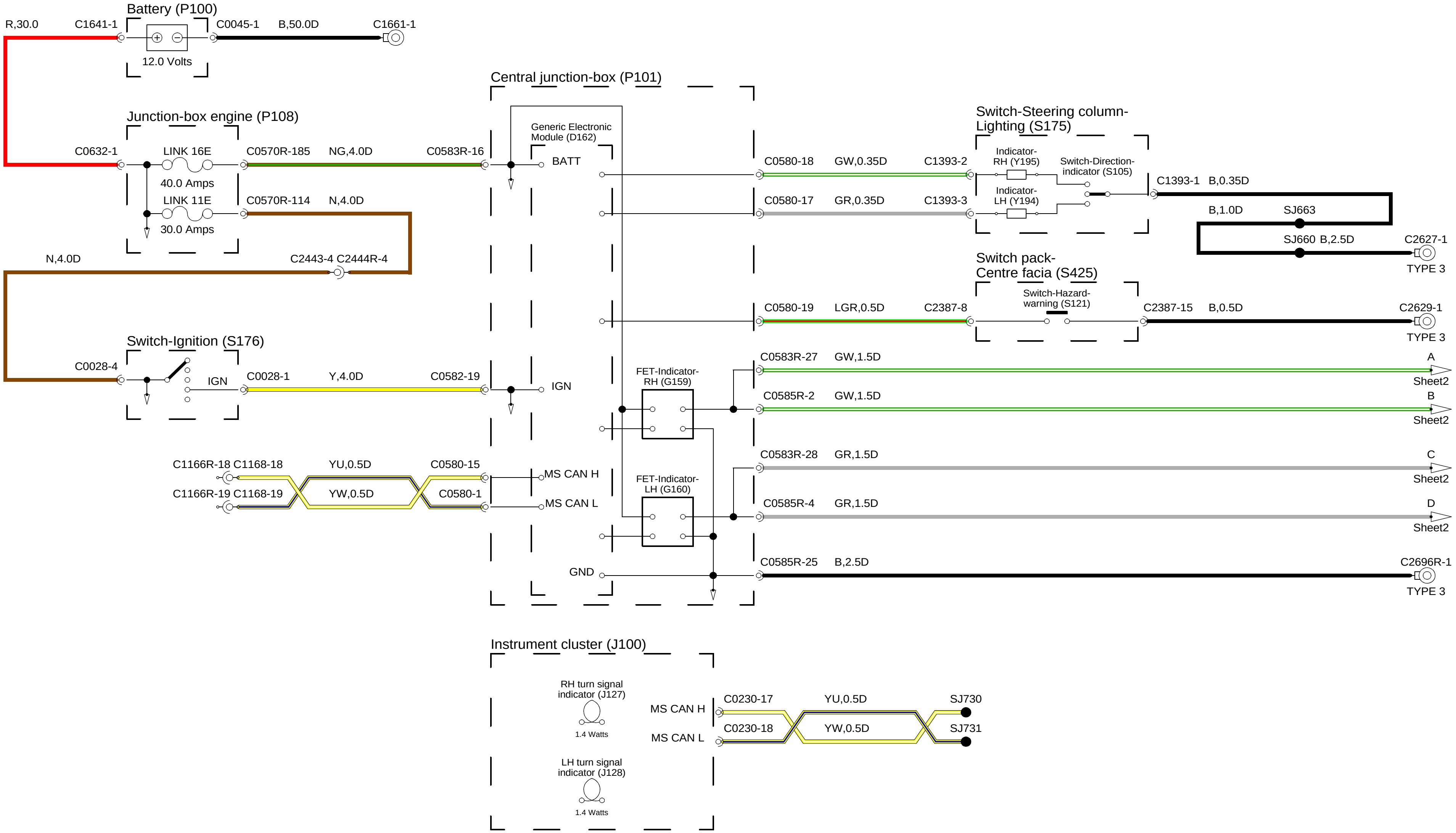

Sensor-Rain-
Ambient light (T328)
K
Sheet1
R,0.5D
SJ1045
R,0.5D
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 3
A
Sheet1
G,0.5D
C0961-4
Tail lamp unit-RH (A140)
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Side marker-
Rear-RH (A134)
5.0 Watts
D
Sheet1
RO,1.0D
C0125-4
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Tail lamp unit-LH (A139)
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Side marker-
Rear-LH (A135)
5.0 Watts
F
Sheet1
RB,1.0D
SJ22
RB,1.0D
C0333-10 C0420-10
RB,1.0D
C0121-4
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
RB,1.0D
Lamp-Rear number
plate-RH (A127)
5.0 Watts
C2739-5 C2740-5
RB,1.0D
SJ946
RB,0.75D
C0138-1
C0138-2
B,0.75D
SJ251
B,1.0D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
Lamp-Rear number
plate-LH (A128)
5.0 Watts
RB,0.75D
C0139-1
C0139-2
B,0.75D

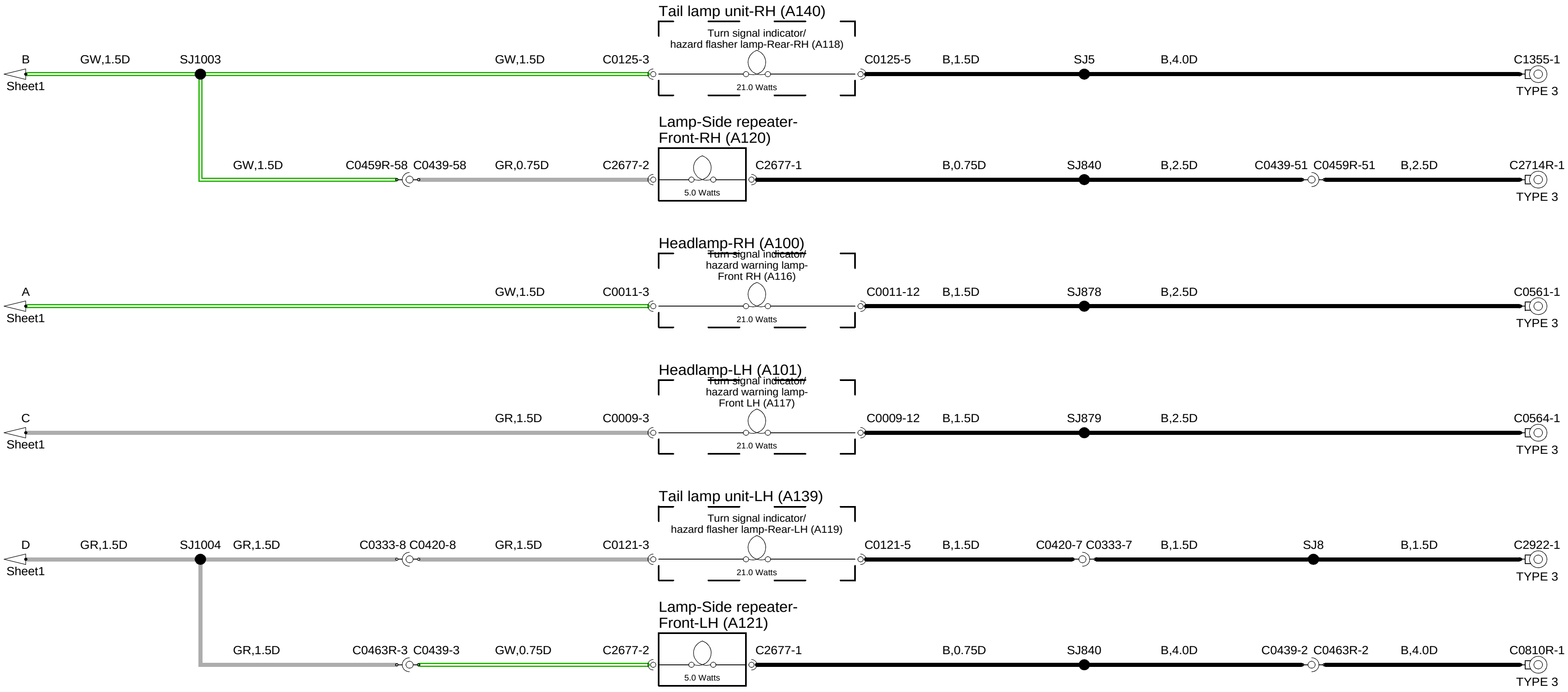

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Relay-Side-lamp (R125)
Relay-Auto-lights (R274)
FUSE 67P
5.0 Amps
Junction-box engine (P108)
C0583R-21
LINK 15E
C0570R-116
NU,4.0D
40.0 Amps
C0583R-16
BATT
C0632-1
LINK 16E
C0570R-185
NG,4.0D
FUSE 18P
C0585R-45
G,0.5D
A
Sheet3
40.0 Amps
C0582-30
AUX
5.0 Amps
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
C0582-19
IGN
FET-Dip-beam-RH (G165)
30.0 Amps
Generic Electronic Module (D162)
C0583R-29
UO,1.5D
B
Sheet2
FUSE 25E
C0570R-109
NS,1.5D
C2444R-2 C2443-2
4
1
2
3
5.0 Amps
NG,1.0D
BTS443
21A
FET-Main-beam-RH (G167)
C0583R-32
UB,1.5D
C
N,4.0D
Sheet2
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
FUSE 2P
C0585R-37
RO,1.0D
D
Sheet3
10.0 Amps
C0583R-6
RO,1.0D
E
Sheet2
IGN
C0028-1
Y,4.0D
FUSE 4P
C0585R-38
RB,1.0D
F
Sheet3
10.0 Amps
C0583R-7
RB,1.0D
G
Lighting control switch (S100)
Sheet3
FET-Dip-beam-LH (G166)
C0041-11
30
58
C0041-13
R,0.5D
C0580-24
C0583R-24
UK,1.5D
H
Sheet2
C0041-16
RO,0.5D
C0582-1
FET-Main-beam-LH (G168)
C0583R-33
US,1.5D
J
C0041-8
15
DIP 56
C0041-6
Y,0.5D
C0580-25
Sheet2
AUTO 52
C0041-4
R,0.5D
C0580-26
C0585R-25
B,2.5D
C2696R-1
TYPE 3
Switch-Steering column-Lighting (S175)
C0586R-32
R,0.5D
K
LIN BUS
Dip/Main-beam (Y167)
FLASH
C1393-6
UR,0.35D
C0580-3
Sheet3
FUSE 62P
C0582-9
NP,0.5D
MAIN
C1393-4
UR,0.35D
C0580-28
5.0 Amps
C1393-1
B,0.35D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

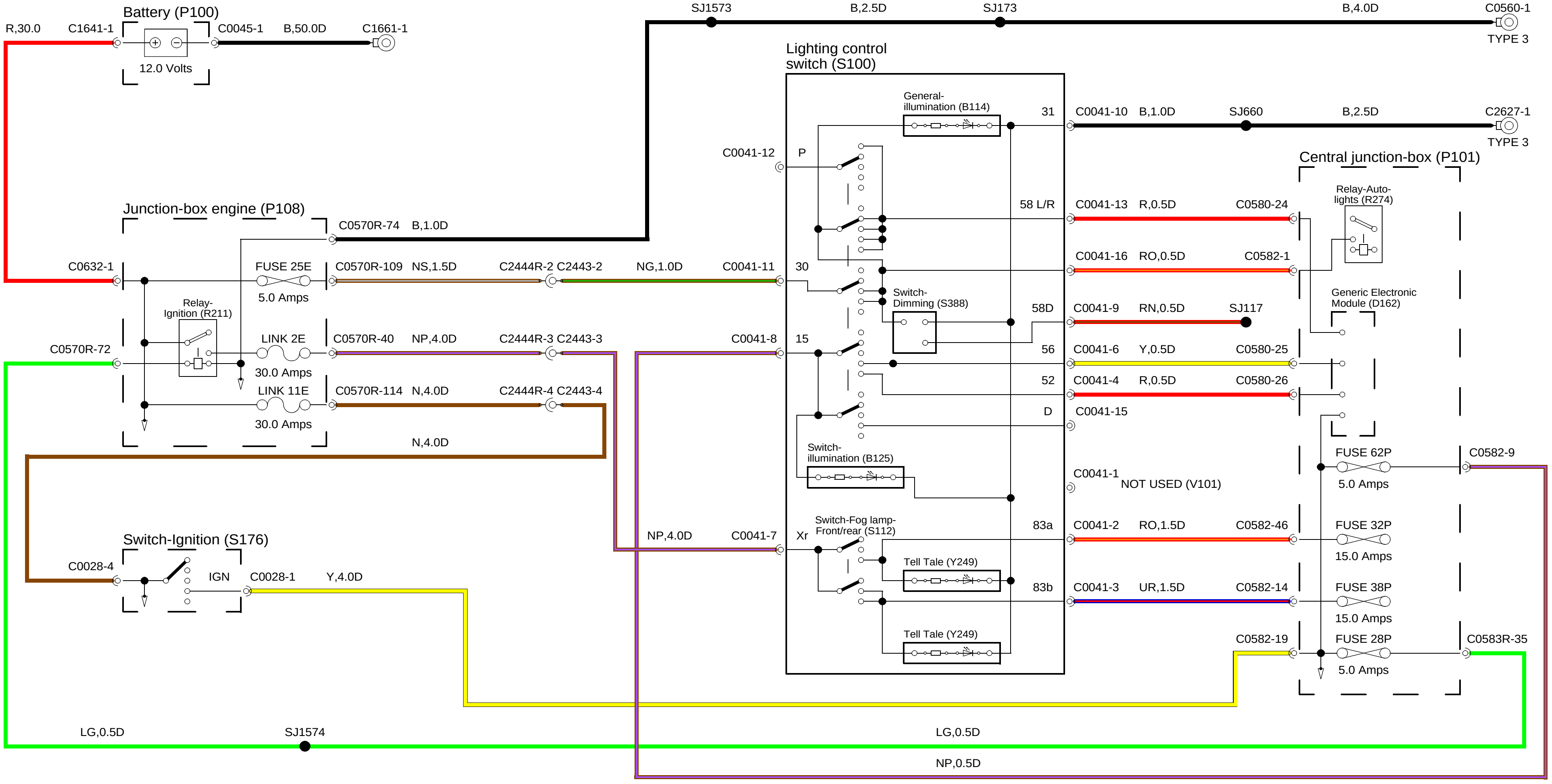

Headlamp-RH (A100)
B
Sheet1
UO,1.5D
C0011-11
Dipped beam-
RH (Y133)
55.0 Watts
C0011-9
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
C
Sheet1
UB,1.5D
C0011-10
Main beam-
RH (Y132)
55.0 Watts
C0011-12
B,1.5D
E
Sheet1
RO,1.0D
C0011-2
Lamp-Side marker-
Front-RH (A132)
5.0 Watts
C0011-1
B,1.5D
Side light-
RH (Y134)
5.0 Watts

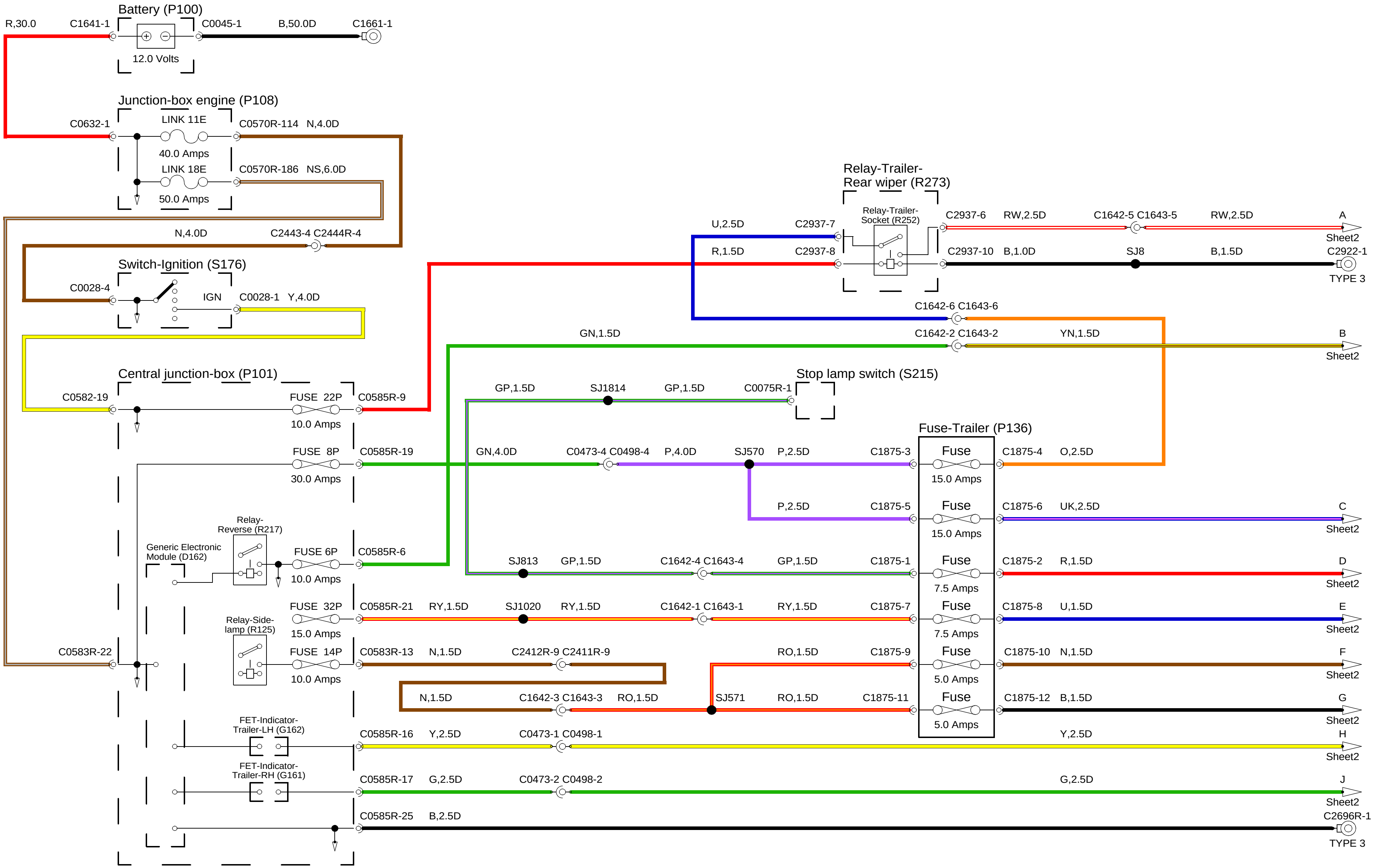

Headlamp-LH (A101)
H
Sheet1
UK,1.5D
C0009-11
Dipped beam-
LH (Y136)
55.0 Watts
C0009-9
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
J
Sheet1
US,1.5D
C0009-10
Main beam-
LH (Y135)
55.0 Watts
C0009-12
B,1.5D
G
Sheet1
RB,1.0D
C0009-2
Side light-
LH (Y137)
5.0 Watts
C0009-1
B,1.5D
Lamp-Side marker-
Front-LH (A133)
5.0 Watts

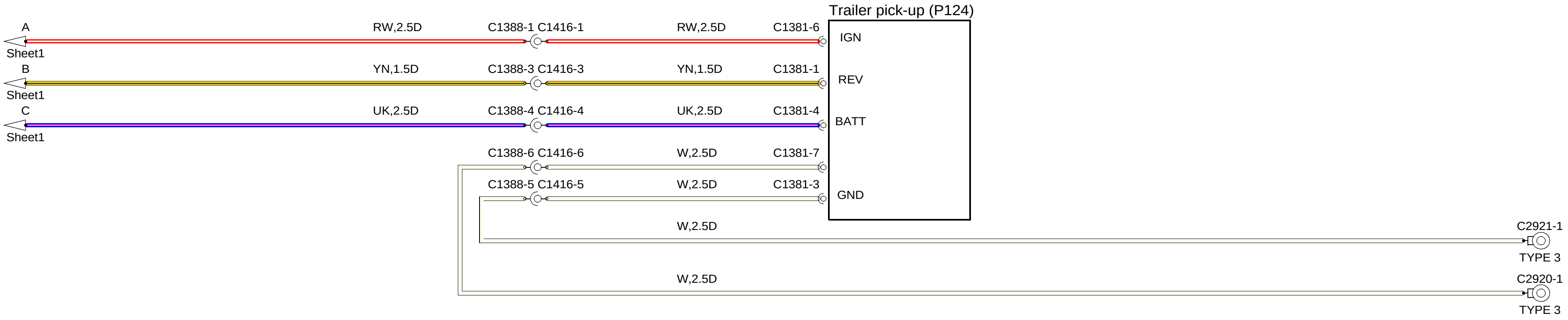

Sensor-Rain-
Ambient light (T328)
K
R,0.5D
SJ1045
R,0.5D
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 3
Sheet1
A
G,0.5D
C0961-4
Sheet1
Tail lamp unit-RH (A140)
Lamp-Tail-
RH (A114)
D
RO,1.0D
C0125-4
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Sheet1
5.0 Watts
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Side marker-
Rear-RH (A134)
5.0 Watts
Tail lamp unit-LH (A139)
Lamp-Tail-
LH (A115)
F
RB,1.0D
SJ22
RB,1.0D
C0333-10 C0420-10
RB,1.0D
C0121-4
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Sheet1
5.0 Watts
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Side marker-
Rear-LH (A135)
5.0 Watts
RB,1.0D
Lamp-Rear number
plate-RH (A127)
C2739-5 C2740-5
RB,1.0D
SJ946
RB,0.75D
C0138-1
C0138-2
B,0.75D
SJ251
B,1.0D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
5.0 Watts
TYPE 3
Lamp-Rear number
plate-LH (A128)
RB,0.75D
C0139-1
C0139-2
B,0.75D
5.0 Watts

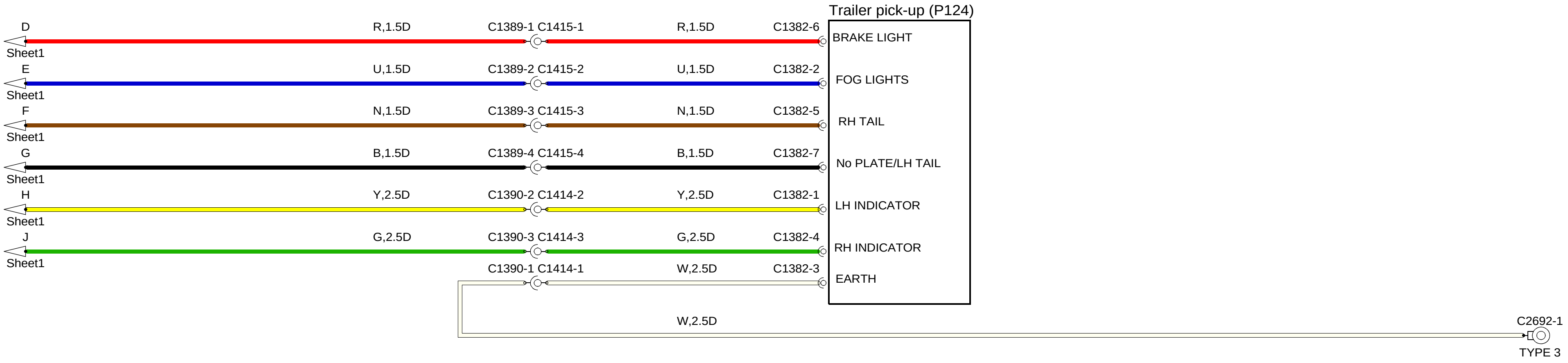

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Junction-box engine (P108)
C0632-1
LINK 16E
40.0 Amps
LINK 11E
30.0 Amps
C0570R-185
NG,4.0D
C0583R-16
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Generic Electronic Module (D162)
BATT
IGN
MS CAN H
MS CAN L
GND
FET-Indicator-RH (G159)
FET-Indicator-LH (G160)
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
C1166R-18 C1168-18
YU,0.5D
C0580-15
C1166R-19 C1168-19
YW,0.5D
C0580-1
Switch-Steering column-Lighting (S175)
Indicator-RH (Y195)
Indicator-LH (Y194)
Switch-Direction-indicator (S105)
C0580-18
GW,0.35D
C1393-2
C0580-17
GR,0.35D
C1393-3
C1393-1
B,0.35D
B,1.0D
SJ663
SJ660 B,2.5D
C2627-1
TYPE 3
Switch pack-Centre facia (S425)
Switch-Hazard-warning (S121)
C0580-19
LGR,0.5D
C2387-8
C2387-15
B,0.5D
C2629-1
TYPE 3
C0583R-27
GW,1.5D
A
Sheet2
C0585R-2
GW,1.5D
B
Sheet2
C0583R-28
GR,1.5D
C
Sheet2
C0585R-4
GR,1.5D
D
Sheet2
C0585R-25
B,2.5D
C2696R-1
TYPE 3
Instrument cluster (J100)
RH turn signal indicator (J127)
1.4 Watts
LH turn signal indicator (J128)
1.4 Watts
MS CAN H
MS CAN L
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731

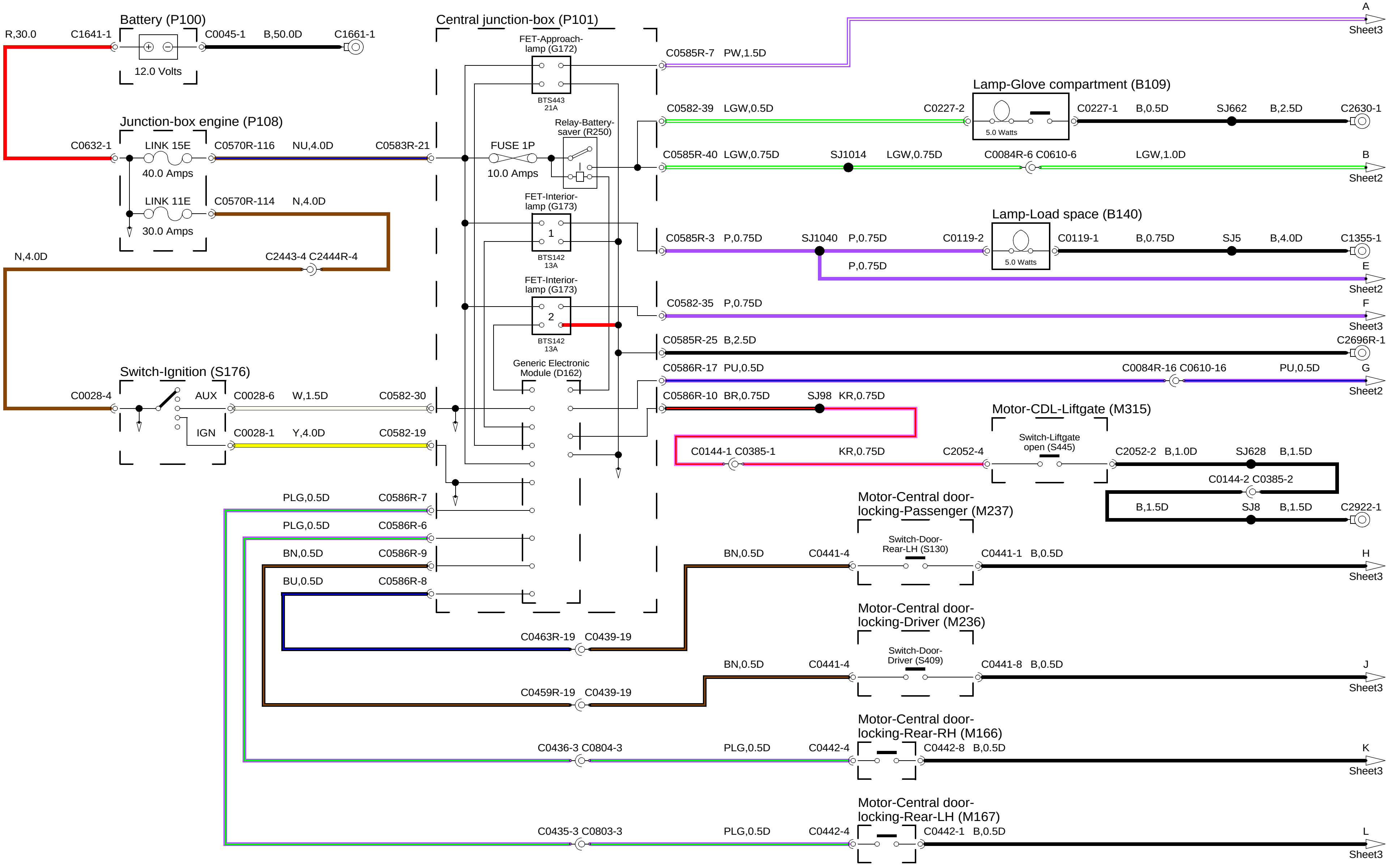

Tail lamp unit-RH (A140)
Turn signal indicator/
hazard flasher lamp-Rear-RH (A118)
21.0 Watts
B
Sheet1
GW,1.5D
SJ1003
GW,1.5D
C0125-3
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Lamp-Side repeater-
Front-RH (A120)
5.0 Watts
GW,1.5D
C0459R-58
C0439-58
GR,0.75D
C2677-2
C2677-1
B,0.75D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
Headlamp-RH (A100)
Turn signal indicator/
hazard warning lamp-
Front RH (A116)
21.0 Watts
A
Sheet1
GW,1.5D
C0011-3
C0011-12
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
Headlamp-LH (A101)
Turn signal indicator/
hazard warning lamp-
Front LH (A117)
21.0 Watts
C
Sheet1
GR,1.5D
C0009-3
C0009-12
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
Tail lamp unit-LH (A139)
Turn signal indicator/
hazard flasher lamp-Rear-LH (A119)
21.0 Watts
D
Sheet1
GR,1.5D
SJ1004
GR,1.5D
C0333-8
C0420-8
GR,1.5D
C0121-3
C0121-5
B,1.5D
C0420-7
C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Lamp-Side repeater-
Front-LH (A121)
5.0 Watts
GR,1.5D
C0463R-3
C0439-3
GW,0.75D
C2677-2
C2677-1
B,0.75D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3

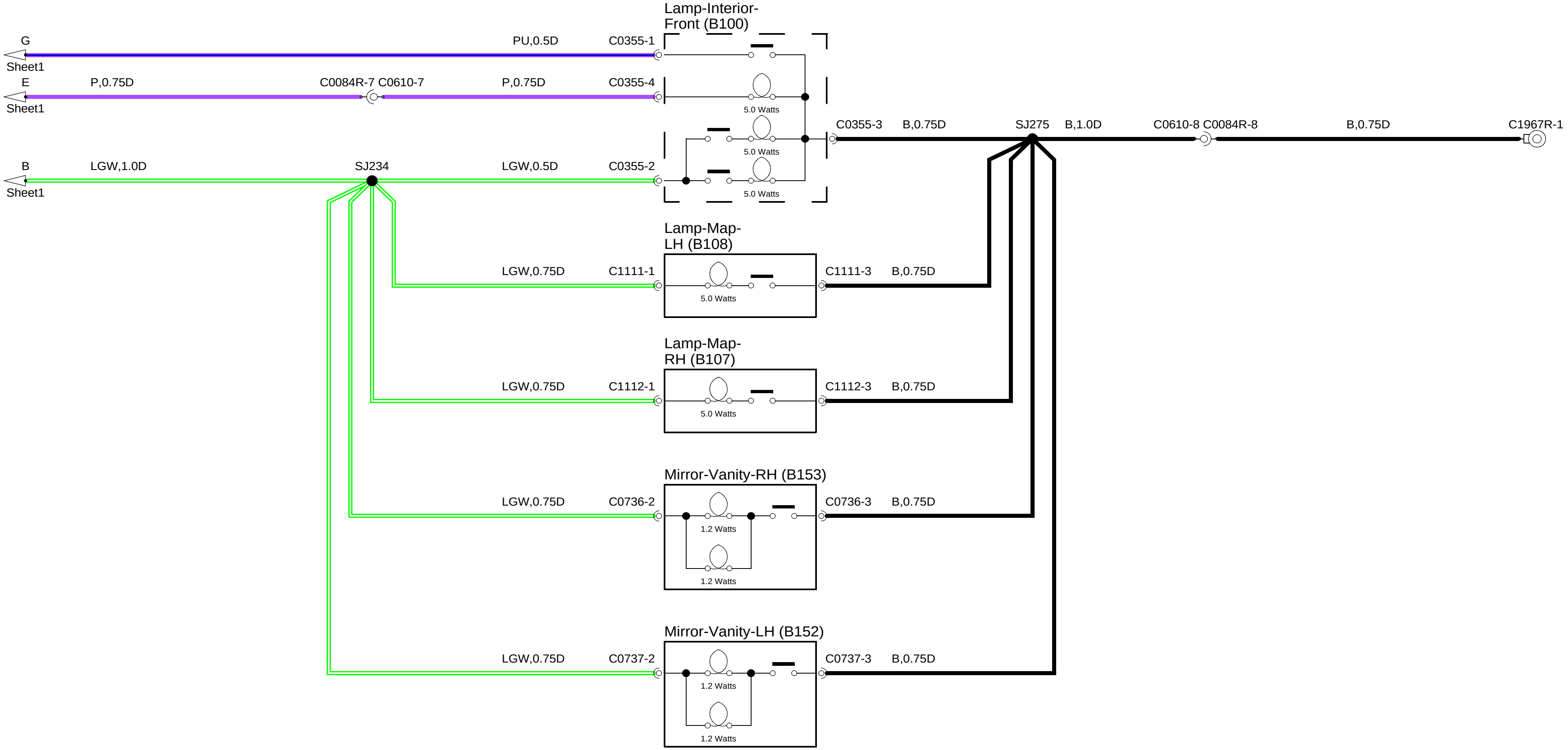

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ1573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Lighting control switch (S100)
General-illumination (B114)
31
C0041-10
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
C0041-12
P
Central junction-box (P101)
Relay-Auto-lights (R274)
Junction-box engine (P108)
C0570R-74
B,1.0D
58 L/R
C0041-13
R,0.5D
C0580-24
C0632-1
FUSE 25E
5.0 Amps
C0570R-109
NS,1.5D
C2444R-2 C2443-2
NG,1.0D
C0041-11
30
C0041-16
RO,0.5D
C0582-1
Relay-Ignition (R211)
Switch-Dimming (S388)
Generic Electronic Module (D162)
58D
C0041-9
RN,0.5D
SJ117
C0570R-72
LINK 2E
30.0 Amps
C0570R-40
NP,4.0D
C2444R-3 C2443-3
C0041-8
15
56
C0041-6
Y,0.5D
C0580-25
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
52
C0041-4
R,0.5D
C0580-26
D
C0041-15
N,4.0D
Switch-illumination (B125)
FUSE 62P
5.0 Amps
C0582-9
C0041-1
NOT USED (V101)
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
NP,4.0D
C0041-7
Xr
Switch-Fog lamp-Front/rear (S112)
83a
C0041-2
RO,1.5D
C0582-46
FUSE 32P
15.0 Amps
Tell Tale (Y249)
83b
C0041-3
UR,1.5D
C0582-14
FUSE 38P
15.0 Amps
Tell Tale (Y249)
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
SJ1574
LG,0.5D
NP,0.5D

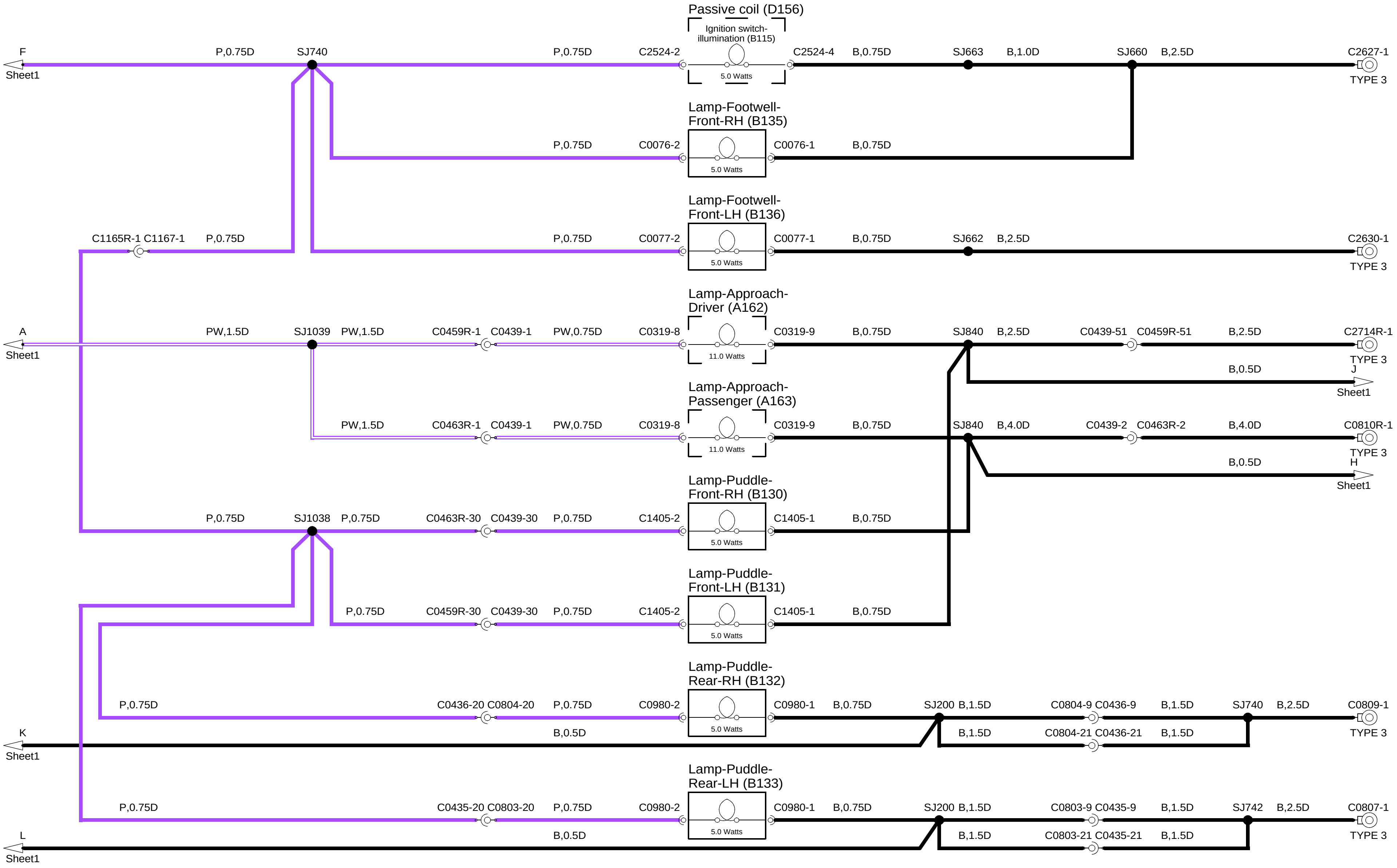

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
40.0 Amps
C0570R-114 N,4.0D
LINK 18E
50.0 Amps
C0570R-186 NS,6.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1 Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 22P
10.0 Amps
C0585R-9
FUSE 8P
30.0 Amps
C0585R-19
Generic Electronic Module (D162)
Relay-Reverse (R217)
FUSE 6P
10.0 Amps
C0585R-6
FUSE 32P
15.0 Amps
C0585R-21
Relay-Side-lamp (R125)
C0583R-22
FUSE 14P
10.0 Amps
C0583R-13
FET-Indicator-Trailer-LH (G162)
C0585R-16
FET-Indicator-Trailer-RH (G161)
C0585R-17
C0585R-25
Relay-Trailer-Rear wiper (R273)
Relay-Trailer-Socket (R252)
U,2.5D
C2937-7
R,1.5D
C2937-8
C2937-6
RW,2.5D
C1642-5 C1643-5
RW,2.5D
A
Sheet2
C2937-10
B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
C1642-6 C1643-6
GN,1.5D
C1642-2 C1643-2
YN,1.5D
B
Sheet2
Stop lamp switch (S215)
GP,1.5D
SJ1814
GP,1.5D
C0075R-1
Fuse-Trailer (P136)
GN,4.0D
C0473-4 C0498-4
P,4.0D
SJ570
P,2.5D
C1875-3
Fuse
15.0 Amps
C1875-4
O,2.5D
P,2.5D
C1875-5
Fuse
15.0 Amps
C1875-6
UK,2.5D
C
Sheet2
SJ813
GP,1.5D
C1642-4 C1643-4
GP,1.5D
C1875-1
Fuse
7.5 Amps
C1875-2
R,1.5D
D
Sheet2
RY,1.5D
SJ1020
RY,1.5D
C1642-1 C1643-1
RY,1.5D
C1875-7
Fuse
7.5 Amps
C1875-8
U,1.5D
E
Sheet2
N,1.5D
C2412R-9 C2411R-9
RO,1.5D
C1875-9
Fuse
5.0 Amps
C1875-10
N,1.5D
F
Sheet2
N,1.5D
C1642-3 C1643-3
RO,1.5D
SJ571
RO,1.5D
C1875-11
Fuse
5.0 Amps
C1875-12
B,1.5D
G
Sheet2
Y,2.5D
C0473-1 C0498-1
Y,2.5D
H
Sheet2
G,2.5D
C0473-2 C0498-2
G,2.5D
J
Sheet2
B,2.5D
C2696R-1
TYPE 3

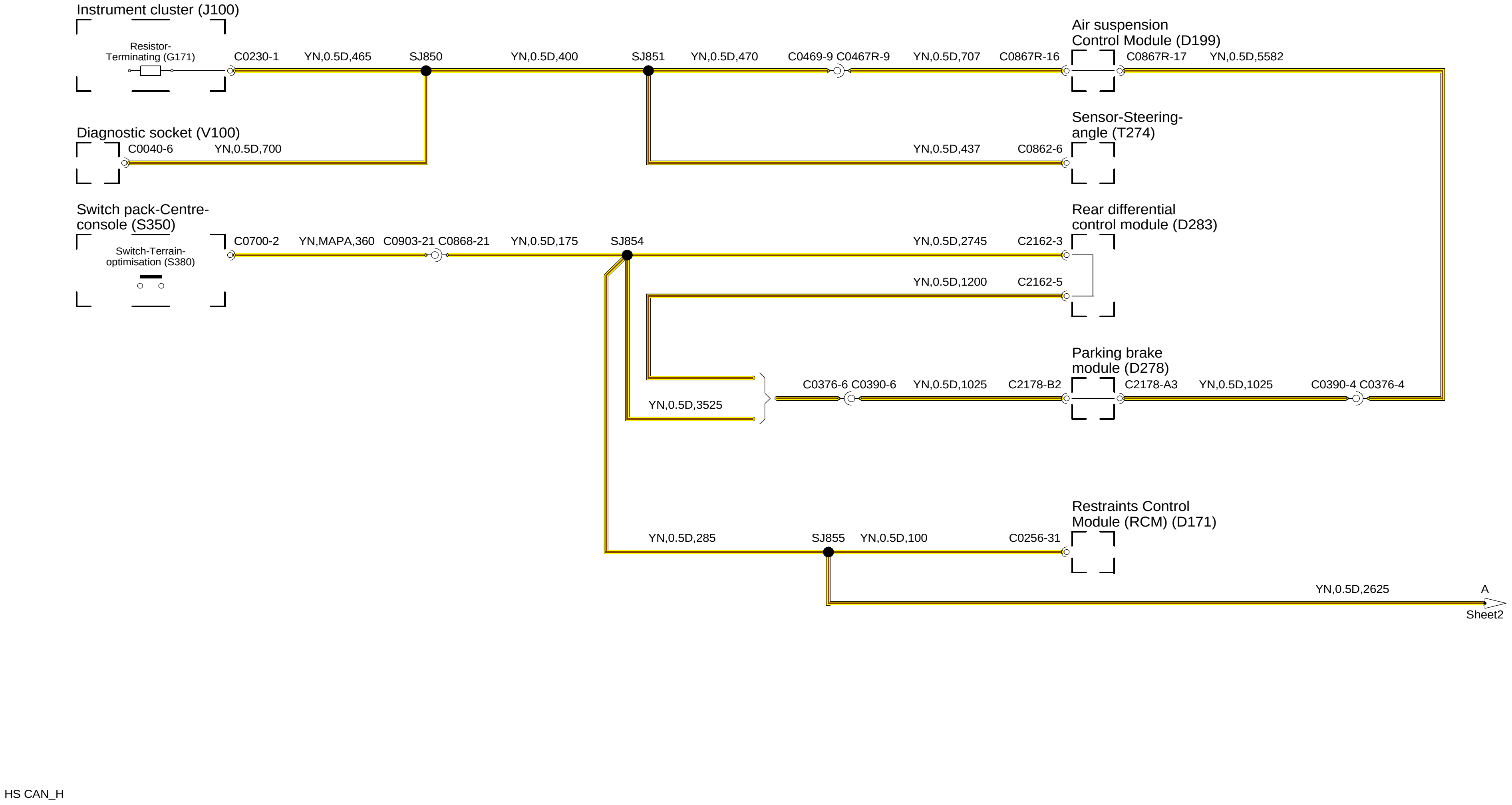

Trailer pick-up (P124)
A
Sheet1
RW,2.5D
C1388-1 C1416-1
RW,2.5D
C1381-6
IGN
B
Sheet1
YN,1.5D
C1388-3 C1416-3
YN,1.5D
C1381-1
REV
C
Sheet1
UK,2.5D
C1388-4 C1416-4
UK,2.5D
C1381-4
BATT
C1388-6 C1416-6
W,2.5D
C1381-7
C1388-5 C1416-5
W,2.5D
C1381-3
GND
W,2.5D
C2921-1
TYPE 3
W,2.5D
C2920-1
TYPE 3

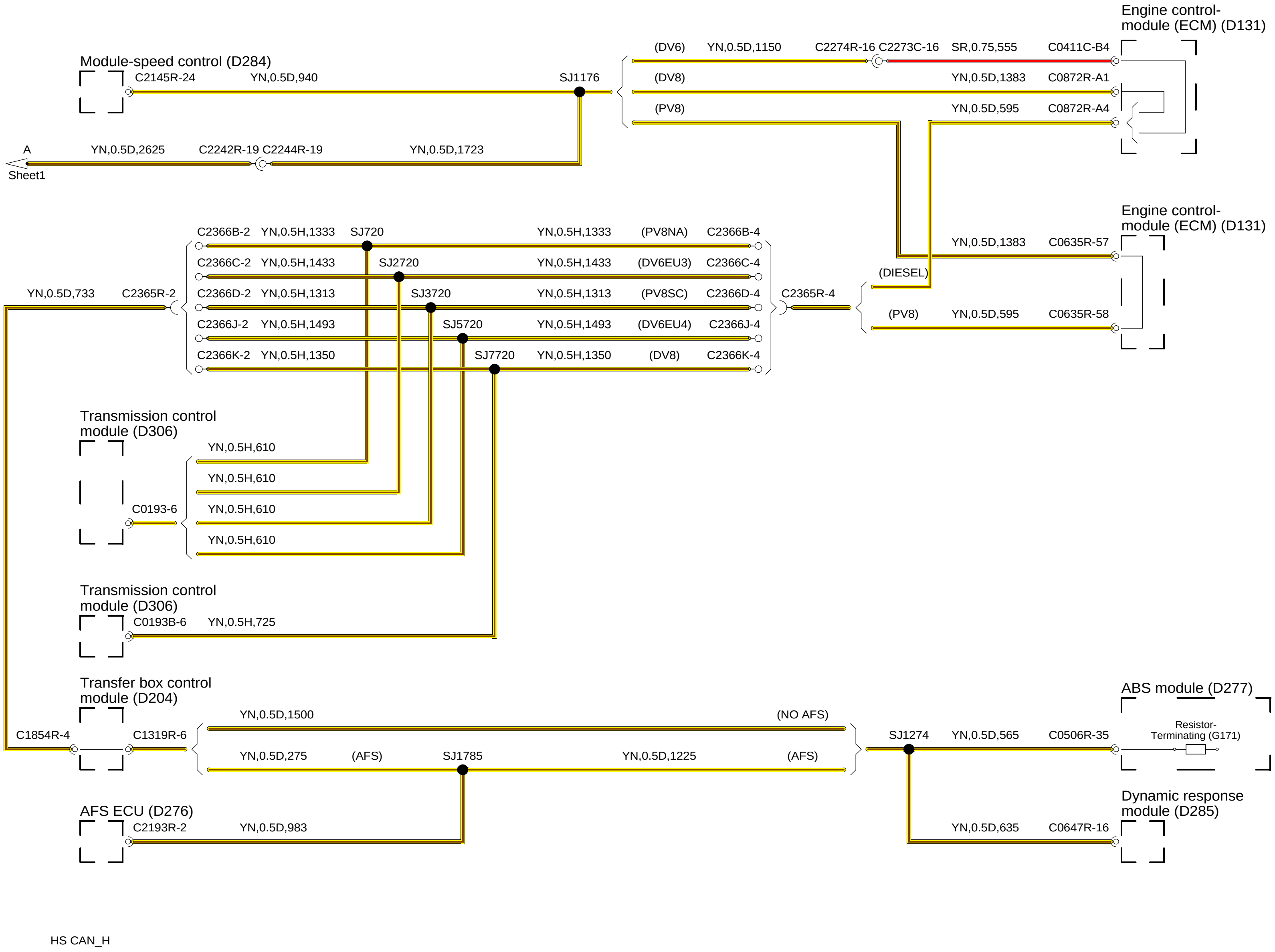

Trailer pick-up (P124)
D
Sheet1
R,1.5D
C1389-1 C1415-1
R,1.5D
C1382-6
BRAKE LIGHT
E
Sheet1
U,1.5D
C1389-2 C1415-2
U,1.5D
C1382-2
FOG LIGHTS
F
Sheet1
N,1.5D
C1389-3 C1415-3
N,1.5D
C1382-5
RH TAIL
G
Sheet1
B,1.5D
C1389-4 C1415-4
B,1.5D
C1382-7
No PLATE/LH TAIL
H
Sheet1
Y,2.5D
C1390-2 C1414-2
Y,2.5D
C1382-1
LH INDICATOR
J
Sheet1
G,2.5D
C1390-3 C1414-3
G,2.5D
C1382-4
RH INDICATOR
C1390-1 C1414-1
W,2.5D
C1382-3
EARTH
W,2.5D
C2692-1
TYPE 3

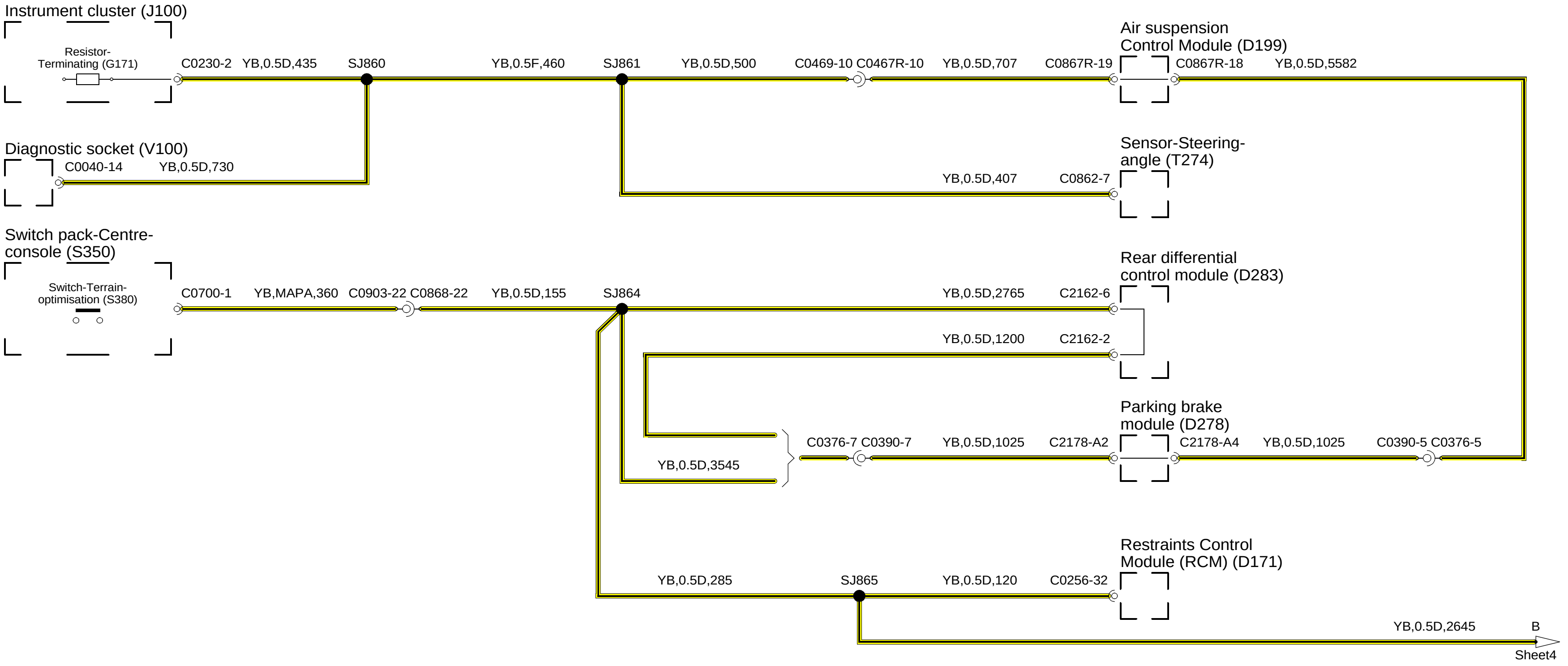

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
FET-Approach-lamp (G172)
BTS443 21A
C0585R-7
PW,1.5D
A
Sheet3
Lamp-Glove compartment (B109)
C0582-39
LGW,0.5D
C0227-2
5.0 Watts
C0227-1
B,0.5D
SJ662
B,2.5D
C2630-1
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0583R-21
FUSE 1P
10.0 Amps
Relay-Battery-saver (R250)
C0585R-40
LGW,0.75D
SJ1014
LGW,0.75D
C0084R-6 C0610-6
LGW,1.0D
B
Sheet2
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
FET-Interior-lamp (G173)
1
BTS142 13A
Lamp-Load space (B140)
C0585R-3
P,0.75D
SJ1040
P,0.75D
C0119-2
5.0 Watts
C0119-1
B,0.75D
SJ5
B,4.0D
C1355-1
N,4.0D
C2443-4 C2444R-4
P,0.75D
E
Sheet2
FET-Interior-lamp (G173)
2
BTS142 13A
C0582-35
P,0.75D
F
Sheet3
C0585R-25
B,2.5D
C2696R-1
Generic Electronic Module (D162)
C0586R-17
PU,0.5D
C0084R-16 C0610-16
PU,0.5D
G
Sheet2
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0582-30
C0586R-10
BR,0.75D
SJ98
KR,0.75D
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
IGN
C0028-1
Y,4.0D
C0582-19
C0144-1 C0385-1
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0144-2 C0385-2
PLG,0.5D
C0586R-7
Motor-Central door-locking-Passenger (M237)
B,1.5D
SJ8
B,1.5D
C2922-1
PLG,0.5D
C0586R-6
Switch-Door-Rear-LH (S130)
BN,0.5D
C0586R-9
BN,0.5D
C0441-4
C0441-1
B,0.5D
H
Sheet3
BU,0.5D
C0586R-8
Motor-Central door-locking-Driver (M236)
C0463R-19
C0439-19
Switch-Door-Driver (S409)
BN,0.5D
C0441-4
C0441-8
B,0.5D
J
Sheet3
C0459R-19
C0439-19
Motor-Central door-locking-Rear-RH (M166)
C0436-3 C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
K
Sheet3
Motor-Central door-locking-Rear-LH (M167)
C0435-3 C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
L
Sheet3


Lamp-Interior-Front (B100)
G
Sheet1
PU,0.5D
C0355-1
E
Sheet1
P,0.75D
C0084R-7 C0610-7
P,0.75D
C0355-4
5.0 Watts
5.0 Watts
5.0 Watts
C0355-3
B,0.75D
SJ275
B,1.0D
C0610-8 C0084R-8
B,0.75D
C1967R-1
B
Sheet1
LGW,1.0D
SJ234
LGW,0.5D
C0355-2
Lamp-Map-LH (B108)
LGW,0.75D
C1111-1
5.0 Watts
C1111-3
B,0.75D
Lamp-Map-RH (B107)
LGW,0.75D
C1112-1
5.0 Watts
C1112-3
B,0.75D
Mirror-Vanity-RH (B153)
LGW,0.75D
C0736-2
1.2 Watts
1.2 Watts
C0736-3
B,0.75D
Mirror-Vanity-LH (B152)
LGW,0.75D
C0737-2
1.2 Watts
1.2 Watts
C0737-3
B,0.75D

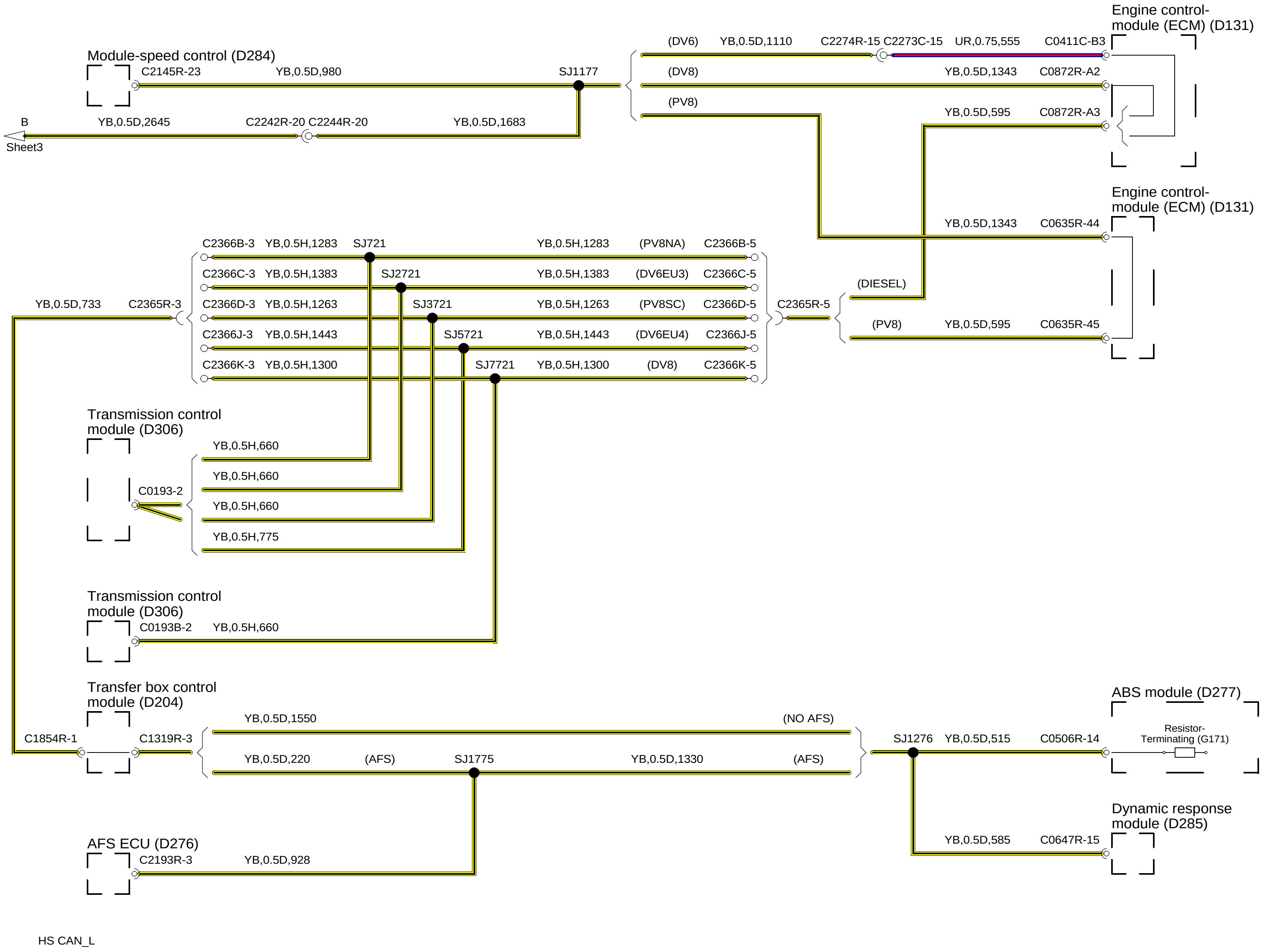

Passive coil (D156)
Ignition switch-illumination (B115)
5.0 Watts
F
Sheet1
P,0.75D
SJ740
P,0.75D
C2524-2
C2524-4
B,0.75D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Lamp-Footwell-Front-RH (B135)
P,0.75D
C0076-2
C0076-1
B,0.75D
5.0 Watts
Lamp-Footwell-Front-LH (B136)
C1165R-1 C1167-1
P,0.75D
P,0.75D
C0077-2
C0077-1
B,0.75D
SJ662
B,2.5D
C2630-1
TYPE 3
5.0 Watts
Lamp-Approach-Driver (A162)
A
Sheet1
PW,1.5D
SJ1039
PW,1.5D
C0459R-1
C0439-1
PW,0.75D
C0319-8
C0319-9
B,0.75D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
11.0 Watts
B,0.5D
J
Sheet1
Lamp-Approach-Passenger (A163)
PW,1.5D
C0463R-1
C0439-1
PW,0.75D
C0319-8
C0319-9
B,0.75D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3
11.0 Watts
B,0.5D
H
Sheet1
Lamp-Puddle-Front-RH (B130)
P,0.75D
SJ1038
P,0.75D
C0463R-30
C0439-30
P,0.75D
C1405-2
C1405-1
B,0.75D
5.0 Watts
Lamp-Puddle-Front-LH (B131)
P,0.75D
C0459R-30
C0439-30
P,0.75D
C1405-2
C1405-1
B,0.75D
5.0 Watts
Lamp-Puddle-Rear-RH (B132)
P,0.75D
C0436-20 C0804-20
P,0.75D
C0980-2
C0980-1
B,0.75D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
5.0 Watts
K
Sheet1
B,0.5D
B,1.5D
C0804-21 C0436-21
B,1.5D
Lamp-Puddle-Rear-LH (B133)
P,0.75D
C0435-20 C0803-20
P,0.75D
C0980-2
C0980-1
B,0.75D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
5.0 Watts
L
Sheet1
B,0.5D
B,1.5D
C0803-21 C0435-21
B,1.5D

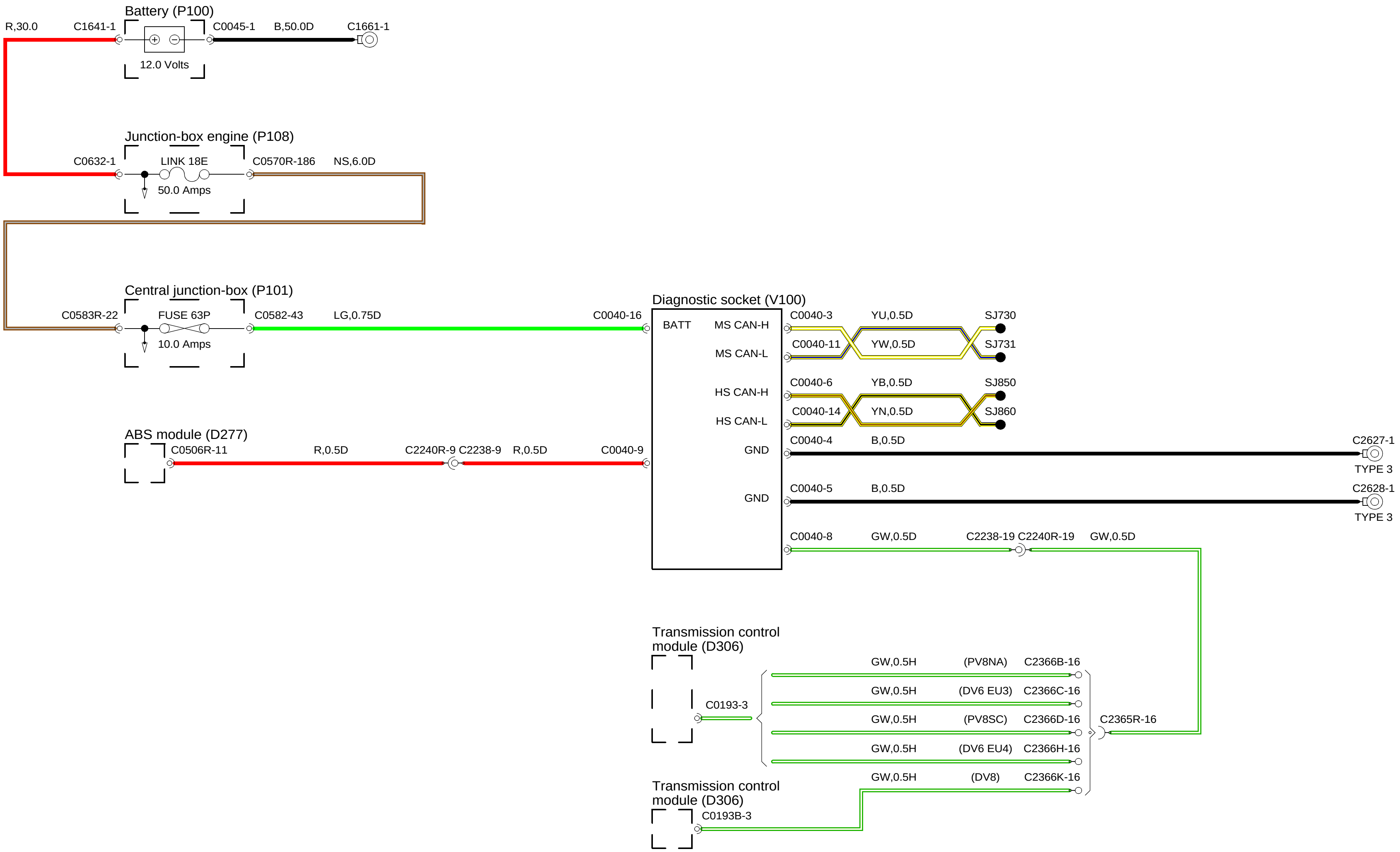

Instrument cluster (J100)
Resistor-Terminating (G171)
C0230-1
YN,0.5D,465
SJ850
YN,0.5D,400
SJ851
YN,0.5D,470
C0469-9 C0467R-9
YN,0.5D,707
C0867R-16
Air suspension Control Module (D199)
C0867R-17
YN,0.5D,5582
Diagnostic socket (V100)
C0040-6
YN,0.5D,700
Sensor-Steering-angle (T274)
YN,0.5D,437
C0862-6
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0700-2
YN,MAPA,360
C0903-21 C0868-21
YN,0.5D,175
SJ854
YN,0.5D,2745
C2162-3
Rear differential control module (D283)
YN,0.5D,1200
C2162-5
Parking brake module (D278)
C0376-6 C0390-6
YN,0.5D,1025
C2178-B2
C2178-A3
YN,0.5D,1025
C0390-4 C0376-4
YN,0.5D,3525
Restraints Control Module (RCM) (D171)
YN,0.5D,285
SJ855
YN,0.5D,100
C0256-31
YN,0.5D,2625
A
Sheet2
HS CAN_H

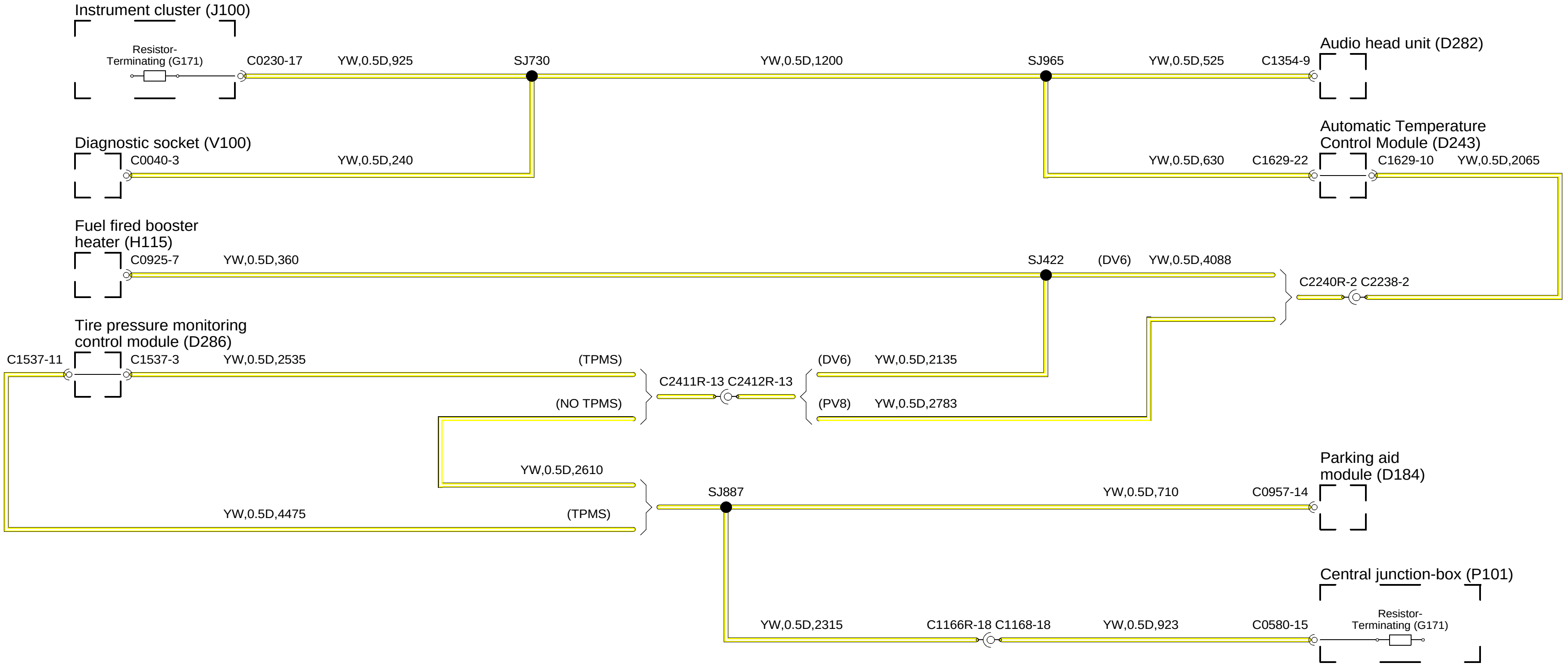

Engine control-
module (ECM) (D131)
(DV6)
YN,0.5D,1150
C2274R-16 C2273C-16
SR,0.75,555
C0411C-B4
Module-speed control (D284)
C2145R-24
YN,0.5D,940
SJ1176
(DV8)
YN,0.5D,1383
C0872R-A1
(PV8)
YN,0.5D,595
C0872R-A4
A
Sheet1
YN,0.5D,2625
C2242R-19 C2244R-19
YN,0.5D,1723
Engine control-
module (ECM) (D131)
C2366B-2
YN,0.5H,1333
SJ720
YN,0.5H,1333
(PV8NA)
C2366B-4
YN,0.5D,1383
C0635R-57
C2366C-2
YN,0.5H,1433
SJ2720
YN,0.5H,1433
(DV6EU3)
C2366C-4
(DIESEL)
YN,0.5D,733
C2365R-2
C2366D-2
YN,0.5H,1313
SJ3720
YN,0.5H,1313
(PV8SC)
C2366D-4
C2365R-4
(PV8)
YN,0.5D,595
C0635R-58
C2366J-2
YN,0.5H,1493
SJ5720
YN,0.5H,1493
(DV6EU4)
C2366J-4
C2366K-2
YN,0.5H,1350
SJ7720
YN,0.5H,1350
(DV8)
C2366K-4
Transmission control
module (D306)
YN,0.5H,610
YN,0.5H,610
C0193-6
YN,0.5H,610
YN,0.5H,610
Transmission control
module (D306)
C0193B-6
YN,0.5H,725
Transfer box control
module (D204)
YN,0.5D,1500
(NO AFS)
ABS module (D277)
C1854R-4
C1319R-6
SJ1274
YN,0.5D,565
C0506R-35
Resistor-
Terminating (G171)
YN,0.5D,275
(AFS)
SJ1785
YN,0.5D,1225
(AFS)
Dynamic response
module (D285)
AFS ECU (D276)
C2193R-2
YN,0.5D,983
YN,0.5D,635
C0647R-16
HS CAN_H


Instrument cluster (J100)
Resistor-Terminating (G171)
C0230-2
YB,0.5D,435
SJ860
YB,0.5F,460
SJ861
YB,0.5D,500
C0469-10 C0467R-10
YB,0.5D,707
C0867R-19
Air suspension Control Module (D199)
C0867R-18
YB,0.5D,5582
Diagnostic socket (V100)
C0040-14
YB,0.5D,730
Sensor-Steering-angle (T274)
YB,0.5D,407
C0862-7
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0700-1
YB,MAPA,360
C0903-22 C0868-22
YB,0.5D,155
SJ864
Rear differential control module (D283)
YB,0.5D,2765
C2162-6
YB,0.5D,1200
C2162-2
Parking brake module (D278)
C0376-7 C0390-7
YB,0.5D,1025
C2178-A2
C2178-A4
YB,0.5D,1025
C0390-5 C0376-5
YB,0.5D,3545
Restraints Control Module (RCM) (D171)
YB,0.5D,285
SJ865
YB,0.5D,120
C0256-32
YB,0.5D,2645
B
Sheet4

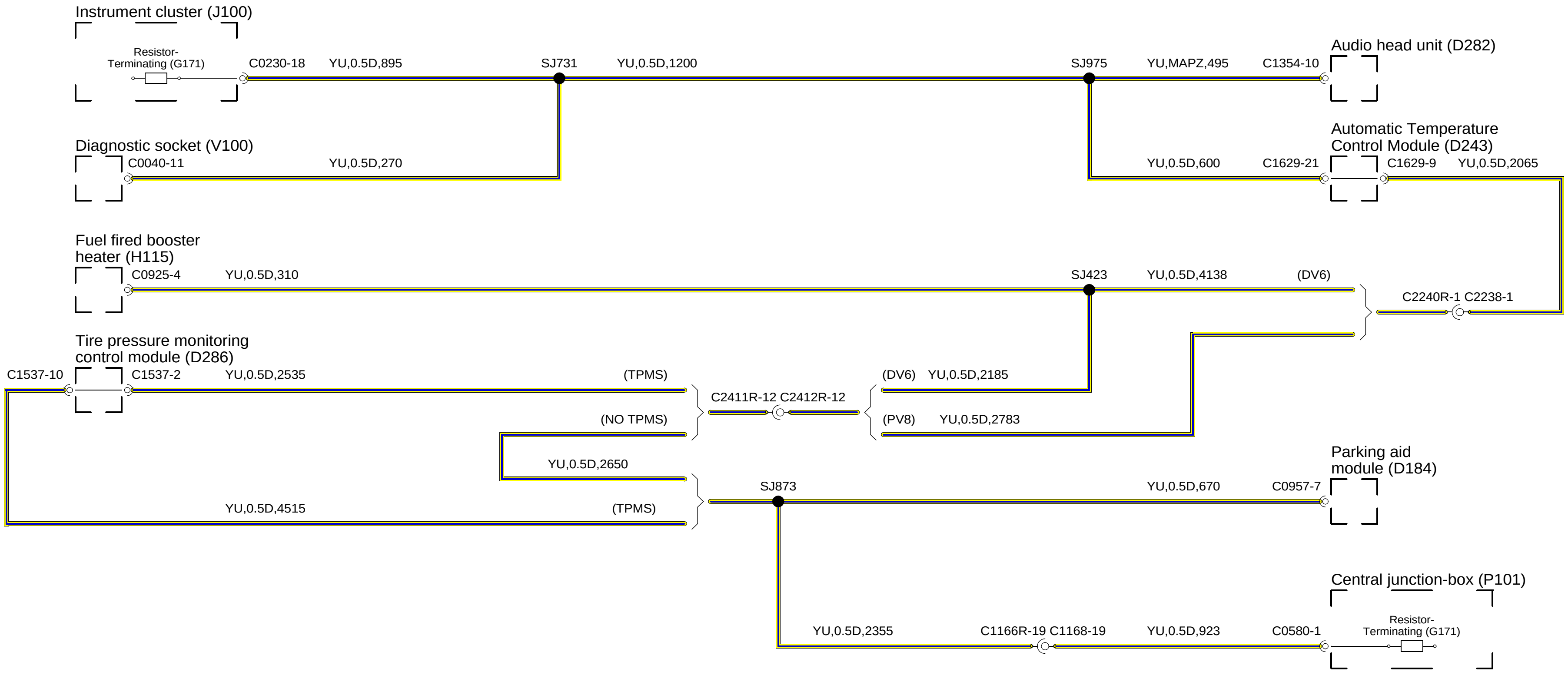
HS CAN_L


Engine control-module (ECM) (D131)
Module-speed control (D284)
C2145R-23
YB,0.5D,980
SJ1177
(DV6)
YB,0.5D,1110
C2274R-15 C2273C-15
UR,0.75,555
C0411C-B3
(DV8)
YB,0.5D,1343
C0872R-A2
(PV8)
YB,0.5D,595
C0872R-A3
B
Sheet3
YB,0.5D,2645
C2242R-20 C2244R-20
YB,0.5D,1683
Engine control-module (ECM) (D131)
YB,0.5D,1343
C0635R-44
C2366B-3
YB,0.5H,1283
SJ721
YB,0.5H,1283
(PV8NA)
C2366B-5
C2366C-3
YB,0.5H,1383
SJ2721
YB,0.5H,1383
(DV6EU3)
C2366C-5
(DIESEL)
YB,0.5D,733
C2365R-3
C2366D-3
YB,0.5H,1263
SJ3721
YB,0.5H,1263
(PV8SC)
C2366D-5
C2365R-5
(PV8)
YB,0.5D,595
C0635R-45
C2366J-3
YB,0.5H,1443
SJ5721
YB,0.5H,1443
(DV6EU4)
C2366J-5
C2366K-3
YB,0.5H,1300
SJ7721
YB,0.5H,1300
(DV8)
C2366K-5
Transmission control module (D306)
YB,0.5H,660
YB,0.5H,660
C0193-2
YB,0.5H,660
YB,0.5H,775
Transmission control module (D306)
C0193B-2
YB,0.5H,660
Transfer box control module (D204)
ABS module (D277)
YB,0.5D,1550
(NO AFS)
C1854R-1
C1319R-3
SJ1276
YB,0.5D,515
C0506R-14
Resistor-Terminating (G171)
YB,0.5D,220
(AFS)
SJ1775
YB,0.5D,1330
(AFS)
Dynamic response module (D285)
AFS ECU (D276)
YB,0.5D,585
C0647R-15
C2193R-3
YB,0.5D,928
HS CAN_L

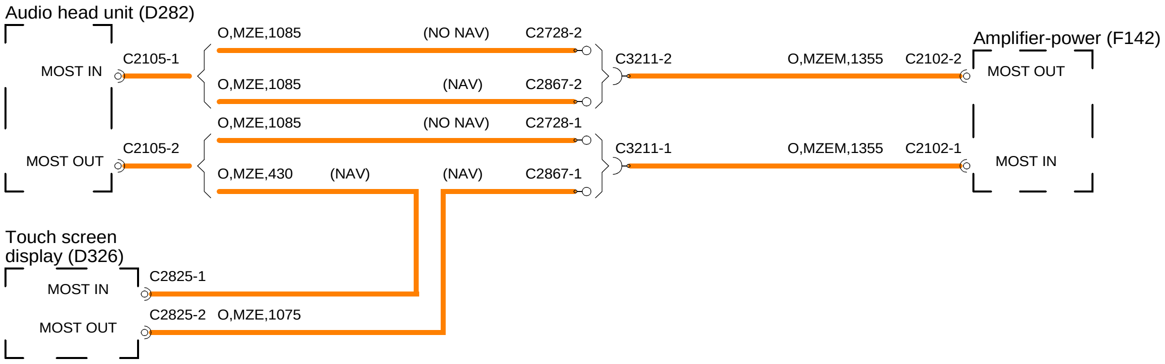

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Central junction-box (P101)
C0583R-22
FUSE 63P
C0582-43
LG,0.75D
C0040-16
10.0 Amps
Diagnostic socket (V100)
BATT
MS CAN-H
MS CAN-L
HS CAN-H
HS CAN-L
GND
GND
C0040-3
YU,0.5D
SJ730
C0040-11
YW,0.5D
SJ731
C0040-6
YB,0.5D
SJ850
C0040-14
YN,0.5D
SJ860
C0040-4
B,0.5D
C2627-1
TYPE 3
C0040-5
B,0.5D
C2628-1
TYPE 3
C0040-8
GW,0.5D
C2238-19 C2240R-19
GW,0.5D
ABS module (D277)
C0506R-11
R,0.5D
C2240R-9 C2238-9
R,0.5D
C0040-9
Transmission control module (D306)
C0193-3
GW,0.5H
(PV8NA)
C2366B-16
GW,0.5H
(DV6 EU3)
C2366C-16
GW,0.5H
(PV8SC)
C2366D-16
C2365R-16
GW,0.5H
(DV6 EU4)
C2366H-16
GW,0.5H
(DV8)
C2366K-16
Transmission control module (D306)
C0193B-3

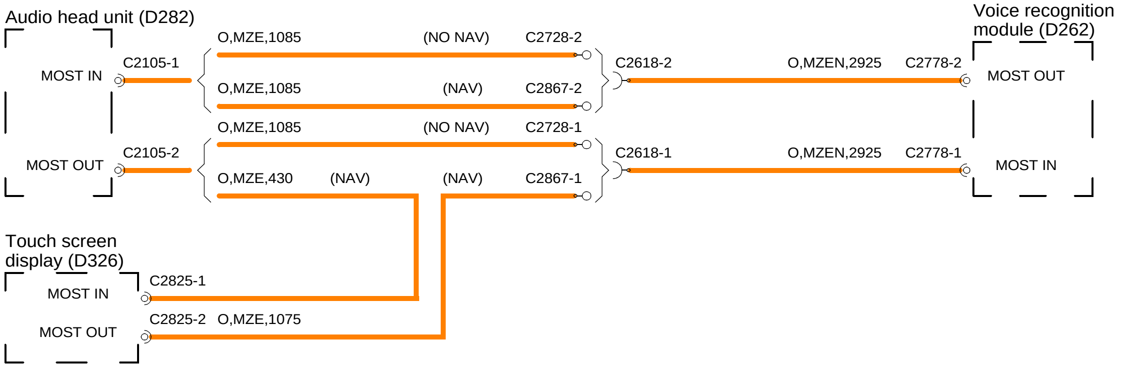

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-17
YW,0.5D,925
SJ730
YW,0.5D,1200
SJ965
YW,0.5D,525
C1354-9
Audio head unit (D282)
Diagnostic socket (V100)
C0040-3
YW,0.5D,240
Automatic Temperature
Control Module (D243)
YW,0.5D,630
C1629-22
C1629-10
YW,0.5D,2065
Fuel fired booster
heater (H115)
C0925-7
YW,0.5D,360
SJ422
(DV6)
YW,0.5D,4088
C2240R-2 C2238-2
Tire pressure monitoring
control module (D286)
C1537-11
C1537-3
YW,0.5D,2535
(TPMS)
C2411R-13 C2412R-13
(DV6)
YW,0.5D,2135
(NO TPMS)
(PV8)
YW,0.5D,2783
YW,0.5D,2610
SJ887
YW,0.5D,710
C0957-14
Parking aid
module (D184)
YW,0.5D,4475
(TPMS)
Central junction-box (P101)
YW,0.5D,2315
C1166R-18 C1168-18
YW,0.5D,923
C0580-15
Resistor-
Terminating (G171)

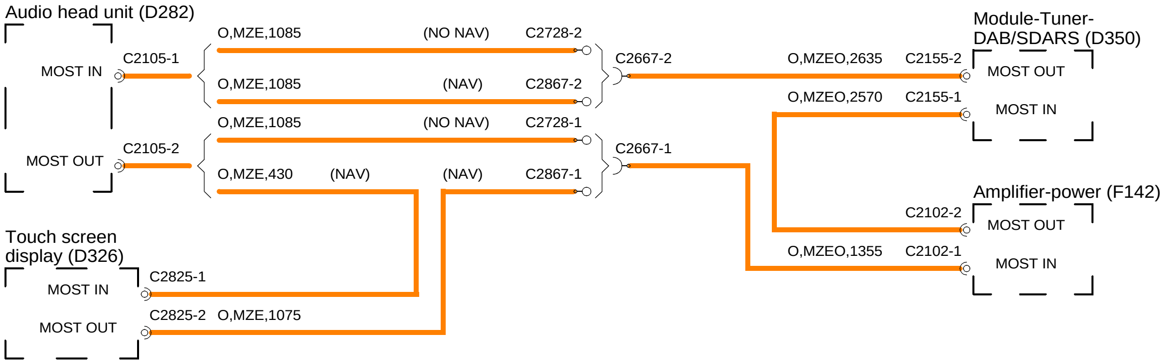
MS CAN_H

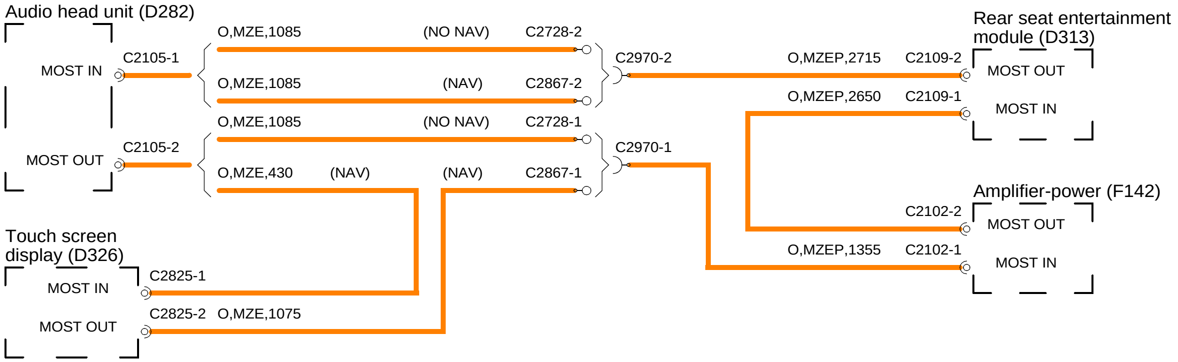

Instrument cluster (J100)
Resistor-Terminating (G171)
C0230-18
YU,0.5D,895
SJ731
YU,0.5D,1200
SJ975
YU,MAPZ,495
C1354-10
Audio head unit (D282)
Diagnostic socket (V100)
C0040-11
YU,0.5D,270
Automatic Temperature Control Module (D243)
YU,0.5D,600
C1629-21
C1629-9
YU,0.5D,2065
Fuel fired booster heater (H115)
C0925-4
YU,0.5D,310
SJ423
YU,0.5D,4138
(DV6)
C2240R-1 C2238-1
Tire pressure monitoring control module (D286)
C1537-10
C1537-2
YU,0.5D,2535
(TPMS)
C2411R-12 C2412R-12
(DV6) YU,0.5D,2185
(NO TPMS)
(PV8)
YU,0.5D,2783
YU,0.5D,2650
SJ873
YU,0.5D,670
C0957-7
Parking aid module (D184)
YU,0.5D,4515
(TPMS)
Central junction-box (P101)
YU,0.5D,2355
C1166R-19 C1168-19
YU,0.5D,923
C0580-1
Resistor-Terminating (G171)

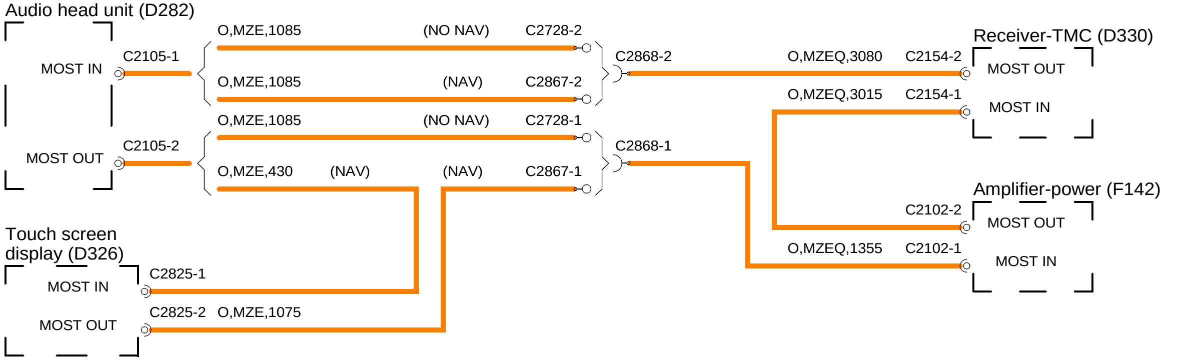
MS CAN_L

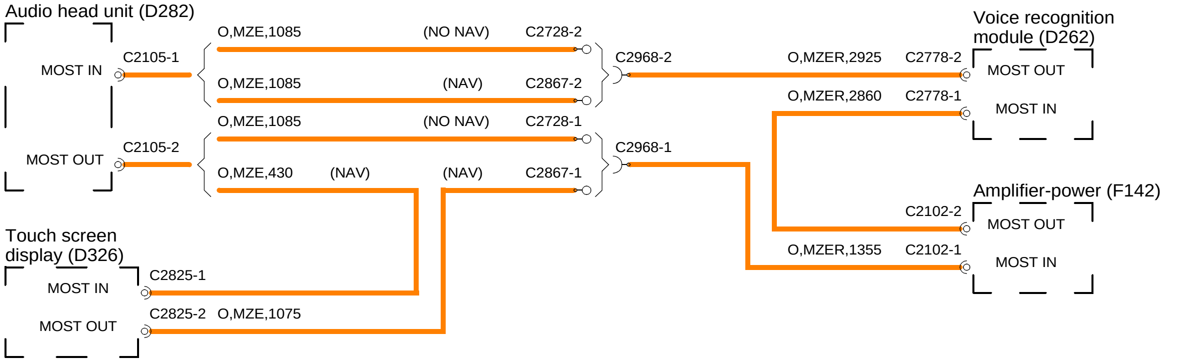

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3211-2
O,MZEM,1355
C2102-2
C3211-1
O,MZEM,1355
C2102-1
Amplifier-power (F142)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075

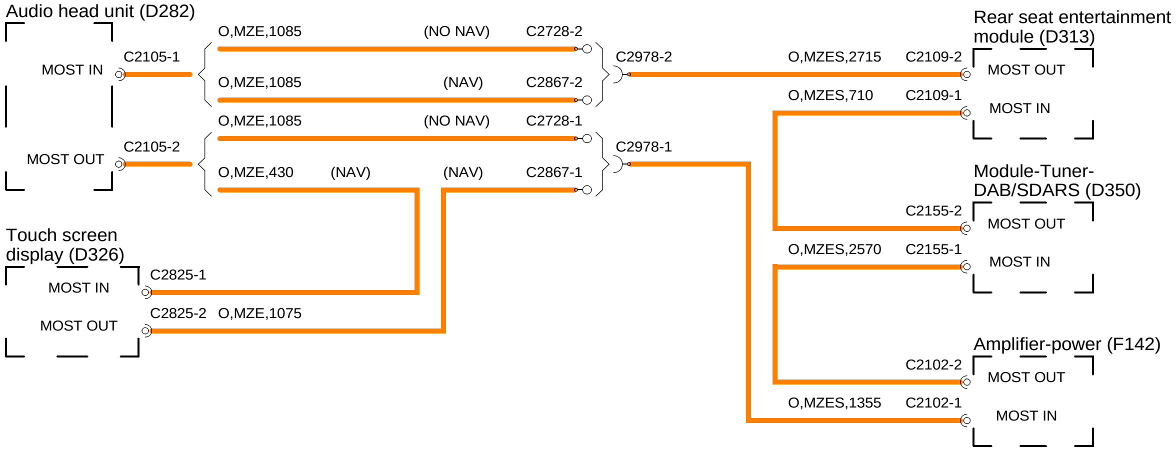

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2618-2
O,MZEN,2925
C2778-2
C2618-1
O,MZEN,2925
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075

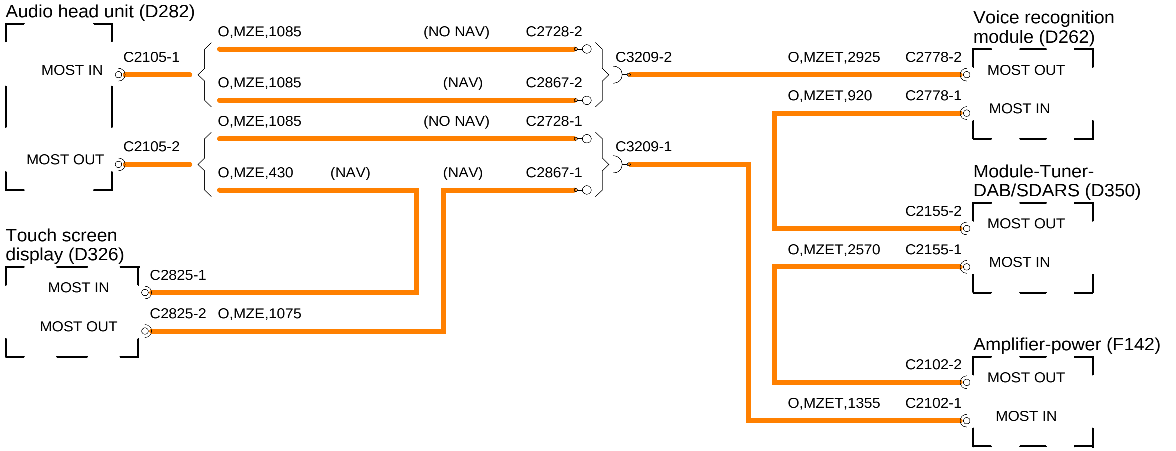

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2667-2
O,MZEO,2635
C2155-2
O,MZEO,2570
C2155-1
C2667-1
Module-Tuner-DAB/SDARS (D350)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEO,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075

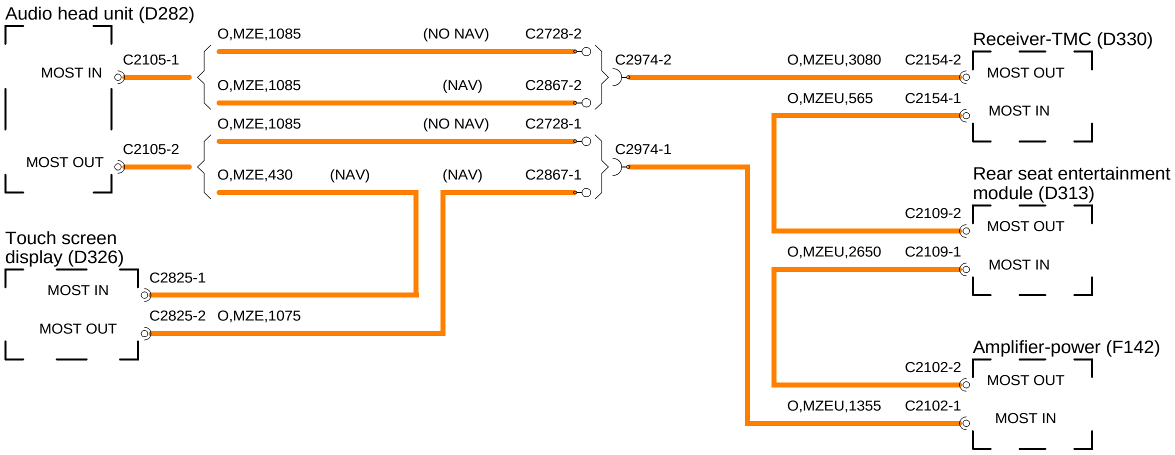

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2970-2
C2970-1
O,MZEP,2715
C2109-2
O,MZEP,2650
C2109-1
Rear seat entertainment module (D313)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEP,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

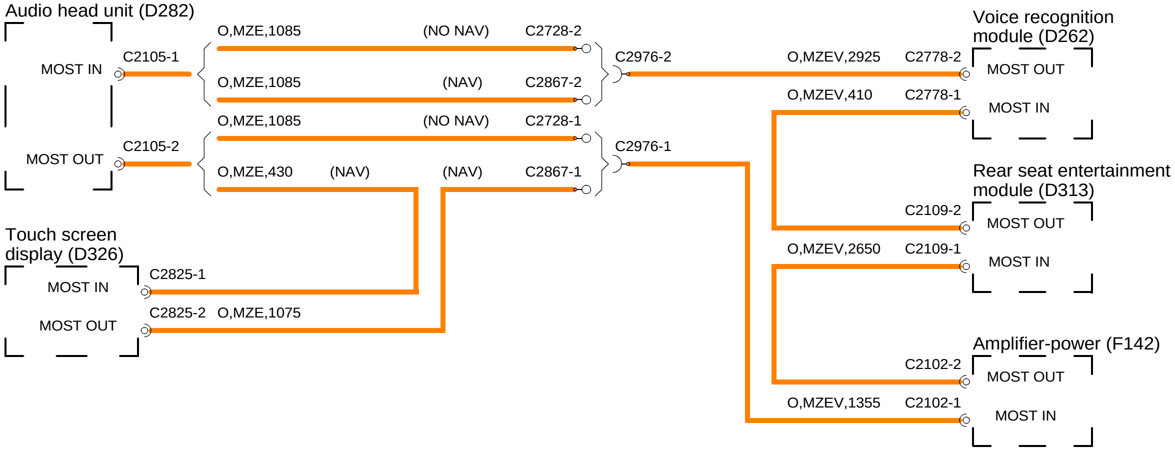

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2868-2
C2868-1
O,MZEQ,3080
C2154-2
O,MZEQ,3015
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEQ,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

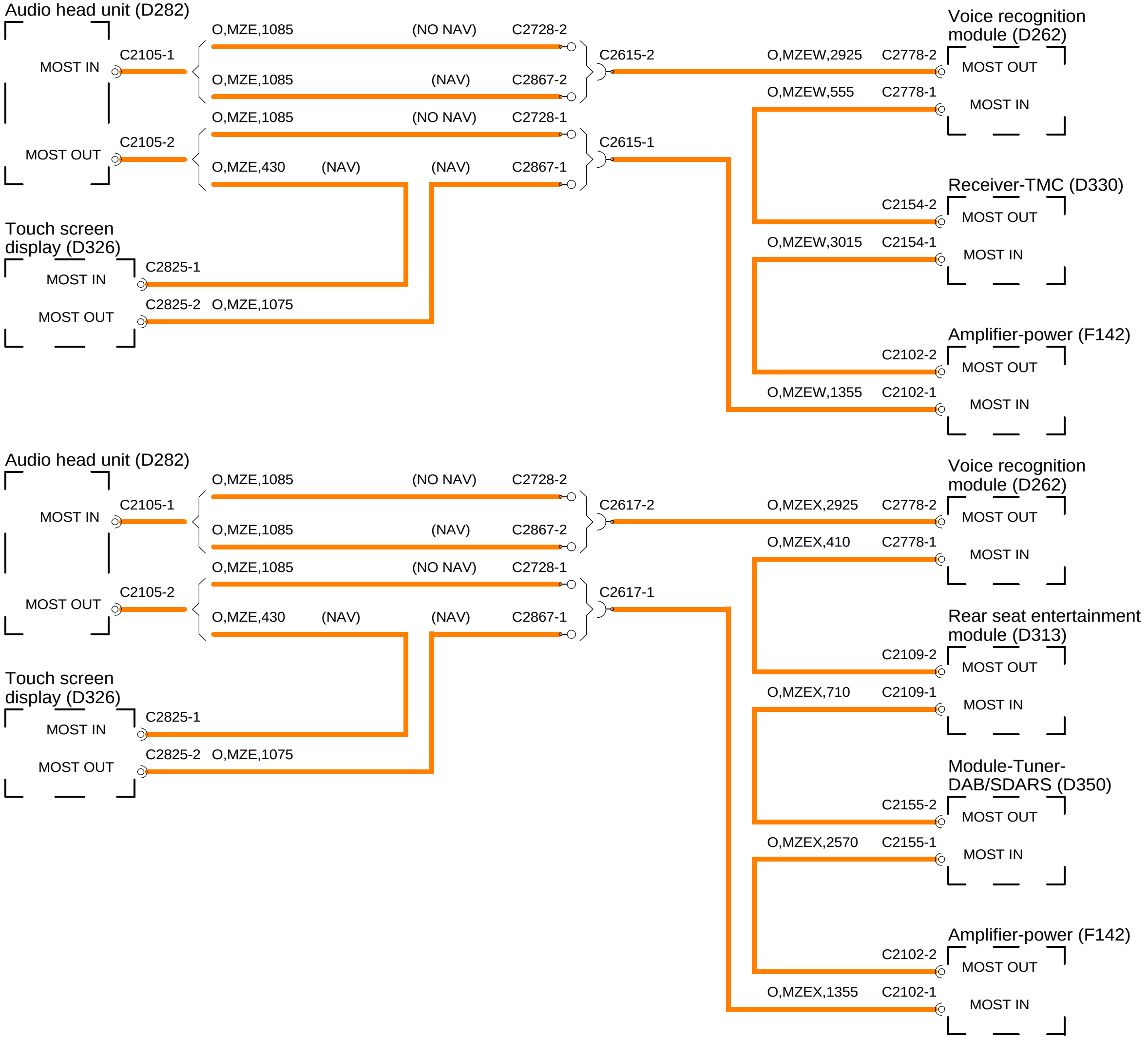

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2968-2
C2968-1
O,MZER,2925
C2778-2
O,MZER,2860
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZER,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

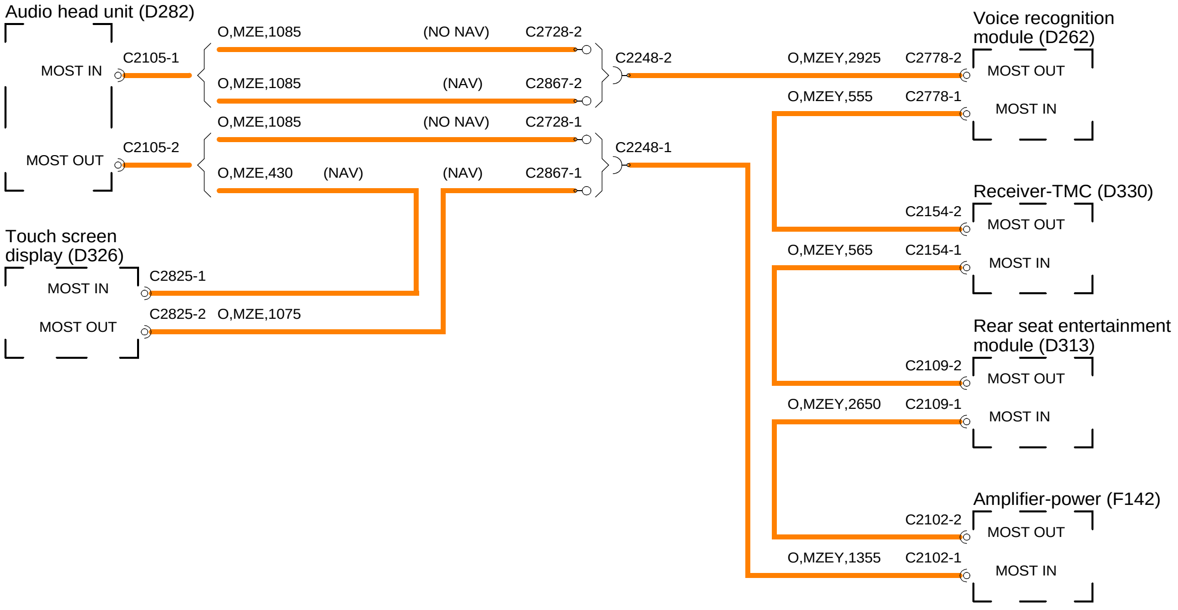

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2978-2
C2978-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
Rear seat entertainment module (D313)
O,MZES,2715
C2109-2
MOST OUT
O,MZES,710
C2109-1
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZES,2570
C2155-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZES,1355
C2102-1
MOST IN

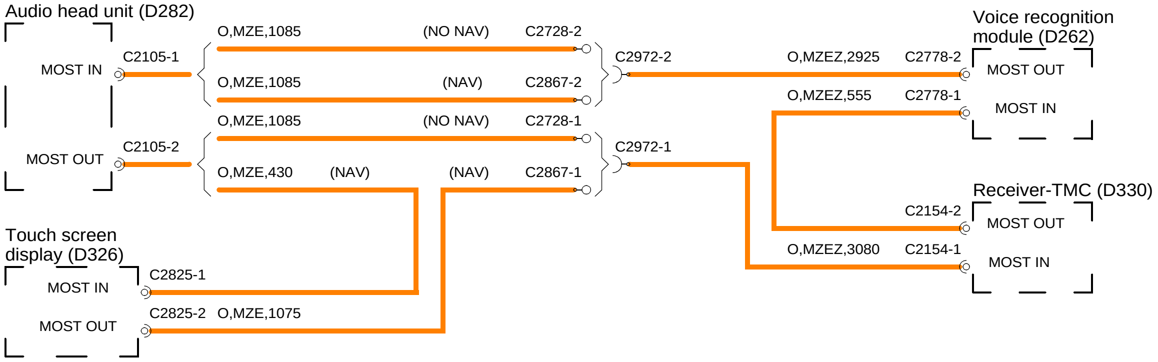

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3209-2
C3209-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZET,2925
C2778-2
MOST OUT
O,MZET,920
C2778-1
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZET,2570
C2155-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZET,1355
C2102-1
MOST IN

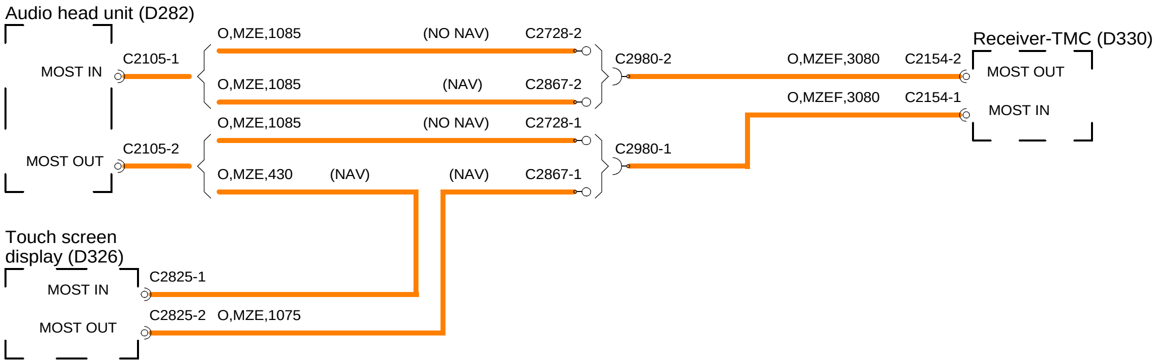

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2974-2
C2974-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
O,MZEU,3080
C2154-2
O,MZEU,565
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEU,2650
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEU,1355
C2102-1
MOST IN

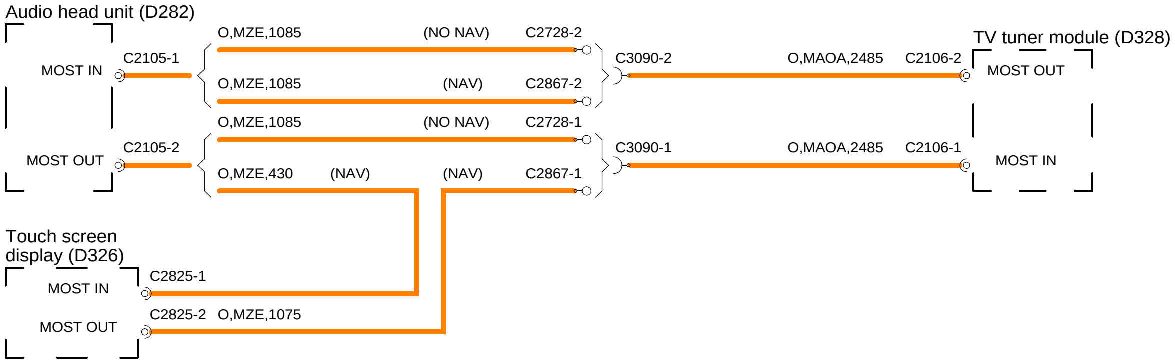

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2976-2
C2976-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
O,MZEV,2925
C2778-2
O,MZEV,410
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEV,2650
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEV,1355
C2102-1
MOST IN

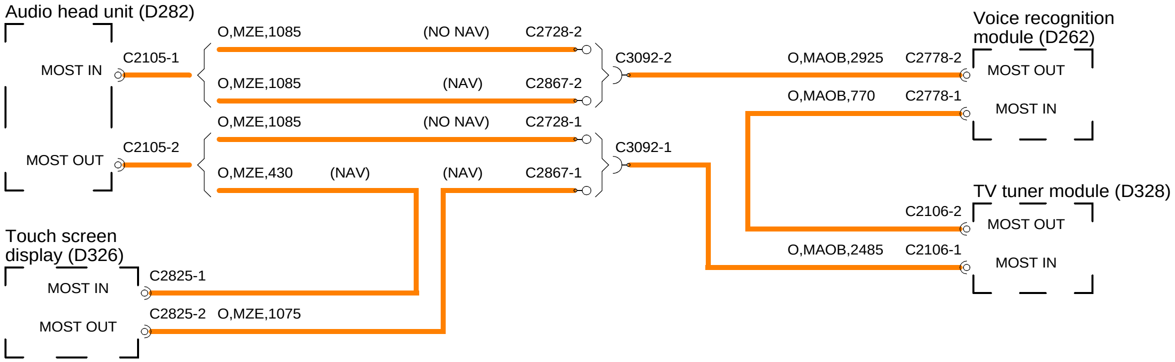

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2615-2
C2615-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEW,2925
C2778-2
MOST OUT
O,MZEW,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEW,3015
C2154-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEW,1355
C2102-1
MOST IN
Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2617-2
C2617-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEX,2925
C2778-2
MOST OUT
O,MZEX,410
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEX,710
C2109-1
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZEX,2570
C2155-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEX,1355
C2102-1
MOST IN

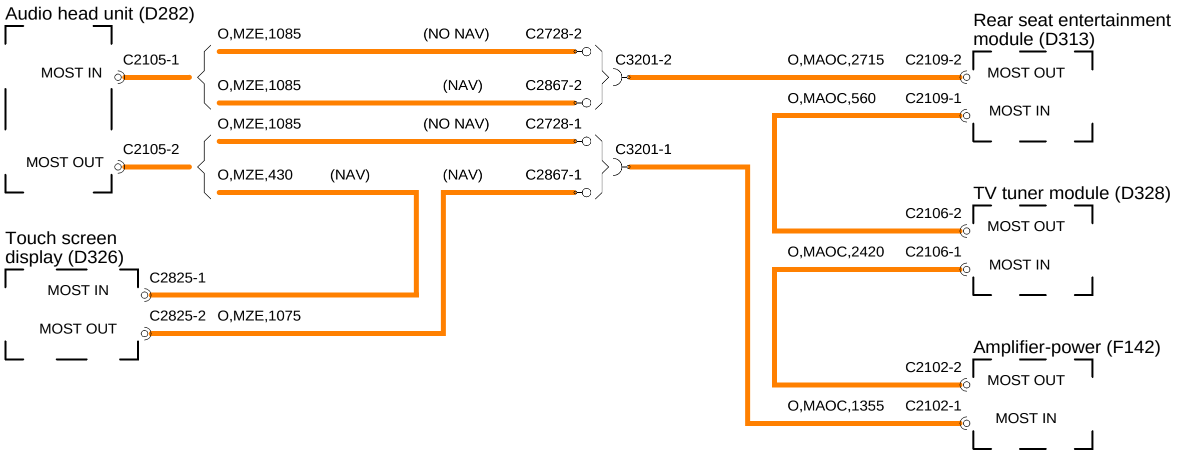

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2248-2
C2248-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
O,MZEY,2925
C2778-2
O,MZEY,555
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEY,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEY,2650
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEY,1355
C2102-1
MOST IN

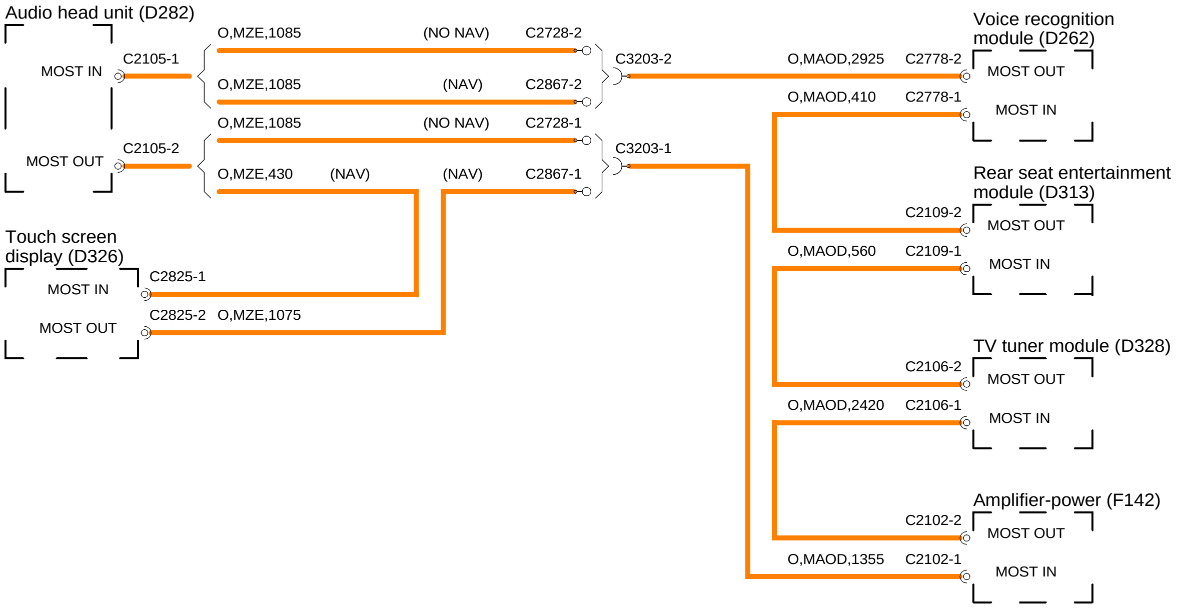

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2972-2
C2972-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
O,MZEZ,2925
C2778-2
O,MZEZ,555
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEZ,3080
C2154-1
MOST IN

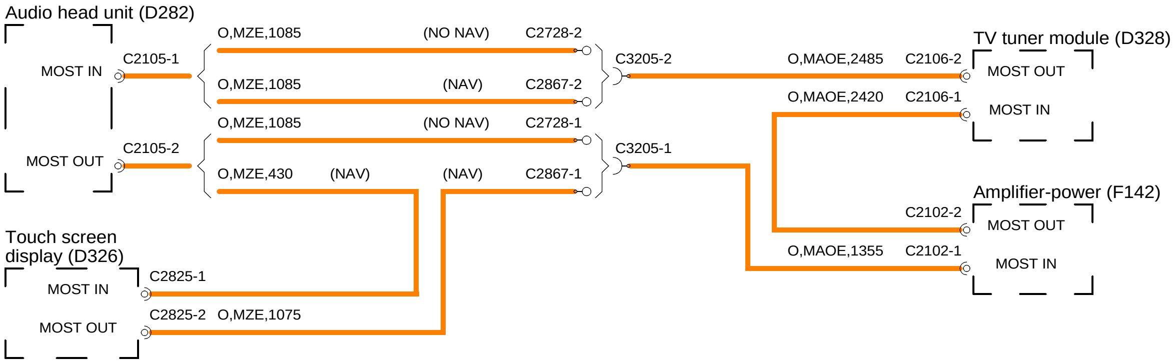

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2980-2
C2980-1
O,MZEF,3080
C2154-2
O,MZEF,3080
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

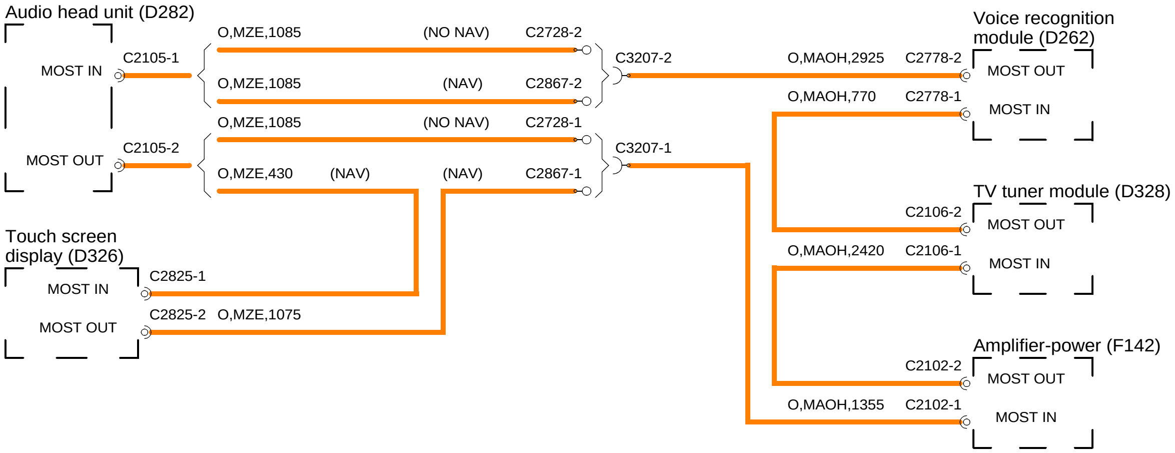

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3090-2
C3090-1
O,MAOA,2485
C2106-2
O,MAOA,2485
C2106-1
TV tuner module (D328)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

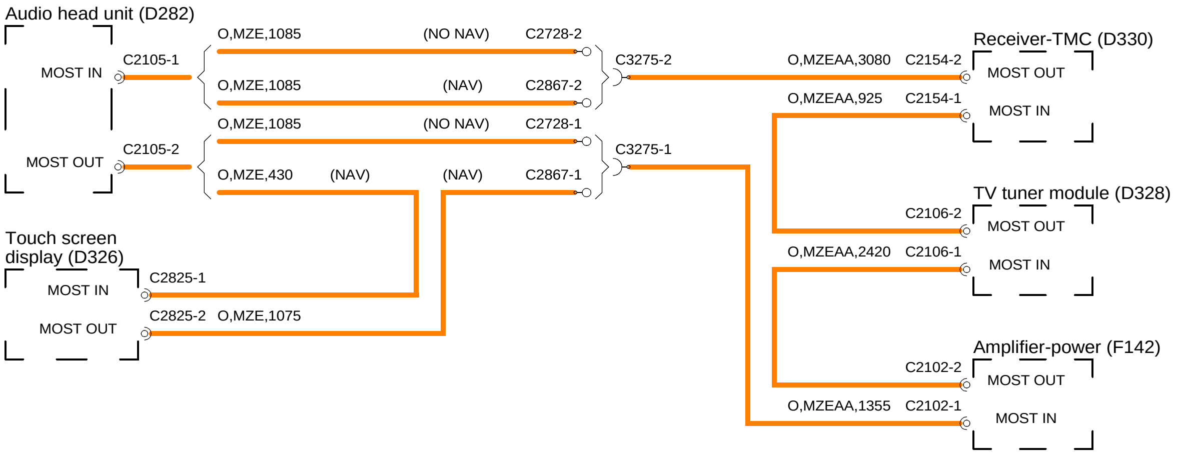

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3092-2
C3092-1
O,MAOB,2925
C2778-2
O,MAOB,770
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOB,2485
C2106-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

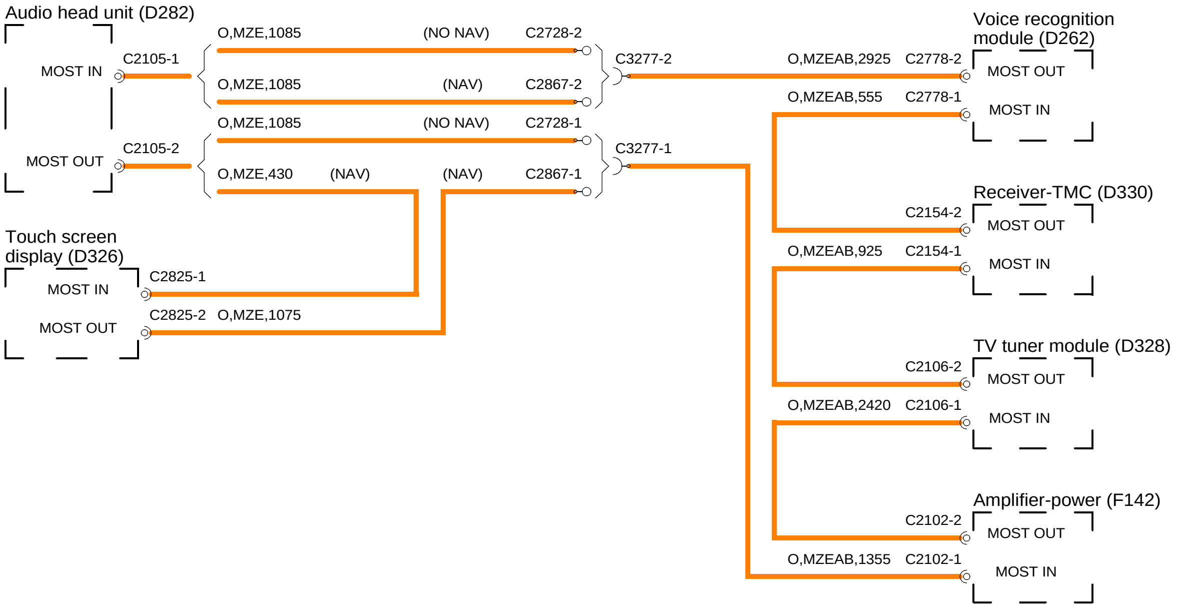

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3201-2
C3201-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Rear seat entertainment module (D313)
O,MAOC,2715
C2109-2
MOST OUT
O,MAOC,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOC,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOC,1355
C2102-1
MOST IN

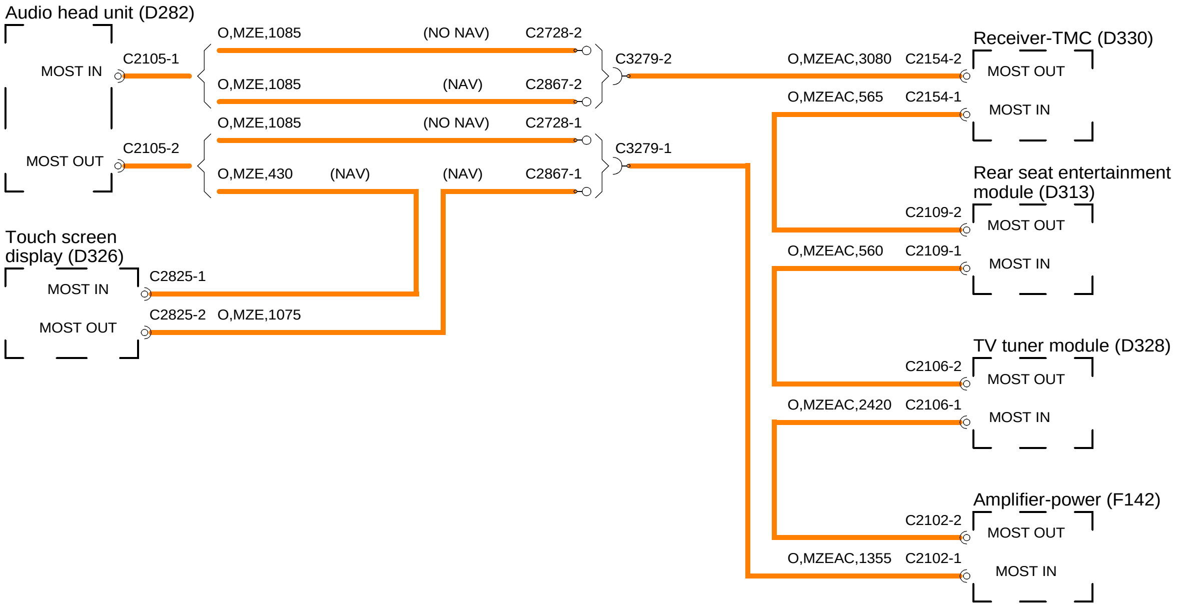

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3203-2
C3203-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MAOD,2925
C2778-2
MOST OUT
O,MAOD,410
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MAOD,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOD,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOD,1355
C2102-1
MOST IN

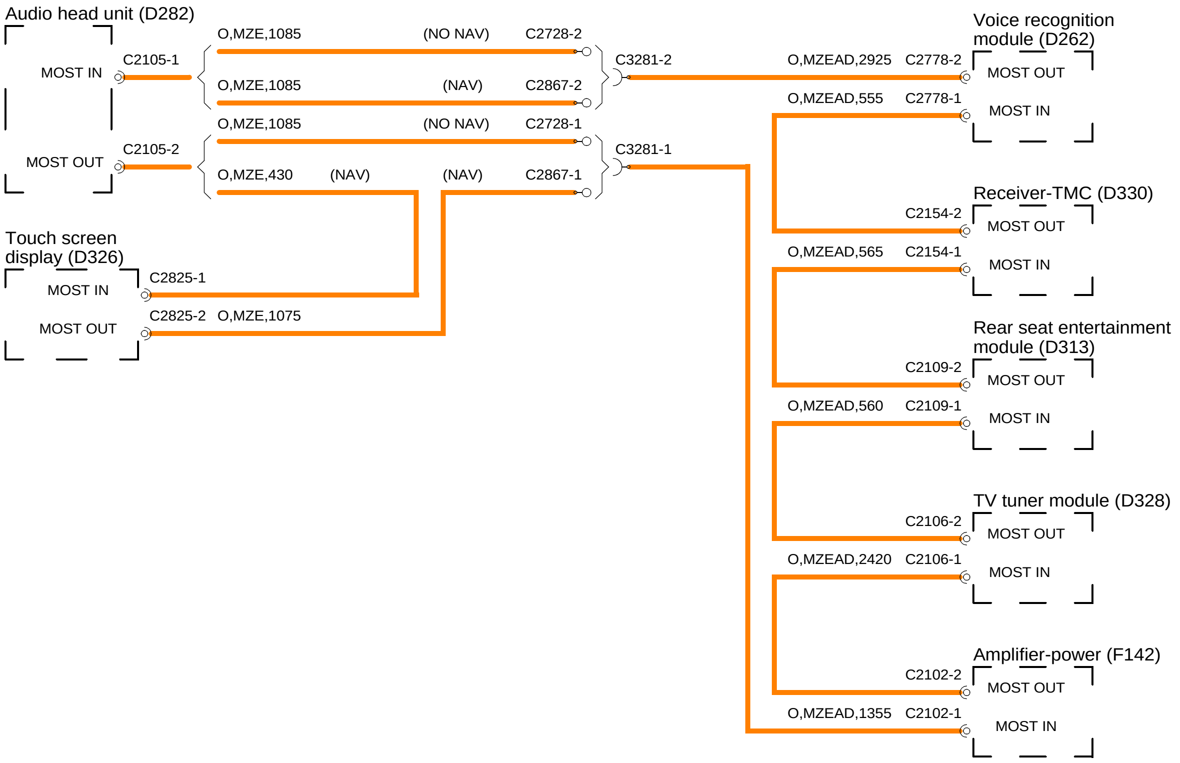

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3205-2
C3205-1
O,MAOE,2485
C2106-2
O,MAOE,2420
C2106-1
TV tuner module (D328)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOE,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

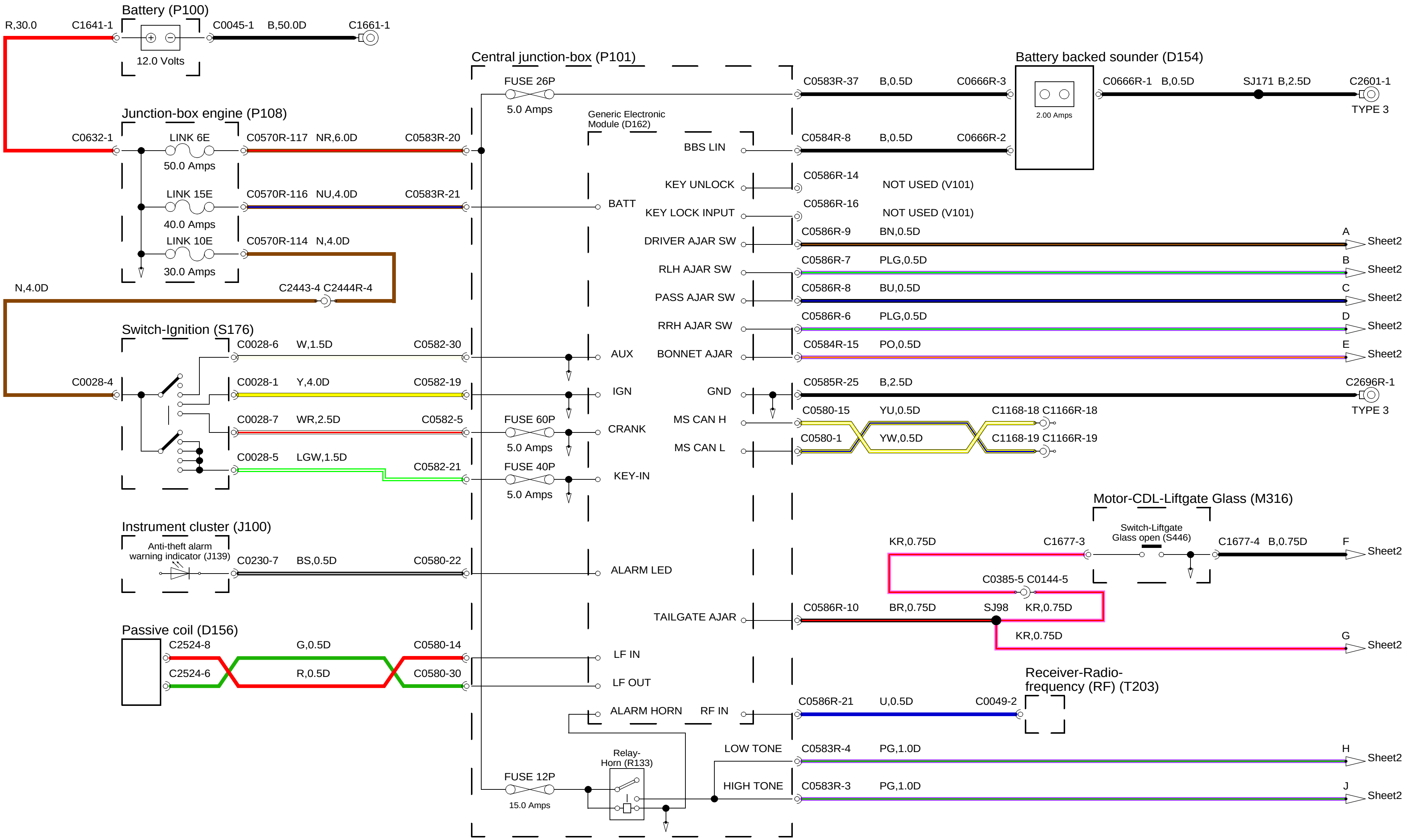

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3207-2
C3207-1
O,MAOH,2925
C2778-2
O,MAOH,770
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOH,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOH,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

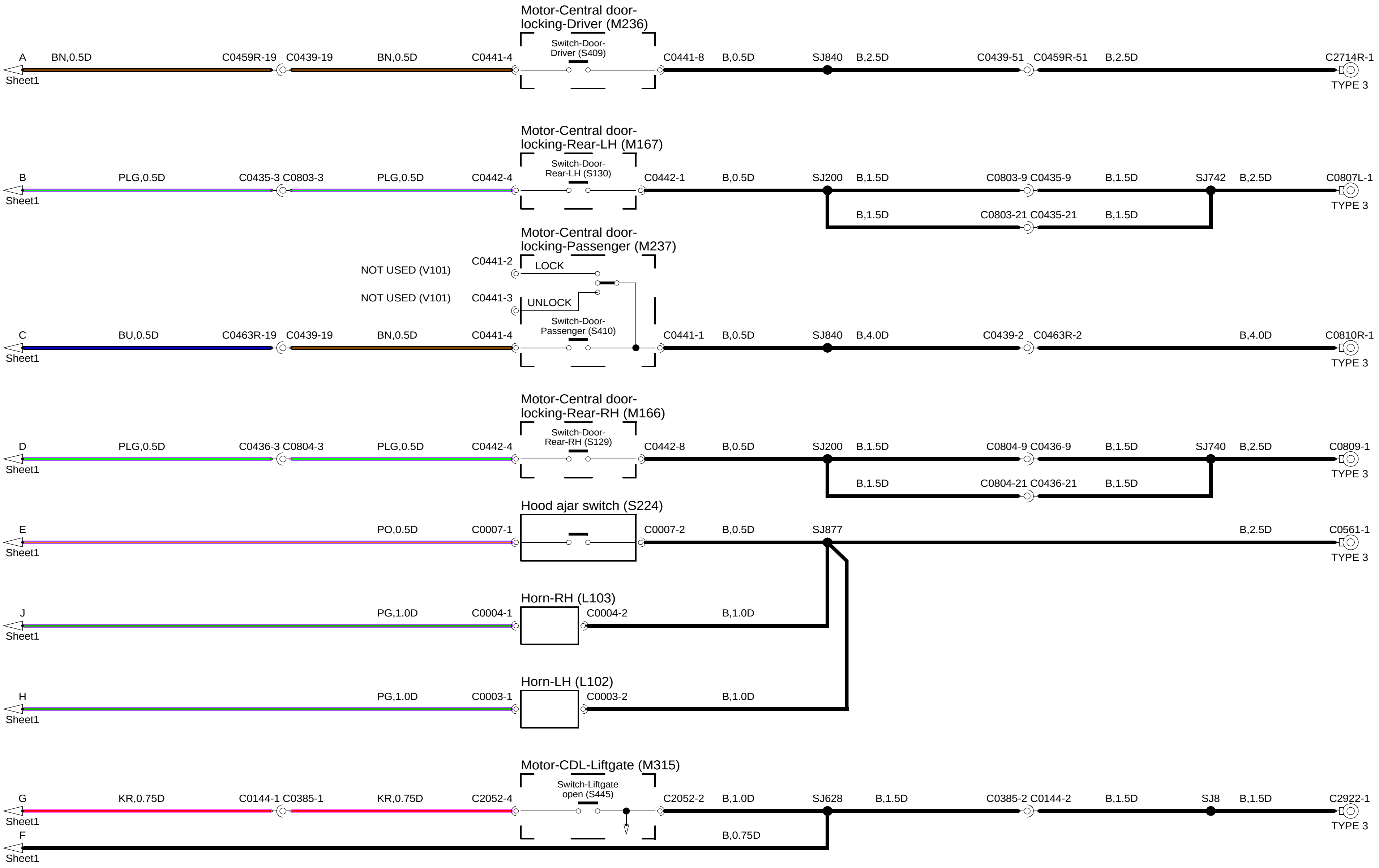

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3275-2
C3275-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
O,MZEAA,3080
C2154-2
O,MZEAA,925
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAA,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAA,1355
C2102-1
MOST IN

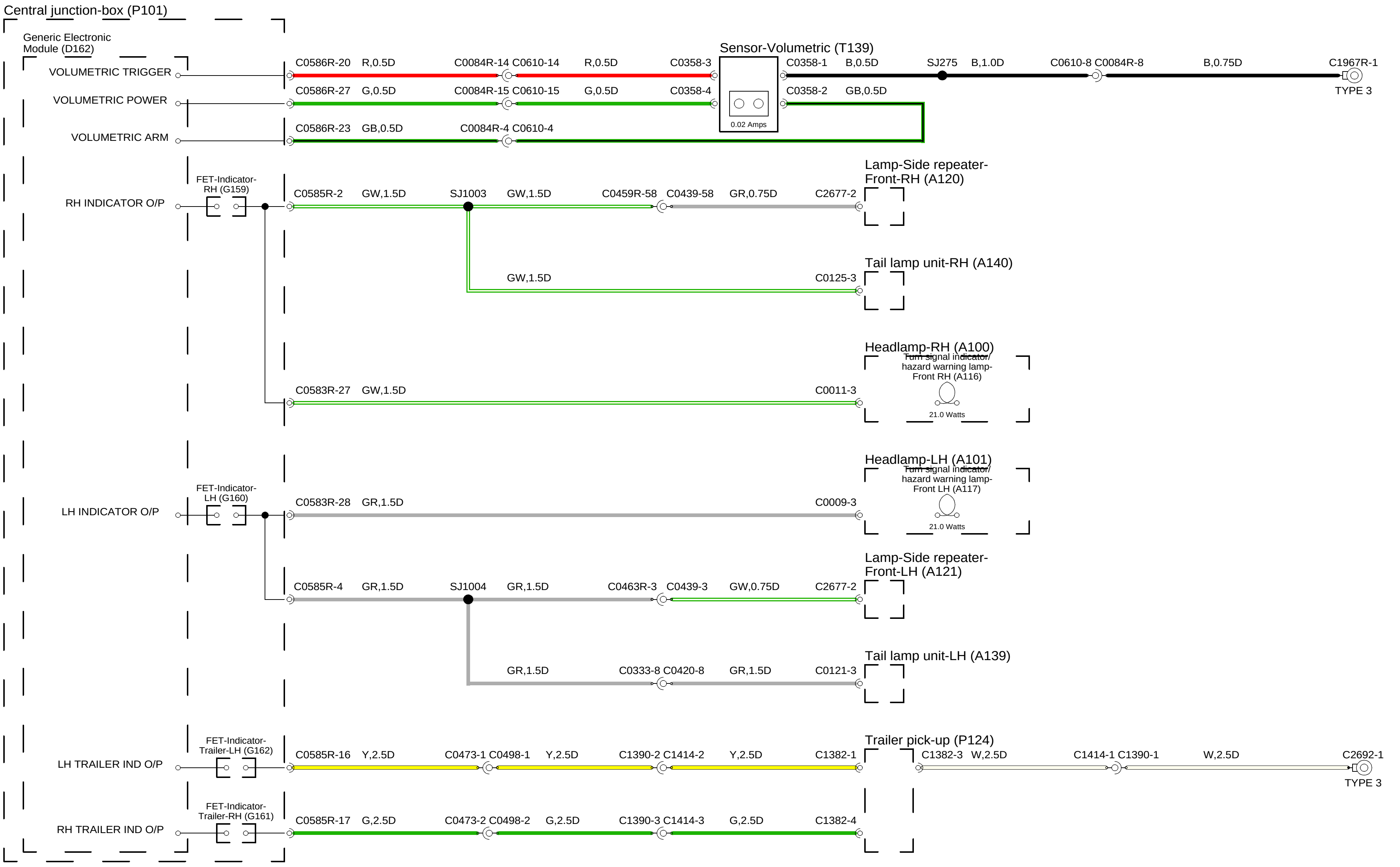

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3277-2
C3277-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEAB,2925
C2778-2
MOST OUT
O,MZEAB,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEAB,925
C2154-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAB,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAB,1355
C2102-1
MOST IN

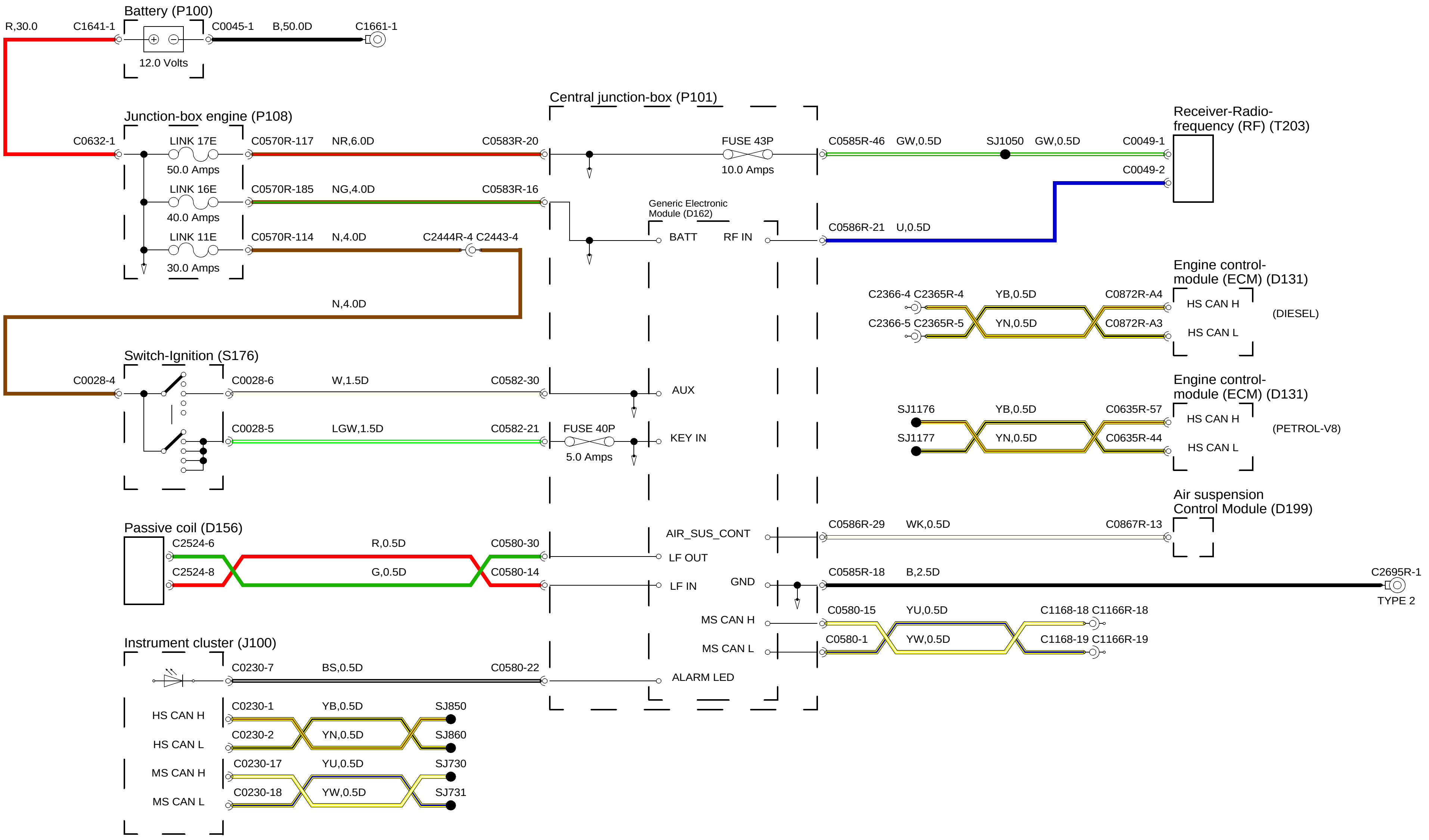

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3279-2
C3279-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Receiver-TMC (D330)
O,MZEAC,3080
C2154-2
MOST OUT
O,MZEAC,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEAC,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAC,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAC,1355
C2102-1
MOST IN

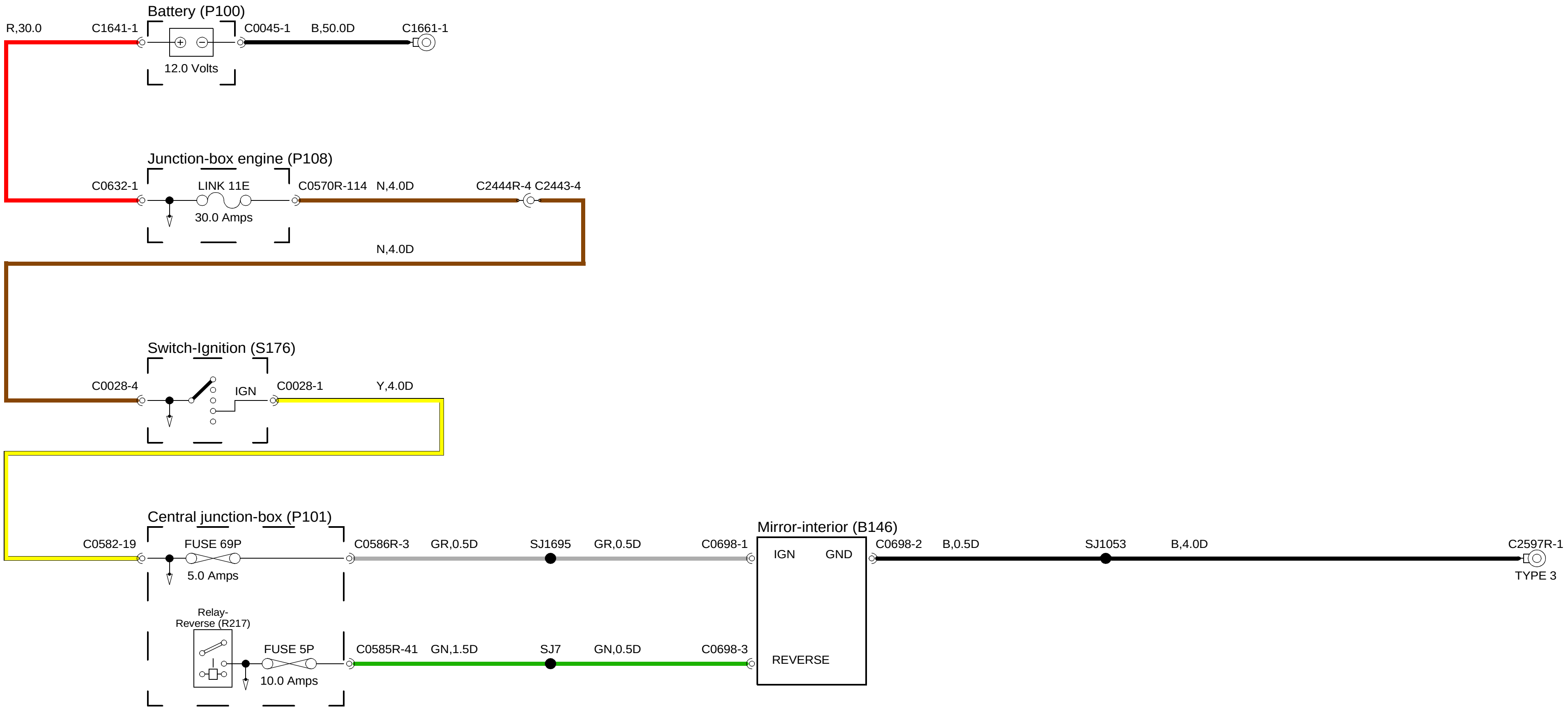

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3281-2
C3281-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEAD,2925
C2778-2
MOST OUT
O,MZEAD,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEAD,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEAD,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAD,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAD,1355
C2102-1
MOST IN

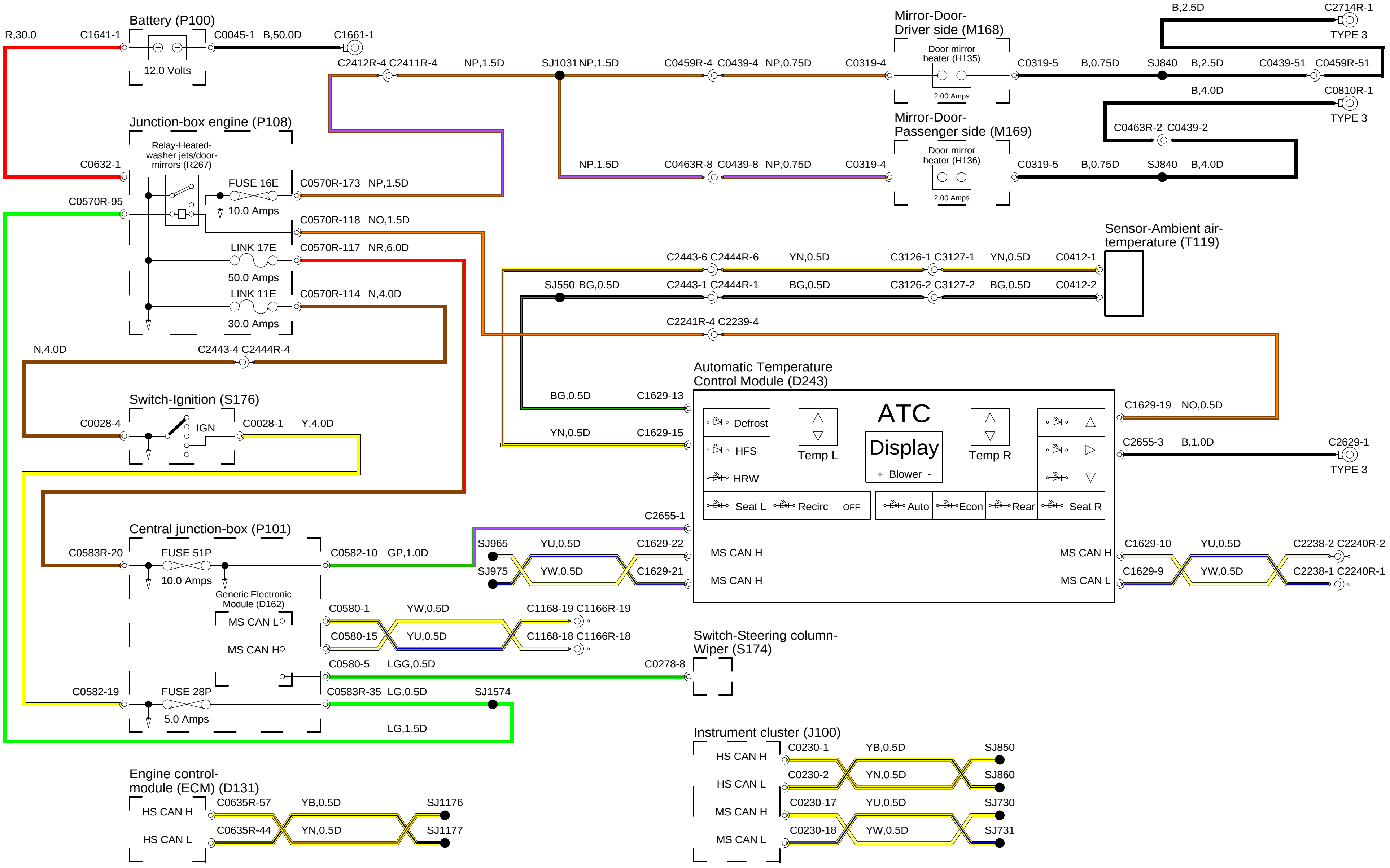

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
Battery backed sounder (D154)
FUSE 26P
5.0 Amps
C0583R-37
B,0.5D
C0666R-3
2.00 Amps
C0666R-1
B,0.5D
SJ171
B,2.5D
C2601-1
TYPE 3
Junction-box engine (P108)
Generic Electronic Module (D162)
C0632-1
LINK 6E
50.0 Amps
C0570R-117
NR,6.0D
C0583R-20
BBS LIN
C0584R-8
B,0.5D
C0666R-2
KEY UNLOCK
C0586R-14
NOT USED (V101)
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0583R-21
BATT
KEY LOCK INPUT
C0586R-16
NOT USED (V101)
LINK 10E
30.0 Amps
C0570R-114
N,4.0D
DRIVER AJAR SW
C0586R-9
BN,0.5D
A
Sheet2
RLH AJAR SW
C0586R-7
PLG,0.5D
B
Sheet2
N,4.0D
C2443-4 C2444R-4
PASS AJAR SW
C0586R-8
BU,0.5D
C
Sheet2
Switch-Ignition (S176)
RRH AJAR SW
C0586R-6
PLG,0.5D
D
Sheet2
C0028-6
W,1.5D
C0582-30
AUX
BONNET AJAR
C0584R-15
PO,0.5D
E
Sheet2
C0028-4
C0028-1
Y,4.0D
C0582-19
IGN
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
MS CAN H
C0580-15
YU,0.5D
C1168-18 C1166R-18
MS CAN L
C0580-1
YW,0.5D
C1168-19 C1166R-19
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY-IN
Motor-CDL-Liftgate Glass (M316)
Switch-Liftgate Glass open (S446)
Instrument cluster (J100)
Anti-theft alarm warning indicator (J139)
KR,0.75D
C1677-3
C1677-4
B,0.75D
F
Sheet2
C0230-7
BS,0.5D
C0580-22
ALARM LED
C0385-5 C0144-5
TAILGATE AJAR
C0586R-10
BR,0.75D
SJ98
KR,0.75D
Passive coil (D156)
KR,0.75D
G
Sheet2
C2524-8
G,0.5D
C0580-14
LF IN
C2524-6
R,0.5D
C0580-30
LF OUT
Receiver-Radio-frequency (RF) (T203)
ALARM HORN
RF IN
C0586R-21
U,0.5D
C0049-2
Relay-Horn (R133)
LOW TONE
C0583R-4
PG,1.0D
H
Sheet2
FUSE 12P
15.0 Amps
HIGH TONE
C0583R-3
PG,1.0D
J
Sheet2

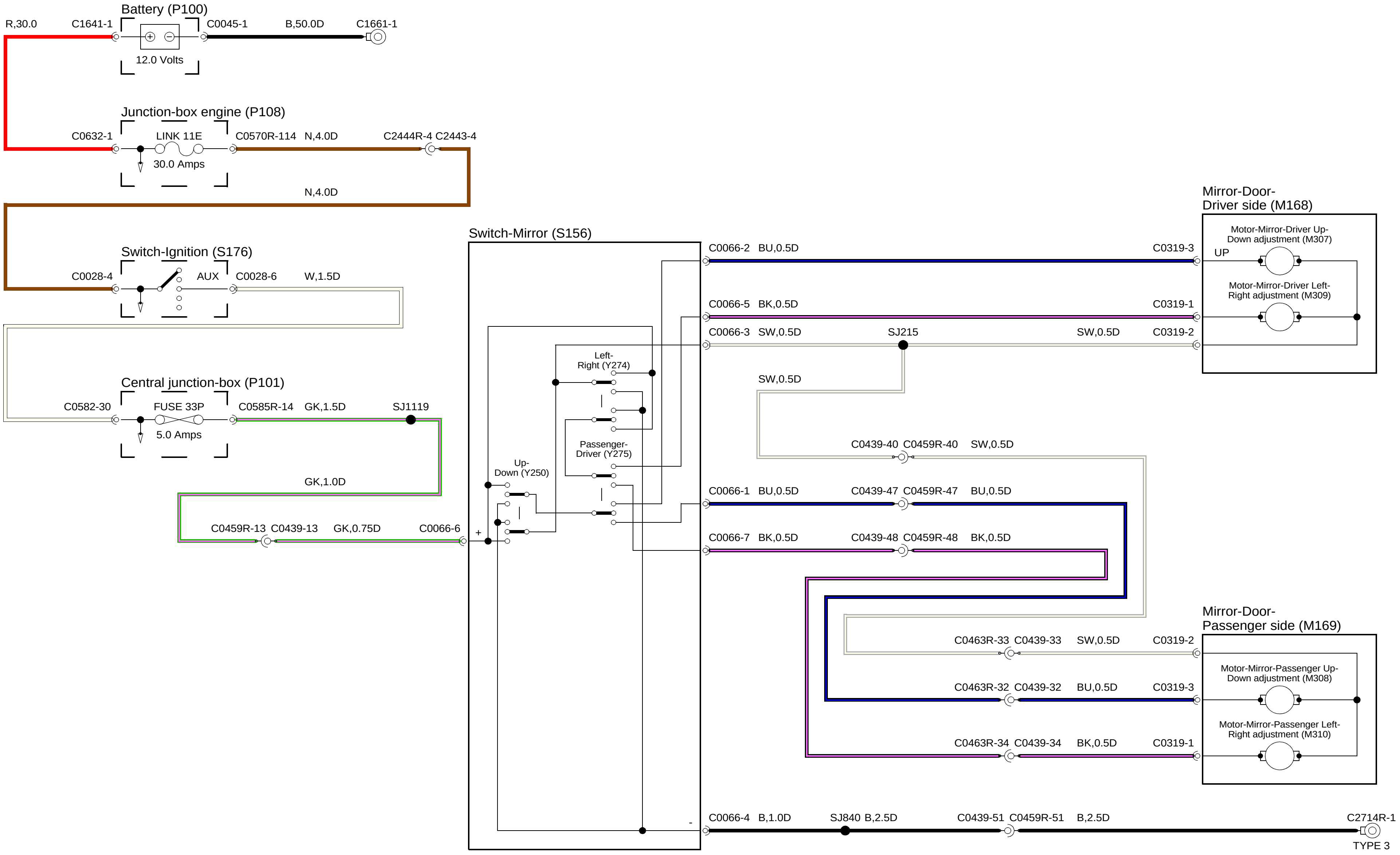

Motor-Central door-locking-Driver (M236)
Switch-Door-Driver (S409)
A
Sheet1
BN,0.5D
C0459R-19
C0439-19
BN,0.5D
C0441-4
C0441-8
B,0.5D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
B
Sheet1
PLG,0.5D
C0435-3
C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9
C0435-9
B,1.5D
SJ742
B,2.5D
C0807L-1
TYPE 3
B,1.5D
C0803-21
C0435-21
B,1.5D
Motor-Central door-locking-Passenger (M237)
NOT USED (V101)
C0441-2
LOCK
NOT USED (V101)
C0441-3
UNLOCK
Switch-Door-Passenger (S410)
C
Sheet1
BU,0.5D
C0463R-19
C0439-19
BN,0.5D
C0441-4
C0441-1
B,0.5D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3
Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
D
Sheet1
PLG,0.5D
C0436-3
C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9
C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21
C0436-21
B,1.5D
Hood ajar switch (S224)
E
Sheet1
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
J
Sheet1
PG,1.0D
C0004-1
C0004-2
B,1.0D
Horn-LH (L102)
H
Sheet1
PG,1.0D
C0003-1
C0003-2
B,1.0D
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
G
Sheet1
KR,0.75D
C0144-1
C0385-1
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0385-2
C0144-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
F
Sheet1
B,0.75D

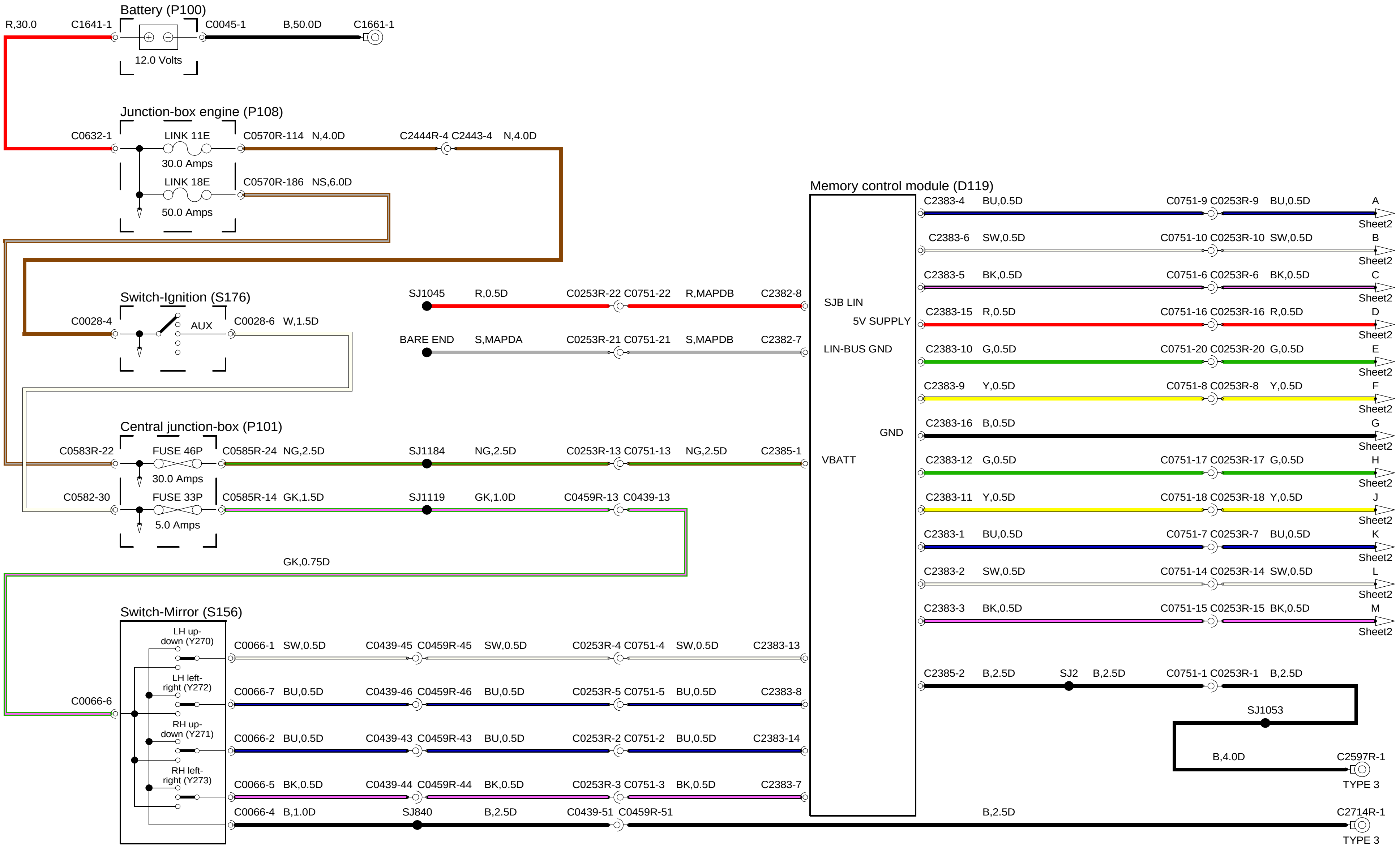

Central junction-box (P101)
Generic Electronic Module (D162)
VOLUMETRIC TRIGGER
VOLUMETRIC POWER
VOLUMETRIC ARM
RH INDICATOR O/P
FET-Indicator-RH (G159)
LH INDICATOR O/P
FET-Indicator-LH (G160)
LH TRAILER IND O/P
FET-Indicator-Trailer-LH (G162)
RH TRAILER IND O/P
FET-Indicator-Trailer-RH (G161)
C0586R-20 R,0.5D
C0084R-14 C0610-14
R,0.5D
C0358-3
C0586R-27 G,0.5D
C0084R-15 C0610-15
G,0.5D
C0358-4
C0586R-23 GB,0.5D
C0084R-4 C0610-4
Sensor-Volumetric (T139)
0.02 Amps
C0358-1 B,0.5D
SJ275 B,1.0D
C0610-8 C0084R-8
B,0.75D
C1967R-1
TYPE 3
C0358-2 GB,0.5D
Lamp-Side repeater-Front-RH (A120)
C0585R-2 GW,1.5D
SJ1003 GW,1.5D
C0459R-58 C0439-58
GR,0.75D
C2677-2
Tail lamp unit-RH (A140)
GW,1.5D
C0125-3
Headlamp-RH (A100)
Turn signal indicator/ hazard warning lamp-Front RH (A116)
C0583R-27 GW,1.5D
C0011-3
21.0 Watts
Headlamp-LH (A101)
Turn signal indicator/ hazard warning lamp-Front LH (A117)
C0583R-28 GR,1.5D
C0009-3
21.0 Watts
Lamp-Side repeater-Front-LH (A121)
C0585R-4 GR,1.5D
SJ1004 GR,1.5D
C0463R-3 C0439-3
GW,0.75D
C2677-2
Tail lamp unit-LH (A139)
GR,1.5D
C0333-8 C0420-8
GR,1.5D
C0121-3
Trailer pick-up (P124)
C0585R-16 Y,2.5D
C0473-1 C0498-1
Y,2.5D
C1390-2 C1414-2
Y,2.5D
C1382-1
C1382-3 W,2.5D
C1414-1 C1390-1
W,2.5D
C2692-1
TYPE 3
C0585R-17 G,2.5D
C0473-2 C0498-2
G,2.5D
C1390-3 C1414-3
G,2.5D
C1382-4

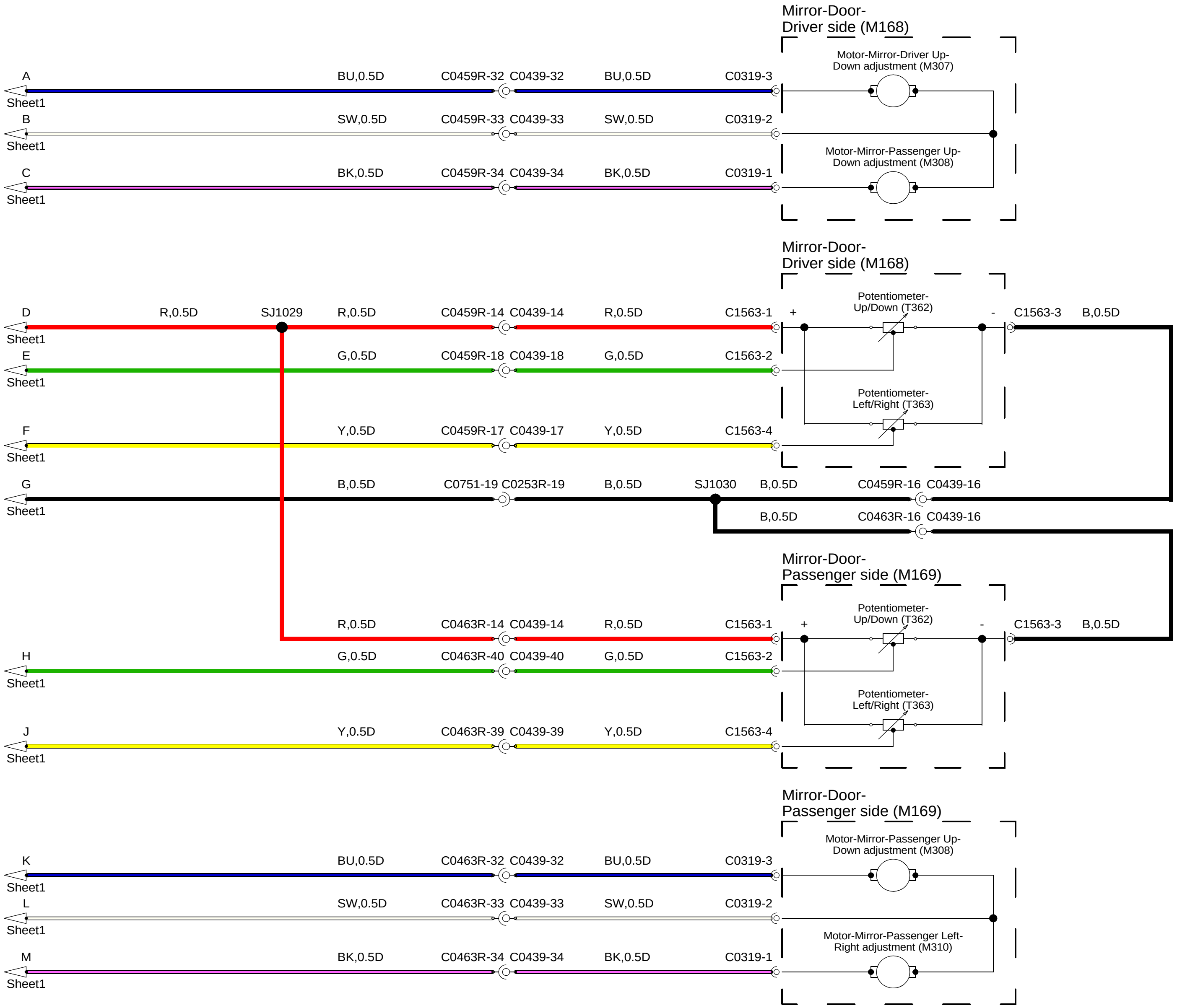

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 17E
50.0 Amps
LINK 16E
40.0 Amps
LINK 11E
30.0 Amps
C0570R-117
NR,6.0D
C0583R-20
C0570R-185
NG,4.0D
C0583R-16
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Central junction-box (P101)
FUSE 43P
10.0 Amps
Generic Electronic Module (D162)
BATT
RF IN
C0585R-46
GW,0.5D
SJ1050
GW,0.5D
C0049-1
C0049-2
Receiver-Radio-frequency (RF) (T203)
C0586R-21
U,0.5D
Engine control-module (ECM) (D131)
C2366-4 C2365R-4
YB,0.5D
C0872R-A4
HS CAN H
C2366-5 C2365R-5
YN,0.5D
C0872R-A3
HS CAN L
(DIESEL)
Switch-Ignition (S176)
C0028-4
C0028-6
W,1.5D
C0582-30
AUX
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY IN
Engine control-module (ECM) (D131)
SJ1176
YB,0.5D
C0635R-57
HS CAN H
SJ1177
YN,0.5D
C0635R-44
HS CAN L
(PETROL-V8)
Air suspension Control Module (D199)
AIR_SUS_CONT
C0586R-29
WK,0.5D
C0867R-13
Passive coil (D156)
C2524-6
R,0.5D
C0580-30
LF OUT
C2524-8
G,0.5D
C0580-14
LF IN
GND
C0585R-18
B,2.5D
C2695R-1
TYPE 2
MS CAN H
C0580-15
YU,0.5D
C1168-18 C1166R-18
MS CAN L
C0580-1
YW,0.5D
C1168-19 C1166R-19
Instrument cluster (J100)
C0230-7
BS,0.5D
C0580-22
ALARM LED
HS CAN H
C0230-1
YB,0.5D
SJ850
HS CAN L
C0230-2
YN,0.5D
SJ860
MS CAN H
C0230-17
YU,0.5D
SJ730
MS CAN L
C0230-18
YW,0.5D
SJ731

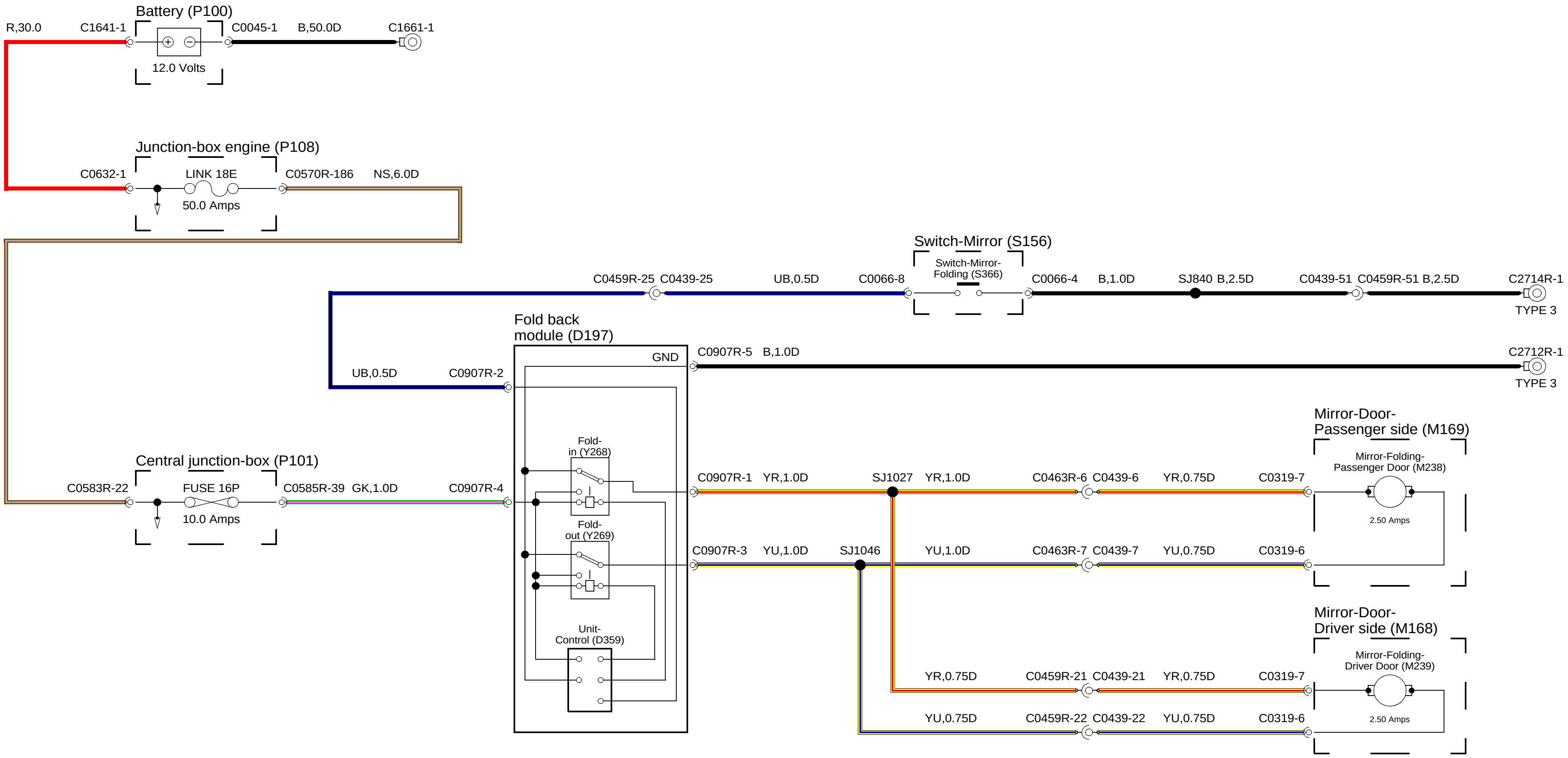

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 69P
5.0 Amps
C0586R-3
GR,0.5D
SJ1695
GR,0.5D
C0698-1
Mirror-interior (B146)
IGN
GND
C0698-2
B,0.5D
SJ1053
B,4.0D
C2597R-1
TYPE 3
Relay-
Reverse (R217)
FUSE 5P
10.0 Amps
C0585R-41
GN,1.5D
SJ7
GN,0.5D
C0698-3
REVERSE

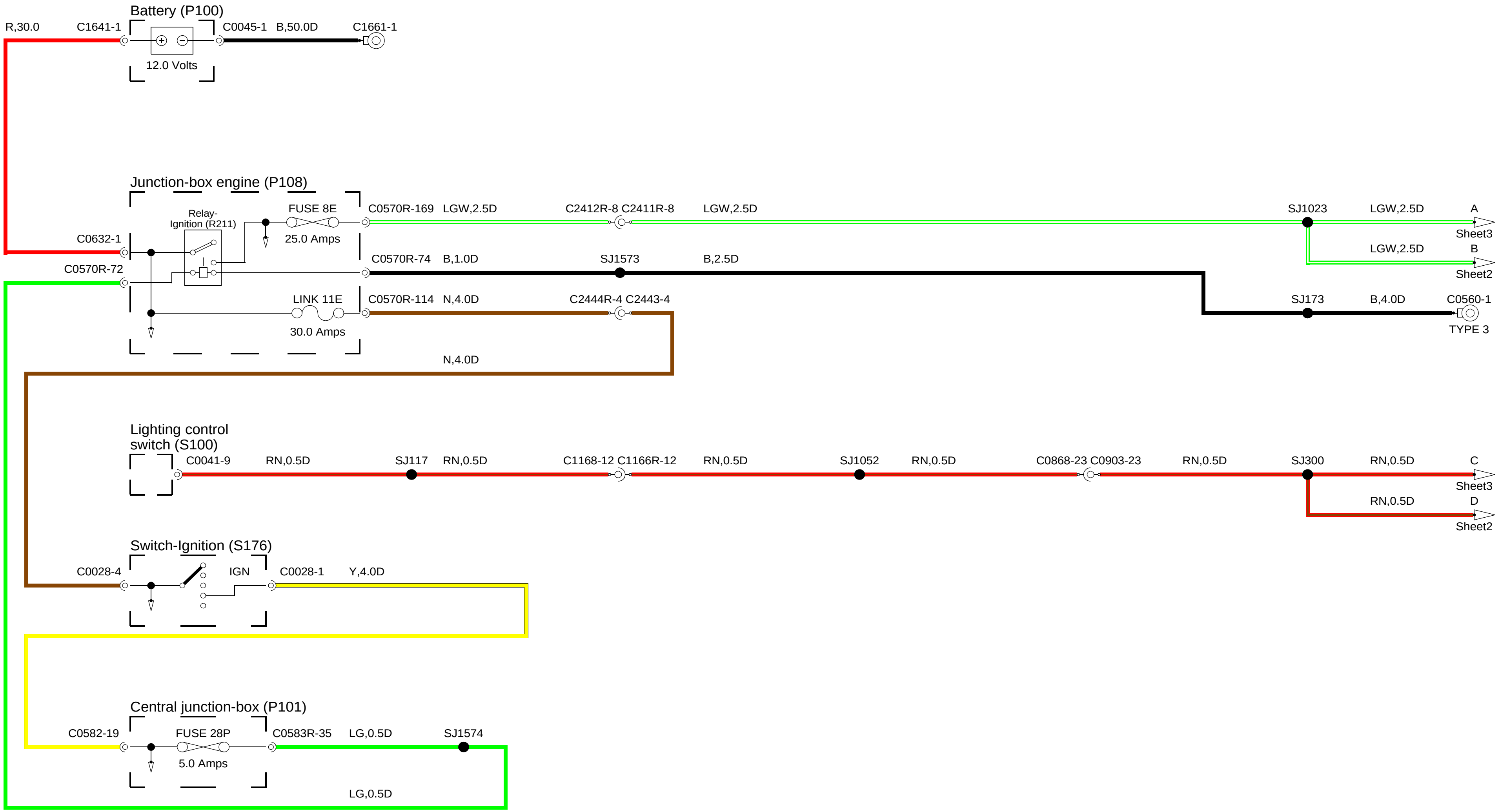

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Mirror-Door-
Driver side (M168)
Door mirror
heater (H135)
2.00 Amps
B,2.5D
C2714R-1
TYPE 3
C2412R-4 C2411R-4
NP,1.5D
SJ1031
NP,1.5D
C0459R-4 C0439-4
NP,0.75D
C0319-4
C0319-5
B,0.75D
SJ840
B,2.5D
C0439-51 C0459R-51
B,4.0D
C0810R-1
TYPE 3
Junction-box engine (P108)
Relay-Heated-
washer jets/door-
mirrors (R267)
C0632-1
C0570R-95
FUSE 16E
10.0 Amps
C0570R-173 NP,1.5D
Mirror-Door-
Passenger side (M169)
Door mirror
heater (H136)
2.00 Amps
C0463R-2 C0439-2
NP,1.5D
C0463R-8 C0439-8
NP,0.75D
C0319-4
C0319-5
B,0.75D
SJ840
B,4.0D
C0570R-118 NO,1.5D
LINK 17E
50.0 Amps
C0570R-117 NR,6.0D
LINK 11E
30.0 Amps
C0570R-114 N,4.0D
Sensor-Ambient air-
temperature (T119)
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550 BG,0.5D
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
C2241R-4 C2239-4
N,4.0D
C2443-4 C2444R-4
Automatic Temperature
Control Module (D243)
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
BG,0.5D
C1629-13
YN,0.5D
C1629-15
C1629-19 NO,0.5D
C2655-3 B,1.0D
C2629-1
TYPE 3
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
C2655-1
Central junction-box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D
SJ965
YU,0.5D
C1629-22
SJ975
YW,0.5D
C1629-21
MS CAN H
MS CAN H
MS CAN H
MS CAN L
C1629-10
YU,0.5D
C2238-2 C2240R-2
C1629-9
YW,0.5D
C2238-1 C2240R-1
Generic Electronic
Module (D162)
MS CAN L
MS CAN H
C0580-1
YW,0.5D
C1168-19 C1166R-19
C0580-15
YU,0.5D
C1168-18 C1166R-18
Switch-Steering column-
Wiper (S174)
C0580-5
LGG,0.5D
C0278-8
C0582-19
FUSE 28P
5.0 Amps
C0583R-35 LG,0.5D
SJ1574
LG,1.5D
Instrument cluster (J100)
HS CAN H
C0230-1
YB,0.5D
SJ850
HS CAN L
C0230-2
YN,0.5D
SJ860
MS CAN H
C0230-17
YU,0.5D
SJ730
MS CAN L
C0230-18
YW,0.5D
SJ731
Engine control-
module (ECM) (D131)
HS CAN H
C0635R-57
YB,0.5D
SJ1176
HS CAN L
C0635R-44
YN,0.5D
SJ1177

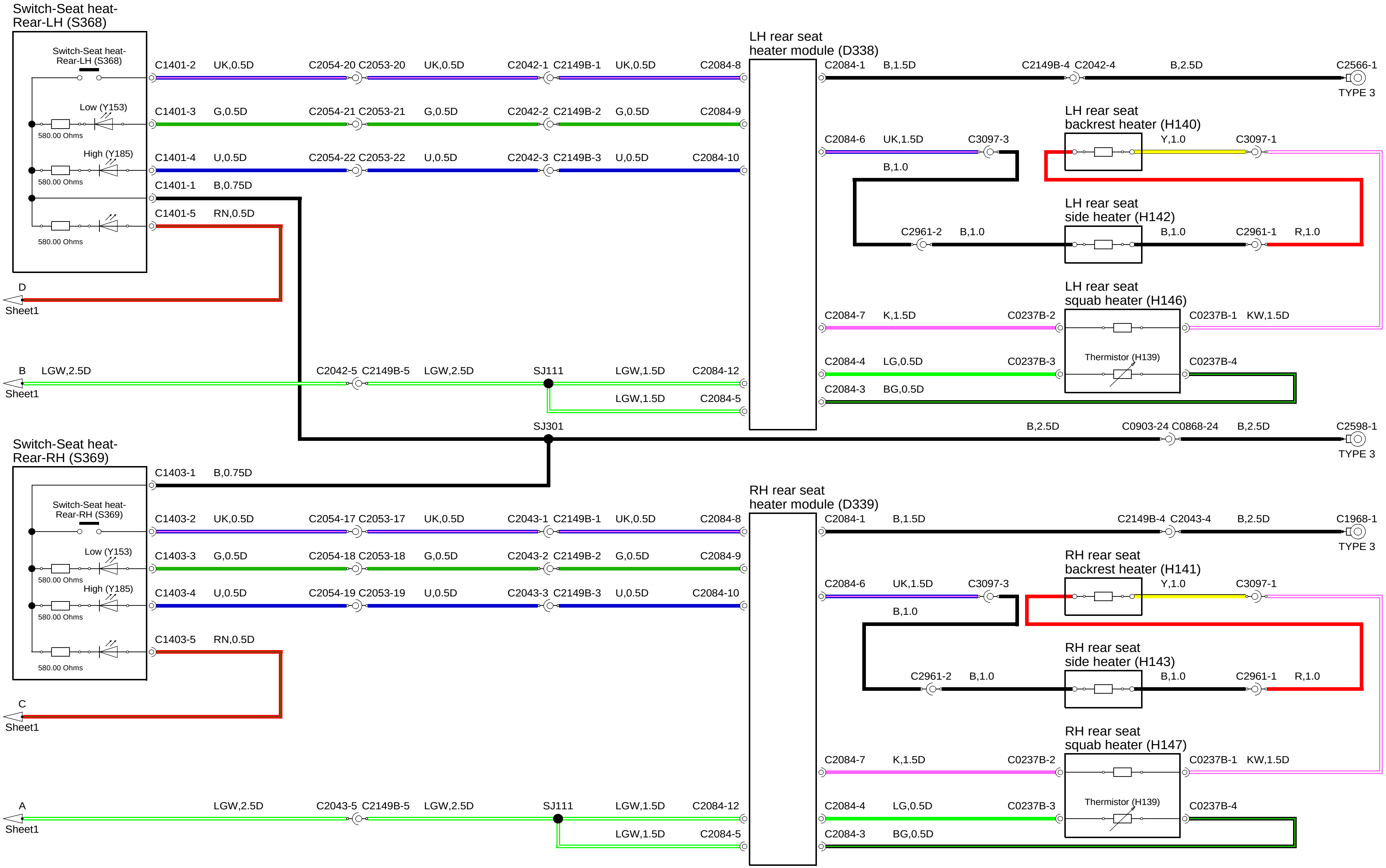

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central junction-box (P101)
C0582-30
FUSE 33P
C0585R-14
GK,1.5D
SJ1119
5.0 Amps
GK,1.0D
C0459R-13 C0439-13
GK,0.75D
C0066-6
Switch-Mirror (S156)
Left-Right (Y274)
Passenger-Driver (Y275)
Up-Down (Y250)
+
-
C0066-2
BU,0.5D
C0319-3
C0066-5
BK,0.5D
C0319-1
C0066-3
SW,0.5D
SJ215
SW,0.5D
C0319-2
SW,0.5D
C0439-40 C0459R-40
SW,0.5D
C0066-1
BU,0.5D
C0439-47 C0459R-47
BU,0.5D
C0066-7
BK,0.5D
C0439-48 C0459R-48
BK,0.5D
Mirror-Door-Driver side (M168)
Motor-Mirror-Driver Up-Down adjustment (M307)
UP
Motor-Mirror-Driver Left-Right adjustment (M309)
Mirror-Door-Passenger side (M169)
C0463R-33 C0439-33
SW,0.5D
C0319-2
Motor-Mirror-Passenger Up-Down adjustment (M308)
C0463R-32 C0439-32
BU,0.5D
C0319-3
Motor-Mirror-Passenger Left-Right adjustment (M310)
C0463R-34 C0439-34
BK,0.5D
C0319-1
C0066-4
B,1.0D
SJ840
B,2.5D
C0439-51 C0459R-51
B,2.5D
C2714R-1
TYPE 3

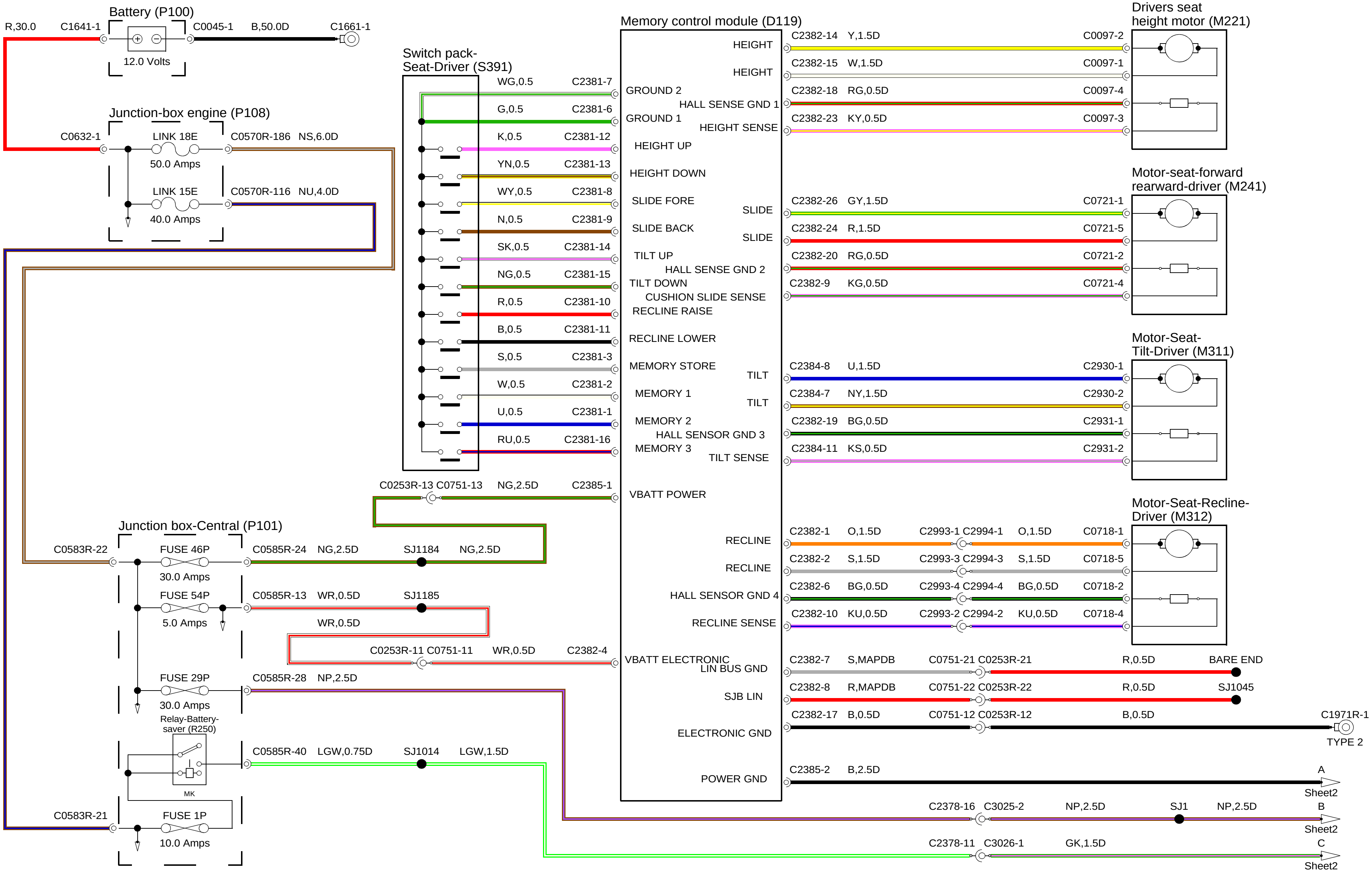

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 18E
50.0 Amps
C0570R-114 N,4.0D
C2444R-4 C2443-4 N,4.0D
C0570R-186 NS,6.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6 W,1.5D
SJ1045 R,0.5D
C0253R-22 C0751-22 R,MAPDB C2382-8
BARE END S,MAPDA
C0253R-21 C0751-21 S,MAPDB C2382-7
Central junction-box (P101)
C0583R-22
FUSE 46P
30.0 Amps
C0585R-24 NG,2.5D
SJ1184 NG,2.5D
C0253R-13 C0751-13 NG,2.5D C2385-1
C0582-30
FUSE 33P
5.0 Amps
C0585R-14 GK,1.5D
SJ1119 GK,1.0D
C0459R-13 C0439-13
GK,0.75D
Switch-Mirror (S156)
LH up-down (Y270)
LH left-right (Y272)
RH up-down (Y271)
RH left-right (Y273)
C0066-6
C0066-1 SW,0.5D C0439-45 C0459R-45 SW,0.5D C0253R-4 C0751-4 SW,0.5D C2383-13
C0066-7 BU,0.5D C0439-46 C0459R-46 BU,0.5D C0253R-5 C0751-5 BU,0.5D C2383-8
C0066-2 BU,0.5D C0439-43 C0459R-43 BU,0.5D C0253R-2 C0751-2 BU,0.5D C2383-14
C0066-5 BK,0.5D C0439-44 C0459R-44 BK,0.5D C0253R-3 C0751-3 BK,0.5D C2383-7
C0066-4 B,1.0D SJ840 B,2.5D C0439-51 C0459R-51 B,2.5D C2714R-1 TYPE 3
Memory control module (D119)
SJB LIN
5V SUPPLY
LIN-BUS GND
GND
VBATT
C2383-4 BU,0.5D C0751-9 C0253R-9 BU,0.5D A Sheet2
C2383-6 SW,0.5D C0751-10 C0253R-10 SW,0.5D B Sheet2
C2383-5 BK,0.5D C0751-6 C0253R-6 BK,0.5D C Sheet2
C2383-15 R,0.5D C0751-16 C0253R-16 R,0.5D D Sheet2
C2383-10 G,0.5D C0751-20 C0253R-20 G,0.5D E Sheet2
C2383-9 Y,0.5D C0751-8 C0253R-8 Y,0.5D F Sheet2
C2383-16 B,0.5D G Sheet2
C2383-12 G,0.5D C0751-17 C0253R-17 G,0.5D H Sheet2
C2383-11 Y,0.5D C0751-18 C0253R-18 Y,0.5D J Sheet2
C2383-1 BU,0.5D C0751-7 C0253R-7 BU,0.5D K Sheet2
C2383-2 SW,0.5D C0751-14 C0253R-14 SW,0.5D L Sheet2
C2383-3 BK,0.5D C0751-15 C0253R-15 BK,0.5D M Sheet2
C2385-2 B,2.5D SJ2 B,2.5D C0751-1 C0253R-1 B,2.5D
SJ1053
B,4.0D C2597R-1 TYPE 3

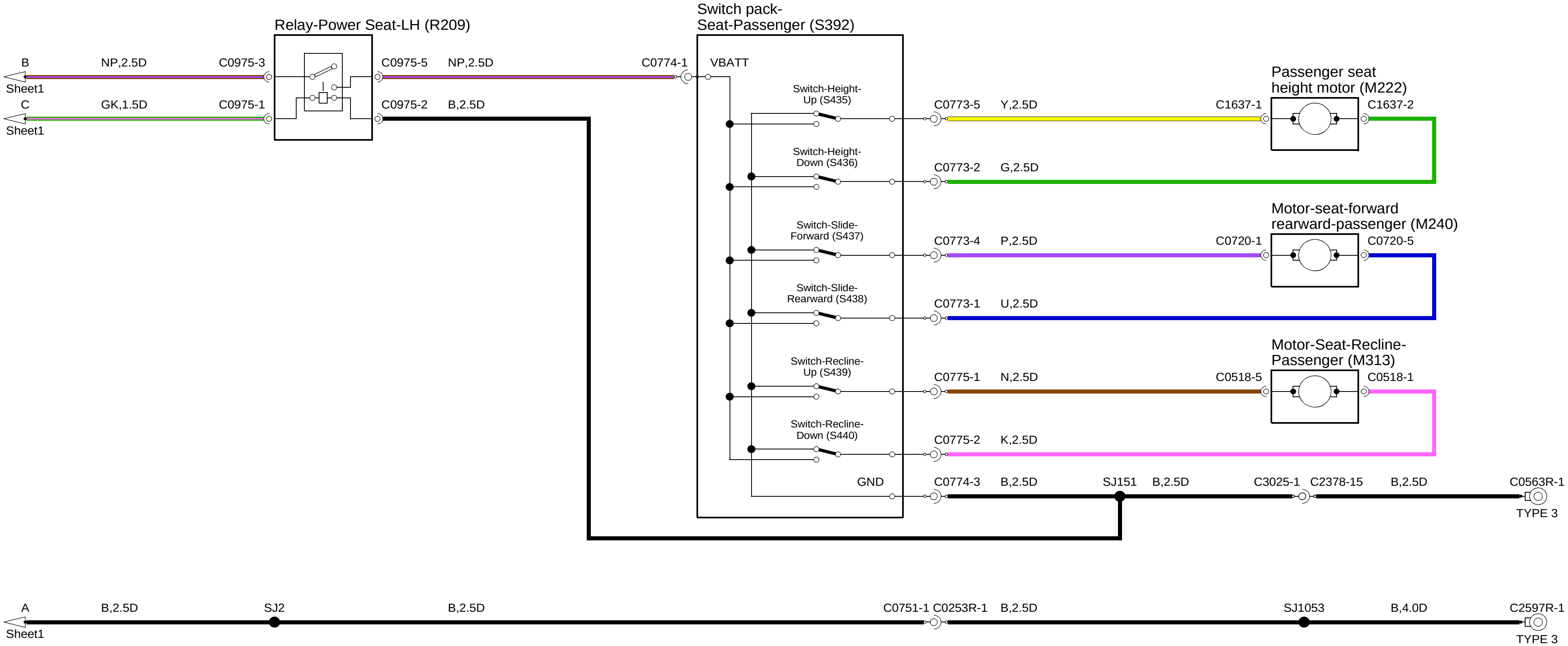

Mirror-Door-
Driver side (M168)
Motor-Mirror-Driver Up-
Down adjustment (M307)
A
Sheet1
BU,0.5D
C0459R-32 C0439-32
BU,0.5D
C0319-3
B
Sheet1
SW,0.5D
C0459R-33 C0439-33
SW,0.5D
C0319-2
Motor-Mirror-Passenger Up-
Down adjustment (M308)
C
Sheet1
BK,0.5D
C0459R-34 C0439-34
BK,0.5D
C0319-1
Mirror-Door-
Driver side (M168)
Potentiometer-
Up/Down (T362)
D
Sheet1
R,0.5D
SJ1029
R,0.5D
C0459R-14 C0439-14
R,0.5D
C1563-1
+
-
C1563-3
B,0.5D
E
Sheet1
G,0.5D
C0459R-18 C0439-18
G,0.5D
C1563-2
Potentiometer-
Left/Right (T363)
F
Sheet1
Y,0.5D
C0459R-17 C0439-17
Y,0.5D
C1563-4
G
Sheet1
B,0.5D
C0751-19 C0253R-19
B,0.5D
SJ1030
B,0.5D
C0459R-16 C0439-16
B,0.5D
C0463R-16 C0439-16
Mirror-Door-
Passenger side (M169)
Potentiometer-
Up/Down (T362)
R,0.5D
C0463R-14 C0439-14
R,0.5D
C1563-1
+
-
C1563-3
B,0.5D
H
Sheet1
G,0.5D
C0463R-40 C0439-40
G,0.5D
C1563-2
Potentiometer-
Left/Right (T363)
J
Sheet1
Y,0.5D
C0463R-39 C0439-39
Y,0.5D
C1563-4
Mirror-Door-
Passenger side (M169)
Motor-Mirror-Passenger Up-
Down adjustment (M308)
K
Sheet1
BU,0.5D
C0463R-32 C0439-32
BU,0.5D
C0319-3
L
Sheet1
SW,0.5D
C0463R-33 C0439-33
SW,0.5D
C0319-2
Motor-Mirror-Passenger Left-
Right adjustment (M310)
M
Sheet1
BK,0.5D
C0463R-34 C0439-34
BK,0.5D
C0319-1

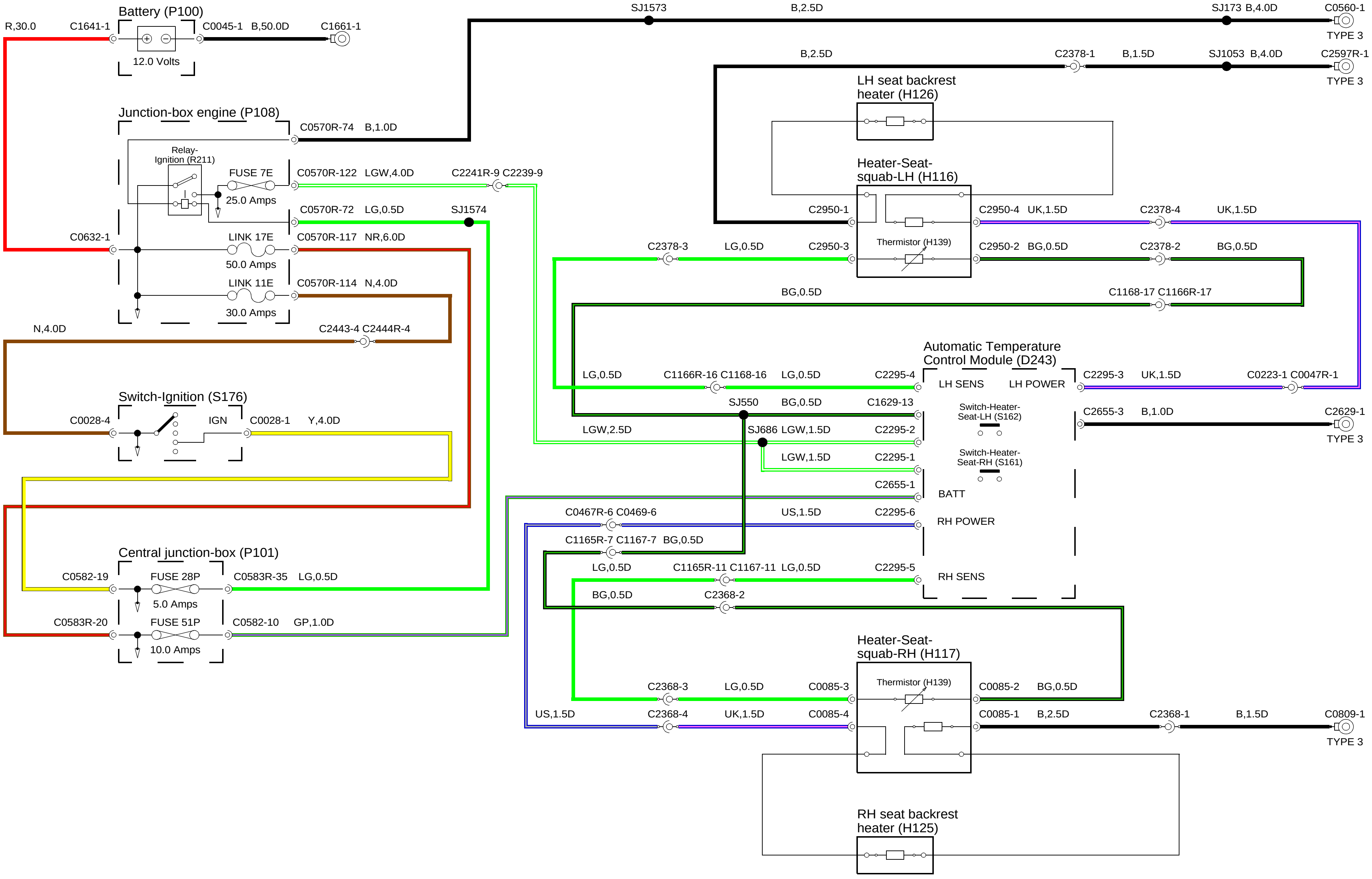

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
Switch-Mirror (S156)
Switch-Mirror-Folding (S366)
C0459R-25
C0439-25
UB,0.5D
C0066-8
C0066-4
B,1.0D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
Fold back module (D197)
GND
C0907R-5
B,1.0D
C2712R-1
TYPE 3
UB,0.5D
C0907R-2
Mirror-Door-Passenger side (M169)
Mirror-Folding-Passenger Door (M238)
2.50 Amps
Central junction-box (P101)
C0583R-22
FUSE 16P
10.0 Amps
C0585R-39
GK,1.0D
C0907R-4
Fold-in (Y268)
Fold-out (Y269)
C0907R-1
YR,1.0D
SJ1027
YR,1.0D
C0463R-6
C0439-6
YR,0.75D
C0319-7
C0907R-3
YU,1.0D
SJ1046
YU,1.0D
C0463R-7
C0439-7
YU,0.75D
C0319-6
Unit-Control (D359)
Mirror-Door-Driver side (M168)
Mirror-Folding-Driver Door (M239)
YR,0.75D
C0459R-21
C0439-21
YR,0.75D
C0319-7
2.50 Amps
YU,0.75D
C0459R-22
C0439-22
YU,0.75D
C0319-6

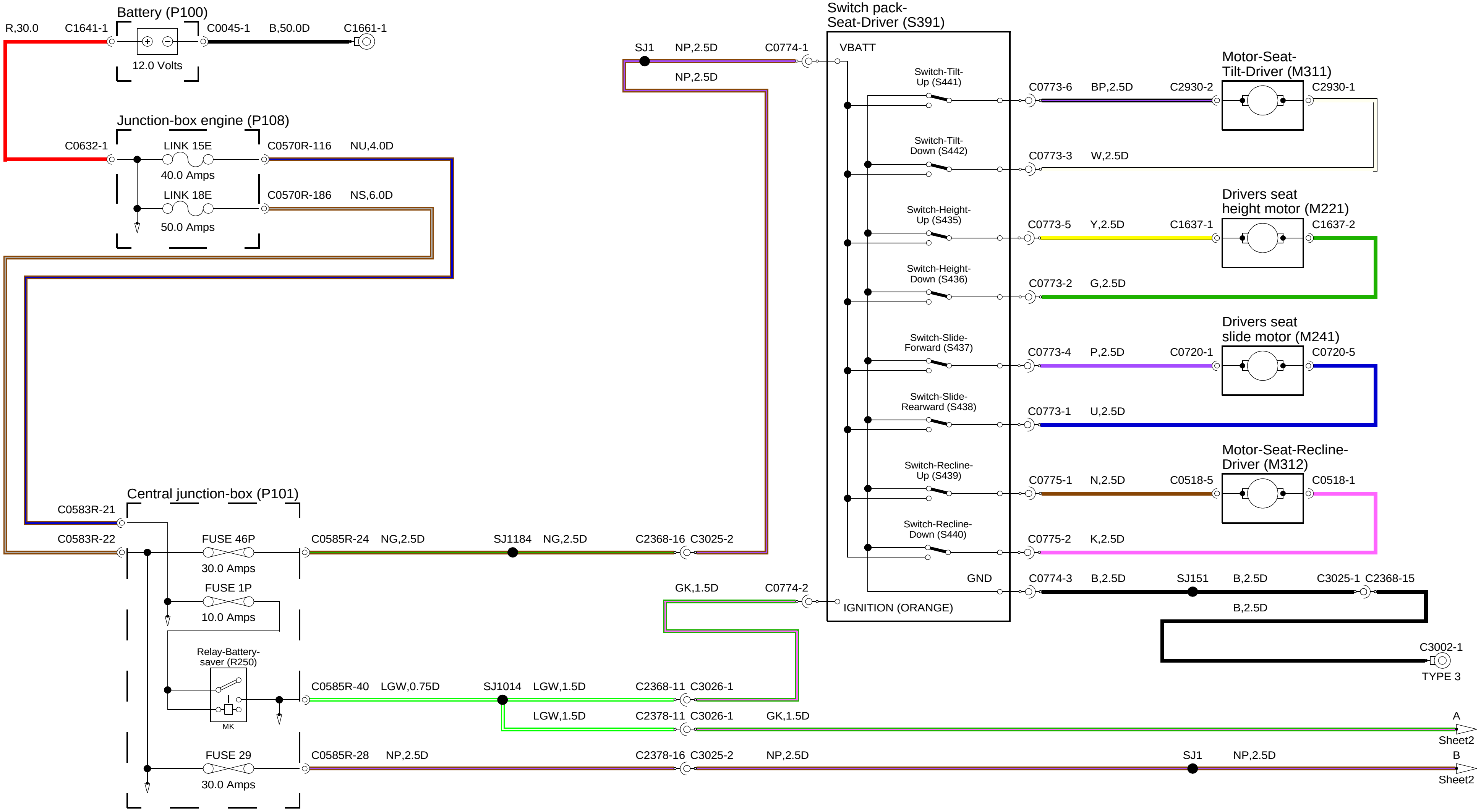

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-
Ignition (R211)
FUSE 8E
25.0 Amps
C0570R-169
LGW,2.5D
C2412R-8 C2411R-8
LGW,2.5D
SJ1023
LGW,2.5D
A
Sheet3
LGW,2.5D
B
Sheet2
C0632-1
C0570R-72
C0570R-74
B,1.0D
SJ1573
B,2.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
SJ173
B,4.0D
C0560-1
TYPE 3
N,4.0D
Lighting control
switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1168-12 C1166R-12
RN,0.5D
SJ1052
RN,0.5D
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C
Sheet3
RN,0.5D
D
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
SJ1574
LG,0.5D

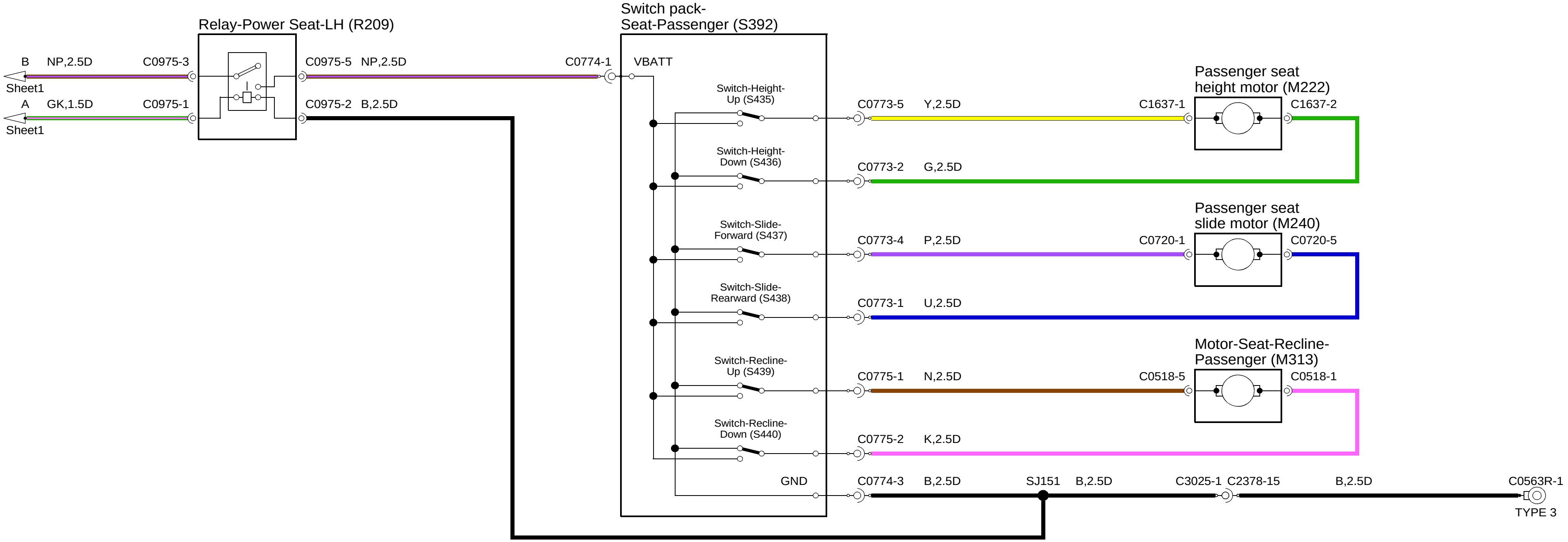

Switch-Seat heat-Rear-LH (S368)
Switch-Seat heat-Rear-LH (S368)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1401-2 UK,0.5D
C2054-20 C2053-20 UK,0.5D
C2042-1 C2149B-1 UK,0.5D
C2084-8
C1401-3 G,0.5D
C2054-21 C2053-21 G,0.5D
C2042-2 C2149B-2 G,0.5D
C2084-9
C1401-4 U,0.5D
C2054-22 C2053-22 U,0.5D
C2042-3 C2149B-3 U,0.5D
C2084-10
C1401-1 B,0.75D
C1401-5 RN,0.5D
D
Sheet1
B LGW,2.5D
Sheet1
C2042-5 C2149B-5 LGW,2.5D
SJ111
LGW,1.5D C2084-12
LGW,1.5D C2084-5
SJ301
LH rear seat heater module (D338)
C2084-1 B,1.5D
C2149B-4 C2042-4 B,2.5D
C2566-1
TYPE 3
LH rear seat backrest heater (H140)
C2084-6 UK,1.5D C3097-3
Y,1.0 C3097-1
B,1.0
LH rear seat side heater (H142)
C2961-2 B,1.0
B,1.0 C2961-1 R,1.0
LH rear seat squab heater (H146)
C2084-7 K,1.5D C0237B-2
C0237B-1 KW,1.5D
C2084-4 LG,0.5D C0237B-3
Thermistor (H139)
C0237B-4
C2084-3 BG,0.5D
B,2.5D C0903-24 C0868-24 B,2.5D
C2598-1
TYPE 3
Switch-Seat heat-Rear-RH (S369)
C1403-1 B,0.75D
Switch-Seat heat-Rear-RH (S369)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1403-2 UK,0.5D
C2054-17 C2053-17 UK,0.5D
C2043-1 C2149B-1 UK,0.5D
C2084-8
C1403-3 G,0.5D
C2054-18 C2053-18 G,0.5D
C2043-2 C2149B-2 G,0.5D
C2084-9
C1403-4 U,0.5D
C2054-19 C2053-19 U,0.5D
C2043-3 C2149B-3 U,0.5D
C2084-10
C1403-5 RN,0.5D
C
Sheet1
A LGW,2.5D
Sheet1
C2043-5 C2149B-5 LGW,2.5D
SJ111
LGW,1.5D C2084-12
LGW,1.5D C2084-5
RH rear seat heater module (D339)
C2084-1 B,1.5D
C2149B-4 C2043-4 B,2.5D
C1968-1
TYPE 3
RH rear seat backrest heater (H141)
C2084-6 UK,1.5D C3097-3
Y,1.0 C3097-1
B,1.0
RH rear seat side heater (H143)
C2961-2 B,1.0
B,1.0 C2961-1 R,1.0
RH rear seat squab heater (H147)
C2084-7 K,1.5D C0237B-2
C0237B-1 KW,1.5D
C2084-4 LG,0.5D C0237B-3
Thermistor (H139)
C0237B-4
C2084-3 BG,0.5D

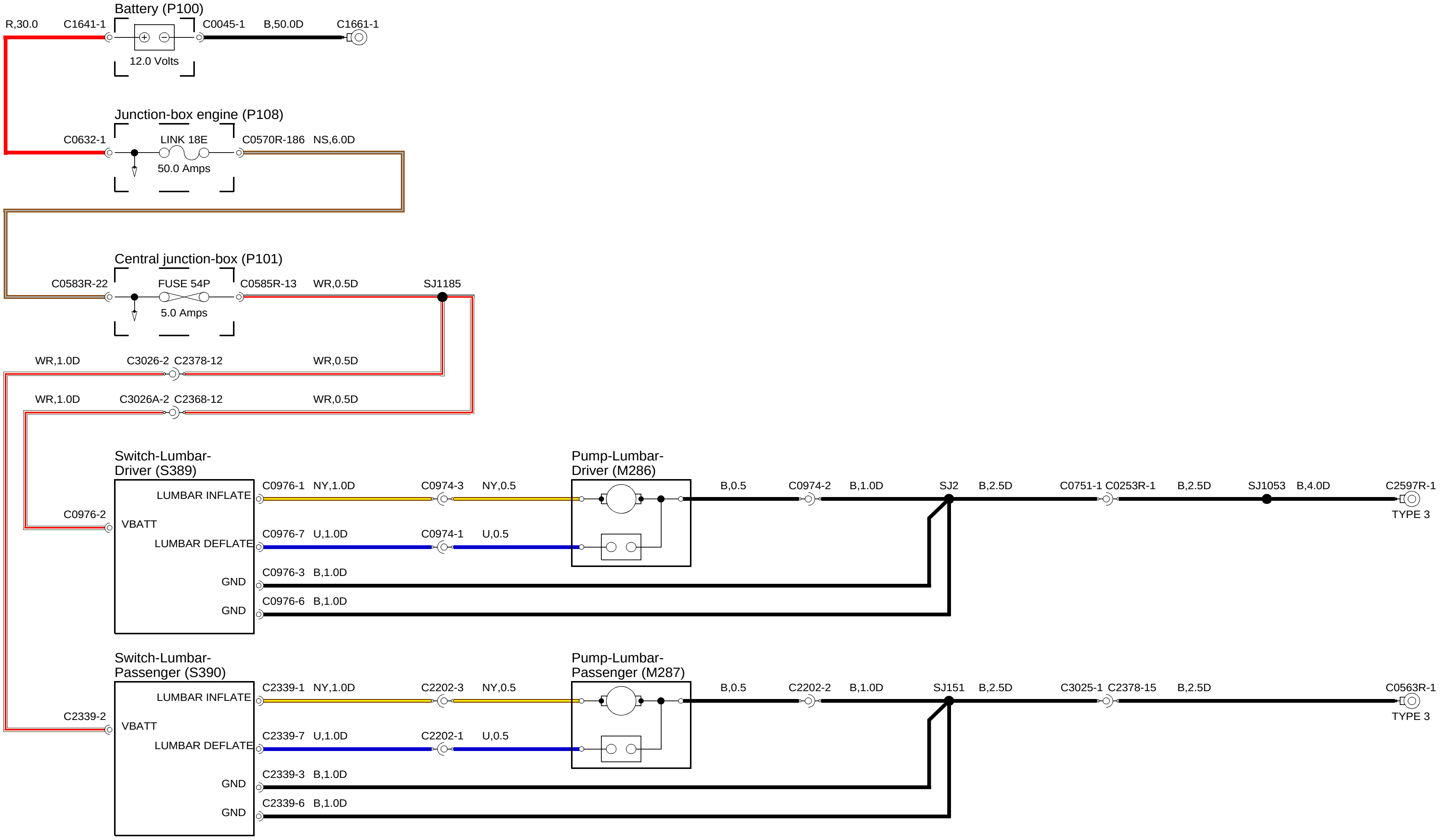

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
Switch pack-
Seat-Driver (S391)
WG,0.5
C2381-7
G,0.5
C2381-6
K,0.5
C2381-12
YN,0.5
C2381-13
WY,0.5
C2381-8
N,0.5
C2381-9
SK,0.5
C2381-14
NG,0.5
C2381-15
R,0.5
C2381-10
B,0.5
C2381-11
S,0.5
C2381-3
W,0.5
C2381-2
U,0.5
C2381-1
RU,0.5
C2381-16
C0253R-13 C0751-13
NG,2.5D
C2385-1
Memory control module (D119)
HEIGHT
HEIGHT
GROUND 2
HALL SENSE GND 1
GROUND 1
HEIGHT SENSE
HEIGHT UP
HEIGHT DOWN
SLIDE FORE
SLIDE
SLIDE BACK
SLIDE
TILT UP
HALL SENSE GND 2
TILT DOWN
CUSHION SLIDE SENSE
RECLINE RAISE
RECLINE LOWER
MEMORY STORE
TILT
MEMORY 1
TILT
MEMORY 2
HALL SENSOR GND 3
MEMORY 3
TILT SENSE
VBATT POWER
RECLINE
RECLINE
HALL SENSOR GND 4
RECLINE SENSE
VBATT ELECTRONIC
LIN BUS GND
SJB LIN
ELECTRONIC GND
POWER GND
Drivers seat
height motor (M221)
C2382-14 Y,1.5D C0097-2
C2382-15 W,1.5D C0097-1
C2382-18 RG,0.5D C0097-4
C2382-23 KY,0.5D C0097-3
Motor-seat-forward
rearward-driver (M241)
C2382-26 GY,1.5D C0721-1
C2382-24 R,1.5D C0721-5
C2382-20 RG,0.5D C0721-2
C2382-9 KG,0.5D C0721-4
Motor-Seat-
Tilt-Driver (M311)
C2384-8 U,1.5D C2930-1
C2384-7 NY,1.5D C2930-2
C2382-19 BG,0.5D C2931-1
C2384-11 KS,0.5D C2931-2
Motor-Seat-Recline-
Driver (M312)
C2382-1 O,1.5D C2993-1 C2994-1 O,1.5D C0718-1
C2382-2 S,1.5D C2993-3 C2994-3 S,1.5D C0718-5
C2382-6 BG,0.5D C2993-4 C2994-4 BG,0.5D C0718-2
C2382-10 KU,0.5D C2993-2 C2994-2 KU,0.5D C0718-4
C2382-7 S,MAPDB C0751-21 C0253R-21 R,0.5D BARE END
C2382-8 R,MAPDB C0751-22 C0253R-22 R,0.5D SJ1045
C2382-17 B,0.5D C0751-12 C0253R-12 B,0.5D C1971R-1
TYPE 2
C2385-2 B,2.5D
A
Sheet2
C2378-16 C3025-2 NP,2.5D SJ1 NP,2.5D
B
Sheet2
C2378-11 C3026-1 GK,1.5D
C
Sheet2
Junction box-Central (P101)
C0583R-22
FUSE 46P
30.0 Amps
C0585R-24
NG,2.5D
SJ1184
NG,2.5D
FUSE 54P
5.0 Amps
C0585R-13
WR,0.5D
SJ1185
WR,0.5D
C0253R-11 C0751-11
WR,0.5D
C2382-4
FUSE 29P
30.0 Amps
C0585R-28
NP,2.5D
Relay-Battery-
saver (R250)
MK
C0585R-40
LGW,0.75D
SJ1014
LGW,1.5D
C0583R-21
FUSE 1P
10.0 Amps

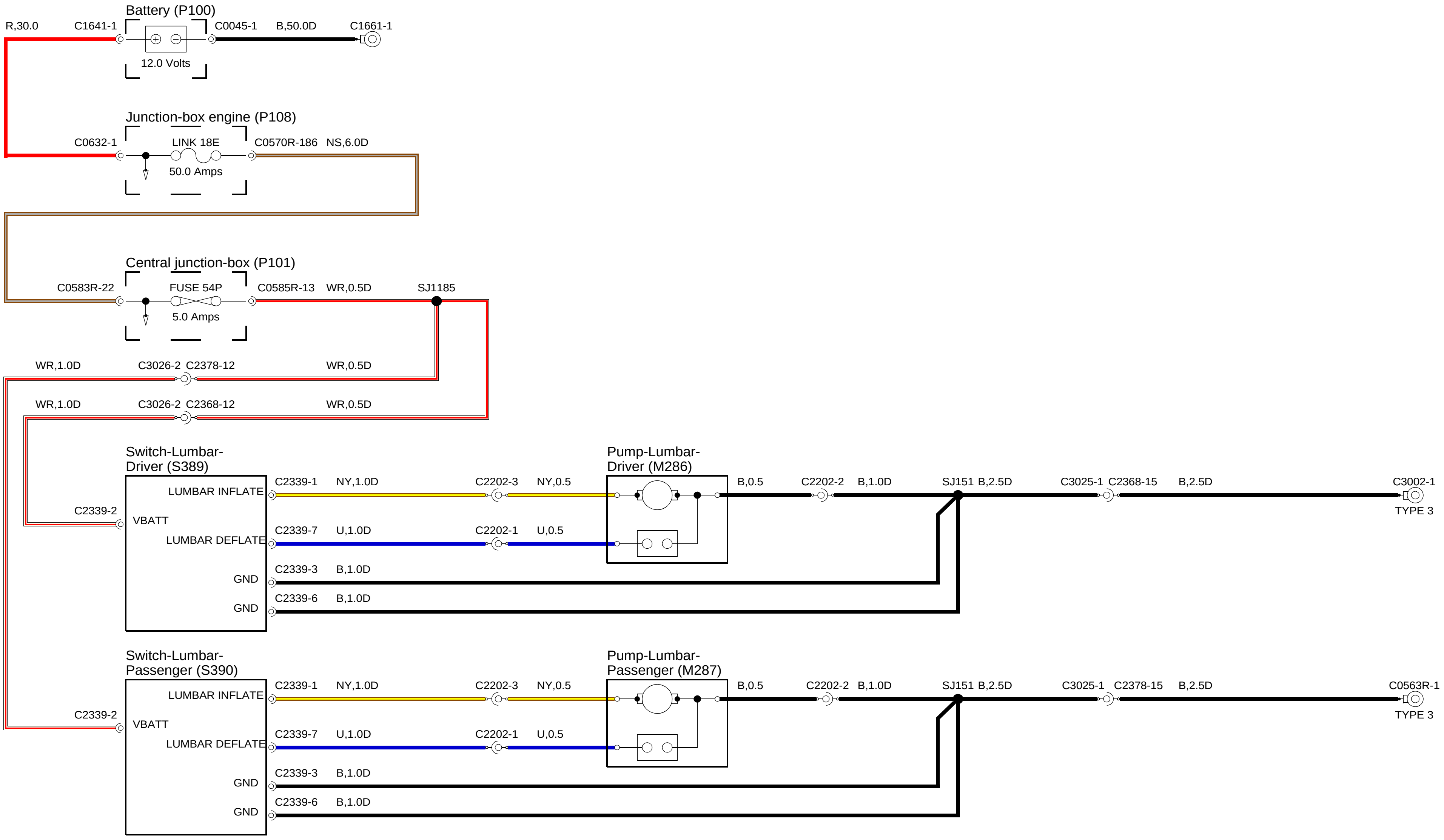

Relay-Power Seat-LH (R209)
Switch pack-
Seat-Passenger (S392)
B
Sheet1
NP,2.5D
C0975-3
C
Sheet1
GK,1.5D
C0975-1
C0975-5
NP,2.5D
C0975-2
B,2.5D
C0774-1
VBATT
Switch-Height-Up (S435)
Switch-Height-Down (S436)
Switch-Slide-Forward (S437)
Switch-Slide-Rearward (S438)
Switch-Recline-Up (S439)
Switch-Recline-Down (S440)
GND
Passenger seat height motor (M222)
C0773-5
Y,2.5D
C1637-1
C1637-2
C0773-2
G,2.5D
Motor-seat-forward rearward-passenger (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3
A
Sheet1
B,2.5D
SJ2
B,2.5D
C0751-1
C0253R-1
B,2.5D
SJ1053
B,4.0D
C2597R-1
TYPE 3

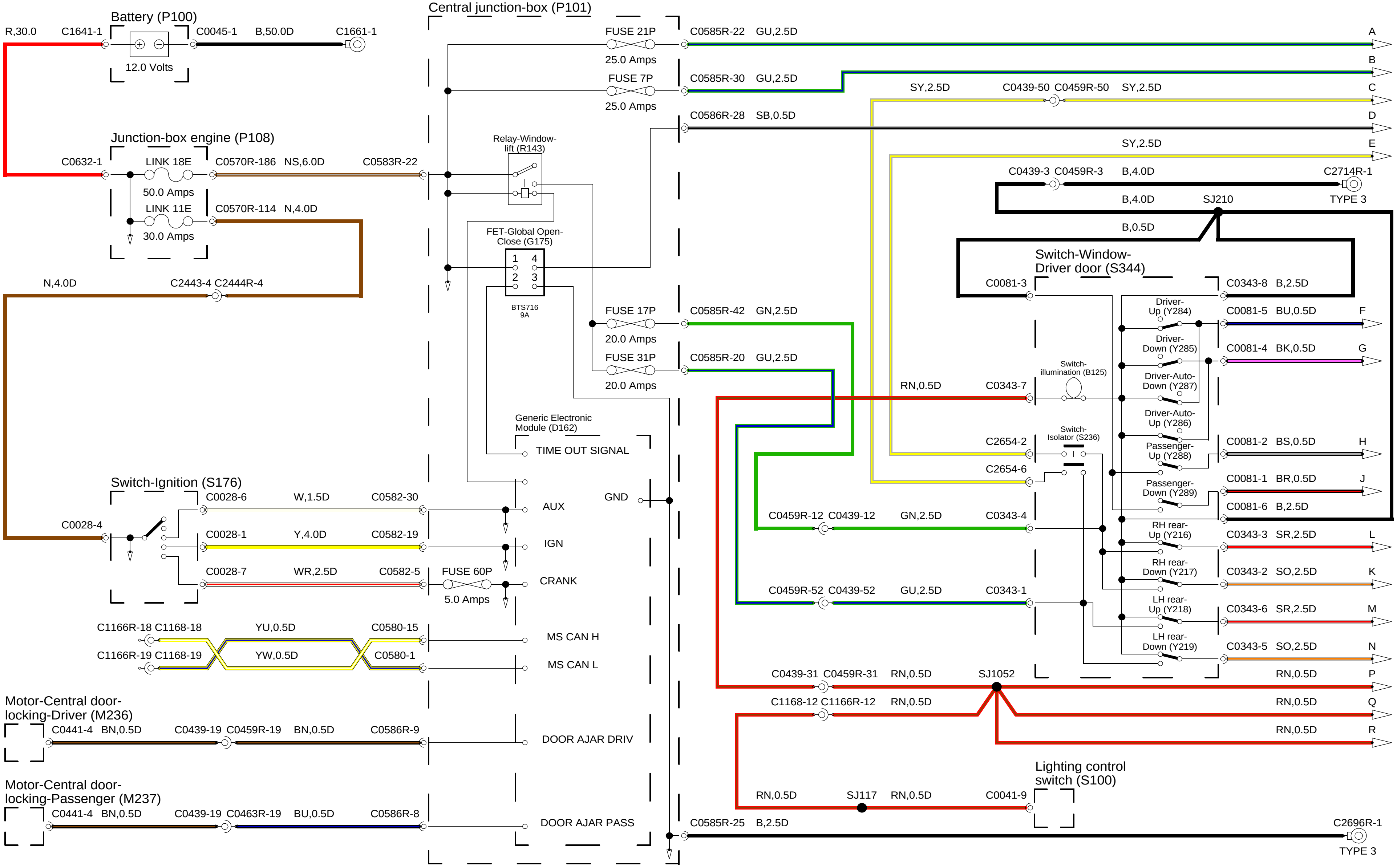

Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
12.0 Volts
SJ1573
B,2.5D
SJ173 B,4.0D
C0560-1
TYPE 3
B,2.5D
C2378-1
B,1.5D
SJ1053 B,4.0D
C2597R-1
TYPE 3
LH seat backrest heater (H126)
Junction-box engine (P108)
C0570R-74 B,1.0D
Relay-Ignition (R211)
FUSE 7E
25.0 Amps
C0570R-122 LGW,4.0D
C2241R-9 C2239-9
Heater-Seat-squab-LH (H116)
C0570R-72 LG,0.5D
SJ1574
C2950-1
C2950-4 UK,1.5D
C2378-4
UK,1.5D
C0632-1
LINK 17E
50.0 Amps
C0570R-117 NR,6.0D
C2378-3
LG,0.5D
C2950-3
Thermistor (H139)
C2950-2 BG,0.5D
C2378-2
BG,0.5D
LINK 11E
30.0 Amps
C0570R-114 N,4.0D
BG,0.5D
C1168-17 C1166R-17
N,4.0D
C2443-4 C2444R-4
Automatic Temperature Control Module (D243)
LG,0.5D
C1166R-16 C1168-16
LG,0.5D
C2295-4
LH SENS
LH POWER
C2295-3
UK,1.5D
C0223-1 C0047R-1
Switch-Ignition (S176)
SJ550
BG,0.5D
C1629-13
Switch-Heater-Seat-LH (S162)
C2655-3
B,1.0D
C2629-1
TYPE 3
C0028-4
IGN
C0028-1
Y,4.0D
LGW,2.5D
SJ686 LGW,1.5D
C2295-2
LGW,1.5D
C2295-1
Switch-Heater-Seat-RH (S161)
C2655-1
BATT
C0467R-6 C0469-6
US,1.5D
C2295-6
RH POWER
C1165R-7 C1167-7 BG,0.5D
Central junction-box (P101)
LG,0.5D
C1165R-11 C1167-11 LG,0.5D
C2295-5
RH SENS
C0582-19
FUSE 28P
5.0 Amps
C0583R-35 LG,0.5D
BG,0.5D
C2368-2
C0583R-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D
Heater-Seat-squab-RH (H117)
C2368-3
LG,0.5D
C0085-3
Thermistor (H139)
C0085-2 BG,0.5D
US,1.5D
C2368-4
UK,1.5D
C0085-4
C0085-1 B,2.5D
C2368-1
B,1.5D
C0809-1
TYPE 3
RH seat backrest heater (H125)

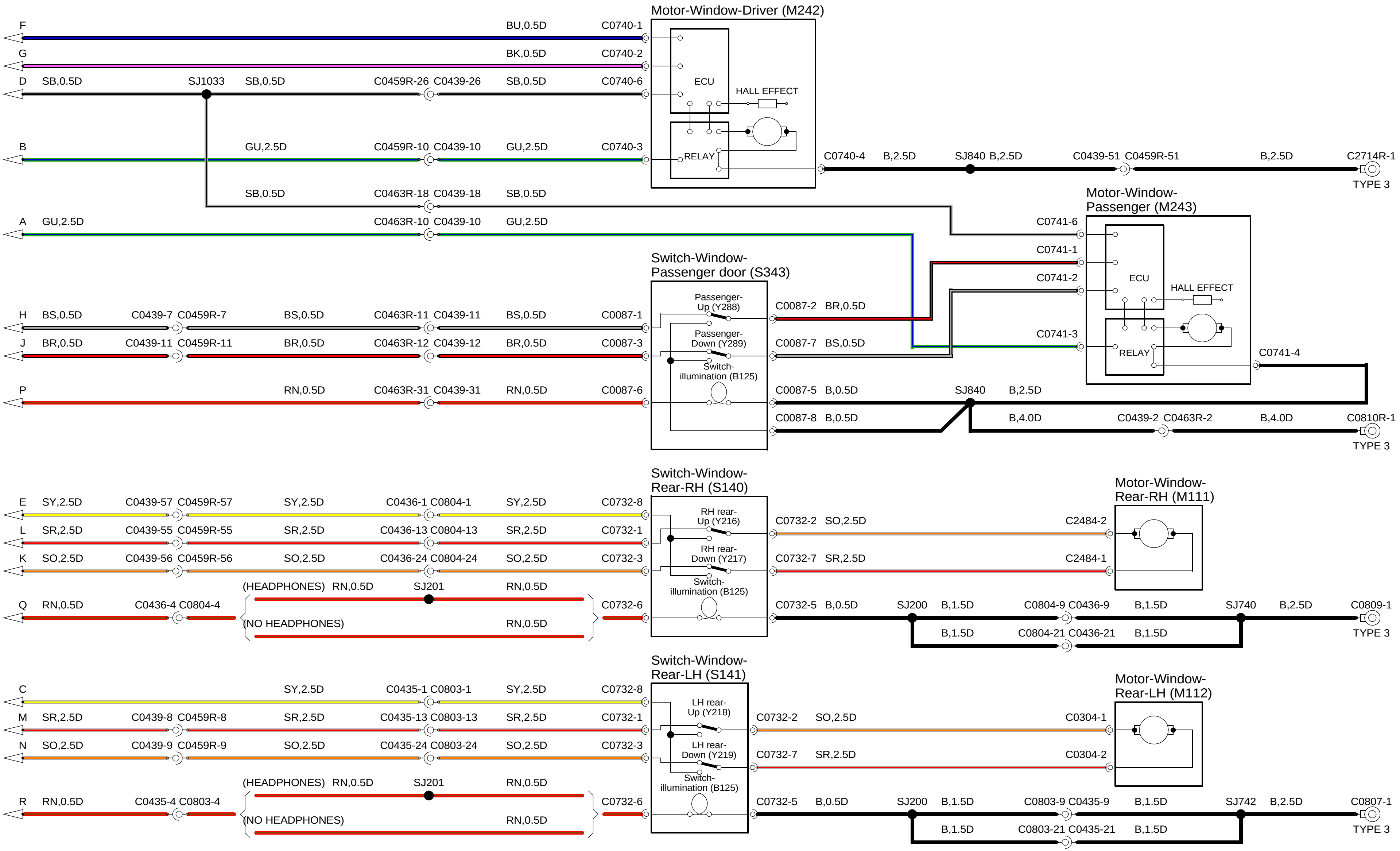

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
LINK 18E
50.0 Amps
C0570R-116
NU,4.0D
C0570R-186
NS,6.0D
SJ1
NP,2.5D
C0774-1
NP,2.5D
Switch pack-
Seat-Driver (S391)
VBATT
Switch-Tilt-
Up (S441)
Switch-Tilt-
Down (S442)
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
IGNITION (ORANGE)
Motor-Seat-
Tilt-Driver (M311)
C0773-6
BP,2.5D
C2930-2
C2930-1
C0773-3
W,2.5D
Drivers seat
height motor (M221)
C0773-5
Y,2.5D
C1637-1
C1637-2
C0773-2
G,2.5D
Drivers seat
slide motor (M241)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Driver (M312)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C3002-1
TYPE 3
Central junction-box (P101)
C0583R-21
C0583R-22
FUSE 46P
30.0 Amps
C0585R-24
NG,2.5D
SJ1184
NG,2.5D
C2368-16
C3025-2
FUSE 1P
10.0 Amps
GK,1.5D
C0774-2
Relay-Battery-
saver (R250)
MK
C0585R-40
LGW,0.75D
SJ1014
LGW,1.5D
C2368-11
C3026-1
LGW,1.5D
C2378-11
C3026-1
GK,1.5D
A
Sheet2
FUSE 29
30.0 Amps
C0585R-28
NP,2.5D
C2378-16
C3025-2
NP,2.5D
SJ1
NP,2.5D
B
Sheet2

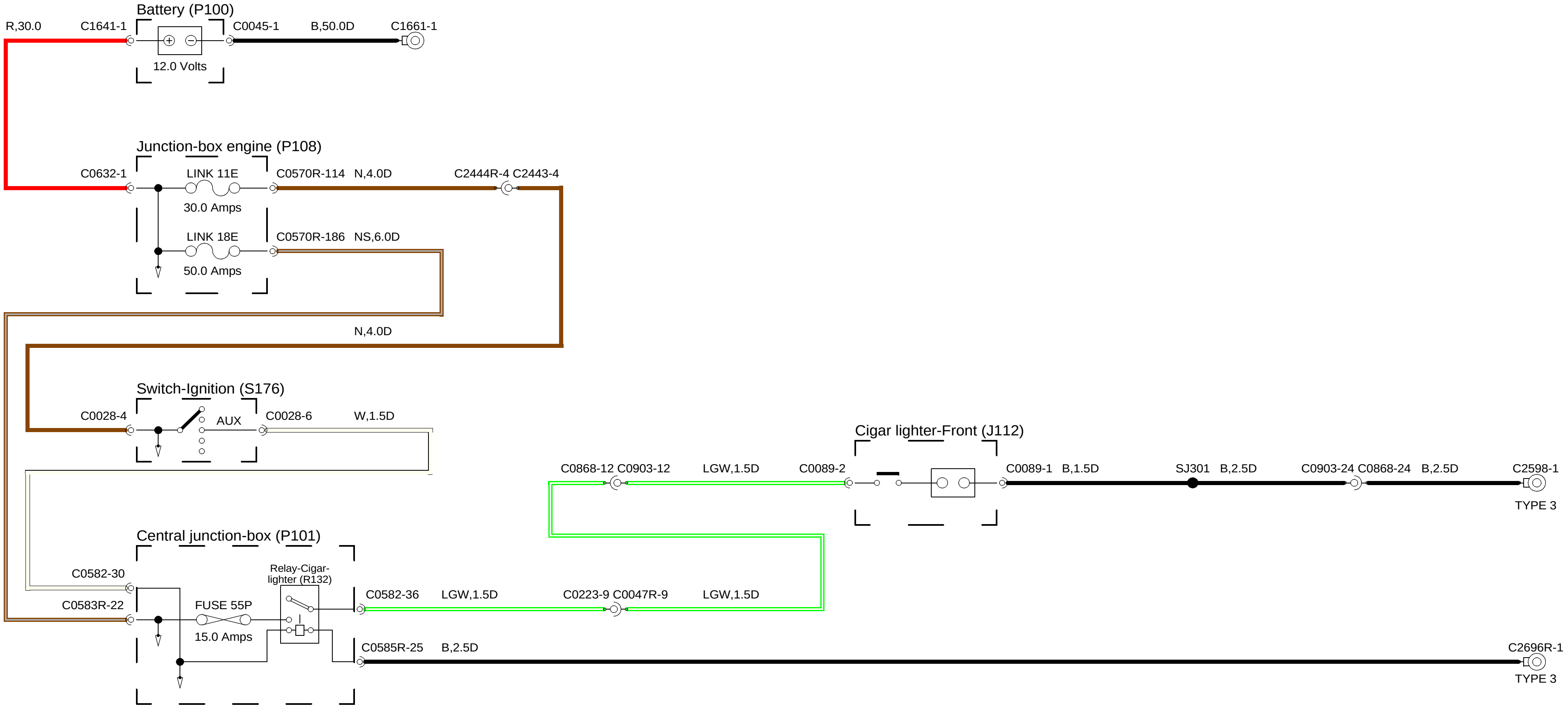

Relay-Power Seat-LH (R209)
Switch pack-
Seat-Passenger (S392)
B
NP,2.5D
C0975-3
Sheet1
A
GK,1.5D
C0975-1
Sheet1
C0975-5
NP,2.5D
C0975-2
B,2.5D
C0774-1
VBATT
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
C0773-5
Y,2.5D
C1637-1
Passenger seat
height motor (M222)
C1637-2
C0773-2
G,2.5D
Passenger seat
slide motor (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3

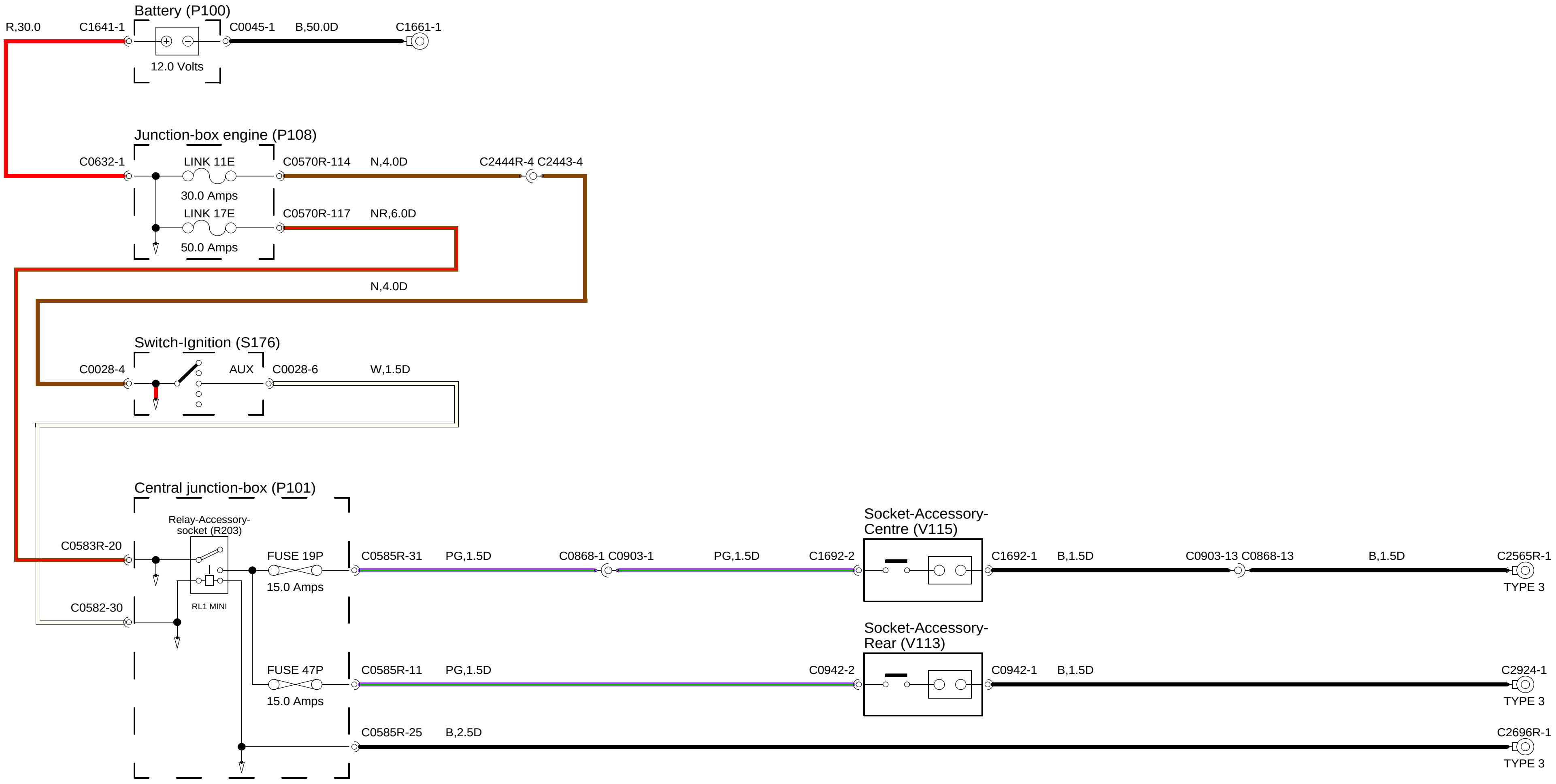

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Central junction-box (P101)
C0583R-22
FUSE 54P
C0585R-13
WR,0.5D
SJ1185
5.0 Amps
WR,1.0D
C3026-2
C2378-12
WR,0.5D
WR,1.0D
C3026A-2
C2368-12
WR,0.5D
Switch-Lumbar-Driver (S389)
LUMBAR INFLATE
C0976-2
VBATT
LUMBAR DEFLATE
GND
GND
C0976-1
NY,1.0D
C0974-3
NY,0.5
C0976-7
U,1.0D
C0974-1
U,0.5
C0976-3
B,1.0D
C0976-6
B,1.0D
Pump-Lumbar-Driver (M286)
B,0.5
C0974-2
B,1.0D
SJ2
B,2.5D
C0751-1
C0253R-1
B,2.5D
SJ1053
B,4.0D
C2597R-1
TYPE 3
Switch-Lumbar-Passenger (S390)
LUMBAR INFLATE
C2339-2
VBATT
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3

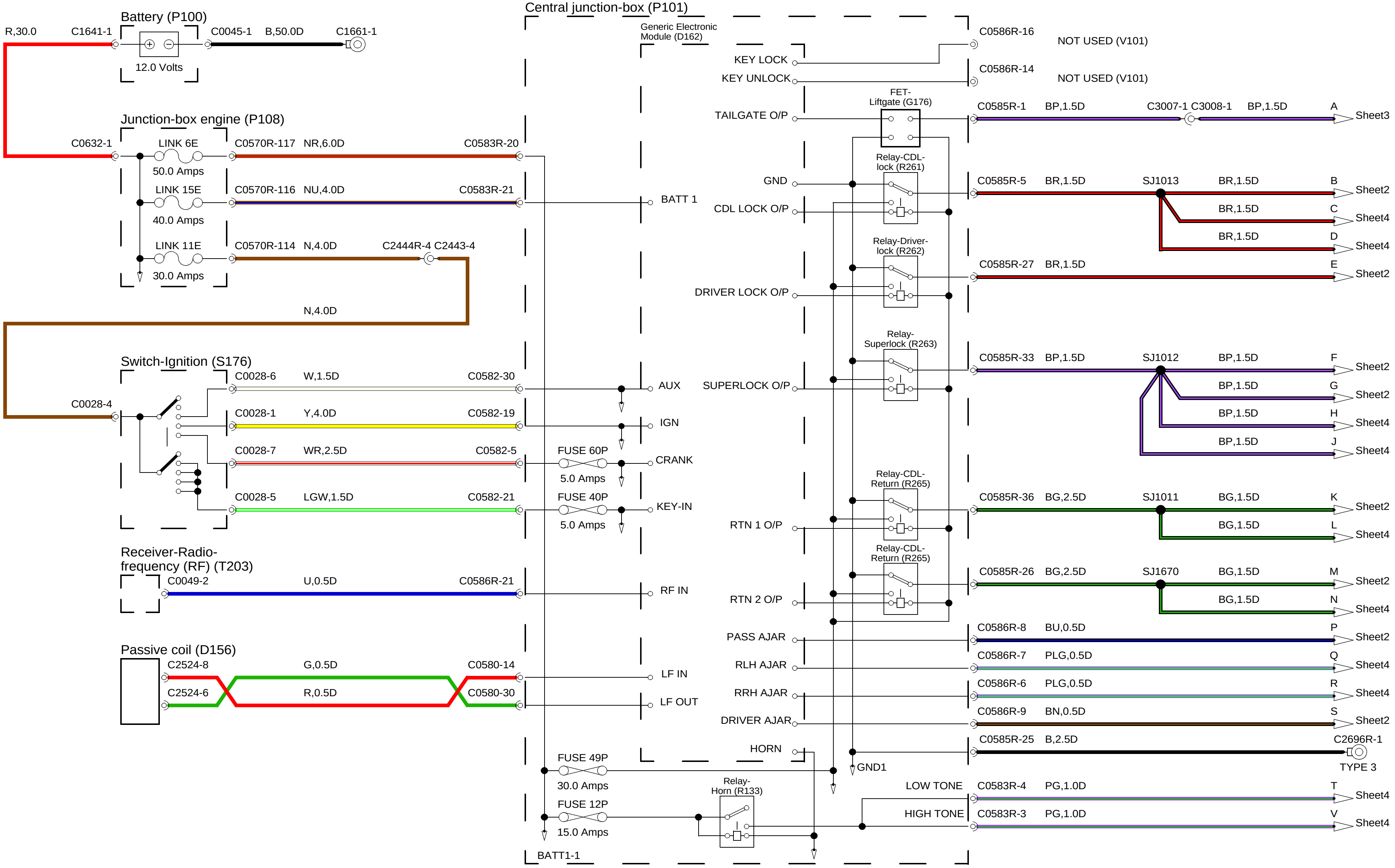

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Central junction-box (P101)
C0583R-22
FUSE 54P
C0585R-13
WR,0.5D
SJ1185
5.0 Amps
WR,1.0D
C3026-2
C2378-12
WR,0.5D
WR,1.0D
C3026-2
C2368-12
WR,0.5D
Switch-Lumbar-Driver (S389)
C2339-2
VBATT
LUMBAR INFLATE
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Driver (M286)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C3002-1
TYPE 3
Switch-Lumbar-Passenger (S390)
C2339-2
VBATT
LUMBAR INFLATE
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3

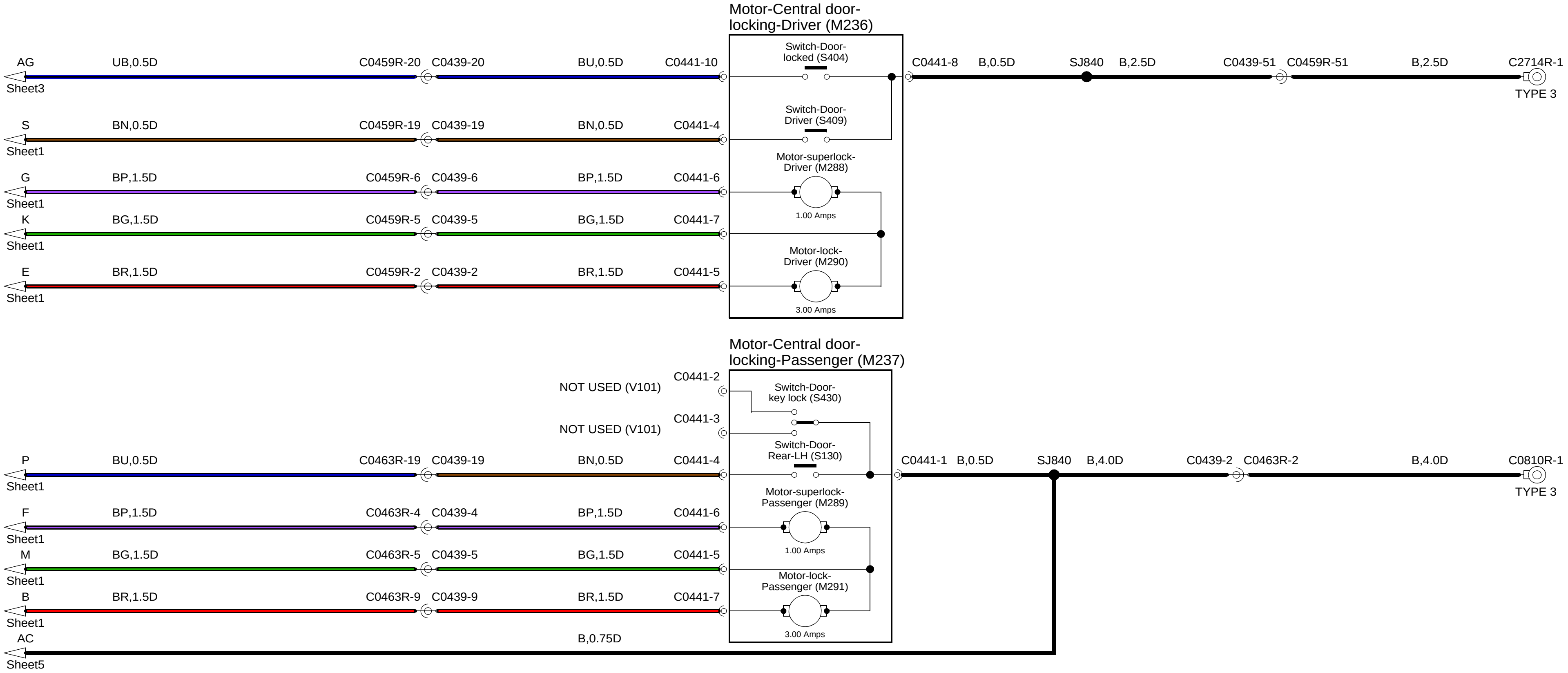

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
FUSE 21P
25.0 Amps
C0585R-22
GU,2.5D
A
B
FUSE 7P
25.0 Amps
C0585R-30
GU,2.5D
SY,2.5D
C0439-50
C0459R-50
SY,2.5D
C
C0586R-28
SB,0.5D
D
SY,2.5D
E
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
C0583R-22
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
Relay-Window-lift (R143)
C0439-3
C0459R-3
B,4.0D
C2714R-1
B,4.0D
SJ210
TYPE 3
B,0.5D
FET-Global Open-Close (G175)
1
4
2
3
BTS716 9A
N,4.0D
C2443-4
C2444R-4
Switch-Window-Driver door (S344)
C0081-3
C0343-8
B,2.5D
FUSE 17P
20.0 Amps
C0585R-42
GN,2.5D
Driver-Up (Y284)
C0081-5
BU,0.5D
F
Driver-Down (Y285)
C0081-4
BK,0.5D
G
FUSE 31P
20.0 Amps
C0585R-20
GU,2.5D
Switch-illumination (B125)
RN,0.5D
C0343-7
Driver-Auto-Down (Y287)
Generic Electronic Module (D162)
TIME OUT SIGNAL
Driver-Auto-Up (Y286)
Switch-Isolator (S236)
C2654-2
Passenger-Up (Y288)
C0081-2
BS,0.5D
H
C2654-6
Passenger-Down (Y289)
C0081-1
BR,0.5D
J
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
GND
AUX
C0081-6
B,2.5D
C0028-4
C0459R-12
C0439-12
GN,2.5D
C0343-4
RH rear-Up (Y216)
C0343-3
SR,2.5D
L
C0028-1
Y,4.0D
C0582-19
IGN
RH rear-Down (Y217)
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
C0343-2
SO,2.5D
K
C0459R-52
C0439-52
GU,2.5D
C0343-1
LH rear-Up (Y218)
C0343-6
SR,2.5D
M
C1166R-18
C1168-18
YU,0.5D
C0580-15
MS CAN H
LH rear-Down (Y219)
C0343-5
SO,2.5D
N
C1166R-19
C1168-19
YW,0.5D
C0580-1
MS CAN L
C0439-31
C0459R-31
RN,0.5D
SJ1052
RN,0.5D
P
Motor-Central door-locking-Driver (M236)
C1168-12
C1166R-12
RN,0.5D
RN,0.5D
Q
C0441-4
BN,0.5D
C0439-19
C0459R-19
BN,0.5D
C0586R-9
DOOR AJAR DRIV
RN,0.5D
R
Lighting control switch (S100)
Motor-Central door-locking-Passenger (M237)
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0441-4
BN,0.5D
C0439-19
C0463R-19
BU,0.5D
C0586R-8
DOOR AJAR PASS
C0585R-25
B,2.5D
C2696R-1
TYPE 3

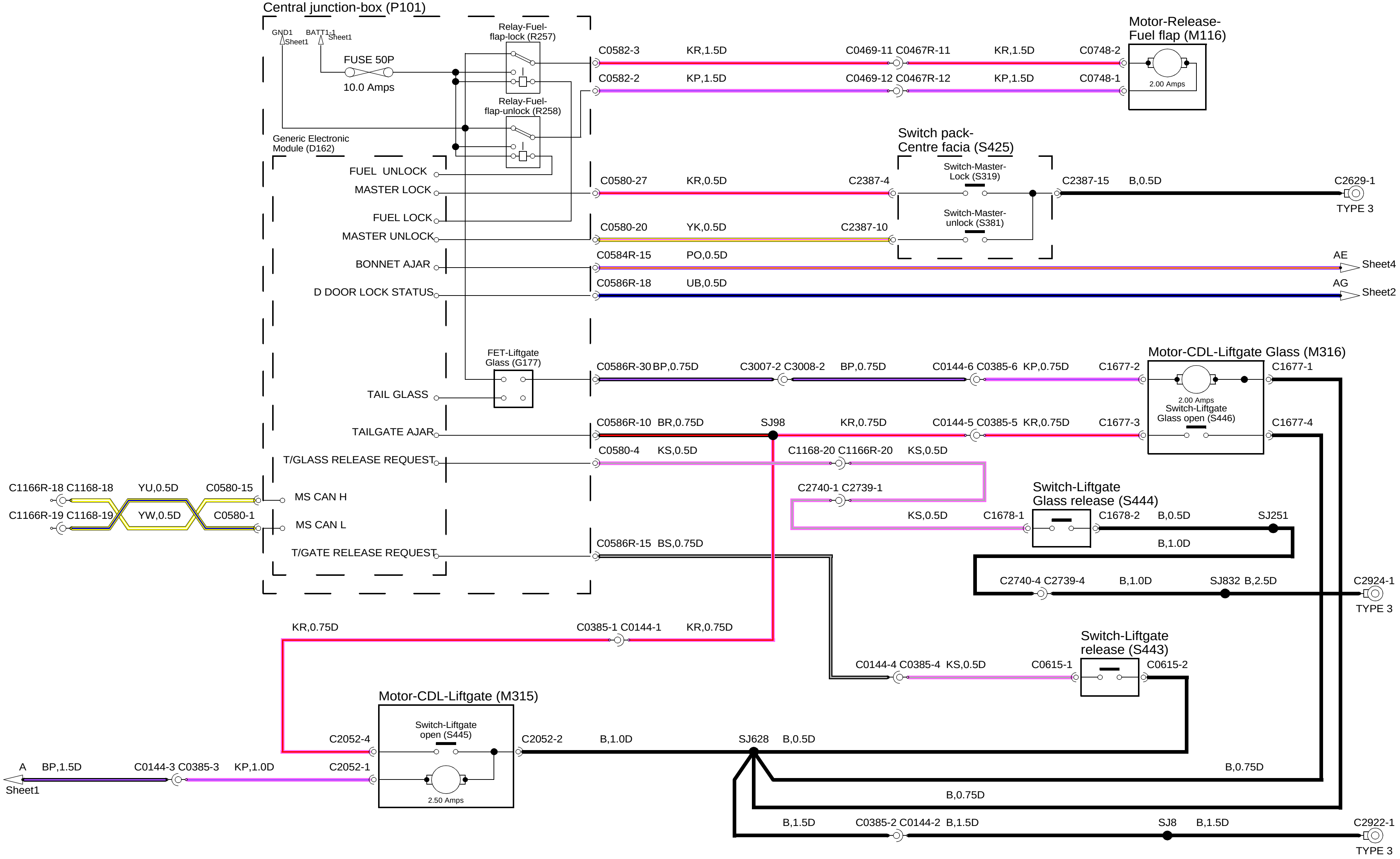

Motor-Window-Driver (M242)
F
BU,0.5D
C0740-1
G
BK,0.5D
C0740-2
D
SB,0.5D
SJ1033
SB,0.5D
C0459R-26 C0439-26
SB,0.5D
C0740-6
ECU
HALL EFFECT
B
GU,2.5D
C0459R-10 C0439-10
GU,2.5D
C0740-3
RELAY
C0740-4
B,2.5D
SJ840 B,2.5D
C0439-51 C0459R-51
B,2.5D
C2714R-1
TYPE 3
SB,0.5D
C0463R-18 C0439-18
SB,0.5D
Motor-Window-Passenger (M243)
A
GU,2.5D
C0463R-10 C0439-10
GU,2.5D
C0741-6
C0741-1
C0741-2
ECU
HALL EFFECT
Switch-Window-Passenger door (S343)
Passenger-Up (Y288)
H
BS,0.5D
C0439-7 C0459R-7
BS,0.5D
C0463R-11 C0439-11
BS,0.5D
C0087-1
C0087-2 BR,0.5D
Passenger-Down (Y289)
J
BR,0.5D
C0439-11 C0459R-11
BR,0.5D
C0463R-12 C0439-12
BR,0.5D
C0087-3
C0087-7 BS,0.5D
C0741-3
RELAY
C0741-4
Switch-illumination (B125)
P
RN,0.5D
C0463R-31 C0439-31
RN,0.5D
C0087-6
C0087-5 B,0.5D
SJ840
B,2.5D
C0087-8 B,0.5D
B,4.0D
C0439-2 C0463R-2
B,4.0D
C0810R-1
TYPE 3
Switch-Window-Rear-RH (S140)
Motor-Window-Rear-RH (M111)
RH rear-Up (Y216)
E
SY,2.5D
C0439-57 C0459R-57
SY,2.5D
C0436-1 C0804-1
SY,2.5D
C0732-8
C0732-2 SO,2.5D
C2484-2
L
SR,2.5D
C0439-55 C0459R-55
SR,2.5D
C0436-13 C0804-13
SR,2.5D
C0732-1
RH rear-Down (Y217)
K
SO,2.5D
C0439-56 C0459R-56
SO,2.5D
C0436-24 C0804-24
SO,2.5D
C0732-3
C0732-7 SR,2.5D
C2484-1
Switch-illumination (B125)
(HEADPHONES) RN,0.5D
SJ201
RN,0.5D
Q
RN,0.5D
C0436-4 C0804-4
C0732-6
(NO HEADPHONES)
RN,0.5D
C0732-5 B,0.5D
SJ200 B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
B,1.5D
C0804-21 C0436-21
B,1.5D
TYPE 3
Switch-Window-Rear-LH (S141)
Motor-Window-Rear-LH (M112)
LH rear-Up (Y218)
C
SY,2.5D
C0435-1 C0803-1
SY,2.5D
C0732-8
M
SR,2.5D
C0439-8 C0459R-8
SR,2.5D
C0435-13 C0803-13
SR,2.5D
C0732-1
C0732-2 SO,2.5D
C0304-1
LH rear-Down (Y219)
N
SO,2.5D
C0439-9 C0459R-9
SO,2.5D
C0435-24 C0803-24
SO,2.5D
C0732-3
C0732-7 SR,2.5D
C0304-2
Switch-illumination (B125)
(HEADPHONES) RN,0.5D
SJ201
RN,0.5D
R
RN,0.5D
C0435-4 C0803-4
C0732-6
(NO HEADPHONES)
RN,0.5D
C0732-5 B,0.5D
SJ200 B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742 B,2.5D
C0807-1
B,1.5D
C0803-21 C0435-21
B,1.5D
TYPE 3

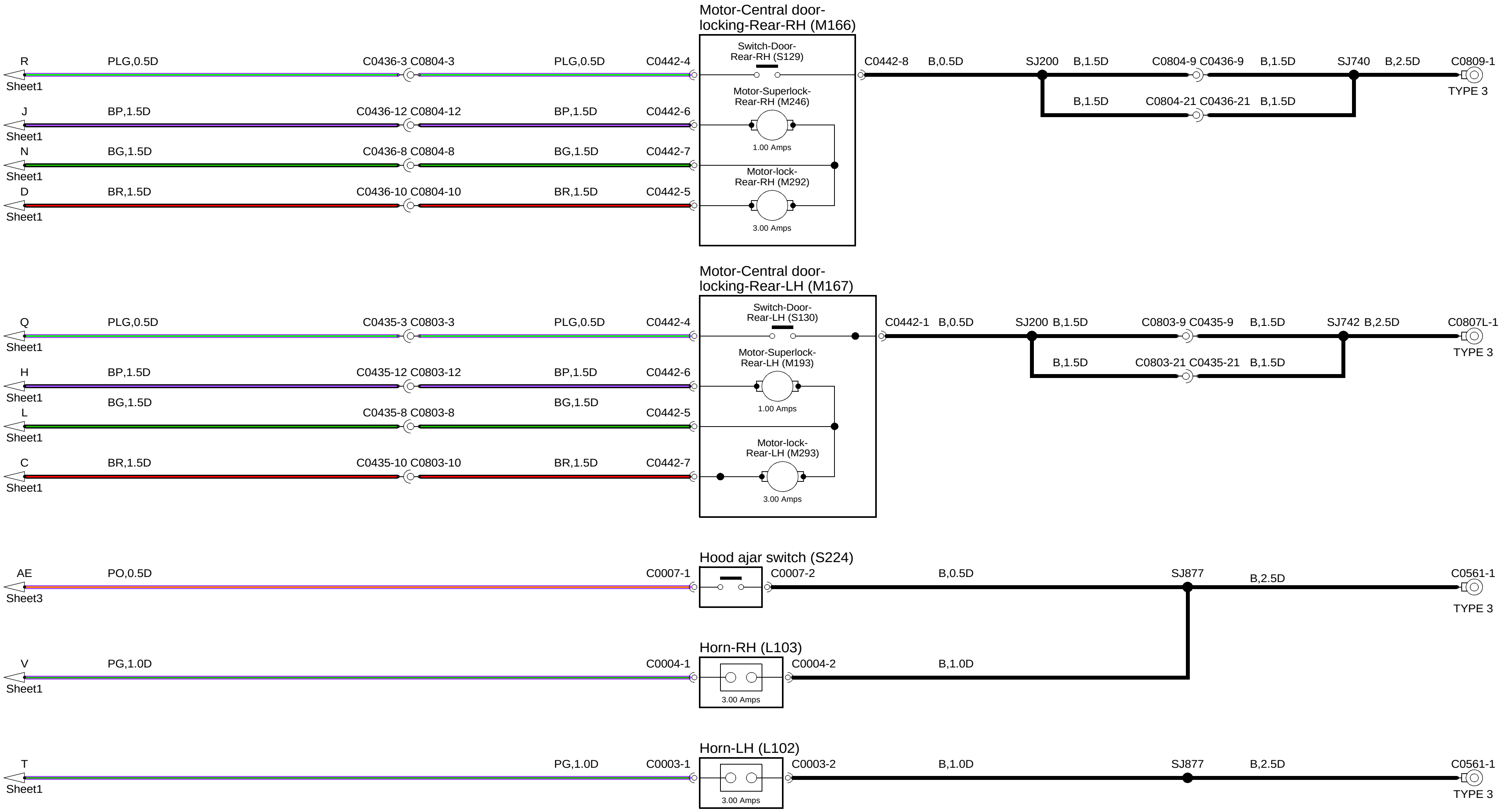

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Cigar lighter-Front (J112)
C0868-12 C0903-12
LGW,1.5D
C0089-2
C0089-1
B,1.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Central junction-box (P101)
Relay-Cigar-lighter (R132)
C0582-30
C0583R-22
FUSE 55P
15.0 Amps
C0582-36
LGW,1.5D
C0223-9 C0047R-9
LGW,1.5D
C0585R-25
B,2.5D
C2696R-1
TYPE 3

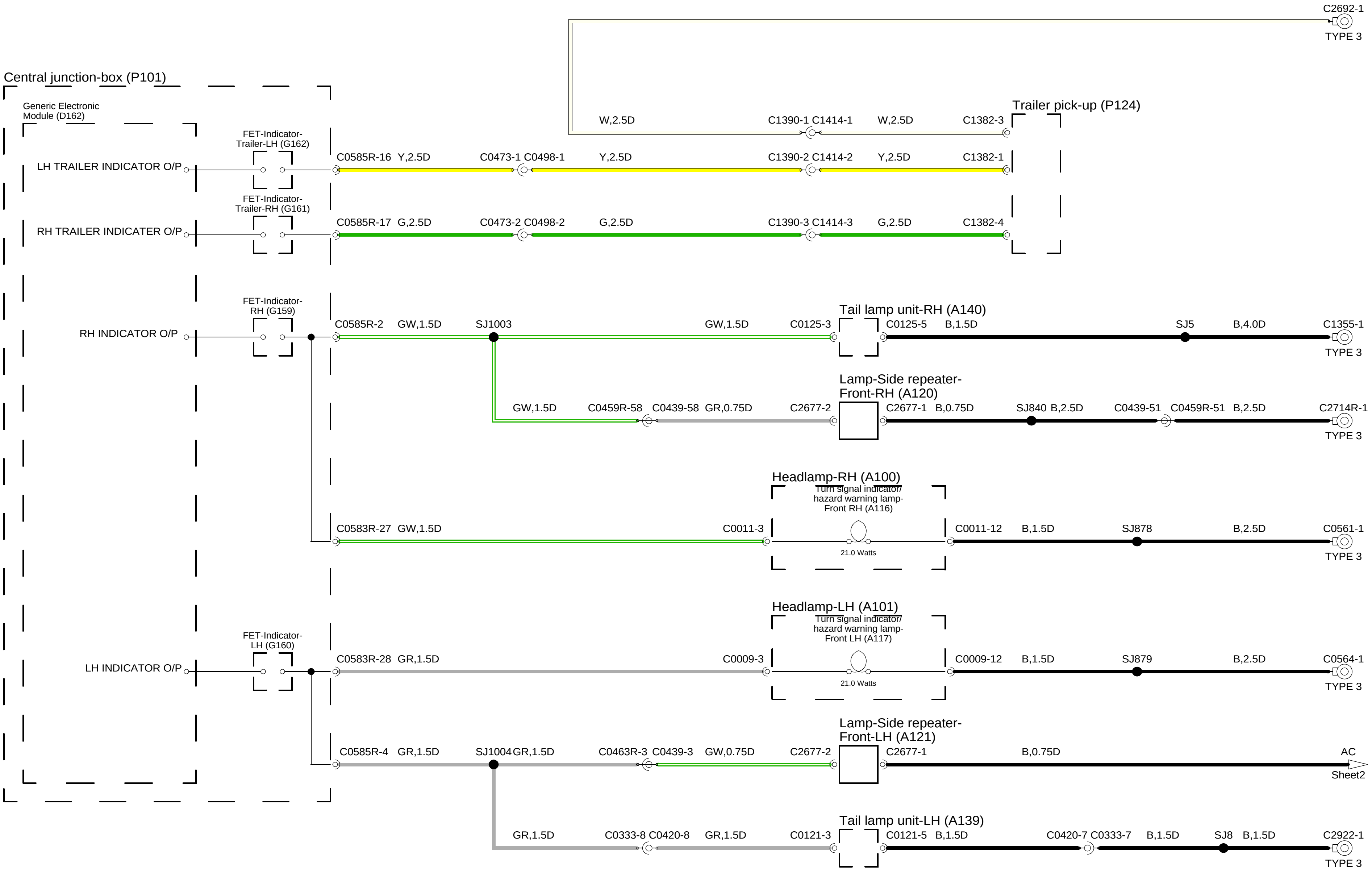

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
30.0 Amps
LINK 17E
C0570R-117
NR,6.0D
50.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central junction-box (P101)
Relay-Accessory-socket (R203)
C0583R-20
RL1 MINI
C0582-30
FUSE 19P
15.0 Amps
C0585R-31
PG,1.5D
C0868-1 C0903-1
PG,1.5D
C1692-2
Socket-Accessory-Centre (V115)
C1692-1
B,1.5D
C0903-13 C0868-13
B,1.5D
C2565R-1
TYPE 3
FUSE 47P
15.0 Amps
C0585R-11
PG,1.5D
C0942-2
Socket-Accessory-Rear (V113)
C0942-1
B,1.5D
C2924-1
TYPE 3
C0585R-25
B,2.5D
C2696R-1
TYPE 3

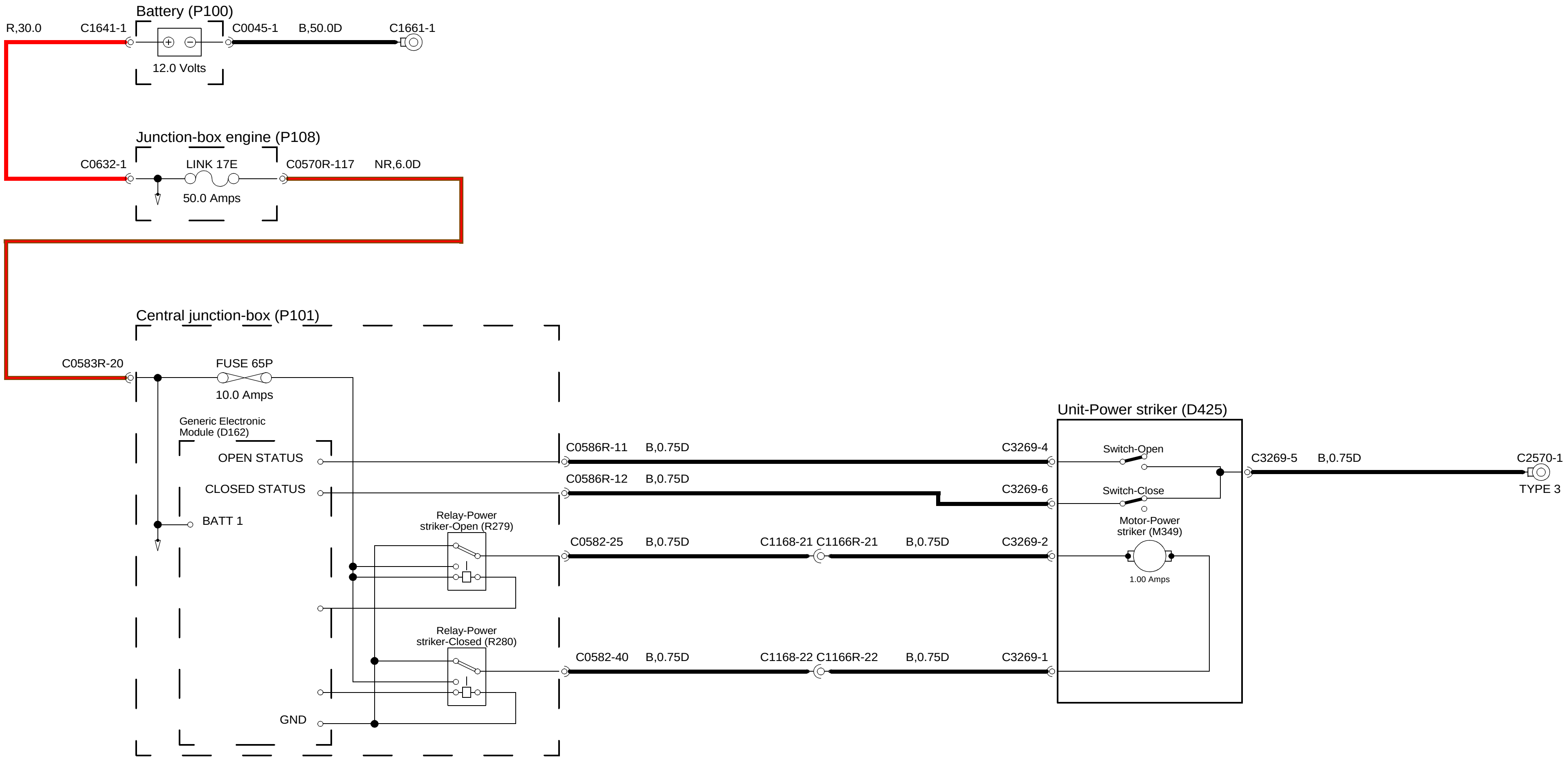

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
Generic Electronic Module (D162)
C0586R-16
NOT USED (V101)
KEY LOCK
KEY UNLOCK
C0586R-14
NOT USED (V101)
FET-Liftgate (G176)
TAILGATE O/P
C0585R-1
BP,1.5D
C3007-1 C3008-1
BP,1.5D
A
Sheet3
Junction-box engine (P108)
C0632-1
LINK 6E
50.0 Amps
C0570R-117
NR,6.0D
C0583R-20
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0583R-21
BATT 1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Relay-CDL-lock (R261)
GND
CDL LOCK O/P
C0585R-5
BR,1.5D
SJ1013
BR,1.5D
B
Sheet2
BR,1.5D
C
Sheet4
BR,1.5D
D
Sheet4
Relay-Driver-lock (R262)
DRIVER LOCK O/P
C0585R-27
BR,1.5D
E
Sheet2
Relay-Superlock (R263)
SUPERLOCK O/P
C0585R-33
BP,1.5D
SJ1012
BP,1.5D
F
Sheet2
BP,1.5D
G
Sheet2
BP,1.5D
H
Sheet4
BP,1.5D
J
Sheet4
Switch-Ignition (S176)
C0028-4
C0028-6
W,1.5D
C0582-30
AUX
C0028-1
Y,4.0D
C0582-19
IGN
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY-IN
Relay-CDL-Return (R265)
RTN 1 O/P
C0585R-36
BG,2.5D
SJ1011
BG,1.5D
K
Sheet2
BG,1.5D
L
Sheet4
Receiver-Radio-frequency (RF) (T203)
C0049-2
U,0.5D
C0586R-21
RF IN
Relay-CDL-Return (R265)
RTN 2 O/P
C0585R-26
BG,2.5D
SJ1670
BG,1.5D
M
Sheet2
BG,1.5D
N
Sheet4
PASS AJAR
C0586R-8
BU,0.5D
P
Sheet2
Passive coil (D156)
C2524-8
G,0.5D
C0580-14
LF IN
RLH AJAR
C0586R-7
PLG,0.5D
Q
Sheet4
C2524-6
R,0.5D
C0580-30
LF OUT
RRH AJAR
C0586R-6
PLG,0.5D
R
Sheet4
DRIVER AJAR
C0586R-9
BN,0.5D
S
Sheet2
HORN
C0585R-25
B,2.5D
C2696R-1
TYPE 3
GND1
FUSE 49P
30.0 Amps
Relay-Horn (R133)
LOW TONE
C0583R-4
PG,1.0D
T
Sheet4
FUSE 12P
15.0 Amps
HIGH TONE
C0583R-3
PG,1.0D
V
Sheet4
BATT1-1

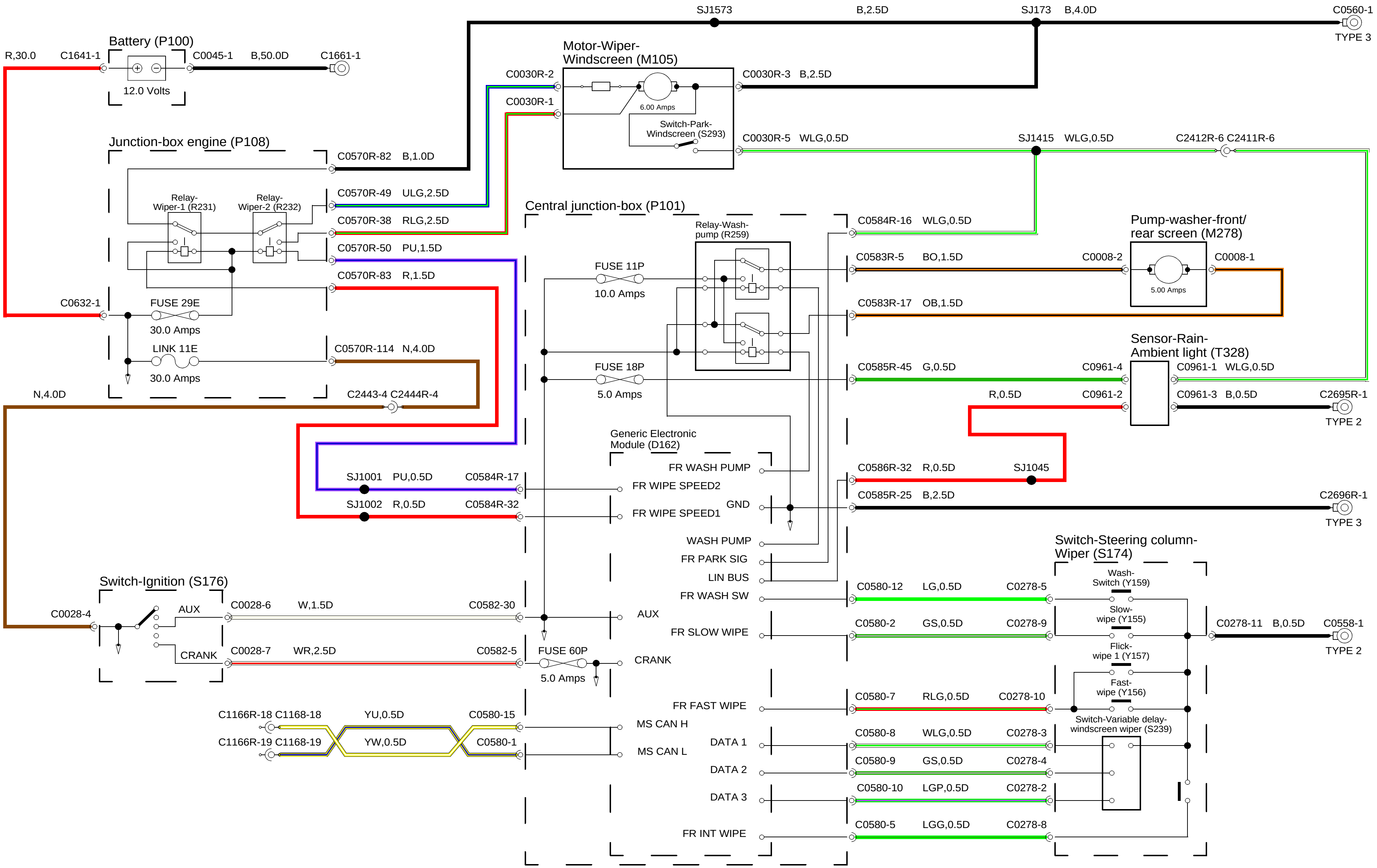

Motor-Central door-locking-Driver (M236)
AG
Sheet3
UB,0.5D
C0459R-20
C0439-20
BU,0.5D
C0441-10
Switch-Door-locked (S404)
C0441-8
B,0.5D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
S
Sheet1
BN,0.5D
C0459R-19
C0439-19
BN,0.5D
C0441-4
Switch-Door-Driver (S409)
G
Sheet1
BP,1.5D
C0459R-6
C0439-6
BP,1.5D
C0441-6
Motor-superlock-Driver (M288)
1.00 Amps
K
Sheet1
BG,1.5D
C0459R-5
C0439-5
BG,1.5D
C0441-7
E
Sheet1
BR,1.5D
C0459R-2
C0439-2
BR,1.5D
C0441-5
Motor-lock-Driver (M290)
3.00 Amps
Motor-Central door-locking-Passenger (M237)
NOT USED (V101)
C0441-2
Switch-Door-key lock (S430)
NOT USED (V101)
C0441-3
Switch-Door-Rear-LH (S130)
P
Sheet1
BU,0.5D
C0463R-19
C0439-19
BN,0.5D
C0441-4
C0441-1
B,0.5D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3
Motor-superlock-Passenger (M289)
1.00 Amps
F
Sheet1
BP,1.5D
C0463R-4
C0439-4
BP,1.5D
C0441-6
M
Sheet1
BG,1.5D
C0463R-5
C0439-5
BG,1.5D
C0441-5
Motor-lock-Passenger (M291)
3.00 Amps
B
Sheet1
BR,1.5D
C0463R-9
C0439-9
BR,1.5D
C0441-7
AC
Sheet5
B,0.75D

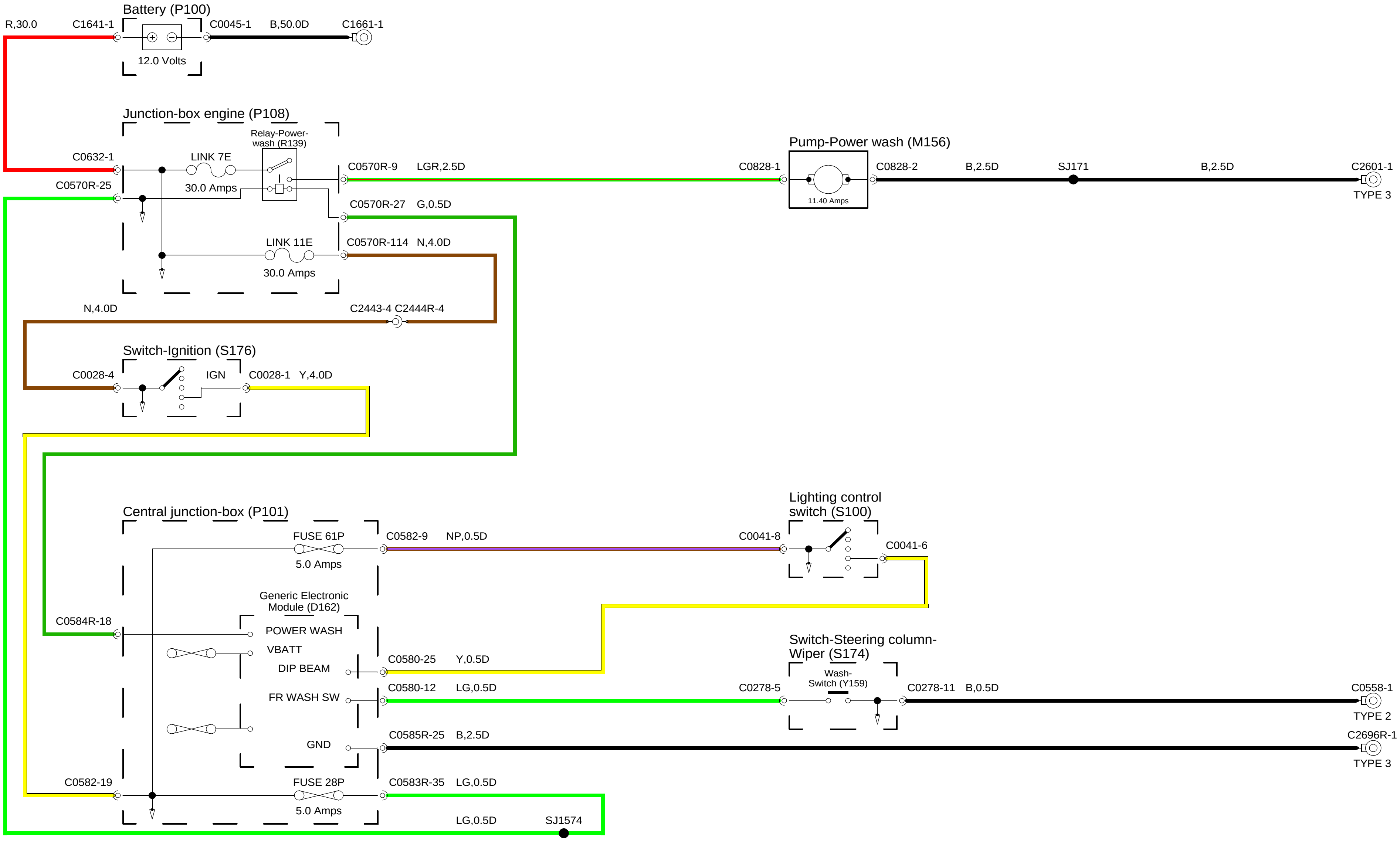

Central junction-box (P101)
GND1
Sheet1
BATT1-1
Sheet1
FUSE 50P
10.0 Amps
Relay-Fuel-flap-lock (R257)
Relay-Fuel-flap-unlock (R258)
Generic Electronic Module (D162)
FUEL UNLOCK
MASTER LOCK
FUEL LOCK
MASTER UNLOCK
BONNET AJAR
D DOOR LOCK STATUS
TAIL GLASS
TAILGATE AJAR
T/GLASS RELEASE REQUEST
MS CAN H
MS CAN L
T/GATE RELEASE REQUEST
FET-Liftgate Glass (G177)
Motor-Release-Fuel flap (M116)
2.00 Amps
C0582-3
KR,1.5D
C0469-11 C0467R-11
KR,1.5D
C0748-2
C0582-2
KP,1.5D
C0469-12 C0467R-12
KP,1.5D
C0748-1
Switch pack-Centre facia (S425)
Switch-Master-Lock (S319)
Switch-Master-unlock (S381)
C0580-27
KR,0.5D
C2387-4
C2387-15
B,0.5D
C2629-1
TYPE 3
C0580-20
YK,0.5D
C2387-10
C0584R-15
PO,0.5D
AE
Sheet4
C0586R-18
UB,0.5D
AG
Sheet2
Motor-CDL-Liftgate Glass (M316)
2.00 Amps
Switch-Liftgate Glass open (S446)
C0586R-30 BP,0.75D
C3007-2 C3008-2
BP,0.75D
C0144-6 C0385-6
KP,0.75D
C1677-2
C1677-1
C0586R-10
BR,0.75D
SJ98
KR,0.75D
C0144-5 C0385-5
KR,0.75D
C1677-3
C1677-4
C0580-4
KS,0.5D
C1168-20 C1166R-20
KS,0.5D
C1166R-18 C1168-18
YU,0.5D
C0580-15
C1166R-19 C1168-19
YW,0.5D
C0580-1
C2740-1 C2739-1
Switch-Liftgate Glass release (S444)
KS,0.5D
C1678-1
C1678-2
B,0.5D
SJ251
C0586R-15
BS,0.75D
B,1.0D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
TYPE 3
KR,0.75D
C0385-1 C0144-1
KR,0.75D
Switch-Liftgate release (S443)
C0144-4 C0385-4
KS,0.5D
C0615-1
C0615-2
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
2.50 Amps
C2052-4
C2052-2
B,1.0D
SJ628
B,0.5D
A
BP,1.5D
Sheet1
C0144-3 C0385-3
KP,1.0D
C2052-1
B,0.75D
B,0.75D
B,1.5D
C0385-2 C0144-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3


Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
Motor-Superlock-Rear-RH (M246)
1.00 Amps
Motor-lock-Rear-RH (M292)
3.00 Amps
R
Sheet1
PLG,0.5D
C0436-3 C0804-3
PLG,0.5D
C0442-4
J
Sheet1
BP,1.5D
C0436-12 C0804-12
BP,1.5D
C0442-6
N
Sheet1
BG,1.5D
C0436-8 C0804-8
BG,1.5D
C0442-7
D
Sheet1
BR,1.5D
C0436-10 C0804-10
BR,1.5D
C0442-5
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21 C0436-21
B,1.5D
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
Motor-Superlock-Rear-LH (M193)
1.00 Amps
Motor-lock-Rear-LH (M293)
3.00 Amps
Q
Sheet1
PLG,0.5D
C0435-3 C0803-3
PLG,0.5D
C0442-4
H
Sheet1
BP,1.5D
C0435-12 C0803-12
BP,1.5D
C0442-6
L
Sheet1
BG,1.5D
C0435-8 C0803-8
BG,1.5D
C0442-5
C
Sheet1
BR,1.5D
C0435-10 C0803-10
BR,1.5D
C0442-7
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807L-1
TYPE 3
B,1.5D
C0803-21 C0435-21
B,1.5D
Hood ajar switch (S224)
AE
Sheet3
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
V
Sheet1
PG,1.0D
C0004-1
C0004-2
B,1.0D
3.00 Amps
Horn-LH (L102)
T
Sheet1
PG,1.0D
C0003-1
C0003-2
B,1.0D
SJ877
B,2.5D
C0561-1
TYPE 3
3.00 Amps

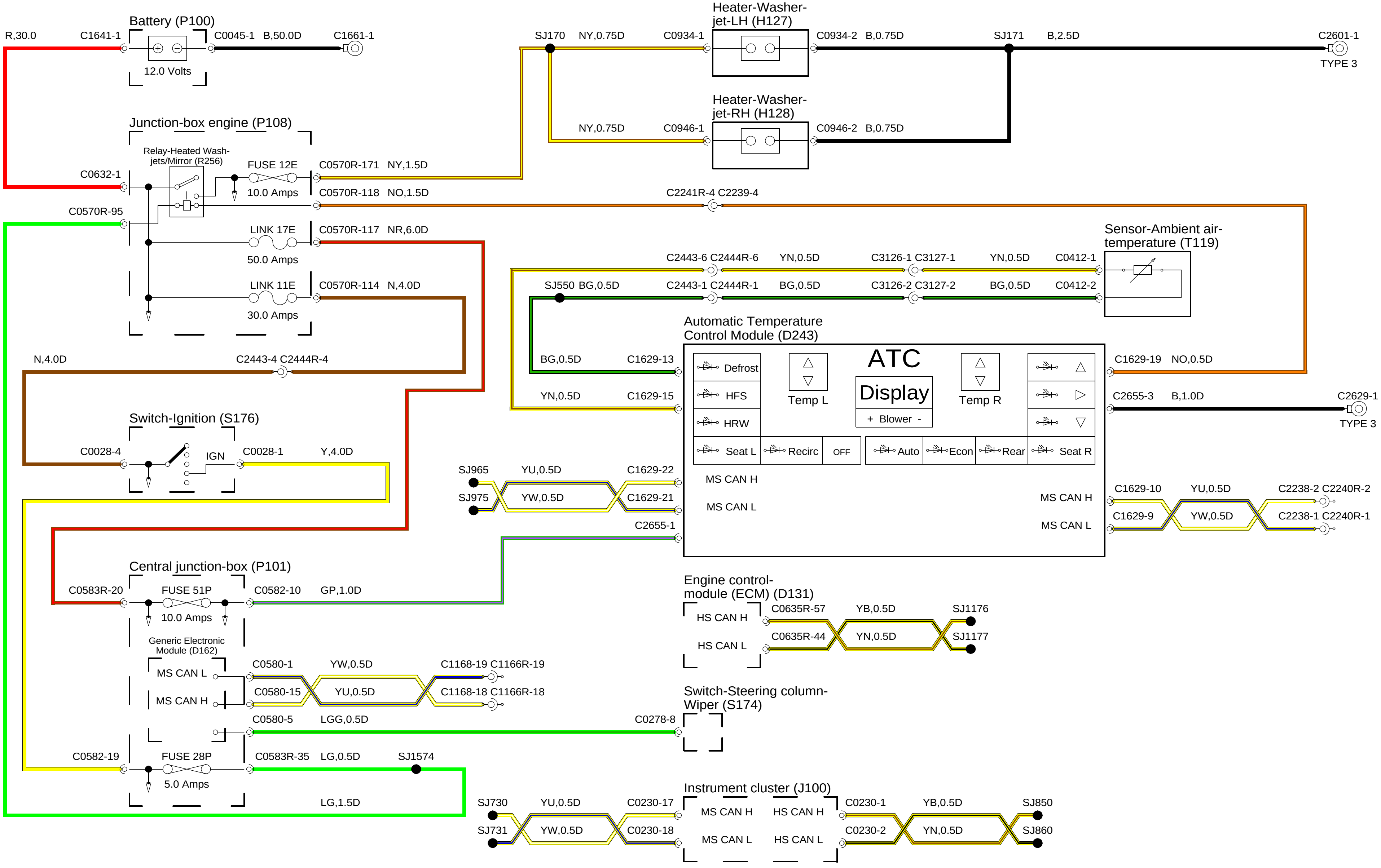

C2692-1
TYPE 3
Central junction-box (P101)
Generic Electronic Module (D162)
Trailer pick-up (P124)
W,2.5D
C1390-1 C1414-1
W,2.5D
C1382-3
FET-Indicator-Trailer-LH (G162)
LH TRAILER INDICATOR O/P
C0585R-16 Y,2.5D
C0473-1 C0498-1
Y,2.5D
C1390-2 C1414-2
Y,2.5D
C1382-1
FET-Indicator-Trailer-RH (G161)
RH TRAILER INDICATER O/P
C0585R-17 G,2.5D
C0473-2 C0498-2
G,2.5D
C1390-3 C1414-3
G,2.5D
C1382-4
FET-Indicator-RH (G159)
RH INDICATOR O/P
C0585R-2 GW,1.5D
SJ1003
GW,1.5D
C0125-3
Tail lamp unit-RH (A140)
C0125-5 B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Lamp-Side repeater-Front-RH (A120)
GW,1.5D
C0459R-58 C0439-58 GR,0.75D
C2677-2
C2677-1 B,0.75D
SJ840 B,2.5D
C0439-51 C0459R-51 B,2.5D
C2714R-1
TYPE 3
Headlamp-RH (A100)
Turn signal indicator/ hazard warning lamp- Front RH (A116)
C0583R-27 GW,1.5D
C0011-3
21.0 Watts
C0011-12
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
Headlamp-LH (A101)
Turn signal indicator/ hazard warning lamp- Front LH (A117)
FET-Indicator-LH (G160)
LH INDICATOR O/P
C0583R-28 GR,1.5D
C0009-3
21.0 Watts
C0009-12
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
Lamp-Side repeater-Front-LH (A121)
C0585R-4 GR,1.5D
SJ1004 GR,1.5D
C0463R-3 C0439-3
GW,0.75D
C2677-2
C2677-1
B,0.75D
AC
Sheet2
Tail lamp unit-LH (A139)
GR,1.5D
C0333-8 C0420-8
GR,1.5D
C0121-3
C0121-5 B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8 B,1.5D
C2922-1
TYPE 3

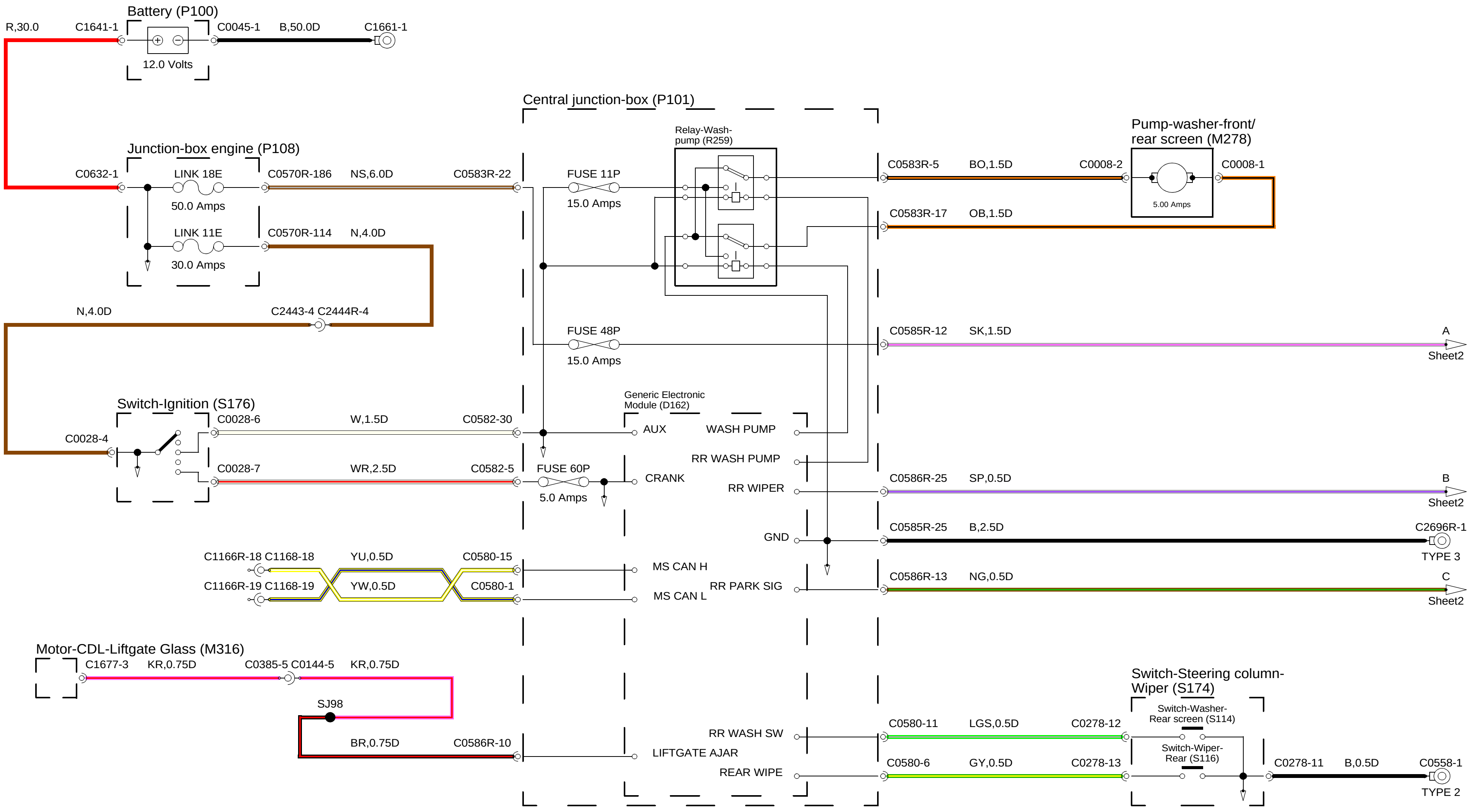

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
Central junction-box (P101)
C0583R-20
FUSE 65P
10.0 Amps
Generic Electronic Module (D162)
OPEN STATUS
CLOSED STATUS
BATT 1
GND
Relay-Power striker-Open (R279)
Relay-Power striker-Closed (R280)
C0586R-11
B,0.75D
C0586R-12
B,0.75D
C0582-25
B,0.75D
C1168-21 C1166R-21
B,0.75D
C0582-40
B,0.75D
C1168-22 C1166R-22
B,0.75D
C3269-4
C3269-6
C3269-2
C3269-1
Unit-Power striker (D425)
Switch-Open
Switch-Close
Motor-Power striker (M349)
1.00 Amps
C3269-5
B,0.75D
C2570-1
TYPE 3

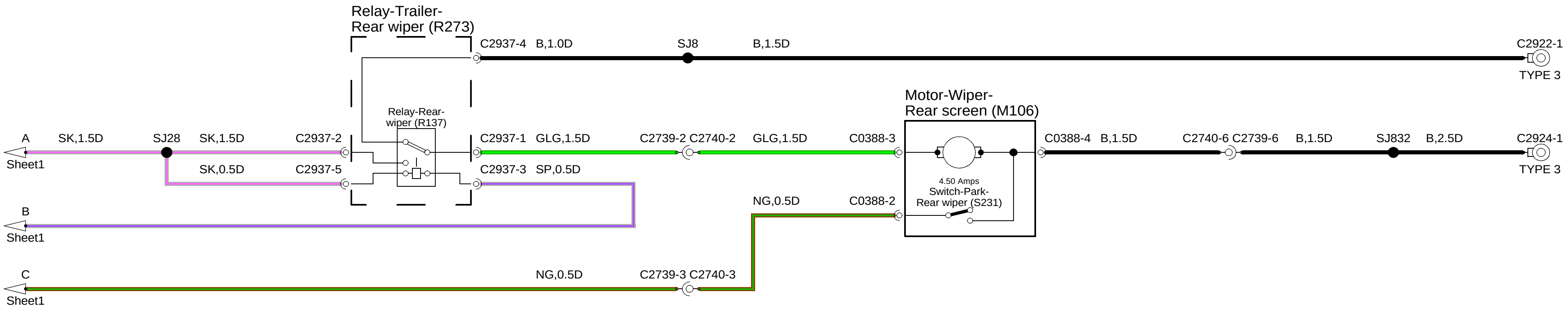

SJ1573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Motor-Wiper-
Windscreen (M105)
C0030R-2
C0030R-1
6.00 Amps
Switch-Park-
Windscreen (S293)
C0030R-3
B,2.5D
C0030R-5
WLG,0.5D
SJ1415
WLG,0.5D
C2412R-6 C2411R-6
Junction-box engine (P108)
C0570R-82
B,1.0D
Relay-
Wiper-1 (R231)
Relay-
Wiper-2 (R232)
C0570R-49
ULG,2.5D
C0570R-38
RLG,2.5D
C0570R-50
PU,1.5D
C0570R-83
R,1.5D
C0632-1
FUSE 29E
30.0 Amps
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Central junction-box (P101)
Relay-Wash-
pump (R259)
C0584R-16
WLG,0.5D
Pump-washer-front/
rear screen (M278)
FUSE 11P
10.0 Amps
C0583R-5
BO,1.5D
C0008-2
C0008-1
5.00 Amps
C0583R-17
OB,1.5D
Sensor-Rain-
Ambient light (T328)
FUSE 18P
5.0 Amps
C0585R-45
G,0.5D
C0961-4
C0961-1
WLG,0.5D
R,0.5D
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 2
Generic Electronic
Module (D162)
FR WASH PUMP
FR WIPE SPEED2
GND
FR WIPE SPEED1
SJ1001
PU,0.5D
C0584R-17
SJ1002
R,0.5D
C0584R-32
C0586R-32
R,0.5D
SJ1045
C0585R-25
B,2.5D
C2696R-1
TYPE 3
WASH PUMP
FR PARK SIG
LIN BUS
FR WASH SW
Switch-Steering column-
Wiper (S174)
Wash-
Switch (Y159)
C0580-12
LG,0.5D
C0278-5
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0582-30
AUX
FR SLOW WIPE
C0580-2
GS,0.5D
C0278-9
Slow-
wipe (Y155)
C0278-11
B,0.5D
C0558-1
TYPE 2
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
Flick-
wipe 1 (Y157)
Fast-
wipe (Y156)
FR FAST WIPE
C0580-7
RLG,0.5D
C0278-10
Switch-Variable delay-
windscreen wiper (S239)
C1166R-18 C1168-18
YU,0.5D
C0580-15
MS CAN H
C1166R-19 C1168-19
YW,0.5D
C0580-1
MS CAN L
DATA 1
C0580-8
WLG,0.5D
C0278-3
DATA 2
C0580-9
GS,0.5D
C0278-4
DATA 3
C0580-10
LGP,0.5D
C0278-2
FR INT WIPE
C0580-5
LGG,0.5D
C0278-8


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Power-wash (R139)
C0632-1
LINK 7E
30.0 Amps
C0570R-25
C0570R-9
LGR,2.5D
C0570R-27
G,0.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
Pump-Power wash (M156)
C0828-1
C0828-2
11.40 Amps
B,2.5D
SJ171
B,2.5D
C2601-1
TYPE 3
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
FUSE 61P
5.0 Amps
C0582-9
NP,0.5D
Lighting control switch (S100)
C0041-8
C0041-6
Generic Electronic Module (D162)
C0584R-18
POWER WASH
VBATT
DIP BEAM
C0580-25
Y,0.5D
Switch-Steering column-Wiper (S174)
Wash-Switch (Y159)
FR WASH SW
C0580-12
LG,0.5D
C0278-5
C0278-11
B,0.5D
C0558-1
TYPE 2
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
LG,0.5D
SJ1574

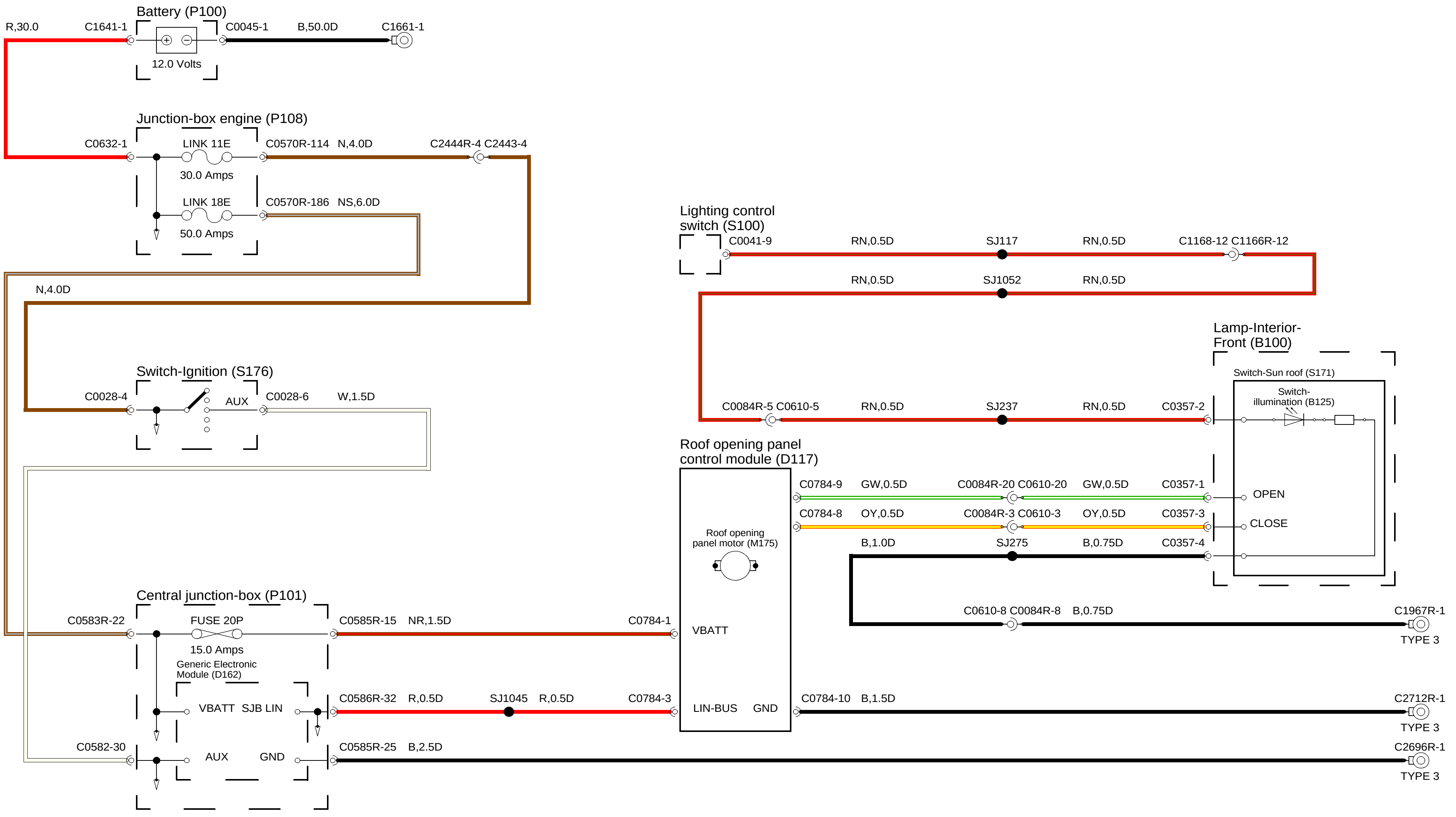
Washer jets - heated

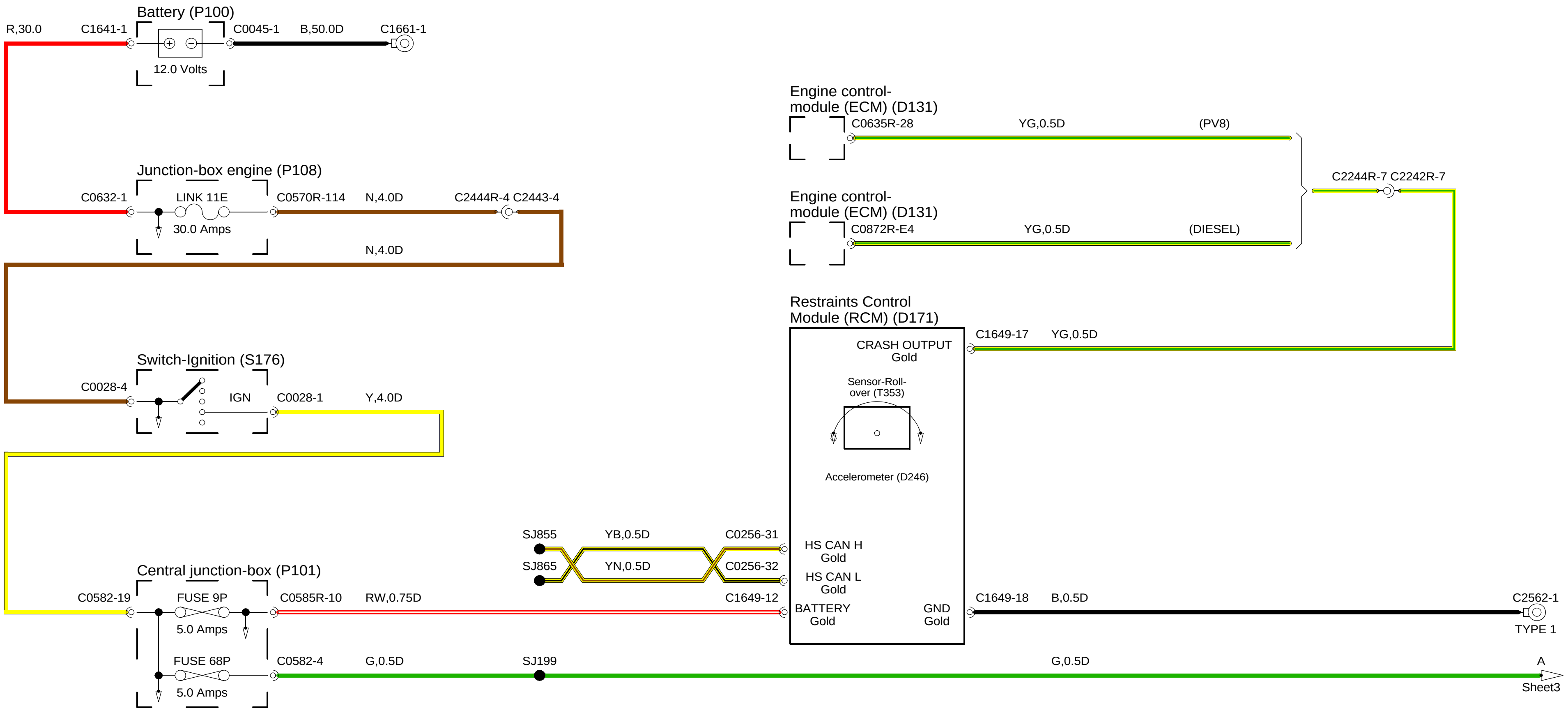

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1 B,50.0D
C1661-1
SJ170 NY,0.75D
C0934-1
Heater-Washer-jet-LH (H127)
C0934-2 B,0.75D
SJ171
B,2.5D
C2601-1
TYPE 3
Heater-Washer-jet-RH (H128)
NY,0.75D
C0946-1
C0946-2 B,0.75D
Junction-box engine (P108)
Relay-Heated Wash-jets/Mirror (R256)
C0632-1
FUSE 12E
10.0 Amps
C0570R-171 NY,1.5D
C0570R-118 NO,1.5D
C2241R-4 C2239-4
C0570R-95
LINK 17E
50.0 Amps
C0570R-117 NR,6.0D
LINK 11E
30.0 Amps
C0570R-114 N,4.0D
Sensor-Ambient air-temperature (T119)
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550 BG,0.5D
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Automatic Temperature Control Module (D243)
N,4.0D
C2443-4 C2444R-4
BG,0.5D
C1629-13
YN,0.5D
C1629-15
ATC
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
C1629-19 NO,0.5D
C2655-3 B,1.0D
C2629-1
TYPE 3
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
SJ965
YU,0.5D
C1629-22
SJ975
YW,0.5D
C1629-21
MS CAN H
MS CAN L
C2655-1
C1629-10
YU,0.5D
C2238-2 C2240R-2
C1629-9
YW,0.5D
C2238-1 C2240R-1
MS CAN H
MS CAN L
Central junction-box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D
Engine control-module (ECM) (D131)
HS CAN H
C0635R-57
YB,0.5D
SJ1176
HS CAN L
C0635R-44
YN,0.5D
SJ1177
Generic Electronic Module (D162)
MS CAN L
C0580-1
YW,0.5D
C1168-19 C1166R-19
MS CAN H
C0580-15
YU,0.5D
C1168-18 C1166R-18
C0580-5
LGG,0.5D
C0278-8
Switch-Steering column-Wiper (S174)
C0582-19
FUSE 28P
5.0 Amps
C0583R-35 LG,0.5D
SJ1574
LG,1.5D
Instrument cluster (J100)
SJ730
YU,0.5D
C0230-17
SJ731
YW,0.5D
C0230-18
MS CAN H
HS CAN H
MS CAN L
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860

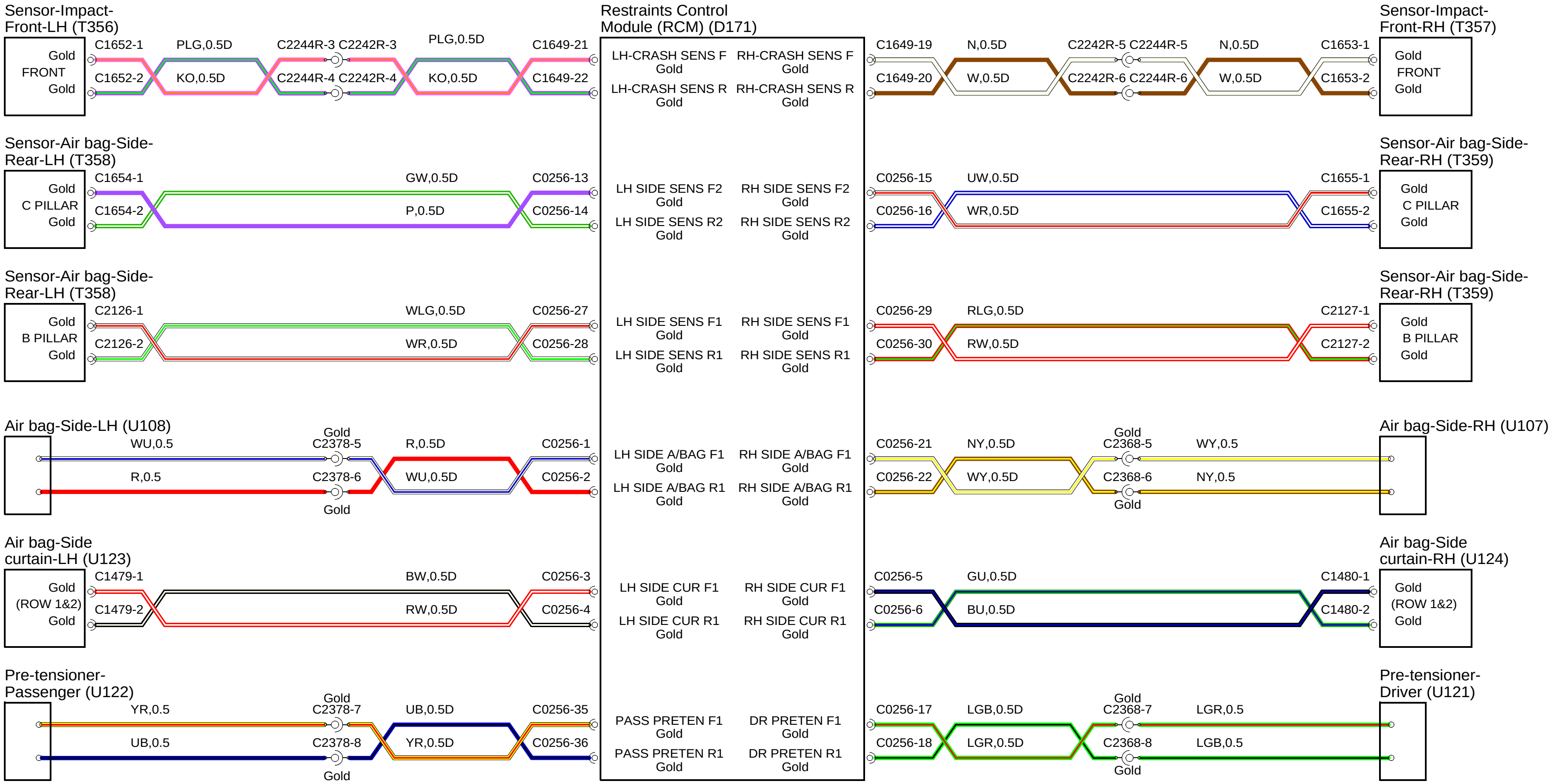

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Relay-Wash-pump (R259)
Pump-washer-front/ rear screen (M278)
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
C0583R-22
FUSE 11P
15.0 Amps
C0583R-5
BO,1.5D
C0008-2
C0008-1
5.00 Amps
C0583R-17
OB,1.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
FUSE 48P
15.0 Amps
C0585R-12
SK,1.5D
A
Sheet2
Generic Electronic Module (D162)
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
AUX
WASH PUMP
C0028-4
RR WASH PUMP
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
RR WIPER
C0586R-25
SP,0.5D
B
Sheet2
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C1166R-18 C1168-18
YU,0.5D
C0580-15
MS CAN H
C1166R-19 C1168-19
YW,0.5D
C0580-1
MS CAN L
RR PARK SIG
C0586R-13
NG,0.5D
C
Sheet2
Motor-CDL-Liftgate Glass (M316)
C1677-3
KR,0.75D
C0385-5 C0144-5
KR,0.75D
SJ98
Switch-Steering column-Wiper (S174)
Switch-Washer-Rear screen (S114)
BR,0.75D
C0586R-10
RR WASH SW
C0580-11
LGS,0.5D
C0278-12
LIFTGATE AJAR
Switch-Wiper-Rear (S116)
REAR WIPE
C0580-6
GY,0.5D
C0278-13
C0278-11
B,0.5D
C0558-1
TYPE 2

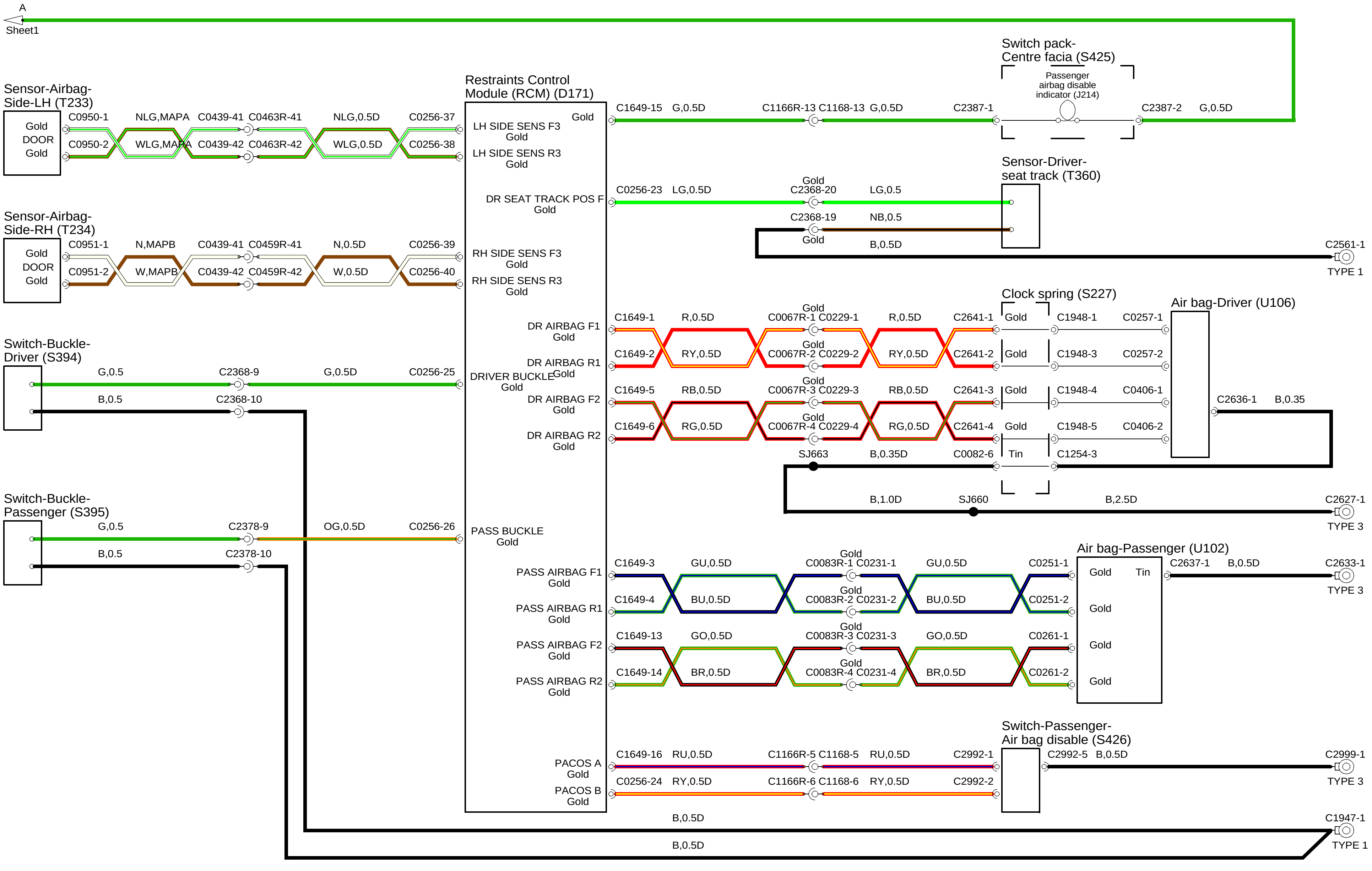

Relay-Trailer-
Rear wiper (R273)
C2937-4 B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
Motor-Wiper-
Rear screen (M106)
Relay-Rear-
wiper (R137)
A
SK,1.5D
SJ28
SK,1.5D
C2937-2
C2937-1 GLG,1.5D
C2739-2 C2740-2
GLG,1.5D
C0388-3
C0388-4 B,1.5D
C2740-6 C2739-6
B,1.5D
SJ832
B,2.5D
C2924-1
TYPE 3
Sheet1
SK,0.5D
C2937-5
C2937-3 SP,0.5D
4.50 Amps
Switch-Park-
Rear wiper (S231)
NG,0.5D
C0388-2
B
Sheet1
C
NG,0.5D
C2739-3 C2740-3
Sheet1

501-17 ROOF OPENING PANEL


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
N,4.0D
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1168-12 C1166R-12
RN,0.5D
SJ1052
RN,0.5D
Lamp-Interior-Front (B100)
Switch-Sun roof (S171)
Switch-illumination (B125)
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0084R-5 C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
Roof opening panel control module (D117)
C0784-9
GW,0.5D
C0084R-20 C0610-20
GW,0.5D
C0357-1
OPEN
C0784-8
OY,0.5D
C0084R-3 C0610-3
OY,0.5D
C0357-3
CLOSE
Roof opening panel motor (M175)
B,1.0D
SJ275
B,0.75D
C0357-4
Central junction-box (P101)
C0583R-22
FUSE 20P
15.0 Amps
C0585R-15
NR,1.5D
C0784-1
VBATT
C0610-8 C0084R-8
B,0.75D
C1967R-1
TYPE 3
Generic Electronic Module (D162)
VBATT
SJB LIN
C0586R-32
R,0.5D
SJ1045
R,0.5D
C0784-3
LIN-BUS
GND
C0784-10
B,1.5D
C2712R-1
TYPE 3
C0582-30
AUX
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Engine control-module (ECM) (D131)
C0635R-28
YG,0.5D
(PV8)
Junction-box engine (P108)
C2244R-7 C2242R-7
C0632-1
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
30.0 Amps
Engine control-module (ECM) (D131)
C0872R-E4
YG,0.5D
(DIESEL)
N,4.0D
Restraints Control Module (RCM) (D171)
C1649-17
YG,0.5D
CRASH OUTPUT Gold
Switch-Ignition (S176)
Sensor-Roll-over (T353)
C0028-4
IGN
C0028-1
Y,4.0D
Accelerometer (D246)
SJ855
YB,0.5D
C0256-31
HS CAN H Gold
SJ865
YN,0.5D
C0256-32
Central junction-box (P101)
HS CAN L Gold
C0582-19
FUSE 9P
C0585R-10
RW,0.75D
C1649-12
C1649-18
B,0.5D
C2562-1
BATTERY Gold
GND Gold
5.0 Amps
TYPE 1
FUSE 68P
C0582-4
G,0.5D
SJ199
G,0.5D
A
5.0 Amps
Sheet3


Sensor-Impact-Front-LH (T356)
Gold
FRONT
Gold
C1652-1
PLG,0.5D
C2244R-3 C2242R-3
PLG,0.5D
C1649-21
C1652-2
KO,0.5D
C2244R-4 C2242R-4
KO,0.5D
C1649-22
Restraints Control Module (RCM) (D171)
LH-CRASH SENS F
Gold
RH-CRASH SENS F
Gold
LH-CRASH SENS R
Gold
RH-CRASH SENS R
Gold
C1649-19
N,0.5D
C2242R-5 C2244R-5
N,0.5D
C1653-1
C1649-20
W,0.5D
C2242R-6 C2244R-6
W,0.5D
C1653-2
Sensor-Impact-Front-RH (T357)
Gold
FRONT
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C1654-1
GW,0.5D
C0256-13
C1654-2
P,0.5D
C0256-14
LH SIDE SENS F2
Gold
RH SIDE SENS F2
Gold
LH SIDE SENS R2
Gold
RH SIDE SENS R2
Gold
C0256-15
UW,0.5D
C1655-1
C0256-16
WR,0.5D
C1655-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
C PILLAR
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
B PILLAR
Gold
C2126-1
WLG,0.5D
C0256-27
C2126-2
WR,0.5D
C0256-28
LH SIDE SENS F1
Gold
RH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
RH SIDE SENS R1
Gold
C0256-29
RLG,0.5D
C2127-1
C0256-30
RW,0.5D
C2127-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
B PILLAR
Gold
Air bag-Side-LH (U108)
WU,0.5
Gold
C2378-5
R,0.5D
C0256-1
R,0.5
C2378-6
WU,0.5D
C0256-2
Gold
LH SIDE A/BAG F1
Gold
RH SIDE A/BAG F1
Gold
LH SIDE A/BAG R1
Gold
RH SIDE A/BAG R1
Gold
C0256-21
NY,0.5D
Gold
C2368-5
WY,0.5
C0256-22
WY,0.5D
C2368-6
NY,0.5
Gold
Air bag-Side-RH (U107)
Air bag-Side curtain-LH (U123)
Gold
(ROW 1&2)
Gold
C1479-1
BW,0.5D
C0256-3
C1479-2
RW,0.5D
C0256-4
LH SIDE CUR F1
Gold
RH SIDE CUR F1
Gold
LH SIDE CUR R1
Gold
RH SIDE CUR R1
Gold
C0256-5
GU,0.5D
C1480-1
C0256-6
BU,0.5D
C1480-2
Air bag-Side curtain-RH (U124)
Gold
(ROW 1&2)
Gold
Pre-tensioner-Passenger (U122)
YR,0.5
Gold
C2378-7
UB,0.5D
C0256-35
UB,0.5
C2378-8
YR,0.5D
C0256-36
Gold
PASS PRETEN F1
Gold
DR PRETEN F1
Gold
PASS PRETEN R1
Gold
DR PRETEN R1
Gold
C0256-17
LGB,0.5D
Gold
C2368-7
LGR,0.5
C0256-18
LGR,0.5D
C2368-8
LGB,0.5
Gold
Pre-tensioner-Driver (U121)


A
Sheet1
Switch pack-
Centre facia (S425)
Passenger
airbag disable
indicator (J214)
Restraints Control
Module (RCM) (D171)
Sensor-Airbag-
Side-LH (T233)
Gold
DOOR
Gold
C0950-1
NLG,MAPA
C0439-41
C0463R-41
NLG,0.5D
C0256-37
C0950-2
WLG,MAPA
C0439-42
C0463R-42
WLG,0.5D
C0256-38
LH SIDE SENS F3
Gold
LH SIDE SENS R3
Gold
Gold
C1649-15
G,0.5D
C1166R-13
C1168-13
G,0.5D
C2387-1
C2387-2
G,0.5D
Sensor-Driver-
seat track (T360)
DR SEAT TRACK POS F
Gold
C0256-23
LG,0.5D
Gold
C2368-20
LG,0.5
C2368-19
NB,0.5
Gold
B,0.5D
C2561-1
TYPE 1
Sensor-Airbag-
Side-RH (T234)
Gold
DOOR
Gold
C0951-1
N,MAPB
C0439-41
C0459R-41
N,0.5D
C0256-39
C0951-2
W,MAPB
C0439-42
C0459R-42
W,0.5D
C0256-40
RH SIDE SENS F3
Gold
RH SIDE SENS R3
Gold
Clock spring (S227)
Air bag-Driver (U106)
DR AIRBAG F1
Gold
C1649-1
R,0.5D
Gold
C0067R-1
C0229-1
R,0.5D
C2641-1
Gold
C1948-1
C0257-1
DR AIRBAG R1
Gold
C1649-2
RY,0.5D
Gold
C0067R-2
C0229-2
RY,0.5D
C2641-2
Gold
C1948-3
C0257-2
DRIVER BUCKLE
Gold
Switch-Buckle-
Driver (S394)
G,0.5
C2368-9
G,0.5D
C0256-25
B,0.5
C2368-10
DR AIRBAG F2
Gold
C1649-5
RB,0.5D
Gold
C0067R-3
C0229-3
RB,0.5D
C2641-3
Gold
C1948-4
C0406-1
C2636-1
B,0.35
DR AIRBAG R2
Gold
C1649-6
RG,0.5D
Gold
C0067R-4
C0229-4
RG,0.5D
C2641-4
Gold
C1948-5
C0406-2
SJ663
B,0.35D
C0082-6
Tin
C1254-3
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Switch-Buckle-
Passenger (S395)
G,0.5
C2378-9
OG,0.5D
C0256-26
B,0.5
C2378-10
PASS BUCKLE
Gold
Air bag-Passenger (U102)
PASS AIRBAG F1
Gold
C1649-3
GU,0.5D
Gold
C0083R-1
C0231-1
GU,0.5D
C0251-1
Gold
Tin
C2637-1
B,0.5D
C2633-1
TYPE 3
PASS AIRBAG R1
Gold
C1649-4
BU,0.5D
Gold
C0083R-2
C0231-2
BU,0.5D
C0251-2
Gold
PASS AIRBAG F2
Gold
C1649-13
GO,0.5D
Gold
C0083R-3
C0231-3
GO,0.5D
C0261-1
Gold
PASS AIRBAG R2
Gold
C1649-14
BR,0.5D
Gold
C0083R-4
C0231-4
BR,0.5D
C0261-2
Gold
Switch-Passenger-
Air bag disable (S426)
PACOS A
Gold
C1649-16
RU,0.5D
C1166R-5
C1168-5
RU,0.5D
C2992-1
C2992-5
B,0.5D
C2999-1
TYPE 3
PACOS B
Gold
C0256-24
RY,0.5D
C1166R-6
C1168-6
RY,0.5D
C2992-2
B,0.5D
C1947-1
TYPE 1
B,0.5D

LAND
ROVER

Health and safety

Always follow health and safety guidelines, specifically those detailed in the Workshop Manual.

Using this publication

The information provided in this publication is for use only by competent, qualified auto-electricians. Good product knowledge is assumed, as well as the ability to access and use recommended test equipment and other reference material provided.

Test equipment and other reference material

The information in this publication should be used in conjunction with the recommended test equipment; refer to Workshop Manual. Other reference material includes: Technical Service Bulletins (TSB) and the Workshop Manual.

The Electrical Reference Library (ERL) may also prove useful since it provides detailed connector information.

Battery disconnection and reconnection

It is imperative that any information relating to battery disconnection and reconnection is followed; refer to the appropriate sections in the Workshop Manual.

Fault Diagnosis

Always use the recommended test equipment for correct and reliable fault diagnosis, refer to the Workshop Manual.

Harness Repair

Repairs should only be undertaken for connectors where a Service Repair Kit is available; refer to the appropriate Electrical Reference Library (ERL).
Note: Fibre Optic circuits cannot be repaired; refer to the Workshop Manual.

Abbreviations

Abbreviation	Description
ABS	Anti-lock braking system
AFS	Adaptive front lighting system
AUTO	Automatic transmission
CAN	Controller area network
DSC	Dynamic stability control
DV6	Diesel engine - V6
DV8	Diesel engine - V8
EGR	Exhaust gas recirculation
EU3	DV6 - Without inlet port deactivation
EU4	DV6 - With inlet port deactivation
FET	Field effect transistor
GPS	Global positioning system
PV6	Petrol engine - V6
PV8	Petrol engine - V8
PV8NA	Naturally aspirated engine - V8
PV8SC	Super charged engine - V8
LH	Left-hand
MAF/IAT	Mass air flow / intake air temperature
NAS	North American specification
PDC	Park distance control
RH	Right-hand
TPMS	Tire pressure monitoring system
TSD	Touch screen display

Section numbering

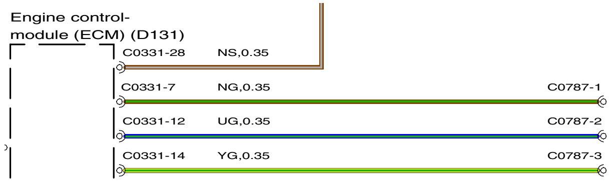
The sections in this publication are ordered to match the Global Outline numbering system as found in the current Workshop Manual. The Power and Ground distribution circuits can be found under section 414-01, BATTERY, MOUNTING AND CABLES.
Note: Where circuit diagrams show more than one sub-system, the circuit will be located in the section that carries the first-named sub-system, for example: Starting and Charging will be located under section 303-06 Starting System, since 'Starting' is the first-named sub-system.

Circuit sheet numbering

The figures in brackets to the left of the page number indicate a circuit sheet number and the total number of sheets per circuit, for example (01 / 05) represents sheet 1 of 5.

Understanding the circuit diagrams

Components

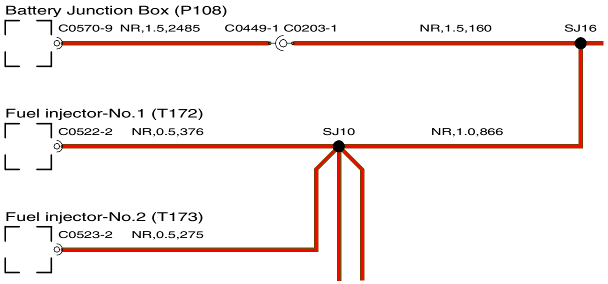

Engine control-
module (ECM) (D131)
C0331-28
NS,0.35
C0331-7
NG,0.35
C0787-1
C0331-12
UG,0.35
C0787-2
C0331-14
YG,0.35
C0787-3

After each component description, a translation code is displayed in brackets, for example: Starter relay (R102), Engine control-module (ECM)(D131). The codes can be ignored.
Note: A dotted outline indicates that the component identified is not shown in its entirety.

Connectors

Connectors and header joints are identified by their corresponding connector number with a numbered suffix to indicate the pin-out detail of the wire, i.e. C0292-1 identifies connector 292, pin number 1. Wire insulation colours are listed in a table at the end of this section. Where wires have a predominant colour with a secondary colour tracer, the main colour is identified first, i.e. LGS - light green with a slate tracer.

Splices

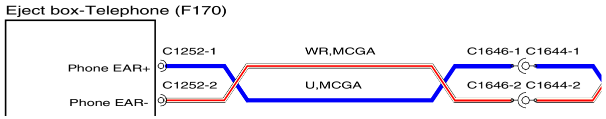

Battery Junction Box (P108)
C0570-9
NR,1.5,2485
C0449-1
C0203-1
NR,1.5,160
SJ16
Fuel injector-No.1 (T172)
C0522-2
NR,0.5,376
SJ10
NR,1.0,866
Fuel injector-No.2 (T173)
C0523-2
NR,0.5,275

The splices (and where appropriate, the header) circuit pages show the full interconnectivity of components and systems.
Note: The splice information shown on individual system circuits is not complete. Always refer to the splices circuit pages for complete information for each splice.

Wire length (Splices, Power and Ground Distribution only)

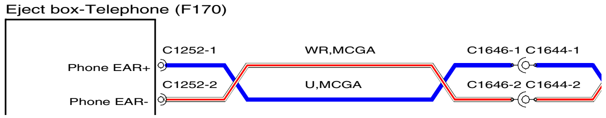
The wire length (in millimetres) is displayed after the colour and cross sectional area; for example, SR,0.35,480. In this example, the figure, 480 indicates the approximate position of the harness splice is 480mm from connector C2335.

Wire Types

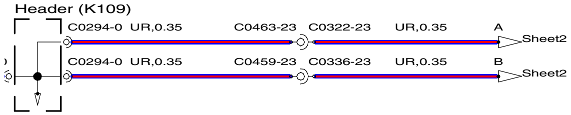

Eject box-Telephone (F170)
C1252-1
WR,MCGA
C1646-1 C1644-1
Phone EAR+
C1252-2
U,MCGA
C1646-2 C1644-2
Phone EAR-

Multicore wires are identified by the prefix M suffixed by three or four other letters, for example MCGA, MAPN. The suffix precisely defines the parameters that comprise the specification of the wire type. The specification is defined during the design process of an electrical system, therefore it is imperative that the correct specification is maintained to ensure the correct operating characteristics and continued functionality for a given system.

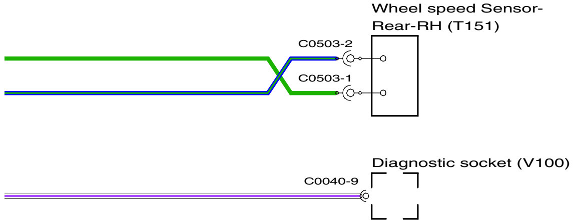
Line Types


Eject box-Telephone (F170)
Phone EAR+
Phone EAR-
C1252-1
C1252-2
WR,MCGA
U,MCGA
C1646-1 C1644-1
C1646-2 C1644-2

Crossed wires as illustrated above show an example of how a twisted pair of wires may be represented on the circuits.


Header (K109)
C0294-0 UR,0.35
C0463-23
C0322-23
UR,0.35
A
Sheet2
C0294-0 UR,0.35
C0459-23
C0336-23
UR,0.35
B
Sheet2

The arrows illustrated above show an example of the page break symbols, identifying that the circuit continues at the corresponding letter on the sheet number indicated.


Wheel speed Sensor-
Rear-RH (T151)
C0503-2
C0503-1
Diagnostic socket (V100)
C0040-9

The cup and ball symbol represents the male and female halves of connector. Most connectors plug directly into a component but some are wired directly to the component using a ‘flylead’ as with C503 above.

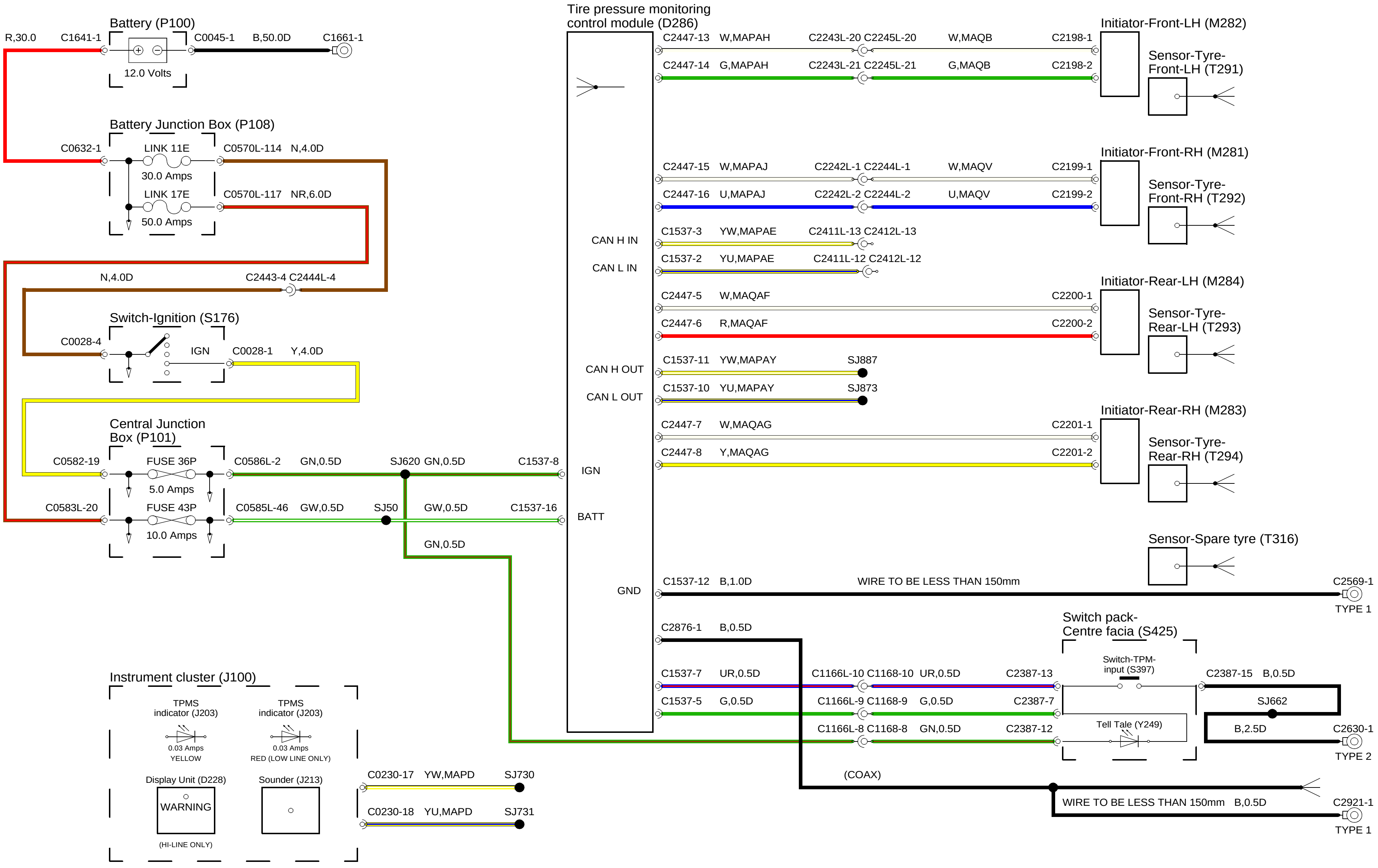
Ground points

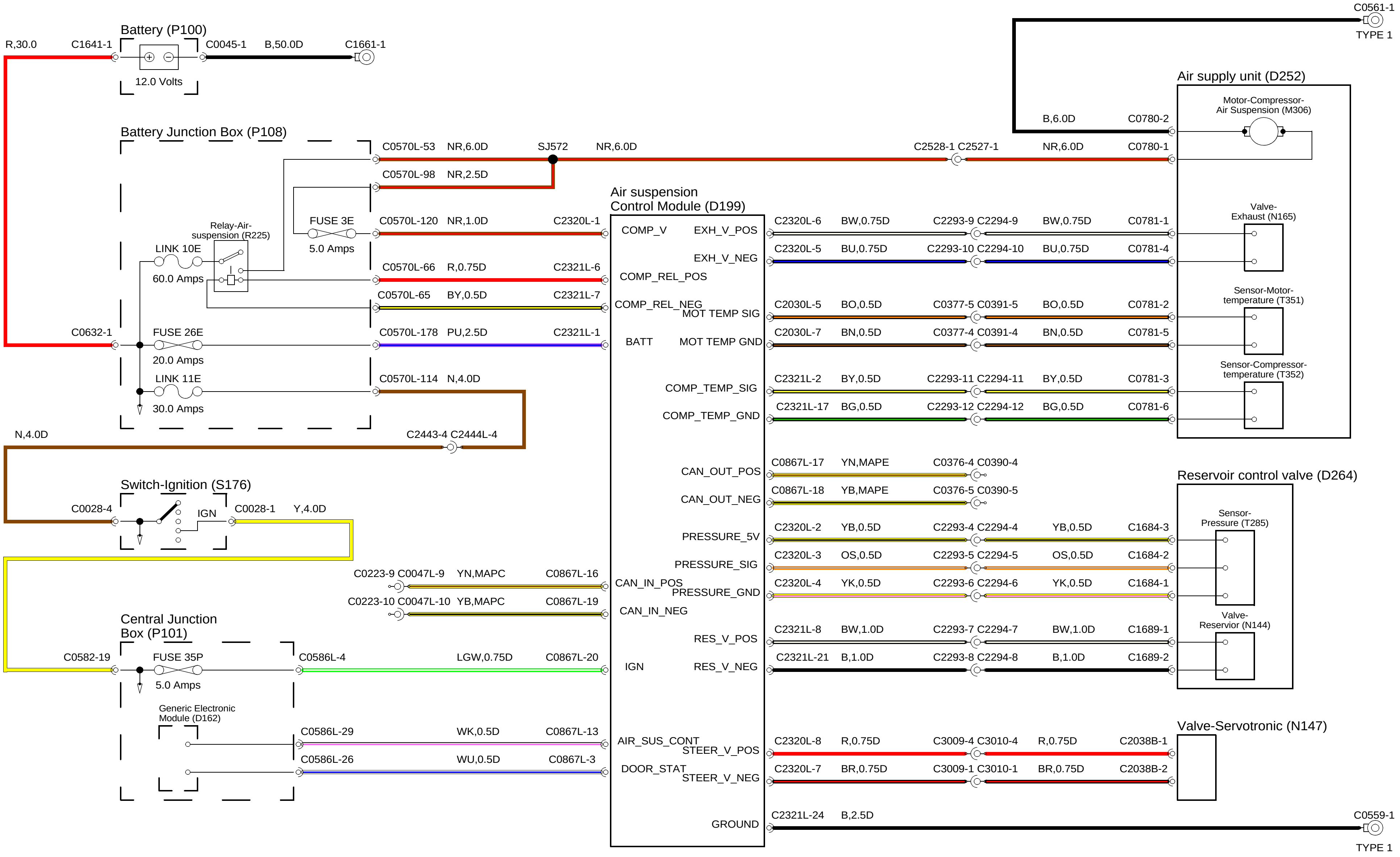
Ground points are identified with an eyelet symbol and a connector number, except where components are grounded through its fixings, when only the eyelet is shown.

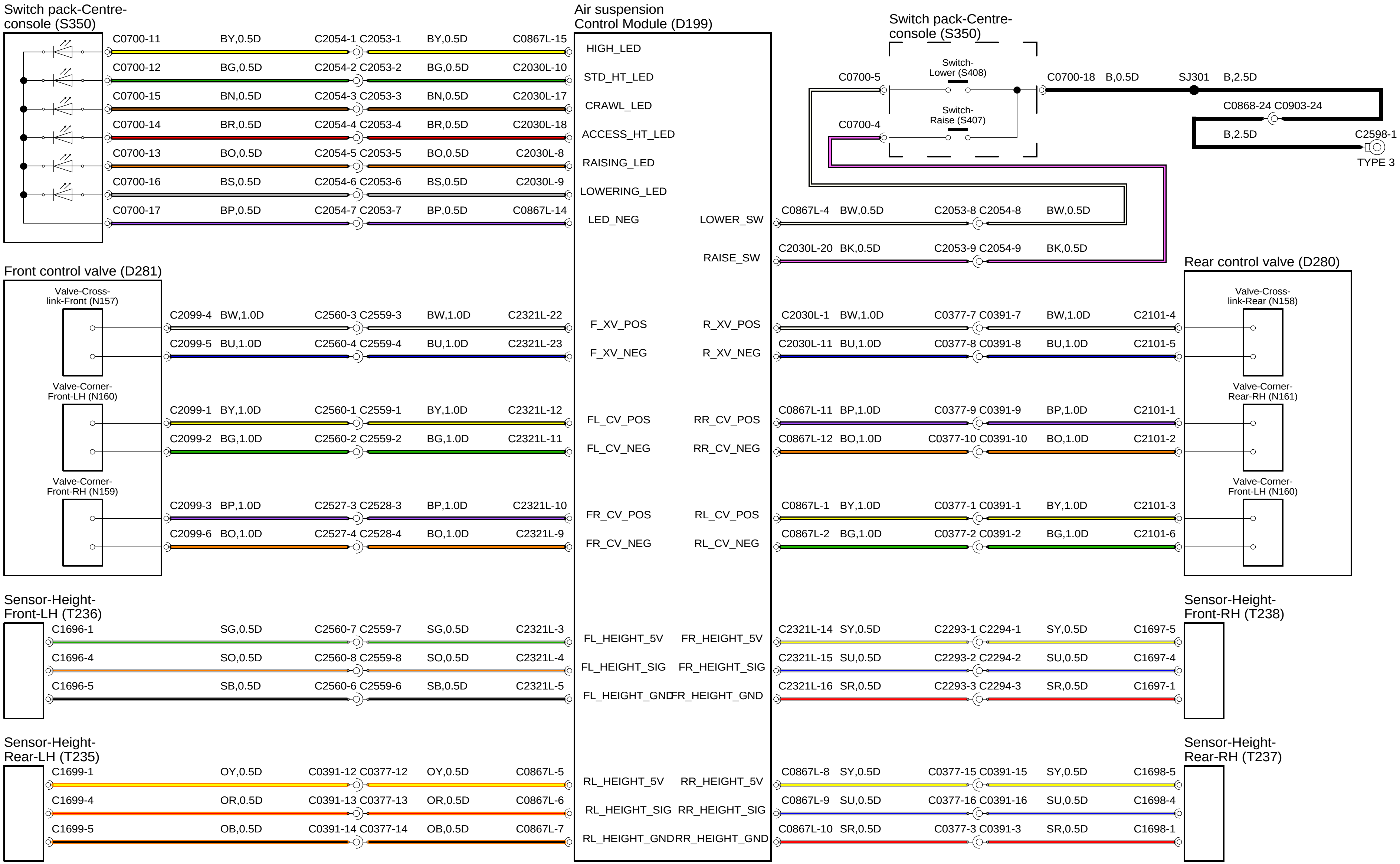
Colour Codes

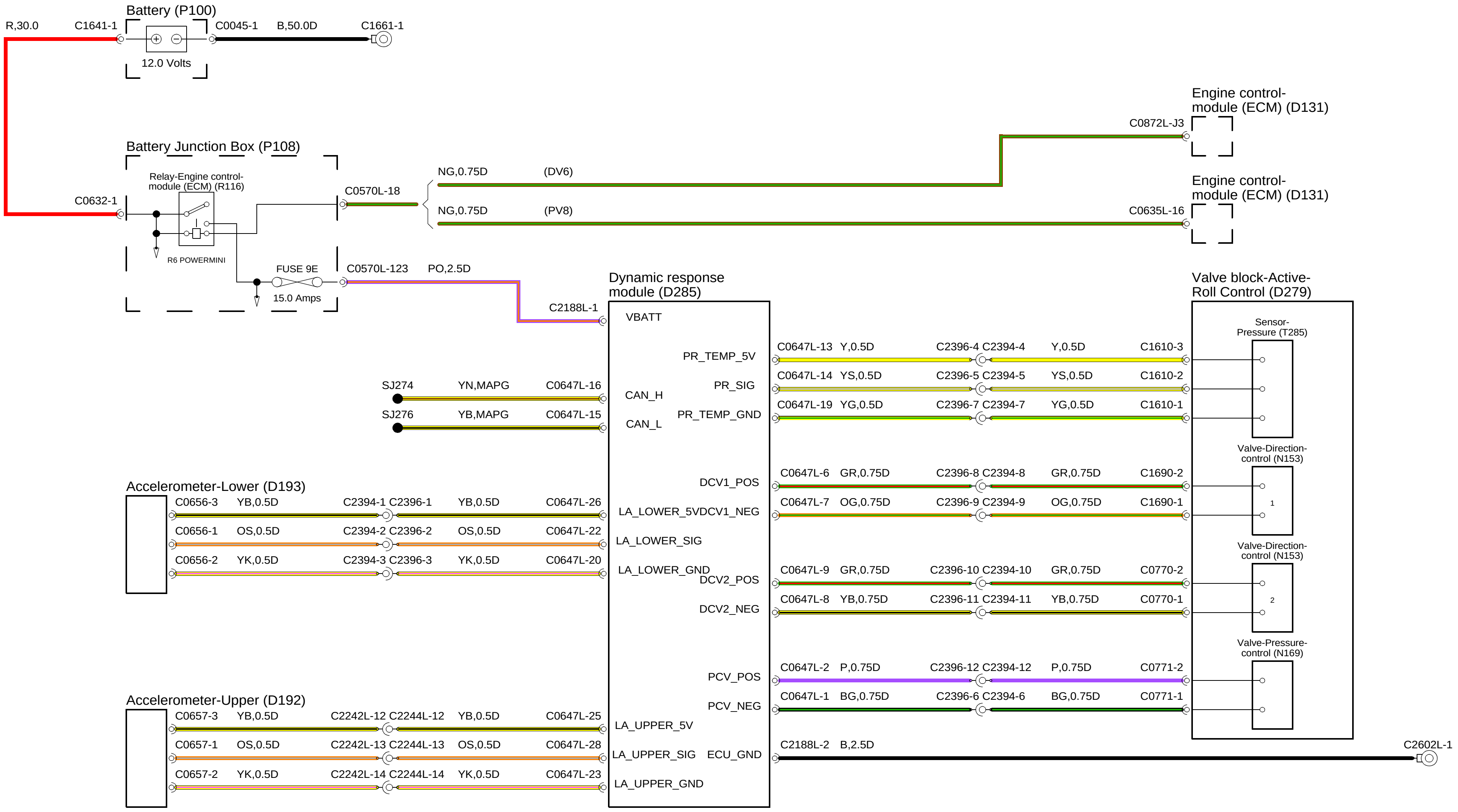
DRAADKLEURCODES	CODES DES COULEURS DES FILS	KABELFARBCODES
CODICI COLORI DEI CAVI	CODIGOS DE COLORES DE LOS CABLES	CÓDIGOS DAS CORES DOS FIOS

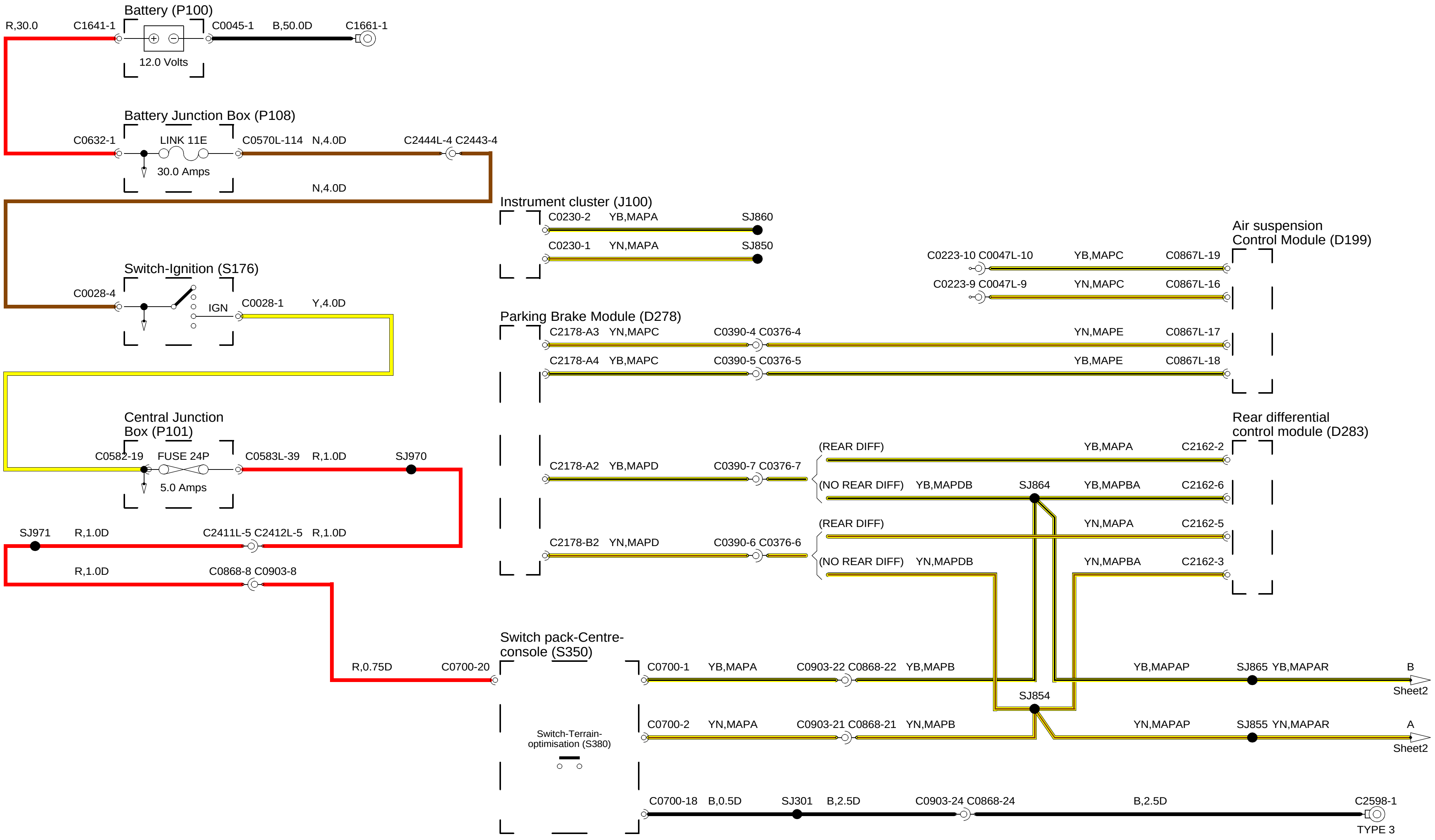
CODE	**COLOUR**	**CODE**	**KLEUR**	**CODE**	**COULEUR**	**CODE**	**FARBE**	**CODICE**	**COLORE**	**CODIGO**	**COLOR**	**CÓDIGO**	**COR**
B	BLACK	B	ZWART	B	NOIR	B	SCHWARZ	B	NERO	B	NEGRO	B	PRETO
G	GREEN	G	GROEN	G	VERT	G	GRÜN	G	VERDE	G	VERDE	G	VERDE
K	PINK	K	ROZE	K	ROSE	K	ROSA	K	ROSA	K	ROSA	K	ROSA
LG	LIGHT GREEN	LG	LICHTGROEN	LG	VERT CLAIR	LG	HELLGRÜN	LG	VERDE CHIARO	LG	VERDE CLARO	LG	VERDE CLARO
N	BROWN	N	BRUIN	N	BRUN	N	BRAUN	N	MARRONE	N	MARRON	N	CASTANHO
O	ORANGE	O	ORANJE	O	ORANGE	O	ORANGE	O	ARANCIONE	O	NARANJA	O	LARANJA
P	PURPLE	P	PAARS	P	VIOLET	P	LILA	P	PORPORA	P	PURPURA	P	ROXO
R	RED	R	ROOD	R	ROUGE	R	ROT	R	ROSSO	R	ROJO	R	VERMELHO
S	SLATE (grey)	S	LEIGRIJS	S	GRIS	S	GRAU	S	ARDESIA (grigio)	S	PIZARRO (gris)	S	CINZENTO
T	TRANSPARENT	T	TRANSPARANT	T	TRANSPARENT	T	TRANSPARENT	T	TRASPARENTE	T	TRANSPARENTE	T	TRANSPARENTE
U	BLUE	U	BLAUW	U	BLEU	U	BLAU	U	BLU	U	AZUL	U	AZUL
W	WHITE	W	WIT	W	BLANC	W	WEISS	W	BIANCO	W	BLANCO	W	BRANCO
Y	YELLOW	Y	GEEL	Y	JAUNE	Y	GELB	Y	GIALLO	Y	AMARILLO	Y	AMARELO

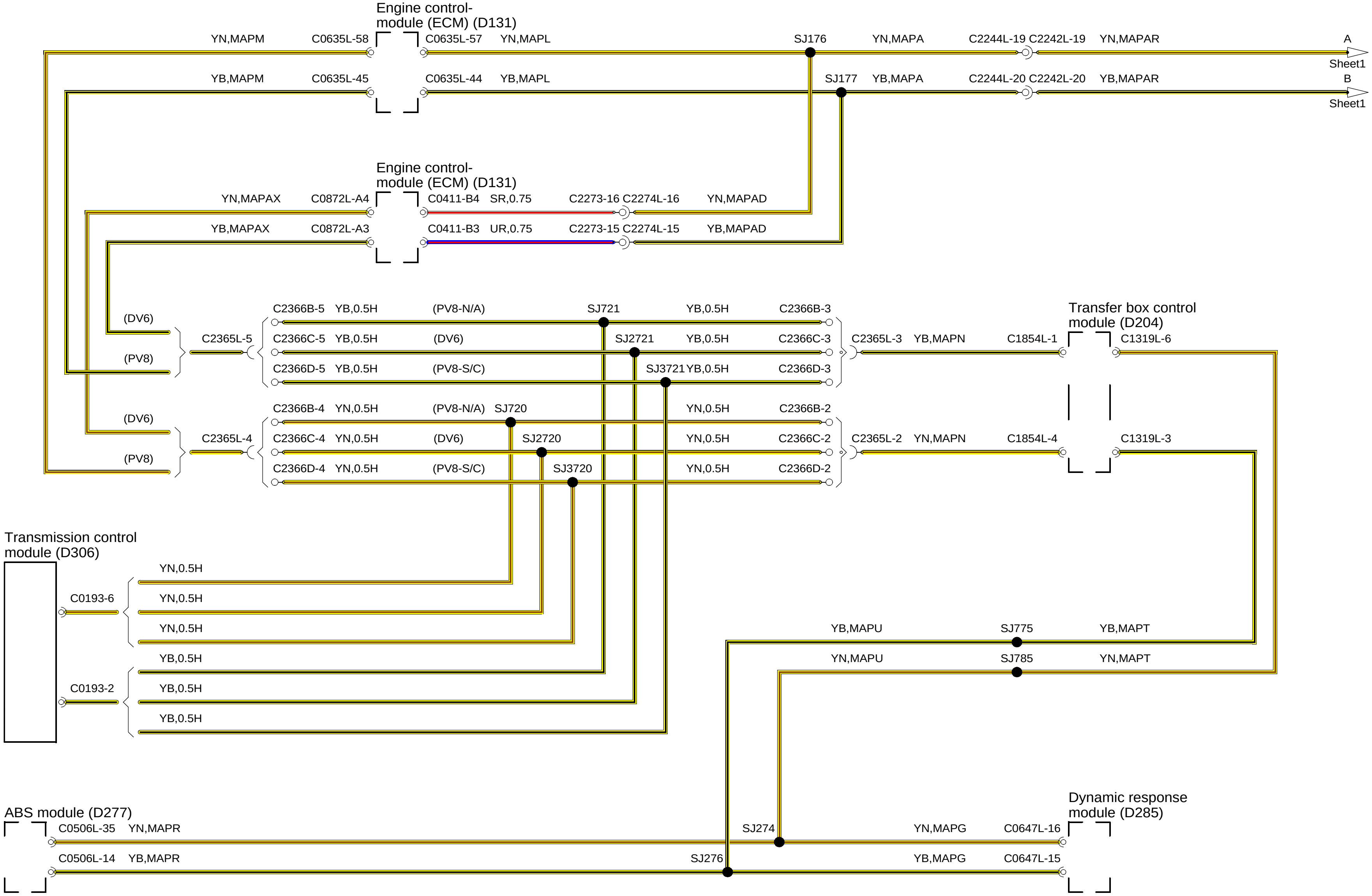

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 36P
5.0 Amps
C0586L-2
GN,0.5D
SJ620 GN,0.5D
C1537-8
C0583L-20
FUSE 43P
10.0 Amps
C0585L-46
GW,0.5D
SJ50
GW,0.5D
C1537-16
GN,0.5D
Tire pressure monitoring control module (D286)
CAN H IN
CAN L IN
CAN H OUT
CAN L OUT
IGN
BATT
GND
C2447-13
W,MAPAH
C2243L-20 C2245L-20
W,MAQB
C2198-1
C2447-14
G,MAPAH
C2243L-21 C2245L-21
G,MAQB
C2198-2
Initiator-Front-LH (M282)
Sensor-Tyre-Front-LH (T291)
C2447-15
W,MAPAJ
C2242L-1 C2244L-1
W,MAQV
C2199-1
C2447-16
U,MAPAJ
C2242L-2 C2244L-2
U,MAQV
C2199-2
Initiator-Front-RH (M281)
Sensor-Tyre-Front-RH (T292)
C1537-3
YW,MAPAE
C2411L-13 C2412L-13
C1537-2
YU,MAPAE
C2411L-12 C2412L-12
C2447-5
W,MAQAF
C2200-1
C2447-6
R,MAQAF
C2200-2
Initiator-Rear-LH (M284)
Sensor-Tyre-Rear-LH (T293)
C1537-11
YW,MAPAY
SJ887
C1537-10
YU,MAPAY
SJ873
C2447-7
W,MAQAG
C2201-1
C2447-8
Y,MAQAG
C2201-2
Initiator-Rear-RH (M283)
Sensor-Tyre-Rear-RH (T294)
Sensor-Spare tyre (T316)
C1537-12
B,1.0D
WIRE TO BE LESS THAN 150mm
C2569-1
TYPE 1
C2876-1
B,0.5D
Switch pack-Centre facia (S425)
Switch-TPM-input (S397)
C1537-7
UR,0.5D
C1166L-10 C1168-10
UR,0.5D
C2387-13
C2387-15
B,0.5D
C1537-5
G,0.5D
C1166L-9 C1168-9
G,0.5D
C2387-7
SJ662
Tell Tale (Y249)
C1166L-8 C1168-8
GN,0.5D
C2387-12
B,2.5D
C2630-1
TYPE 2
(COAX)
WIRE TO BE LESS THAN 150mm
B,0.5D
C2921-1
TYPE 1
Instrument cluster (J100)
TPMS indicator (J203)
0.03 Amps
YELLOW
TPMS indicator (J203)
0.03 Amps
RED (LOW LINE ONLY)
Display Unit (D228)
WARNING
(HI-LINE ONLY)
Sounder (J213)
C0230-17
YW,MAPD
SJ730
C0230-18
YU,MAPD
SJ731

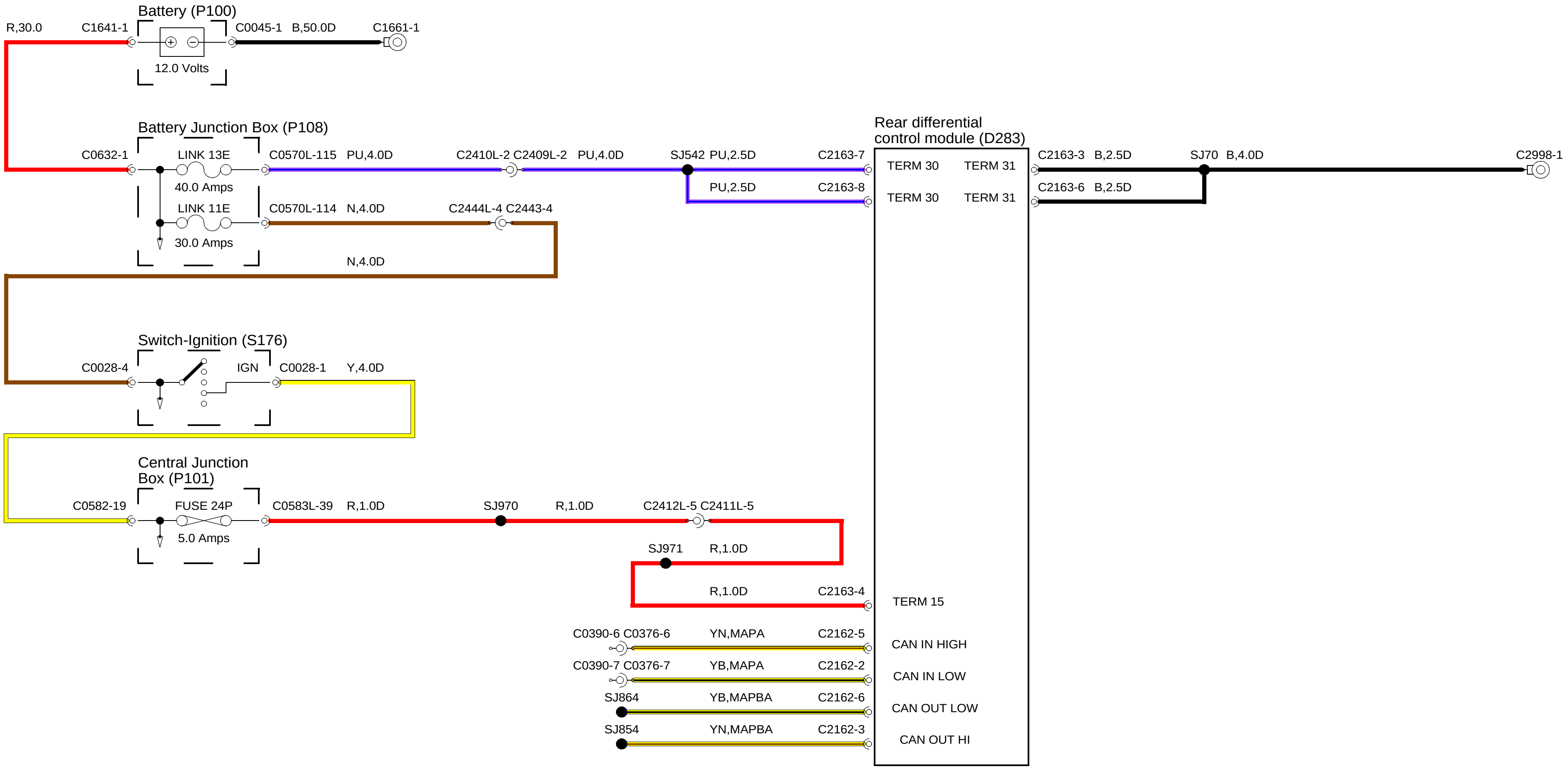

C0561-1
TYPE 1
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Air supply unit (D252)
Motor-Compressor-Air Suspension (M306)
B,6.0D
C0780-2
Battery Junction Box (P108)
C0570L-53
NR,6.0D
SJ572
NR,6.0D
C2528-1 C2527-1
NR,6.0D
C0780-1
C0570L-98
NR,2.5D
Air suspension Control Module (D199)
Relay-Air-suspension (R225)
FUSE 3E
5.0 Amps
C0570L-120
NR,1.0D
C2320L-1
COMP_V
EXH_V_POS
C2320L-6
BW,0.75D
C2293-9 C2294-9
BW,0.75D
C0781-1
Valve-Exhaust (N165)
LINK 10E
60.0 Amps
C2320L-5
BU,0.75D
C2293-10 C2294-10
BU,0.75D
C0781-4
EXH_V_NEG
C0570L-66
R,0.75D
C2321L-6
COMP_REL_POS
Sensor-Motor-temperature (T351)
C0570L-65
BY,0.5D
C2321L-7
COMP_REL_NEG
MOT TEMP SIG
C2030L-5
BO,0.5D
C0377-5 C0391-5
BO,0.5D
C0781-2
C0632-1
FUSE 26E
20.0 Amps
C0570L-178
PU,2.5D
C2321L-1
BATT
MOT TEMP GND
C2030L-7
BN,0.5D
C0377-4 C0391-4
BN,0.5D
C0781-5
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
COMP_TEMP_SIG
C2321L-2
BY,0.5D
C2293-11 C2294-11
BY,0.5D
C0781-3
Sensor-Compressor-temperature (T352)
COMP_TEMP_GND
C2321L-17
BG,0.5D
C2293-12 C2294-12
BG,0.5D
C0781-6
N,4.0D
C2443-4 C2444L-4
CAN_OUT_POS
C0867L-17
YN,MAPE
C0376-4 C0390-4
Reservoir control valve (D264)
Switch-Ignition (S176)
CAN_OUT_NEG
C0867L-18
YB,MAPE
C0376-5 C0390-5
C0028-4
IGN
C0028-1
Y,4.0D
PRESSURE_5V
C2320L-2
YB,0.5D
C2293-4 C2294-4
YB,0.5D
C1684-3
Sensor-Pressure (T285)
PRESSURE_SIG
C2320L-3
OS,0.5D
C2293-5 C2294-5
OS,0.5D
C1684-2
C0223-9 C0047L-9
YN,MAPC
C0867L-16
CAN_IN_POS
PRESSURE_GND
C2320L-4
YK,0.5D
C2293-6 C2294-6
YK,0.5D
C1684-1
C0223-10 C0047L-10
YB,MAPC
C0867L-19
CAN_IN_NEG
Central Junction Box (P101)
Valve-Reservior (N144)
RES_V_POS
C2321L-8
BW,1.0D
C2293-7 C2294-7
BW,1.0D
C1689-1
C0582-19
FUSE 35P
5.0 Amps
C0586L-4
LGW,0.75D
C0867L-20
IGN
RES_V_NEG
C2321L-21
B,1.0D
C2293-8 C2294-8
B,1.0D
C1689-2
Generic Electronic Module (D162)
Valve-Servotronic (N147)
C0586L-29
WK,0.5D
C0867L-13
AIR_SUS_CONT
STEER_V_POS
C2320L-8
R,0.75D
C3009-4 C3010-4
R,0.75D
C2038B-1
C0586L-26
WU,0.5D
C0867L-3
DOOR_STAT
STEER_V_NEG
C2320L-7
BR,0.75D
C3009-1 C3010-1
BR,0.75D
C2038B-2
GROUND
C2321L-24
B,2.5D
C0559-1
TYPE 1

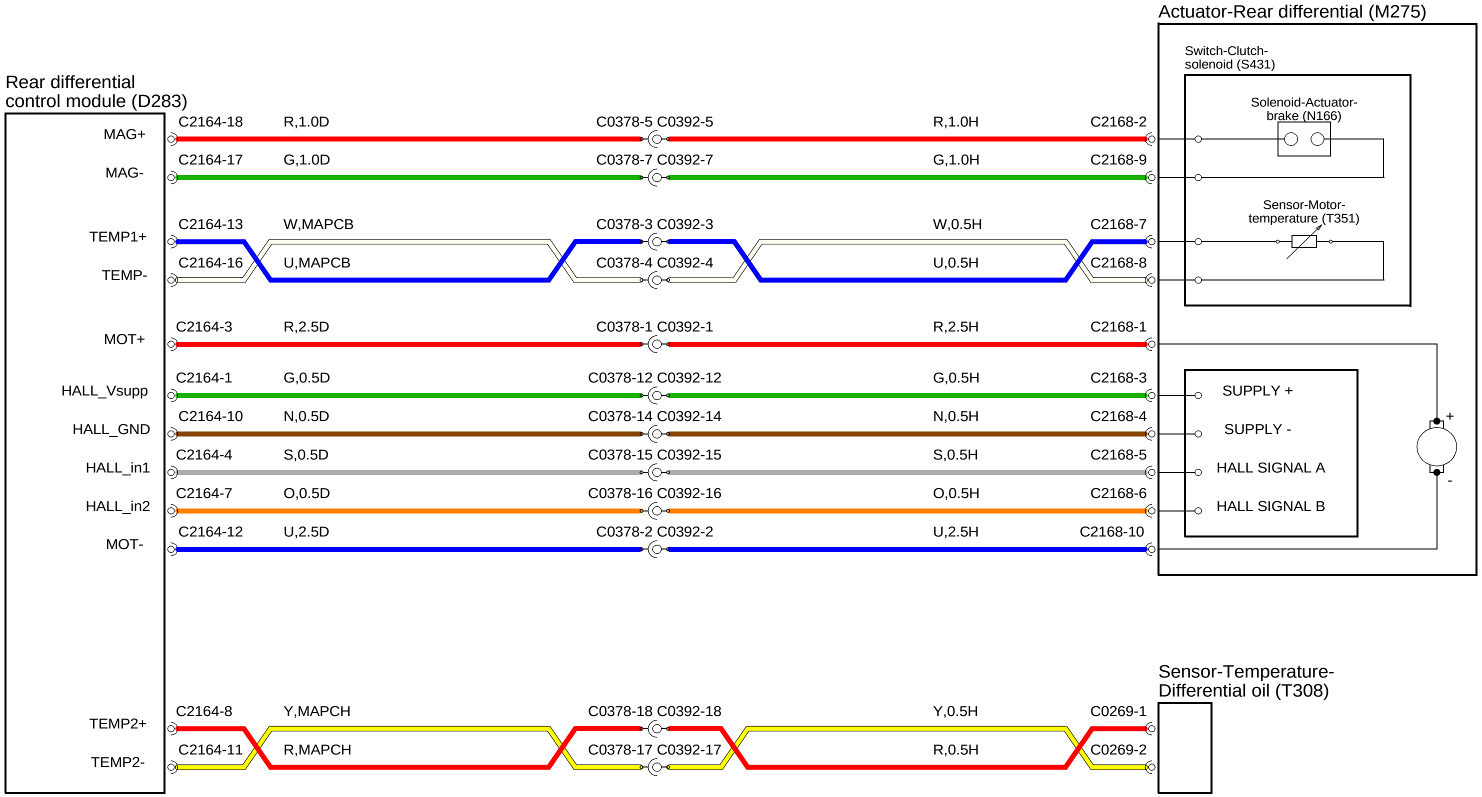

Switch pack-Centre-console (S350)
C0700-11 BY,0.5D C2054-1 C2053-1 BY,0.5D C0867L-15
C0700-12 BG,0.5D C2054-2 C2053-2 BG,0.5D C2030L-10
C0700-15 BN,0.5D C2054-3 C2053-3 BN,0.5D C2030L-17
C0700-14 BR,0.5D C2054-4 C2053-4 BR,0.5D C2030L-18
C0700-13 BO,0.5D C2054-5 C2053-5 BO,0.5D C2030L-8
C0700-16 BS,0.5D C2054-6 C2053-6 BS,0.5D C2030L-9
C0700-17 BP,0.5D C2054-7 C2053-7 BP,0.5D C0867L-14
Air suspension Control Module (D199)
HIGH_LED
STD_HT_LED
CRAWL_LED
ACCESS_HT_LED
RAISING_LED
LOWERING_LED
LED_NEG
LOWER_SW
RAISE_SW
Switch pack-Centre-console (S350)
C0700-5
Switch-Lower (S408)
C0700-4
Switch-Raise (S407)
C0700-18 B,0.5D
SJ301 B,2.5D
C0868-24 C0903-24
B,2.5D
C2598-1
TYPE 3
C0867L-4 BW,0.5D C2053-8 C2054-8 BW,0.5D
C2030L-20 BK,0.5D C2053-9 C2054-9 BK,0.5D
Front control valve (D281)
Valve-Cross-link-Front (N157)
Valve-Corner-Front-LH (N160)
Valve-Corner-Front-RH (N159)
C2099-4 BW,1.0D C2560-3 C2559-3 BW,1.0D C2321L-22
C2099-5 BU,1.0D C2560-4 C2559-4 BU,1.0D C2321L-23
C2099-1 BY,1.0D C2560-1 C2559-1 BY,1.0D C2321L-12
C2099-2 BG,1.0D C2560-2 C2559-2 BG,1.0D C2321L-11
C2099-3 BP,1.0D C2527-3 C2528-3 BP,1.0D C2321L-10
C2099-6 BO,1.0D C2527-4 C2528-4 BO,1.0D C2321L-9
F_XV_POS
F_XV_NEG
FL_CV_POS
FL_CV_NEG
FR_CV_POS
FR_CV_NEG
R_XV_POS
R_XV_NEG
RR_CV_POS
RR_CV_NEG
RL_CV_POS
RL_CV_NEG
Rear control valve (D280)
Valve-Cross-link-Rear (N158)
Valve-Corner-Rear-RH (N161)
Valve-Corner-Front-LH (N160)
C2030L-1 BW,1.0D C0377-7 C0391-7 BW,1.0D C2101-4
C2030L-11 BU,1.0D C0377-8 C0391-8 BU,1.0D C2101-5
C0867L-11 BP,1.0D C0377-9 C0391-9 BP,1.0D C2101-1
C0867L-12 BO,1.0D C0377-10 C0391-10 BO,1.0D C2101-2
C0867L-1 BY,1.0D C0377-1 C0391-1 BY,1.0D C2101-3
C0867L-2 BG,1.0D C0377-2 C0391-2 BG,1.0D C2101-6
Sensor-Height-Front-LH (T236)
C1696-1 SG,0.5D C2560-7 C2559-7 SG,0.5D C2321L-3
C1696-4 SO,0.5D C2560-8 C2559-8 SO,0.5D C2321L-4
C1696-5 SB,0.5D C2560-6 C2559-6 SB,0.5D C2321L-5
FL_HEIGHT_5V
FL_HEIGHT_SIG
FL_HEIGHT_GND
FR_HEIGHT_5V
FR_HEIGHT_SIG
FR_HEIGHT_GND
Sensor-Height-Front-RH (T238)
C2321L-14 SY,0.5D C2293-1 C2294-1 SY,0.5D C1697-5
C2321L-15 SU,0.5D C2293-2 C2294-2 SU,0.5D C1697-4
C2321L-16 SR,0.5D C2293-3 C2294-3 SR,0.5D C1697-1
Sensor-Height-Rear-LH (T235)
C1699-1 OY,0.5D C0391-12 C0377-12 OY,0.5D C0867L-5
C1699-4 OR,0.5D C0391-13 C0377-13 OR,0.5D C0867L-6
C1699-5 OB,0.5D C0391-14 C0377-14 OB,0.5D C0867L-7
RL_HEIGHT_5V
RL_HEIGHT_SIG
RL_HEIGHT_GND
RR_HEIGHT_5V
RR_HEIGHT_SIG
RR_HEIGHT_GND
Sensor-Height-Rear-RH (T237)
C0867L-8 SY,0.5D C0377-15 C0391-15 SY,0.5D C1698-5
C0867L-9 SU,0.5D C0377-16 C0391-16 SU,0.5D C1698-4
C0867L-10 SR,0.5D C0377-3 C0391-3 SR,0.5D C1698-1

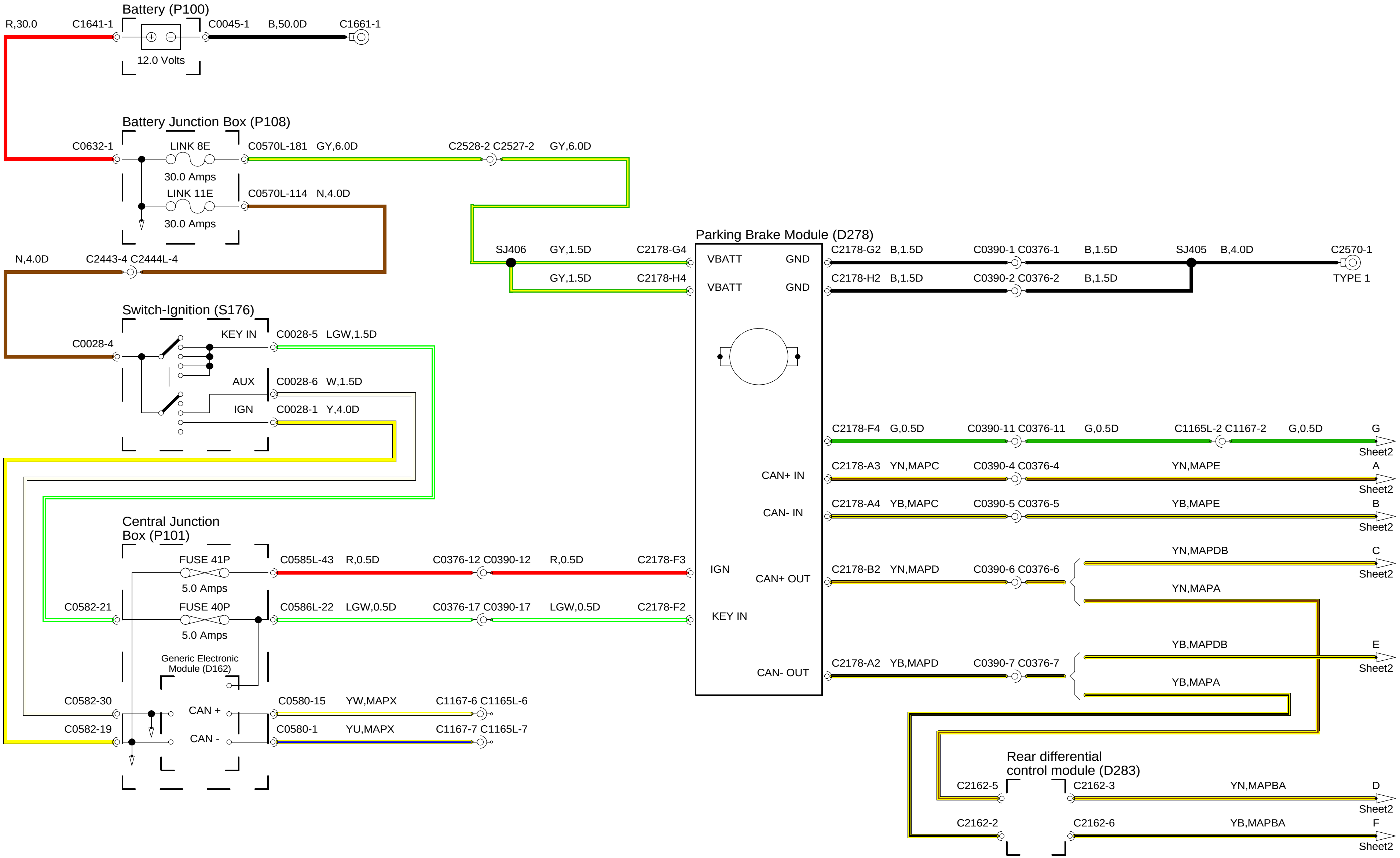

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Engine control-module (ECM) (D131)
C0872L-J3
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
C0570L-18
NG,0.75D
(DV6)
NG,0.75D
(PV8)
Engine control-module (ECM) (D131)
C0635L-16
R6 POWERMINI
FUSE 9E
15.0 Amps
C0570L-123
PO,2.5D
C2188L-1
Dynamic response module (D285)
Valve block-Active-Roll Control (D279)
VBATT
PR_TEMP_5V
PR_SIG
PR_TEMP_GND
CAN_H
CAN_L
Sensor-Pressure (T285)
C0647L-13
Y,0.5D
C2396-4 C2394-4
Y,0.5D
C1610-3
C0647L-14
YS,0.5D
C2396-5 C2394-5
YS,0.5D
C1610-2
C0647L-19
YG,0.5D
C2396-7 C2394-7
YG,0.5D
C1610-1
SJ274
YN,MAPG
C0647L-16
SJ276
YB,MAPG
C0647L-15
Valve-Direction-control (N153)
DCV1_POS
C0647L-6
GR,0.75D
C2396-8 C2394-8
GR,0.75D
C1690-2
1
DCV1_NEG
C0647L-7
OG,0.75D
C2396-9 C2394-9
OG,0.75D
C1690-1
Accelerometer-Lower (D193)
C0656-3
YB,0.5D
C2394-1 C2396-1
YB,0.5D
C0647L-26
LA_LOWER_5V
C0656-1
OS,0.5D
C2394-2 C2396-2
OS,0.5D
C0647L-22
LA_LOWER_SIG
C0656-2
YK,0.5D
C2394-3 C2396-3
YK,0.5D
C0647L-20
LA_LOWER_GND
Valve-Direction-control (N153)
DCV2_POS
C0647L-9
GR,0.75D
C2396-10 C2394-10
GR,0.75D
C0770-2
2
DCV2_NEG
C0647L-8
YB,0.75D
C2396-11 C2394-11
YB,0.75D
C0770-1
Valve-Pressure-control (N169)
PCV_POS
C0647L-2
P,0.75D
C2396-12 C2394-12
P,0.75D
C0771-2
PCV_NEG
C0647L-1
BG,0.75D
C2396-6 C2394-6
BG,0.75D
C0771-1
Accelerometer-Upper (D192)
C0657-3
YB,0.5D
C2242L-12 C2244L-12
YB,0.5D
C0647L-25
LA_UPPER_5V
C0657-1
OS,0.5D
C2242L-13 C2244L-13
OS,0.5D
C0647L-28
LA_UPPER_SIG
ECU_GND
C2188L-2
B,2.5D
C2602L-1
C0657-2
YK,0.5D
C2242L-14 C2244L-14
YK,0.5D
C0647L-23
LA_UPPER_GND

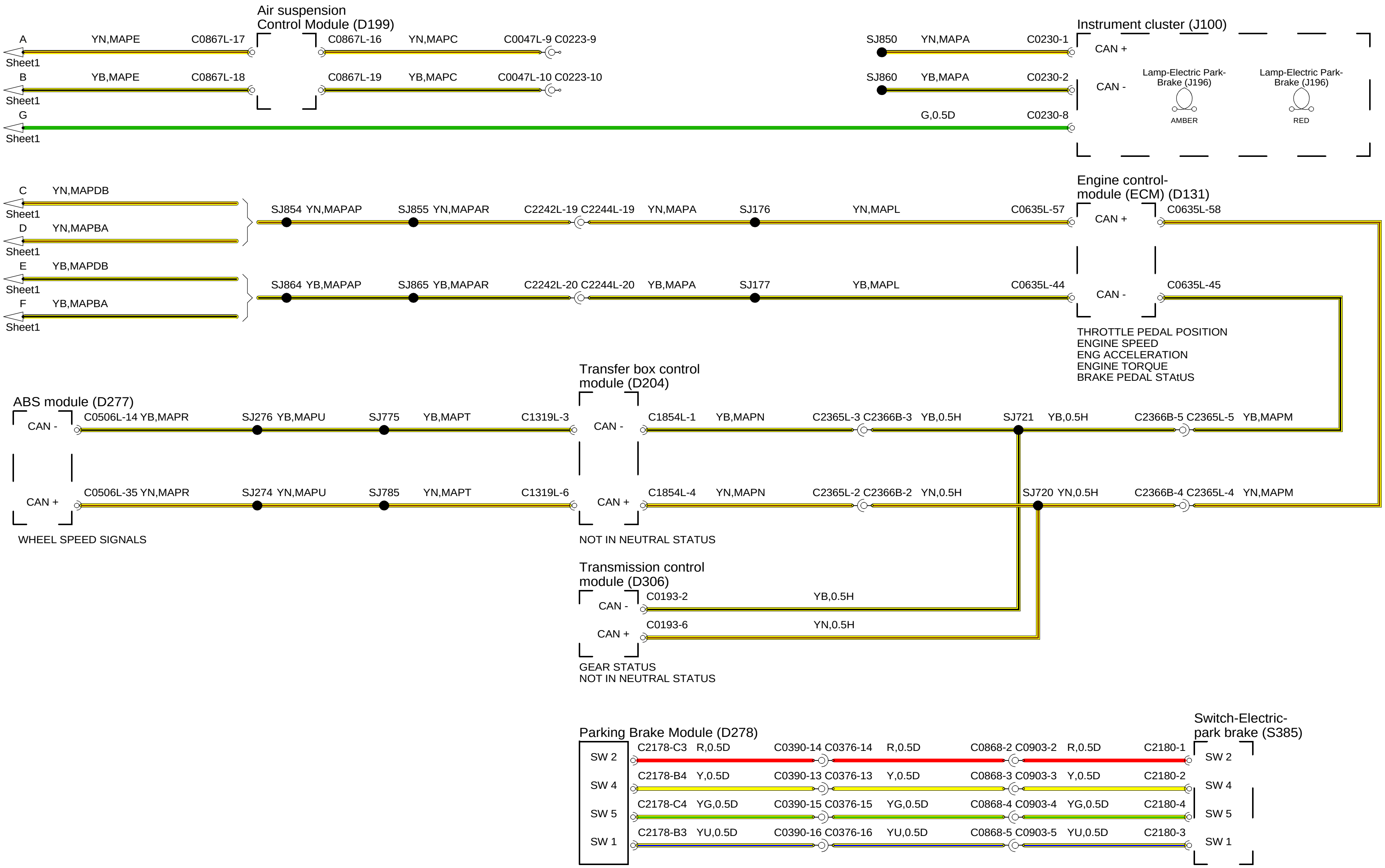

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D
SJ970
SJ971
R,1.0D
C2411L-5 C2412L-5
R,1.0D
R,1.0D
C0868-8 C0903-8
R,0.75D
C0700-20
Instrument cluster (J100)
C0230-2
YB,MAPA
SJ860
C0230-1
YN,MAPA
SJ850
Air suspension Control Module (D199)
C0223-10 C0047L-10
YB,MAPC
C0867L-19
C0223-9 C0047L-9
YN,MAPC
C0867L-16
Parking Brake Module (D278)
C2178-A3
YN,MAPC
C0390-4 C0376-4
YN,MAPE
C0867L-17
C2178-A4
YB,MAPC
C0390-5 C0376-5
YB,MAPE
C0867L-18
Rear differential control module (D283)
(REAR DIFF)
YB,MAPA
C2162-2
C2178-A2
YB,MAPD
C0390-7 C0376-7
(NO REAR DIFF)
YB,MAPDB
SJ864
YB,MAPBA
C2162-6
(REAR DIFF)
YN,MAPA
C2162-5
C2178-B2
YN,MAPD
C0390-6 C0376-6
(NO REAR DIFF)
YN,MAPDB
YN,MAPBA
C2162-3
Switch pack-Centre-console (S350)
C0700-1
YB,MAPA
C0903-22 C0868-22
YB,MAPB
YB,MAPAP
SJ865
YB,MAPAR
B
Sheet2
SJ854
Switch-Terrain-optimisation (S380)
C0700-2
YN,MAPA
C0903-21 C0868-21
YN,MAPB
YN,MAPAP
SJ855
YN,MAPAR
A
Sheet2
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3


Engine control-module (ECM) (D131)
YN,MAPM
C0635L-58
C0635L-57
YN,MAPL
SJ176
YN,MAPA
C2244L-19
C2242L-19
YN,MAPAR
A
Sheet1
YB,MAPM
C0635L-45
C0635L-44
YB,MAPL
SJ177
YB,MAPA
C2244L-20
C2242L-20
YB,MAPAR
B
Sheet1
Engine control-module (ECM) (D131)
YN,MAPAX
C0872L-A4
C0411-B4
SR,0.75
C2273-16
C2274L-16
YN,MAPAD
YB,MAPAX
C0872L-A3
C0411-B3
UR,0.75
C2273-15
C2274L-15
YB,MAPAD
(DV6)
(PV8)
C2365L-5
C2366B-5
YB,0.5H
(PV8-N/A)
SJ721
YB,0.5H
C2366B-3
C2366C-5
YB,0.5H
(DV6)
SJ2721
YB,0.5H
C2366C-3
C2365L-3
YB,MAPN
C1854L-1
C1319L-6
C2366D-5
YB,0.5H
(PV8-S/C)
SJ3721
YB,0.5H
C2366D-3
Transfer box control module (D204)
(DV6)
(PV8)
C2365L-4
C2366B-4
YN,0.5H
(PV8-N/A)
SJ720
YN,0.5H
C2366B-2
C2366C-4
YN,0.5H
(DV6)
SJ2720
YN,0.5H
C2366C-2
C2365L-2
YN,MAPN
C1854L-4
C1319L-3
C2366D-4
YN,0.5H
(PV8-S/C)
SJ3720
YN,0.5H
C2366D-2
Transmission control module (D306)
C0193-6
YN,0.5H
YN,0.5H
YN,0.5H
C0193-2
YB,0.5H
YB,0.5H
YB,0.5H
YB,MAPU
SJ775
YB,MAPT
YN,MAPU
SJ785
YN,MAPT
ABS module (D277)
C0506L-35
YN,MAPR
SJ274
YN,MAPG
C0647L-16
Dynamic response module (D285)
C0506L-14
YB,MAPR
SJ276
YB,MAPG
C0647L-15

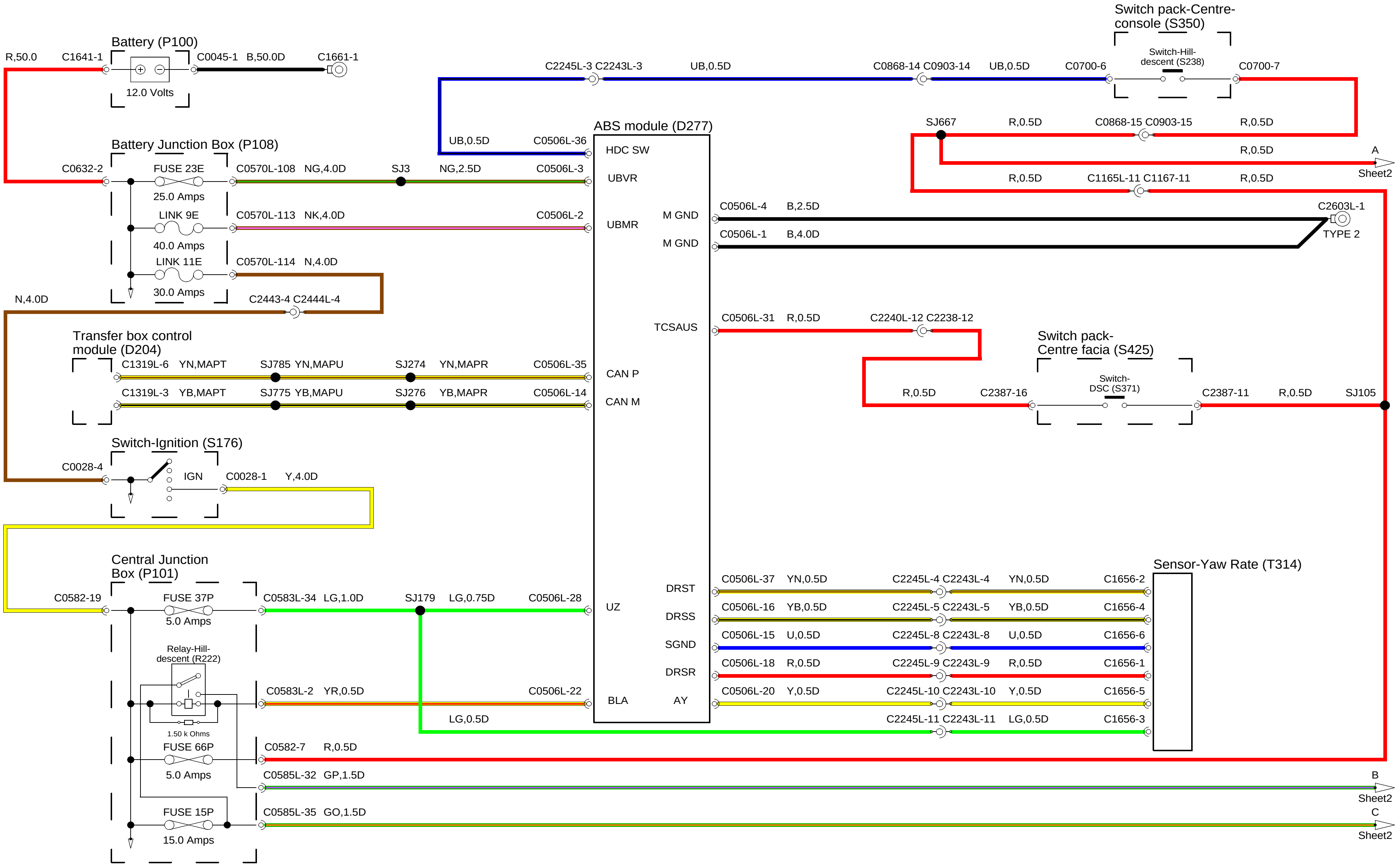

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 13E
40.0 Amps
LINK 11E
30.0 Amps
C0570L-115
PU,4.0D
C2410L-2 C2409L-2
PU,4.0D
SJ542
PU,2.5D
C2163-7
PU,2.5D
C2163-8
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Rear differential
control module (D283)
TERM 30
TERM 31
TERM 30
TERM 31
C2163-3
B,2.5D
SJ70
B,4.0D
C2998-1
C2163-6
B,2.5D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction
Box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D
SJ970
R,1.0D
C2412L-5 C2411L-5
SJ971
R,1.0D
R,1.0D
C2163-4
TERM 15
C0390-6 C0376-6
YN,MAPA
C2162-5
CAN IN HIGH
C0390-7 C0376-7
YB,MAPA
C2162-2
CAN IN LOW
SJ864
YB,MAPBA
C2162-6
CAN OUT LOW
SJ854
YN,MAPBA
C2162-3
CAN OUT HI


Actuator-Rear differential (M275)
Switch-Clutch-solenoid (S431)
Solenoid-Actuator-brake (N166)
Sensor-Motor-temperature (T351)
Rear differential control module (D283)
MAG+
MAG-
TEMP1+
TEMP-
MOT+
HALL_Vsupp
HALL_GND
HALL_in1
HALL_in2
MOT-
TEMP2+
TEMP2-
C2164-18
R,1.0D
C0378-5 C0392-5
R,1.0H
C2168-2
C2164-17
G,1.0D
C0378-7 C0392-7
G,1.0H
C2168-9
C2164-13
W,MAPCB
C0378-3 C0392-3
W,0.5H
C2168-7
C2164-16
U,MAPCB
C0378-4 C0392-4
U,0.5H
C2168-8
C2164-3
R,2.5D
C0378-1 C0392-1
R,2.5H
C2168-1
C2164-1
G,0.5D
C0378-12 C0392-12
G,0.5H
C2168-3
C2164-10
N,0.5D
C0378-14 C0392-14
N,0.5H
C2168-4
C2164-4
S,0.5D
C0378-15 C0392-15
S,0.5H
C2168-5
C2164-7
O,0.5D
C0378-16 C0392-16
O,0.5H
C2168-6
C2164-12
U,2.5D
C0378-2 C0392-2
U,2.5H
C2168-10
SUPPLY +
SUPPLY -
HALL SIGNAL A
HALL SIGNAL B
+
-
Sensor-Temperature-Differential oil (T308)
C2164-8
Y,MAPCH
C0378-18 C0392-18
Y,0.5H
C0269-1
C2164-11
R,MAPCH
C0378-17 C0392-17
R,0.5H
C0269-2


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 8E
30.0 Amps
C0570L-181 GY,6.0D
C2528-2 C2527-2
GY,6.0D
LINK 11E
30.0 Amps
C0570L-114 N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
KEY IN
C0028-5 LGW,1.5D
C0028-4
AUX
C0028-6 W,1.5D
IGN
C0028-1 Y,4.0D
Central Junction Box (P101)
FUSE 41P
5.0 Amps
C0585L-43 R,0.5D
C0376-12 C0390-12
R,0.5D
C2178-F3
C0582-21
FUSE 40P
5.0 Amps
C0586L-22 LGW,0.5D
C0376-17 C0390-17
LGW,0.5D
C2178-F2
Generic Electronic Module (D162)
C0582-30
CAN +
C0580-15
YW,MAPX
C1167-6 C1165L-6
C0582-19
CAN -
C0580-1
YU,MAPX
C1167-7 C1165L-7
Parking Brake Module (D278)
SJ406
GY,1.5D
C2178-G4
GY,1.5D
C2178-H4
VBATT
GND
VBATT
GND
C2178-G2 B,1.5D
C0390-1 C0376-1
B,1.5D
SJ405
B,4.0D
C2570-1
TYPE 1
C2178-H2 B,1.5D
C0390-2 C0376-2
B,1.5D
C2178-F4 G,0.5D
C0390-11 C0376-11
G,0.5D
C1165L-2 C1167-2
G,0.5D
G
Sheet2
CAN+ IN
C2178-A3 YN,MAPC
C0390-4 C0376-4
YN,MAPE
A
Sheet2
CAN- IN
C2178-A4 YB,MAPC
C0390-5 C0376-5
YB,MAPE
B
Sheet2
IGN
CAN+ OUT
C2178-B2 YN,MAPD
C0390-6 C0376-6
YN,MAPDB
C
Sheet2
YN,MAPA
KEY IN
CAN- OUT
C2178-A2 YB,MAPD
C0390-7 C0376-7
YB,MAPDB
E
Sheet2
YB,MAPA
Rear differential control module (D283)
C2162-5
C2162-3
YN,MAPBA
D
Sheet2
C2162-2
C2162-6
YB,MAPBA
F
Sheet2


Air suspension Control Module (D199)
A
YN,MAPE
C0867L-17
Sheet1
C0867L-16
YN,MAPC
C0047L-9 C0223-9
B
YB,MAPE
C0867L-18
Sheet1
C0867L-19
YB,MAPC
C0047L-10 C0223-10
G
Sheet1
SJ850
YN,MAPA
C0230-1
SJ860
YB,MAPA
C0230-2
G,0.5D
C0230-8
Instrument cluster (J100)
CAN +
CAN -
Lamp-Electric Park-Brake (J196)
AMBER
Lamp-Electric Park-Brake (J196)
RED
C
YN,MAPDB
Sheet1
D
YN,MAPBA
Sheet1
E
YB,MAPDB
Sheet1
F
YB,MAPBA
Sheet1
SJ854 YN,MAPAP
SJ855 YN,MAPAR
C2242L-19 C2244L-19
YN,MAPA
SJ176
YN,MAPL
C0635L-57
SJ864 YB,MAPAP
SJ865 YB,MAPAR
C2242L-20 C2244L-20
YB,MAPA
SJ177
YB,MAPL
C0635L-44
Engine control-module (ECM) (D131)
CAN +
CAN -
C0635L-58
C0635L-45
THROTTLE PEDAL POSITION
ENGINE SPEED
ENG ACCELERATION
ENGINE TORQUE
BRAKE PEDAL STAtUS
Transfer box control module (D204)
ABS module (D277)
CAN -
C0506L-14 YB,MAPR
SJ276 YB,MAPU
SJ775
YB,MAPT
C1319L-3
CAN -
C1854L-1
YB,MAPN
C2365L-3 C2366B-3
YB,0.5H
SJ721
YB,0.5H
C2366B-5 C2365L-5
YB,MAPM
CAN +
C0506L-35 YN,MAPR
SJ274 YN,MAPU
SJ785
YN,MAPT
C1319L-6
CAN +
C1854L-4
YN,MAPN
C2365L-2 C2366B-2
YN,0.5H
SJ720 YN,0.5H
C2366B-4 C2365L-4
YN,MAPM
WHEEL SPEED SIGNALS
NOT IN NEUTRAL STATUS
Transmission control module (D306)
CAN -
C0193-2
YB,0.5H
CAN +
C0193-6
YN,0.5H
GEAR STATUS
NOT IN NEUTRAL STATUS
Parking Brake Module (D278)
Switch-Electric-park brake (S385)
SW 2
C2178-C3
R,0.5D
C0390-14 C0376-14
R,0.5D
C0868-2 C0903-2
R,0.5D
C2180-1
SW 2
SW 4
C2178-B4
Y,0.5D
C0390-13 C0376-13
Y,0.5D
C0868-3 C0903-3
Y,0.5D
C2180-2
SW 4
SW 5
C2178-C4
YG,0.5D
C0390-15 C0376-15
YG,0.5D
C0868-4 C0903-4
YG,0.5D
C2180-4
SW 5
SW 1
C2178-B3
YU,0.5D
C0390-16 C0376-16
YU,0.5D
C0868-5 C0903-5
YU,0.5D
C2180-3
SW 1

206-09 ANTI-LOCK CONTROL


Battery (P100)
R,50.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-2
FUSE 23E
25.0 Amps
LINK 9E
40.0 Amps
LINK 11E
30.0 Amps
C0570L-108
NG,4.0D
SJ3
NG,2.5D
C0506L-3
C0570L-113
NK,4.0D
C0506L-2
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
UB,0.5D
C0506L-36
C2245L-3 C2243L-3
UB,0.5D
C0868-14 C0903-14
UB,0.5D
C0700-6
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Switch-Hill-descent (S238)
C0700-7
ABS module (D277)
HDC SW
UBVR
UBMR
M GND
M GND
TCSAUS
CAN P
CAN M
UZ
DRST
DRSS
SGND
DRSR
BLA
AY
SJ667
R,0.5D
C0868-15 C0903-15
R,0.5D
R,0.5D
A
Sheet2
R,0.5D
C1165L-11 C1167-11
R,0.5D
C0506L-4
B,2.5D
C0506L-1
B,4.0D
C2603L-1
TYPE 2
C0506L-31
R,0.5D
C2240L-12 C2238-12
Switch pack-Centre facia (S425)
Switch-DSC (S371)
R,0.5D
C2387-16
C2387-11
R,0.5D
SJ105
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C1319L-6
YN,MAPT
SJ785 YN,MAPU
SJ274
YN,MAPR
C0506L-35
C1319L-3
YB,MAPT
SJ775 YB,MAPU
SJ276
YB,MAPR
C0506L-14
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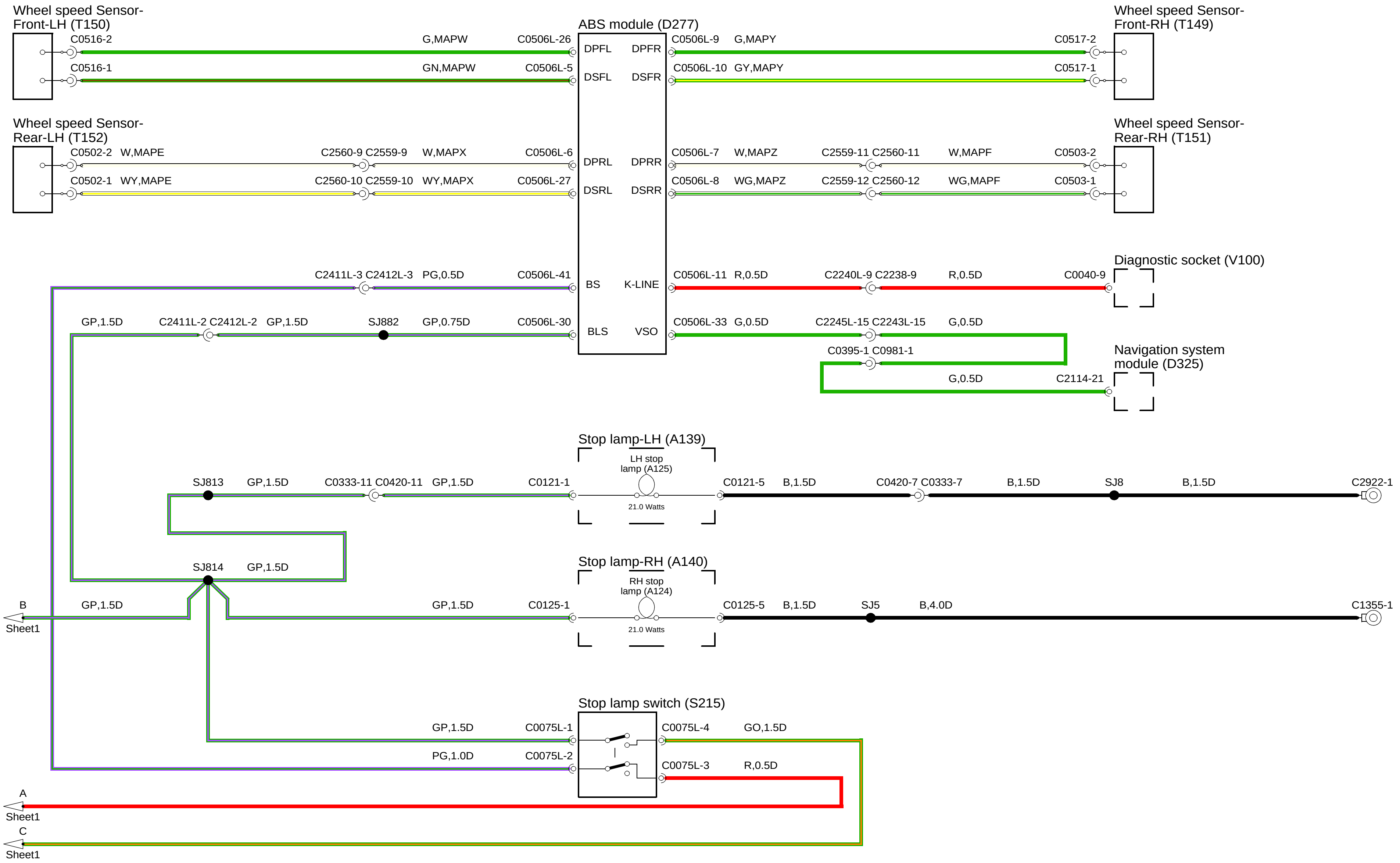
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 37P
5.0 Amps
C0583L-34
LG,1.0D
SJ179
LG,0.75D
C0506L-28
Relay-Hill-descent (R222)
1.50 k Ohms
C0583L-2
YR,0.5D
C0506L-22
LG,0.5D
FUSE 66P
5.0 Amps
C0582-7
R,0.5D
C0585L-32
GP,1.5D
B
Sheet2
FUSE 15P
15.0 Amps
C0585L-35
GO,1.5D
C
Sheet2
C0506L-37
YN,0.5D
C2245L-4 C2243L-4
YN,0.5D
C1656-2
C0506L-16
YB,0.5D
C2245L-5 C2243L-5
YB,0.5D
C1656-4
C0506L-15
U,0.5D
C2245L-8 C2243L-8
U,0.5D
C1656-6
C0506L-18
R,0.5D
C2245L-9 C2243L-9
R,0.5D
C1656-1
C0506L-20
Y,0.5D
C2245L-10 C2243L-10
Y,0.5D
C1656-5
C2245L-11 C2243L-11
LG,0.5D
C1656-3
Sensor-Yaw Rate (T314)


Wheel speed Sensor-Front-LH (T150)
C0516-2
G,MAPW
C0506L-26
C0516-1
GN,MAPW
C0506L-5
ABS module (D277)
DPFL
DPFR
DSFL
DSFR
DPRL
DPRR
DSRL
DSRR
BS
K-LINE
BLS
VSO
C0506L-9
G,MAPY
C0517-2
C0506L-10
GY,MAPY
C0517-1
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C0502-2
W,MAPE
C2560-9 C2559-9
W,MAPX
C0506L-6
C0502-1
WY,MAPE
C2560-10 C2559-10
WY,MAPX
C0506L-27
Wheel speed Sensor-Rear-RH (T151)
C0506L-7
W,MAPZ
C2559-11 C2560-11
W,MAPF
C0503-2
C0506L-8
WG,MAPZ
C2559-12 C2560-12
WG,MAPF
C0503-1
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PG,0.5D
C0506L-41
C0506L-11
R,0.5D
C2240L-9 C2238-9
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C0040-9
Diagnostic socket (V100)
GP,1.5D
C2411L-2 C2412L-2
GP,1.5D
SJ882
GP,0.75D
C0506L-30
C0506L-33
G,0.5D
C2245L-15 C2243L-15
G,0.5D
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G,0.5D
C2114-21
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LH stop lamp (A125)
21.0 Watts
SJ813
GP,1.5D
C0333-11 C0420-11
GP,1.5D
C0121-1
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
SJ814
GP,1.5D
Stop lamp-RH (A140)
RH stop lamp (A124)
21.0 Watts
B
Sheet1
GP,1.5D
GP,1.5D
C0125-1
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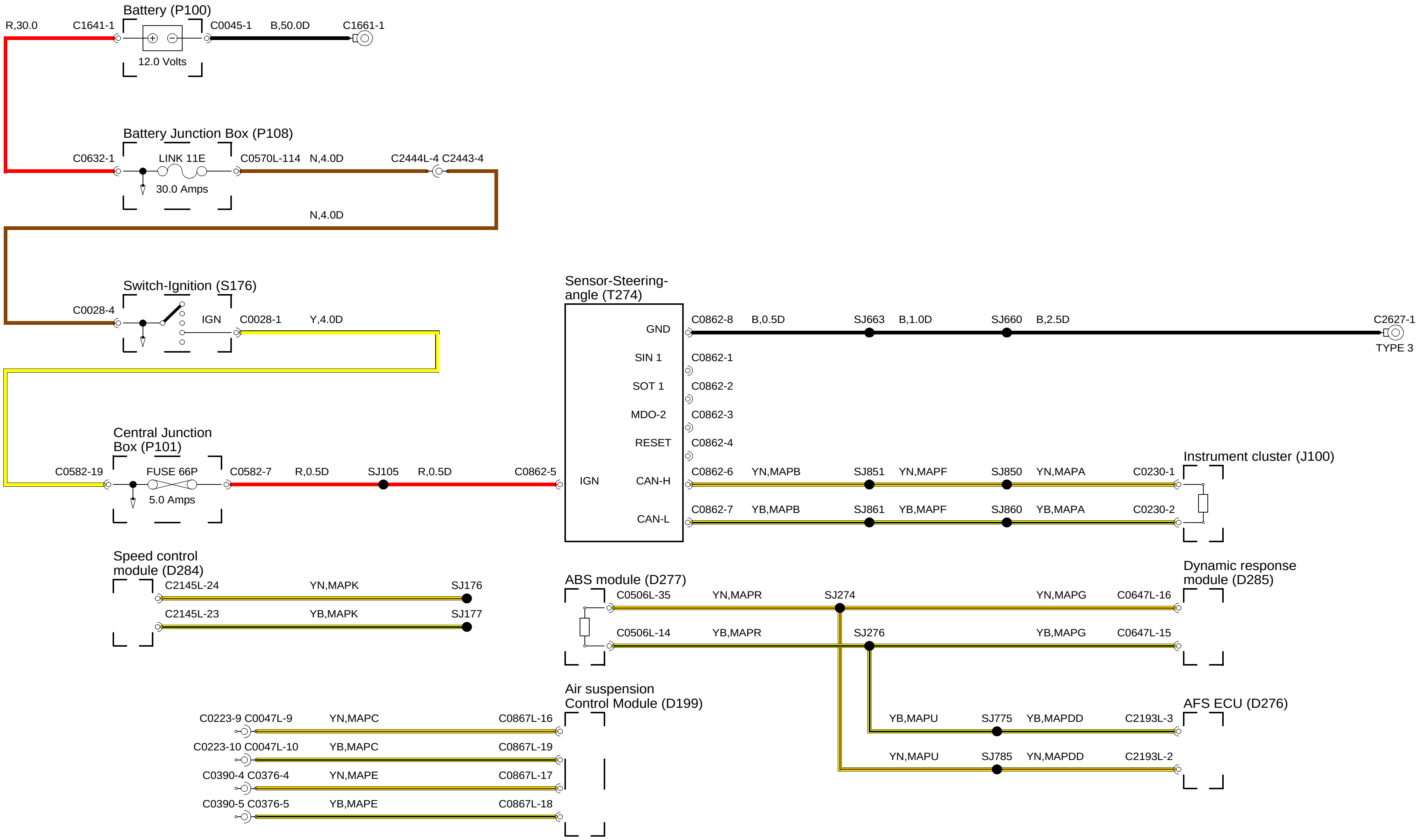
B,1.5D
SJ5
B,4.0D
C1355-1
Stop lamp switch (S215)
GP,1.5D
C0075L-1
C0075L-4
GO,1.5D
PG,1.0D
C0075L-2
C0075L-3
R,0.5D
A
Sheet1
C
Sheet1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 66P
5.0 Amps
C0582-7
R,0.5D
SJ105
R,0.5D
C0862-5
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GND
SIN 1
SOT 1
MDO-2
RESET
IGN
CAN-H
CAN-L
C0862-8
B,0.5D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
C0862-1
C0862-2
C0862-3
C0862-4
C0862-6
YN,MAPB
SJ851
YN,MAPF
SJ850
YN,MAPA
C0230-1
Instrument cluster (J100)
C0862-7
YB,MAPB
SJ861
YB,MAPF
SJ860
YB,MAPA
C0230-2
Speed control module (D284)
C2145L-24
YN,MAPK
SJ176
C2145L-23
YB,MAPK
SJ177
ABS module (D277)
C0506L-35
YN,MAPR
SJ274
YN,MAPG
C0647L-16
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YB,MAPR
SJ276
YB,MAPG
C0647L-15
Air suspension Control Module (D199)
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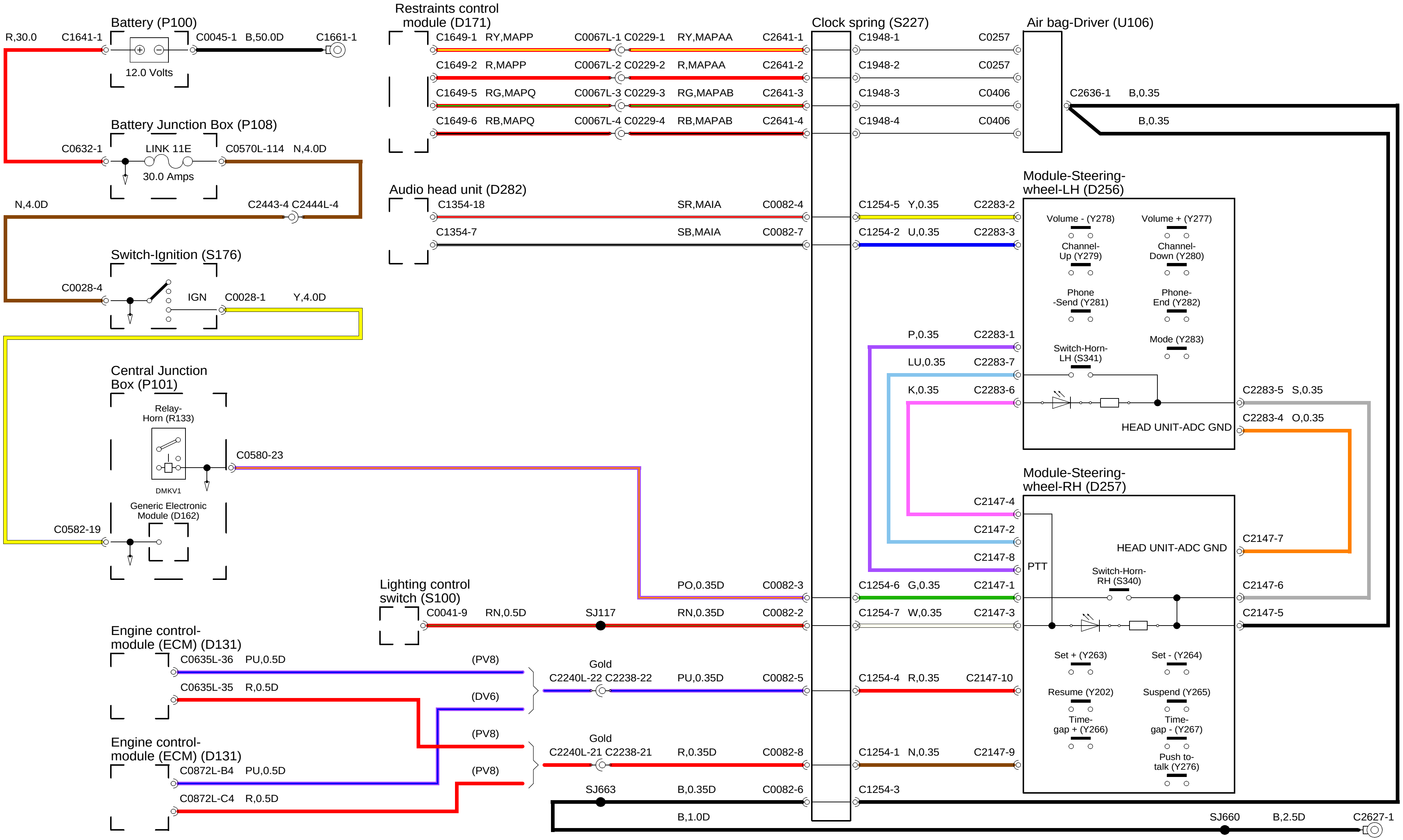
YN,MAPC
C0867L-16
C0223-10 C0047L-10
YB,MAPC
C0867L-19
C0390-4 C0376-4
YN,MAPE
C0867L-17
C0390-5 C0376-5
YB,MAPE
C0867L-18
AFS ECU (D276)
YB,MAPU
SJ775
YB,MAPDD
C2193L-3
YN,MAPU
SJ785
YN,MAPDD
C2193L-2


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
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C0635L-35
R,0.5D
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PU,0.5D
C0872L-C4
R,0.5D
Restraints control module (D171)
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RY,MAPP
C0067L-1 C0229-1
RY,MAPAA
C2641-1
C1649-2
R,MAPP
C0067L-2 C0229-2
R,MAPAA
C2641-2
C1649-5
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C0067L-3 C0229-3
RG,MAPAB
C2641-3
C1649-6
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C0067L-4 C0229-4
RB,MAPAB
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SJ117
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Gold
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(DV6)
(PV8)
Gold
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(PV8)
SJ663
B,0.35D
C0082-6
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C1948-1
C0257
C1948-2
C0257
C1948-3
C0406
C1948-4
C0406
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
P,0.35
C2283-1
LU,0.35
C2283-7
K,0.35
C2283-6
C2147-4
C2147-2
C2147-8
C1254-6
G,0.35
C2147-1
C1254-7
W,0.35
C2147-3
C1254-4
R,0.35
C2147-10
C1254-1
N,0.35
C2147-9
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C2636-1
B,0.35
B,0.35
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone -Send (Y281)
Phone-End (Y282)
Mode (Y283)
Switch-Horn-LH (S341)
HEAD UNIT-ADC GND
C2283-5
S,0.35
C2283-4
O,0.35
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HEAD UNIT-ADC GND
PTT
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Set + (Y263)
Set - (Y264)
Resume (Y202)
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SJ660
B,2.5D
C2627-1

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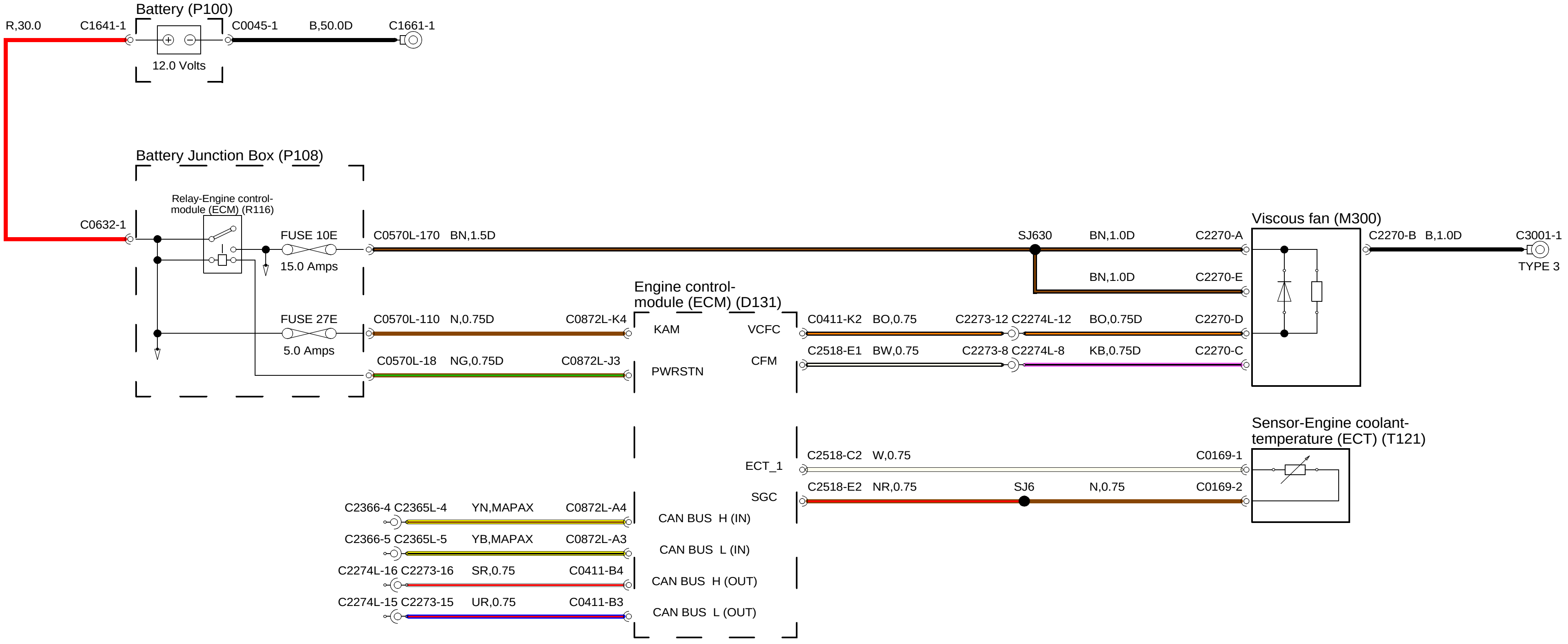
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
FUSE 10E
15.0 Amps
C0570L-170
BN,1.5D
SJ630
BN,1.0D
C2270-A
BN,1.0D
C2270-E
Viscous fan (M300)
C2270-B
B,1.0D
C3001-1
TYPE 3
FUSE 27E
5.0 Amps
C0570L-110
N,0.75D
C0872L-K4
C0570L-18
NG,0.75D
C0872L-J3
Engine control-module (ECM) (D131)
KAM
VCFC
PWRSTN
CFM
C0411-K2
BO,0.75
C2273-12 C2274L-12
BO,0.75D
C2270-D
C2518-E1
BW,0.75
C2273-8 C2274L-8
KB,0.75D
C2270-C
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C0169-1
SGC
C2518-E2
NR,0.75
SJ6
N,0.75
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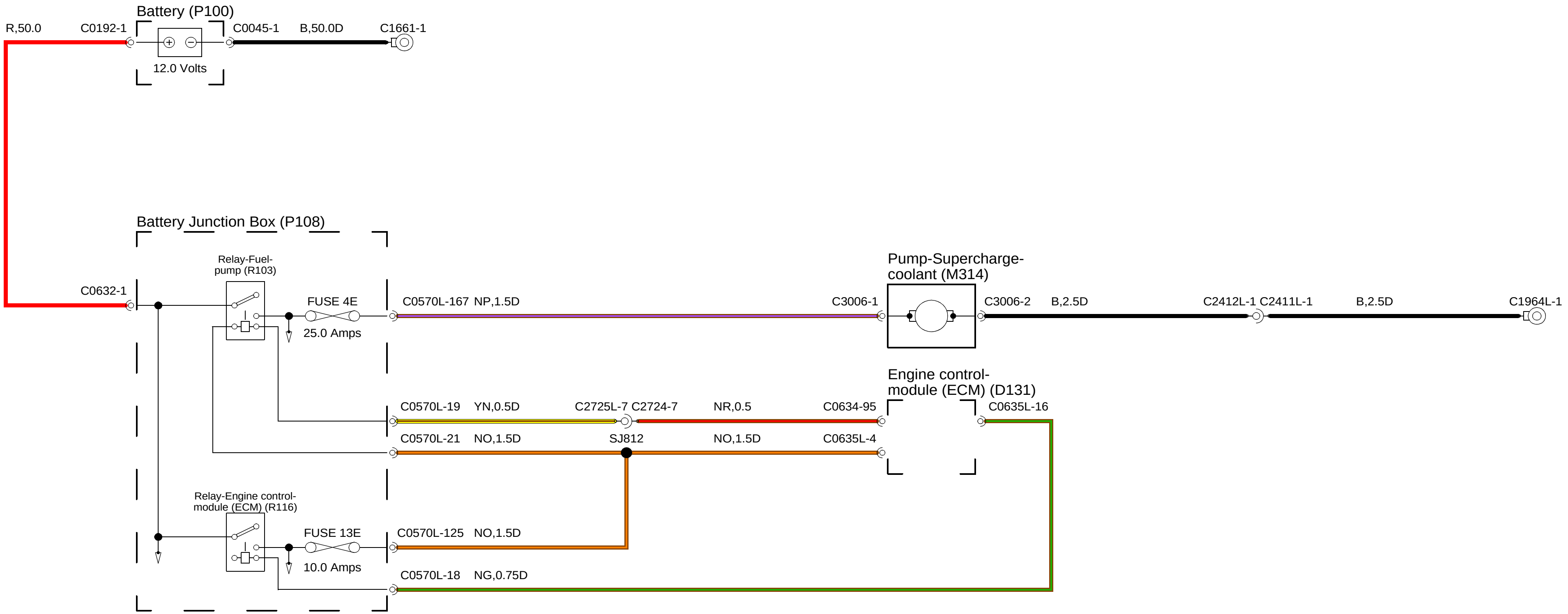
C2366-4 C2365L-4
YN,MAPAX
C0872L-A4
CAN BUS H (IN)
C2366-5 C2365L-5
YB,MAPAX
C0872L-A3
CAN BUS L (IN)
C2274L-16 C2273-16
SR,0.75
C0411-B4
CAN BUS H (OUT)
C2274L-15 C2273-15
UR,0.75
C0411-B3
CAN BUS L (OUT)


Battery (P100)
R,50.0
C0192-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Fuel-
pump (R103)
C0632-1
FUSE 4E
25.0 Amps
C0570L-167
NP,1.5D
Pump-Supercharge-
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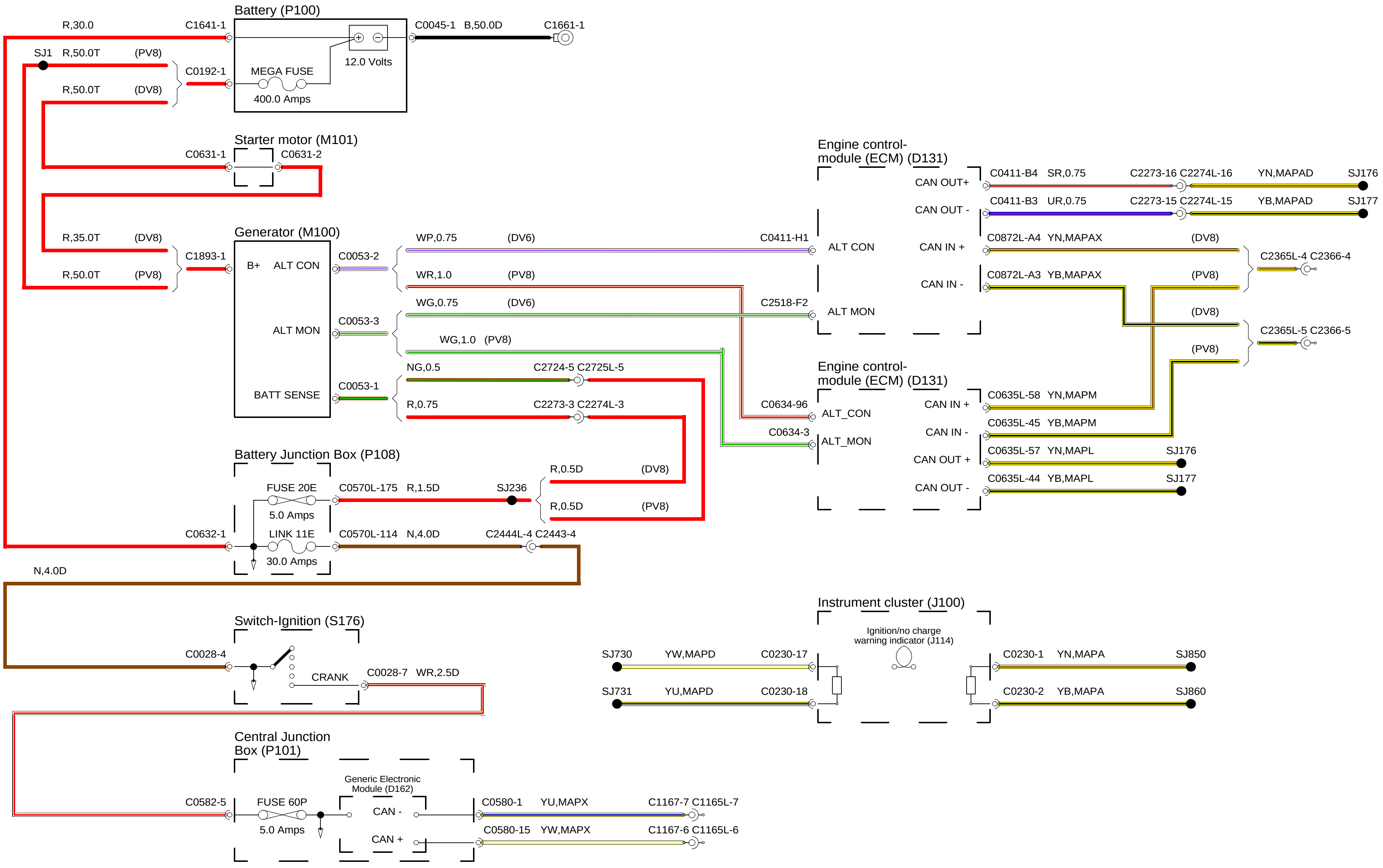
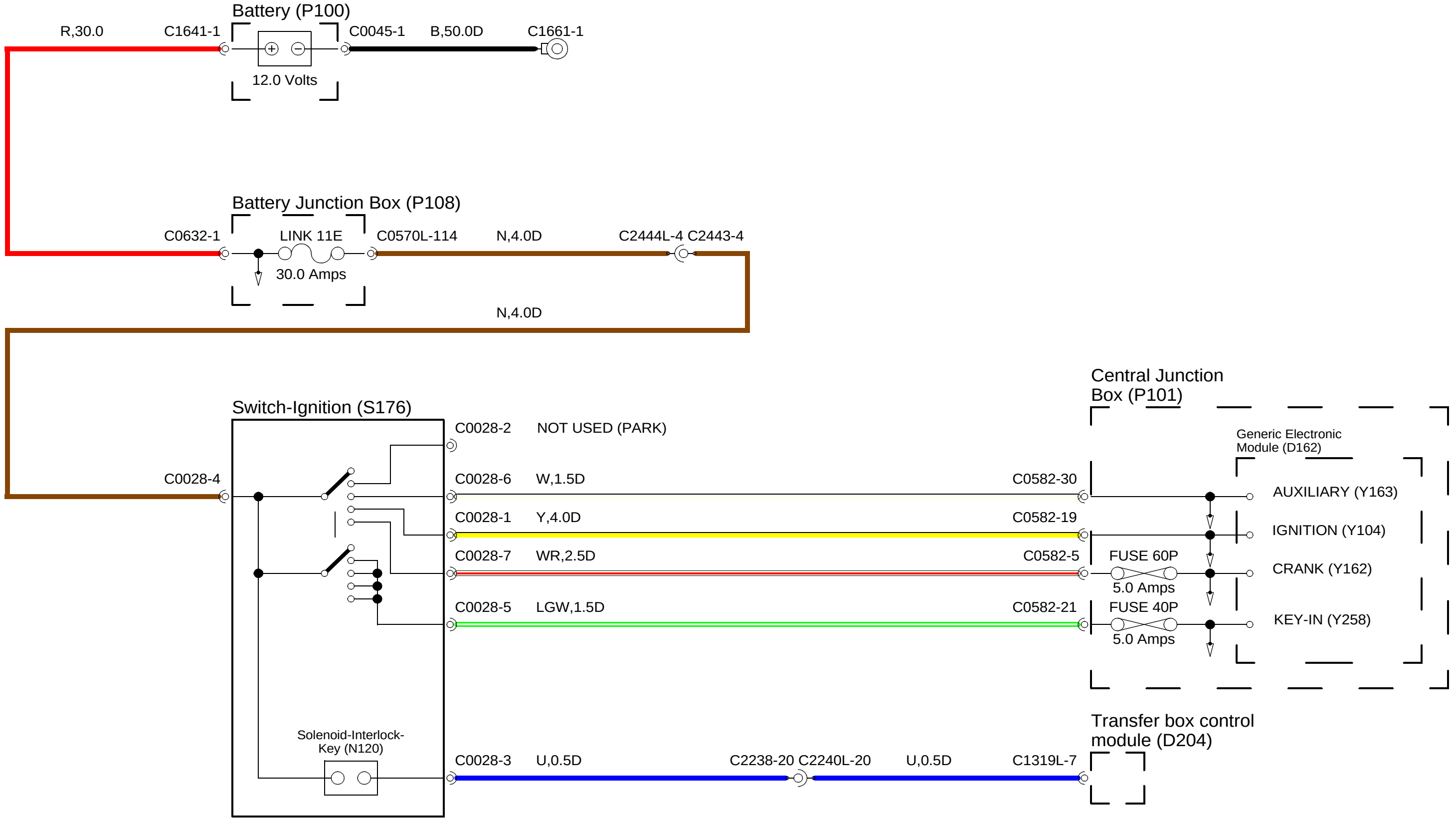
C3006-2
B,2.5D
C2412L-1
C2411L-1
B,2.5D
C1964L-1
Engine control-
module (ECM) (D131)
C0570L-19
YN,0.5D
C2725L-7
C2724-7
NR,0.5
C0634-95
C0635L-16
C0570L-21
NO,1.5D
SJ812
NO,1.5D
C0635L-4
Relay-Engine control-
module (ECM) (R116)
FUSE 13E
10.0 Amps
C0570L-125
NO,1.5D
C0570L-18
NG,0.75D


Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
SJ1 R,50.0T (PV8)
C0192-1
R,50.0T (DV8)
MEGA FUSE
400.0 Amps
12.0 Volts
Starter motor (M101)
C0631-1
C0631-2
Generator (M100)
R,35.0T (DV8)
R,50.0T (PV8)
C1893-1
B+
ALT CON
ALT MON
BATT SENSE
C0053-2
C0053-3
C0053-1
WP,0.75 (DV6)
WR,1.0 (PV8)
WG,0.75 (DV6)
WG,1.0 (PV8)
NG,0.5
C2724-5 C2725L-5
R,0.75
C2273-3 C2274L-3
C0411-H1
C2518-F2
C0634-96
C0634-3
Engine control-module (ECM) (D131)
ALT CON
ALT MON
CAN OUT+
CAN OUT -
CAN IN +
CAN IN -
C0411-B4 SR,0.75
C0411-B3 UR,0.75
C2273-16 C2274L-16
C2273-15 C2274L-15
YN,MAPAD
YB,MAPAD
SJ176
SJ177
C0872L-A4 YN,MAPAX (DV8)
C0872L-A3 YB,MAPAX (PV8)
(DV8)
(PV8)
C2365L-4 C2366-4
C2365L-5 C2366-5
Engine control-module (ECM) (D131)
ALT_CON
ALT_MON
CAN IN +
CAN IN -
CAN OUT +
CAN OUT -
C0635L-58 YN,MAPM
C0635L-45 YB,MAPM
C0635L-57 YN,MAPL
C0635L-44 YB,MAPL
SJ176
SJ177
Battery Junction Box (P108)
FUSE 20E
5.0 Amps
LINK 11E
30.0 Amps
C0570L-175 R,1.5D
SJ236
R,0.5D (DV8)
R,0.5D (PV8)
C0632-1
C0570L-114 N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7 WR,2.5D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
SJ730 YW,MAPD
C0230-17
SJ731 YU,MAPD
C0230-18
C0230-1 YN,MAPA
SJ850
C0230-2 YB,MAPA
SJ860
Central Junction Box (P101)
C0582-5
FUSE 60P
5.0 Amps
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1 YU,MAPX
C0580-15 YW,MAPX
C1167-7 C1165L-7
C1167-6 C1165L-6


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
C0028-2
NOT USED (PARK)
C0028-6
W,1.5D
C0582-30
C0028-1
Y,4.0D
C0582-19
C0028-7
WR,2.5D
C0582-5
C0028-5
LGW,1.5D
C0582-21
Central Junction Box (P101)
Generic Electronic Module (D162)
AUXILIARY (Y163)
IGNITION (Y104)
FUSE 60P
5.0 Amps
CRANK (Y162)
FUSE 40P
5.0 Amps
KEY-IN (Y258)
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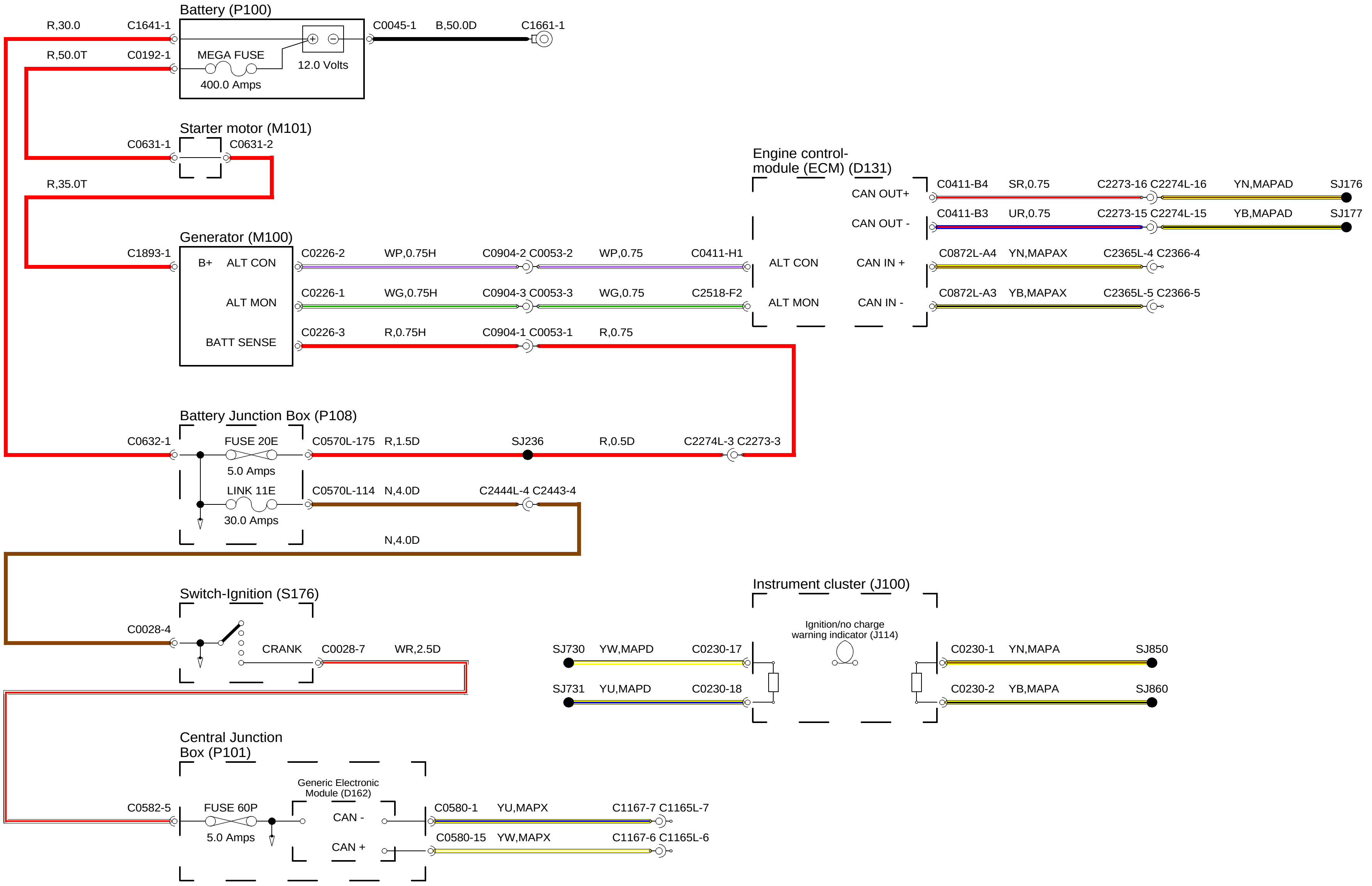
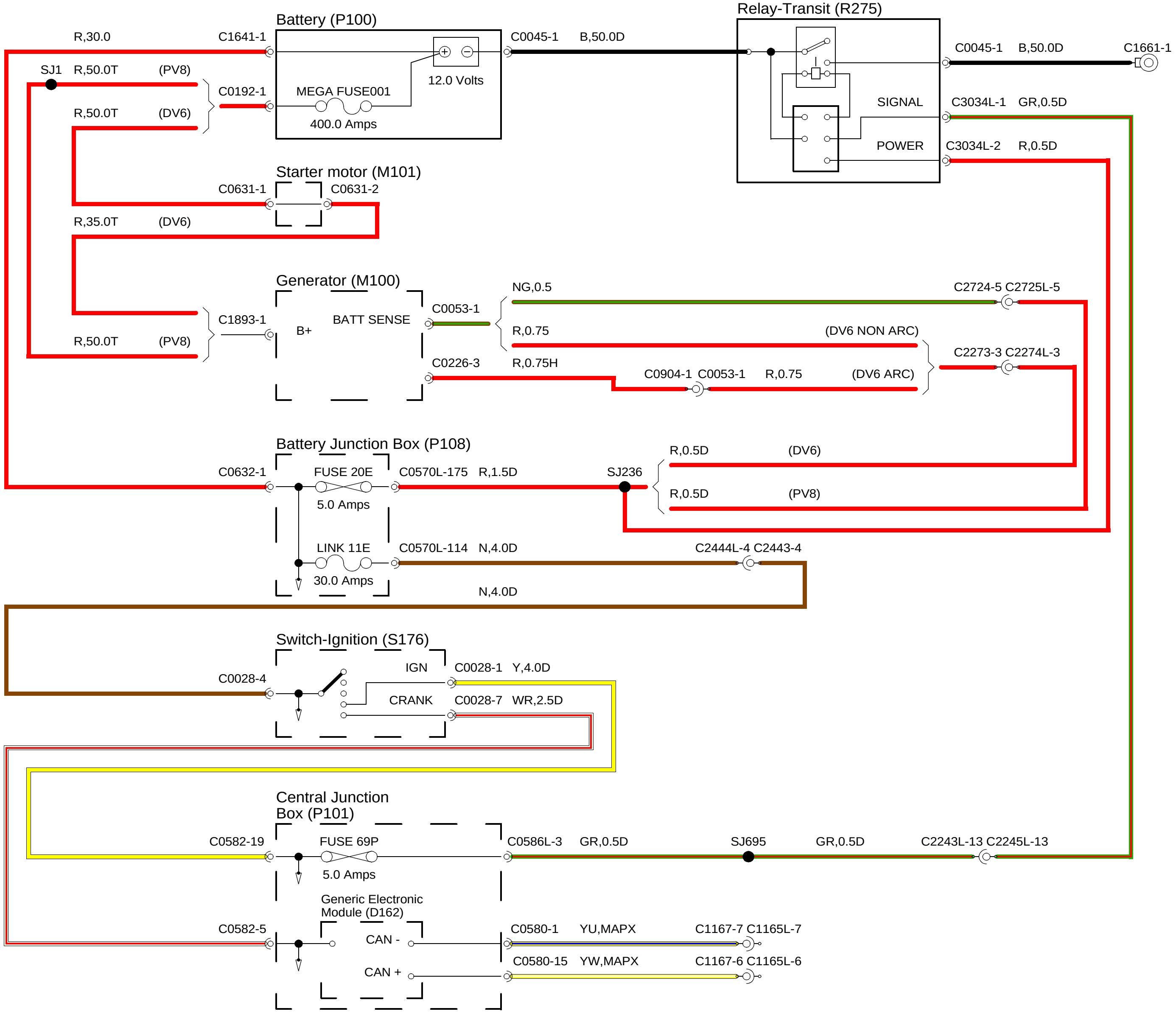
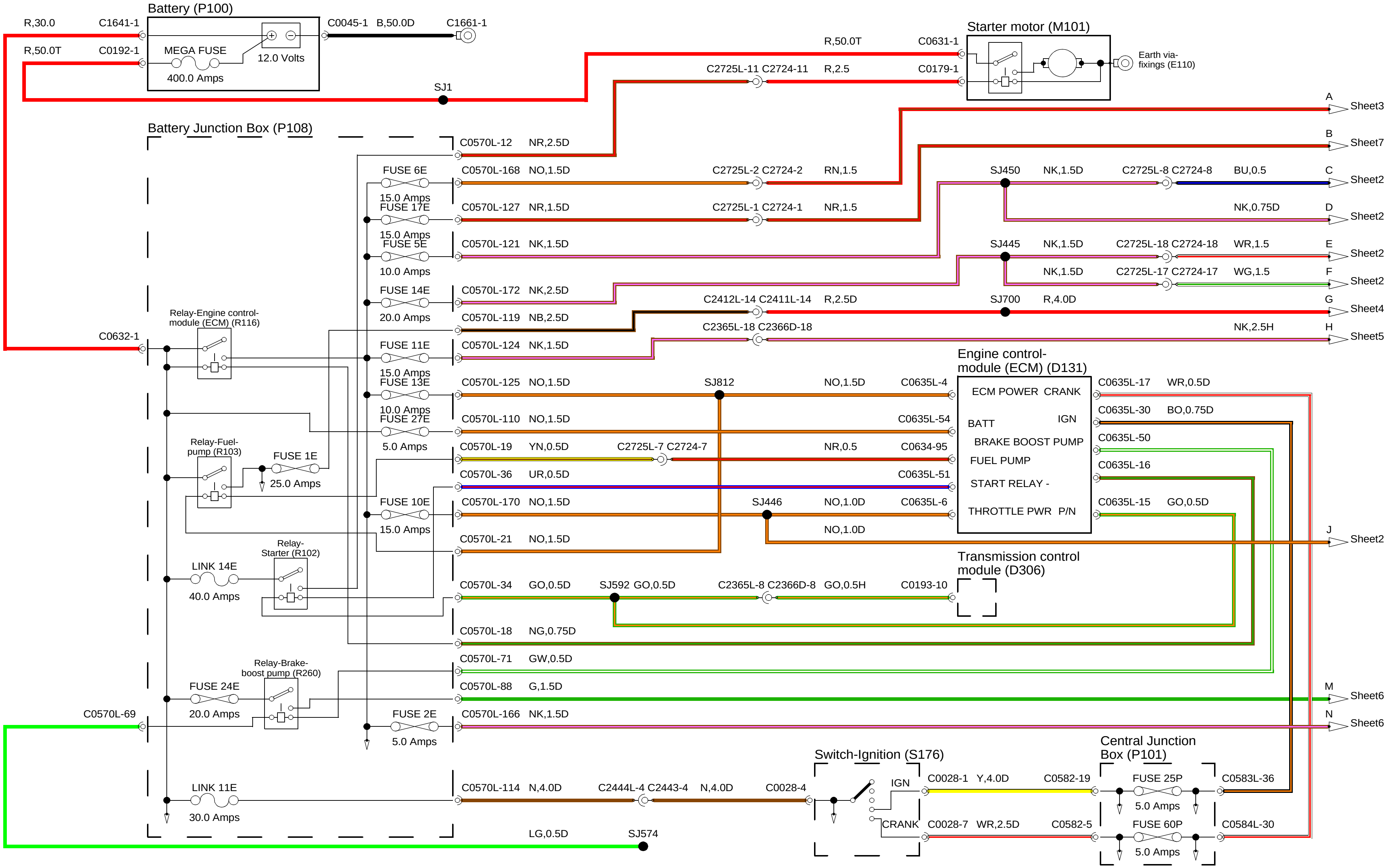
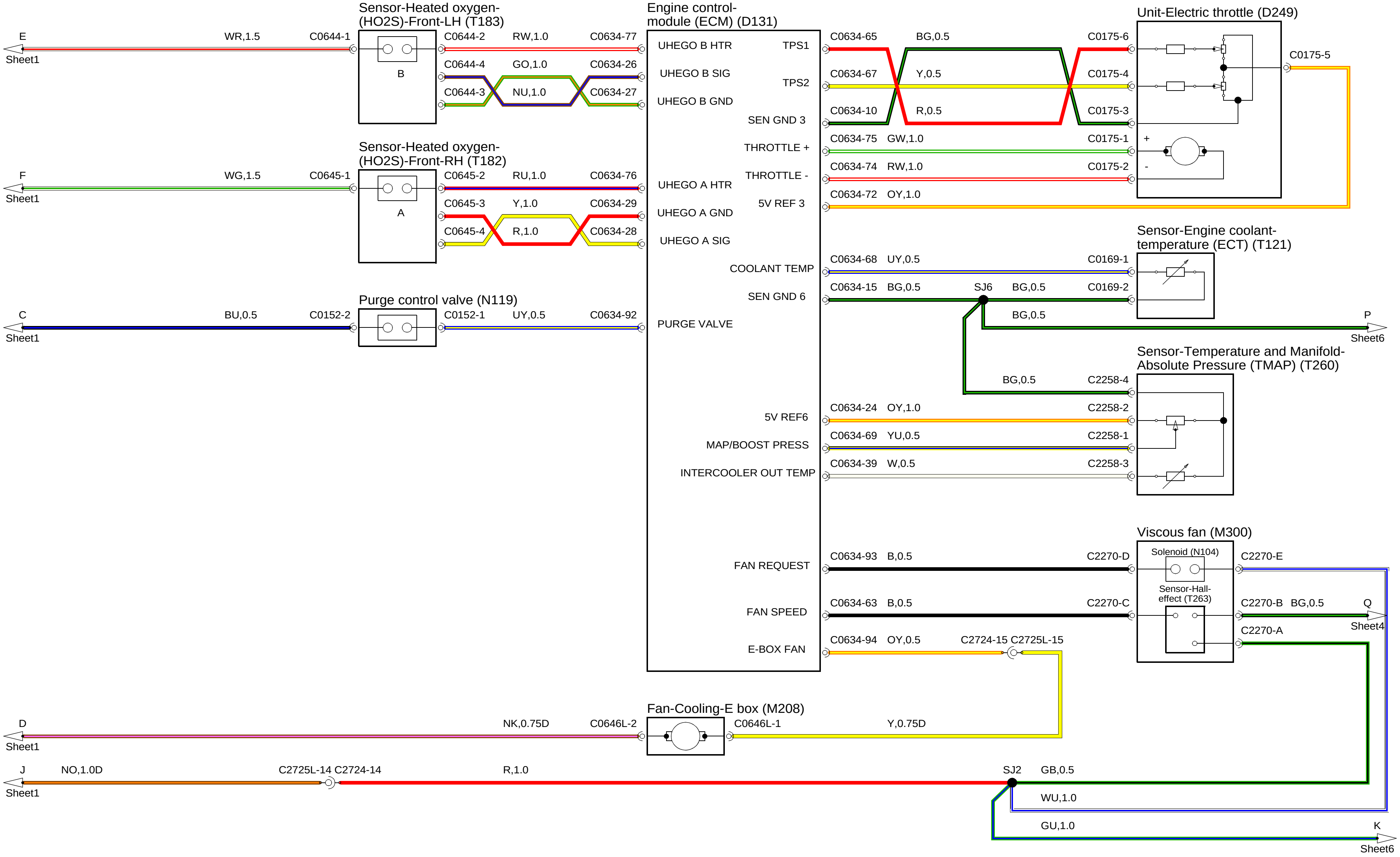
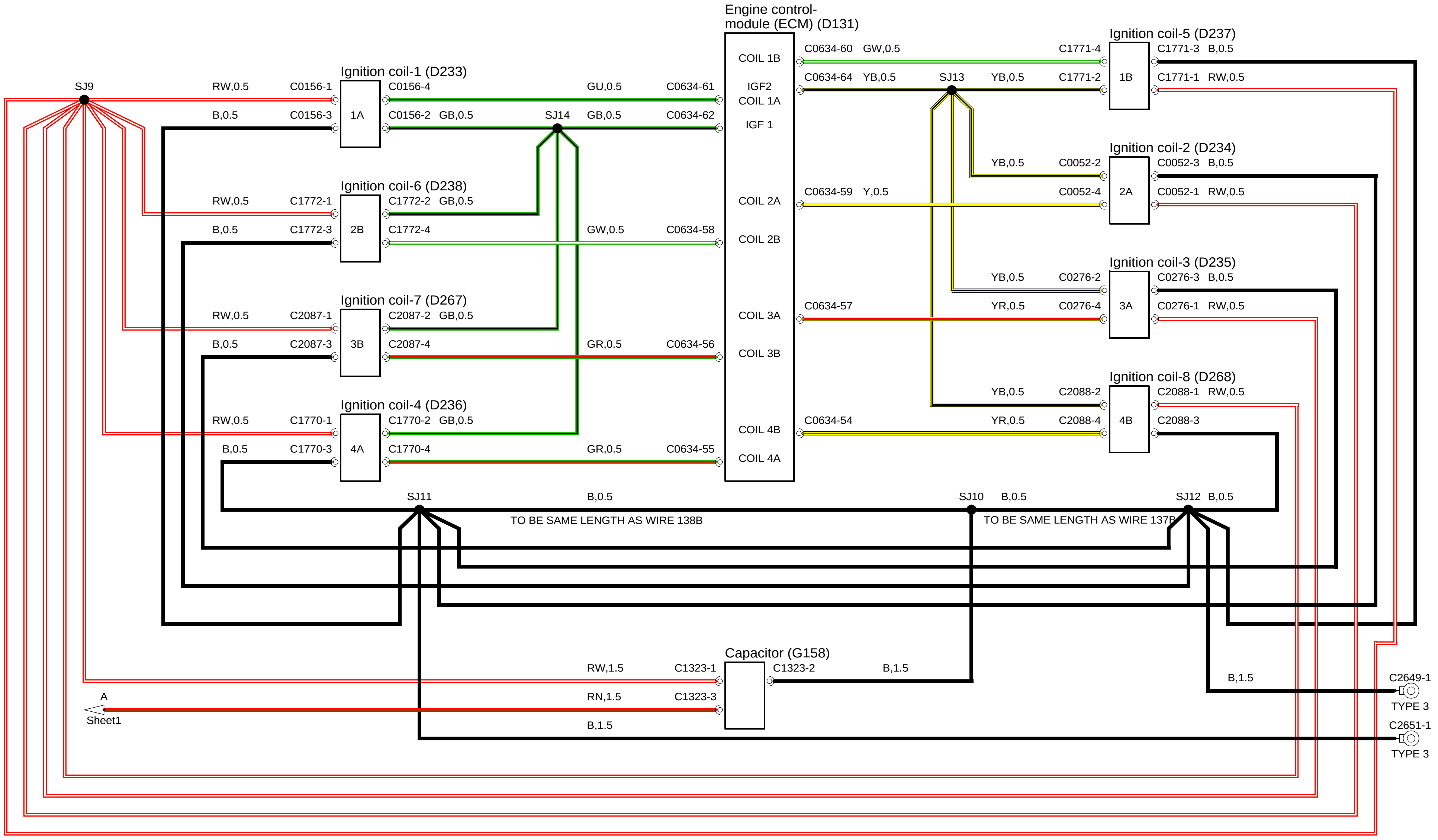
C0028-3
U,0.5D
C2238-20 C2240L-20
U,0.5D
C1319L-7

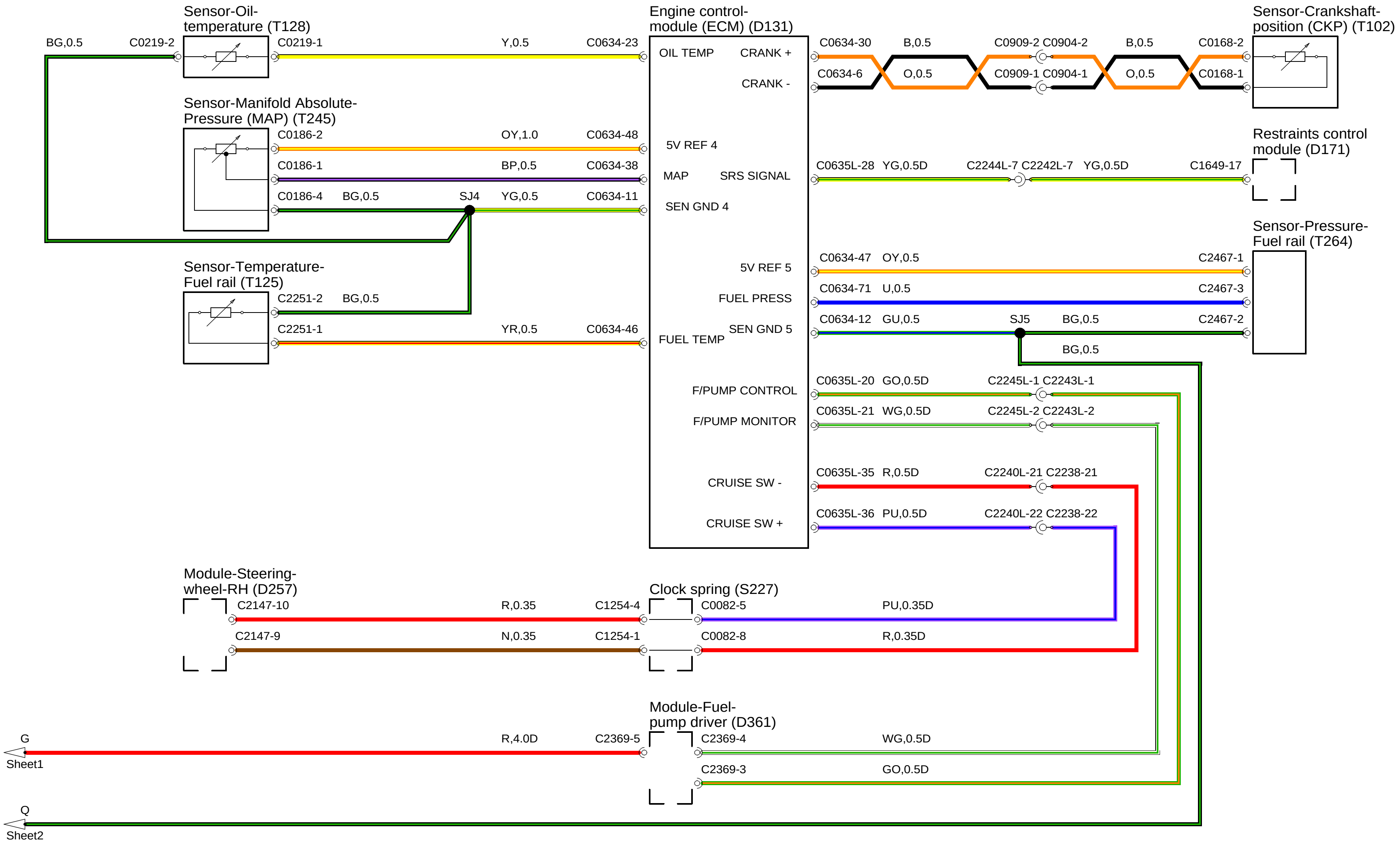

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
Starter motor (M101)
C0631-1
C0631-2
R,35.0T
Engine control-
module (ECM) (D131)
C0411-B4
SR,0.75
C2273-16 C2274L-16
YN,MAPAD
SJ176
CAN OUT+
C0411-B3
UR,0.75
C2273-15 C2274L-15
YB,MAPAD
SJ177
CAN OUT -
Generator (M100)
C1893-1
B+
ALT CON
C0226-2
WP,0.75H
C0904-2 C0053-2
WP,0.75
C0411-H1
ALT CON
CAN IN +
C0872L-A4
YN,MAPAX
C2365L-4 C2366-4
ALT MON
C0226-1
WG,0.75H
C0904-3 C0053-3
WG,0.75
C2518-F2
ALT MON
CAN IN -
C0872L-A3
YB,MAPAX
C2365L-5 C2366-5
BATT SENSE
C0226-3
R,0.75H
C0904-1 C0053-1
R,0.75
Battery Junction Box (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570L-175
R,1.5D
SJ236
R,0.5D
C2274L-3 C2273-3
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
Instrument cluster (J100)
Ignition/no charge
warning indicator (J114)
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
SJ731
YU,MAPD
C0230-18
C0230-2
YB,MAPA
SJ860
Central Junction
Box (P101)
Generic Electronic
Module (D162)
C0582-5
FUSE 60P
5.0 Amps
CAN -
CAN +
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0580-15
YW,MAPX
C1167-6 C1165L-6

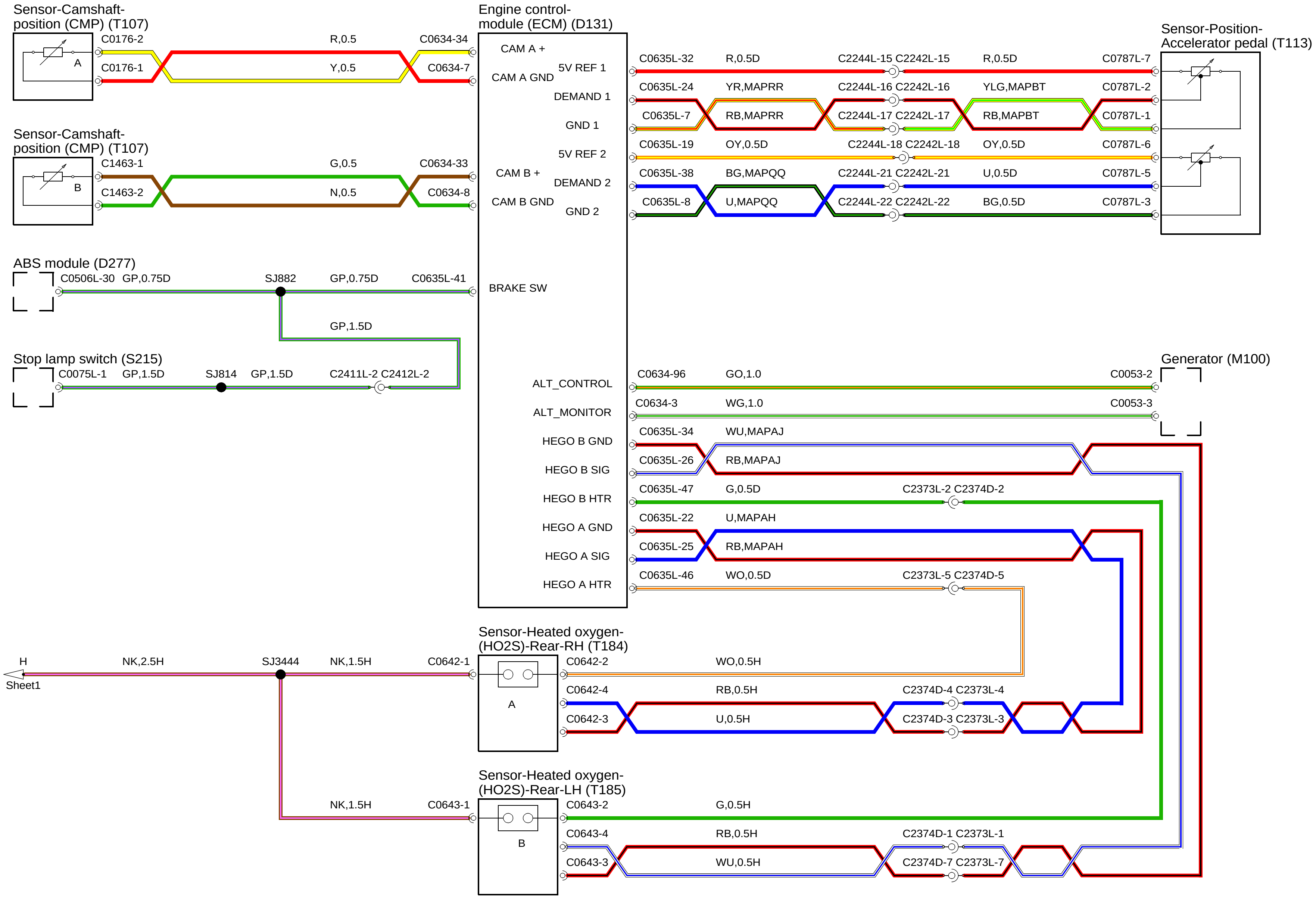

Battery (P100)
Relay-Transit (R275)
R,30.0
C1641-1
C0045-1
B,50.0D
SJ1
R,50.0T
(PV8)
C0192-1
MEGA FUSE001
400.0 Amps
12.0 Volts
R,50.0T
(DV6)
C0045-1
B,50.0D
C1661-1
SIGNAL
C3034L-1
GR,0.5D
POWER
C3034L-2
R,0.5D
Starter motor (M101)
C0631-1
C0631-2
R,35.0T
(DV6)
Generator (M100)
C0053-1
NG,0.5
C2724-5 C2725L-5
C1893-1
B+
BATT SENSE
R,0.75
(DV6 NON ARC)
R,50.0T
(PV8)
C0226-3
R,0.75H
C2273-3 C2274L-3
C0904-1 C0053-1
R,0.75
(DV6 ARC)
Battery Junction Box (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570L-175
R,1.5D
SJ236
R,0.5D
(DV6)
R,0.5D
(PV8)
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
CRANK
C0028-7
WR,2.5D
Central Junction Box (P101)
C0582-19
FUSE 69P
5.0 Amps
C0586L-3
GR,0.5D
SJ695
GR,0.5D
C2243L-13 C2245L-13
Generic Electronic Module (D162)
C0582-5
CAN -
CAN +
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0580-15
YW,MAPX
C1167-6 C1165L-6

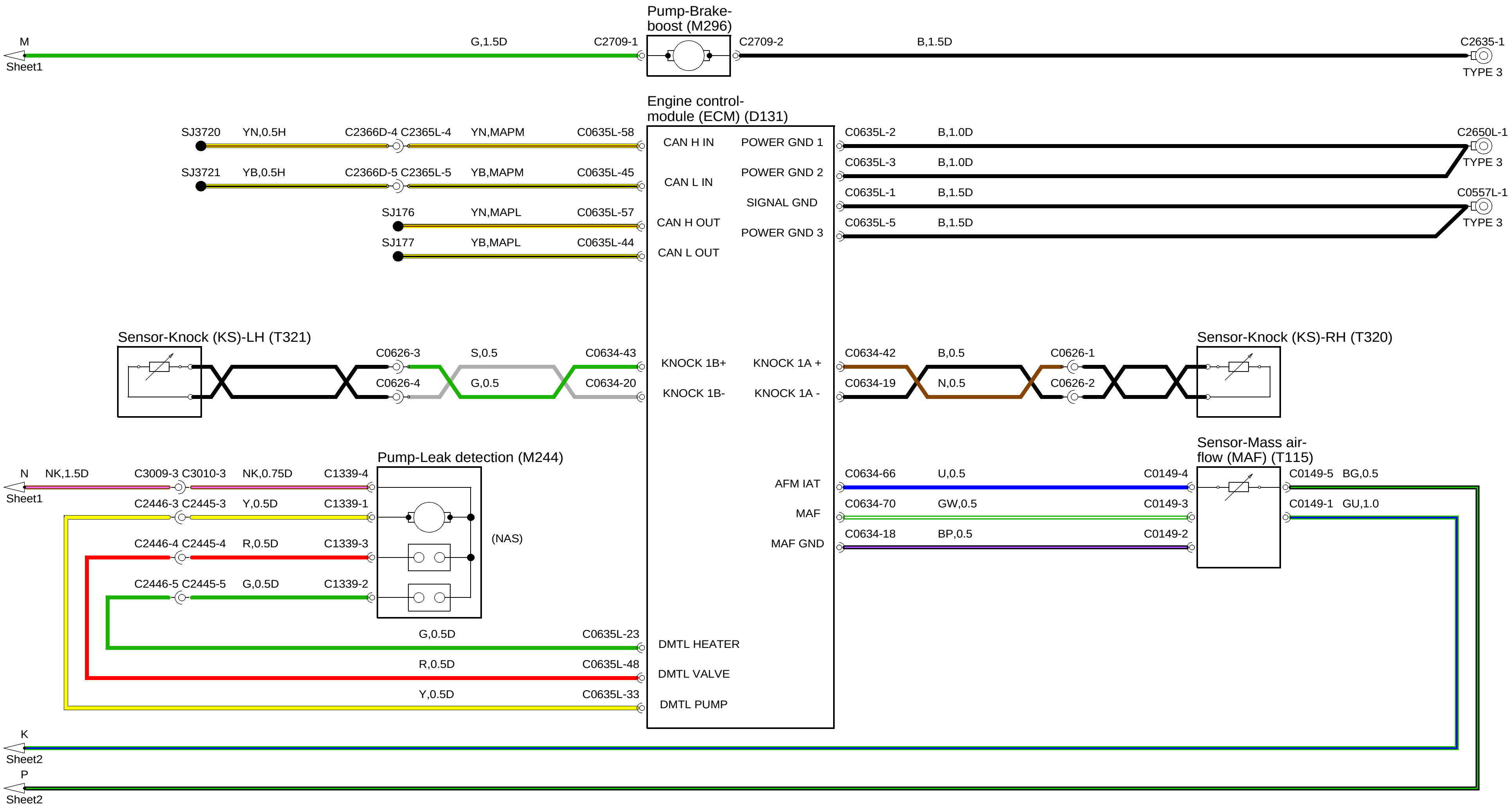

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1 B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631-1
C2725L-11 C2724-11
R,2.5
C0179-1
Earth via-
fixings (E110)
Battery Junction Box (P108)
C0570L-12 NR,2.5D
A Sheet3
B Sheet7
FUSE 6E
15.0 Amps
C0570L-168 NO,1.5D
C2725L-2 C2724-2
RN,1.5
SJ450
NK,1.5D
C2725L-8 C2724-8
BU,0.5
C Sheet2
FUSE 17E
15.0 Amps
C0570L-127 NR,1.5D
C2725L-1 C2724-1
NR,1.5
NK,0.75D
D Sheet2
FUSE 5E
10.0 Amps
C0570L-121 NK,1.5D
SJ445
NK,1.5D
C2725L-18 C2724-18
WR,1.5
E Sheet2
NK,1.5D
C2725L-17 C2724-17
WG,1.5
F Sheet2
FUSE 14E
20.0 Amps
C0570L-172 NK,2.5D
C2412L-14 C2411L-14
R,2.5D
SJ700
R,4.0D
G Sheet4
C0570L-119 NB,2.5D
C2365L-18 C2366D-18
NK,2.5H
H Sheet5
Relay-Engine control-
module (ECM) (R116)
C0632-1
FUSE 11E
15.0 Amps
C0570L-124 NK,1.5D
Engine control-
module (ECM) (D131)
FUSE 13E
10.0 Amps
C0570L-125 NO,1.5D
SJ812
NO,1.5D
C0635L-4
ECM POWER
CRANK
C0635L-17 WR,0.5D
FUSE 27E
5.0 Amps
C0570L-110 NO,1.5D
C0635L-54
BATT
IGN
C0635L-30 BO,0.75D
Relay-Fuel-
pump (R103)
FUSE 1E
25.0 Amps
C0570L-19 YN,0.5D
C2725L-7 C2724-7
NR,0.5
C0634-95
BRAKE BOOST PUMP
C0635L-50
FUEL PUMP
C0635L-16
C0570L-36 UR,0.5D
C0635L-51
START RELAY -
FUSE 10E
15.0 Amps
C0570L-170 NO,1.5D
SJ446
NO,1.0D
C0635L-6
THROTTLE PWR P/N
C0635L-15 GO,0.5D
NO,1.0D
J Sheet2
C0570L-21 NO,1.5D
Relay-
Starter (R102)
LINK 14E
40.0 Amps
Transmission control
module (D306)
C0570L-34 GO,0.5D
SJ592 GO,0.5D
C2365L-8 C2366D-8
GO,0.5H
C0193-10
C0570L-18 NG,0.75D
C0570L-71 GW,0.5D
Relay-Brake-
boost pump (R260)
FUSE 24E
20.0 Amps
C0570L-88 G,1.5D
M Sheet6
C0570L-69
FUSE 2E
5.0 Amps
C0570L-166 NK,1.5D
N Sheet6
Switch-Ignition (S176)
Central Junction
Box (P101)
IGN
C0028-1 Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583L-36
LINK 11E
30.0 Amps
C0570L-114 N,4.0D
C2444L-4 C2443-4
N,4.0D
C0028-4
CRANK
C0028-7 WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584L-30
LG,0.5D
SJ574

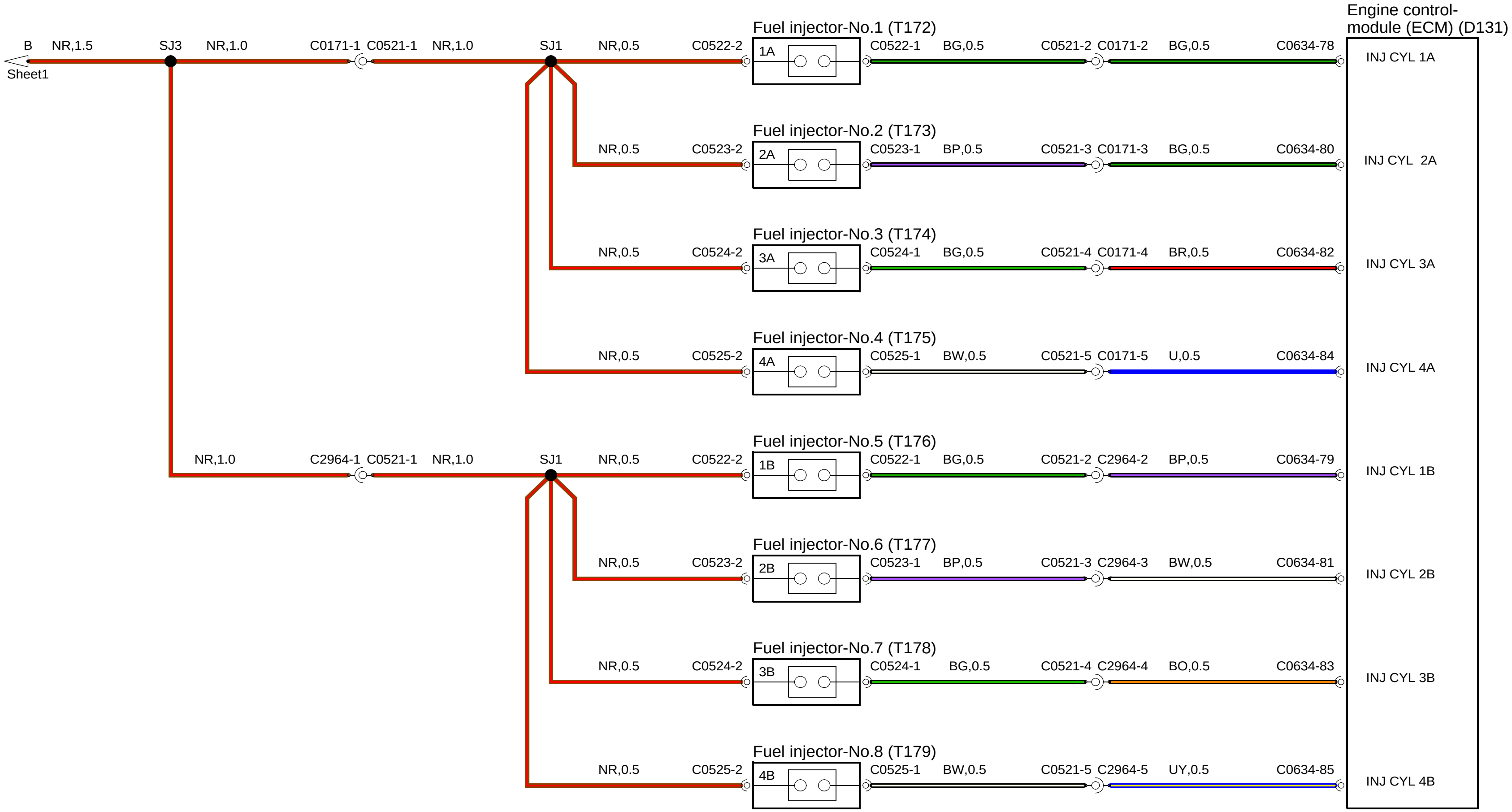

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
Purge control valve (N119)
Engine control-module (ECM) (D131)
Unit-Electric throttle (D249)
Sensor-Engine coolant-temperature (ECT) (T121)
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
Viscous fan (M300)
Solenoid (N104)
Sensor-Hall-effect (T263)
Fan-Cooling-E box (M208)
E
Sheet1
WR,1.5
C0644-1
B
C0644-2
RW,1.0
C0634-77
C0644-4
GO,1.0
C0634-26
C0644-3
NU,1.0
C0634-27
F
Sheet1
WG,1.5
C0645-1
A
C0645-2
RU,1.0
C0634-76
C0645-3
Y,1.0
C0634-29
C0645-4
R,1.0
C0634-28
C
Sheet1
BU,0.5
C0152-2
C0152-1
UY,0.5
C0634-92
UHEGO B HTR
UHEGO B SIG
UHEGO B GND
TPS1
TPS2
SEN GND 3
THROTTLE +
THROTTLE -
UHEGO A HTR
UHEGO A GND
5V REF 3
UHEGO A SIG
COOLANT TEMP
SEN GND 6
PURGE VALVE
5V REF6
MAP/BOOST PRESS
INTERCOOLER OUT TEMP
FAN REQUEST
FAN SPEED
E-BOX FAN
C0634-65
BG,0.5
C0175-6
C0634-67
Y,0.5
C0175-4
C0175-5
C0634-10
R,0.5
C0175-3
C0634-75
GW,1.0
C0175-1
+
C0634-74
RW,1.0
C0175-2
-
C0634-72
OY,1.0
C0634-68
UY,0.5
C0169-1
C0634-15
BG,0.5
SJ6
BG,0.5
C0169-2
BG,0.5
P
Sheet6
BG,0.5
C2258-4
C0634-24
OY,1.0
C2258-2
C0634-69
YU,0.5
C2258-1
C0634-39
W,0.5
C2258-3
C0634-93
B,0.5
C2270-D
C2270-E
C0634-63
B,0.5
C2270-C
C2270-B
BG,0.5
Q
Sheet4
C2270-A
C0634-94
OY,0.5
C2724-15 C2725L-15
D
Sheet1
NK,0.75D
C0646L-2
C0646L-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725L-14 C2724-14
R,1.0
SJ2
GB,0.5
WU,1.0
GU,1.0
K
Sheet6

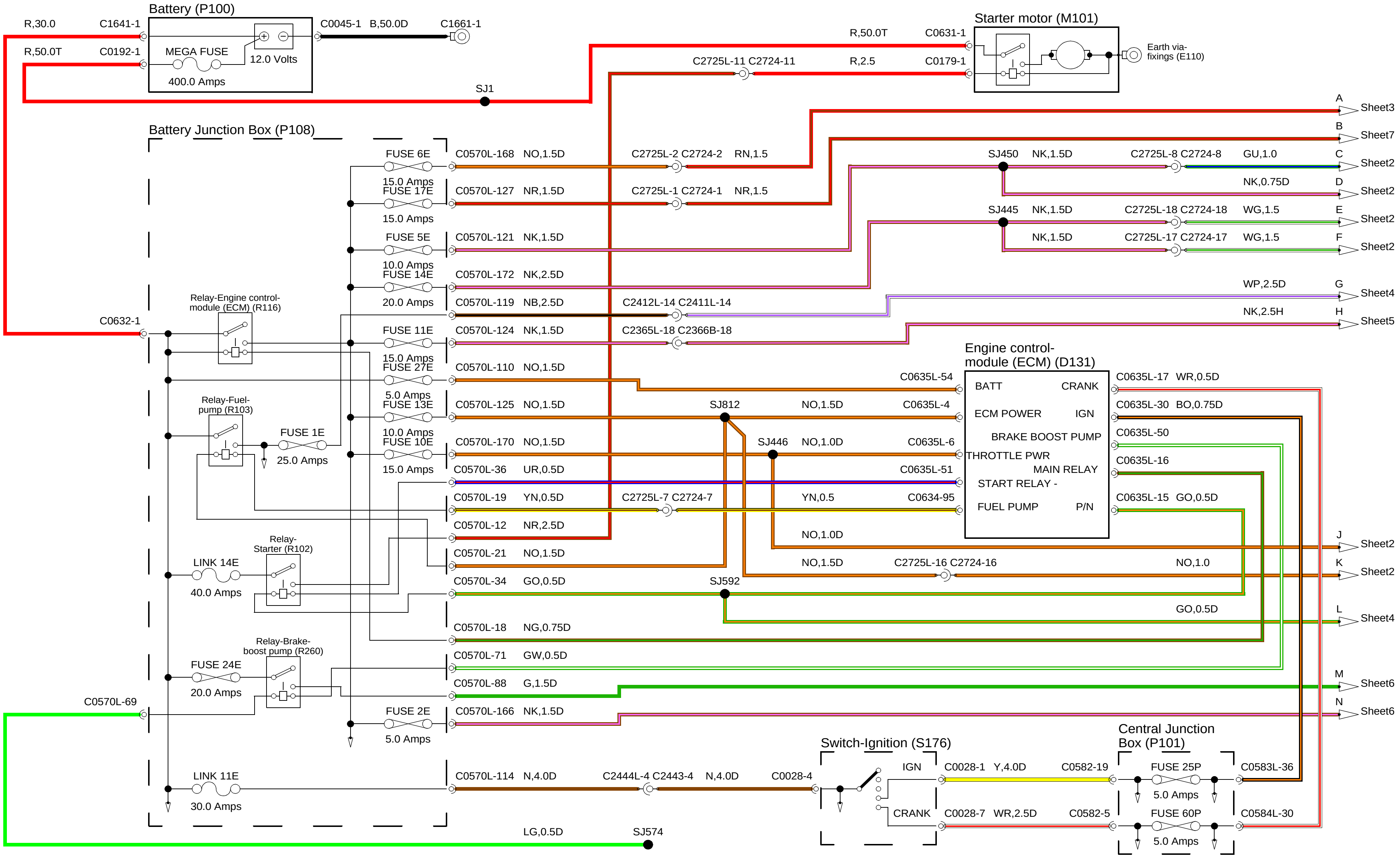

Engine control-
module (ECM) (D131)
COIL 1B
IGF2
COIL 1A
IGF 1
COIL 2A
COIL 2B
COIL 3A
COIL 3B
COIL 4B
COIL 4A
Ignition coil-1 (D233)
1A
Ignition coil-6 (D238)
2B
Ignition coil-7 (D267)
3B
Ignition coil-4 (D236)
4A
Ignition coil-5 (D237)
1B
Ignition coil-2 (D234)
2A
Ignition coil-3 (D235)
3A
Ignition coil-8 (D268)
4B
SJ9
RW,0.5 C0156-1
B,0.5 C0156-3
C0156-4 GU,0.5 C0634-61
C0156-2 GB,0.5 SJ14 GB,0.5 C0634-62
RW,0.5 C1772-1
C1772-2 GB,0.5
B,0.5 C1772-3
C1772-4 GW,0.5 C0634-58
RW,0.5 C2087-1
C2087-2 GB,0.5
B,0.5 C2087-3
C2087-4 GR,0.5 C0634-56
RW,0.5 C1770-1
C1770-2 GB,0.5
B,0.5 C1770-3
C1770-4 GR,0.5 C0634-55
C0634-60 GW,0.5 C1771-4
C1771-3 B,0.5
C0634-64 YB,0.5 SJ13 YB,0.5 C1771-2
C1771-1 RW,0.5
YB,0.5 C0052-2
C0052-3 B,0.5
C0634-59 Y,0.5 C0052-4
C0052-1 RW,0.5
YB,0.5 C0276-2
C0276-3 B,0.5
C0634-57 YR,0.5 C0276-4
C0276-1 RW,0.5
YB,0.5 C2088-2
C2088-1 RW,0.5
C0634-54 YR,0.5 C2088-4
C2088-3
SJ11 B,0.5
TO BE SAME LENGTH AS WIRE 138B
SJ10 B,0.5
TO BE SAME LENGTH AS WIRE 137B
SJ12 B,0.5
Capacitor (G158)
RW,1.5 C1323-1
C1323-2 B,1.5
A
Sheet1
RN,1.5 C1323-3
B,1.5
B,1.5
C2649-1
TYPE 3
C2651-1
TYPE 3

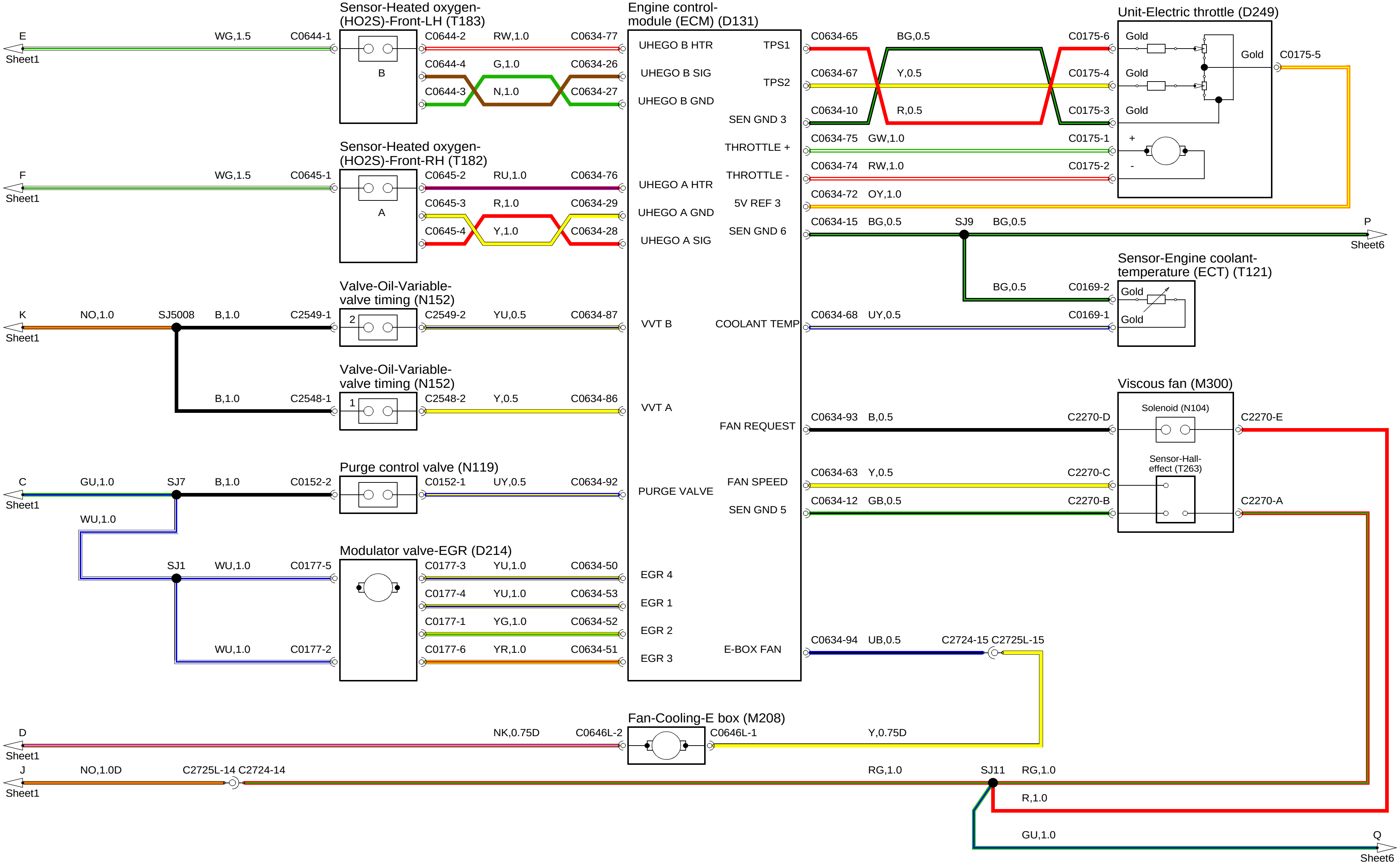

Sensor-Oil-temperature (T128)
Engine control-module (ECM) (D131)
Sensor-Crankshaft-position (CKP) (T102)
BG,0.5
C0219-2
C0219-1
Y,0.5
C0634-23
OIL TEMP
CRANK +
CRANK -
C0634-30
B,0.5
C0909-2 C0904-2
B,0.5
C0168-2
C0634-6
O,0.5
C0909-1 C0904-1
O,0.5
C0168-1
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186-2
OY,1.0
C0634-48
5V REF 4
Restraints control module (D171)
C0186-1
BP,0.5
C0634-38
MAP
SRS SIGNAL
C0635L-28
YG,0.5D
C2244L-7 C2242L-7
YG,0.5D
C1649-17
C0186-4
BG,0.5
SJ4
YG,0.5
C0634-11
SEN GND 4
Sensor-Pressure-Fuel rail (T264)
Sensor-Temperature-Fuel rail (T125)
5V REF 5
C0634-47
OY,0.5
C2467-1
C2251-2
BG,0.5
FUEL PRESS
C0634-71
U,0.5
C2467-3
C2251-1
YR,0.5
C0634-46
FUEL TEMP
SEN GND 5
C0634-12
GU,0.5
SJ5
BG,0.5
C2467-2
BG,0.5
F/PUMP CONTROL
C0635L-20
GO,0.5D
C2245L-1 C2243L-1
F/PUMP MONITOR
C0635L-21
WG,0.5D
C2245L-2 C2243L-2
CRUISE SW -
C0635L-35
R,0.5D
C2240L-21 C2238-21
CRUISE SW +
C0635L-36
PU,0.5D
C2240L-22 C2238-22
Module-Steering-wheel-RH (D257)
Clock spring (S227)
C2147-10
R,0.35
C1254-4
C0082-5
PU,0.35D
C2147-9
N,0.35
C1254-1
C0082-8
R,0.35D
Module-Fuel-pump driver (D361)
G
R,4.0D
C2369-5
C2369-4
WG,0.5D
Sheet1
C2369-3
GO,0.5D
Q
Sheet2

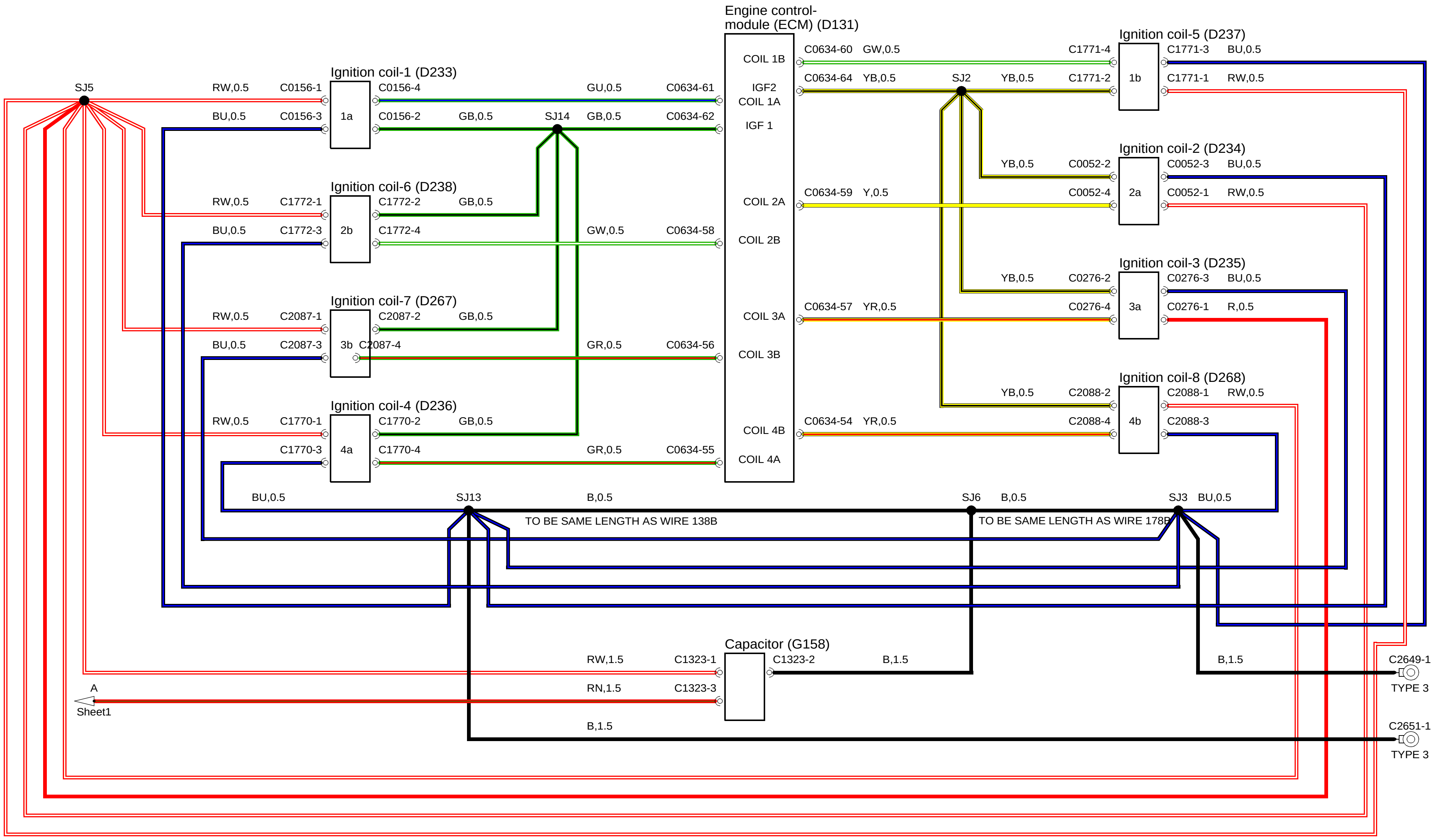

Sensor-Camshaft-position (CMP) (T107)
C0176-2
R,0.5
C0634-34
A
C0176-1
Y,0.5
C0634-7
Sensor-Camshaft-position (CMP) (T107)
C1463-1
G,0.5
C0634-33
B
C1463-2
N,0.5
C0634-8
Engine control-module (ECM) (D131)
CAM A +
CAM A GND
5V REF 1
DEMAND 1
GND 1
5V REF 2
CAM B +
DEMAND 2
CAM B GND
GND 2
BRAKE SW
ALT_CONTROL
ALT_MONITOR
HEGO B GND
HEGO B SIG
HEGO B HTR
HEGO A GND
HEGO A SIG
HEGO A HTR
Sensor-Position-Accelerator pedal (T113)
C0635L-32
R,0.5D
C2244L-15 C2242L-15
R,0.5D
C0787L-7
C0635L-24
YR,MAPRR
C2244L-16 C2242L-16
YLG,MAPBT
C0787L-2
C0635L-7
RB,MAPRR
C2244L-17 C2242L-17
RB,MAPBT
C0787L-1
C0635L-19
OY,0.5D
C2244L-18 C2242L-18
OY,0.5D
C0787L-6
C0635L-38
BG,MAPQQ
C2244L-21 C2242L-21
U,0.5D
C0787L-5
C0635L-8
U,MAPQQ
C2244L-22 C2242L-22
BG,0.5D
C0787L-3
ABS module (D277)
C0506L-30
GP,0.75D
SJ882
GP,0.75D
C0635L-41
GP,1.5D
Stop lamp switch (S215)
C0075L-1
GP,1.5D
SJ814
GP,1.5D
C2411L-2 C2412L-2
Generator (M100)
C0634-96
GO,1.0
C0053-2
C0634-3
WG,1.0
C0053-3
C0635L-34
WU,MAPAJ
C0635L-26
RB,MAPAJ
C0635L-47
G,0.5D
C2373L-2 C2374D-2
C0635L-22
U,MAPAH
C0635L-25
RB,MAPAH
C0635L-46
WO,0.5D
C2373L-5 C2374D-5
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
H
Sheet1
NK,2.5H
SJ3444
NK,1.5H
C0642-1
C0642-2
WO,0.5H
A
C0642-4
RB,0.5H
C2374D-4 C2373L-4
C0642-3
U,0.5H
C2374D-3 C2373L-3
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H
C0643-1
C0643-2
G,0.5H
B
C0643-4
RB,0.5H
C2374D-1 C2373L-1
C0643-3
WU,0.5H
C2374D-7 C2373L-7

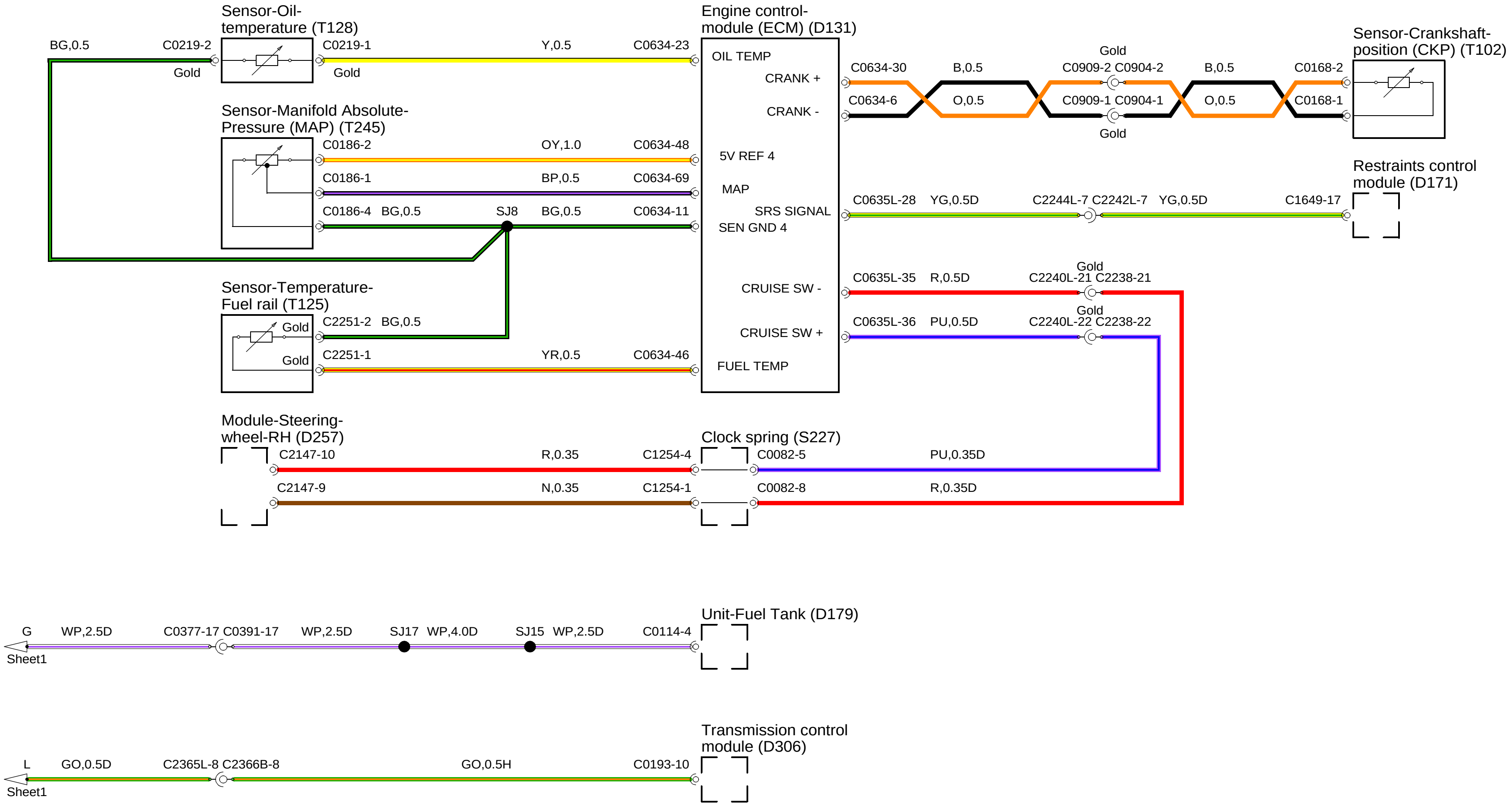

Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
SJ3720
YN,0.5H
C2366D-4 C2365L-4
YN,MAPM
C0635L-58
SJ3721
YB,0.5H
C2366D-5 C2365L-5
YB,MAPM
C0635L-45
SJ176
YN,MAPL
C0635L-57
SJ177
YB,MAPL
C0635L-44
CAN H IN
CAN L IN
CAN H OUT
CAN L OUT
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635L-2
B,1.0D
C0635L-3
B,1.0D
C0635L-1
B,1.5D
C0635L-5
B,1.5D
C2650L-1
TYPE 3
C0557L-1
TYPE 3
Sensor-Knock (KS)-LH (T321)
C0626-3
S,0.5
C0634-43
C0626-4
G,0.5
C0634-20
KNOCK 1B+
KNOCK 1B-
KNOCK 1A +
KNOCK 1A -
C0634-42
B,0.5
C0626-1
C0634-19
N,0.5
C0626-2
Sensor-Knock (KS)-RH (T320)
Pump-Leak detection (M244)
N
NK,1.5D
Sheet1
C3009-3 C3010-3
NK,0.75D
C1339-4
C2446-3 C2445-3
Y,0.5D
C1339-1
C2446-4 C2445-4
R,0.5D
C1339-3
C2446-5 C2445-5
G,0.5D
C1339-2
(NAS)
G,0.5D
C0635L-23
R,0.5D
C0635L-48
Y,0.5D
C0635L-33
DMTL HEATER
DMTL VALVE
DMTL PUMP
AFM IAT
MAF
MAF GND
C0634-66
U,0.5
C0149-4
C0634-70
GW,0.5
C0149-3
C0634-18
BP,0.5
C0149-2
Sensor-Mass air-flow (MAF) (T115)
C0149-5
BG,0.5
C0149-1
GU,1.0
K
Sheet2
P
Sheet2

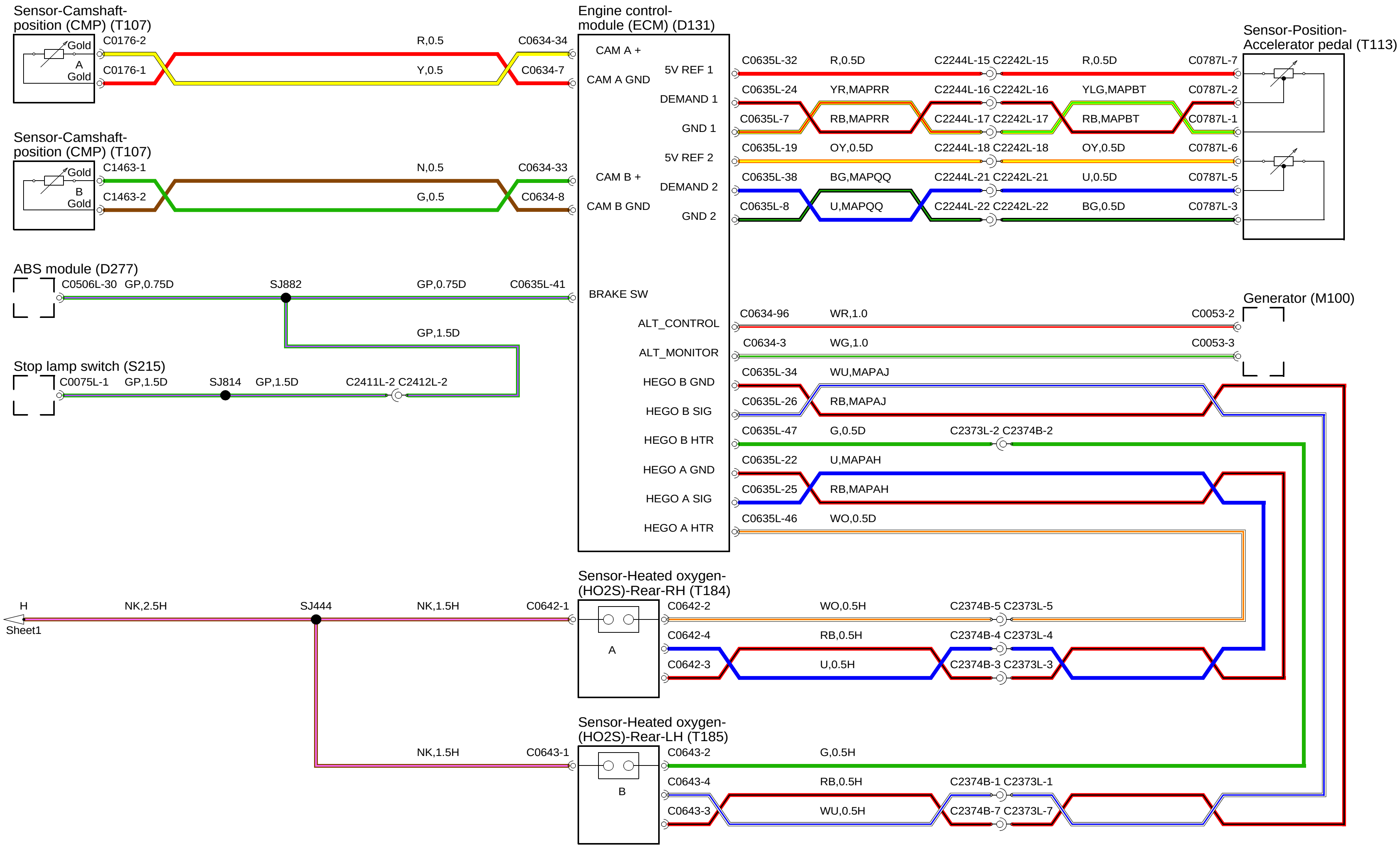

B
NR,1.5
Sheet1
SJ3
NR,1.0
C0171-1
C0521-1
NR,1.0
SJ1
NR,0.5
C0522-2
Fuel injector-No.1 (T172)
1A
C0522-1
BG,0.5
C0521-2
C0171-2
BG,0.5
C0634-78
Engine control-module (ECM) (D131)
INJ CYL 1A
NR,0.5
C0523-2
Fuel injector-No.2 (T173)
2A
C0523-1
BP,0.5
C0521-3
C0171-3
BG,0.5
C0634-80
INJ CYL 2A
NR,0.5
C0524-2
Fuel injector-No.3 (T174)
3A
C0524-1
BG,0.5
C0521-4
C0171-4
BR,0.5
C0634-82
INJ CYL 3A
NR,0.5
C0525-2
Fuel injector-No.4 (T175)
4A
C0525-1
BW,0.5
C0521-5
C0171-5
U,0.5
C0634-84
INJ CYL 4A
NR,1.0
C2964-1
C0521-1
NR,1.0
SJ1
NR,0.5
C0522-2
Fuel injector-No.5 (T176)
1B
C0522-1
BG,0.5
C0521-2
C2964-2
BP,0.5
C0634-79
INJ CYL 1B
NR,0.5
C0523-2
Fuel injector-No.6 (T177)
2B
C0523-1
BP,0.5
C0521-3
C2964-3
BW,0.5
C0634-81
INJ CYL 2B
NR,0.5
C0524-2
Fuel injector-No.7 (T178)
3B
C0524-1
BG,0.5
C0521-4
C2964-4
BO,0.5
C0634-83
INJ CYL 3B
NR,0.5
C0525-2
Fuel injector-No.8 (T179)
4B
C0525-1
BW,0.5
C0521-5
C2964-5
UY,0.5
C0634-85
INJ CYL 4B

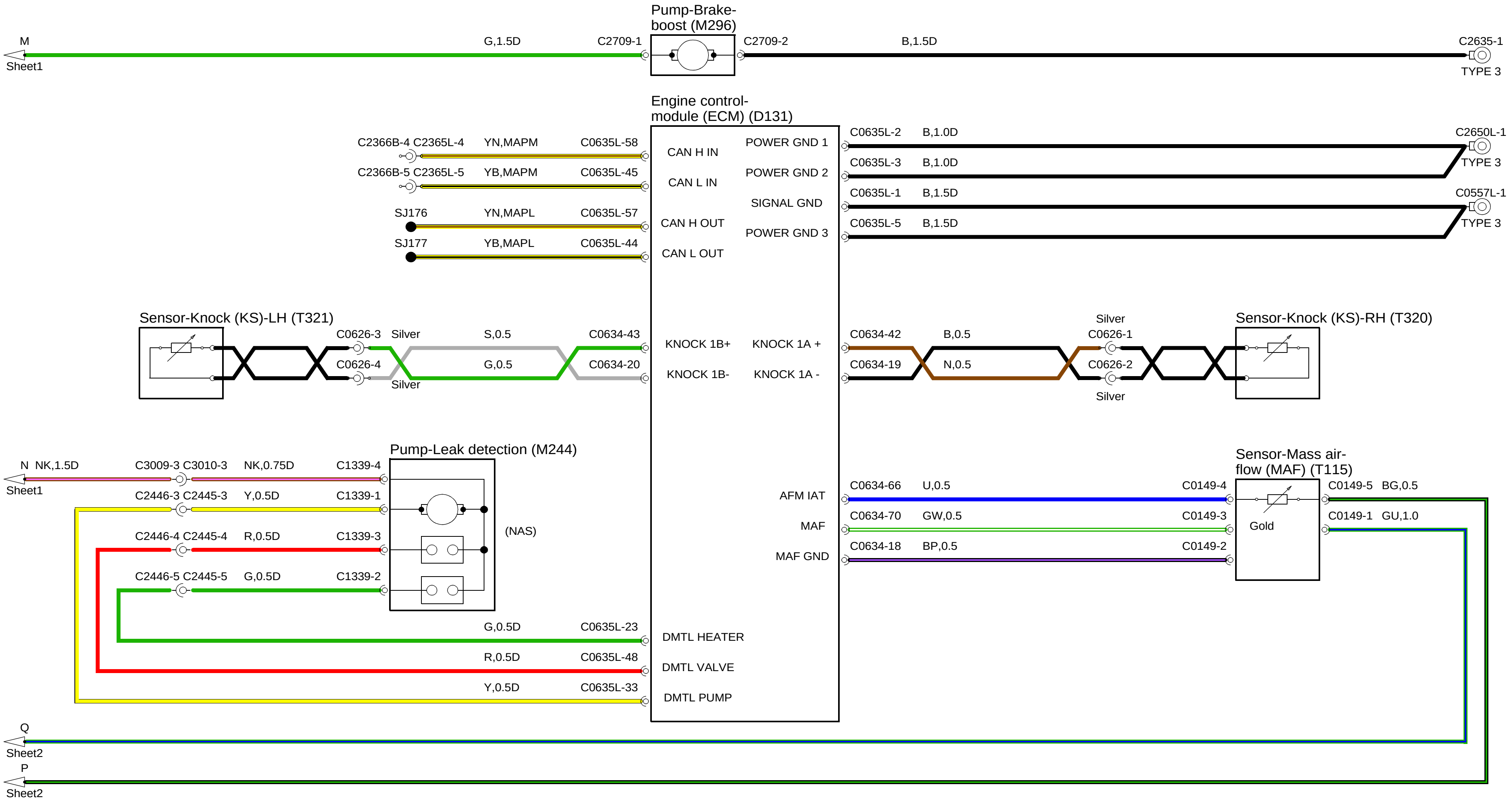

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631-1
C2725L-11 C2724-11
R,2.5
C0179-1
Earth via-fixings (E110)
Battery Junction Box (P108)
A
Sheet3
B
Sheet7
FUSE 6E
15.0 Amps
C0570L-168
NO,1.5D
C2725L-2 C2724-2
RN,1.5
SJ450
NK,1.5D
C2725L-8 C2724-8
GU,1.0
C
Sheet2
FUSE 17E
15.0 Amps
C0570L-127
NR,1.5D
C2725L-1 C2724-1
NR,1.5
NK,0.75D
D
Sheet2
SJ445
NK,1.5D
C2725L-18 C2724-18
WG,1.5
E
Sheet2
FUSE 5E
10.0 Amps
C0570L-121
NK,1.5D
NK,1.5D
C2725L-17 C2724-17
WG,1.5
F
Sheet2
FUSE 14E
20.0 Amps
C0570L-172
NK,2.5D
WP,2.5D
G
Sheet4
Relay-Engine control-module (ECM) (R116)
C0570L-119
NB,2.5D
C2412L-14 C2411L-14
NK,2.5H
H
Sheet5
C0632-1
FUSE 11E
15.0 Amps
C0570L-124
NK,1.5D
C2365L-18 C2366B-18
Engine control-module (ECM) (D131)
FUSE 27E
5.0 Amps
C0570L-110
NO,1.5D
C0635L-54
BATT
CRANK
C0635L-17
WR,0.5D
Relay-Fuel-pump (R103)
FUSE 13E
10.0 Amps
C0570L-125
NO,1.5D
SJ812
NO,1.5D
C0635L-4
ECM POWER
IGN
C0635L-30
BO,0.75D
FUSE 1E
25.0 Amps
BRAKE BOOST PUMP
C0635L-50
FUSE 10E
15.0 Amps
C0570L-170
NO,1.5D
SJ446
NO,1.0D
C0635L-6
THROTTLE PWR
MAIN RELAY
C0635L-16
C0570L-36
UR,0.5D
C0635L-51
START RELAY -
C0570L-19
YN,0.5D
C2725L-7 C2724-7
YN,0.5
C0634-95
FUEL PUMP
P/N
C0635L-15
GO,0.5D
C0570L-12
NR,2.5D
NO,1.0D
J
Sheet2
Relay-Starter (R102)
LINK 14E
40.0 Amps
C0570L-21
NO,1.5D
NO,1.5D
C2725L-16 C2724-16
NO,1.0
K
Sheet2
C0570L-34
GO,0.5D
SJ592
GO,0.5D
L
Sheet4
C0570L-18
NG,0.75D
Relay-Brake-boost pump (R260)
FUSE 24E
20.0 Amps
C0570L-71
GW,0.5D
C0570L-88
G,1.5D
M
Sheet6
C0570L-69
FUSE 2E
5.0 Amps
C0570L-166
NK,1.5D
N
Sheet6
Switch-Ignition (S176)
Central Junction Box (P101)
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583L-36
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584L-30
LG,0.5D
SJ574

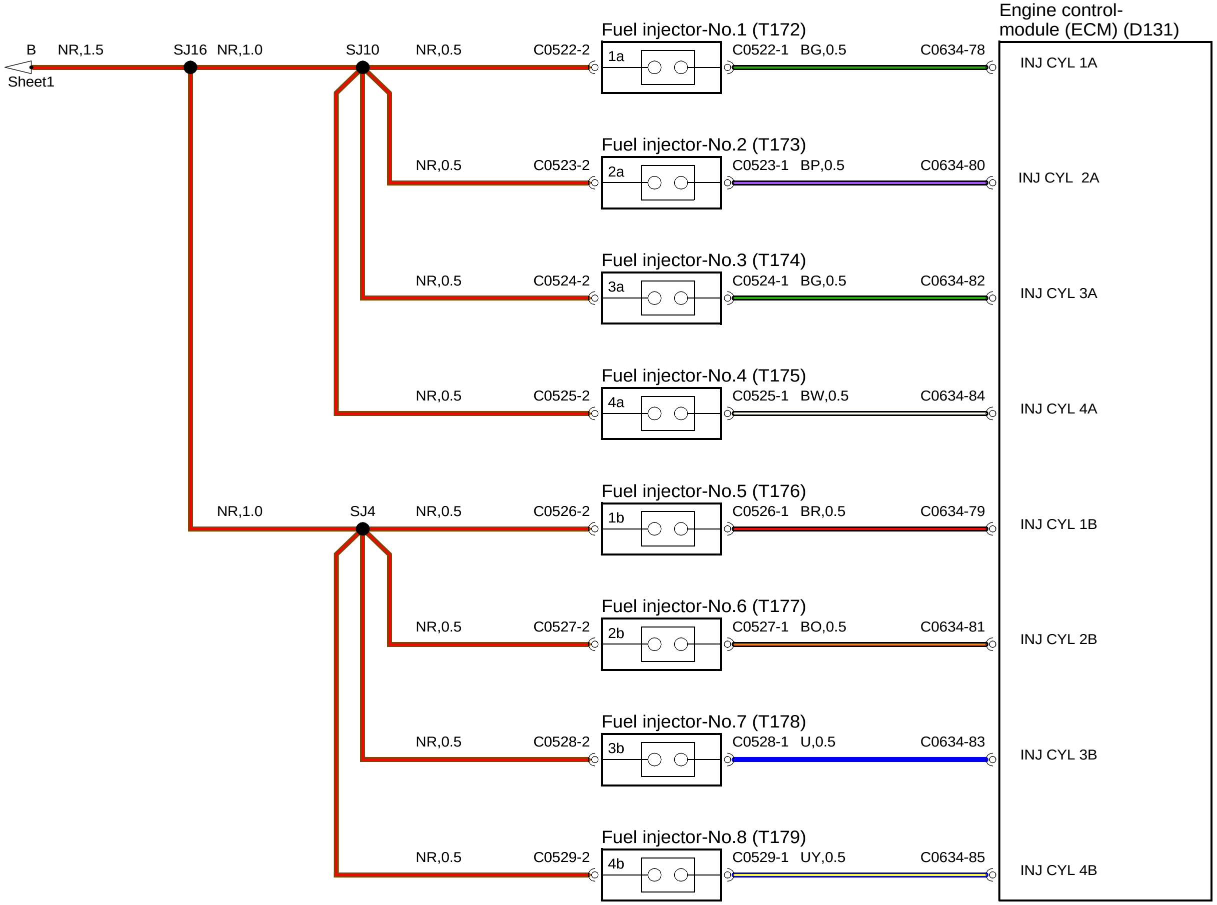

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
Engine control-module (ECM) (D131)
Unit-Electric throttle (D249)
E
Sheet1
WG,1.5
C0644-1
C0644-2
RW,1.0
C0634-77
B
C0644-4
G,1.0
C0634-26
C0644-3
N,1.0
C0634-27
UHEGO B HTR
UHEGO B SIG
UHEGO B GND
TPS1
TPS2
SEN GND 3
THROTTLE +
THROTTLE -
5V REF 3
SEN GND 6
C0634-65
BG,0.5
C0175-6
C0634-67
Y,0.5
C0175-4
C0634-10
R,0.5
C0175-3
Gold
Gold
Gold
Gold
C0175-5
C0634-75
GW,1.0
C0175-1
+
C0634-74
RW,1.0
C0175-2
-
C0634-72
OY,1.0
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
F
Sheet1
WG,1.5
C0645-1
C0645-2
RU,1.0
C0634-76
A
C0645-3
R,1.0
C0634-29
C0645-4
Y,1.0
C0634-28
UHEGO A HTR
UHEGO A GND
UHEGO A SIG
C0634-15
BG,0.5
SJ9
BG,0.5
P
Sheet6
Sensor-Engine coolant-temperature (ECT) (T121)
BG,0.5
C0169-2
Gold
Gold
Valve-Oil-Variable-valve timing (N152)
K
Sheet1
NO,1.0
SJ5008
B,1.0
C2549-1
2
C2549-2
YU,0.5
C0634-87
VVT B
COOLANT TEMP
C0634-68
UY,0.5
C0169-1
Valve-Oil-Variable-valve timing (N152)
B,1.0
C2548-1
1
C2548-2
Y,0.5
C0634-86
VVT A
Viscous fan (M300)
Solenoid (N104)
FAN REQUEST
C0634-93
B,0.5
C2270-D
C2270-E
Sensor-Hall-effect (T263)
Purge control valve (N119)
C
Sheet1
GU,1.0
SJ7
B,1.0
C0152-2
C0152-1
UY,0.5
C0634-92
PURGE VALVE
FAN SPEED
SEN GND 5
C0634-63
Y,0.5
C2270-C
C0634-12
GB,0.5
C2270-B
C2270-A
WU,1.0
Modulator valve-EGR (D214)
SJ1
WU,1.0
C0177-5
C0177-3
YU,1.0
C0634-50
EGR 4
C0177-4
YU,1.0
C0634-53
EGR 1
C0177-1
YG,1.0
C0634-52
EGR 2
WU,1.0
C0177-2
C0177-6
YR,1.0
C0634-51
EGR 3
E-BOX FAN
C0634-94
UB,0.5
C2724-15 C2725L-15
Fan-Cooling-E box (M208)
D
Sheet1
NK,0.75D
C0646L-2
C0646L-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725L-14 C2724-14
RG,1.0
SJ11
RG,1.0
R,1.0
GU,1.0
Q
Sheet6

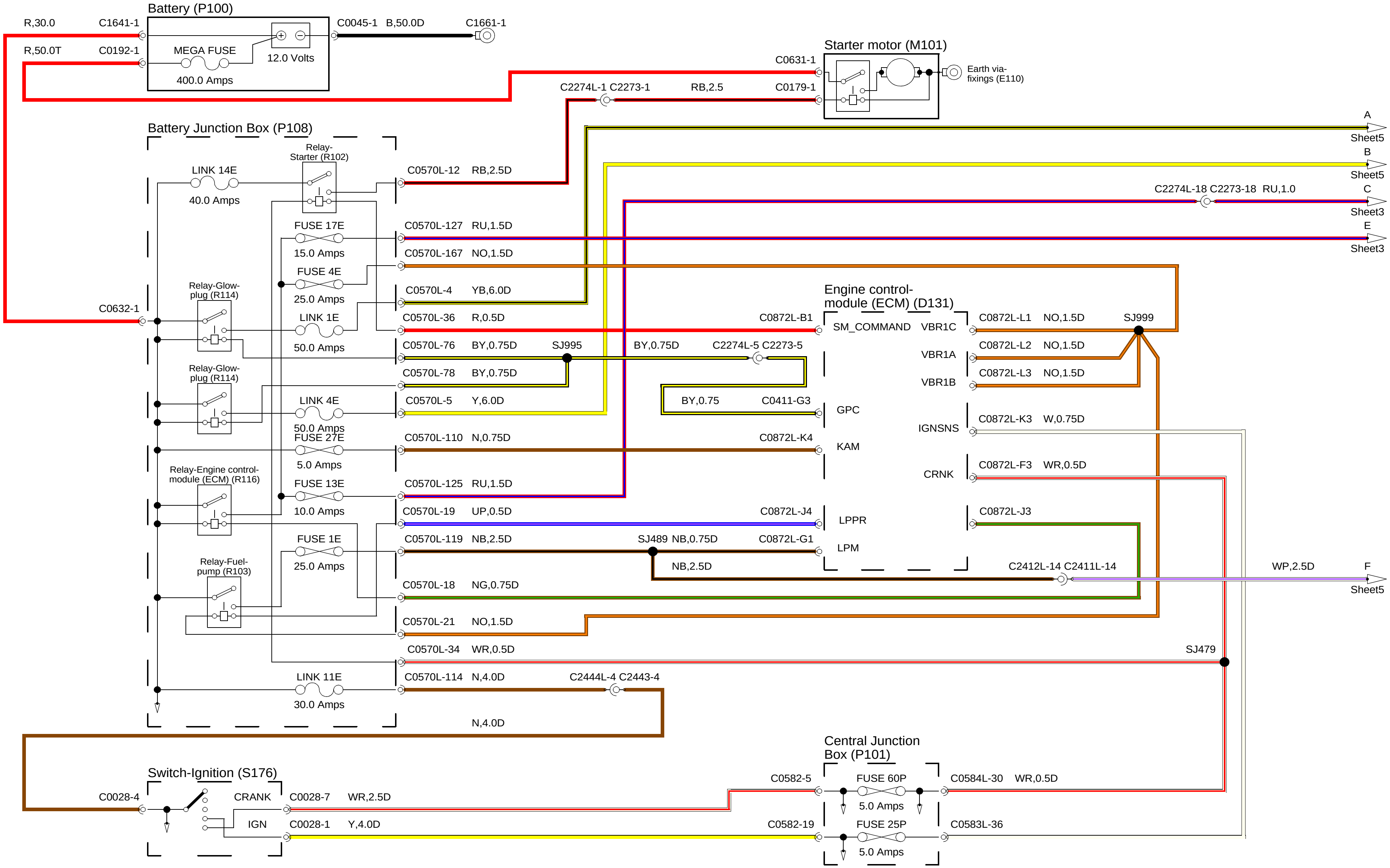

Engine control-module (ECM) (D131)
COIL 1B
IGF2
COIL 1A
IGF 1
COIL 2A
COIL 2B
COIL 3A
COIL 3B
COIL 4B
COIL 4A
Ignition coil-1 (D233)
1a
Ignition coil-6 (D238)
2b
Ignition coil-7 (D267)
3b
Ignition coil-4 (D236)
4a
Ignition coil-5 (D237)
1b
Ignition coil-2 (D234)
2a
Ignition coil-3 (D235)
3a
Ignition coil-8 (D268)
4b
Capacitor (G158)
SJ5
SJ14
SJ2
SJ13
SJ6
SJ3
RW,0.5
C0156-1
C0156-4
GU,0.5
C0634-61
BU,0.5
C0156-3
C0156-2
GB,0.5
C0634-62
C1772-1
C1772-2
C1772-3
C1772-4
GW,0.5
C0634-58
C2087-1
C2087-2
C2087-3
C2087-4
GR,0.5
C0634-56
C1770-1
C1770-2
C1770-3
C1770-4
C0634-55
C0634-60
C1771-4
C1771-3
C0634-64
YB,0.5
C1771-2
C1771-1
C0052-2
C0052-3
C0634-59
Y,0.5
C0052-4
C0052-1
C0276-2
C0276-3
C0634-57
YR,0.5
C0276-4
C0276-1
R,0.5
C2088-2
C2088-1
C0634-54
C2088-4
C2088-3
B,0.5
TO BE SAME LENGTH AS WIRE 138B
TO BE SAME LENGTH AS WIRE 178B
RW,1.5
C1323-1
C1323-2
B,1.5
RN,1.5
C1323-3
A
Sheet1
C2649-1
TYPE 3
C2651-1
TYPE 3

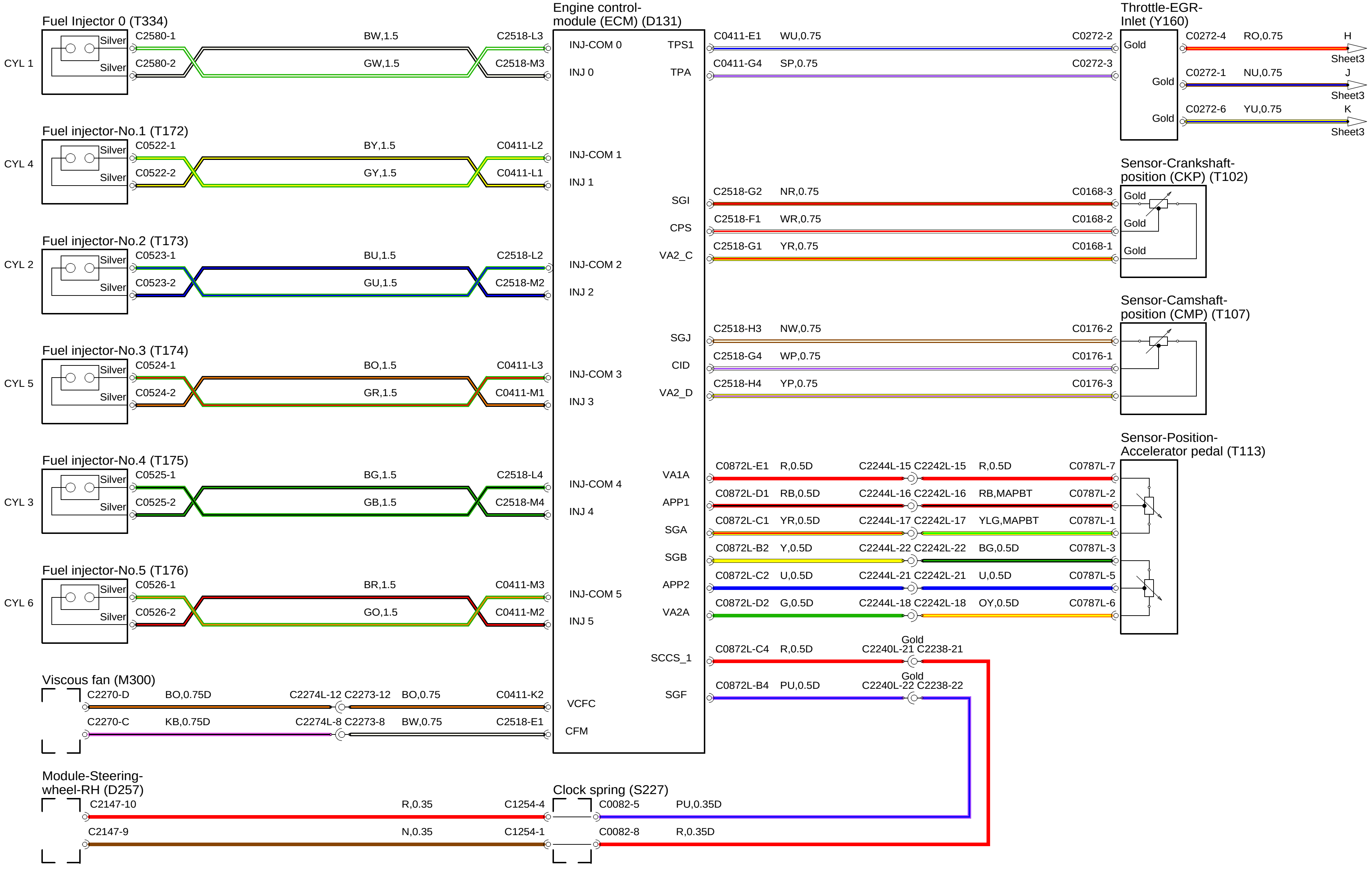

Sensor-Oil-temperature (T128)
BG,0.5
C0219-2
Gold
C0219-1
Gold
Y,0.5
C0634-23
Engine control-module (ECM) (D131)
OIL TEMP
CRANK +
CRANK -
5V REF 4
MAP
SRS SIGNAL
SEN GND 4
CRUISE SW -
CRUISE SW +
FUEL TEMP
C0634-30
B,0.5
Gold
C0909-2 C0904-2
B,0.5
C0168-2
C0634-6
O,0.5
C0909-1 C0904-1
O,0.5
C0168-1
Gold
Sensor-Crankshaft-position (CKP) (T102)
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186-2
OY,1.0
C0634-48
C0186-1
BP,0.5
C0634-69
C0186-4
BG,0.5
SJ8
BG,0.5
C0634-11
Restraints control module (D171)
C0635L-28
YG,0.5D
C2244L-7 C2242L-7
YG,0.5D
C1649-17
C0635L-35
R,0.5D
Gold
C2240L-21 C2238-21
C0635L-36
PU,0.5D
Gold
C2240L-22 C2238-22
Sensor-Temperature-Fuel rail (T125)
Gold
C2251-2
BG,0.5
Gold
C2251-1
YR,0.5
C0634-46
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
Clock spring (S227)
C0082-5
PU,0.35D
C2147-9
N,0.35
C1254-1
C0082-8
R,0.35D
Unit-Fuel Tank (D179)
G
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
Sheet1
Transmission control module (D306)
L
GO,0.5D
C2365L-8 C2366B-8
GO,0.5H
C0193-10
Sheet1

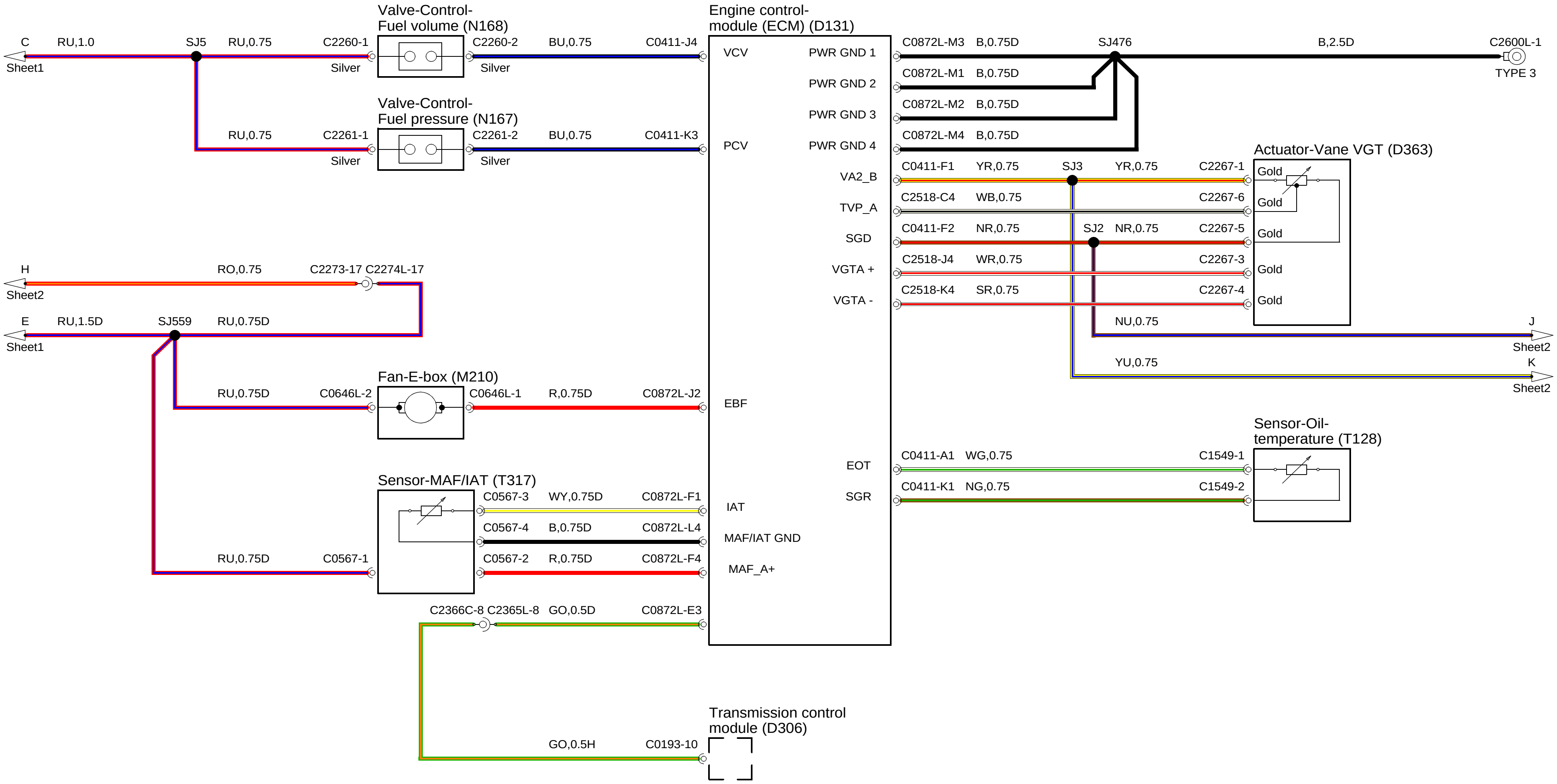

Sensor-Camshaft-position (CMP) (T107)
Gold
A
Gold
C0176-2
C0176-1
R,0.5
Y,0.5
C0634-34
C0634-7
Engine control-module (ECM) (D131)
CAM A +
CAM A GND
5V REF 1
DEMAND 1
GND 1
5V REF 2
CAM B +
DEMAND 2
CAM B GND
GND 2
BRAKE SW
ALT_CONTROL
ALT_MONITOR
HEGO B GND
HEGO B SIG
HEGO B HTR
HEGO A GND
HEGO A SIG
HEGO A HTR
Sensor-Position-Accelerator pedal (T113)
C0635L-32
R,0.5D
C2244L-15 C2242L-15
R,0.5D
C0787L-7
C0635L-24
YR,MAPRR
C2244L-16 C2242L-16
YLG,MAPBT
C0787L-2
C0635L-7
RB,MAPRR
C2244L-17 C2242L-17
RB,MAPBT
C0787L-1
C0635L-19
OY,0.5D
C2244L-18 C2242L-18
OY,0.5D
C0787L-6
C0635L-38
BG,MAPQQ
C2244L-21 C2242L-21
U,0.5D
C0787L-5
C0635L-8
U,MAPQQ
C2244L-22 C2242L-22
BG,0.5D
C0787L-3
Sensor-Camshaft-position (CMP) (T107)
Gold
B
Gold
C1463-1
C1463-2
N,0.5
G,0.5
C0634-33
C0634-8
ABS module (D277)
C0506L-30
GP,0.75D
SJ882
GP,0.75D
C0635L-41
GP,1.5D
Stop lamp switch (S215)
C0075L-1
GP,1.5D
SJ814
GP,1.5D
C2411L-2 C2412L-2
Generator (M100)
C0634-96
WR,1.0
C0053-2
C0634-3
WG,1.0
C0053-3
C0635L-34
WU,MAPAJ
C0635L-26
RB,MAPAJ
C0635L-47
G,0.5D
C2373L-2 C2374B-2
C0635L-22
U,MAPAH
C0635L-25
RB,MAPAH
C0635L-46
WO,0.5D
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
H
Sheet1
NK,2.5H
SJ444
NK,1.5H
C0642-1
C0642-2
WO,0.5H
C2374B-5 C2373L-5
A
C0642-4
RB,0.5H
C2374B-4 C2373L-4
C0642-3
U,0.5H
C2374B-3 C2373L-3
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H
C0643-1
C0643-2
G,0.5H
B
C0643-4
RB,0.5H
C2374B-1 C2373L-1
C0643-3
WU,0.5H
C2374B-7 C2373L-7

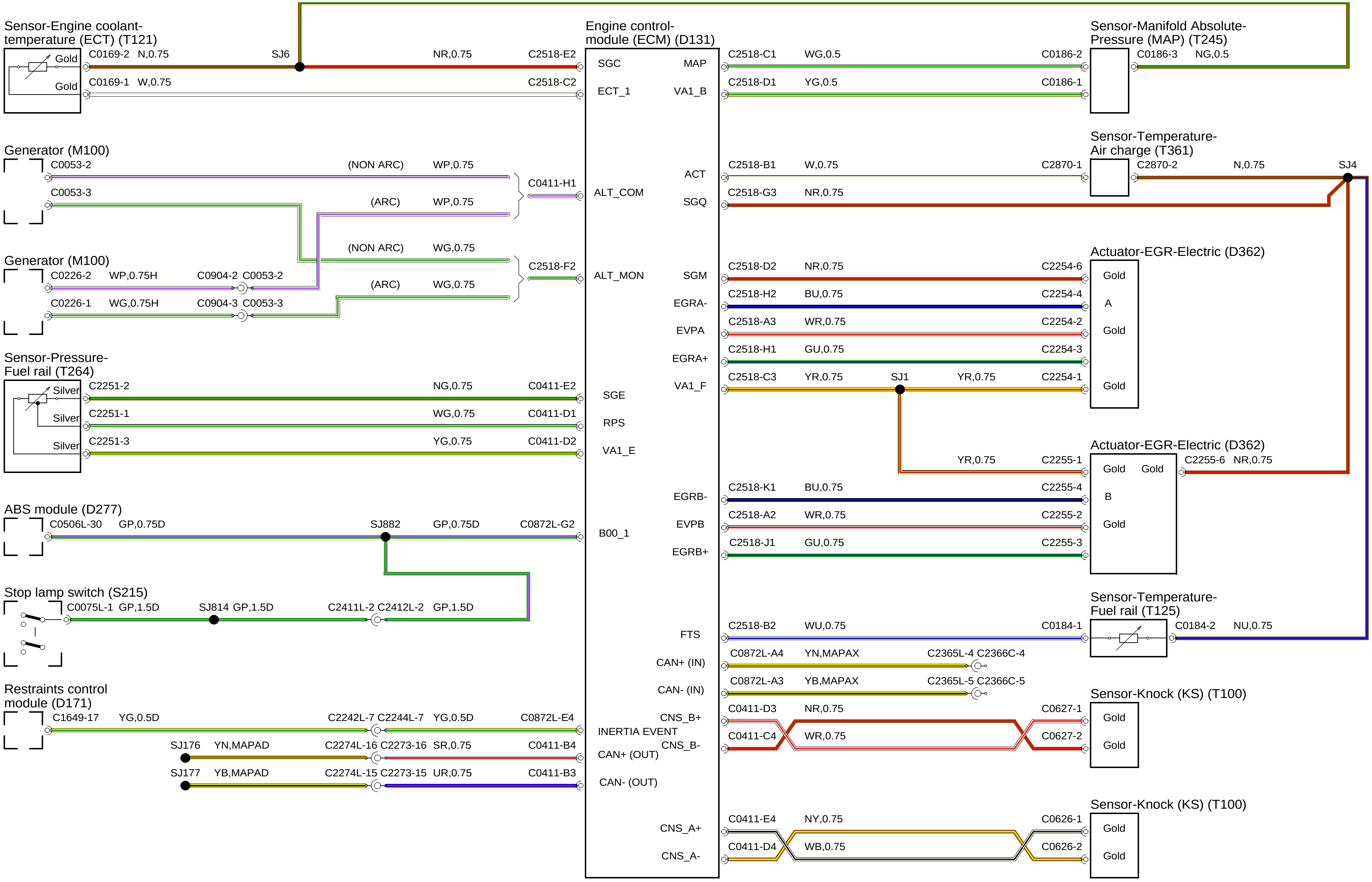

Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
C2366B-4 C2365L-4
YN,MAPM
C0635L-58
C2366B-5 C2365L-5
YB,MAPM
C0635L-45
SJ176
YN,MAPL
C0635L-57
SJ177
YB,MAPL
C0635L-44
CAN H IN
CAN L IN
CAN H OUT
CAN L OUT
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635L-2
B,1.0D
C0635L-3
B,1.0D
C0635L-1
B,1.5D
C0635L-5
B,1.5D
C2650L-1
TYPE 3
C0557L-1
TYPE 3
Sensor-Knock (KS)-LH (T321)
C0626-3
Silver
S,0.5
C0634-43
C0626-4
G,0.5
C0634-20
Silver
KNOCK 1B+
KNOCK 1B-
KNOCK 1A +
KNOCK 1A -
C0634-42
B,0.5
Silver
C0626-1
C0634-19
N,0.5
C0626-2
Silver
Sensor-Knock (KS)-RH (T320)
Pump-Leak detection (M244)
N
NK,1.5D
Sheet1
C3009-3 C3010-3
NK,0.75D
C1339-4
C2446-3 C2445-3
Y,0.5D
C1339-1
(NAS)
C2446-4 C2445-4
R,0.5D
C1339-3
C2446-5 C2445-5
G,0.5D
C1339-2
G,0.5D
C0635L-23
DMTL HEATER
R,0.5D
C0635L-48
DMTL VALVE
Y,0.5D
C0635L-33
DMTL PUMP
Sensor-Mass air-flow (MAF) (T115)
AFM IAT
MAF
MAF GND
C0634-66
U,0.5
C0149-4
C0634-70
GW,0.5
C0149-3
C0634-18
BP,0.5
C0149-2
Gold
C0149-5
BG,0.5
C0149-1
GU,1.0
Q
Sheet2
P
Sheet2

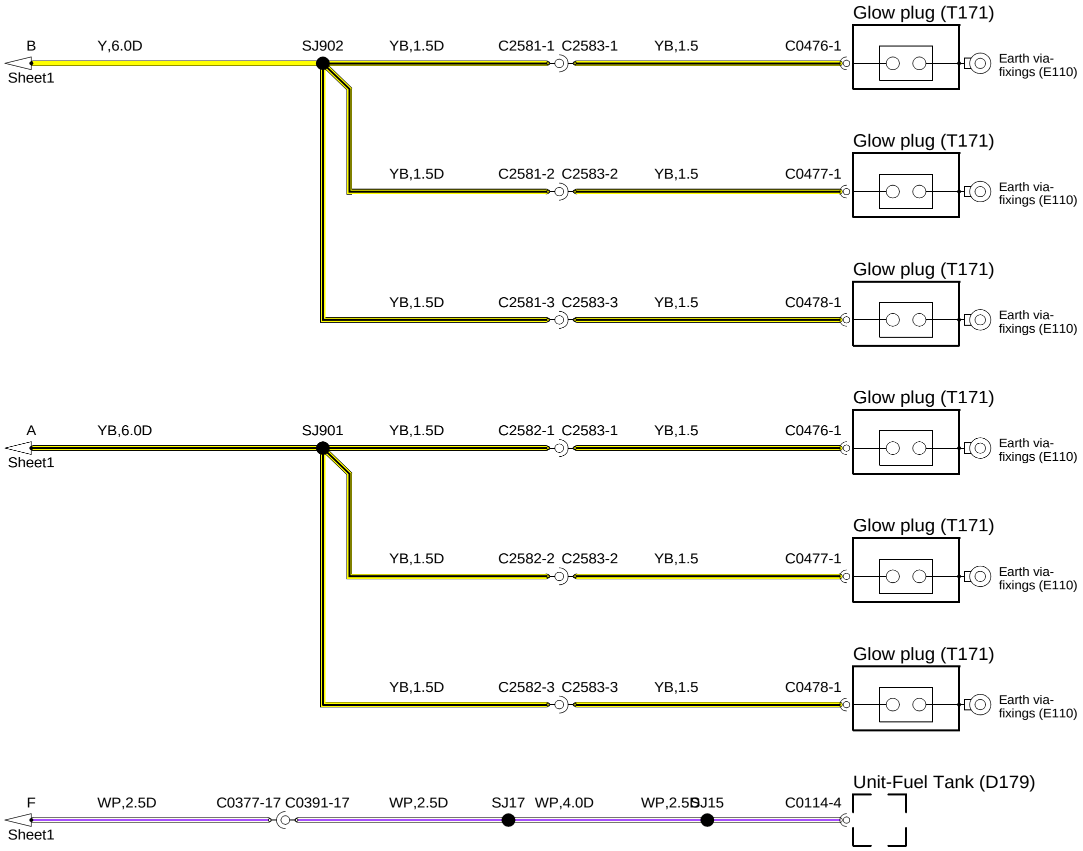

B
NR,1.5
Sheet1
SJ16
NR,1.0
SJ10
NR,0.5
C0522-2
Fuel injector-No.1 (T172)
1a
C0522-1 BG,0.5
C0634-78
Engine control-
module (ECM) (D131)
INJ CYL 1A
NR,0.5
C0523-2
Fuel injector-No.2 (T173)
2a
C0523-1 BP,0.5
C0634-80
INJ CYL 2A
NR,0.5
C0524-2
Fuel injector-No.3 (T174)
3a
C0524-1 BG,0.5
C0634-82
INJ CYL 3A
NR,0.5
C0525-2
Fuel injector-No.4 (T175)
4a
C0525-1 BW,0.5
C0634-84
INJ CYL 4A
NR,1.0
SJ4
NR,0.5
C0526-2
Fuel injector-No.5 (T176)
1b
C0526-1 BR,0.5
C0634-79
INJ CYL 1B
NR,0.5
C0527-2
Fuel injector-No.6 (T177)
2b
C0527-1 BO,0.5
C0634-81
INJ CYL 2B
NR,0.5
C0528-2
Fuel injector-No.7 (T178)
3b
C0528-1 U,0.5
C0634-83
INJ CYL 3B
NR,0.5
C0529-2
Fuel injector-No.8 (T179)
4b
C0529-1 UY,0.5
C0634-85
INJ CYL 4B

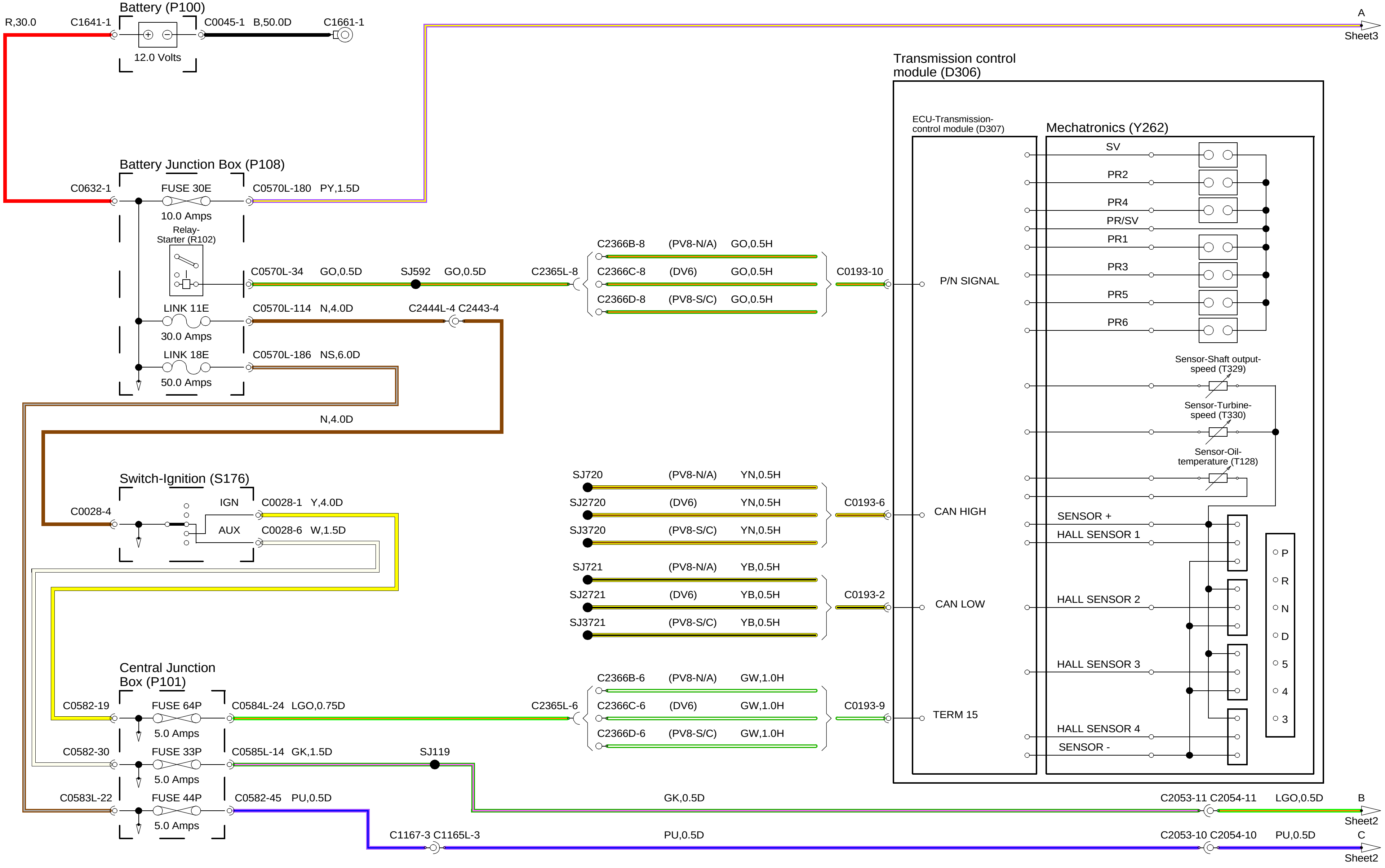

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
Earth via-
fixings (E110)
C2274L-1 C2273-1
RB,2.5
C0179-1
Battery Junction Box (P108)
Relay-
Starter (R102)
LINK 14E
40.0 Amps
C0570L-12
RB,2.5D
A
Sheet5
B
Sheet5
C2274L-18 C2273-18
RU,1.0
C
Sheet3
E
Sheet3
FUSE 17E
15.0 Amps
C0570L-127
RU,1.5D
C0570L-167
NO,1.5D
FUSE 4E
25.0 Amps
C0570L-4
YB,6.0D
Relay-Glow-
plug (R114)
C0632-1
LINK 1E
50.0 Amps
C0570L-36
R,0.5D
Engine control-
module (ECM) (D131)
C0872L-B1
SM_COMMAND
VBR1C
C0872L-L1
NO,1.5D
SJ999
C0570L-76
BY,0.75D
SJ995
BY,0.75D
C2274L-5 C2273-5
VBR1A
C0872L-L2
NO,1.5D
Relay-Glow-
plug (R114)
C0570L-78
BY,0.75D
VBR1B
C0872L-L3
NO,1.5D
LINK 4E
50.0 Amps
C0570L-5
Y,6.0D
BY,0.75
C0411-G3
GPC
IGNSNS
C0872L-K3
W,0.75D
FUSE 27E
5.0 Amps
C0570L-110
N,0.75D
C0872L-K4
KAM
Relay-Engine control-
module (ECM) (R116)
CRNK
C0872L-F3
WR,0.5D
FUSE 13E
10.0 Amps
C0570L-125
RU,1.5D
C0570L-19
UP,0.5D
C0872L-J4
LPPR
C0872L-J3
FUSE 1E
25.0 Amps
C0570L-119
NB,2.5D
SJ489
NB,0.75D
C0872L-G1
LPM
Relay-Fuel-
pump (R103)
NB,2.5D
C2412L-14 C2411L-14
WP,2.5D
F
Sheet5
C0570L-18
NG,0.75D
C0570L-21
NO,1.5D
C0570L-34
WR,0.5D
SJ479
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Central Junction
Box (P101)
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
IGN
C0028-1
Y,4.0D
C0582-5
FUSE 60P
5.0 Amps
C0584L-30
WR,0.5D
C0582-19
FUSE 25P
5.0 Amps
C0583L-36

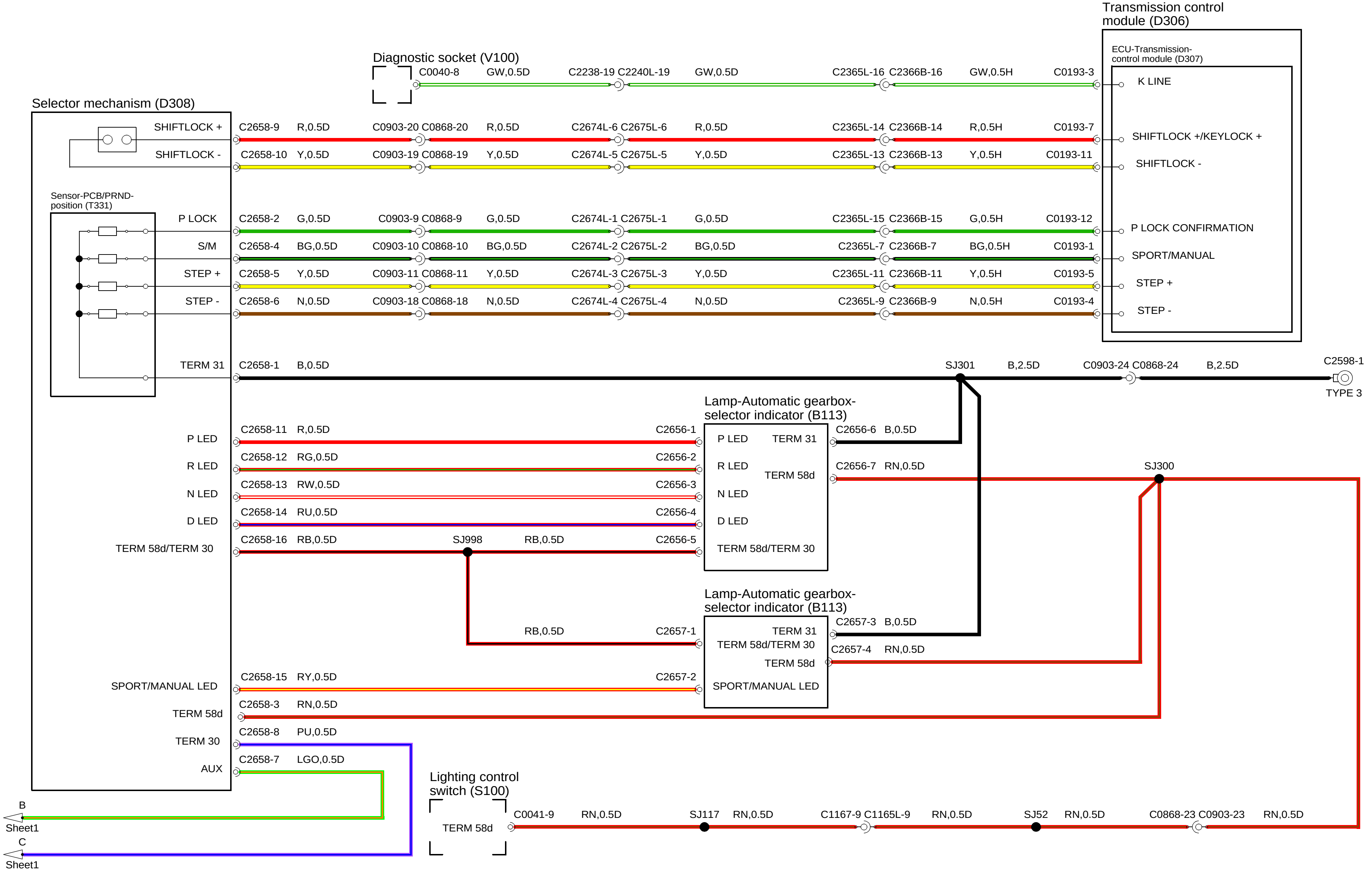

Fuel Injector 0 (T334)
CYL 1
Silver
Silver
C2580-1
BW,1.5
C2518-L3
C2580-2
GW,1.5
C2518-M3
Fuel injector-No.1 (T172)
CYL 4
C0522-1
BY,1.5
C0411-L2
C0522-2
GY,1.5
C0411-L1
Fuel injector-No.2 (T173)
CYL 2
C0523-1
BU,1.5
C2518-L2
C0523-2
GU,1.5
C2518-M2
Fuel injector-No.3 (T174)
CYL 5
C0524-1
BO,1.5
C0411-L3
C0524-2
GR,1.5
C0411-M1
Fuel injector-No.4 (T175)
CYL 3
C0525-1
BG,1.5
C2518-L4
C0525-2
GB,1.5
C2518-M4
Fuel injector-No.5 (T176)
CYL 6
C0526-1
BR,1.5
C0411-M3
C0526-2
GO,1.5
C0411-M2
Viscous fan (M300)
C2270-D
BO,0.75D
C2274L-12 C2273-12
BO,0.75
C0411-K2
C2270-C
KB,0.75D
C2274L-8 C2273-8
BW,0.75
C2518-E1
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
C2147-9
N,0.35
C1254-1
Engine control-module (ECM) (D131)
INJ-COM 0
INJ 0
INJ-COM 1
INJ 1
INJ-COM 2
INJ 2
INJ-COM 3
INJ 3
INJ-COM 4
INJ 4
INJ-COM 5
INJ 5
VCFC
CFM
TPS1
TPA
SGI
CPS
VA2_C
SGJ
CID
VA2_D
VA1A
APP1
SGA
SGB
APP2
VA2A
SCCS_1
SGF
C0411-E1
WU,0.75
C0272-2
C0411-G4
SP,0.75
C0272-3
Throttle-EGR-Inlet (Y160)
Gold
Gold
Gold
C0272-4
RO,0.75
H
Sheet3
C0272-1
NU,0.75
J
Sheet3
C0272-6
YU,0.75
K
Sheet3
C2518-G2
NR,0.75
C0168-3
C2518-F1
WR,0.75
C0168-2
C2518-G1
YR,0.75
C0168-1
Sensor-Crankshaft-position (CKP) (T102)
Gold
Gold
Gold
C2518-H3
NW,0.75
C0176-2
C2518-G4
WP,0.75
C0176-1
C2518-H4
YP,0.75
C0176-3
Sensor-Camshaft-position (CMP) (T107)
Sensor-Position-Accelerator pedal (T113)
C0872L-E1
R,0.5D
C2244L-15 C2242L-15
R,0.5D
C0787L-7
C0872L-D1
RB,0.5D
C2244L-16 C2242L-16
RB,MAPBT
C0787L-2
C0872L-C1
YR,0.5D
C2244L-17 C2242L-17
YLG,MAPBT
C0787L-1
C0872L-B2
Y,0.5D
C2244L-22 C2242L-22
BG,0.5D
C0787L-3
C0872L-C2
U,0.5D
C2244L-21 C2242L-21
U,0.5D
C0787L-5
C0872L-D2
G,0.5D
C2244L-18 C2242L-18
OY,0.5D
C0787L-6
C0872L-C4
R,0.5D
Gold
C2240L-21 C2238-21
C0872L-B4
PU,0.5D
Gold
C2240L-22 C2238-22
Clock spring (S227)
C0082-5
PU,0.35D
C0082-8
R,0.35D

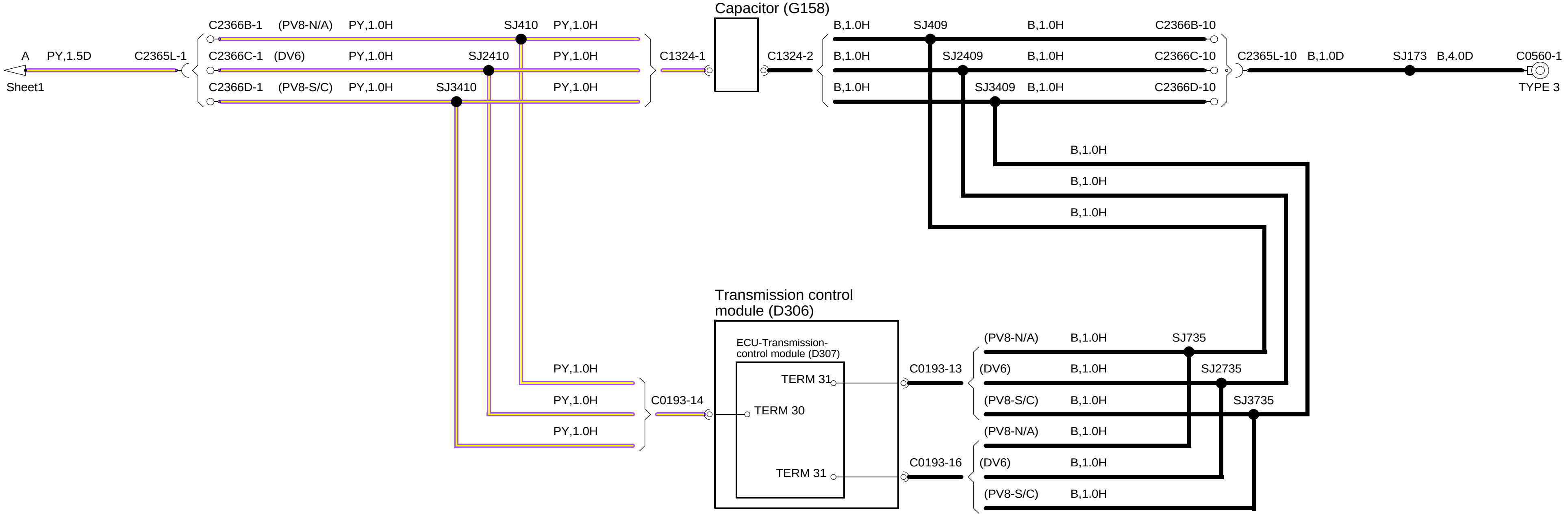

Valve-Control-Fuel volume (N168)
Engine control-module (ECM) (D131)
C
Sheet1
RU,1.0
SJ5
RU,0.75
C2260-1
Silver
C2260-2
Silver
BU,0.75
C0411-J4
VCV
PWR GND 1
C0872L-M3
B,0.75D
SJ476
B,2.5D
C2600L-1
TYPE 3
PWR GND 2
C0872L-M1
B,0.75D
Valve-Control-Fuel pressure (N167)
PWR GND 3
C0872L-M2
B,0.75D
RU,0.75
C2261-1
Silver
C2261-2
Silver
BU,0.75
C0411-K3
PCV
PWR GND 4
C0872L-M4
B,0.75D
Actuator-Vane VGT (D363)
VA2_B
C0411-F1
YR,0.75
SJ3
YR,0.75
C2267-1
Gold
TVP_A
C2518-C4
WB,0.75
C2267-6
Gold
SGD
C0411-F2
NR,0.75
SJ2
NR,0.75
C2267-5
Gold
H
Sheet2
RO,0.75
C2273-17 C2274L-17
VGTA +
C2518-J4
WR,0.75
C2267-3
Gold
VGTA -
C2518-K4
SR,0.75
C2267-4
Gold
E
Sheet1
RU,1.5D
SJ559
RU,0.75D
NU,0.75
J
Sheet2
YU,0.75
K
Sheet2
Fan-E-box (M210)
RU,0.75D
C0646L-2
C0646L-1
R,0.75D
C0872L-J2
EBF
Sensor-Oil-temperature (T128)
EOT
C0411-A1
WG,0.75
C1549-1
SGR
C0411-K1
NG,0.75
C1549-2
Sensor-MAF/IAT (T317)
C0567-3
WY,0.75D
C0872L-F1
IAT
C0567-4
B,0.75D
C0872L-L4
MAF/IAT GND
RU,0.75D
C0567-1
C0567-2
R,0.75D
C0872L-F4
MAF_A+
C2366C-8 C2365L-8
GO,0.5D
C0872L-E3
Transmission control module (D306)
GO,0.5H
C0193-10

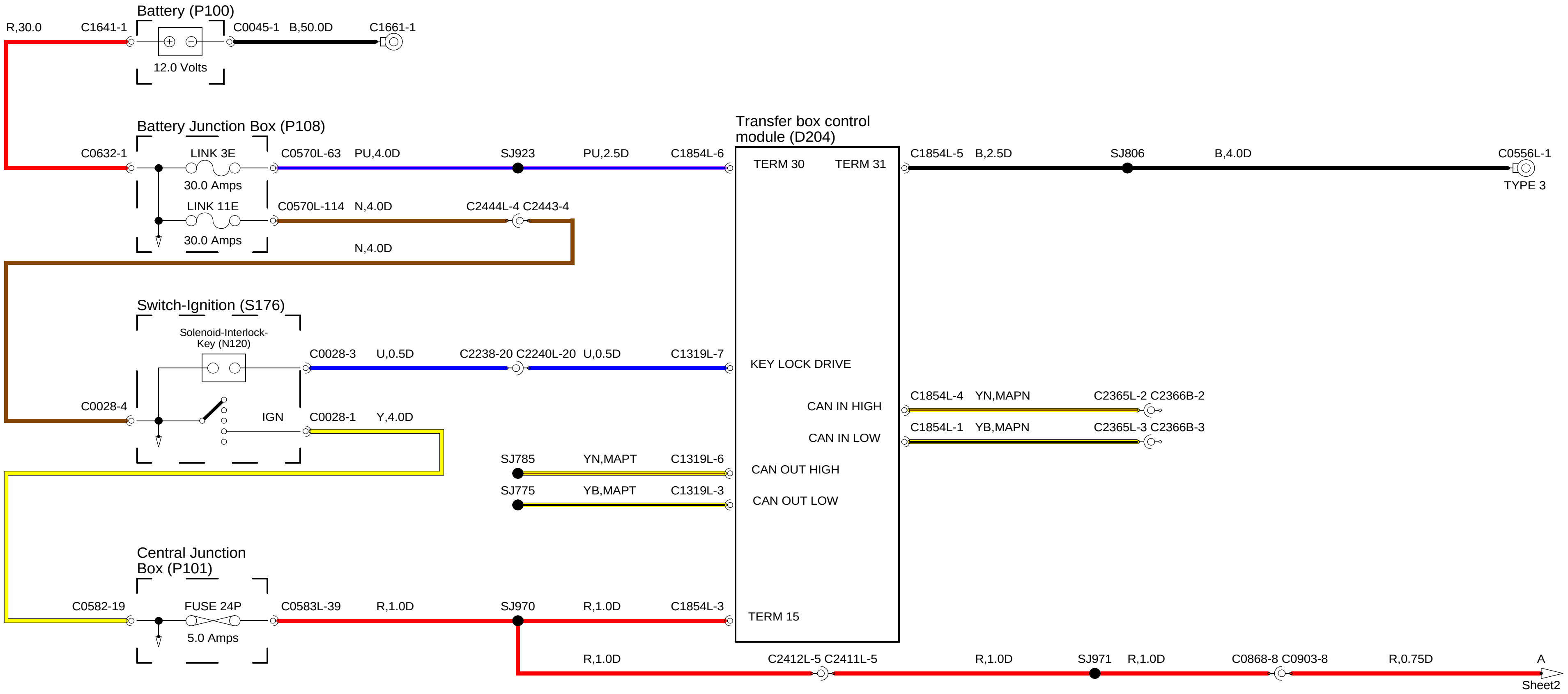

Sensor-Engine coolant-temperature (ECT) (T121)
Gold
Gold
C0169-2 N,0.75
SJ6
NR,0.75
C2518-E2
C0169-1 W,0.75
C2518-C2
Engine control-module (ECM) (D131)
SGC
MAP
ECT_1
VA1_B
C2518-C1 WG,0.5 C0186-2
C2518-D1 YG,0.5 C0186-1
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186-3 NG,0.5
Generator (M100)
C0053-2
(NON ARC) WP,0.75
C0053-3
(ARC) WP,0.75
C0411-H1
ALT_COM
(NON ARC) WG,0.75
Generator (M100)
C0226-2 WP,0.75H C0904-2 C0053-2
(ARC) WG,0.75
C2518-F2
ALT_MON
C0226-1 WG,0.75H C0904-3 C0053-3
Sensor-Temperature-Air charge (T361)
ACT
SGQ
C2518-B1 W,0.75 C2870-1
C2870-2 N,0.75 SJ4
C2518-G3 NR,0.75
Actuator-EGR-Electric (D362)
SGM
C2518-D2 NR,0.75 C2254-6
Gold
EGRA-
C2518-H2 BU,0.75 C2254-4
A
EVPA
C2518-A3 WR,0.75 C2254-2
Gold
EGRA+
C2518-H1 GU,0.75 C2254-3
VA1_F
C2518-C3 YR,0.75 SJ1 YR,0.75 C2254-1
Gold
Sensor-Pressure-Fuel rail (T264)
Silver
Silver
Silver
C2251-2 NG,0.75 C0411-E2
C2251-1 WG,0.75 C0411-D1
C2251-3 YG,0.75 C0411-D2
SGE
RPS
VA1_E
Actuator-EGR-Electric (D362)
YR,0.75 C2255-1
Gold Gold
C2255-6 NR,0.75
EGRB-
C2518-K1 BU,0.75 C2255-4
B
EVPB
C2518-A2 WR,0.75 C2255-2
Gold
EGRB+
C2518-J1 GU,0.75 C2255-3
ABS module (D277)
C0506L-30 GP,0.75D SJ882 GP,0.75D C0872L-G2
B00_1
Stop lamp switch (S215)
C0075L-1 GP,1.5D SJ814 GP,1.5D C2411L-2 C2412L-2 GP,1.5D
Sensor-Temperature-Fuel rail (T125)
FTS
C2518-B2 WU,0.75 C0184-1
C0184-2 NU,0.75
CAN+ (IN)
C0872L-A4 YN,MAPAX C2365L-4 C2366C-4
CAN- (IN)
C0872L-A3 YB,MAPAX C2365L-5 C2366C-5
Sensor-Knock (KS) (T100)
Restraints control module (D171)
C1649-17 YG,0.5D C2242L-7 C2244L-7 YG,0.5D C0872L-E4
CNS_B+
INERTIA EVENT
C0411-D3 NR,0.75 C0627-1
Gold
SJ176 YN,MAPAD C2274L-16 C2273-16 SR,0.75 C0411-B4
CNS_B-
CAN+ (OUT)
C0411-C4 WR,0.75 C0627-2
Gold
SJ177 YB,MAPAD C2274L-15 C2273-15 UR,0.75 C0411-B3
CAN- (OUT)
Sensor-Knock (KS) (T100)
CNS_A+
C0411-E4 NY,0.75 C0626-1
Gold
CNS_A-
C0411-D4 WB,0.75 C0626-2
Gold

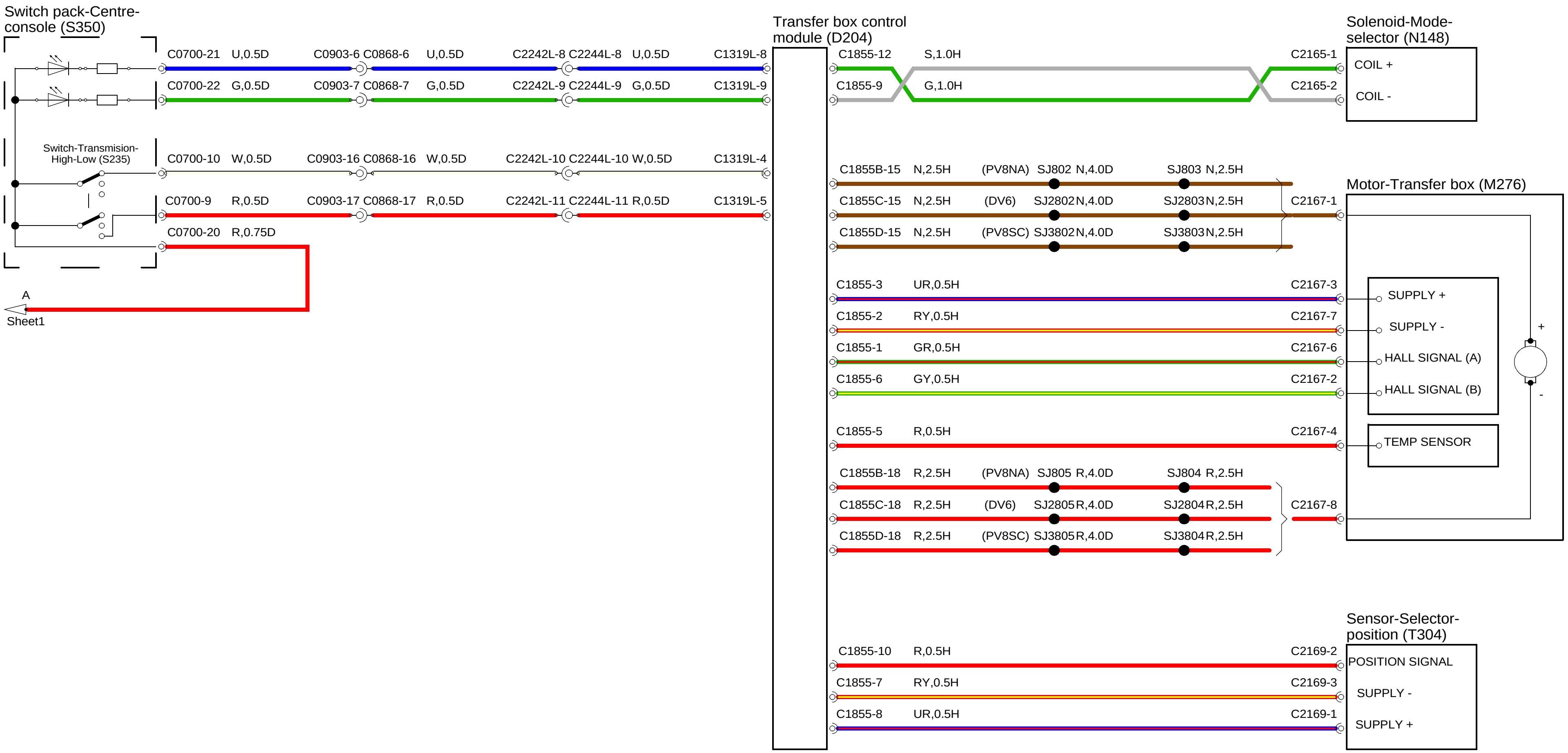

Glow plug (T171)
B
Sheet1
Y,6.0D
SJ902
YB,1.5D
C2581-1
C2583-1
YB,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-2
C2583-2
YB,1.5
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-3
C2583-3
YB,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
A
Sheet1
YB,6.0D
SJ901
YB,1.5D
C2582-1
C2583-1
YB,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-2
C2583-2
YB,1.5
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-3
C2583-3
YB,1.5
C0478-1
Earth via-
fixings (E110)
Unit-Fuel Tank (D179)
F
Sheet1
WP,2.5D
C0377-17
C0391-17
WP,2.5D
SJ17
WP,4.0D
WP,2.5D
SJ15
C0114-4


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
A
Sheet3
Transmission control module (D306)
ECU-Transmission-control module (D307)
Mechatronics (Y262)
SV
PR2
PR4
PR/SV
PR1
PR3
PR5
PR6
Battery Junction Box (P108)
C0632-1
FUSE 30E
10.0 Amps
C0570L-180
PY,1.5D
Relay-Starter (R102)
C2366B-8
(PV8-N/A)
GO,0.5H
C0570L-34
GO,0.5D
SJ592
GO,0.5D
C2365L-8
C2366C-8
(DV6)
GO,0.5H
C0193-10
P/N SIGNAL
C2366D-8
(PV8-S/C)
GO,0.5H
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Sensor-Shaft output-speed (T329)
Sensor-Turbine-speed (T330)
N,4.0D
Sensor-Oil-temperature (T128)
Switch-Ignition (S176)
SJ720
(PV8-N/A)
YN,0.5H
IGN
C0028-1
Y,4.0D
SJ2720
(DV6)
YN,0.5H
C0193-6
CAN HIGH
C0028-4
SENSOR +
AUX
C0028-6
W,1.5D
SJ3720
(PV8-S/C)
YN,0.5H
HALL SENSOR 1
P
R
SJ721
(PV8-N/A)
YB,0.5H
SJ2721
(DV6)
YB,0.5H
C0193-2
HALL SENSOR 2
CAN LOW
N
SJ3721
(PV8-S/C)
YB,0.5H
D
Central Junction Box (P101)
HALL SENSOR 3
5
C2366B-6
(PV8-N/A)
GW,1.0H
4
C0582-19
FUSE 64P
C0584L-24
LGO,0.75D
C2365L-6
C2366C-6
(DV6)
GW,1.0H
C0193-9
TERM 15
3
5.0 Amps
C2366D-6
(PV8-S/C)
GW,1.0H
HALL SENSOR 4
C0582-30
FUSE 33P
C0585L-14
GK,1.5D
SJ119
SENSOR -
5.0 Amps
C0583L-22
FUSE 44P
C0582-45
PU,0.5D
GK,0.5D
C2053-11 C2054-11
LGO,0.5D
B
5.0 Amps
Sheet2
C1167-3 C1165L-3
PU,0.5D
C2053-10 C2054-10
PU,0.5D
C
Sheet2

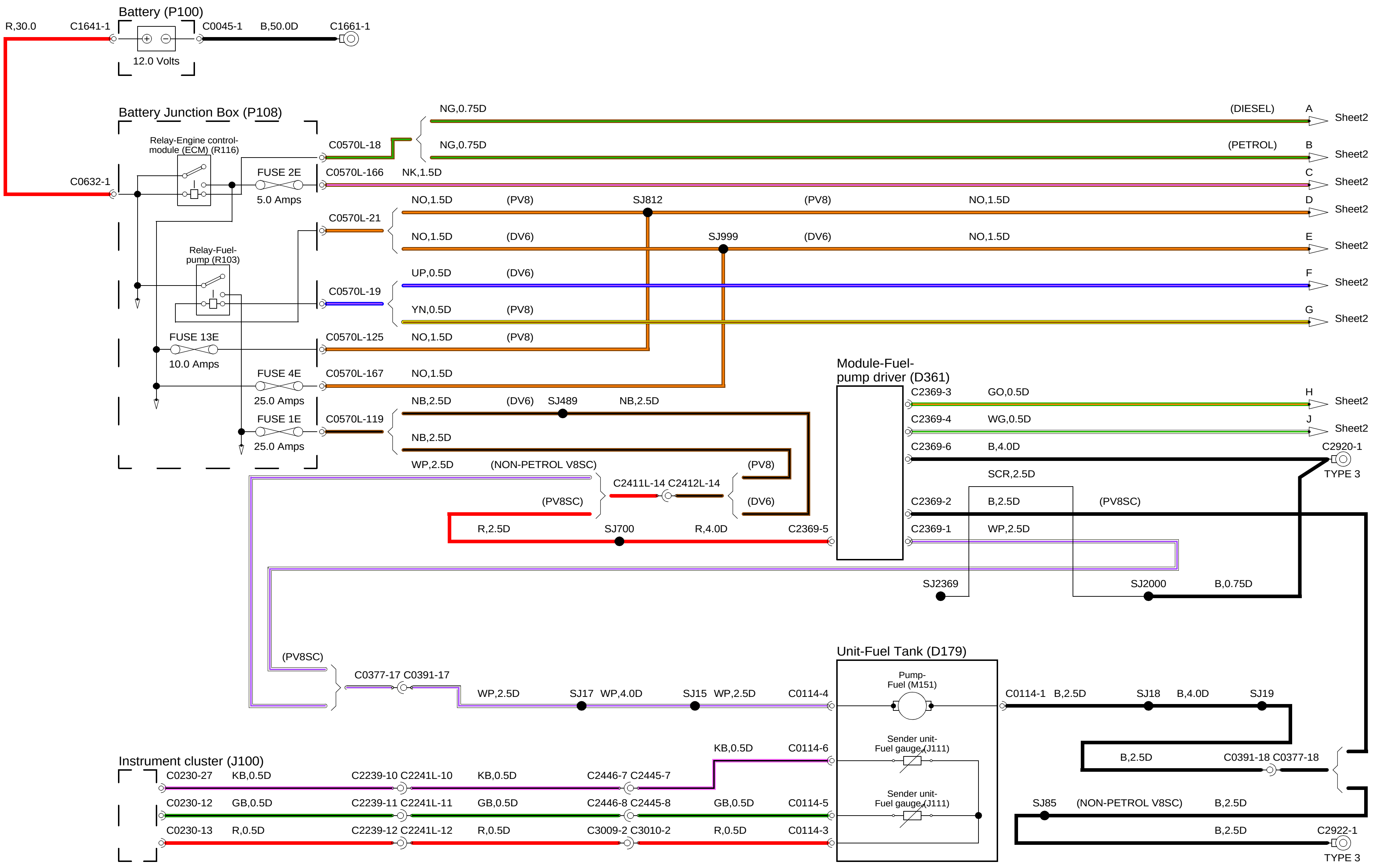

Transmission control module (D306)
ECU-Transmission-control module (D307)
K LINE
SHIFTLOCK +/KEYLOCK +
SHIFTLOCK -
P LOCK CONFIRMATION
SPORT/MANUAL
STEP +
STEP -
Diagnostic socket (V100)
C0040-8
GW,0.5D
C2238-19 C2240L-19
GW,0.5D
C2365L-16 C2366B-16
GW,0.5H
C0193-3
Selector mechanism (D308)
SHIFTLOCK +
SHIFTLOCK -
C2658-9
R,0.5D
C0903-20 C0868-20
R,0.5D
C2674L-6 C2675L-6
R,0.5D
C2365L-14 C2366B-14
R,0.5H
C0193-7
C2658-10
Y,0.5D
C0903-19 C0868-19
Y,0.5D
C2674L-5 C2675L-5
Y,0.5D
C2365L-13 C2366B-13
Y,0.5H
C0193-11
Sensor-PCB/PRND-position (T331)
P LOCK
C2658-2
G,0.5D
C0903-9 C0868-9
G,0.5D
C2674L-1 C2675L-1
G,0.5D
C2365L-15 C2366B-15
G,0.5H
C0193-12
S/M
C2658-4
BG,0.5D
C0903-10 C0868-10
BG,0.5D
C2674L-2 C2675L-2
BG,0.5D
C2365L-7 C2366B-7
BG,0.5H
C0193-1
STEP +
C2658-5
Y,0.5D
C0903-11 C0868-11
Y,0.5D
C2674L-3 C2675L-3
Y,0.5D
C2365L-11 C2366B-11
Y,0.5H
C0193-5
STEP -
C2658-6
N,0.5D
C0903-18 C0868-18
N,0.5D
C2674L-4 C2675L-4
N,0.5D
C2365L-9 C2366B-9
N,0.5H
C0193-4
TERM 31
C2658-1
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Lamp-Automatic gearbox-selector indicator (B113)
P LED
C2658-11
R,0.5D
C2656-1
P LED
TERM 31
C2656-6
B,0.5D
R LED
C2658-12
RG,0.5D
C2656-2
R LED
TERM 58d
C2656-7
RN,0.5D
SJ300
N LED
C2658-13
RW,0.5D
C2656-3
N LED
D LED
C2658-14
RU,0.5D
C2656-4
D LED
TERM 58d/TERM 30
C2658-16
RB,0.5D
SJ998
RB,0.5D
C2656-5
TERM 58d/TERM 30
Lamp-Automatic gearbox-selector indicator (B113)
RB,0.5D
C2657-1
TERM 31
TERM 58d/TERM 30
TERM 58d
C2657-3
B,0.5D
C2657-4
RN,0.5D
SPORT/MANUAL LED
C2658-15
RY,0.5D
C2657-2
SPORT/MANUAL LED
TERM 58d
C2658-3
RN,0.5D
TERM 30
C2658-8
PU,0.5D
AUX
C2658-7
LGO,0.5D
B
Sheet1
C
Sheet1
Lighting control switch (S100)
TERM 58d
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1167-9 C1165L-9
RN,0.5D
SJ52
RN,0.5D
C0868-23 C0903-23
RN,0.5D

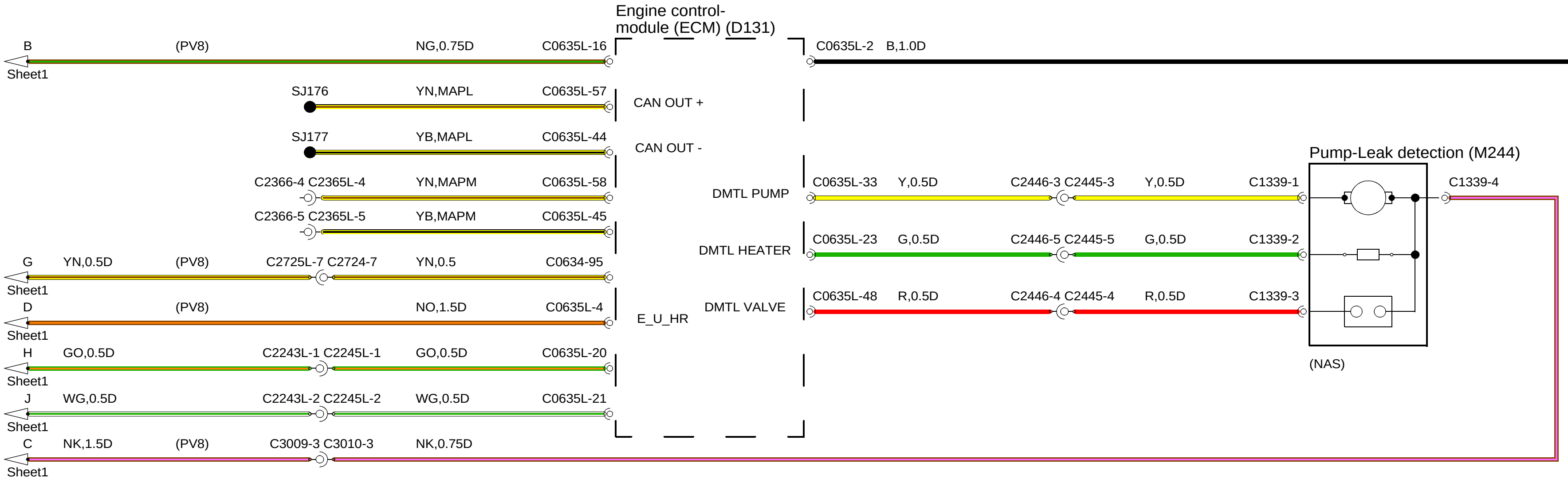

Capacitor (G158)
A
PY,1.5D
C2365L-1
Sheet1
C2366B-1
(PV8-N/A)
PY,1.0H
SJ410
PY,1.0H
C2366C-1
(DV6)
PY,1.0H
SJ2410
PY,1.0H
C2366D-1
(PV8-S/C)
PY,1.0H
SJ3410
PY,1.0H
C1324-1
C1324-2
B,1.0H
SJ409
B,1.0H
C2366B-10
B,1.0H
SJ2409
B,1.0H
C2366C-10
C2365L-10
B,1.0D
SJ173
B,4.0D
C0560-1
B,1.0H
SJ3409
B,1.0H
C2366D-10
TYPE 3
B,1.0H
B,1.0H
B,1.0H
Transmission control module (D306)
ECU-Transmission-control module (D307)
TERM 31
TERM 30
TERM 31
PY,1.0H
PY,1.0H
PY,1.0H
C0193-14
C0193-13
C0193-16
(PV8-N/A)
B,1.0H
SJ735
(DV6)
B,1.0H
SJ2735
(PV8-S/C)
B,1.0H
SJ3735
(PV8-N/A)
B,1.0H
(DV6)
B,1.0H
(PV8-S/C)
B,1.0H

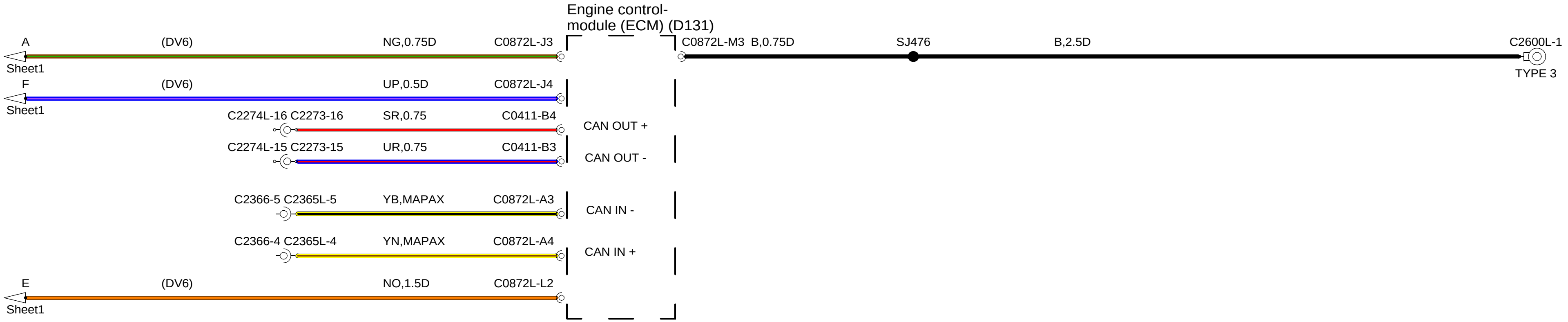

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 3E
30.0 Amps
C0570L-63
PU,4.0D
SJ923
PU,2.5D
C1854L-6
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Transfer box control module (D204)
TERM 30
TERM 31
C1854L-5
B,2.5D
SJ806
B,4.0D
C0556L-1
TYPE 3
Switch-Ignition (S176)
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240L-20
U,0.5D
C1319L-7
KEY LOCK DRIVE
C0028-4
IGN
C0028-1
Y,4.0D
C1854L-4
YN,MAPN
C2365L-2 C2366B-2
CAN IN HIGH
C1854L-1
YB,MAPN
C2365L-3 C2366B-3
CAN IN LOW
SJ785
YN,MAPT
C1319L-6
CAN OUT HIGH
SJ775
YB,MAPT
C1319L-3
CAN OUT LOW
Central Junction Box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D
SJ970
R,1.0D
C1854L-3
TERM 15
R,1.0D
C2412L-5 C2411L-5
R,1.0D
SJ971
R,1.0D
C0868-8 C0903-8
R,0.75D
A
Sheet2

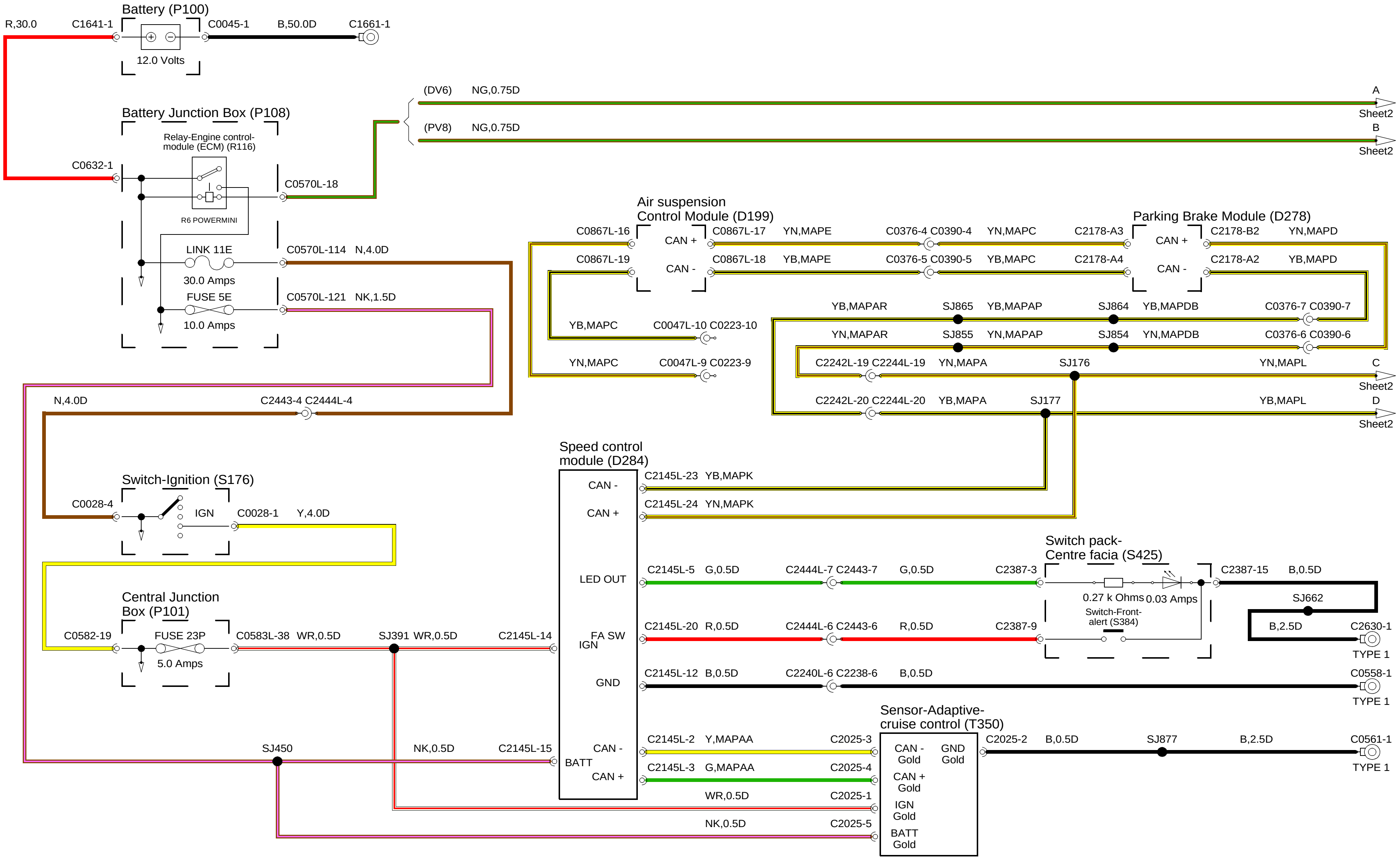

Switch pack-Centre-console (S350)
Switch-Transmision-High-Low (S235)
A
Sheet1
C0700-21 U,0.5D
C0903-6 C0868-6 U,0.5D
C2242L-8 C2244L-8 U,0.5D
C1319L-8
C0700-22 G,0.5D
C0903-7 C0868-7 G,0.5D
C2242L-9 C2244L-9 G,0.5D
C1319L-9
C0700-10 W,0.5D
C0903-16 C0868-16 W,0.5D
C2242L-10 C2244L-10 W,0.5D
C1319L-4
C0700-9 R,0.5D
C0903-17 C0868-17 R,0.5D
C2242L-11 C2244L-11 R,0.5D
C1319L-5
C0700-20 R,0.75D
Transfer box control module (D204)
C1855-12 S,1.0H
C1855-9 G,1.0H
C2165-1
C2165-2
Solenoid-Mode-selector (N148)
COIL +
COIL -
C1855B-15 N,2.5H (PV8NA) SJ802 N,4.0D SJ803 N,2.5H
C1855C-15 N,2.5H (DV6) SJ2802 N,4.0D SJ2803 N,2.5H
C1855D-15 N,2.5H (PV8SC) SJ3802 N,4.0D SJ3803 N,2.5H
C2167-1
Motor-Transfer box (M276)
C1855-3 UR,0.5H C2167-3
C1855-2 RY,0.5H C2167-7
C1855-1 GR,0.5H C2167-6
C1855-6 GY,0.5H C2167-2
C1855-5 R,0.5H C2167-4
SUPPLY +
SUPPLY -
HALL SIGNAL (A)
HALL SIGNAL (B)
TEMP SENSOR
+
-
C1855B-18 R,2.5H (PV8NA) SJ805 R,4.0D SJ804 R,2.5H
C1855C-18 R,2.5H (DV6) SJ2805 R,4.0D SJ2804 R,2.5H
C1855D-18 R,2.5H (PV8SC) SJ3805 R,4.0D SJ3804 R,2.5H
C2167-8
Sensor-Selector-position (T304)
C1855-10 R,0.5H C2169-2
C1855-7 RY,0.5H C2169-3
C1855-8 UR,0.5H C2169-1
POSITION SIGNAL
SUPPLY -
SUPPLY +

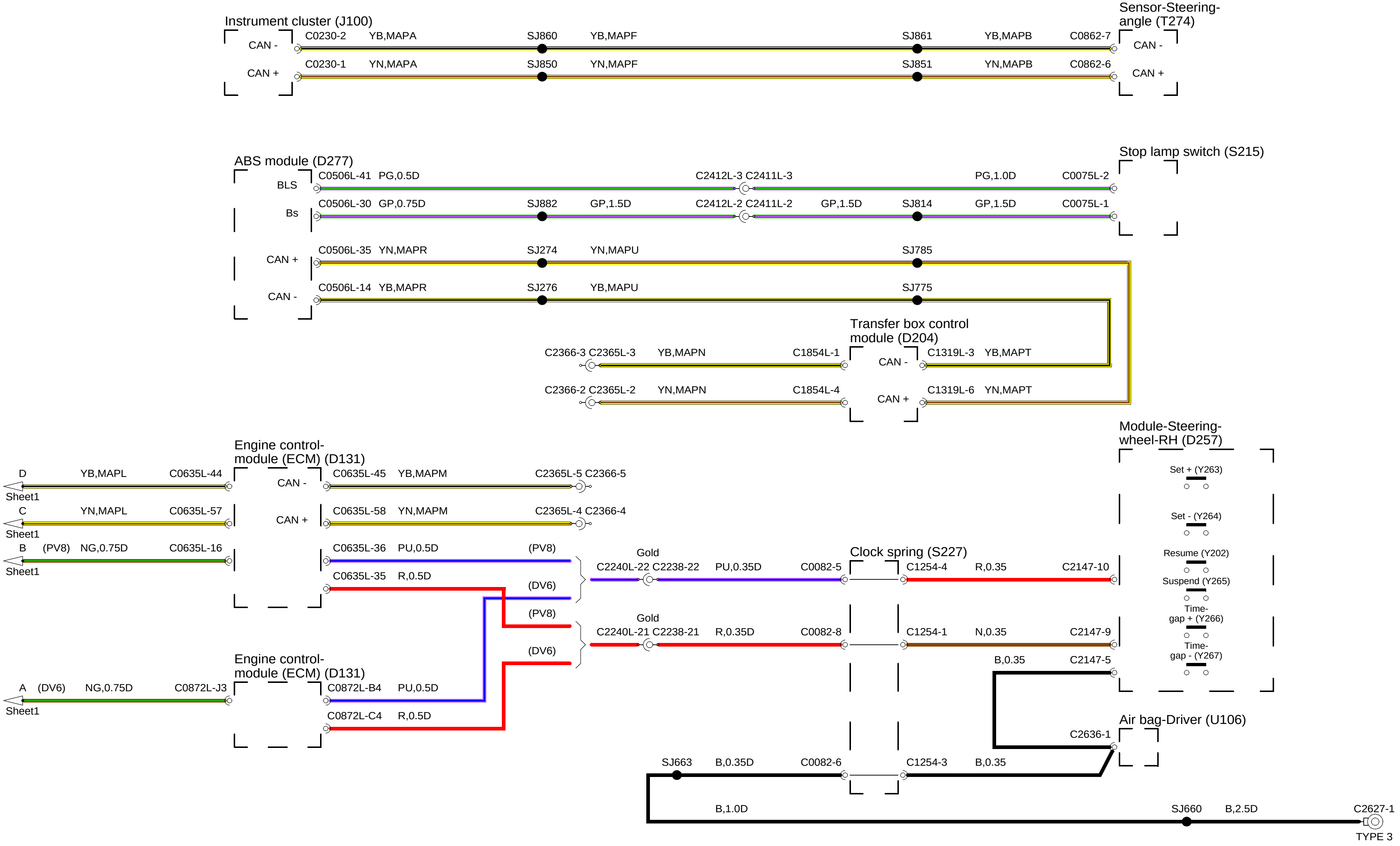
310-01 FUEL TANK AND FUEL LINES

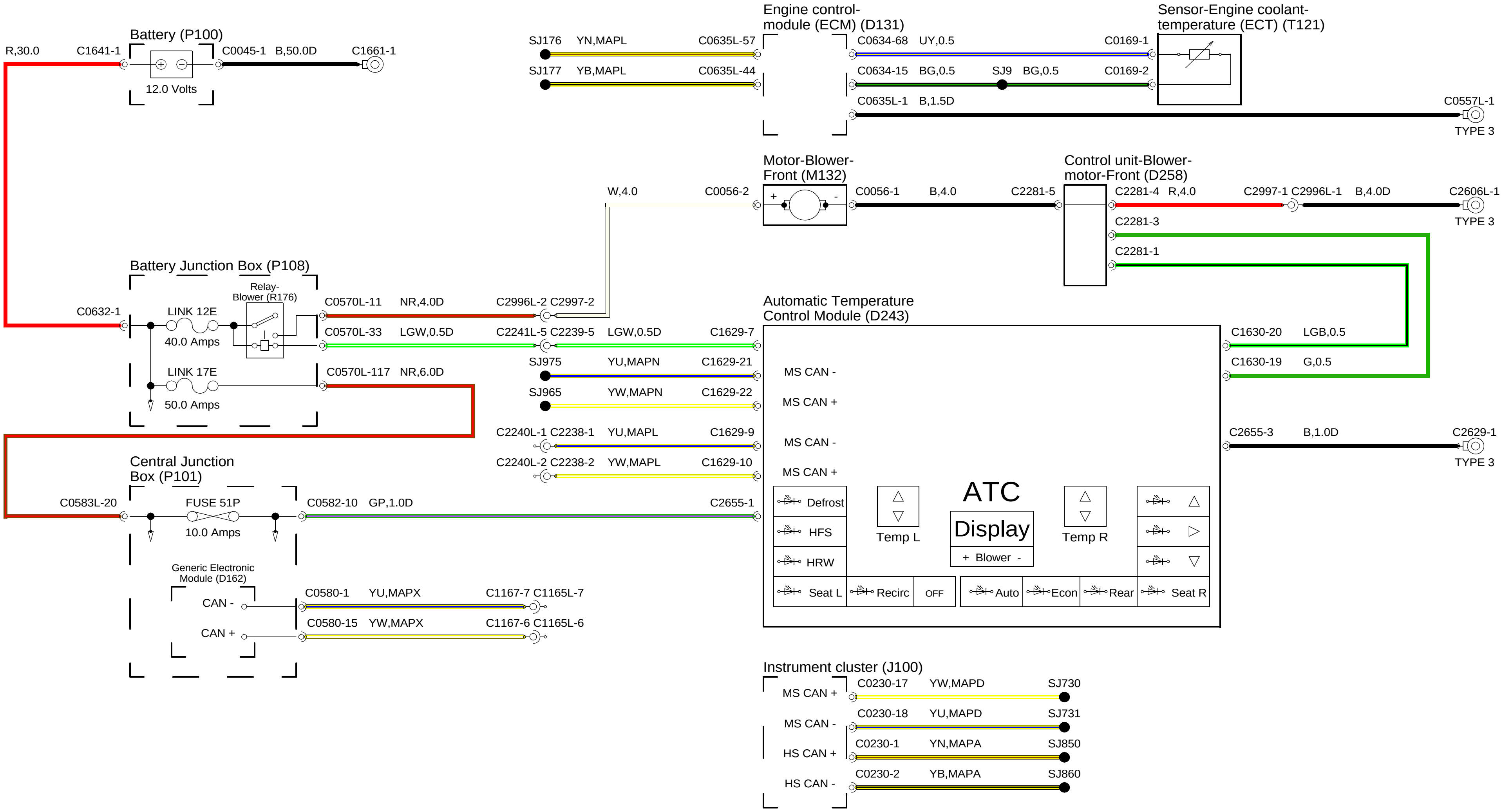

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
FUSE 2E
5.0 Amps
Relay-Fuel-pump (R103)
FUSE 13E
10.0 Amps
FUSE 4E
25.0 Amps
FUSE 1E
25.0 Amps
C0570L-18
C0570L-166
C0570L-21
C0570L-19
C0570L-125
C0570L-167
C0570L-119
NG,0.75D
(DIESEL)
A
Sheet2
NG,0.75D
(PETROL)
B
Sheet2
NK,1.5D
C
Sheet2
NO,1.5D
(PV8)
SJ812
(PV8)
NO,1.5D
D
Sheet2
NO,1.5D
(DV6)
SJ999
(DV6)
NO,1.5D
E
Sheet2
UP,0.5D
(DV6)
F
Sheet2
YN,0.5D
(PV8)
G
Sheet2
NO,1.5D
(PV8)
NO,1.5D
NB,2.5D
(DV6)
SJ489
NB,2.5D
NB,2.5D
WP,2.5D
(NON-PETROL V8SC)
(PV8)
C2411L-14 C2412L-14
(PV8SC)
(DV6)
R,2.5D
SJ700
R,4.0D
C2369-5
Module-Fuel-pump driver (D361)
C2369-3
GO,0.5D
H
Sheet2
C2369-4
WG,0.5D
J
Sheet2
C2369-6
B,4.0D
C2920-1
TYPE 3
SCR,2.5D
C2369-2
B,2.5D
(PV8SC)
C2369-1
WP,2.5D
SJ2369
SJ2000
B,0.75D
Unit-Fuel Tank (D179)
Pump-Fuel (M151)
Sender unit-Fuel gauge (J111)
Sender unit-Fuel gauge (J111)
(PV8SC)
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
C0114-1
B,2.5D
SJ18
B,4.0D
SJ19
B,2.5D
C0391-18 C0377-18
KB,0.5D
C0114-6
Instrument cluster (J100)
C0230-27
KB,0.5D
C2239-10 C2241L-10
KB,0.5D
C2446-7 C2445-7
C0230-12
GB,0.5D
C2239-11 C2241L-11
GB,0.5D
C2446-8 C2445-8
GB,0.5D
C0114-5
SJ85
(NON-PETROL V8SC)
B,2.5D
C0230-13
R,0.5D
C2239-12 C2241L-12
R,0.5D
C3009-2 C3010-2
R,0.5D
C0114-3
B,2.5D
C2922-1
TYPE 3

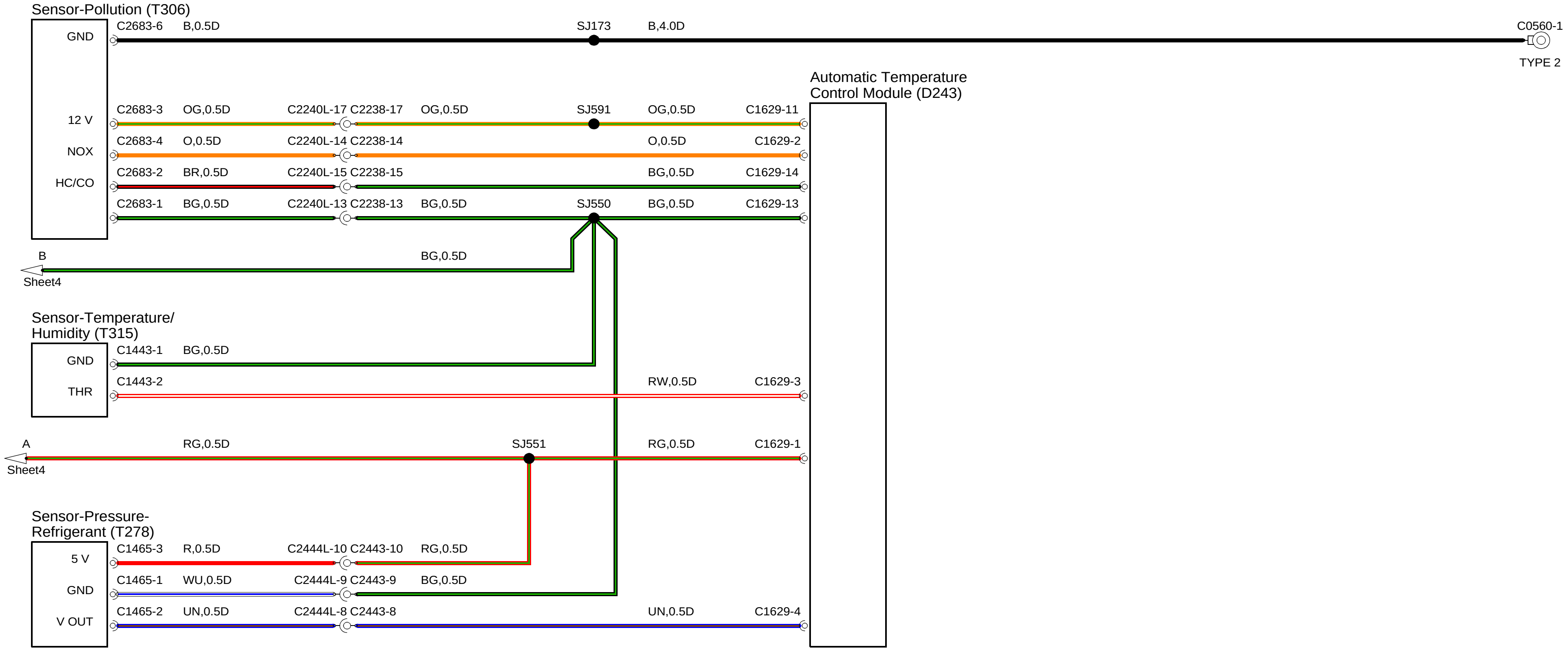

Engine control-module (ECM) (D131)
B
Sheet1
(PV8)
NG,0.75D
C0635L-16
C0635L-2
B,1.0D
C2650L-1
TYPE 3
SJ176
YN,MAPL
C0635L-57
CAN OUT +
SJ177
YB,MAPL
C0635L-44
CAN OUT -
Pump-Leak detection (M244)
C2366-4 C2365L-4
YN,MAPM
C0635L-58
DMTL PUMP
C0635L-33
Y,0.5D
C2446-3 C2445-3
Y,0.5D
C1339-1
C1339-4
C2366-5 C2365L-5
YB,MAPM
C0635L-45
G
YN,0.5D
(PV8)
C2725L-7 C2724-7
YN,0.5
C0634-95
Sheet1
DMTL HEATER
C0635L-23
G,0.5D
C2446-5 C2445-5
G,0.5D
C1339-2
D
(PV8)
NO,1.5D
C0635L-4
E_U_HR
DMTL VALVE
C0635L-48
R,0.5D
C2446-4 C2445-4
R,0.5D
C1339-3
Sheet1
(NAS)
H
GO,0.5D
C2243L-1 C2245L-1
GO,0.5D
C0635L-20
Sheet1
J
WG,0.5D
C2243L-2 C2245L-2
WG,0.5D
C0635L-21
Sheet1
C
NK,1.5D
(PV8)
C3009-3 C3010-3
NK,0.75D
Sheet1

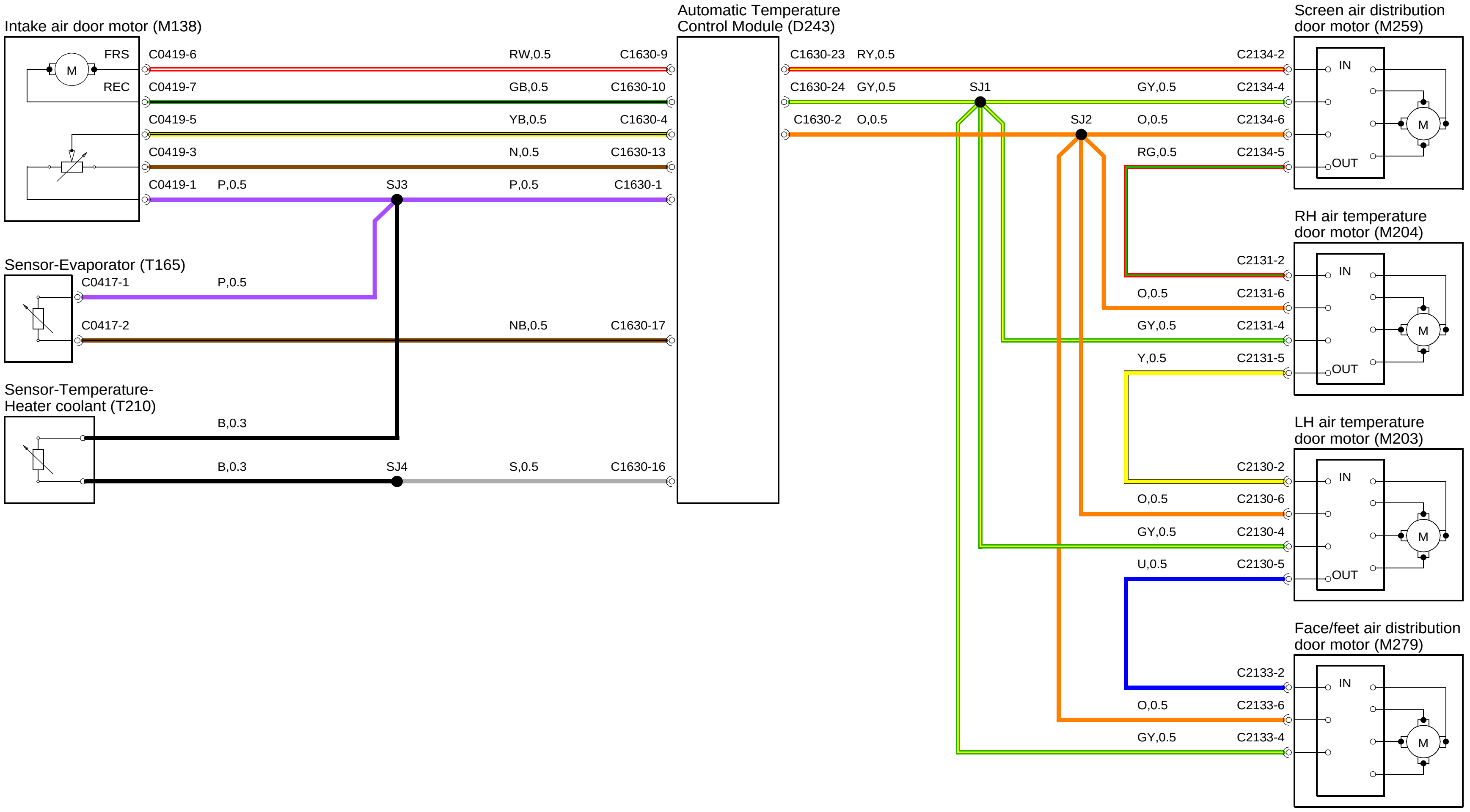

Engine control-module (ECM) (D131)
A
Sheet1
(DV6)
NG,0.75D
C0872L-J3
C0872L-M3
B,0.75D
SJ476
B,2.5D
C2600L-1
TYPE 3
F
Sheet1
(DV6)
UP,0.5D
C0872L-J4
C2274L-16 C2273-16
SR,0.75
C0411-B4
CAN OUT +
C2274L-15 C2273-15
UR,0.75
C0411-B3
CAN OUT -
C2366-5 C2365L-5
YB,MAPAX
C0872L-A3
CAN IN -
C2366-4 C2365L-4
YN,MAPAX
C0872L-A4
CAN IN +
E
Sheet1
(DV6)
NO,1.5D
C0872L-L2

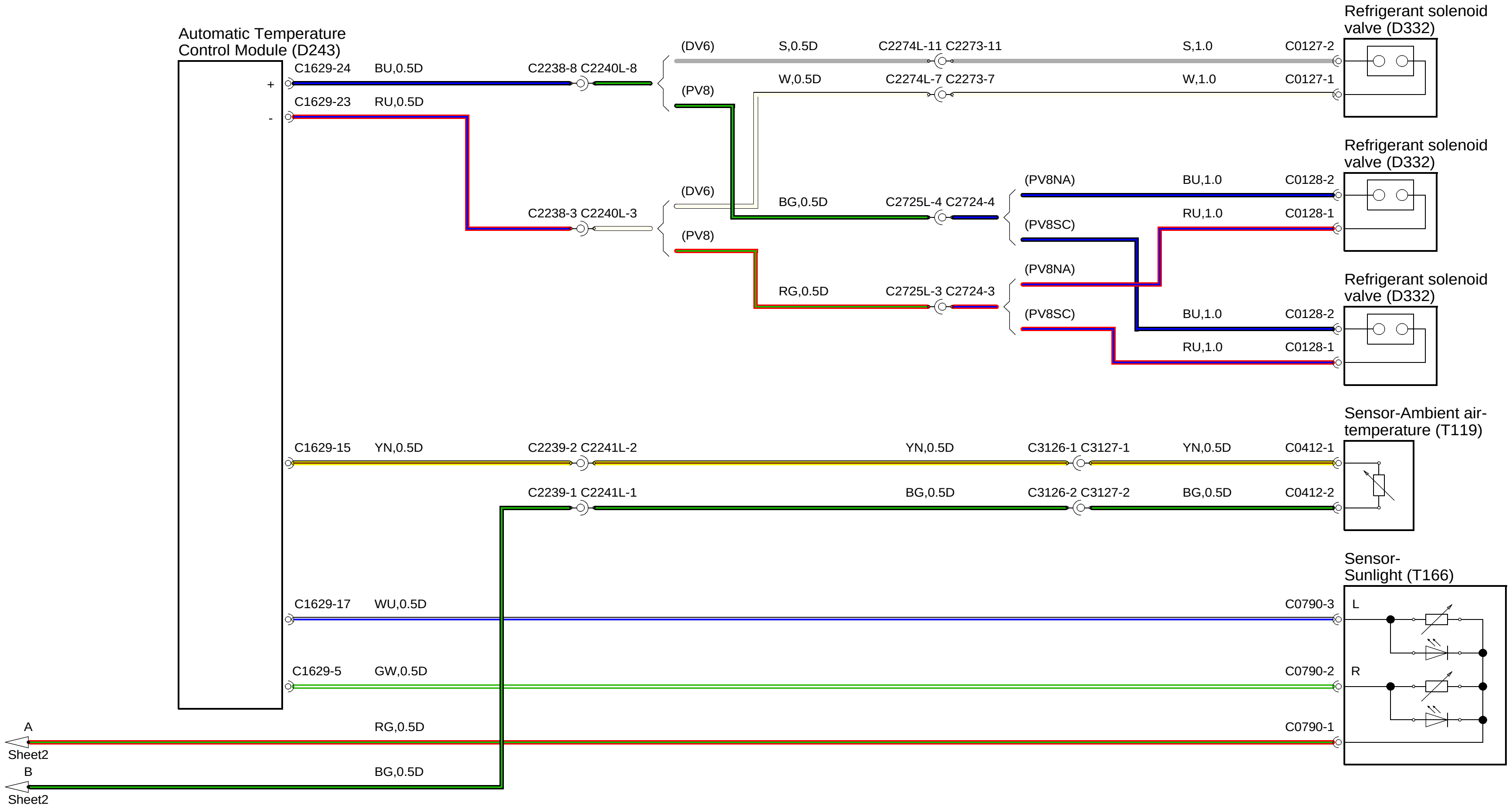

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
R6 POWERMINI
C0632-1
C0570L-18
(DV6)
NG,0.75D
A
Sheet2
(PV8)
NG,0.75D
B
Sheet2
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
FUSE 5E
10.0 Amps
C0570L-121
NK,1.5D
Air suspension Control Module (D199)
C0867L-16
CAN +
C0867L-17
YN,MAPE
C0867L-19
CAN -
C0867L-18
YB,MAPE
C0376-4 C0390-4
YN,MAPC
C0376-5 C0390-5
YB,MAPC
Parking Brake Module (D278)
C2178-A3
CAN +
C2178-B2
YN,MAPD
C2178-A4
CAN -
C2178-A2
YB,MAPD
YB,MAPAR
SJ865
YB,MAPAP
SJ864
YB,MAPDB
C0376-7 C0390-7
YN,MAPAR
SJ855
YN,MAPAP
SJ854
YN,MAPDB
C0376-6 C0390-6
YB,MAPC
C0047L-10 C0223-10
YN,MAPC
C0047L-9 C0223-9
C2242L-19 C2244L-19
YN,MAPA
SJ176
YN,MAPL
C
Sheet2
C2242L-20 C2244L-20
YB,MAPA
SJ177
YB,MAPL
D
Sheet2
N,4.0D
C2443-4 C2444L-4
Speed control module (D284)
CAN -
C2145L-23
YB,MAPK
CAN +
C2145L-24
YN,MAPK
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Switch pack-Centre facia (S425)
LED OUT
C2145L-5
G,0.5D
C2444L-7 C2443-7
G,0.5D
C2387-3
C2387-15
B,0.5D
0.27 k Ohms
0.03 Amps
Switch-Front-alert (S384)
SJ662
B,2.5D
C2630-1
TYPE 1
Central Junction Box (P101)
C0582-19
FUSE 23P
5.0 Amps
C0583L-38
WR,0.5D
SJ391
WR,0.5D
C2145L-14
FA SW
IGN
C2145L-20
R,0.5D
C2444L-6 C2443-6
R,0.5D
C2387-9
GND
C2145L-12
B,0.5D
C2240L-6 C2238-6
B,0.5D
C0558-1
TYPE 1
Sensor-Adaptive-cruise control (T350)
C2145L-2
Y,MAPAA
C2025-3
CAN -
Gold
GND
Gold
C2025-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 1
SJ450
NK,0.5D
C2145L-15
CAN -
BATT
CAN +
C2145L-3
G,MAPAA
C2025-4
CAN +
Gold
WR,0.5D
C2025-1
IGN
Gold
NK,0.5D
C2025-5
BATT
Gold

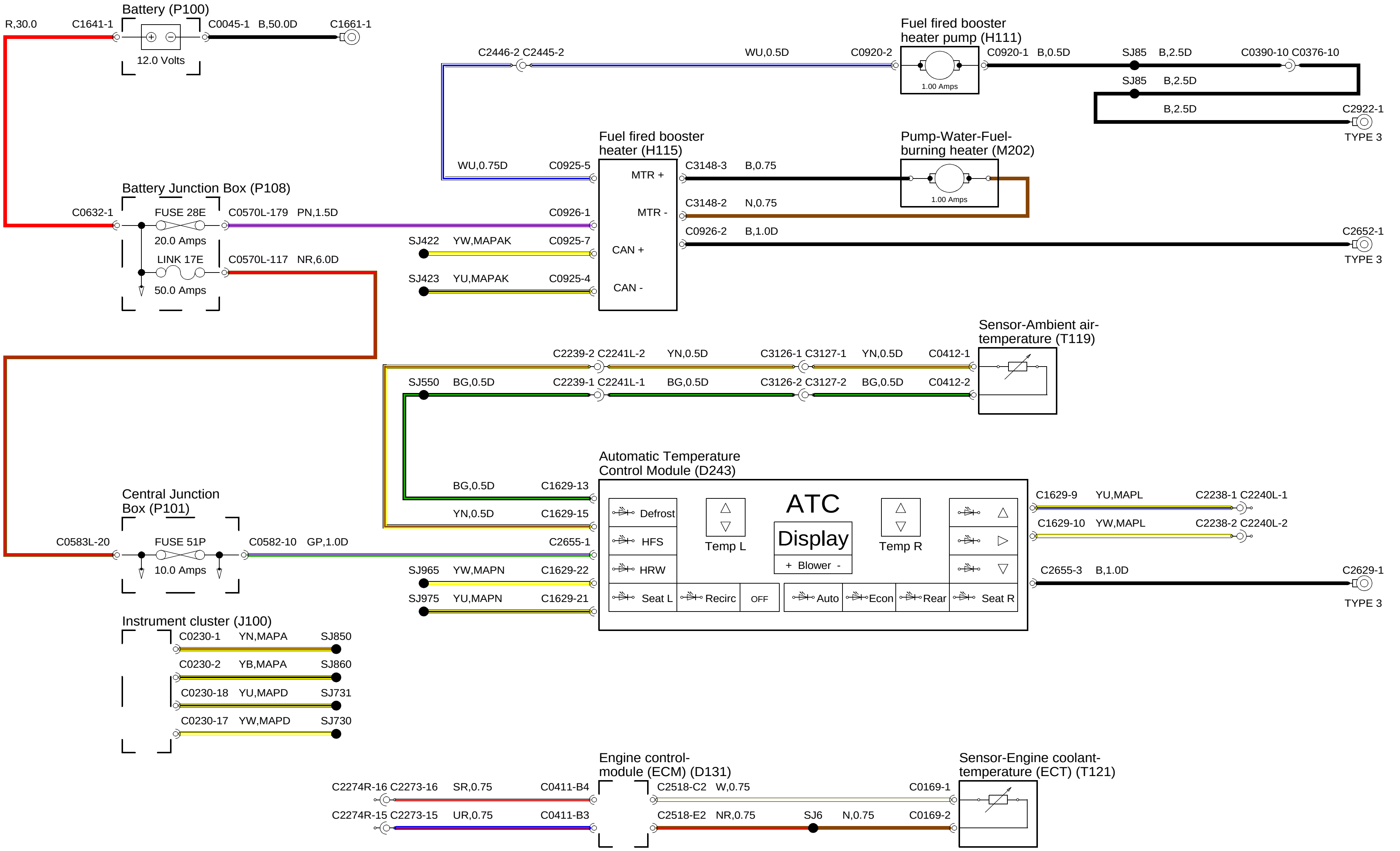

Instrument cluster (J100)
CAN -
CAN +
C0230-2
YB,MAPA
SJ860
YB,MAPF
SJ861
YB,MAPB
C0862-7
C0230-1
YN,MAPA
SJ850
YN,MAPF
SJ851
YN,MAPB
C0862-6
Sensor-Steering-angle (T274)
CAN -
CAN +
ABS module (D277)
BLS
Bs
CAN +
CAN -
C0506L-41
PG,0.5D
C2412L-3 C2411L-3
PG,1.0D
C0075L-2
C0506L-30
GP,0.75D
SJ882
GP,1.5D
C2412L-2 C2411L-2
GP,1.5D
SJ814
GP,1.5D
C0075L-1
Stop lamp switch (S215)
C0506L-35
YN,MAPR
SJ274
YN,MAPU
SJ785
C0506L-14
YB,MAPR
SJ276
YB,MAPU
SJ775
Transfer box control module (D204)
C2366-3 C2365L-3
YB,MAPN
C1854L-1
CAN -
C1319L-3
YB,MAPT
C2366-2 C2365L-2
YN,MAPN
C1854L-4
CAN +
C1319L-6
YN,MAPT
Engine control-module (ECM) (D131)
D
YB,MAPL
C0635L-44
Sheet1
CAN -
C0635L-45
YB,MAPM
C2365L-5 C2366-5
C
YN,MAPL
C0635L-57
Sheet1
CAN +
C0635L-58
YN,MAPM
C2365L-4 C2366-4
B
(PV8)
NG,0.75D
C0635L-16
Sheet1
C0635L-36
PU,0.5D
(PV8)
C0635L-35
R,0.5D
(DV6)
(PV8)
(DV6)
Gold
C2240L-22 C2238-22
PU,0.35D
C0082-5
Clock spring (S227)
C1254-4
R,0.35
C2147-10
Gold
C2240L-21 C2238-21
R,0.35D
C0082-8
C1254-1
N,0.35
C2147-9
B,0.35
C2147-5
Module-Steering-wheel-RH (D257)
Set + (Y263)
Set - (Y264)
Resume (Y202)
Suspend (Y265)
Time-gap + (Y266)
Time-gap - (Y267)
Engine control-module (ECM) (D131)
A
(DV6)
NG,0.75D
C0872L-J3
Sheet1
C0872L-B4
PU,0.5D
C0872L-C4
R,0.5D
Air bag-Driver (U106)
C2636-1
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

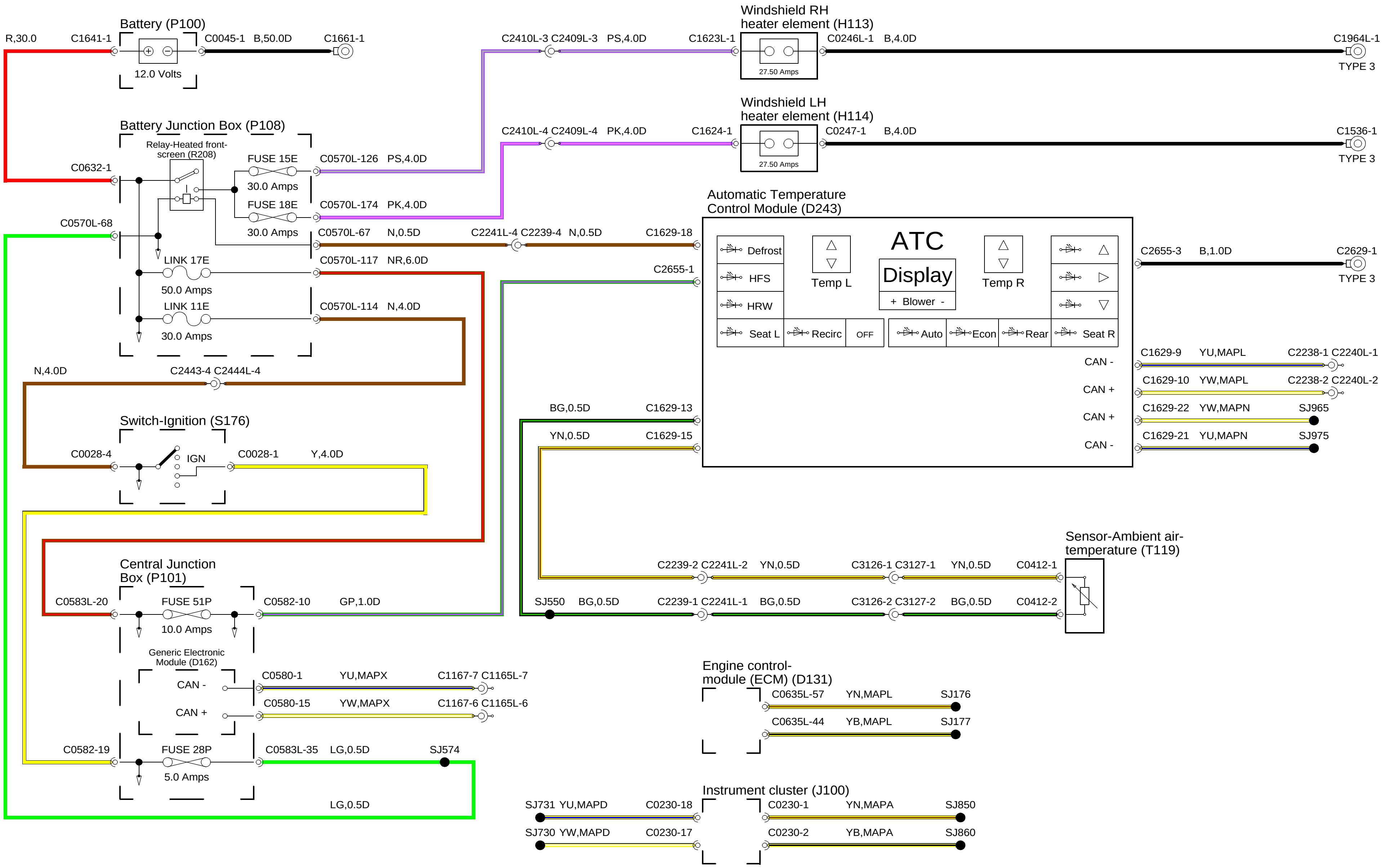

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ176
YN,MAPL
C0635L-57
SJ177
YB,MAPL
C0635L-44
Engine control-module (ECM) (D131)
C0634-68
UY,0.5
C0169-1
C0634-15
BG,0.5
SJ9
BG,0.5
C0169-2
C0635L-1
B,1.5D
Sensor-Engine coolant-temperature (ECT) (T121)
C0557L-1
TYPE 3
Motor-Blower-Front (M132)
W,4.0
C0056-2
C0056-1
B,4.0
C2281-5
Control unit-Blower-motor-Front (D258)
C2281-4
R,4.0
C2997-1 C2996L-1
B,4.0D
C2606L-1
TYPE 3
C2281-3
C2281-1
Battery Junction Box (P108)
Relay-Blower (R176)
C0632-1
LINK 12E
40.0 Amps
LINK 17E
50.0 Amps
C0570L-11
NR,4.0D
C2996L-2 C2997-2
C0570L-33
LGW,0.5D
C2241L-5 C2239-5
LGW,0.5D
C1629-7
C0570L-117
NR,6.0D
SJ975
YU,MAPN
C1629-21
SJ965
YW,MAPN
C1629-22
C2240L-1 C2238-1
YU,MAPL
C1629-9
C2240L-2 C2238-2
YW,MAPL
C1629-10
Automatic Temperature Control Module (D243)
C1630-20
LGB,0.5
C1630-19
G,0.5
C2655-3
B,1.0D
C2629-1
TYPE 3
MS CAN -
MS CAN +
MS CAN -
MS CAN +
Central Junction Box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
C2655-1
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0580-15
YW,MAPX
C1167-6 C1165L-6
Instrument cluster (J100)
MS CAN +
C0230-17
YW,MAPD
SJ730
MS CAN -
C0230-18
YU,MAPD
SJ731
HS CAN +
C0230-1
YN,MAPA
SJ850
HS CAN -
C0230-2
YB,MAPA
SJ860

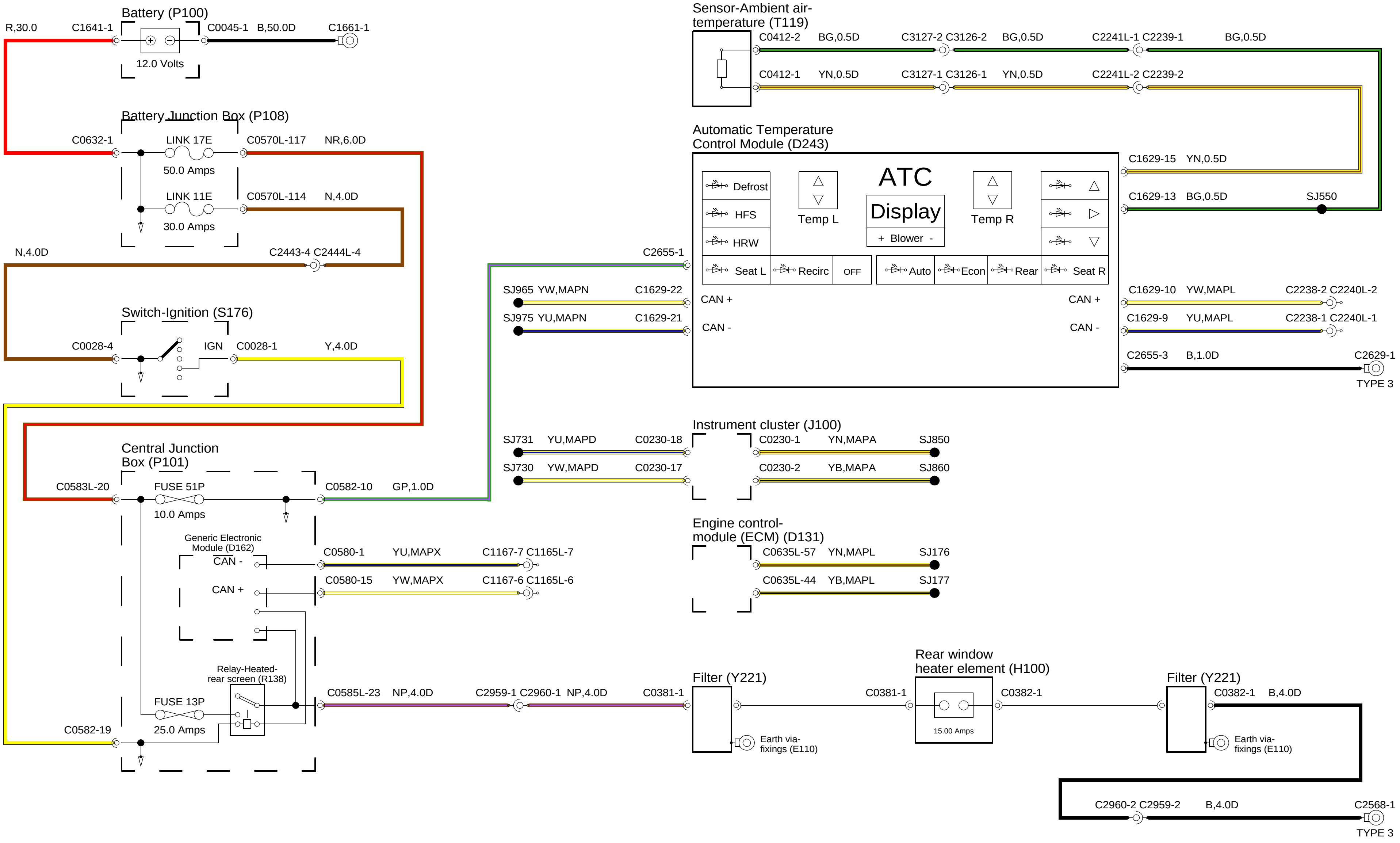

Sensor-Pollution (T306)
GND
12 V
NOX
HC/CO
C2683-6
B,0.5D
SJ173
B,4.0D
C0560-1
TYPE 2
Automatic Temperature Control Module (D243)
C2683-3
OG,0.5D
C2240L-17
C2238-17
OG,0.5D
SJ591
OG,0.5D
C1629-11
C2683-4
O,0.5D
C2240L-14
C2238-14
O,0.5D
C1629-2
C2683-2
BR,0.5D
C2240L-15
C2238-15
BG,0.5D
C1629-14
C2683-1
BG,0.5D
C2240L-13
C2238-13
BG,0.5D
SJ550
BG,0.5D
C1629-13
B
Sheet4
BG,0.5D
Sensor-Temperature/ Humidity (T315)
GND
THR
C1443-1
BG,0.5D
C1443-2
RW,0.5D
C1629-3
A
Sheet4
RG,0.5D
SJ551
RG,0.5D
C1629-1
Sensor-Pressure-Refrigerant (T278)
5 V
GND
V OUT
C1465-3
R,0.5D
C2444L-10
C2443-10
RG,0.5D
C1465-1
WU,0.5D
C2444L-9
C2443-9
BG,0.5D
C1465-2
UN,0.5D
C2444L-8
C2443-8
UN,0.5D
C1629-4

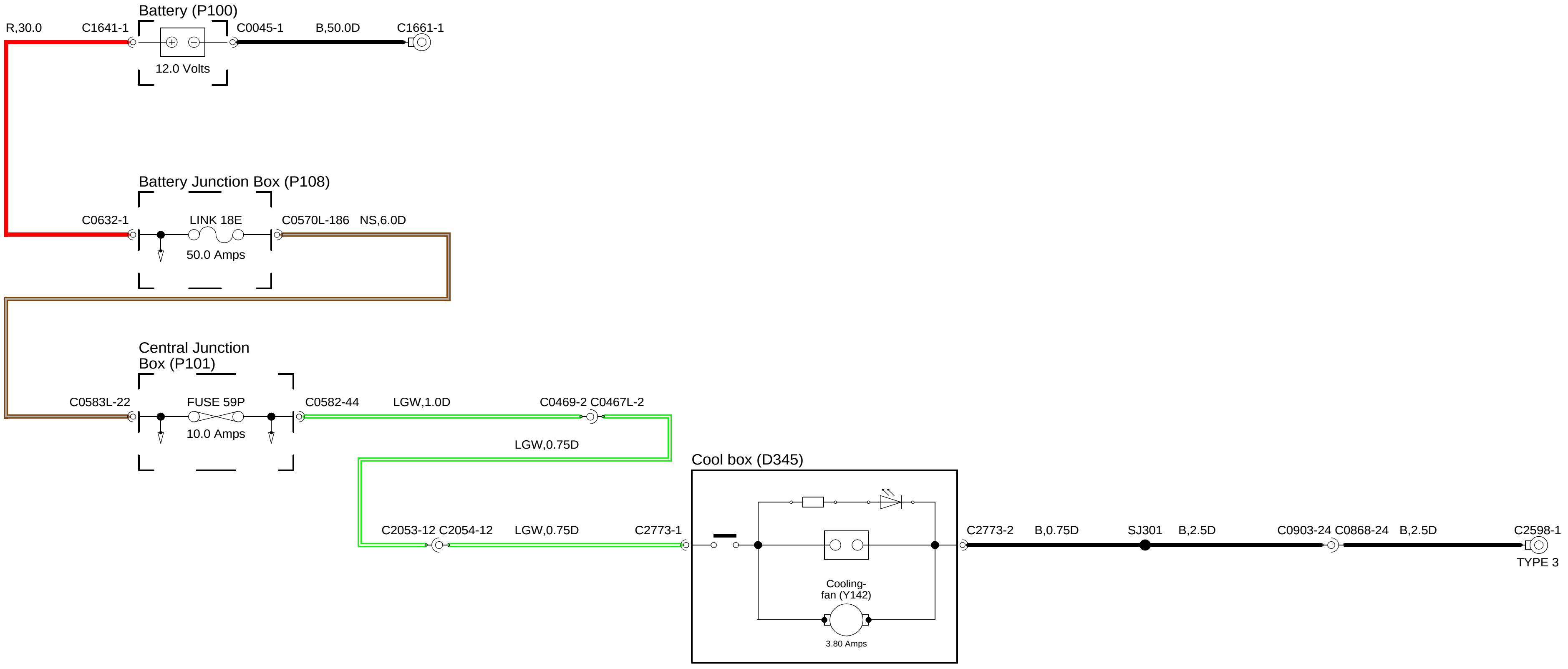

Intake air door motor (M138)
M
FRS
REC
C0419-6
RW,0.5
C1630-9
C0419-7
GB,0.5
C1630-10
C0419-5
YB,0.5
C1630-4
C0419-3
N,0.5
C1630-13
C0419-1
P,0.5
SJ3
P,0.5
C1630-1
Sensor-Evaporator (T165)
C0417-1
P,0.5
C0417-2
NB,0.5
C1630-17
Sensor-Temperature-Heater coolant (T210)
B,0.3
B,0.3
SJ4
S,0.5
C1630-16
Automatic Temperature Control Module (D243)
C1630-23
RY,0.5
C2134-2
C1630-24
GY,0.5
SJ1
GY,0.5
C2134-4
C1630-2
O,0.5
SJ2
O,0.5
C2134-6
RG,0.5
C2134-5
Screen air distribution door motor (M259)
IN
OUT
M
RH air temperature door motor (M204)
C2131-2
O,0.5
C2131-6
GY,0.5
C2131-4
Y,0.5
C2131-5
IN
OUT
M
LH air temperature door motor (M203)
C2130-2
O,0.5
C2130-6
GY,0.5
C2130-4
U,0.5
C2130-5
IN
OUT
M
Face/feet air distribution door motor (M279)
C2133-2
O,0.5
C2133-6
GY,0.5
C2133-4
IN
M


Automatic Temperature Control Module (D243)
+
-
C1629-24
BU,0.5D
C1629-23
RU,0.5D
C2238-8 C2240L-8
C2238-3 C2240L-3
(DV6)
(PV8)
(DV6)
(PV8)
S,0.5D
C2274L-11 C2273-11
S,1.0
C0127-2
W,0.5D
C2274L-7 C2273-7
W,1.0
C0127-1
Refrigerant solenoid valve (D332)
BG,0.5D
C2725L-4 C2724-4
(PV8NA)
BU,1.0
C0128-2
RU,1.0
C0128-1
(PV8SC)
Refrigerant solenoid valve (D332)
RG,0.5D
C2725L-3 C2724-3
(PV8NA)
(PV8SC)
BU,1.0
C0128-2
RU,1.0
C0128-1
Refrigerant solenoid valve (D332)
C1629-15
YN,0.5D
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
Sensor-Ambient air-temperature (T119)
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
C1629-17
WU,0.5D
C0790-3
L
Sensor-Sunlight (T166)
C1629-5
GW,0.5D
C0790-2
R
A
Sheet2
RG,0.5D
C0790-1
B
Sheet2
BG,0.5D

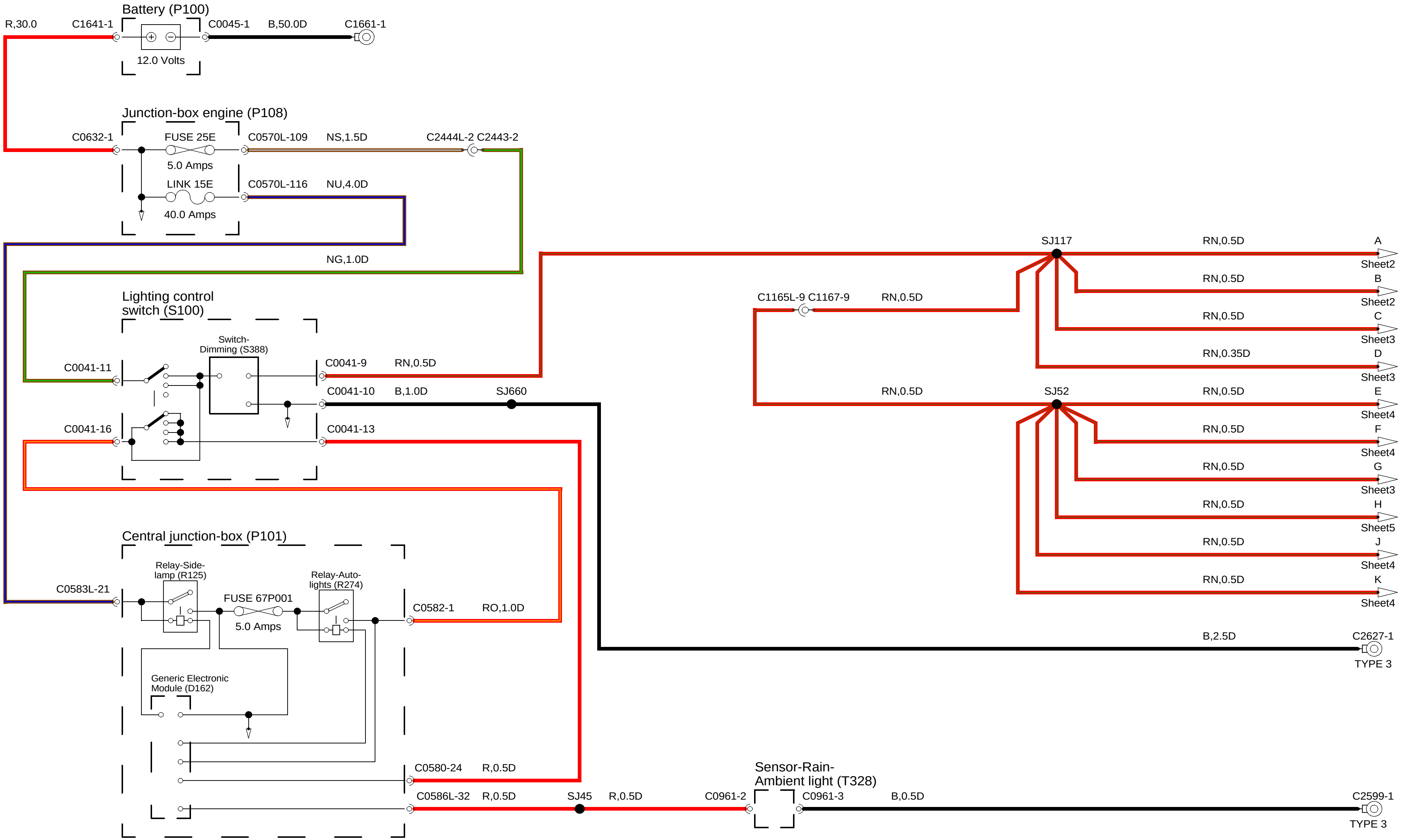

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
C2446-2 C2445-2
WU,0.5D
C0920-2
Fuel fired booster heater pump (H111)
C0920-1
B,0.5D
1.00 Amps
SJ85
B,2.5D
C0390-10 C0376-10
SJ85
B,2.5D
B,2.5D
C2922-1
TYPE 3
Fuel fired booster heater (H115)
WU,0.75D
C0925-5
MTR +
C3148-3
B,0.75
Pump-Water-Fuel-burning heater (M202)
1.00 Amps
Battery Junction Box (P108)
C0632-1
FUSE 28E
C0570L-179
PN,1.5D
C0926-1
MTR -
C3148-2
N,0.75
20.0 Amps
LINK 17E
C0570L-117
NR,6.0D
SJ422
YW,MAPAK
C0925-7
CAN +
C0926-2
B,1.0D
C2652-1
TYPE 3
50.0 Amps
SJ423
YU,MAPAK
C0925-4
CAN -
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Automatic Temperature Control Module (D243)
BG,0.5D
C1629-13
YN,0.5D
C1629-15
Central Junction Box (P101)
C0583L-20
FUSE 51P
C0582-10
GP,1.0D
C2655-1
10.0 Amps
SJ965
YW,MAPN
C1629-22
SJ975
YU,MAPN
C1629-21
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
C1629-9
YU,MAPL
C2238-1 C2240L-1
C1629-10
YW,MAPL
C2238-2 C2240L-2
C2655-3
B,1.0D
C2629-1
TYPE 3
Instrument cluster (J100)
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860
C0230-18
YU,MAPD
SJ731
C0230-17
YW,MAPD
SJ730
Engine control-module (ECM) (D131)
Sensor-Engine coolant-temperature (ECT) (T121)
C2274R-16 C2273-16
SR,0.75
C0411-B4
C2518-C2
W,0.75
C0169-1
C2274R-15 C2273-15
UR,0.75
C0411-B3
C2518-E2
NR,0.75
SJ6
N,0.75
C0169-2

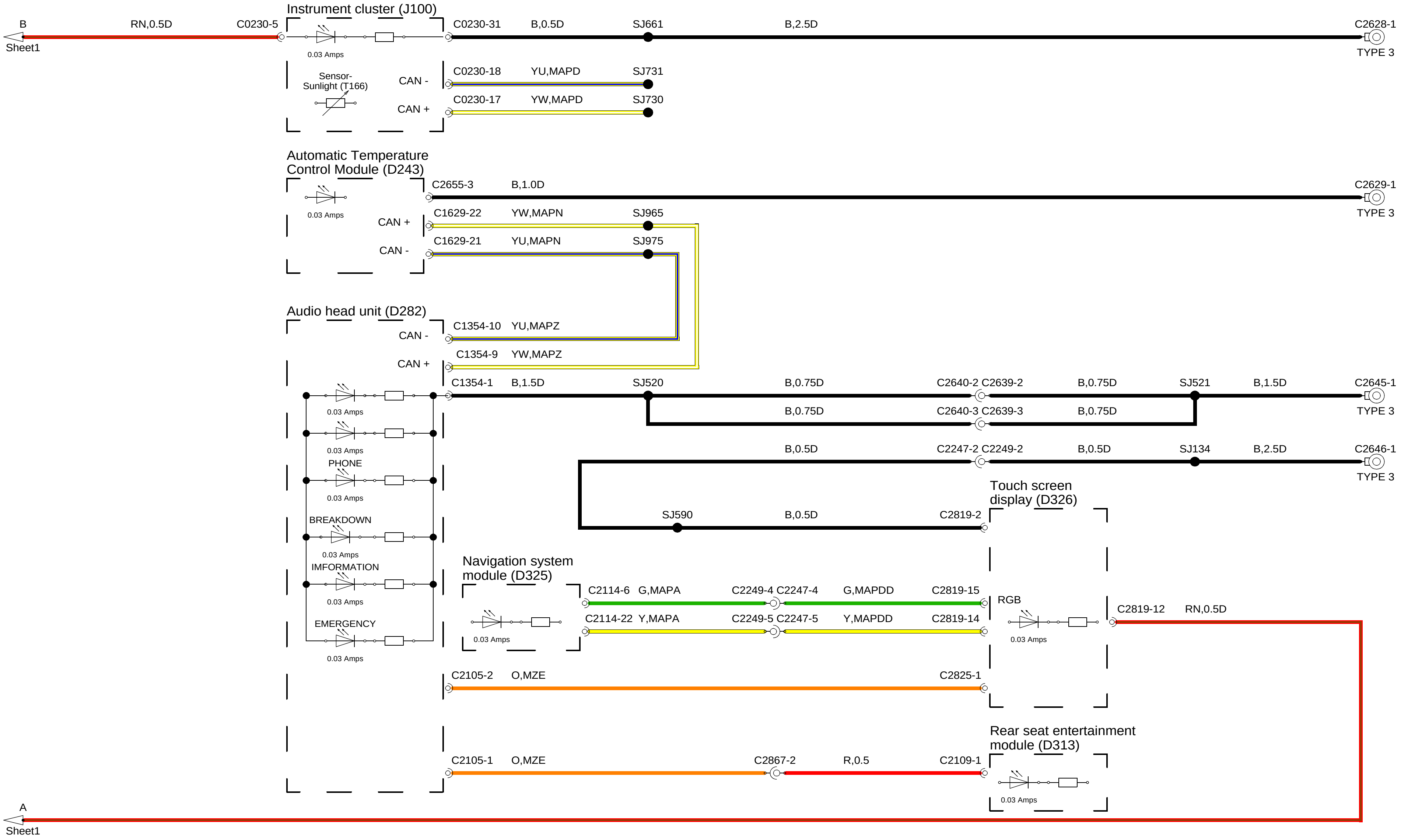

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
C2410L-3 C2409L-3
PS,4.0D
C1623L-1
Windshield RH heater element (H113)
27.50 Amps
C0246L-1
B,4.0D
C1964L-1
TYPE 3
Battery Junction Box (P108)
Relay-Heated front-screen (R208)
C0632-1
FUSE 15E
30.0 Amps
FUSE 18E
30.0 Amps
C0570L-126
PS,4.0D
C0570L-174
PK,4.0D
C2410L-4 C2409L-4
PK,4.0D
C1624-1
Windshield LH heater element (H114)
27.50 Amps
C0247-1
B,4.0D
C1536-1
TYPE 3
C0570L-68
LINK 17E
50.0 Amps
LINK 11E
30.0 Amps
C0570L-67
N,0.5D
C2241L-4 C2239-4
N,0.5D
C1629-18
C0570L-117
NR,6.0D
C2655-1
C0570L-114
N,4.0D
Automatic Temperature Control Module (D243)
Defrost
HFS
HRW
Temp L
ATC
Display
+ Blower -
Temp R
Seat L
Recirc
OFF
Auto
Econ
Rear
Seat R
CAN -
CAN +
CAN +
CAN -
C2655-3
B,1.0D
C2629-1
TYPE 3
C1629-9
YU,MAPL
C2238-1 C2240L-1
C1629-10
YW,MAPL
C2238-2 C2240L-2
C1629-22
YW,MAPN
SJ965
C1629-21
YU,MAPN
SJ975
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
BG,0.5D
C1629-13
YN,0.5D
C1629-15
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Central Junction Box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0580-15
YW,MAPX
C1167-6 C1165L-6
Engine control-module (ECM) (D131)
C0635L-57
YN,MAPL
SJ176
C0635L-44
YB,MAPL
SJ177
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,0.5D
Instrument cluster (J100)
SJ731 YU,MAPD
C0230-18
SJ730 YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860

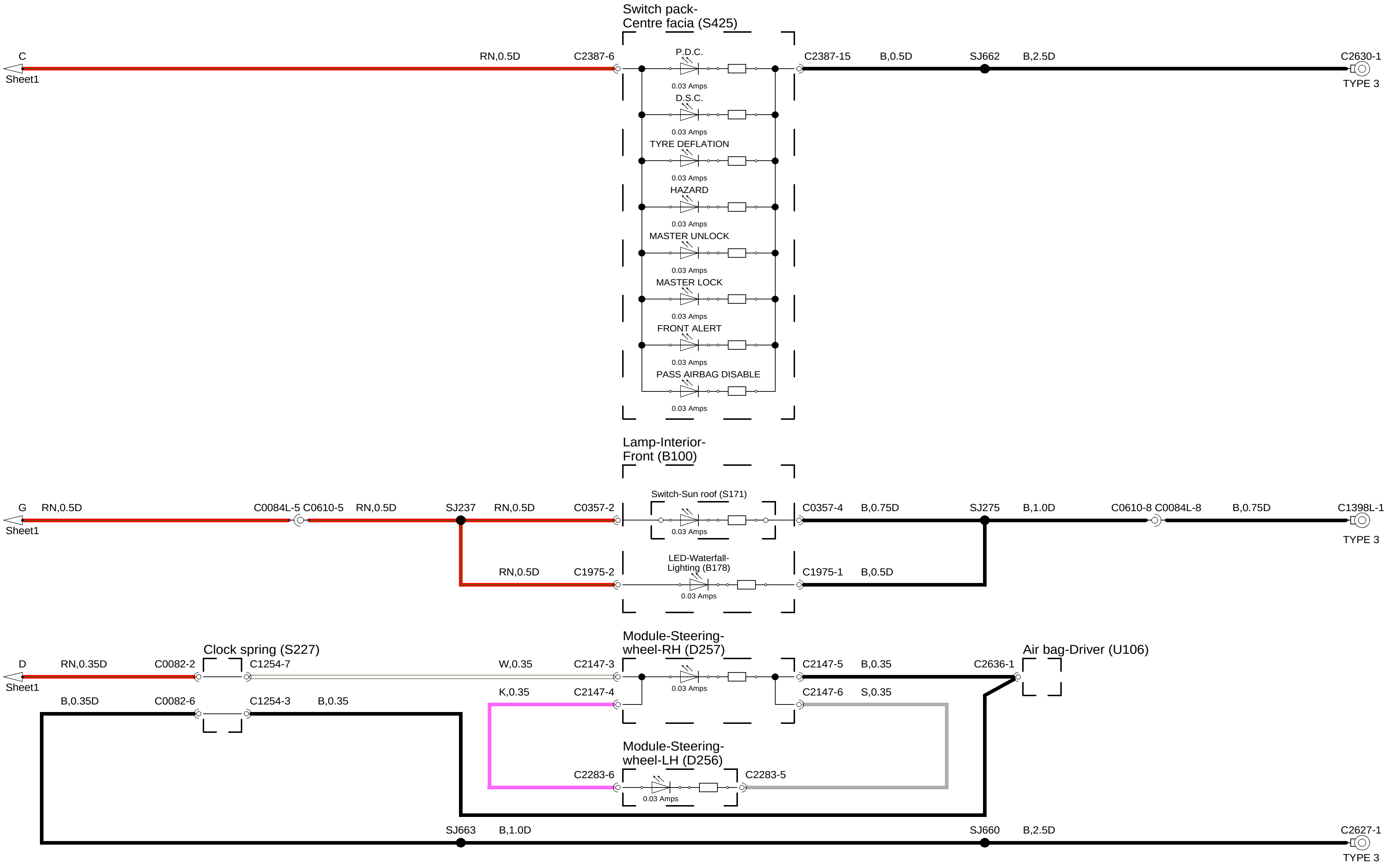

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0580-15
YW,MAPX
C1167-6 C1165L-6
Relay-Heated-rear screen (R138)
FUSE 13P
25.0 Amps
C0582-19
C0585L-23
NP,4.0D
C2959-1 C2960-1
NP,4.0D
C0381-1
Sensor-Ambient air-temperature (T119)
C0412-2
BG,0.5D
C3127-2 C3126-2
BG,0.5D
C2241L-1 C2239-1
BG,0.5D
C0412-1
YN,0.5D
C3127-1 C3126-1
YN,0.5D
C2241L-2 C2239-2
Automatic Temperature Control Module (D243)
C2655-1
ATC
Display
+ Blower -
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
Temp R
Auto
Econ
Rear
Seat R
CAN +
CAN -
CAN +
CAN -
C1629-15
YN,0.5D
C1629-13
BG,0.5D
SJ550
SJ965
YW,MAPN
C1629-22
SJ975
YU,MAPN
C1629-21
C1629-10
YW,MAPL
C2238-2 C2240L-2
C1629-9
YU,MAPL
C2238-1 C2240L-1
C2655-3
B,1.0D
C2629-1
TYPE 3
Instrument cluster (J100)
SJ731
YU,MAPD
C0230-18
C0230-1
YN,MAPA
SJ850
SJ730
YW,MAPD
C0230-17
C0230-2
YB,MAPA
SJ860
Engine control-module (ECM) (D131)
C0635L-57
YN,MAPL
SJ176
C0635L-44
YB,MAPL
SJ177
Filter (Y221)
Earth via-fixings (E110)
Rear window heater element (H100)
C0381-1
C0382-1
15.00 Amps
Filter (Y221)
C0382-1
B,4.0D
Earth via-fixings (E110)
C2960-2 C2959-2
B,4.0D
C2568-1
TYPE 3

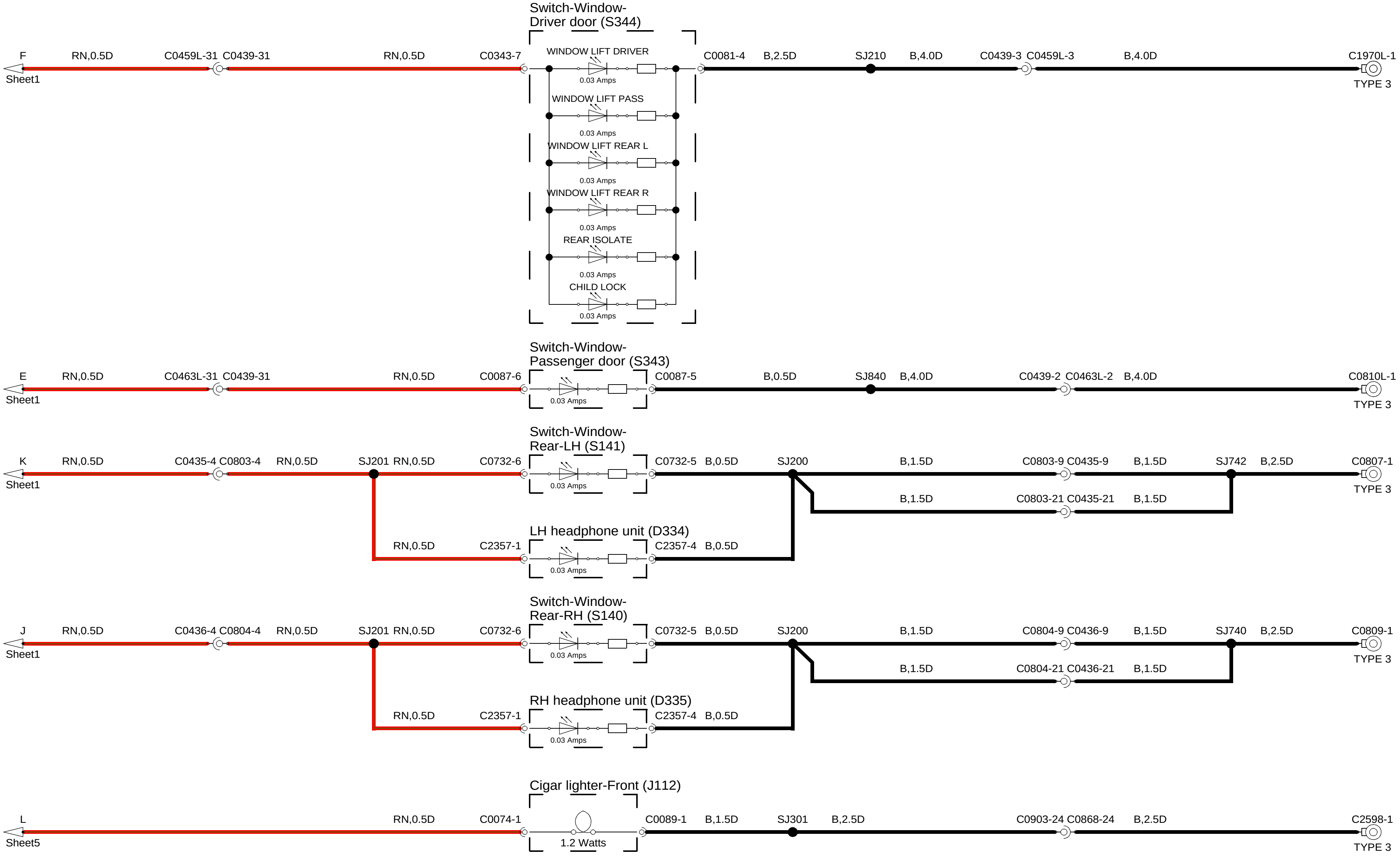

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Central Junction Box (P101)
C0583L-22
FUSE 59P
C0582-44
LGW,1.0D
C0469-2 C0467L-2
10.0 Amps
LGW,0.75D
Cool box (D345)
C2053-12 C2054-12
LGW,0.75D
C2773-1
Cooling-fan (Y142)
3.80 Amps
C2773-2
B,0.75D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3

413-00 INSTRUMENT CLUSTER AND PANEL ILLUMINATION

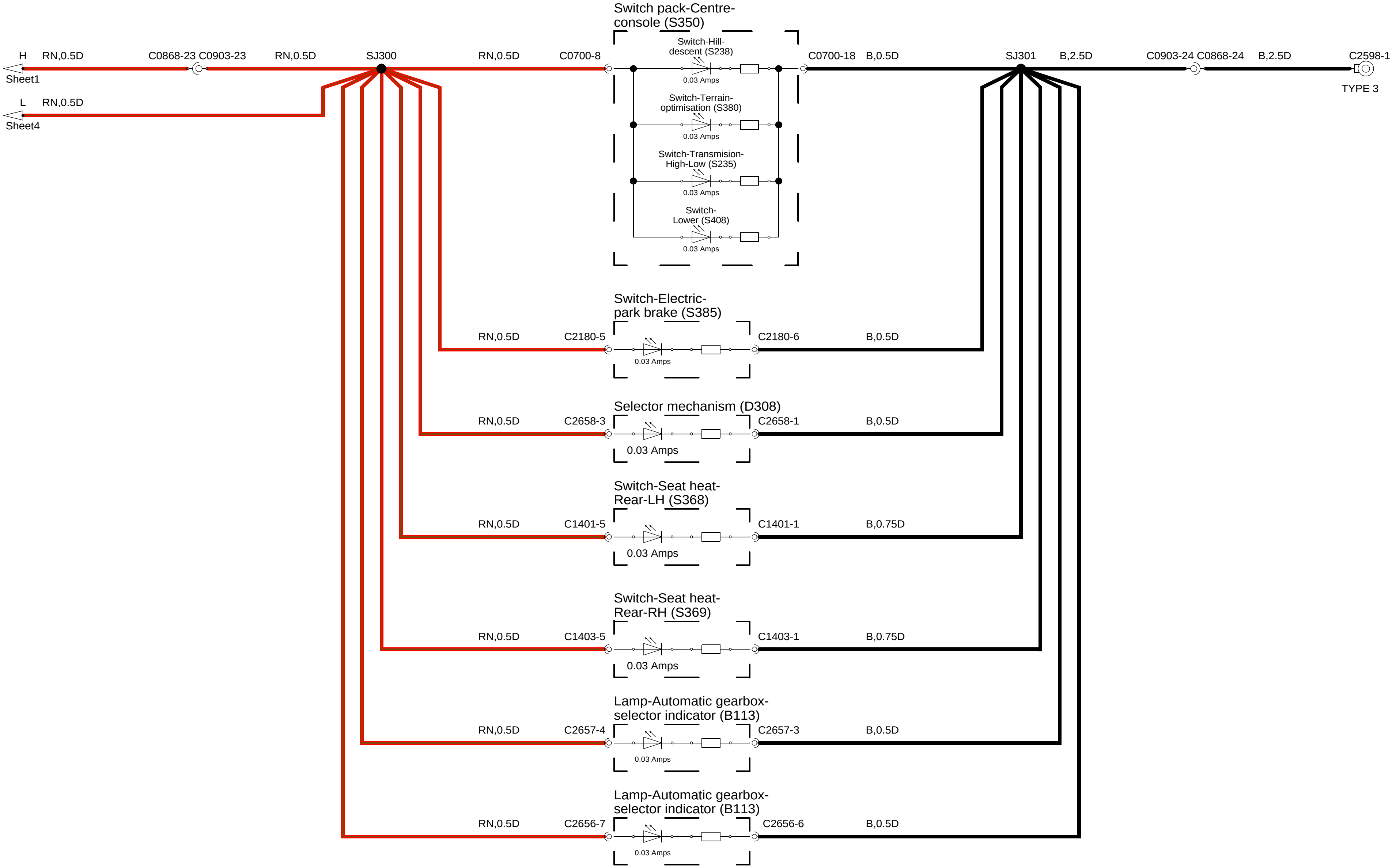

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
FUSE 25E
5.0 Amps
LINK 15E
40.0 Amps
C0570L-109
NS,1.5D
C2444L-2 C2443-2
C0570L-116
NU,4.0D
NG,1.0D
Lighting control switch (S100)
Switch-Dimming (S388)
C0041-11
C0041-9
RN,0.5D
C0041-10
B,1.0D
SJ660
C0041-16
C0041-13
Central junction-box (P101)
Relay-Side-lamp (R125)
Relay-Auto-lights (R274)
FUSE 67P001
5.0 Amps
C0583L-21
C0582-1
RO,1.0D
Generic Electronic Module (D162)
C0580-24
R,0.5D
C0586L-32
R,0.5D
SJ45
R,0.5D
C0961-2
Sensor-Rain-Ambient light (T328)
C0961-3
B,0.5D
C2599-1
TYPE 3
SJ117
RN,0.5D
A
Sheet2
RN,0.5D
B
Sheet2
C1165L-9 C1167-9
RN,0.5D
RN,0.5D
C
Sheet3
RN,0.35D
D
Sheet3
RN,0.5D
SJ52
RN,0.5D
E
Sheet4
RN,0.5D
F
Sheet4
RN,0.5D
G
Sheet3
RN,0.5D
H
Sheet5
RN,0.5D
J
Sheet4
RN,0.5D
K
Sheet4
B,2.5D
C2627-1
TYPE 3

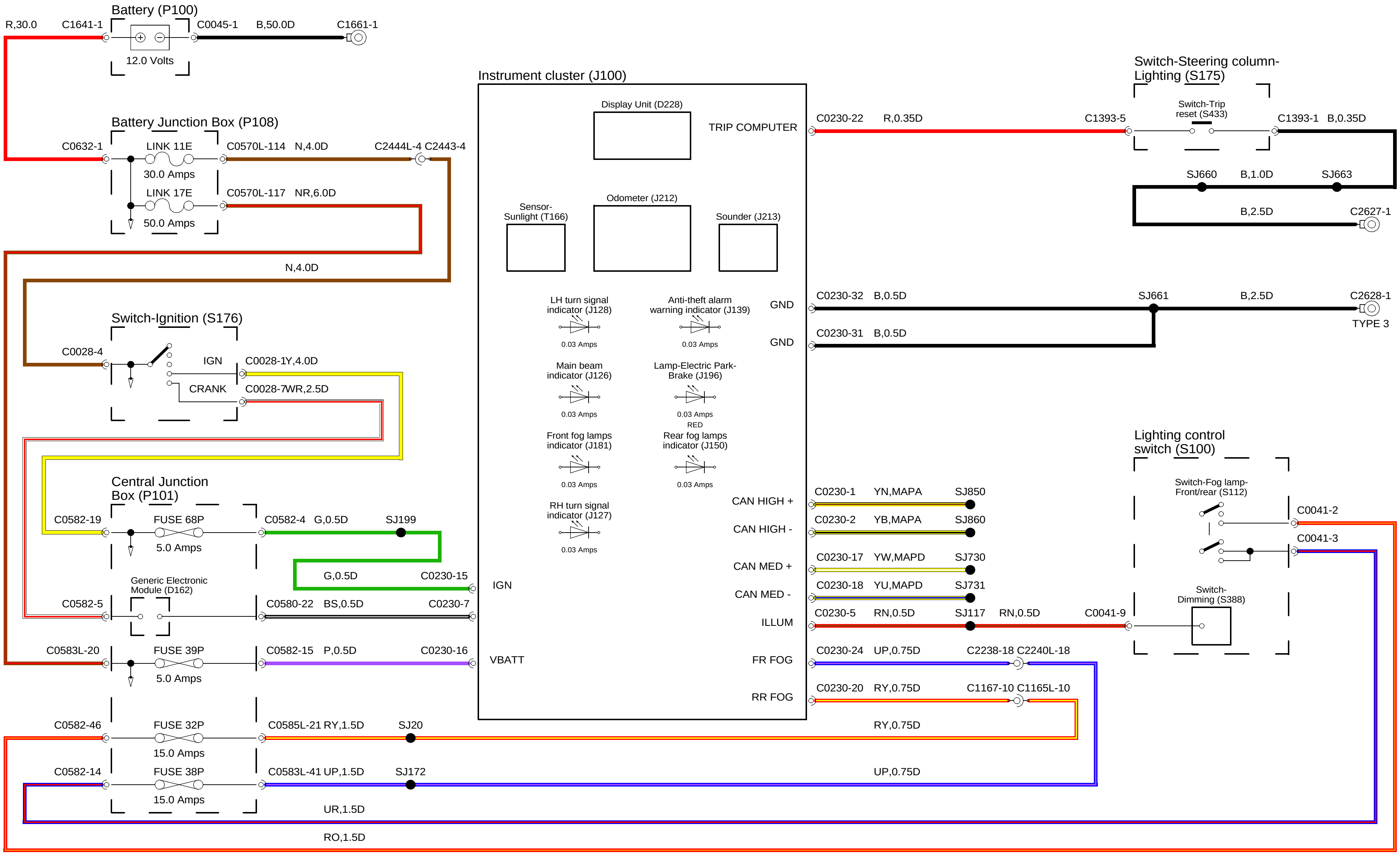

B
Sheet1
RN,0.5D
C0230-5
Instrument cluster (J100)
0.03 Amps
Sensor-
Sunlight (T166)
CAN -
CAN +
C0230-31
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
C0230-18
YU,MAPD
SJ731
C0230-17
YW,MAPD
SJ730
Automatic Temperature
Control Module (D243)
0.03 Amps
CAN +
CAN -
C2655-3
B,1.0D
C2629-1
TYPE 3
C1629-22
YW,MAPN
SJ965
C1629-21
YU,MAPN
SJ975
Audio head unit (D282)
CAN -
CAN +
C1354-10
YU,MAPZ
C1354-9
YW,MAPZ
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
TYPE 3
B,0.75D
C2640-3 C2639-3
B,0.75D
0.03 Amps
0.03 Amps
PHONE
0.03 Amps
BREAKDOWN
0.03 Amps
IMFORMATION
0.03 Amps
EMERGENCY
0.03 Amps
B,0.5D
C2247-2 C2249-2
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
Touch screen
display (D326)
SJ590
B,0.5D
C2819-2
Navigation system
module (D325)
0.03 Amps
C2114-6
G,MAPA
C2249-4 C2247-4
G,MAPDD
C2819-15
RGB
C2114-22
Y,MAPA
C2249-5 C2247-5
Y,MAPDD
C2819-14
0.03 Amps
C2819-12
RN,0.5D
C2105-2
O,MZE
C2825-1
Rear seat entertainment
module (D313)
C2105-1
O,MZE
C2867-2
R,0.5
C2109-1
0.03 Amps
A
Sheet1

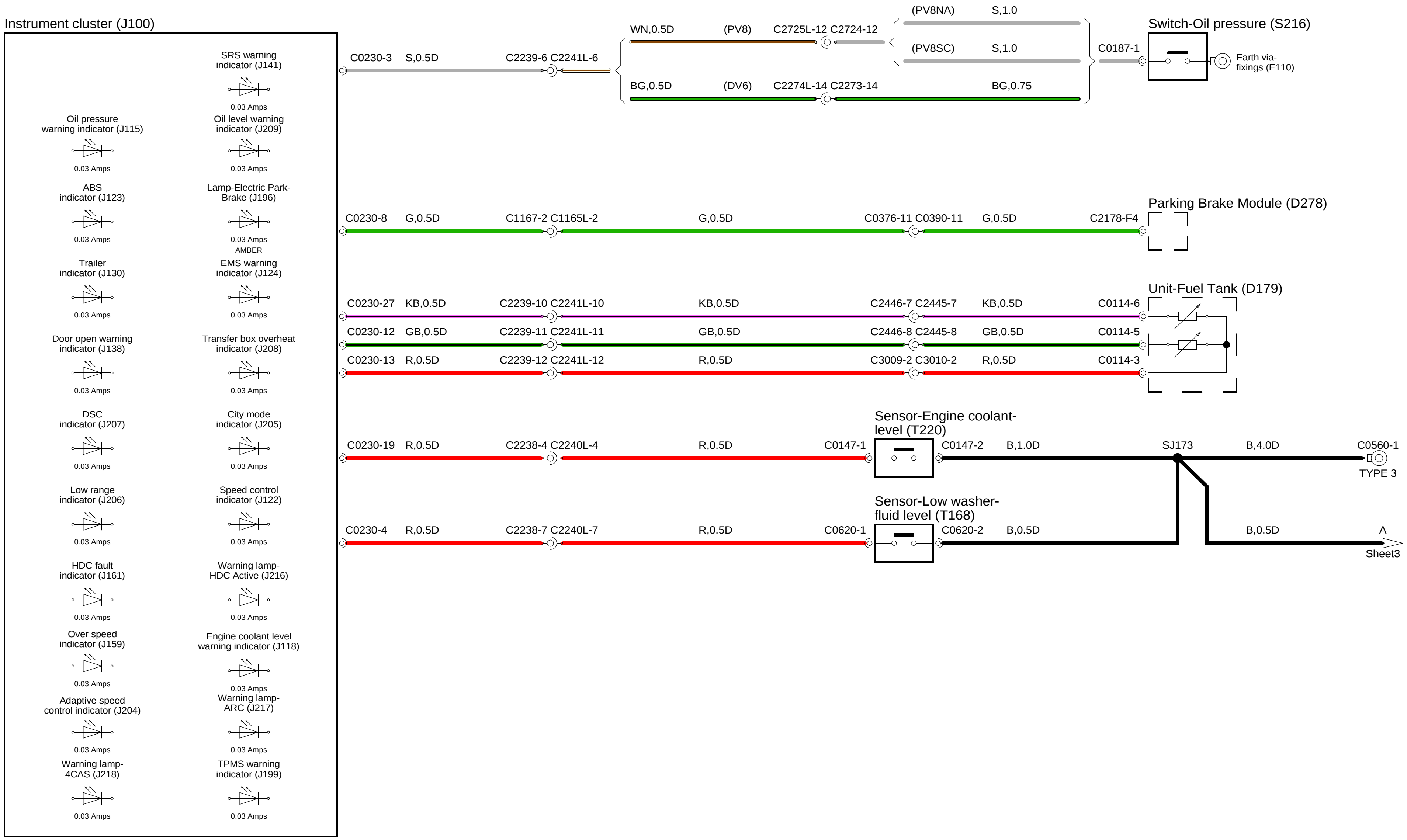

Switch pack-
Centre facia (S425)
C
Sheet1
RN,0.5D
C2387-6
P.D.C.
0.03 Amps
D.S.C.
0.03 Amps
TYRE DEFLATION
0.03 Amps
HAZARD
0.03 Amps
MASTER UNLOCK
0.03 Amps
MASTER LOCK
0.03 Amps
FRONT ALERT
0.03 Amps
PASS AIRBAG DISABLE
0.03 Amps
C2387-15
B,0.5D
SJ662
B,2.5D
C2630-1
TYPE 3
Lamp-Interior-
Front (B100)
G
Sheet1
RN,0.5D
C0084L-5 C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
Switch-Sun roof (S171)
0.03 Amps
C0357-4
B,0.75D
SJ275
B,1.0D
C0610-8 C0084L-8
B,0.75D
C1398L-1
TYPE 3
RN,0.5D
C1975-2
LED-Waterfall-
Lighting (B178)
0.03 Amps
C1975-1
B,0.5D
D
Sheet1
RN,0.35D
C0082-2
Clock spring (S227)
C1254-7
W,0.35
C2147-3
Module-Steering-
wheel-RH (D257)
0.03 Amps
C2147-5
B,0.35
C2636-1
Air bag-Driver (U106)
B,0.35D
C0082-6
C1254-3
B,0.35
K,0.35
C2147-4
C2147-6
S,0.35
Module-Steering-
wheel-LH (D256)
C2283-6
0.03 Amps
C2283-5
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

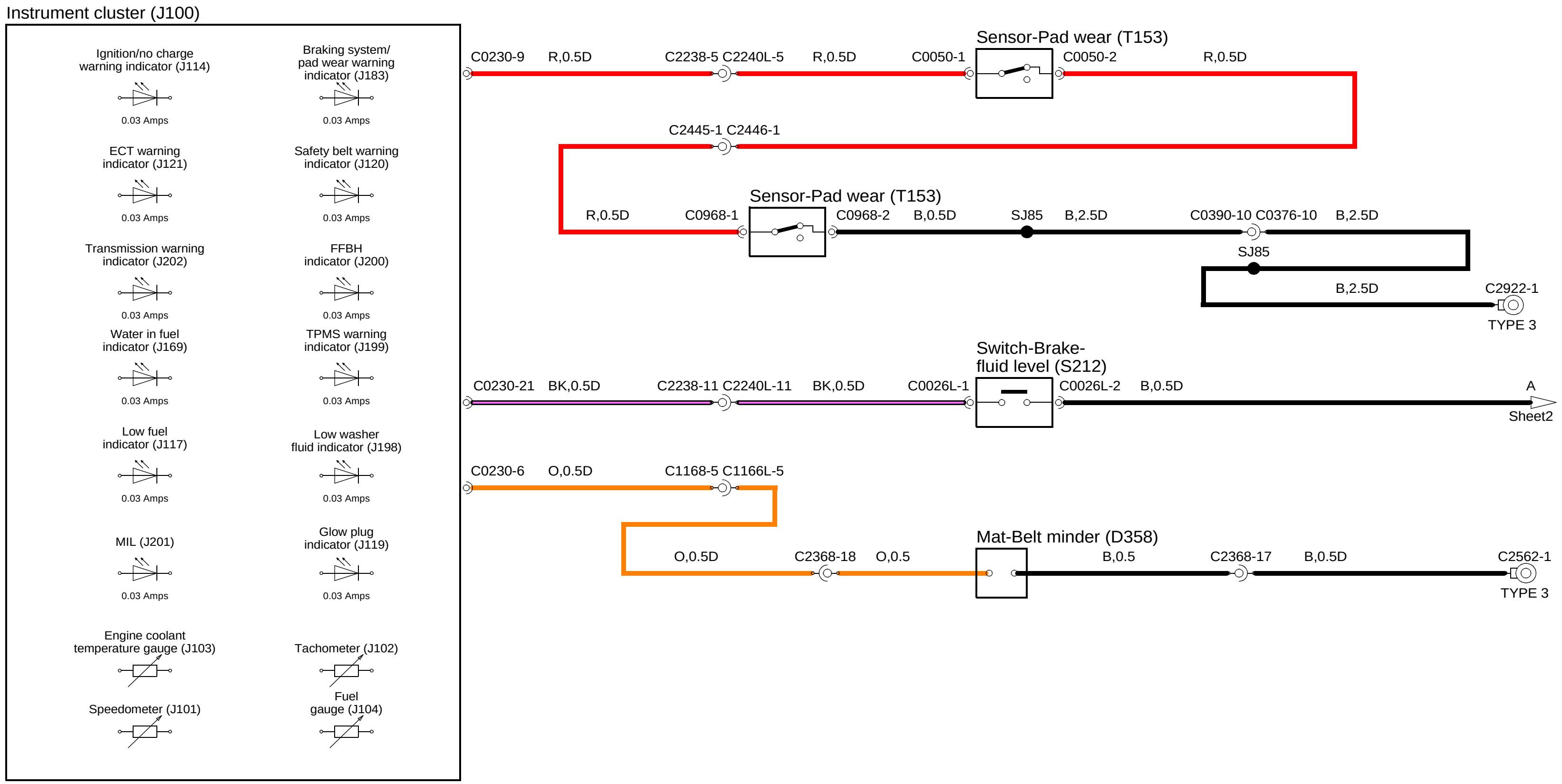

Switch-Window-
Driver door (S344)
F
Sheet1
RN,0.5D
C0459L-31
C0439-31
RN,0.5D
C0343-7
WINDOW LIFT DRIVER
0.03 Amps
WINDOW LIFT PASS
0.03 Amps
WINDOW LIFT REAR L
0.03 Amps
WINDOW LIFT REAR R
0.03 Amps
REAR ISOLATE
0.03 Amps
CHILD LOCK
0.03 Amps
C0081-4
B,2.5D
SJ210
B,4.0D
C0439-3
C0459L-3
B,4.0D
C1970L-1
TYPE 3
Switch-Window-
Passenger door (S343)
E
Sheet1
RN,0.5D
C0463L-31
C0439-31
RN,0.5D
C0087-6
0.03 Amps
C0087-5
B,0.5D
SJ840
B,4.0D
C0439-2
C0463L-2
B,4.0D
C0810L-1
TYPE 3
Switch-Window-
Rear-LH (S141)
K
Sheet1
RN,0.5D
C0435-4
C0803-4
RN,0.5D
SJ201
RN,0.5D
C0732-6
0.03 Amps
C0732-5
B,0.5D
SJ200
B,1.5D
C0803-9
C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21
C0435-21
B,1.5D
LH headphone unit (D334)
RN,0.5D
C2357-1
0.03 Amps
C2357-4
B,0.5D
Switch-Window-
Rear-RH (S140)
J
Sheet1
RN,0.5D
C0436-4
C0804-4
RN,0.5D
SJ201
RN,0.5D
C0732-6
0.03 Amps
C0732-5
B,0.5D
SJ200
B,1.5D
C0804-9
C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21
C0436-21
B,1.5D
RH headphone unit (D335)
RN,0.5D
C2357-1
0.03 Amps
C2357-4
B,0.5D
Cigar lighter-Front (J112)
L
Sheet5
RN,0.5D
C0074-1
1.2 Watts
C0089-1
B,1.5D
SJ301
B,2.5D
C0903-24
C0868-24
B,2.5D
C2598-1
TYPE 3

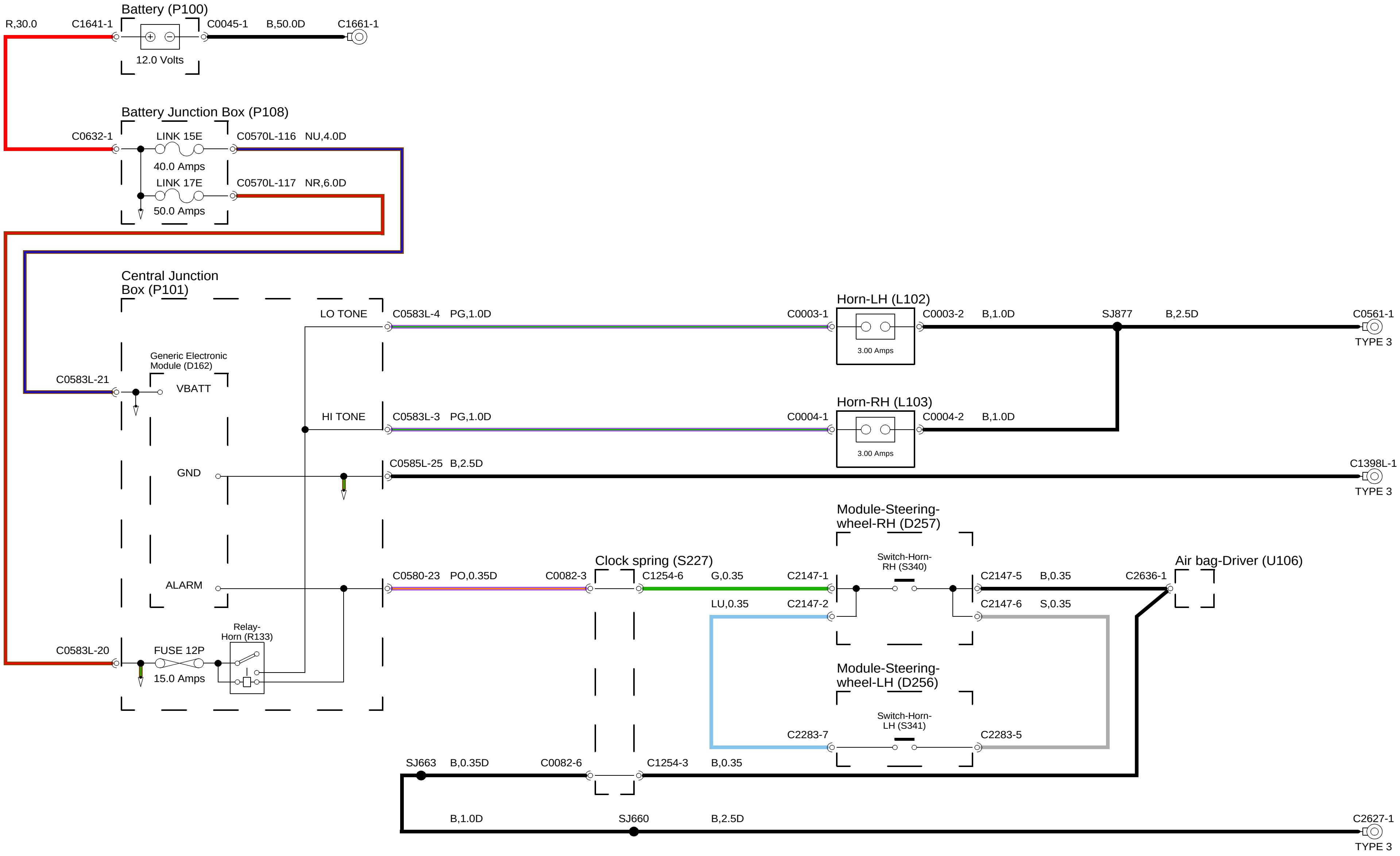
413-00 INSTRUMENT CLUSTER AND PANEL ILLUMINATION

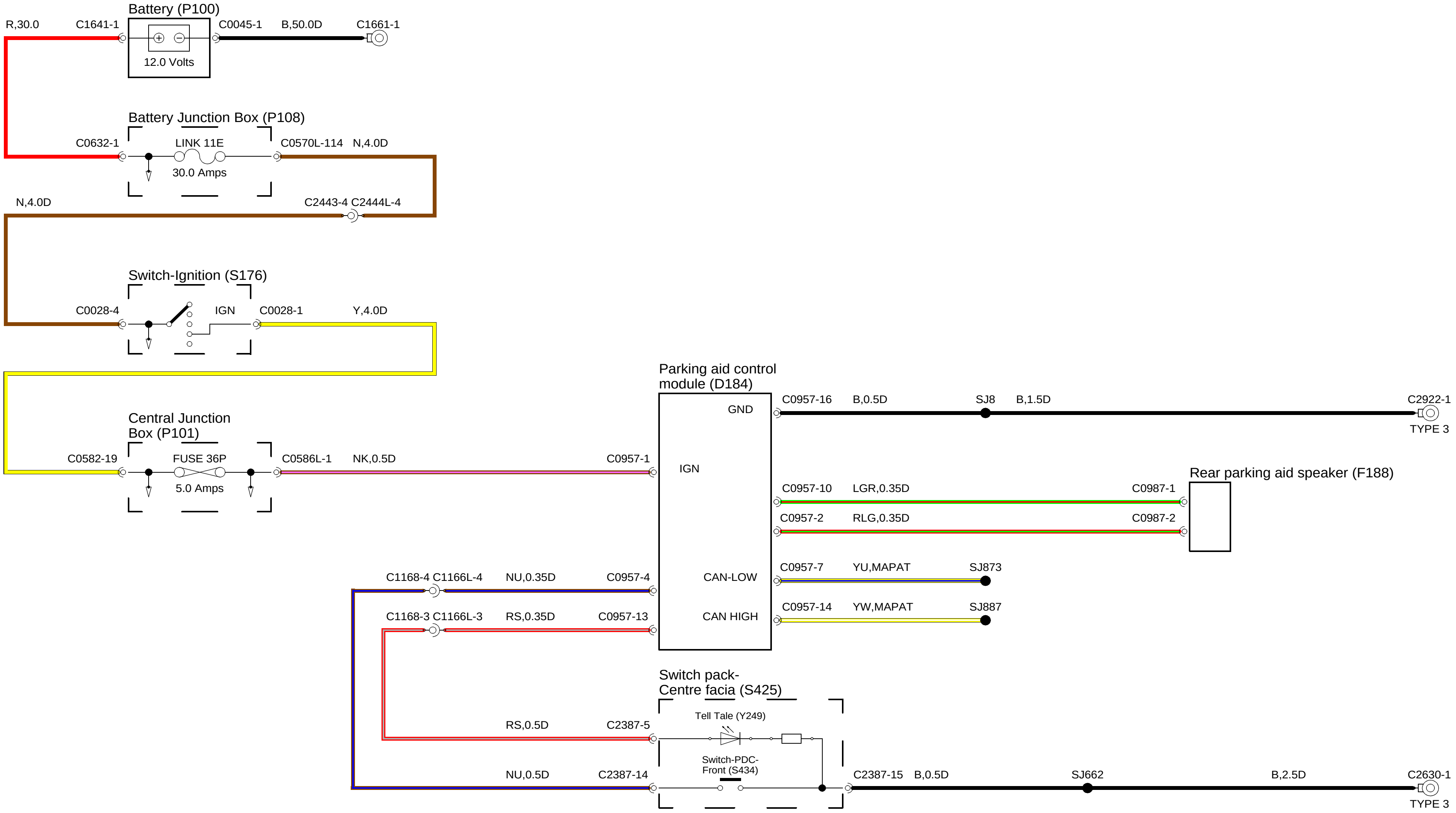

Switch pack-Centre-console (S350)
H
RN,0.5D
Sheet1
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C0700-8
Switch-Hill-descent (S238)
0.03 Amps
Switch-Terrain-optimisation (S380)
0.03 Amps
Switch-Transmision-High-Low (S235)
0.03 Amps
Switch-Lower (S408)
0.03 Amps
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
L
RN,0.5D
Sheet4
Switch-Electric-park brake (S385)
RN,0.5D
C2180-5
0.03 Amps
C2180-6
B,0.5D
Selector mechanism (D308)
RN,0.5D
C2658-3
0.03 Amps
C2658-1
B,0.5D
Switch-Seat heat-Rear-LH (S368)
RN,0.5D
C1401-5
0.03 Amps
C1401-1
B,0.75D
Switch-Seat heat-Rear-RH (S369)
RN,0.5D
C1403-5
0.03 Amps
C1403-1
B,0.75D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2657-4
0.03 Amps
C2657-3
B,0.5D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2656-7
0.03 Amps
C2656-6
B,0.5D

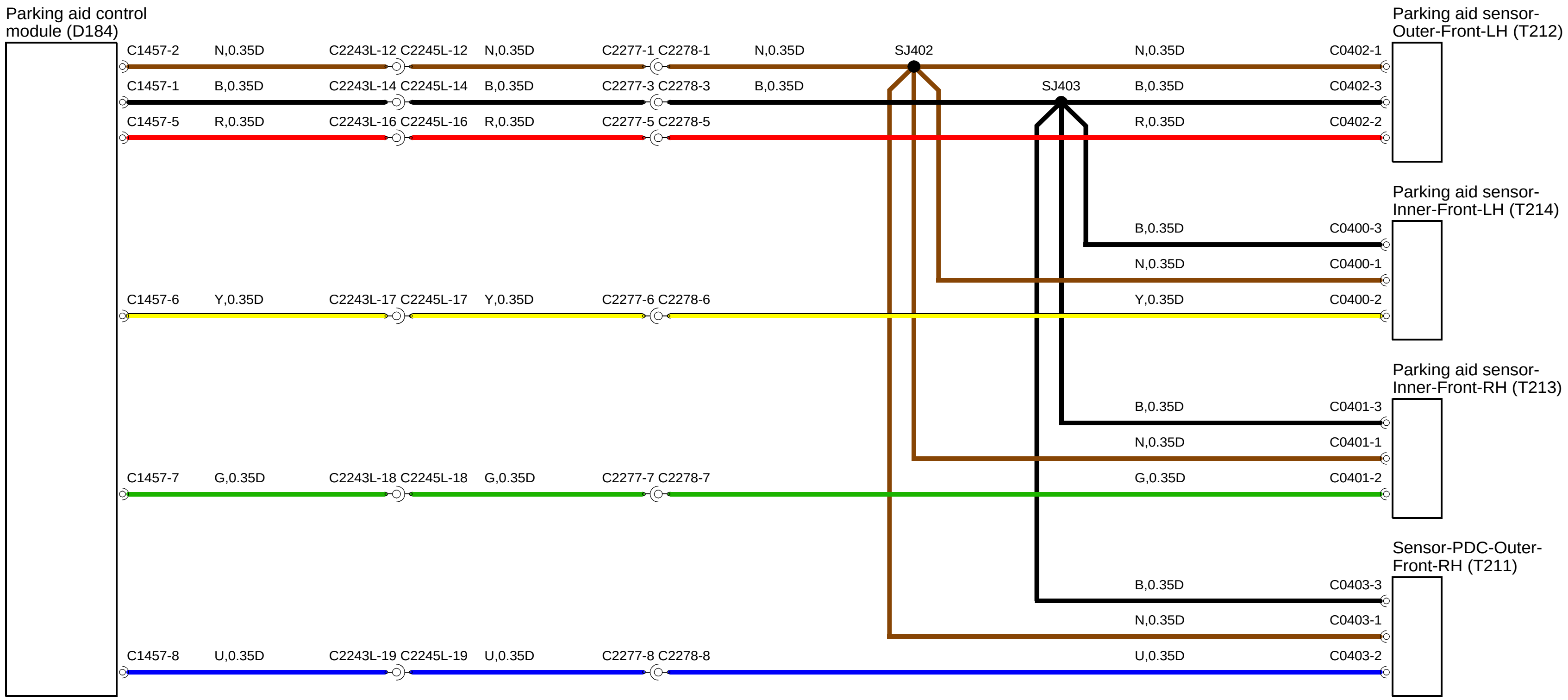

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 17E
C0570L-117
NR,6.0D
50.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1Y,4.0D
CRANK
C0028-7WR,2.5D
Central Junction Box (P101)
C0582-19
FUSE 68P
5.0 Amps
C0582-4
G,0.5D
SJ199
G,0.5D
C0230-15
Generic Electronic Module (D162)
C0582-5
C0580-22
BS,0.5D
C0230-7
C0583L-20
FUSE 39P
5.0 Amps
C0582-15
P,0.5D
C0230-16
C0582-46
FUSE 32P
15.0 Amps
C0585L-21 RY,1.5D
SJ20
C0582-14
FUSE 38P
15.0 Amps
C0583L-41 UP,1.5D
SJ172
UR,1.5D
RO,1.5D
Instrument cluster (J100)
Display Unit (D228)
TRIP COMPUTER
Sensor-Sunlight (T166)
Odometer (J212)
Sounder (J213)
LH turn signal indicator (J128)
0.03 Amps
Anti-theft alarm warning indicator (J139)
0.03 Amps
GND
GND
Main beam indicator (J126)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
RED
Front fog lamps indicator (J181)
0.03 Amps
Rear fog lamps indicator (J150)
0.03 Amps
RH turn signal indicator (J127)
0.03 Amps
CAN HIGH +
CAN HIGH -
CAN MED +
CAN MED -
IGN
ILLUM
VBATT
FR FOG
RR FOG
C0230-22
R,0.35D
C1393-5
Switch-Steering column-Lighting (S175)
Switch-Trip reset (S433)
C1393-1
B,0.35D
SJ660
B,1.0D
SJ663
B,2.5D
C2627-1
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
C0230-31
B,0.5D
Lighting control switch (S100)
Switch-Fog lamp-Front/rear (S112)
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860
C0041-2
C0041-3
C0230-17
YW,MAPD
SJ730
C0230-18
YU,MAPD
SJ731
Switch-Dimming (S388)
C0230-5
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0230-24
UP,0.75D
C2238-18 C2240L-18
C0230-20
RY,0.75D
C1167-10 C1165L-10
RY,0.75D
UP,0.75D

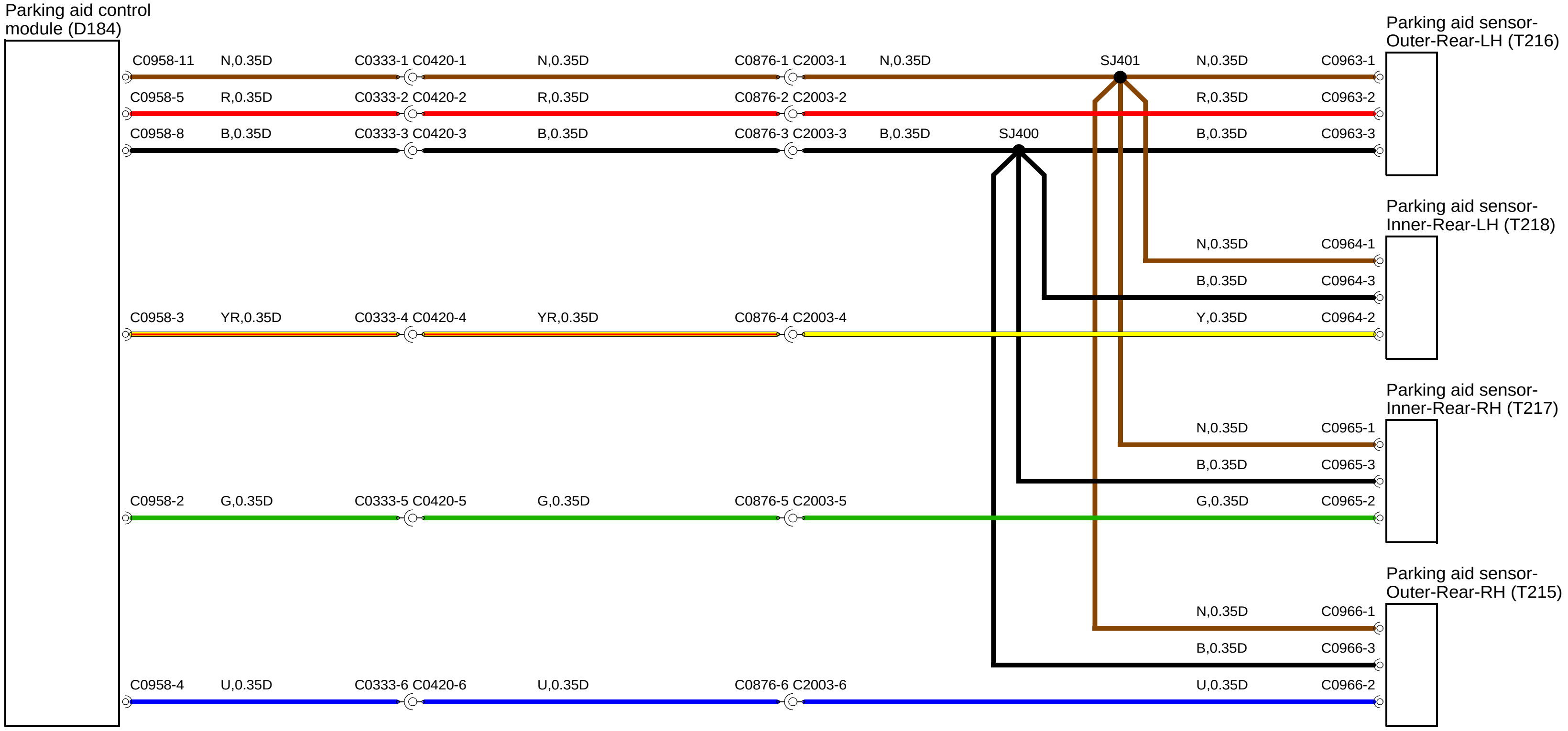

Instrument cluster (J100)
SRS warning indicator (J141)
0.03 Amps
Oil pressure warning indicator (J115)
0.03 Amps
Oil level warning indicator (J209)
0.03 Amps
ABS indicator (J123)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
AMBER
Trailer indicator (J130)
0.03 Amps
EMS warning indicator (J124)
0.03 Amps
Door open warning indicator (J138)
0.03 Amps
Transfer box overheat indicator (J208)
0.03 Amps
DSC indicator (J207)
0.03 Amps
City mode indicator (J205)
0.03 Amps
Low range indicator (J206)
0.03 Amps
Speed control indicator (J122)
0.03 Amps
HDC fault indicator (J161)
0.03 Amps
Warning lamp-HDC Active (J216)
0.03 Amps
Over speed indicator (J159)
0.03 Amps
Engine coolant level warning indicator (J118)
0.03 Amps
Adaptive speed control indicator (J204)
0.03 Amps
Warning lamp-ARC (J217)
0.03 Amps
Warning lamp-4CAS (J218)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
C0230-3
S,0.5D
C2239-6 C2241L-6
WN,0.5D
(PV8)
C2725L-12 C2724-12
(PV8NA)
S,1.0
(PV8SC)
S,1.0
BG,0.5D
(DV6)
C2274L-14 C2273-14
BG,0.75
C0187-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
Parking Brake Module (D278)
C0230-8
G,0.5D
C1167-2 C1165L-2
G,0.5D
C0376-11 C0390-11
G,0.5D
C2178-F4
Unit-Fuel Tank (D179)
C0230-27
KB,0.5D
C2239-10 C2241L-10
KB,0.5D
C2446-7 C2445-7
KB,0.5D
C0114-6
C0230-12
GB,0.5D
C2239-11 C2241L-11
GB,0.5D
C2446-8 C2445-8
GB,0.5D
C0114-5
C0230-13
R,0.5D
C2239-12 C2241L-12
R,0.5D
C3009-2 C3010-2
R,0.5D
C0114-3
Sensor-Engine coolant-level (T220)
C0230-19
R,0.5D
C2238-4 C2240L-4
R,0.5D
C0147-1
C0147-2
B,1.0D
SJ173
B,4.0D
C0560-1
TYPE 3
Sensor-Low washer-fluid level (T168)
C0230-4
R,0.5D
C2238-7 C2240L-7
R,0.5D
C0620-1
C0620-2
B,0.5D
B,0.5D
A
Sheet3


Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
0.03 Amps
Braking system/ pad wear warning indicator (J183)
0.03 Amps
ECT warning indicator (J121)
0.03 Amps
Safety belt warning indicator (J120)
0.03 Amps
Transmission warning indicator (J202)
0.03 Amps
FFBH indicator (J200)
0.03 Amps
Water in fuel indicator (J169)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
Low fuel indicator (J117)
0.03 Amps
Low washer fluid indicator (J198)
0.03 Amps
MIL (J201)
0.03 Amps
Glow plug indicator (J119)
0.03 Amps
Engine coolant temperature gauge (J103)
Tachometer (J102)
Speedometer (J101)
Fuel gauge (J104)
C0230-9
R,0.5D
C2238-5 C2240L-5
R,0.5D
C0050-1
Sensor-Pad wear (T153)
C0050-2
R,0.5D
C2445-1 C2446-1
Sensor-Pad wear (T153)
R,0.5D
C0968-1
C0968-2
B,0.5D
SJ85
B,2.5D
C0390-10 C0376-10
B,2.5D
SJ85
B,2.5D
C2922-1
TYPE 3
Switch-Brake- fluid level (S212)
C0230-21
BK,0.5D
C2238-11 C2240L-11
BK,0.5D
C0026L-1
C0026L-2
B,0.5D
A
Sheet2
C0230-6
O,0.5D
C1168-5 C1166L-5
Mat-Belt minder (D358)
O,0.5D
C2368-18
O,0.5
B,0.5
C2368-17
B,0.5D
C2562-1
TYPE 3

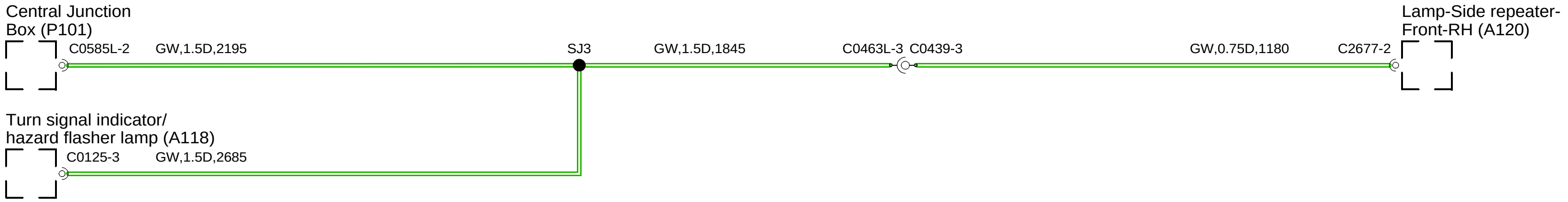

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
Central Junction Box (P101)
LO TONE
C0583L-4
PG,1.0D
C0003-1
Horn-LH (L102)
3.00 Amps
C0003-2
B,1.0D
SJ877
B,2.5D
C0561-1
TYPE 3
Generic Electronic Module (D162)
VBATT
C0583L-21
HI TONE
C0583L-3
PG,1.0D
C0004-1
Horn-RH (L103)
3.00 Amps
C0004-2
B,1.0D
GND
C0585L-25
B,2.5D
C1398L-1
TYPE 3
Module-Steering-wheel-RH (D257)
Switch-Horn-RH (S340)
Clock spring (S227)
Air bag-Driver (U106)
ALARM
C0580-23
PO,0.35D
C0082-3
C1254-6
G,0.35
C2147-1
C2147-5
B,0.35
C2636-1
LU,0.35
C2147-2
C2147-6
S,0.35
Relay-Horn (R133)
C0583L-20
FUSE 12P
15.0 Amps
Module-Steering-wheel-LH (D256)
Switch-Horn-LH (S341)
C2283-7
C2283-5
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3


Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Parking aid control module (D184)
GND
C0957-16
B,0.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Central Junction Box (P101)
C0582-19
FUSE 36P
5.0 Amps
C0586L-1
NK,0.5D
C0957-1
IGN
Rear parking aid speaker (F188)
C0957-10
LGR,0.35D
C0987-1
C0957-2
RLG,0.35D
C0987-2
C0957-7
YU,MAPAT
SJ873
C1168-4 C1166L-4
NU,0.35D
C0957-4
CAN-LOW
C0957-14
YW,MAPAT
SJ887
C1168-3 C1166L-3
RS,0.35D
C0957-13
CAN HIGH
Switch pack-Centre facia (S425)
Tell Tale (Y249)
RS,0.5D
C2387-5
Switch-PDC-Front (S434)
NU,0.5D
C2387-14
C2387-15
B,0.5D
SJ662
B,2.5D
C2630-1
TYPE 3

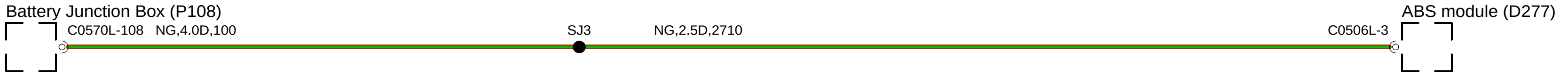

Parking aid control module (D184)
C1457-2
N,0.35D
C2243L-12 C2245L-12
N,0.35D
C2277-1 C2278-1
N,0.35D
SJ402
N,0.35D
C0402-1
C1457-1
B,0.35D
C2243L-14 C2245L-14
B,0.35D
C2277-3 C2278-3
B,0.35D
SJ403
B,0.35D
C0402-3
C1457-5
R,0.35D
C2243L-16 C2245L-16
R,0.35D
C2277-5 C2278-5
R,0.35D
C0402-2
Parking aid sensor-Outer-Front-LH (T212)
Parking aid sensor-Inner-Front-LH (T214)
B,0.35D
C0400-3
N,0.35D
C0400-1
C1457-6
Y,0.35D
C2243L-17 C2245L-17
Y,0.35D
C2277-6 C2278-6
Y,0.35D
C0400-2
Parking aid sensor-Inner-Front-RH (T213)
B,0.35D
C0401-3
N,0.35D
C0401-1
C1457-7
G,0.35D
C2243L-18 C2245L-18
G,0.35D
C2277-7 C2278-7
G,0.35D
C0401-2
Sensor-PDC-Outer-Front-RH (T211)
B,0.35D
C0403-3
N,0.35D
C0403-1
C1457-8
U,0.35D
C2243L-19 C2245L-19
U,0.35D
C2277-8 C2278-8
U,0.35D
C0403-2


Parking aid control module (D184)
Parking aid sensor-Outer-Rear-LH (T216)
Parking aid sensor-Inner-Rear-LH (T218)
Parking aid sensor-Inner-Rear-RH (T217)
Parking aid sensor-Outer-Rear-RH (T215)
C0958-11
N,0.35D
C0333-1 C0420-1
N,0.35D
C0876-1 C2003-1
N,0.35D
SJ401
N,0.35D
C0963-1
C0958-5
R,0.35D
C0333-2 C0420-2
R,0.35D
C0876-2 C2003-2
R,0.35D
C0963-2
C0958-8
B,0.35D
C0333-3 C0420-3
B,0.35D
C0876-3 C2003-3
B,0.35D
SJ400
B,0.35D
C0963-3
N,0.35D
C0964-1
B,0.35D
C0964-3
C0958-3
YR,0.35D
C0333-4 C0420-4
YR,0.35D
C0876-4 C2003-4
Y,0.35D
C0964-2
N,0.35D
C0965-1
B,0.35D
C0965-3
C0958-2
G,0.35D
C0333-5 C0420-5
G,0.35D
C0876-5 C2003-5
G,0.35D
C0965-2
N,0.35D
C0966-1
B,0.35D
C0966-3
C0958-4
U,0.35D
C0333-6 C0420-6
U,0.35D
C0876-6 C2003-6
U,0.35D
C0966-2

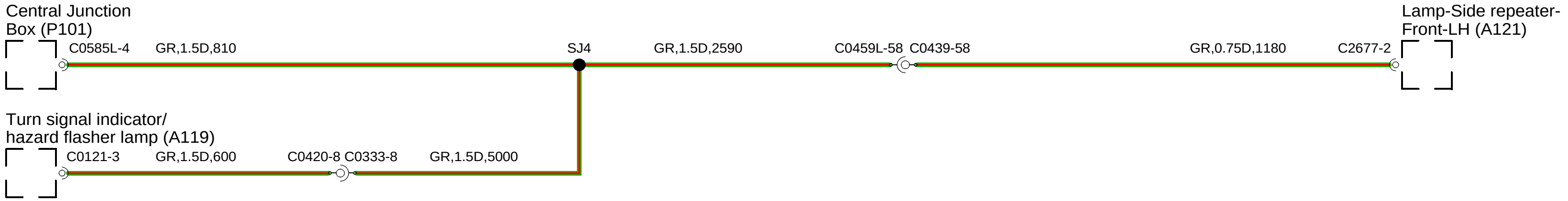
SJ3 (GW) MAIN


Central Junction Box (P101)
C0585L-2
GW,1.5D,2195
SJ3
GW,1.5D,1845
C0463L-3
C0439-3
GW,0.75D,1180
C2677-2
Lamp-Side repeater-Front-RH (A120)
Turn signal indicator/ hazard flasher lamp (A118)
C0125-3
GW,1.5D,2685

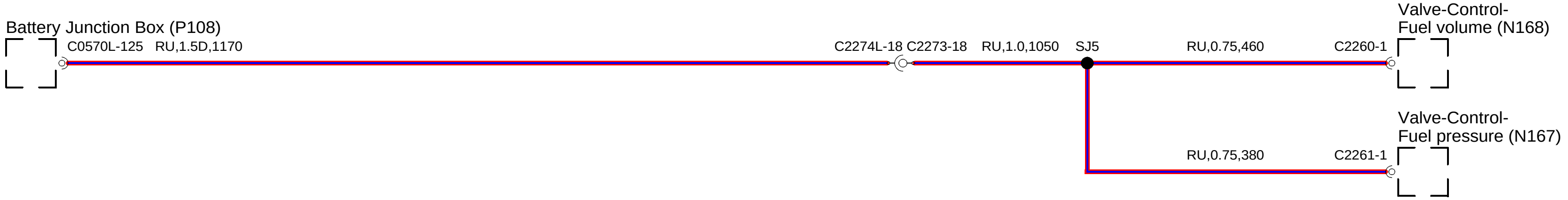
SJ3 (NG) ENGINE BAY

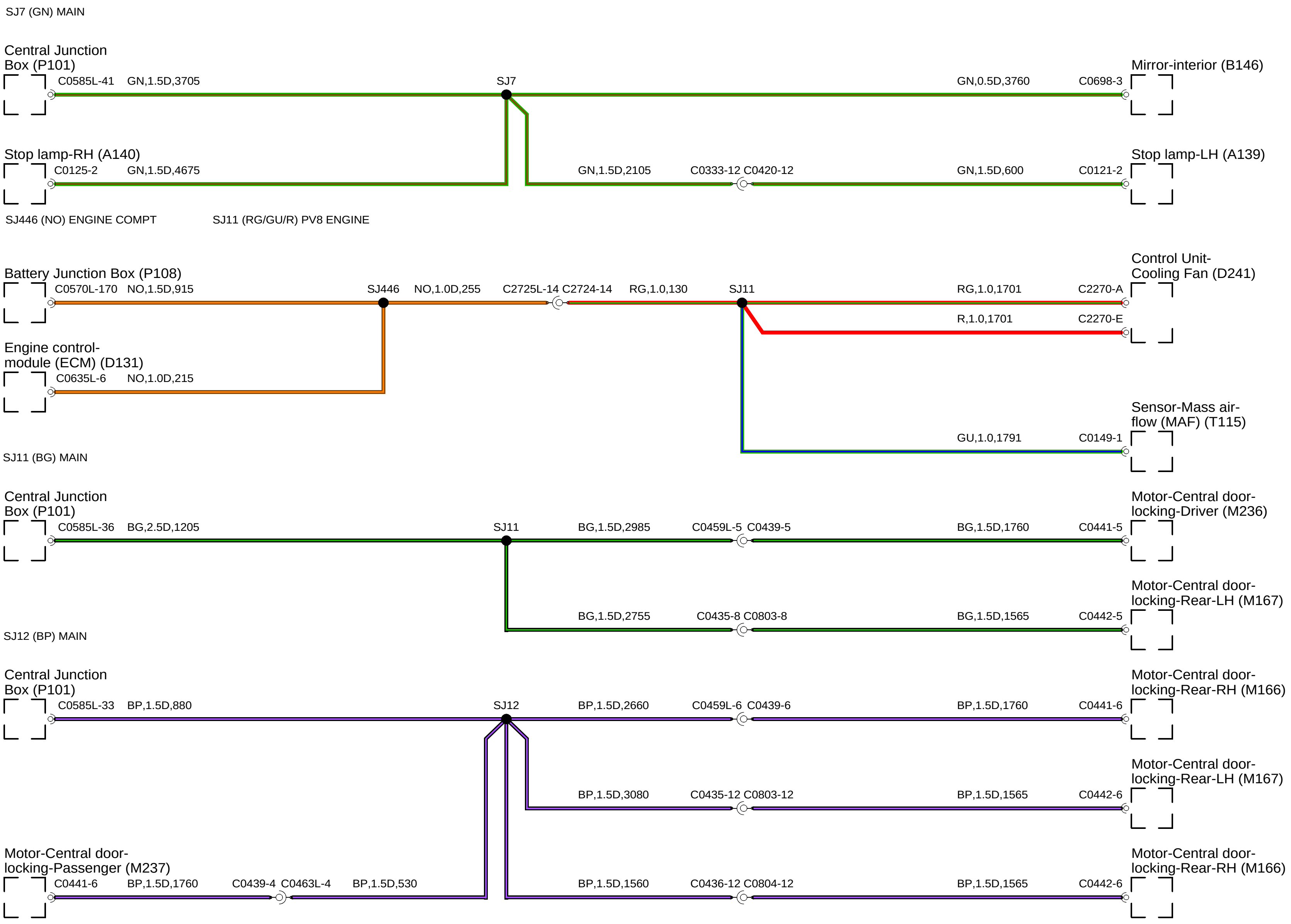

Battery Junction Box (P108)
C0570L-108
NG,4.0D,100
SJ3
NG,2.5D,2710
C0506L-3
ABS module (D277)

SJ4 (GR) MAIN

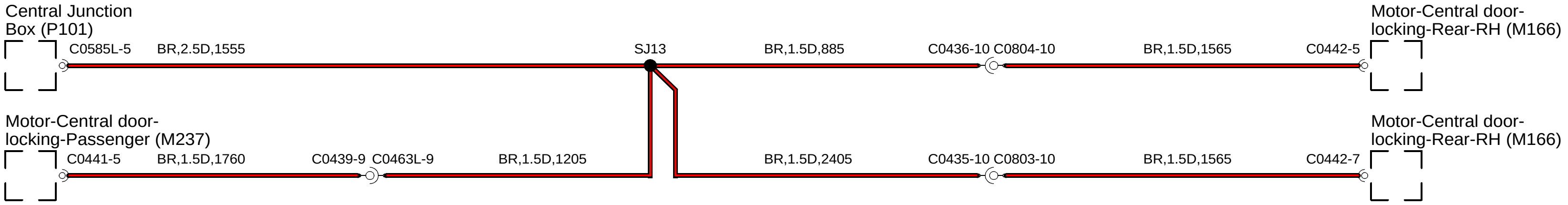

Central Junction Box (P101)
C0585L-4
GR,1.5D,810
SJ4
GR,1.5D,2590
C0459L-58
C0439-58
GR,0.75D,1180
C2677-2
Lamp-Side repeater-Front-LH (A121)
Turn signal indicator/ hazard flasher lamp (A119)
C0121-3
GR,1.5D,600
C0420-8
C0333-8
GR,1.5D,5000

SJ5 (RU) ENGINE

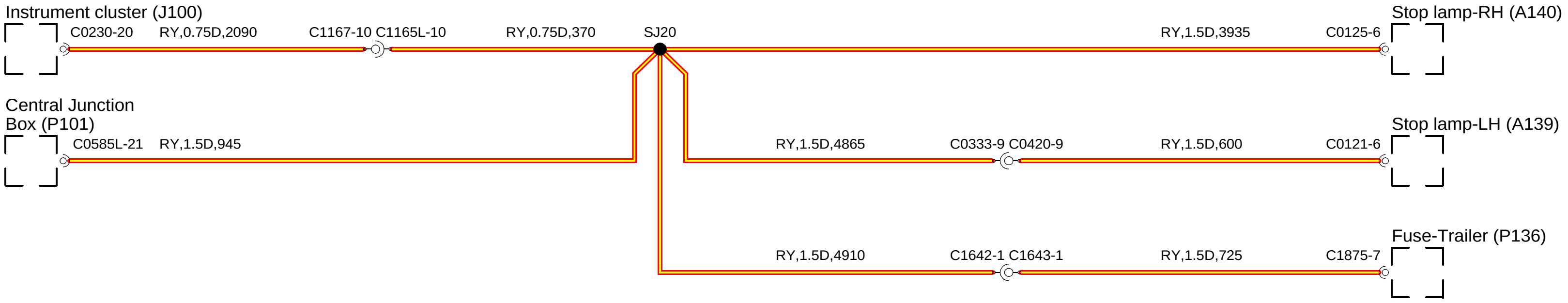

Battery Junction Box (P108)
C0570L-125
RU,1.5D,1170
C2274L-18
C2273-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260-1
Valve-Control-Fuel volume (N168)
RU,0.75,380
C2261-1
Valve-Control-Fuel pressure (N167)


SJ7 (GN) MAIN
Central Junction Box (P101)
C0585L-41
GN,1.5D,3705
SJ7
GN,0.5D,3760
C0698-3
Mirror-interior (B146)
Stop lamp-RH (A140)
C0125-2
GN,1.5D,4675
GN,1.5D,2105
C0333-12 C0420-12
GN,1.5D,600
C0121-2
Stop lamp-LH (A139)
SJ446 (NO) ENGINE COMPT
SJ11 (RG/GU/R) PV8 ENGINE
Battery Junction Box (P108)
C0570L-170
NO,1.5D,915
SJ446
NO,1.0D,255
C2725L-14 C2724-14
RG,1.0,130
SJ11
RG,1.0,1701
C2270-A
Control Unit-Cooling Fan (D241)
R,1.0,1701
C2270-E
Engine control-module (ECM) (D131)
C0635L-6
NO,1.0D,215
Sensor-Mass air-flow (MAF) (T115)
GU,1.0,1791
C0149-1
SJ11 (BG) MAIN
Central Junction Box (P101)
C0585L-36
BG,2.5D,1205
SJ11
BG,1.5D,2985
C0459L-5 C0439-5
BG,1.5D,1760
C0441-5
Motor-Central door-locking-Driver (M236)
BG,1.5D,2755
C0435-8 C0803-8
BG,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-LH (M167)
SJ12 (BP) MAIN
Central Junction Box (P101)
C0585L-33
BP,1.5D,880
SJ12
BP,1.5D,2660
C0459L-6 C0439-6
BP,1.5D,1760
C0441-6
Motor-Central door-locking-Rear-RH (M166)
BP,1.5D,3080
C0435-12 C0803-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-LH (M167)
Motor-Central door-locking-Passenger (M237)
C0441-6
BP,1.5D,1760
C0439-4 C0463L-4
BP,1.5D,530
BP,1.5D,1560
C0436-12 C0804-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-RH (M166)

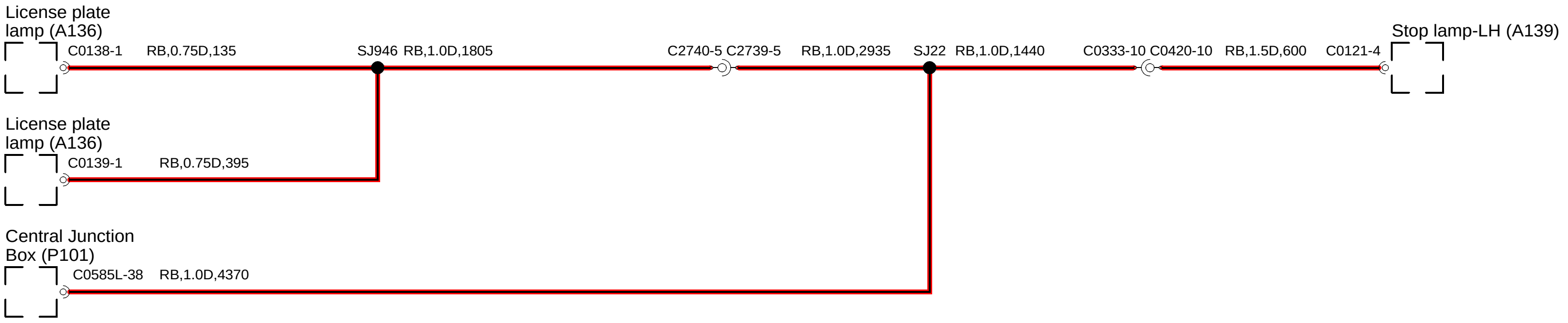
SJ13 (BR) MAIN

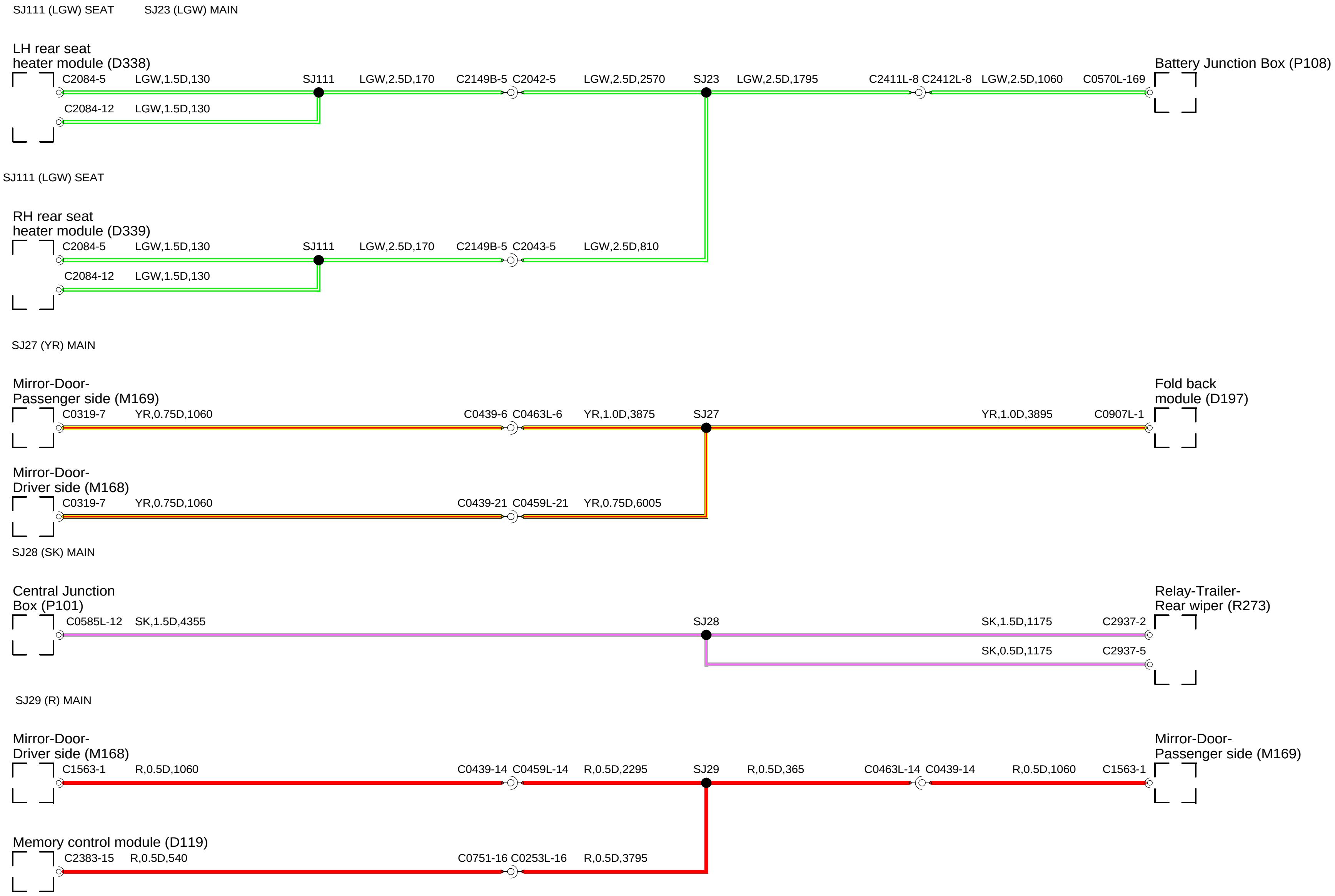

Central Junction Box (P101)
C0585L-5
BR,2.5D,1555
SJ13
BR,1.5D,885
C0436-10 C0804-10
BR,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-RH (M166)
Motor-Central door-locking-Passenger (M237)
C0441-5
BR,1.5D,1760
C0439-9 C0463L-9
BR,1.5D,1205
BR,1.5D,2405
C0435-10 C0803-10
BR,1.5D,1565
C0442-7
Motor-Central door-locking-Rear-RH (M166)

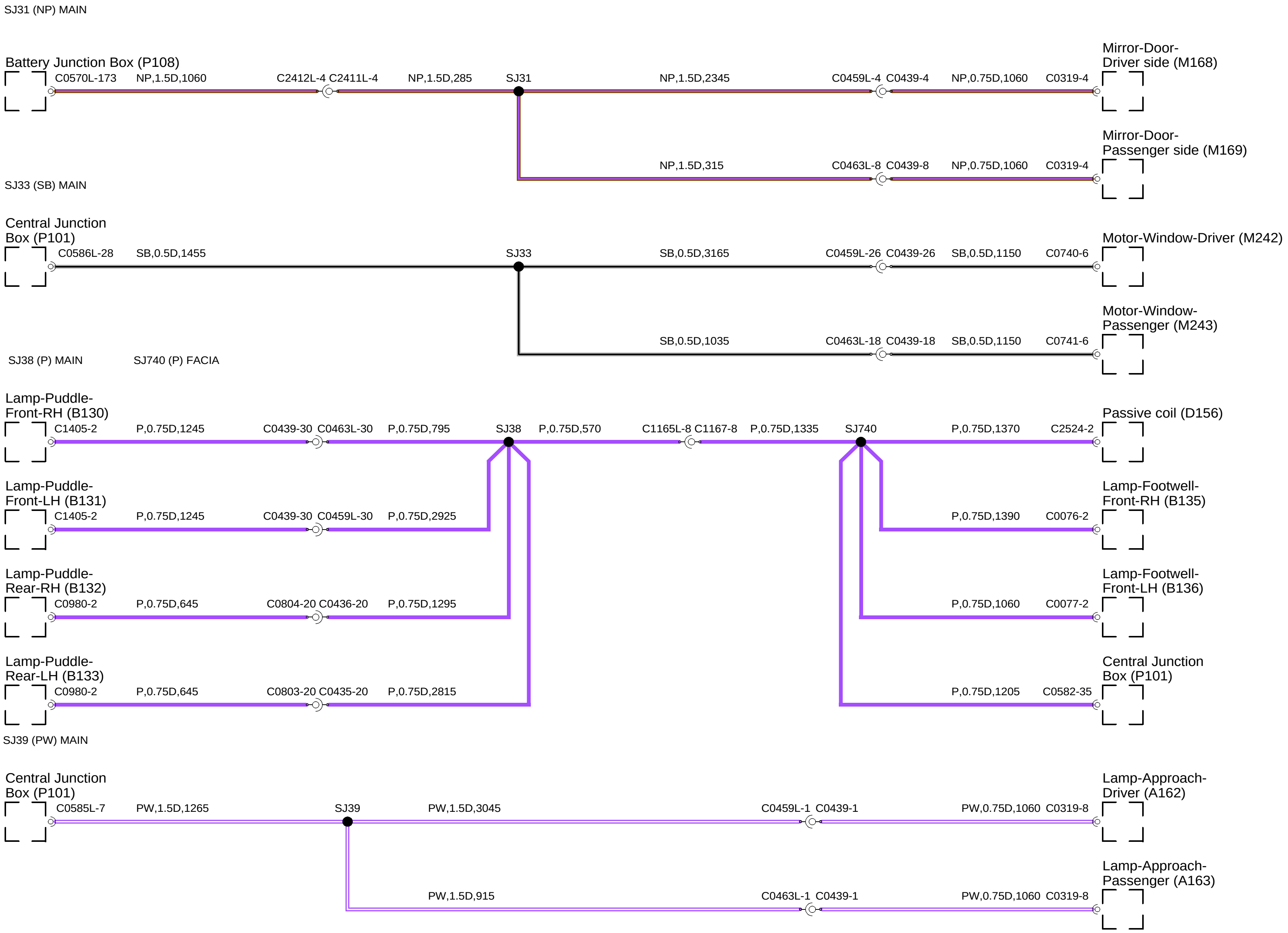
SJ20 (RY) MAIN

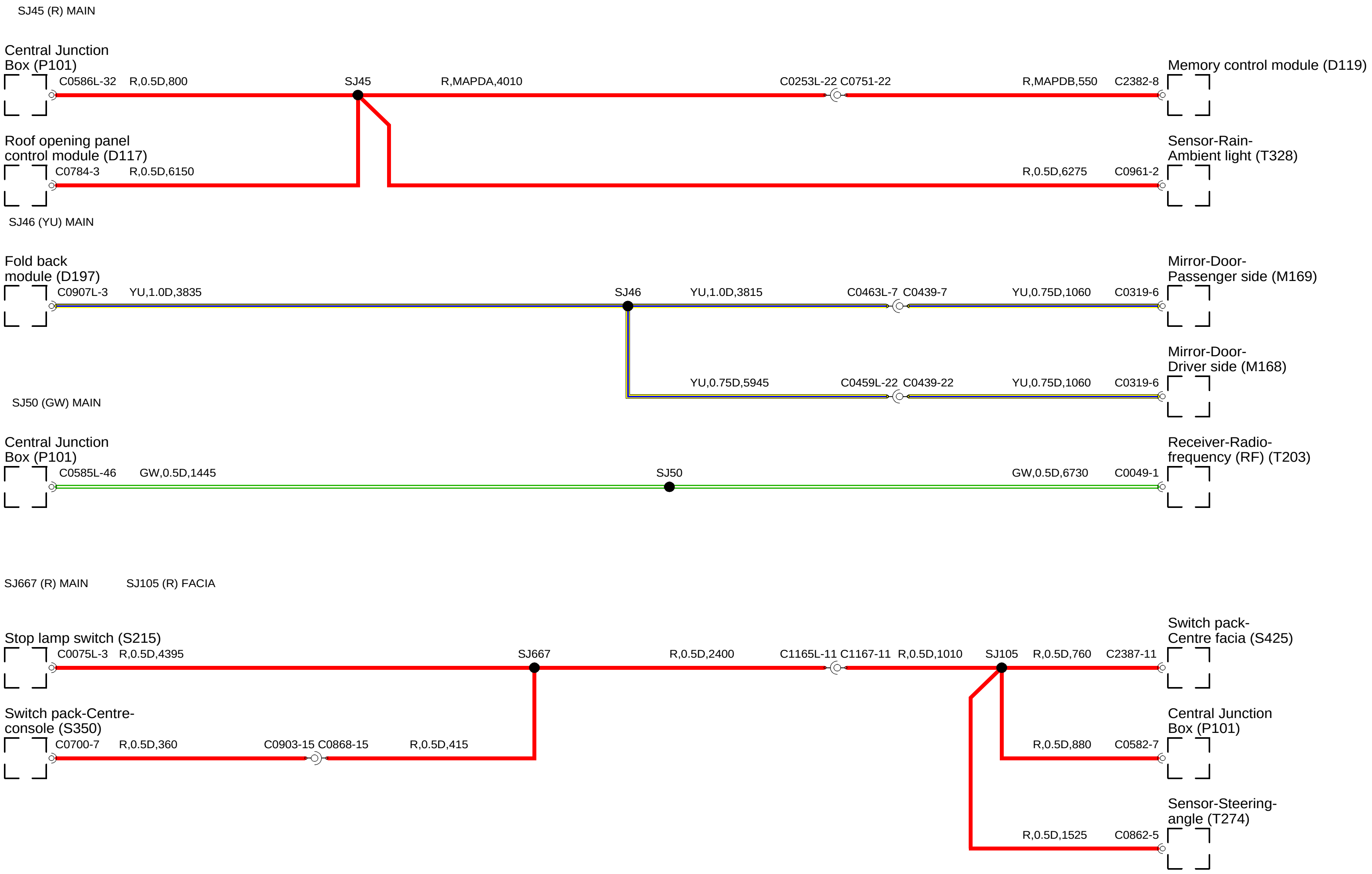

Instrument cluster (J100)
C0230-20
RY,0.75D,2090
C1167-10 C1165L-10
RY,0.75D,370
SJ20
RY,1.5D,3935
C0125-6
Stop lamp-RH (A140)
Central Junction Box (P101)
C0585L-21
RY,1.5D,945
RY,1.5D,4865
C0333-9 C0420-9
RY,1.5D,600
C0121-6
Stop lamp-LH (A139)
RY,1.5D,4910
C1642-1 C1643-1
RY,1.5D,725
C1875-7
Fuse-Trailer (P136)

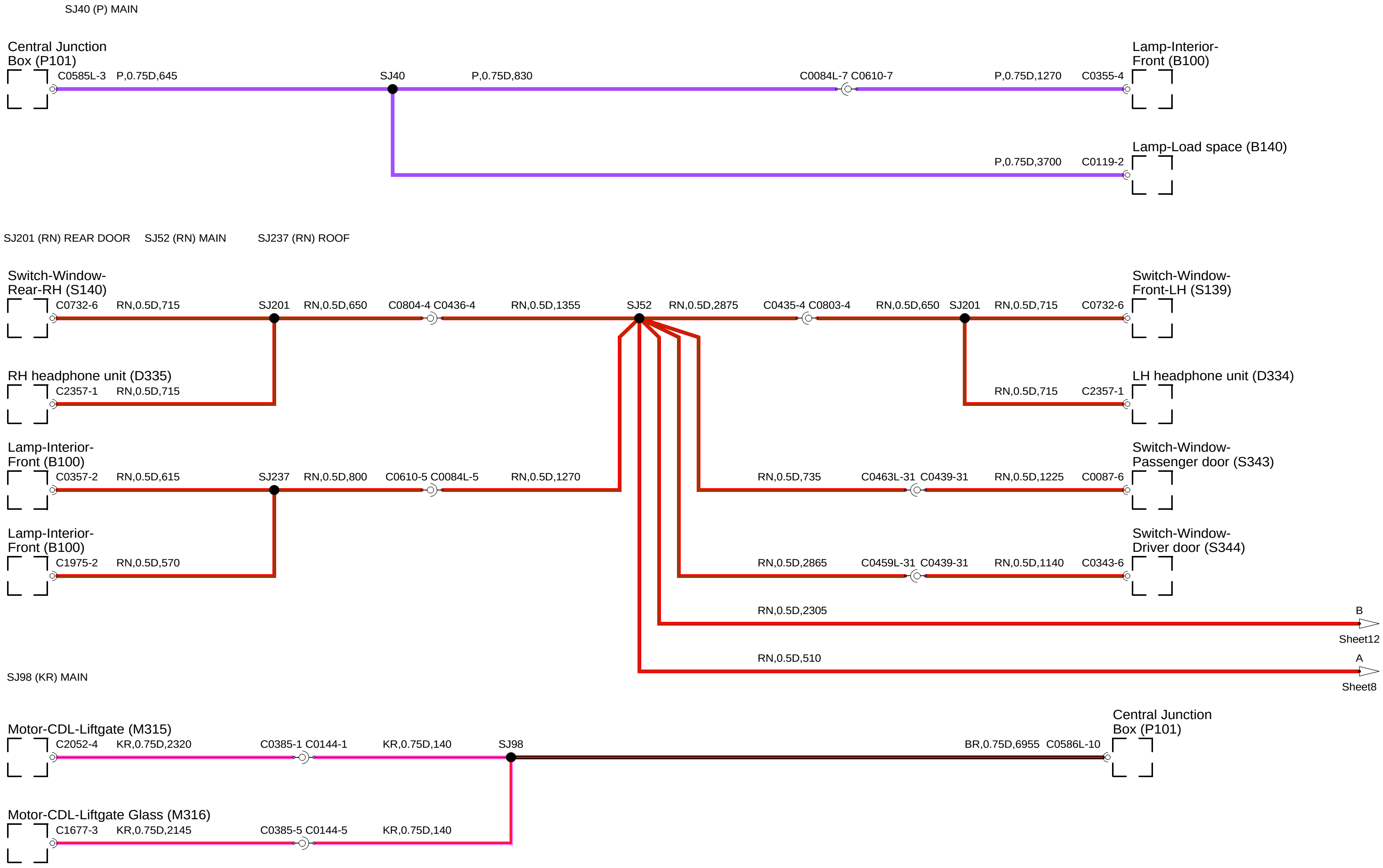
SJ22 (RB) MAIN

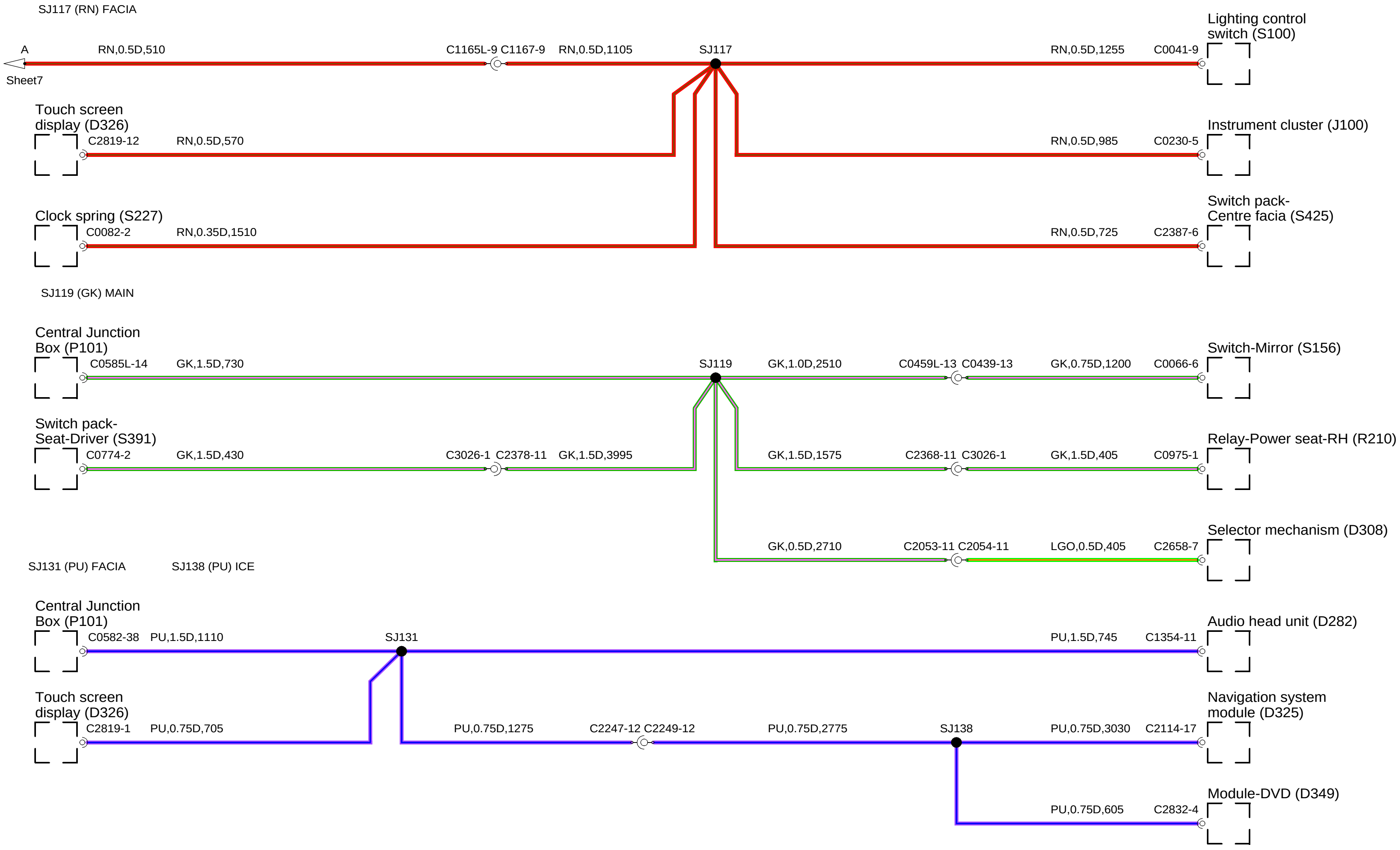

License plate lamp (A136)
C0138-1
RB,0.75D,135
SJ946
RB,1.0D,1805
C2740-5 C2739-5
RB,1.0D,2935
SJ22
RB,1.0D,1440
C0333-10 C0420-10
RB,1.5D,600
C0121-4
Stop lamp-LH (A139)
License plate lamp (A136)
C0139-1
RB,0.75D,395
Central Junction Box (P101)
C0585L-38
RB,1.0D,4370

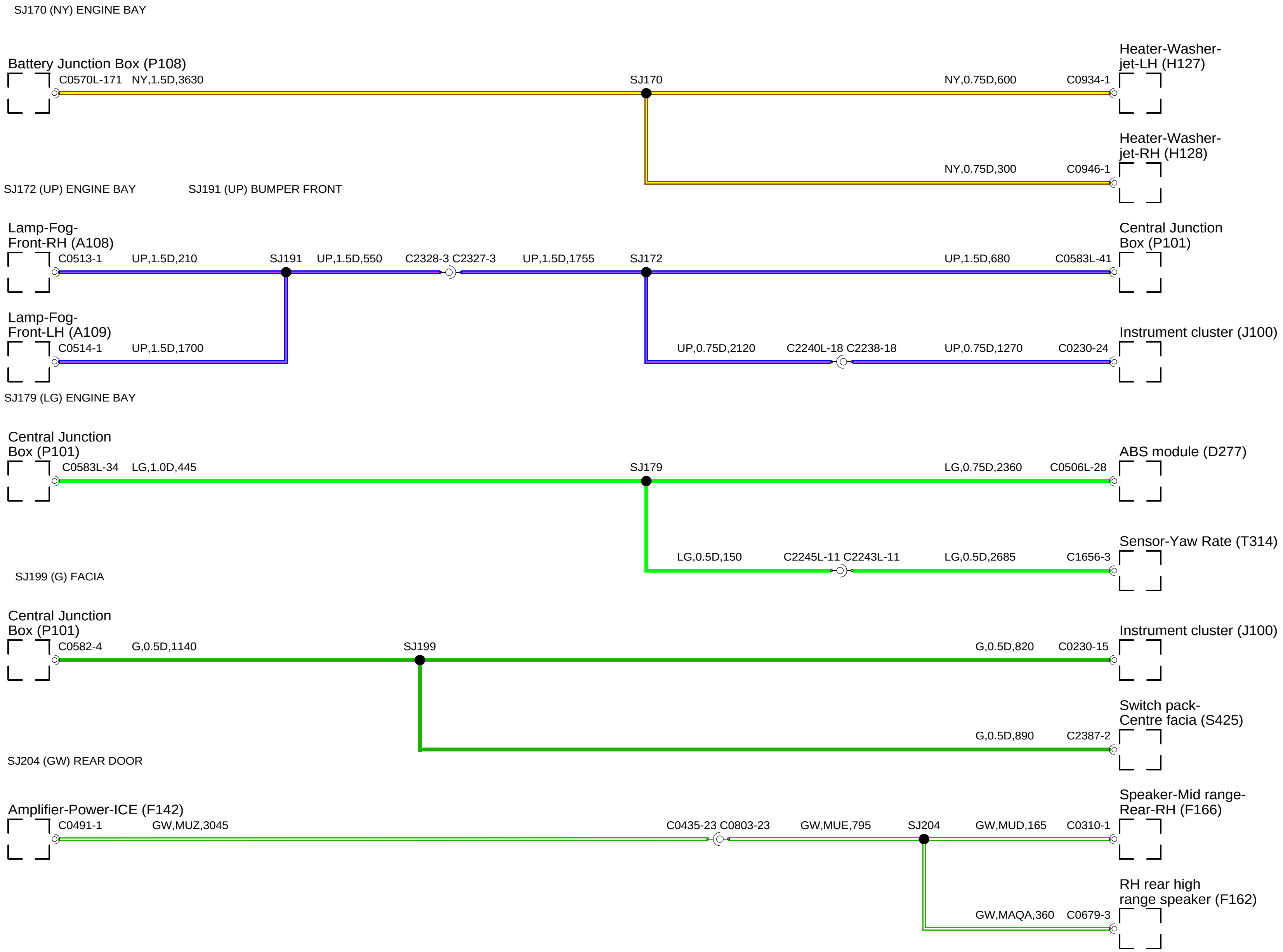

SJ111 (LGW) SEAT
SJ23 (LGW) MAIN
LH rear seat heater module (D338)
C2084-5
LGW,1.5D,130
SJ111
LGW,2.5D,170
C2149B-5
C2042-5
LGW,2.5D,2570
SJ23
LGW,2.5D,1795
C2411L-8
C2412L-8
LGW,2.5D,1060
C0570L-169
Battery Junction Box (P108)
C2084-12
LGW,1.5D,130
SJ111 (LGW) SEAT
RH rear seat heater module (D339)
C2084-5
LGW,1.5D,130
SJ111
LGW,2.5D,170
C2149B-5
C2043-5
LGW,2.5D,810
C2084-12
LGW,1.5D,130
SJ27 (YR) MAIN
Mirror-Door-Passenger side (M169)
C0319-7
YR,0.75D,1060
C0439-6
C0463L-6
YR,1.0D,3875
SJ27
YR,1.0D,3895
C0907L-1
Fold back module (D197)
Mirror-Door-Driver side (M168)
C0319-7
YR,0.75D,1060
C0439-21
C0459L-21
YR,0.75D,6005
SJ28 (SK) MAIN
Central Junction Box (P101)
C0585L-12
SK,1.5D,4355
SJ28
SK,1.5D,1175
C2937-2
Relay-Trailer-Rear wiper (R273)
SK,0.5D,1175
C2937-5
SJ29 (R) MAIN
Mirror-Door-Driver side (M168)
C1563-1
R,0.5D,1060
C0439-14
C0459L-14
R,0.5D,2295
SJ29
R,0.5D,365
C0463L-14
C0439-14
R,0.5D,1060
C1563-1
Mirror-Door-Passenger side (M169)
Memory control module (D119)
C2383-15
R,0.5D,540
C0751-16
C0253L-16
R,0.5D,3795


SJ31 (NP) MAIN
Battery Junction Box (P108)
C0570L-173
NP,1.5D,1060
C2412L-4 C2411L-4
NP,1.5D,285
SJ31
NP,1.5D,2345
C0459L-4 C0439-4
NP,0.75D,1060
C0319-4
Mirror-Door-Driver side (M168)
NP,1.5D,315
C0463L-8 C0439-8
NP,0.75D,1060
C0319-4
Mirror-Door-Passenger side (M169)
SJ33 (SB) MAIN
Central Junction Box (P101)
C0586L-28
SB,0.5D,1455
SJ33
SB,0.5D,3165
C0459L-26 C0439-26
SB,0.5D,1150
C0740-6
Motor-Window-Driver (M242)
SB,0.5D,1035
C0463L-18 C0439-18
SB,0.5D,1150
C0741-6
Motor-Window-Passenger (M243)
SJ38 (P) MAIN
SJ740 (P) FACIA
Lamp-Puddle-Front-RH (B130)
C1405-2
P,0.75D,1245
C0439-30 C0463L-30
P,0.75D,795
SJ38
P,0.75D,570
C1165L-8 C1167-8
P,0.75D,1335
SJ740
P,0.75D,1370
C2524-2
Passive coil (D156)
Lamp-Puddle-Front-LH (B131)
C1405-2
P,0.75D,1245
C0439-30 C0459L-30
P,0.75D,2925
P,0.75D,1390
C0076-2
Lamp-Footwell-Front-RH (B135)
Lamp-Puddle-Rear-RH (B132)
C0980-2
P,0.75D,645
C0804-20 C0436-20
P,0.75D,1295
P,0.75D,1060
C0077-2
Lamp-Footwell-Front-LH (B136)
Lamp-Puddle-Rear-LH (B133)
C0980-2
P,0.75D,645
C0803-20 C0435-20
P,0.75D,2815
P,0.75D,1205
C0582-35
Central Junction Box (P101)
SJ39 (PW) MAIN
Central Junction Box (P101)
C0585L-7
PW,1.5D,1265
SJ39
PW,1.5D,3045
C0459L-1 C0439-1
PW,0.75D,1060 C0319-8
Lamp-Approach-Driver (A162)
PW,1.5D,915
C0463L-1 C0439-1
PW,0.75D,1060 C0319-8
Lamp-Approach-Passenger (A163)

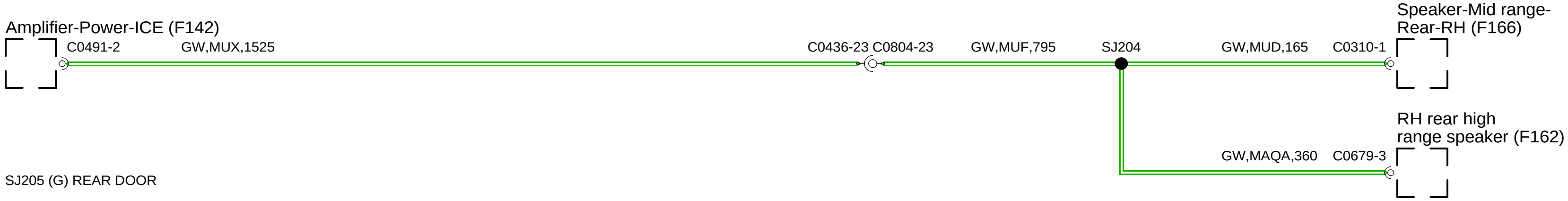

SJ45 (R) MAIN
Central Junction Box (P101)
C0586L-32
R,0.5D,800
SJ45
R,MAPDA,4010
C0253L-22 C0751-22
R,MAPDB,550
C2382-8
Memory control module (D119)
Roof opening panel control module (D117)
C0784-3
R,0.5D,6150
Sensor-Rain-Ambient light (T328)
R,0.5D,6275
C0961-2
SJ46 (YU) MAIN
Fold back module (D197)
C0907L-3
YU,1.0D,3835
SJ46
YU,1.0D,3815
C0463L-7 C0439-7
YU,0.75D,1060
C0319-6
Mirror-Door-Passenger side (M169)
Mirror-Door-Driver side (M168)
YU,0.75D,5945
C0459L-22 C0439-22
YU,0.75D,1060
C0319-6
SJ50 (GW) MAIN
Central Junction Box (P101)
C0585L-46
GW,0.5D,1445
SJ50
GW,0.5D,6730
C0049-1
Receiver-Radio-frequency (RF) (T203)
SJ667 (R) MAIN
SJ105 (R) FACIA
Stop lamp switch (S215)
C0075L-3
R,0.5D,4395
SJ667
R,0.5D,2400
C1165L-11 C1167-11
R,0.5D,1010
SJ105
R,0.5D,760
C2387-11
Switch pack-Centre facia (S425)
Switch pack-Centre console (S350)
C0700-7
R,0.5D,360
C0903-15 C0868-15
R,0.5D,415
Central Junction Box (P101)
R,0.5D,880
C0582-7
Sensor-Steering-angle (T274)
R,0.5D,1525
C0862-5


SJ40 (P) MAIN
Central Junction Box (P101)
C0585L-3
P,0.75D,645
SJ40
P,0.75D,830
C0084L-7 C0610-7
P,0.75D,1270
C0355-4
Lamp-Interior-Front (B100)
Lamp-Load space (B140)
P,0.75D,3700
C0119-2
SJ201 (RN) REAR DOOR
SJ52 (RN) MAIN
SJ237 (RN) ROOF
Switch-Window-Rear-RH (S140)
C0732-6
RN,0.5D,715
SJ201
RN,0.5D,650
C0804-4 C0436-4
RN,0.5D,1355
SJ52
RN,0.5D,2875
C0435-4 C0803-4
RN,0.5D,650
SJ201
RN,0.5D,715
C0732-6
Switch-Window-Front-LH (S139)
RH headphone unit (D335)
C2357-1
RN,0.5D,715
LH headphone unit (D334)
RN,0.5D,715
C2357-1
Lamp-Interior-Front (B100)
C0357-2
RN,0.5D,615
SJ237
RN,0.5D,800
C0610-5 C0084L-5
RN,0.5D,1270
RN,0.5D,735
C0463L-31 C0439-31
RN,0.5D,1225
C0087-6
Switch-Window-Passenger door (S343)
Lamp-Interior-Front (B100)
C1975-2
RN,0.5D,570
RN,0.5D,2865
C0459L-31 C0439-31
RN,0.5D,1140
C0343-6
Switch-Window-Driver door (S344)
RN,0.5D,2305
B
Sheet12
RN,0.5D,510
A
Sheet8
SJ98 (KR) MAIN
Motor-CDL-Liftgate (M315)
C2052-4
KR,0.75D,2320
C0385-1 C0144-1
KR,0.75D,140
SJ98
BR,0.75D,6955
C0586L-10
Central Junction Box (P101)
Motor-CDL-Liftgate Glass (M316)
C1677-3
KR,0.75D,2145
C0385-5 C0144-5
KR,0.75D,140

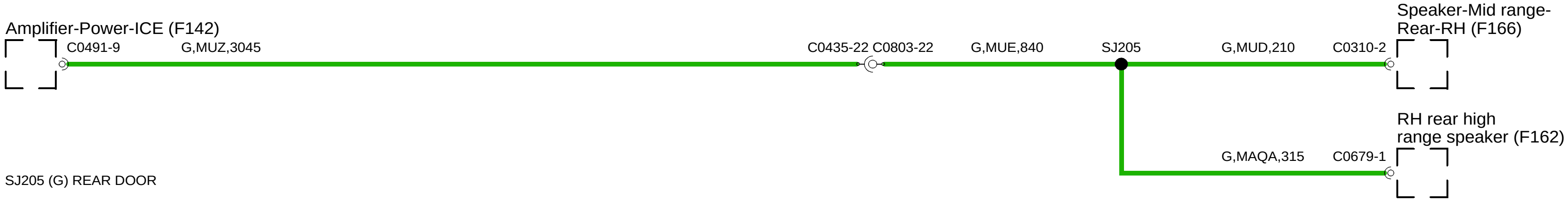

SJ117 (RN) FACIA
A
Sheet7
RN,0.5D,510
C1165L-9 C1167-9
RN,0.5D,1105
SJ117
RN,0.5D,1255
C0041-9
Lighting control switch (S100)
Touch screen display (D326)
C2819-12
RN,0.5D,570
RN,0.5D,985
C0230-5
Instrument cluster (J100)
Clock spring (S227)
C0082-2
RN,0.35D,1510
RN,0.5D,725
C2387-6
Switch pack-Centre facia (S425)
SJ119 (GK) MAIN
Central Junction Box (P101)
C0585L-14
GK,1.5D,730
SJ119
GK,1.0D,2510
C0459L-13 C0439-13
GK,0.75D,1200
C0066-6
Switch-Mirror (S156)
Switch pack-Seat-Driver (S391)
C0774-2
GK,1.5D,430
C3026-1 C2378-11
GK,1.5D,3995
GK,1.5D,1575
C2368-11 C3026-1
GK,1.5D,405
C0975-1
Relay-Power seat-RH (R210)
GK,0.5D,2710
C2053-11 C2054-11
LGO,0.5D,405
C2658-7
Selector mechanism (D308)
SJ131 (PU) FACIA
SJ138 (PU) ICE
Central Junction Box (P101)
C0582-38
PU,1.5D,1110
SJ131
PU,1.5D,745
C1354-11
Audio head unit (D282)
Touch screen display (D326)
C2819-1
PU,0.75D,705
PU,0.75D,1275
C2247-12 C2249-12
PU,0.75D,2775
SJ138
PU,0.75D,3030
C2114-17
Navigation system module (D325)
PU,0.75D,605
C2832-4
Module-DVD (D349)


SJ170 (NY) ENGINE BAY
Battery Junction Box (P108)
C0570L-171
NY,1.5D,3630
SJ170
NY,0.75D,600
C0934-1
Heater-Washer-jet-LH (H127)
NY,0.75D,300
C0946-1
Heater-Washer-jet-RH (H128)
SJ172 (UP) ENGINE BAY
SJ191 (UP) BUMPER FRONT
Lamp-Fog-Front-RH (A108)
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
UP,1.5D,1755
SJ172
UP,1.5D,680
C0583L-41
Central Junction Box (P101)
Lamp-Fog-Front-LH (A109)
C0514-1
UP,1.5D,1700
UP,0.75D,2120
C2240L-18 C2238-18
UP,0.75D,1270
C0230-24
Instrument cluster (J100)
SJ179 (LG) ENGINE BAY
Central Junction Box (P101)
C0583L-34
LG,1.0D,445
SJ179
LG,0.75D,2360
C0506L-28
ABS module (D277)
LG,0.5D,150
C2245L-11 C2243L-11
LG,0.5D,2685
C1656-3
Sensor-Yaw Rate (T314)
SJ199 (G) FACIA
Central Junction Box (P101)
C0582-4
G,0.5D,1140
SJ199
G,0.5D,820
C0230-15
Instrument cluster (J100)
G,0.5D,890
C2387-2
Switch pack-Centre facia (S425)
SJ204 (GW) REAR DOOR
Amplifier-Power-ICE (F142)
C0491-1
GW,MUZ,3045
C0435-23 C0803-23
GW,MUE,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-RH (F166)
GW,MAQA,360
C0679-3
RH rear high range speaker (F162)

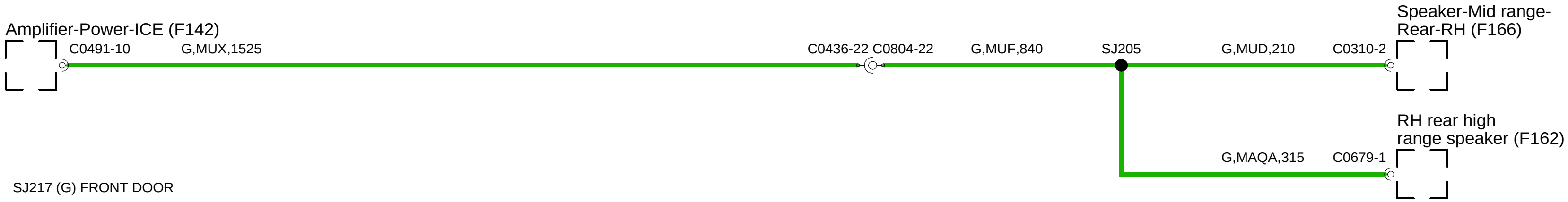
SJ204 (GW) REAR DOOR


Amplifier-Power-ICE (F142)
C0491-2
GW,MUX,1525
C0436-23 C0804-23
GW,MUF,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
GW,MAQA,360
C0679-3

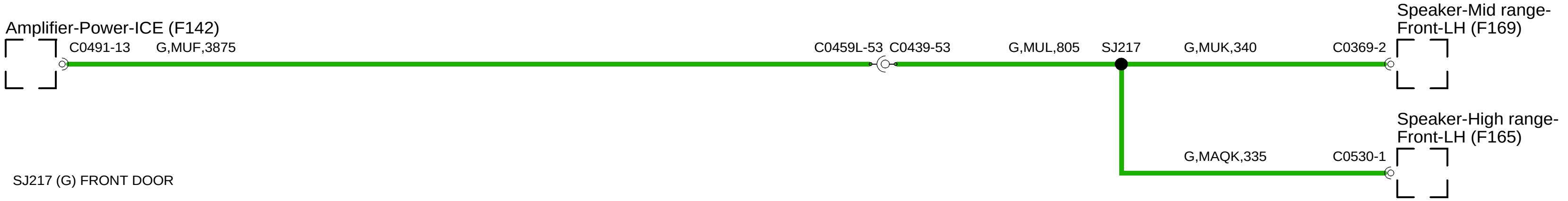
SJ205 (G) REAR DOOR


Amplifier-Power-ICE (F142)
C0491-9
G,MUZ,3045
C0435-22 C0803-22
G,MUE,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
G,MAQA,315
C0679-1

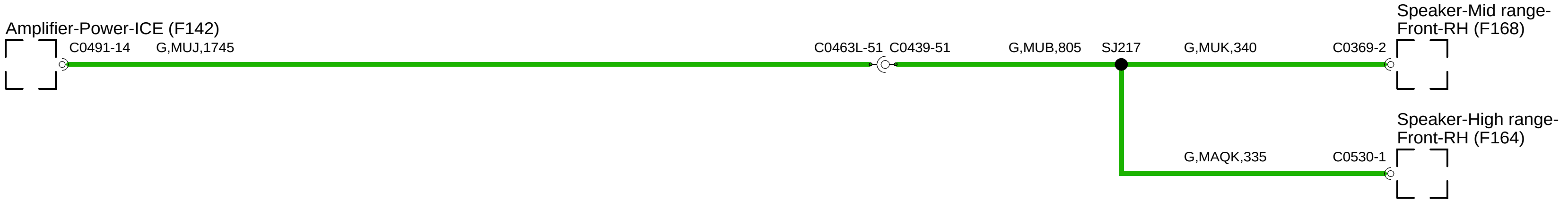
SJ205 (G) REAR DOOR


Amplifier-Power-ICE (F142)
C0491-10
G,MUX,1525
C0436-22 C0804-22
G,MUF,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
G,MAQA,315
C0679-1

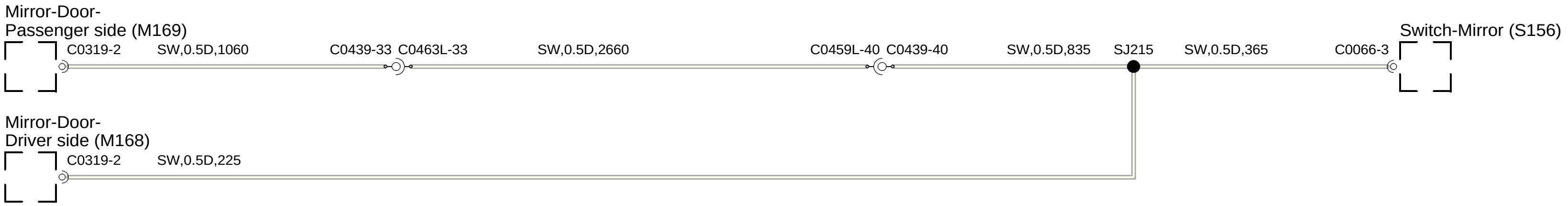
SJ217 (G) FRONT DOOR


Amplifier-Power-ICE (F142)
C0491-13
G,MUF,3875
C0459L-53 C0439-53
G,MUL,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-Front-LH (F169)
Speaker-High range-Front-LH (F165)
G,MAQK,335
C0530-1

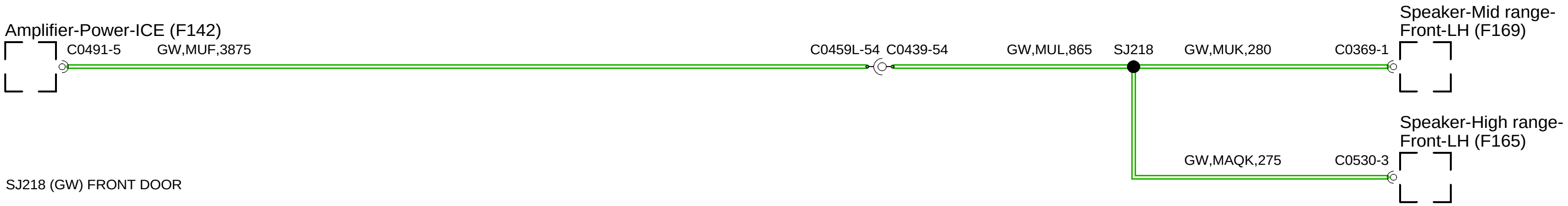
SJ217 (G) FRONT DOOR


Amplifier-Power-ICE (F142)
C0491-14
G,MUJ,1745
C0463L-51 C0439-51
G,MUB,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-Front-RH (F168)
Speaker-High range-Front-RH (F164)
G,MAQK,335
C0530-1

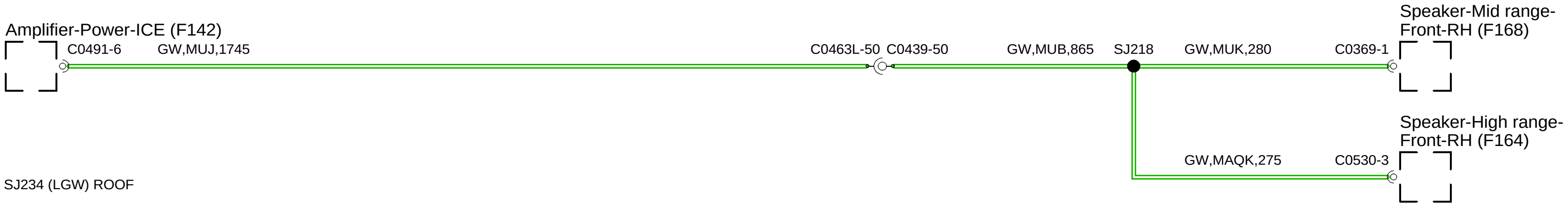
SJ215 (SW) FRONT DOOR


Mirror-Door-
Passenger side (M169)
C0319-2
SW,0.5D,1060
C0439-33
C0463L-33
SW,0.5D,2660
C0459L-40
C0439-40
SW,0.5D,835
SJ215
SW,0.5D,365
C0066-3
Switch-Mirror (S156)
Mirror-Door-
Driver side (M168)
C0319-2
SW,0.5D,225

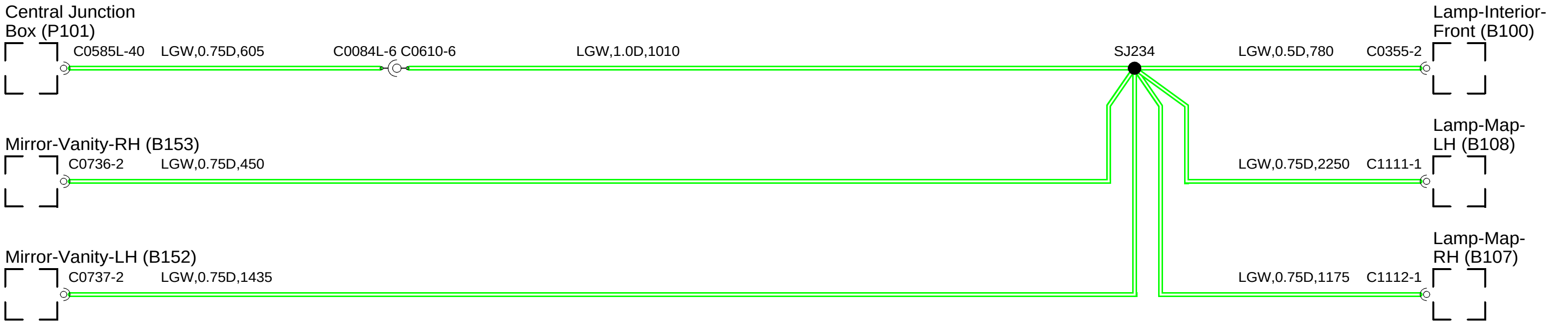
SJ218 (GW) FRONT DOOR

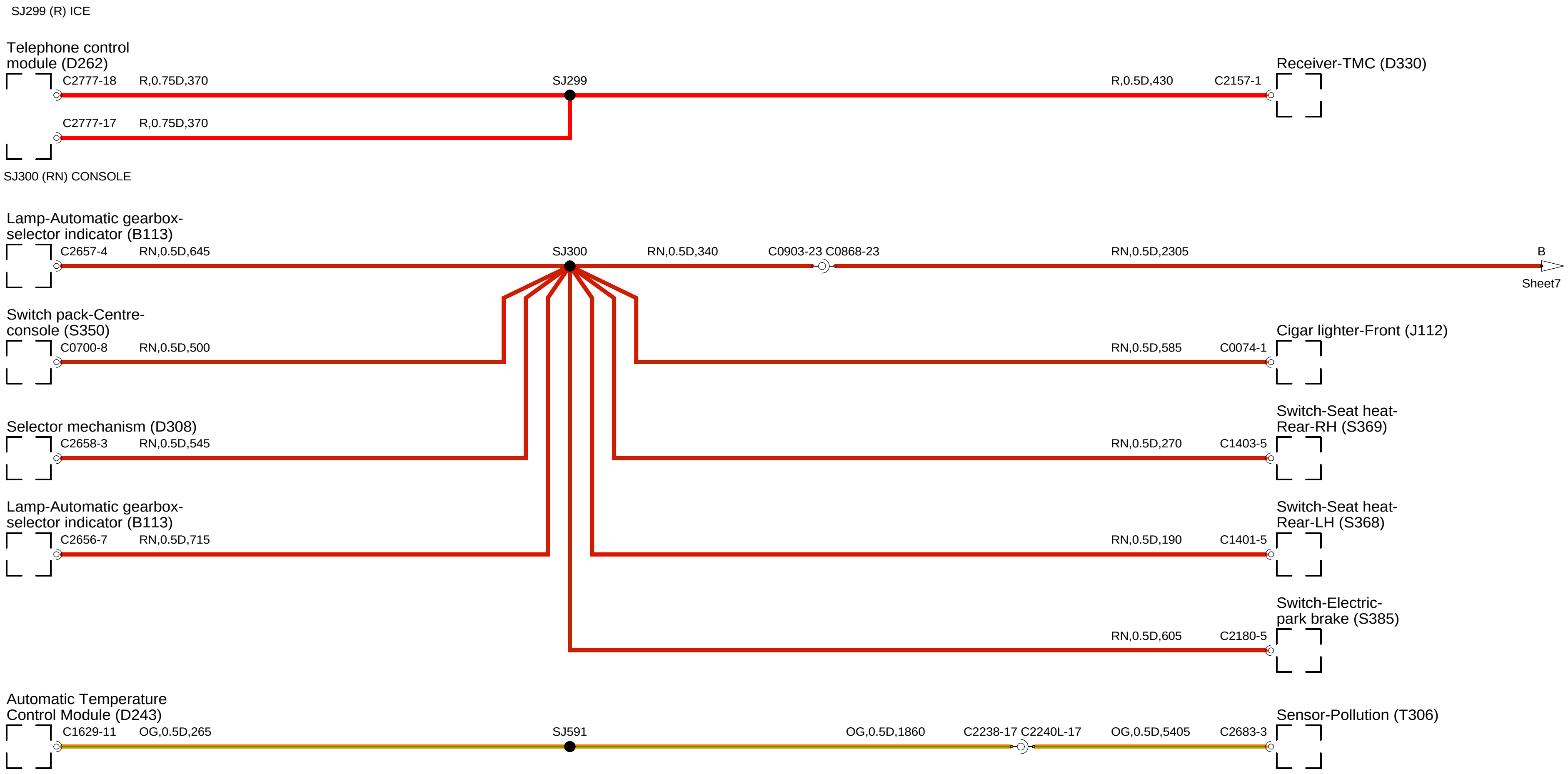

Amplifier-Power-ICE (F142)
C0491-5
GW,MUF,3875
C0459L-54
C0439-54
GW,MUL,865
SJ218
GW,MUK,280
C0369-1
Speaker-Mid range-
Front-LH (F169)
GW,MAQK,275
C0530-3
Speaker-High range-
Front-LH (F165)

SJ218 (GW) FRONT DOOR

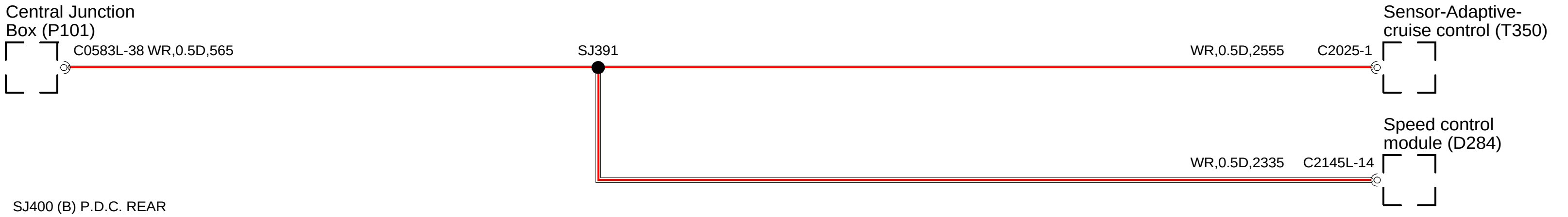

Amplifier-Power-ICE (F142)
C0491-6
GW,MUJ,1745
C0463L-50
C0439-50
GW,MUB,865
SJ218
GW,MUK,280
C0369-1
Speaker-Mid range-
Front-RH (F168)
GW,MAQK,275
C0530-3
Speaker-High range-
Front-RH (F164)

SJ234 (LGW) ROOF

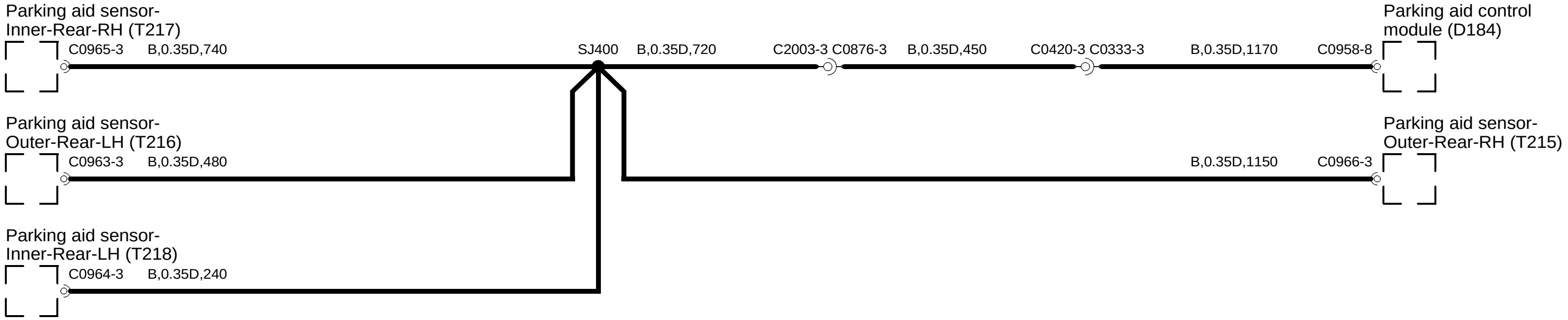

Central Junction
Box (P101)
C0585L-40
LGW,0.75D,605
C0084L-6
C0610-6
LGW,1.0D,1010
SJ234
LGW,0.5D,780
C0355-2
Lamp-Interior-
Front (B100)
Mirror-Vanity-RH (B153)
C0736-2
LGW,0.75D,450
LGW,0.75D,2250
C1111-1
Lamp-Map-
LH (B108)
Mirror-Vanity-LH (B152)
C0737-2
LGW,0.75D,1435
LGW,0.75D,1175
C1112-1
Lamp-Map-
RH (B107)


SJ299 (R) ICE
Telephone control module (D262)
C2777-18
R,0.75D,370
SJ299
R,0.5D,430
C2157-1
Receiver-TMC (D330)
C2777-17
R,0.75D,370
SJ300 (RN) CONSOLE
Lamp-Automatic gearbox-selector indicator (B113)
C2657-4
RN,0.5D,645
SJ300
RN,0.5D,340
C0903-23 C0868-23
RN,0.5D,2305
B
Sheet7
Switch pack-Centre-console (S350)
C0700-8
RN,0.5D,500
Cigar lighter-Front (J112)
RN,0.5D,585
C0074-1
Selector mechanism (D308)
C2658-3
RN,0.5D,545
Switch-Seat heat-Rear-RH (S369)
RN,0.5D,270
C1403-5
Lamp-Automatic gearbox-selector indicator (B113)
C2656-7
RN,0.5D,715
Switch-Seat heat-Rear-LH (S368)
RN,0.5D,190
C1401-5
Switch-Electric-park brake (S385)
RN,0.5D,605
C2180-5
Automatic Temperature Control Module (D243)
C1629-11
OG,0.5D,265
SJ591
OG,0.5D,1860
C2238-17 C2240L-17
OG,0.5D,5405
C2683-3
Sensor-Pollution (T306)

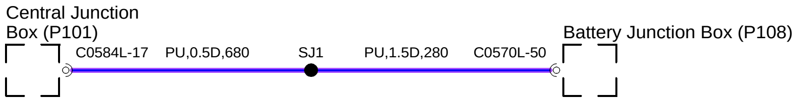
SJ391 (WR) MAIN


Central Junction Box (P101)
C0583L-38 WR,0.5D,565
SJ391
WR,0.5D,2555
C2025-1
Sensor-Adaptive-cruise control (T350)
Speed control module (D284)
WR,0.5D,2335
C2145L-14

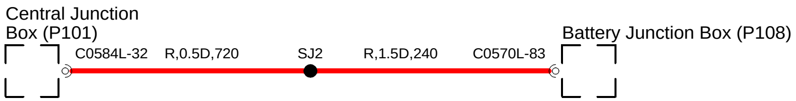
SJ400 (B) P.D.C. REAR


Parking aid sensor-Inner-Rear-RH (T217)
C0965-3
B,0.35D,740
SJ400
B,0.35D,720
C2003-3 C0876-3
B,0.35D,450
C0420-3 C0333-3
B,0.35D,1170
C0958-8
Parking aid control module (D184)
Parking aid sensor-Outer-Rear-LH (T216)
C0963-3
B,0.35D,480
B,0.35D,1150
C0966-3
Parking aid sensor-Outer-Rear-RH (T215)
Parking aid sensor-Inner-Rear-LH (T218)
C0964-3
B,0.35D,240

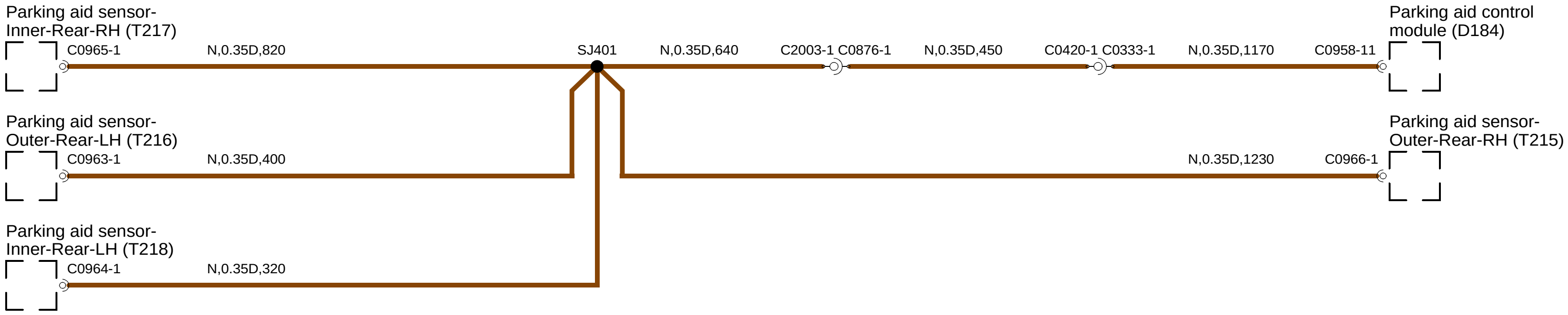
SJ1 (PU) ENGINE COMPARTMENT


Central Junction Box (P101)
C0584L-17
PU,0.5D,680
SJ1
PU,1.5D,280
C0570L-50
Battery Junction Box (P108)

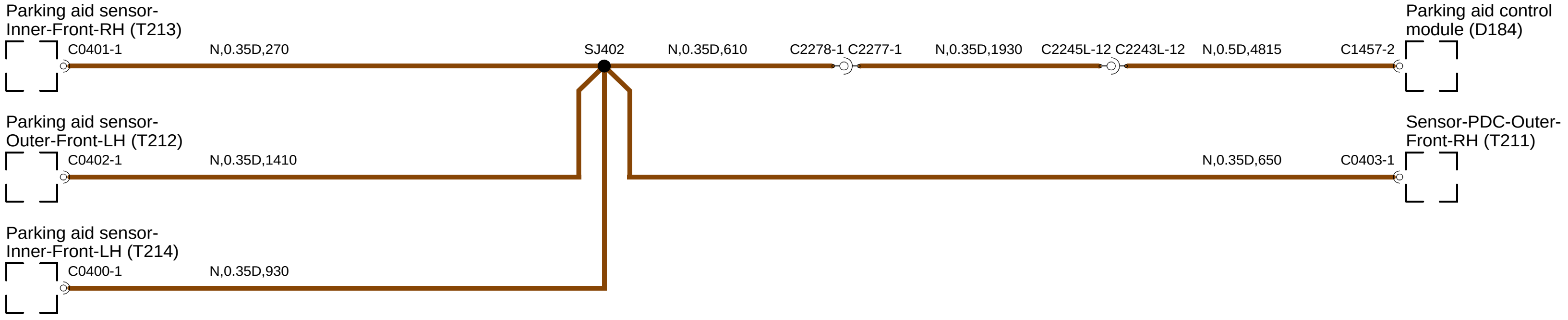
SJ2 (R) ENGINE COMPARTMENT


Central Junction Box (P101)
C0584L-32
R,0.5D,720
SJ2
R,1.5D,240
C0570L-83
Battery Junction Box (P108)

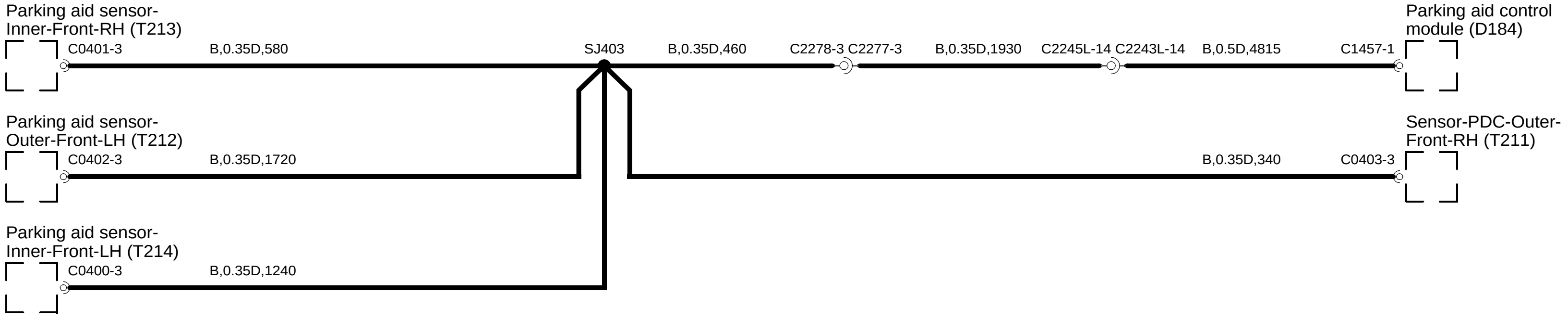
SJ401 (N) P.D.C. REAR

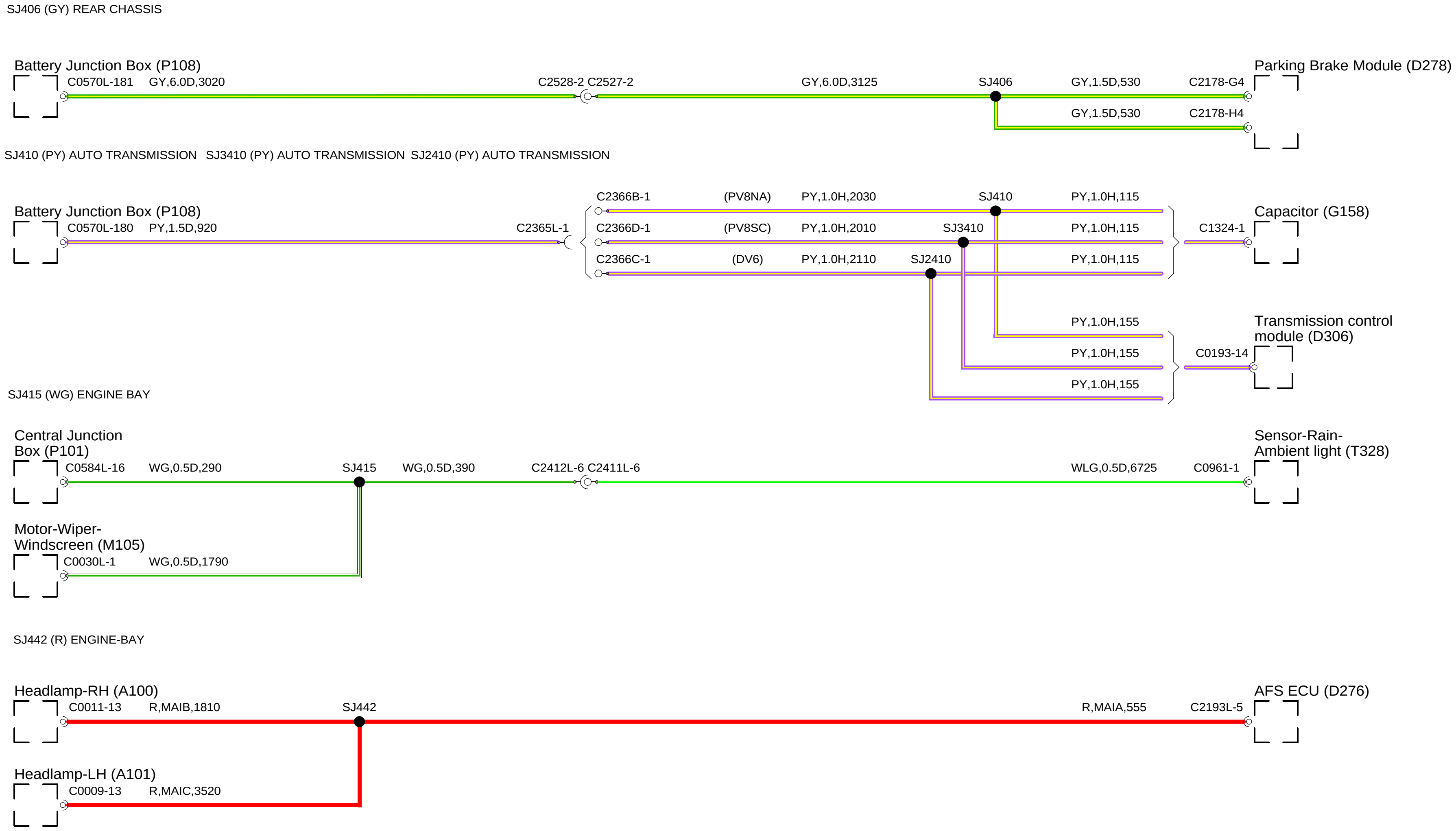

Parking aid sensor-Inner-Rear-RH (T217)
C0965-1
N,0.35D,820
SJ401
N,0.35D,640
C2003-1 C0876-1
N,0.35D,450
C0420-1 C0333-1
N,0.35D,1170
C0958-11
Parking aid control module (D184)
Parking aid sensor-Outer-Rear-LH (T216)
C0963-1
N,0.35D,400
Parking aid sensor-Outer-Rear-RH (T215)
N,0.35D,1230
C0966-1
Parking aid sensor-Inner-Rear-LH (T218)
C0964-1
N,0.35D,320

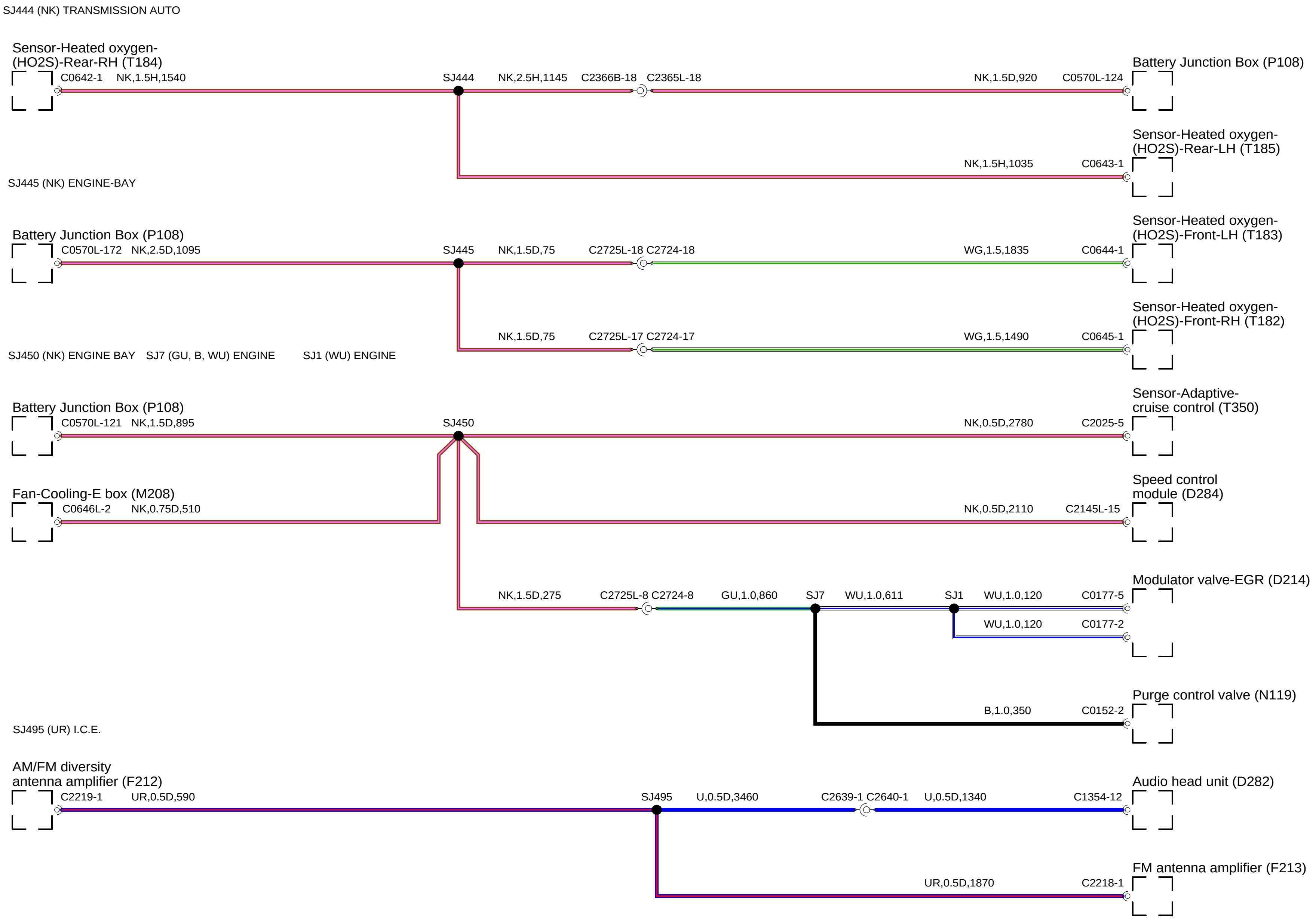
SJ402 (N) FRONT BUMPER


Parking aid sensor-Inner-Front-RH (T213)
C0401-1
N,0.35D,270
SJ402
N,0.35D,610
C2278-1 C2277-1
N,0.35D,1930
C2245L-12 C2243L-12
N,0.5D,4815
C1457-2
Parking aid control module (D184)
Parking aid sensor-Outer-Front-LH (T212)
C0402-1
N,0.35D,1410
Sensor-PDC-Outer-Front-RH (T211)
N,0.35D,650
C0403-1
Parking aid sensor-Inner-Front-LH (T214)
C0400-1
N,0.35D,930

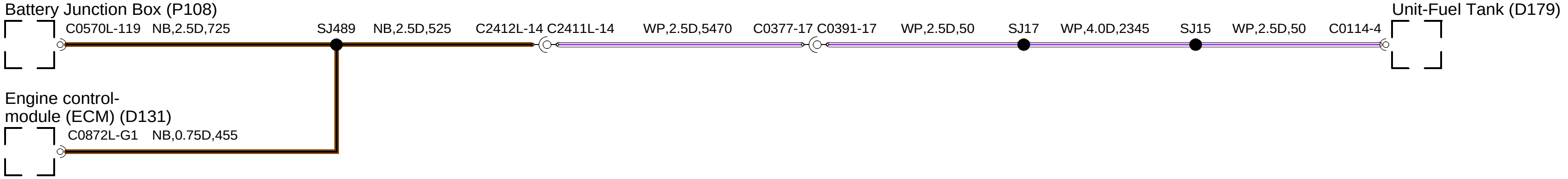
SJ403 (B) FRONT BUMPER


Parking aid sensor-Inner-Front-RH (T213)
C0401-3
B,0.35D,580
SJ403
B,0.35D,460
C2278-3 C2277-3
B,0.35D,1930
C2245L-14 C2243L-14
B,0.5D,4815
C1457-1
Parking aid control module (D184)
Parking aid sensor-Outer-Front-LH (T212)
C0402-3
B,0.35D,1720
Sensor-PDC-Outer-Front-RH (T211)
B,0.35D,340
C0403-3
Parking aid sensor-Inner-Front-LH (T214)
C0400-3
B,0.35D,1240

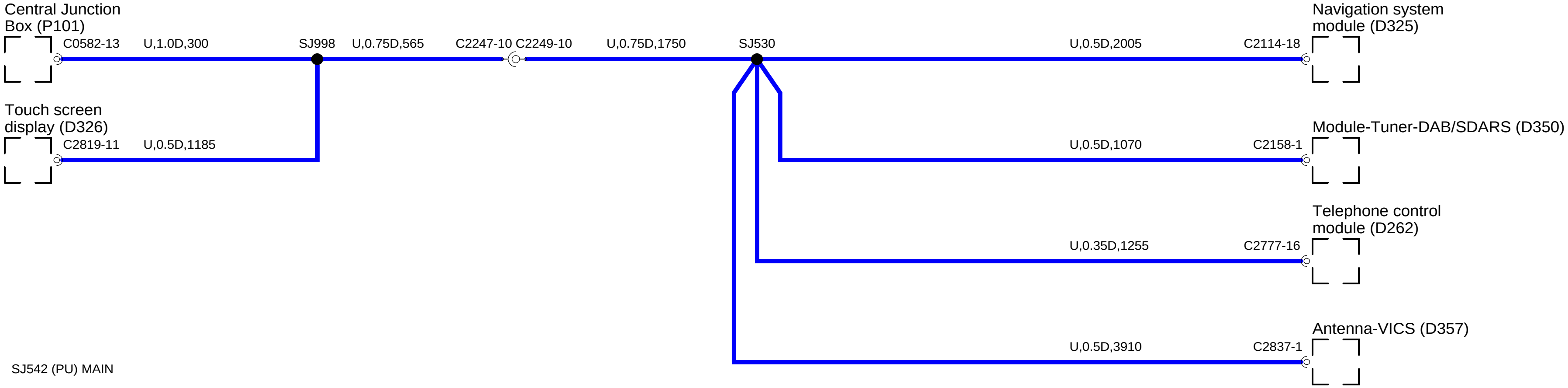

SJ406 (GY) REAR CHASSIS
Battery Junction Box (P108)
C0570L-181
GY,6.0D,3020
C2528-2 C2527-2
GY,6.0D,3125
SJ406
GY,1.5D,530
C2178-G4
GY,1.5D,530
C2178-H4
Parking Brake Module (D278)
SJ410 (PY) AUTO TRANSMISSION
SJ3410 (PY) AUTO TRANSMISSION
SJ2410 (PY) AUTO TRANSMISSION
Battery Junction Box (P108)
C0570L-180
PY,1.5D,920
C2365L-1
C2366B-1
(PV8NA)
PY,1.0H,2030
SJ410
PY,1.0H,115
C2366D-1
(PV8SC)
PY,1.0H,2010
SJ3410
PY,1.0H,115
C2366C-1
(DV6)
PY,1.0H,2110
SJ2410
PY,1.0H,115
C1324-1
Capacitor (G158)
PY,1.0H,155
PY,1.0H,155
PY,1.0H,155
C0193-14
Transmission control module (D306)
SJ415 (WG) ENGINE BAY
Central Junction Box (P101)
C0584L-16
WG,0.5D,290
SJ415
WG,0.5D,390
C2412L-6 C2411L-6
WLG,0.5D,6725
C0961-1
Sensor-Rain-Ambient light (T328)
Motor-Wiper-Windscreen (M105)
C0030L-1
WG,0.5D,1790
SJ442 (R) ENGINE-BAY
Headlamp-RH (A100)
C0011-13
R,MAIB,1810
SJ442
R,MAIA,555
C2193L-5
AFS ECU (D276)
Headlamp-LH (A101)
C0009-13
R,MAIC,3520


SJ444 (NK) TRANSMISSION AUTO
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
C0642-1
NK,1.5H,1540
SJ444
NK,2.5H,1145
C2366B-18
C2365L-18
NK,1.5D,920
C0570L-124
Battery Junction Box (P108)
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H,1035
C0643-1
SJ445 (NK) ENGINE-BAY
Battery Junction Box (P108)
C0570L-172
NK,2.5D,1095
SJ445
NK,1.5D,75
C2725L-18 C2724-18
WG,1.5,1835
C0644-1
Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
NK,1.5D,75
C2725L-17 C2724-17
WG,1.5,1490
C0645-1
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
SJ450 (NK) ENGINE BAY
SJ7 (GU, B, WU) ENGINE
SJ1 (WU) ENGINE
Battery Junction Box (P108)
C0570L-121
NK,1.5D,895
SJ450
NK,0.5D,2780
C2025-5
Sensor-Adaptive-cruise control (T350)
Fan-Cooling-E box (M208)
C0646L-2
NK,0.75D,510
NK,0.5D,2110
C2145L-15
Speed control module (D284)
NK,1.5D,275
C2725L-8 C2724-8
GU,1.0,860
SJ7
WU,1.0,611
SJ1
WU,1.0,120
C0177-5
Modulator valve-EGR (D214)
WU,1.0,120
C0177-2
B,1.0,350
C0152-2
Purge control valve (N119)
SJ495 (UR) I.C.E.
AM/FM diversity antenna amplifier (F212)
C2219-1
UR,0.5D,590
SJ495
U,0.5D,3460
C2639-1 C2640-1
U,0.5D,1340
C1354-12
Audio head unit (D282)
UR,0.5D,1870
C2218-1
FM antenna amplifier (F213)

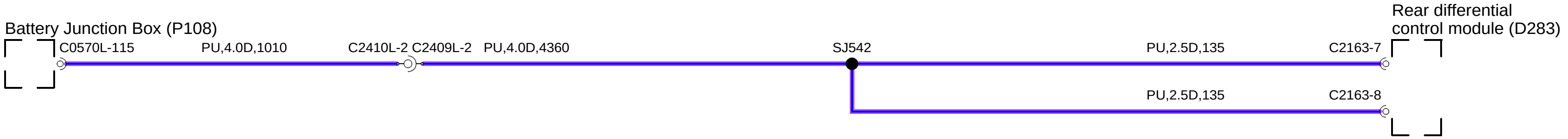
SJ489 (NB) ENGINE BAY

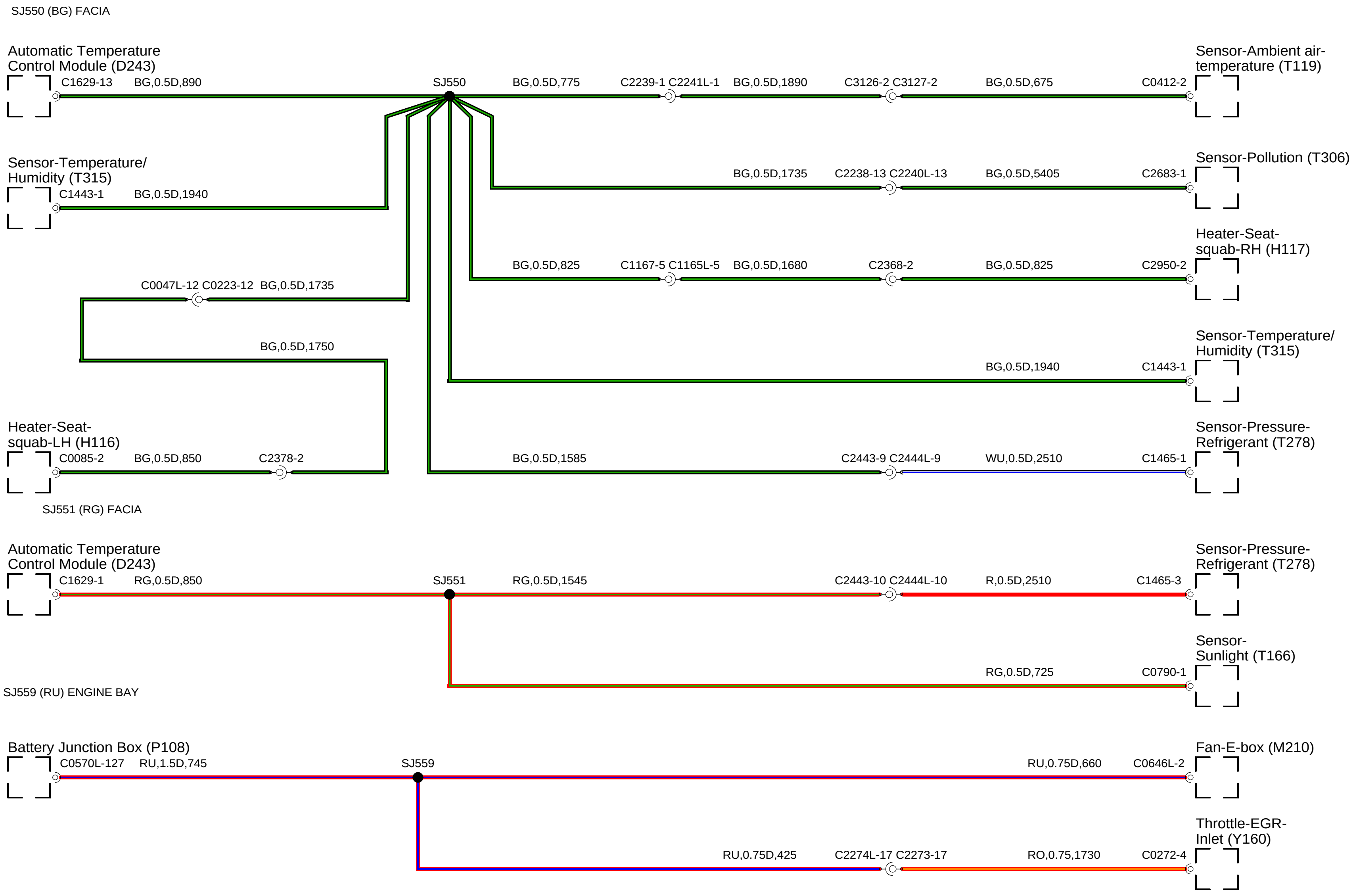

Battery Junction Box (P108)
C0570L-119
NB,2.5D,725
SJ489
NB,2.5D,525
C2412L-14 C2411L-14
WP,2.5D,5470
C0377-17 C0391-17
WP,2.5D,50
SJ17
WP,4.0D,2345
SJ15
WP,2.5D,50
C0114-4
Unit-Fuel Tank (D179)
Engine control-
module (ECM) (D131)
C0872L-G1
NB,0.75D,455

SJ998 (U) FACIA SJ530 (U) ICE

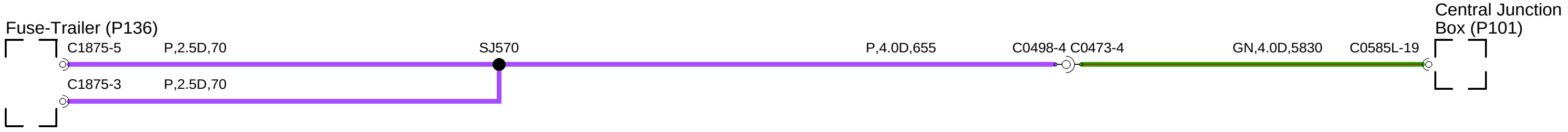

Central Junction
Box (P101)
C0582-13
U,1.0D,300
SJ998
U,0.75D,565
C2247-10 C2249-10
U,0.75D,1750
SJ530
U,0.5D,2005
C2114-18
Navigation system
module (D325)
Touch screen
display (D326)
C2819-11
U,0.5D,1185
U,0.5D,1070
C2158-1
Module-Tuner-DAB/SDARS (D350)
Telephone control
module (D262)
U,0.35D,1255
C2777-16
Antenna-VICS (D357)
U,0.5D,3910
C2837-1

SJ542 (PU) MAIN

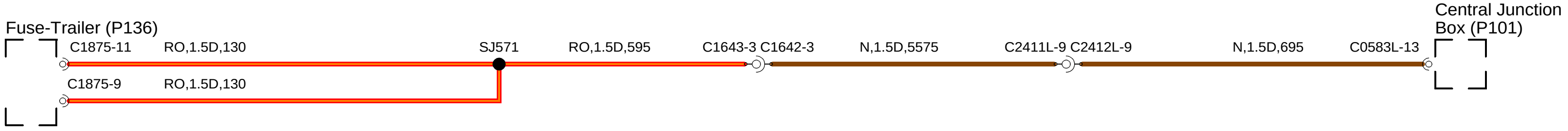

Battery Junction Box (P108)
C0570L-115
PU,4.0D,1010
C2410L-2 C2409L-2
PU,4.0D,4360
SJ542
PU,2.5D,135
C2163-7
Rear differential
control module (D283)
PU,2.5D,135
C2163-8


SJ550 (BG) FACIA
Automatic Temperature Control Module (D243)
C1629-13
BG,0.5D,890
SJ550
BG,0.5D,775
C2239-1 C2241L-1
BG,0.5D,1890
C3126-2 C3127-2
BG,0.5D,675
C0412-2
Sensor-Ambient air-temperature (T119)
Sensor-Temperature/ Humidity (T315)
C1443-1
BG,0.5D,1940
Sensor-Pollution (T306)
BG,0.5D,1735
C2238-13 C2240L-13
BG,0.5D,5405
C2683-1
Heater-Seat-squab-RH (H117)
BG,0.5D,825
C1167-5 C1165L-5
BG,0.5D,1680
C2368-2
BG,0.5D,825
C2950-2
C0047L-12 C0223-12
BG,0.5D,1735
BG,0.5D,1750
Sensor-Temperature/ Humidity (T315)
BG,0.5D,1940
C1443-1
Heater-Seat-squab-LH (H116)
C0085-2
BG,0.5D,850
C2378-2
BG,0.5D,1585
C2443-9 C2444L-9
WU,0.5D,2510
C1465-1
Sensor-Pressure-Refrigerant (T278)
SJ551 (RG) FACIA
Automatic Temperature Control Module (D243)
C1629-1
RG,0.5D,850
SJ551
RG,0.5D,1545
C2443-10 C2444L-10
R,0.5D,2510
C1465-3
Sensor-Pressure-Refrigerant (T278)
Sensor-Sunlight (T166)
RG,0.5D,725
C0790-1
SJ559 (RU) ENGINE BAY
Battery Junction Box (P108)
C0570L-127
RU,1.5D,745
SJ559
RU,0.75D,660
C0646L-2
Fan-E-box (M210)
Throttle-EGR-Inlet (Y160)
RU,0.75D,425
C2274L-17 C2273-17
RO,0.75,1730
C0272-4

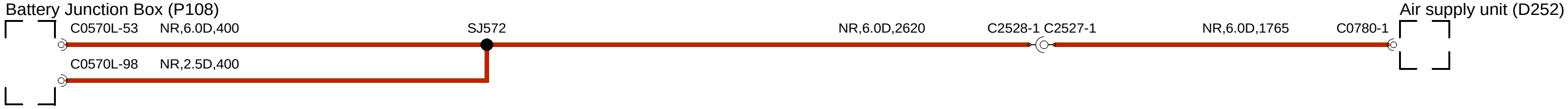
SJ570 (P) TRAILER LINK


Fuse-Trailer (P136)
C1875-5
P,2.5D,70
C1875-3
P,2.5D,70
SJ570
P,4.0D,655
C0498-4 C0473-4
GN,4.0D,5830
C0585L-19
Central Junction Box (P101)

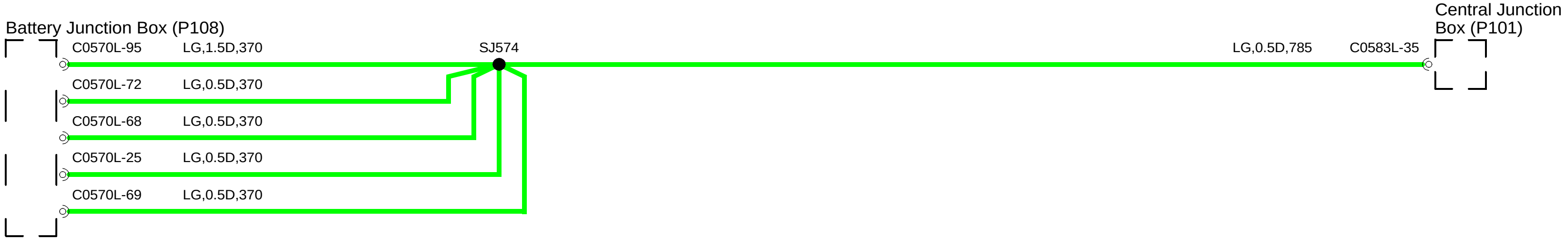
SJ571 (RO) TRAILER LINK


Fuse-Trailer (P136)
C1875-11
RO,1.5D,130
C1875-9
RO,1.5D,130
SJ571
RO,1.5D,595
C1643-3 C1642-3
N,1.5D,5575
C2411L-9 C2412L-9
N,1.5D,695
C0583L-13
Central Junction Box (P101)

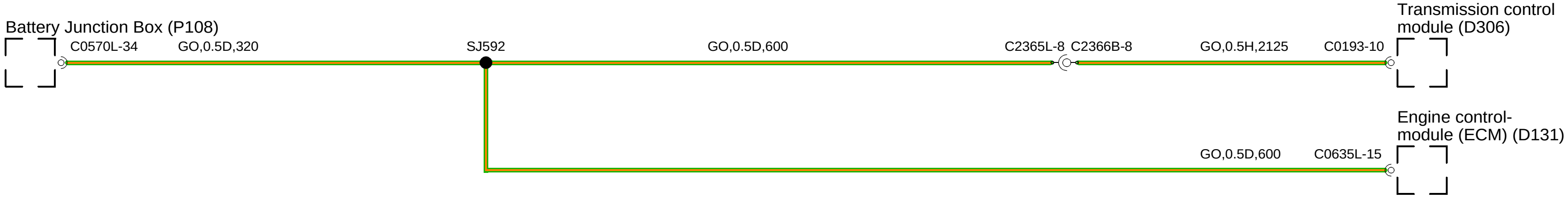
SJ572 (NR) ENGINE BAY

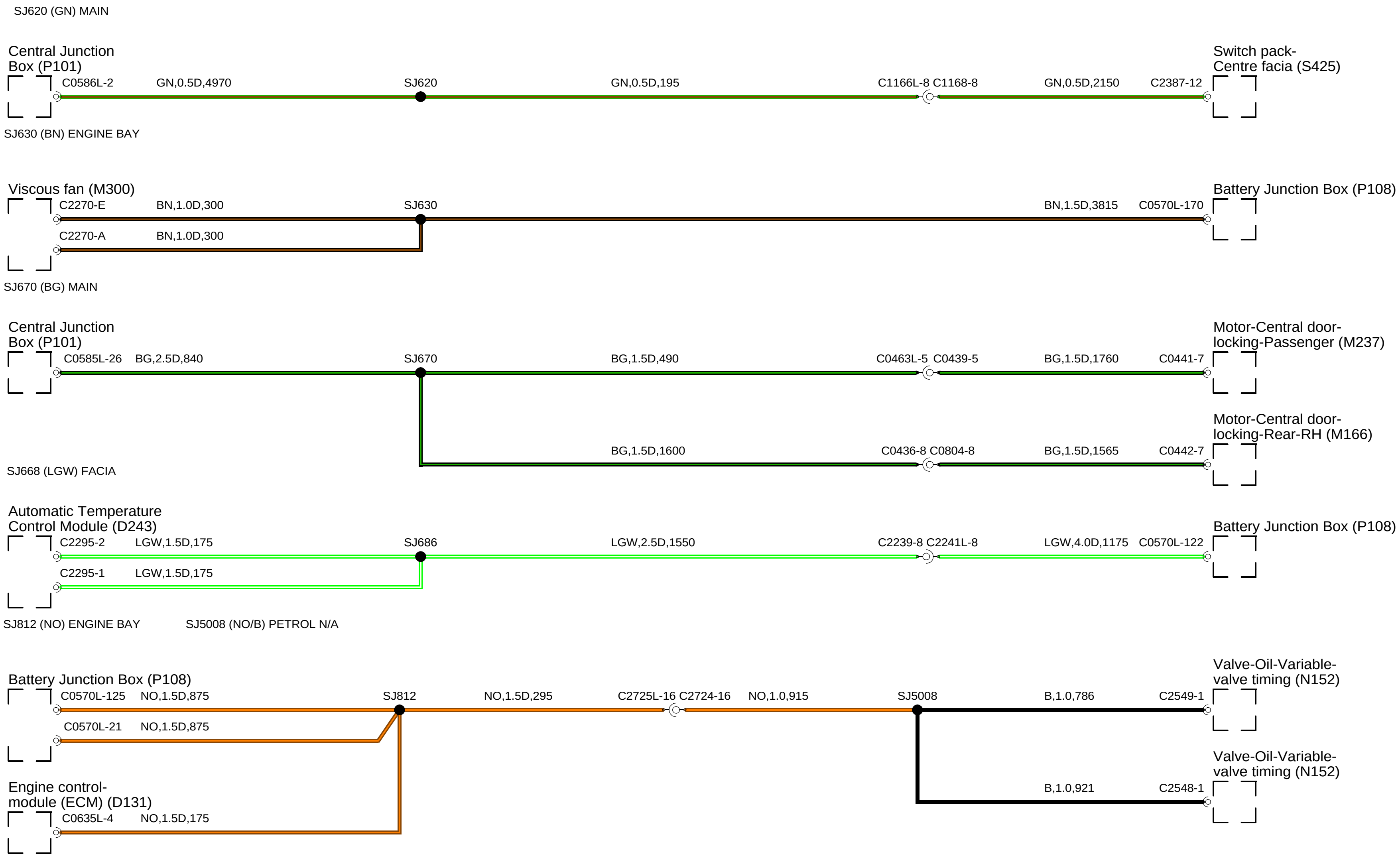

Battery Junction Box (P108)
C0570L-53
NR,6.0D,400
C0570L-98
NR,2.5D,400
SJ572
NR,6.0D,2620
C2528-1 C2527-1
NR,6.0D,1765
C0780-1
Air supply unit (D252)

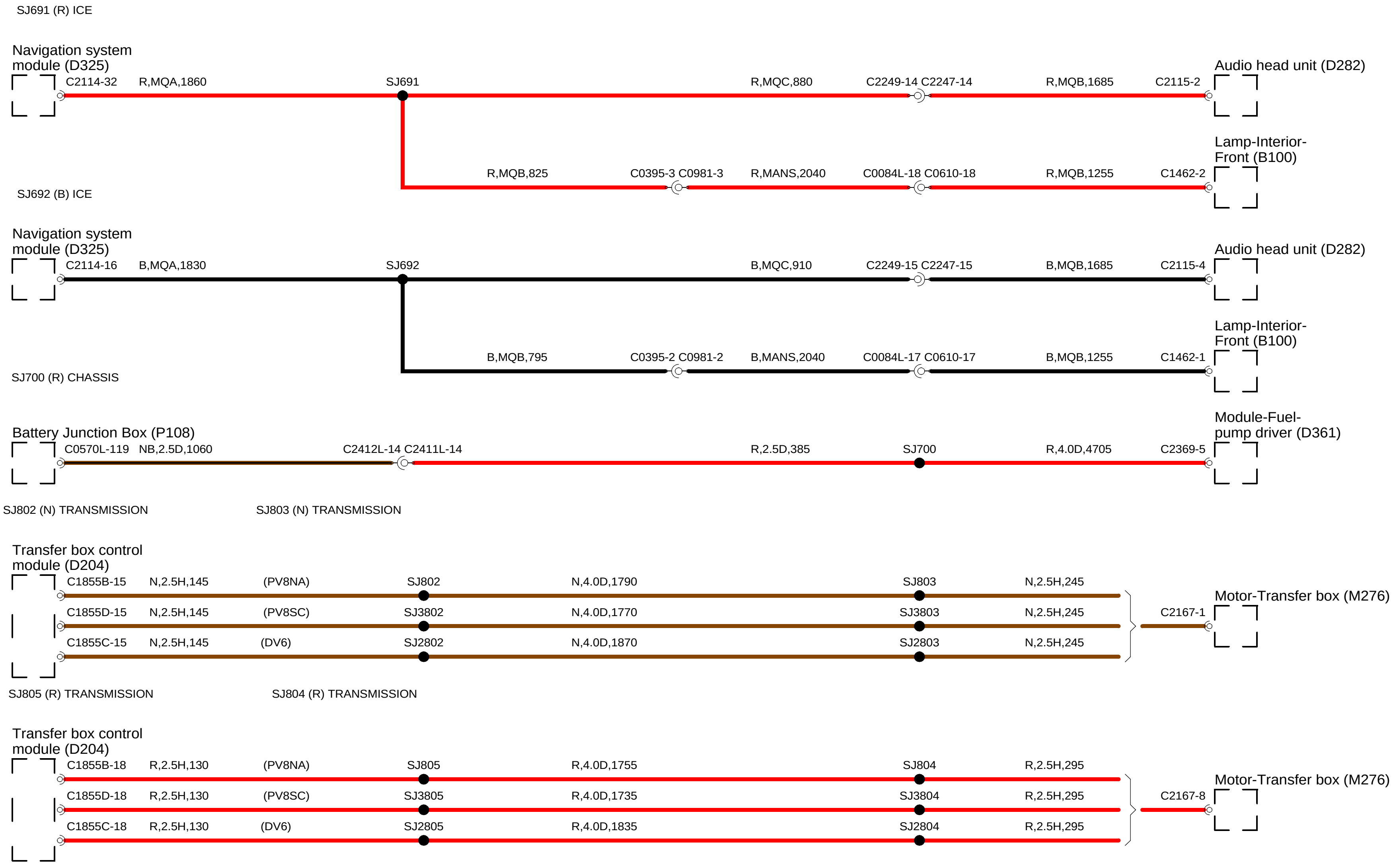
SJ574 (LG) ENGINE BAY

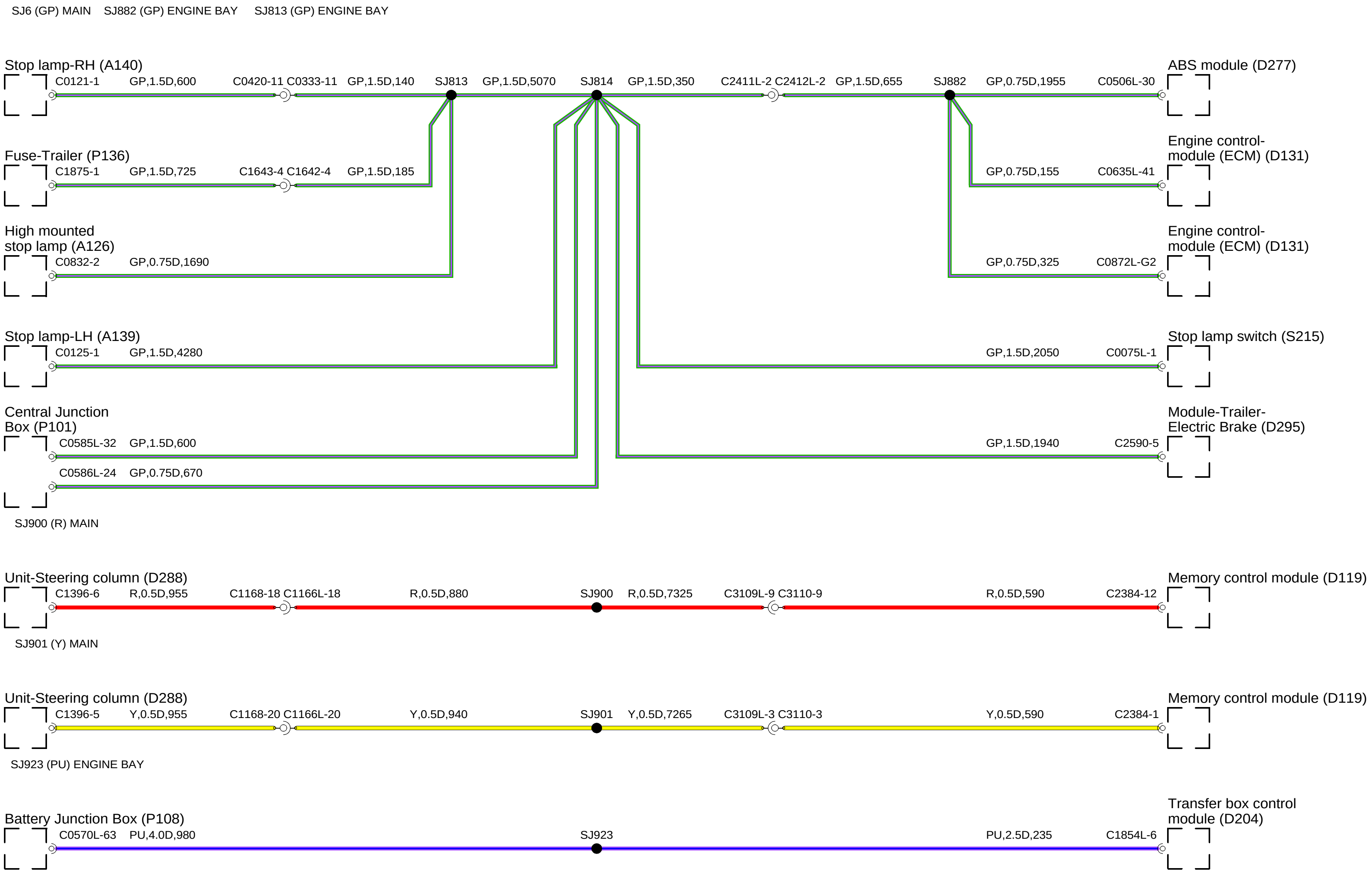

Battery Junction Box (P108)
C0570L-95
LG,1.5D,370
C0570L-72
LG,0.5D,370
C0570L-68
LG,0.5D,370
C0570L-25
LG,0.5D,370
C0570L-69
LG,0.5D,370
SJ574
LG,0.5D,785
C0583L-35
Central Junction Box (P101)

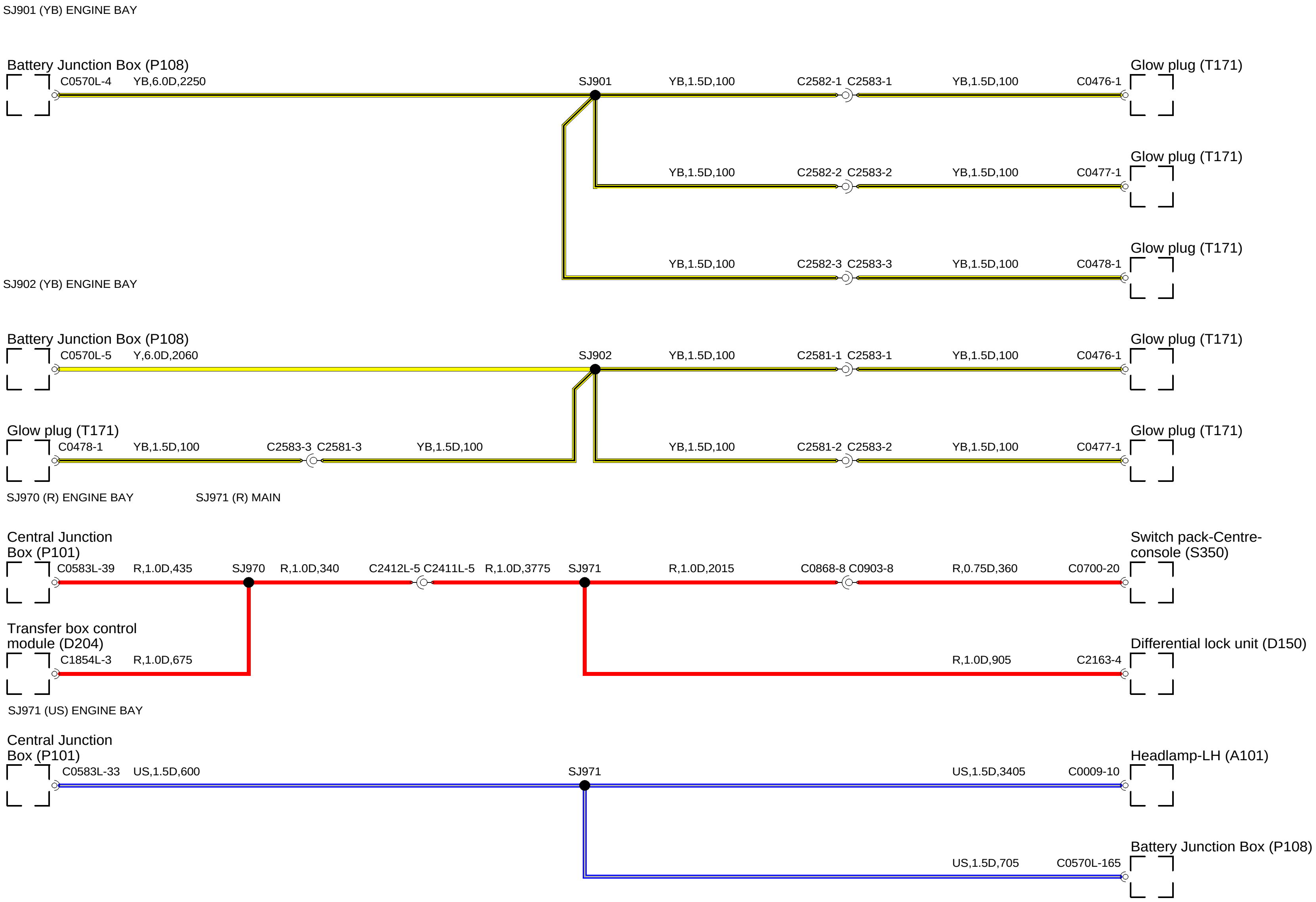
SJ592 (GO) ENGINE BAY

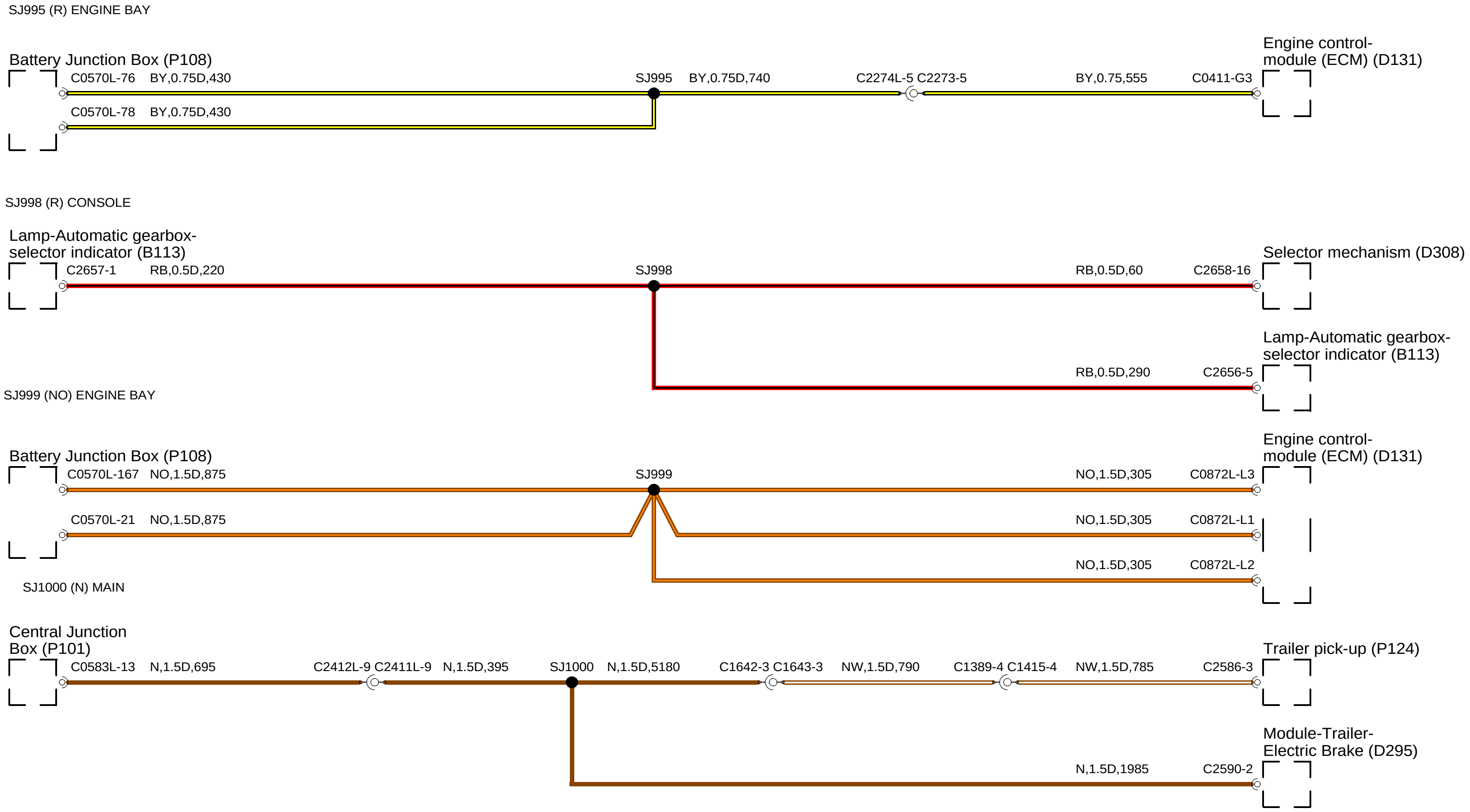

Battery Junction Box (P108)
C0570L-34
GO,0.5D,320
SJ592
GO,0.5D,600
C2365L-8 C2366B-8
GO,0.5H,2125
C0193-10
Transmission control module (D306)
GO,0.5D,600
C0635L-15
Engine control-module (ECM) (D131)

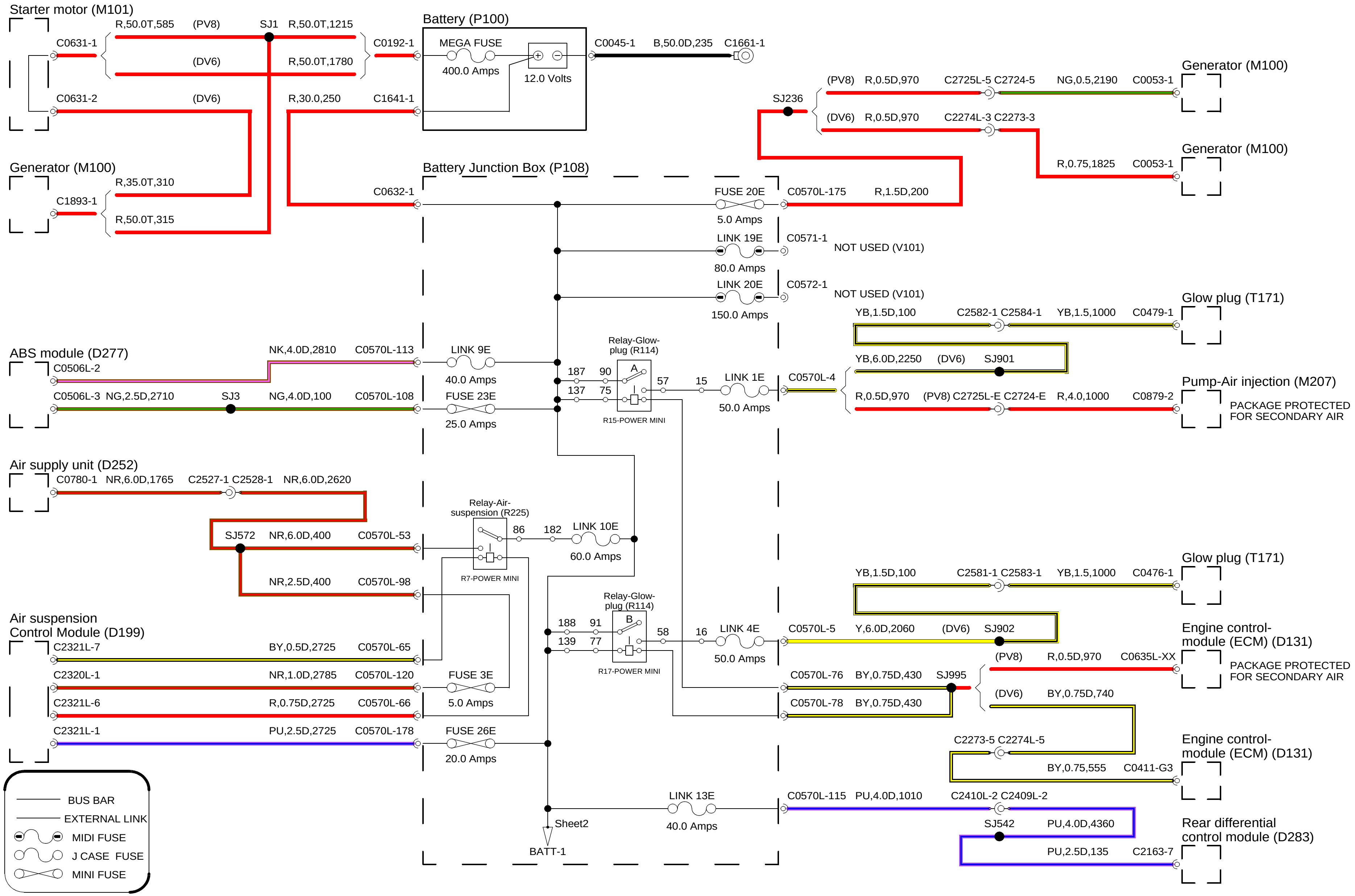

SJ620 (GN) MAIN
Central Junction Box (P101)
C0586L-2
GN,0.5D,4970
SJ620
GN,0.5D,195
C1166L-8 C1168-8
GN,0.5D,2150
C2387-12
Switch pack-Centre facia (S425)
SJ630 (BN) ENGINE BAY
Viscous fan (M300)
C2270-E
BN,1.0D,300
SJ630
BN,1.5D,3815
C0570L-170
Battery Junction Box (P108)
C2270-A
BN,1.0D,300
SJ670 (BG) MAIN
Central Junction Box (P101)
C0585L-26
BG,2.5D,840
SJ670
BG,1.5D,490
C0463L-5 C0439-5
BG,1.5D,1760
C0441-7
Motor-Central door-locking-Passenger (M237)
Motor-Central door-locking-Rear-RH (M166)
BG,1.5D,1600
C0436-8 C0804-8
BG,1.5D,1565
C0442-7
SJ668 (LGW) FACIA
Automatic Temperature Control Module (D243)
C2295-2
LGW,1.5D,175
SJ686
LGW,2.5D,1550
C2239-8 C2241L-8
LGW,4.0D,1175
C0570L-122
Battery Junction Box (P108)
C2295-1
LGW,1.5D,175
SJ812 (NO) ENGINE BAY
SJ5008 (NO/B) PETROL N/A
Battery Junction Box (P108)
C0570L-125
NO,1.5D,875
SJ812
NO,1.5D,295
C2725L-16 C2724-16
NO,1.0,915
SJ5008
B,1.0,786
C2549-1
Valve-Oil-Variable-valve timing (N152)
C0570L-21
NO,1.5D,875
Valve-Oil-Variable-valve timing (N152)
B,1.0,921
C2548-1
Engine control-module (ECM) (D131)
C0635L-4
NO,1.5D,175

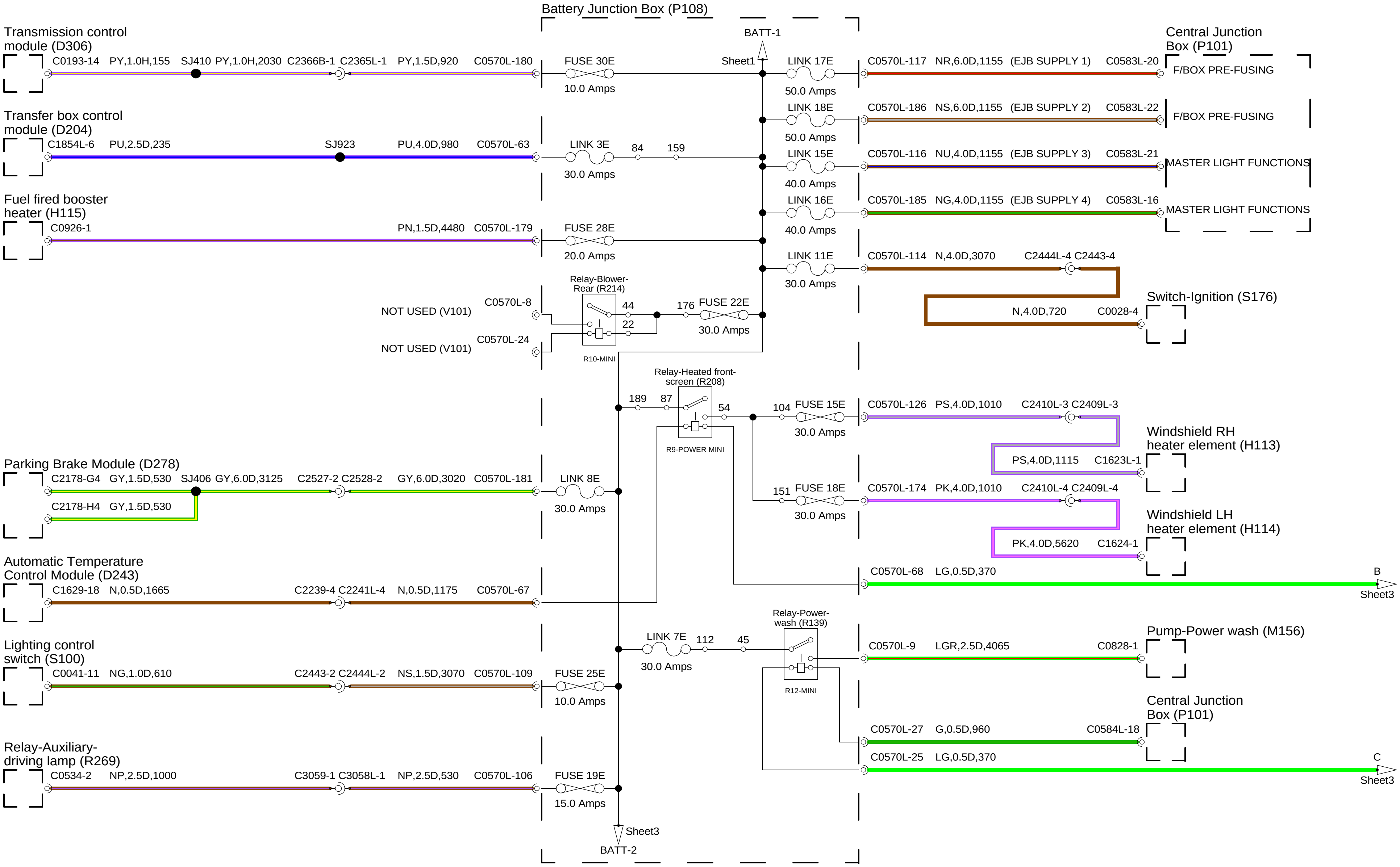

SJ691 (R) ICE
Navigation system module (D325)
C2114-32
R,MQA,1860
SJ691
R,MQC,880
C2249-14 C2247-14
R,MQB,1685
C2115-2
Audio head unit (D282)
Lamp-Interior-Front (B100)
R,MQB,825
C0395-3 C0981-3
R,MANS,2040
C0084L-18 C0610-18
R,MQB,1255
C1462-2
SJ692 (B) ICE
Navigation system module (D325)
C2114-16
B,MQA,1830
SJ692
B,MQC,910
C2249-15 C2247-15
B,MQB,1685
C2115-4
Audio head unit (D282)
Lamp-Interior-Front (B100)
B,MQB,795
C0395-2 C0981-2
B,MANS,2040
C0084L-17 C0610-17
B,MQB,1255
C1462-1
SJ700 (R) CHASSIS
Battery Junction Box (P108)
C0570L-119
NB,2.5D,1060
C2412L-14 C2411L-14
R,2.5D,385
SJ700
R,4.0D,4705
C2369-5
Module-Fuel-pump driver (D361)
SJ802 (N) TRANSMISSION
SJ803 (N) TRANSMISSION
Transfer box control module (D204)
C1855B-15
N,2.5H,145
(PV8NA)
SJ802
N,4.0D,1790
SJ803
N,2.5H,245
C1855D-15
N,2.5H,145
(PV8SC)
SJ3802
N,4.0D,1770
SJ3803
N,2.5H,245
C1855C-15
N,2.5H,145
(DV6)
SJ2802
N,4.0D,1870
SJ2803
N,2.5H,245
C2167-1
Motor-Transfer box (M276)
SJ805 (R) TRANSMISSION
SJ804 (R) TRANSMISSION
Transfer box control module (D204)
C1855B-18
R,2.5H,130
(PV8NA)
SJ805
R,4.0D,1755
SJ804
R,2.5H,295
C1855D-18
R,2.5H,130
(PV8SC)
SJ3805
R,4.0D,1735
SJ3804
R,2.5H,295
C1855C-18
R,2.5H,130
(DV6)
SJ2805
R,4.0D,1835
SJ2804
R,2.5H,295
C2167-8
Motor-Transfer box (M276)

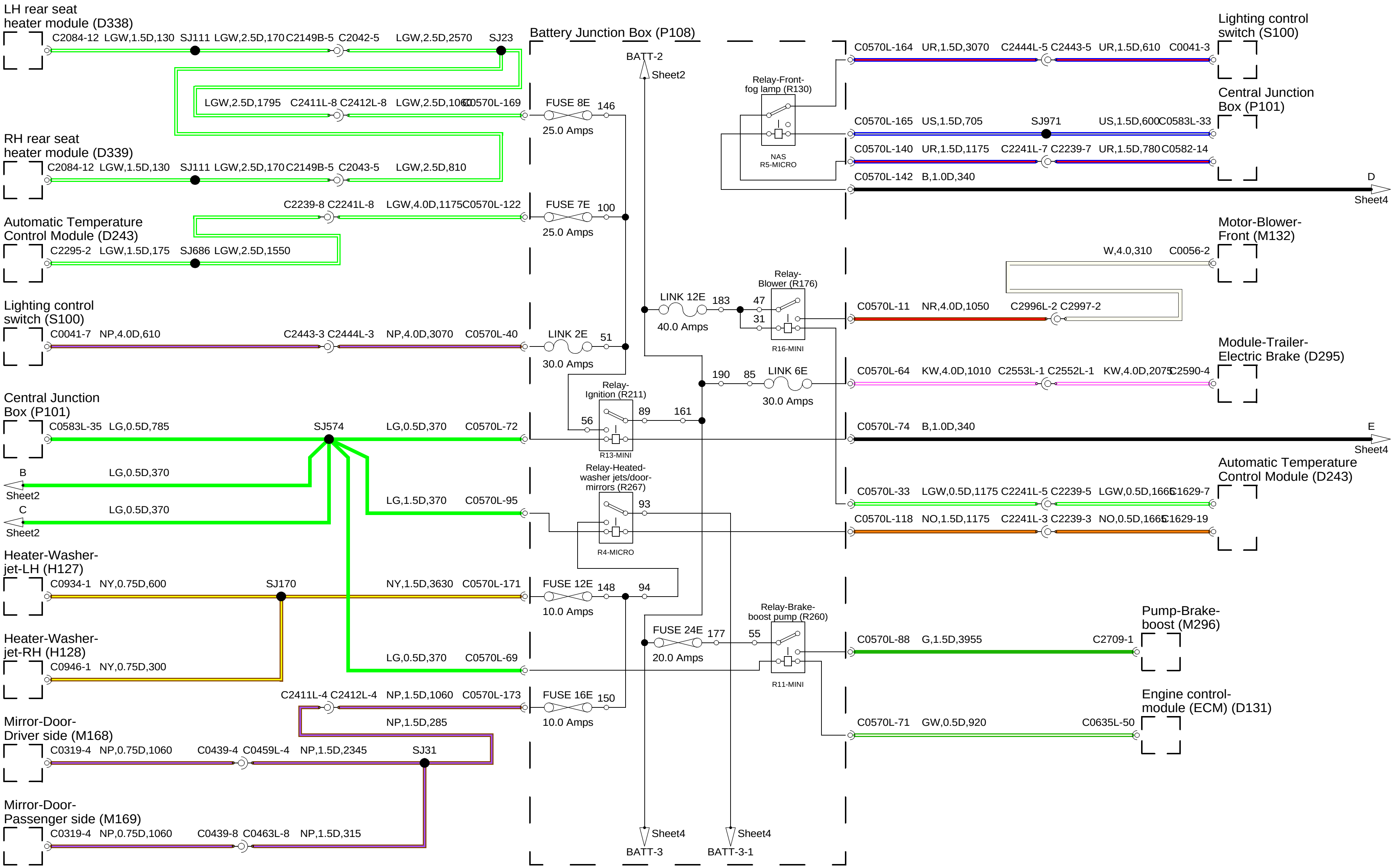

SJ6 (GP) MAIN
SJ882 (GP) ENGINE BAY
SJ813 (GP) ENGINE BAY
Stop lamp-RH (A140)
C0121-1
GP,1.5D,600
C0420-11 C0333-11
GP,1.5D,140
SJ813
GP,1.5D,5070
SJ814
GP,1.5D,350
C2411L-2 C2412L-2
GP,1.5D,655
SJ882
GP,0.75D,1955
C0506L-30
ABS module (D277)
Fuse-Trailer (P136)
C1875-1
GP,1.5D,725
C1643-4 C1642-4
GP,1.5D,185
Engine control-module (ECM) (D131)
GP,0.75D,155
C0635L-41
High mounted stop lamp (A126)
C0832-2
GP,0.75D,1690
Engine control-module (ECM) (D131)
GP,0.75D,325
C0872L-G2
Stop lamp-LH (A139)
C0125-1
GP,1.5D,4280
Stop lamp switch (S215)
GP,1.5D,2050
C0075L-1
Central Junction Box (P101)
C0585L-32
GP,1.5D,600
C0586L-24
GP,0.75D,670
Module-Trailer-Electric Brake (D295)
GP,1.5D,1940
C2590-5
SJ900 (R) MAIN
Unit-Steering column (D288)
C1396-6
R,0.5D,955
C1168-18 C1166L-18
R,0.5D,880
SJ900
R,0.5D,7325
C3109L-9 C3110-9
R,0.5D,590
C2384-12
Memory control module (D119)
SJ901 (Y) MAIN
Unit-Steering column (D288)
C1396-5
Y,0.5D,955
C1168-20 C1166L-20
Y,0.5D,940
SJ901
Y,0.5D,7265
C3109L-3 C3110-3
Y,0.5D,590
C2384-1
Memory control module (D119)
SJ923 (PU) ENGINE BAY
Battery Junction Box (P108)
C0570L-63
PU,4.0D,980
SJ923
PU,2.5D,235
C1854L-6
Transfer box control module (D204)

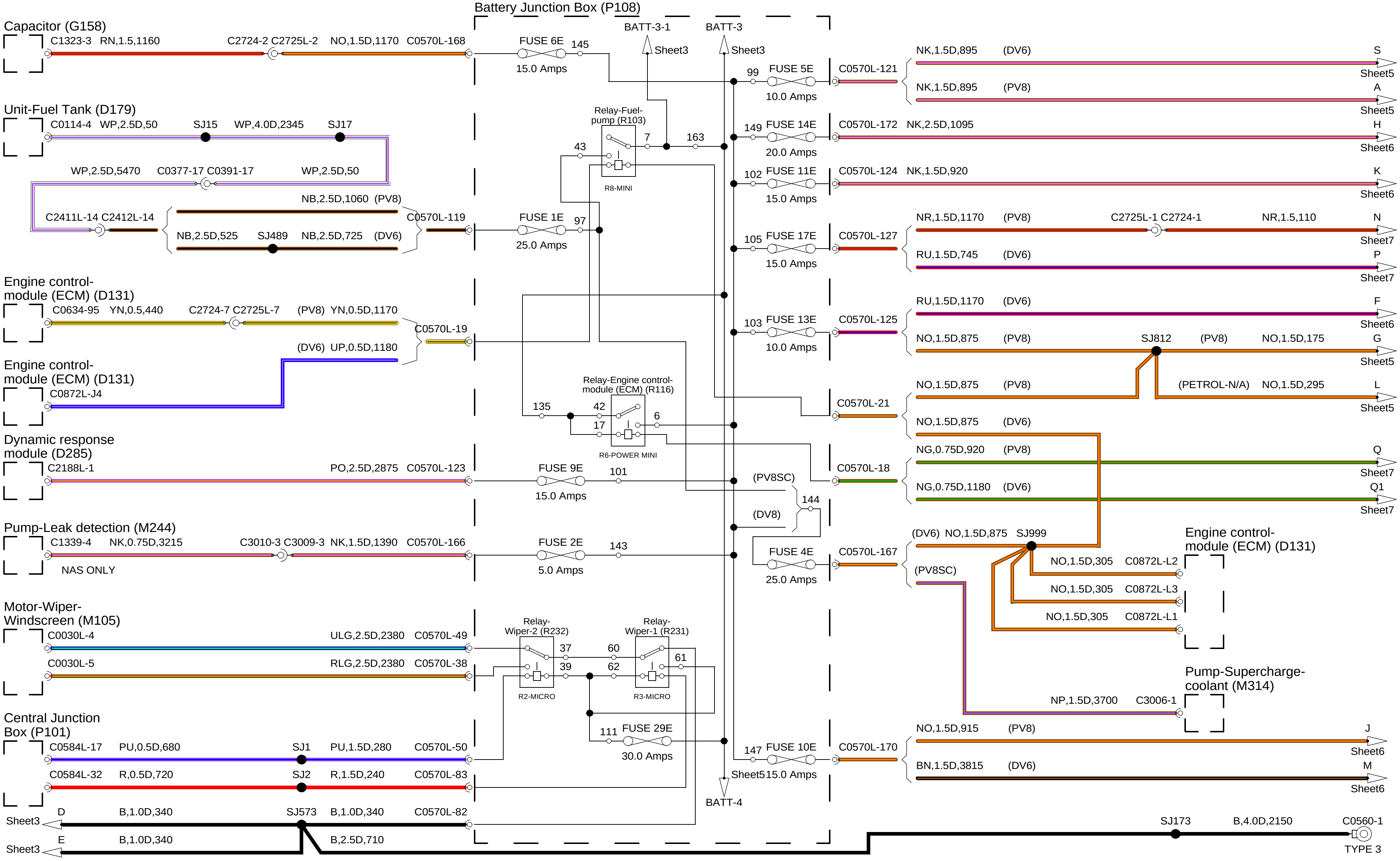

SJ901 (YB) ENGINE BAY
Battery Junction Box (P108)
C0570L-4
YB,6.0D,2250
SJ901
YB,1.5D,100
C2582-1 C2583-1
YB,1.5D,100
C0476-1
Glow plug (T171)
YB,1.5D,100
C2582-2 C2583-2
YB,1.5D,100
C0477-1
Glow plug (T171)
YB,1.5D,100
C2582-3 C2583-3
YB,1.5D,100
C0478-1
Glow plug (T171)
SJ902 (YB) ENGINE BAY
Battery Junction Box (P108)
C0570L-5
Y,6.0D,2060
SJ902
YB,1.5D,100
C2581-1 C2583-1
YB,1.5D,100
C0476-1
Glow plug (T171)
Glow plug (T171)
C0478-1
YB,1.5D,100
C2583-3 C2581-3
YB,1.5D,100
YB,1.5D,100
C2581-2 C2583-2
YB,1.5D,100
C0477-1
Glow plug (T171)
SJ970 (R) ENGINE BAY
SJ971 (R) MAIN
Central Junction Box (P101)
C0583L-39
R,1.0D,435
SJ970
R,1.0D,340
C2412L-5 C2411L-5
R,1.0D,3775
SJ971
R,1.0D,2015
C0868-8 C0903-8
R,0.75D,360
C0700-20
Switch pack-Centre-console (S350)
Transfer box control module (D204)
C1854L-3
R,1.0D,675
R,1.0D,905
C2163-4
Differential lock unit (D150)
SJ971 (US) ENGINE BAY
Central Junction Box (P101)
C0583L-33
US,1.5D,600
SJ971
US,1.5D,3405
C0009-10
Headlamp-LH (A101)
US,1.5D,705
C0570L-165
Battery Junction Box (P108)

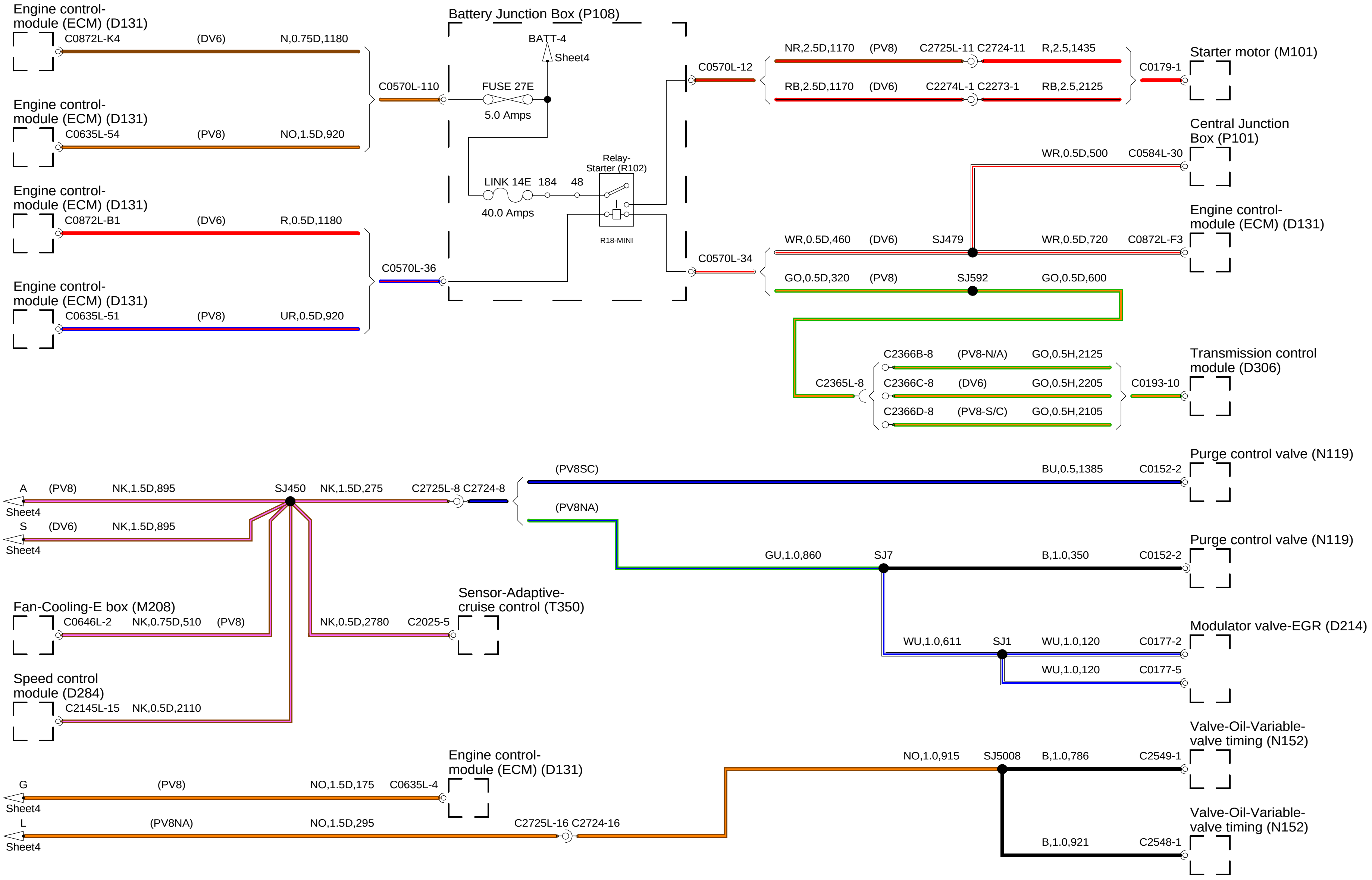

SJ995 (R) ENGINE BAY
Battery Junction Box (P108)
C0570L-76
BY,0.75D,430
SJ995
BY,0.75D,740
C2274L-5 C2273-5
BY,0.75,555
C0411-G3
Engine control-module (ECM) (D131)
C0570L-78
BY,0.75D,430
SJ998 (R) CONSOLE
Lamp-Automatic gearbox-selector indicator (B113)
C2657-1
RB,0.5D,220
SJ998
RB,0.5D,60
C2658-16
Selector mechanism (D308)
Lamp-Automatic gearbox-selector indicator (B113)
RB,0.5D,290
C2656-5
SJ999 (NO) ENGINE BAY
Battery Junction Box (P108)
C0570L-167
NO,1.5D,875
SJ999
NO,1.5D,305
C0872L-L3
Engine control-module (ECM) (D131)
C0570L-21
NO,1.5D,875
NO,1.5D,305
C0872L-L1
NO,1.5D,305
C0872L-L2
SJ1000 (N) MAIN
Central Junction Box (P101)
C0583L-13
N,1.5D,695
C2412L-9 C2411L-9
N,1.5D,395
SJ1000
N,1.5D,5180
C1642-3 C1643-3
NW,1.5D,790
C1389-4 C1415-4
NW,1.5D,785
C2586-3
Trailer pick-up (P124)
Module-Trailer-Electric Brake (D295)
N,1.5D,1985
C2590-2

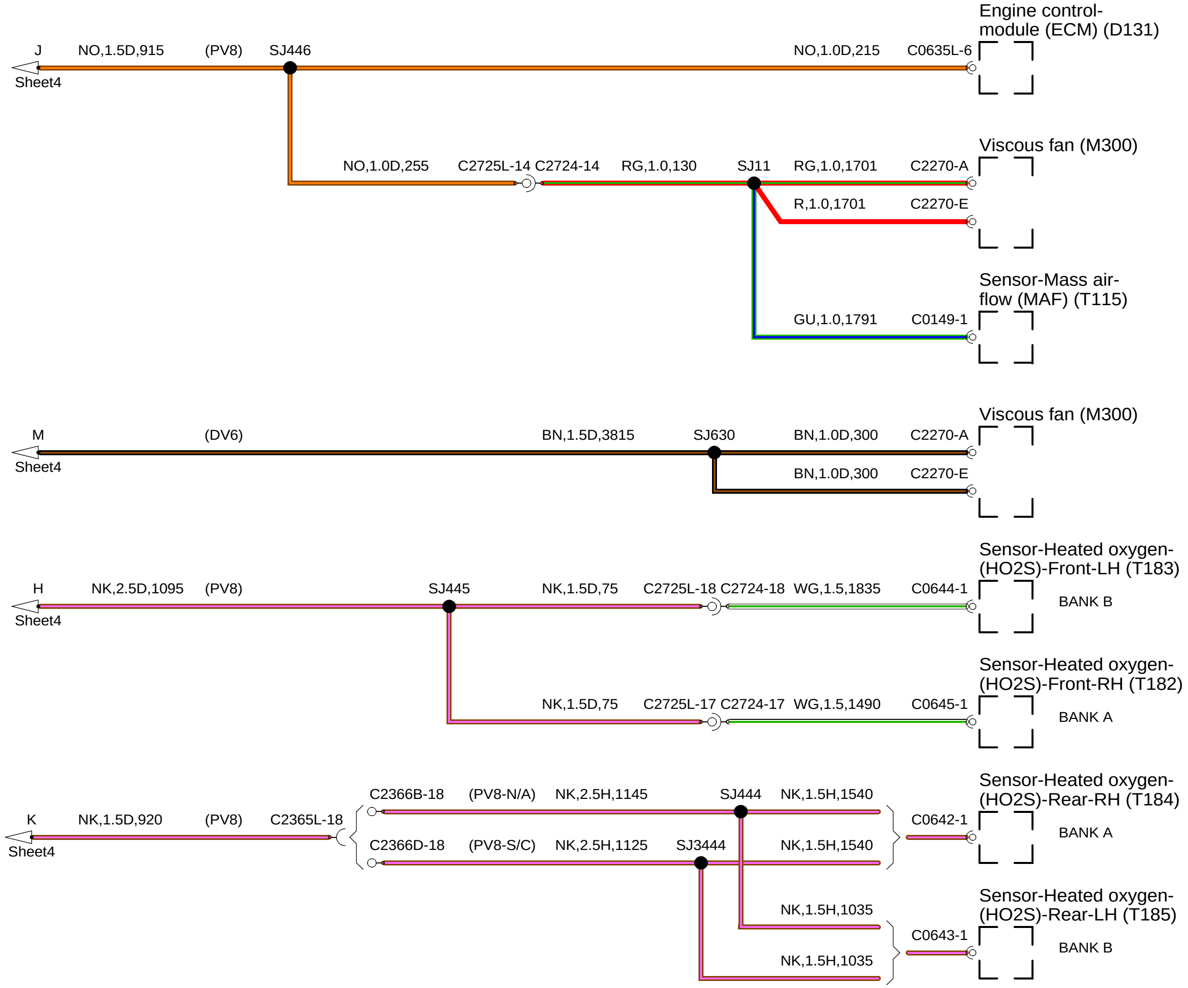

Starter motor (M101)
R,50.0T,585
(PV8)
SJ1
R,50.0T,1215
C0631-1
C0192-1
(DV6)
R,50.0T,1780
C0631-2
(DV6)
R,30.0,250
C1641-1
Battery (P100)
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D,235
C1661-1
Generator (M100)
(PV8)
R,0.5D,970
C2725L-5 C2724-5
NG,0.5,2190
C0053-1
SJ236
(DV6)
R,0.5D,970
C2274L-3 C2273-3
Generator (M100)
R,0.75,1825
C0053-1
Generator (M100)
R,35.0T,310
C1893-1
R,50.0T,315
Battery Junction Box (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570L-175
R,1.5D,200
LINK 19E
80.0 Amps
C0571-1
NOT USED (V101)
LINK 20E
150.0 Amps
C0572-1
NOT USED (V101)
Glow plug (T171)
YB,1.5D,100
C2582-1 C2584-1
YB,1.5,1000
C0479-1
ABS module (D277)
C0506L-2
NK,4.0D,2810
C0570L-113
LINK 9E
40.0 Amps
Relay-Glow-plug (R114)
A
187
90
137
75
57
15
LINK 1E
50.0 Amps
R15-POWER MINI
C0570L-4
YB,6.0D,2250
(DV6)
SJ901
Pump-Air injection (M207)
R,0.5D,970
(PV8) C2725L-E C2724-E
R,4.0,1000
C0879-2
PACKAGE PROTECTED FOR SECONDARY AIR
C0506L-3
NG,2.5D,2710
SJ3
NG,4.0D,100
C0570L-108
FUSE 23E
25.0 Amps
Air supply unit (D252)
C0780-1
NR,6.0D,1765
C2527-1 C2528-1
NR,6.0D,2620
Relay-Air-suspension (R225)
86
182
LINK 10E
60.0 Amps
SJ572
NR,6.0D,400
C0570L-53
R7-POWER MINI
NR,2.5D,400
C0570L-98
Glow plug (T171)
YB,1.5D,100
C2581-1 C2583-1
YB,1.5,1000
C0476-1
Air suspension Control Module (D199)
Relay-Glow-plug (R114)
B
188
91
139
77
58
16
LINK 4E
50.0 Amps
R17-POWER MINI
C0570L-5
Y,6.0D,2060
(DV6)
SJ902
Engine control-module (ECM) (D131)
C2321L-7
BY,0.5D,2725
C0570L-65
(PV8)
R,0.5D,970
C0635L-XX
PACKAGE PROTECTED FOR SECONDARY AIR
C2320L-1
NR,1.0D,2785
C0570L-120
FUSE 3E
5.0 Amps
C0570L-76
BY,0.75D,430
SJ995
(DV6)
BY,0.75D,740
C2321L-6
R,0.75D,2725
C0570L-66
C0570L-78
BY,0.75D,430
C2321L-1
PU,2.5D,2725
C0570L-178
FUSE 26E
20.0 Amps
C2273-5 C2274L-5
Engine control-module (ECM) (D131)
BY,0.75,555
C0411-G3
LINK 13E
40.0 Amps
C0570L-115
PU,4.0D,1010
C2410L-2 C2409L-2
Sheet2
BATT-1
SJ542
PU,4.0D,4360
Rear differential control module (D283)
PU,2.5D,135
C2163-7
BUS BAR
EXTERNAL LINK
MIDI FUSE
J CASE FUSE
MINI FUSE

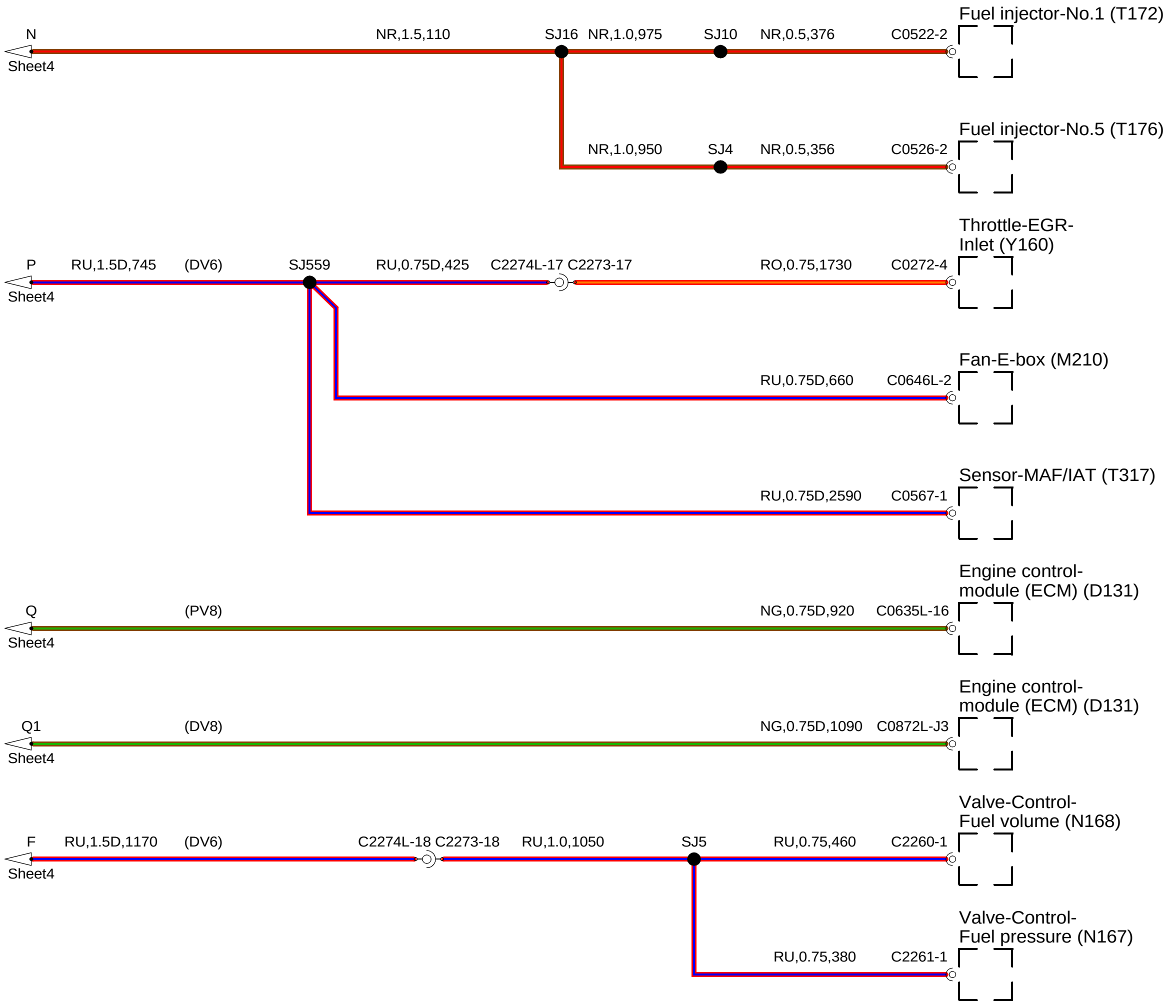

Battery Junction Box (P108)
BATT-1
Sheet1
Transmission control module (D306)
C0193-14 PY,1.0H,155 SJ410 PY,1.0H,2030 C2366B-1 C2365L-1 PY,1.5D,920 C0570L-180
FUSE 30E
10.0 Amps
LINK 17E
50.0 Amps
C0570L-117 NR,6.0D,1155 (EJB SUPPLY 1) C0583L-20
Central Junction Box (P101)
F/BOX PRE-FUSING
LINK 18E
50.0 Amps
C0570L-186 NS,6.0D,1155 (EJB SUPPLY 2) C0583L-22
F/BOX PRE-FUSING
Transfer box control module (D204)
C1854L-6 PU,2.5D,235 SJ923 PU,4.0D,980 C0570L-63
LINK 3E
30.0 Amps
84
159
LINK 15E
40.0 Amps
C0570L-116 NU,4.0D,1155 (EJB SUPPLY 3) C0583L-21
MASTER LIGHT FUNCTIONS
LINK 16E
40.0 Amps
C0570L-185 NG,4.0D,1155 (EJB SUPPLY 4) C0583L-16
MASTER LIGHT FUNCTIONS
Fuel fired booster heater (H115)
C0926-1 PN,1.5D,4480 C0570L-179
FUSE 28E
20.0 Amps
LINK 11E
30.0 Amps
C0570L-114 N,4.0D,3070 C2444L-4 C2443-4
Switch-Ignition (S176)
N,4.0D,720 C0028-4
Relay-Blower-Rear (R214)
NOT USED (V101) C0570L-8
NOT USED (V101) C0570L-24
44
22
R10-MINI
176 FUSE 22E
30.0 Amps
Relay-Heated front-screen (R208)
189 87 54
R9-POWER MINI
104 FUSE 15E
30.0 Amps
C0570L-126 PS,4.0D,1010 C2410L-3 C2409L-3
Windshield RH heater element (H113)
PS,4.0D,1115 C1623L-1
Parking Brake Module (D278)
C2178-G4 GY,1.5D,530 SJ406 GY,6.0D,3125 C2527-2 C2528-2 GY,6.0D,3020 C0570L-181
C2178-H4 GY,1.5D,530
LINK 8E
30.0 Amps
151 FUSE 18E
30.0 Amps
C0570L-174 PK,4.0D,1010 C2410L-4 C2409L-4
Windshield LH heater element (H114)
PK,4.0D,5620 C1624-1
Automatic Temperature Control Module (D243)
C1629-18 N,0.5D,1665 C2239-4 C2241L-4 N,0.5D,1175 C0570L-67
C0570L-68 LG,0.5D,370
B
Sheet3
LINK 7E 112 45
30.0 Amps
Relay-Power-wash (R139)
R12-MINI
C0570L-9 LGR,2.5D,4065 C0828-1
Pump-Power wash (M156)
Lighting control switch (S100)
C0041-11 NG,1.0D,610 C2443-2 C2444L-2 NS,1.5D,3070 C0570L-109
FUSE 25E
10.0 Amps
Central Junction Box (P101)
C0570L-27 G,0.5D,960 C0584L-18
C0570L-25 LG,0.5D,370
C
Sheet3
Relay-Auxiliary-driving lamp (R269)
C0534-2 NP,2.5D,1000 C3059-1 C3058L-1 NP,2.5D,530 C0570L-106
FUSE 19E
15.0 Amps
Sheet3
BATT-2

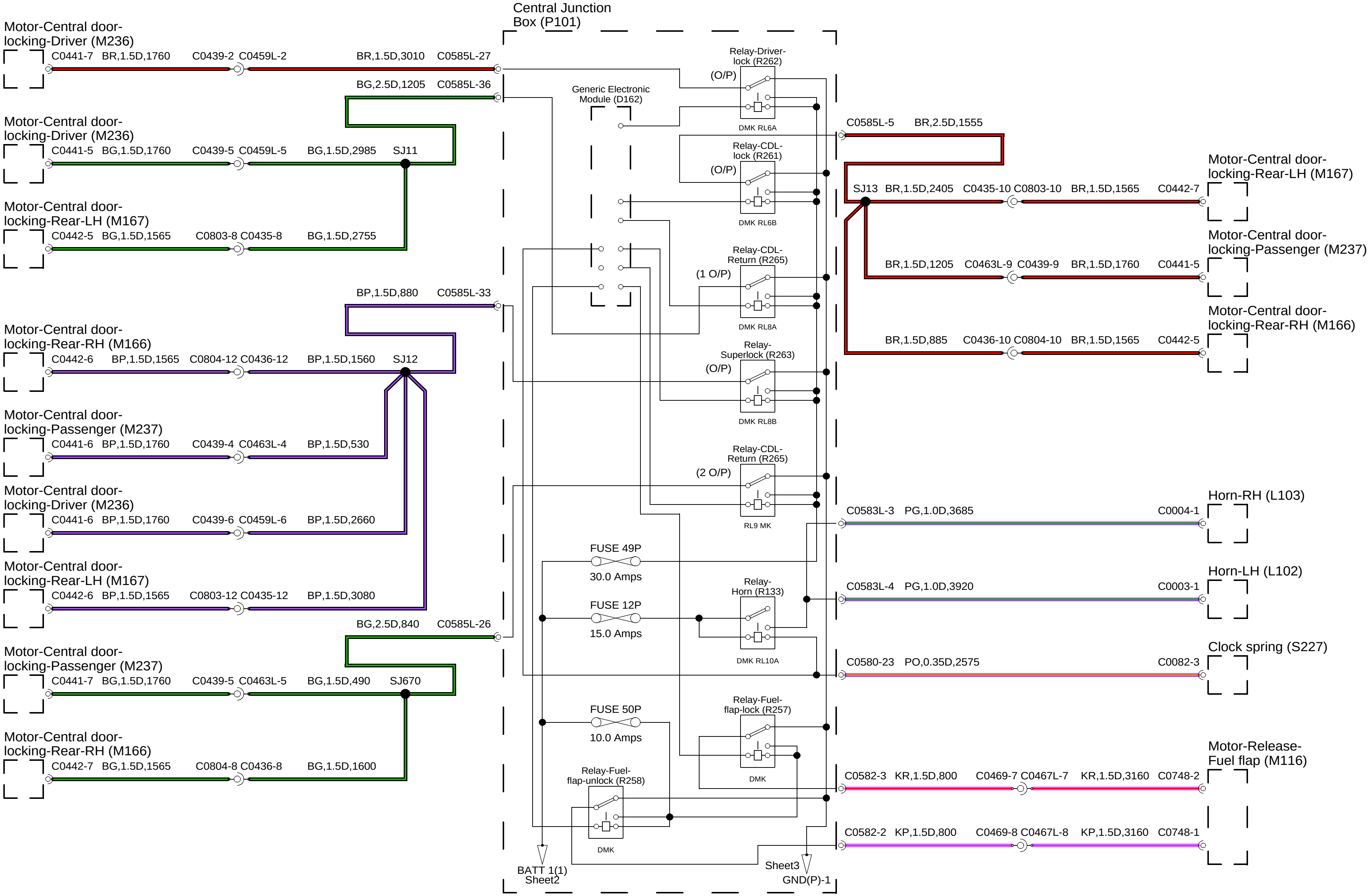

LH rear seat heater module (D338)
C2084-12 LGW,1.5D,130
SJ111
LGW,2.5D,170
C2149B-5
C2042-5
LGW,2.5D,2570
SJ23
LGW,2.5D,1795
C2411L-8 C2412L-8
LGW,2.5D,1060
C0570L-169
RH rear seat heater module (D339)
C2084-12 LGW,1.5D,130
SJ111
LGW,2.5D,170
C2149B-5
C2043-5
LGW,2.5D,810
C2239-8 C2241L-8
LGW,4.0D,1175
C0570L-122
Automatic Temperature Control Module (D243)
C2295-2 LGW,1.5D,175
SJ686
LGW,2.5D,1550
Lighting control switch (S100)
C0041-7 NP,4.0D,610
C2443-3 C2444L-3
NP,4.0D,3070
C0570L-40
Central Junction Box (P101)
C0583L-35 LG,0.5D,785
SJ574
LG,0.5D,370
C0570L-72
B
LG,0.5D,370
Sheet2
LG,1.5D,370
C0570L-95
C
LG,0.5D,370
Sheet2
Heater-Washer-jet-LH (H127)
C0934-1 NY,0.75D,600
SJ170
NY,1.5D,3630
C0570L-171
Heater-Washer-jet-RH (H128)
LG,0.5D,370
C0570L-69
C0946-1 NY,0.75D,300
C2411L-4 C2412L-4
NP,1.5D,1060
C0570L-173
NP,1.5D,285
Mirror-Door-Driver side (M168)
C0319-4 NP,0.75D,1060
C0439-4 C0459L-4
NP,1.5D,2345
SJ31
Mirror-Door-Passenger side (M169)
C0319-4 NP,0.75D,1060
C0439-8 C0463L-8
NP,1.5D,315
Battery Junction Box (P108)
BATT-2
Sheet2
FUSE 8E
146
25.0 Amps
FUSE 7E
100
25.0 Amps
LINK 12E
183
40.0 Amps
LINK 2E
51
30.0 Amps
Relay-Ignition (R211)
56
89
161
R13-MINI
190
85
LINK 6E
30.0 Amps
Relay-Heated-washer jets/door-mirrors (R267)
93
R4-MICRO
FUSE 12E
148
94
10.0 Amps
FUSE 24E
177
55
20.0 Amps
Relay-Brake-boost pump (R260)
R11-MINI
FUSE 16E
150
10.0 Amps
Sheet4
BATT-3
Sheet4
BATT-3-1
Relay-Front-fog lamp (R130)
NAS
R5-MICRO
Relay-Blower (R176)
47
31
R16-MINI
Lighting control switch (S100)
C0570L-164 UR,1.5D,3070
C2444L-5 C2443-5
UR,1.5D,610
C0041-3
Central Junction Box (P101)
C0570L-165 US,1.5D,705
SJ971
US,1.5D,600
C0583L-33
C0570L-140 UR,1.5D,1175
C2241L-7 C2239-7
UR,1.5D,780
C0582-14
C0570L-142 B,1.0D,340
D
Sheet4
Motor-Blower-Front (M132)
W,4.0,310
C0056-2
C0570L-11 NR,4.0D,1050
C2996L-2 C2997-2
Module-Trailer-Electric Brake (D295)
C0570L-64 KW,4.0D,1010
C2553L-1 C2552L-1
KW,4.0D,2075
C2590-4
C0570L-74 B,1.0D,340
E
Sheet4
Automatic Temperature Control Module (D243)
C0570L-33 LGW,0.5D,1175
C2241L-5 C2239-5
LGW,0.5D,1665
C1629-7
C0570L-118 NO,1.5D,1175
C2241L-3 C2239-3
NO,0.5D,1665
C1629-19
Pump-Brake-boost (M296)
C0570L-88 G,1.5D,3955
C2709-1
Engine control-module (ECM) (D131)
C0570L-71 GW,0.5D,920
C0635L-50

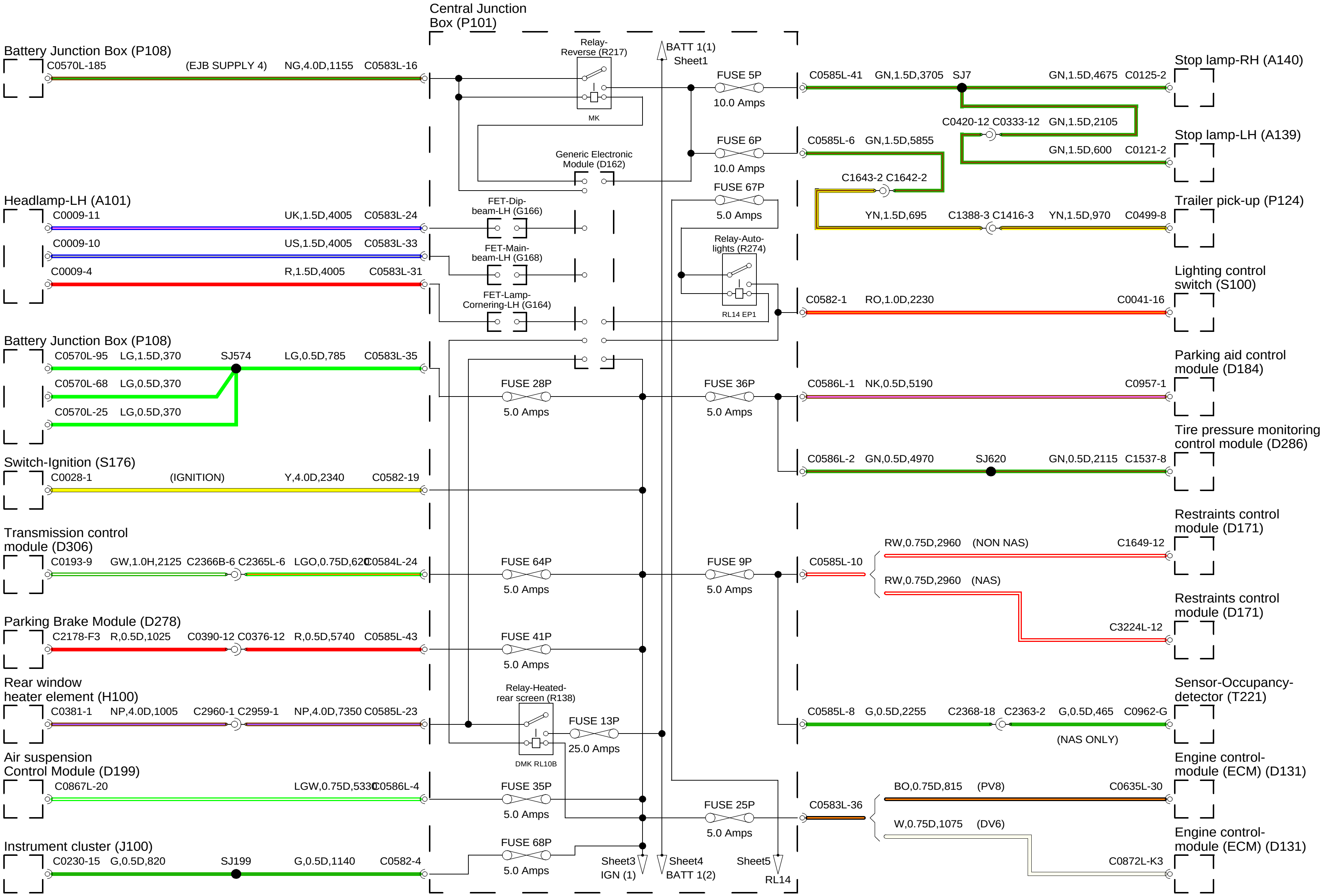

Battery Junction Box (P108)
Capacitor (G158)
C1323-3 RN,1.5,1160
C2724-2 C2725L-2 NO,1.5D,1170 C0570L-168
FUSE 6E 145
15.0 Amps
BATT-3-1
Sheet3
BATT-3
Sheet3
99 FUSE 5E
10.0 Amps
C0570L-121
NK,1.5D,895 (DV6)
S
Sheet5
NK,1.5D,895 (PV8)
A
Sheet5
Unit-Fuel Tank (D179)
C0114-4 WP,2.5D,50
SJ15 WP,4.0D,2345 SJ17
Relay-Fuel-pump (R103)
7
163
43
R8-MINI
149 FUSE 14E
20.0 Amps
C0570L-172 NK,2.5D,1095
H
Sheet6
WP,2.5D,5470 C0377-17 C0391-17 WP,2.5D,50
102 FUSE 11E
15.0 Amps
C0570L-124 NK,1.5D,920
K
Sheet6
NB,2.5D,1060 (PV8)
C2411L-14 C2412L-14
NB,2.5D,525 SJ489 NB,2.5D,725 (DV6)
C0570L-119
FUSE 1E 97
25.0 Amps
105 FUSE 17E
15.0 Amps
C0570L-127
NR,1.5D,1170 (PV8) C2725L-1 C2724-1 NR,1.5,110
N
Sheet7
RU,1.5D,745 (DV6)
P
Sheet7
Engine control-module (ECM) (D131)
C0634-95 YN,0.5,440 C2724-7 C2725L-7 (PV8) YN,0.5D,1170
C0570L-19
(DV6) UP,0.5D,1180
103 FUSE 13E
10.0 Amps
C0570L-125
RU,1.5D,1170 (DV6)
F
Sheet6
NO,1.5D,875 (PV8) SJ812 (PV8) NO,1.5D,175
G
Sheet5
Engine control-module (ECM) (D131)
C0872L-J4
Relay-Engine control-module (ECM) (R116)
135
42
6
17
R6-POWER MINI
C0570L-21
NO,1.5D,875 (PV8)
(PETROL-N/A) NO,1.5D,295
L
Sheet5
NO,1.5D,875 (DV6)
Dynamic response module (D285)
C2188L-1
PO,2.5D,2875 C0570L-123
FUSE 9E
101
15.0 Amps
(PV8SC)
144
(DV8)
C0570L-18
NG,0.75D,920 (PV8)
Q
Sheet7
NG,0.75D,1180 (DV6)
Q1
Sheet7
Pump-Leak detection (M244)
C1339-4 NK,0.75D,3215
C3010-3 C3009-3 NK,1.5D,1390 C0570L-166
NAS ONLY
FUSE 2E
143
5.0 Amps
FUSE 4E
25.0 Amps
C0570L-167
(DV6) NO,1.5D,875 SJ999
(PV8SC)
Engine control-module (ECM) (D131)
NO,1.5D,305 C0872L-L2
NO,1.5D,305 C0872L-L3
NO,1.5D,305 C0872L-L1
Motor-Wiper-Windscreen (M105)
C0030L-4
ULG,2.5D,2380 C0570L-49
C0030L-5
RLG,2.5D,2380 C0570L-38
Relay-Wiper-2 (R232)
Relay-Wiper-1 (R231)
37
60
61
39
62
R2-MICRO
R3-MICRO
Pump-Supercharge-coolant (M314)
NP,1.5D,3700 C3006-1
Central Junction Box (P101)
C0584L-17 PU,0.5D,680
SJ1 PU,1.5D,280 C0570L-50
C0584L-32 R,0.5D,720
SJ2 R,1.5D,240 C0570L-83
111 FUSE 29E
30.0 Amps
147 FUSE 10E
15.0 Amps
Sheet5
C0570L-170
NO,1.5D,915 (PV8)
J
Sheet6
BN,1.5D,3815 (DV6)
M
Sheet6
BATT-4
Sheet3
D
B,1.0D,340
SJ573 B,1.0D,340 C0570L-82
SJ173 B,4.0D,2150 C0560-1
Sheet3
E
B,1.0D,340
B,2.5D,710
TYPE 3

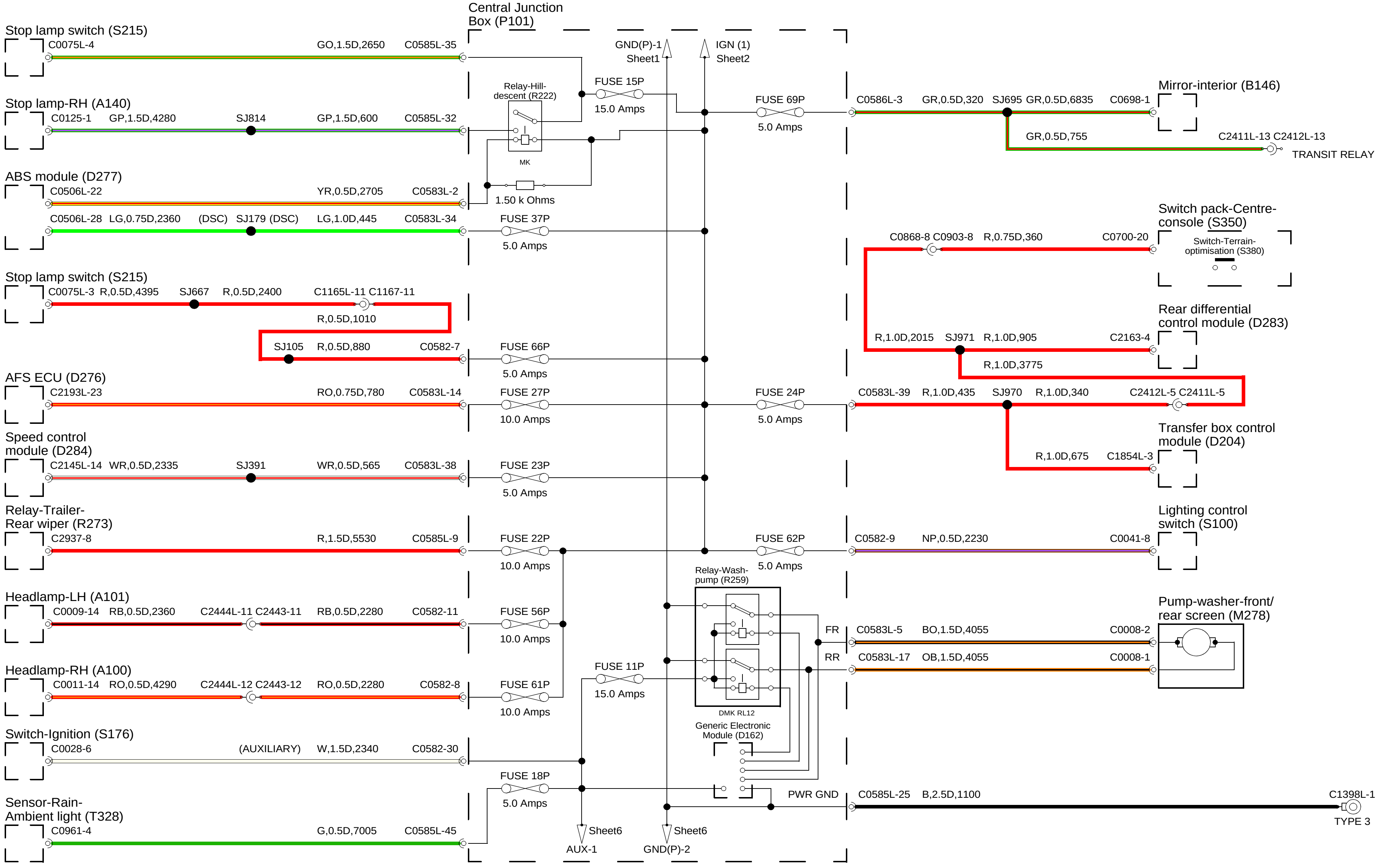

Engine control-module (ECM) (D131)
C0872L-K4
(DV6)
N,0.75D,1180
Engine control-module (ECM) (D131)
C0635L-54
(PV8)
NO,1.5D,920
Engine control-module (ECM) (D131)
C0872L-B1
(DV6)
R,0.5D,1180
Engine control-module (ECM) (D131)
C0635L-51
(PV8)
UR,0.5D,920
Battery Junction Box (P108)
BATT-4
Sheet4
C0570L-110
FUSE 27E
5.0 Amps
LINK 14E
184
48
40.0 Amps
Relay-Starter (R102)
R18-MINI
C0570L-36
C0570L-12
C0570L-34
NR,2.5D,1170
(PV8)
C2725L-11 C2724-11
R,2.5,1435
RB,2.5D,1170
(DV6)
C2274L-1 C2273-1
RB,2.5,2125
C0179-1
Starter motor (M101)
Central Junction Box (P101)
WR,0.5D,500
C0584L-30
Engine control-module (ECM) (D131)
WR,0.5D,460
(DV6)
SJ479
WR,0.5D,720
C0872L-F3
GO,0.5D,320
(PV8)
SJ592
GO,0.5D,600
C2366B-8
(PV8-N/A)
GO,0.5H,2125
C2365L-8
C2366C-8
(DV6)
GO,0.5H,2205
C0193-10
Transmission control module (D306)
C2366D-8
(PV8-S/C)
GO,0.5H,2105
A
(PV8)
NK,1.5D,895
Sheet4
SJ450
NK,1.5D,275
C2725L-8 C2724-8
S
(DV6)
NK,1.5D,895
Sheet4
(PV8SC)
BU,0.5,1385
C0152-2
Purge control valve (N119)
(PV8NA)
GU,1.0,860
SJ7
B,1.0,350
C0152-2
Purge control valve (N119)
Fan-Cooling-E box (M208)
C0646L-2
NK,0.75D,510
(PV8)
NK,0.5D,2780
C2025-5
Sensor-Adaptive-cruise control (T350)
WU,1.0,611
SJ1
WU,1.0,120
C0177-2
Modulator valve-EGR (D214)
WU,1.0,120
C0177-5
Speed control module (D284)
C2145L-15
NK,0.5D,2110
Valve-Oil-Variable-valve timing (N152)
NO,1.0,915
SJ5008
B,1.0,786
C2549-1
Engine control-module (ECM) (D131)
G
(PV8)
NO,1.5D,175
C0635L-4
Sheet4
L
(PV8NA)
NO,1.5D,295
C2725L-16 C2724-16
Sheet4
B,1.0,921
C2548-1
Valve-Oil-Variable-valve timing (N152)

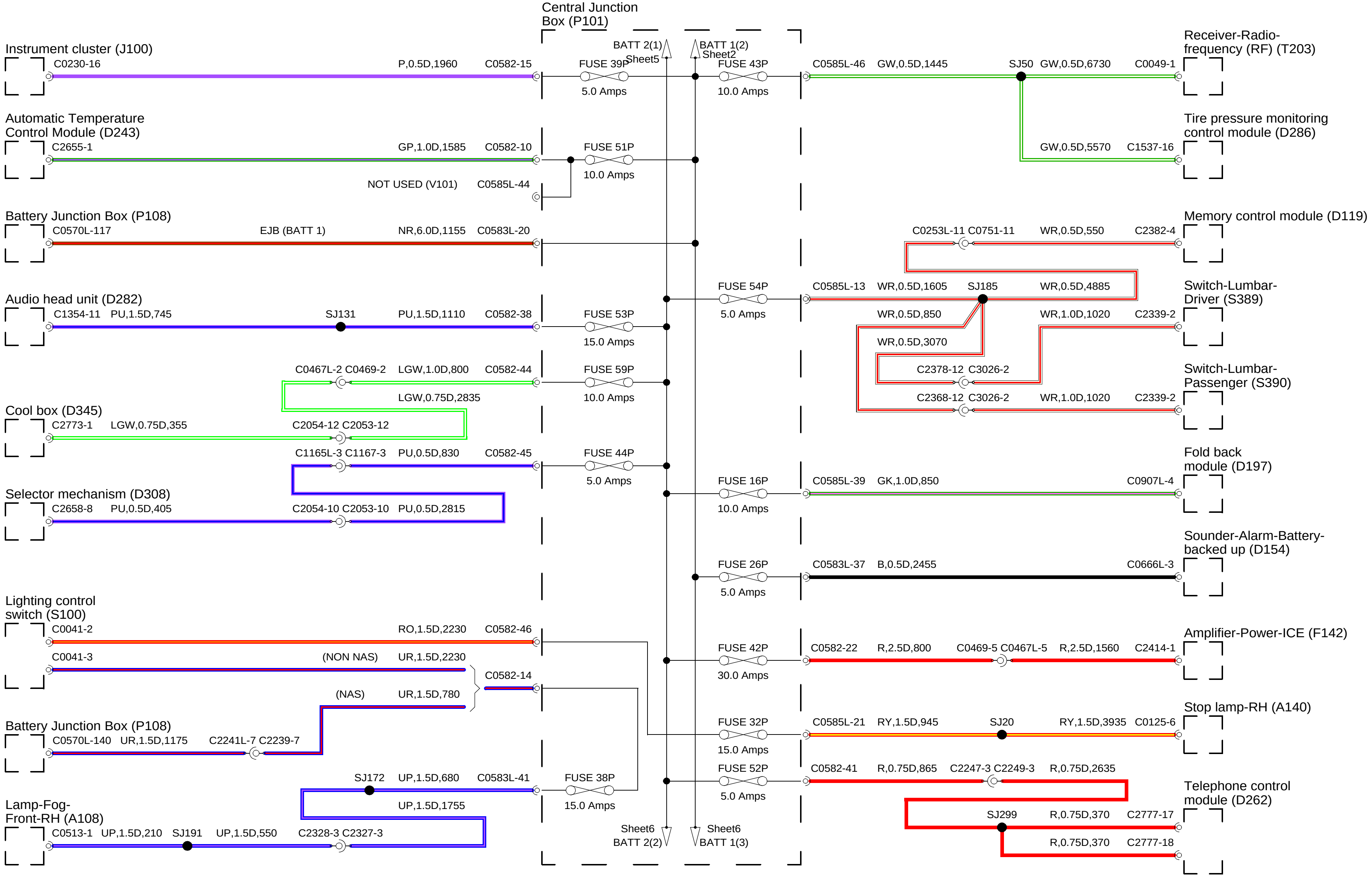

Engine control-module (ECM) (D131)
J
Sheet4
NO,1.5D,915
(PV8)
SJ446
NO,1.0D,215
C0635L-6
Viscous fan (M300)
NO,1.0D,255
C2725L-14
C2724-14
RG,1.0,130
SJ11
RG,1.0,1701
C2270-A
R,1.0,1701
C2270-E
Sensor-Mass air-flow (MAF) (T115)
GU,1.0,1791
C0149-1
Viscous fan (M300)
M
Sheet4
(DV6)
BN,1.5D,3815
SJ630
BN,1.0D,300
C2270-A
BN,1.0D,300
C2270-E
Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
H
Sheet4
NK,2.5D,1095
(PV8)
SJ445
NK,1.5D,75
C2725L-18
C2724-18
WG,1.5,1835
C0644-1
BANK B
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
NK,1.5D,75
C2725L-17
C2724-17
WG,1.5,1490
C0645-1
BANK A
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
K
Sheet4
NK,1.5D,920
(PV8)
C2365L-18
C2366B-18
(PV8-N/A)
NK,2.5H,1145
SJ444
NK,1.5H,1540
C0642-1
BANK A
C2366D-18
(PV8-S/C)
NK,2.5H,1125
SJ3444
NK,1.5H,1540
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H,1035
C0643-1
BANK B
NK,1.5H,1035

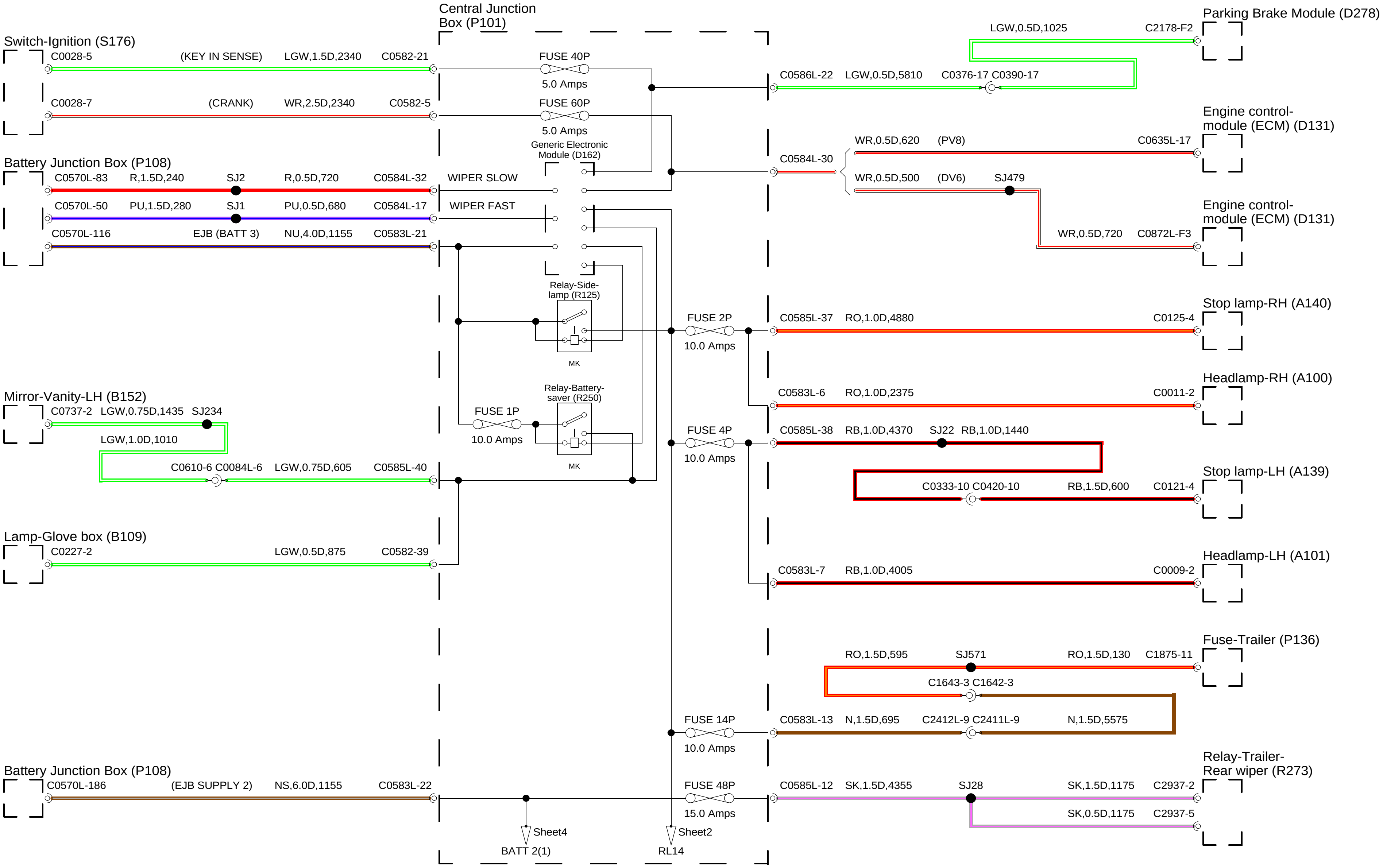

N
Sheet4
NR,1.5,110
SJ16
NR,1.0,975
SJ10
NR,0.5,376
C0522-2
Fuel injector-No.1 (T172)
NR,1.0,950
SJ4
NR,0.5,356
C0526-2
Fuel injector-No.5 (T176)
P
Sheet4
RU,1.5D,745
(DV6)
SJ559
RU,0.75D,425
C2274L-17 C2273-17
RO,0.75,1730
C0272-4
Throttle-EGR-Inlet (Y160)
RU,0.75D,660
C0646L-2
Fan-E-box (M210)
RU,0.75D,2590
C0567-1
Sensor-MAF/IAT (T317)
Q
Sheet4
(PV8)
NG,0.75D,920
C0635L-16
Engine control-module (ECM) (D131)
Q1
Sheet4
(DV8)
NG,0.75D,1090
C0872L-J3
Engine control-module (ECM) (D131)
F
Sheet4
RU,1.5D,1170
(DV6)
C2274L-18 C2273-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260-1
Valve-Control-Fuel volume (N168)
RU,0.75,380
C2261-1
Valve-Control-Fuel pressure (N167)

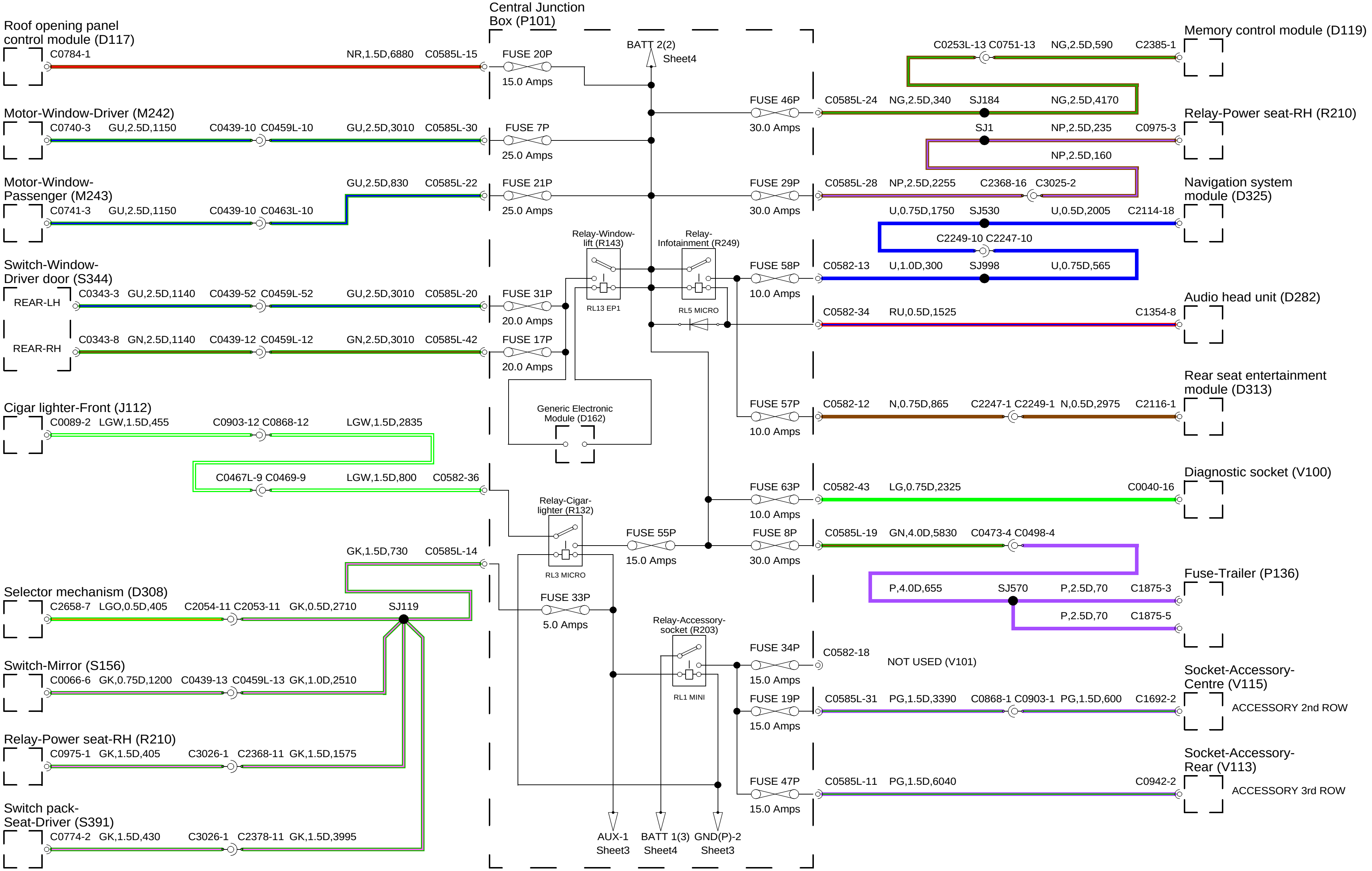

Central Junction Box (P101)
Motor-Central door-locking-Driver (M236)
C0441-7 BR,1.5D,1760 C0439-2 C0459L-2 BR,1.5D,3010 C0585L-27
BG,2.5D,1205 C0585L-36
Motor-Central door-locking-Driver (M236)
C0441-5 BG,1.5D,1760 C0439-5 C0459L-5 BG,1.5D,2985 SJ11
Motor-Central door-locking-Rear-LH (M167)
C0442-5 BG,1.5D,1565 C0803-8 C0435-8 BG,1.5D,2755
BP,1.5D,880 C0585L-33
Motor-Central door-locking-Rear-RH (M166)
C0442-6 BP,1.5D,1565 C0804-12 C0436-12 BP,1.5D,1560 SJ12
Motor-Central door-locking-Passenger (M237)
C0441-6 BP,1.5D,1760 C0439-4 C0463L-4 BP,1.5D,530
Motor-Central door-locking-Driver (M236)
C0441-6 BP,1.5D,1760 C0439-6 C0459L-6 BP,1.5D,2660
Motor-Central door-locking-Rear-LH (M167)
C0442-6 BP,1.5D,1565 C0803-12 C0435-12 BP,1.5D,3080
BG,2.5D,840 C0585L-26
Motor-Central door-locking-Passenger (M237)
C0441-7 BG,1.5D,1760 C0439-5 C0463L-5 BG,1.5D,490 SJ670
Motor-Central door-locking-Rear-RH (M166)
C0442-7 BG,1.5D,1565 C0804-8 C0436-8 BG,1.5D,1600
Generic Electronic Module (D162)
Relay-Driver-lock (R262)
(O/P)
DMK RL6A
Relay-CDL-lock (R261)
(O/P)
DMK RL6B
Relay-CDL-Return (R265)
(1 O/P)
DMK RL8A
Relay-Superlock (R263)
(O/P)
DMK RL8B
Relay-CDL-Return (R265)
(2 O/P)
RL9 MK
FUSE 49P
30.0 Amps
FUSE 12P
15.0 Amps
Relay-Horn (R133)
DMK RL10A
FUSE 50P
10.0 Amps
Relay-Fuel-flap-lock (R257)
DMK
Relay-Fuel-flap-unlock (R258)
DMK
BATT 1(1) Sheet2
Sheet3 GND(P)-1
C0585L-5 BR,2.5D,1555
SJ13 BR,1.5D,2405 C0435-10 C0803-10 BR,1.5D,1565 C0442-7
Motor-Central door-locking-Rear-LH (M167)
BR,1.5D,1205 C0463L-9 C0439-9 BR,1.5D,1760 C0441-5
Motor-Central door-locking-Passenger (M237)
BR,1.5D,885 C0436-10 C0804-10 BR,1.5D,1565 C0442-5
Motor-Central door-locking-Rear-RH (M166)
C0583L-3 PG,1.0D,3685 C0004-1
Horn-RH (L103)
C0583L-4 PG,1.0D,3920 C0003-1
Horn-LH (L102)
C0580-23 PO,0.35D,2575 C0082-3
Clock spring (S227)
C0582-3 KR,1.5D,800 C0469-7 C0467L-7 KR,1.5D,3160 C0748-2
C0582-2 KP,1.5D,800 C0469-8 C0467L-8 KP,1.5D,3160 C0748-1
Motor-Release-Fuel flap (M116)

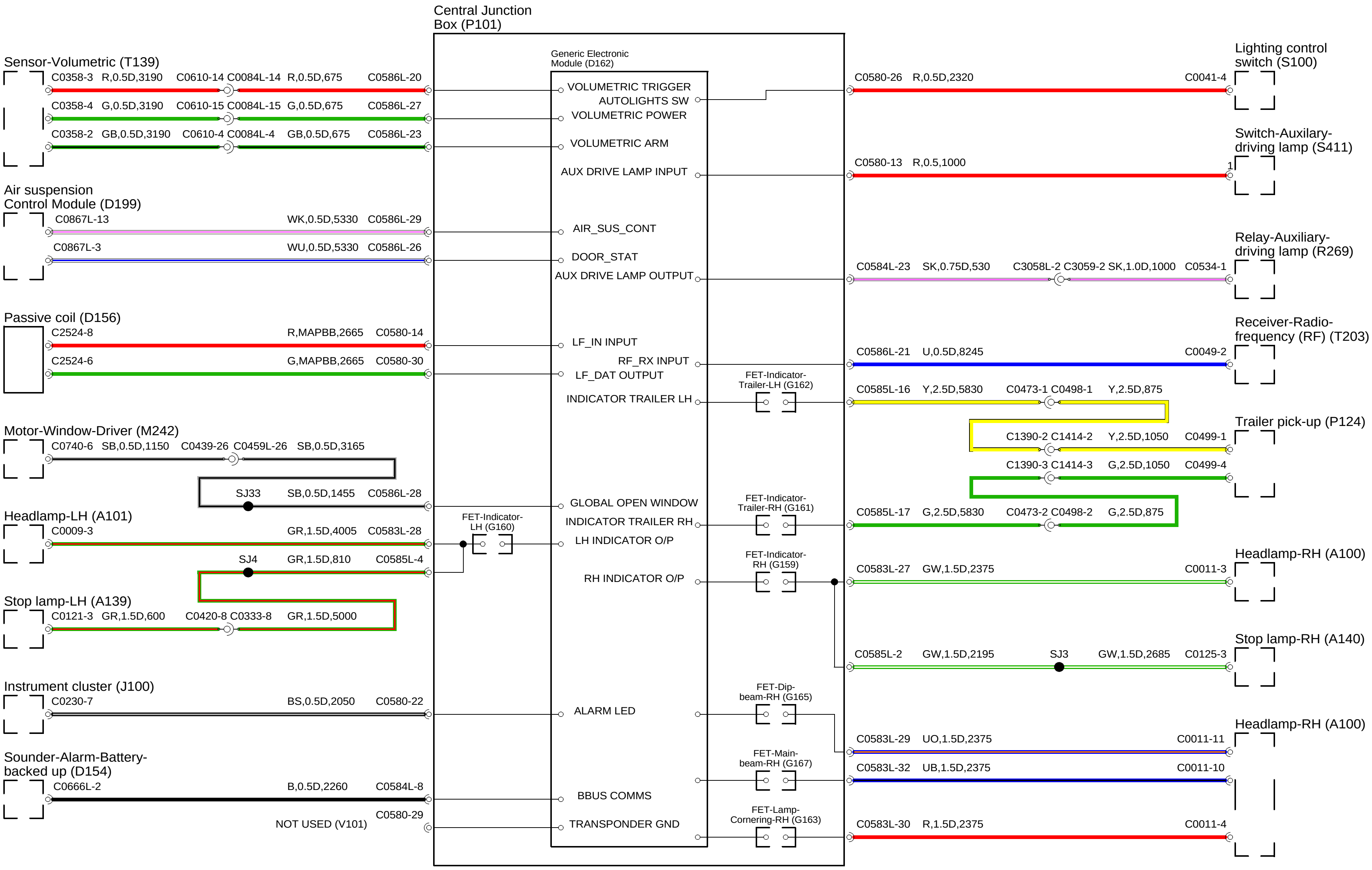

Central Junction Box (P101)
Battery Junction Box (P108)
C0570L-185
(EJB SUPPLY 4)
NG,4.0D,1155
C0583L-16
Relay-Reverse (R217)
MK
BATT 1(1)
Sheet1
FUSE 5P
10.0 Amps
C0585L-41
GN,1.5D,3705
SJ7
GN,1.5D,4675
C0125-2
Stop lamp-RH (A140)
C0420-12 C0333-12
GN,1.5D,2105
FUSE 6P
10.0 Amps
C0585L-6
GN,1.5D,5855
GN,1.5D,600
C0121-2
Stop lamp-LH (A139)
Generic Electronic Module (D162)
C1643-2 C1642-2
FUSE 67P
5.0 Amps
Headlamp-LH (A101)
C0009-11
UK,1.5D,4005
C0583L-24
FET-Dip-beam-LH (G166)
YN,1.5D,695
C1388-3 C1416-3
YN,1.5D,970
C0499-8
Trailer pick-up (P124)
C0009-10
US,1.5D,4005
C0583L-33
FET-Main-beam-LH (G168)
Relay-Auto-lights (R274)
C0009-4
R,1.5D,4005
C0583L-31
Lighting control switch (S100)
FET-Lamp-Cornering-LH (G164)
RL14 EP1
C0582-1
RO,1.0D,2230
C0041-16
Battery Junction Box (P108)
C0570L-95
LG,1.5D,370
SJ574
LG,0.5D,785
C0583L-35
Parking aid control module (D184)
C0570L-68
LG,0.5D,370
FUSE 28P
5.0 Amps
FUSE 36P
5.0 Amps
C0586L-1
NK,0.5D,5190
C0957-1
C0570L-25
LG,0.5D,370
Tire pressure monitoring control module (D286)
Switch-Ignition (S176)
C0586L-2
GN,0.5D,4970
SJ620
GN,0.5D,2115
C1537-8
C0028-1
(IGNITION)
Y,4.0D,2340
C0582-19
Restraints control module (D171)
Transmission control module (D306)
RW,0.75D,2960
(NON NAS)
C1649-12
C0193-9
GW,1.0H,2125
C2366B-6 C2365L-6
LGO,0.75D,620
C0584L-24
FUSE 64P
5.0 Amps
FUSE 9P
5.0 Amps
C0585L-10
RW,0.75D,2960
(NAS)
Restraints control module (D171)
Parking Brake Module (D278)
C3224L-12
C2178-F3
R,0.5D,1025
C0390-12 C0376-12
R,0.5D,5740
C0585L-43
FUSE 41P
5.0 Amps
Rear window heater element (H100)
Relay-Heated-rear screen (R138)
Sensor-Occupancy-detector (T221)
C0381-1
NP,4.0D,1005
C2960-1 C2959-1
NP,4.0D,7350
C0585L-23
FUSE 13P
25.0 Amps
C0585L-8
G,0.5D,2255
C2368-18
C2363-2
G,0.5D,465
C0962-G
DMK RL10B
(NAS ONLY)
Air suspension Control Module (D199)
Engine control-module (ECM) (D131)
C0867L-20
LGW,0.75D,5330
C0586L-4
FUSE 35P
5.0 Amps
BO,0.75D,815
(PV8)
C0635L-30
FUSE 25P
5.0 Amps
C0583L-36
W,0.75D,1075
(DV6)
Engine control-module (ECM) (D131)
Instrument cluster (J100)
FUSE 68P
5.0 Amps
C0230-15
G,0.5D,820
SJ199
G,0.5D,1140
C0582-4
Sheet3
IGN (1)
Sheet4
BATT 1(2)
Sheet5
RL14
C0872L-K3

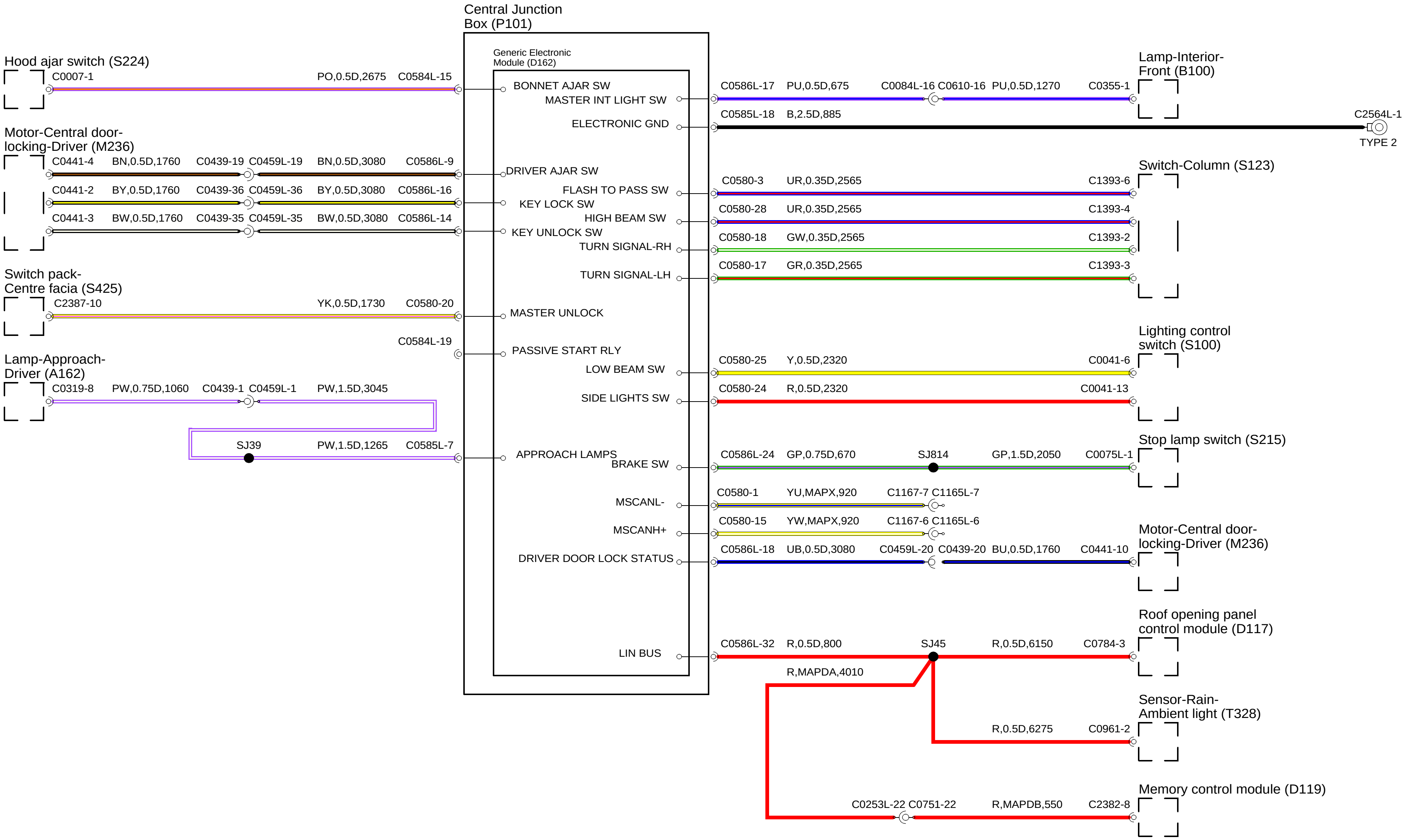

Central Junction Box (P101)
Stop lamp switch (S215)
C0075L-4
GO,1.5D,2650
C0585L-35
GND(P)-1
Sheet1
IGN (1)
Sheet2
Relay-Hill-descent (R222)
FUSE 15P
15.0 Amps
MK
Stop lamp-RH (A140)
C0125-1
GP,1.5D,4280
SJ814
GP,1.5D,600
C0585L-32
FUSE 69P
5.0 Amps
C0586L-3
GR,0.5D,320
SJ695
GR,0.5D,6835
C0698-1
Mirror-interior (B146)
GR,0.5D,755
C2411L-13 C2412L-13
TRANSIT RELAY
ABS module (D277)
C0506L-22
YR,0.5D,2705
C0583L-2
1.50 k Ohms
C0506L-28
LG,0.75D,2360
(DSC)
SJ179 (DSC)
LG,1.0D,445
C0583L-34
FUSE 37P
5.0 Amps
Switch pack-Centre-console (S350)
C0868-8 C0903-8
R,0.75D,360
C0700-20
Switch-Terrain-optimisation (S380)
Stop lamp switch (S215)
C0075L-3
R,0.5D,4395
SJ667
R,0.5D,2400
C1165L-11 C1167-11
R,0.5D,1010
Rear differential control module (D283)
R,1.0D,2015
SJ971
R,1.0D,905
C2163-4
SJ105
R,0.5D,880
C0582-7
FUSE 66P
5.0 Amps
R,1.0D,3775
AFS ECU (D276)
C2193L-23
RO,0.75D,780
C0583L-14
FUSE 27P
10.0 Amps
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D,435
SJ970
R,1.0D,340
C2412L-5 C2411L-5
Transfer box control module (D204)
R,1.0D,675
C1854L-3
Speed control module (D284)
C2145L-14
WR,0.5D,2335
SJ391
WR,0.5D,565
C0583L-38
FUSE 23P
5.0 Amps
Relay-Trailer-Rear wiper (R273)
C2937-8
R,1.5D,5530
C0585L-9
FUSE 22P
10.0 Amps
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D,2230
C0041-8
Lighting control switch (S100)
Relay-Wash-pump (R259)
Headlamp-LH (A101)
C0009-14
RB,0.5D,2360
C2444L-11 C2443-11
RB,0.5D,2280
C0582-11
FUSE 56P
10.0 Amps
FR
C0583L-5
BO,1.5D,4055
C0008-2
Pump-washer-front/rear screen (M278)
RR
C0583L-17
OB,1.5D,4055
C0008-1
FUSE 11P
15.0 Amps
Headlamp-RH (A100)
C0011-14
RO,0.5D,4290
C2444L-12 C2443-12
RO,0.5D,2280
C0582-8
FUSE 61P
10.0 Amps
DMK RL12
Generic Electronic Module (D162)
Switch-Ignition (S176)
C0028-6
(AUXILIARY)
W,1.5D,2340
C0582-30
FUSE 18P
5.0 Amps
PWR GND
C0585L-25
B,2.5D,1100
C1398L-1
TYPE 3
Sensor-Rain-Ambient light (T328)
C0961-4
G,0.5D,7005
C0585L-45
Sheet6
AUX-1
Sheet6
GND(P)-2

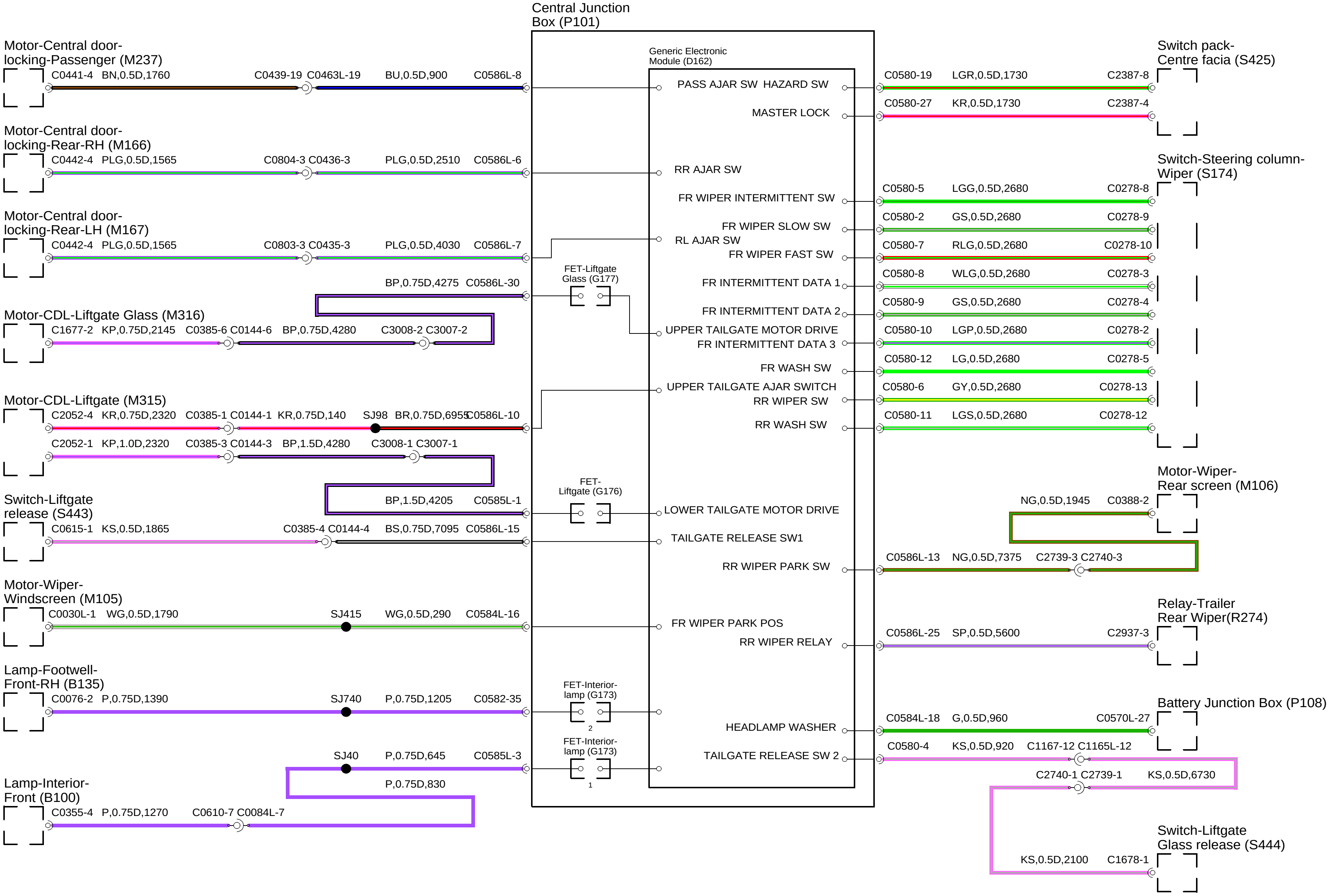

Central Junction Box (P101)
Instrument cluster (J100)
C0230-16
P,0.5D,1960
C0582-15
FUSE 39P
5.0 Amps
BATT 2(1) Sheet5
BATT 1(2) Sheet2
FUSE 43P
10.0 Amps
C0585L-46
GW,0.5D,1445
SJ50
GW,0.5D,6730
C0049-1
Receiver-Radio-frequency (RF) (T203)
Automatic Temperature Control Module (D243)
C2655-1
GP,1.0D,1585
C0582-10
FUSE 51P
10.0 Amps
NOT USED (V101)
C0585L-44
GW,0.5D,5570
C1537-16
Tire pressure monitoring control module (D286)
Battery Junction Box (P108)
C0570L-117
EJB (BATT 1)
NR,6.0D,1155
C0583L-20
C0253L-11 C0751-11
WR,0.5D,550
C2382-4
Memory control module (D119)
Audio head unit (D282)
C1354-11
PU,1.5D,745
SJ131
PU,1.5D,1110
C0582-38
FUSE 53P
15.0 Amps
FUSE 54P
5.0 Amps
C0585L-13
WR,0.5D,1605
SJ185
WR,0.5D,4885
WR,0.5D,850
WR,1.0D,1020
C2339-2
Switch-Lumbar-Driver (S389)
WR,0.5D,3070
C0467L-2 C0469-2
LGW,1.0D,800
C0582-44
FUSE 59P
10.0 Amps
LGW,0.75D,2835
C2378-12 C3026-2
Switch-Lumbar-Passenger (S390)
C2368-12 C3026-2
WR,1.0D,1020
C2339-2
Cool box (D345)
C2773-1
LGW,0.75D,355
C2054-12 C2053-12
C1165L-3 C1167-3
PU,0.5D,830
C0582-45
FUSE 44P
5.0 Amps
Fold back module (D197)
FUSE 16P
10.0 Amps
C0585L-39
GK,1.0D,850
C0907L-4
Selector mechanism (D308)
C2658-8
PU,0.5D,405
C2054-10 C2053-10
PU,0.5D,2815
Sounder-Alarm-Battery-backed up (D154)
FUSE 26P
5.0 Amps
C0583L-37
B,0.5D,2455
C0666L-3
Lighting control switch (S100)
C0041-2
RO,1.5D,2230
C0582-46
Amplifier-Power-ICE (F142)
C0041-3
(NON NAS)
UR,1.5D,2230
FUSE 42P
30.0 Amps
C0582-22
R,2.5D,800
C0469-5 C0467L-5
R,2.5D,1560
C2414-1
C0582-14
(NAS)
UR,1.5D,780
Battery Junction Box (P108)
C0570L-140
UR,1.5D,1175
C2241L-7 C2239-7
Stop lamp-RH (A140)
FUSE 32P
15.0 Amps
C0585L-21
RY,1.5D,945
SJ20
RY,1.5D,3935
C0125-6
SJ172
UP,1.5D,680
C0583L-41
FUSE 38P
15.0 Amps
FUSE 52P
5.0 Amps
C0582-41
R,0.75D,865
C2247-3 C2249-3
R,0.75D,2635
Telephone control module (D262)
UP,1.5D,1755
Lamp-Fog-Front-RH (A108)
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
Sheet6 BATT 2(2)
Sheet6 BATT 1(3)
SJ299
R,0.75D,370
C2777-17
R,0.75D,370
C2777-18

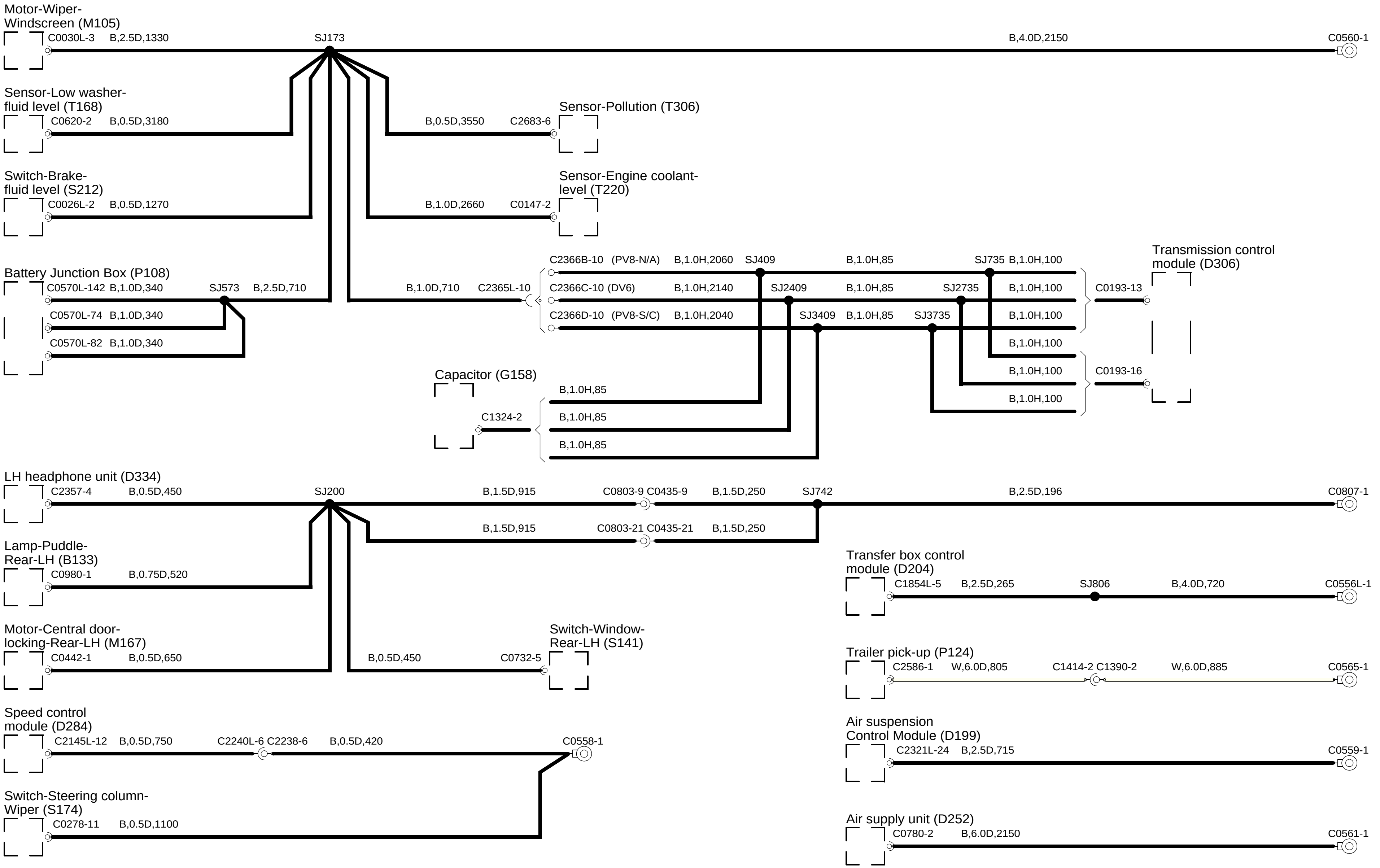

Central Junction Box (P101)
Switch-Ignition (S176)
C0028-5
(KEY IN SENSE)
LGW,1.5D,2340
C0582-21
FUSE 40P
5.0 Amps
C0028-7
(CRANK)
WR,2.5D,2340
C0582-5
FUSE 60P
5.0 Amps
Generic Electronic Module (D162)
Battery Junction Box (P108)
C0570L-83
R,1.5D,240
SJ2
R,0.5D,720
C0584L-32
WIPER SLOW
C0570L-50
PU,1.5D,280
SJ1
PU,0.5D,680
C0584L-17
WIPER FAST
C0570L-116
EJB (BATT 3)
NU,4.0D,1155
C0583L-21
Relay-Side-lamp (R125)
MK
Relay-Battery-saver (R250)
MK
FUSE 1P
10.0 Amps
Mirror-Vanity-LH (B152)
C0737-2
LGW,0.75D,1435
SJ234
LGW,1.0D,1010
C0610-6 C0084L-6
LGW,0.75D,605
C0585L-40
Lamp-Glove box (B109)
C0227-2
LGW,0.5D,875
C0582-39
Battery Junction Box (P108)
C0570L-186
(EJB SUPPLY 2)
NS,6.0D,1155
C0583L-22
Sheet4
BATT 2(1)
Sheet2
RL14
Parking Brake Module (D278)
LGW,0.5D,1025
C2178-F2
C0586L-22
LGW,0.5D,5810
C0376-17 C0390-17
Engine control-module (ECM) (D131)
WR,0.5D,620
(PV8)
C0635L-17
C0584L-30
WR,0.5D,500
(DV6)
SJ479
Engine control-module (ECM) (D131)
WR,0.5D,720
C0872L-F3
Stop lamp-RH (A140)
FUSE 2P
10.0 Amps
C0585L-37
RO,1.0D,4880
C0125-4
Headlamp-RH (A100)
C0583L-6
RO,1.0D,2375
C0011-2
FUSE 4P
10.0 Amps
C0585L-38
RB,1.0D,4370
SJ22
RB,1.0D,1440
Stop lamp-LH (A139)
C0333-10 C0420-10
RB,1.5D,600
C0121-4
Headlamp-LH (A101)
C0583L-7
RB,1.0D,4005
C0009-2
Fuse-Trailer (P136)
RO,1.5D,595
SJ571
RO,1.5D,130
C1875-11
C1643-3 C1642-3
FUSE 14P
10.0 Amps
C0583L-13
N,1.5D,695
C2412L-9 C2411L-9
N,1.5D,5575
Relay-Trailer-Rear wiper (R273)
FUSE 48P
15.0 Amps
C0585L-12
SK,1.5D,4355
SJ28
SK,1.5D,1175
C2937-2
SK,0.5D,1175
C2937-5

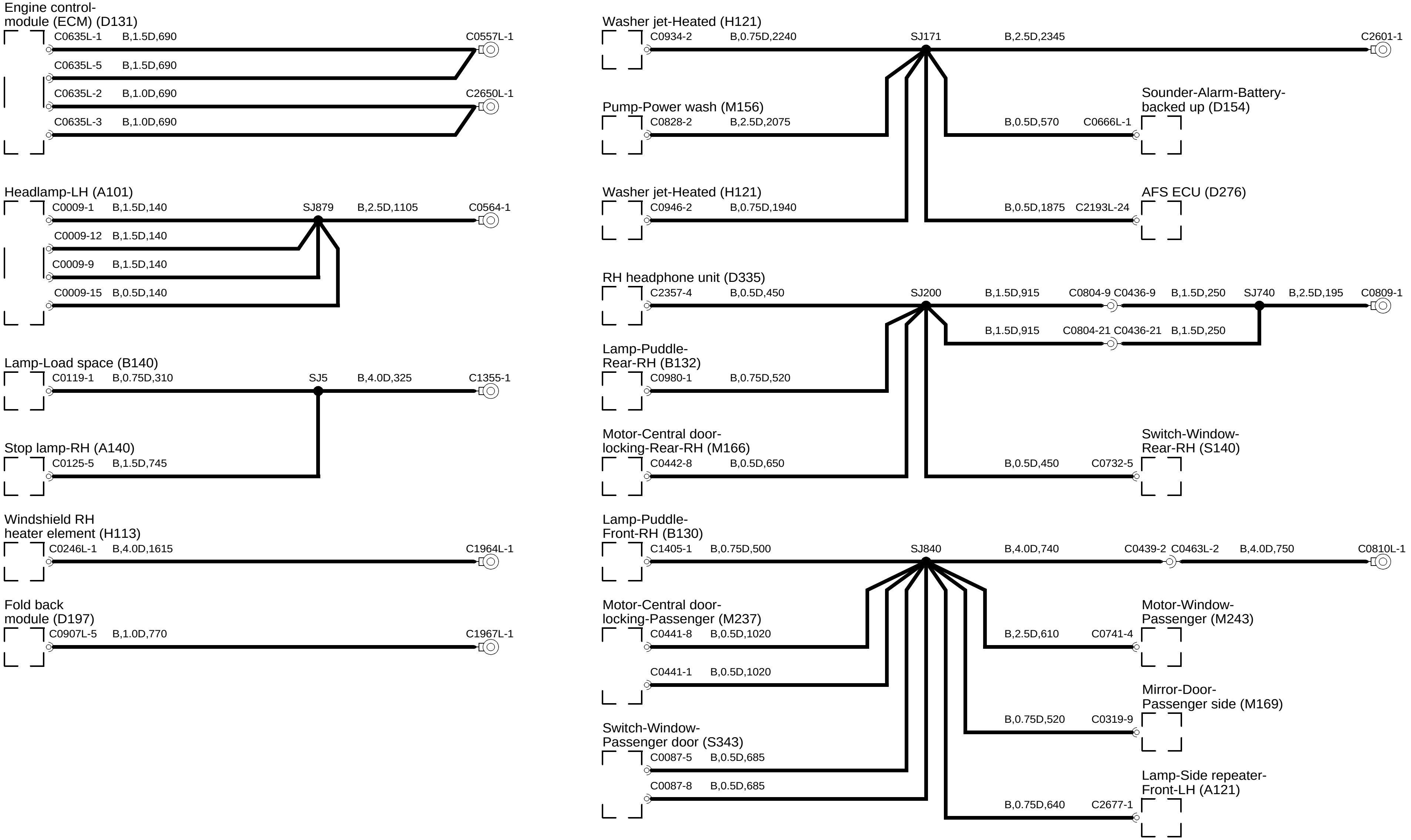

Roof opening panel control module (D117)
C0784-1
NR,1.5D,6880
C0585L-15
Central Junction Box (P101)
FUSE 20P
15.0 Amps
BATT 2(2)
Sheet4
Memory control module (D119)
C0253L-13 C0751-13
NG,2.5D,590
C2385-1
Motor-Window-Driver (M242)
C0740-3
GU,2.5D,1150
C0439-10 C0459L-10
GU,2.5D,3010
C0585L-30
FUSE 7P
25.0 Amps
FUSE 46P
30.0 Amps
C0585L-24
NG,2.5D,340
SJ184
NG,2.5D,4170
Relay-Power seat-RH (R210)
SJ1
NP,2.5D,235
C0975-3
NP,2.5D,160
Motor-Window-Passenger (M243)
C0741-3
GU,2.5D,1150
C0439-10 C0463L-10
GU,2.5D,830
C0585L-22
FUSE 21P
25.0 Amps
FUSE 29P
30.0 Amps
C0585L-28
NP,2.5D,2255
C2368-16 C3025-2
Navigation system module (D325)
U,0.75D,1750
SJ530
U,0.5D,2005
C2114-18
Relay-Window-lift (R143)
Relay-Infotainment (R249)
C2249-10 C2247-10
Switch-Window-Driver door (S344)
REAR-LH
C0343-3
GU,2.5D,1140
C0439-52 C0459L-52
GU,2.5D,3010
C0585L-20
FUSE 31P
20.0 Amps
RL13 EP1
FUSE 58P
10.0 Amps
C0582-13
U,1.0D,300
SJ998
U,0.75D,565
Audio head unit (D282)
RL5 MICRO
C0582-34
RU,0.5D,1525
C1354-8
REAR-RH
C0343-8
GN,2.5D,1140
C0439-12 C0459L-12
GN,2.5D,3010
C0585L-42
FUSE 17P
20.0 Amps
Rear seat entertainment module (D313)
Cigar lighter-Front (J112)
C0089-2
LGW,1.5D,455
C0903-12 C0868-12
LGW,1.5D,2835
Generic Electronic Module (D162)
FUSE 57P
10.0 Amps
C0582-12
N,0.75D,865
C2247-1 C2249-1
N,0.5D,2975
C2116-1
Diagnostic socket (V100)
C0467L-9 C0469-9
LGW,1.5D,800
C0582-36
FUSE 63P
10.0 Amps
C0582-43
LG,0.75D,2325
C0040-16
Relay-Cigar-lighter (R132)
FUSE 55P
15.0 Amps
FUSE 8P
30.0 Amps
C0585L-19
GN,4.0D,5830
C0473-4 C0498-4
GK,1.5D,730
C0585L-14
RL3 MICRO
Fuse-Trailer (P136)
P,4.0D,655
SJ570
P,2.5D,70
C1875-3
Selector mechanism (D308)
C2658-7
LGO,0.5D,405
C2054-11 C2053-11
GK,0.5D,2710
SJ119
FUSE 33P
5.0 Amps
P,2.5D,70
C1875-5
Relay-Accessory-socket (R203)
FUSE 34P
15.0 Amps
C0582-18
NOT USED (V101)
RL1 MINI
Switch-Mirror (S156)
C0066-6
GK,0.75D,1200
C0439-13 C0459L-13
GK,1.0D,2510
Socket-Accessory-Centre (V115)
FUSE 19P
15.0 Amps
C0585L-31
PG,1.5D,3390
C0868-1 C0903-1
PG,1.5D,600
C1692-2
ACCESSORY 2nd ROW
Relay-Power seat-RH (R210)
C0975-1
GK,1.5D,405
C3026-1
C2368-11
GK,1.5D,1575
Socket-Accessory-Rear (V113)
FUSE 47P
15.0 Amps
C0585L-11
PG,1.5D,6040
C0942-2
ACCESSORY 3rd ROW
Switch pack-Seat-Driver (S391)
C0774-2
GK,1.5D,430
C3026-1
C2378-11
GK,1.5D,3995
AUX-1
Sheet3
BATT 1(3)
Sheet4
GND(P)-2
Sheet3

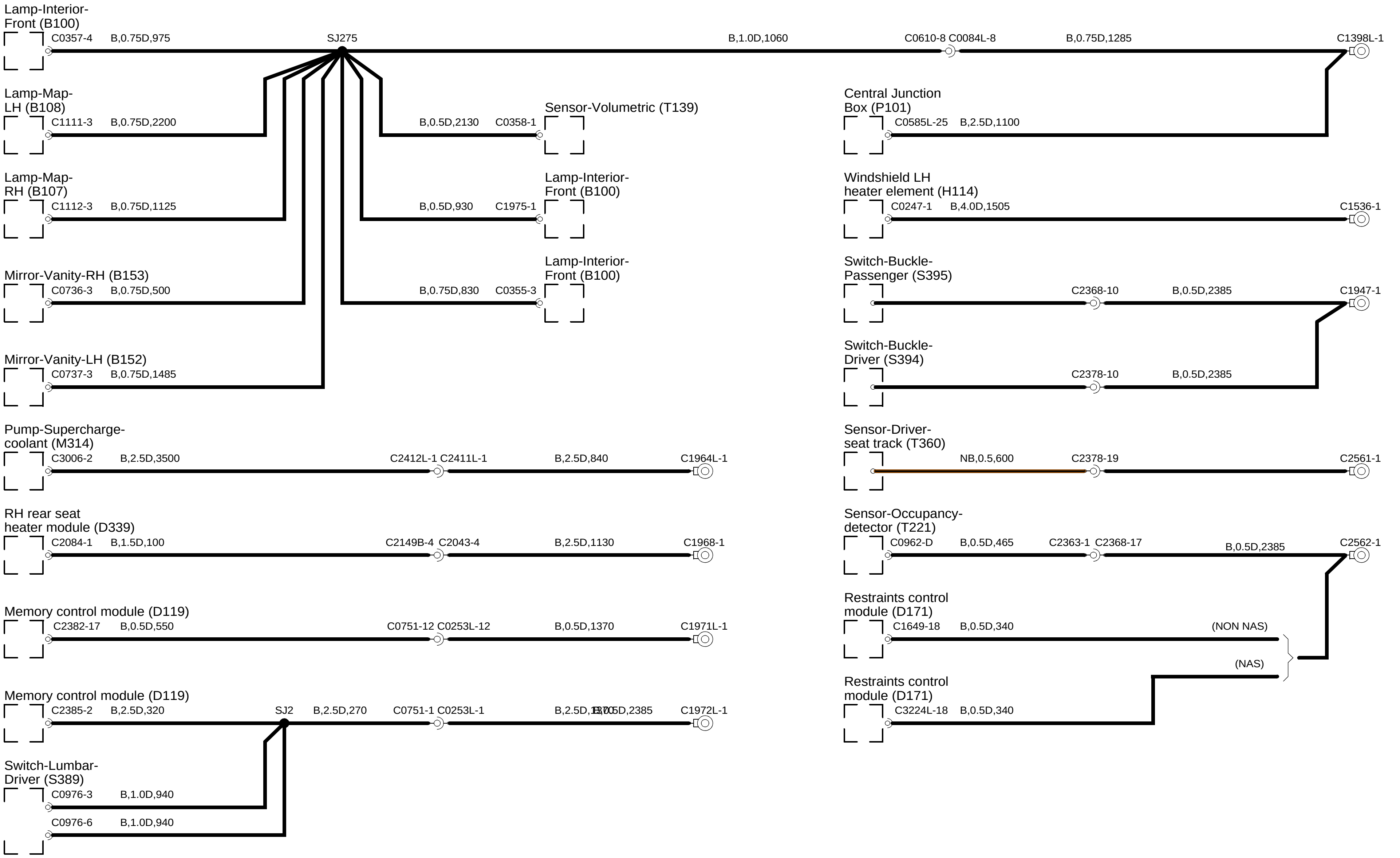

Central Junction Box (P101)
Generic Electronic Module (D162)
Sensor-Volumetric (T139)
C0358-3 R,0.5D,3190 C0610-14 C0084L-14 R,0.5D,675 C0586L-20
C0358-4 G,0.5D,3190 C0610-15 C0084L-15 G,0.5D,675 C0586L-27
C0358-2 GB,0.5D,3190 C0610-4 C0084L-4 GB,0.5D,675 C0586L-23
Air suspension Control Module (D199)
C0867L-13 WK,0.5D,5330 C0586L-29
C0867L-3 WU,0.5D,5330 C0586L-26
Passive coil (D156)
C2524-8 R,MAPBB,2665 C0580-14
C2524-6 G,MAPBB,2665 C0580-30
Motor-Window-Driver (M242)
C0740-6 SB,0.5D,1150 C0439-26 C0459L-26 SB,0.5D,3165
SJ33 SB,0.5D,1455 C0586L-28
Headlamp-LH (A101)
C0009-3 GR,1.5D,4005 C0583L-28
SJ4 GR,1.5D,810 C0585L-4
Stop lamp-LH (A139)
C0121-3 GR,1.5D,600 C0420-8 C0333-8 GR,1.5D,5000
Instrument cluster (J100)
C0230-7 BS,0.5D,2050 C0580-22
Sounder-Alarm-Battery-backed up (D154)
C0666L-2 B,0.5D,2260 C0584L-8
NOT USED (V101) C0580-29
VOLUMETRIC TRIGGER
AUTOLIGHTS SW
VOLUMETRIC POWER
VOLUMETRIC ARM
AUX DRIVE LAMP INPUT
AIR_SUS_CONT
DOOR_STAT
AUX DRIVE LAMP OUTPUT
LF_IN INPUT
RF_RX INPUT
LF_DAT OUTPUT
INDICATOR TRAILER LH
GLOBAL OPEN WINDOW
INDICATOR TRAILER RH
LH INDICATOR O/P
RH INDICATOR O/P
ALARM LED
BBUS COMMS
TRANSPONDER GND
FET-Indicator-LH (G160)
FET-Indicator-Trailer-LH (G162)
FET-Indicator-Trailer-RH (G161)
FET-Indicator-RH (G159)
FET-Dip-beam-RH (G165)
FET-Main-beam-RH (G167)
FET-Lamp-Cornering-RH (G163)
Lighting control switch (S100)
C0580-26 R,0.5D,2320 C0041-4
Switch-Auxilary-driving lamp (S411)
C0580-13 R,0.5,1000
1
Relay-Auxiliary-driving lamp (R269)
C0584L-23 SK,0.75D,530 C3058L-2 C3059-2 SK,1.0D,1000 C0534-1
Receiver-Radio-frequency (RF) (T203)
C0586L-21 U,0.5D,8245 C0049-2
C0585L-16 Y,2.5D,5830 C0473-1 C0498-1 Y,2.5D,875
Trailer pick-up (P124)
C1390-2 C1414-2 Y,2.5D,1050 C0499-1
C1390-3 C1414-3 G,2.5D,1050 C0499-4
C0585L-17 G,2.5D,5830 C0473-2 C0498-2 G,2.5D,875
Headlamp-RH (A100)
C0583L-27 GW,1.5D,2375 C0011-3
Stop lamp-RH (A140)
C0585L-2 GW,1.5D,2195 SJ3 GW,1.5D,2685 C0125-3
Headlamp-RH (A100)
C0583L-29 UO,1.5D,2375 C0011-11
C0583L-32 UB,1.5D,2375 C0011-10
C0583L-30 R,1.5D,2375 C0011-4

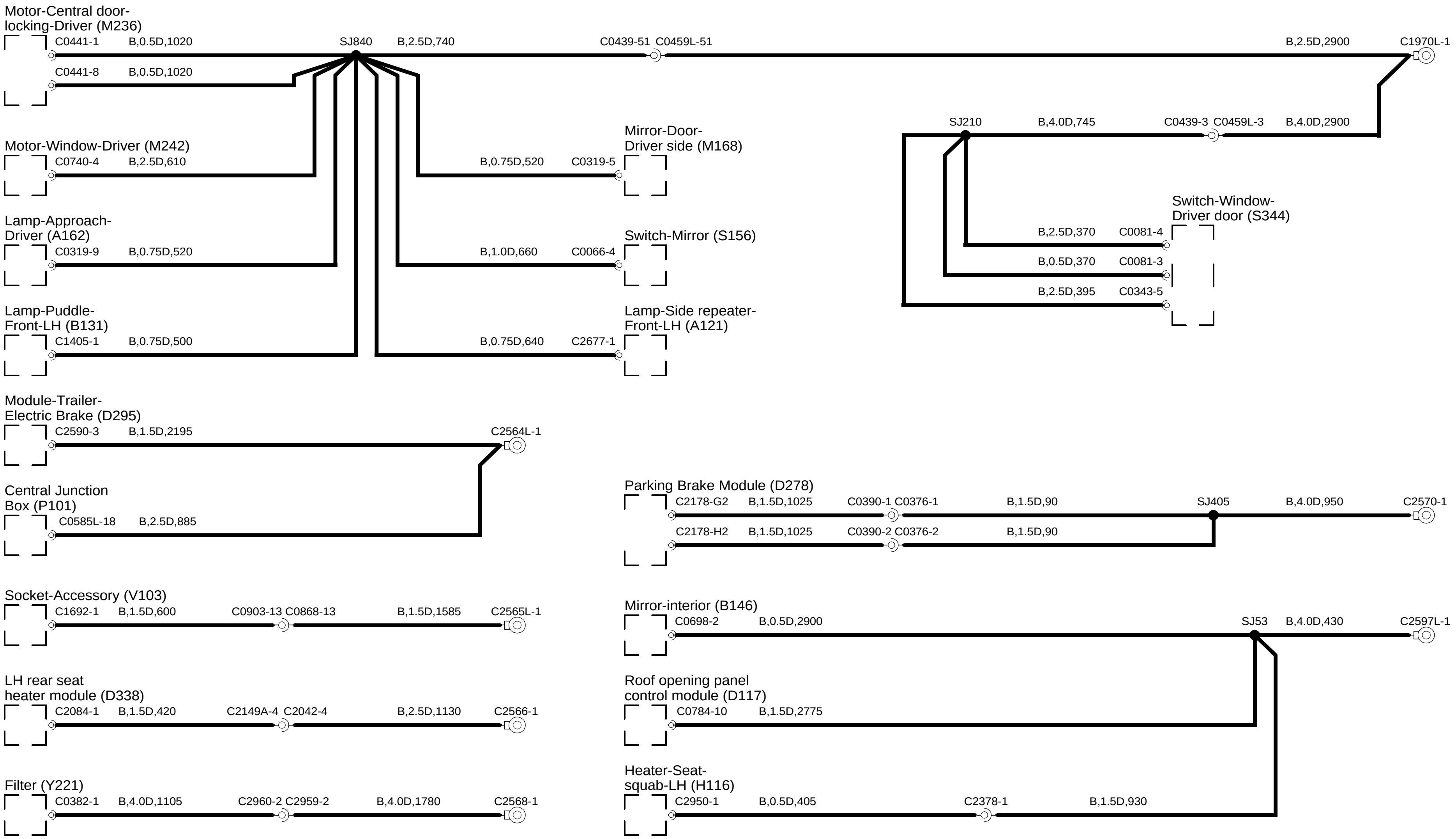

Central Junction Box (P101)
Generic Electronic Module (D162)
Hood ajar switch (S224)
C0007-1
PO,0.5D,2675
C0584L-15
BONNET AJAR SW
MASTER INT LIGHT SW
C0586L-17
PU,0.5D,675
C0084L-16 C0610-16
PU,0.5D,1270
C0355-1
Lamp-Interior-Front (B100)
ELECTRONIC GND
C0585L-18
B,2.5D,885
C2564L-1
TYPE 2
Motor-Central door-locking-Driver (M236)
C0441-4
BN,0.5D,1760
C0439-19 C0459L-19
BN,0.5D,3080
C0586L-9
DRIVER AJAR SW
C0441-2
BY,0.5D,1760
C0439-36 C0459L-36
BY,0.5D,3080
C0586L-16
FLASH TO PASS SW
KEY LOCK SW
C0441-3
BW,0.5D,1760
C0439-35 C0459L-35
BW,0.5D,3080
C0586L-14
HIGH BEAM SW
KEY UNLOCK SW
TURN SIGNAL-RH
TURN SIGNAL-LH
Switch-Column (S123)
C0580-3
UR,0.35D,2565
C1393-6
C0580-28
UR,0.35D,2565
C1393-4
C0580-18
GW,0.35D,2565
C1393-2
C0580-17
GR,0.35D,2565
C1393-3
Switch pack-Centre facia (S425)
C2387-10
YK,0.5D,1730
C0580-20
MASTER UNLOCK
C0584L-19
PASSIVE START RLY
LOW BEAM SW
SIDE LIGHTS SW
Lighting control switch (S100)
C0580-25
Y,0.5D,2320
C0041-6
C0580-24
R,0.5D,2320
C0041-13
Lamp-Approach-Driver (A162)
C0319-8
PW,0.75D,1060
C0439-1 C0459L-1
PW,1.5D,3045
SJ39
PW,1.5D,1265
C0585L-7
APPROACH LAMPS
BRAKE SW
Stop lamp switch (S215)
C0586L-24
GP,0.75D,670
SJ814
GP,1.5D,2050
C0075L-1
MSCANL-
C0580-1
YU,MAPX,920
C1167-7 C1165L-7
MSCANH+
C0580-15
YW,MAPX,920
C1167-6 C1165L-6
DRIVER DOOR LOCK STATUS
Motor-Central door-locking-Driver (M236)
C0586L-18
UB,0.5D,3080
C0459L-20 C0439-20
BU,0.5D,1760
C0441-10
LIN BUS
Roof opening panel control module (D117)
C0586L-32
R,0.5D,800
SJ45
R,0.5D,6150
C0784-3
R,MAPDA,4010
Sensor-Rain-Ambient light (T328)
R,0.5D,6275
C0961-2
Memory control module (D119)
C0253L-22 C0751-22
R,MAPDB,550
C2382-8

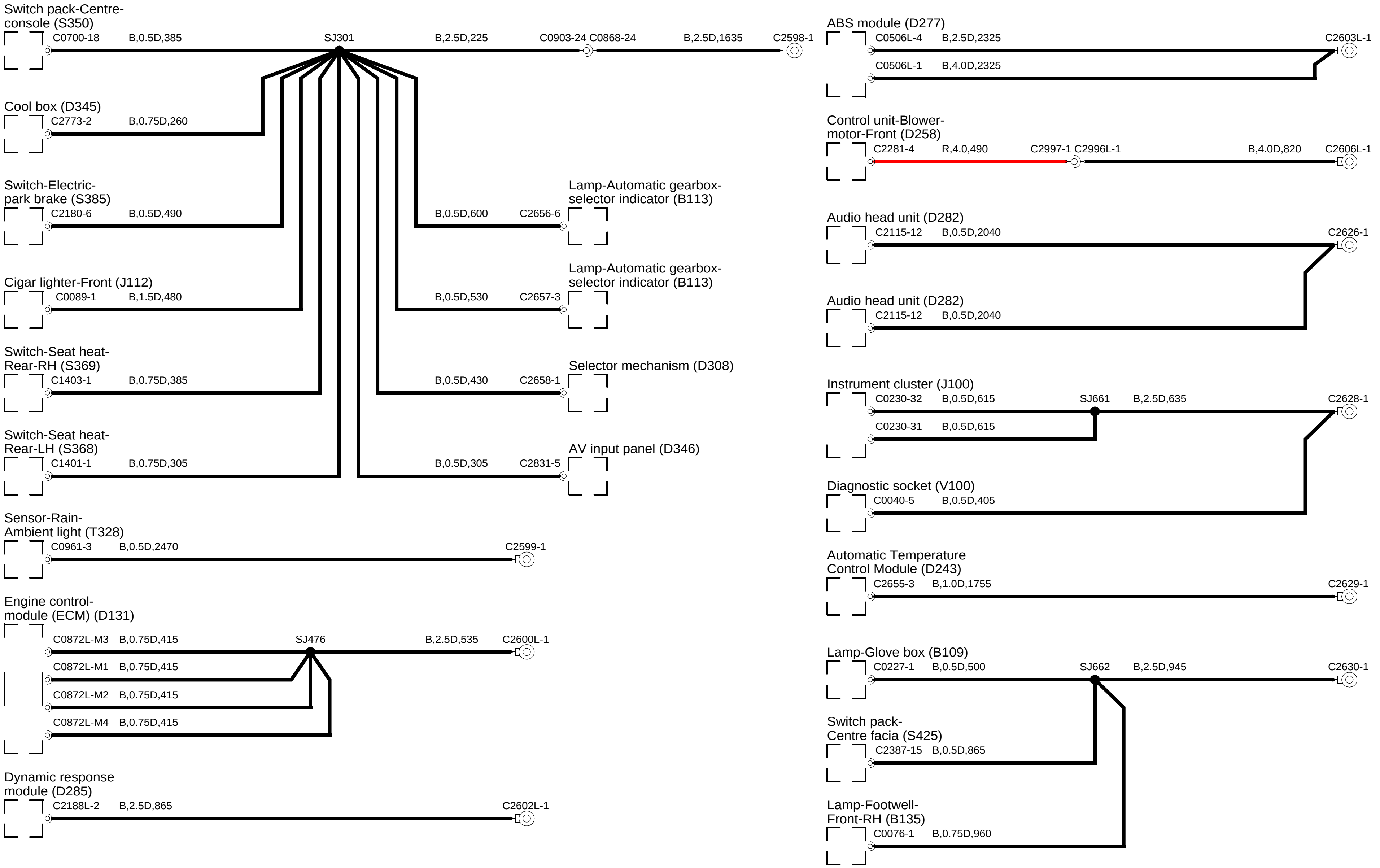

Central Junction Box (P101)
Generic Electronic Module (D162)
Motor-Central door-locking-Passenger (M237)
C0441-4 BN,0.5D,1760 C0439-19 C0463L-19 BU,0.5D,900 C0586L-8
PASS AJAR SW HAZARD SW
MASTER LOCK
Motor-Central door-locking-Rear-RH (M166)
C0442-4 PLG,0.5D,1565 C0804-3 C0436-3 PLG,0.5D,2510 C0586L-6
RR AJAR SW
FR WIPER INTERMITTENT SW
Motor-Central door-locking-Rear-LH (M167)
C0442-4 PLG,0.5D,1565 C0803-3 C0435-3 PLG,0.5D,4030 C0586L-7
FR WIPER SLOW SW
RL AJAR SW
FR WIPER FAST SW
BP,0.75D,4275 C0586L-30
FET-Liftgate Glass (G177)
FR INTERMITTENT DATA 1
FR INTERMITTENT DATA 2
Motor-CDL-Liftgate Glass (M316)
C1677-2 KP,0.75D,2145 C0385-6 C0144-6 BP,0.75D,4280 C3008-2 C3007-2
UPPER TAILGATE MOTOR DRIVE
FR INTERMITTENT DATA 3
FR WASH SW
UPPER TAILGATE AJAR SWITCH
RR WIPER SW
Motor-CDL-Liftgate (M315)
C2052-4 KR,0.75D,2320 C0385-1 C0144-1 KR,0.75D,140 SJ98 BR,0.75D,6955 C0586L-10
RR WASH SW
C2052-1 KP,1.0D,2320 C0385-3 C0144-3 BP,1.5D,4280 C3008-1 C3007-1
Switch-Liftgate release (S443)
BP,1.5D,4205 C0585L-1
FET-Liftgate (G176)
LOWER TAILGATE MOTOR DRIVE
C0615-1 KS,0.5D,1865 C0385-4 C0144-4 BS,0.75D,7095 C0586L-15
TAILGATE RELEASE SW1
RR WIPER PARK SW
Motor-Wiper-Windscreen (M105)
C0030L-1 WG,0.5D,1790 SJ415 WG,0.5D,290 C0584L-16
FR WIPER PARK POS
RR WIPER RELAY
Lamp-Footwell-Front-RH (B135)
C0076-2 P,0.75D,1390 SJ740 P,0.75D,1205 C0582-35
FET-Interior-lamp (G173)
2
HEADLAMP WASHER
FET-Interior-lamp (G173)
1
TAILGATE RELEASE SW 2
SJ40 P,0.75D,645 C0585L-3
P,0.75D,830
Lamp-Interior-Front (B100)
C0355-4 P,0.75D,1270 C0610-7 C0084L-7
Switch pack-Centre facia (S425)
C0580-19 LGR,0.5D,1730 C2387-8
C0580-27 KR,0.5D,1730 C2387-4
Switch-Steering column-Wiper (S174)
C0580-5 LGG,0.5D,2680 C0278-8
C0580-2 GS,0.5D,2680 C0278-9
C0580-7 RLG,0.5D,2680 C0278-10
C0580-8 WLG,0.5D,2680 C0278-3
C0580-9 GS,0.5D,2680 C0278-4
C0580-10 LGP,0.5D,2680 C0278-2
C0580-12 LG,0.5D,2680 C0278-5
C0580-6 GY,0.5D,2680 C0278-13
C0580-11 LGS,0.5D,2680 C0278-12
Motor-Wiper-Rear screen (M106)
NG,0.5D,1945 C0388-2
C0586L-13 NG,0.5D,7375 C2739-3 C2740-3
Relay-Trailer Rear Wiper(R274)
C0586L-25 SP,0.5D,5600 C2937-3
Battery Junction Box (P108)
C0584L-18 G,0.5D,960 C0570L-27
C0580-4 KS,0.5D,920 C1167-12 C1165L-12
C2740-1 C2739-1 KS,0.5D,6730
Switch-Liftgate Glass release (S444)
KS,0.5D,2100 C1678-1

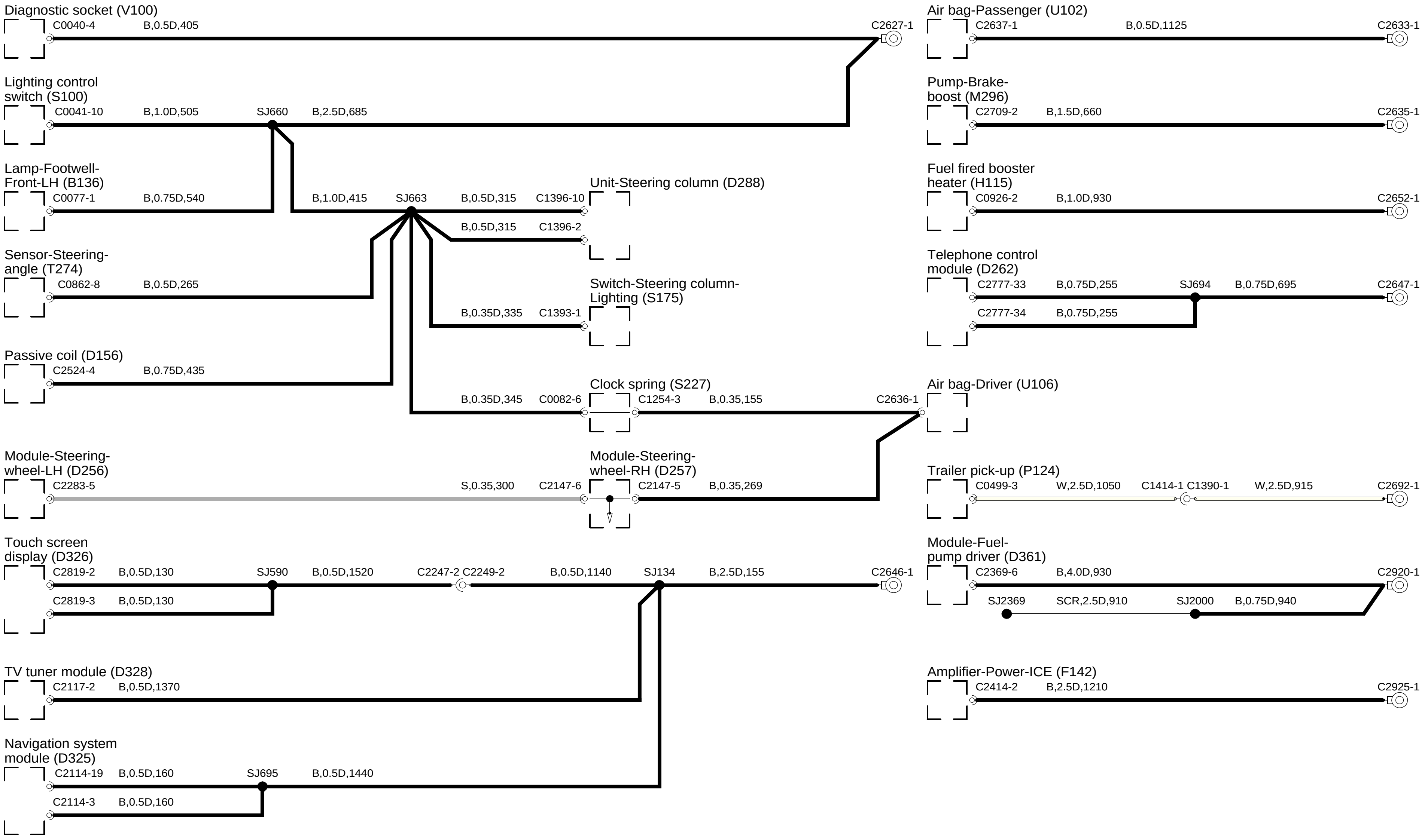

Motor-Wiper-Windscreen (M105)
C0030L-3
B,2.5D,1330
SJ173
B,4.0D,2150
C0560-1
Sensor-Low washer-fluid level (T168)
C0620-2
B,0.5D,3180
B,0.5D,3550
C2683-6
Sensor-Pollution (T306)
Switch-Brake-fluid level (S212)
C0026L-2
B,0.5D,1270
B,1.0D,2660
C0147-2
Sensor-Engine coolant-level (T220)
Battery Junction Box (P108)
C0570L-142
B,1.0D,340
SJ573
B,2.5D,710
B,1.0D,710
C2365L-10
C0570L-74
B,1.0D,340
C0570L-82
B,1.0D,340
C2366B-10 (PV8-N/A)
B,1.0H,2060
SJ409
B,1.0H,85
SJ735
B,1.0H,100
C2366C-10 (DV6)
B,1.0H,2140
SJ2409
B,1.0H,85
SJ2735
B,1.0H,100
C0193-13
C2366D-10 (PV8-S/C)
B,1.0H,2040
SJ3409
B,1.0H,85
SJ3735
B,1.0H,100
B,1.0H,100
B,1.0H,100
C0193-16
B,1.0H,100
Transmission control module (D306)
Capacitor (G158)
C1324-2
B,1.0H,85
B,1.0H,85
B,1.0H,85
LH headphone unit (D334)
C2357-4
B,0.5D,450
SJ200
B,1.5D,915
C0803-9 C0435-9
B,1.5D,250
SJ742
B,2.5D,196
C0807-1
B,1.5D,915
C0803-21 C0435-21
B,1.5D,250
Lamp-Puddle-Rear-LH (B133)
C0980-1
B,0.75D,520
Transfer box control module (D204)
C1854L-5
B,2.5D,265
SJ806
B,4.0D,720
C0556L-1
Motor-Central door-locking-Rear-LH (M167)
C0442-1
B,0.5D,650
B,0.5D,450
C0732-5
Switch-Window-Rear-LH (S141)
Trailer pick-up (P124)
C2586-1
W,6.0D,805
C1414-2 C1390-2
W,6.0D,885
C0565-1
Speed control module (D284)
C2145L-12
B,0.5D,750
C2240L-6 C2238-6
B,0.5D,420
C0558-1
Air suspension Control Module (D199)
C2321L-24
B,2.5D,715
C0559-1
Switch-Steering column-Wiper (S174)
C0278-11
B,0.5D,1100
Air supply unit (D252)
C0780-2
B,6.0D,2150
C0561-1

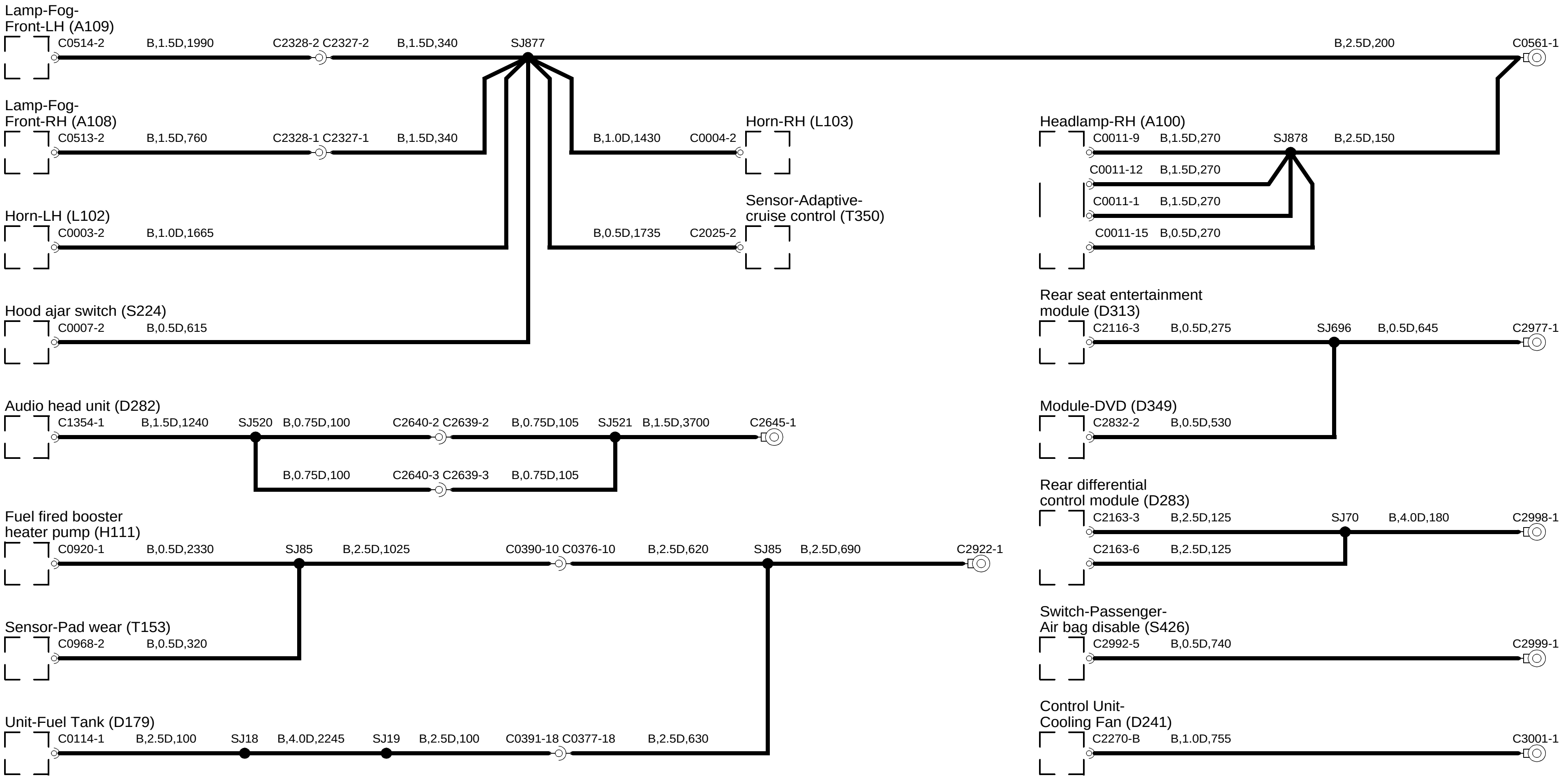

Engine control-module (ECM) (D131)
C0635L-1 B,1.5D,690
C0557L-1
C0635L-5 B,1.5D,690
C0635L-2 B,1.0D,690
C2650L-1
C0635L-3 B,1.0D,690
Headlamp-LH (A101)
C0009-1 B,1.5D,140
SJ879 B,2.5D,1105
C0564-1
C0009-12 B,1.5D,140
C0009-9 B,1.5D,140
C0009-15 B,0.5D,140
Lamp-Load space (B140)
C0119-1 B,0.75D,310
SJ5 B,4.0D,325
C1355-1
Stop lamp-RH (A140)
C0125-5 B,1.5D,745
Windshield RH heater element (H113)
C0246L-1 B,4.0D,1615
C1964L-1
Fold back module (D197)
C0907L-5 B,1.0D,770
C1967L-1
Washer jet-Heated (H121)
C0934-2 B,0.75D,2240
SJ171 B,2.5D,2345
C2601-1
Pump-Power wash (M156)
C0828-2 B,2.5D,2075
Sounder-Alarm-Battery-backed up (D154)
B,0.5D,570 C0666L-1
Washer jet-Heated (H121)
C0946-2 B,0.75D,1940
AFS ECU (D276)
B,0.5D,1875 C2193L-24
RH headphone unit (D335)
C2357-4 B,0.5D,450
SJ200 B,1.5D,915
C0804-9 C0436-9 B,1.5D,250
SJ740 B,2.5D,195
C0809-1
B,1.5D,915 C0804-21 C0436-21 B,1.5D,250
Lamp-Puddle-Rear-RH (B132)
C0980-1 B,0.75D,520
Motor-Central door-locking-Rear-RH (M166)
C0442-8 B,0.5D,650
Switch-Window-Rear-RH (S140)
B,0.5D,450 C0732-5
Lamp-Puddle-Front-RH (B130)
C1405-1 B,0.75D,500
SJ840 B,4.0D,740
C0439-2 C0463L-2 B,4.0D,750
C0810L-1
Motor-Central door-locking-Passenger (M237)
C0441-8 B,0.5D,1020
Motor-Window-Passenger (M243)
B,2.5D,610 C0741-4
C0441-1 B,0.5D,1020
Mirror-Door-Passenger side (M169)
B,0.75D,520 C0319-9
Switch-Window-Passenger door (S343)
C0087-5 B,0.5D,685
C0087-8 B,0.5D,685
Lamp-Side repeater-Front-LH (A121)
B,0.75D,640 C2677-1

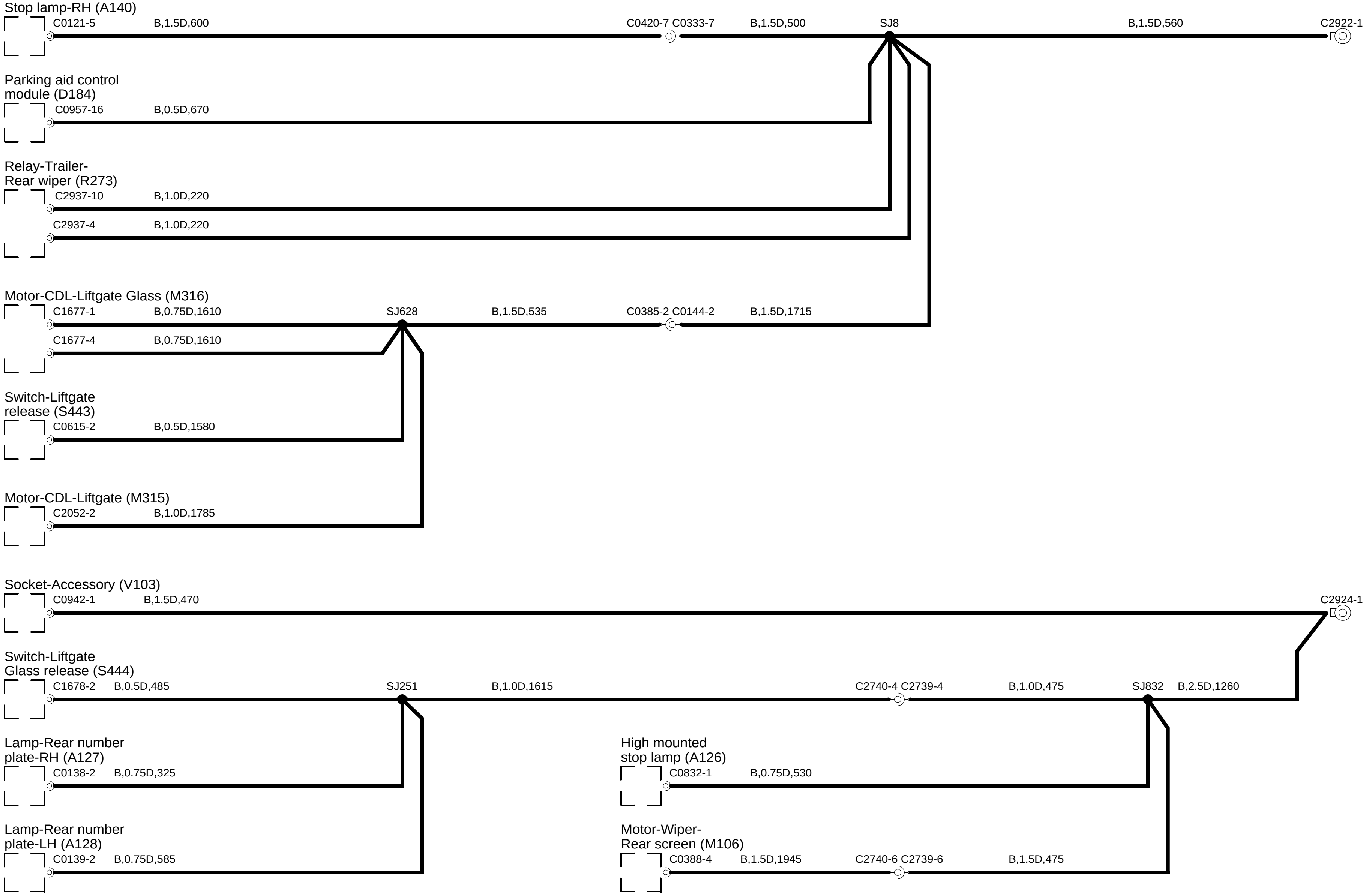

Lamp-Interior-Front (B100)
C0357-4
B,0.75D,975
SJ275
B,1.0D,1060
C0610-8 C0084L-8
B,0.75D,1285
C1398L-1
Lamp-Map-LH (B108)
C1111-3
B,0.75D,2200
B,0.5D,2130
C0358-1
Sensor-Volumetric (T139)
Central Junction Box (P101)
C0585L-25
B,2.5D,1100
Lamp-Map-RH (B107)
C1112-3
B,0.75D,1125
B,0.5D,930
C1975-1
Lamp-Interior-Front (B100)
Windshield LH heater element (H114)
C0247-1
B,4.0D,1505
C1536-1
Mirror-Vanity-RH (B153)
C0736-3
B,0.75D,500
B,0.75D,830
C0355-3
Lamp-Interior-Front (B100)
Switch-Buckle-Passenger (S395)
C2368-10
B,0.5D,2385
C1947-1
Mirror-Vanity-LH (B152)
C0737-3
B,0.75D,1485
Switch-Buckle-Driver (S394)
C2378-10
B,0.5D,2385
Pump-Supercharge-coolant (M314)
C3006-2
B,2.5D,3500
C2412L-1 C2411L-1
B,2.5D,840
C1964L-1
Sensor-Driver-seat track (T360)
NB,0.5,600
C2378-19
C2561-1
RH rear seat heater module (D339)
C2084-1
B,1.5D,100
C2149B-4 C2043-4
B,2.5D,1130
C1968-1
Sensor-Occupancy-detector (T221)
C0962-D
B,0.5D,465
C2363-1 C2368-17
B,0.5D,2385
C2562-1
Memory control module (D119)
C2382-17
B,0.5D,550
C0751-12 C0253L-12
B,0.5D,1370
C1971L-1
Restraints control module (D171)
C1649-18
B,0.5D,340
(NON NAS)
(NAS)
Memory control module (D119)
C2385-2
B,2.5D,320
SJ2
B,2.5D,270
C0751-1 C0253L-1
B,2.5D,1370
B,0.5D,2385
C1972L-1
Restraints control module (D171)
C3224L-18
B,0.5D,340
Switch-Lumbar-Driver (S389)
C0976-3
B,1.0D,940
C0976-6
B,1.0D,940


Motor-Central door-locking-Driver (M236)
C0441-1
B,0.5D,1020
C0441-8
B,0.5D,1020
SJ840
B,2.5D,740
C0439-51
C0459L-51
B,2.5D,2900
C1970L-1
Motor-Window-Driver (M242)
C0740-4
B,2.5D,610
Mirror-Door-Driver side (M168)
B,0.75D,520
C0319-5
Lamp-Approach-Driver (A162)
C0319-9
B,0.75D,520
Switch-Mirror (S156)
B,1.0D,660
C0066-4
Lamp-Puddle-Front-LH (B131)
C1405-1
B,0.75D,500
Lamp-Side repeater-Front-LH (A121)
B,0.75D,640
C2677-1
SJ210
B,4.0D,745
C0439-3
C0459L-3
B,4.0D,2900
Switch-Window-Driver door (S344)
B,2.5D,370
C0081-4
B,0.5D,370
C0081-3
B,2.5D,395
C0343-5
Module-Trailer-Electric Brake (D295)
C2590-3
B,1.5D,2195
C2564L-1
Central Junction Box (P101)
C0585L-18
B,2.5D,885
Parking Brake Module (D278)
C2178-G2
B,1.5D,1025
C0390-1
C0376-1
B,1.5D,90
SJ405
B,4.0D,950
C2570-1
C2178-H2
B,1.5D,1025
C0390-2
C0376-2
B,1.5D,90
Socket-Accessory (V103)
C1692-1
B,1.5D,600
C0903-13
C0868-13
B,1.5D,1585
C2565L-1
Mirror-interior (B146)
C0698-2
B,0.5D,2900
SJ53
B,4.0D,430
C2597L-1
LH rear seat heater module (D338)
C2084-1
B,1.5D,420
C2149A-4
C2042-4
B,2.5D,1130
C2566-1
Roof opening panel control module (D117)
C0784-10
B,1.5D,2775
Filter (Y221)
C0382-1
B,4.0D,1105
C2960-2
C2959-2
B,4.0D,1780
C2568-1
Heater-Seat-squab-LH (H116)
C2950-1
B,0.5D,405
C2378-1
B,1.5D,930

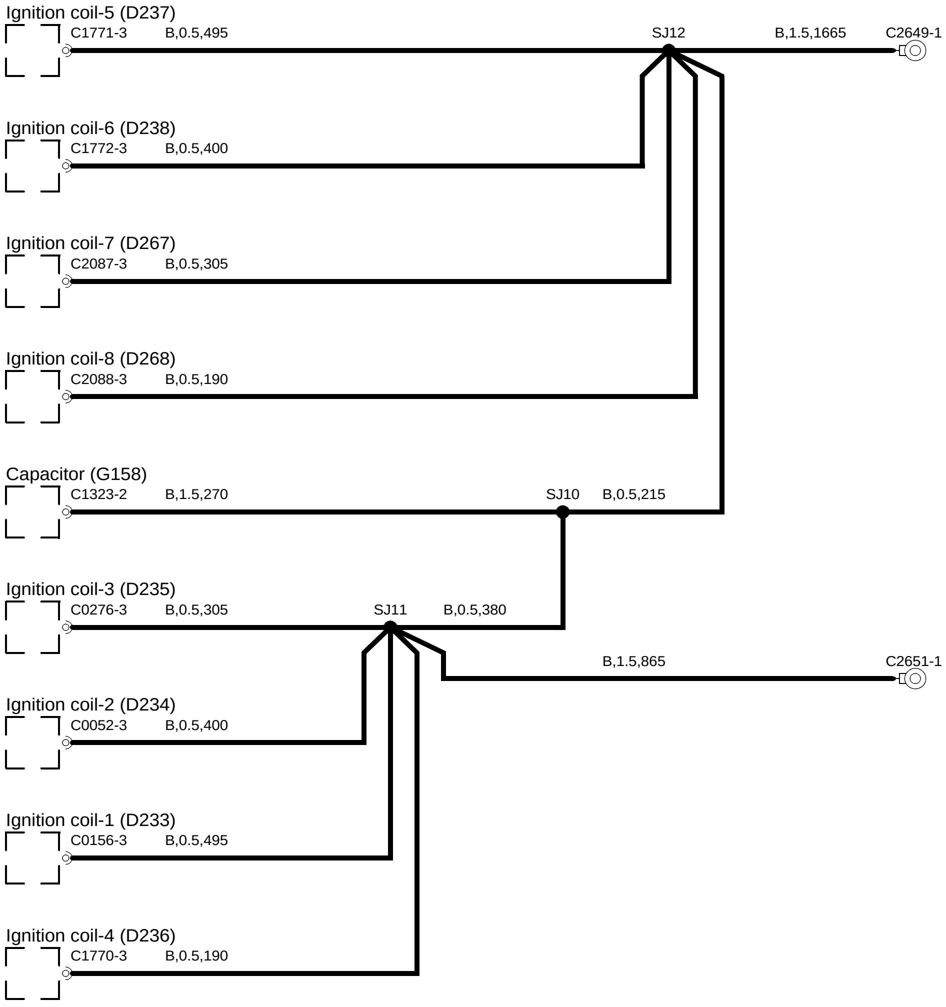

Switch pack-Centre-console (S350)
C0700-18
B,0.5D,385
SJ301
B,2.5D,225
C0903-24 C0868-24
B,2.5D,1635
C2598-1
Cool box (D345)
C2773-2
B,0.75D,260
Switch-Electric-park brake (S385)
C2180-6
B,0.5D,490
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,600
C2656-6
Cigar lighter-Front (J112)
C0089-1
B,1.5D,480
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,530
C2657-3
Switch-Seat heat-Rear-RH (S369)
C1403-1
B,0.75D,385
Selector mechanism (D308)
B,0.5D,430
C2658-1
Switch-Seat heat-Rear-LH (S368)
C1401-1
B,0.75D,305
AV input panel (D346)
B,0.5D,305
C2831-5
Sensor-Rain-Ambient light (T328)
C0961-3
B,0.5D,2470
C2599-1
Engine control-module (ECM) (D131)
C0872L-M3
B,0.75D,415
SJ476
B,2.5D,535
C2600L-1
C0872L-M1
B,0.75D,415
C0872L-M2
B,0.75D,415
C0872L-M4
B,0.75D,415
Dynamic response module (D285)
C2188L-2
B,2.5D,865
C2602L-1
ABS module (D277)
C0506L-4
B,2.5D,2325
C2603L-1
C0506L-1
B,4.0D,2325
Control unit-Blower-motor-Front (D258)
C2281-4
R,4.0,490
C2997-1 C2996L-1
B,4.0D,820
C2606L-1
Audio head unit (D282)
C2115-12
B,0.5D,2040
C2626-1
Audio head unit (D282)
C2115-12
B,0.5D,2040
Instrument cluster (J100)
C0230-32
B,0.5D,615
SJ661
B,2.5D,635
C2628-1
C0230-31
B,0.5D,615
Diagnostic socket (V100)
C0040-5
B,0.5D,405
Automatic Temperature Control Module (D243)
C2655-3
B,1.0D,1755
C2629-1
Lamp-Glove box (B109)
C0227-1
B,0.5D,500
SJ662
B,2.5D,945
C2630-1
Switch pack-Centre facia (S425)
C2387-15
B,0.5D,865
Lamp-Footwell-Front-RH (B135)
C0076-1
B,0.75D,960


Diagnostic socket (V100)
C0040-4
B,0.5D,405
C2627-1
Lighting control switch (S100)
C0041-10
B,1.0D,505
SJ660
B,2.5D,685
Lamp-Footwell-Front-LH (B136)
C0077-1
B,0.75D,540
B,1.0D,415
SJ663
B,0.5D,315
C1396-10
Unit-Steering column (D288)
B,0.5D,315
C1396-2
Sensor-Steering-angle (T274)
C0862-8
B,0.5D,265
Switch-Steering column-Lighting (S175)
B,0.35D,335
C1393-1
Passive coil (D156)
C2524-4
B,0.75D,435
Clock spring (S227)
B,0.35D,345
C0082-6
C1254-3
B,0.35,155
C2636-1
Module-Steering-wheel-LH (D256)
C2283-5
S,0.35,300
C2147-6
Module-Steering-wheel-RH (D257)
C2147-5
B,0.35,269
Touch screen display (D326)
C2819-2
B,0.5D,130
SJ590
B,0.5D,1520
C2247-2 C2249-2
B,0.5D,1140
SJ134
B,2.5D,155
C2646-1
C2819-3
B,0.5D,130
TV tuner module (D328)
C2117-2
B,0.5D,1370
Navigation system module (D325)
C2114-19
B,0.5D,160
SJ695
B,0.5D,1440
C2114-3
B,0.5D,160
Air bag-Passenger (U102)
C2637-1
B,0.5D,1125
C2633-1
Pump-Brake-boost (M296)
C2709-2
B,1.5D,660
C2635-1
Fuel fired booster heater (H115)
C0926-2
B,1.0D,930
C2652-1
Telephone control module (D262)
C2777-33
B,0.75D,255
SJ694
B,0.75D,695
C2647-1
C2777-34
B,0.75D,255
Air bag-Driver (U106)
Trailer pick-up (P124)
C0499-3
W,2.5D,1050
C1414-1 C1390-1
W,2.5D,915
C2692-1
Module-Fuel-pump driver (D361)
C2369-6
B,4.0D,930
C2920-1
SJ2369
SCR,2.5D,910
SJ2000
B,0.75D,940
Amplifier-Power-ICE (F142)
C2414-2
B,2.5D,1210
C2925-1

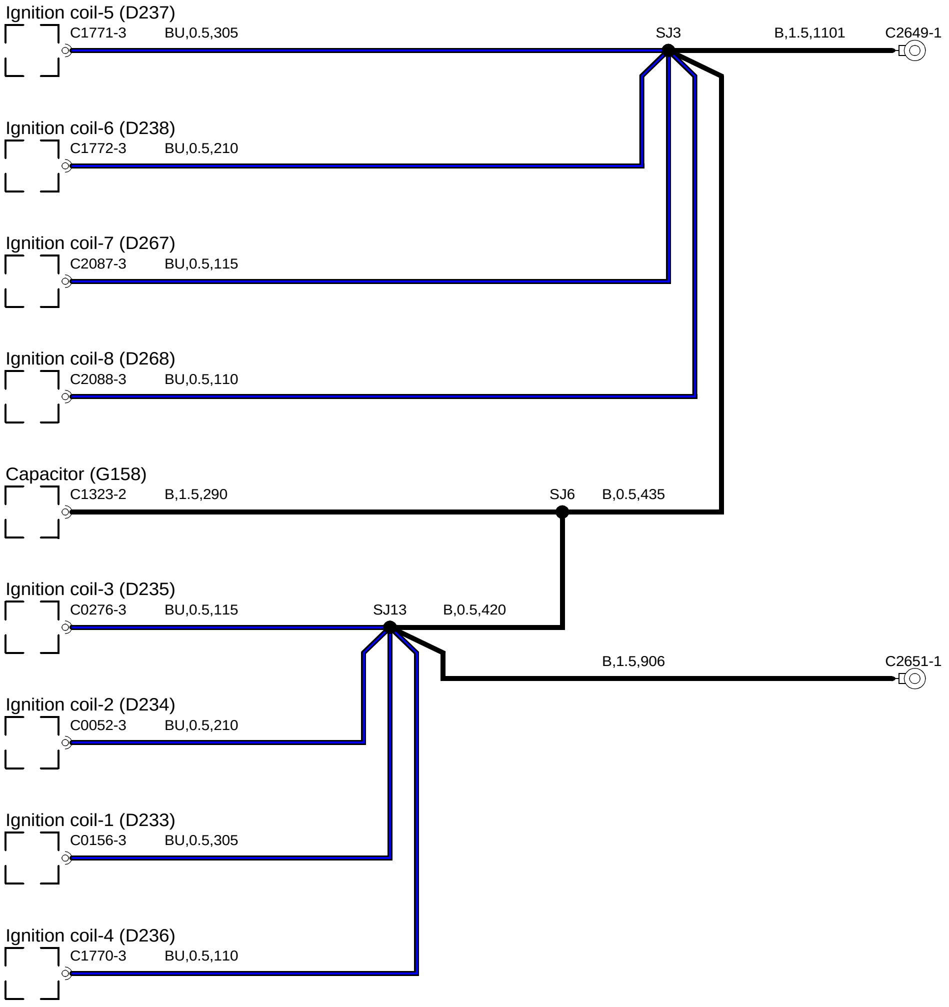

Lamp-Fog-Front-LH (A109)
C0514-2
B,1.5D,1990
C2328-2 C2327-2
B,1.5D,340
SJ877
B,2.5D,200
C0561-1
Lamp-Fog-Front-RH (A108)
C0513-2
B,1.5D,760
C2328-1 C2327-1
B,1.5D,340
B,1.0D,1430
C0004-2
Horn-RH (L103)
Headlamp-RH (A100)
C0011-9
B,1.5D,270
SJ878
B,2.5D,150
C0011-12
B,1.5D,270
C0011-1
B,1.5D,270
C0011-15
B,0.5D,270
Horn-LH (L102)
C0003-2
B,1.0D,1665
B,0.5D,1735
C2025-2
Sensor-Adaptive-cruise control (T350)
Hood ajar switch (S224)
C0007-2
B,0.5D,615
Rear seat entertainment module (D313)
C2116-3
B,0.5D,275
SJ696
B,0.5D,645
C2977-1
Audio head unit (D282)
C1354-1
B,1.5D,1240
SJ520
B,0.75D,100
C2640-2 C2639-2
B,0.75D,105
SJ521
B,1.5D,3700
C2645-1
B,0.75D,100
C2640-3 C2639-3
B,0.75D,105
Module-DVD (D349)
C2832-2
B,0.5D,530
Rear differential control module (D283)
C2163-3
B,2.5D,125
SJ70
B,4.0D,180
C2998-1
C2163-6
B,2.5D,125
Fuel fired booster heater pump (H111)
C0920-1
B,0.5D,2330
SJ85
B,2.5D,1025
C0390-10 C0376-10
B,2.5D,620
SJ85
B,2.5D,690
C2922-1
Sensor-Pad wear (T153)
C0968-2
B,0.5D,320
Switch-Passenger-Air bag disable (S426)
C2992-5
B,0.5D,740
C2999-1
Unit-Fuel Tank (D179)
C0114-1
B,2.5D,100
SJ18
B,4.0D,2245
SJ19
B,2.5D,100
C0391-18 C0377-18
B,2.5D,630
Control Unit-Cooling Fan (D241)
C2270-B
B,1.0D,755
C3001-1

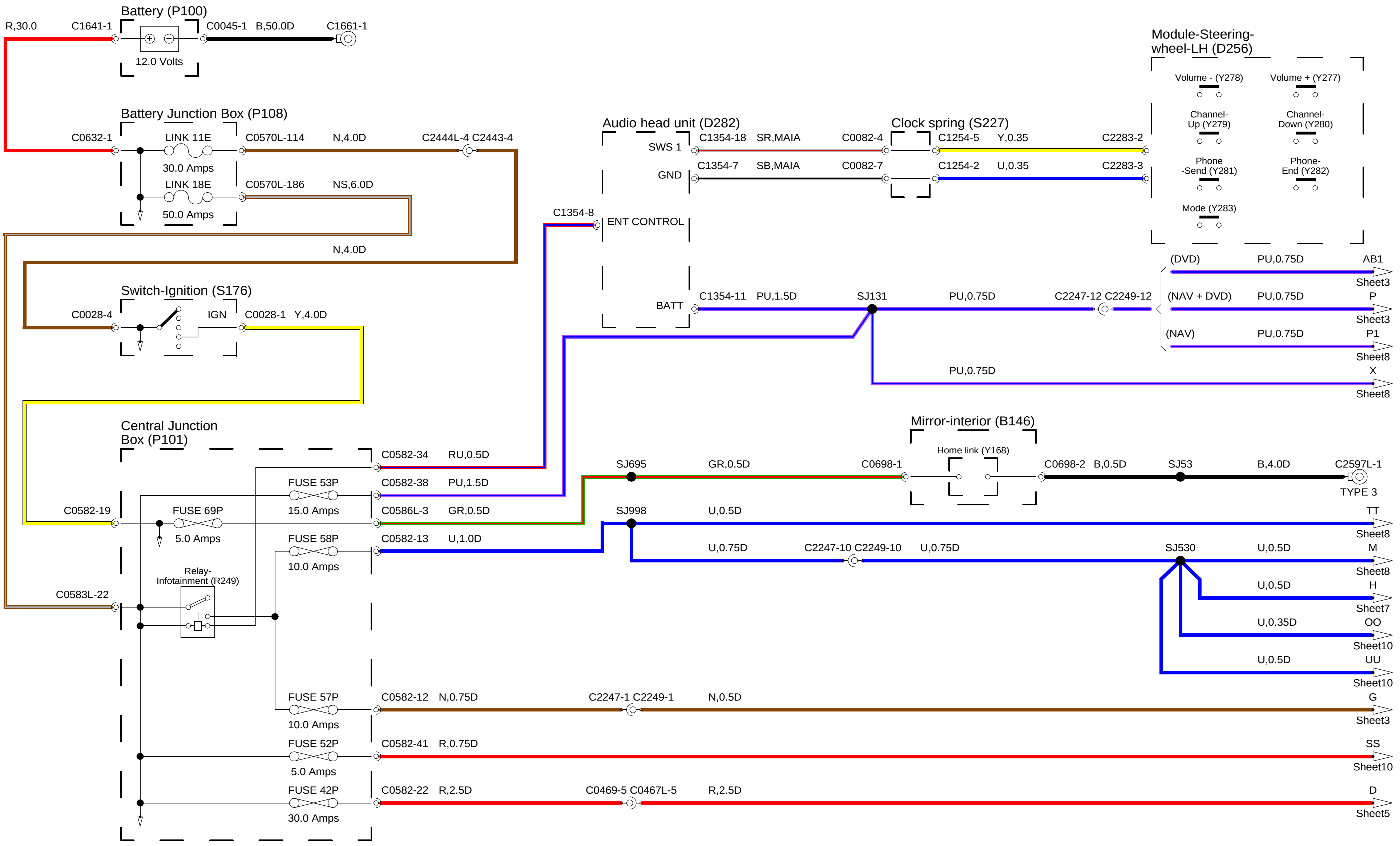

Stop lamp-RH (A140)
C0121-5
B,1.5D,600
C0420-7 C0333-7
B,1.5D,500
SJ8
B,1.5D,560
C2922-1
Parking aid control module (D184)
C0957-16
B,0.5D,670
Relay-Trailer-Rear wiper (R273)
C2937-10
B,1.0D,220
C2937-4
B,1.0D,220
Motor-CDL-Liftgate Glass (M316)
C1677-1
B,0.75D,1610
SJ628
B,1.5D,535
C0385-2 C0144-2
B,1.5D,1715
C1677-4
B,0.75D,1610
Switch-Liftgate release (S443)
C0615-2
B,0.5D,1580
Motor-CDL-Liftgate (M315)
C2052-2
B,1.0D,1785
Socket-Accessory (V103)
C0942-1
B,1.5D,470
C2924-1
Switch-Liftgate Glass release (S444)
C1678-2
B,0.5D,485
SJ251
B,1.0D,1615
C2740-4 C2739-4
B,1.0D,475
SJ832
B,2.5D,1260
Lamp-Rear number plate-RH (A127)
C0138-2
B,0.75D,325
High mounted stop lamp (A126)
C0832-1
B,0.75D,530
Lamp-Rear number plate-LH (A128)
C0139-2
B,0.75D,585
Motor-Wiper-Rear screen (M106)
C0388-4
B,1.5D,1945
C2740-6 C2739-6
B,1.5D,475

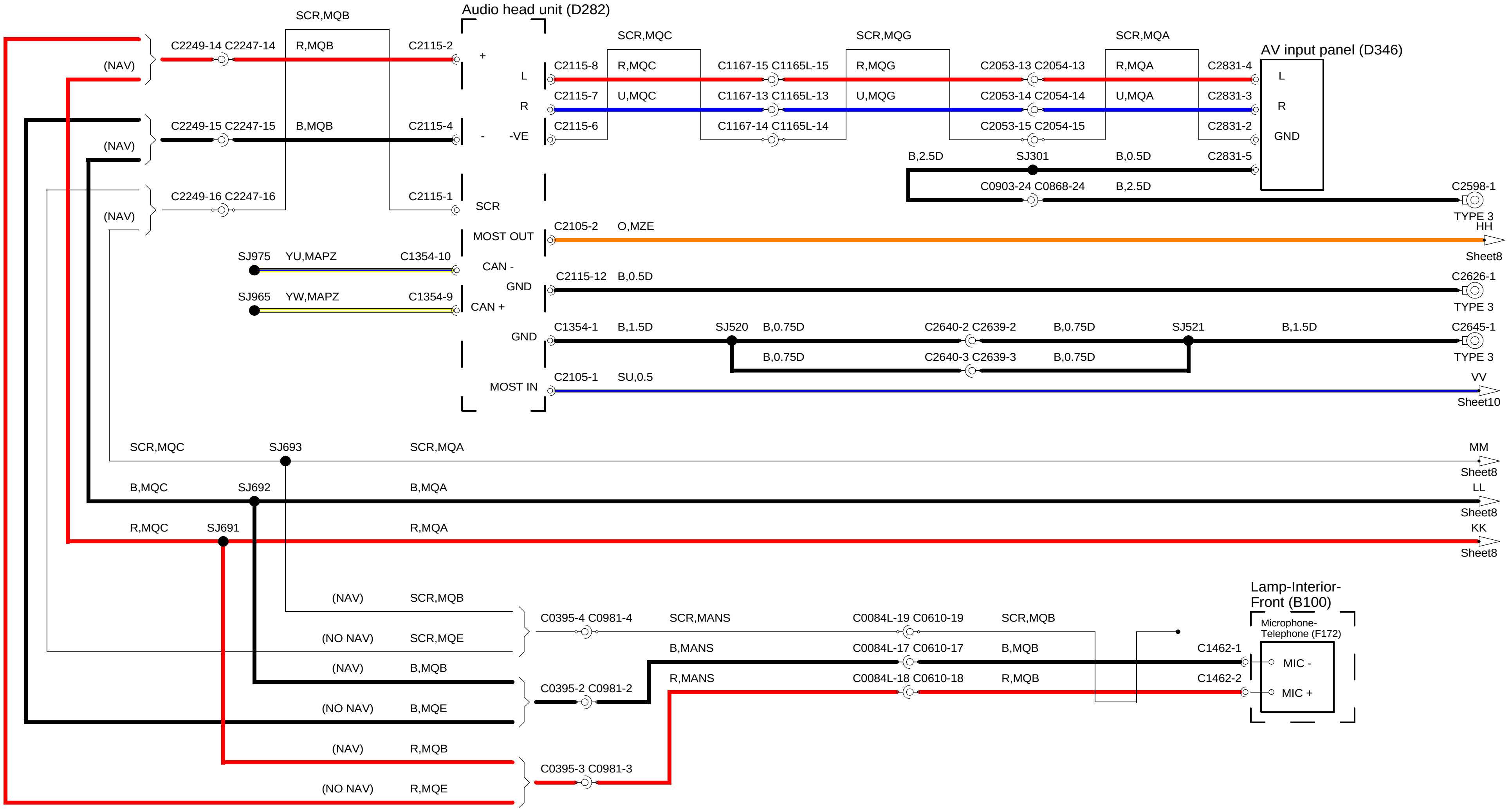
(PV8SC)

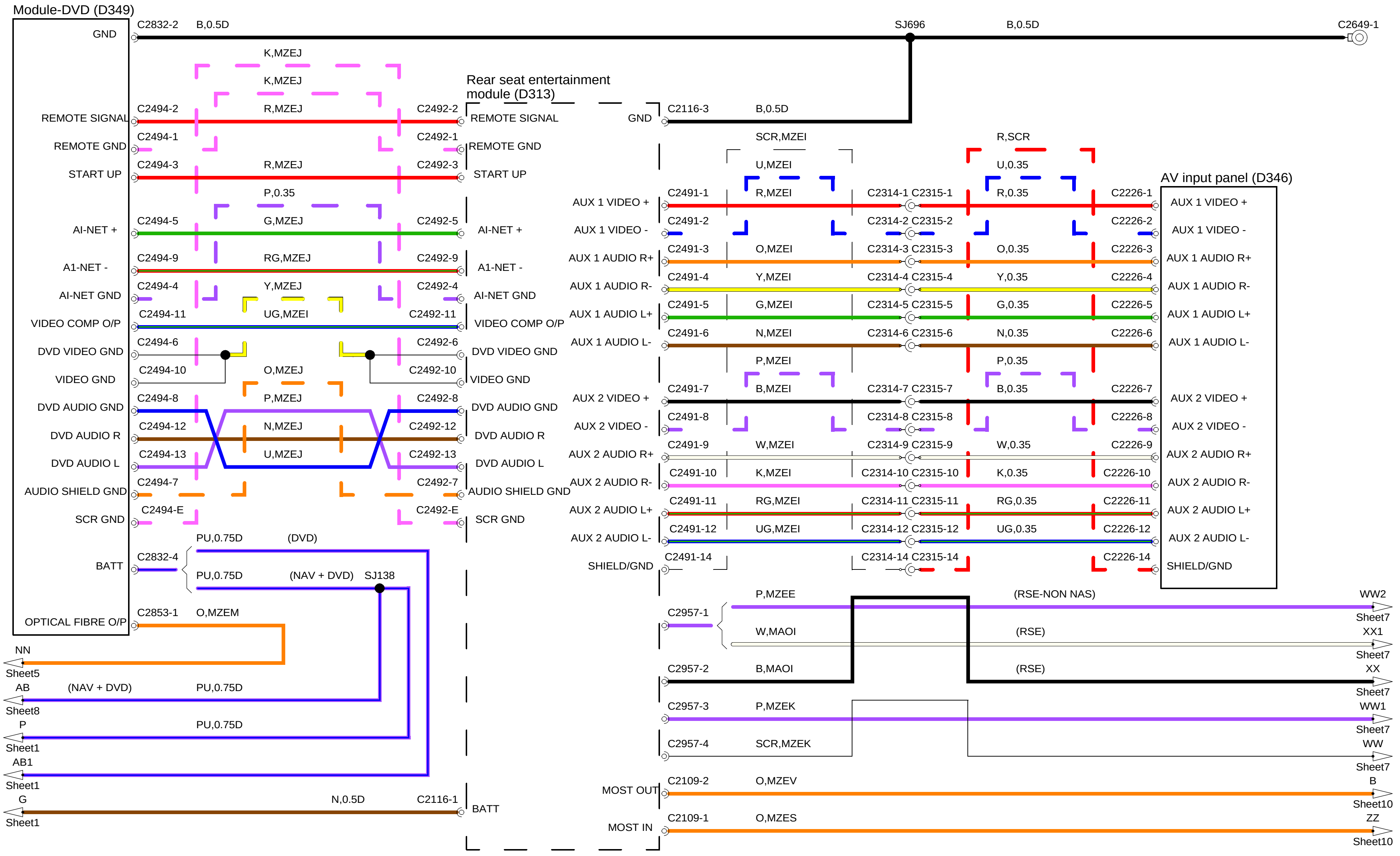

Ignition coil-5 (D237)
C1771-3
B,0.5,495
SJ12
B,1.5,1665
C2649-1
Ignition coil-6 (D238)
C1772-3
B,0.5,400
Ignition coil-7 (D267)
C2087-3
B,0.5,305
Ignition coil-8 (D268)
C2088-3
B,0.5,190
Capacitor (G158)
C1323-2
B,1.5,270
SJ10
B,0.5,215
Ignition coil-3 (D235)
C0276-3
B,0.5,305
SJ11
B,0.5,380
B,1.5,865
C2651-1
Ignition coil-2 (D234)
C0052-3
B,0.5,400
Ignition coil-1 (D233)
C0156-3
B,0.5,495
Ignition coil-4 (D236)
C1770-3
B,0.5,190

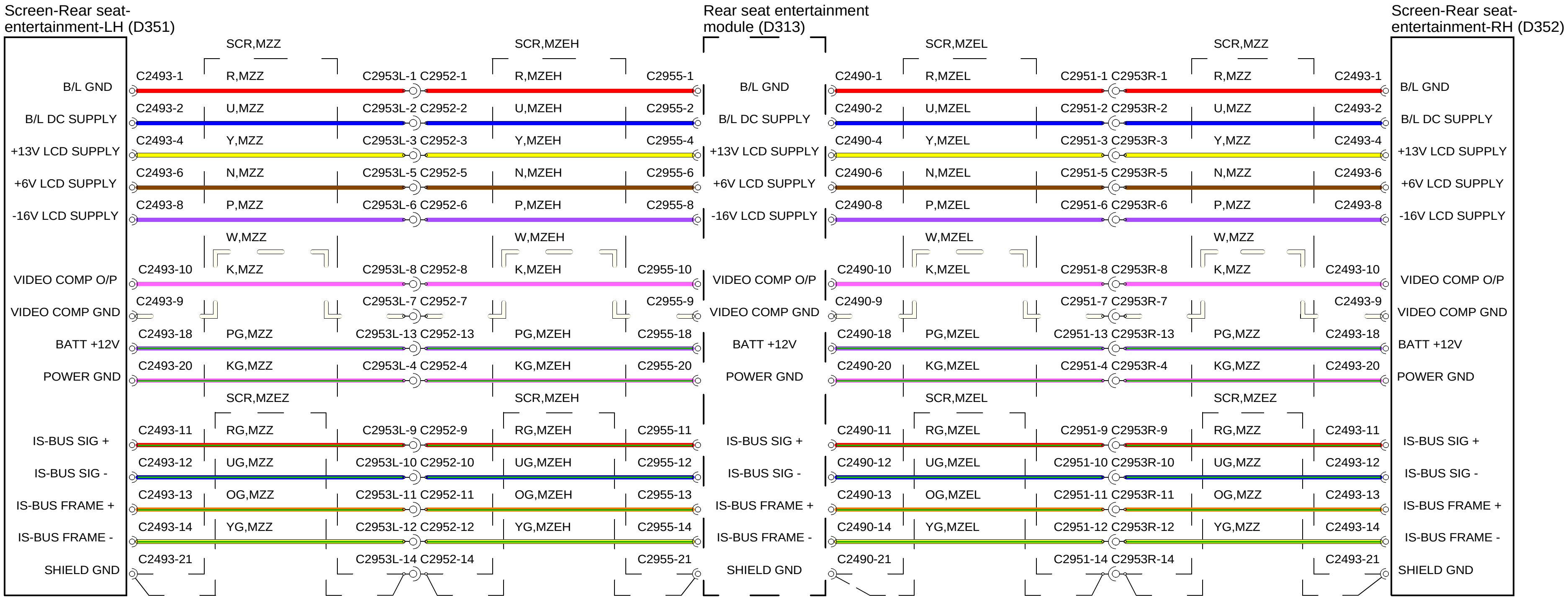
(PV8NA)

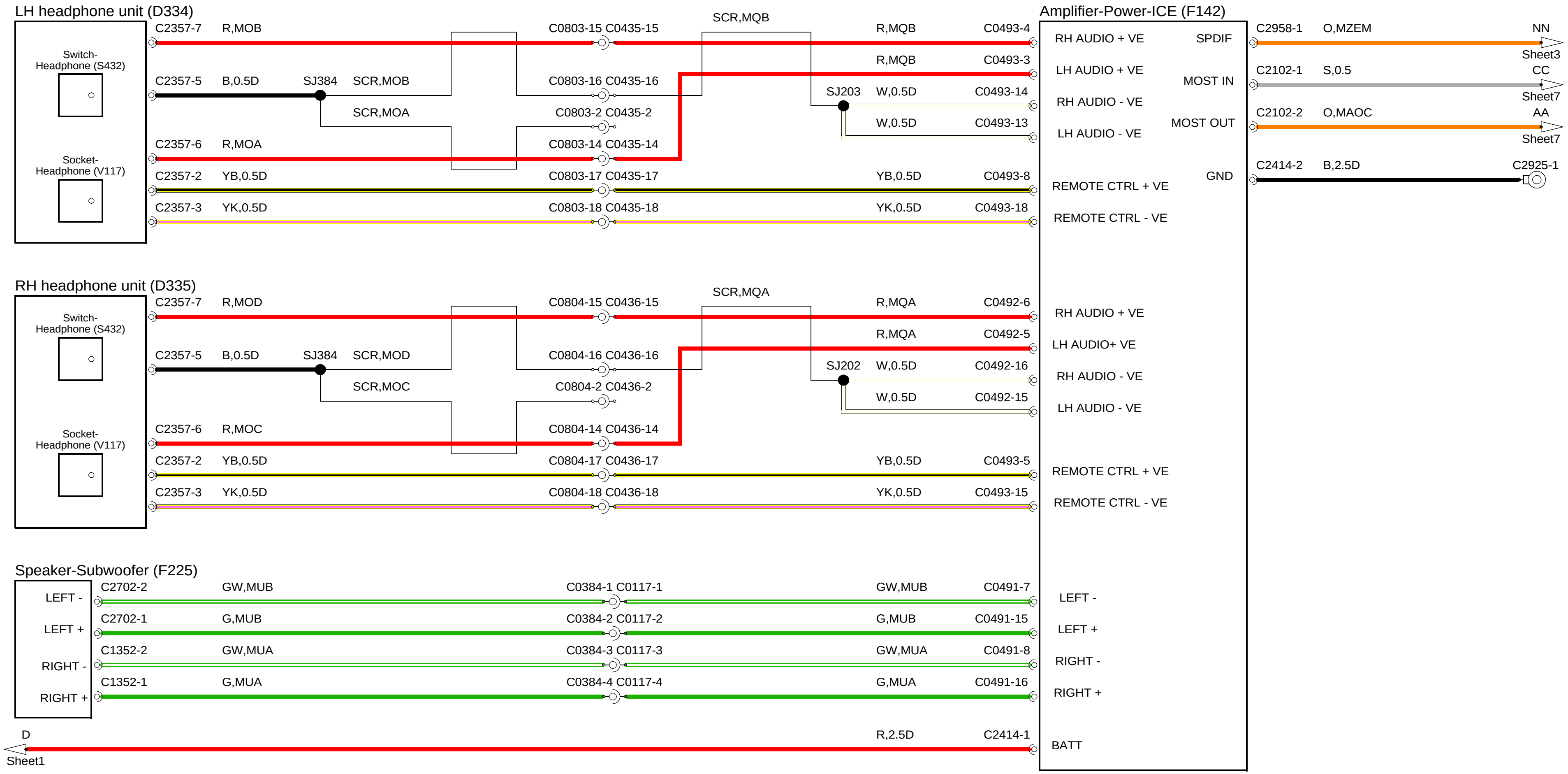

Ignition coil-5 (D237)
C1771-3
BU,0.5,305
SJ3
B,1.5,1101
C2649-1
Ignition coil-6 (D238)
C1772-3
BU,0.5,210
Ignition coil-7 (D267)
C2087-3
BU,0.5,115
Ignition coil-8 (D268)
C2088-3
BU,0.5,110
Capacitor (G158)
C1323-2
B,1.5,290
SJ6
B,0.5,435
Ignition coil-3 (D235)
C0276-3
BU,0.5,115
SJ13
B,0.5,420
B,1.5,906
C2651-1
Ignition coil-2 (D234)
C0052-3
BU,0.5,210
Ignition coil-1 (D233)
C0156-3
BU,0.5,305
Ignition coil-4 (D236)
C1770-3
BU,0.5,110

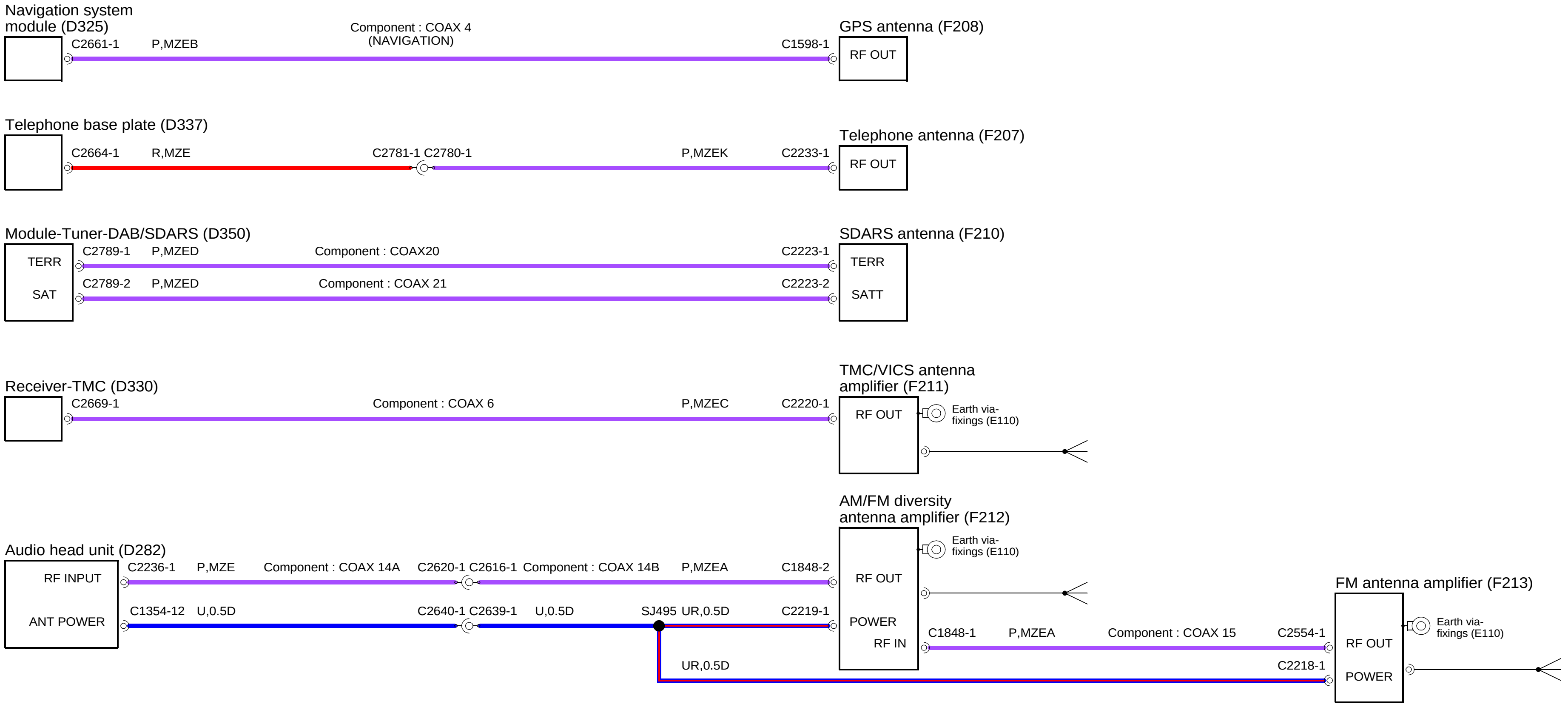

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 18E
50.0 Amps
C0570L-114
N,4.0D
C0570L-186
NS,6.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Audio head unit (D282)
SWS 1
GND
ENT CONTROL
BATT
C1354-18
SR,MAIA
C0082-4
C1354-7
SB,MAIA
C0082-7
C1354-8
C1354-11
PU,1.5D
SJ131
PU,0.75D
C2247-12 C2249-12
Clock spring (S227)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone -Send (Y281)
Phone-End (Y282)
Mode (Y283)
(DVD)
PU,0.75D
AB1
Sheet3
(NAV + DVD)
PU,0.75D
P
Sheet3
(NAV)
PU,0.75D
P1
Sheet8
PU,0.75D
X
Sheet8
Central Junction Box (P101)
C0582-34
RU,0.5D
FUSE 53P
15.0 Amps
C0582-38
PU,1.5D
C0582-19
FUSE 69P
5.0 Amps
C0586L-3
GR,0.5D
FUSE 58P
10.0 Amps
C0582-13
U,1.0D
Relay-Infotainment (R249)
C0583L-22
Mirror-interior (B146)
Home link (Y168)
SJ695
GR,0.5D
C0698-1
C0698-2
B,0.5D
SJ53
B,4.0D
C2597L-1
TYPE 3
SJ998
U,0.5D
TT
Sheet8
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet8
U,0.5D
H
Sheet7
U,0.35D
OO
Sheet10
U,0.5D
UU
Sheet10
FUSE 57P
10.0 Amps
C0582-12
N,0.75D
C2247-1 C2249-1
N,0.5D
G
Sheet3
FUSE 52P
5.0 Amps
C0582-41
R,0.75D
SS
Sheet10
FUSE 42P
30.0 Amps
C0582-22
R,2.5D
C0469-5 C0467L-5
R,2.5D
D
Sheet5

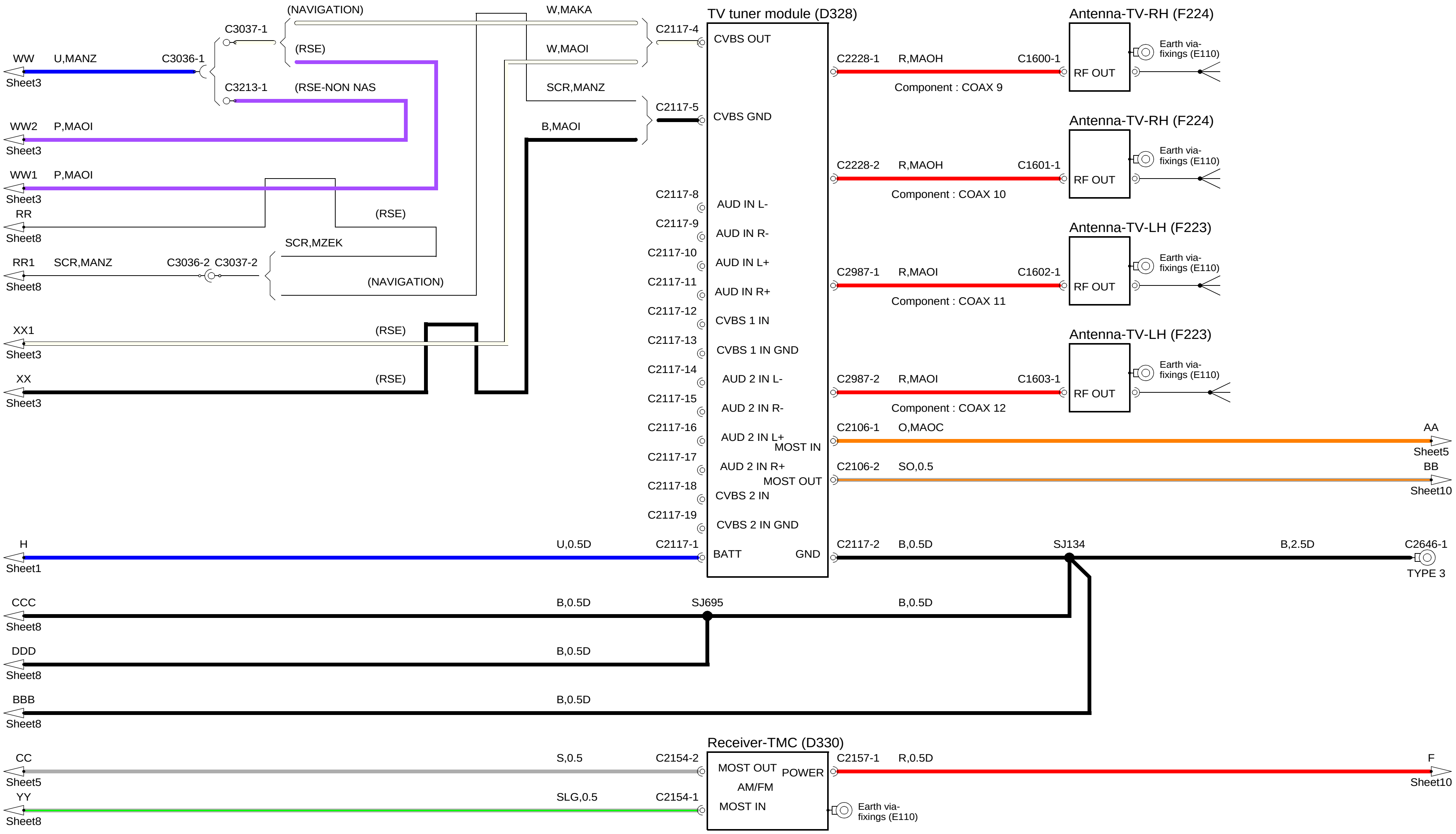

Audio head unit (D282)
SCR,MQB
C2249-14 C2247-14
R,MQB
C2115-2
(NAV)
+
L
R
-VE
-
C2249-15 C2247-15
B,MQB
C2115-4
(NAV)
C2249-16 C2247-16
C2115-1
(NAV)
SCR
SCR,MQC
C2115-8
R,MQC
C2115-7
U,MQC
C2115-6
SCR,MQG
C1167-15 C1165L-15
R,MQG
C1167-13 C1165L-13
U,MQG
C1167-14 C1165L-14
SCR,MQA
C2053-13 C2054-13
R,MQA
C2053-14 C2054-14
U,MQA
C2053-15 C2054-15
C2831-4
C2831-3
C2831-2
C2831-5
AV input panel (D346)
L
R
GND
B,2.5D
SJ301
B,0.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
MOST OUT
C2105-2
O,MZE
HH
Sheet8
SJ975
YU,MAPZ
C1354-10
CAN -
GND
C2115-12
B,0.5D
C2626-1
TYPE 3
SJ965
YW,MAPZ
C1354-9
CAN +
GND
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
TYPE 3
B,0.75D
C2640-3 C2639-3
B,0.75D
MOST IN
C2105-1
SU,0.5
VV
Sheet10
SCR,MQC
SJ693
SCR,MQA
MM
Sheet8
B,MQC
SJ692
B,MQA
LL
Sheet8
R,MQC
SJ691
R,MQA
KK
Sheet8
(NAV)
SCR,MQB
(NO NAV)
SCR,MQE
C0395-4 C0981-4
SCR,MANS
C0084L-19 C0610-19
SCR,MQB
Lamp-Interior-Front (B100)
Microphone-Telephone (F172)
(NAV)
B,MQB
B,MANS
C0084L-17 C0610-17
B,MQB
C1462-1
MIC -
C0395-2 C0981-2
R,MANS
C0084L-18 C0610-18
R,MQB
C1462-2
MIC +
(NO NAV)
B,MQE
(NAV)
R,MQB
C0395-3 C0981-3
(NO NAV)
R,MQE

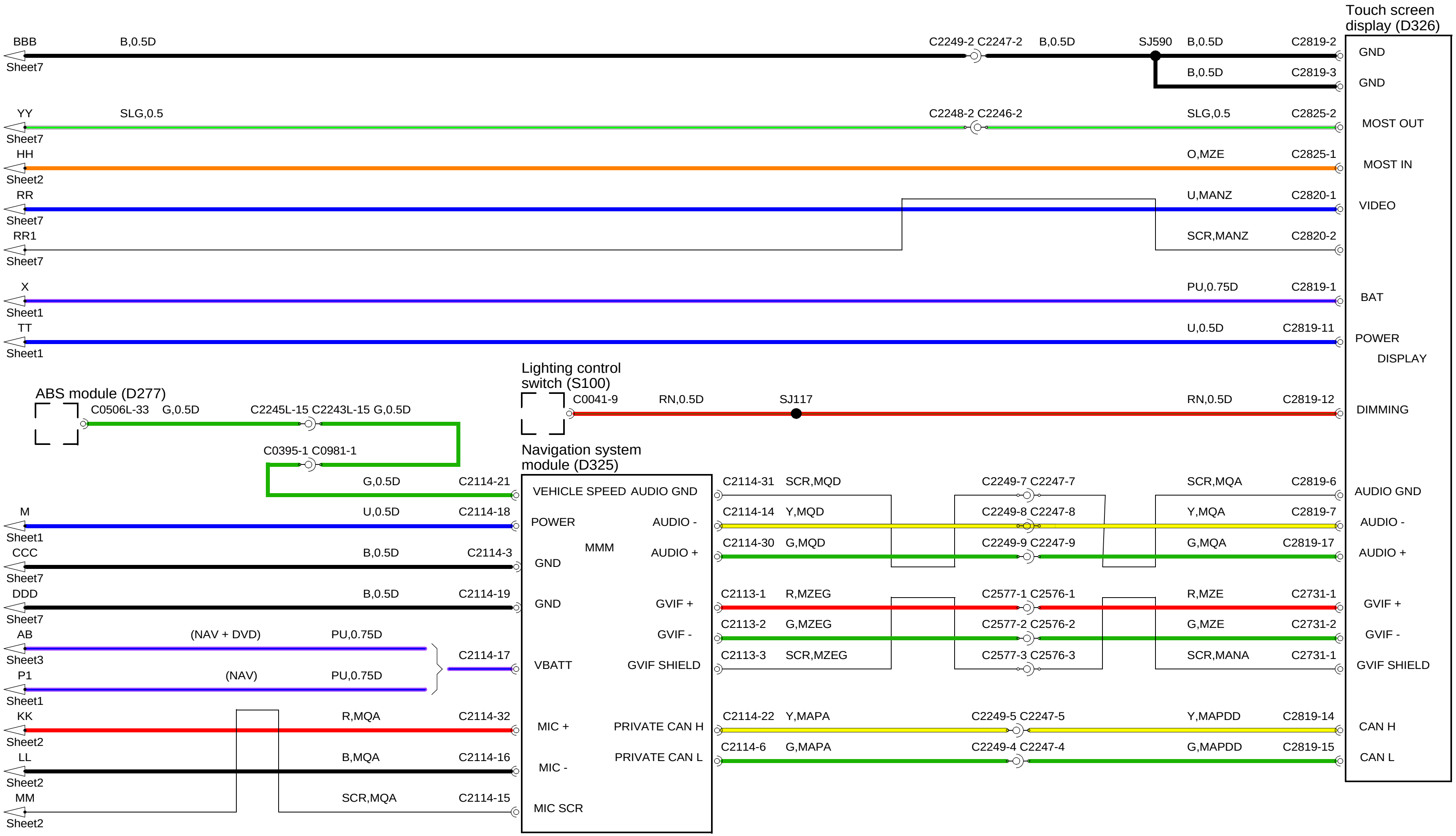

Module-DVD (D349)
GND
C2832-2
B,0.5D
SJ696
B,0.5D
C2649-1
K,MZEJ
K,MZEJ
Rear seat entertainment module (D313)
REMOTE SIGNAL
C2494-2
R,MZEJ
C2492-2
REMOTE SIGNAL
GND
C2116-3
B,0.5D
REMOTE GND
C2494-1
C2492-1
REMOTE GND
SCR,MZEI
R,SCR
START UP
C2494-3
R,MZEJ
C2492-3
START UP
U,MZEI
U,0.35
AV input panel (D346)
P,0.35
AUX 1 VIDEO +
C2491-1
R,MZEI
C2314-1 C2315-1
R,0.35
C2226-1
AUX 1 VIDEO +
AI-NET +
C2494-5
G,MZEJ
C2492-5
AI-NET +
AUX 1 VIDEO -
C2491-2
C2314-2 C2315-2
C2226-2
AUX 1 VIDEO -
A1-NET -
C2494-9
RG,MZEJ
C2492-9
A1-NET -
AUX 1 AUDIO R+
C2491-3
O,MZEI
C2314-3 C2315-3
O,0.35
C2226-3
AUX 1 AUDIO R+
AI-NET GND
C2494-4
Y,MZEJ
C2492-4
AI-NET GND
AUX 1 AUDIO R-
C2491-4
Y,MZEI
C2314-4 C2315-4
Y,0.35
C2226-4
AUX 1 AUDIO R-
VIDEO COMP O/P
C2494-11
UG,MZEI
C2492-11
VIDEO COMP O/P
AUX 1 AUDIO L+
C2491-5
G,MZEI
C2314-5 C2315-5
G,0.35
C2226-5
AUX 1 AUDIO L+
DVD VIDEO GND
C2494-6
C2492-6
DVD VIDEO GND
AUX 1 AUDIO L-
C2491-6
N,MZEI
C2314-6 C2315-6
N,0.35
C2226-6
AUX 1 AUDIO L-
VIDEO GND
C2494-10
O,MZEJ
C2492-10
VIDEO GND
P,MZEI
P,0.35
DVD AUDIO GND
C2494-8
P,MZEJ
C2492-8
DVD AUDIO GND
AUX 2 VIDEO +
C2491-7
B,MZEI
C2314-7 C2315-7
B,0.35
C2226-7
AUX 2 VIDEO +
DVD AUDIO R
C2494-12
N,MZEJ
C2492-12
DVD AUDIO R
AUX 2 VIDEO -
C2491-8
C2314-8 C2315-8
C2226-8
AUX 2 VIDEO -
DVD AUDIO L
C2494-13
U,MZEJ
C2492-13
DVD AUDIO L
AUX 2 AUDIO R+
C2491-9
W,MZEI
C2314-9 C2315-9
W,0.35
C2226-9
AUX 2 AUDIO R+
AUDIO SHIELD GND
C2494-7
C2492-7
AUDIO SHIELD GND
AUX 2 AUDIO R-
C2491-10
K,MZEI
C2314-10 C2315-10
K,0.35
C2226-10
AUX 2 AUDIO R-
SCR GND
C2494-E
C2492-E
SCR GND
AUX 2 AUDIO L+
C2491-11
RG,MZEI
C2314-11 C2315-11
RG,0.35
C2226-11
AUX 2 AUDIO L+
AUX 2 AUDIO L-
C2491-12
UG,MZEI
C2314-12 C2315-12
UG,0.35
C2226-12
AUX 2 AUDIO L-
PU,0.75D
(DVD)
BATT
C2832-4
SHIELD/GND
C2491-14
C2314-14 C2315-14
C2226-14
SHIELD/GND
PU,0.75D
(NAV + DVD)
SJ138
P,MZEE
(RSE-NON NAS)
WW2
Sheet7
C2957-1
OPTICAL FIBRE O/P
C2853-1
O,MZEM
W,MAOI
(RSE)
XX1
Sheet7
NN
Sheet5
C2957-2
B,MAOI
(RSE)
XX
AB
(NAV + DVD)
PU,0.75D
Sheet7
Sheet8
C2957-3
P,MZEK
WW1
P
PU,0.75D
Sheet7
Sheet1
C2957-4
SCR,MZEK
WW
AB1
Sheet7
Sheet1
MOST OUT
C2109-2
O,MZEV
B
G
N,0.5D
C2116-1
BATT
Sheet10
Sheet1
MOST IN
C2109-1
O,MZES
ZZ
Sheet10

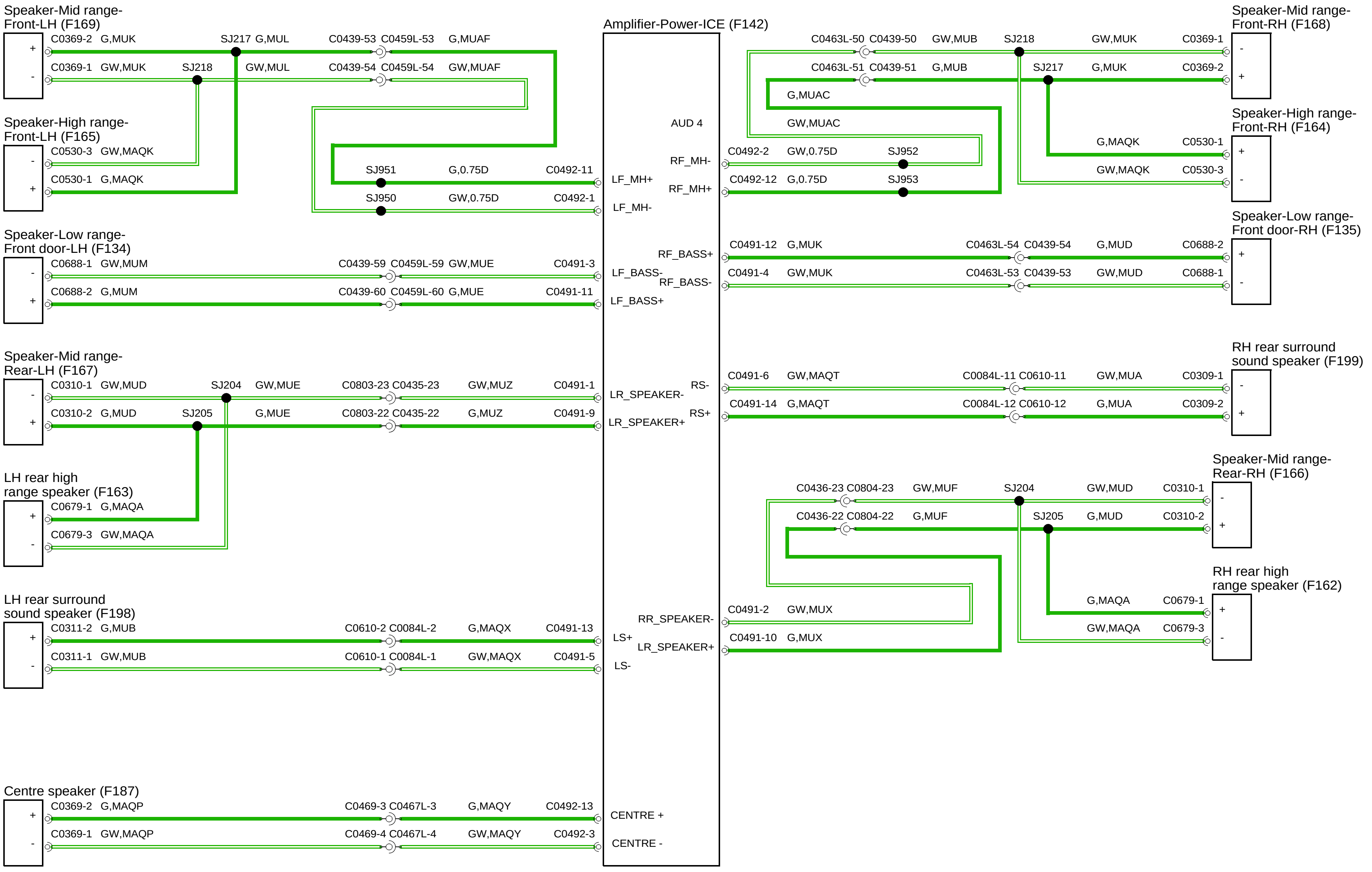

Screen-Rear seat-entertainment-LH (D351)
Rear seat entertainment module (D313)
Screen-Rear seat-entertainment-RH (D352)
SCR,MZZ
SCR,MZEH
SCR,MZEL
SCR,MZZ
B/L GND
C2493-1
R,MZZ
C2953L-1
C2952-1
R,MZEH
C2955-1
B/L GND
C2490-1
R,MZEL
C2951-1
C2953R-1
R,MZZ
C2493-1
B/L GND
B/L DC SUPPLY
C2493-2
U,MZZ
C2953L-2
C2952-2
U,MZEH
C2955-2
B/L DC SUPPLY
C2490-2
U,MZEL
C2951-2
C2953R-2
U,MZZ
C2493-2
B/L DC SUPPLY
+13V LCD SUPPLY
C2493-4
Y,MZZ
C2953L-3
C2952-3
Y,MZEH
C2955-4
+13V LCD SUPPLY
C2490-4
Y,MZEL
C2951-3
C2953R-3
Y,MZZ
C2493-4
+13V LCD SUPPLY
+6V LCD SUPPLY
C2493-6
N,MZZ
C2953L-5
C2952-5
N,MZEH
C2955-6
+6V LCD SUPPLY
C2490-6
N,MZEL
C2951-5
C2953R-5
N,MZZ
C2493-6
+6V LCD SUPPLY
-16V LCD SUPPLY
C2493-8
P,MZZ
C2953L-6
C2952-6
P,MZEH
C2955-8
-16V LCD SUPPLY
C2490-8
P,MZEL
C2951-6
C2953R-6
P,MZZ
C2493-8
-16V LCD SUPPLY
W,MZZ
W,MZEH
W,MZEL
W,MZZ
VIDEO COMP O/P
C2493-10
K,MZZ
C2953L-8
C2952-8
K,MZEH
C2955-10
VIDEO COMP O/P
C2490-10
K,MZEL
C2951-8
C2953R-8
K,MZZ
C2493-10
VIDEO COMP O/P
VIDEO COMP GND
C2493-9
C2953L-7
C2952-7
C2955-9
VIDEO COMP GND
C2490-9
C2951-7
C2953R-7
C2493-9
VIDEO COMP GND
BATT +12V
C2493-18
PG,MZZ
C2953L-13
C2952-13
PG,MZEH
C2955-18
BATT +12V
C2490-18
PG,MZEL
C2951-13
C2953R-13
PG,MZZ
C2493-18
BATT +12V
POWER GND
C2493-20
KG,MZZ
C2953L-4
C2952-4
KG,MZEH
C2955-20
POWER GND
C2490-20
KG,MZEL
C2951-4
C2953R-4
KG,MZZ
C2493-20
POWER GND
SCR,MZEZ
SCR,MZEH
SCR,MZEL
SCR,MZEZ
IS-BUS SIG +
C2493-11
RG,MZZ
C2953L-9
C2952-9
RG,MZEH
C2955-11
IS-BUS SIG +
C2490-11
RG,MZEL
C2951-9
C2953R-9
RG,MZZ
C2493-11
IS-BUS SIG +
IS-BUS SIG -
C2493-12
UG,MZZ
C2953L-10
C2952-10
UG,MZEH
C2955-12
IS-BUS SIG -
C2490-12
UG,MZEL
C2951-10
C2953R-10
UG,MZZ
C2493-12
IS-BUS SIG -
IS-BUS FRAME +
C2493-13
OG,MZZ
C2953L-11
C2952-11
OG,MZEH
C2955-13
IS-BUS FRAME +
C2490-13
OG,MZEL
C2951-11
C2953R-11
OG,MZZ
C2493-13
IS-BUS FRAME +
IS-BUS FRAME -
C2493-14
YG,MZZ
C2953L-12
C2952-12
YG,MZEH
C2955-14
IS-BUS FRAME -
C2490-14
YG,MZEL
C2951-12
C2953R-12
YG,MZZ
C2493-14
IS-BUS FRAME -
SHIELD GND
C2493-21
C2953L-14
C2952-14
C2955-21
SHIELD GND
C2490-21
C2951-14
C2953R-14
C2493-21
SHIELD GND

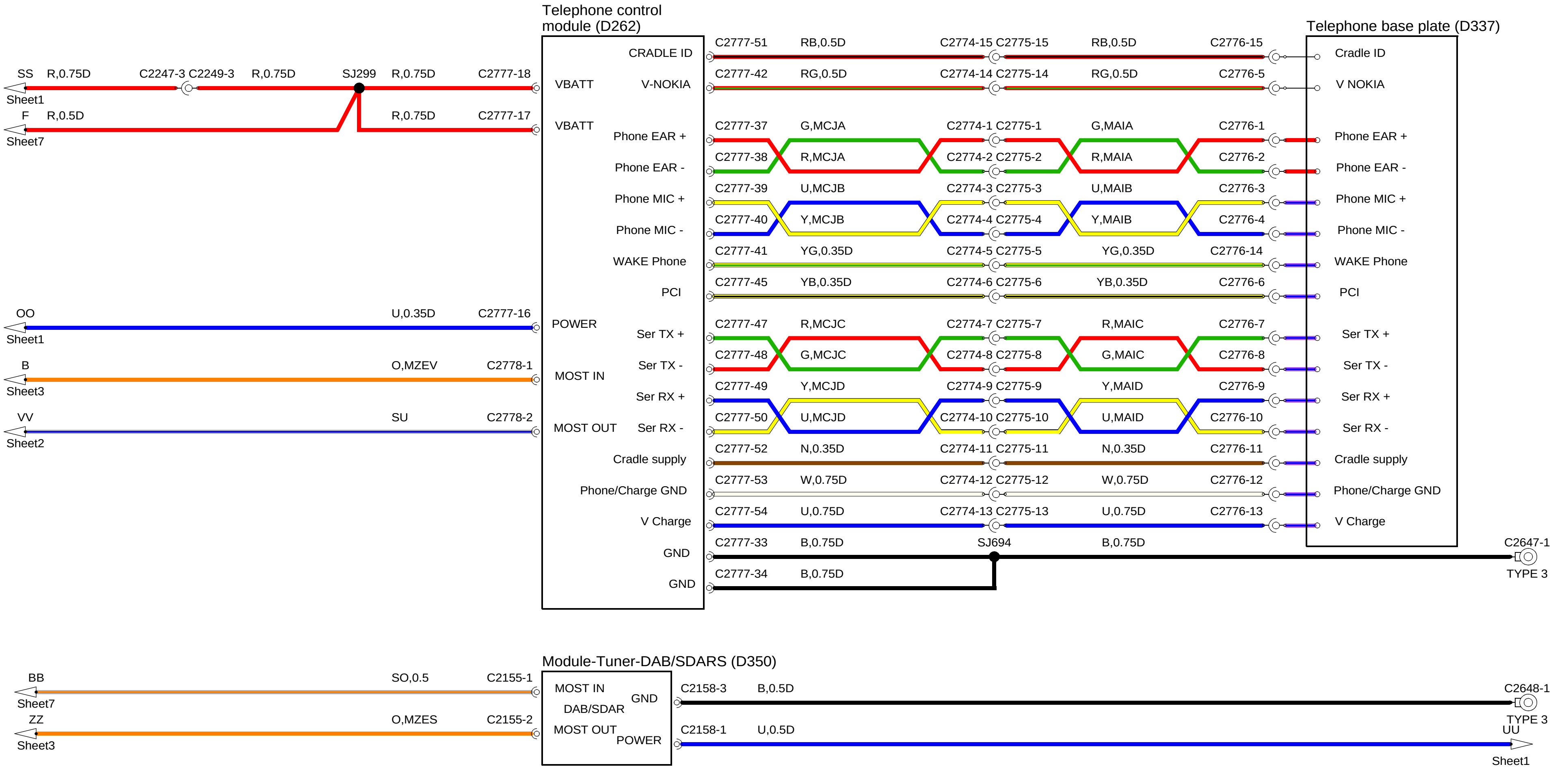

LH headphone unit (D334)
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOB
C0803-15 C0435-15
SCR,MQB
R,MQB C0493-4
R,MQB C0493-3
C2357-5 B,0.5D SJ384 SCR,MOB
C0803-16 C0435-16
SJ203 W,0.5D C0493-14
SCR,MOA
C0803-2 C0435-2
W,0.5D C0493-13
C2357-6 R,MOA
C0803-14 C0435-14
C2357-2 YB,0.5D
C0803-17 C0435-17
YB,0.5D C0493-8
C2357-3 YK,0.5D
C0803-18 C0435-18
YK,0.5D C0493-18
Amplifier-Power-ICE (F142)
RH AUDIO + VE
LH AUDIO + VE
RH AUDIO - VE
LH AUDIO - VE
REMOTE CTRL + VE
REMOTE CTRL - VE
SPDIF
MOST IN
MOST OUT
GND
C2958-1 O,MZEM
NN
Sheet3
C2102-1 S,0.5
CC
Sheet7
C2102-2 O,MAOC
AA
Sheet7
C2414-2 B,2.5D
C2925-1
RH headphone unit (D335)
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOD
C0804-15 C0436-15
SCR,MQA
R,MQA C0492-6
R,MQA C0492-5
C2357-5 B,0.5D SJ384 SCR,MOD
C0804-16 C0436-16
SJ202 W,0.5D C0492-16
SCR,MOC
C0804-2 C0436-2
W,0.5D C0492-15
C2357-6 R,MOC
C0804-14 C0436-14
C2357-2 YB,0.5D
C0804-17 C0436-17
YB,0.5D C0493-5
C2357-3 YK,0.5D
C0804-18 C0436-18
YK,0.5D C0493-15
RH AUDIO + VE
LH AUDIO+ VE
RH AUDIO - VE
LH AUDIO - VE
REMOTE CTRL + VE
REMOTE CTRL - VE
Speaker-Subwoofer (F225)
LEFT -
LEFT +
RIGHT -
RIGHT +
C2702-2 GW,MUB
C0384-1 C0117-1
GW,MUB C0491-7
C2702-1 G,MUB
C0384-2 C0117-2
G,MUB C0491-15
C1352-2 GW,MUA
C0384-3 C0117-3
GW,MUA C0491-8
C1352-1 G,MUA
C0384-4 C0117-4
G,MUA C0491-16
LEFT -
LEFT +
RIGHT -
RIGHT +
D
Sheet1
R,2.5D C2414-1
BATT

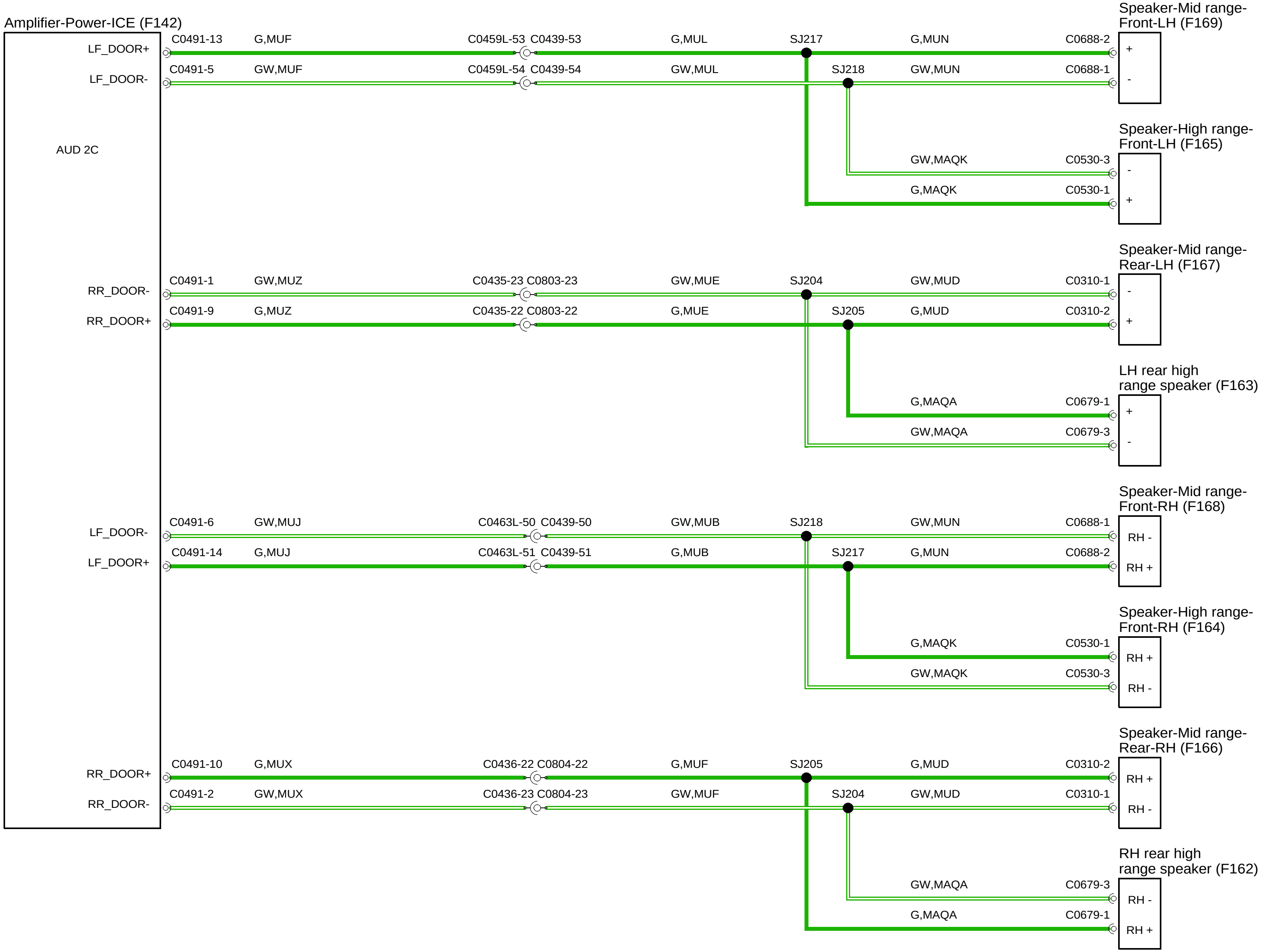

Navigation system module (D325)
C2661-1
P,MZEB
Component : COAX 4 (NAVIGATION)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Module-Tuner-DAB/SDARS (D350)
TERR
SAT
C2789-1
P,MZED
Component : COAX20
C2223-1
C2789-2
P,MZED
Component : COAX 21
C2223-2
SDARS antenna (F210)
TERR
SATT
Receiver-TMC (D330)
C2669-1
Component : COAX 6
P,MZEC
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via-fixings (E110)
AM/FM diversity antenna amplifier (F212)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
Component : COAX 14A
C2620-1 C2616-1
Component : COAX 14B
P,MZEA
C1848-2
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495
UR,0.5D
C2219-1
RF OUT
POWER
RF IN
Earth via-fixings (E110)
C1848-1
P,MZEA
Component : COAX 15
C2554-1
UR,0.5D
C2218-1
FM antenna amplifier (F213)
RF OUT
POWER
Earth via-fixings (E110)

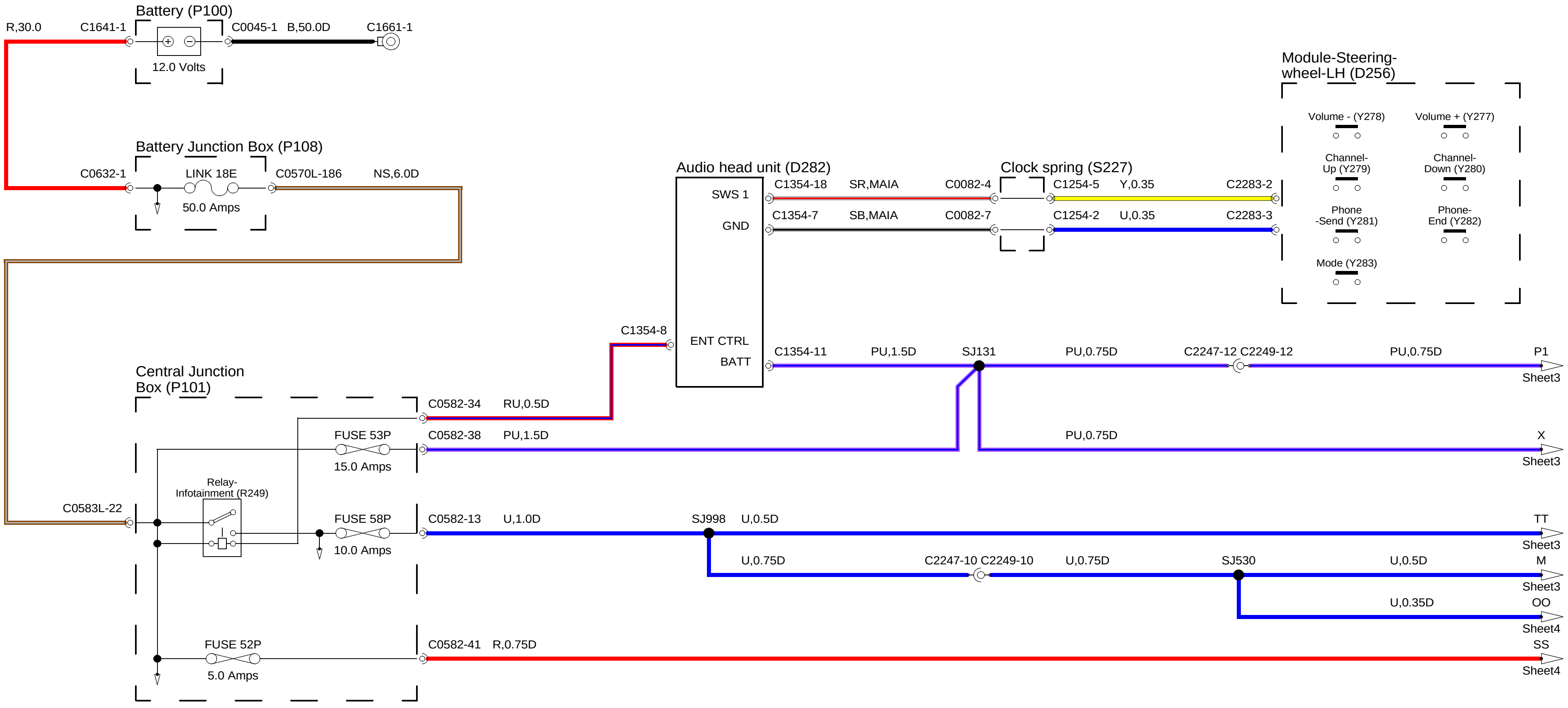

(NAVIGATION)
W,MAKA
C3037-1
C2117-4
TV tuner module (D328)
Antenna-TV-RH (F224)
CVBS OUT
(RSE)
W,MAOI
Earth via-
fixings (E110)
WW
U,MANZ
C3036-1
C2228-1
R,MAOH
C1600-1
Sheet3
RF OUT
C3213-1
(RSE-NON NAS
SCR,MANZ
Component : COAX 9
C2117-5
WW2
P,MAOI
B,MAOI
CVBS GND
Antenna-TV-RH (F224)
Sheet3
Earth via-
fixings (E110)
C2228-2
R,MAOH
C1601-1
WW1
P,MAOI
RF OUT
Sheet3
C2117-8
Component : COAX 10
AUD IN L-
RR
(RSE)
C2117-9
Antenna-TV-LH (F223)
Sheet8
AUD IN R-
SCR,MZEK
Earth via-
fixings (E110)
RR1
SCR,MANZ
C3036-2
C3037-2
C2117-10
C2987-1
R,MAOI
C1602-1
AUD IN L+
Sheet8
(NAVIGATION)
RF OUT
C2117-11
AUD IN R+
Component : COAX 11
C2117-12
CVBS 1 IN
XX1
(RSE)
Antenna-TV-LH (F223)
Sheet3
C2117-13
CVBS 1 IN GND
Earth via-
fixings (E110)
C2117-14
XX
(RSE)
AUD 2 IN L-
C2987-2
R,MAOI
C1603-1
Sheet3
RF OUT
C2117-15
AUD 2 IN R-
Component : COAX 12
C2117-16
C2106-1
O,MAOC
AA
AUD 2 IN L+
MOST IN
Sheet5
C2117-17
AUD 2 IN R+
C2106-2
SO,0.5
BB
MOST OUT
C2117-18
Sheet10
CVBS 2 IN
C2117-19
CVBS 2 IN GND
H
U,0.5D
C2117-1
C2117-2
B,0.5D
SJ134
B,2.5D
C2646-1
BATT
GND
Sheet1
TYPE 3
CCC
B,0.5D
SJ695
B,0.5D
Sheet8
DDD
B,0.5D
Sheet8
BBB
B,0.5D
Sheet8
Receiver-TMC (D330)
CC
S,0.5
C2154-2
C2157-1
R,0.5D
F
MOST OUT
POWER
Sheet5
Sheet10
AM/FM
YY
SLG,0.5
C2154-1
MOST IN
Earth via-
fixings (E110)
Sheet8

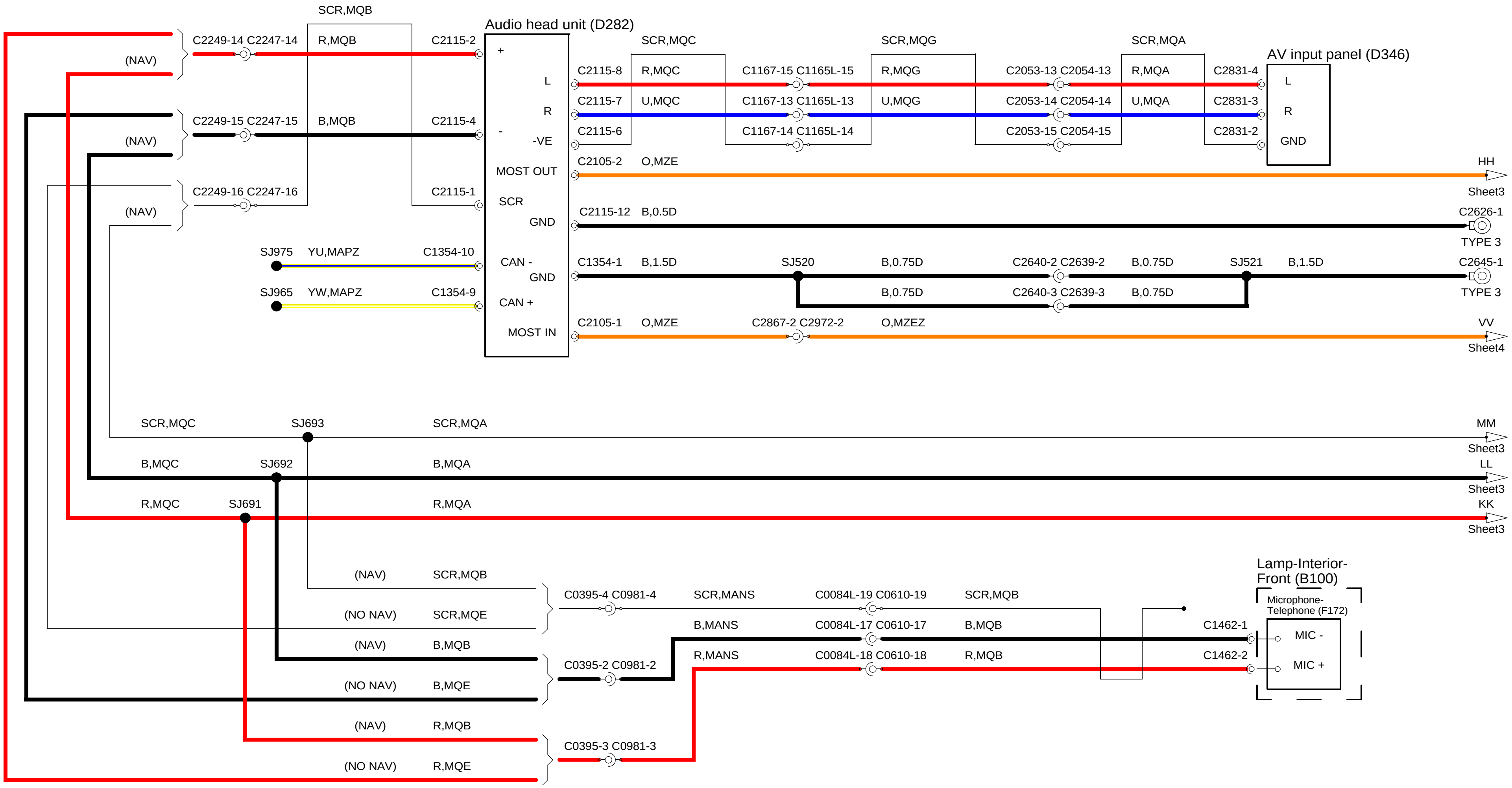

Touch screen display (D326)
BBB
Sheet7
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
YY
Sheet7
SLG,0.5
C2248-2 C2246-2
SLG,0.5
C2825-2
MOST OUT
HH
Sheet2
O,MZE
C2825-1
MOST IN
RR
Sheet7
U,MANZ
C2820-1
VIDEO
RR1
Sheet7
SCR,MANZ
C2820-2
X
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
POWER DISPLAY
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
DIMMING
ABS module (D277)
C0506L-33
G,0.5D
C2245L-15 C2243L-15 G,0.5D
C0395-1 C0981-1
Navigation system module (D325)
G,0.5D
C2114-21
VEHICLE SPEED
AUDIO GND
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,MQD
C2249-8 C2247-8
Y,MQA
C2819-7
AUDIO -
CCC
Sheet7
B,0.5D
C2114-3
MMM
GND
AUDIO +
C2114-30
G,MQD
C2249-9 C2247-9
G,MQA
C2819-17
AUDIO +
DDD
Sheet7
B,0.5D
C2114-19
GND
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2731-1
GVIF +
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2731-2
GVIF -
AB
Sheet3
(NAV + DVD)
PU,0.75D
C2114-17
VBATT
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MANA
C2731-1
GVIF SHIELD
P1
Sheet1
(NAV)
PU,0.75D
KK
Sheet2
R,MQA
C2114-32
MIC +
PRIVATE CAN H
C2114-22
Y,MAPA
C2249-5 C2247-5
Y,MAPDD
C2819-14
CAN H
LL
Sheet2
B,MQA
C2114-16
MIC -
PRIVATE CAN L
C2114-6
G,MAPA
C2249-4 C2247-4
G,MAPDD
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR

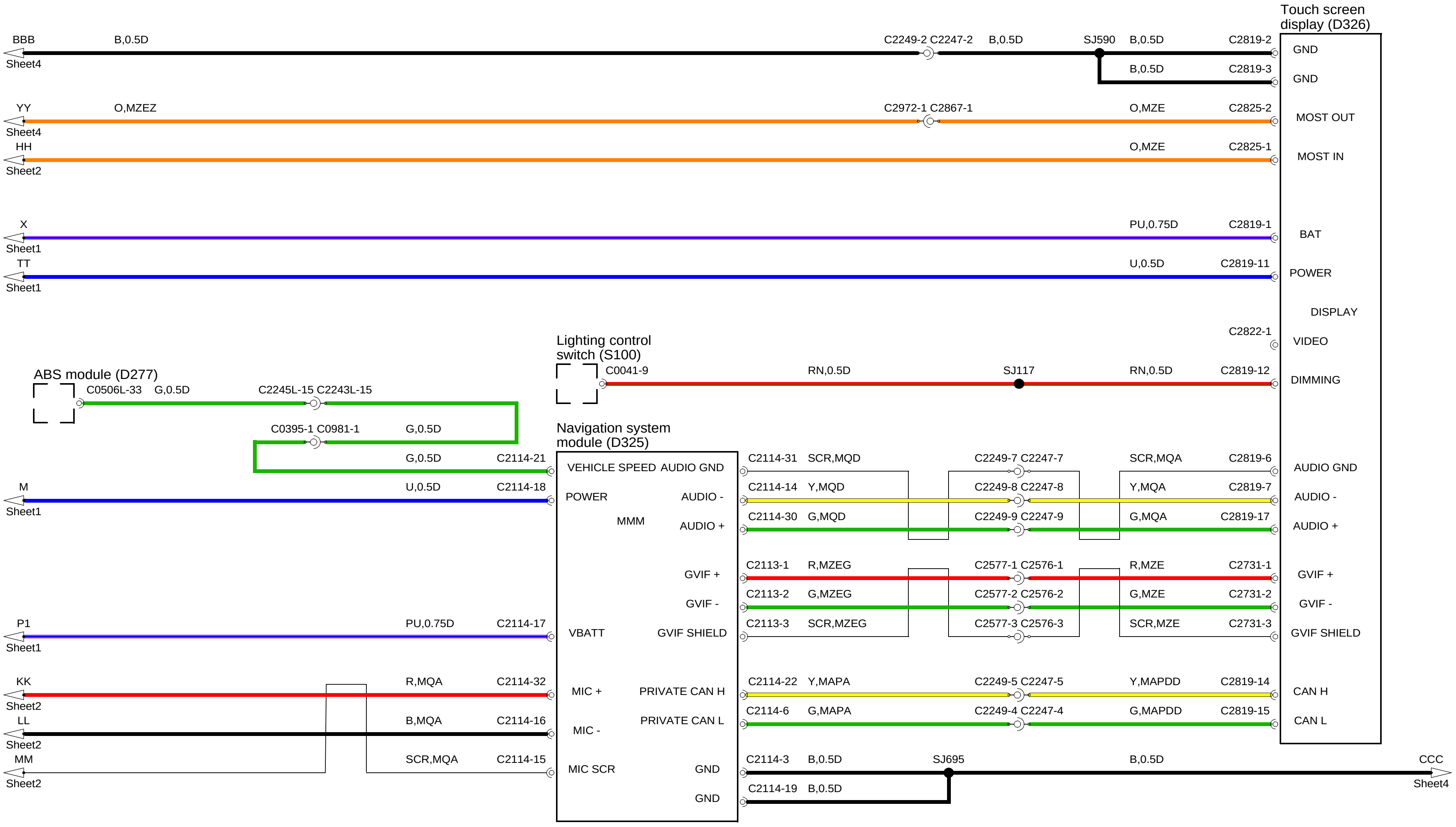

Speaker-Mid range-Front-LH (F169)
C0369-2 G,MUK
SJ217 G,MUL
C0439-53 C0459L-53 G,MUAF
C0369-1 GW,MUK
SJ218
GW,MUL
C0439-54 C0459L-54 GW,MUAF
Speaker-High range-Front-LH (F165)
C0530-3 GW,MAQK
C0530-1 G,MAQK
SJ951 G,0.75D C0492-11
SJ950 GW,0.75D C0492-1
Speaker-Low range-Front door-LH (F134)
C0688-1 GW,MUM
C0439-59 C0459L-59 GW,MUE C0491-3
C0688-2 G,MUM
C0439-60 C0459L-60 G,MUE C0491-11
Speaker-Mid range-Rear-LH (F167)
C0310-1 GW,MUD
SJ204 GW,MUE
C0803-23 C0435-23 GW,MUZ C0491-1
C0310-2 G,MUD
SJ205 G,MUE
C0803-22 C0435-22 G,MUZ C0491-9
LH rear high range speaker (F163)
C0679-1 G,MAQA
C0679-3 GW,MAQA
LH rear surround sound speaker (F198)
C0311-2 G,MUB
C0610-2 C0084L-2 G,MAQX C0491-13
C0311-1 GW,MUB
C0610-1 C0084L-1 GW,MAQX C0491-5
Centre speaker (F187)
C0369-2 G,MAQP
C0469-3 C0467L-3 G,MAQY C0492-13
C0369-1 GW,MAQP
C0469-4 C0467L-4 GW,MAQY C0492-3
Amplifier-Power-ICE (F142)
AUD 4
RF_MH-
LF_MH+
RF_MH+
LF_MH-
RF_BASS+
LF_BASS-
RF_BASS-
LF_BASS+
RS-
LR_SPEAKER-
RS+
LR_SPEAKER+
RR_SPEAKER-
LS+
LR_SPEAKER+
LS-
CENTRE +
CENTRE -
Speaker-Mid range-Front-RH (F168)
C0463L-50 C0439-50 GW,MUB
SJ218 GW,MUK C0369-1
C0463L-51 C0439-51 G,MUB
SJ217 G,MUK C0369-2
G,MUAC
GW,MUAC
Speaker-High range-Front-RH (F164)
G,MAQK C0530-1
GW,MAQK C0530-3
C0492-2 GW,0.75D SJ952
C0492-12 G,0.75D SJ953
Speaker-Low range-Front door-RH (F135)
C0491-12 G,MUK
C0463L-54 C0439-54 G,MUD C0688-2
C0491-4 GW,MUK
C0463L-53 C0439-53 GW,MUD C0688-1
RH rear surround sound speaker (F199)
C0491-6 GW,MAQT
C0084L-11 C0610-11 GW,MUA C0309-1
C0491-14 G,MAQT
C0084L-12 C0610-12 G,MUA C0309-2
Speaker-Mid range-Rear-RH (F166)
C0436-23 C0804-23 GW,MUF
SJ204 GW,MUD C0310-1
C0436-22 C0804-22 G,MUF
SJ205 G,MUD C0310-2
RH rear high range speaker (F162)
G,MAQA C0679-1
GW,MAQA C0679-3
C0491-2 GW,MUX
C0491-10 G,MUX
+
-

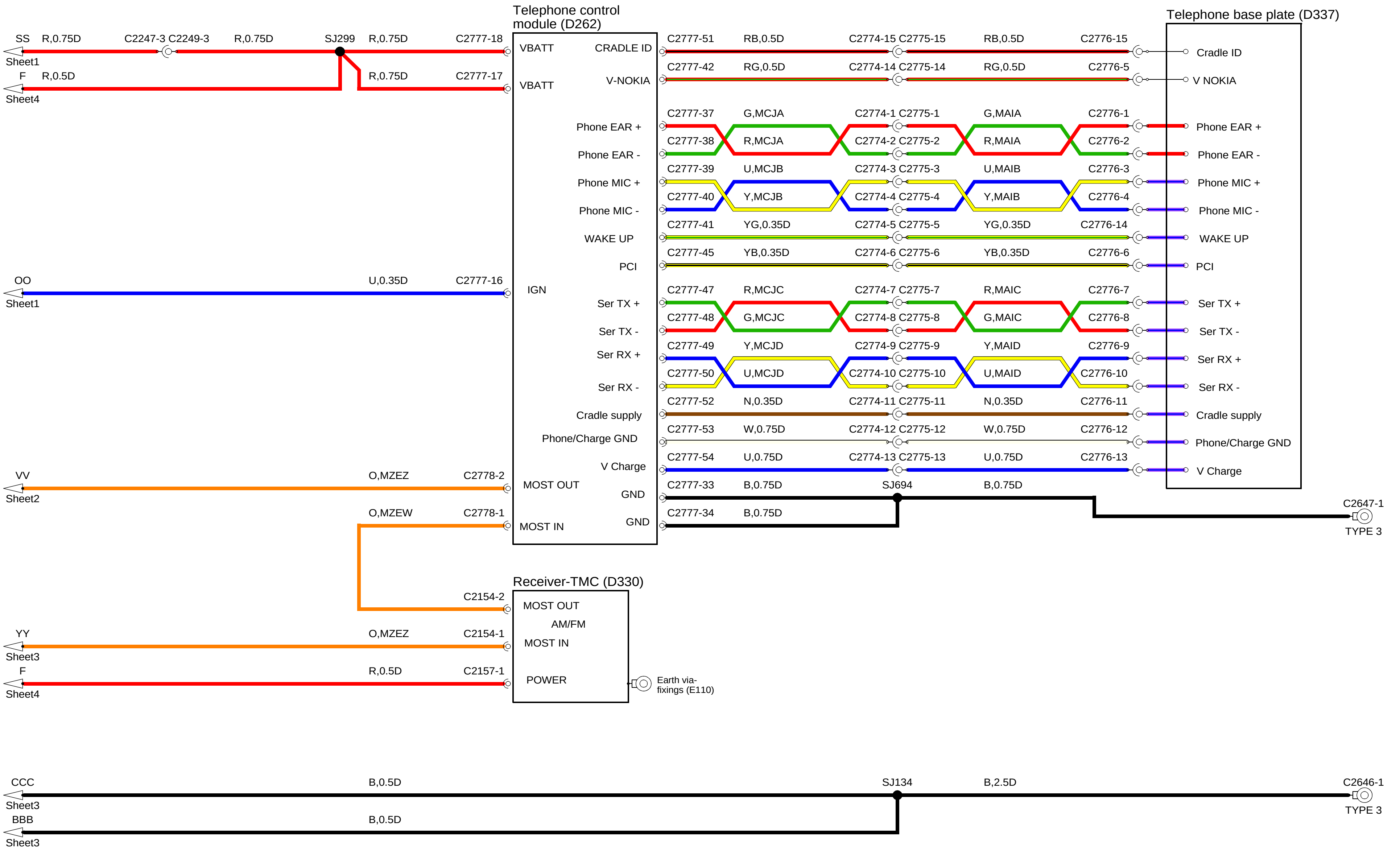

Telephone control module (D262)
Telephone base plate (D337)
CRADLE ID
VBATT
V-NOKIA
VBATT
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE Phone
PCI
POWER
Ser TX +
Ser TX -
MOST IN
Ser RX +
MOST OUT
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
GND
GND
Cradle ID
V NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE Phone
PCI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
SS
R,0.75D
C2247-3 C2249-3
R,0.75D
SJ299
R,0.75D
C2777-18
Sheet1
F
R,0.5D
R,0.75D
C2777-17
Sheet7
OO
U,0.35D
C2777-16
Sheet1
B
O,MZEV
C2778-1
Sheet3
VV
SU
C2778-2
Sheet2
C2777-51
RB,0.5D
C2774-15 C2775-15
RB,0.5D
C2776-15
C2777-42
RG,0.5D
C2774-14 C2775-14
RG,0.5D
C2776-5
C2777-37
G,MCJA
C2774-1 C2775-1
G,MAIA
C2776-1
C2777-38
R,MCJA
C2774-2 C2775-2
R,MAIA
C2776-2
C2777-39
U,MCJB
C2774-3 C2775-3
U,MAIB
C2776-3
C2777-40
Y,MCJB
C2774-4 C2775-4
Y,MAIB
C2776-4
C2777-41
YG,0.35D
C2774-5 C2775-5
YG,0.35D
C2776-14
C2777-45
YB,0.35D
C2774-6 C2775-6
YB,0.35D
C2776-6
C2777-47
R,MCJC
C2774-7 C2775-7
R,MAIC
C2776-7
C2777-48
G,MCJC
C2774-8 C2775-8
G,MAIC
C2776-8
C2777-49
Y,MCJD
C2774-9 C2775-9
Y,MAID
C2776-9
C2777-50
U,MCJD
C2774-10 C2775-10
U,MAID
C2776-10
C2777-52
N,0.35D
C2774-11 C2775-11
N,0.35D
C2776-11
C2777-53
W,0.75D
C2774-12 C2775-12
W,0.75D
C2776-12
C2777-54
U,0.75D
C2774-13 C2775-13
U,0.75D
C2776-13
C2777-33
B,0.75D
SJ694
B,0.75D
C2647-1
TYPE 3
C2777-34
B,0.75D
Module-Tuner-DAB/SDARS (D350)
MOST IN
DAB/SDAR
MOST OUT
GND
POWER
BB
SO,0.5
C2155-1
Sheet7
ZZ
O,MZES
C2155-2
Sheet3
C2158-3
B,0.5D
C2648-1
TYPE 3
C2158-1
U,0.5D
UU
Sheet1

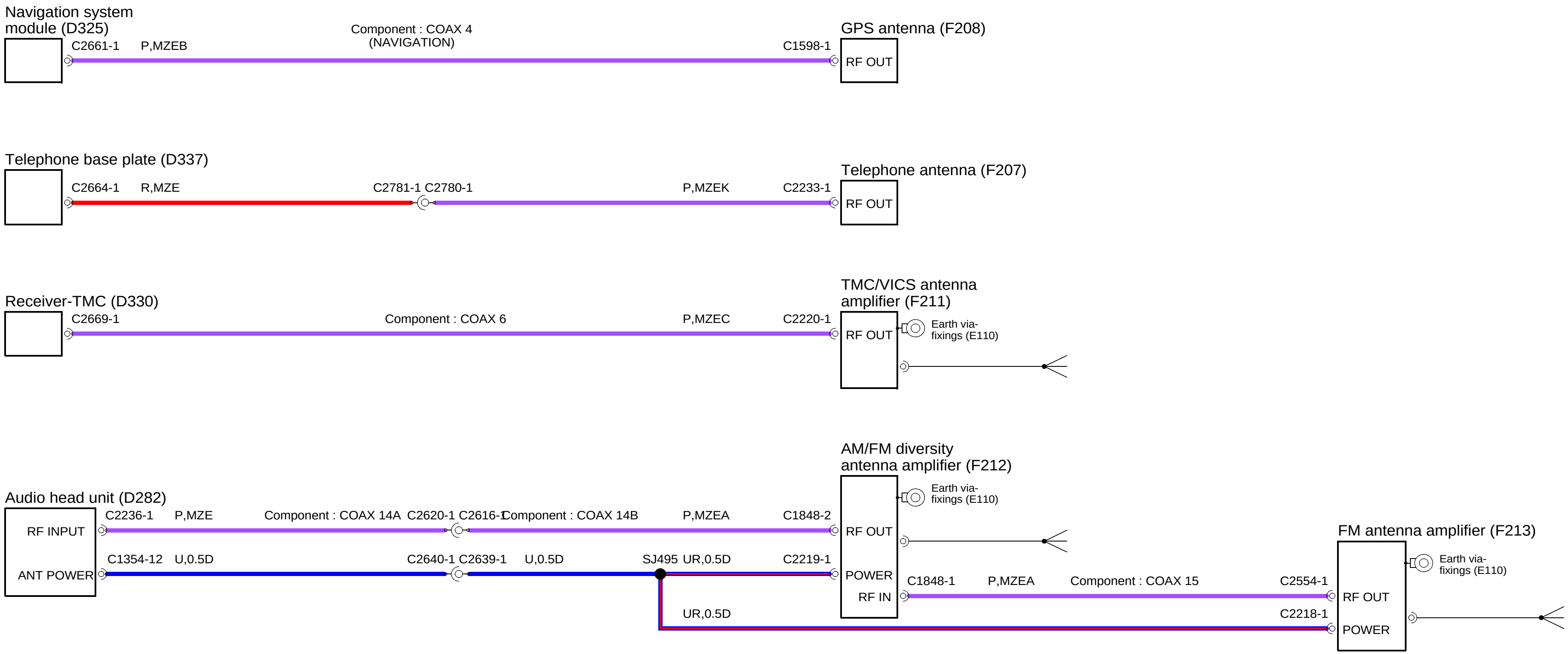

Amplifier-Power-ICE (F142)
AUD 2C
LF_DOOR+
LF_DOOR-
RR_DOOR-
RR_DOOR+
LF_DOOR-
LF_DOOR+
RR_DOOR+
RR_DOOR-
C0491-13
G,MUF
C0459L-53
C0439-53
G,MUL
SJ217
G,MUN
C0688-2
C0491-5
GW,MUF
C0459L-54
C0439-54
GW,MUL
SJ218
GW,MUN
C0688-1
Speaker-Mid range-Front-LH (F169)
+
-
Speaker-High range-Front-LH (F165)
GW,MAQK
C0530-3
G,MAQK
C0530-1
-
+
C0491-1
GW,MUZ
C0435-23
C0803-23
GW,MUE
SJ204
GW,MUD
C0310-1
C0491-9
G,MUZ
C0435-22
C0803-22
G,MUE
SJ205
G,MUD
C0310-2
Speaker-Mid range-Rear-LH (F167)
-
+
LH rear high range speaker (F163)
G,MAQA
C0679-1
GW,MAQA
C0679-3
+
-
C0491-6
GW,MUJ
C0463L-50
C0439-50
GW,MUB
SJ218
GW,MUN
C0688-1
C0491-14
G,MUJ
C0463L-51
C0439-51
G,MUB
SJ217
G,MUN
C0688-2
Speaker-Mid range-Front-RH (F168)
RH -
RH +
Speaker-High range-Front-RH (F164)
G,MAQK
C0530-1
GW,MAQK
C0530-3
RH +
RH -
C0491-10
G,MUX
C0436-22
C0804-22
G,MUF
SJ205
G,MUD
C0310-2
C0491-2
GW,MUX
C0436-23
C0804-23
GW,MUF
SJ204
GW,MUD
C0310-1
Speaker-Mid range-Rear-RH (F166)
RH +
RH -
RH rear high range speaker (F162)
GW,MAQA
C0679-3
G,MAQA
C0679-1
RH -
RH +

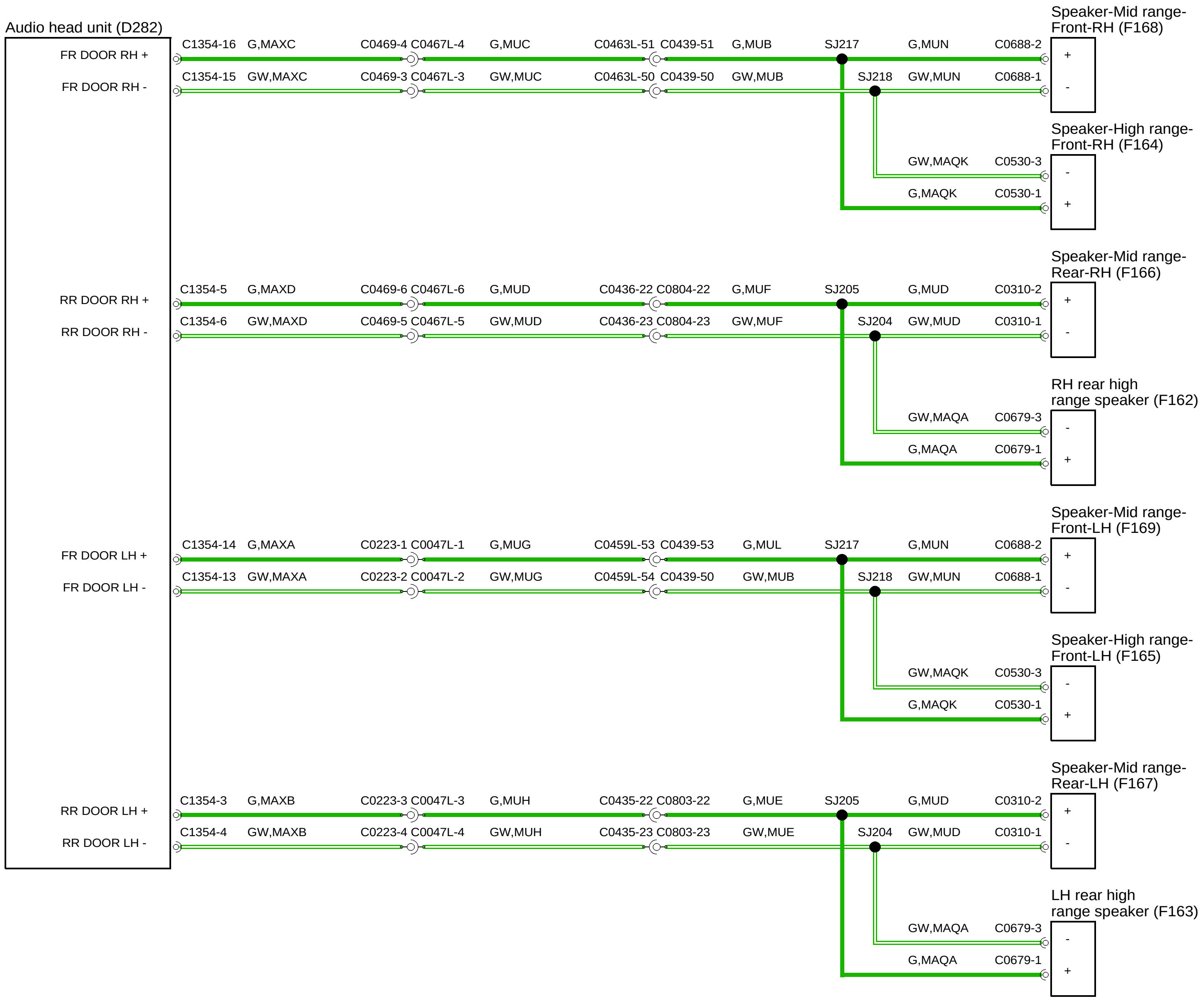

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Audio head unit (D282)
SWS 1
GND
C1354-18
SR,MAIA
C0082-4
C1354-7
SB,MAIA
C0082-7
Clock spring (S227)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone -Send (Y281)
Phone-End (Y282)
Mode (Y283)
C1354-8
ENT CTRL
BATT
C1354-11
PU,1.5D
SJ131
PU,0.75D
C2247-12 C2249-12
PU,0.75D
P1
Sheet3
Central Junction Box (P101)
C0582-34
RU,0.5D
FUSE 53P
15.0 Amps
C0582-38
PU,1.5D
PU,0.75D
X
Sheet3
Relay-Infotainment (R249)
C0583L-22
FUSE 58P
10.0 Amps
C0582-13
U,1.0D
SJ998
U,0.5D
TT
Sheet3
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet3
U,0.35D
OO
Sheet4
FUSE 52P
5.0 Amps
C0582-41
R,0.75D
SS
Sheet4

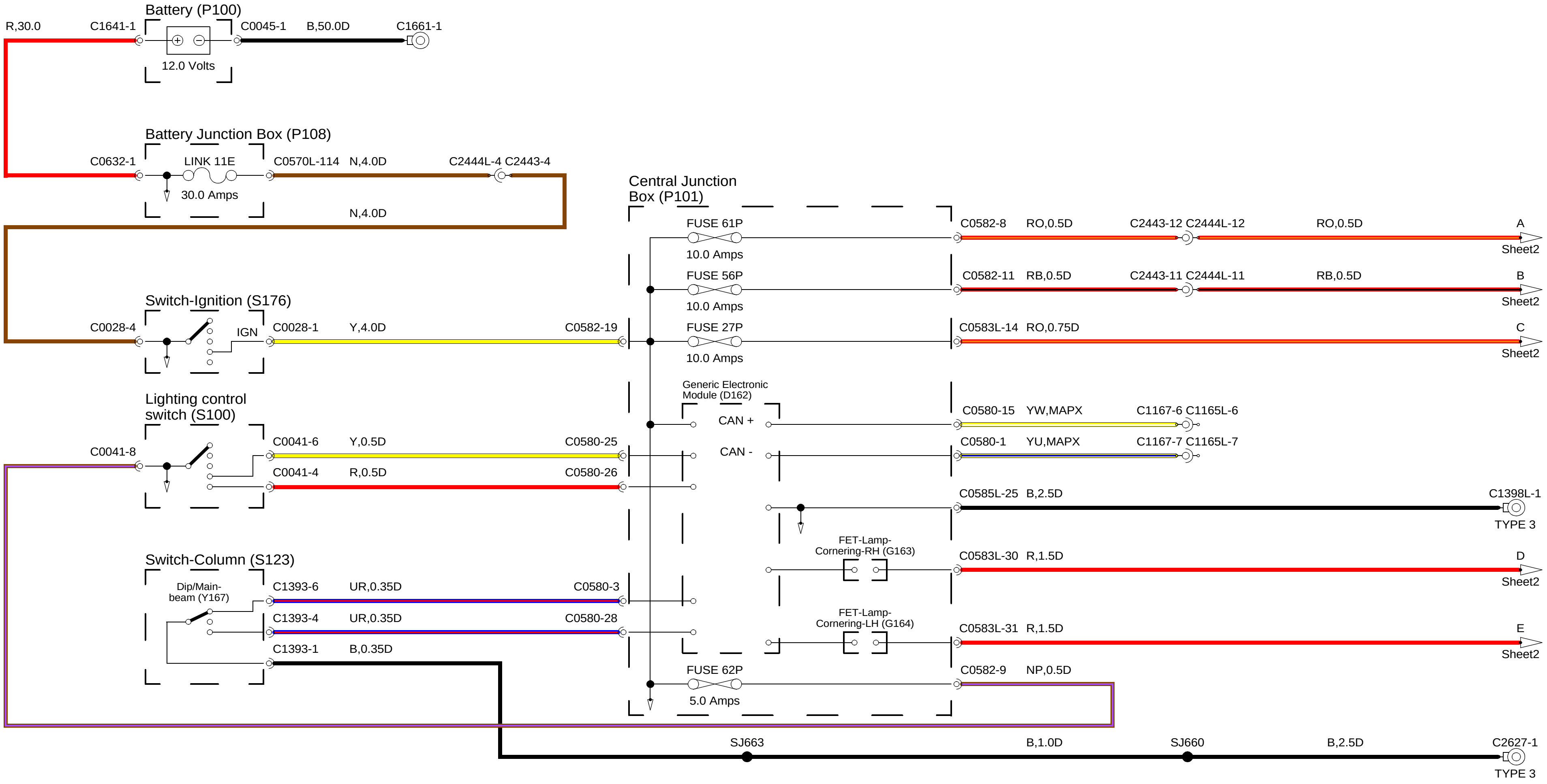

Audio head unit (D282)
AV input panel (D346)
Lamp-Interior-Front (B100)
Microphone-Telephone (F172)
(NAV)
C2249-14 C2247-14
SCR,MQB
R,MQB
C2115-2
C2249-15 C2247-15
B,MQB
C2115-4
C2249-16 C2247-16
C2115-1
+
L
R
-
-VE
MOST OUT
SCR
GND
CAN -
CAN +
MOST IN
SJ975
YU,MAPZ
C1354-10
SJ965
YW,MAPZ
C1354-9
SCR,MQC
C2115-8
R,MQC
C2115-7
U,MQC
C2115-6
C1167-15 C1165L-15
C1167-13 C1165L-13
C1167-14 C1165L-14
SCR,MQG
R,MQG
U,MQG
C2053-13 C2054-13
C2053-14 C2054-14
C2053-15 C2054-15
SCR,MQA
R,MQA
U,MQA
C2831-4
C2831-3
C2831-2
C2105-2
O,MZE
HH
Sheet3
C2115-12
B,0.5D
C2626-1
TYPE 3
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
SJ521
C2645-1
C2640-3 C2639-3
C2105-1
C2867-2 C2972-2
O,MZEZ
VV
Sheet4
SJ693
MM
B,MQC
SJ692
B,MQA
LL
R,MQC
SJ691
R,MQA
KK
(NO NAV)
SCR,MQE
C0395-4 C0981-4
SCR,MANS
C0084L-19 C0610-19
B,MANS
C0084L-17 C0610-17
C1462-1
MIC -
R,MANS
C0084L-18 C0610-18
C1462-2
MIC +
C0395-2 C0981-2
B,MQE
C0395-3 C0981-3
R,MQE

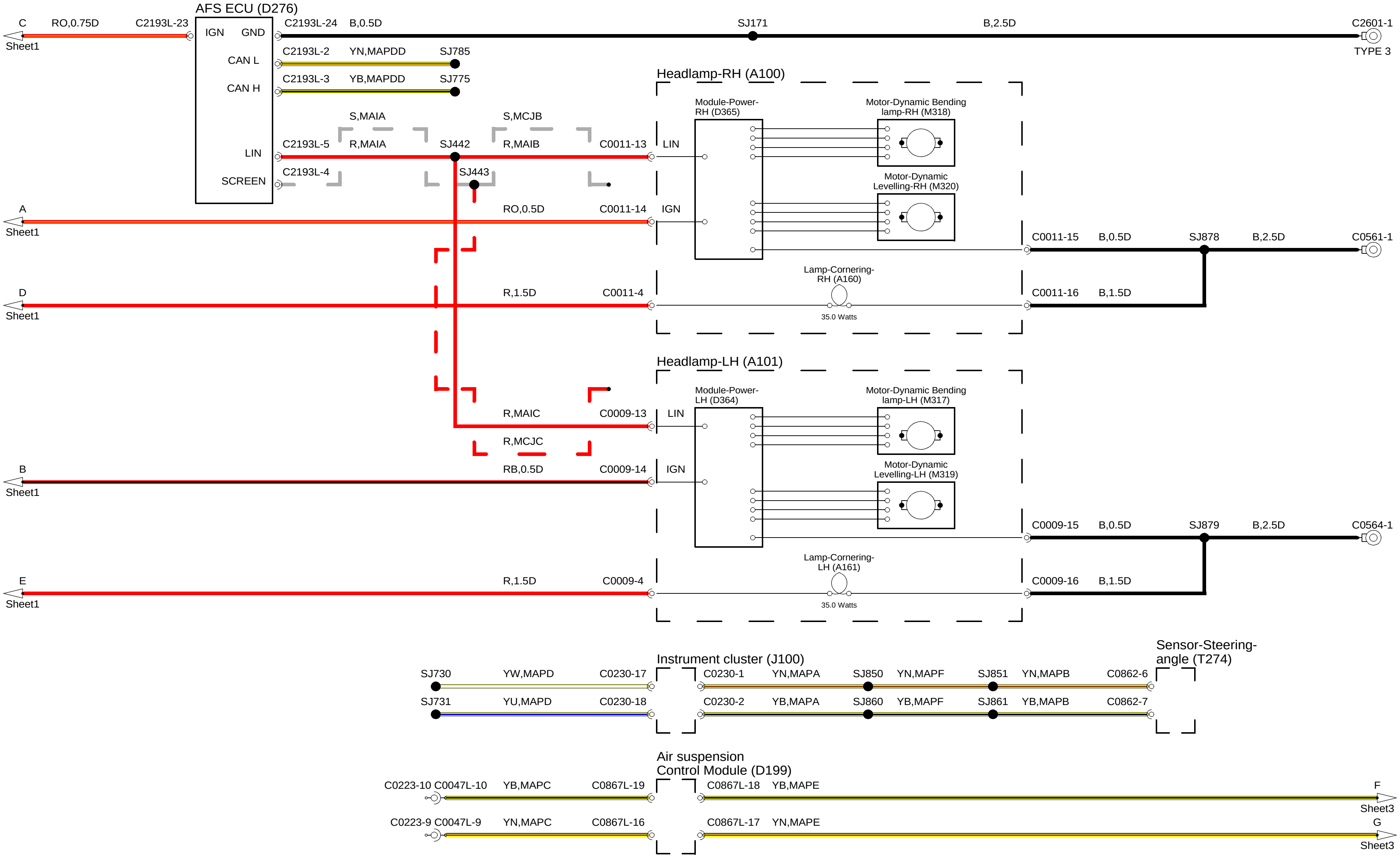

Touch screen display (D326)
BBB
Sheet4
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
YY
Sheet4
O,MZEZ
C2972-1 C2867-1
O,MZE
C2825-2
MOST OUT
HH
Sheet2
O,MZE
C2825-1
MOST IN
X
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
POWER
DISPLAY
C2822-1
VIDEO
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
DIMMING
ABS module (D277)
C0506L-33
G,0.5D
C2245L-15 C2243L-15
C0395-1 C0981-1
G,0.5D
Navigation system module (D325)
G,0.5D
C2114-21
VEHICLE SPEED
AUDIO GND
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,MQD
C2249-8 C2247-8
Y,MQA
C2819-7
AUDIO -
MMM
AUDIO +
C2114-30
G,MQD
C2249-9 C2247-9
G,MQA
C2819-17
AUDIO +
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2731-1
GVIF +
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2731-2
GVIF -
P1
Sheet1
PU,0.75D
C2114-17
VBATT
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MZE
C2731-3
GVIF SHIELD
KK
Sheet2
R,MQA
C2114-32
MIC +
PRIVATE CAN H
C2114-22
Y,MAPA
C2249-5 C2247-5
Y,MAPDD
C2819-14
CAN H
LL
Sheet2
B,MQA
C2114-16
MIC -
PRIVATE CAN L
C2114-6
G,MAPA
C2249-4 C2247-4
G,MAPDD
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR
GND
C2114-3
B,0.5D
SJ695
B,0.5D
CCC
Sheet4
GND
C2114-19
B,0.5D

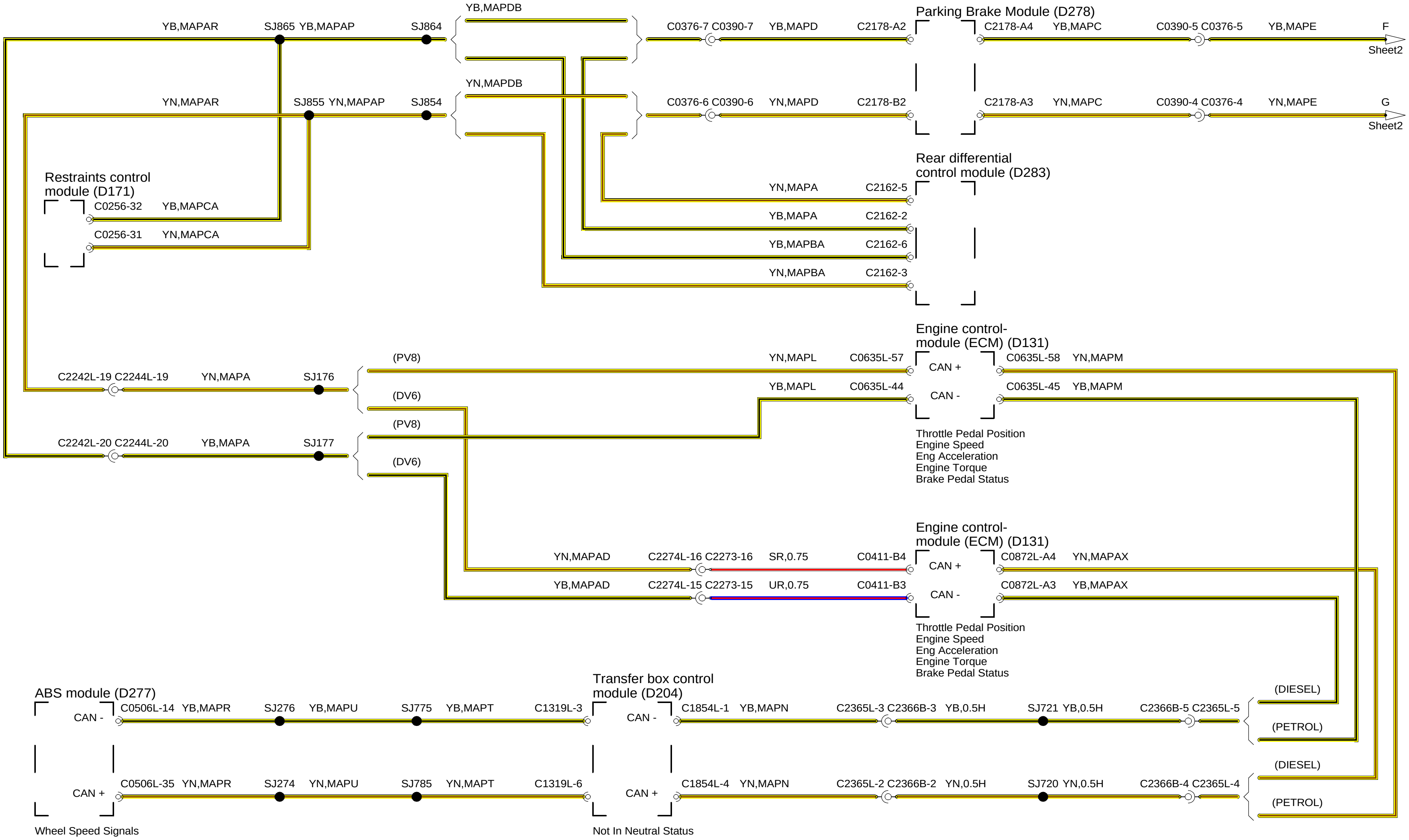

Telephone control module (D262)
Telephone base plate (D337)
SS
Sheet1
R,0.75D
C2247-3 C2249-3
R,0.75D
SJ299
R,0.75D
C2777-18
F
Sheet4
R,0.5D
R,0.75D
C2777-17
VBATT
VBATT
CRADLE ID
V-NOKIA
C2777-51
RB,0.5D
C2774-15 C2775-15
RB,0.5D
C2776-15
Cradle ID
C2777-42
RG,0.5D
C2774-14 C2775-14
RG,0.5D
C2776-5
V NOKIA
C2777-37
G,MCJA
C2774-1 C2775-1
G,MAIA
C2776-1
Phone EAR +
C2777-38
R,MCJA
C2774-2 C2775-2
R,MAIA
C2776-2
Phone EAR -
C2777-39
U,MCJB
C2774-3 C2775-3
U,MAIB
C2776-3
Phone MIC +
C2777-40
Y,MCJB
C2774-4 C2775-4
Y,MAIB
C2776-4
Phone MIC -
C2777-41
YG,0.35D
C2774-5 C2775-5
YG,0.35D
C2776-14
WAKE UP
C2777-45
YB,0.35D
C2774-6 C2775-6
YB,0.35D
C2776-6
PCI
OO
Sheet1
U,0.35D
C2777-16
IGN
C2777-47
R,MCJC
C2774-7 C2775-7
R,MAIC
C2776-7
Ser TX +
C2777-48
G,MCJC
C2774-8 C2775-8
G,MAIC
C2776-8
Ser TX -
C2777-49
Y,MCJD
C2774-9 C2775-9
Y,MAID
C2776-9
Ser RX +
C2777-50
U,MCJD
C2774-10 C2775-10
U,MAID
C2776-10
Ser RX -
C2777-52
N,0.35D
C2774-11 C2775-11
N,0.35D
C2776-11
Cradle supply
C2777-53
W,0.75D
C2774-12 C2775-12
W,0.75D
C2776-12
Phone/Charge GND
C2777-54
U,0.75D
C2774-13 C2775-13
U,0.75D
C2776-13
V Charge
VV
Sheet2
O,MZEZ
C2778-2
MOST OUT
GND
C2777-33
B,0.75D
SJ694
B,0.75D
C2647-1
TYPE 3
O,MZEW
C2778-1
MOST IN
GND
C2777-34
B,0.75D
Receiver-TMC (D330)
C2154-2
MOST OUT
AM/FM
MOST IN
YY
Sheet3
O,MZEZ
C2154-1
F
Sheet4
R,0.5D
C2157-1
POWER
Earth via-
fixings (E110)
CCC
Sheet3
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
BBB
Sheet3
B,0.5D

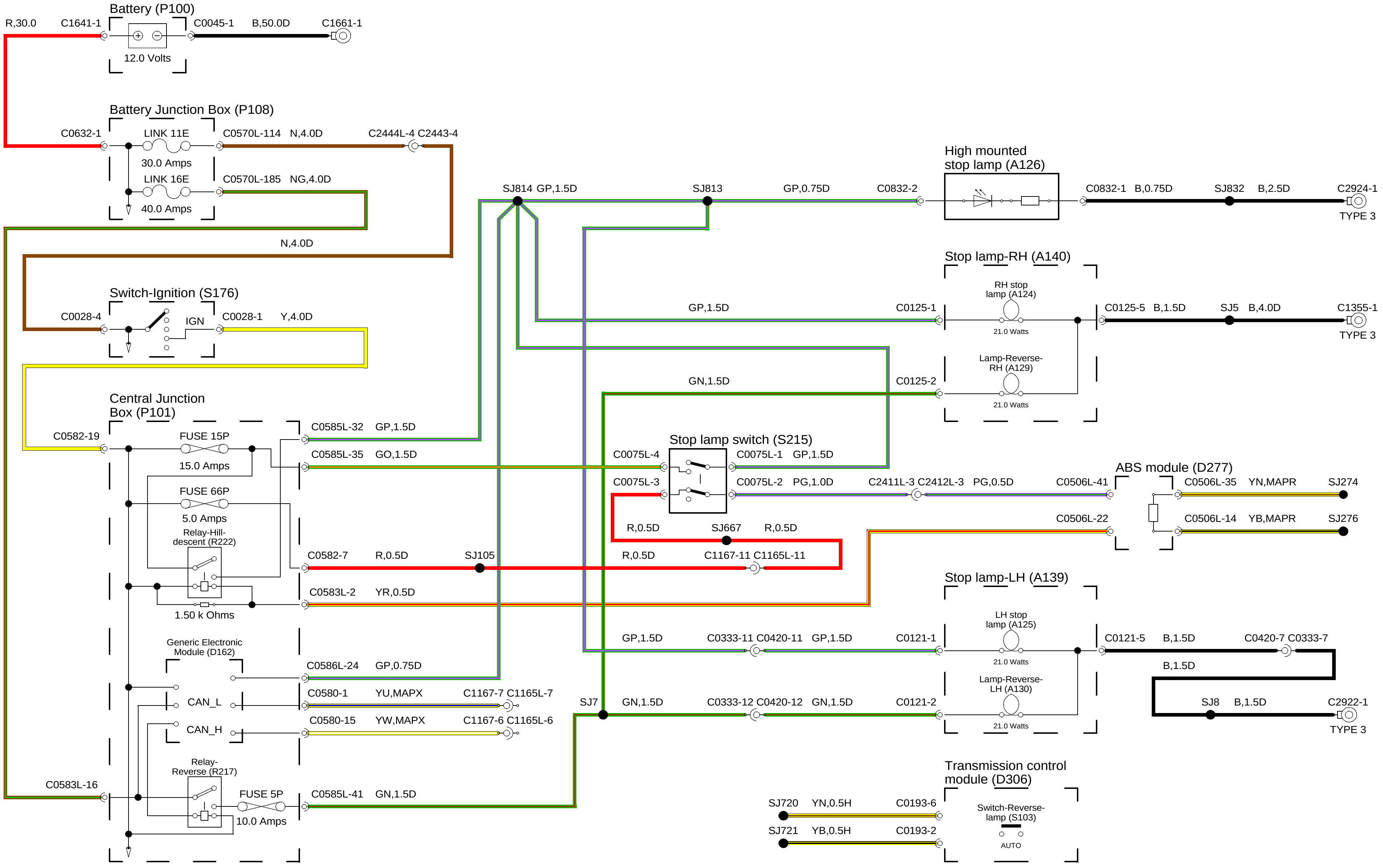

Navigation system module (D325)
C2661-1
P,MZEB
Component : COAX 4 (NAVIGATION)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Receiver-TMC (D330)
C2669-1
Component : COAX 6
P,MZEC
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via-fixings (E110)
AM/FM diversity antenna amplifier (F212)
Earth via-fixings (E110)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
Component : COAX 14A
C2620-1 C2616-1
Component : COAX 14B
P,MZEA
C1848-2
RF OUT
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495
UR,0.5D
C2219-1
POWER
RF IN
C1848-1
P,MZEA
Component : COAX 15
C2554-1
UR,0.5D
C2218-1
FM antenna amplifier (F213)
Earth via-fixings (E110)
RF OUT
POWER

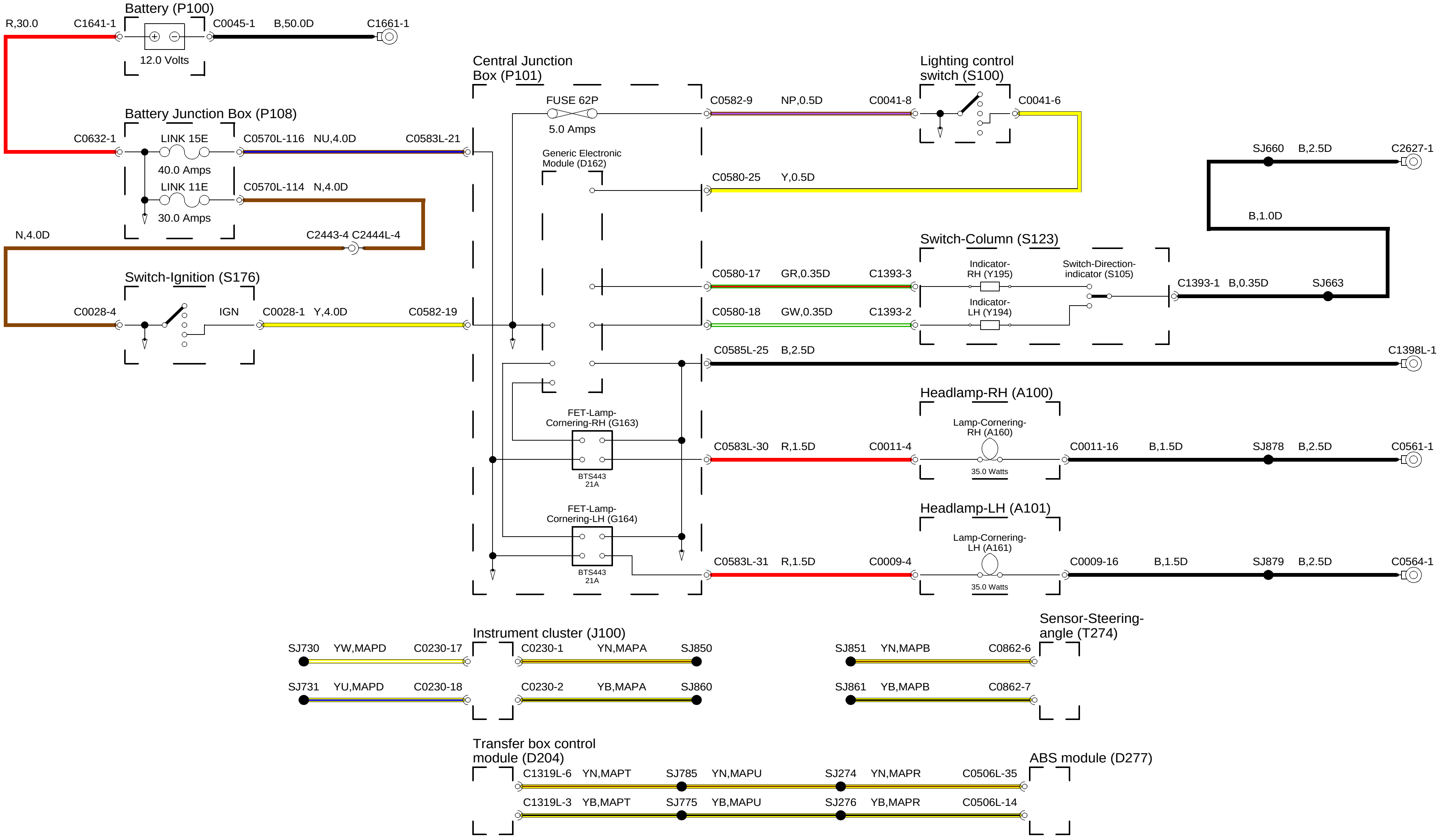

Audio head unit (D282)
FR DOOR RH +
FR DOOR RH -
RR DOOR RH +
RR DOOR RH -
FR DOOR LH +
FR DOOR LH -
RR DOOR LH +
RR DOOR LH -
C1354-16 G,MAXC C0469-4 C0467L-4 G,MUC C0463L-51 C0439-51 G,MUB SJ217 G,MUN C0688-2
C1354-15 GW,MAXC C0469-3 C0467L-3 GW,MUC C0463L-50 C0439-50 GW,MUB SJ218 GW,MUN C0688-1
Speaker-Mid range-Front-RH (F168)
+
-
Speaker-High range-Front-RH (F164)
GW,MAQK C0530-3
G,MAQK C0530-1
-
+
C1354-5 G,MAXD C0469-6 C0467L-6 G,MUD C0436-22 C0804-22 G,MUF SJ205 G,MUD C0310-2
C1354-6 GW,MAXD C0469-5 C0467L-5 GW,MUD C0436-23 C0804-23 GW,MUF SJ204 GW,MUD C0310-1
Speaker-Mid range-Rear-RH (F166)
+
-
RH rear high range speaker (F162)
GW,MAQA C0679-3
G,MAQA C0679-1
-
+
C1354-14 G,MAXA C0223-1 C0047L-1 G,MUG C0459L-53 C0439-53 G,MUL SJ217 G,MUN C0688-2
C1354-13 GW,MAXA C0223-2 C0047L-2 GW,MUG C0459L-54 C0439-50 GW,MUB SJ218 GW,MUN C0688-1
Speaker-Mid range-Front-LH (F169)
+
-
Speaker-High range-Front-LH (F165)
GW,MAQK C0530-3
G,MAQK C0530-1
-
+
C1354-3 G,MAXB C0223-3 C0047L-3 G,MUH C0435-22 C0803-22 G,MUE SJ205 G,MUD C0310-2
C1354-4 GW,MAXB C0223-4 C0047L-4 GW,MUH C0435-23 C0803-23 GW,MUE SJ204 GW,MUD C0310-1
Speaker-Mid range-Rear-LH (F167)
+
-
LH rear high range speaker (F163)
GW,MAQA C0679-3
G,MAQA C0679-1
-
+

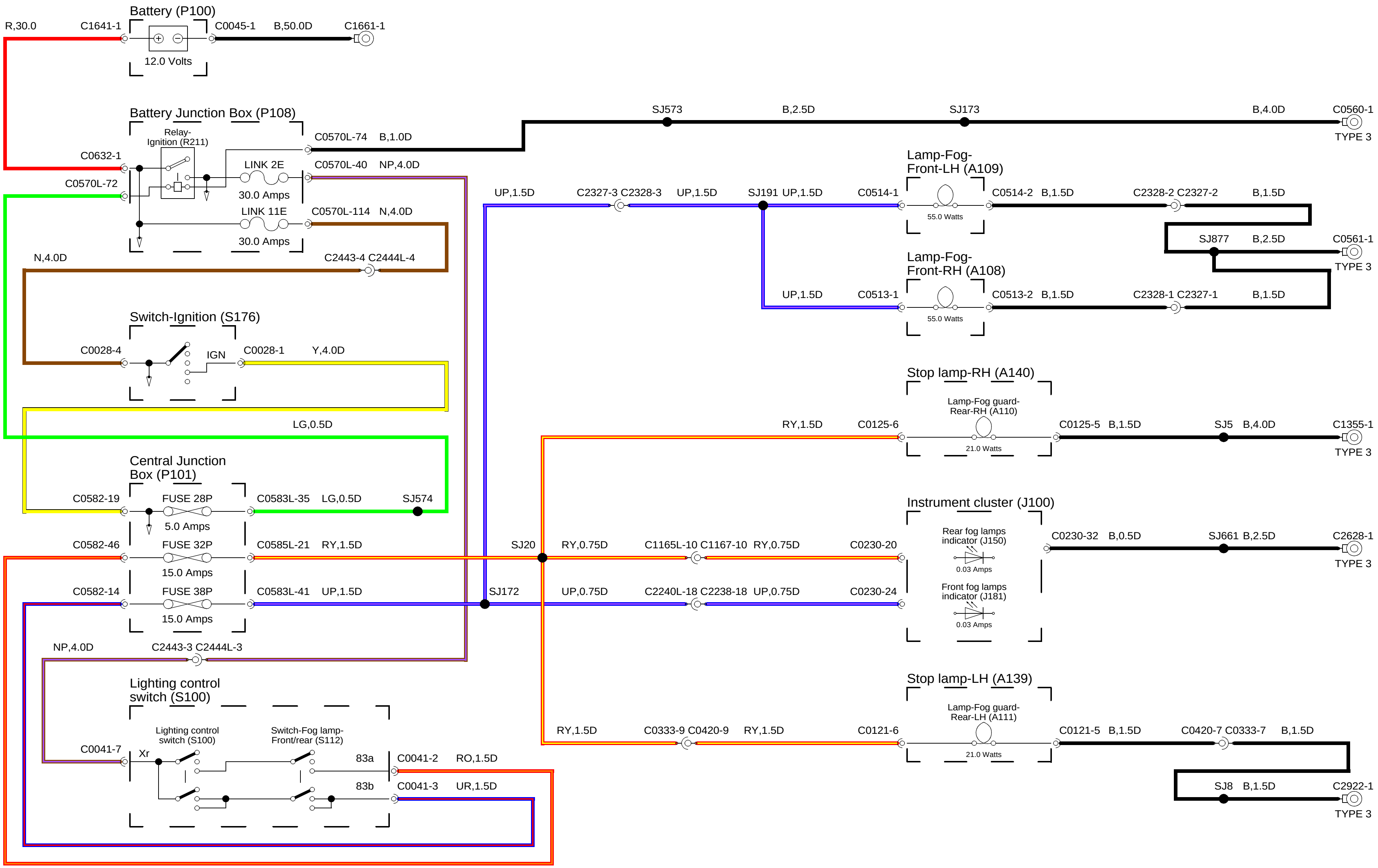

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Central Junction Box (P101)
FUSE 61P
10.0 Amps
C0582-8
RO,0.5D
C2443-12 C2444L-12
RO,0.5D
A
Sheet2
FUSE 56P
10.0 Amps
C0582-11
RB,0.5D
C2443-11 C2444L-11
RB,0.5D
B
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 27P
10.0 Amps
C0583L-14
RO,0.75D
C
Sheet2
Generic Electronic Module (D162)
Lighting control switch (S100)
CAN +
C0580-15
YW,MAPX
C1167-6 C1165L-6
C0041-8
C0041-6
Y,0.5D
C0580-25
CAN -
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0041-4
R,0.5D
C0580-26
C0585L-25
B,2.5D
C1398L-1
TYPE 3
Switch-Column (S123)
FET-Lamp-Cornering-RH (G163)
C0583L-30
R,1.5D
D
Sheet2
Dip/Main-beam (Y167)
C1393-6
UR,0.35D
C0580-3
C1393-4
UR,0.35D
C0580-28
FET-Lamp-Cornering-LH (G164)
C0583L-31
R,1.5D
E
Sheet2
C1393-1
B,0.35D
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

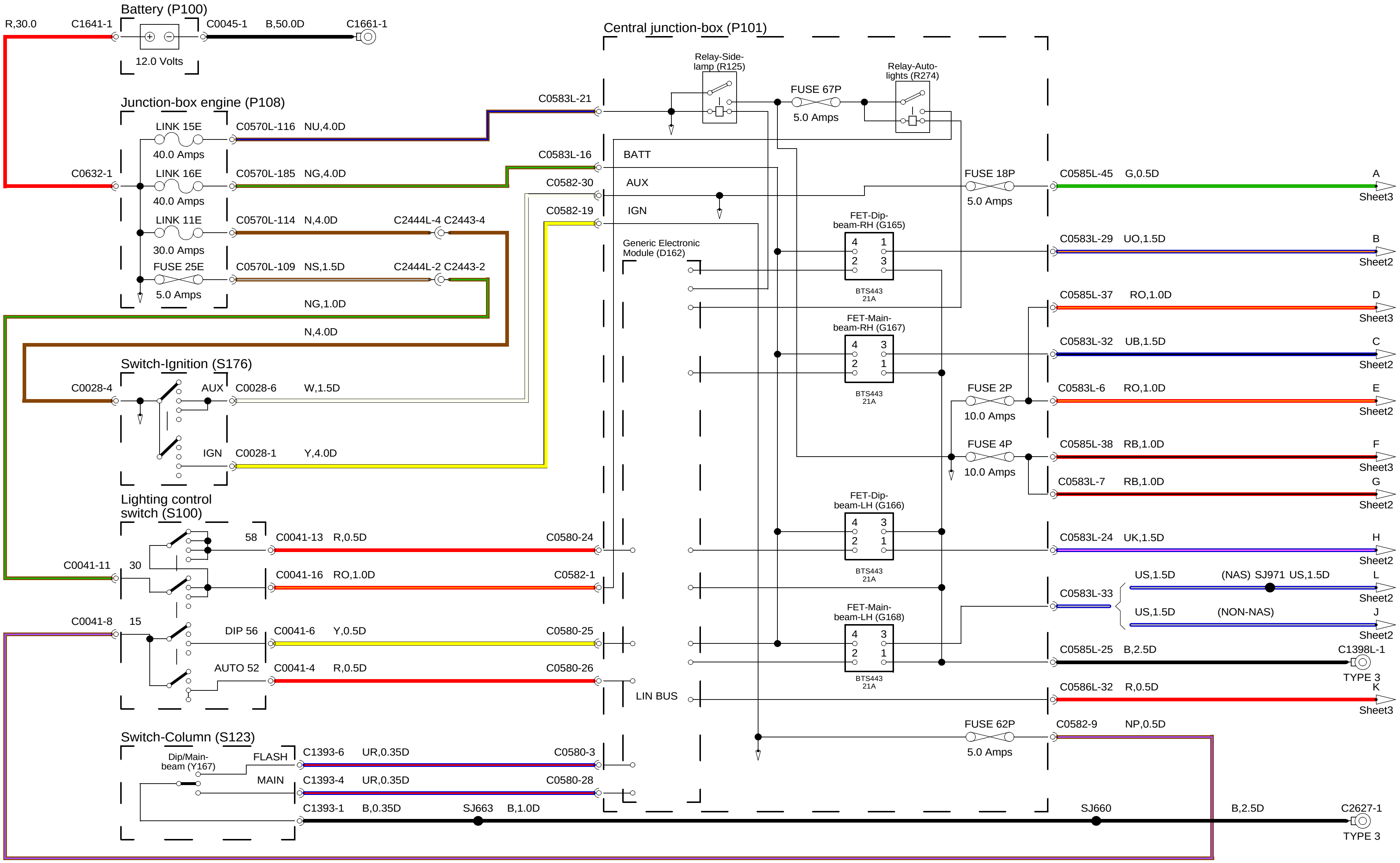

AFS ECU (D276)
C
Sheet1
RO,0.75D
C2193L-23
IGN
GND
CAN L
CAN H
LIN
SCREEN
C2193L-24
B,0.5D
SJ171
B,2.5D
C2601-1
TYPE 3
C2193L-2
YN,MAPDD
SJ785
C2193L-3
YB,MAPDD
SJ775
S,MAIA
S,MCJB
C2193L-5
R,MAIA
SJ442
R,MAIB
C0011-13
C2193L-4
SJ443
Headlamp-RH (A100)
Module-Power-RH (D365)
Motor-Dynamic Bending lamp-RH (M318)
Motor-Dynamic Levelling-RH (M320)
LIN
IGN
A
Sheet1
RO,0.5D
C0011-14
C0011-15
B,0.5D
SJ878
B,2.5D
C0561-1
Lamp-Cornering-RH (A160)
35.0 Watts
D
Sheet1
R,1.5D
C0011-4
C0011-16
B,1.5D
Headlamp-LH (A101)
Module-Power-LH (D364)
Motor-Dynamic Bending lamp-LH (M317)
Motor-Dynamic Levelling-LH (M319)
R,MAIC
C0009-13
LIN
R,MCJC
B
Sheet1
RB,0.5D
C0009-14
IGN
C0009-15
B,0.5D
SJ879
B,2.5D
C0564-1
Lamp-Cornering-LH (A161)
35.0 Watts
E
Sheet1
R,1.5D
C0009-4
C0009-16
B,1.5D
Instrument cluster (J100)
Sensor-Steering-angle (T274)
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
YN,MAPF
SJ851
YN,MAPB
C0862-6
SJ731
YU,MAPD
C0230-18
C0230-2
YB,MAPA
SJ860
YB,MAPF
SJ861
YB,MAPB
C0862-7
Air suspension Control Module (D199)
C0223-10 C0047L-10
YB,MAPC
C0867L-19
C0867L-18
YB,MAPE
F
Sheet3
C0223-9 C0047L-9
YN,MAPC
C0867L-16
C0867L-17
YN,MAPE
G
Sheet3

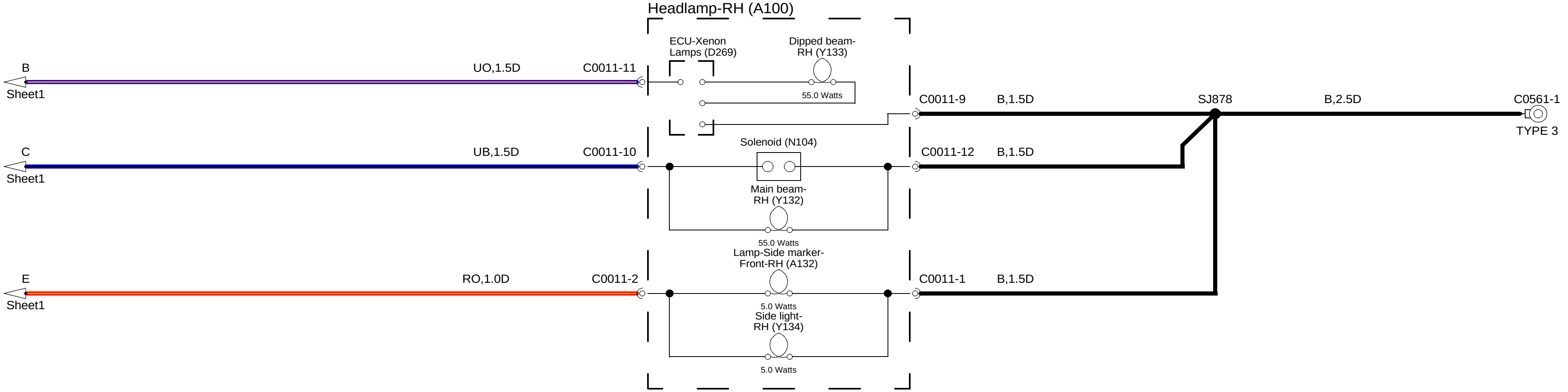

YB,MAPDB
YB,MAPAR
SJ865
YB,MAPAP
SJ864
C0376-7 C0390-7
YB,MAPD
C2178-A2
Parking Brake Module (D278)
C2178-A4
YB,MAPC
C0390-5 C0376-5
YB,MAPE
F
Sheet2
YN,MAPDB
YN,MAPAR
SJ855
YN,MAPAP
SJ854
C0376-6 C0390-6
YN,MAPD
C2178-B2
C2178-A3
YN,MAPC
C0390-4 C0376-4
YN,MAPE
G
Sheet2
Rear differential control module (D283)
Restraints control module (D171)
C0256-32
YB,MAPCA
C0256-31
YN,MAPCA
YN,MAPA
C2162-5
YB,MAPA
C2162-2
YB,MAPBA
C2162-6
YN,MAPBA
C2162-3
Engine control-module (ECM) (D131)
(PV8)
YN,MAPL
C0635L-57
CAN +
C0635L-58
YN,MAPM
C2242L-19 C2244L-19
YN,MAPA
SJ176
(DV6)
YB,MAPL
C0635L-44
CAN -
C0635L-45
YB,MAPM
(PV8)
C2242L-20 C2244L-20
YB,MAPA
SJ177
(DV6)
Throttle Pedal Position
Engine Speed
Eng Acceleration
Engine Torque
Brake Pedal Status
Engine control-module (ECM) (D131)
YN,MAPAD
C2274L-16 C2273-16
SR,0.75
C0411-B4
CAN +
C0872L-A4
YN,MAPAX
YB,MAPAD
C2274L-15 C2273-15
UR,0.75
C0411-B3
CAN -
C0872L-A3
YB,MAPAX
Throttle Pedal Position
Engine Speed
Eng Acceleration
Engine Torque
Brake Pedal Status
Transfer box control module (D204)
ABS module (D277)
(DIESEL)
CAN -
C0506L-14
YB,MAPR
SJ276
YB,MAPU
SJ775
YB,MAPT
C1319L-3
CAN -
C1854L-1
YB,MAPN
C2365L-3 C2366B-3
YB,0.5H
SJ721
YB,0.5H
C2366B-5 C2365L-5
(PETROL)
(DIESEL)
CAN +
C0506L-35
YN,MAPR
SJ274
YN,MAPU
SJ785
YN,MAPT
C1319L-6
CAN +
C1854L-4
YN,MAPN
C2365L-2 C2366B-2
YN,0.5H
SJ720
YN,0.5H
C2366B-4 C2365L-4
(PETROL)
Wheel Speed Signals
Not In Neutral Status

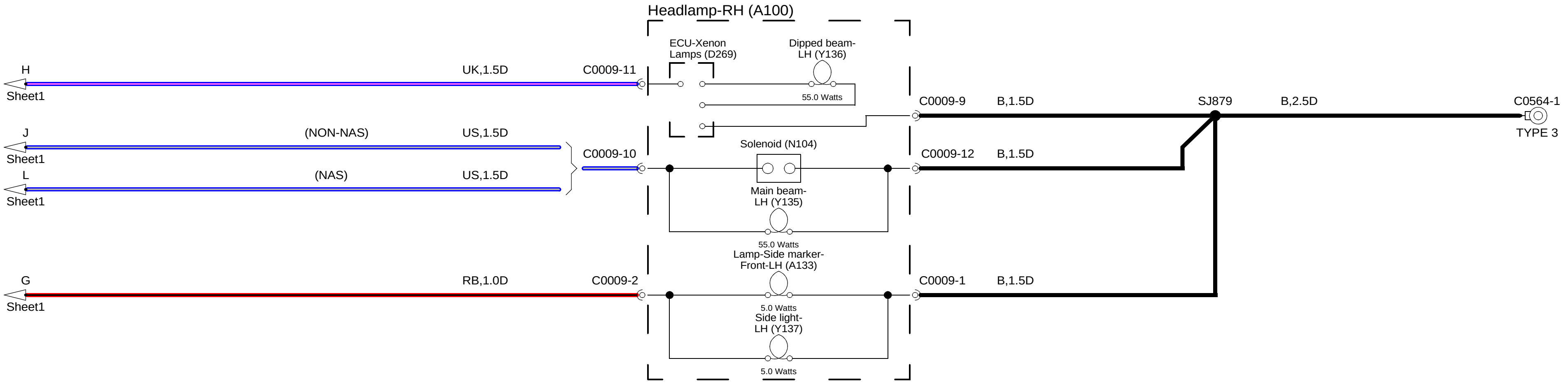

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 16E
40.0 Amps
C0570L-185
NG,4.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 15P
15.0 Amps
FUSE 66P
5.0 Amps
Relay-Hill-descent (R222)
1.50 k Ohms
Generic Electronic Module (D162)
CAN_L
CAN_H
Relay-Reverse (R217)
FUSE 5P
10.0 Amps
C0583L-16
C0585L-32
GP,1.5D
C0585L-35
GO,1.5D
C0582-7
R,0.5D
SJ105
C0583L-2
YR,0.5D
C0586L-24
GP,0.75D
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0580-15
YW,MAPX
C1167-6 C1165L-6
C0585L-41
GN,1.5D
SJ814
GP,1.5D
SJ813
GP,0.75D
C0832-2
High mounted stop lamp (A126)
C0832-1
B,0.75D
SJ832
B,2.5D
C2924-1
TYPE 3
Stop lamp-RH (A140)
GP,1.5D
C0125-1
RH stop lamp (A124)
21.0 Watts
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Lamp-Reverse-RH (A129)
GN,1.5D
C0125-2
21.0 Watts
Stop lamp switch (S215)
C0075L-4
C0075L-1
GP,1.5D
C0075L-3
C0075L-2
PG,1.0D
C2411L-3 C2412L-3
PG,0.5D
C0506L-41
ABS module (D277)
C0506L-35
YN,MAPR
SJ274
C0506L-22
C0506L-14
YB,MAPR
SJ276
R,0.5D
SJ667
R,0.5D
R,0.5D
C1167-11 C1165L-11
Stop lamp-LH (A139)
GP,1.5D
C0333-11 C0420-11
GP,1.5D
C0121-1
LH stop lamp (A125)
21.0 Watts
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
Lamp-Reverse-LH (A130)
SJ7
GN,1.5D
C0333-12 C0420-12
GN,1.5D
C0121-2
21.0 Watts
SJ8
B,1.5D
C2922-1
TYPE 3
Transmission control module (D306)
SJ720
YN,0.5H
C0193-6
SJ721
YB,0.5H
C0193-2
Switch-Reverse-lamp (S103)
AUTO

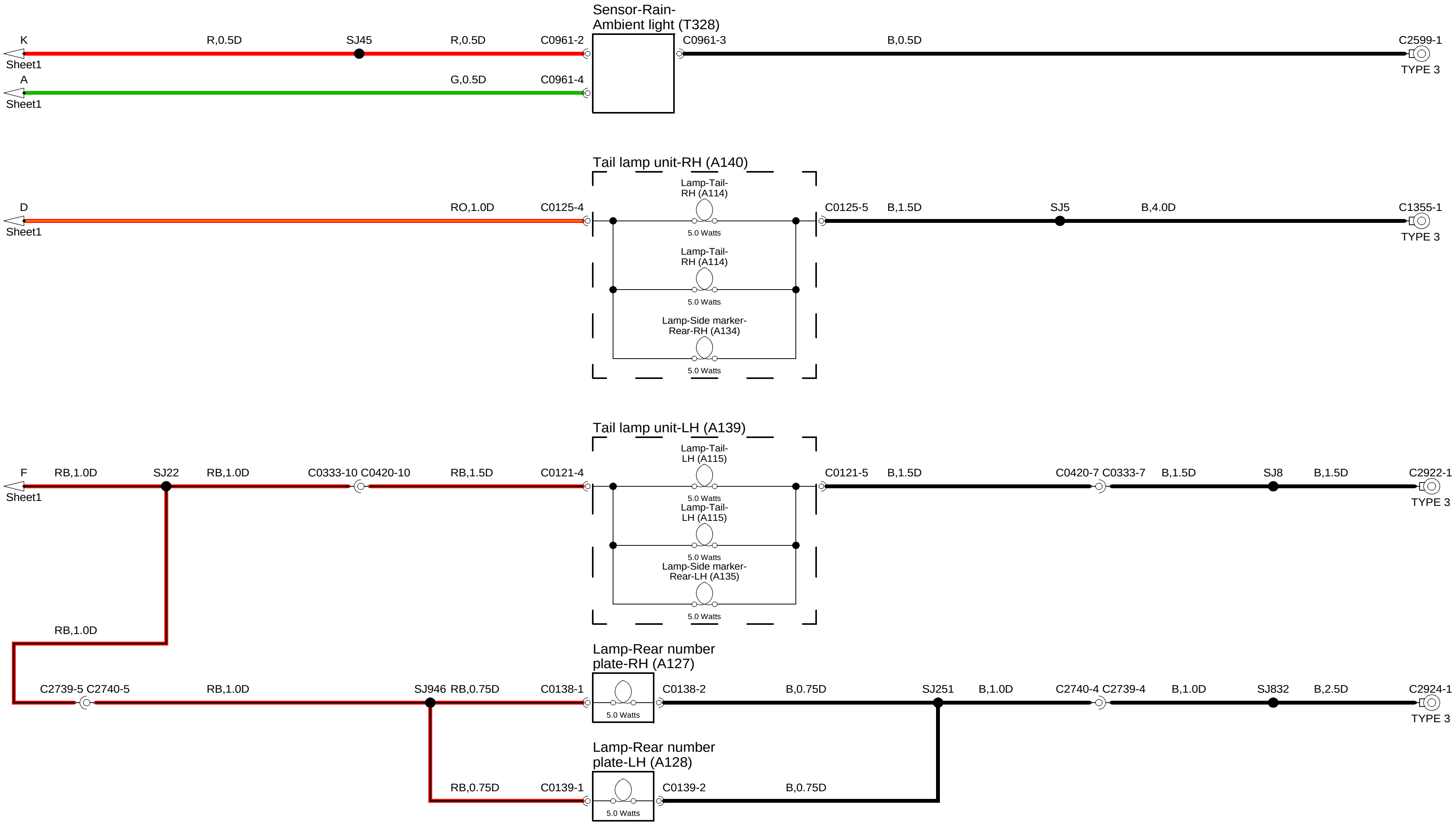

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central Junction Box (P101)
Lighting control switch (S100)
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D
C0041-8
C0041-6
Battery Junction Box (P108)
C0632-1
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
C0583L-21
SJ660
B,2.5D
C2627-1
Generic Electronic Module (D162)
C0580-25
Y,0.5D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
B,1.0D
N,4.0D
C2443-4 C2444L-4
Switch-Column (S123)
Indicator-RH (Y195)
Switch-Direction-indicator (S105)
Switch-Ignition (S176)
C0580-17
GR,0.35D
C1393-3
C1393-1
B,0.35D
SJ663
Indicator-LH (Y194)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
C0580-18
GW,0.35D
C1393-2
C0585L-25
B,2.5D
C1398L-1
Headlamp-RH (A100)
FET-Lamp-Cornering-RH (G163)
Lamp-Cornering-RH (A160)
C0583L-30
R,1.5D
C0011-4
C0011-16
B,1.5D
SJ878
B,2.5D
C0561-1
BTS443
21A
35.0 Watts
Headlamp-LH (A101)
FET-Lamp-Cornering-LH (G164)
Lamp-Cornering-LH (A161)
C0583L-31
R,1.5D
C0009-4
C0009-16
B,1.5D
SJ879
B,2.5D
C0564-1
BTS443
21A
35.0 Watts
Instrument cluster (J100)
Sensor-Steering-angle (T274)
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
SJ851
YN,MAPB
C0862-6
SJ731
YU,MAPD
C0230-18
C0230-2
YB,MAPA
SJ860
SJ861
YB,MAPB
C0862-7
Transfer box control module (D204)
ABS module (D277)
C1319L-6
YN,MAPT
SJ785
YN,MAPU
SJ274
YN,MAPR
C0506L-35
C1319L-3
YB,MAPT
SJ775
YB,MAPU
SJ276
YB,MAPR
C0506L-14

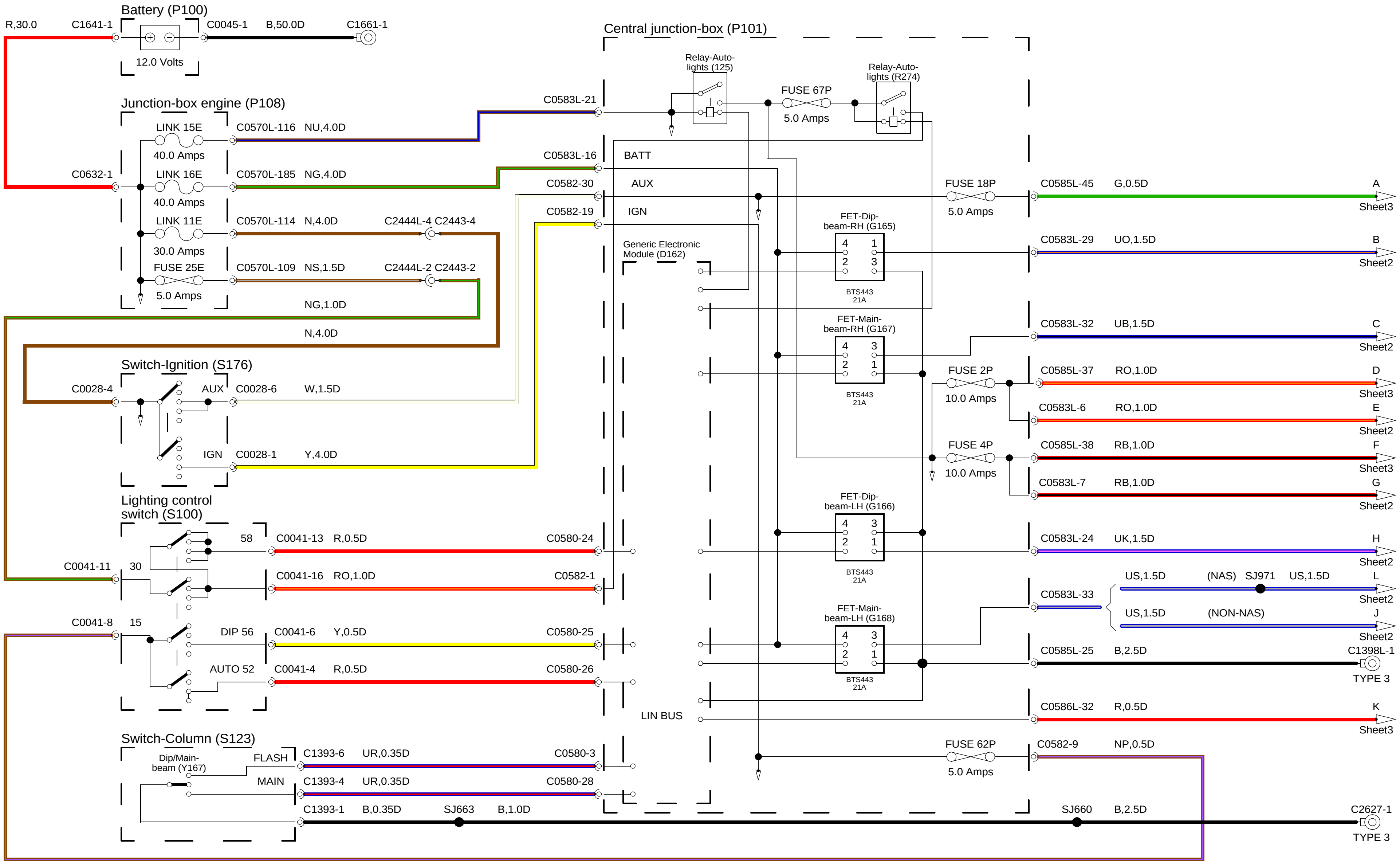

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-
Ignition (R211)
C0570L-74
B,1.0D
SJ573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
C0632-1
LINK 2E
C0570L-40
NP,4.0D
C0570L-72
30.0 Amps
LINK 11E
C0570L-114
N,4.0D
30.0 Amps
N,4.0D
C2443-4 C2444L-4
Lamp-Fog-
Front-LH (A109)
UP,1.5D
C2327-3 C2328-3
UP,1.5D
SJ191
UP,1.5D
C0514-1
C0514-2
B,1.5D
C2328-2 C2327-2
B,1.5D
55.0 Watts
SJ877
B,2.5D
C0561-1
TYPE 3
Lamp-Fog-
Front-RH (A108)
UP,1.5D
C0513-1
C0513-2
B,1.5D
C2328-1 C2327-1
B,1.5D
55.0 Watts
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Stop lamp-RH (A140)
Lamp-Fog guard-
Rear-RH (A110)
LG,0.5D
RY,1.5D
C0125-6
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
21.0 Watts
Central Junction
Box (P101)
C0582-19
FUSE 28P
C0583L-35
LG,0.5D
SJ574
5.0 Amps
Instrument cluster (J100)
Rear fog lamps
indicator (J150)
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
C0582-46
FUSE 32P
C0585L-21
RY,1.5D
SJ20
RY,0.75D
C1165L-10 C1167-10
RY,0.75D
C0230-20
15.0 Amps
0.03 Amps
Front fog lamps
indicator (J181)
C0582-14
FUSE 38P
C0583L-41
UP,1.5D
SJ172
UP,0.75D
C2240L-18 C2238-18
UP,0.75D
C0230-24
15.0 Amps
0.03 Amps
NP,4.0D
C2443-3 C2444L-3
Stop lamp-LH (A139)
Lamp-Fog guard-
Rear-LH (A111)
Lighting control
switch (S100)
Lighting control
switch (S100)
Switch-Fog lamp-
Front/rear (S112)
RY,1.5D
C0333-9 C0420-9
RY,1.5D
C0121-6
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
C0041-7
Xr
83a
C0041-2
RO,1.5D
21.0 Watts
83b
C0041-3
UR,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3

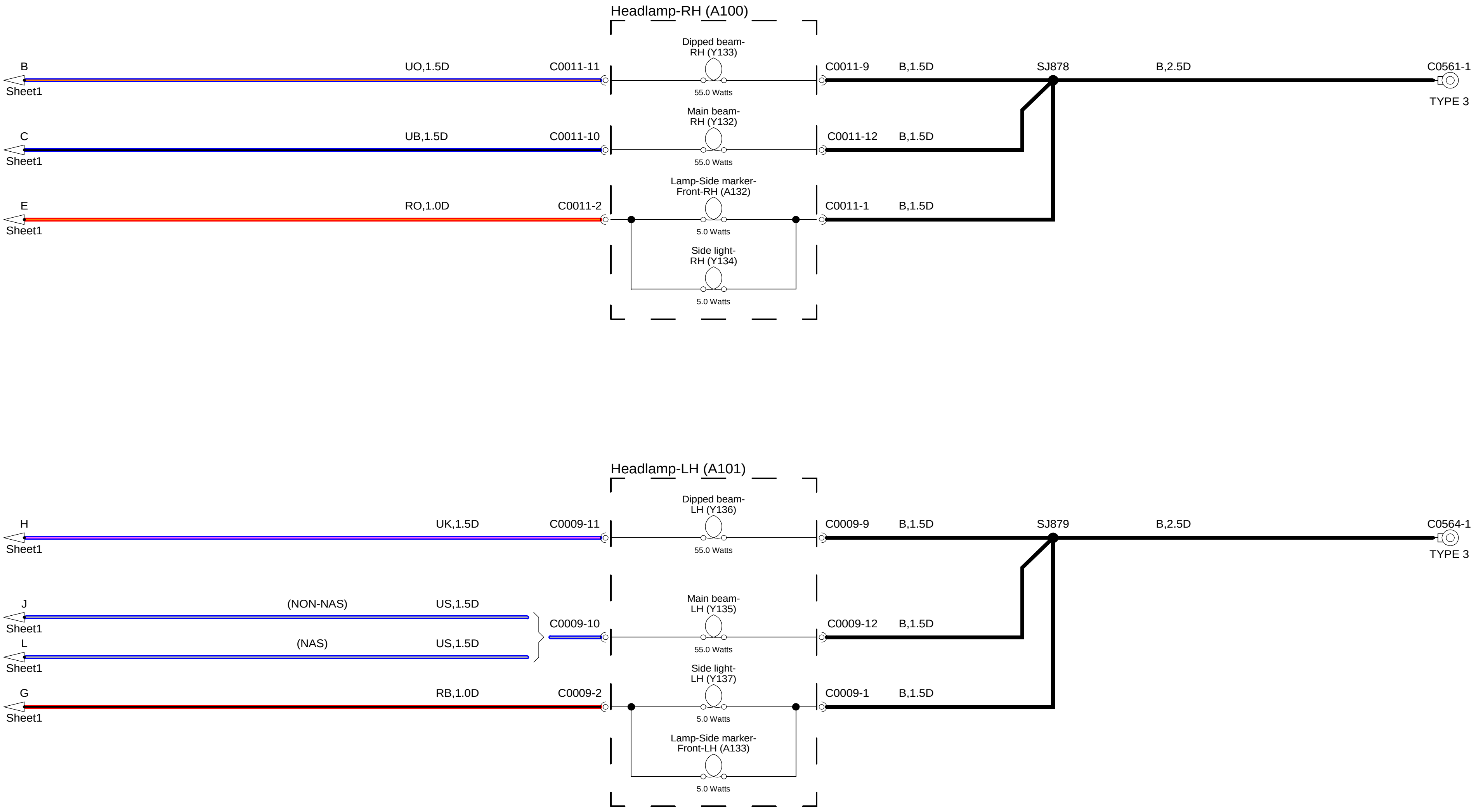

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
C0632-1
LINK 16E
40.0 Amps
C0570L-185
NG,4.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
FUSE 25E
5.0 Amps
C0570L-109
NS,1.5D
C2444L-2 C2443-2
NG,1.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
IGN
C0028-1
Y,4.0D
Lighting control switch (S100)
58
C0041-13
R,0.5D
C0580-24
C0041-11
30
C0041-16
RO,1.0D
C0582-1
C0041-8
15
DIP 56
C0041-6
Y,0.5D
C0580-25
AUTO 52
C0041-4
R,0.5D
C0580-26
LIN BUS
Switch-Column (S123)
Dip/Main-beam (Y167)
FLASH
C1393-6
UR,0.35D
C0580-3
MAIN
C1393-4
UR,0.35D
C0580-28
C1393-1
B,0.35D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Central junction-box (P101)
C0583L-21
Relay-Side-lamp (R125)
FUSE 67P
5.0 Amps
Relay-Auto-lights (R274)
C0583L-16
BATT
C0582-30
AUX
C0582-19
IGN
Generic Electronic Module (D162)
FUSE 18P
5.0 Amps
C0585L-45
G,0.5D
A
Sheet3
FET-Dip-beam-RH (G165)
4
1
2
3
BTS443 21A
C0583L-29
UO,1.5D
B
Sheet2
C0585L-37
RO,1.0D
D
Sheet3
FET-Main-beam-RH (G167)
4
3
2
1
BTS443 21A
C0583L-32
UB,1.5D
C
Sheet2
FUSE 2P
10.0 Amps
C0583L-6
RO,1.0D
E
Sheet2
FUSE 4P
10.0 Amps
C0585L-38
RB,1.0D
F
Sheet3
C0583L-7
RB,1.0D
G
Sheet2
FET-Dip-beam-LH (G166)
4
3
2
1
BTS443 21A
C0583L-24
UK,1.5D
H
Sheet2
US,1.5D
(NAS) SJ971 US,1.5D
L
Sheet2
C0583L-33
US,1.5D
(NON-NAS)
J
Sheet2
FET-Main-beam-LH (G168)
4
3
2
1
BTS443 21A
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C0586L-32
R,0.5D
K
Sheet3
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D

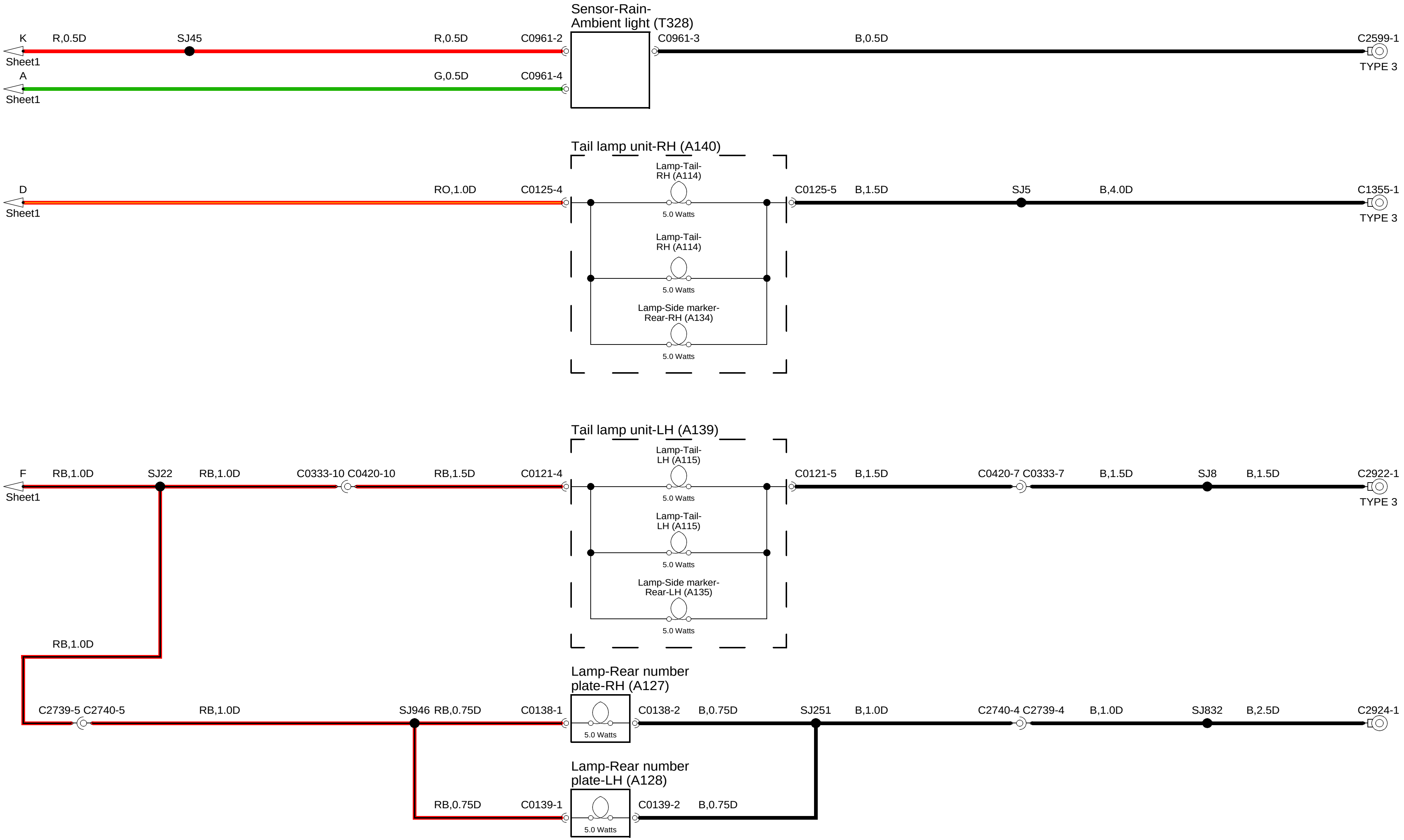

Headlamp-RH (A100)
ECU-Xenon Lamps (D269)
Dipped beam-RH (Y133)
55.0 Watts
B
Sheet1
UO,1.5D
C0011-11
C0011-9
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
Solenoid (N104)
C
Sheet1
UB,1.5D
C0011-10
C0011-12
B,1.5D
Main beam-RH (Y132)
55.0 Watts
Lamp-Side marker-Front-RH (A132)
E
Sheet1
RO,1.0D
C0011-2
C0011-1
B,1.5D
5.0 Watts
Side light-RH (Y134)
5.0 Watts

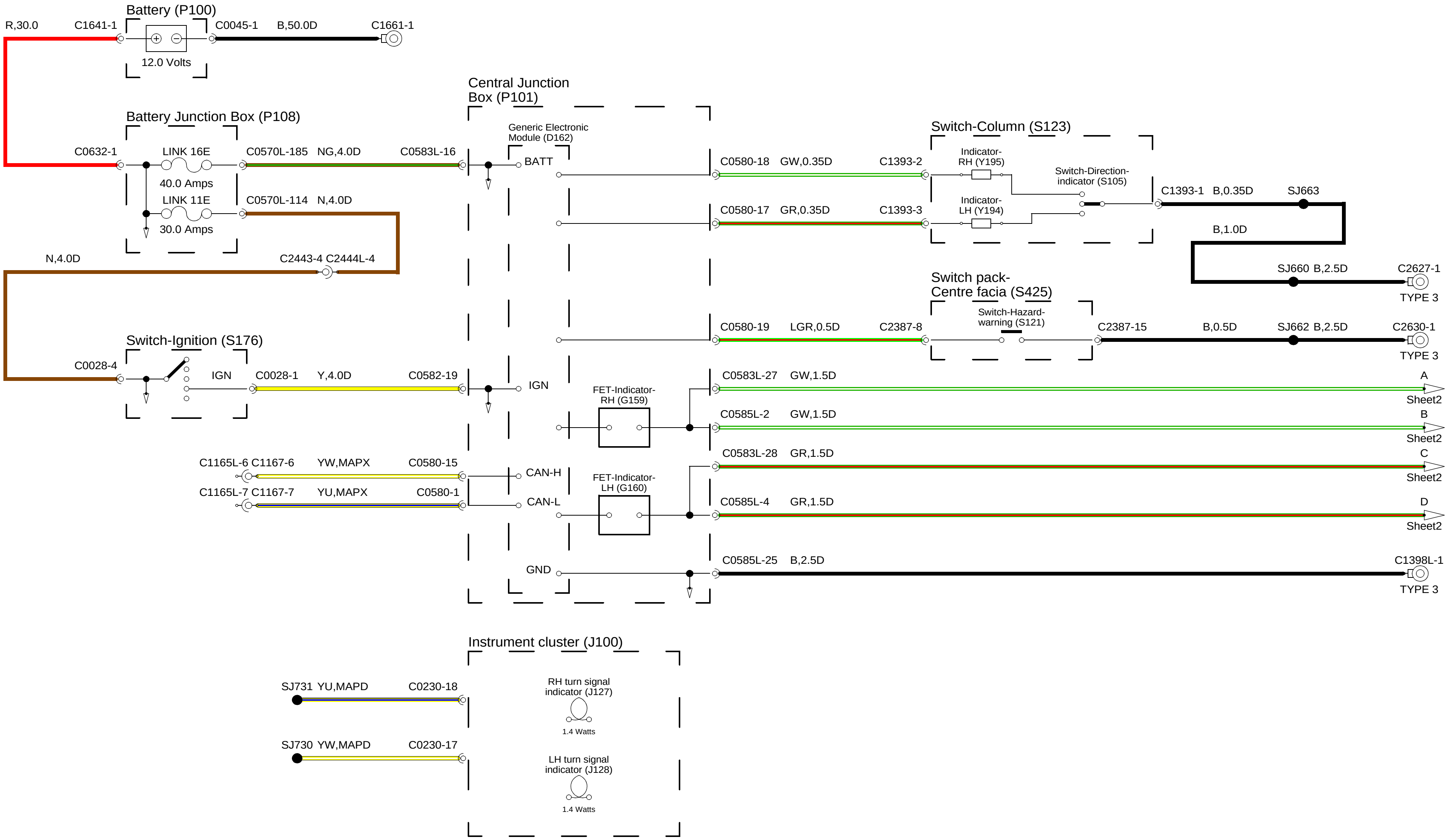

Headlamp-RH (A100)
ECU-Xenon Lamps (D269)
Dipped beam-LH (Y136)
55.0 Watts
H
Sheet1
UK,1.5D
C0009-11
C0009-9
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
J
Sheet1
(NON-NAS)
US,1.5D
C0009-10
Solenoid (N104)
C0009-12
B,1.5D
L
Sheet1
(NAS)
US,1.5D
Main beam-LH (Y135)
55.0 Watts
Lamp-Side marker-Front-LH (A133)
G
Sheet1
RB,1.0D
C0009-2
C0009-1
B,1.5D
5.0 Watts
Side light-LH (Y137)
5.0 Watts

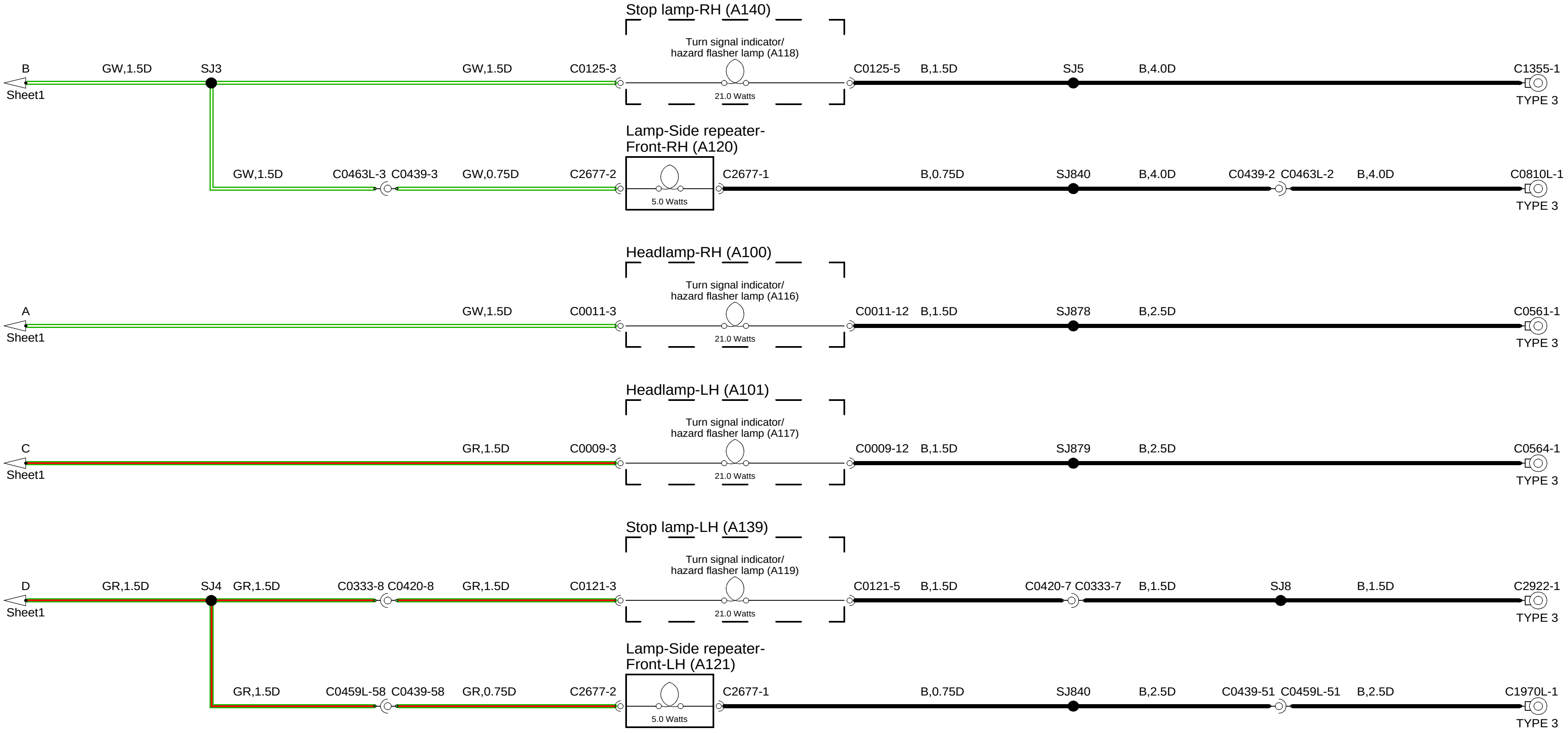

Sensor-Rain-
Ambient light (T328)
K
Sheet1
R,0.5D
SJ45
R,0.5D
C0961-2
C0961-3
B,0.5D
C2599-1
TYPE 3
A
Sheet1
G,0.5D
C0961-4
Tail lamp unit-RH (A140)
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Side marker-
Rear-RH (A134)
5.0 Watts
D
Sheet1
RO,1.0D
C0125-4
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Tail lamp unit-LH (A139)
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Side marker-
Rear-LH (A135)
5.0 Watts
F
Sheet1
RB,1.0D
SJ22
RB,1.0D
C0333-10 C0420-10
RB,1.5D
C0121-4
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
RB,1.0D
Lamp-Rear number
plate-RH (A127)
C2739-5 C2740-5
RB,1.0D
SJ946
RB,0.75D
C0138-1
5.0 Watts
C0138-2
B,0.75D
SJ251
B,1.0D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
TYPE 3
Lamp-Rear number
plate-LH (A128)
RB,0.75D
C0139-1
5.0 Watts
C0139-2
B,0.75D


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
C0632-1
LINK 16E
40.0 Amps
C0570L-185
NG,4.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
FUSE 25E
5.0 Amps
C0570L-109
NS,1.5D
C2444L-2 C2443-2
NG,1.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
IGN
C0028-1
Y,4.0D
Lighting control switch (S100)
58
C0041-13
R,0.5D
C0580-24
C0041-11
30
C0041-16
RO,1.0D
C0582-1
C0041-8
15
DIP 56
C0041-6
Y,0.5D
C0580-25
AUTO 52
C0041-4
R,0.5D
C0580-26
Switch-Column (S123)
Dip/Main-beam (Y167)
FLASH
C1393-6
UR,0.35D
C0580-3
MAIN
C1393-4
UR,0.35D
C0580-28
C1393-1
B,0.35D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Central junction-box (P101)
C0583L-21
Relay-Auto-lights (125)
FUSE 67P
5.0 Amps
Relay-Auto-lights (R274)
C0583L-16
BATT
C0582-30
AUX
C0582-19
IGN
Generic Electronic Module (D162)
LIN BUS
FUSE 18P
5.0 Amps
C0585L-45
G,0.5D
A
Sheet3
FET-Dip-beam-RH (G165)
4 1
2 3
BTS443
21A
C0583L-29
UO,1.5D
B
Sheet2
FET-Main-beam-RH (G167)
4 3
2 1
BTS443
21A
C0583L-32
UB,1.5D
C
Sheet2
FUSE 2P
10.0 Amps
C0585L-37
RO,1.0D
D
Sheet3
C0583L-6
RO,1.0D
E
Sheet2
FUSE 4P
10.0 Amps
C0585L-38
RB,1.0D
F
Sheet3
C0583L-7
RB,1.0D
G
Sheet2
FET-Dip-beam-LH (G166)
4 3
2 1
BTS443
21A
C0583L-24
UK,1.5D
H
Sheet2
C0583L-33
US,1.5D
(NAS)
SJ971
US,1.5D
L
Sheet2
US,1.5D
(NON-NAS)
J
Sheet2
FET-Main-beam-LH (G168)
4 3
2 1
BTS443
21A
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C0586L-32
R,0.5D
K
Sheet3
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D

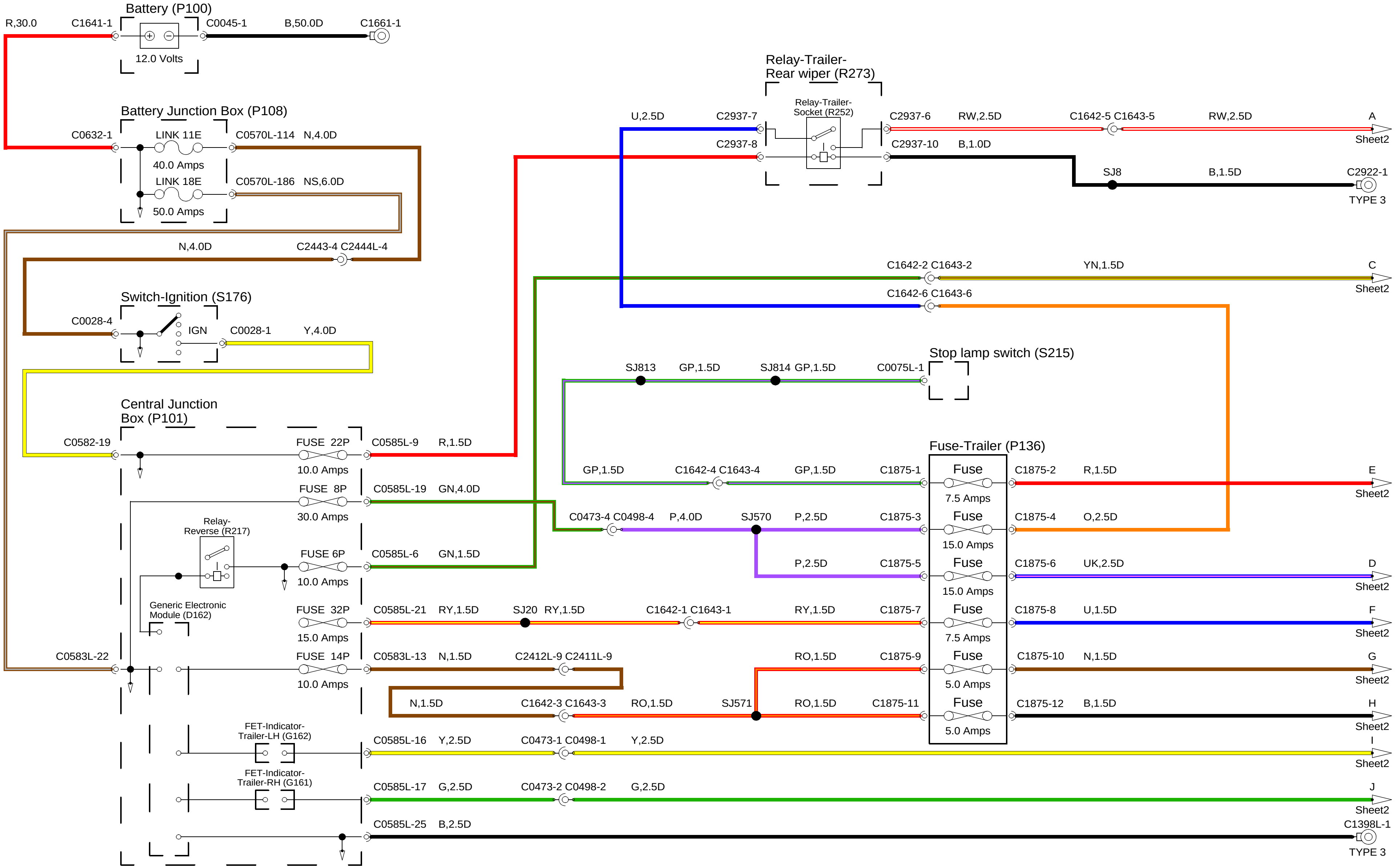

Headlamp-RH (A100)
B
Sheet1
UO,1.5D
C0011-11
Dipped beam-
RH (Y133)
55.0 Watts
C0011-9
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
C
Sheet1
UB,1.5D
C0011-10
Main beam-
RH (Y132)
55.0 Watts
C0011-12
B,1.5D
E
Sheet1
RO,1.0D
C0011-2
Lamp-Side marker-
Front-RH (A132)
5.0 Watts
C0011-1
B,1.5D
Side light-
RH (Y134)
5.0 Watts
Headlamp-LH (A101)
H
Sheet1
UK,1.5D
C0009-11
Dipped beam-
LH (Y136)
55.0 Watts
C0009-9
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
J
Sheet1
(NON-NAS)
US,1.5D
L
Sheet1
(NAS)
US,1.5D
C0009-10
Main beam-
LH (Y135)
55.0 Watts
C0009-12
B,1.5D
G
Sheet1
RB,1.0D
C0009-2
Side light-
LH (Y137)
5.0 Watts
C0009-1
B,1.5D
Lamp-Side marker-
Front-LH (A133)
5.0 Watts

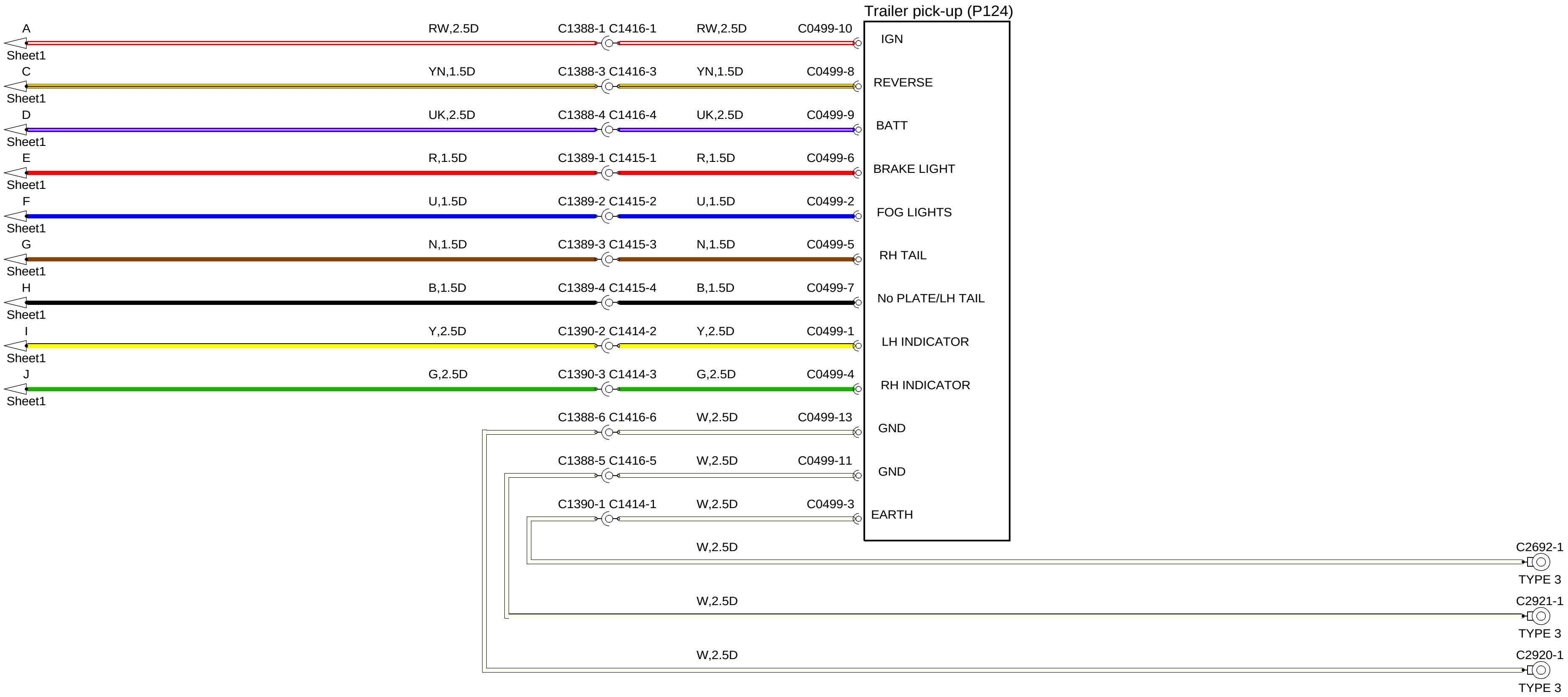

Sensor-Rain-
Ambient light (T328)
K
Sheet1
R,0.5D
SJ45
R,0.5D
C0961-2
C0961-3
B,0.5D
C2599-1
TYPE 3
A
Sheet1
G,0.5D
C0961-4
Tail lamp unit-RH (A140)
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Side marker-
Rear-RH (A134)
5.0 Watts
D
Sheet1
RO,1.0D
C0125-4
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Tail lamp unit-LH (A139)
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Side marker-
Rear-LH (A135)
5.0 Watts
F
Sheet1
RB,1.0D
SJ22
RB,1.0D
C0333-10 C0420-10
RB,1.5D
C0121-4
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
RB,1.0D
Lamp-Rear number
plate-RH (A127)
5.0 Watts
C2739-5 C2740-5
RB,1.0D
SJ946
RB,0.75D
C0138-1
C0138-2
B,0.75D
SJ251
B,1.0D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
Lamp-Rear number
plate-LH (A128)
5.0 Watts
RB,0.75D
C0139-1
C0139-2
B,0.75D

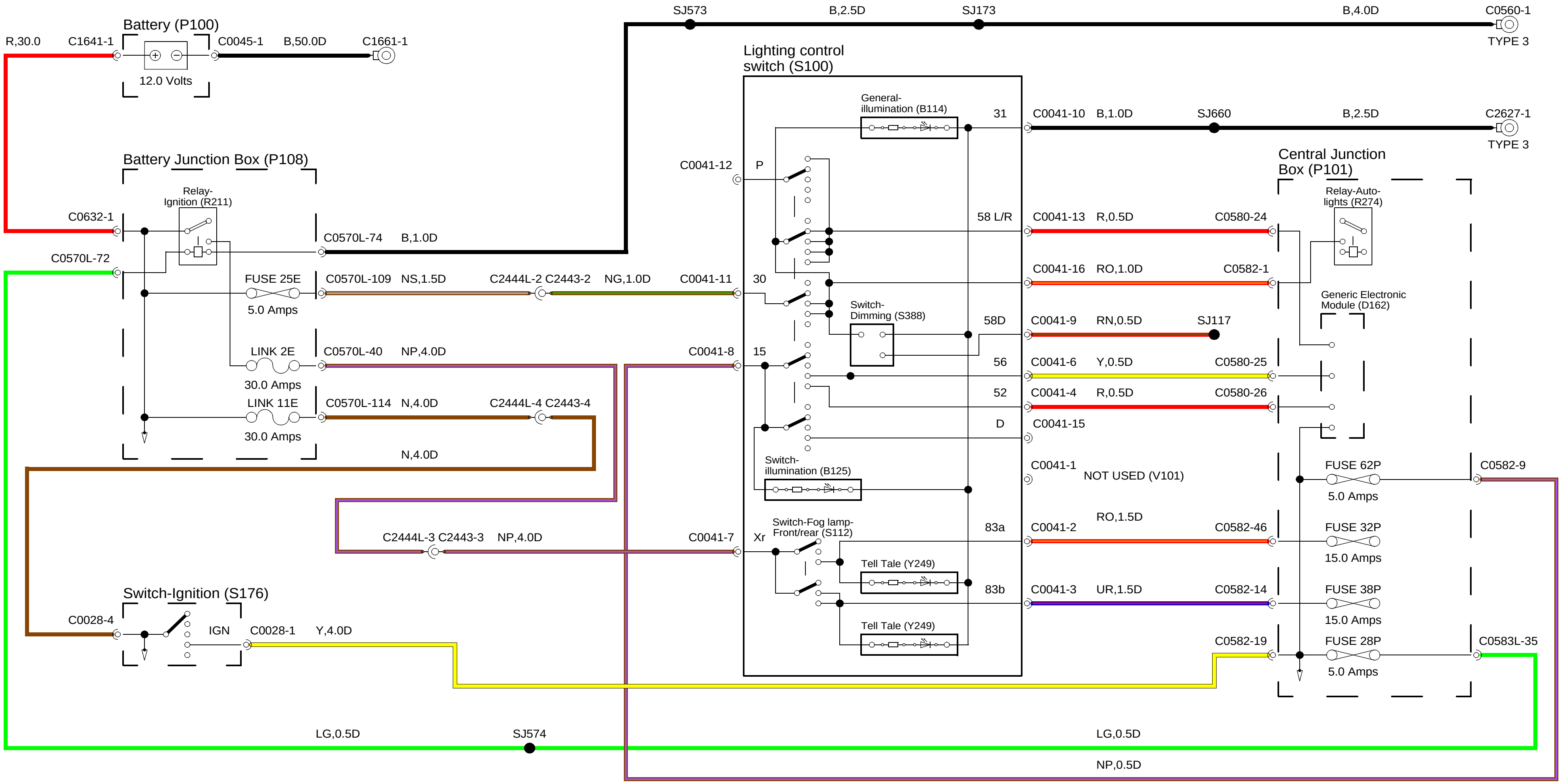

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central Junction Box (P101)
Battery Junction Box (P108)
Generic Electronic Module (D162)
Switch-Column (S123)
C0632-1
LINK 16E
C0570L-185
NG,4.0D
C0583L-16
BATT
C0580-18
GW,0.35D
C1393-2
Indicator-RH (Y195)
Switch-Direction-indicator (S105)
40.0 Amps
LINK 11E
C0570L-114
N,4.0D
C1393-1
B,0.35D
SJ663
Indicator-LH (Y194)
C0580-17
GR,0.35D
C1393-3
30.0 Amps
B,1.0D
N,4.0D
C2443-4 C2444L-4
SJ660 B,2.5D
C2627-1
TYPE 3
Switch pack-Centre facia (S425)
Switch-Hazard-warning (S121)
Switch-Ignition (S176)
C0580-19
LGR,0.5D
C2387-8
C2387-15
B,0.5D
SJ662 B,2.5D
C2630-1
TYPE 3
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
IGN
C0583L-27
GW,1.5D
A
Sheet2
FET-Indicator-RH (G159)
C0585L-2
GW,1.5D
B
Sheet2
C0583L-28
GR,1.5D
C
Sheet2
C1165L-6 C1167-6
YW,MAPX
C0580-15
CAN-H
FET-Indicator-LH (G160)
C1165L-7 C1167-7
YU,MAPX
C0580-1
CAN-L
C0585L-4
GR,1.5D
D
Sheet2
GND
C0585L-25
B,2.5D
C1398L-1
TYPE 3
Instrument cluster (J100)
SJ731 YU,MAPD
C0230-18
RH turn signal indicator (J127)
1.4 Watts
SJ730 YW,MAPD
C0230-17
LH turn signal indicator (J128)
1.4 Watts

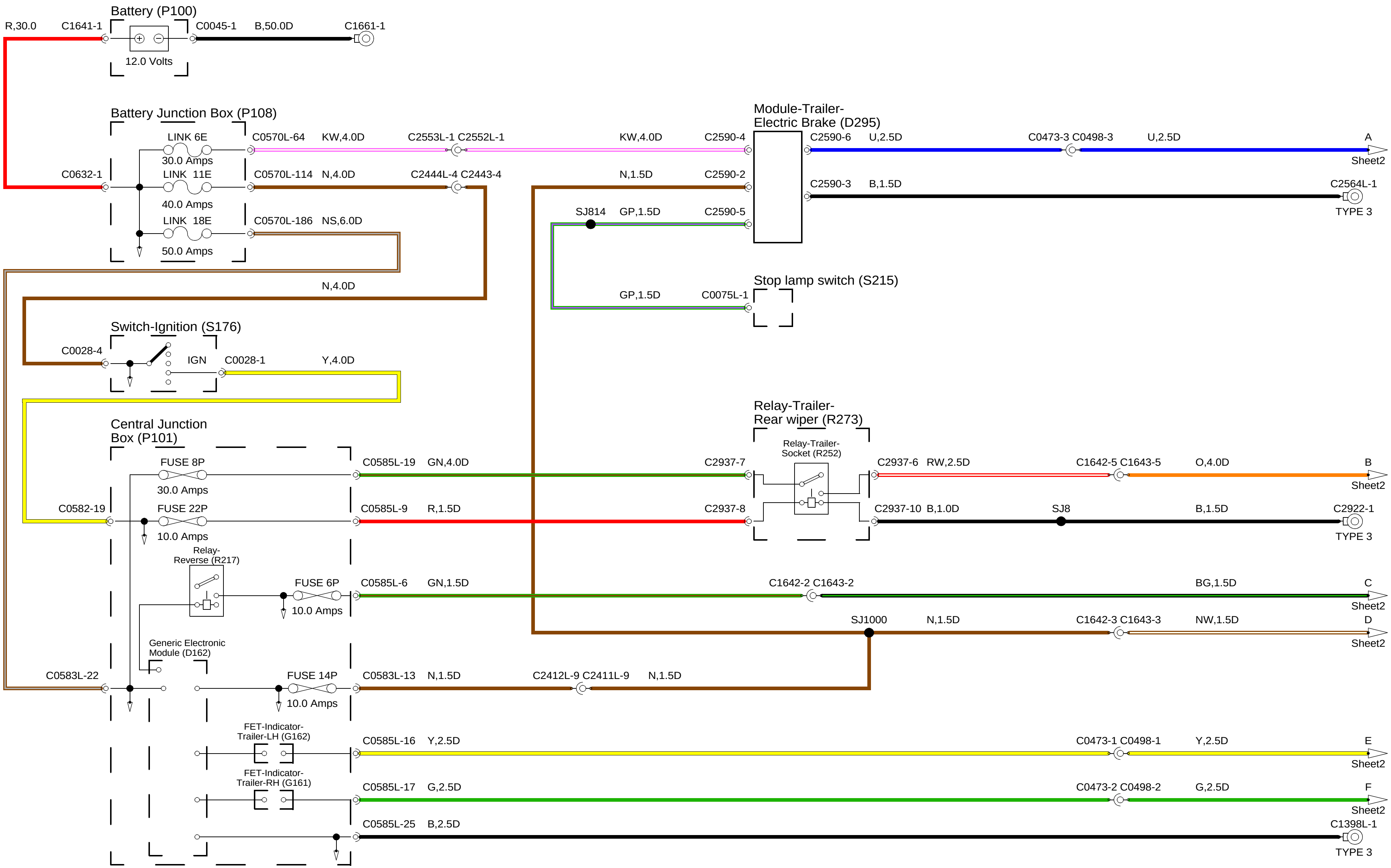

Stop lamp-RH (A140)
Turn signal indicator/
hazard flasher lamp (A118)
B
GW,1.5D
SJ3
GW,1.5D
C0125-3
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
Sheet1
21.0 Watts
TYPE 3
Lamp-Side repeater-
Front-RH (A120)
GW,1.5D
C0463L-3
C0439-3
GW,0.75D
C2677-2
C2677-1
B,0.75D
SJ840
B,4.0D
C0439-2
C0463L-2
B,4.0D
C0810L-1
5.0 Watts
TYPE 3
Headlamp-RH (A100)
Turn signal indicator/
hazard flasher lamp (A116)
A
GW,1.5D
C0011-3
C0011-12
B,1.5D
SJ878
B,2.5D
C0561-1
Sheet1
21.0 Watts
TYPE 3
Headlamp-LH (A101)
Turn signal indicator/
hazard flasher lamp (A117)
C
GR,1.5D
C0009-3
C0009-12
B,1.5D
SJ879
B,2.5D
C0564-1
Sheet1
21.0 Watts
TYPE 3
Stop lamp-LH (A139)
Turn signal indicator/
hazard flasher lamp (A119)
D
GR,1.5D
SJ4
GR,1.5D
C0333-8
C0420-8
GR,1.5D
C0121-3
C0121-5
B,1.5D
C0420-7
C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
Sheet1
21.0 Watts
TYPE 3
Lamp-Side repeater-
Front-LH (A121)
GR,1.5D
C0459L-58
C0439-58
GR,0.75D
C2677-2
C2677-1
B,0.75D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
5.0 Watts
TYPE 3

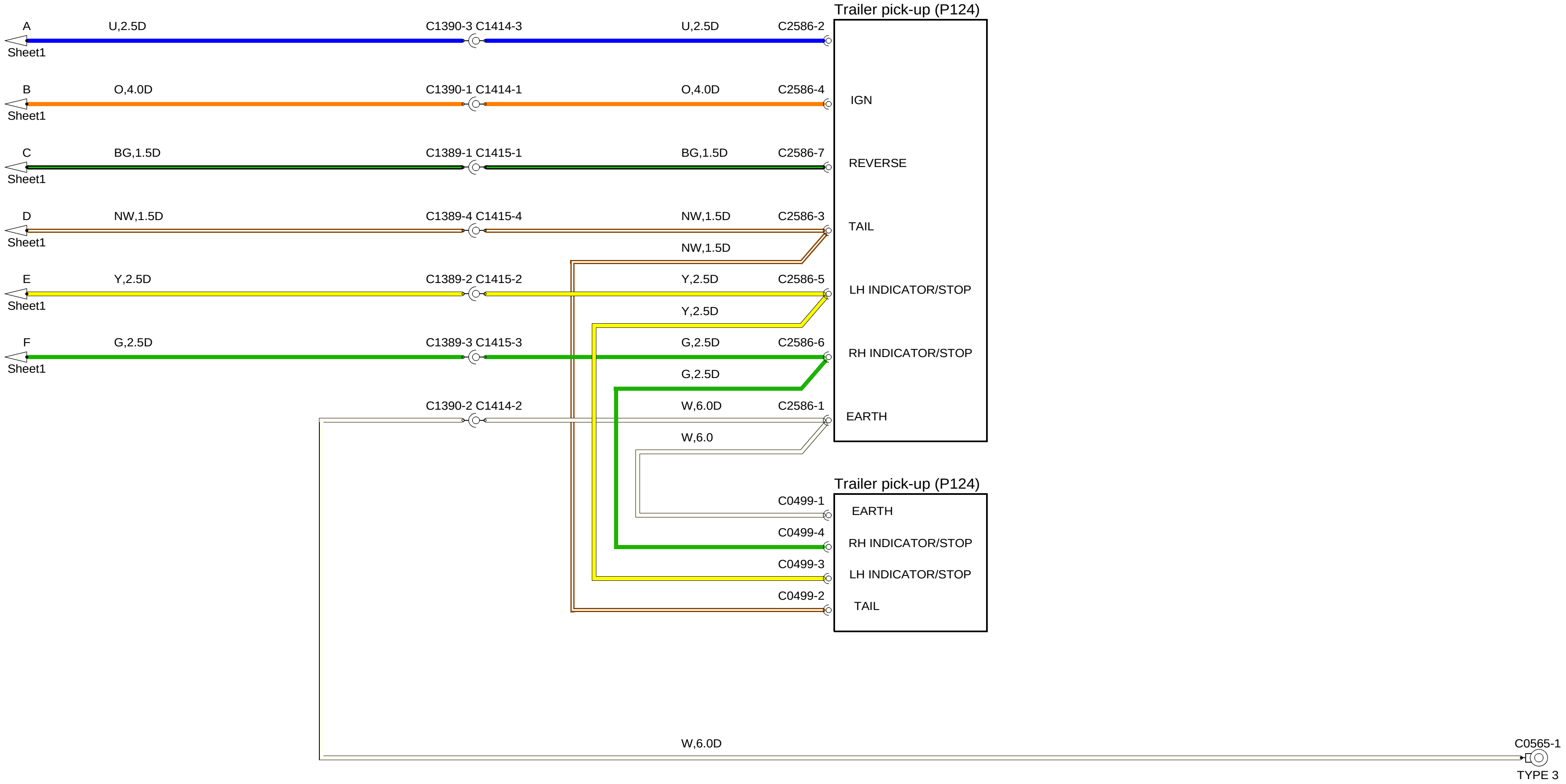
Trailer socket - Europe

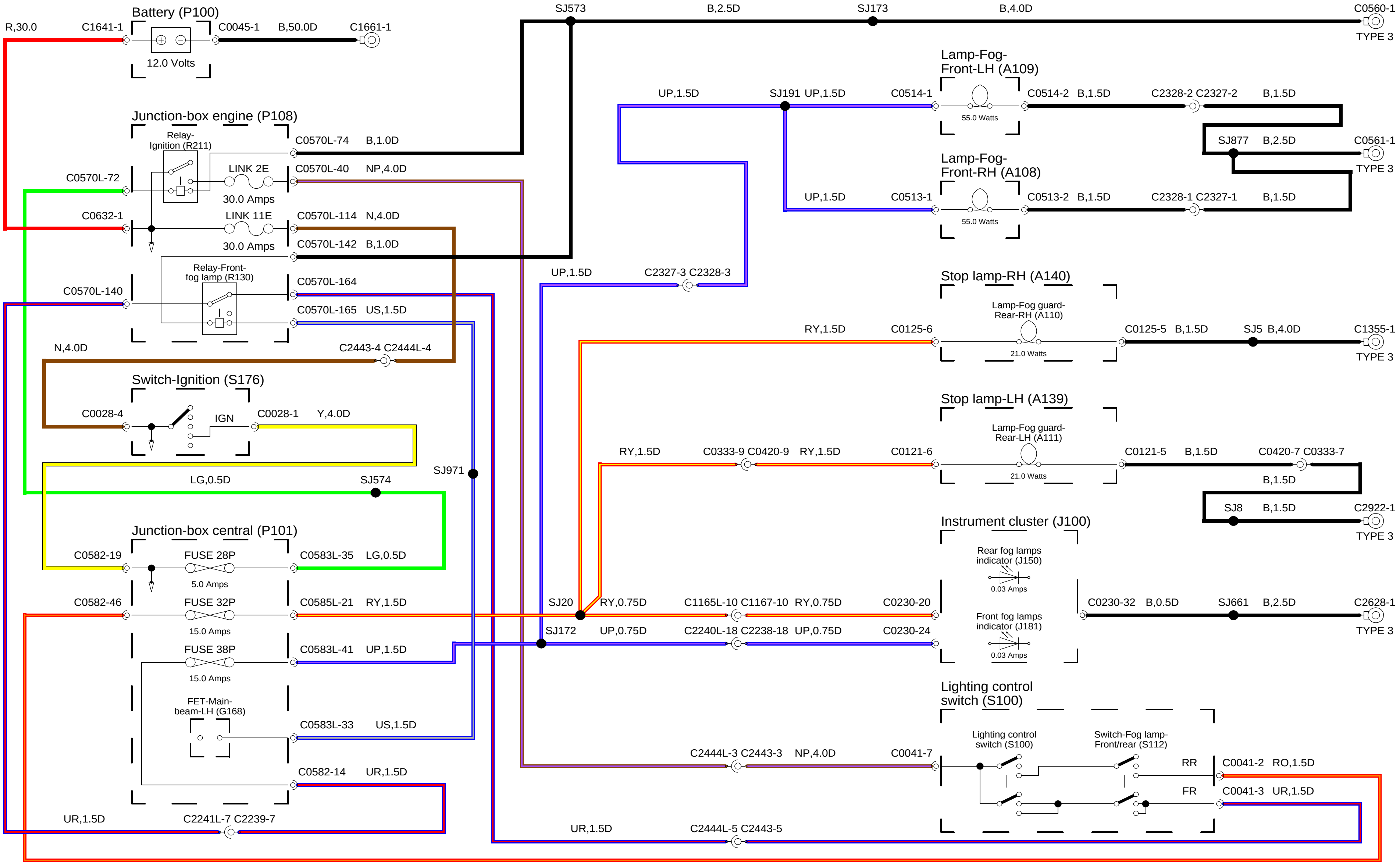

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
40.0 Amps
LINK 18E
50.0 Amps
C0570L-114
N,4.0D
C0570L-186
NS,6.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 22P
10.0 Amps
C0585L-9
R,1.5D
FUSE 8P
30.0 Amps
C0585L-19
GN,4.0D
Relay-Reverse (R217)
FUSE 6P
10.0 Amps
C0585L-6
GN,1.5D
Generic Electronic Module (D162)
FUSE 32P
15.0 Amps
C0585L-21
RY,1.5D
SJ20
RY,1.5D
C1642-1 C1643-1
RY,1.5D
C1875-7
C0583L-22
FUSE 14P
10.0 Amps
C0583L-13
N,1.5D
C2412L-9 C2411L-9
N,1.5D
C1642-3 C1643-3
RO,1.5D
SJ571
RO,1.5D
C1875-11
RO,1.5D
C1875-9
FET-Indicator-Trailer-LH (G162)
C0585L-16
Y,2.5D
C0473-1 C0498-1
Y,2.5D
FET-Indicator-Trailer-RH (G161)
C0585L-17
G,2.5D
C0473-2 C0498-2
G,2.5D
C0585L-25
B,2.5D
C1398L-1
TYPE 3
Relay-Trailer-Rear wiper (R273)
Relay-Trailer-Socket (R252)
U,2.5D
C2937-7
C2937-8
C2937-6
RW,2.5D
C1642-5 C1643-5
RW,2.5D
A
Sheet2
C2937-10
B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
C1642-2 C1643-2
YN,1.5D
C
Sheet2
C1642-6 C1643-6
Stop lamp switch (S215)
SJ813
GP,1.5D
SJ814
GP,1.5D
C0075L-1
Fuse-Trailer (P136)
GP,1.5D
C1642-4 C1643-4
GP,1.5D
C1875-1
Fuse
7.5 Amps
C1875-2
R,1.5D
E
Sheet2
C0473-4 C0498-4
P,4.0D
SJ570
P,2.5D
C1875-3
Fuse
15.0 Amps
C1875-4
O,2.5D
P,2.5D
C1875-5
Fuse
15.0 Amps
C1875-6
UK,2.5D
D
Sheet2
Fuse
7.5 Amps
C1875-8
U,1.5D
F
Sheet2
Fuse
5.0 Amps
C1875-10
N,1.5D
G
Sheet2
Fuse
5.0 Amps
C1875-12
B,1.5D
H
Sheet2
I
Sheet2
J
Sheet2

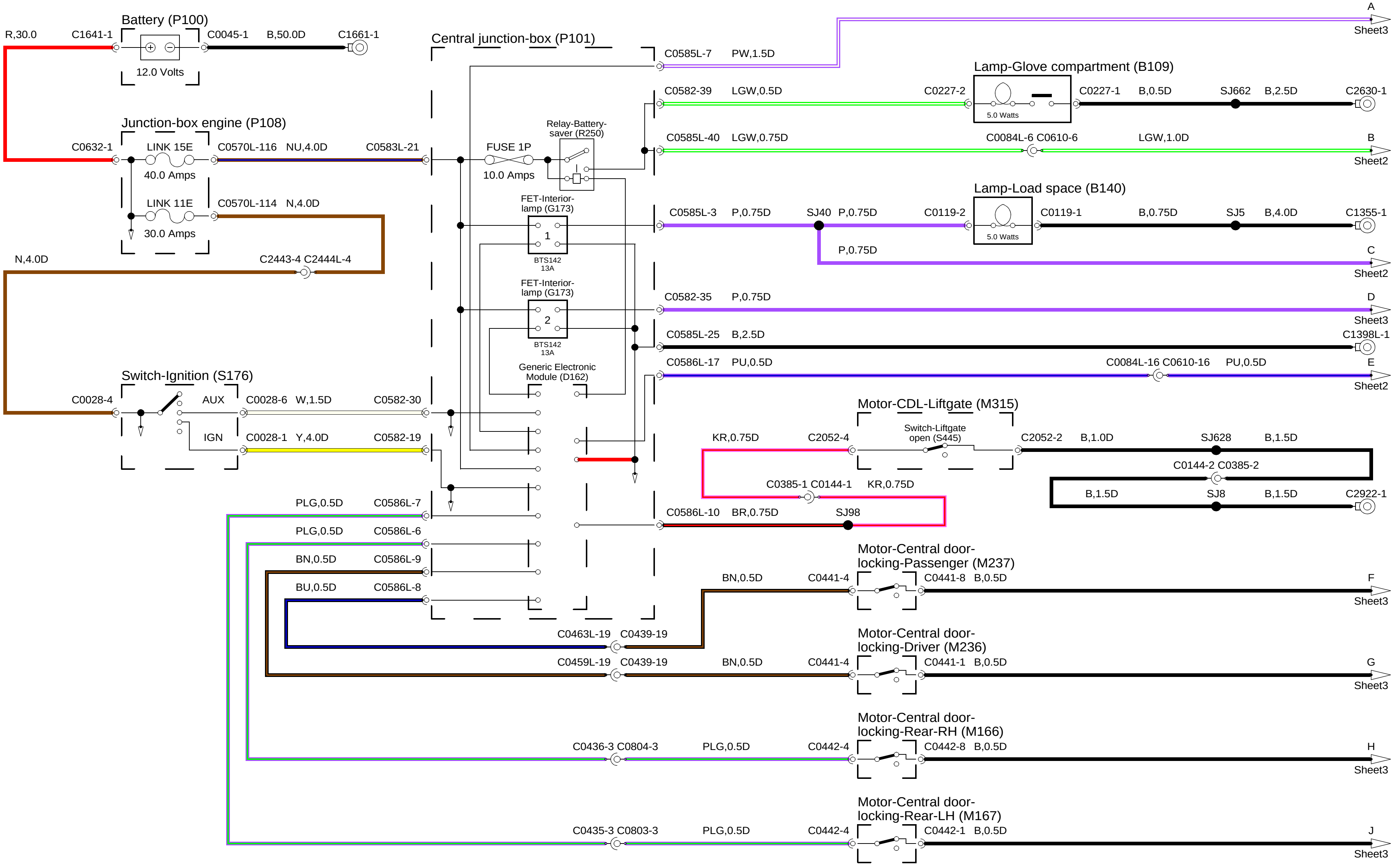

Trailer pick-up (P124)
A
Sheet1
RW,2.5D
C1388-1 C1416-1
RW,2.5D
C0499-10
IGN
C
Sheet1
YN,1.5D
C1388-3 C1416-3
YN,1.5D
C0499-8
REVERSE
D
Sheet1
UK,2.5D
C1388-4 C1416-4
UK,2.5D
C0499-9
BATT
E
Sheet1
R,1.5D
C1389-1 C1415-1
R,1.5D
C0499-6
BRAKE LIGHT
F
Sheet1
U,1.5D
C1389-2 C1415-2
U,1.5D
C0499-2
FOG LIGHTS
G
Sheet1
N,1.5D
C1389-3 C1415-3
N,1.5D
C0499-5
RH TAIL
H
Sheet1
B,1.5D
C1389-4 C1415-4
B,1.5D
C0499-7
No PLATE/LH TAIL
I
Sheet1
Y,2.5D
C1390-2 C1414-2
Y,2.5D
C0499-1
LH INDICATOR
J
Sheet1
G,2.5D
C1390-3 C1414-3
G,2.5D
C0499-4
RH INDICATOR
C1388-6 C1416-6
W,2.5D
C0499-13
GND
C1388-5 C1416-5
W,2.5D
C0499-11
GND
C1390-1 C1414-1
W,2.5D
C0499-3
EARTH
W,2.5D
C2692-1
TYPE 3
W,2.5D
C2921-1
TYPE 3
W,2.5D
C2920-1
TYPE 3

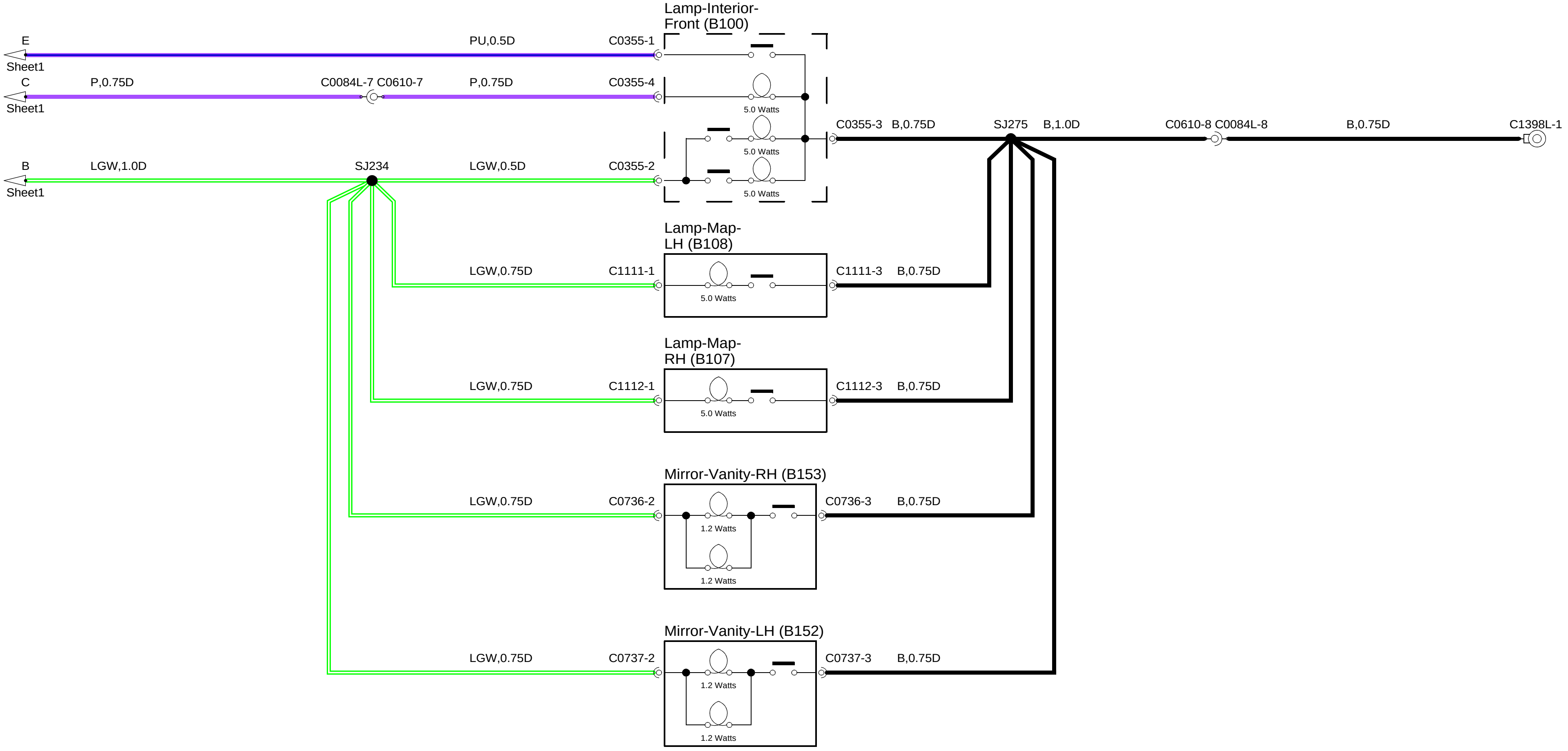

SJ573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Lighting control switch (S100)
General-illumination (B114)
31
C0041-10
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Battery Junction Box (P108)
Relay-Ignition (R211)
C0041-12
P
Central Junction Box (P101)
Relay-Auto-lights (R274)
C0632-1
58 L/R
C0041-13
R,0.5D
C0580-24
C0570L-74
B,1.0D
C0570L-72
C0041-16
RO,1.0D
C0582-1
FUSE 25E
5.0 Amps
C0570L-109
NS,1.5D
C2444L-2 C2443-2
NG,1.0D
C0041-11
30
Generic Electronic Module (D162)
Switch-Dimming (S388)
58D
C0041-9
RN,0.5D
SJ117
LINK 2E
30.0 Amps
C0570L-40
NP,4.0D
C0041-8
15
56
C0041-6
Y,0.5D
C0580-25
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
52
C0041-4
R,0.5D
C0580-26
D
C0041-15
N,4.0D
Switch-illumination (B125)
C0041-1
NOT USED (V101)
FUSE 62P
5.0 Amps
C0582-9
Switch-Fog lamp-Front/rear (S112)
83a
C0041-2
RO,1.5D
C0582-46
FUSE 32P
15.0 Amps
C2444L-3 C2443-3
NP,4.0D
C0041-7
Xr
Tell Tale (Y249)
83b
C0041-3
UR,1.5D
C0582-14
FUSE 38P
15.0 Amps
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Tell Tale (Y249)
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,0.5D
NP,0.5D

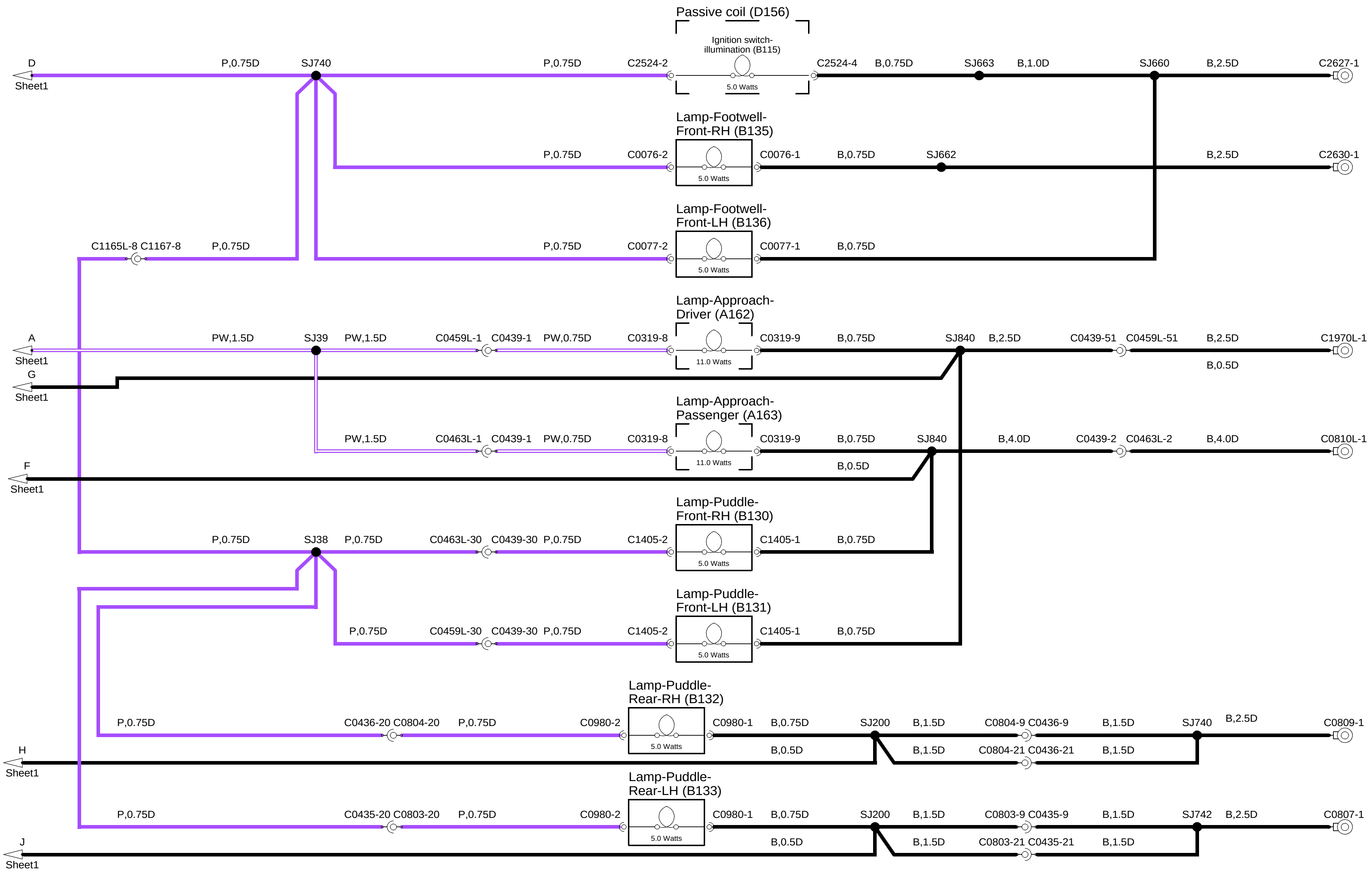

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
LINK 6E
30.0 Amps
LINK 11E
40.0 Amps
LINK 18E
50.0 Amps
C0632-1
C0570L-64
KW,4.0D
C2553L-1 C2552L-1
KW,4.0D
C2590-4
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,1.5D
C2590-2
C0570L-186
NS,6.0D
SJ814
GP,1.5D
C2590-5
Module-Trailer-
Electric Brake (D295)
C2590-6
U,2.5D
C0473-3 C0498-3
U,2.5D
A
Sheet2
C2590-3
B,1.5D
C2564L-1
TYPE 3
Stop lamp switch (S215)
GP,1.5D
C0075L-1
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Relay-Trailer-
Rear wiper (R273)
Relay-Trailer-
Socket (R252)
Central Junction
Box (P101)
FUSE 8P
30.0 Amps
C0585L-19
GN,4.0D
C2937-7
C2937-6
RW,2.5D
C1642-5 C1643-5
O,4.0D
B
Sheet2
C0582-19
FUSE 22P
10.0 Amps
C0585L-9
R,1.5D
C2937-8
C2937-10
B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
Relay-
Reverse (R217)
FUSE 6P
10.0 Amps
C0585L-6
GN,1.5D
C1642-2 C1643-2
BG,1.5D
C
Sheet2
SJ1000
N,1.5D
C1642-3 C1643-3
NW,1.5D
D
Sheet2
Generic Electronic
Module (D162)
C0583L-22
FUSE 14P
10.0 Amps
C0583L-13
N,1.5D
C2412L-9 C2411L-9
N,1.5D
FET-Indicator-
Trailer-LH (G162)
C0585L-16
Y,2.5D
C0473-1 C0498-1
Y,2.5D
E
Sheet2
FET-Indicator-
Trailer-RH (G161)
C0585L-17
G,2.5D
C0473-2 C0498-2
G,2.5D
F
Sheet2
C0585L-25
B,2.5D
C1398L-1
TYPE 3

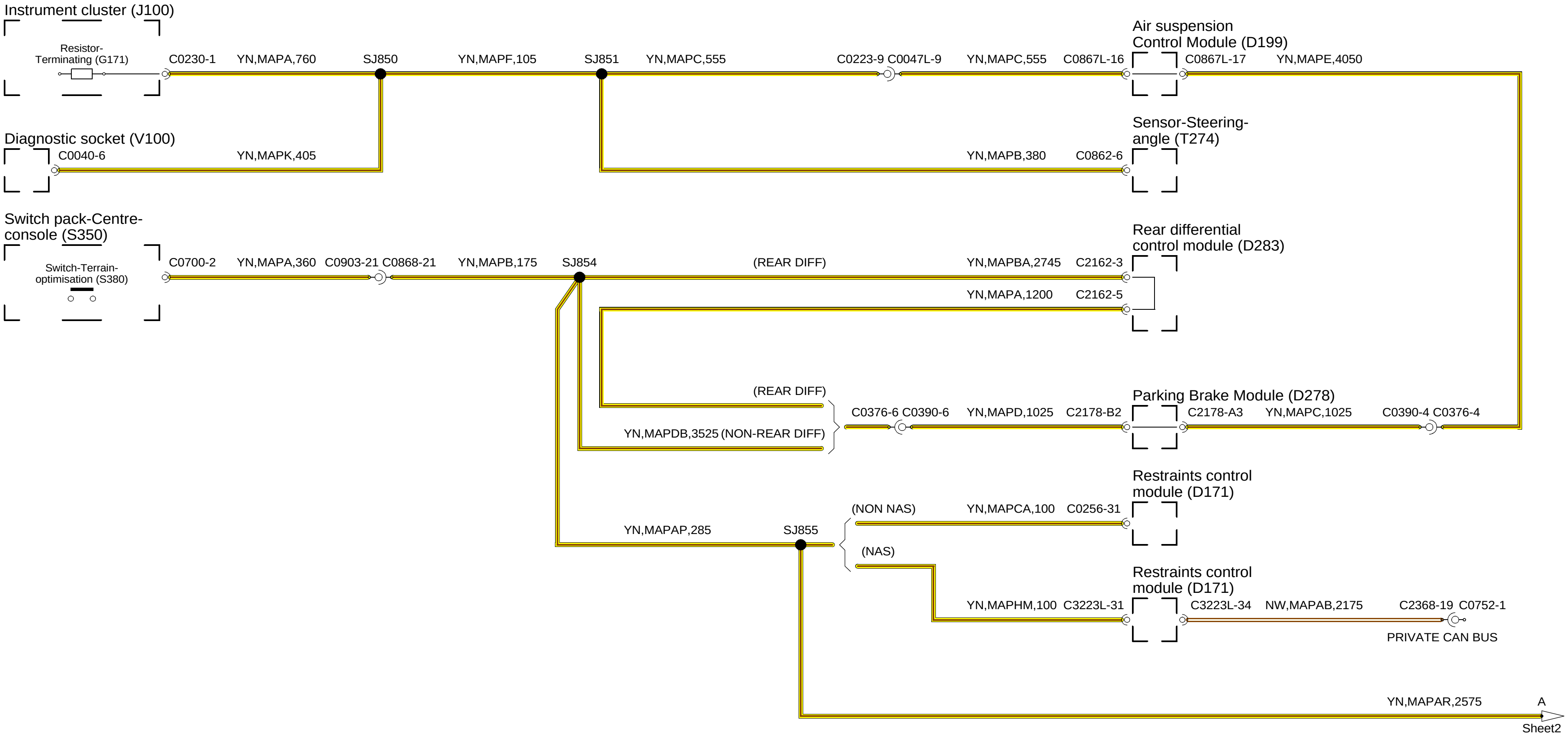

Trailer pick-up (P124)
A
Sheet1
U,2.5D
C1390-3 C1414-3
U,2.5D
C2586-2
B
Sheet1
O,4.0D
C1390-1 C1414-1
O,4.0D
C2586-4
IGN
C
Sheet1
BG,1.5D
C1389-1 C1415-1
BG,1.5D
C2586-7
REVERSE
D
Sheet1
NW,1.5D
C1389-4 C1415-4
NW,1.5D
C2586-3
TAIL
NW,1.5D
E
Sheet1
Y,2.5D
C1389-2 C1415-2
Y,2.5D
C2586-5
LH INDICATOR/STOP
Y,2.5D
F
Sheet1
G,2.5D
C1389-3 C1415-3
G,2.5D
C2586-6
RH INDICATOR/STOP
G,2.5D
C1390-2 C1414-2
W,6.0D
C2586-1
EARTH
W,6.0
Trailer pick-up (P124)
C0499-1
EARTH
C0499-4
RH INDICATOR/STOP
C0499-3
LH INDICATOR/STOP
C0499-2
TAIL
W,6.0D
C0565-1
TYPE 3


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Lamp-Fog-Front-LH (A109)
UP,1.5D
SJ191
UP,1.5D
C0514-1
C0514-2
B,1.5D
C2328-2 C2327-2
B,1.5D
55.0 Watts
Junction-box engine (P108)
Relay-Ignition (R211)
C0570L-74
B,1.0D
SJ877
B,2.5D
C0561-1
TYPE 3
LINK 2E
C0570L-40
NP,4.0D
C0570L-72
30.0 Amps
Lamp-Fog-Front-RH (A108)
UP,1.5D
C0513-1
C0513-2
B,1.5D
C2328-1 C2327-1
B,1.5D
55.0 Watts
C0632-1
LINK 11E
C0570L-114
N,4.0D
30.0 Amps
C0570L-142
B,1.0D
Relay-Front-fog lamp (R130)
C0570L-164
UP,1.5D
C2327-3 C2328-3
Stop lamp-RH (A140)
C0570L-140
C0570L-165
US,1.5D
Lamp-Fog guard-Rear-RH (A110)
RY,1.5D
C0125-6
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
21.0 Watts
TYPE 3
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
Stop lamp-LH (A139)
C0028-4
IGN
C0028-1
Y,4.0D
Lamp-Fog guard-Rear-LH (A111)
RY,1.5D
C0333-9 C0420-9
RY,1.5D
C0121-6
C0121-5
B,1.5D
C0420-7 C0333-7
21.0 Watts
SJ971
LG,0.5D
SJ574
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Instrument cluster (J100)
Junction-box central (P101)
Rear fog lamps indicator (J150)
C0582-19
FUSE 28P
C0583L-35
LG,0.5D
5.0 Amps
0.03 Amps
C0582-46
FUSE 32P
C0585L-21
RY,1.5D
SJ20
RY,0.75D
C1165L-10 C1167-10
RY,0.75D
C0230-20
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
15.0 Amps
Front fog lamps indicator (J181)
SJ172
UP,0.75D
C2240L-18 C2238-18
UP,0.75D
C0230-24
TYPE 3
FUSE 38P
C0583L-41
UP,1.5D
0.03 Amps
15.0 Amps
Lighting control switch (S100)
FET-Main-beam-LH (G168)
C0583L-33
US,1.5D
Lighting control switch (S100)
Switch-Fog lamp-Front/rear (S112)
C2444L-3 C2443-3
NP,4.0D
C0041-7
RR
C0041-2
RO,1.5D
C0582-14
UR,1.5D
FR
C0041-3
UR,1.5D
UR,1.5D
C2241L-7 C2239-7
UR,1.5D
C2444L-5 C2443-5

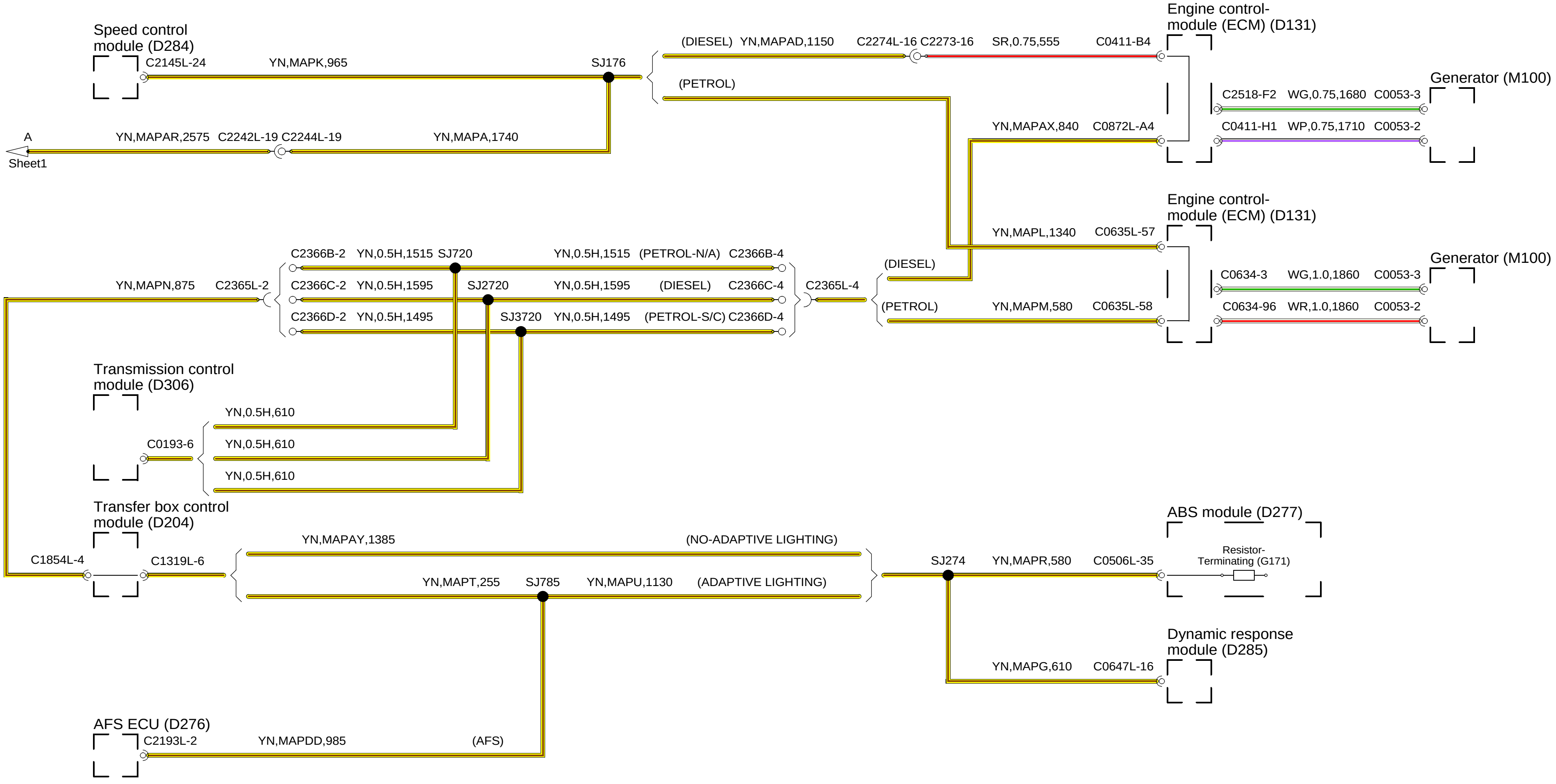

A
Sheet3
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
C0585L-7
PW,1.5D
Lamp-Glove compartment (B109)
C0582-39
LGW,0.5D
C0227-2
C0227-1
B,0.5D
SJ662
B,2.5D
C2630-1
5.0 Watts
Junction-box engine (P108)
C0632-1
LINK 15E
C0570L-116
NU,4.0D
C0583L-21
FUSE 1P
Relay-Battery-saver (R250)
C0585L-40
LGW,0.75D
C0084L-6 C0610-6
LGW,1.0D
B
Sheet2
40.0 Amps
10.0 Amps
LINK 11E
C0570L-114
N,4.0D
FET-Interior-lamp (G173)
Lamp-Load space (B140)
C0585L-3
P,0.75D
SJ40
P,0.75D
C0119-2
C0119-1
B,0.75D
SJ5
B,4.0D
C1355-1
1
30.0 Amps
BTS142
13A
5.0 Watts
P,0.75D
C
Sheet2
N,4.0D
C2443-4 C2444L-4
FET-Interior-lamp (G173)
C0582-35
P,0.75D
D
Sheet3
2
C0585L-25
B,2.5D
C1398L-1
BTS142
13A
Generic Electronic Module (D162)
C0586L-17
PU,0.5D
C0084L-16 C0610-16
PU,0.5D
E
Sheet2
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0582-30
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
IGN
C0028-1
Y,4.0D
C0582-19
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0144-2 C0385-2
C0385-1 C0144-1
KR,0.75D
B,1.5D
SJ8
B,1.5D
C2922-1
PLG,0.5D
C0586L-7
C0586L-10
BR,0.75D
SJ98
PLG,0.5D
C0586L-6
Motor-Central door-locking-Passenger (M237)
BN,0.5D
C0586L-9
BN,0.5D
C0441-4
C0441-8
B,0.5D
F
Sheet3
BU,0.5D
C0586L-8
C0463L-19
C0439-19
Motor-Central door-locking-Driver (M236)
C0459L-19
C0439-19
BN,0.5D
C0441-4
C0441-1
B,0.5D
G
Sheet3
Motor-Central door-locking-Rear-RH (M166)
C0436-3 C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
H
Sheet3
Motor-Central door-locking-Rear-LH (M167)
C0435-3 C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
J
Sheet3


Lamp-Interior-Front (B100)
E
Sheet1
PU,0.5D
C0355-1
C
Sheet1
P,0.75D
C0084L-7 C0610-7
P,0.75D
C0355-4
5.0 Watts
5.0 Watts
5.0 Watts
C0355-3
B,0.75D
SJ275
B,1.0D
C0610-8 C0084L-8
B,0.75D
C1398L-1
B
Sheet1
LGW,1.0D
SJ234
LGW,0.5D
C0355-2
Lamp-Map-LH (B108)
LGW,0.75D
C1111-1
5.0 Watts
C1111-3
B,0.75D
Lamp-Map-RH (B107)
LGW,0.75D
C1112-1
5.0 Watts
C1112-3
B,0.75D
Mirror-Vanity-RH (B153)
LGW,0.75D
C0736-2
1.2 Watts
1.2 Watts
C0736-3
B,0.75D
Mirror-Vanity-LH (B152)
LGW,0.75D
C0737-2
1.2 Watts
1.2 Watts
C0737-3
B,0.75D

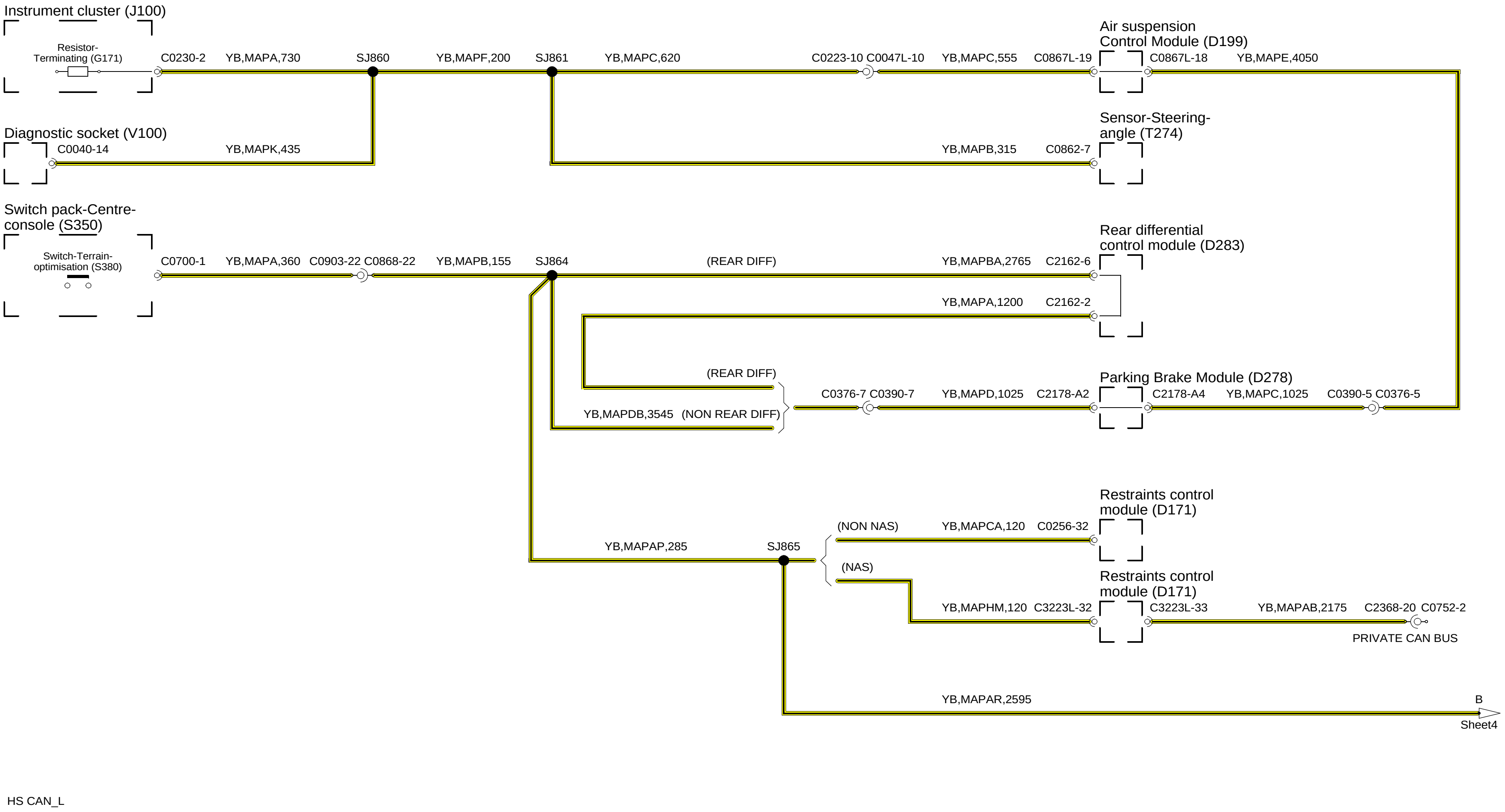

Passive coil (D156)
Ignition switch-illumination (B115)
5.0 Watts
D
Sheet1
P,0.75D
SJ740
P,0.75D
C2524-2
C2524-4
B,0.75D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
Lamp-Footwell-Front-RH (B135)
P,0.75D
C0076-2
5.0 Watts
C0076-1
B,0.75D
SJ662
B,2.5D
C2630-1
Lamp-Footwell-Front-LH (B136)
C1165L-8 C1167-8
P,0.75D
P,0.75D
C0077-2
5.0 Watts
C0077-1
B,0.75D
Lamp-Approach-Driver (A162)
A
Sheet1
PW,1.5D
SJ39
PW,1.5D
C0459L-1
C0439-1
PW,0.75D
C0319-8
11.0 Watts
C0319-9
B,0.75D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
B,0.5D
G
Sheet1
Lamp-Approach-Passenger (A163)
PW,1.5D
C0463L-1
C0439-1
PW,0.75D
C0319-8
11.0 Watts
C0319-9
B,0.75D
SJ840
B,4.0D
C0439-2
C0463L-2
B,4.0D
C0810L-1
F
Sheet1
B,0.5D
Lamp-Puddle-Front-RH (B130)
P,0.75D
SJ38
P,0.75D
C0463L-30
C0439-30
P,0.75D
C1405-2
5.0 Watts
C1405-1
B,0.75D
Lamp-Puddle-Front-LH (B131)
P,0.75D
C0459L-30
C0439-30
P,0.75D
C1405-2
5.0 Watts
C1405-1
B,0.75D
Lamp-Puddle-Rear-RH (B132)
P,0.75D
C0436-20 C0804-20
P,0.75D
C0980-2
5.0 Watts
C0980-1
B,0.75D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
H
Sheet1
B,0.5D
B,1.5D
C0804-21 C0436-21
B,1.5D
Lamp-Puddle-Rear-LH (B133)
P,0.75D
C0435-20 C0803-20
P,0.75D
C0980-2
5.0 Watts
C0980-1
B,0.75D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
J
Sheet1
B,0.5D
B,1.5D
C0803-21 C0435-21
B,1.5D

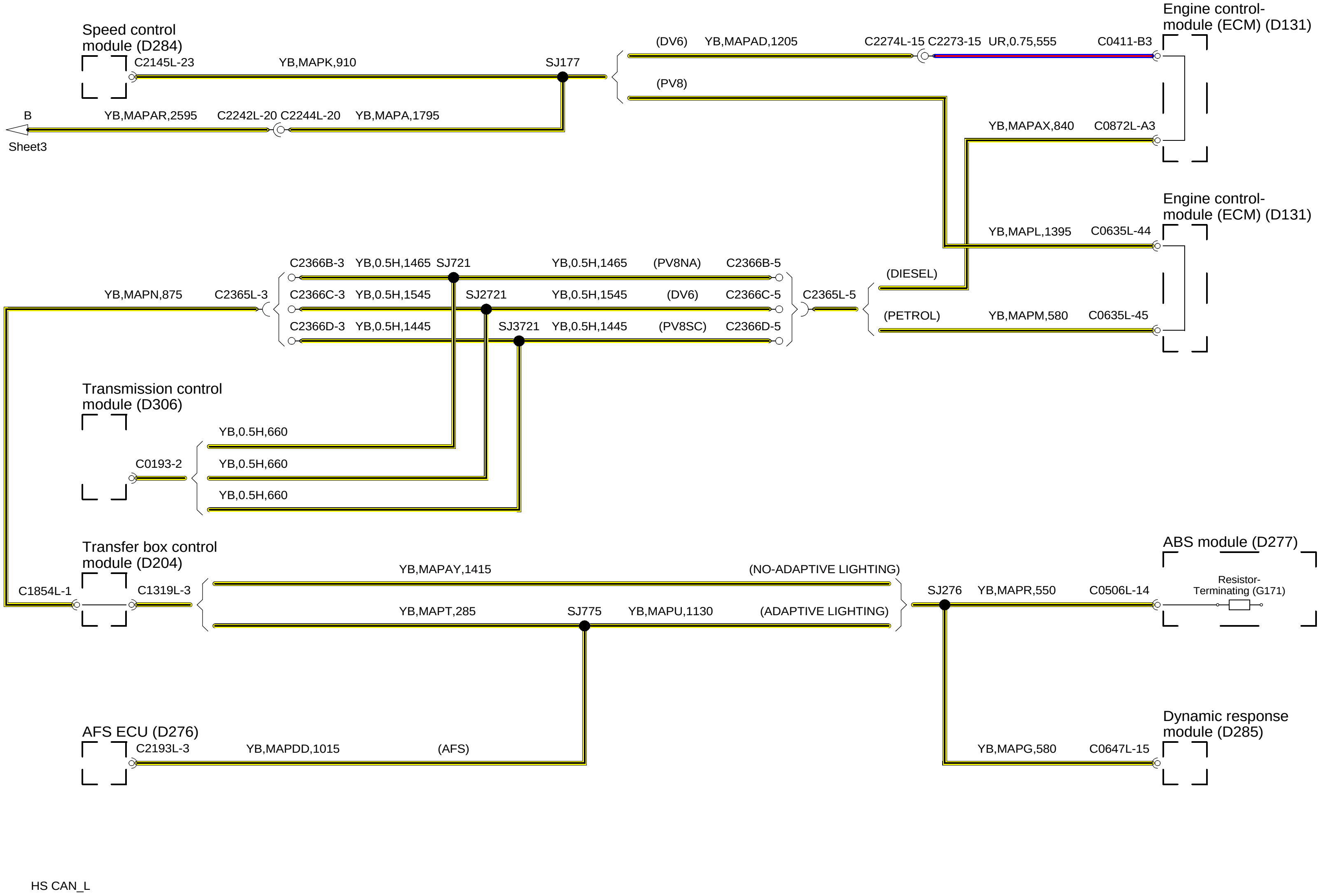

Instrument cluster (J100)
Resistor-Terminating (G171)
C0230-1
YN,MAPA,760
SJ850
YN,MAPF,105
SJ851
YN,MAPC,555
C0223-9 C0047L-9
YN,MAPC,555
C0867L-16
Air suspension Control Module (D199)
C0867L-17
YN,MAPE,4050
Diagnostic socket (V100)
C0040-6
YN,MAPK,405
Sensor-Steering-angle (T274)
YN,MAPB,380
C0862-6
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0700-2
YN,MAPA,360
C0903-21 C0868-21
YN,MAPB,175
SJ854
(REAR DIFF)
YN,MAPBA,2745
C2162-3
Rear differential control module (D283)
YN,MAPA,1200
C2162-5
(REAR DIFF)
YN,MAPDB,3525 (NON-REAR DIFF)
C0376-6 C0390-6
YN,MAPD,1025
C2178-B2
Parking Brake Module (D278)
C2178-A3
YN,MAPC,1025
C0390-4 C0376-4
Restraints control module (D171)
(NON NAS)
YN,MAPCA,100
C0256-31
YN,MAPAP,285
SJ855
(NAS)
Restraints control module (D171)
YN,MAPHM,100
C3223L-31
C3223L-34
NW,MAPAB,2175
C2368-19 C0752-1
PRIVATE CAN BUS
YN,MAPAR,2575
A
Sheet2

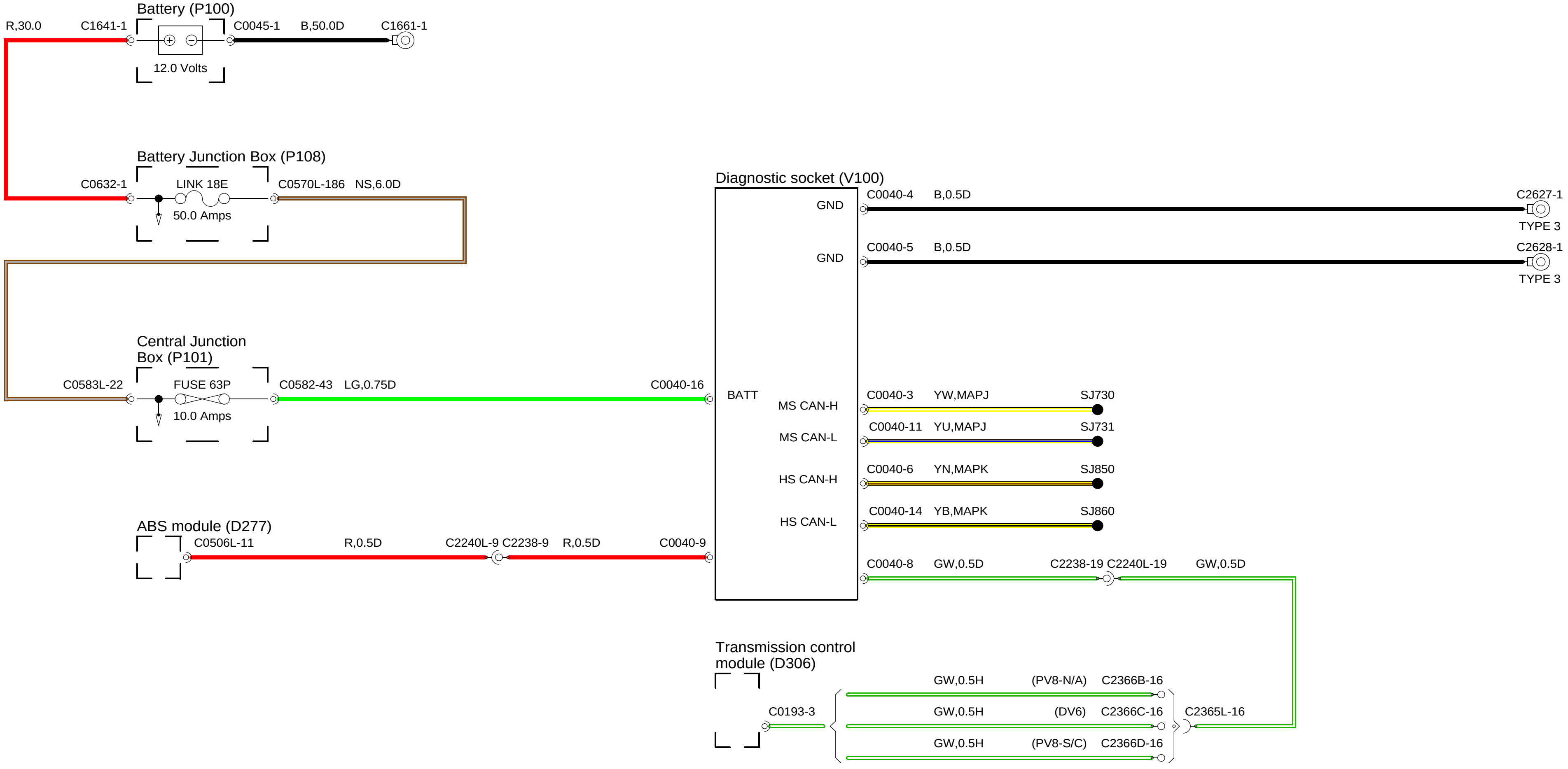
HS CAN_H

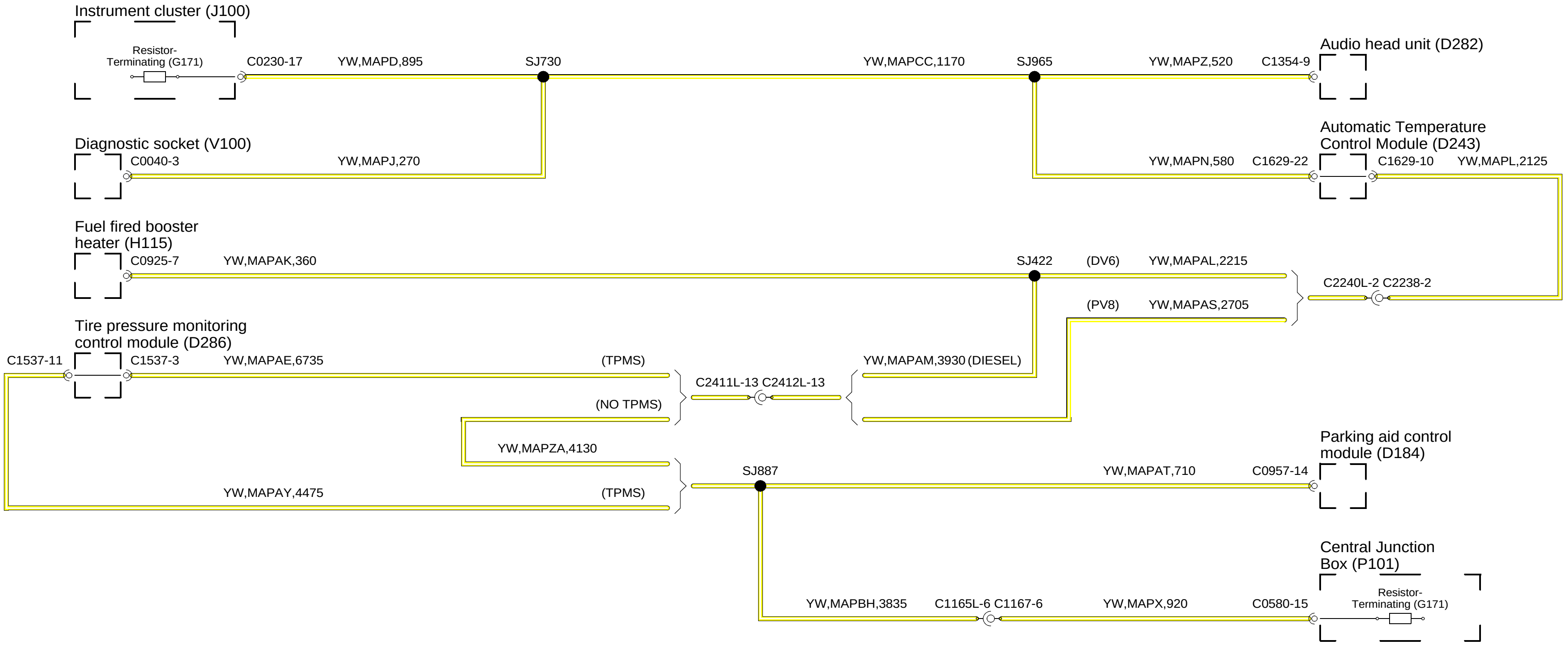

Speed control module (D284)
C2145L-24
YN,MAPK,965
SJ176
(DIESEL)
YN,MAPAD,1150
C2274L-16
C2273-16
SR,0.75,555
C0411-B4
Engine control-module (ECM) (D131)
(PETROL)
Generator (M100)
C2518-F2
WG,0.75,1680
C0053-3
A
Sheet1
YN,MAPAR,2575
C2242L-19
C2244L-19
YN,MAPA,1740
YN,MAPAX,840
C0872L-A4
C0411-H1
WP,0.75,1710
C0053-2
Engine control-module (ECM) (D131)
YN,MAPL,1340
C0635L-57
Generator (M100)
C2366B-2
YN,0.5H,1515
SJ720
YN,0.5H,1515
(PETROL-N/A)
C2366B-4
(DIESEL)
C0634-3
WG,1.0,1860
C0053-3
YN,MAPN,875
C2365L-2
C2366C-2
YN,0.5H,1595
SJ2720
YN,0.5H,1595
(DIESEL)
C2366C-4
C2365L-4
(PETROL)
YN,MAPM,580
C0635L-58
C0634-96
WR,1.0,1860
C0053-2
C2366D-2
YN,0.5H,1495
SJ3720
YN,0.5H,1495
(PETROL-S/C)
C2366D-4
Transmission control module (D306)
YN,0.5H,610
C0193-6
YN,0.5H,610
YN,0.5H,610
Transfer box control module (D204)
ABS module (D277)
YN,MAPAY,1385
(NO-ADAPTIVE LIGHTING)
Resistor-Terminating (G171)
C1854L-4
C1319L-6
SJ274
YN,MAPR,580
C0506L-35
YN,MAPT,255
SJ785
YN,MAPU,1130
(ADAPTIVE LIGHTING)
Dynamic response module (D285)
YN,MAPG,610
C0647L-16
AFS ECU (D276)
C2193L-2
YN,MAPDD,985
(AFS)

HS CAN_H

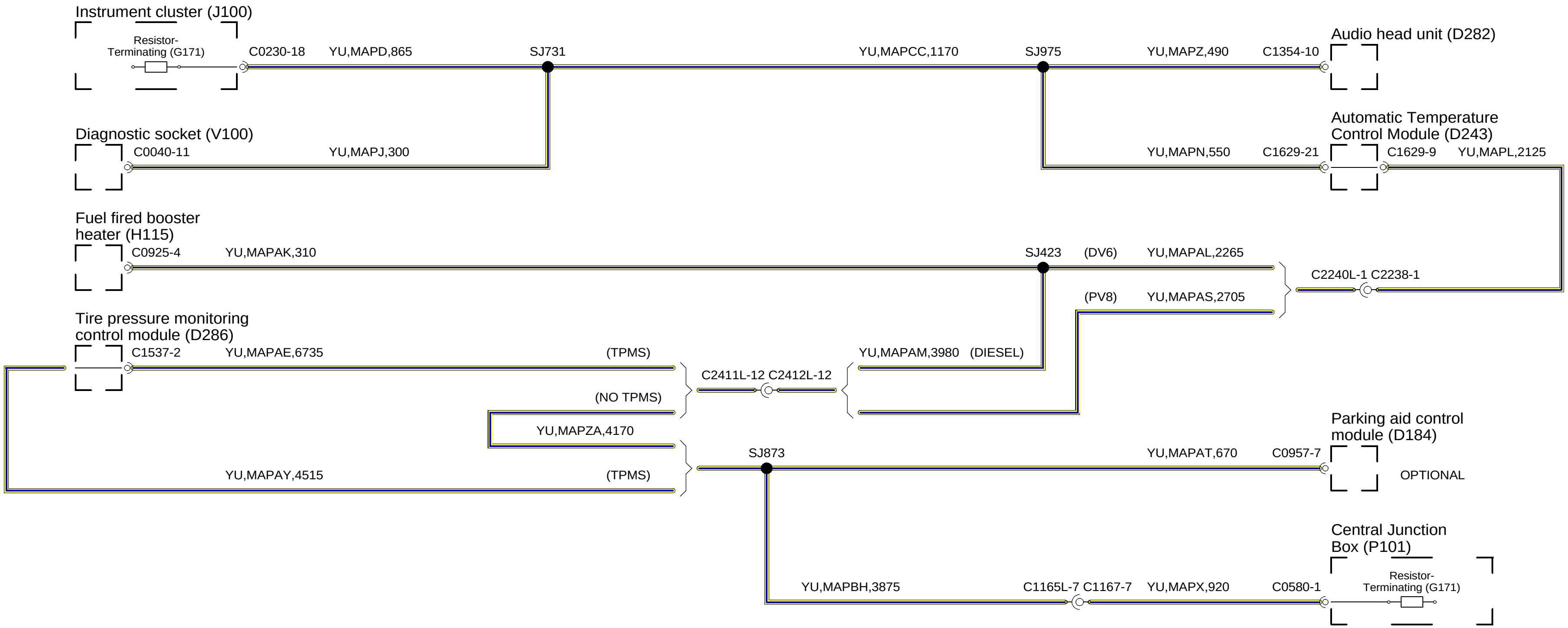

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-2
YB,MAPA,730
SJ860
YB,MAPF,200
SJ861
YB,MAPC,620
C0223-10 C0047L-10
YB,MAPC,555
C0867L-19
Air suspension
Control Module (D199)
C0867L-18
YB,MAPE,4050
Diagnostic socket (V100)
C0040-14
YB,MAPK,435
Sensor-Steering-
angle (T274)
YB,MAPB,315
C0862-7
Switch pack-Centre-
console (S350)
Switch-Terrain-
optimisation (S380)
C0700-1
YB,MAPA,360
C0903-22 C0868-22
YB,MAPB,155
SJ864
(REAR DIFF)
Rear differential
control module (D283)
YB,MAPBA,2765
C2162-6
YB,MAPA,1200
C2162-2
(REAR DIFF)
YB,MAPDB,3545
(NON REAR DIFF)
C0376-7 C0390-7
YB,MAPD,1025
C2178-A2
Parking Brake Module (D278)
C2178-A4
YB,MAPC,1025
C0390-5 C0376-5
Restraints control
module (D171)
(NON NAS)
YB,MAPCA,120
C0256-32
YB,MAPAP,285
SJ865
(NAS)
Restraints control
module (D171)
YB,MAPHM,120
C3223L-32
C3223L-33
YB,MAPAB,2175
C2368-20 C0752-2
PRIVATE CAN BUS
YB,MAPAR,2595
B
Sheet4
HS CAN_L


Speed control module (D284)
C2145L-23
YB,MAPK,910
SJ177
B
Sheet3
YB,MAPAR,2595
C2242L-20
C2244L-20
YB,MAPA,1795
(DV6)
YB,MAPAD,1205
C2274L-15
C2273-15
UR,0.75,555
C0411-B3
(PV8)
Engine control-module (ECM) (D131)
YB,MAPAX,840
C0872L-A3
Engine control-module (ECM) (D131)
YB,MAPL,1395
C0635L-44
(DIESEL)
C2365L-5
(PETROL)
YB,MAPM,580
C0635L-45
YB,MAPN,875
C2365L-3
C2366B-3
YB,0.5H,1465
SJ721
YB,0.5H,1465
(PV8NA)
C2366B-5
C2366C-3
YB,0.5H,1545
SJ2721
YB,0.5H,1545
(DV6)
C2366C-5
C2366D-3
YB,0.5H,1445
SJ3721
YB,0.5H,1445
(PV8SC)
C2366D-5
Transmission control module (D306)
YB,0.5H,660
C0193-2
YB,0.5H,660
YB,0.5H,660
Transfer box control module (D204)
C1854L-1
C1319L-3
YB,MAPAY,1415
(NO-ADAPTIVE LIGHTING)
YB,MAPT,285
SJ775
YB,MAPU,1130
(ADAPTIVE LIGHTING)
SJ276
YB,MAPR,550
C0506L-14
ABS module (D277)
Resistor-Terminating (G171)
AFS ECU (D276)
C2193L-3
YB,MAPDD,1015
(AFS)
YB,MAPG,580
C0647L-15
Dynamic response module (D285)
HS CAN_L

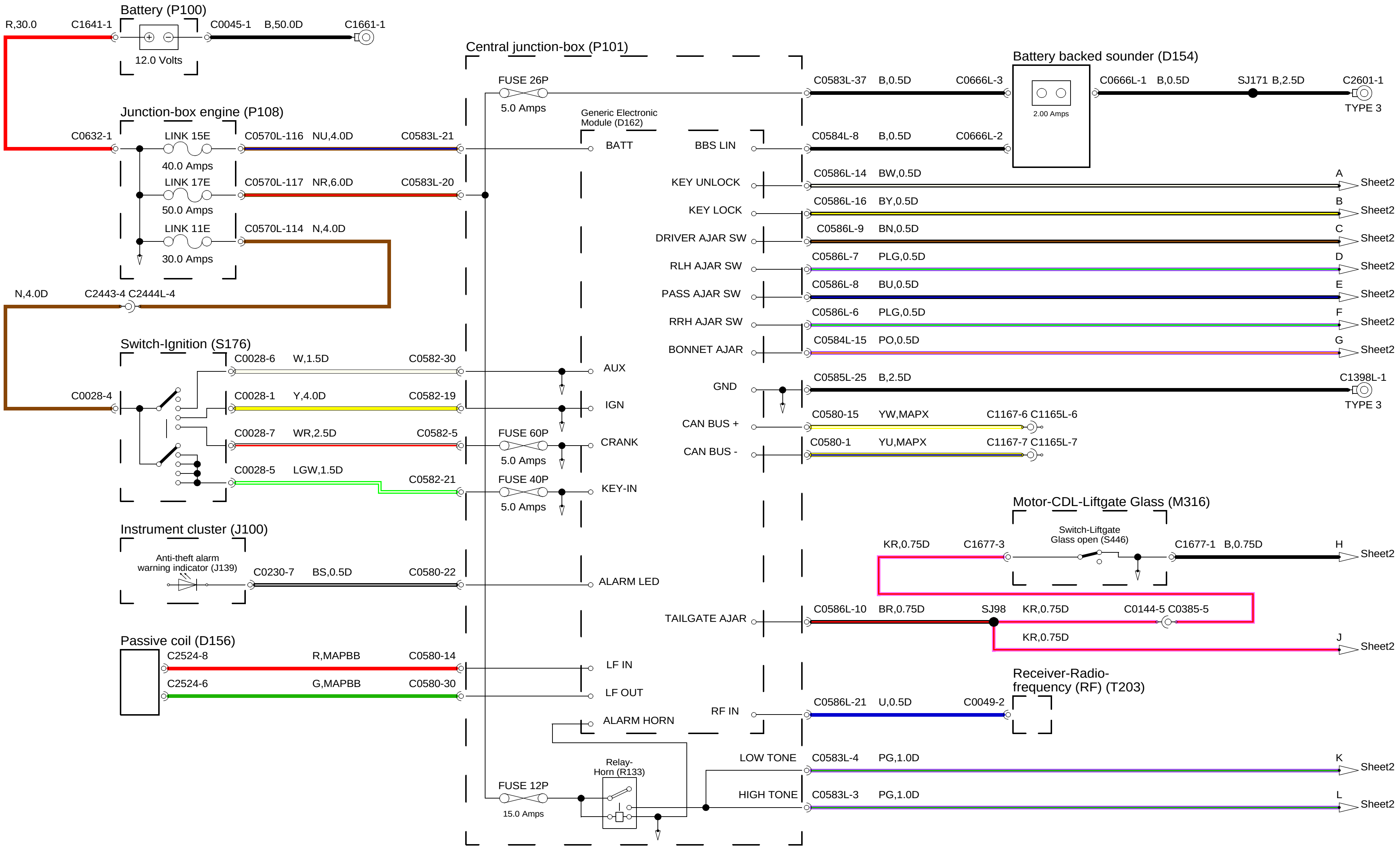

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Central Junction Box (P101)
C0583L-22
FUSE 63P
10.0 Amps
C0582-43
LG,0.75D
C0040-16
ABS module (D277)
C0506L-11
R,0.5D
C2240L-9
C2238-9
R,0.5D
C0040-9
Diagnostic socket (V100)
GND
GND
BATT
MS CAN-H
MS CAN-L
HS CAN-H
HS CAN-L
C0040-4
B,0.5D
C2627-1
TYPE 3
C0040-5
B,0.5D
C2628-1
TYPE 3
C0040-3
YW,MAPJ
SJ730
C0040-11
YU,MAPJ
SJ731
C0040-6
YN,MAPK
SJ850
C0040-14
YB,MAPK
SJ860
C0040-8
GW,0.5D
C2238-19
C2240L-19
GW,0.5D
Transmission control module (D306)
C0193-3
GW,0.5H
(PV8-N/A)
C2366B-16
GW,0.5H
(DV6)
C2366C-16
GW,0.5H
(PV8-S/C)
C2366D-16
C2365L-16

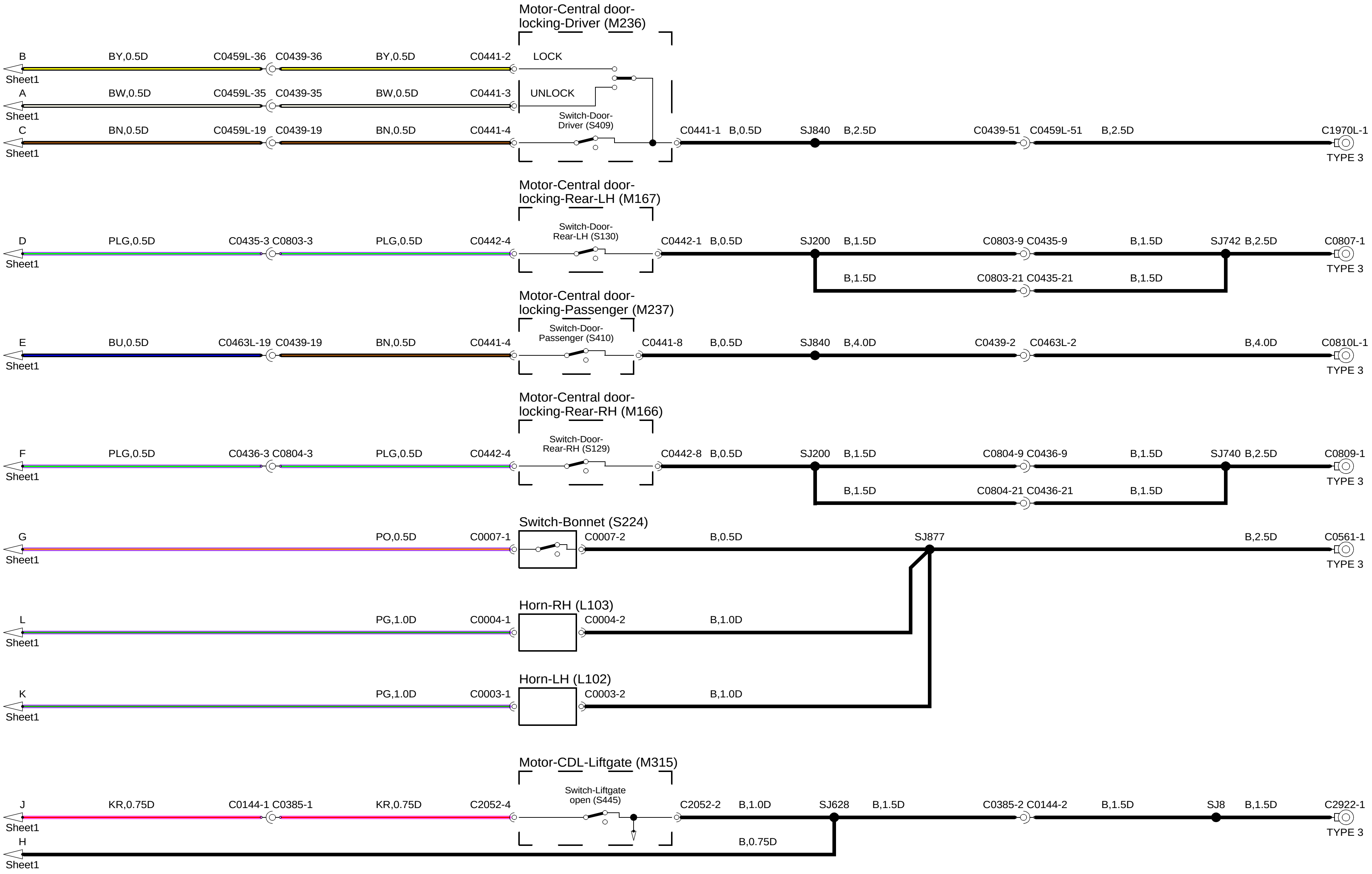

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-17
YW,MAPD,895
SJ730
YW,MAPCC,1170
SJ965
YW,MAPZ,520
C1354-9
Audio head unit (D282)
Diagnostic socket (V100)
C0040-3
YW,MAPJ,270
Automatic Temperature
Control Module (D243)
YW,MAPN,580
C1629-22
C1629-10
YW,MAPL,2125
Fuel fired booster
heater (H115)
C0925-7
YW,MAPAK,360
SJ422
(DV6)
YW,MAPAL,2215
C2240L-2 C2238-2
(PV8)
YW,MAPAS,2705
Tire pressure monitoring
control module (D286)
C1537-11
C1537-3
YW,MAPAE,6735
(TPMS)
C2411L-13 C2412L-13
YW,MAPAM,3930 (DIESEL)
(NO TPMS)
YW,MAPZA,4130
SJ887
YW,MAPAT,710
C0957-14
Parking aid control
module (D184)
YW,MAPAY,4475
(TPMS)
Central Junction
Box (P101)
YW,MAPBH,3835
C1165L-6 C1167-6
YW,MAPX,920
C0580-15
Resistor-
Terminating (G171)

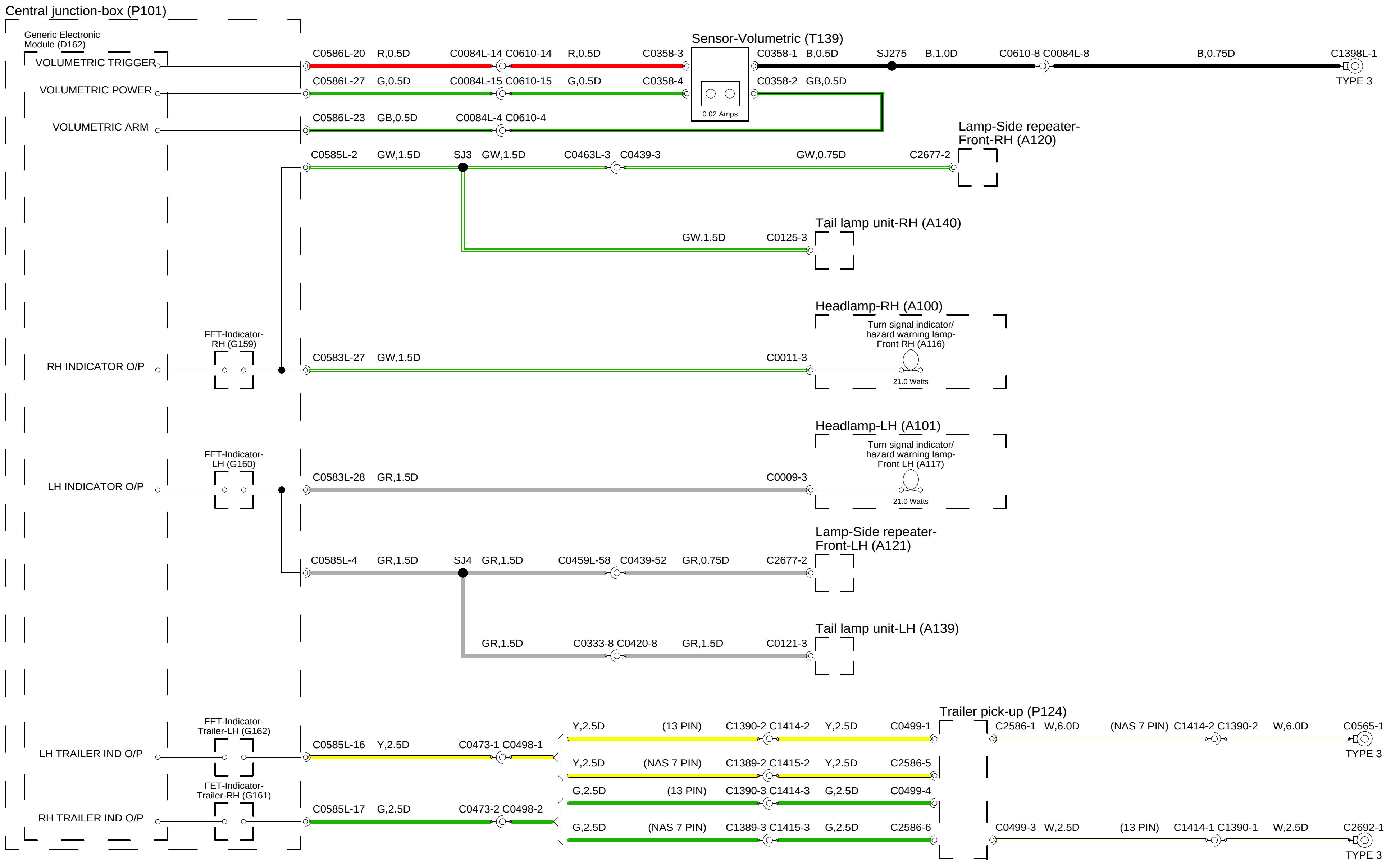
MS CAN_H

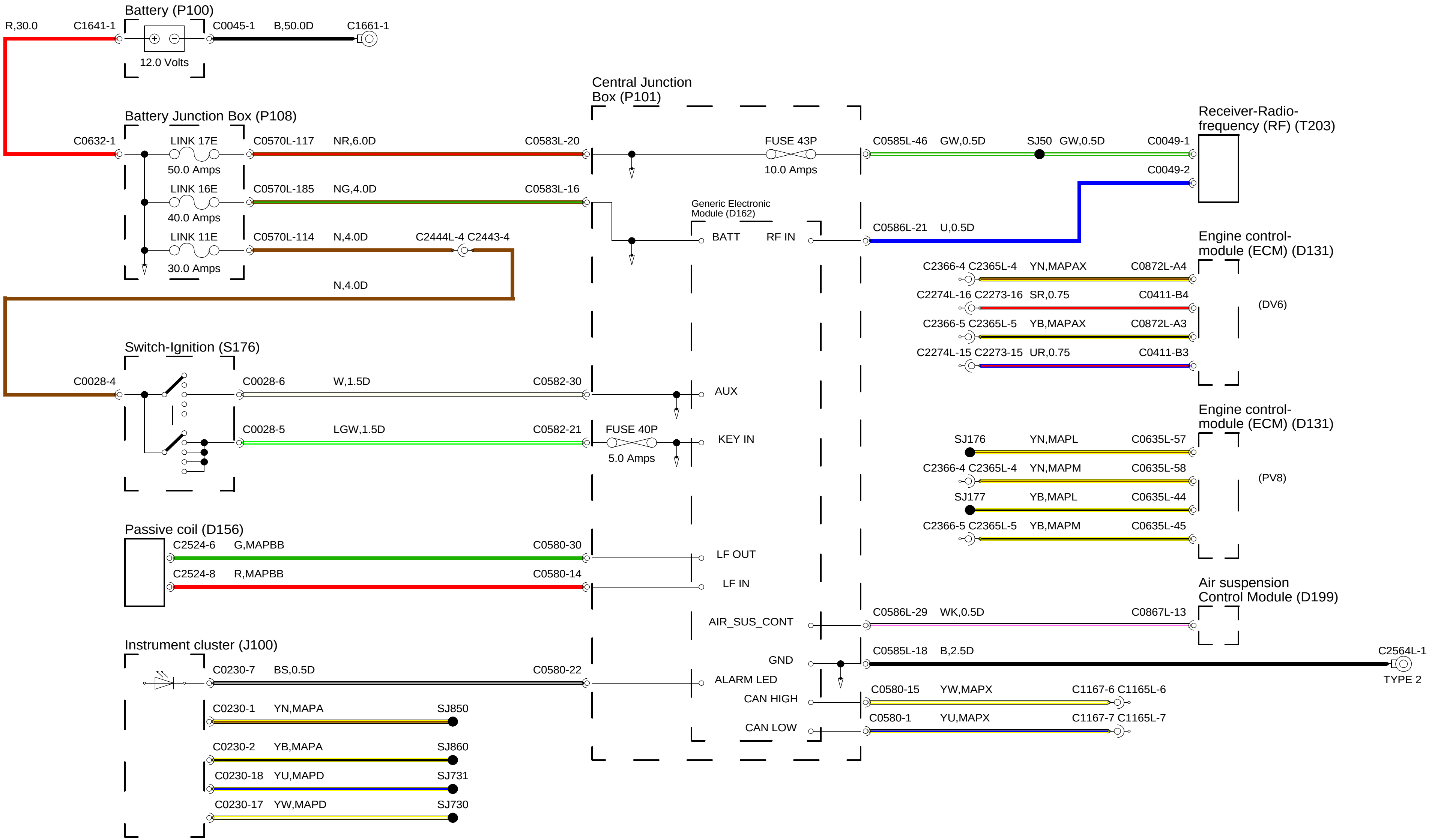

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-18
YU,MAPD,865
SJ731
YU,MAPCC,1170
SJ975
YU,MAPZ,490
C1354-10
Audio head unit (D282)
Diagnostic socket (V100)
C0040-11
YU,MAPJ,300
Automatic Temperature
Control Module (D243)
YU,MAPN,550
C1629-21
C1629-9
YU,MAPL,2125
Fuel fired booster
heater (H115)
C0925-4
YU,MAPAK,310
SJ423
(DV6)
YU,MAPAL,2265
C2240L-1 C2238-1
(PV8)
YU,MAPAS,2705
Tire pressure monitoring
control module (D286)
C1537-2
YU,MAPAE,6735
(TPMS)
C2411L-12 C2412L-12
YU,MAPAM,3980
(DIESEL)
(NO TPMS)
YU,MAPZA,4170
Parking aid control
module (D184)
SJ873
YU,MAPAT,670
C0957-7
OPTIONAL
YU,MAPAY,4515
(TPMS)
Central Junction
Box (P101)
YU,MAPBH,3875
C1165L-7 C1167-7
YU,MAPX,920
C0580-1
Resistor-
Terminating (G171)

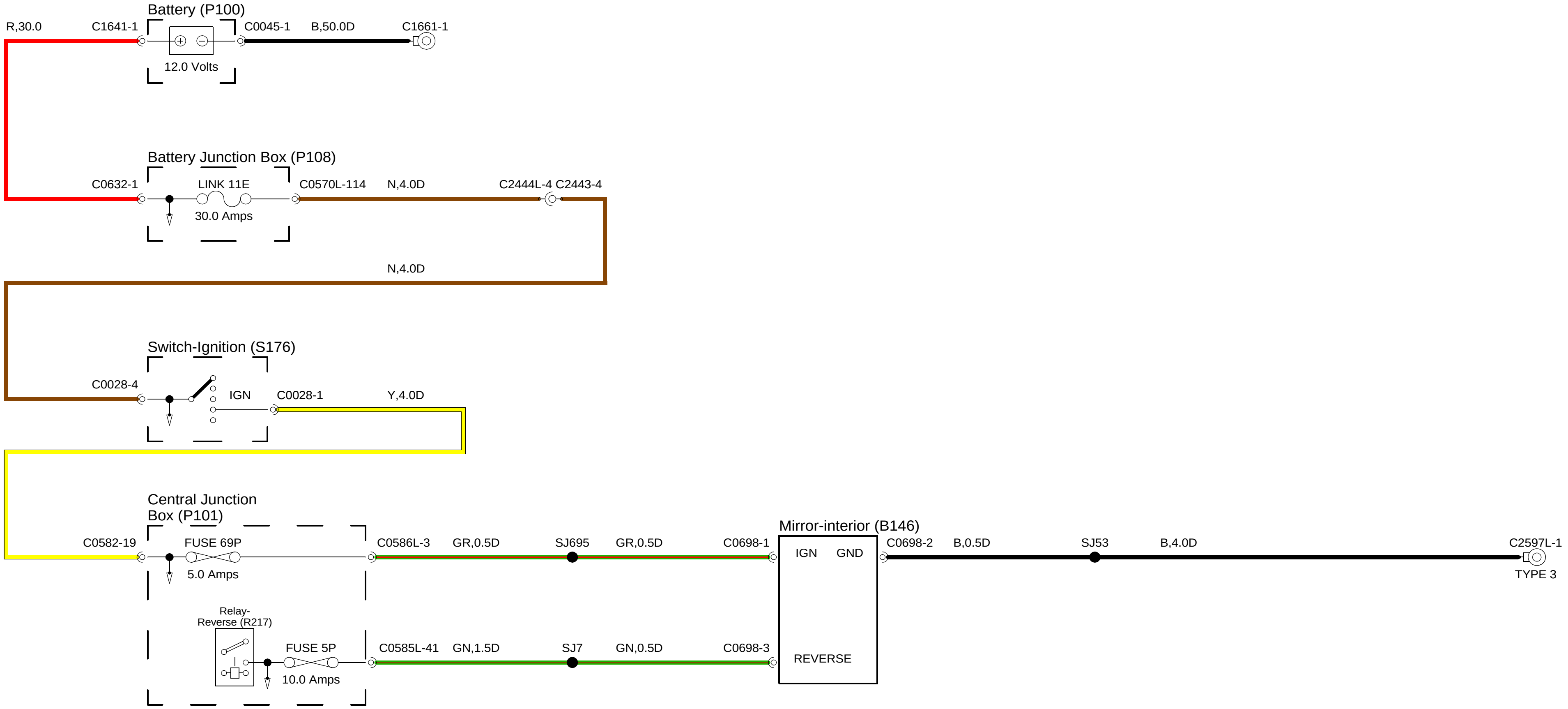
MS CAN_L

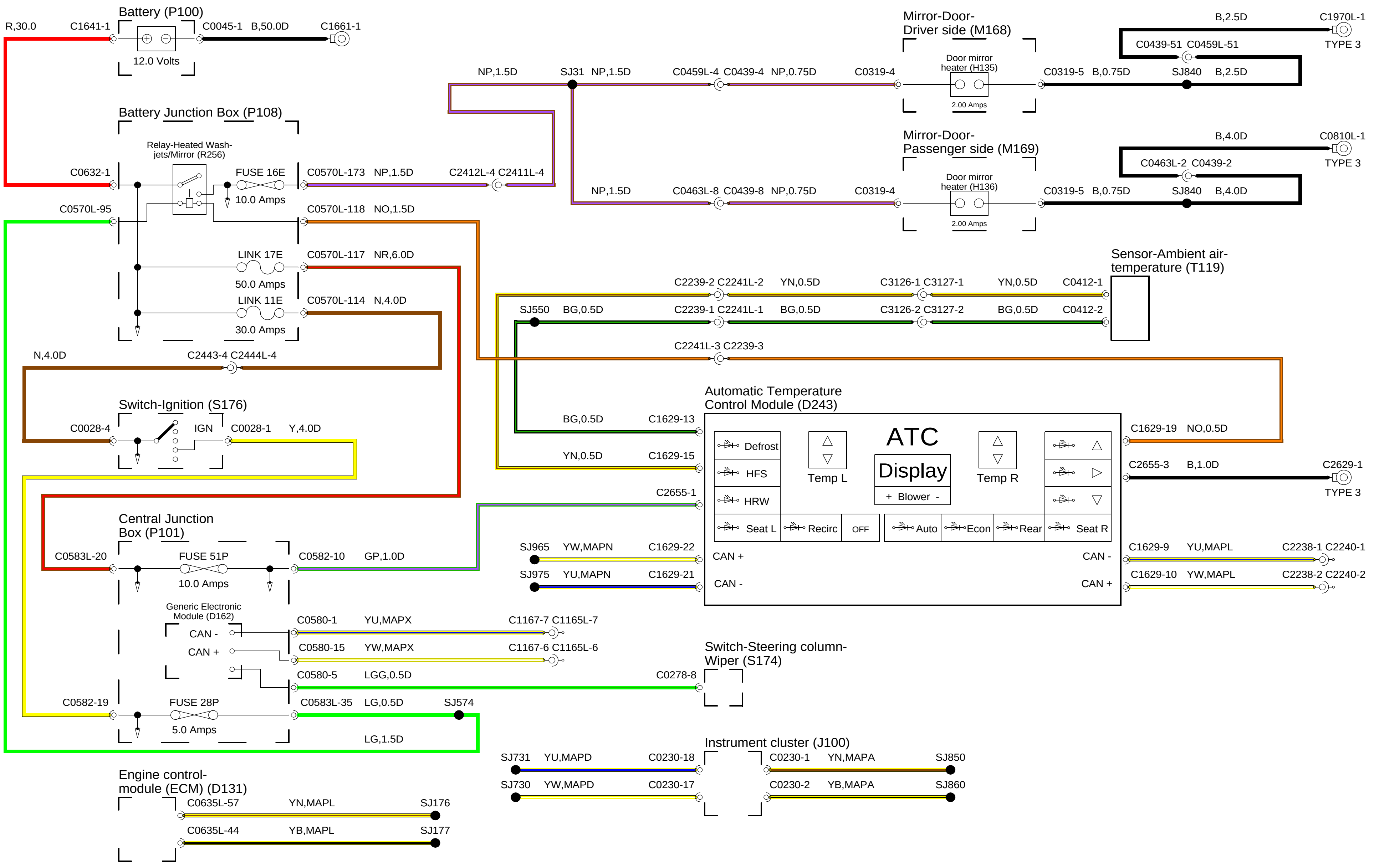

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
Battery backed sounder (D154)
FUSE 26P
5.0 Amps
C0583L-37
B,0.5D
C0666L-3
2.00 Amps
C0666L-1
B,0.5D
SJ171
B,2.5D
C2601-1
TYPE 3
Junction-box engine (P108)
Generic Electronic Module (D162)
C0632-1
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
C0583L-21
BATT
BBS LIN
C0584L-8
B,0.5D
C0666L-2
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
C0583L-20
KEY UNLOCK
C0586L-14
BW,0.5D
A
Sheet2
KEY LOCK
C0586L-16
BY,0.5D
B
Sheet2
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
DRIVER AJAR SW
C0586L-9
BN,0.5D
C
Sheet2
RLH AJAR SW
C0586L-7
PLG,0.5D
D
Sheet2
N,4.0D
C2443-4 C2444L-4
PASS AJAR SW
C0586L-8
BU,0.5D
E
Sheet2
RRH AJAR SW
C0586L-6
PLG,0.5D
F
Sheet2
Switch-Ignition (S176)
BONNET AJAR
C0584L-15
PO,0.5D
G
Sheet2
C0028-6
W,1.5D
C0582-30
AUX
GND
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C0028-4
C0028-1
Y,4.0D
C0582-19
IGN
C0580-15
YW,MAPX
C1167-6 C1165L-6
CAN BUS +
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
CAN BUS -
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY-IN
Motor-CDL-Liftgate Glass (M316)
Instrument cluster (J100)
Switch-Liftgate Glass open (S446)
KR,0.75D
C1677-3
C1677-1
B,0.75D
H
Sheet2
Anti-theft alarm warning indicator (J139)
C0230-7
BS,0.5D
C0580-22
ALARM LED
C0586L-10
BR,0.75D
SJ98
KR,0.75D
C0144-5 C0385-5
TAILGATE AJAR
Passive coil (D156)
KR,0.75D
J
Sheet2
C2524-8
R,MAPBB
C0580-14
LF IN
Receiver-Radio-frequency (RF) (T203)
C2524-6
G,MAPBB
C0580-30
LF OUT
RF IN
C0586L-21
U,0.5D
C0049-2
ALARM HORN
LOW TONE
C0583L-4
PG,1.0D
K
Sheet2
Relay-Horn (R133)
FUSE 12P
15.0 Amps
HIGH TONE
C0583L-3
PG,1.0D
L
Sheet2

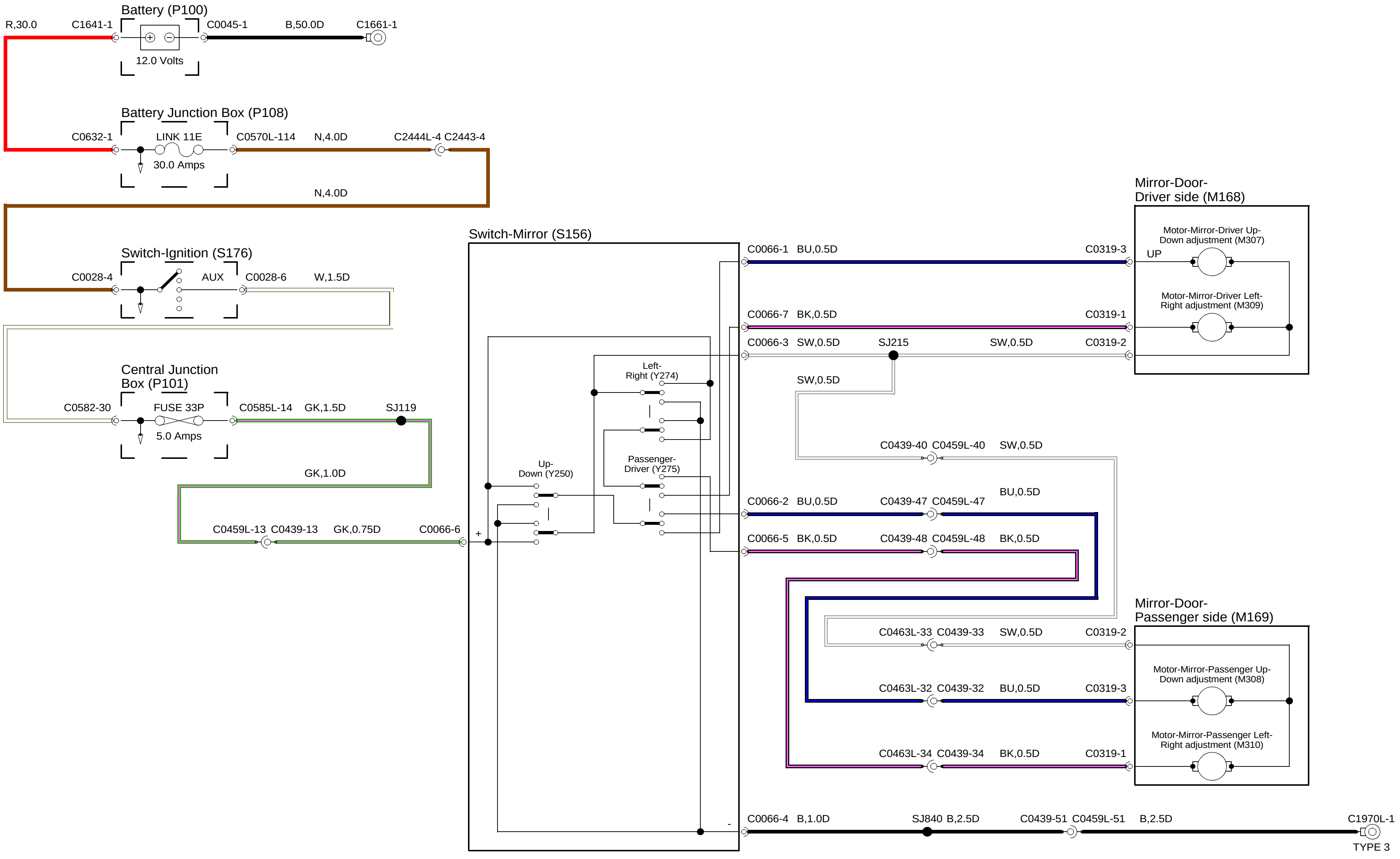

Motor-Central door-locking-Driver (M236)
B
Sheet1
BY,0.5D
C0459L-36
C0439-36
BY,0.5D
C0441-2
LOCK
A
Sheet1
BW,0.5D
C0459L-35
C0439-35
BW,0.5D
C0441-3
UNLOCK
Switch-Door-Driver (S409)
C
Sheet1
BN,0.5D
C0459L-19
C0439-19
BN,0.5D
C0441-4
C0441-1
B,0.5D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
TYPE 3
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
D
Sheet1
PLG,0.5D
C0435-3
C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9
C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21
C0435-21
B,1.5D
Motor-Central door-locking-Passenger (M237)
Switch-Door-Passenger (S410)
E
Sheet1
BU,0.5D
C0463L-19
C0439-19
BN,0.5D
C0441-4
C0441-8
B,0.5D
SJ840
B,4.0D
C0439-2
C0463L-2
B,4.0D
C0810L-1
TYPE 3
Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
F
Sheet1
PLG,0.5D
C0436-3
C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9
C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21
C0436-21
B,1.5D
Switch-Bonnet (S224)
G
Sheet1
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
L
Sheet1
PG,1.0D
C0004-1
C0004-2
B,1.0D
Horn-LH (L102)
K
Sheet1
PG,1.0D
C0003-1
C0003-2
B,1.0D
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
J
Sheet1
KR,0.75D
C0144-1
C0385-1
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0385-2
C0144-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
H
Sheet1
B,0.75D

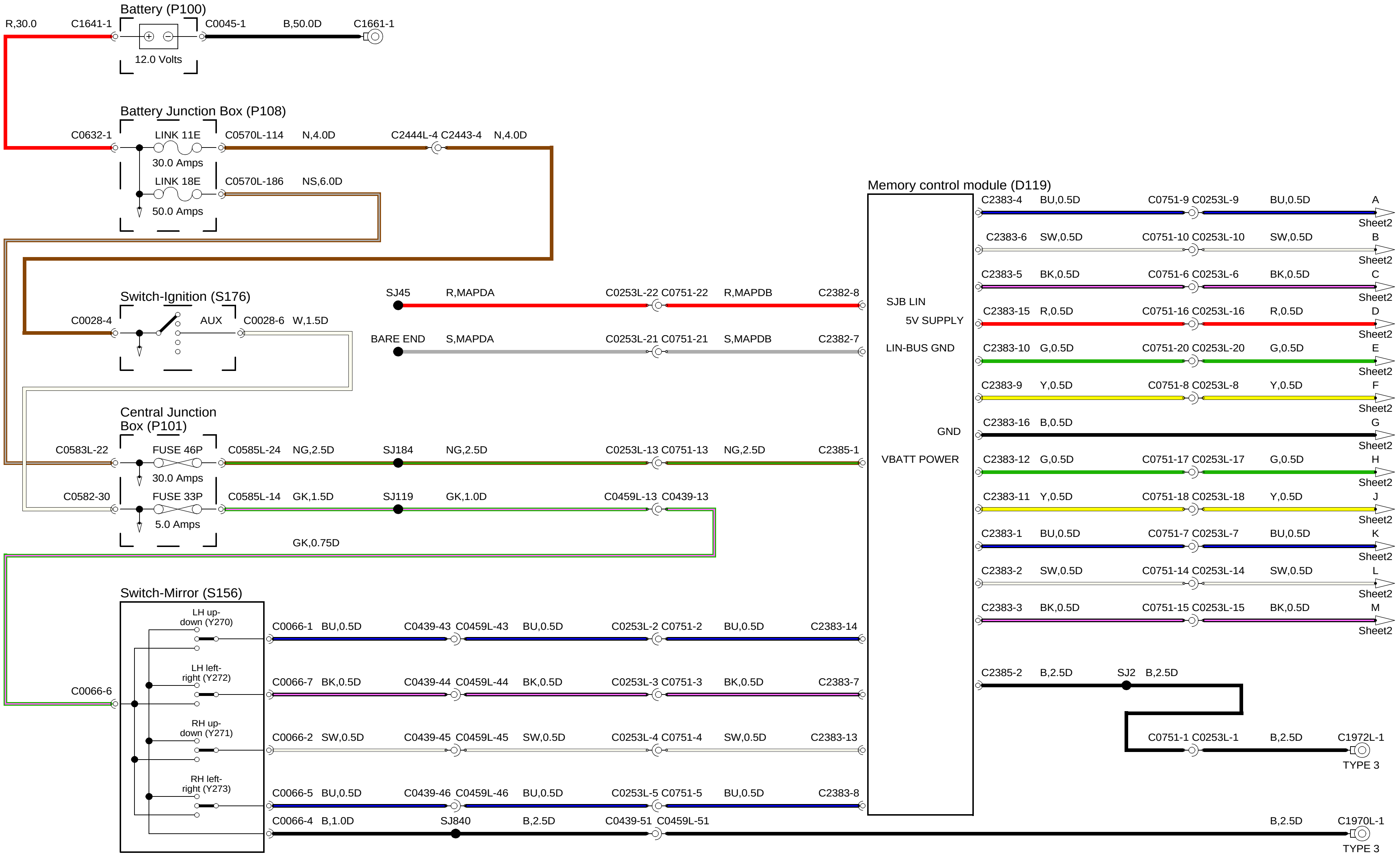

Central junction-box (P101)
Generic Electronic Module (D162)
VOLUMETRIC TRIGGER
VOLUMETRIC POWER
VOLUMETRIC ARM
RH INDICATOR O/P
LH INDICATOR O/P
LH TRAILER IND O/P
RH TRAILER IND O/P
FET-Indicator-RH (G159)
FET-Indicator-LH (G160)
FET-Indicator-Trailer-LH (G162)
FET-Indicator-Trailer-RH (G161)
C0586L-20 R,0.5D C0084L-14 C0610-14 R,0.5D C0358-3
C0586L-27 G,0.5D C0084L-15 C0610-15 G,0.5D C0358-4
C0586L-23 GB,0.5D C0084L-4 C0610-4
Sensor-Volumetric (T139)
0.02 Amps
C0358-1 B,0.5D SJ275 B,1.0D C0610-8 C0084L-8 B,0.75D C1398L-1
TYPE 3
C0358-2 GB,0.5D
Lamp-Side repeater-Front-RH (A120)
C0585L-2 GW,1.5D SJ3 GW,1.5D C0463L-3 C0439-3 GW,0.75D C2677-2
Tail lamp unit-RH (A140)
GW,1.5D C0125-3
Headlamp-RH (A100)
Turn signal indicator/ hazard warning lamp-Front RH (A116)
21.0 Watts
C0583L-27 GW,1.5D C0011-3
Headlamp-LH (A101)
Turn signal indicator/ hazard warning lamp-Front LH (A117)
21.0 Watts
C0583L-28 GR,1.5D C0009-3
Lamp-Side repeater-Front-LH (A121)
C0585L-4 GR,1.5D SJ4 GR,1.5D C0459L-58 C0439-52 GR,0.75D C2677-2
Tail lamp unit-LH (A139)
GR,1.5D C0333-8 C0420-8 GR,1.5D C0121-3
Trailer pick-up (P124)
C0585L-16 Y,2.5D C0473-1 C0498-1
Y,2.5D (13 PIN) C1390-2 C1414-2 Y,2.5D C0499-1
Y,2.5D (NAS 7 PIN) C1389-2 C1415-2 Y,2.5D C2586-5
C2586-1 W,6.0D (NAS 7 PIN) C1414-2 C1390-2 W,6.0D C0565-1
TYPE 3
C0585L-17 G,2.5D C0473-2 C0498-2
G,2.5D (13 PIN) C1390-3 C1414-3 G,2.5D C0499-4
G,2.5D (NAS 7 PIN) C1389-3 C1415-3 G,2.5D C2586-6
C0499-3 W,2.5D (13 PIN) C1414-1 C1390-1 W,2.5D C2692-1
TYPE 3

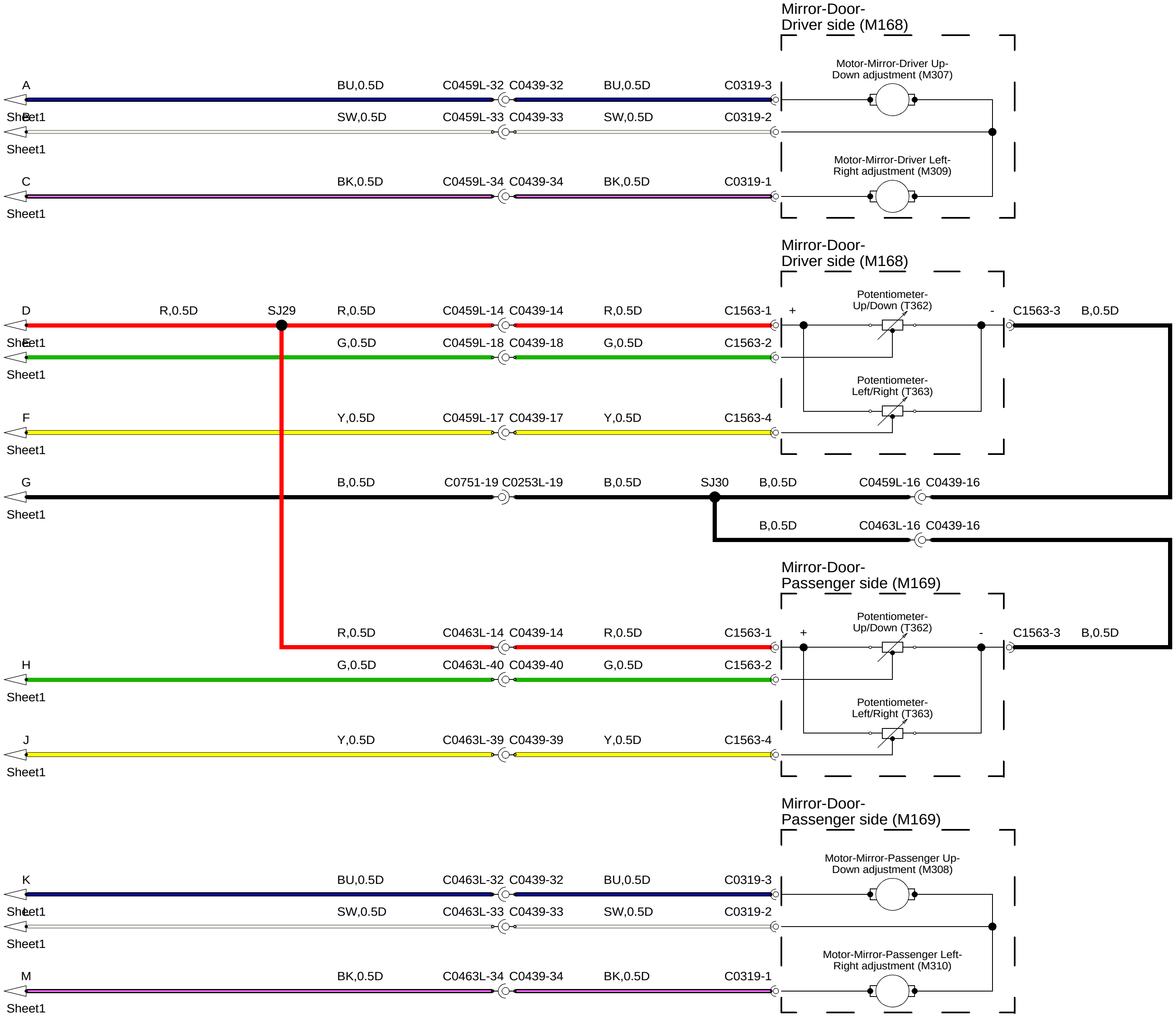

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central Junction Box (P101)
Battery Junction Box (P108)
Receiver-Radio-frequency (RF) (T203)
C0632-1
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
C0583L-20
FUSE 43P
10.0 Amps
C0585L-46
GW,0.5D
SJ50
GW,0.5D
C0049-1
C0049-2
LINK 16E
40.0 Amps
C0570L-185
NG,4.0D
C0583L-16
Generic Electronic Module (D162)
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
BATT
RF IN
C0586L-21
U,0.5D
Engine control-module (ECM) (D131)
C2366-4 C2365L-4
YN,MAPAX
C0872L-A4
C2274L-16 C2273-16
SR,0.75
C0411-B4
(DV6)
C2366-5 C2365L-5
YB,MAPAX
C0872L-A3
C2274L-15 C2273-15
UR,0.75
C0411-B3
Switch-Ignition (S176)
C0028-4
C0028-6
W,1.5D
C0582-30
AUX
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY IN
Engine control-module (ECM) (D131)
SJ176
YN,MAPL
C0635L-57
C2366-4 C2365L-4
YN,MAPM
C0635L-58
(PV8)
SJ177
YB,MAPL
C0635L-44
C2366-5 C2365L-5
YB,MAPM
C0635L-45
Passive coil (D156)
C2524-6
G,MAPBB
C0580-30
LF OUT
C2524-8
R,MAPBB
C0580-14
LF IN
Air suspension Control Module (D199)
AIR_SUS_CONT
C0586L-29
WK,0.5D
C0867L-13
Instrument cluster (J100)
GND
C0585L-18
B,2.5D
C2564L-1
TYPE 2
C0230-7
BS,0.5D
C0580-22
ALARM LED
CAN HIGH
C0580-15
YW,MAPX
C1167-6 C1165L-6
CAN LOW
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860
C0230-18
YU,MAPD
SJ731
C0230-17
YW,MAPD
SJ730

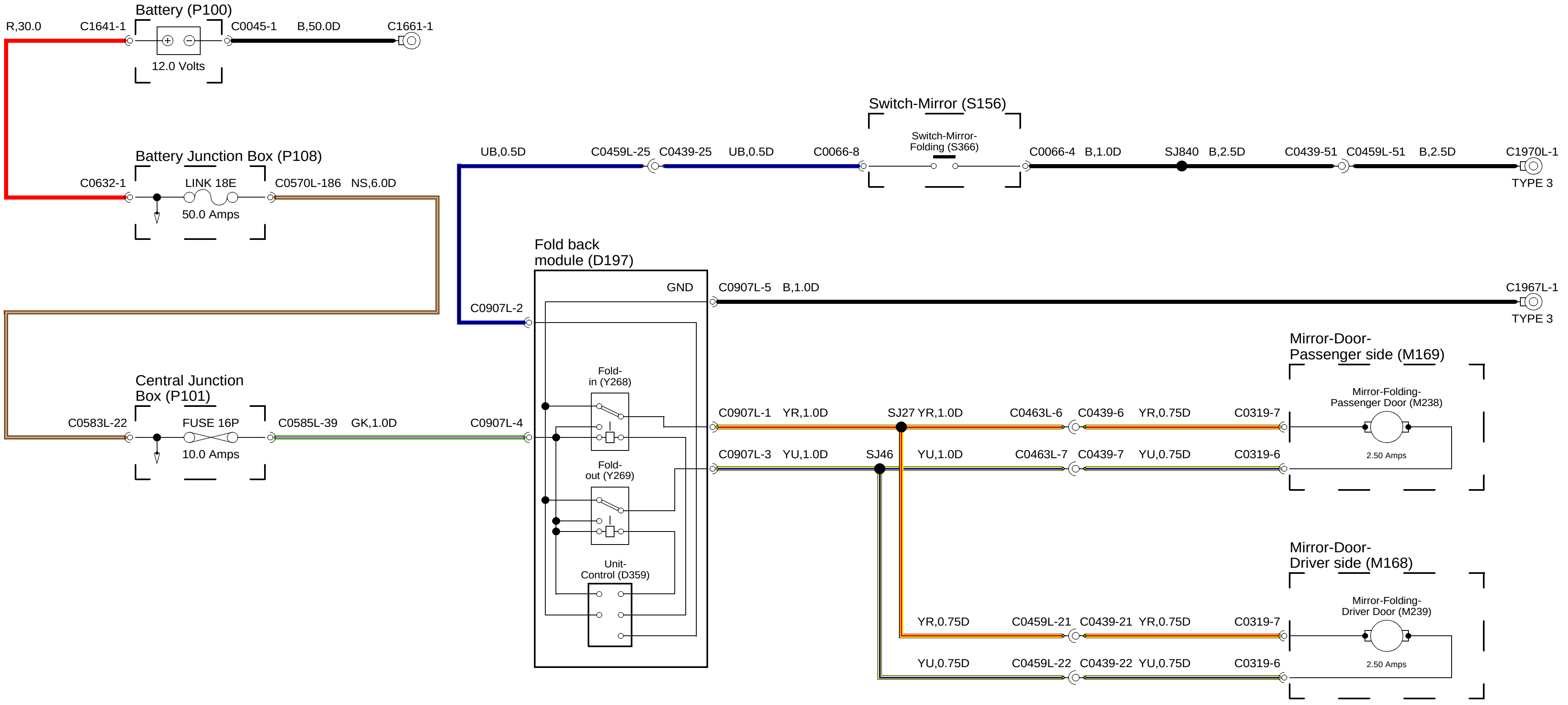

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 69P
5.0 Amps
C0586L-3
GR,0.5D
SJ695
GR,0.5D
C0698-1
Mirror-interior (B146)
IGN
GND
C0698-2
B,0.5D
SJ53
B,4.0D
C2597L-1
TYPE 3
Relay-Reverse (R217)
FUSE 5P
10.0 Amps
C0585L-41
GN,1.5D
SJ7
GN,0.5D
C0698-3
REVERSE

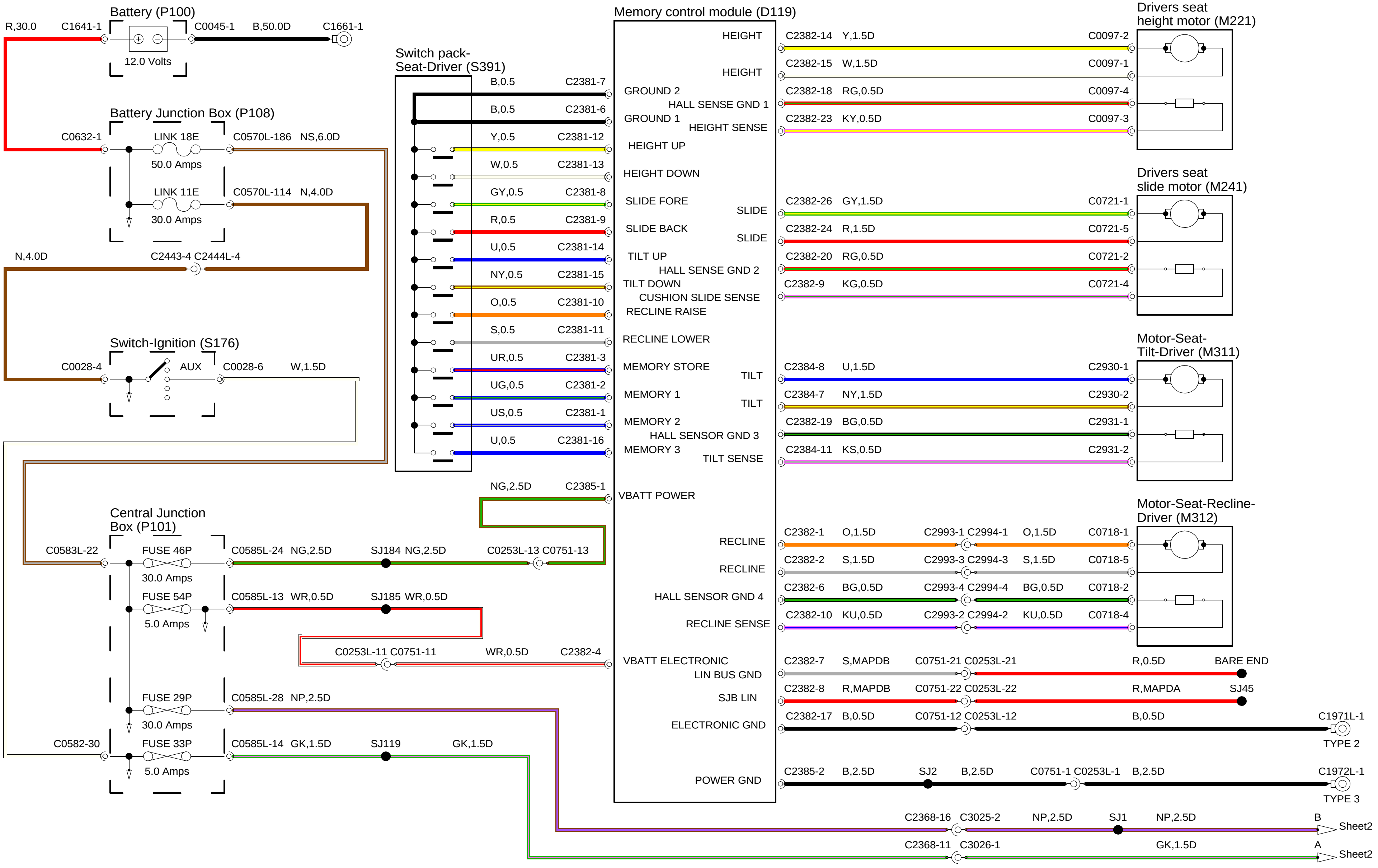

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Heated Wash-jets/Mirror (R256)
C0632-1
FUSE 16E
10.0 Amps
C0570L-173
NP,1.5D
C2412L-4 C2411L-4
C0570L-95
C0570L-118
NO,1.5D
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1
YU,MAPX
C1167-7 C1165L-7
C0580-15
YW,MAPX
C1167-6 C1165L-6
C0580-5
LGG,0.5D
C0278-8
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,1.5D
Engine control-module (ECM) (D131)
C0635L-57
YN,MAPL
SJ176
C0635L-44
YB,MAPL
SJ177
NP,1.5D
SJ31
NP,1.5D
C0459L-4 C0439-4
NP,0.75D
C0319-4
Mirror-Door-Driver side (M168)
Door mirror heater (H135)
2.00 Amps
C0319-5
B,0.75D
SJ840
B,2.5D
B,2.5D
C1970L-1
C0439-51 C0459L-51
TYPE 3
Mirror-Door-Passenger side (M169)
NP,1.5D
C0463L-8 C0439-8
NP,0.75D
C0319-4
Door mirror heater (H136)
2.00 Amps
C0319-5
B,0.75D
SJ840
B,4.0D
B,4.0D
C0810L-1
C0463L-2 C0439-2
TYPE 3
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
C2241L-3 C2239-3
Automatic Temperature Control Module (D243)
BG,0.5D
C1629-13
YN,0.5D
C1629-15
C2655-1
SJ965
YW,MAPN
C1629-22
SJ975
YU,MAPN
C1629-21
ATC
Display
+ Blower -
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
Temp R
Auto
Econ
Rear
Seat R
CAN +
CAN -
CAN -
CAN +
C1629-19
NO,0.5D
C2655-3
B,1.0D
C2629-1
TYPE 3
C1629-9
YU,MAPL
C2238-1 C2240-1
C1629-10
YW,MAPL
C2238-2 C2240-2
Switch-Steering column-Wiper (S174)
Instrument cluster (J100)
SJ731
YU,MAPD
C0230-18
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860

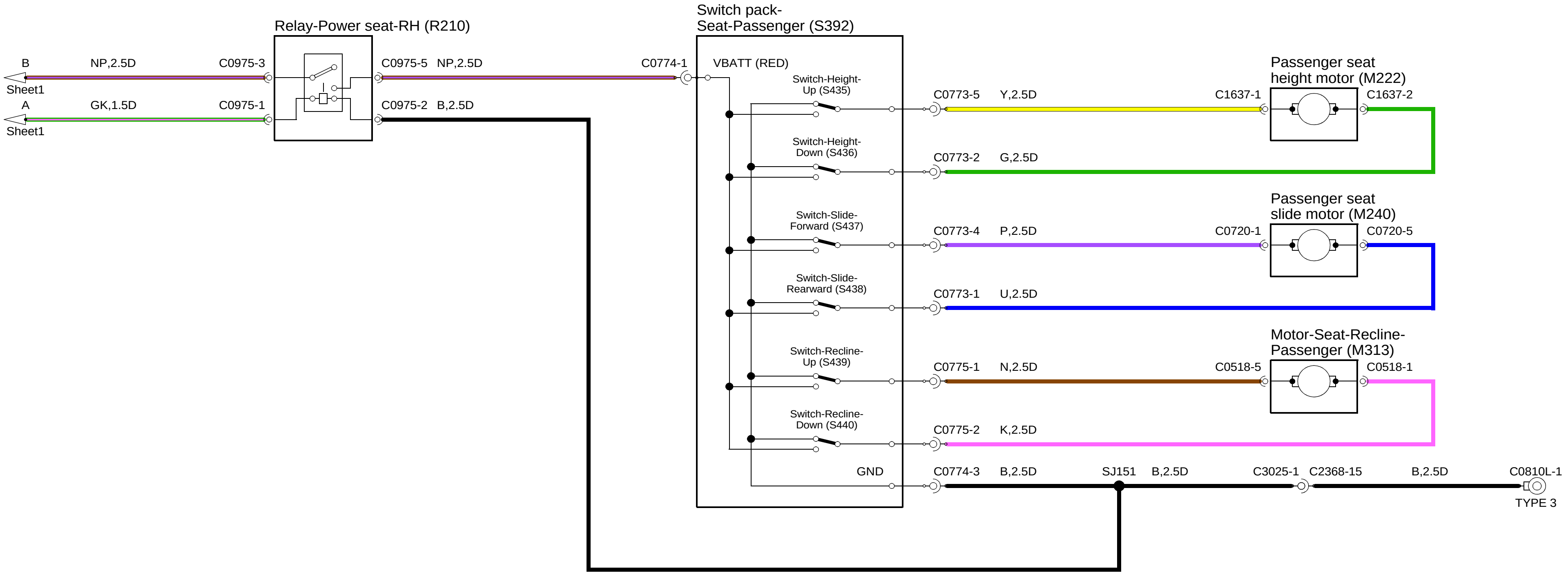

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Mirror-Door-
Driver side (M168)
Switch-Mirror (S156)
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0066-1 BU,0.5D
C0319-3
Motor-Mirror-Driver Up-Down adjustment (M307)
UP
C0066-7 BK,0.5D
C0319-1
Motor-Mirror-Driver Left-Right adjustment (M309)
C0066-3 SW,0.5D
SJ215
SW,0.5D
C0319-2
Left-Right (Y274)
Central Junction Box (P101)
C0582-30
FUSE 33P
C0585L-14 GK,1.5D
SJ119
5.0 Amps
SW,0.5D
C0439-40 C0459L-40 SW,0.5D
GK,1.0D
Up-Down (Y250)
Passenger-Driver (Y275)
BU,0.5D
C0066-2 BU,0.5D
C0439-47 C0459L-47
C0459L-13 C0439-13 GK,0.75D
C0066-6
+
C0066-5 BK,0.5D
C0439-48 C0459L-48 BK,0.5D
Mirror-Door-
Passenger side (M169)
C0463L-33 C0439-33 SW,0.5D
C0319-2
Motor-Mirror-Passenger Up-Down adjustment (M308)
C0463L-32 C0439-32 BU,0.5D
C0319-3
Motor-Mirror-Passenger Left-Right adjustment (M310)
C0463L-34 C0439-34 BK,0.5D
C0319-1
-
C0066-4 B,1.0D
SJ840 B,2.5D
C0439-51 C0459L-51 B,2.5D
C1970L-1
TYPE 3

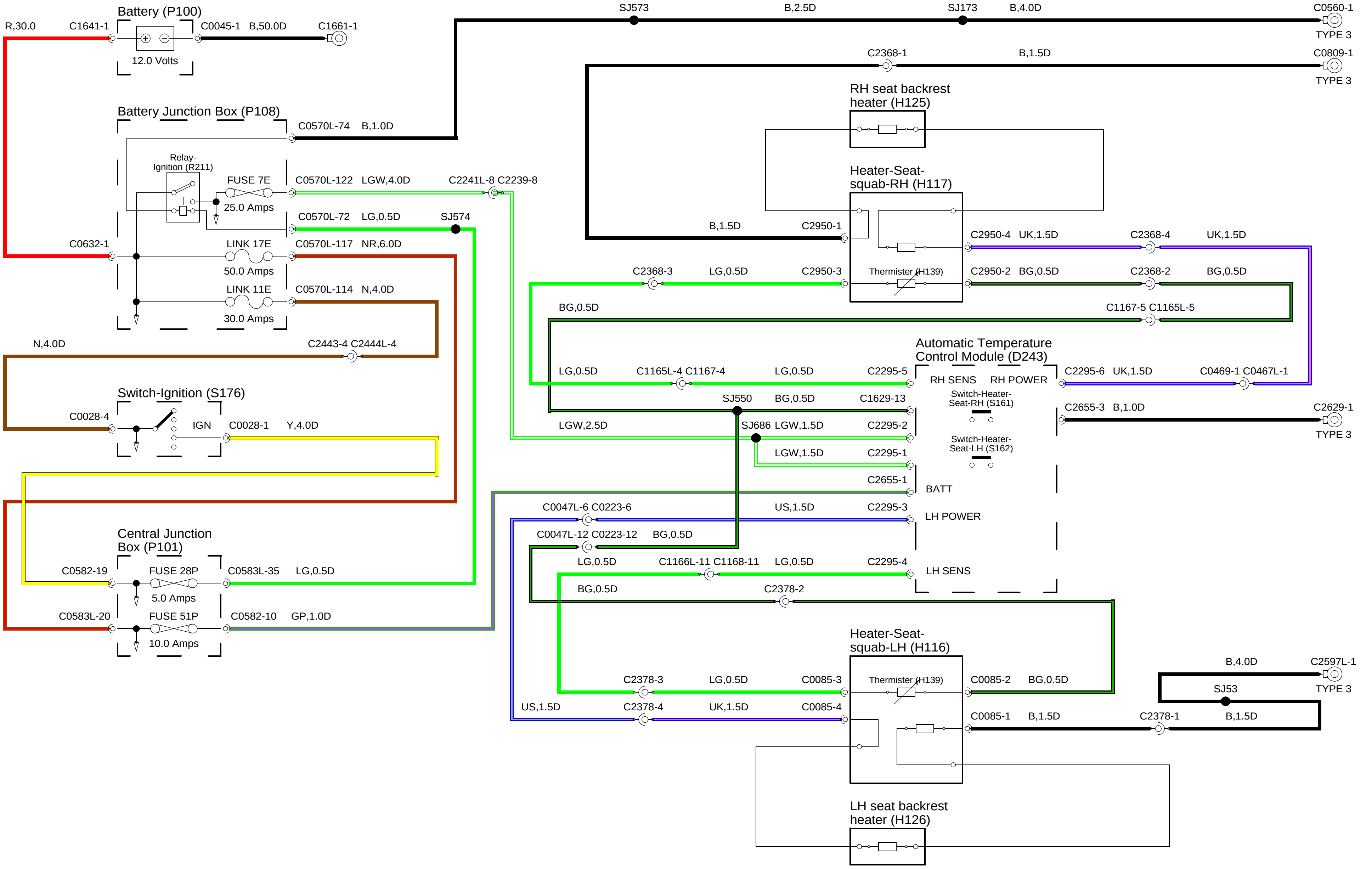

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
SJ45
R,MAPDA
C0253L-22 C0751-22
R,MAPDB
C2382-8
BARE END
S,MAPDA
C0253L-21 C0751-21
S,MAPDB
C2382-7
Central Junction Box (P101)
C0583L-22
FUSE 46P
30.0 Amps
C0585L-24
NG,2.5D
SJ184
NG,2.5D
C0253L-13 C0751-13
NG,2.5D
C2385-1
C0582-30
FUSE 33P
5.0 Amps
C0585L-14
GK,1.5D
SJ119
GK,1.0D
C0459L-13 C0439-13
GK,0.75D
Switch-Mirror (S156)
LH up-down (Y270)
LH left-right (Y272)
RH up-down (Y271)
RH left-right (Y273)
C0066-6
C0066-1
BU,0.5D
C0439-43 C0459L-43
BU,0.5D
C0253L-2 C0751-2
BU,0.5D
C2383-14
C0066-7
BK,0.5D
C0439-44 C0459L-44
BK,0.5D
C0253L-3 C0751-3
BK,0.5D
C2383-7
C0066-2
SW,0.5D
C0439-45 C0459L-45
SW,0.5D
C0253L-4 C0751-4
SW,0.5D
C2383-13
C0066-5
BU,0.5D
C0439-46 C0459L-46
BU,0.5D
C0253L-5 C0751-5
BU,0.5D
C2383-8
C0066-4
B,1.0D
SJ840
B,2.5D
C0439-51 C0459L-51
B,2.5D
C1970L-1
TYPE 3
Memory control module (D119)
SJB LIN
5V SUPPLY
LIN-BUS GND
GND
VBATT POWER
C2383-4
BU,0.5D
C0751-9 C0253L-9
BU,0.5D
A
Sheet2
C2383-6
SW,0.5D
C0751-10 C0253L-10
SW,0.5D
B
Sheet2
C2383-5
BK,0.5D
C0751-6 C0253L-6
BK,0.5D
C
Sheet2
C2383-15
R,0.5D
C0751-16 C0253L-16
R,0.5D
D
Sheet2
C2383-10
G,0.5D
C0751-20 C0253L-20
G,0.5D
E
Sheet2
C2383-9
Y,0.5D
C0751-8 C0253L-8
Y,0.5D
F
Sheet2
C2383-16
B,0.5D
G
Sheet2
C2383-12
G,0.5D
C0751-17 C0253L-17
G,0.5D
H
Sheet2
C2383-11
Y,0.5D
C0751-18 C0253L-18
Y,0.5D
J
Sheet2
C2383-1
BU,0.5D
C0751-7 C0253L-7
BU,0.5D
K
Sheet2
C2383-2
SW,0.5D
C0751-14 C0253L-14
SW,0.5D
L
Sheet2
C2383-3
BK,0.5D
C0751-15 C0253L-15
BK,0.5D
M
Sheet2
C2385-2
B,2.5D
SJ2
B,2.5D
C0751-1 C0253L-1
B,2.5D
C1972L-1
TYPE 3

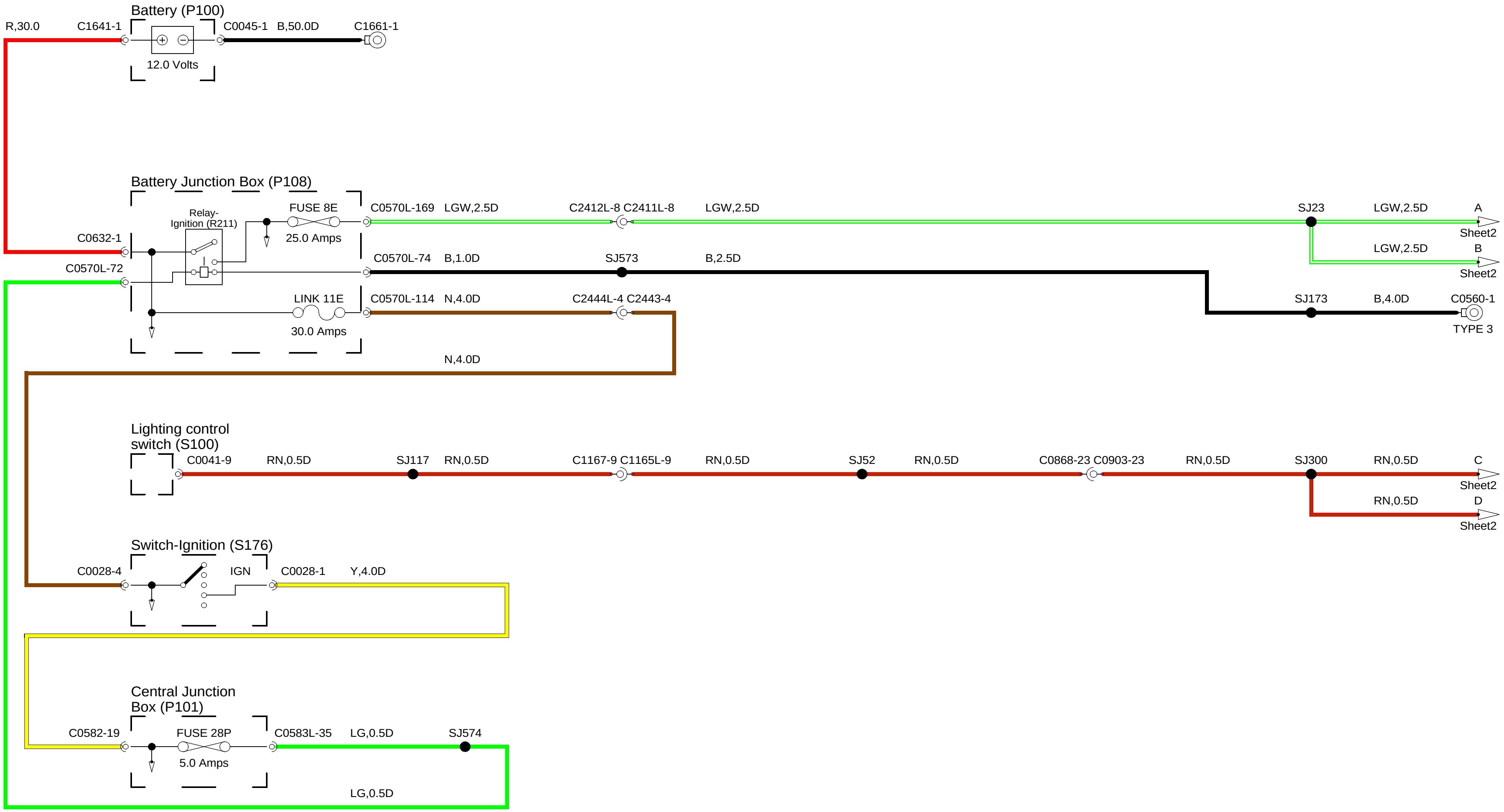

Mirror-Door-
Driver side (M168)
Motor-Mirror-Driver Up-Down adjustment (M307)
Motor-Mirror-Driver Left-Right adjustment (M309)
A
Sheet1
BU,0.5D
C0459L-32 C0439-32
BU,0.5D
C0319-3
B
Sheet1
SW,0.5D
C0459L-33 C0439-33
SW,0.5D
C0319-2
C
Sheet1
BK,0.5D
C0459L-34 C0439-34
BK,0.5D
C0319-1
Mirror-Door-
Driver side (M168)
Potentiometer-Up/Down (T362)
Potentiometer-Left/Right (T363)
D
Sheet1
R,0.5D
SJ29
R,0.5D
C0459L-14 C0439-14
R,0.5D
C1563-1
+
-
C1563-3
B,0.5D
E
Sheet1
G,0.5D
C0459L-18 C0439-18
G,0.5D
C1563-2
F
Sheet1
Y,0.5D
C0459L-17 C0439-17
Y,0.5D
C1563-4
G
Sheet1
B,0.5D
C0751-19 C0253L-19
B,0.5D
SJ30
B,0.5D
C0459L-16 C0439-16
B,0.5D
C0463L-16 C0439-16
Mirror-Door-
Passenger side (M169)
Potentiometer-Up/Down (T362)
Potentiometer-Left/Right (T363)
R,0.5D
C0463L-14 C0439-14
R,0.5D
C1563-1
+
-
C1563-3
B,0.5D
H
Sheet1
G,0.5D
C0463L-40 C0439-40
G,0.5D
C1563-2
J
Sheet1
Y,0.5D
C0463L-39 C0439-39
Y,0.5D
C1563-4
Mirror-Door-
Passenger side (M169)
Motor-Mirror-Passenger Up-Down adjustment (M308)
Motor-Mirror-Passenger Left-Right adjustment (M310)
K
Sheet1
BU,0.5D
C0463L-32 C0439-32
BU,0.5D
C0319-3
L
Sheet1
SW,0.5D
C0463L-33 C0439-33
SW,0.5D
C0319-2
M
Sheet1
BK,0.5D
C0463L-34 C0439-34
BK,0.5D
C0319-1

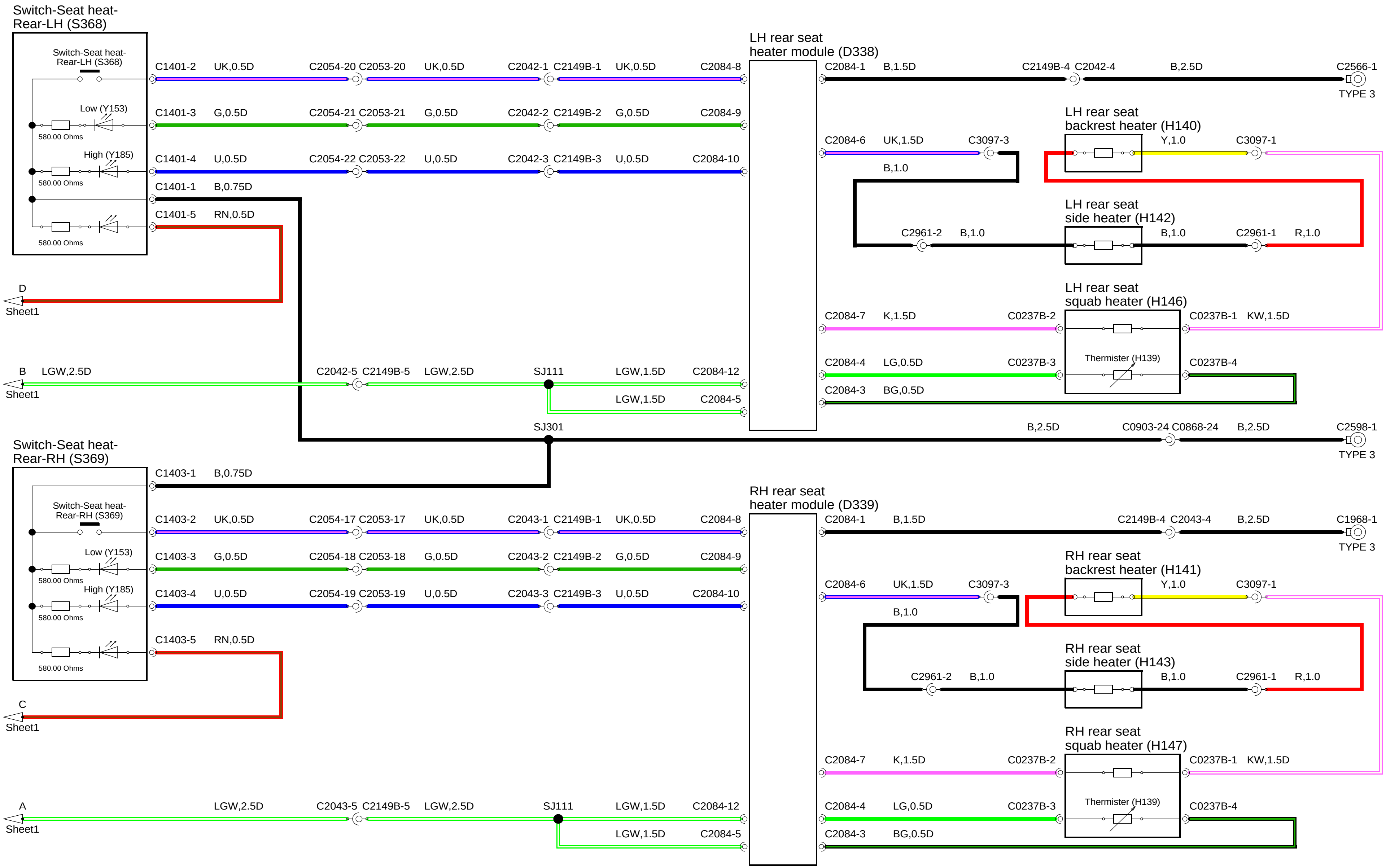

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Switch-Mirror (S156)
Switch-Mirror-
Folding (S366)
Battery Junction Box (P108)
UB,0.5D
C0459L-25
C0439-25
UB,0.5D
C0066-8
C0066-4
B,1.0D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
TYPE 3
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Fold back
module (D197)
GND
C0907L-5
B,1.0D
C1967L-1
TYPE 3
C0907L-2
Mirror-Door-
Passenger side (M169)
Fold-
in (Y268)
Mirror-Folding-
Passenger Door (M238)
Central Junction
Box (P101)
C0907L-1
YR,1.0D
SJ27 YR,1.0D
C0463L-6
C0439-6
YR,0.75D
C0319-7
C0583L-22
FUSE 16P
C0585L-39
GK,1.0D
C0907L-4
10.0 Amps
C0907L-3
YU,1.0D
SJ46
YU,1.0D
C0463L-7
C0439-7
YU,0.75D
C0319-6
2.50 Amps
Fold-
out (Y269)
Mirror-Door-
Driver side (M168)
Unit-
Control (D359)
Mirror-Folding-
Driver Door (M239)
YR,0.75D
C0459L-21
C0439-21
YR,0.75D
C0319-7
YU,0.75D
C0459L-22
C0439-22
YU,0.75D
C0319-6
2.50 Amps

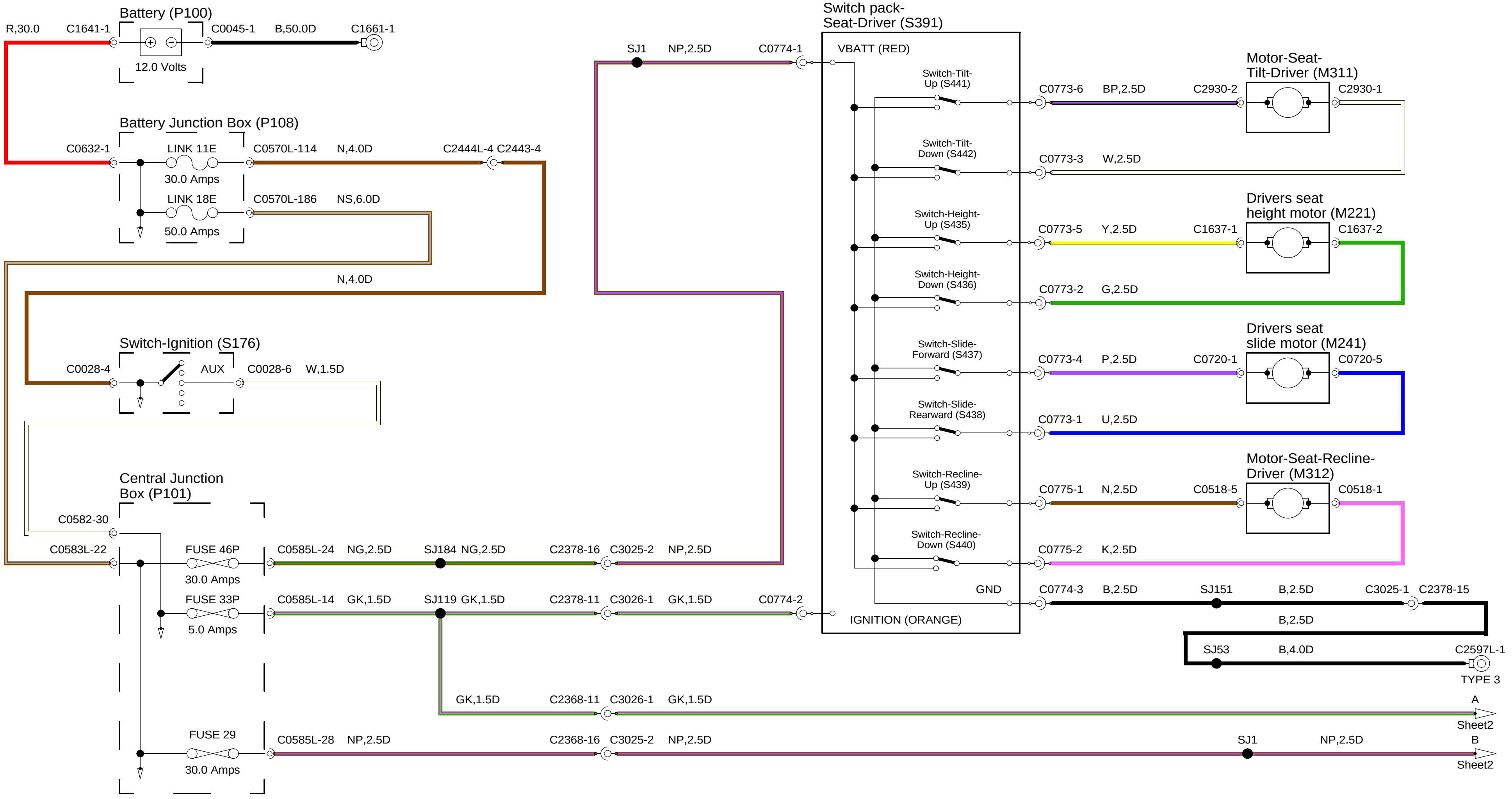

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central Junction Box (P101)
C0583L-22
FUSE 46P
30.0 Amps
C0585L-24
NG,2.5D
SJ184
NG,2.5D
C0253L-13 C0751-13
FUSE 54P
5.0 Amps
C0585L-13
WR,0.5D
SJ185
WR,0.5D
C0253L-11 C0751-11
WR,0.5D
C2382-4
FUSE 29P
30.0 Amps
C0585L-28
NP,2.5D
C0582-30
FUSE 33P
5.0 Amps
C0585L-14
GK,1.5D
SJ119
GK,1.5D
Switch pack-Seat-Driver (S391)
B,0.5
C2381-7
B,0.5
C2381-6
Y,0.5
C2381-12
W,0.5
C2381-13
GY,0.5
C2381-8
R,0.5
C2381-9
U,0.5
C2381-14
NY,0.5
C2381-15
O,0.5
C2381-10
S,0.5
C2381-11
UR,0.5
C2381-3
UG,0.5
C2381-2
US,0.5
C2381-1
U,0.5
C2381-16
NG,2.5D
C2385-1
Memory control module (D119)
HEIGHT
HEIGHT
GROUND 2
HALL SENSE GND 1
GROUND 1
HEIGHT SENSE
HEIGHT UP
HEIGHT DOWN
SLIDE FORE
SLIDE
SLIDE BACK
SLIDE
TILT UP
HALL SENSE GND 2
TILT DOWN
CUSHION SLIDE SENSE
RECLINE RAISE
RECLINE LOWER
MEMORY STORE
TILT
MEMORY 1
TILT
MEMORY 2
HALL SENSOR GND 3
MEMORY 3
TILT SENSE
VBATT POWER
RECLINE
RECLINE
HALL SENSOR GND 4
RECLINE SENSE
VBATT ELECTRONIC
LIN BUS GND
SJB LIN
ELECTRONIC GND
POWER GND
C2382-14
Y,1.5D
C0097-2
C2382-15
W,1.5D
C0097-1
C2382-18
RG,0.5D
C0097-4
C2382-23
KY,0.5D
C0097-3
Drivers seat height motor (M221)
C2382-26
GY,1.5D
C0721-1
C2382-24
R,1.5D
C0721-5
C2382-20
RG,0.5D
C0721-2
C2382-9
KG,0.5D
C0721-4
Drivers seat slide motor (M241)
C2384-8
U,1.5D
C2930-1
C2384-7
NY,1.5D
C2930-2
C2382-19
BG,0.5D
C2931-1
C2384-11
KS,0.5D
C2931-2
Motor-Seat-Tilt-Driver (M311)
C2382-1
O,1.5D
C2993-1 C2994-1
O,1.5D
C0718-1
C2382-2
S,1.5D
C2993-3 C2994-3
S,1.5D
C0718-5
C2382-6
BG,0.5D
C2993-4 C2994-4
BG,0.5D
C0718-2
C2382-10
KU,0.5D
C2993-2 C2994-2
KU,0.5D
C0718-4
Motor-Seat-Recline-Driver (M312)
C2382-7
S,MAPDB
C0751-21 C0253L-21
R,0.5D
BARE END
C2382-8
R,MAPDB
C0751-22 C0253L-22
R,MAPDA
SJ45
C2382-17
B,0.5D
C0751-12 C0253L-12
B,0.5D
C1971L-1
TYPE 2
C2385-2
B,2.5D
SJ2
B,2.5D
C0751-1 C0253L-1
B,2.5D
C1972L-1
TYPE 3
C2368-16
C3025-2
NP,2.5D
SJ1
NP,2.5D
B
Sheet2
C2368-11
C3026-1
GK,1.5D
A
Sheet2

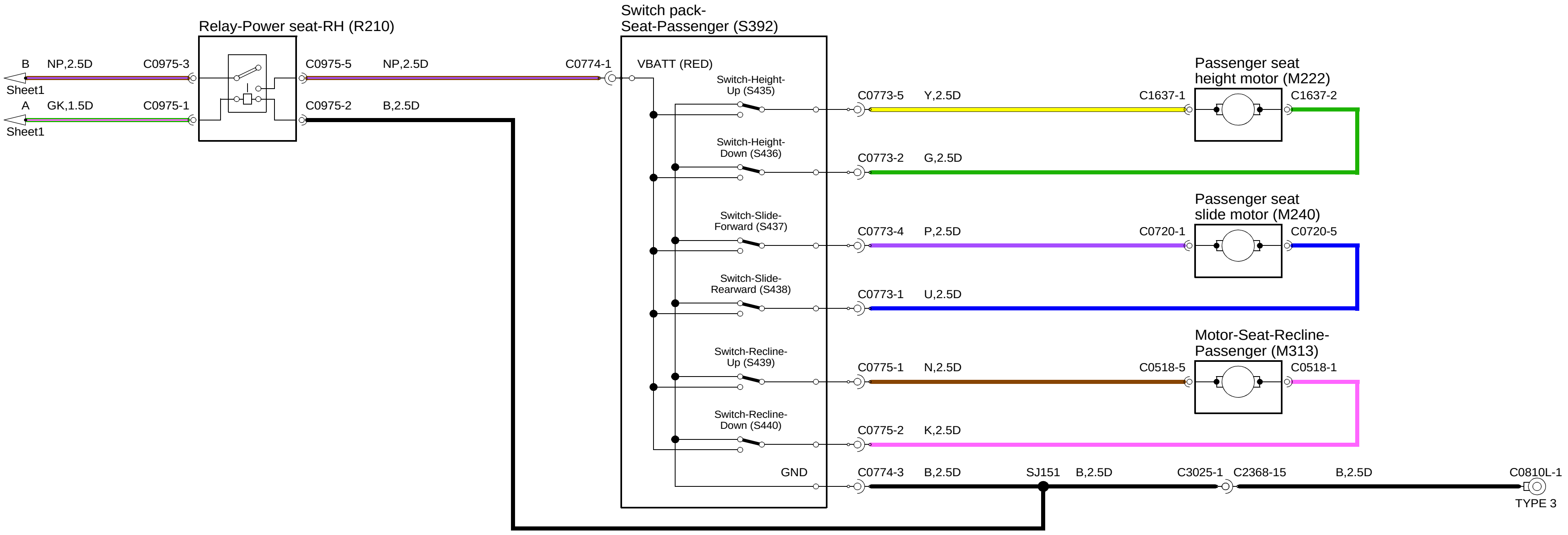

Relay-Power seat-RH (R210)
Switch pack-
Seat-Passenger (S392)
B
NP,2.5D
C0975-3
Sheet1
A
GK,1.5D
C0975-1
Sheet1
C0975-5 NP,2.5D
C0975-2 B,2.5D
C0774-1
VBATT (RED)
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
C0773-5
Y,2.5D
C1637-1
Passenger seat
height motor (M222)
C1637-2
C0773-2
G,2.5D
Passenger seat
slide motor (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

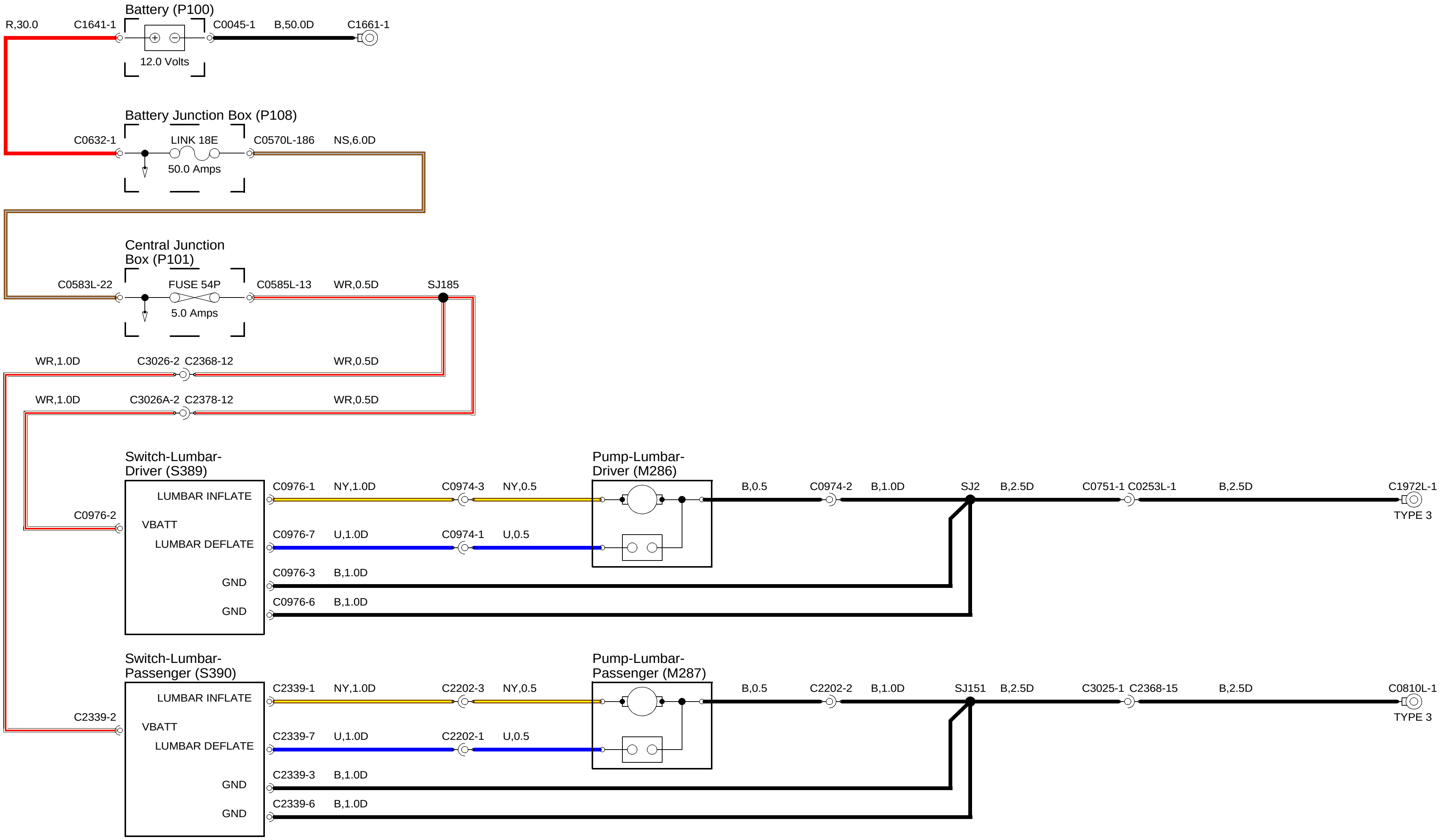

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0570L-74
B,1.0D
Relay-
Ignition (R211)
FUSE 7E
25.0 Amps
C0570L-122
LGW,4.0D
C2241L-8 C2239-8
C0570L-72
LG,0.5D
SJ574
C0632-1
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction
Box (P101)
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
SJ573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
C2368-1
B,1.5D
C0809-1
TYPE 3
RH seat backrest
heater (H125)
Heater-Seat-
squab-RH (H117)
B,1.5D
C2950-1
C2950-4
UK,1.5D
C2368-4
UK,1.5D
C2368-3
LG,0.5D
C2950-3
Thermister (H139)
C2950-2
BG,0.5D
C2368-2
BG,0.5D
BG,0.5D
C1167-5 C1165L-5
Automatic Temperature
Control Module (D243)
LG,0.5D
C1165L-4 C1167-4
LG,0.5D
C2295-5
RH SENS
RH POWER
C2295-6
UK,1.5D
C0469-1 C0467L-1
SJ550
BG,0.5D
C1629-13
Switch-Heater-
Seat-RH (S161)
C2655-3
B,1.0D
C2629-1
TYPE 3
LGW,2.5D
SJ686
LGW,1.5D
C2295-2
Switch-Heater-
Seat-LH (S162)
LGW,1.5D
C2295-1
C2655-1
BATT
C0047L-6 C0223-6
US,1.5D
C2295-3
LH POWER
C0047L-12 C0223-12
BG,0.5D
LG,0.5D
C1166L-11 C1168-11
LG,0.5D
C2295-4
LH SENS
BG,0.5D
C2378-2
Heater-Seat-
squab-LH (H116)
C2378-3
LG,0.5D
C0085-3
Thermister (H139)
C0085-2
BG,0.5D
B,4.0D
C2597L-1
TYPE 3
SJ53
US,1.5D
C2378-4
UK,1.5D
C0085-4
C0085-1
B,1.5D
C2378-1
B,1.5D
LH seat backrest
heater (H126)

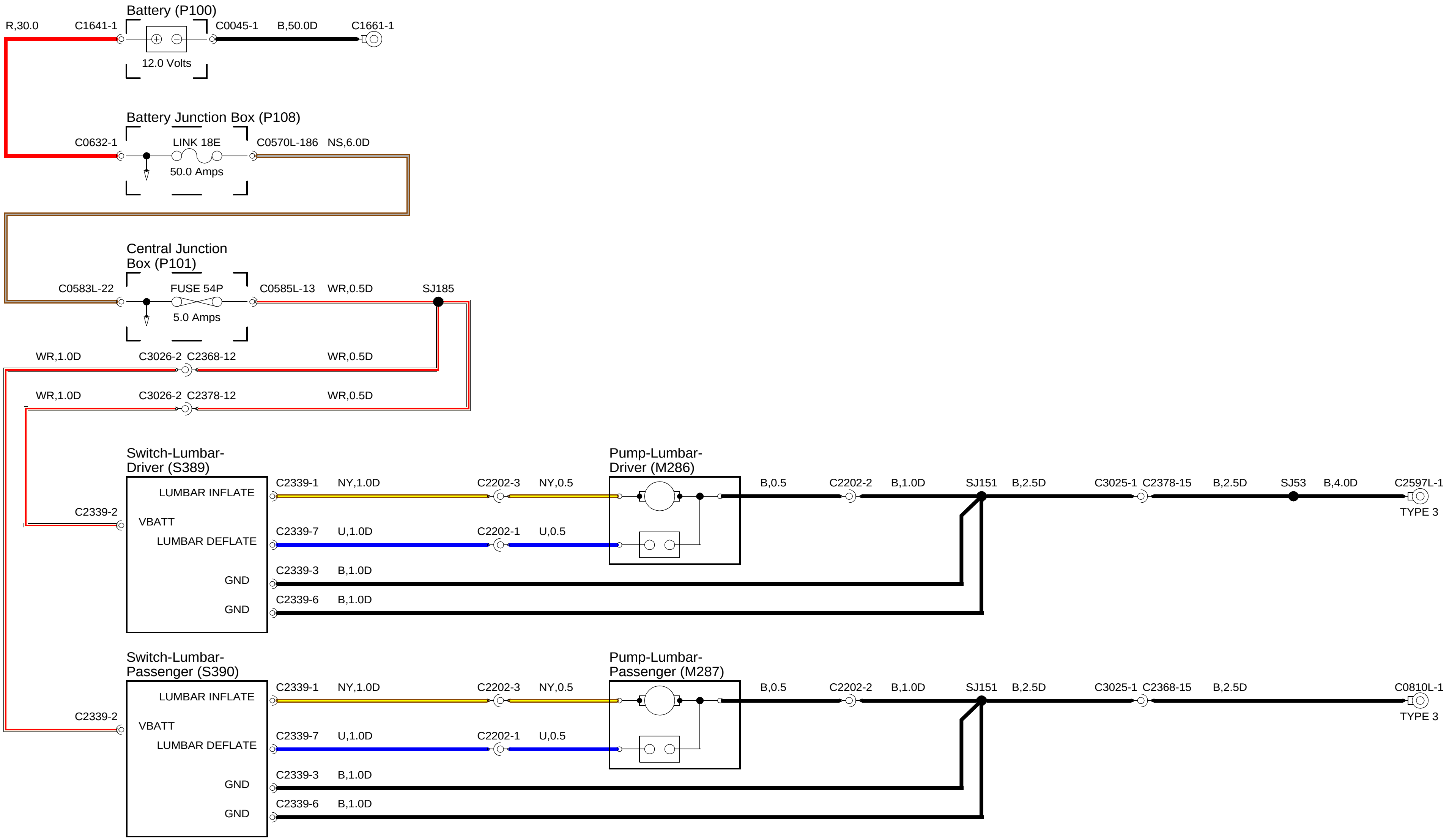

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-
Ignition (R211)
FUSE 8E
25.0 Amps
C0570L-169
LGW,2.5D
C2412L-8 C2411L-8
LGW,2.5D
SJ23
LGW,2.5D
A
Sheet2
LGW,2.5D
B
Sheet2
C0632-1
C0570L-74
B,1.0D
SJ573
B,2.5D
C0570L-72
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
SJ173
B,4.0D
C0560-1
TYPE 3
N,4.0D
Lighting control
switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1167-9 C1165L-9
RN,0.5D
SJ52
RN,0.5D
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C
Sheet2
RN,0.5D
D
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction
Box (P101)
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,0.5D

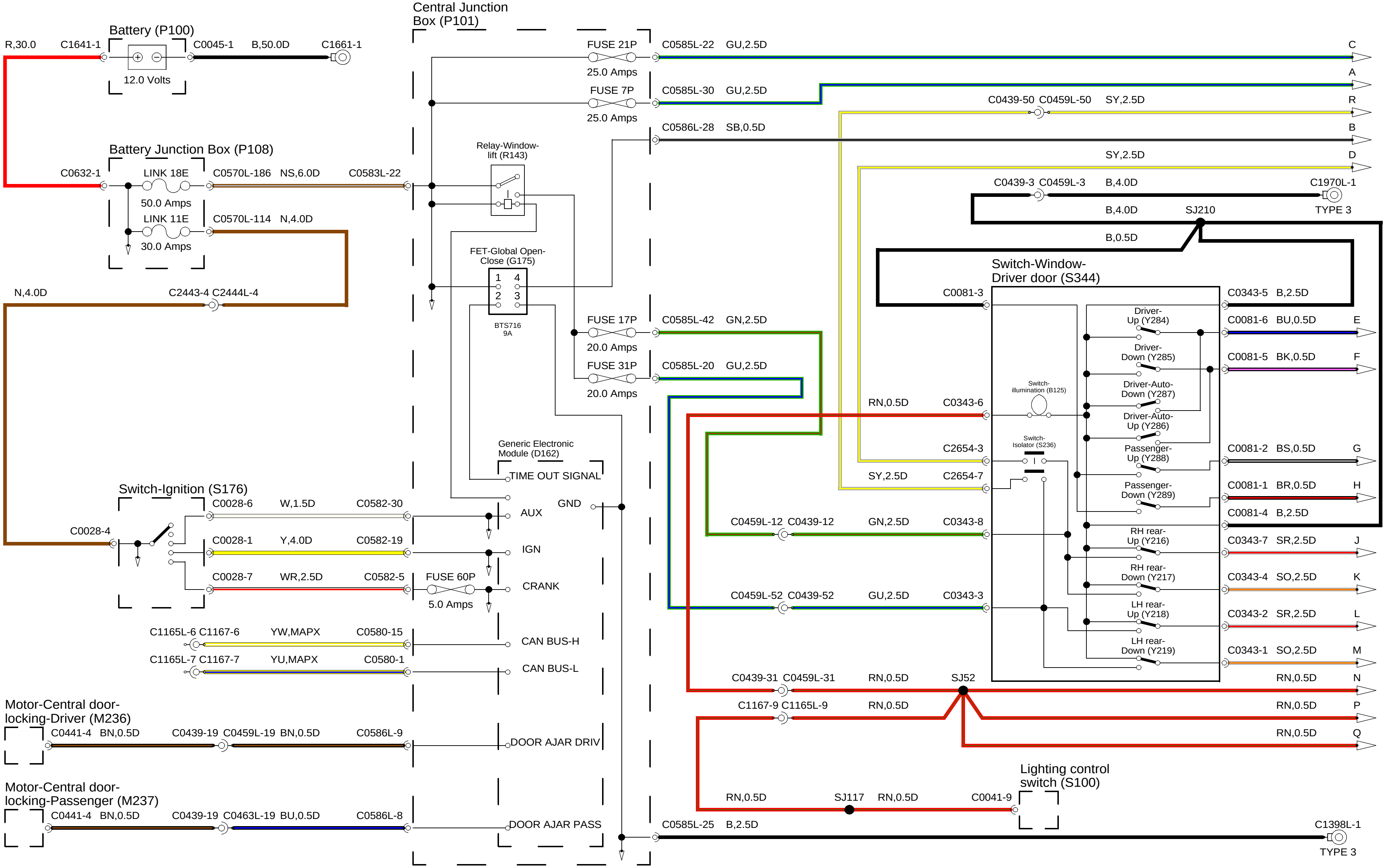

Switch-Seat heat-Rear-LH (S368)
Switch-Seat heat-Rear-LH (S368)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1401-2
UK,0.5D
C2054-20
C2053-20
UK,0.5D
C2042-1
C2149B-1
UK,0.5D
C2084-8
C1401-3
G,0.5D
C2054-21
C2053-21
G,0.5D
C2042-2
C2149B-2
G,0.5D
C2084-9
C1401-4
U,0.5D
C2054-22
C2053-22
U,0.5D
C2042-3
C2149B-3
U,0.5D
C2084-10
C1401-1
B,0.75D
C1401-5
RN,0.5D
D
Sheet1
B
LGW,2.5D
Sheet1
C2042-5
C2149B-5
LGW,2.5D
SJ111
LGW,1.5D
C2084-12
LGW,1.5D
C2084-5
LH rear seat heater module (D338)
C2084-1
B,1.5D
C2149B-4
C2042-4
B,2.5D
C2566-1
TYPE 3
LH rear seat backrest heater (H140)
C2084-6
UK,1.5D
C3097-3
Y,1.0
C3097-1
B,1.0
LH rear seat side heater (H142)
C2961-2
B,1.0
B,1.0
C2961-1
R,1.0
LH rear seat squab heater (H146)
C2084-7
K,1.5D
C0237B-2
C0237B-1
KW,1.5D
Thermister (H139)
C2084-4
LG,0.5D
C0237B-3
C0237B-4
C2084-3
BG,0.5D
SJ301
B,2.5D
C0903-24
C0868-24
B,2.5D
C2598-1
TYPE 3
Switch-Seat heat-Rear-RH (S369)
C1403-1
B,0.75D
Switch-Seat heat-Rear-RH (S369)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1403-2
UK,0.5D
C2054-17
C2053-17
UK,0.5D
C2043-1
C2149B-1
UK,0.5D
C2084-8
C1403-3
G,0.5D
C2054-18
C2053-18
G,0.5D
C2043-2
C2149B-2
G,0.5D
C2084-9
C1403-4
U,0.5D
C2054-19
C2053-19
U,0.5D
C2043-3
C2149B-3
U,0.5D
C2084-10
C1403-5
RN,0.5D
C
Sheet1
RH rear seat heater module (D339)
C2084-1
B,1.5D
C2149B-4
C2043-4
B,2.5D
C1968-1
TYPE 3
RH rear seat backrest heater (H141)
C2084-6
UK,1.5D
C3097-3
Y,1.0
C3097-1
B,1.0
RH rear seat side heater (H143)
C2961-2
B,1.0
B,1.0
C2961-1
R,1.0
RH rear seat squab heater (H147)
C2084-7
K,1.5D
C0237B-2
C0237B-1
KW,1.5D
Thermister (H139)
C2084-4
LG,0.5D
C0237B-3
C0237B-4
C2084-3
BG,0.5D
A
Sheet1
LGW,2.5D
C2043-5
C2149B-5
LGW,2.5D
SJ111
LGW,1.5D
C2084-12
LGW,1.5D
C2084-5

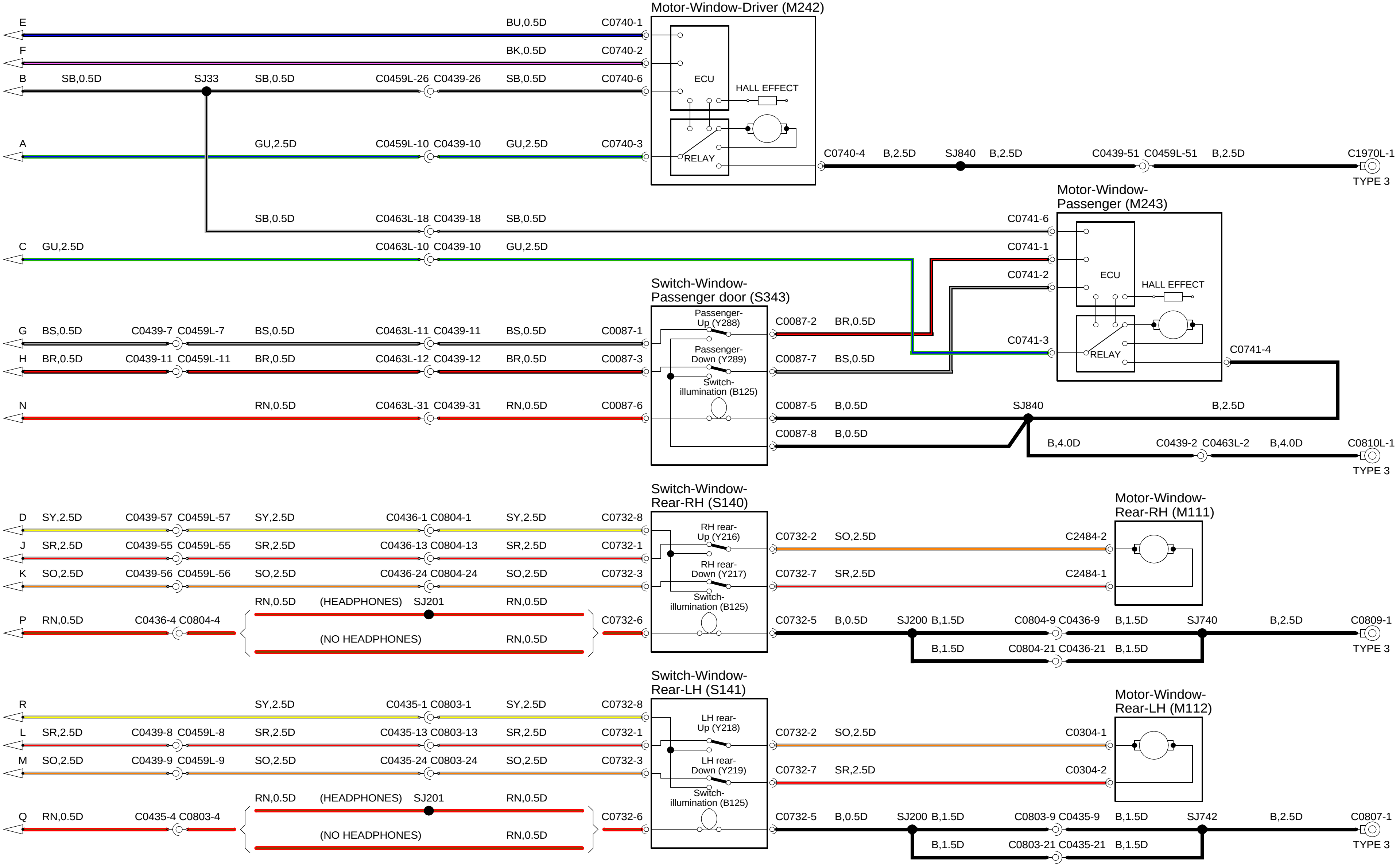

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central Junction Box (P101)
C0582-30
C0583L-22
FUSE 46P
30.0 Amps
C0585L-24
NG,2.5D
SJ184 NG,2.5D
C2378-16
C3025-2
NP,2.5D
FUSE 33P
5.0 Amps
C0585L-14
GK,1.5D
SJ119 GK,1.5D
C2378-11
C3026-1
GK,1.5D
C0774-2
GK,1.5D
C2368-11
C3026-1
GK,1.5D
A
Sheet2
FUSE 29
30.0 Amps
C0585L-28
NP,2.5D
C2368-16
C3025-2
NP,2.5D
SJ1
NP,2.5D
B
Sheet2
SJ1
NP,2.5D
C0774-1
Switch pack-Seat-Driver (S391)
VBATT (RED)
Switch-Tilt-Up (S441)
Switch-Tilt-Down (S442)
Switch-Height-Up (S435)
Switch-Height-Down (S436)
Switch-Slide-Forward (S437)
Switch-Slide-Rearward (S438)
Switch-Recline-Up (S439)
Switch-Recline-Down (S440)
GND
IGNITION (ORANGE)
Motor-Seat-Tilt-Driver (M311)
C0773-6
BP,2.5D
C2930-2
C2930-1
C0773-3
W,2.5D
Drivers seat height motor (M221)
C0773-5
Y,2.5D
C1637-1
C1637-2
C0773-2
G,2.5D
Drivers seat slide motor (M241)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-Driver (M312)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
SJ53
B,4.0D
C2597L-1
TYPE 3

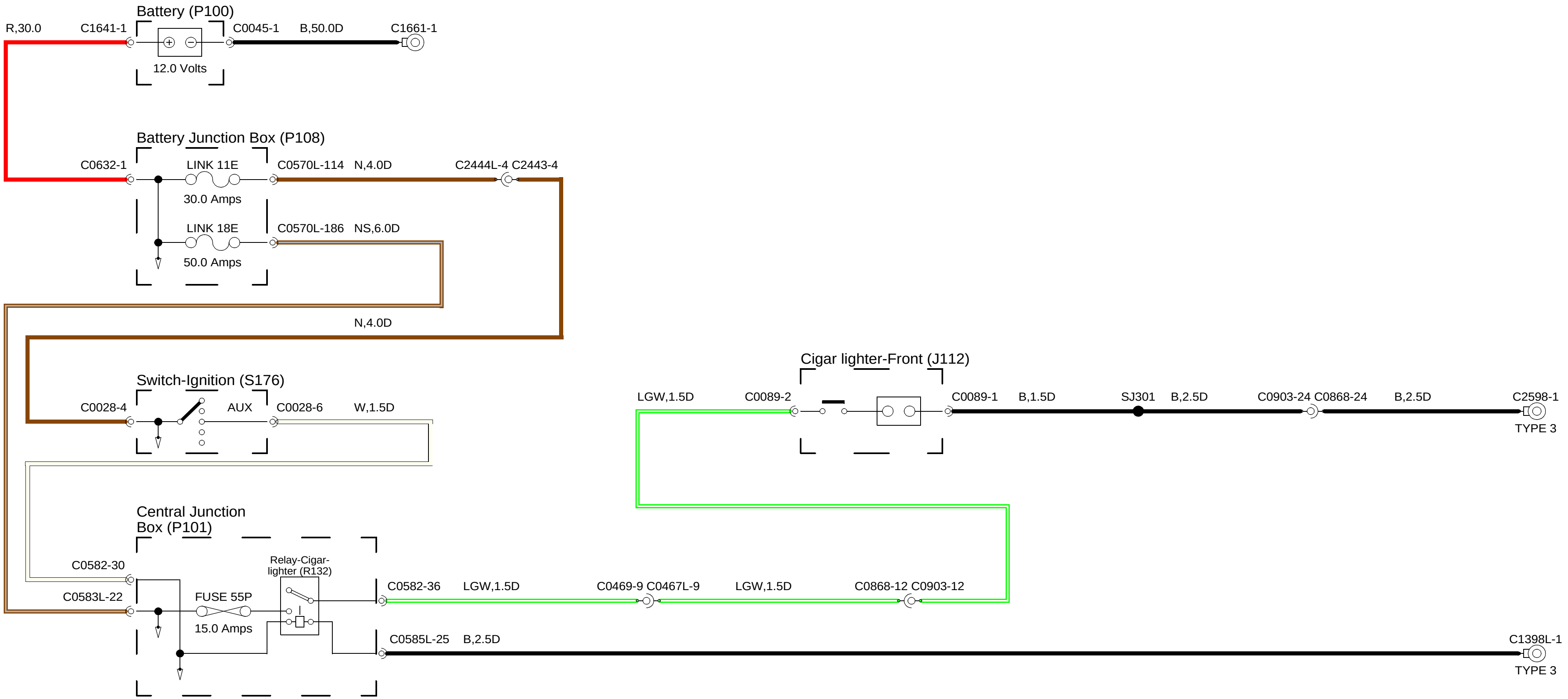

Relay-Power seat-RH (R210)
Switch pack-
Seat-Passenger (S392)
B
NP,2.5D
C0975-3
Sheet1
A
GK,1.5D
C0975-1
Sheet1
C0975-5
NP,2.5D
C0774-1
C0975-2
B,2.5D
VBATT (RED)
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
C0773-5
Y,2.5D
C1637-1
C1637-2
Passenger seat
height motor (M222)
C0773-2
G,2.5D
Passenger seat
slide motor (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

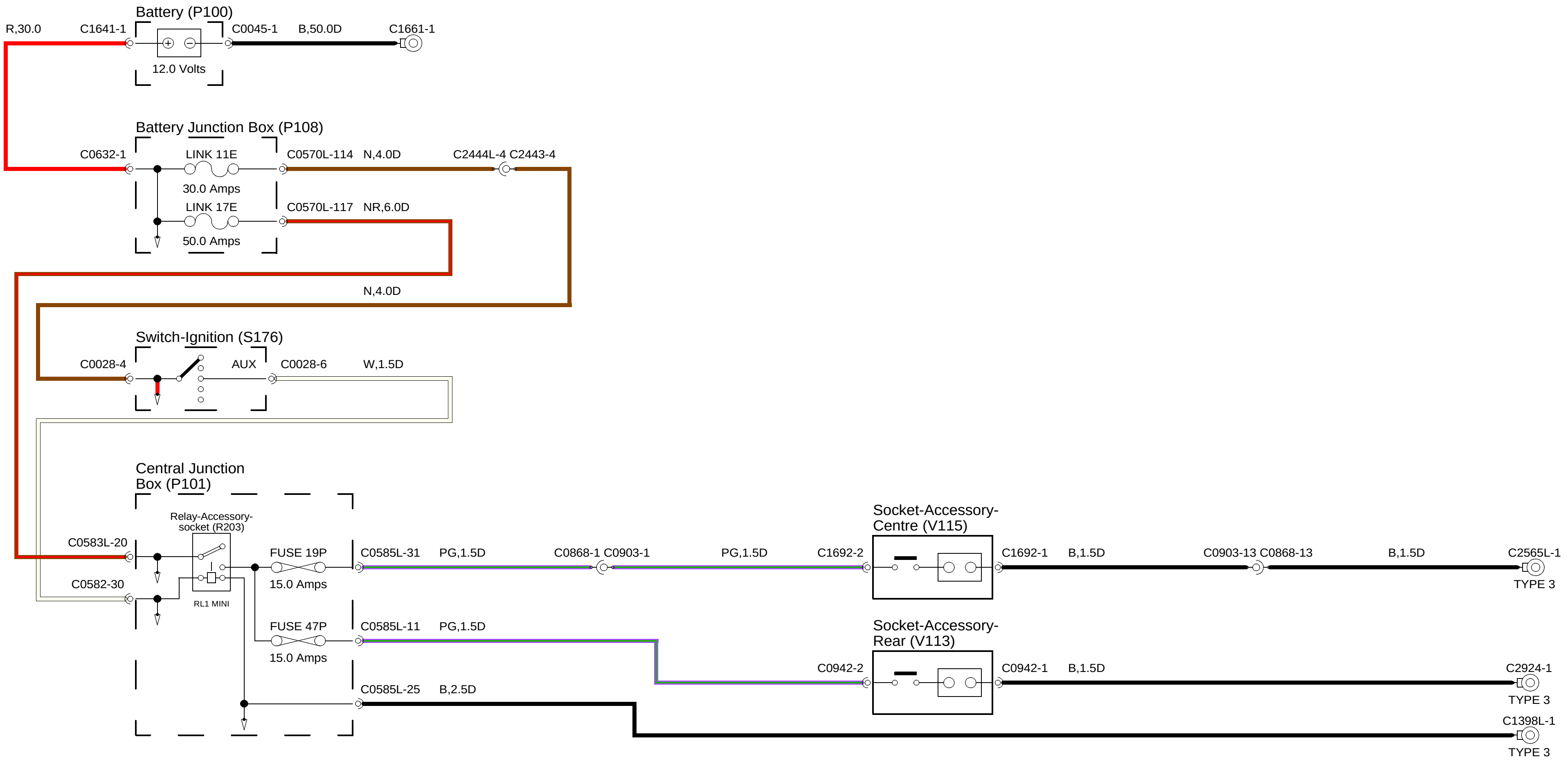

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Central Junction
Box (P101)
C0583L-22
FUSE 54P
5.0 Amps
C0585L-13
WR,0.5D
SJ185
WR,1.0D
C3026-2
C2368-12
WR,0.5D
WR,1.0D
C3026A-2
C2378-12
WR,0.5D
Switch-Lumbar-
Driver (S389)
C0976-2
LUMBAR INFLATE
VBATT
LUMBAR DEFLATE
GND
GND
C0976-1
NY,1.0D
C0974-3
NY,0.5
C0976-7
U,1.0D
C0974-1
U,0.5
C0976-3
B,1.0D
C0976-6
B,1.0D
Pump-Lumbar-
Driver (M286)
B,0.5
C0974-2
B,1.0D
SJ2
B,2.5D
C0751-1
C0253L-1
B,2.5D
C1972L-1
TYPE 3
Switch-Lumbar-
Passenger (S390)
C2339-2
LUMBAR INFLATE
VBATT
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-
Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

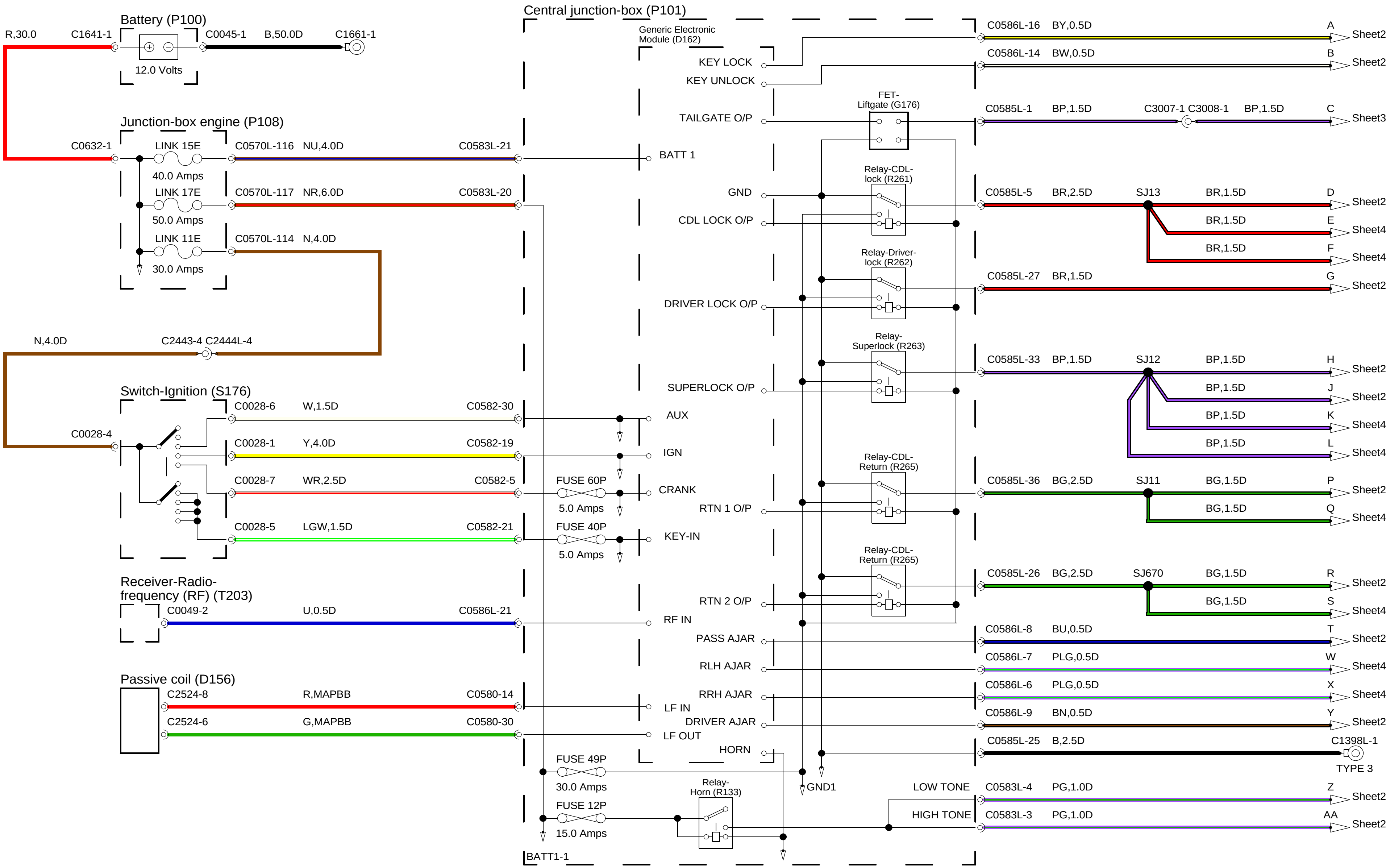

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Central Junction Box (P101)
C0583L-22
FUSE 54P
C0585L-13
WR,0.5D
SJ185
5.0 Amps
WR,1.0D
C3026-2
C2368-12
WR,0.5D
WR,1.0D
C3026-2
C2378-12
WR,0.5D
Switch-Lumbar-Driver (S389)
LUMBAR INFLATE
VBATT
LUMBAR DEFLATE
GND
GND
C2339-2
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Driver (M286)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
SJ53
B,4.0D
C2597L-1
TYPE 3
Switch-Lumbar-Passenger (S390)
LUMBAR INFLATE
VBATT
LUMBAR DEFLATE
GND
GND
C2339-2
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

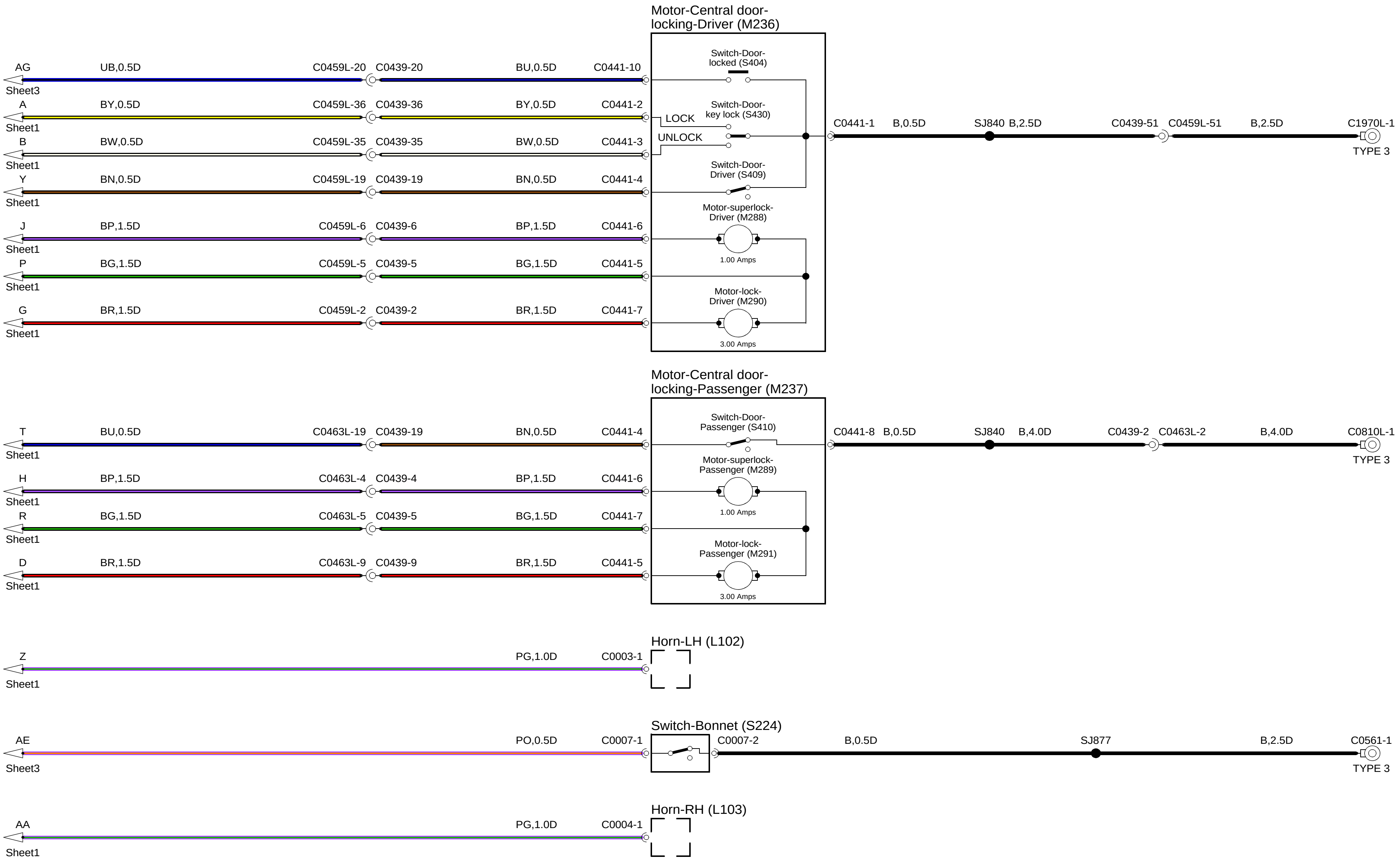

Central Junction Box (P101)
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
FUSE 21P
25.0 Amps
C0585L-22
GU,2.5D
C
A
FUSE 7P
25.0 Amps
C0585L-30
GU,2.5D
C0439-50
C0459L-50
SY,2.5D
R
C0586L-28
SB,0.5D
B
Battery Junction Box (P108)
Relay-Window-lift (R143)
SY,2.5D
D
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
C0583L-22
C0439-3
C0459L-3
B,4.0D
C1970L-1
TYPE 3
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
B,4.0D
SJ210
B,0.5D
FET-Global Open-Close (G175)
1
4
2
3
BTS716
9A
Switch-Window-Driver door (S344)
N,4.0D
C2443-4
C2444L-4
C0081-3
C0343-5
B,2.5D
FUSE 17P
20.0 Amps
C0585L-42
GN,2.5D
Driver-Up (Y284)
C0081-6
BU,0.5D
E
Driver-Down (Y285)
C0081-5
BK,0.5D
F
FUSE 31P
20.0 Amps
C0585L-20
GU,2.5D
Switch-illumination (B125)
Driver-Auto-Down (Y287)
RN,0.5D
C0343-6
Driver-Auto-Up (Y286)
Switch-Isolator (S236)
C2654-3
Passenger-Up (Y288)
C0081-2
BS,0.5D
G
Generic Electronic Module (D162)
TIME OUT SIGNAL
SY,2.5D
C2654-7
Passenger-Down (Y289)
C0081-1
BR,0.5D
H
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
GND
AUX
C0081-4
B,2.5D
C0028-4
C0459L-12
C0439-12
GN,2.5D
C0343-8
RH rear-Up (Y216)
C0343-7
SR,2.5D
J
C0028-1
Y,4.0D
C0582-19
IGN
RH rear-Down (Y217)
C0343-4
SO,2.5D
K
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
C0459L-52
C0439-52
GU,2.5D
C0343-3
LH rear-Up (Y218)
C0343-2
SR,2.5D
L
C1165L-6
C1167-6
YW,MAPX
C0580-15
CAN BUS-H
LH rear-Down (Y219)
C0343-1
SO,2.5D
M
C1165L-7
C1167-7
YU,MAPX
C0580-1
CAN BUS-L
C0439-31
C0459L-31
RN,0.5D
SJ52
RN,0.5D
N
Motor-Central door-locking-Driver (M236)
C1167-9
C1165L-9
RN,0.5D
RN,0.5D
P
C0441-4
BN,0.5D
C0439-19
C0459L-19
BN,0.5D
C0586L-9
DOOR AJAR DRIV
RN,0.5D
Q
Lighting control switch (S100)
Motor-Central door-locking-Passenger (M237)
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0441-4
BN,0.5D
C0439-19
C0463L-19
BU,0.5D
C0586L-8
DOOR AJAR PASS
C0585L-25
B,2.5D
C1398L-1
TYPE 3

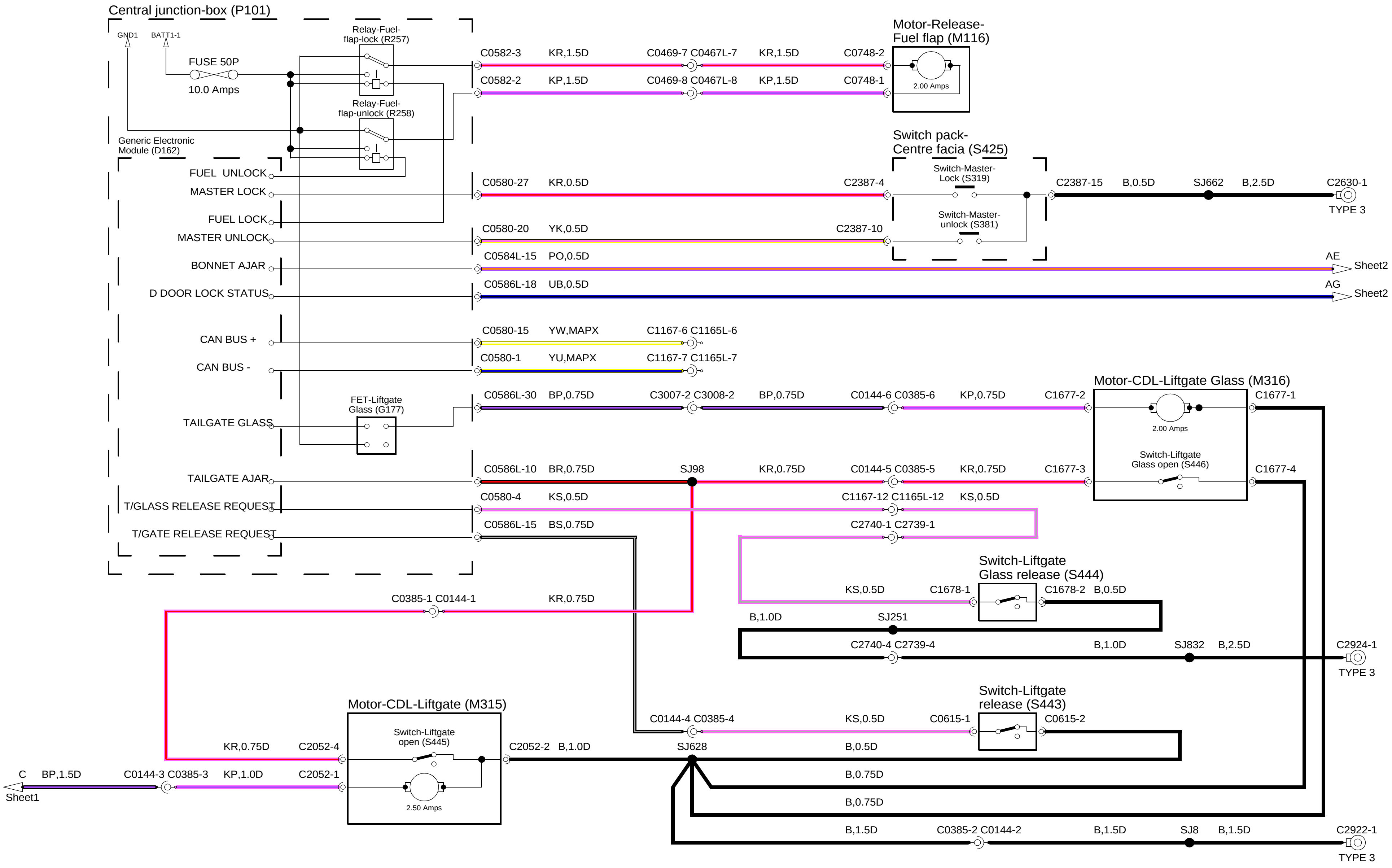

Motor-Window-Driver (M242)
E
BU,0.5D
C0740-1
F
BK,0.5D
C0740-2
B
SB,0.5D
SJ33
SB,0.5D
C0459L-26 C0439-26
SB,0.5D
C0740-6
ECU
HALL EFFECT
A
GU,2.5D
C0459L-10 C0439-10
GU,2.5D
C0740-3
RELAY
C0740-4
B,2.5D
SJ840
B,2.5D
C0439-51 C0459L-51
B,2.5D
C1970L-1
TYPE 3
Motor-Window-Passenger (M243)
SB,0.5D
C0463L-18 C0439-18
SB,0.5D
C0741-6
C
GU,2.5D
C0463L-10 C0439-10
GU,2.5D
C0741-1
C0741-2
ECU
HALL EFFECT
Switch-Window-Passenger door (S343)
Passenger-Up (Y288)
G
BS,0.5D
C0439-7 C0459L-7
BS,0.5D
C0463L-11 C0439-11
BS,0.5D
C0087-1
C0087-2
BR,0.5D
C0741-3
Passenger-Down (Y289)
H
BR,0.5D
C0439-11 C0459L-11
BR,0.5D
C0463L-12 C0439-12
BR,0.5D
C0087-3
C0087-7
BS,0.5D
RELAY
C0741-4
Switch-illumination (B125)
N
RN,0.5D
C0463L-31 C0439-31
RN,0.5D
C0087-6
C0087-5
B,0.5D
SJ840
B,2.5D
C0087-8
B,0.5D
B,4.0D
C0439-2 C0463L-2
B,4.0D
C0810L-1
TYPE 3
Switch-Window-Rear-RH (S140)
Motor-Window-Rear-RH (M111)
RH rear-Up (Y216)
D
SY,2.5D
C0439-57 C0459L-57
SY,2.5D
C0436-1 C0804-1
SY,2.5D
C0732-8
C0732-2
SO,2.5D
C2484-2
J
SR,2.5D
C0439-55 C0459L-55
SR,2.5D
C0436-13 C0804-13
SR,2.5D
C0732-1
RH rear-Down (Y217)
K
SO,2.5D
C0439-56 C0459L-56
SO,2.5D
C0436-24 C0804-24
SO,2.5D
C0732-3
C0732-7
SR,2.5D
C2484-1
Switch-illumination (B125)
RN,0.5D
(HEADPHONES)
SJ201
RN,0.5D
P
RN,0.5D
C0436-4 C0804-4
C0732-6
C0732-5
B,0.5D
SJ200 B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
(NO HEADPHONES)
RN,0.5D
B,1.5D
C0804-21 C0436-21
B,1.5D
TYPE 3
Switch-Window-Rear-LH (S141)
Motor-Window-Rear-LH (M112)
R
SY,2.5D
C0435-1 C0803-1
SY,2.5D
C0732-8
LH rear-Up (Y218)
L
SR,2.5D
C0439-8 C0459L-8
SR,2.5D
C0435-13 C0803-13
SR,2.5D
C0732-1
C0732-2
SO,2.5D
C0304-1
M
SO,2.5D
C0439-9 C0459L-9
SO,2.5D
C0435-24 C0803-24
SO,2.5D
C0732-3
LH rear-Down (Y219)
C0732-7
SR,2.5D
C0304-2
Switch-illumination (B125)
RN,0.5D
(HEADPHONES)
SJ201
RN,0.5D
Q
RN,0.5D
C0435-4 C0803-4
C0732-6
C0732-5
B,0.5D
SJ200 B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
(NO HEADPHONES)
RN,0.5D
B,1.5D
C0803-21 C0435-21
B,1.5D
TYPE 3

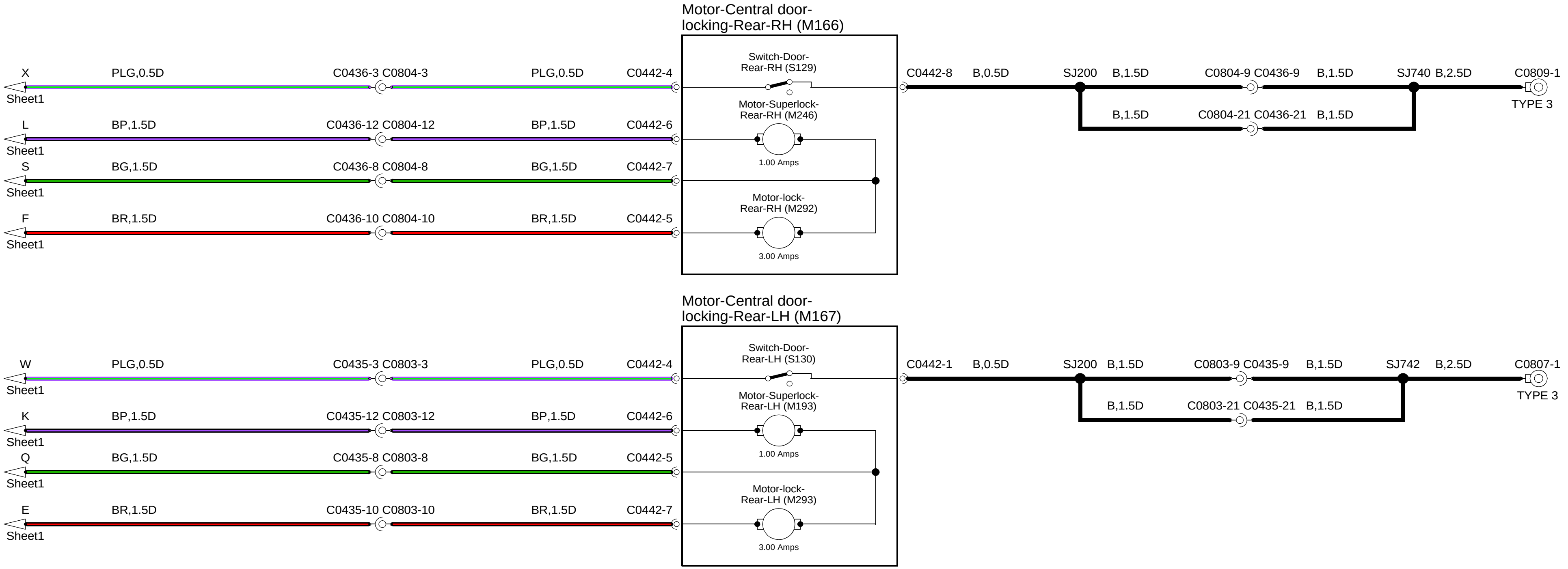

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Cigar lighter-Front (J112)
LGW,1.5D
C0089-2
C0089-1
B,1.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Central Junction Box (P101)
C0582-30
Relay-Cigar-lighter (R132)
C0583L-22
FUSE 55P
15.0 Amps
C0582-36
LGW,1.5D
C0469-9 C0467L-9
LGW,1.5D
C0868-12 C0903-12
C0585L-25
B,2.5D
C1398L-1
TYPE 3

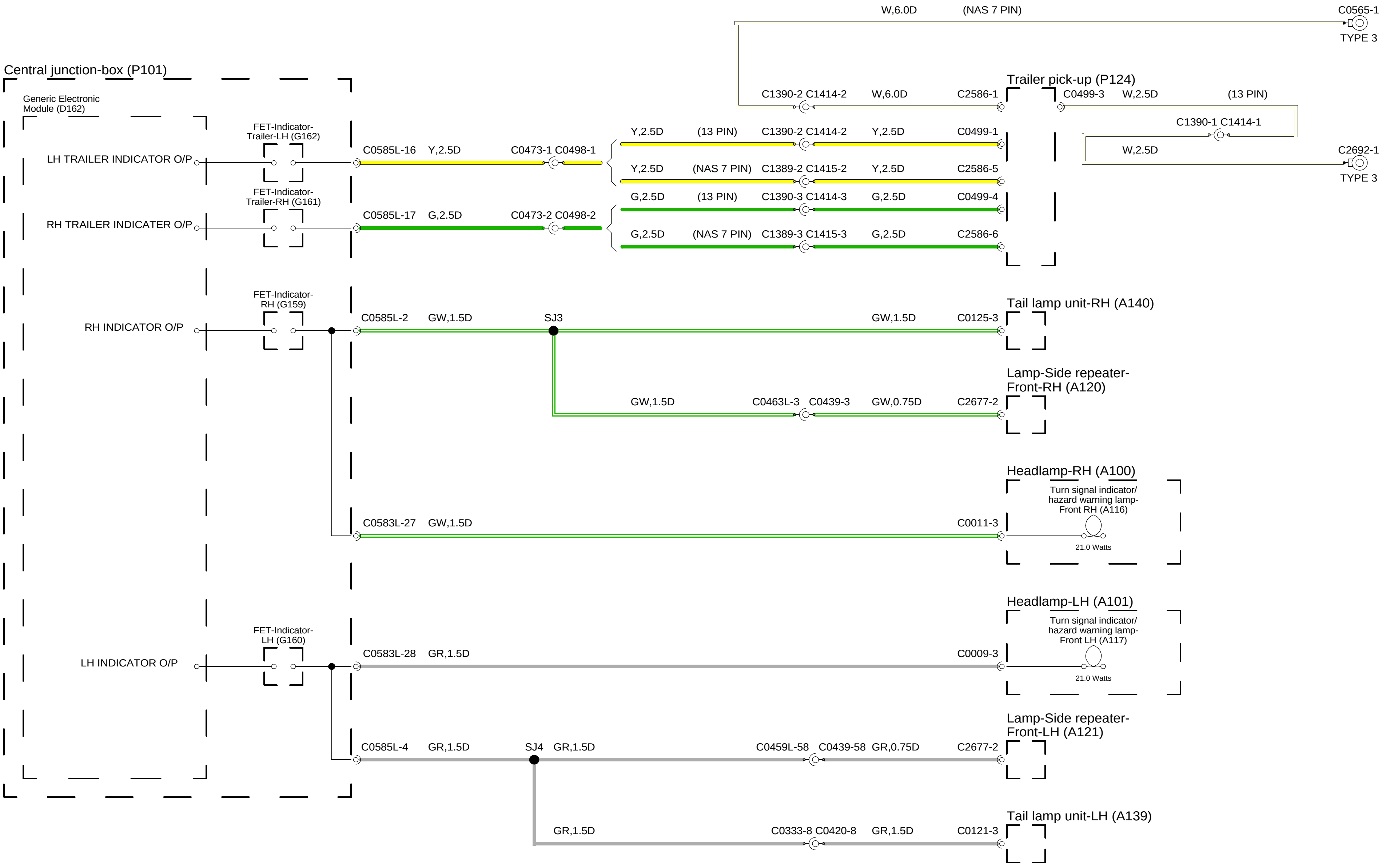

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central Junction Box (P101)
Relay-Accessory-socket (R203)
RL1 MINI
C0583L-20
C0582-30
FUSE 19P
15.0 Amps
C0585L-31
PG,1.5D
C0868-1 C0903-1
PG,1.5D
C1692-2
Socket-Accessory-Centre (V115)
C1692-1
B,1.5D
C0903-13 C0868-13
B,1.5D
C2565L-1
TYPE 3
FUSE 47P
15.0 Amps
C0585L-11
PG,1.5D
Socket-Accessory-Rear (V113)
C0942-2
C0942-1
B,1.5D
C2924-1
TYPE 3
C0585L-25
B,2.5D
C1398L-1
TYPE 3

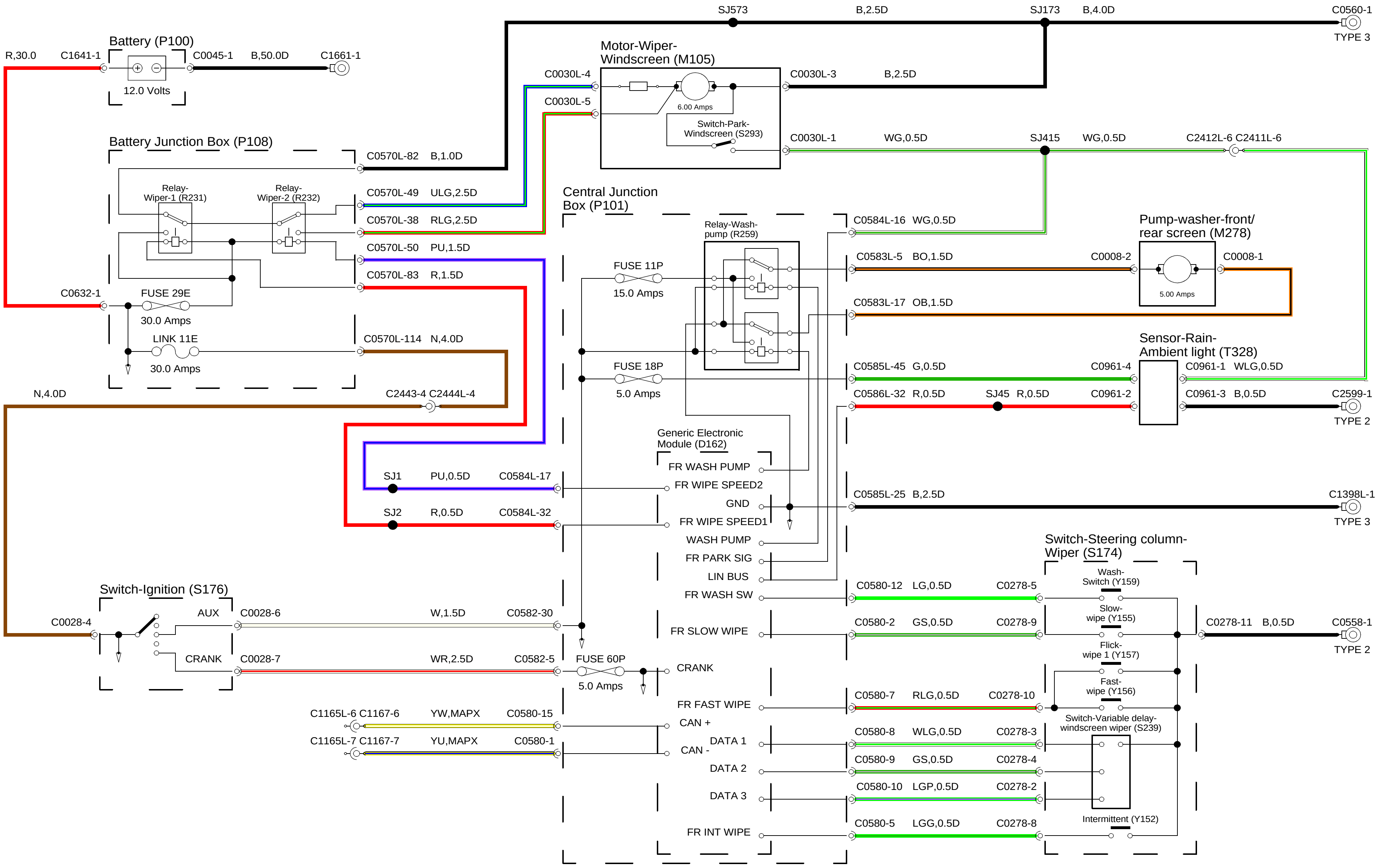

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
LINK 17E
50.0 Amps
LINK 11E
30.0 Amps
C0570L-116
NU,4.0D
C0583L-21
C0570L-117
NR,6.0D
C0583L-20
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
C0028-6
W,1.5D
C0582-30
C0028-1
Y,4.0D
C0582-19
C0028-7
WR,2.5D
C0582-5
C0028-5
LGW,1.5D
C0582-21
Receiver-Radio-frequency (RF) (T203)
C0049-2
U,0.5D
C0586L-21
Passive coil (D156)
C2524-8
R,MAPBB
C0580-14
C2524-6
G,MAPBB
C0580-30
Central junction-box (P101)
Generic Electronic Module (D162)
KEY LOCK
KEY UNLOCK
TAILGATE O/P
BATT 1
GND
CDL LOCK O/P
DRIVER LOCK O/P
SUPERLOCK O/P
AUX
IGN
FUSE 60P
5.0 Amps
CRANK
RTN 1 O/P
FUSE 40P
5.0 Amps
KEY-IN
RTN 2 O/P
RF IN
PASS AJAR
RLH AJAR
RRH AJAR
LF IN
DRIVER AJAR
LF OUT
HORN
FUSE 49P
30.0 Amps
FUSE 12P
15.0 Amps
BATT1-1
GND1
Relay-Horn (R133)
FET-Liftgate (G176)
Relay-CDL-lock (R261)
Relay-Driver-lock (R262)
Relay-Superlock (R263)
Relay-CDL-Return (R265)
Relay-CDL-Return (R265)
LOW TONE
HIGH TONE
C0586L-16
BY,0.5D
A
Sheet2
C0586L-14
BW,0.5D
B
Sheet2
C0585L-1
BP,1.5D
C3007-1 C3008-1
BP,1.5D
C
Sheet3
C0585L-5
BR,2.5D
SJ13
BR,1.5D
D
Sheet2
BR,1.5D
E
Sheet4
BR,1.5D
F
Sheet4
C0585L-27
BR,1.5D
G
Sheet2
C0585L-33
BP,1.5D
SJ12
BP,1.5D
H
Sheet2
BP,1.5D
J
Sheet2
BP,1.5D
K
Sheet4
BP,1.5D
L
Sheet4
C0585L-36
BG,2.5D
SJ11
BG,1.5D
P
Sheet2
BG,1.5D
Q
Sheet4
C0585L-26
BG,2.5D
SJ670
BG,1.5D
R
Sheet2
BG,1.5D
S
Sheet4
C0586L-8
BU,0.5D
T
Sheet2
C0586L-7
PLG,0.5D
W
Sheet4
C0586L-6
PLG,0.5D
X
Sheet4
C0586L-9
BN,0.5D
Y
Sheet2
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C0583L-4
PG,1.0D
Z
Sheet2
C0583L-3
PG,1.0D
AA
Sheet2

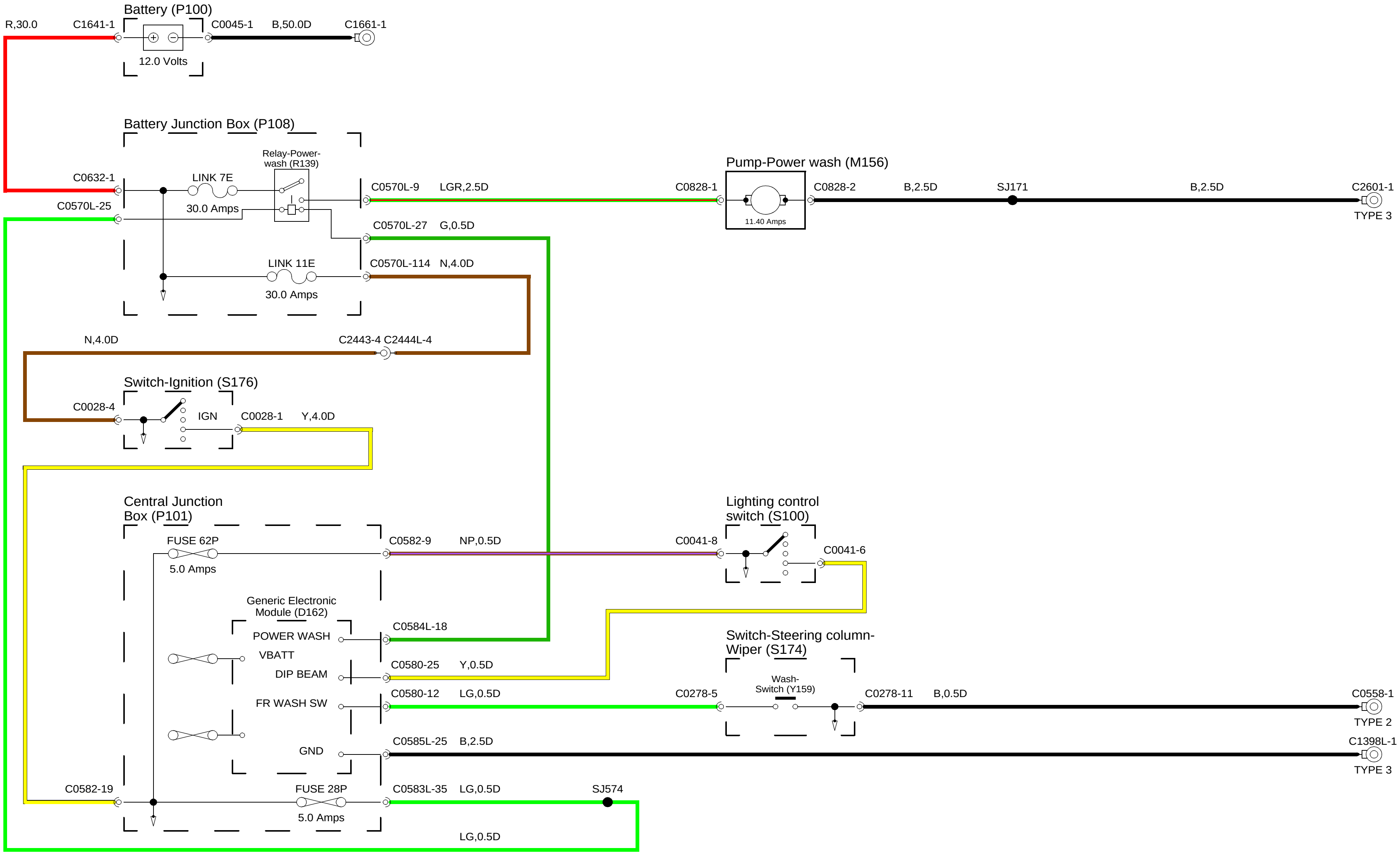

Motor-Central door-locking-Driver (M236)
Switch-Door-locked (S404)
Switch-Door-key lock (S430)
LOCK
UNLOCK
Switch-Door-Driver (S409)
Motor-superlock-Driver (M288)
1.00 Amps
Motor-lock-Driver (M290)
3.00 Amps
AG
Sheet3
UB,0.5D
C0459L-20
C0439-20
BU,0.5D
C0441-10
A
Sheet1
BY,0.5D
C0459L-36
C0439-36
BY,0.5D
C0441-2
B
Sheet1
BW,0.5D
C0459L-35
C0439-35
BW,0.5D
C0441-3
Y
Sheet1
BN,0.5D
C0459L-19
C0439-19
BN,0.5D
C0441-4
J
Sheet1
BP,1.5D
C0459L-6
C0439-6
BP,1.5D
C0441-6
P
Sheet1
BG,1.5D
C0459L-5
C0439-5
BG,1.5D
C0441-5
G
Sheet1
BR,1.5D
C0459L-2
C0439-2
BR,1.5D
C0441-7
C0441-1
B,0.5D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
TYPE 3
Motor-Central door-locking-Passenger (M237)
Switch-Door-Passenger (S410)
Motor-superlock-Passenger (M289)
1.00 Amps
Motor-lock-Passenger (M291)
3.00 Amps
T
Sheet1
BU,0.5D
C0463L-19
C0439-19
BN,0.5D
C0441-4
H
Sheet1
BP,1.5D
C0463L-4
C0439-4
BP,1.5D
C0441-6
R
Sheet1
BG,1.5D
C0463L-5
C0439-5
BG,1.5D
C0441-7
D
Sheet1
BR,1.5D
C0463L-9
C0439-9
BR,1.5D
C0441-5
C0441-8
B,0.5D
SJ840
B,4.0D
C0439-2
C0463L-2
B,4.0D
C0810L-1
TYPE 3
Horn-LH (L102)
Z
Sheet1
PG,1.0D
C0003-1
Switch-Bonnet (S224)
AE
Sheet3
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
AA
Sheet1
PG,1.0D
C0004-1

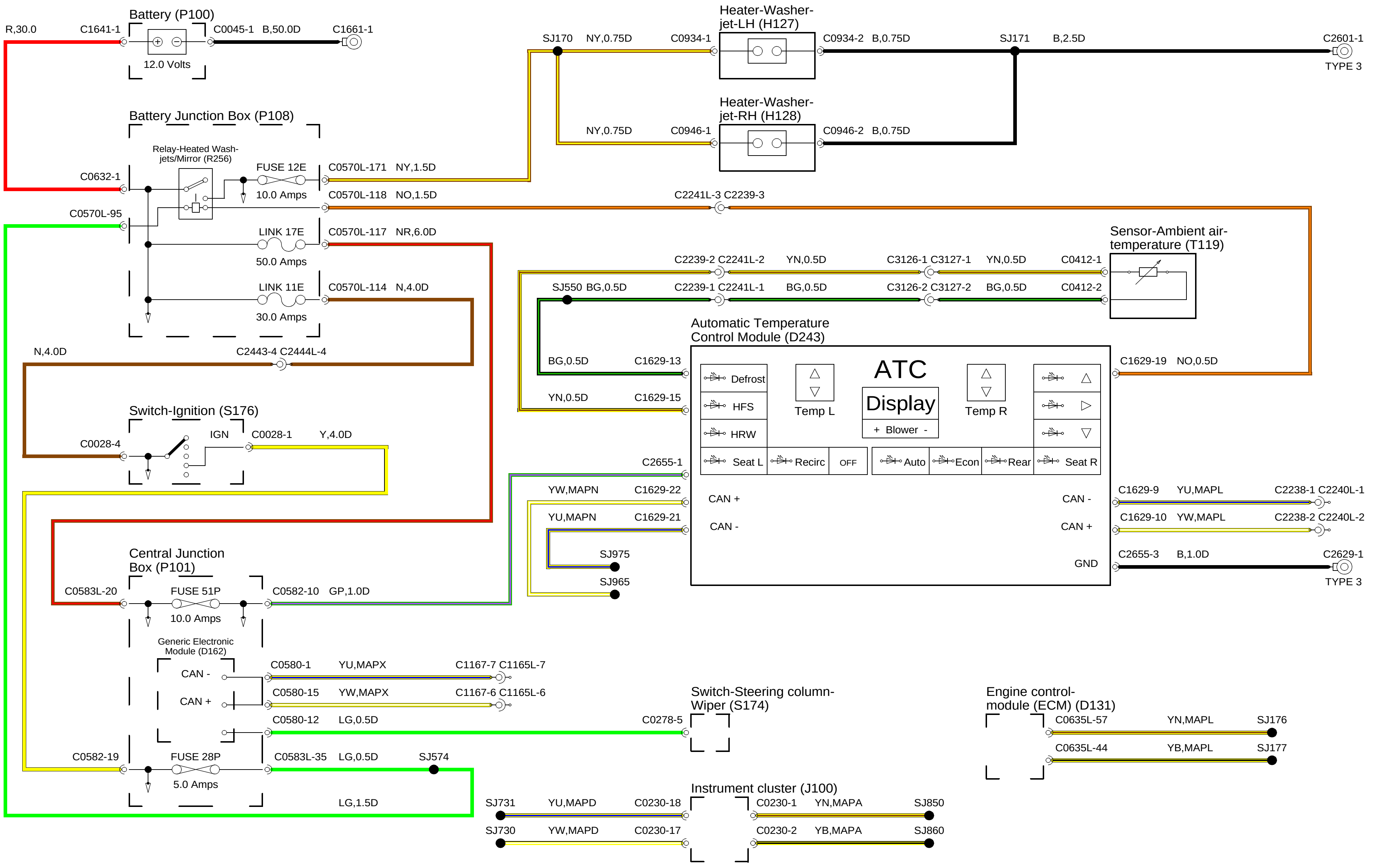

Central junction-box (P101)
GND1
BATT1-1
FUSE 50P
10.0 Amps
Relay-Fuel-
flap-lock (R257)
Relay-Fuel-
flap-unlock (R258)
Generic Electronic
Module (D162)
FUEL UNLOCK
MASTER LOCK
FUEL LOCK
MASTER UNLOCK
BONNET AJAR
D DOOR LOCK STATUS
CAN BUS +
CAN BUS -
FET-Liftgate
Glass (G177)
TAILGATE GLASS
TAILGATE AJAR
T/GLASS RELEASE REQUEST
T/GATE RELEASE REQUEST
C0582-3
KR,1.5D
C0469-7 C0467L-7
KR,1.5D
C0748-2
C0582-2
KP,1.5D
C0469-8 C0467L-8
KP,1.5D
C0748-1
Motor-Release-
Fuel flap (M116)
2.00 Amps
Switch pack-
Centre facia (S425)
Switch-Master-
Lock (S319)
Switch-Master-
unlock (S381)
C0580-27
KR,0.5D
C2387-4
C2387-15
B,0.5D
SJ662
B,2.5D
C2630-1
TYPE 3
C0580-20
YK,0.5D
C2387-10
C0584L-15
PO,0.5D
AE
Sheet2
C0586L-18
UB,0.5D
AG
Sheet2
C0580-15
YW,MAPX
C1167-6 C1165L-6
C0580-1
YU,MAPX
C1167-7 C1165L-7
Motor-CDL-Liftgate Glass (M316)
C0586L-30
BP,0.75D
C3007-2 C3008-2
BP,0.75D
C0144-6 C0385-6
KP,0.75D
C1677-2
C1677-1
2.00 Amps
Switch-Liftgate
Glass open (S446)
C0586L-10
BR,0.75D
SJ98
KR,0.75D
C0144-5 C0385-5
KR,0.75D
C1677-3
C1677-4
C0580-4
KS,0.5D
C1167-12 C1165L-12
KS,0.5D
C0586L-15
BS,0.75D
C2740-1 C2739-1
Switch-Liftgate
Glass release (S444)
KS,0.5D
C1678-1
C1678-2
B,0.5D
B,1.0D
SJ251
C0385-1 C0144-1
KR,0.75D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
TYPE 3
Switch-Liftgate
release (S443)
Motor-CDL-Liftgate (M315)
C0144-4 C0385-4
KS,0.5D
C0615-1
C0615-2
Switch-Liftgate
open (S445)
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,0.5D
C
BP,1.5D
C0144-3 C0385-3
KP,1.0D
C2052-1
B,0.75D
Sheet1
2.50 Amps
B,0.75D
B,1.5D
C0385-2 C0144-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3

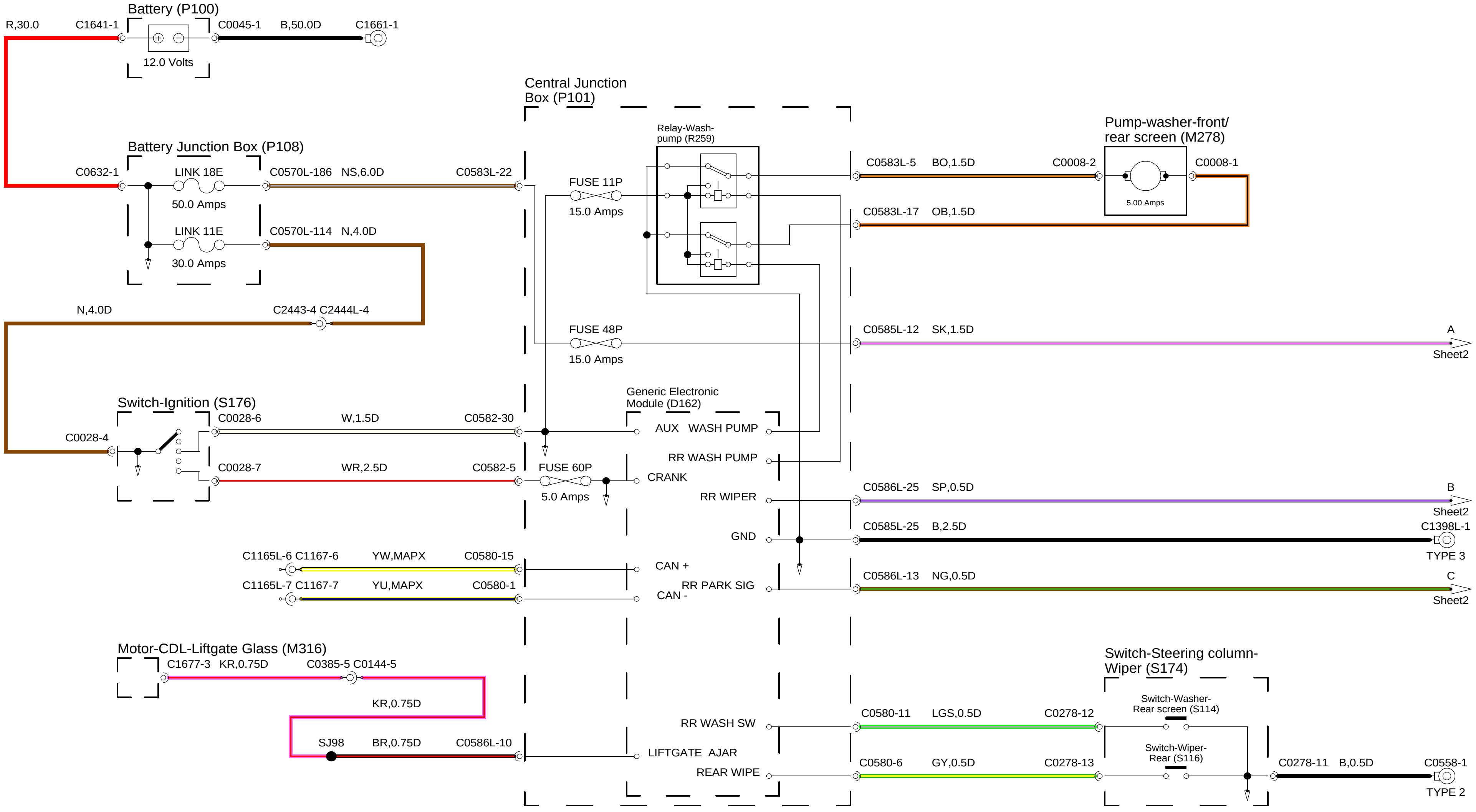

Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
Motor-Superlock-Rear-RH (M246)
1.00 Amps
Motor-lock-Rear-RH (M292)
3.00 Amps
X
Sheet1
PLG,0.5D
C0436-3 C0804-3
PLG,0.5D
C0442-4
L
Sheet1
BP,1.5D
C0436-12 C0804-12
BP,1.5D
C0442-6
S
Sheet1
BG,1.5D
C0436-8 C0804-8
BG,1.5D
C0442-7
F
Sheet1
BR,1.5D
C0436-10 C0804-10
BR,1.5D
C0442-5
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21 C0436-21
B,1.5D
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
Motor-Superlock-Rear-LH (M193)
1.00 Amps
Motor-lock-Rear-LH (M293)
3.00 Amps
W
Sheet1
PLG,0.5D
C0435-3 C0803-3
PLG,0.5D
C0442-4
K
Sheet1
BP,1.5D
C0435-12 C0803-12
BP,1.5D
C0442-6
Q
Sheet1
BG,1.5D
C0435-8 C0803-8
BG,1.5D
C0442-5
E
Sheet1
BR,1.5D
C0435-10 C0803-10
BR,1.5D
C0442-7
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21 C0435-21
B,1.5D

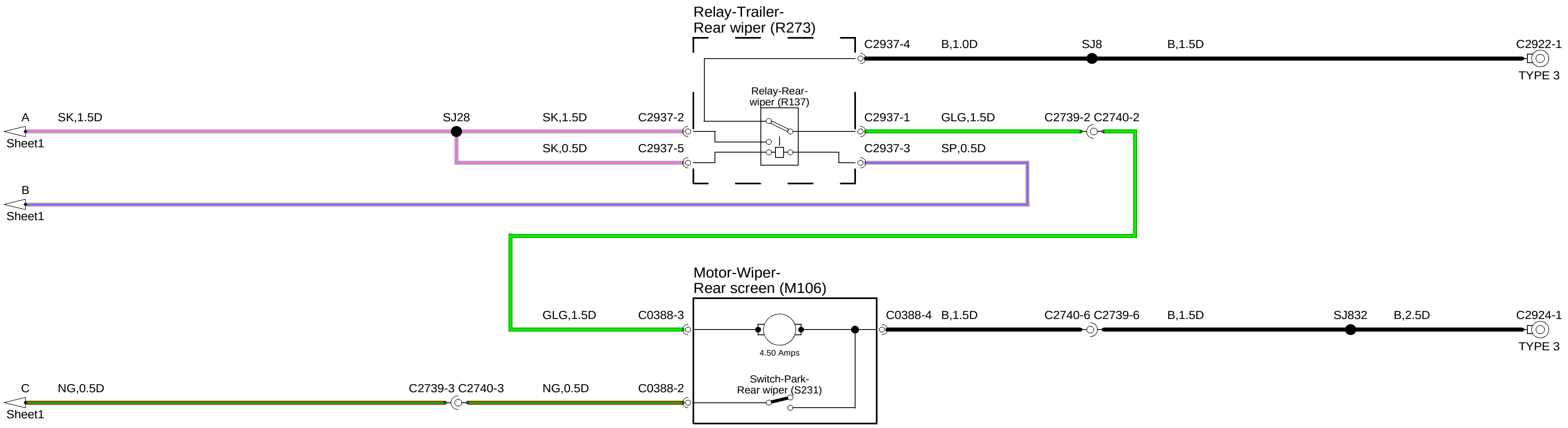

W,6.0D
(NAS 7 PIN)
C0565-1
TYPE 3
Central junction-box (P101)
Generic Electronic Module (D162)
Trailer pick-up (P124)
C1390-2 C1414-2
W,6.0D
C2586-1
C0499-3
W,2.5D
(13 PIN)
C1390-1 C1414-1
W,2.5D
C2692-1
TYPE 3
FET-Indicator-Trailer-LH (G162)
LH TRAILER INDICATOR O/P
C0585L-16
Y,2.5D
C0473-1 C0498-1
Y,2.5D
(13 PIN)
C1390-2 C1414-2
Y,2.5D
C0499-1
Y,2.5D
(NAS 7 PIN)
C1389-2 C1415-2
Y,2.5D
C2586-5
FET-Indicator-Trailer-RH (G161)
RH TRAILER INDICATER O/P
C0585L-17
G,2.5D
C0473-2 C0498-2
G,2.5D
(13 PIN)
C1390-3 C1414-3
G,2.5D
C0499-4
G,2.5D
(NAS 7 PIN)
C1389-3 C1415-3
G,2.5D
C2586-6
FET-Indicator-RH (G159)
RH INDICATOR O/P
C0585L-2
GW,1.5D
SJ3
GW,1.5D
C0125-3
Tail lamp unit-RH (A140)
Lamp-Side repeater-Front-RH (A120)
GW,1.5D
C0463L-3
C0439-3
GW,0.75D
C2677-2
Headlamp-RH (A100)
Turn signal indicator/ hazard warning lamp-Front RH (A116)
C0583L-27
GW,1.5D
C0011-3
21.0 Watts
Headlamp-LH (A101)
Turn signal indicator/ hazard warning lamp-Front LH (A117)
FET-Indicator-LH (G160)
LH INDICATOR O/P
C0583L-28
GR,1.5D
C0009-3
21.0 Watts
Lamp-Side repeater-Front-LH (A121)
C0585L-4
GR,1.5D
SJ4
GR,1.5D
C0459L-58
C0439-58
GR,0.75D
C2677-2
Tail lamp unit-LH (A139)
GR,1.5D
C0333-8 C0420-8
GR,1.5D
C0121-3


SJ573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Motor-Wiper-Windscreen (M105)
C0030L-4
C0030L-5
C0030L-3
B,2.5D
6.00 Amps
Switch-Park-Windscreen (S293)
C0030L-1
WG,0.5D
SJ415
WG,0.5D
C2412L-6 C2411L-6
Battery Junction Box (P108)
C0570L-82
B,1.0D
Relay-Wiper-1 (R231)
Relay-Wiper-2 (R232)
C0570L-49
ULG,2.5D
C0570L-38
RLG,2.5D
C0570L-50
PU,1.5D
C0570L-83
R,1.5D
C0632-1
FUSE 29E
30.0 Amps
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Central Junction Box (P101)
Relay-Wash-pump (R259)
FUSE 11P
15.0 Amps
FUSE 18P
5.0 Amps
C0584L-16
WG,0.5D
Pump-washer-front/rear screen (M278)
C0583L-5
BO,1.5D
C0008-2
C0008-1
5.00 Amps
C0583L-17
OB,1.5D
Sensor-Rain-Ambient light (T328)
C0585L-45
G,0.5D
C0961-4
C0961-1
WLG,0.5D
C0586L-32
R,0.5D
SJ45
R,0.5D
C0961-2
C0961-3
B,0.5D
C2599-1
TYPE 2
Generic Electronic Module (D162)
FR WASH PUMP
FR WIPE SPEED2
GND
FR WIPE SPEED1
WASH PUMP
FR PARK SIG
LIN BUS
FR WASH SW
FR SLOW WIPE
CRANK
FR FAST WIPE
CAN +
DATA 1
CAN -
DATA 2
DATA 3
FR INT WIPE
SJ1
PU,0.5D
C0584L-17
SJ2
R,0.5D
C0584L-32
C0585L-25
B,2.5D
C1398L-1
TYPE 3
Switch-Steering column-Wiper (S174)
Wash-Switch (Y159)
Slow-wipe (Y155)
Flick-wipe 1 (Y157)
Fast-wipe (Y156)
Switch-Variable delay-windscreen wiper (S239)
Intermittent (Y152)
C0580-12
LG,0.5D
C0278-5
C0580-2
GS,0.5D
C0278-9
C0278-11
B,0.5D
C0558-1
TYPE 2
C0580-7
RLG,0.5D
C0278-10
C0580-8
WLG,0.5D
C0278-3
C0580-9
GS,0.5D
C0278-4
C0580-10
LGP,0.5D
C0278-2
C0580-5
LGG,0.5D
C0278-8
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0582-30
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C1165L-6 C1167-6
YW,MAPX
C0580-15
C1165L-7 C1167-7
YU,MAPX
C0580-1

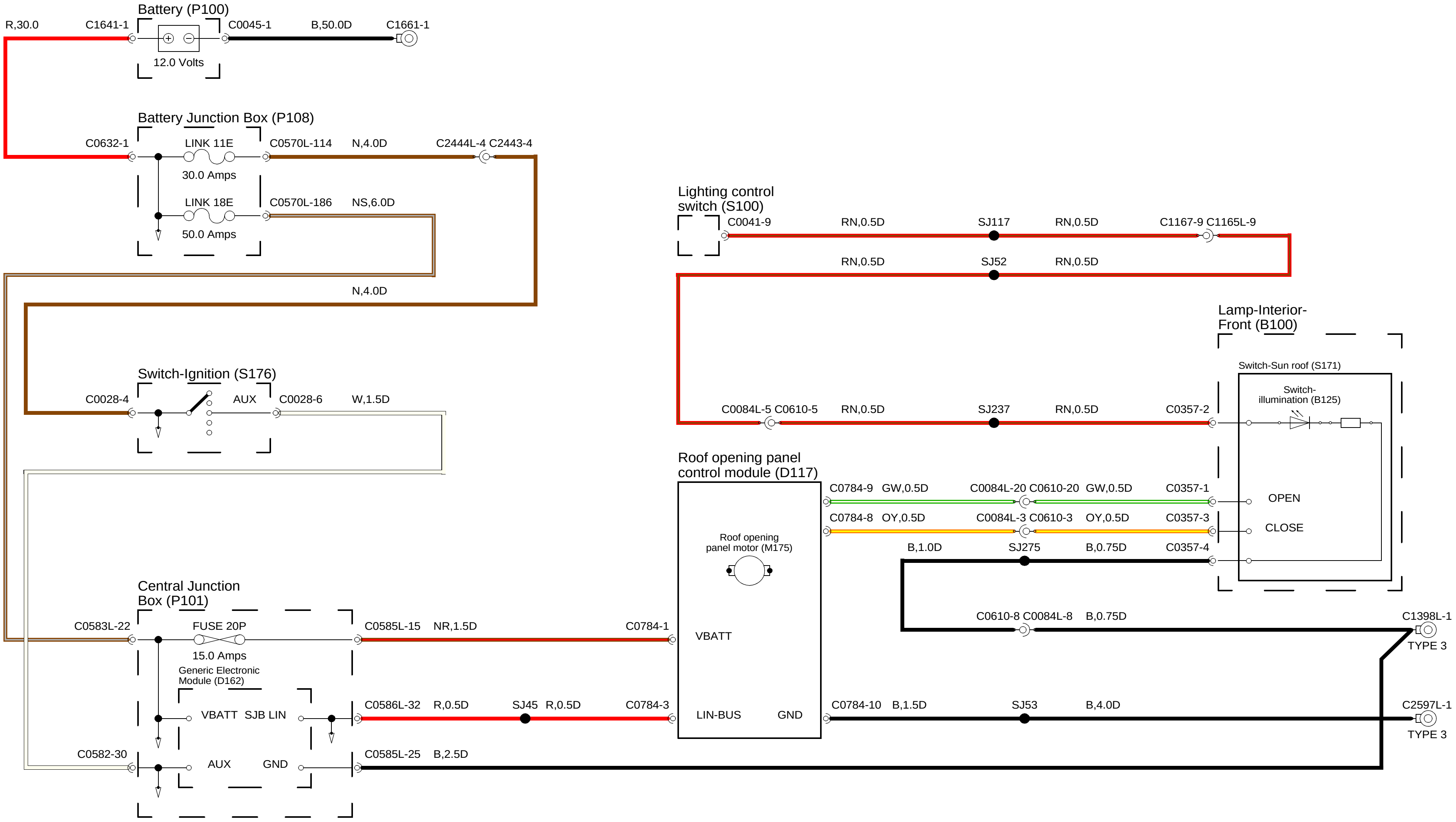

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Power-wash (R139)
C0632-1
LINK 7E
30.0 Amps
C0570L-25
C0570L-9
LGR,2.5D
C0570L-27
G,0.5D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
Pump-Power wash (M156)
C0828-1
C0828-2
B,2.5D
SJ171
B,2.5D
C2601-1
TYPE 3
11.40 Amps
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D
Lighting control switch (S100)
C0041-8
C0041-6
Generic Electronic Module (D162)
POWER WASH
VBATT
DIP BEAM
FR WASH SW
GND
C0584L-18
C0580-25
Y,0.5D
Switch-Steering column-Wiper (S174)
Wash-Switch (Y159)
C0580-12
LG,0.5D
C0278-5
C0278-11
B,0.5D
C0558-1
TYPE 2
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,0.5D


Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1 B,50.0D
C1661-1
Heater-Washer-jet-LH (H127)
SJ170 NY,0.75D
C0934-1
C0934-2 B,0.75D
SJ171 B,2.5D
C2601-1
TYPE 3
Heater-Washer-jet-RH (H128)
NY,0.75D
C0946-1
C0946-2 B,0.75D
Battery Junction Box (P108)
Relay-Heated Wash-jets/Mirror (R256)
C0632-1
FUSE 12E
10.0 Amps
C0570L-171 NY,1.5D
C0570L-118 NO,1.5D
C0570L-95
C2241L-3 C2239-3
LINK 17E
50.0 Amps
C0570L-117 NR,6.0D
LINK 11E
30.0 Amps
C0570L-114 N,4.0D
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2 YN,0.5D
C3126-1 C3127-1 YN,0.5D
C0412-1
SJ550 BG,0.5D
C2239-1 C2241L-1 BG,0.5D
C3126-2 C3127-2 BG,0.5D
C0412-2
N,4.0D
C2443-4 C2444L-4
Automatic Temperature Control Module (D243)
BG,0.5D C1629-13
C1629-19 NO,0.5D
YN,0.5D C1629-15
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
Switch-Ignition (S176)
IGN
C0028-4
C0028-1 Y,4.0D
C2655-1
YW,MAPN C1629-22
YU,MAPN C1629-21
CAN +
CAN -
CAN -
CAN +
C1629-9 YU,MAPL C2238-1 C2240L-1
C1629-10 YW,MAPL C2238-2 C2240L-2
SJ975
SJ965
GND
C2655-3 B,1.0D
C2629-1
TYPE 3
Central Junction Box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1 YU,MAPX C1167-7 C1165L-7
C0580-15 YW,MAPX C1167-6 C1165L-6
C0580-12 LG,0.5D
C0278-5
Switch-Steering column-Wiper (S174)
Engine control-module (ECM) (D131)
C0635L-57 YN,MAPL SJ176
C0635L-44 YB,MAPL SJ177
C0582-19
FUSE 28P
5.0 Amps
C0583L-35 LG,0.5D
SJ574
LG,1.5D
Instrument cluster (J100)
SJ731 YU,MAPD C0230-18
SJ730 YW,MAPD C0230-17
C0230-1 YN,MAPA SJ850
C0230-2 YB,MAPA SJ860

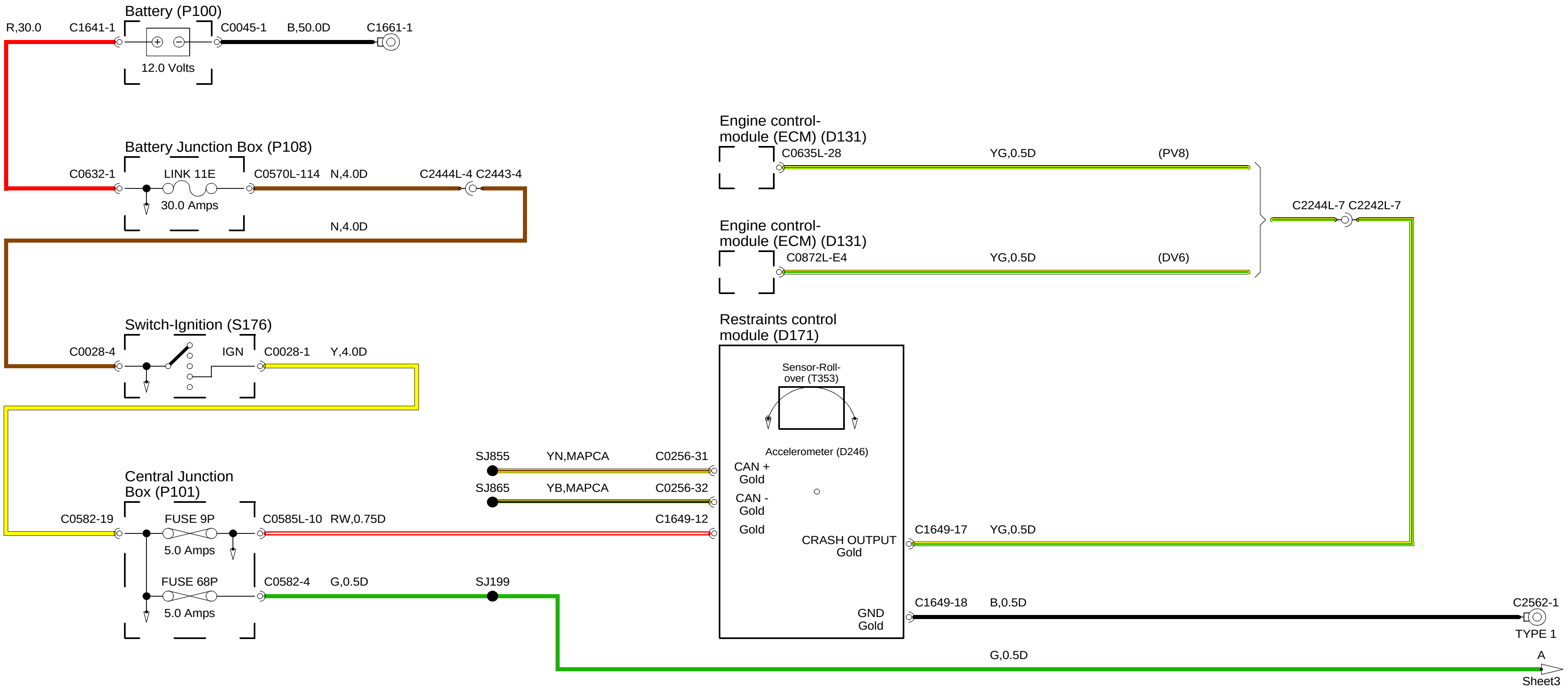

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central Junction Box (P101)
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
C0583L-22
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Relay-Wash-pump (R259)
FUSE 11P
15.0 Amps
Pump-washer-front/ rear screen (M278)
C0583L-5
BO,1.5D
C0008-2
C0008-1
5.00 Amps
C0583L-17
OB,1.5D
FUSE 48P
15.0 Amps
C0585L-12
SK,1.5D
A
Sheet2
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
Generic Electronic Module (D162)
AUX
WASH PUMP
C0028-4
RR WASH PUMP
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
RR WIPER
C0586L-25
SP,0.5D
B
Sheet2
GND
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C1165L-6 C1167-6
YW,MAPX
C0580-15
CAN +
C1165L-7 C1167-7
YU,MAPX
C0580-1
RR PARK SIG
CAN -
C0586L-13
NG,0.5D
C
Sheet2
Motor-CDL-Liftgate Glass (M316)
C1677-3
KR,0.75D
C0385-5 C0144-5
KR,0.75D
Switch-Steering column-Wiper (S174)
Switch-Washer-Rear screen (S114)
RR WASH SW
C0580-11
LGS,0.5D
C0278-12
SJ98
BR,0.75D
C0586L-10
LIFTGATE AJAR
Switch-Wiper-Rear (S116)
REAR WIPE
C0580-6
GY,0.5D
C0278-13
C0278-11
B,0.5D
C0558-1
TYPE 2

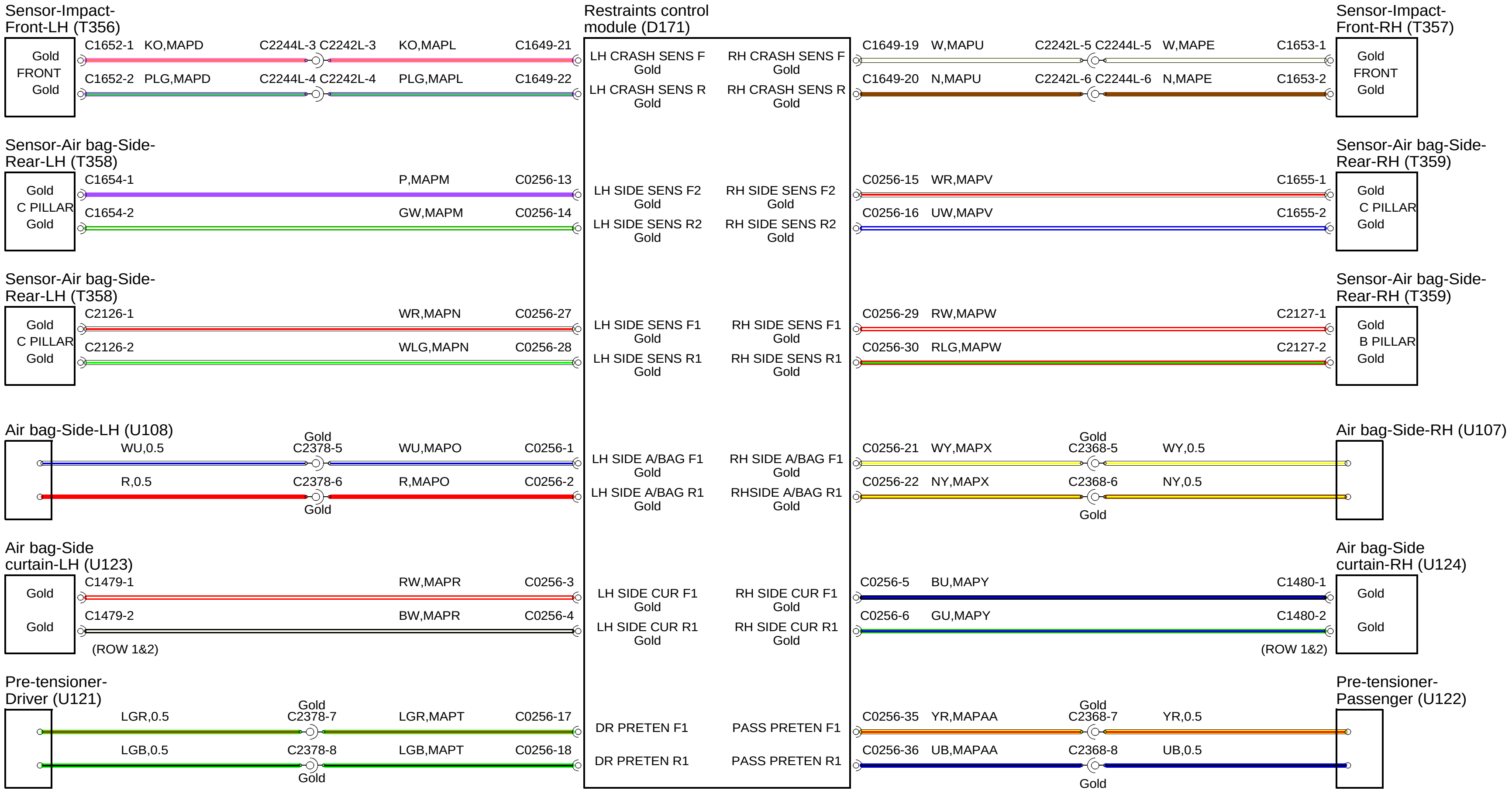

Relay-Trailer-
Rear wiper (R273)
C2937-4
B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
Relay-Rear-
wiper (R137)
A
SK,1.5D
Sheet1
SJ28
SK,1.5D
C2937-2
C2937-1
GLG,1.5D
C2739-2 C2740-2
SK,0.5D
C2937-5
C2937-3
SP,0.5D
B
Sheet1
Motor-Wiper-
Rear screen (M106)
GLG,1.5D
C0388-3
C0388-4
B,1.5D
C2740-6 C2739-6
B,1.5D
SJ832
B,2.5D
C2924-1
TYPE 3
4.50 Amps
Switch-Park-
Rear wiper (S231)
C
NG,0.5D
Sheet1
C2739-3 C2740-3
NG,0.5D
C0388-2

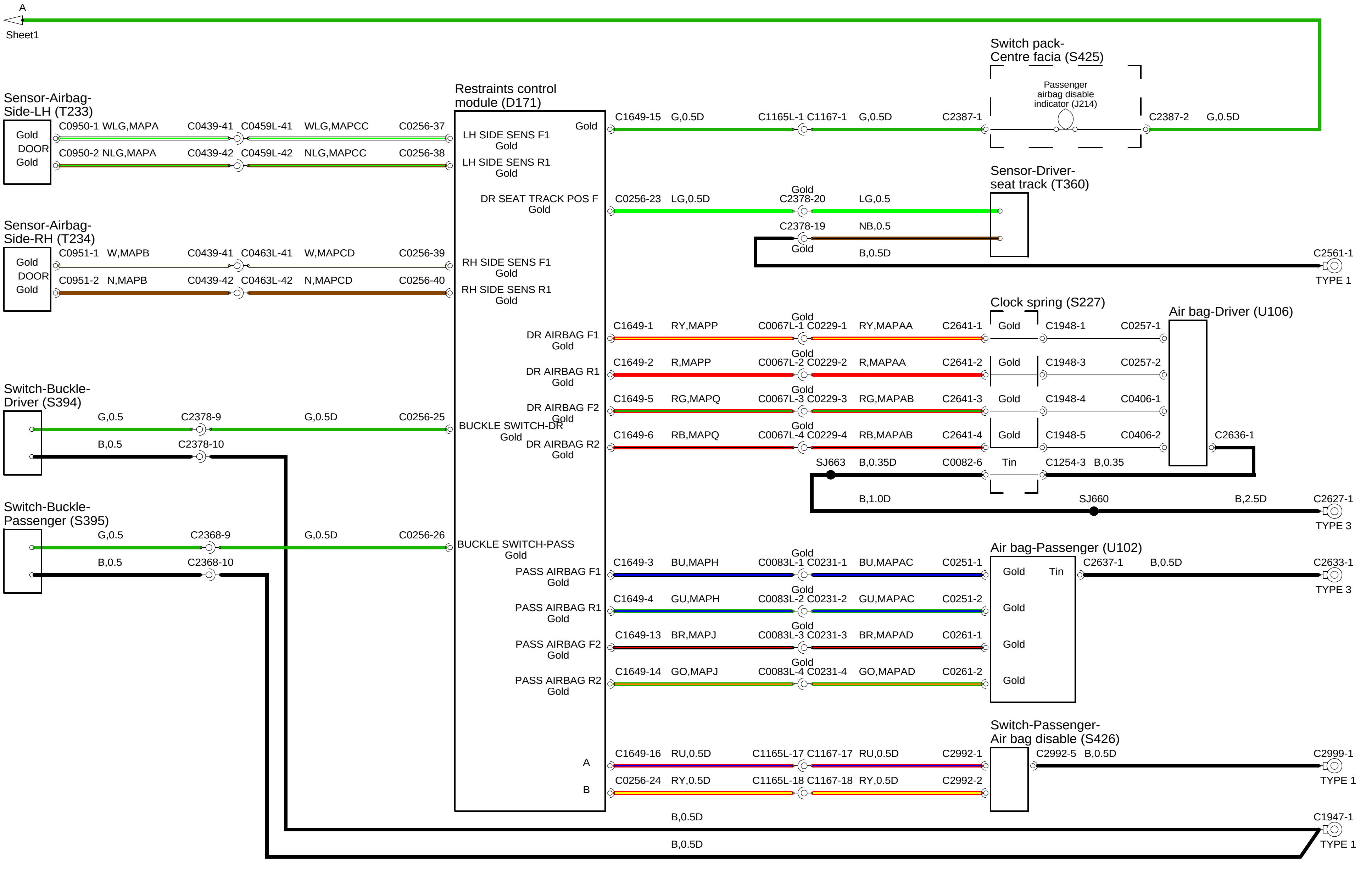
501-17 ROOF OPENING PANEL



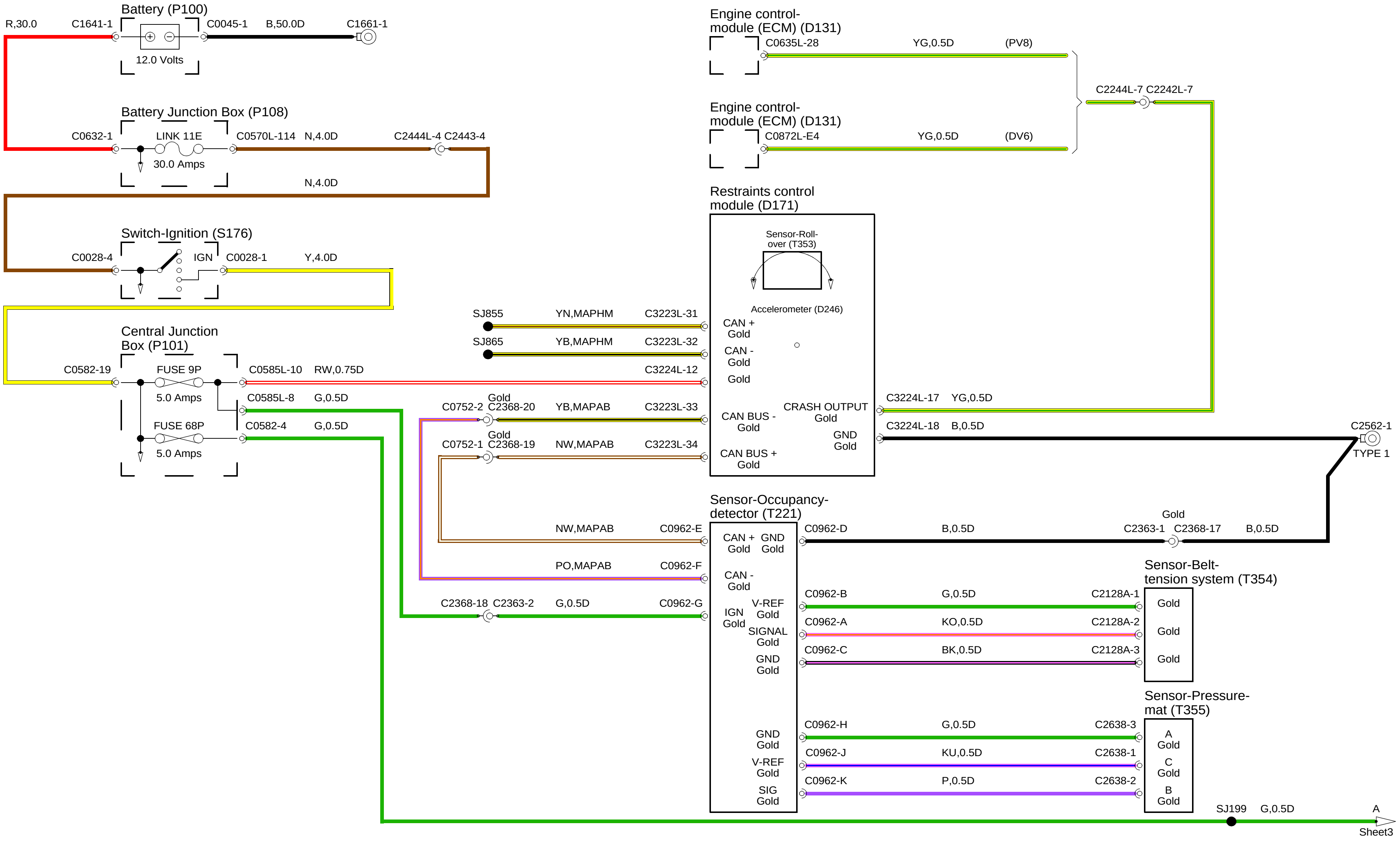
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1167-9 C1165L-9
RN,0.5D
SJ52
RN,0.5D
Lamp-Interior-Front (B100)
Switch-Sun roof (S171)
Switch-illumination (B125)
C0084L-5 C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
Roof opening panel control module (D117)
C0784-9
GW,0.5D
C0084L-20 C0610-20
GW,0.5D
C0357-1
OPEN
C0784-8
OY,0.5D
C0084L-3 C0610-3
OY,0.5D
C0357-3
CLOSE
Roof opening panel motor (M175)
B,1.0D
SJ275
B,0.75D
C0357-4
C0610-8 C0084L-8
B,0.75D
C1398L-1
TYPE 3
Central Junction Box (P101)
C0583L-22
FUSE 20P
C0585L-15
NR,1.5D
C0784-1
VBATT
15.0 Amps
Generic Electronic Module (D162)
VBATT
SJB LIN
C0586L-32
R,0.5D
SJ45
R,0.5D
C0784-3
LIN-BUS
GND
C0784-10
B,1.5D
SJ53
B,4.0D
C2597L-1
TYPE 3
C0582-30
AUX
GND
C0585L-25
B,2.5D

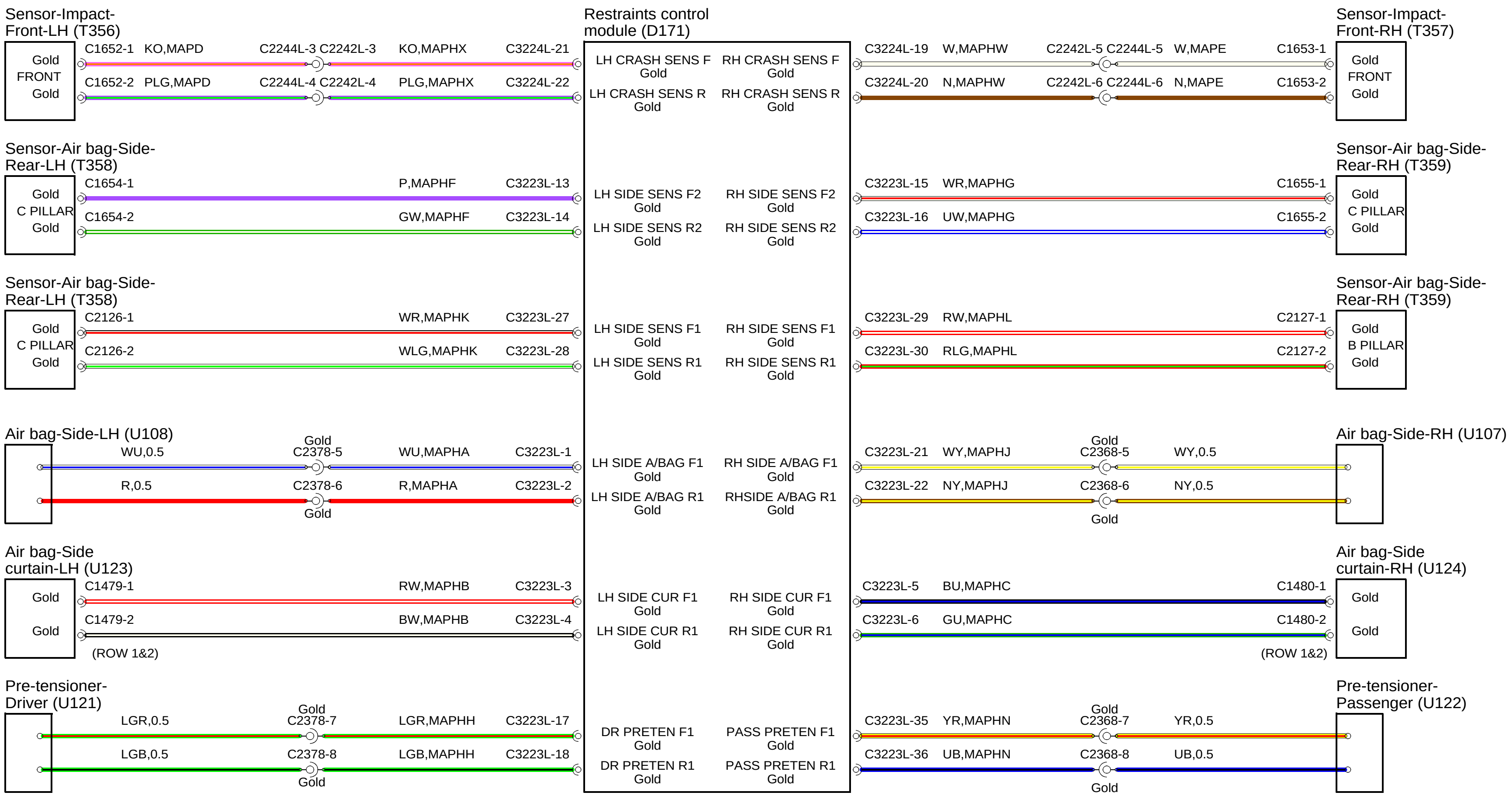

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 9P
5.0 Amps
C0585L-10
RW,0.75D
FUSE 68P
5.0 Amps
C0582-4
G,0.5D
SJ199
SJ855
YN,MAPCA
C0256-31
SJ865
YB,MAPCA
C0256-32
C1649-12
Engine control-module (ECM) (D131)
C0635L-28
YG,0.5D
(PV8)
Engine control-module (ECM) (D131)
C0872L-E4
YG,0.5D
(DV6)
C2244L-7 C2242L-7
Restraints control module (D171)
Sensor-Roll-over (T353)
Accelerometer (D246)
CAN + Gold
CAN - Gold
Gold
CRASH OUTPUT Gold
GND Gold
C1649-17
YG,0.5D
C1649-18
B,0.5D
C2562-1
TYPE 1
G,0.5D
A
Sheet3

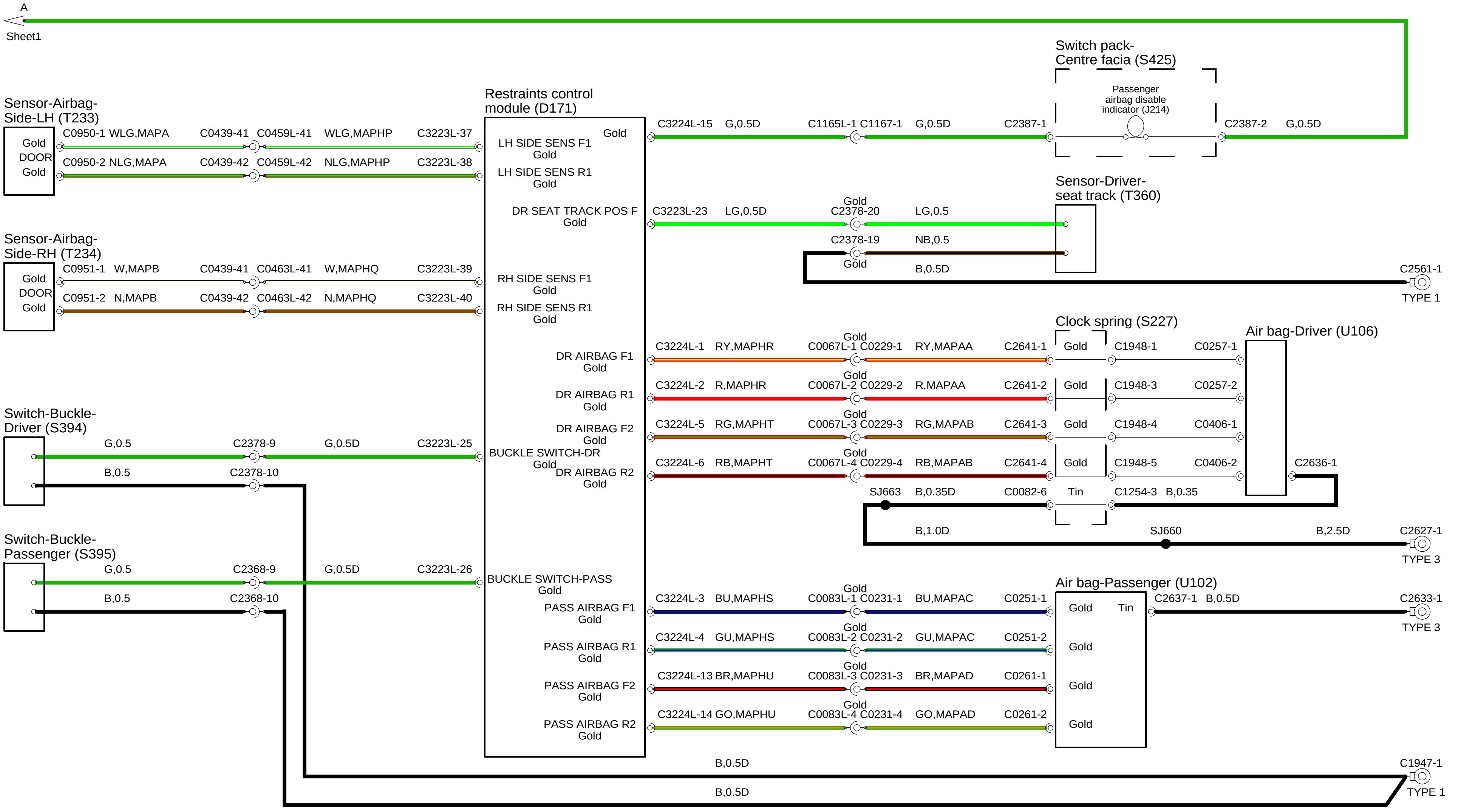

Sensor-Impact-Front-LH (T356)
Gold
FRONT
Gold
C1652-1 KO,MAPD C2244L-3 C2242L-3 KO,MAPL C1649-21
C1652-2 PLG,MAPD C2244L-4 C2242L-4 PLG,MAPL C1649-22
Restraints control module (D171)
LH CRASH SENS F Gold
LH CRASH SENS R Gold
RH CRASH SENS F Gold
RH CRASH SENS R Gold
C1649-19 W,MAPU C2242L-5 C2244L-5 W,MAPE C1653-1
C1649-20 N,MAPU C2242L-6 C2244L-6 N,MAPE C1653-2
Sensor-Impact-Front-RH (T357)
Gold
FRONT
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C1654-1 P,MAPM C0256-13
C1654-2 GW,MAPM C0256-14
LH SIDE SENS F2 Gold
LH SIDE SENS R2 Gold
RH SIDE SENS F2 Gold
RH SIDE SENS R2 Gold
C0256-15 WR,MAPV C1655-1
C0256-16 UW,MAPV C1655-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
C PILLAR
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C2126-1 WR,MAPN C0256-27
C2126-2 WLG,MAPN C0256-28
LH SIDE SENS F1 Gold
LH SIDE SENS R1 Gold
RH SIDE SENS F1 Gold
RH SIDE SENS R1 Gold
C0256-29 RW,MAPW C2127-1
C0256-30 RLG,MAPW C2127-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
B PILLAR
Gold
Air bag-Side-LH (U108)
WU,0.5 Gold C2378-5 WU,MAPO C0256-1
R,0.5 C2378-6 Gold R,MAPO C0256-2
LH SIDE A/BAG F1 Gold
LH SIDE A/BAG R1 Gold
RH SIDE A/BAG F1 Gold
RHSIDE A/BAG R1 Gold
C0256-21 WY,MAPX Gold C2368-5 WY,0.5
C0256-22 NY,MAPX C2368-6 Gold NY,0.5
Air bag-Side-RH (U107)
Air bag-Side curtain-LH (U123)
Gold
Gold
C1479-1 RW,MAPR C0256-3
C1479-2 BW,MAPR C0256-4
(ROW 1&2)
LH SIDE CUR F1 Gold
LH SIDE CUR R1 Gold
RH SIDE CUR F1 Gold
RH SIDE CUR R1 Gold
C0256-5 BU,MAPY C1480-1
C0256-6 GU,MAPY C1480-2
(ROW 1&2)
Air bag-Side curtain-RH (U124)
Gold
Gold
Pre-tensioner-Driver (U121)
LGR,0.5 Gold C2378-7 LGR,MAPT C0256-17
LGB,0.5 C2378-8 Gold LGB,MAPT C0256-18
DR PRETEN F1
DR PRETEN R1
PASS PRETEN F1
PASS PRETEN R1
C0256-35 YR,MAPAA Gold C2368-7 YR,0.5
C0256-36 UB,MAPAA C2368-8 Gold UB,0.5
Pre-tensioner-Passenger (U122)



A
Sheet1
Switch pack-
Centre facia (S425)
Passenger
airbag disable
indicator (J214)
C2387-1
C2387-2 G,0.5D
Restraints control
module (D171)
Sensor-Airbag-
Side-LH (T233)
Gold
DOOR
Gold
C0950-1 WLG,MAPA C0439-41 C0459L-41 WLG,MAPCC C0256-37
C0950-2 NLG,MAPA C0439-42 C0459L-42 NLG,MAPCC C0256-38
LH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
C1649-15 G,0.5D C1165L-1 C1167-1 G,0.5D
DR SEAT TRACK POS F
Gold
C0256-23 LG,0.5D
Gold
C2378-20 LG,0.5
C2378-19 NB,0.5
Gold
B,0.5D
Sensor-Driver-
seat track (T360)
C2561-1
TYPE 1
Sensor-Airbag-
Side-RH (T234)
C0951-1 W,MAPB C0439-41 C0463L-41 W,MAPCD C0256-39
C0951-2 N,MAPB C0439-42 C0463L-42 N,MAPCD C0256-40
RH SIDE SENS F1
Gold
RH SIDE SENS R1
Gold
Clock spring (S227)
Air bag-Driver (U106)
DR AIRBAG F1
Gold
C1649-1 RY,MAPP C0067L-1 C0229-1 RY,MAPAA C2641-1 Gold C1948-1 C0257-1
DR AIRBAG R1
Gold
C1649-2 R,MAPP C0067L-2 C0229-2 R,MAPAA C2641-2 Gold C1948-3 C0257-2
DR AIRBAG F2
Gold
C1649-5 RG,MAPQ C0067L-3 C0229-3 RG,MAPAB C2641-3 Gold C1948-4 C0406-1
DR AIRBAG R2
Gold
C1649-6 RB,MAPQ C0067L-4 C0229-4 RB,MAPAB C2641-4 Gold C1948-5 C0406-2
C2636-1
SJ663 B,0.35D C0082-6 Tin C1254-3 B,0.35
B,1.0D SJ660 B,2.5D
C2627-1
TYPE 3
Switch-Buckle-
Driver (S394)
G,0.5 C2378-9 G,0.5D C0256-25
B,0.5 C2378-10
BUCKLE SWITCH-DR
Gold
Switch-Buckle-
Passenger (S395)
G,0.5 C2368-9 G,0.5D C0256-26
B,0.5 C2368-10
BUCKLE SWITCH-PASS
Gold
Air bag-Passenger (U102)
PASS AIRBAG F1
Gold
C1649-3 BU,MAPH C0083L-1 C0231-1 BU,MAPAC C0251-1 Gold Tin C2637-1 B,0.5D
C2633-1
TYPE 3
PASS AIRBAG R1
Gold
C1649-4 GU,MAPH C0083L-2 C0231-2 GU,MAPAC C0251-2 Gold
PASS AIRBAG F2
Gold
C1649-13 BR,MAPJ C0083L-3 C0231-3 BR,MAPAD C0261-1 Gold
PASS AIRBAG R2
Gold
C1649-14 GO,MAPJ C0083L-4 C0231-4 GO,MAPAD C0261-2 Gold
Switch-Passenger-
Air bag disable (S426)
A
C1649-16 RU,0.5D C1165L-17 C1167-17 RU,0.5D C2992-1 C2992-5 B,0.5D
C2999-1
TYPE 1
B
C0256-24 RY,0.5D C1165L-18 C1167-18 RY,0.5D C2992-2
B,0.5D
C1947-1
TYPE 1
B,0.5D


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 9P
5.0 Amps
C0585L-10
RW,0.75D
C0585L-8
G,0.5D
FUSE 68P
5.0 Amps
C0582-4
G,0.5D
Engine control-module (ECM) (D131)
C0635L-28
YG,0.5D
(PV8)
Engine control-module (ECM) (D131)
C0872L-E4
YG,0.5D
(DV6)
C2244L-7 C2242L-7
Restraints control module (D171)
Sensor-Roll-over (T353)
Accelerometer (D246)
CAN + Gold
CAN - Gold
Gold
CAN BUS - Gold
CRASH OUTPUT Gold
GND Gold
CAN BUS + Gold
SJ855
YN,MAPHM
C3223L-31
SJ865
YB,MAPHM
C3223L-32
C3224L-12
C0752-2 Gold C2368-20
YB,MAPAB
C3223L-33
C0752-1 Gold C2368-19
NW,MAPAB
C3223L-34
C3224L-17
YG,0.5D
C3224L-18
B,0.5D
C2562-1
TYPE 1
Sensor-Occupancy-detector (T221)
CAN + Gold
GND Gold
CAN - Gold
IGN Gold
V-REF Gold
SIGNAL Gold
GND Gold
GND Gold
V-REF Gold
SIG Gold
NW,MAPAB
C0962-E
PO,MAPAB
C0962-F
C2368-18 C2363-2
G,0.5D
C0962-G
C0962-D
B,0.5D
Gold
C2363-1 C2368-17
B,0.5D
Sensor-Belt-tension system (T354)
C0962-B
G,0.5D
C2128A-1
Gold
C0962-A
KO,0.5D
C2128A-2
Gold
C0962-C
BK,0.5D
C2128A-3
Gold
Sensor-Pressure-mat (T355)
C0962-H
G,0.5D
C2638-3
A Gold
C0962-J
KU,0.5D
C2638-1
C Gold
C0962-K
P,0.5D
C2638-2
B Gold
SJ199
G,0.5D
A
Sheet3


Sensor-Impact-Front-LH (T356)
Gold
FRONT
Gold
C1652-1 KO,MAPD
C2244L-3 C2242L-3
KO,MAPHX
C3224L-21
C1652-2 PLG,MAPD
C2244L-4 C2242L-4
PLG,MAPHX
C3224L-22
Restraints control module (D171)
LH CRASH SENS F
Gold
LH CRASH SENS R
Gold
RH CRASH SENS F
Gold
RH CRASH SENS R
Gold
C3224L-19 W,MAPHW
C2242L-5 C2244L-5 W,MAPE
C1653-1
C3224L-20 N,MAPHW
C2242L-6 C2244L-6 N,MAPE
C1653-2
Sensor-Impact-Front-RH (T357)
Gold
FRONT
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C1654-1
P,MAPHF
C3223L-13
C1654-2
GW,MAPHF
C3223L-14
LH SIDE SENS F2
Gold
LH SIDE SENS R2
Gold
RH SIDE SENS F2
Gold
RH SIDE SENS R2
Gold
C3223L-15 WR,MAPHG
C1655-1
C3223L-16 UW,MAPHG
C1655-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
C PILLAR
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C2126-1
WR,MAPHK
C3223L-27
C2126-2
WLG,MAPHK
C3223L-28
LH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
RH SIDE SENS F1
Gold
RH SIDE SENS R1
Gold
C3223L-29 RW,MAPHL
C2127-1
C3223L-30 RLG,MAPHL
C2127-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
B PILLAR
Gold
Air bag-Side-LH (U108)
WU,0.5
Gold
C2378-5
WU,MAPHA
C3223L-1
R,0.5
C2378-6
Gold
R,MAPHA
C3223L-2
LH SIDE A/BAG F1
Gold
LH SIDE A/BAG R1
Gold
RH SIDE A/BAG F1
Gold
RHSIDE A/BAG R1
Gold
C3223L-21 WY,MAPHJ
Gold
C2368-5
WY,0.5
C3223L-22 NY,MAPHJ
C2368-6
Gold
NY,0.5
Air bag-Side-RH (U107)
Air bag-Side curtain-LH (U123)
Gold
Gold
C1479-1
RW,MAPHB
C3223L-3
C1479-2
BW,MAPHB
C3223L-4
(ROW 1&2)
LH SIDE CUR F1
Gold
LH SIDE CUR R1
Gold
RH SIDE CUR F1
Gold
RH SIDE CUR R1
Gold
C3223L-5 BU,MAPHC
C1480-1
C3223L-6 GU,MAPHC
C1480-2
(ROW 1&2)
Air bag-Side curtain-RH (U124)
Gold
Gold
Pre-tensioner-Driver (U121)
LGR,0.5
Gold
C2378-7
LGR,MAPHH
C3223L-17
LGB,0.5
C2378-8
Gold
LGB,MAPHH
C3223L-18
DR PRETEN F1
Gold
DR PRETEN R1
Gold
PASS PRETEN F1
Gold
PASS PRETEN R1
Gold
C3223L-35 YR,MAPHN
Gold
C2368-7
YR,0.5
C3223L-36 UB,MAPHN
C2368-8
Gold
UB,0.5
Pre-tensioner-Passenger (U122)


A
Sheet1
Switch pack-Centre facia (S425)
Passenger airbag disable indicator (J214)
Sensor-Airbag-Side-LH (T233)
Gold
DOOR
Gold
C0950-1 WLG,MAPA
C0439-41
C0459L-41
WLG,MAPHP
C3223L-37
C0950-2 NLG,MAPA
C0439-42
C0459L-42
NLG,MAPHP
C3223L-38
Restraints control module (D171)
Gold
LH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
C3224L-15
G,0.5D
C1165L-1 C1167-1
G,0.5D
C2387-1
C2387-2
G,0.5D
DR SEAT TRACK POS F
Gold
C3223L-23
LG,0.5D
Gold
C2378-20
LG,0.5
Sensor-Driver-seat track (T360)
C2378-19
NB,0.5
Gold
B,0.5D
C2561-1
TYPE 1
Sensor-Airbag-Side-RH (T234)
Gold
DOOR
Gold
C0951-1 W,MAPB
C0439-41
C0463L-41
W,MAPHQ
C3223L-39
C0951-2 N,MAPB
C0439-42
C0463L-42
N,MAPHQ
C3223L-40
RH SIDE SENS F1
Gold
RH SIDE SENS R1
Gold
Clock spring (S227)
Air bag-Driver (U106)
DR AIRBAG F1
Gold
C3224L-1
RY,MAPHR
Gold
C0067L-1 C0229-1
RY,MAPAA
C2641-1
Gold
C1948-1
C0257-1
DR AIRBAG R1
Gold
C3224L-2
R,MAPHR
Gold
C0067L-2 C0229-2
R,MAPAA
C2641-2
Gold
C1948-3
C0257-2
DR AIRBAG F2
Gold
C3224L-5
RG,MAPHT
Gold
C0067L-3 C0229-3
RG,MAPAB
C2641-3
Gold
C1948-4
C0406-1
BUCKLE SWITCH-DR
Gold
DR AIRBAG R2
Gold
C3224L-6
RB,MAPHT
Gold
C0067L-4 C0229-4
RB,MAPAB
C2641-4
Gold
C1948-5
C0406-2
C2636-1
SJ663
B,0.35D
C0082-6
Tin
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Switch-Buckle-Driver (S394)
G,0.5
C2378-9
G,0.5D
C3223L-25
B,0.5
C2378-10
Switch-Buckle-Passenger (S395)
G,0.5
C2368-9
G,0.5D
C3223L-26
B,0.5
C2368-10
BUCKLE SWITCH-PASS
Gold
Air bag-Passenger (U102)
PASS AIRBAG F1
Gold
C3224L-3
BU,MAPHS
Gold
C0083L-1 C0231-1
BU,MAPAC
C0251-1
Gold
Tin
C2637-1
B,0.5D
C2633-1
TYPE 3
PASS AIRBAG R1
Gold
C3224L-4
GU,MAPHS
Gold
C0083L-2 C0231-2
GU,MAPAC
C0251-2
Gold
PASS AIRBAG F2
Gold
C3224L-13
BR,MAPHU
Gold
C0083L-3 C0231-3
BR,MAPAD
C0261-1
Gold
PASS AIRBAG R2
Gold
C3224L-14
GO,MAPHU
Gold
C0083L-4 C0231-4
GO,MAPAD
C0261-2
Gold
B,0.5D
C1947-1
TYPE 1
B,0.5D

LAND
ROVER

Health and safety

Always follow health and safety guidelines, specifically those detailed in the Workshop Manual.

Using this publication

The information provided in this publication is for use only by competent, qualified auto-electricians. Good product knowledge is assumed, as well as the ability to access and use recommended test equipment and other reference material provided.

Test equipment and other reference material

The information in this publication should be used in conjunction with the recommended test equipment; refer to Workshop Manual. Other reference material includes: Technical Service Bulletins (TSB) and the Workshop Manual.

The Electrical Reference Library (ERL) may also prove useful since it provides detailed connector information.

Battery disconnection and reconnection

It is imperative that any information relating to battery disconnection and reconnection is followed; refer to the appropriate sections in the Workshop Manual.

Fault Diagnosis

Always use the recommended test equipment for correct and reliable fault diagnosis, refer to the Workshop Manual.

Harness Repair

Repairs should only be undertaken for connectors where a Service Repair Kit is available; refer to the appropriate Electrical Reference Library (ERL).
Note: Fibre Optic circuits cannot be repaired; refer to the Workshop Manual.

Abbreviations

Abbreviation	Description
ABS	Anti-lock braking system
AFS	Adaptive front lighting system
AUTO	Automatic transmission
CAN	Controller area network
DSC	Dynamic stability control
DV6	Diesel engine - V6
DV8	Diesel engine - V8
EGR	Exhaust gas recirculation
EU3	DV6 - Without inlet port deactivation
EU4	DV6 - With inlet port deactivation
FET	Field effect transistor
GPS	Global positioning system
PV6	Petrol engine - V6
PV8	Petrol engine - V8
PV8NA	Naturally aspirated engine - V8
PV8SC	Super charged engine - V8
LH	Left-hand
MAF/IAT	Mass air flow / intake air temperature
NAS	North American specification
PDC	Park distance control
RH	Right-hand
TPMS	Tire pressure monitoring system
TSD	Touch screen display

Section numbering

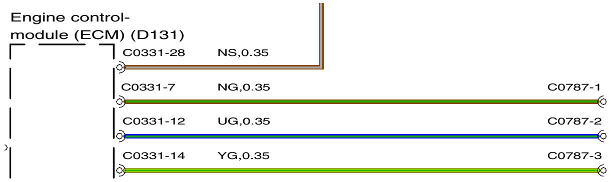
The sections in this publication are ordered to match the Global Outline numbering system as found in the current Workshop Manual. The Power and Ground distribution circuits can be found under section 414-01, BATTERY, MOUNTING AND CABLES.
Note: Where circuit diagrams show more than one sub-system, the circuit will be located in the section that carries the first-named sub-system, for example: Starting and Charging will be located under section 303-06 Starting System, since 'Starting' is the first-named sub-system.

Circuit sheet numbering

The figures in brackets to the left of the page number indicate a circuit sheet number and the total number of sheets per circuit, for example (01 / 05) represents sheet 1 of 5.

Understanding the circuit diagrams

Components

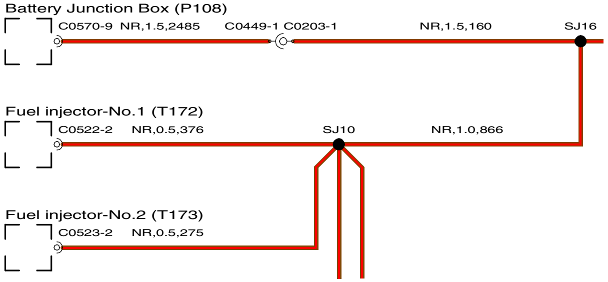

Engine control-
module (ECM) (D131)
C0331-28
NS,0.35
C0331-7
NG,0.35
C0787-1
C0331-12
UG,0.35
C0787-2
C0331-14
YG,0.35
C0787-3

After each component description, a translation code is displayed in brackets, for example: Starter relay (R102), Engine control-module (ECM)(D131). The codes can be ignored.
Note: A dotted outline indicates that the component identified is not shown in its entirety.

Connectors

Connectors and header joints are identified by their corresponding connector number with a numbered suffix to indicate the pin-out detail of the wire, i.e. C0292-1 identifies connector 292, pin number 1. Wire insulation colours are listed in a table at the end of this section. Where wires have a predominant colour with a secondary colour tracer, the main colour is identified first, i.e. LGS - light green with a slate tracer.

Splices

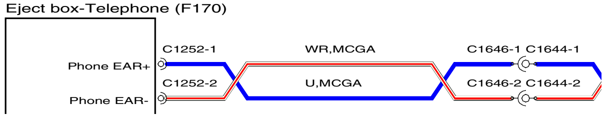

Battery Junction Box (P108)
C0570-9
NR,1.5,2485
C0449-1 C0203-1
NR,1.5,160
SJ16
Fuel injector-No.1 (T172)
C0522-2
NR,0.5,376
SJ10
NR,1.0,866
Fuel injector-No.2 (T173)
C0523-2
NR,0.5,275

The splices (and where appropriate, the header) circuit pages show the full interconnectivity of components and systems.
Note: The splice information shown on individual system circuits is not complete. Always refer to the splices circuit pages for complete information for each splice.

Wire length (Splices, Power and Ground Distribution only)

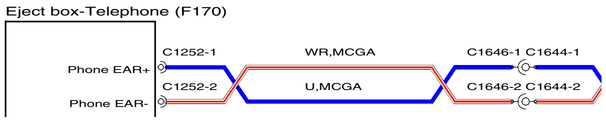
The wire length (in millimetres) is displayed after the colour and cross sectional area; for example, SR,0.35,480. In this example, the figure, 480 indicates the approximate position of the harness splice is 480mm from connector C2335.

Wire Types

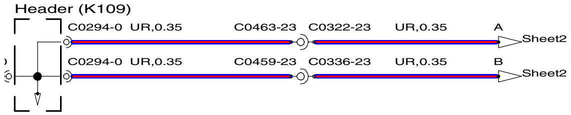

Eject box-Telephone (F170)
Phone EAR+
Phone EAR-
C1252-1
C1252-2
WR,MCGA
U,MCGA
C1646-1 C1644-1
C1646-2 C1644-2

Multicore wires are identified by the prefix M suffixed by three or four other letters, for example MCGA, MAPN. The suffix precisely defines the parameters that comprise the specification of the wire type. The specification is defined during the design process of an electrical system, therefore it is imperative that the correct specification is maintained to ensure the correct operating characteristics and continued functionality for a given system.

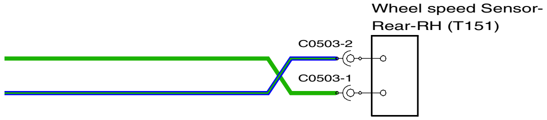
Line Types

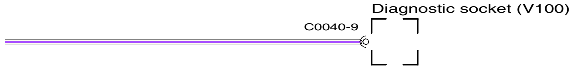

Eject box-Telephone (F170)
Phone EAR+
Phone EAR-
C1252-1
C1252-2
WR,MCGA
U,MCGA
C1646-1 C1644-1
C1646-2 C1644-2

Crossed wires as illustrated above show an example of how a twisted pair of wires may be represented on the circuits.


Header (K109)
C0294-0 UR,0.35
C0463-23 C0322-23
UR,0.35
A
Sheet2
C0294-0 UR,0.35
C0459-23 C0336-23
UR,0.35
B
Sheet2

The arrows illustrated above show an example of the page break symbols, identifying that the circuit continues at the corresponding letter on the sheet number indicated.


Wheel speed Sensor-
Rear-RH (T151)
C0503-2
C0503-1


Diagnostic socket (V100)
C0040-9

The cup and ball symbol represents the male and female halves of connector. Most connectors plug directly into a component but some are wired directly to the component using a ‘flylead’ as with C503 above.

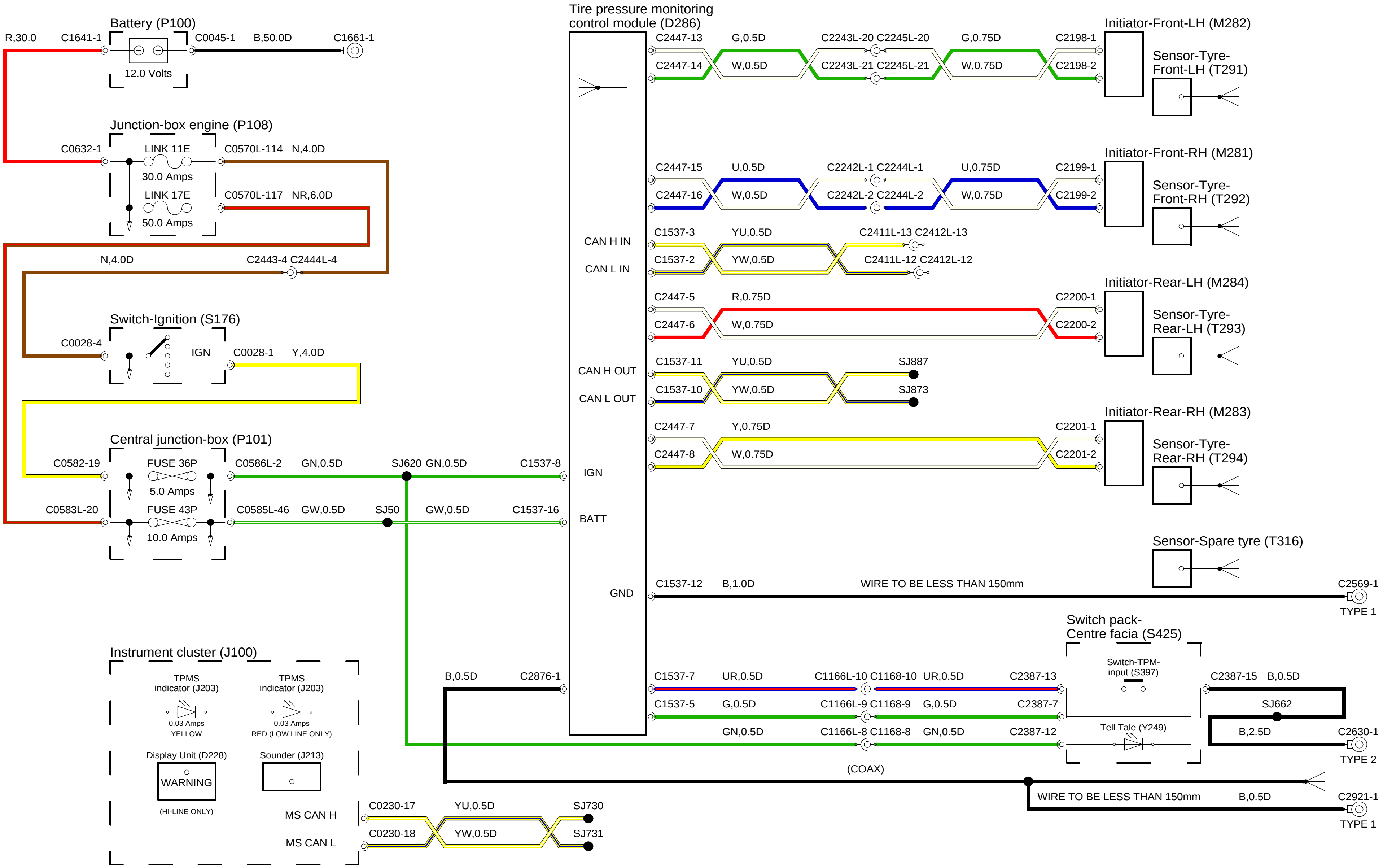
Ground points

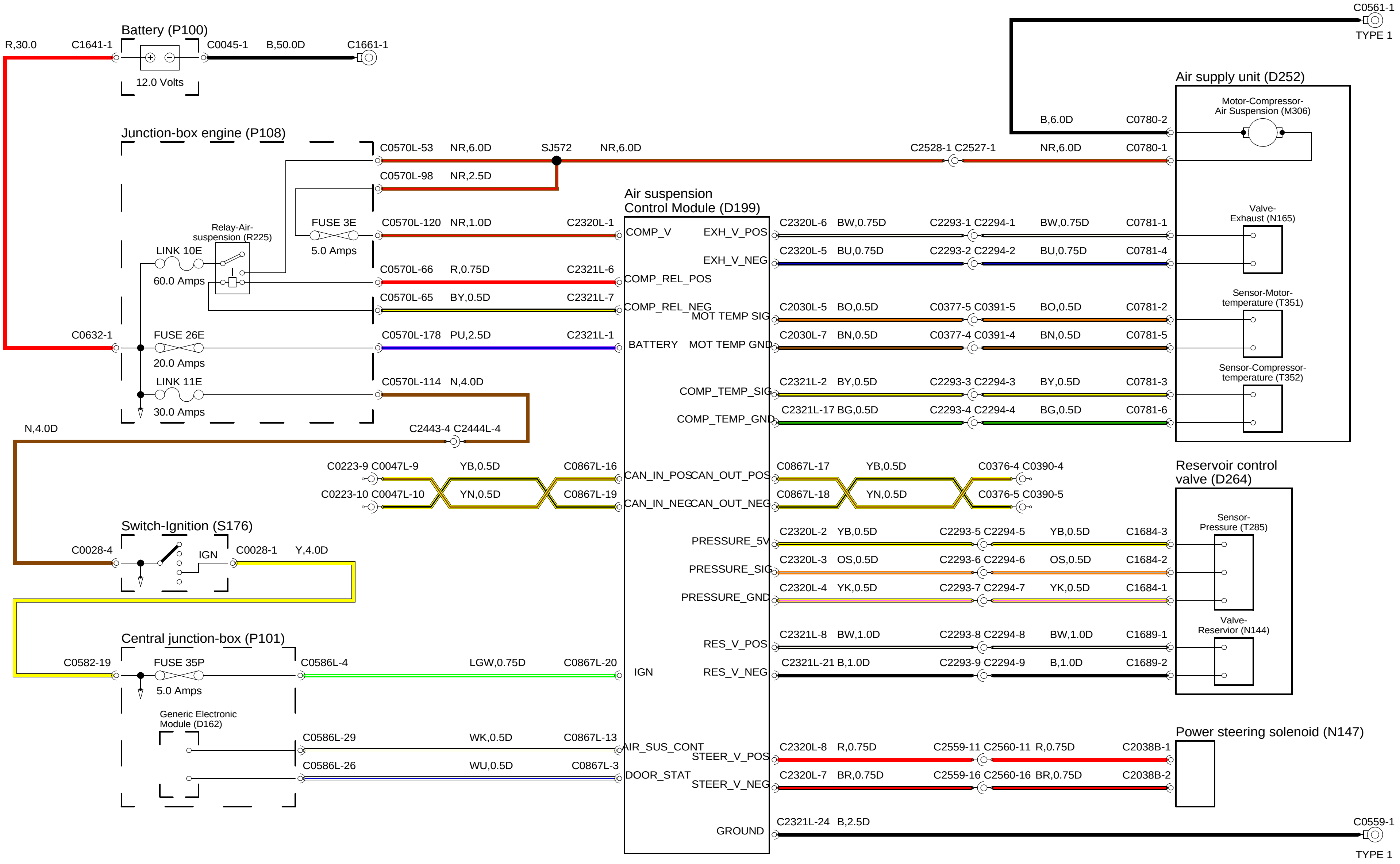
Ground points are identified with an eyelet symbol and a connector number, except where components are grounded through its fixings, when only the eyelet is shown.

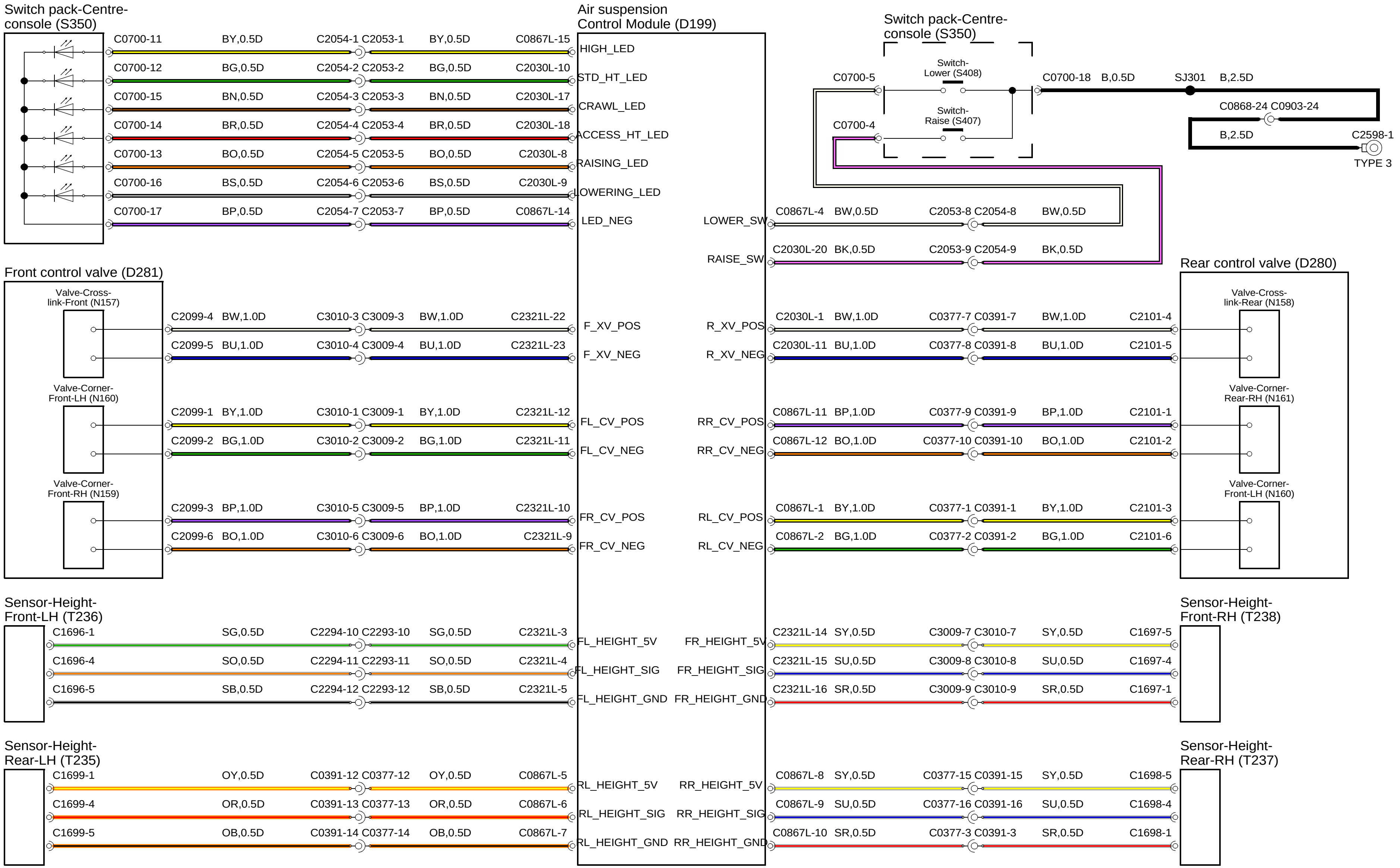
Colour Codes

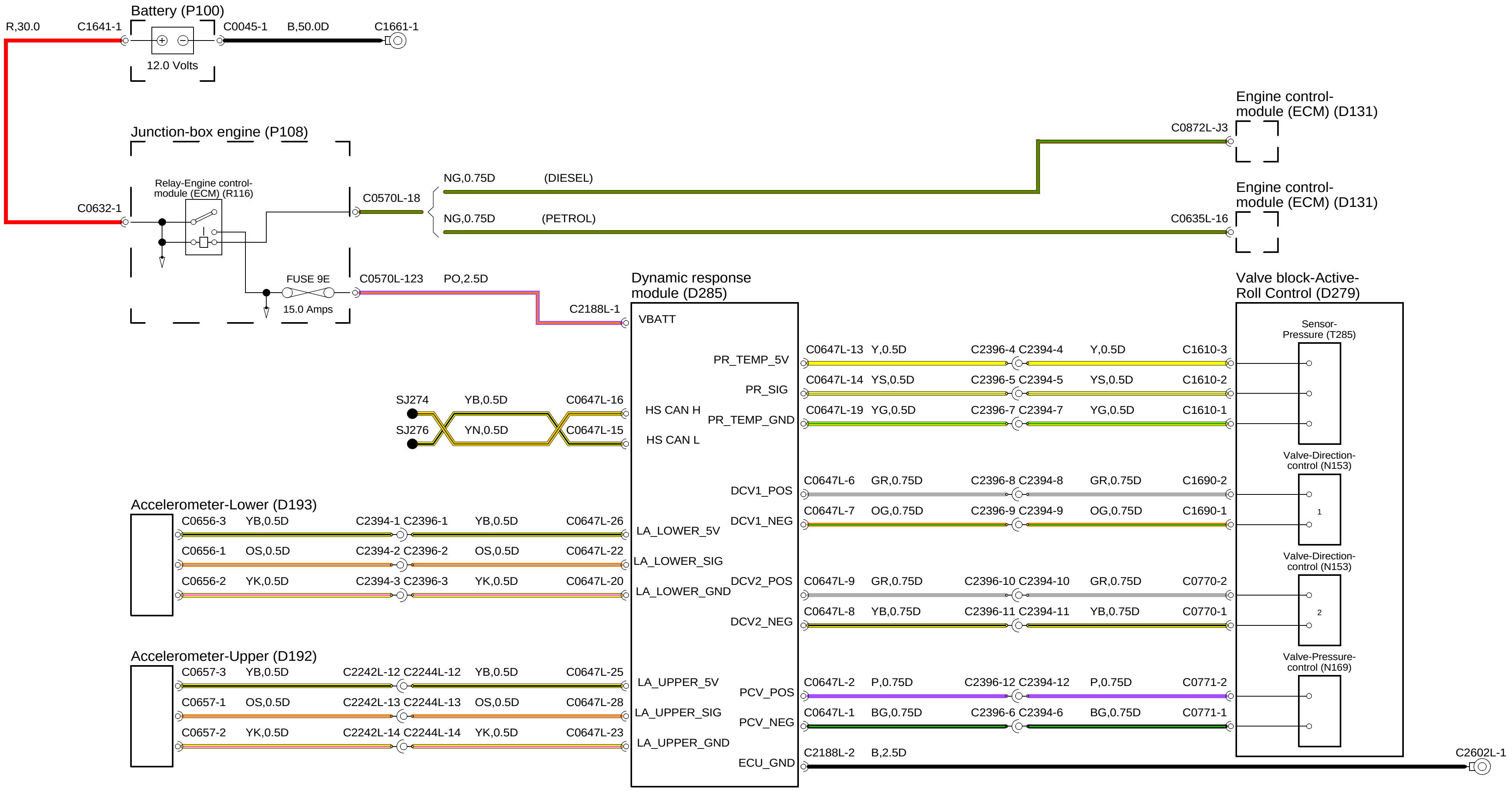
DRAADKLEURCODES	CODES DES COULEURS DES FILS	KABELFARBCODES
CODICI COLORI DEI CAVI	CODIGOS DE COLORES DE LOS CABLES	CÓDIGOS DAS CORES DOS FIOS

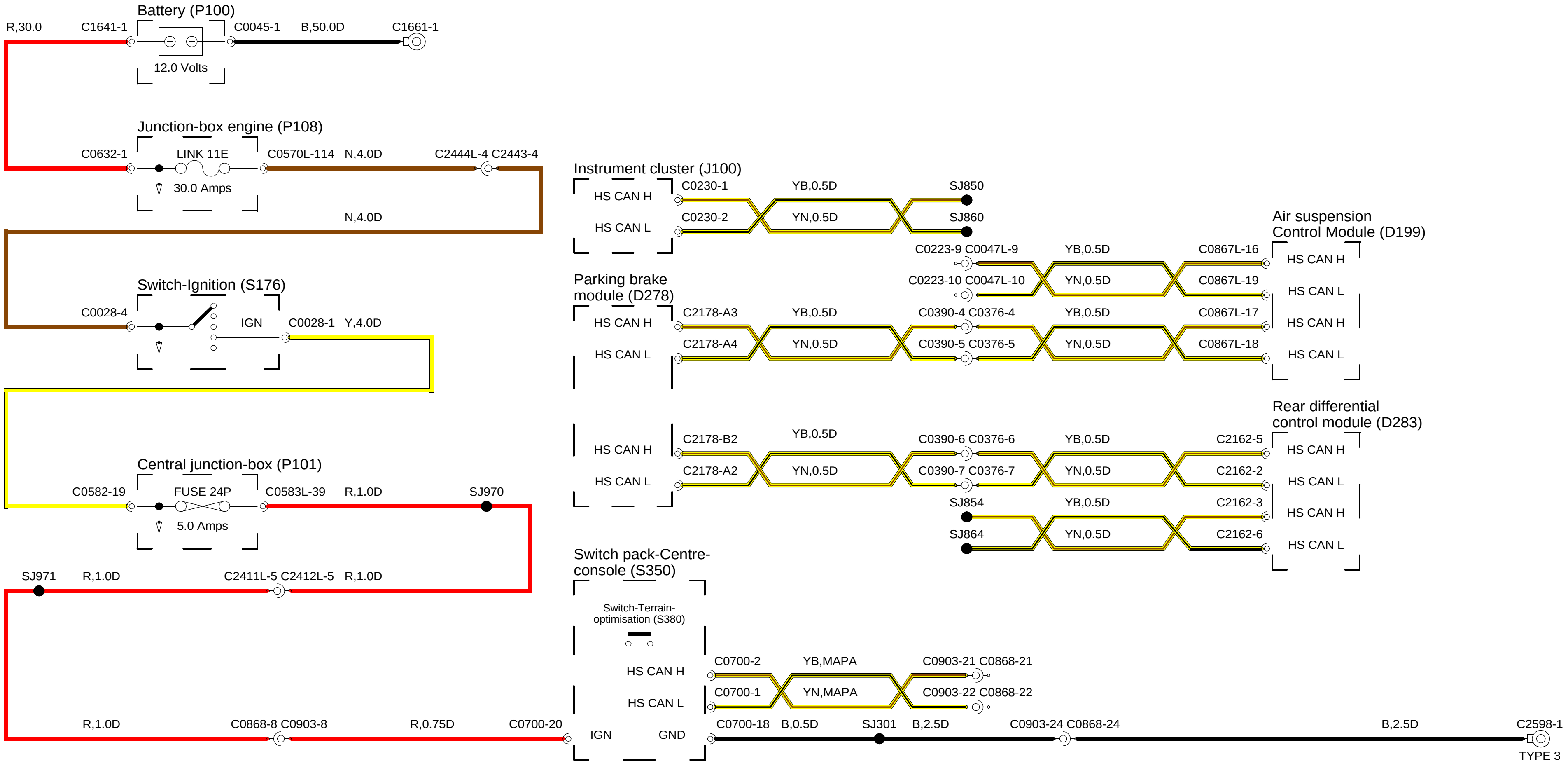
CODE	COLOUR	CODE	KLEUR	CODE	COULEUR	CODE	FARBE	CODICE	COLORE	CODIGO	COLOR	CÓDIGO	COR
B	BLACK	B	ZWART	B	NOIR	B	SCHWARZ	B	NERO	B	NEGRO	B	PRETO
G	GREEN	G	GROEN	G	VERT	G	GRÜN	G	VERDE	G	VERDE	G	VERDE
K	PINK	K	ROZE	K	ROSE	K	ROSA	K	ROSA	K	ROSA	K	ROSA
LG	LIGHT GREEN	LG	LICHTGROEN	LG	VERT CLAIR	LG	HELLGRÜN	LG	VERDE CHIARO	LG	VERDE CLARO	LG	VERDE CLARO
N	BROWN	N	BRUIN	N	BRUN	N	BRAUN	N	MARRONE	N	MARRON	N	CASTANHO
O	ORANGE	O	ORANJE	O	ORANGE	O	ORANGE	O	ARANCIONE	O	NARANJA	O	LARANJA
P	PURPLE	P	PAARS	P	VIOLET	P	LILA	P	PORPORA	P	PURPURA	P	ROXO
R	RED	R	ROOD	R	ROUGE	R	ROT	R	ROSSO	R	ROJO	R	VERMELHO
S	SLATE (grey)	S	LEIGRIJS	S	GRIS	S	GRAU	S	ARDESIA (grigio)	S	PIZARRO (gris)	S	CINZENTO
T	TRANSPARENT	T	TRANSPARANT	T	TRANSPARENT	T	TRANSPARENT	T	TRASPARENTE	T	TRANSPARENTE	T	TRANSPARENTE
U	BLUE	U	BLAUW	U	BLEU	U	BLAU	U	BLU	U	AZUL	U	AZUL
W	WHITE	W	WIT	W	BLANC	W	WEISS	W	BIANCO	W	BLANCO	W	BRANCO
Y	YELLOW	Y	GEEL	Y	JAUNE	Y	GELB	Y	GIALLO	Y	AMARILLO	Y	AMARELO

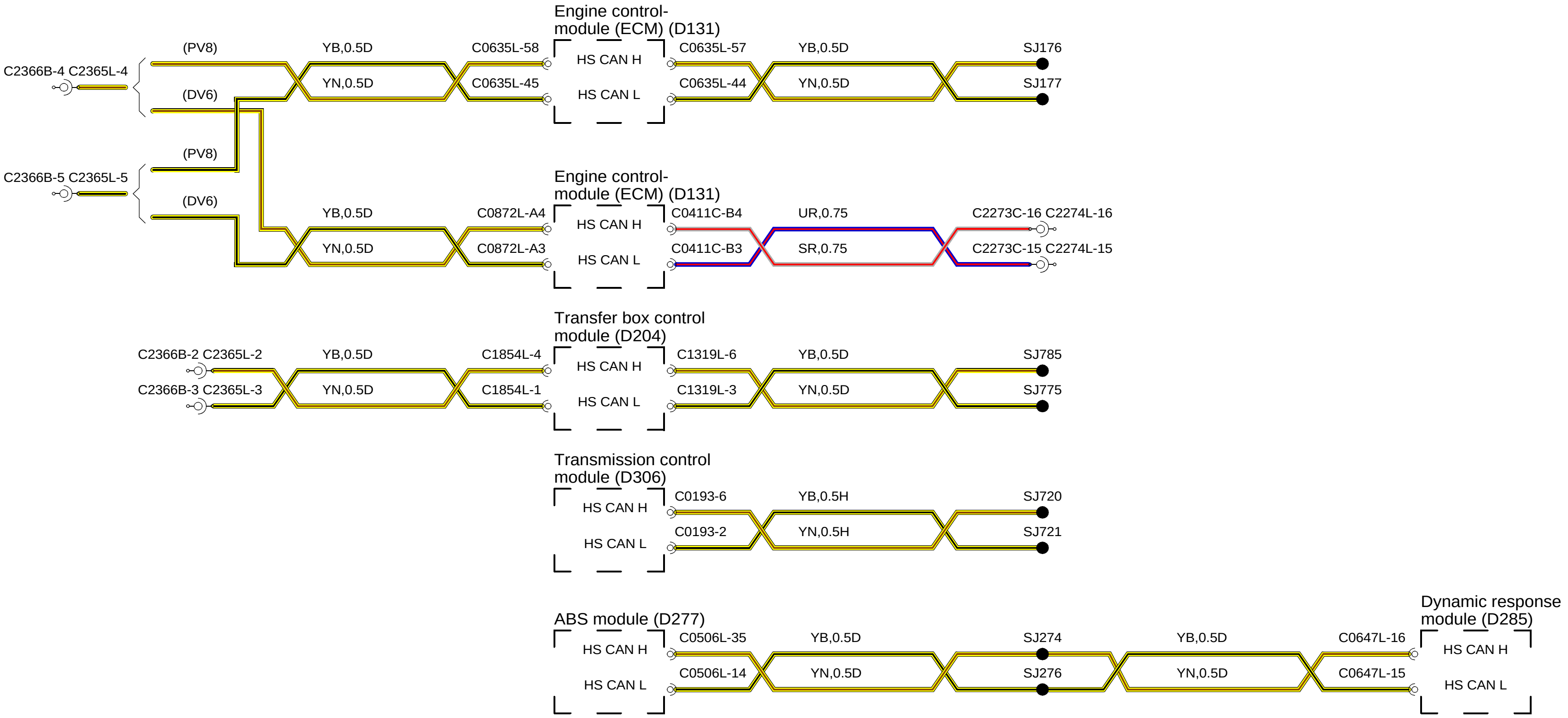

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 17E
50.0 Amps
C0570L-114
N,4.0D
C0570L-117
NR,6.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 36P
5.0 Amps
C0586L-2
GN,0.5D
SJ620 GN,0.5D
C1537-8
C0583L-20
FUSE 43P
10.0 Amps
C0585L-46
GW,0.5D
SJ50
GW,0.5D
C1537-16
Tire pressure monitoring control module (D286)
CAN H IN
CAN L IN
CAN H OUT
CAN L OUT
IGN
BATT
GND
C2447-13
G,0.5D
C2243L-20 C2245L-20
G,0.75D
C2198-1
C2447-14
W,0.5D
C2243L-21 C2245L-21
W,0.75D
C2198-2
Initiator-Front-LH (M282)
Sensor-Tyre-Front-LH (T291)
C2447-15
U,0.5D
C2242L-1 C2244L-1
U,0.75D
C2199-1
C2447-16
W,0.5D
C2242L-2 C2244L-2
W,0.75D
C2199-2
Initiator-Front-RH (M281)
Sensor-Tyre-Front-RH (T292)
C1537-3
YU,0.5D
C2411L-13 C2412L-13
C1537-2
YW,0.5D
C2411L-12 C2412L-12
C2447-5
R,0.75D
C2200-1
C2447-6
W,0.75D
C2200-2
Initiator-Rear-LH (M284)
Sensor-Tyre-Rear-LH (T293)
C1537-11
YU,0.5D
SJ887
C1537-10
YW,0.5D
SJ873
C2447-7
Y,0.75D
C2201-1
C2447-8
W,0.75D
C2201-2
Initiator-Rear-RH (M283)
Sensor-Tyre-Rear-RH (T294)
Sensor-Spare tyre (T316)
C1537-12
B,1.0D
WIRE TO BE LESS THAN 150mm
C2569-1
TYPE 1
Switch pack-Centre facia (S425)
Switch-TPM-input (S397)
Tell Tale (Y249)
B,0.5D
C2876-1
C1537-7
UR,0.5D
C1166L-10 C1168-10
UR,0.5D
C2387-13
C2387-15
B,0.5D
C1537-5
G,0.5D
C1166L-9 C1168-9
G,0.5D
C2387-7
SJ662
GN,0.5D
C1166L-8 C1168-8
GN,0.5D
C2387-12
B,2.5D
C2630-1
TYPE 2
(COAX)
WIRE TO BE LESS THAN 150mm
B,0.5D
C2921-1
TYPE 1
Instrument cluster (J100)
TPMS indicator (J203)
0.03 Amps
YELLOW
TPMS indicator (J203)
0.03 Amps
RED (LOW LINE ONLY)
Display Unit (D228)
WARNING
(HI-LINE ONLY)
Sounder (J213)
MS CAN H
MS CAN L
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731


C0561-1
TYPE 1
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Air supply unit (D252)
Motor-Compressor-
Air Suspension (M306)
B,6.0D
C0780-2
Junction-box engine (P108)
C0570L-53
NR,6.0D
SJ572
NR,6.0D
C2528-1 C2527-1
NR,6.0D
C0780-1
C0570L-98
NR,2.5D
Air suspension
Control Module (D199)
Relay-Air-
suspension (R225)
FUSE 3E
5.0 Amps
C0570L-120
NR,1.0D
C2320L-1
COMP_V
EXH_V_POS
C2320L-6
BW,0.75D
C2293-1 C2294-1
BW,0.75D
C0781-1
Valve-
Exhaust (N165)
LINK 10E
60.0 Amps
EXH_V_NEG
C2320L-5
BU,0.75D
C2293-2 C2294-2
BU,0.75D
C0781-4
C0570L-66
R,0.75D
C2321L-6
COMP_REL_POS
C0570L-65
BY,0.5D
C2321L-7
COMP_REL_NEG
MOT TEMP SIG
C2030L-5
BO,0.5D
C0377-5 C0391-5
BO,0.5D
C0781-2
Sensor-Motor-
temperature (T351)
C0632-1
FUSE 26E
20.0 Amps
C0570L-178
PU,2.5D
C2321L-1
BATTERY
MOT TEMP GND
C2030L-7
BN,0.5D
C0377-4 C0391-4
BN,0.5D
C0781-5
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
COMP_TEMP_SIG
C2321L-2
BY,0.5D
C2293-3 C2294-3
BY,0.5D
C0781-3
Sensor-Compressor-
temperature (T352)
N,4.0D
C2443-4 C2444L-4
COMP_TEMP_GND
C2321L-17
BG,0.5D
C2293-4 C2294-4
BG,0.5D
C0781-6
C0223-9 C0047L-9
YB,0.5D
C0867L-16
CAN_IN_POS
CAN_OUT_POS
C0867L-17
YB,0.5D
C0376-4 C0390-4
Reservoir control
valve (D264)
C0223-10 C0047L-10
YN,0.5D
C0867L-19
CAN_IN_NEG
CAN_OUT_NEG
C0867L-18
YN,0.5D
C0376-5 C0390-5
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
PRESSURE_5V
C2320L-2
YB,0.5D
C2293-5 C2294-5
YB,0.5D
C1684-3
Sensor-
Pressure (T285)
PRESSURE_SIG
C2320L-3
OS,0.5D
C2293-6 C2294-6
OS,0.5D
C1684-2
PRESSURE_GND
C2320L-4
YK,0.5D
C2293-7 C2294-7
YK,0.5D
C1684-1
Valve-
Reservoir (N144)
Central junction-box (P101)
RES_V_POS
C2321L-8
BW,1.0D
C2293-8 C2294-8
BW,1.0D
C1689-1
C0582-19
FUSE 35P
C0586L-4
LGW,0.75D
C0867L-20
IGN
RES_V_NEG
C2321L-21
B,1.0D
C2293-9 C2294-9
B,1.0D
C1689-2
5.0 Amps
Generic Electronic
Module (D162)
Power steering solenoid (N147)
C0586L-29
WK,0.5D
C0867L-13
AIR_SUS_CONT
STEER_V_POS
C2320L-8
R,0.75D
C2559-11 C2560-11
R,0.75D
C2038B-1
C0586L-26
WU,0.5D
C0867L-3
DOOR_STAT
STEER_V_NEG
C2320L-7
BR,0.75D
C2559-16 C2560-16
BR,0.75D
C2038B-2
GROUND
C2321L-24
B,2.5D
C0559-1
TYPE 1

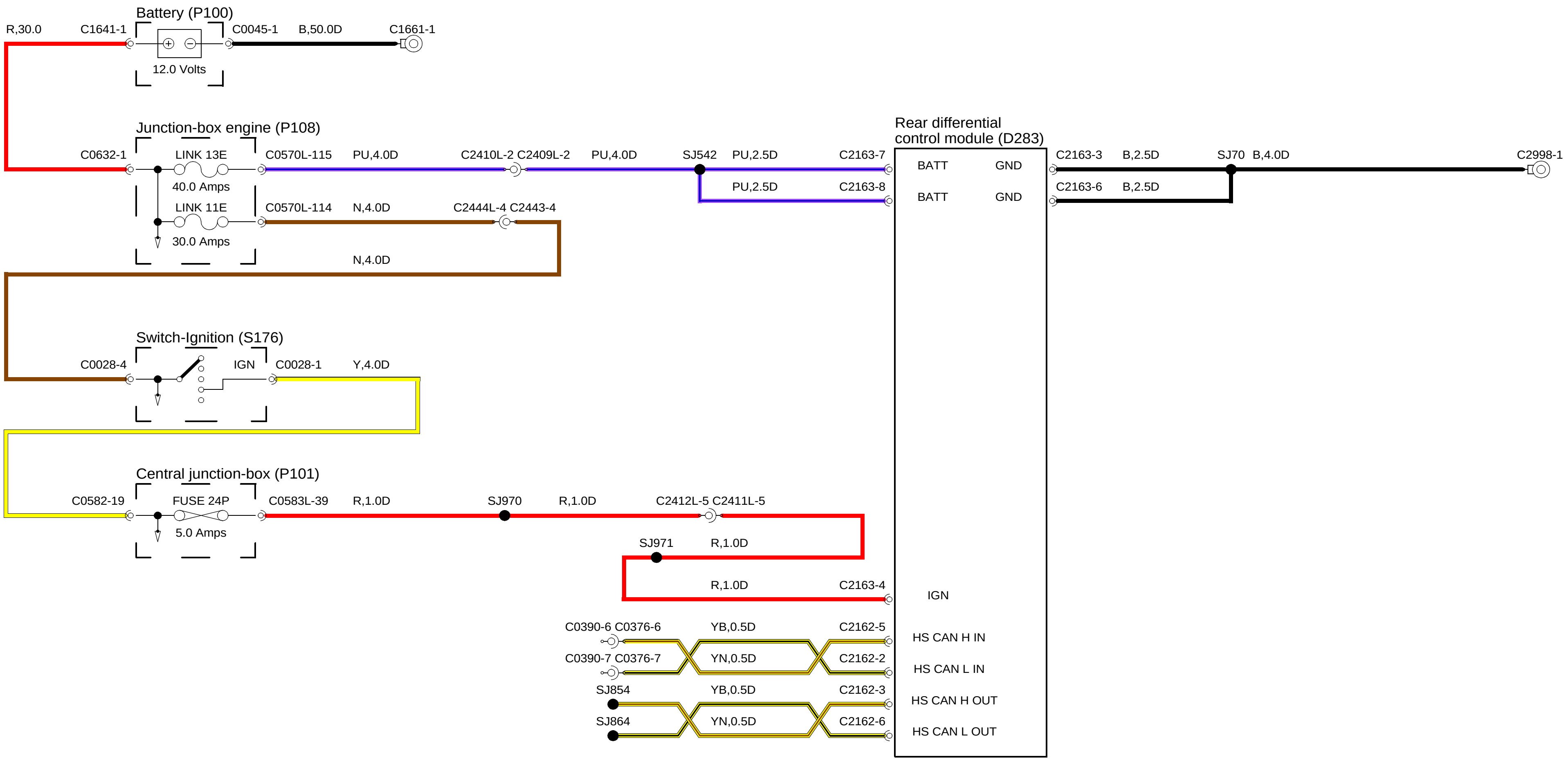

Switch pack-Centre-console (S350)
C0700-11 BY,0.5D C2054-1 C2053-1 BY,0.5D C0867L-15
C0700-12 BG,0.5D C2054-2 C2053-2 BG,0.5D C2030L-10
C0700-15 BN,0.5D C2054-3 C2053-3 BN,0.5D C2030L-17
C0700-14 BR,0.5D C2054-4 C2053-4 BR,0.5D C2030L-18
C0700-13 BO,0.5D C2054-5 C2053-5 BO,0.5D C2030L-8
C0700-16 BS,0.5D C2054-6 C2053-6 BS,0.5D C2030L-9
C0700-17 BP,0.5D C2054-7 C2053-7 BP,0.5D C0867L-14
Air suspension Control Module (D199)
HIGH_LED
STD_HT_LED
CRAWL_LED
ACCESS_HT_LED
RAISING_LED
LOWERING_LED
LED_NEG
LOWER_SW
RAISE_SW
Switch pack-Centre-console (S350)
C0700-5
Switch-Lower (S408)
C0700-18 B,0.5D
SJ301 B,2.5D
C0868-24 C0903-24
Switch-Raise (S407)
C0700-4
B,2.5D
C2598-1
TYPE 3
C0867L-4 BW,0.5D C2053-8 C2054-8 BW,0.5D
C2030L-20 BK,0.5D C2053-9 C2054-9 BK,0.5D
Front control valve (D281)
Valve-Cross-link-Front (N157)
Valve-Corner-Front-LH (N160)
Valve-Corner-Front-RH (N159)
C2099-4 BW,1.0D C3010-3 C3009-3 BW,1.0D C2321L-22
C2099-5 BU,1.0D C3010-4 C3009-4 BU,1.0D C2321L-23
C2099-1 BY,1.0D C3010-1 C3009-1 BY,1.0D C2321L-12
C2099-2 BG,1.0D C3010-2 C3009-2 BG,1.0D C2321L-11
C2099-3 BP,1.0D C3010-5 C3009-5 BP,1.0D C2321L-10
C2099-6 BO,1.0D C3010-6 C3009-6 BO,1.0D C2321L-9
F_XV_POS
F_XV_NEG
FL_CV_POS
FL_CV_NEG
FR_CV_POS
FR_CV_NEG
R_XV_POS
R_XV_NEG
RR_CV_POS
RR_CV_NEG
RL_CV_POS
RL_CV_NEG
Rear control valve (D280)
Valve-Cross-link-Rear (N158)
Valve-Corner-Rear-RH (N161)
Valve-Corner-Front-LH (N160)
C2030L-1 BW,1.0D C0377-7 C0391-7 BW,1.0D C2101-4
C2030L-11 BU,1.0D C0377-8 C0391-8 BU,1.0D C2101-5
C0867L-11 BP,1.0D C0377-9 C0391-9 BP,1.0D C2101-1
C0867L-12 BO,1.0D C0377-10 C0391-10 BO,1.0D C2101-2
C0867L-1 BY,1.0D C0377-1 C0391-1 BY,1.0D C2101-3
C0867L-2 BG,1.0D C0377-2 C0391-2 BG,1.0D C2101-6
Sensor-Height-Front-LH (T236)
C1696-1 SG,0.5D C2294-10 C2293-10 SG,0.5D C2321L-3
C1696-4 SO,0.5D C2294-11 C2293-11 SO,0.5D C2321L-4
C1696-5 SB,0.5D C2294-12 C2293-12 SB,0.5D C2321L-5
FL_HEIGHT_5V
FL_HEIGHT_SIG
FL_HEIGHT_GND
FR_HEIGHT_5V
FR_HEIGHT_SIG
FR_HEIGHT_GND
Sensor-Height-Front-RH (T238)
C2321L-14 SY,0.5D C3009-7 C3010-7 SY,0.5D C1697-5
C2321L-15 SU,0.5D C3009-8 C3010-8 SU,0.5D C1697-4
C2321L-16 SR,0.5D C3009-9 C3010-9 SR,0.5D C1697-1
Sensor-Height-Rear-LH (T235)
C1699-1 OY,0.5D C0391-12 C0377-12 OY,0.5D C0867L-5
C1699-4 OR,0.5D C0391-13 C0377-13 OR,0.5D C0867L-6
C1699-5 OB,0.5D C0391-14 C0377-14 OB,0.5D C0867L-7
RL_HEIGHT_5V
RL_HEIGHT_SIG
RL_HEIGHT_GND
RR_HEIGHT_5V
RR_HEIGHT_SIG
RR_HEIGHT_GND
Sensor-Height-Rear-RH (T237)
C0867L-8 SY,0.5D C0377-15 C0391-15 SY,0.5D C1698-5
C0867L-9 SU,0.5D C0377-16 C0391-16 SU,0.5D C1698-4
C0867L-10 SR,0.5D C0377-3 C0391-3 SR,0.5D C1698-1

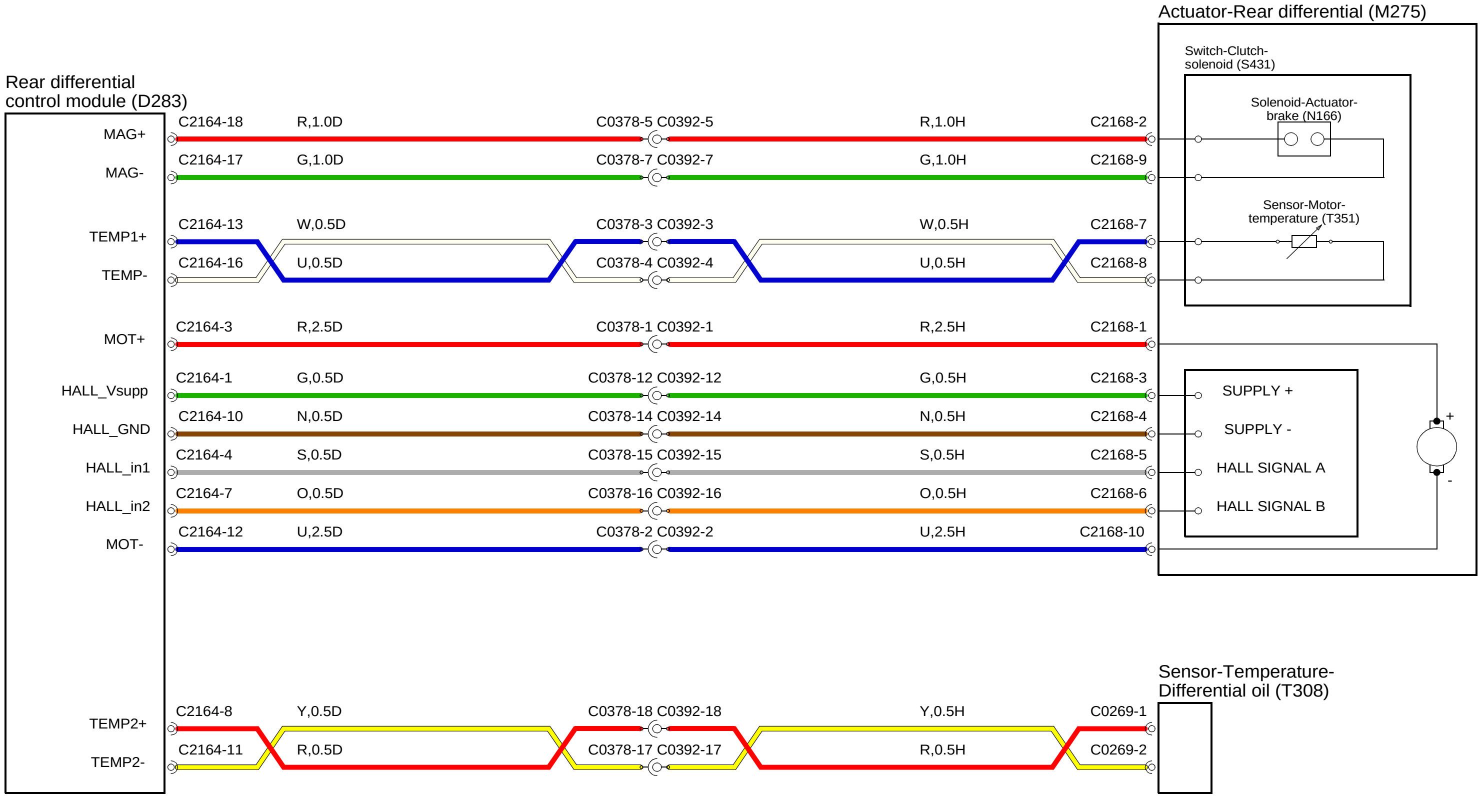

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
C0570L-18
NG,0.75D
(DIESEL)
NG,0.75D
(PETROL)
Engine control-module (ECM) (D131)
C0872L-J3
Engine control-module (ECM) (D131)
C0635L-16
FUSE 9E
15.0 Amps
C0570L-123
PO,2.5D
C2188L-1
Dynamic response module (D285)
VBATT
PR_TEMP_5V
PR_SIG
HS CAN H
PR_TEMP_GND
HS CAN L
DCV1_POS
DCV1_NEG
LA_LOWER_5V
LA_LOWER_SIG
DCV2_POS
LA_LOWER_GND
DCV2_NEG
LA_UPPER_5V
PCV_POS
LA_UPPER_SIG
PCV_NEG
LA_UPPER_GND
ECU_GND
Valve block-Active-Roll Control (D279)
Sensor-Pressure (T285)
Valve-Direction-control (N153)
1
Valve-Direction-control (N153)
2
Valve-Pressure-control (N169)
SJ274
YB,0.5D
C0647L-16
SJ276
YN,0.5D
C0647L-15
C0647L-13 Y,0.5D C2396-4 C2394-4 Y,0.5D C1610-3
C0647L-14 YS,0.5D C2396-5 C2394-5 YS,0.5D C1610-2
C0647L-19 YG,0.5D C2396-7 C2394-7 YG,0.5D C1610-1
C0647L-6 GR,0.75D C2396-8 C2394-8 GR,0.75D C1690-2
C0647L-7 OG,0.75D C2396-9 C2394-9 OG,0.75D C1690-1
C0647L-9 GR,0.75D C2396-10 C2394-10 GR,0.75D C0770-2
C0647L-8 YB,0.75D C2396-11 C2394-11 YB,0.75D C0770-1
C0647L-2 P,0.75D C2396-12 C2394-12 P,0.75D C0771-2
C0647L-1 BG,0.75D C2396-6 C2394-6 BG,0.75D C0771-1
C2188L-2 B,2.5D C2602L-1
Accelerometer-Lower (D193)
C0656-3 YB,0.5D C2394-1 C2396-1 YB,0.5D C0647L-26
C0656-1 OS,0.5D C2394-2 C2396-2 OS,0.5D C0647L-22
C0656-2 YK,0.5D C2394-3 C2396-3 YK,0.5D C0647L-20
Accelerometer-Upper (D192)
C0657-3 YB,0.5D C2242L-12 C2244L-12 YB,0.5D C0647L-25
C0657-1 OS,0.5D C2242L-13 C2244L-13 OS,0.5D C0647L-28
C0657-2 YK,0.5D C2242L-14 C2244L-14 YK,0.5D C0647L-23


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 24P
C0583L-39
R,1.0D
SJ970
5.0 Amps
SJ971
R,1.0D
C2411L-5 C2412L-5
R,1.0D
R,1.0D
C0868-8 C0903-8
R,0.75D
C0700-20
Instrument cluster (J100)
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Air suspension Control Module (D199)
C0223-9 C0047L-9
YB,0.5D
C0867L-16
HS CAN H
C0223-10 C0047L-10
YN,0.5D
C0867L-19
HS CAN L
Parking brake module (D278)
HS CAN H
HS CAN L
C2178-A3
YB,0.5D
C0390-4 C0376-4
YB,0.5D
C0867L-17
HS CAN H
C2178-A4
YN,0.5D
C0390-5 C0376-5
YN,0.5D
C0867L-18
HS CAN L
Rear differential control module (D283)
HS CAN H
HS CAN L
C2178-B2
YB,0.5D
C0390-6 C0376-6
YB,0.5D
C2162-5
HS CAN H
C2178-A2
YN,0.5D
C0390-7 C0376-7
YN,0.5D
C2162-2
HS CAN L
SJ854
YB,0.5D
C2162-3
HS CAN H
SJ864
YN,0.5D
C2162-6
HS CAN L
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
HS CAN H
HS CAN L
C0700-2
YB,MAPA
C0903-21 C0868-21
C0700-1
YN,MAPA
C0903-22 C0868-22
IGN
GND
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3

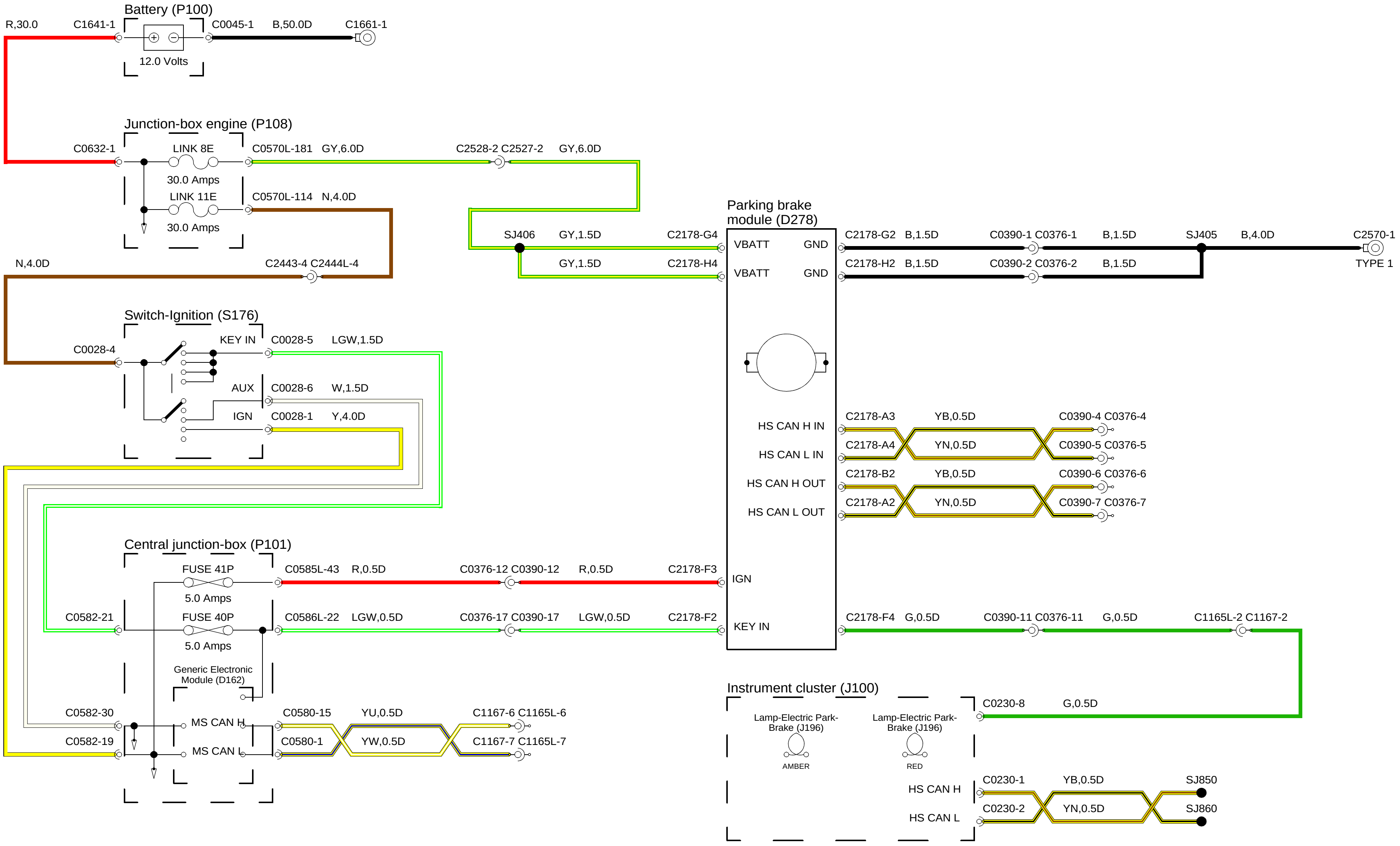

Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C2366B-4 C2365L-4
(PV8)
(DV6)
YB,0.5D
YN,0.5D
C0635L-58
C0635L-45
C0635L-57
C0635L-44
SJ176
SJ177
C2366B-5 C2365L-5
(PV8)
(DV6)
Engine control-module (ECM) (D131)
C0872L-A4
C0872L-A3
C0411C-B4
C0411C-B3
UR,0.75
SR,0.75
C2273C-16 C2274L-16
C2273C-15 C2274L-15
Transfer box control module (D204)
C2366B-2 C2365L-2
C2366B-3 C2365L-3
C1854L-4
C1854L-1
C1319L-6
C1319L-3
SJ785
SJ775
Transmission control module (D306)
C0193-6
C0193-2
YB,0.5H
YN,0.5H
SJ720
SJ721
ABS module (D277)
C0506L-35
C0506L-14
SJ274
SJ276
C0647L-16
C0647L-15
Dynamic response module (D285)

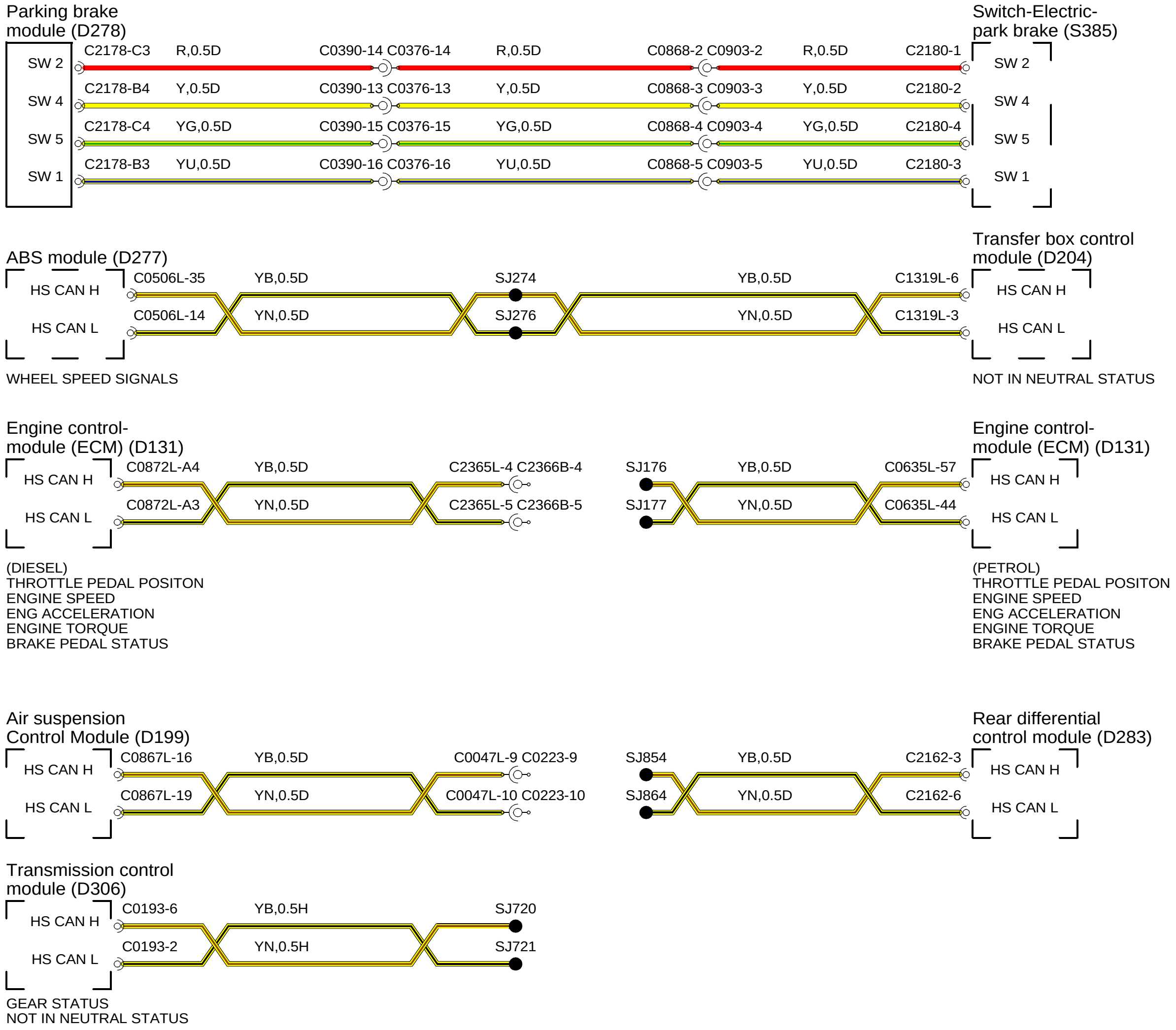
205-02 REAR DRIVE AXLE AND DIFFERENTIAL

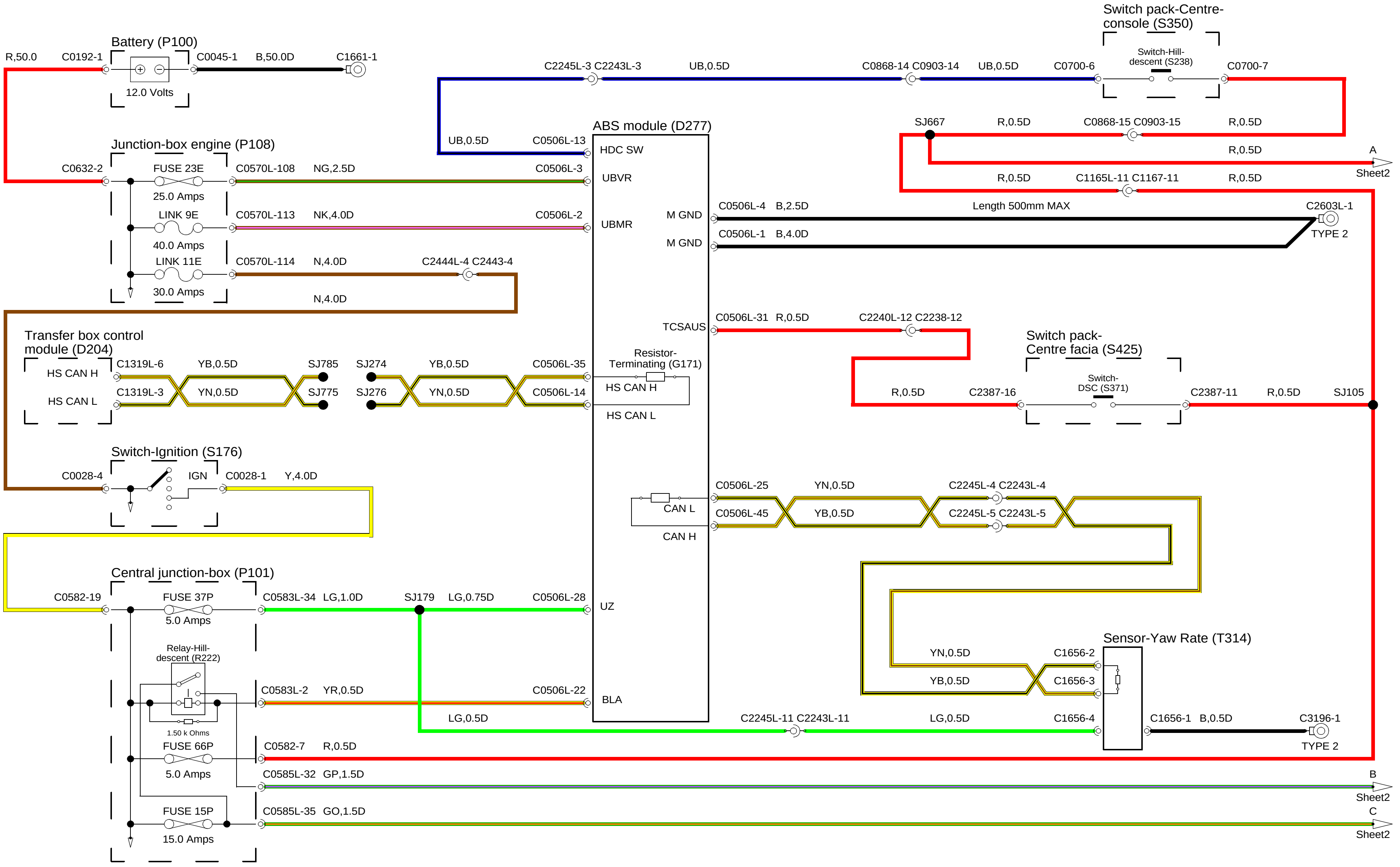

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 13E
40.0 Amps
C0570L-115
PU,4.0D
C2410L-2 C2409L-2
PU,4.0D
SJ542
PU,2.5D
C2163-7
PU,2.5D
C2163-8
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Rear differential control module (D283)
BATT
GND
BATT
GND
C2163-3
B,2.5D
SJ70
B,4.0D
C2998-1
C2163-6
B,2.5D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D
SJ970
R,1.0D
C2412L-5 C2411L-5
SJ971
R,1.0D
R,1.0D
C2163-4
IGN
C0390-6 C0376-6
YB,0.5D
C2162-5
HS CAN H IN
C0390-7 C0376-7
YN,0.5D
C2162-2
HS CAN L IN
SJ854
YB,0.5D
C2162-3
HS CAN H OUT
SJ864
YN,0.5D
C2162-6
HS CAN L OUT

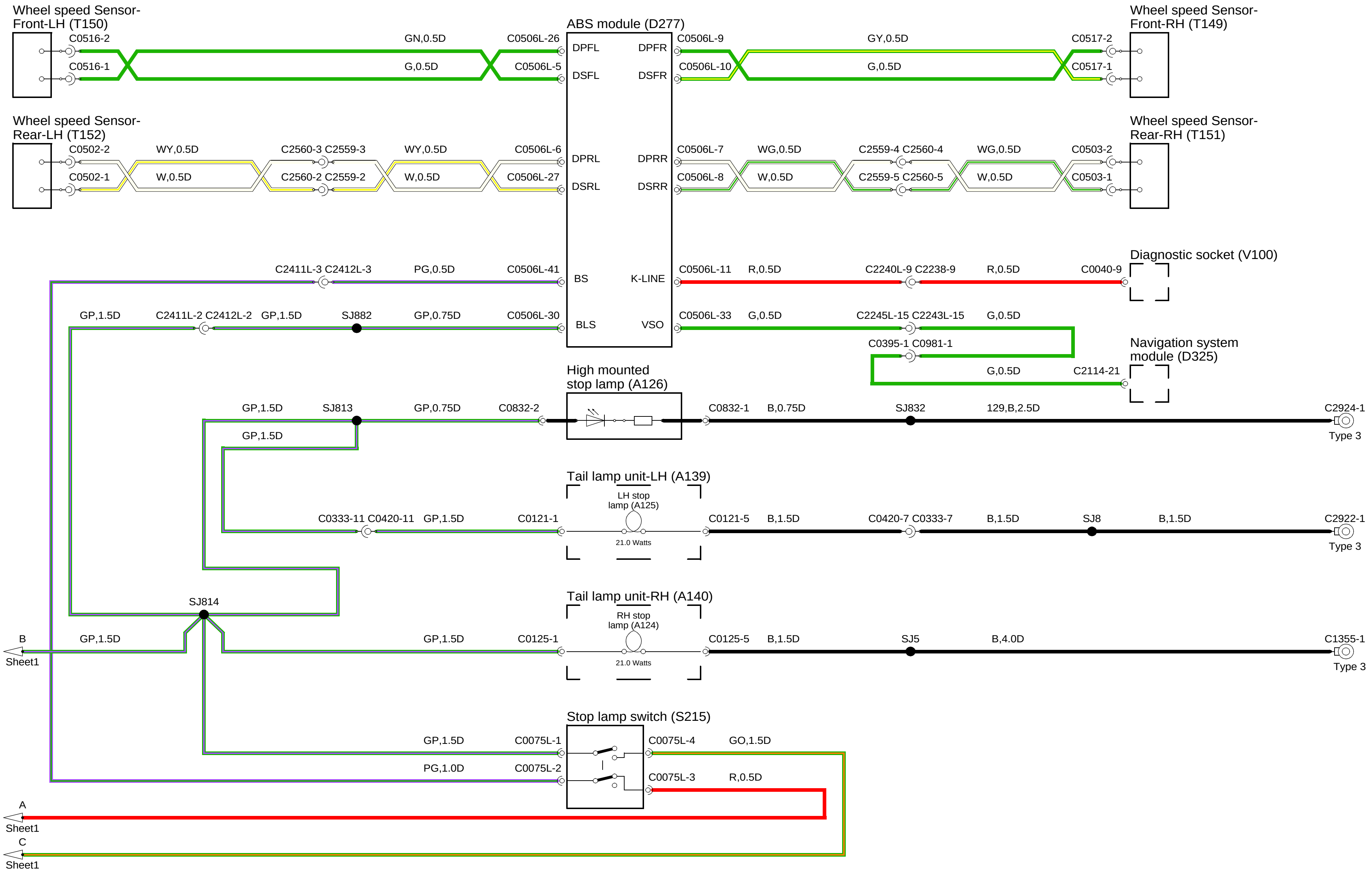

Actuator-Rear differential (M275)
Switch-Clutch-solenoid (S431)
Solenoid-Actuator-brake (N166)
Sensor-Motor-temperature (T351)
Rear differential control module (D283)
MAG+
MAG-
TEMP1+
TEMP-
MOT+
HALL_Vsupp
HALL_GND
HALL_in1
HALL_in2
MOT-
TEMP2+
TEMP2-
C2164-18
R,1.0D
C0378-5 C0392-5
R,1.0H
C2168-2
C2164-17
G,1.0D
C0378-7 C0392-7
G,1.0H
C2168-9
C2164-13
W,0.5D
C0378-3 C0392-3
W,0.5H
C2168-7
C2164-16
U,0.5D
C0378-4 C0392-4
U,0.5H
C2168-8
C2164-3
R,2.5D
C0378-1 C0392-1
R,2.5H
C2168-1
C2164-1
G,0.5D
C0378-12 C0392-12
G,0.5H
C2168-3
C2164-10
N,0.5D
C0378-14 C0392-14
N,0.5H
C2168-4
C2164-4
S,0.5D
C0378-15 C0392-15
S,0.5H
C2168-5
C2164-7
O,0.5D
C0378-16 C0392-16
O,0.5H
C2168-6
C2164-12
U,2.5D
C0378-2 C0392-2
U,2.5H
C2168-10
SUPPLY +
SUPPLY -
HALL SIGNAL A
HALL SIGNAL B
+
-
Sensor-Temperature-Differential oil (T308)
C2164-8
Y,0.5D
C0378-18 C0392-18
Y,0.5H
C0269-1
C2164-11
R,0.5D
C0378-17 C0392-17
R,0.5H
C0269-2

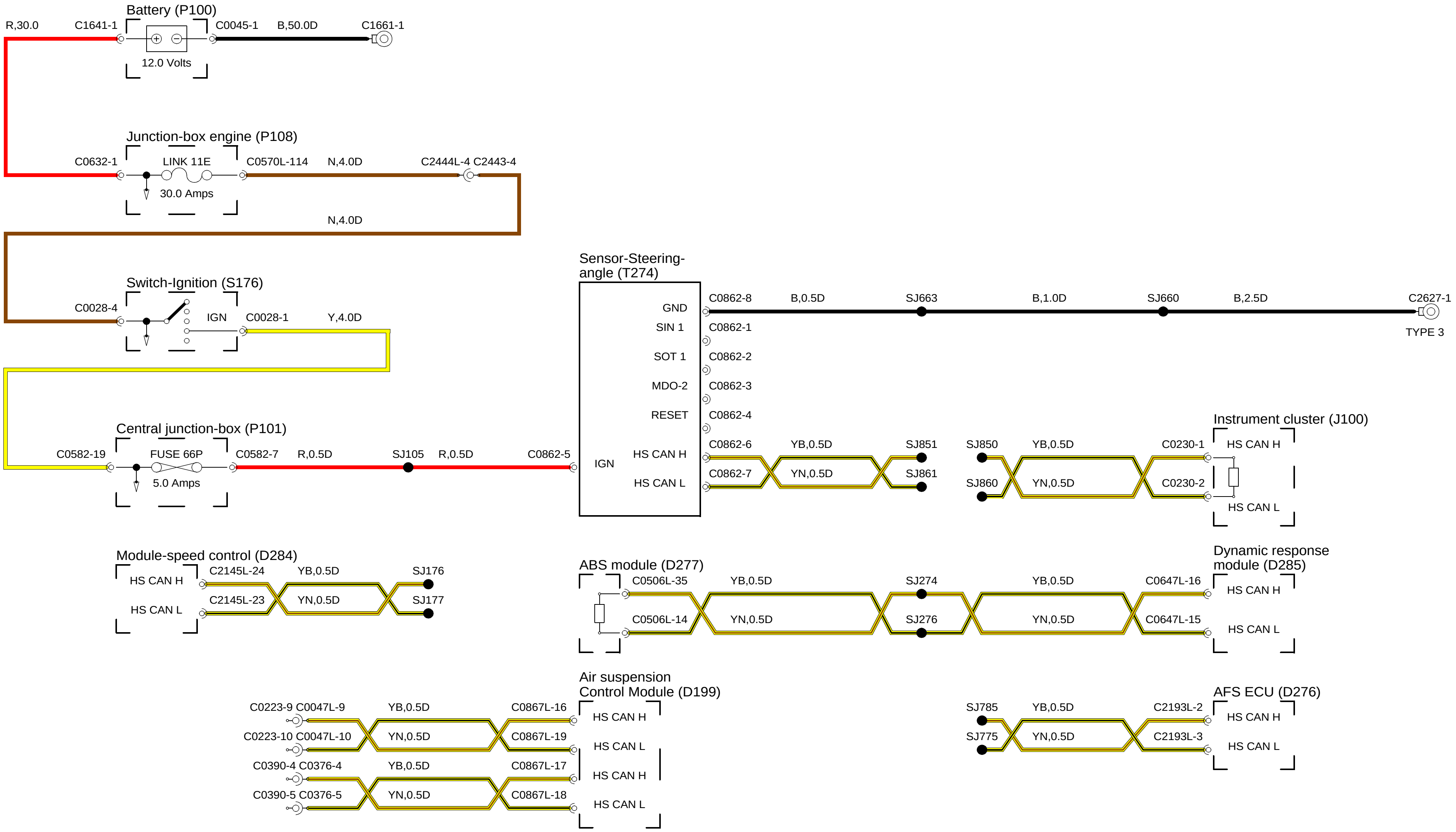
206-05 PARKING BRAKE AND ACTUATION

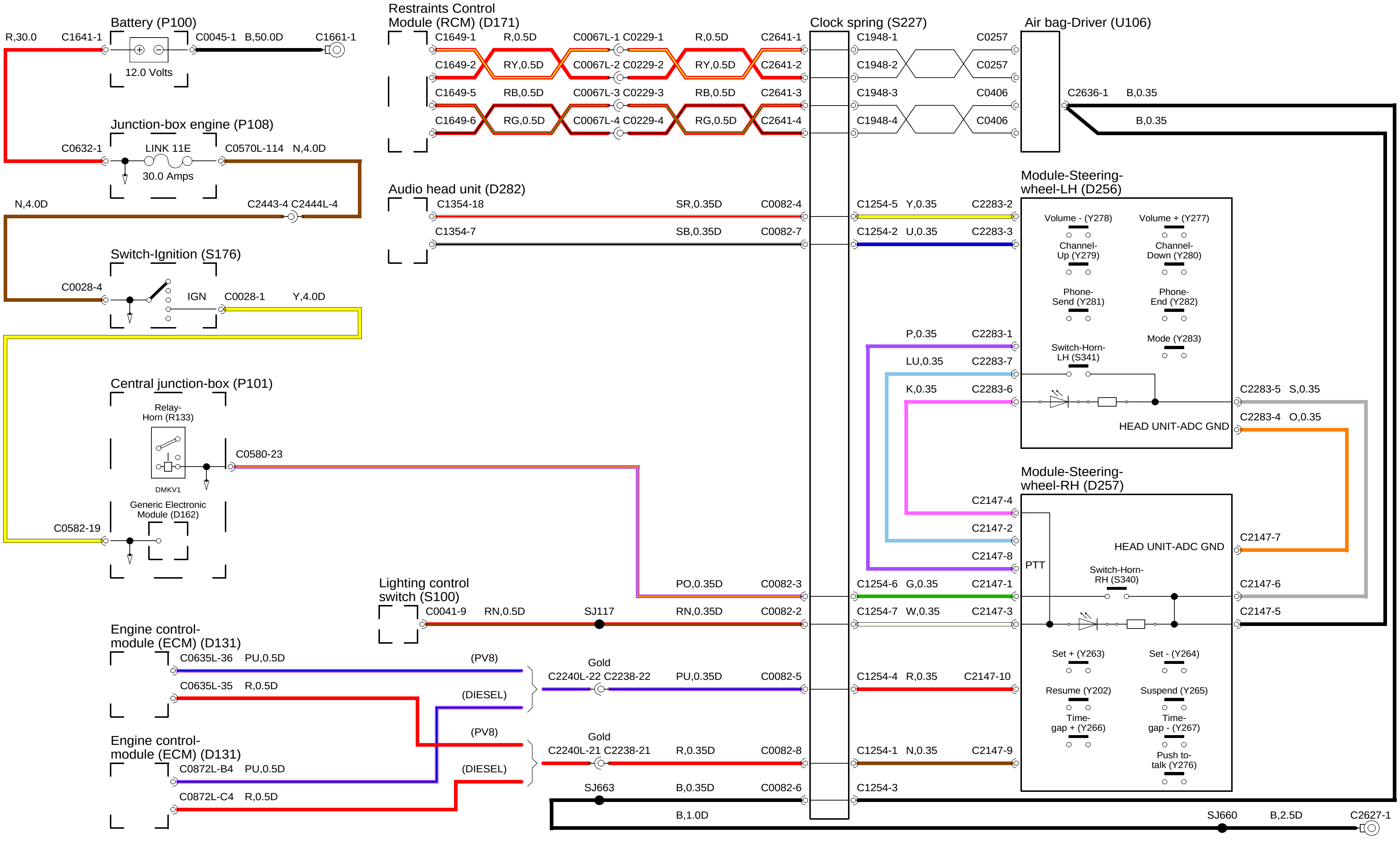

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 8E
30.0 Amps
C0570L-181
GY,6.0D
C2528-2 C2527-2
GY,6.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Parking brake module (D278)
SJ406
GY,1.5D
C2178-G4
GY,1.5D
C2178-H4
VBATT
VBATT
GND
GND
C2178-G2
B,1.5D
C0390-1 C0376-1
B,1.5D
SJ405
B,4.0D
C2570-1
C2178-H2
B,1.5D
C0390-2 C0376-2
B,1.5D
TYPE 1
Switch-Ignition (S176)
C0028-4
KEY IN
C0028-5
LGW,1.5D
AUX
C0028-6
W,1.5D
IGN
C0028-1
Y,4.0D
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
C2178-A3
YB,0.5D
C0390-4 C0376-4
C2178-A4
YN,0.5D
C0390-5 C0376-5
C2178-B2
YB,0.5D
C0390-6 C0376-6
C2178-A2
YN,0.5D
C0390-7 C0376-7
Central junction-box (P101)
FUSE 41P
5.0 Amps
C0585L-43
R,0.5D
C0376-12 C0390-12
R,0.5D
C2178-F3
IGN
C0582-21
FUSE 40P
5.0 Amps
C0586L-22
LGW,0.5D
C0376-17 C0390-17
LGW,0.5D
C2178-F2
KEY IN
C2178-F4
G,0.5D
C0390-11 C0376-11
G,0.5D
C1165L-2 C1167-2
Generic Electronic Module (D162)
C0582-30
MS CAN H
C0580-15
YU,0.5D
C1167-6 C1165L-6
C0582-19
MS CAN L
C0580-1
YW,0.5D
C1167-7 C1165L-7
Instrument cluster (J100)
C0230-8
G,0.5D
Lamp-Electric Park-Brake (J196)
AMBER
Lamp-Electric Park-Brake (J196)
RED
HS CAN H
C0230-1
YB,0.5D
SJ850
HS CAN L
C0230-2
YN,0.5D
SJ860


Parking brake module (D278)
SW 2
SW 4
SW 5
SW 1
C2178-C3
R,0.5D
C0390-14 C0376-14
R,0.5D
C0868-2 C0903-2
R,0.5D
C2180-1
C2178-B4
Y,0.5D
C0390-13 C0376-13
Y,0.5D
C0868-3 C0903-3
Y,0.5D
C2180-2
C2178-C4
YG,0.5D
C0390-15 C0376-15
YG,0.5D
C0868-4 C0903-4
YG,0.5D
C2180-4
C2178-B3
YU,0.5D
C0390-16 C0376-16
YU,0.5D
C0868-5 C0903-5
YU,0.5D
C2180-3
Switch-Electric-park brake (S385)
SW 2
SW 4
SW 5
SW 1
ABS module (D277)
HS CAN H
HS CAN L
C0506L-35
YB,0.5D
SJ274
YB,0.5D
C1319L-6
C0506L-14
YN,0.5D
SJ276
YN,0.5D
C1319L-3
Transfer box control module (D204)
HS CAN H
HS CAN L
WHEEL SPEED SIGNALS
NOT IN NEUTRAL STATUS
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0872L-A4
YB,0.5D
C2365L-4 C2366B-4
C0872L-A3
YN,0.5D
C2365L-5 C2366B-5
SJ176
YB,0.5D
C0635L-57
SJ177
YN,0.5D
C0635L-44
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
(DIESEL)
THROTTLE PEDAL POSITON
ENGINE SPEED
ENG ACCELERATION
ENGINE TORQUE
BRAKE PEDAL STATUS
(PETROL)
THROTTLE PEDAL POSITON
ENGINE SPEED
ENG ACCELERATION
ENGINE TORQUE
BRAKE PEDAL STATUS
Air suspension Control Module (D199)
HS CAN H
HS CAN L
C0867L-16
YB,0.5D
C0047L-9 C0223-9
C0867L-19
YN,0.5D
C0047L-10 C0223-10
SJ854
YB,0.5D
C2162-3
SJ864
YN,0.5D
C2162-6
Rear differential control module (D283)
HS CAN H
HS CAN L
Transmission control module (D306)
HS CAN H
HS CAN L
C0193-6
YB,0.5H
SJ720
C0193-2
YN,0.5H
SJ721
GEAR STATUS
NOT IN NEUTRAL STATUS


Switch pack-Centre-console (S350)
Switch-Hill-descent (S238)
Battery (P100)
R,50.0
C0192-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
C2245L-3 C2243L-3
UB,0.5D
C0868-14 C0903-14
UB,0.5D
C0700-6
C0700-7
ABS module (D277)
SJ667
R,0.5D
C0868-15 C0903-15
R,0.5D
Junction-box engine (P108)
UB,0.5D
C0506L-13
HDC SW
R,0.5D
A
Sheet2
C0632-2
FUSE 23E
C0570L-108
NG,2.5D
C0506L-3
UBVR
R,0.5D
C1165L-11 C1167-11
R,0.5D
25.0 Amps
LINK 9E
C0570L-113
NK,4.0D
C0506L-2
UBMR
M GND
C0506L-4
B,2.5D
Length 500mm MAX
C2603L-1
M GND
C0506L-1
B,4.0D
TYPE 2
40.0 Amps
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
TCSAUS
C0506L-31
R,0.5D
C2240L-12 C2238-12
Transfer box control module (D204)
Switch pack-Centre facia (S425)
HS CAN H
C1319L-6
YB,0.5D
SJ785
SJ274
YB,0.5D
C0506L-35
Resistor-Terminating (G171)
HS CAN H
R,0.5D
C2387-16
Switch-DSC (S371)
C2387-11
R,0.5D
SJ105
HS CAN L
C1319L-3
YN,0.5D
SJ775
SJ276
YN,0.5D
C0506L-14
HS CAN L
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C0506L-25
YN,0.5D
C2245L-4 C2243L-4
CAN L
C0506L-45
YB,0.5D
C2245L-5 C2243L-5
CAN H
Central junction-box (P101)
C0582-19
FUSE 37P
C0583L-34
LG,1.0D
SJ179
LG,0.75D
C0506L-28
UZ
5.0 Amps
Sensor-Yaw Rate (T314)
Relay-Hill-descent (R222)
YN,0.5D
C1656-2
YB,0.5D
C1656-3
C0583L-2
YR,0.5D
C0506L-22
BLA
LG,0.5D
C2245L-11 C2243L-11
LG,0.5D
C1656-4
C1656-1
B,0.5D
C3196-1
1.50 k Ohms
FUSE 66P
C0582-7
R,0.5D
TYPE 2
5.0 Amps
C0585L-32
GP,1.5D
B
Sheet2
FUSE 15P
C0585L-35
GO,1.5D
C
Sheet2
15.0 Amps


Wheel speed Sensor-
Front-LH (T150)
C0516-2
C0516-1
GN,0.5D
G,0.5D
C0506L-26
C0506L-5
ABS module (D277)
DPFL
DSFL
DPFR
DSFR
C0506L-9
C0506L-10
GY,0.5D
G,0.5D
C0517-2
C0517-1
Wheel speed Sensor-
Front-RH (T149)
Wheel speed Sensor-
Rear-LH (T152)
C0502-2
C0502-1
WY,0.5D
W,0.5D
C2560-3 C2559-3
C2560-2 C2559-2
WY,0.5D
W,0.5D
C0506L-6
C0506L-27
DPRL
DSRL
DPRR
DSRR
C0506L-7
C0506L-8
WG,0.5D
W,0.5D
C2559-4 C2560-4
C2559-5 C2560-5
WG,0.5D
W,0.5D
C0503-2
C0503-1
Wheel speed Sensor-
Rear-RH (T151)
C2411L-3 C2412L-3
PG,0.5D
C0506L-41
BS
K-LINE
C0506L-11
R,0.5D
C2240L-9 C2238-9
R,0.5D
C0040-9
Diagnostic socket (V100)
GP,1.5D
C2411L-2 C2412L-2
GP,1.5D
SJ882
GP,0.75D
C0506L-30
BLS
VSO
C0506L-33
G,0.5D
C2245L-15 C2243L-15
G,0.5D
C0395-1 C0981-1
Navigation system
module (D325)
G,0.5D
C2114-21
High mounted
stop lamp (A126)
GP,1.5D
SJ813
GP,0.75D
C0832-2
C0832-1
B,0.75D
SJ832
129,B,2.5D
C2924-1
Type 3
GP,1.5D
Tail lamp unit-LH (A139)
LH stop
lamp (A125)
21.0 Watts
C0333-11 C0420-11
GP,1.5D
C0121-1
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
Type 3
SJ814
Tail lamp unit-RH (A140)
RH stop
lamp (A124)
21.0 Watts
B
Sheet1
GP,1.5D
GP,1.5D
C0125-1
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
Type 3
Stop lamp switch (S215)
GP,1.5D
C0075L-1
PG,1.0D
C0075L-2
C0075L-4
GO,1.5D
C0075L-3
R,0.5D
A
Sheet1
C
Sheet1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 66P
C0582-7
R,0.5D
SJ105
R,0.5D
C0862-5
5.0 Amps
Sensor-Steering-angle (T274)
GND
SIN 1
SOT 1
MDO-2
RESET
IGN
HS CAN H
HS CAN L
C0862-8
B,0.5D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
C0862-1
C0862-2
C0862-3
C0862-4
C0862-6
YB,0.5D
SJ851
SJ850
YB,0.5D
C0230-1
C0862-7
YN,0.5D
SJ861
SJ860
YN,0.5D
C0230-2
Instrument cluster (J100)
HS CAN H
HS CAN L
Module-speed control (D284)
HS CAN H
C2145L-24
YB,0.5D
SJ176
HS CAN L
C2145L-23
YN,0.5D
SJ177
ABS module (D277)
C0506L-35
YB,0.5D
SJ274
YB,0.5D
C0647L-16
C0506L-14
YN,0.5D
SJ276
YN,0.5D
C0647L-15
Dynamic response module (D285)
HS CAN H
HS CAN L
Air suspension Control Module (D199)
C0223-9 C0047L-9
YB,0.5D
C0867L-16
HS CAN H
C0223-10 C0047L-10
YN,0.5D
C0867L-19
HS CAN L
C0390-4 C0376-4
YB,0.5D
C0867L-17
HS CAN H
C0390-5 C0376-5
YN,0.5D
C0867L-18
HS CAN L
AFS ECU (D276)
SJ785
YB,0.5D
C2193L-2
HS CAN H
SJ775
YN,0.5D
C2193L-3
HS CAN L


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
Relay-Horn (R133)
DMKV1
Generic Electronic Module (D162)
C0580-23
C0582-19
Restraints Control Module (RCM) (D171)
C1649-1
R,0.5D
C0067L-1 C0229-1
R,0.5D
C2641-1
C1649-2
RY,0.5D
C0067L-2 C0229-2
RY,0.5D
C2641-2
C1649-5
RB,0.5D
C0067L-3 C0229-3
RB,0.5D
C2641-3
C1649-6
RG,0.5D
C0067L-4 C0229-4
RG,0.5D
C2641-4
Clock spring (S227)
C1948-1
C0257
C1948-2
C0257
C1948-3
C0406
C1948-4
C0406
Air bag-Driver (U106)
C2636-1
B,0.35
B,0.35
Audio head unit (D282)
C1354-18
SR,0.35D
C0082-4
C1354-7
SB,0.35D
C0082-7
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone-Send (Y281)
Phone-End (Y282)
Mode (Y283)
Switch-Horn-LH (S341)
HEAD UNIT-ADC GND
P,0.35
C2283-1
LU,0.35
C2283-7
K,0.35
C2283-6
C2283-5
S,0.35
C2283-4
O,0.35
Module-Steering-wheel-RH (D257)
C2147-4
C2147-2
C2147-8
C2147-7
HEAD UNIT-ADC GND
PTT
Switch-Horn-RH (S340)
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.35D
C0082-2
PO,0.35D
C0082-3
C1254-6
G,0.35
C2147-1
C2147-6
C1254-7
W,0.35
C2147-3
C2147-5
Engine control-module (ECM) (D131)
C0635L-36
PU,0.5D
(PV8)
C0635L-35
R,0.5D
(DIESEL)
Gold
C2240L-22 C2238-22
PU,0.35D
C0082-5
C1254-4
R,0.35
C2147-10
Set + (Y263)
Set - (Y264)
Resume (Y202)
Suspend (Y265)
Time-gap + (Y266)
Time-gap - (Y267)
Push to-talk (Y276)
Engine control-module (ECM) (D131)
C0872L-B4
PU,0.5D
(PV8)
(DIESEL)
C0872L-C4
R,0.5D
Gold
C2240L-21 C2238-21
R,0.35D
C0082-8
C1254-1
N,0.35
C2147-9
SJ663
B,0.35D
C0082-6
C1254-3
B,1.0D
SJ660
B,2.5D
C2627-1

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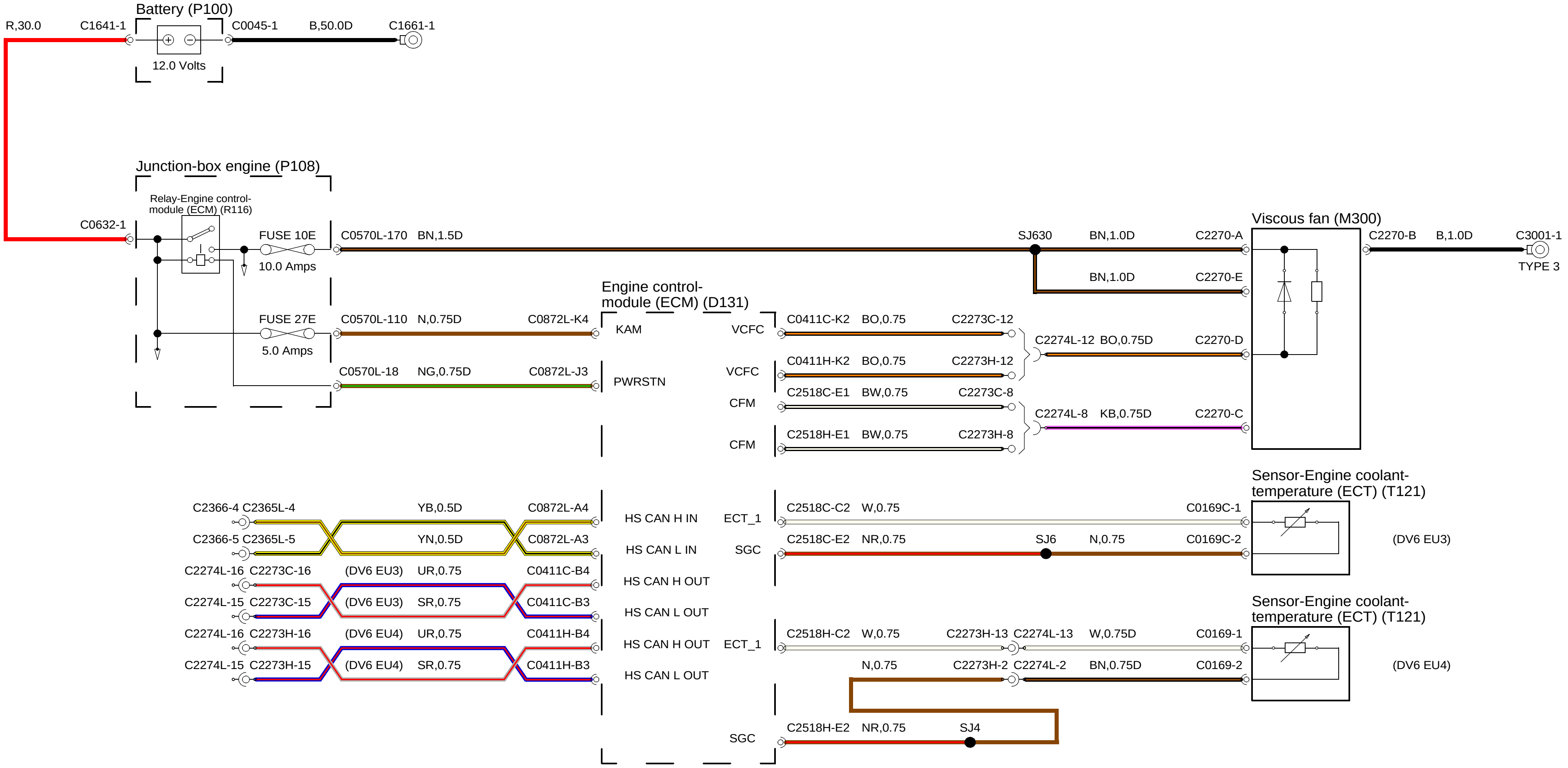
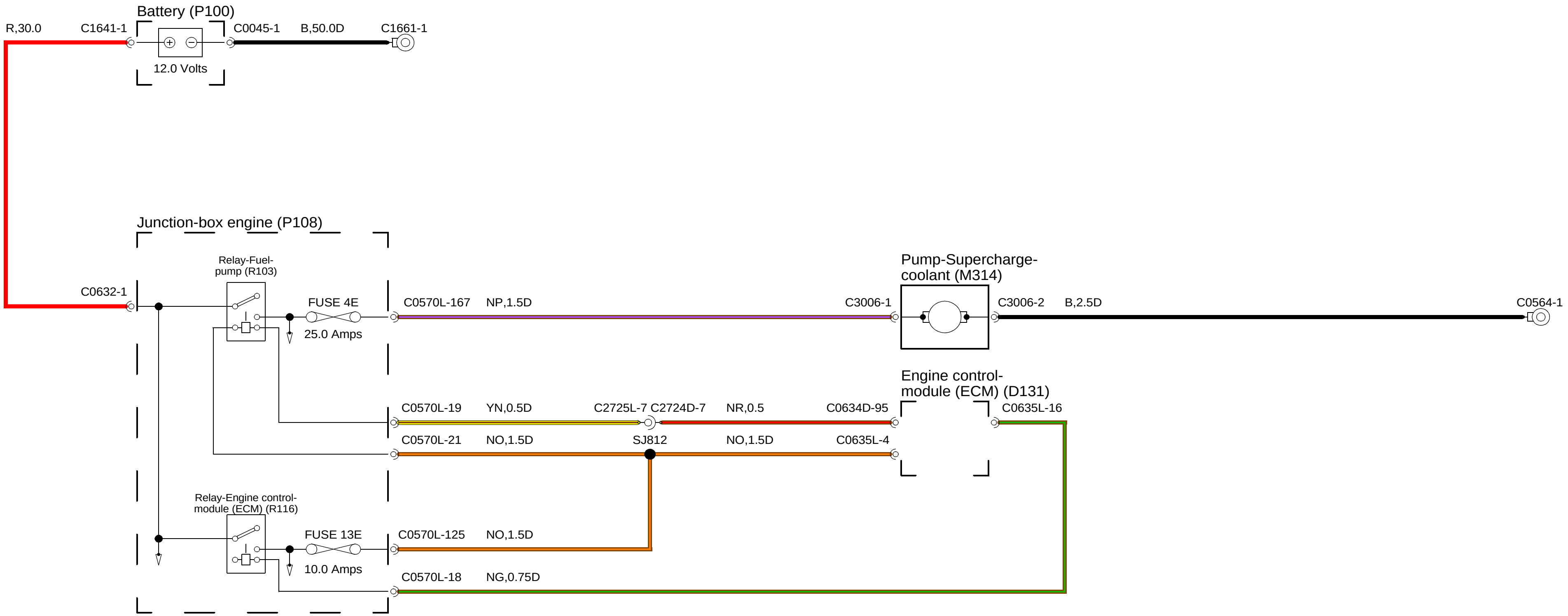
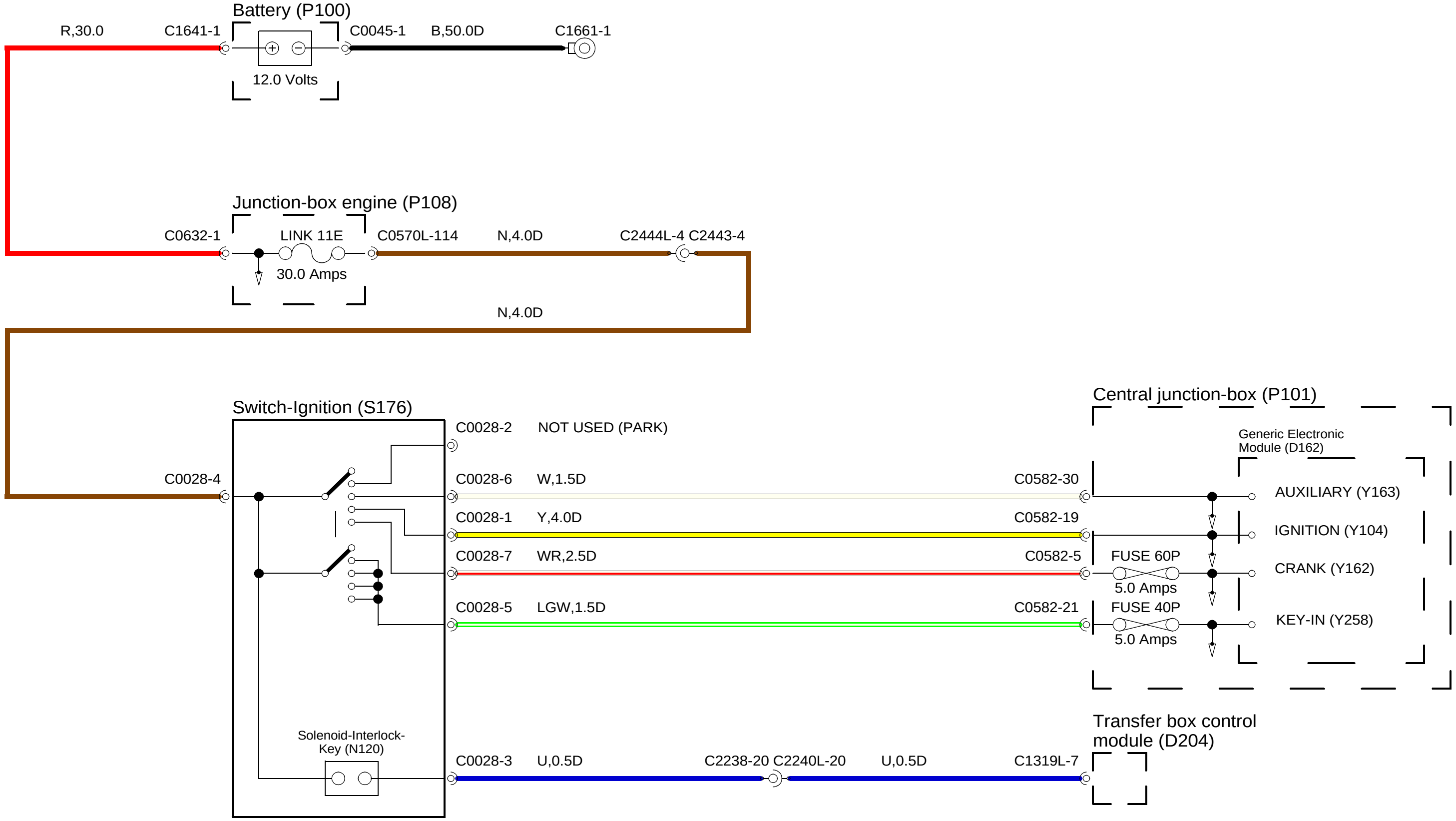
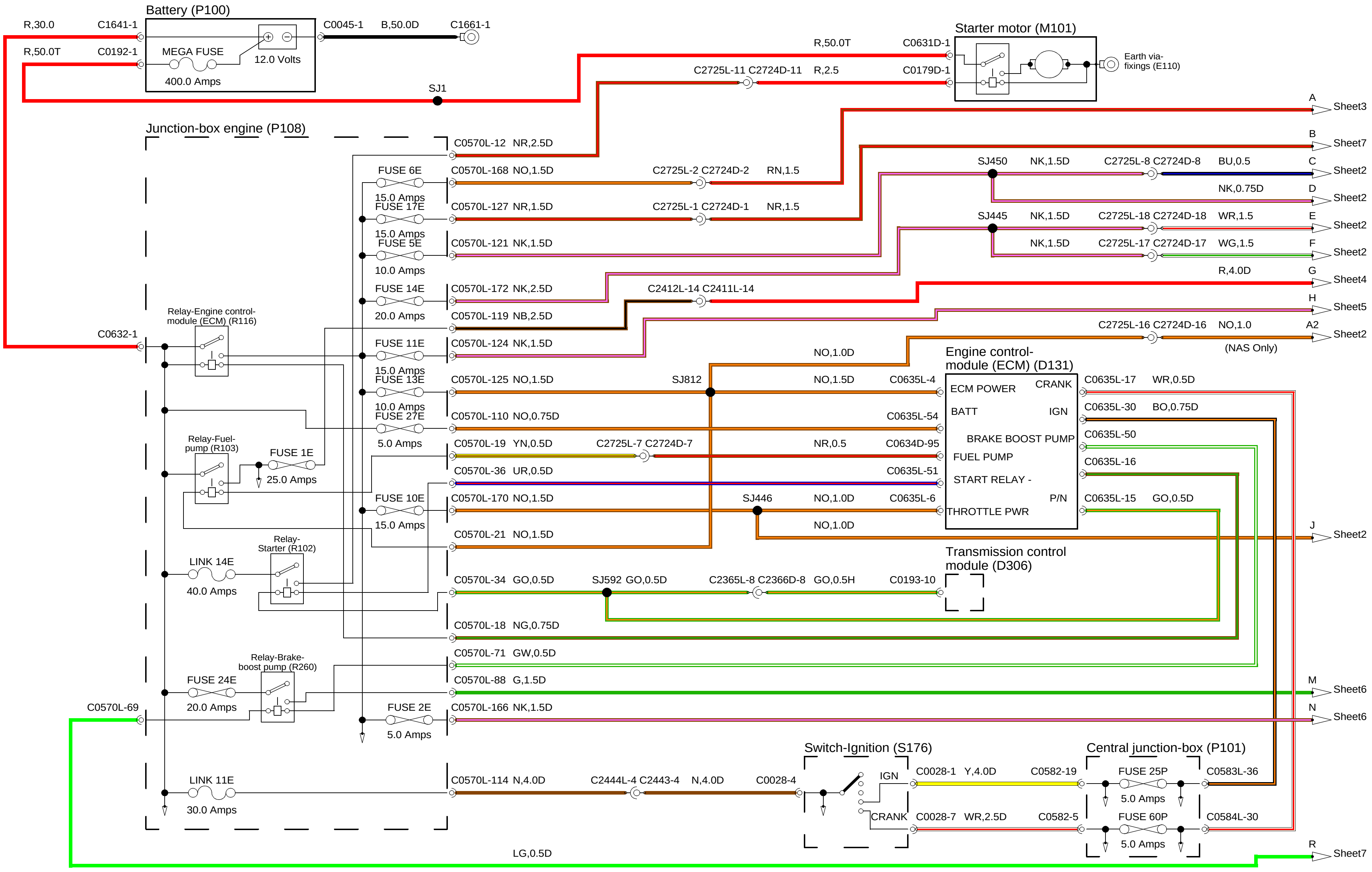
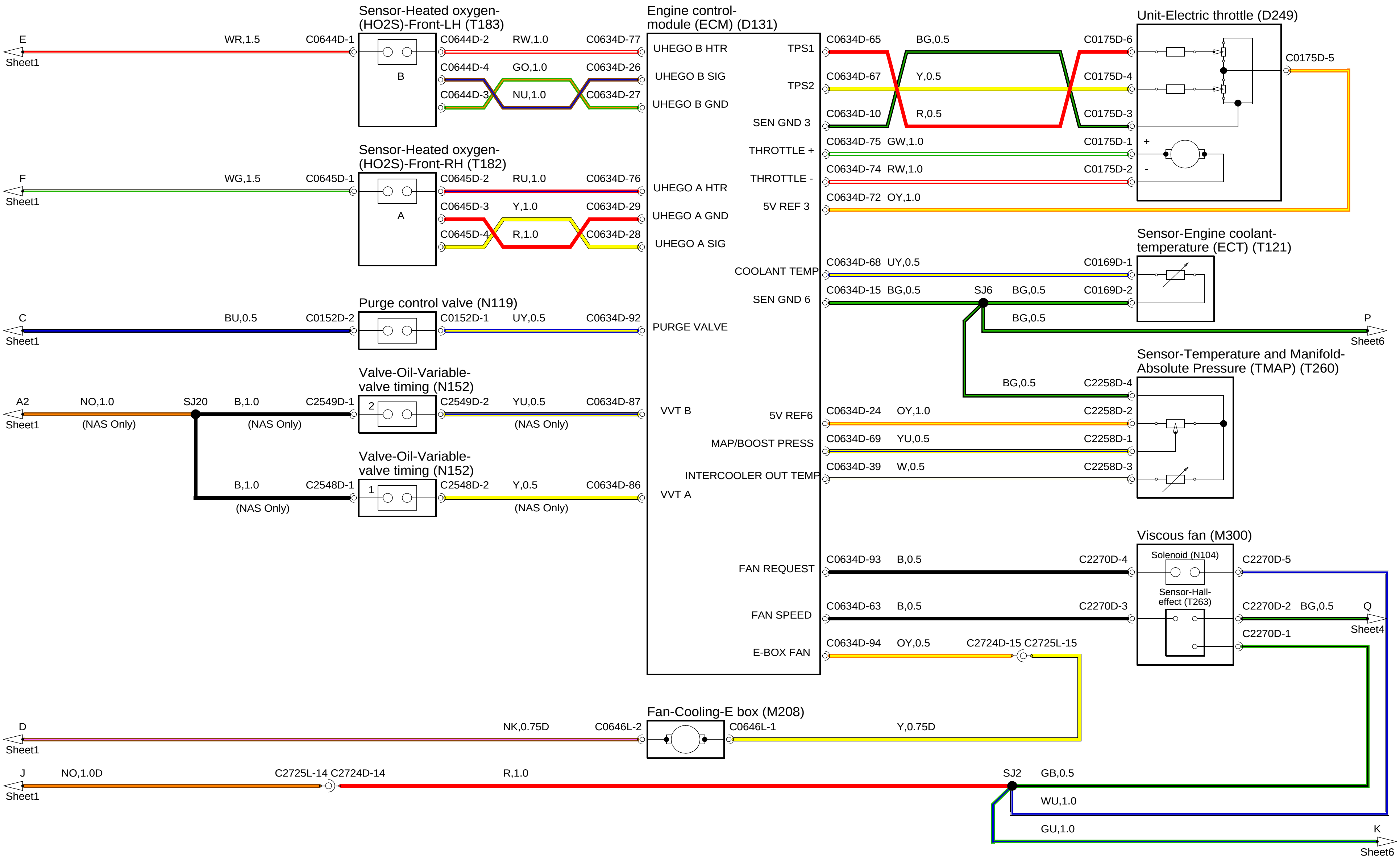
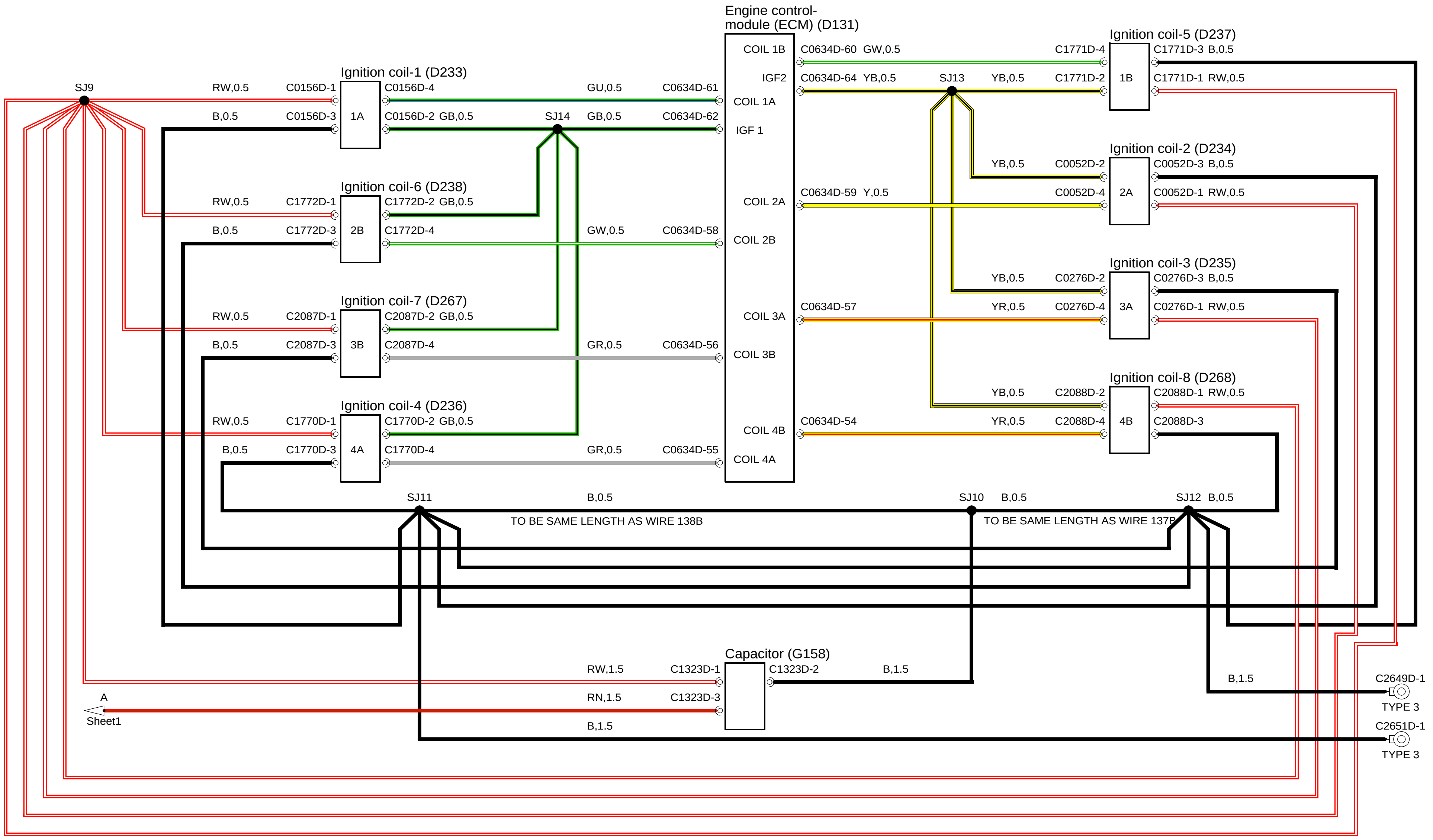

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
FUSE 10E
10.0 Amps
C0570L-170
BN,1.5D
SJ630
BN,1.0D
C2270-A
Viscous fan (M300)
C2270-B
B,1.0D
C3001-1
TYPE 3
BN,1.0D
C2270-E
FUSE 27E
5.0 Amps
C0570L-110
N,0.75D
C0872L-K4
Engine control-module (ECM) (D131)
KAM
VCFC
C0411C-K2
BO,0.75
C2273C-12
C2274L-12
BO,0.75D
C2270-D
C0570L-18
NG,0.75D
C0872L-J3
PWRSTN
VCFC
C0411H-K2
BO,0.75
C2273H-12
CFM
C2518C-E1
BW,0.75
C2273C-8
C2274L-8
KB,0.75D
C2270-C
CFM
C2518H-E1
BW,0.75
C2273H-8
Sensor-Engine coolant-temperature (ECT) (T121)
C2366-4 C2365L-4
YB,0.5D
C0872L-A4
HS CAN H IN
ECT_1
C2518C-C2
W,0.75
C0169C-1
C2366-5 C2365L-5
YN,0.5D
C0872L-A3
HS CAN L IN
SGC
C2518C-E2
NR,0.75
SJ6
N,0.75
C0169C-2
(DV6 EU3)
C2274L-16 C2273C-16
(DV6 EU3)
UR,0.75
C0411C-B4
HS CAN H OUT
C2274L-15 C2273C-15
(DV6 EU3)
SR,0.75
C0411C-B3
HS CAN L OUT
Sensor-Engine coolant-temperature (ECT) (T121)
C2274L-16 C2273H-16
(DV6 EU4)
UR,0.75
C0411H-B4
HS CAN H OUT
ECT_1
C2518H-C2
W,0.75
C2273H-13 C2274L-13
W,0.75D
C0169-1
C2274L-15 C2273H-15
(DV6 EU4)
SR,0.75
C0411H-B3
HS CAN L OUT
N,0.75
C2273H-2 C2274L-2
BN,0.75D
C0169-2
(DV6 EU4)
SGC
C2518H-E2
NR,0.75
SJ4

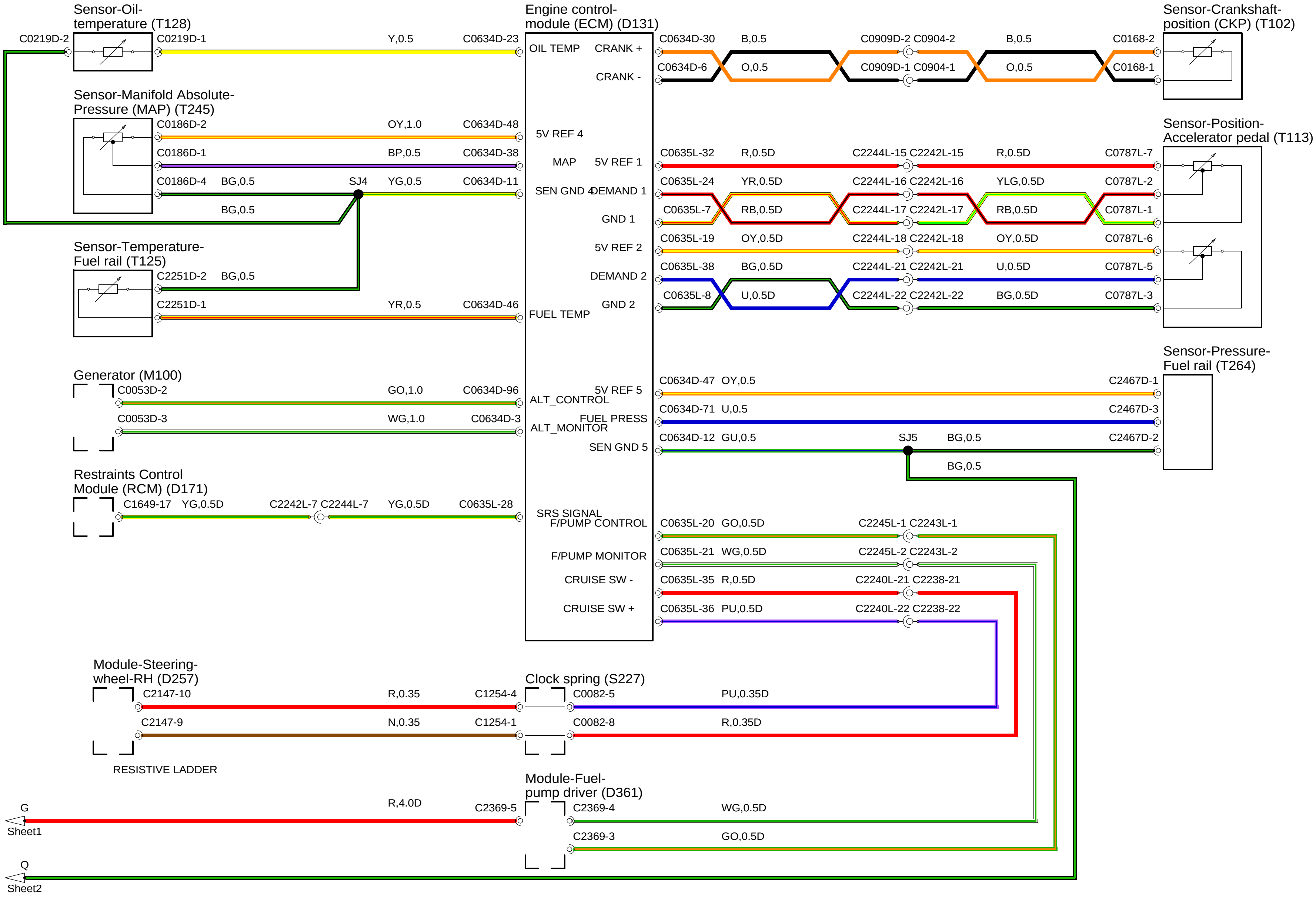

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Fuel-pump (R103)
C0632-1
FUSE 4E
25.0 Amps
C0570L-167
NP,1.5D
C3006-1
Pump-Supercharge-coolant (M314)
C3006-2
B,2.5D
C0564-1
Engine control-module (ECM) (D131)
C0570L-19
YN,0.5D
C2725L-7 C2724D-7
NR,0.5
C0634D-95
C0635L-16
C0570L-21
NO,1.5D
SJ812
NO,1.5D
C0635L-4
Relay-Engine control-module (ECM) (R116)
FUSE 13E
10.0 Amps
C0570L-125
NO,1.5D
C0570L-18
NG,0.75D

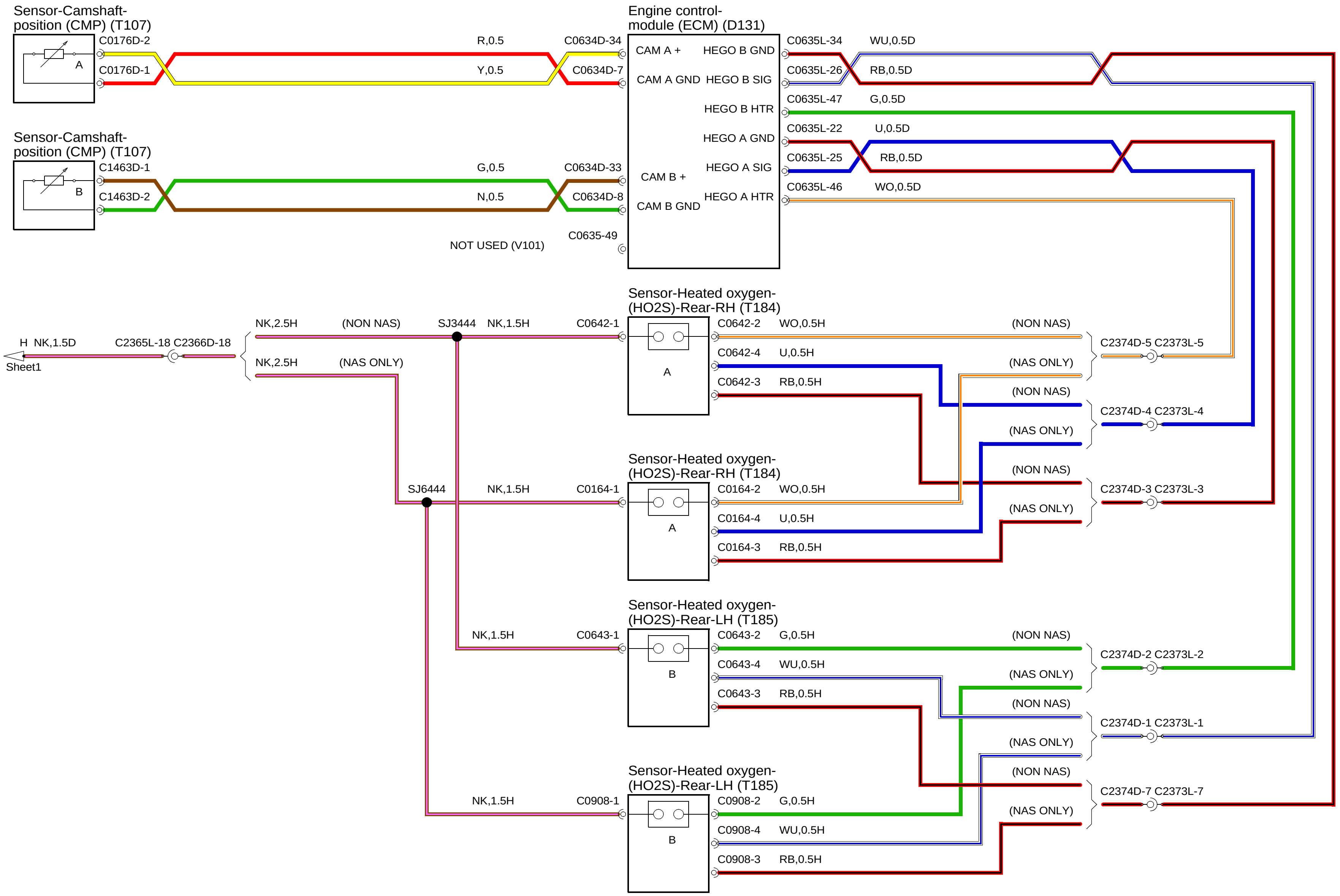

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
C0028-2
NOT USED (PARK)
C0028-6
W,1.5D
C0582-30
C0028-1
Y,4.0D
C0582-19
C0028-7
WR,2.5D
C0582-5
C0028-5
LGW,1.5D
C0582-21
Central junction-box (P101)
Generic Electronic Module (D162)
AUXILIARY (Y163)
IGNITION (Y104)
CRANK (Y162)
KEY-IN (Y258)
FUSE 60P
5.0 Amps
FUSE 40P
5.0 Amps
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240L-20
U,0.5D
C1319L-7
Transfer box control module (D204)

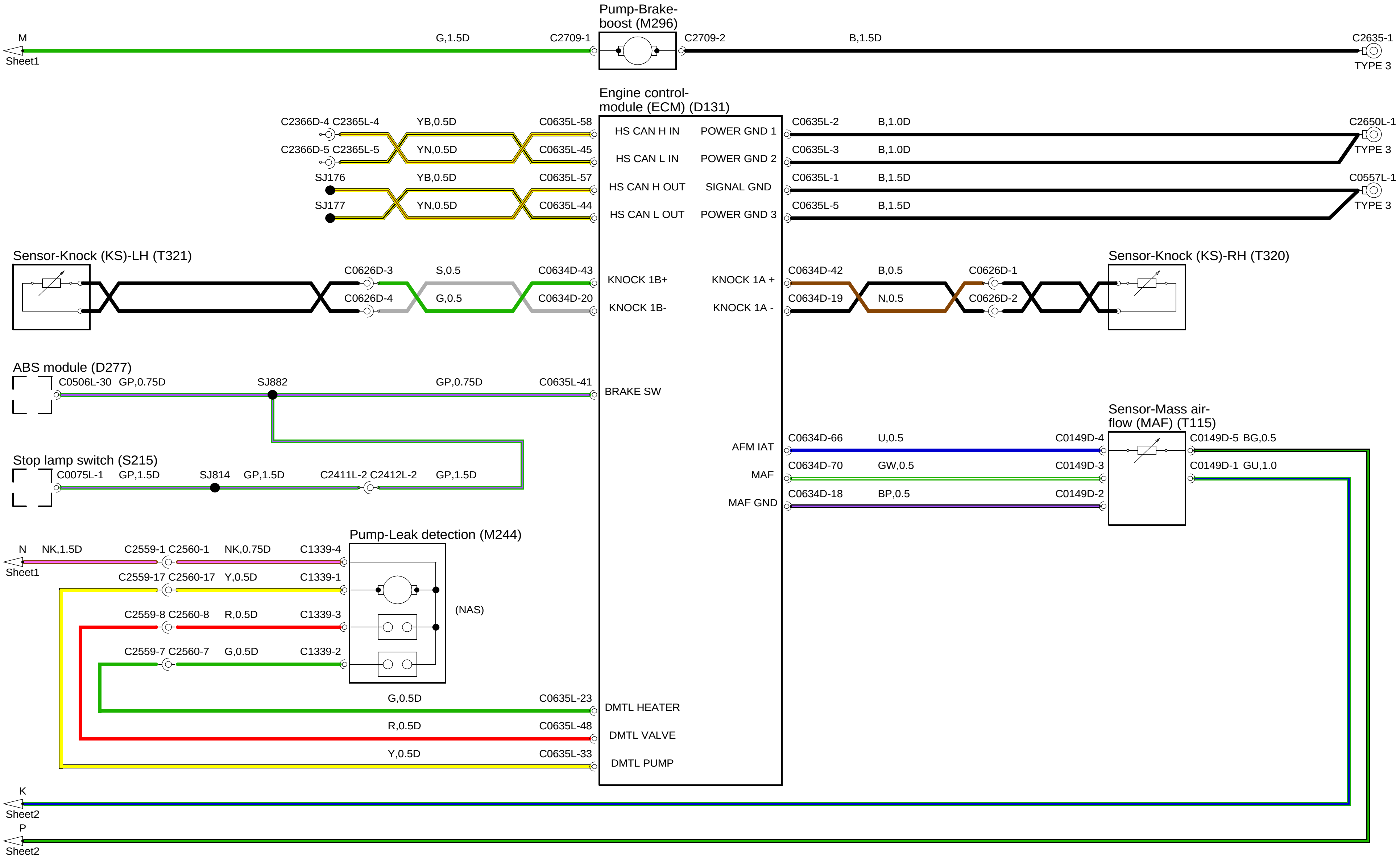

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631D-1
C2725L-11 C2724D-11
R,2.5
C0179D-1
Earth via-
fixings (E110)
Junction-box engine (P108)
C0570L-12 NR,2.5D
A
Sheet3
B
Sheet7
FUSE 6E
15.0 Amps
C0570L-168 NO,1.5D
C2725L-2 C2724D-2
RN,1.5
SJ450
NK,1.5D
C2725L-8 C2724D-8
BU,0.5
C
Sheet2
NK,0.75D
D
Sheet2
FUSE 17E
15.0 Amps
C0570L-127 NR,1.5D
C2725L-1 C2724D-1
NR,1.5
SJ445
NK,1.5D
C2725L-18 C2724D-18
WR,1.5
E
Sheet2
FUSE 5E
10.0 Amps
C0570L-121 NK,1.5D
NK,1.5D
C2725L-17 C2724D-17
WG,1.5
F
Sheet2
R,4.0D
G
Sheet4
FUSE 14E
20.0 Amps
C0570L-172 NK,2.5D
C2412L-14 C2411L-14
H
Sheet5
C0570L-119 NB,2.5D
Relay-Engine control-
module (ECM) (R116)
C0632-1
C2725L-16 C2724D-16
NO,1.0
A2
Sheet2
(NAS Only)
FUSE 11E
15.0 Amps
C0570L-124 NK,1.5D
NO,1.0D
Engine control-
module (ECM) (D131)
FUSE 13E
10.0 Amps
C0570L-125 NO,1.5D
SJ812
NO,1.5D
C0635L-4
ECM POWER
CRANK
C0635L-17
WR,0.5D
BATT
IGN
C0635L-30
BO,0.75D
FUSE 27E
5.0 Amps
C0570L-110 NO,0.75D
C0635L-54
BRAKE BOOST PUMP
C0635L-50
Relay-Fuel-
pump (R103)
FUSE 1E
25.0 Amps
C0570L-19 YN,0.5D
C2725L-7 C2724D-7
NR,0.5
C0634D-95
FUEL PUMP
C0635L-16
C0570L-36 UR,0.5D
C0635L-51
START RELAY -
FUSE 10E
15.0 Amps
C0570L-170 NO,1.5D
SJ446
NO,1.0D
C0635L-6
P/N
THROTTLE PWR
C0635L-15
GO,0.5D
NO,1.0D
J
Sheet2
C0570L-21 NO,1.5D
Relay-
Starter (R102)
LINK 14E
40.0 Amps
Transmission control
module (D306)
C0570L-34 GO,0.5D
SJ592 GO,0.5D
C2365L-8 C2366D-8
GO,0.5H
C0193-10
C0570L-18 NG,0.75D
Relay-Brake-
boost pump (R260)
C0570L-71 GW,0.5D
FUSE 24E
20.0 Amps
C0570L-88 G,1.5D
M
Sheet6
C0570L-69
FUSE 2E
5.0 Amps
C0570L-166 NK,1.5D
N
Sheet6
Switch-Ignition (S176)
Central junction-box (P101)
LINK 11E
30.0 Amps
C0570L-114 N,4.0D
C2444L-4 C2443-4
N,4.0D
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583L-36
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584L-30
LG,0.5D
R
Sheet7

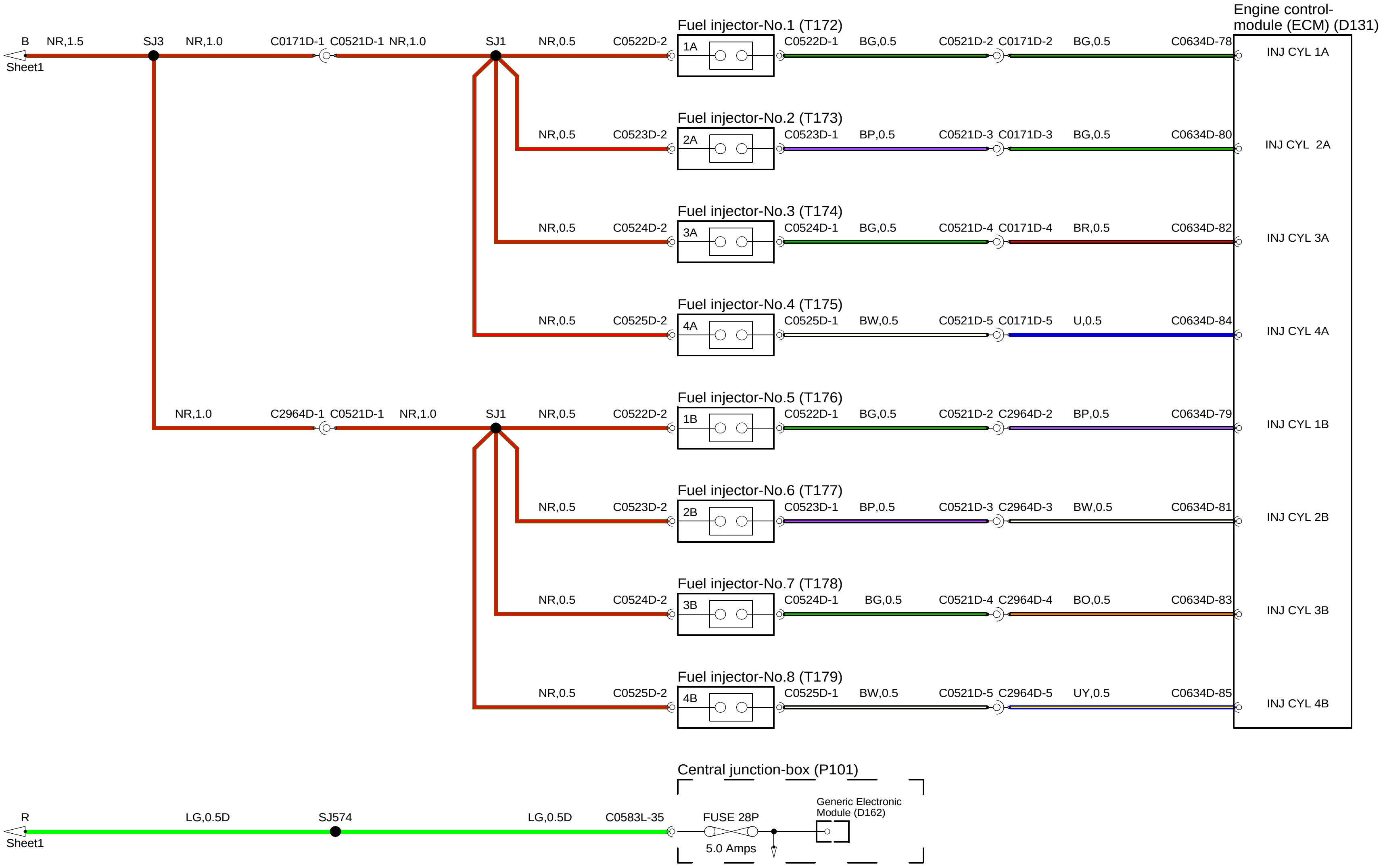

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
E
Sheet1
WR,1.5
C0644D-1
B
C0644D-2
RW,1.0
C0634D-77
C0644D-4
GO,1.0
C0634D-26
C0644D-3
NU,1.0
C0634D-27
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
F
Sheet1
WG,1.5
C0645D-1
A
C0645D-2
RU,1.0
C0634D-76
C0645D-3
Y,1.0
C0634D-29
C0645D-4
R,1.0
C0634D-28
Purge control valve (N119)
C
Sheet1
BU,0.5
C0152D-2
C0152D-1
UY,0.5
C0634D-92
Valve-Oil-Variable-valve timing (N152)
A2
Sheet1
NO,1.0
(NAS Only)
SJ20
B,1.0
(NAS Only)
C2549D-1
2
C2549D-2
YU,0.5
C0634D-87
(NAS Only)
Valve-Oil-Variable-valve timing (N152)
B,1.0
(NAS Only)
C2548D-1
1
C2548D-2
Y,0.5
C0634D-86
(NAS Only)
Engine control-module (ECM) (D131)
UHEGO B HTR
UHEGO B SIG
UHEGO B GND
TPS1
TPS2
SEN GND 3
THROTTLE +
THROTTLE -
UHEGO A HTR
UHEGO A GND
UHEGO A SIG
5V REF 3
COOLANT TEMP
SEN GND 6
PURGE VALVE
VVT B
5V REF6
MAP/BOOST PRESS
INTERCOOLER OUT TEMP
VVT A
FAN REQUEST
FAN SPEED
E-BOX FAN
Unit-Electric throttle (D249)
C0634D-65
BG,0.5
C0175D-6
C0175D-5
C0634D-67
Y,0.5
C0175D-4
C0634D-10
R,0.5
C0175D-3
C0634D-75
GW,1.0
C0175D-1
+
C0634D-74
RW,1.0
C0175D-2
-
C0634D-72
OY,1.0
Sensor-Engine coolant-temperature (ECT) (T121)
C0634D-68
UY,0.5
C0169D-1
C0634D-15
BG,0.5
SJ6
BG,0.5
C0169D-2
BG,0.5
P
Sheet6
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
BG,0.5
C2258D-4
C0634D-24
OY,1.0
C2258D-2
C0634D-69
YU,0.5
C2258D-1
C0634D-39
W,0.5
C2258D-3
Viscous fan (M300)
Solenoid (N104)
Sensor-Hall-effect (T263)
C0634D-93
B,0.5
C2270D-4
C2270D-5
C0634D-63
B,0.5
C2270D-3
C2270D-2
BG,0.5
Q
Sheet4
C2270D-1
C0634D-94
OY,0.5
C2724D-15 C2725L-15
Fan-Cooling-E box (M208)
D
Sheet1
NK,0.75D
C0646L-2
C0646L-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725L-14 C2724D-14
R,1.0
SJ2
GB,0.5
WU,1.0
GU,1.0
K
Sheet6

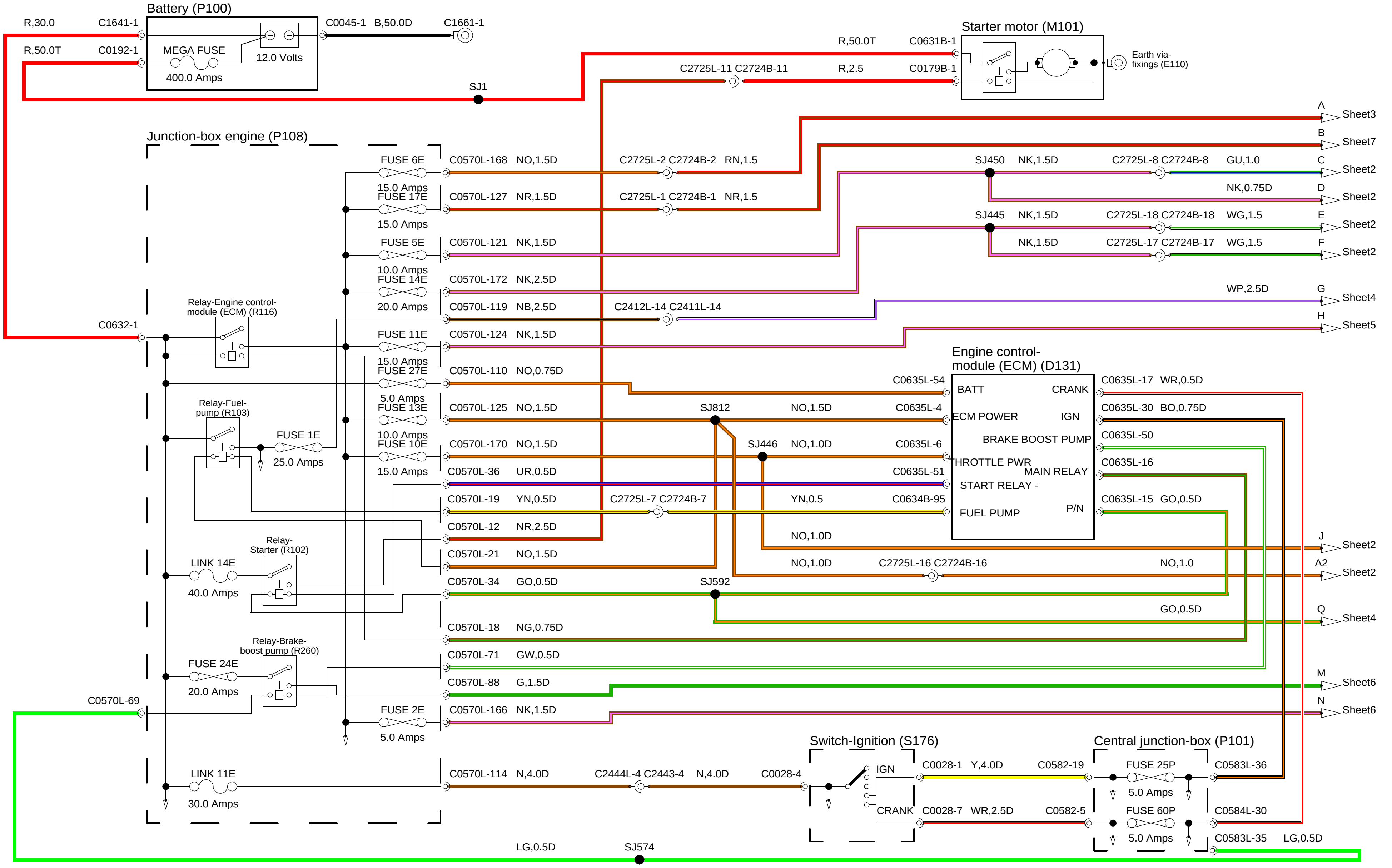

Engine control-module (ECM) (D131)
COIL 1B
IGF2
COIL 1A
IGF 1
COIL 2A
COIL 2B
COIL 3A
COIL 3B
COIL 4B
COIL 4A
Ignition coil-1 (D233)
1A
Ignition coil-6 (D238)
2B
Ignition coil-7 (D267)
3B
Ignition coil-4 (D236)
4A
Ignition coil-5 (D237)
1B
Ignition coil-2 (D234)
2A
Ignition coil-3 (D235)
3A
Ignition coil-8 (D268)
4B
SJ9
RW,0.5
C0156D-1
B,0.5
C0156D-3
C0156D-4
GU,0.5
C0634D-61
C0156D-2 GB,0.5
SJ14
GB,0.5
C0634D-62
RW,0.5
C1772D-1
C1772D-2 GB,0.5
B,0.5
C1772D-3
C1772D-4
GW,0.5
C0634D-58
RW,0.5
C2087D-1
C2087D-2 GB,0.5
B,0.5
C2087D-3
C2087D-4
GR,0.5
C0634D-56
RW,0.5
C1770D-1
C1770D-2 GB,0.5
B,0.5
C1770D-3
C1770D-4
GR,0.5
C0634D-55
C0634D-60 GW,0.5
C1771D-4
C1771D-3 B,0.5
C0634D-64 YB,0.5
SJ13
YB,0.5
C1771D-2
C1771D-1 RW,0.5
YB,0.5
C0052D-2
C0052D-3 B,0.5
C0634D-59 Y,0.5
C0052D-4
C0052D-1 RW,0.5
YB,0.5
C0276D-2
C0276D-3 B,0.5
C0634D-57
YR,0.5
C0276D-4
C0276D-1 RW,0.5
YB,0.5
C2088D-2
C2088D-1 RW,0.5
C0634D-54
YR,0.5
C2088D-4
C2088D-3
SJ11
B,0.5
TO BE SAME LENGTH AS WIRE 138B
SJ10
B,0.5
TO BE SAME LENGTH AS WIRE 137B
SJ12 B,0.5
Capacitor (G158)
RW,1.5
C1323D-1
C1323D-2
B,1.5
A
Sheet1
RN,1.5
C1323D-3
B,1.5
B,1.5
C2649D-1
TYPE 3
C2651D-1
TYPE 3

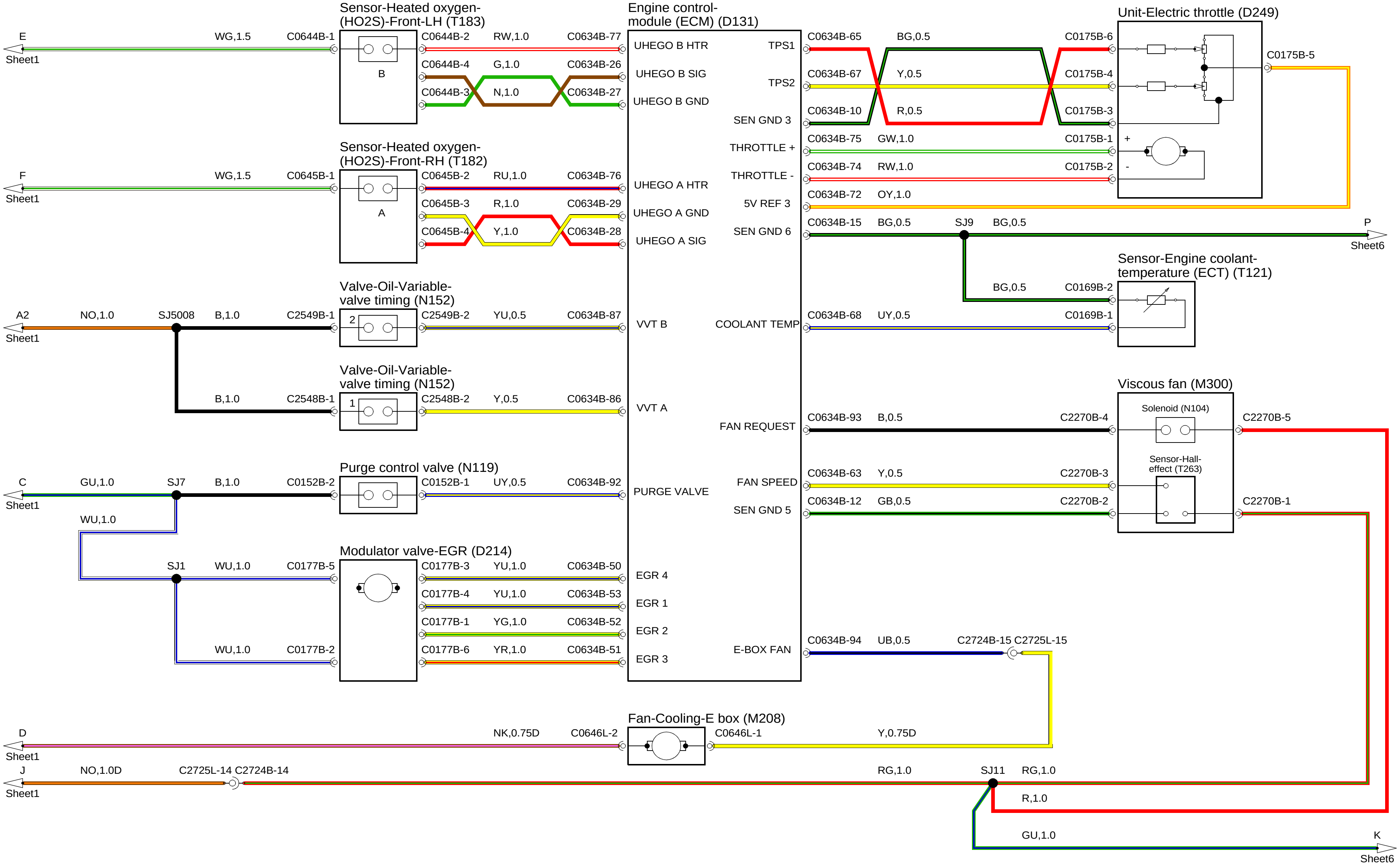

Sensor-Oil-temperature (T128)
C0219D-2
C0219D-1
Y,0.5
C0634D-23
Engine control-module (ECM) (D131)
OIL TEMP
CRANK +
CRANK -
C0634D-30
B,0.5
C0909D-2 C0904-2
B,0.5
C0168-2
C0634D-6
O,0.5
C0909D-1 C0904-1
O,0.5
C0168-1
Sensor-Crankshaft-position (CKP) (T102)
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186D-2
OY,1.0
C0634D-48
5V REF 4
C0186D-1
BP,0.5
C0634D-38
MAP
5V REF 1
C0635L-32
R,0.5D
C2244L-15 C2242L-15
R,0.5D
C0787L-7
Sensor-Position-Accelerator pedal (T113)
C0186D-4
BG,0.5
SJ4
YG,0.5
C0634D-11
SEN GND 4
DEMAND 1
C0635L-24
YR,0.5D
C2244L-16 C2242L-16
YLG,0.5D
C0787L-2
BG,0.5
GND 1
C0635L-7
RB,0.5D
C2244L-17 C2242L-17
RB,0.5D
C0787L-1
5V REF 2
C0635L-19
OY,0.5D
C2244L-18 C2242L-18
OY,0.5D
C0787L-6
Sensor-Temperature-Fuel rail (T125)
C2251D-2
BG,0.5
DEMAND 2
C0635L-38
BG,0.5D
C2244L-21 C2242L-21
U,0.5D
C0787L-5
C2251D-1
YR,0.5
C0634D-46
FUEL TEMP
GND 2
C0635L-8
U,0.5D
C2244L-22 C2242L-22
BG,0.5D
C0787L-3
Sensor-Pressure-Fuel rail (T264)
Generator (M100)
C0053D-2
GO,1.0
C0634D-96
ALT_CONTROL
5V REF 5
C0634D-47
OY,0.5
C2467D-1
C0053D-3
WG,1.0
C0634D-3
ALT_MONITOR
FUEL PRESS
C0634D-71
U,0.5
C2467D-3
SEN GND 5
C0634D-12
GU,0.5
SJ5
BG,0.5
C2467D-2
BG,0.5
Restraints Control Module (RCM) (D171)
C1649-17
YG,0.5D
C2242L-7 C2244L-7
YG,0.5D
C0635L-28
SRS SIGNAL
F/PUMP CONTROL
C0635L-20
GO,0.5D
C2245L-1 C2243L-1
F/PUMP MONITOR
C0635L-21
WG,0.5D
C2245L-2 C2243L-2
CRUISE SW -
C0635L-35
R,0.5D
C2240L-21 C2238-21
CRUISE SW +
C0635L-36
PU,0.5D
C2240L-22 C2238-22
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
Clock spring (S227)
C0082-5
PU,0.35D
C2147-9
N,0.35
C1254-1
C0082-8
R,0.35D
RESISTIVE LADDER
Module-Fuel-pump driver (D361)
G
Sheet1
R,4.0D
C2369-5
C2369-4
WG,0.5D
C2369-3
GO,0.5D
Q
Sheet2

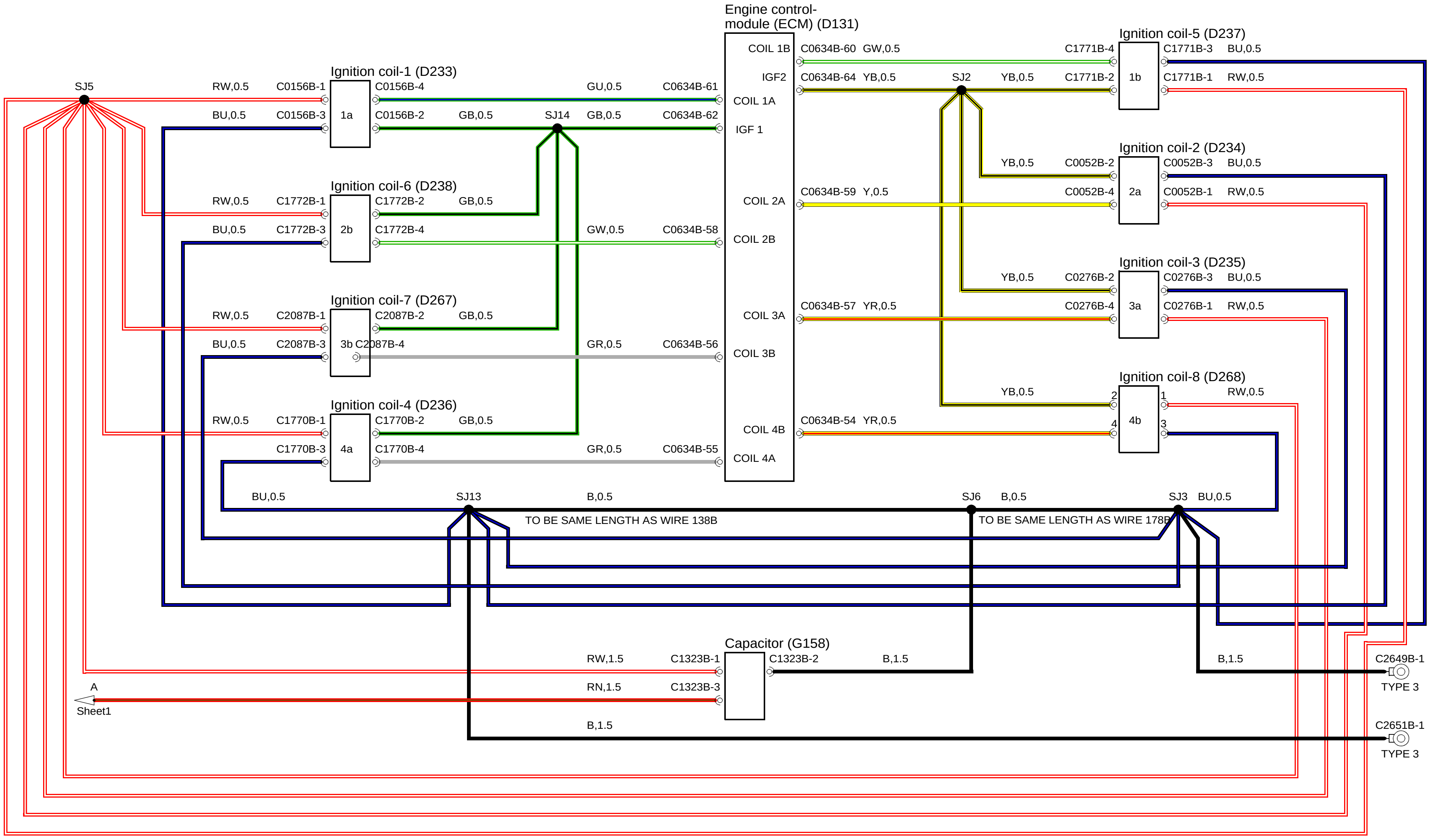

Sensor-Camshaft-position (CMP) (T107)
C0176D-2
C0176D-1
A
R,0.5
Y,0.5
C0634D-34
C0634D-7
Sensor-Camshaft-position (CMP) (T107)
C1463D-1
C1463D-2
B
G,0.5
N,0.5
C0634D-33
C0634D-8
NOT USED (V101)
C0635-49
Engine control-module (ECM) (D131)
CAM A +
CAM A GND
CAM B +
CAM B GND
HEGO B GND
HEGO B SIG
HEGO B HTR
HEGO A GND
HEGO A SIG
HEGO A HTR
C0635L-34
WU,0.5D
C0635L-26
RB,0.5D
C0635L-47
G,0.5D
C0635L-22
U,0.5D
C0635L-25
RB,0.5D
C0635L-46
WO,0.5D
H NK,1.5D
Sheet1
C2365L-18 C2366D-18
NK,2.5H
(NON NAS)
NK,2.5H
(NAS ONLY)
SJ3444
NK,1.5H
C0642-1
SJ6444
NK,1.5H
C0164-1
NK,1.5H
C0643-1
NK,1.5H
C0908-1
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
A
C0642-2 WO,0.5H
C0642-4 U,0.5H
C0642-3 RB,0.5H
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
A
C0164-2 WO,0.5H
C0164-4 U,0.5H
C0164-3 RB,0.5H
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
B
C0643-2 G,0.5H
C0643-4 WU,0.5H
C0643-3 RB,0.5H
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
B
C0908-2 G,0.5H
C0908-4 WU,0.5H
C0908-3 RB,0.5H
(NON NAS)
(NAS ONLY)
C2374D-5 C2373L-5
C2374D-4 C2373L-4
C2374D-3 C2373L-3
C2374D-2 C2373L-2
C2374D-1 C2373L-1
C2374D-7 C2373L-7

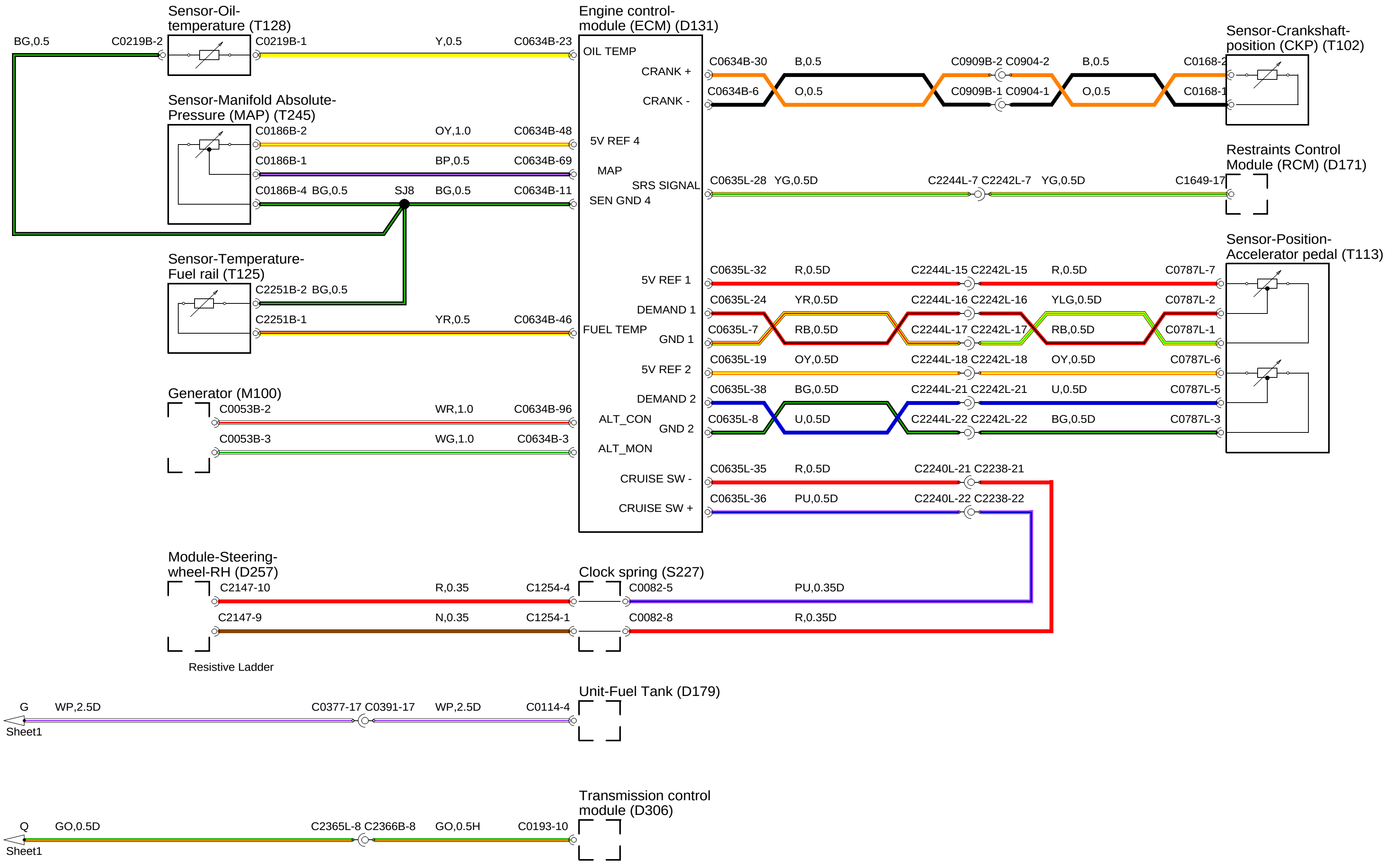

Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
C2366D-4 C2365L-4
YB,0.5D
C0635L-58
C2366D-5 C2365L-5
YN,0.5D
C0635L-45
SJ176
YB,0.5D
C0635L-57
SJ177
YN,0.5D
C0635L-44
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635L-2
B,1.0D
C2650L-1
C0635L-3
B,1.0D
TYPE 3
C0635L-1
B,1.5D
C0557L-1
C0635L-5
B,1.5D
TYPE 3
Sensor-Knock (KS)-LH (T321)
C0626D-3
S,0.5
C0634D-43
C0626D-4
G,0.5
C0634D-20
KNOCK 1B+
KNOCK 1B-
KNOCK 1A +
KNOCK 1A -
C0634D-42
B,0.5
C0626D-1
C0634D-19
N,0.5
C0626D-2
Sensor-Knock (KS)-RH (T320)
ABS module (D277)
C0506L-30
GP,0.75D
SJ882
GP,0.75D
C0635L-41
BRAKE SW
Stop lamp switch (S215)
C0075L-1
GP,1.5D
SJ814
GP,1.5D
C2411L-2 C2412L-2
GP,1.5D
Sensor-Mass air-flow (MAF) (T115)
AFM IAT
MAF
MAF GND
C0634D-66
U,0.5
C0149D-4
C0634D-70
GW,0.5
C0149D-3
C0634D-18
BP,0.5
C0149D-2
C0149D-5 BG,0.5
C0149D-1 GU,1.0
Pump-Leak detection (M244)
N
Sheet1
NK,1.5D
C2559-1 C2560-1
NK,0.75D
C1339-4
C2559-17 C2560-17
Y,0.5D
C1339-1
(NAS)
C2559-8 C2560-8
R,0.5D
C1339-3
C2559-7 C2560-7
G,0.5D
C1339-2
G,0.5D
C0635L-23
DMTL HEATER
R,0.5D
C0635L-48
DMTL VALVE
Y,0.5D
C0635L-33
DMTL PUMP
K
Sheet2
P
Sheet2

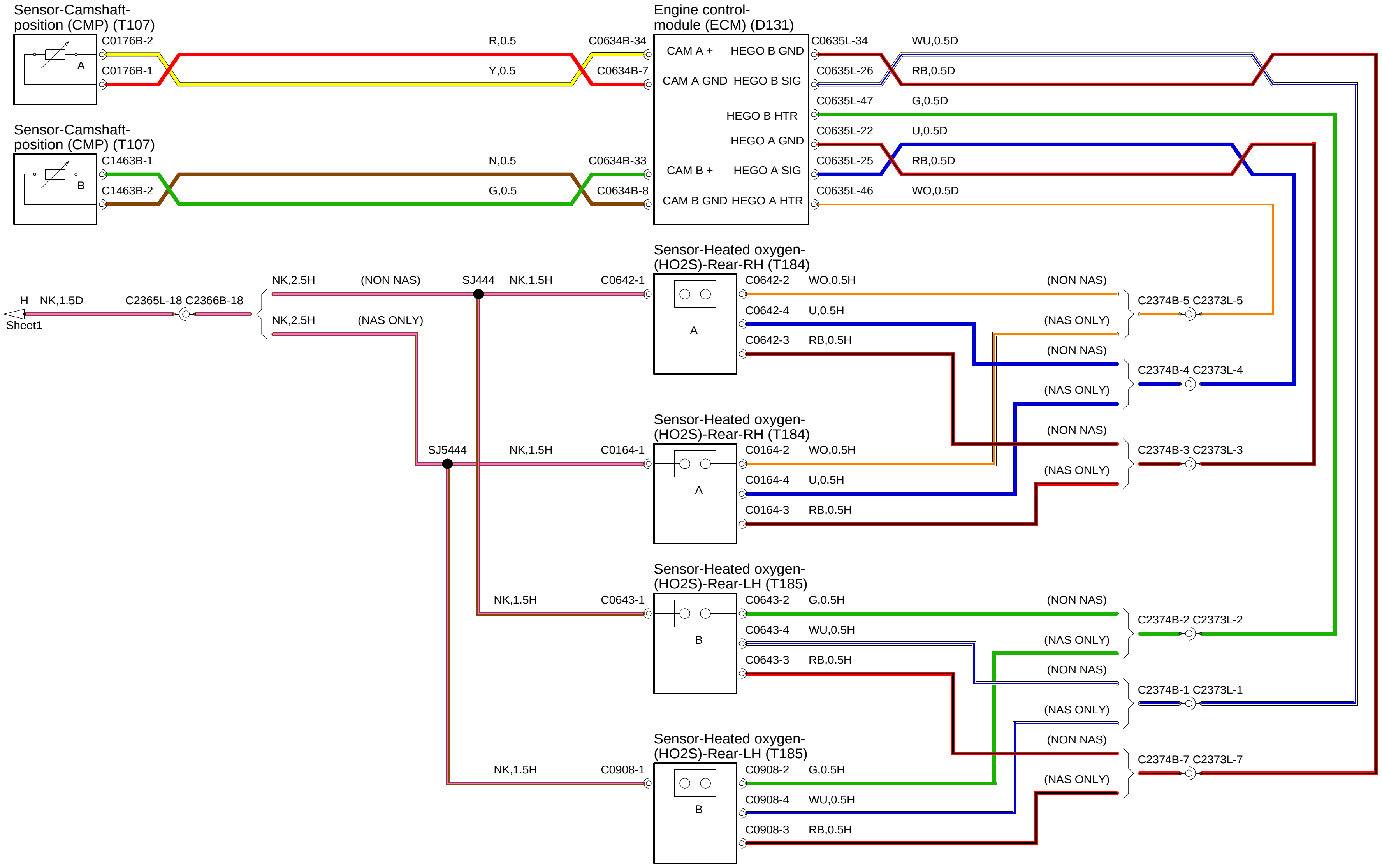

Engine control-
module (ECM) (D131)
B
NR,1.5
SJ3
NR,1.0
C0171D-1
C0521D-1
NR,1.0
SJ1
NR,0.5
C0522D-2
Sheet1
Fuel injector-No.1 (T172)
1A
C0522D-1
BG,0.5
C0521D-2
C0171D-2
BG,0.5
C0634D-78
INJ CYL 1A
Fuel injector-No.2 (T173)
NR,0.5
C0523D-2
2A
C0523D-1
BP,0.5
C0521D-3
C0171D-3
BG,0.5
C0634D-80
INJ CYL 2A
Fuel injector-No.3 (T174)
NR,0.5
C0524D-2
3A
C0524D-1
BG,0.5
C0521D-4
C0171D-4
BR,0.5
C0634D-82
INJ CYL 3A
Fuel injector-No.4 (T175)
NR,0.5
C0525D-2
4A
C0525D-1
BW,0.5
C0521D-5
C0171D-5
U,0.5
C0634D-84
INJ CYL 4A
Fuel injector-No.5 (T176)
NR,1.0
C2964D-1
C0521D-1
NR,1.0
SJ1
NR,0.5
C0522D-2
1B
C0522D-1
BG,0.5
C0521D-2
C2964D-2
BP,0.5
C0634D-79
INJ CYL 1B
Fuel injector-No.6 (T177)
NR,0.5
C0523D-2
2B
C0523D-1
BP,0.5
C0521D-3
C2964D-3
BW,0.5
C0634D-81
INJ CYL 2B
Fuel injector-No.7 (T178)
NR,0.5
C0524D-2
3B
C0524D-1
BG,0.5
C0521D-4
C2964D-4
BO,0.5
C0634D-83
INJ CYL 3B
Fuel injector-No.8 (T179)
NR,0.5
C0525D-2
4B
C0525D-1
BW,0.5
C0521D-5
C2964D-5
UY,0.5
C0634D-85
INJ CYL 4B
Central junction-box (P101)
R
LG,0.5D
SJ574
LG,0.5D
C0583L-35
FUSE 28P
Generic Electronic
Module (D162)
Sheet1
5.0 Amps

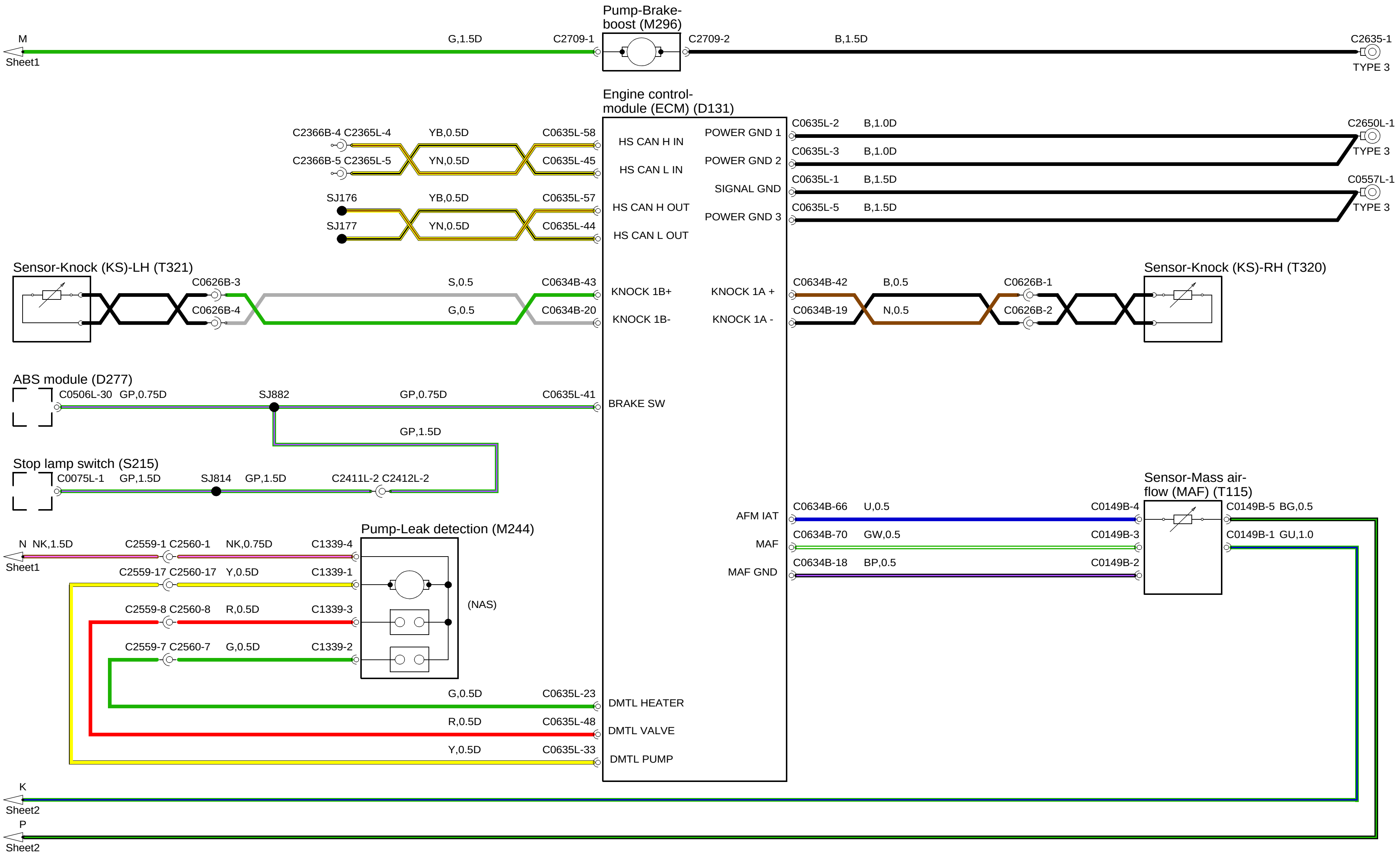

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1 B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631B-1
C2725L-11 C2724B-11
R,2.5
C0179B-1
Earth via-
fixings (E110)
Junction-box engine (P108)
FUSE 6E
15.0 Amps
FUSE 17E
15.0 Amps
FUSE 5E
10.0 Amps
FUSE 14E
20.0 Amps
FUSE 11E
15.0 Amps
FUSE 27E
5.0 Amps
FUSE 13E
10.0 Amps
FUSE 10E
15.0 Amps
FUSE 1E
25.0 Amps
LINK 14E
40.0 Amps
FUSE 24E
20.0 Amps
FUSE 2E
5.0 Amps
LINK 11E
30.0 Amps
Relay-Engine control-
module (ECM) (R116)
Relay-Fuel-
pump (R103)
Relay-
Starter (R102)
Relay-Brake-
boost pump (R260)
C0632-1
C0570L-69
C0570L-168 NO,1.5D
C2725L-2 C2724B-2 RN,1.5
C0570L-127 NR,1.5D
C2725L-1 C2724B-1 NR,1.5
C0570L-121 NK,1.5D
C0570L-172 NK,2.5D
C0570L-119 NB,2.5D
C2412L-14 C2411L-14
C0570L-124 NK,1.5D
C0570L-110 NO,0.75D
C0570L-125 NO,1.5D
C0570L-170 NO,1.5D
C0570L-36 UR,0.5D
C0570L-19 YN,0.5D
C2725L-7 C2724B-7
YN,0.5
C0570L-12 NR,2.5D
C0570L-21 NO,1.5D
C0570L-34 GO,0.5D
C0570L-18 NG,0.75D
C0570L-71 GW,0.5D
C0570L-88 G,1.5D
C0570L-166 NK,1.5D
C0570L-114 N,4.0D
C2444L-4 C2443-4 N,4.0D
C0028-4
SJ450 NK,1.5D
C2725L-8 C2724B-8 GU,1.0
NK,0.75D
SJ445 NK,1.5D
C2725L-18 C2724B-18 WG,1.5
NK,1.5D
C2725L-17 C2724B-17 WG,1.5
WP,2.5D
A Sheet3
B Sheet7
C Sheet2
D Sheet2
E Sheet2
F Sheet2
G Sheet4
H Sheet5
Engine control-
module (ECM) (D131)
C0635L-54
BATT
CRANK
C0635L-17 WR,0.5D
SJ812
NO,1.5D
C0635L-4
ECM POWER
IGN
C0635L-30 BO,0.75D
SJ446 NO,1.0D
C0635L-6
BRAKE BOOST PUMP
C0635L-50
THROTTLE PWR
MAIN RELAY
C0635L-16
C0635L-51
START RELAY -
C0634B-95
FUEL PUMP
P/N
C0635L-15 GO,0.5D
NO,1.0D
J Sheet2
NO,1.0D
C2725L-16 C2724B-16
NO,1.0
A2 Sheet2
SJ592
GO,0.5D
Q Sheet4
M Sheet6
N Sheet6
Switch-Ignition (S176)
IGN
CRANK
C0028-1 Y,4.0D
C0582-19
C0028-7 WR,2.5D
C0582-5
Central junction-box (P101)
FUSE 25P
5.0 Amps
FUSE 60P
5.0 Amps
C0583L-36
C0584L-30
C0583L-35 LG,0.5D
LG,0.5D
SJ574

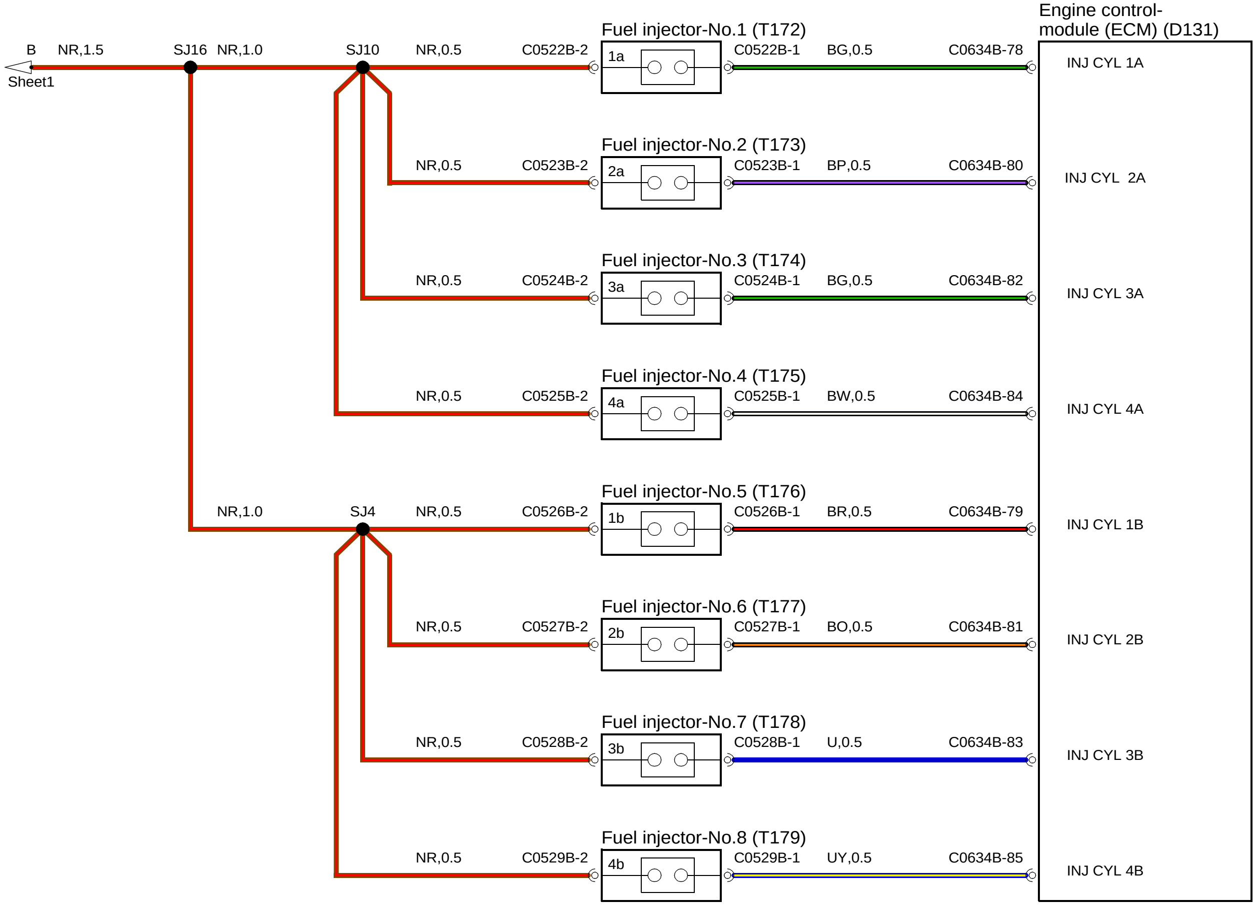

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
Engine control-module (ECM) (D131)
Unit-Electric throttle (D249)
E
Sheet1
WG,1.5
C0644B-1
C0644B-2
RW,1.0
C0634B-77
B
C0644B-4
G,1.0
C0634B-26
C0644B-3
N,1.0
C0634B-27
UHEGO B HTR
UHEGO B SIG
UHEGO B GND
TPS1
TPS2
SEN GND 3
THROTTLE +
THROTTLE -
5V REF 3
SEN GND 6
C0634B-65
BG,0.5
C0175B-6
C0634B-67
Y,0.5
C0175B-4
C0634B-10
R,0.5
C0175B-3
C0175B-5
C0634B-75
GW,1.0
C0175B-1
+
C0634B-74
RW,1.0
C0175B-2
-
C0634B-72
OY,1.0
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
F
Sheet1
WG,1.5
C0645B-1
C0645B-2
RU,1.0
C0634B-76
A
C0645B-3
R,1.0
C0634B-29
C0645B-4
Y,1.0
C0634B-28
UHEGO A HTR
UHEGO A GND
UHEGO A SIG
C0634B-15
BG,0.5
SJ9
BG,0.5
P
Sheet6
Sensor-Engine coolant-temperature (ECT) (T121)
BG,0.5
C0169B-2
Valve-Oil-Variable-valve timing (N152)
A2
Sheet1
NO,1.0
SJ5008
B,1.0
C2549B-1
2
C2549B-2
YU,0.5
C0634B-87
VVT B
COOLANT TEMP
C0634B-68
UY,0.5
C0169B-1
Valve-Oil-Variable-valve timing (N152)
B,1.0
C2548B-1
1
C2548B-2
Y,0.5
C0634B-86
VVT A
Viscous fan (M300)
Solenoid (N104)
C0634B-93
B,0.5
C2270B-4
C2270B-5
FAN REQUEST
Sensor-Hall-effect (T263)
Purge control valve (N119)
C
Sheet1
GU,1.0
SJ7
B,1.0
C0152B-2
C0152B-1
UY,0.5
C0634B-92
PURGE VALVE
FAN SPEED
SEN GND 5
C0634B-63
Y,0.5
C2270B-3
C0634B-12
GB,0.5
C2270B-2
C2270B-1
WU,1.0
Modulator valve-EGR (D214)
SJ1
WU,1.0
C0177B-5
C0177B-3
YU,1.0
C0634B-50
EGR 4
C0177B-4
YU,1.0
C0634B-53
EGR 1
C0177B-1
YG,1.0
C0634B-52
EGR 2
WU,1.0
C0177B-2
C0177B-6
YR,1.0
C0634B-51
EGR 3
E-BOX FAN
C0634B-94
UB,0.5
C2724B-15 C2725L-15
Fan-Cooling-E box (M208)
D
Sheet1
NK,0.75D
C0646L-2
C0646L-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725L-14 C2724B-14
RG,1.0
SJ11
RG,1.0
R,1.0
GU,1.0
K
Sheet6

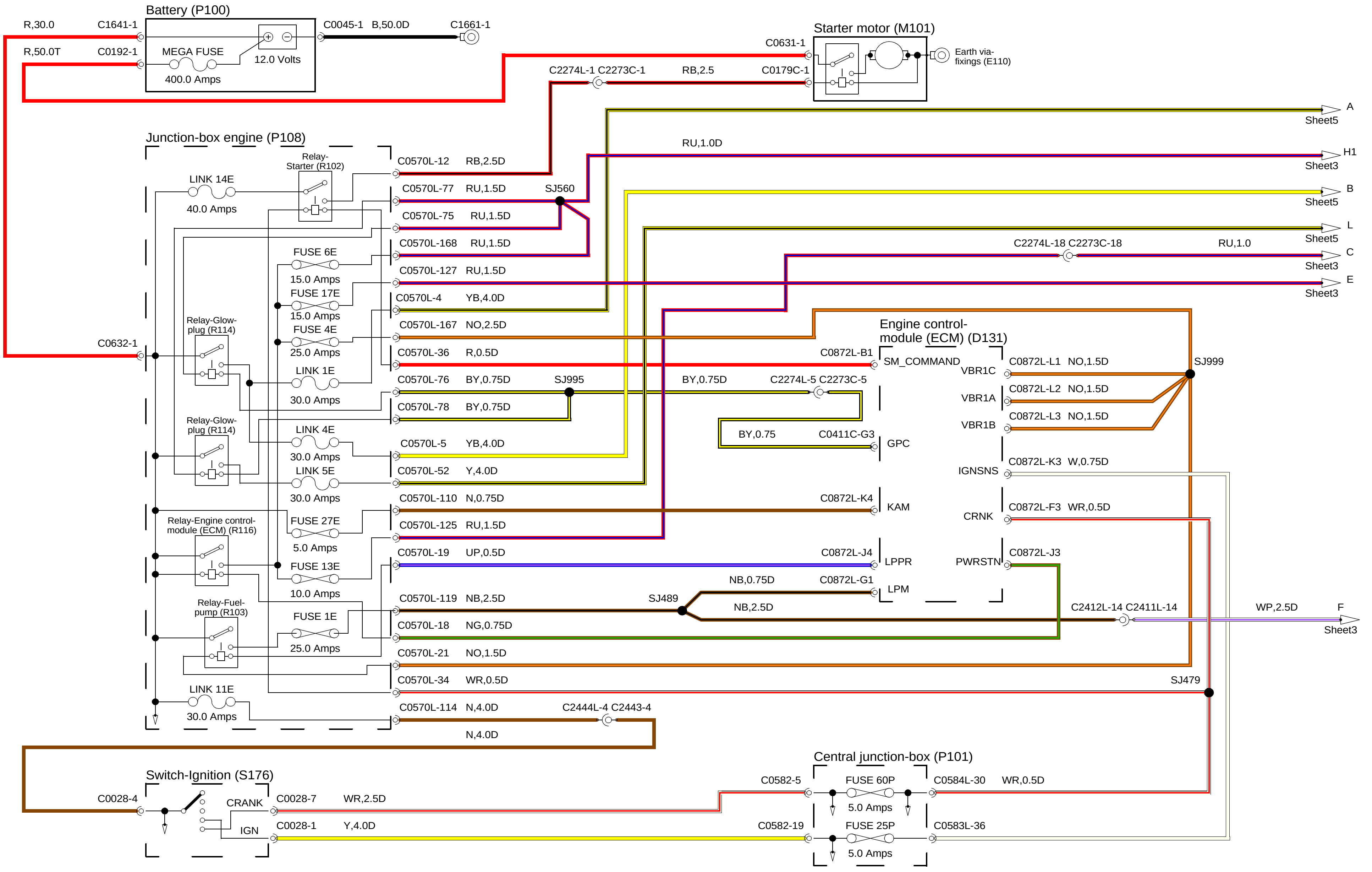

Engine control-module (ECM) (D131)
COIL 1B
IGF2
COIL 1A
IGF 1
COIL 2A
COIL 2B
COIL 3A
COIL 3B
COIL 4B
COIL 4A
Ignition coil-1 (D233)
1a
Ignition coil-6 (D238)
2b
Ignition coil-7 (D267)
3b
Ignition coil-4 (D236)
4a
Ignition coil-5 (D237)
1b
Ignition coil-2 (D234)
2a
Ignition coil-3 (D235)
3a
Ignition coil-8 (D268)
4b
SJ5
SJ14
SJ2
SJ13
SJ6
SJ3
RW,0.5 C0156B-1
BU,0.5 C0156B-3
C0156B-4 GU,0.5 C0634B-61
C0156B-2 GB,0.5 GB,0.5 C0634B-62
RW,0.5 C1772B-1
BU,0.5 C1772B-3
C1772B-2 GB,0.5
C1772B-4 GW,0.5 C0634B-58
RW,0.5 C2087B-1
BU,0.5 C2087B-3
C2087B-2 GB,0.5
C2087B-4 GR,0.5 C0634B-56
RW,0.5 C1770B-1
C1770B-3
C1770B-2 GB,0.5
C1770B-4 GR,0.5 C0634B-55
C0634B-60 GW,0.5 C1771B-4
C0634B-64 YB,0.5 YB,0.5 C1771B-2
C1771B-3 BU,0.5
C1771B-1 RW,0.5
YB,0.5 C0052B-2
C0634B-59 Y,0.5 C0052B-4
C0052B-3 BU,0.5
C0052B-1 RW,0.5
YB,0.5 C0276B-2
C0634B-57 YR,0.5 C0276B-4
C0276B-3 BU,0.5
C0276B-1 RW,0.5
YB,0.5 2
C0634B-54 YR,0.5 4
1 RW,0.5
3
BU,0.5
B,0.5
TO BE SAME LENGTH AS WIRE 138B
B,0.5
TO BE SAME LENGTH AS WIRE 178B
BU,0.5
Capacitor (G158)
RW,1.5 C1323B-1
RN,1.5 C1323B-3
C1323B-2 B,1.5
B,1.5
B,1.5
A
Sheet1
C2649B-1
TYPE 3
C2651B-1
TYPE 3

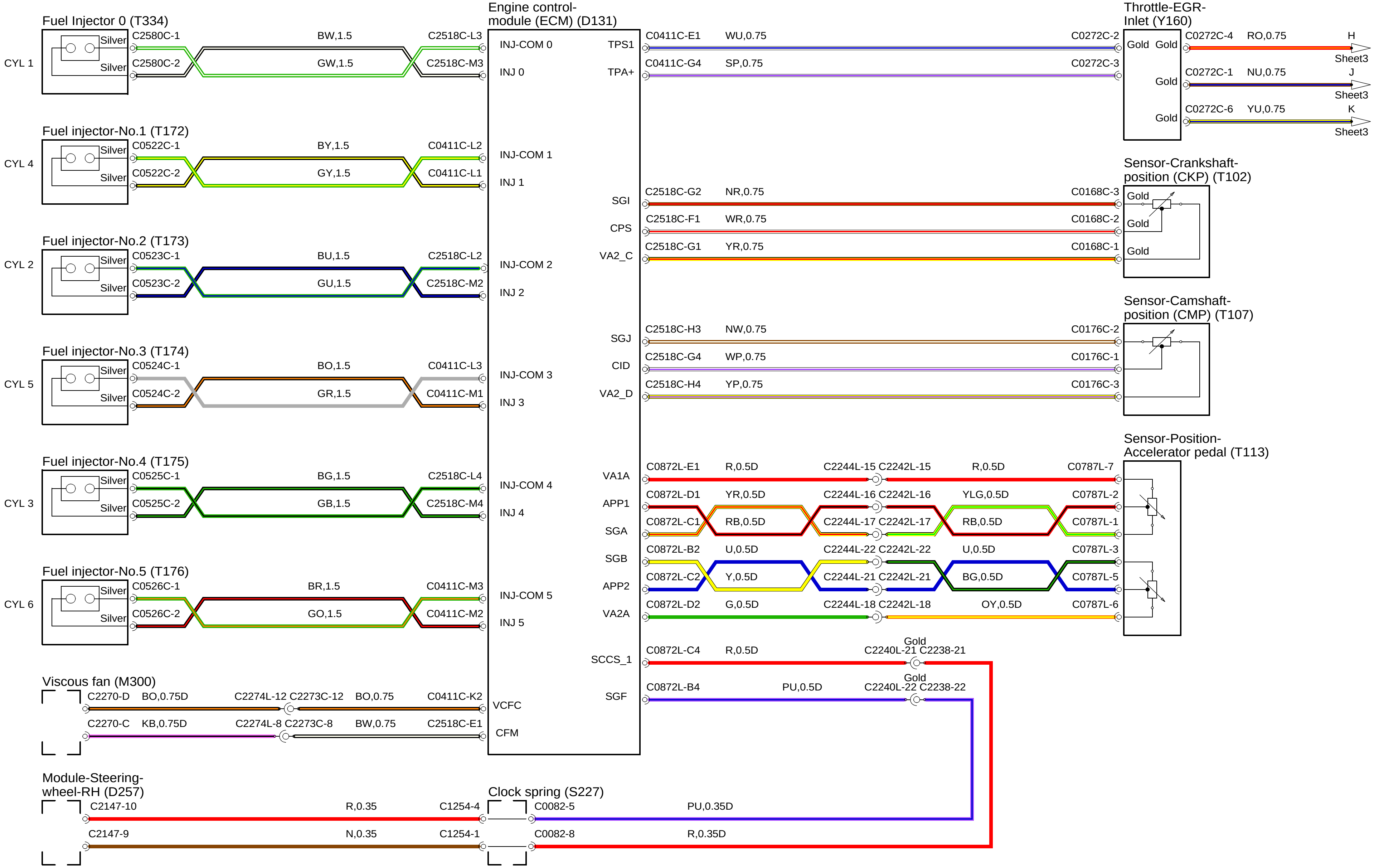

Sensor-Oil-temperature (T128)
BG,0.5
C0219B-2
C0219B-1
Y,0.5
C0634B-23
Engine control-module (ECM) (D131)
OIL TEMP
CRANK +
CRANK -
5V REF 4
MAP
SRS SIGNAL
SEN GND 4
5V REF 1
DEMAND 1
FUEL TEMP
GND 1
5V REF 2
DEMAND 2
ALT_CON
GND 2
ALT_MON
CRUISE SW -
CRUISE SW +
Sensor-Crankshaft-position (CKP) (T102)
C0634B-30
B,0.5
C0909B-2 C0904-2
B,0.5
C0168-2
C0634B-6
O,0.5
C0909B-1 C0904-1
O,0.5
C0168-1
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186B-2
OY,1.0
C0634B-48
C0186B-1
BP,0.5
C0634B-69
C0186B-4 BG,0.5
SJ8
BG,0.5
C0634B-11
Restraints Control Module (RCM) (D171)
C0635L-28 YG,0.5D
C2244L-7 C2242L-7 YG,0.5D
C1649-17
Sensor-Temperature-Fuel rail (T125)
C2251B-2 BG,0.5
C2251B-1
YR,0.5
C0634B-46
Sensor-Position-Accelerator pedal (T113)
C0635L-32
R,0.5D
C2244L-15 C2242L-15
R,0.5D
C0787L-7
C0635L-24
YR,0.5D
C2244L-16 C2242L-16
YLG,0.5D
C0787L-2
C0635L-7
RB,0.5D
C2244L-17 C2242L-17
RB,0.5D
C0787L-1
C0635L-19
OY,0.5D
C2244L-18 C2242L-18
OY,0.5D
C0787L-6
C0635L-38
BG,0.5D
C2244L-21 C2242L-21
U,0.5D
C0787L-5
C0635L-8
U,0.5D
C2244L-22 C2242L-22
BG,0.5D
C0787L-3
Generator (M100)
C0053B-2
WR,1.0
C0634B-96
C0053B-3
WG,1.0
C0634B-3
C0635L-35
R,0.5D
C2240L-21 C2238-21
C0635L-36
PU,0.5D
C2240L-22 C2238-22
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
Clock spring (S227)
C0082-5
PU,0.35D
C2147-9
N,0.35
C1254-1
C0082-8
R,0.35D
Resistive Ladder
Unit-Fuel Tank (D179)
G
WP,2.5D
C0377-17 C0391-17
WP,2.5D
C0114-4
Sheet1
Transmission control module (D306)
Q
GO,0.5D
C2365L-8 C2366B-8
GO,0.5H
C0193-10
Sheet1

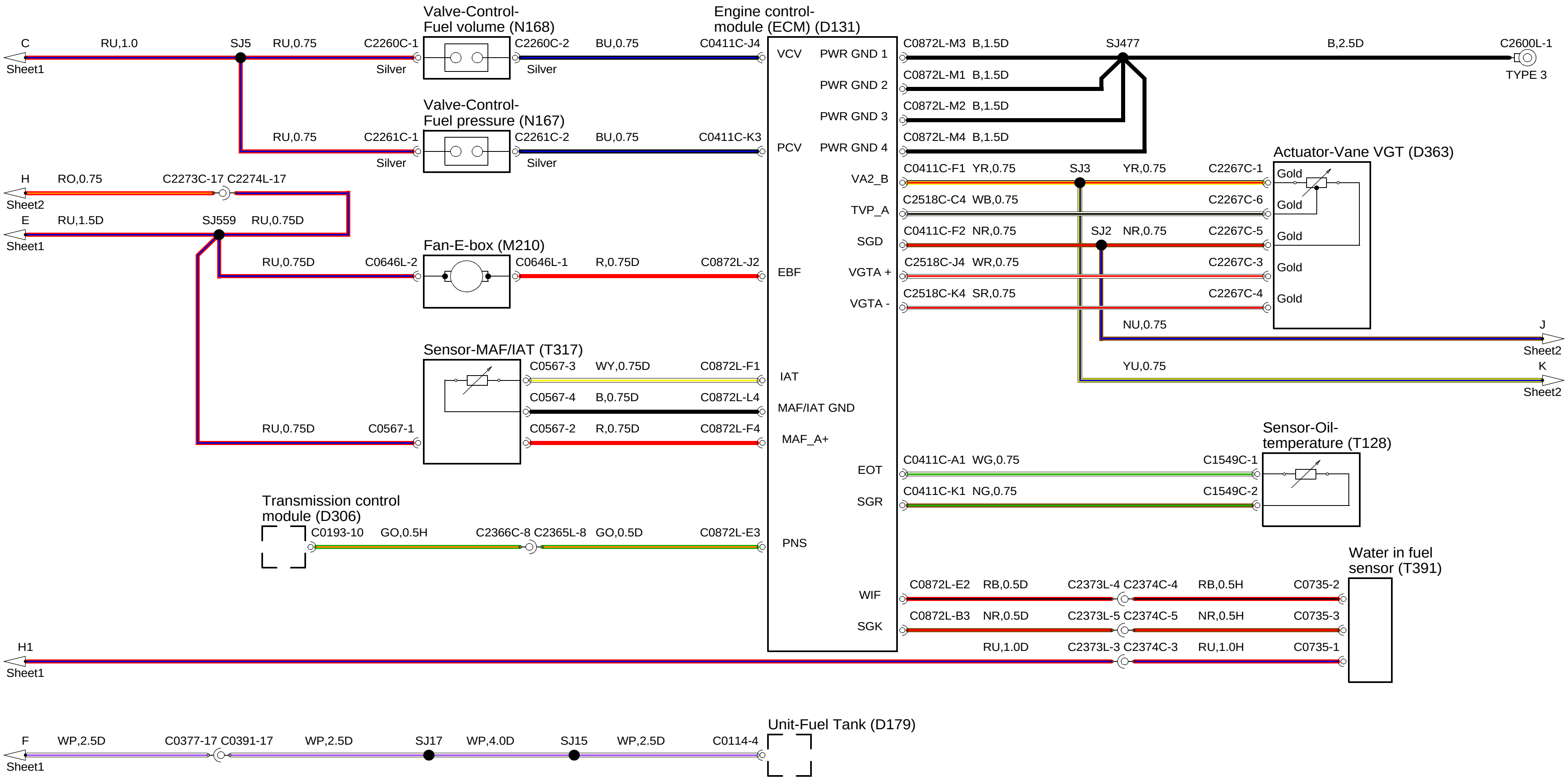

Sensor-Camshaft-position (CMP) (T107)
C0176B-2
C0176B-1
A
R,0.5
Y,0.5
C0634B-34
C0634B-7
Engine control-module (ECM) (D131)
CAM A +
CAM A GND
HEGO B GND
HEGO B SIG
HEGO B HTR
HEGO A GND
CAM B +
HEGO A SIG
CAM B GND
HEGO A HTR
C0635L-34
WU,0.5D
C0635L-26
RB,0.5D
C0635L-47
G,0.5D
C0635L-22
U,0.5D
C0635L-25
RB,0.5D
C0635L-46
WO,0.5D
Sensor-Camshaft-position (CMP) (T107)
C1463B-1
C1463B-2
B
N,0.5
G,0.5
C0634B-33
C0634B-8
H NK,1.5D
Sheet1
C2365L-18 C2366B-18
NK,2.5H
(NON NAS)
NK,2.5H
(NAS ONLY)
SJ444
NK,1.5H
C0642-1
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
A
C0642-2 WO,0.5H
C0642-4 U,0.5H
C0642-3 RB,0.5H
(NON NAS)
(NAS ONLY)
(NON NAS)
(NAS ONLY)
C2374B-5 C2373L-5
C2374B-4 C2373L-4
SJ5444
NK,1.5H
C0164-1
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
A
C0164-2 WO,0.5H
C0164-4 U,0.5H
C0164-3 RB,0.5H
(NON NAS)
(NAS ONLY)
C2374B-3 C2373L-3
NK,1.5H
C0643-1
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
B
C0643-2 G,0.5H
C0643-4 WU,0.5H
C0643-3 RB,0.5H
(NON NAS)
(NAS ONLY)
(NON NAS)
(NAS ONLY)
C2374B-2 C2373L-2
C2374B-1 C2373L-1
NK,1.5H
C0908-1
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
B
C0908-2 G,0.5H
C0908-4 WU,0.5H
C0908-3 RB,0.5H
(NON NAS)
(NAS ONLY)
C2374B-7 C2373L-7

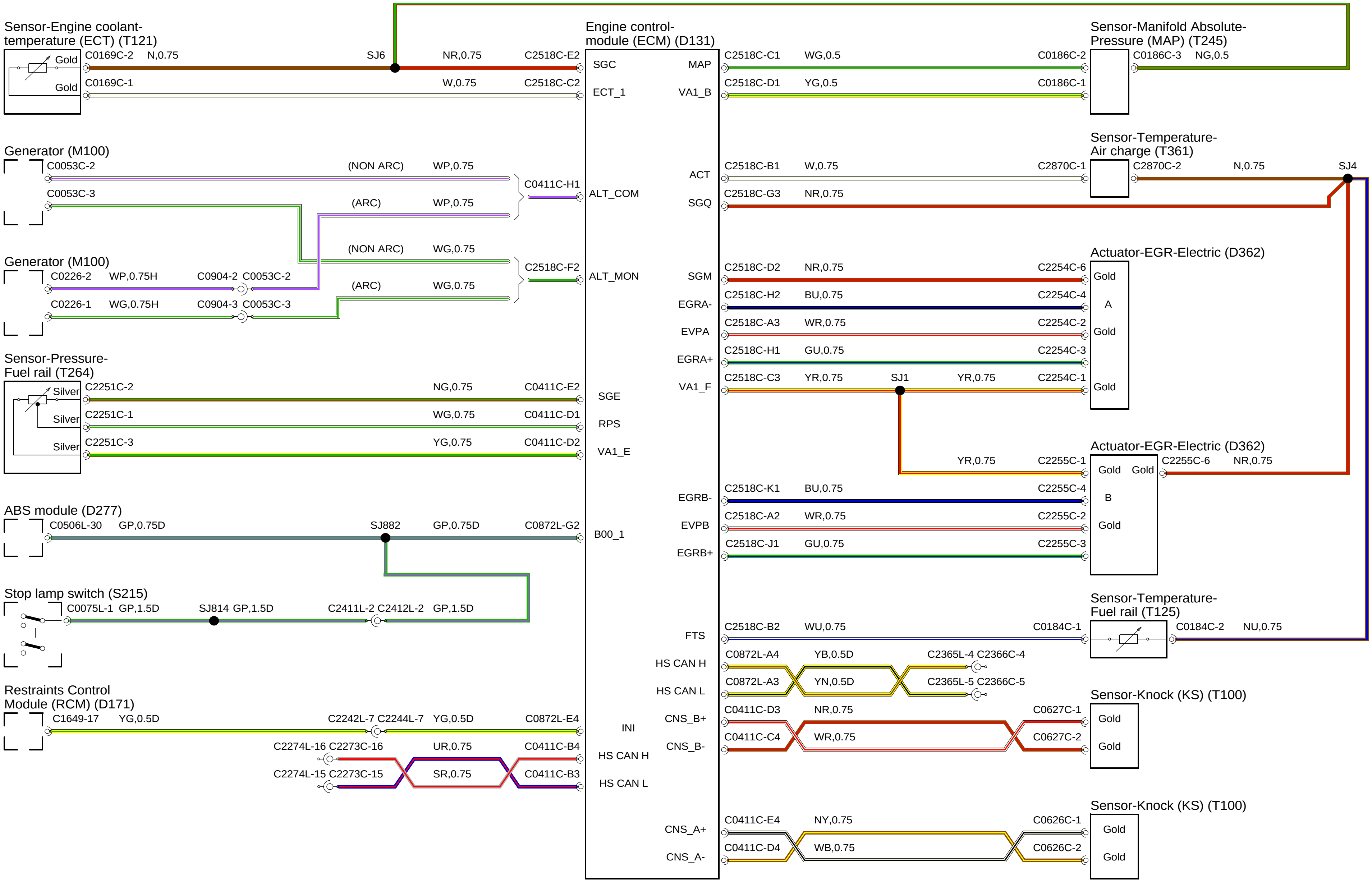

Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
C2366B-4 C2365L-4
YB,0.5D
C0635L-58
C2366B-5 C2365L-5
YN,0.5D
C0635L-45
SJ176
YB,0.5D
C0635L-57
SJ177
YN,0.5D
C0635L-44
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635L-2
B,1.0D
C2650L-1
TYPE 3
C0635L-3
B,1.0D
C0635L-1
B,1.5D
C0557L-1
TYPE 3
C0635L-5
B,1.5D
Sensor-Knock (KS)-LH (T321)
C0626B-3
S,0.5
C0634B-43
C0626B-4
G,0.5
C0634B-20
KNOCK 1B+
KNOCK 1B-
KNOCK 1A +
KNOCK 1A -
C0634B-42
B,0.5
C0626B-1
C0634B-19
N,0.5
C0626B-2
Sensor-Knock (KS)-RH (T320)
ABS module (D277)
C0506L-30 GP,0.75D
SJ882
GP,0.75D
C0635L-41
BRAKE SW
GP,1.5D
Stop lamp switch (S215)
C0075L-1
GP,1.5D
SJ814
GP,1.5D
C2411L-2 C2412L-2
Sensor-Mass air-flow (MAF) (T115)
AFM IAT
MAF
MAF GND
C0634B-66
U,0.5
C0149B-4
C0634B-70
GW,0.5
C0149B-3
C0634B-18
BP,0.5
C0149B-2
C0149B-5 BG,0.5
C0149B-1 GU,1.0
Pump-Leak detection (M244)
N NK,1.5D
Sheet1
C2559-1 C2560-1
NK,0.75D
C1339-4
C2559-17 C2560-17
Y,0.5D
C1339-1
C2559-8 C2560-8
R,0.5D
C1339-3
C2559-7 C2560-7
G,0.5D
C1339-2
(NAS)
G,0.5D
C0635L-23
DMTL HEATER
R,0.5D
C0635L-48
DMTL VALVE
Y,0.5D
C0635L-33
DMTL PUMP
K
Sheet2
P
Sheet2

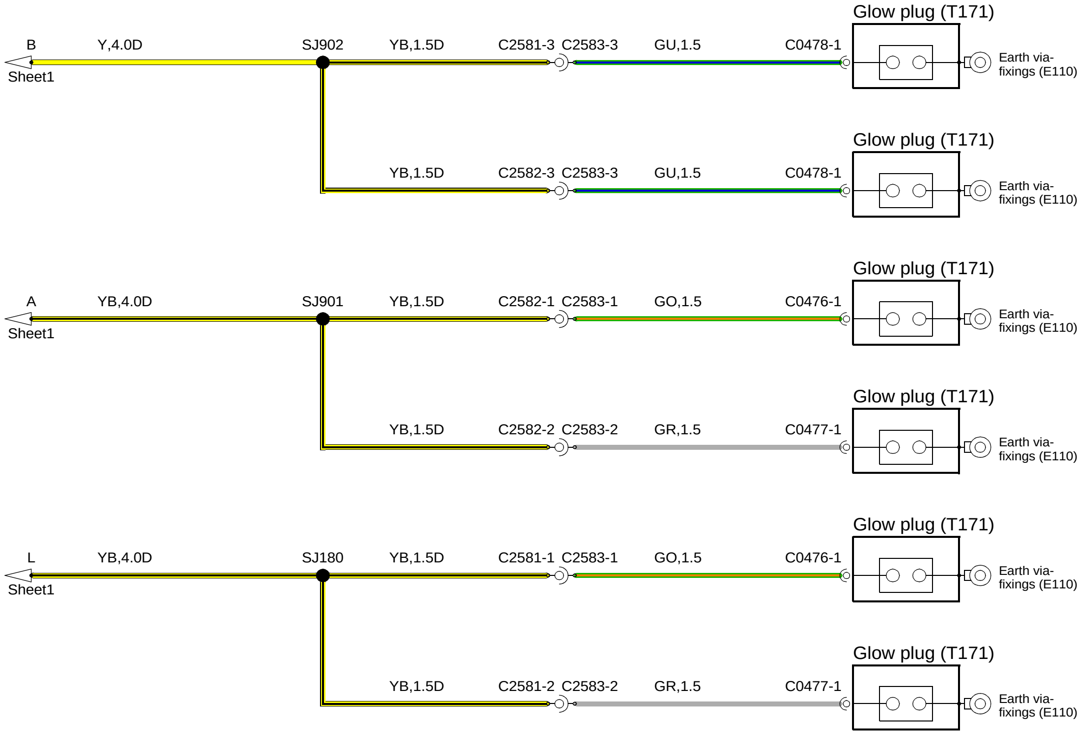

Engine control-
module (ECM) (D131)
B
NR,1.5
Sheet1
SJ16
NR,1.0
SJ10
NR,0.5
C0522B-2
Fuel injector-No.1 (T172)
1a
C0522B-1
BG,0.5
C0634B-78
INJ CYL 1A
NR,0.5
C0523B-2
Fuel injector-No.2 (T173)
2a
C0523B-1
BP,0.5
C0634B-80
INJ CYL 2A
NR,0.5
C0524B-2
Fuel injector-No.3 (T174)
3a
C0524B-1
BG,0.5
C0634B-82
INJ CYL 3A
NR,0.5
C0525B-2
Fuel injector-No.4 (T175)
4a
C0525B-1
BW,0.5
C0634B-84
INJ CYL 4A
NR,1.0
SJ4
NR,0.5
C0526B-2
Fuel injector-No.5 (T176)
1b
C0526B-1
BR,0.5
C0634B-79
INJ CYL 1B
NR,0.5
C0527B-2
Fuel injector-No.6 (T177)
2b
C0527B-1
BO,0.5
C0634B-81
INJ CYL 2B
NR,0.5
C0528B-2
Fuel injector-No.7 (T178)
3b
C0528B-1
U,0.5
C0634B-83
INJ CYL 3B
NR,0.5
C0529B-2
Fuel injector-No.8 (T179)
4b
C0529B-1
UY,0.5
C0634B-85
INJ CYL 4B

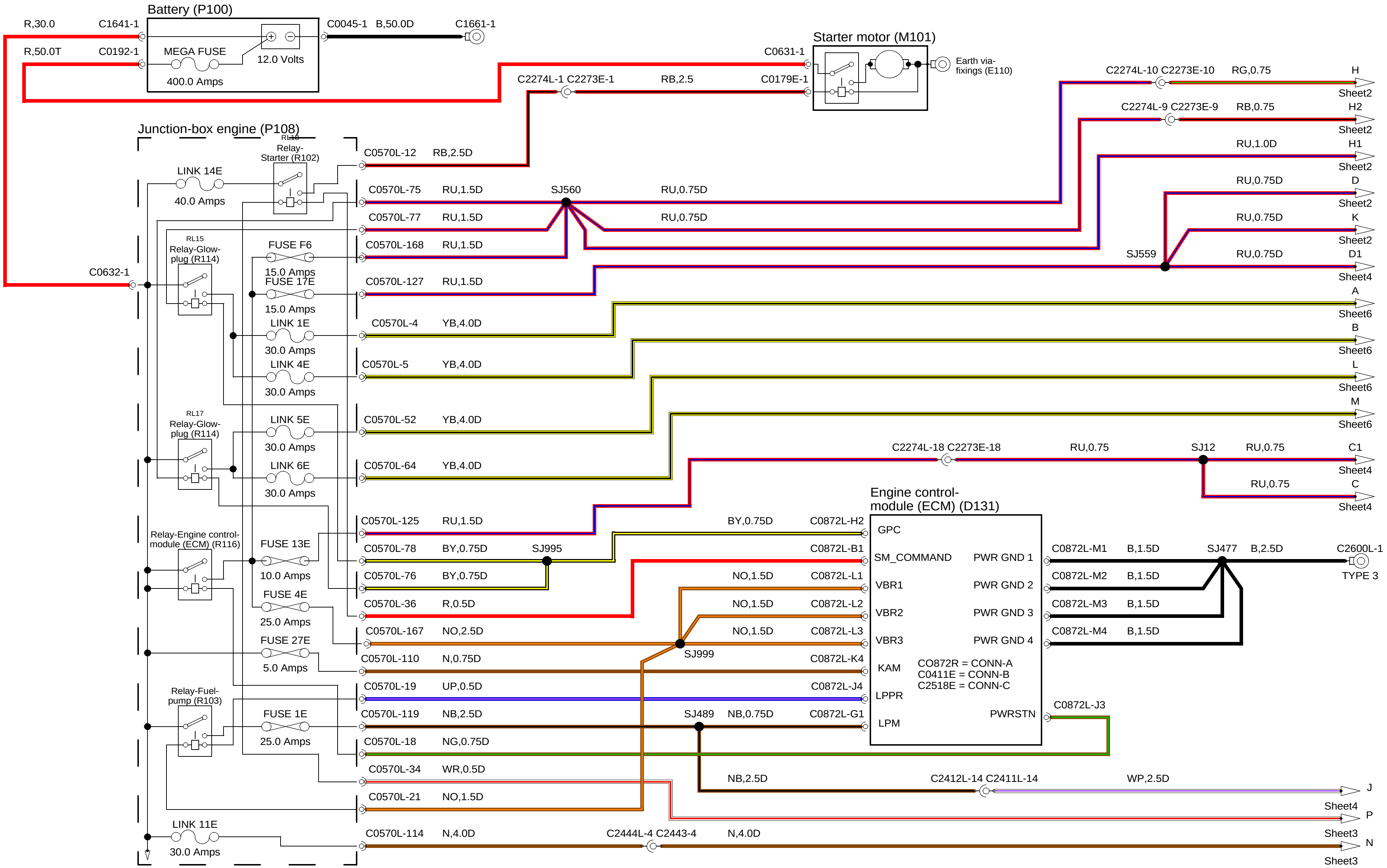

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C2274L-1 C2273C-1
RB,2.5
C0179C-1
Earth via-fixings (E110)
A
Sheet5
H1
Sheet3
B
Sheet5
L
Sheet5
C
Sheet3
E
Sheet3
RU,1.0D
Junction-box engine (P108)
Relay-Starter (R102)
LINK 14E
40.0 Amps
C0570L-12
RB,2.5D
C0570L-77
RU,1.5D
SJ560
C0570L-75
RU,1.5D
C0570L-168
RU,1.5D
FUSE 6E
15.0 Amps
C0570L-127
RU,1.5D
C2274L-18 C2273C-18
RU,1.0
FUSE 17E
15.0 Amps
C0570L-4
YB,4.0D
FUSE 4E
25.0 Amps
C0570L-167
NO,2.5D
Relay-Glow-plug (R114)
C0632-1
C0570L-36
R,0.5D
LINK 1E
30.0 Amps
C0570L-76
BY,0.75D
SJ995
BY,0.75D
C2274L-5 C2273C-5
C0570L-78
BY,0.75D
Engine control-module (ECM) (D131)
C0872L-B1
SM_COMMAND
VBR1C
C0872L-L1
NO,1.5D
SJ999
VBR1A
C0872L-L2
NO,1.5D
VBR1B
C0872L-L3
NO,1.5D
BY,0.75
C0411C-G3
GPC
Relay-Glow-plug (R114)
LINK 4E
30.0 Amps
C0570L-5
YB,4.0D
LINK 5E
30.0 Amps
C0570L-52
Y,4.0D
IGNSNS
C0872L-K3
W,0.75D
C0570L-110
N,0.75D
C0872L-K4
KAM
CRNK
C0872L-F3
WR,0.5D
Relay-Engine control-module (ECM) (R116)
FUSE 27E
5.0 Amps
C0570L-125
RU,1.5D
FUSE 13E
10.0 Amps
C0570L-19
UP,0.5D
C0872L-J4
LPPR
PWRSTN
C0872L-J3
NB,0.75D
C0872L-G1
LPM
Relay-Fuel-pump (R103)
C0570L-119
NB,2.5D
SJ489
NB,2.5D
C2412L-14 C2411L-14
WP,2.5D
F
Sheet3
FUSE 1E
25.0 Amps
C0570L-18
NG,0.75D
C0570L-21
NO,1.5D
C0570L-34
WR,0.5D
SJ479
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-5
FUSE 60P
5.0 Amps
C0584L-30
WR,0.5D
C0582-19
FUSE 25P
5.0 Amps
C0583L-36

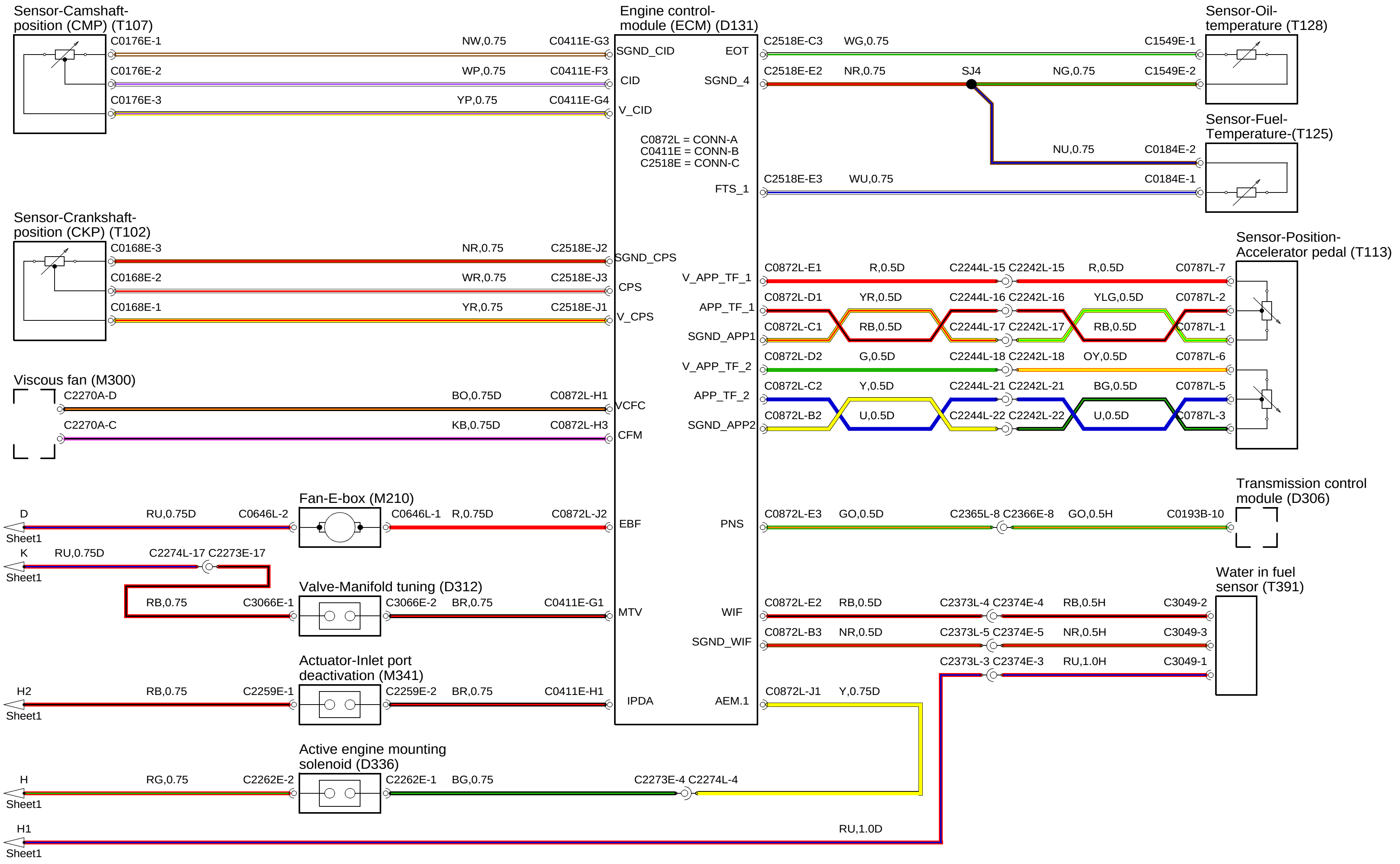

Fuel Injector 0 (T334)
CYL 1
Silver
Silver
C2580C-1
BW,1.5
C2518C-L3
C2580C-2
GW,1.5
C2518C-M3
Engine control-module (ECM) (D131)
INJ-COM 0
INJ 0
TPS1
TPA+
C0411C-E1
WU,0.75
C0272C-2
C0411C-G4
SP,0.75
C0272C-3
Throttle-EGR-Inlet (Y160)
Gold
Gold
Gold
Gold
C0272C-4
RO,0.75
H
Sheet3
C0272C-1
NU,0.75
J
Sheet3
C0272C-6
YU,0.75
K
Sheet3
Fuel injector-No.1 (T172)
CYL 4
Silver
Silver
C0522C-1
BY,1.5
C0411C-L2
C0522C-2
GY,1.5
C0411C-L1
INJ-COM 1
INJ 1
Sensor-Crankshaft-position (CKP) (T102)
SGI
CPS
VA2_C
C2518C-G2
NR,0.75
C0168C-3
C2518C-F1
WR,0.75
C0168C-2
C2518C-G1
YR,0.75
C0168C-1
Gold
Gold
Gold
Fuel injector-No.2 (T173)
CYL 2
Silver
Silver
C0523C-1
BU,1.5
C2518C-L2
C0523C-2
GU,1.5
C2518C-M2
INJ-COM 2
INJ 2
Sensor-Camshaft-position (CMP) (T107)
SGJ
CID
VA2_D
C2518C-H3
NW,0.75
C0176C-2
C2518C-G4
WP,0.75
C0176C-1
C2518C-H4
YP,0.75
C0176C-3
Fuel injector-No.3 (T174)
CYL 5
Silver
Silver
C0524C-1
BO,1.5
C0411C-L3
C0524C-2
GR,1.5
C0411C-M1
INJ-COM 3
INJ 3
Sensor-Position-Accelerator pedal (T113)
Fuel injector-No.4 (T175)
CYL 3
Silver
Silver
C0525C-1
BG,1.5
C2518C-L4
C0525C-2
GB,1.5
C2518C-M4
INJ-COM 4
INJ 4
VA1A
APP1
SGA
SGB
APP2
VA2A
C0872L-E1
R,0.5D
C2244L-15 C2242L-15
R,0.5D
C0787L-7
C0872L-D1
YR,0.5D
C2244L-16 C2242L-16
YLG,0.5D
C0787L-2
C0872L-C1
RB,0.5D
C2244L-17 C2242L-17
RB,0.5D
C0787L-1
C0872L-B2
U,0.5D
C2244L-22 C2242L-22
U,0.5D
C0787L-3
C0872L-C2
Y,0.5D
C2244L-21 C2242L-21
BG,0.5D
C0787L-5
C0872L-D2
G,0.5D
C2244L-18 C2242L-18
OY,0.5D
C0787L-6
Fuel injector-No.5 (T176)
CYL 6
Silver
Silver
C0526C-1
BR,1.5
C0411C-M3
C0526C-2
GO,1.5
C0411C-M2
INJ-COM 5
INJ 5
SCCS_1
C0872L-C4
R,0.5D
Gold
C2240L-21 C2238-21
SGF
C0872L-B4
PU,0.5D
Gold
C2240L-22 C2238-22
Viscous fan (M300)
C2270-D
BO,0.75D
C2274L-12 C2273C-12
BO,0.75
C0411C-K2
VCFC
C2270-C
KB,0.75D
C2274L-8 C2273C-8
BW,0.75
C2518C-E1
CFM
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
Clock spring (S227)
C0082-5
PU,0.35D
C2147-9
N,0.35
C1254-1
C0082-8
R,0.35D

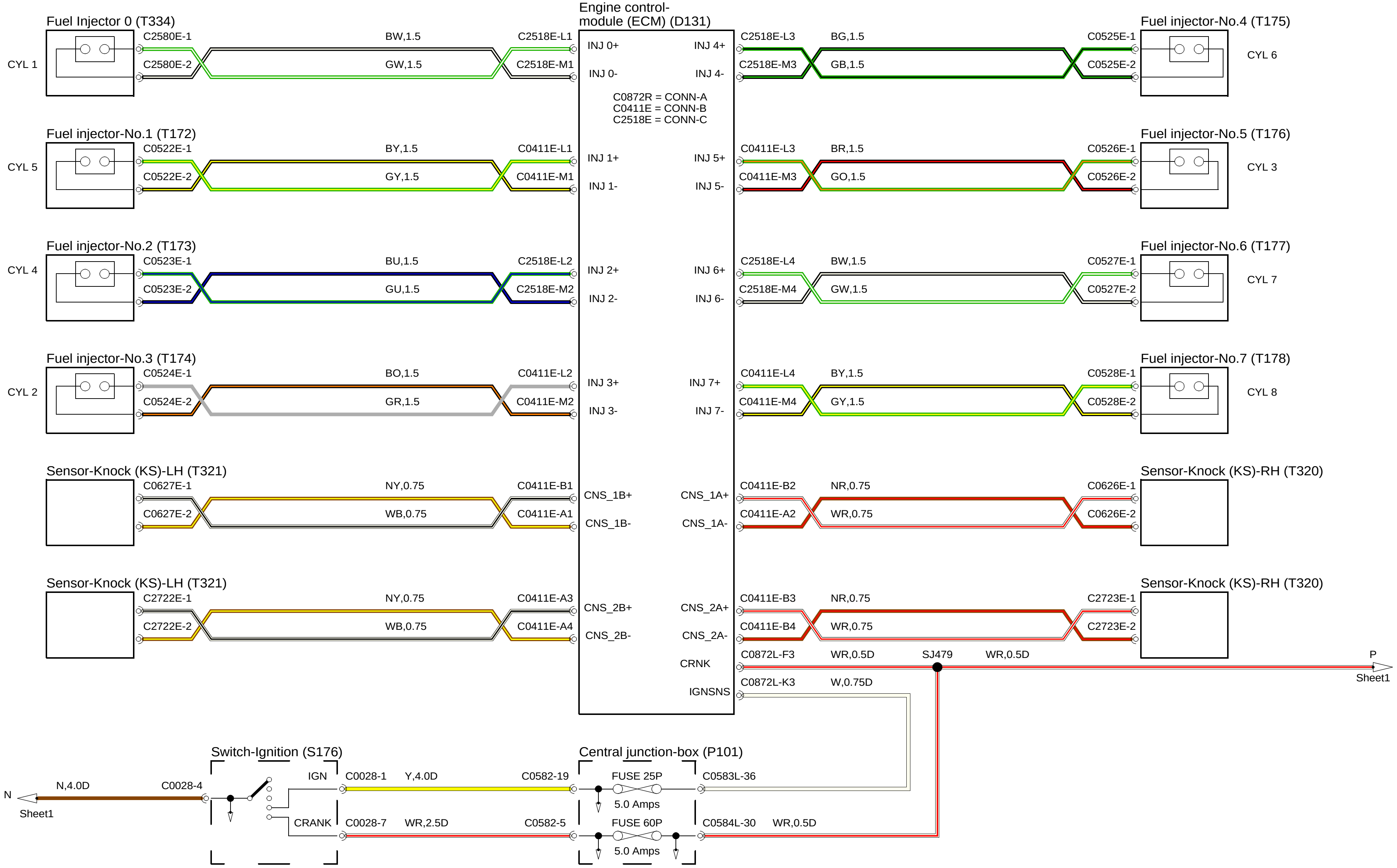

Valve-Control-
Fuel volume (N168)
Engine control-
module (ECM) (D131)
C
Sheet1
RU,1.0
SJ5
RU,0.75
C2260C-1
Silver
C2260C-2
Silver
BU,0.75
C0411C-J4
VCV
PWR GND 1
C0872L-M3 B,1.5D
SJ477
B,2.5D
C2600L-1
TYPE 3
PWR GND 2
C0872L-M1 B,1.5D
Valve-Control-
Fuel pressure (N167)
PWR GND 3
C0872L-M2 B,1.5D
RU,0.75
C2261C-1
Silver
C2261C-2
Silver
BU,0.75
C0411C-K3
PCV
PWR GND 4
C0872L-M4 B,1.5D
Actuator-Vane VGT (D363)
H
Sheet2
RO,0.75
C2273C-17 C2274L-17
VA2_B
C0411C-F1 YR,0.75
SJ3
YR,0.75
C2267C-1
Gold
E
Sheet1
RU,1.5D
SJ559
RU,0.75D
TVP_A
C2518C-C4 WB,0.75
C2267C-6
Gold
SGD
C0411C-F2 NR,0.75
SJ2
NR,0.75
C2267C-5
Gold
Fan-E-box (M210)
RU,0.75D
C0646L-2
C0646L-1
R,0.75D
C0872L-J2
EBF
VGTA +
C2518C-J4 WR,0.75
C2267C-3
Gold
VGTA -
C2518C-K4 SR,0.75
C2267C-4
Gold
NU,0.75
J
Sheet2
Sensor-MAF/IAT (T317)
C0567-3
WY,0.75D
C0872L-F1
IAT
YU,0.75
K
Sheet2
C0567-4
B,0.75D
C0872L-L4
MAF/IAT GND
RU,0.75D
C0567-1
C0567-2
R,0.75D
C0872L-F4
MAF_A+
Sensor-Oil-
temperature (T128)
EOT
C0411C-A1 WG,0.75
C1549C-1
Transmission control
module (D306)
SGR
C0411C-K1 NG,0.75
C1549C-2
C0193-10
GO,0.5H
C2366C-8 C2365L-8
GO,0.5D
C0872L-E3
PNS
Water in fuel
sensor (T391)
WIF
C0872L-E2
RB,0.5D
C2373L-4 C2374C-4
RB,0.5H
C0735-2
SGK
C0872L-B3
NR,0.5D
C2373L-5 C2374C-5
NR,0.5H
C0735-3
H1
Sheet1
RU,1.0D
C2373L-3 C2374C-3
RU,1.0H
C0735-1
Unit-Fuel Tank (D179)
F
Sheet1
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4

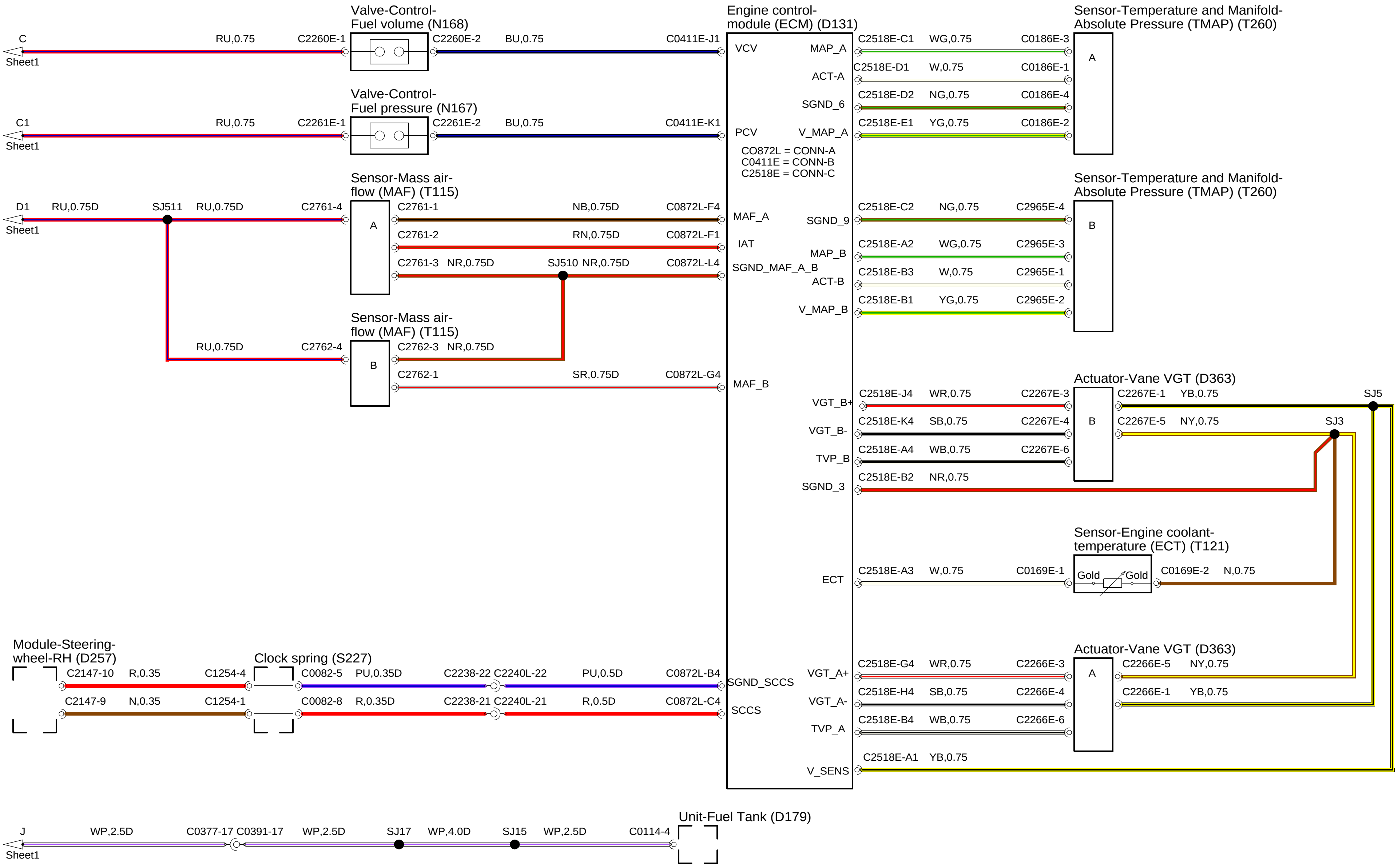

Sensor-Engine coolant-temperature (ECT) (T121)
Gold
Gold
C0169C-2 N,0.75
SJ6
NR,0.75 C2518C-E2
C0169C-1
W,0.75 C2518C-C2
Engine control-module (ECM) (D131)
SGC
ECT_1
MAP
VA1_B
C2518C-C1 WG,0.5 C0186C-2
C2518C-D1 YG,0.5 C0186C-1
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186C-3 NG,0.5
Generator (M100)
C0053C-2
(NON ARC) WP,0.75
C0411C-H1
ALT_COM
C0053C-3
(ARC) WP,0.75
(NON ARC) WG,0.75
C2518C-F2
ALT_MON
Generator (M100)
C0226-2 WP,0.75H C0904-2 C0053C-2
(ARC) WG,0.75
C0226-1 WG,0.75H C0904-3 C0053C-3
ACT
SGQ
C2518C-B1 W,0.75 C2870C-1
C2518C-G3 NR,0.75
Sensor-Temperature-Air charge (T361)
C2870C-2 N,0.75 SJ4
Actuator-EGR-Electric (D362)
SGM
C2518C-D2 NR,0.75 C2254C-6
Gold
EGRA-
C2518C-H2 BU,0.75 C2254C-4
A
EVPA
C2518C-A3 WR,0.75 C2254C-2
Gold
EGRA+
C2518C-H1 GU,0.75 C2254C-3
VA1_F
C2518C-C3 YR,0.75 SJ1 YR,0.75 C2254C-1
Gold
Sensor-Pressure-Fuel rail (T264)
Silver
Silver
Silver
C2251C-2 NG,0.75 C0411C-E2
SGE
C2251C-1 WG,0.75 C0411C-D1
RPS
C2251C-3 YG,0.75 C0411C-D2
VA1_E
Actuator-EGR-Electric (D362)
YR,0.75 C2255C-1
Gold Gold
C2255C-6 NR,0.75
EGRB-
C2518C-K1 BU,0.75 C2255C-4
B
ABS module (D277)
C0506L-30 GP,0.75D SJ882 GP,0.75D C0872L-G2
B00_1
EVPB
C2518C-A2 WR,0.75 C2255C-2
Gold
EGRB+
C2518C-J1 GU,0.75 C2255C-3
Stop lamp switch (S215)
C0075L-1 GP,1.5D SJ814 GP,1.5D C2411L-2 C2412L-2 GP,1.5D
Sensor-Temperature-Fuel rail (T125)
FTS
C2518C-B2 WU,0.75 C0184C-1
C0184C-2 NU,0.75
HS CAN H
C0872L-A4 YB,0.5D C2365L-4 C2366C-4
HS CAN L
C0872L-A3 YN,0.5D C2365L-5 C2366C-5
Sensor-Knock (KS) (T100)
Restraints Control Module (RCM) (D171)
C1649-17 YG,0.5D C2242L-7 C2244L-7 YG,0.5D C0872L-E4
INI
CNS_B+
C0411C-D3 NR,0.75 C0627C-1
Gold
C2274L-16 C2273C-16 UR,0.75 C0411C-B4
HS CAN H
CNS_B-
C0411C-C4 WR,0.75 C0627C-2
Gold
C2274L-15 C2273C-15 SR,0.75 C0411C-B3
HS CAN L
Sensor-Knock (KS) (T100)
CNS_A+
C0411C-E4 NY,0.75 C0626C-1
Gold
CNS_A-
C0411C-D4 WB,0.75 C0626C-2
Gold

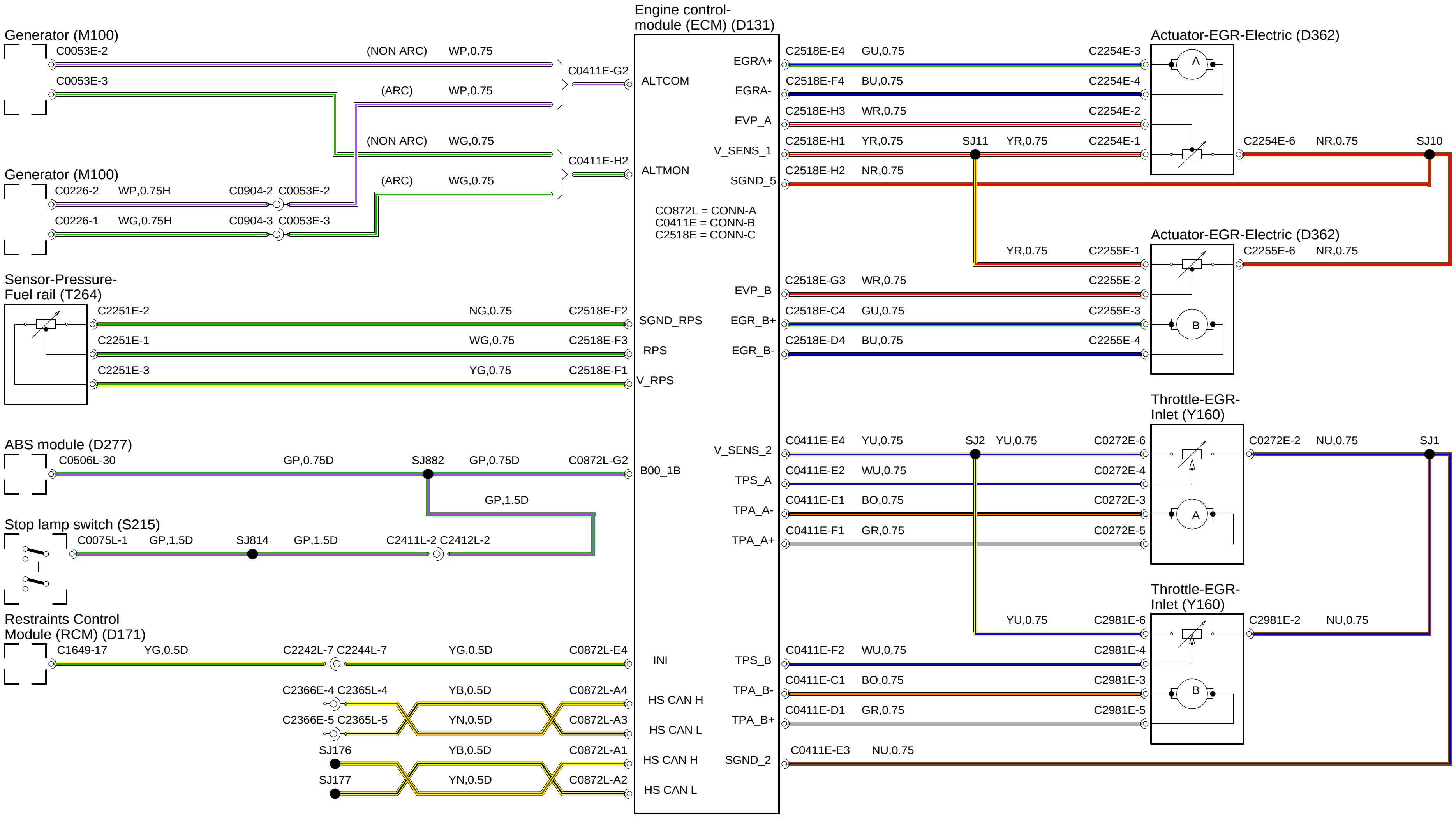

Glow plug (T171)
B
Sheet1
Y,4.0D
SJ902
YB,1.5D
C2581-3
C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-3
C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
A
Sheet1
YB,4.0D
SJ901
YB,1.5D
C2582-1
C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-2
C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
L
Sheet1
YB,4.0D
SJ180
YB,1.5D
C2581-1
C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-2
C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)

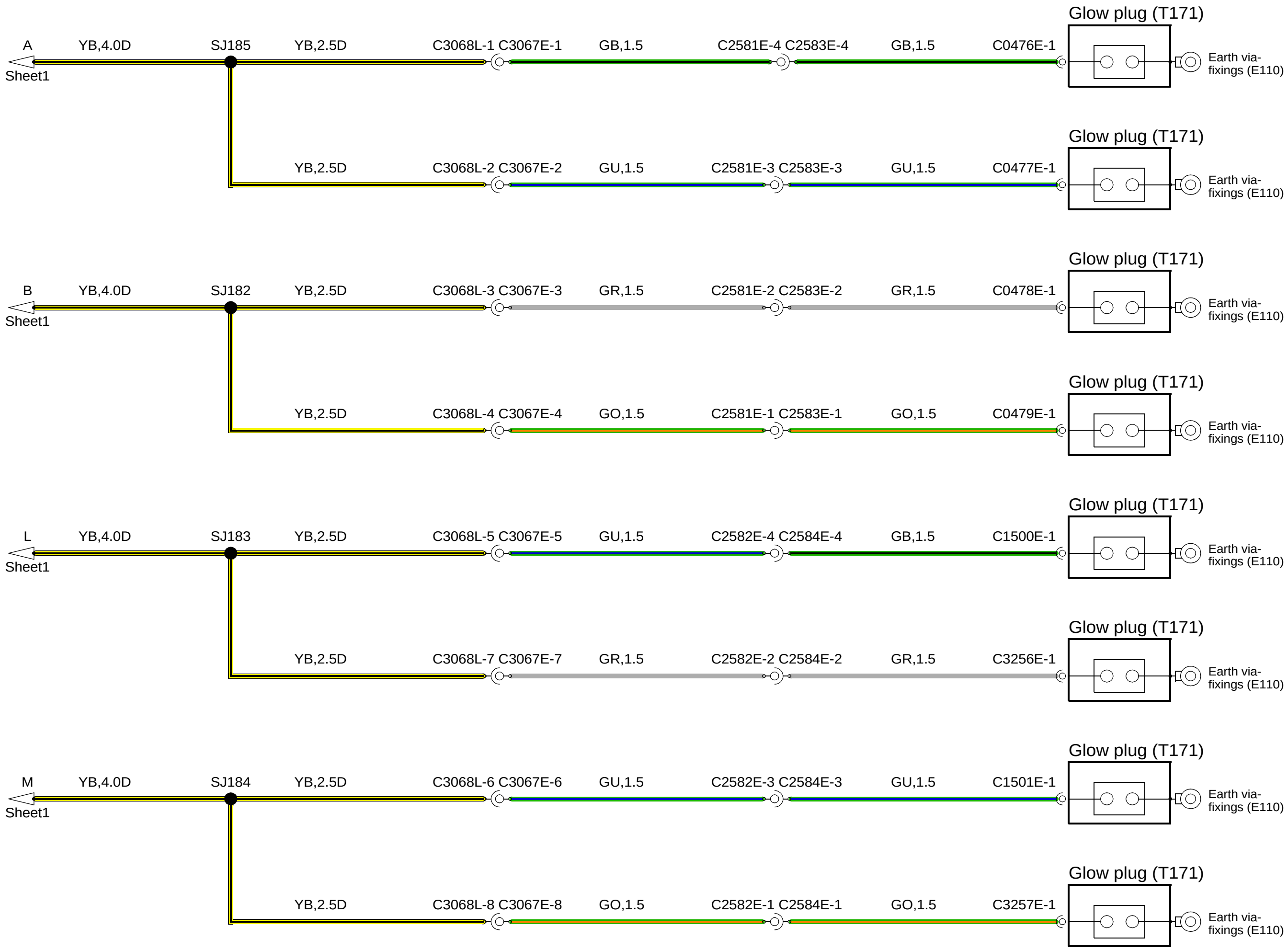

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C0179E-1
Earth via-fixings (E110)
C2274L-1 C2273E-1
RB,2.5
C2274L-10 C2273E-10
RG,0.75
H
Sheet2
C2274L-9 C2273E-9
RB,0.75
H2
Sheet2
RU,1.0D
H1
Sheet2
RU,0.75D
D
Sheet2
RU,0.75D
K
Sheet2
SJ559
RU,0.75D
D1
Sheet4
A
Sheet6
B
Sheet6
L
Sheet6
M
Sheet6
Junction-box engine (P108)
RL16
Relay-Starter (R102)
LINK 14E
40.0 Amps
RL15
Relay-Glow-plug (R114)
FUSE F6
15.0 Amps
FUSE 17E
15.0 Amps
LINK 1E
30.0 Amps
LINK 4E
30.0 Amps
RL17
Relay-Glow-plug (R114)
LINK 5E
30.0 Amps
LINK 6E
30.0 Amps
Relay-Engine control-module (ECM) (R116)
FUSE 13E
10.0 Amps
FUSE 4E
25.0 Amps
FUSE 27E
5.0 Amps
Relay-Fuel-pump (R103)
FUSE 1E
25.0 Amps
LINK 11E
30.0 Amps
C0632-1
C0570L-12
RB,2.5D
C0570L-75
RU,1.5D
SJ560
RU,0.75D
C0570L-77
RU,1.5D
RU,0.75D
C0570L-168
RU,1.5D
C0570L-127
RU,1.5D
C0570L-4
YB,4.0D
C0570L-5
YB,4.0D
C0570L-52
YB,4.0D
C0570L-64
YB,4.0D
C2274L-18 C2273E-18
RU,0.75
SJ12
RU,0.75
C1
Sheet4
RU,0.75
C
Sheet4
Engine control-module (ECM) (D131)
C0570L-125
RU,1.5D
BY,0.75D
C0872L-H2
GPC
C0570L-78
BY,0.75D
SJ995
C0872L-B1
SM_COMMAND
PWR GND 1
C0872L-M1
B,1.5D
SJ477
B,2.5D
C2600L-1
TYPE 3
C0570L-76
BY,0.75D
NO,1.5D
C0872L-L1
VBR1
PWR GND 2
C0872L-M2
B,1.5D
C0570L-36
R,0.5D
NO,1.5D
C0872L-L2
VBR2
PWR GND 3
C0872L-M3
B,1.5D
C0570L-167
NO,2.5D
NO,1.5D
C0872L-L3
VBR3
PWR GND 4
C0872L-M4
B,1.5D
C0570L-110
N,0.75D
SJ999
C0872L-K4
KAM
CO872R = CONN-A
C0411E = CONN-B
C2518E = CONN-C
C0570L-19
UP,0.5D
C0872L-J4
LPPR
C0872L-J3
C0570L-119
NB,2.5D
SJ489
NB,0.75D
C0872L-G1
PWRSTN
LPM
C0570L-18
NG,0.75D
C0570L-34
WR,0.5D
NB,2.5D
C2412L-14 C2411L-14
WP,2.5D
J
Sheet4
C0570L-21
NO,1.5D
P
Sheet3
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
N
Sheet3

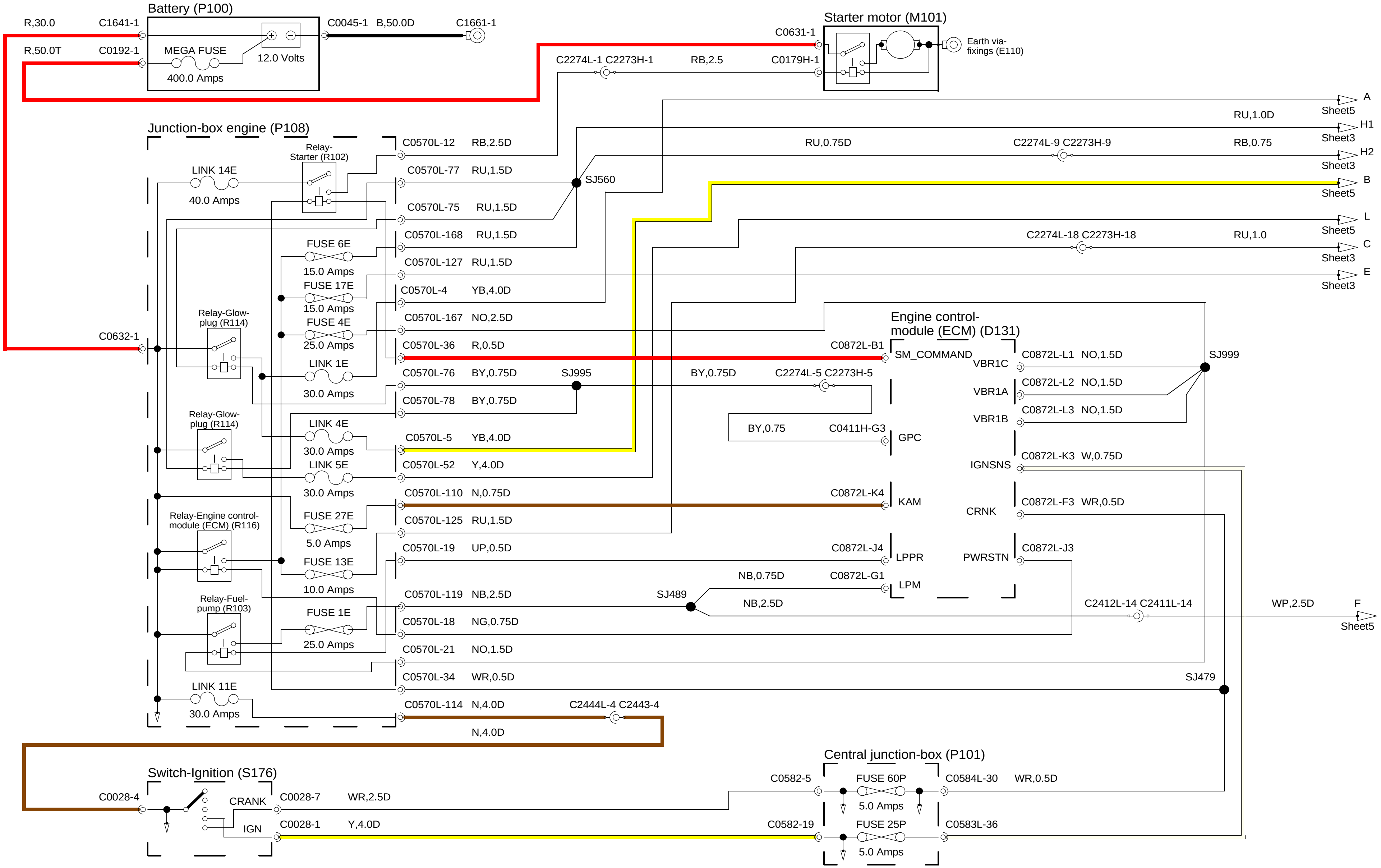

Sensor-Camshaft-position (CMP) (T107)
C0176E-1 NW,0.75 C0411E-G3
C0176E-2 WP,0.75 C0411E-F3
C0176E-3 YP,0.75 C0411E-G4
Engine control-module (ECM) (D131)
SGND_CID
CID
V_CID
EOT
SGND_4
C0872L = CONN-A
C0411E = CONN-B
C2518E = CONN-C
FTS_1
C2518E-C3 WG,0.75 C1549E-1
C2518E-E2 NR,0.75 SJ4 NG,0.75 C1549E-2
Sensor-Oil-temperature (T128)
Sensor-Fuel-Temperature-(T125)
NU,0.75 C0184E-2
C2518E-E3 WU,0.75 C0184E-1
Sensor-Crankshaft-position (CKP) (T102)
C0168E-3 NR,0.75 C2518E-J2
C0168E-2 WR,0.75 C2518E-J3
C0168E-1 YR,0.75 C2518E-J1
SGND_CPS
CPS
V_CPS
V_APP_TF_1
APP_TF_1
SGND_APP1
V_APP_TF_2
APP_TF_2
SGND_APP2
Sensor-Position-Accelerator pedal (T113)
C0872L-E1 R,0.5D C2244L-15 C2242L-15 R,0.5D C0787L-7
C0872L-D1 YR,0.5D C2244L-16 C2242L-16 YLG,0.5D C0787L-2
C0872L-C1 RB,0.5D C2244L-17 C2242L-17 RB,0.5D C0787L-1
C0872L-D2 G,0.5D C2244L-18 C2242L-18 OY,0.5D C0787L-6
C0872L-C2 Y,0.5D C2244L-21 C2242L-21 BG,0.5D C0787L-5
C0872L-B2 U,0.5D C2244L-22 C2242L-22 U,0.5D C0787L-3
Viscous fan (M300)
C2270A-D BO,0.75D C0872L-H1
C2270A-C KB,0.75D C0872L-H3
VCFC
CFM
Fan-E-box (M210)
D RU,0.75D C0646L-2
Sheet1
C0646L-1 R,0.75D C0872L-J2
EBF
PNS
C0872L-E3 GO,0.5D C2365L-8 C2366E-8 GO,0.5H C0193B-10
Transmission control module (D306)
K RU,0.75D C2274L-17 C2273E-17
Sheet1
Valve-Manifold tuning (D312)
RB,0.75 C3066E-1
C3066E-2 BR,0.75 C0411E-G1
MTV
WIF
SGND_WIF
Water in fuel sensor (T391)
C0872L-E2 RB,0.5D C2373L-4 C2374E-4 RB,0.5H C3049-2
C0872L-B3 NR,0.5D C2373L-5 C2374E-5 NR,0.5H C3049-3
C2373L-3 C2374E-3 RU,1.0H C3049-1
Actuator-Inlet port deactivation (M341)
H2 RB,0.75 C2259E-1
Sheet1
C2259E-2 BR,0.75 C0411E-H1
IPDA
AEM.1
C0872L-J1 Y,0.75D
Active engine mounting solenoid (D336)
H RG,0.75 C2262E-2
Sheet1
C2262E-1 BG,0.75 C2273E-4 C2274L-4
H1
Sheet1
RU,1.0D

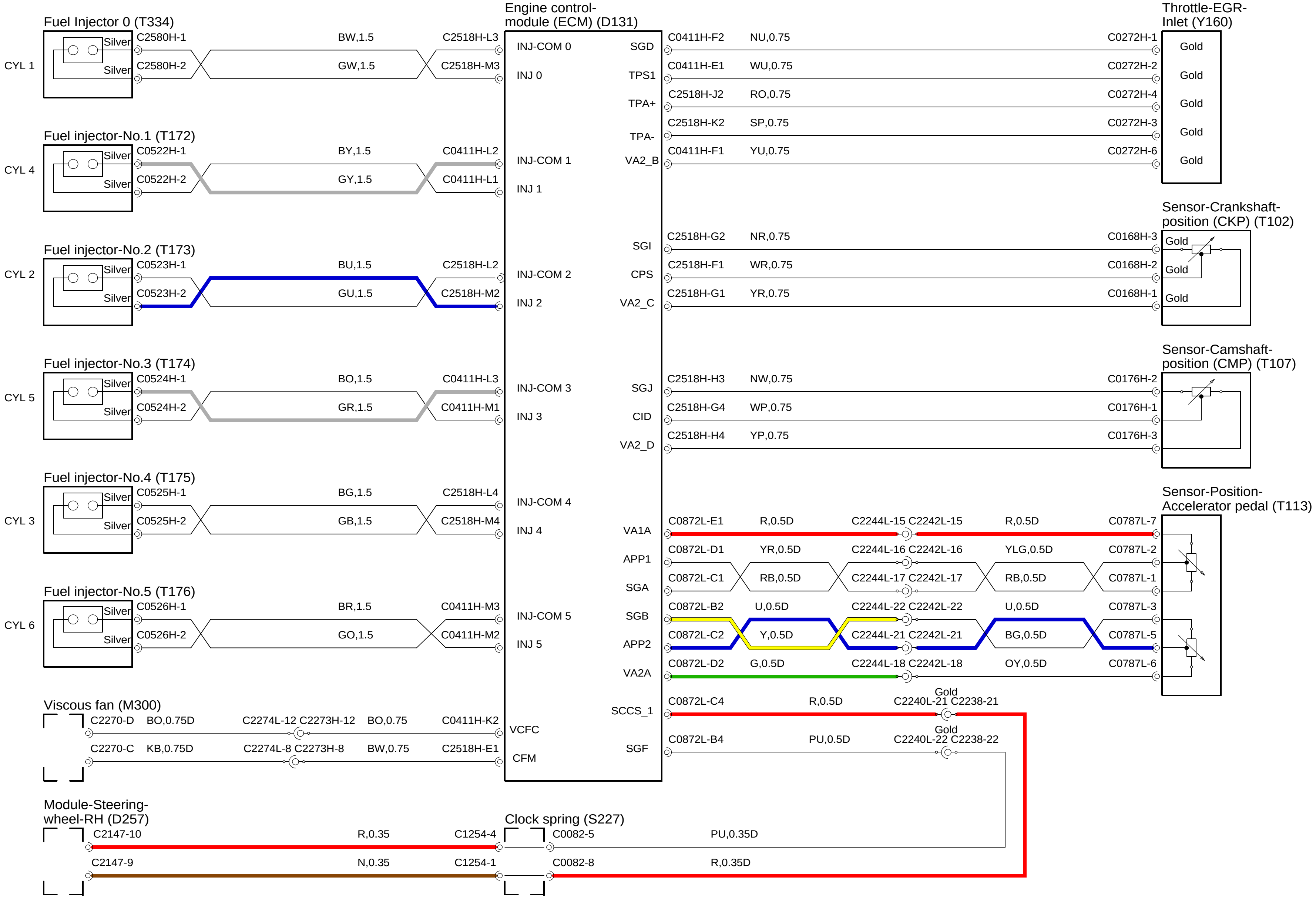

Engine control-module (ECM) (D131)
C0872R = CONN-A
C0411E = CONN-B
C2518E = CONN-C
Fuel Injector 0 (T334)
CYL 1
C2580E-1
C2580E-2
BW,1.5
GW,1.5
C2518E-L1
C2518E-M1
INJ 0+
INJ 0-
Fuel injector-No.1 (T172)
CYL 5
C0522E-1
C0522E-2
BY,1.5
GY,1.5
C0411E-L1
C0411E-M1
INJ 1+
INJ 1-
Fuel injector-No.2 (T173)
CYL 4
C0523E-1
C0523E-2
BU,1.5
GU,1.5
C2518E-L2
C2518E-M2
INJ 2+
INJ 2-
Fuel injector-No.3 (T174)
CYL 2
C0524E-1
C0524E-2
BO,1.5
GR,1.5
C0411E-L2
C0411E-M2
INJ 3+
INJ 3-
Sensor-Knock (KS)-LH (T321)
C0627E-1
C0627E-2
NY,0.75
WB,0.75
C0411E-B1
C0411E-A1
CNS_1B+
CNS_1B-
Sensor-Knock (KS)-LH (T321)
C2722E-1
C2722E-2
NY,0.75
WB,0.75
C0411E-A3
C0411E-A4
CNS_2B+
CNS_2B-
INJ 4+
INJ 4-
C2518E-L3
C2518E-M3
BG,1.5
GB,1.5
C0525E-1
C0525E-2
Fuel injector-No.4 (T175)
CYL 6
INJ 5+
INJ 5-
C0411E-L3
C0411E-M3
BR,1.5
GO,1.5
C0526E-1
C0526E-2
Fuel injector-No.5 (T176)
CYL 3
INJ 6+
INJ 6-
C2518E-L4
C2518E-M4
BW,1.5
GW,1.5
C0527E-1
C0527E-2
Fuel injector-No.6 (T177)
CYL 7
INJ 7+
INJ 7-
C0411E-L4
C0411E-M4
BY,1.5
GY,1.5
C0528E-1
C0528E-2
Fuel injector-No.7 (T178)
CYL 8
CNS_1A+
CNS_1A-
C0411E-B2
C0411E-A2
NR,0.75
WR,0.75
C0626E-1
C0626E-2
Sensor-Knock (KS)-RH (T320)
CNS_2A+
CNS_2A-
C0411E-B3
C0411E-B4
NR,0.75
WR,0.75
C2723E-1
C2723E-2
Sensor-Knock (KS)-RH (T320)
CRNK
C0872L-F3
WR,0.5D
SJ479
WR,0.5D
P
Sheet1
IGNSNS
C0872L-K3
W,0.75D
N
Sheet1
N,4.0D
C0028-4
Switch-Ignition (S176)
IGN
C0028-1
Y,4.0D
C0582-19
CRANK
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
FUSE 25P
5.0 Amps
FUSE 60P
5.0 Amps
C0583L-36
C0584L-30
WR,0.5D

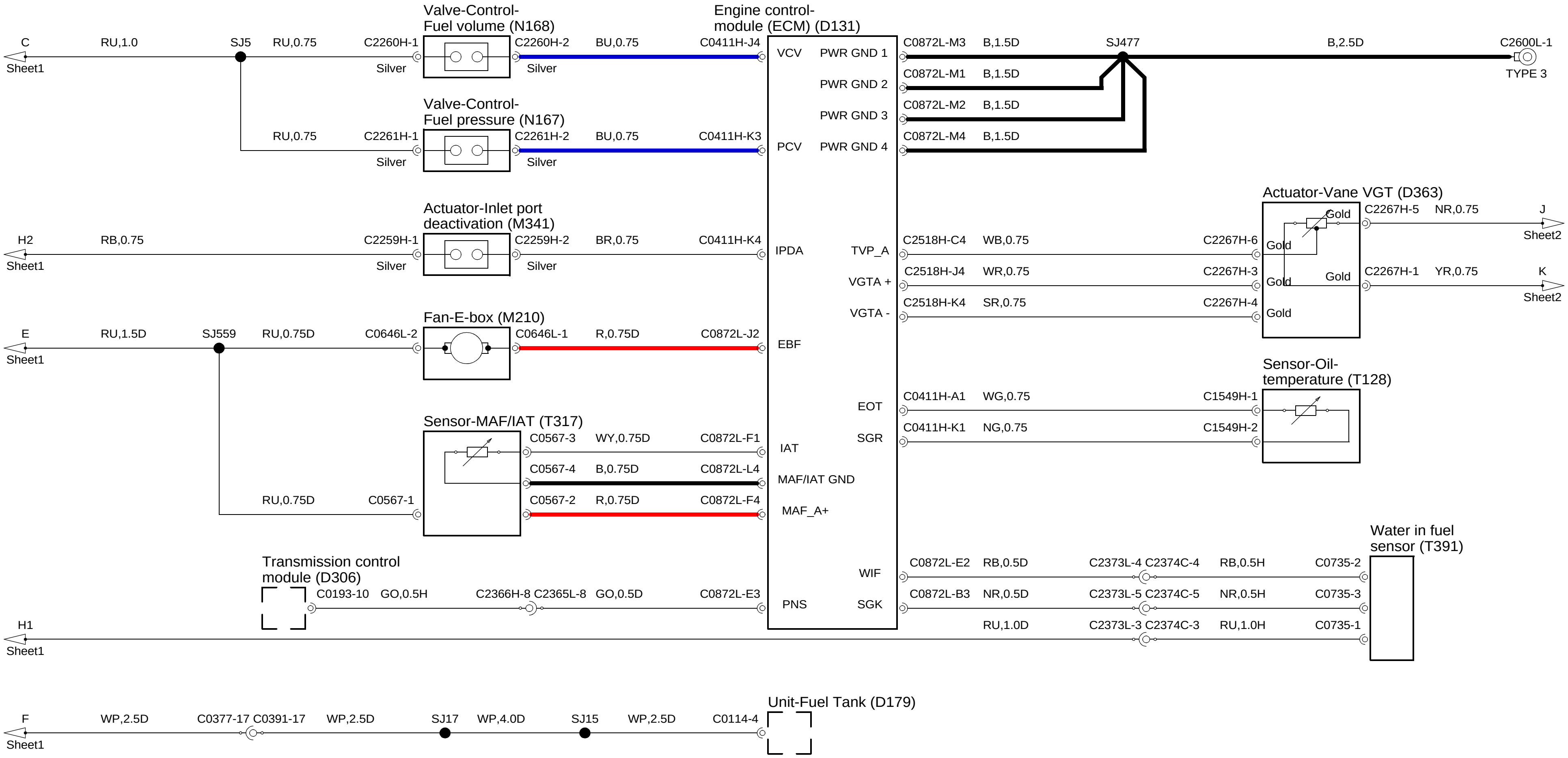

Valve-Control-Fuel volume (N168)
C
Sheet1
RU,0.75
C2260E-1
C2260E-2
BU,0.75
C0411E-J1
Valve-Control-Fuel pressure (N167)
C1
Sheet1
RU,0.75
C2261E-1
C2261E-2
BU,0.75
C0411E-K1
Sensor-Mass air-flow (MAF) (T115)
D1
Sheet1
RU,0.75D
SJ511
RU,0.75D
C2761-4
A
C2761-1
NB,0.75D
C0872L-F4
C2761-2
RN,0.75D
C0872L-F1
C2761-3
NR,0.75D
SJ510
NR,0.75D
C0872L-L4
Sensor-Mass air-flow (MAF) (T115)
RU,0.75D
C2762-4
B
C2762-3
NR,0.75D
C2762-1
SR,0.75D
C0872L-G4
Engine control-module (ECM) (D131)
VCV
PCV
CO872L = CONN-A
C0411E = CONN-B
C2518E = CONN-C
MAF_A
IAT
SGND_MAF_A_B
MAF_B
SGND_SCCS
SCCS
MAP_A
ACT-A
SGND_6
V_MAP_A
SGND_9
MAP_B
ACT-B
V_MAP_B
VGT_B+
VGT_B-
TVP_B
SGND_3
ECT
VGT_A+
VGT_A-
TVP_A
V_SENS
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
A
C2518E-C1
WG,0.75
C0186E-3
C2518E-D1
W,0.75
C0186E-1
C2518E-D2
NG,0.75
C0186E-4
C2518E-E1
YG,0.75
C0186E-2
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
B
C2518E-C2
NG,0.75
C2965E-4
C2518E-A2
WG,0.75
C2965E-3
C2518E-B3
W,0.75
C2965E-1
C2518E-B1
YG,0.75
C2965E-2
Actuator-Vane VGT (D363)
B
C2518E-J4
WR,0.75
C2267E-3
C2518E-K4
SB,0.75
C2267E-4
C2518E-A4
WB,0.75
C2267E-6
C2518E-B2
NR,0.75
C2267E-1
YB,0.75
SJ5
C2267E-5
NY,0.75
SJ3
Sensor-Engine coolant-temperature (ECT) (T121)
C2518E-A3
W,0.75
C0169E-1
Gold
Gold
C0169E-2
N,0.75
Actuator-Vane VGT (D363)
A
C2518E-G4
WR,0.75
C2266E-3
C2518E-H4
SB,0.75
C2266E-4
C2518E-B4
WB,0.75
C2266E-6
C2518E-A1
YB,0.75
C2266E-5
NY,0.75
C2266E-1
YB,0.75
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
C2147-9
N,0.35
C1254-1
Clock spring (S227)
C0082-5
PU,0.35D
C2238-22 C2240L-22
PU,0.5D
C0872L-B4
C0082-8
R,0.35D
C2238-21 C2240L-21
R,0.5D
C0872L-C4
J
Sheet1
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
Unit-Fuel Tank (D179)

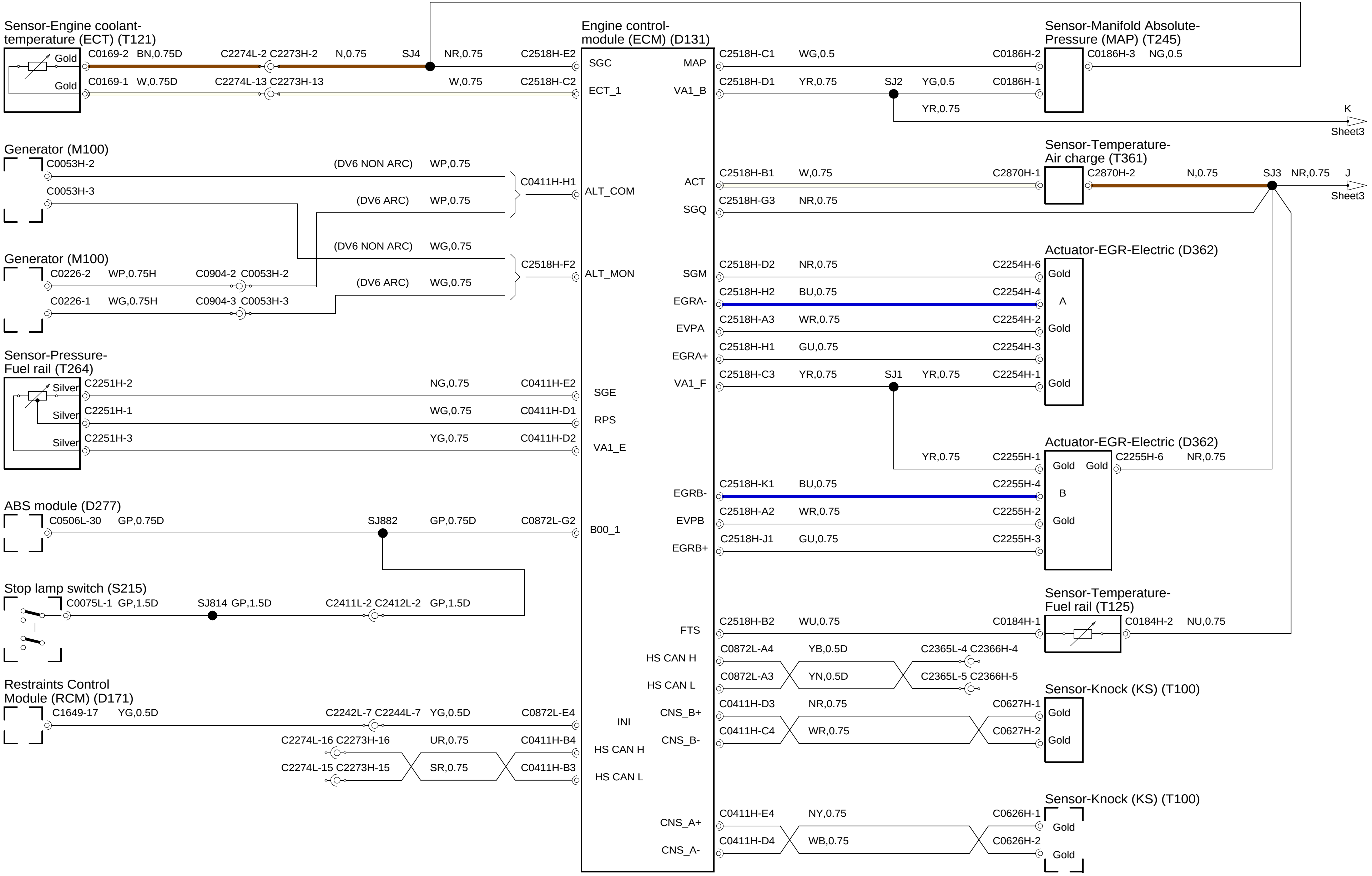

Engine control-module (ECM) (D131)
Generator (M100)
C0053E-2
(NON ARC)
WP,0.75
C0411E-G2
C0053E-3
(ARC)
WP,0.75
ALTCOM
(NON ARC)
WG,0.75
C0411E-H2
(ARC)
WG,0.75
ALTMON
Generator (M100)
C0226-2
WP,0.75H
C0904-2
C0053E-2
C0226-1
WG,0.75H
C0904-3
C0053E-3
CO872L = CONN-A
C0411E = CONN-B
C2518E = CONN-C
Sensor-Pressure-Fuel rail (T264)
C2251E-2
NG,0.75
C2518E-F2
SGND_RPS
C2251E-1
WG,0.75
C2518E-F3
RPS
C2251E-3
YG,0.75
C2518E-F1
V_RPS
ABS module (D277)
C0506L-30
GP,0.75D
SJ882
GP,0.75D
C0872L-G2
B00_1B
GP,1.5D
Stop lamp switch (S215)
C0075L-1
GP,1.5D
SJ814
GP,1.5D
C2411L-2 C2412L-2
Restraints Control Module (RCM) (D171)
C1649-17
YG,0.5D
C2242L-7 C2244L-7
YG,0.5D
C0872L-E4
INI
C2366E-4 C2365L-4
YB,0.5D
C0872L-A4
HS CAN H
C2366E-5 C2365L-5
YN,0.5D
C0872L-A3
HS CAN L
SJ176
YB,0.5D
C0872L-A1
HS CAN H
SJ177
YN,0.5D
C0872L-A2
HS CAN L
EGRA+
EGRA-
EVP_A
V_SENS_1
SGND_5
EVP_B
EGR_B+
EGR_B-
V_SENS_2
TPS_A
TPA_A-
TPA_A+
TPS_B
TPA_B-
TPA_B+
SGND_2
Actuator-EGR-Electric (D362)
C2518E-E4
GU,0.75
C2254E-3
A
C2518E-F4
BU,0.75
C2254E-4
C2518E-H3
WR,0.75
C2254E-2
C2518E-H1
YR,0.75
SJ11
YR,0.75
C2254E-1
C2254E-6
NR,0.75
SJ10
C2518E-H2
NR,0.75
Actuator-EGR-Electric (D362)
YR,0.75
C2255E-1
C2255E-6
NR,0.75
C2518E-G3
WR,0.75
C2255E-2
C2518E-C4
GU,0.75
C2255E-3
B
C2518E-D4
BU,0.75
C2255E-4
Throttle-EGR-Inlet (Y160)
C0411E-E4
YU,0.75
SJ2
YU,0.75
C0272E-6
C0272E-2
NU,0.75
SJ1
C0411E-E2
WU,0.75
C0272E-4
C0411E-E1
BO,0.75
C0272E-3
A
C0411E-F1
GR,0.75
C0272E-5
Throttle-EGR-Inlet (Y160)
YU,0.75
C2981E-6
C2981E-2
NU,0.75
C0411E-F2
WU,0.75
C2981E-4
C0411E-C1
BO,0.75
C2981E-3
B
C0411E-D1
GR,0.75
C2981E-5
C0411E-E3
NU,0.75

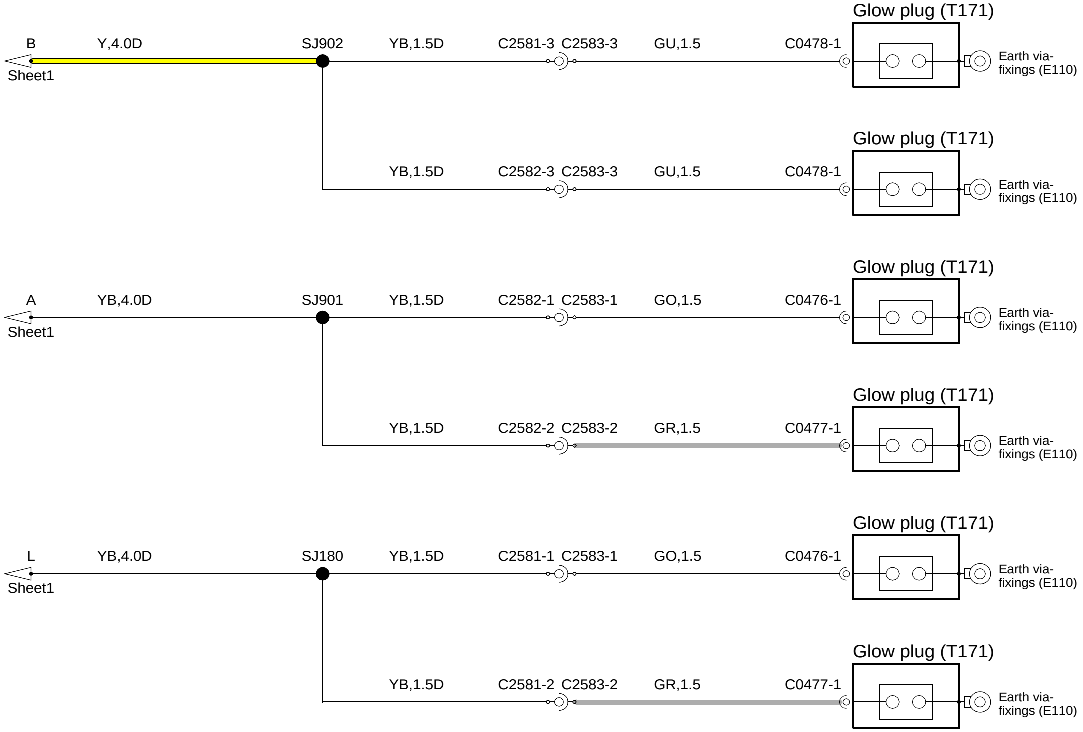

Glow plug (T171)
A
YB,4.0D
SJ185
YB,2.5D
C3068L-1 C3067E-1
GB,1.5
C2581E-4 C2583E-4
GB,1.5
C0476E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068L-2 C3067E-2
GU,1.5
C2581E-3 C2583E-3
GU,1.5
C0477E-1
Earth via-
fixings (E110)
Glow plug (T171)
B
YB,4.0D
SJ182
YB,2.5D
C3068L-3 C3067E-3
GR,1.5
C2581E-2 C2583E-2
GR,1.5
C0478E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068L-4 C3067E-4
GO,1.5
C2581E-1 C2583E-1
GO,1.5
C0479E-1
Earth via-
fixings (E110)
Glow plug (T171)
L
YB,4.0D
SJ183
YB,2.5D
C3068L-5 C3067E-5
GU,1.5
C2582E-4 C2584E-4
GB,1.5
C1500E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068L-7 C3067E-7
GR,1.5
C2582E-2 C2584E-2
GR,1.5
C3256E-1
Earth via-
fixings (E110)
Glow plug (T171)
M
YB,4.0D
SJ184
YB,2.5D
C3068L-6 C3067E-6
GU,1.5
C2582E-3 C2584E-3
GU,1.5
C1501E-1
Earth via-
fixings (E110)
Sheet1
Glow plug (T171)
YB,2.5D
C3068L-8 C3067E-8
GO,1.5
C2582E-1 C2584E-1
GO,1.5
C3257E-1
Earth via-
fixings (E110)

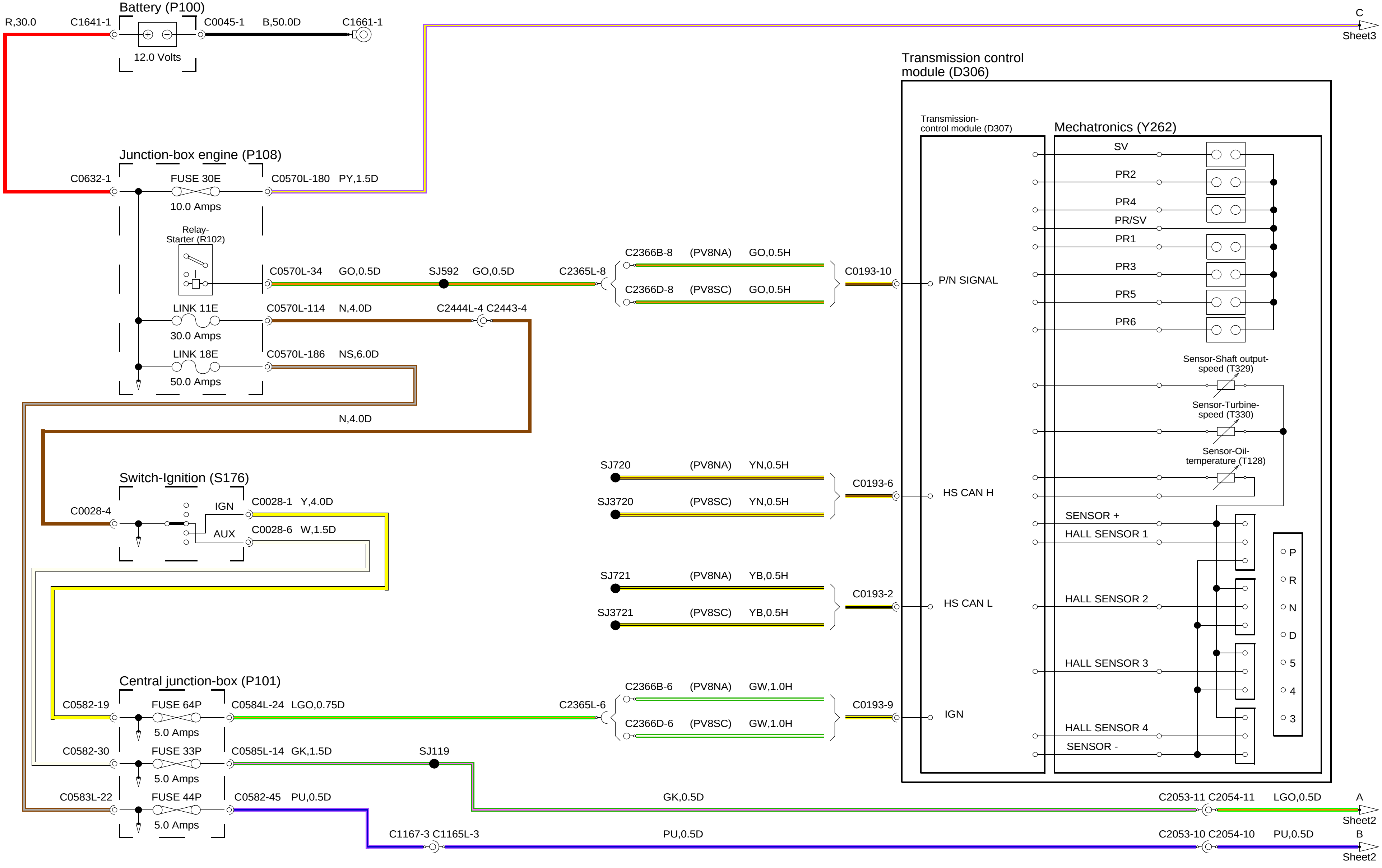

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1 B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C0179H-1
Earth via-fixings (E110)
C2274L-1 C2273H-1
RB,2.5
Junction-box engine (P108)
Relay-Starter (R102)
LINK 14E
40.0 Amps
C0570L-12 RB,2.5D
C0570L-77 RU,1.5D
SJ560
C0570L-75 RU,1.5D
C0570L-168 RU,1.5D
FUSE 6E
15.0 Amps
C0570L-127 RU,1.5D
FUSE 17E
15.0 Amps
C0570L-4 YB,4.0D
FUSE 4E
25.0 Amps
C0570L-167 NO,2.5D
Relay-Glow-plug (R114)
C0632-1
C0570L-36 R,0.5D
LINK 1E
30.0 Amps
C0570L-76 BY,0.75D
SJ995
BY,0.75D
C2274L-5 C2273H-5
C0570L-78 BY,0.75D
Relay-Glow-plug (R114)
LINK 4E
30.0 Amps
C0570L-5 YB,4.0D
LINK 5E
30.0 Amps
C0570L-52 Y,4.0D
C0570L-110 N,0.75D
Relay-Engine control-module (ECM) (R116)
FUSE 27E
5.0 Amps
C0570L-125 RU,1.5D
C0570L-19 UP,0.5D
FUSE 13E
10.0 Amps
Relay-Fuel-pump (R103)
C0570L-119 NB,2.5D
SJ489
NB,0.75D
NB,2.5D
FUSE 1E
25.0 Amps
C0570L-18 NG,0.75D
C0570L-21 NO,1.5D
C0570L-34 WR,0.5D
SJ479
LINK 11E
30.0 Amps
C0570L-114 N,4.0D
C2444L-4 C2443-4
N,4.0D
RU,1.0D
A
Sheet5
H1
Sheet3
RU,0.75D
C2274L-9 C2273H-9
RB,0.75
H2
Sheet3
B
Sheet5
L
Sheet5
C2274L-18 C2273H-18
RU,1.0
C
Sheet3
E
Sheet3
Engine control-module (ECM) (D131)
C0872L-B1
SM_COMMAND
VBR1C
C0872L-L1 NO,1.5D
SJ999
VBR1A
C0872L-L2 NO,1.5D
VBR1B
C0872L-L3 NO,1.5D
BY,0.75
C0411H-G3
GPC
IGNSNS
C0872L-K3 W,0.75D
C0872L-K4
KAM
CRNK
C0872L-F3 WR,0.5D
C0872L-J4
LPPR
PWRSTN
C0872L-J3
C0872L-G1
LPM
C2412L-14 C2411L-14
WP,2.5D
F
Sheet5
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7 WR,2.5D
IGN
C0028-1 Y,4.0D
Central junction-box (P101)
C0582-5
FUSE 60P
5.0 Amps
C0584L-30 WR,0.5D
C0582-19
FUSE 25P
5.0 Amps
C0583L-36

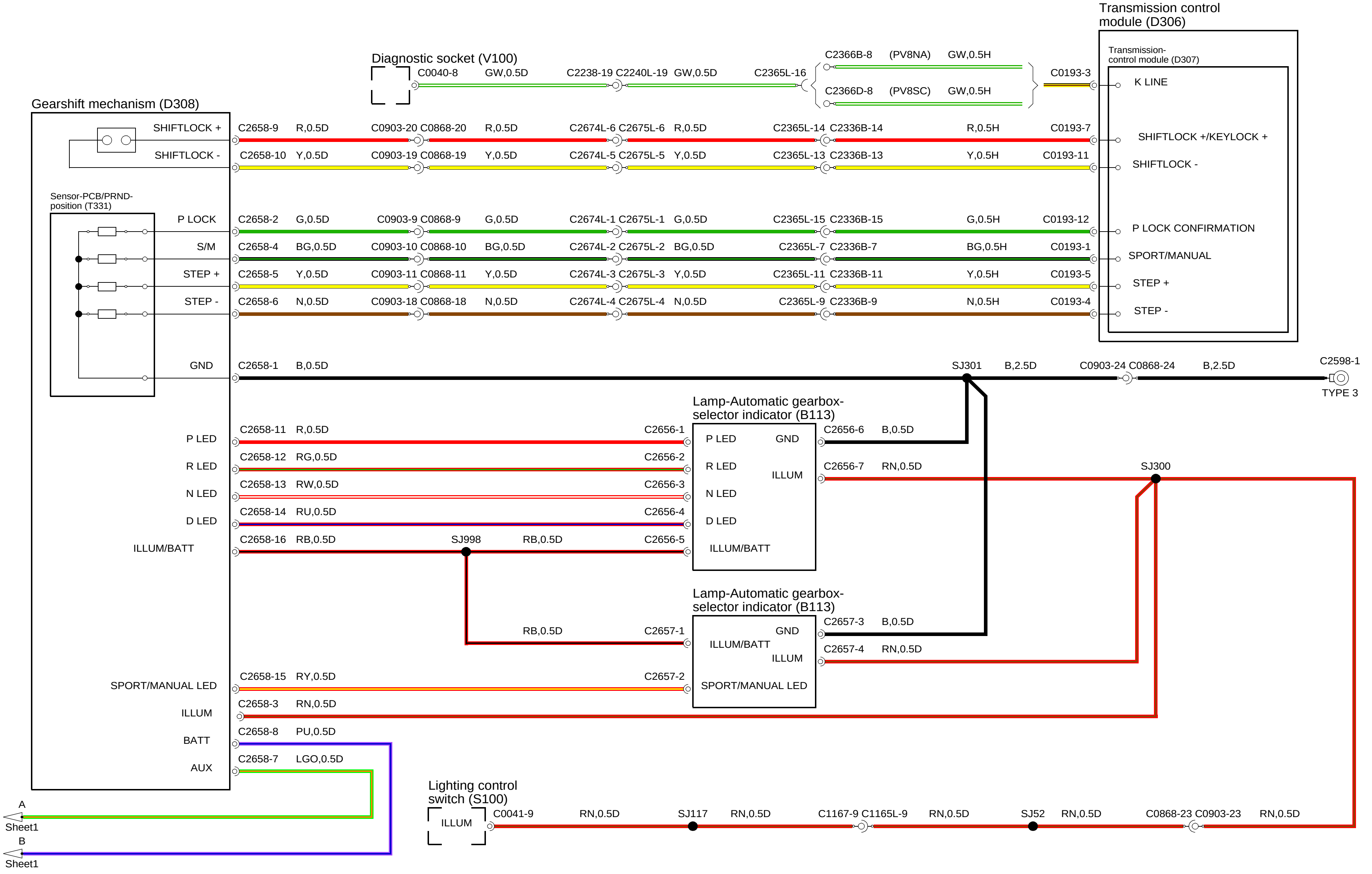

Fuel Injector 0 (T334)
CYL 1
Silver
Silver
C2580H-1
BW,1.5
C2518H-L3
C2580H-2
GW,1.5
C2518H-M3
Engine control-module (ECM) (D131)
INJ-COM 0
INJ 0
INJ-COM 1
INJ 1
INJ-COM 2
INJ 2
INJ-COM 3
INJ 3
INJ-COM 4
INJ 4
INJ-COM 5
INJ 5
VCFC
CFM
SGD
TPS1
TPA+
TPA-
VA2_B
SGI
CPS
VA2_C
SGJ
CID
VA2_D
VA1A
APP1
SGA
SGB
APP2
VA2A
SCCS_1
SGF
Fuel injector-No.1 (T172)
CYL 4
C0522H-1
BY,1.5
C0411H-L2
C0522H-2
GY,1.5
C0411H-L1
Fuel injector-No.2 (T173)
CYL 2
C0523H-1
BU,1.5
C2518H-L2
C0523H-2
GU,1.5
C2518H-M2
Fuel injector-No.3 (T174)
CYL 5
C0524H-1
BO,1.5
C0411H-L3
C0524H-2
GR,1.5
C0411H-M1
Fuel injector-No.4 (T175)
CYL 3
C0525H-1
BG,1.5
C2518H-L4
C0525H-2
GB,1.5
C2518H-M4
Fuel injector-No.5 (T176)
CYL 6
C0526H-1
BR,1.5
C0411H-M3
C0526H-2
GO,1.5
C0411H-M2
Viscous fan (M300)
C2270-D
BO,0.75D
C2274L-12 C2273H-12
BO,0.75
C0411H-K2
C2270-C
KB,0.75D
C2274L-8 C2273H-8
BW,0.75
C2518H-E1
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
C2147-9
N,0.35
C1254-1
Clock spring (S227)
C0082-5
PU,0.35D
C0082-8
R,0.35D
Throttle-EGR-Inlet (Y160)
C0411H-F2
NU,0.75
C0272H-1
C0411H-E1
WU,0.75
C0272H-2
C2518H-J2
RO,0.75
C0272H-4
C2518H-K2
SP,0.75
C0272H-3
C0411H-F1
YU,0.75
C0272H-6
Gold
Sensor-Crankshaft-position (CKP) (T102)
C2518H-G2
NR,0.75
C0168H-3
C2518H-F1
WR,0.75
C0168H-2
C2518H-G1
YR,0.75
C0168H-1
Sensor-Camshaft-position (CMP) (T107)
C2518H-H3
NW,0.75
C0176H-2
C2518H-G4
WP,0.75
C0176H-1
C2518H-H4
YP,0.75
C0176H-3
Sensor-Position-Accelerator pedal (T113)
C0872L-E1
R,0.5D
C2244L-15 C2242L-15
R,0.5D
C0787L-7
C0872L-D1
YR,0.5D
C2244L-16 C2242L-16
YLG,0.5D
C0787L-2
C0872L-C1
RB,0.5D
C2244L-17 C2242L-17
RB,0.5D
C0787L-1
C0872L-B2
U,0.5D
C2244L-22 C2242L-22
U,0.5D
C0787L-3
C0872L-C2
Y,0.5D
C2244L-21 C2242L-21
BG,0.5D
C0787L-5
C0872L-D2
G,0.5D
C2244L-18 C2242L-18
OY,0.5D
C0787L-6
C0872L-C4
R,0.5D
Gold
C2240L-21 C2238-21
C0872L-B4
PU,0.5D
Gold
C2240L-22 C2238-22

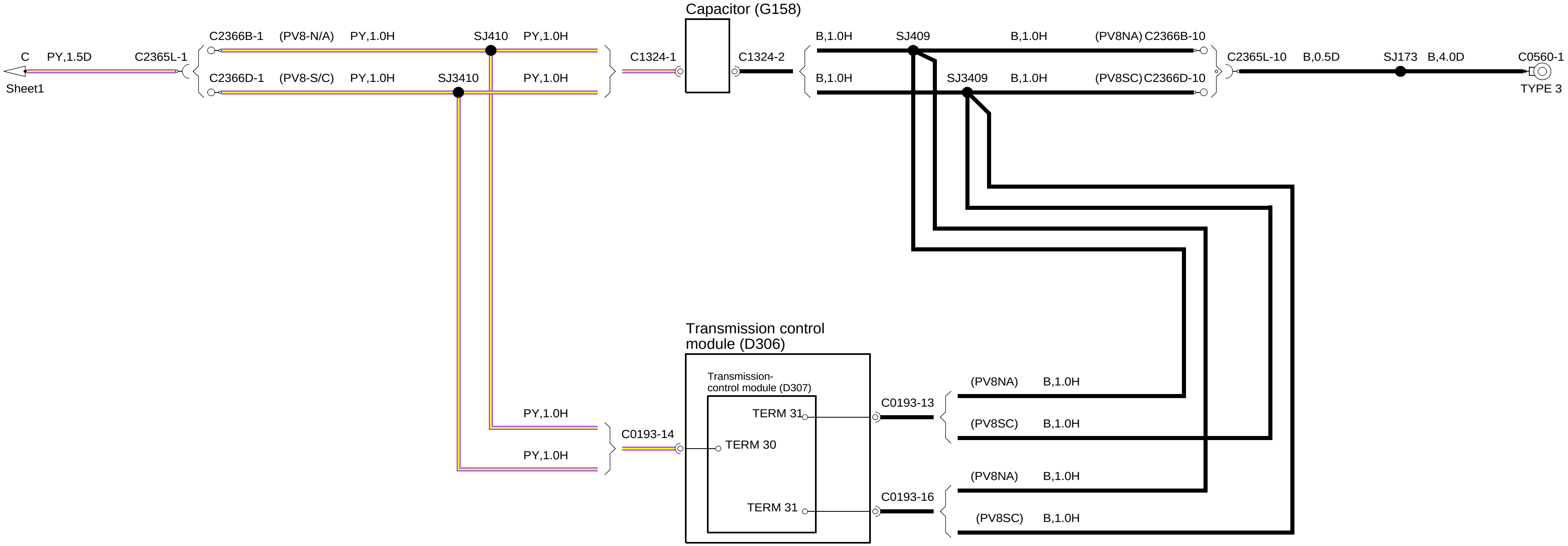

Valve-Control-
Fuel volume (N168)
Engine control-
module (ECM) (D131)
C
Sheet1
RU,1.0
SJ5
RU,0.75
C2260H-1
Silver
C2260H-2
Silver
BU,0.75
C0411H-J4
VCV
PWR GND 1
C0872L-M3
B,1.5D
SJ477
B,2.5D
C2600L-1
TYPE 3
PWR GND 2
C0872L-M1
B,1.5D
Valve-Control-
Fuel pressure (N167)
PWR GND 3
C0872L-M2
B,1.5D
RU,0.75
C2261H-1
Silver
C2261H-2
Silver
BU,0.75
C0411H-K3
PCV
PWR GND 4
C0872L-M4
B,1.5D
Actuator-Vane VGT (D363)
Actuator-Inlet port
deactivation (M341)
Gold
C2267H-5
NR,0.75
J
Sheet2
H2
Sheet1
RB,0.75
C2259H-1
Silver
C2259H-2
Silver
BR,0.75
C0411H-K4
IPDA
TVP_A
C2518H-C4
WB,0.75
C2267H-6
Gold
VGTA +
C2518H-J4
WR,0.75
C2267H-3
Gold
Gold
C2267H-1
YR,0.75
K
Sheet2
VGTA -
C2518H-K4
SR,0.75
C2267H-4
Gold
Fan-E-box (M210)
E
Sheet1
RU,1.5D
SJ559
RU,0.75D
C0646L-2
C0646L-1
R,0.75D
C0872L-J2
EBF
Sensor-Oil-
temperature (T128)
EOT
C0411H-A1
WG,0.75
C1549H-1
Sensor-MAF/IAT (T317)
SGR
C0411H-K1
NG,0.75
C1549H-2
C0567-3
WY,0.75D
C0872L-F1
IAT
C0567-4
B,0.75D
C0872L-L4
MAF/IAT GND
RU,0.75D
C0567-1
C0567-2
R,0.75D
C0872L-F4
MAF_A+
Water in fuel
sensor (T391)
Transmission control
module (D306)
WIF
C0872L-E2
RB,0.5D
C2373L-4 C2374C-4
RB,0.5H
C0735-2
C0193-10
GO,0.5H
C2366H-8 C2365L-8
GO,0.5D
C0872L-E3
PNS
SGK
C0872L-B3
NR,0.5D
C2373L-5 C2374C-5
NR,0.5H
C0735-3
H1
Sheet1
RU,1.0D
C2373L-3 C2374C-3
RU,1.0H
C0735-1
Unit-Fuel Tank (D179)
F
Sheet1
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4

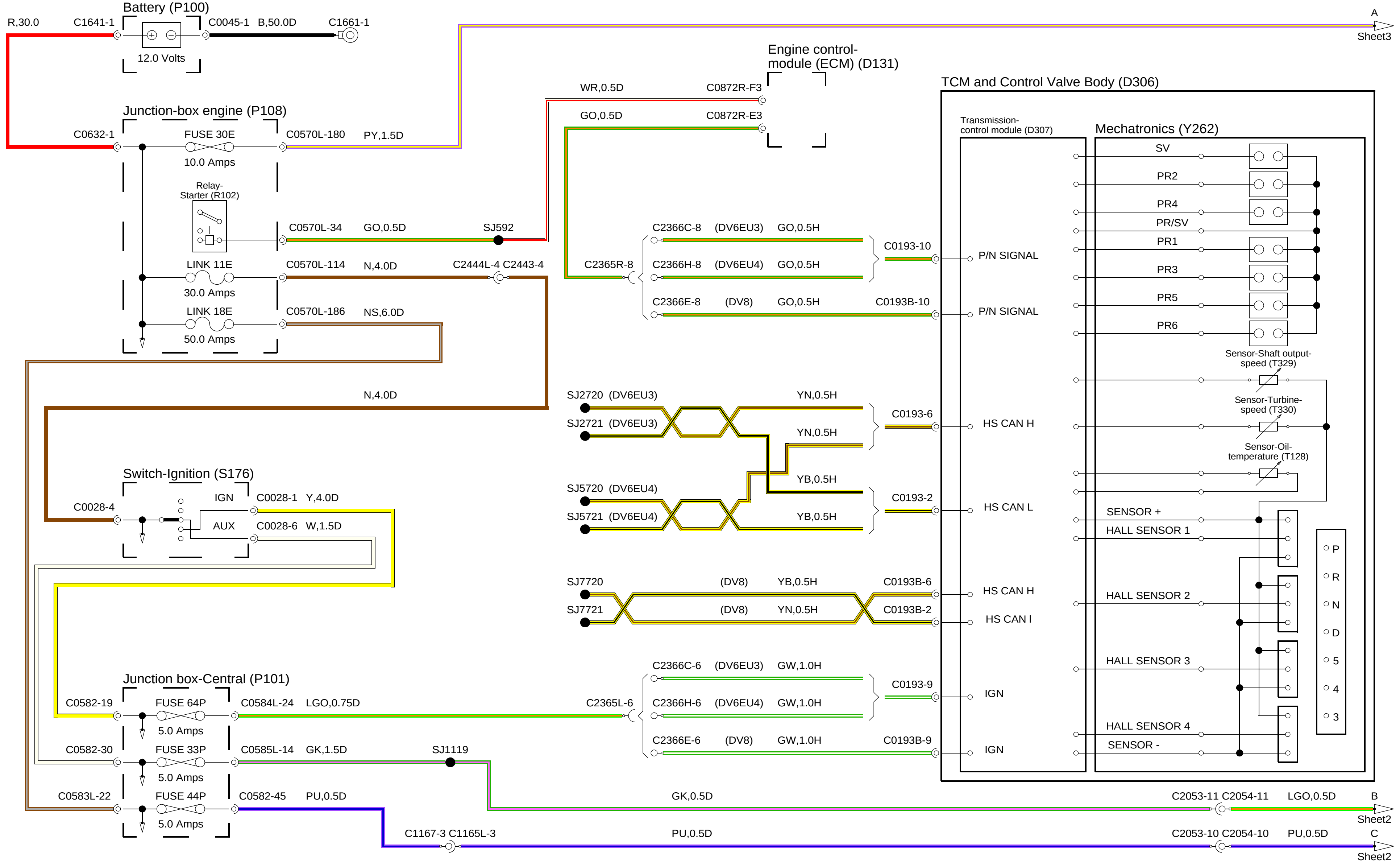

Sensor-Engine coolant-temperature (ECT) (T121)
Gold
Gold
C0169-2 BN,0.75D
C2274L-2 C2273H-2 N,0.75
SJ4 NR,0.75 C2518H-E2
C0169-1 W,0.75D
C2274L-13 C2273H-13
W,0.75 C2518H-C2
Engine control-module (ECM) (D131)
SGC
ECT_1
MAP
VA1_B
ACT
SGQ
ALT_COM
ALT_MON
SGM
EGRA-
EVPA
EGRA+
VA1_F
SGE
RPS
VA1_E
EGRB-
EVPB
EGRB+
B00_1
FTS
HS CAN H
HS CAN L
INI
CNS_B+
CNS_B-
HS CAN H
HS CAN L
CNS_A+
CNS_A-
Generator (M100)
C0053H-2
(DV6 NON ARC) WP,0.75
C0053H-3
(DV6 ARC) WP,0.75
C0411H-H1
(DV6 NON ARC) WG,0.75
C2518H-F2
Generator (M100)
C0226-2 WP,0.75H C0904-2 C0053H-2
(DV6 ARC) WG,0.75
C0226-1 WG,0.75H C0904-3 C0053H-3
Sensor-Pressure-Fuel rail (T264)
Silver C2251H-2 NG,0.75 C0411H-E2
Silver C2251H-1 WG,0.75 C0411H-D1
Silver C2251H-3 YG,0.75 C0411H-D2
ABS module (D277)
C0506L-30 GP,0.75D
SJ882 GP,0.75D C0872L-G2
Stop lamp switch (S215)
C0075L-1 GP,1.5D
SJ814 GP,1.5D
C2411L-2 C2412L-2 GP,1.5D
Restraints Control Module (RCM) (D171)
C1649-17 YG,0.5D
C2242L-7 C2244L-7 YG,0.5D C0872L-E4
C2274L-16 C2273H-16 UR,0.75 C0411H-B4
C2274L-15 C2273H-15 SR,0.75 C0411H-B3
C2518H-C1 WG,0.5 C0186H-2
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186H-3 NG,0.5
C2518H-D1 YR,0.75 SJ2 YG,0.5 C0186H-1
YR,0.75
K
Sheet3
Sensor-Temperature-Air charge (T361)
C2518H-B1 W,0.75 C2870H-1
C2870H-2 N,0.75 SJ3 NR,0.75 J
Sheet3
C2518H-G3 NR,0.75
Actuator-EGR-Electric (D362)
C2518H-D2 NR,0.75 C2254H-6 Gold
C2518H-H2 BU,0.75 C2254H-4 A
C2518H-A3 WR,0.75 C2254H-2 Gold
C2518H-H1 GU,0.75 C2254H-3
C2518H-C3 YR,0.75 SJ1 YR,0.75 C2254H-1 Gold
Actuator-EGR-Electric (D362)
YR,0.75 C2255H-1 Gold Gold C2255H-6 NR,0.75
C2518H-K1 BU,0.75 C2255H-4 B
C2518H-A2 WR,0.75 C2255H-2 Gold
C2518H-J1 GU,0.75 C2255H-3
Sensor-Temperature-Fuel rail (T125)
C2518H-B2 WU,0.75 C0184H-1
C0184H-2 NU,0.75
C0872L-A4 YB,0.5D C2365L-4 C2366H-4
C0872L-A3 YN,0.5D C2365L-5 C2366H-5
Sensor-Knock (KS) (T100)
C0411H-D3 NR,0.75 C0627H-1 Gold
C0411H-C4 WR,0.75 C0627H-2 Gold
Sensor-Knock (KS) (T100)
C0411H-E4 NY,0.75 C0626H-1 Gold
C0411H-D4 WB,0.75 C0626H-2 Gold

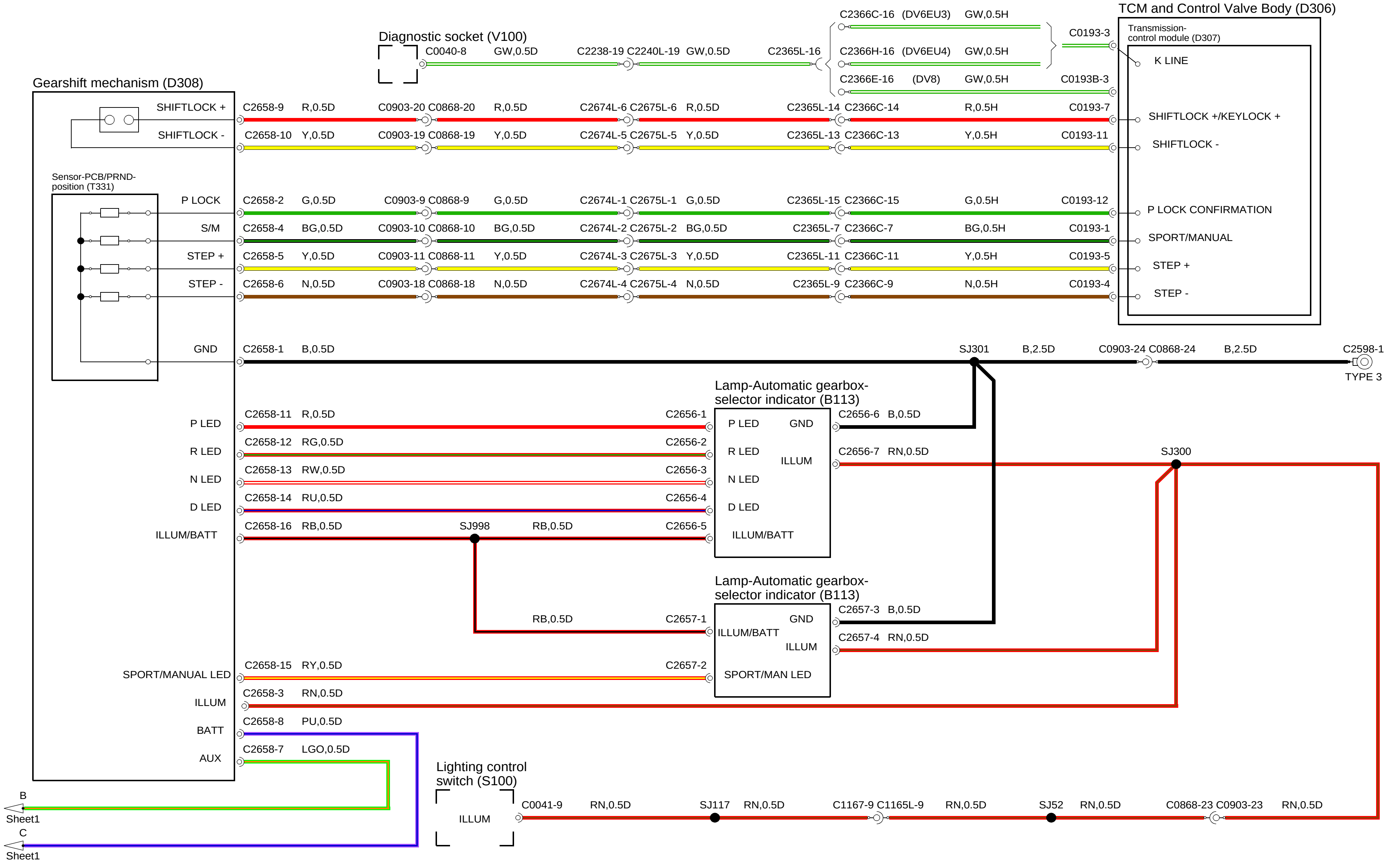

Glow plug (T171)
B
Sheet1
Y,4.0D
SJ902
YB,1.5D
C2581-3 C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-3 C2583-3
GU,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
A
Sheet1
YB,4.0D
SJ901
YB,1.5D
C2582-1 C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-2 C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
L
Sheet1
YB,4.0D
SJ180
YB,1.5D
C2581-1 C2583-1
GO,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-2 C2583-2
GR,1.5
C0477-1
Earth via-
fixings (E110)

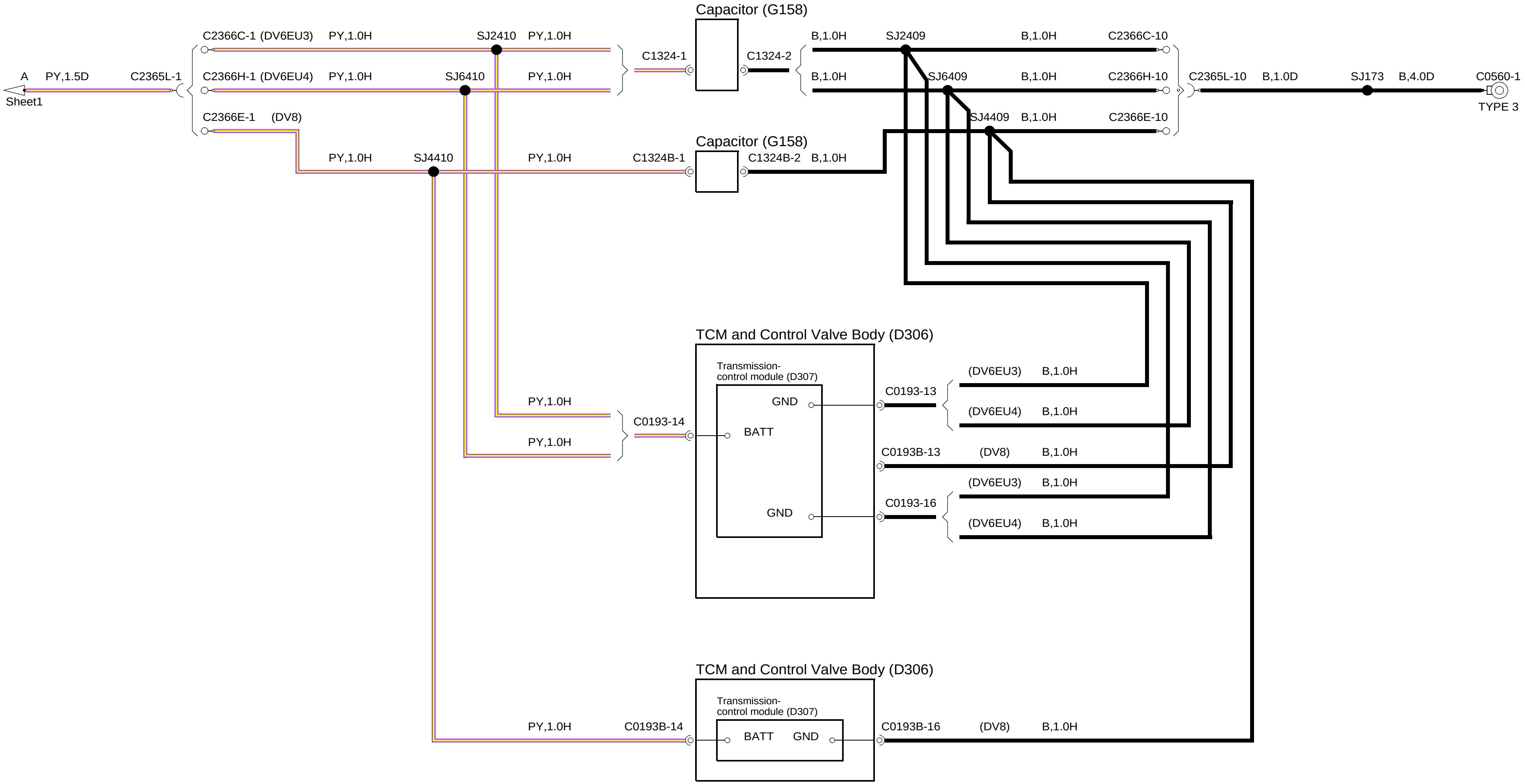

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
C
Sheet3
Transmission control module (D306)
Transmission-control module (D307)
Mechatronics (Y262)
SV
PR2
PR4
PR/SV
PR1
PR3
PR5
PR6
Junction-box engine (P108)
C0632-1
FUSE 30E
10.0 Amps
C0570L-180
PY,1.5D
Relay-Starter (R102)
C0570L-34
GO,0.5D
SJ592
GO,0.5D
C2365L-8
C2366B-8
(PV8NA)
GO,0.5H
C2366D-8
(PV8SC)
GO,0.5H
C0193-10
P/N SIGNAL
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Sensor-Shaft output-speed (T329)
Sensor-Turbine-speed (T330)
N,4.0D
Sensor-Oil-temperature (T128)
SJ720
(PV8NA)
YN,0.5H
SJ3720
(PV8SC)
YN,0.5H
C0193-6
HS CAN H
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
AUX
C0028-6
W,1.5D
SENSOR +
HALL SENSOR 1
P
R
N
D
5
4
3
SJ721
(PV8NA)
YB,0.5H
SJ3721
(PV8SC)
YB,0.5H
C0193-2
HS CAN L
HALL SENSOR 2
HALL SENSOR 3
Central junction-box (P101)
C0582-19
FUSE 64P
5.0 Amps
C0584L-24
LGO,0.75D
C2365L-6
C2366B-6
(PV8NA)
GW,1.0H
C2366D-6
(PV8SC)
GW,1.0H
C0193-9
IGN
HALL SENSOR 4
SENSOR -
C0582-30
FUSE 33P
5.0 Amps
C0585L-14
GK,1.5D
SJ119
C0583L-22
FUSE 44P
5.0 Amps
C0582-45
PU,0.5D
GK,0.5D
C2053-11 C2054-11
LGO,0.5D
A
Sheet2
C1167-3 C1165L-3
PU,0.5D
C2053-10 C2054-10
PU,0.5D
B
Sheet2

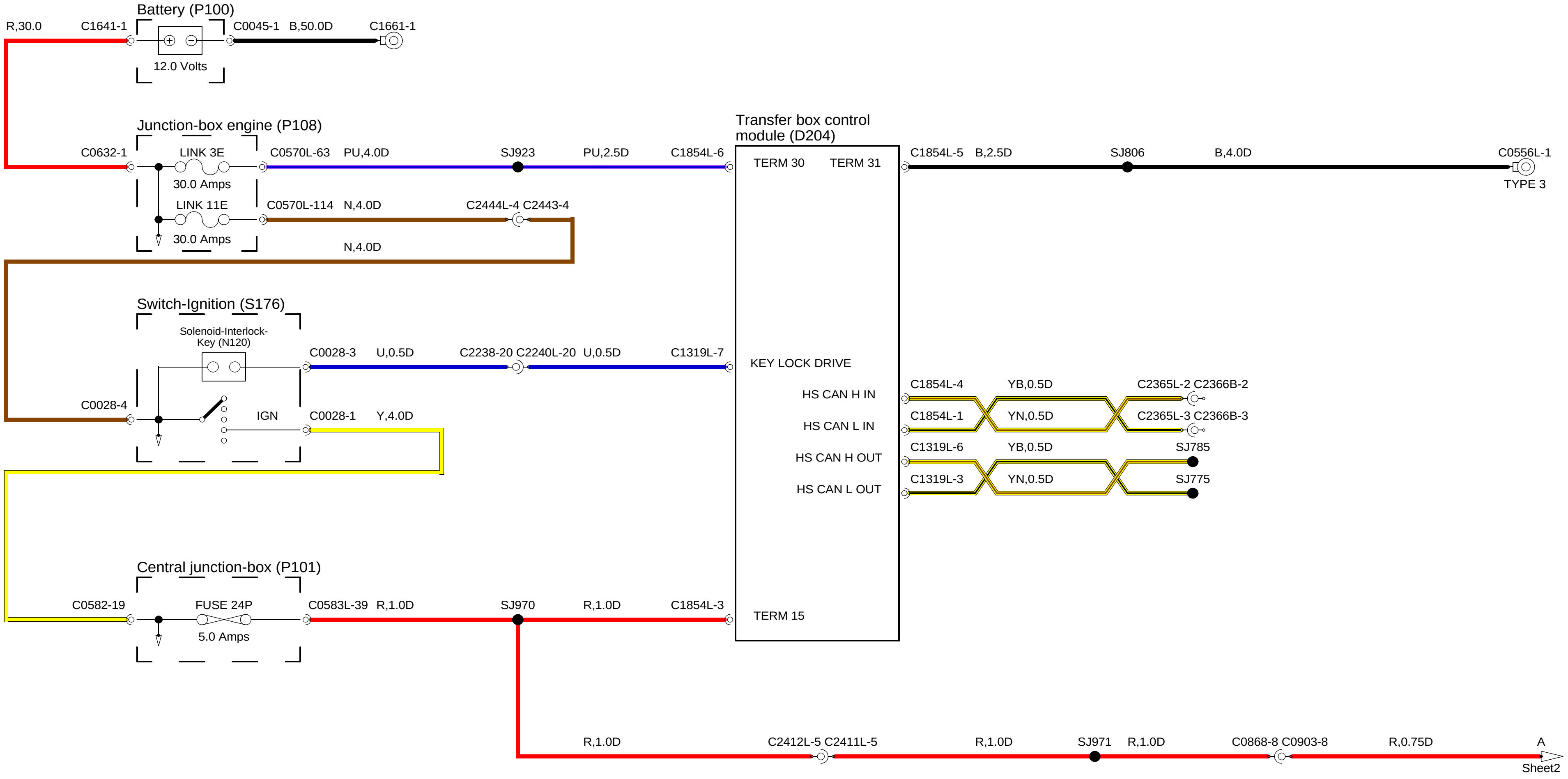

Transmission control module (D306)
Transmission-control module (D307)
K LINE
SHIFTLOCK +/KEYLOCK +
SHIFTLOCK -
P LOCK CONFIRMATION
SPORT/MANUAL
STEP +
STEP -
Diagnostic socket (V100)
C0040-8 GW,0.5D
C2238-19 C2240L-19 GW,0.5D
C2365L-16
C2366B-8 (PV8NA) GW,0.5H
C2366D-8 (PV8SC) GW,0.5H
C0193-3
Gearshift mechanism (D308)
SHIFTLOCK +
SHIFTLOCK -
C2658-9 R,0.5D C0903-20 C0868-20 R,0.5D C2674L-6 C2675L-6 R,0.5D C2365L-14 C2336B-14 R,0.5H C0193-7
C2658-10 Y,0.5D C0903-19 C0868-19 Y,0.5D C2674L-5 C2675L-5 Y,0.5D C2365L-13 C2336B-13 Y,0.5H C0193-11
Sensor-PCB/PRND-position (T331)
P LOCK
C2658-2 G,0.5D C0903-9 C0868-9 G,0.5D C2674L-1 C2675L-1 G,0.5D C2365L-15 C2336B-15 G,0.5H C0193-12
S/M
C2658-4 BG,0.5D C0903-10 C0868-10 BG,0.5D C2674L-2 C2675L-2 BG,0.5D C2365L-7 C2336B-7 BG,0.5H C0193-1
STEP +
C2658-5 Y,0.5D C0903-11 C0868-11 Y,0.5D C2674L-3 C2675L-3 Y,0.5D C2365L-11 C2336B-11 Y,0.5H C0193-5
STEP -
C2658-6 N,0.5D C0903-18 C0868-18 N,0.5D C2674L-4 C2675L-4 N,0.5D C2365L-9 C2336B-9 N,0.5H C0193-4
GND
C2658-1 B,0.5D SJ301 B,2.5D C0903-24 C0868-24 B,2.5D C2598-1
TYPE 3
Lamp-Automatic gearbox-selector indicator (B113)
P LED C2658-11 R,0.5D C2656-1
R LED C2658-12 RG,0.5D C2656-2
N LED C2658-13 RW,0.5D C2656-3
D LED C2658-14 RU,0.5D C2656-4
ILLUM/BATT C2658-16 RB,0.5D SJ998 RB,0.5D C2656-5
P LED
GND
R LED
ILLUM
N LED
D LED
ILLUM/BATT
C2656-6 B,0.5D
C2656-7 RN,0.5D
SJ300
Lamp-Automatic gearbox-selector indicator (B113)
RB,0.5D C2657-1
GND
ILLUM/BATT
ILLUM
C2657-3 B,0.5D
C2657-4 RN,0.5D
SPORT/MANUAL LED C2658-15 RY,0.5D C2657-2
SPORT/MANUAL LED
ILLUM C2658-3 RN,0.5D
BATT C2658-8 PU,0.5D
AUX C2658-7 LGO,0.5D
A
Sheet1
B
Sheet1
Lighting control switch (S100)
ILLUM
C0041-9 RN,0.5D SJ117 RN,0.5D C1167-9 C1165L-9 RN,0.5D SJ52 RN,0.5D C0868-23 C0903-23 RN,0.5D

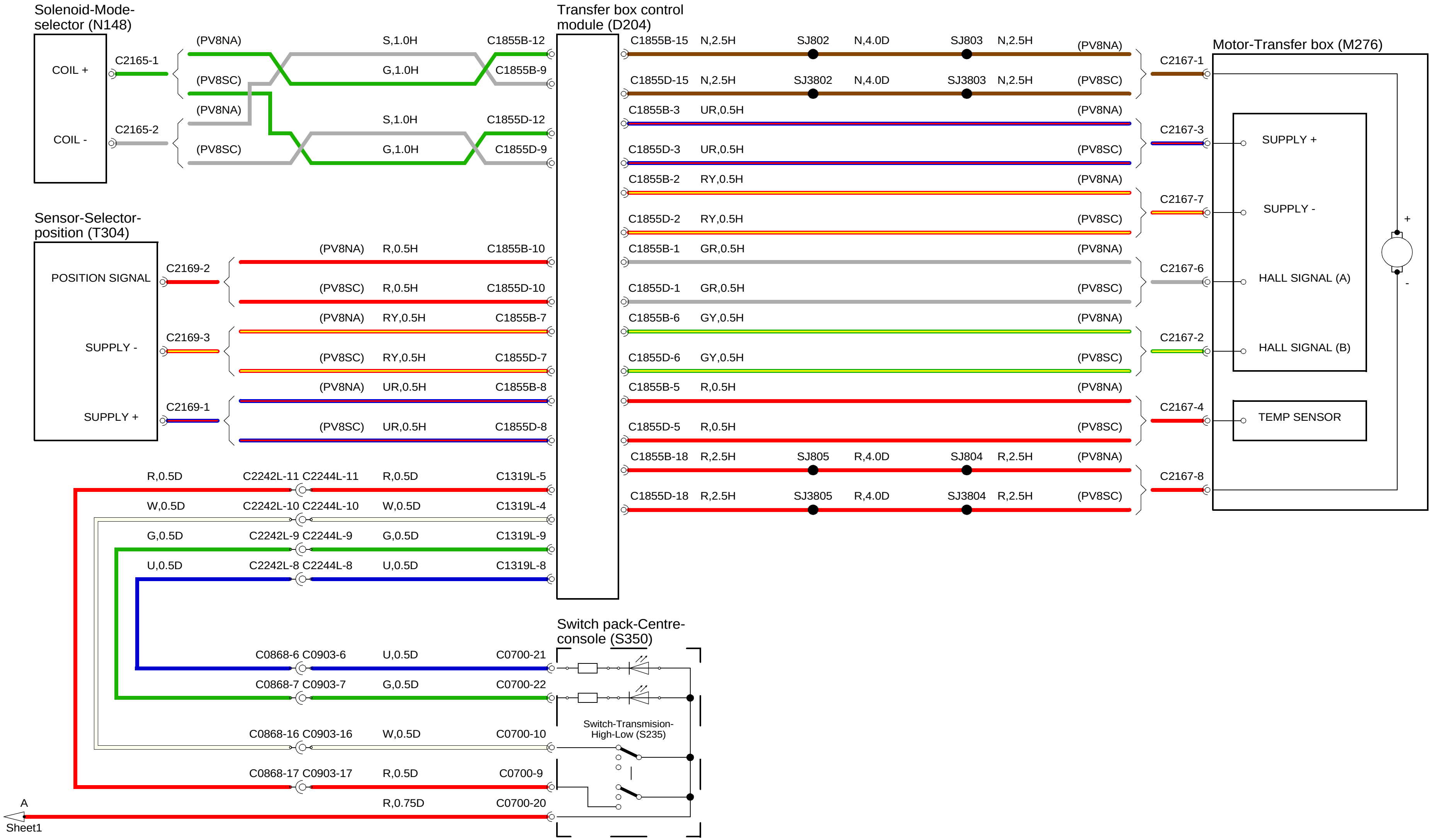

Capacitor (G158)
C
PY,1.5D
C2365L-1
Sheet1
C2366B-1
(PV8-N/A)
PY,1.0H
SJ410
PY,1.0H
C2366D-1
(PV8-S/C)
PY,1.0H
SJ3410
PY,1.0H
C1324-1
C1324-2
B,1.0H
SJ409
B,1.0H
(PV8NA) C2366B-10
B,1.0H
SJ3409
B,1.0H
(PV8SC) C2366D-10
C2365L-10
B,0.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Transmission control module (D306)
Transmission-control module (D307)
TERM 31
TERM 30
TERM 31
PY,1.0H
C0193-14
PY,1.0H
C0193-13
(PV8NA)
B,1.0H
(PV8SC)
B,1.0H
C0193-16
(PV8NA)
B,1.0H
(PV8SC)
B,1.0H

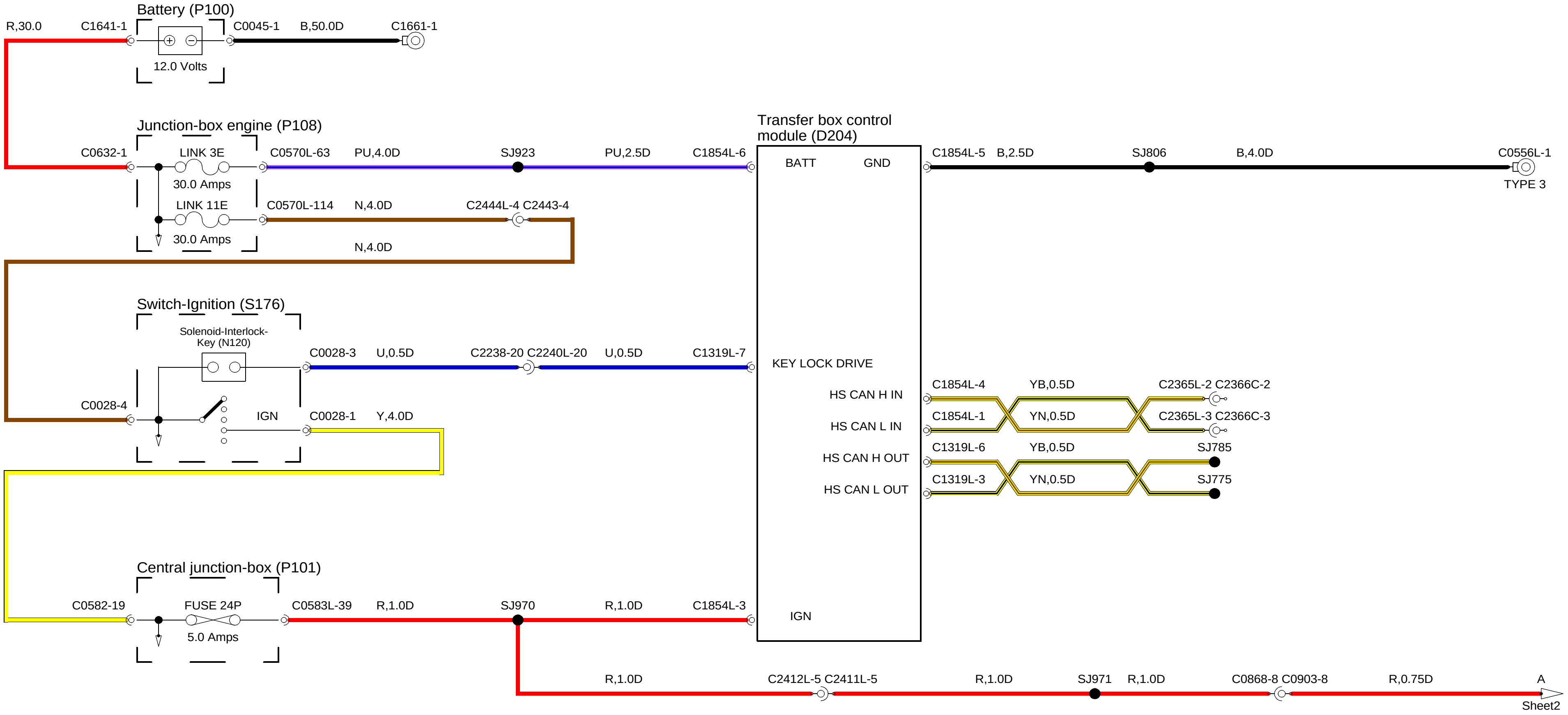

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
A
Sheet3
Engine control-module (ECM) (D131)
WR,0.5D
C0872R-F3
GO,0.5D
C0872R-E3
TCM and Control Valve Body (D306)
Transmission-control module (D307)
Mechatronics (Y262)
Junction-box engine (P108)
C0632-1
FUSE 30E
10.0 Amps
C0570L-180
PY,1.5D
Relay-Starter (R102)
C0570L-34
GO,0.5D
SJ592
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
C2365R-8
C2366C-8 (DV6EU3) GO,0.5H
C2366H-8 (DV6EU4) GO,0.5H
C2366E-8 (DV8) GO,0.5H
C0193-10
C0193B-10
P/N SIGNAL
P/N SIGNAL
SV
PR2
PR4
PR/SV
PR1
PR3
PR5
PR6
Sensor-Shaft output-speed (T329)
Sensor-Turbine-speed (T330)
Sensor-Oil-temperature (T128)
N,4.0D
SJ2720 (DV6EU3)
SJ2721 (DV6EU3)
YN,0.5H
YN,0.5H
C0193-6
HS CAN H
SJ5720 (DV6EU4)
SJ5721 (DV6EU4)
YB,0.5H
YB,0.5H
C0193-2
HS CAN L
Switch-Ignition (S176)
C0028-4
IGN
AUX
C0028-1 Y,4.0D
C0028-6 W,1.5D
SENSOR +
HALL SENSOR 1
P
R
N
D
5
4
3
SJ7720
SJ7721
(DV8) YB,0.5H
(DV8) YN,0.5H
C0193B-6
C0193B-2
HS CAN H
HS CAN I
HALL SENSOR 2
HALL SENSOR 3
HALL SENSOR 4
SENSOR -
Junction box-Central (P101)
C0582-19
FUSE 64P
5.0 Amps
C0584L-24 LGO,0.75D
C2365L-6
C2366C-6 (DV6EU3) GW,1.0H
C2366H-6 (DV6EU4) GW,1.0H
C2366E-6 (DV8) GW,1.0H
C0193-9
C0193B-9
IGN
IGN
C0582-30
FUSE 33P
5.0 Amps
C0585L-14 GK,1.5D
SJ1119
C0583L-22
FUSE 44P
5.0 Amps
C0582-45 PU,0.5D
GK,0.5D
C2053-11 C2054-11 LGO,0.5D
B
Sheet2
C1167-3 C1165L-3
PU,0.5D
C2053-10 C2054-10 PU,0.5D
C
Sheet2

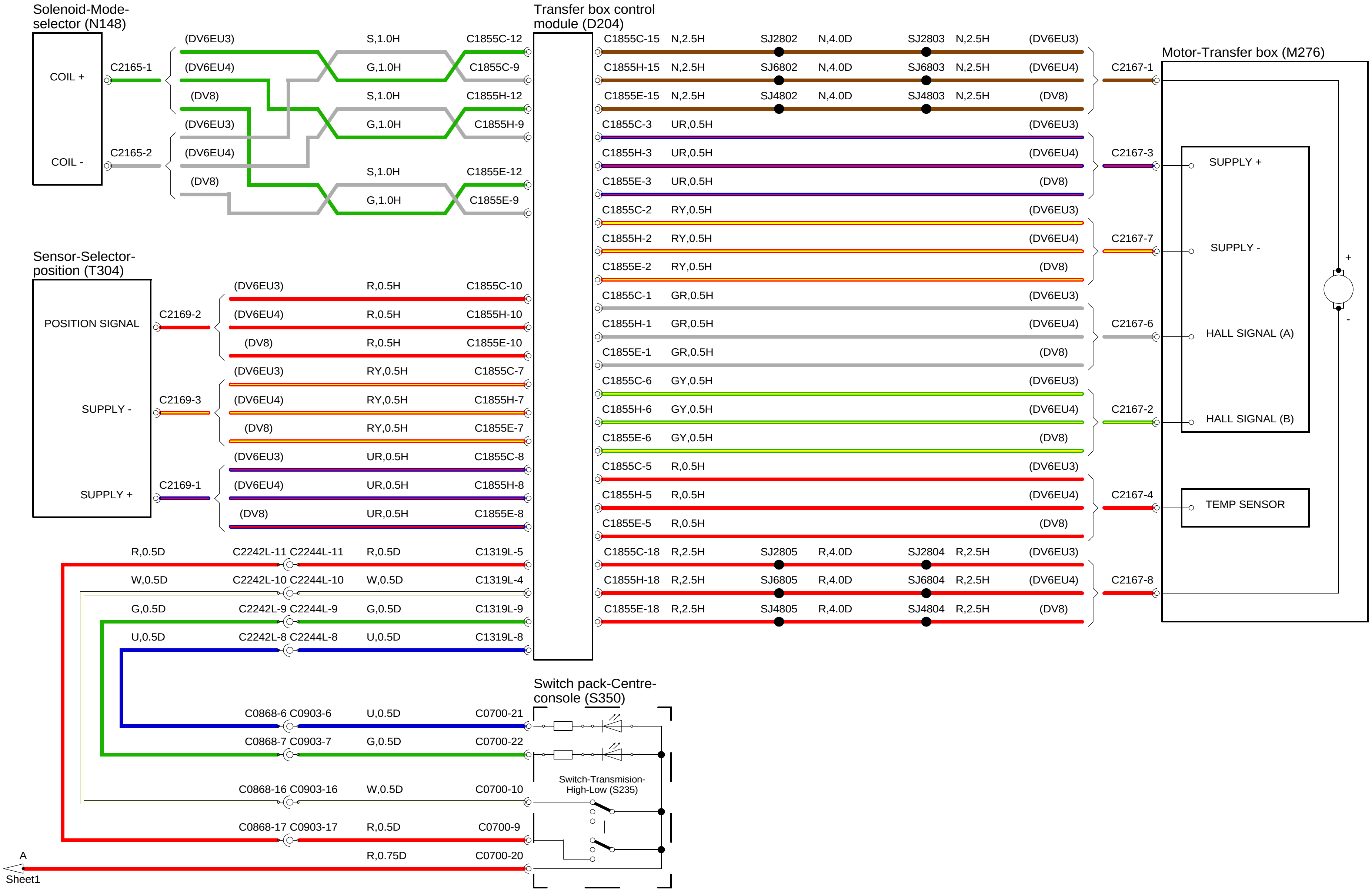

Diagnostic socket (V100)
C0040-8
GW,0.5D
C2238-19 C2240L-19
GW,0.5D
C2365L-16
C2366C-16 (DV6EU3) GW,0.5H
C2366H-16 (DV6EU4) GW,0.5H
C2366E-16 (DV8) GW,0.5H
C0193-3
C0193B-3
TCM and Control Valve Body (D306)
Transmission-control module (D307)
K LINE
SHIFTLOCK +/KEYLOCK +
SHIFTLOCK -
P LOCK CONFIRMATION
SPORT/MANUAL
STEP +
STEP -
Gearshift mechanism (D308)
SHIFTLOCK +
SHIFTLOCK -
C2658-9 R,0.5D
C0903-20 C0868-20 R,0.5D
C2674L-6 C2675L-6 R,0.5D
C2365L-14 C2366C-14 R,0.5H
C0193-7
C2658-10 Y,0.5D
C0903-19 C0868-19 Y,0.5D
C2674L-5 C2675L-5 Y,0.5D
C2365L-13 C2366C-13 Y,0.5H
C0193-11
Sensor-PCB/PRND-position (T331)
P LOCK
C2658-2 G,0.5D
C0903-9 C0868-9 G,0.5D
C2674L-1 C2675L-1 G,0.5D
C2365L-15 C2366C-15 G,0.5H
C0193-12
S/M
C2658-4 BG,0.5D
C0903-10 C0868-10 BG,0.5D
C2674L-2 C2675L-2 BG,0.5D
C2365L-7 C2366C-7 BG,0.5H
C0193-1
STEP +
C2658-5 Y,0.5D
C0903-11 C0868-11 Y,0.5D
C2674L-3 C2675L-3 Y,0.5D
C2365L-11 C2366C-11 Y,0.5H
C0193-5
STEP -
C2658-6 N,0.5D
C0903-18 C0868-18 N,0.5D
C2674L-4 C2675L-4 N,0.5D
C2365L-9 C2366C-9 N,0.5H
C0193-4
GND
C2658-1 B,0.5D
SJ301 B,2.5D
C0903-24 C0868-24 B,2.5D
C2598-1
TYPE 3
Lamp-Automatic gearbox-selector indicator (B113)
P LED
C2658-11 R,0.5D
C2656-1
R LED
C2658-12 RG,0.5D
C2656-2
N LED
C2658-13 RW,0.5D
C2656-3
D LED
C2658-14 RU,0.5D
C2656-4
ILLUM/BATT
C2658-16 RB,0.5D
SJ998 RB,0.5D
C2656-5
P LED
GND
R LED
ILLUM
N LED
D LED
ILLUM/BATT
C2656-6 B,0.5D
C2656-7 RN,0.5D
SJ300
Lamp-Automatic gearbox-selector indicator (B113)
C2657-3 B,0.5D
GND
RB,0.5D
C2657-1
ILLUM/BATT
ILLUM
C2657-4 RN,0.5D
SPORT/MANUAL LED
C2658-15 RY,0.5D
C2657-2
SPORT/MAN LED
ILLUM
C2658-3 RN,0.5D
BATT
C2658-8 PU,0.5D
AUX
C2658-7 LGO,0.5D
B
Sheet1
C
Sheet1
Lighting control switch (S100)
ILLUM
C0041-9 RN,0.5D
SJ117 RN,0.5D
C1167-9 C1165L-9 RN,0.5D
SJ52 RN,0.5D
C0868-23 C0903-23 RN,0.5D

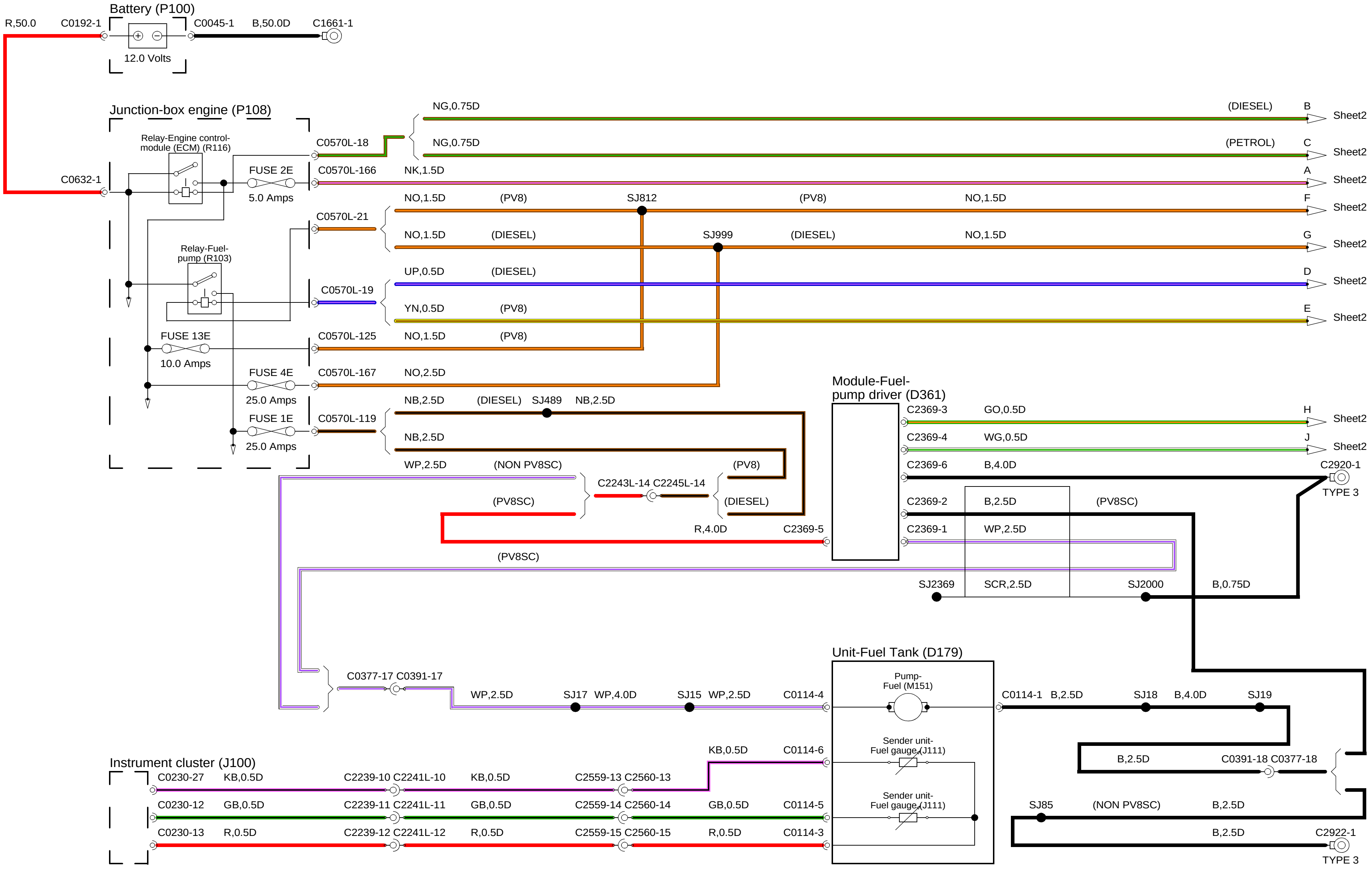

Capacitor (G158)
C2366C-1 (DV6EU3)
PY,1.0H
SJ2410
PY,1.0H
C1324-1
C1324-2
B,1.0H
SJ2409
B,1.0H
C2366C-10
A
PY,1.5D
C2365L-1
Sheet1
C2366H-1 (DV6EU4)
PY,1.0H
SJ6410
PY,1.0H
B,1.0H
SJ6409
B,1.0H
C2366H-10
C2365L-10
B,1.0D
SJ173
B,4.0D
C0560-1
TYPE 3
C2366E-1 (DV8)
SJ4409
B,1.0H
C2366E-10
Capacitor (G158)
PY,1.0H
SJ4410
PY,1.0H
C1324B-1
C1324B-2
B,1.0H
TCM and Control Valve Body (D306)
Transmission-control module (D307)
GND
BATT
GND
PY,1.0H
C0193-14
PY,1.0H
C0193-13
(DV6EU3) B,1.0H
(DV6EU4) B,1.0H
C0193B-13 (DV8) B,1.0H
(DV6EU3) B,1.0H
C0193-16
(DV6EU4) B,1.0H
TCM and Control Valve Body (D306)
Transmission-control module (D307)
BATT
GND
PY,1.0H
C0193B-14
C0193B-16 (DV8) B,1.0H

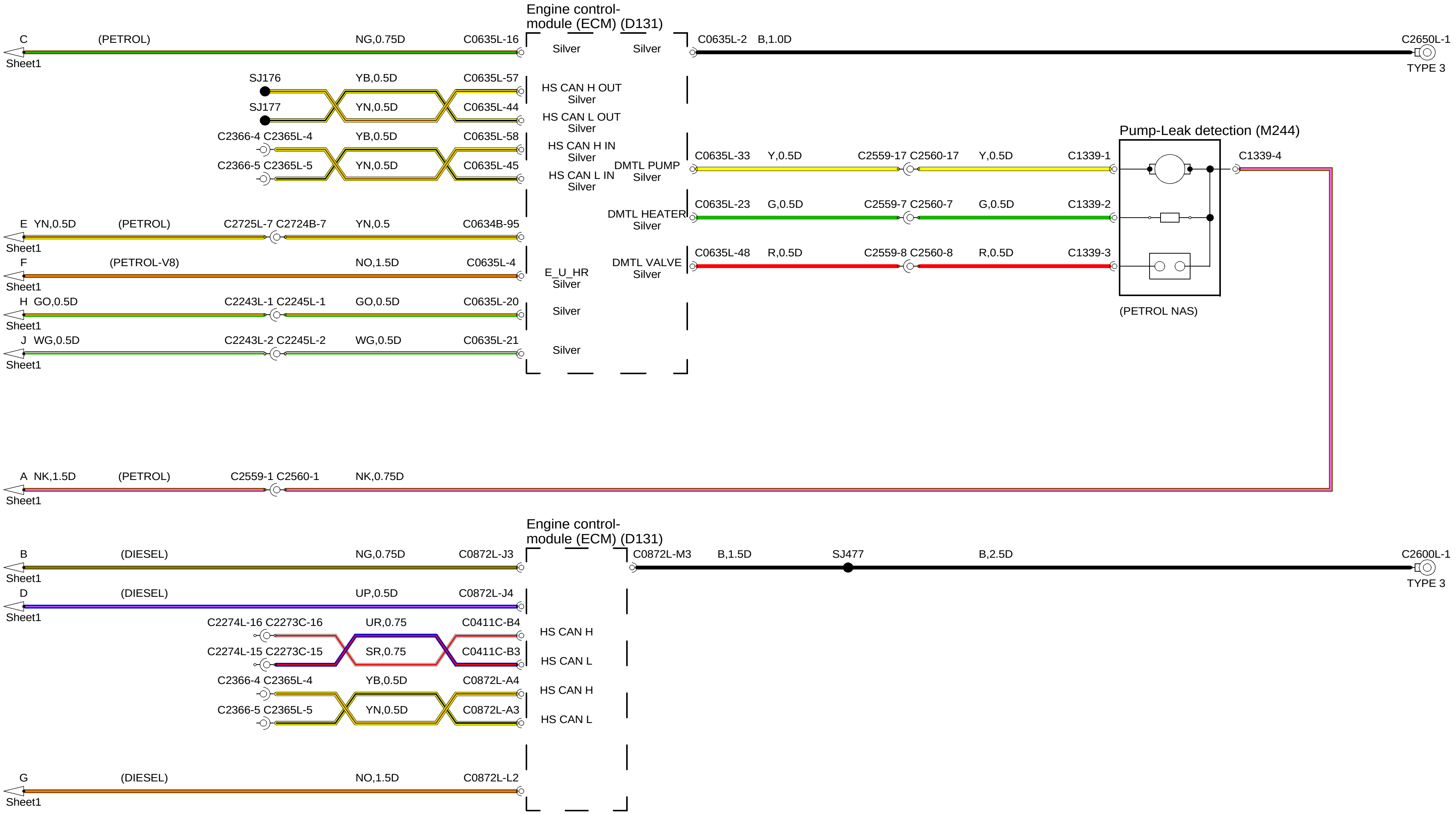

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 3E
30.0 Amps
C0570L-63
PU,4.0D
SJ923
PU,2.5D
C1854L-6
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Transfer box control module (D204)
TERM 30
TERM 31
C1854L-5
B,2.5D
SJ806
B,4.0D
C0556L-1
TYPE 3
Switch-Ignition (S176)
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240L-20
U,0.5D
C1319L-7
KEY LOCK DRIVE
C0028-4
IGN
C0028-1
Y,4.0D
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
C1854L-4
YB,0.5D
C2365L-2 C2366B-2
C1854L-1
YN,0.5D
C2365L-3 C2366B-3
C1319L-6
YB,0.5D
SJ785
C1319L-3
YN,0.5D
SJ775
Central junction-box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D
SJ970
R,1.0D
C1854L-3
TERM 15
R,1.0D
C2412L-5 C2411L-5
R,1.0D
SJ971
R,1.0D
C0868-8 C0903-8
R,0.75D
A
Sheet2

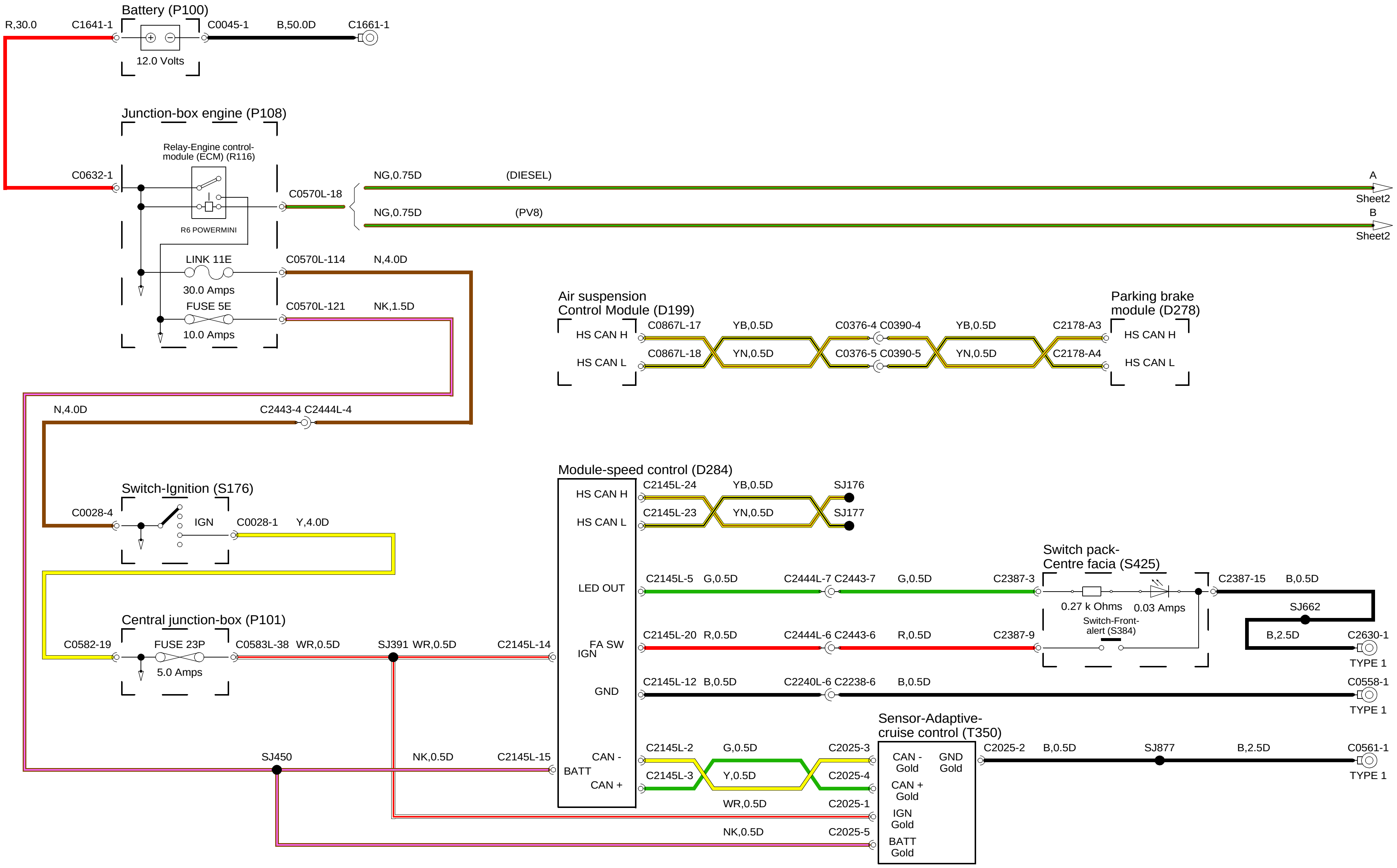

Solenoid-Mode-selector (N148)
COIL +
COIL -
C2165-1
C2165-2
(PV8NA)
(PV8SC)
S,1.0H
G,1.0H
C1855B-12
C1855B-9
C1855D-12
C1855D-9
Transfer box control module (D204)
Sensor-Selector-position (T304)
POSITION SIGNAL
SUPPLY -
SUPPLY +
C2169-2
C2169-3
C2169-1
R,0.5H
RY,0.5H
UR,0.5H
C1855B-10
C1855D-10
C1855B-7
C1855D-7
C1855B-8
C1855D-8
R,0.5D
W,0.5D
G,0.5D
U,0.5D
C2242L-11 C2244L-11
C2242L-10 C2244L-10
C2242L-9 C2244L-9
C2242L-8 C2244L-8
C1319L-5
C1319L-4
C1319L-9
C1319L-8
C1855B-15
C1855D-15
N,2.5H
N,4.0D
SJ802
SJ803
SJ3802
SJ3803
C1855B-3
C1855D-3
C1855B-2
C1855D-2
C1855B-1
C1855D-1
GR,0.5H
C1855B-6
C1855D-6
GY,0.5H
C1855B-5
C1855D-5
C1855B-18
C1855D-18
R,2.5H
R,4.0D
SJ805
SJ804
SJ3805
SJ3804
Motor-Transfer box (M276)
C2167-1
C2167-3
C2167-7
C2167-6
C2167-2
C2167-4
C2167-8
SUPPLY +
SUPPLY -
HALL SIGNAL (A)
HALL SIGNAL (B)
TEMP SENSOR
+
-
Switch pack-Centre-console (S350)
C0868-6 C0903-6
C0868-7 C0903-7
C0868-16 C0903-16
C0868-17 C0903-17
C0700-21
C0700-22
C0700-10
C0700-9
C0700-20
R,0.75D
Switch-Transmision-High-Low (S235)
A
Sheet1

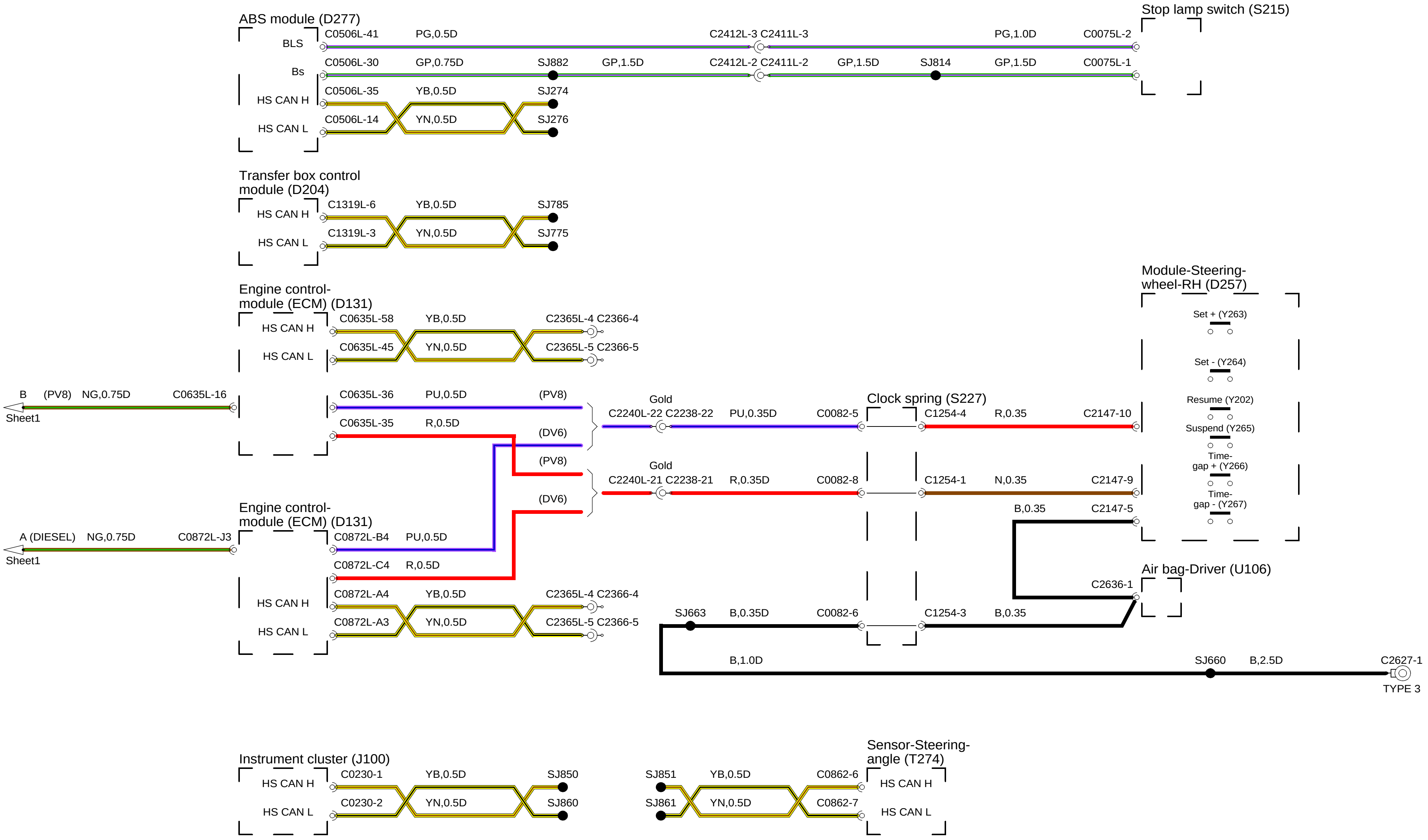

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 3E
30.0 Amps
LINK 11E
30.0 Amps
C0570L-63
PU,4.0D
SJ923
PU,2.5D
C1854L-6
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Transfer box control module (D204)
BATT
GND
C1854L-5
B,2.5D
SJ806
B,4.0D
C0556L-1
TYPE 3
Switch-Ignition (S176)
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240L-20
U,0.5D
C1319L-7
KEY LOCK DRIVE
C0028-4
IGN
C0028-1
Y,4.0D
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
C1854L-4
YB,0.5D
C2365L-2 C2366C-2
C1854L-1
YN,0.5D
C2365L-3 C2366C-3
C1319L-6
YB,0.5D
SJ785
C1319L-3
YN,0.5D
SJ775
Central junction-box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D
SJ970
R,1.0D
C1854L-3
IGN
R,1.0D
C2412L-5 C2411L-5
R,1.0D
SJ971
R,1.0D
C0868-8 C0903-8
R,0.75D
A
Sheet2

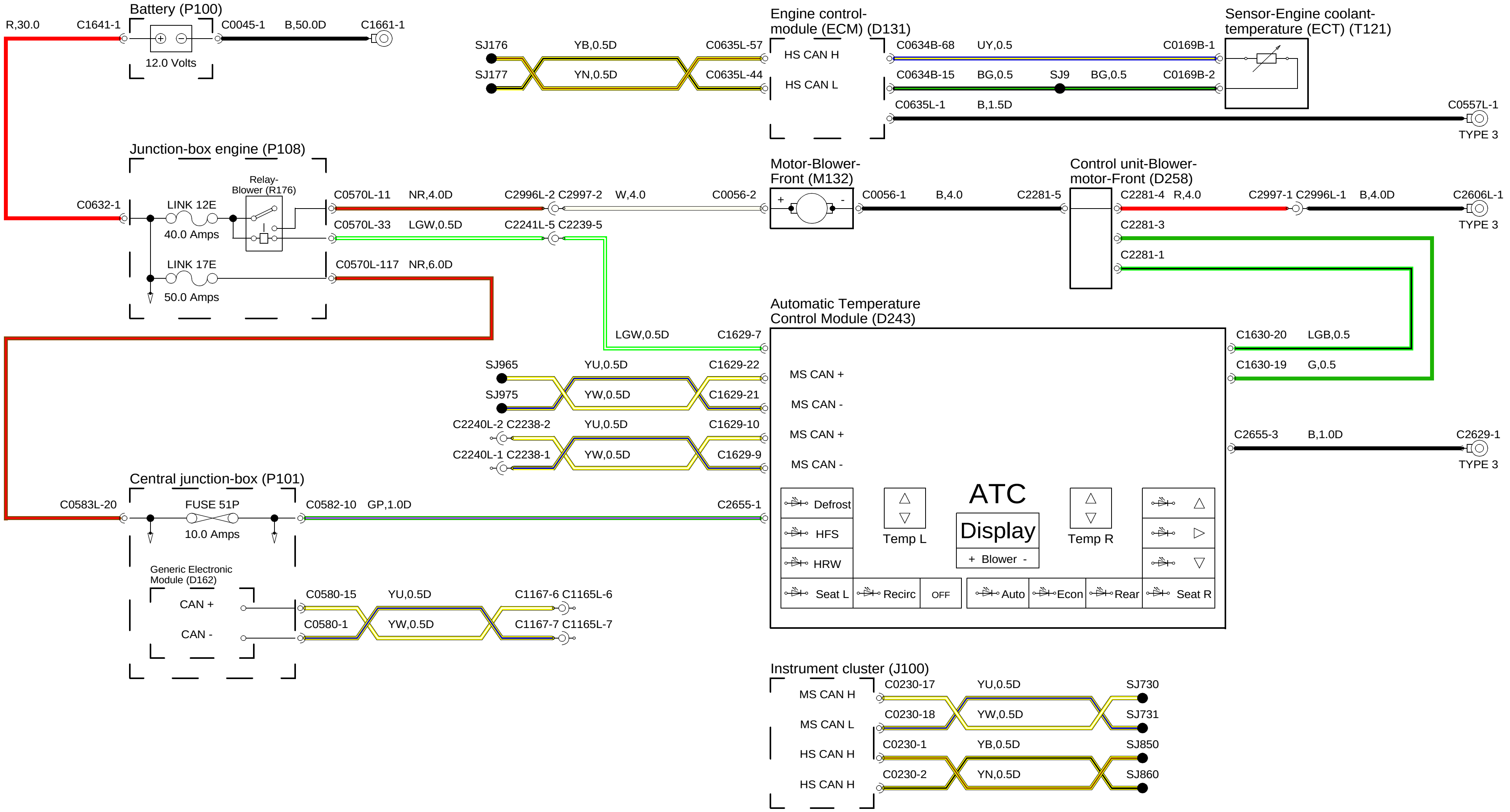

Solenoid-Mode-selector (N148)
COIL +
COIL -
C2165-1
C2165-2
(DV6EU3)
(DV6EU4)
(DV8)
S,1.0H
G,1.0H
C1855C-12
C1855C-9
C1855H-12
C1855H-9
C1855E-12
C1855E-9
Transfer box control module (D204)
Sensor-Selector-position (T304)
POSITION SIGNAL
SUPPLY -
SUPPLY +
C2169-2
C2169-3
C2169-1
R,0.5H
RY,0.5H
UR,0.5H
C1855C-10
C1855H-10
C1855E-10
C1855C-7
C1855H-7
C1855E-7
C1855C-8
C1855H-8
C1855E-8
R,0.5D
W,0.5D
G,0.5D
U,0.5D
C2242L-11 C2244L-11
C2242L-10 C2244L-10
C2242L-9 C2244L-9
C2242L-8 C2244L-8
C1319L-5
C1319L-4
C1319L-9
C1319L-8
C1855C-15
C1855H-15
C1855E-15
N,2.5H
N,4.0D
SJ2802
SJ2803
SJ6802
SJ6803
SJ4802
SJ4803
C1855C-3
C1855H-3
C1855E-3
C1855C-2
C1855H-2
C1855E-2
C1855C-1
C1855H-1
C1855E-1
GR,0.5H
C1855C-6
C1855H-6
C1855E-6
GY,0.5H
C1855C-5
C1855H-5
C1855E-5
C1855C-18
C1855H-18
C1855E-18
R,2.5H
R,4.0D
SJ2805
SJ2804
SJ6805
SJ6804
SJ4805
SJ4804
Motor-Transfer box (M276)
C2167-1
C2167-3
C2167-7
C2167-6
C2167-2
C2167-4
C2167-8
SUPPLY +
SUPPLY -
HALL SIGNAL (A)
HALL SIGNAL (B)
TEMP SENSOR
+
-
Switch pack-Centre-console (S350)
C0868-6 C0903-6
C0868-7 C0903-7
C0868-16 C0903-16
C0868-17 C0903-17
U,0.5D
G,0.5D
W,0.5D
R,0.5D
R,0.75D
C0700-21
C0700-22
C0700-10
C0700-9
C0700-20
Switch-Transmision-High-Low (S235)
A
Sheet1

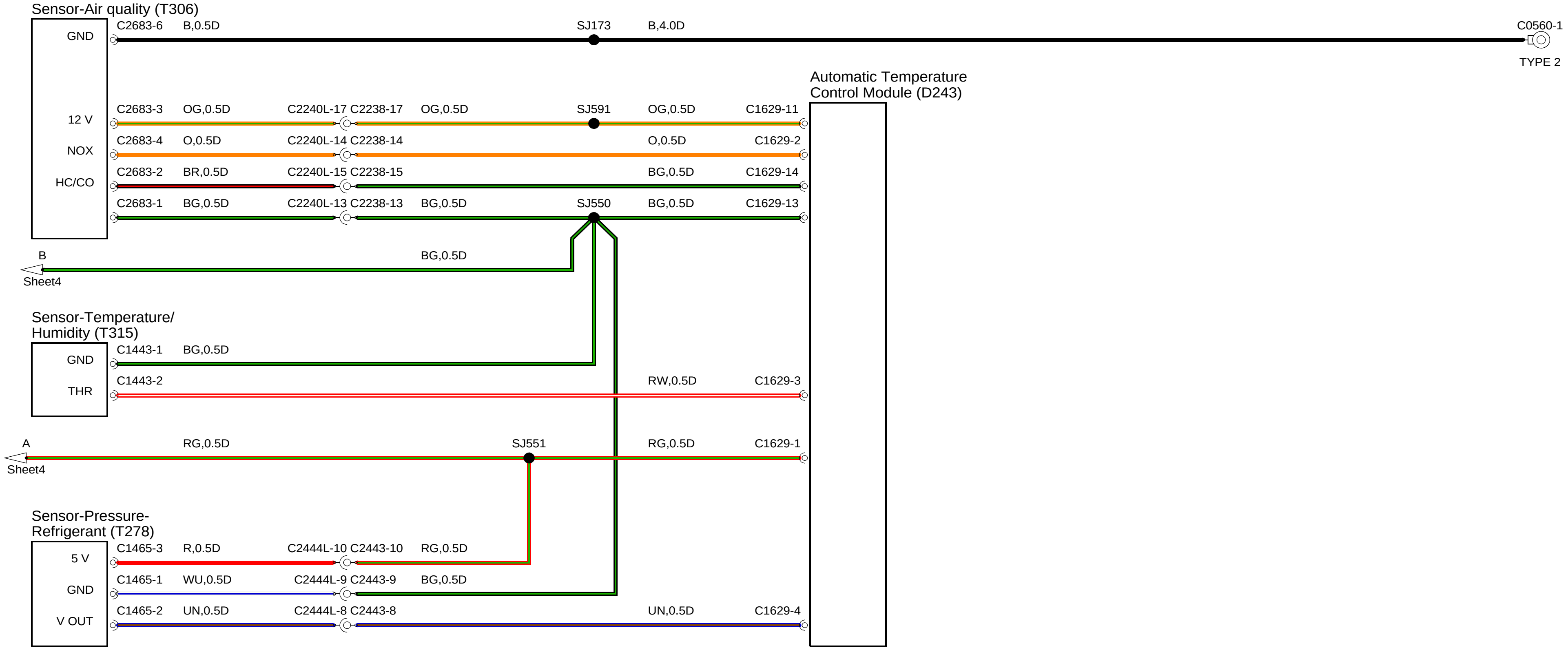

Battery (P100)
R,50.0
C0192-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
FUSE 2E
5.0 Amps
Relay-Fuel-pump (R103)
FUSE 13E
10.0 Amps
FUSE 4E
25.0 Amps
FUSE 1E
25.0 Amps
C0570L-18
C0570L-166
C0570L-21
C0570L-19
C0570L-125
C0570L-167
C0570L-119
NG,0.75D
(DIESEL)
B
Sheet2
NG,0.75D
(PETROL)
C
Sheet2
NK,1.5D
A
Sheet2
NO,1.5D
(PV8)
SJ812
(PV8)
NO,1.5D
F
Sheet2
NO,1.5D
(DIESEL)
SJ999
(DIESEL)
NO,1.5D
G
Sheet2
UP,0.5D
(DIESEL)
D
Sheet2
YN,0.5D
(PV8)
E
Sheet2
NO,1.5D
(PV8)
NO,2.5D
NB,2.5D
(DIESEL)
SJ489
NB,2.5D
NB,2.5D
WP,2.5D
(NON PV8SC)
(PV8)
C2243L-14 C2245L-14
(PV8SC)
(DIESEL)
R,4.0D
C2369-5
(PV8SC)
Module-Fuel-pump driver (D361)
C2369-3
GO,0.5D
H
Sheet2
C2369-4
WG,0.5D
J
Sheet2
C2369-6
B,4.0D
C2920-1
TYPE 3
C2369-2
B,2.5D
(PV8SC)
C2369-1
WP,2.5D
SJ2369
SCR,2.5D
SJ2000
B,0.75D
Unit-Fuel Tank (D179)
Pump-Fuel (M151)
Sender unit-Fuel gauge (J111)
Sender unit-Fuel gauge (J111)
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
C0114-1
B,2.5D
SJ18
B,4.0D
SJ19
B,2.5D
C0391-18 C0377-18
KB,0.5D
C0114-6
Instrument cluster (J100)
C0230-27
KB,0.5D
C2239-10 C2241L-10
KB,0.5D
C2559-13 C2560-13
C0230-12
GB,0.5D
C2239-11 C2241L-11
GB,0.5D
C2559-14 C2560-14
GB,0.5D
C0114-5
C0230-13
R,0.5D
C2239-12 C2241L-12
R,0.5D
C2559-15 C2560-15
R,0.5D
C0114-3
SJ85
(NON PV8SC)
B,2.5D
B,2.5D
C2922-1
TYPE 3

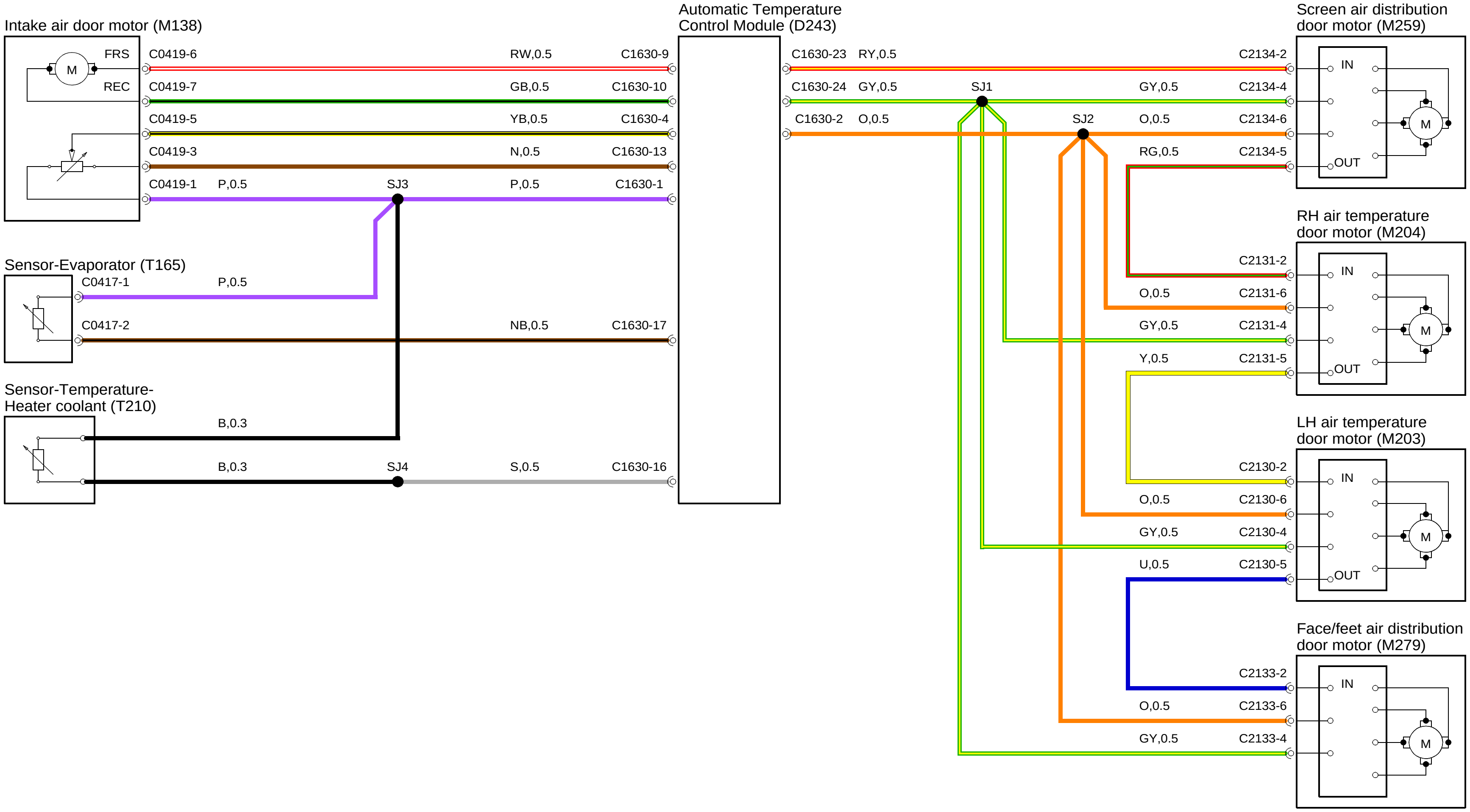

Engine control-
module (ECM) (D131)
C
(PETROL)
NG,0.75D
C0635L-16
Sheet1
Silver
Silver
C0635L-2
B,1.0D
C2650L-1
TYPE 3
SJ176
YB,0.5D
C0635L-57
HS CAN H OUT
Silver
SJ177
YN,0.5D
C0635L-44
HS CAN L OUT
Silver
C2366-4 C2365L-4
YB,0.5D
C0635L-58
HS CAN H IN
Silver
C2366-5 C2365L-5
YN,0.5D
C0635L-45
HS CAN L IN
Silver
Pump-Leak detection (M244)
C0635L-33
Y,0.5D
C2559-17 C2560-17
Y,0.5D
C1339-1
C1339-4
DMTL PUMP
Silver
C0635L-23
G,0.5D
C2559-7 C2560-7
G,0.5D
C1339-2
DMTL HEATER
Silver
E
YN,0.5D
(PETROL)
C2725L-7 C2724B-7
YN,0.5
C0634B-95
Sheet1
C0635L-48
R,0.5D
C2559-8 C2560-8
R,0.5D
C1339-3
F
(PETROL-V8)
NO,1.5D
C0635L-4
DMTL VALVE
Silver
E_U_HR
Silver
Sheet1
(PETROL NAS)
H
GO,0.5D
C2243L-1 C2245L-1
GO,0.5D
C0635L-20
Silver
Sheet1
J
WG,0.5D
C2243L-2 C2245L-2
WG,0.5D
C0635L-21
Silver
Sheet1
A
NK,1.5D
(PETROL)
C2559-1 C2560-1
NK,0.75D
Sheet1
Engine control-
module (ECM) (D131)
B
(DIESEL)
NG,0.75D
C0872L-J3
C0872L-M3
B,1.5D
SJ477
B,2.5D
C2600L-1
Sheet1
TYPE 3
D
(DIESEL)
UP,0.5D
C0872L-J4
Sheet1
C2274L-16 C2273C-16
UR,0.75
C0411C-B4
HS CAN H
C2274L-15 C2273C-15
SR,0.75
C0411C-B3
HS CAN L
C2366-4 C2365L-4
YB,0.5D
C0872L-A4
HS CAN H
C2366-5 C2365L-5
YN,0.5D
C0872L-A3
HS CAN L
G
(DIESEL)
NO,1.5D
C0872L-L2
Sheet1

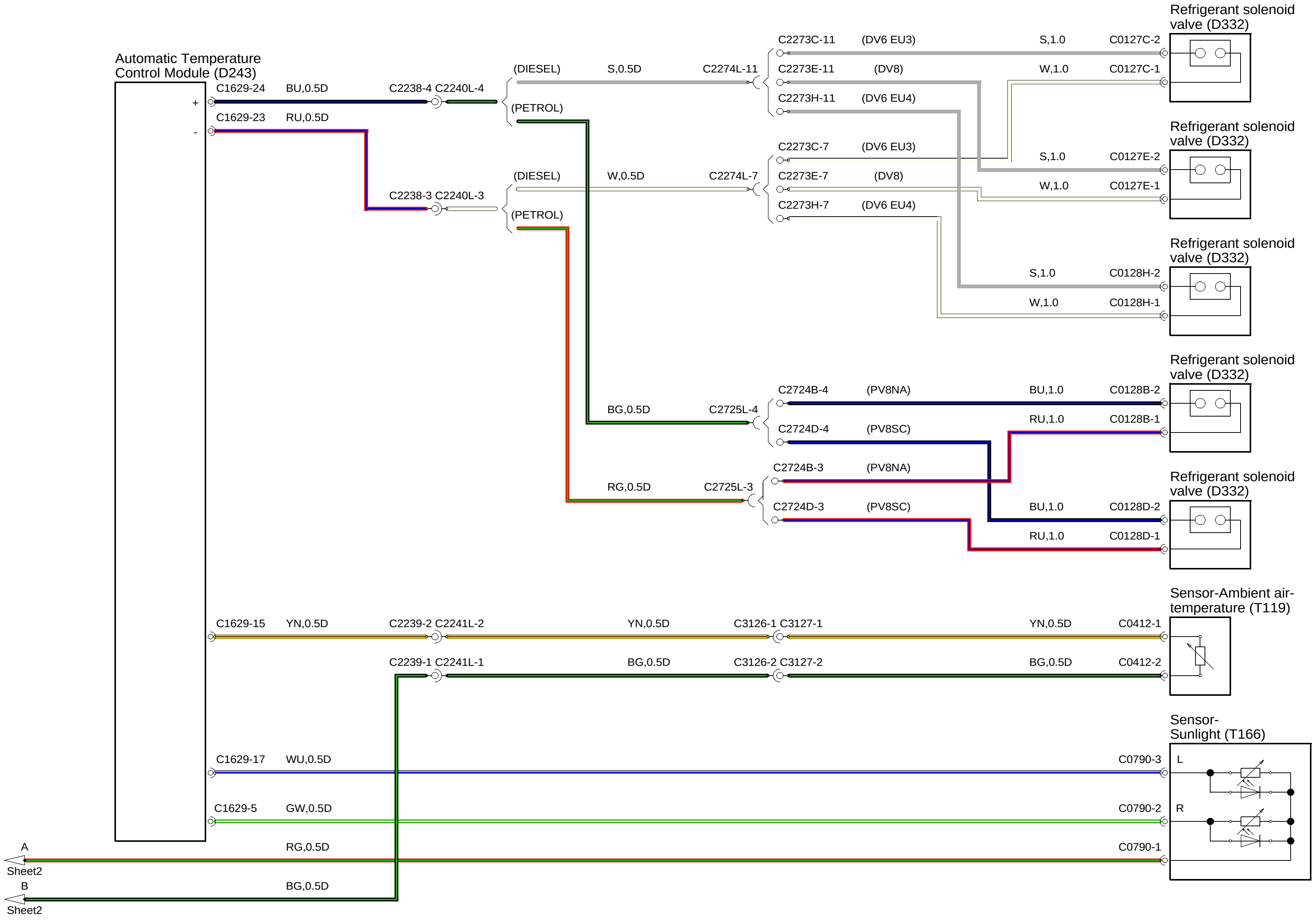

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
R6 POWERMINI
C0570L-18
NG,0.75D
(DIESEL)
A
Sheet2
NG,0.75D
(PV8)
B
Sheet2
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
FUSE 5E
10.0 Amps
C0570L-121
NK,1.5D
N,4.0D
C2443-4 C2444L-4
Air suspension Control Module (D199)
HS CAN H
HS CAN L
C0867L-17
YB,0.5D
C0376-4 C0390-4
YB,0.5D
C2178-A3
C0867L-18
YN,0.5D
C0376-5 C0390-5
YN,0.5D
C2178-A4
Parking brake module (D278)
HS CAN H
HS CAN L
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Module-speed control (D284)
HS CAN H
HS CAN L
C2145L-24
YB,0.5D
SJ176
C2145L-23
YN,0.5D
SJ177
LED OUT
C2145L-5
G,0.5D
C2444L-7 C2443-7
G,0.5D
C2387-3
Switch pack-Centre facia (S425)
0.27 k Ohms
0.03 Amps
Switch-Front-alert (S384)
C2387-15
B,0.5D
SJ662
B,2.5D
C2630-1
TYPE 1
Central junction-box (P101)
C0582-19
FUSE 23P
5.0 Amps
C0583L-38
WR,0.5D
SJ391
WR,0.5D
C2145L-14
FA SW
IGN
C2145L-20
R,0.5D
C2444L-6 C2443-6
R,0.5D
C2387-9
GND
C2145L-12
B,0.5D
C2240L-6 C2238-6
B,0.5D
C0558-1
TYPE 1
Sensor-Adaptive-cruise control (T350)
SJ450
NK,0.5D
C2145L-15
CAN -
BATT
CAN +
C2145L-2
G,0.5D
C2025-3
C2145L-3
Y,0.5D
C2025-4
WR,0.5D
C2025-1
NK,0.5D
C2025-5
CAN - Gold
GND Gold
CAN + Gold
IGN Gold
BATT Gold
C2025-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 1

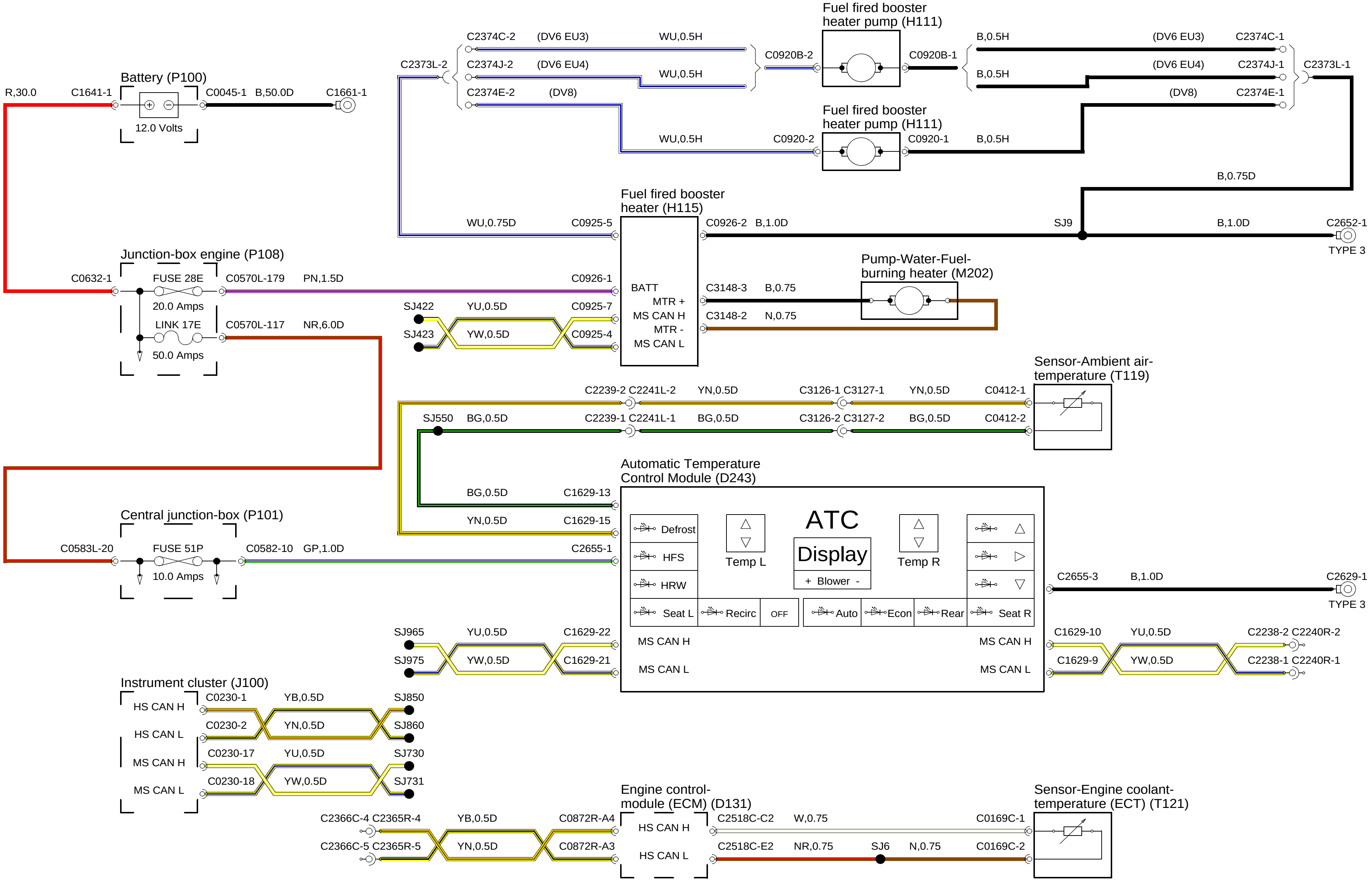

ABS module (D277)
BLS
Bs
HS CAN H
HS CAN L
C0506L-41
PG,0.5D
C2412L-3 C2411L-3
PG,1.0D
C0075L-2
C0506L-30
GP,0.75D
SJ882
GP,1.5D
C2412L-2 C2411L-2
GP,1.5D
SJ814
GP,1.5D
C0075L-1
C0506L-35
YB,0.5D
SJ274
C0506L-14
YN,0.5D
SJ276
Stop lamp switch (S215)
Transfer box control module (D204)
HS CAN H
HS CAN L
C1319L-6
YB,0.5D
SJ785
C1319L-3
YN,0.5D
SJ775
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0635L-58
YB,0.5D
C2365L-4 C2366-4
C0635L-45
YN,0.5D
C2365L-5 C2366-5
B (PV8) NG,0.75D
C0635L-16
Sheet1
C0635L-36
PU,0.5D
(PV8)
C0635L-35
R,0.5D
(DV6)
(PV8)
(DV6)
Gold
C2240L-22 C2238-22
PU,0.35D
C0082-5
Gold
C2240L-21 C2238-21
R,0.35D
C0082-8
Clock spring (S227)
C1254-4
R,0.35
C2147-10
C1254-1
N,0.35
C2147-9
B,0.35
C2147-5
Module-Steering-wheel-RH (D257)
Set + (Y263)
Set - (Y264)
Resume (Y202)
Suspend (Y265)
Time-gap + (Y266)
Time-gap - (Y267)
Engine control-module (ECM) (D131)
A (DIESEL) NG,0.75D
C0872L-J3
Sheet1
C0872L-B4
PU,0.5D
C0872L-C4
R,0.5D
HS CAN H
HS CAN L
C0872L-A4
YB,0.5D
C2365L-4 C2366-4
C0872L-A3
YN,0.5D
C2365L-5 C2366-5
Air bag-Driver (U106)
C2636-1
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Instrument cluster (J100)
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
SJ851
YB,0.5D
C0862-6
SJ861
YN,0.5D
C0862-7
Sensor-Steering-angle (T274)
HS CAN H
HS CAN L

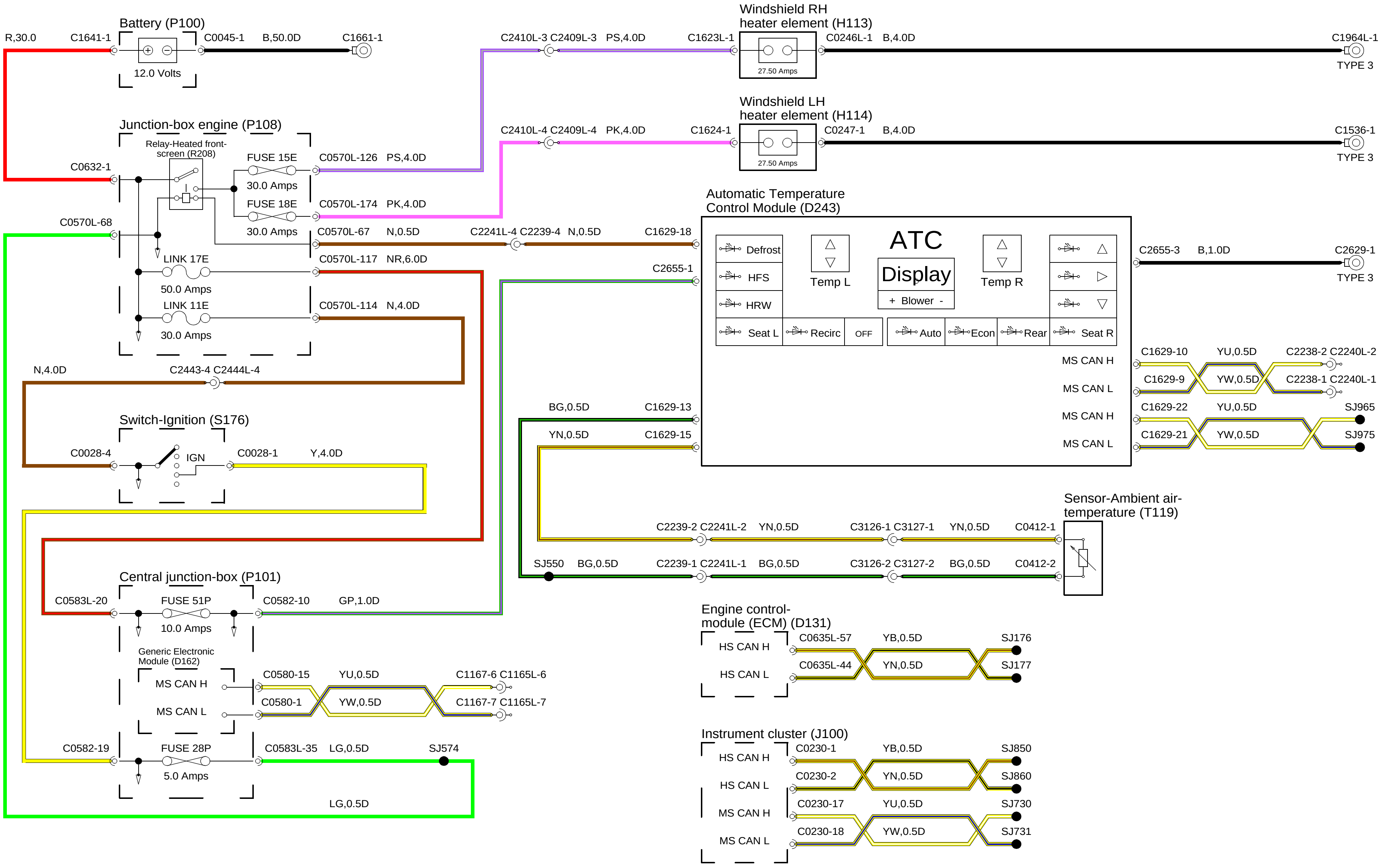

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ176
YB,0.5D
C0635L-57
SJ177
YN,0.5D
C0635L-44
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0634B-68
UY,0.5
C0169B-1
C0634B-15
BG,0.5
SJ9
BG,0.5
C0169B-2
C0635L-1
B,1.5D
C0557L-1
TYPE 3
Sensor-Engine coolant-temperature (ECT) (T121)
Junction-box engine (P108)
Relay-Blower (R176)
C0632-1
LINK 12E
40.0 Amps
LINK 17E
50.0 Amps
C0570L-11
NR,4.0D
C2996L-2 C2997-2
W,4.0
C0056-2
C0570L-33
LGW,0.5D
C2241L-5 C2239-5
C0570L-117
NR,6.0D
Motor-Blower-Front (M132)
C0056-1
B,4.0
C2281-5
Control unit-Blower-motor-Front (D258)
C2281-4
R,4.0
C2997-1 C2996L-1
B,4.0D
C2606L-1
TYPE 3
C2281-3
C2281-1
Automatic Temperature Control Module (D243)
LGW,0.5D
C1629-7
C1630-20
LGB,0.5
C1630-19
G,0.5
SJ965
YU,0.5D
C1629-22
SJ975
YW,0.5D
C1629-21
C2240L-2 C2238-2
YU,0.5D
C1629-10
C2240L-1 C2238-1
YW,0.5D
C1629-9
MS CAN +
MS CAN -
MS CAN +
MS CAN -
C2655-3
B,1.0D
C2629-1
TYPE 3
Central junction-box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
C2655-1
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
Generic Electronic Module (D162)
CAN +
CAN -
C0580-15
YU,0.5D
C1167-6 C1165L-6
C0580-1
YW,0.5D
C1167-7 C1165L-7
Instrument cluster (J100)
MS CAN H
MS CAN L
HS CAN H
HS CAN H
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860

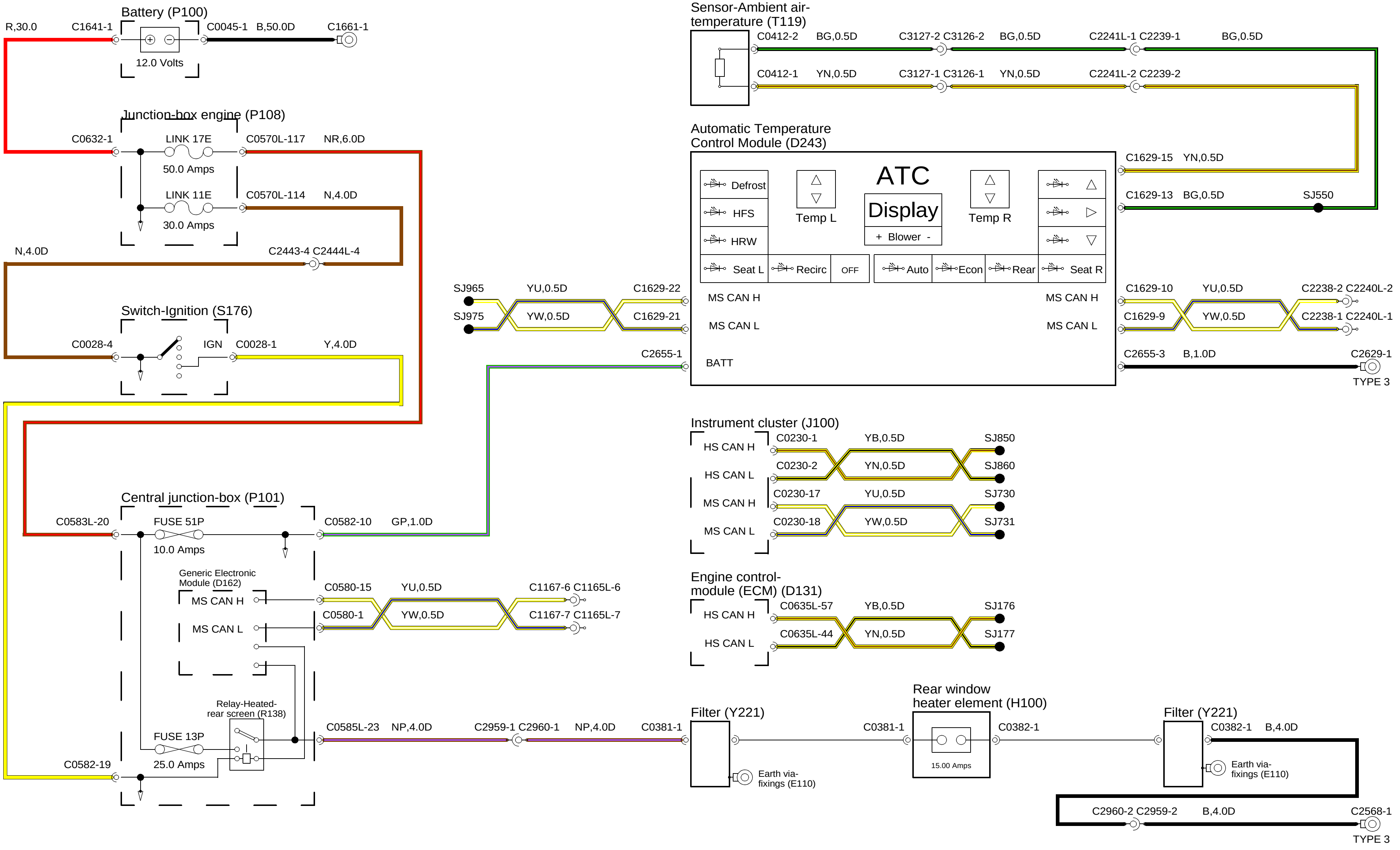

Sensor-Air quality (T306)
GND
12 V
NOX
HC/CO
C2683-6
B,0.5D
SJ173
B,4.0D
C0560-1
TYPE 2
Automatic Temperature Control Module (D243)
C2683-3
OG,0.5D
C2240L-17
C2238-17
OG,0.5D
SJ591
OG,0.5D
C1629-11
C2683-4
O,0.5D
C2240L-14
C2238-14
O,0.5D
C1629-2
C2683-2
BR,0.5D
C2240L-15
C2238-15
BG,0.5D
C1629-14
C2683-1
BG,0.5D
C2240L-13
C2238-13
BG,0.5D
SJ550
BG,0.5D
C1629-13
B
Sheet4
BG,0.5D
Sensor-Temperature/ Humidity (T315)
GND
THR
C1443-1
BG,0.5D
C1443-2
RW,0.5D
C1629-3
A
Sheet4
RG,0.5D
SJ551
RG,0.5D
C1629-1
Sensor-Pressure-Refrigerant (T278)
5 V
GND
V OUT
C1465-3
R,0.5D
C2444L-10
C2443-10
RG,0.5D
C1465-1
WU,0.5D
C2444L-9
C2443-9
BG,0.5D
C1465-2
UN,0.5D
C2444L-8
C2443-8
UN,0.5D
C1629-4

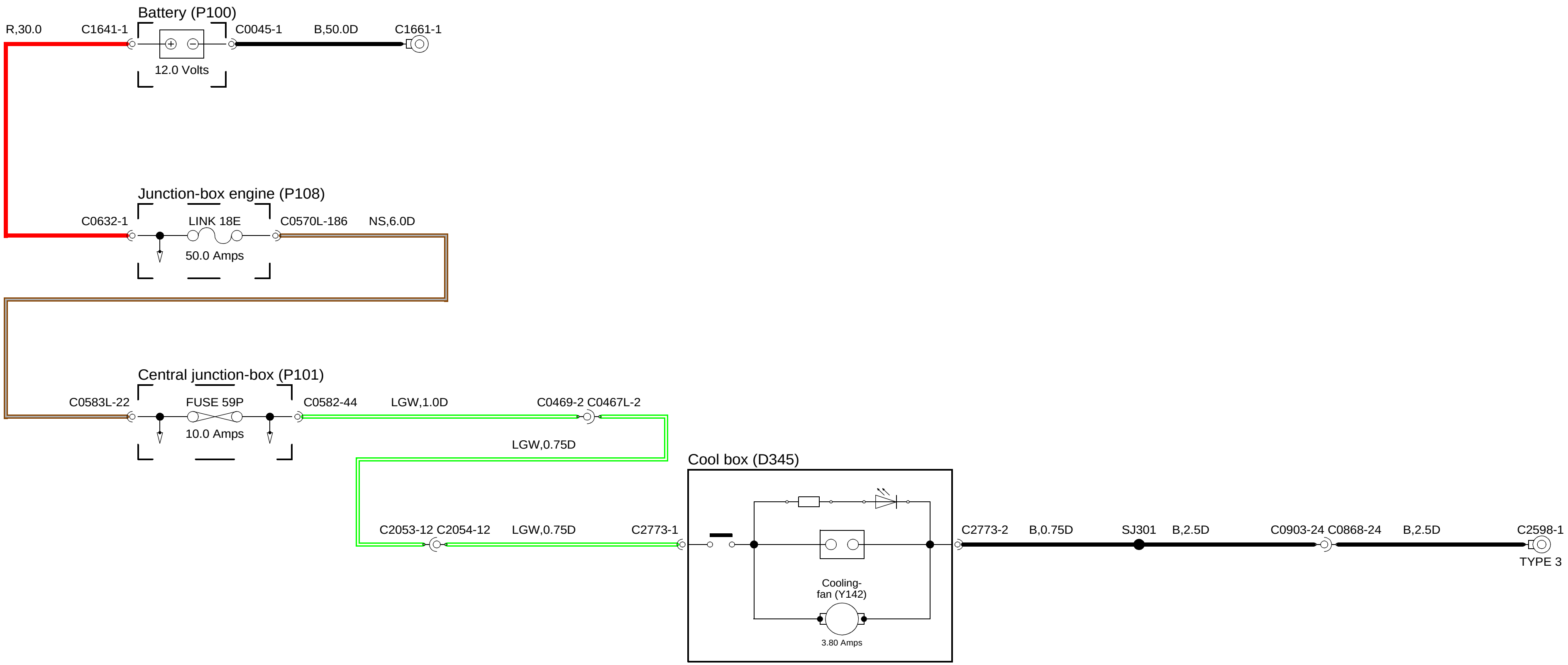

Intake air door motor (M138)
FRS
REC
M
C0419-6
RW,0.5
C1630-9
C0419-7
GB,0.5
C1630-10
C0419-5
YB,0.5
C1630-4
C0419-3
N,0.5
C1630-13
C0419-1
P,0.5
SJ3
P,0.5
C1630-1
Sensor-Evaporator (T165)
C0417-1
P,0.5
C0417-2
NB,0.5
C1630-17
Sensor-Temperature-Heater coolant (T210)
B,0.3
B,0.3
SJ4
S,0.5
C1630-16
Automatic Temperature Control Module (D243)
C1630-23
RY,0.5
C2134-2
C1630-24
GY,0.5
SJ1
GY,0.5
C2134-4
C1630-2
O,0.5
SJ2
O,0.5
C2134-6
RG,0.5
C2134-5
Screen air distribution door motor (M259)
IN
OUT
M
RH air temperature door motor (M204)
C2131-2
O,0.5
C2131-6
GY,0.5
C2131-4
Y,0.5
C2131-5
IN
OUT
M
LH air temperature door motor (M203)
C2130-2
O,0.5
C2130-6
GY,0.5
C2130-4
U,0.5
C2130-5
IN
OUT
M
Face/feet air distribution door motor (M279)
C2133-2
O,0.5
C2133-6
GY,0.5
C2133-4
IN
M

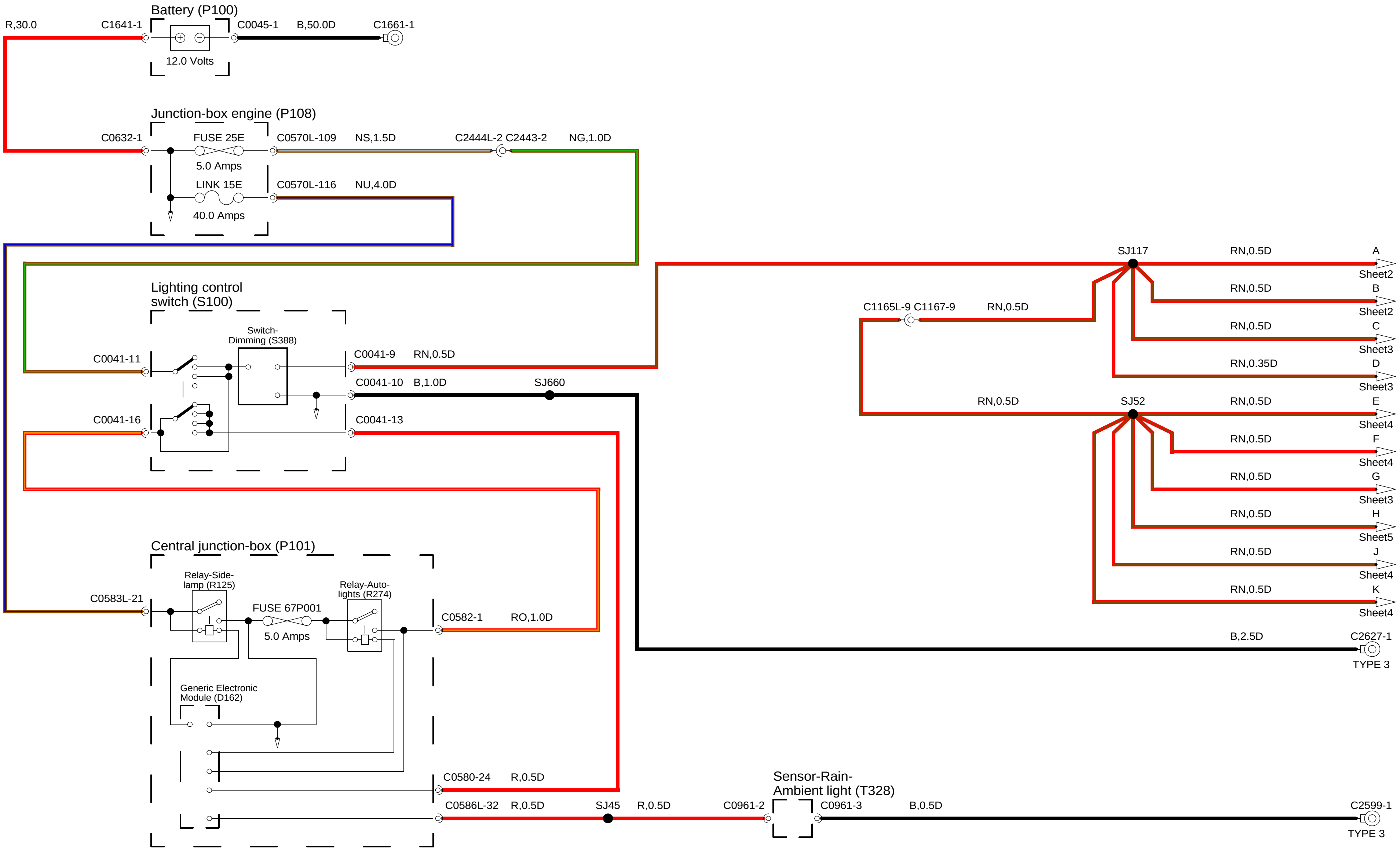

Automatic Temperature Control Module (D243)
C1629-24
BU,0.5D
+
C1629-23
RU,0.5D
-
C2238-4 C2240L-4
C2238-3 C2240L-3
(DIESEL)
S,0.5D
C2274L-11
(PETROL)
(DIESEL)
W,0.5D
C2274L-7
(PETROL)
C2273C-11
(DV6 EU3)
C2273E-11
(DV8)
C2273H-11
(DV6 EU4)
C2273C-7
(DV6 EU3)
C2273E-7
(DV8)
C2273H-7
(DV6 EU4)
S,1.0
C0127C-2
W,1.0
C0127C-1
Refrigerant solenoid valve (D332)
S,1.0
C0127E-2
W,1.0
C0127E-1
Refrigerant solenoid valve (D332)
S,1.0
C0128H-2
W,1.0
C0128H-1
Refrigerant solenoid valve (D332)
BG,0.5D
C2725L-4
C2724B-4
(PV8NA)
BU,1.0
C0128B-2
C2724D-4
(PV8SC)
RU,1.0
C0128B-1
Refrigerant solenoid valve (D332)
RG,0.5D
C2725L-3
C2724B-3
(PV8NA)
C2724D-3
(PV8SC)
BU,1.0
C0128D-2
RU,1.0
C0128D-1
Refrigerant solenoid valve (D332)
C1629-15
YN,0.5D
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Sensor-Ambient air-temperature (T119)
C1629-17
WU,0.5D
C0790-3
L
C1629-5
GW,0.5D
C0790-2
R
A
RG,0.5D
C0790-1
Sheet2
B
BG,0.5D
Sheet2
Sensor-Sunlight (T166)

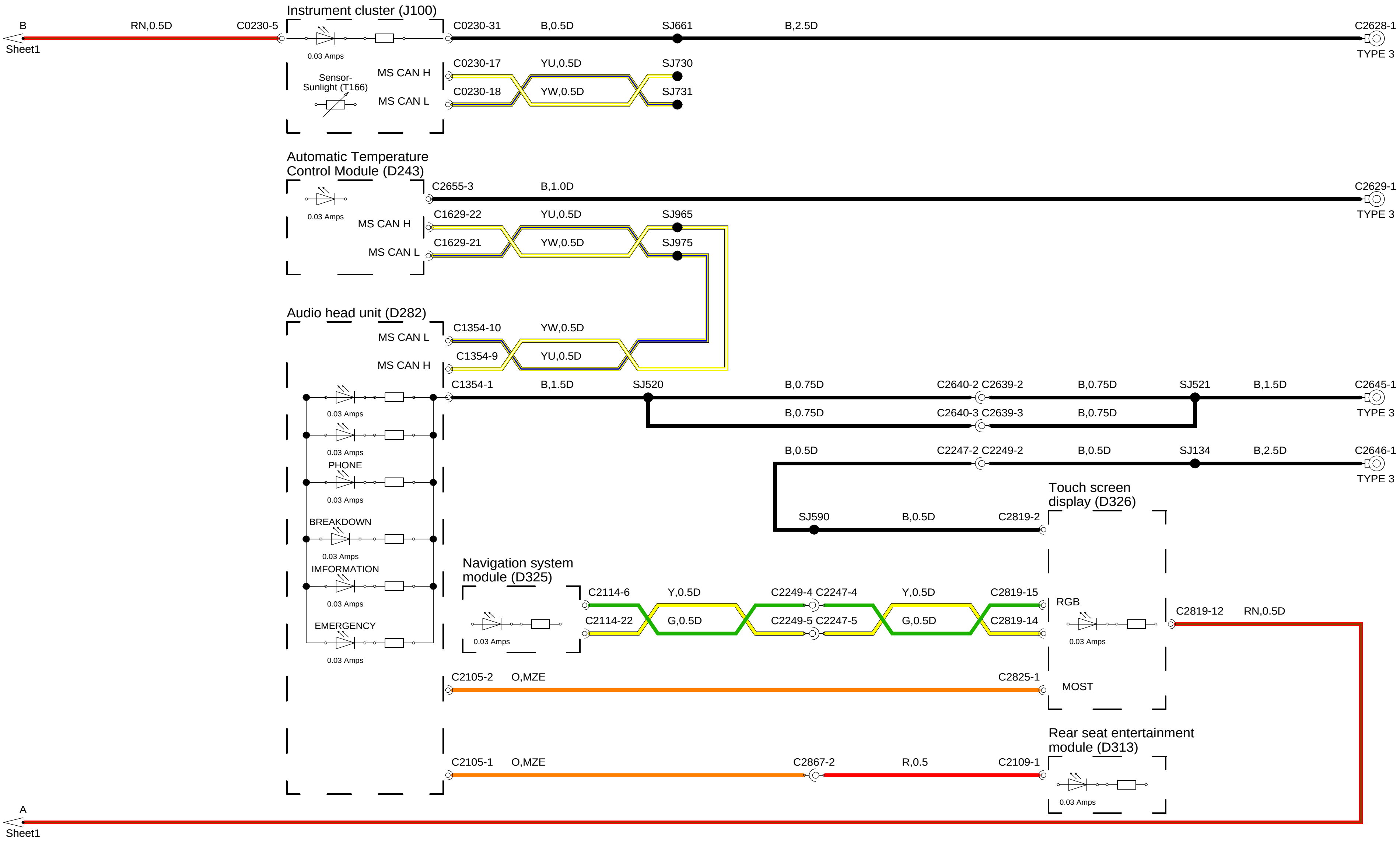

Fuel fired booster heater pump (H111)
C2374C-2
(DV6 EU3)
WU,0.5H
C2373L-2
C2374J-2
(DV6 EU4)
WU,0.5H
C2374E-2
(DV8)
C0920B-2
C0920B-1
B,0.5H
(DV6 EU3)
C2374C-1
(DV6 EU4)
C2374J-1
C2373L-1
B,0.5H
(DV8)
C2374E-1
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Fuel fired booster heater pump (H111)
WU,0.5H
C0920-2
C0920-1
B,0.5H
B,0.75D
Fuel fired booster heater (H115)
WU,0.75D
C0925-5
C0926-2
B,1.0D
SJ9
B,1.0D
C2652-1
TYPE 3
Junction-box engine (P108)
Pump-Water-Fuel-burning heater (M202)
C0632-1
FUSE 28E
C0570L-179
PN,1.5D
C0926-1
BATT
C3148-3
B,0.75
20.0 Amps
SJ422
YU,0.5D
C0925-7
MTR +
MS CAN H
C3148-2
N,0.75
LINK 17E
C0570L-117
NR,6.0D
SJ423
YW,0.5D
C0925-4
MTR -
MS CAN L
50.0 Amps
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Automatic Temperature Control Module (D243)
BG,0.5D
C1629-13
Central junction-box (P101)
YN,0.5D
C1629-15
ATC
Display
+ Blower -
Defrost
HFS
HRW
Temp L
Temp R
C0583L-20
FUSE 51P
C0582-10
GP,1.0D
C2655-1
10.0 Amps
C2655-3
B,1.0D
C2629-1
TYPE 3
Seat L
Recirc
OFF
Auto
Econ
Rear
Seat R
SJ965
YU,0.5D
C1629-22
C1629-10
YU,0.5D
C2238-2 C2240R-2
MS CAN H
MS CAN H
SJ975
YW,0.5D
C1629-21
C1629-9
YW,0.5D
C2238-1 C2240R-1
MS CAN L
MS CAN L
Instrument cluster (J100)
C0230-1
YB,0.5D
SJ850
HS CAN H
C0230-2
YN,0.5D
SJ860
HS CAN L
C0230-17
YU,0.5D
SJ730
MS CAN H
C0230-18
YW,0.5D
SJ731
MS CAN L
Engine control-module (ECM) (D131)
Sensor-Engine coolant-temperature (ECT) (T121)
C2366C-4 C2365R-4
YB,0.5D
C0872R-A4
HS CAN H
C2518C-C2
W,0.75
C0169C-1
C2366C-5 C2365R-5
YN,0.5D
C0872R-A3
HS CAN L
C2518C-E2
NR,0.75
SJ6
N,0.75
C0169C-2

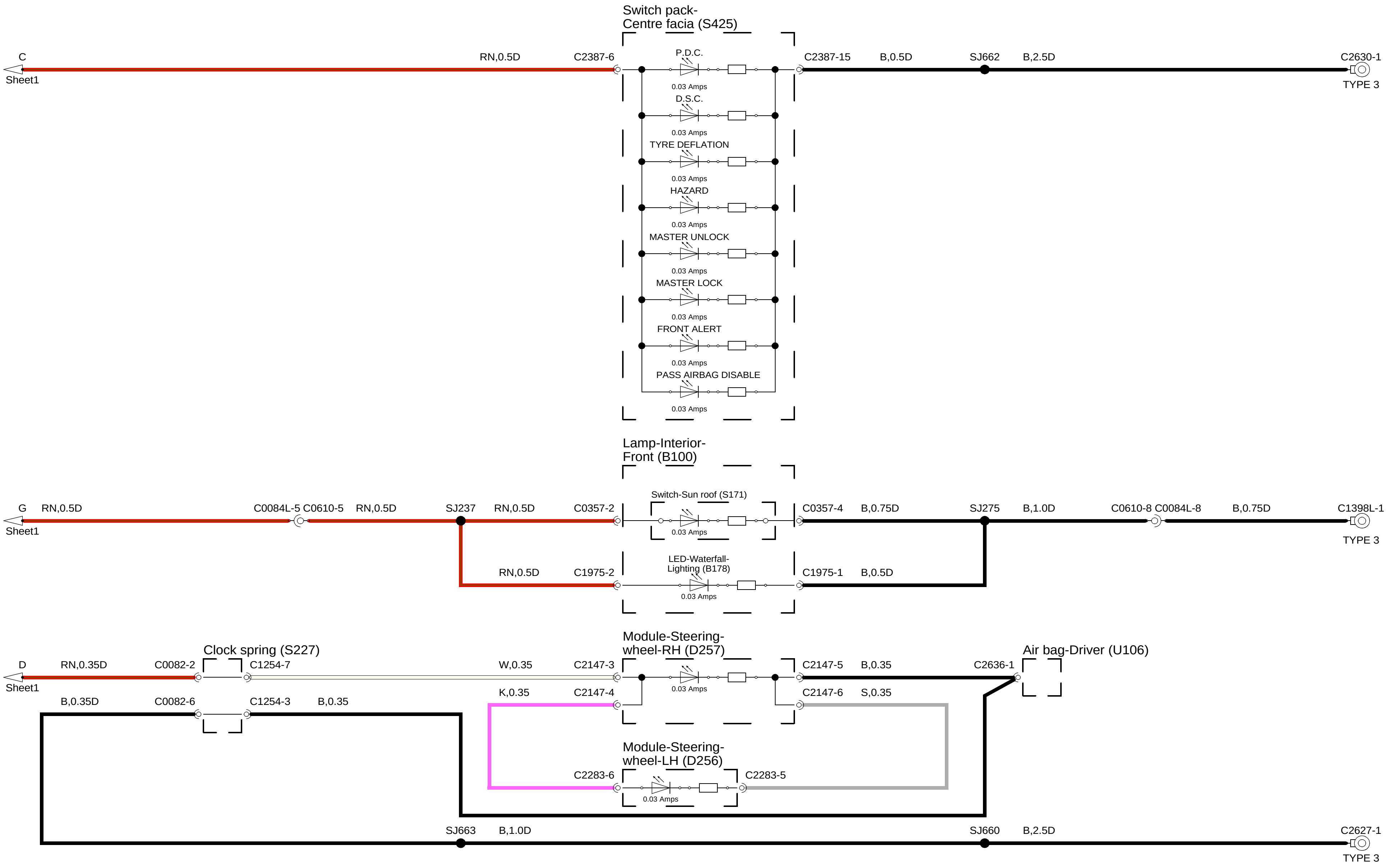

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
C2410L-3 C2409L-3
PS,4.0D
C1623L-1
Windshield RH heater element (H113)
27.50 Amps
C0246L-1
B,4.0D
C1964L-1
TYPE 3
Junction-box engine (P108)
Relay-Heated front-screen (R208)
C0632-1
FUSE 15E
30.0 Amps
C0570L-126
PS,4.0D
FUSE 18E
30.0 Amps
C0570L-174
PK,4.0D
C2410L-4 C2409L-4
PK,4.0D
C1624-1
Windshield LH heater element (H114)
27.50 Amps
C0247-1
B,4.0D
C1536-1
TYPE 3
C0570L-68
C0570L-67
N,0.5D
C2241L-4 C2239-4
N,0.5D
C1629-18
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
C2655-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
Automatic Temperature Control Module (D243)
Defrost
HFS
HRW
Temp L
ATC
Display
+ Blower -
Temp R
Seat L
Recirc
OFF
Auto
Econ
Rear
Seat R
C2655-3
B,1.0D
C2629-1
TYPE 3
MS CAN H
MS CAN L
MS CAN H
MS CAN L
C1629-10
YU,0.5D
C2238-2 C2240L-2
C1629-9
YW,0.5D
C2238-1 C2240L-1
C1629-22
YU,0.5D
SJ965
C1629-21
YW,0.5D
SJ975
N,4.0D
C2443-4 C2444L-4
BG,0.5D
C1629-13
YN,0.5D
C1629-15
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Central junction-box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0635L-57
YB,0.5D
SJ176
C0635L-44
YN,0.5D
SJ177
Generic Electronic Module (D162)
MS CAN H
MS CAN L
C0580-15
YU,0.5D
C1167-6 C1165L-6
C0580-1
YW,0.5D
C1167-7 C1165L-7
Instrument cluster (J100)
HS CAN H
HS CAN L
MS CAN H
MS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,0.5D


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 17E
C0570L-117
NR,6.0D
50.0 Amps
LINK 11E
C0570L-114
N,4.0D
30.0 Amps
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
MS CAN H
MS CAN L
C0580-15
YU,0.5D
C1167-6 C1165L-6
C0580-1
YW,0.5D
C1167-7 C1165L-7
Relay-Heated-rear screen (R138)
FUSE 13P
25.0 Amps
C0582-19
C0585L-23
NP,4.0D
C2959-1 C2960-1
NP,4.0D
C0381-1
Sensor-Ambient air-temperature (T119)
C0412-2
BG,0.5D
C3127-2 C3126-2
BG,0.5D
C2241L-1 C2239-1
BG,0.5D
C0412-1
YN,0.5D
C3127-1 C3126-1
YN,0.5D
C2241L-2 C2239-2
Automatic Temperature Control Module (D243)
C1629-15
YN,0.5D
C1629-13
BG,0.5D
SJ550
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
SJ965
YU,0.5D
C1629-22
SJ975
YW,0.5D
C1629-21
MS CAN H
MS CAN L
C2655-1
BATT
MS CAN H
MS CAN L
C1629-10
YU,0.5D
C2238-2 C2240L-2
C1629-9
YW,0.5D
C2238-1 C2240L-1
C2655-3
B,1.0D
C2629-1
TYPE 3
Instrument cluster (J100)
HS CAN H
C0230-1
YB,0.5D
SJ850
HS CAN L
C0230-2
YN,0.5D
SJ860
MS CAN H
C0230-17
YU,0.5D
SJ730
MS CAN L
C0230-18
YW,0.5D
SJ731
Engine control-module (ECM) (D131)
HS CAN H
C0635L-57
YB,0.5D
SJ176
HS CAN L
C0635L-44
YN,0.5D
SJ177
Filter (Y221)
Earth via-fixings (E110)
C0381-1
Rear window heater element (H100)
15.00 Amps
C0382-1
Filter (Y221)
C0382-1
B,4.0D
Earth via-fixings (E110)
C2960-2 C2959-2
B,4.0D
C2568-1
TYPE 3

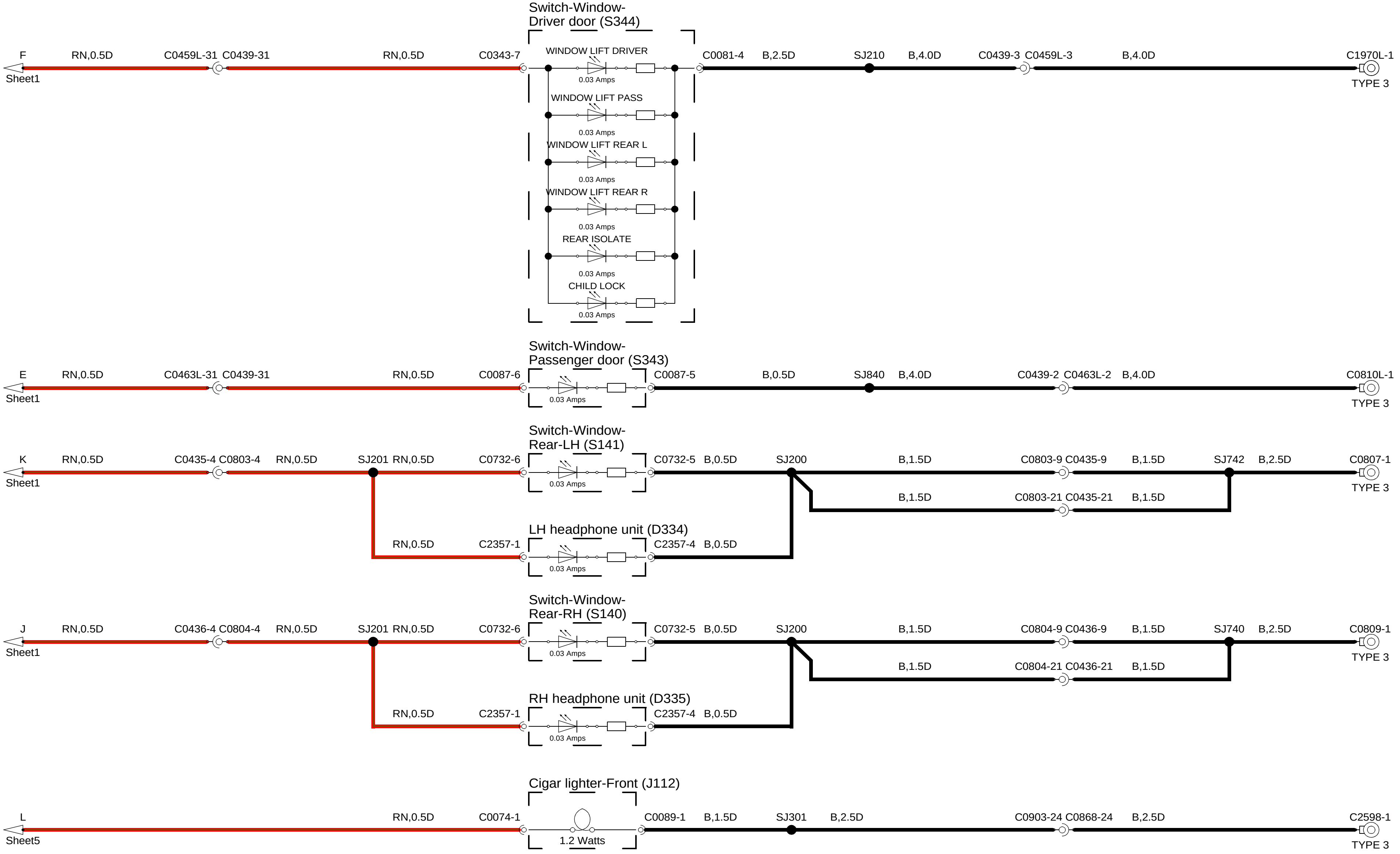

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Central junction-box (P101)
C0583L-22
FUSE 59P
C0582-44
LGW,1.0D
C0469-2 C0467L-2
10.0 Amps
LGW,0.75D
Cool box (D345)
C2053-12 C2054-12
LGW,0.75D
C2773-1
C2773-2
B,0.75D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Cooling-
fan (Y142)
3.80 Amps

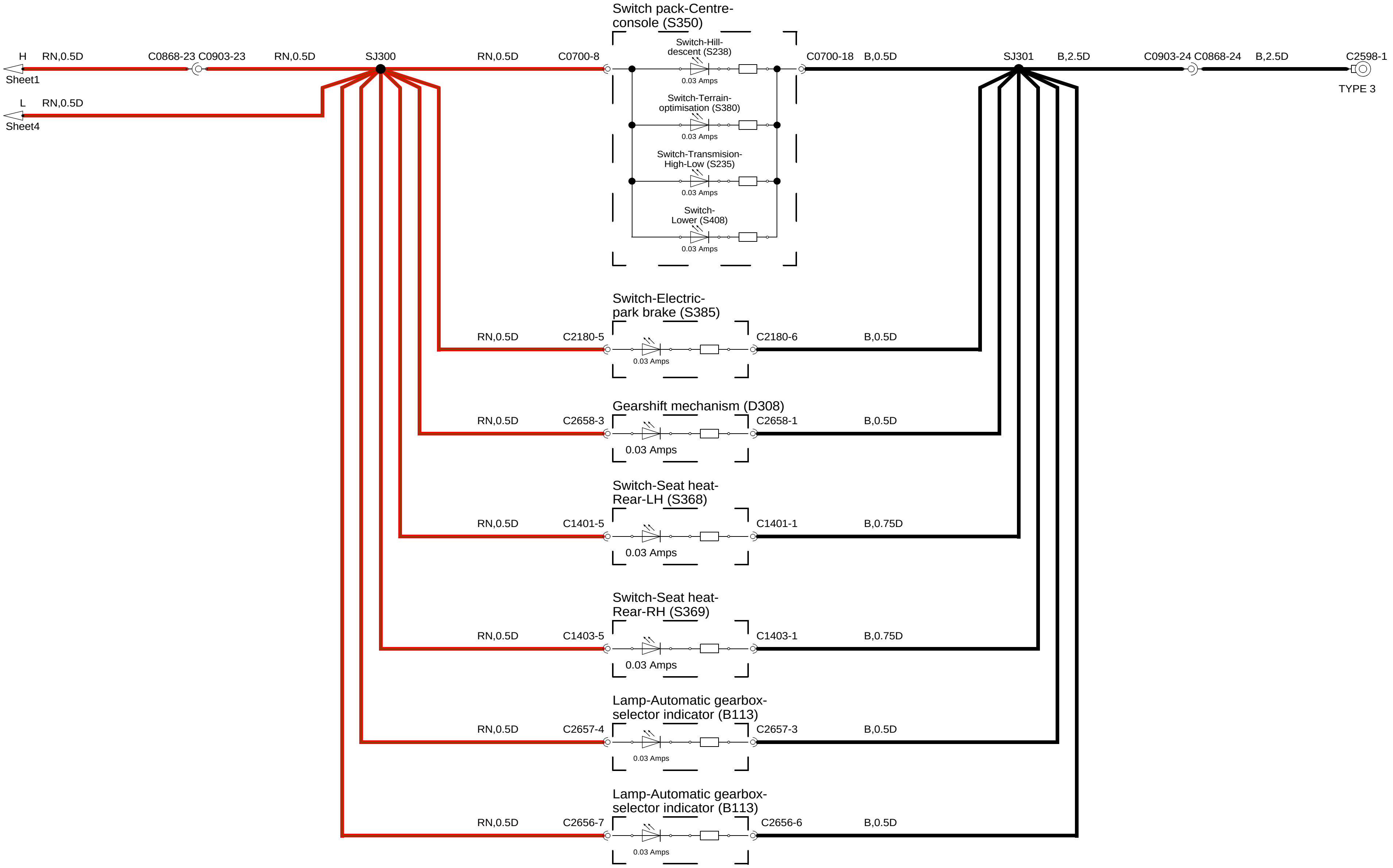

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
FUSE 25E
5.0 Amps
C0570L-109
NS,1.5D
C2444L-2 C2443-2
NG,1.0D
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
Lighting control switch (S100)
Switch-Dimming (S388)
C0041-11
C0041-9
RN,0.5D
C0041-10
B,1.0D
SJ660
C0041-16
C0041-13
SJ117
RN,0.5D
A
Sheet2
B
Sheet2
C
Sheet3
RN,0.35D
D
Sheet3
E
Sheet4
F
Sheet4
G
Sheet3
H
Sheet5
J
Sheet4
K
Sheet4
C1165L-9 C1167-9
SJ52
B,2.5D
C2627-1
TYPE 3
Central junction-box (P101)
Relay-Side-lamp (R125)
Relay-Auto-lights (R274)
C0583L-21
FUSE 67P001
5.0 Amps
C0582-1
RO,1.0D
Generic Electronic Module (D162)
C0580-24
R,0.5D
C0586L-32
R,0.5D
SJ45
R,0.5D
Sensor-Rain-Ambient light (T328)
C0961-2
C0961-3
B,0.5D
C2599-1
TYPE 3

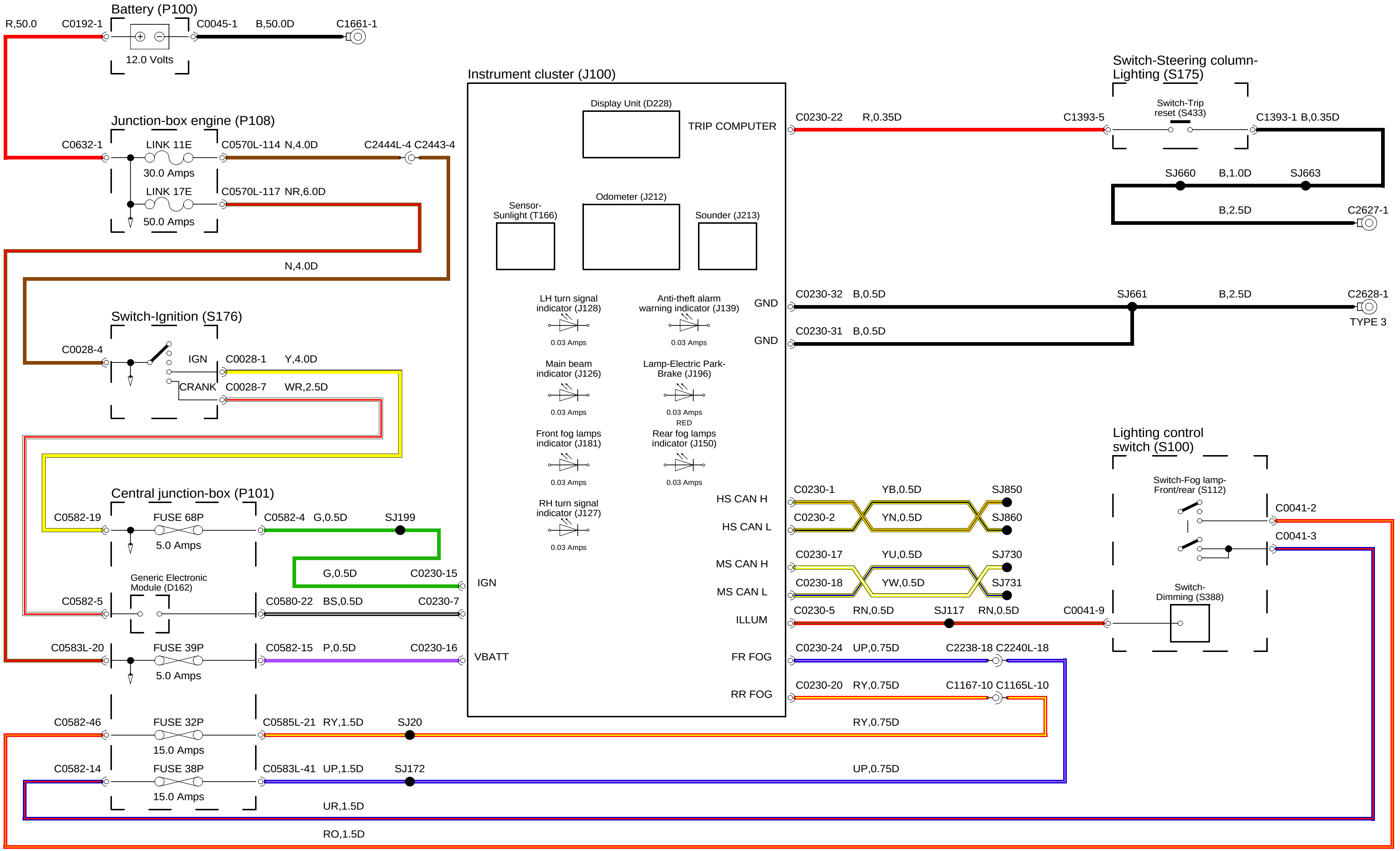

B
Sheet1
RN,0.5D
C0230-5
Instrument cluster (J100)
0.03 Amps
C0230-31
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
Sensor-Sunlight (T166)
MS CAN H
MS CAN L
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
Automatic Temperature Control Module (D243)
C2655-3
B,1.0D
C2629-1
TYPE 3
0.03 Amps
MS CAN H
MS CAN L
C1629-22
YU,0.5D
SJ965
C1629-21
YW,0.5D
SJ975
Audio head unit (D282)
MS CAN L
MS CAN H
C1354-10
YW,0.5D
C1354-9
YU,0.5D
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
TYPE 3
B,0.75D
C2640-3 C2639-3
B,0.75D
0.03 Amps
0.03 Amps
PHONE
0.03 Amps
BREAKDOWN
0.03 Amps
IMFORMATION
0.03 Amps
EMERGENCY
0.03 Amps
B,0.5D
C2247-2 C2249-2
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
Touch screen display (D326)
SJ590
B,0.5D
C2819-2
Navigation system module (D325)
0.03 Amps
C2114-6
Y,0.5D
C2249-4 C2247-4
Y,0.5D
C2819-15
C2114-22
G,0.5D
C2249-5 C2247-5
G,0.5D
C2819-14
RGB
0.03 Amps
C2819-12
RN,0.5D
C2105-2
O,MZE
C2825-1
MOST
Rear seat entertainment module (D313)
C2105-1
O,MZE
C2867-2
R,0.5
C2109-1
0.03 Amps
A
Sheet1

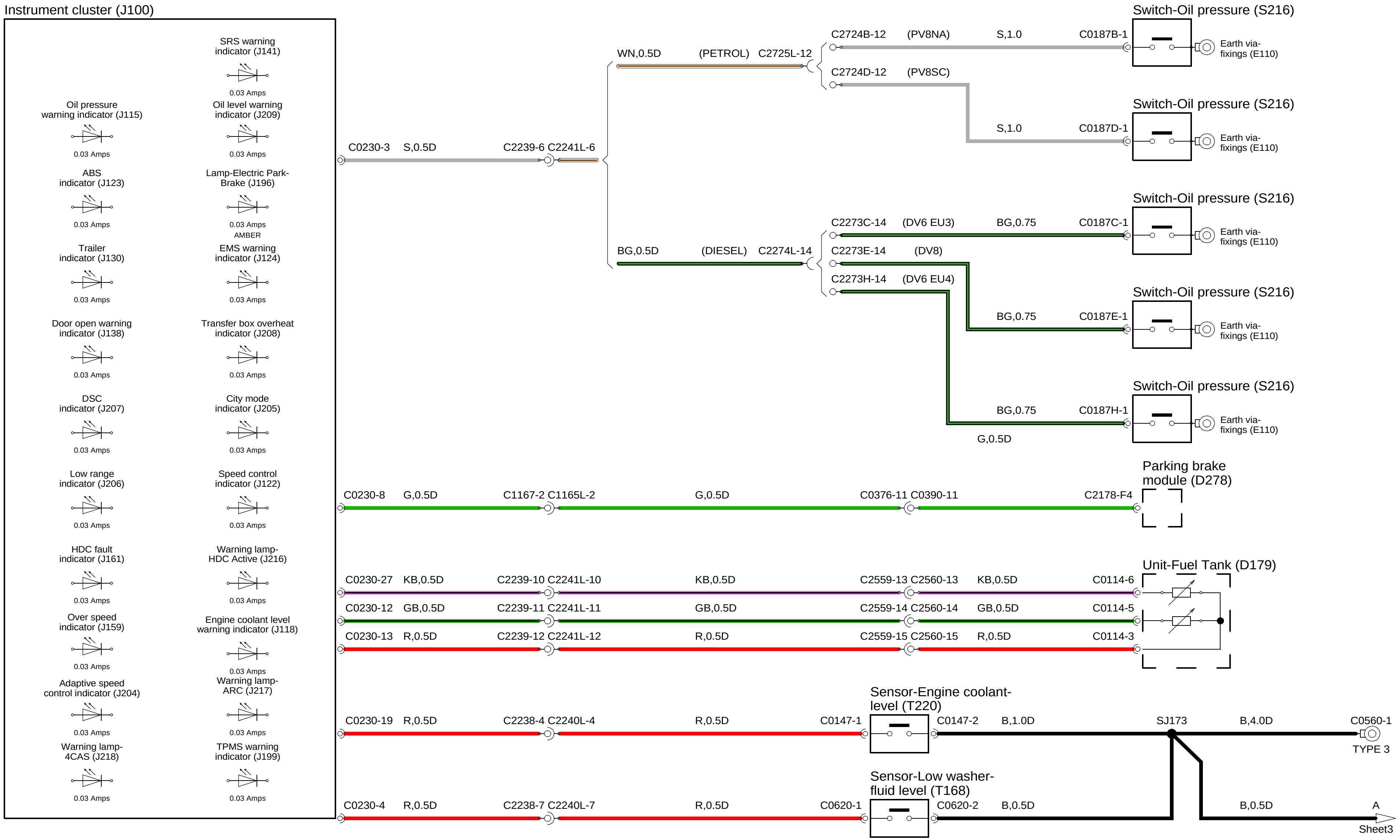

Switch pack-
Centre facia (S425)
C
Sheet1
RN,0.5D
C2387-6
P.D.C.
0.03 Amps
D.S.C.
0.03 Amps
TYRE DEFLATION
0.03 Amps
HAZARD
0.03 Amps
MASTER UNLOCK
0.03 Amps
MASTER LOCK
0.03 Amps
FRONT ALERT
0.03 Amps
PASS AIRBAG DISABLE
0.03 Amps
C2387-15
B,0.5D
SJ662
B,2.5D
C2630-1
TYPE 3
Lamp-Interior-
Front (B100)
Switch-Sun roof (S171)
0.03 Amps
G
Sheet1
RN,0.5D
C0084L-5
C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
C0357-4
B,0.75D
SJ275
B,1.0D
C0610-8
C0084L-8
B,0.75D
C1398L-1
TYPE 3
LED-Waterfall-
Lighting (B178)
0.03 Amps
RN,0.5D
C1975-2
C1975-1
B,0.5D
Module-Steering-
wheel-RH (D257)
Clock spring (S227)
D
Sheet1
RN,0.35D
C0082-2
C1254-7
W,0.35
C2147-3
0.03 Amps
C2147-5
B,0.35
C2636-1
Air bag-Driver (U106)
B,0.35D
C0082-6
C1254-3
B,0.35
K,0.35
C2147-4
C2147-6
S,0.35
Module-Steering-
wheel-LH (D256)
C2283-6
0.03 Amps
C2283-5
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

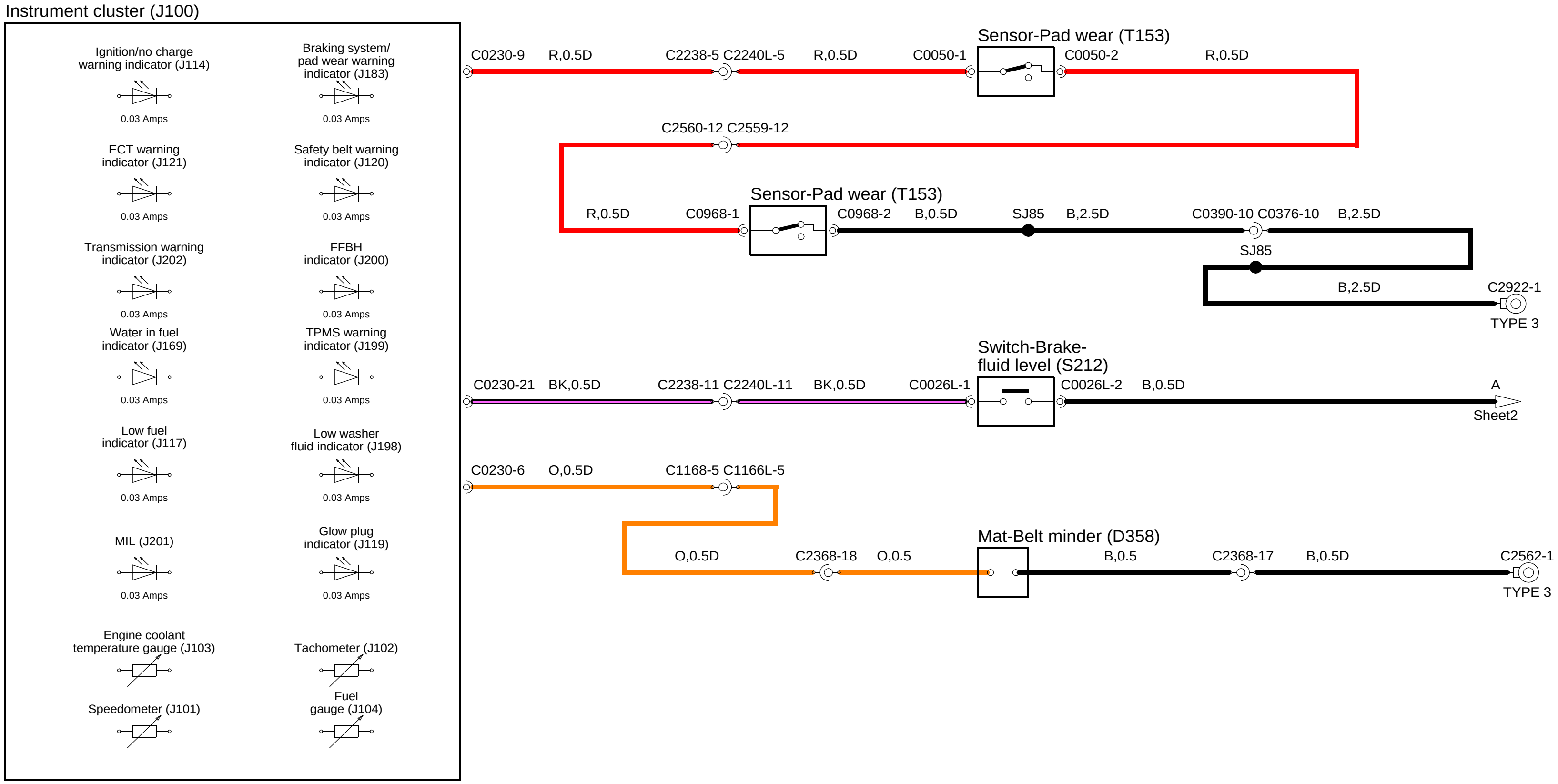
413-00 INSTRUMENT CLUSTER AND PANEL ILLUMINATION

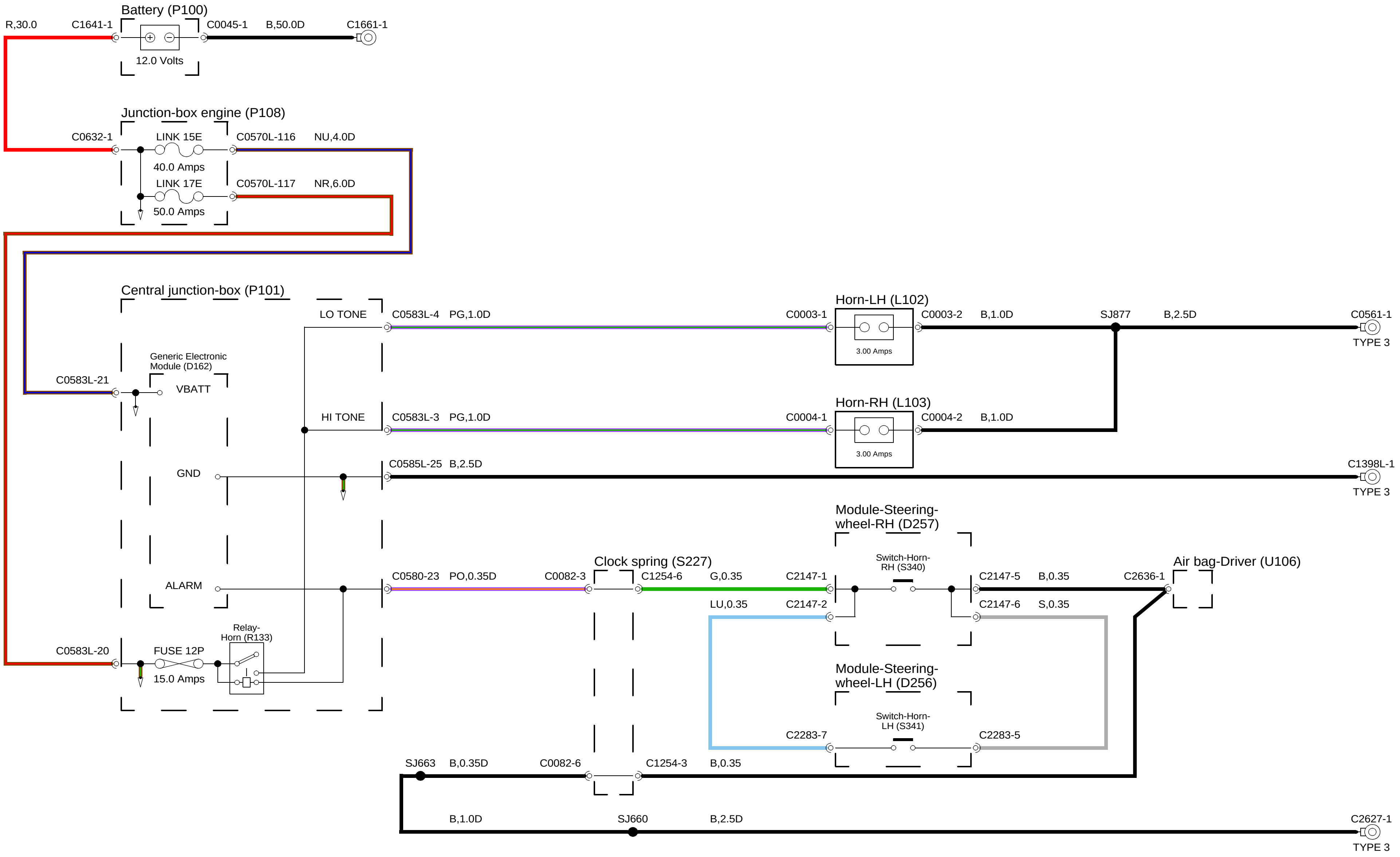

Switch-Window-
Driver door (S344)
F
Sheet1
RN,0.5D
C0459L-31 C0439-31
RN,0.5D
C0343-7
WINDOW LIFT DRIVER
0.03 Amps
WINDOW LIFT PASS
0.03 Amps
WINDOW LIFT REAR L
0.03 Amps
WINDOW LIFT REAR R
0.03 Amps
REAR ISOLATE
0.03 Amps
CHILD LOCK
0.03 Amps
C0081-4
B,2.5D
SJ210
B,4.0D
C0439-3 C0459L-3
B,4.0D
C1970L-1
TYPE 3
Switch-Window-
Passenger door (S343)
E
Sheet1
RN,0.5D
C0463L-31 C0439-31
RN,0.5D
C0087-6
0.03 Amps
C0087-5
B,0.5D
SJ840
B,4.0D
C0439-2 C0463L-2
B,4.0D
C0810L-1
TYPE 3
Switch-Window-
Rear-LH (S141)
K
Sheet1
RN,0.5D
C0435-4 C0803-4
RN,0.5D
SJ201 RN,0.5D
C0732-6
0.03 Amps
C0732-5 B,0.5D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21 C0435-21
B,1.5D
LH headphone unit (D334)
RN,0.5D
C2357-1
0.03 Amps
C2357-4 B,0.5D
Switch-Window-
Rear-RH (S140)
J
Sheet1
RN,0.5D
C0436-4 C0804-4
RN,0.5D
SJ201 RN,0.5D
C0732-6
0.03 Amps
C0732-5 B,0.5D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21 C0436-21
B,1.5D
RH headphone unit (D335)
RN,0.5D
C2357-1
0.03 Amps
C2357-4 B,0.5D
Cigar lighter-Front (J112)
L
Sheet5
RN,0.5D
C0074-1
1.2 Watts
C0089-1
B,1.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3


H
RN,0.5D
Sheet1
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C0700-8
L
RN,0.5D
Sheet4
Switch pack-Centre-console (S350)
Switch-Hill-descent (S238)
0.03 Amps
Switch-Terrain-optimisation (S380)
0.03 Amps
Switch-Transmision-High-Low (S235)
0.03 Amps
Switch-Lower (S408)
0.03 Amps
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Switch-Electric-park brake (S385)
RN,0.5D
C2180-5
0.03 Amps
C2180-6
B,0.5D
Gearshift mechanism (D308)
RN,0.5D
C2658-3
0.03 Amps
C2658-1
B,0.5D
Switch-Seat heat-Rear-LH (S368)
RN,0.5D
C1401-5
0.03 Amps
C1401-1
B,0.75D
Switch-Seat heat-Rear-RH (S369)
RN,0.5D
C1403-5
0.03 Amps
C1403-1
B,0.75D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2657-4
0.03 Amps
C2657-3
B,0.5D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2656-7
0.03 Amps
C2656-6
B,0.5D

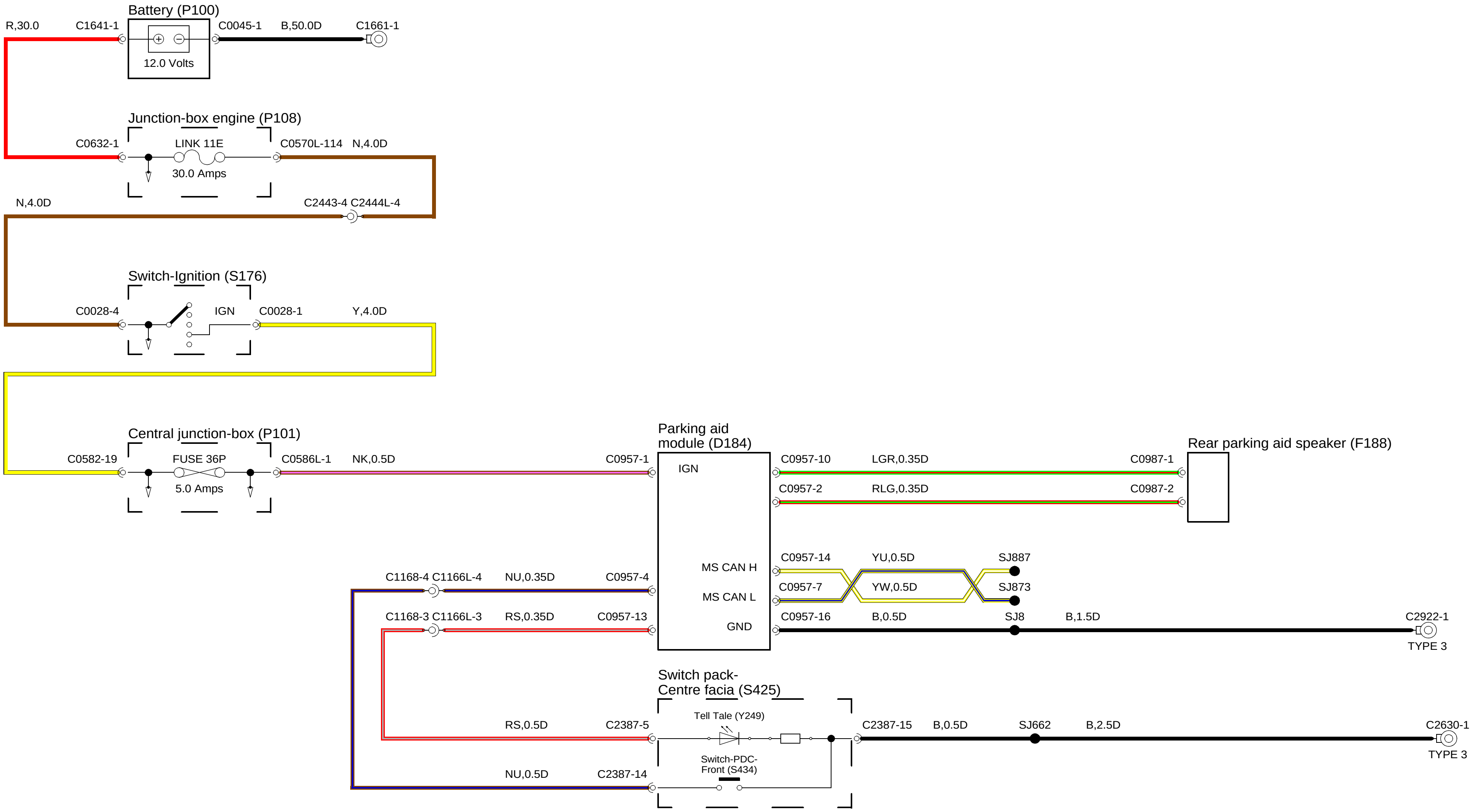

Battery (P100)
R,50.0
C0192-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 17E
50.0 Amps
C0570L-114 N,4.0D
C2444L-4 C2443-4
C0570L-117 NR,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
CRANK
C0028-1
Y,4.0D
C0028-7
WR,2.5D
Central junction-box (P101)
C0582-19
FUSE 68P
5.0 Amps
C0582-4
G,0.5D
SJ199
G,0.5D
C0230-15
Generic Electronic Module (D162)
C0582-5
C0580-22
BS,0.5D
C0230-7
C0583L-20
FUSE 39P
5.0 Amps
C0582-15
P,0.5D
C0230-16
C0582-46
FUSE 32P
15.0 Amps
C0585L-21
RY,1.5D
SJ20
C0582-14
FUSE 38P
15.0 Amps
C0583L-41
UP,1.5D
SJ172
UR,1.5D
RO,1.5D
Instrument cluster (J100)
Display Unit (D228)
TRIP COMPUTER
Sensor-Sunlight (T166)
Odometer (J212)
Sounder (J213)
LH turn signal indicator (J128)
0.03 Amps
Anti-theft alarm warning indicator (J139)
0.03 Amps
GND
GND
Main beam indicator (J126)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
RED
Front fog lamps indicator (J181)
0.03 Amps
Rear fog lamps indicator (J150)
0.03 Amps
RH turn signal indicator (J127)
0.03 Amps
HS CAN H
HS CAN L
MS CAN H
MS CAN L
IGN
ILLUM
VBATT
FR FOG
RR FOG
Switch-Steering column-Lighting (S175)
Switch-Trip reset (S433)
C0230-22
R,0.35D
C1393-5
C1393-1 B,0.35D
SJ660
B,1.0D
SJ663
B,2.5D
C2627-1
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
C0230-31
B,0.5D
Lighting control switch (S100)
Switch-Fog lamp-Front/rear (S112)
C0041-2
C0041-3
Switch-Dimming (S388)
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
C0230-17
YU,0.5D
SJ730
C0230-18
YW,0.5D
SJ731
C0230-5
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0230-24
UP,0.75D
C2238-18 C2240L-18
C0230-20
RY,0.75D
C1167-10 C1165L-10
RY,0.75D
UP,0.75D

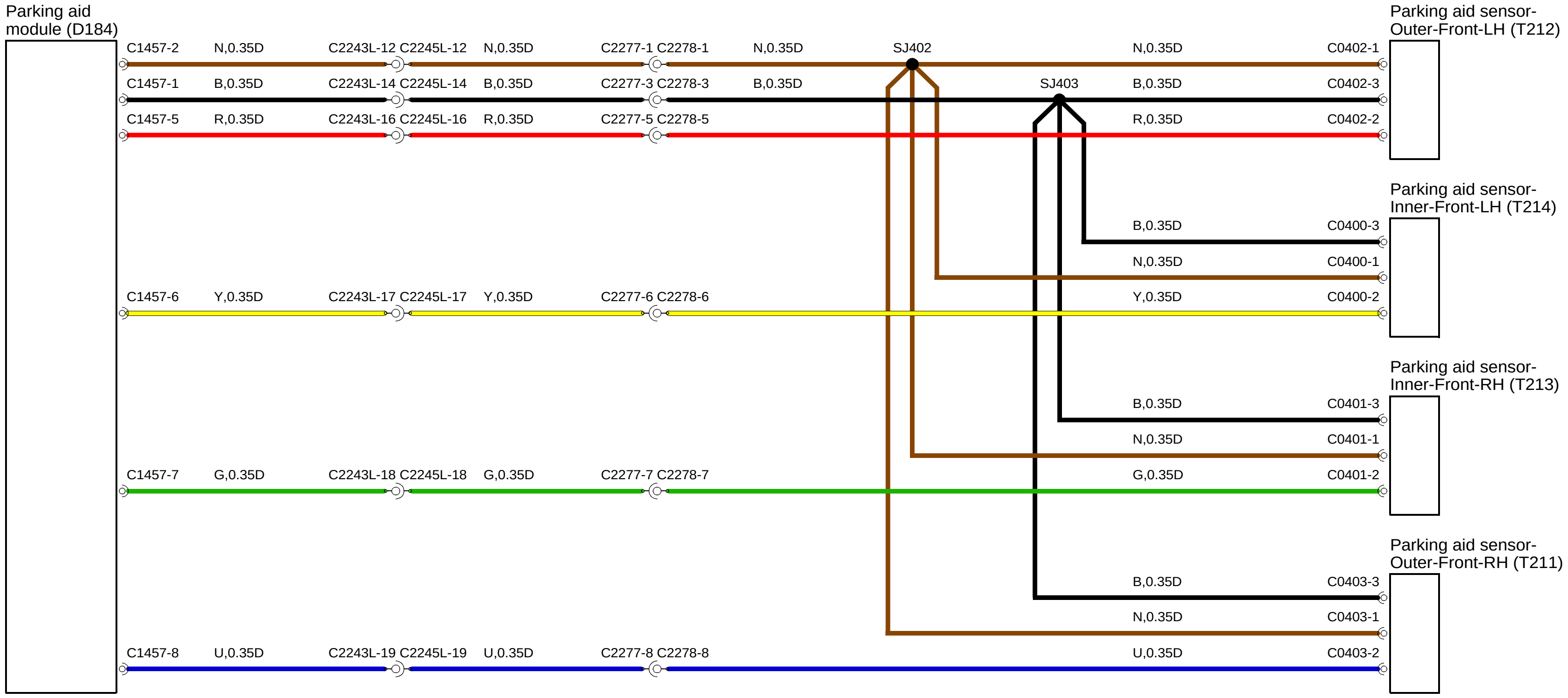

Instrument cluster (J100)
SRS warning indicator (J141)
0.03 Amps
Oil pressure warning indicator (J115)
0.03 Amps
Oil level warning indicator (J209)
0.03 Amps
ABS indicator (J123)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
AMBER
Trailer indicator (J130)
0.03 Amps
EMS warning indicator (J124)
0.03 Amps
Door open warning indicator (J138)
0.03 Amps
Transfer box overheat indicator (J208)
0.03 Amps
DSC indicator (J207)
0.03 Amps
City mode indicator (J205)
0.03 Amps
Low range indicator (J206)
0.03 Amps
Speed control indicator (J122)
0.03 Amps
HDC fault indicator (J161)
0.03 Amps
Warning lamp-HDC Active (J216)
0.03 Amps
Over speed indicator (J159)
0.03 Amps
Engine coolant level warning indicator (J118)
0.03 Amps
Adaptive speed control indicator (J204)
0.03 Amps
Warning lamp-ARC (J217)
0.03 Amps
Warning lamp-4CAS (J218)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
C0230-3 S,0.5D
C2239-6 C2241L-6
WN,0.5D (PETROL) C2725L-12
C2724B-12 (PV8NA) S,1.0 C0187B-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
C2724D-12 (PV8SC)
S,1.0 C0187D-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
BG,0.5D (DIESEL) C2274L-14
C2273C-14 (DV6 EU3) BG,0.75 C0187C-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
C2273E-14 (DV8)
C2273H-14 (DV6 EU4)
BG,0.75 C0187E-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
BG,0.75 C0187H-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
G,0.5D
C0230-8 G,0.5D C1167-2 C1165L-2 G,0.5D C0376-11 C0390-11 C2178-F4
Parking brake module (D278)
Unit-Fuel Tank (D179)
C0230-27 KB,0.5D C2239-10 C2241L-10 KB,0.5D C2559-13 C2560-13 KB,0.5D C0114-6
C0230-12 GB,0.5D C2239-11 C2241L-11 GB,0.5D C2559-14 C2560-14 GB,0.5D C0114-5
C0230-13 R,0.5D C2239-12 C2241L-12 R,0.5D C2559-15 C2560-15 R,0.5D C0114-3
Sensor-Engine coolant-level (T220)
C0230-19 R,0.5D C2238-4 C2240L-4 R,0.5D C0147-1 C0147-2 B,1.0D SJ173 B,4.0D C0560-1
TYPE 3
Sensor-Low washer-fluid level (T168)
C0230-4 R,0.5D C2238-7 C2240L-7 R,0.5D C0620-1 C0620-2 B,0.5D B,0.5D A
Sheet3

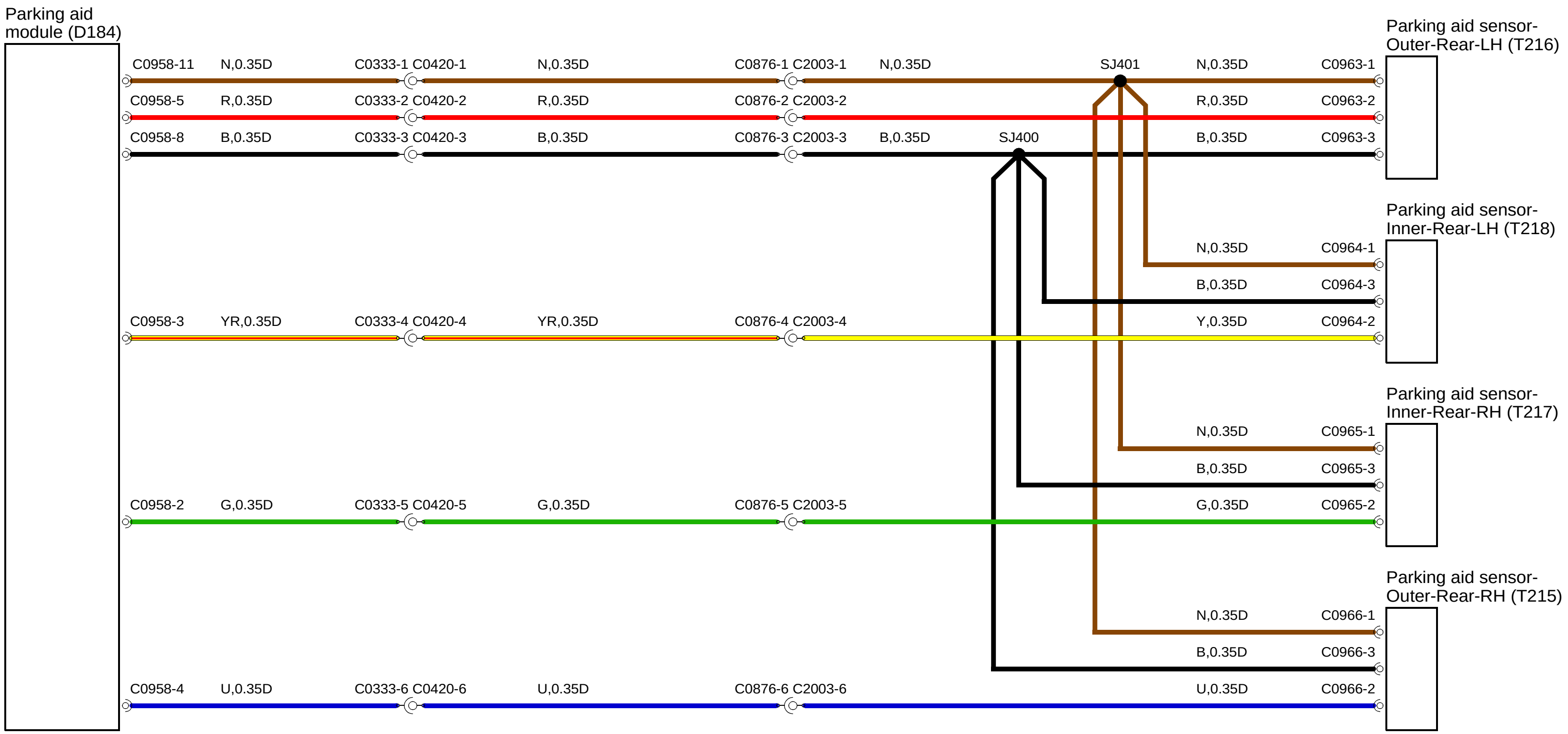

Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
0.03 Amps
Braking system/ pad wear warning indicator (J183)
0.03 Amps
ECT warning indicator (J121)
0.03 Amps
Safety belt warning indicator (J120)
0.03 Amps
Transmission warning indicator (J202)
0.03 Amps
FFBH indicator (J200)
0.03 Amps
Water in fuel indicator (J169)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
Low fuel indicator (J117)
0.03 Amps
Low washer fluid indicator (J198)
0.03 Amps
MIL (J201)
0.03 Amps
Glow plug indicator (J119)
0.03 Amps
Engine coolant temperature gauge (J103)
Tachometer (J102)
Speedometer (J101)
Fuel gauge (J104)
C0230-9
R,0.5D
C2238-5 C2240L-5
R,0.5D
C0050-1
Sensor-Pad wear (T153)
C0050-2
R,0.5D
C2560-12 C2559-12
R,0.5D
C0968-1
Sensor-Pad wear (T153)
C0968-2
B,0.5D
SJ85
B,2.5D
C0390-10 C0376-10
B,2.5D
SJ85
B,2.5D
C2922-1
TYPE 3
Switch-Brake-fluid level (S212)
C0230-21
BK,0.5D
C2238-11 C2240L-11
BK,0.5D
C0026L-1
C0026L-2
B,0.5D
A
Sheet2
C0230-6
O,0.5D
C1168-5 C1166L-5
O,0.5D
C2368-18
O,0.5
Mat-Belt minder (D358)
B,0.5
C2368-17
B,0.5D
C2562-1
TYPE 3


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 15E
C0570L-116
NU,4.0D
40.0 Amps
LINK 17E
C0570L-117
NR,6.0D
50.0 Amps
Central junction-box (P101)
LO TONE
C0583L-4
PG,1.0D
C0003-1
Horn-LH (L102)
C0003-2
B,1.0D
SJ877
B,2.5D
C0561-1
TYPE 3
3.00 Amps
Generic Electronic Module (D162)
C0583L-21
VBATT
HI TONE
C0583L-3
PG,1.0D
C0004-1
Horn-RH (L103)
C0004-2
B,1.0D
3.00 Amps
GND
C0585L-25
B,2.5D
C1398L-1
TYPE 3
Module-Steering-wheel-RH (D257)
Clock spring (S227)
Switch-Horn-RH (S340)
Air bag-Driver (U106)
ALARM
C0580-23
PO,0.35D
C0082-3
C1254-6
G,0.35
C2147-1
C2147-5
B,0.35
C2636-1
LU,0.35
C2147-2
C2147-6
S,0.35
Relay-Horn (R133)
C0583L-20
FUSE 12P
15.0 Amps
Module-Steering-wheel-LH (D256)
Switch-Horn-LH (S341)
C2283-7
C2283-5
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

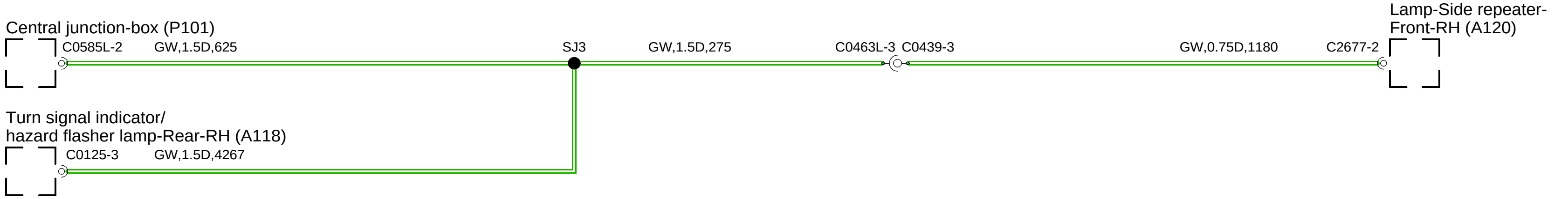
413-13 PARKING AID


Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 36P
5.0 Amps
C0586L-1
NK,0.5D
C0957-1
Parking aid module (D184)
IGN
MS CAN H
MS CAN L
GND
C0957-10
LGR,0.35D
C0987-1
C0957-2
RLG,0.35D
C0987-2
Rear parking aid speaker (F188)
C0957-14
YU,0.5D
SJ887
C0957-7
YW,0.5D
SJ873
C1168-4 C1166L-4
NU,0.35D
C0957-4
C1168-3 C1166L-3
RS,0.35D
C0957-13
C0957-16
B,0.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Switch pack-Centre facia (S425)
Tell Tale (Y249)
RS,0.5D
C2387-5
Switch-PDC-Front (S434)
NU,0.5D
C2387-14
C2387-15
B,0.5D
SJ662
B,2.5D
C2630-1
TYPE 3

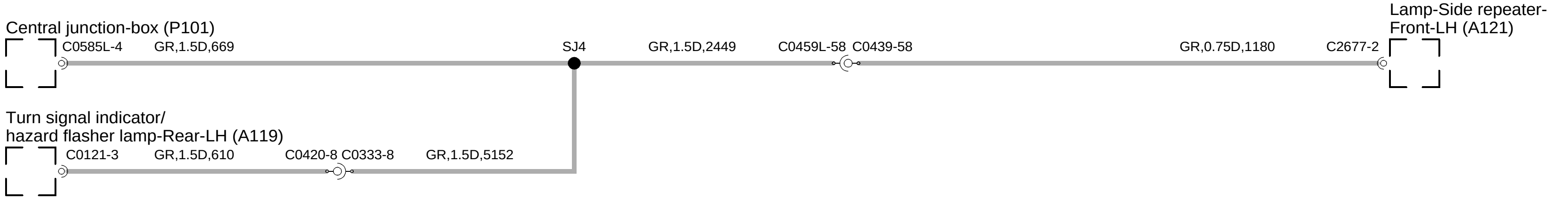

Parking aid module (D184)
C1457-2
N,0.35D
C2243L-12 C2245L-12
N,0.35D
C2277-1 C2278-1
N,0.35D
SJ402
N,0.35D
C0402-1
C1457-1
B,0.35D
C2243L-14 C2245L-14
B,0.35D
C2277-3 C2278-3
B,0.35D
SJ403
B,0.35D
C0402-3
C1457-5
R,0.35D
C2243L-16 C2245L-16
R,0.35D
C2277-5 C2278-5
R,0.35D
C0402-2
Parking aid sensor-Outer-Front-LH (T212)
Parking aid sensor-Inner-Front-LH (T214)
B,0.35D
C0400-3
N,0.35D
C0400-1
C1457-6
Y,0.35D
C2243L-17 C2245L-17
Y,0.35D
C2277-6 C2278-6
Y,0.35D
C0400-2
Parking aid sensor-Inner-Front-RH (T213)
B,0.35D
C0401-3
N,0.35D
C0401-1
C1457-7
G,0.35D
C2243L-18 C2245L-18
G,0.35D
C2277-7 C2278-7
G,0.35D
C0401-2
Parking aid sensor-Outer-Front-RH (T211)
B,0.35D
C0403-3
N,0.35D
C0403-1
C1457-8
U,0.35D
C2243L-19 C2245L-19
U,0.35D
C2277-8 C2278-8
U,0.35D
C0403-2


Parking aid module (D184)
C0958-11
N,0.35D
C0333-1 C0420-1
N,0.35D
C0876-1 C2003-1
N,0.35D
SJ401
N,0.35D
C0963-1
Parking aid sensor-Outer-Rear-LH (T216)
C0958-5
R,0.35D
C0333-2 C0420-2
R,0.35D
C0876-2 C2003-2
R,0.35D
C0963-2
C0958-8
B,0.35D
C0333-3 C0420-3
B,0.35D
C0876-3 C2003-3
B,0.35D
SJ400
B,0.35D
C0963-3
Parking aid sensor-Inner-Rear-LH (T218)
N,0.35D
C0964-1
B,0.35D
C0964-3
C0958-3
YR,0.35D
C0333-4 C0420-4
YR,0.35D
C0876-4 C2003-4
Y,0.35D
C0964-2
Parking aid sensor-Inner-Rear-RH (T217)
N,0.35D
C0965-1
B,0.35D
C0965-3
C0958-2
G,0.35D
C0333-5 C0420-5
G,0.35D
C0876-5 C2003-5
G,0.35D
C0965-2
Parking aid sensor-Outer-Rear-RH (T215)
N,0.35D
C0966-1
B,0.35D
C0966-3
C0958-4
U,0.35D
C0333-6 C0420-6
U,0.35D
C0876-6 C2003-6
U,0.35D
C0966-2

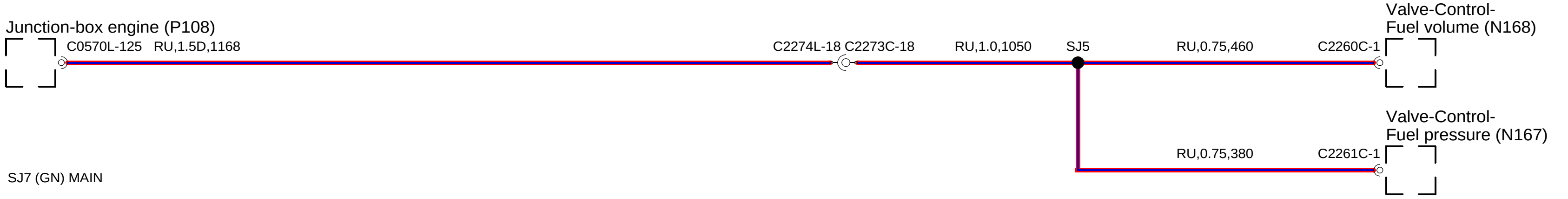
SJ3 (GW) MAIN


Central junction-box (P101)
C0585L-2
GW,1.5D,625
SJ3
GW,1.5D,275
C0463L-3
C0439-3
GW,0.75D,1180
C2677-2
Lamp-Side repeater-Front-RH (A120)
Turn signal indicator/hazard flasher lamp-Rear-RH (A118)
C0125-3
GW,1.5D,4267

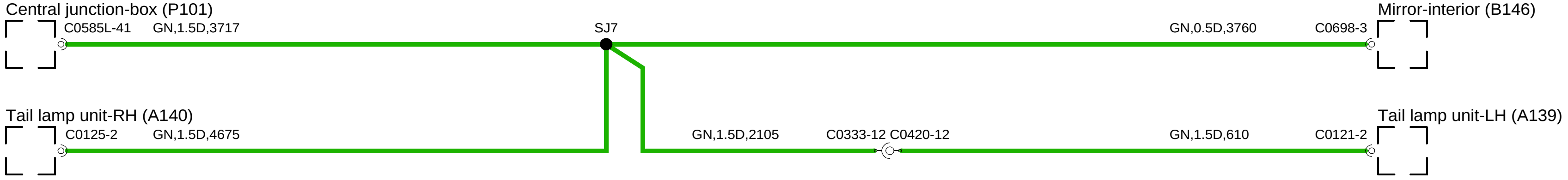
SJ4 (GR) MAIN

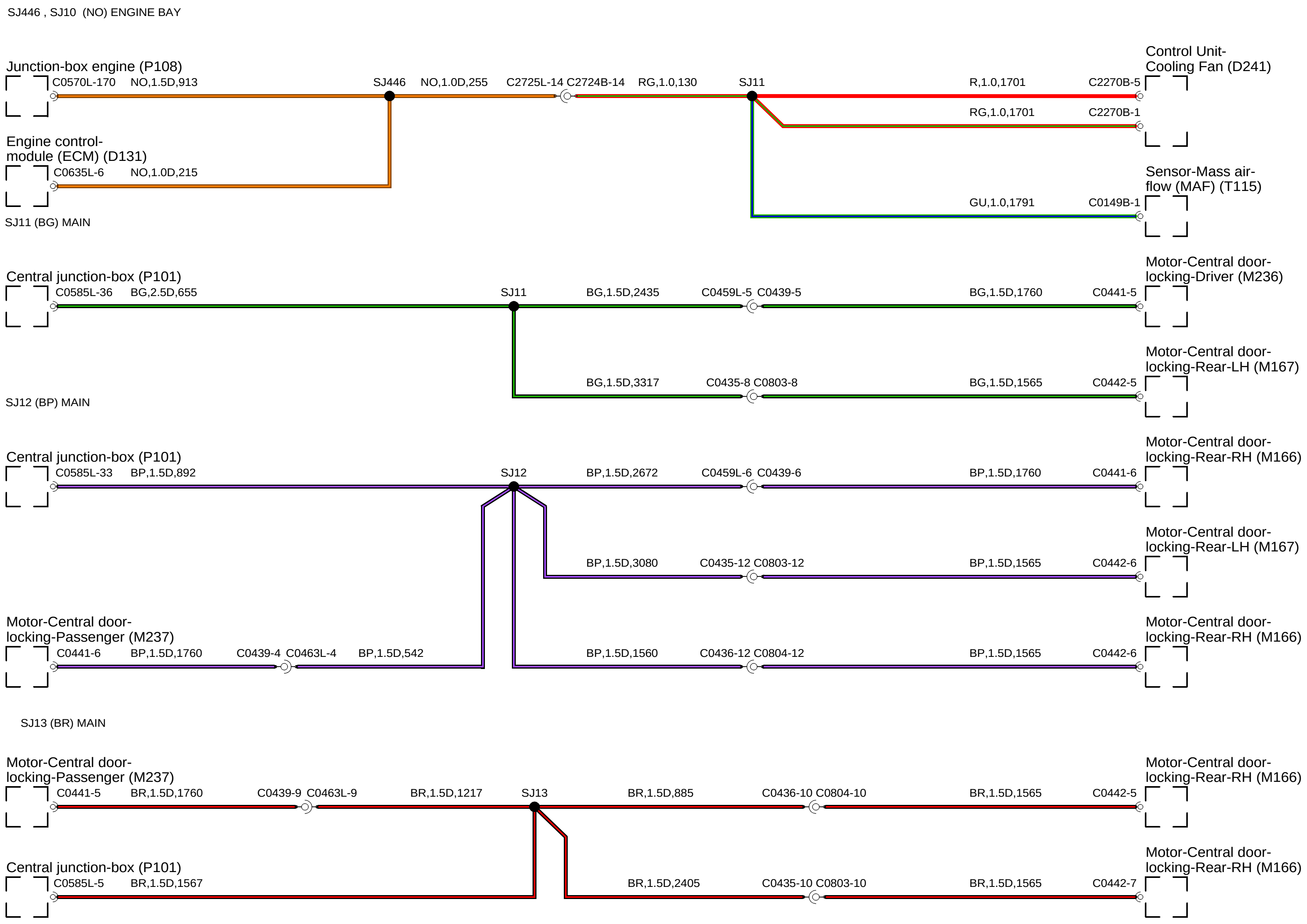

Central junction-box (P101)
C0585L-4
GR,1.5D,669
SJ4
GR,1.5D,2449
C0459L-58
C0439-58
GR,0.75D,1180
C2677-2
Lamp-Side repeater-Front-LH (A121)
Turn signal indicator/hazard flasher lamp-Rear-LH (A119)
C0121-3
GR,1.5D,610
C0420-8
C0333-8
GR,1.5D,5152

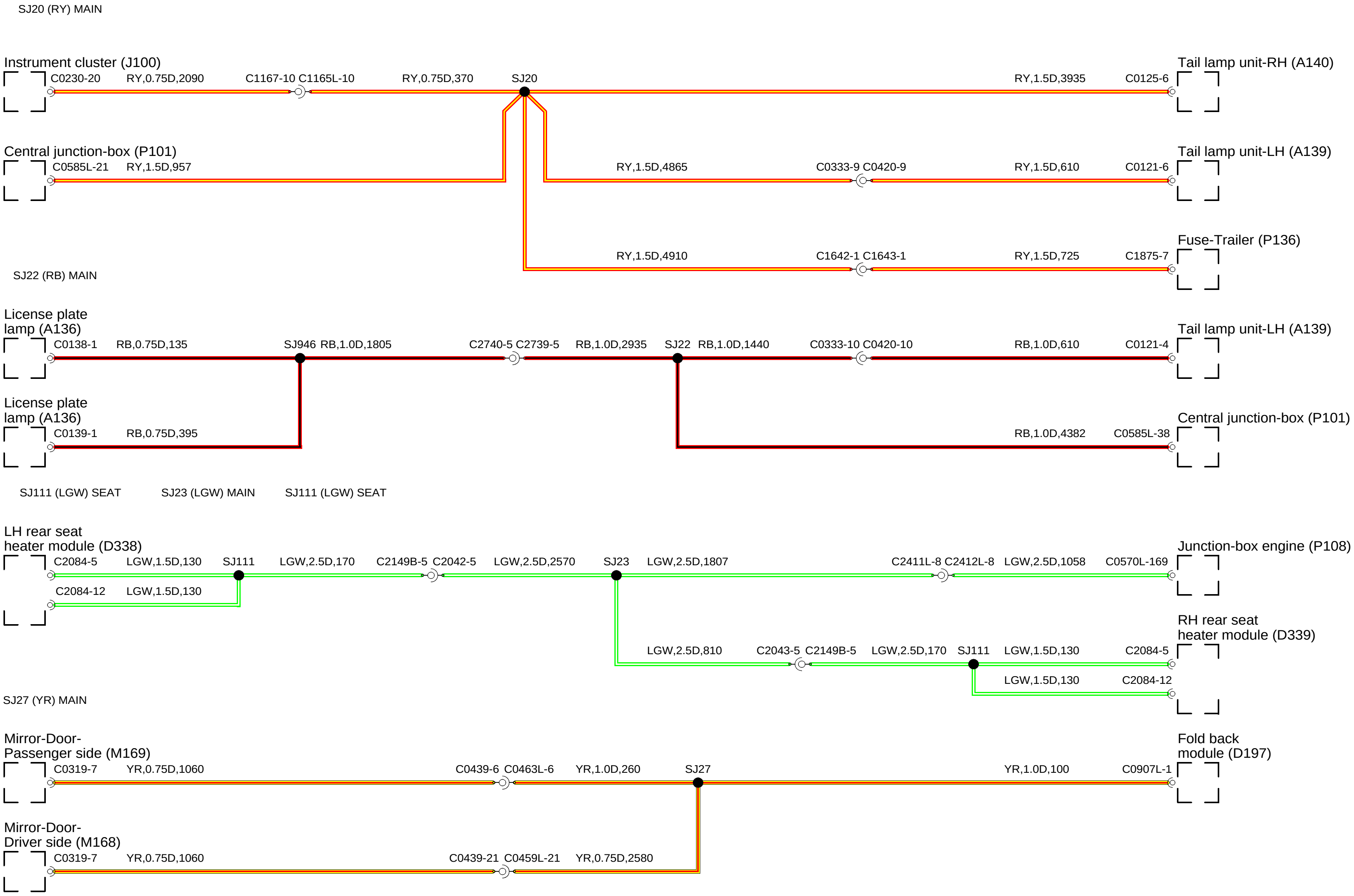
SJ5 (RU) ENGINE


Junction-box engine (P108)
C0570L-125
RU,1.5D,1168
C2274L-18
C2273C-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260C-1
Valve-Control-Fuel volume (N168)
Valve-Control-Fuel pressure (N167)
RU,0.75,380
C2261C-1

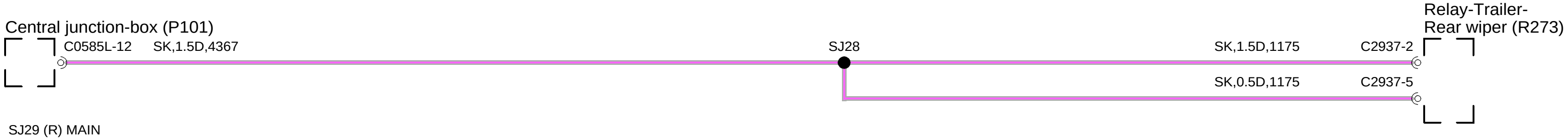
SJ7 (GN) MAIN


Central junction-box (P101)
C0585L-41
GN,1.5D,3717
SJ7
GN,0.5D,3760
C0698-3
Mirror-interior (B146)
Tail lamp unit-RH (A140)
C0125-2
GN,1.5D,4675
GN,1.5D,2105
C0333-12
C0420-12
GN,1.5D,610
C0121-2
Tail lamp unit-LH (A139)

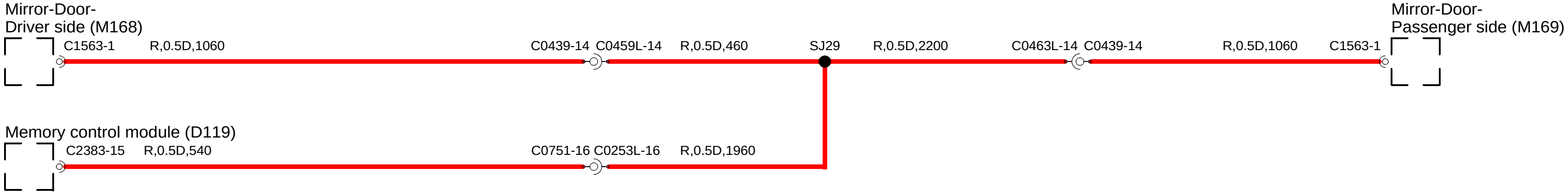

SJ446 , SJ10 (NO) ENGINE BAY
Junction-box engine (P108)
C0570L-170
NO,1.5D,913
SJ446
NO,1.0D,255
C2725L-14 C2724B-14
RG,1.0,130
SJ11
R,1.0,1701
C2270B-5
Control Unit-Cooling Fan (D241)
RG,1.0,1701
C2270B-1
Engine control-module (ECM) (D131)
C0635L-6
NO,1.0D,215
Sensor-Mass air-flow (MAF) (T115)
GU,1.0,1791
C0149B-1
SJ11 (BG) MAIN
Central junction-box (P101)
C0585L-36
BG,2.5D,655
SJ11
BG,1.5D,2435
C0459L-5 C0439-5
BG,1.5D,1760
C0441-5
Motor-Central door-locking-Driver (M236)
BG,1.5D,3317
C0435-8 C0803-8
BG,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-LH (M167)
SJ12 (BP) MAIN
Central junction-box (P101)
C0585L-33
BP,1.5D,892
SJ12
BP,1.5D,2672
C0459L-6 C0439-6
BP,1.5D,1760
C0441-6
Motor-Central door-locking-Rear-RH (M166)
BP,1.5D,3080
C0435-12 C0803-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-LH (M167)
Motor-Central door-locking-Passenger (M237)
C0441-6
BP,1.5D,1760
C0439-4 C0463L-4
BP,1.5D,542
BP,1.5D,1560
C0436-12 C0804-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-RH (M166)
SJ13 (BR) MAIN
Motor-Central door-locking-Passenger (M237)
C0441-5
BR,1.5D,1760
C0439-9 C0463L-9
BR,1.5D,1217
SJ13
BR,1.5D,885
C0436-10 C0804-10
BR,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-RH (M166)
Central junction-box (P101)
C0585L-5
BR,1.5D,1567
BR,1.5D,2405
C0435-10 C0803-10
BR,1.5D,1565
C0442-7
Motor-Central door-locking-Rear-RH (M166)


SJ20 (RY) MAIN
Instrument cluster (J100)
C0230-20
RY,0.75D,2090
C1167-10 C1165L-10
RY,0.75D,370
SJ20
RY,1.5D,3935
C0125-6
Tail lamp unit-RH (A140)
Central junction-box (P101)
C0585L-21
RY,1.5D,957
RY,1.5D,4865
C0333-9 C0420-9
RY,1.5D,610
C0121-6
Tail lamp unit-LH (A139)
RY,1.5D,4910
C1642-1 C1643-1
RY,1.5D,725
C1875-7
Fuse-Trailer (P136)
SJ22 (RB) MAIN
License plate lamp (A136)
C0138-1
RB,0.75D,135
SJ946
RB,1.0D,1805
C2740-5 C2739-5
RB,1.0D,2935
SJ22
RB,1.0D,1440
C0333-10 C0420-10
RB,1.0D,610
C0121-4
Tail lamp unit-LH (A139)
License plate lamp (A136)
C0139-1
RB,0.75D,395
RB,1.0D,4382
C0585L-38
Central junction-box (P101)
SJ111 (LGW) SEAT
SJ23 (LGW) MAIN
SJ111 (LGW) SEAT
LH rear seat heater module (D338)
C2084-5
LGW,1.5D,130
SJ111
LGW,2.5D,170
C2149B-5 C2042-5
LGW,2.5D,2570
SJ23
LGW,2.5D,1807
C2411L-8 C2412L-8
LGW,2.5D,1058
C0570L-169
Junction-box engine (P108)
C2084-12
LGW,1.5D,130
LGW,2.5D,810
C2043-5 C2149B-5
LGW,2.5D,170
SJ111
LGW,1.5D,130
C2084-5
RH rear seat heater module (D339)
LGW,1.5D,130
C2084-12
SJ27 (YR) MAIN
Mirror-Door-Passenger side (M169)
C0319-7
YR,0.75D,1060
C0439-6 C0463L-6
YR,1.0D,260
SJ27
YR,1.0D,100
C0907L-1
Fold back module (D197)
Mirror-Door-Driver side (M168)
C0319-7
YR,0.75D,1060
C0439-21 C0459L-21
YR,0.75D,2580

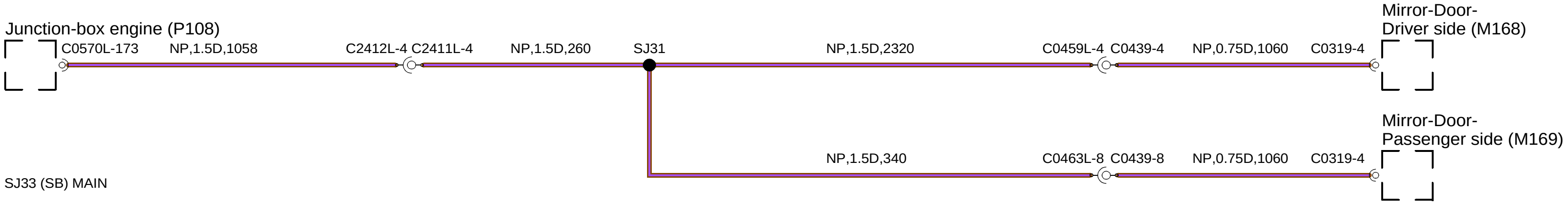
SJ28 (SK) MAIN


Central junction-box (P101)
C0585L-12
SK,1.5D,4367
SJ28
SK,1.5D,1175
C2937-2
SK,0.5D,1175
C2937-5
Relay-Trailer-
Rear wiper (R273)

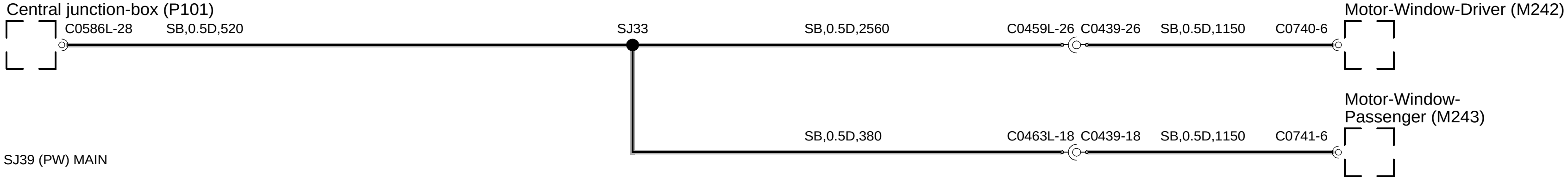
SJ29 (R) MAIN


Mirror-Door-
Driver side (M168)
C1563-1
R,0.5D,1060
C0439-14
C0459L-14
R,0.5D,460
SJ29
R,0.5D,2200
C0463L-14
C0439-14
R,0.5D,1060
C1563-1
Mirror-Door-
Passenger side (M169)
Memory control module (D119)
C2383-15
R,0.5D,540
C0751-16
C0253L-16
R,0.5D,1960

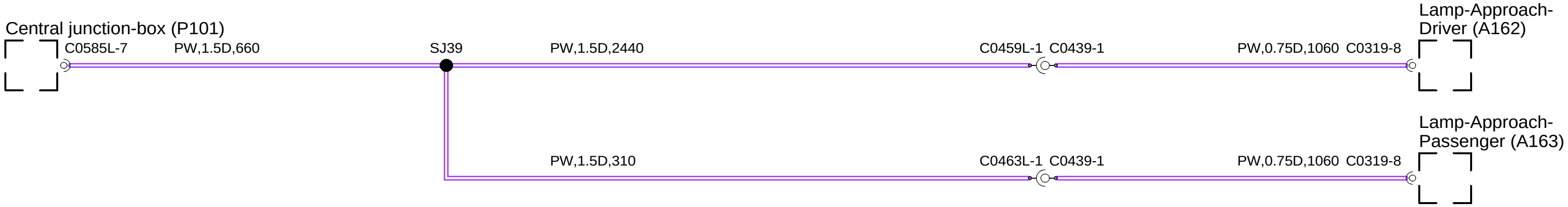
SJ31 (NP) MAIN

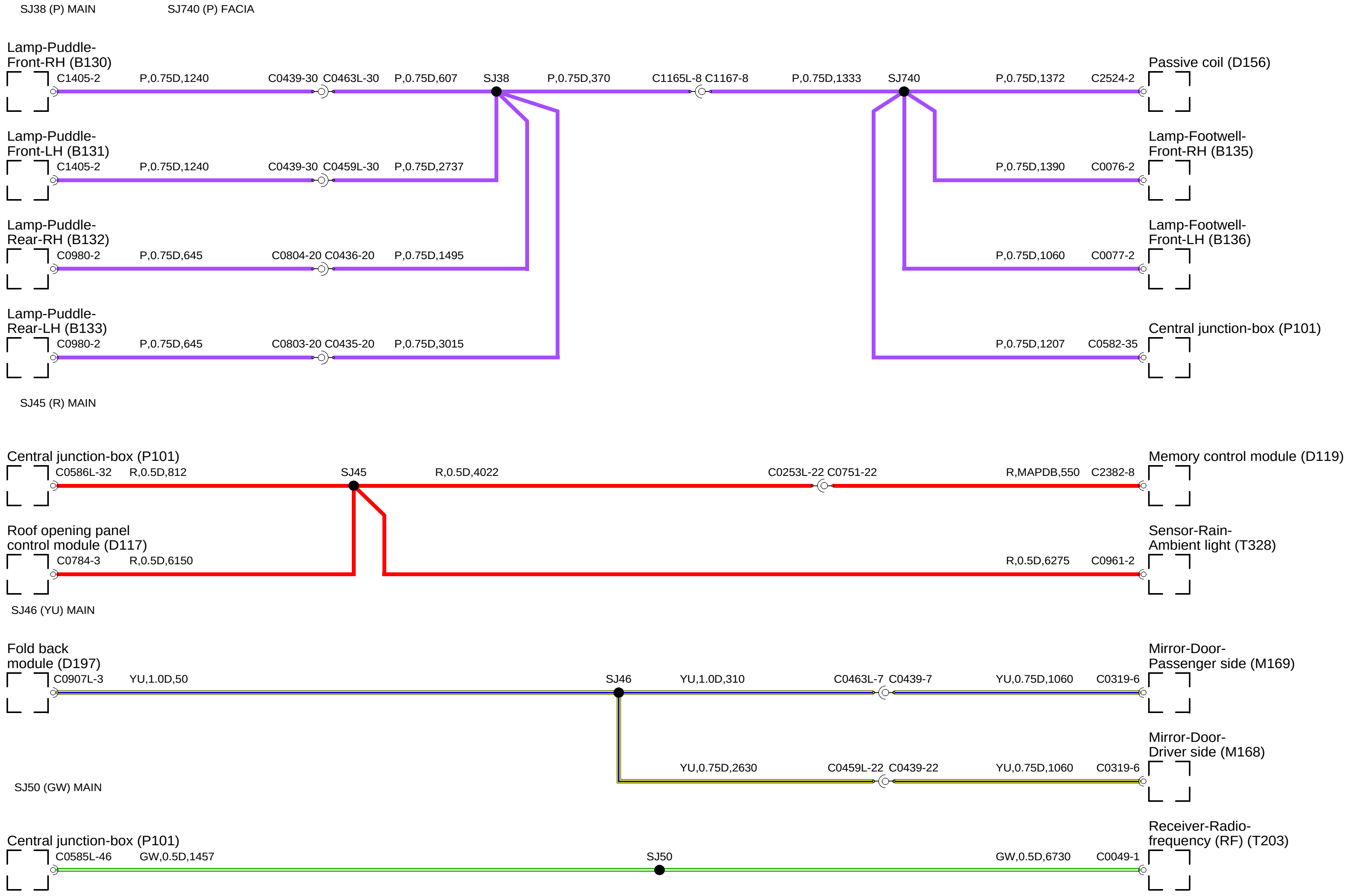

Junction-box engine (P108)
C0570L-173
NP,1.5D,1058
C2412L-4
C2411L-4
NP,1.5D,260
SJ31
NP,1.5D,2320
C0459L-4
C0439-4
NP,0.75D,1060
C0319-4
Mirror-Door-
Driver side (M168)
NP,1.5D,340
C0463L-8
C0439-8
NP,0.75D,1060
C0319-4
Mirror-Door-
Passenger side (M169)

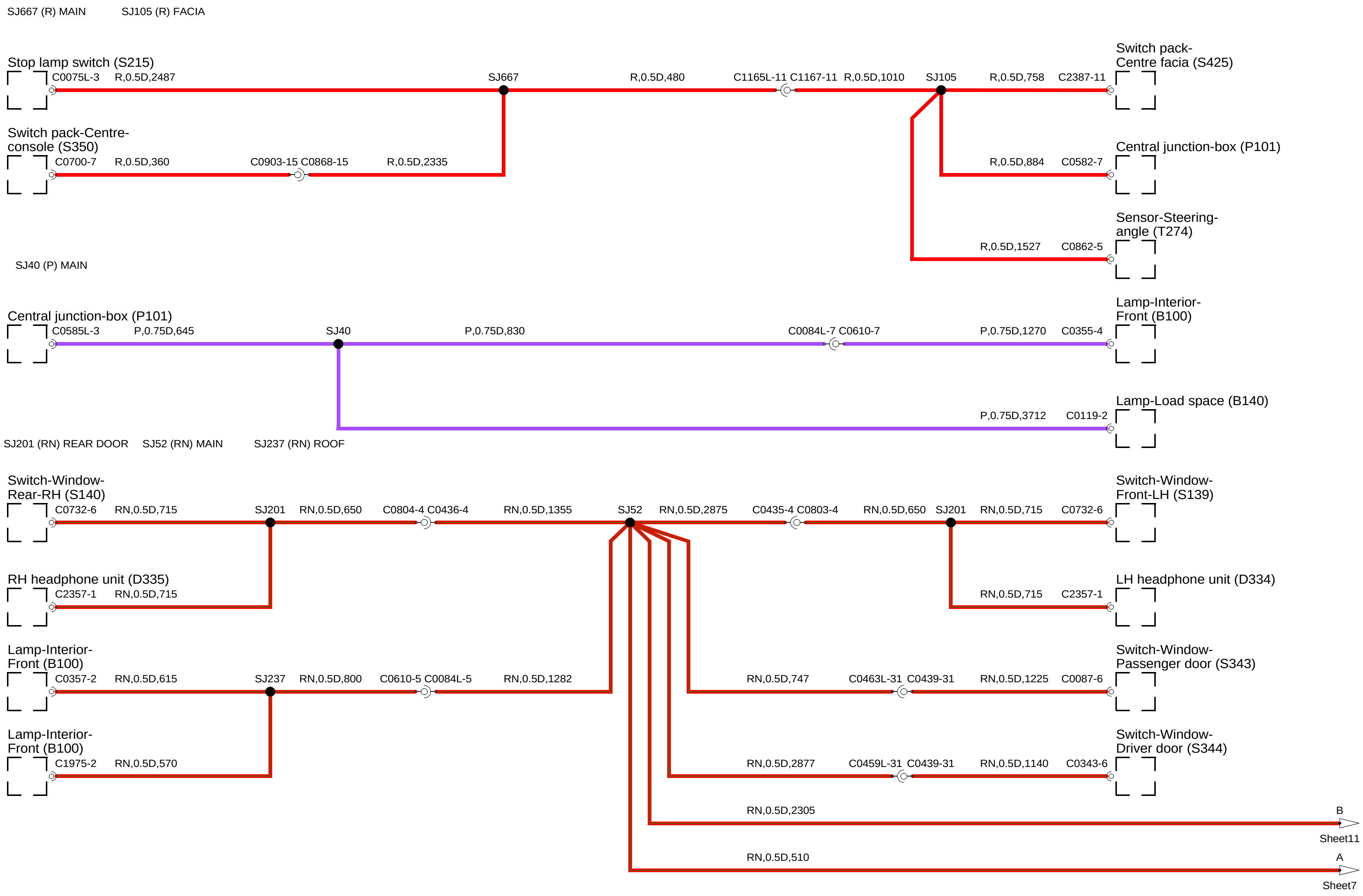
SJ33 (SB) MAIN

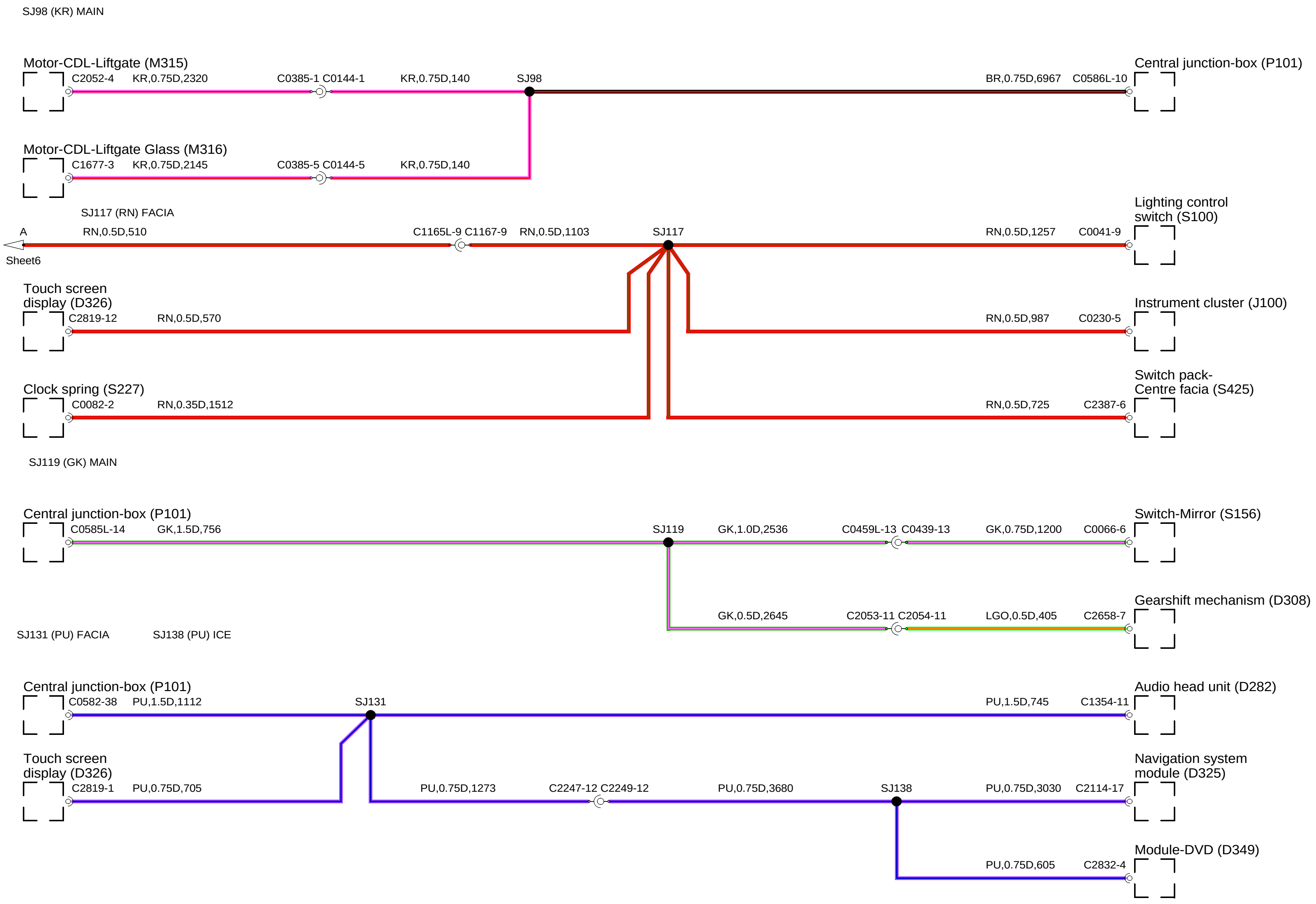

Central junction-box (P101)
C0586L-28
SB,0.5D,520
SJ33
SB,0.5D,2560
C0459L-26
C0439-26
SB,0.5D,1150
C0740-6
Motor-Window-Driver (M242)
SB,0.5D,380
C0463L-18
C0439-18
SB,0.5D,1150
C0741-6
Motor-Window-
Passenger (M243)

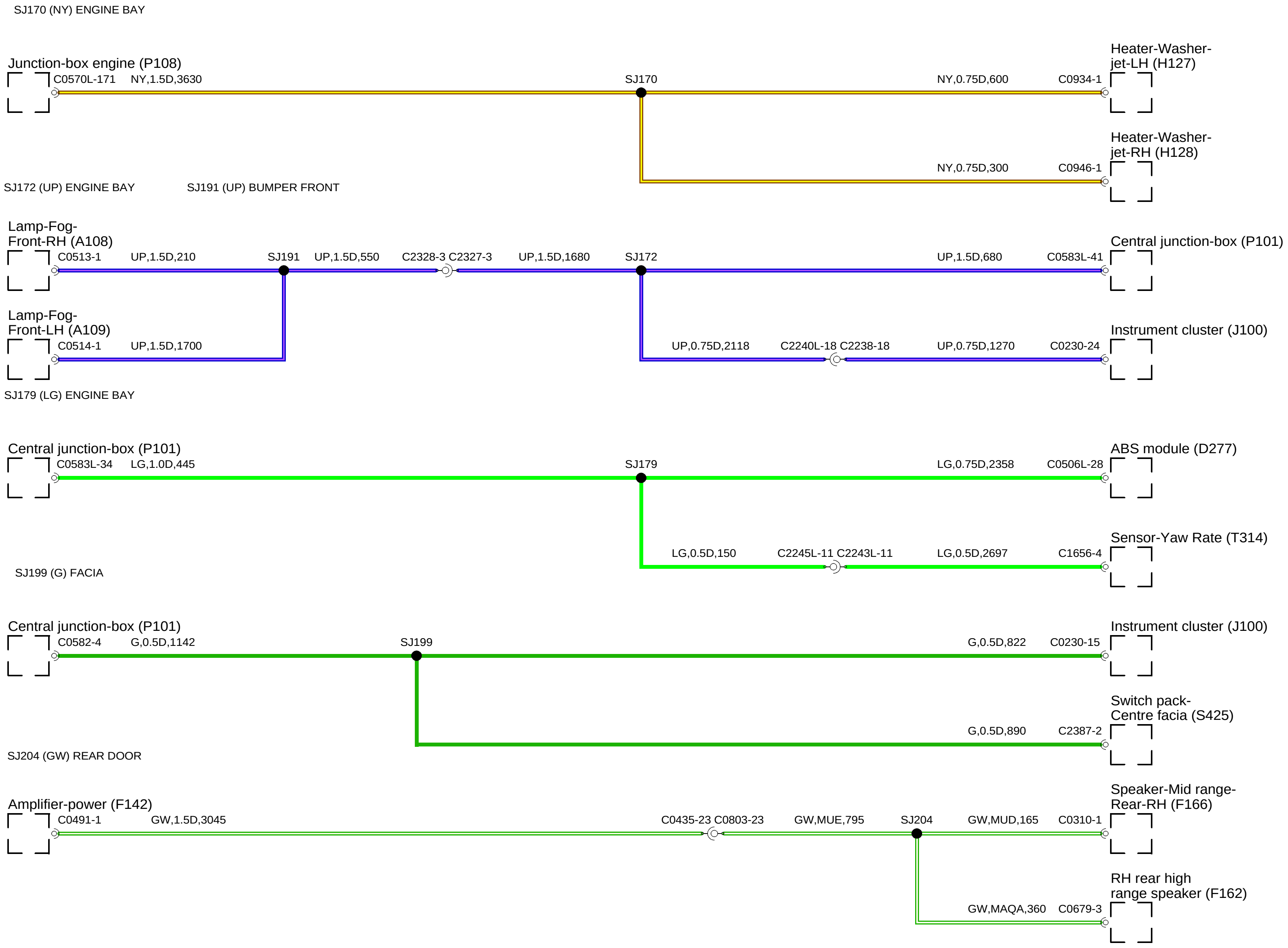
SJ39 (PW) MAIN


Central junction-box (P101)
C0585L-7
PW,1.5D,660
SJ39
PW,1.5D,2440
C0459L-1
C0439-1
PW,0.75D,1060
C0319-8
Lamp-Approach-
Driver (A162)
PW,1.5D,310
C0463L-1
C0439-1
PW,0.75D,1060
C0319-8
Lamp-Approach-
Passenger (A163)

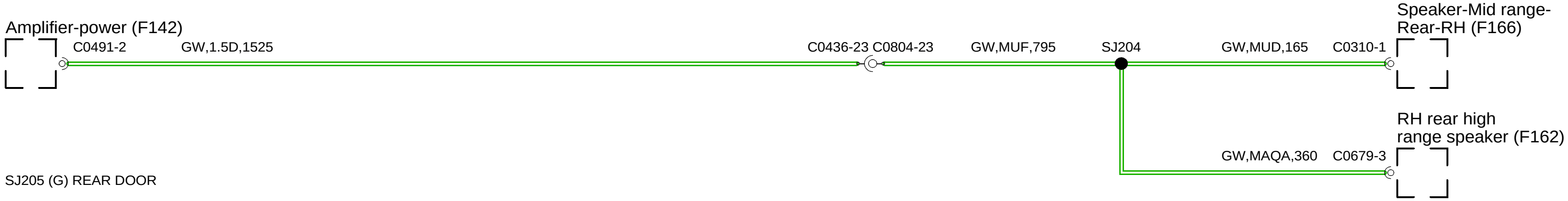

SJ38 (P) MAIN
SJ740 (P) FACIA
Lamp-Puddle-Front-RH (B130)
C1405-2
P,0.75D,1240
C0439-30 C0463L-30
P,0.75D,607
SJ38
P,0.75D,370
C1165L-8 C1167-8
P,0.75D,1333
SJ740
P,0.75D,1372
C2524-2
Passive coil (D156)
Lamp-Puddle-Front-LH (B131)
C1405-2
P,0.75D,1240
C0439-30 C0459L-30
P,0.75D,2737
Lamp-Footwell-Front-RH (B135)
P,0.75D,1390
C0076-2
Lamp-Puddle-Rear-RH (B132)
C0980-2
P,0.75D,645
C0804-20 C0436-20
P,0.75D,1495
Lamp-Footwell-Front-LH (B136)
P,0.75D,1060
C0077-2
Lamp-Puddle-Rear-LH (B133)
C0980-2
P,0.75D,645
C0803-20 C0435-20
P,0.75D,3015
Central junction-box (P101)
P,0.75D,1207
C0582-35
SJ45 (R) MAIN
Central junction-box (P101)
C0586L-32
R,0.5D,812
SJ45
R,0.5D,4022
C0253L-22 C0751-22
R,MAPDB,550
C2382-8
Memory control module (D119)
Roof opening panel control module (D117)
C0784-3
R,0.5D,6150
Sensor-Rain-Ambient light (T328)
R,0.5D,6275
C0961-2
SJ46 (YU) MAIN
Fold back module (D197)
C0907L-3
YU,1.0D,50
SJ46
YU,1.0D,310
C0463L-7 C0439-7
YU,0.75D,1060
C0319-6
Mirror-Door-Passenger side (M169)
YU,0.75D,2630
C0459L-22 C0439-22
YU,0.75D,1060
C0319-6
Mirror-Door-Driver side (M168)
SJ50 (GW) MAIN
Central junction-box (P101)
C0585L-46
GW,0.5D,1457
SJ50
GW,0.5D,6730
C0049-1
Receiver-Radio-frequency (RF) (T203)


SJ667 (R) MAIN
SJ105 (R) FACIA
Stop lamp switch (S215)
C0075L-3
R,0.5D,2487
SJ667
R,0.5D,480
C1165L-11 C1167-11
R,0.5D,1010
SJ105
R,0.5D,758
C2387-11
Switch pack-Centre facia (S425)
Switch pack-Centre-console (S350)
C0700-7
R,0.5D,360
C0903-15 C0868-15
R,0.5D,2335
Central junction-box (P101)
R,0.5D,884
C0582-7
Sensor-Steering-angle (T274)
R,0.5D,1527
C0862-5
SJ40 (P) MAIN
Central junction-box (P101)
C0585L-3
P,0.75D,645
SJ40
P,0.75D,830
C0084L-7 C0610-7
P,0.75D,1270
C0355-4
Lamp-Interior-Front (B100)
Lamp-Load space (B140)
P,0.75D,3712
C0119-2
SJ201 (RN) REAR DOOR
SJ52 (RN) MAIN
SJ237 (RN) ROOF
Switch-Window-Rear-RH (S140)
C0732-6
RN,0.5D,715
SJ201
RN,0.5D,650
C0804-4 C0436-4
RN,0.5D,1355
SJ52
RN,0.5D,2875
C0435-4 C0803-4
RN,0.5D,650
SJ201
RN,0.5D,715
C0732-6
Switch-Window-Front-LH (S139)
RH headphone unit (D335)
C2357-1
RN,0.5D,715
LH headphone unit (D334)
RN,0.5D,715
C2357-1
Lamp-Interior-Front (B100)
C0357-2
RN,0.5D,615
SJ237
RN,0.5D,800
C0610-5 C0084L-5
RN,0.5D,1282
RN,0.5D,747
C0463L-31 C0439-31
RN,0.5D,1225
C0087-6
Switch-Window-Passenger door (S343)
Lamp-Interior-Front (B100)
C1975-2
RN,0.5D,570
RN,0.5D,2877
C0459L-31 C0439-31
RN,0.5D,1140
C0343-6
Switch-Window-Driver door (S344)
RN,0.5D,2305
B
Sheet11
RN,0.5D,510
A
Sheet7

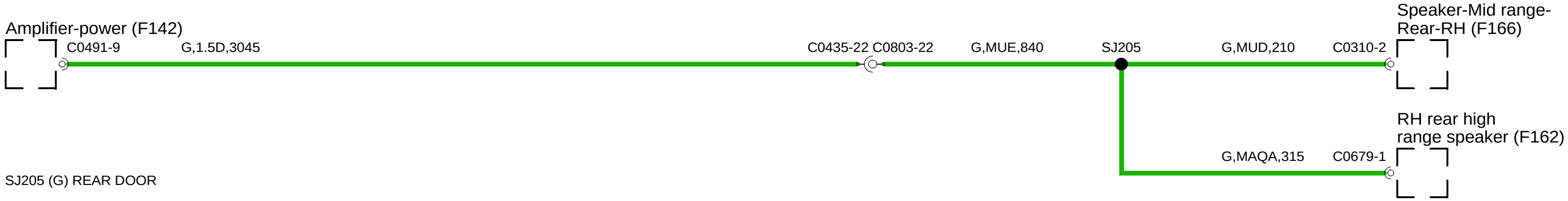

SJ98 (KR) MAIN
Motor-CDL-Liftgate (M315)
C2052-4
KR,0.75D,2320
C0385-1 C0144-1
KR,0.75D,140
SJ98
BR,0.75D,6967
C0586L-10
Central junction-box (P101)
Motor-CDL-Liftgate Glass (M316)
C1677-3
KR,0.75D,2145
C0385-5 C0144-5
KR,0.75D,140
SJ117 (RN) FACIA
A
RN,0.5D,510
Sheet6
C1165L-9 C1167-9
RN,0.5D,1103
SJ117
RN,0.5D,1257
C0041-9
Lighting control switch (S100)
Touch screen display (D326)
C2819-12
RN,0.5D,570
RN,0.5D,987
C0230-5
Instrument cluster (J100)
Clock spring (S227)
C0082-2
RN,0.35D,1512
RN,0.5D,725
C2387-6
Switch pack-Centre facia (S425)
SJ119 (GK) MAIN
Central junction-box (P101)
C0585L-14
GK,1.5D,756
SJ119
GK,1.0D,2536
C0459L-13 C0439-13
GK,0.75D,1200
C0066-6
Switch-Mirror (S156)
GK,0.5D,2645
C2053-11 C2054-11
LGO,0.5D,405
C2658-7
Gearshift mechanism (D308)
SJ131 (PU) FACIA
SJ138 (PU) ICE
Central junction-box (P101)
C0582-38
PU,1.5D,1112
SJ131
PU,1.5D,745
C1354-11
Audio head unit (D282)
Touch screen display (D326)
C2819-1
PU,0.75D,705
PU,0.75D,1273
C2247-12 C2249-12
PU,0.75D,3680
SJ138
PU,0.75D,3030
C2114-17
Navigation system module (D325)
PU,0.75D,605
C2832-4
Module-DVD (D349)


SJ170 (NY) ENGINE BAY
Junction-box engine (P108)
C0570L-171
NY,1.5D,3630
SJ170
NY,0.75D,600
C0934-1
Heater-Washer-jet-LH (H127)
NY,0.75D,300
C0946-1
Heater-Washer-jet-RH (H128)
SJ172 (UP) ENGINE BAY
SJ191 (UP) BUMPER FRONT
Lamp-Fog-Front-RH (A108)
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
UP,1.5D,1680
SJ172
UP,1.5D,680
C0583L-41
Central junction-box (P101)
Lamp-Fog-Front-LH (A109)
C0514-1
UP,1.5D,1700
UP,0.75D,2118
C2240L-18 C2238-18
UP,0.75D,1270
C0230-24
Instrument cluster (J100)
SJ179 (LG) ENGINE BAY
Central junction-box (P101)
C0583L-34
LG,1.0D,445
SJ179
LG,0.75D,2358
C0506L-28
ABS module (D277)
LG,0.5D,150
C2245L-11 C2243L-11
LG,0.5D,2697
C1656-4
Sensor-Yaw Rate (T314)
SJ199 (G) FACIA
Central junction-box (P101)
C0582-4
G,0.5D,1142
SJ199
G,0.5D,822
C0230-15
Instrument cluster (J100)
G,0.5D,890
C2387-2
Switch pack-Centre facia (S425)
SJ204 (GW) REAR DOOR
Amplifier-power (F142)
C0491-1
GW,1.5D,3045
C0435-23 C0803-23
GW,MUE,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-RH (F166)
GW,MAQA,360
C0679-3
RH rear high range speaker (F162)

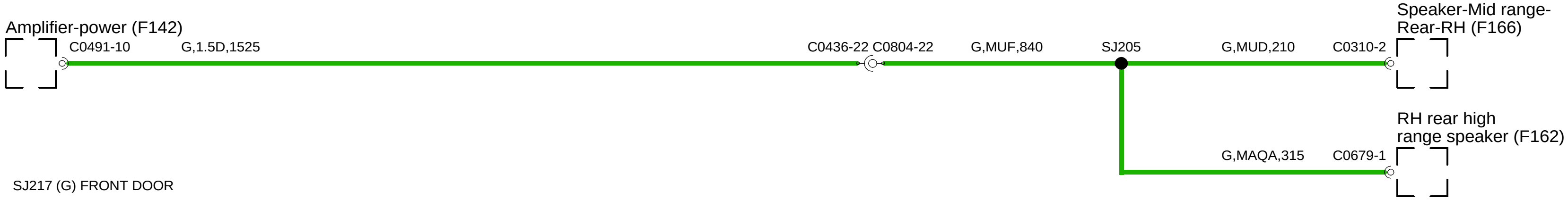
SJ204 (GW) REAR DOOR


Amplifier-power (F142)
C0491-2
GW,1.5D,1525
C0436-23 C0804-23
GW,MUF,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
GW,MAQA,360
C0679-3

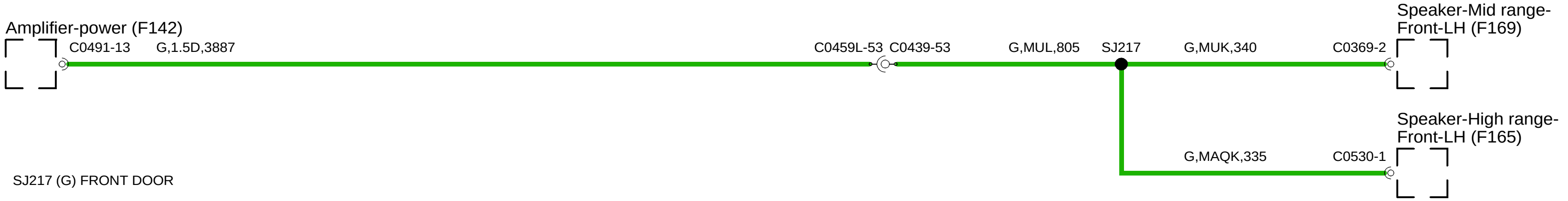
SJ205 (G) REAR DOOR


Amplifier-power (F142)
C0491-9
G,1.5D,3045
C0435-22 C0803-22
G,MUE,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
G,MAQA,315
C0679-1

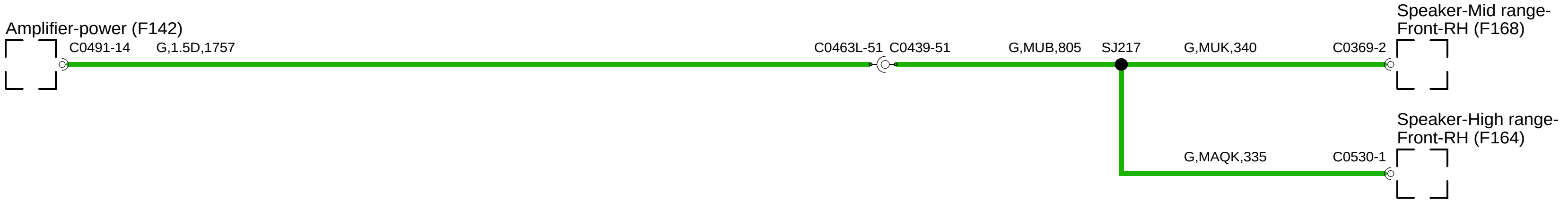
SJ205 (G) REAR DOOR


Amplifier-power (F142)
C0491-10
G,1.5D,1525
C0436-22 C0804-22
G,MUF,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
G,MAQA,315
C0679-1

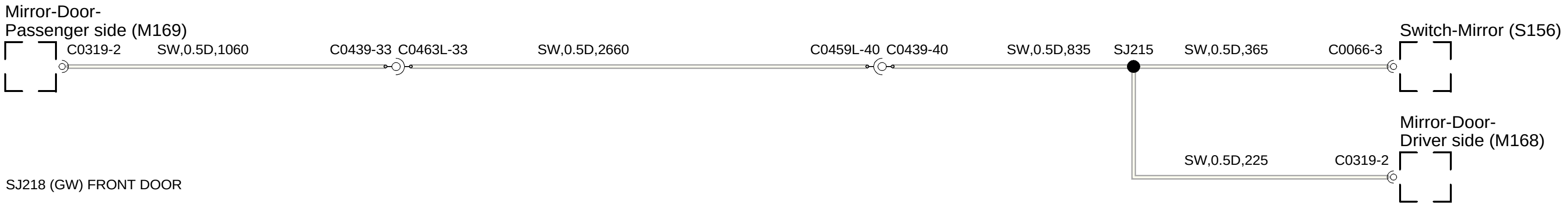
SJ217 (G) FRONT DOOR


Amplifier-power (F142)
C0491-13
G,1.5D,3887
C0459L-53 C0439-53
G,MUL,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-Front-LH (F169)
Speaker-High range-Front-LH (F165)
G,MAQK,335
C0530-1

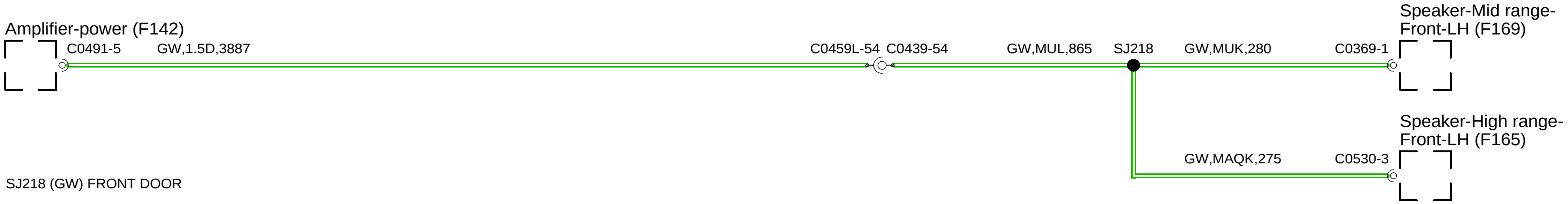
SJ217 (G) FRONT DOOR


Amplifier-power (F142)
C0491-14
G,1.5D,1757
C0463L-51 C0439-51
G,MUB,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-Front-RH (F168)
Speaker-High range-Front-RH (F164)
G,MAQK,335
C0530-1

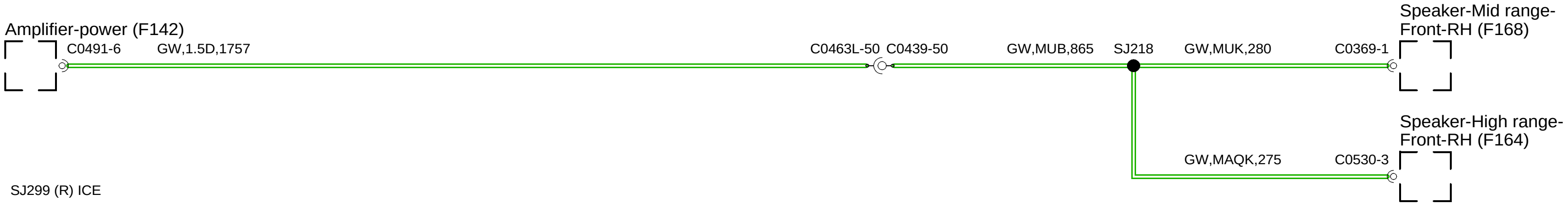
SJ215 (SW) FRONT DOOR


Mirror-Door-
Passenger side (M169)
C0319-2
SW,0.5D,1060
C0439-33
C0463L-33
SW,0.5D,2660
C0459L-40
C0439-40
SW,0.5D,835
SJ215
SW,0.5D,365
C0066-3
Switch-Mirror (S156)
Mirror-Door-
Driver side (M168)
SW,0.5D,225
C0319-2

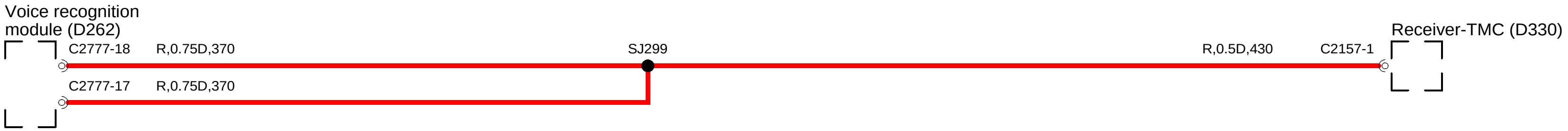
SJ218 (GW) FRONT DOOR


Amplifier-power (F142)
C0491-5
GW,1.5D,3887
C0459L-54
C0439-54
GW,MUL,865
SJ218
GW,MUK,280
C0369-1
Speaker-Mid range-
Front-LH (F169)
Speaker-High range-
Front-LH (F165)
GW,MAQK,275
C0530-3

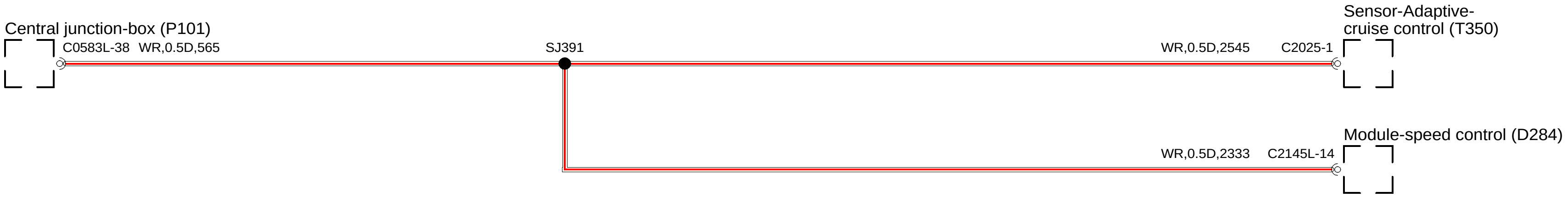
SJ218 (GW) FRONT DOOR

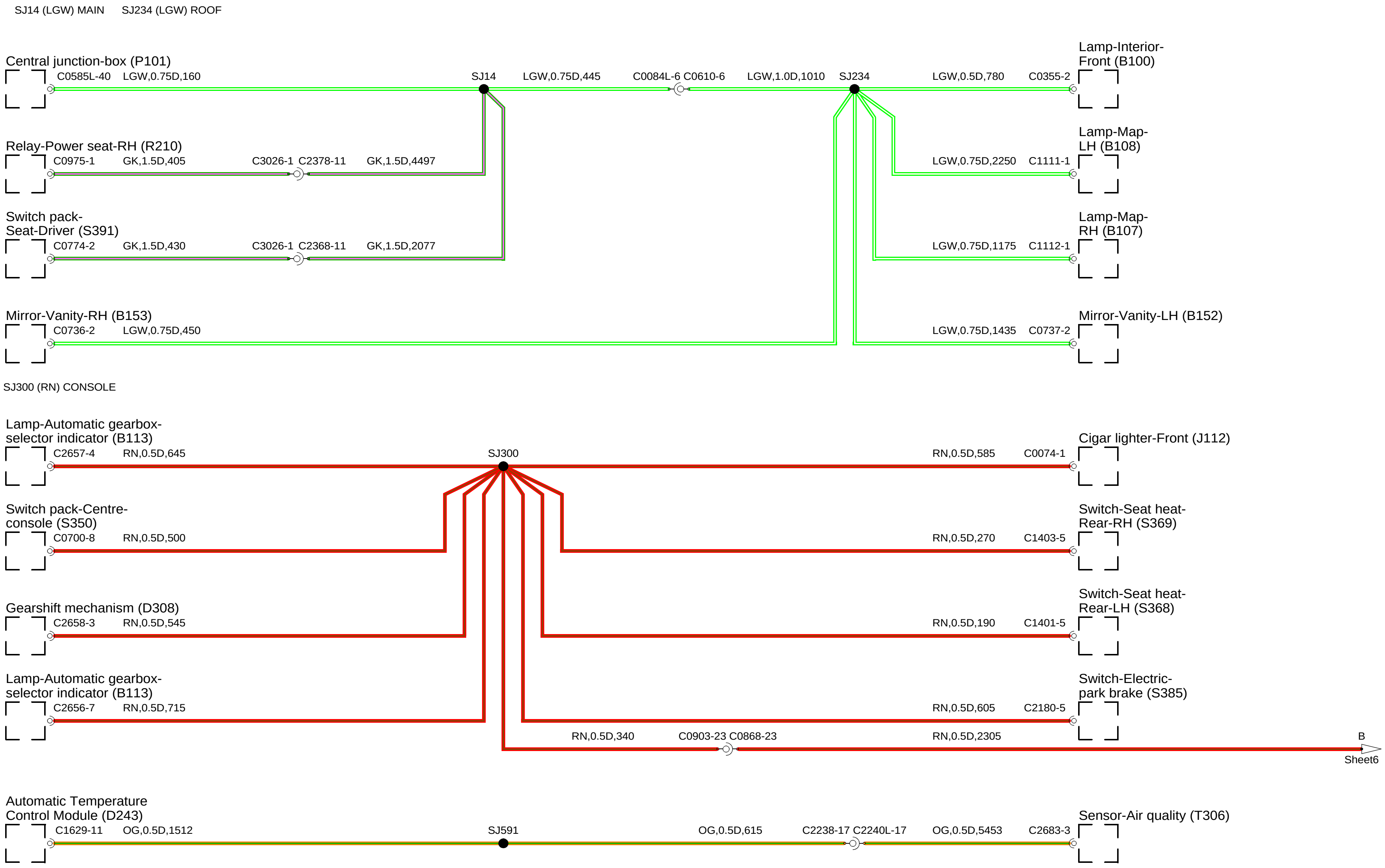

Amplifier-power (F142)
C0491-6
GW,1.5D,1757
C0463L-50
C0439-50
GW,MUB,865
SJ218
GW,MUK,280
C0369-1
Speaker-Mid range-
Front-RH (F168)
Speaker-High range-
Front-RH (F164)
GW,MAQK,275
C0530-3

SJ299 (R) ICE

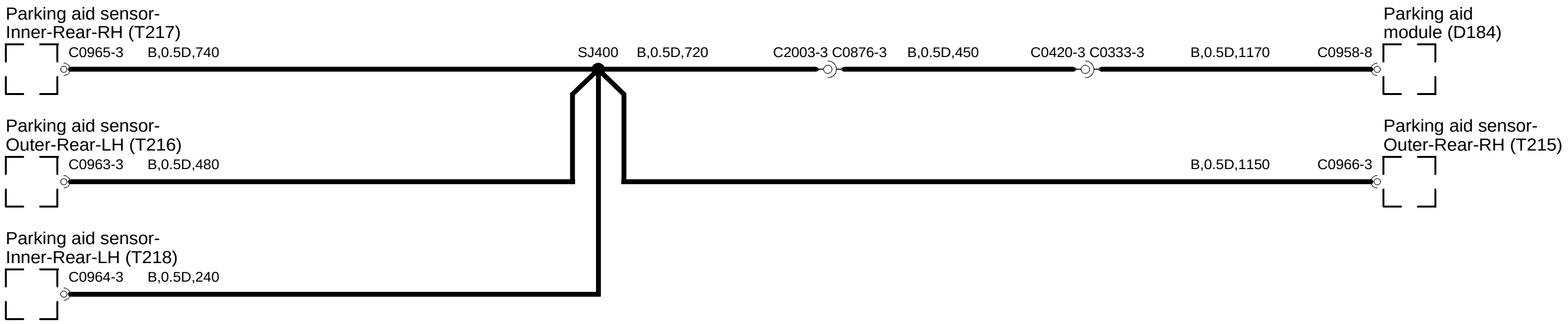

Voice recognition
module (D262)
C2777-18
R,0.75D,370
C2777-17
R,0.75D,370
SJ299
R,0.5D,430
C2157-1
Receiver-TMC (D330)

SJ391 (WR) MAIN

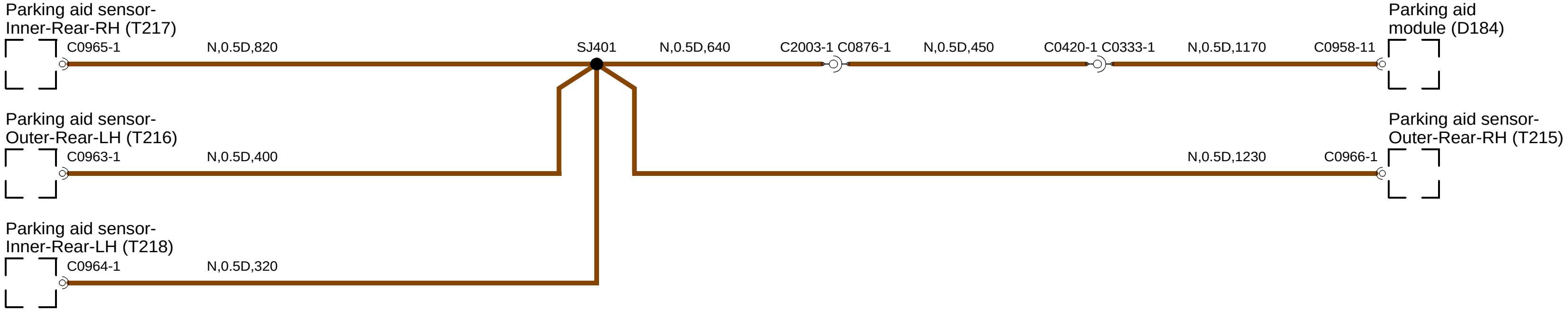

Central junction-box (P101)
C0583L-38
WR,0.5D,565
SJ391
WR,0.5D,2545
C2025-1
Sensor-Adaptive-
cruise control (T350)
Module-speed control (D284)
WR,0.5D,2333
C2145L-14


SJ14 (LGW) MAIN
SJ234 (LGW) ROOF
Central junction-box (P101)
C0585L-40
LGW,0.75D,160
SJ14
LGW,0.75D,445
C0084L-6 C0610-6
LGW,1.0D,1010
SJ234
LGW,0.5D,780
C0355-2
Lamp-Interior-Front (B100)
Relay-Power seat-RH (R210)
C0975-1
GK,1.5D,405
C3026-1 C2378-11
GK,1.5D,4497
LGW,0.75D,2250
C1111-1
Lamp-Map-LH (B108)
Switch pack-Seat-Driver (S391)
C0774-2
GK,1.5D,430
C3026-1 C2368-11
GK,1.5D,2077
LGW,0.75D,1175
C1112-1
Lamp-Map-RH (B107)
Mirror-Vanity-RH (B153)
C0736-2
LGW,0.75D,450
LGW,0.75D,1435
C0737-2
Mirror-Vanity-LH (B152)
SJ300 (RN) CONSOLE
Lamp-Automatic gearbox-selector indicator (B113)
C2657-4
RN,0.5D,645
SJ300
RN,0.5D,585
C0074-1
Cigar lighter-Front (J112)
Switch pack-Centre-console (S350)
C0700-8
RN,0.5D,500
RN,0.5D,270
C1403-5
Switch-Seat heat-Rear-RH (S369)
Gearshift mechanism (D308)
C2658-3
RN,0.5D,545
RN,0.5D,190
C1401-5
Switch-Seat heat-Rear-LH (S368)
Lamp-Automatic gearbox-selector indicator (B113)
C2656-7
RN,0.5D,715
RN,0.5D,605
C2180-5
Switch-Electric-park brake (S385)
RN,0.5D,340
C0903-23 C0868-23
RN,0.5D,2305
B
Sheet6
Automatic Temperature Control Module (D243)
C1629-11
OG,0.5D,1512
SJ591
OG,0.5D,615
C2238-17 C2240L-17
OG,0.5D,5453
C2683-3
Sensor-Air quality (T306)

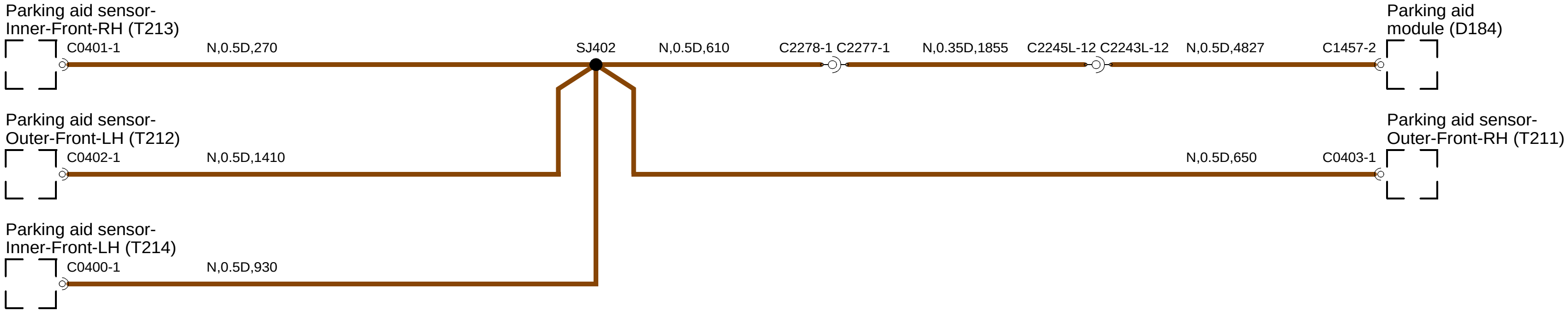
SJ400 (B) P.D.C. REAR


Parking aid sensor-
Inner-Rear-RH (T217)
C0965-3
B,0.5D,740
SJ400
B,0.5D,720
C2003-3 C0876-3
B,0.5D,450
C0420-3 C0333-3
B,0.5D,1170
C0958-8
Parking aid
module (D184)
Parking aid sensor-
Outer-Rear-LH (T216)
C0963-3
B,0.5D,480
Parking aid sensor-
Outer-Rear-RH (T215)
B,0.5D,1150
C0966-3
Parking aid sensor-
Inner-Rear-LH (T218)
C0964-3
B,0.5D,240

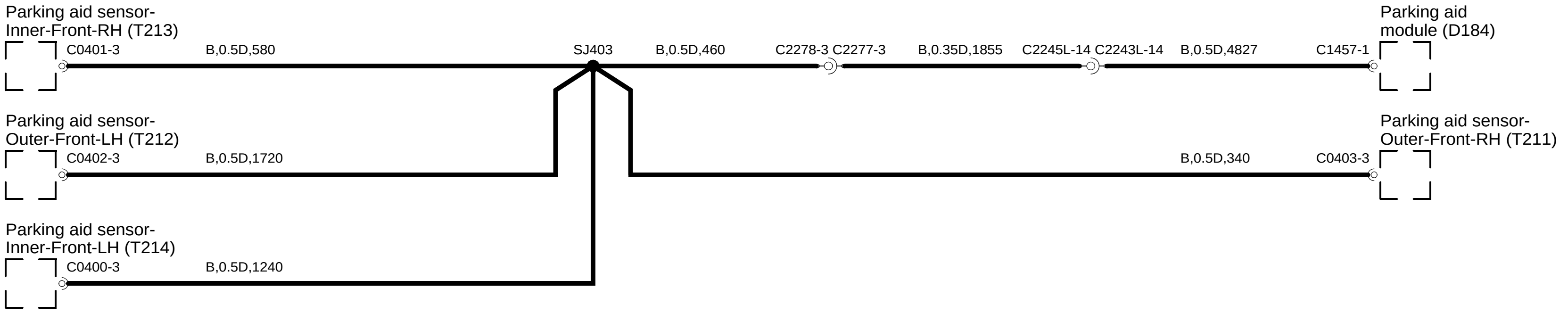
SJ401 (N) P.D.C. REAR


Parking aid sensor-
Inner-Rear-RH (T217)
C0965-1
N,0.5D,820
SJ401
N,0.5D,640
C2003-1 C0876-1
N,0.5D,450
C0420-1 C0333-1
N,0.5D,1170
C0958-11
Parking aid
module (D184)
Parking aid sensor-
Outer-Rear-LH (T216)
C0963-1
N,0.5D,400
Parking aid sensor-
Outer-Rear-RH (T215)
N,0.5D,1230
C0966-1
Parking aid sensor-
Inner-Rear-LH (T218)
C0964-1
N,0.5D,320

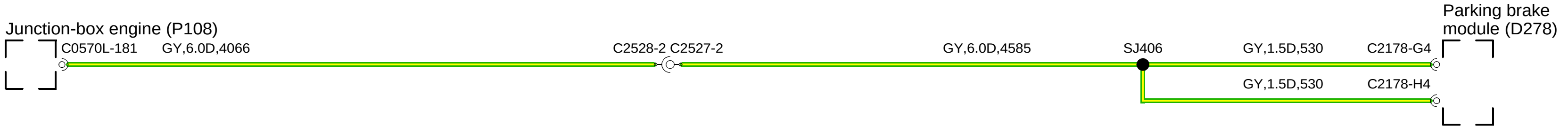
SJ402 (N) FRONT BUMPER


Parking aid sensor-
Inner-Front-RH (T213)
C0401-1
N,0.5D,270
SJ402
N,0.5D,610
C2278-1 C2277-1
N,0.35D,1855
C2245L-12 C2243L-12
N,0.5D,4827
C1457-2
Parking aid
module (D184)
Parking aid sensor-
Outer-Front-LH (T212)
C0402-1
N,0.5D,1410
Parking aid sensor-
Outer-Front-RH (T211)
N,0.5D,650
C0403-1
Parking aid sensor-
Inner-Front-LH (T214)
C0400-1
N,0.5D,930

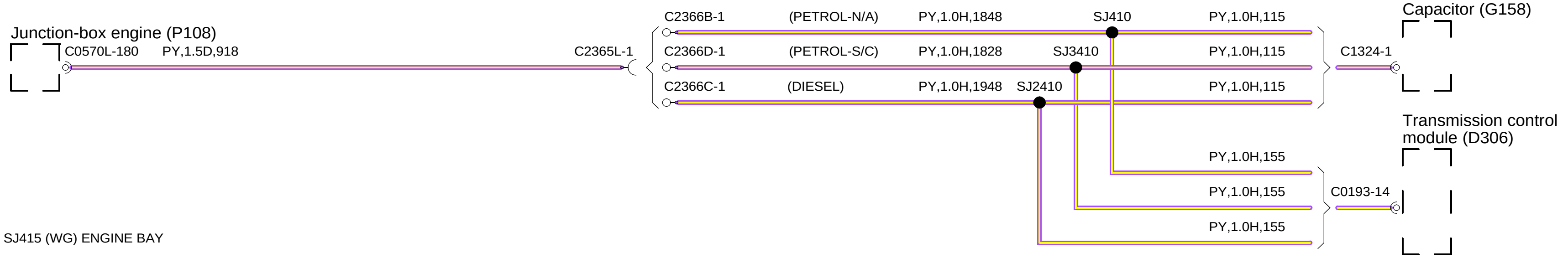
SJ403 (B) FRONT BUMPER


Parking aid sensor-
Inner-Front-RH (T213)
C0401-3
B,0.5D,580
SJ403
B,0.5D,460
C2278-3 C2277-3
B,0.35D,1855
C2245L-14 C2243L-14
B,0.5D,4827
C1457-1
Parking aid
module (D184)
Parking aid sensor-
Outer-Front-LH (T212)
C0402-3
B,0.5D,1720
B,0.5D,340
C0403-3
Parking aid sensor-
Outer-Front-RH (T211)
Parking aid sensor-
Inner-Front-LH (T214)
C0400-3
B,0.5D,1240

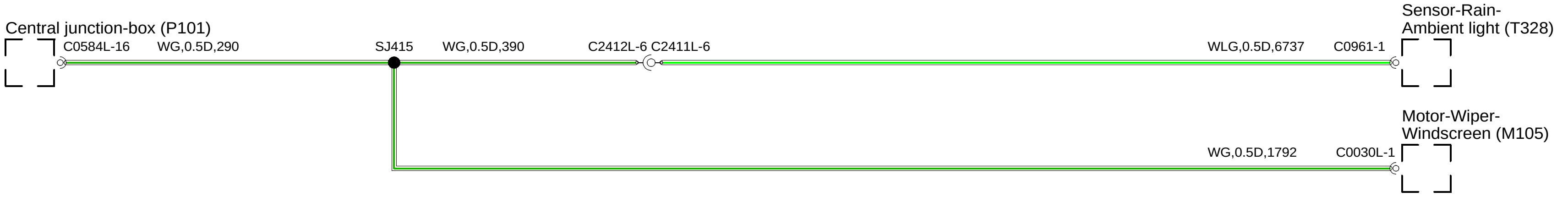
SJ406 (GY) REAR CHASSIS


Junction-box engine (P108)
C0570L-181
GY,6.0D,4066
C2528-2 C2527-2
GY,6.0D,4585
SJ406
GY,1.5D,530
C2178-G4
Parking brake
module (D278)
GY,1.5D,530
C2178-H4

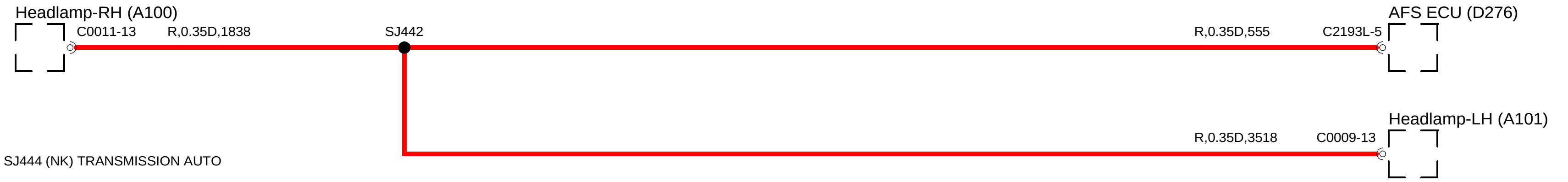
SJ410 (PY) AUTO TRANSMISSION SJ3410 (PY) AUTO TRANSMISSION SJ2410 (PY) AUTO TRANSMISSION


Junction-box engine (P108)
C0570L-180
PY,1.5D,918
C2365L-1
C2366B-1
(PETROL-N/A)
PY,1.0H,1848
SJ410
PY,1.0H,115
C2366D-1
(PETROL-S/C)
PY,1.0H,1828
SJ3410
PY,1.0H,115
C1324-1
Capacitor (G158)
C2366C-1
(DIESEL)
PY,1.0H,1948
SJ2410
PY,1.0H,115
Transmission control
module (D306)
PY,1.0H,155
PY,1.0H,155
C0193-14
PY,1.0H,155

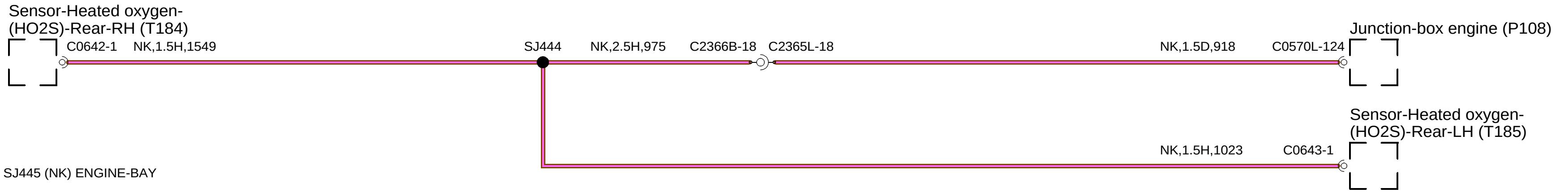
SJ415 (WG) ENGINE BAY


Central junction-box (P101)
C0584L-16
WG,0.5D,290
SJ415
WG,0.5D,390
C2412L-6 C2411L-6
WLG,0.5D,6737
C0961-1
Sensor-Rain-
Ambient light (T328)
Motor-Wiper-
Windscreen (M105)
WG,0.5D,1792
C0030L-1

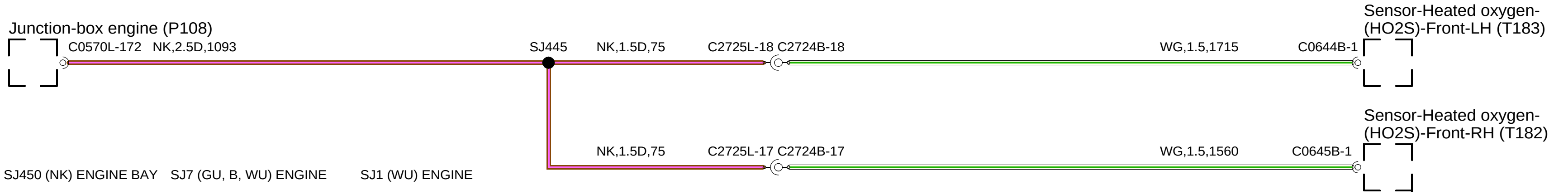
SJ442 (R) ENGINE-BAY


Headlamp-RH (A100)
C0011-13
R,0.35D,1838
SJ442
R,0.35D,555
C2193L-5
AFS ECU (D276)
Headlamp-LH (A101)
R,0.35D,3518
C0009-13

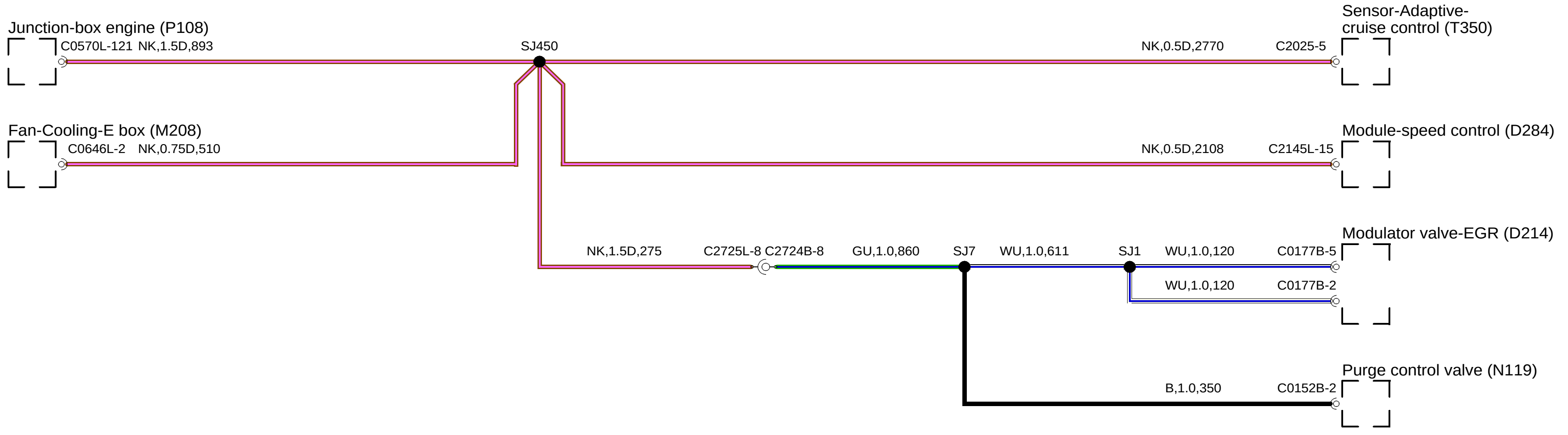
SJ444 (NK) TRANSMISSION AUTO

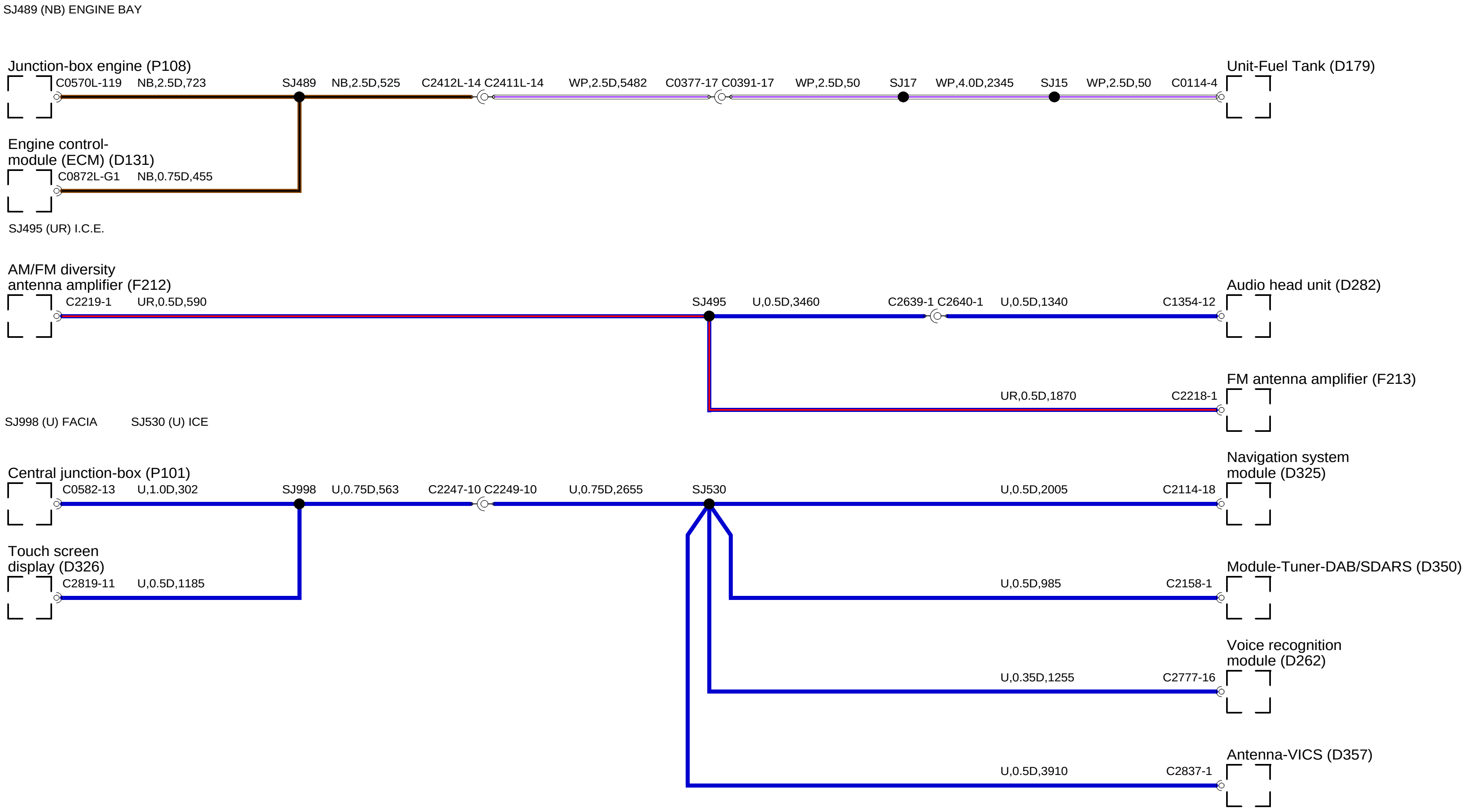

Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
C0642-1
NK,1.5H,1549
SJ444
NK,2.5H,975
C2366B-18
C2365L-18
NK,1.5D,918
C0570L-124
Junction-box engine (P108)
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H,1023
C0643-1

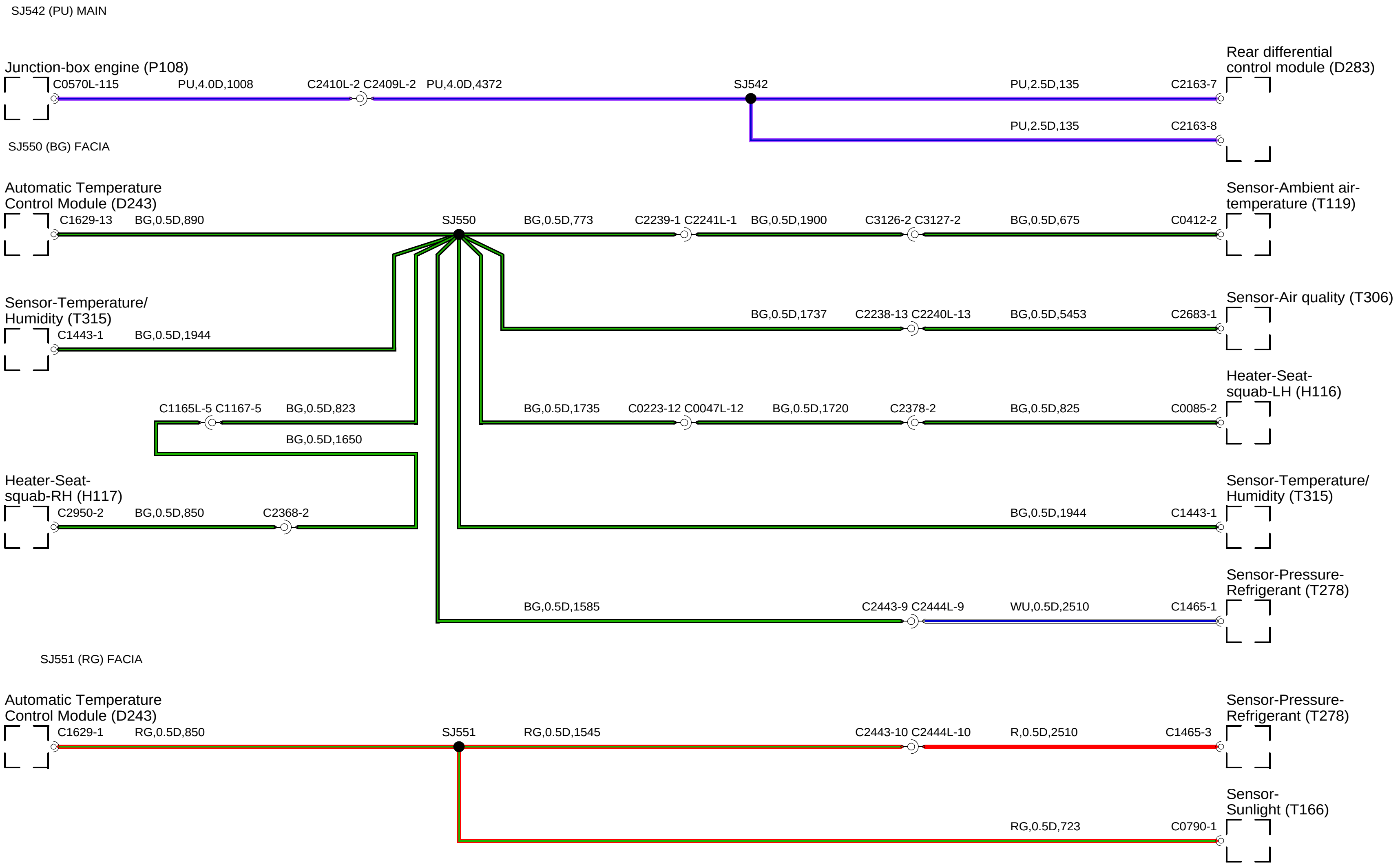
SJ445 (NK) ENGINE-BAY


Junction-box engine (P108)
C0570L-172
NK,2.5D,1093
SJ445
NK,1.5D,75
C2725L-18
C2724B-18
WG,1.5,1715
C0644B-1
Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
NK,1.5D,75
C2725L-17
C2724B-17
WG,1.5,1560
C0645B-1

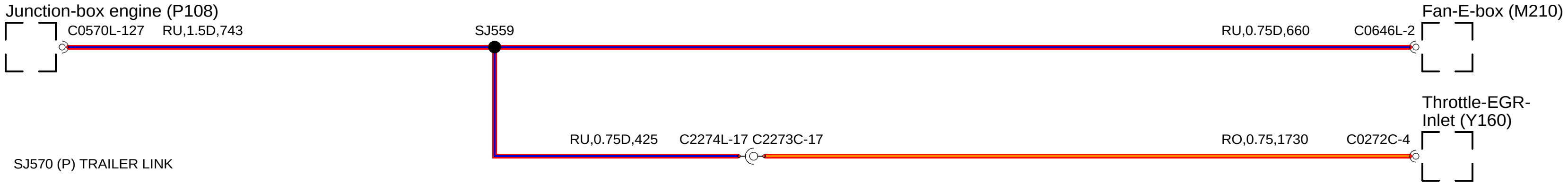
SJ450 (NK) ENGINE BAY SJ7 (GU, B, WU) ENGINE SJ1 (WU) ENGINE


Junction-box engine (P108)
C0570L-121
NK,1.5D,893
SJ450
NK,0.5D,2770
C2025-5
Sensor-Adaptive-cruise control (T350)
Fan-Cooling-E box (M208)
C0646L-2
NK,0.75D,510
NK,0.5D,2108
C2145L-15
Module-speed control (D284)
NK,1.5D,275
C2725L-8
C2724B-8
GU,1.0,860
SJ7
WU,1.0,611
SJ1
WU,1.0,120
C0177B-5
Modulator valve-EGR (D214)
WU,1.0,120
C0177B-2
Purge control valve (N119)
B,1.0,350
C0152B-2

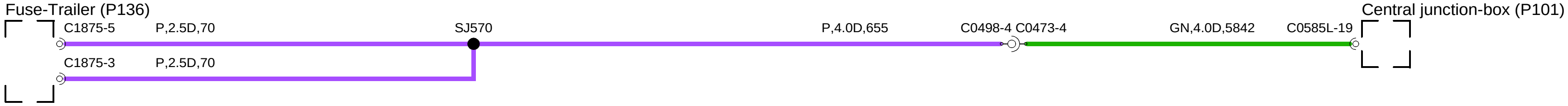

SJ489 (NB) ENGINE BAY
Junction-box engine (P108)
C0570L-119
NB,2.5D,723
SJ489
NB,2.5D,525
C2412L-14 C2411L-14
WP,2.5D,5482
C0377-17 C0391-17
WP,2.5D,50
SJ17
WP,4.0D,2345
SJ15
WP,2.5D,50
C0114-4
Unit-Fuel Tank (D179)
Engine control-module (ECM) (D131)
C0872L-G1
NB,0.75D,455
SJ495 (UR) I.C.E.
AM/FM diversity antenna amplifier (F212)
C2219-1
UR,0.5D,590
SJ495
U,0.5D,3460
C2639-1 C2640-1
U,0.5D,1340
C1354-12
Audio head unit (D282)
UR,0.5D,1870
C2218-1
FM antenna amplifier (F213)
SJ998 (U) FACIA
SJ530 (U) ICE
Central junction-box (P101)
C0582-13
U,1.0D,302
SJ998
U,0.75D,563
C2247-10 C2249-10
U,0.75D,2655
SJ530
U,0.5D,2005
C2114-18
Navigation system module (D325)
Touch screen display (D326)
C2819-11
U,0.5D,1185
U,0.5D,985
C2158-1
Module-Tuner-DAB/SDARS (D350)
U,0.35D,1255
C2777-16
Voice recognition module (D262)
U,0.5D,3910
C2837-1
Antenna-VICS (D357)


SJ542 (PU) MAIN
Junction-box engine (P108)
C0570L-115
PU,4.0D,1008
C2410L-2 C2409L-2
PU,4.0D,4372
SJ542
PU,2.5D,135
C2163-7
Rear differential control module (D283)
PU,2.5D,135
C2163-8
SJ550 (BG) FACIA
Automatic Temperature Control Module (D243)
C1629-13
BG,0.5D,890
SJ550
BG,0.5D,773
C2239-1 C2241L-1
BG,0.5D,1900
C3126-2 C3127-2
BG,0.5D,675
C0412-2
Sensor-Ambient air-temperature (T119)
Sensor-Temperature/ Humidity (T315)
C1443-1
BG,0.5D,1944
BG,0.5D,1737
C2238-13 C2240L-13
BG,0.5D,5453
C2683-1
Sensor-Air quality (T306)
C1165L-5 C1167-5
BG,0.5D,823
BG,0.5D,1735
C0223-12 C0047L-12
BG,0.5D,1720
C2378-2
BG,0.5D,825
C0085-2
Heater-Seat-squab-LH (H116)
BG,0.5D,1650
Heater-Seat-squab-RH (H117)
C2950-2
BG,0.5D,850
C2368-2
BG,0.5D,1944
C1443-1
Sensor-Temperature/ Humidity (T315)
BG,0.5D,1585
C2443-9 C2444L-9
WU,0.5D,2510
C1465-1
Sensor-Pressure-Refrigerant (T278)
SJ551 (RG) FACIA
Automatic Temperature Control Module (D243)
C1629-1
RG,0.5D,850
SJ551
RG,0.5D,1545
C2443-10 C2444L-10
R,0.5D,2510
C1465-3
Sensor-Pressure-Refrigerant (T278)
RG,0.5D,723
C0790-1
Sensor-Sunlight (T166)

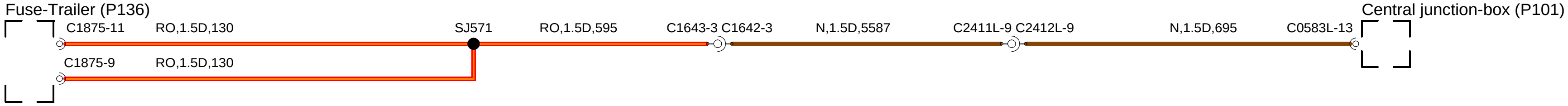
SJ559 (RU) ENGINE BAY


Junction-box engine (P108)
C0570L-127
RU,1.5D,743
SJ559
RU,0.75D,660
C0646L-2
Fan-E-box (M210)
Throttle-EGR-Inlet (Y160)
RU,0.75D,425
C2274L-17 C2273C-17
RO,0.75,1730
C0272C-4

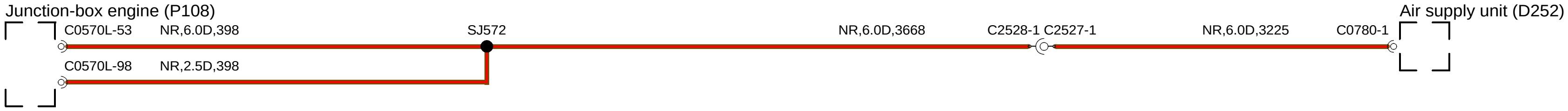
SJ570 (P) TRAILER LINK


Fuse-Trailer (P136)
C1875-5
P,2.5D,70
SJ570
P,4.0D,655
C0498-4 C0473-4
GN,4.0D,5842
C0585L-19
Central junction-box (P101)
C1875-3
P,2.5D,70

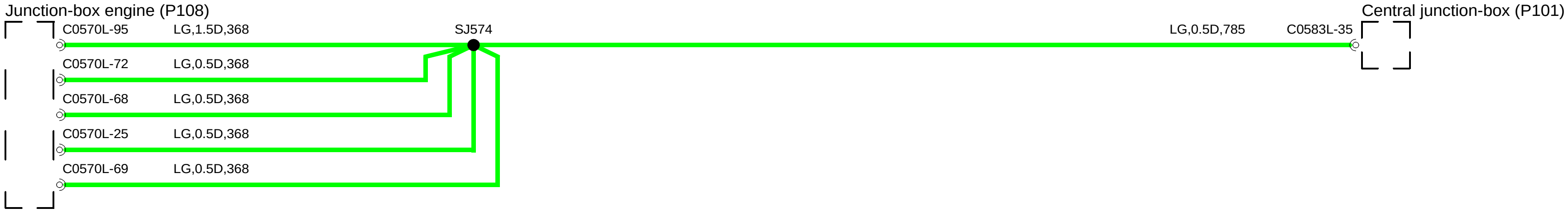
SJ571 (RO) TRAILER LINK

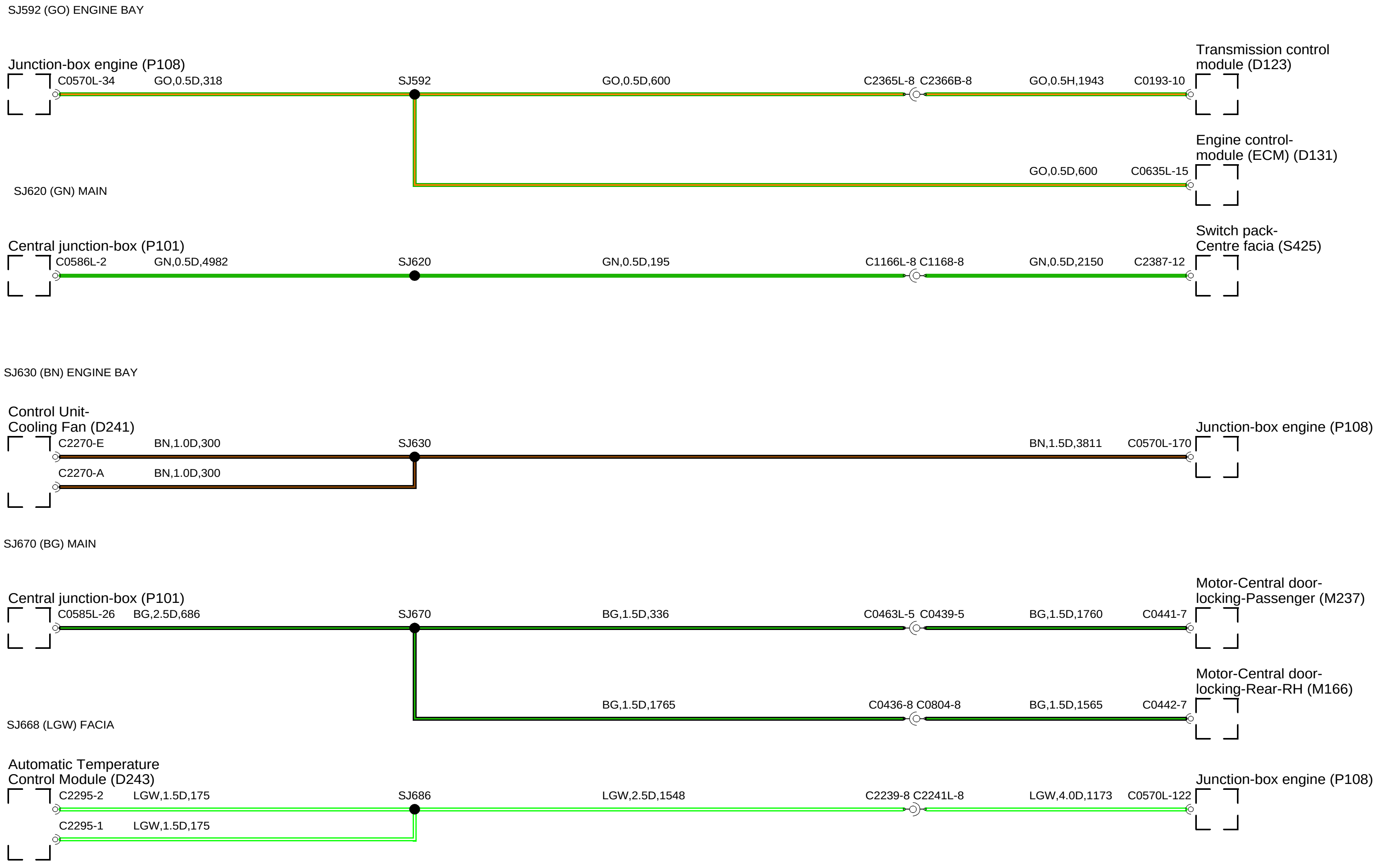

Fuse-Trailer (P136)
C1875-11
RO,1.5D,130
SJ571
RO,1.5D,595
C1643-3 C1642-3
N,1.5D,5587
C2411L-9 C2412L-9
N,1.5D,695
C0583L-13
Central junction-box (P101)
C1875-9
RO,1.5D,130

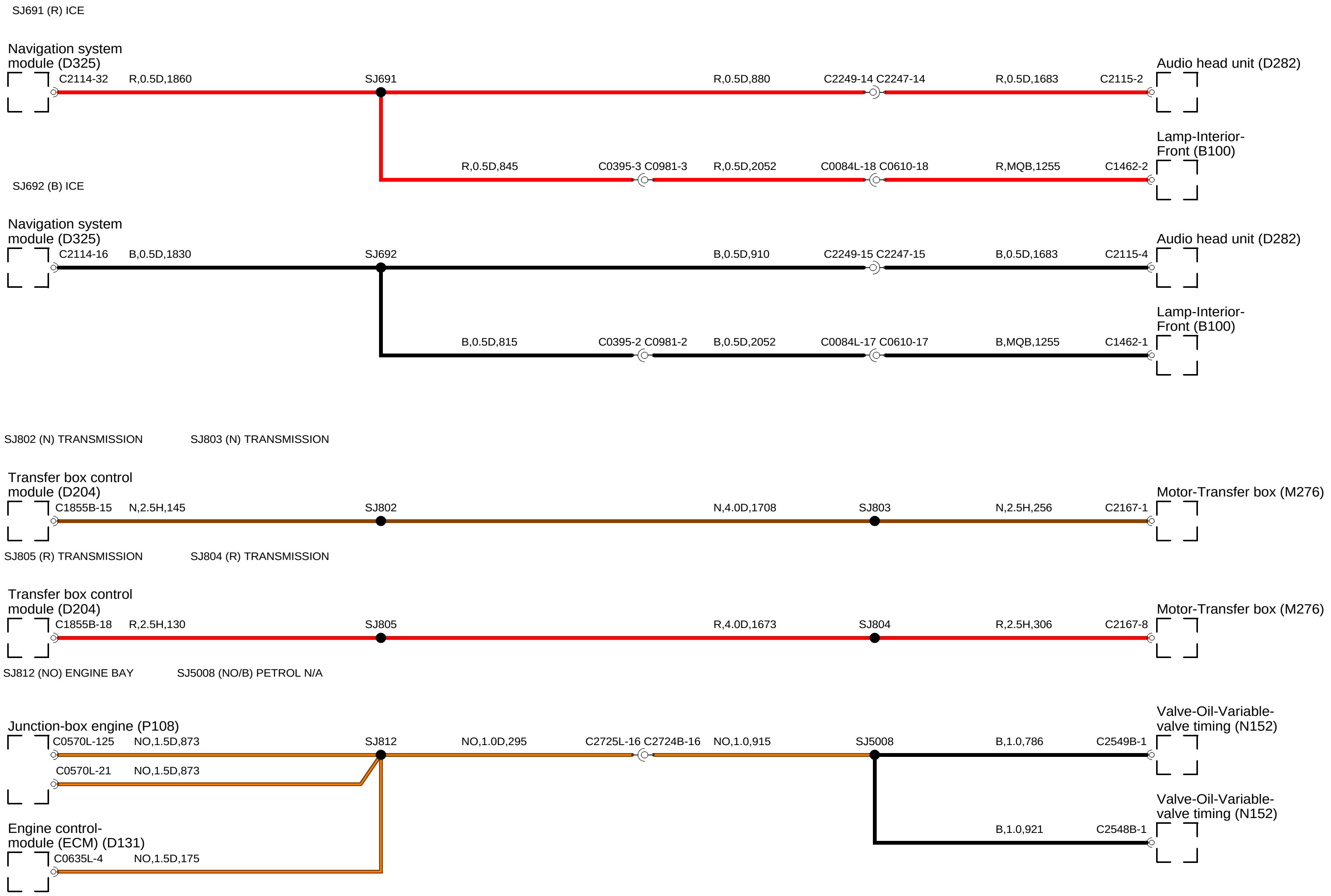
SJ572 (NR) ENGINE BAY


Junction-box engine (P108)
C0570L-53
NR,6.0D,398
SJ572
NR,6.0D,3668
C2528-1 C2527-1
NR,6.0D,3225
C0780-1
Air supply unit (D252)
C0570L-98
NR,2.5D,398

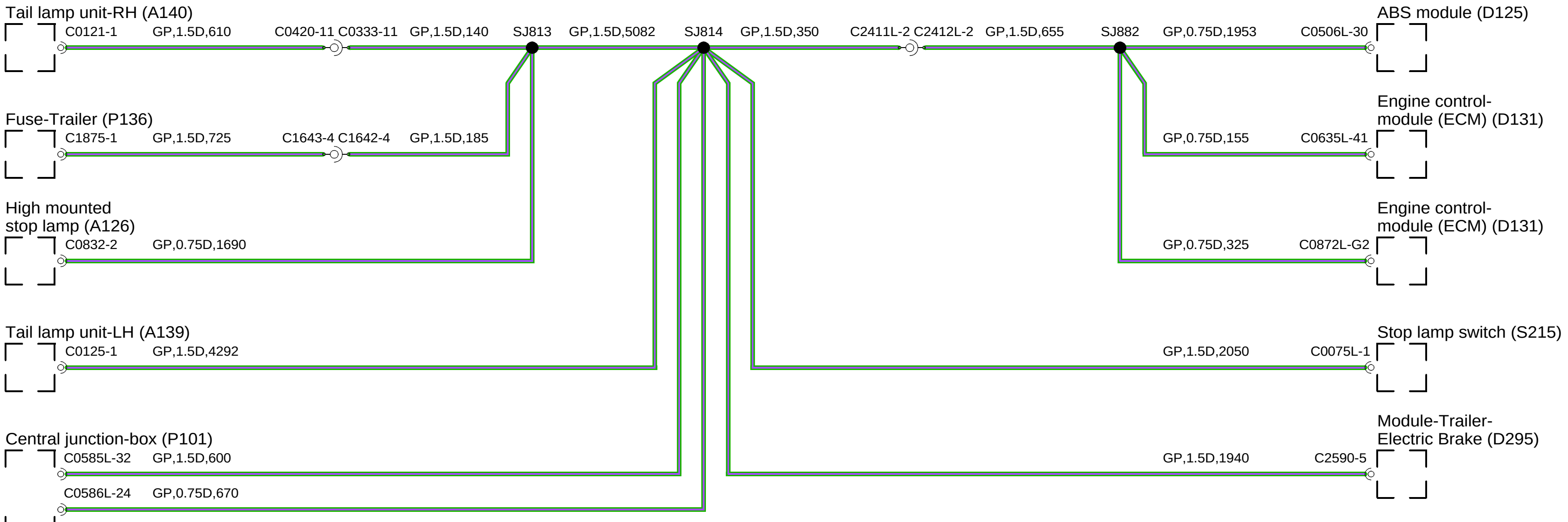
SJ574 (LG) ENGINE BAY


Junction-box engine (P108)
C0570L-95
LG,1.5D,368
SJ574
LG,0.5D,785
C0583L-35
Central junction-box (P101)
C0570L-72
LG,0.5D,368
C0570L-68
LG,0.5D,368
C0570L-25
LG,0.5D,368
C0570L-69
LG,0.5D,368

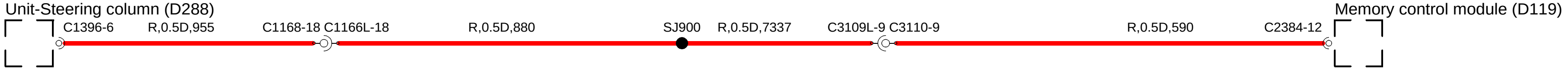

SJ592 (GO) ENGINE BAY
Junction-box engine (P108)
C0570L-34
GO,0.5D,318
SJ592
GO,0.5D,600
C2365L-8
C2366B-8
GO,0.5H,1943
C0193-10
Transmission control module (D123)
Engine control-module (ECM) (D131)
GO,0.5D,600
C0635L-15
SJ620 (GN) MAIN
Central junction-box (P101)
C0586L-2
GN,0.5D,4982
SJ620
GN,0.5D,195
C1166L-8
C1168-8
GN,0.5D,2150
C2387-12
Switch pack-Centre facia (S425)
SJ630 (BN) ENGINE BAY
Control Unit-Cooling Fan (D241)
C2270-E
BN,1.0D,300
C2270-A
BN,1.0D,300
SJ630
BN,1.5D,3811
C0570L-170
Junction-box engine (P108)
SJ670 (BG) MAIN
Central junction-box (P101)
C0585L-26
BG,2.5D,686
SJ670
BG,1.5D,336
C0463L-5
C0439-5
BG,1.5D,1760
C0441-7
Motor-Central door-locking-Passenger (M237)
BG,1.5D,1765
C0436-8
C0804-8
BG,1.5D,1565
C0442-7
Motor-Central door-locking-Rear-RH (M166)
SJ668 (LGW) FACIA
Automatic Temperature Control Module (D243)
C2295-2
LGW,1.5D,175
C2295-1
LGW,1.5D,175
SJ686
LGW,2.5D,1548
C2239-8
C2241L-8
LGW,4.0D,1173
C0570L-122
Junction-box engine (P108)


SJ691 (R) ICE
Navigation system module (D325)
C2114-32
R,0.5D,1860
SJ691
R,0.5D,880
C2249-14 C2247-14
R,0.5D,1683
C2115-2
Audio head unit (D282)
R,0.5D,845
C0395-3 C0981-3
R,0.5D,2052
C0084L-18 C0610-18
R,MQB,1255
C1462-2
Lamp-Interior-Front (B100)
SJ692 (B) ICE
Navigation system module (D325)
C2114-16
B,0.5D,1830
SJ692
B,0.5D,910
C2249-15 C2247-15
B,0.5D,1683
C2115-4
Audio head unit (D282)
B,0.5D,815
C0395-2 C0981-2
B,0.5D,2052
C0084L-17 C0610-17
B,MQB,1255
C1462-1
Lamp-Interior-Front (B100)
SJ802 (N) TRANSMISSION
SJ803 (N) TRANSMISSION
Transfer box control module (D204)
C1855B-15
N,2.5H,145
SJ802
N,4.0D,1708
SJ803
N,2.5H,256
C2167-1
Motor-Transfer box (M276)
SJ805 (R) TRANSMISSION
SJ804 (R) TRANSMISSION
Transfer box control module (D204)
C1855B-18
R,2.5H,130
SJ805
R,4.0D,1673
SJ804
R,2.5H,306
C2167-8
Motor-Transfer box (M276)
SJ812 (NO) ENGINE BAY
SJ5008 (NO/B) PETROL N/A
Junction-box engine (P108)
C0570L-125
NO,1.5D,873
SJ812
NO,1.0D,295
C2725L-16 C2724B-16
NO,1.0,915
SJ5008
B,1.0,786
C2549B-1
Valve-Oil-Variable-valve timing (N152)
C0570L-21
NO,1.5D,873
Valve-Oil-Variable-valve timing (N152)
B,1.0,921
C2548B-1
Engine control-module (ECM) (D131)
C0635L-4
NO,1.5D,175

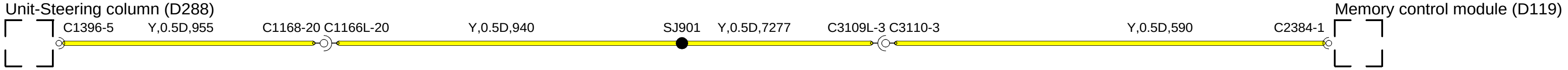
SJ6 (GP) MAIN SJ882 (GP) ENGINE BAY SJ813 (GP) ENGINE BAY


Tail lamp unit-RH (A140)
C0121-1
GP,1.5D,610
C0420-11 C0333-11
GP,1.5D,140
SJ813
GP,1.5D,5082
SJ814
GP,1.5D,350
C2411L-2 C2412L-2
GP,1.5D,655
SJ882
GP,0.75D,1953
C0506L-30
ABS module (D125)
Fuse-Trailer (P136)
C1875-1
GP,1.5D,725
C1643-4 C1642-4
GP,1.5D,185
Engine control-module (ECM) (D131)
GP,0.75D,155
C0635L-41
High mounted stop lamp (A126)
C0832-2
GP,0.75D,1690
Engine control-module (ECM) (D131)
GP,0.75D,325
C0872L-G2
Tail lamp unit-LH (A139)
C0125-1
GP,1.5D,4292
Stop lamp switch (S215)
GP,1.5D,2050
C0075L-1
Central junction-box (P101)
C0585L-32
GP,1.5D,600
Module-Trailer-Electric Brake (D295)
GP,1.5D,1940
C2590-5
C0586L-24
GP,0.75D,670

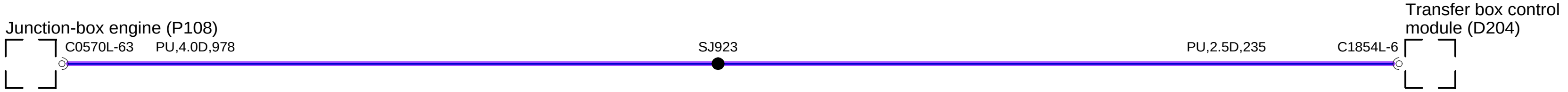
SJ900 (R) MAIN


Unit-Steering column (D288)
C1396-6
R,0.5D,955
C1168-18 C1166L-18
R,0.5D,880
SJ900
R,0.5D,7337
C3109L-9 C3110-9
R,0.5D,590
C2384-12
Memory control module (D119)

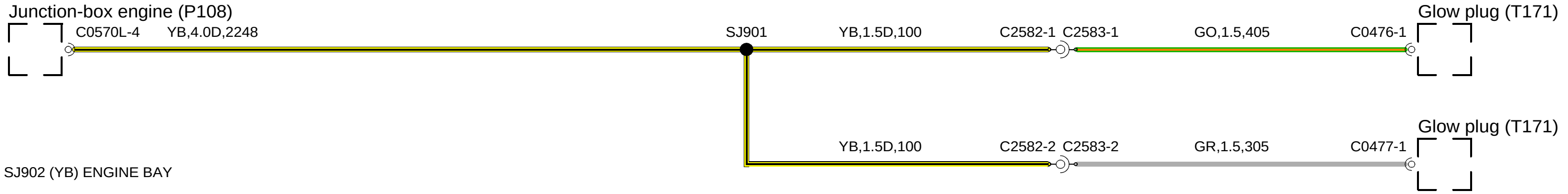
SJ901 (Y) MAIN


Unit-Steering column (D288)
C1396-5
Y,0.5D,955
C1168-20 C1166L-20
Y,0.5D,940
SJ901
Y,0.5D,7277
C3109L-3 C3110-3
Y,0.5D,590
C2384-1
Memory control module (D119)

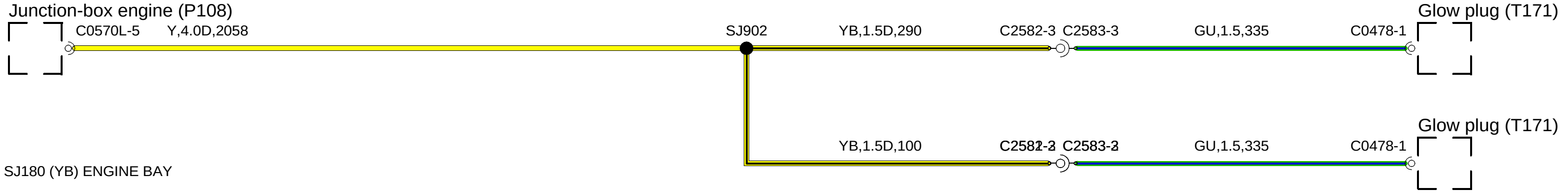
SJ923 (PU) ENGINE BAY


Junction-box engine (P108)
C0570L-63
PU,4.0D,978
SJ923
PU,2.5D,235
C1854L-6
Transfer box control module (D204)

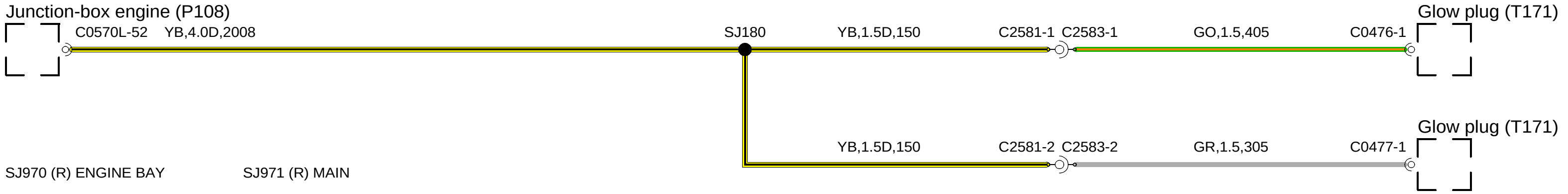
SJ901 (YB) ENGINE BAY


Junction-box engine (P108)
C0570L-4
YB,4.0D,2248
SJ901
YB,1.5D,100
C2582-1 C2583-1
GO,1.5,405
C0476-1
Glow plug (T171)
YB,1.5D,100
C2582-2 C2583-2
GR,1.5,305
C0477-1
Glow plug (T171)

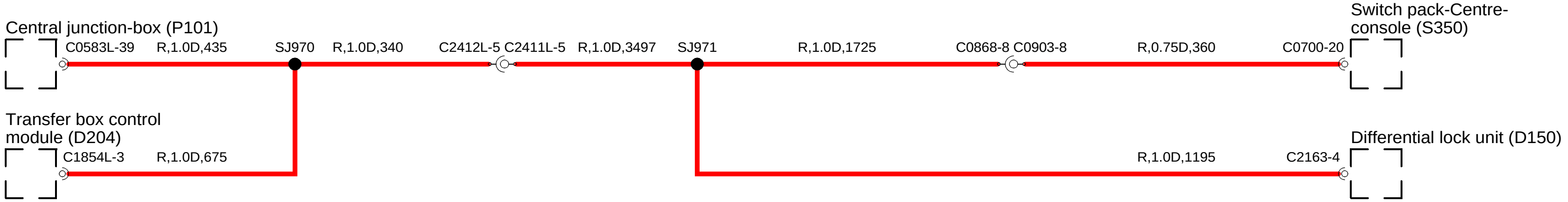
SJ902 (YB) ENGINE BAY


Junction-box engine (P108)
C0570L-5
Y,4.0D,2058
SJ902
YB,1.5D,290
C2582-3 C2583-3
GU,1.5,335
C0478-1
Glow plug (T171)
YB,1.5D,100
C2582-3 C2583-3
GU,1.5,335
C0478-1
Glow plug (T171)

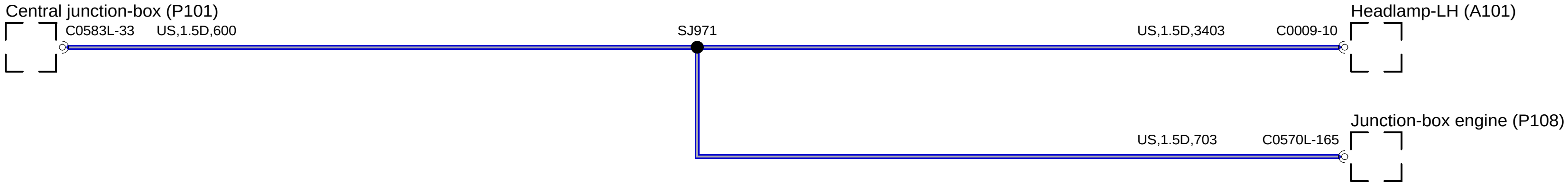
SJ180 (YB) ENGINE BAY

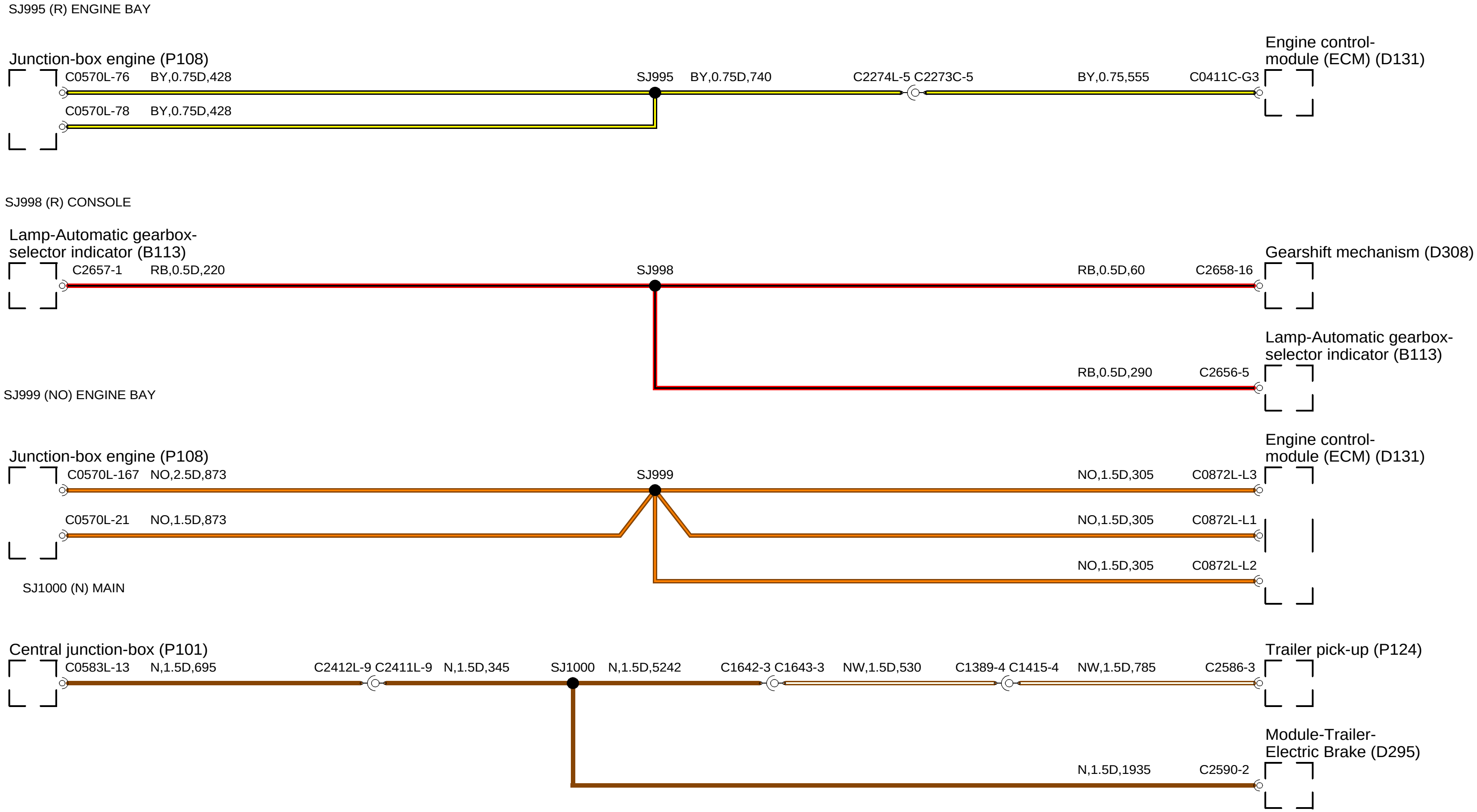

Junction-box engine (P108)
C0570L-52
YB,4.0D,2008
SJ180
YB,1.5D,150
C2581-1 C2583-1
GO,1.5,405
C0476-1
Glow plug (T171)
YB,1.5D,150
C2581-2 C2583-2
GR,1.5,305
C0477-1
Glow plug (T171)

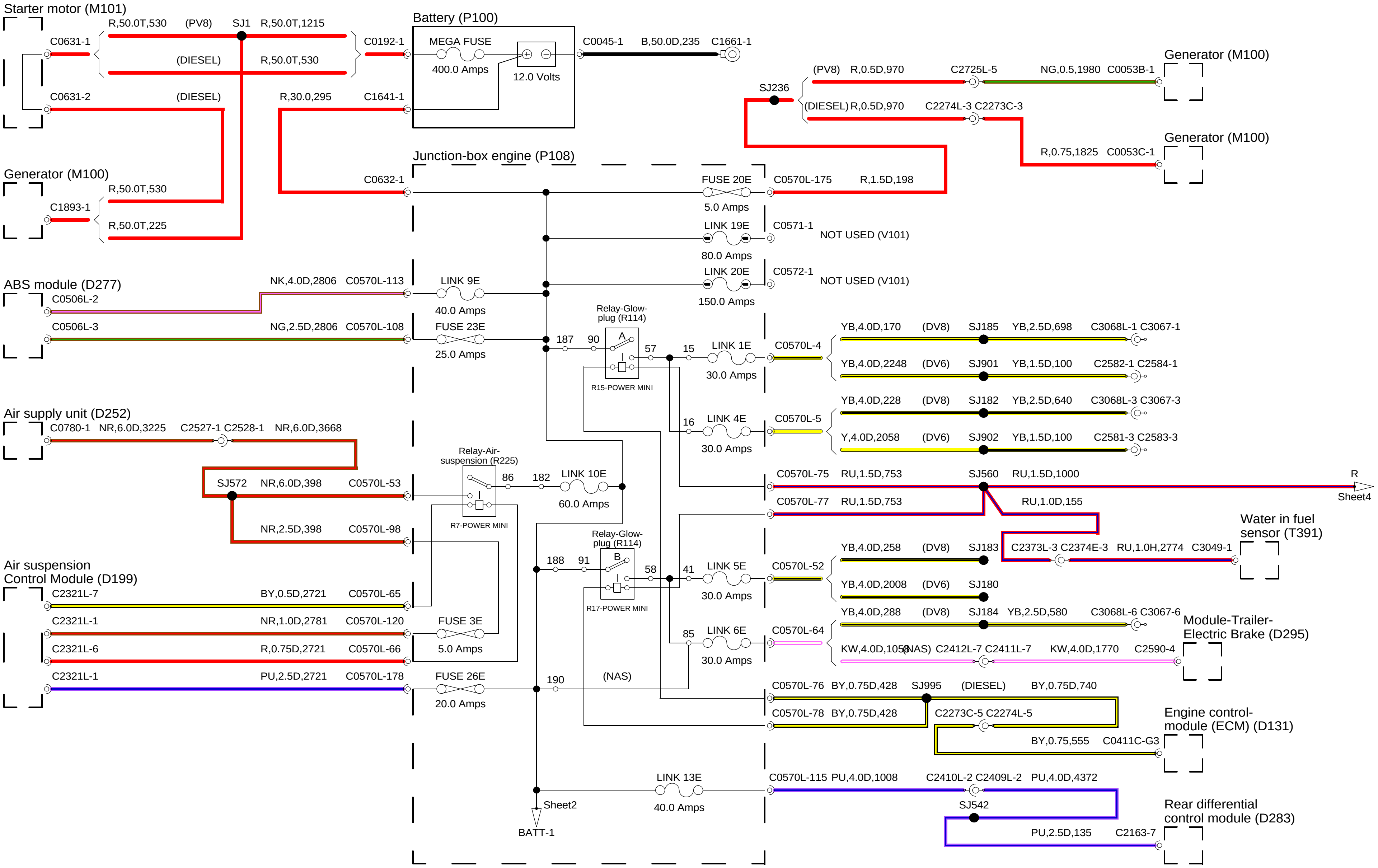
SJ970 (R) ENGINE BAY SJ971 (R) MAIN

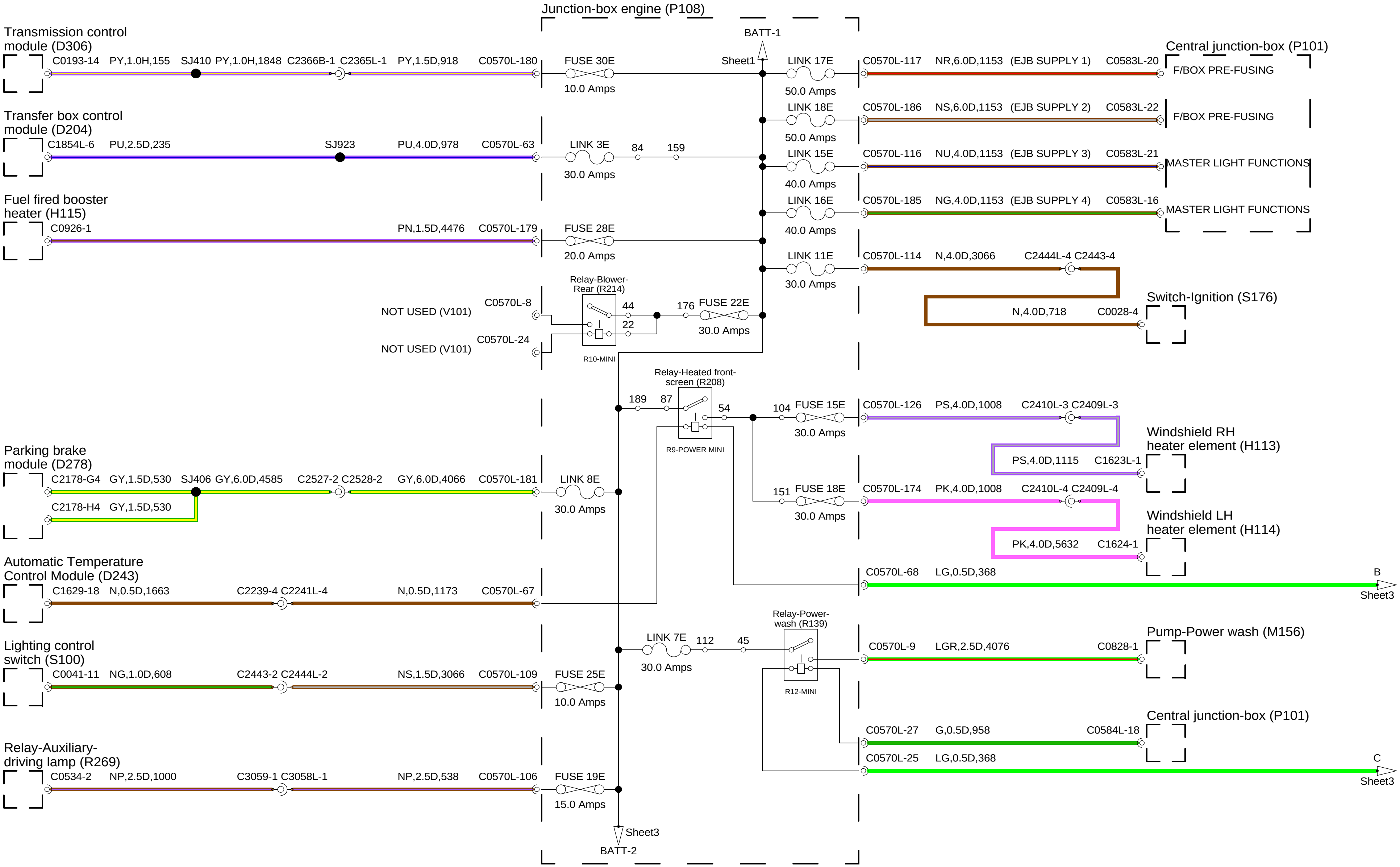

Central junction-box (P101)
C0583L-39
R,1.0D,435
SJ970
R,1.0D,340
C2412L-5 C2411L-5
R,1.0D,3497
SJ971
R,1.0D,1725
C0868-8 C0903-8
R,0.75D,360
C0700-20
Switch pack-Centre-console (S350)
Transfer box control module (D204)
C1854L-3
R,1.0D,675
R,1.0D,1195
C2163-4
Differential lock unit (D150)

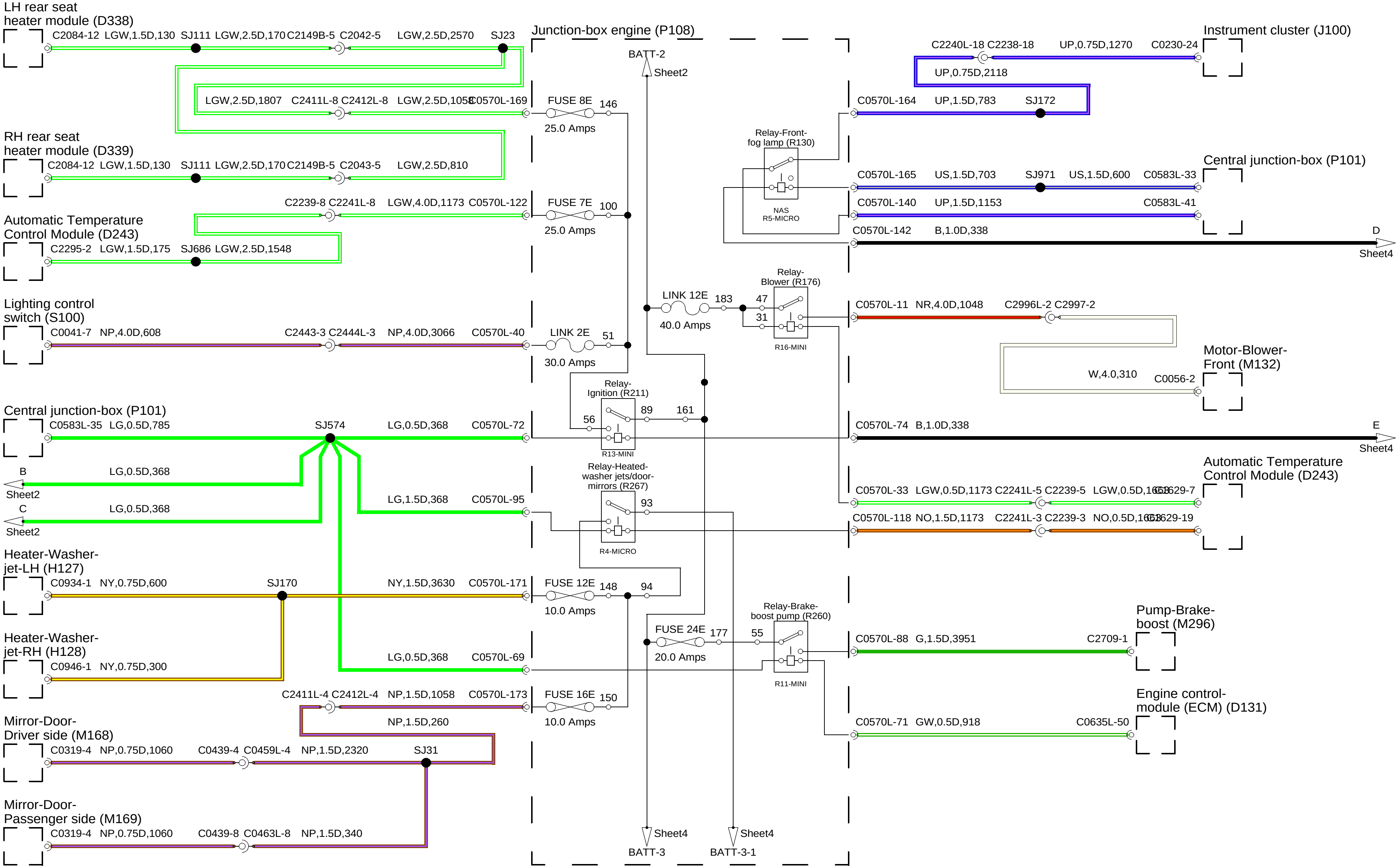
SJ971 (US) ENGINE BAY

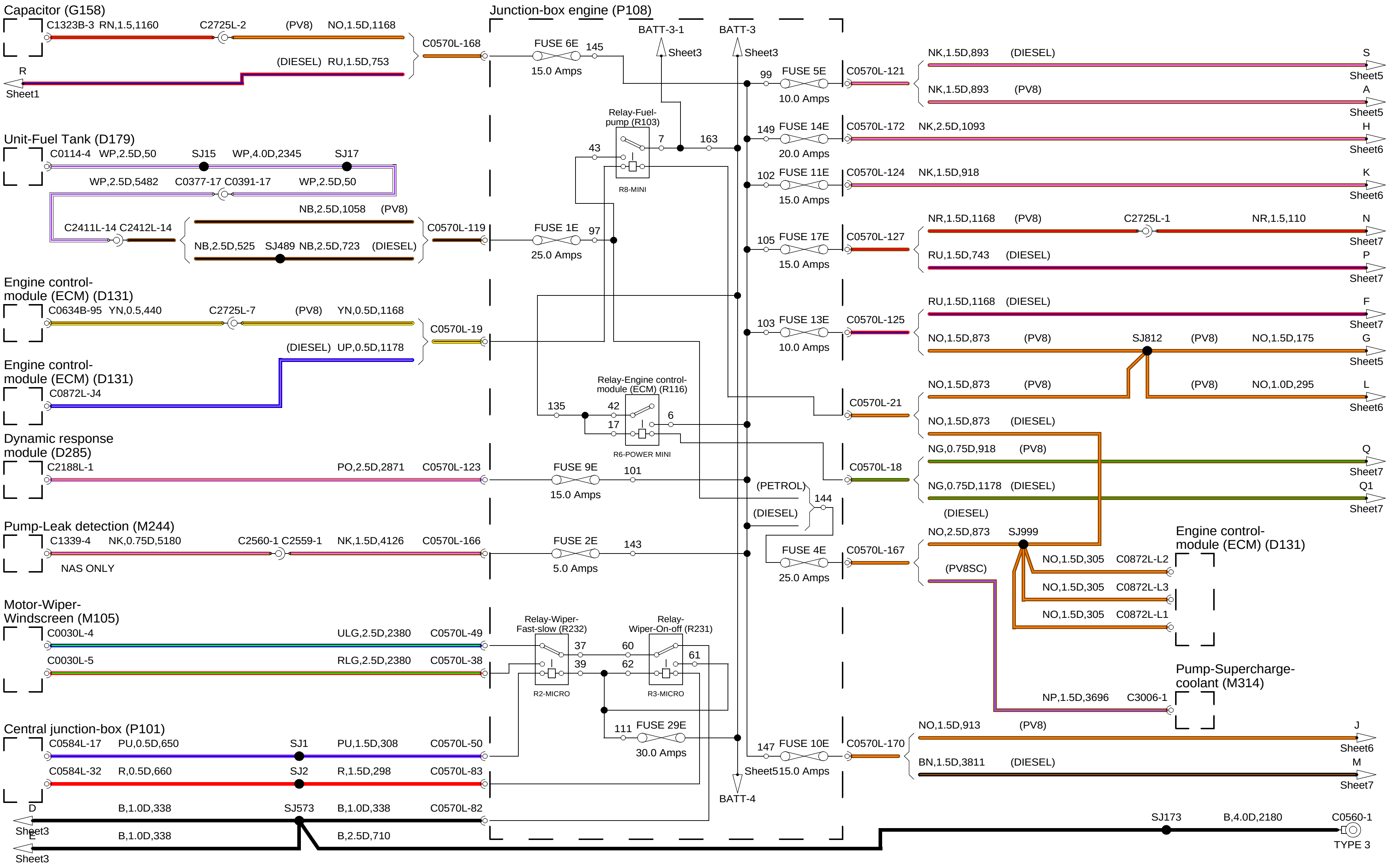

Central junction-box (P101)
C0583L-33
US,1.5D,600
SJ971
US,1.5D,3403
C0009-10
Headlamp-LH (A101)
US,1.5D,703
C0570L-165
Junction-box engine (P108)

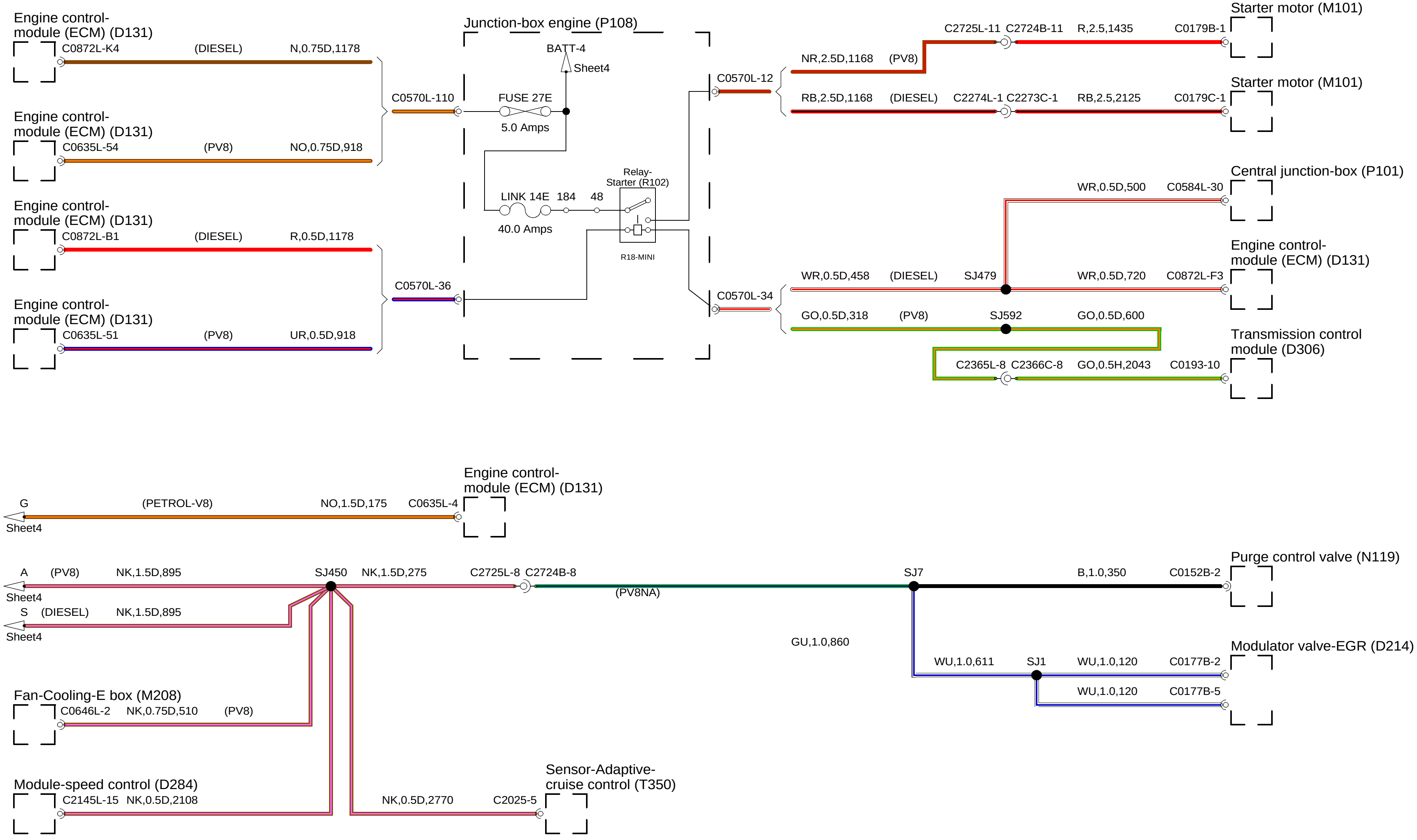

SJ995 (R) ENGINE BAY
Junction-box engine (P108)
C0570L-76
BY,0.75D,428
C0570L-78
BY,0.75D,428
SJ995
BY,0.75D,740
C2274L-5 C2273C-5
BY,0.75,555
C0411C-G3
Engine control-module (ECM) (D131)
SJ998 (R) CONSOLE
Lamp-Automatic gearbox-selector indicator (B113)
C2657-1
RB,0.5D,220
SJ998
RB,0.5D,60
C2658-16
Gearshift mechanism (D308)
RB,0.5D,290
C2656-5
Lamp-Automatic gearbox-selector indicator (B113)
SJ999 (NO) ENGINE BAY
Junction-box engine (P108)
C0570L-167
NO,2.5D,873
C0570L-21
NO,1.5D,873
SJ999
NO,1.5D,305
C0872L-L3
NO,1.5D,305
C0872L-L1
NO,1.5D,305
C0872L-L2
Engine control-module (ECM) (D131)
SJ1000 (N) MAIN
Central junction-box (P101)
C0583L-13
N,1.5D,695
C2412L-9 C2411L-9
N,1.5D,345
SJ1000
N,1.5D,5242
C1642-3 C1643-3
NW,1.5D,530
C1389-4 C1415-4
NW,1.5D,785
C2586-3
Trailer pick-up (P124)
N,1.5D,1935
C2590-2
Module-Trailer-Electric Brake (D295)

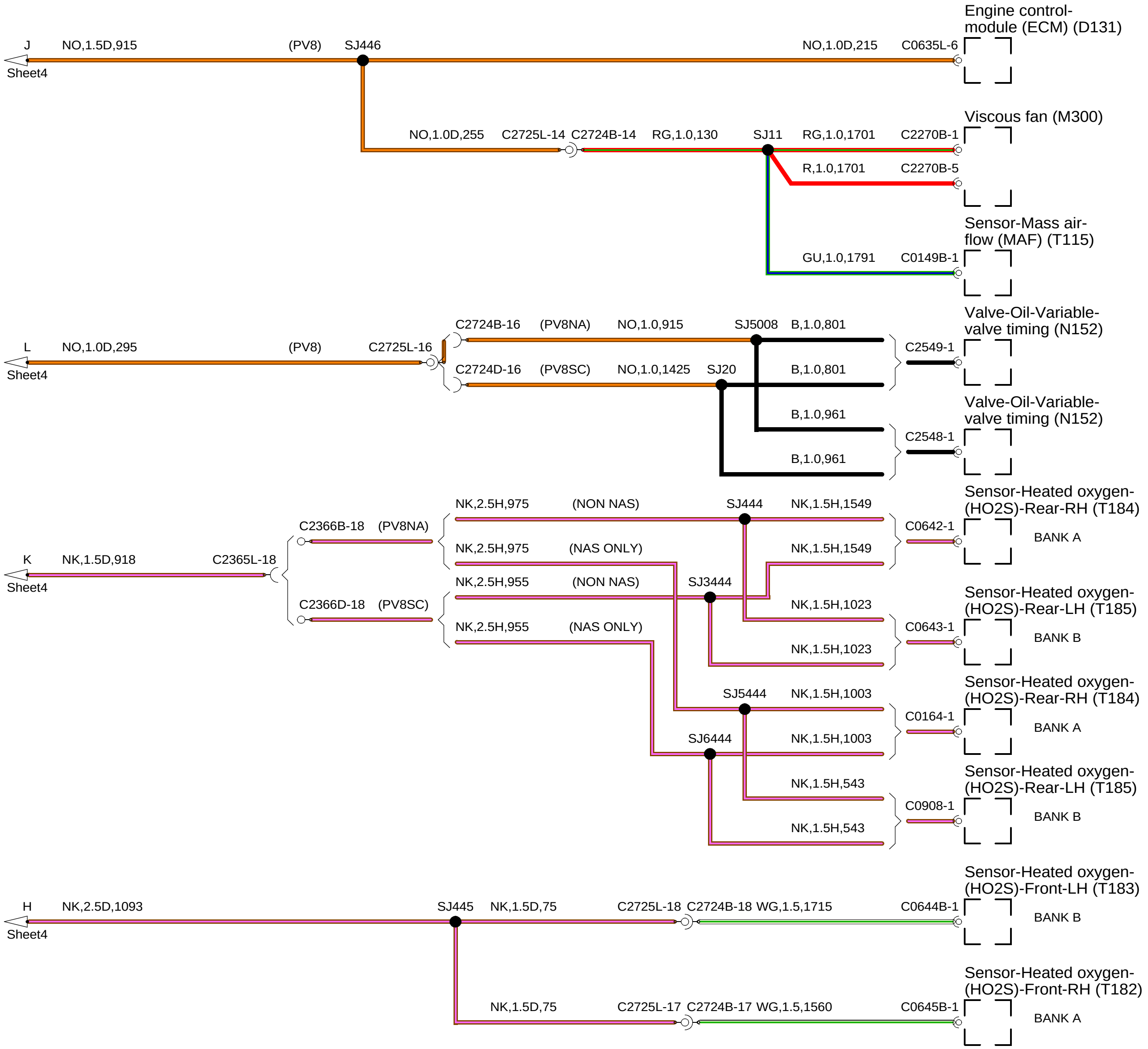

Starter motor (M101)
R,50.0T,530
(PV8)
SJ1
R,50.0T,1215
C0631-1
(DIESEL)
R,50.0T,530
C0192-1
C0631-2
(DIESEL)
R,30.0,295
C1641-1
Battery (P100)
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D,235
C1661-1
Generator (M100)
(PV8)
R,0.5D,970
C2725L-5
NG,0.5,1980
C0053B-1
SJ236
(DIESEL)
R,0.5D,970
C2274L-3
C2273C-3
Generator (M100)
R,0.75,1825
C0053C-1
Junction-box engine (P108)
Generator (M100)
R,50.0T,530
C1893-1
R,50.0T,225
C0632-1
FUSE 20E
5.0 Amps
C0570L-175
R,1.5D,198
LINK 19E
80.0 Amps
C0571-1
NOT USED (V101)
LINK 20E
150.0 Amps
C0572-1
NOT USED (V101)
ABS module (D277)
C0506L-2
NK,4.0D,2806
C0570L-113
LINK 9E
40.0 Amps
C0506L-3
NG,2.5D,2806
C0570L-108
FUSE 23E
25.0 Amps
Relay-Glow-plug (R114)
187
90
A
57
15
LINK 1E
30.0 Amps
R15-POWER MINI
C0570L-4
YB,4.0D,170
(DV8)
SJ185
YB,2.5D,698
C3068L-1
C3067-1
YB,4.0D,2248
(DV6)
SJ901
YB,1.5D,100
C2582-1
C2584-1
16
LINK 4E
30.0 Amps
C0570L-5
YB,4.0D,228
(DV8)
SJ182
YB,2.5D,640
C3068L-3
C3067-3
Y,4.0D,2058
(DV6)
SJ902
YB,1.5D,100
C2581-3
C2583-3
Air supply unit (D252)
C0780-1
NR,6.0D,3225
C2527-1
C2528-1
NR,6.0D,3668
Relay-Air-suspension (R225)
86
182
LINK 10E
60.0 Amps
R7-POWER MINI
SJ572
NR,6.0D,398
C0570L-53
NR,2.5D,398
C0570L-98
C0570L-75
RU,1.5D,753
SJ560
RU,1.5D,1000
R
Sheet4
C0570L-77
RU,1.5D,753
RU,1.0D,155
Water in fuel sensor (T391)
Relay-Glow-plug (R114)
188
91
B
58
41
LINK 5E
30.0 Amps
R17-POWER MINI
C0570L-52
YB,4.0D,258
(DV8)
SJ183
C2373L-3
C2374E-3
RU,1.0H,2774
C3049-1
YB,4.0D,2008
(DV6)
SJ180
Air suspension Control Module (D199)
C2321L-7
BY,0.5D,2721
C0570L-65
C2321L-1
NR,1.0D,2781
C0570L-120
FUSE 3E
5.0 Amps
C2321L-6
R,0.75D,2721
C0570L-66
C2321L-1
PU,2.5D,2721
C0570L-178
FUSE 26E
20.0 Amps
190
(NAS)
85
LINK 6E
30.0 Amps
C0570L-64
YB,4.0D,288
(DV8)
SJ184
YB,2.5D,580
C3068L-6
C3067-6
Module-Trailer-Electric Brake (D295)
KW,4.0D,1058
(NAS)
C2412L-7
C2411L-7
KW,4.0D,1770
C2590-4
C0570L-76
BY,0.75D,428
SJ995
(DIESEL)
BY,0.75D,740
C0570L-78
BY,0.75D,428
C2273C-5
C2274L-5
Engine control-module (ECM) (D131)
BY,0.75,555
C0411C-G3
LINK 13E
40.0 Amps
Sheet2
BATT-1
C0570L-115
PU,4.0D,1008
C2410L-2
C2409L-2
PU,4.0D,4372
SJ542
Rear differential control module (D283)
PU,2.5D,135
C2163-7

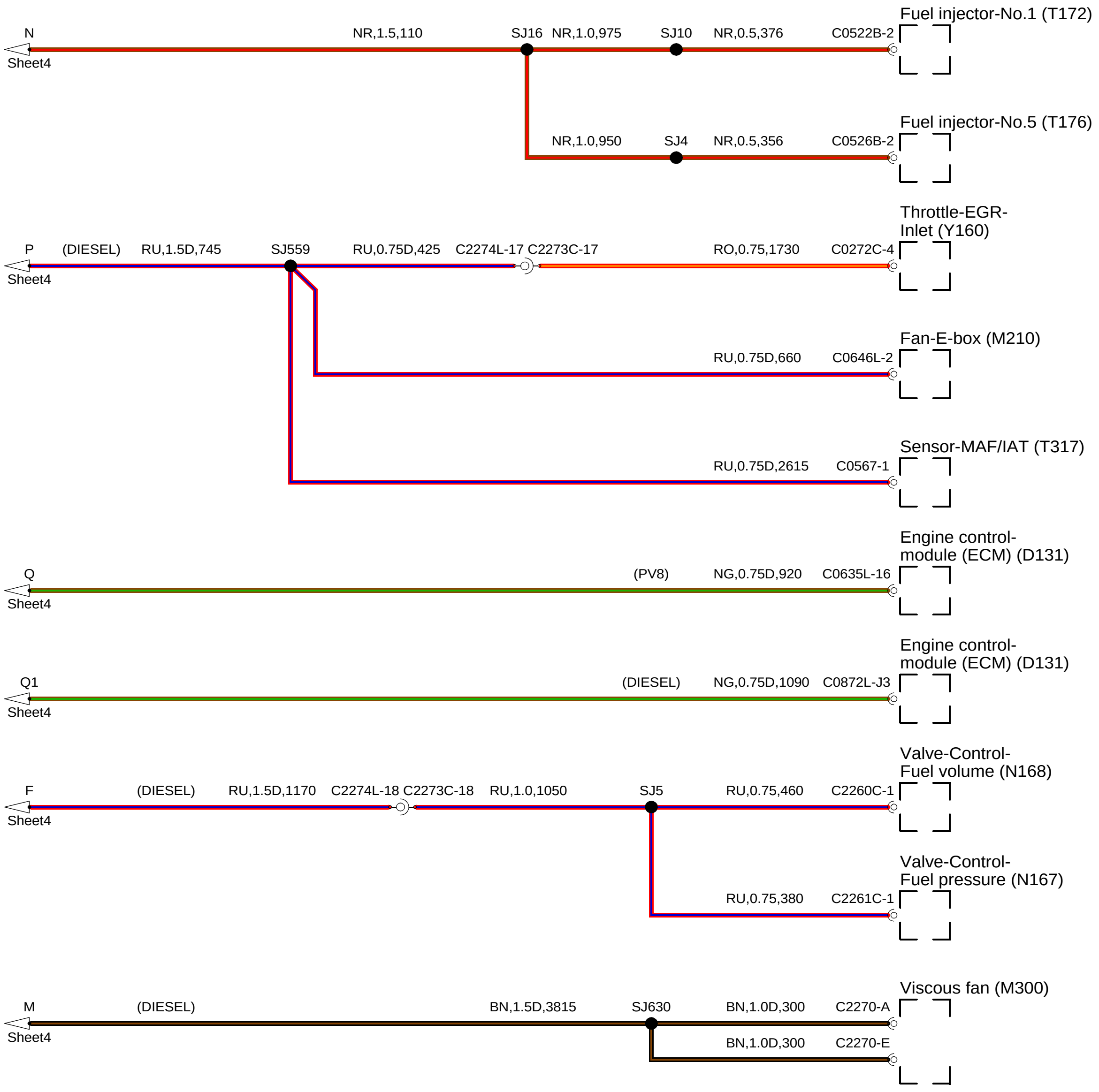

Junction-box engine (P108)
BATT-1
Sheet1
Transmission control module (D306)
C0193-14
PY,1.0H,155
SJ410
PY,1.0H,1848
C2366B-1
C2365L-1
PY,1.5D,918
C0570L-180
FUSE 30E
10.0 Amps
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D,1153
(EJB SUPPLY 1)
C0583L-20
Central junction-box (P101)
F/BOX PRE-FUSING
Transfer box control module (D204)
C1854L-6
PU,2.5D,235
SJ923
PU,4.0D,978
C0570L-63
LINK 3E
30.0 Amps
84
159
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D,1153
(EJB SUPPLY 2)
C0583L-22
F/BOX PRE-FUSING
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D,1153
(EJB SUPPLY 3)
C0583L-21
MASTER LIGHT FUNCTIONS
Fuel fired booster heater (H115)
C0926-1
PN,1.5D,4476
C0570L-179
FUSE 28E
20.0 Amps
LINK 16E
40.0 Amps
C0570L-185
NG,4.0D,1153
(EJB SUPPLY 4)
C0583L-16
MASTER LIGHT FUNCTIONS
LINK 11E
30.0 Amps
C0570L-114
N,4.0D,3066
C2444L-4
C2443-4
Switch-Ignition (S176)
N,4.0D,718
C0028-4
Relay-Blower-Rear (R214)
C0570L-8
NOT USED (V101)
44
22
176
FUSE 22E
30.0 Amps
C0570L-24
NOT USED (V101)
R10-MINI
Relay-Heated front-screen (R208)
189
87
54
104
FUSE 15E
30.0 Amps
C0570L-126
PS,4.0D,1008
C2410L-3
C2409L-3
R9-POWER MINI
Windshield RH heater element (H113)
PS,4.0D,1115
C1623L-1
Parking brake module (D278)
C2178-G4
GY,1.5D,530
SJ406
GY,6.0D,4585
C2527-2
C2528-2
GY,6.0D,4066
C0570L-181
LINK 8E
30.0 Amps
C2178-H4
GY,1.5D,530
151
FUSE 18E
30.0 Amps
C0570L-174
PK,4.0D,1008
C2410L-4
C2409L-4
Windshield LH heater element (H114)
PK,4.0D,5632
C1624-1
Automatic Temperature Control Module (D243)
C1629-18
N,0.5D,1663
C2239-4
C2241L-4
N,0.5D,1173
C0570L-67
C0570L-68
LG,0.5D,368
B
Sheet3
Relay-Power-wash (R139)
LINK 7E
30.0 Amps
112
45
C0570L-9
LGR,2.5D,4076
C0828-1
Pump-Power wash (M156)
R12-MINI
Lighting control switch (S100)
C0041-11
NG,1.0D,608
C2443-2
C2444L-2
NS,1.5D,3066
C0570L-109
FUSE 25E
10.0 Amps
Central junction-box (P101)
C0570L-27
G,0.5D,958
C0584L-18
C0570L-25
LG,0.5D,368
C
Sheet3
Relay-Auxiliary-driving lamp (R269)
C0534-2
NP,2.5D,1000
C3059-1
C3058L-1
NP,2.5D,538
C0570L-106
FUSE 19E
15.0 Amps
Sheet3
BATT-2

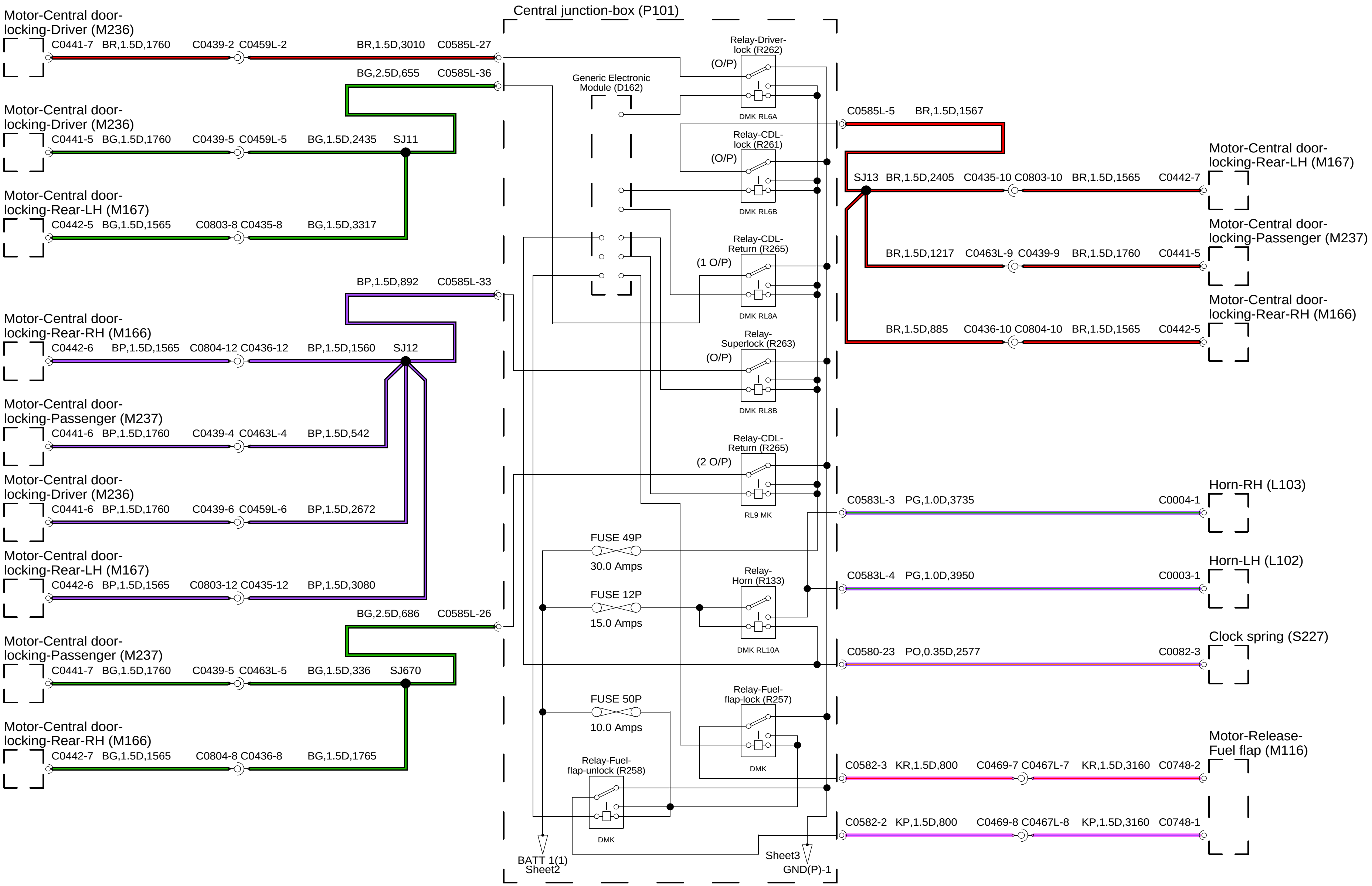

LH rear seat heater module (D338)
C2084-12 LGW,1.5D,130 SJ111 LGW,2.5D,170 C2149B-5 C2042-5 LGW,2.5D,2570 SJ23
Junction-box engine (P108)
BATT-2
Sheet2
LGW,2.5D,1807 C2411L-8 C2412L-8 LGW,2.5D,1058 C0570L-169
FUSE 8E 146
25.0 Amps
RH rear seat heater module (D339)
C2084-12 LGW,1.5D,130 SJ111 LGW,2.5D,170 C2149B-5 C2043-5 LGW,2.5D,810
C2239-8 C2241L-8 LGW,4.0D,1173 C0570L-122
FUSE 7E 100
25.0 Amps
Automatic Temperature Control Module (D243)
C2295-2 LGW,1.5D,175 SJ686 LGW,2.5D,1548
Lighting control switch (S100)
C0041-7 NP,4.0D,608 C2443-3 C2444L-3 NP,4.0D,3066 C0570L-40
LINK 2E 51
30.0 Amps
LINK 12E 183
40.0 Amps
Relay-Ignition (R211)
56 89 161
R13-MINI
Central junction-box (P101)
C0583L-35 LG,0.5D,785 SJ574 LG,0.5D,368 C0570L-72
B
LG,0.5D,368
Sheet2
C
LG,0.5D,368
Sheet2
LG,1.5D,368 C0570L-95
Relay-Heated-washer jets/door-mirrors (R267)
93
R4-MICRO
Heater-Washer-jet-LH (H127)
C0934-1 NY,0.75D,600 SJ170 NY,1.5D,3630 C0570L-171
FUSE 12E 148 94
10.0 Amps
Heater-Washer-jet-RH (H128)
C0946-1 NY,0.75D,300
LG,0.5D,368 C0570L-69
FUSE 24E 177
20.0 Amps
C2411L-4 C2412L-4 NP,1.5D,1058 C0570L-173
FUSE 16E 150
10.0 Amps
NP,1.5D,260
Mirror-Door-Driver side (M168)
C0319-4 NP,0.75D,1060 C0439-4 C0459L-4 NP,1.5D,2320 SJ31
Mirror-Door-Passenger side (M169)
C0319-4 NP,0.75D,1060 C0439-8 C0463L-8 NP,1.5D,340
Sheet4
BATT-3
Sheet4
BATT-3-1
C2240L-18 C2238-18 UP,0.75D,1270 C0230-24
Instrument cluster (J100)
UP,0.75D,2118
C0570L-164 UP,1.5D,783 SJ172
Relay-Front-fog lamp (R130)
NAS
R5-MICRO
Central junction-box (P101)
C0570L-165 US,1.5D,703 SJ971 US,1.5D,600 C0583L-33
C0570L-140 UP,1.5D,1153 C0583L-41
C0570L-142 B,1.0D,338
D
Sheet4
Relay-Blower (R176)
47
31
R16-MINI
C0570L-11 NR,4.0D,1048 C2996L-2 C2997-2
Motor-Blower-Front (M132)
W,4.0,310 C0056-2
C0570L-74 B,1.0D,338
E
Sheet4
Automatic Temperature Control Module (D243)
C0570L-33 LGW,0.5D,1173 C2241L-5 C2239-5 LGW,0.5D,1663 C3629-7
C0570L-118 NO,1.5D,1173 C2241L-3 C2239-3 NO,0.5D,1663 C3629-19
Relay-Brake-boost pump (R260)
55
R11-MINI
Pump-Brake-boost (M296)
C0570L-88 G,1.5D,3951 C2709-1
Engine control-module (ECM) (D131)
C0570L-71 GW,0.5D,918 C0635L-50

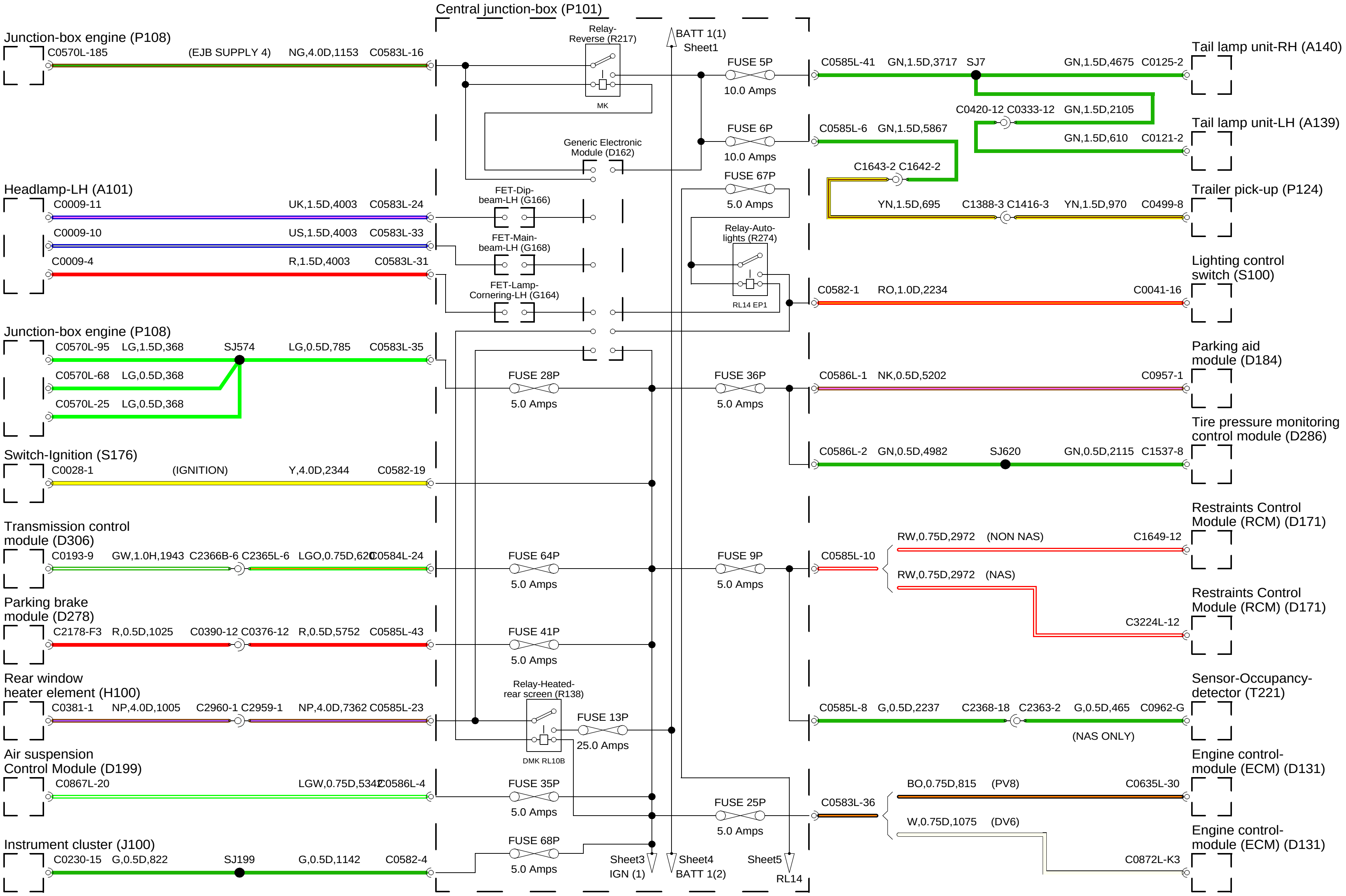

Capacitor (G158)
C1323B-3 RN,1.5,1160
C2725L-2
(PV8) NO,1.5D,1168
(DIESEL) RU,1.5D,753
R
Sheet1
C0570L-168
Junction-box engine (P108)
FUSE 6E
145
15.0 Amps
BATT-3-1
Sheet3
BATT-3
Sheet3
99
FUSE 5E
10.0 Amps
C0570L-121
NK,1.5D,893 (DIESEL)
S
Sheet5
NK,1.5D,893 (PV8)
A
Sheet5
Relay-Fuel-pump (R103)
R8-MINI
43
7
163
149
FUSE 14E
20.0 Amps
C0570L-172 NK,2.5D,1093
H
Sheet6
Unit-Fuel Tank (D179)
C0114-4 WP,2.5D,50
SJ15
WP,4.0D,2345
SJ17
WP,2.5D,5482
C0377-17 C0391-17
WP,2.5D,50
102
FUSE 11E
15.0 Amps
C0570L-124 NK,1.5D,918
K
Sheet6
NB,2.5D,1058 (PV8)
C2411L-14 C2412L-14
NB,2.5D,525 SJ489 NB,2.5D,723 (DIESEL)
C0570L-119
FUSE 1E
97
25.0 Amps
NR,1.5D,1168 (PV8)
C2725L-1
NR,1.5,110
N
Sheet7
105
FUSE 17E
15.0 Amps
C0570L-127
RU,1.5D,743 (DIESEL)
P
Sheet7
Engine control-module (ECM) (D131)
C0634B-95 YN,0.5,440
C2725L-7
(PV8) YN,0.5D,1168
C0570L-19
(DIESEL) UP,0.5D,1178
RU,1.5D,1168 (DIESEL)
F
Sheet7
103
FUSE 13E
10.0 Amps
C0570L-125
NO,1.5D,873 (PV8)
SJ812
(PV8) NO,1.5D,175
G
Sheet5
Engine control-module (ECM) (D131)
C0872L-J4
Relay-Engine control-module (ECM) (R116)
R6-POWER MINI
135
42
17
6
NO,1.5D,873 (PV8)
(PV8) NO,1.0D,295
L
Sheet6
C0570L-21
NO,1.5D,873 (DIESEL)
Dynamic response module (D285)
C2188L-1
PO,2.5D,2871
C0570L-123
FUSE 9E
101
15.0 Amps
NG,0.75D,918 (PV8)
Q
Sheet7
C0570L-18
(PETROL)
144
(DIESEL)
NG,0.75D,1178 (DIESEL)
Q1
Sheet7
(DIESEL)
Pump-Leak detection (M244)
C1339-4 NK,0.75D,5180
C2560-1 C2559-1 NK,1.5D,4126
C0570L-166
NAS ONLY
FUSE 2E
143
5.0 Amps
FUSE 4E
25.0 Amps
C0570L-167
NO,2.5D,873
SJ999
Engine control-module (ECM) (D131)
NO,1.5D,305 C0872L-L2
(PV8SC)
NO,1.5D,305 C0872L-L3
NO,1.5D,305 C0872L-L1
Motor-Wiper-Windscreen (M105)
C0030L-4
ULG,2.5D,2380
C0570L-49
C0030L-5
RLG,2.5D,2380
C0570L-38
Relay-Wiper-Fast-slow (R232)
R2-MICRO
37
39
60
62
Relay-Wiper-On-off (R231)
R3-MICRO
61
Pump-Supercharge-coolant (M314)
NP,1.5D,3696
C3006-1
111
FUSE 29E
30.0 Amps
Central junction-box (P101)
C0584L-17 PU,0.5D,650
SJ1
PU,1.5D,308
C0570L-50
147
FUSE 10E
15.0 Amps
Sheet5
C0570L-170
NO,1.5D,913 (PV8)
J
Sheet6
BN,1.5D,3811 (DIESEL)
M
Sheet7
C0584L-32 R,0.5D,660
SJ2
R,1.5D,298
C0570L-83
BATT-4
D
B,1.0D,338
SJ573
B,1.0D,338
C0570L-82
Sheet3
E
B,1.0D,338
B,2.5D,710
Sheet3
SJ173
B,4.0D,2180
C0560-1
TYPE 3

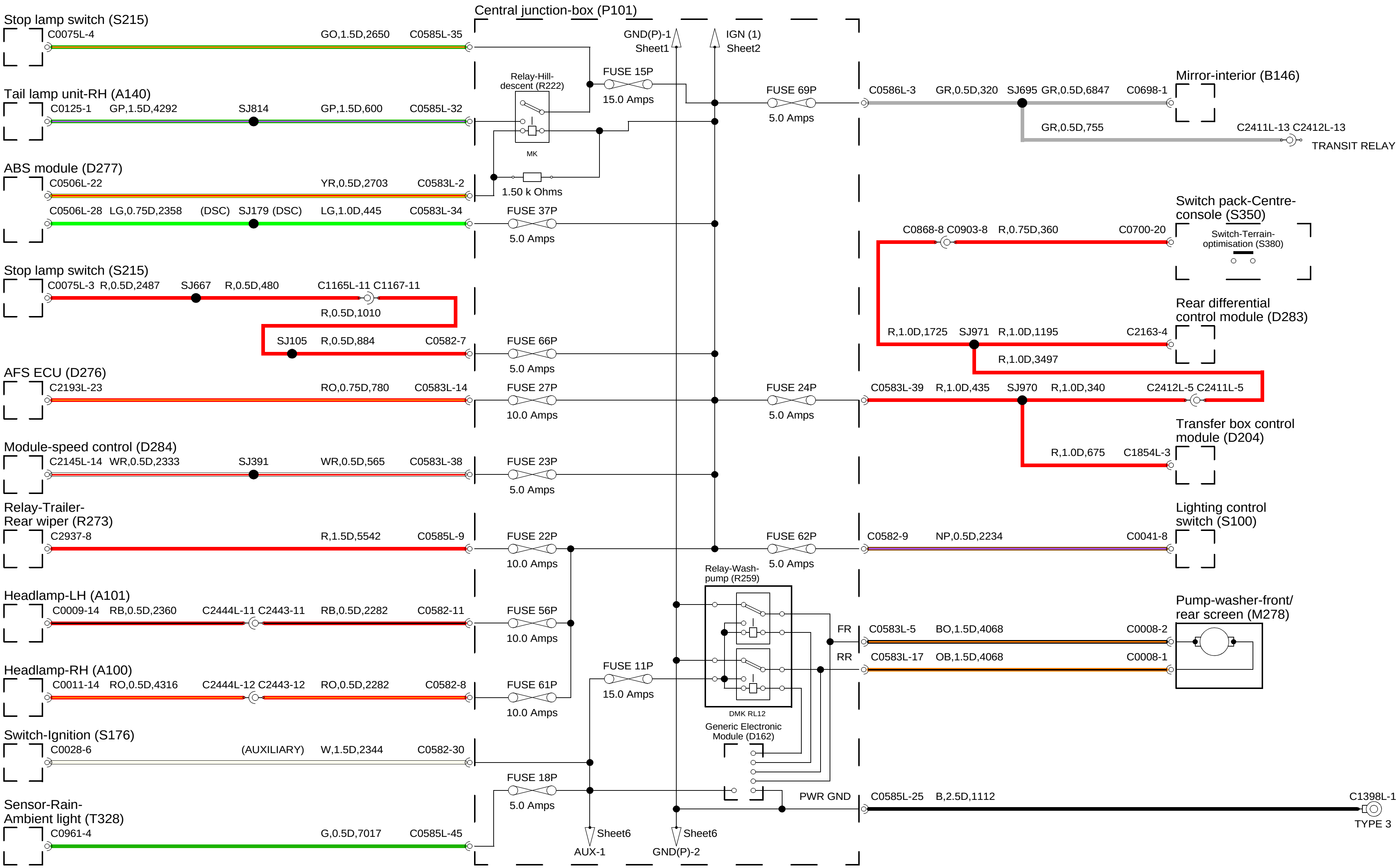

Engine control-module (ECM) (D131)
C0872L-K4
(DIESEL)
N,0.75D,1178
Engine control-module (ECM) (D131)
C0635L-54
(PV8)
NO,0.75D,918
Engine control-module (ECM) (D131)
C0872L-B1
(DIESEL)
R,0.5D,1178
Engine control-module (ECM) (D131)
C0635L-51
(PV8)
UR,0.5D,918
C0570L-110
C0570L-36
Junction-box engine (P108)
BATT-4
Sheet4
FUSE 27E
5.0 Amps
LINK 14E
184
48
40.0 Amps
Relay-Starter (R102)
R18-MINI
C0570L-12
C0570L-34
NR,2.5D,1168
(PV8)
C2725L-11
C2724B-11
R,2.5,1435
C0179B-1
Starter motor (M101)
RB,2.5D,1168
(DIESEL)
C2274L-1
C2273C-1
RB,2.5,2125
C0179C-1
Starter motor (M101)
Central junction-box (P101)
WR,0.5D,500
C0584L-30
Engine control-module (ECM) (D131)
WR,0.5D,458
(DIESEL)
SJ479
WR,0.5D,720
C0872L-F3
GO,0.5D,318
(PV8)
SJ592
GO,0.5D,600
Transmission control module (D306)
C2365L-8
C2366C-8
GO,0.5H,2043
C0193-10
G
(PETROL-V8)
NO,1.5D,175
C0635L-4
Sheet4
Engine control-module (ECM) (D131)
A
(PV8)
NK,1.5D,895
SJ450
NK,1.5D,275
C2725L-8
C2724B-8
(PV8NA)
SJ7
B,1.0,350
C0152B-2
Purge control valve (N119)
Sheet4
S
(DIESEL)
NK,1.5D,895
Sheet4
GU,1.0,860
WU,1.0,611
SJ1
WU,1.0,120
C0177B-2
Modulator valve-EGR (D214)
WU,1.0,120
C0177B-5
Fan-Cooling-E box (M208)
C0646L-2
NK,0.75D,510
(PV8)
Module-speed control (D284)
C2145L-15
NK,0.5D,2108
NK,0.5D,2770
C2025-5
Sensor-Adaptive-cruise control (T350)

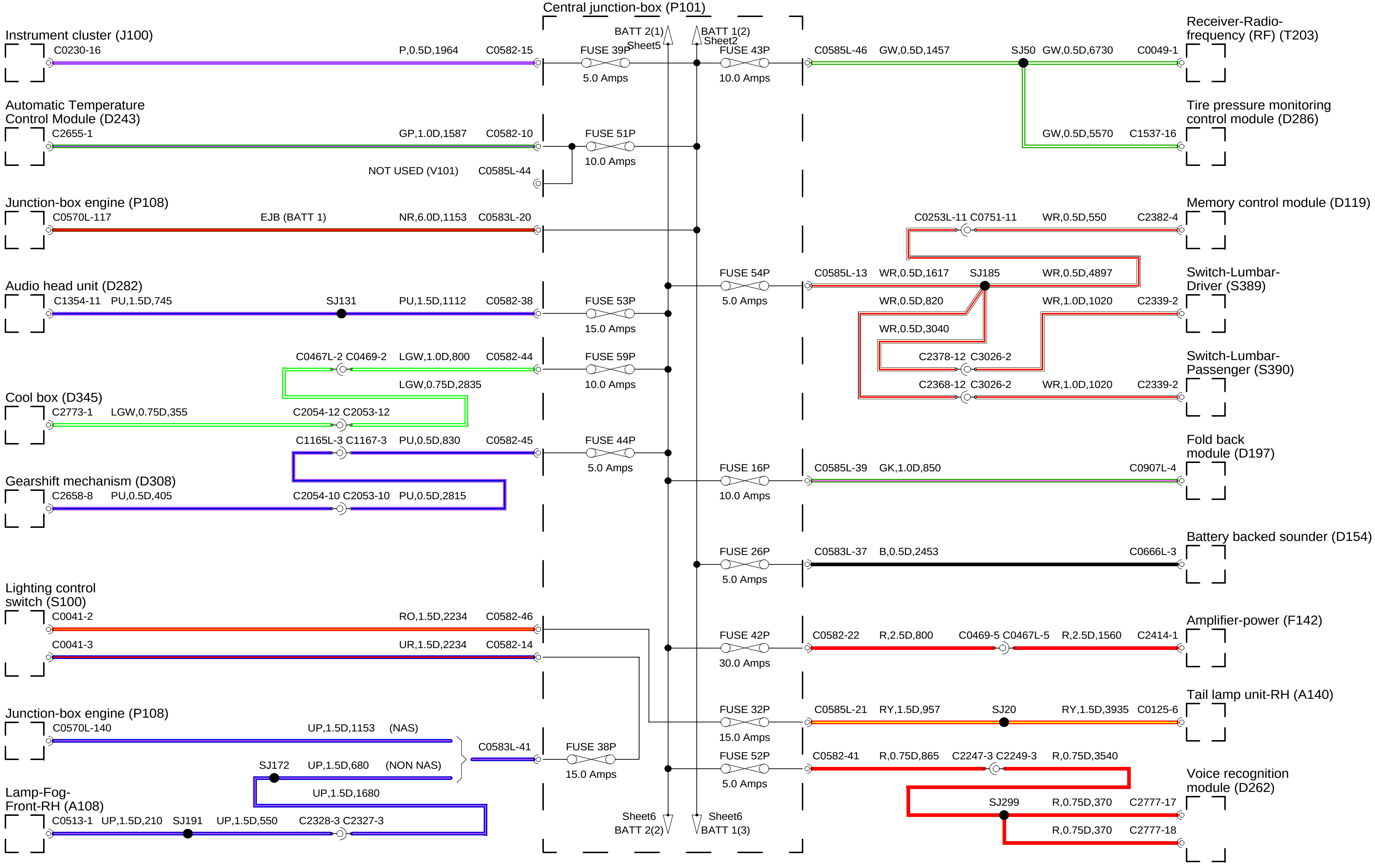

Engine control-module (ECM) (D131)
J
Sheet4
NO,1.5D,915
(PV8)
SJ446
NO,1.0D,215
C0635L-6
Viscous fan (M300)
NO,1.0D,255
C2725L-14
C2724B-14
RG,1.0,130
SJ11
RG,1.0,1701
C2270B-1
R,1.0,1701
C2270B-5
Sensor-Mass air-flow (MAF) (T115)
GU,1.0,1791
C0149B-1
Valve-Oil-Variable-valve timing (N152)
C2724B-16
(PV8NA)
NO,1.0,915
SJ5008
B,1.0,801
L
Sheet4
NO,1.0D,295
(PV8)
C2725L-16
C2549-1
C2724D-16
(PV8SC)
NO,1.0,1425
SJ20
B,1.0,801
Valve-Oil-Variable-valve timing (N152)
B,1.0,961
C2548-1
B,1.0,961
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
NK,2.5H,975
(NON NAS)
SJ444
NK,1.5H,1549
C2366B-18
(PV8NA)
C0642-1
BANK A
NK,2.5H,975
(NAS ONLY)
NK,1.5H,1549
K
Sheet4
NK,1.5D,918
C2365L-18
NK,2.5H,955
(NON NAS)
SJ3444
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
C2366D-18
(PV8SC)
NK,1.5H,1023
C0643-1
BANK B
NK,2.5H,955
(NAS ONLY)
NK,1.5H,1023
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
SJ5444
NK,1.5H,1003
C0164-1
BANK A
SJ6444
NK,1.5H,1003
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H,543
C0908-1
BANK B
NK,1.5H,543
Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
H
Sheet4
NK,2.5D,1093
SJ445
NK,1.5D,75
C2725L-18
C2724B-18
WG,1.5,1715
C0644B-1
BANK B
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
NK,1.5D,75
C2725L-17
C2724B-17
WG,1.5,1560
C0645B-1
BANK A

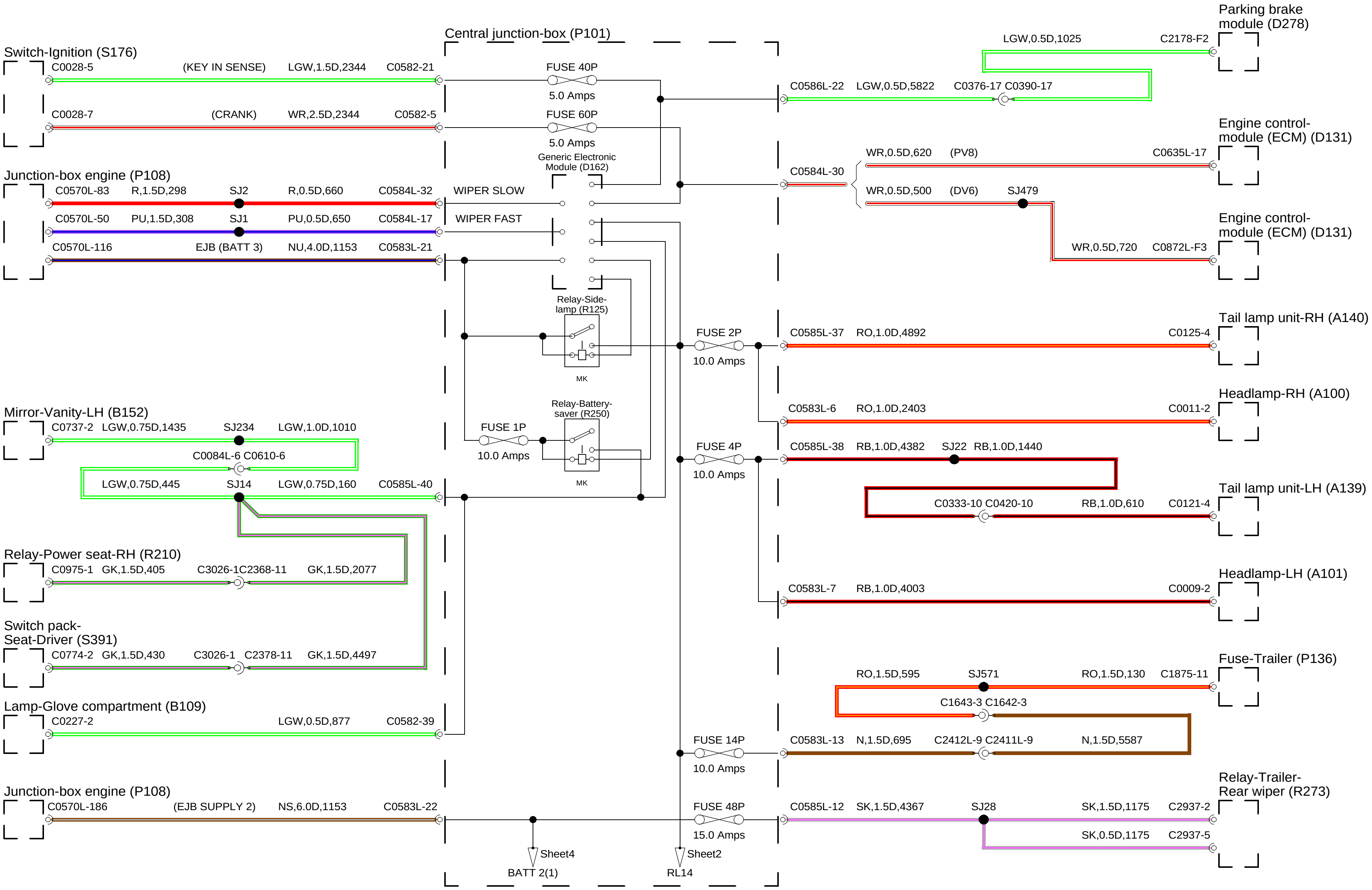

N
Sheet4
NR,1.5,110
SJ16
NR,1.0,975
SJ10
NR,0.5,376
C0522B-2
Fuel injector-No.1 (T172)
NR,1.0,950
SJ4
NR,0.5,356
C0526B-2
Fuel injector-No.5 (T176)
P
Sheet4
(DIESEL)
RU,1.5D,745
SJ559
RU,0.75D,425
C2274L-17 C2273C-17
RO,0.75,1730
C0272C-4
Throttle-EGR-Inlet (Y160)
RU,0.75D,660
C0646L-2
Fan-E-box (M210)
RU,0.75D,2615
C0567-1
Sensor-MAF/IAT (T317)
Q
Sheet4
(PV8)
NG,0.75D,920
C0635L-16
Engine control-module (ECM) (D131)
Q1
Sheet4
(DIESEL)
NG,0.75D,1090
C0872L-J3
Engine control-module (ECM) (D131)
F
Sheet4
(DIESEL)
RU,1.5D,1170
C2274L-18 C2273C-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260C-1
Valve-Control-Fuel volume (N168)
RU,0.75,380
C2261C-1
Valve-Control-Fuel pressure (N167)
M
Sheet4
(DIESEL)
BN,1.5D,3815
SJ630
BN,1.0D,300
C2270-A
BN,1.0D,300
C2270-E
Viscous fan (M300)

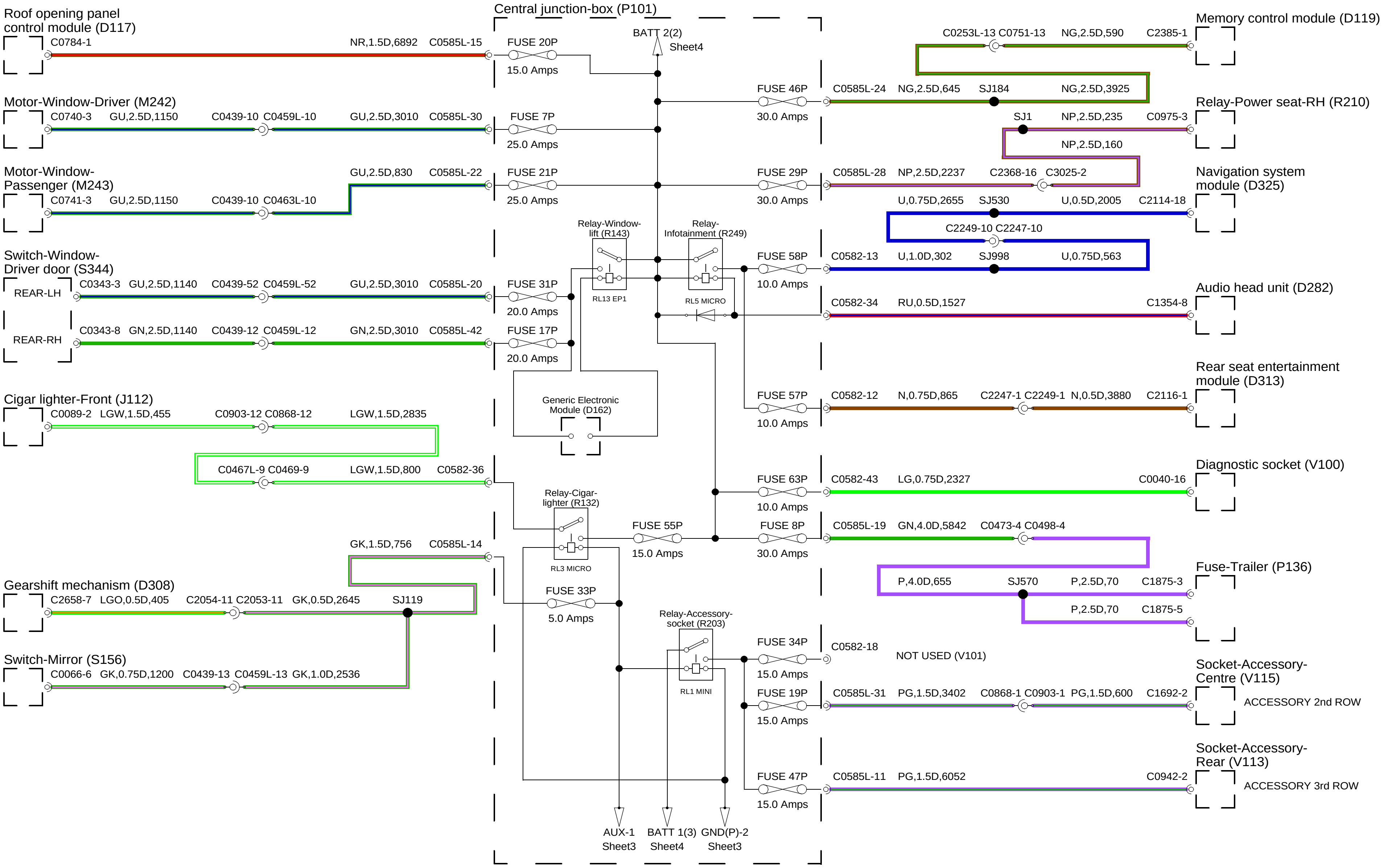

Central junction-box (P101)
Motor-Central door-locking-Driver (M236)
C0441-7 BR,1.5D,1760 C0439-2 C0459L-2
BR,1.5D,3010 C0585L-27
BG,2.5D,655 C0585L-36
Motor-Central door-locking-Driver (M236)
C0441-5 BG,1.5D,1760 C0439-5 C0459L-5 BG,1.5D,2435 SJ11
Motor-Central door-locking-Rear-LH (M167)
C0442-5 BG,1.5D,1565 C0803-8 C0435-8 BG,1.5D,3317
BP,1.5D,892 C0585L-33
Motor-Central door-locking-Rear-RH (M166)
C0442-6 BP,1.5D,1565 C0804-12 C0436-12 BP,1.5D,1560 SJ12
Motor-Central door-locking-Passenger (M237)
C0441-6 BP,1.5D,1760 C0439-4 C0463L-4 BP,1.5D,542
Motor-Central door-locking-Driver (M236)
C0441-6 BP,1.5D,1760 C0439-6 C0459L-6 BP,1.5D,2672
Motor-Central door-locking-Rear-LH (M167)
C0442-6 BP,1.5D,1565 C0803-12 C0435-12 BP,1.5D,3080
BG,2.5D,686 C0585L-26
Motor-Central door-locking-Passenger (M237)
C0441-7 BG,1.5D,1760 C0439-5 C0463L-5 BG,1.5D,336 SJ670
Motor-Central door-locking-Rear-RH (M166)
C0442-7 BG,1.5D,1565 C0804-8 C0436-8 BG,1.5D,1765
Relay-Driver-lock (R262)
(O/P)
DMK RL6A
Generic Electronic Module (D162)
Relay-CDL-lock (R261)
(O/P)
DMK RL6B
Relay-CDL-Return (R265)
(1 O/P)
DMK RL8A
Relay-Superlock (R263)
(O/P)
DMK RL8B
Relay-CDL-Return (R265)
(2 O/P)
RL9 MK
FUSE 49P
30.0 Amps
FUSE 12P
15.0 Amps
Relay-Horn (R133)
DMK RL10A
FUSE 50P
10.0 Amps
Relay-Fuel-flap-lock (R257)
DMK
Relay-Fuel-flap-unlock (R258)
DMK
BATT 1(1)
Sheet2
Sheet3
GND(P)-1
C0585L-5 BR,1.5D,1567
SJ13 BR,1.5D,2405 C0435-10 C0803-10 BR,1.5D,1565 C0442-7
Motor-Central door-locking-Rear-LH (M167)
BR,1.5D,1217 C0463L-9 C0439-9 BR,1.5D,1760 C0441-5
Motor-Central door-locking-Passenger (M237)
BR,1.5D,885 C0436-10 C0804-10 BR,1.5D,1565 C0442-5
Motor-Central door-locking-Rear-RH (M166)
C0583L-3 PG,1.0D,3735 C0004-1
Horn-RH (L103)
C0583L-4 PG,1.0D,3950 C0003-1
Horn-LH (L102)
C0580-23 PO,0.35D,2577 C0082-3
Clock spring (S227)
C0582-3 KR,1.5D,800 C0469-7 C0467L-7 KR,1.5D,3160 C0748-2
Motor-Release-Fuel flap (M116)
C0582-2 KP,1.5D,800 C0469-8 C0467L-8 KP,1.5D,3160 C0748-1

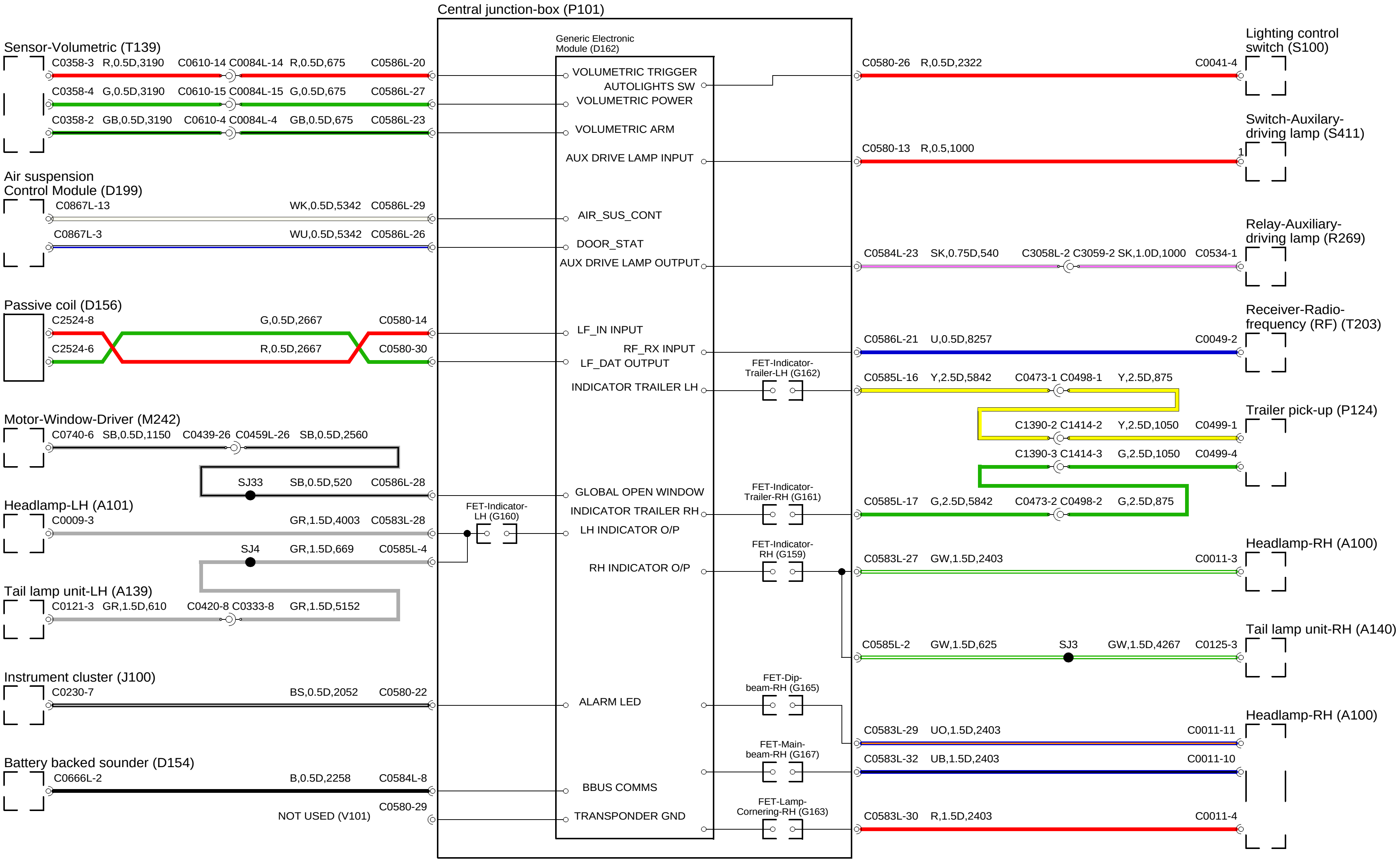

Central junction-box (P101)
Junction-box engine (P108)
C0570L-185
(EJB SUPPLY 4)
NG,4.0D,1153
C0583L-16
Relay-Reverse (R217)
MK
BATT 1(1) Sheet1
FUSE 5P
10.0 Amps
C0585L-41
GN,1.5D,3717
SJ7
GN,1.5D,4675
C0125-2
Tail lamp unit-RH (A140)
C0420-12 C0333-12
GN,1.5D,2105
FUSE 6P
10.0 Amps
C0585L-6
GN,1.5D,5867
GN,1.5D,610
C0121-2
Tail lamp unit-LH (A139)
Generic Electronic Module (D162)
C1643-2 C1642-2
FUSE 67P
5.0 Amps
Trailer pick-up (P124)
YN,1.5D,695
C1388-3 C1416-3
YN,1.5D,970
C0499-8
Headlamp-LH (A101)
C0009-11
UK,1.5D,4003
C0583L-24
FET-Dip-beam-LH (G166)
C0009-10
US,1.5D,4003
C0583L-33
FET-Main-beam-LH (G168)
C0009-4
R,1.5D,4003
C0583L-31
Relay-Auto-lights (R274)
RL14 EP1
FET-Lamp-Cornering-LH (G164)
Lighting control switch (S100)
C0582-1
RO,1.0D,2234
C0041-16
Junction-box engine (P108)
C0570L-95
LG,1.5D,368
SJ574
LG,0.5D,785
C0583L-35
C0570L-68
LG,0.5D,368
C0570L-25
LG,0.5D,368
FUSE 28P
5.0 Amps
FUSE 36P
5.0 Amps
Parking aid module (D184)
C0586L-1
NK,0.5D,5202
C0957-1
Tire pressure monitoring control module (D286)
C0586L-2
GN,0.5D,4982
SJ620
GN,0.5D,2115
C1537-8
Switch-Ignition (S176)
C0028-1
(IGNITION)
Y,4.0D,2344
C0582-19
Transmission control module (D306)
C0193-9
GW,1.0H,1943
C2366B-6 C2365L-6
LGO,0.75D,620
C0584L-24
FUSE 64P
5.0 Amps
FUSE 9P
5.0 Amps
C0585L-10
Restraints Control Module (RCM) (D171)
RW,0.75D,2972
(NON NAS)
C1649-12
RW,0.75D,2972
(NAS)
Restraints Control Module (RCM) (D171)
C3224L-12
Parking brake module (D278)
C2178-F3
R,0.5D,1025
C0390-12 C0376-12
R,0.5D,5752
C0585L-43
FUSE 41P
5.0 Amps
Rear window heater element (H100)
C0381-1
NP,4.0D,1005
C2960-1 C2959-1
NP,4.0D,7362
C0585L-23
Relay-Heated-rear screen (R138)
DMK RL10B
FUSE 13P
25.0 Amps
Sensor-Occupancy-detector (T221)
C0585L-8
G,0.5D,2237
C2368-18
C2363-2
G,0.5D,465
C0962-G
(NAS ONLY)
Air suspension Control Module (D199)
C0867L-20
LGW,0.75D,5342
C0586L-4
FUSE 35P
5.0 Amps
FUSE 25P
5.0 Amps
C0583L-36
BO,0.75D,815
(PV8)
C0635L-30
Engine control-module (ECM) (D131)
W,0.75D,1075
(DV6)
C0872L-K3
Engine control-module (ECM) (D131)
Instrument cluster (J100)
C0230-15
G,0.5D,822
SJ199
G,0.5D,1142
C0582-4
FUSE 68P
5.0 Amps
Sheet3 IGN (1)
Sheet4 BATT 1(2)
Sheet5 RL14

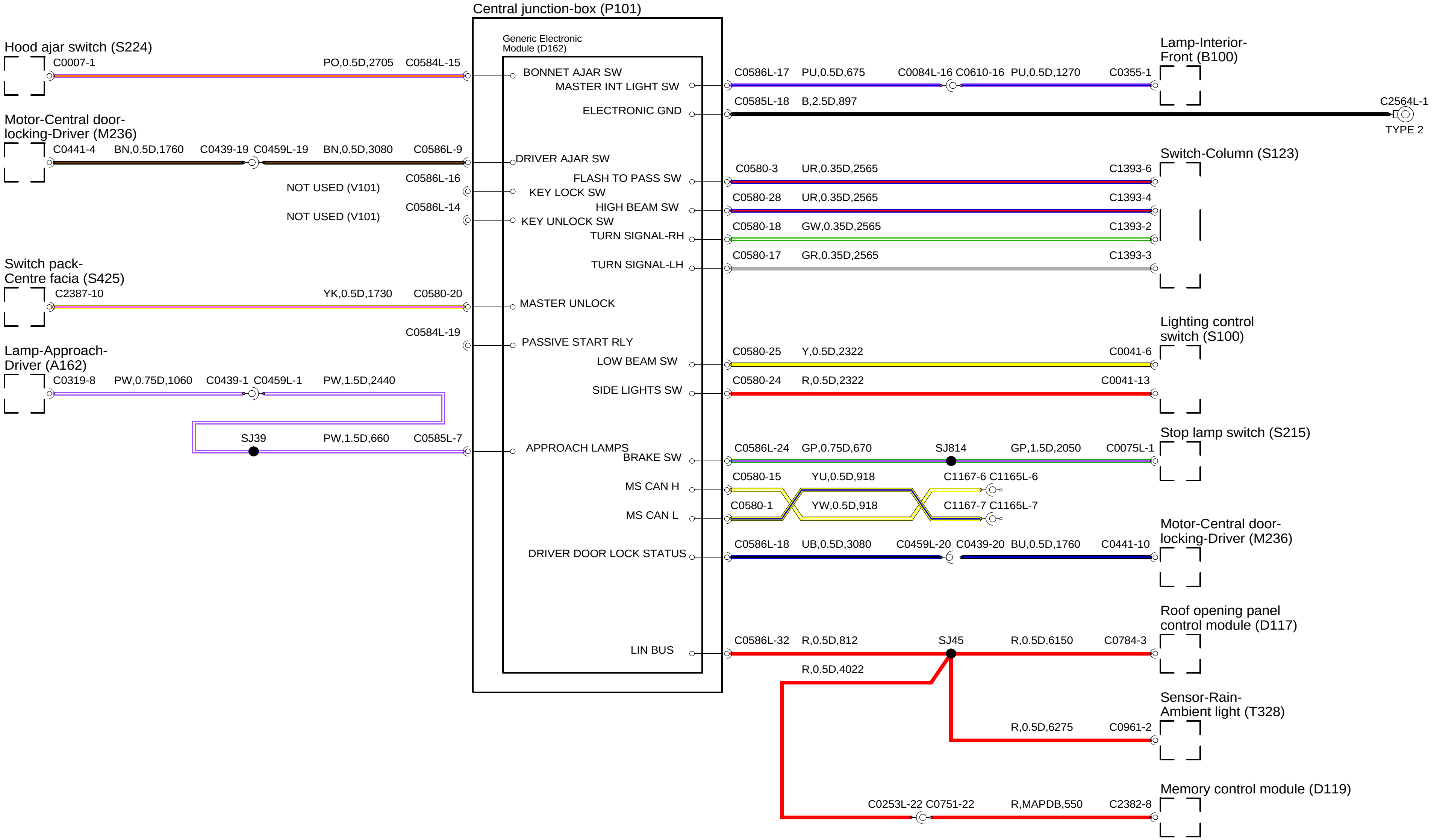

Central junction-box (P101)
Stop lamp switch (S215)
C0075L-4
GO,1.5D,2650
C0585L-35
GND(P)-1
Sheet1
IGN (1)
Sheet2
Relay-Hill-descent (R222)
FUSE 15P
15.0 Amps
MK
Tail lamp unit-RH (A140)
C0125-1
GP,1.5D,4292
SJ814
GP,1.5D,600
C0585L-32
FUSE 69P
5.0 Amps
C0586L-3
GR,0.5D,320
SJ695
GR,0.5D,6847
C0698-1
Mirror-interior (B146)
GR,0.5D,755
C2411L-13 C2412L-13
TRANSIT RELAY
ABS module (D277)
C0506L-22
YR,0.5D,2703
C0583L-2
1.50 k Ohms
C0506L-28
LG,0.75D,2358
(DSC)
SJ179 (DSC)
LG,1.0D,445
C0583L-34
FUSE 37P
5.0 Amps
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0868-8 C0903-8
R,0.75D,360
C0700-20
Stop lamp switch (S215)
C0075L-3
R,0.5D,2487
SJ667
R,0.5D,480
C1165L-11 C1167-11
R,0.5D,1010
SJ105
R,0.5D,884
C0582-7
FUSE 66P
5.0 Amps
Rear differential control module (D283)
R,1.0D,1725
SJ971
R,1.0D,1195
C2163-4
R,1.0D,3497
AFS ECU (D276)
C2193L-23
RO,0.75D,780
C0583L-14
FUSE 27P
10.0 Amps
FUSE 24P
5.0 Amps
C0583L-39
R,1.0D,435
SJ970
R,1.0D,340
C2412L-5 C2411L-5
Transfer box control module (D204)
R,1.0D,675
C1854L-3
Module-speed control (D284)
C2145L-14
WR,0.5D,2333
SJ391
WR,0.5D,565
C0583L-38
FUSE 23P
5.0 Amps
Relay-Trailer-Rear wiper (R273)
C2937-8
R,1.5D,5542
C0585L-9
FUSE 22P
10.0 Amps
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D,2234
C0041-8
Lighting control switch (S100)
Relay-Wash-pump (R259)
Headlamp-LH (A101)
C0009-14
RB,0.5D,2360
C2444L-11 C2443-11
RB,0.5D,2282
C0582-11
FUSE 56P
10.0 Amps
FR
C0583L-5
BO,1.5D,4068
C0008-2
Pump-washer-front/rear screen (M278)
RR
C0583L-17
OB,1.5D,4068
C0008-1
Headlamp-RH (A100)
C0011-14
RO,0.5D,4316
C2444L-12 C2443-12
RO,0.5D,2282
C0582-8
FUSE 61P
10.0 Amps
FUSE 11P
15.0 Amps
DMK RL12
Generic Electronic Module (D162)
Switch-Ignition (S176)
C0028-6
(AUXILIARY)
W,1.5D,2344
C0582-30
FUSE 18P
5.0 Amps
PWR GND
C0585L-25
B,2.5D,1112
C1398L-1
TYPE 3
Sensor-Rain-Ambient light (T328)
C0961-4
G,0.5D,7017
C0585L-45
Sheet6
AUX-1
Sheet6
GND(P)-2

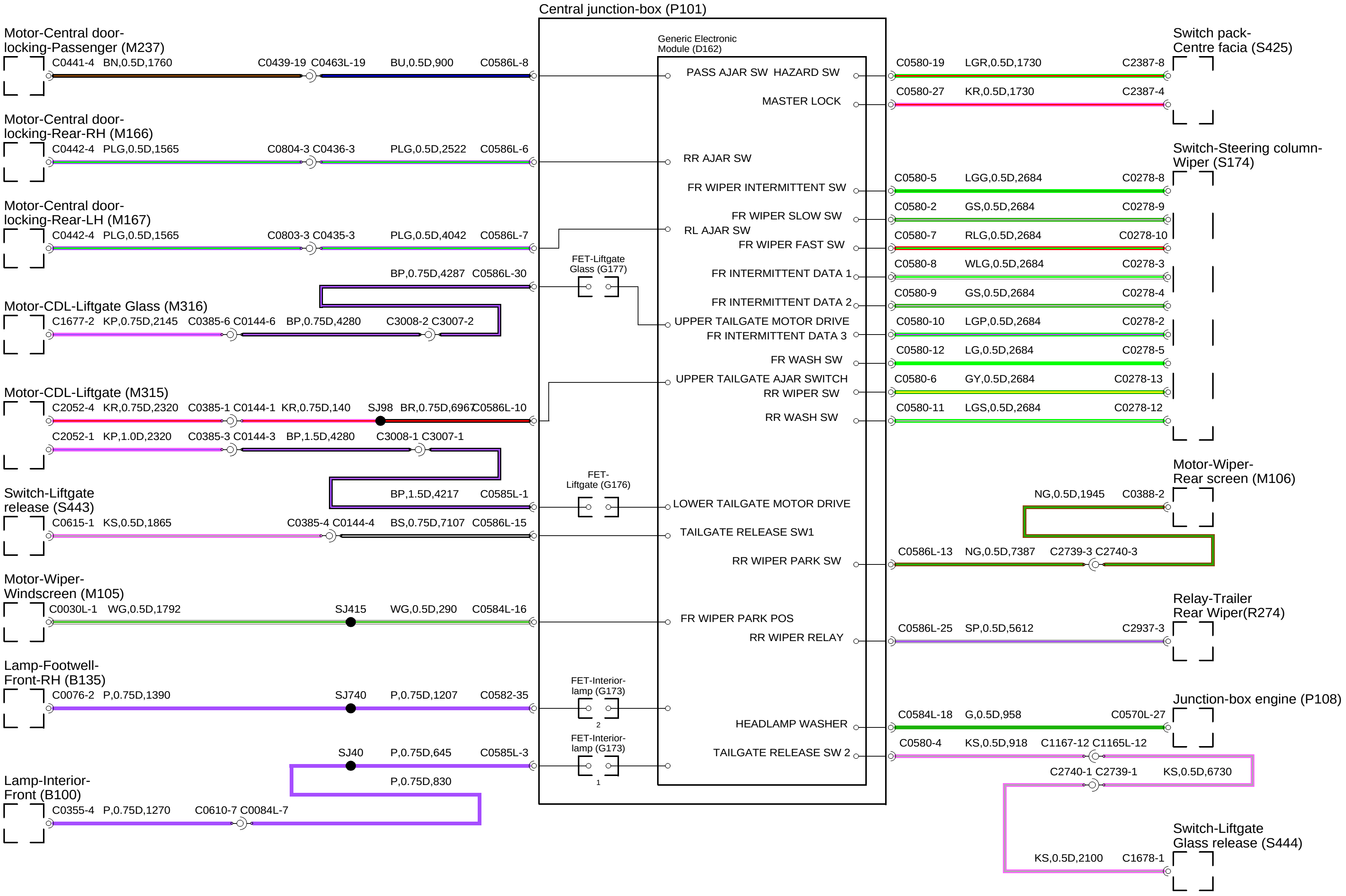

Central junction-box (P101)
Instrument cluster (J100)
C0230-16
P,0.5D,1964
C0582-15
FUSE 39P
5.0 Amps
BATT 2(1)
Sheet5
BATT 1(2)
Sheet2
FUSE 43P
10.0 Amps
C0585L-46
GW,0.5D,1457
SJ50
GW,0.5D,6730
C0049-1
Receiver-Radio-frequency (RF) (T203)
Automatic Temperature Control Module (D243)
C2655-1
GP,1.0D,1587
C0582-10
FUSE 51P
10.0 Amps
NOT USED (V101)
C0585L-44
GW,0.5D,5570
C1537-16
Tire pressure monitoring control module (D286)
Junction-box engine (P108)
C0570L-117
EJB (BATT 1)
NR,6.0D,1153
C0583L-20
C0253L-11 C0751-11
WR,0.5D,550
C2382-4
Memory control module (D119)
FUSE 54P
5.0 Amps
C0585L-13
WR,0.5D,1617
SJ185
WR,0.5D,4897
Switch-Lumbar-Driver (S389)
Audio head unit (D282)
C1354-11
PU,1.5D,745
SJ131
PU,1.5D,1112
C0582-38
FUSE 53P
15.0 Amps
WR,0.5D,820
WR,1.0D,1020
C2339-2
WR,0.5D,3040
C0467L-2 C0469-2
LGW,1.0D,800
C0582-44
FUSE 59P
10.0 Amps
C2378-12 C3026-2
Switch-Lumbar-Passenger (S390)
LGW,0.75D,2835
C2368-12 C3026-2
WR,1.0D,1020
C2339-2
Cool box (D345)
C2773-1
LGW,0.75D,355
C2054-12 C2053-12
C1165L-3 C1167-3
PU,0.5D,830
C0582-45
FUSE 44P
5.0 Amps
Fold back module (D197)
FUSE 16P
10.0 Amps
C0585L-39
GK,1.0D,850
C0907L-4
Gearshift mechanism (D308)
C2658-8
PU,0.5D,405
C2054-10 C2053-10
PU,0.5D,2815
Battery backed sounder (D154)
FUSE 26P
5.0 Amps
C0583L-37
B,0.5D,2453
C0666L-3
Lighting control switch (S100)
C0041-2
RO,1.5D,2234
C0582-46
C0041-3
UR,1.5D,2234
C0582-14
Amplifier-power (F142)
FUSE 42P
30.0 Amps
C0582-22
R,2.5D,800
C0469-5 C0467L-5
R,2.5D,1560
C2414-1
Tail lamp unit-RH (A140)
FUSE 32P
15.0 Amps
C0585L-21
RY,1.5D,957
SJ20
RY,1.5D,3935
C0125-6
Junction-box engine (P108)
C0570L-140
UP,1.5D,1153
(NAS)
C0583L-41
FUSE 38P
15.0 Amps
SJ172
UP,1.5D,680
(NON NAS)
FUSE 52P
5.0 Amps
C0582-41
R,0.75D,865
C2247-3 C2249-3
R,0.75D,3540
Voice recognition module (D262)
UP,1.5D,1680
Lamp-Fog-Front-RH (A108)
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
SJ299
R,0.75D,370
C2777-17
R,0.75D,370
C2777-18
Sheet6
BATT 2(2)
Sheet6
BATT 1(3)

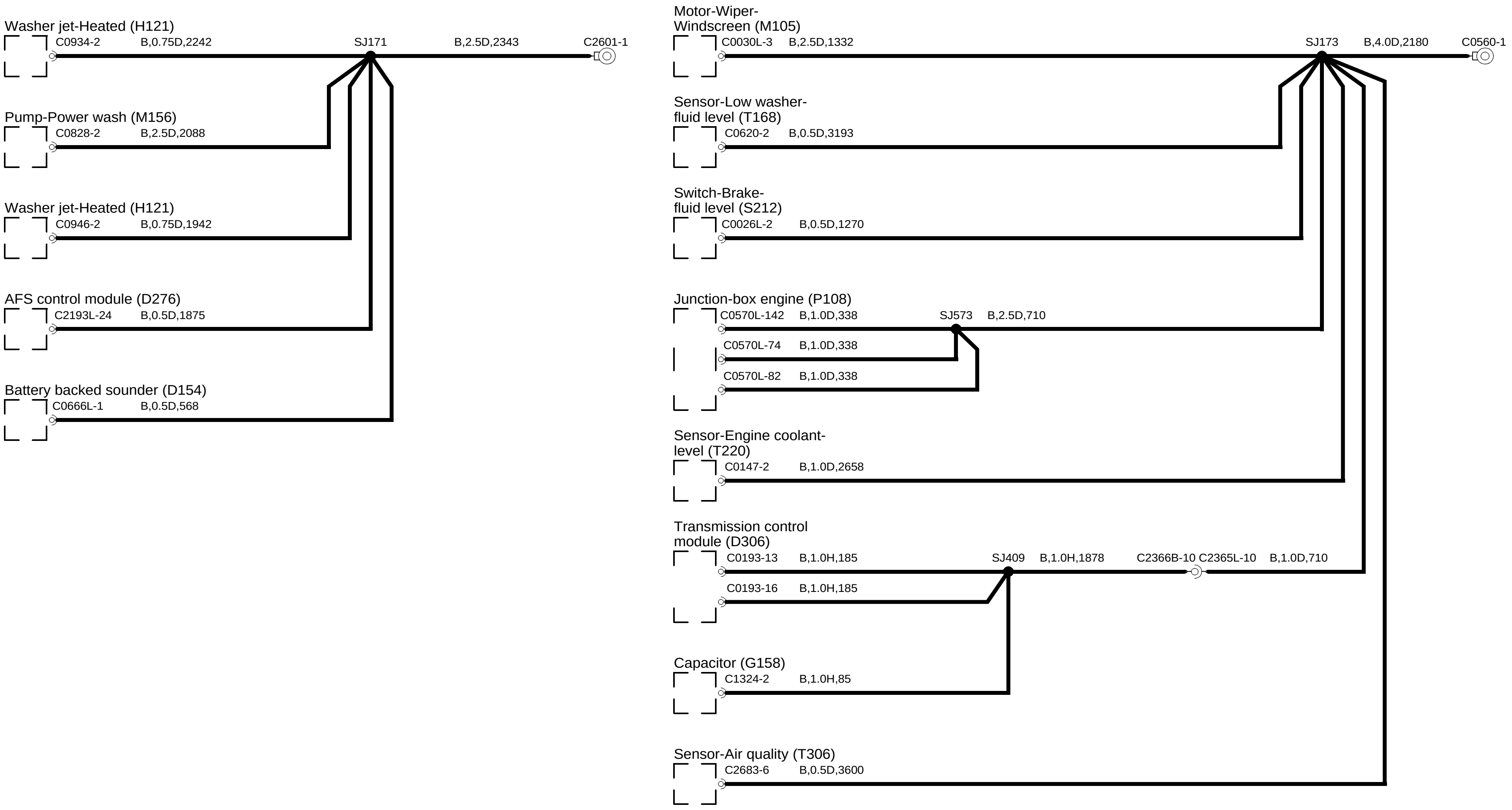

Parking brake module (D278)
Central junction-box (P101)
LGW,0.5D,1025
C2178-F2
Switch-Ignition (S176)
C0028-5
(KEY IN SENSE)
LGW,1.5D,2344
C0582-21
FUSE 40P
5.0 Amps
C0586L-22
LGW,0.5D,5822
C0376-17 C0390-17
C0028-7
(CRANK)
WR,2.5D,2344
C0582-5
FUSE 60P
5.0 Amps
Engine control-module (ECM) (D131)
Generic Electronic Module (D162)
WR,0.5D,620
(PV8)
C0635L-17
C0584L-30
Junction-box engine (P108)
C0570L-83
R,1.5D,298
SJ2
R,0.5D,660
C0584L-32
WIPER SLOW
WR,0.5D,500
(DV6)
SJ479
C0570L-50
PU,1.5D,308
SJ1
PU,0.5D,650
C0584L-17
WIPER FAST
Engine control-module (ECM) (D131)
C0570L-116
EJB (BATT 3)
NU,4.0D,1153
C0583L-21
WR,0.5D,720
C0872L-F3
Relay-Side-lamp (R125)
Tail lamp unit-RH (A140)
FUSE 2P
C0585L-37
RO,1.0D,4892
C0125-4
10.0 Amps
MK
Headlamp-RH (A100)
Relay-Battery-saver (R250)
C0583L-6
RO,1.0D,2403
C0011-2
Mirror-Vanity-LH (B152)
C0737-2
LGW,0.75D,1435
SJ234
LGW,1.0D,1010
FUSE 1P
FUSE 4P
C0585L-38
RB,1.0D,4382
SJ22
RB,1.0D,1440
C0084L-6 C0610-6
10.0 Amps
10.0 Amps
MK
Tail lamp unit-LH (A139)
LGW,0.75D,445
SJ14
LGW,0.75D,160
C0585L-40
C0333-10 C0420-10
RB,1.0D,610
C0121-4
Relay-Power seat-RH (R210)
C0975-1
GK,1.5D,405
C3026-1C2368-11
GK,1.5D,2077
Headlamp-LH (A101)
C0583L-7
RB,1.0D,4003
C0009-2
Switch pack-Seat-Driver (S391)
C0774-2
GK,1.5D,430
C3026-1
C2378-11
GK,1.5D,4497
Fuse-Trailer (P136)
RO,1.5D,595
SJ571
RO,1.5D,130
C1875-11
C1643-3 C1642-3
Lamp-Glove compartment (B109)
C0227-2
LGW,0.5D,877
C0582-39
FUSE 14P
C0583L-13
N,1.5D,695
C2412L-9 C2411L-9
N,1.5D,5587
10.0 Amps
Relay-Trailer-Rear wiper (R273)
Junction-box engine (P108)
C0570L-186
(EJB SUPPLY 2)
NS,6.0D,1153
C0583L-22
FUSE 48P
C0585L-12
SK,1.5D,4367
SJ28
SK,1.5D,1175
C2937-2
15.0 Amps
SK,0.5D,1175
C2937-5
Sheet4
Sheet2
BATT 2(1)
RL14

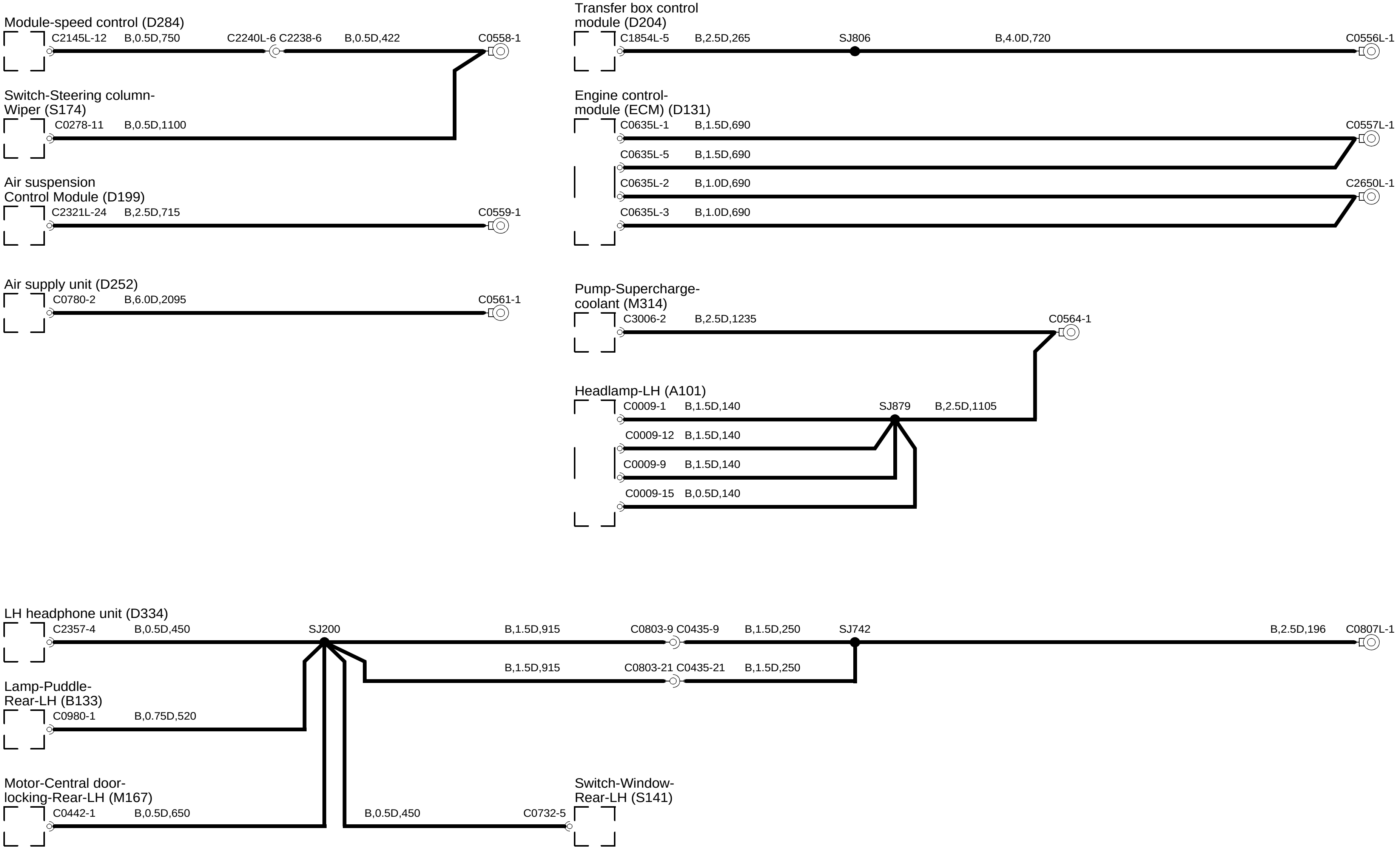

Central junction-box (P101)
Roof opening panel control module (D117)
C0784-1
NR,1.5D,6892
C0585L-15
FUSE 20P
15.0 Amps
BATT 2(2)
Sheet4
Memory control module (D119)
C0253L-13 C0751-13
NG,2.5D,590
C2385-1
FUSE 46P
30.0 Amps
C0585L-24
NG,2.5D,645
SJ184
NG,2.5D,3925
Motor-Window-Driver (M242)
C0740-3
GU,2.5D,1150
C0439-10 C0459L-10
GU,2.5D,3010
C0585L-30
FUSE 7P
25.0 Amps
Relay-Power seat-RH (R210)
SJ1
NP,2.5D,235
C0975-3
NP,2.5D,160
Motor-Window-Passenger (M243)
C0741-3
GU,2.5D,1150
C0439-10 C0463L-10
GU,2.5D,830
C0585L-22
FUSE 21P
25.0 Amps
FUSE 29P
30.0 Amps
C0585L-28
NP,2.5D,2237
C2368-16 C3025-2
Navigation system module (D325)
U,0.75D,2655
SJ530
U,0.5D,2005
C2114-18
C2249-10 C2247-10
Relay-Window-lift (R143)
RL13 EP1
Relay-Infotainment (R249)
RL5 MICRO
Switch-Window-Driver door (S344)
REAR-LH
C0343-3
GU,2.5D,1140
C0439-52 C0459L-52
GU,2.5D,3010
C0585L-20
FUSE 31P
20.0 Amps
FUSE 58P
10.0 Amps
C0582-13
U,1.0D,302
SJ998
U,0.75D,563
Audio head unit (D282)
C0582-34
RU,0.5D,1527
C1354-8
REAR-RH
C0343-8
GN,2.5D,1140
C0439-12 C0459L-12
GN,2.5D,3010
C0585L-42
FUSE 17P
20.0 Amps
Rear seat entertainment module (D313)
FUSE 57P
10.0 Amps
C0582-12
N,0.75D,865
C2247-1 C2249-1
N,0.5D,3880
C2116-1
Cigar lighter-Front (J112)
C0089-2
LGW,1.5D,455
C0903-12 C0868-12
LGW,1.5D,2835
Generic Electronic Module (D162)
Diagnostic socket (V100)
C0467L-9 C0469-9
LGW,1.5D,800
C0582-36
FUSE 63P
10.0 Amps
C0582-43
LG,0.75D,2327
C0040-16
Relay-Cigar-lighter (R132)
RL3 MICRO
FUSE 55P
15.0 Amps
FUSE 8P
30.0 Amps
C0585L-19
GN,4.0D,5842
C0473-4 C0498-4
GK,1.5D,756
C0585L-14
Fuse-Trailer (P136)
P,4.0D,655
SJ570
P,2.5D,70
C1875-3
P,2.5D,70
C1875-5
Gearshift mechanism (D308)
C2658-7
LGO,0.5D,405
C2054-11 C2053-11
GK,0.5D,2645
SJ119
FUSE 33P
5.0 Amps
Relay-Accessory-socket (R203)
RL1 MINI
FUSE 34P
15.0 Amps
C0582-18
NOT USED (V101)
Switch-Mirror (S156)
C0066-6
GK,0.75D,1200
C0439-13 C0459L-13
GK,1.0D,2536
Socket-Accessory-Centre (V115)
FUSE 19P
15.0 Amps
C0585L-31
PG,1.5D,3402
C0868-1 C0903-1
PG,1.5D,600
C1692-2
ACCESSORY 2nd ROW
Socket-Accessory-Rear (V113)
FUSE 47P
15.0 Amps
C0585L-11
PG,1.5D,6052
C0942-2
ACCESSORY 3rd ROW
AUX-1
Sheet3
BATT 1(3)
Sheet4
GND(P)-2
Sheet3

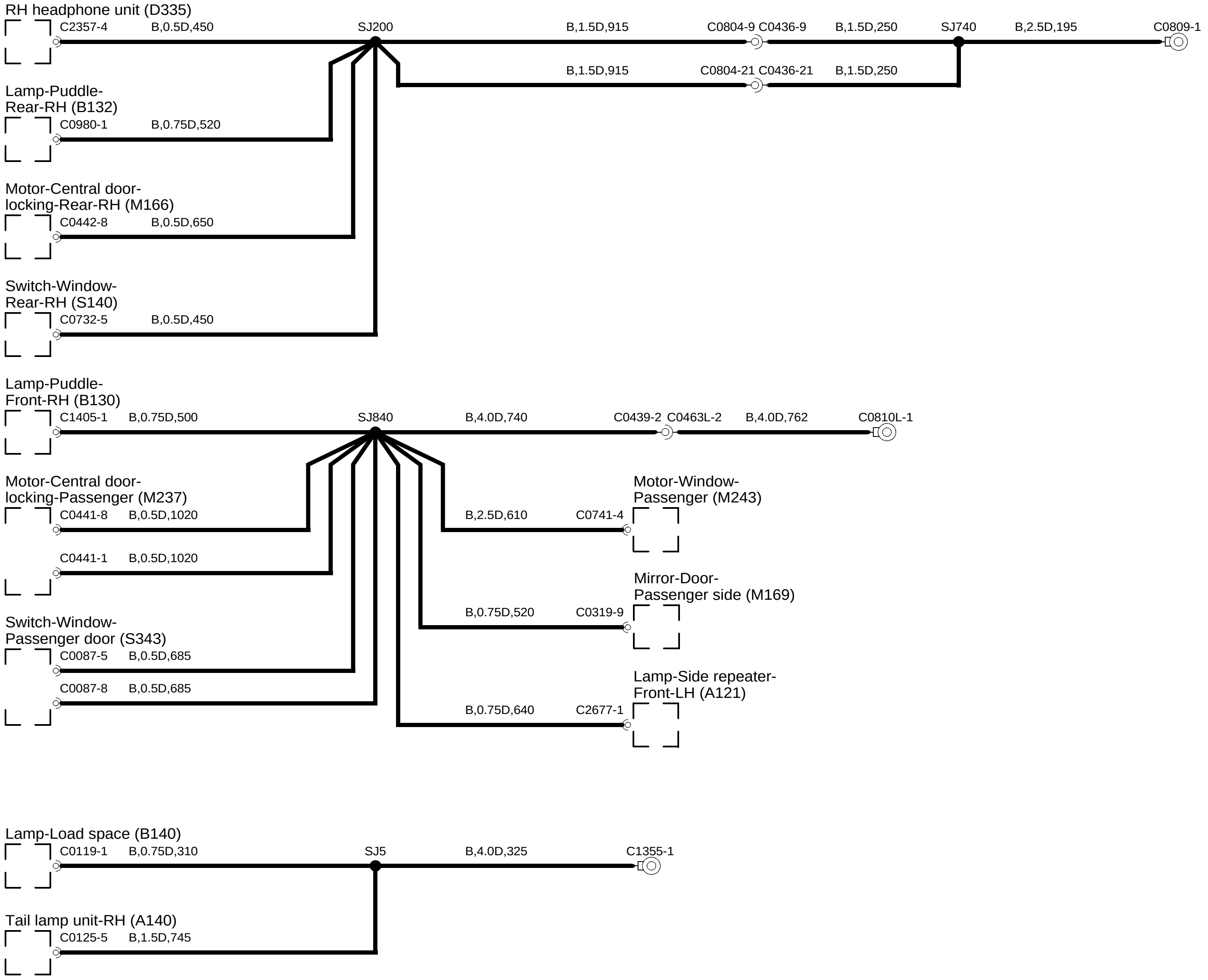

Central junction-box (P101)
Generic Electronic Module (D162)
Sensor-Volumetric (T139)
C0358-3 R,0.5D,3190 C0610-14 C0084L-14 R,0.5D,675 C0586L-20
C0358-4 G,0.5D,3190 C0610-15 C0084L-15 G,0.5D,675 C0586L-27
C0358-2 GB,0.5D,3190 C0610-4 C0084L-4 GB,0.5D,675 C0586L-23
VOLUMETRIC TRIGGER
AUTOLIGHTS SW
VOLUMETRIC POWER
VOLUMETRIC ARM
AUX DRIVE LAMP INPUT
Air suspension Control Module (D199)
C0867L-13 WK,0.5D,5342 C0586L-29
C0867L-3 WU,0.5D,5342 C0586L-26
AIR_SUS_CONT
DOOR_STAT
AUX DRIVE LAMP OUTPUT
Passive coil (D156)
C2524-8 G,0.5D,2667 C0580-14
C2524-6 R,0.5D,2667 C0580-30
LF_IN INPUT
RF_RX INPUT
LF_DAT OUTPUT
INDICATOR TRAILER LH
Motor-Window-Driver (M242)
C0740-6 SB,0.5D,1150 C0439-26 C0459L-26 SB,0.5D,2560
SJ33 SB,0.5D,520 C0586L-28
GLOBAL OPEN WINDOW
INDICATOR TRAILER RH
Headlamp-LH (A101)
C0009-3 GR,1.5D,4003 C0583L-28
FET-Indicator-LH (G160)
LH INDICATOR O/P
SJ4 GR,1.5D,669 C0585L-4
RH INDICATOR O/P
Tail lamp unit-LH (A139)
C0121-3 GR,1.5D,610 C0420-8 C0333-8 GR,1.5D,5152
Instrument cluster (J100)
C0230-7 BS,0.5D,2052 C0580-22
ALARM LED
Battery backed sounder (D154)
C0666L-2 B,0.5D,2258 C0584L-8
BBUS COMMS
NOT USED (V101) C0580-29
TRANSPONDER GND
Lighting control switch (S100)
C0580-26 R,0.5D,2322 C0041-4
Switch-Auxilary-driving lamp (S411)
C0580-13 R,0.5,1000
1
Relay-Auxiliary-driving lamp (R269)
C0584L-23 SK,0.75D,540 C3058L-2 C3059-2 SK,1.0D,1000 C0534-1
Receiver-Radio-frequency (RF) (T203)
C0586L-21 U,0.5D,8257 C0049-2
FET-Indicator-Trailer-LH (G162)
C0585L-16 Y,2.5D,5842 C0473-1 C0498-1 Y,2.5D,875
Trailer pick-up (P124)
C1390-2 C1414-2 Y,2.5D,1050 C0499-1
C1390-3 C1414-3 G,2.5D,1050 C0499-4
FET-Indicator-Trailer-RH (G161)
C0585L-17 G,2.5D,5842 C0473-2 C0498-2 G,2.5D,875
FET-Indicator-RH (G159)
Headlamp-RH (A100)
C0583L-27 GW,1.5D,2403 C0011-3
Tail lamp unit-RH (A140)
C0585L-2 GW,1.5D,625 SJ3 GW,1.5D,4267 C0125-3
FET-Dip-beam-RH (G165)
Headlamp-RH (A100)
C0583L-29 UO,1.5D,2403 C0011-11
FET-Main-beam-RH (G167)
C0583L-32 UB,1.5D,2403 C0011-10
FET-Lamp-Cornering-RH (G163)
C0583L-30 R,1.5D,2403 C0011-4

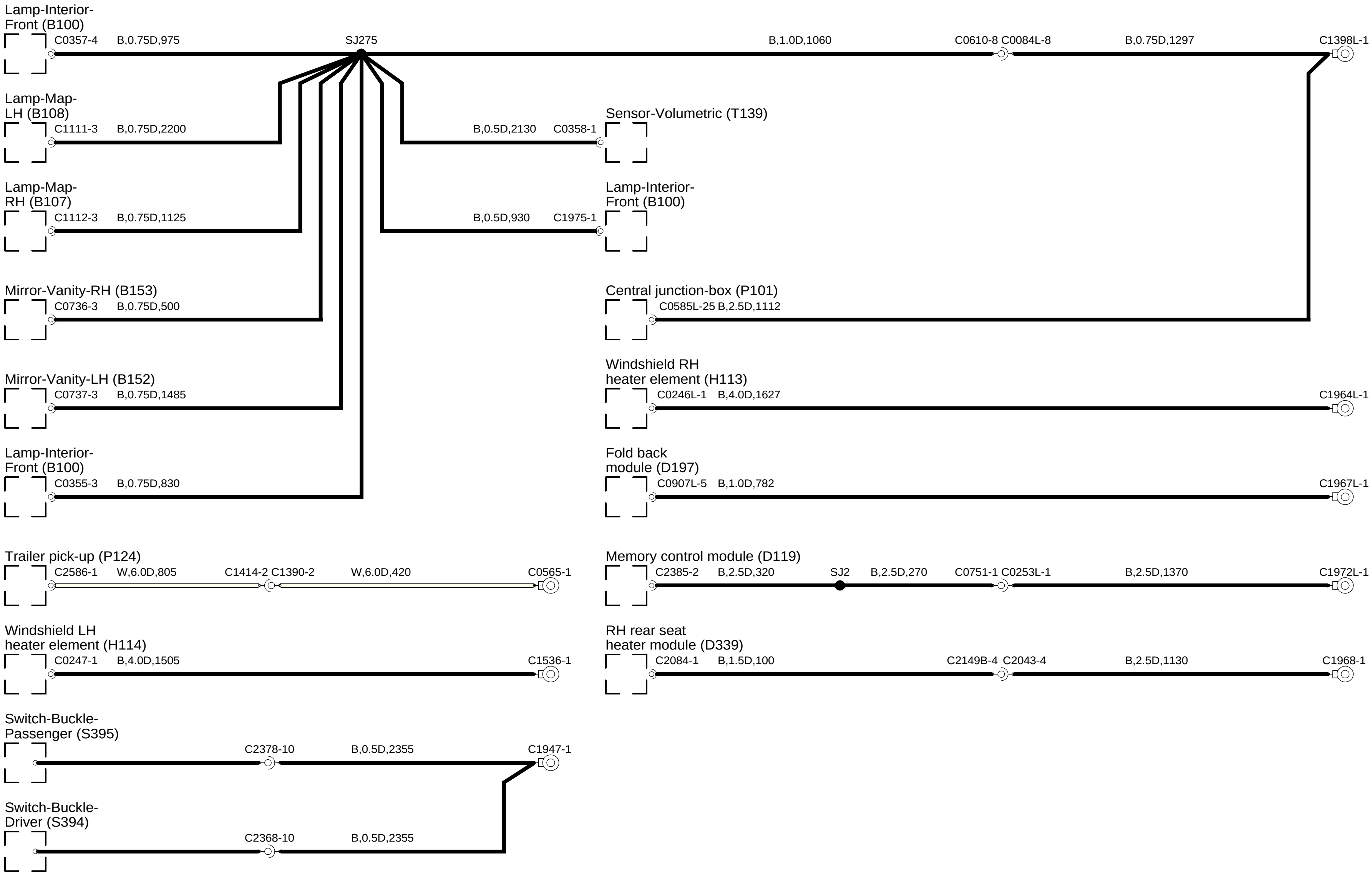

Central junction-box (P101)
Generic Electronic Module (D162)
Hood ajar switch (S224)
C0007-1
PO,0.5D,2705
C0584L-15
BONNET AJAR SW
MASTER INT LIGHT SW
ELECTRONIC GND
Motor-Central door-locking-Driver (M236)
C0441-4
BN,0.5D,1760
C0439-19
C0459L-19
BN,0.5D,3080
C0586L-9
DRIVER AJAR SW
C0586L-16
NOT USED (V101)
FLASH TO PASS SW
KEY LOCK SW
C0586L-14
NOT USED (V101)
HIGH BEAM SW
KEY UNLOCK SW
TURN SIGNAL-RH
TURN SIGNAL-LH
Switch pack-Centre facia (S425)
C2387-10
YK,0.5D,1730
C0580-20
MASTER UNLOCK
C0584L-19
PASSIVE START RLY
LOW BEAM SW
SIDE LIGHTS SW
Lamp-Approach-Driver (A162)
C0319-8
PW,0.75D,1060
C0439-1
C0459L-1
PW,1.5D,2440
SJ39
PW,1.5D,660
C0585L-7
APPROACH LAMPS
BRAKE SW
MS CAN H
MS CAN L
DRIVER DOOR LOCK STATUS
LIN BUS
Lamp-Interior-Front (B100)
C0586L-17
PU,0.5D,675
C0084L-16
C0610-16
PU,0.5D,1270
C0355-1
C0585L-18
B,2.5D,897
C2564L-1
TYPE 2
Switch-Column (S123)
C0580-3
UR,0.35D,2565
C1393-6
C0580-28
UR,0.35D,2565
C1393-4
C0580-18
GW,0.35D,2565
C1393-2
C0580-17
GR,0.35D,2565
C1393-3
Lighting control switch (S100)
C0580-25
Y,0.5D,2322
C0041-6
C0580-24
R,0.5D,2322
C0041-13
Stop lamp switch (S215)
C0586L-24
GP,0.75D,670
SJ814
GP,1.5D,2050
C0075L-1
C0580-15
YU,0.5D,918
C1167-6
C1165L-6
C0580-1
YW,0.5D,918
C1167-7
C1165L-7
Motor-Central door-locking-Driver (M236)
C0586L-18
UB,0.5D,3080
C0459L-20
C0439-20
BU,0.5D,1760
C0441-10
Roof opening panel control module (D117)
C0586L-32
R,0.5D,812
SJ45
R,0.5D,6150
C0784-3
R,0.5D,4022
Sensor-Rain-Ambient light (T328)
R,0.5D,6275
C0961-2
Memory control module (D119)
C0253L-22
C0751-22
R,MAPDB,550
C2382-8

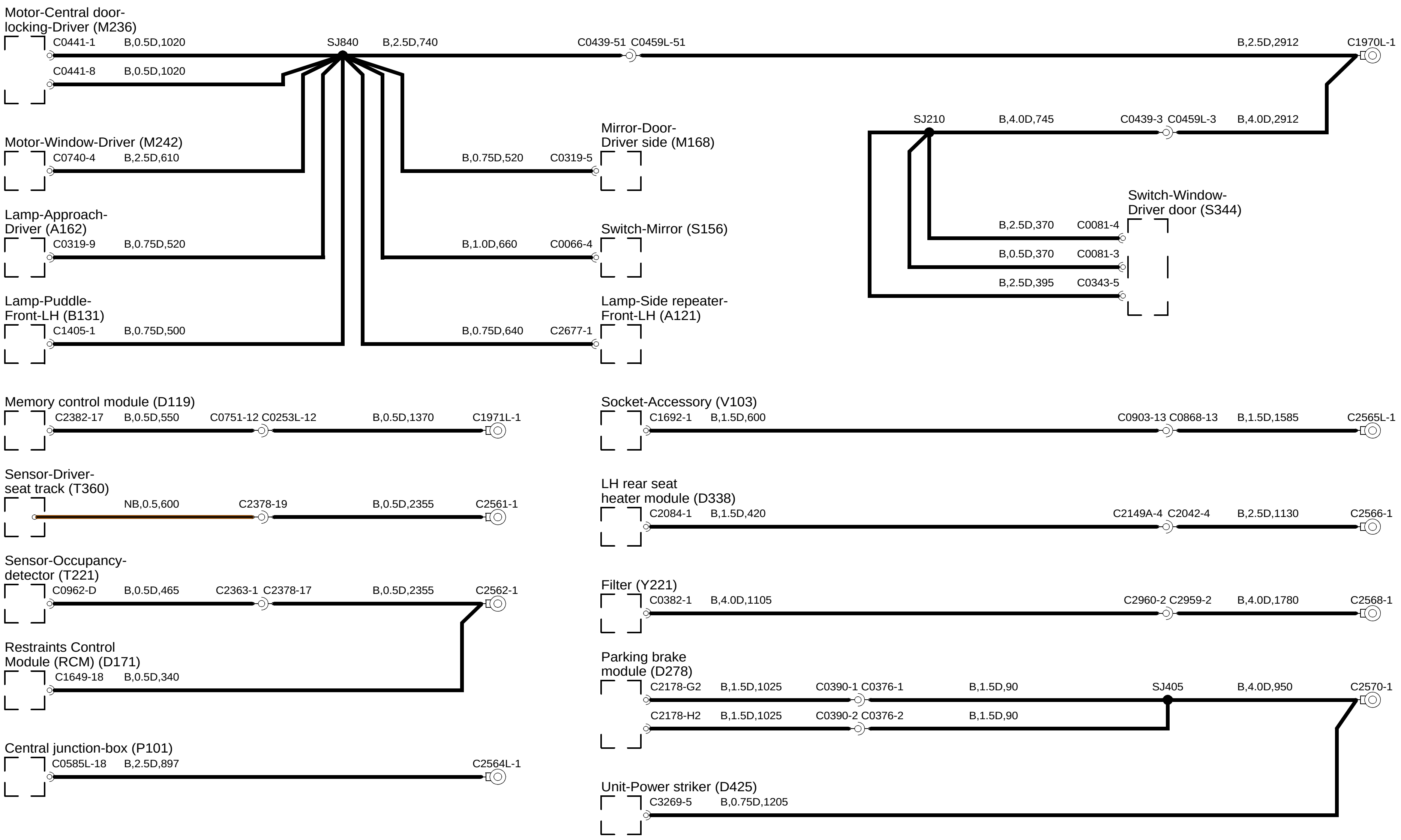

Central junction-box (P101)
Generic Electronic Module (D162)
Motor-Central door-locking-Passenger (M237)
C0441-4 BN,0.5D,1760
C0439-19 C0463L-19
BU,0.5D,900
C0586L-8
PASS AJAR SW
HAZARD SW
C0580-19 LGR,0.5D,1730 C2387-8
Switch pack-Centre facia (S425)
MASTER LOCK
C0580-27 KR,0.5D,1730 C2387-4
Motor-Central door-locking-Rear-RH (M166)
C0442-4 PLG,0.5D,1565
C0804-3 C0436-3
PLG,0.5D,2522 C0586L-6
RR AJAR SW
Switch-Steering column-Wiper (S174)
FR WIPER INTERMITTENT SW
C0580-5 LGG,0.5D,2684 C0278-8
Motor-Central door-locking-Rear-LH (M167)
C0442-4 PLG,0.5D,1565
C0803-3 C0435-3
PLG,0.5D,4042 C0586L-7
FR WIPER SLOW SW
C0580-2 GS,0.5D,2684 C0278-9
RL AJAR SW
FR WIPER FAST SW
C0580-7 RLG,0.5D,2684 C0278-10
FET-Liftgate Glass (G177)
BP,0.75D,4287 C0586L-30
FR INTERMITTENT DATA 1
C0580-8 WLG,0.5D,2684 C0278-3
Motor-CDL-Liftgate Glass (M316)
FR INTERMITTENT DATA 2
C0580-9 GS,0.5D,2684 C0278-4
C1677-2 KP,0.75D,2145
C0385-6 C0144-6
BP,0.75D,4280
C3008-2 C3007-2
UPPER TAILGATE MOTOR DRIVE
C0580-10 LGP,0.5D,2684 C0278-2
FR INTERMITTENT DATA 3
FR WASH SW
C0580-12 LG,0.5D,2684 C0278-5
Motor-CDL-Liftgate (M315)
UPPER TAILGATE AJAR SWITCH
C0580-6 GY,0.5D,2684 C0278-13
RR WIPER SW
C2052-4 KR,0.75D,2320
C0385-1 C0144-1
KR,0.75D,140
SJ98
BR,0.75D,6967
C0586L-10
RR WASH SW
C0580-11 LGS,0.5D,2684 C0278-12
C2052-1 KP,1.0D,2320
C0385-3 C0144-3
BP,1.5D,4280
C3008-1 C3007-1
Motor-Wiper-Rear screen (M106)
FET-Liftgate (G176)
NG,0.5D,1945 C0388-2
Switch-Liftgate release (S443)
BP,1.5D,4217 C0585L-1
LOWER TAILGATE MOTOR DRIVE
C0615-1 KS,0.5D,1865
C0385-4 C0144-4
BS,0.75D,7107 C0586L-15
TAILGATE RELEASE SW1
RR WIPER PARK SW
C0586L-13 NG,0.5D,7387
C2739-3 C2740-3
Motor-Wiper-Windscreen (M105)
Relay-Trailer Rear Wiper(R274)
C0030L-1 WG,0.5D,1792
SJ415
WG,0.5D,290 C0584L-16
FR WIPER PARK POS
RR WIPER RELAY
C0586L-25 SP,0.5D,5612 C2937-3
Lamp-Footwell-Front-RH (B135)
FET-Interior-lamp (G173)
Junction-box engine (P108)
C0076-2 P,0.75D,1390
SJ740
P,0.75D,1207 C0582-35
2
C0584L-18 G,0.5D,958 C0570L-27
HEADLAMP WASHER
SJ40
P,0.75D,645 C0585L-3
FET-Interior-lamp (G173)
TAILGATE RELEASE SW 2
C0580-4 KS,0.5D,918
C1167-12 C1165L-12
Lamp-Interior-Front (B100)
P,0.75D,830
1
C2740-1 C2739-1 KS,0.5D,6730
C0355-4 P,0.75D,1270
C0610-7 C0084L-7
Switch-Liftgate Glass release (S444)
KS,0.5D,2100 C1678-1

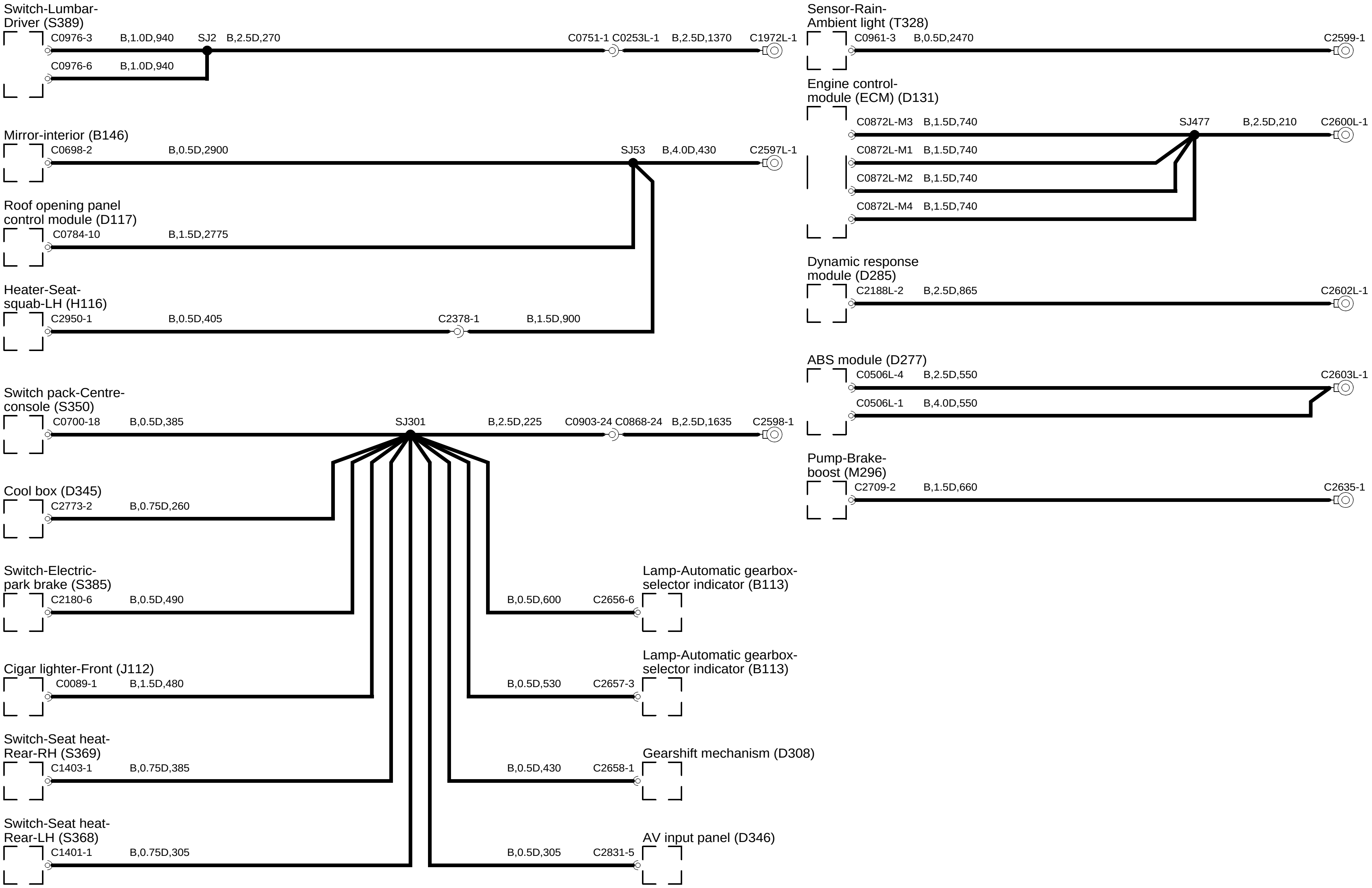

Washer jet-Heated (H121)
C0934-2
B,0.75D,2242
SJ171
B,2.5D,2343
C2601-1
Pump-Power wash (M156)
C0828-2
B,2.5D,2088
Washer jet-Heated (H121)
C0946-2
B,0.75D,1942
AFS control module (D276)
C2193L-24
B,0.5D,1875
Battery backed sounder (D154)
C0666L-1
B,0.5D,568
Motor-Wiper-Windscreen (M105)
C0030L-3
B,2.5D,1332
SJ173
B,4.0D,2180
C0560-1
Sensor-Low washer-fluid level (T168)
C0620-2
B,0.5D,3193
Switch-Brake-fluid level (S212)
C0026L-2
B,0.5D,1270
Junction-box engine (P108)
C0570L-142
B,1.0D,338
SJ573
B,2.5D,710
C0570L-74
B,1.0D,338
C0570L-82
B,1.0D,338
Sensor-Engine coolant-level (T220)
C0147-2
B,1.0D,2658
Transmission control module (D306)
C0193-13
B,1.0H,185
SJ409
B,1.0H,1878
C2366B-10
C2365L-10
B,1.0D,710
C0193-16
B,1.0H,185
Capacitor (G158)
C1324-2
B,1.0H,85
Sensor-Air quality (T306)
C2683-6
B,0.5D,3600

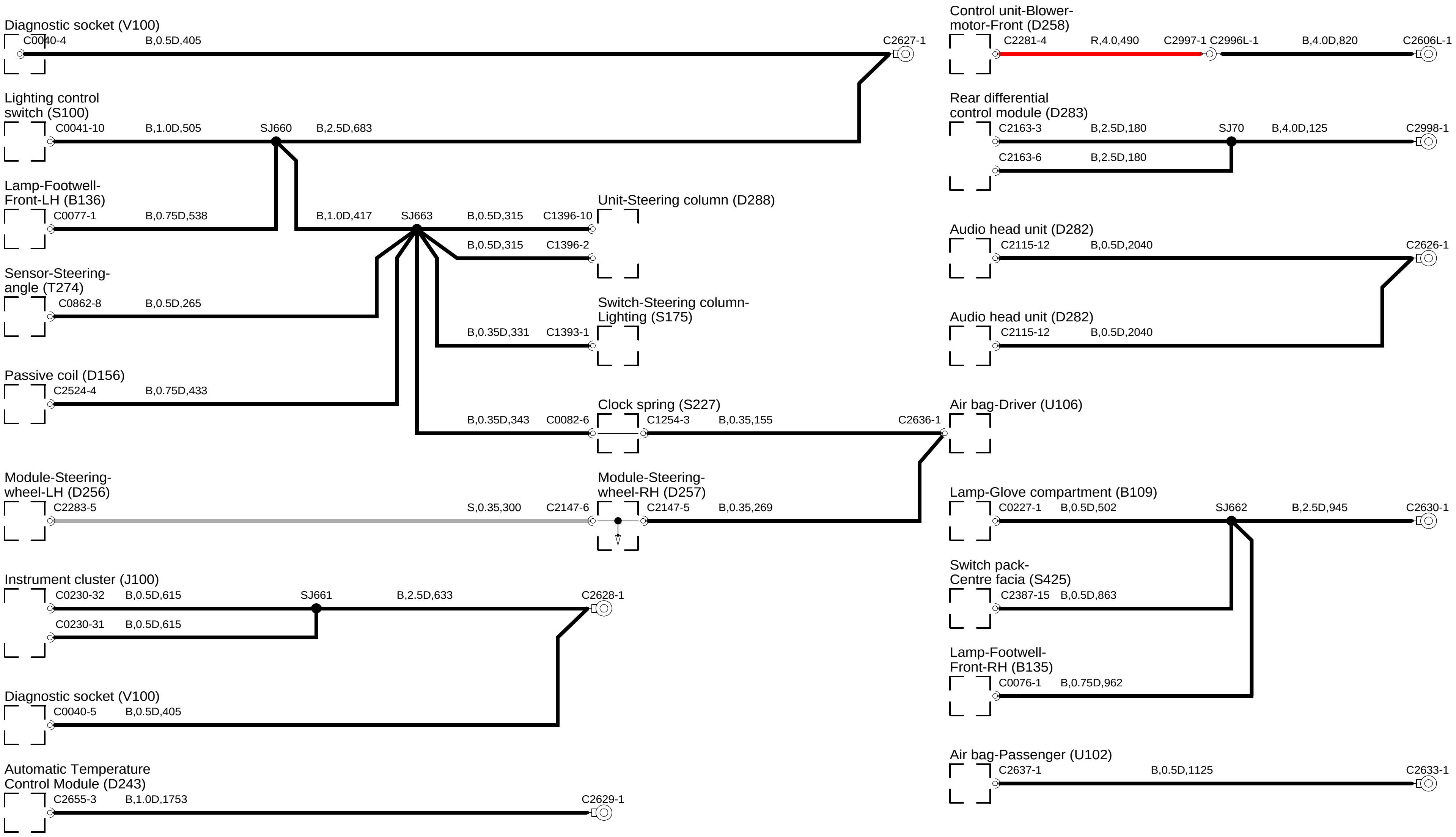

Module-speed control (D284)
C2145L-12
B,0.5D,750
C2240L-6 C2238-6
B,0.5D,422
C0558-1
Switch-Steering column-Wiper (S174)
C0278-11
B,0.5D,1100
Air suspension Control Module (D199)
C2321L-24
B,2.5D,715
C0559-1
Air supply unit (D252)
C0780-2
B,6.0D,2095
C0561-1
Transfer box control module (D204)
C1854L-5
B,2.5D,265
SJ806
B,4.0D,720
C0556L-1
Engine control-module (ECM) (D131)
C0635L-1
B,1.5D,690
C0557L-1
C0635L-5
B,1.5D,690
C0635L-2
B,1.0D,690
C2650L-1
C0635L-3
B,1.0D,690
Pump-Supercharge-coolant (M314)
C3006-2
B,2.5D,1235
C0564-1
Headlamp-LH (A101)
C0009-1
B,1.5D,140
SJ879
B,2.5D,1105
C0009-12
B,1.5D,140
C0009-9
B,1.5D,140
C0009-15
B,0.5D,140
LH headphone unit (D334)
C2357-4
B,0.5D,450
SJ200
B,1.5D,915
C0803-9 C0435-9
B,1.5D,250
SJ742
B,2.5D,196
C0807L-1
B,1.5D,915
C0803-21 C0435-21
B,1.5D,250
Lamp-Puddle-Rear-LH (B133)
C0980-1
B,0.75D,520
Motor-Central door-locking-Rear-LH (M167)
C0442-1
B,0.5D,650
B,0.5D,450
C0732-5
Switch-Window-Rear-LH (S141)

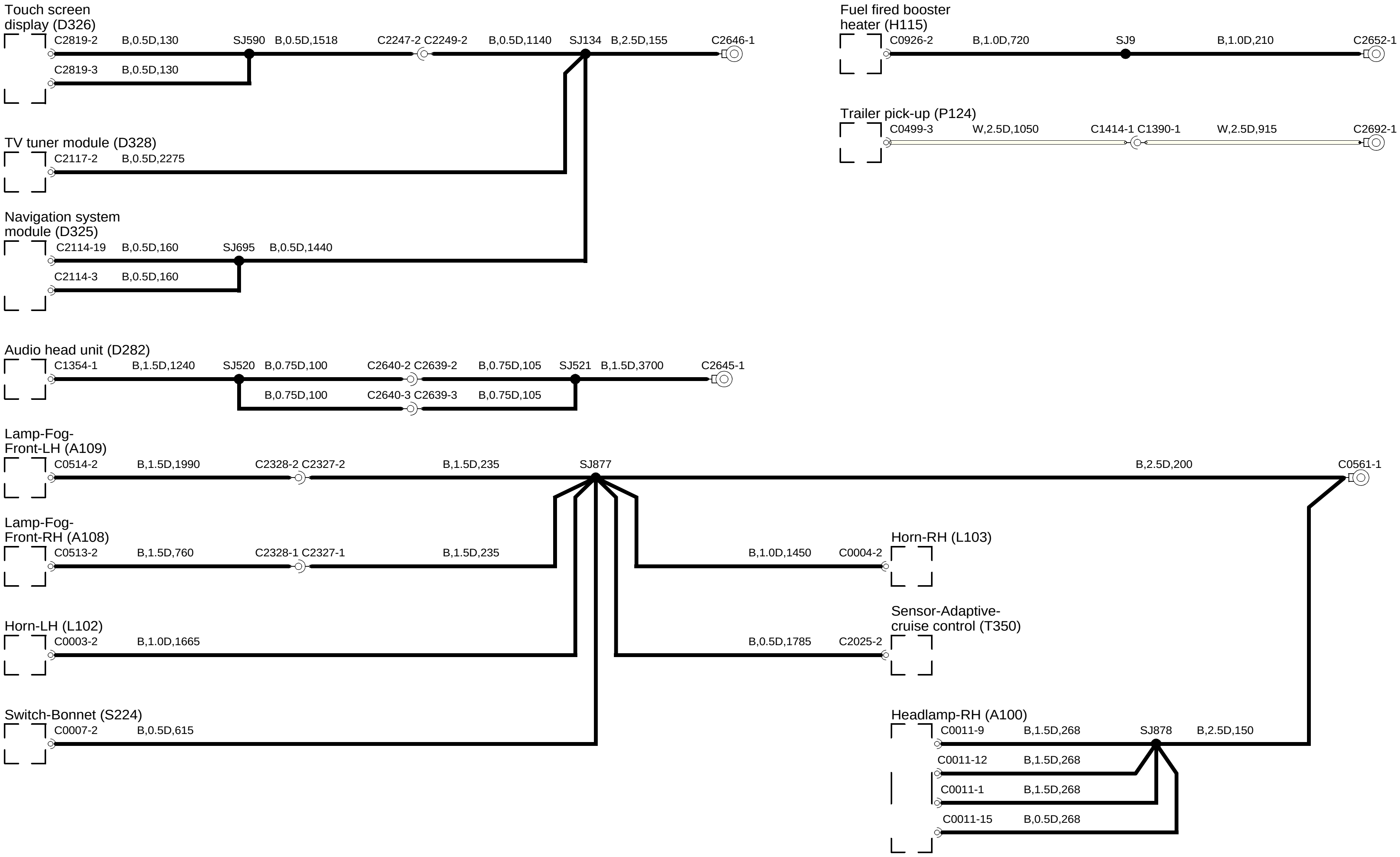

RH headphone unit (D335)
C2357-4
B,0.5D,450
SJ200
B,1.5D,915
C0804-9 C0436-9
B,1.5D,250
SJ740
B,2.5D,195
C0809-1
B,1.5D,915
C0804-21 C0436-21
B,1.5D,250
Lamp-Puddle-Rear-RH (B132)
C0980-1
B,0.75D,520
Motor-Central door-locking-Rear-RH (M166)
C0442-8
B,0.5D,650
Switch-Window-Rear-RH (S140)
C0732-5
B,0.5D,450
Lamp-Puddle-Front-RH (B130)
C1405-1
B,0.75D,500
SJ840
B,4.0D,740
C0439-2 C0463L-2
B,4.0D,762
C0810L-1
Motor-Central door-locking-Passenger (M237)
C0441-8
B,0.5D,1020
B,2.5D,610
C0741-4
Motor-Window-Passenger (M243)
C0441-1
B,0.5D,1020
Mirror-Door-Passenger side (M169)
B,0.75D,520
C0319-9
Switch-Window-Passenger door (S343)
C0087-5
B,0.5D,685
Lamp-Side repeater-Front-LH (A121)
C0087-8
B,0.5D,685
B,0.75D,640
C2677-1
Lamp-Load space (B140)
C0119-1
B,0.75D,310
SJ5
B,4.0D,325
C1355-1
Tail lamp unit-RH (A140)
C0125-5
B,1.5D,745

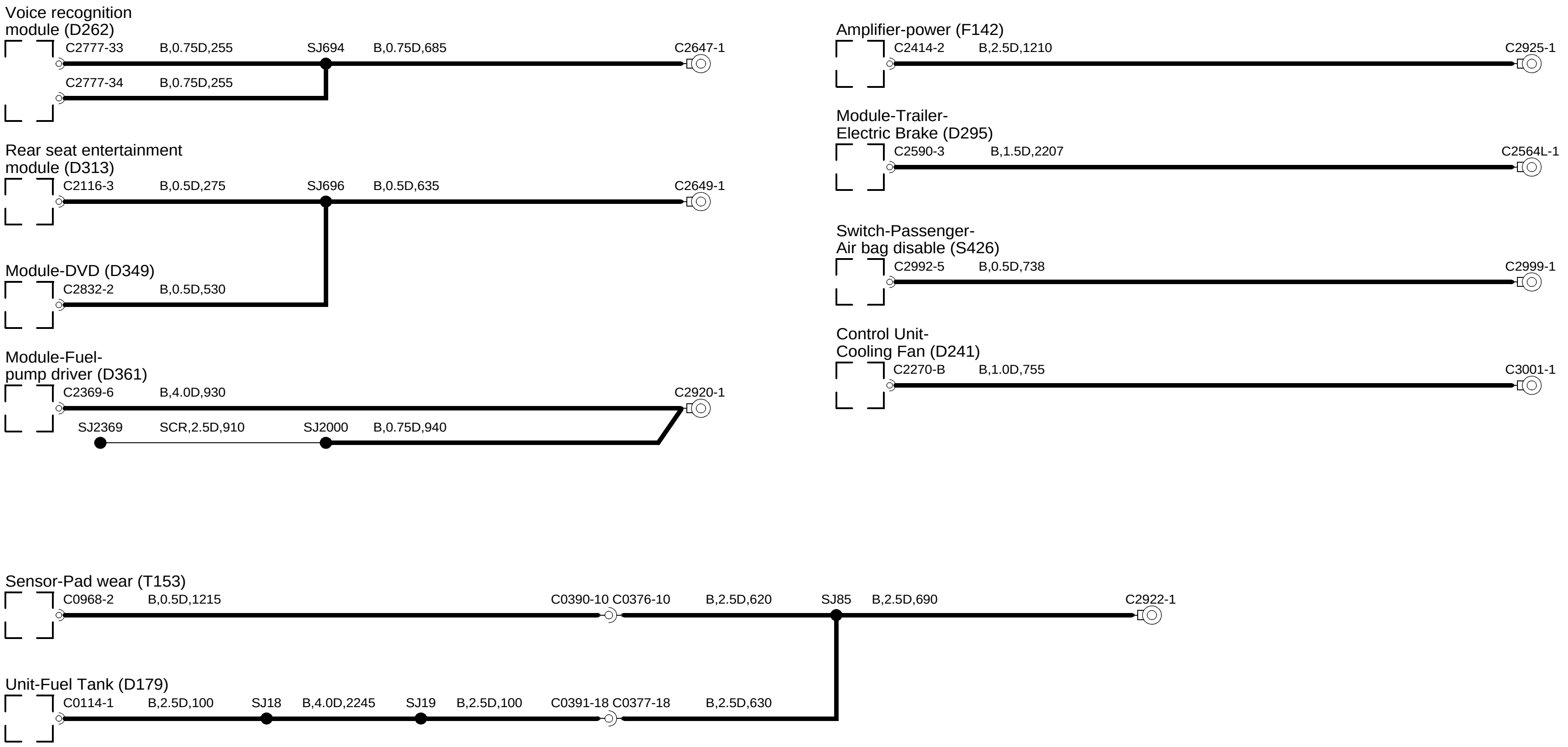

Lamp-Interior-Front (B100)
C0357-4
B,0.75D,975
SJ275
B,1.0D,1060
C0610-8 C0084L-8
B,0.75D,1297
C1398L-1
Lamp-Map-LH (B108)
C1111-3
B,0.75D,2200
B,0.5D,2130
C0358-1
Sensor-Volumetric (T139)
Lamp-Map-RH (B107)
C1112-3
B,0.75D,1125
B,0.5D,930
C1975-1
Lamp-Interior-Front (B100)
Mirror-Vanity-RH (B153)
C0736-3
B,0.75D,500
Central junction-box (P101)
C0585L-25 B,2.5D,1112
Mirror-Vanity-LH (B152)
C0737-3
B,0.75D,1485
Windshield RH heater element (H113)
C0246L-1
B,4.0D,1627
C1964L-1
Lamp-Interior-Front (B100)
C0355-3
B,0.75D,830
Fold back module (D197)
C0907L-5
B,1.0D,782
C1967L-1
Trailer pick-up (P124)
C2586-1
W,6.0D,805
C1414-2 C1390-2
W,6.0D,420
C0565-1
Memory control module (D119)
C2385-2
B,2.5D,320
SJ2
B,2.5D,270
C0751-1 C0253L-1
B,2.5D,1370
C1972L-1
Windshield LH heater element (H114)
C0247-1
B,4.0D,1505
C1536-1
RH rear seat heater module (D339)
C2084-1
B,1.5D,100
C2149B-4 C2043-4
B,2.5D,1130
C1968-1
Switch-Buckle-Passenger (S395)
C2378-10
B,0.5D,2355
C1947-1
Switch-Buckle-Driver (S394)
C2368-10
B,0.5D,2355

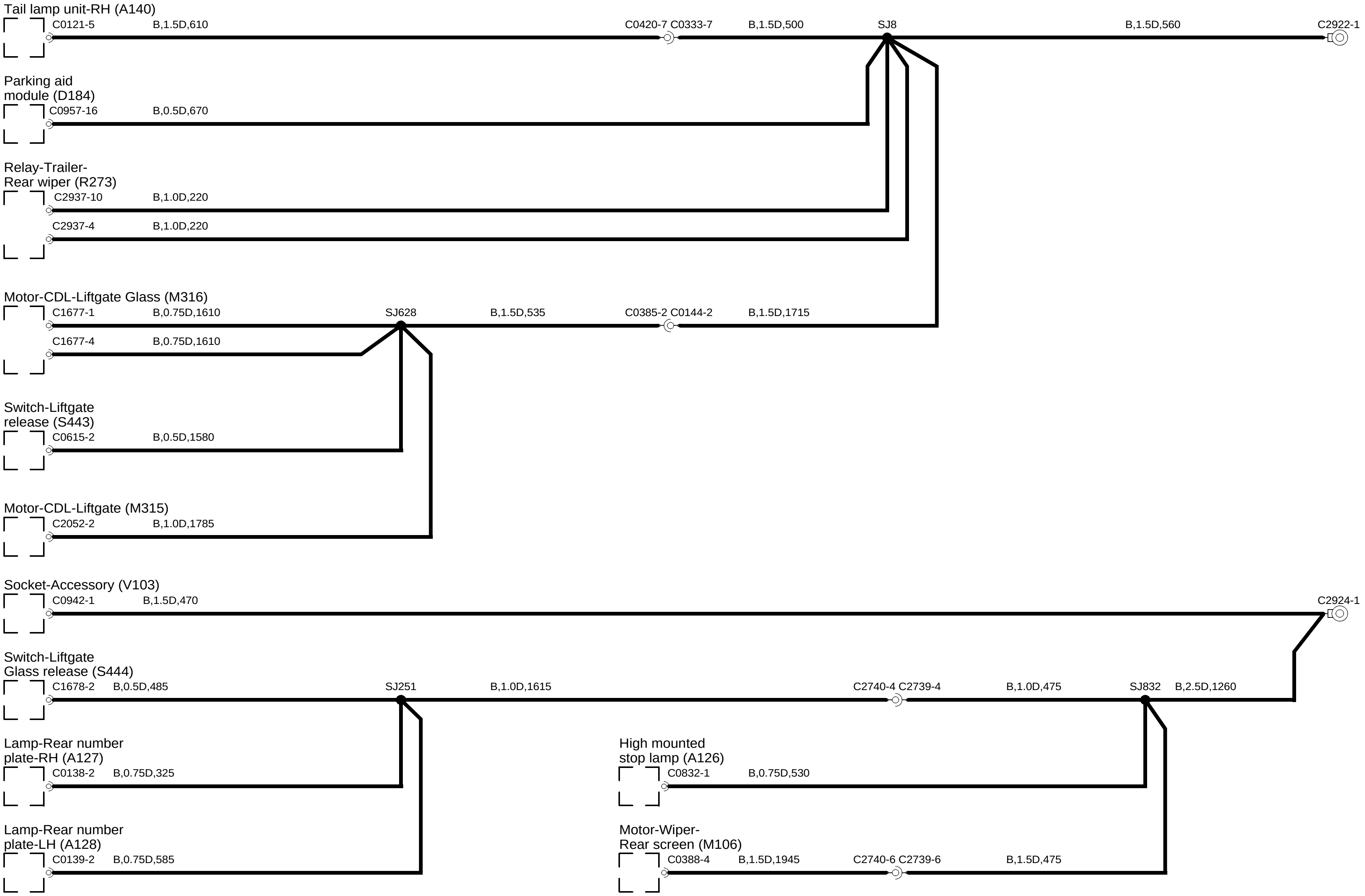

Motor-Central door-locking-Driver (M236)
C0441-1
B,0.5D,1020
C0441-8
B,0.5D,1020
SJ840
B,2.5D,740
C0439-51 C0459L-51
B,2.5D,2912
C1970L-1
Motor-Window-Driver (M242)
C0740-4
B,2.5D,610
Mirror-Door-Driver side (M168)
B,0.75D,520
C0319-5
Lamp-Approach-Driver (A162)
C0319-9
B,0.75D,520
Switch-Mirror (S156)
B,1.0D,660
C0066-4
Lamp-Puddle-Front-LH (B131)
C1405-1
B,0.75D,500
Lamp-Side repeater-Front-LH (A121)
B,0.75D,640
C2677-1
SJ210
B,4.0D,745
C0439-3 C0459L-3
B,4.0D,2912
Switch-Window-Driver door (S344)
B,2.5D,370
C0081-4
B,0.5D,370
C0081-3
B,2.5D,395
C0343-5
Memory control module (D119)
C2382-17
B,0.5D,550
C0751-12 C0253L-12
B,0.5D,1370
C1971L-1
Sensor-Driver-seat track (T360)
NB,0.5,600
C2378-19
B,0.5D,2355
C2561-1
Sensor-Occupancy-detector (T221)
C0962-D
B,0.5D,465
C2363-1 C2378-17
B,0.5D,2355
C2562-1
Restraints Control Module (RCM) (D171)
C1649-18
B,0.5D,340
Central junction-box (P101)
C0585L-18
B,2.5D,897
C2564L-1
Socket-Accessory (V103)
C1692-1
B,1.5D,600
C0903-13 C0868-13
B,1.5D,1585
C2565L-1
LH rear seat heater module (D338)
C2084-1
B,1.5D,420
C2149A-4 C2042-4
B,2.5D,1130
C2566-1
Filter (Y221)
C0382-1
B,4.0D,1105
C2960-2 C2959-2
B,4.0D,1780
C2568-1
Parking brake module (D278)
C2178-G2
B,1.5D,1025
C0390-1 C0376-1
B,1.5D,90
SJ405
B,4.0D,950
C2570-1
C2178-H2
B,1.5D,1025
C0390-2 C0376-2
B,1.5D,90
Unit-Power striker (D425)
C3269-5
B,0.75D,1205


Switch-Lumbar-Driver (S389)
C0976-3
B,1.0D,940
SJ2
B,2.5D,270
C0751-1
C0253L-1
B,2.5D,1370
C1972L-1
C0976-6
B,1.0D,940
Mirror-interior (B146)
C0698-2
B,0.5D,2900
SJ53
B,4.0D,430
C2597L-1
Roof opening panel control module (D117)
C0784-10
B,1.5D,2775
Heater-Seat-squab-LH (H116)
C2950-1
B,0.5D,405
C2378-1
B,1.5D,900
Switch pack-Centre-console (S350)
C0700-18
B,0.5D,385
SJ301
B,2.5D,225
C0903-24
C0868-24
B,2.5D,1635
C2598-1
Cool box (D345)
C2773-2
B,0.75D,260
Switch-Electric-park brake (S385)
C2180-6
B,0.5D,490
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,600
C2656-6
Cigar lighter-Front (J112)
C0089-1
B,1.5D,480
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,530
C2657-3
Switch-Seat heat-Rear-RH (S369)
C1403-1
B,0.75D,385
Gearshift mechanism (D308)
B,0.5D,430
C2658-1
Switch-Seat heat-Rear-LH (S368)
C1401-1
B,0.75D,305
AV input panel (D346)
B,0.5D,305
C2831-5
Sensor-Rain-Ambient light (T328)
C0961-3
B,0.5D,2470
C2599-1
Engine control-module (ECM) (D131)
C0872L-M3
B,1.5D,740
SJ477
B,2.5D,210
C2600L-1
C0872L-M1
B,1.5D,740
C0872L-M2
B,1.5D,740
C0872L-M4
B,1.5D,740
Dynamic response module (D285)
C2188L-2
B,2.5D,865
C2602L-1
ABS module (D277)
C0506L-4
B,2.5D,550
C2603L-1
C0506L-1
B,4.0D,550
Pump-Brake-boost (M296)
C2709-2
B,1.5D,660
C2635-1

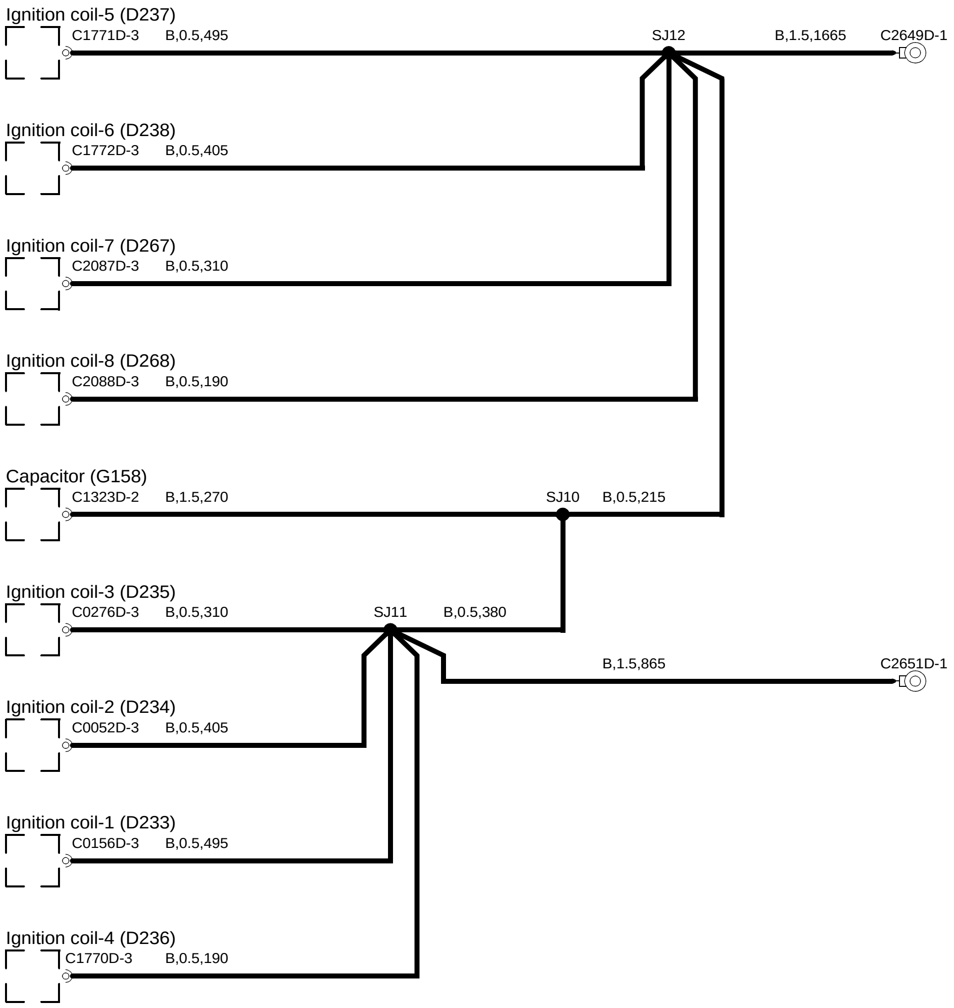

Diagnostic socket (V100)
C0040-4
B,0.5D,405
C2627-1
Lighting control switch (S100)
C0041-10
B,1.0D,505
SJ660
B,2.5D,683
Lamp-Footwell-Front-LH (B136)
C0077-1
B,0.75D,538
B,1.0D,417
SJ663
B,0.5D,315
C1396-10
Unit-Steering column (D288)
B,0.5D,315
C1396-2
Sensor-Steering-angle (T274)
C0862-8
B,0.5D,265
Switch-Steering column-Lighting (S175)
B,0.35D,331
C1393-1
Passive coil (D156)
C2524-4
B,0.75D,433
Clock spring (S227)
B,0.35D,343
C0082-6
C1254-3
B,0.35,155
C2636-1
Module-Steering-wheel-LH (D256)
C2283-5
S,0.35,300
C2147-6
Module-Steering-wheel-RH (D257)
C2147-5
B,0.35,269
Instrument cluster (J100)
C0230-32
B,0.5D,615
SJ661
B,2.5D,633
C2628-1
C0230-31
B,0.5D,615
Diagnostic socket (V100)
C0040-5
B,0.5D,405
Automatic Temperature Control Module (D243)
C2655-3
B,1.0D,1753
C2629-1
Control unit-Blower-motor-Front (D258)
C2281-4
R,4.0,490
C2997-1
C2996L-1
B,4.0D,820
C2606L-1
Rear differential control module (D283)
C2163-3
B,2.5D,180
SJ70
B,4.0D,125
C2998-1
C2163-6
B,2.5D,180
Audio head unit (D282)
C2115-12
B,0.5D,2040
C2626-1
Audio head unit (D282)
C2115-12
B,0.5D,2040
Air bag-Driver (U106)
Lamp-Glove compartment (B109)
C0227-1
B,0.5D,502
SJ662
B,2.5D,945
C2630-1
Switch pack-Centre facia (S425)
C2387-15
B,0.5D,863
Lamp-Footwell-Front-RH (B135)
C0076-1
B,0.75D,962
Air bag-Passenger (U102)
C2637-1
B,0.5D,1125
C2633-1


Touch screen display (D326)
C2819-2
B,0.5D,130
SJ590
B,0.5D,1518
C2247-2 C2249-2
B,0.5D,1140
SJ134
B,2.5D,155
C2646-1
C2819-3
B,0.5D,130
TV tuner module (D328)
C2117-2
B,0.5D,2275
Navigation system module (D325)
C2114-19
B,0.5D,160
SJ695
B,0.5D,1440
C2114-3
B,0.5D,160
Audio head unit (D282)
C1354-1
B,1.5D,1240
SJ520
B,0.75D,100
C2640-2 C2639-2
B,0.75D,105
SJ521
B,1.5D,3700
C2645-1
B,0.75D,100
C2640-3 C2639-3
B,0.75D,105
Lamp-Fog-Front-LH (A109)
C0514-2
B,1.5D,1990
C2328-2 C2327-2
B,1.5D,235
SJ877
B,2.5D,200
C0561-1
Lamp-Fog-Front-RH (A108)
C0513-2
B,1.5D,760
C2328-1 C2327-1
B,1.5D,235
B,1.0D,1450
C0004-2
Horn-RH (L103)
Horn-LH (L102)
C0003-2
B,1.0D,1665
B,0.5D,1785
C2025-2
Sensor-Adaptive-cruise control (T350)
Switch-Bonnet (S224)
C0007-2
B,0.5D,615
Headlamp-RH (A100)
C0011-9
B,1.5D,268
SJ878
B,2.5D,150
C0011-12
B,1.5D,268
C0011-1
B,1.5D,268
C0011-15
B,0.5D,268
Fuel fired booster heater (H115)
C0926-2
B,1.0D,720
SJ9
B,1.0D,210
C2652-1
Trailer pick-up (P124)
C0499-3
W,2.5D,1050
C1414-1 C1390-1
W,2.5D,915
C2692-1

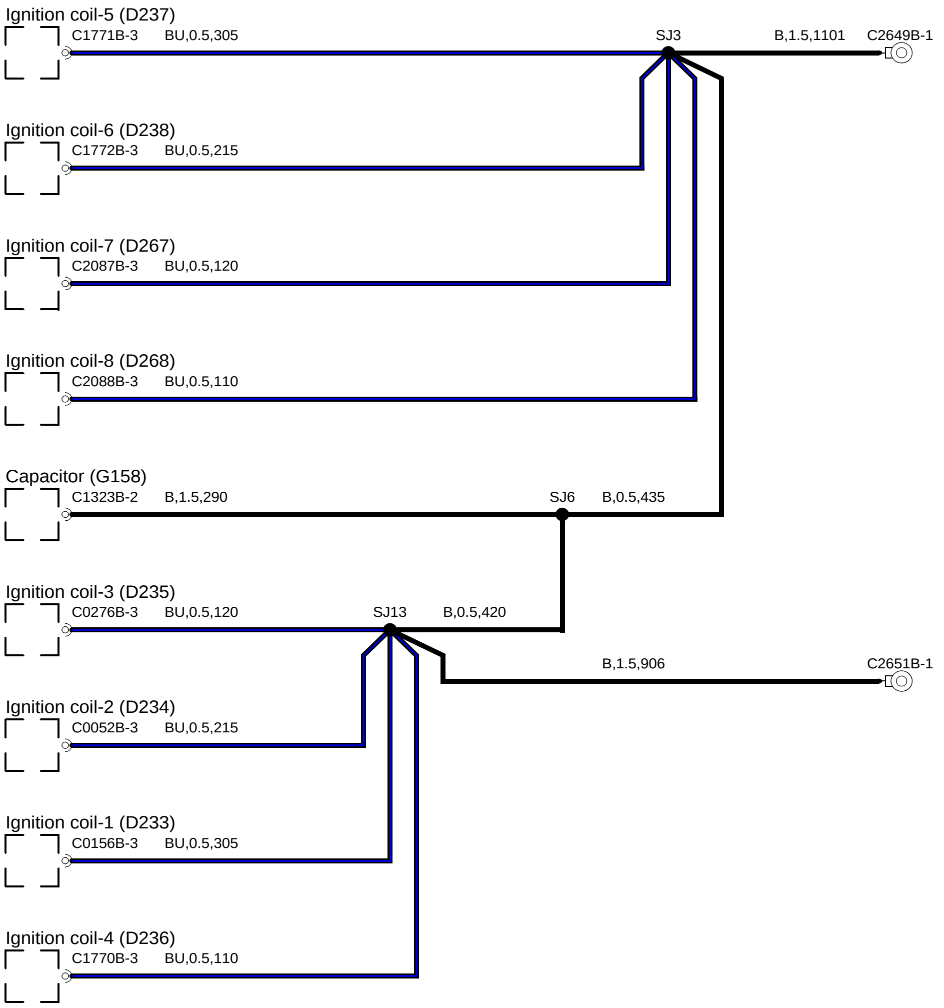

Voice recognition module (D262)
C2777-33
B,0.75D,255
SJ694
B,0.75D,685
C2647-1
C2777-34
B,0.75D,255
Rear seat entertainment module (D313)
C2116-3
B,0.5D,275
SJ696
B,0.5D,635
C2649-1
Module-DVD (D349)
C2832-2
B,0.5D,530
Module-Fuel-pump driver (D361)
C2369-6
B,4.0D,930
C2920-1
SJ2369
SCR,2.5D,910
SJ2000
B,0.75D,940
Amplifier-power (F142)
C2414-2
B,2.5D,1210
C2925-1
Module-Trailer-Electric Brake (D295)
C2590-3
B,1.5D,2207
C2564L-1
Switch-Passenger-Air bag disable (S426)
C2992-5
B,0.5D,738
C2999-1
Control Unit-Cooling Fan (D241)
C2270-B
B,1.0D,755
C3001-1
Sensor-Pad wear (T153)
C0968-2
B,0.5D,1215
C0390-10 C0376-10
B,2.5D,620
SJ85
B,2.5D,690
C2922-1
Unit-Fuel Tank (D179)
C0114-1
B,2.5D,100
SJ18
B,4.0D,2245
SJ19
B,2.5D,100
C0391-18 C0377-18
B,2.5D,630

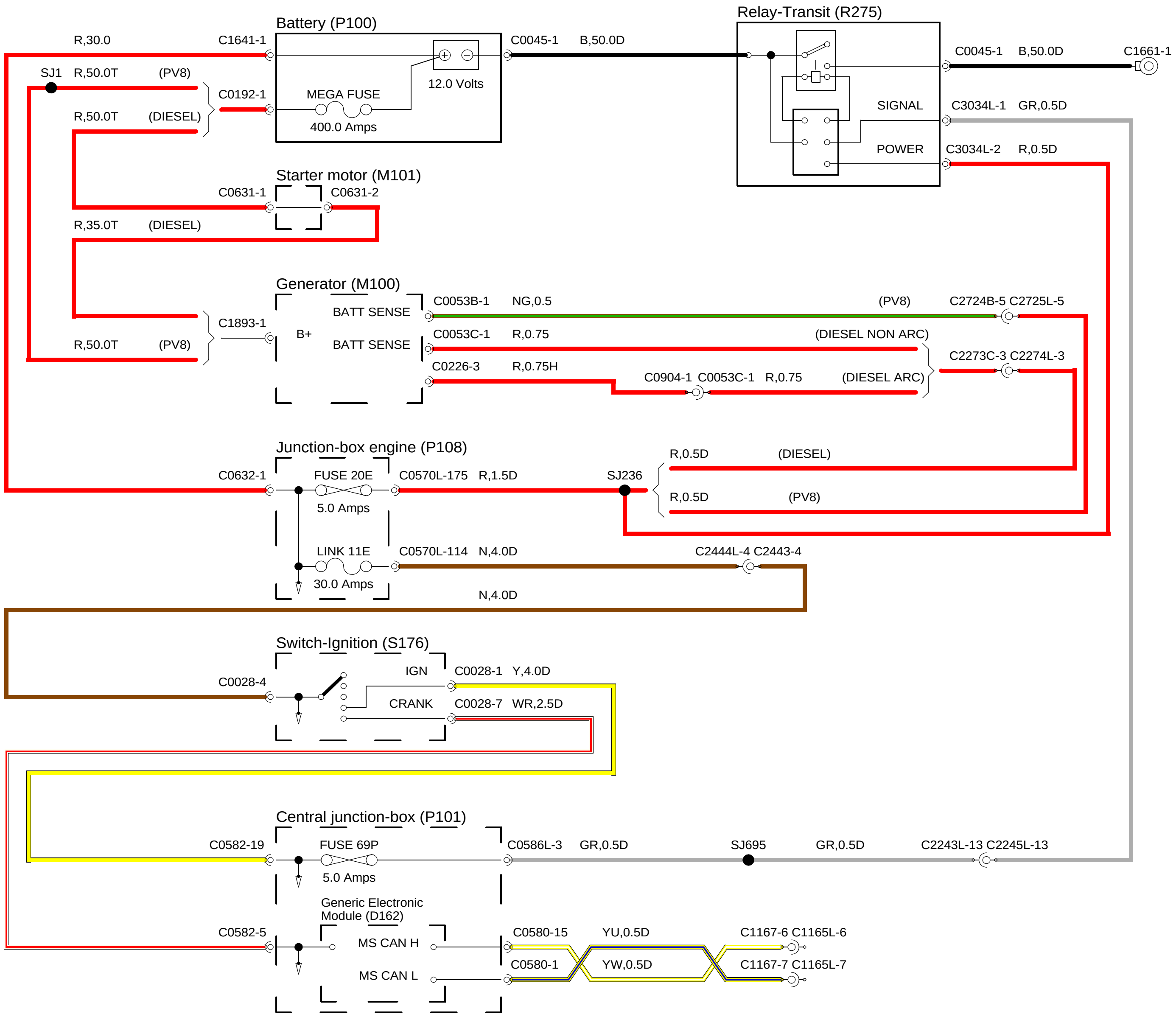

Tail lamp unit-RH (A140)
C0121-5
B,1.5D,610
C0420-7 C0333-7
B,1.5D,500
SJ8
B,1.5D,560
C2922-1
Parking aid module (D184)
C0957-16
B,0.5D,670
Relay-Trailer-Rear wiper (R273)
C2937-10
B,1.0D,220
C2937-4
B,1.0D,220
Motor-CDL-Liftgate Glass (M316)
C1677-1
B,0.75D,1610
SJ628
B,1.5D,535
C0385-2 C0144-2
B,1.5D,1715
C1677-4
B,0.75D,1610
Switch-Liftgate release (S443)
C0615-2
B,0.5D,1580
Motor-CDL-Liftgate (M315)
C2052-2
B,1.0D,1785
Socket-Accessory (V103)
C0942-1
B,1.5D,470
C2924-1
Switch-Liftgate Glass release (S444)
C1678-2
B,0.5D,485
SJ251
B,1.0D,1615
C2740-4 C2739-4
B,1.0D,475
SJ832
B,2.5D,1260
Lamp-Rear number plate-RH (A127)
C0138-2
B,0.75D,325
High mounted stop lamp (A126)
C0832-1
B,0.75D,530
Lamp-Rear number plate-LH (A128)
C0139-2
B,0.75D,585
Motor-Wiper-Rear screen (M106)
C0388-4
B,1.5D,1945
C2740-6 C2739-6
B,1.5D,475

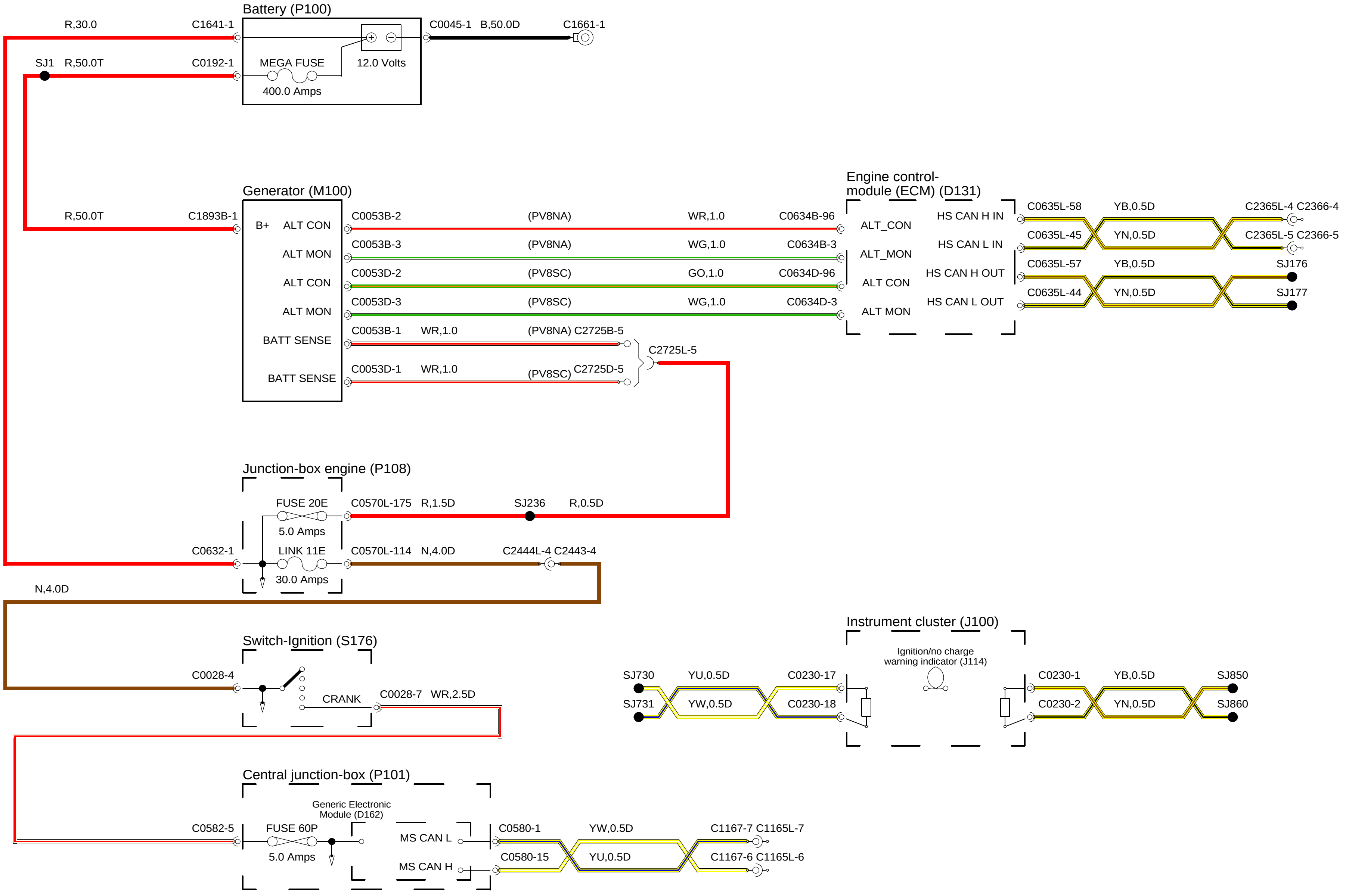
(PETROL-S/C)

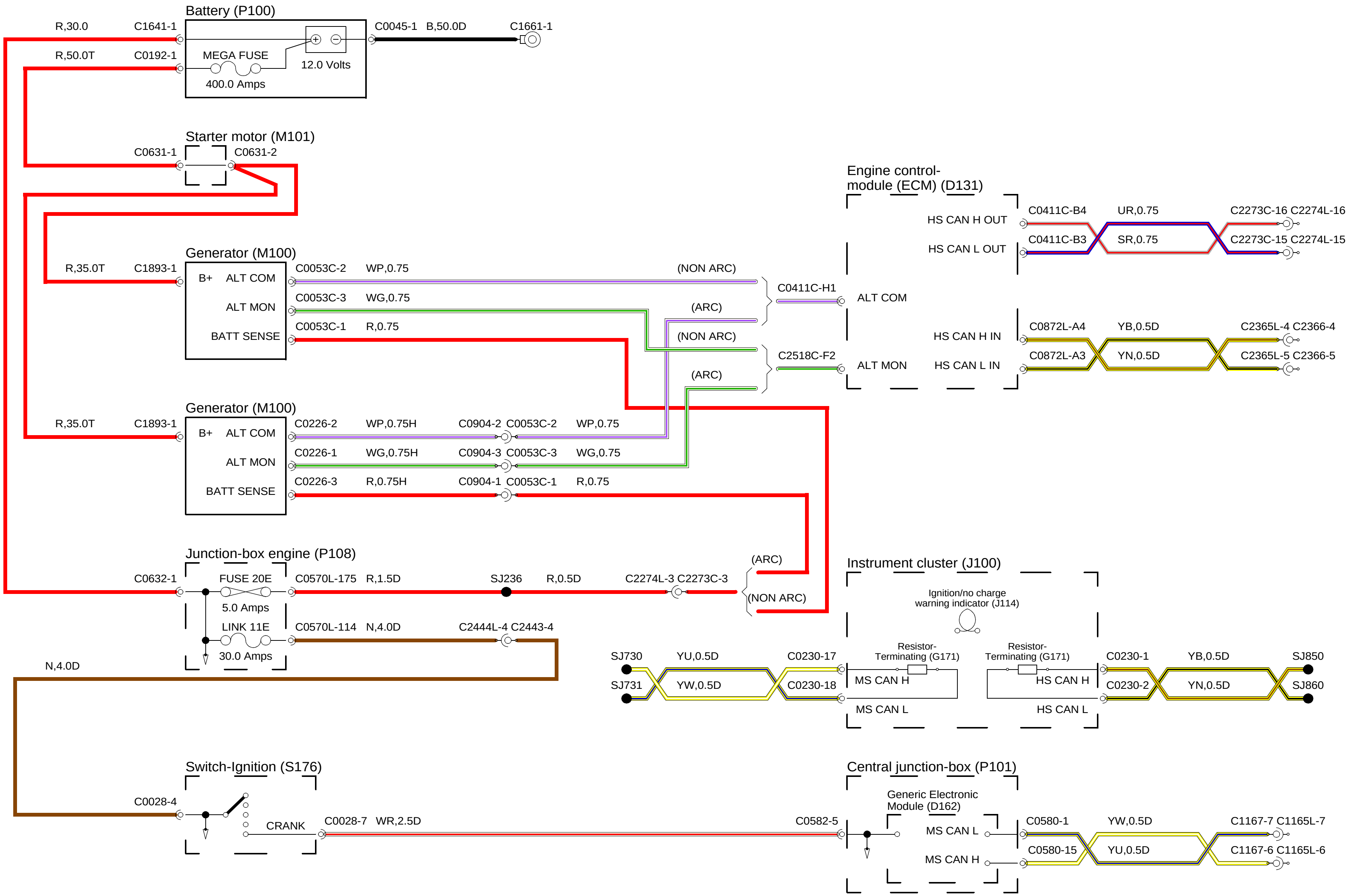

Ignition coil-5 (D237)
C1771D-3 B,0.5,495
SJ12
B,1.5,1665
C2649D-1
Ignition coil-6 (D238)
C1772D-3 B,0.5,405
Ignition coil-7 (D267)
C2087D-3 B,0.5,310
Ignition coil-8 (D268)
C2088D-3 B,0.5,190
Capacitor (G158)
C1323D-2 B,1.5,270
SJ10
B,0.5,215
Ignition coil-3 (D235)
C0276D-3 B,0.5,310
SJ11
B,0.5,380
B,1.5,865
C2651D-1
Ignition coil-2 (D234)
C0052D-3 B,0.5,405
Ignition coil-1 (D233)
C0156D-3 B,0.5,495
Ignition coil-4 (D236)
C1770D-3 B,0.5,190

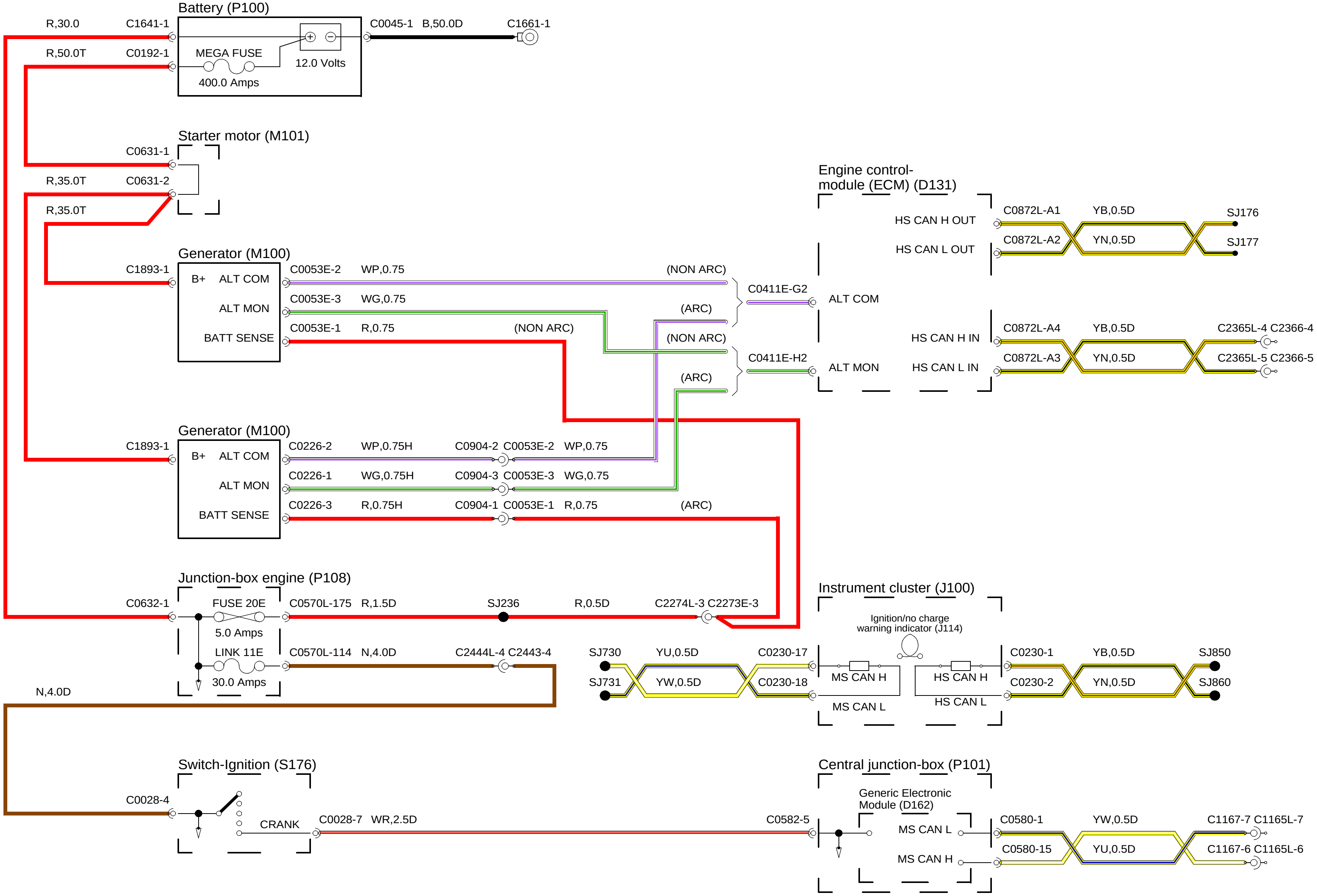
(PETROL-N/A)

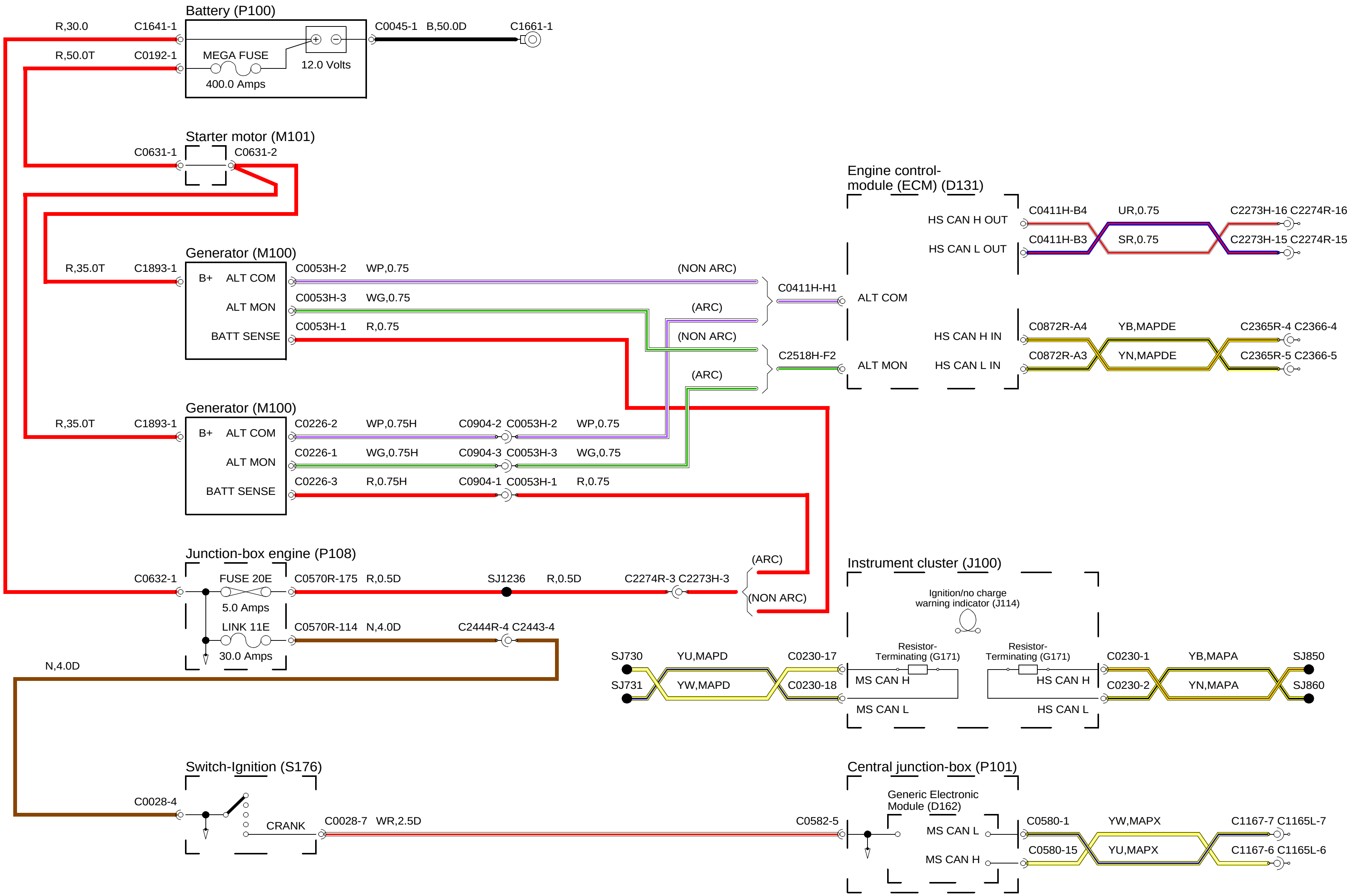

Ignition coil-5 (D237)
C1771B-3 BU,0.5,305
SJ3
B,1.5,1101
C2649B-1
Ignition coil-6 (D238)
C1772B-3 BU,0.5,215
Ignition coil-7 (D267)
C2087B-3 BU,0.5,120
Ignition coil-8 (D268)
C2088B-3 BU,0.5,110
Capacitor (G158)
C1323B-2 B,1.5,290
SJ6
B,0.5,435
Ignition coil-3 (D235)
C0276B-3 BU,0.5,120
SJ13
B,0.5,420
B,1.5,906
C2651B-1
Ignition coil-2 (D234)
C0052B-3 BU,0.5,215
Ignition coil-1 (D233)
C0156B-3 BU,0.5,305
Ignition coil-4 (D236)
C1770B-3 BU,0.5,110

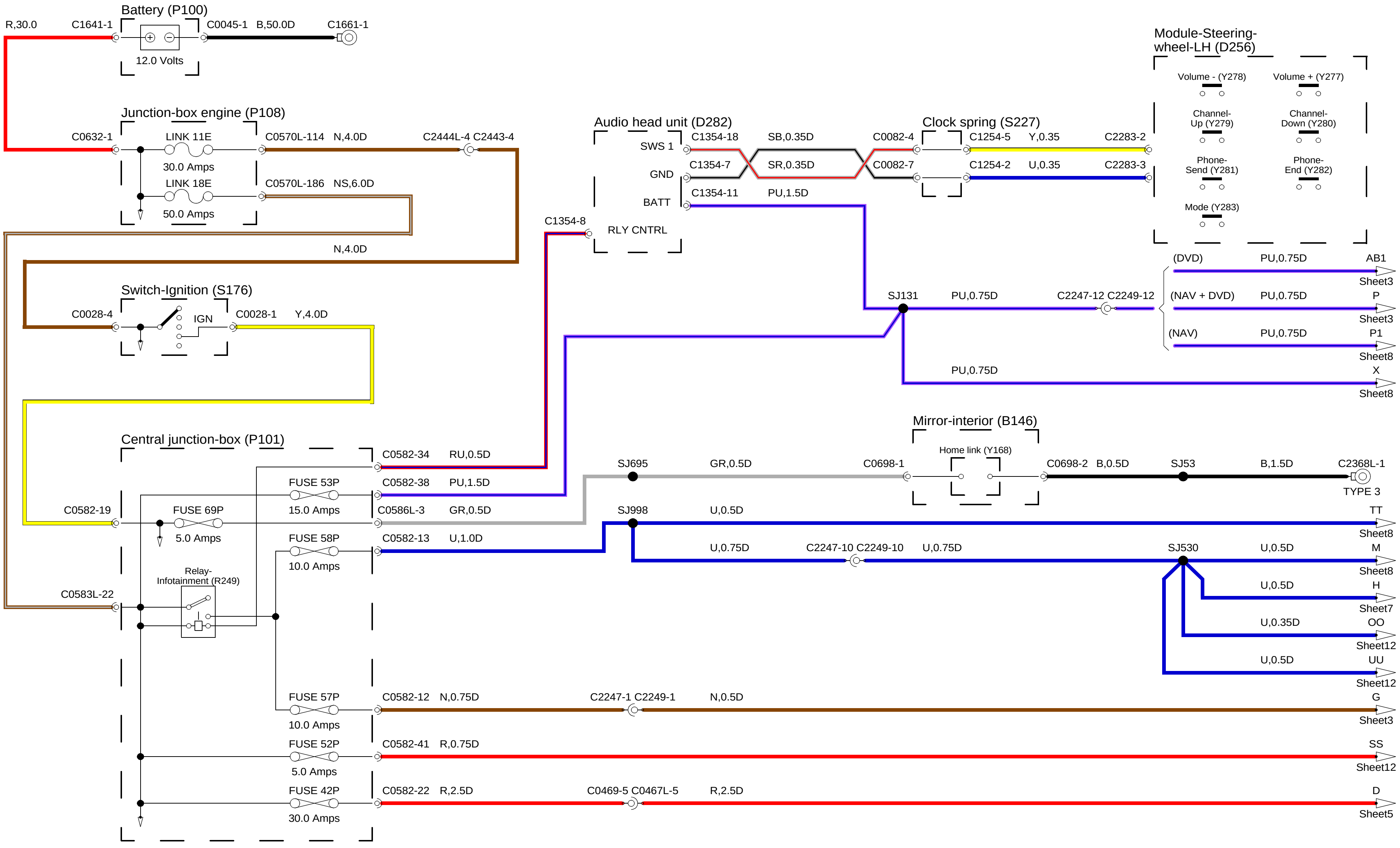

Battery (P100)
Relay-Transit (R275)
R,30.0
C1641-1
C0045-1
B,50.0D
C0045-1
B,50.0D
C1661-1
SJ1
R,50.0T
(PV8)
C0192-1
MEGA FUSE
12.0 Volts
R,50.0T
(DIESEL)
400.0 Amps
SIGNAL
C3034L-1
GR,0.5D
POWER
C3034L-2
R,0.5D
Starter motor (M101)
C0631-1
C0631-2
R,35.0T
(DIESEL)
Generator (M100)
BATT SENSE
C0053B-1
NG,0.5
(PV8)
C2724B-5 C2725L-5
C1893-1
B+
C0053C-1
R,0.75
(DIESEL NON ARC)
R,50.0T
(PV8)
BATT SENSE
C2273C-3 C2274L-3
C0226-3
R,0.75H
C0904-1 C0053C-1
R,0.75
(DIESEL ARC)
Junction-box engine (P108)
R,0.5D
(DIESEL)
C0632-1
FUSE 20E
C0570L-175
R,1.5D
SJ236
5.0 Amps
R,0.5D
(PV8)
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
IGN
C0028-1
Y,4.0D
C0028-4
CRANK
C0028-7
WR,2.5D
Central junction-box (P101)
C0582-19
FUSE 69P
C0586L-3
GR,0.5D
SJ695
GR,0.5D
C2243L-13 C2245L-13
5.0 Amps
Generic Electronic Module (D162)
C0582-5
C0580-15
YU,0.5D
C1167-6 C1165L-6
MS CAN H
C0580-1
YW,0.5D
C1167-7 C1165L-7
MS CAN L


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
SJ1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
Generator (M100)
R,50.0T
C1893B-1
B+
ALT CON
ALT MON
ALT CON
ALT MON
BATT SENSE
BATT SENSE
C0053B-2
(PV8NA)
WR,1.0
C0634B-96
C0053B-3
(PV8NA)
WG,1.0
C0634B-3
C0053D-2
(PV8SC)
GO,1.0
C0634D-96
C0053D-3
(PV8SC)
WG,1.0
C0634D-3
C0053B-1
WR,1.0
(PV8NA) C2725B-5
C2725L-5
C0053D-1
WR,1.0
(PV8SC)
C2725D-5
Engine control-module (ECM) (D131)
ALT_CON
ALT_MON
ALT CON
ALT MON
HS CAN H IN
HS CAN L IN
HS CAN H OUT
HS CAN L OUT
C0635L-58
YB,0.5D
C2365L-4 C2366-4
C0635L-45
YN,0.5D
C2365L-5 C2366-5
C0635L-57
YB,0.5D
SJ176
C0635L-44
YN,0.5D
SJ177
Junction-box engine (P108)
FUSE 20E
5.0 Amps
C0570L-175
R,1.5D
SJ236
R,0.5D
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
SJ730
YU,0.5D
C0230-17
SJ731
YW,0.5D
C0230-18
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Central junction-box (P101)
Generic Electronic Module (D162)
C0582-5
FUSE 60P
5.0 Amps
MS CAN L
MS CAN H
C0580-1
YW,0.5D
C1167-7 C1165L-7
C0580-15
YU,0.5D
C1167-6 C1165L-6

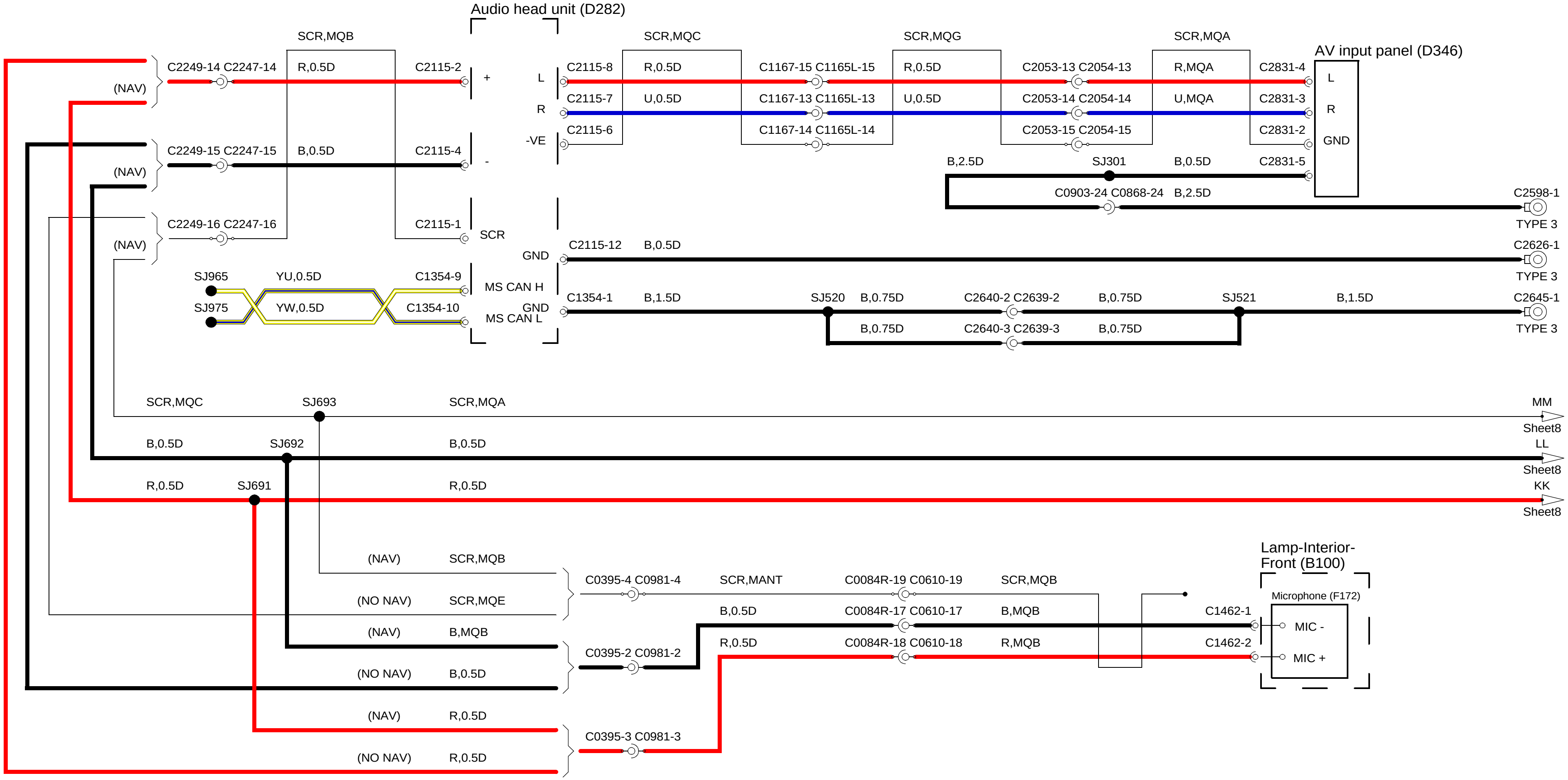

Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
Starter motor (M101)
C0631-1
C0631-2
Engine control-module (ECM) (D131)
HS CAN H OUT
HS CAN L OUT
C0411C-B4
UR,0.75
C2273C-16 C2274L-16
C0411C-B3
SR,0.75
C2273C-15 C2274L-15
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0053C-2
WP,0.75
(NON ARC)
C0053C-3
WG,0.75
(ARC)
C0053C-1
R,0.75
(NON ARC)
(ARC)
C0411C-H1
ALT COM
C2518C-F2
ALT MON
HS CAN H IN
HS CAN L IN
C0872L-A4
YB,0.5D
C2365L-4 C2366-4
C0872L-A3
YN,0.5D
C2365L-5 C2366-5
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0226-2
WP,0.75H
C0904-2 C0053C-2
WP,0.75
C0226-1
WG,0.75H
C0904-3 C0053C-3
WG,0.75
C0226-3
R,0.75H
C0904-1 C0053C-1
R,0.75
Junction-box engine (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570L-175
R,1.5D
SJ236
R,0.5D
C2274L-3 C2273C-3
(ARC)
(NON ARC)
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
Resistor-Terminating (G171)
Resistor-Terminating (G171)
SJ730
YU,0.5D
C0230-17
SJ731
YW,0.5D
C0230-18
MS CAN H
MS CAN L
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
Generic Electronic Module (D162)
MS CAN L
MS CAN H
C0580-1
YW,0.5D
C1167-7 C1165L-7
C0580-15
YU,0.5D
C1167-6 C1165L-6

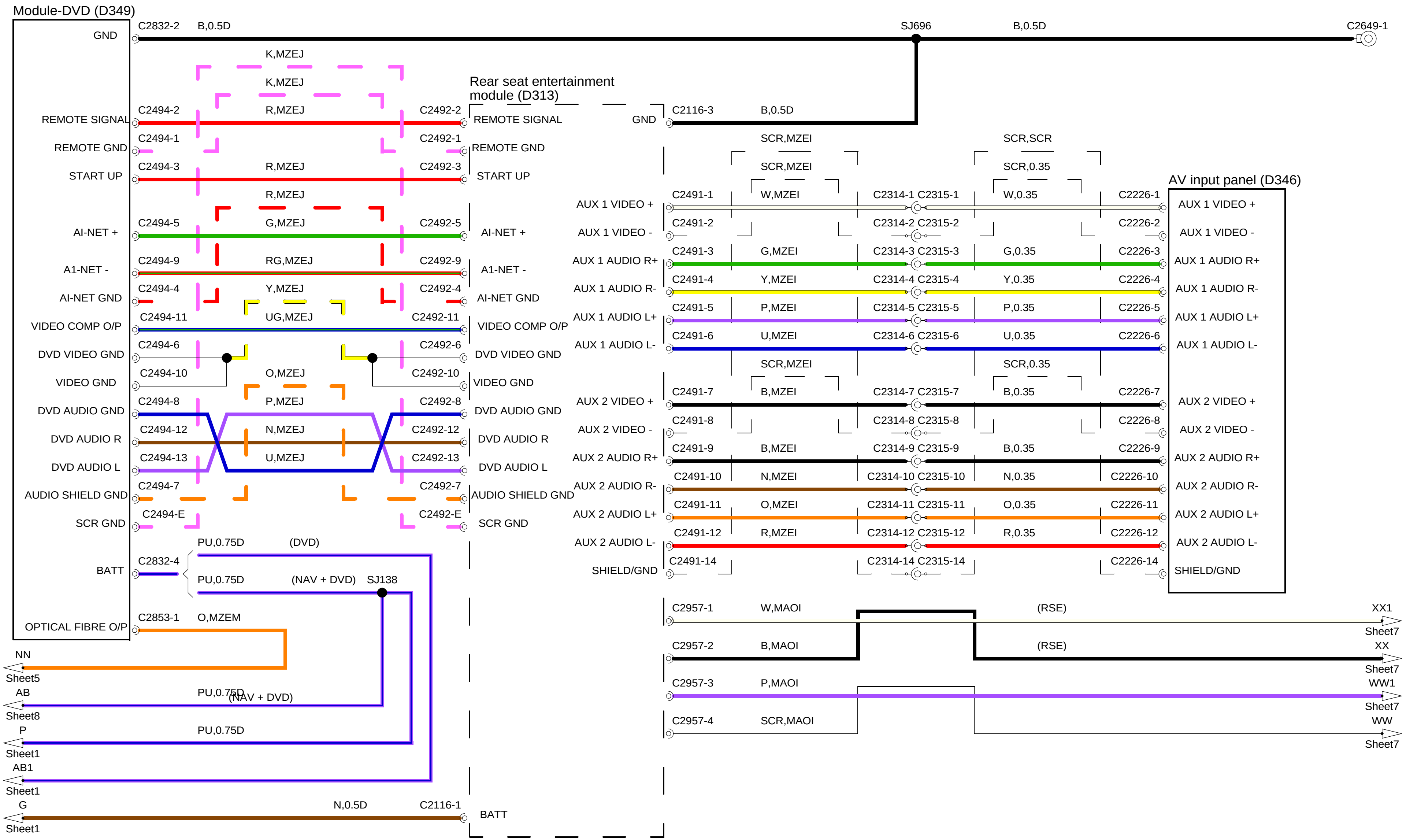

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
Starter motor (M101)
C0631-1
R,35.0T
C0631-2
R,35.0T
Engine control-module (ECM) (D131)
HS CAN H OUT
HS CAN L OUT
C0872L-A1
YB,0.5D
SJ176
C0872L-A2
YN,0.5D
SJ177
Generator (M100)
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0053E-2
WP,0.75
(NON ARC)
C0053E-3
WG,0.75
(ARC)
C0053E-1
R,0.75
(NON ARC)
(NON ARC)
(ARC)
C0411E-G2
ALT COM
C0411E-H2
ALT MON
HS CAN H IN
HS CAN L IN
C0872L-A4
YB,0.5D
C2365L-4 C2366-4
C0872L-A3
YN,0.5D
C2365L-5 C2366-5
Generator (M100)
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0226-2
WP,0.75H
C0904-2
C0053E-2
WP,0.75
C0226-1
WG,0.75H
C0904-3
C0053E-3
WG,0.75
C0226-3
R,0.75H
C0904-1
C0053E-1
R,0.75
(ARC)
Junction-box engine (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570L-175
R,1.5D
SJ236
R,0.5D
C2274L-3 C2273E-3
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
SJ730
YU,0.5D
C0230-17
SJ731
YW,0.5D
C0230-18
MS CAN H
MS CAN L
HS CAN H
HS CAN L
C0230-1
YB,0.5D
SJ850
C0230-2
YN,0.5D
SJ860
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
Generic Electronic Module (D162)
MS CAN L
MS CAN H
C0580-1
YW,0.5D
C1167-7 C1165L-7
C0580-15
YU,0.5D
C1167-6 C1165L-6

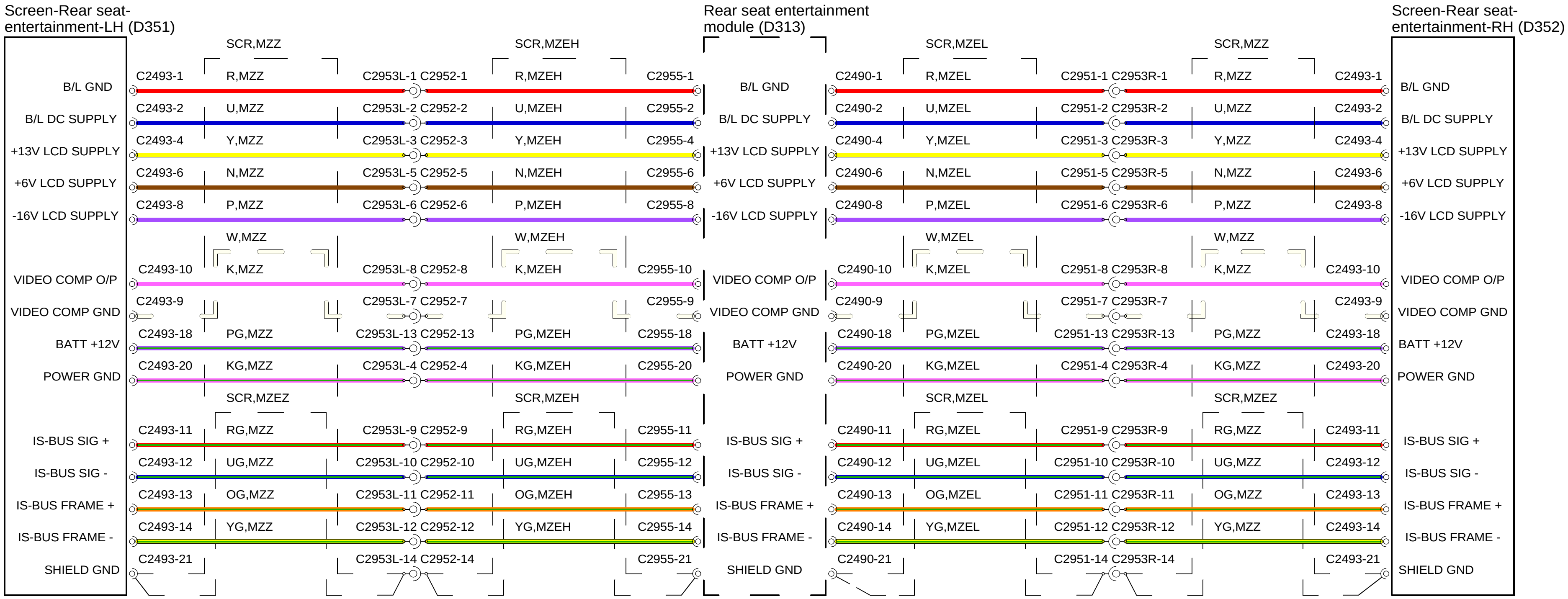

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
Starter motor (M101)
C0631-1
C0631-2
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0053H-2
WP,0.75
(NON ARC)
C0053H-3
WG,0.75
(ARC)
C0053H-1
R,0.75
(NON ARC)
(ARC)
C0411H-H1
C2518H-F2
Engine control-module (ECM) (D131)
HS CAN H OUT
HS CAN L OUT
ALT COM
ALT MON
HS CAN H IN
HS CAN L IN
C0411H-B4
UR,0.75
C2273H-16 C2274R-16
C0411H-B3
SR,0.75
C2273H-15 C2274R-15
C0872R-A4
YB,MAPDE
C2365R-4 C2366-4
C0872R-A3
YN,MAPDE
C2365R-5 C2366-5
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
ALT MON
BATT SENSE
C0226-2
WP,0.75H
C0904-2
C0053H-2
WP,0.75
C0226-1
WG,0.75H
C0904-3
C0053H-3
WG,0.75
C0226-3
R,0.75H
C0904-1
C0053H-1
R,0.75
Junction-box engine (P108)
C0632-1
FUSE 20E
5.0 Amps
LINK 11E
30.0 Amps
C0570R-175
R,0.5D
SJ1236
R,0.5D
C2274R-3 C2273H-3
(ARC)
(NON ARC)
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
SJ730
YU,MAPD
C0230-17
SJ731
YW,MAPD
C0230-18
Resistor-Terminating (G171)
MS CAN H
MS CAN L
Resistor-Terminating (G171)
HS CAN H
HS CAN L
C0230-1
YB,MAPA
SJ850
C0230-2
YN,MAPA
SJ860
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
Central junction-box (P101)
Generic Electronic Module (D162)
MS CAN L
MS CAN H
C0580-1
YW,MAPX
C1167-7 C1165L-7
C0580-15
YU,MAPX
C1167-6 C1165L-6

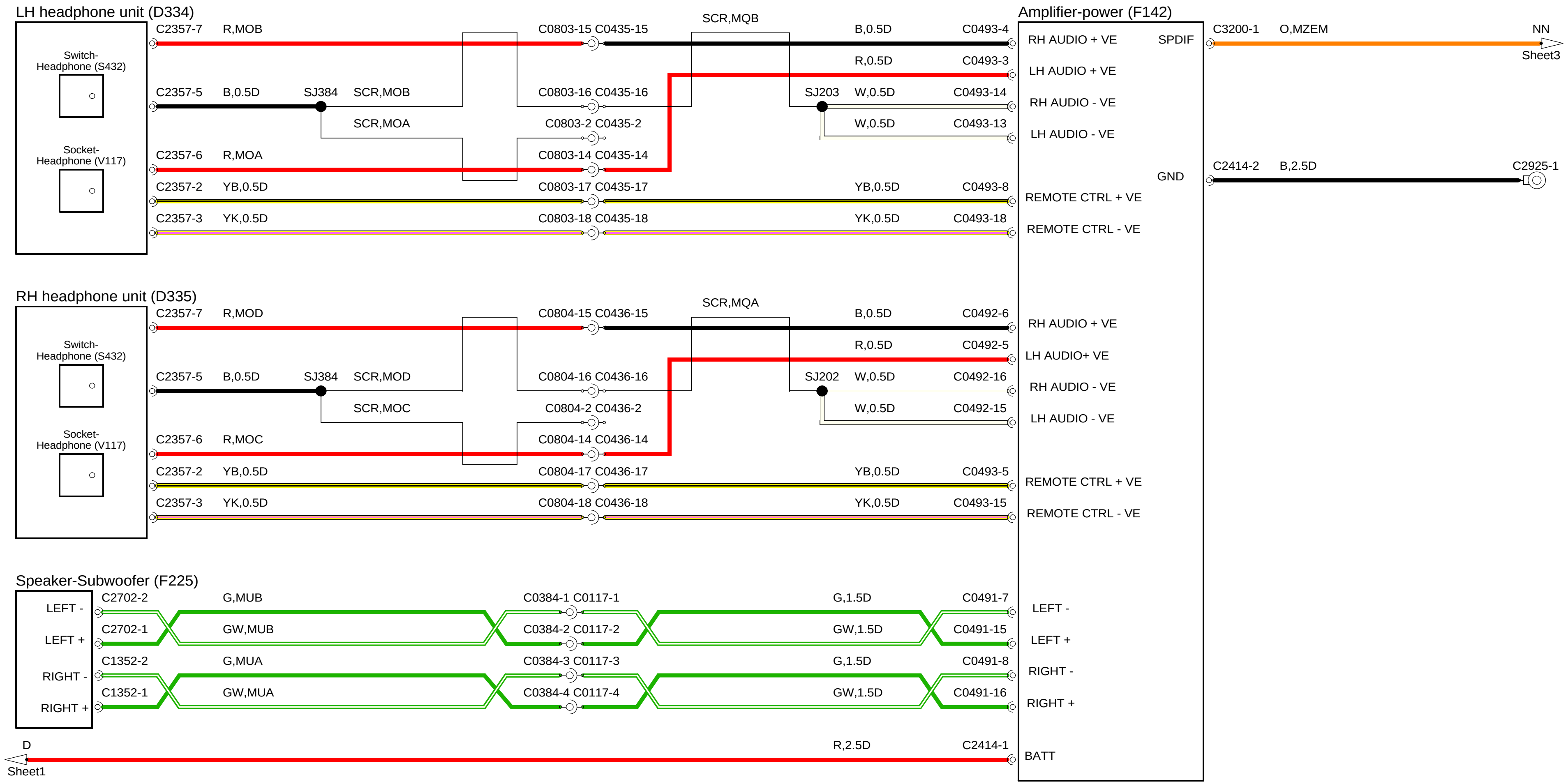


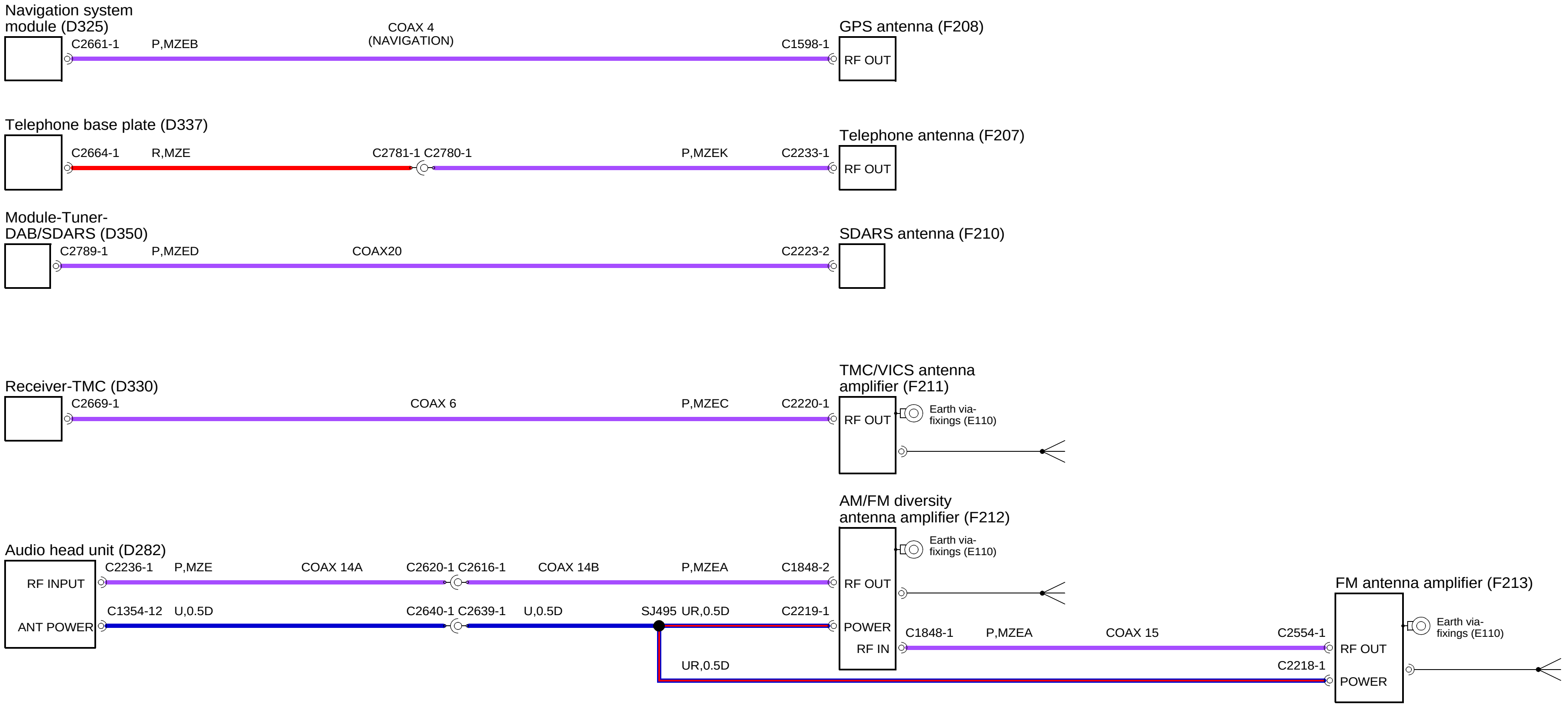
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 18E
50.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
C0570L-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Audio head unit (D282)
SWS 1
GND
BATT
RLY CNTRL
C1354-8
C1354-18
SB,0.35D
C1354-7
SR,0.35D
C1354-11
PU,1.5D
C0082-4
C0082-7
Clock spring (S227)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone-Send (Y281)
Phone-End (Y282)
Mode (Y283)
(DVD)
PU,0.75D
AB1
Sheet3
SJ131
PU,0.75D
C2247-12 C2249-12
(NAV + DVD)
PU,0.75D
P
Sheet3
(NAV)
PU,0.75D
P1
Sheet8
PU,0.75D
X
Sheet8
Mirror-interior (B146)
Home link (Y168)
Central junction-box (P101)
C0582-34
RU,0.5D
FUSE 53P
15.0 Amps
C0582-38
PU,1.5D
C0582-19
FUSE 69P
5.0 Amps
C0586L-3
GR,0.5D
SJ695
GR,0.5D
C0698-1
C0698-2
B,0.5D
SJ53
B,1.5D
C2368L-1
TYPE 3
SJ998
U,0.5D
TT
Sheet8
FUSE 58P
10.0 Amps
C0582-13
U,1.0D
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet8
U,0.5D
H
Sheet7
U,0.35D
OO
Sheet12
U,0.5D
UU
Sheet12
Relay-Infotainment (R249)
C0583L-22
FUSE 57P
10.0 Amps
C0582-12
N,0.75D
C2247-1 C2249-1
N,0.5D
G
Sheet3
FUSE 52P
5.0 Amps
C0582-41
R,0.75D
SS
Sheet12
FUSE 42P
30.0 Amps
C0582-22
R,2.5D
C0469-5 C0467L-5
R,2.5D
D
Sheet5

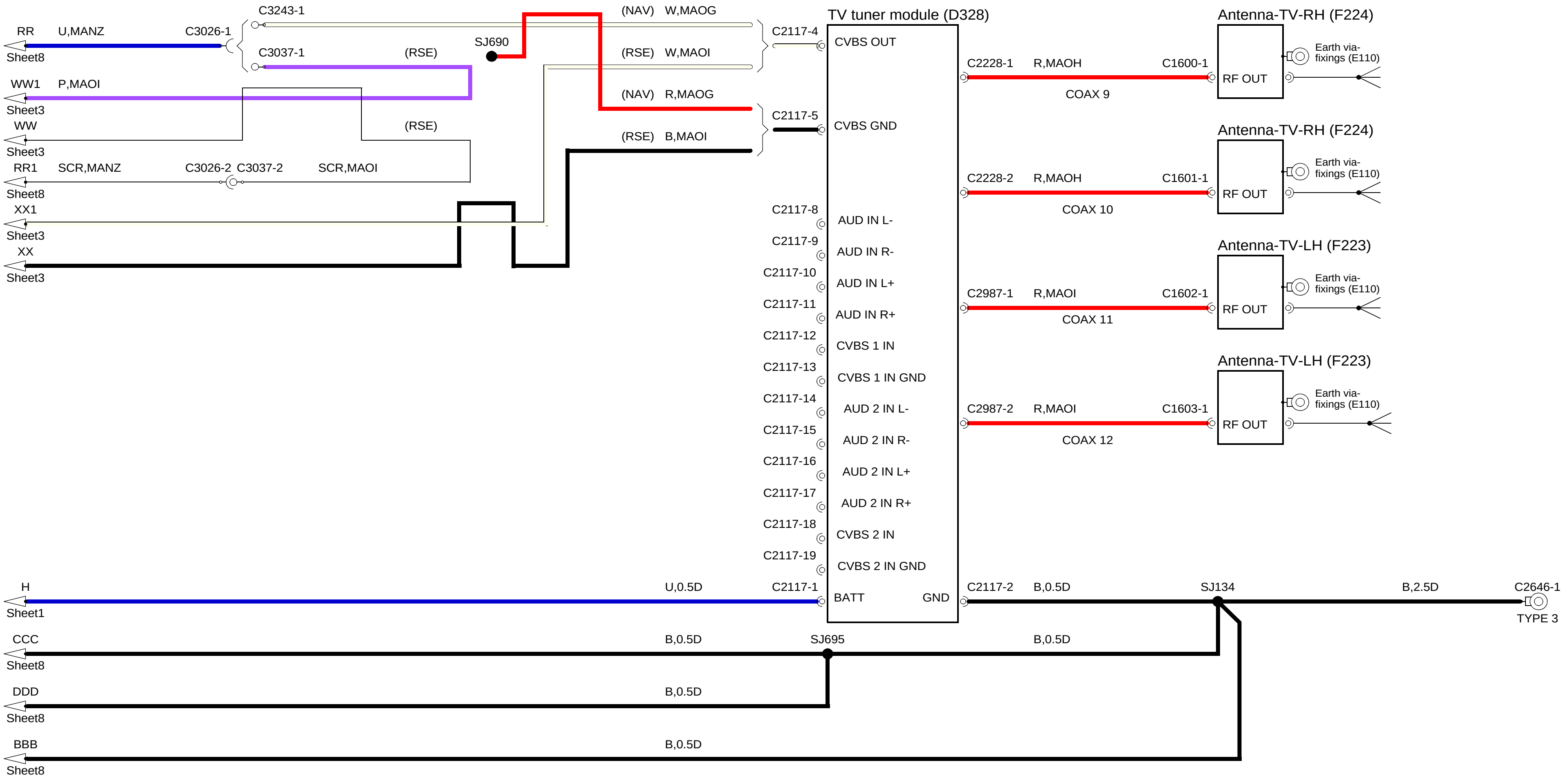

Audio head unit (D282)
SCR,MQB
SCR,MQC
SCR,MQG
SCR,MQA
AV input panel (D346)
C2249-14 C2247-14
R,0.5D
C2115-2
+
L
R
-VE
C2115-8
C2115-7
C2115-6
R,0.5D
U,0.5D
C1167-15 C1165L-15
C1167-13 C1165L-13
C1167-14 C1165L-14
R,0.5D
U,0.5D
C2053-13 C2054-13
C2053-14 C2054-14
C2053-15 C2054-15
R,MQA
U,MQA
C2831-4
C2831-3
C2831-2
C2831-5
L
R
GND
(NAV)
C2249-15 C2247-15
B,0.5D
C2115-4
-
(NAV)
B,2.5D
SJ301
B,0.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
C2249-16 C2247-16
C2115-1
SCR
(NAV)
GND
C2115-12
B,0.5D
C2626-1
TYPE 3
SJ965
YU,0.5D
C1354-9
MS CAN H
SJ975
YW,0.5D
C1354-10
GND
MS CAN L
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
TYPE 3
B,0.75D
C2640-3 C2639-3
B,0.75D
SCR,MQC
SJ693
SCR,MQA
MM
Sheet8
B,0.5D
SJ692
B,0.5D
LL
Sheet8
R,0.5D
SJ691
R,0.5D
KK
Sheet8
Lamp-Interior-Front (B100)
Microphone (F172)
(NAV)
SCR,MQB
C0395-4 C0981-4
SCR,MANT
C0084R-19 C0610-19
SCR,MQB
(NO NAV)
SCR,MQE
B,0.5D
C0084R-17 C0610-17
B,MQB
C1462-1
MIC -
(NAV)
B,MQB
R,0.5D
C0084R-18 C0610-18
R,MQB
C1462-2
MIC +
C0395-2 C0981-2
(NO NAV)
B,0.5D
(NAV)
R,0.5D
C0395-3 C0981-3
(NO NAV)
R,0.5D

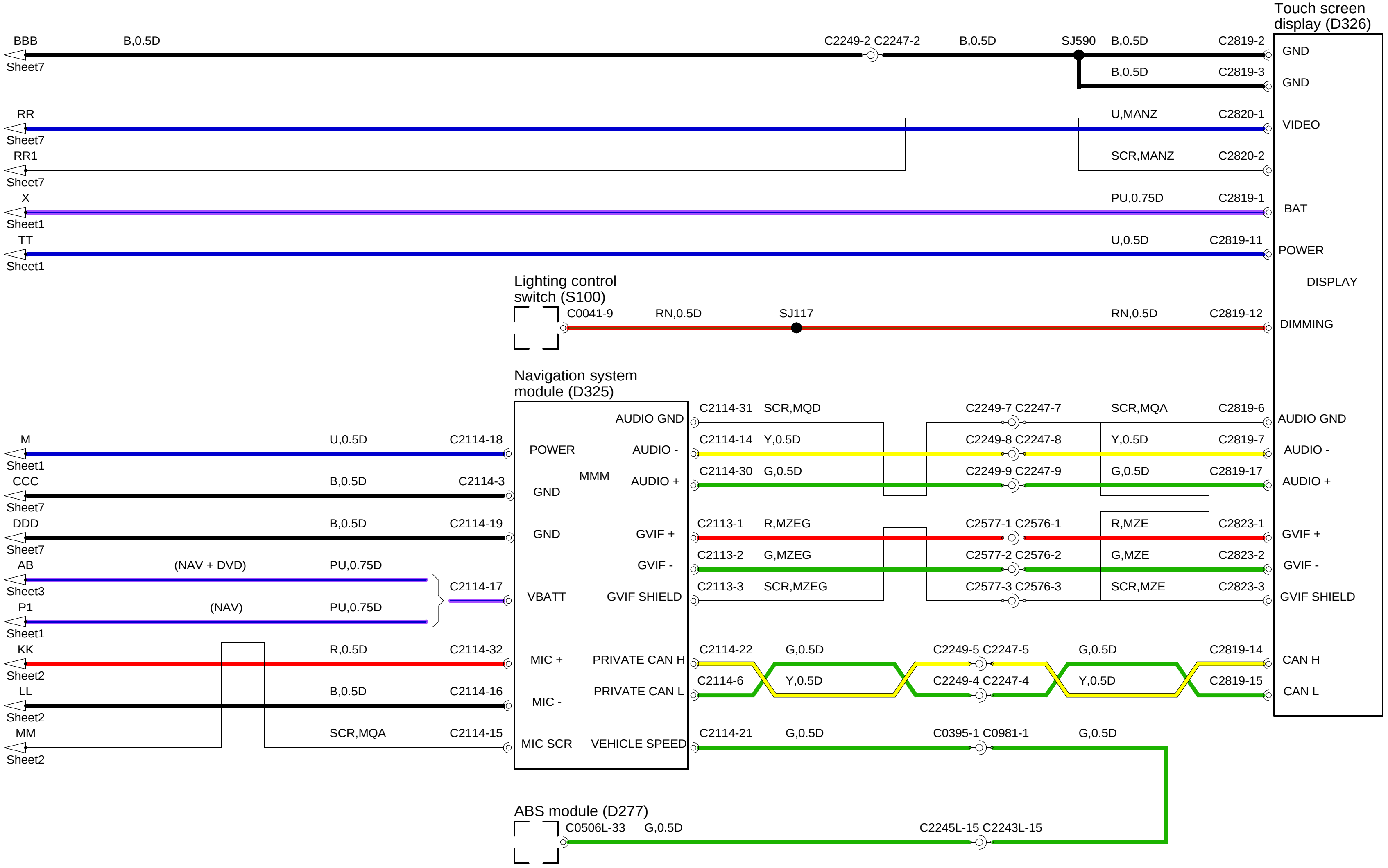

Module-DVD (D349)
GND
C2832-2
B,0.5D
SJ696
B,0.5D
C2649-1
K,MZEJ
K,MZEJ
Rear seat entertainment module (D313)
REMOTE SIGNAL
C2494-2
R,MZEJ
C2492-2
REMOTE SIGNAL
GND
C2116-3
B,0.5D
REMOTE GND
C2494-1
C2492-1
REMOTE GND
SCR,MZEI
SCR,SCR
START UP
C2494-3
R,MZEJ
C2492-3
START UP
SCR,MZEI
SCR,0.35
AV input panel (D346)
R,MZEJ
C2491-1
W,MZEI
C2314-1 C2315-1
W,0.35
C2226-1
AUX 1 VIDEO +
AUX 1 VIDEO +
AI-NET +
C2494-5
G,MZEJ
C2492-5
AI-NET +
AUX 1 VIDEO -
C2491-2
C2314-2 C2315-2
C2226-2
AUX 1 VIDEO -
A1-NET -
C2494-9
RG,MZEJ
C2492-9
A1-NET -
AUX 1 AUDIO R+
C2491-3
G,MZEI
C2314-3 C2315-3
G,0.35
C2226-3
AUX 1 AUDIO R+
AI-NET GND
C2494-4
Y,MZEJ
C2492-4
AI-NET GND
AUX 1 AUDIO R-
C2491-4
Y,MZEI
C2314-4 C2315-4
Y,0.35
C2226-4
AUX 1 AUDIO R-
VIDEO COMP O/P
C2494-11
UG,MZEJ
C2492-11
VIDEO COMP O/P
AUX 1 AUDIO L+
C2491-5
P,MZEI
C2314-5 C2315-5
P,0.35
C2226-5
AUX 1 AUDIO L+
DVD VIDEO GND
C2494-6
C2492-6
DVD VIDEO GND
AUX 1 AUDIO L-
C2491-6
U,MZEI
C2314-6 C2315-6
U,0.35
C2226-6
AUX 1 AUDIO L-
VIDEO GND
C2494-10
O,MZEJ
C2492-10
VIDEO GND
SCR,MZEI
SCR,0.35
DVD AUDIO GND
C2494-8
P,MZEJ
C2492-8
DVD AUDIO GND
AUX 2 VIDEO +
C2491-7
B,MZEI
C2314-7 C2315-7
B,0.35
C2226-7
AUX 2 VIDEO +
DVD AUDIO R
C2494-12
N,MZEJ
C2492-12
DVD AUDIO R
AUX 2 VIDEO -
C2491-8
C2314-8 C2315-8
C2226-8
AUX 2 VIDEO -
DVD AUDIO L
C2494-13
U,MZEJ
C2492-13
DVD AUDIO L
AUX 2 AUDIO R+
C2491-9
B,MZEI
C2314-9 C2315-9
B,0.35
C2226-9
AUX 2 AUDIO R+
AUDIO SHIELD GND
C2494-7
C2492-7
AUDIO SHIELD GND
AUX 2 AUDIO R-
C2491-10
N,MZEI
C2314-10 C2315-10
N,0.35
C2226-10
AUX 2 AUDIO R-
SCR GND
C2494-E
C2492-E
SCR GND
AUX 2 AUDIO L+
C2491-11
O,MZEI
C2314-11 C2315-11
O,0.35
C2226-11
AUX 2 AUDIO L+
PU,0.75D
(DVD)
AUX 2 AUDIO L-
C2491-12
R,MZEI
C2314-12 C2315-12
R,0.35
C2226-12
AUX 2 AUDIO L-
BATT
C2832-4
PU,0.75D
(NAV + DVD)
SJ138
SHIELD/GND
C2491-14
C2314-14 C2315-14
C2226-14
SHIELD/GND
OPTICAL FIBRE O/P
C2853-1
O,MZEM
C2957-1
W,MAOI
(RSE)
XX1
Sheet7
NN
Sheet5
C2957-2
B,MAOI
(RSE)
XX
Sheet7
AB
PU,0.75D
(NAV + DVD)
Sheet8
C2957-3
P,MAOI
WW1
Sheet7
P
PU,0.75D
C2957-4
SCR,MAOI
WW
Sheet7
Sheet1
AB1
Sheet1
G
N,0.5D
C2116-1
BATT
Sheet1

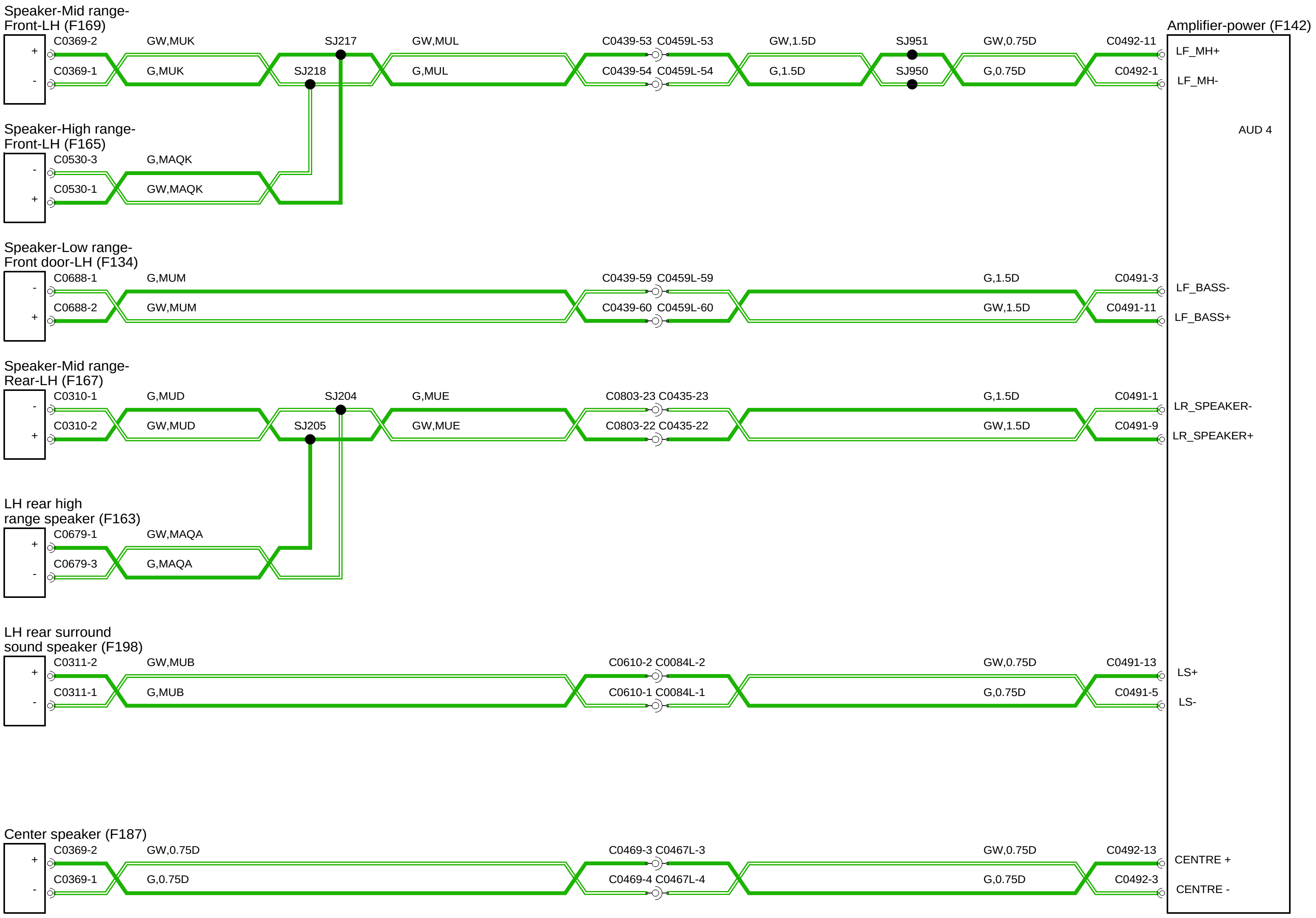

Screen-Rear seat-entertainment-LH (D351)
Rear seat entertainment module (D313)
Screen-Rear seat-entertainment-RH (D352)
SCR,MZZ
SCR,MZEH
SCR,MZEL
SCR,MZZ
B/L GND
C2493-1
R,MZZ
C2953L-1 C2952-1
R,MZEH
C2955-1
B/L GND
C2490-1
R,MZEL
C2951-1 C2953R-1
R,MZZ
C2493-1
B/L GND
B/L DC SUPPLY
C2493-2
U,MZZ
C2953L-2 C2952-2
U,MZEH
C2955-2
B/L DC SUPPLY
C2490-2
U,MZEL
C2951-2 C2953R-2
U,MZZ
C2493-2
B/L DC SUPPLY
+13V LCD SUPPLY
C2493-4
Y,MZZ
C2953L-3 C2952-3
Y,MZEH
C2955-4
+13V LCD SUPPLY
C2490-4
Y,MZEL
C2951-3 C2953R-3
Y,MZZ
C2493-4
+13V LCD SUPPLY
+6V LCD SUPPLY
C2493-6
N,MZZ
C2953L-5 C2952-5
N,MZEH
C2955-6
+6V LCD SUPPLY
C2490-6
N,MZEL
C2951-5 C2953R-5
N,MZZ
C2493-6
+6V LCD SUPPLY
-16V LCD SUPPLY
C2493-8
P,MZZ
C2953L-6 C2952-6
P,MZEH
C2955-8
-16V LCD SUPPLY
C2490-8
P,MZEL
C2951-6 C2953R-6
P,MZZ
C2493-8
-16V LCD SUPPLY
W,MZZ
W,MZEH
W,MZEL
W,MZZ
VIDEO COMP O/P
C2493-10
K,MZZ
C2953L-8 C2952-8
K,MZEH
C2955-10
VIDEO COMP O/P
C2490-10
K,MZEL
C2951-8 C2953R-8
K,MZZ
C2493-10
VIDEO COMP O/P
VIDEO COMP GND
C2493-9
C2953L-7 C2952-7
C2955-9
VIDEO COMP GND
C2490-9
C2951-7 C2953R-7
C2493-9
VIDEO COMP GND
BATT +12V
C2493-18
PG,MZZ
C2953L-13 C2952-13
PG,MZEH
C2955-18
BATT +12V
C2490-18
PG,MZEL
C2951-13 C2953R-13
PG,MZZ
C2493-18
BATT +12V
POWER GND
C2493-20
KG,MZZ
C2953L-4 C2952-4
KG,MZEH
C2955-20
POWER GND
C2490-20
KG,MZEL
C2951-4 C2953R-4
KG,MZZ
C2493-20
POWER GND
SCR,MZEZ
SCR,MZEH
SCR,MZEL
SCR,MZEZ
IS-BUS SIG +
C2493-11
RG,MZZ
C2953L-9 C2952-9
RG,MZEH
C2955-11
IS-BUS SIG +
C2490-11
RG,MZEL
C2951-9 C2953R-9
RG,MZZ
C2493-11
IS-BUS SIG +
IS-BUS SIG -
C2493-12
UG,MZZ
C2953L-10 C2952-10
UG,MZEH
C2955-12
IS-BUS SIG -
C2490-12
UG,MZEL
C2951-10 C2953R-10
UG,MZZ
C2493-12
IS-BUS SIG -
IS-BUS FRAME +
C2493-13
OG,MZZ
C2953L-11 C2952-11
OG,MZEH
C2955-13
IS-BUS FRAME +
C2490-13
OG,MZEL
C2951-11 C2953R-11
OG,MZZ
C2493-13
IS-BUS FRAME +
IS-BUS FRAME -
C2493-14
YG,MZZ
C2953L-12 C2952-12
YG,MZEH
C2955-14
IS-BUS FRAME -
C2490-14
YG,MZEL
C2951-12 C2953R-12
YG,MZZ
C2493-14
IS-BUS FRAME -
SHIELD GND
C2493-21
C2953L-14 C2952-14
C2955-21
SHIELD GND
C2490-21
C2951-14 C2953R-14
C2493-21
SHIELD GND

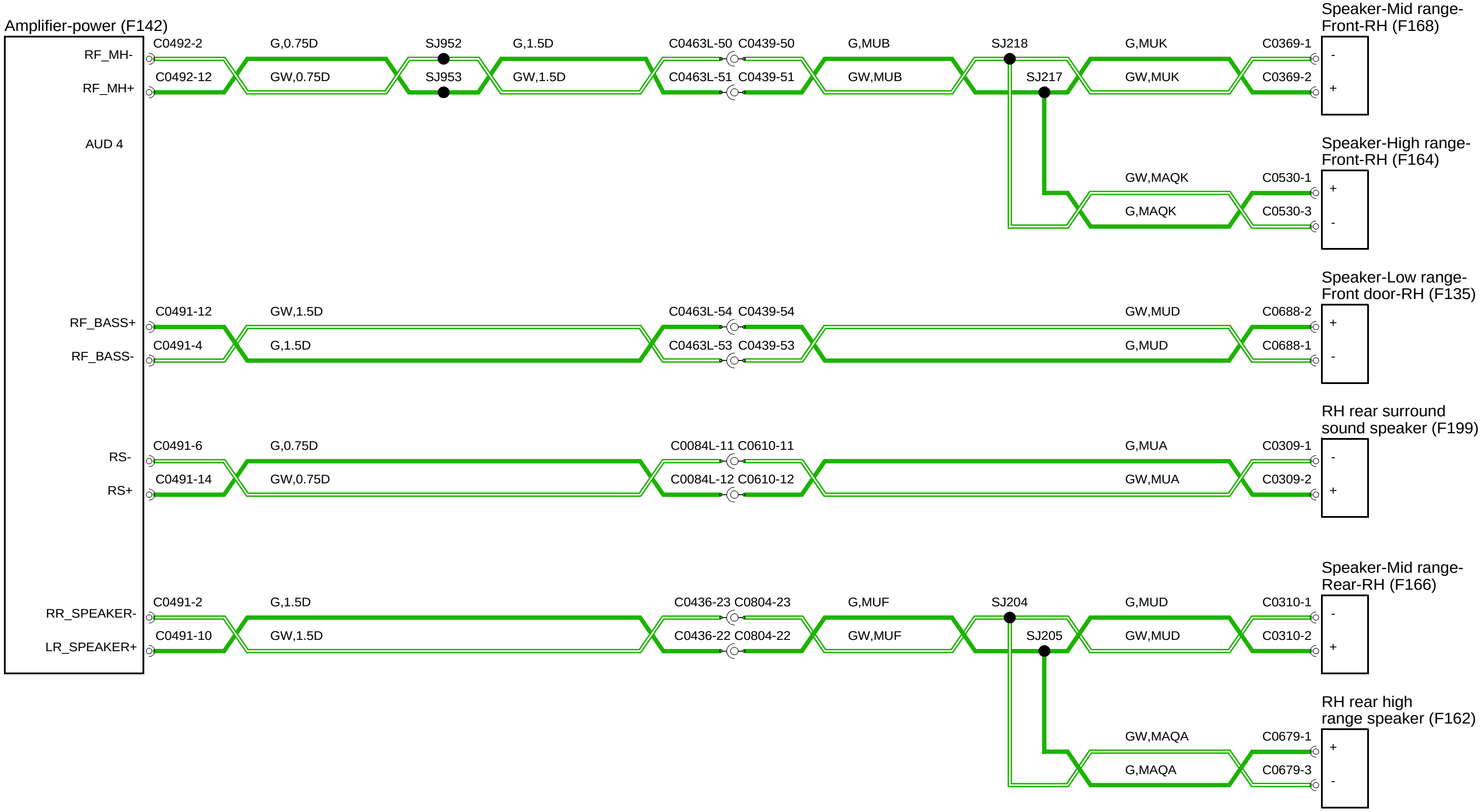

LH headphone unit (D334)
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOB
C2357-5 B,0.5D
SJ384
SCR,MOB
SCR,MOA
C2357-6 R,MOA
C2357-2 YB,0.5D
C2357-3 YK,0.5D
C0803-15 C0435-15
C0803-16 C0435-16
C0803-2 C0435-2
C0803-14 C0435-14
C0803-17 C0435-17
C0803-18 C0435-18
SCR,MQB
SJ203
B,0.5D C0493-4
R,0.5D C0493-3
W,0.5D C0493-14
W,0.5D C0493-13
YB,0.5D C0493-8
YK,0.5D C0493-18
RH headphone unit (D335)
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOD
C2357-5 B,0.5D
SJ384
SCR,MOD
SCR,MOC
C2357-6 R,MOC
C2357-2 YB,0.5D
C2357-3 YK,0.5D
C0804-15 C0436-15
C0804-16 C0436-16
C0804-2 C0436-2
C0804-14 C0436-14
C0804-17 C0436-17
C0804-18 C0436-18
SCR,MQA
SJ202
B,0.5D C0492-6
R,0.5D C0492-5
W,0.5D C0492-16
W,0.5D C0492-15
YB,0.5D C0493-5
YK,0.5D C0493-15
Speaker-Subwoofer (F225)
LEFT -
LEFT +
RIGHT -
RIGHT +
C2702-2 G,MUB
C2702-1 GW,MUB
C1352-2 G,MUA
C1352-1 GW,MUA
C0384-1 C0117-1
C0384-2 C0117-2
C0384-3 C0117-3
C0384-4 C0117-4
G,1.5D C0491-7
GW,1.5D C0491-15
G,1.5D C0491-8
GW,1.5D C0491-16
D
Sheet1
R,2.5D C2414-1
Amplifier-power (F142)
RH AUDIO + VE
LH AUDIO + VE
RH AUDIO - VE
LH AUDIO - VE
REMOTE CTRL + VE
REMOTE CTRL - VE
RH AUDIO + VE
LH AUDIO+ VE
RH AUDIO - VE
LH AUDIO - VE
REMOTE CTRL + VE
REMOTE CTRL - VE
LEFT -
LEFT +
RIGHT -
RIGHT +
BATT
SPDIF
GND
C3200-1 O,MZEM
NN
Sheet3
C2414-2 B,2.5D
C2925-1

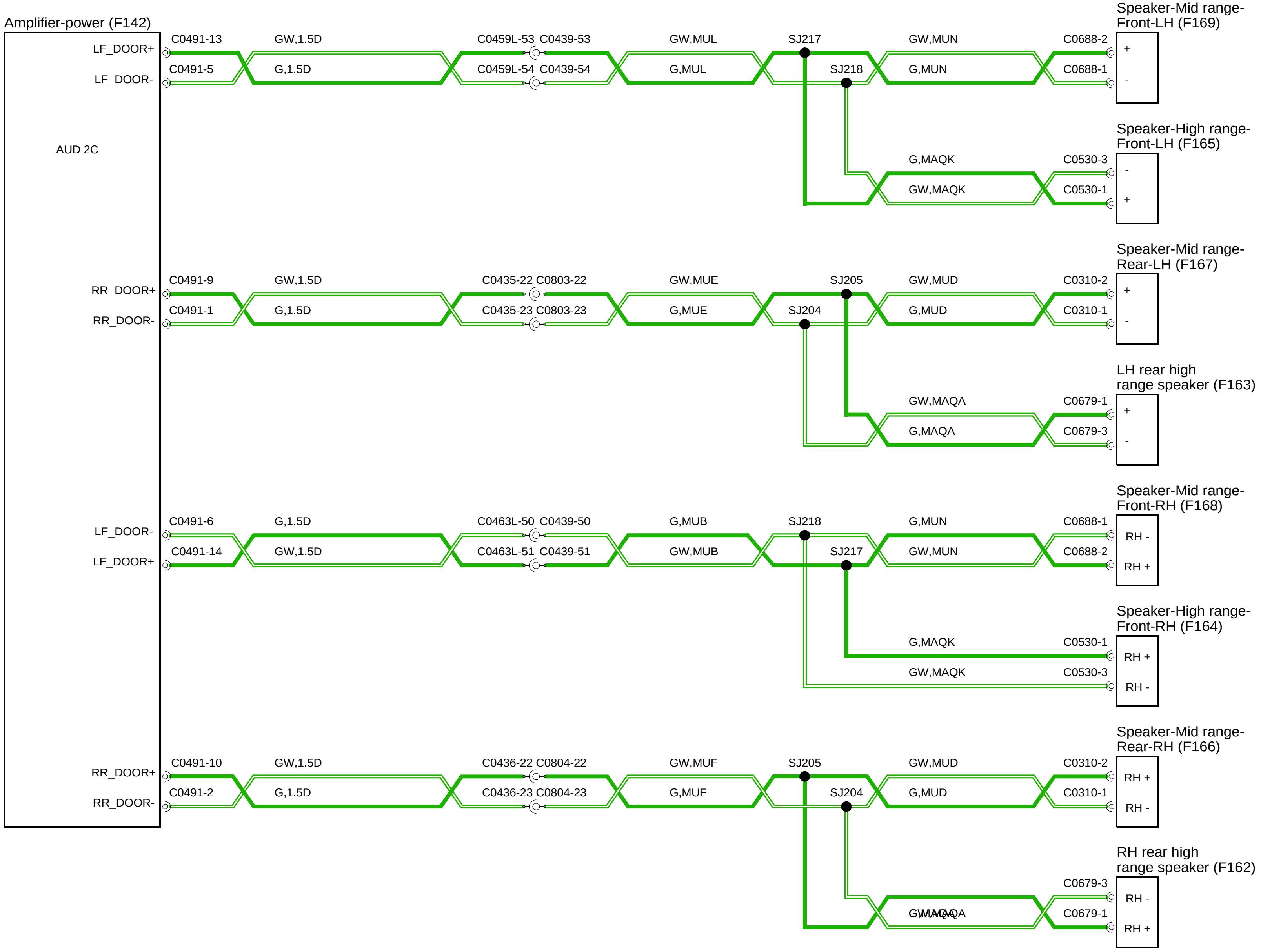

Navigation system module (D325)
C2661-1
P,MZEB
COAX 4 (NAVIGATION)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Module-Tuner-DAB/SDARS (D350)
C2789-1
P,MZED
COAX20
C2223-2
SDARS antenna (F210)
Receiver-TMC (D330)
C2669-1
COAX 6
P,MZEC
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via-fixings (E110)
AM/FM diversity antenna amplifier (F212)
Earth via-fixings (E110)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
COAX 14A
C2620-1 C2616-1
COAX 14B
P,MZEA
C1848-2
RF OUT
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495 UR,0.5D
C2219-1
POWER
RF IN
C1848-1
P,MZEA
COAX 15
C2554-1
UR,0.5D
C2218-1
FM antenna amplifier (F213)
Earth via-fixings (E110)
RF OUT
POWER

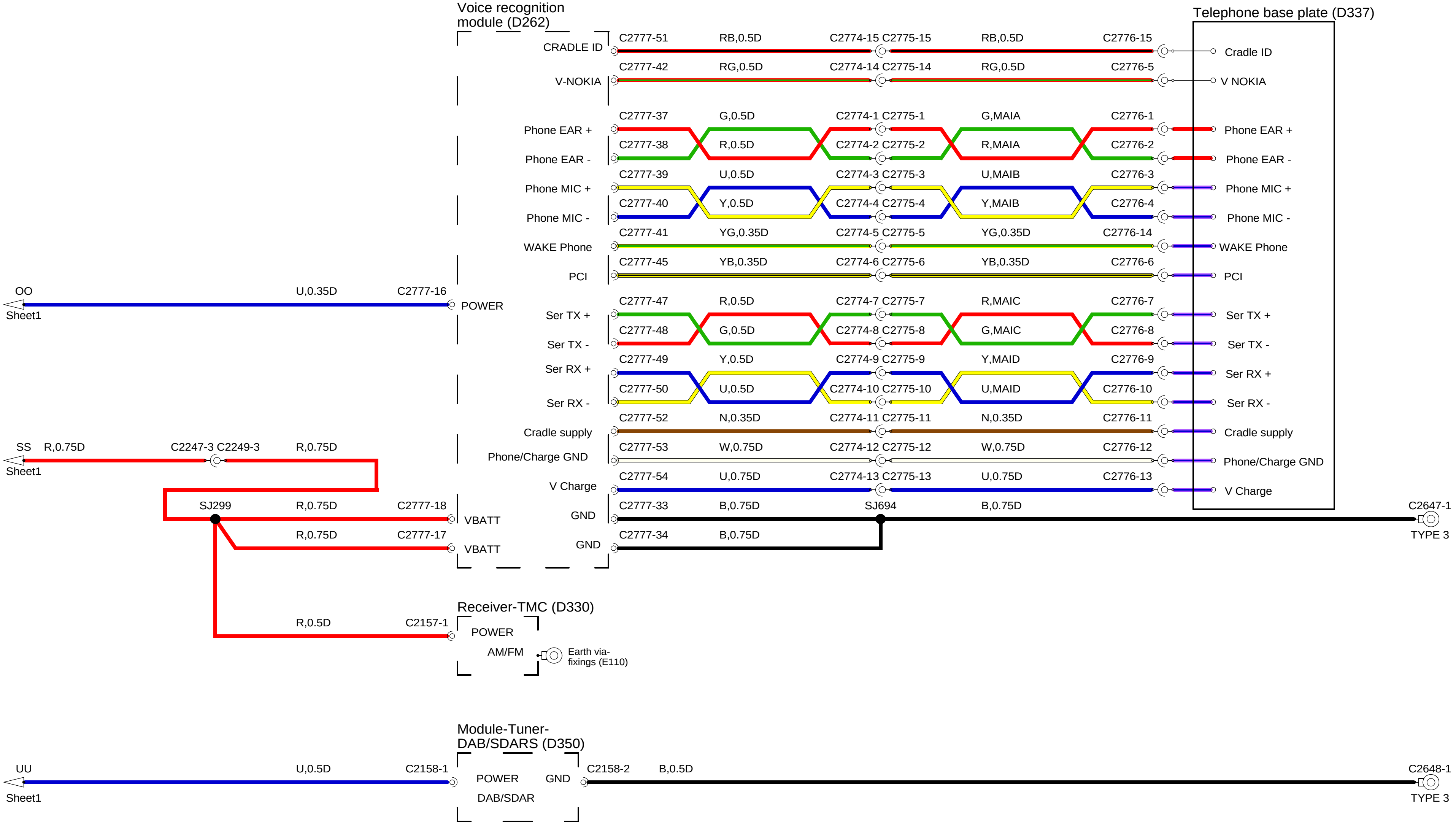

C3243-1
(NAV) W,MAOG
TV tuner module (D328)
Antenna-TV-RH (F224)
RR
U,MANZ
C3026-1
C2117-4
CVBS OUT
Sheet8
C3037-1
(RSE)
SJ690
(RSE) W,MAOI
C2228-1
R,MAOH
C1600-1
Earth via-fixings (E110)
RF OUT
WW1
P,MAOI
COAX 9
(NAV) R,MAOG
Sheet3
C2117-5
WW
(RSE)
CVBS GND
Antenna-TV-RH (F224)
Sheet3
(RSE) B,MAOI
RR1
SCR,MANZ
C3026-2
C3037-2
SCR,MAOI
C2228-2
R,MAOH
C1601-1
Earth via-fixings (E110)
Sheet8
RF OUT
XX1
C2117-8
COAX 10
AUD IN L-
Sheet3
C2117-9
Antenna-TV-LH (F223)
XX
AUD IN R-
Sheet3
C2117-10
Earth via-fixings (E110)
AUD IN L+
C2987-1
R,MAOI
C1602-1
C2117-11
AUD IN R+
RF OUT
COAX 11
C2117-12
CVBS 1 IN
C2117-13
Antenna-TV-LH (F223)
CVBS 1 IN GND
C2117-14
Earth via-fixings (E110)
AUD 2 IN L-
C2987-2
R,MAOI
C1603-1
RF OUT
C2117-15
AUD 2 IN R-
COAX 12
C2117-16
AUD 2 IN L+
C2117-17
AUD 2 IN R+
C2117-18
CVBS 2 IN
C2117-19
CVBS 2 IN GND
H
U,0.5D
C2117-1
C2117-2
B,0.5D
SJ134
B,2.5D
C2646-1
BATT
GND
Sheet1
TYPE 3
CCC
B,0.5D
SJ695
B,0.5D
Sheet8
DDD
B,0.5D
Sheet8
BBB
B,0.5D
Sheet8

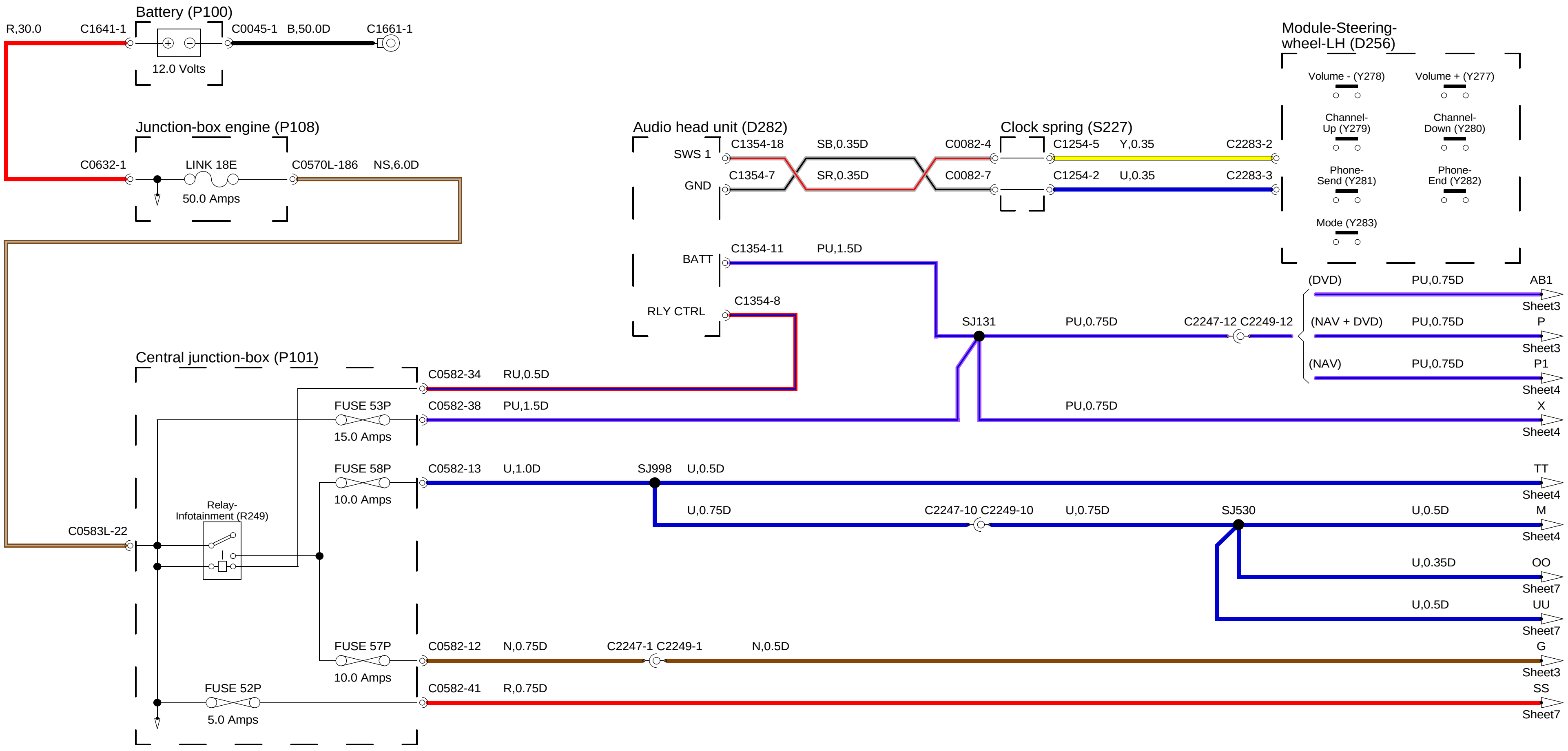

Touch screen display (D326)
BBB
Sheet7
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
RR
Sheet7
U,MANZ
C2820-1
VIDEO
RR1
Sheet7
SCR,MANZ
C2820-2
X
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
POWER
DISPLAY
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
DIMMING
Navigation system module (D325)
AUDIO GND
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,0.5D
C2249-8 C2247-8
Y,0.5D
C2819-7
AUDIO -
CCC
Sheet7
B,0.5D
C2114-3
GND
MMM
AUDIO +
C2114-30
G,0.5D
C2249-9 C2247-9
G,0.5D
C2819-17
AUDIO +
DDD
Sheet7
B,0.5D
C2114-19
GND
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2823-1
GVIF +
AB
Sheet3
(NAV + DVD)
PU,0.75D
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2823-2
GVIF -
C2114-17
VBATT
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MZE
C2823-3
GVIF SHIELD
P1
Sheet1
(NAV)
PU,0.75D
KK
Sheet2
R,0.5D
C2114-32
MIC +
PRIVATE CAN H
C2114-22
G,0.5D
C2249-5 C2247-5
G,0.5D
C2819-14
CAN H
LL
Sheet2
B,0.5D
C2114-16
MIC -
PRIVATE CAN L
C2114-6
Y,0.5D
C2249-4 C2247-4
Y,0.5D
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR
VEHICLE SPEED
C2114-21
G,0.5D
C0395-1 C0981-1
G,0.5D
ABS module (D277)
C0506L-33
G,0.5D
C2245L-15 C2243L-15

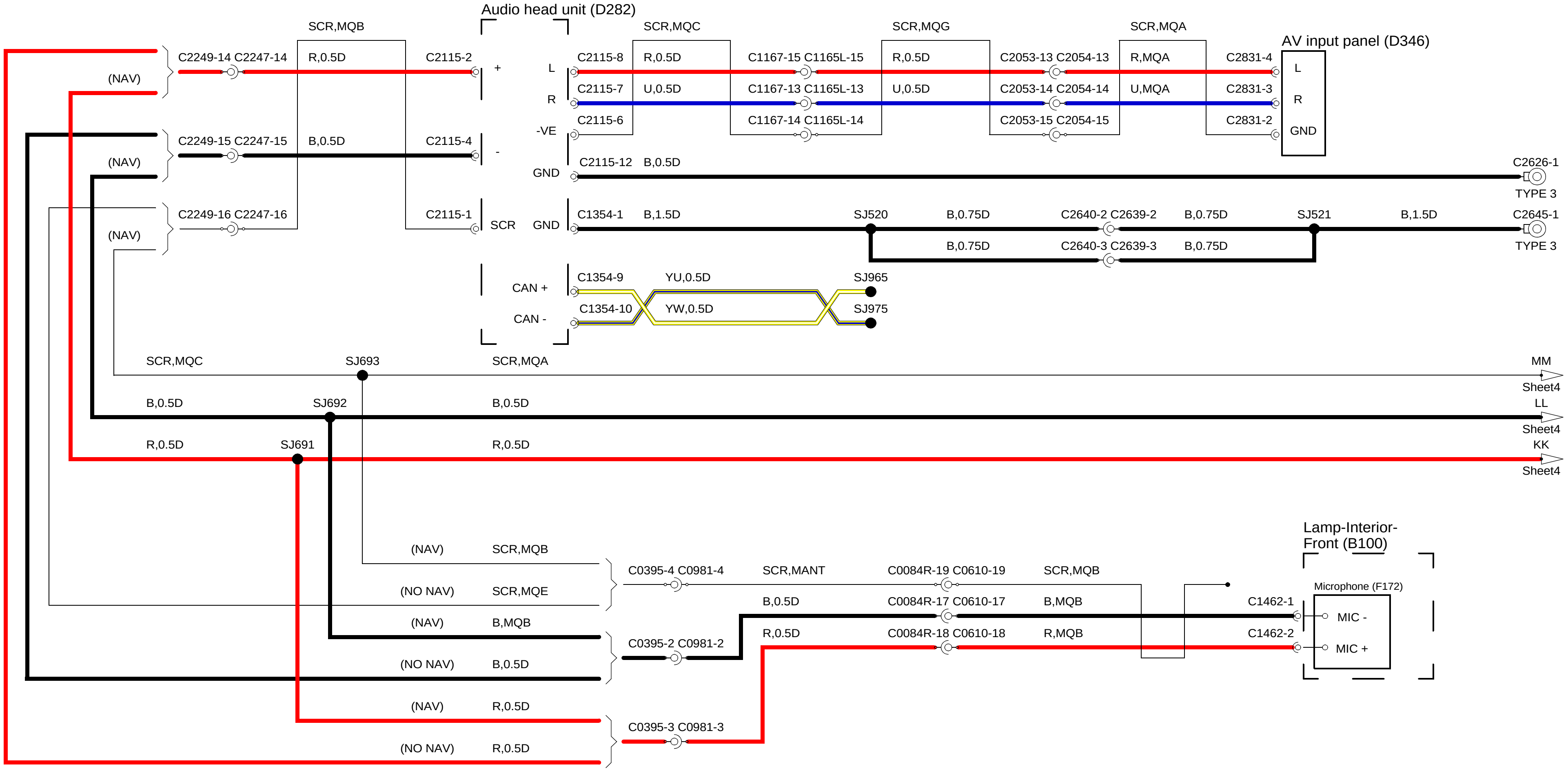

Speaker-Mid range-Front-LH (F169)
+
-
C0369-2
C0369-1
GW,MUK
G,MUK
SJ217
SJ218
GW,MUL
G,MUL
C0439-53 C0459L-53
C0439-54 C0459L-54
GW,1.5D
G,1.5D
SJ951
SJ950
GW,0.75D
G,0.75D
C0492-11
C0492-1
Amplifier-power (F142)
LF_MH+
LF_MH-
AUD 4
Speaker-High range-Front-LH (F165)
-
+
C0530-3
C0530-1
G,MAQK
GW,MAQK
Speaker-Low range-Front door-LH (F134)
-
+
C0688-1
C0688-2
G,MUM
GW,MUM
C0439-59 C0459L-59
C0439-60 C0459L-60
G,1.5D
GW,1.5D
C0491-3
C0491-11
LF_BASS-
LF_BASS+
Speaker-Mid range-Rear-LH (F167)
-
+
C0310-1
C0310-2
G,MUD
GW,MUD
SJ204
SJ205
G,MUE
GW,MUE
C0803-23 C0435-23
C0803-22 C0435-22
G,1.5D
GW,1.5D
C0491-1
C0491-9
LR_SPEAKER-
LR_SPEAKER+
LH rear high range speaker (F163)
+
-
C0679-1
C0679-3
GW,MAQA
G,MAQA
LH rear surround sound speaker (F198)
+
-
C0311-2
C0311-1
GW,MUB
G,MUB
C0610-2 C0084L-2
C0610-1 C0084L-1
GW,0.75D
G,0.75D
C0491-13
C0491-5
LS+
LS-
Center speaker (F187)
+
-
C0369-2
C0369-1
GW,0.75D
G,0.75D
C0469-3 C0467L-3
C0469-4 C0467L-4
GW,0.75D
G,0.75D
C0492-13
C0492-3
CENTRE +
CENTRE -

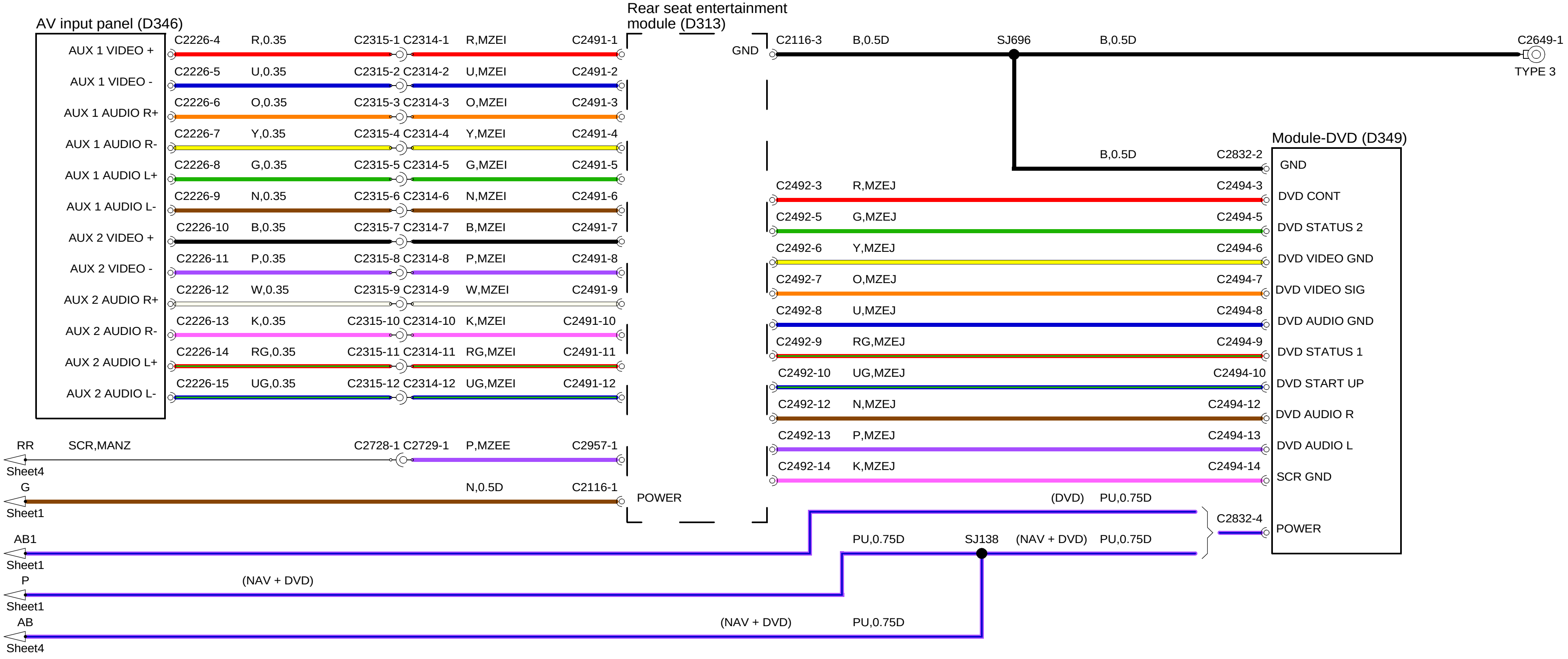

Amplifier-power (F142)
RF_MH-
RF_MH+
AUD 4
RF_BASS+
RF_BASS-
RS-
RS+
RR_SPEAKER-
LR_SPEAKER+
C0492-2
G,0.75D
SJ952
G,1.5D
C0463L-50
C0439-50
G,MUB
SJ218
G,MUK
C0369-1
C0492-12
GW,0.75D
SJ953
GW,1.5D
C0463L-51
C0439-51
GW,MUB
SJ217
GW,MUK
C0369-2
Speaker-Mid range-Front-RH (F168)
-
+
GW,MAQK
C0530-1
G,MAQK
C0530-3
Speaker-High range-Front-RH (F164)
+
-
C0491-12
GW,1.5D
C0463L-54
C0439-54
GW,MUD
C0688-2
C0491-4
G,1.5D
C0463L-53
C0439-53
G,MUD
C0688-1
Speaker-Low range-Front door-RH (F135)
+
-
C0491-6
G,0.75D
C0084L-11
C0610-11
G,MUA
C0309-1
C0491-14
GW,0.75D
C0084L-12
C0610-12
GW,MUA
C0309-2
RH rear surround sound speaker (F199)
-
+
C0491-2
G,1.5D
C0436-23
C0804-23
G,MUF
SJ204
G,MUD
C0310-1
C0491-10
GW,1.5D
C0436-22
C0804-22
GW,MUF
SJ205
GW,MUD
C0310-2
Speaker-Mid range-Rear-RH (F166)
-
+
GW,MAQA
C0679-1
G,MAQA
C0679-3
RH rear high range speaker (F162)
+
-

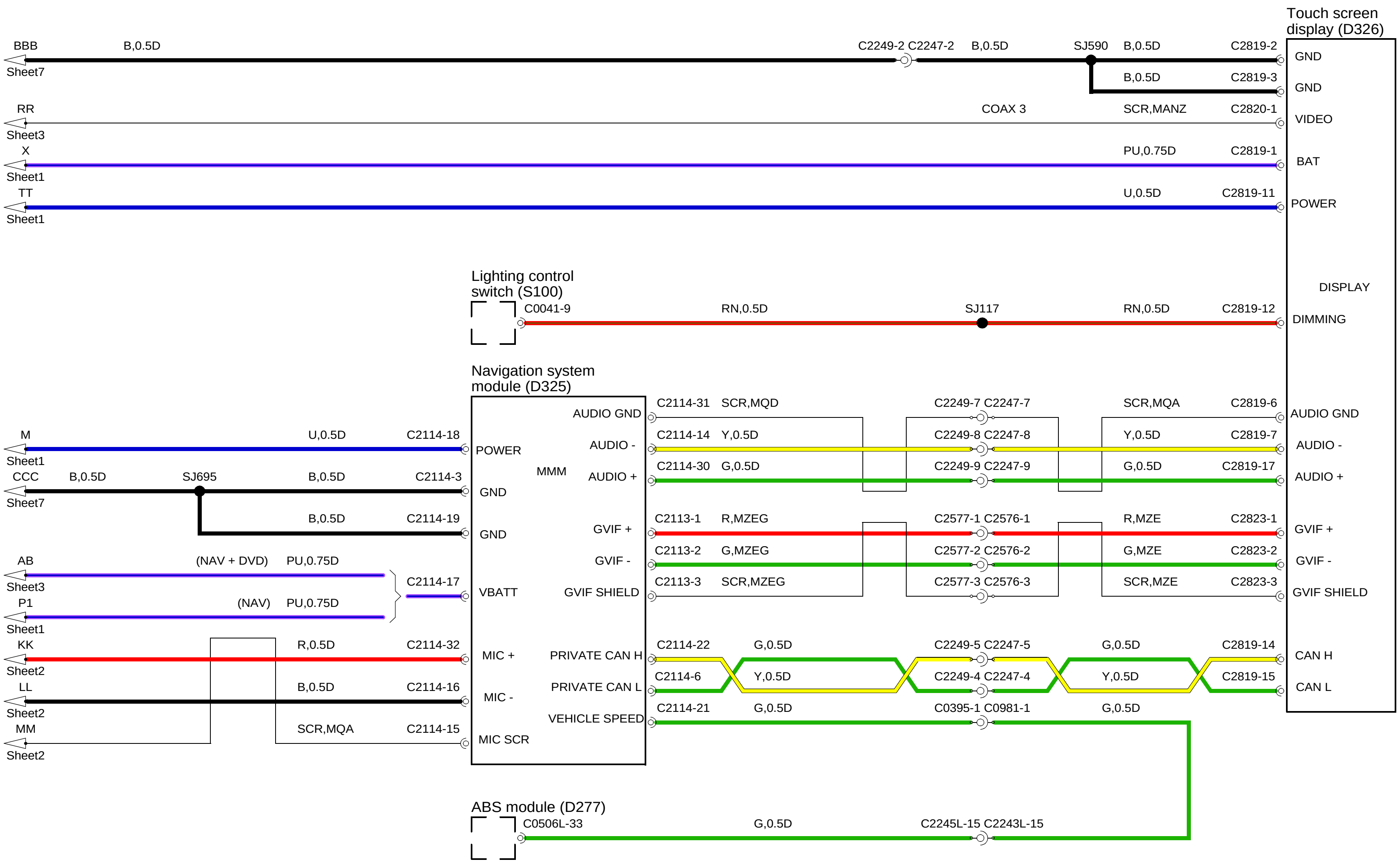

Amplifier-power (F142)
AUD 2C
LF_DOOR+
LF_DOOR-
RR_DOOR+
RR_DOOR-
LF_DOOR-
LF_DOOR+
RR_DOOR+
RR_DOOR-
C0491-13
GW,1.5D
C0459L-53 C0439-53
GW,MUL
SJ217
GW,MUN
C0688-2
C0491-5
G,1.5D
C0459L-54 C0439-54
G,MUL
SJ218
G,MUN
C0688-1
Speaker-Mid range-Front-LH (F169)
+
-
G,MAQK
C0530-3
GW,MAQK
C0530-1
Speaker-High range-Front-LH (F165)
-
+
C0491-9
GW,1.5D
C0435-22 C0803-22
GW,MUE
SJ205
GW,MUD
C0310-2
C0491-1
G,1.5D
C0435-23 C0803-23
G,MUE
SJ204
G,MUD
C0310-1
Speaker-Mid range-Rear-LH (F167)
+
-
GW,MAQA
C0679-1
G,MAQA
C0679-3
LH rear high range speaker (F163)
+
-
C0491-6
G,1.5D
C0463L-50 C0439-50
G,MUB
SJ218
G,MUN
C0688-1
C0491-14
GW,1.5D
C0463L-51 C0439-51
GW,MUB
SJ217
GW,MUN
C0688-2
Speaker-Mid range-Front-RH (F168)
RH -
RH +
G,MAQK
C0530-1
GW,MAQK
C0530-3
Speaker-High range-Front-RH (F164)
RH +
RH -
C0491-10
GW,1.5D
C0436-22 C0804-22
GW,MUF
SJ205
GW,MUD
C0310-2
C0491-2
G,1.5D
C0436-23 C0804-23
G,MUF
SJ204
G,MUD
C0310-1
Speaker-Mid range-Rear-RH (F166)
RH +
RH -
C0679-3
GW,MAQA
G,MAQA
C0679-1
RH rear high range speaker (F162)
RH -
RH +

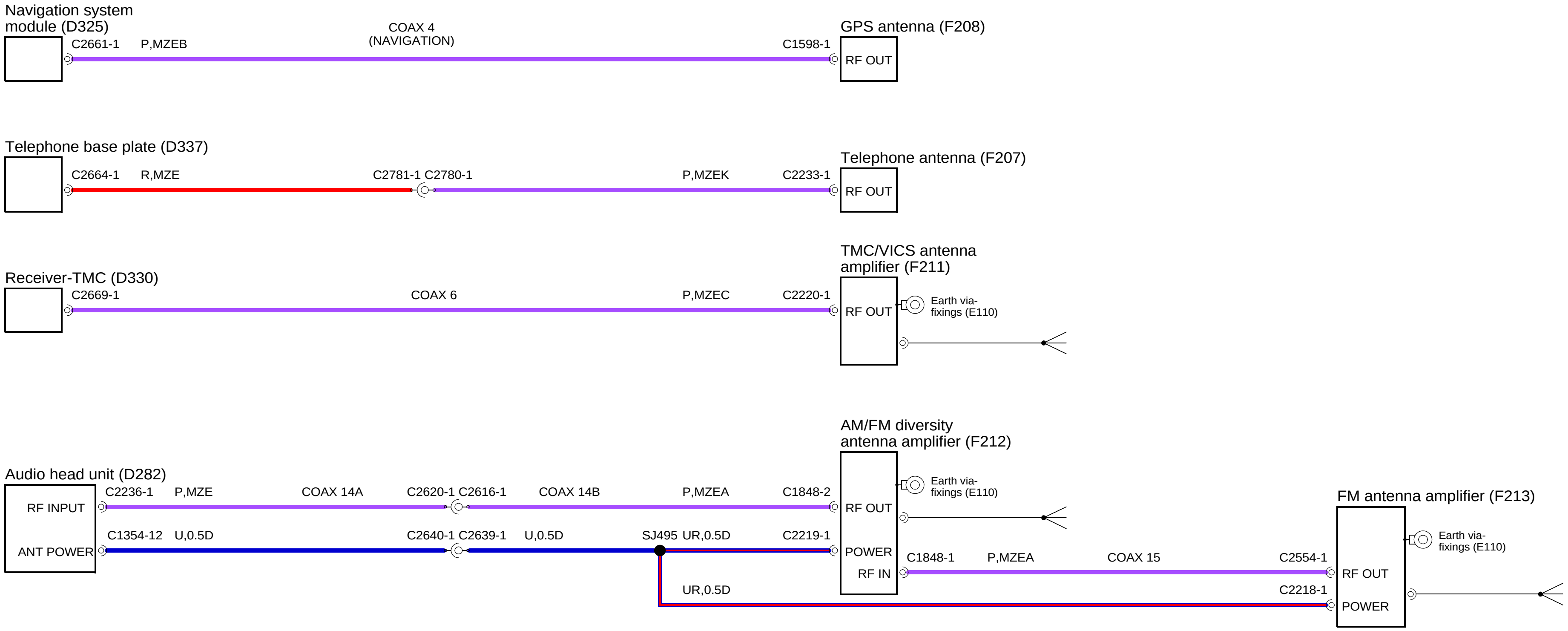

Voice recognition module (D262)
Telephone base plate (D337)
CRADLE ID
C2777-51
RB,0.5D
C2774-15 C2775-15
RB,0.5D
C2776-15
Cradle ID
V-NOKIA
C2777-42
RG,0.5D
C2774-14 C2775-14
RG,0.5D
C2776-5
V NOKIA
Phone EAR +
C2777-37
G,0.5D
C2774-1 C2775-1
G,MAIA
C2776-1
Phone EAR +
Phone EAR -
C2777-38
R,0.5D
C2774-2 C2775-2
R,MAIA
C2776-2
Phone EAR -
Phone MIC +
C2777-39
U,0.5D
C2774-3 C2775-3
U,MAIB
C2776-3
Phone MIC +
Phone MIC -
C2777-40
Y,0.5D
C2774-4 C2775-4
Y,MAIB
C2776-4
Phone MIC -
WAKE Phone
C2777-41
YG,0.35D
C2774-5 C2775-5
YG,0.35D
C2776-14
WAKE Phone
PCI
C2777-45
YB,0.35D
C2774-6 C2775-6
YB,0.35D
C2776-6
PCI
OO
Sheet1
U,0.35D
C2777-16
POWER
Ser TX +
C2777-47
R,0.5D
C2774-7 C2775-7
R,MAIC
C2776-7
Ser TX +
Ser TX -
C2777-48
G,0.5D
C2774-8 C2775-8
G,MAIC
C2776-8
Ser TX -
Ser RX +
C2777-49
Y,0.5D
C2774-9 C2775-9
Y,MAID
C2776-9
Ser RX +
Ser RX -
C2777-50
U,0.5D
C2774-10 C2775-10
U,MAID
C2776-10
Ser RX -
Cradle supply
C2777-52
N,0.35D
C2774-11 C2775-11
N,0.35D
C2776-11
Cradle supply
SS
R,0.75D
Sheet1
C2247-3 C2249-3
R,0.75D
Phone/Charge GND
C2777-53
W,0.75D
C2774-12 C2775-12
W,0.75D
C2776-12
Phone/Charge GND
V Charge
C2777-54
U,0.75D
C2774-13 C2775-13
U,0.75D
C2776-13
V Charge
SJ299
R,0.75D
C2777-18
VBATT
GND
C2777-33
B,0.75D
SJ694
B,0.75D
C2647-1
TYPE 3
R,0.75D
C2777-17
VBATT
GND
C2777-34
B,0.75D
Receiver-TMC (D330)
R,0.5D
C2157-1
POWER
AM/FM
Earth via-fixings (E110)
Module-Tuner-DAB/SDARS (D350)
UU
Sheet1
U,0.5D
C2158-1
POWER
DAB/SDAR
GND
C2158-2
B,0.5D
C2648-1
TYPE 3

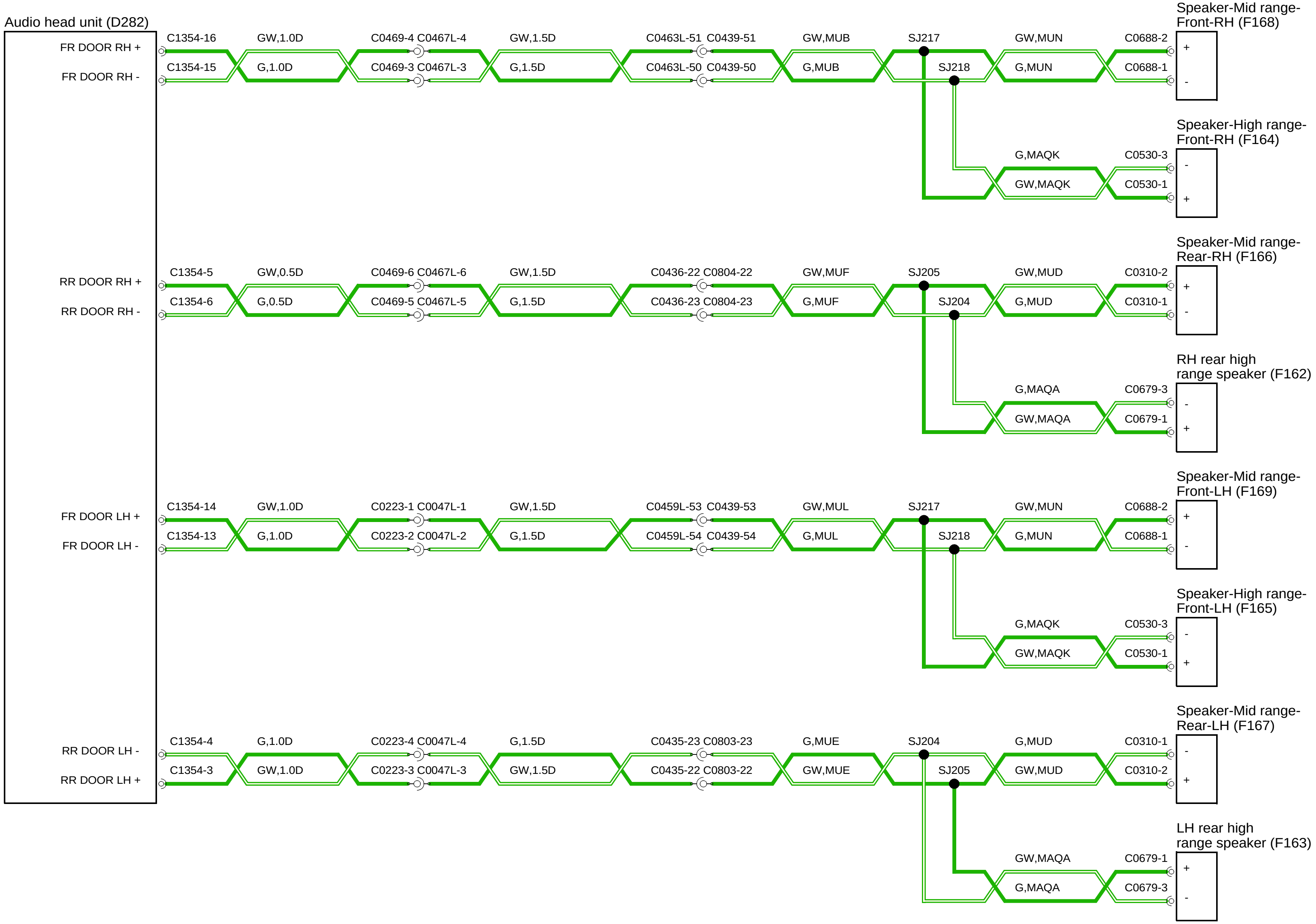

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Audio head unit (D282)
SWS 1
GND
C1354-18
SB,0.35D
C0082-4
C1354-7
SR,0.35D
C0082-7
Clock spring (S227)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone-Send (Y281)
Phone-End (Y282)
Mode (Y283)
BATT
C1354-11
PU,1.5D
RLY CTRL
C1354-8
SJ131
PU,0.75D
C2247-12 C2249-12
(DVD)
PU,0.75D
AB1
Sheet3
(NAV + DVD)
PU,0.75D
P
Sheet3
(NAV)
PU,0.75D
P1
Sheet4
Central junction-box (P101)
C0582-34
RU,0.5D
FUSE 53P
15.0 Amps
C0582-38
PU,1.5D
PU,0.75D
X
Sheet4
FUSE 58P
10.0 Amps
C0582-13
U,1.0D
SJ998
U,0.5D
TT
Sheet4
Relay-Infotainment (R249)
C0583L-22
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet4
U,0.35D
OO
Sheet7
U,0.5D
UU
Sheet7
FUSE 57P
10.0 Amps
C0582-12
N,0.75D
C2247-1 C2249-1
N,0.5D
G
Sheet3
FUSE 52P
5.0 Amps
C0582-41
R,0.75D
SS
Sheet7

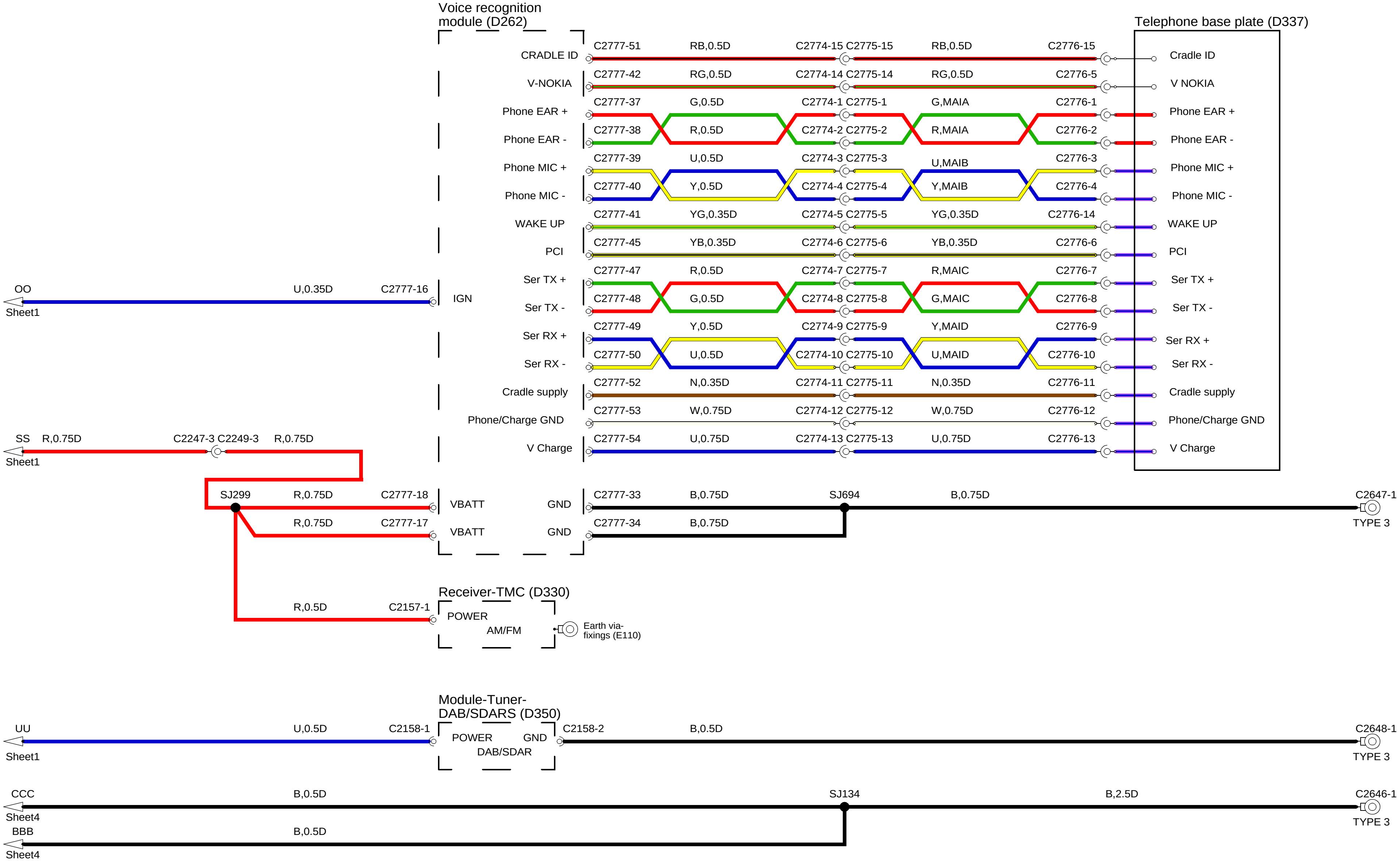

Audio head unit (D282)
SCR,MQB
SCR,MQC
SCR,MQG
SCR,MQA
AV input panel (D346)
C2249-14 C2247-14
R,0.5D
C2115-2
+
L
C2115-8
R,0.5D
C1167-15 C1165L-15
R,0.5D
C2053-13 C2054-13
R,MQA
C2831-4
L
(NAV)
R
C2115-7
U,0.5D
C1167-13 C1165L-13
U,0.5D
C2053-14 C2054-14
U,MQA
C2831-3
R
-VE
C2115-6
C1167-14 C1165L-14
C2053-15 C2054-15
C2831-2
GND
C2249-15 C2247-15
B,0.5D
C2115-4
-
(NAV)
GND
C2115-12
B,0.5D
C2626-1
TYPE 3
C2249-16 C2247-16
C2115-1
SCR
GND
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
(NAV)
B,0.75D
C2640-3 C2639-3
B,0.75D
TYPE 3
C1354-9
YU,0.5D
SJ965
CAN +
C1354-10
YW,0.5D
SJ975
CAN -
SCR,MQC
SJ693
SCR,MQA
MM
Sheet4
B,0.5D
SJ692
B,0.5D
LL
Sheet4
R,0.5D
SJ691
R,0.5D
KK
Sheet4
Lamp-Interior-Front (B100)
(NAV)
SCR,MQB
C0395-4 C0981-4
SCR,MANT
C0084R-19 C0610-19
SCR,MQB
Microphone (F172)
(NO NAV)
SCR,MQE
B,0.5D
C0084R-17 C0610-17
B,MQB
C1462-1
MIC -
(NAV)
B,MQB
C0395-2 C0981-2
R,0.5D
C0084R-18 C0610-18
R,MQB
C1462-2
MIC +
(NO NAV)
B,0.5D
(NAV)
R,0.5D
C0395-3 C0981-3
(NO NAV)
R,0.5D

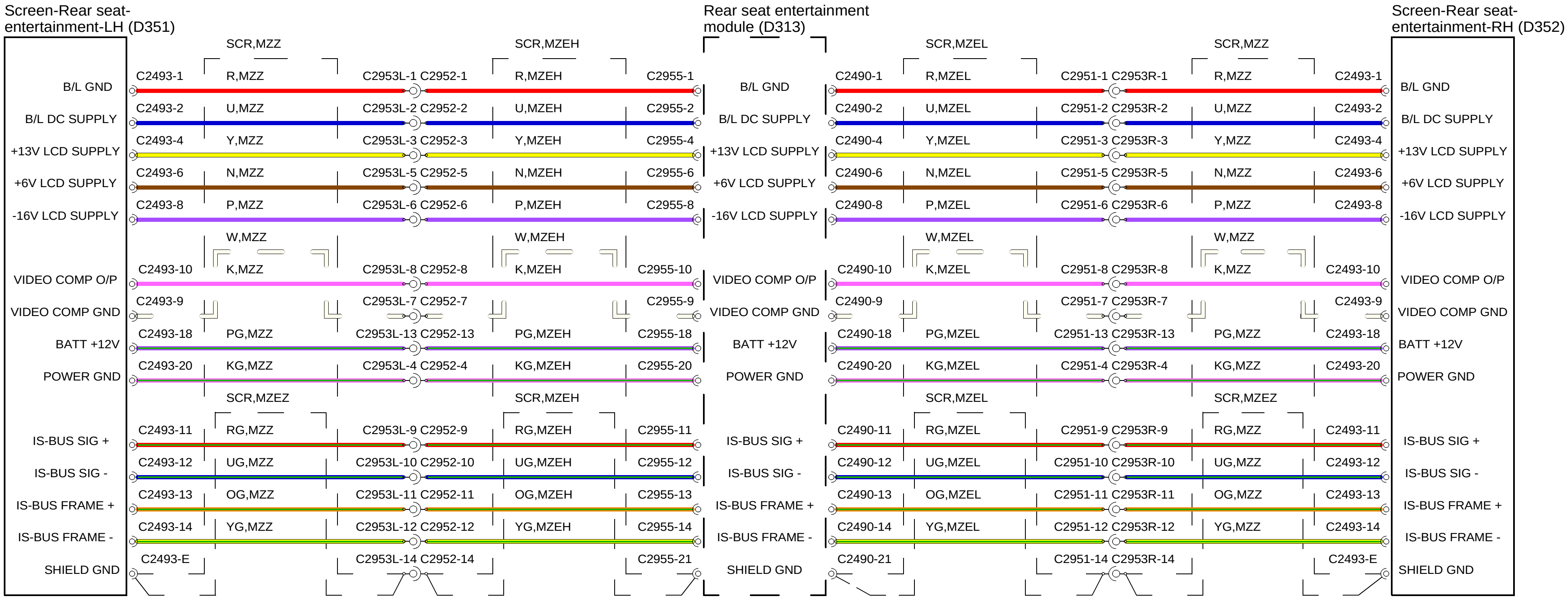

AV input panel (D346)
AUX 1 VIDEO +
AUX 1 VIDEO -
AUX 1 AUDIO R+
AUX 1 AUDIO R-
AUX 1 AUDIO L+
AUX 1 AUDIO L-
AUX 2 VIDEO +
AUX 2 VIDEO -
AUX 2 AUDIO R+
AUX 2 AUDIO R-
AUX 2 AUDIO L+
AUX 2 AUDIO L-
C2226-4 R,0.35 C2315-1 C2314-1 R,MZEI C2491-1
C2226-5 U,0.35 C2315-2 C2314-2 U,MZEI C2491-2
C2226-6 O,0.35 C2315-3 C2314-3 O,MZEI C2491-3
C2226-7 Y,0.35 C2315-4 C2314-4 Y,MZEI C2491-4
C2226-8 G,0.35 C2315-5 C2314-5 G,MZEI C2491-5
C2226-9 N,0.35 C2315-6 C2314-6 N,MZEI C2491-6
C2226-10 B,0.35 C2315-7 C2314-7 B,MZEI C2491-7
C2226-11 P,0.35 C2315-8 C2314-8 P,MZEI C2491-8
C2226-12 W,0.35 C2315-9 C2314-9 W,MZEI C2491-9
C2226-13 K,0.35 C2315-10 C2314-10 K,MZEI C2491-10
C2226-14 RG,0.35 C2315-11 C2314-11 RG,MZEI C2491-11
C2226-15 UG,0.35 C2315-12 C2314-12 UG,MZEI C2491-12
Rear seat entertainment module (D313)
GND
POWER
C2116-3 B,0.5D SJ696 B,0.5D C2649-1
TYPE 3
B,0.5D C2832-2
Module-DVD (D349)
GND
DVD CONT
DVD STATUS 2
DVD VIDEO GND
DVD VIDEO SIG
DVD AUDIO GND
DVD STATUS 1
DVD START UP
DVD AUDIO R
DVD AUDIO L
SCR GND
POWER
C2492-3 R,MZEJ C2494-3
C2492-5 G,MZEJ C2494-5
C2492-6 Y,MZEJ C2494-6
C2492-7 O,MZEJ C2494-7
C2492-8 U,MZEJ C2494-8
C2492-9 RG,MZEJ C2494-9
C2492-10 UG,MZEJ C2494-10
C2492-12 N,MZEJ C2494-12
C2492-13 P,MZEJ C2494-13
C2492-14 K,MZEJ C2494-14
RR SCR,MANZ C2728-1 C2729-1 P,MZEE C2957-1
Sheet4
G N,0.5D C2116-1
Sheet1
(DVD) PU,0.75D
C2832-4
AB1
Sheet1
PU,0.75D SJ138 (NAV + DVD) PU,0.75D
P (NAV + DVD)
Sheet1
AB (NAV + DVD) PU,0.75D
Sheet4

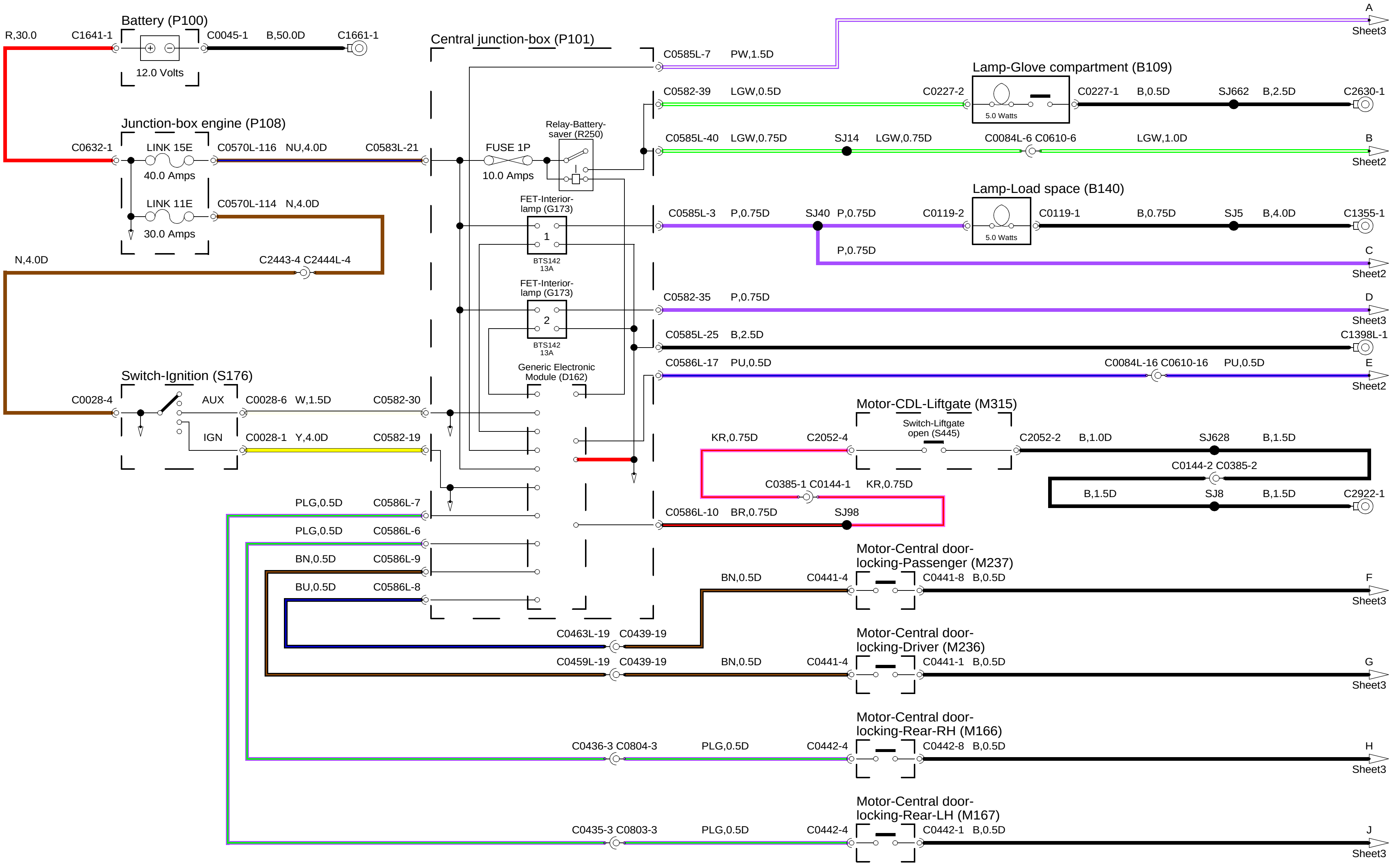

Touch screen display (D326)
BBB
Sheet7
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
RR
Sheet3
COAX 3
SCR,MANZ
C2820-1
VIDEO
X
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
POWER
DISPLAY
DIMMING
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
Navigation system module (D325)
AUDIO GND
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,0.5D
C2249-8 C2247-8
Y,0.5D
C2819-7
AUDIO -
MMM
AUDIO +
C2114-30
G,0.5D
C2249-9 C2247-9
G,0.5D
C2819-17
AUDIO +
CCC
Sheet7
B,0.5D
SJ695
B,0.5D
C2114-3
GND
B,0.5D
C2114-19
GND
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2823-1
GVIF +
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2823-2
GVIF -
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MZE
C2823-3
GVIF SHIELD
AB
Sheet3
(NAV + DVD)
PU,0.75D
C2114-17
VBATT
P1
Sheet1
(NAV)
PU,0.75D
KK
Sheet2
R,0.5D
C2114-32
MIC +
PRIVATE CAN H
C2114-22
G,0.5D
C2249-5 C2247-5
G,0.5D
C2819-14
CAN H
LL
Sheet2
B,0.5D
C2114-16
MIC -
PRIVATE CAN L
C2114-6
Y,0.5D
C2249-4 C2247-4
Y,0.5D
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR
VEHICLE SPEED
C2114-21
G,0.5D
C0395-1 C0981-1
G,0.5D
ABS module (D277)
C0506L-33
G,0.5D
C2245L-15 C2243L-15

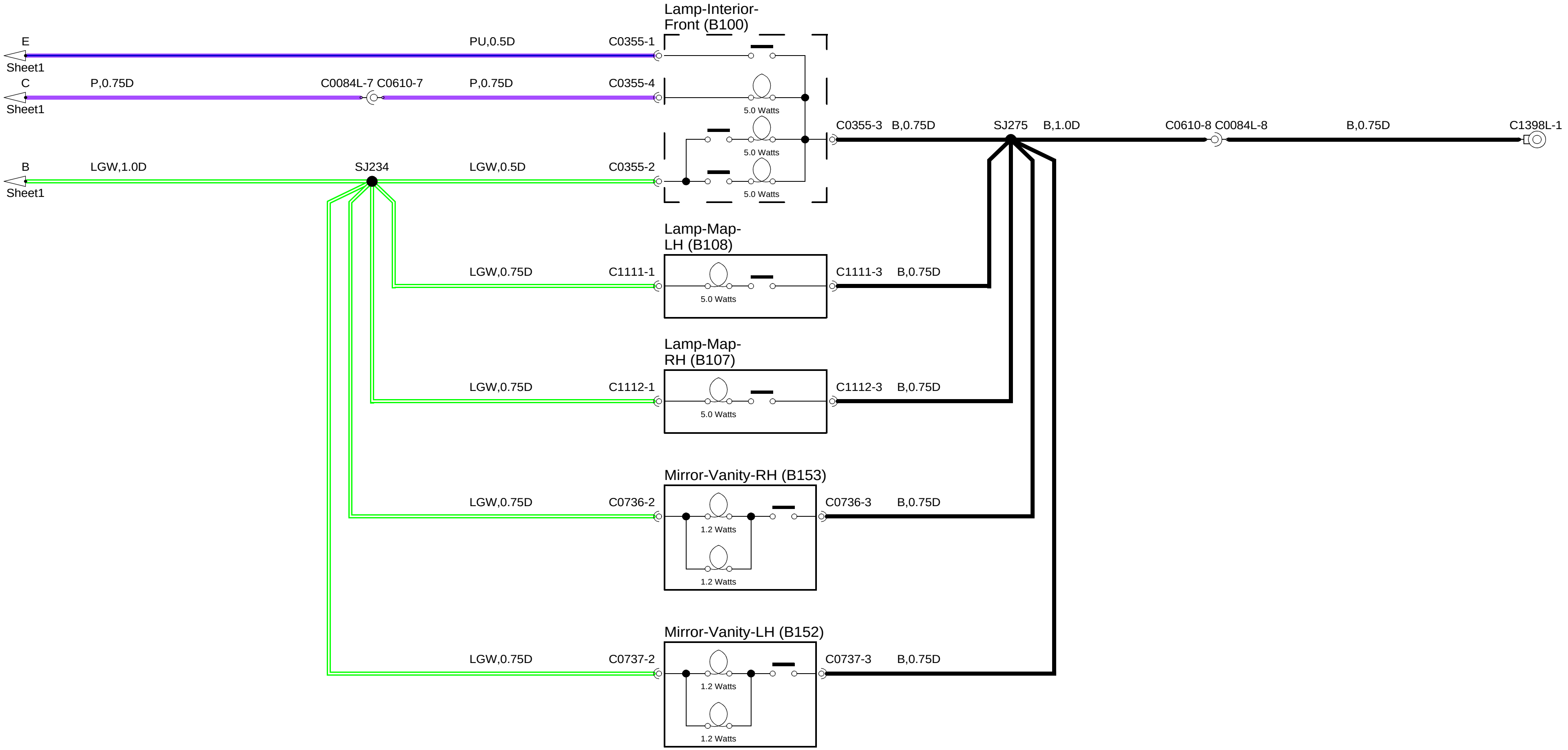

Navigation system module (D325)
C2661-1
P,MZEB
COAX 4 (NAVIGATION)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Receiver-TMC (D330)
C2669-1
COAX 6
P,MZEC
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via-fixings (E110)
AM/FM diversity antenna amplifier (F212)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
COAX 14A
C2620-1 C2616-1
COAX 14B
P,MZEA
C1848-2
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495
UR,0.5D
C2219-1
RF OUT
POWER
RF IN
Earth via-fixings (E110)
C1848-1
P,MZEA
COAX 15
C2554-1
UR,0.5D
C2218-1
FM antenna amplifier (F213)
RF OUT
POWER
Earth via-fixings (E110)

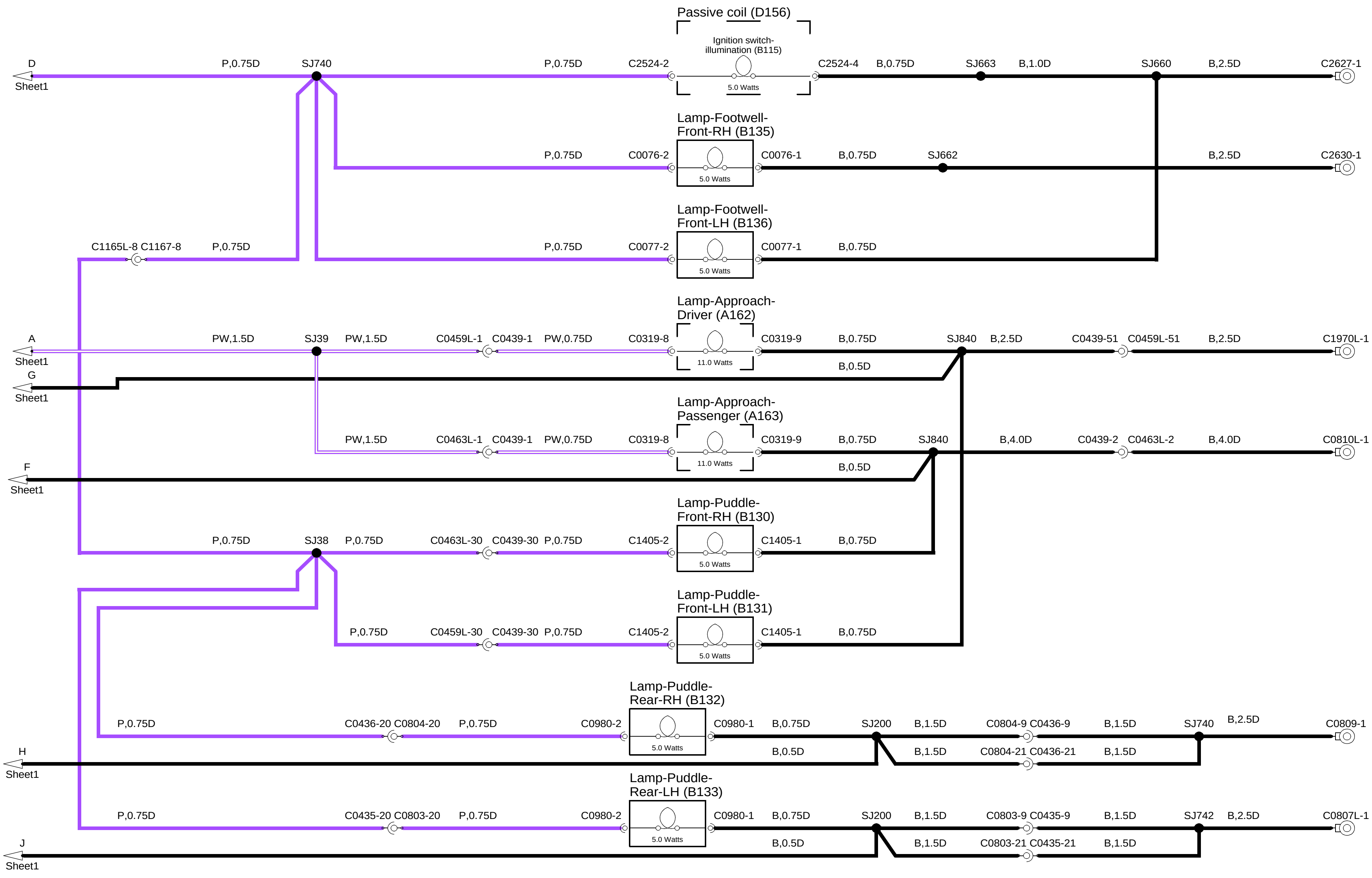

Audio head unit (D282)
FR DOOR RH +
FR DOOR RH -
RR DOOR RH +
RR DOOR RH -
FR DOOR LH +
FR DOOR LH -
RR DOOR LH -
RR DOOR LH +
C1354-16
C1354-15
GW,1.0D
G,1.0D
C0469-4 C0467L-4
C0469-3 C0467L-3
GW,1.5D
G,1.5D
C0463L-51 C0439-51
C0463L-50 C0439-50
GW,MUB
G,MUB
SJ217
SJ218
GW,MUN
G,MUN
C0688-2
C0688-1
Speaker-Mid range-Front-RH (F168)
+
-
G,MAQK
GW,MAQK
C0530-3
C0530-1
Speaker-High range-Front-RH (F164)
-
+
C1354-5
C1354-6
GW,0.5D
G,0.5D
C0469-6 C0467L-6
C0469-5 C0467L-5
GW,1.5D
G,1.5D
C0436-22 C0804-22
C0436-23 C0804-23
GW,MUF
G,MUF
SJ205
SJ204
GW,MUD
G,MUD
C0310-2
C0310-1
Speaker-Mid range-Rear-RH (F166)
+
-
G,MAQA
GW,MAQA
C0679-3
C0679-1
RH rear high range speaker (F162)
-
+
C1354-14
C1354-13
GW,1.0D
G,1.0D
C0223-1 C0047L-1
C0223-2 C0047L-2
GW,1.5D
G,1.5D
C0459L-53 C0439-53
C0459L-54 C0439-54
GW,MUL
G,MUL
SJ217
SJ218
GW,MUN
G,MUN
C0688-2
C0688-1
Speaker-Mid range-Front-LH (F169)
+
-
G,MAQK
GW,MAQK
C0530-3
C0530-1
Speaker-High range-Front-LH (F165)
-
+
C1354-4
C1354-3
G,1.0D
GW,1.0D
C0223-4 C0047L-4
C0223-3 C0047L-3
G,1.5D
GW,1.5D
C0435-23 C0803-23
C0435-22 C0803-22
G,MUE
GW,MUE
SJ204
SJ205
G,MUD
GW,MUD
C0310-1
C0310-2
Speaker-Mid range-Rear-LH (F167)
-
+
GW,MAQA
G,MAQA
C0679-1
C0679-3
LH rear high range speaker (F163)
+
-

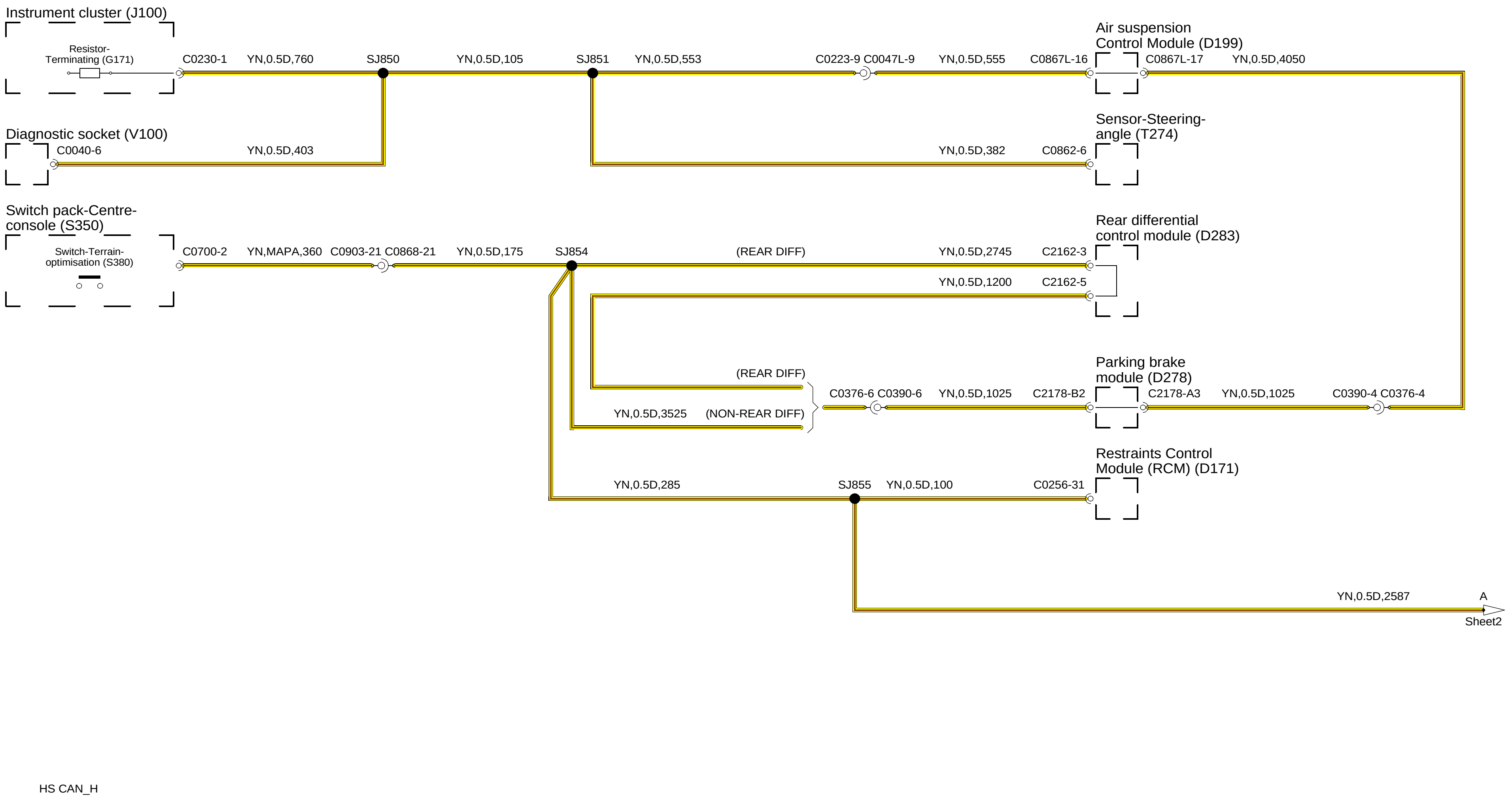

Voice recognition module (D262)
Telephone base plate (D337)
CRADLE ID
C2777-51
RB,0.5D
C2774-15 C2775-15
RB,0.5D
C2776-15
Cradle ID
V-NOKIA
C2777-42
RG,0.5D
C2774-14 C2775-14
RG,0.5D
C2776-5
V NOKIA
Phone EAR +
C2777-37
G,0.5D
C2774-1 C2775-1
G,MAIA
C2776-1
Phone EAR +
Phone EAR -
C2777-38
R,0.5D
C2774-2 C2775-2
R,MAIA
C2776-2
Phone EAR -
Phone MIC +
C2777-39
U,0.5D
C2774-3 C2775-3
U,MAIB
C2776-3
Phone MIC +
Phone MIC -
C2777-40
Y,0.5D
C2774-4 C2775-4
Y,MAIB
C2776-4
Phone MIC -
WAKE UP
C2777-41
YG,0.35D
C2774-5 C2775-5
YG,0.35D
C2776-14
WAKE UP
PCI
C2777-45
YB,0.35D
C2774-6 C2775-6
YB,0.35D
C2776-6
PCI
Ser TX +
C2777-47
R,0.5D
C2774-7 C2775-7
R,MAIC
C2776-7
Ser TX +
Ser TX -
C2777-48
G,0.5D
C2774-8 C2775-8
G,MAIC
C2776-8
Ser TX -
Ser RX +
C2777-49
Y,0.5D
C2774-9 C2775-9
Y,MAID
C2776-9
Ser RX +
Ser RX -
C2777-50
U,0.5D
C2774-10 C2775-10
U,MAID
C2776-10
Ser RX -
Cradle supply
C2777-52
N,0.35D
C2774-11 C2775-11
N,0.35D
C2776-11
Cradle supply
Phone/Charge GND
C2777-53
W,0.75D
C2774-12 C2775-12
W,0.75D
C2776-12
Phone/Charge GND
V Charge
C2777-54
U,0.75D
C2774-13 C2775-13
U,0.75D
C2776-13
V Charge
OO
Sheet1
U,0.35D
C2777-16
IGN
SS
R,0.75D
Sheet1
C2247-3 C2249-3
R,0.75D
SJ299
R,0.75D
C2777-18
VBATT
GND
C2777-33
B,0.75D
SJ694
B,0.75D
C2647-1
TYPE 3
R,0.75D
C2777-17
VBATT
GND
C2777-34
B,0.75D
Receiver-TMC (D330)
R,0.5D
C2157-1
POWER
AM/FM
Earth via-
fixings (E110)
Module-Tuner-
DAB/SDARS (D350)
UU
Sheet1
U,0.5D
C2158-1
POWER
GND
DAB/SDAR
C2158-2
B,0.5D
C2648-1
TYPE 3
CCC
Sheet4
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
BBB
Sheet4
B,0.5D

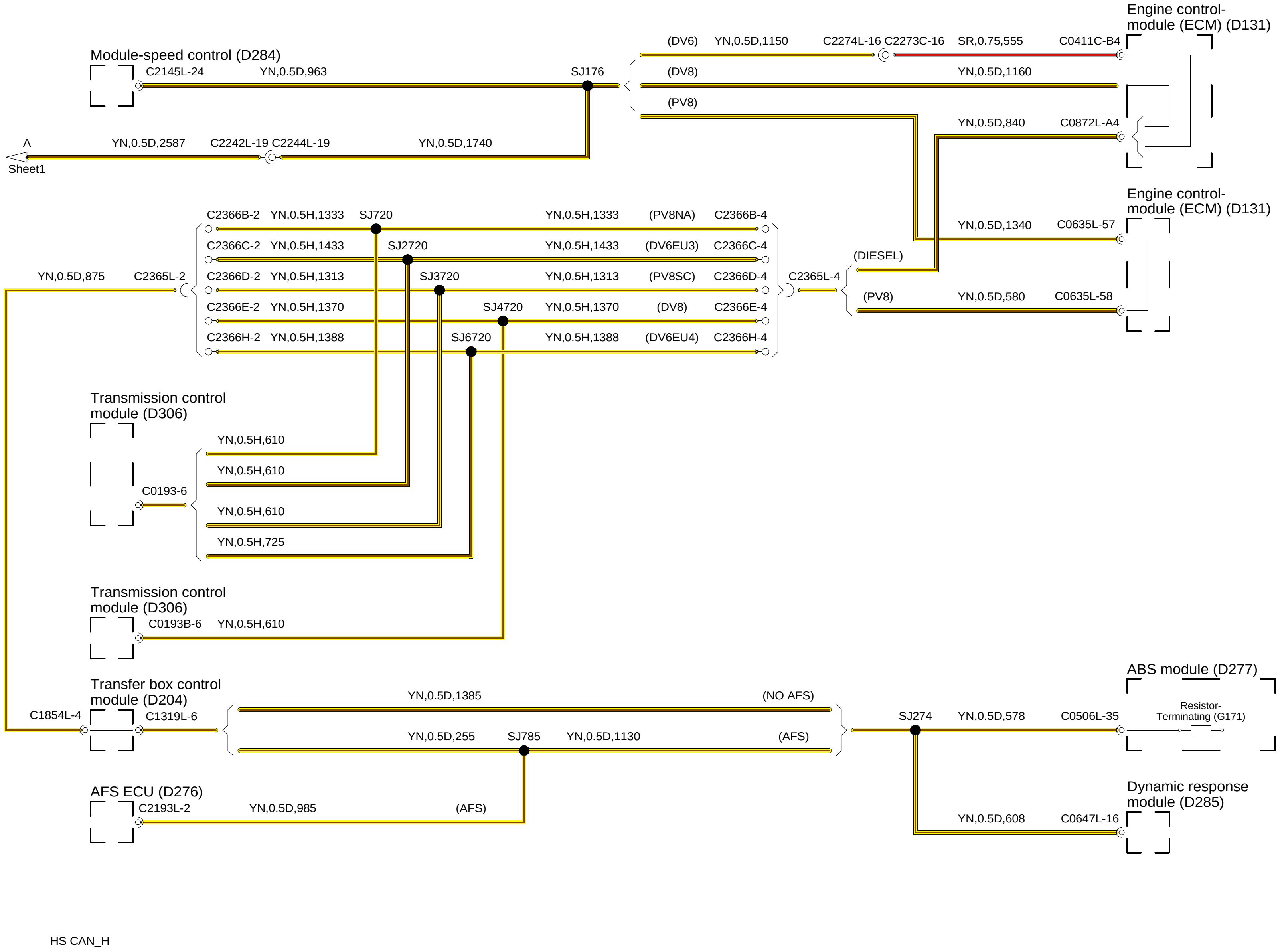

Screen-Rear seat-entertainment-LH (D351)
Rear seat entertainment module (D313)
Screen-Rear seat-entertainment-RH (D352)
SCR,MZZ
SCR,MZEH
SCR,MZEL
SCR,MZZ
B/L GND
C2493-1 R,MZZ C2953L-1 C2952-1 R,MZEH C2955-1
B/L GND
C2490-1 R,MZEL C2951-1 C2953R-1 R,MZZ C2493-1
B/L GND
B/L DC SUPPLY
C2493-2 U,MZZ C2953L-2 C2952-2 U,MZEH C2955-2
B/L DC SUPPLY
C2490-2 U,MZEL C2951-2 C2953R-2 U,MZZ C2493-2
B/L DC SUPPLY
+13V LCD SUPPLY
C2493-4 Y,MZZ C2953L-3 C2952-3 Y,MZEH C2955-4
+13V LCD SUPPLY
C2490-4 Y,MZEL C2951-3 C2953R-3 Y,MZZ C2493-4
+13V LCD SUPPLY
+6V LCD SUPPLY
C2493-6 N,MZZ C2953L-5 C2952-5 N,MZEH C2955-6
+6V LCD SUPPLY
C2490-6 N,MZEL C2951-5 C2953R-5 N,MZZ C2493-6
+6V LCD SUPPLY
-16V LCD SUPPLY
C2493-8 P,MZZ C2953L-6 C2952-6 P,MZEH C2955-8
-16V LCD SUPPLY
C2490-8 P,MZEL C2951-6 C2953R-6 P,MZZ C2493-8
-16V LCD SUPPLY
W,MZZ
W,MZEH
W,MZEL
W,MZZ
VIDEO COMP O/P
C2493-10 K,MZZ C2953L-8 C2952-8 K,MZEH C2955-10
VIDEO COMP O/P
C2490-10 K,MZEL C2951-8 C2953R-8 K,MZZ C2493-10
VIDEO COMP O/P
VIDEO COMP GND
C2493-9 C2953L-7 C2952-7 C2955-9
VIDEO COMP GND
C2490-9 C2951-7 C2953R-7 C2493-9
VIDEO COMP GND
BATT +12V
C2493-18 PG,MZZ C2953L-13 C2952-13 PG,MZEH C2955-18
BATT +12V
C2490-18 PG,MZEL C2951-13 C2953R-13 PG,MZZ C2493-18
BATT +12V
POWER GND
C2493-20 KG,MZZ C2953L-4 C2952-4 KG,MZEH C2955-20
POWER GND
C2490-20 KG,MZEL C2951-4 C2953R-4 KG,MZZ C2493-20
POWER GND
SCR,MZEZ
SCR,MZEH
SCR,MZEL
SCR,MZEZ
IS-BUS SIG +
C2493-11 RG,MZZ C2953L-9 C2952-9 RG,MZEH C2955-11
IS-BUS SIG +
C2490-11 RG,MZEL C2951-9 C2953R-9 RG,MZZ C2493-11
IS-BUS SIG +
IS-BUS SIG -
C2493-12 UG,MZZ C2953L-10 C2952-10 UG,MZEH C2955-12
IS-BUS SIG -
C2490-12 UG,MZEL C2951-10 C2953R-10 UG,MZZ C2493-12
IS-BUS SIG -
IS-BUS FRAME +
C2493-13 OG,MZZ C2953L-11 C2952-11 OG,MZEH C2955-13
IS-BUS FRAME +
C2490-13 OG,MZEL C2951-11 C2953R-11 OG,MZZ C2493-13
IS-BUS FRAME +
IS-BUS FRAME -
C2493-14 YG,MZZ C2953L-12 C2952-12 YG,MZEH C2955-14
IS-BUS FRAME -
C2490-14 YG,MZEL C2951-12 C2953R-12 YG,MZZ C2493-14
IS-BUS FRAME -
SHIELD GND
C2493-E C2953L-14 C2952-14 C2955-21
SHIELD GND
C2490-21 C2951-14 C2953R-14 C2493-E
SHIELD GND

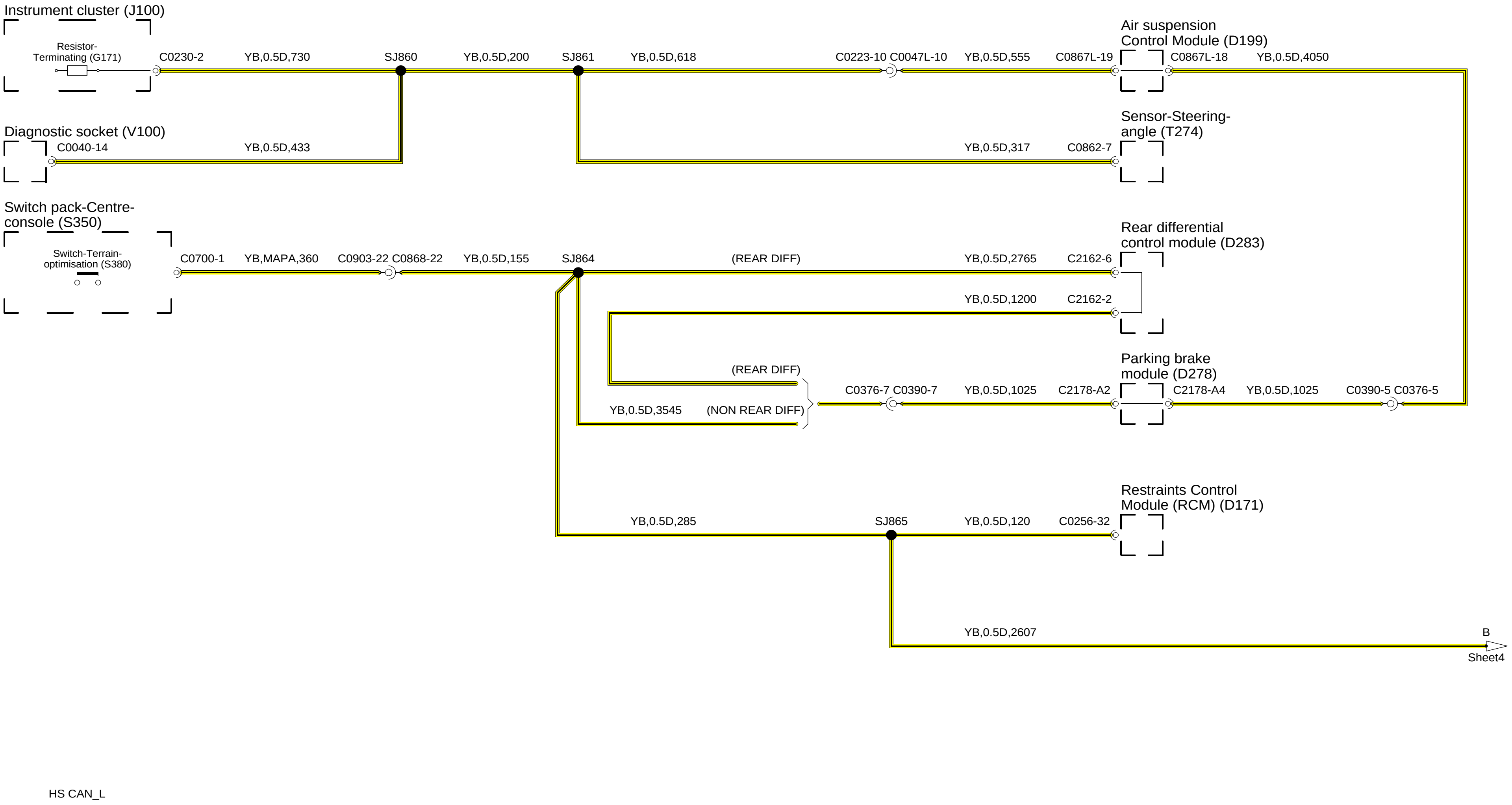

A
Sheet3
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
C0585L-7
PW,1.5D
Lamp-Glove compartment (B109)
C0582-39
LGW,0.5D
C0227-2
5.0 Watts
C0227-1
B,0.5D
SJ662
B,2.5D
C2630-1
Junction-box engine (P108)
Relay-Battery-saver (R250)
C0632-1
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
C0583L-21
FUSE 1P
10.0 Amps
C0585L-40
LGW,0.75D
SJ14
LGW,0.75D
C0084L-6 C0610-6
LGW,1.0D
B
Sheet2
Lamp-Load space (B140)
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
FET-Interior-lamp (G173)
1
BTS142
13A
C0585L-3
P,0.75D
SJ40
P,0.75D
C0119-2
5.0 Watts
C0119-1
B,0.75D
SJ5
B,4.0D
C1355-1
N,4.0D
C2443-4 C2444L-4
P,0.75D
C
Sheet2
FET-Interior-lamp (G173)
2
BTS142
13A
C0582-35
P,0.75D
D
Sheet3
C0585L-25
B,2.5D
C1398L-1
Generic Electronic Module (D162)
C0586L-17
PU,0.5D
C0084L-16 C0610-16
PU,0.5D
E
Sheet2
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0582-30
IGN
C0028-1
Y,4.0D
C0582-19
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0144-2 C0385-2
C0385-1 C0144-1
KR,0.75D
B,1.5D
SJ8
B,1.5D
C2922-1
PLG,0.5D
C0586L-7
C0586L-10
BR,0.75D
SJ98
PLG,0.5D
C0586L-6
Motor-Central door-locking-Passenger (M237)
BN,0.5D
C0586L-9
BN,0.5D
C0441-4
C0441-8
B,0.5D
F
Sheet3
BU,0.5D
C0586L-8
C0463L-19
C0439-19
Motor-Central door-locking-Driver (M236)
C0459L-19
C0439-19
BN,0.5D
C0441-4
C0441-1
B,0.5D
G
Sheet3
Motor-Central door-locking-Rear-RH (M166)
C0436-3 C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
H
Sheet3
Motor-Central door-locking-Rear-LH (M167)
C0435-3 C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
J
Sheet3

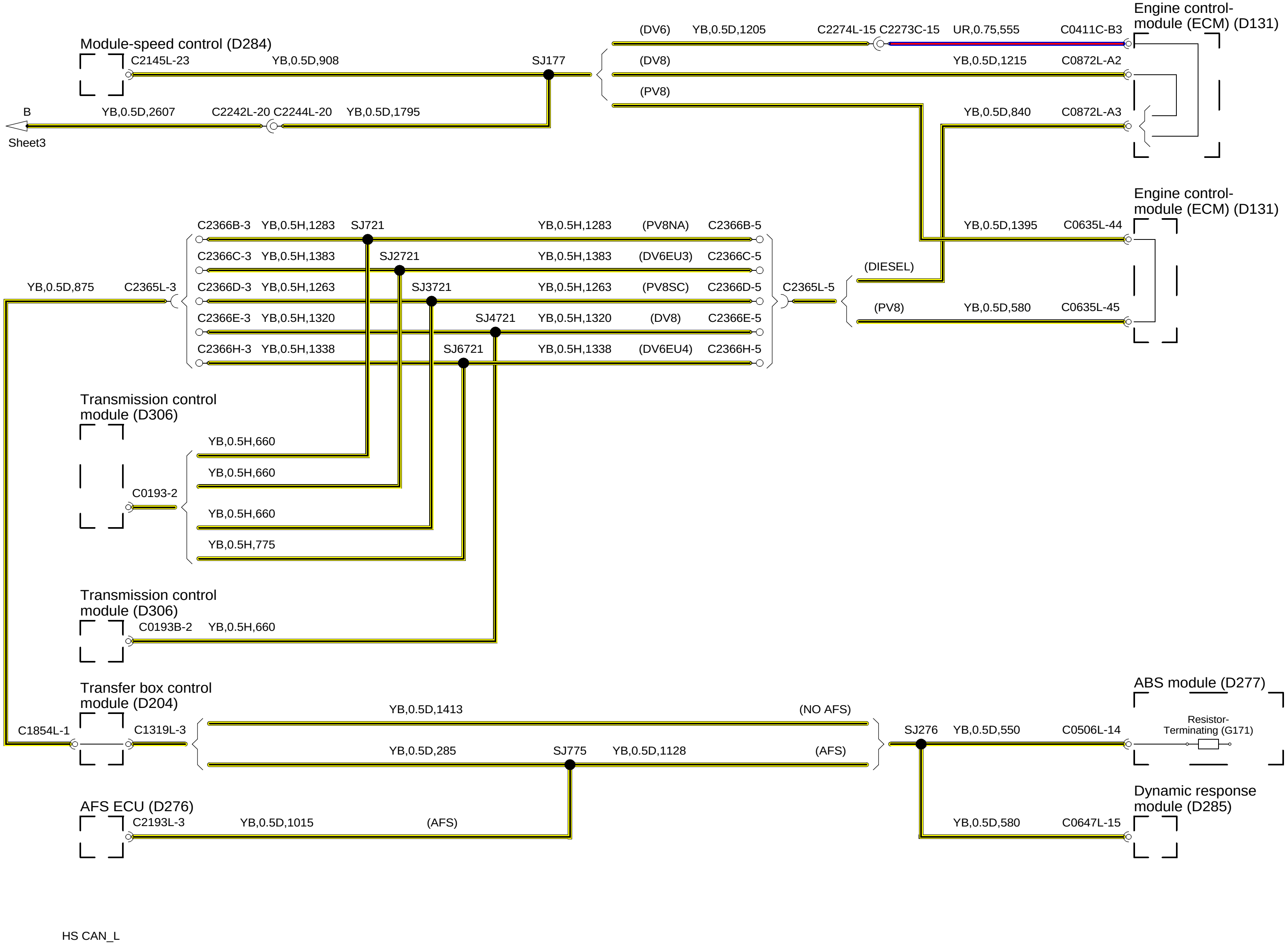

Lamp-Interior-
Front (B100)
E
Sheet1
PU,0.5D
C0355-1
C
Sheet1
P,0.75D
C0084L-7 C0610-7
P,0.75D
C0355-4
5.0 Watts
C0355-3
B,0.75D
SJ275
B,1.0D
C0610-8 C0084L-8
B,0.75D
C1398L-1
5.0 Watts
B
Sheet1
LGW,1.0D
SJ234
LGW,0.5D
C0355-2
5.0 Watts
Lamp-Map-
LH (B108)
LGW,0.75D
C1111-1
5.0 Watts
C1111-3
B,0.75D
Lamp-Map-
RH (B107)
LGW,0.75D
C1112-1
5.0 Watts
C1112-3
B,0.75D
Mirror-Vanity-RH (B153)
LGW,0.75D
C0736-2
1.2 Watts
1.2 Watts
C0736-3
B,0.75D
Mirror-Vanity-LH (B152)
LGW,0.75D
C0737-2
1.2 Watts
1.2 Watts
C0737-3
B,0.75D

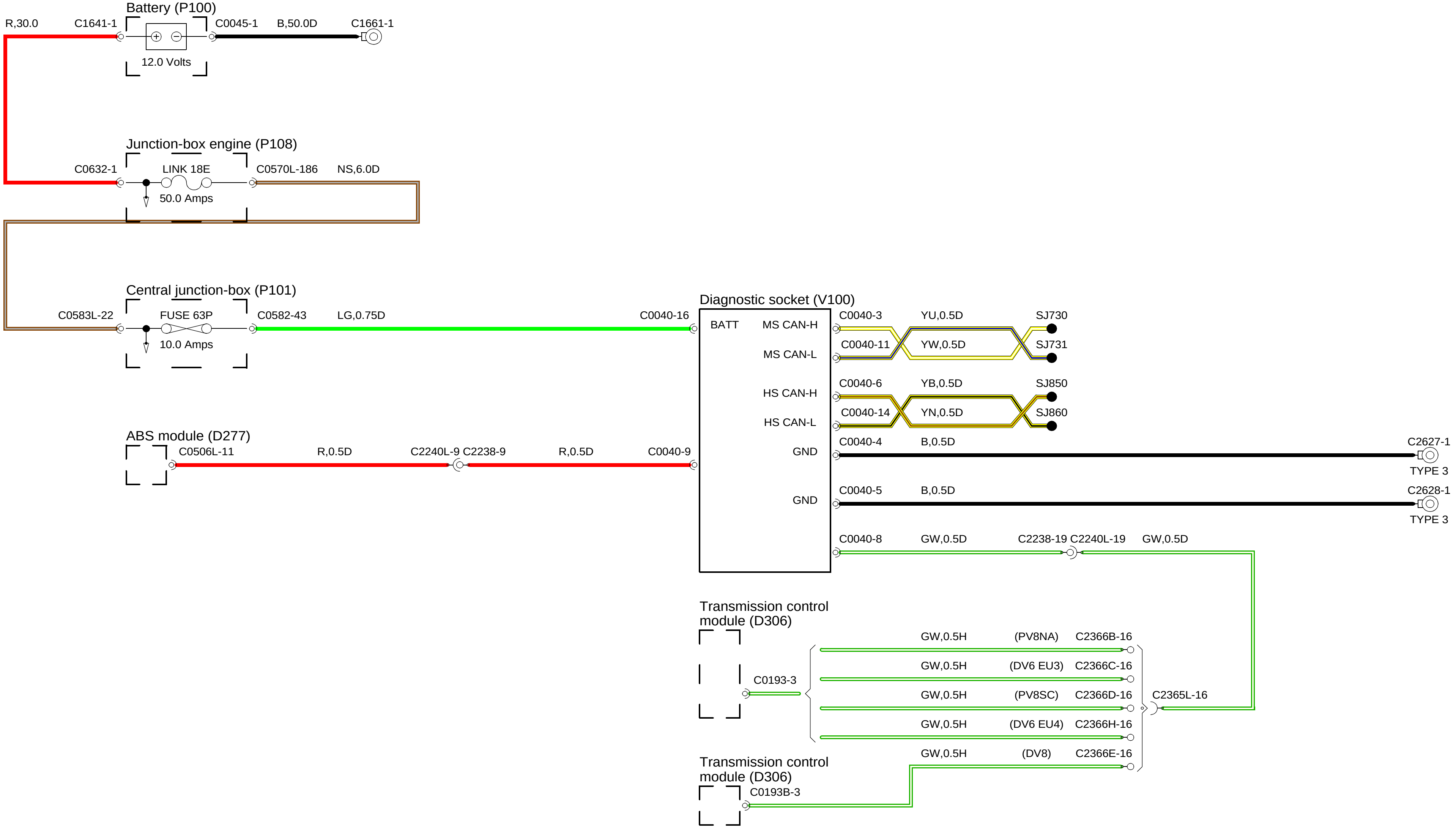

Passive coil (D156)
Ignition switch-illumination (B115)
5.0 Watts
D
Sheet1
P,0.75D
SJ740
C2524-2
C2524-4
B,0.75D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
Lamp-Footwell-Front-RH (B135)
C0076-2
C0076-1
SJ662
C2630-1
Lamp-Footwell-Front-LH (B136)
C1165L-8 C1167-8
C0077-2
C0077-1
Lamp-Approach-Driver (A162)
A
PW,1.5D
SJ39
C0459L-1
C0439-1
PW,0.75D
C0319-8
11.0 Watts
C0319-9
SJ840
B,2.5D
C0439-51
C0459L-51
C1970L-1
B,0.5D
G
Lamp-Approach-Passenger (A163)
C0463L-1
B,4.0D
C0439-2
C0463L-2
C0810L-1
F
Lamp-Puddle-Front-RH (B130)
SJ38
C0463L-30
C0439-30
C1405-2
C1405-1
Lamp-Puddle-Front-LH (B131)
C0459L-30
Lamp-Puddle-Rear-RH (B132)
C0436-20 C0804-20
C0980-2
C0980-1
SJ200
B,1.5D
C0804-9 C0436-9
C0809-1
H
C0804-21 C0436-21
Lamp-Puddle-Rear-LH (B133)
C0435-20 C0803-20
C0803-9 C0435-9
SJ742
C0807L-1
J
C0803-21 C0435-21

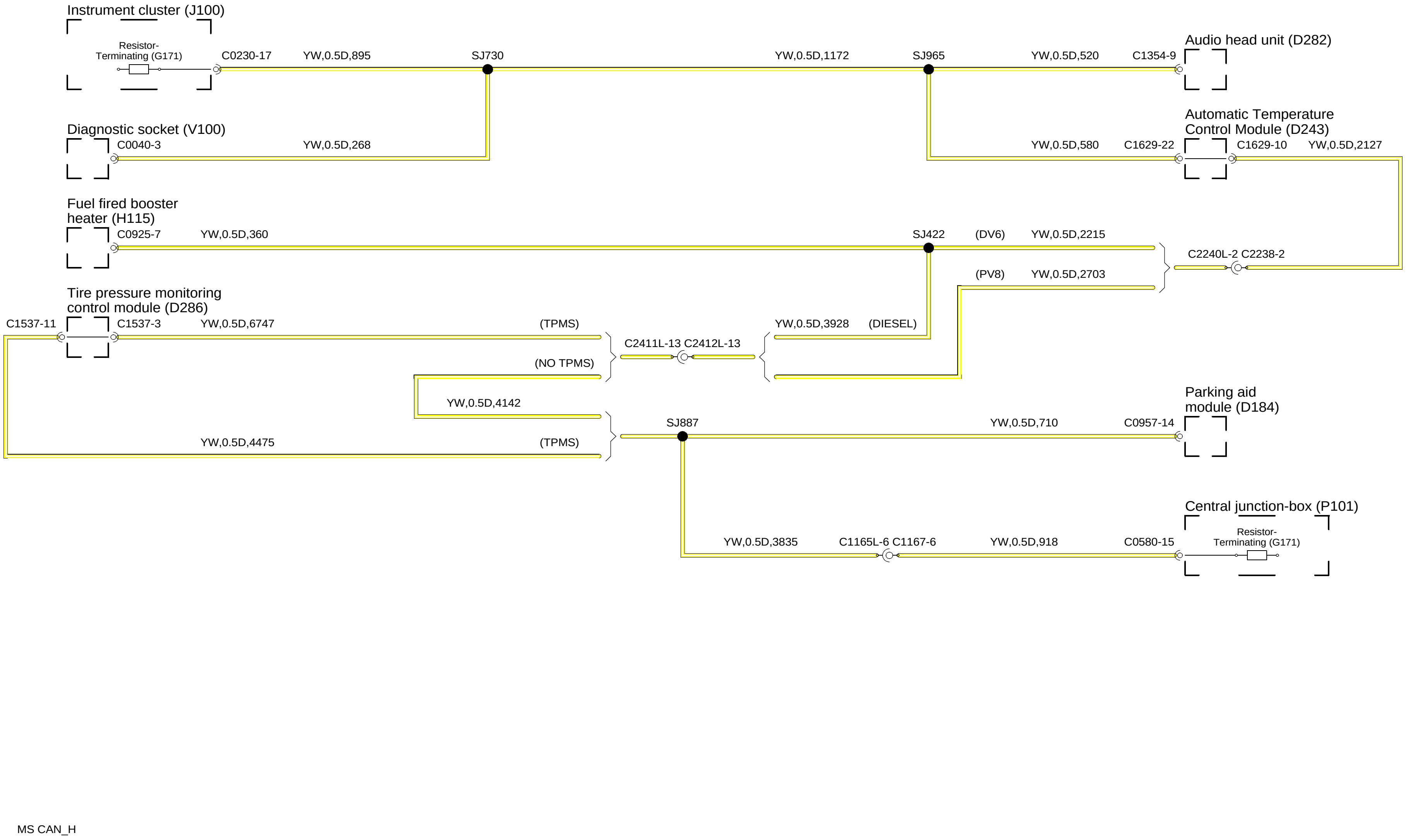

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-1
YN,0.5D,760
SJ850
YN,0.5D,105
SJ851
YN,0.5D,553
C0223-9 C0047L-9
YN,0.5D,555
C0867L-16
Air suspension
Control Module (D199)
C0867L-17
YN,0.5D,4050
Diagnostic socket (V100)
C0040-6
YN,0.5D,403
Sensor-Steering-
angle (T274)
YN,0.5D,382
C0862-6
Switch pack-Centre-
console (S350)
Switch-Terrain-
optimisation (S380)
C0700-2
YN,MAPA,360
C0903-21 C0868-21
YN,0.5D,175
SJ854
(REAR DIFF)
YN,0.5D,2745
C2162-3
Rear differential
control module (D283)
YN,0.5D,1200
C2162-5
(REAR DIFF)
YN,0.5D,3525
(NON-REAR DIFF)
C0376-6 C0390-6
YN,0.5D,1025
C2178-B2
Parking brake
module (D278)
C2178-A3
YN,0.5D,1025
C0390-4 C0376-4
YN,0.5D,285
SJ855
YN,0.5D,100
C0256-31
Restraints Control
Module (RCM) (D171)
YN,0.5D,2587
A
Sheet2
HS CAN_H

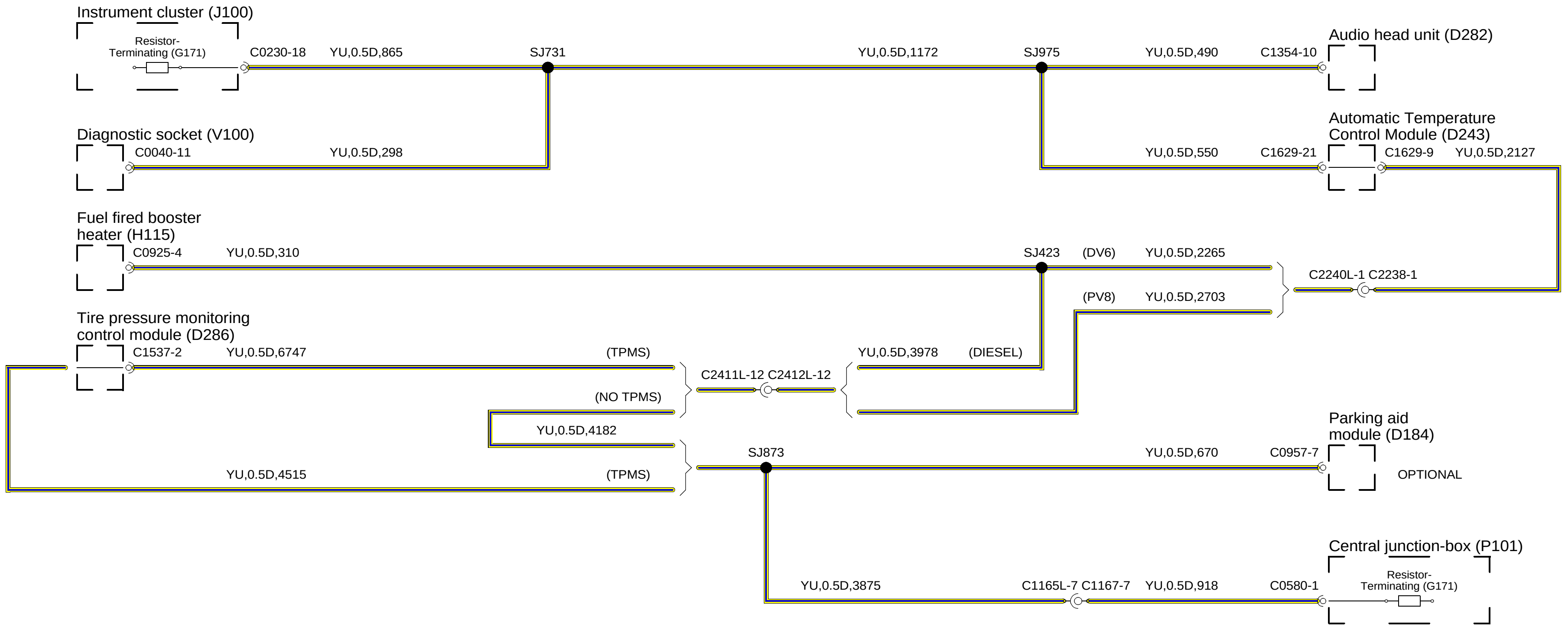

Engine control-module (ECM) (D131)
(DV6)
YN,0.5D,1150
C2274L-16
C2273C-16
SR,0.75,555
C0411C-B4
Module-speed control (D284)
C2145L-24
YN,0.5D,963
SJ176
(DV8)
YN,0.5D,1160
(PV8)
YN,0.5D,840
C0872L-A4
A
Sheet1
YN,0.5D,2587
C2242L-19
C2244L-19
YN,0.5D,1740
Engine control-module (ECM) (D131)
C2366B-2
YN,0.5H,1333
SJ720
YN,0.5H,1333
(PV8NA)
C2366B-4
YN,0.5D,1340
C0635L-57
C2366C-2
YN,0.5H,1433
SJ2720
YN,0.5H,1433
(DV6EU3)
C2366C-4
(DIESEL)
YN,0.5D,875
C2365L-2
C2366D-2
YN,0.5H,1313
SJ3720
YN,0.5H,1313
(PV8SC)
C2366D-4
C2365L-4
(PV8)
YN,0.5D,580
C0635L-58
C2366E-2
YN,0.5H,1370
SJ4720
YN,0.5H,1370
(DV8)
C2366E-4
C2366H-2
YN,0.5H,1388
SJ6720
YN,0.5H,1388
(DV6EU4)
C2366H-4
Transmission control module (D306)
YN,0.5H,610
YN,0.5H,610
C0193-6
YN,0.5H,610
YN,0.5H,725
Transmission control module (D306)
C0193B-6
YN,0.5H,610
ABS module (D277)
Transfer box control module (D204)
YN,0.5D,1385
(NO AFS)
C1854L-4
C1319L-6
SJ274
YN,0.5D,578
C0506L-35
Resistor-Terminating (G171)
YN,0.5D,255
SJ785
YN,0.5D,1130
(AFS)
AFS ECU (D276)
C2193L-2
YN,0.5D,985
(AFS)
Dynamic response module (D285)
YN,0.5D,608
C0647L-16
HS CAN_H


Instrument cluster (J100)
Resistor-Terminating (G171)
C0230-2
YB,0.5D,730
SJ860
YB,0.5D,200
SJ861
YB,0.5D,618
C0223-10 C0047L-10
YB,0.5D,555
C0867L-19
Air suspension Control Module (D199)
C0867L-18
YB,0.5D,4050
Diagnostic socket (V100)
C0040-14
YB,0.5D,433
Sensor-Steering-angle (T274)
YB,0.5D,317
C0862-7
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0700-1
YB,MAPA,360
C0903-22 C0868-22
YB,0.5D,155
SJ864
(REAR DIFF)
YB,0.5D,2765
C2162-6
Rear differential control module (D283)
YB,0.5D,1200
C2162-2
(REAR DIFF)
Parking brake module (D278)
C0376-7 C0390-7
YB,0.5D,1025
C2178-A2
C2178-A4
YB,0.5D,1025
C0390-5 C0376-5
YB,0.5D,3545
(NON REAR DIFF)
Restraints Control Module (RCM) (D171)
YB,0.5D,285
SJ865
YB,0.5D,120
C0256-32
YB,0.5D,2607
B
Sheet4
HS CAN_L

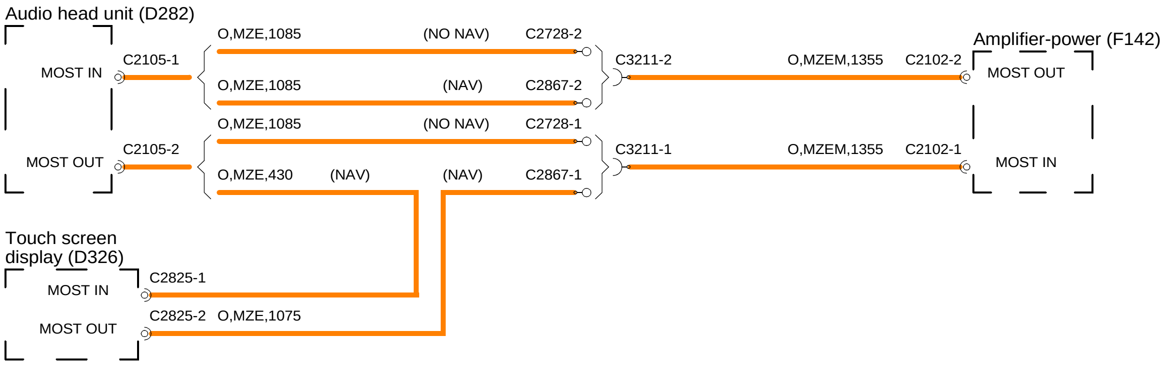

Engine control-module (ECM) (D131)
(DV6)
YB,0.5D,1205
C2274L-15
C2273C-15
UR,0.75,555
C0411C-B3
Module-speed control (D284)
C2145L-23
YB,0.5D,908
SJ177
(DV8)
YB,0.5D,1215
C0872L-A2
(PV8)
B
YB,0.5D,2607
C2242L-20
C2244L-20
YB,0.5D,1795
YB,0.5D,840
C0872L-A3
Sheet3
Engine control-module (ECM) (D131)
C2366B-3
YB,0.5H,1283
SJ721
YB,0.5H,1283
(PV8NA)
C2366B-5
YB,0.5D,1395
C0635L-44
C2366C-3
YB,0.5H,1383
SJ2721
YB,0.5H,1383
(DV6EU3)
C2366C-5
(DIESEL)
YB,0.5D,875
C2365L-3
C2366D-3
YB,0.5H,1263
SJ3721
YB,0.5H,1263
(PV8SC)
C2366D-5
C2365L-5
(PV8)
YB,0.5D,580
C0635L-45
C2366E-3
YB,0.5H,1320
SJ4721
YB,0.5H,1320
(DV8)
C2366E-5
C2366H-3
YB,0.5H,1338
SJ6721
YB,0.5H,1338
(DV6EU4)
C2366H-5
Transmission control module (D306)
YB,0.5H,660
YB,0.5H,660
C0193-2
YB,0.5H,660
YB,0.5H,775
Transmission control module (D306)
C0193B-2
YB,0.5H,660
Transfer box control module (D204)
YB,0.5D,1413
(NO AFS)
ABS module (D277)
C1854L-1
C1319L-3
SJ276
YB,0.5D,550
C0506L-14
Resistor-Terminating (G171)
YB,0.5D,285
SJ775
YB,0.5D,1128
(AFS)
Dynamic response module (D285)
AFS ECU (D276)
C2193L-3
YB,0.5D,1015
(AFS)
YB,0.5D,580
C0647L-15
HS CAN_L

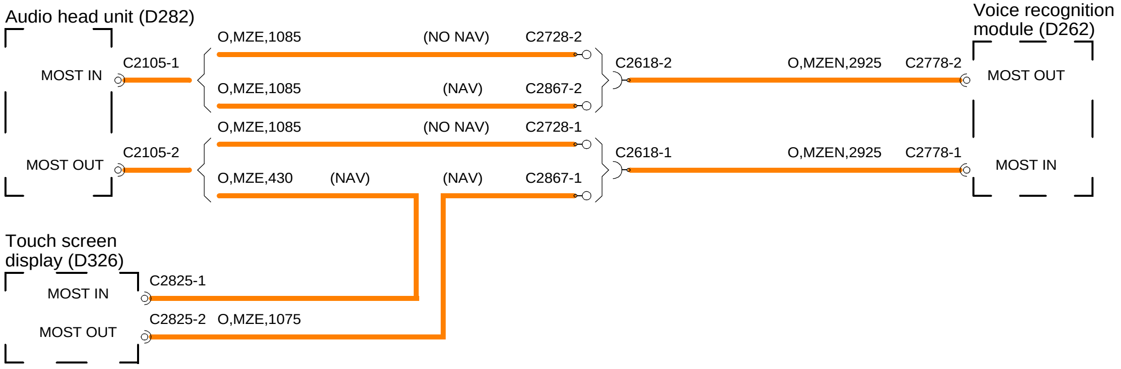

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Central junction-box (P101)
C0583L-22
FUSE 63P
10.0 Amps
C0582-43
LG,0.75D
C0040-16
Diagnostic socket (V100)
BATT
MS CAN-H
MS CAN-L
HS CAN-H
HS CAN-L
GND
GND
C0040-3
YU,0.5D
SJ730
C0040-11
YW,0.5D
SJ731
C0040-6
YB,0.5D
SJ850
C0040-14
YN,0.5D
SJ860
C0040-4
B,0.5D
C2627-1
TYPE 3
C0040-5
B,0.5D
C2628-1
TYPE 3
C0040-8
GW,0.5D
C2238-19 C2240L-19
GW,0.5D
ABS module (D277)
C0506L-11
R,0.5D
C2240L-9 C2238-9
R,0.5D
C0040-9
Transmission control module (D306)
C0193-3
GW,0.5H
(PV8NA)
C2366B-16
GW,0.5H
(DV6 EU3)
C2366C-16
GW,0.5H
(PV8SC)
C2366D-16
C2365L-16
GW,0.5H
(DV6 EU4)
C2366H-16
GW,0.5H
(DV8)
C2366E-16
Transmission control module (D306)
C0193B-3

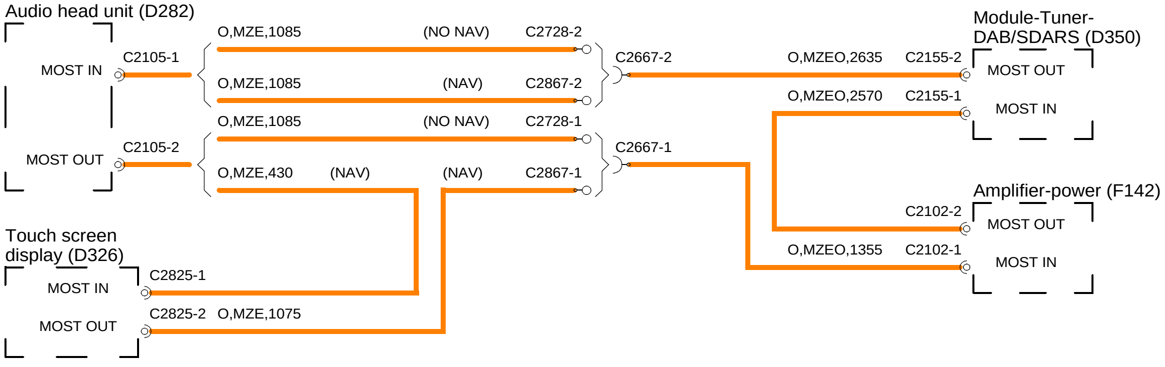

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-17
YW,0.5D,895
SJ730
YW,0.5D,1172
SJ965
YW,0.5D,520
C1354-9
Audio head unit (D282)
Diagnostic socket (V100)
C0040-3
YW,0.5D,268
Automatic Temperature
Control Module (D243)
YW,0.5D,580
C1629-22
C1629-10
YW,0.5D,2127
Fuel fired booster
heater (H115)
C0925-7
YW,0.5D,360
SJ422
(DV6)
YW,0.5D,2215
C2240L-2 C2238-2
(PV8)
YW,0.5D,2703
Tire pressure monitoring
control module (D286)
C1537-11
C1537-3
YW,0.5D,6747
(TPMS)
C2411L-13 C2412L-13
YW,0.5D,3928
(DIESEL)
(NO TPMS)
YW,0.5D,4142
SJ887
YW,0.5D,710
C0957-14
Parking aid
module (D184)
YW,0.5D,4475
(TPMS)
Central junction-box (P101)
Resistor-
Terminating (G171)
YW,0.5D,3835
C1165L-6 C1167-6
YW,0.5D,918
C0580-15
MS CAN_H

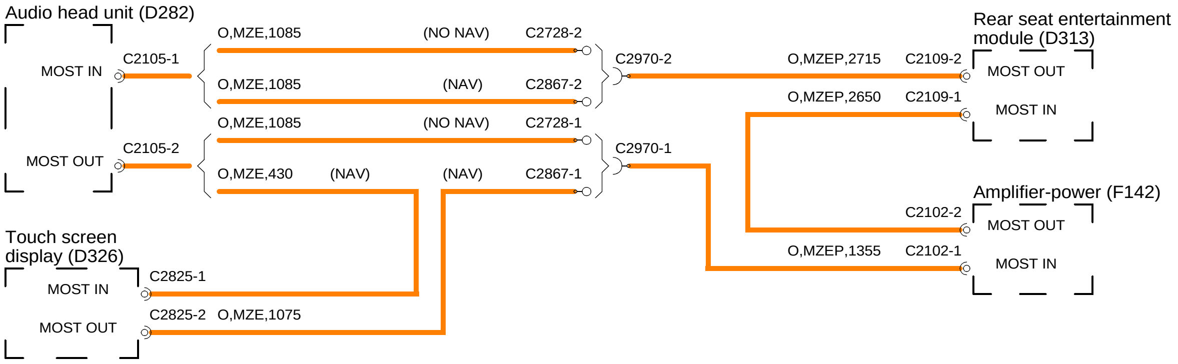

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-18
YU,0.5D,865
SJ731
YU,0.5D,1172
SJ975
YU,0.5D,490
C1354-10
Audio head unit (D282)
Diagnostic socket (V100)
C0040-11
YU,0.5D,298
YU,0.5D,550
C1629-21
Automatic Temperature
Control Module (D243)
C1629-9
YU,0.5D,2127
Fuel fired booster
heater (H115)
C0925-4
YU,0.5D,310
SJ423
(DV6)
YU,0.5D,2265
C2240L-1 C2238-1
(PV8)
YU,0.5D,2703
Tire pressure monitoring
control module (D286)
C1537-2
YU,0.5D,6747
(TPMS)
C2411L-12 C2412L-12
YU,0.5D,3978
(DIESEL)
(NO TPMS)
YU,0.5D,4182
SJ873
YU,0.5D,4515
(TPMS)
Parking aid
module (D184)
YU,0.5D,670
C0957-7
OPTIONAL
Central junction-box (P101)
Resistor-
Terminating (G171)
YU,0.5D,3875
C1165L-7 C1167-7
YU,0.5D,918
C0580-1

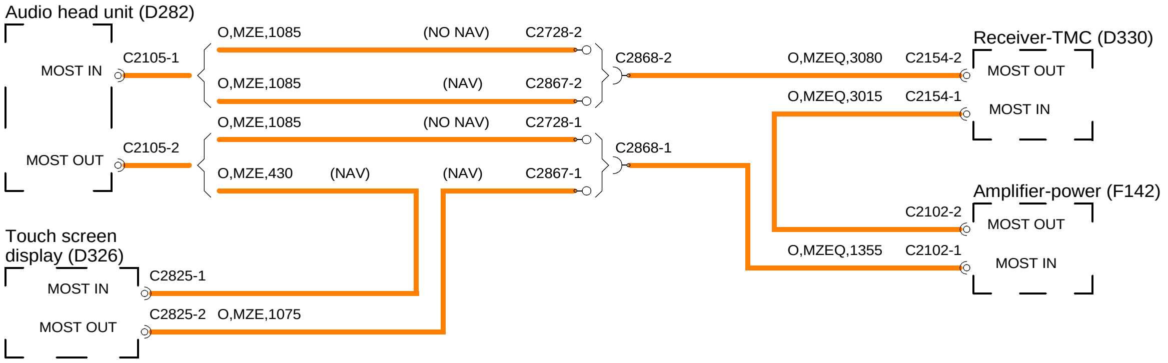
MS CAN_L

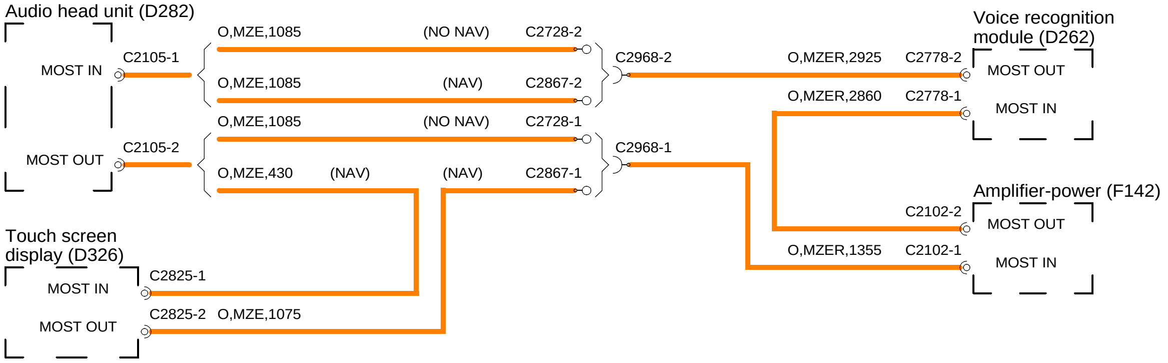

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3211-2
C3211-1
O,MZEM,1355
C2102-2
O,MZEM,1355
C2102-1
Amplifier-power (F142)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075

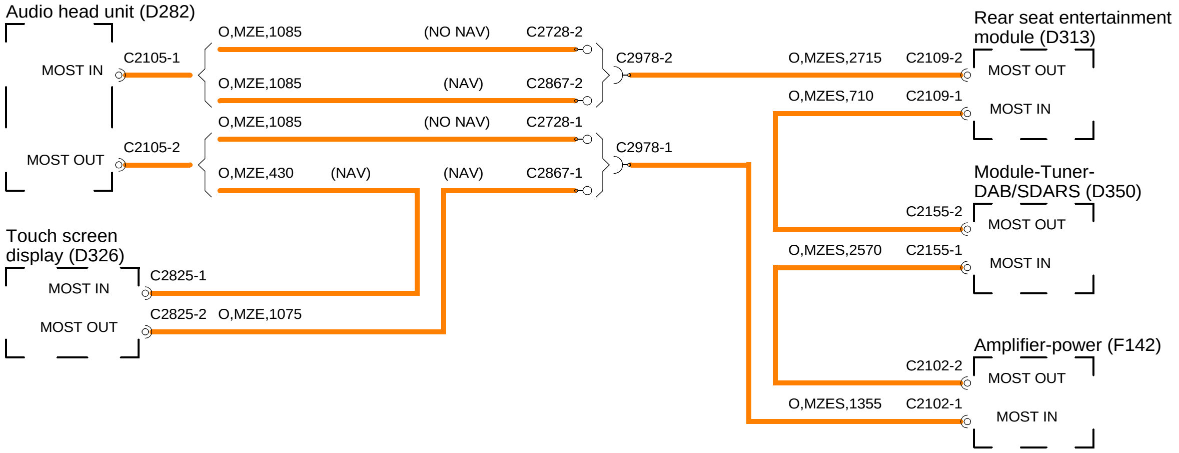

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2618-2
C2618-1
O,MZEN,2925
C2778-2
O,MZEN,2925
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075

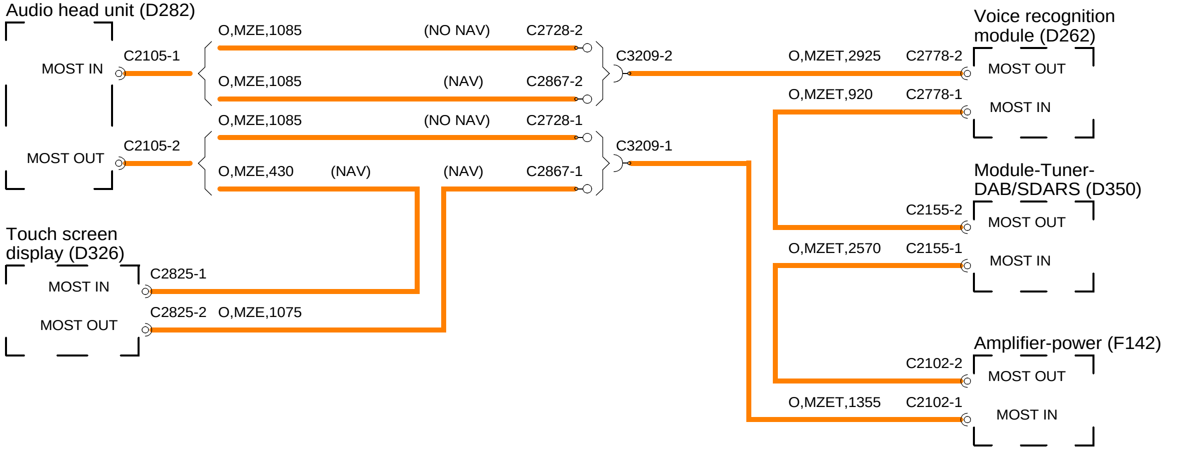

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2667-2
C2667-1
O,MZEO,2635
C2155-2
O,MZEO,2570
C2155-1
Module-Tuner-DAB/SDARS (D350)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEO,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075

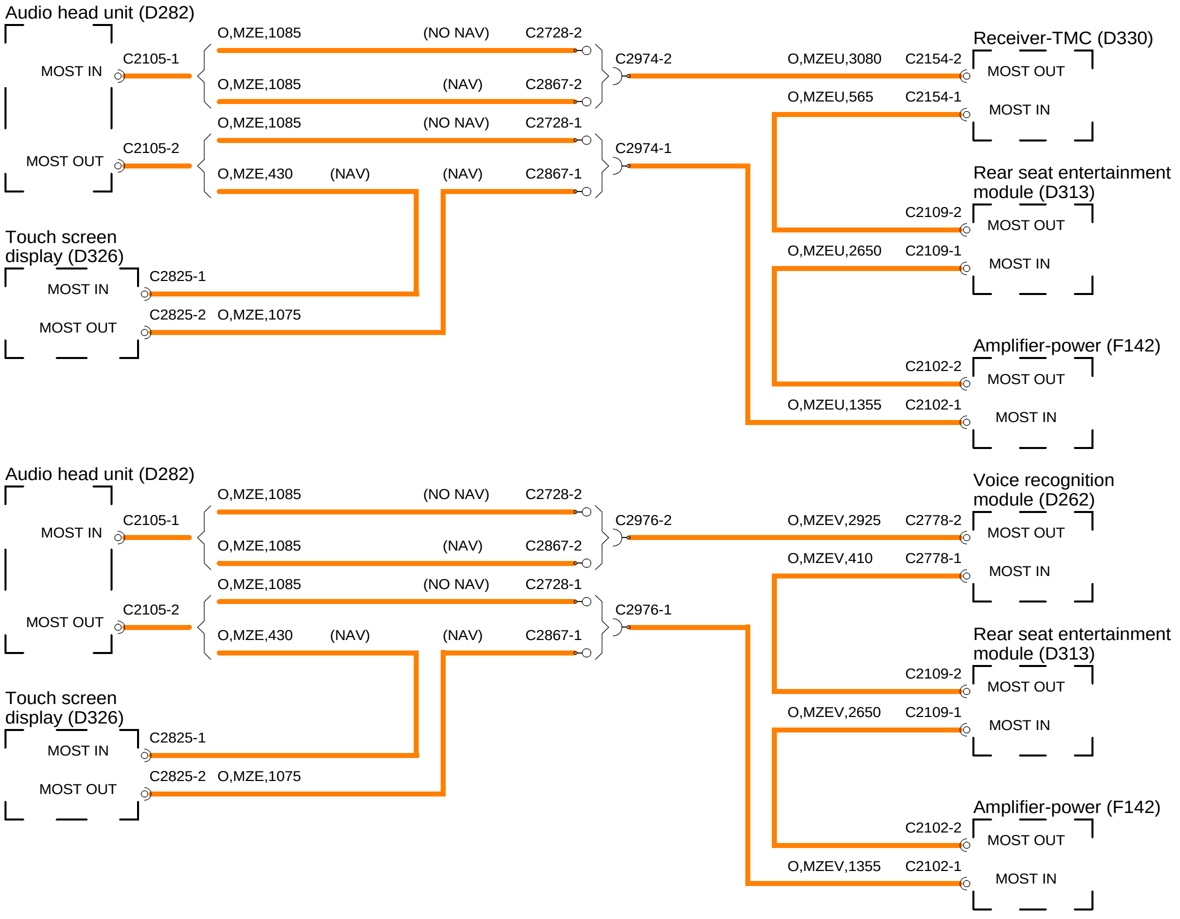

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2970-2
C2970-1
O,MZEP,2715
C2109-2
O,MZEP,2650
C2109-1
Rear seat entertainment module (D313)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEP,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

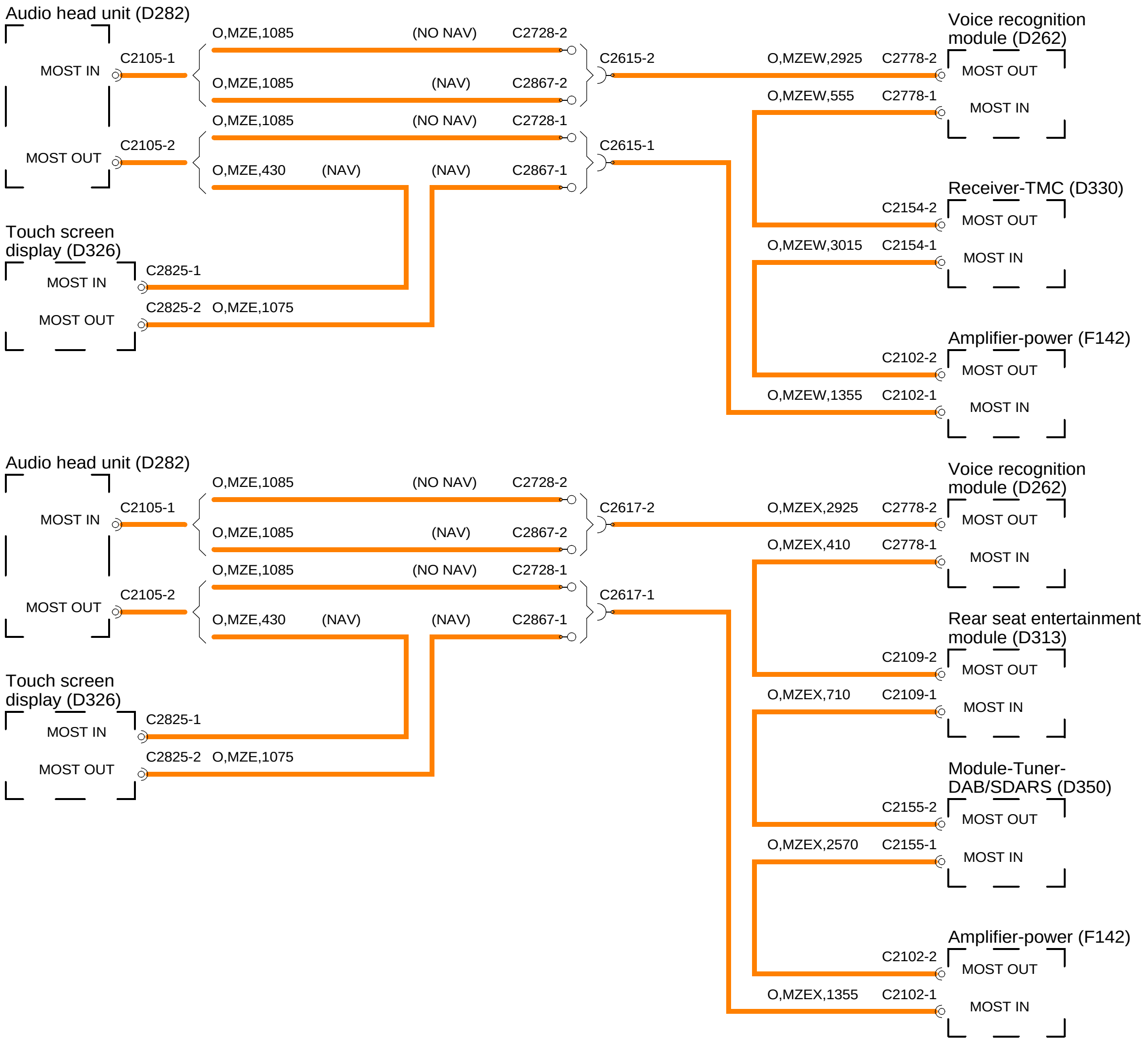

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2868-2
C2868-1
O,MZEQ,3080
C2154-2
O,MZEQ,3015
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEQ,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

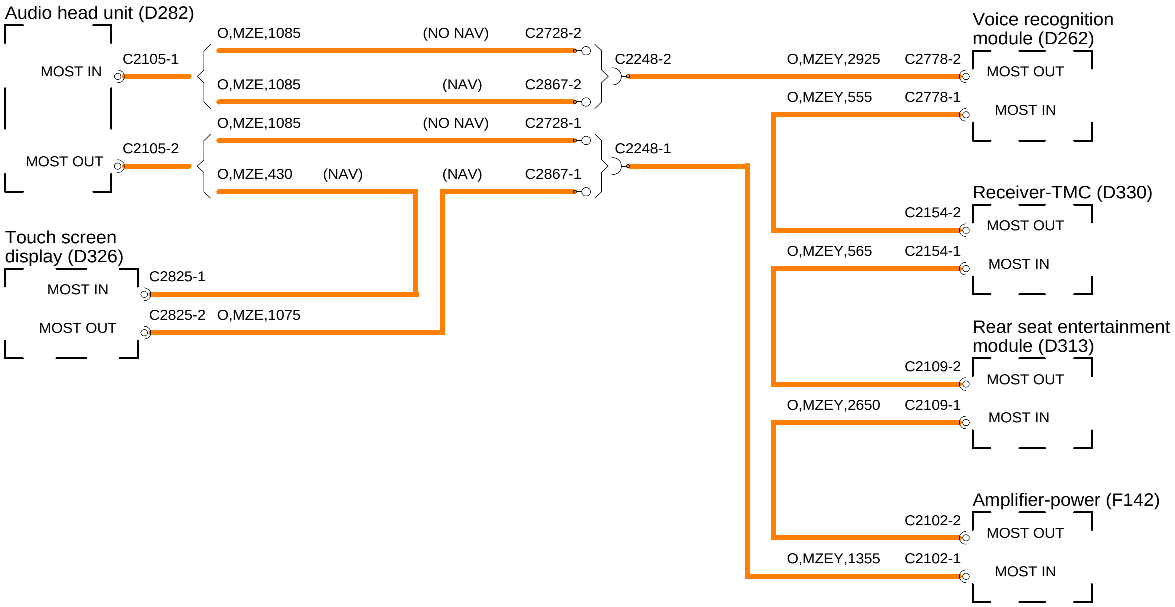

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2968-2
C2968-1
O,MZER,2925
C2778-2
O,MZER,2860
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZER,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

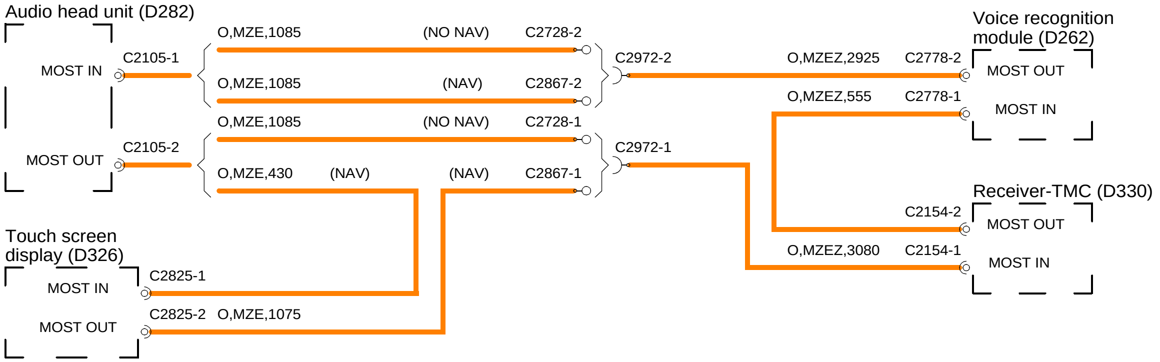

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2978-2
C2978-1
O,MZES,2715
C2109-2
O,MZES,710
C2109-1
Rear seat entertainment module (D313)
MOST OUT
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZES,2570
C2155-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZES,1355
C2102-1
MOST IN

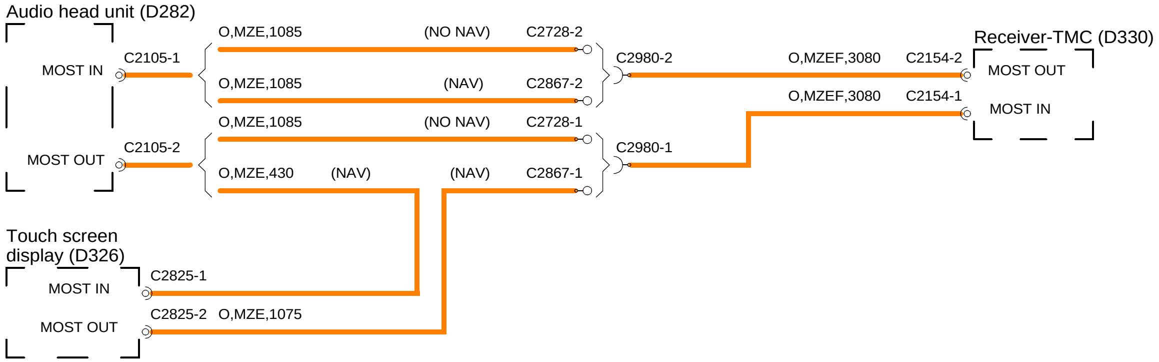

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3209-2
C3209-1
O,MZET,2925
C2778-2
O,MZET,920
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZET,2570
C2155-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZET,1355
C2102-1
MOST IN

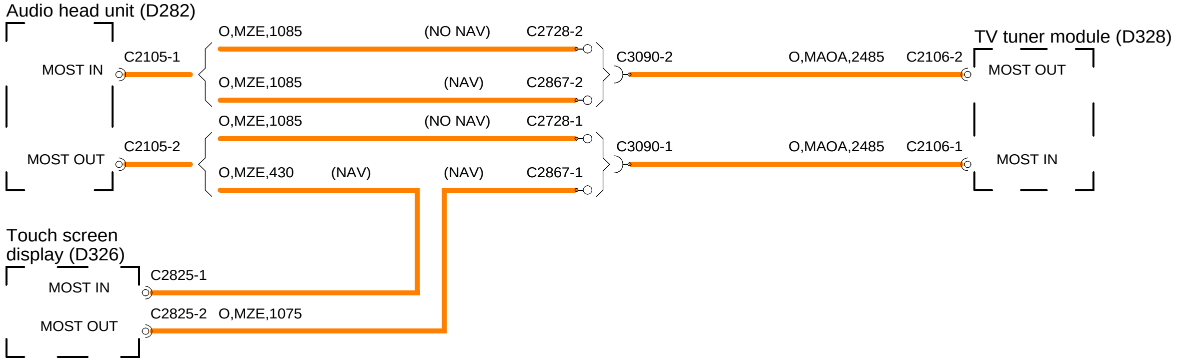

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2974-2
C2974-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
Receiver-TMC (D330)
O,MZEU,3080
C2154-2
MOST OUT
O,MZEU,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEU,2650
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEU,1355
C2102-1
MOST IN
Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2976-2
C2976-1
Touch screen display (D326)
MOST IN
MOST OUT
C2825-1
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEV,2925
C2778-2
MOST OUT
O,MZEV,410
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEV,2650
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEV,1355
C2102-1
MOST IN

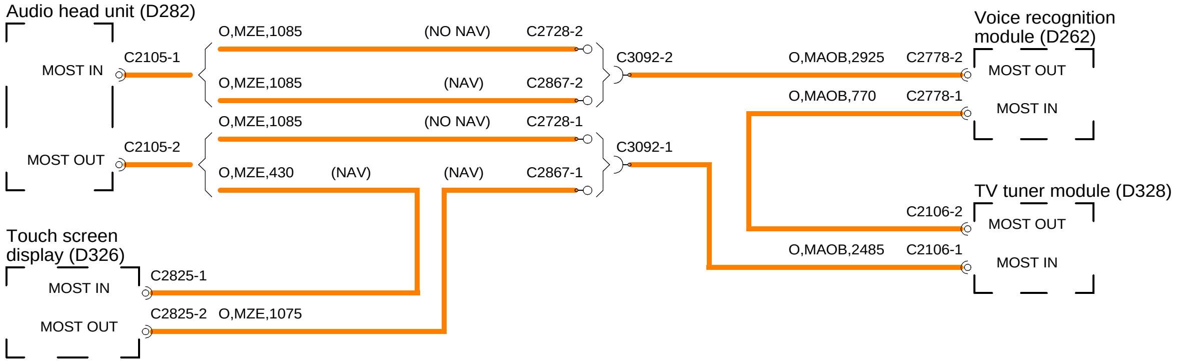

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2615-2
C2615-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEW,2925
C2778-2
MOST OUT
O,MZEW,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEW,3015
C2154-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEW,1355
C2102-1
MOST IN
Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2617-2
C2617-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEX,2925
C2778-2
MOST OUT
O,MZEX,410
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEX,710
C2109-1
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZEX,2570
C2155-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEX,1355
C2102-1
MOST IN

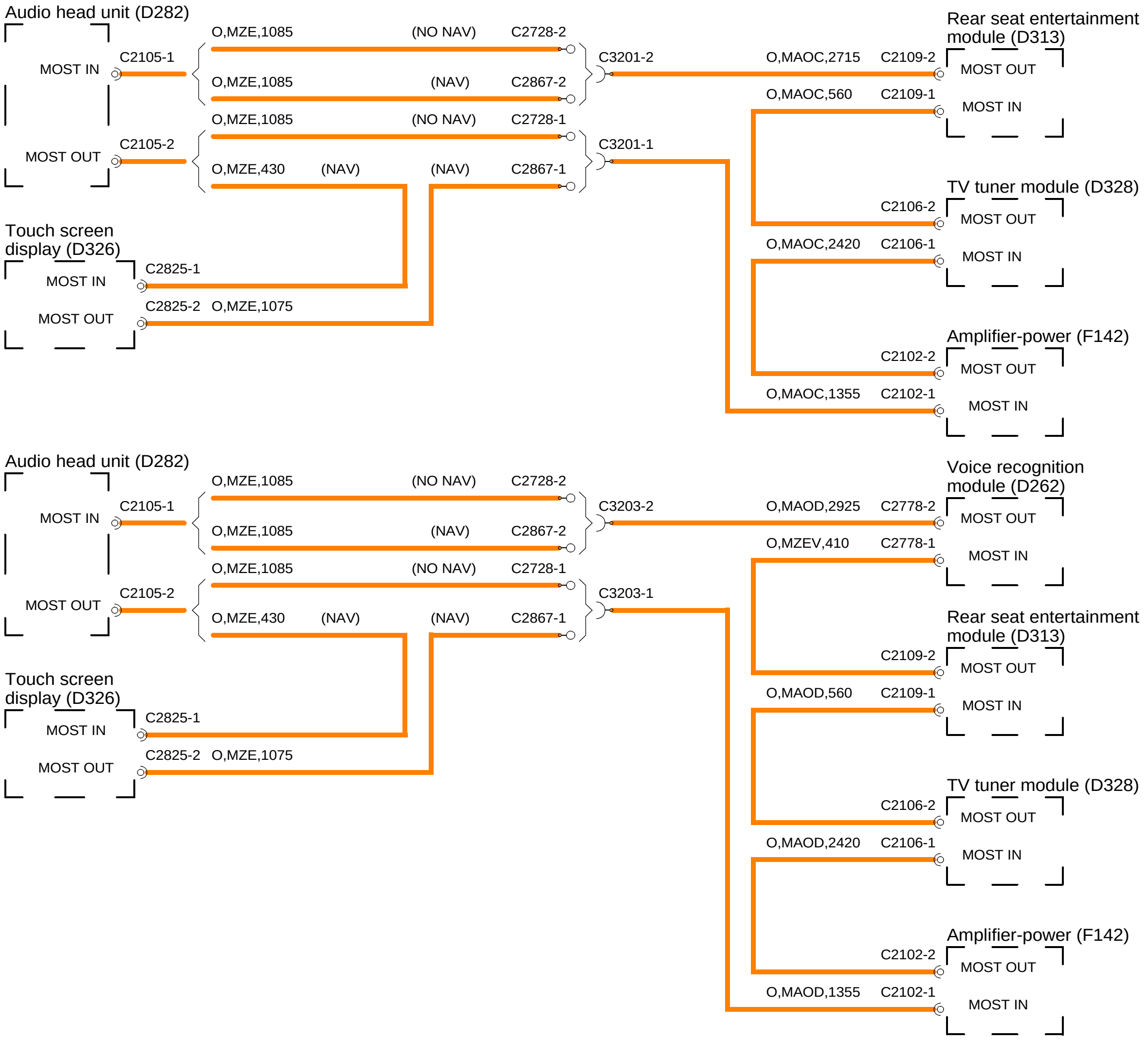

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2248-2
C2248-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEY,2925
C2778-2
MOST OUT
O,MZEY,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEY,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEY,2650
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEY,1355
C2102-1
MOST IN

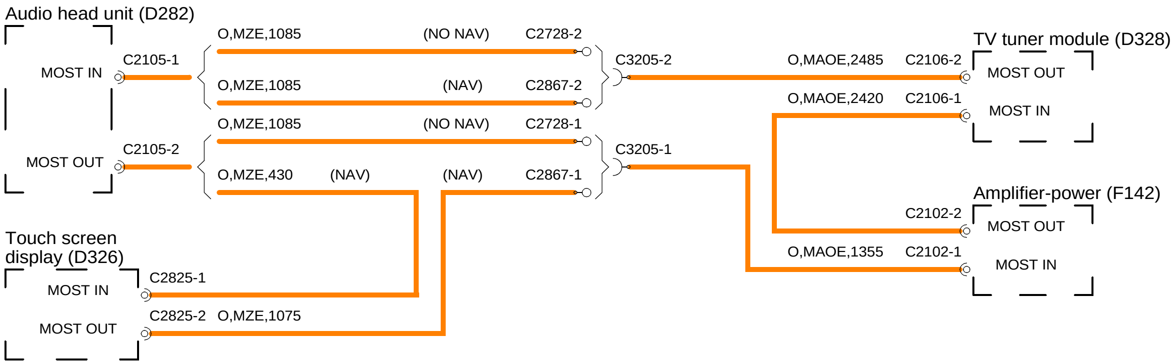

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2972-2
C2972-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEZ,2925
C2778-2
MOST OUT
O,MZEZ,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEZ,3080
C2154-1
MOST IN

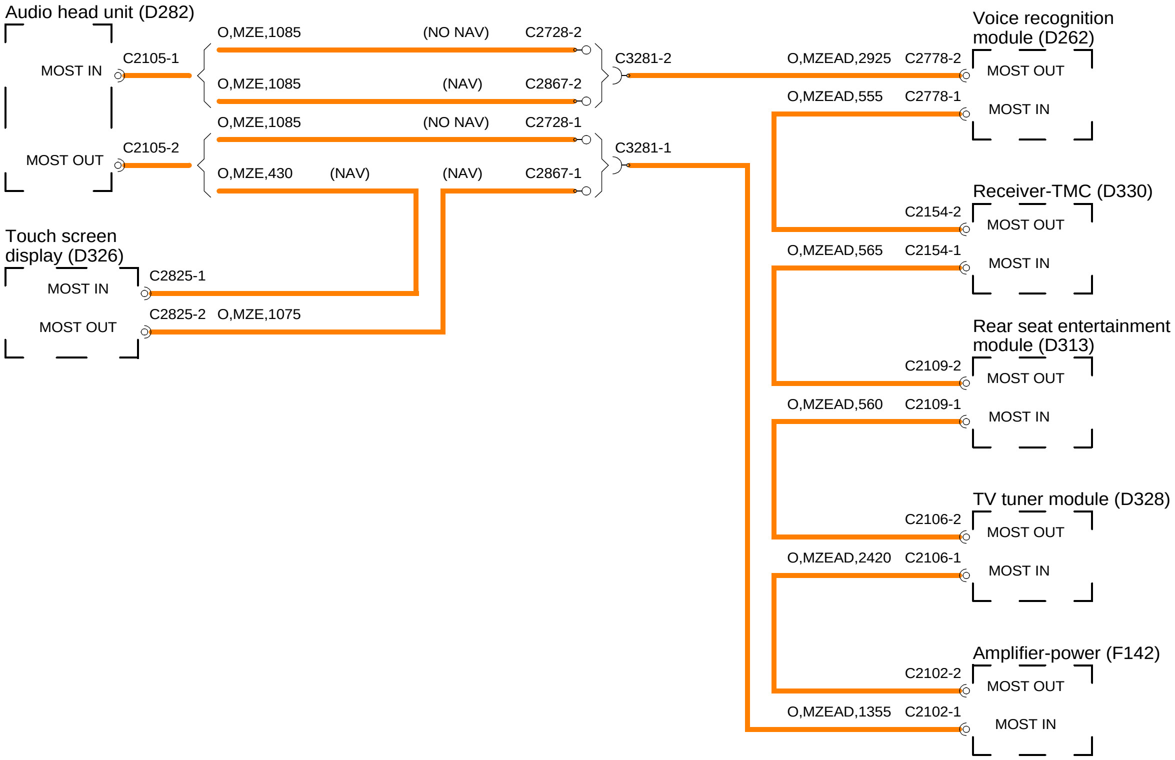

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C2980-2
C2980-1
O,MZEF,3080
C2154-2
O,MZEF,3080
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
C2825-2
O,MZE,1075
MOST OUT

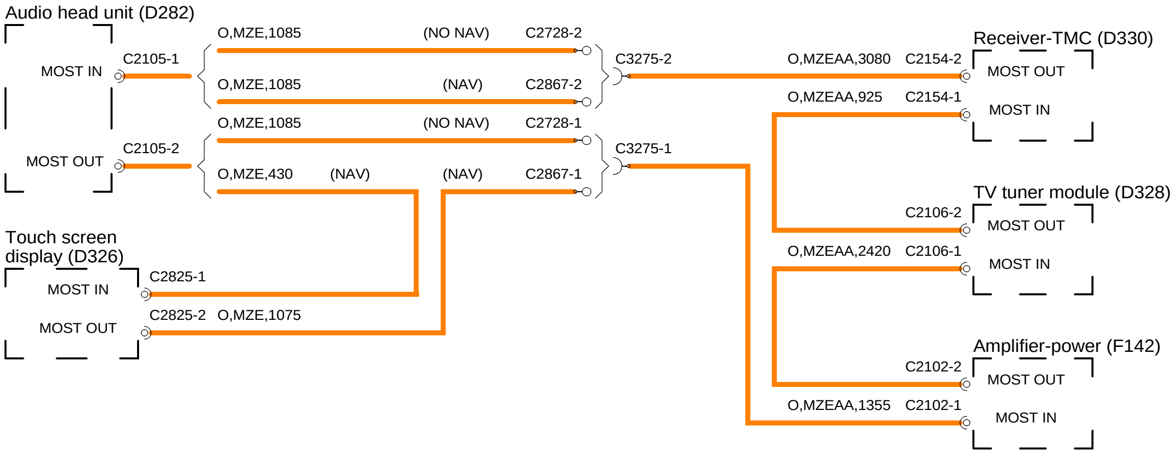

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3090-2
C3090-1
O,MAOA,2485
C2106-2
O,MAOA,2485
C2106-1
TV tuner module (D328)
MOST OUT
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
C2825-2
O,MZE,1075
MOST OUT

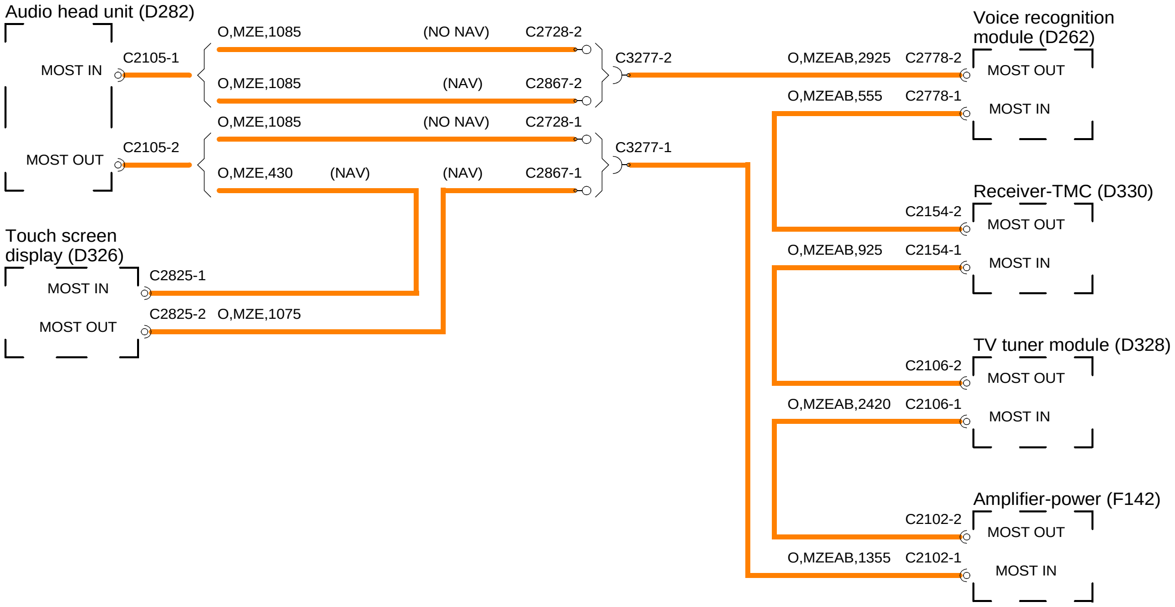

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3092-2
C3092-1
O,MAOB,2925
C2778-2
O,MAOB,770
C2778-1
Voice recognition module (D262)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOB,2485
C2106-1
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
C2825-2
O,MZE,1075
MOST OUT

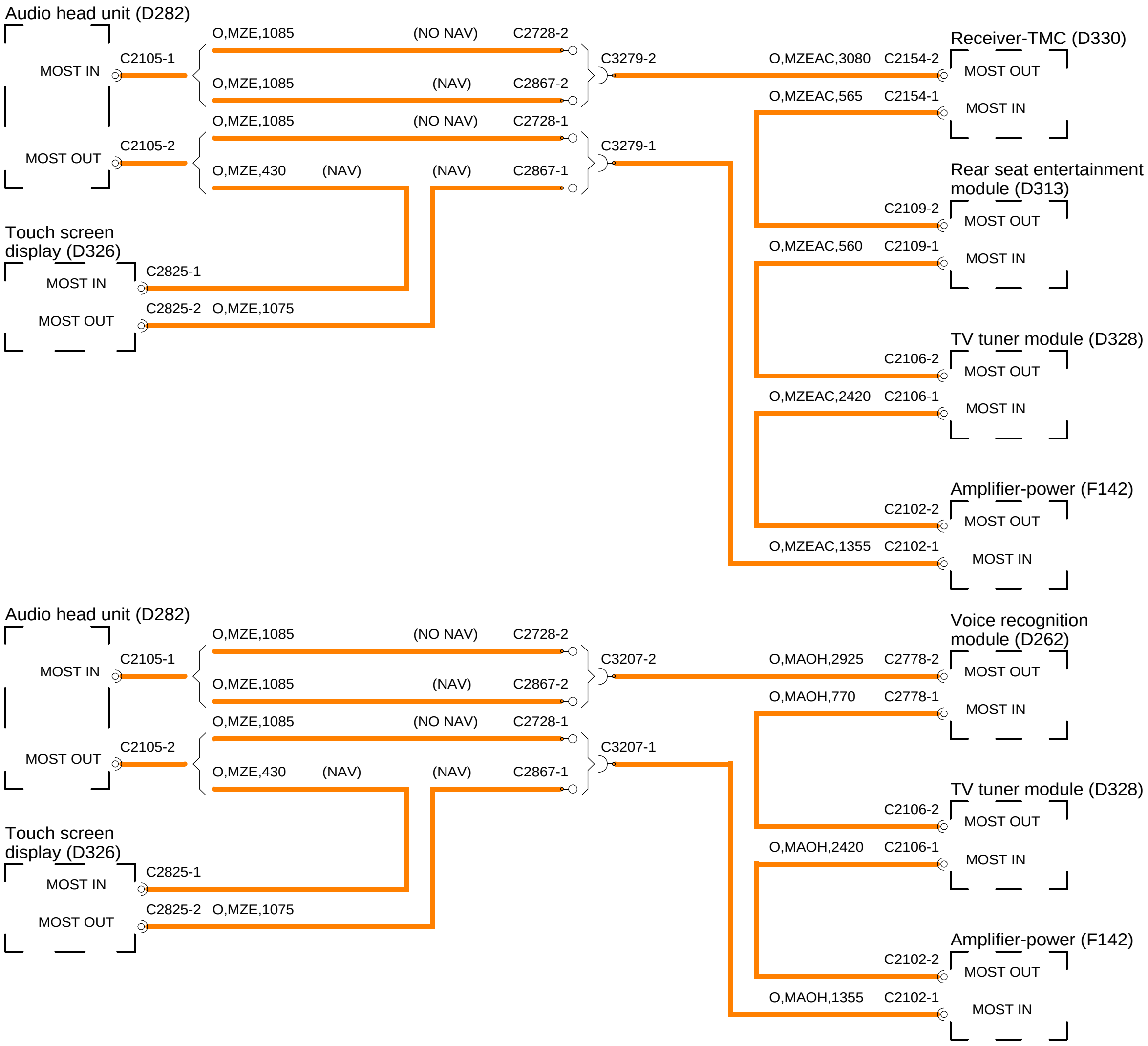

Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3201-2
C3201-1
O,MAOC,2715
C2109-2
O,MAOC,560
C2109-1
Rear seat entertainment module (D313)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOC,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOC,1355
C2102-1
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
C2825-2
O,MZE,1075
MOST OUT
Audio head unit (D282)
MOST IN
MOST OUT
C2105-1
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3203-2
C3203-1
O,MAOD,2925
C2778-2
Voice recognition module (D262)
MOST OUT
O,MZEV,410
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MAOD,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOD,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOD,1355
C2102-1
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
C2825-2
O,MZE,1075
MOST OUT

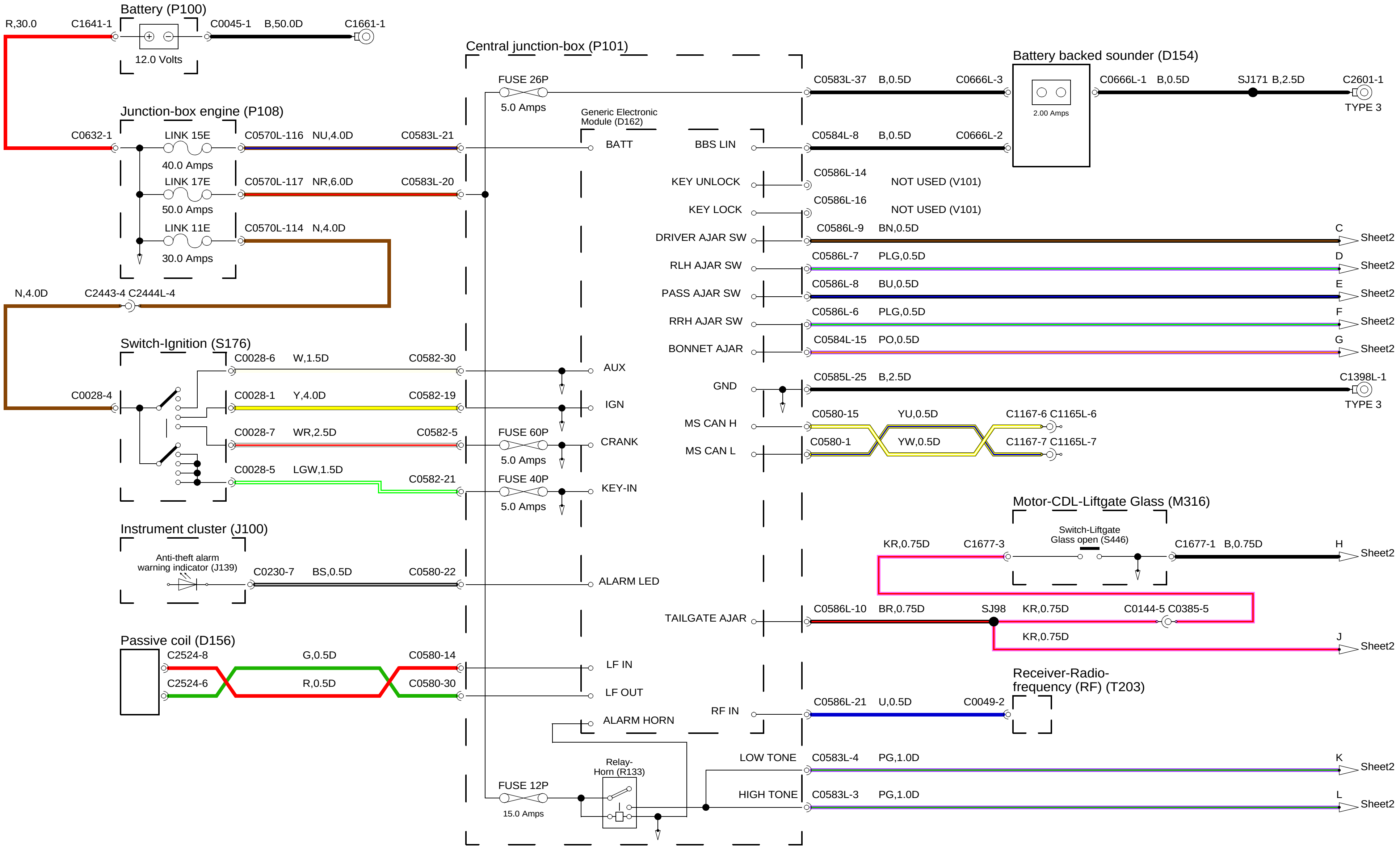

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3205-2
C3205-1
O,MAOE,2485
C2106-2
O,MAOE,2420
C2106-1
TV tuner module (D328)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOE,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

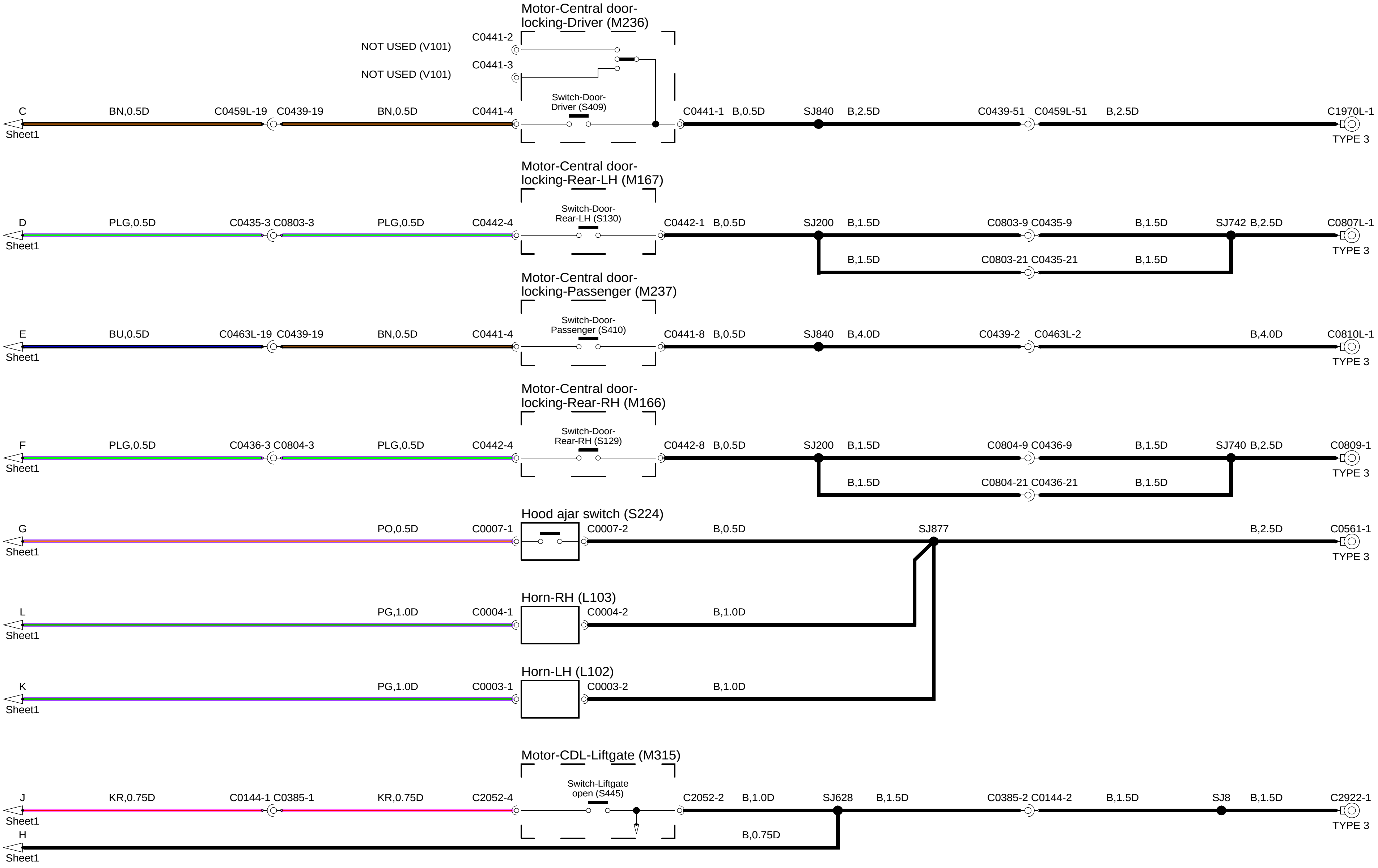

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3281-2
C3281-1
O,MZEAD,2925
C2778-2
Voice recognition module (D262)
MOST OUT
O,MZEAD,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEAD,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEAD,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAD,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAD,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075

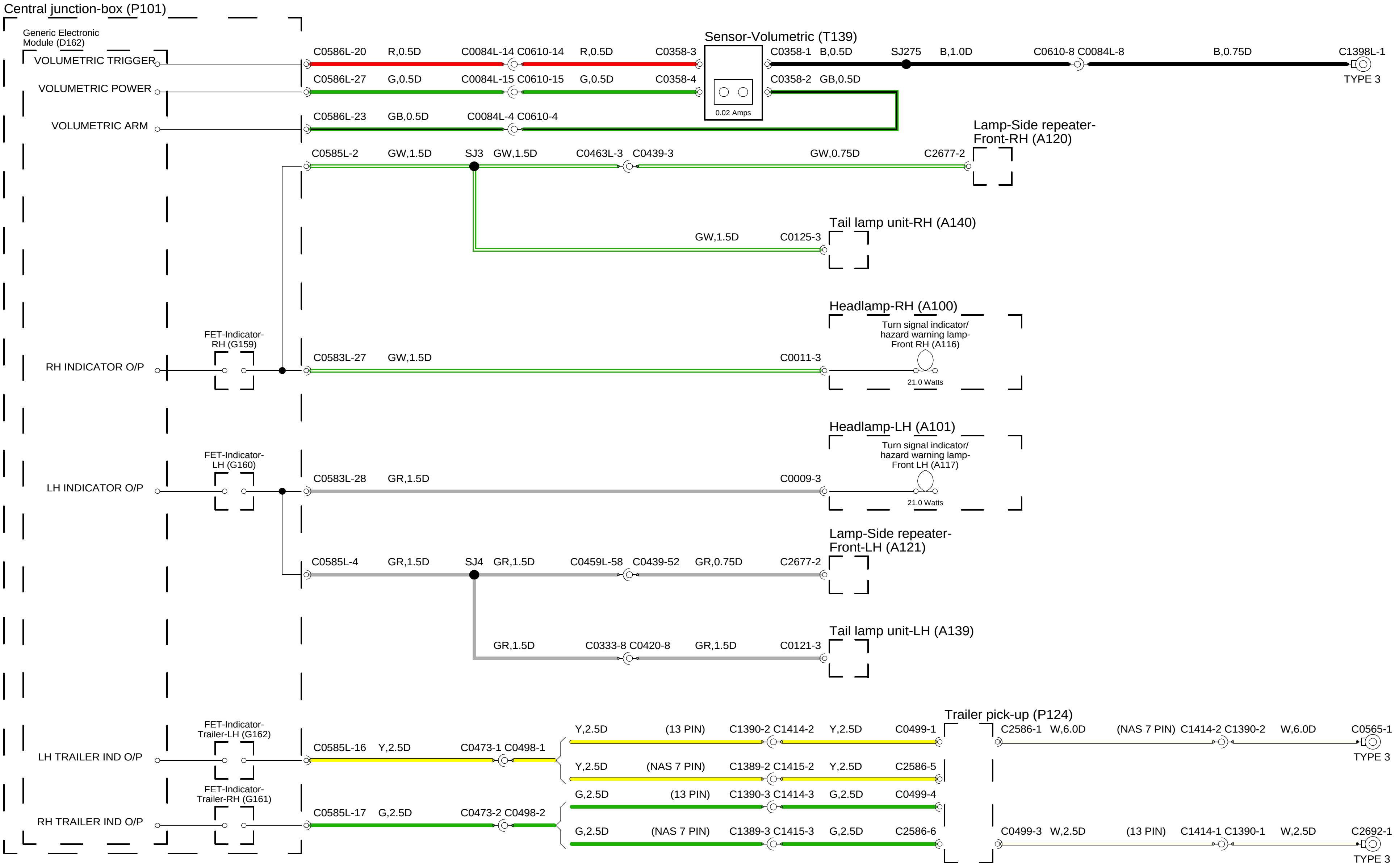

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3275-2
C3275-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
O,MZEAA,3080
C2154-2
O,MZEAA,925
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAA,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAA,1355
C2102-1
MOST IN

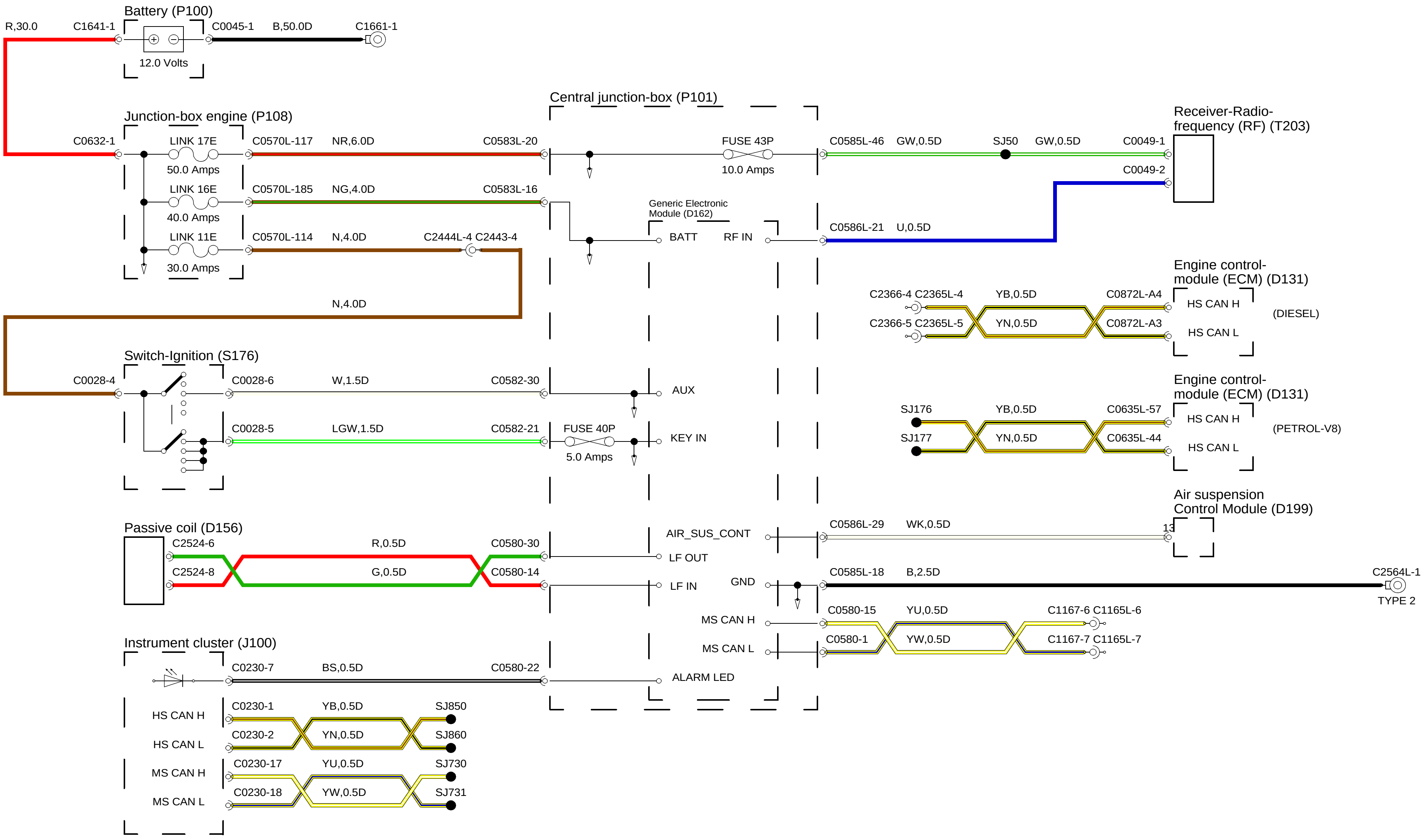

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3277-2
C3277-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
Voice recognition module (D262)
O,MZEAB,2925
C2778-2
MOST OUT
O,MZEAB,555
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEAB,925
C2154-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAB,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAB,1355
C2102-1
MOST IN

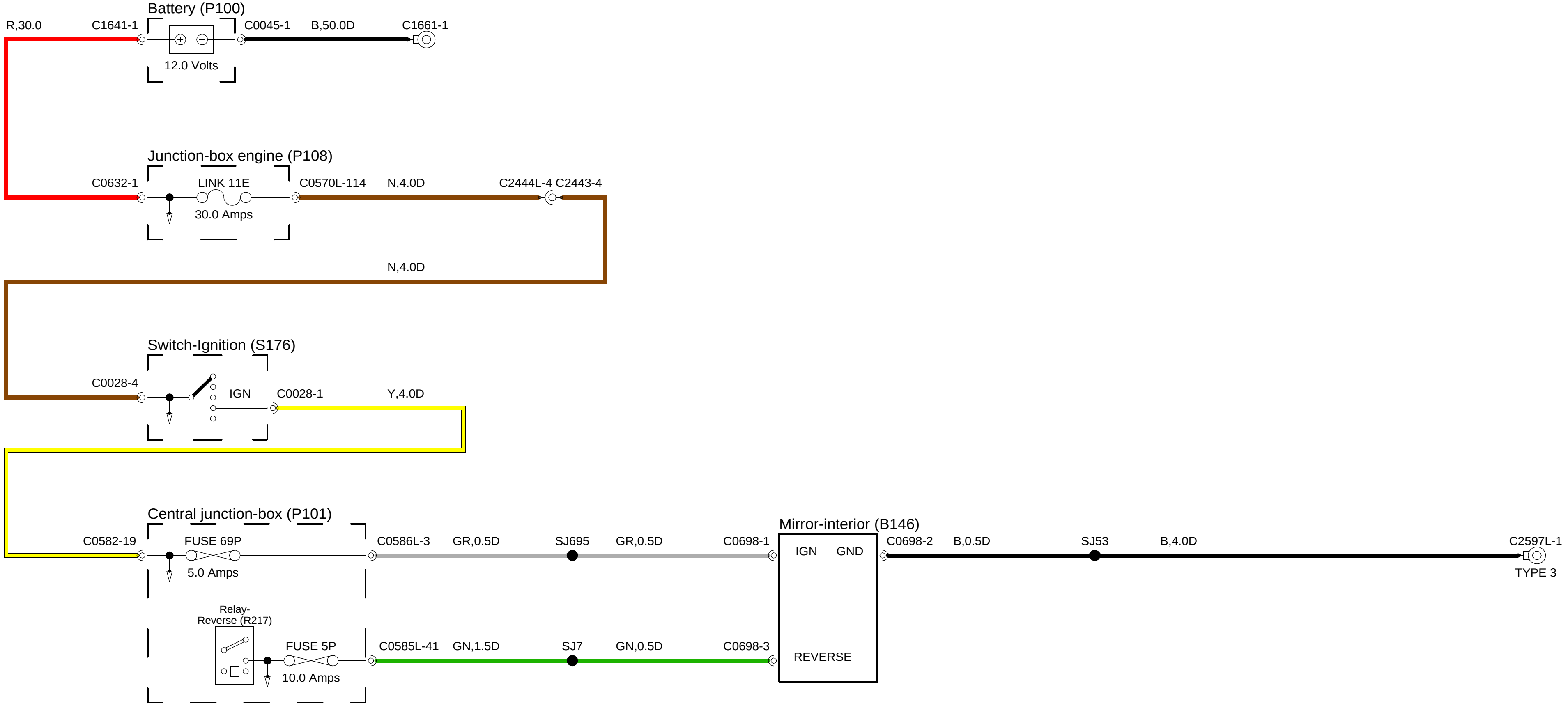

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3279-2
C3279-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
O,MZEAC,3080
C2154-2
Receiver-TMC (D330)
MOST OUT
O,MZEAC,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEAC,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MZEAC,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEAC,1355
C2102-1
MOST IN
Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1085
(NO NAV)
C2728-2
O,MZE,1085
(NAV)
C2867-2
O,MZE,1085
(NO NAV)
C2728-1
O,MZE,430
(NAV)
(NAV)
C2867-1
C3207-2
C3207-1
Touch screen display (D326)
MOST IN
C2825-1
MOST OUT
C2825-2
O,MZE,1075
O,MAOH,2925
C2778-2
Voice recognition module (D262)
MOST OUT
O,MAOH,770
C2778-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOH,2420
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOH,1355
C2102-1
MOST IN

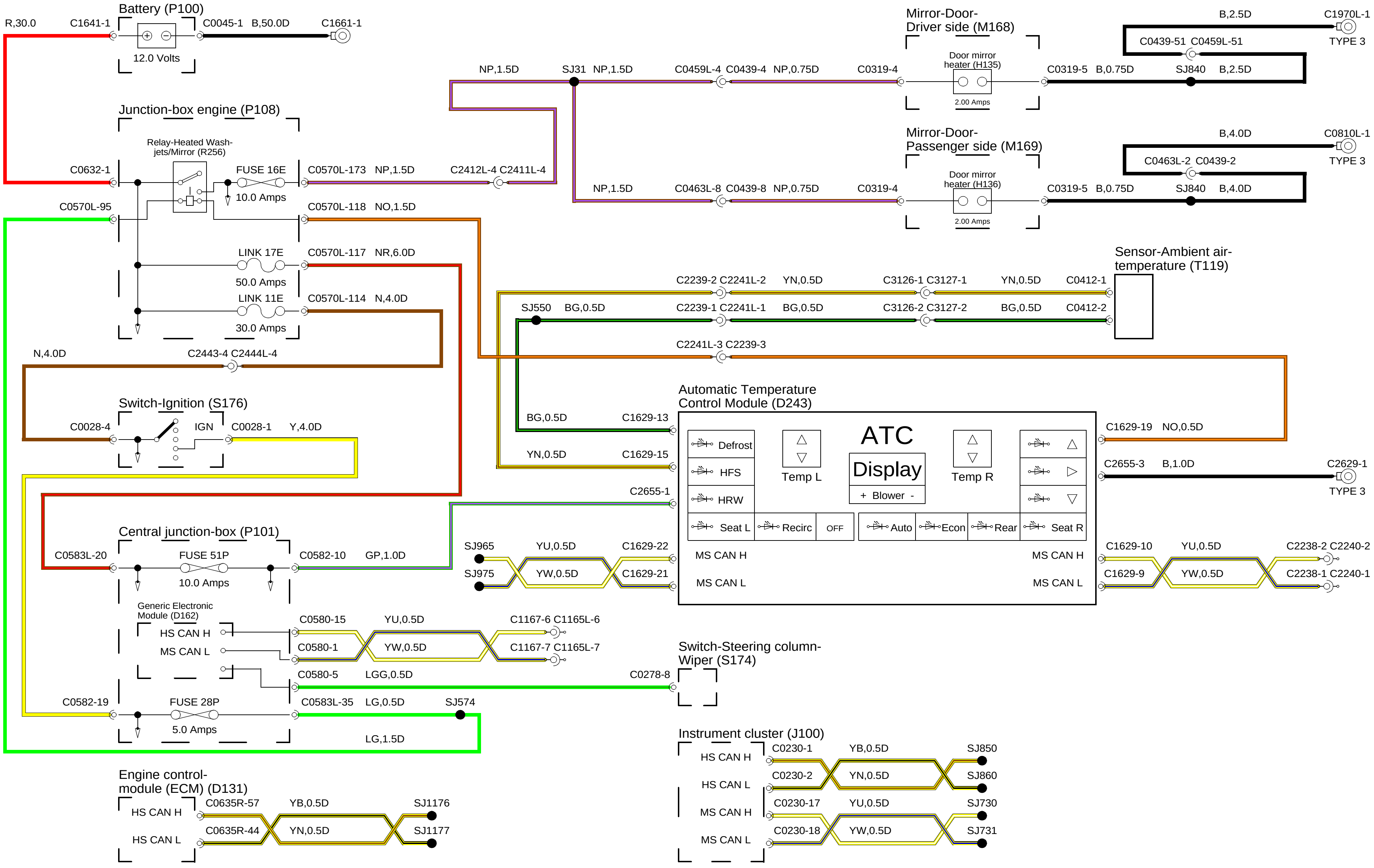

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
FUSE 26P
5.0 Amps
Battery backed sounder (D154)
C0583L-37
B,0.5D
C0666L-3
2.00 Amps
C0666L-1
B,0.5D
SJ171
B,2.5D
C2601-1
TYPE 3
Junction-box engine (P108)
Generic Electronic Module (D162)
C0632-1
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
C0583L-21
BATT
BBS LIN
C0584L-8
B,0.5D
C0666L-2
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
C0583L-20
KEY UNLOCK
C0586L-14
NOT USED (V101)
KEY LOCK
C0586L-16
NOT USED (V101)
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
DRIVER AJAR SW
C0586L-9
BN,0.5D
C
Sheet2
RLH AJAR SW
C0586L-7
PLG,0.5D
D
Sheet2
N,4.0D
C2443-4 C2444L-4
PASS AJAR SW
C0586L-8
BU,0.5D
E
Sheet2
RRH AJAR SW
C0586L-6
PLG,0.5D
F
Sheet2
Switch-Ignition (S176)
BONNET AJAR
C0584L-15
PO,0.5D
G
Sheet2
C0028-6
W,1.5D
C0582-30
AUX
GND
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C0028-4
C0028-1
Y,4.0D
C0582-19
IGN
MS CAN H
C0580-15
YU,0.5D
C1167-6 C1165L-6
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
MS CAN L
C0580-1
YW,0.5D
C1167-7 C1165L-7
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY-IN
Motor-CDL-Liftgate Glass (M316)
Instrument cluster (J100)
Switch-Liftgate Glass open (S446)
KR,0.75D
C1677-3
C1677-1
B,0.75D
H
Sheet2
Anti-theft alarm warning indicator (J139)
C0230-7
BS,0.5D
C0580-22
ALARM LED
TAILGATE AJAR
C0586L-10
BR,0.75D
SJ98
KR,0.75D
C0144-5 C0385-5
KR,0.75D
J
Sheet2
Passive coil (D156)
C2524-8
G,0.5D
C0580-14
LF IN
C2524-6
R,0.5D
C0580-30
LF OUT
Receiver-Radio-frequency (RF) (T203)
RF IN
C0586L-21
U,0.5D
C0049-2
ALARM HORN
Relay-Horn (R133)
LOW TONE
C0583L-4
PG,1.0D
K
Sheet2
FUSE 12P
15.0 Amps
HIGH TONE
C0583L-3
PG,1.0D
L
Sheet2

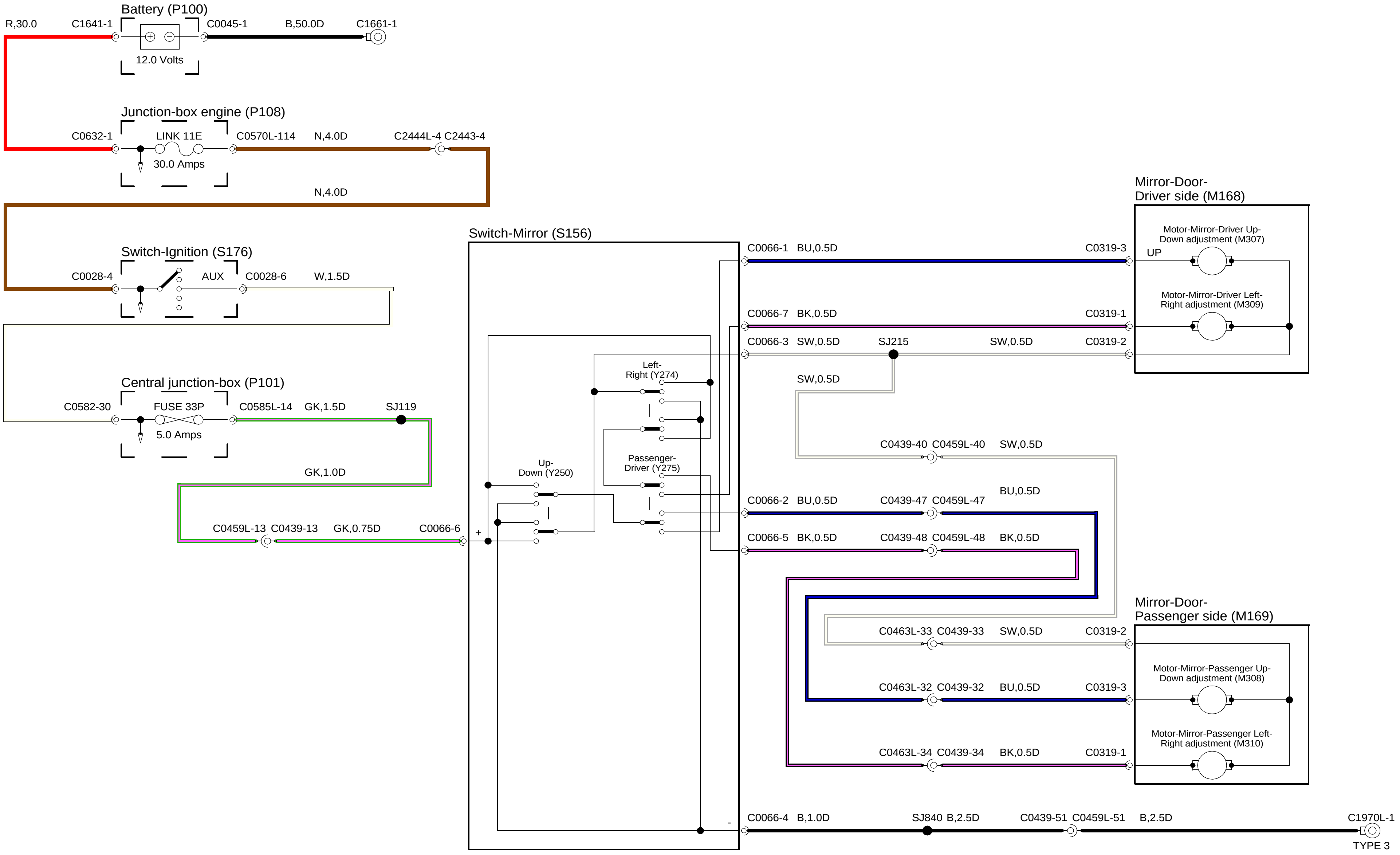

Motor-Central door-locking-Driver (M236)
NOT USED (V101)
C0441-2
NOT USED (V101)
C0441-3
Switch-Door-Driver (S409)
C
Sheet1
BN,0.5D
C0459L-19
C0439-19
BN,0.5D
C0441-4
C0441-1
B,0.5D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
TYPE 3
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
D
Sheet1
PLG,0.5D
C0435-3
C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9
C0435-9
B,1.5D
SJ742
B,2.5D
C0807L-1
TYPE 3
B,1.5D
C0803-21
C0435-21
B,1.5D
Motor-Central door-locking-Passenger (M237)
Switch-Door-Passenger (S410)
E
Sheet1
BU,0.5D
C0463L-19
C0439-19
BN,0.5D
C0441-4
C0441-8
B,0.5D
SJ840
B,4.0D
C0439-2
C0463L-2
B,4.0D
C0810L-1
TYPE 3
Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
F
Sheet1
PLG,0.5D
C0436-3
C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9
C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21
C0436-21
B,1.5D
Hood ajar switch (S224)
G
Sheet1
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
L
Sheet1
PG,1.0D
C0004-1
C0004-2
B,1.0D
Horn-LH (L102)
K
Sheet1
PG,1.0D
C0003-1
C0003-2
B,1.0D
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
J
Sheet1
KR,0.75D
C0144-1
C0385-1
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0385-2
C0144-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
H
Sheet1
B,0.75D

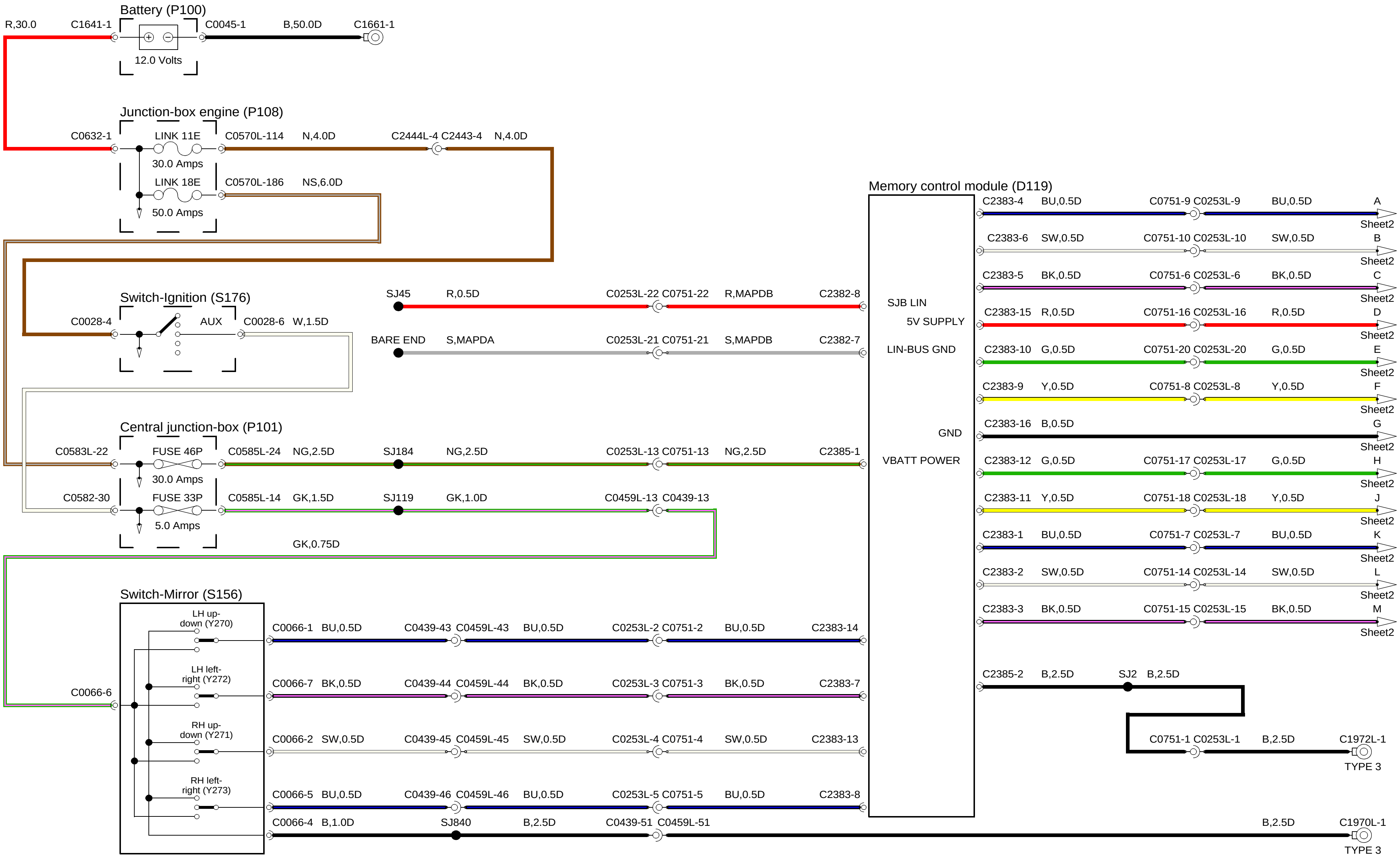

Central junction-box (P101)
Generic Electronic Module (D162)
VOLUMETRIC TRIGGER
VOLUMETRIC POWER
VOLUMETRIC ARM
C0586L-20 R,0.5D C0084L-14 C0610-14 R,0.5D C0358-3
C0586L-27 G,0.5D C0084L-15 C0610-15 G,0.5D C0358-4
C0586L-23 GB,0.5D C0084L-4 C0610-4
Sensor-Volumetric (T139)
0.02 Amps
C0358-1 B,0.5D SJ275 B,1.0D C0610-8 C0084L-8 B,0.75D C1398L-1
TYPE 3
C0358-2 GB,0.5D
Lamp-Side repeater-Front-RH (A120)
C0585L-2 GW,1.5D SJ3 GW,1.5D C0463L-3 C0439-3 GW,0.75D C2677-2
Tail lamp unit-RH (A140)
GW,1.5D C0125-3
Headlamp-RH (A100)
Turn signal indicator/ hazard warning lamp-Front RH (A116)
21.0 Watts
FET-Indicator-RH (G159)
RH INDICATOR O/P
C0583L-27 GW,1.5D C0011-3
Headlamp-LH (A101)
Turn signal indicator/ hazard warning lamp-Front LH (A117)
21.0 Watts
FET-Indicator-LH (G160)
LH INDICATOR O/P
C0583L-28 GR,1.5D C0009-3
Lamp-Side repeater-Front-LH (A121)
C0585L-4 GR,1.5D SJ4 GR,1.5D C0459L-58 C0439-52 GR,0.75D C2677-2
Tail lamp unit-LH (A139)
GR,1.5D C0333-8 C0420-8 GR,1.5D C0121-3
FET-Indicator-Trailer-LH (G162)
LH TRAILER IND O/P
C0585L-16 Y,2.5D C0473-1 C0498-1
Y,2.5D (13 PIN) C1390-2 C1414-2 Y,2.5D C0499-1
Y,2.5D (NAS 7 PIN) C1389-2 C1415-2 Y,2.5D C2586-5
Trailer pick-up (P124)
C2586-1 W,6.0D (NAS 7 PIN) C1414-2 C1390-2 W,6.0D C0565-1
TYPE 3
FET-Indicator-Trailer-RH (G161)
RH TRAILER IND O/P
C0585L-17 G,2.5D C0473-2 C0498-2
G,2.5D (13 PIN) C1390-3 C1414-3 G,2.5D C0499-4
G,2.5D (NAS 7 PIN) C1389-3 C1415-3 G,2.5D C2586-6
C0499-3 W,2.5D (13 PIN) C1414-1 C1390-1 W,2.5D C2692-1
TYPE 3

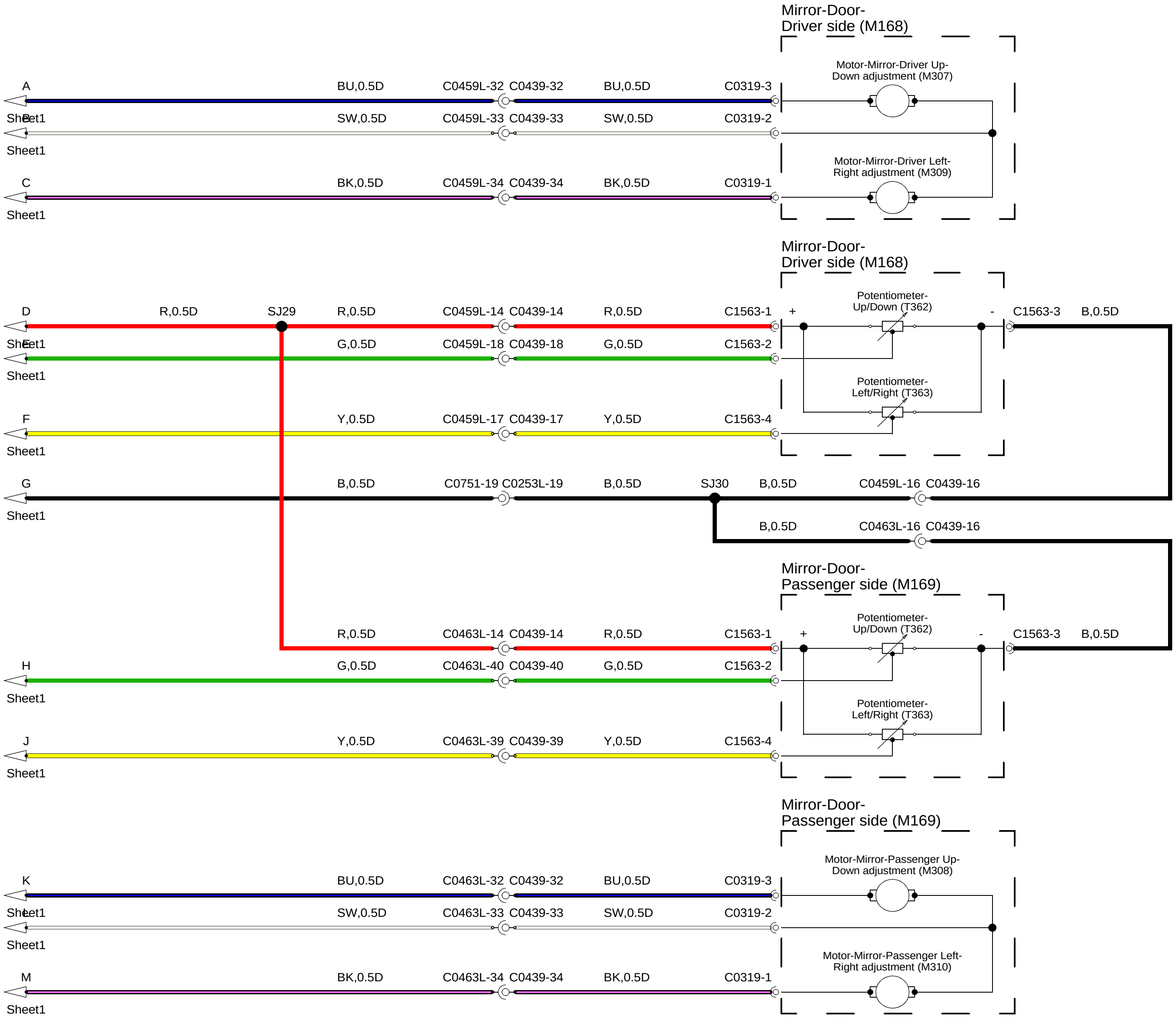

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Junction-box engine (P108)
Receiver-Radio-frequency (RF) (T203)
C0632-1
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
C0583L-20
FUSE 43P
10.0 Amps
C0585L-46
GW,0.5D
SJ50
GW,0.5D
C0049-1
C0049-2
LINK 16E
40.0 Amps
C0570L-185
NG,4.0D
C0583L-16
Generic Electronic Module (D162)
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
BATT
RF IN
C0586L-21
U,0.5D
Engine control-module (ECM) (D131)
C2366-4 C2365L-4
YB,0.5D
C0872L-A4
HS CAN H
(DIESEL)
C2366-5 C2365L-5
YN,0.5D
C0872L-A3
HS CAN L
N,4.0D
Switch-Ignition (S176)
C0028-4
C0028-6
W,1.5D
C0582-30
AUX
Engine control-module (ECM) (D131)
SJ176
YB,0.5D
C0635L-57
HS CAN H
(PETROL-V8)
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY IN
SJ177
YN,0.5D
C0635L-44
HS CAN L
Air suspension Control Module (D199)
Passive coil (D156)
C2524-6
R,0.5D
C0580-30
AIR_SUS_CONT
C0586L-29
WK,0.5D
13
LF OUT
C2524-8
G,0.5D
C0580-14
LF IN
GND
C0585L-18
B,2.5D
C2564L-1
TYPE 2
C0580-15
YU,0.5D
C1167-6 C1165L-6
MS CAN H
Instrument cluster (J100)
MS CAN L
C0580-1
YW,0.5D
C1167-7 C1165L-7
C0230-7
BS,0.5D
C0580-22
ALARM LED
HS CAN H
C0230-1
YB,0.5D
SJ850
HS CAN L
C0230-2
YN,0.5D
SJ860
MS CAN H
C0230-17
YU,0.5D
SJ730
MS CAN L
C0230-18
YW,0.5D
SJ731

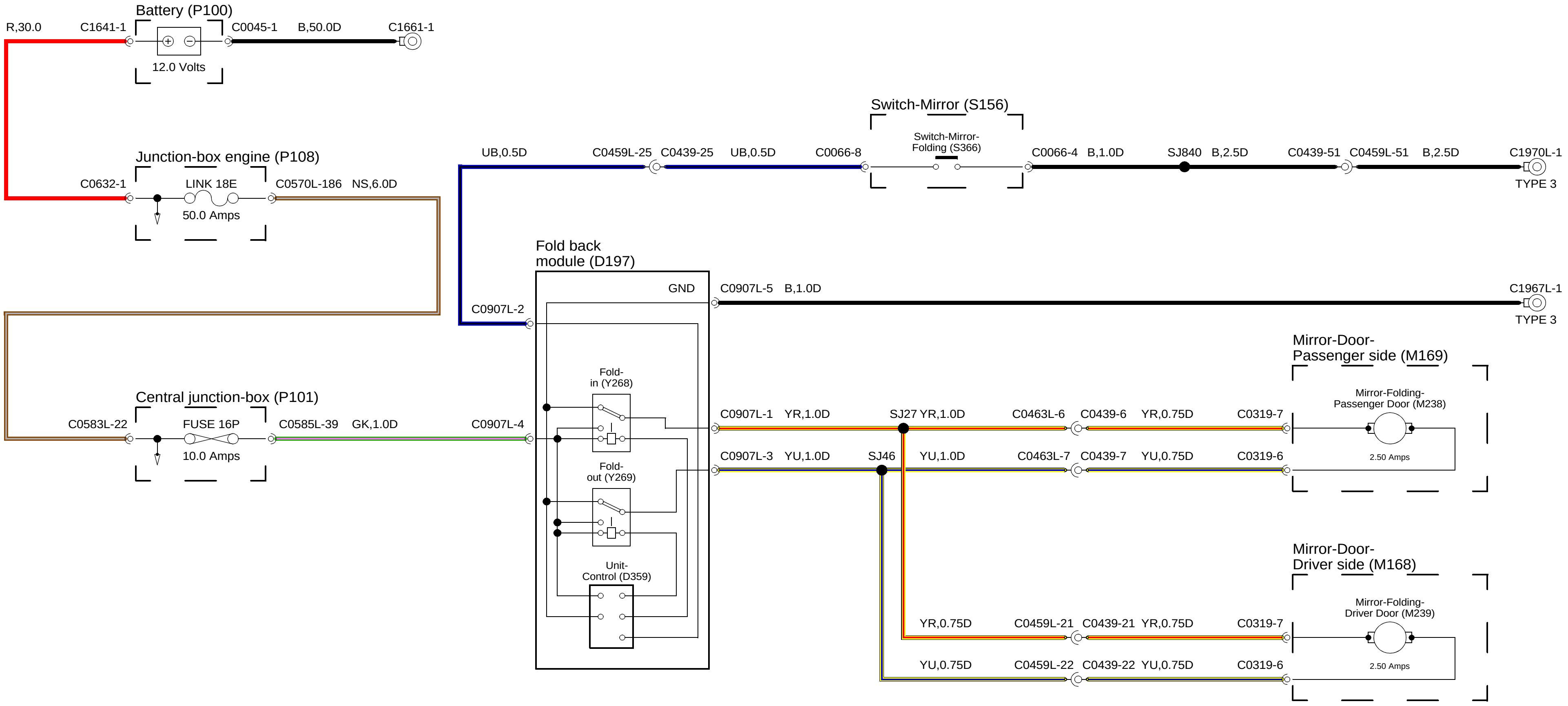

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 69P
5.0 Amps
C0586L-3
GR,0.5D
SJ695
GR,0.5D
C0698-1
Mirror-interior (B146)
IGN
GND
REVERSE
C0698-2
B,0.5D
SJ53
B,4.0D
C2597L-1
TYPE 3
Relay-
Reverse (R217)
FUSE 5P
10.0 Amps
C0585L-41
GN,1.5D
SJ7
GN,0.5D
C0698-3

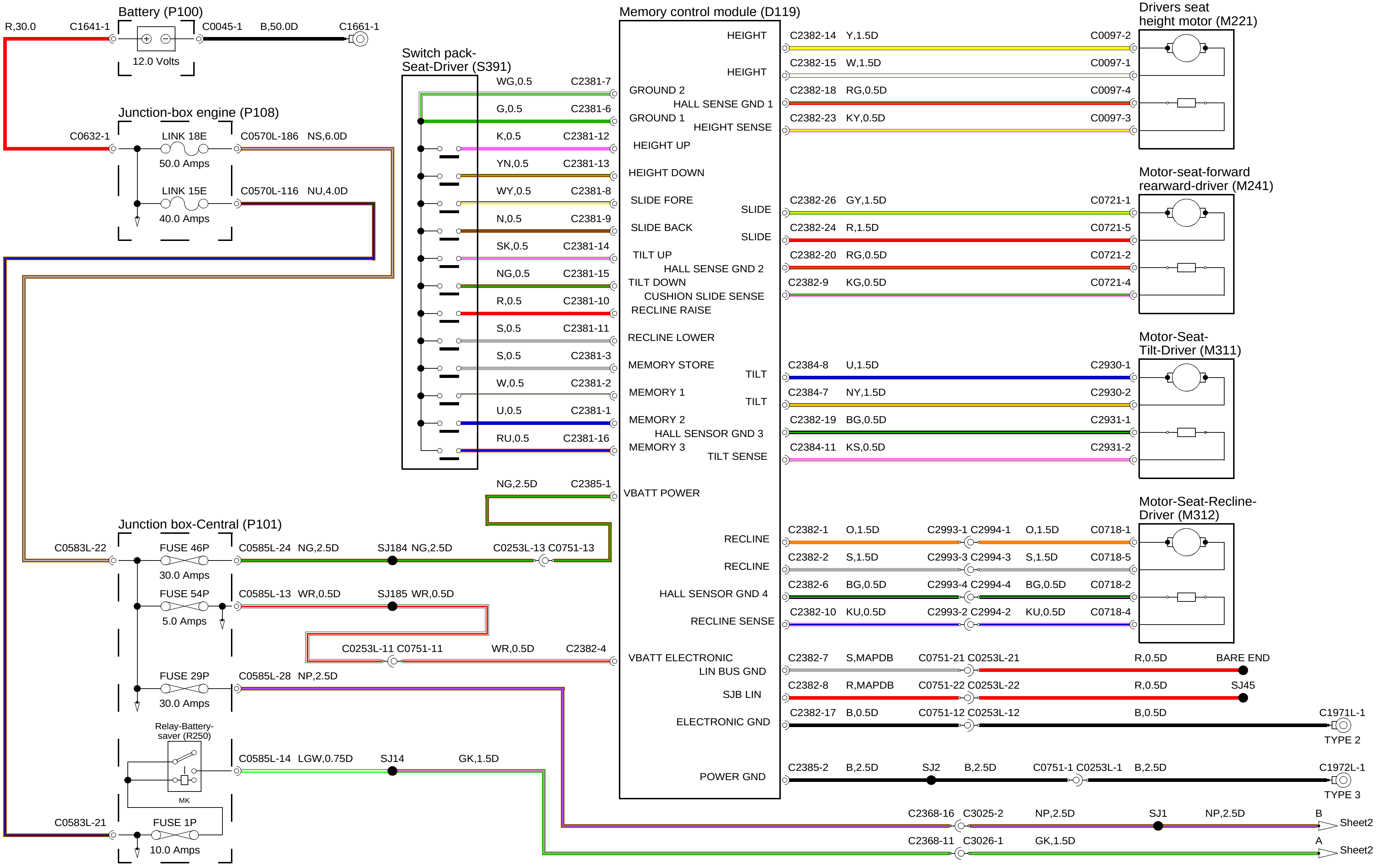

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-Heated Wash-jets/Mirror (R256)
C0632-1
FUSE 16E
10.0 Amps
C0570L-173
NP,1.5D
C2412L-4 C2411L-4
C0570L-95
C0570L-118
NO,1.5D
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
HS CAN H
MS CAN L
C0580-15
YU,0.5D
C1167-6 C1165L-6
C0580-1
YW,0.5D
C1167-7 C1165L-7
C0580-5
LGG,0.5D
C0278-8
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,1.5D
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0635R-57
YB,0.5D
SJ1176
C0635R-44
YN,0.5D
SJ1177
NP,1.5D
SJ31
NP,1.5D
C0459L-4 C0439-4
NP,0.75D
C0319-4
Mirror-Door-Driver side (M168)
Door mirror heater (H135)
2.00 Amps
C0319-5
B,0.75D
SJ840
B,2.5D
B,2.5D
C1970L-1
C0439-51 C0459L-51
TYPE 3
Mirror-Door-Passenger side (M169)
Door mirror heater (H136)
2.00 Amps
NP,1.5D
C0463L-8 C0439-8
NP,0.75D
C0319-4
C0319-5
B,0.75D
SJ840
B,4.0D
B,4.0D
C0810L-1
C0463L-2 C0439-2
TYPE 3
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2239-1 C2241L-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
C2241L-3 C2239-3
Automatic Temperature Control Module (D243)
BG,0.5D
C1629-13
YN,0.5D
C1629-15
C2655-1
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
C1629-19
NO,0.5D
C2655-3
B,1.0D
C2629-1
TYPE 3
SJ965
YU,0.5D
C1629-22
SJ975
YW,0.5D
C1629-21
MS CAN H
MS CAN L
MS CAN H
MS CAN L
C1629-10
YU,0.5D
C2238-2 C2240-2
C1629-9
YW,0.5D
C2238-1 C2240-1
Switch-Steering column-Wiper (S174)
Instrument cluster (J100)
HS CAN H
C0230-1
YB,0.5D
SJ850
HS CAN L
C0230-2
YN,0.5D
SJ860
MS CAN H
C0230-17
YU,0.5D
SJ730
MS CAN L
C0230-18
YW,0.5D
SJ731

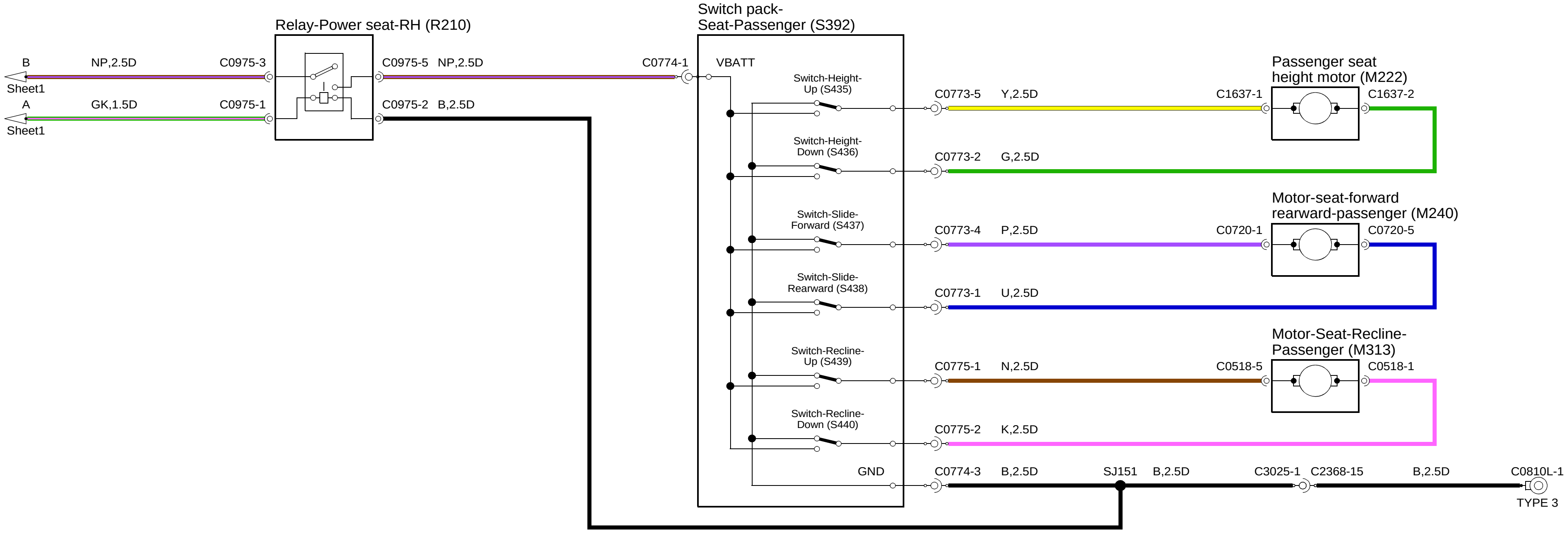

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
30.0 Amps
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central junction-box (P101)
C0582-30
FUSE 33P
C0585L-14
GK,1.5D
SJ119
5.0 Amps
GK,1.0D
C0459L-13
C0439-13
GK,0.75D
C0066-6
Switch-Mirror (S156)
Left-Right (Y274)
Up-Down (Y250)
Passenger-Driver (Y275)
+
-
Mirror-Door-Driver side (M168)
Motor-Mirror-Driver Up-Down adjustment (M307)
UP
Motor-Mirror-Driver Left-Right adjustment (M309)
C0066-1
BU,0.5D
C0319-3
C0066-7
BK,0.5D
C0319-1
C0066-3
SW,0.5D
SJ215
SW,0.5D
C0319-2
SW,0.5D
C0439-40 C0459L-40
SW,0.5D
BU,0.5D
C0066-2
BU,0.5D
C0439-47 C0459L-47
C0066-5
BK,0.5D
C0439-48 C0459L-48
BK,0.5D
Mirror-Door-Passenger side (M169)
C0463L-33 C0439-33
SW,0.5D
C0319-2
Motor-Mirror-Passenger Up-Down adjustment (M308)
C0463L-32 C0439-32
BU,0.5D
C0319-3
Motor-Mirror-Passenger Left-Right adjustment (M310)
C0463L-34 C0439-34
BK,0.5D
C0319-1
C0066-4
B,1.0D
SJ840
B,2.5D
C0439-51 C0459L-51
B,2.5D
C1970L-1
TYPE 3

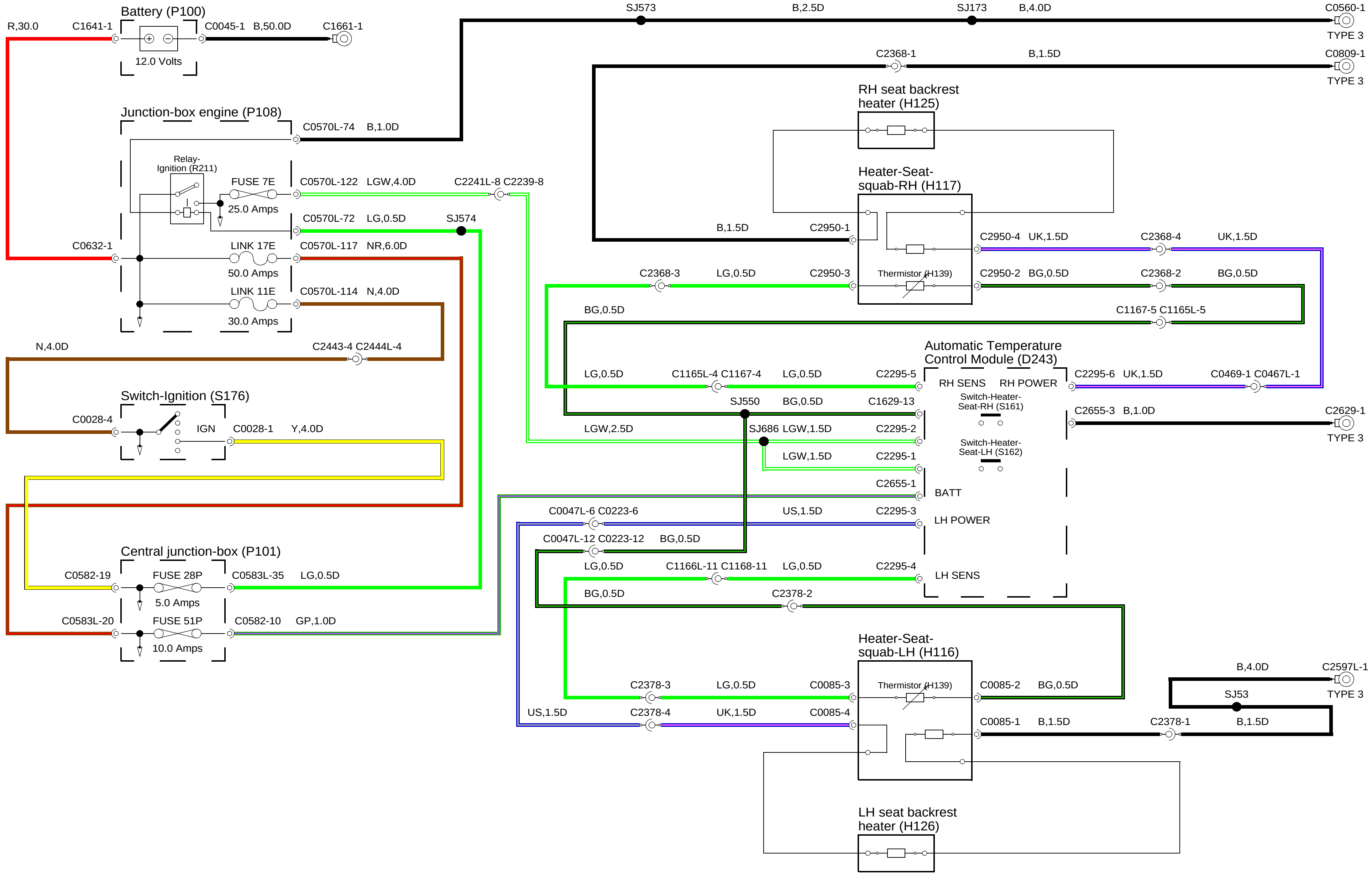

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
30.0 Amps
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Memory control module (D119)
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
SJ45
R,0.5D
C0253L-22 C0751-22
R,MAPDB
C2382-8
BARE END
S,MAPDA
C0253L-21 C0751-21
S,MAPDB
C2382-7
SJB LIN
5V SUPPLY
LIN-BUS GND
GND
VBATT POWER
Central junction-box (P101)
C0583L-22
FUSE 46P
C0585L-24
NG,2.5D
SJ184
NG,2.5D
C0253L-13 C0751-13
NG,2.5D
C2385-1
30.0 Amps
C0582-30
FUSE 33P
C0585L-14
GK,1.5D
SJ119
GK,1.0D
C0459L-13 C0439-13
5.0 Amps
GK,0.75D
C2383-4 BU,0.5D C0751-9 C0253L-9 BU,0.5D A Sheet2
C2383-6 SW,0.5D C0751-10 C0253L-10 SW,0.5D B Sheet2
C2383-5 BK,0.5D C0751-6 C0253L-6 BK,0.5D C Sheet2
C2383-15 R,0.5D C0751-16 C0253L-16 R,0.5D D Sheet2
C2383-10 G,0.5D C0751-20 C0253L-20 G,0.5D E Sheet2
C2383-9 Y,0.5D C0751-8 C0253L-8 Y,0.5D F Sheet2
C2383-16 B,0.5D G Sheet2
C2383-12 G,0.5D C0751-17 C0253L-17 G,0.5D H Sheet2
C2383-11 Y,0.5D C0751-18 C0253L-18 Y,0.5D J Sheet2
C2383-1 BU,0.5D C0751-7 C0253L-7 BU,0.5D K Sheet2
C2383-2 SW,0.5D C0751-14 C0253L-14 SW,0.5D L Sheet2
C2383-3 BK,0.5D C0751-15 C0253L-15 BK,0.5D M Sheet2
Switch-Mirror (S156)
LH up-down (Y270)
C0066-1 BU,0.5D C0439-43 C0459L-43 BU,0.5D C0253L-2 C0751-2 BU,0.5D C2383-14
LH left-right (Y272)
C0066-6
C0066-7 BK,0.5D C0439-44 C0459L-44 BK,0.5D C0253L-3 C0751-3 BK,0.5D C2383-7
RH up-down (Y271)
C0066-2 SW,0.5D C0439-45 C0459L-45 SW,0.5D C0253L-4 C0751-4 SW,0.5D C2383-13
RH left-right (Y273)
C0066-5 BU,0.5D C0439-46 C0459L-46 BU,0.5D C0253L-5 C0751-5 BU,0.5D C2383-8
C0066-4 B,1.0D SJ840 B,2.5D C0439-51 C0459L-51 B,2.5D C1970L-1 TYPE 3
C2385-2 B,2.5D SJ2 B,2.5D
C0751-1 C0253L-1 B,2.5D C1972L-1 TYPE 3

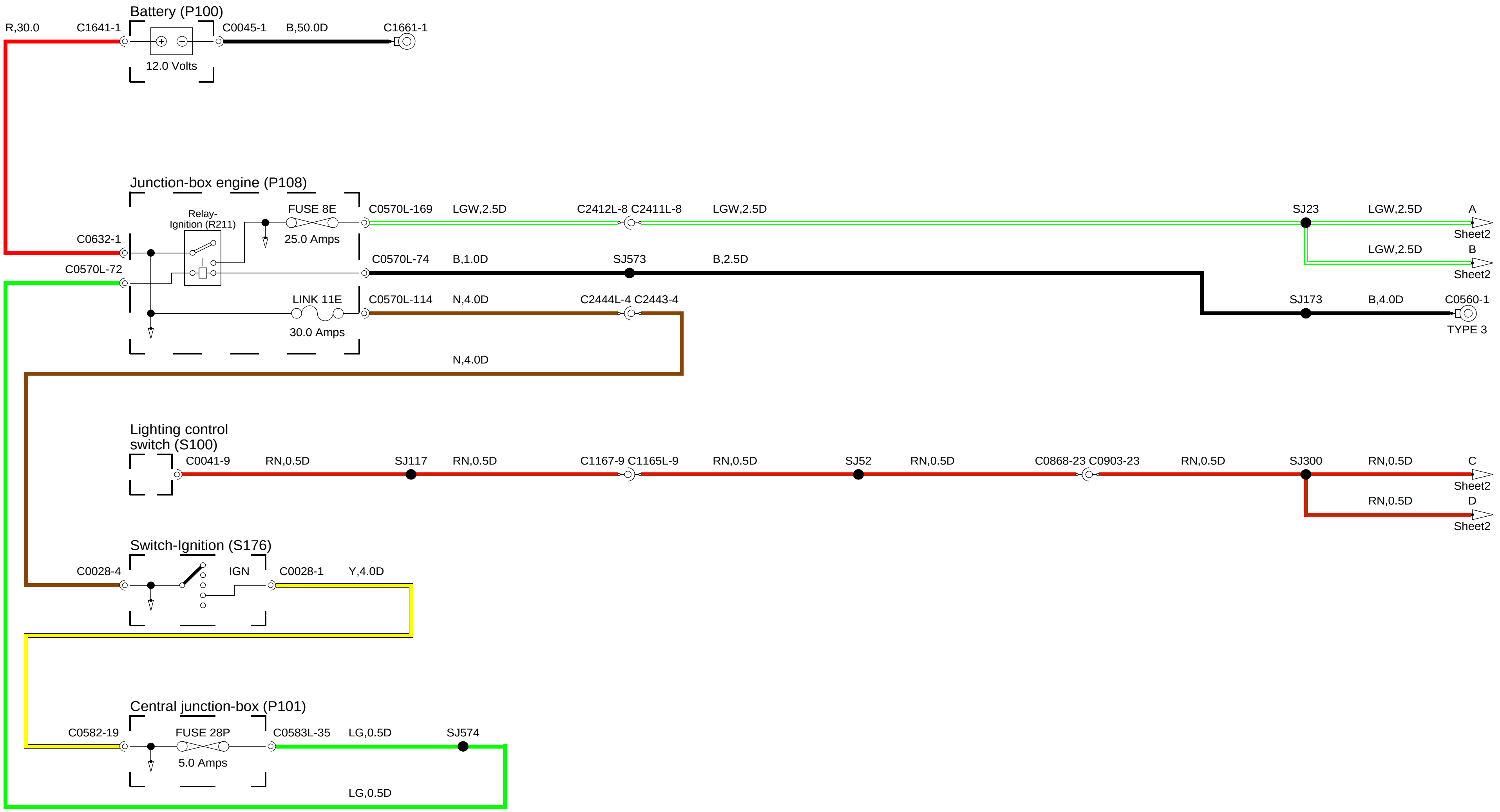

Mirror-Door-Driver side (M168)
Motor-Mirror-Driver Up-Down adjustment (M307)
Motor-Mirror-Driver Left-Right adjustment (M309)
A Sheet1 BU,0.5D C0459L-32 C0439-32 BU,0.5D C0319-3
B Sheet1 SW,0.5D C0459L-33 C0439-33 SW,0.5D C0319-2
C Sheet1 BK,0.5D C0459L-34 C0439-34 BK,0.5D C0319-1
Potentiometer-Up/Down (T362)
Potentiometer-Left/Right (T363)
D Sheet1 R,0.5D SJ29 R,0.5D C0459L-14 C0439-14 R,0.5D C1563-1 +
- C1563-3 B,0.5D
E Sheet1 G,0.5D C0459L-18 C0439-18 G,0.5D C1563-2
F Sheet1 Y,0.5D C0459L-17 C0439-17 Y,0.5D C1563-4
G Sheet1 B,0.5D C0751-19 C0253L-19 B,0.5D SJ30 B,0.5D C0459L-16 C0439-16
B,0.5D C0463L-16 C0439-16
Mirror-Door-Passenger side (M169)
R,0.5D C0463L-14 C0439-14 R,0.5D C1563-1 +
- C1563-3 B,0.5D
H Sheet1 G,0.5D C0463L-40 C0439-40 G,0.5D C1563-2
J Sheet1 Y,0.5D C0463L-39 C0439-39 Y,0.5D C1563-4
Motor-Mirror-Passenger Up-Down adjustment (M308)
Motor-Mirror-Passenger Left-Right adjustment (M310)
K Sheet1 BU,0.5D C0463L-32 C0439-32 BU,0.5D C0319-3
L Sheet1 SW,0.5D C0463L-33 C0439-33 SW,0.5D C0319-2
M Sheet1 BK,0.5D C0463L-34 C0439-34 BK,0.5D C0319-1

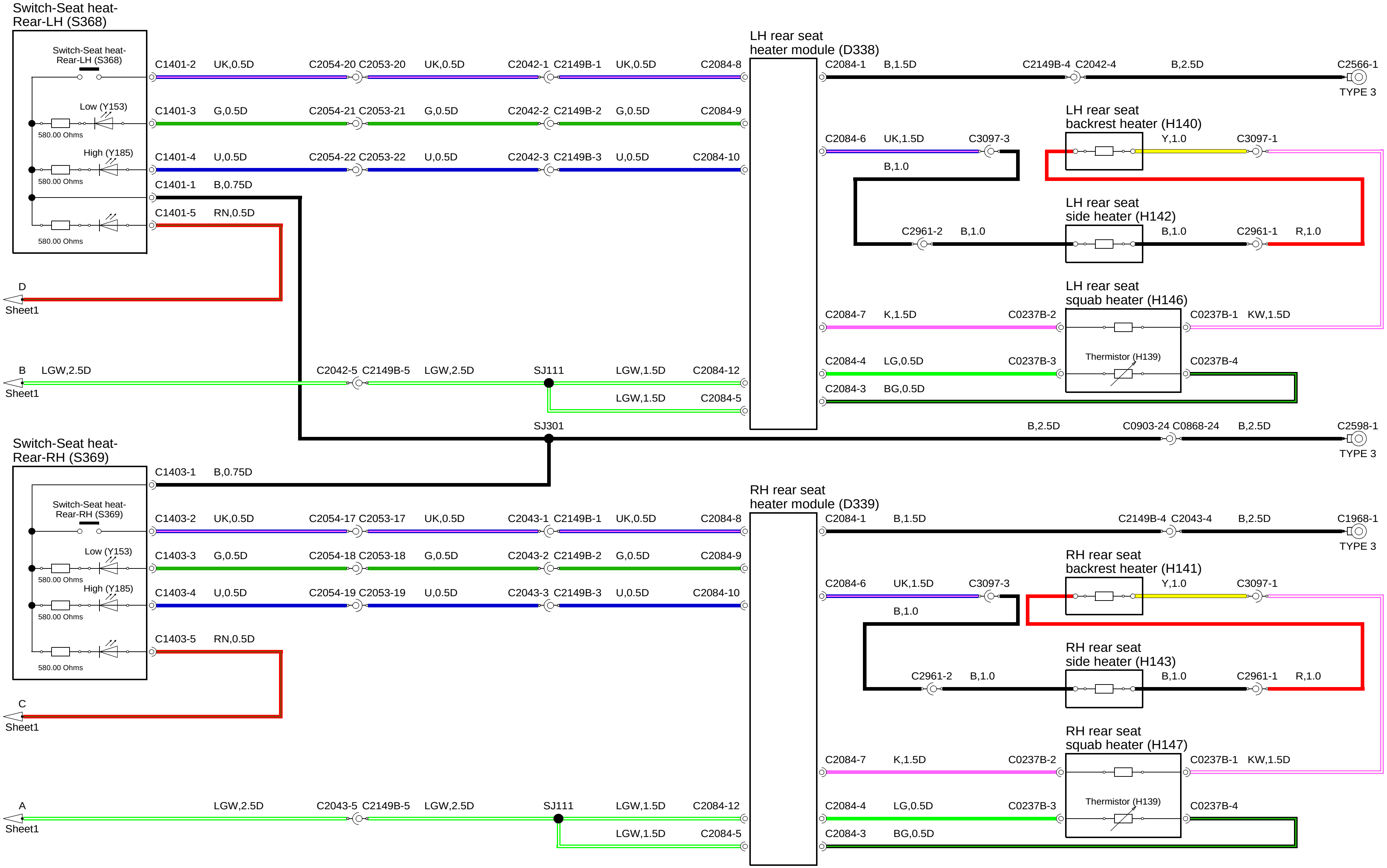

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Switch-Mirror (S156)
Switch-Mirror-
Folding (S366)
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
UB,0.5D
C0459L-25
C0439-25
UB,0.5D
C0066-8
C0066-4
B,1.0D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
TYPE 3
Fold back
module (D197)
GND
C0907L-5
B,1.0D
C1967L-1
TYPE 3
C0907L-2
Mirror-Door-
Passenger side (M169)
Mirror-Folding-
Passenger Door (M238)
2.50 Amps
Fold-
in (Y268)
Central junction-box (P101)
C0583L-22
FUSE 16P
10.0 Amps
C0585L-39
GK,1.0D
C0907L-4
C0907L-1
YR,1.0D
SJ27
YR,1.0D
C0463L-6
C0439-6
YR,0.75D
C0319-7
C0907L-3
YU,1.0D
SJ46
YU,1.0D
C0463L-7
C0439-7
YU,0.75D
C0319-6
Fold-
out (Y269)
Unit-
Control (D359)
Mirror-Door-
Driver side (M168)
Mirror-Folding-
Driver Door (M239)
YR,0.75D
C0459L-21
C0439-21
YR,0.75D
C0319-7
2.50 Amps
YU,0.75D
C0459L-22
C0439-22
YU,0.75D
C0319-6

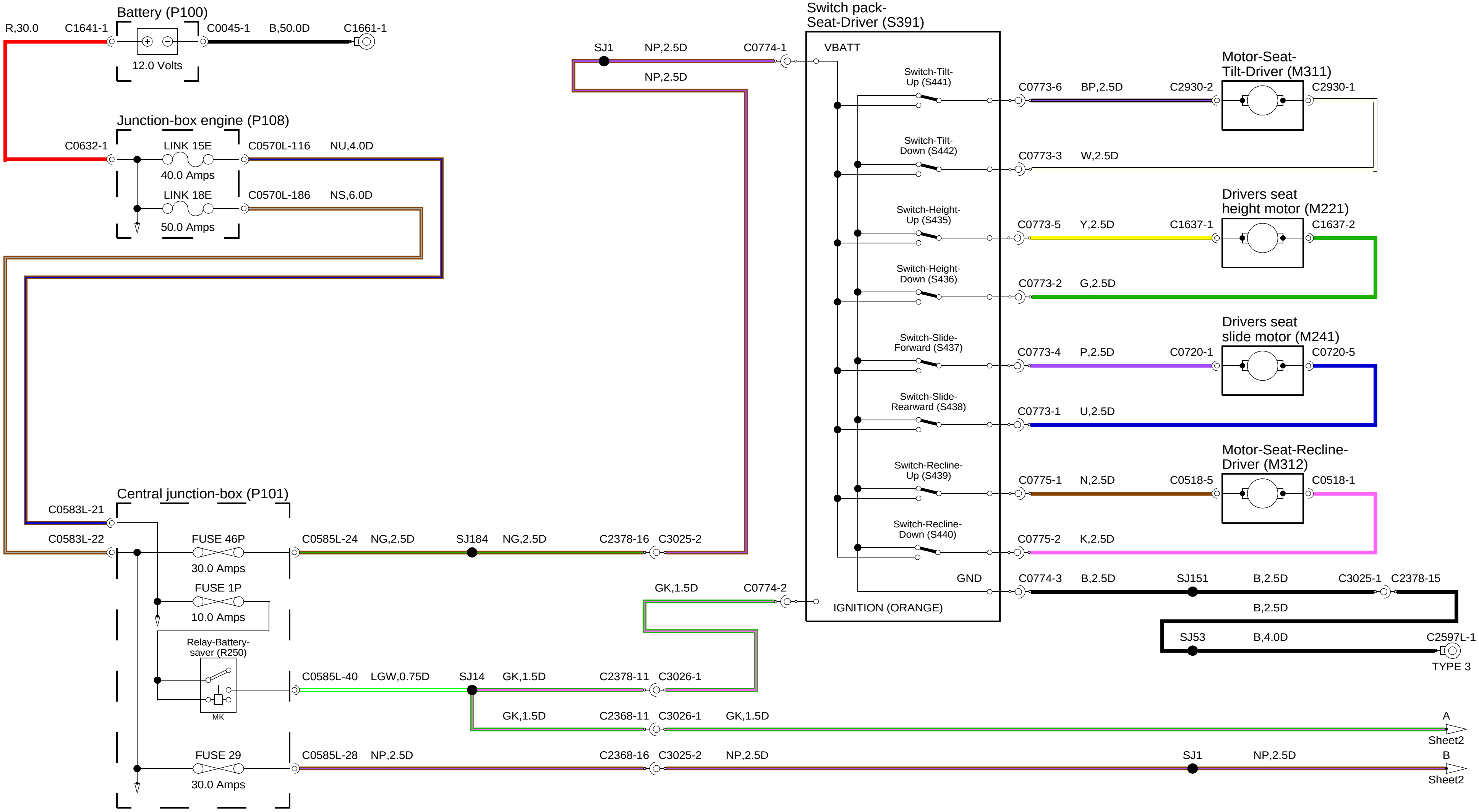

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
Switch pack-
Seat-Driver (S391)
WG,0.5
C2381-7
G,0.5
C2381-6
K,0.5
C2381-12
YN,0.5
C2381-13
WY,0.5
C2381-8
N,0.5
C2381-9
SK,0.5
C2381-14
NG,0.5
C2381-15
R,0.5
C2381-10
S,0.5
C2381-11
S,0.5
C2381-3
W,0.5
C2381-2
U,0.5
C2381-1
RU,0.5
C2381-16
NG,2.5D
C2385-1
Memory control module (D119)
HEIGHT
HEIGHT
GROUND 2
HALL SENSE GND 1
GROUND 1
HEIGHT SENSE
HEIGHT UP
HEIGHT DOWN
SLIDE FORE
SLIDE
SLIDE BACK
SLIDE
TILT UP
HALL SENSE GND 2
TILT DOWN
CUSHION SLIDE SENSE
RECLINE RAISE
RECLINE LOWER
MEMORY STORE
TILT
MEMORY 1
TILT
MEMORY 2
HALL SENSOR GND 3
MEMORY 3
TILT SENSE
VBATT POWER
RECLINE
RECLINE
HALL SENSOR GND 4
RECLINE SENSE
VBATT ELECTRONIC
LIN BUS GND
SJB LIN
ELECTRONIC GND
POWER GND
Drivers seat
height motor (M221)
C2382-14
Y,1.5D
C0097-2
C2382-15
W,1.5D
C0097-1
C2382-18
RG,0.5D
C0097-4
C2382-23
KY,0.5D
C0097-3
Motor-seat-forward
rearward-driver (M241)
C2382-26
GY,1.5D
C0721-1
C2382-24
R,1.5D
C0721-5
C2382-20
RG,0.5D
C0721-2
C2382-9
KG,0.5D
C0721-4
Motor-Seat-
Tilt-Driver (M311)
C2384-8
U,1.5D
C2930-1
C2384-7
NY,1.5D
C2930-2
C2382-19
BG,0.5D
C2931-1
C2384-11
KS,0.5D
C2931-2
Motor-Seat-Recline-
Driver (M312)
C2382-1
O,1.5D
C2993-1 C2994-1
O,1.5D
C0718-1
C2382-2
S,1.5D
C2993-3 C2994-3
S,1.5D
C0718-5
C2382-6
BG,0.5D
C2993-4 C2994-4
BG,0.5D
C0718-2
C2382-10
KU,0.5D
C2993-2 C2994-2
KU,0.5D
C0718-4
Junction box-Central (P101)
C0583L-22
FUSE 46P
30.0 Amps
C0585L-24
NG,2.5D
SJ184
NG,2.5D
C0253L-13 C0751-13
FUSE 54P
5.0 Amps
C0585L-13
WR,0.5D
SJ185
WR,0.5D
C0253L-11 C0751-11
WR,0.5D
C2382-4
FUSE 29P
30.0 Amps
C0585L-28
NP,2.5D
Relay-Battery-
saver (R250)
MK
C0585L-14
LGW,0.75D
SJ14
GK,1.5D
C0583L-21
FUSE 1P
10.0 Amps
C2382-7
S,MAPDB
C0751-21 C0253L-21
R,0.5D
BARE END
C2382-8
R,MAPDB
C0751-22 C0253L-22
R,0.5D
SJ45
C2382-17
B,0.5D
C0751-12 C0253L-12
B,0.5D
C1971L-1
TYPE 2
C2385-2
B,2.5D
SJ2
B,2.5D
C0751-1 C0253L-1
B,2.5D
C1972L-1
TYPE 3
C2368-16
C3025-2
NP,2.5D
SJ1
NP,2.5D
B
Sheet2
C2368-11
C3026-1
GK,1.5D
A
Sheet2

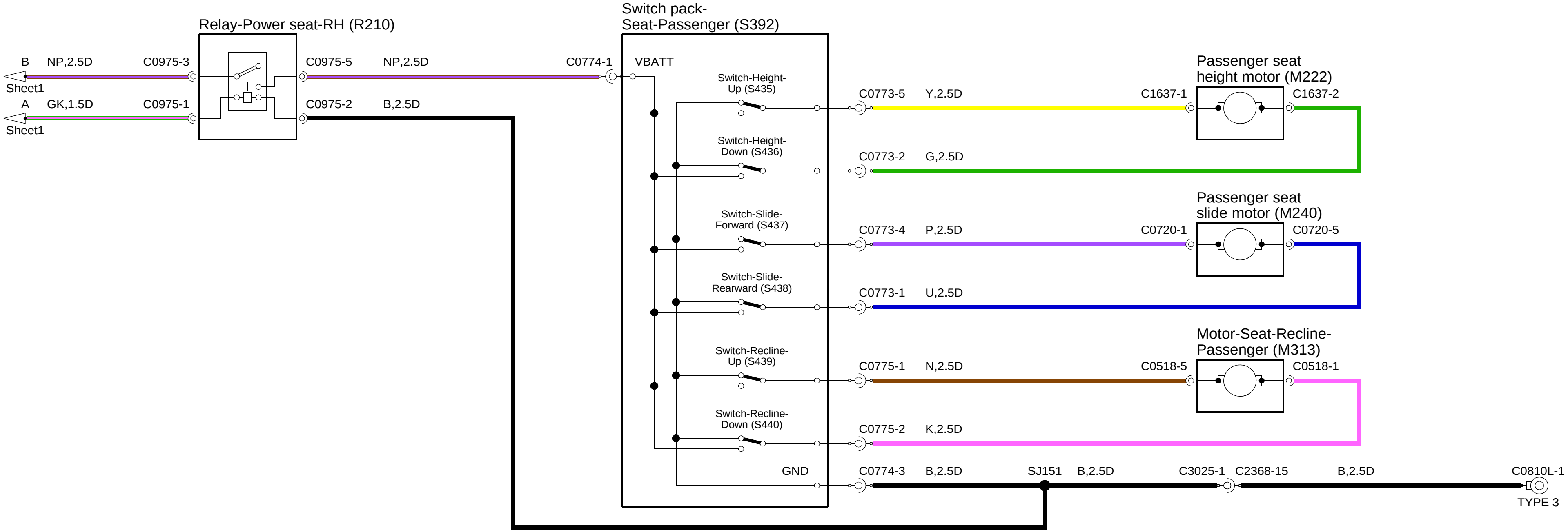

Relay-Power seat-RH (R210)
Switch pack-
Seat-Passenger (S392)
B
NP,2.5D
C0975-3
Sheet1
A
GK,1.5D
C0975-1
Sheet1
C0975-5
NP,2.5D
C0975-2
B,2.5D
C0774-1
VBATT
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
C0773-5
Y,2.5D
C1637-1
Passenger seat
height motor (M222)
C1637-2
C0773-2
G,2.5D
Motor-seat-forward
rearward-passenger (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

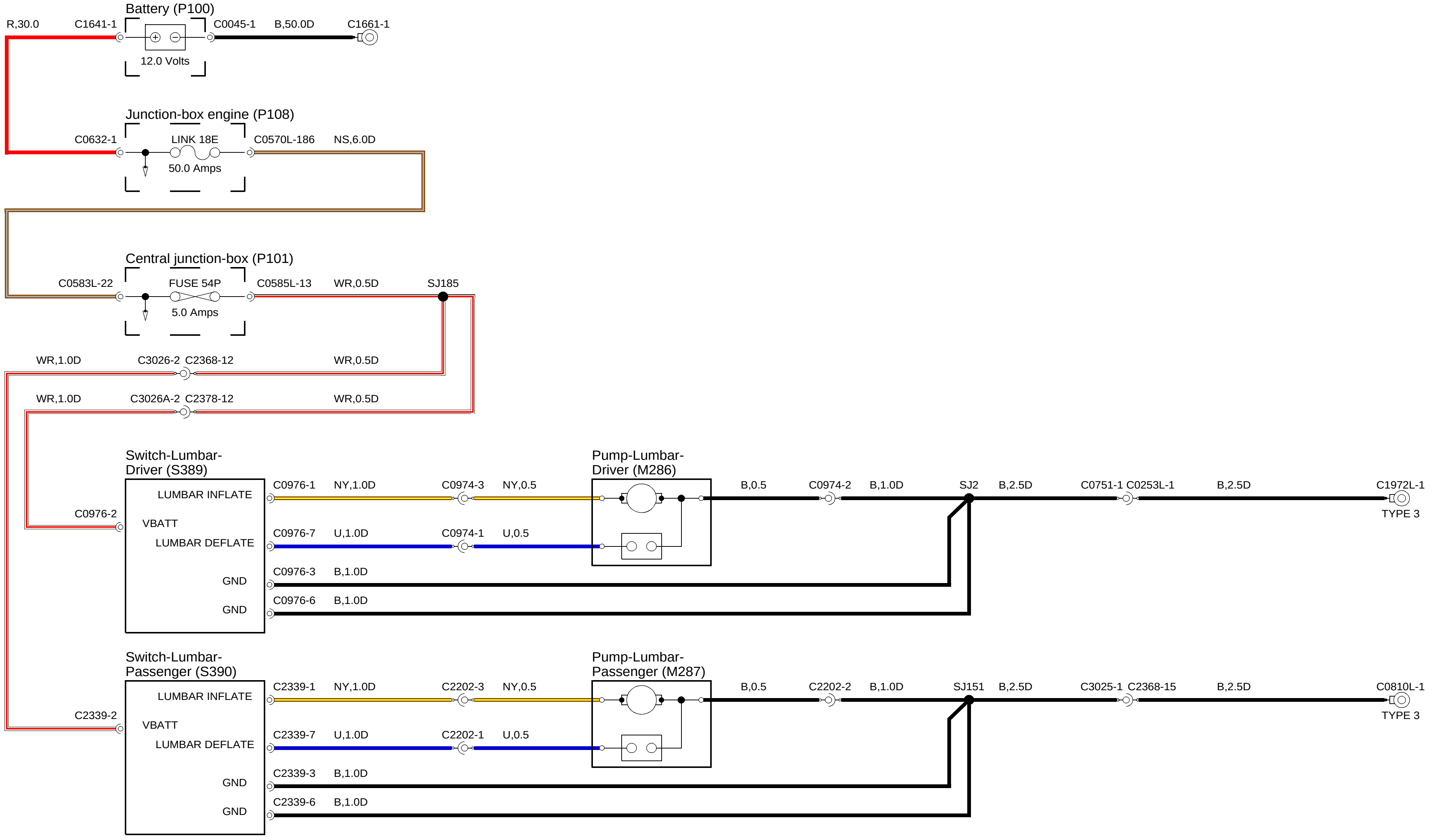

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
C2368-1
B,1.5D
C0809-1
TYPE 3
RH seat backrest heater (H125)
Junction-box engine (P108)
C0570L-74
B,1.0D
Relay-Ignition (R211)
FUSE 7E
25.0 Amps
C0570L-122
LGW,4.0D
C2241L-8 C2239-8
Heater-Seat-squab-RH (H117)
C0570L-72
LG,0.5D
SJ574
B,1.5D
C2950-1
C2950-4
UK,1.5D
C2368-4
UK,1.5D
C0632-1
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
C2368-3
LG,0.5D
C2950-3
Thermistor (H139)
C2950-2
BG,0.5D
C2368-2
BG,0.5D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
BG,0.5D
C1167-5 C1165L-5
N,4.0D
C2443-4 C2444L-4
Automatic Temperature Control Module (D243)
LG,0.5D
C1165L-4 C1167-4
LG,0.5D
C2295-5
RH SENS
RH POWER
C2295-6
UK,1.5D
C0469-1 C0467L-1
Switch-Ignition (S176)
SJ550
BG,0.5D
C1629-13
Switch-Heater-Seat-RH (S161)
C2655-3
B,1.0D
C2629-1
C0028-4
IGN
C0028-1
Y,4.0D
LGW,2.5D
SJ686
LGW,1.5D
C2295-2
TYPE 3
Switch-Heater-Seat-LH (S162)
LGW,1.5D
C2295-1
C2655-1
BATT
C0047L-6 C0223-6
US,1.5D
C2295-3
LH POWER
C0047L-12 C0223-12
BG,0.5D
Central junction-box (P101)
LG,0.5D
C1166L-11 C1168-11
LG,0.5D
C2295-4
LH SENS
C0582-19
FUSE 28P
C0583L-35
LG,0.5D
5.0 Amps
BG,0.5D
C2378-2
C0583L-20
FUSE 51P
C0582-10
GP,1.0D
10.0 Amps
Heater-Seat-squab-LH (H116)
B,4.0D
C2597L-1
C2378-3
LG,0.5D
C0085-3
Thermistor (H139)
C0085-2
BG,0.5D
SJ53
TYPE 3
US,1.5D
C2378-4
UK,1.5D
C0085-4
C0085-1
B,1.5D
C2378-1
B,1.5D
LH seat backrest heater (H126)

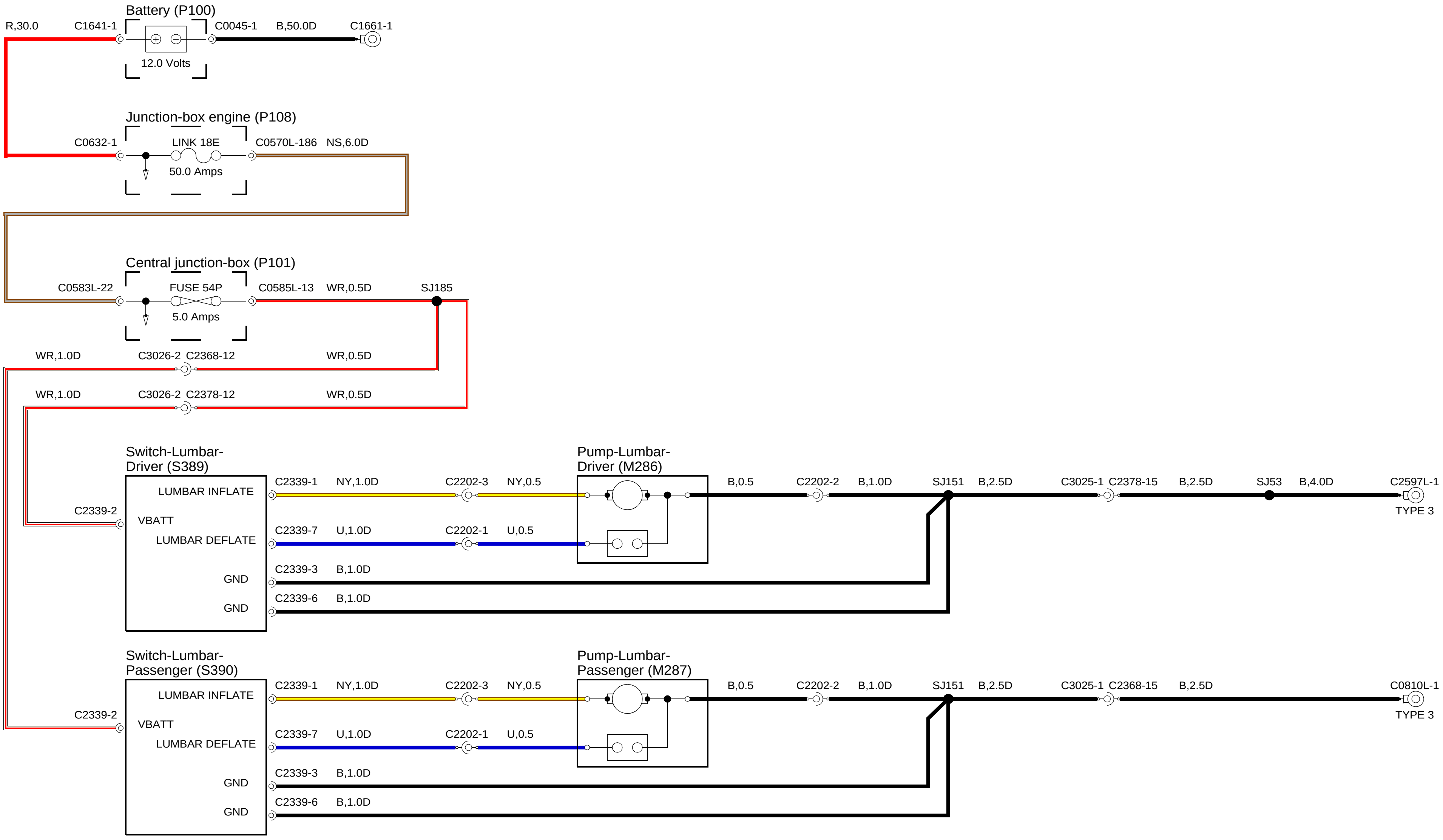

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
Relay-
Ignition (R211)
FUSE 8E
25.0 Amps
C0570L-169
LGW,2.5D
C2412L-8 C2411L-8
LGW,2.5D
SJ23
LGW,2.5D
A
Sheet2
LGW,2.5D
B
Sheet2
C0632-1
C0570L-74
B,1.0D
SJ573
B,2.5D
C0570L-72
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
SJ173
B,4.0D
C0560-1
TYPE 3
N,4.0D
Lighting control
switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1167-9 C1165L-9
RN,0.5D
SJ52
RN,0.5D
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C
Sheet2
RN,0.5D
D
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,0.5D

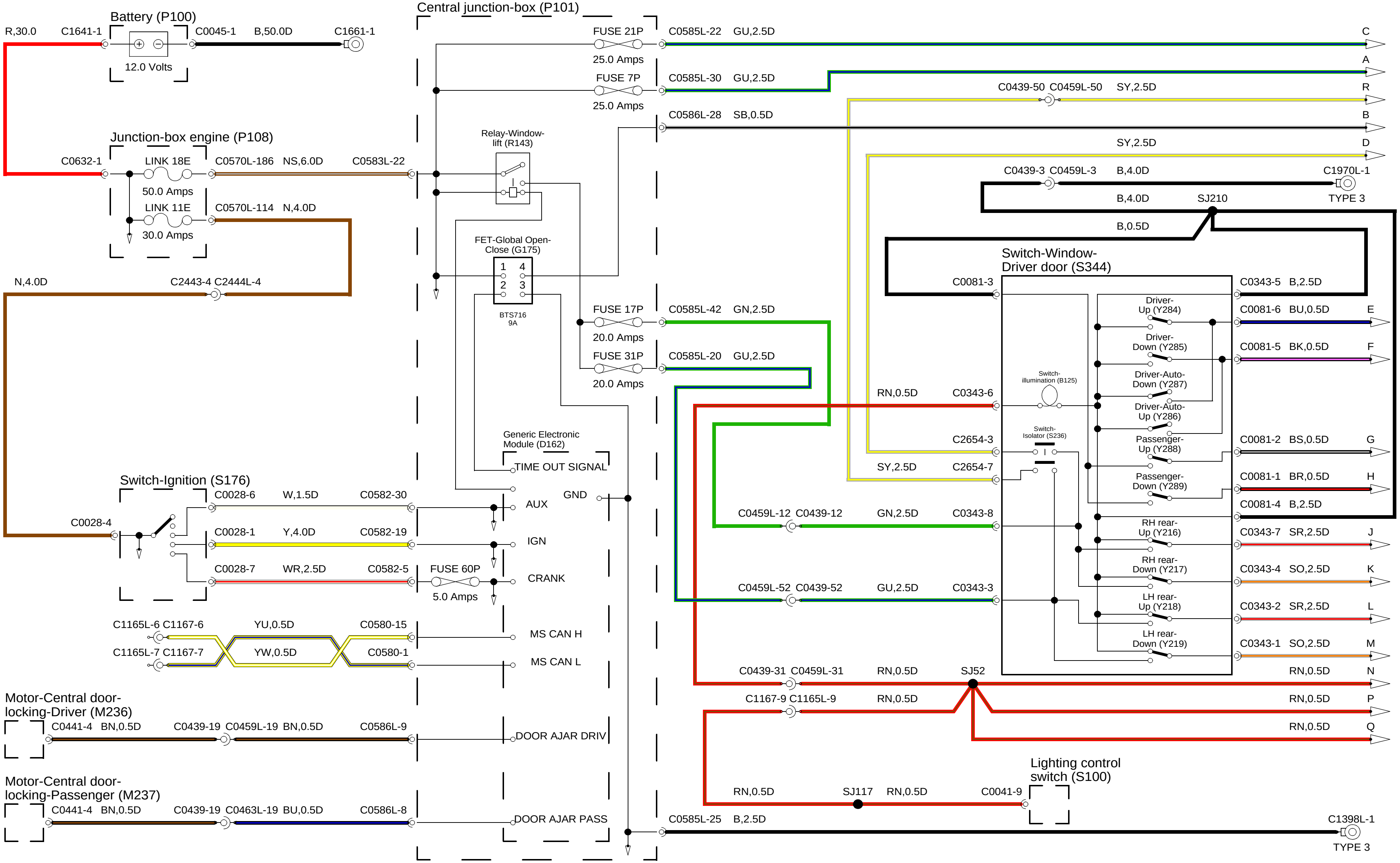

Switch-Seat heat-Rear-LH (S368)
Switch-Seat heat-Rear-LH (S368)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1401-2 UK,0.5D
C2054-20 C2053-20 UK,0.5D
C2042-1 C2149B-1 UK,0.5D
C2084-8
C1401-3 G,0.5D
C2054-21 C2053-21 G,0.5D
C2042-2 C2149B-2 G,0.5D
C2084-9
C1401-4 U,0.5D
C2054-22 C2053-22 U,0.5D
C2042-3 C2149B-3 U,0.5D
C2084-10
C1401-1 B,0.75D
C1401-5 RN,0.5D
D
Sheet1
B LGW,2.5D
Sheet1
C2042-5 C2149B-5 LGW,2.5D
SJ111
LGW,1.5D C2084-12
LGW,1.5D C2084-5
SJ301
LH rear seat heater module (D338)
C2084-1 B,1.5D
C2149B-4 C2042-4 B,2.5D
C2566-1
TYPE 3
LH rear seat backrest heater (H140)
C2084-6 UK,1.5D C3097-3
B,1.0
Y,1.0 C3097-1
LH rear seat side heater (H142)
C2961-2 B,1.0
B,1.0 C2961-1 R,1.0
LH rear seat squab heater (H146)
C2084-7 K,1.5D C0237B-2
C0237B-1 KW,1.5D
C2084-4 LG,0.5D C0237B-3
Thermistor (H139)
C0237B-4
C2084-3 BG,0.5D
B,2.5D C0903-24 C0868-24 B,2.5D
C2598-1
TYPE 3
Switch-Seat heat-Rear-RH (S369)
C1403-1 B,0.75D
Switch-Seat heat-Rear-RH (S369)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1403-2 UK,0.5D
C2054-17 C2053-17 UK,0.5D
C2043-1 C2149B-1 UK,0.5D
C2084-8
C1403-3 G,0.5D
C2054-18 C2053-18 G,0.5D
C2043-2 C2149B-2 G,0.5D
C2084-9
C1403-4 U,0.5D
C2054-19 C2053-19 U,0.5D
C2043-3 C2149B-3 U,0.5D
C2084-10
C1403-5 RN,0.5D
C
Sheet1
A LGW,2.5D
Sheet1
C2043-5 C2149B-5 LGW,2.5D
SJ111
LGW,1.5D C2084-12
LGW,1.5D C2084-5
RH rear seat heater module (D339)
C2084-1 B,1.5D
C2149B-4 C2043-4 B,2.5D
C1968-1
TYPE 3
RH rear seat backrest heater (H141)
C2084-6 UK,1.5D C3097-3
B,1.0
Y,1.0 C3097-1
RH rear seat side heater (H143)
C2961-2 B,1.0
B,1.0 C2961-1 R,1.0
RH rear seat squab heater (H147)
C2084-7 K,1.5D C0237B-2
C0237B-1 KW,1.5D
C2084-4 LG,0.5D C0237B-3
Thermistor (H139)
C0237B-4
C2084-3 BG,0.5D

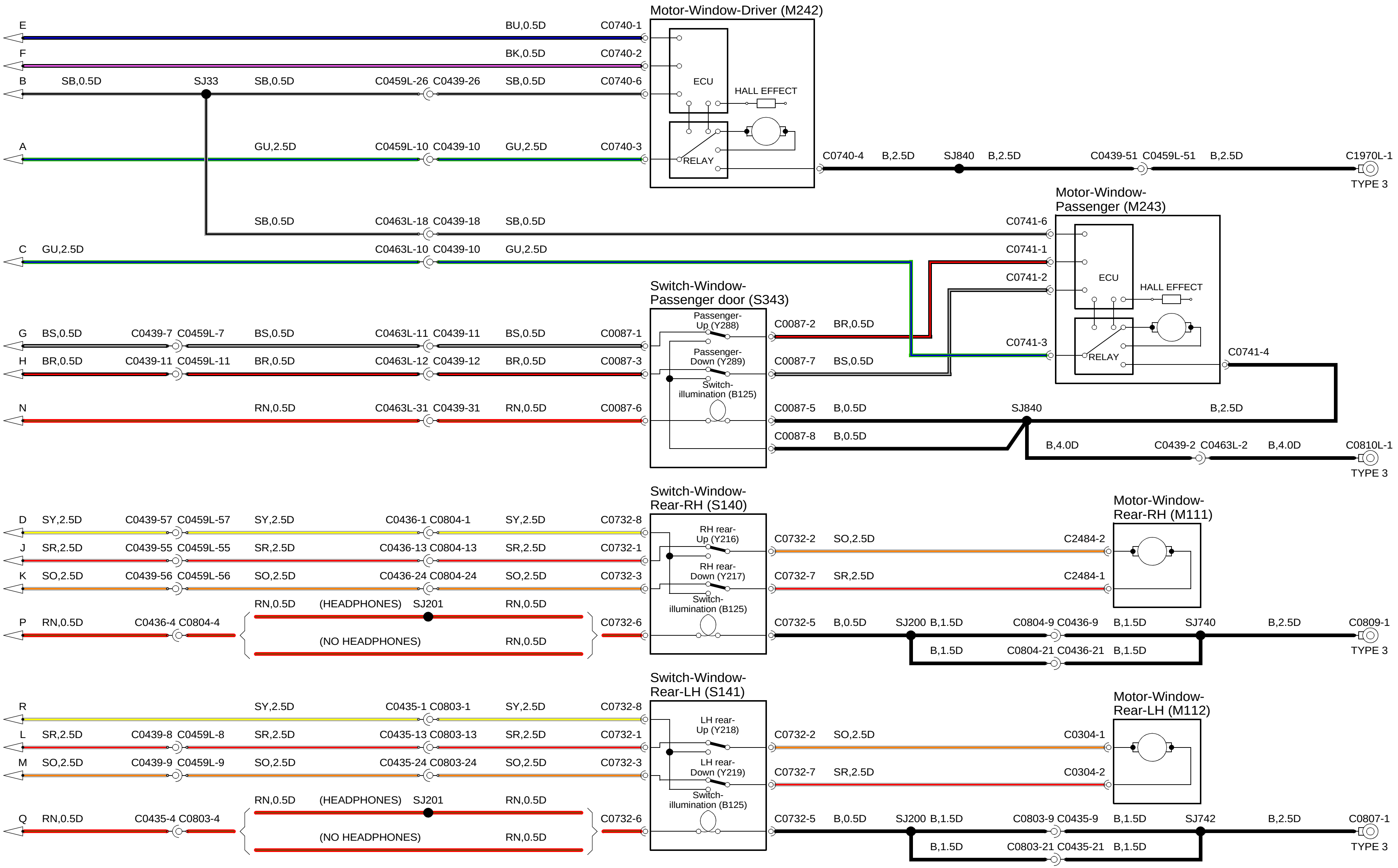

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
Central junction-box (P101)
C0583L-21
C0583L-22
FUSE 46P
30.0 Amps
C0585L-24
NG,2.5D
SJ184
NG,2.5D
C2378-16
C3025-2
FUSE 1P
10.0 Amps
Relay-Battery-saver (R250)
MK
C0585L-40
LGW,0.75D
SJ14
GK,1.5D
C2378-11
C3026-1
GK,1.5D
C2368-11
C3026-1
GK,1.5D
A
Sheet2
FUSE 29
30.0 Amps
C0585L-28
NP,2.5D
C2368-16
C3025-2
NP,2.5D
SJ1
NP,2.5D
B
Sheet2
SJ1
NP,2.5D
C0774-1
NP,2.5D
GK,1.5D
C0774-2
Switch pack-Seat-Driver (S391)
VBATT
Switch-Tilt-Up (S441)
Switch-Tilt-Down (S442)
Switch-Height-Up (S435)
Switch-Height-Down (S436)
Switch-Slide-Forward (S437)
Switch-Slide-Rearward (S438)
Switch-Recline-Up (S439)
Switch-Recline-Down (S440)
GND
IGNITION (ORANGE)
Motor-Seat-Tilt-Driver (M311)
C0773-6
BP,2.5D
C2930-2
C2930-1
C0773-3
W,2.5D
Drivers seat height motor (M221)
C0773-5
Y,2.5D
C1637-1
C1637-2
C0773-2
G,2.5D
Drivers seat slide motor (M241)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-Driver (M312)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
SJ53
B,4.0D
C2597L-1
TYPE 3

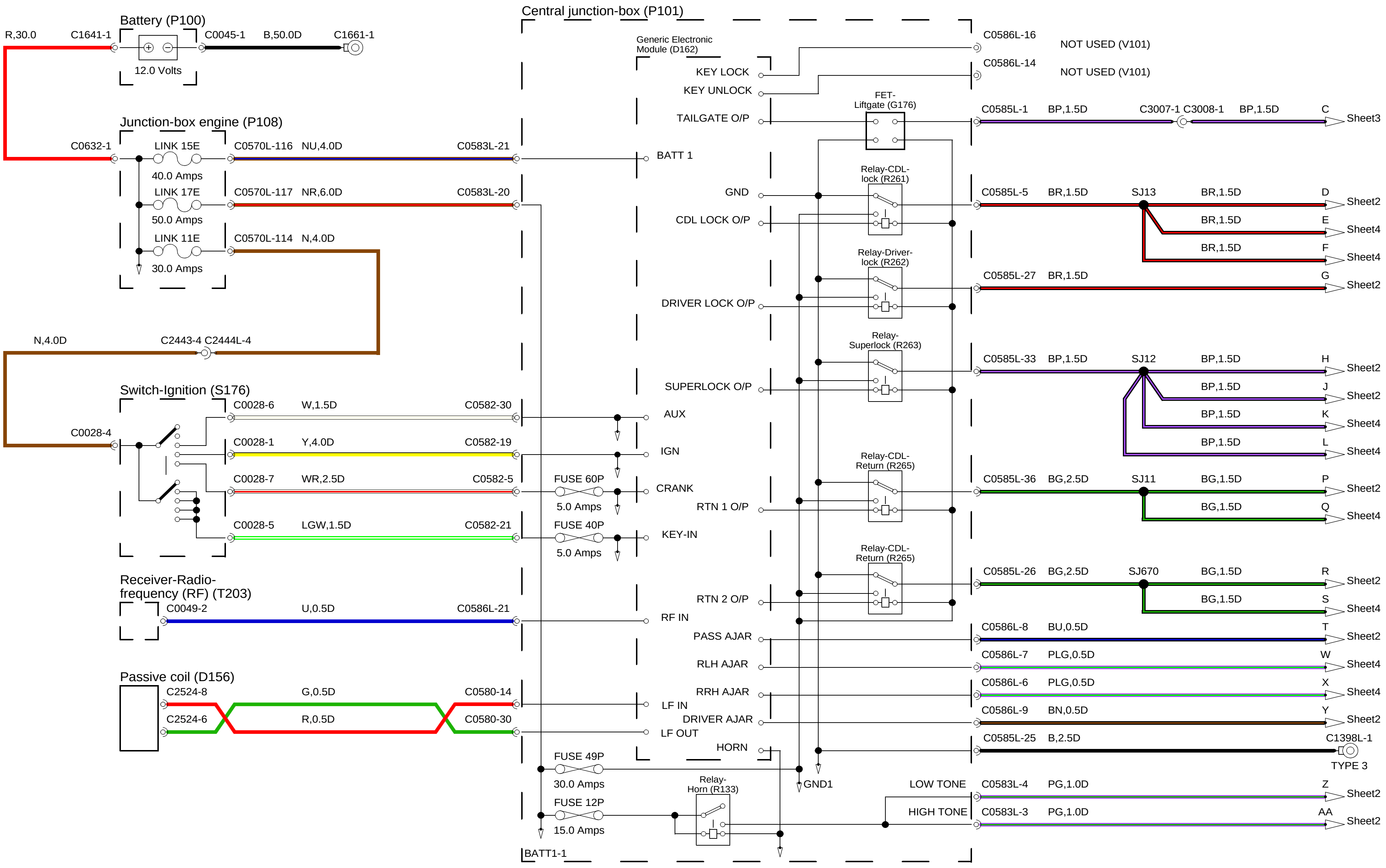

Relay-Power seat-RH (R210)
Switch pack-
Seat-Passenger (S392)
B
NP,2.5D
C0975-3
Sheet1
A
GK,1.5D
C0975-1
Sheet1
C0975-5
NP,2.5D
C0975-2
B,2.5D
C0774-1
VBATT
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
C0773-5
Y,2.5D
C1637-1
Passenger seat
height motor (M222)
C1637-2
C0773-2
G,2.5D
Passenger seat
slide motor (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

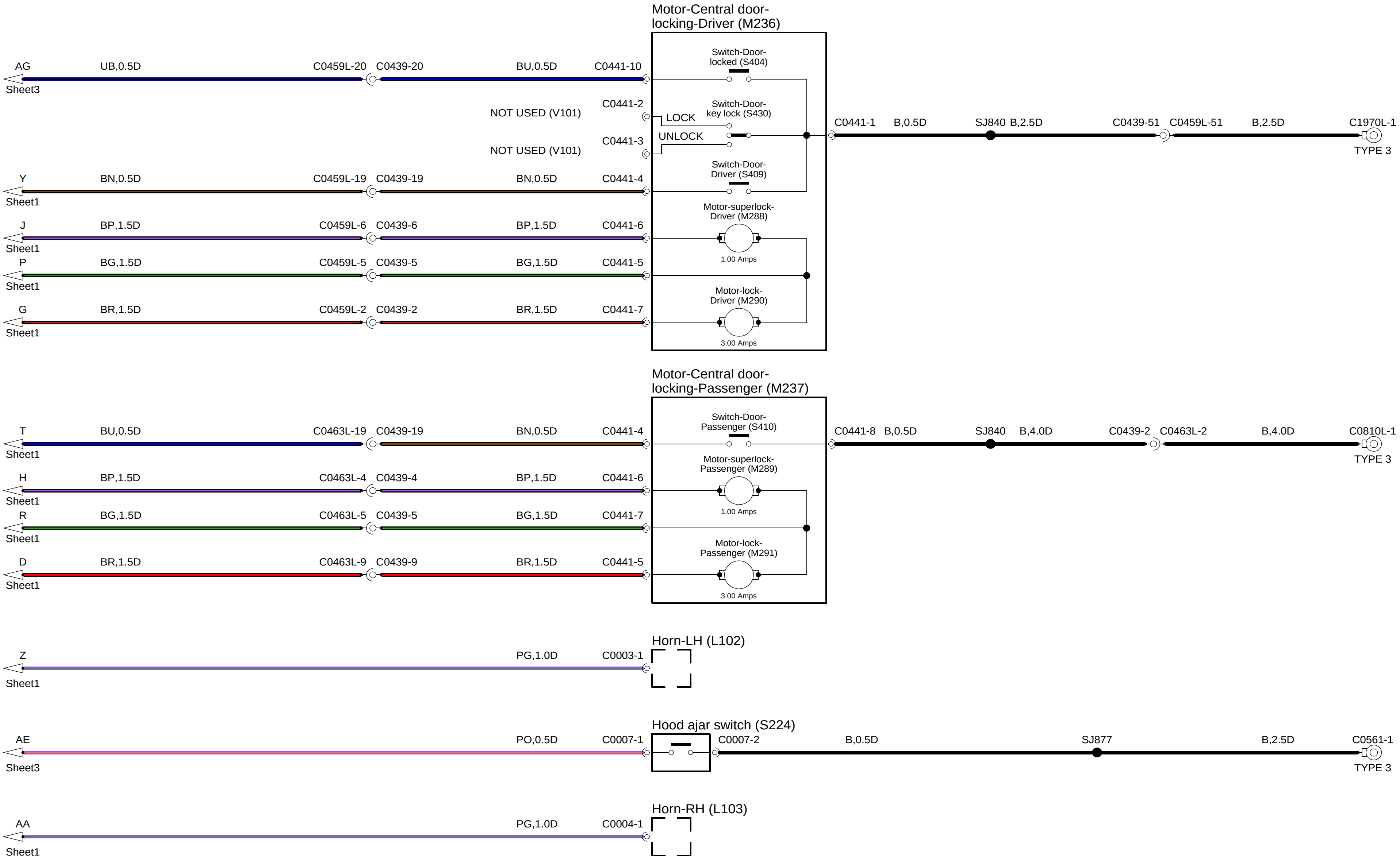

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Central junction-box (P101)
C0583L-22
FUSE 54P
C0585L-13
WR,0.5D
SJ185
5.0 Amps
WR,1.0D
C3026-2
C2368-12
WR,0.5D
WR,1.0D
C3026A-2
C2378-12
WR,0.5D
Switch-Lumbar-Driver (S389)
LUMBAR INFLATE
C0976-2
VBATT
LUMBAR DEFLATE
GND
GND
C0976-1
NY,1.0D
C0974-3
NY,0.5
C0976-7
U,1.0D
C0974-1
U,0.5
C0976-3
B,1.0D
C0976-6
B,1.0D
Pump-Lumbar-Driver (M286)
B,0.5
C0974-2
B,1.0D
SJ2
B,2.5D
C0751-1
C0253L-1
B,2.5D
C1972L-1
TYPE 3
Switch-Lumbar-Passenger (S390)
LUMBAR INFLATE
C2339-2
VBATT
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

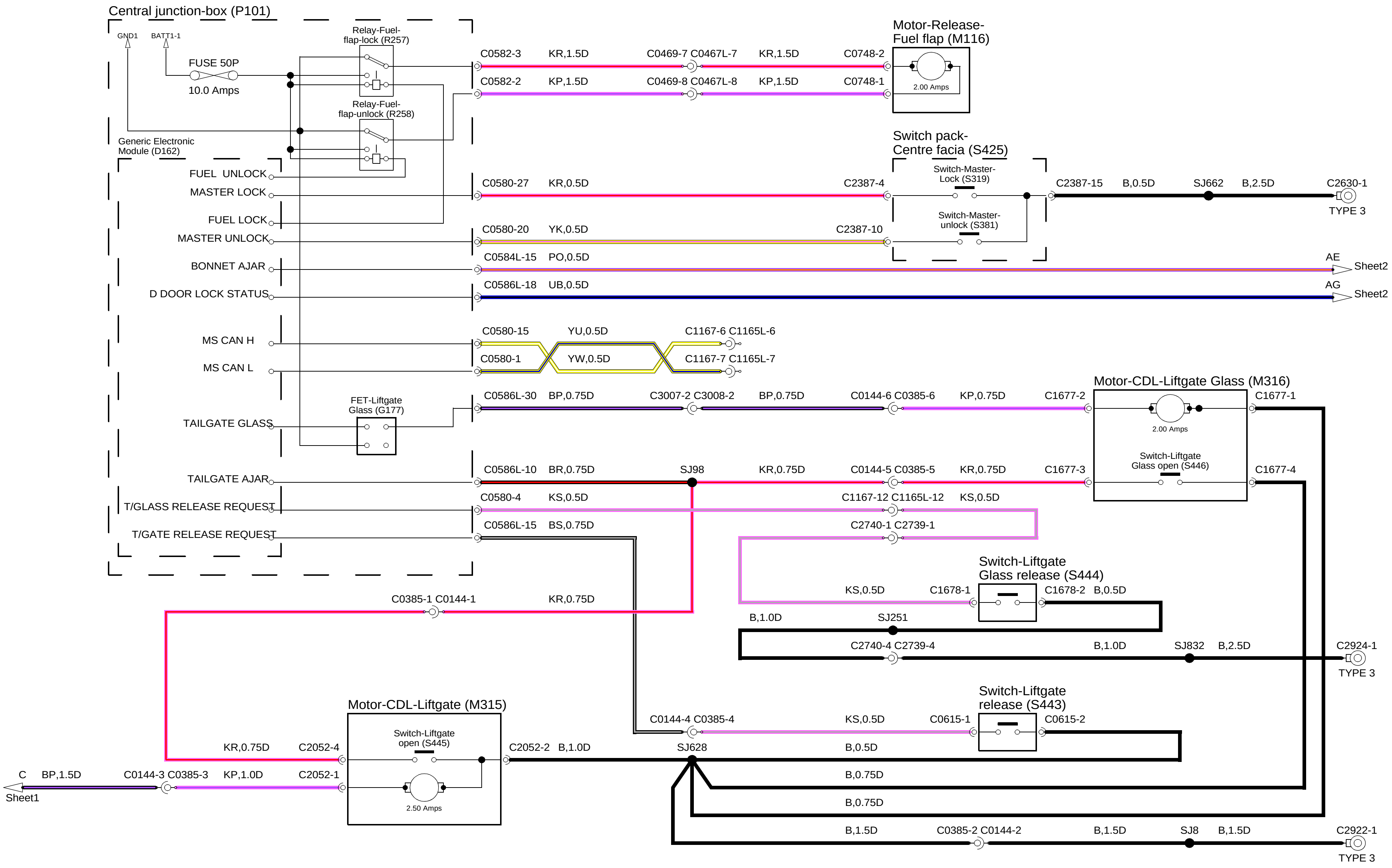

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 18E
C0570L-186
NS,6.0D
50.0 Amps
Central junction-box (P101)
C0583L-22
FUSE 54P
C0585L-13
WR,0.5D
SJ185
5.0 Amps
WR,1.0D
C3026-2
C2368-12
WR,0.5D
WR,1.0D
C3026-2
C2378-12
WR,0.5D
Switch-Lumbar-Driver (S389)
LUMBAR INFLATE
VBATT
LUMBAR DEFLATE
GND
GND
C2339-2
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Driver (M286)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
SJ53
B,4.0D
C2597L-1
TYPE 3
Switch-Lumbar-Passenger (S390)
LUMBAR INFLATE
VBATT
LUMBAR DEFLATE
GND
GND
C2339-2
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C0810L-1
TYPE 3

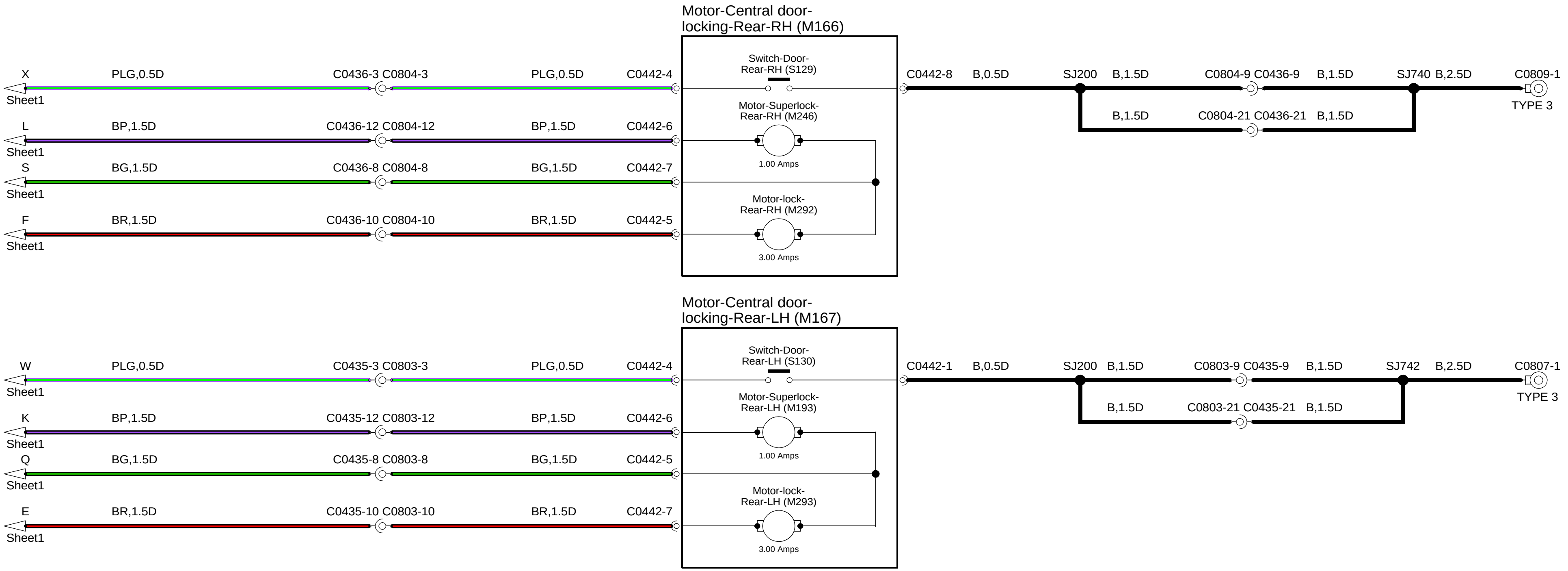

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
FUSE 21P
25.0 Amps
C0585L-22
GU,2.5D
C
A
FUSE 7P
25.0 Amps
C0585L-30
GU,2.5D
C0439-50 C0459L-50
SY,2.5D
R
C0586L-28
SB,0.5D
B
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
C0583L-22
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
Relay-Window-lift (R143)
SY,2.5D
D
C0439-3 C0459L-3
B,4.0D
C1970L-1
B,4.0D
SJ210
TYPE 3
B,0.5D
FET-Global Open-Close (G175)
1
4
2
3
BTS716
9A
N,4.0D
C2443-4 C2444L-4
Switch-Window-Driver door (S344)
C0081-3
C0343-5
B,2.5D
FUSE 17P
20.0 Amps
C0585L-42
GN,2.5D
Driver-Up (Y284)
C0081-6
BU,0.5D
E
Driver-Down (Y285)
C0081-5
BK,0.5D
F
FUSE 31P
20.0 Amps
C0585L-20
GU,2.5D
Driver-Auto-Down (Y287)
Switch-illumination (B125)
RN,0.5D
C0343-6
Driver-Auto-Up (Y286)
Switch-Isolator (S236)
C2654-3
Passenger-Up (Y288)
C0081-2
BS,0.5D
G
Generic Electronic Module (D162)
TIME OUT SIGNAL
SY,2.5D
C2654-7
Passenger-Down (Y289)
C0081-1
BR,0.5D
H
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
GND
AUX
C0081-4
B,2.5D
C0459L-12 C0439-12
GN,2.5D
C0343-8
C0028-4
RH rear-Up (Y216)
C0343-7
SR,2.5D
J
C0028-1
Y,4.0D
C0582-19
IGN
RH rear-Down (Y217)
C0343-4
SO,2.5D
K
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
C0459L-52 C0439-52
GU,2.5D
C0343-3
LH rear-Up (Y218)
C0343-2
SR,2.5D
L
C1165L-6 C1167-6
YU,0.5D
C0580-15
MS CAN H
LH rear-Down (Y219)
C0343-1
SO,2.5D
M
C1165L-7 C1167-7
YW,0.5D
C0580-1
MS CAN L
C0439-31 C0459L-31
RN,0.5D
SJ52
RN,0.5D
N
Motor-Central door-locking-Driver (M236)
C1167-9 C1165L-9
RN,0.5D
RN,0.5D
P
C0441-4
BN,0.5D
C0439-19 C0459L-19
BN,0.5D
C0586L-9
DOOR AJAR DRIV
RN,0.5D
Q
Lighting control switch (S100)
Motor-Central door-locking-Passenger (M237)
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0441-4
BN,0.5D
C0439-19 C0463L-19
BU,0.5D
C0586L-8
DOOR AJAR PASS
C0585L-25
B,2.5D
C1398L-1
TYPE 3

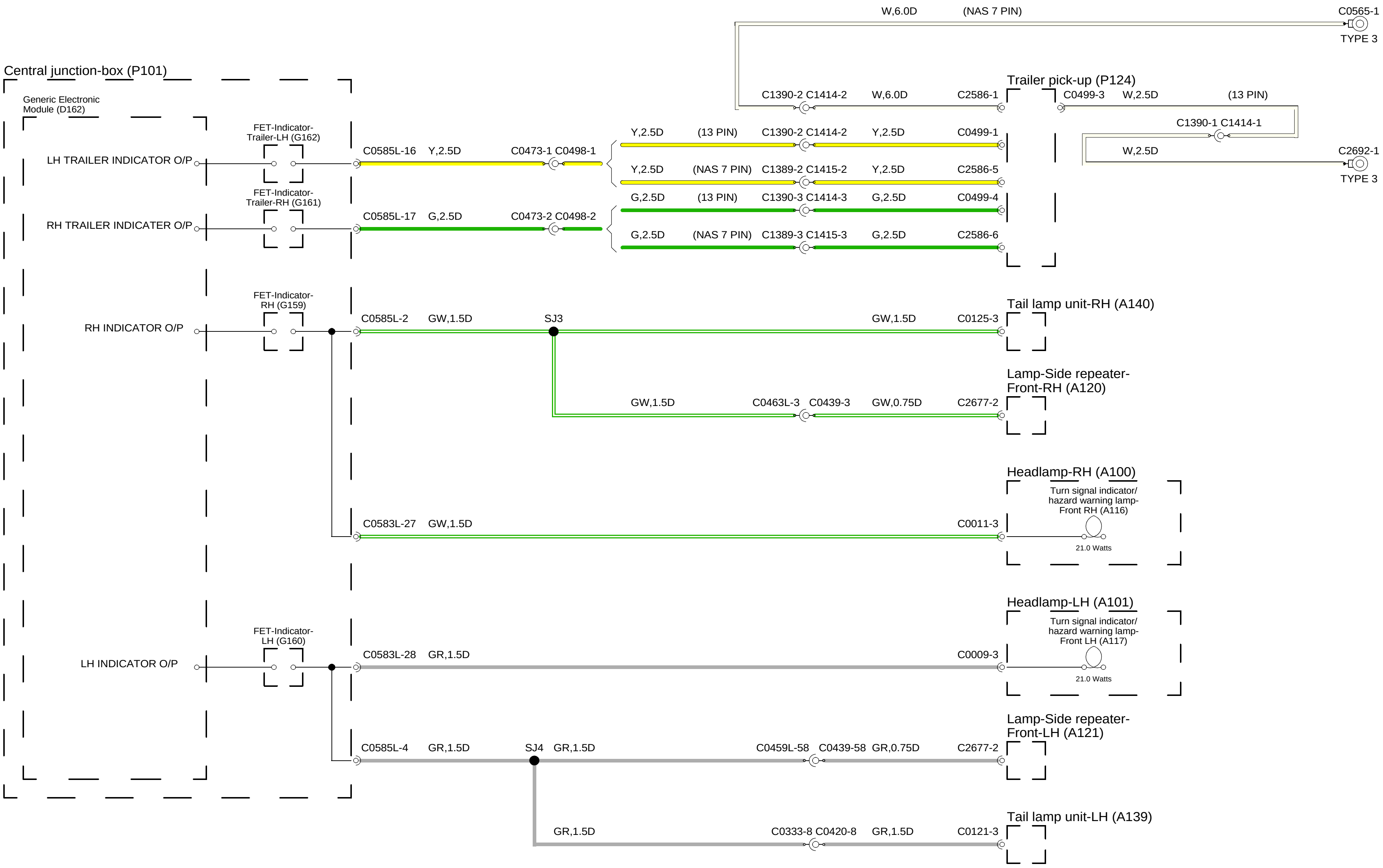

Motor-Window-Driver (M242)
E
BU,0.5D
C0740-1
F
BK,0.5D
C0740-2
B
SB,0.5D
SJ33
SB,0.5D
C0459L-26 C0439-26
SB,0.5D
C0740-6
ECU
HALL EFFECT
A
GU,2.5D
C0459L-10 C0439-10
GU,2.5D
C0740-3
RELAY
C0740-4
B,2.5D
SJ840
B,2.5D
C0439-51 C0459L-51
B,2.5D
C1970L-1
TYPE 3
Motor-Window-Passenger (M243)
SB,0.5D
C0463L-18 C0439-18
SB,0.5D
C0741-6
C
GU,2.5D
C0463L-10 C0439-10
GU,2.5D
C0741-1
C0741-2
ECU
HALL EFFECT
Switch-Window-Passenger door (S343)
Passenger-Up (Y288)
C0087-2
BR,0.5D
G
BS,0.5D
C0439-7 C0459L-7
BS,0.5D
C0463L-11 C0439-11
BS,0.5D
C0087-1
C0741-3
Passenger-Down (Y289)
H
BR,0.5D
C0439-11 C0459L-11
BR,0.5D
C0463L-12 C0439-12
BR,0.5D
C0087-3
C0087-7
BS,0.5D
RELAY
C0741-4
Switch-illumination (B125)
N
RN,0.5D
C0463L-31 C0439-31
RN,0.5D
C0087-6
C0087-5
B,0.5D
SJ840
B,2.5D
C0087-8
B,0.5D
B,4.0D
C0439-2 C0463L-2
B,4.0D
C0810L-1
TYPE 3
Switch-Window-Rear-RH (S140)
Motor-Window-Rear-RH (M111)
D
SY,2.5D
C0439-57 C0459L-57
SY,2.5D
C0436-1 C0804-1
SY,2.5D
C0732-8
RH rear-Up (Y216)
J
SR,2.5D
C0439-55 C0459L-55
SR,2.5D
C0436-13 C0804-13
SR,2.5D
C0732-1
C0732-2
SO,2.5D
C2484-2
RH rear-Down (Y217)
K
SO,2.5D
C0439-56 C0459L-56
SO,2.5D
C0436-24 C0804-24
SO,2.5D
C0732-3
C0732-7
SR,2.5D
C2484-1
Switch-illumination (B125)
RN,0.5D
(HEADPHONES)
SJ201
RN,0.5D
P
RN,0.5D
C0436-4 C0804-4
C0732-6
(NO HEADPHONES)
RN,0.5D
C0732-5
B,0.5D
SJ200 B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21 C0436-21
B,1.5D
Switch-Window-Rear-LH (S141)
Motor-Window-Rear-LH (M112)
R
SY,2.5D
C0435-1 C0803-1
SY,2.5D
C0732-8
LH rear-Up (Y218)
L
SR,2.5D
C0439-8 C0459L-8
SR,2.5D
C0435-13 C0803-13
SR,2.5D
C0732-1
C0732-2
SO,2.5D
C0304-1
LH rear-Down (Y219)
M
SO,2.5D
C0439-9 C0459L-9
SO,2.5D
C0435-24 C0803-24
SO,2.5D
C0732-3
C0732-7
SR,2.5D
C0304-2
Switch-illumination (B125)
RN,0.5D
(HEADPHONES)
SJ201
RN,0.5D
Q
RN,0.5D
C0435-4 C0803-4
C0732-6
(NO HEADPHONES)
RN,0.5D
C0732-5
B,0.5D
SJ200 B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21 C0435-21
B,1.5D

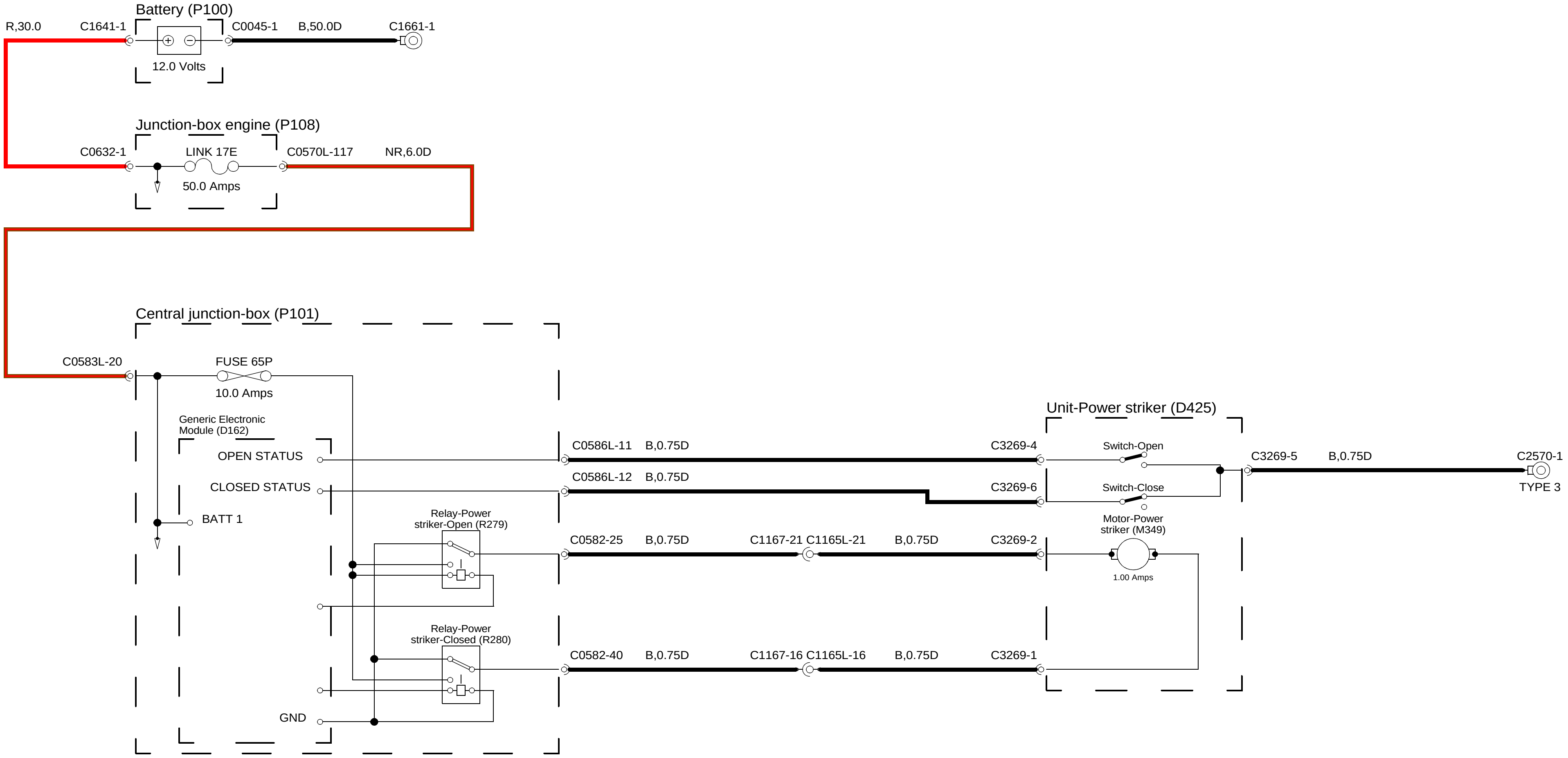

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
Generic Electronic Module (D162)
KEY LOCK
KEY UNLOCK
TAILGATE O/P
C0586L-16
NOT USED (V101)
C0586L-14
NOT USED (V101)
FET-Liftgate (G176)
C0585L-1
BP,1.5D
C3007-1 C3008-1
BP,1.5D
C
Sheet3
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
C0570L-116
NU,4.0D
C0583L-21
BATT 1
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
C0583L-20
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
GND
CDL LOCK O/P
Relay-CDL-lock (R261)
C0585L-5
BR,1.5D
SJ13
BR,1.5D
D
Sheet2
BR,1.5D
E
Sheet4
BR,1.5D
F
Sheet4
Relay-Driver-lock (R262)
C0585L-27
BR,1.5D
G
Sheet2
DRIVER LOCK O/P
N,4.0D
C2443-4 C2444L-4
Relay-Superlock (R263)
C0585L-33
BP,1.5D
SJ12
BP,1.5D
H
Sheet2
BP,1.5D
J
Sheet2
BP,1.5D
K
Sheet4
BP,1.5D
L
Sheet4
SUPERLOCK O/P
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
AUX
C0028-4
C0028-1
Y,4.0D
C0582-19
IGN
Relay-CDL-Return (R265)
C0585L-36
BG,2.5D
SJ11
BG,1.5D
P
Sheet2
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
RTN 1 O/P
BG,1.5D
Q
Sheet4
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY-IN
Relay-CDL-Return (R265)
C0585L-26
BG,2.5D
SJ670
BG,1.5D
R
Sheet2
Receiver-Radio-frequency (RF) (T203)
C0049-2
U,0.5D
C0586L-21
RTN 2 O/P
RF IN
BG,1.5D
S
Sheet4
PASS AJAR
C0586L-8
BU,0.5D
T
Sheet2
RLH AJAR
C0586L-7
PLG,0.5D
W
Sheet4
Passive coil (D156)
C2524-8
G,0.5D
C0580-14
RRH AJAR
C0586L-6
PLG,0.5D
X
Sheet4
LF IN
C2524-6
R,0.5D
C0580-30
DRIVER AJAR
C0586L-9
BN,0.5D
Y
Sheet2
LF OUT
HORN
C0585L-25
B,2.5D
C1398L-1
TYPE 3
FUSE 49P
30.0 Amps
GND1
Relay-Horn (R133)
LOW TONE
C0583L-4
PG,1.0D
Z
Sheet2
FUSE 12P
15.0 Amps
HIGH TONE
C0583L-3
PG,1.0D
AA
Sheet2
BATT1-1

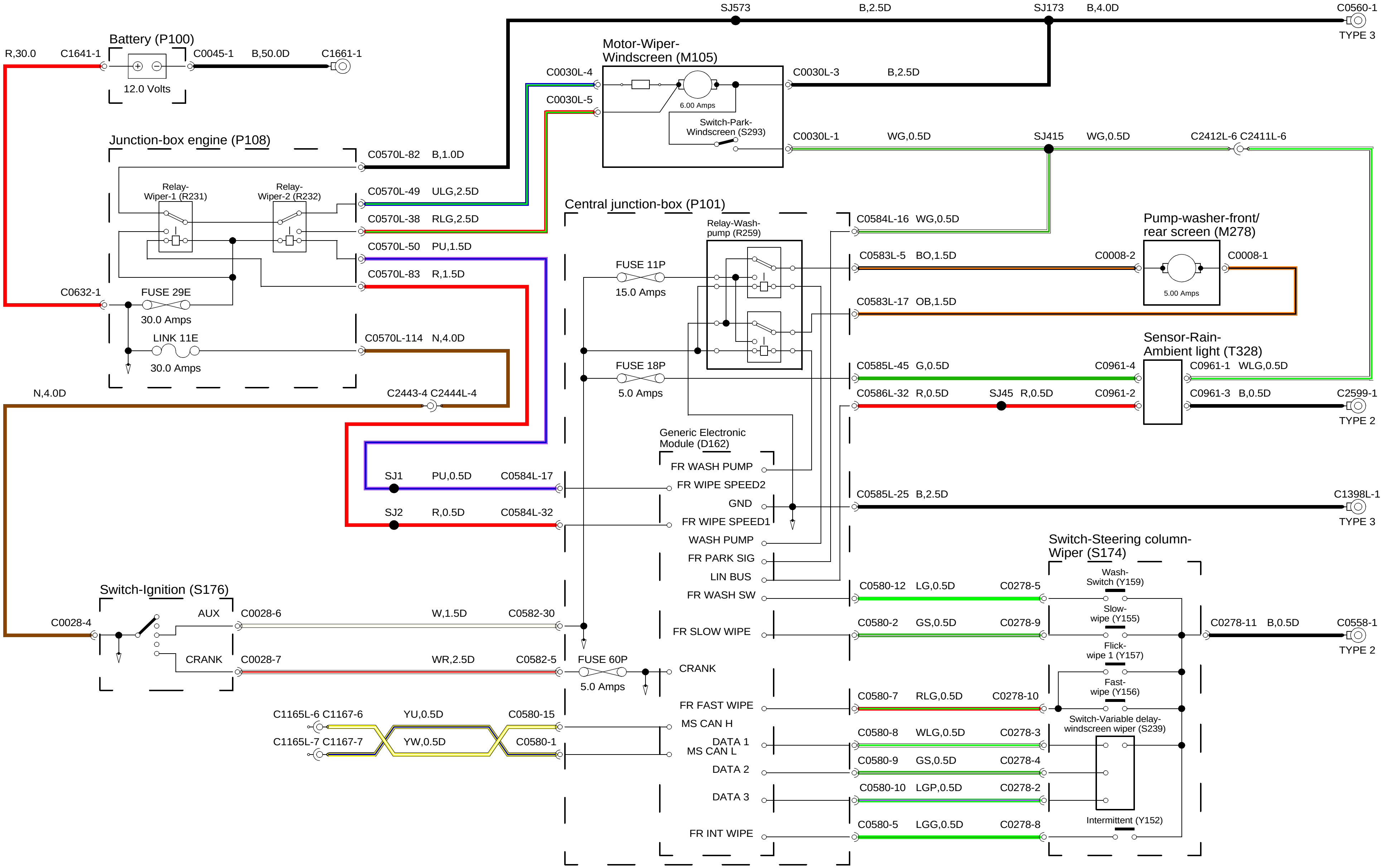

Motor-Central door-locking-Driver (M236)
Switch-Door-locked (S404)
Switch-Door-key lock (S430)
LOCK
UNLOCK
Switch-Door-Driver (S409)
Motor-superlock-Driver (M288)
1.00 Amps
Motor-lock-Driver (M290)
3.00 Amps
AG
Sheet3
UB,0.5D
C0459L-20
C0439-20
BU,0.5D
C0441-10
NOT USED (V101)
C0441-2
NOT USED (V101)
C0441-3
Y
Sheet1
BN,0.5D
C0459L-19
C0439-19
BN,0.5D
C0441-4
J
Sheet1
BP,1.5D
C0459L-6
C0439-6
BP,1.5D
C0441-6
P
Sheet1
BG,1.5D
C0459L-5
C0439-5
BG,1.5D
C0441-5
G
Sheet1
BR,1.5D
C0459L-2
C0439-2
BR,1.5D
C0441-7
C0441-1
B,0.5D
SJ840
B,2.5D
C0439-51
C0459L-51
B,2.5D
C1970L-1
TYPE 3
Motor-Central door-locking-Passenger (M237)
Switch-Door-Passenger (S410)
Motor-superlock-Passenger (M289)
1.00 Amps
Motor-lock-Passenger (M291)
3.00 Amps
T
Sheet1
BU,0.5D
C0463L-19
C0439-19
BN,0.5D
C0441-4
H
Sheet1
BP,1.5D
C0463L-4
C0439-4
BP,1.5D
C0441-6
R
Sheet1
BG,1.5D
C0463L-5
C0439-5
BG,1.5D
C0441-7
D
Sheet1
BR,1.5D
C0463L-9
C0439-9
BR,1.5D
C0441-5
C0441-8
B,0.5D
SJ840
B,4.0D
C0439-2
C0463L-2
B,4.0D
C0810L-1
TYPE 3
Horn-LH (L102)
Z
Sheet1
PG,1.0D
C0003-1
Hood ajar switch (S224)
AE
Sheet3
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
AA
Sheet1
PG,1.0D
C0004-1

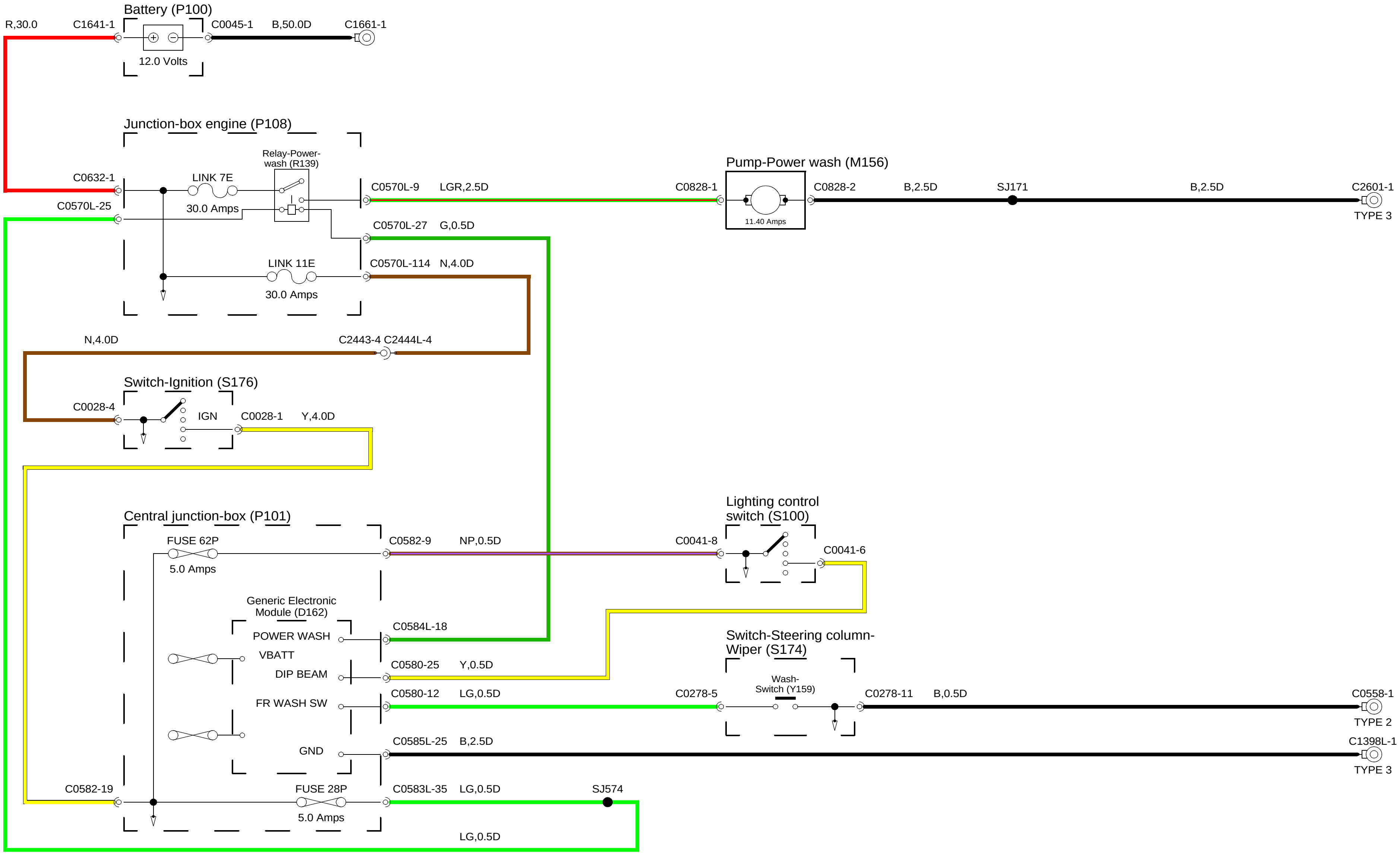

Central junction-box (P101)
GND1
BATT1-1
FUSE 50P
10.0 Amps
Relay-Fuel-flap-lock (R257)
Relay-Fuel-flap-unlock (R258)
Generic Electronic Module (D162)
FUEL UNLOCK
MASTER LOCK
FUEL LOCK
MASTER UNLOCK
BONNET AJAR
D DOOR LOCK STATUS
MS CAN H
MS CAN L
TAILGATE GLASS
TAILGATE AJAR
T/GLASS RELEASE REQUEST
T/GATE RELEASE REQUEST
FET-Liftgate Glass (G177)
Motor-Release-Fuel flap (M116)
2.00 Amps
C0582-3
KR,1.5D
C0469-7 C0467L-7
KR,1.5D
C0748-2
C0582-2
KP,1.5D
C0469-8 C0467L-8
KP,1.5D
C0748-1
Switch pack-Centre facia (S425)
Switch-Master-Lock (S319)
Switch-Master-unlock (S381)
C0580-27
KR,0.5D
C2387-4
C2387-15
B,0.5D
SJ662
B,2.5D
C2630-1
TYPE 3
C0580-20
YK,0.5D
C2387-10
C0584L-15
PO,0.5D
AE
Sheet2
C0586L-18
UB,0.5D
AG
Sheet2
C0580-15
YU,0.5D
C1167-6 C1165L-6
C0580-1
YW,0.5D
C1167-7 C1165L-7
Motor-CDL-Liftgate Glass (M316)
C0586L-30
BP,0.75D
C3007-2 C3008-2
BP,0.75D
C0144-6 C0385-6
KP,0.75D
C1677-2
C1677-1
2.00 Amps
Switch-Liftgate Glass open (S446)
C0586L-10
BR,0.75D
SJ98
KR,0.75D
C0144-5 C0385-5
KR,0.75D
C1677-3
C1677-4
C0580-4
KS,0.5D
C1167-12 C1165L-12
KS,0.5D
C0586L-15
BS,0.75D
C2740-1 C2739-1
Switch-Liftgate Glass release (S444)
KS,0.5D
C1678-1
C1678-2
B,0.5D
B,1.0D
SJ251
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
TYPE 3
C0385-1 C0144-1
KR,0.75D
Switch-Liftgate release (S443)
C0144-4 C0385-4
KS,0.5D
C0615-1
C0615-2
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,0.5D
C
BP,1.5D
C0144-3 C0385-3
KP,1.0D
C2052-1
Sheet1
2.50 Amps
B,0.75D
B,0.75D
B,1.5D
C0385-2 C0144-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3

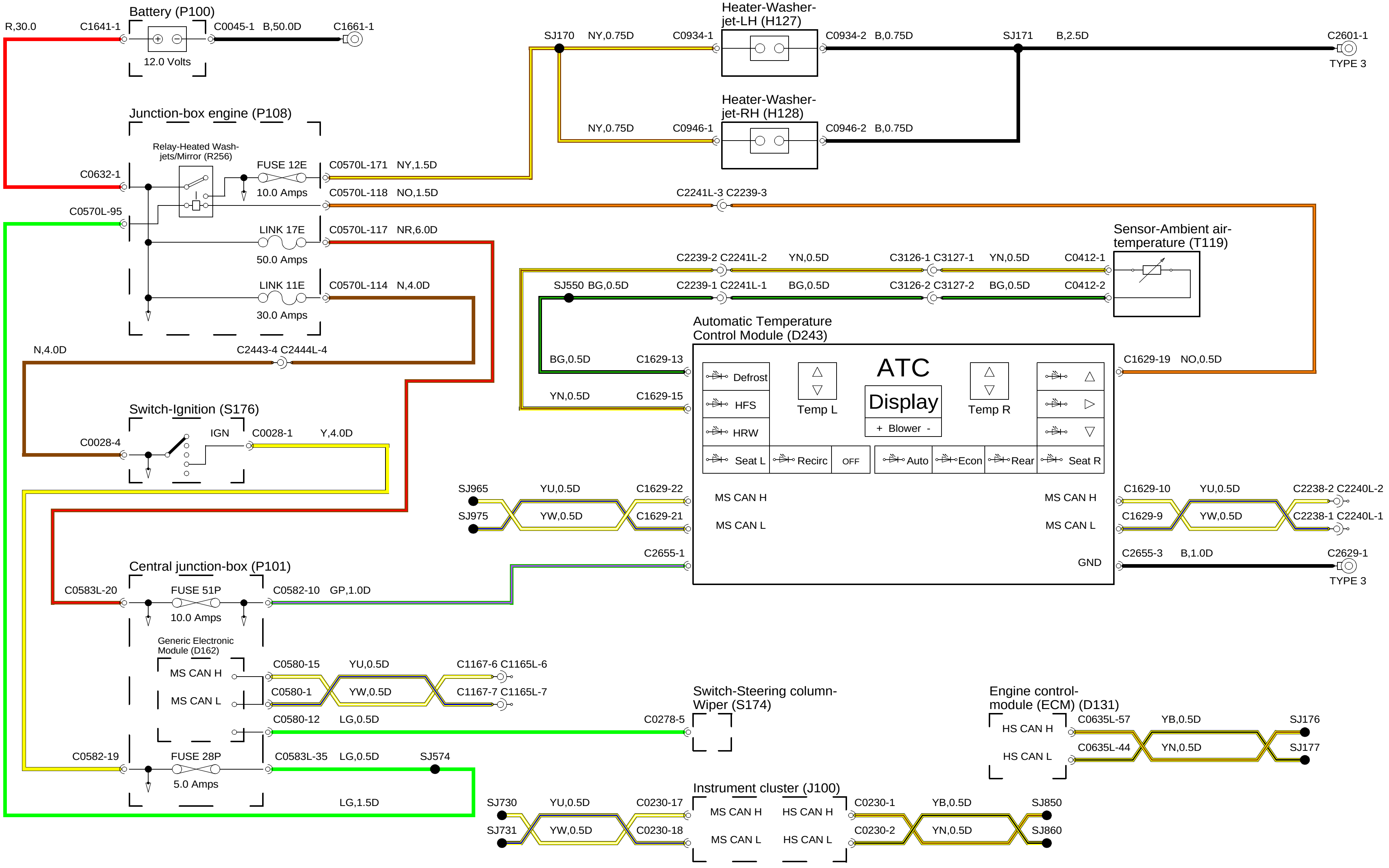

Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
Motor-Superlock-Rear-RH (M246)
1.00 Amps
Motor-lock-Rear-RH (M292)
3.00 Amps
X
Sheet1
PLG,0.5D
C0436-3 C0804-3
PLG,0.5D
C0442-4
L
Sheet1
BP,1.5D
C0436-12 C0804-12
BP,1.5D
C0442-6
S
Sheet1
BG,1.5D
C0436-8 C0804-8
BG,1.5D
C0442-7
F
Sheet1
BR,1.5D
C0436-10 C0804-10
BR,1.5D
C0442-5
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21 C0436-21
B,1.5D
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
Motor-Superlock-Rear-LH (M193)
1.00 Amps
Motor-lock-Rear-LH (M293)
3.00 Amps
W
Sheet1
PLG,0.5D
C0435-3 C0803-3
PLG,0.5D
C0442-4
K
Sheet1
BP,1.5D
C0435-12 C0803-12
BP,1.5D
C0442-6
Q
Sheet1
BG,1.5D
C0435-8 C0803-8
BG,1.5D
C0442-5
E
Sheet1
BR,1.5D
C0435-10 C0803-10
BR,1.5D
C0442-7
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21 C0435-21
B,1.5D

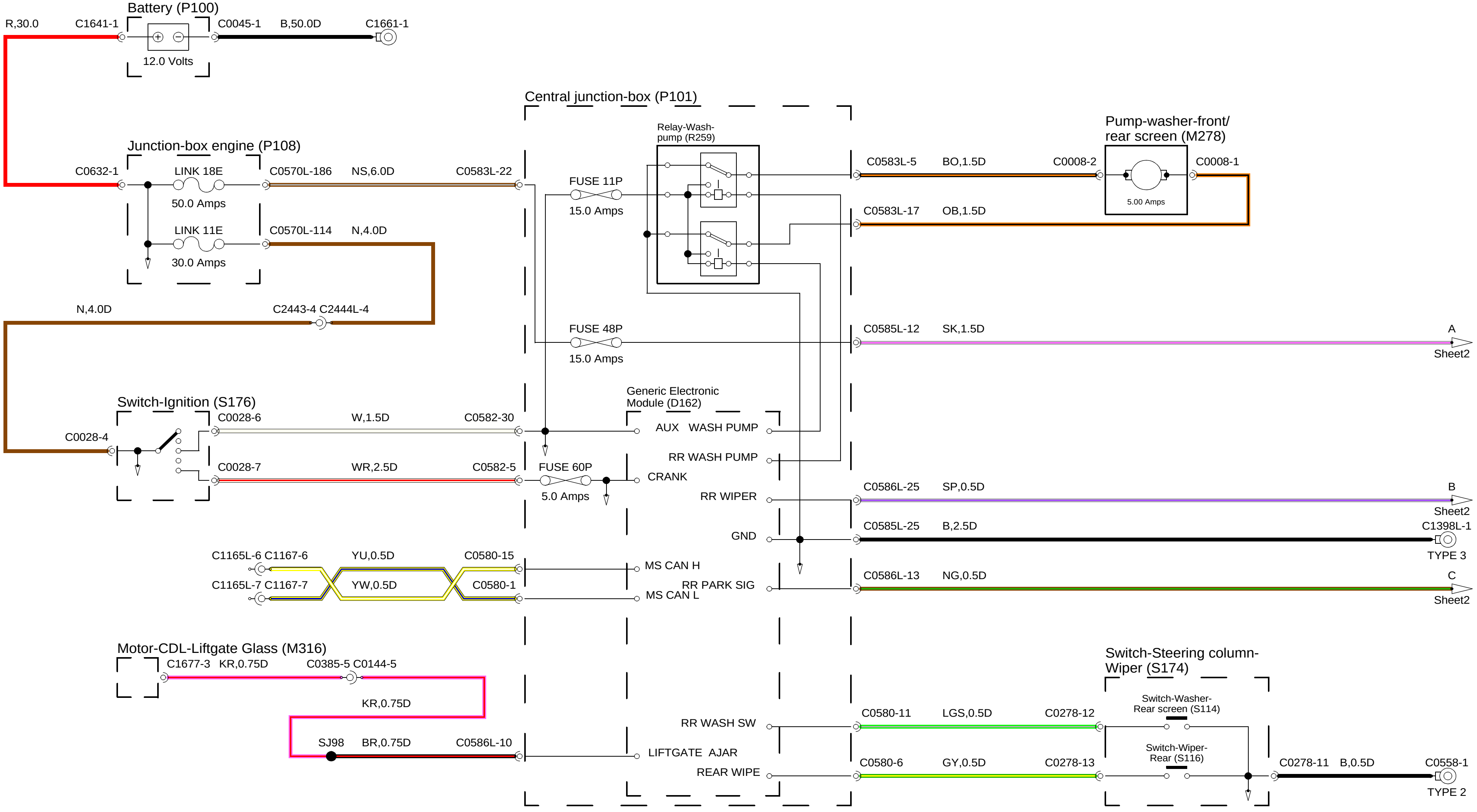

W,6.0D
(NAS 7 PIN)
C0565-1
TYPE 3
Central junction-box (P101)
Generic Electronic Module (D162)
Trailer pick-up (P124)
C1390-2 C1414-2
W,6.0D
C2586-1
C0499-3
W,2.5D
(13 PIN)
C1390-1 C1414-1
W,2.5D
C2692-1
TYPE 3
FET-Indicator-Trailer-LH (G162)
LH TRAILER INDICATOR O/P
C0585L-16
Y,2.5D
C0473-1 C0498-1
Y,2.5D
(13 PIN)
C1390-2 C1414-2
Y,2.5D
C0499-1
Y,2.5D
(NAS 7 PIN)
C1389-2 C1415-2
Y,2.5D
C2586-5
FET-Indicator-Trailer-RH (G161)
RH TRAILER INDICATER O/P
C0585L-17
G,2.5D
C0473-2 C0498-2
G,2.5D
(13 PIN)
C1390-3 C1414-3
G,2.5D
C0499-4
G,2.5D
(NAS 7 PIN)
C1389-3 C1415-3
G,2.5D
C2586-6
FET-Indicator-RH (G159)
RH INDICATOR O/P
C0585L-2
GW,1.5D
SJ3
GW,1.5D
C0125-3
Tail lamp unit-RH (A140)
Lamp-Side repeater-Front-RH (A120)
GW,1.5D
C0463L-3 C0439-3
GW,0.75D
C2677-2
Headlamp-RH (A100)
Turn signal indicator/ hazard warning lamp-Front RH (A116)
21.0 Watts
C0583L-27
GW,1.5D
C0011-3
Headlamp-LH (A101)
Turn signal indicator/ hazard warning lamp-Front LH (A117)
21.0 Watts
FET-Indicator-LH (G160)
LH INDICATOR O/P
C0583L-28
GR,1.5D
C0009-3
Lamp-Side repeater-Front-LH (A121)
C0585L-4
GR,1.5D
SJ4
GR,1.5D
C0459L-58 C0439-58
GR,0.75D
C2677-2
Tail lamp unit-LH (A139)
GR,1.5D
C0333-8 C0420-8
GR,1.5D
C0121-3

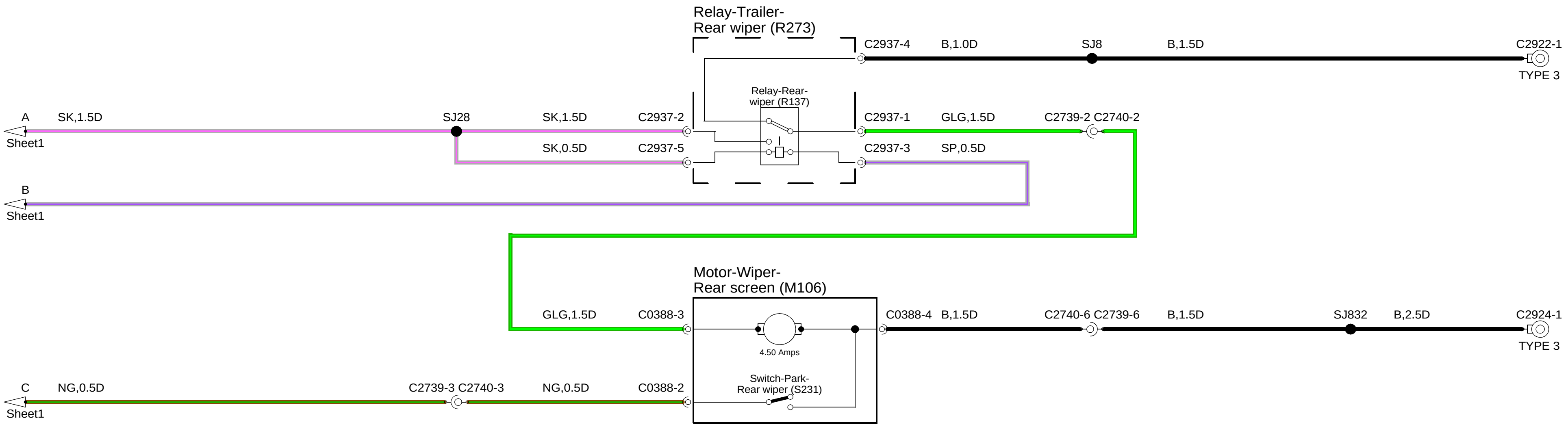

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 17E
50.0 Amps
C0570L-117
NR,6.0D
Central junction-box (P101)
C0583L-20
FUSE 65P
10.0 Amps
Generic Electronic Module (D162)
OPEN STATUS
CLOSED STATUS
BATT 1
GND
Relay-Power striker-Open (R279)
Relay-Power striker-Closed (R280)
C0586L-11
B,0.75D
C0586L-12
B,0.75D
C0582-25
B,0.75D
C1167-21 C1165L-21
B,0.75D
C0582-40
B,0.75D
C1167-16 C1165L-16
B,0.75D
Unit-Power striker (D425)
C3269-4
C3269-6
C3269-2
C3269-1
Switch-Open
Switch-Close
Motor-Power striker (M349)
1.00 Amps
C3269-5
B,0.75D
C2570-1
TYPE 3


SJ573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Motor-Wiper-Windscreen (M105)
C0030L-4
C0030L-3
B,2.5D
C0030L-5
6.00 Amps
Switch-Park-Windscreen (S293)
C0030L-1
WG,0.5D
SJ415
WG,0.5D
C2412L-6 C2411L-6
Junction-box engine (P108)
C0570L-82
B,1.0D
Relay-Wiper-1 (R231)
Relay-Wiper-2 (R232)
C0570L-49
ULG,2.5D
C0570L-38
RLG,2.5D
C0570L-50
PU,1.5D
C0570L-83
R,1.5D
C0632-1
FUSE 29E
30.0 Amps
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
N,4.0D
C2443-4 C2444L-4
Central junction-box (P101)
Relay-Wash-pump (R259)
C0584L-16
WG,0.5D
Pump-washer-front/rear screen (M278)
FUSE 11P
15.0 Amps
C0583L-5
BO,1.5D
C0008-2
C0008-1
5.00 Amps
C0583L-17
OB,1.5D
Sensor-Rain-Ambient light (T328)
FUSE 18P
5.0 Amps
C0585L-45
G,0.5D
C0961-4
C0961-1
WLG,0.5D
C0586L-32
R,0.5D
SJ45
R,0.5D
C0961-2
C0961-3
B,0.5D
C2599-1
TYPE 2
Generic Electronic Module (D162)
FR WASH PUMP
SJ1
PU,0.5D
C0584L-17
FR WIPE SPEED2
GND
C0585L-25
B,2.5D
C1398L-1
TYPE 3
SJ2
R,0.5D
C0584L-32
FR WIPE SPEED1
WASH PUMP
Switch-Steering column-Wiper (S174)
FR PARK SIG
LIN BUS
Wash-Switch (Y159)
Switch-Ignition (S176)
FR WASH SW
C0580-12
LG,0.5D
C0278-5
AUX
C0028-6
W,1.5D
C0582-30
Slow-wipe (Y155)
C0028-4
FR SLOW WIPE
C0580-2
GS,0.5D
C0278-9
C0278-11
B,0.5D
C0558-1
TYPE 2
Flick-wipe 1 (Y157)
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
Fast-wipe (Y156)
FR FAST WIPE
C0580-7
RLG,0.5D
C0278-10
C1165L-6 C1167-6
YU,0.5D
C0580-15
MS CAN H
Switch-Variable delay-windscreen wiper (S239)
C1165L-7 C1167-7
YW,0.5D
C0580-1
DATA 1
MS CAN L
C0580-8
WLG,0.5D
C0278-3
DATA 2
C0580-9
GS,0.5D
C0278-4
DATA 3
C0580-10
LGP,0.5D
C0278-2
Intermittent (Y152)
FR INT WIPE
C0580-5
LGG,0.5D
C0278-8

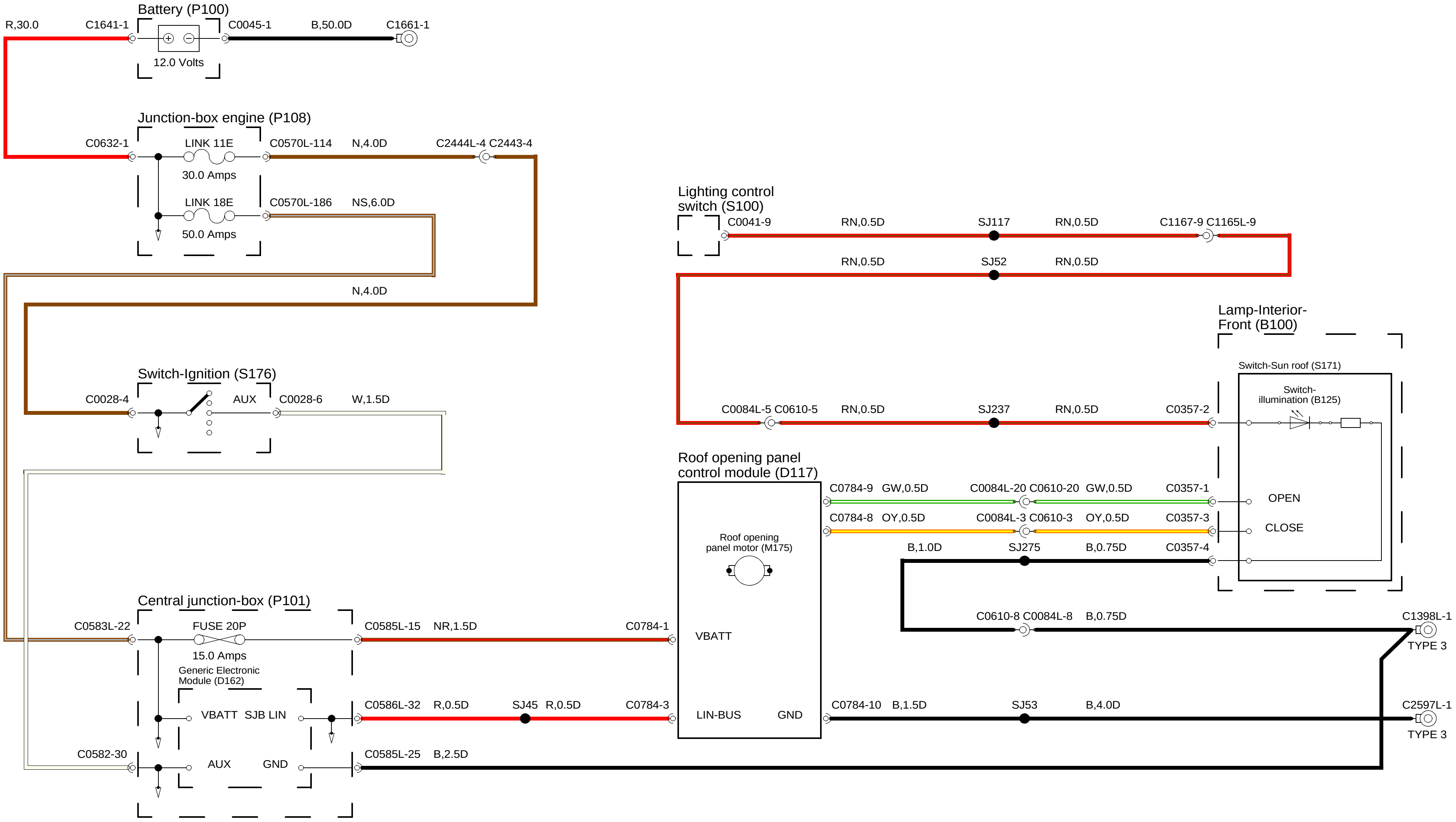

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
Relay-Power-wash (R139)
C0632-1
LINK 7E
30.0 Amps
C0570L-25
C0570L-9
LGR,2.5D
C0570L-27
G,0.5D
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
Pump-Power wash (M156)
C0828-1
11.40 Amps
C0828-2
B,2.5D
SJ171
B,2.5D
C2601-1
TYPE 3
N,4.0D
C2443-4 C2444L-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D
Lighting control switch (S100)
C0041-8
C0041-6
Generic Electronic Module (D162)
POWER WASH
VBATT
DIP BEAM
FR WASH SW
GND
C0584L-18
C0580-25
Y,0.5D
C0580-12
LG,0.5D
Switch-Steering column-Wiper (S174)
C0278-5
Wash-Switch (Y159)
C0278-11
B,0.5D
C0558-1
TYPE 2
C0585L-25
B,2.5D
C1398L-1
TYPE 3
C0582-19
FUSE 28P
5.0 Amps
C0583L-35
LG,0.5D
SJ574
LG,0.5D

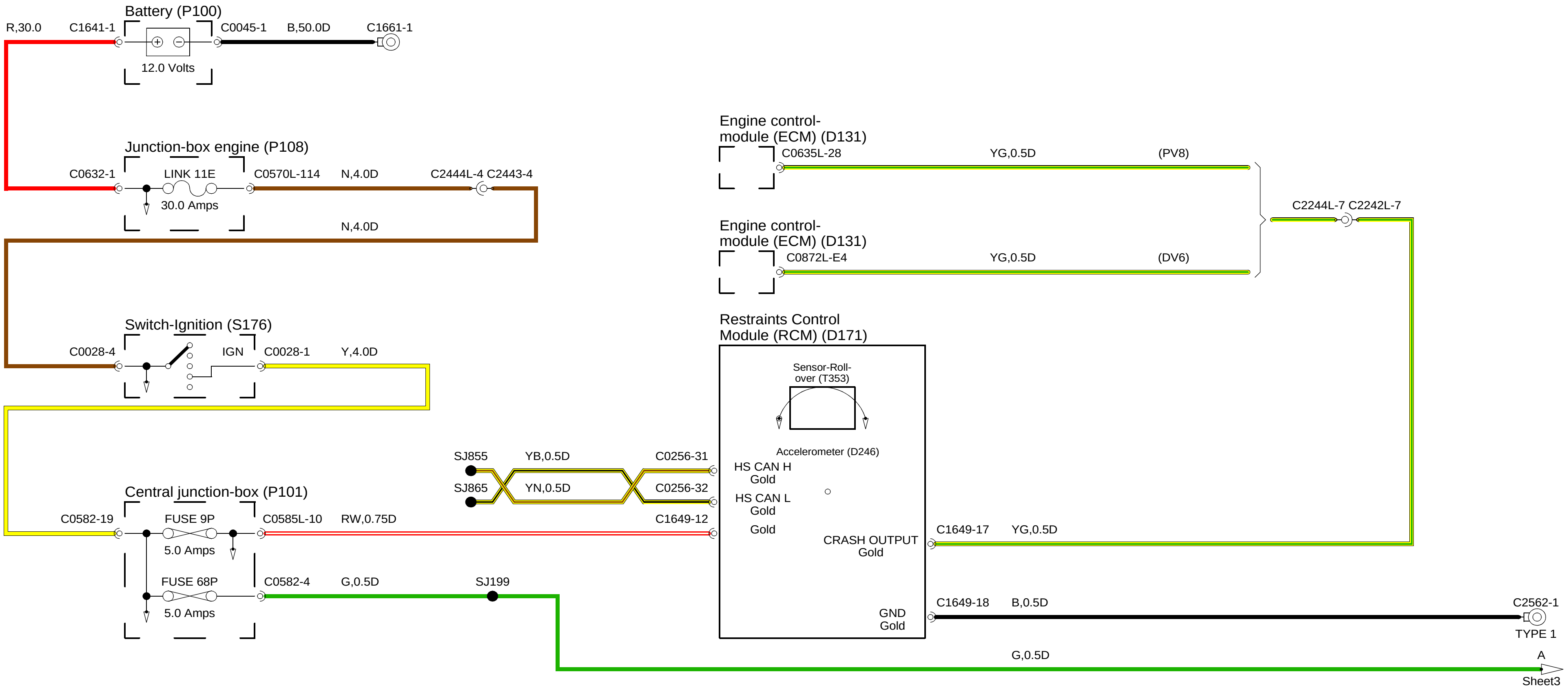

Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
12.0 Volts
Heater-Washer-jet-LH (H127)
SJ170 NY,0.75D
C0934-1
C0934-2 B,0.75D
SJ171 B,2.5D
C2601-1
TYPE 3
Heater-Washer-jet-RH (H128)
NY,0.75D
C0946-1
C0946-2 B,0.75D
Junction-box engine (P108)
Relay-Heated Wash-jets/Mirror (R256)
C0632-1
FUSE 12E
10.0 Amps
C0570L-171 NY,1.5D
C0570L-118 NO,1.5D
C2241L-3 C2239-3
C0570L-95
LINK 17E
50.0 Amps
C0570L-117 NR,6.0D
LINK 11E
30.0 Amps
C0570L-114 N,4.0D
Sensor-Ambient air-temperature (T119)
C2239-2 C2241L-2 YN,0.5D
C3126-1 C3127-1 YN,0.5D
C0412-1
SJ550 BG,0.5D
C2239-1 C2241L-1 BG,0.5D
C3126-2 C3127-2 BG,0.5D
C0412-2
Automatic Temperature Control Module (D243)
N,4.0D
C2443-4 C2444L-4
BG,0.5D C1629-13
YN,0.5D C1629-15
C1629-19 NO,0.5D
ATC
Display
+ Blower -
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
Temp R
Auto
Econ
Rear
Seat R
Switch-Ignition (S176)
IGN
C0028-4
C0028-1 Y,4.0D
SJ965 YU,0.5D C1629-22
SJ975 YW,0.5D C1629-21
MS CAN H
MS CAN L
MS CAN H
MS CAN L
C1629-10 YU,0.5D C2238-2 C2240L-2
C1629-9 YW,0.5D C2238-1 C2240L-1
C2655-1
GND
C2655-3 B,1.0D
C2629-1
TYPE 3
Central junction-box (P101)
C0583L-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D
Generic Electronic Module (D162)
MS CAN H
MS CAN L
C0580-15 YU,0.5D C1167-6 C1165L-6
C0580-1 YW,0.5D C1167-7 C1165L-7
Switch-Steering column-Wiper (S174)
C0580-12 LG,0.5D
C0278-5
Engine control-module (ECM) (D131)
HS CAN H
HS CAN L
C0635L-57 YB,0.5D SJ176
C0635L-44 YN,0.5D SJ177
C0582-19
FUSE 28P
5.0 Amps
C0583L-35 LG,0.5D SJ574
LG,1.5D
Instrument cluster (J100)
SJ730 YU,0.5D C0230-17
SJ731 YW,0.5D C0230-18
MS CAN H
MS CAN L
HS CAN H
HS CAN L
C0230-1 YB,0.5D SJ850
C0230-2 YN,0.5D SJ860

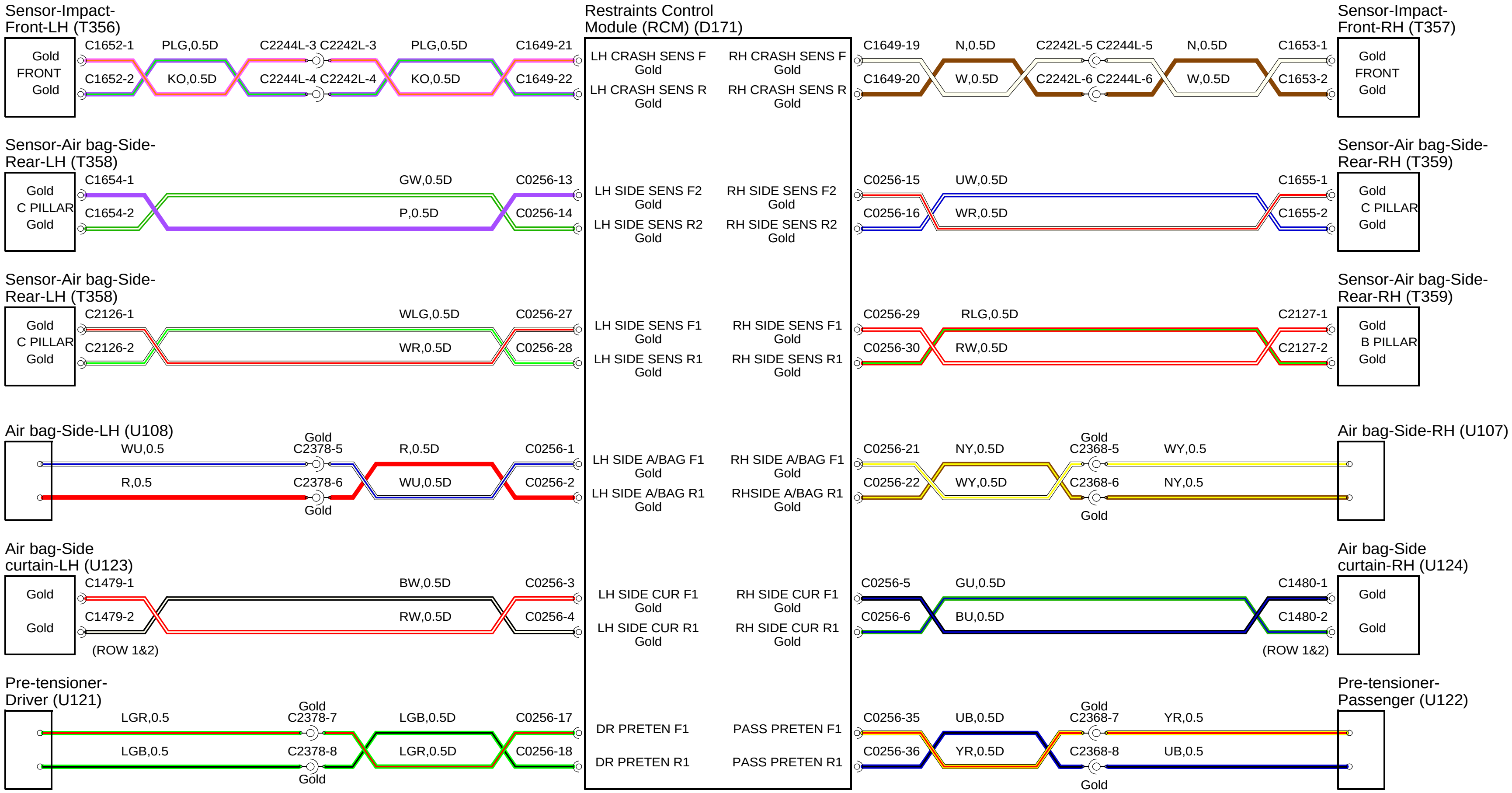

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Relay-Wash-pump (R259)
Pump-washer-front/ rear screen (M278)
Junction-box engine (P108)
C0632-1
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
C0583L-22
FUSE 11P
15.0 Amps
C0583L-5
BO,1.5D
C0008-2
C0008-1
5.00 Amps
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C0583L-17
OB,1.5D
N,4.0D
C2443-4 C2444L-4
FUSE 48P
15.0 Amps
C0585L-12
SK,1.5D
A
Sheet2
Generic Electronic Module (D162)
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
AUX WASH PUMP
C0028-4
RR WASH PUMP
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
RR WIPER
C0586L-25
SP,0.5D
B
Sheet2
C0585L-25
B,2.5D
C1398L-1
GND
TYPE 3
C1165L-6 C1167-6
YU,0.5D
C0580-15
MS CAN H
C1165L-7 C1167-7
YW,0.5D
C0580-1
RR PARK SIG
MS CAN L
C0586L-13
NG,0.5D
C
Sheet2
Motor-CDL-Liftgate Glass (M316)
C1677-3
KR,0.75D
C0385-5 C0144-5
KR,0.75D
Switch-Steering column-Wiper (S174)
Switch-Washer-Rear screen (S114)
RR WASH SW
C0580-11
LGS,0.5D
C0278-12
SJ98
BR,0.75D
C0586L-10
LIFTGATE AJAR
Switch-Wiper-Rear (S116)
REAR WIPE
C0580-6
GY,0.5D
C0278-13
C0278-11
B,0.5D
C0558-1
TYPE 2

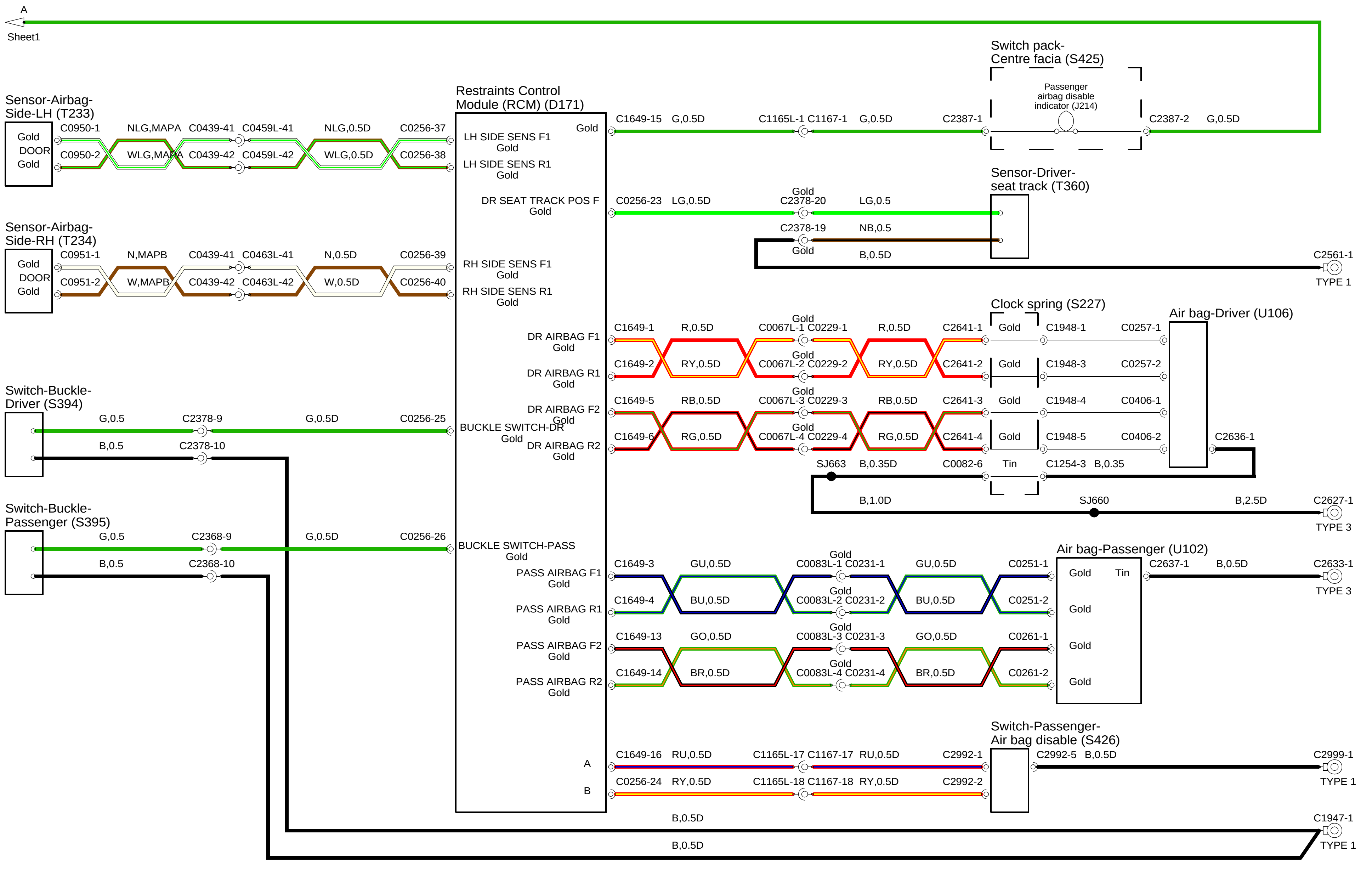

Relay-Trailer-
Rear wiper (R273)
C2937-4
B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
Relay-Rear-
wiper (R137)
A
SK,1.5D
SJ28
SK,1.5D
C2937-2
C2937-1
GLG,1.5D
C2739-2 C2740-2
Sheet1
SK,0.5D
C2937-5
C2937-3
SP,0.5D
B
Sheet1
Motor-Wiper-
Rear screen (M106)
GLG,1.5D
C0388-3
C0388-4
B,1.5D
C2740-6 C2739-6
B,1.5D
SJ832
B,2.5D
C2924-1
TYPE 3
4.50 Amps
Switch-Park-
Rear wiper (S231)
C
NG,0.5D
C2739-3 C2740-3
NG,0.5D
C0388-2
Sheet1

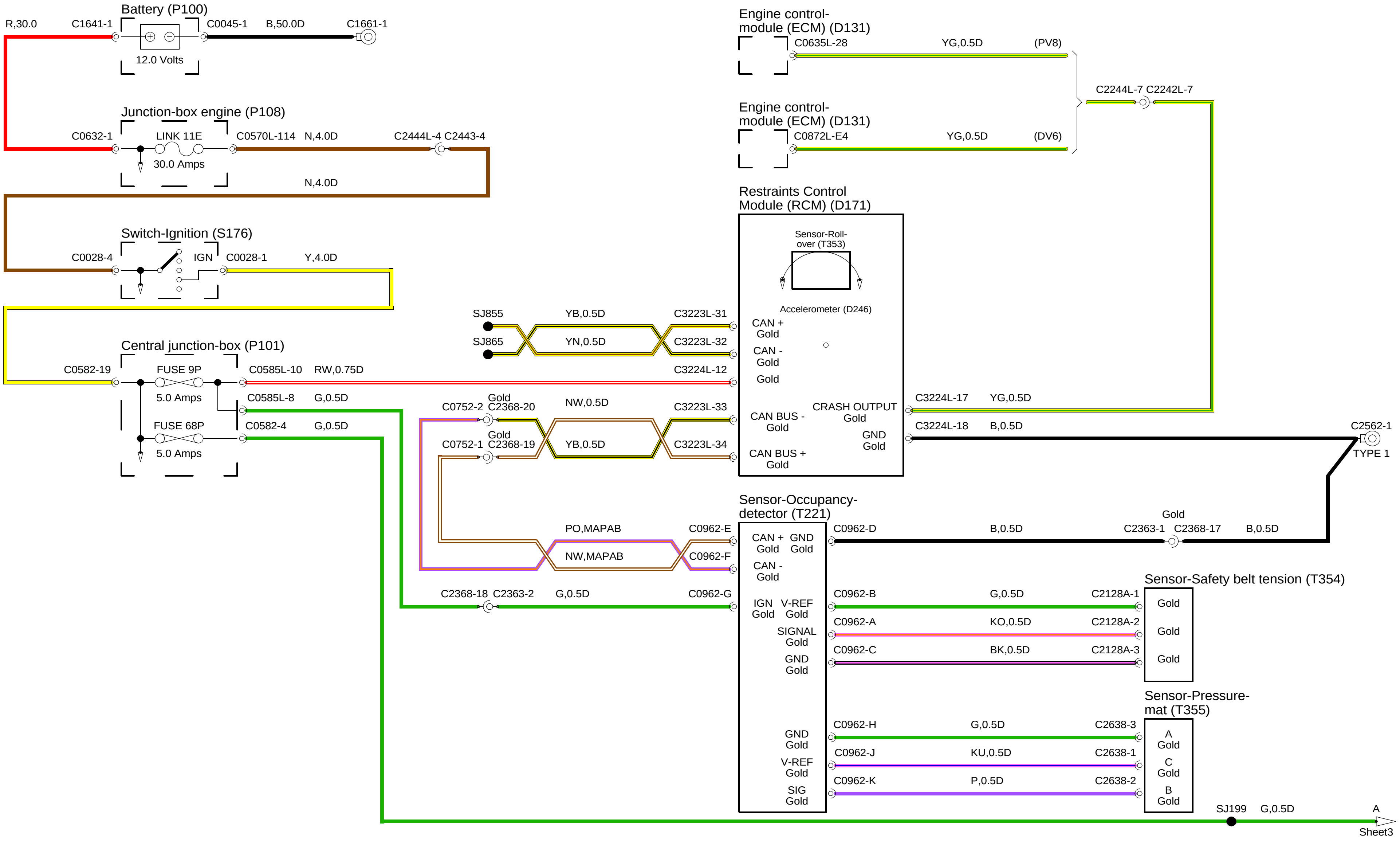
501-17 ROOF OPENING PANEL

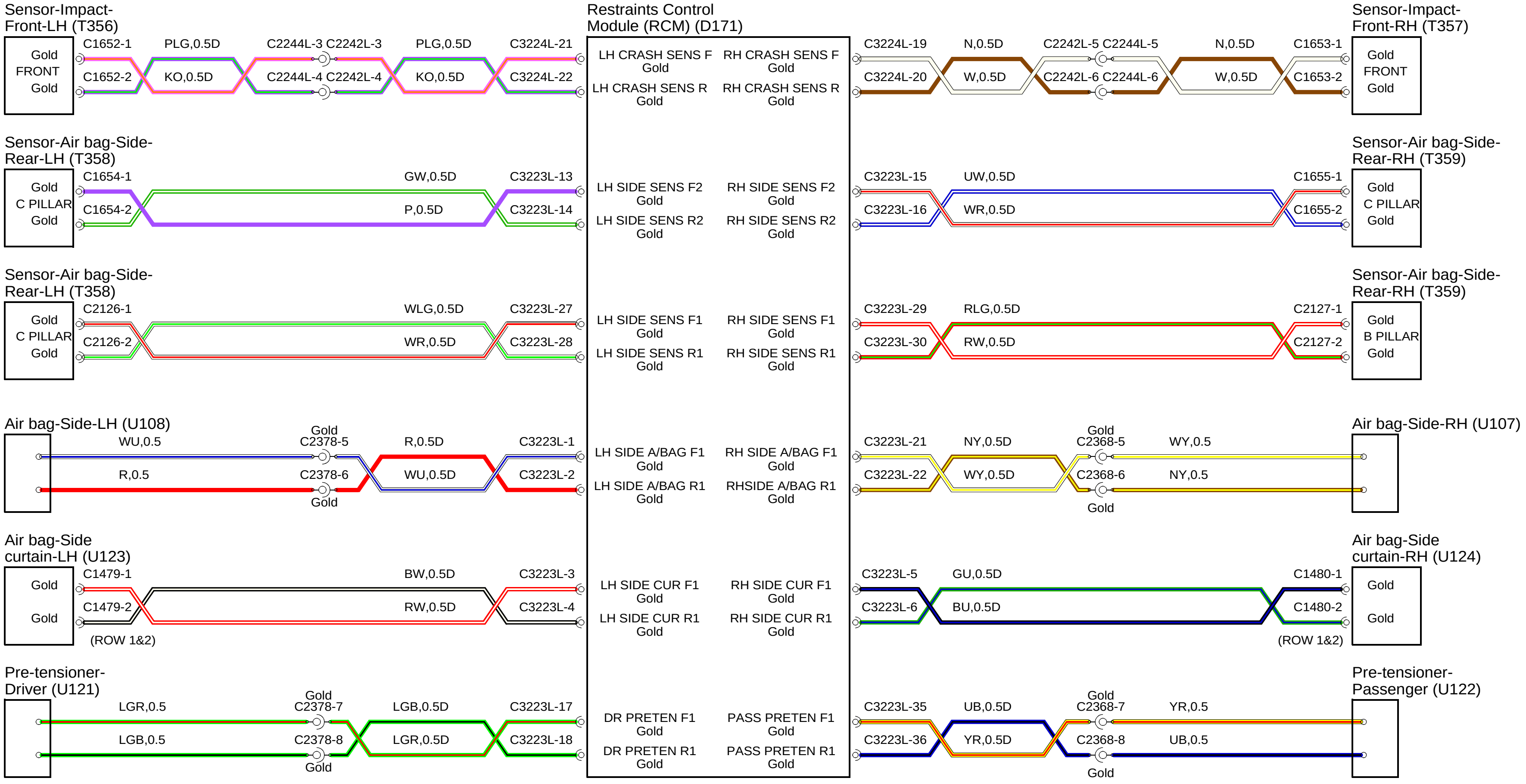

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
LINK 18E
50.0 Amps
C0570L-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central junction-box (P101)
C0583L-22
FUSE 20P
15.0 Amps
C0585L-15
NR,1.5D
C0784-1
Generic Electronic Module (D162)
VBATT
SJB LIN
C0586L-32
R,0.5D
SJ45
R,0.5D
C0784-3
C0582-30
AUX
GND
C0585L-25
B,2.5D
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1167-9 C1165L-9
RN,0.5D
SJ52
RN,0.5D
Lamp-Interior-Front (B100)
Switch-Sun roof (S171)
Switch-illumination (B125)
C0084L-5 C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
Roof opening panel control module (D117)
C0784-9
GW,0.5D
C0084L-20 C0610-20
GW,0.5D
C0357-1
OPEN
C0784-8
OY,0.5D
C0084L-3 C0610-3
OY,0.5D
C0357-3
CLOSE
Roof opening panel motor (M175)
B,1.0D
SJ275
B,0.75D
C0357-4
C0610-8 C0084L-8
B,0.75D
C1398L-1
TYPE 3
VBATT
LIN-BUS
GND
C0784-10
B,1.5D
SJ53
B,4.0D
C2597L-1
TYPE 3

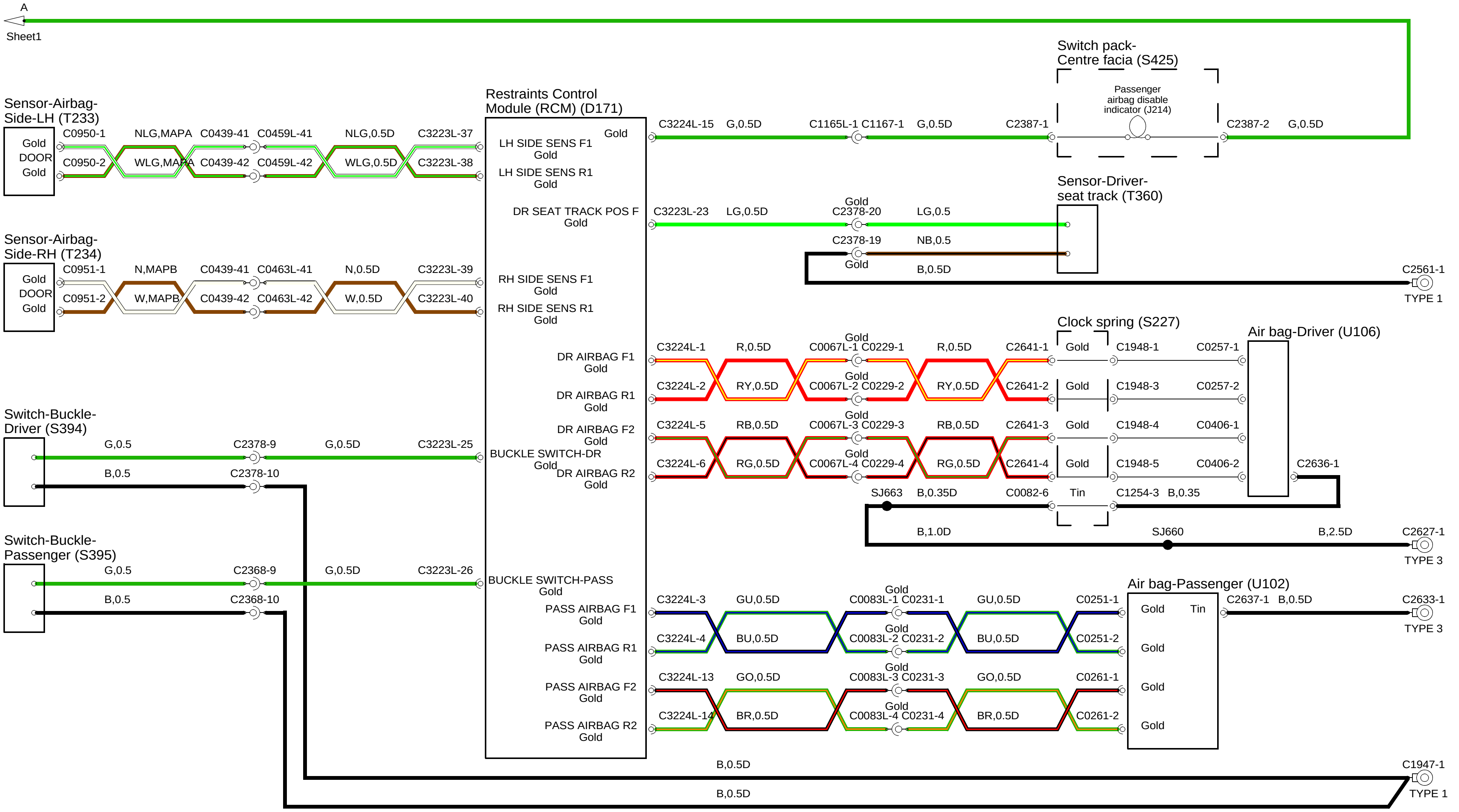

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 9P
5.0 Amps
C0585L-10
RW,0.75D
FUSE 68P
5.0 Amps
C0582-4
G,0.5D
SJ199
SJ855
YB,0.5D
C0256-31
SJ865
YN,0.5D
C0256-32
C1649-12
Engine control-module (ECM) (D131)
C0635L-28
YG,0.5D
(PV8)
Engine control-module (ECM) (D131)
C0872L-E4
YG,0.5D
(DV6)
C2244L-7 C2242L-7
Restraints Control Module (RCM) (D171)
Sensor-Roll-over (T353)
Accelerometer (D246)
HS CAN H
Gold
HS CAN L
Gold
Gold
CRASH OUTPUT
Gold
GND
Gold
C1649-17
YG,0.5D
C1649-18
B,0.5D
C2562-1
TYPE 1
G,0.5D
A
Sheet3


Sensor-Impact-Front-LH (T356)
Gold
FRONT
Gold
C1652-1
PLG,0.5D
C2244L-3 C2242L-3
PLG,0.5D
C1649-21
C1652-2
KO,0.5D
C2244L-4 C2242L-4
KO,0.5D
C1649-22
Restraints Control Module (RCM) (D171)
LH CRASH SENS F
Gold
RH CRASH SENS F
Gold
LH CRASH SENS R
Gold
RH CRASH SENS R
Gold
C1649-19
N,0.5D
C2242L-5 C2244L-5
N,0.5D
C1653-1
C1649-20
W,0.5D
C2242L-6 C2244L-6
W,0.5D
C1653-2
Sensor-Impact-Front-RH (T357)
Gold
FRONT
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C1654-1
GW,0.5D
C0256-13
C1654-2
P,0.5D
C0256-14
LH SIDE SENS F2
Gold
RH SIDE SENS F2
Gold
LH SIDE SENS R2
Gold
RH SIDE SENS R2
Gold
C0256-15
UW,0.5D
C1655-1
C0256-16
WR,0.5D
C1655-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
C PILLAR
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C2126-1
WLG,0.5D
C0256-27
C2126-2
WR,0.5D
C0256-28
LH SIDE SENS F1
Gold
RH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
RH SIDE SENS R1
Gold
C0256-29
RLG,0.5D
C2127-1
C0256-30
RW,0.5D
C2127-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
B PILLAR
Gold
Air bag-Side-LH (U108)
WU,0.5
Gold
C2378-5
R,0.5D
C0256-1
R,0.5
C2378-6
Gold
WU,0.5D
C0256-2
LH SIDE A/BAG F1
Gold
RH SIDE A/BAG F1
Gold
LH SIDE A/BAG R1
Gold
RHSIDE A/BAG R1
Gold
C0256-21
NY,0.5D
Gold
C2368-5
WY,0.5
C0256-22
WY,0.5D
C2368-6
Gold
NY,0.5
Air bag-Side-RH (U107)
Air bag-Side curtain-LH (U123)
Gold
Gold
C1479-1
BW,0.5D
C0256-3
C1479-2
RW,0.5D
C0256-4
(ROW 1&2)
LH SIDE CUR F1
Gold
RH SIDE CUR F1
Gold
LH SIDE CUR R1
Gold
RH SIDE CUR R1
Gold
C0256-5
GU,0.5D
C1480-1
C0256-6
BU,0.5D
C1480-2
(ROW 1&2)
Air bag-Side curtain-RH (U124)
Gold
Gold
Pre-tensioner-Driver (U121)
LGR,0.5
Gold
C2378-7
LGB,0.5D
C0256-17
LGB,0.5
C2378-8
Gold
LGR,0.5D
C0256-18
DR PRETEN F1
PASS PRETEN F1
DR PRETEN R1
PASS PRETEN R1
C0256-35
UB,0.5D
Gold
C2368-7
YR,0.5
C0256-36
YR,0.5D
C2368-8
Gold
UB,0.5
Pre-tensioner-Passenger (U122)


A
Sheet1
Switch pack-
Centre facia (S425)
Passenger
airbag disable
indicator (J214)
C2387-1
C2387-2
G,0.5D
Restraints Control
Module (RCM) (D171)
Sensor-Airbag-
Side-LH (T233)
Gold
DOOR
Gold
C0950-1
NLG,MAPA
C0439-41
C0459L-41
NLG,0.5D
C0256-37
C0950-2
WLG,MAPA
C0439-42
C0459L-42
WLG,0.5D
C0256-38
LH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
C1649-15
G,0.5D
C1165L-1 C1167-1
G,0.5D
DR SEAT TRACK POS F
Gold
C0256-23
LG,0.5D
Gold
C2378-20
LG,0.5
Sensor-Driver-
seat track (T360)
C2378-19
NB,0.5
Gold
B,0.5D
C2561-1
TYPE 1
Sensor-Airbag-
Side-RH (T234)
Gold
DOOR
Gold
C0951-1
N,MAPB
C0439-41
C0463L-41
N,0.5D
C0256-39
C0951-2
W,MAPB
C0439-42
C0463L-42
W,0.5D
C0256-40
RH SIDE SENS F1
Gold
RH SIDE SENS R1
Gold
Clock spring (S227)
Air bag-Driver (U106)
DR AIRBAG F1
Gold
C1649-1
R,0.5D
Gold
C0067L-1 C0229-1
R,0.5D
C2641-1
Gold
C1948-1
C0257-1
DR AIRBAG R1
Gold
C1649-2
RY,0.5D
Gold
C0067L-2 C0229-2
RY,0.5D
C2641-2
Gold
C1948-3
C0257-2
DR AIRBAG F2
Gold
C1649-5
RB,0.5D
Gold
C0067L-3 C0229-3
RB,0.5D
C2641-3
Gold
C1948-4
C0406-1
DR AIRBAG R2
Gold
C1649-6
RG,0.5D
Gold
C0067L-4 C0229-4
RG,0.5D
C2641-4
Gold
C1948-5
C0406-2
C2636-1
SJ663
B,0.35D
C0082-6
Tin
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Switch-Buckle-
Driver (S394)
G,0.5
C2378-9
G,0.5D
C0256-25
BUCKLE SWITCH-DR
Gold
B,0.5
C2378-10
Switch-Buckle-
Passenger (S395)
G,0.5
C2368-9
G,0.5D
C0256-26
BUCKLE SWITCH-PASS
Gold
B,0.5
C2368-10
Air bag-Passenger (U102)
PASS AIRBAG F1
Gold
C1649-3
GU,0.5D
Gold
C0083L-1 C0231-1
GU,0.5D
C0251-1
Gold
Tin
C2637-1
B,0.5D
C2633-1
TYPE 3
PASS AIRBAG R1
Gold
C1649-4
BU,0.5D
Gold
C0083L-2 C0231-2
BU,0.5D
C0251-2
Gold
PASS AIRBAG F2
Gold
C1649-13
GO,0.5D
Gold
C0083L-3 C0231-3
GO,0.5D
C0261-1
Gold
PASS AIRBAG R2
Gold
C1649-14
BR,0.5D
Gold
C0083L-4 C0231-4
BR,0.5D
C0261-2
Gold
Switch-Passenger-
Air bag disable (S426)
A
C1649-16
RU,0.5D
C1165L-17 C1167-17
RU,0.5D
C2992-1
C2992-5
B,0.5D
C2999-1
TYPE 1
B
C0256-24
RY,0.5D
C1165L-18 C1167-18
RY,0.5D
C2992-2
B,0.5D
C1947-1
TYPE 1
B,0.5D


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
LINK 11E
30.0 Amps
C0570L-114
N,4.0D
C2444L-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central junction-box (P101)
C0582-19
FUSE 9P
5.0 Amps
FUSE 68P
5.0 Amps
C0585L-10
RW,0.75D
C0585L-8
G,0.5D
C0582-4
G,0.5D
SJ855
YB,0.5D
C3223L-31
SJ865
YN,0.5D
C3223L-32
C3224L-12
Gold
C0752-2 C2368-20
NW,0.5D
C3223L-33
Gold
C0752-1 C2368-19
YB,0.5D
C3223L-34
PO,MAPAB
C0962-E
NW,MAPAB
C0962-F
C2368-18 C2363-2
G,0.5D
C0962-G
Engine control-module (ECM) (D131)
C0635L-28
YG,0.5D
(PV8)
Engine control-module (ECM) (D131)
C0872L-E4
YG,0.5D
(DV6)
C2244L-7 C2242L-7
Restraints Control Module (RCM) (D171)
Sensor-Roll-over (T353)
Accelerometer (D246)
CAN + Gold
CAN - Gold
Gold
CAN BUS - Gold
CRASH OUTPUT Gold
GND Gold
CAN BUS + Gold
C3224L-17
YG,0.5D
C3224L-18
B,0.5D
C2562-1
TYPE 1
Sensor-Occupancy-detector (T221)
CAN + Gold
GND Gold
CAN - Gold
IGN Gold
V-REF Gold
SIGNAL Gold
GND Gold
GND Gold
V-REF Gold
SIG Gold
C0962-D
B,0.5D
Gold
C2363-1 C2368-17
B,0.5D
Sensor-Safety belt tension (T354)
C0962-B
G,0.5D
C2128A-1
C0962-A
KO,0.5D
C2128A-2
C0962-C
BK,0.5D
C2128A-3
Gold
Gold
Gold
Sensor-Pressure-mat (T355)
C0962-H
G,0.5D
C2638-3
C0962-J
KU,0.5D
C2638-1
C0962-K
P,0.5D
C2638-2
A Gold
C Gold
B Gold
SJ199
G,0.5D
A
Sheet3


Sensor-Impact-Front-LH (T356)
Gold
FRONT
Gold
C1652-1
C1652-2
PLG,0.5D
KO,0.5D
C2244L-3 C2242L-3
C2244L-4 C2242L-4
PLG,0.5D
KO,0.5D
C3224L-21
C3224L-22
Restraints Control Module (RCM) (D171)
LH CRASH SENS F
Gold
LH CRASH SENS R
Gold
RH CRASH SENS F
Gold
RH CRASH SENS R
Gold
C3224L-19
C3224L-20
N,0.5D
W,0.5D
C2242L-5 C2244L-5
C2242L-6 C2244L-6
N,0.5D
W,0.5D
C1653-1
C1653-2
Sensor-Impact-Front-RH (T357)
Gold
FRONT
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C1654-1
C1654-2
GW,0.5D
P,0.5D
C3223L-13
C3223L-14
LH SIDE SENS F2
Gold
LH SIDE SENS R2
Gold
RH SIDE SENS F2
Gold
RH SIDE SENS R2
Gold
C3223L-15
C3223L-16
UW,0.5D
WR,0.5D
C1655-1
C1655-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
C PILLAR
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C2126-1
C2126-2
WLG,0.5D
WR,0.5D
C3223L-27
C3223L-28
LH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
RH SIDE SENS F1
Gold
RH SIDE SENS R1
Gold
C3223L-29
C3223L-30
RLG,0.5D
RW,0.5D
C2127-1
C2127-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
B PILLAR
Gold
Air bag-Side-LH (U108)
WU,0.5
R,0.5
Gold
C2378-5
C2378-6
Gold
R,0.5D
WU,0.5D
C3223L-1
C3223L-2
LH SIDE A/BAG F1
Gold
LH SIDE A/BAG R1
Gold
RH SIDE A/BAG F1
Gold
RHSIDE A/BAG R1
Gold
C3223L-21
C3223L-22
NY,0.5D
WY,0.5D
Gold
C2368-5
C2368-6
Gold
WY,0.5
NY,0.5
Air bag-Side-RH (U107)
Air bag-Side curtain-LH (U123)
Gold
Gold
C1479-1
C1479-2
(ROW 1&2)
BW,0.5D
RW,0.5D
C3223L-3
C3223L-4
LH SIDE CUR F1
Gold
LH SIDE CUR R1
Gold
RH SIDE CUR F1
Gold
RH SIDE CUR R1
Gold
C3223L-5
C3223L-6
GU,0.5D
BU,0.5D
C1480-1
C1480-2
(ROW 1&2)
Air bag-Side curtain-RH (U124)
Gold
Gold
Pre-tensioner-Driver (U121)
LGR,0.5
LGB,0.5
Gold
C2378-7
C2378-8
Gold
LGB,0.5D
LGR,0.5D
C3223L-17
C3223L-18
DR PRETEN F1
Gold
DR PRETEN R1
Gold
PASS PRETEN F1
Gold
PASS PRETEN R1
Gold
C3223L-35
C3223L-36
UB,0.5D
YR,0.5D
Gold
C2368-7
C2368-8
Gold
YR,0.5
UB,0.5
Pre-tensioner-Passenger (U122)


A
Sheet1
Switch pack-
Centre facia (S425)
Passenger
airbag disable
indicator (J214)
Sensor-Airbag-
Side-LH (T233)
Restraints Control
Module (RCM) (D171)
Gold
DOOR
Gold
C0950-1
C0950-2
NLG,MAPA
WLG,MAPA
C0439-41
C0439-42
C0459L-41
C0459L-42
NLG,0.5D
WLG,0.5D
C3223L-37
C3223L-38
LH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
C3224L-15
G,0.5D
C1165L-1 C1167-1
G,0.5D
C2387-1
C2387-2
G,0.5D
Sensor-Driver-
seat track (T360)
DR SEAT TRACK POS F
Gold
C3223L-23
LG,0.5D
C2378-20
LG,0.5
C2378-19
NB,0.5
B,0.5D
C2561-1
TYPE 1
Sensor-Airbag-
Side-RH (T234)
C0951-1
C0951-2
N,MAPB
W,MAPB
C0439-41
C0439-42
C0463L-41
C0463L-42
N,0.5D
W,0.5D
C3223L-39
C3223L-40
RH SIDE SENS F1
Gold
RH SIDE SENS R1
Gold
Clock spring (S227)
Air bag-Driver (U106)
DR AIRBAG F1
Gold
DR AIRBAG R1
Gold
DR AIRBAG F2
Gold
DR AIRBAG R2
Gold
C3224L-1
R,0.5D
C0067L-1 C0229-1
R,0.5D
C2641-1
C1948-1
C0257-1
C3224L-2
RY,0.5D
C0067L-2 C0229-2
RY,0.5D
C2641-2
C1948-3
C0257-2
C3224L-5
RB,0.5D
C0067L-3 C0229-3
RB,0.5D
C2641-3
C1948-4
C0406-1
C3224L-6
RG,0.5D
C0067L-4 C0229-4
RG,0.5D
C2641-4
C1948-5
C0406-2
C2636-1
SJ663
B,0.35D
C0082-6
Tin
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Switch-Buckle-
Driver (S394)
G,0.5
C2378-9
G,0.5D
C3223L-25
BUCKLE SWITCH-DR
Gold
B,0.5
C2378-10
Switch-Buckle-
Passenger (S395)
G,0.5
C2368-9
G,0.5D
C3223L-26
BUCKLE SWITCH-PASS
Gold
B,0.5
C2368-10
Air bag-Passenger (U102)
PASS AIRBAG F1
Gold
PASS AIRBAG R1
Gold
PASS AIRBAG F2
Gold
PASS AIRBAG R2
Gold
C3224L-3
GU,0.5D
C0083L-1 C0231-1
GU,0.5D
C0251-1
C3224L-4
BU,0.5D
C0083L-2 C0231-2
BU,0.5D
C0251-2
C3224L-13
GO,0.5D
C0083L-3 C0231-3
GO,0.5D
C0261-1
C3224L-14
BR,0.5D
C0083L-4 C0231-4
BR,0.5D
C0261-2
Tin
C2637-1
B,0.5D
C2633-1
TYPE 3
B,0.5D
B,0.5D
C1947-1
TYPE 1

Health and safety

Always follow health and safety guidelines, specifically those detailed in the Workshop Manual.

Using this publication

The information provided in this publication is for use only by competent, qualified auto-electricians. Good product knowledge is assumed, as well as the ability to access and use recommended test equipment and other reference material provided.

Test equipment and other reference material

The information in this publication should be used in conjunction with the recommended test equipment; refer to Workshop Manual. Other reference material includes: Technical Service Bulletins (TSB) and the Workshop Manual.

The Electrical Reference Library (ERL) may also prove useful since it provides detailed connector information.

Battery disconnection and reconnection

It is imperative that any information relating to battery disconnection and reconnection is followed; refer to the appropriate sections in the Workshop Manual.

Fault Diagnosis

Always use the recommended test equipment for correct and reliable fault diagnosis, refer to the Workshop Manual.

Harness Repair

Repairs should only be undertaken for connectors where a Service Repair Kit is available; refer to the appropriate Electrical Reference Library (ERL).
Note: Fibre Optic circuits cannot be repaired; refer to the Workshop Manual.

Abbreviations

Abbreviation	Description
ABS	Anti-lock braking system
AFS	Adaptive front lighting system
AUTO	Automatic transmission
CAN	Controller area network
DSC	Dynamic stability control
DV6	Diesel engine - V6
DV8	Diesel engine - V8
EGR	Exhaust gas recirculation
EU3	DV6 - Without inlet port deactivation
EU4	DV6 - With inlet port deactivation
FET	Field effect transistor
GPS	Global positioning system
PV6	Petrol engine - V6
PV8	Petrol engine - V8
PV8NA	Naturally aspirated engine - V8
PV8SC	Super charged engine - V8
LH	Left-hand
MAF/IAT	Mass air flow / intake air temperature
NAS	North American specification
PDC	Park distance control
RH	Right-hand
TPMS	Tire pressure monitoring system
TSD	Touch screen display

Section numbering

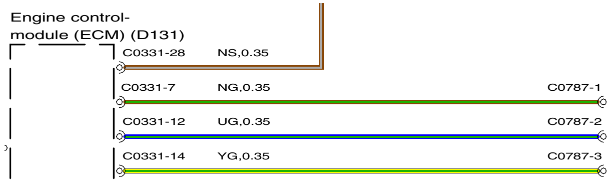
The sections in this publication are ordered to match the Global Outline numbering system as found in the current Workshop Manual. The Power and Ground distribution circuits can be found under section 414-01, BATTERY, MOUNTING AND CABLES.
Note: Where circuit diagrams show more than one sub-system, the circuit will be located in the section that carries the first-named sub-system, for example: Starting and Charging will be located under section 303-06 Starting System, since 'Starting' is the first-named sub-system.

Circuit sheet numbering

The figures in brackets to the left of the page number indicate a circuit sheet number and the total number of sheets per circuit, for example (01 / 05) represents sheet 1 of 5.

Understanding the circuit diagrams

Components

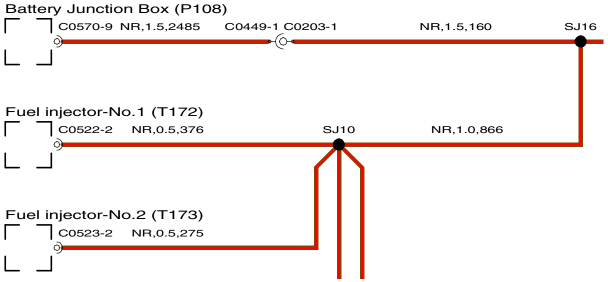

Engine control-module (ECM) (D131)
C0331-28
NS,0.35
C0331-7
NG,0.35
C0787-1
C0331-12
UG,0.35
C0787-2
C0331-14
YG,0.35
C0787-3

After each component description, a translation code is displayed in brackets, for example: Starter relay (R102), Engine control-module (ECM)(D131). The codes can be ignored.
Note: A dotted outline indicates that the component identified is not shown in its entirety.

Connectors

Connectors and header joints are identified by their corresponding connector number with a numbered suffix to indicate the pin-out detail of the wire, i.e. C0292-1 identifies connector 292, pin number 1. Wire insulation colours are listed in a table at the end of this section. Where wires have a predominant colour with a secondary colour tracer, the main colour is identified first, i.e. LGS - light green with a slate tracer.

Splices

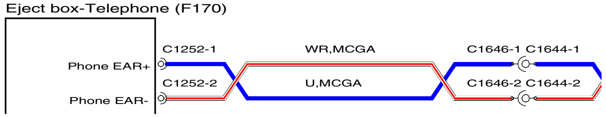

Battery Junction Box (P108)
C0570-9
NR,1.5,2485
C0449-1
C0203-1
NR,1.5,160
SJ16
Fuel injector-No.1 (T172)
C0522-2
NR,0.5,376
SJ10
NR,1.0,866
Fuel injector-No.2 (T173)
C0523-2
NR,0.5,275

The splices (and where appropriate, the header) circuit pages show the full interconnectivity of components and systems.
Note: The splice information shown on individual system circuits is not complete. Always refer to the splices circuit pages for complete information for each splice.

Wire length (Splices, Power and Ground Distribution only)

The wire length (in millimetres) is displayed after the colour and cross sectional area; for example, SR,0.35,480. In this example, the figure, 480 indicates the approximate position of the harness splice is 480mm from connector C2335.

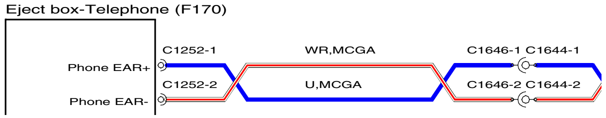
Wire Types


Eject box-Telephone (F170)
Phone EAR+
Phone EAR-
C1252-1
WR,MCGA
C1646-1 C1644-1
C1252-2
U,MCGA
C1646-2 C1644-2

Multicore wires are identified by the prefix M suffixed by three or four other letters, for example MCGA, MAPN. The suffix precisely defines the parameters that comprise the specification of the wire type. The specification is defined during the design process of an electrical system, therefore it is imperative that the correct specification is maintained to ensure the correct operating characteristics and continued functionality for a given system.

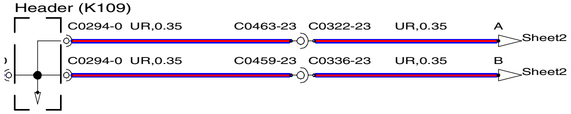
INTRODUCTION

Line Types



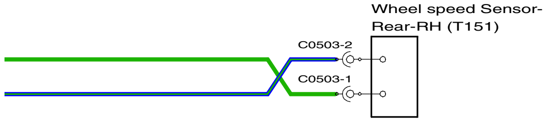
Eject box-Telephone (F170)
Phone EAR+
Phone EAR-
C1252-1
C1252-2
WR,MCGA
U,MCGA
C1646-1 C1644-1
C1646-2 C1644-2

Crossed wires as illustrated above show an example of how a twisted pair of wires may be represented on the circuits.

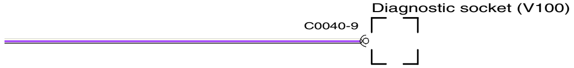


Header (K109)
C0294-0 UR,0.35
C0463-23 C0322-23
UR,0.35
A
Sheet2
C0294-0 UR,0.35
C0459-23 C0336-23
UR,0.35
B
Sheet2

The arrows illustrated above show an example of the page break symbols, identifying that the circuit continues at the corresponding letter on the sheet number indicated.



Wheel speed Sensor-
Rear-RH (T151)
C0503-2
C0503-1



Diagnostic socket (V100)
C0040-9

The cup and ball symbol represents the male and female halves of connector. Most connectors plug directly into a component but some are wired directly to the component using a ‘flylead’ as with C503 above.

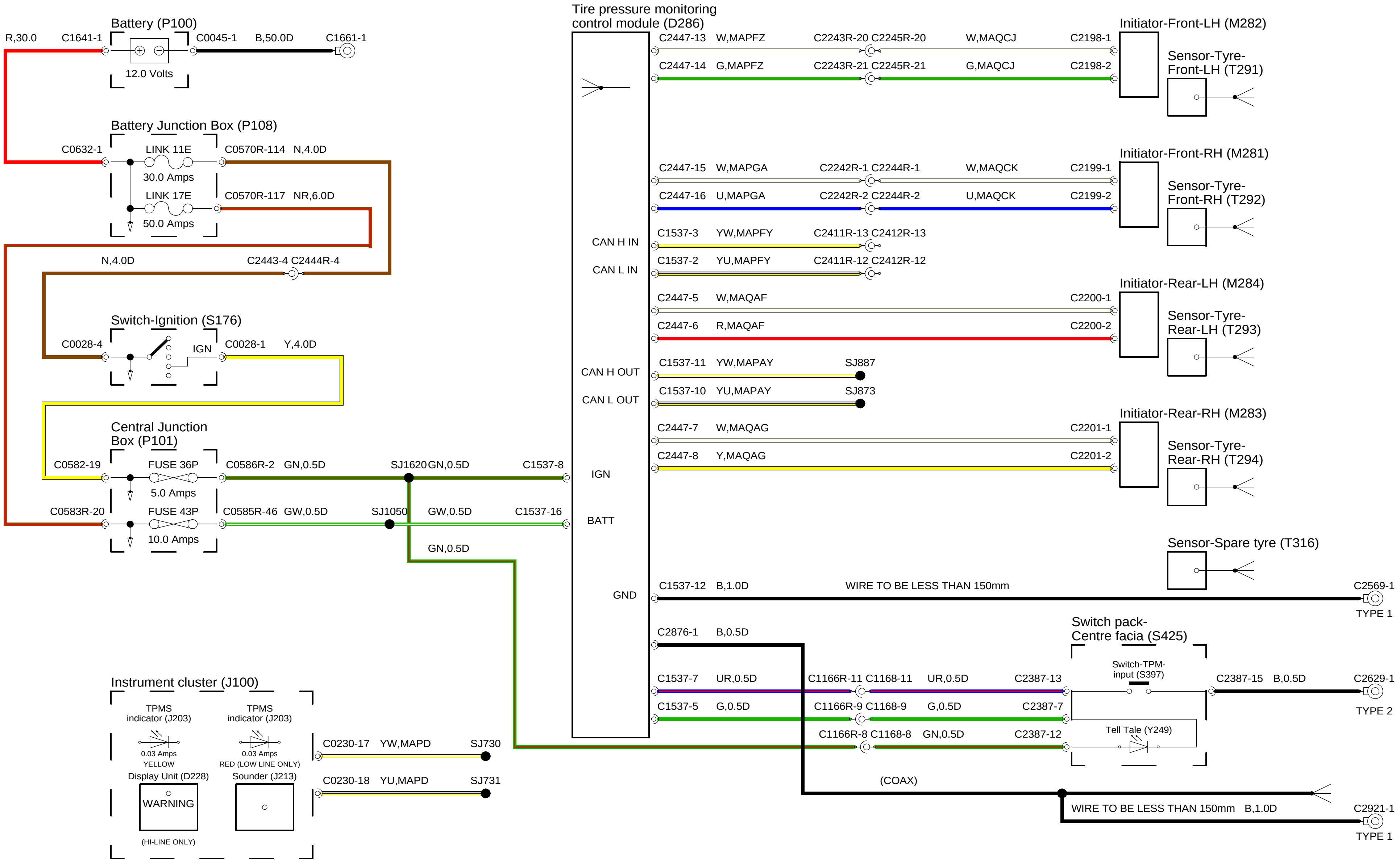
Ground points

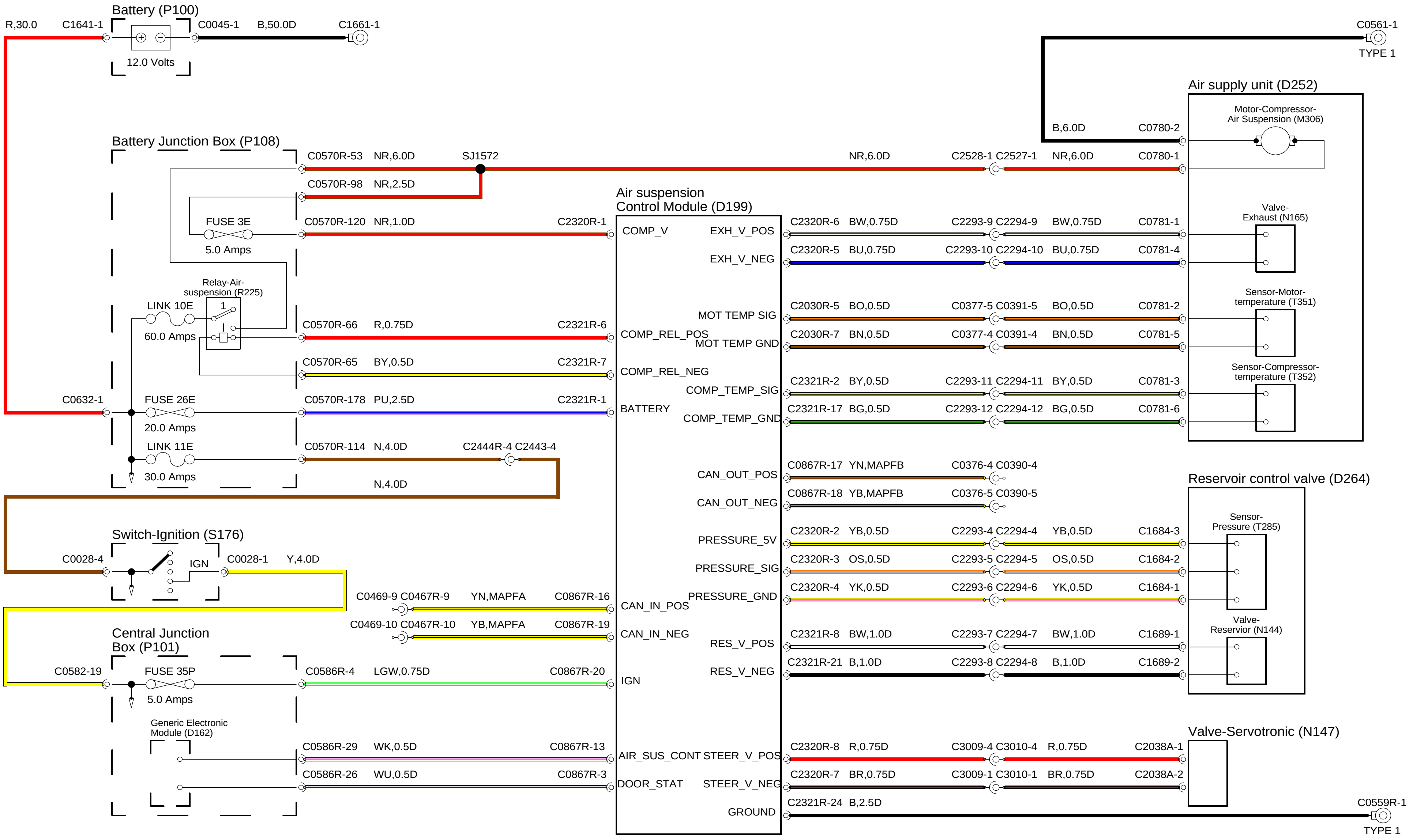
Ground points are identified with an eyelet symbol and a connector number, except where components are grounded through its fixings, when only the eyelet is shown.

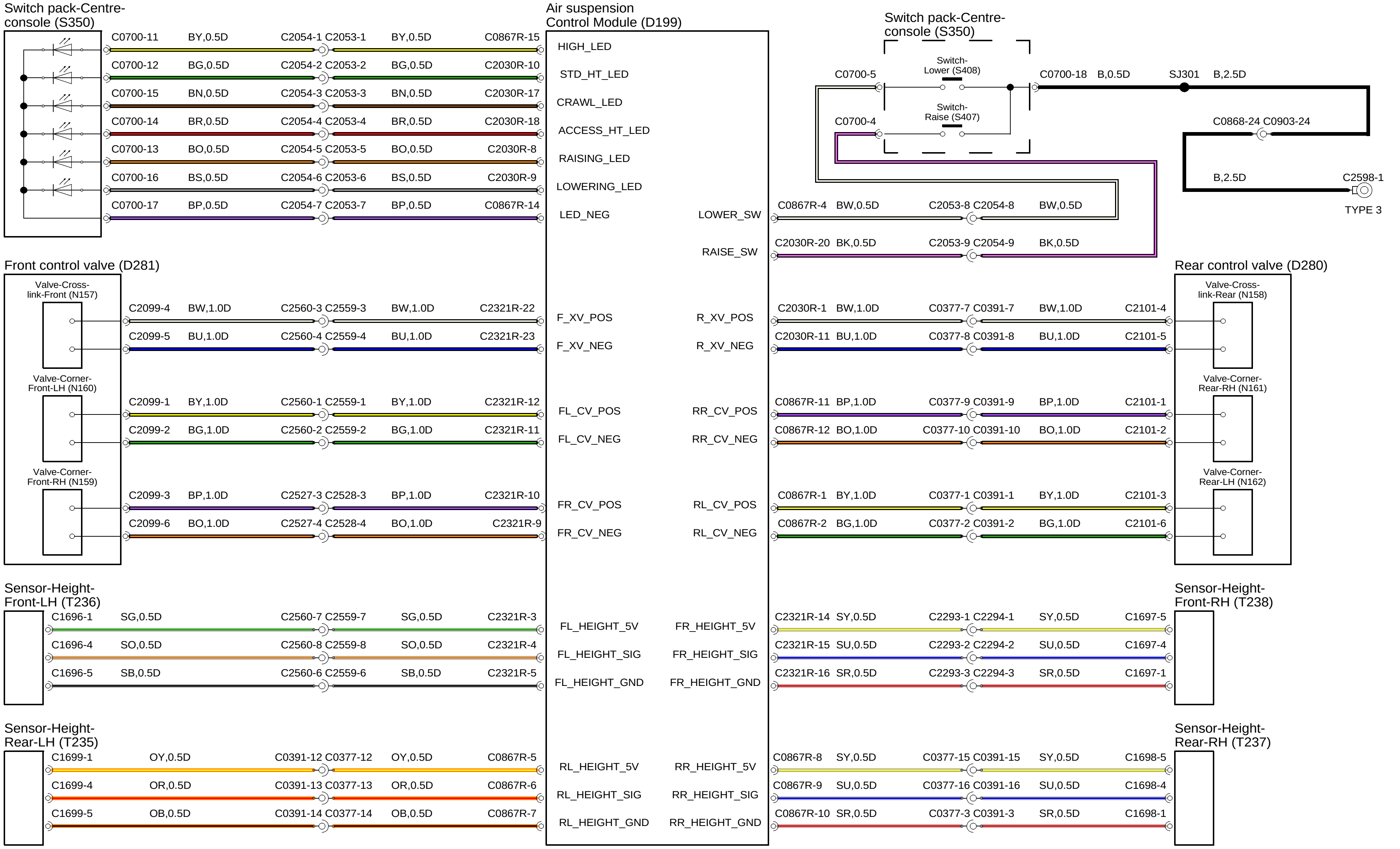
Colour Codes

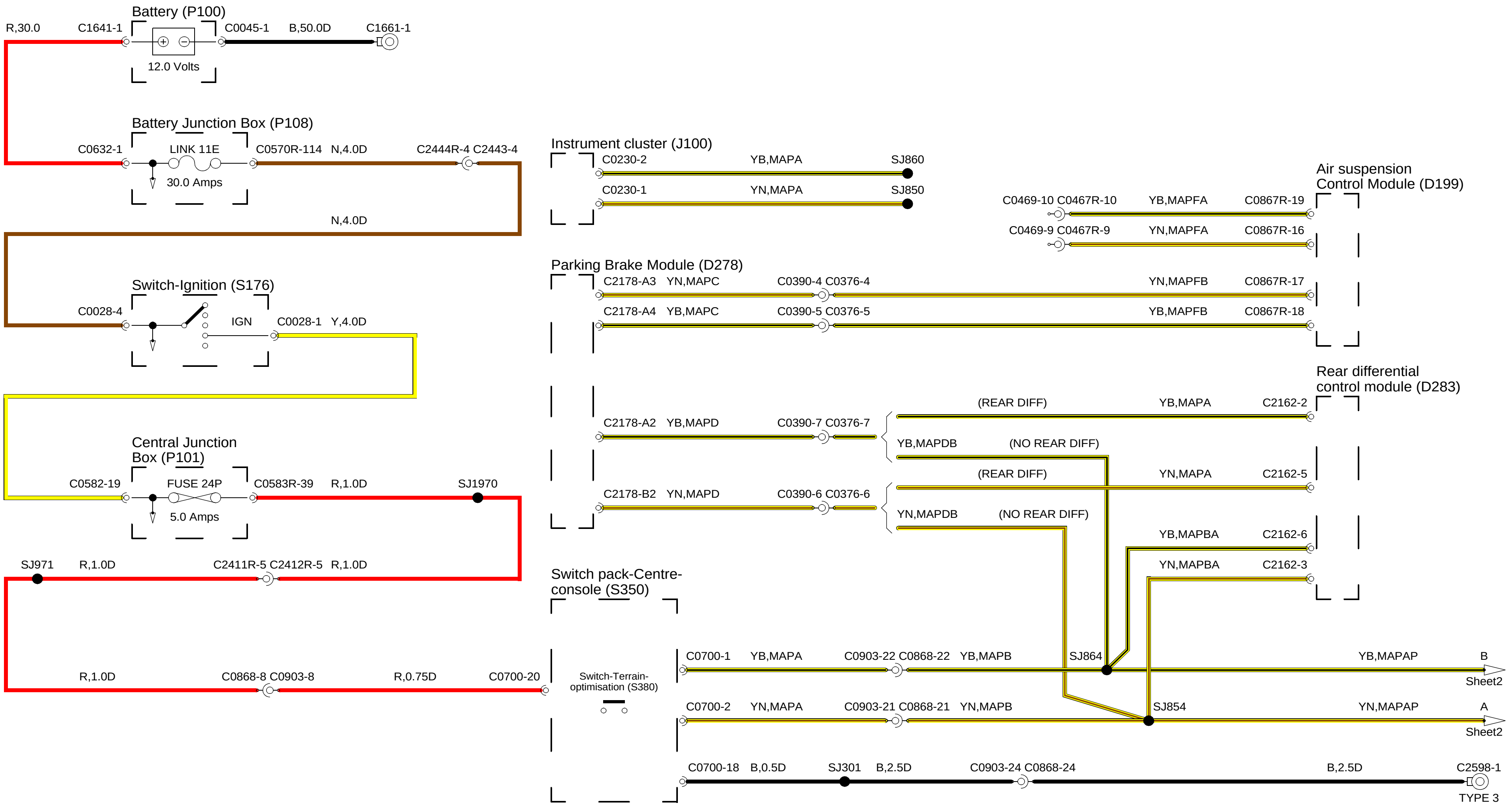
DRAADKLEURCODES	CODES DES COULEURS DES FILS	KABELFARBCODES
CODICI COLORI DEI CAVI	CODIGOS DE COLORES DE LOS CABLES	CÓDIGOS DAS CORES DOS FIOS

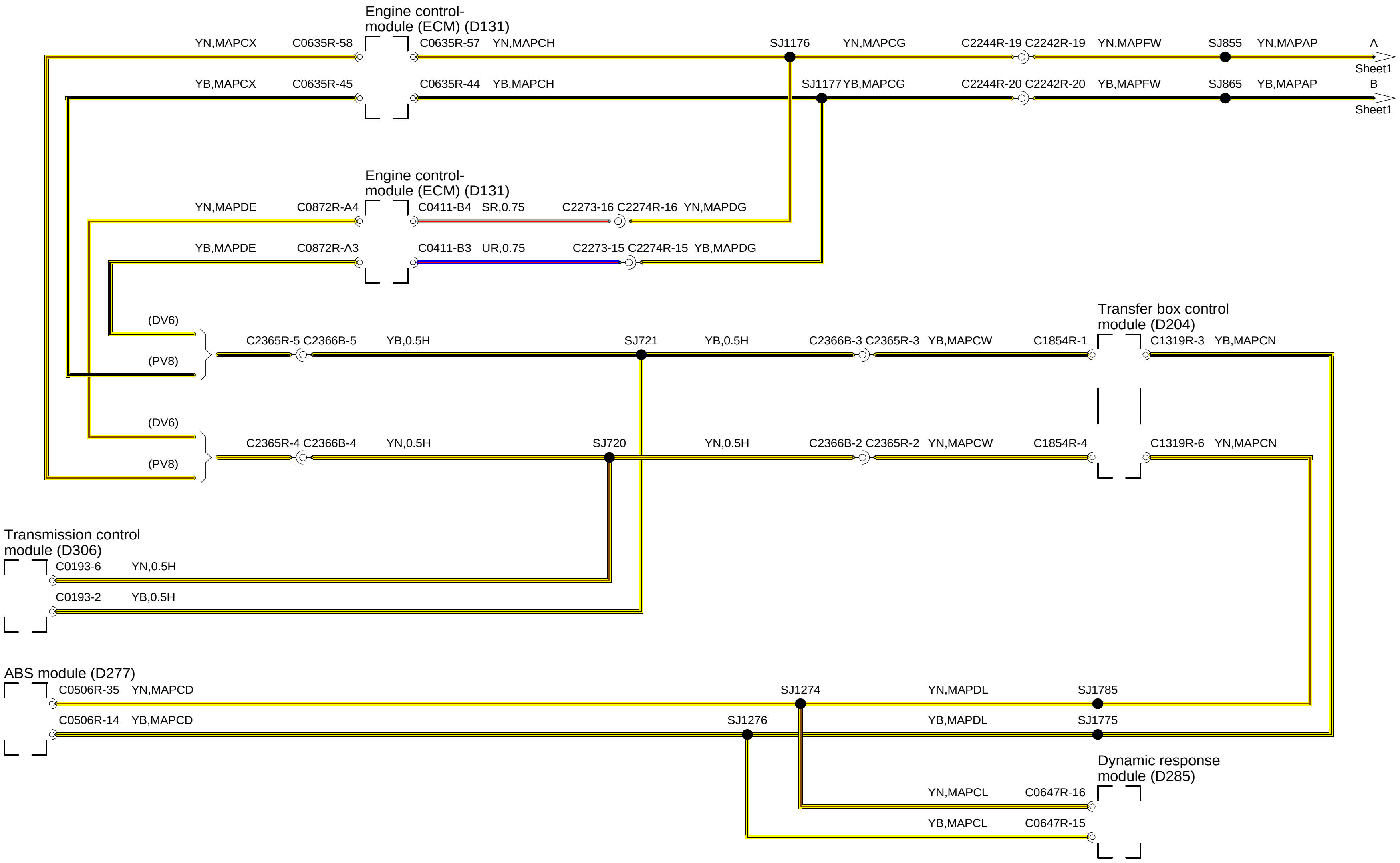
CODE	COLOUR	CODE	KLEUR	CODE	COULEUR	CODE	FARBE	CODICE	COLORE	CODIGO	COLOR	CÓDIGO	COR
B	BLACK	B	ZWART	B	NOIR	B	SCHWARZ	B	NERO	B	NEGRO	B	PRETO
G	GREEN	G	GROEN	G	VERT	G	GRÜN	G	VERDE	G	VERDE	G	VERDE
K	PINK	K	ROZE	K	ROSE	K	ROSA	K	ROSA	K	ROSA	K	ROSA
LG	LIGHT GREEN	LG	LICHTGROEN	LG	VERT CLAIR	LG	HELLGRÜN	LG	VERDE CHIARO	LG	VERDE CLARO	LG	VERDE CLARO
N	BROWN	N	BRUIN	N	BRUN	N	BRAUN	N	MARRONE	N	MARRON	N	CASTANHO
O	ORANGE	O	ORANJE	O	ORANGE	O	ORANGE	O	ARANCIONE	O	NARANJA	O	LARANJA
P	PURPLE	P	PAARS	P	VIOLET	P	LILA	P	PORPORA	P	PURPURA	P	ROXO
R	RED	R	ROOD	R	ROUGE	R	ROT	R	ROSSO	R	ROJO	R	VERMELHO
S	SLATE (grey)	S	LEIGRIJS	S	GRIS	S	GRAU	S	ARDESIA (grigio)	S	PIZARRO (gris)	S	CINZENTO
T	TRANSPARENT	T	TRANSPARANT	T	TRANSPARENT	T	TRANSPARENT	T	TRASPARENTE	T	TRANSPARENTE	T	TRANSPARENTE
U	BLUE	U	BLAUW	U	BLEU	U	BLAU	U	BLU	U	AZUL	U	AZUL
W	WHITE	W	WIT	W	BLANC	W	WEISS	W	BIANCO	W	BLANCO	W	BRANCO
Y	YELLOW	Y	GEEL	Y	JAUNE	Y	GELB	Y	GIALLO	Y	AMARILLO	Y	AMARELO

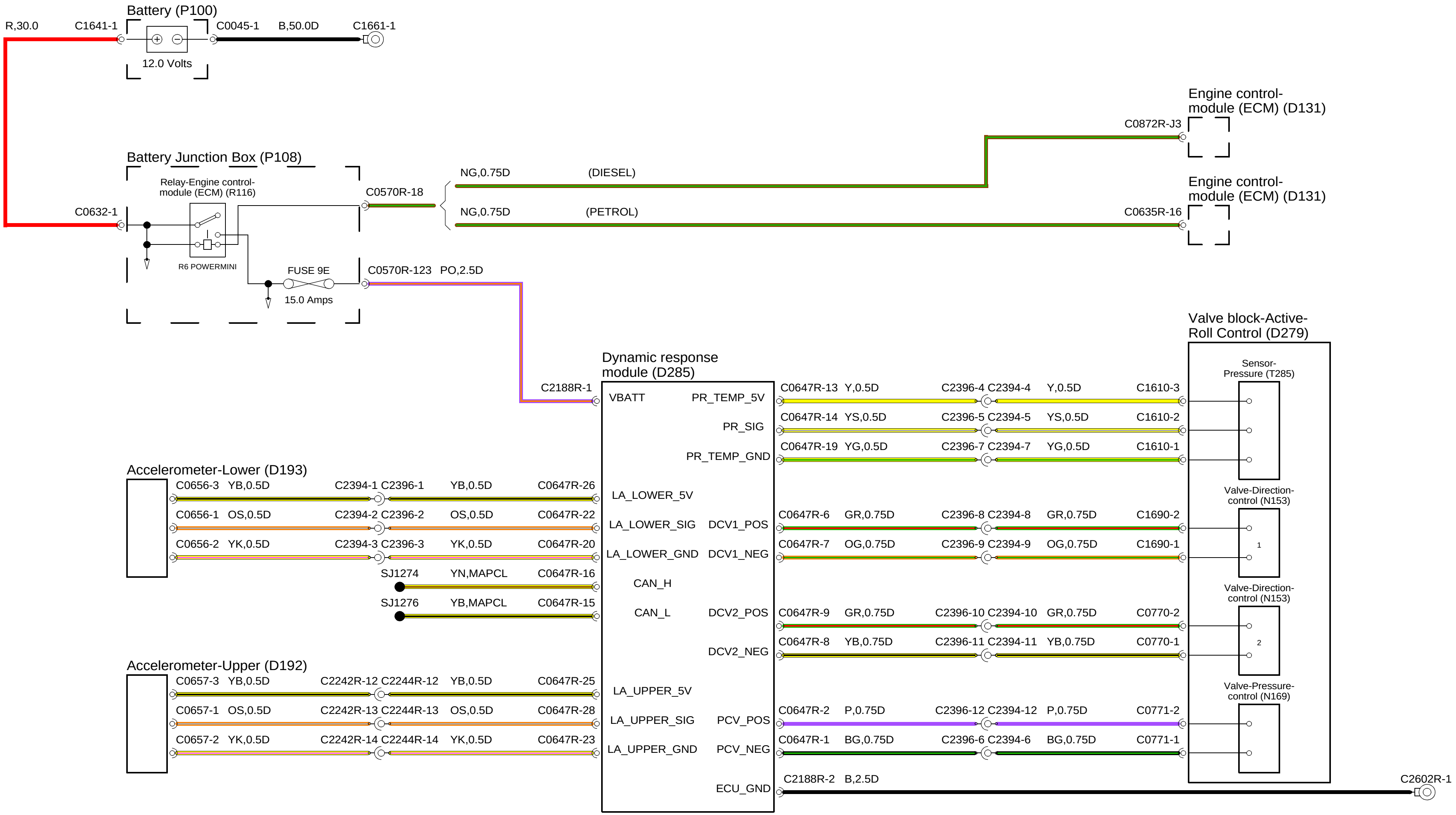

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
C0570R-114
N,4.0D
30.0 Amps
LINK 17E
C0570R-117
NR,6.0D
50.0 Amps
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 36P
C0586R-2
GN,0.5D
SJ1620
GN,0.5D
C1537-8
5.0 Amps
C0583R-20
FUSE 43P
C0585R-46
GW,0.5D
SJ1050
GW,0.5D
C1537-16
10.0 Amps
GN,0.5D
Instrument cluster (J100)
TPMS indicator (J203)
TPMS indicator (J203)
0.03 Amps
YELLOW
0.03 Amps
RED (LOW LINE ONLY)
Display Unit (D228)
Sounder (J213)
WARNING
(HI-LINE ONLY)
C0230-17
YW,MAPD
SJ730
C0230-18
YU,MAPD
SJ731
Tire pressure monitoring control module (D286)
CAN H IN
CAN L IN
CAN H OUT
CAN L OUT
IGN
BATT
GND
C2447-13
W,MAPFZ
C2243R-20 C2245R-20
W,MAQCJ
C2198-1
C2447-14
G,MAPFZ
C2243R-21 C2245R-21
G,MAQCJ
C2198-2
Initiator-Front-LH (M282)
Sensor-Tyre-Front-LH (T291)
C2447-15
W,MAPGA
C2242R-1 C2244R-1
W,MAQCK
C2199-1
C2447-16
U,MAPGA
C2242R-2 C2244R-2
U,MAQCK
C2199-2
Initiator-Front-RH (M281)
Sensor-Tyre-Front-RH (T292)
C1537-3
YW,MAPFY
C2411R-13 C2412R-13
C1537-2
YU,MAPFY
C2411R-12 C2412R-12
Initiator-Rear-LH (M284)
C2447-5
W,MAQAF
C2200-1
C2447-6
R,MAQAF
C2200-2
Sensor-Tyre-Rear-LH (T293)
C1537-11
YW,MAPAY
SJ887
C1537-10
YU,MAPAY
SJ873
Initiator-Rear-RH (M283)
C2447-7
W,MAQAG
C2201-1
C2447-8
Y,MAQAG
C2201-2
Sensor-Tyre-Rear-RH (T294)
Sensor-Spare tyre (T316)
C1537-12
B,1.0D
WIRE TO BE LESS THAN 150mm
C2569-1
TYPE 1
C2876-1
B,0.5D
Switch pack-Centre facia (S425)
Switch-TPM-input (S397)
C1537-7
UR,0.5D
C1166R-11 C1168-11
UR,0.5D
C2387-13
C2387-15
B,0.5D
C2629-1
TYPE 2
C1537-5
G,0.5D
C1166R-9 C1168-9
G,0.5D
C2387-7
Tell Tale (Y249)
C1166R-8 C1168-8
GN,0.5D
C2387-12
(COAX)
WIRE TO BE LESS THAN 150mm
B,1.0D
C2921-1
TYPE 1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
C0561-1
TYPE 1
Air supply unit (D252)
Motor-Compressor-Air Suspension (M306)
B,6.0D
C0780-2
Battery Junction Box (P108)
C0570R-53
NR,6.0D
SJ1572
NR,6.0D
C2528-1 C2527-1
NR,6.0D
C0780-1
C0570R-98
NR,2.5D
Air suspension Control Module (D199)
FUSE 3E
5.0 Amps
C0570R-120
NR,1.0D
C2320R-1
COMP_V
EXH_V_POS
C2320R-6
BW,0.75D
C2293-9 C2294-9
BW,0.75D
C0781-1
Valve-Exhaust (N165)
EXH_V_NEG
C2320R-5
BU,0.75D
C2293-10 C2294-10
BU,0.75D
C0781-4
Relay-Air-suspension (R225)
1
LINK 10E
60.0 Amps
Sensor-Motor-temperature (T351)
MOT TEMP SIG
C2030R-5
BO,0.5D
C0377-5 C0391-5
BO,0.5D
C0781-2
C0570R-66
R,0.75D
C2321R-6
COMP_REL_POS
MOT TEMP GND
C2030R-7
BN,0.5D
C0377-4 C0391-4
BN,0.5D
C0781-5
C0570R-65
BY,0.5D
C2321R-7
COMP_REL_NEG
Sensor-Compressor-temperature (T352)
COMP_TEMP_SIG
C2321R-2
BY,0.5D
C2293-11 C2294-11
BY,0.5D
C0781-3
C0632-1
FUSE 26E
20.0 Amps
C0570R-178
PU,2.5D
C2321R-1
BATTERY
COMP_TEMP_GND
C2321R-17
BG,0.5D
C2293-12 C2294-12
BG,0.5D
C0781-6
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
CAN_OUT_POS
C0867R-17
YN,MAPFB
C0376-4 C0390-4
CAN_OUT_NEG
C0867R-18
YB,MAPFB
C0376-5 C0390-5
Reservoir control valve (D264)
Sensor-Pressure (T285)
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
PRESSURE_5V
C2320R-2
YB,0.5D
C2293-4 C2294-4
YB,0.5D
C1684-3
PRESSURE_SIG
C2320R-3
OS,0.5D
C2293-5 C2294-5
OS,0.5D
C1684-2
C0469-9 C0467R-9
YN,MAPFA
C0867R-16
CAN_IN_POS
PRESSURE_GND
C2320R-4
YK,0.5D
C2293-6 C2294-6
YK,0.5D
C1684-1
Valve-Reservior (N144)
C0469-10 C0467R-10
YB,MAPFA
C0867R-19
CAN_IN_NEG
Central Junction Box (P101)
RES_V_POS
C2321R-8
BW,1.0D
C2293-7 C2294-7
BW,1.0D
C1689-1
C0582-19
FUSE 35P
5.0 Amps
C0586R-4
LGW,0.75D
C0867R-20
IGN
RES_V_NEG
C2321R-21
B,1.0D
C2293-8 C2294-8
B,1.0D
C1689-2
Generic Electronic Module (D162)
Valve-Servotronic (N147)
C0586R-29
WK,0.5D
C0867R-13
AIR_SUS_CONT
STEER_V_POS
C2320R-8
R,0.75D
C3009-4 C3010-4
R,0.75D
C2038A-1
C0586R-26
WU,0.5D
C0867R-3
DOOR_STAT
STEER_V_NEG
C2320R-7
BR,0.75D
C3009-1 C3010-1
BR,0.75D
C2038A-2
C2321R-24
B,2.5D
C0559R-1
GROUND
TYPE 1

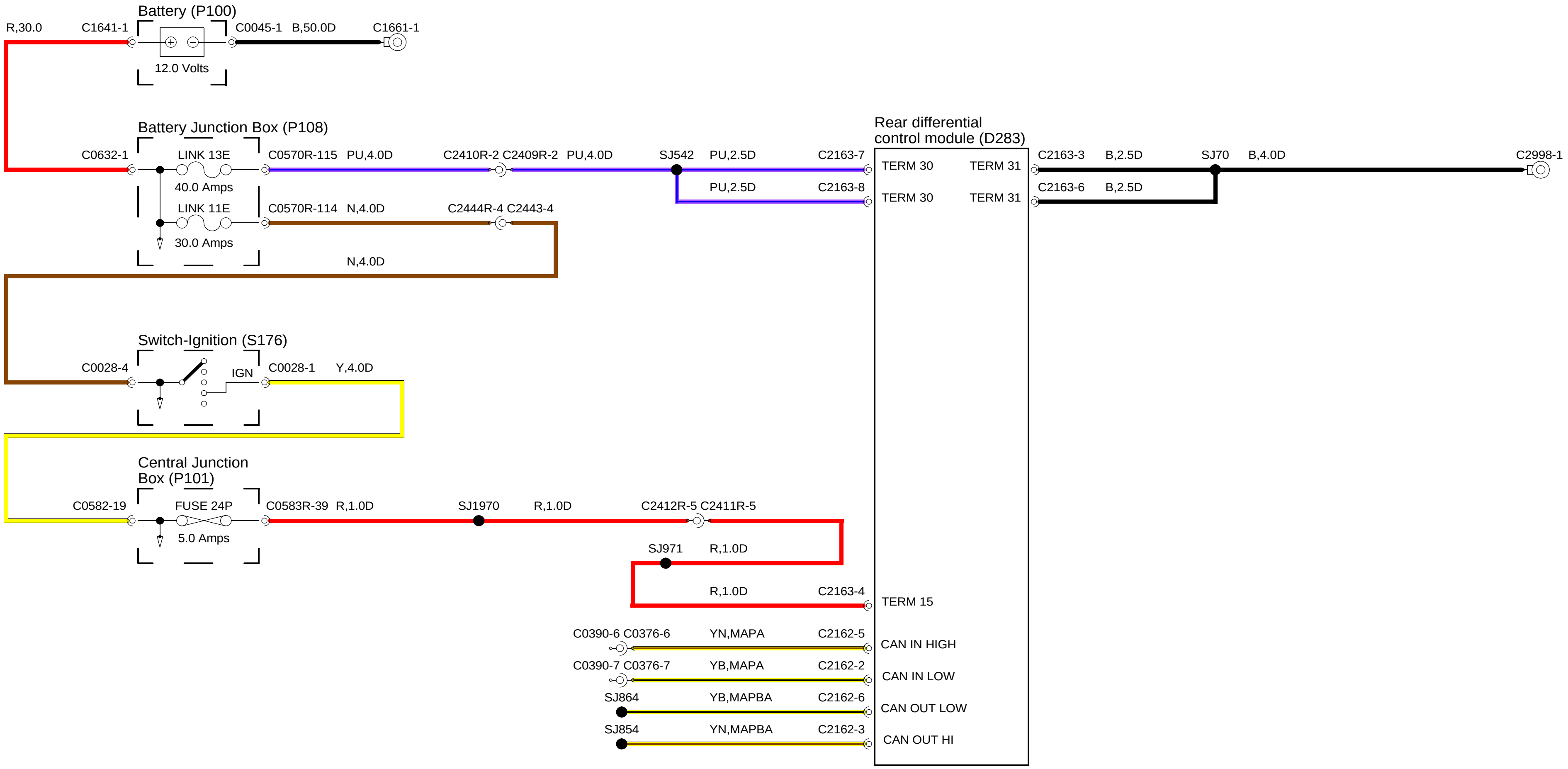

Switch pack-Centre-console (S350)
C0700-11 BY,0.5D C2054-1 C2053-1 BY,0.5D C0867R-15
C0700-12 BG,0.5D C2054-2 C2053-2 BG,0.5D C2030R-10
C0700-15 BN,0.5D C2054-3 C2053-3 BN,0.5D C2030R-17
C0700-14 BR,0.5D C2054-4 C2053-4 BR,0.5D C2030R-18
C0700-13 BO,0.5D C2054-5 C2053-5 BO,0.5D C2030R-8
C0700-16 BS,0.5D C2054-6 C2053-6 BS,0.5D C2030R-9
C0700-17 BP,0.5D C2054-7 C2053-7 BP,0.5D C0867R-14
Air suspension Control Module (D199)
HIGH_LED
STD_HT_LED
CRAWL_LED
ACCESS_HT_LED
RAISING_LED
LOWERING_LED
LED_NEG
LOWER_SW
RAISE_SW
Switch pack-Centre-console (S350)
Switch-Lower (S408)
Switch-Raise (S407)
C0700-5
C0700-4
C0700-18 B,0.5D
SJ301 B,2.5D
C0868-24 C0903-24
B,2.5D
C2598-1
TYPE 3
C0867R-4 BW,0.5D C2053-8 C2054-8 BW,0.5D
C2030R-20 BK,0.5D C2053-9 C2054-9 BK,0.5D
Front control valve (D281)
Valve-Cross-link-Front (N157)
Valve-Corner-Front-LH (N160)
Valve-Corner-Front-RH (N159)
C2099-4 BW,1.0D C2560-3 C2559-3 BW,1.0D C2321R-22
C2099-5 BU,1.0D C2560-4 C2559-4 BU,1.0D C2321R-23
C2099-1 BY,1.0D C2560-1 C2559-1 BY,1.0D C2321R-12
C2099-2 BG,1.0D C2560-2 C2559-2 BG,1.0D C2321R-11
C2099-3 BP,1.0D C2527-3 C2528-3 BP,1.0D C2321R-10
C2099-6 BO,1.0D C2527-4 C2528-4 BO,1.0D C2321R-9
F_XV_POS
F_XV_NEG
FL_CV_POS
FL_CV_NEG
FR_CV_POS
FR_CV_NEG
R_XV_POS
R_XV_NEG
RR_CV_POS
RR_CV_NEG
RL_CV_POS
RL_CV_NEG
Rear control valve (D280)
Valve-Cross-link-Rear (N158)
Valve-Corner-Rear-RH (N161)
Valve-Corner-Rear-LH (N162)
C2030R-1 BW,1.0D C0377-7 C0391-7 BW,1.0D C2101-4
C2030R-11 BU,1.0D C0377-8 C0391-8 BU,1.0D C2101-5
C0867R-11 BP,1.0D C0377-9 C0391-9 BP,1.0D C2101-1
C0867R-12 BO,1.0D C0377-10 C0391-10 BO,1.0D C2101-2
C0867R-1 BY,1.0D C0377-1 C0391-1 BY,1.0D C2101-3
C0867R-2 BG,1.0D C0377-2 C0391-2 BG,1.0D C2101-6
Sensor-Height-Front-LH (T236)
C1696-1 SG,0.5D C2560-7 C2559-7 SG,0.5D C2321R-3
C1696-4 SO,0.5D C2560-8 C2559-8 SO,0.5D C2321R-4
C1696-5 SB,0.5D C2560-6 C2559-6 SB,0.5D C2321R-5
FL_HEIGHT_5V
FL_HEIGHT_SIG
FL_HEIGHT_GND
FR_HEIGHT_5V
FR_HEIGHT_SIG
FR_HEIGHT_GND
Sensor-Height-Front-RH (T238)
C2321R-14 SY,0.5D C2293-1 C2294-1 SY,0.5D C1697-5
C2321R-15 SU,0.5D C2293-2 C2294-2 SU,0.5D C1697-4
C2321R-16 SR,0.5D C2293-3 C2294-3 SR,0.5D C1697-1
Sensor-Height-Rear-LH (T235)
C1699-1 OY,0.5D C0391-12 C0377-12 OY,0.5D C0867R-5
C1699-4 OR,0.5D C0391-13 C0377-13 OR,0.5D C0867R-6
C1699-5 OB,0.5D C0391-14 C0377-14 OB,0.5D C0867R-7
RL_HEIGHT_5V
RL_HEIGHT_SIG
RL_HEIGHT_GND
RR_HEIGHT_5V
RR_HEIGHT_SIG
RR_HEIGHT_GND
Sensor-Height-Rear-RH (T237)
C0867R-8 SY,0.5D C0377-15 C0391-15 SY,0.5D C1698-5
C0867R-9 SU,0.5D C0377-16 C0391-16 SU,0.5D C1698-4
C0867R-10 SR,0.5D C0377-3 C0391-3 SR,0.5D C1698-1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583R-39
R,1.0D
SJ1970
SJ971
R,1.0D
C2411R-5 C2412R-5
R,1.0D
R,1.0D
C0868-8 C0903-8
R,0.75D
C0700-20
Instrument cluster (J100)
C0230-2
YB,MAPA
SJ860
C0230-1
YN,MAPA
SJ850
Air suspension Control Module (D199)
C0469-10 C0467R-10
YB,MAPFA
C0867R-19
C0469-9 C0467R-9
YN,MAPFA
C0867R-16
Parking Brake Module (D278)
C2178-A3
YN,MAPC
C0390-4 C0376-4
YN,MAPFB
C0867R-17
C2178-A4
YB,MAPC
C0390-5 C0376-5
YB,MAPFB
C0867R-18
Rear differential control module (D283)
(REAR DIFF)
YB,MAPA
C2162-2
C2178-A2
YB,MAPD
C0390-7 C0376-7
YB,MAPDB
(NO REAR DIFF)
(REAR DIFF)
YN,MAPA
C2162-5
C2178-B2
YN,MAPD
C0390-6 C0376-6
YN,MAPDB
(NO REAR DIFF)
YB,MAPBA
C2162-6
YN,MAPBA
C2162-3
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0700-1
YB,MAPA
C0903-22 C0868-22
YB,MAPB
SJ864
YB,MAPAP
B
Sheet2
C0700-2
YN,MAPA
C0903-21 C0868-21
YN,MAPB
SJ854
YN,MAPAP
A
Sheet2
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3

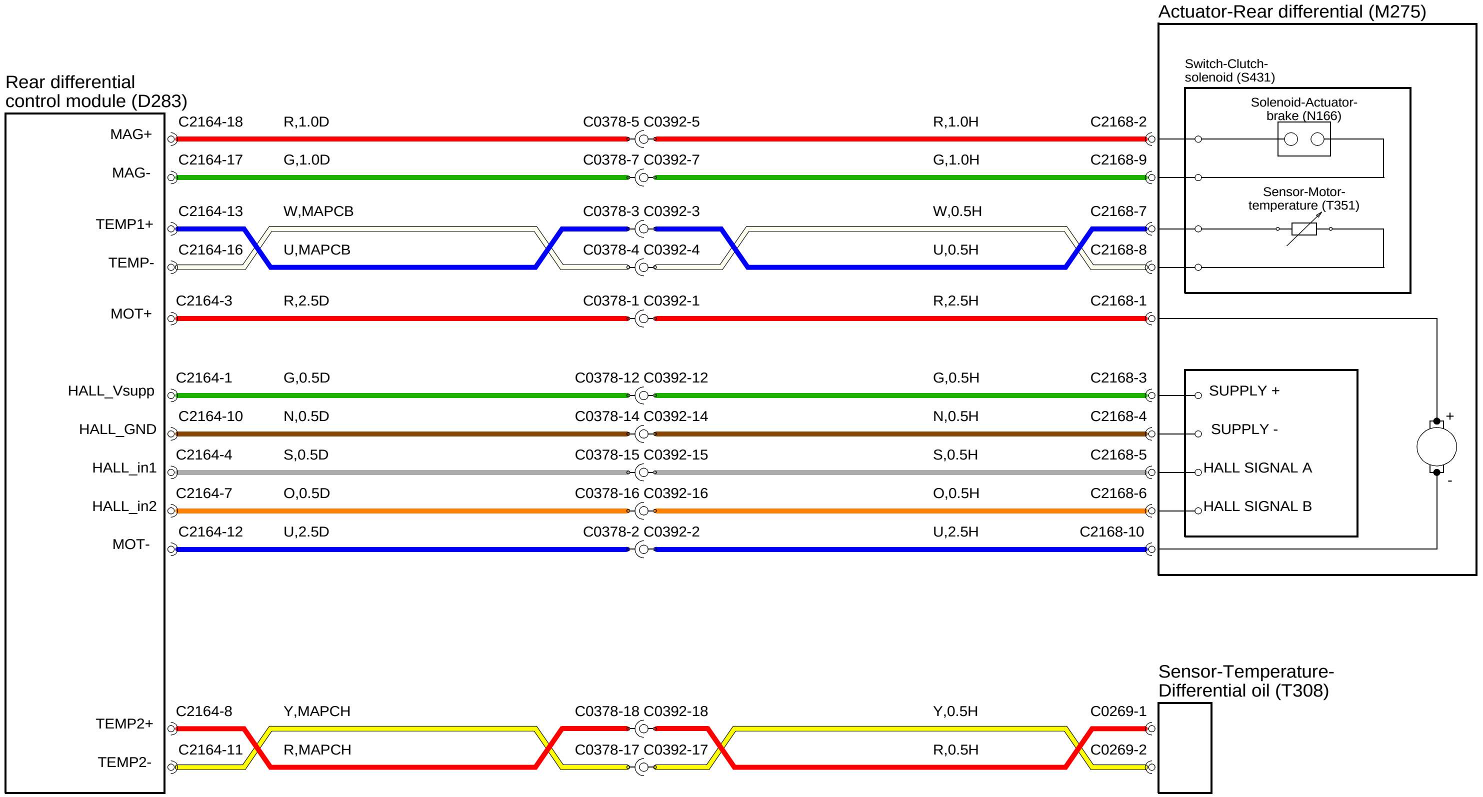

Engine control-
module (ECM) (D131)
YN,MAPCX
C0635R-58
C0635R-57
YN,MAPCH
SJ1176
YN,MAPCG
C2244R-19 C2242R-19
YN,MAPFW
SJ855
YN,MAPAP
A
Sheet1
YB,MAPCX
C0635R-45
C0635R-44
YB,MAPCH
SJ1177 YB,MAPCG
C2244R-20 C2242R-20
YB,MAPFW
SJ865
YB,MAPAP
B
Sheet1
Engine control-
module (ECM) (D131)
YN,MAPDE
C0872R-A4
C0411-B4
SR,0.75
C2273-16 C2274R-16
YN,MAPDG
YB,MAPDE
C0872R-A3
C0411-B3
UR,0.75
C2273-15 C2274R-15
YB,MAPDG
Transfer box control
module (D204)
(DV6)
(PV8)
C2365R-5 C2366B-5
YB,0.5H
SJ721
YB,0.5H
C2366B-3 C2365R-3
YB,MAPCW
C1854R-1
C1319R-3
YB,MAPCN
(DV6)
(PV8)
C2365R-4 C2366B-4
YN,0.5H
SJ720
YN,0.5H
C2366B-2 C2365R-2
YN,MAPCW
C1854R-4
C1319R-6
YN,MAPCN
Transmission control
module (D306)
C0193-6
YN,0.5H
C0193-2
YB,0.5H
ABS module (D277)
C0506R-35
YN,MAPCD
SJ1274
YN,MAPDL
SJ1785
C0506R-14
YB,MAPCD
SJ1276
YB,MAPDL
SJ1775
Dynamic response
module (D285)
YN,MAPCL
C0647R-16
YB,MAPCL
C0647R-15

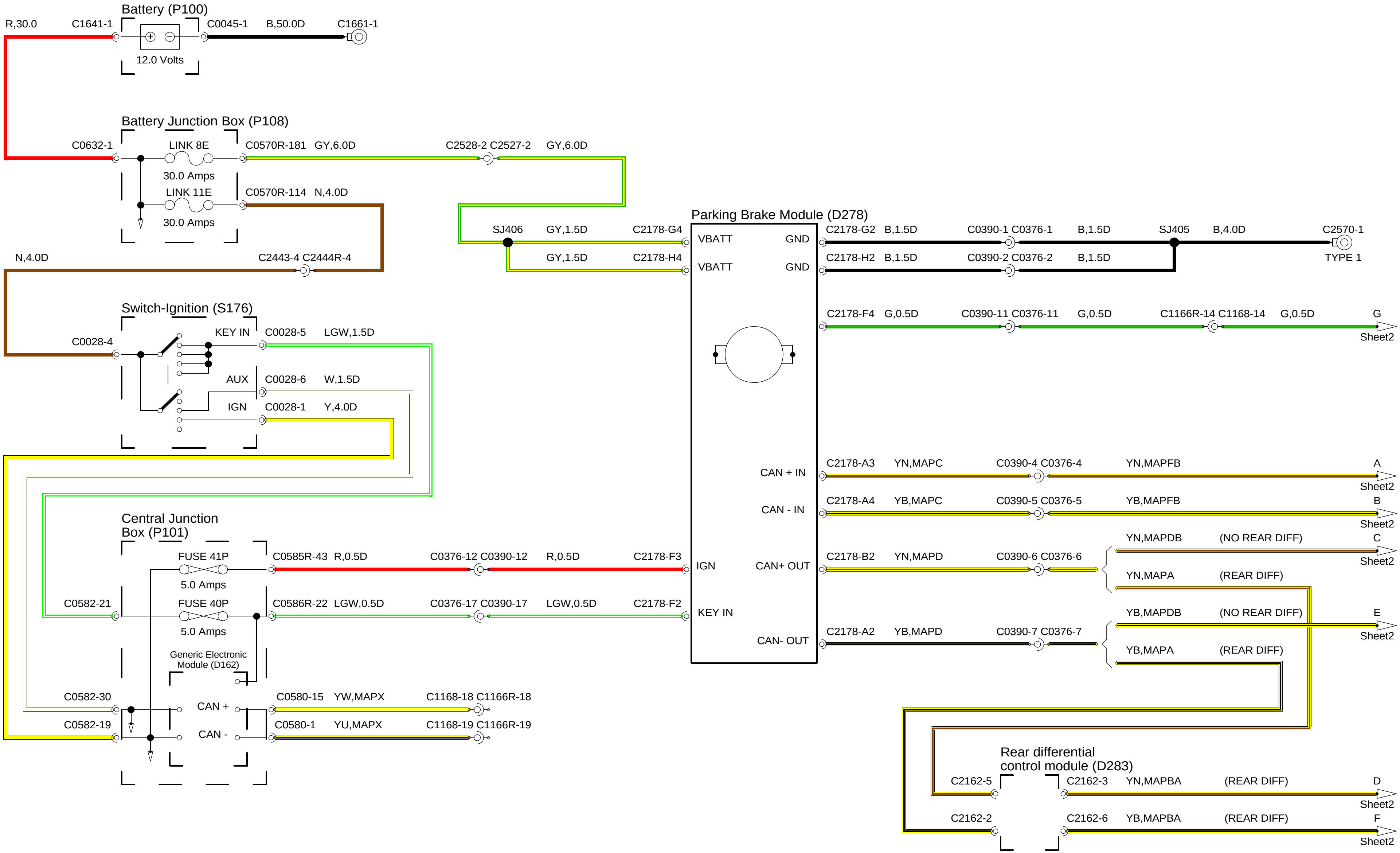

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Engine control-module (ECM) (D131)
C0872R-J3
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
R6 POWERMINI
C0632-1
C0570R-18
NG,0.75D
(DIESEL)
NG,0.75D
(PETROL)
Engine control-module (ECM) (D131)
C0635R-16
FUSE 9E
15.0 Amps
C0570R-123
PO,2.5D
Valve block-Active-Roll Control (D279)
Dynamic response module (D285)
C2188R-1
VBATT
PR_TEMP_5V
PR_SIG
PR_TEMP_GND
LA_LOWER_5V
LA_LOWER_SIG
LA_LOWER_GND
DCV1_POS
DCV1_NEG
CAN_H
CAN_L
DCV2_POS
DCV2_NEG
LA_UPPER_5V
LA_UPPER_SIG
LA_UPPER_GND
PCV_POS
PCV_NEG
ECU_GND
C0647R-13 Y,0.5D C2396-4 C2394-4 Y,0.5D C1610-3
C0647R-14 YS,0.5D C2396-5 C2394-5 YS,0.5D C1610-2
C0647R-19 YG,0.5D C2396-7 C2394-7 YG,0.5D C1610-1
Sensor-Pressure (T285)
Valve-Direction-control (N153)
1
C0647R-6 GR,0.75D C2396-8 C2394-8 GR,0.75D C1690-2
C0647R-7 OG,0.75D C2396-9 C2394-9 OG,0.75D C1690-1
Valve-Direction-control (N153)
2
C0647R-9 GR,0.75D C2396-10 C2394-10 GR,0.75D C0770-2
C0647R-8 YB,0.75D C2396-11 C2394-11 YB,0.75D C0770-1
Valve-Pressure-control (N169)
C0647R-2 P,0.75D C2396-12 C2394-12 P,0.75D C0771-2
C0647R-1 BG,0.75D C2396-6 C2394-6 BG,0.75D C0771-1
C2188R-2 B,2.5D
C2602R-1
Accelerometer-Lower (D193)
C0656-3 YB,0.5D C2394-1 C2396-1 YB,0.5D C0647R-26
C0656-1 OS,0.5D C2394-2 C2396-2 OS,0.5D C0647R-22
C0656-2 YK,0.5D C2394-3 C2396-3 YK,0.5D C0647R-20
SJ1274 YN,MAPCL C0647R-16
SJ1276 YB,MAPCL C0647R-15
Accelerometer-Upper (D192)
C0657-3 YB,0.5D C2242R-12 C2244R-12 YB,0.5D C0647R-25
C0657-1 OS,0.5D C2242R-13 C2244R-13 OS,0.5D C0647R-28
C0657-2 YK,0.5D C2242R-14 C2244R-14 YK,0.5D C0647R-23

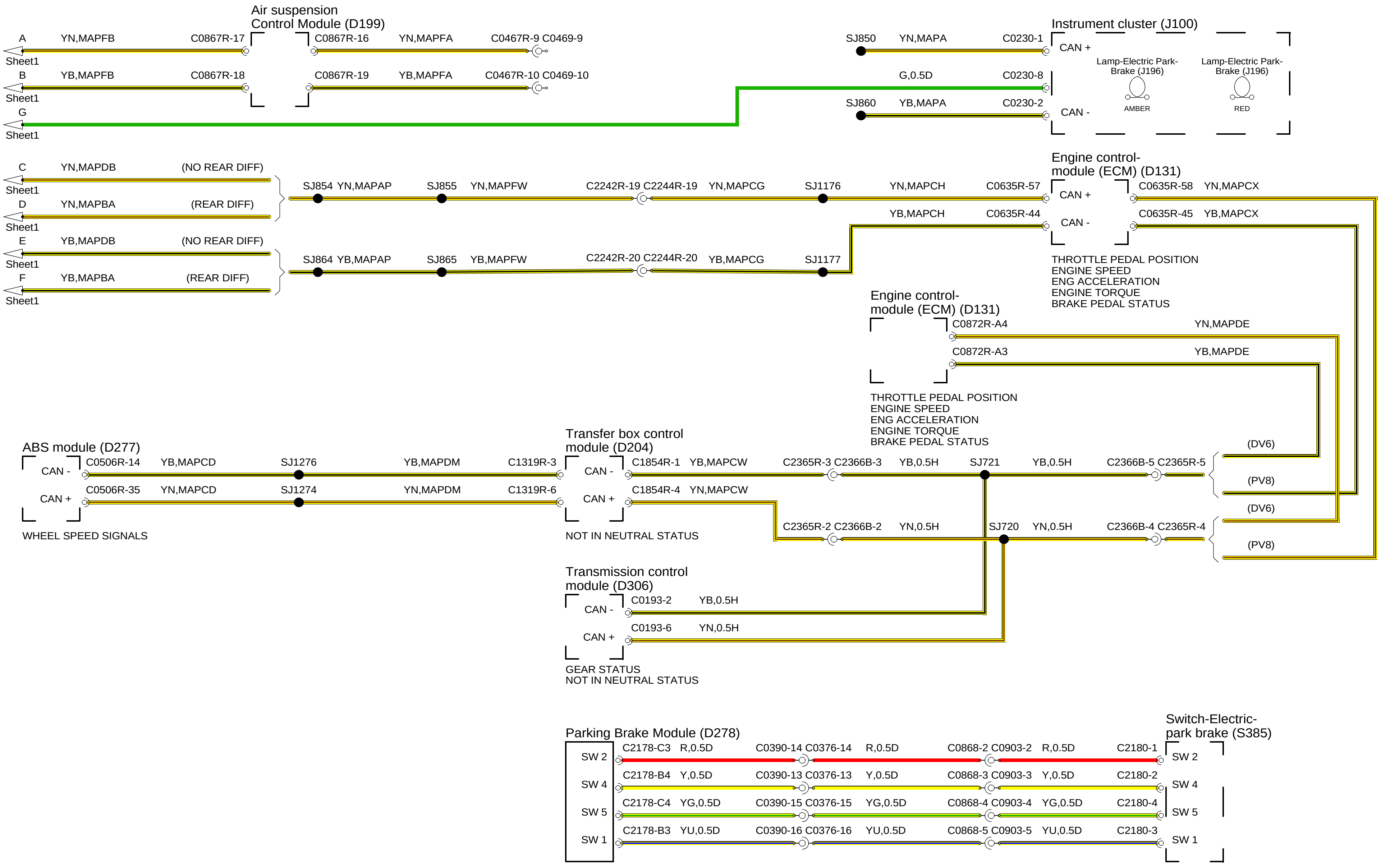
205-02 REAR DRIVE AXLE AND DIFFERENTIAL

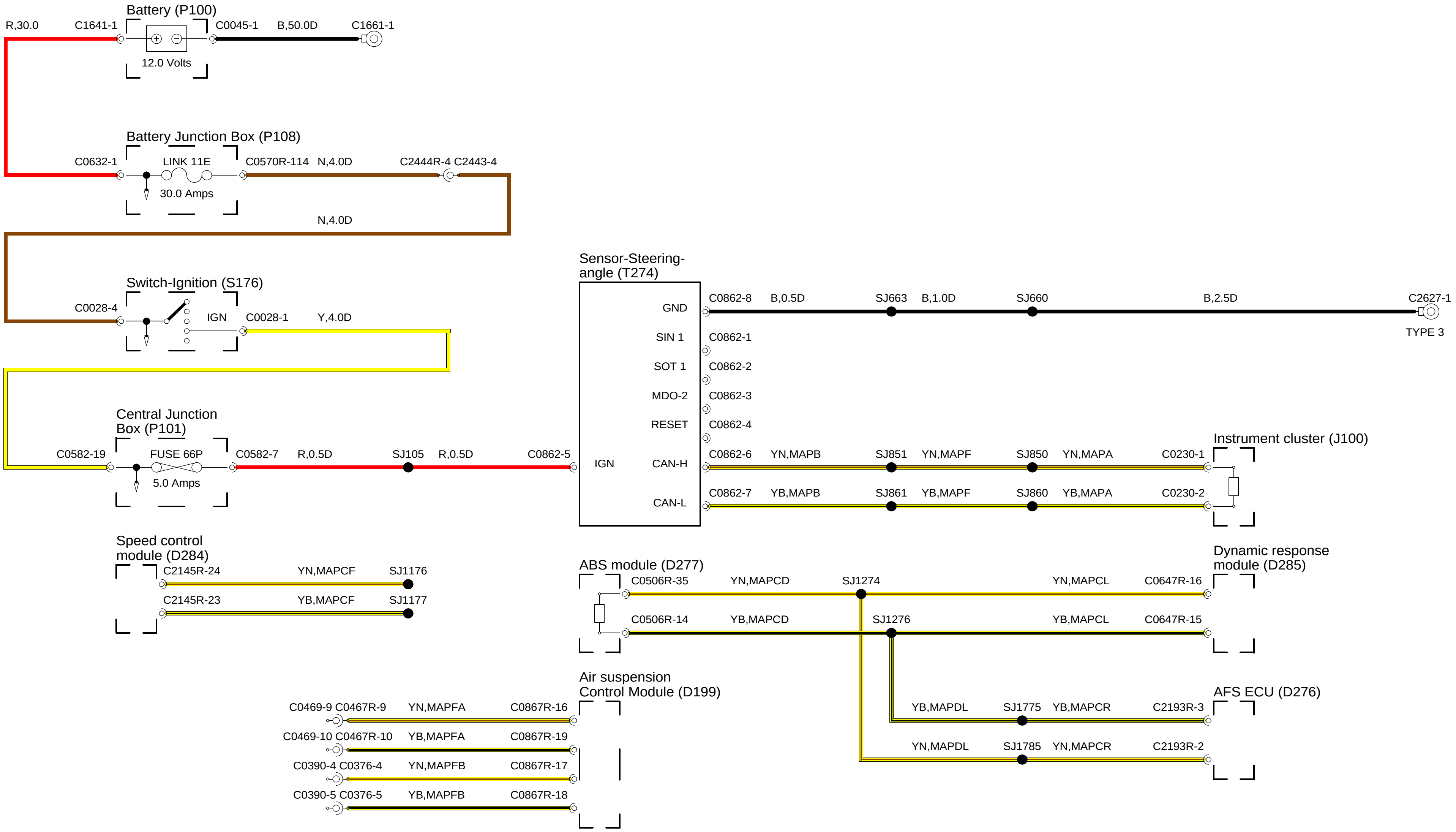


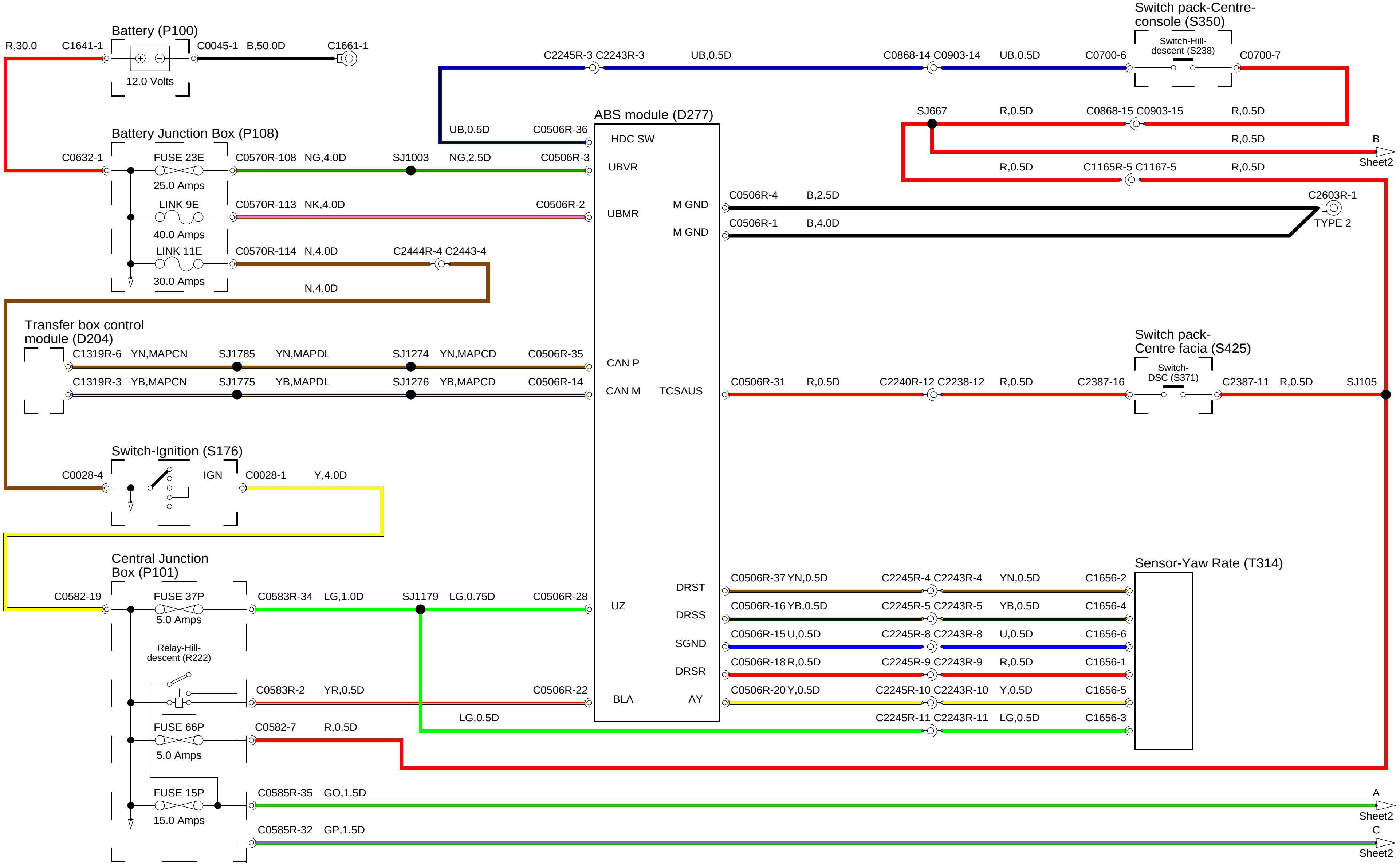
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 13E
40.0 Amps
LINK 11E
30.0 Amps
C0570R-115
PU,4.0D
C2410R-2 C2409R-2
PU,4.0D
SJ542
PU,2.5D
C2163-7
PU,2.5D
C2163-8
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Rear differential control module (D283)
TERM 30
TERM 31
TERM 30
TERM 31
C2163-3
B,2.5D
SJ70
B,4.0D
C2998-1
C2163-6
B,2.5D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583R-39
R,1.0D
SJ1970
R,1.0D
C2412R-5 C2411R-5
SJ971
R,1.0D
R,1.0D
C2163-4
TERM 15
C0390-6 C0376-6
YN,MAPA
C2162-5
CAN IN HIGH
C0390-7 C0376-7
YB,MAPA
C2162-2
CAN IN LOW
SJ864
YB,MAPBA
C2162-6
CAN OUT LOW
SJ854
YN,MAPBA
C2162-3
CAN OUT HI

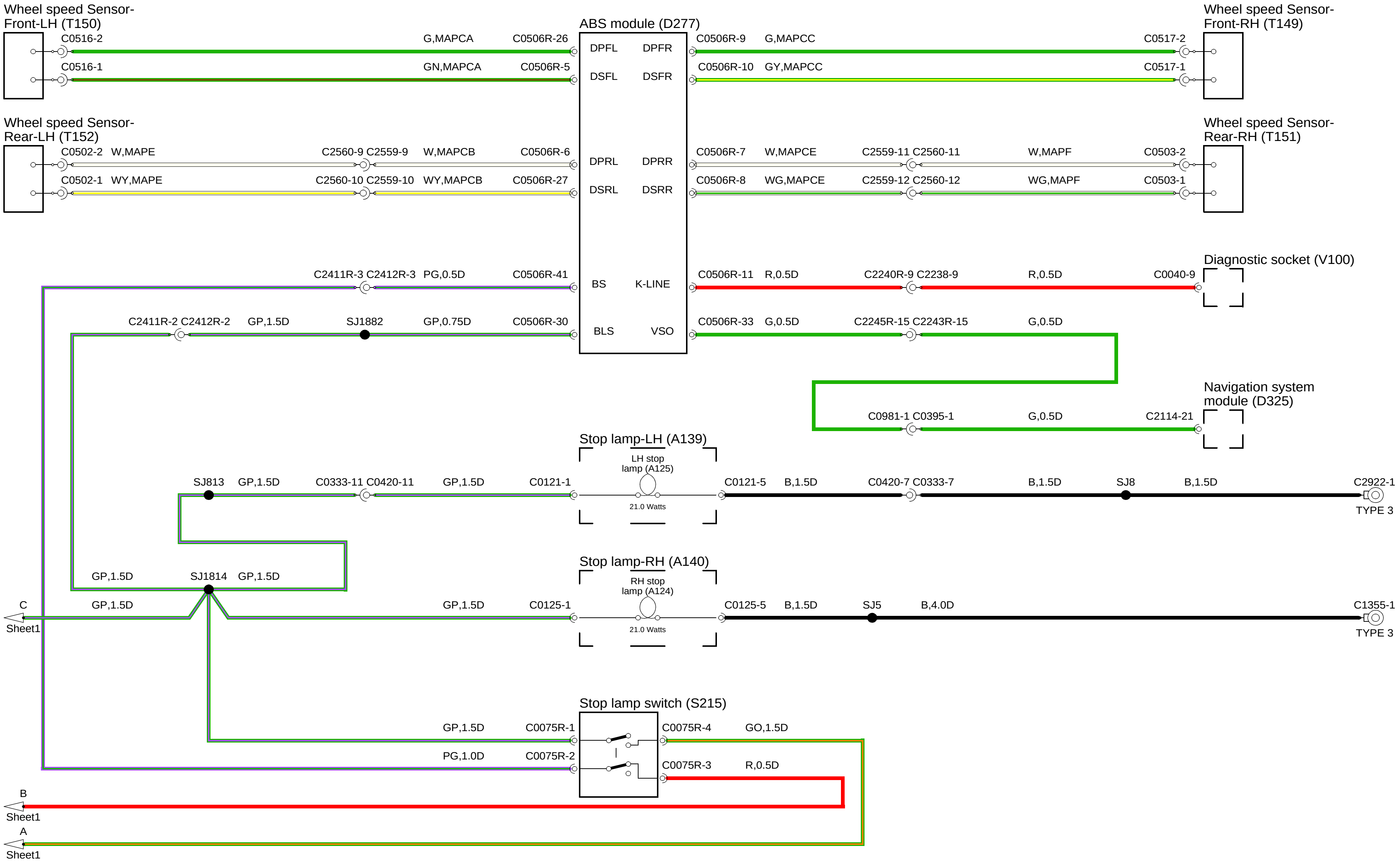

Actuator-Rear differential (M275)
Switch-Clutch-solenoid (S431)
Solenoid-Actuator-brake (N166)
Sensor-Motor-temperature (T351)
Rear differential control module (D283)
MAG+
MAG-
TEMP1+
TEMP-
MOT+
HALL_Vsupp
HALL_GND
HALL_in1
HALL_in2
MOT-
TEMP2+
TEMP2-
C2164-18
R,1.0D
C0378-5 C0392-5
R,1.0H
C2168-2
C2164-17
G,1.0D
C0378-7 C0392-7
G,1.0H
C2168-9
C2164-13
W,MAPCB
C0378-3 C0392-3
W,0.5H
C2168-7
C2164-16
U,MAPCB
C0378-4 C0392-4
U,0.5H
C2168-8
C2164-3
R,2.5D
C0378-1 C0392-1
R,2.5H
C2168-1
C2164-1
G,0.5D
C0378-12 C0392-12
G,0.5H
C2168-3
C2164-10
N,0.5D
C0378-14 C0392-14
N,0.5H
C2168-4
C2164-4
S,0.5D
C0378-15 C0392-15
S,0.5H
C2168-5
C2164-7
O,0.5D
C0378-16 C0392-16
O,0.5H
C2168-6
C2164-12
U,2.5D
C0378-2 C0392-2
U,2.5H
C2168-10
SUPPLY +
SUPPLY -
HALL SIGNAL A
HALL SIGNAL B
+
-
Sensor-Temperature-Differential oil (T308)
C2164-8
Y,MAPCH
C0378-18 C0392-18
Y,0.5H
C0269-1
C2164-11
R,MAPCH
C0378-17 C0392-17
R,0.5H
C0269-2

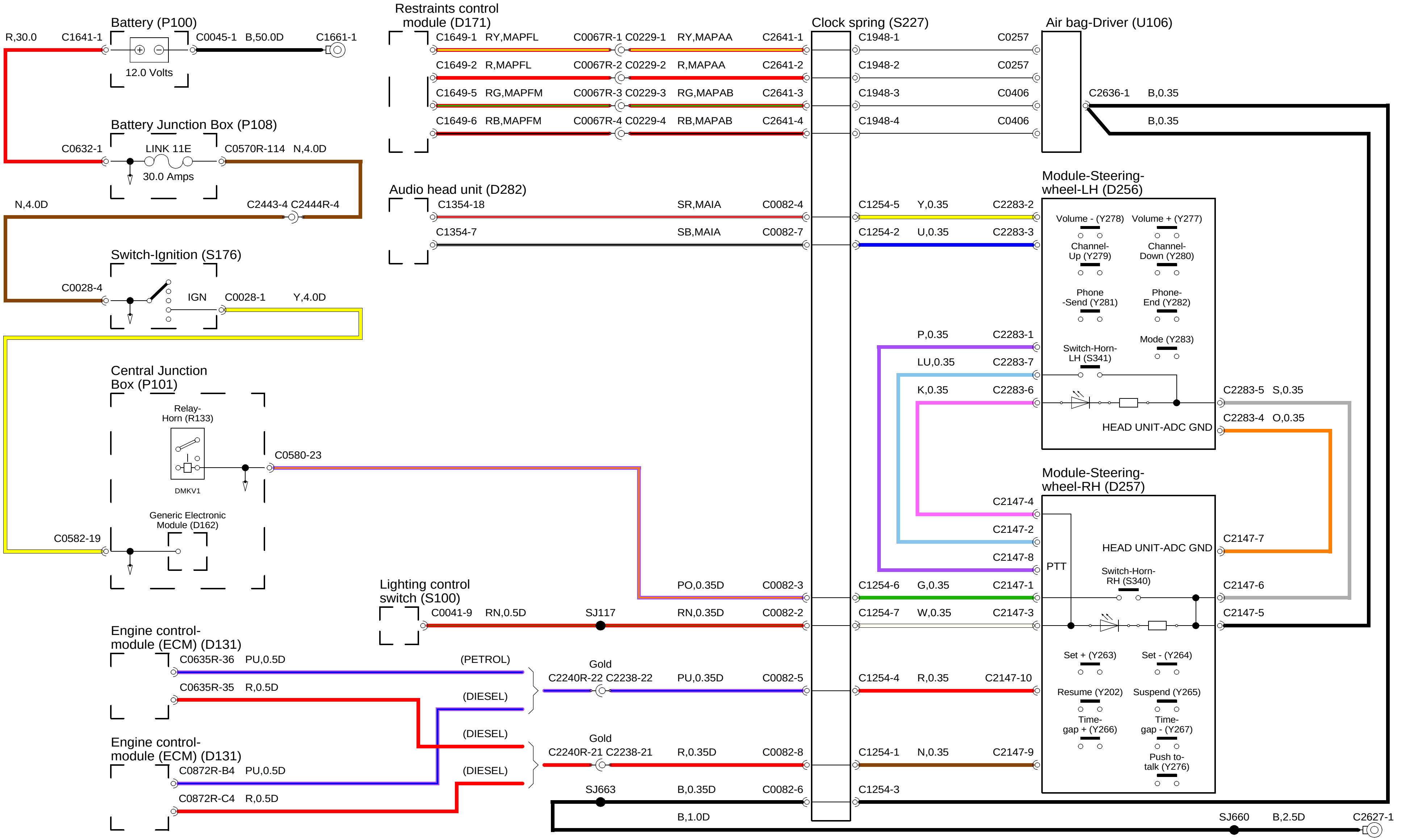

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 8E
30.0 Amps
LINK 11E
30.0 Amps
C0570R-181
GY,6.0D
C2528-2 C2527-2
GY,6.0D
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Parking Brake Module (D278)
SJ406
GY,1.5D
C2178-G4
VBATT
GND
C2178-G2
B,1.5D
C0390-1 C0376-1
B,1.5D
SJ405
B,4.0D
C2570-1
GY,1.5D
C2178-H4
VBATT
GND
C2178-H2
B,1.5D
C0390-2 C0376-2
B,1.5D
TYPE 1
C2178-F4
G,0.5D
C0390-11 C0376-11
G,0.5D
C1166R-14 C1168-14
G,0.5D
G
Sheet2
Switch-Ignition (S176)
C0028-4
KEY IN
C0028-5
LGW,1.5D
AUX
C0028-6
W,1.5D
IGN
C0028-1
Y,4.0D
CAN + IN
C2178-A3
YN,MAPC
C0390-4 C0376-4
YN,MAPFB
A
Sheet2
CAN - IN
C2178-A4
YB,MAPC
C0390-5 C0376-5
YB,MAPFB
B
Sheet2
Central Junction Box (P101)
YN,MAPDB
(NO REAR DIFF)
C
Sheet2
FUSE 41P
C0585R-43
R,0.5D
C0376-12 C0390-12
R,0.5D
C2178-F3
IGN
CAN+ OUT
C2178-B2
YN,MAPD
C0390-6 C0376-6
5.0 Amps
YN,MAPA
(REAR DIFF)
C0582-21
FUSE 40P
C0586R-22
LGW,0.5D
C0376-17 C0390-17
LGW,0.5D
C2178-F2
KEY IN
YB,MAPDB
(NO REAR DIFF)
E
Sheet2
5.0 Amps
C2178-A2
YB,MAPD
C0390-7 C0376-7
CAN- OUT
Generic Electronic Module (D162)
YB,MAPA
(REAR DIFF)
C0582-30
CAN +
C0580-15
YW,MAPX
C1168-18 C1166R-18
C0582-19
CAN -
C0580-1
YU,MAPX
C1168-19 C1166R-19
Rear differential control module (D283)
C2162-5
C2162-3
YN,MAPBA
(REAR DIFF)
D
Sheet2
C2162-2
C2162-6
YB,MAPBA
(REAR DIFF)
F
Sheet2


Air suspension Control Module (D199)
A
YN,MAPFB
C0867R-17
Sheet1
C0867R-16
YN,MAPFA
C0467R-9 C0469-9
B
YB,MAPFB
C0867R-18
Sheet1
C0867R-19
YB,MAPFA
C0467R-10 C0469-10
G
Sheet1
Instrument cluster (J100)
SJ850
YN,MAPA
C0230-1
CAN +
G,0.5D
C0230-8
SJ860
YB,MAPA
C0230-2
CAN -
Lamp-Electric Park-Brake (J196)
AMBER
Lamp-Electric Park-Brake (J196)
RED
C
YN,MAPDB
(NO REAR DIFF)
Sheet1
D
YN,MAPBA
(REAR DIFF)
Sheet1
E
YB,MAPDB
(NO REAR DIFF)
Sheet1
F
YB,MAPBA
(REAR DIFF)
Sheet1
SJ854 YN,MAPAP
SJ855
YN,MAPFW
C2242R-19 C2244R-19
YN,MAPCG
SJ1176
YN,MAPCH
C0635R-57
SJ864 YB,MAPAP
SJ865
YB,MAPFW
C2242R-20 C2244R-20
YB,MAPCG
SJ1177
YB,MAPCH
C0635R-44
Engine control-module (ECM) (D131)
CAN +
CAN -
C0635R-58
YN,MAPCX
C0635R-45
YB,MAPCX
THROTTLE PEDAL POSITION
ENGINE SPEED
ENG ACCELERATION
ENGINE TORQUE
BRAKE PEDAL STATUS
Engine control-module (ECM) (D131)
C0872R-A4
YN,MAPDE
C0872R-A3
YB,MAPDE
THROTTLE PEDAL POSITION
ENGINE SPEED
ENG ACCELERATION
ENGINE TORQUE
BRAKE PEDAL STATUS
ABS module (D277)
CAN -
C0506R-14
YB,MAPCD
SJ1276
YB,MAPDM
C1319R-3
CAN +
C0506R-35
YN,MAPCD
SJ1274
YN,MAPDM
C1319R-6
WHEEL SPEED SIGNALS
Transfer box control module (D204)
CAN -
C1854R-1
YB,MAPCW
C2365R-3 C2366B-3
YB,0.5H
SJ721
YB,0.5H
C2366B-5 C2365R-5
CAN +
C1854R-4
YN,MAPCW
C2365R-2 C2366B-2
YN,0.5H
SJ720
YN,0.5H
C2366B-4 C2365R-4
(DV6)
(PV8)
(DV6)
(PV8)
NOT IN NEUTRAL STATUS
Transmission control module (D306)
CAN -
C0193-2
YB,0.5H
CAN +
C0193-6
YN,0.5H
GEAR STATUS
NOT IN NEUTRAL STATUS
Parking Brake Module (D278)
SW 2
C2178-C3
R,0.5D
C0390-14 C0376-14
R,0.5D
C0868-2 C0903-2
R,0.5D
C2180-1
SW 4
C2178-B4
Y,0.5D
C0390-13 C0376-13
Y,0.5D
C0868-3 C0903-3
Y,0.5D
C2180-2
SW 5
C2178-C4
YG,0.5D
C0390-15 C0376-15
YG,0.5D
C0868-4 C0903-4
YG,0.5D
C2180-4
SW 1
C2178-B3
YU,0.5D
C0390-16 C0376-16
YU,0.5D
C0868-5 C0903-5
YU,0.5D
C2180-3
Switch-Electric-park brake (S385)
SW 2
SW 4
SW 5
SW 1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 66P
5.0 Amps
C0582-7
R,0.5D
SJ105
R,0.5D
C0862-5
Sensor-Steering-angle (T274)
GND
SIN 1
SOT 1
MDO-2
RESET
IGN
CAN-H
CAN-L
C0862-8
B,0.5D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
C0862-1
C0862-2
C0862-3
C0862-4
C0862-6
YN,MAPB
SJ851
YN,MAPF
SJ850
YN,MAPA
C0230-1
Instrument cluster (J100)
C0862-7
YB,MAPB
SJ861
YB,MAPF
SJ860
YB,MAPA
C0230-2
Speed control module (D284)
C2145R-24
YN,MAPCF
SJ1176
C2145R-23
YB,MAPCF
SJ1177
ABS module (D277)
C0506R-35
YN,MAPCD
SJ1274
YN,MAPCL
C0647R-16
Dynamic response module (D285)
C0506R-14
YB,MAPCD
SJ1276
YB,MAPCL
C0647R-15
Air suspension Control Module (D199)
AFS ECU (D276)
C0469-9 C0467R-9
YN,MAPFA
C0867R-16
C0469-10 C0467R-10
YB,MAPFA
C0867R-19
C0390-4 C0376-4
YN,MAPFB
C0867R-17
C0390-5 C0376-5
YB,MAPFB
C0867R-18
YB,MAPDL
SJ1775
YB,MAPCR
C2193R-3
YN,MAPDL
SJ1785
YN,MAPCR
C2193R-2


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Switch pack-Centre-console (S350)
Switch-Hill-descent (S238)
C2245R-3 C2243R-3
UB,0.5D
C0868-14 C0903-14
UB,0.5D
C0700-6
C0700-7
SJ667
R,0.5D
C0868-15 C0903-15
R,0.5D
ABS module (D277)
UB,0.5D
C0506R-36
HDC SW
R,0.5D
B
Sheet2
Battery Junction Box (P108)
C0632-1
FUSE 23E
25.0 Amps
C0570R-108
NG,4.0D
SJ1003
NG,2.5D
C0506R-3
UBVR
R,0.5D
C1165R-5 C1167-5
R,0.5D
LINK 9E
40.0 Amps
C0570R-113
NK,4.0D
C0506R-2
UBMR
M GND
M GND
C0506R-4
B,2.5D
C0506R-1
B,4.0D
C2603R-1
TYPE 2
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Transfer box control module (D204)
C1319R-6
YN,MAPCN
SJ1785
YN,MAPDL
SJ1274
YN,MAPCD
C0506R-35
CAN P
Switch pack-Centre facia (S425)
Switch-DSC (S371)
C1319R-3
YB,MAPCN
SJ1775
YB,MAPDL
SJ1276
YB,MAPCD
C0506R-14
CAN M
TCSAUS
C0506R-31
R,0.5D
C2240R-12 C2238-12
R,0.5D
C2387-16
C2387-11
R,0.5D
SJ105
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 37P
5.0 Amps
C0583R-34
LG,1.0D
SJ1179
LG,0.75D
C0506R-28
UZ
DRST
DRSS
SGND
DRSR
BLA
AY
Sensor-Yaw Rate (T314)
C0506R-37 YN,0.5D
C2245R-4 C2243R-4
YN,0.5D
C1656-2
C0506R-16 YB,0.5D
C2245R-5 C2243R-5
YB,0.5D
C1656-4
C0506R-15 U,0.5D
C2245R-8 C2243R-8
U,0.5D
C1656-6
C0506R-18 R,0.5D
C2245R-9 C2243R-9
R,0.5D
C1656-1
Relay-Hill-descent (R222)
C0583R-2
YR,0.5D
C0506R-22
C0506R-20 Y,0.5D
C2245R-10 C2243R-10
Y,0.5D
C1656-5
LG,0.5D
C2245R-11 C2243R-11
LG,0.5D
C1656-3
FUSE 66P
5.0 Amps
C0582-7
R,0.5D
FUSE 15P
15.0 Amps
C0585R-35
GO,1.5D
A
Sheet2
C0585R-32
GP,1.5D
C
Sheet2


Wheel speed Sensor-Front-LH (T150)
C0516-2
G,MAPCA
C0506R-26
C0516-1
GN,MAPCA
C0506R-5
ABS module (D277)
DPFL
DPFR
DSFL
DSFR
DPRL
DPRR
DSRL
DSRR
BS
K-LINE
BLS
VSO
C0506R-9
G,MAPCC
C0517-2
C0506R-10
GY,MAPCC
C0517-1
Wheel speed Sensor-Front-RH (T149)
Wheel speed Sensor-Rear-LH (T152)
C0502-2
W,MAPE
C2560-9 C2559-9
W,MAPCB
C0506R-6
C0502-1
WY,MAPE
C2560-10 C2559-10
WY,MAPCB
C0506R-27
C0506R-7
W,MAPCE
C2559-11 C2560-11
W,MAPF
C0503-2
C0506R-8
WG,MAPCE
C2559-12 C2560-12
WG,MAPF
C0503-1
Wheel speed Sensor-Rear-RH (T151)
C2411R-3 C2412R-3
PG,0.5D
C0506R-41
C0506R-11
R,0.5D
C2240R-9 C2238-9
R,0.5D
C0040-9
Diagnostic socket (V100)
C2411R-2 C2412R-2
GP,1.5D
SJ1882
GP,0.75D
C0506R-30
C0506R-33
G,0.5D
C2245R-15 C2243R-15
G,0.5D
Navigation system module (D325)
C0981-1 C0395-1
G,0.5D
C2114-21
Stop lamp-LH (A139)
LH stop lamp (A125)
21.0 Watts
SJ813
GP,1.5D
C0333-11 C0420-11
GP,1.5D
C0121-1
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Stop lamp-RH (A140)
RH stop lamp (A124)
21.0 Watts
GP,1.5D
SJ1814
GP,1.5D
C
Sheet1
GP,1.5D
GP,1.5D
C0125-1
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Stop lamp switch (S215)
GP,1.5D
C0075R-1
PG,1.0D
C0075R-2
C0075R-4
GO,1.5D
C0075R-3
R,0.5D
B
Sheet1
A
Sheet1


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
Relay-Horn (R133)
DMKV1
C0580-23
Generic Electronic Module (D162)
C0582-19
Restraints control module (D171)
C1649-1
RY,MAPFL
C0067R-1 C0229-1
RY,MAPAA
C2641-1
C1649-2
R,MAPFL
C0067R-2 C0229-2
R,MAPAA
C2641-2
C1649-5
RG,MAPFM
C0067R-3 C0229-3
RG,MAPAB
C2641-3
C1649-6
RB,MAPFM
C0067R-4 C0229-4
RB,MAPAB
C2641-4
Audio head unit (D282)
C1354-18
SR,MAIA
C0082-4
C1354-7
SB,MAIA
C0082-7
Clock spring (S227)
C1948-1
C0257
C1948-2
C0257
C1948-3
C0406
C1948-4
C0406
Air bag-Driver (U106)
C2636-1
B,0.35
B,0.35
Module-Steering-wheel-LH (D256)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone -Send (Y281)
Phone-End (Y282)
Mode (Y283)
Switch-Horn-LH (S341)
P,0.35
C2283-1
LU,0.35
C2283-7
K,0.35
C2283-6
C2283-5
S,0.35
C2283-4
O,0.35
HEAD UNIT-ADC GND
Module-Steering-wheel-RH (D257)
C2147-4
C2147-2
C2147-8
PTT
HEAD UNIT-ADC GND
C2147-7
Switch-Horn-RH (S340)
C2147-6
C2147-5
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.35D
C0082-2
PO,0.35D
C0082-3
C1254-6
G,0.35
C2147-1
C1254-7
W,0.35
C2147-3
Engine control-module (ECM) (D131)
C0635R-36
PU,0.5D
(PETROL)
C0635R-35
R,0.5D
(DIESEL)
Gold
C2240R-22 C2238-22
PU,0.35D
C0082-5
C1254-4
R,0.35
C2147-10
Set + (Y263)
Set - (Y264)
Resume (Y202)
Suspend (Y265)
Time-gap + (Y266)
Time-gap - (Y267)
Push to-talk (Y276)
Engine control-module (ECM) (D131)
(DIESEL)
C0872R-B4
PU,0.5D
(DIESEL)
C0872R-C4
R,0.5D
Gold
C2240R-21 C2238-21
R,0.35D
C0082-8
C1254-1
N,0.35
C2147-9
SJ663
B,0.35D
C0082-6
C1254-3
B,1.0D
SJ660
B,2.5D
C2627-1

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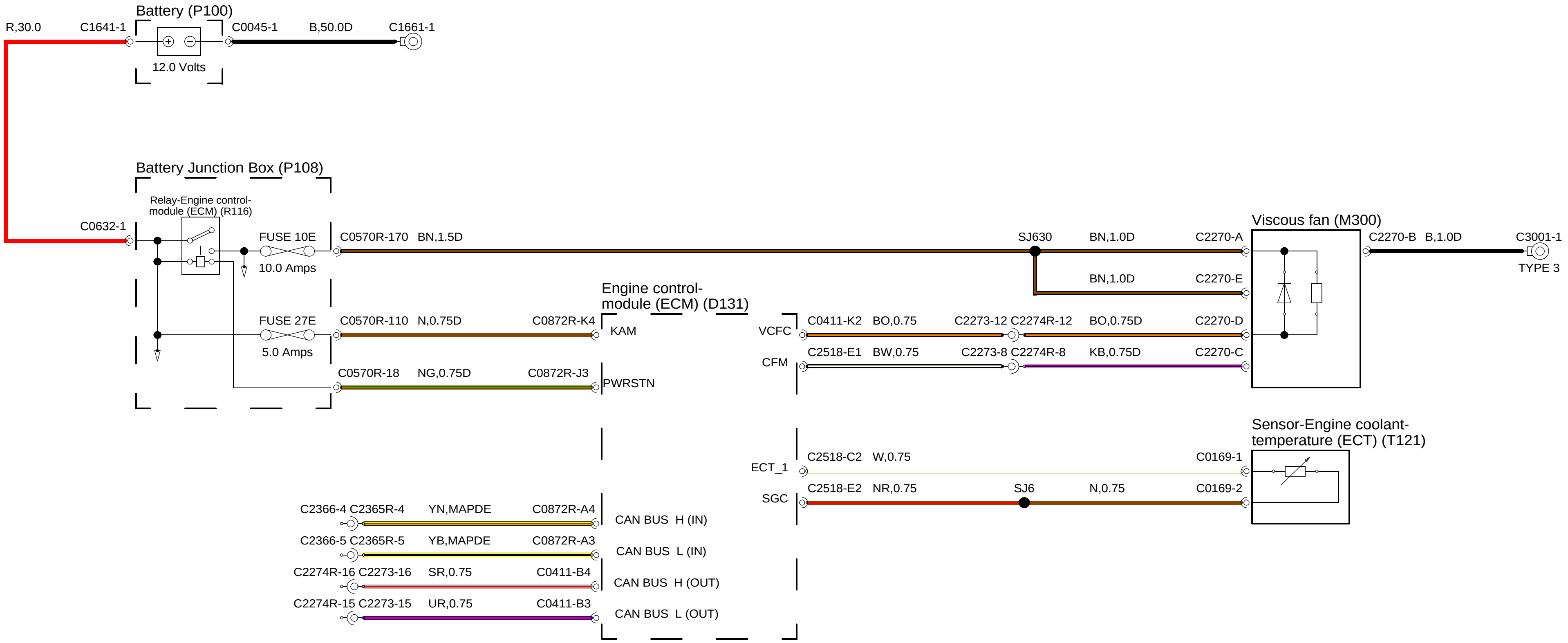
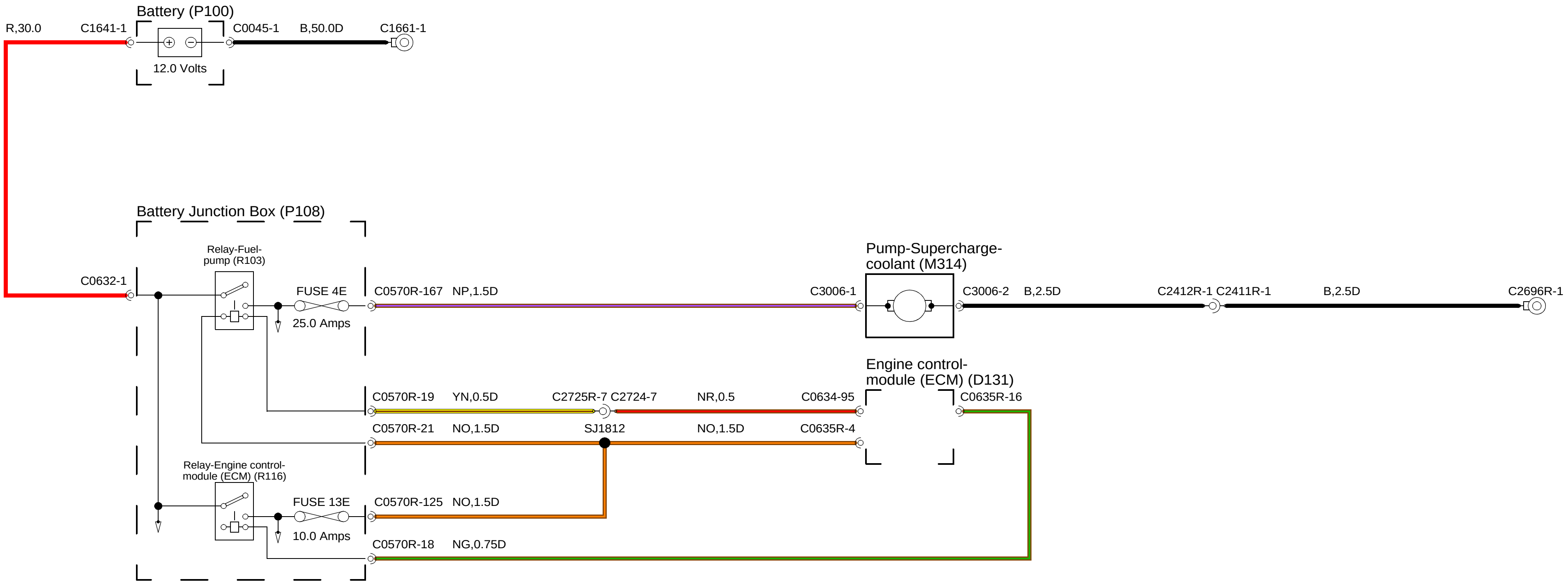
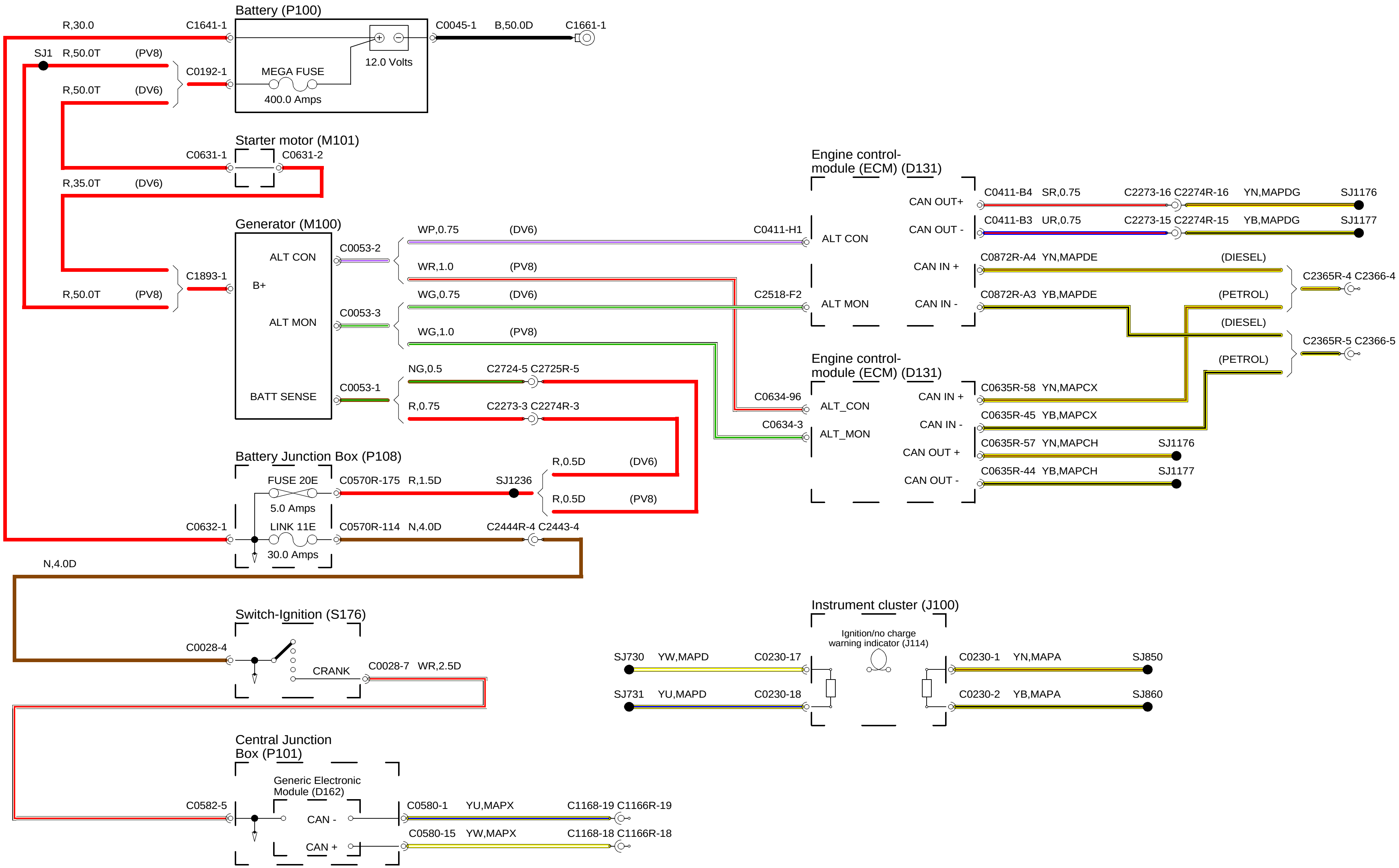
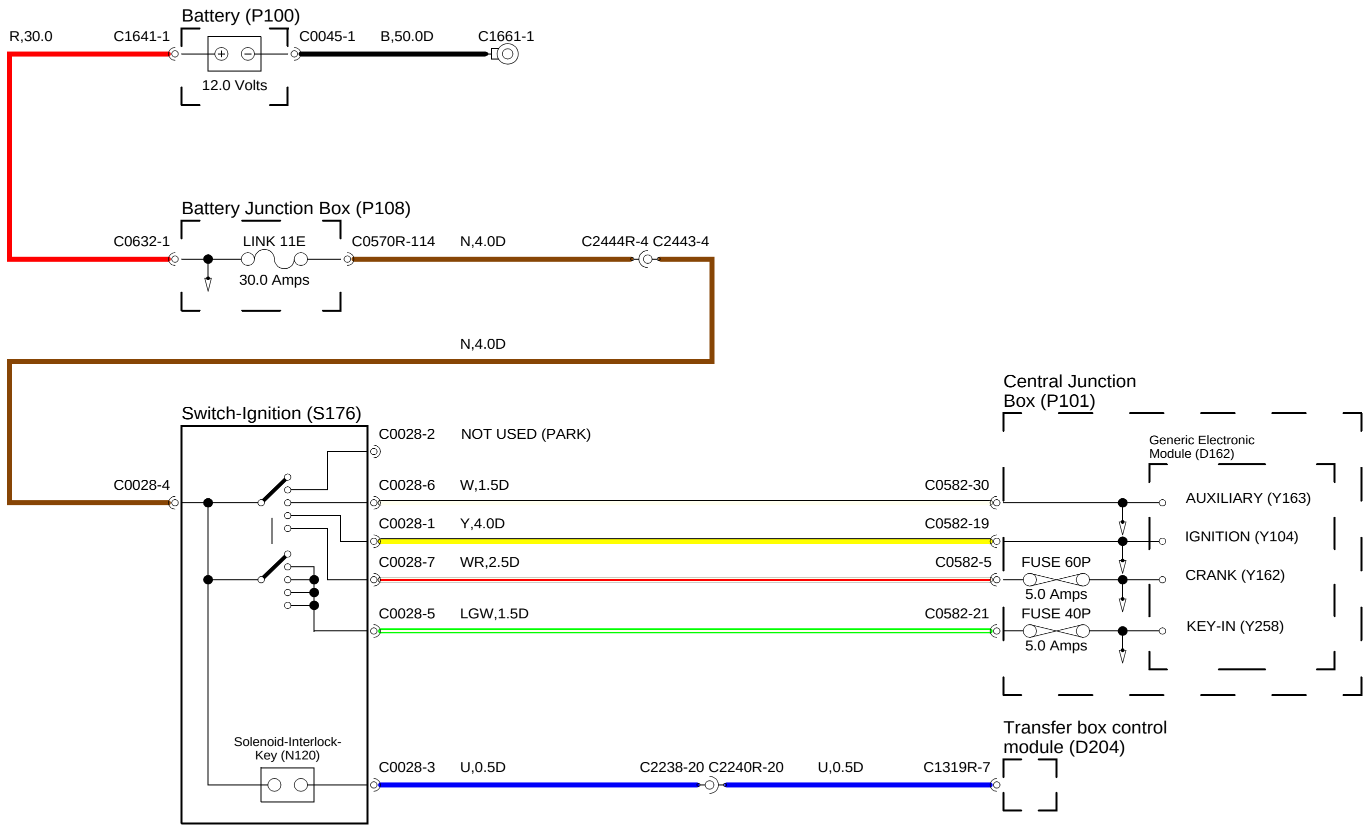
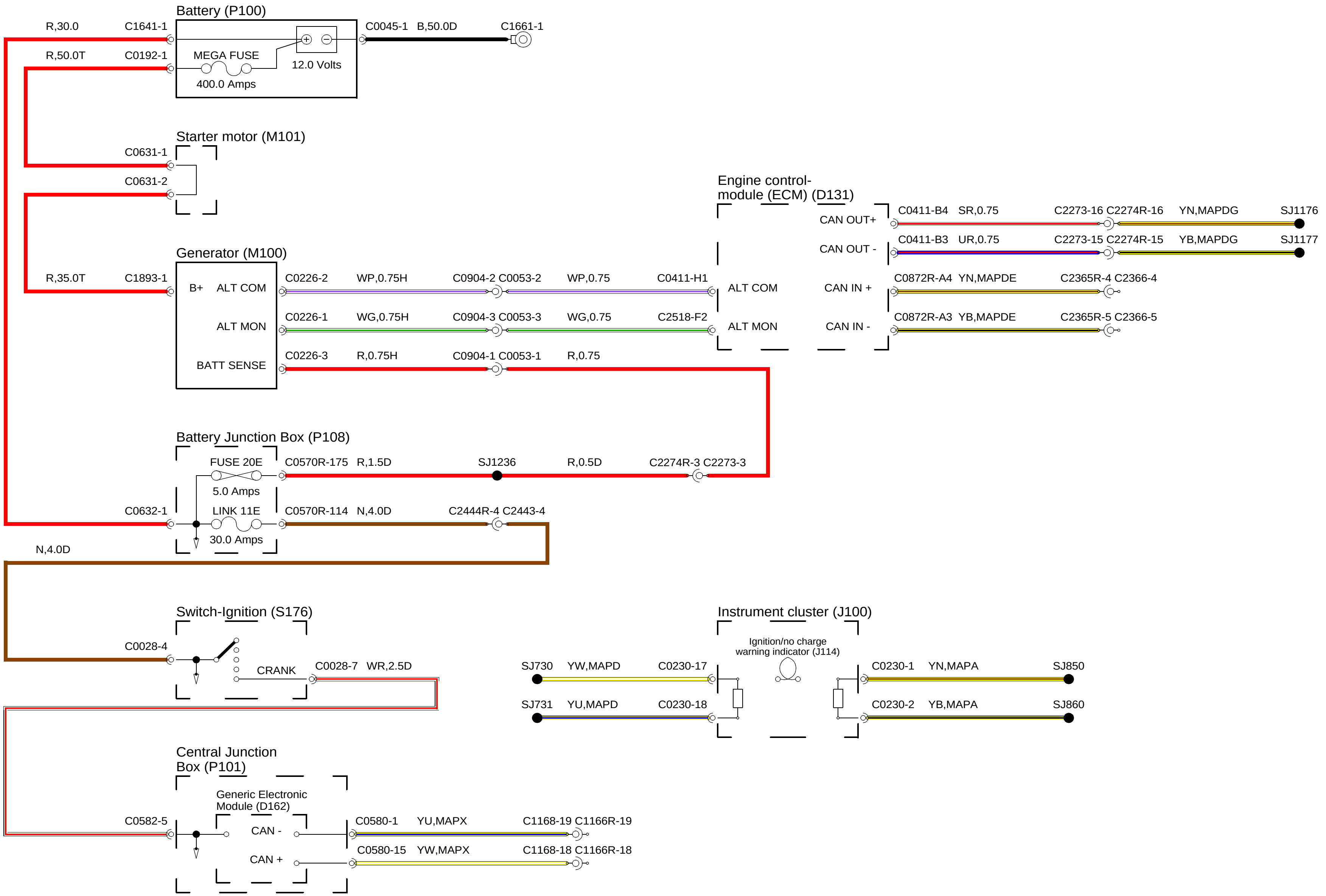
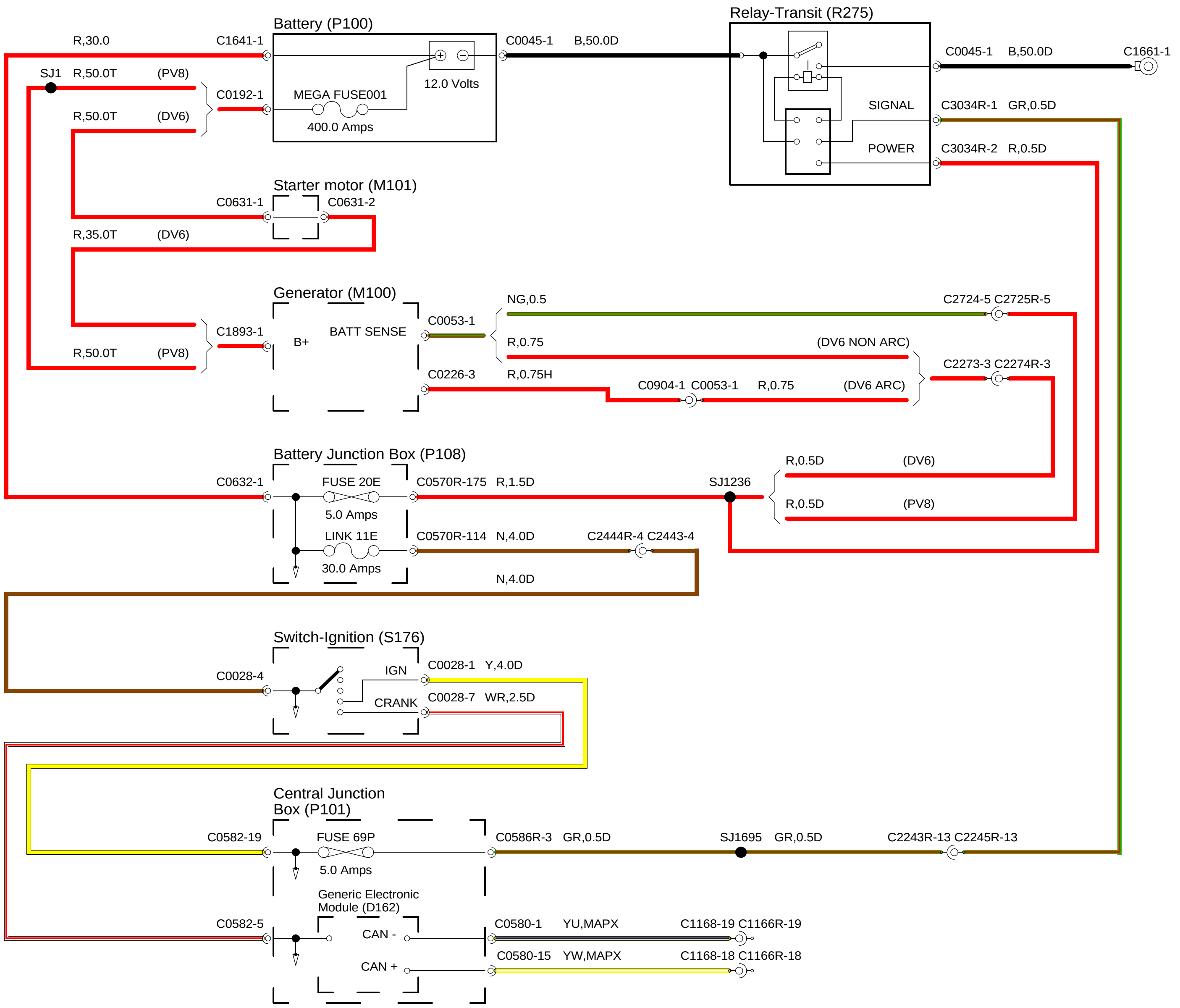

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
FUSE 10E
10.0 Amps
C0570R-170
BN,1.5D
SJ630
BN,1.0D
C2270-A
BN,1.0D
C2270-E
Viscous fan (M300)
C2270-B
B,1.0D
C3001-1
TYPE 3
FUSE 27E
5.0 Amps
C0570R-110
N,0.75D
C0872R-K4
KAM
C0570R-18
NG,0.75D
C0872R-J3
PWRSTN
Engine control-module (ECM) (D131)
VCFC
C0411-K2
BO,0.75
C2273-12 C2274R-12
BO,0.75D
C2270-D
CFM
C2518-E1
BW,0.75
C2273-8 C2274R-8
KB,0.75D
C2270-C
Sensor-Engine coolant-temperature (ECT) (T121)
ECT_1
C2518-C2
W,0.75
C0169-1
SGC
C2518-E2
NR,0.75
SJ6
N,0.75
C0169-2
C2366-4 C2365R-4
YN,MAPDE
C0872R-A4
CAN BUS H (IN)
C2366-5 C2365R-5
YB,MAPDE
C0872R-A3
CAN BUS L (IN)
C2274R-16 C2273-16
SR,0.75
C0411-B4
CAN BUS H (OUT)
C2274R-15 C2273-15
UR,0.75
C0411-B3
CAN BUS L (OUT)

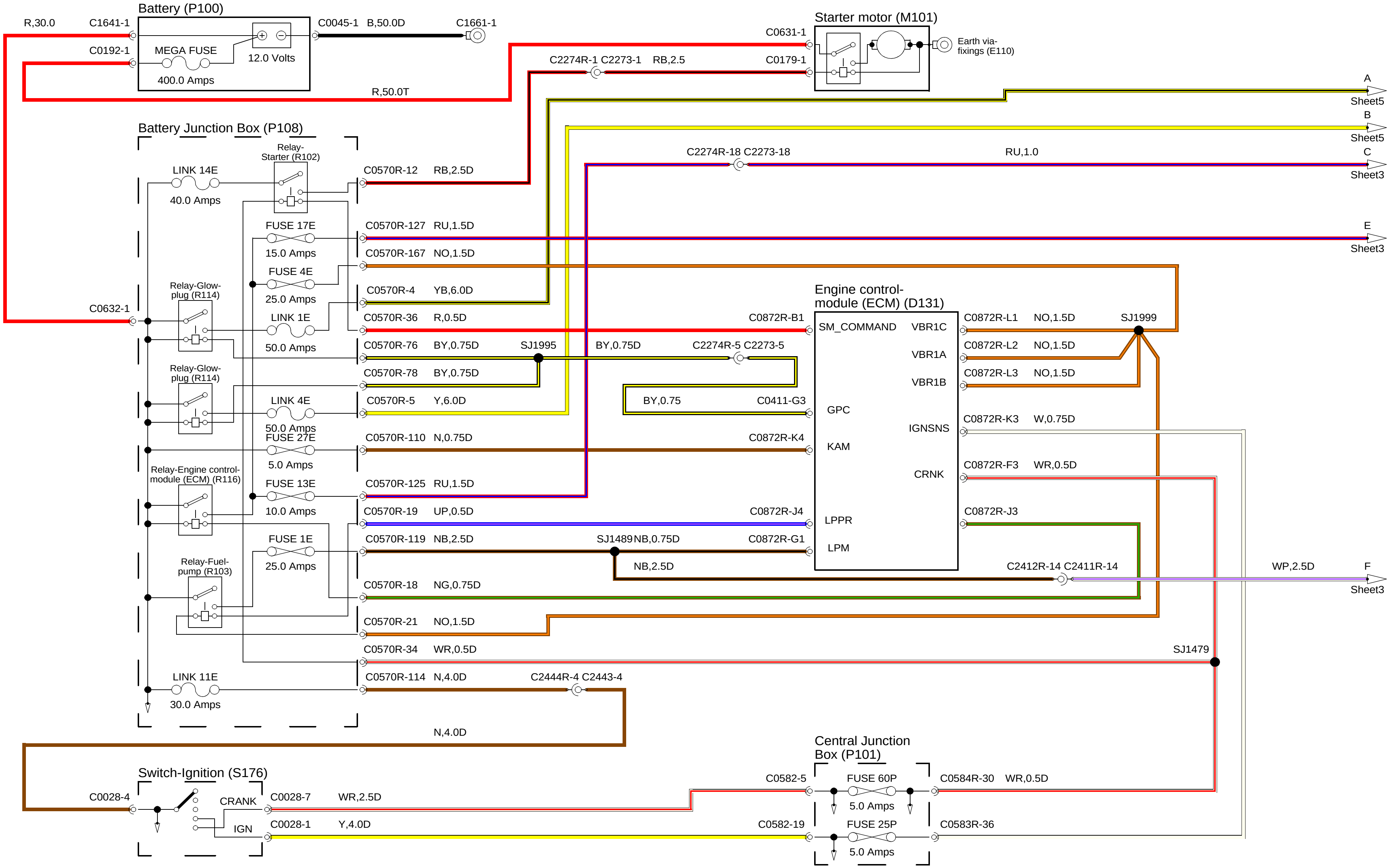

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Fuel-pump (R103)
C0632-1
FUSE 4E
25.0 Amps
C0570R-167
NP,1.5D
C3006-1
Pump-Supercharge-coolant (M314)
C3006-2
B,2.5D
C2412R-1
C2411R-1
B,2.5D
C2696R-1
Engine control-module (ECM) (D131)
C0570R-19
YN,0.5D
C2725R-7
C2724-7
NR,0.5
C0634-95
C0635R-16
C0570R-21
NO,1.5D
SJ1812
NO,1.5D
C0635R-4
Relay-Engine control-module (ECM) (R116)
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D
C0570R-18
NG,0.75D

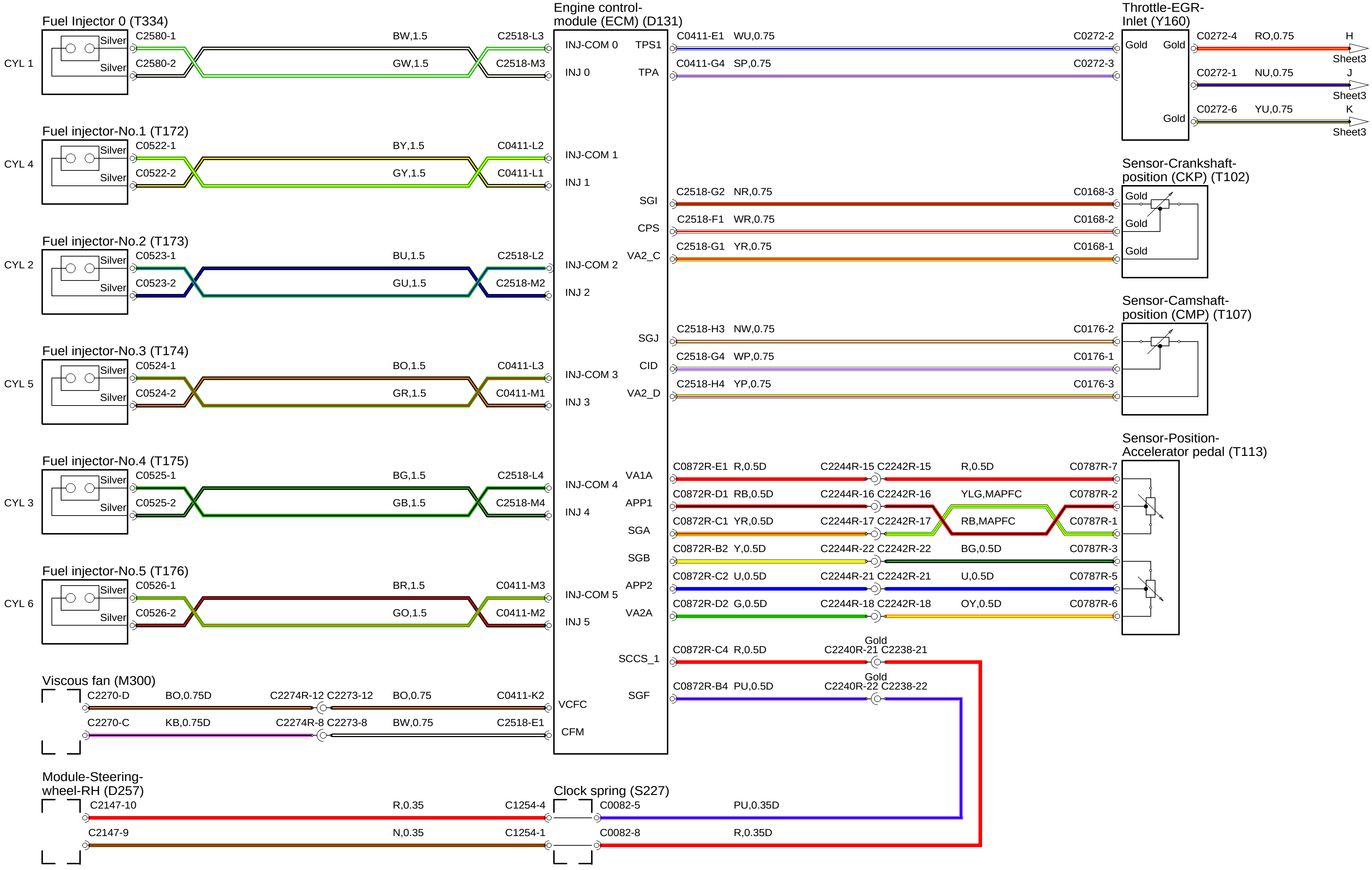

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ1
R,50.0T
(PV8)
C0192-1
MEGA FUSE
400.0 Amps
R,50.0T
(DV6)
Starter motor (M101)
C0631-1
C0631-2
R,35.0T
(DV6)
Generator (M100)
ALT CON
B+
ALT MON
BATT SENSE
C0053-2
C0053-3
C0053-1
C1893-1
R,50.0T
(PV8)
WP,0.75
(DV6)
C0411-H1
WR,1.0
(PV8)
WG,0.75
(DV6)
C2518-F2
WG,1.0
(PV8)
NG,0.5
C2724-5 C2725R-5
R,0.75
C2273-3 C2274R-3
Engine control-module (ECM) (D131)
ALT CON
ALT MON
CAN OUT+
CAN OUT -
CAN IN +
CAN IN -
C0411-B4
SR,0.75
C2273-16 C2274R-16
YN,MAPDG
SJ1176
C0411-B3
UR,0.75
C2273-15 C2274R-15
YB,MAPDG
SJ1177
C0872R-A4
YN,MAPDE
(DIESEL)
C2365R-4 C2366-4
C0872R-A3
YB,MAPDE
(PETROL)
(DIESEL)
C2365R-5 C2366-5
(PETROL)
Engine control-module (ECM) (D131)
C0634-96
ALT_CON
C0634-3
ALT_MON
CAN IN +
CAN IN -
CAN OUT +
CAN OUT -
C0635R-58
YN,MAPCX
C0635R-45
YB,MAPCX
C0635R-57
YN,MAPCH
SJ1176
C0635R-44
YB,MAPCH
SJ1177
Battery Junction Box (P108)
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
(DV6)
R,0.5D
(PV8)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
SJ730
YW,MAPD
C0230-17
SJ731
YU,MAPD
C0230-18
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860
Central Junction Box (P101)
Generic Electronic Module (D162)
C0582-5
CAN -
CAN +
C0580-1
YU,MAPX
C1168-19 C1166R-19
C0580-15
YW,MAPX
C1168-18 C1166R-18

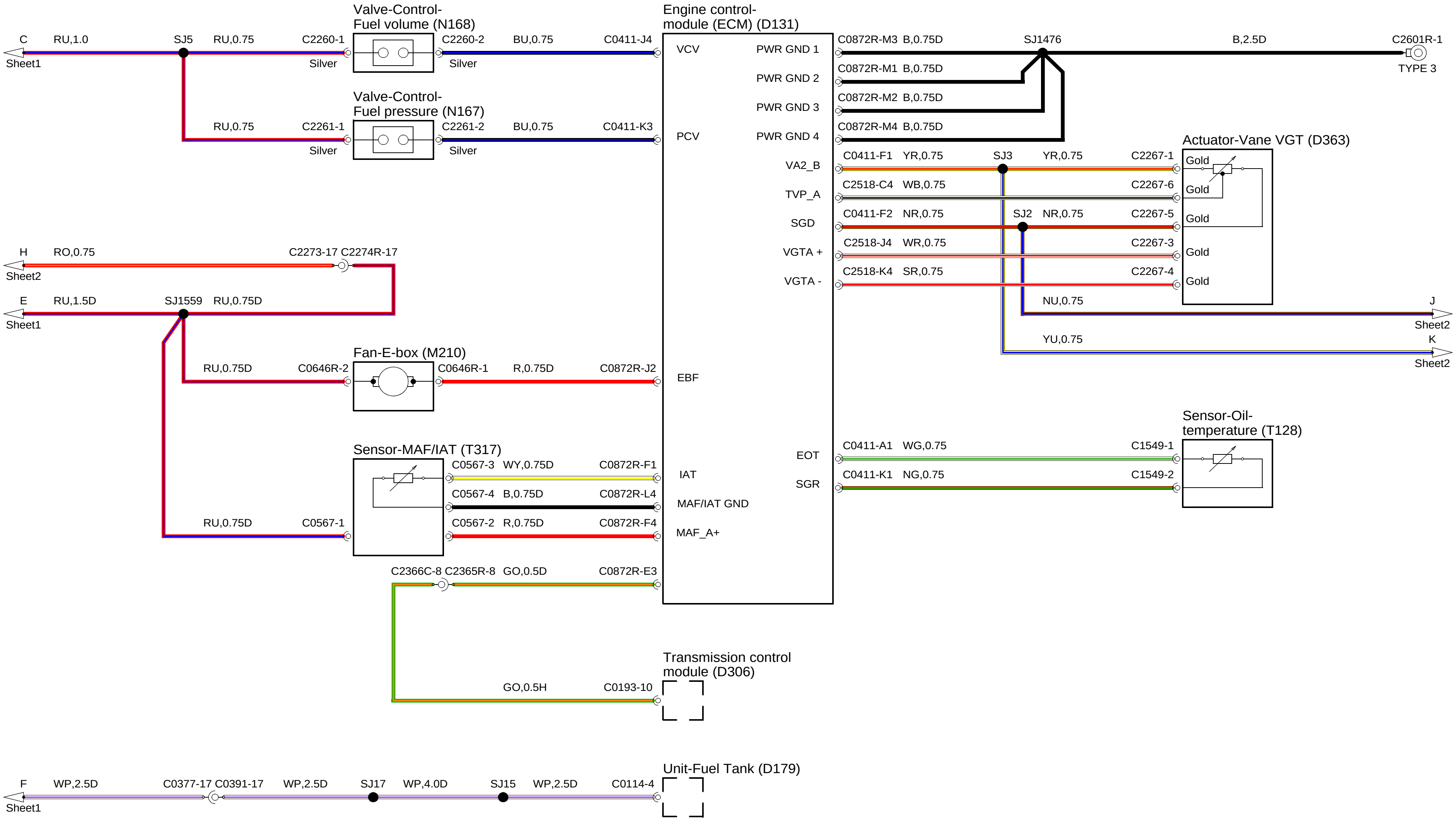

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-2
NOT USED (PARK)
C0028-4
C0028-6
W,1.5D
C0582-30
C0028-1
Y,4.0D
C0582-19
C0028-7
WR,2.5D
C0582-5
C0028-5
LGW,1.5D
C0582-21
Central Junction Box (P101)
Generic Electronic Module (D162)
AUXILIARY (Y163)
IGNITION (Y104)
FUSE 60P
5.0 Amps
CRANK (Y162)
FUSE 40P
5.0 Amps
KEY-IN (Y258)
Solenoid-Interlock-Key (N120)
C0028-3
U,0.5D
C2238-20 C2240R-20
U,0.5D
C1319R-7
Transfer box control module (D204)

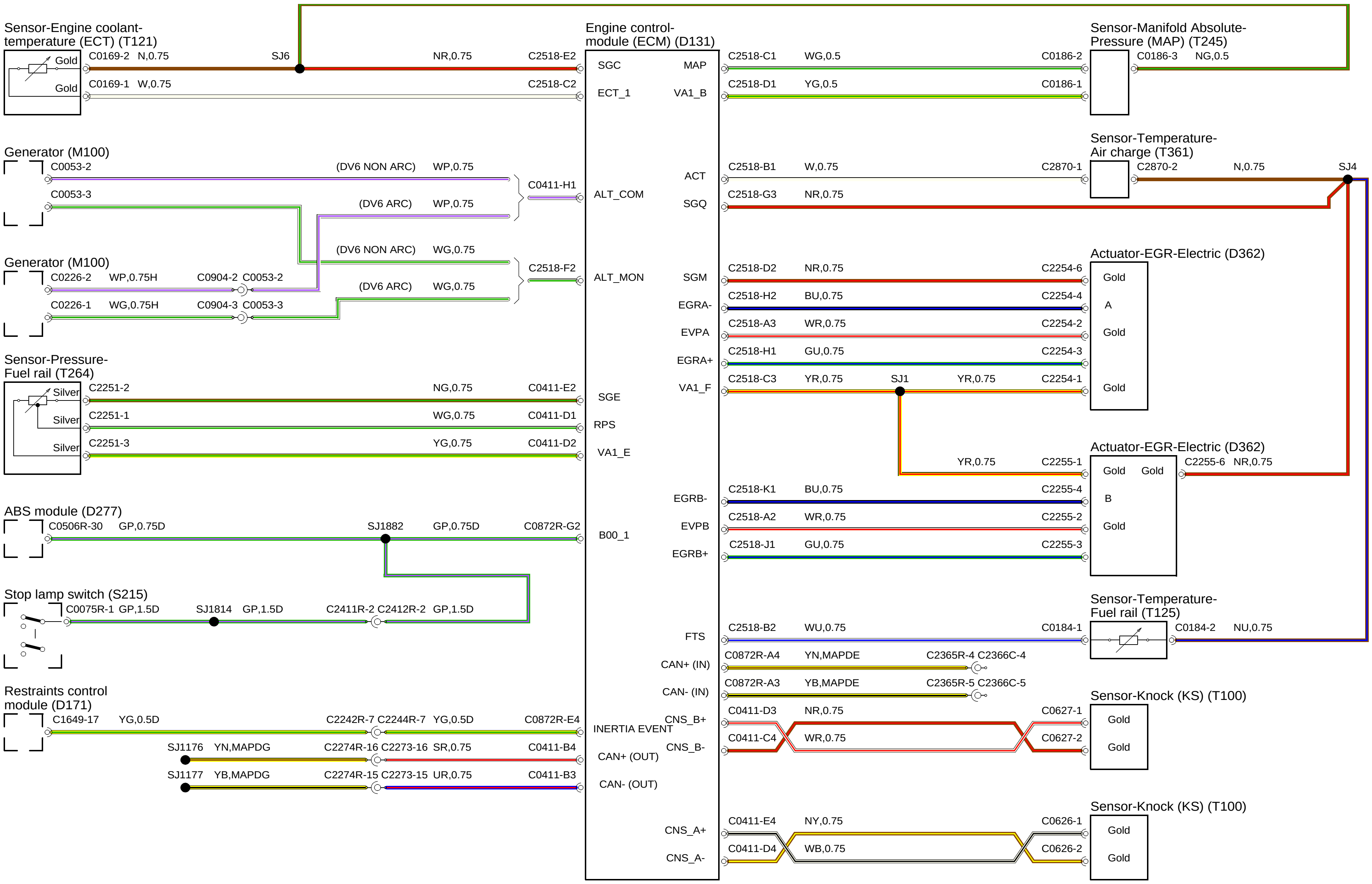

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
Starter motor (M101)
C0631-1
C0631-2
Engine control-
module (ECM) (D131)
CAN OUT+
C0411-B4
SR,0.75
C2273-16 C2274R-16
YN,MAPDG
SJ1176
CAN OUT -
C0411-B3
UR,0.75
C2273-15 C2274R-15
YB,MAPDG
SJ1177
Generator (M100)
R,35.0T
C1893-1
B+
ALT COM
C0226-2
WP,0.75H
C0904-2 C0053-2
WP,0.75
C0411-H1
ALT COM
CAN IN +
C0872R-A4
YN,MAPDE
C2365R-4 C2366-4
ALT MON
C0226-1
WG,0.75H
C0904-3 C0053-3
WG,0.75
C2518-F2
ALT MON
CAN IN -
C0872R-A3
YB,MAPDE
C2365R-5 C2366-5
BATT SENSE
C0226-3
R,0.75H
C0904-1 C0053-1
R,0.75
Battery Junction Box (P108)
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
C2274R-3 C2273-3
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
CRANK
C0028-7
WR,2.5D
Instrument cluster (J100)
Ignition/no charge
warning indicator (J114)
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
SJ731
YU,MAPD
C0230-18
C0230-2
YB,MAPA
SJ860
Central Junction
Box (P101)
Generic Electronic
Module (D162)
C0582-5
CAN -
C0580-1
YU,MAPX
C1168-19 C1166R-19
CAN +
C0580-15
YW,MAPX
C1168-18 C1166R-18

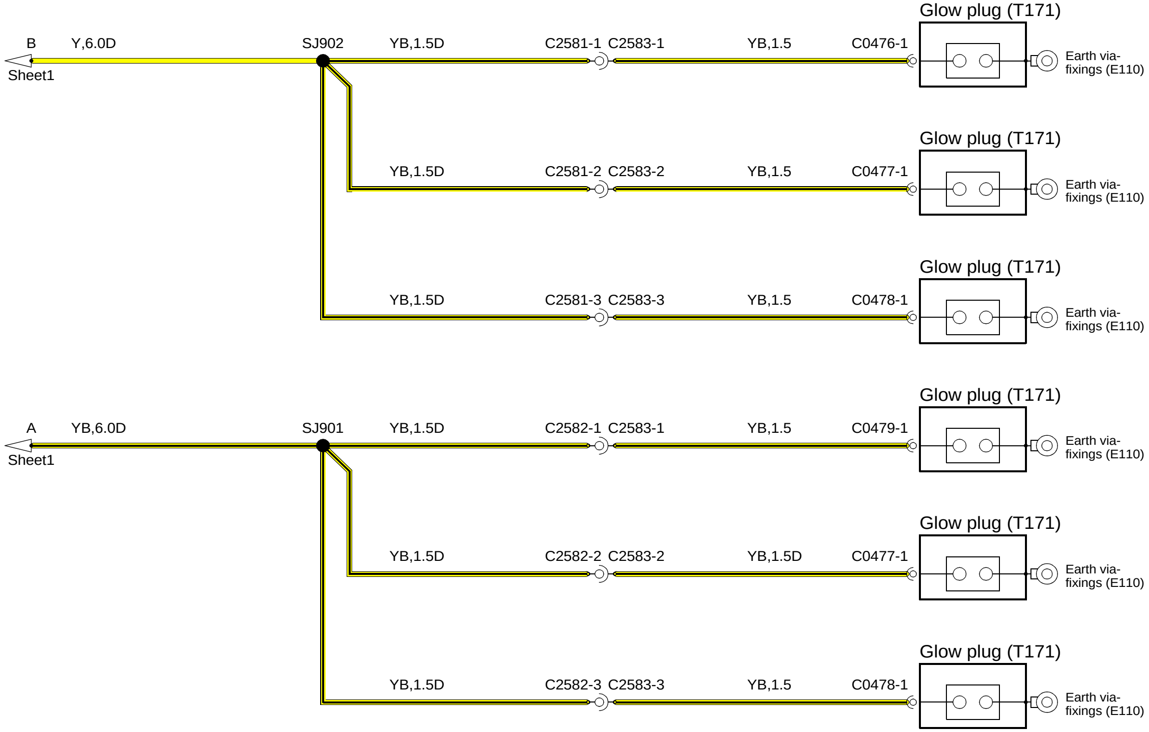

Battery (P100)
R,30.0
C1641-1
SJ1
R,50.0T
(PV8)
C0192-1
R,50.0T
(DV6)
MEGA FUSE001
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
Relay-Transit (R275)
C0045-1
B,50.0D
C1661-1
SIGNAL
C3034R-1
GR,0.5D
POWER
C3034R-2
R,0.5D
Starter motor (M101)
C0631-1
C0631-2
R,35.0T
(DV6)
Generator (M100)
C0053-1
NG,0.5
C2724-5 C2725R-5
BATT SENSE
B+
C1893-1
R,0.75
(DV6 NON ARC)
R,50.0T
(PV8)
C0226-3
R,0.75H
C2273-3 C2274R-3
C0904-1 C0053-1
R,0.75
(DV6 ARC)
Battery Junction Box (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D
SJ1236
R,0.5D
(DV6)
R,0.5D
(PV8)
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
CRANK
C0028-7
WR,2.5D
Central Junction
Box (P101)
C0582-19
FUSE 69P
5.0 Amps
C0586R-3
GR,0.5D
SJ1695
GR,0.5D
C2243R-13 C2245R-13
Generic Electronic
Module (D162)
C0582-5
CAN -
C0580-1
YU,MAPX
C1168-19 C1166R-19
CAN +
C0580-15
YW,MAPX
C1168-18 C1166R-18

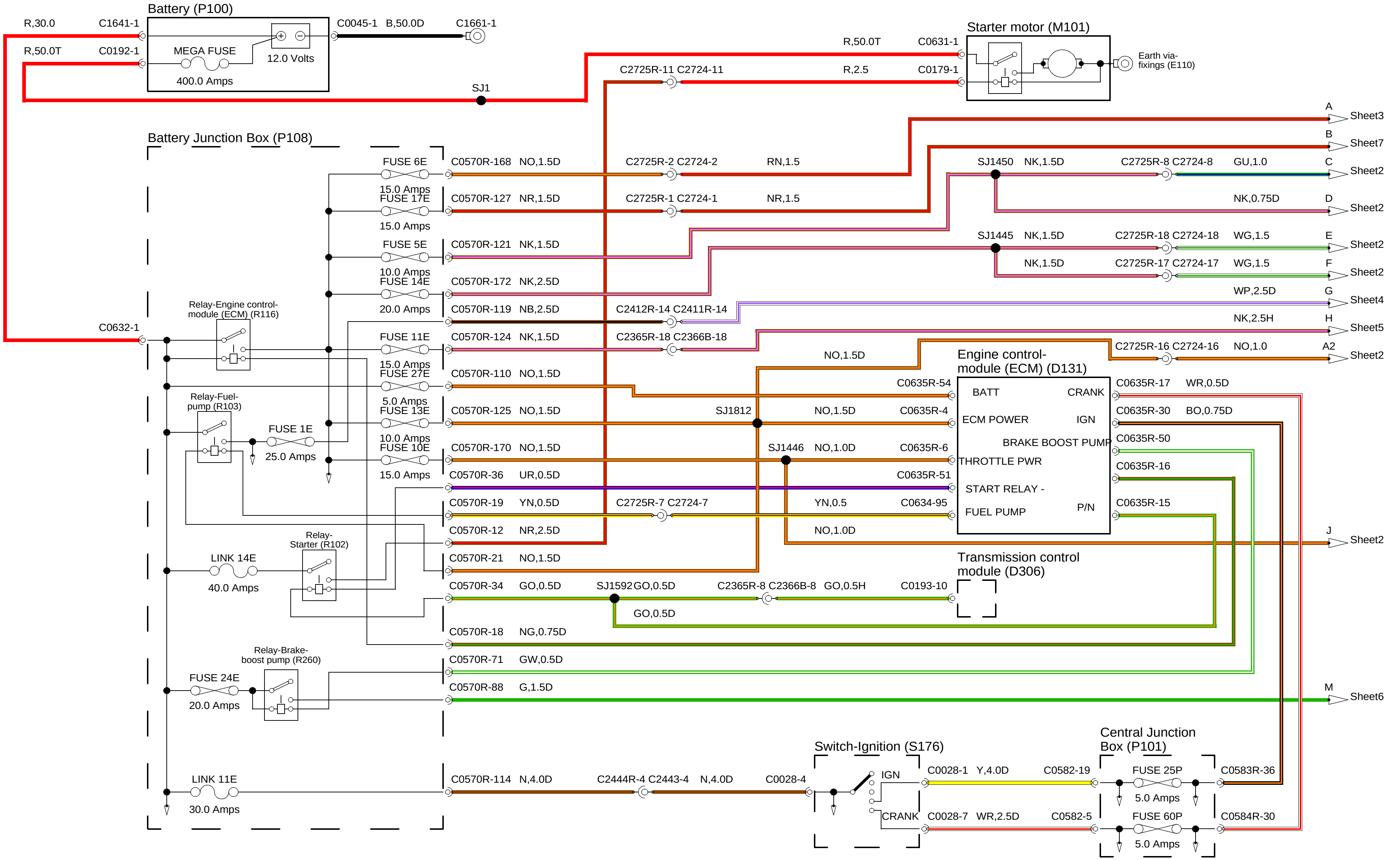

Battery (P100)
R,30.0
C1641-1
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
R,50.0T
Starter motor (M101)
C0631-1
C0179-1
Earth via-
fixings (E110)
C2274R-1 C2273-1
RB,2.5
A
Sheet5
B
Sheet5
C
Sheet3
E
Sheet3
F
Sheet3
Battery Junction Box (P108)
Relay-
Starter (R102)
LINK 14E
40.0 Amps
C0570R-12
RB,2.5D
C2274R-18 C2273-18
RU,1.0
FUSE 17E
15.0 Amps
C0570R-127
RU,1.5D
C0570R-167
NO,1.5D
FUSE 4E
25.0 Amps
C0570R-4
YB,6.0D
Relay-Glow-
plug (R114)
C0632-1
LINK 1E
50.0 Amps
C0570R-36
R,0.5D
C0872R-B1
Engine control-
module (ECM) (D131)
SM_COMMAND
VBR1C
VBR1A
VBR1B
GPC
IGNSNS
KAM
CRNK
LPPR
LPM
C0872R-L1
NO,1.5D
SJ1999
C0872R-L2
NO,1.5D
C0872R-L3
NO,1.5D
C0570R-76
BY,0.75D
SJ1995
BY,0.75D
C2274R-5 C2273-5
C0570R-78
BY,0.75D
Relay-Glow-
plug (R114)
LINK 4E
50.0 Amps
C0570R-5
Y,6.0D
BY,0.75
C0411-G3
C0872R-K3
W,0.75D
FUSE 27E
5.0 Amps
C0570R-110
N,0.75D
C0872R-K4
Relay-Engine control-
module (ECM) (R116)
C0872R-F3
WR,0.5D
FUSE 13E
10.0 Amps
C0570R-125
RU,1.5D
C0570R-19
UP,0.5D
C0872R-J4
C0872R-J3
FUSE 1E
25.0 Amps
C0570R-119
NB,2.5D
SJ1489
NB,0.75D
C0872R-G1
Relay-Fuel-
pump (R103)
NB,2.5D
C2412R-14 C2411R-14
WP,2.5D
C0570R-18
NG,0.75D
C0570R-21
NO,1.5D
C0570R-34
WR,0.5D
SJ1479
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Central Junction
Box (P101)
Switch-Ignition (S176)
C0028-4
CRANK
IGN
C0028-7
WR,2.5D
C0028-1
Y,4.0D
C0582-5
FUSE 60P
5.0 Amps
C0584R-30
WR,0.5D
C0582-19
FUSE 25P
5.0 Amps
C0583R-36

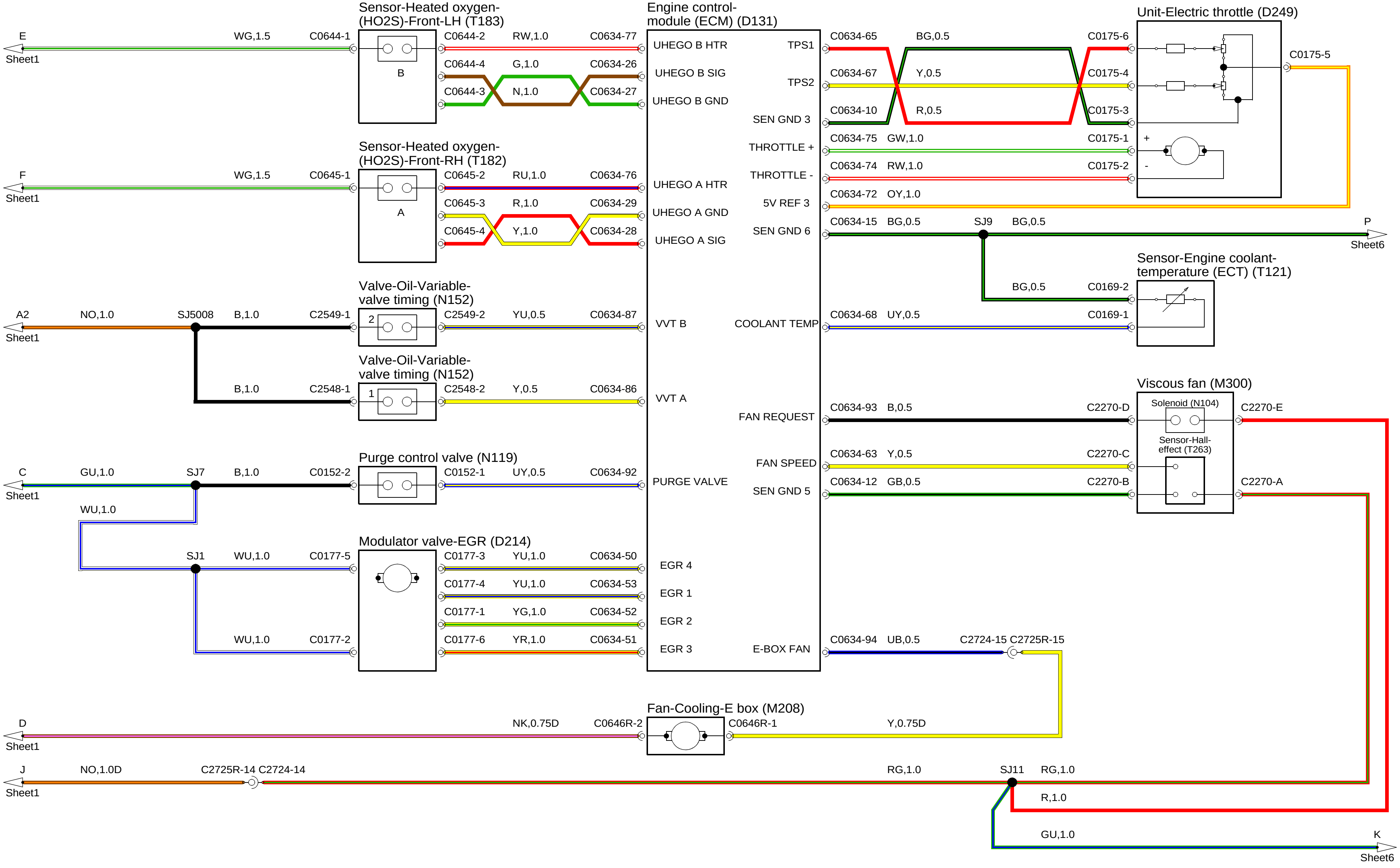

Fuel Injector 0 (T334)
CYL 1
Silver
Silver
C2580-1
BW,1.5
C2518-L3
C2580-2
GW,1.5
C2518-M3
Engine control-module (ECM) (D131)
INJ-COM 0
INJ 0
TPS1
TPA
C0411-E1 WU,0.75
C0272-2
C0411-G4 SP,0.75
C0272-3
Throttle-EGR-Inlet (Y160)
Gold
Gold
Gold
C0272-4 RO,0.75 H Sheet3
C0272-1 NU,0.75 J Sheet3
C0272-6 YU,0.75 K Sheet3
Fuel injector-No.1 (T172)
CYL 4
C0522-1 BY,1.5 C0411-L2
C0522-2 GY,1.5 C0411-L1
INJ-COM 1
INJ 1
Sensor-Crankshaft-position (CKP) (T102)
SGI
CPS
VA2_C
C2518-G2 NR,0.75 C0168-3
C2518-F1 WR,0.75 C0168-2
C2518-G1 YR,0.75 C0168-1
Gold
Gold
Gold
Fuel injector-No.2 (T173)
CYL 2
C0523-1 BU,1.5 C2518-L2
C0523-2 GU,1.5 C2518-M2
INJ-COM 2
INJ 2
Sensor-Camshaft-position (CMP) (T107)
SGJ
CID
VA2_D
C2518-H3 NW,0.75 C0176-2
C2518-G4 WP,0.75 C0176-1
C2518-H4 YP,0.75 C0176-3
Fuel injector-No.3 (T174)
CYL 5
C0524-1 BO,1.5 C0411-L3
C0524-2 GR,1.5 C0411-M1
INJ-COM 3
INJ 3
Sensor-Position-Accelerator pedal (T113)
Fuel injector-No.4 (T175)
CYL 3
C0525-1 BG,1.5 C2518-L4
C0525-2 GB,1.5 C2518-M4
INJ-COM 4
INJ 4
VA1A
APP1
SGA
SGB
APP2
VA2A
C0872R-E1 R,0.5D C2244R-15 C2242R-15 R,0.5D C0787R-7
C0872R-D1 RB,0.5D C2244R-16 C2242R-16 YLG,MAPFC C0787R-2
C0872R-C1 YR,0.5D C2244R-17 C2242R-17 RB,MAPFC C0787R-1
C0872R-B2 Y,0.5D C2244R-22 C2242R-22 BG,0.5D C0787R-3
C0872R-C2 U,0.5D C2244R-21 C2242R-21 U,0.5D C0787R-5
C0872R-D2 G,0.5D C2244R-18 C2242R-18 OY,0.5D C0787R-6
Fuel injector-No.5 (T176)
CYL 6
C0526-1 BR,1.5 C0411-M3
C0526-2 GO,1.5 C0411-M2
INJ-COM 5
INJ 5
SCCS_1
SGF
C0872R-C4 R,0.5D Gold C2240R-21 C2238-21
C0872R-B4 PU,0.5D Gold C2240R-22 C2238-22
Viscous fan (M300)
C2270-D BO,0.75D C2274R-12 C2273-12 BO,0.75 C0411-K2
C2270-C KB,0.75D C2274R-8 C2273-8 BW,0.75 C2518-E1
VCFC
CFM
Module-Steering-wheel-RH (D257)
C2147-10 R,0.35 C1254-4
C2147-9 N,0.35 C1254-1
Clock spring (S227)
C0082-5 PU,0.35D
C0082-8 R,0.35D

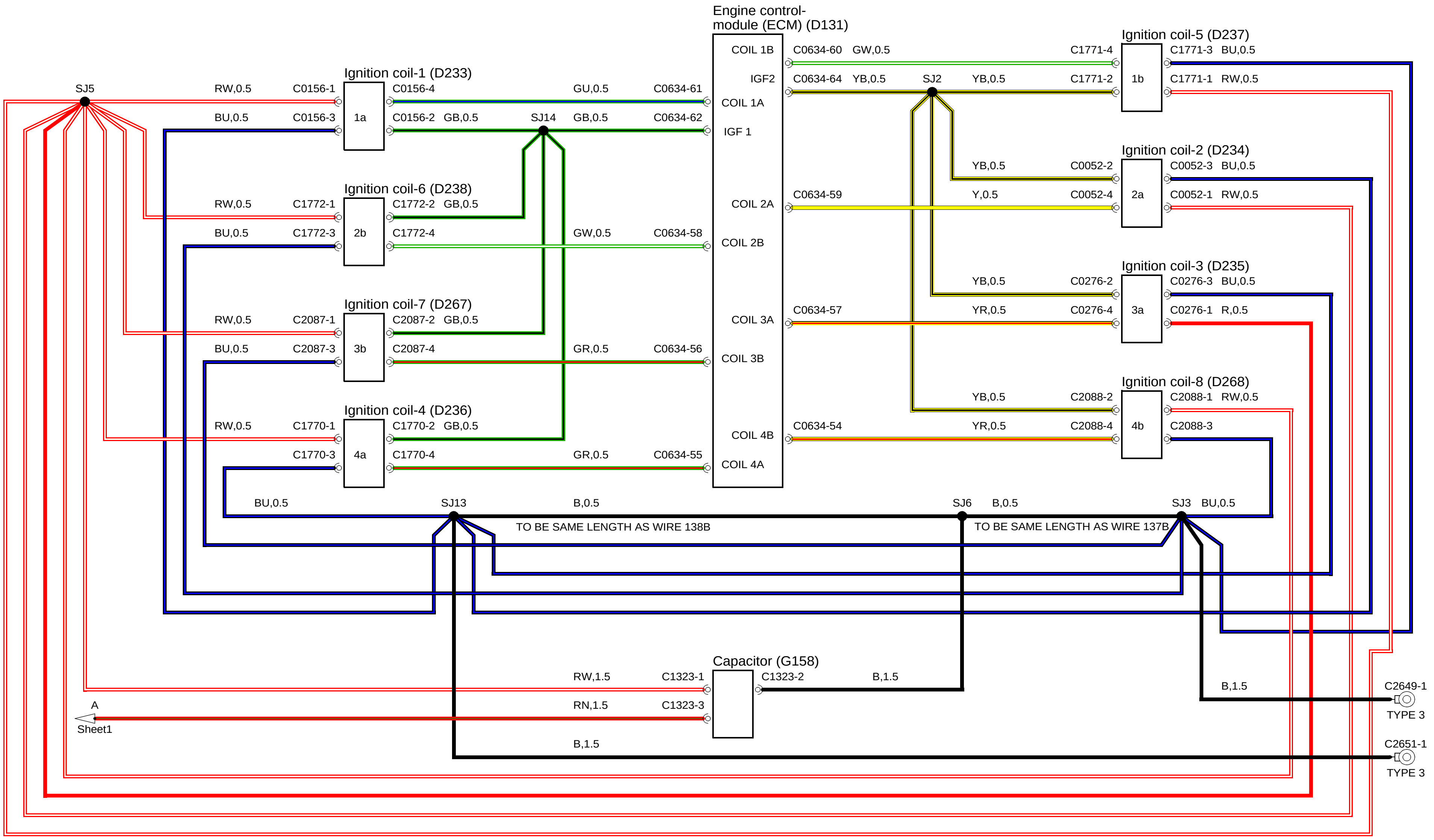

Valve-Control-Fuel volume (N168)
Valve-Control-Fuel pressure (N167)
Engine control-module (ECM) (D131)
Actuator-Vane VGT (D363)
Fan-E-box (M210)
Sensor-MAF/IAT (T317)
Sensor-Oil-temperature (T128)
Transmission control module (D306)
Unit-Fuel Tank (D179)
C
Sheet1
RU,1.0
SJ5
RU,0.75
C2260-1
Silver
C2260-2
BU,0.75
C0411-J4
RU,0.75
C2261-1
C2261-2
C0411-K3
VCV
PCV
PWR GND 1
PWR GND 2
PWR GND 3
PWR GND 4
VA2_B
TVP_A
SGD
VGTA +
VGTA -
EBF
IAT
MAF/IAT GND
MAF_A+
EOT
SGR
C0872R-M3 B,0.75D
C0872R-M1 B,0.75D
C0872R-M2 B,0.75D
C0872R-M4 B,0.75D
SJ1476
B,2.5D
C2601R-1
TYPE 3
C0411-F1 YR,0.75
SJ3
YR,0.75
C2267-1
C2518-C4 WB,0.75
C2267-6
C0411-F2 NR,0.75
SJ2
NR,0.75
C2267-5
C2518-J4 WR,0.75
C2267-3
C2518-K4 SR,0.75
C2267-4
Gold
NU,0.75
J
Sheet2
YU,0.75
K
H
RO,0.75
C2273-17 C2274R-17
E
RU,1.5D
SJ1559
RU,0.75D
C0646R-2
C0646R-1
R,0.75D
C0872R-J2
C0567-3 WY,0.75D
C0872R-F1
C0567-4 B,0.75D
C0872R-L4
C0567-2 R,0.75D
C0872R-F4
C0567-1
C0411-A1 WG,0.75
C1549-1
C0411-K1 NG,0.75
C1549-2
C2366C-8 C2365R-8 GO,0.5D
C0872R-E3
GO,0.5H
C0193-10
F
WP,2.5D
C0377-17 C0391-17
SJ17
WP,4.0D
SJ15
C0114-4

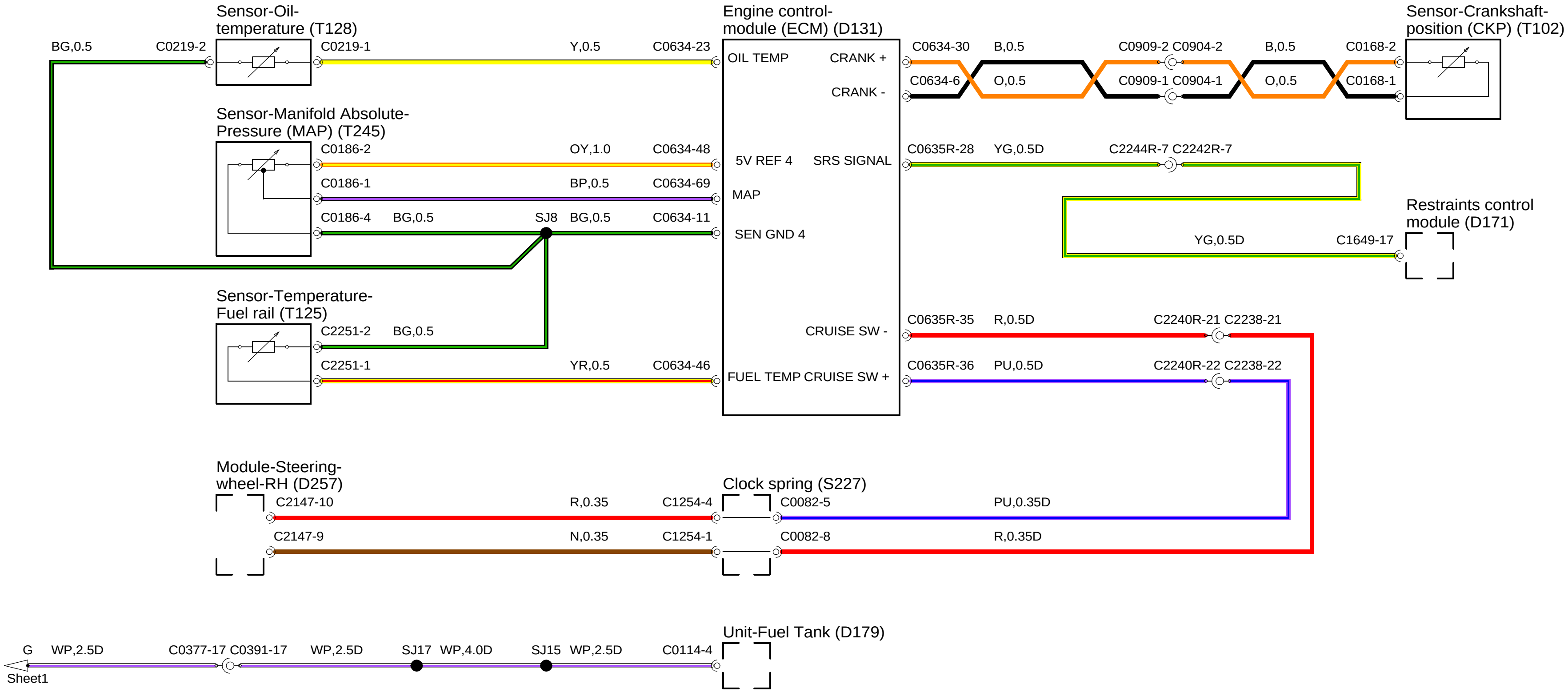

Sensor-Engine coolant-temperature (ECT) (T121)
Gold
Gold
C0169-2 N,0.75
SJ6
NR,0.75
C2518-E2
C0169-1 W,0.75
C2518-C2
Engine control-module (ECM) (D131)
SGC
MAP
ECT_1
VA1_B
C2518-C1 WG,0.5
C0186-2
C2518-D1 YG,0.5
C0186-1
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186-3 NG,0.5
Generator (M100)
C0053-2
(DV6 NON ARC) WP,0.75
C0411-H1
ALT_COM
C0053-3
(DV6 ARC) WP,0.75
ACT
SGQ
C2518-B1 W,0.75
C2870-1
C2518-G3 NR,0.75
Sensor-Temperature-Air charge (T361)
C2870-2 N,0.75
SJ4
Generator (M100)
(DV6 NON ARC) WG,0.75
C0226-2 WP,0.75H
C0904-2 C0053-2
C2518-F2
ALT_MON
(DV6 ARC) WG,0.75
C0226-1 WG,0.75H
C0904-3 C0053-3
SGM
EGRA-
EVPA
EGRA+
VA1_F
C2518-D2 NR,0.75 C2254-6
C2518-H2 BU,0.75 C2254-4
C2518-A3 WR,0.75 C2254-2
C2518-H1 GU,0.75 C2254-3
C2518-C3 YR,0.75 SJ1 YR,0.75 C2254-1
Actuator-EGR-Electric (D362)
Gold
A
Gold
Gold
Sensor-Pressure-Fuel rail (T264)
Silver
Silver
Silver
C2251-2 NG,0.75 C0411-E2
C2251-1 WG,0.75 C0411-D1
C2251-3 YG,0.75 C0411-D2
SGE
RPS
VA1_E
YR,0.75 C2255-1
Actuator-EGR-Electric (D362)
C2255-6 NR,0.75
Gold Gold
B
Gold
EGRB-
EVPB
EGRB+
C2518-K1 BU,0.75 C2255-4
C2518-A2 WR,0.75 C2255-2
C2518-J1 GU,0.75 C2255-3
ABS module (D277)
C0506R-30 GP,0.75D
SJ1882 GP,0.75D
C0872R-G2
B00_1
Stop lamp switch (S215)
C0075R-1 GP,1.5D
SJ1814 GP,1.5D
C2411R-2 C2412R-2 GP,1.5D
FTS
C2518-B2 WU,0.75 C0184-1
Sensor-Temperature-Fuel rail (T125)
C0184-2 NU,0.75
CAN+ (IN)
CAN- (IN)
C0872R-A4 YN,MAPDE C2365R-4 C2366C-4
C0872R-A3 YB,MAPDE C2365R-5 C2366C-5
Restraints control module (D171)
C1649-17 YG,0.5D
C2242R-7 C2244R-7 YG,0.5D
C0872R-E4
INERTIA EVENT
SJ1176 YN,MAPDG
C2274R-16 C2273-16 SR,0.75
C0411-B4
CAN+ (OUT)
SJ1177 YB,MAPDG
C2274R-15 C2273-15 UR,0.75
C0411-B3
CAN- (OUT)
CNS_B+
CNS_B-
C0411-D3 NR,0.75 C0627-1
C0411-C4 WR,0.75 C0627-2
Sensor-Knock (KS) (T100)
Gold
Gold
CNS_A+
CNS_A-
C0411-E4 NY,0.75 C0626-1
C0411-D4 WB,0.75 C0626-2
Sensor-Knock (KS) (T100)
Gold
Gold

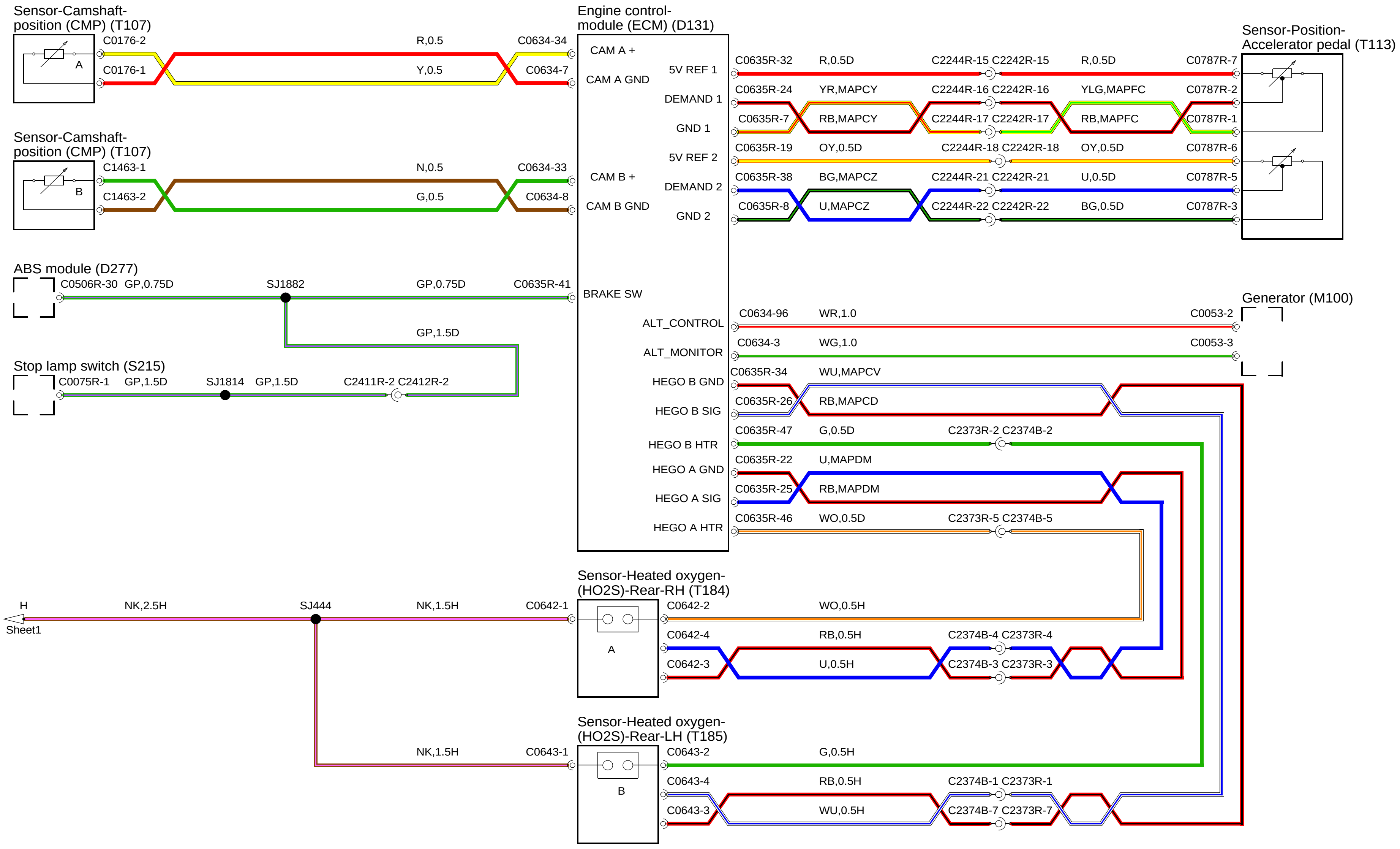

Glow plug (T171)
B
Y,6.0D
Sheet1
SJ902
YB,1.5D
C2581-1 C2583-1
YB,1.5
C0476-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-2 C2583-2
YB,1.5
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2581-3 C2583-3
YB,1.5
C0478-1
Earth via-
fixings (E110)
Glow plug (T171)
A
YB,6.0D
Sheet1
SJ901
YB,1.5D
C2582-1 C2583-1
YB,1.5
C0479-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-2 C2583-2
YB,1.5D
C0477-1
Earth via-
fixings (E110)
Glow plug (T171)
YB,1.5D
C2582-3 C2583-3
YB,1.5
C0478-1
Earth via-
fixings (E110)

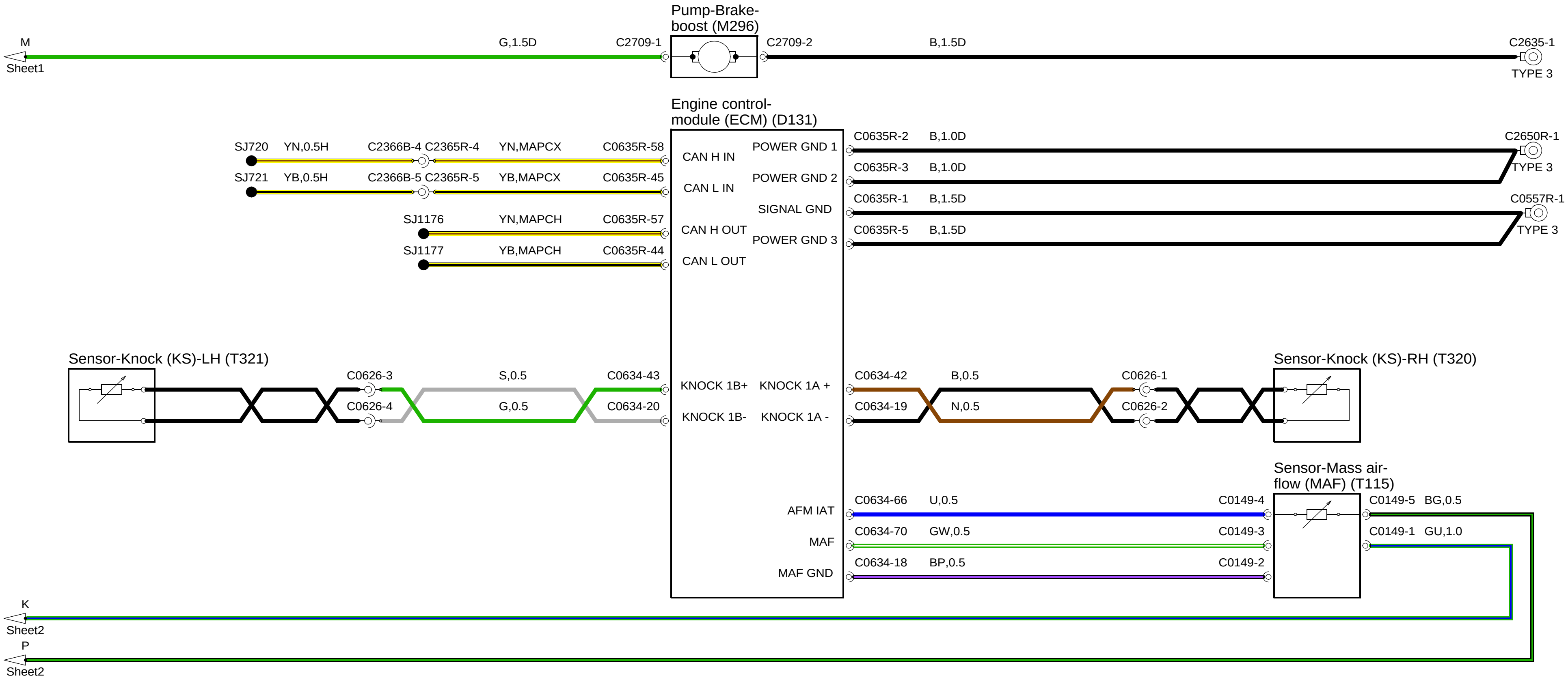

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1 B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631-1
R,2.5
C0179-1
C2725R-11 C2724-11
Earth via-fixings (E110)
Battery Junction Box (P108)
A Sheet3
B Sheet7
C Sheet2
D Sheet2
E Sheet2
F Sheet2
G Sheet4
H Sheet5
A2 Sheet2
J Sheet2
M Sheet6
FUSE 6E
15.0 Amps
C0570R-168 NO,1.5D
C2725R-2 C2724-2
RN,1.5
FUSE 17E
15.0 Amps
C0570R-127 NR,1.5D
C2725R-1 C2724-1
NR,1.5
SJ1450 NK,1.5D
C2725R-8 C2724-8
GU,1.0
NK,0.75D
FUSE 5E
10.0 Amps
C0570R-121 NK,1.5D
SJ1445 NK,1.5D
C2725R-18 C2724-18
WG,1.5
NK,1.5D
C2725R-17 C2724-17
WG,1.5
FUSE 14E
20.0 Amps
C0570R-172 NK,2.5D
WP,2.5D
C0570R-119 NB,2.5D
C2412R-14 C2411R-14
Relay-Engine control-module (ECM) (R116)
C0632-1
NK,2.5H
FUSE 11E
15.0 Amps
C0570R-124 NK,1.5D
C2365R-18 C2366B-18
C2725R-16 C2724-16
NO,1.0
NO,1.5D
Engine control-module (ECM) (D131)
FUSE 27E
5.0 Amps
C0570R-110 NO,1.5D
C0635R-54
BATT
CRANK
C0635R-17 WR,0.5D
Relay-Fuel-pump (R103)
FUSE 13E
10.0 Amps
C0570R-125 NO,1.5D
SJ1812
NO,1.5D
C0635R-4
ECM POWER
IGN
C0635R-30 BO,0.75D
FUSE 1E
25.0 Amps
FUSE 10E
15.0 Amps
C0570R-170 NO,1.5D
SJ1446 NO,1.0D
C0635R-6
BRAKE BOOST PUMP
C0635R-50
THROTTLE PWR
C0570R-36 UR,0.5D
C0635R-51
C0635R-16
START RELAY -
C0570R-19 YN,0.5D
C2725R-7 C2724-7
YN,0.5
C0634-95
FUEL PUMP
P/N
C0635R-15
C0570R-12 NR,2.5D
NO,1.0D
Relay-Starter (R102)
LINK 14E
40.0 Amps
C0570R-21 NO,1.5D
Transmission control module (D306)
C0570R-34 GO,0.5D
SJ1592 GO,0.5D
C2365R-8 C2366B-8 GO,0.5H
C0193-10
GO,0.5D
C0570R-18 NG,0.75D
Relay-Brake-boost pump (R260)
FUSE 24E
20.0 Amps
C0570R-71 GW,0.5D
C0570R-88 G,1.5D
Switch-Ignition (S176)
Central Junction Box (P101)
LINK 11E
30.0 Amps
C0570R-114 N,4.0D
C2444R-4 C2443-4 N,4.0D
C0028-4
IGN
CRANK
C0028-1 Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583R-36
C0028-7 WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584R-30

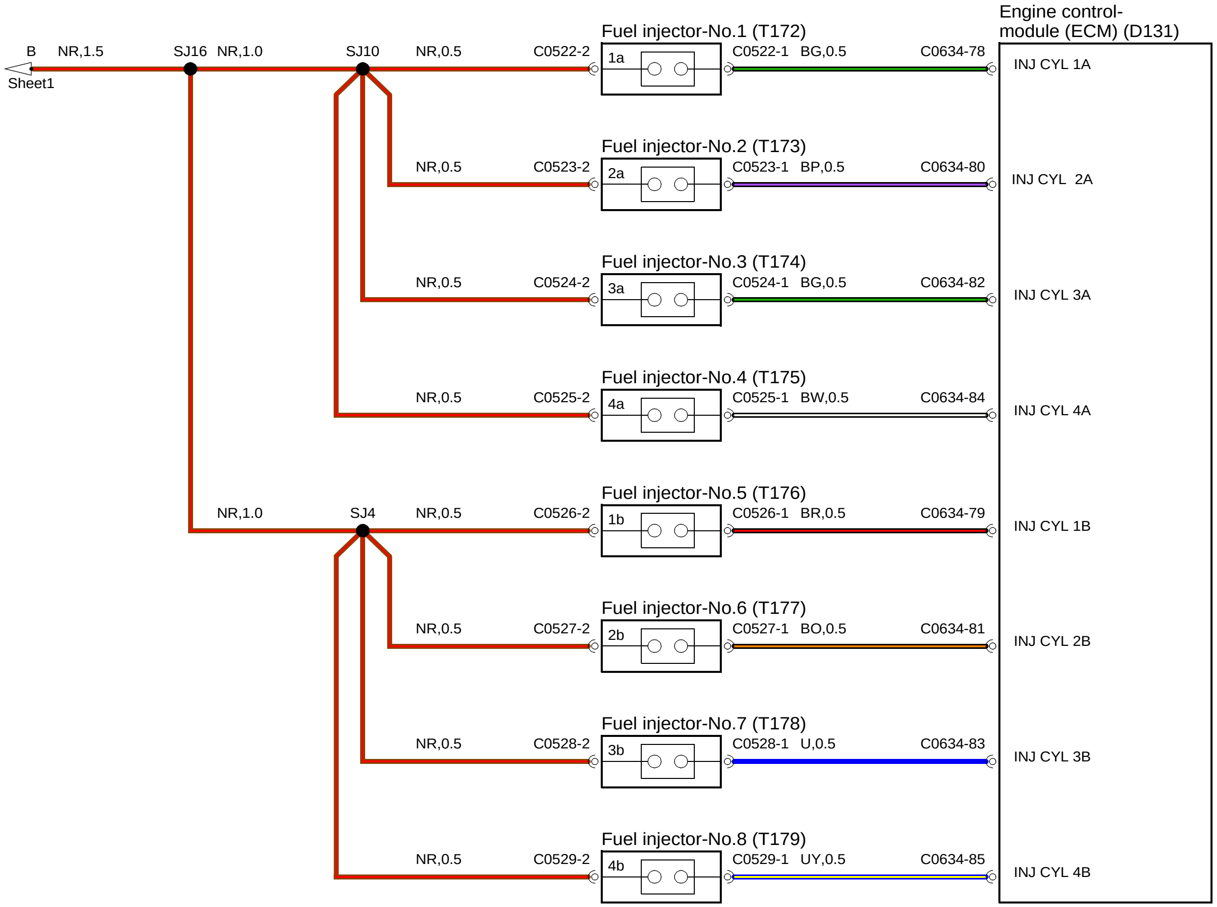

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
Engine control-module (ECM) (D131)
Unit-Electric throttle (D249)
E
Sheet1
WG,1.5
C0644-1
C0644-2
RW,1.0
C0634-77
B
C0644-4
G,1.0
C0634-26
C0644-3
N,1.0
C0634-27
UHEGO B HTR
UHEGO B SIG
UHEGO B GND
TPS1
TPS2
SEN GND 3
THROTTLE +
THROTTLE -
5V REF 3
SEN GND 6
C0634-65
BG,0.5
C0175-6
C0175-5
C0634-67
Y,0.5
C0175-4
C0634-10
R,0.5
C0175-3
C0634-75
GW,1.0
C0175-1
+
C0634-74
RW,1.0
C0175-2
-
C0634-72
OY,1.0
C0634-15
BG,0.5
SJ9
BG,0.5
P
Sheet6
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
F
Sheet1
WG,1.5
C0645-1
C0645-2
RU,1.0
C0634-76
A
C0645-3
R,1.0
C0634-29
C0645-4
Y,1.0
C0634-28
UHEGO A HTR
UHEGO A GND
UHEGO A SIG
Sensor-Engine coolant-temperature (ECT) (T121)
BG,0.5
C0169-2
C0634-68
UY,0.5
C0169-1
COOLANT TEMP
Valve-Oil-Variable-valve timing (N152)
A2
Sheet1
NO,1.0
SJ5008
B,1.0
C2549-1
2
C2549-2
YU,0.5
C0634-87
VVT B
Valve-Oil-Variable-valve timing (N152)
B,1.0
C2548-1
1
C2548-2
Y,0.5
C0634-86
VVT A
Viscous fan (M300)
Solenoid (N104)
Sensor-Hall-effect (T263)
FAN REQUEST
C0634-93
B,0.5
C2270-D
C2270-E
FAN SPEED
C0634-63
Y,0.5
C2270-C
SEN GND 5
C0634-12
GB,0.5
C2270-B
C2270-A
Purge control valve (N119)
C
Sheet1
GU,1.0
SJ7
B,1.0
C0152-2
C0152-1
UY,0.5
C0634-92
PURGE VALVE
WU,1.0
Modulator valve-EGR (D214)
SJ1
WU,1.0
C0177-5
C0177-3
YU,1.0
C0634-50
EGR 4
C0177-4
YU,1.0
C0634-53
EGR 1
C0177-1
YG,1.0
C0634-52
EGR 2
WU,1.0
C0177-2
C0177-6
YR,1.0
C0634-51
EGR 3
E-BOX FAN
C0634-94
UB,0.5
C2724-15 C2725R-15
Fan-Cooling-E box (M208)
D
Sheet1
NK,0.75D
C0646R-2
C0646R-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725R-14 C2724-14
RG,1.0
SJ11
RG,1.0
R,1.0
GU,1.0
K
Sheet6

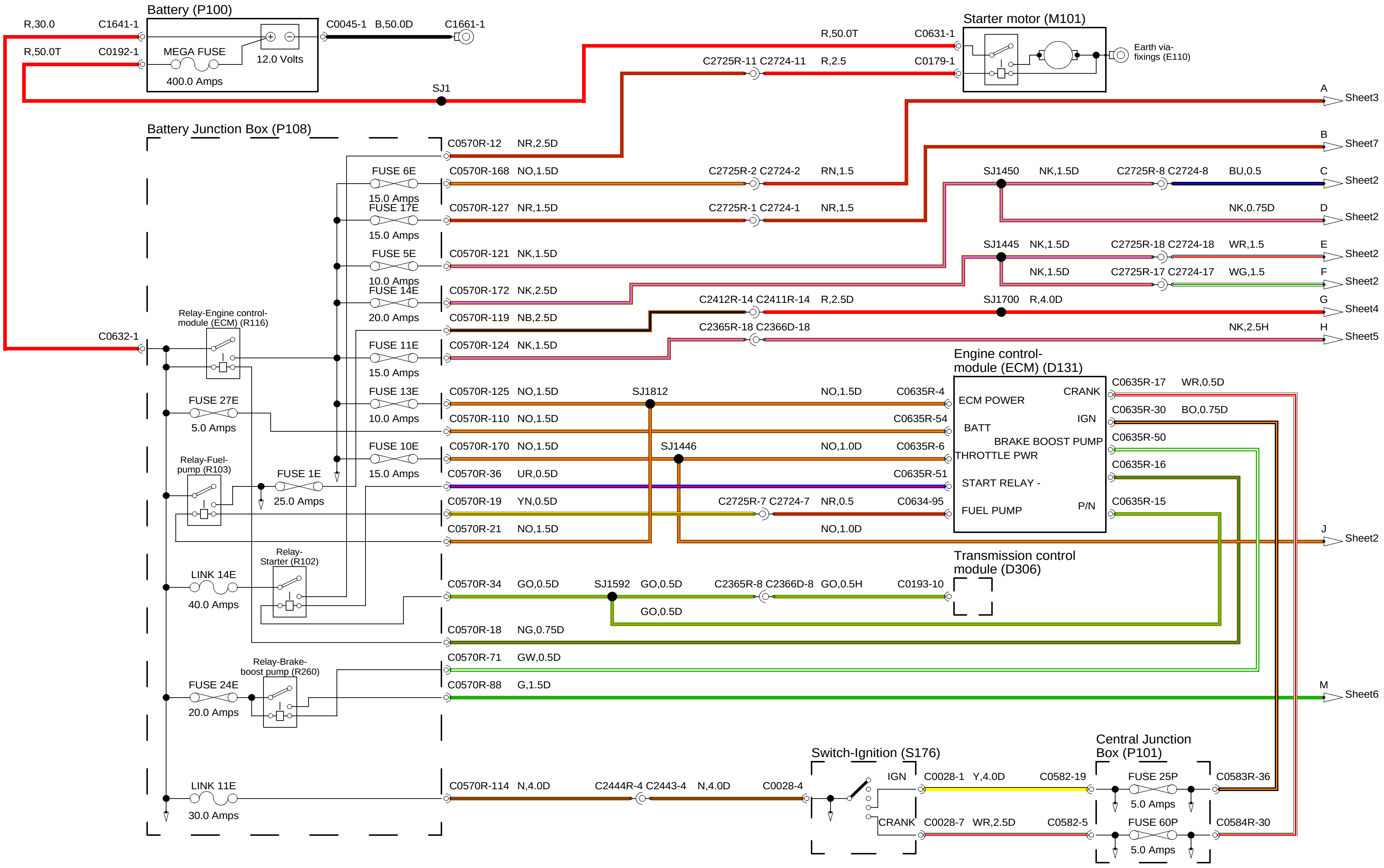

Engine control-
module (ECM) (D131)
COIL 1B
IGF2
COIL 1A
IGF 1
COIL 2A
COIL 2B
COIL 3A
COIL 3B
COIL 4B
COIL 4A
Ignition coil-5 (D237)
1b
C1771-4
C1771-3 BU,0.5
C1771-2
C1771-1 RW,0.5
C0634-60 GW,0.5
C0634-64 YB,0.5
SJ2
YB,0.5
Ignition coil-1 (D233)
1a
SJ5
RW,0.5 C0156-1
BU,0.5 C0156-3
C0156-4 GU,0.5 C0634-61
C0156-2 GB,0.5 SJ14 GB,0.5 C0634-62
Ignition coil-2 (D234)
2a
YB,0.5 C0052-2
C0052-3 BU,0.5
C0634-59 Y,0.5 C0052-4
C0052-1 RW,0.5
Ignition coil-6 (D238)
2b
RW,0.5 C1772-1
C1772-2 GB,0.5
BU,0.5 C1772-3
C1772-4 GW,0.5 C0634-58
Ignition coil-3 (D235)
3a
YB,0.5 C0276-2
C0276-3 BU,0.5
C0634-57 YR,0.5 C0276-4
C0276-1 R,0.5
Ignition coil-7 (D267)
3b
RW,0.5 C2087-1
C2087-2 GB,0.5
BU,0.5 C2087-3
C2087-4 GR,0.5 C0634-56
Ignition coil-8 (D268)
4b
YB,0.5 C2088-2
C2088-1 RW,0.5
C0634-54 YR,0.5 C2088-4
C2088-3
Ignition coil-4 (D236)
4a
RW,0.5 C1770-1
C1770-2 GB,0.5
C1770-3
C1770-4 GR,0.5 C0634-55
BU,0.5
SJ13
B,0.5
TO BE SAME LENGTH AS WIRE 138B
SJ6 B,0.5
TO BE SAME LENGTH AS WIRE 137B
SJ3 BU,0.5
Capacitor (G158)
RW,1.5 C1323-1
C1323-2 B,1.5
A
Sheet1
RN,1.5 C1323-3
B,1.5
B,1.5
C2649-1
TYPE 3
C2651-1
TYPE 3

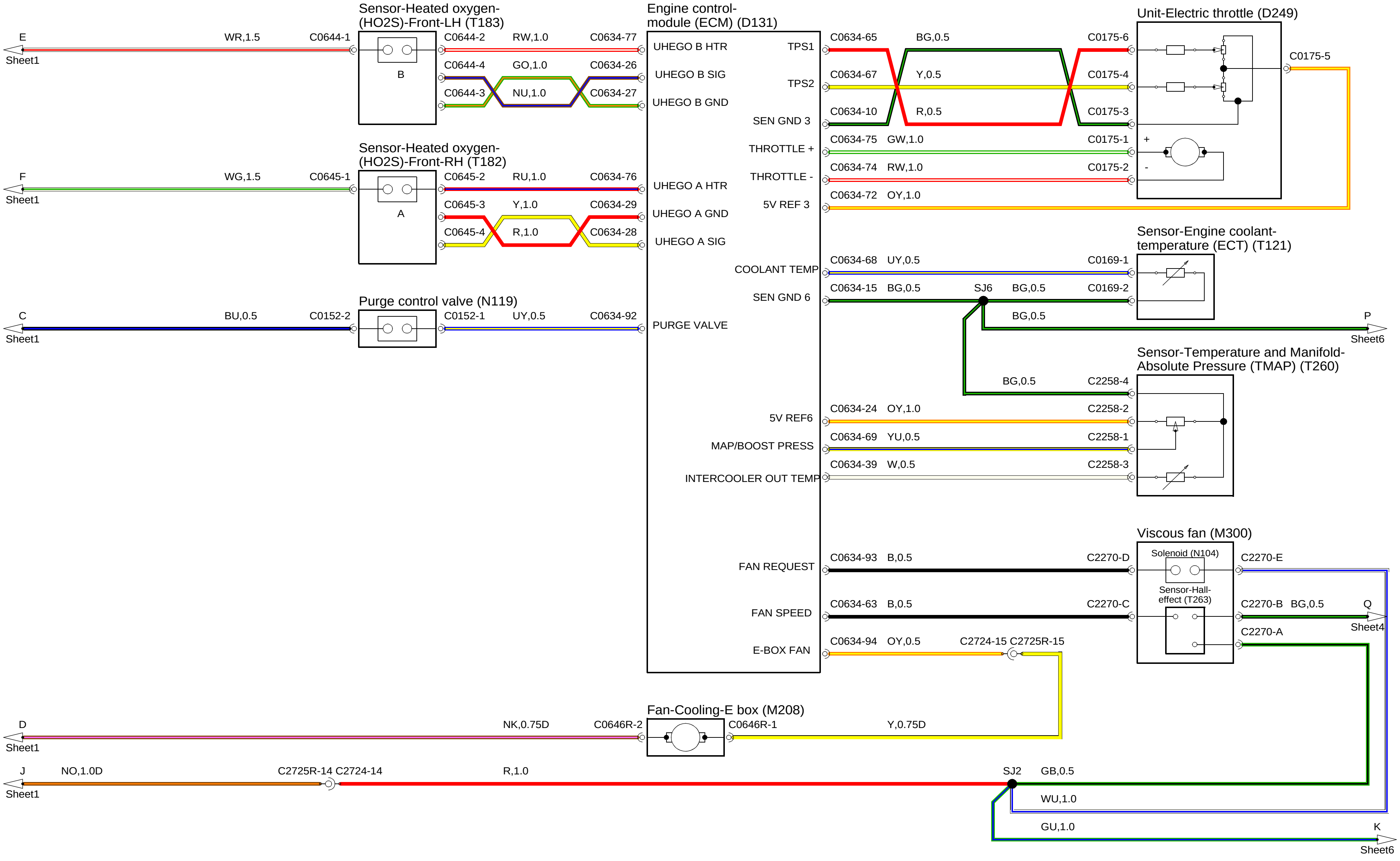

Sensor-Oil-temperature (T128)
BG,0.5
C0219-2
C0219-1
Y,0.5
C0634-23
Engine control-module (ECM) (D131)
OIL TEMP
CRANK +
CRANK -
5V REF 4
SRS SIGNAL
MAP
SEN GND 4
CRUISE SW -
FUEL TEMP CRUISE SW +
C0634-30
B,0.5
C0909-2 C0904-2
B,0.5
C0168-2
C0634-6
O,0.5
C0909-1 C0904-1
O,0.5
C0168-1
Sensor-Crankshaft-position (CKP) (T102)
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186-2
OY,1.0
C0634-48
C0186-1
BP,0.5
C0634-69
C0186-4
BG,0.5
SJ8
BG,0.5
C0634-11
C0635R-28
YG,0.5D
C2244R-7 C2242R-7
Restraints control module (D171)
YG,0.5D
C1649-17
Sensor-Temperature-Fuel rail (T125)
C2251-2
BG,0.5
C2251-1
YR,0.5
C0634-46
C0635R-35
R,0.5D
C2240R-21 C2238-21
C0635R-36
PU,0.5D
C2240R-22 C2238-22
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
Clock spring (S227)
C0082-5
PU,0.35D
C2147-9
N,0.35
C1254-1
C0082-8
R,0.35D
Unit-Fuel Tank (D179)
G
WP,2.5D
C0377-17 C0391-17
WP,2.5D
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
Sheet1

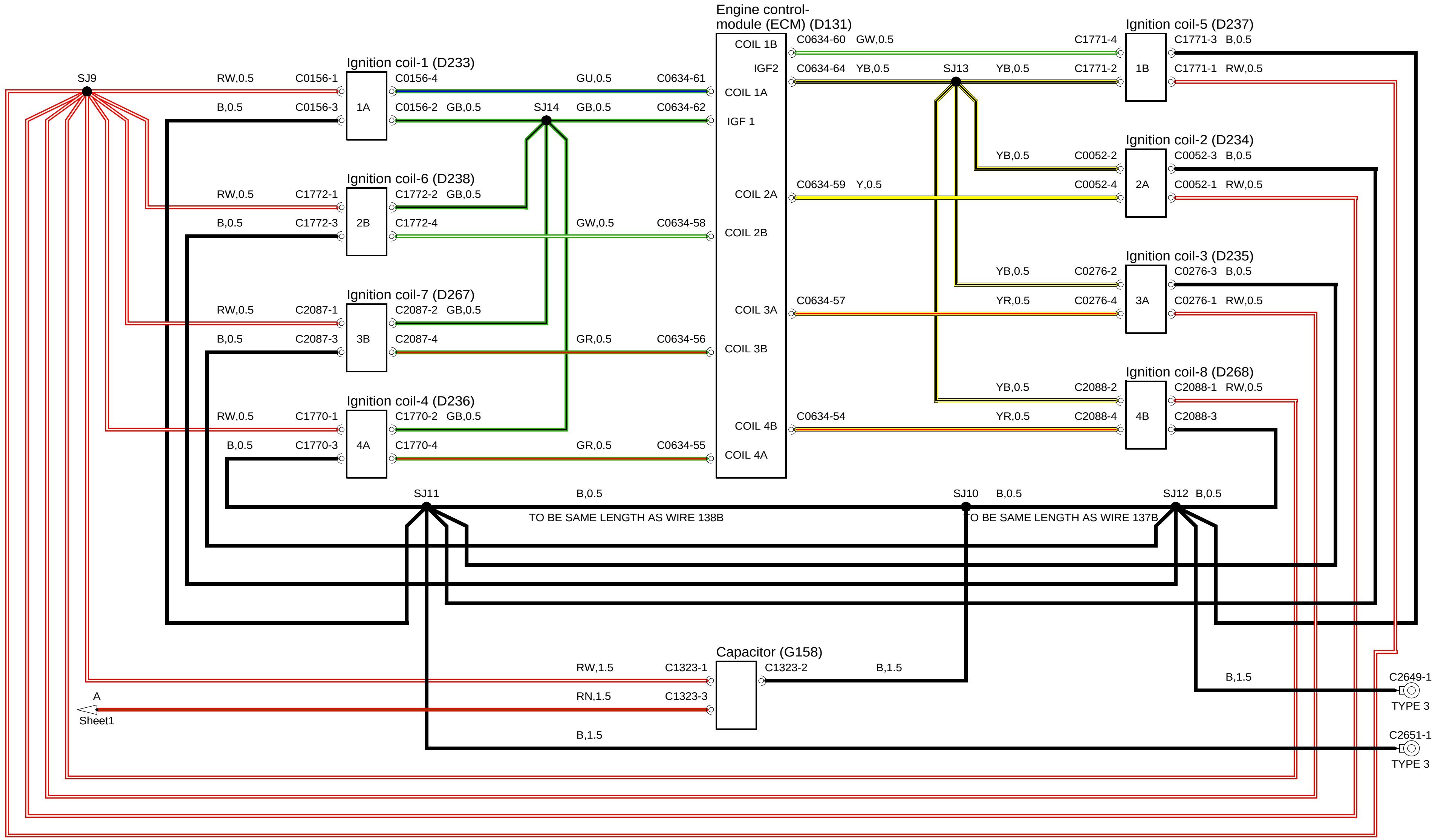

Sensor-Camshaft-position (CMP) (T107)
C0176-2
A
C0176-1
R,0.5
Y,0.5
C0634-34
C0634-7
Engine control-module (ECM) (D131)
CAM A +
CAM A GND
5V REF 1
DEMAND 1
GND 1
5V REF 2
CAM B +
DEMAND 2
CAM B GND
GND 2
BRAKE SW
ALT_CONTROL
ALT_MONITOR
HEGO B GND
HEGO B SIG
HEGO B HTR
HEGO A GND
HEGO A SIG
HEGO A HTR
Sensor-Position-Accelerator pedal (T113)
C0635R-32
R,0.5D
C2244R-15 C2242R-15
R,0.5D
C0787R-7
C0635R-24
YR,MAPCY
C2244R-16 C2242R-16
YLG,MAPFC
C0787R-2
C0635R-7
RB,MAPCY
C2244R-17 C2242R-17
RB,MAPFC
C0787R-1
C0635R-19
OY,0.5D
C2244R-18 C2242R-18
OY,0.5D
C0787R-6
C0635R-38
BG,MAPCZ
C2244R-21 C2242R-21
U,0.5D
C0787R-5
C0635R-8
U,MAPCZ
C2244R-22 C2242R-22
BG,0.5D
C0787R-3
Sensor-Camshaft-position (CMP) (T107)
C1463-1
B
C1463-2
N,0.5
G,0.5
C0634-33
C0634-8
ABS module (D277)
C0506R-30
GP,0.75D
SJ1882
GP,0.75D
C0635R-41
GP,1.5D
Stop lamp switch (S215)
C0075R-1
GP,1.5D
SJ1814
GP,1.5D
C2411R-2 C2412R-2
Generator (M100)
C0634-96
WR,1.0
C0053-2
C0634-3
WG,1.0
C0053-3
C0635R-34
WU,MAPCV
C0635R-26
RB,MAPCD
C0635R-47
G,0.5D
C2373R-2 C2374B-2
C0635R-22
U,MAPDM
C0635R-25
RB,MAPDM
C0635R-46
WO,0.5D
C2373R-5 C2374B-5
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
H
Sheet1
NK,2.5H
SJ444
NK,1.5H
C0642-1
C0642-2
WO,0.5H
A
C0642-4
RB,0.5H
C2374B-4 C2373R-4
C0642-3
U,0.5H
C2374B-3 C2373R-3
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H
C0643-1
C0643-2
G,0.5H
B
C0643-4
RB,0.5H
C2374B-1 C2373R-1
C0643-3
WU,0.5H
C2374B-7 C2373R-7

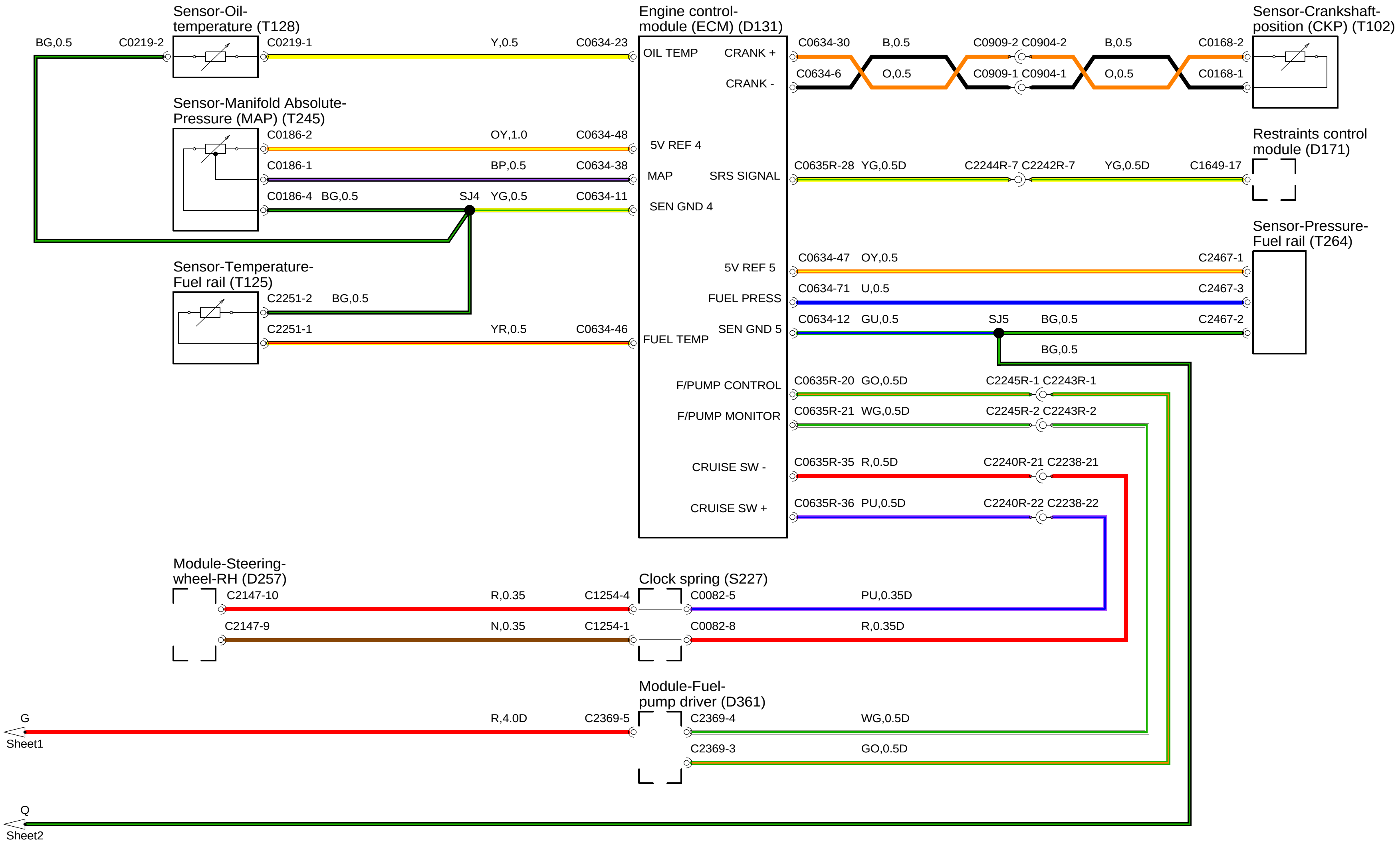

Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
SJ720
YN,0.5H
C2366B-4
C2365R-4
YN,MAPCX
C0635R-58
SJ721
YB,0.5H
C2366B-5
C2365R-5
YB,MAPCX
C0635R-45
SJ1176
YN,MAPCH
C0635R-57
SJ1177
YB,MAPCH
C0635R-44
CAN H IN
CAN L IN
CAN H OUT
CAN L OUT
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635R-2
B,1.0D
C0635R-3
B,1.0D
C0635R-1
B,1.5D
C0635R-5
B,1.5D
C2650R-1
TYPE 3
C0557R-1
TYPE 3
Sensor-Knock (KS)-LH (T321)
C0626-3
S,0.5
C0634-43
C0626-4
G,0.5
C0634-20
KNOCK 1B+
KNOCK 1B-
KNOCK 1A +
KNOCK 1A -
C0634-42
B,0.5
C0626-1
C0634-19
N,0.5
C0626-2
Sensor-Knock (KS)-RH (T320)
Sensor-Mass air-flow (MAF) (T115)
AFM IAT
MAF
MAF GND
C0634-66
U,0.5
C0149-4
C0634-70
GW,0.5
C0149-3
C0634-18
BP,0.5
C0149-2
C0149-5
BG,0.5
C0149-1
GU,1.0
K
Sheet2
P
Sheet2

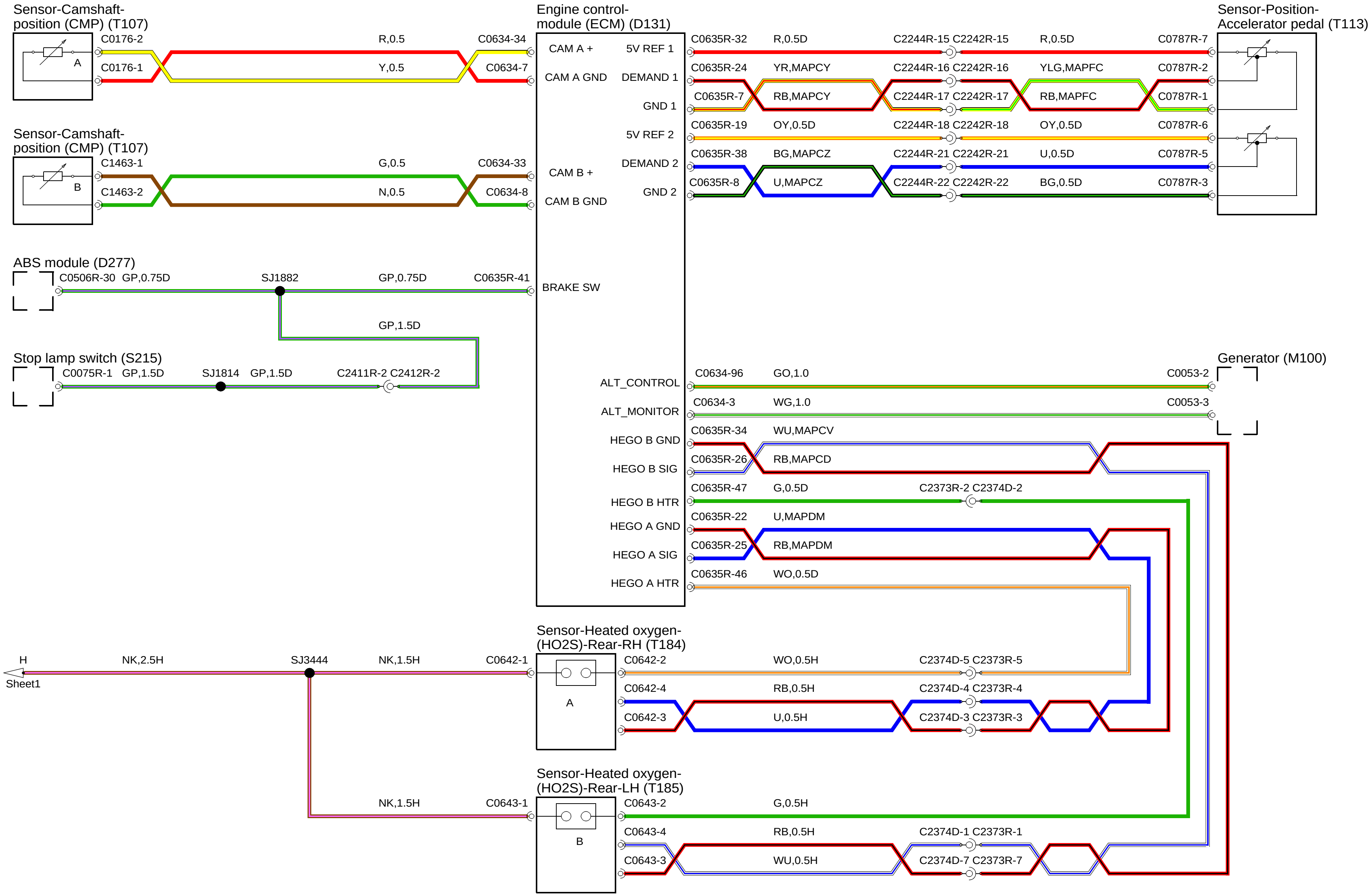

B
NR,1.5
Sheet1
SJ16
NR,1.0
SJ10
NR,0.5
C0522-2
Fuel injector-No.1 (T172)
1a
C0522-1 BG,0.5
C0634-78
Engine control-module (ECM) (D131)
INJ CYL 1A
NR,0.5
C0523-2
Fuel injector-No.2 (T173)
2a
C0523-1 BP,0.5
C0634-80
INJ CYL 2A
NR,0.5
C0524-2
Fuel injector-No.3 (T174)
3a
C0524-1 BG,0.5
C0634-82
INJ CYL 3A
NR,0.5
C0525-2
Fuel injector-No.4 (T175)
4a
C0525-1 BW,0.5
C0634-84
INJ CYL 4A
NR,1.0
SJ4
NR,0.5
C0526-2
Fuel injector-No.5 (T176)
1b
C0526-1 BR,0.5
C0634-79
INJ CYL 1B
NR,0.5
C0527-2
Fuel injector-No.6 (T177)
2b
C0527-1 BO,0.5
C0634-81
INJ CYL 2B
NR,0.5
C0528-2
Fuel injector-No.7 (T178)
3b
C0528-1 U,0.5
C0634-83
INJ CYL 3B
NR,0.5
C0529-2
Fuel injector-No.8 (T179)
4b
C0529-1 UY,0.5
C0634-85
INJ CYL 4B

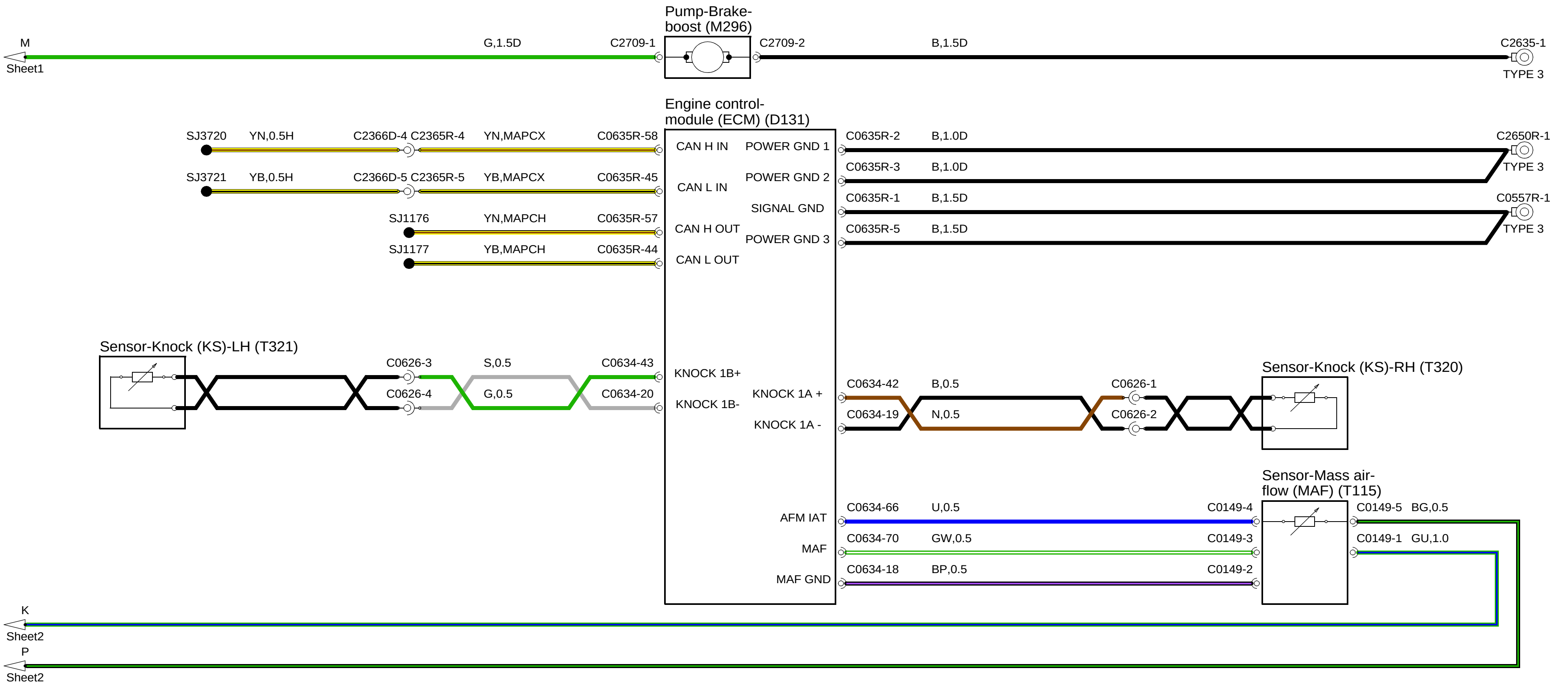

Battery (P100)
R,30.0
C1641-1
R,50.0T
C0192-1
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ1
Starter motor (M101)
R,50.0T
C0631-1
C2725R-11 C2724-11
R,2.5
C0179-1
Earth via-fixings (E110)
A
Sheet3
Battery Junction Box (P108)
C0570R-12
NR,2.5D
B
Sheet7
FUSE 6E
15.0 Amps
C0570R-168
NO,1.5D
C2725R-2 C2724-2
RN,1.5
SJ1450
NK,1.5D
C2725R-8 C2724-8
BU,0.5
C
Sheet2
FUSE 17E
15.0 Amps
C0570R-127
NR,1.5D
C2725R-1 C2724-1
NR,1.5
NK,0.75D
D
Sheet2
FUSE 5E
10.0 Amps
C0570R-121
NK,1.5D
SJ1445
NK,1.5D
C2725R-18 C2724-18
WR,1.5
E
Sheet2
FUSE 14E
20.0 Amps
C0570R-172
NK,2.5D
NK,1.5D
C2725R-17 C2724-17
WG,1.5
F
Sheet2
Relay-Engine control-module (ECM) (R116)
C2412R-14 C2411R-14
R,2.5D
SJ1700
R,4.0D
G
Sheet4
C0570R-119
NB,2.5D
C0632-1
C2365R-18 C2366D-18
NK,2.5H
H
Sheet5
FUSE 11E
15.0 Amps
C0570R-124
NK,1.5D
Engine control-module (ECM) (D131)
FUSE 27E
5.0 Amps
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D
SJ1812
NO,1.5D
C0635R-4
CRANK
ECM POWER
C0635R-17
WR,0.5D
C0570R-110
NO,1.5D
C0635R-54
IGN
BATT
C0635R-30
BO,0.75D
FUSE 10E
15.0 Amps
C0570R-170
NO,1.5D
SJ1446
NO,1.0D
C0635R-6
BRAKE BOOST PUMP
THROTTLE PWR
C0635R-50
Relay-Fuel-pump (R103)
FUSE 1E
25.0 Amps
C0570R-36
UR,0.5D
C0635R-51
START RELAY -
C0635R-16
C0570R-19
YN,0.5D
C2725R-7 C2724-7
NR,0.5
C0634-95
FUEL PUMP
P/N
C0635R-15
C0570R-21
NO,1.5D
NO,1.0D
J
Sheet2
Relay-Starter (R102)
Transmission control module (D306)
LINK 14E
40.0 Amps
C0570R-34
GO,0.5D
SJ1592
GO,0.5D
C2365R-8 C2366D-8
GO,0.5H
C0193-10
GO,0.5D
C0570R-18
NG,0.75D
Relay-Brake-boost pump (R260)
C0570R-71
GW,0.5D
FUSE 24E
20.0 Amps
C0570R-88
G,1.5D
M
Sheet6
Switch-Ignition (S176)
Central Junction Box (P101)
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 25P
5.0 Amps
C0583R-36
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
C0028-4
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
C0584R-30

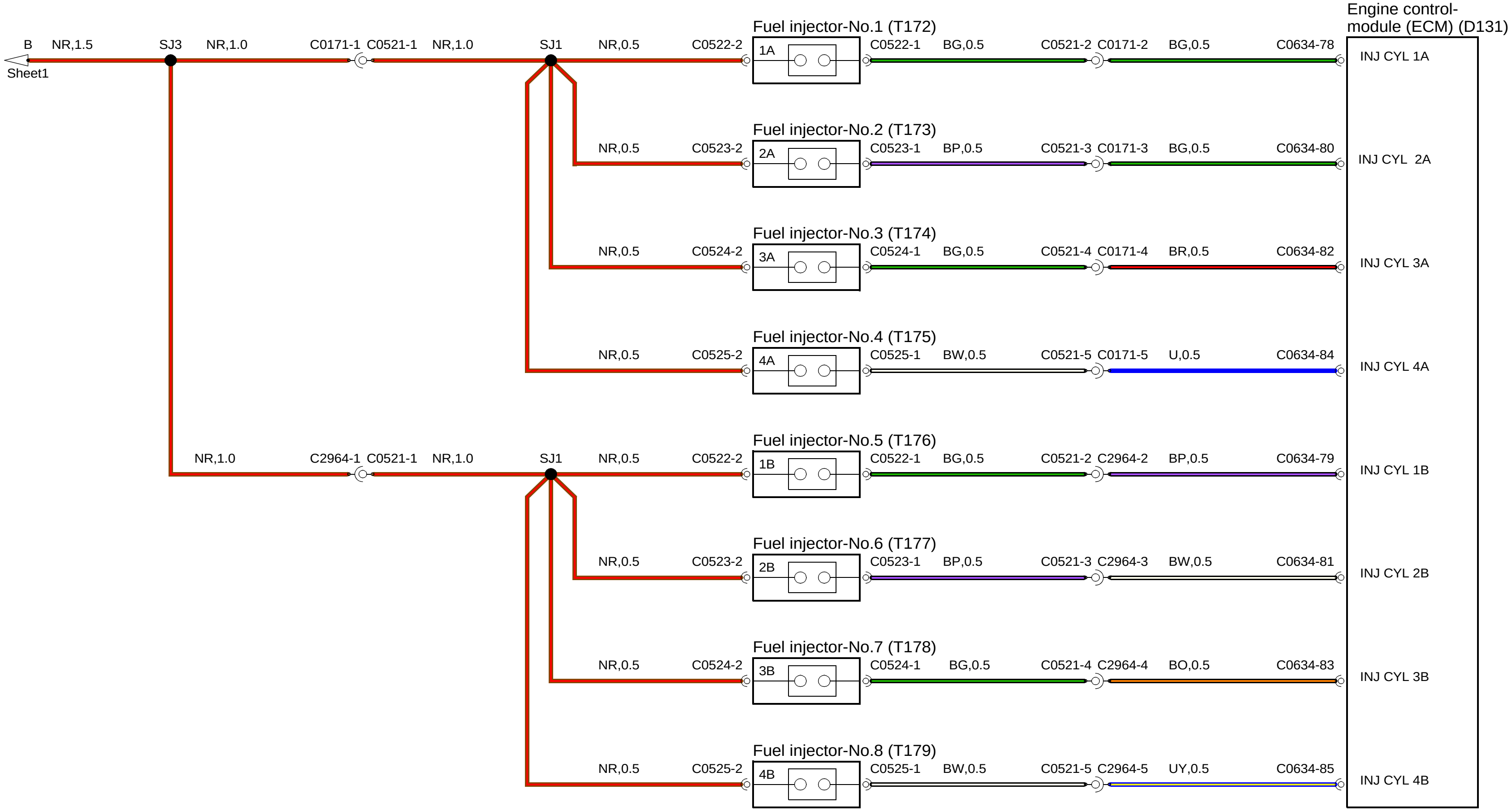

Sensor-Heated oxygen-(HO2S)-Front-LH (T183)
Engine control-module (ECM) (D131)
Unit-Electric throttle (D249)
E
Sheet1
WR,1.5
C0644-1
B
C0644-2
RW,1.0
C0634-77
C0644-4
GO,1.0
C0634-26
C0644-3
NU,1.0
C0634-27
UHEGO B HTR
UHEGO B SIG
UHEGO B GND
TPS1
TPS2
SEN GND 3
THROTTLE +
THROTTLE -
5V REF 3
C0634-65
BG,0.5
C0175-6
C0634-67
Y,0.5
C0175-4
C0634-10
R,0.5
C0175-3
C0634-75
GW,1.0
C0175-1
C0634-74
RW,1.0
C0175-2
C0634-72
OY,1.0
C0175-5
+
-
Sensor-Heated oxygen-(HO2S)-Front-RH (T182)
F
Sheet1
WG,1.5
C0645-1
A
C0645-2
RU,1.0
C0634-76
C0645-3
Y,1.0
C0634-29
C0645-4
R,1.0
C0634-28
UHEGO A HTR
UHEGO A GND
UHEGO A SIG
Sensor-Engine coolant-temperature (ECT) (T121)
COOLANT TEMP
SEN GND 6
C0634-68
UY,0.5
C0169-1
C0634-15
BG,0.5
SJ6
BG,0.5
C0169-2
BG,0.5
P
Sheet6
Purge control valve (N119)
C
Sheet1
BU,0.5
C0152-2
C0152-1
UY,0.5
C0634-92
PURGE VALVE
Sensor-Temperature and Manifold-Absolute Pressure (TMAP) (T260)
BG,0.5
C2258-4
5V REF6
MAP/BOOST PRESS
INTERCOOLER OUT TEMP
C0634-24
OY,1.0
C2258-2
C0634-69
YU,0.5
C2258-1
C0634-39
W,0.5
C2258-3
Viscous fan (M300)
Solenoid (N104)
Sensor-Hall-effect (T263)
FAN REQUEST
FAN SPEED
E-BOX FAN
C0634-93
B,0.5
C2270-D
C2270-E
C0634-63
B,0.5
C2270-C
C2270-B
BG,0.5
Q
Sheet4
C2270-A
C0634-94
OY,0.5
C2724-15 C2725R-15
Fan-Cooling-E box (M208)
D
Sheet1
NK,0.75D
C0646R-2
C0646R-1
Y,0.75D
J
Sheet1
NO,1.0D
C2725R-14 C2724-14
R,1.0
SJ2
GB,0.5
WU,1.0
GU,1.0
K
Sheet6

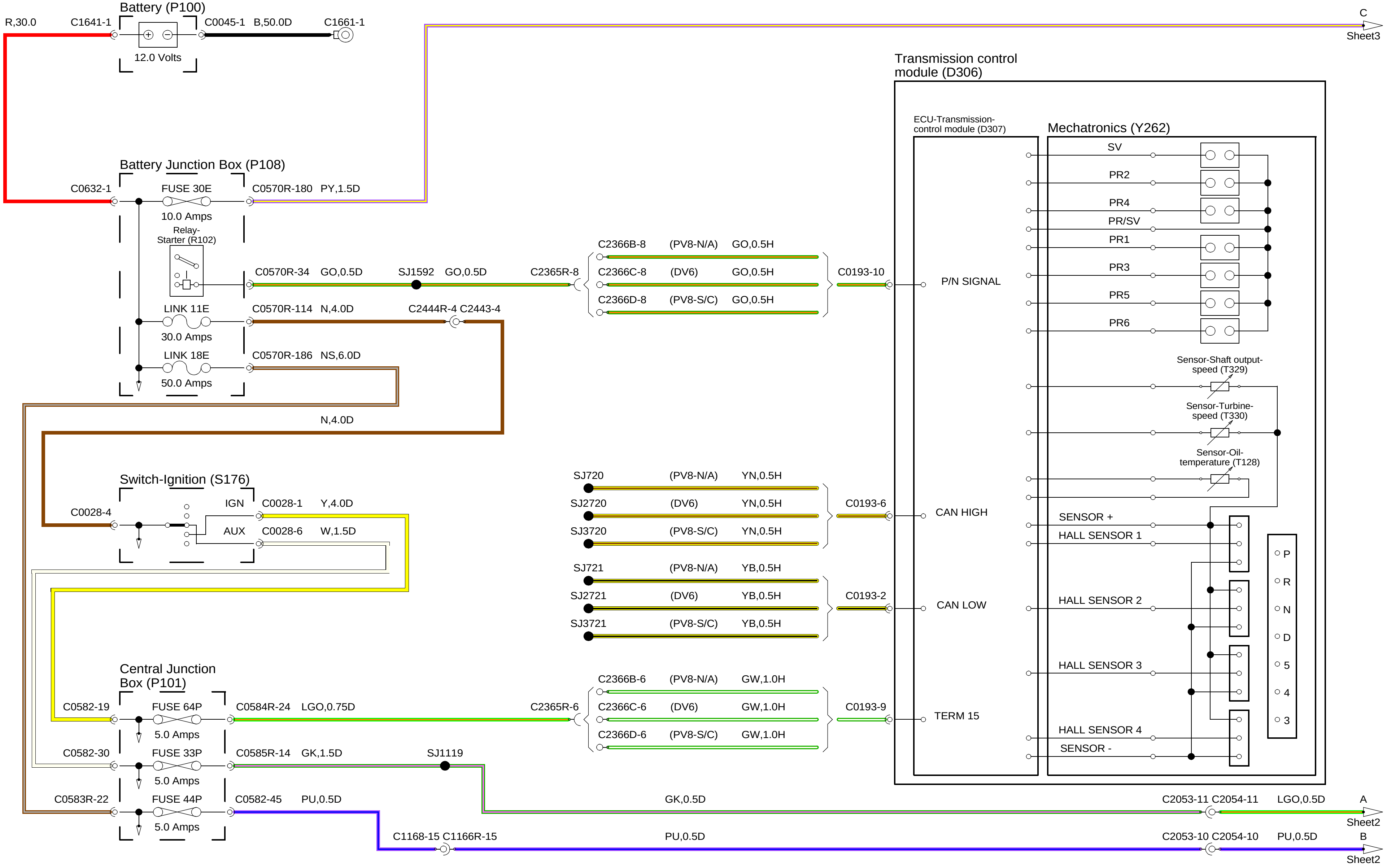

Engine control-
module (ECM) (D131)
COIL 1B
IGF2
COIL 1A
IGF 1
COIL 2A
COIL 2B
COIL 3A
COIL 3B
COIL 4B
COIL 4A
Ignition coil-1 (D233)
1A
Ignition coil-6 (D238)
2B
Ignition coil-7 (D267)
3B
Ignition coil-4 (D236)
4A
Ignition coil-5 (D237)
1B
Ignition coil-2 (D234)
2A
Ignition coil-3 (D235)
3A
Ignition coil-8 (D268)
4B
SJ9
RW,0.5
C0156-1
B,0.5
C0156-3
C0156-4
GU,0.5
C0634-61
C0156-2 GB,0.5
SJ14
GB,0.5
C0634-62
RW,0.5
C1772-1
C1772-2 GB,0.5
B,0.5
C1772-3
C1772-4
GW,0.5
C0634-58
RW,0.5
C2087-1
C2087-2 GB,0.5
B,0.5
C2087-3
C2087-4
GR,0.5
C0634-56
RW,0.5
C1770-1
C1770-2 GB,0.5
B,0.5
C1770-3
C1770-4
GR,0.5
C0634-55
C0634-60 GW,0.5
C1771-4
C1771-3 B,0.5
C0634-64 YB,0.5
SJ13
YB,0.5
C1771-2
C1771-1 RW,0.5
YB,0.5
C0052-2
C0052-3 B,0.5
C0634-59 Y,0.5
C0052-4
C0052-1 RW,0.5
YB,0.5
C0276-2
C0276-3 B,0.5
C0634-57
YR,0.5
C0276-4
C0276-1 RW,0.5
YB,0.5
C2088-2
C2088-1 RW,0.5
C0634-54
YR,0.5
C2088-4
C2088-3
SJ11
B,0.5
SJ10 B,0.5
SJ12 B,0.5
TO BE SAME LENGTH AS WIRE 138B
TO BE SAME LENGTH AS WIRE 137B
Capacitor (G158)
RW,1.5
C1323-1
C1323-2
B,1.5
A
Sheet1
RN,1.5
C1323-3
B,1.5
B,1.5
C2649-1
TYPE 3
C2651-1
TYPE 3

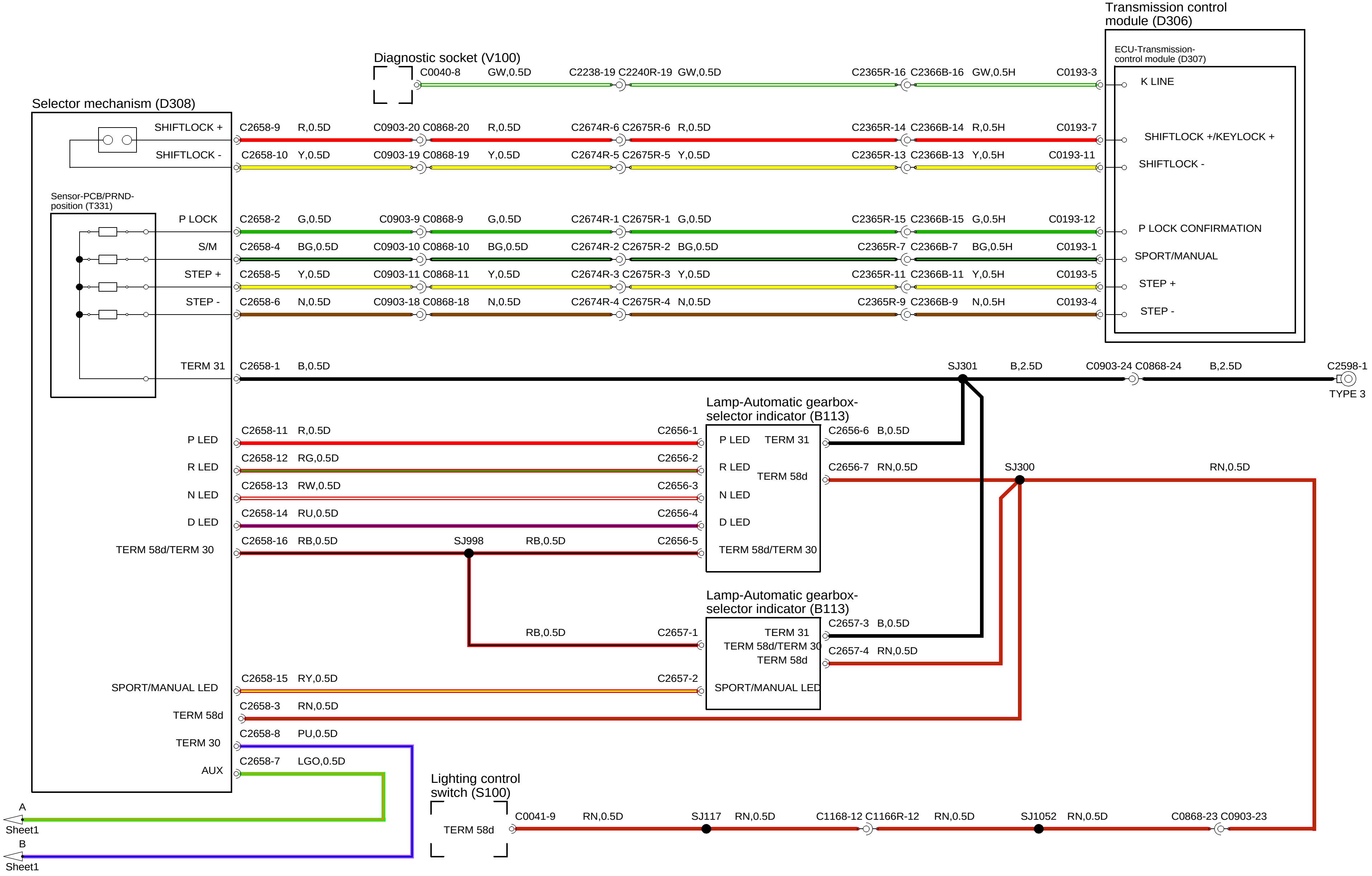

Sensor-Oil-temperature (T128)
BG,0.5
C0219-2
C0219-1
Y,0.5
C0634-23
Engine control-module (ECM) (D131)
OIL TEMP
CRANK +
CRANK -
5V REF 4
MAP
SRS SIGNAL
SEN GND 4
5V REF 5
FUEL PRESS
SEN GND 5
FUEL TEMP
F/PUMP CONTROL
F/PUMP MONITOR
CRUISE SW -
CRUISE SW +
C0634-30
B,0.5
C0909-2 C0904-2
B,0.5
C0168-2
C0634-6
O,0.5
C0909-1 C0904-1
O,0.5
C0168-1
Sensor-Crankshaft-position (CKP) (T102)
Sensor-Manifold Absolute-Pressure (MAP) (T245)
C0186-2
OY,1.0
C0634-48
C0186-1
BP,0.5
C0634-38
C0186-4
BG,0.5
SJ4
YG,0.5
C0634-11
Restraints control module (D171)
C0635R-28
YG,0.5D
C2244R-7 C2242R-7
YG,0.5D
C1649-17
Sensor-Pressure-Fuel rail (T264)
C0634-47
OY,0.5
C2467-1
C0634-71
U,0.5
C2467-3
C0634-12
GU,0.5
SJ5
BG,0.5
C2467-2
BG,0.5
Sensor-Temperature-Fuel rail (T125)
C2251-2
BG,0.5
C2251-1
YR,0.5
C0634-46
C0635R-20
GO,0.5D
C2245R-1 C2243R-1
C0635R-21
WG,0.5D
C2245R-2 C2243R-2
C0635R-35
R,0.5D
C2240R-21 C2238-21
C0635R-36
PU,0.5D
C2240R-22 C2238-22
Module-Steering-wheel-RH (D257)
C2147-10
R,0.35
C1254-4
C2147-9
N,0.35
C1254-1
Clock spring (S227)
C0082-5
PU,0.35D
C0082-8
R,0.35D
Module-Fuel-pump driver (D361)
G
Sheet1
R,4.0D
C2369-5
C2369-4
WG,0.5D
C2369-3
GO,0.5D
Q
Sheet2

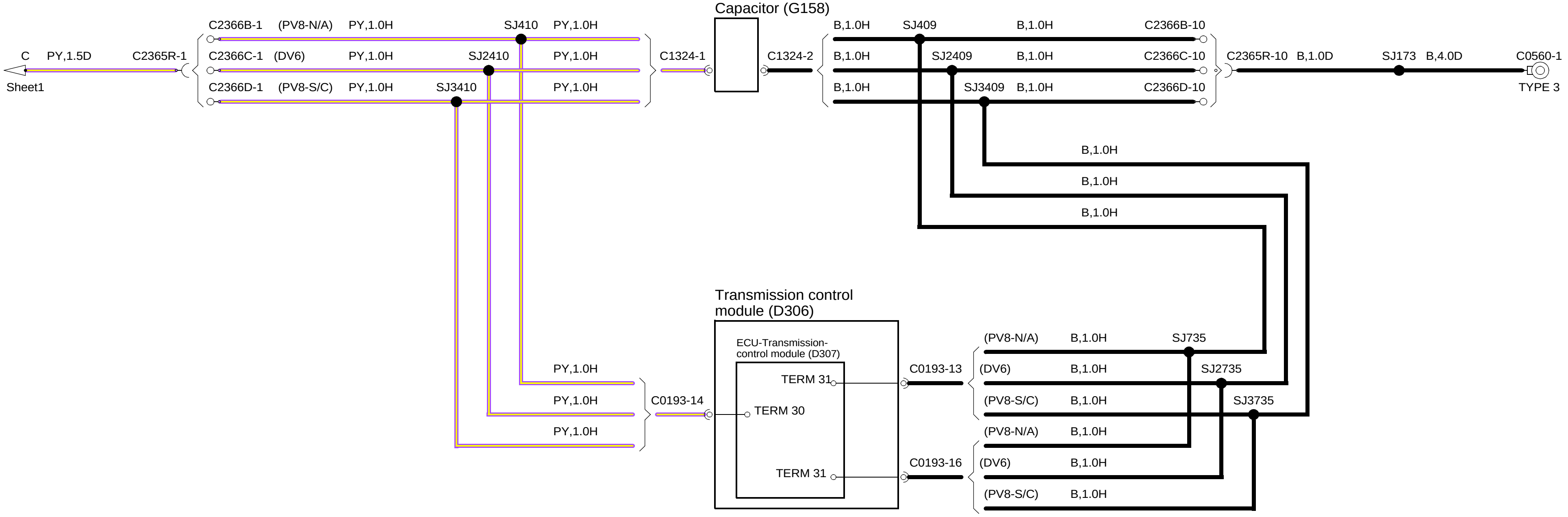

Sensor-Camshaft-position (CMP) (T107)
C0176-2
A
C0176-1
R,0.5
Y,0.5
C0634-34
C0634-7
Engine control-module (ECM) (D131)
CAM A +
CAM A GND
5V REF 1
DEMAND 1
GND 1
5V REF 2
DEMAND 2
GND 2
CAM B +
CAM B GND
C0635R-32
R,0.5D
C2244R-15 C2242R-15
R,0.5D
C0787R-7
C0635R-24
YR,MAPCY
C2244R-16 C2242R-16
YLG,MAPFC
C0787R-2
C0635R-7
RB,MAPCY
C2244R-17 C2242R-17
RB,MAPFC
C0787R-1
C0635R-19
OY,0.5D
C2244R-18 C2242R-18
OY,0.5D
C0787R-6
C0635R-38
BG,MAPCZ
C2244R-21 C2242R-21
U,0.5D
C0787R-5
C0635R-8
U,MAPCZ
C2244R-22 C2242R-22
BG,0.5D
C0787R-3
Sensor-Position-Accelerator pedal (T113)
Sensor-Camshaft-position (CMP) (T107)
C1463-1
B
C1463-2
G,0.5
N,0.5
C0634-33
C0634-8
ABS module (D277)
C0506R-30 GP,0.75D
SJ1882
GP,0.75D
C0635R-41
BRAKE SW
GP,1.5D
Stop lamp switch (S215)
C0075R-1 GP,1.5D
SJ1814 GP,1.5D
C2411R-2 C2412R-2
ALT_CONTROL
ALT_MONITOR
HEGO B GND
HEGO B SIG
HEGO B HTR
HEGO A GND
HEGO A SIG
HEGO A HTR
C0634-96
GO,1.0
C0053-2
Generator (M100)
C0634-3
WG,1.0
C0053-3
C0635R-34
WU,MAPCV
C0635R-26
RB,MAPCD
C0635R-47
G,0.5D
C2373R-2 C2374D-2
C0635R-22
U,MAPDM
C0635R-25
RB,MAPDM
C0635R-46
WO,0.5D
Sensor-Heated oxygen-(HO2S)-Rear-RH (T184)
H
Sheet1
NK,2.5H
SJ3444
NK,1.5H
C0642-1
A
C0642-2
WO,0.5H
C2374D-5 C2373R-5
C0642-4
RB,0.5H
C2374D-4 C2373R-4
C0642-3
U,0.5H
C2374D-3 C2373R-3
Sensor-Heated oxygen-(HO2S)-Rear-LH (T185)
NK,1.5H
C0643-1
B
C0643-2
G,0.5H
C0643-4
RB,0.5H
C2374D-1 C2373R-1
C0643-3
WU,0.5H
C2374D-7 C2373R-7

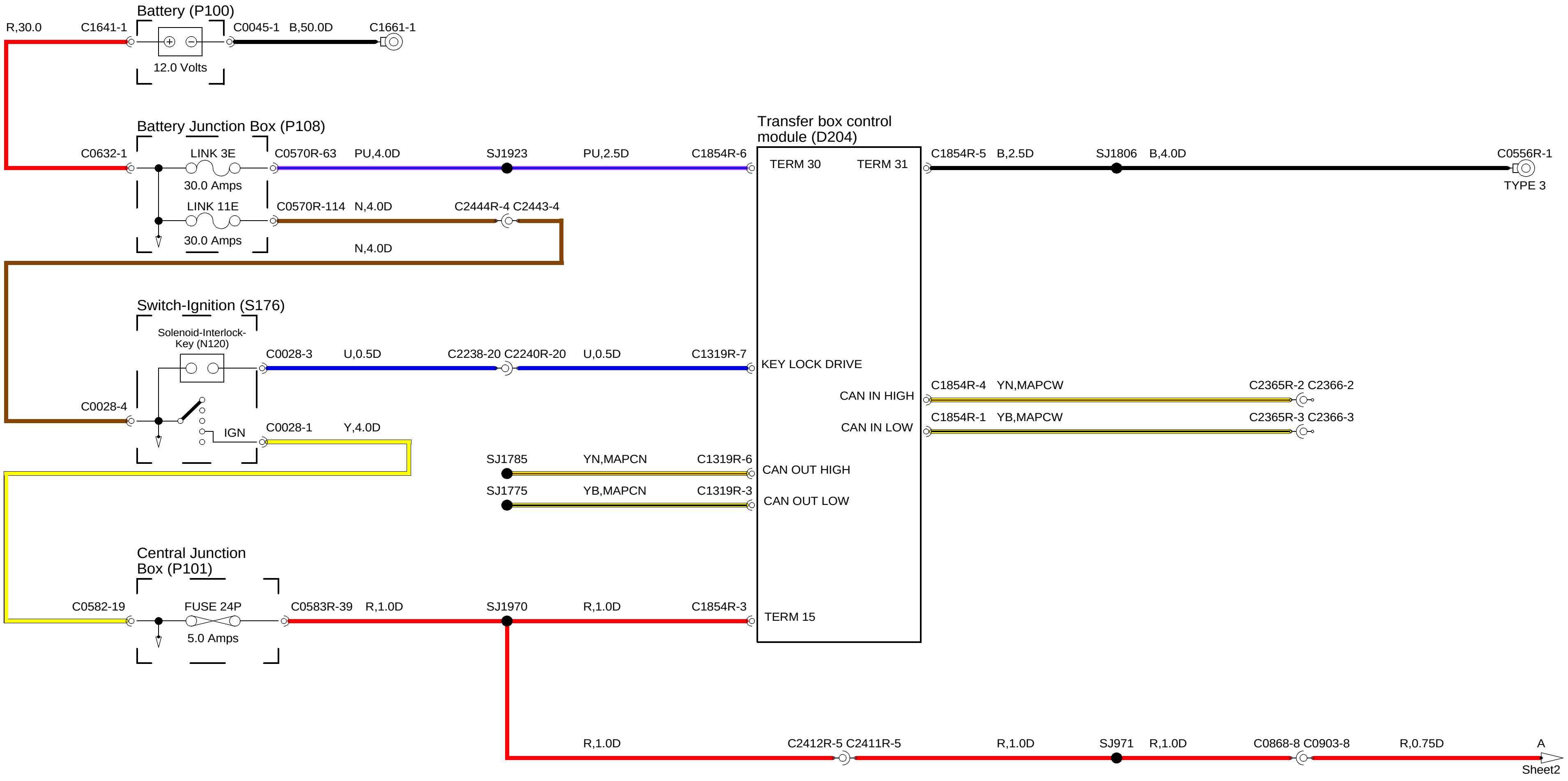

Pump-Brake-boost (M296)
M
Sheet1
G,1.5D
C2709-1
C2709-2
B,1.5D
C2635-1
TYPE 3
Engine control-module (ECM) (D131)
SJ3720
YN,0.5H
C2366D-4
C2365R-4
YN,MAPCX
C0635R-58
SJ3721
YB,0.5H
C2366D-5
C2365R-5
YB,MAPCX
C0635R-45
SJ1176
YN,MAPCH
C0635R-57
SJ1177
YB,MAPCH
C0635R-44
CAN H IN
CAN L IN
CAN H OUT
CAN L OUT
POWER GND 1
POWER GND 2
SIGNAL GND
POWER GND 3
C0635R-2
B,1.0D
C2650R-1
C0635R-3
B,1.0D
TYPE 3
C0635R-1
B,1.5D
C0557R-1
C0635R-5
B,1.5D
TYPE 3
Sensor-Knock (KS)-LH (T321)
C0626-3
S,0.5
C0634-43
C0626-4
G,0.5
C0634-20
KNOCK 1B+
KNOCK 1B-
KNOCK 1A +
KNOCK 1A -
C0634-42
B,0.5
C0626-1
C0634-19
N,0.5
C0626-2
Sensor-Knock (KS)-RH (T320)
Sensor-Mass air-flow (MAF) (T115)
AFM IAT
MAF
MAF GND
C0634-66
U,0.5
C0149-4
C0634-70
GW,0.5
C0149-3
C0634-18
BP,0.5
C0149-2
C0149-5
BG,0.5
C0149-1
GU,1.0
K
Sheet2
P
Sheet2

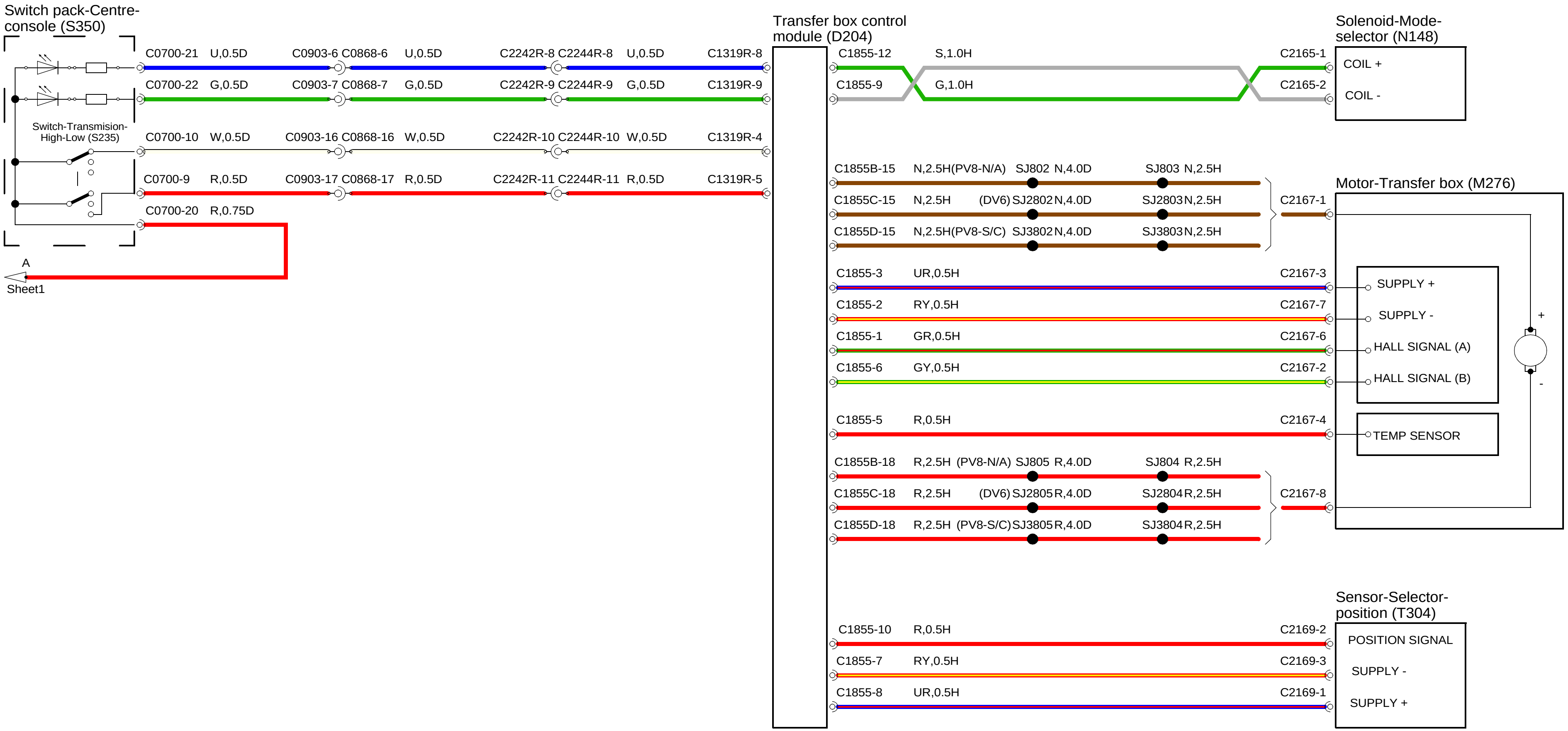

Engine control-
module (ECM) (D131)
B
NR,1.5
Sheet1
SJ3
NR,1.0
C0171-1
C0521-1
NR,1.0
SJ1
NR,0.5
C0522-2
Fuel injector-No.1 (T172)
1A
C0522-1
BG,0.5
C0521-2
C0171-2
BG,0.5
C0634-78
INJ CYL 1A
NR,0.5
C0523-2
Fuel injector-No.2 (T173)
2A
C0523-1
BP,0.5
C0521-3
C0171-3
BG,0.5
C0634-80
INJ CYL 2A
NR,0.5
C0524-2
Fuel injector-No.3 (T174)
3A
C0524-1
BG,0.5
C0521-4
C0171-4
BR,0.5
C0634-82
INJ CYL 3A
NR,0.5
C0525-2
Fuel injector-No.4 (T175)
4A
C0525-1
BW,0.5
C0521-5
C0171-5
U,0.5
C0634-84
INJ CYL 4A
NR,1.0
C2964-1
C0521-1
NR,1.0
SJ1
NR,0.5
C0522-2
Fuel injector-No.5 (T176)
1B
C0522-1
BG,0.5
C0521-2
C2964-2
BP,0.5
C0634-79
INJ CYL 1B
NR,0.5
C0523-2
Fuel injector-No.6 (T177)
2B
C0523-1
BP,0.5
C0521-3
C2964-3
BW,0.5
C0634-81
INJ CYL 2B
NR,0.5
C0524-2
Fuel injector-No.7 (T178)
3B
C0524-1
BG,0.5
C0521-4
C2964-4
BO,0.5
C0634-83
INJ CYL 3B
NR,0.5
C0525-2
Fuel injector-No.8 (T179)
4B
C0525-1
BW,0.5
C0521-5
C2964-5
UY,0.5
C0634-85
INJ CYL 4B

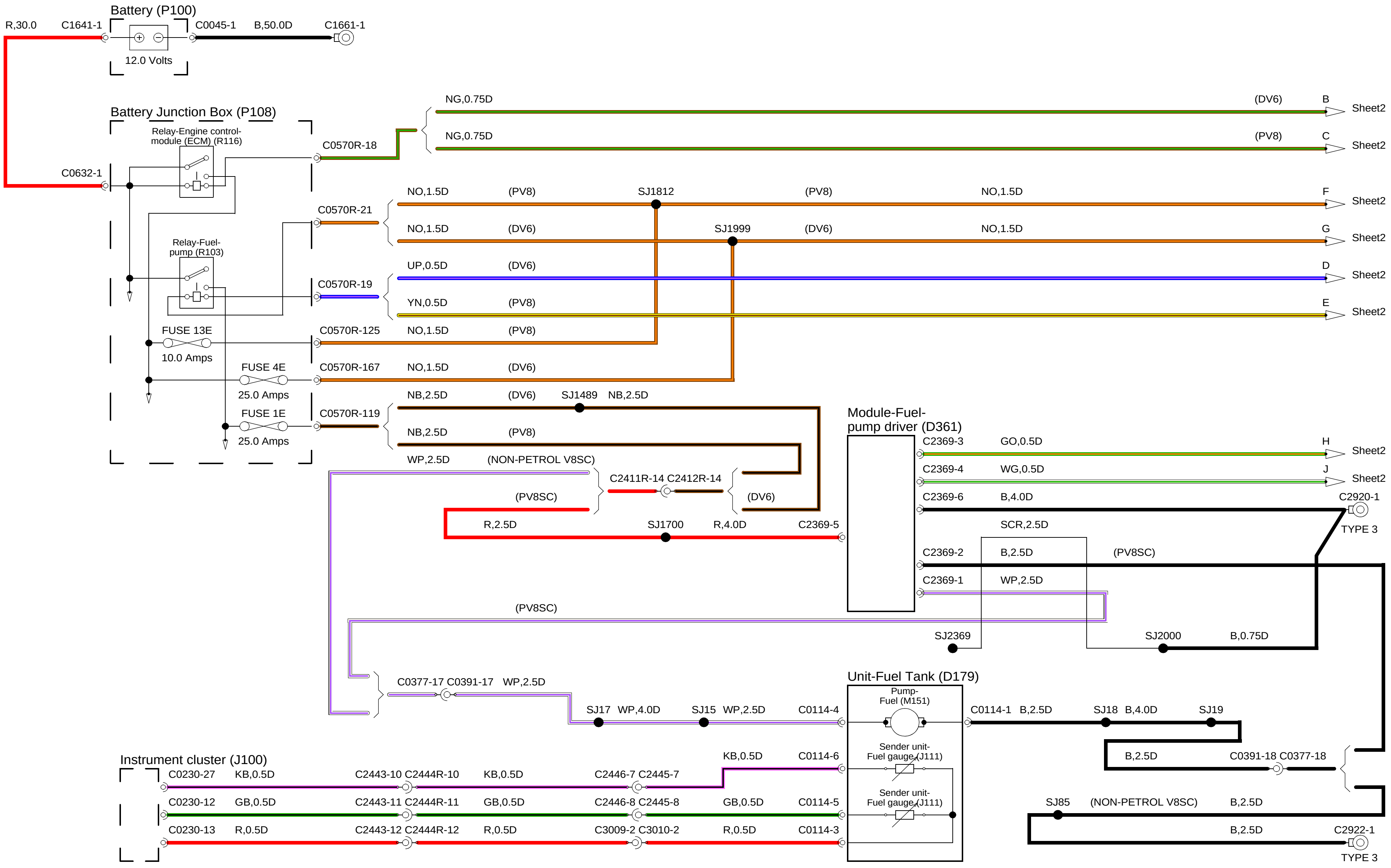

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
C
Sheet3
Transmission control module (D306)
ECU-Transmission-control module (D307)
Mechatronics (Y262)
SV
PR2
PR4
PR/SV
PR1
PR3
PR5
PR6
Battery Junction Box (P108)
C0632-1
FUSE 30E
10.0 Amps
C0570R-180
PY,1.5D
Relay-Starter (R102)
C2366B-8
(PV8-N/A)
GO,0.5H
C0570R-34
GO,0.5D
SJ1592
GO,0.5D
C2365R-8
C2366C-8
(DV6)
GO,0.5H
C0193-10
P/N SIGNAL
C2366D-8
(PV8-S/C)
GO,0.5H
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
Sensor-Shaft output-speed (T329)
Sensor-Turbine-speed (T330)
N,4.0D
Sensor-Oil-temperature (T128)
Switch-Ignition (S176)
SJ720
(PV8-N/A)
YN,0.5H
C0028-4
IGN
C0028-1
Y,4.0D
SJ2720
(DV6)
YN,0.5H
C0193-6
CAN HIGH
SENSOR +
AUX
C0028-6
W,1.5D
SJ3720
(PV8-S/C)
YN,0.5H
HALL SENSOR 1
P
R
N
D
5
4
3
SJ721
(PV8-N/A)
YB,0.5H
SJ2721
(DV6)
YB,0.5H
C0193-2
CAN LOW
HALL SENSOR 2
SJ3721
(PV8-S/C)
YB,0.5H
HALL SENSOR 3
Central Junction Box (P101)
C2366B-6
(PV8-N/A)
GW,1.0H
C0582-19
FUSE 64P
5.0 Amps
C0584R-24
LGO,0.75D
C2365R-6
C2366C-6
(DV6)
GW,1.0H
C0193-9
TERM 15
C2366D-6
(PV8-S/C)
GW,1.0H
HALL SENSOR 4
C0582-30
FUSE 33P
5.0 Amps
C0585R-14
GK,1.5D
SJ1119
SENSOR -
C0583R-22
FUSE 44P
5.0 Amps
C0582-45
PU,0.5D
GK,0.5D
C2053-11 C2054-11
LGO,0.5D
A
Sheet2
C1168-15 C1166R-15
PU,0.5D
C2053-10 C2054-10
PU,0.5D
B
Sheet2

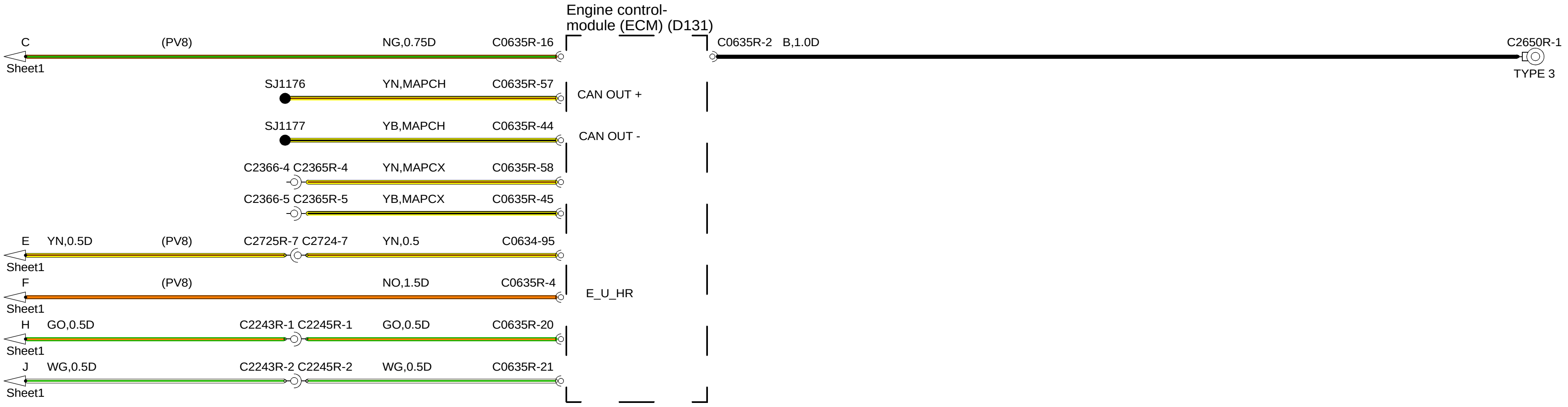

Transmission control module (D306)
ECU-Transmission-control module (D307)
K LINE
SHIFTLOCK +/KEYLOCK +
SHIFTLOCK -
P LOCK CONFIRMATION
SPORT/MANUAL
STEP +
STEP -
Diagnostic socket (V100)
C0040-8
GW,0.5D
C2238-19 C2240R-19
GW,0.5D
C2365R-16 C2366B-16
GW,0.5H
C0193-3
Selector mechanism (D308)
SHIFTLOCK +
SHIFTLOCK -
C2658-9
R,0.5D
C0903-20 C0868-20
R,0.5D
C2674R-6 C2675R-6
R,0.5D
C2365R-14 C2366B-14
R,0.5H
C0193-7
C2658-10
Y,0.5D
C0903-19 C0868-19
Y,0.5D
C2674R-5 C2675R-5
Y,0.5D
C2365R-13 C2366B-13
Y,0.5H
C0193-11
Sensor-PCB/PRND-position (T331)
P LOCK
C2658-2
G,0.5D
C0903-9 C0868-9
G,0.5D
C2674R-1 C2675R-1
G,0.5D
C2365R-15 C2366B-15
G,0.5H
C0193-12
S/M
C2658-4
BG,0.5D
C0903-10 C0868-10
BG,0.5D
C2674R-2 C2675R-2
BG,0.5D
C2365R-7 C2366B-7
BG,0.5H
C0193-1
STEP +
C2658-5
Y,0.5D
C0903-11 C0868-11
Y,0.5D
C2674R-3 C2675R-3
Y,0.5D
C2365R-11 C2366B-11
Y,0.5H
C0193-5
STEP -
C2658-6
N,0.5D
C0903-18 C0868-18
N,0.5D
C2674R-4 C2675R-4
N,0.5D
C2365R-9 C2366B-9
N,0.5H
C0193-4
TERM 31
C2658-1
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Lamp-Automatic gearbox-selector indicator (B113)
P LED
C2658-11
R,0.5D
C2656-1
P LED
TERM 31
C2656-6
B,0.5D
R LED
C2658-12
RG,0.5D
C2656-2
R LED
TERM 58d
C2656-7
RN,0.5D
SJ300
RN,0.5D
N LED
C2658-13
RW,0.5D
C2656-3
N LED
D LED
C2658-14
RU,0.5D
C2656-4
D LED
TERM 58d/TERM 30
C2658-16
RB,0.5D
SJ998
RB,0.5D
C2656-5
TERM 58d/TERM 30
Lamp-Automatic gearbox-selector indicator (B113)
RB,0.5D
C2657-1
TERM 31
TERM 58d/TERM 30
TERM 58d
C2657-3
B,0.5D
C2657-4
RN,0.5D
SPORT/MANUAL LED
C2658-15
RY,0.5D
C2657-2
SPORT/MANUAL LED
TERM 58d
C2658-3
RN,0.5D
TERM 30
C2658-8
PU,0.5D
AUX
C2658-7
LGO,0.5D
A
Sheet1
B
Sheet1
Lighting control switch (S100)
TERM 58d
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1168-12 C1166R-12
RN,0.5D
SJ1052
RN,0.5D
C0868-23 C0903-23

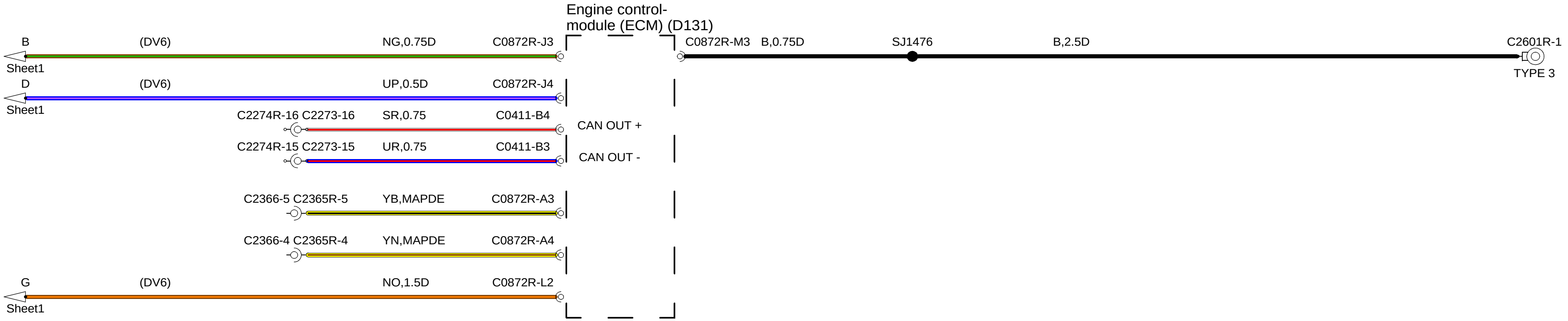

Capacitor (G158)
C
PY,1.5D
C2365R-1
Sheet1
C2366B-1
(PV8-N/A)
PY,1.0H
SJ410
PY,1.0H
C2366C-1
(DV6)
PY,1.0H
SJ2410
PY,1.0H
C2366D-1
(PV8-S/C)
PY,1.0H
SJ3410
PY,1.0H
C1324-1
C1324-2
B,1.0H
SJ409
B,1.0H
C2366B-10
B,1.0H
SJ2409
B,1.0H
C2366C-10
B,1.0H
SJ3409
B,1.0H
C2366D-10
C2365R-10
B,1.0D
SJ173
B,4.0D
C0560-1
TYPE 3
B,1.0H
B,1.0H
B,1.0H
Transmission control module (D306)
ECU-Transmission-control module (D307)
TERM 31
TERM 30
TERM 31
PY,1.0H
PY,1.0H
PY,1.0H
C0193-14
C0193-13
C0193-16
(PV8-N/A)
B,1.0H
SJ735
(DV6)
B,1.0H
SJ2735
(PV8-S/C)
B,1.0H
SJ3735
(PV8-N/A)
B,1.0H
(DV6)
B,1.0H
(PV8-S/C)
B,1.0H


Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 3E
30.0 Amps
LINK 11E
30.0 Amps
C0570R-63 PU,4.0D
SJ1923
PU,2.5D
C1854R-6
C0570R-114 N,4.0D
C2444R-4 C2443-4
N,4.0D
Transfer box control module (D204)
TERM 30
TERM 31
C1854R-5 B,2.5D
SJ1806 B,4.0D
C0556R-1
TYPE 3
Switch-Ignition (S176)
Solenoid-Interlock-Key (N120)
C0028-3 U,0.5D
C2238-20 C2240R-20
U,0.5D
C1319R-7
KEY LOCK DRIVE
C0028-4
IGN
C0028-1 Y,4.0D
C1854R-4 YN,MAPCW
C2365R-2 C2366-2
CAN IN HIGH
C1854R-1 YB,MAPCW
C2365R-3 C2366-3
CAN IN LOW
SJ1785
YN,MAPCN
C1319R-6
CAN OUT HIGH
SJ1775
YB,MAPCN
C1319R-3
CAN OUT LOW
Central Junction Box (P101)
C0582-19
FUSE 24P
5.0 Amps
C0583R-39 R,1.0D
SJ1970
R,1.0D
C1854R-3
TERM 15
R,1.0D
C2412R-5 C2411R-5
R,1.0D
SJ971 R,1.0D
C0868-8 C0903-8
R,0.75D
A
Sheet2

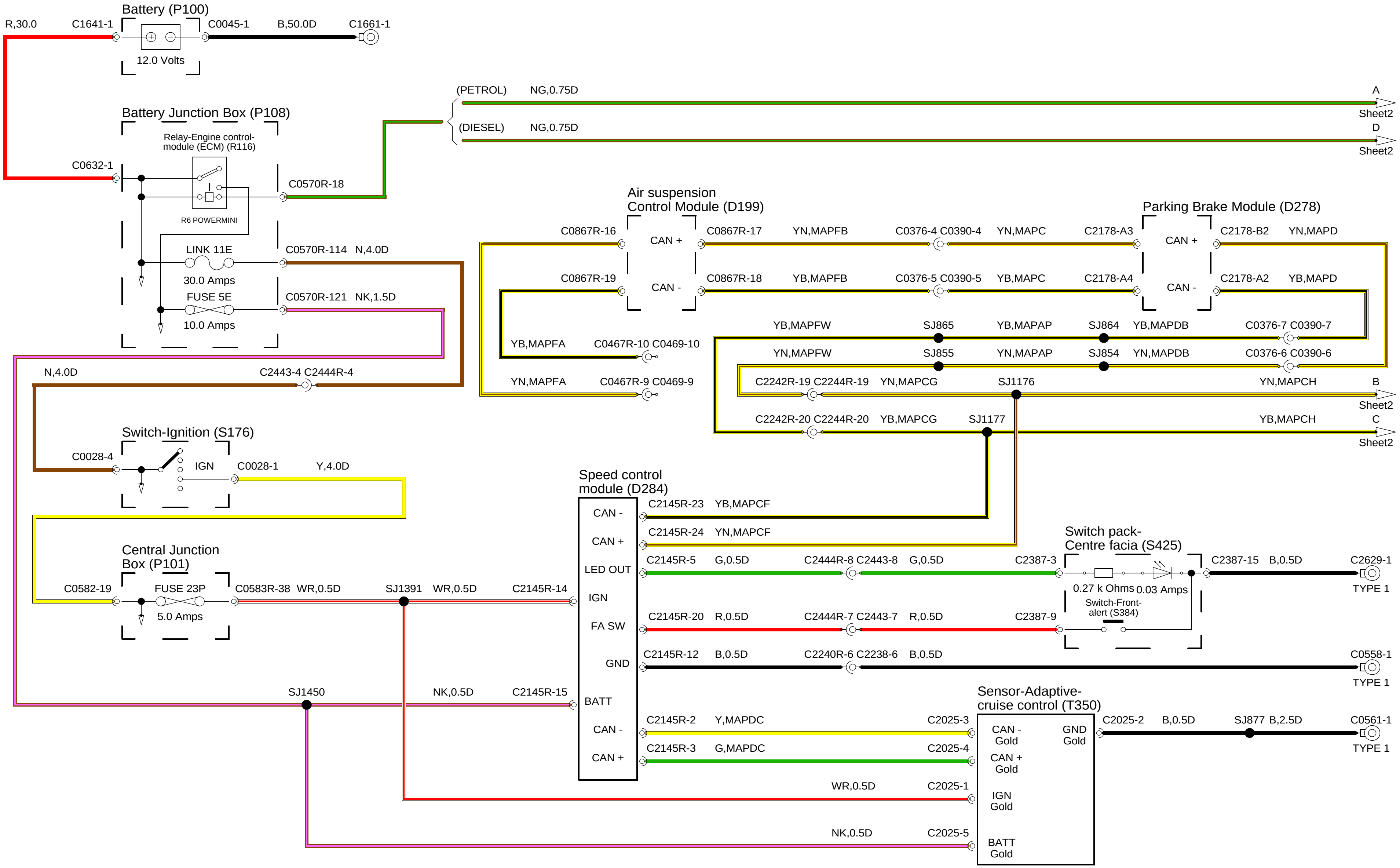

Switch pack-Centre-console (S350)
Switch-Transmision-High-Low (S235)
A
Sheet1
C0700-21 U,0.5D C0903-6 C0868-6 U,0.5D C2242R-8 C2244R-8 U,0.5D C1319R-8
C0700-22 G,0.5D C0903-7 C0868-7 G,0.5D C2242R-9 C2244R-9 G,0.5D C1319R-9
C0700-10 W,0.5D C0903-16 C0868-16 W,0.5D C2242R-10 C2244R-10 W,0.5D C1319R-4
C0700-9 R,0.5D C0903-17 C0868-17 R,0.5D C2242R-11 C2244R-11 R,0.5D C1319R-5
C0700-20 R,0.75D
Transfer box control module (D204)
C1855-12 S,1.0H C2165-1
C1855-9 G,1.0H C2165-2
Solenoid-Mode-selector (N148)
COIL +
COIL -
C1855B-15 N,2.5H(PV8-N/A) SJ802 N,4.0D SJ803 N,2.5H
C1855C-15 N,2.5H (DV6) SJ2802 N,4.0D SJ2803 N,2.5H
C1855D-15 N,2.5H(PV8-S/C) SJ3802 N,4.0D SJ3803 N,2.5H
C2167-1
Motor-Transfer box (M276)
C1855-3 UR,0.5H C2167-3
C1855-2 RY,0.5H C2167-7
C1855-1 GR,0.5H C2167-6
C1855-6 GY,0.5H C2167-2
SUPPLY +
SUPPLY -
HALL SIGNAL (A)
HALL SIGNAL (B)
+
-
C1855-5 R,0.5H C2167-4
TEMP SENSOR
C1855B-18 R,2.5H (PV8-N/A) SJ805 R,4.0D SJ804 R,2.5H
C1855C-18 R,2.5H (DV6) SJ2805 R,4.0D SJ2804 R,2.5H
C1855D-18 R,2.5H (PV8-S/C) SJ3805 R,4.0D SJ3804 R,2.5H
C2167-8
Sensor-Selector-position (T304)
C1855-10 R,0.5H C2169-2
C1855-7 RY,0.5H C2169-3
C1855-8 UR,0.5H C2169-1
POSITION SIGNAL
SUPPLY -
SUPPLY +

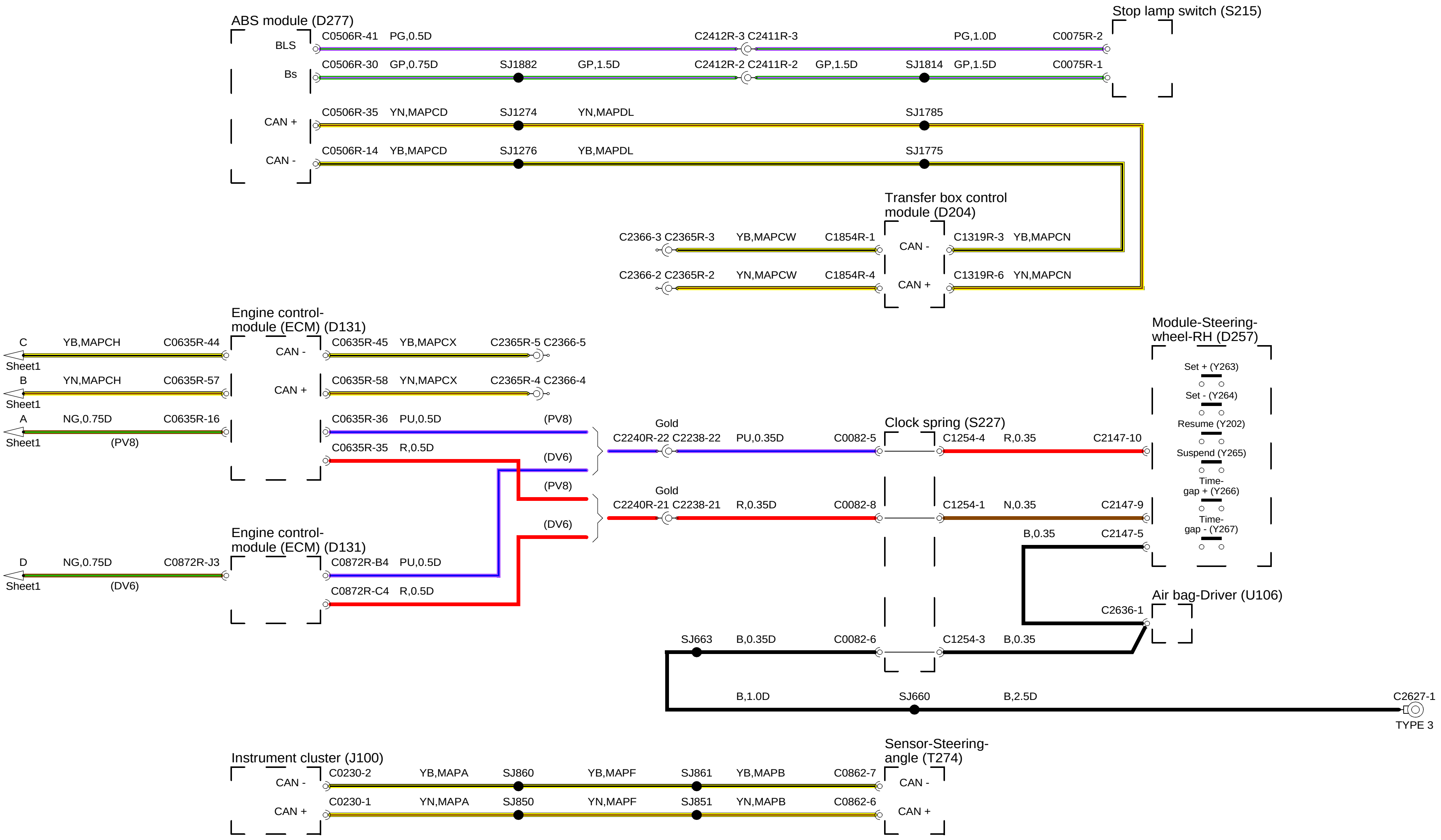

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
C0570R-18
NG,0.75D
(DV6)
B
Sheet2
NG,0.75D
(PV8)
C
Sheet2
NO,1.5D
(PV8)
SJ1812
(PV8)
NO,1.5D
F
Sheet2
C0570R-21
NO,1.5D
(DV6)
SJ1999
(DV6)
NO,1.5D
G
Sheet2
Relay-Fuel-pump (R103)
UP,0.5D
(DV6)
D
Sheet2
C0570R-19
YN,0.5D
(PV8)
E
Sheet2
FUSE 13E
10.0 Amps
C0570R-125
NO,1.5D
(PV8)
FUSE 4E
25.0 Amps
C0570R-167
NO,1.5D
(DV6)
NB,2.5D
(DV6)
SJ1489
NB,2.5D
FUSE 1E
25.0 Amps
C0570R-119
NB,2.5D
(PV8)
Module-Fuel-pump driver (D361)
C2369-3
GO,0.5D
H
Sheet2
WP,2.5D
(NON-PETROL V8SC)
C2369-4
WG,0.5D
J
Sheet2
C2411R-14 C2412R-14
(PV8SC)
(DV6)
C2369-6
B,4.0D
C2920-1
TYPE 3
R,2.5D
SJ1700
R,4.0D
C2369-5
SCR,2.5D
C2369-2
B,2.5D
(PV8SC)
C2369-1
WP,2.5D
(PV8SC)
SJ2369
SJ2000
B,0.75D
Unit-Fuel Tank (D179)
C0377-17 C0391-17
WP,2.5D
Pump-Fuel (M151)
SJ17
WP,4.0D
SJ15
WP,2.5D
C0114-4
C0114-1
B,2.5D
SJ18
B,4.0D
SJ19
Instrument cluster (J100)
KB,0.5D
C0114-6
Sender unit-Fuel gauge (J111)
B,2.5D
C0391-18 C0377-18
C0230-27
KB,0.5D
C2443-10 C2444R-10
KB,0.5D
C2446-7 C2445-7
C0230-12
GB,0.5D
C2443-11 C2444R-11
GB,0.5D
C2446-8 C2445-8
GB,0.5D
C0114-5
Sender unit-Fuel gauge (J111)
SJ85
(NON-PETROL V8SC)
B,2.5D
C0230-13
R,0.5D
C2443-12 C2444R-12
R,0.5D
C3009-2 C3010-2
R,0.5D
C0114-3
B,2.5D
C2922-1
TYPE 3

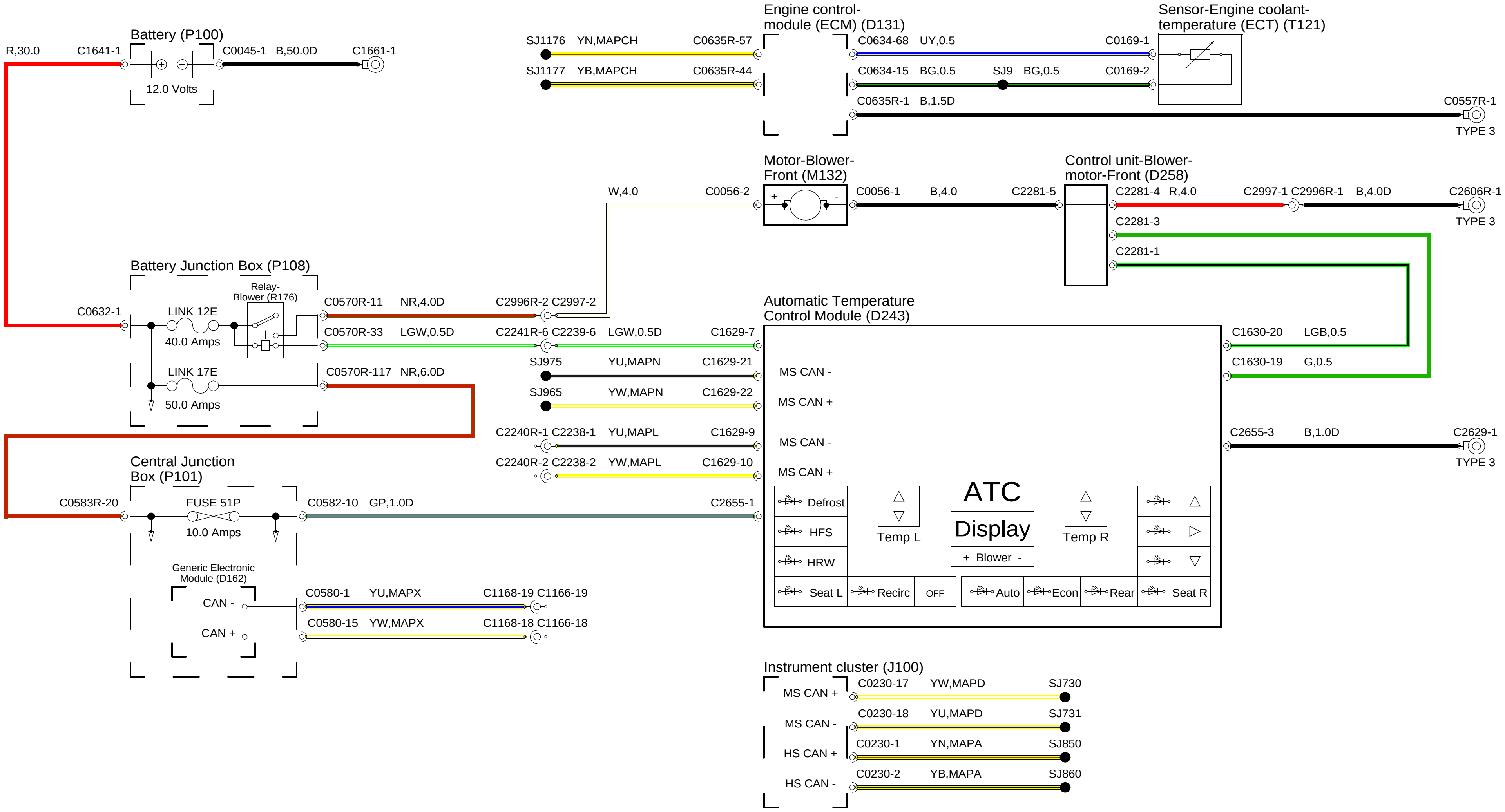

Engine control-module (ECM) (D131)
C
Sheet1
(PV8)
NG,0.75D
C0635R-16
C0635R-2
B,1.0D
C2650R-1
TYPE 3
SJ1176
YN,MAPCH
C0635R-57
CAN OUT +
SJ1177
YB,MAPCH
C0635R-44
CAN OUT -
C2366-4 C2365R-4
YN,MAPCX
C0635R-58
C2366-5 C2365R-5
YB,MAPCX
C0635R-45
E
YN,0.5D
(PV8)
C2725R-7 C2724-7
YN,0.5
C0634-95
Sheet1
F
(PV8)
NO,1.5D
C0635R-4
E_U_HR
Sheet1
H
GO,0.5D
C2243R-1 C2245R-1
GO,0.5D
C0635R-20
Sheet1
J
WG,0.5D
C2243R-2 C2245R-2
WG,0.5D
C0635R-21
Sheet1

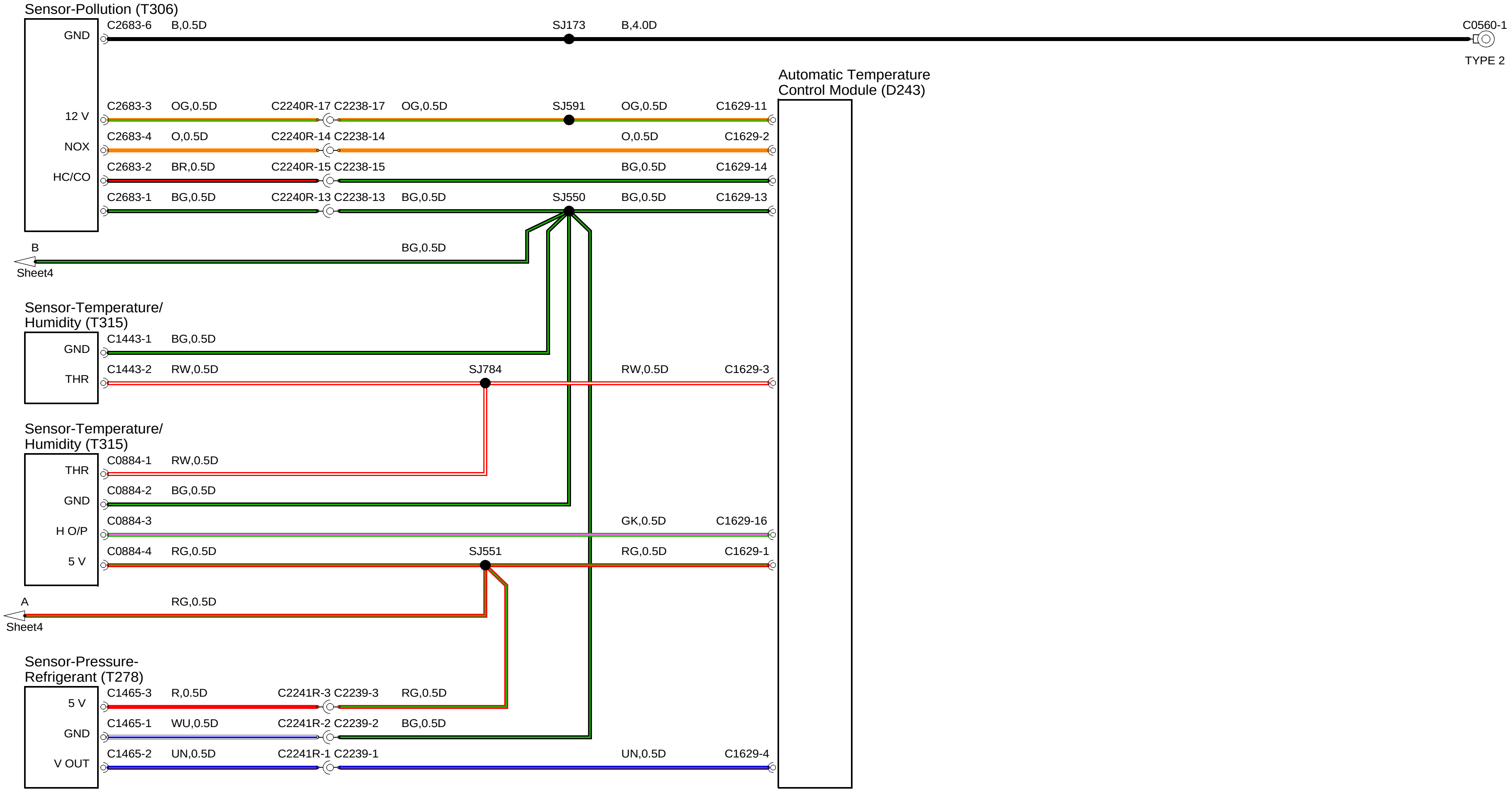

Engine control-module (ECM) (D131)
B
(DV6)
NG,0.75D
C0872R-J3
C0872R-M3
B,0.75D
SJ1476
B,2.5D
C2601R-1
TYPE 3
Sheet1
D
(DV6)
UP,0.5D
C0872R-J4
Sheet1
C2274R-16 C2273-16
SR,0.75
C0411-B4
CAN OUT +
C2274R-15 C2273-15
UR,0.75
C0411-B3
CAN OUT -
C2366-5 C2365R-5
YB,MAPDE
C0872R-A3
C2366-4 C2365R-4
YN,MAPDE
C0872R-A4
G
(DV6)
NO,1.5D
C0872R-L2
Sheet1

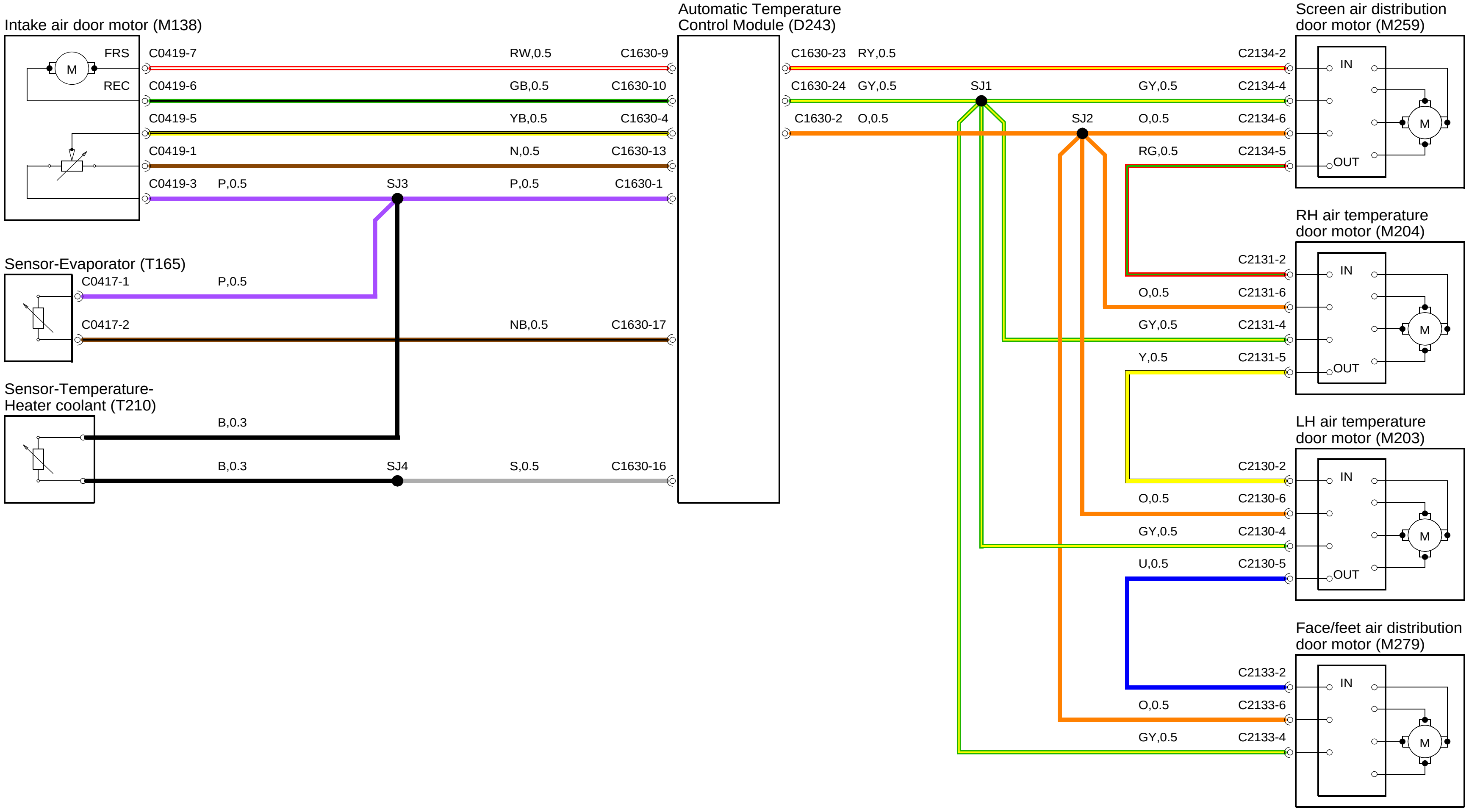
310-03 SPEED CONTROL

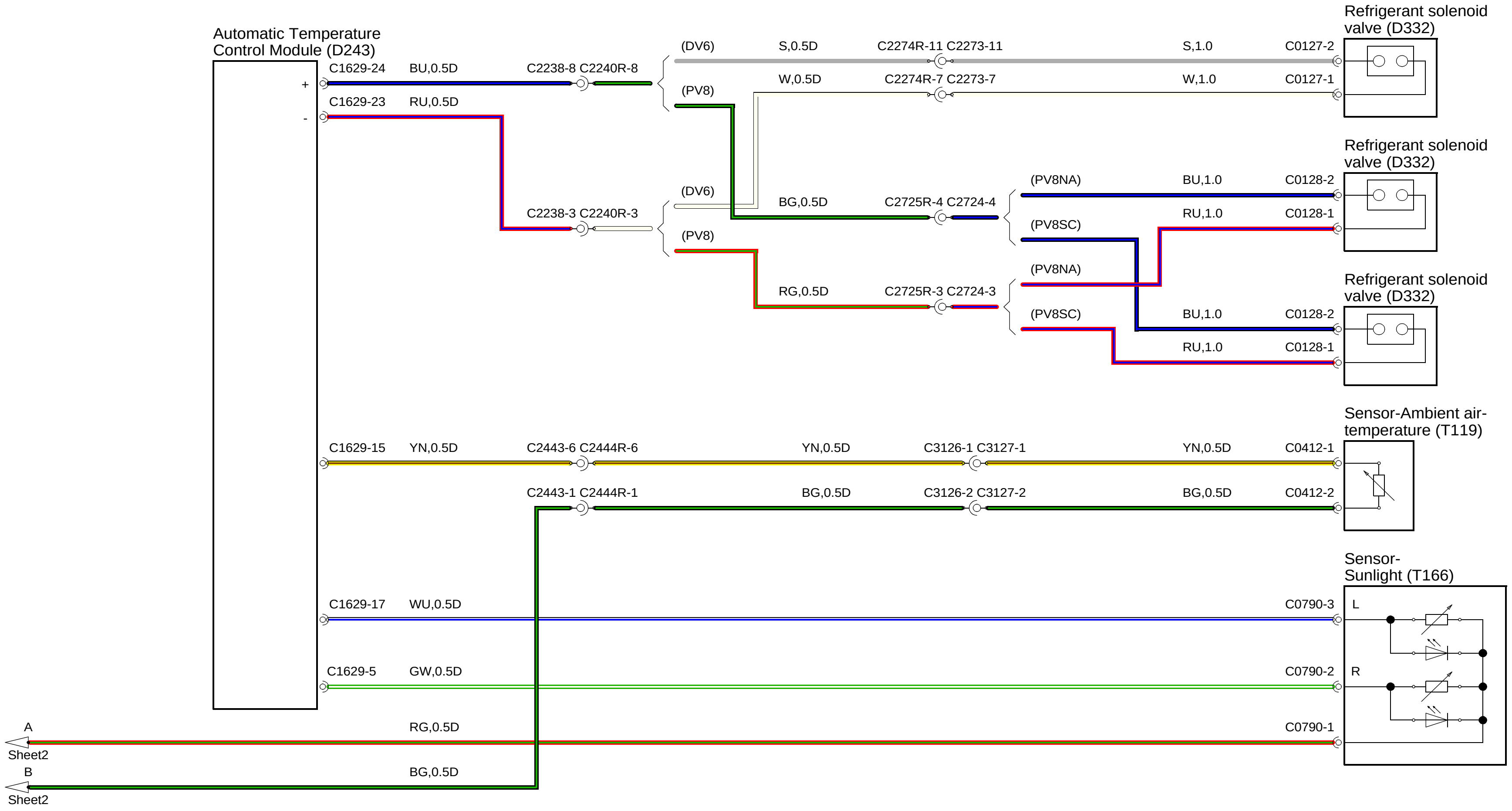

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Engine control-module (ECM) (R116)
C0632-1
C0570R-18
R6 POWERMINI
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
FUSE 5E
10.0 Amps
C0570R-121
NK,1.5D
(PETROL)
NG,0.75D
A
Sheet2
(DIESEL)
NG,0.75D
D
Sheet2
Air suspension Control Module (D199)
C0867R-16
CAN +
C0867R-17
YN,MAPFB
C0376-4 C0390-4
YN,MAPC
C2178-A3
Parking Brake Module (D278)
CAN +
C2178-B2
YN,MAPD
C0867R-19
CAN -
C0867R-18
YB,MAPFB
C0376-5 C0390-5
YB,MAPC
C2178-A4
CAN -
C2178-A2
YB,MAPD
YB,MAPFW
SJ865
YB,MAPAP
SJ864
YB,MAPDB
C0376-7 C0390-7
YB,MAPFA
C0467R-10 C0469-10
YN,MAPFW
SJ855
YN,MAPAP
SJ854
YN,MAPDB
C0376-6 C0390-6
N,4.0D
C2443-4 C2444R-4
YN,MAPFA
C0467R-9 C0469-9
C2242R-19 C2244R-19
YN,MAPCG
SJ1176
YN,MAPCH
B
Sheet2
C2242R-20 C2244R-20
YB,MAPCG
SJ1177
YB,MAPCH
C
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Speed control module (D284)
CAN -
C2145R-23
YB,MAPCF
CAN +
C2145R-24
YN,MAPCF
Switch pack-Centre facia (S425)
LED OUT
C2145R-5
G,0.5D
C2444R-8 C2443-8
G,0.5D
C2387-3
C2387-15
B,0.5D
C2629-1
TYPE 1
Central Junction Box (P101)
C0582-19
FUSE 23P
5.0 Amps
C0583R-38
WR,0.5D
SJ1391
WR,0.5D
C2145R-14
IGN
0.27 k Ohms
0.03 Amps
Switch-Front-alert (S384)
FA SW
C2145R-20
R,0.5D
C2444R-7 C2443-7
R,0.5D
C2387-9
GND
C2145R-12
B,0.5D
C2240R-6 C2238-6
B,0.5D
C0558-1
TYPE 1
SJ1450
NK,0.5D
C2145R-15
BATT
Sensor-Adaptive-cruise control (T350)
CAN -
C2145R-2
Y,MAPDC
C2025-3
CAN - Gold
GND Gold
C2025-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 1
CAN +
C2145R-3
G,MAPDC
C2025-4
CAN + Gold
WR,0.5D
C2025-1
IGN Gold
NK,0.5D
C2025-5
BATT Gold

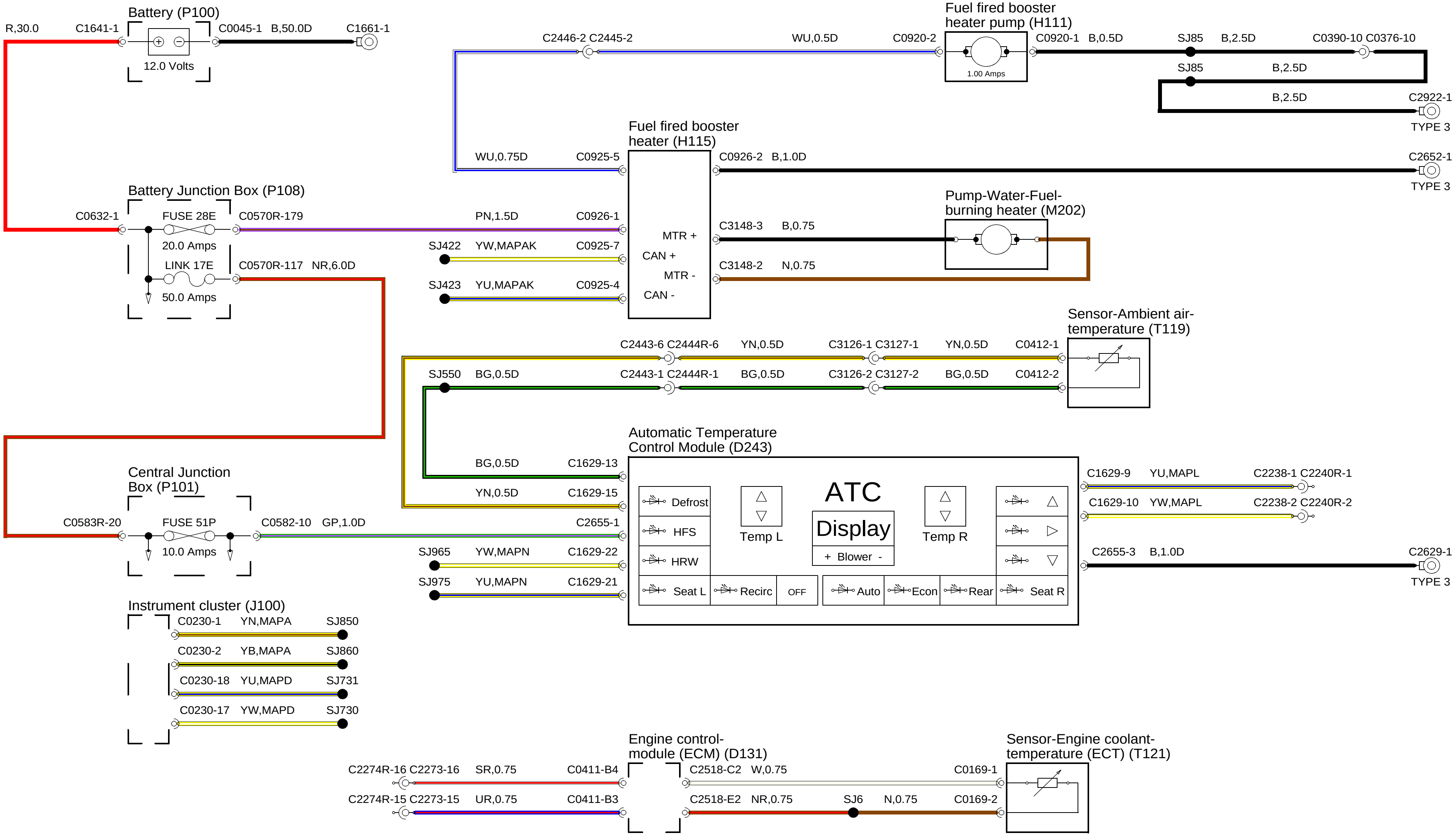

ABS module (D277)
BLS
Bs
CAN +
CAN -
C0506R-41
PG,0.5D
C2412R-3 C2411R-3
PG,1.0D
C0075R-2
Stop lamp switch (S215)
C0506R-30
GP,0.75D
SJ1882
GP,1.5D
C2412R-2 C2411R-2
GP,1.5D
SJ1814
GP,1.5D
C0075R-1
C0506R-35
YN,MAPCD
SJ1274
YN,MAPDL
SJ1785
C0506R-14
YB,MAPCD
SJ1276
YB,MAPDL
SJ1775
Transfer box control module (D204)
C2366-3 C2365R-3
YB,MAPCW
C1854R-1
CAN -
C1319R-3
YB,MAPCN
C2366-2 C2365R-2
YN,MAPCW
C1854R-4
CAN +
C1319R-6
YN,MAPCN
Engine control-module (ECM) (D131)
C
YB,MAPCH
C0635R-44
Sheet1
CAN -
C0635R-45
YB,MAPCX
C2365R-5 C2366-5
B
YN,MAPCH
C0635R-57
Sheet1
CAN +
C0635R-58
YN,MAPCX
C2365R-4 C2366-4
A
NG,0.75D
C0635R-16
Sheet1
(PV8)
C0635R-36
PU,0.5D
(PV8)
C0635R-35
R,0.5D
(DV6)
(PV8)
(DV6)
Module-Steering-wheel-RH (D257)
Set + (Y263)
Set - (Y264)
Resume (Y202)
Suspend (Y265)
Time-gap + (Y266)
Time-gap - (Y267)
Gold
C2240R-22 C2238-22
PU,0.35D
C0082-5
Clock spring (S227)
C1254-4
R,0.35
C2147-10
Gold
C2240R-21 C2238-21
R,0.35D
C0082-8
C1254-1
N,0.35
C2147-9
B,0.35
C2147-5
Engine control-module (ECM) (D131)
D
NG,0.75D
C0872R-J3
Sheet1
(DV6)
C0872R-B4
PU,0.5D
C0872R-C4
R,0.5D
Air bag-Driver (U106)
C2636-1
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Instrument cluster (J100)
CAN -
C0230-2
YB,MAPA
SJ860
YB,MAPF
SJ861
YB,MAPB
C0862-7
Sensor-Steering-angle (T274)
CAN -
CAN +
C0230-1
YN,MAPA
SJ850
YN,MAPF
SJ851
YN,MAPB
C0862-6
CAN +

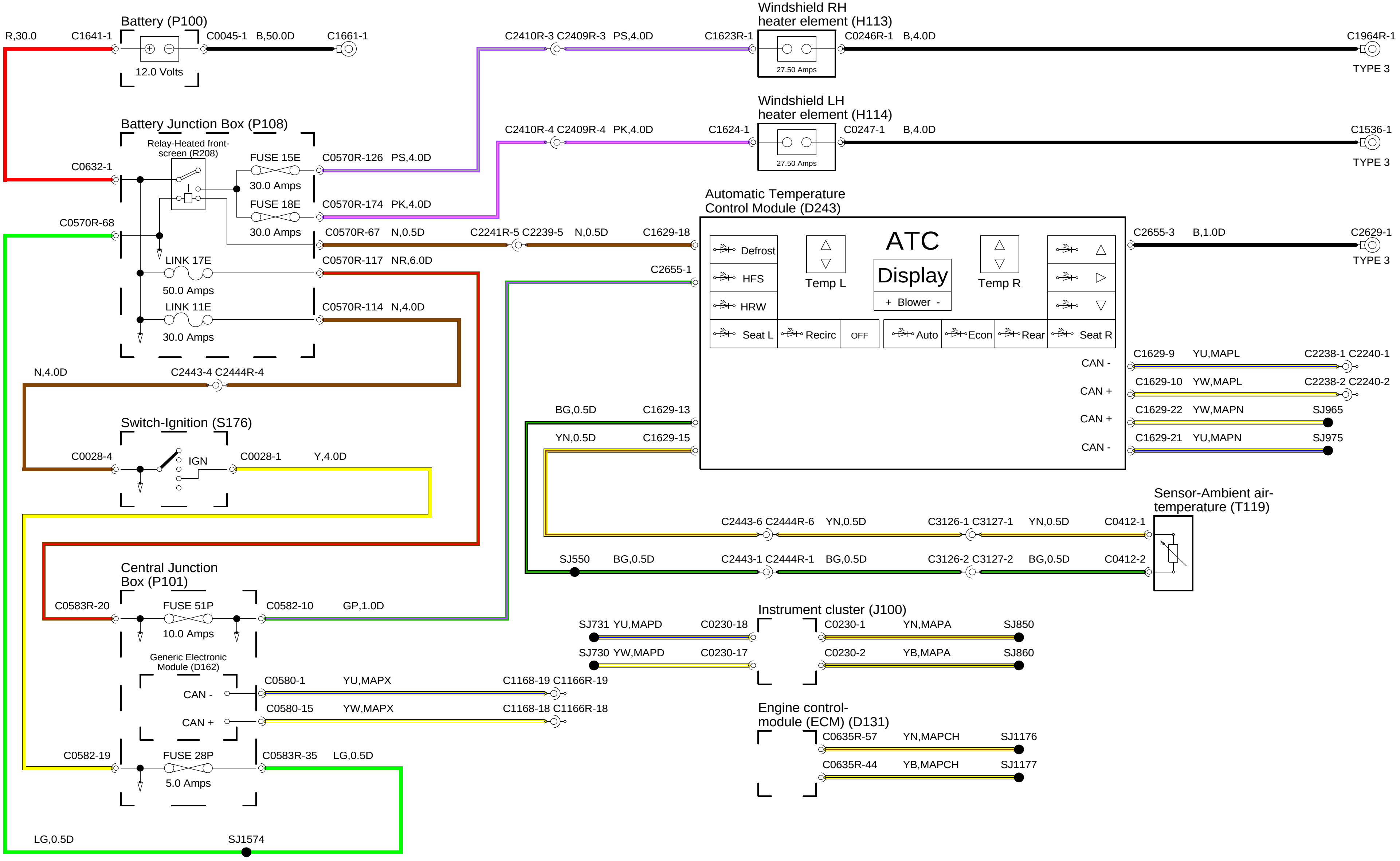

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1 B,50.0D
C1661-1
SJ1176 YN,MAPCH C0635R-57
SJ1177 YB,MAPCH C0635R-44
Engine control-module (ECM) (D131)
C0634-68 UY,0.5 C0169-1
C0634-15 BG,0.5 SJ9 BG,0.5 C0169-2
C0635R-1 B,1.5D
Sensor-Engine coolant-temperature (ECT) (T121)
C0557R-1
TYPE 3
Motor-Blower-Front (M132)
W,4.0 C0056-2
C0056-1 B,4.0 C2281-5
Control unit-Blower-motor-Front (D258)
C2281-4 R,4.0 C2997-1 C2996R-1 B,4.0D C2606R-1
TYPE 3
C2281-3
C2281-1
Battery Junction Box (P108)
Relay-Blower (R176)
C0632-1
LINK 12E
40.0 Amps
LINK 17E
50.0 Amps
C0570R-11 NR,4.0D C2996R-2 C2997-2
C0570R-33 LGW,0.5D C2241R-6 C2239-6 LGW,0.5D C1629-7
C0570R-117 NR,6.0D
SJ975 YU,MAPN C1629-21
SJ965 YW,MAPN C1629-22
C2240R-1 C2238-1 YU,MAPL C1629-9
C2240R-2 C2238-2 YW,MAPL C1629-10
Automatic Temperature Control Module (D243)
C1630-20 LGB,0.5
C1630-19 G,0.5
MS CAN -
MS CAN +
MS CAN -
MS CAN +
C2655-3 B,1.0D C2629-1
TYPE 3
Central Junction Box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D C2655-1
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1 YU,MAPX C1168-19 C1166-19
C0580-15 YW,MAPX C1168-18 C1166-18
Instrument cluster (J100)
MS CAN +
C0230-17 YW,MAPD SJ730
MS CAN -
C0230-18 YU,MAPD SJ731
HS CAN +
C0230-1 YN,MAPA SJ850
HS CAN -
C0230-2 YB,MAPA SJ860

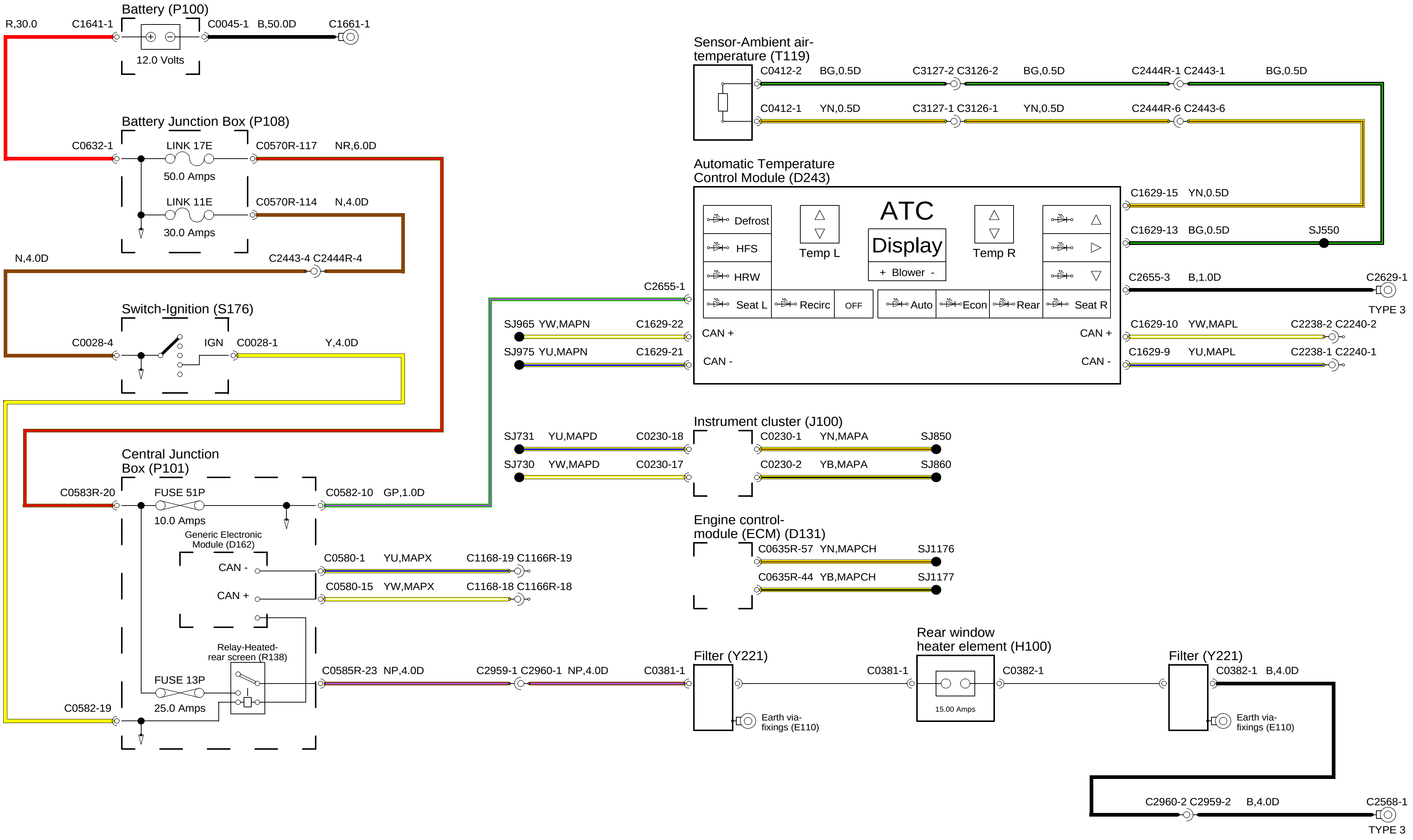

Sensor-Pollution (T306)
GND
12 V
NOX
HC/CO
C2683-6
B,0.5D
SJ173
B,4.0D
C0560-1
TYPE 2
Automatic Temperature Control Module (D243)
C2683-3
OG,0.5D
C2240R-17
C2238-17
OG,0.5D
SJ591
OG,0.5D
C1629-11
C2683-4
O,0.5D
C2240R-14
C2238-14
O,0.5D
C1629-2
C2683-2
BR,0.5D
C2240R-15
C2238-15
BG,0.5D
C1629-14
C2683-1
BG,0.5D
C2240R-13
C2238-13
BG,0.5D
SJ550
BG,0.5D
C1629-13
B
Sheet4
BG,0.5D
Sensor-Temperature/ Humidity (T315)
GND
THR
C1443-1
BG,0.5D
C1443-2
RW,0.5D
SJ784
RW,0.5D
C1629-3
Sensor-Temperature/ Humidity (T315)
THR
GND
H O/P
5 V
C0884-1
RW,0.5D
C0884-2
BG,0.5D
C0884-3
GK,0.5D
C1629-16
C0884-4
RG,0.5D
SJ551
RG,0.5D
C1629-1
A
Sheet4
RG,0.5D
Sensor-Pressure- Refrigerant (T278)
5 V
GND
V OUT
C1465-3
R,0.5D
C2241R-3
C2239-3
RG,0.5D
C1465-1
WU,0.5D
C2241R-2
C2239-2
BG,0.5D
C1465-2
UN,0.5D
C2241R-1
C2239-1
UN,0.5D
C1629-4

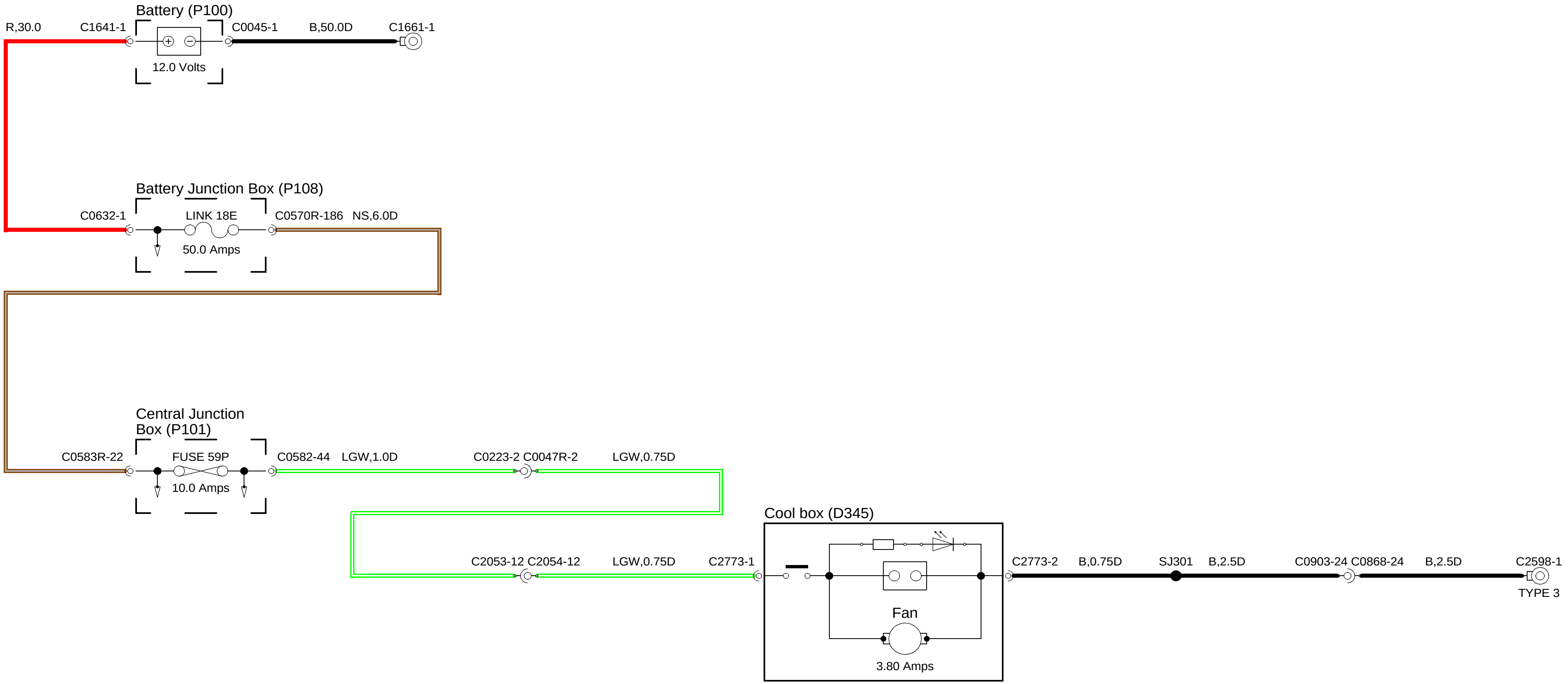

Intake air door motor (M138)
FRS
REC
M
C0419-7
RW,0.5
C1630-9
C0419-6
GB,0.5
C1630-10
C0419-5
YB,0.5
C1630-4
C0419-1
N,0.5
C1630-13
C0419-3
P,0.5
SJ3
P,0.5
C1630-1
Sensor-Evaporator (T165)
C0417-1
P,0.5
C0417-2
NB,0.5
C1630-17
Sensor-Temperature-Heater coolant (T210)
B,0.3
B,0.3
SJ4
S,0.5
C1630-16
Automatic Temperature Control Module (D243)
C1630-23
RY,0.5
C2134-2
C1630-24
GY,0.5
SJ1
GY,0.5
C2134-4
C1630-2
O,0.5
SJ2
O,0.5
C2134-6
RG,0.5
C2134-5
Screen air distribution door motor (M259)
IN
OUT
M
RH air temperature door motor (M204)
C2131-2
O,0.5
C2131-6
GY,0.5
C2131-4
Y,0.5
C2131-5
IN
OUT
M
LH air temperature door motor (M203)
C2130-2
O,0.5
C2130-6
GY,0.5
C2130-4
U,0.5
C2130-5
IN
OUT
M
Face/feet air distribution door motor (M279)
C2133-2
O,0.5
C2133-6
GY,0.5
C2133-4
IN
M


Automatic Temperature Control Module (D243)
C1629-24
BU,0.5D
+
C1629-23
RU,0.5D
-
C2238-8 C2240R-8
C2238-3 C2240R-3
(DV6)
(PV8)
(DV6)
(PV8)
S,0.5D
C2274R-11 C2273-11
S,1.0
C0127-2
W,0.5D
C2274R-7 C2273-7
W,1.0
C0127-1
Refrigerant solenoid valve (D332)
BG,0.5D
C2725R-4 C2724-4
(PV8NA)
BU,1.0
C0128-2
(PV8SC)
RU,1.0
C0128-1
Refrigerant solenoid valve (D332)
RG,0.5D
C2725R-3 C2724-3
(PV8NA)
(PV8SC)
BU,1.0
C0128-2
RU,1.0
C0128-1
Refrigerant solenoid valve (D332)
C1629-15
YN,0.5D
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
Sensor-Ambient air-temperature (T119)
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
C1629-17
WU,0.5D
C0790-3
L
Sensor-Sunlight (T166)
C1629-5
GW,0.5D
C0790-2
R
A
Sheet2
RG,0.5D
C0790-1
B
Sheet2
BG,0.5D

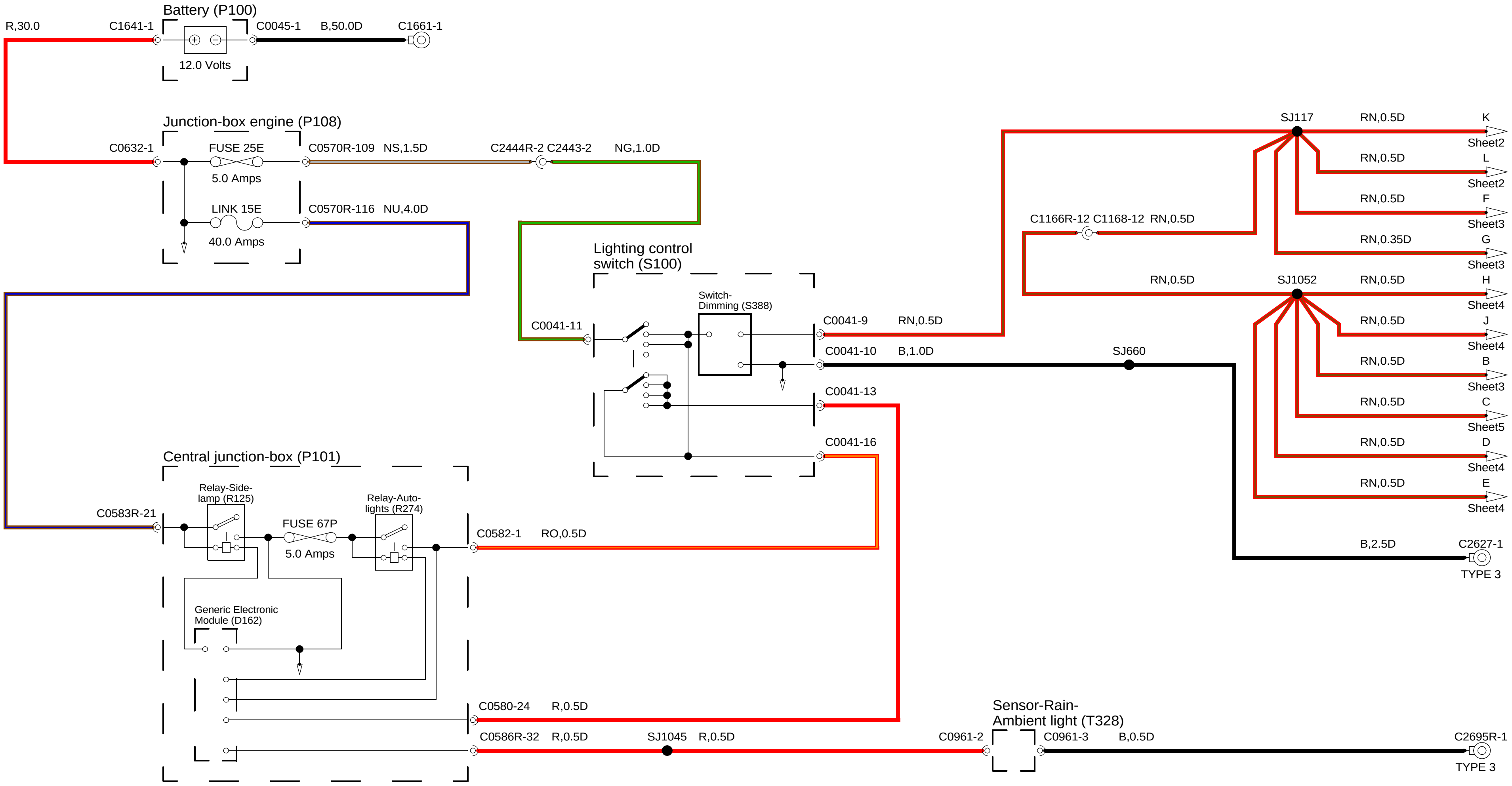

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
C2446-2 C2445-2
WU,0.5D
C0920-2
Fuel fired booster heater pump (H111)
1.00 Amps
C0920-1
B,0.5D
SJ85
B,2.5D
C0390-10 C0376-10
SJ85
B,2.5D
B,2.5D
C2922-1
TYPE 3
Fuel fired booster heater (H115)
WU,0.75D
C0925-5
C0926-2
B,1.0D
C2652-1
TYPE 3
Battery Junction Box (P108)
C0632-1
FUSE 28E
20.0 Amps
C0570R-179
PN,1.5D
C0926-1
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
SJ422
YW,MAPAK
C0925-7
SJ423
YU,MAPAK
C0925-4
MTR +
CAN +
MTR -
CAN -
Pump-Water-Fuel-burning heater (M202)
C3148-3
B,0.75
C3148-2
N,0.75
Sensor-Ambient air-temperature (T119)
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Automatic Temperature Control Module (D243)
BG,0.5D
C1629-13
YN,0.5D
C1629-15
Central Junction Box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
C2655-1
SJ965
YW,MAPN
C1629-22
SJ975
YU,MAPN
C1629-21
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
C1629-9
YU,MAPL
C2238-1 C2240R-1
C1629-10
YW,MAPL
C2238-2 C2240R-2
C2655-3
B,1.0D
C2629-1
TYPE 3
Instrument cluster (J100)
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860
C0230-18
YU,MAPD
SJ731
C0230-17
YW,MAPD
SJ730
Engine control-module (ECM) (D131)
C2274R-16 C2273-16
SR,0.75
C0411-B4
C2274R-15 C2273-15
UR,0.75
C0411-B3
C2518-C2
W,0.75
C0169-1
C2518-E2
NR,0.75
SJ6
N,0.75
C0169-2
Sensor-Engine coolant-temperature (ECT) (T121)

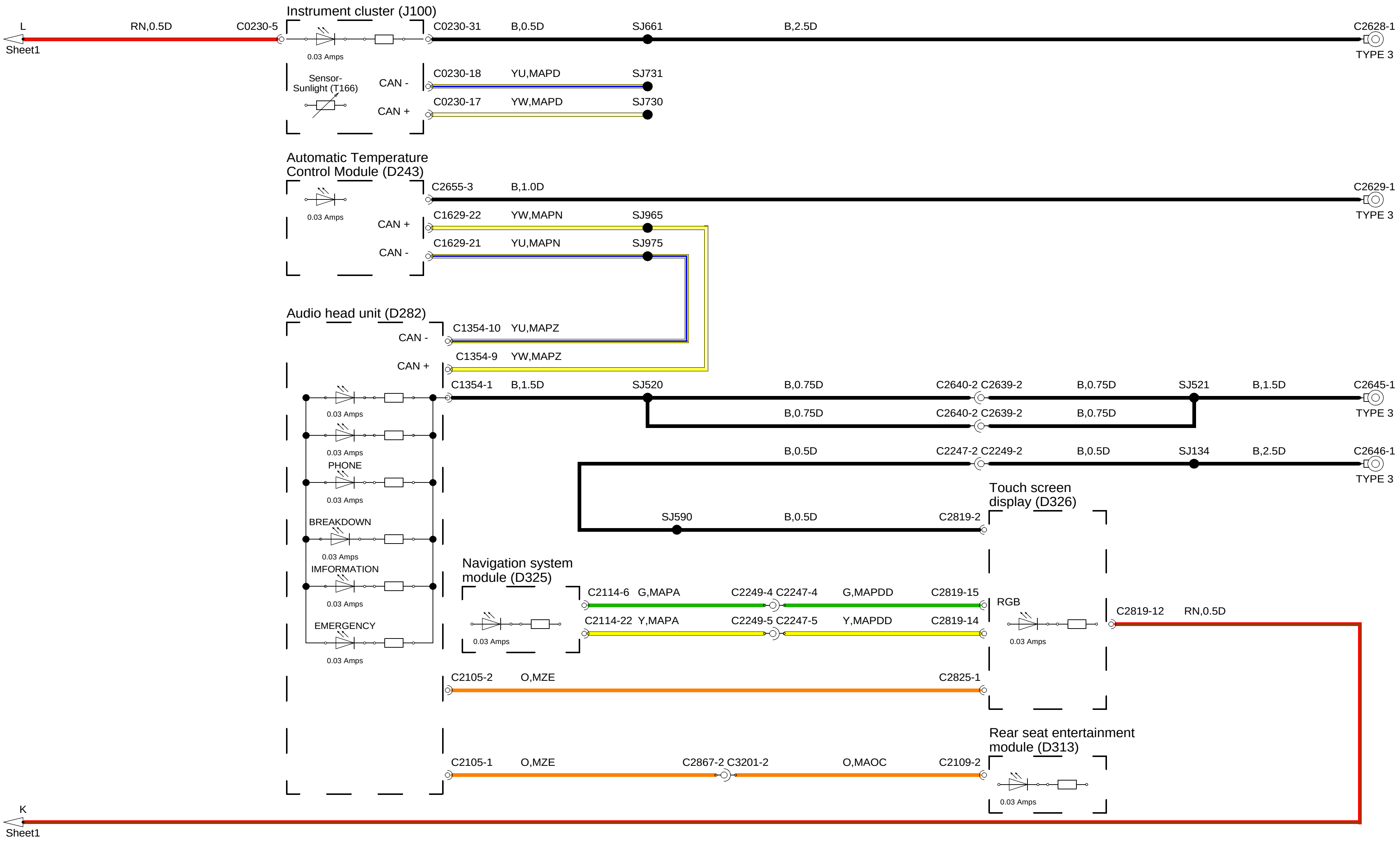

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1 B,50.0D
C1661-1
C2410R-3 C2409R-3 PS,4.0D
C1623R-1
Windshield RH
heater element (H113)
27.50 Amps
C0246R-1 B,4.0D
C1964R-1
TYPE 3
Battery Junction Box (P108)
Relay-Heated front-screen (R208)
C0632-1
FUSE 15E
30.0 Amps
FUSE 18E
30.0 Amps
C0570R-126 PS,4.0D
C0570R-174 PK,4.0D
C2410R-4 C2409R-4 PK,4.0D
C1624-1
Windshield LH
heater element (H114)
27.50 Amps
C0247-1 B,4.0D
C1536-1
TYPE 3
C0570R-68
C0570R-67 N,0.5D
C2241R-5 C2239-5 N,0.5D
C1629-18
LINK 17E
50.0 Amps
C0570R-117 NR,6.0D
LINK 11E
30.0 Amps
C0570R-114 N,4.0D
Automatic Temperature
Control Module (D243)
C2655-1
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
C2655-3 B,1.0D
C2629-1
TYPE 3
CAN -
CAN +
CAN +
CAN -
C1629-9 YU,MAPL
C2238-1 C2240-1
C1629-10 YW,MAPL
C2238-2 C2240-2
C1629-22 YW,MAPN
SJ965
C1629-21 YU,MAPN
SJ975
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1 Y,4.0D
BG,0.5D
C1629-13
YN,0.5D
C1629-15
Sensor-Ambient air-temperature (T119)
C2443-6 C2444R-6 YN,0.5D
C3126-1 C3127-1 YN,0.5D
C0412-1
SJ550 BG,0.5D
C2443-1 C2444R-1 BG,0.5D
C3126-2 C3127-2 BG,0.5D
C0412-2
Central Junction
Box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10 GP,1.0D
Generic Electronic
Module (D162)
CAN -
CAN +
C0580-1 YU,MAPX
C1168-19 C1166R-19
C0580-15 YW,MAPX
C1168-18 C1166R-18
SJ731 YU,MAPD
C0230-18
SJ730 YW,MAPD
C0230-17
Instrument cluster (J100)
C0230-1 YN,MAPA
SJ850
C0230-2 YB,MAPA
SJ860
Engine control-
module (ECM) (D131)
C0635R-57 YN,MAPCH
SJ1176
C0635R-44 YB,MAPCH
SJ1177
C0582-19
FUSE 28P
5.0 Amps
C0583R-35 LG,0.5D
LG,0.5D
SJ1574

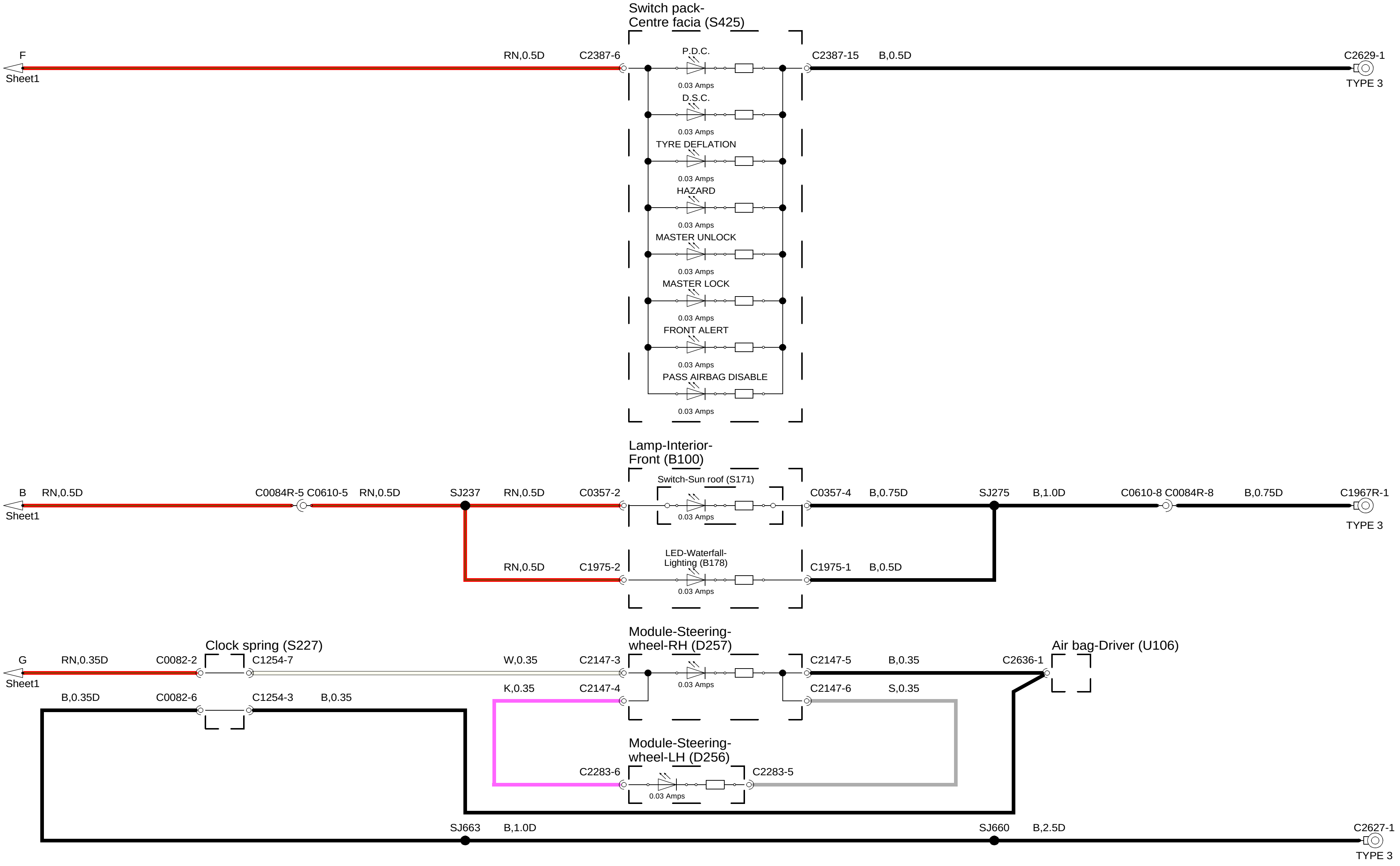

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1
YU,MAPX
C1168-19 C1166R-19
C0580-15
YW,MAPX
C1168-18 C1166R-18
Relay-Heated-rear screen (R138)
FUSE 13P
25.0 Amps
C0582-19
C0585R-23
NP,4.0D
C2959-1 C2960-1
NP,4.0D
C0381-1
Sensor-Ambient air-temperature (T119)
C0412-2
BG,0.5D
C3127-2 C3126-2
BG,0.5D
C2444R-1 C2443-1
BG,0.5D
C0412-1
YN,0.5D
C3127-1 C3126-1
YN,0.5D
C2444R-6 C2443-6
Automatic Temperature Control Module (D243)
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Temp R
Auto
Econ
Rear
Seat R
CAN +
CAN -
CAN +
CAN -
C1629-15
YN,0.5D
C1629-13
BG,0.5D
SJ550
C2655-3
B,1.0D
C2629-1
TYPE 3
C1629-10
YW,MAPL
C2238-2 C2240-2
C1629-9
YU,MAPL
C2238-1 C2240-1
C2655-1
SJ965
YW,MAPN
C1629-22
SJ975
YU,MAPN
C1629-21
Instrument cluster (J100)
SJ731
YU,MAPD
C0230-18
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860
Engine control-module (ECM) (D131)
C0635R-57
YN,MAPCH
SJ1176
C0635R-44
YB,MAPCH
SJ1177
Filter (Y221)
Earth via-fixings (E110)
Rear window heater element (H100)
C0381-1
15.00 Amps
C0382-1
Filter (Y221)
C0382-1
B,4.0D
Earth via-fixings (E110)
C2960-2 C2959-2
B,4.0D
C2568-1
TYPE 3


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Central Junction Box (P101)
C0583R-22
FUSE 59P
C0582-44
LGW,1.0D
C0223-2 C0047R-2
LGW,0.75D
10.0 Amps
Cool box (D345)
C2053-12 C2054-12
LGW,0.75D
C2773-1
C2773-2
B,0.75D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Fan
3.80 Amps

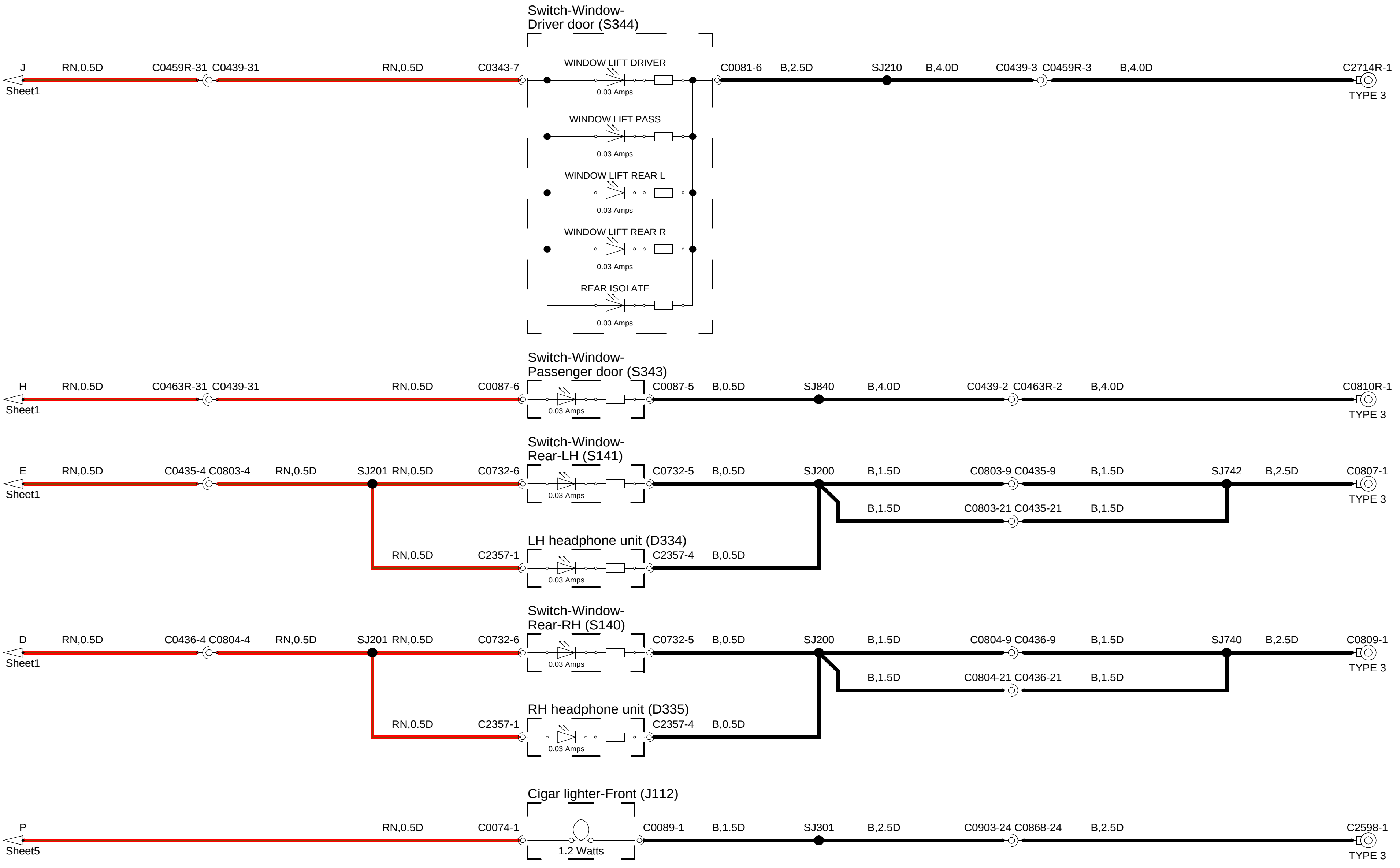
413-00 INSTRUMENT CLUSTER AND PANEL ILLUMINATION


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
C0632-1
FUSE 25E
5.0 Amps
C0570R-109
NS,1.5D
C2444R-2 C2443-2
NG,1.0D
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
Lighting control switch (S100)
Switch-Dimming (S388)
C0041-11
C0041-9
RN,0.5D
C0041-10
B,1.0D
SJ660
C0041-13
C0041-16
SJ117
RN,0.5D
K
Sheet2
RN,0.5D
L
Sheet2
RN,0.5D
F
Sheet3
C1166R-12 C1168-12
RN,0.5D
RN,0.35D
G
Sheet3
RN,0.5D
SJ1052
RN,0.5D
H
Sheet4
RN,0.5D
J
Sheet4
RN,0.5D
B
Sheet3
RN,0.5D
C
Sheet5
RN,0.5D
D
Sheet4
RN,0.5D
E
Sheet4
B,2.5D
C2627-1
TYPE 3
Central junction-box (P101)
Relay-Side-lamp (R125)
Relay-Auto-lights (R274)
C0583R-21
FUSE 67P
5.0 Amps
C0582-1
RO,0.5D
Generic Electronic Module (D162)
C0580-24
R,0.5D
C0586R-32
R,0.5D
SJ1045
R,0.5D
Sensor-Rain-Ambient light (T328)
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 3

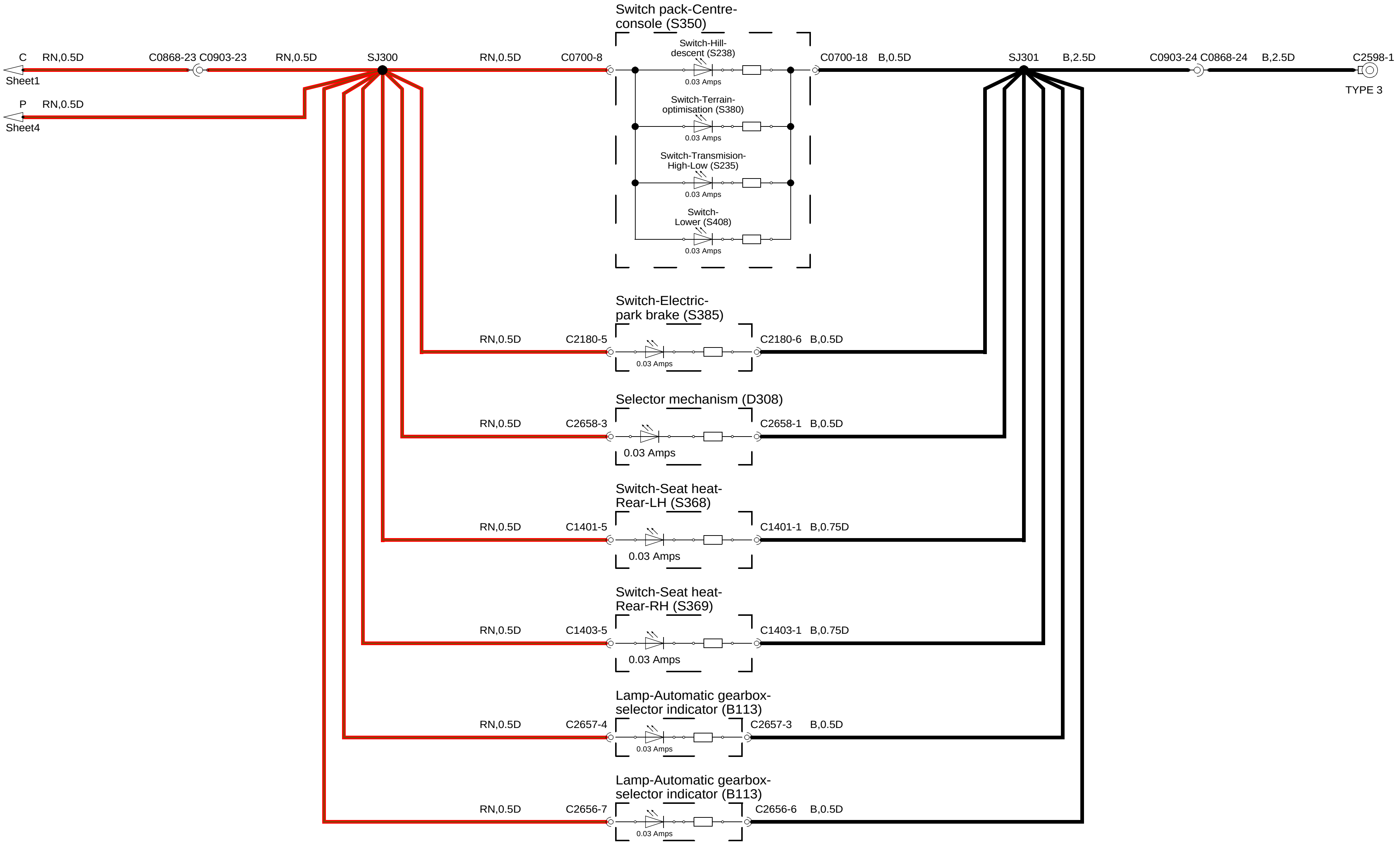

Instrument cluster (J100)
L
Sheet1
RN,0.5D
C0230-5
0.03 Amps
C0230-31
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
Sensor-
Sunlight (T166)
CAN -
CAN +
C0230-18
YU,MAPD
SJ731
C0230-17
YW,MAPD
SJ730
Automatic Temperature
Control Module (D243)
C2655-3
B,1.0D
C2629-1
TYPE 3
0.03 Amps
CAN +
C1629-22
YW,MAPN
SJ965
CAN -
C1629-21
YU,MAPN
SJ975
Audio head unit (D282)
CAN -
C1354-10
YU,MAPZ
CAN +
C1354-9
YW,MAPZ
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
TYPE 3
0.03 Amps
B,0.75D
C2640-2 C2639-2
B,0.75D
0.03 Amps
PHONE
B,0.5D
C2247-2 C2249-2
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
0.03 Amps
Touch screen
display (D326)
BREAKDOWN
SJ590
B,0.5D
C2819-2
0.03 Amps
IMFORMATION
Navigation system
module (D325)
C2114-6
G,MAPA
C2249-4 C2247-4
G,MAPDD
C2819-15
RGB
0.03 Amps
C2819-12
RN,0.5D
C2114-22
Y,MAPA
C2249-5 C2247-5
Y,MAPDD
C2819-14
EMERGENCY
0.03 Amps
0.03 Amps
0.03 Amps
C2105-2
O,MZE
C2825-1
Rear seat entertainment
module (D313)
C2105-1
O,MZE
C2867-2 C3201-2
O,MAOC
C2109-2
0.03 Amps
K
Sheet1

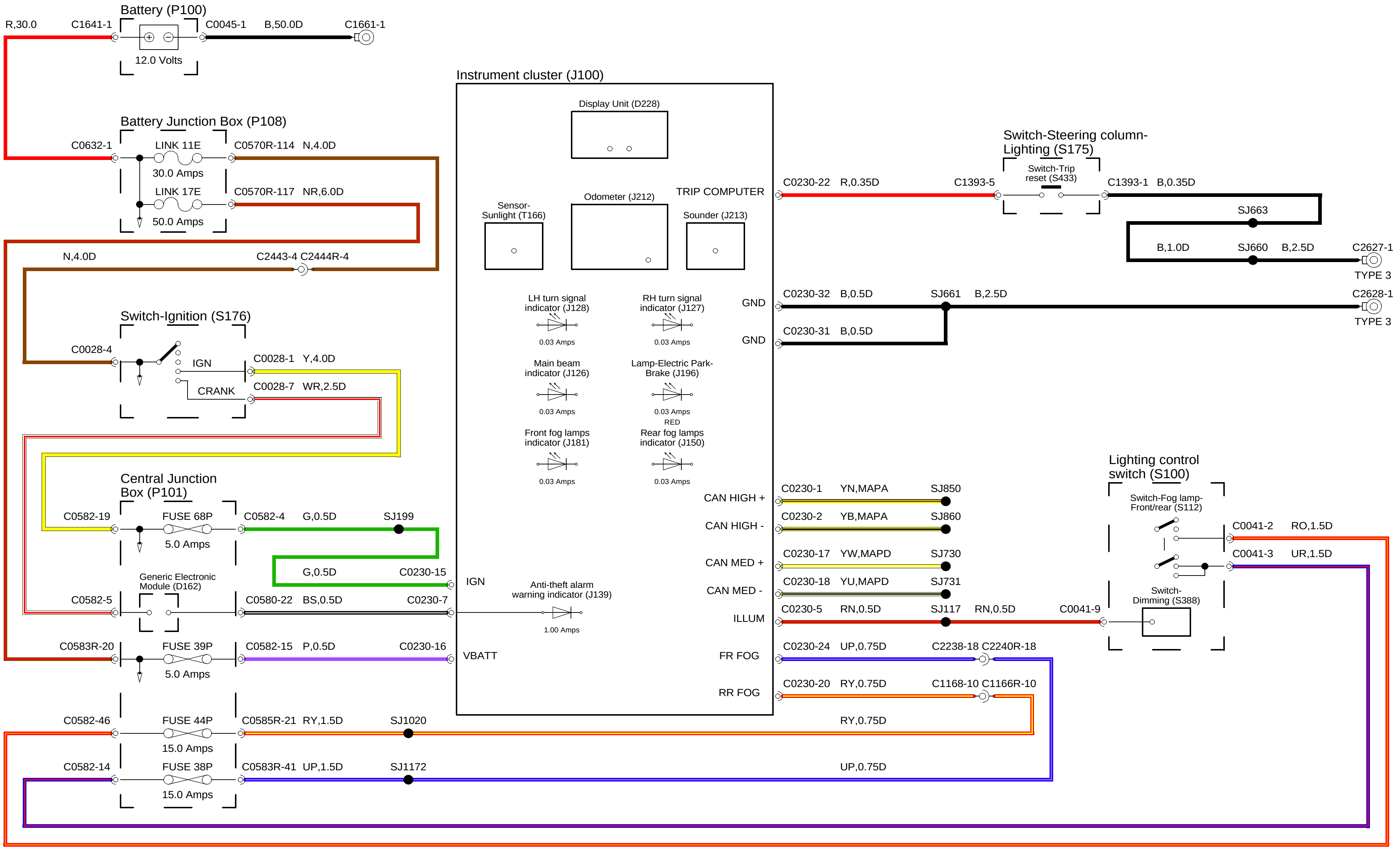

Switch pack-
Centre facia (S425)
F
Sheet1
RN,0.5D
C2387-6
P.D.C.
0.03 Amps
D.S.C.
0.03 Amps
TYRE DEFLATION
0.03 Amps
HAZARD
0.03 Amps
MASTER UNLOCK
0.03 Amps
MASTER LOCK
0.03 Amps
FRONT ALERT
0.03 Amps
PASS AIRBAG DISABLE
0.03 Amps
C2387-15
B,0.5D
C2629-1
TYPE 3
Lamp-Interior-
Front (B100)
B
Sheet1
RN,0.5D
C0084R-5 C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
Switch-Sun roof (S171)
0.03 Amps
C0357-4
B,0.75D
SJ275
B,1.0D
C0610-8 C0084R-8
B,0.75D
C1967R-1
TYPE 3
RN,0.5D
C1975-2
LED-Waterfall-
Lighting (B178)
0.03 Amps
C1975-1
B,0.5D
G
Sheet1
RN,0.35D
C0082-2
Clock spring (S227)
C1254-7
W,0.35
C2147-3
Module-Steering-
wheel-RH (D257)
0.03 Amps
C2147-5
B,0.35
C2636-1
Air bag-Driver (U106)
K,0.35
C2147-4
C2147-6
S,0.35
B,0.35D
C0082-6
C1254-3
B,0.35
Module-Steering-
wheel-LH (D256)
C2283-6
0.03 Amps
C2283-5
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

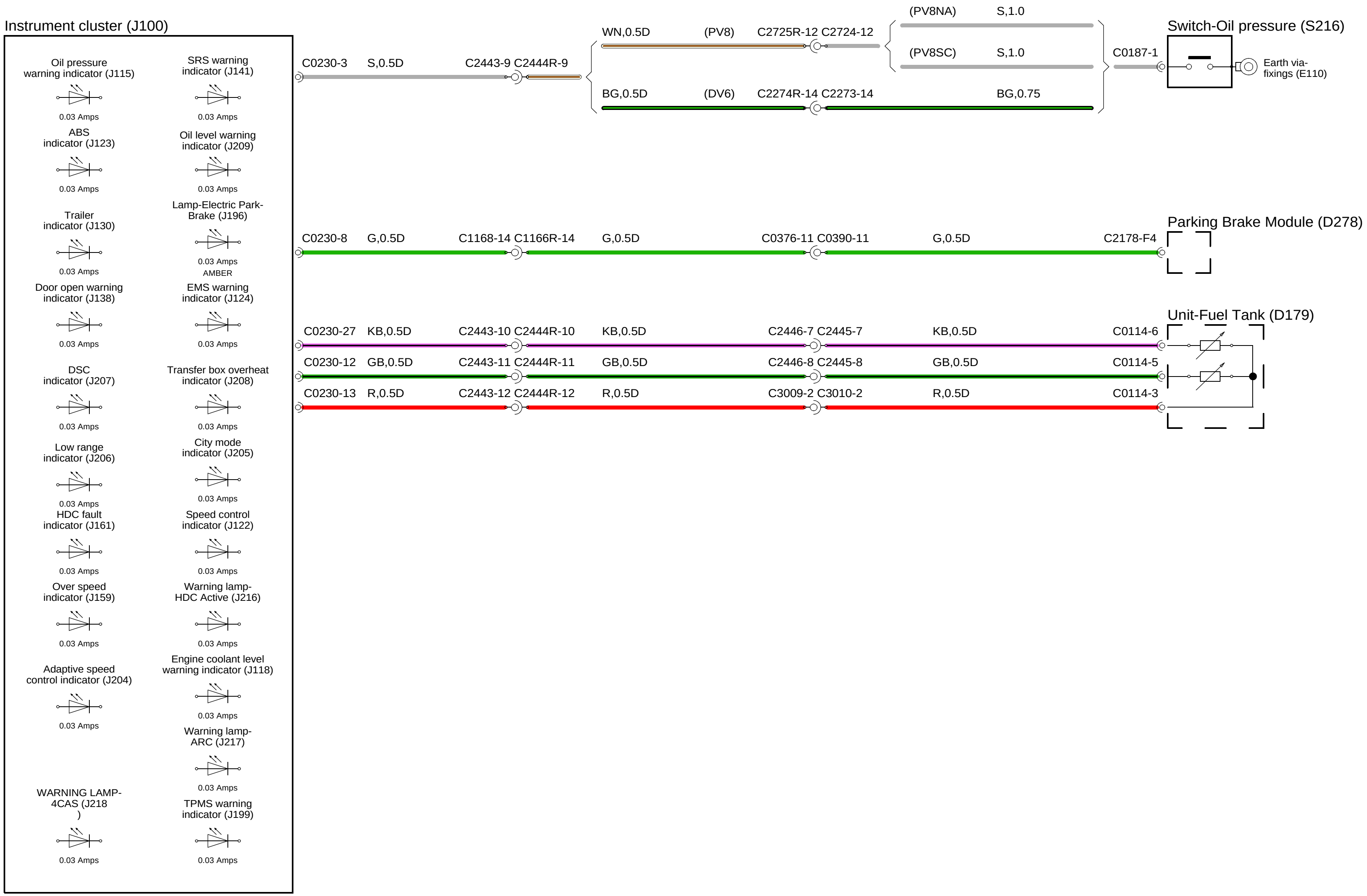
413-00 INSTRUMENT CLUSTER AND PANEL ILLUMINATION

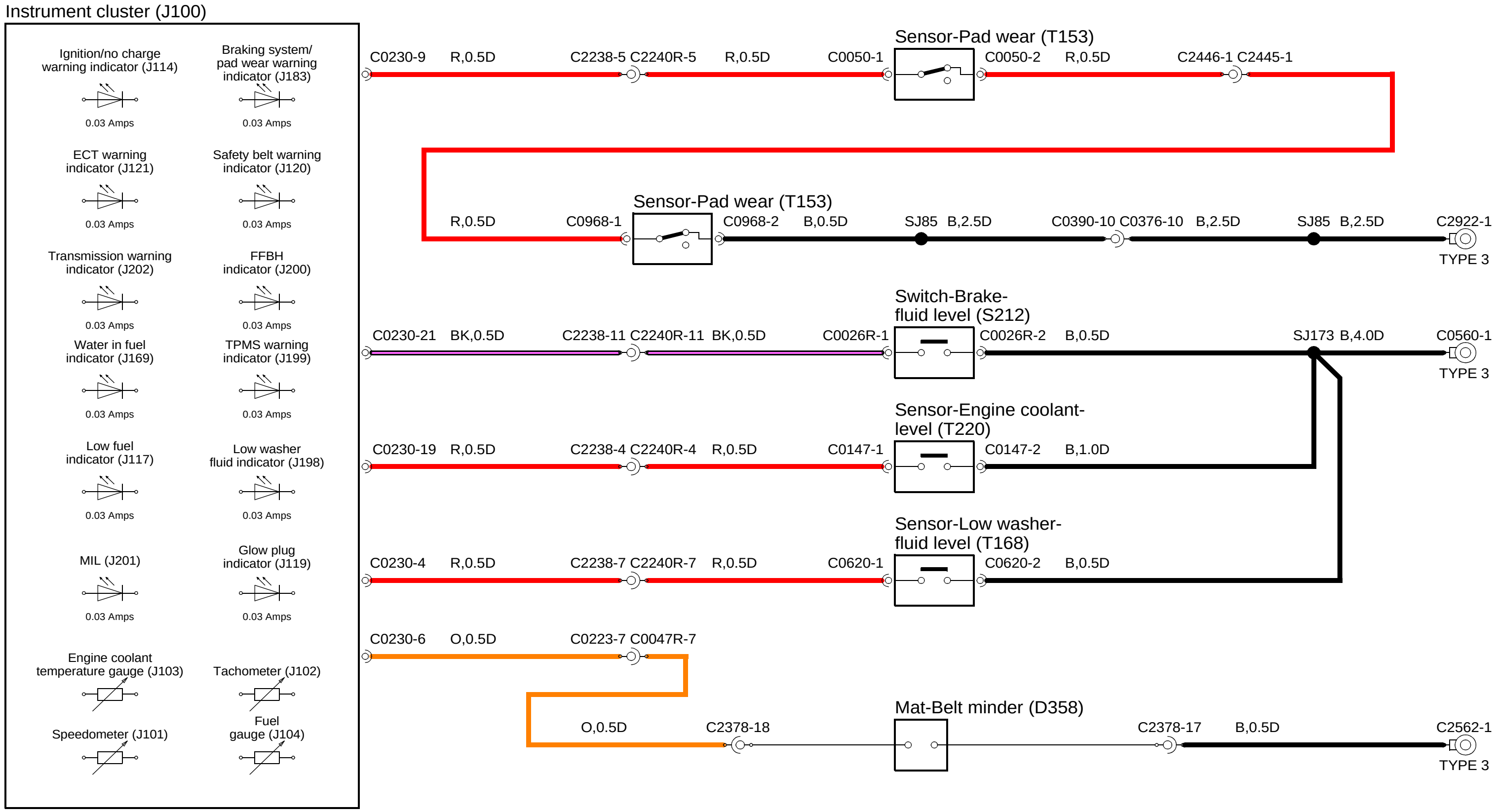

Switch-Window-Driver door (S344)
J
Sheet1
RN,0.5D
C0459R-31
C0439-31
RN,0.5D
C0343-7
WINDOW LIFT DRIVER
0.03 Amps
WINDOW LIFT PASS
0.03 Amps
WINDOW LIFT REAR L
0.03 Amps
WINDOW LIFT REAR R
0.03 Amps
REAR ISOLATE
0.03 Amps
C0081-6
B,2.5D
SJ210
B,4.0D
C0439-3
C0459R-3
B,4.0D
C2714R-1
TYPE 3
Switch-Window-Passenger door (S343)
H
Sheet1
RN,0.5D
C0463R-31
C0439-31
RN,0.5D
C0087-6
0.03 Amps
C0087-5
B,0.5D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3
Switch-Window-Rear-LH (S141)
E
Sheet1
RN,0.5D
C0435-4
C0803-4
RN,0.5D
SJ201
RN,0.5D
C0732-6
0.03 Amps
C0732-5
B,0.5D
SJ200
B,1.5D
C0803-9
C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21
C0435-21
B,1.5D
LH headphone unit (D334)
RN,0.5D
C2357-1
0.03 Amps
C2357-4
B,0.5D
Switch-Window-Rear-RH (S140)
D
Sheet1
RN,0.5D
C0436-4
C0804-4
RN,0.5D
SJ201
RN,0.5D
C0732-6
0.03 Amps
C0732-5
B,0.5D
SJ200
B,1.5D
C0804-9
C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21
C0436-21
B,1.5D
RH headphone unit (D335)
RN,0.5D
C2357-1
0.03 Amps
C2357-4
B,0.5D
Cigar lighter-Front (J112)
P
Sheet5
RN,0.5D
C0074-1
1.2 Watts
C0089-1
B,1.5D
SJ301
B,2.5D
C0903-24
C0868-24
B,2.5D
C2598-1
TYPE 3

413-00 INSTRUMENT CLUSTER AND PANEL ILLUMINATION

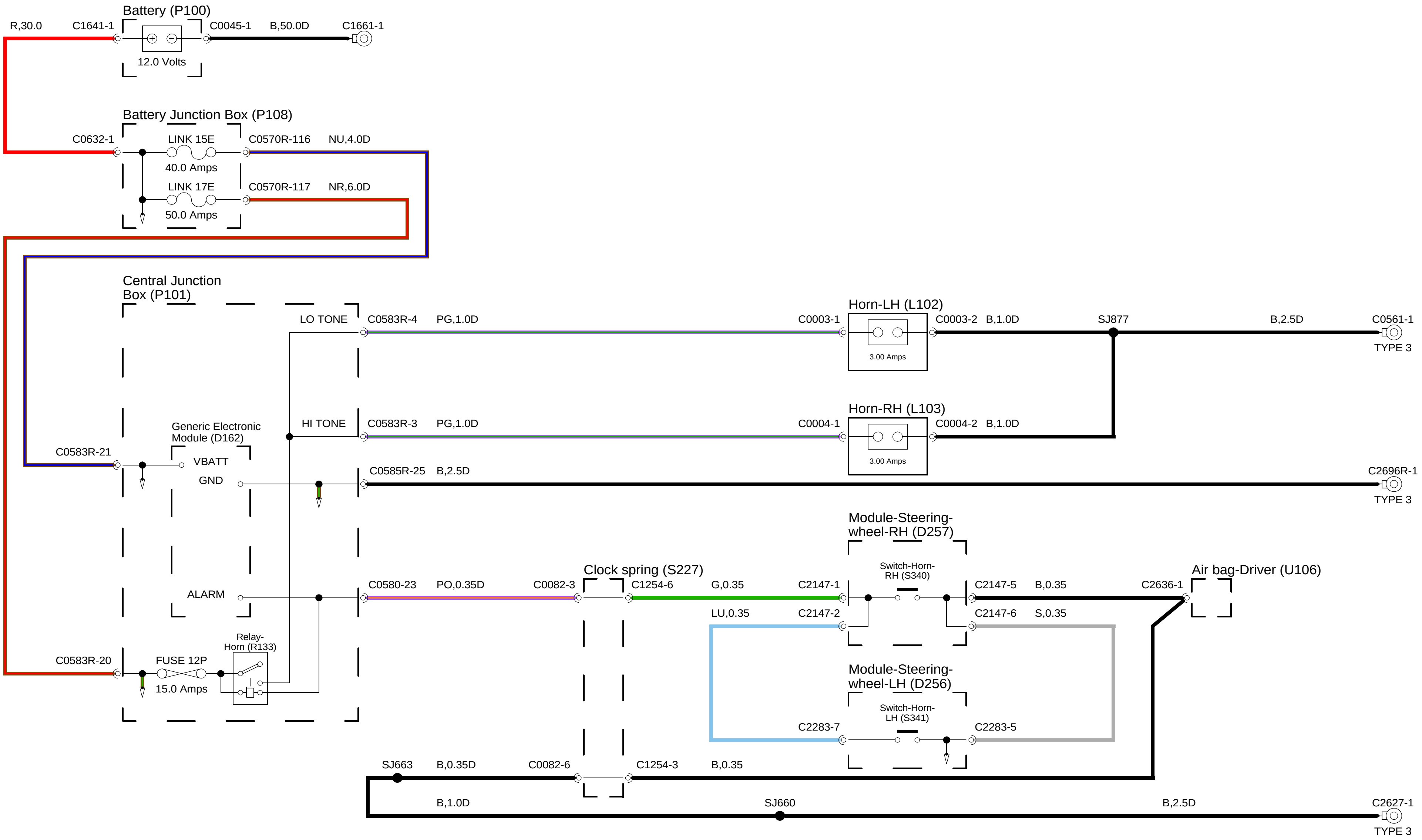

Switch pack-Centre-console (S350)
Switch-Hill-descent (S238)
0.03 Amps
Switch-Terrain-optimisation (S380)
0.03 Amps
Switch-Transmision-High-Low (S235)
0.03 Amps
Switch-Lower (S408)
0.03 Amps
C
RN,0.5D
Sheet1
P
RN,0.5D
Sheet4
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C0700-8
C0700-18
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Switch-Electric-park brake (S385)
RN,0.5D
C2180-5
0.03 Amps
C2180-6
B,0.5D
Selector mechanism (D308)
RN,0.5D
C2658-3
0.03 Amps
C2658-1
B,0.5D
Switch-Seat heat-Rear-LH (S368)
RN,0.5D
C1401-5
0.03 Amps
C1401-1
B,0.75D
Switch-Seat heat-Rear-RH (S369)
RN,0.5D
C1403-5
0.03 Amps
C1403-1
B,0.75D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2657-4
0.03 Amps
C2657-3
B,0.5D
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D
C2656-7
0.03 Amps
C2656-6
B,0.5D

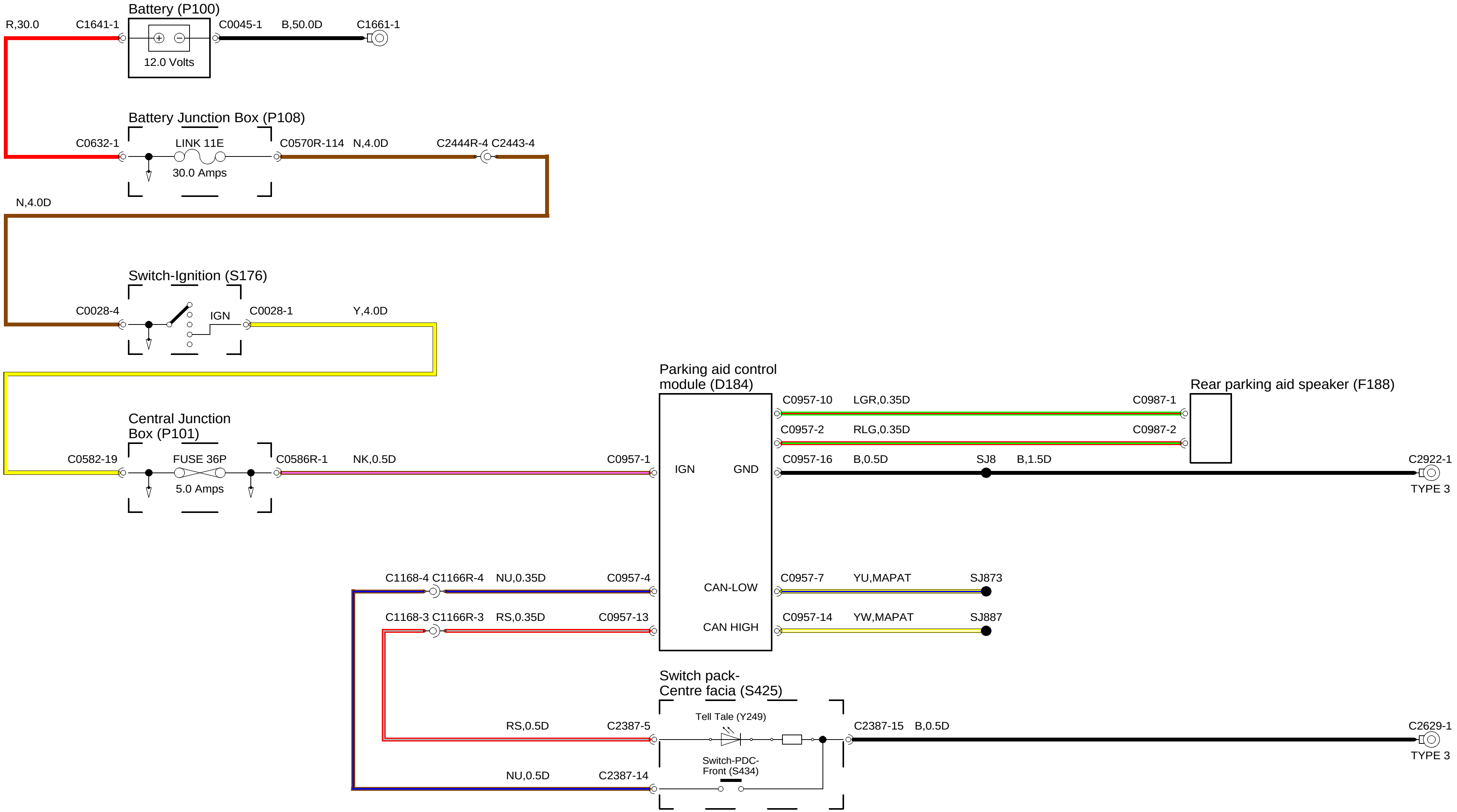

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
LINK 17E
C0570R-117
NR,6.0D
50.0 Amps
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
CRANK
C0028-7
WR,2.5D
Central Junction Box (P101)
C0582-19
FUSE 68P
5.0 Amps
C0582-4
G,0.5D
SJ199
G,0.5D
C0230-15
Generic Electronic Module (D162)
C0582-5
C0580-22
BS,0.5D
C0230-7
C0583R-20
FUSE 39P
5.0 Amps
C0582-15
P,0.5D
C0230-16
C0582-46
FUSE 44P
15.0 Amps
C0585R-21
RY,1.5D
SJ1020
C0582-14
FUSE 38P
15.0 Amps
C0583R-41
UP,1.5D
SJ1172
Instrument cluster (J100)
Display Unit (D228)
Sensor-Sunlight (T166)
Odometer (J212)
TRIP COMPUTER
Sounder (J213)
LH turn signal indicator (J128)
0.03 Amps
RH turn signal indicator (J127)
0.03 Amps
GND
GND
Main beam indicator (J126)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
RED
Front fog lamps indicator (J181)
0.03 Amps
Rear fog lamps indicator (J150)
0.03 Amps
CAN HIGH +
CAN HIGH -
CAN MED +
CAN MED -
ILLUM
IGN
Anti-theft alarm warning indicator (J139)
1.00 Amps
VBATT
FR FOG
RR FOG
Switch-Steering column-Lighting (S175)
Switch-Trip reset (S433)
C0230-22
R,0.35D
C1393-5
C1393-1
B,0.35D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
TYPE 3
C0230-31
B,0.5D
Lighting control switch (S100)
Switch-Fog lamp-Front/rear (S112)
C0041-2
RO,1.5D
C0041-3
UR,1.5D
Switch-Dimming (S388)
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860
C0230-17
YW,MAPD
SJ730
C0230-18
YU,MAPD
SJ731
C0230-5
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0230-24
UP,0.75D
C2238-18 C2240R-18
C0230-20
RY,0.75D
C1168-10 C1166R-10
RY,0.75D
UP,0.75D

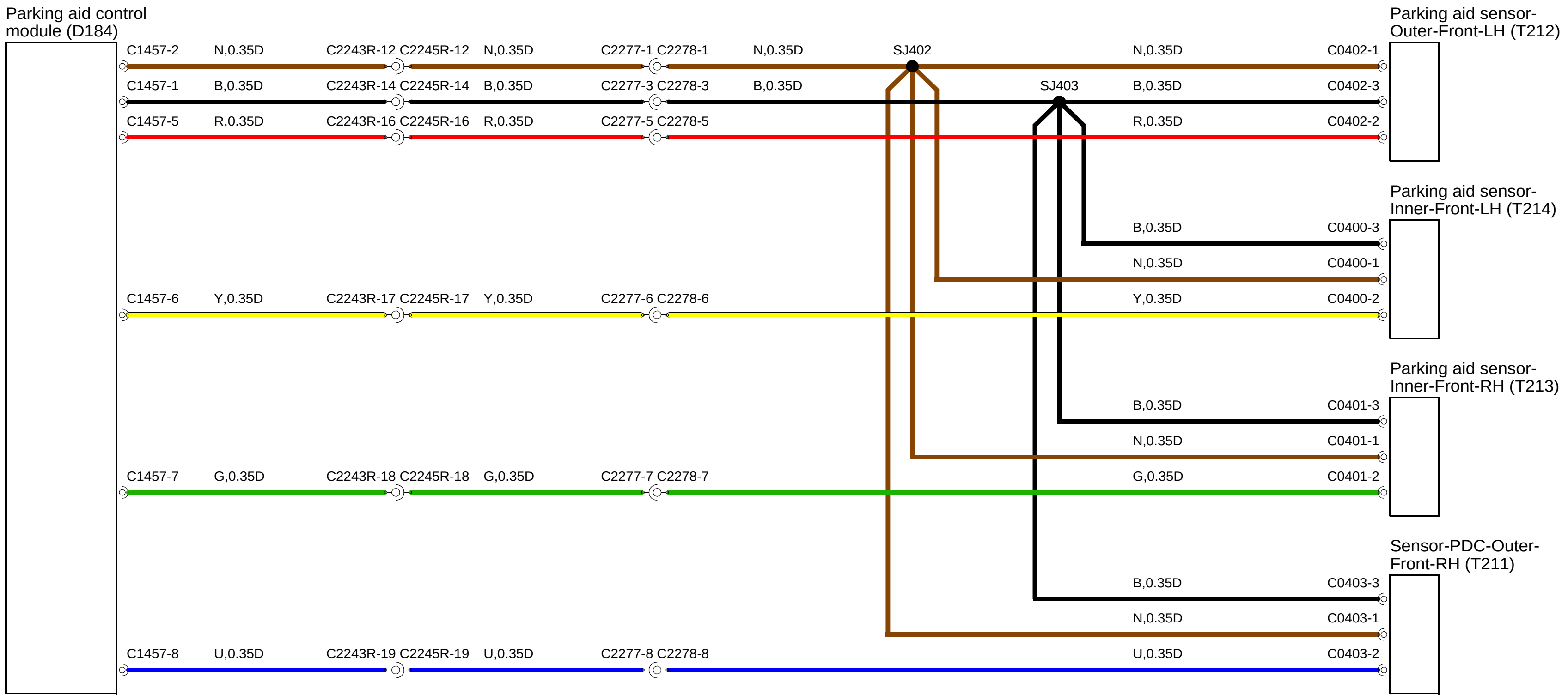

Instrument cluster (J100)
Oil pressure warning indicator (J115)
0.03 Amps
SRS warning indicator (J141)
0.03 Amps
ABS indicator (J123)
0.03 Amps
Oil level warning indicator (J209)
0.03 Amps
Trailer indicator (J130)
0.03 Amps
Lamp-Electric Park-Brake (J196)
0.03 Amps
AMBER
Door open warning indicator (J138)
0.03 Amps
EMS warning indicator (J124)
0.03 Amps
DSC indicator (J207)
0.03 Amps
Transfer box overheat indicator (J208)
0.03 Amps
Low range indicator (J206)
0.03 Amps
City mode indicator (J205)
0.03 Amps
HDC fault indicator (J161)
0.03 Amps
Speed control indicator (J122)
0.03 Amps
Over speed indicator (J159)
0.03 Amps
Warning lamp-HDC Active (J216)
0.03 Amps
Adaptive speed control indicator (J204)
0.03 Amps
Engine coolant level warning indicator (J118)
0.03 Amps
Warning lamp-ARC (J217)
0.03 Amps
WARNING LAMP-4CAS (J218)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
C0230-3
S,0.5D
C2443-9 C2444R-9
WN,0.5D
(PV8)
C2725R-12 C2724-12
(PV8NA)
S,1.0
(PV8SC)
S,1.0
BG,0.5D
(DV6)
C2274R-14 C2273-14
BG,0.75
C0187-1
Switch-Oil pressure (S216)
Earth via-fixings (E110)
C0230-8
G,0.5D
C1168-14 C1166R-14
G,0.5D
C0376-11 C0390-11
G,0.5D
C2178-F4
Parking Brake Module (D278)
Unit-Fuel Tank (D179)
C0230-27
KB,0.5D
C2443-10 C2444R-10
KB,0.5D
C2446-7 C2445-7
KB,0.5D
C0114-6
C0230-12
GB,0.5D
C2443-11 C2444R-11
GB,0.5D
C2446-8 C2445-8
GB,0.5D
C0114-5
C0230-13
R,0.5D
C2443-12 C2444R-12
R,0.5D
C3009-2 C3010-2
R,0.5D
C0114-3

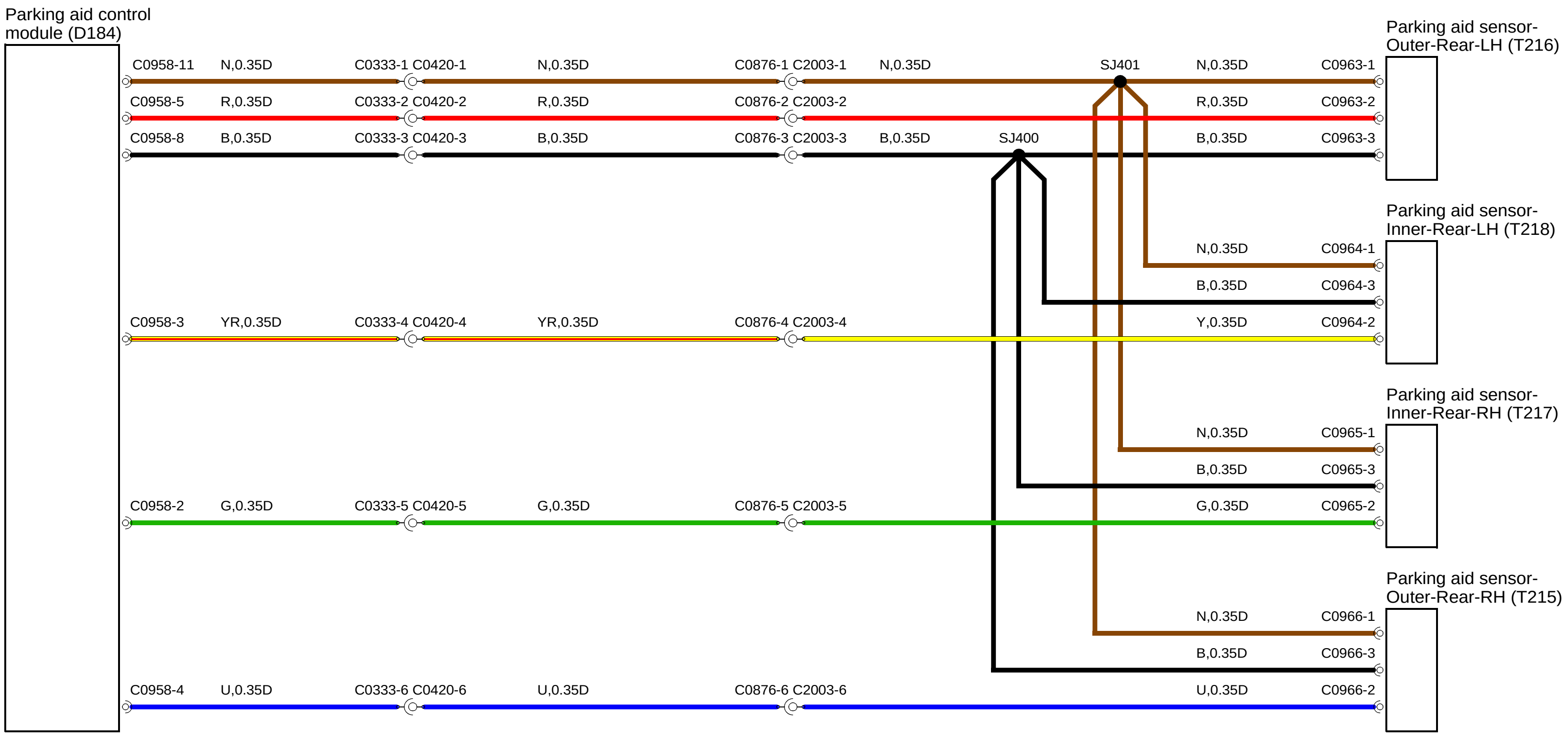

Instrument cluster (J100)
Ignition/no charge warning indicator (J114)
0.03 Amps
Braking system/ pad wear warning indicator (J183)
0.03 Amps
ECT warning indicator (J121)
0.03 Amps
Safety belt warning indicator (J120)
0.03 Amps
Transmission warning indicator (J202)
0.03 Amps
FFBH indicator (J200)
0.03 Amps
Water in fuel indicator (J169)
0.03 Amps
TPMS warning indicator (J199)
0.03 Amps
Low fuel indicator (J117)
0.03 Amps
Low washer fluid indicator (J198)
0.03 Amps
MIL (J201)
0.03 Amps
Glow plug indicator (J119)
0.03 Amps
Engine coolant temperature gauge (J103)
Tachometer (J102)
Speedometer (J101)
Fuel gauge (J104)
C0230-9
R,0.5D
C2238-5 C2240R-5
R,0.5D
C0050-1
Sensor-Pad wear (T153)
C0050-2
R,0.5D
C2446-1 C2445-1
Sensor-Pad wear (T153)
R,0.5D
C0968-1
C0968-2
B,0.5D
SJ85
B,2.5D
C0390-10 C0376-10
B,2.5D
SJ85
B,2.5D
C2922-1
TYPE 3
Switch-Brake- fluid level (S212)
C0230-21
BK,0.5D
C2238-11 C2240R-11
BK,0.5D
C0026R-1
C0026R-2
B,0.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Sensor-Engine coolant- level (T220)
C0230-19
R,0.5D
C2238-4 C2240R-4
R,0.5D
C0147-1
C0147-2
B,1.0D
Sensor-Low washer- fluid level (T168)
C0230-4
R,0.5D
C2238-7 C2240R-7
R,0.5D
C0620-1
C0620-2
B,0.5D
C0230-6
O,0.5D
C0223-7 C0047R-7
Mat-Belt minder (D358)
O,0.5D
C2378-18
C2378-17
B,0.5D
C2562-1
TYPE 3

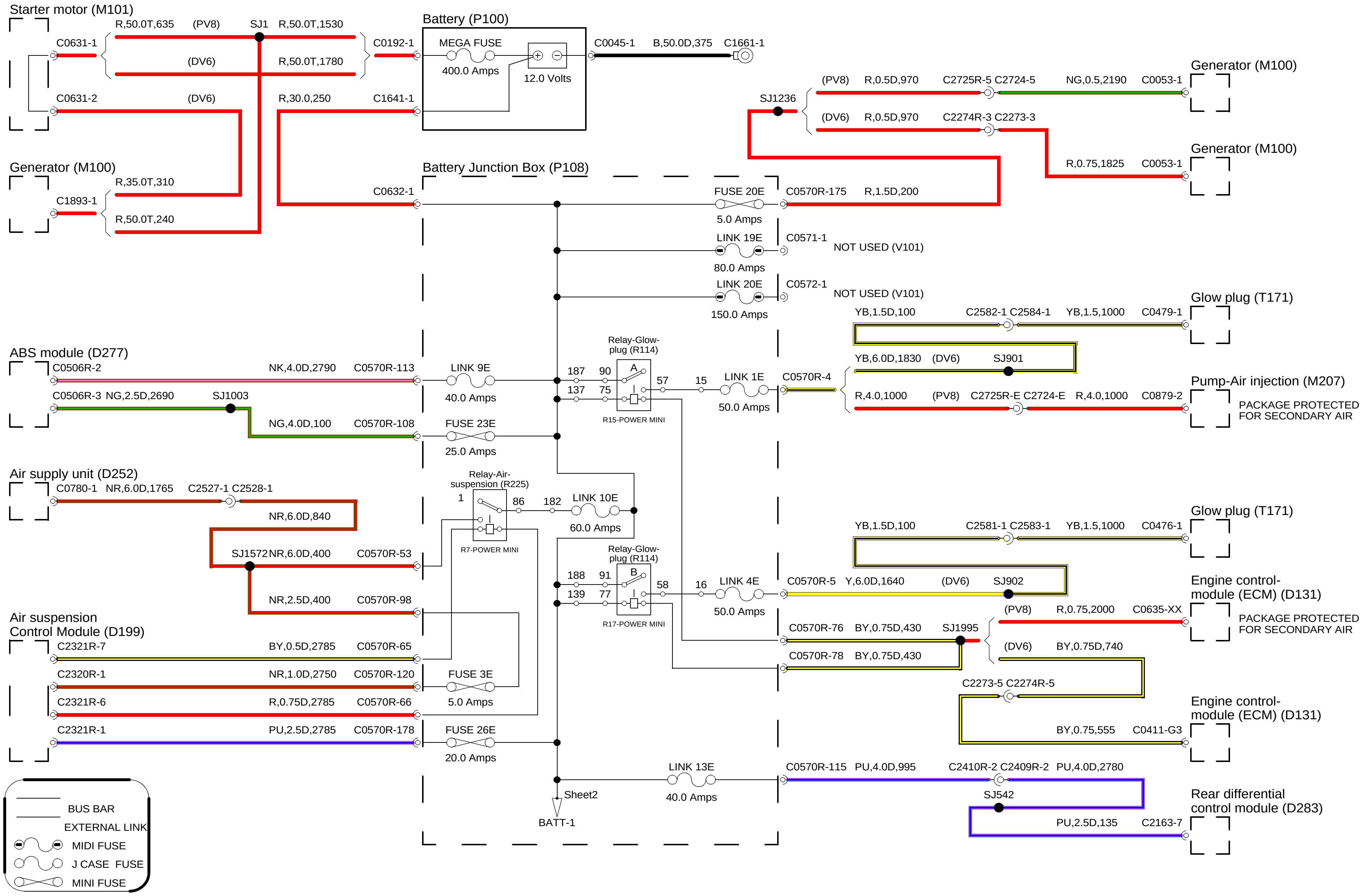
413-06 HORN

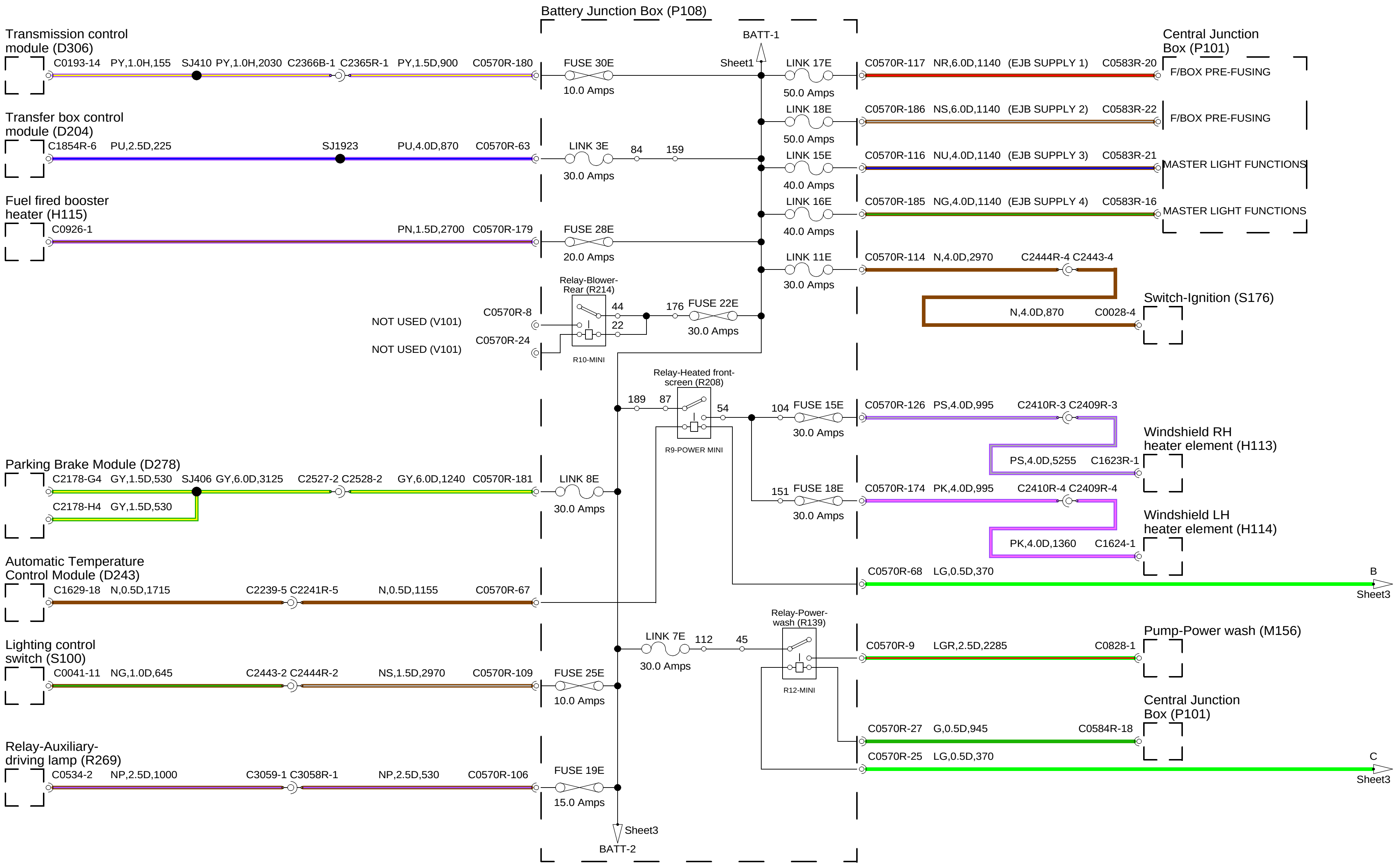

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
Central Junction Box (P101)
LO TONE
C0583R-4
PG,1.0D
C0003-1
Horn-LH (L102)
3.00 Amps
C0003-2
B,1.0D
SJ877
B,2.5D
C0561-1
TYPE 3
HI TONE
C0583R-3
PG,1.0D
C0004-1
Horn-RH (L103)
3.00 Amps
C0004-2
B,1.0D
Generic Electronic Module (D162)
C0583R-21
VBATT
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
Module-Steering-wheel-RH (D257)
Switch-Horn-RH (S340)
Clock spring (S227)
Air bag-Driver (U106)
ALARM
C0580-23
PO,0.35D
C0082-3
C1254-6
G,0.35
C2147-1
C2147-5
B,0.35
C2636-1
LU,0.35
C2147-2
C2147-6
S,0.35
Relay-Horn (R133)
C0583R-20
FUSE 12P
15.0 Amps
Module-Steering-wheel-LH (D256)
Switch-Horn-LH (S341)
C2283-7
C2283-5
SJ663
B,0.35D
C0082-6
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

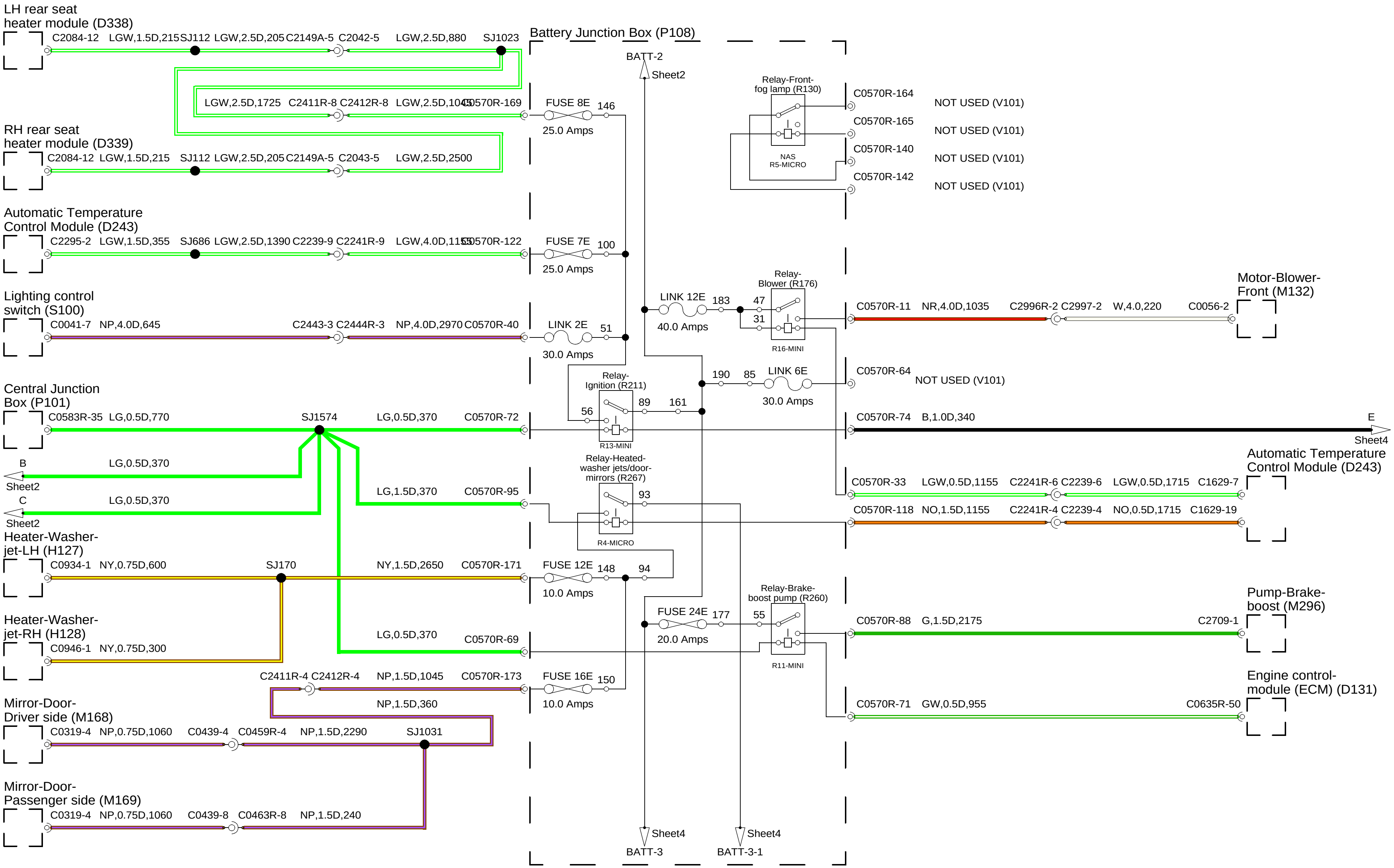

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 36P
5.0 Amps
C0586R-1
NK,0.5D
C0957-1
Parking aid control module (D184)
IGN
GND
CAN-LOW
CAN HIGH
C0957-10
LGR,0.35D
C0987-1
C0957-2
RLG,0.35D
C0987-2
Rear parking aid speaker (F188)
C0957-16
B,0.5D
SJ8
B,1.5D
C2922-1
TYPE 3
C1168-4 C1166R-4
NU,0.35D
C0957-4
C1168-3 C1166R-3
RS,0.35D
C0957-13
C0957-7
YU,MAPAT
SJ873
C0957-14
YW,MAPAT
SJ887
Switch pack-Centre facia (S425)
Tell Tale (Y249)
Switch-PDC-Front (S434)
RS,0.5D
C2387-5
NU,0.5D
C2387-14
C2387-15
B,0.5D
C2629-1
TYPE 3

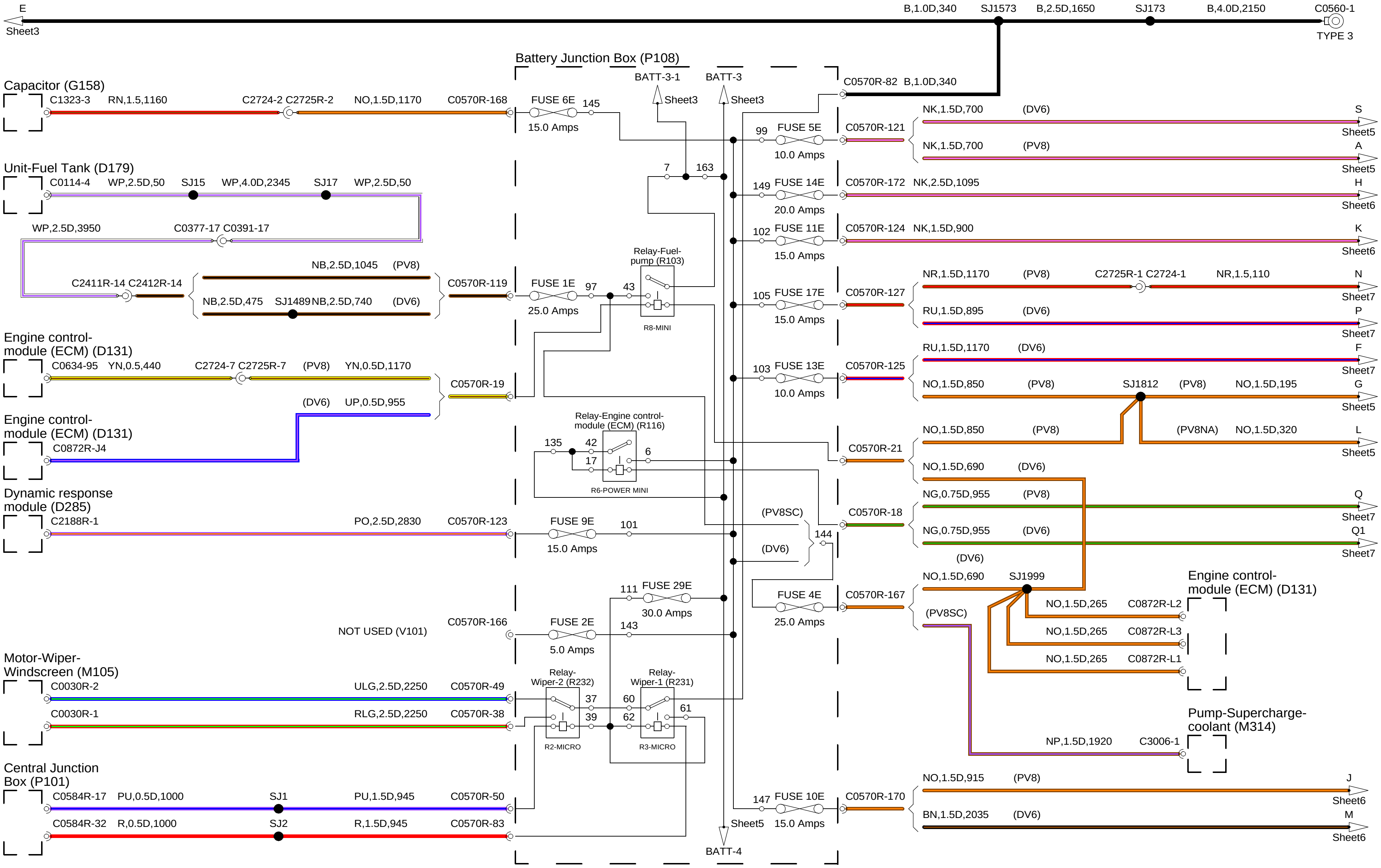

Parking aid control module (D184)
C1457-2
N,0.35D
C2243R-12 C2245R-12
N,0.35D
C2277-1 C2278-1
N,0.35D
SJ402
N,0.35D
C0402-1
C1457-1
B,0.35D
C2243R-14 C2245R-14
B,0.35D
C2277-3 C2278-3
B,0.35D
SJ403
B,0.35D
C0402-3
C1457-5
R,0.35D
C2243R-16 C2245R-16
R,0.35D
C2277-5 C2278-5
R,0.35D
C0402-2
Parking aid sensor-Outer-Front-LH (T212)
Parking aid sensor-Inner-Front-LH (T214)
B,0.35D
C0400-3
N,0.35D
C0400-1
C1457-6
Y,0.35D
C2243R-17 C2245R-17
Y,0.35D
C2277-6 C2278-6
Y,0.35D
C0400-2
Parking aid sensor-Inner-Front-RH (T213)
B,0.35D
C0401-3
N,0.35D
C0401-1
C1457-7
G,0.35D
C2243R-18 C2245R-18
G,0.35D
C2277-7 C2278-7
G,0.35D
C0401-2
Sensor-PDC-Outer-Front-RH (T211)
B,0.35D
C0403-3
N,0.35D
C0403-1
C1457-8
U,0.35D
C2243R-19 C2245R-19
U,0.35D
C2277-8 C2278-8
U,0.35D
C0403-2

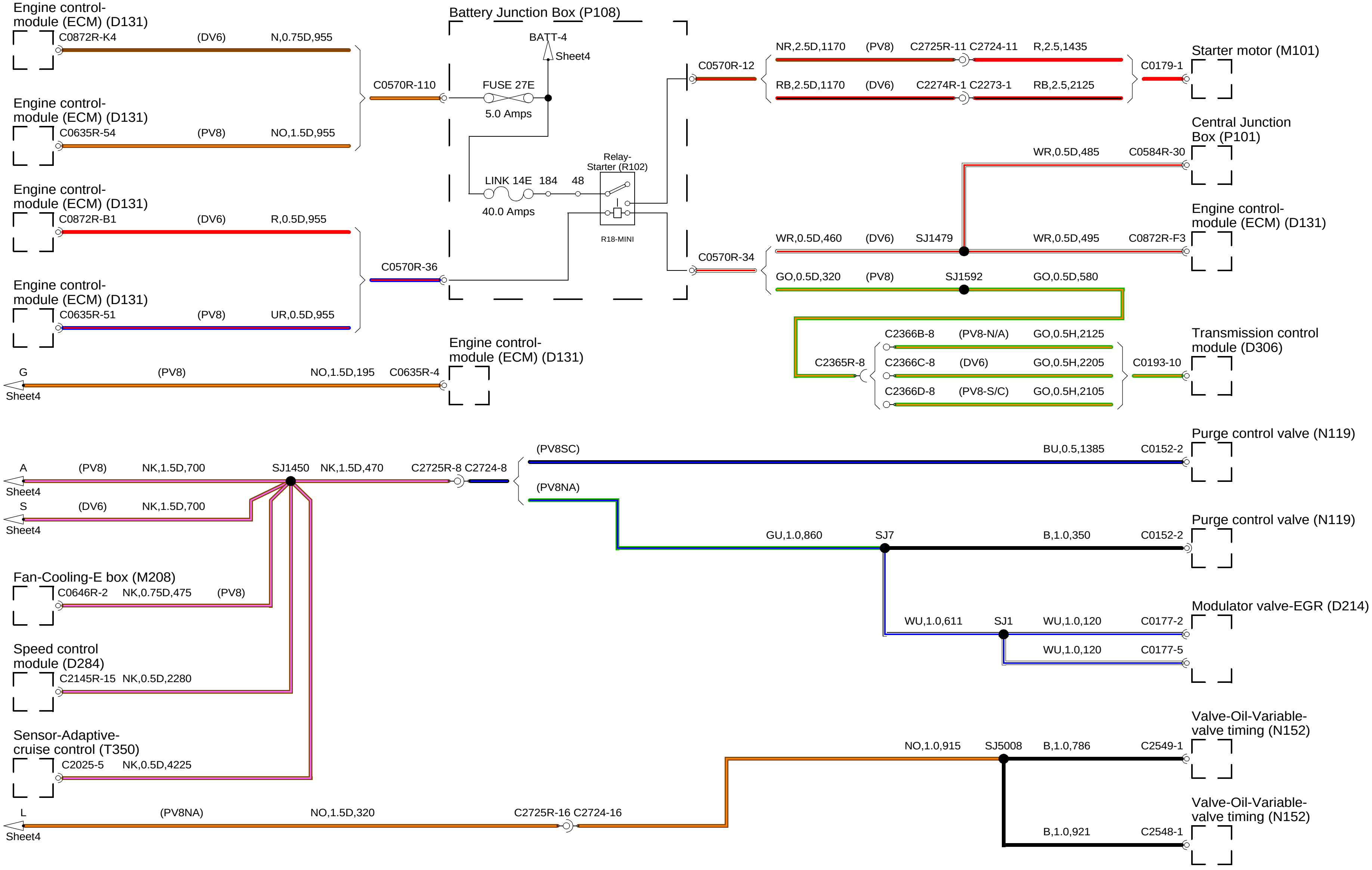

Parking aid control module (D184)
C0958-11
N,0.35D
C0333-1 C0420-1
N,0.35D
C0876-1 C2003-1
N,0.35D
SJ401
N,0.35D
C0963-1
C0958-5
R,0.35D
C0333-2 C0420-2
R,0.35D
C0876-2 C2003-2
R,0.35D
C0963-2
C0958-8
B,0.35D
C0333-3 C0420-3
B,0.35D
C0876-3 C2003-3
B,0.35D
SJ400
B,0.35D
C0963-3
Parking aid sensor-Outer-Rear-LH (T216)
Parking aid sensor-Inner-Rear-LH (T218)
N,0.35D
C0964-1
B,0.35D
C0964-3
C0958-3
YR,0.35D
C0333-4 C0420-4
YR,0.35D
C0876-4 C2003-4
Y,0.35D
C0964-2
Parking aid sensor-Inner-Rear-RH (T217)
N,0.35D
C0965-1
B,0.35D
C0965-3
C0958-2
G,0.35D
C0333-5 C0420-5
G,0.35D
C0876-5 C2003-5
G,0.35D
C0965-2
Parking aid sensor-Outer-Rear-RH (T215)
N,0.35D
C0966-1
B,0.35D
C0966-3
C0958-4
U,0.35D
C0333-6 C0420-6
U,0.35D
C0876-6 C2003-6
U,0.35D
C0966-2

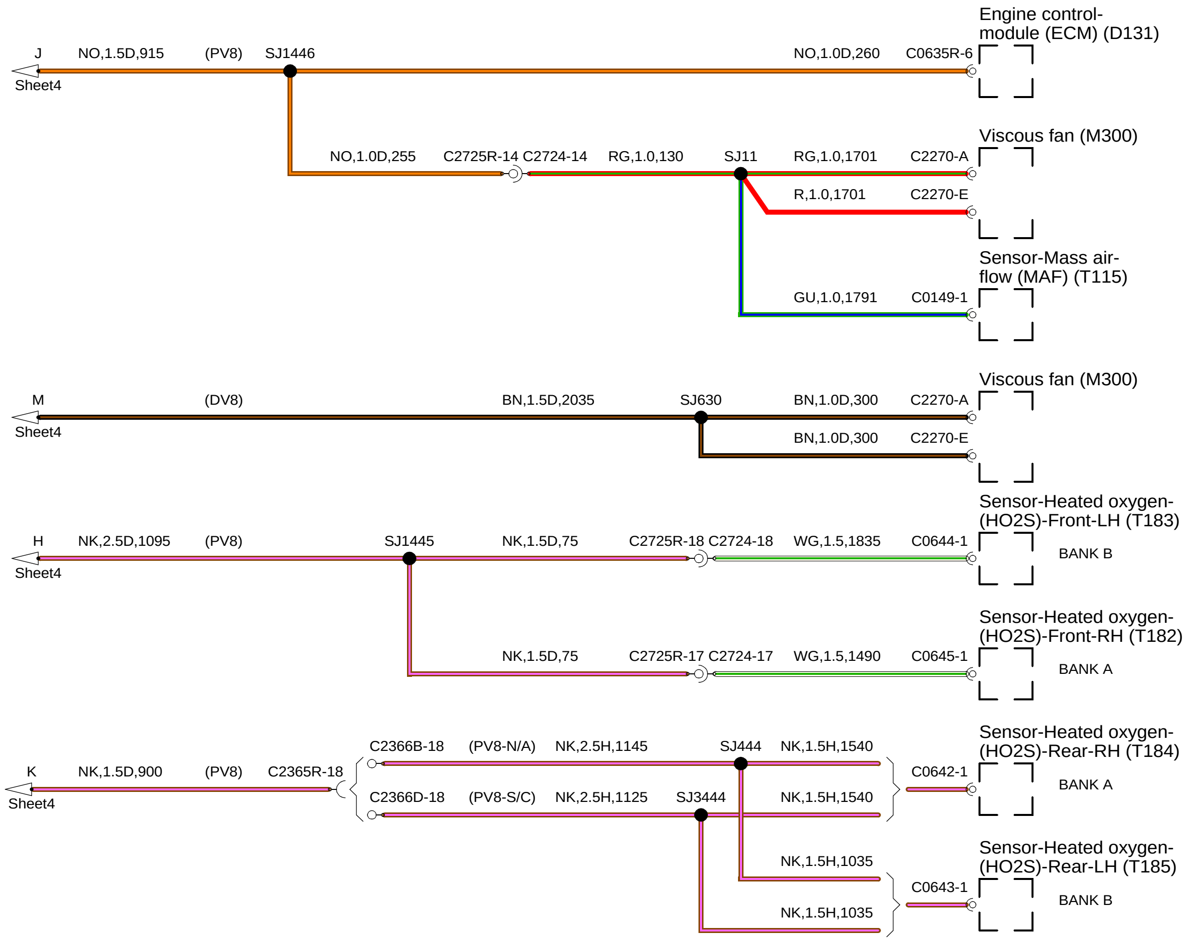

Starter motor (M101)
R,50.0T,635
(PV8)
SJ1
R,50.0T,1530
C0631-1
C0192-1
(DV6)
R,50.0T,1780
C0631-2
(DV6)
R,30.0,250
C1641-1
Battery (P100)
MEGA FUSE
400.0 Amps
12.0 Volts
C0045-1
B,50.0D,375
C1661-1
Generator (M100)
R,35.0T,310
C1893-1
R,50.0T,240
Battery Junction Box (P108)
C0632-1
FUSE 20E
5.0 Amps
C0570R-175
R,1.5D,200
SJ1236
(PV8)
R,0.5D,970
C2725R-5 C2724-5
NG,0.5,2190
C0053-1
Generator (M100)
(DV6)
R,0.5D,970
C2274R-3 C2273-3
R,0.75,1825
C0053-1
Generator (M100)
LINK 19E
80.0 Amps
C0571-1
NOT USED (V101)
LINK 20E
150.0 Amps
C0572-1
NOT USED (V101)
Glow plug (T171)
YB,1.5D,100
C2582-1 C2584-1
YB,1.5,1000
C0479-1
YB,6.0D,1830
(DV6)
SJ901
ABS module (D277)
C0506R-2
NK,4.0D,2790
C0570R-113
LINK 9E
40.0 Amps
Relay-Glow-plug (R114)
187
90
A
137
75
57
R15-POWER MINI
15
LINK 1E
50.0 Amps
C0570R-4
Pump-Air injection (M207)
R,4.0,1000
(PV8)
C2725R-E C2724-E
R,4.0,1000
C0879-2
PACKAGE PROTECTED FOR SECONDARY AIR
C0506R-3
NG,2.5D,2690
SJ1003
NG,4.0D,100
C0570R-108
FUSE 23E
25.0 Amps
Air supply unit (D252)
C0780-1
NR,6.0D,1765
C2527-1 C2528-1
NR,6.0D,840
Relay-Air-suspension (R225)
1
86
182
LINK 10E
60.0 Amps
R7-POWER MINI
SJ1572
NR,6.0D,400
C0570R-53
NR,2.5D,400
C0570R-98
Glow plug (T171)
YB,1.5D,100
C2581-1 C2583-1
YB,1.5,1000
C0476-1
Relay-Glow-plug (R114)
188
91
B
139
77
58
R17-POWER MINI
16
LINK 4E
50.0 Amps
C0570R-5
Y,6.0D,1640
(DV6)
SJ902
Engine control-module (ECM) (D131)
(PV8)
R,0.75,2000
C0635-XX
PACKAGE PROTECTED FOR SECONDARY AIR
Air suspension Control Module (D199)
C2321R-7
BY,0.5D,2785
C0570R-65
C0570R-76
BY,0.75D,430
SJ1995
(DV6)
BY,0.75D,740
C0570R-78
BY,0.75D,430
C2320R-1
NR,1.0D,2750
C0570R-120
FUSE 3E
5.0 Amps
C2273-5 C2274R-5
C2321R-6
R,0.75D,2785
C0570R-66
Engine control-module (ECM) (D131)
C2321R-1
PU,2.5D,2785
C0570R-178
FUSE 26E
20.0 Amps
BY,0.75,555
C0411-G3
LINK 13E
40.0 Amps
C0570R-115
PU,4.0D,995
C2410R-2 C2409R-2
PU,4.0D,2780
Sheet2
BATT-1
SJ542
Rear differential control module (D283)
PU,2.5D,135
C2163-7
BUS BAR
EXTERNAL LINK
MIDI FUSE
J CASE FUSE
MINI FUSE

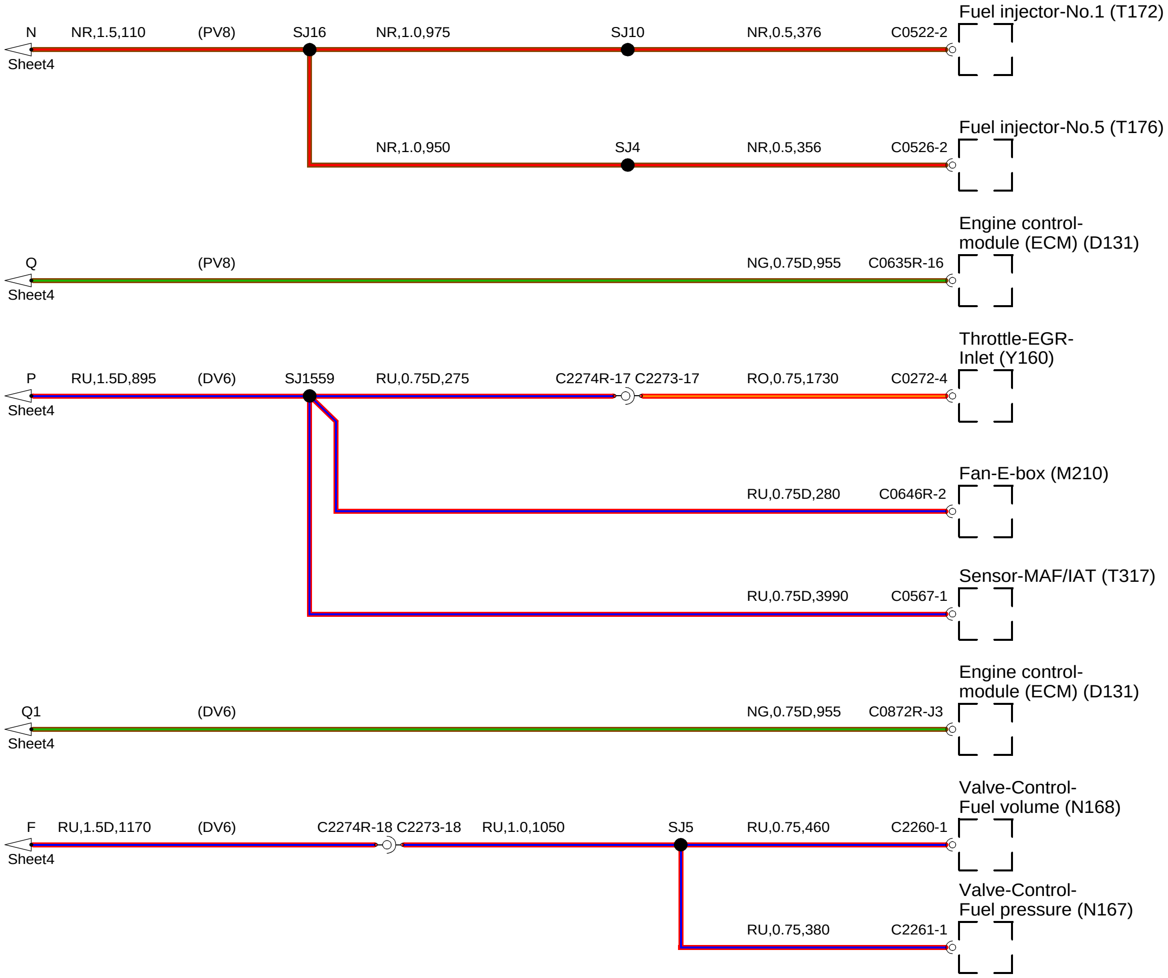

Battery Junction Box (P108)
BATT-1
Sheet1
Transmission control module (D306)
C0193-14
PY,1.0H,155
SJ410
PY,1.0H,2030
C2366B-1
C2365R-1
PY,1.5D,900
C0570R-180
FUSE 30E
10.0 Amps
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D,1140
(EJB SUPPLY 1)
C0583R-20
Central Junction Box (P101)
F/BOX PRE-FUSING
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D,1140
(EJB SUPPLY 2)
C0583R-22
F/BOX PRE-FUSING
Transfer box control module (D204)
C1854R-6
PU,2.5D,225
SJ1923
PU,4.0D,870
C0570R-63
LINK 3E
30.0 Amps
84
159
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D,1140
(EJB SUPPLY 3)
C0583R-21
MASTER LIGHT FUNCTIONS
LINK 16E
40.0 Amps
C0570R-185
NG,4.0D,1140
(EJB SUPPLY 4)
C0583R-16
MASTER LIGHT FUNCTIONS
Fuel fired booster heater (H115)
C0926-1
PN,1.5D,2700
C0570R-179
FUSE 28E
20.0 Amps
LINK 11E
30.0 Amps
C0570R-114
N,4.0D,2970
C2444R-4 C2443-4
Switch-Ignition (S176)
N,4.0D,870
C0028-4
Relay-Blower-Rear (R214)
R10-MINI
44
22
176
FUSE 22E
30.0 Amps
C0570R-8
NOT USED (V101)
C0570R-24
NOT USED (V101)
Relay-Heated front-screen (R208)
R9-POWER MINI
189
87
54
104
FUSE 15E
30.0 Amps
C0570R-126
PS,4.0D,995
C2410R-3 C2409R-3
Windshield RH heater element (H113)
PS,4.0D,5255
C1623R-1
151
FUSE 18E
30.0 Amps
C0570R-174
PK,4.0D,995
C2410R-4 C2409R-4
Windshield LH heater element (H114)
PK,4.0D,1360
C1624-1
Parking Brake Module (D278)
C2178-G4
GY,1.5D,530
SJ406
GY,6.0D,3125
C2527-2 C2528-2
GY,6.0D,1240
C0570R-181
LINK 8E
30.0 Amps
C2178-H4
GY,1.5D,530
C0570R-68
LG,0.5D,370
B
Sheet3
Automatic Temperature Control Module (D243)
C1629-18
N,0.5D,1715
C2239-5 C2241R-5
N,0.5D,1155
C0570R-67
Relay-Power-wash (R139)
R12-MINI
LINK 7E
30.0 Amps
112
45
C0570R-9
LGR,2.5D,2285
C0828-1
Pump-Power wash (M156)
Lighting control switch (S100)
C0041-11
NG,1.0D,645
C2443-2 C2444R-2
NS,1.5D,2970
C0570R-109
FUSE 25E
10.0 Amps
Central Junction Box (P101)
C0570R-27
G,0.5D,945
C0584R-18
C0570R-25
LG,0.5D,370
C
Sheet3
Relay-Auxiliary-driving lamp (R269)
C0534-2
NP,2.5D,1000
C3059-1 C3058R-1
NP,2.5D,530
C0570R-106
FUSE 19E
15.0 Amps
Sheet3
BATT-2

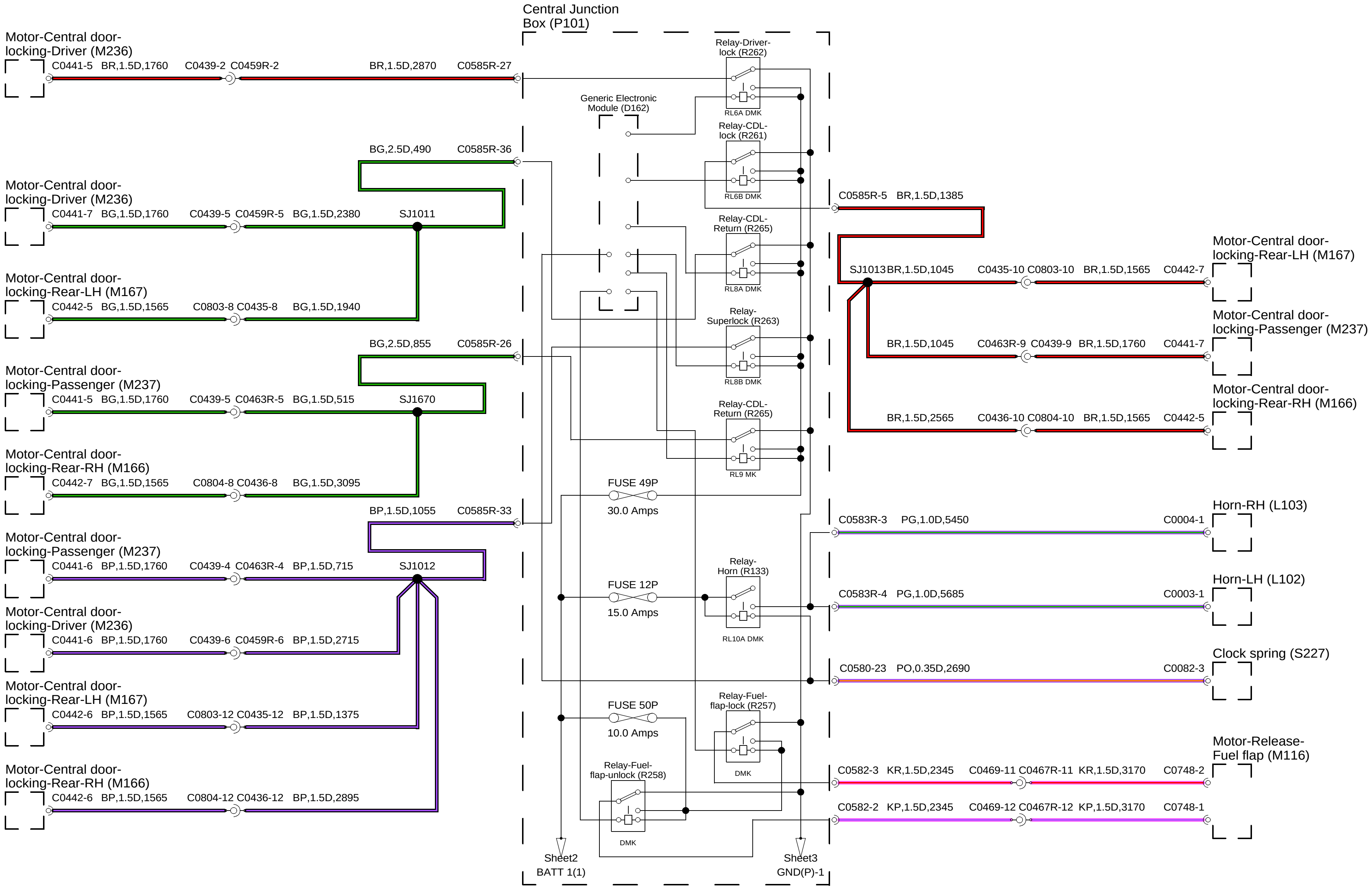

LH rear seat heater module (D338)
C2084-12
LGW,1.5D,215
SJ112
LGW,2.5D,205
C2149A-5
C2042-5
LGW,2.5D,880
SJ1023
Battery Junction Box (P108)
BATT-2
Sheet2
LGW,2.5D,1725
C2411R-8
C2412R-8
LGW,2.5D,1045
C0570R-169
FUSE 8E
146
25.0 Amps
Relay-Front-fog lamp (R130)
NAS R5-MICRO
C0570R-164
NOT USED (V101)
C0570R-165
NOT USED (V101)
C0570R-140
NOT USED (V101)
C0570R-142
NOT USED (V101)
RH rear seat heater module (D339)
C2084-12
LGW,1.5D,215
SJ112
LGW,2.5D,205
C2149A-5
C2043-5
LGW,2.5D,2500
Automatic Temperature Control Module (D243)
C2295-2
LGW,1.5D,355
SJ686
LGW,2.5D,1390
C2239-9
C2241R-9
LGW,4.0D,1155
C0570R-122
FUSE 7E
100
25.0 Amps
Lighting control switch (S100)
C0041-7
NP,4.0D,645
C2443-3
C2444R-3
NP,4.0D,2970
C0570R-40
LINK 2E
51
30.0 Amps
LINK 12E
183
40.0 Amps
Relay-Blower (R176)
47
31
R16-MINI
C0570R-11
NR,4.0D,1035
C2996R-2
C2997-2
W,4.0,220
C0056-2
Motor-Blower-Front (M132)
Relay-Ignition (R211)
56
89
161
R13-MINI
190
85
LINK 6E
30.0 Amps
C0570R-64
NOT USED (V101)
Central Junction Box (P101)
C0583R-35
LG,0.5D,770
SJ1574
LG,0.5D,370
C0570R-72
C0570R-74
B,1.0D,340
E
Sheet4
B
LG,0.5D,370
Sheet2
C
LG,0.5D,370
Sheet2
LG,1.5D,370
C0570R-95
Relay-Heated-washer jets/door-mirrors (R267)
93
R4-MICRO
C0570R-33
LGW,0.5D,1155
C2241R-6
C2239-6
LGW,0.5D,1715
C1629-7
Automatic Temperature Control Module (D243)
C0570R-118
NO,1.5D,1155
C2241R-4
C2239-4
NO,0.5D,1715
C1629-19
Heater-Washer-jet-LH (H127)
C0934-1
NY,0.75D,600
SJ170
NY,1.5D,2650
C0570R-171
FUSE 12E
148
94
10.0 Amps
Relay-Brake-boost pump (R260)
FUSE 24E
177
55
20.0 Amps
R11-MINI
Pump-Brake-boost (M296)
C0570R-88
G,1.5D,2175
C2709-1
Heater-Washer-jet-RH (H128)
C0946-1
NY,0.75D,300
LG,0.5D,370
C0570R-69
C2411R-4
C2412R-4
NP,1.5D,1045
C0570R-173
FUSE 16E
150
10.0 Amps
Engine control-module (ECM) (D131)
C0570R-71
GW,0.5D,955
C0635R-50
NP,1.5D,360
Mirror-Door-Driver side (M168)
C0319-4
NP,0.75D,1060
C0439-4
C0459R-4
NP,1.5D,2290
SJ1031
Mirror-Door-Passenger side (M169)
C0319-4
NP,0.75D,1060
C0439-8
C0463R-8
NP,1.5D,240
Sheet4
BATT-3
Sheet4
BATT-3-1

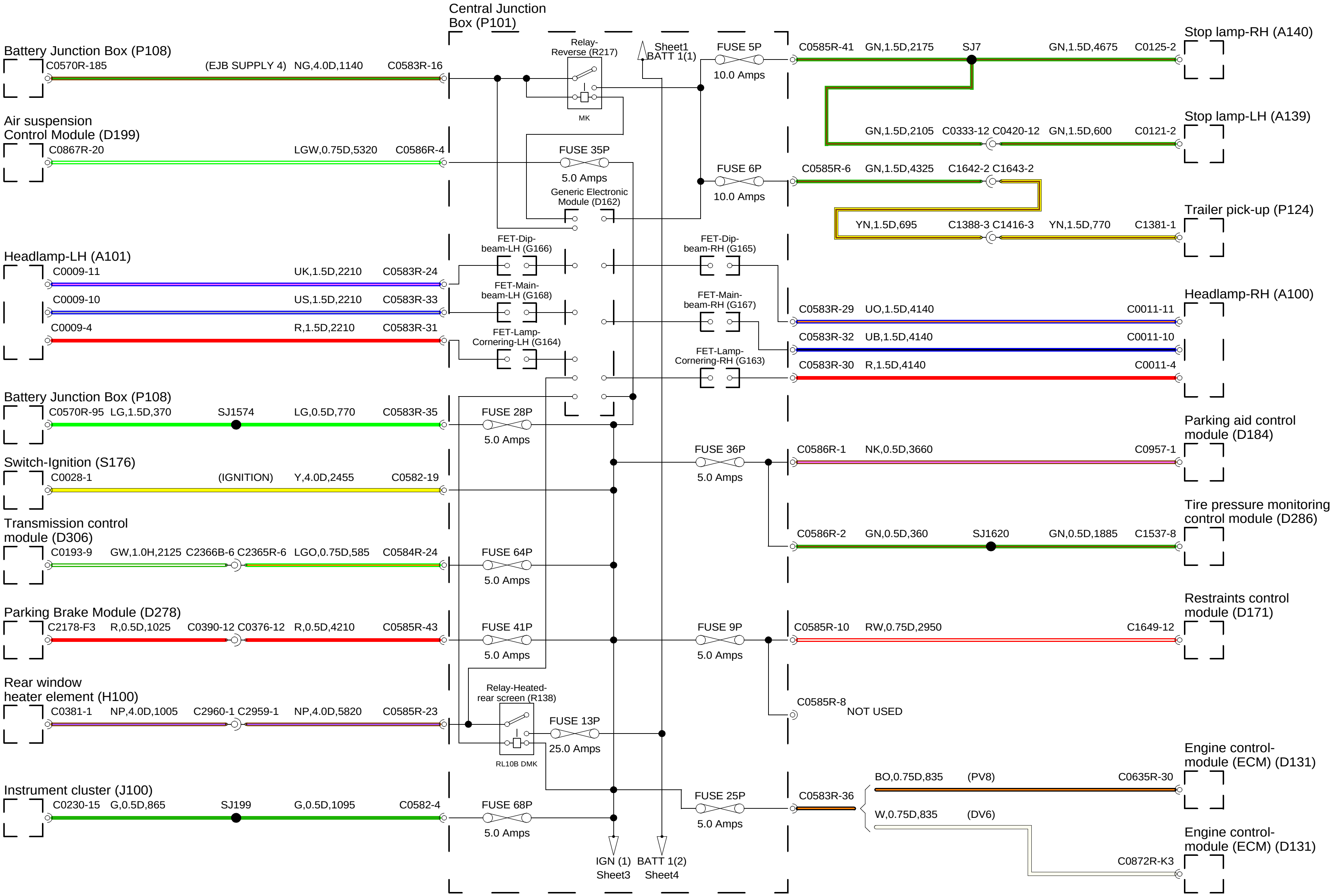

E
Sheet3
B,1.0D,340
SJ1573
B,2.5D,1650
SJ173
B,4.0D,2150
C0560-1
TYPE 3
Battery Junction Box (P108)
BATT-3-1
Sheet3
BATT-3
Sheet3
C0570R-82 B,1.0D,340
Capacitor (G158)
C1323-3
RN,1.5,1160
C2724-2 C2725R-2
NO,1.5D,1170
C0570R-168
FUSE 6E
145
15.0 Amps
NK,1.5D,700
(DV6)
S
Sheet5
99
FUSE 5E
C0570R-121
10.0 Amps
NK,1.5D,700
(PV8)
A
Sheet5
Unit-Fuel Tank (D179)
C0114-4
WP,2.5D,50
SJ15
WP,4.0D,2345
SJ17
WP,2.5D,50
7
163
149
FUSE 14E
C0570R-172
NK,2.5D,1095
H
20.0 Amps
Sheet6
WP,2.5D,3950
C0377-17 C0391-17
102
FUSE 11E
C0570R-124
NK,1.5D,900
K
15.0 Amps
Sheet6
Relay-Fuel-pump (R103)
NB,2.5D,1045
(PV8)
C2411R-14 C2412R-14
C0570R-119
FUSE 1E
97
43
NB,2.5D,475
SJ1489
NB,2.5D,740
(DV6)
25.0 Amps
R8-MINI
NR,1.5D,1170
(PV8)
C2725R-1 C2724-1
NR,1.5,110
N
105
FUSE 17E
C0570R-127
Sheet7
15.0 Amps
RU,1.5D,895
(DV6)
P
Sheet7
Engine control-module (ECM) (D131)
C0634-95
YN,0.5,440
C2724-7 C2725R-7
(PV8)
YN,0.5D,1170
C0570R-19
RU,1.5D,1170
(DV6)
F
103
FUSE 13E
C0570R-125
Sheet7
10.0 Amps
NO,1.5D,850
(PV8)
SJ1812
(PV8)
NO,1.5D,195
G
Sheet5
(DV6)
UP,0.5D,955
Engine control-module (ECM) (D131)
C0872R-J4
Relay-Engine control-module (ECM) (R116)
135
42
17
6
R6-POWER MINI
NO,1.5D,850
(PV8)
(PV8NA)
NO,1.5D,320
L
C0570R-21
Sheet5
NO,1.5D,690
(DV6)
Dynamic response module (D285)
C2188R-1
PO,2.5D,2830
C0570R-123
FUSE 9E
101
15.0 Amps
(PV8SC)
144
(DV6)
C0570R-18
NG,0.75D,955
(PV8)
Q
Sheet7
NG,0.75D,955
(DV6)
Q1
Sheet7
(DV6)
NO,1.5D,690
SJ1999
Engine control-module (ECM) (D131)
111
FUSE 29E
30.0 Amps
FUSE 4E
C0570R-167
25.0 Amps
NO,1.5D,265
C0872R-L2
(PV8SC)
C0570R-166
FUSE 2E
143
NOT USED (V101)
5.0 Amps
NO,1.5D,265
C0872R-L3
NO,1.5D,265
C0872R-L1
Motor-Wiper-Windscreen (M105)
C0030R-2
ULG,2.5D,2250
C0570R-49
Relay-Wiper-2 (R232)
37
Relay-Wiper-1 (R231)
60
61
C0030R-1
RLG,2.5D,2250
C0570R-38
39
62
R2-MICRO
R3-MICRO
Pump-Supercharge-coolant (M314)
NP,1.5D,1920
C3006-1
Central Junction Box (P101)
C0584R-17
PU,0.5D,1000
SJ1
PU,1.5D,945
C0570R-50
147
FUSE 10E
C0570R-170
NO,1.5D,915
(PV8)
J
Sheet6
C0584R-32
R,0.5D,1000
SJ2
R,1.5D,945
C0570R-83
Sheet5
15.0 Amps
BN,1.5D,2035
(DV6)
M
Sheet6
BATT-4

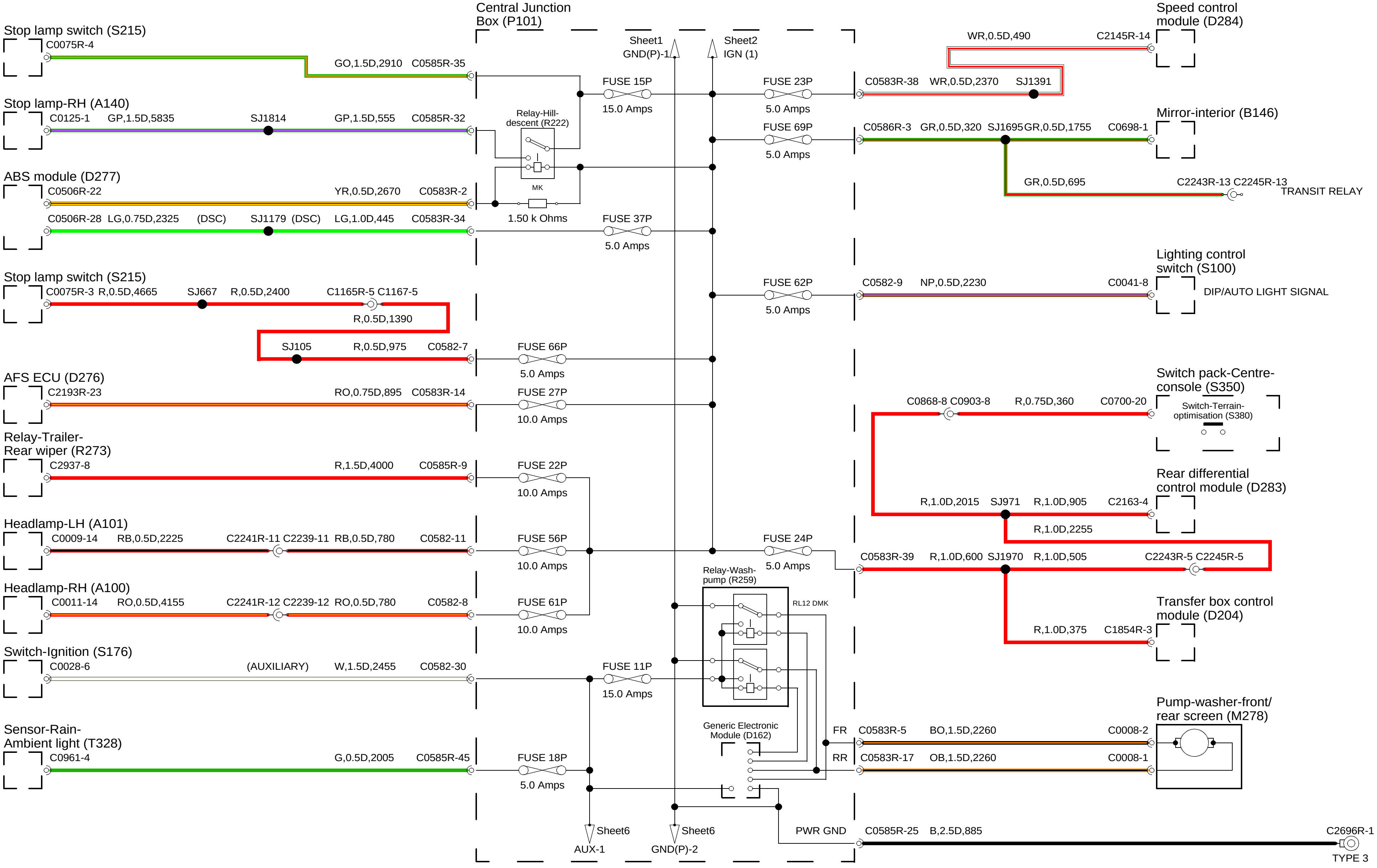

Engine control-module (ECM) (D131)
C0872R-K4
(DV6)
N,0.75D,955
Engine control-module (ECM) (D131)
C0635R-54
(PV8)
NO,1.5D,955
Engine control-module (ECM) (D131)
C0872R-B1
(DV6)
R,0.5D,955
Engine control-module (ECM) (D131)
C0635R-51
(PV8)
UR,0.5D,955
G
Sheet4
(PV8)
NO,1.5D,195
C0635R-4
Engine control-module (ECM) (D131)
C0570R-110
C0570R-36
Battery Junction Box (P108)
BATT-4
Sheet4
FUSE 27E
5.0 Amps
LINK 14E
184
48
40.0 Amps
Relay-Starter (R102)
R18-MINI
C0570R-12
C0570R-34
NR,2.5D,1170
(PV8)
C2725R-11
C2724-11
R,2.5,1435
RB,2.5D,1170
(DV6)
C2274R-1
C2273-1
RB,2.5,2125
C0179-1
Starter motor (M101)
Central Junction Box (P101)
WR,0.5D,485
C0584R-30
Engine control-module (ECM) (D131)
WR,0.5D,460
(DV6)
SJ1479
WR,0.5D,495
C0872R-F3
GO,0.5D,320
(PV8)
SJ1592
GO,0.5D,580
C2365R-8
C2366B-8
(PV8-N/A)
GO,0.5H,2125
C2366C-8
(DV6)
GO,0.5H,2205
C2366D-8
(PV8-S/C)
GO,0.5H,2105
C0193-10
Transmission control module (D306)
A
Sheet4
(PV8)
NK,1.5D,700
S
Sheet4
(DV6)
NK,1.5D,700
SJ1450
NK,1.5D,470
C2725R-8
C2724-8
(PV8SC)
BU,0.5,1385
C0152-2
Purge control valve (N119)
(PV8NA)
GU,1.0,860
SJ7
B,1.0,350
C0152-2
Purge control valve (N119)
Fan-Cooling-E box (M208)
C0646R-2
NK,0.75D,475
(PV8)
WU,1.0,611
SJ1
WU,1.0,120
C0177-2
WU,1.0,120
C0177-5
Modulator valve-EGR (D214)
Speed control module (D284)
C2145R-15
NK,0.5D,2280
Sensor-Adaptive-cruise control (T350)
C2025-5
NK,0.5D,4225
NO,1.0,915
SJ5008
B,1.0,786
C2549-1
Valve-Oil-Variable-valve timing (N152)
L
Sheet4
(PV8NA)
NO,1.5D,320
C2725R-16
C2724-16
B,1.0,921
C2548-1
Valve-Oil-Variable-valve timing (N152)

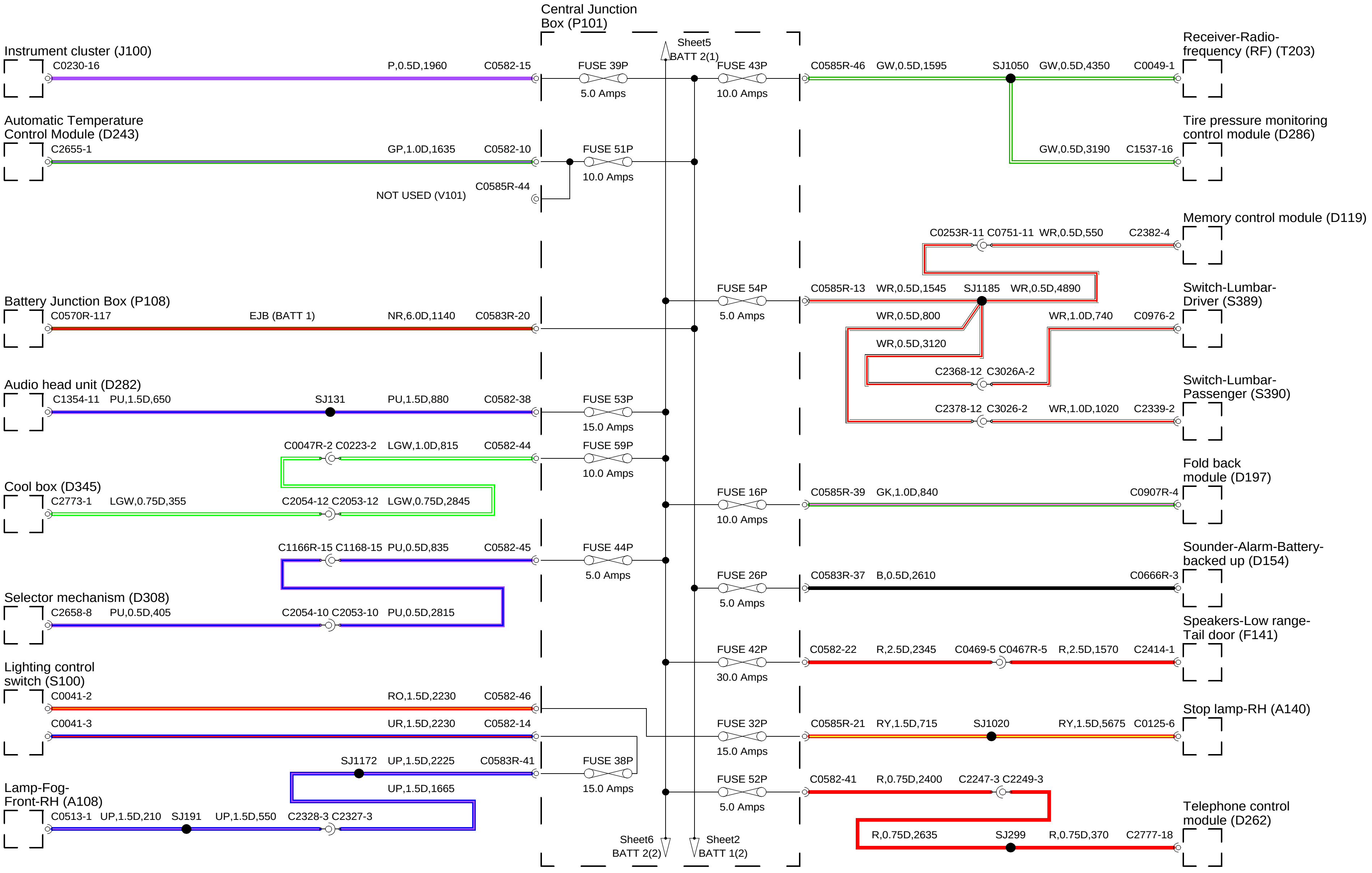

Engine control-
module (ECM) (D131)
J
Sheet4
NO,1.5D,915
(PV8)
SJ1446
NO,1.0D,260
C0635R-6
Viscous fan (M300)
NO,1.0D,255
C2725R-14 C2724-14
RG,1.0,130
SJ11
RG,1.0,1701
C2270-A
R,1.0,1701
C2270-E
Sensor-Mass air-
flow (MAF) (T115)
GU,1.0,1791
C0149-1
Viscous fan (M300)
M
Sheet4
(DV8)
BN,1.5D,2035
SJ630
BN,1.0D,300
C2270-A
BN,1.0D,300
C2270-E
Sensor-Heated oxygen-
(HO2S)-Front-LH (T183)
H
Sheet4
NK,2.5D,1095
(PV8)
SJ1445
NK,1.5D,75
C2725R-18 C2724-18
WG,1.5,1835
C0644-1
BANK B
Sensor-Heated oxygen-
(HO2S)-Front-RH (T182)
NK,1.5D,75
C2725R-17 C2724-17
WG,1.5,1490
C0645-1
BANK A
Sensor-Heated oxygen-
(HO2S)-Rear-RH (T184)
C2366B-18
(PV8-N/A)
NK,2.5H,1145
SJ444
NK,1.5H,1540
K
Sheet4
NK,1.5D,900
(PV8)
C2365R-18
C0642-1
BANK A
C2366D-18
(PV8-S/C)
NK,2.5H,1125
SJ3444
NK,1.5H,1540
Sensor-Heated oxygen-
(HO2S)-Rear-LH (T185)
NK,1.5H,1035
C0643-1
BANK B
NK,1.5H,1035

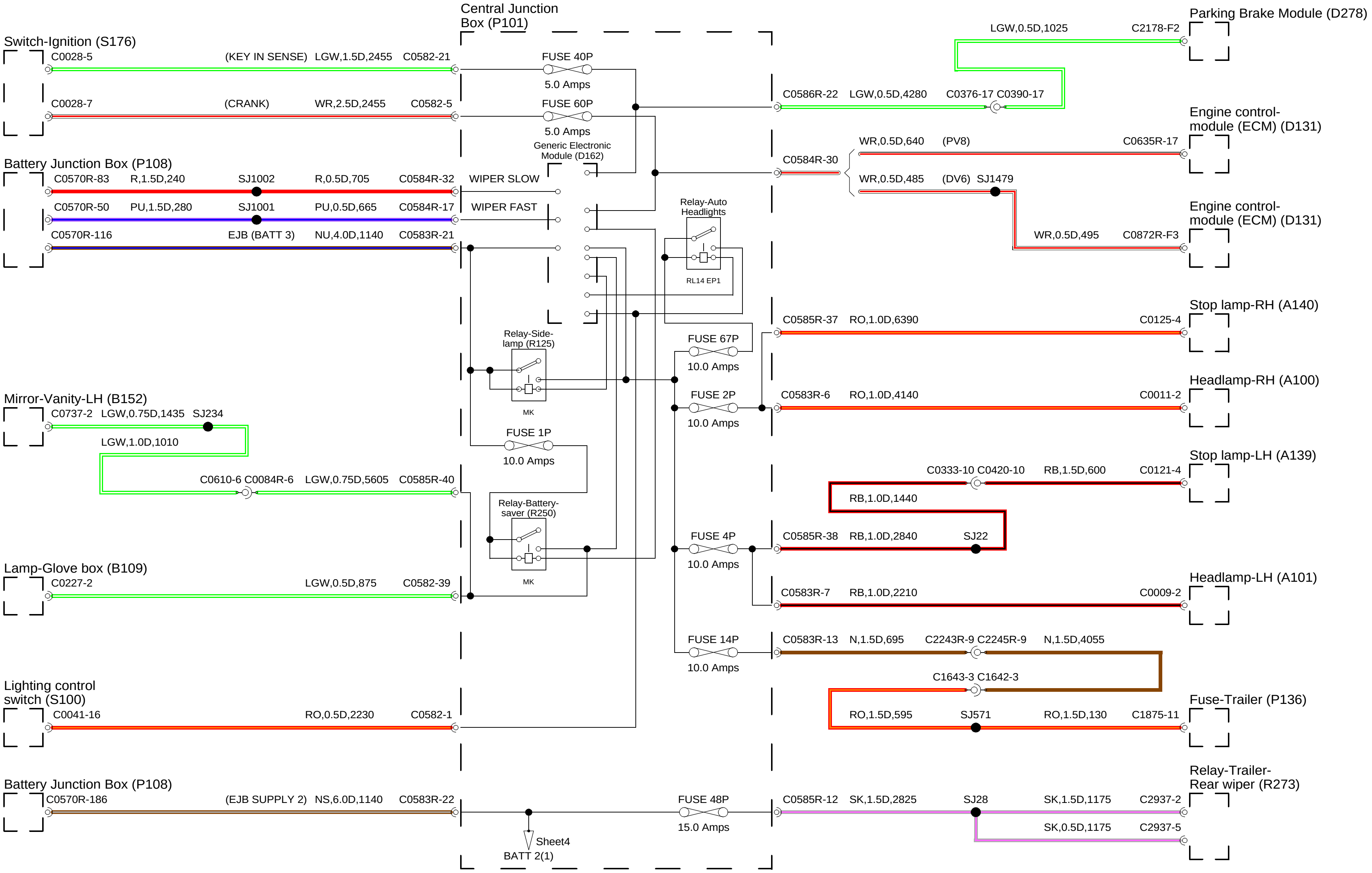

N
Sheet4
NR,1.5,110
(PV8)
SJ16
NR,1.0,975
SJ10
NR,0.5,376
C0522-2
Fuel injector-No.1 (T172)
NR,1.0,950
SJ4
NR,0.5,356
C0526-2
Fuel injector-No.5 (T176)
Q
Sheet4
(PV8)
NG,0.75D,955
C0635R-16
Engine control-module (ECM) (D131)
P
Sheet4
RU,1.5D,895
(DV6)
SJ1559
RU,0.75D,275
C2274R-17 C2273-17
RO,0.75,1730
C0272-4
Throttle-EGR-Inlet (Y160)
RU,0.75D,280
C0646R-2
Fan-E-box (M210)
RU,0.75D,3990
C0567-1
Sensor-MAF/IAT (T317)
Q1
Sheet4
(DV6)
NG,0.75D,955
C0872R-J3
Engine control-module (ECM) (D131)
F
Sheet4
RU,1.5D,1170
(DV6)
C2274R-18 C2273-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260-1
Valve-Control-Fuel volume (N168)
RU,0.75,380
C2261-1
Valve-Control-Fuel pressure (N167)

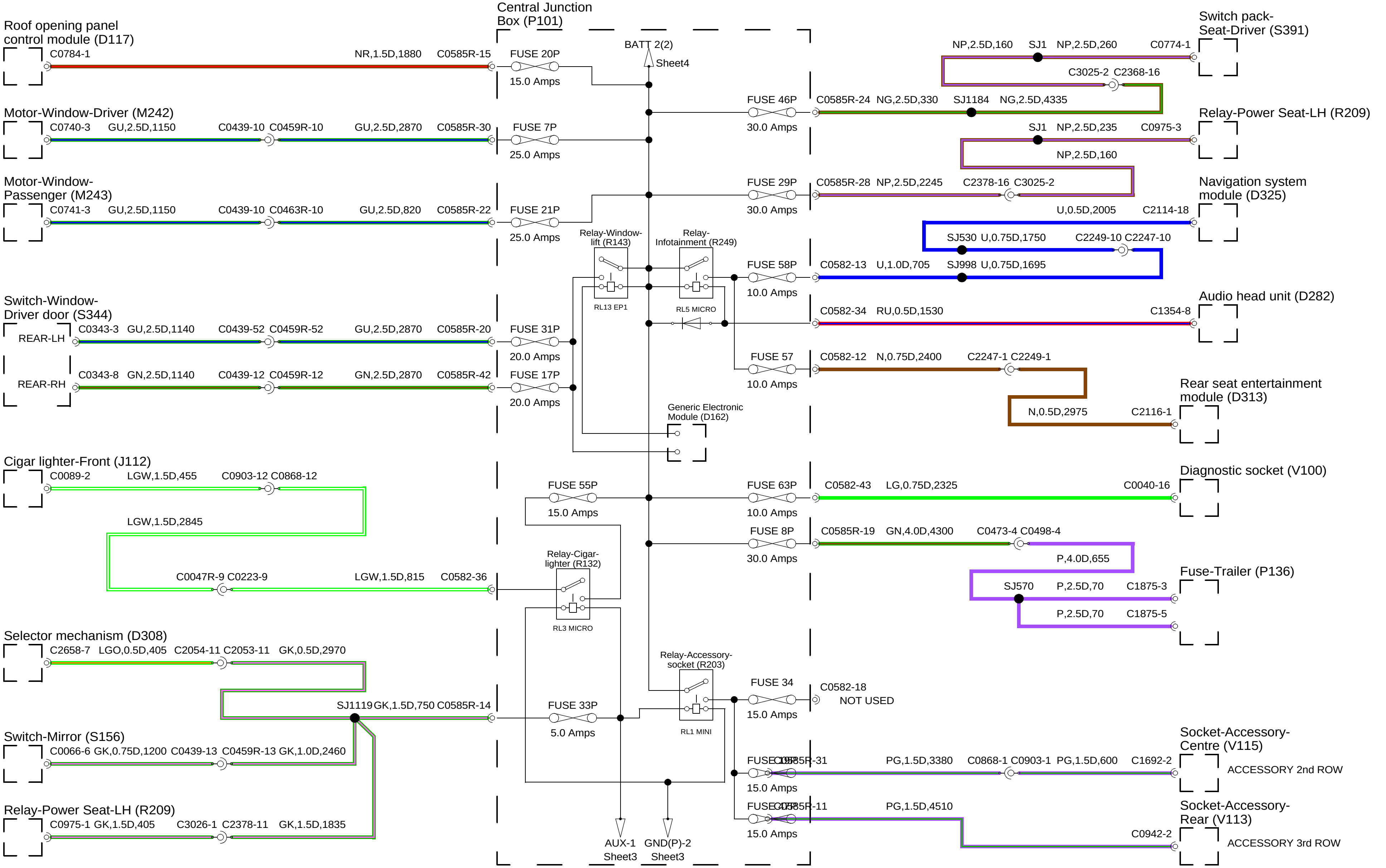

Central Junction Box (P101)
Motor-Central door-locking-Driver (M236)
C0441-5 BR,1.5D,1760 C0439-2 C0459R-2 BR,1.5D,2870 C0585R-27
Relay-Driver-lock (R262)
RL6A DMK
Generic Electronic Module (D162)
Relay-CDL-lock (R261)
RL6B DMK
BG,2.5D,490 C0585R-36
Motor-Central door-locking-Driver (M236)
C0441-7 BG,1.5D,1760 C0439-5 C0459R-5 BG,1.5D,2380 SJ1011
C0585R-5 BR,1.5D,1385
Relay-CDL-Return (R265)
RL8A DMK
Motor-Central door-locking-Rear-LH (M167)
SJ1013 BR,1.5D,1045 C0435-10 C0803-10 BR,1.5D,1565 C0442-7
Motor-Central door-locking-Rear-LH (M167)
C0442-5 BG,1.5D,1565 C0803-8 C0435-8 BG,1.5D,1940
Relay-Superlock (R263)
RL8B DMK
Motor-Central door-locking-Passenger (M237)
BR,1.5D,1045 C0463R-9 C0439-9 BR,1.5D,1760 C0441-7
BG,2.5D,855 C0585R-26
Motor-Central door-locking-Passenger (M237)
C0441-5 BG,1.5D,1760 C0439-5 C0463R-5 BG,1.5D,515 SJ1670
Motor-Central door-locking-Rear-RH (M166)
BR,1.5D,2565 C0436-10 C0804-10 BR,1.5D,1565 C0442-5
Relay-CDL-Return (R265)
RL9 MK
Motor-Central door-locking-Rear-RH (M166)
C0442-7 BG,1.5D,1565 C0804-8 C0436-8 BG,1.5D,3095
FUSE 49P
30.0 Amps
BP,1.5D,1055 C0585R-33
Horn-RH (L103)
C0583R-3 PG,1.0D,5450 C0004-1
Motor-Central door-locking-Passenger (M237)
C0441-6 BP,1.5D,1760 C0439-4 C0463R-4 BP,1.5D,715 SJ1012
Relay-Horn (R133)
FUSE 12P
15.0 Amps
Horn-LH (L102)
C0583R-4 PG,1.0D,5685 C0003-1
Motor-Central door-locking-Driver (M236)
C0441-6 BP,1.5D,1760 C0439-6 C0459R-6 BP,1.5D,2715
RL10A DMK
Clock spring (S227)
C0580-23 PO,0.35D,2690 C0082-3
Motor-Central door-locking-Rear-LH (M167)
C0442-6 BP,1.5D,1565 C0803-12 C0435-12 BP,1.5D,1375
FUSE 50P
10.0 Amps
Relay-Fuel-flap-lock (R257)
Motor-Release-Fuel flap (M116)
Relay-Fuel-flap-unlock (R258)
DMK
C0582-3 KR,1.5D,2345 C0469-11 C0467R-11 KR,1.5D,3170 C0748-2
Motor-Central door-locking-Rear-RH (M166)
C0442-6 BP,1.5D,1565 C0804-12 C0436-12 BP,1.5D,2895
C0582-2 KP,1.5D,2345 C0469-12 C0467R-12 KP,1.5D,3170 C0748-1
DMK
Sheet2
BATT 1(1)
Sheet3
GND(P)-1

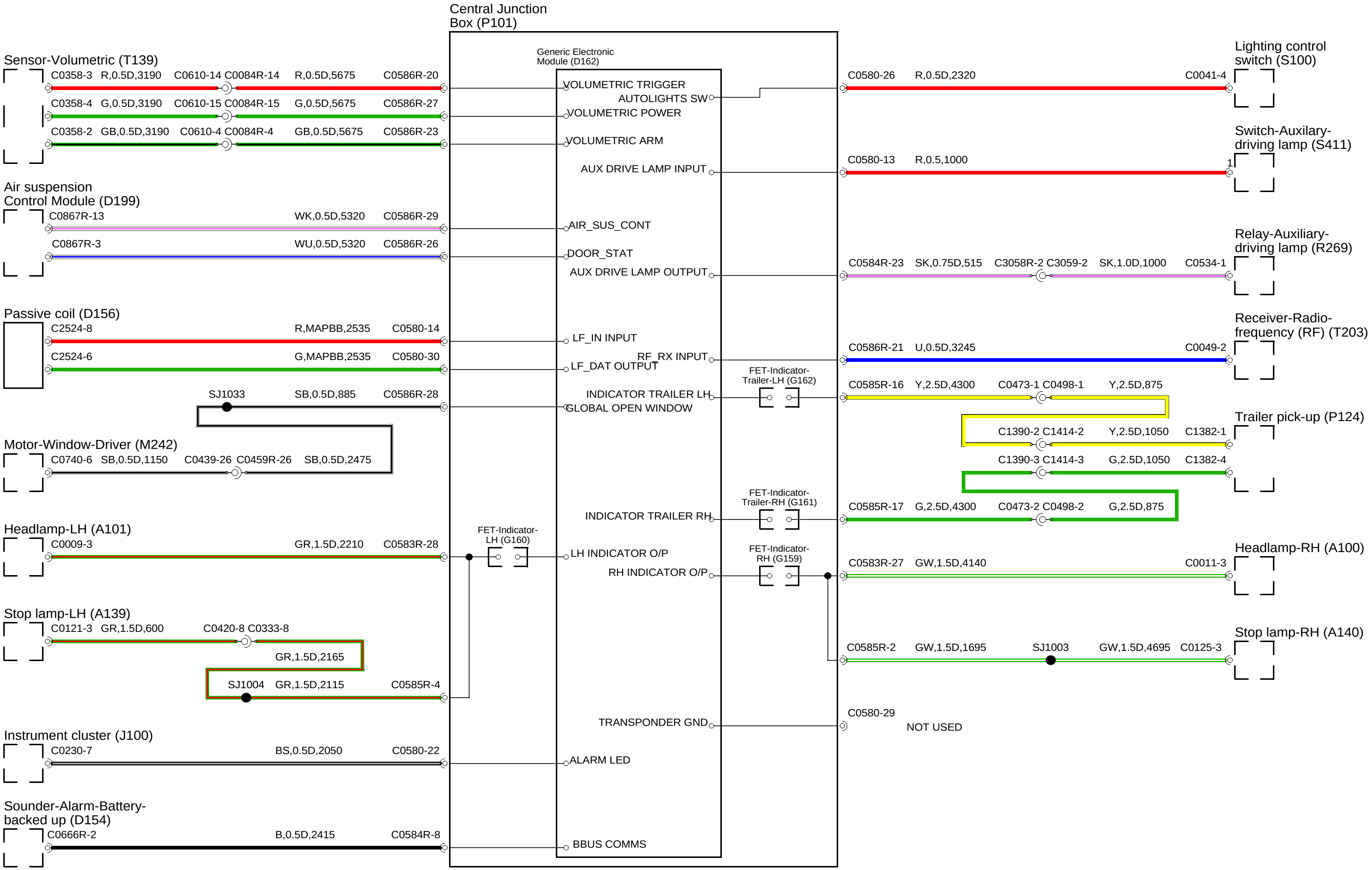

Central Junction Box (P101)
Battery Junction Box (P108)
C0570R-185
(EJB SUPPLY 4)
NG,4.0D,1140
C0583R-16
Relay-Reverse (R217)
MK
Sheet1 BATT 1(1)
FUSE 5P
10.0 Amps
C0585R-41
GN,1.5D,2175
SJ7
GN,1.5D,4675
C0125-2
Stop lamp-RH (A140)
Air suspension Control Module (D199)
C0867R-20
LGW,0.75D,5320
C0586R-4
FUSE 35P
5.0 Amps
Generic Electronic Module (D162)
GN,1.5D,2105
C0333-12 C0420-12
GN,1.5D,600
C0121-2
Stop lamp-LH (A139)
FUSE 6P
10.0 Amps
C0585R-6
GN,1.5D,4325
C1642-2 C1643-2
YN,1.5D,695
C1388-3 C1416-3
YN,1.5D,770
C1381-1
Trailer pick-up (P124)
Headlamp-LH (A101)
C0009-11
UK,1.5D,2210
C0583R-24
FET-Dip-beam-LH (G166)
FET-Dip-beam-RH (G165)
C0009-10
US,1.5D,2210
C0583R-33
FET-Main-beam-LH (G168)
FET-Main-beam-RH (G167)
C0583R-29
UO,1.5D,4140
C0011-11
Headlamp-RH (A100)
C0009-4
R,1.5D,2210
C0583R-31
FET-Lamp-Cornering-LH (G164)
FET-Lamp-Cornering-RH (G163)
C0583R-32
UB,1.5D,4140
C0011-10
C0583R-30
R,1.5D,4140
C0011-4
Battery Junction Box (P108)
C0570R-95
LG,1.5D,370
SJ1574
LG,0.5D,770
C0583R-35
FUSE 28P
5.0 Amps
Parking aid control module (D184)
FUSE 36P
5.0 Amps
C0586R-1
NK,0.5D,3660
C0957-1
Switch-Ignition (S176)
C0028-1
(IGNITION)
Y,4.0D,2455
C0582-19
Tire pressure monitoring control module (D286)
C0586R-2
GN,0.5D,360
SJ1620
GN,0.5D,1885
C1537-8
Transmission control module (D306)
C0193-9
GW,1.0H,2125
C2366B-6 C2365R-6
LGO,0.75D,585
C0584R-24
FUSE 64P
5.0 Amps
Restraints control module (D171)
Parking Brake Module (D278)
C2178-F3
R,0.5D,1025
C0390-12 C0376-12
R,0.5D,4210
C0585R-43
FUSE 41P
5.0 Amps
FUSE 9P
5.0 Amps
C0585R-10
RW,0.75D,2950
C1649-12
Rear window heater element (H100)
C0381-1
NP,4.0D,1005
C2960-1 C2959-1
NP,4.0D,5820
C0585R-23
Relay-Heated-rear screen (R138)
RL10B DMK
FUSE 13P
25.0 Amps
C0585R-8
NOT USED
Engine control-module (ECM) (D131)
BO,0.75D,835
(PV8)
C0635R-30
Instrument cluster (J100)
C0230-15
G,0.5D,865
SJ199
G,0.5D,1095
C0582-4
FUSE 68P
5.0 Amps
FUSE 25P
5.0 Amps
C0583R-36
W,0.75D,835
(DV6)
Engine control-module (ECM) (D131)
C0872R-K3
IGN (1) Sheet3
BATT 1(2) Sheet4

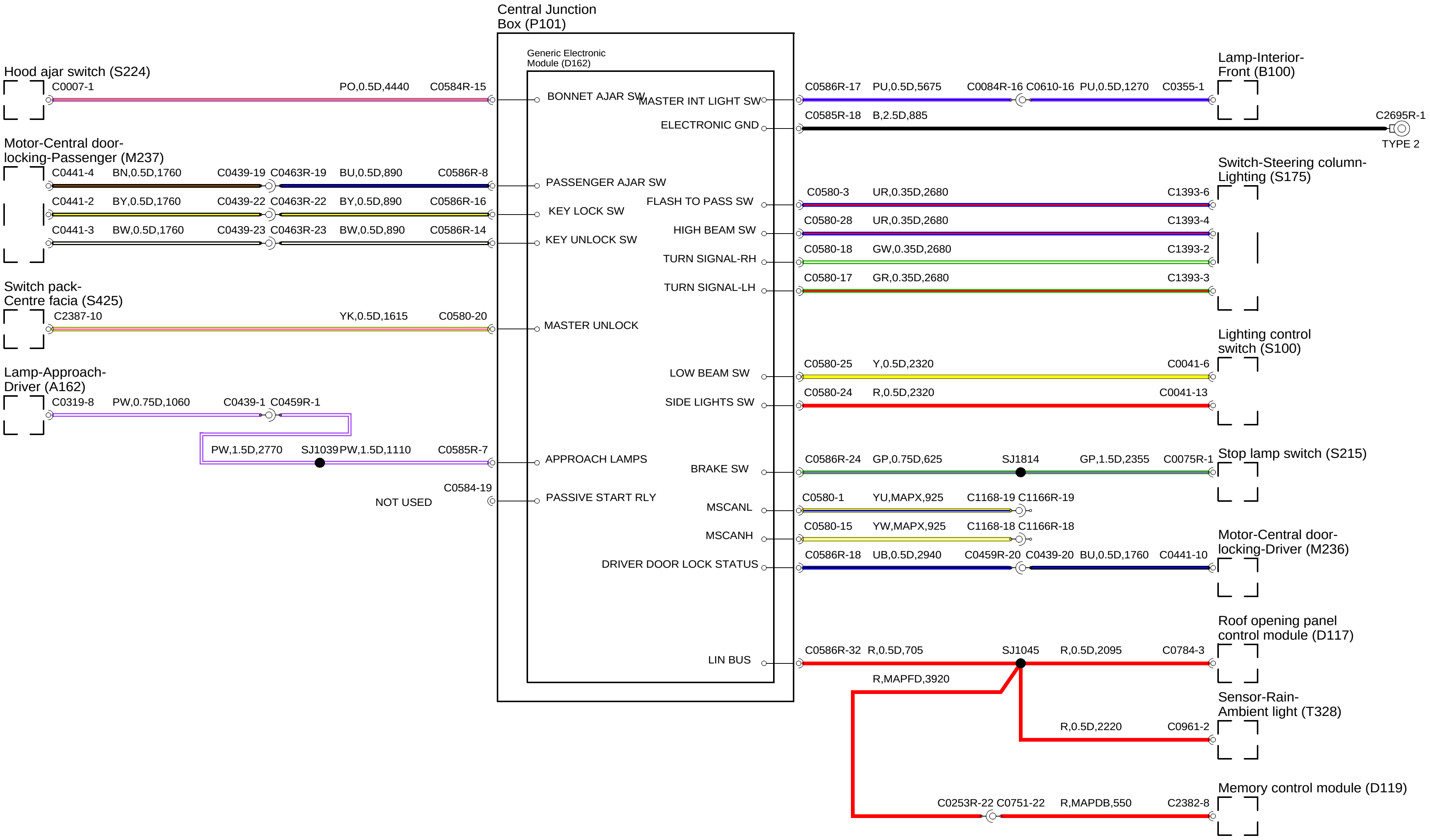

Central Junction Box (P101)
Stop lamp switch (S215)
C0075R-4
GO,1.5D,2910
C0585R-35
Sheet1 GND(P)-1
Sheet2 IGN (1)
FUSE 15P
15.0 Amps
FUSE 23P
5.0 Amps
C0583R-38
WR,0.5D,2370
SJ1391
WR,0.5D,490
C2145R-14
Speed control module (D284)
Stop lamp-RH (A140)
C0125-1
GP,1.5D,5835
SJ1814
GP,1.5D,555
C0585R-32
Relay-Hill-descent (R222)
MK
FUSE 69P
5.0 Amps
C0586R-3
GR,0.5D,320
SJ1695
GR,0.5D,1755
C0698-1
Mirror-interior (B146)
ABS module (D277)
C0506R-22
YR,0.5D,2670
C0583R-2
1.50 k Ohms
GR,0.5D,695
C2243R-13 C2245R-13
TRANSIT RELAY
C0506R-28
LG,0.75D,2325
(DSC)
SJ1179
(DSC)
LG,1.0D,445
C0583R-34
FUSE 37P
5.0 Amps
Lighting control switch (S100)
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D,2230
C0041-8
DIP/AUTO LIGHT SIGNAL
Stop lamp switch (S215)
C0075R-3
R,0.5D,4665
SJ667
R,0.5D,2400
C1165R-5 C1167-5
R,0.5D,1390
SJ105
R,0.5D,975
C0582-7
FUSE 66P
5.0 Amps
AFS ECU (D276)
C2193R-23
RO,0.75D,895
C0583R-14
FUSE 27P
10.0 Amps
Switch pack-Centre-console (S350)
C0868-8 C0903-8
R,0.75D,360
C0700-20
Switch-Terrain-optimisation (S380)
Relay-Trailer-Rear wiper (R273)
C2937-8
R,1.5D,4000
C0585R-9
FUSE 22P
10.0 Amps
Rear differential control module (D283)
R,1.0D,2015
SJ971
R,1.0D,905
C2163-4
R,1.0D,2255
Headlamp-LH (A101)
C0009-14
RB,0.5D,2225
C2241R-11 C2239-11
RB,0.5D,780
C0582-11
FUSE 56P
10.0 Amps
FUSE 24P
5.0 Amps
Relay-Wash-pump (R259)
RL12 DMK
C0583R-39
R,1.0D,600
SJ1970
R,1.0D,505
C2243R-5 C2245R-5
Headlamp-RH (A100)
C0011-14
RO,0.5D,4155
C2241R-12 C2239-12
RO,0.5D,780
C0582-8
FUSE 61P
10.0 Amps
Transfer box control module (D204)
R,1.0D,375
C1854R-3
Switch-Ignition (S176)
C0028-6
(AUXILIARY)
W,1.5D,2455
C0582-30
FUSE 11P
15.0 Amps
Generic Electronic Module (D162)
Pump-washer-front/ rear screen (M278)
FR
C0583R-5
BO,1.5D,2260
C0008-2
RR
C0583R-17
OB,1.5D,2260
C0008-1
Sensor-Rain-Ambient light (T328)
C0961-4
G,0.5D,2005
C0585R-45
FUSE 18P
5.0 Amps
Sheet6 AUX-1
Sheet6 GND(P)-2
PWR GND
C0585R-25
B,2.5D,885
C2696R-1
TYPE 3

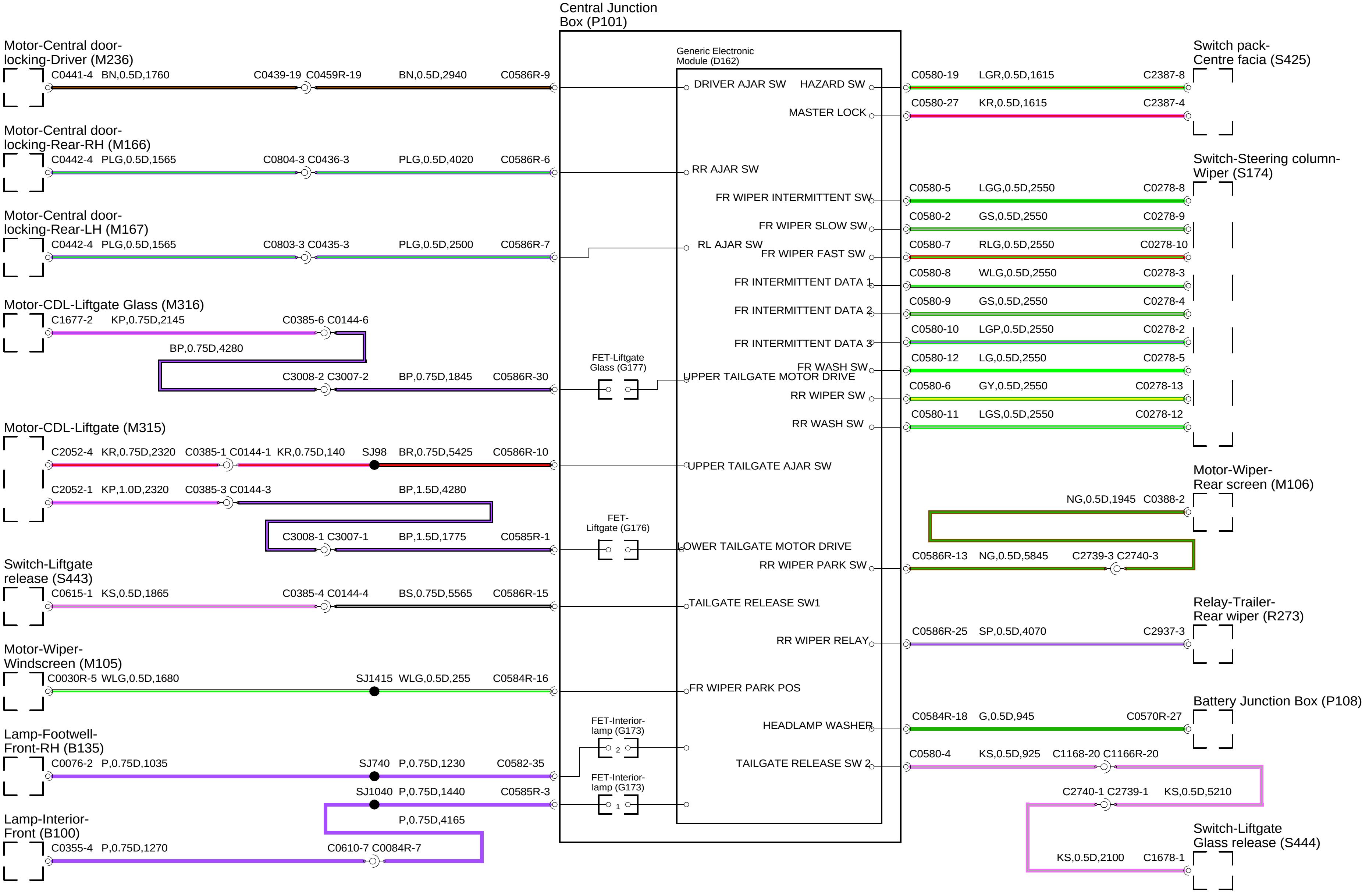

Central Junction Box (P101)
Sheet5 BATT 2(1)
Instrument cluster (J100)
C0230-16
P,0.5D,1960
C0582-15
FUSE 39P
5.0 Amps
FUSE 43P
10.0 Amps
C0585R-46
GW,0.5D,1595
SJ1050
GW,0.5D,4350
C0049-1
Receiver-Radio-frequency (RF) (T203)
Automatic Temperature Control Module (D243)
C2655-1
GP,1.0D,1635
C0582-10
FUSE 51P
10.0 Amps
GW,0.5D,3190
C1537-16
Tire pressure monitoring control module (D286)
C0585R-44
NOT USED (V101)
Memory control module (D119)
C0253R-11 C0751-11
WR,0.5D,550
C2382-4
FUSE 54P
5.0 Amps
C0585R-13
WR,0.5D,1545
SJ1185
WR,0.5D,4890
Switch-Lumbar-Driver (S389)
Battery Junction Box (P108)
C0570R-117
EJB (BATT 1)
NR,6.0D,1140
C0583R-20
WR,0.5D,800
WR,1.0D,740
C0976-2
WR,0.5D,3120
C2368-12 C3026A-2
Audio head unit (D282)
C1354-11
PU,1.5D,650
SJ131
PU,1.5D,880
C0582-38
FUSE 53P
15.0 Amps
Switch-Lumbar-Passenger (S390)
C2378-12 C3026-2
WR,1.0D,1020
C2339-2
C0047R-2 C0223-2
LGW,1.0D,815
C0582-44
FUSE 59P
10.0 Amps
Fold back module (D197)
Cool box (D345)
C2773-1
LGW,0.75D,355
C2054-12 C2053-12
LGW,0.75D,2845
FUSE 16P
10.0 Amps
C0585R-39
GK,1.0D,840
C0907R-4
C1166R-15 C1168-15
PU,0.5D,835
C0582-45
FUSE 44P
5.0 Amps
Sounder-Alarm-Battery-backed up (D154)
FUSE 26P
5.0 Amps
C0583R-37
B,0.5D,2610
C0666R-3
Selector mechanism (D308)
C2658-8
PU,0.5D,405
C2054-10 C2053-10
PU,0.5D,2815
Speakers-Low range-Tail door (F141)
FUSE 42P
30.0 Amps
C0582-22
R,2.5D,2345
C0469-5 C0467R-5
R,2.5D,1570
C2414-1
Lighting control switch (S100)
C0041-2
RO,1.5D,2230
C0582-46
Stop lamp-RH (A140)
C0041-3
UR,1.5D,2230
C0582-14
FUSE 32P
15.0 Amps
C0585R-21
RY,1.5D,715
SJ1020
RY,1.5D,5675
C0125-6
SJ1172
UP,1.5D,2225
C0583R-41
FUSE 38P
15.0 Amps
FUSE 52P
5.0 Amps
C0582-41
R,0.75D,2400
C2247-3 C2249-3
Lamp-Fog-Front-RH (A108)
UP,1.5D,1665
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
Telephone control module (D262)
R,0.75D,2635
SJ299
R,0.75D,370
C2777-18
Sheet6 BATT 2(2)
Sheet2 BATT 1(2)

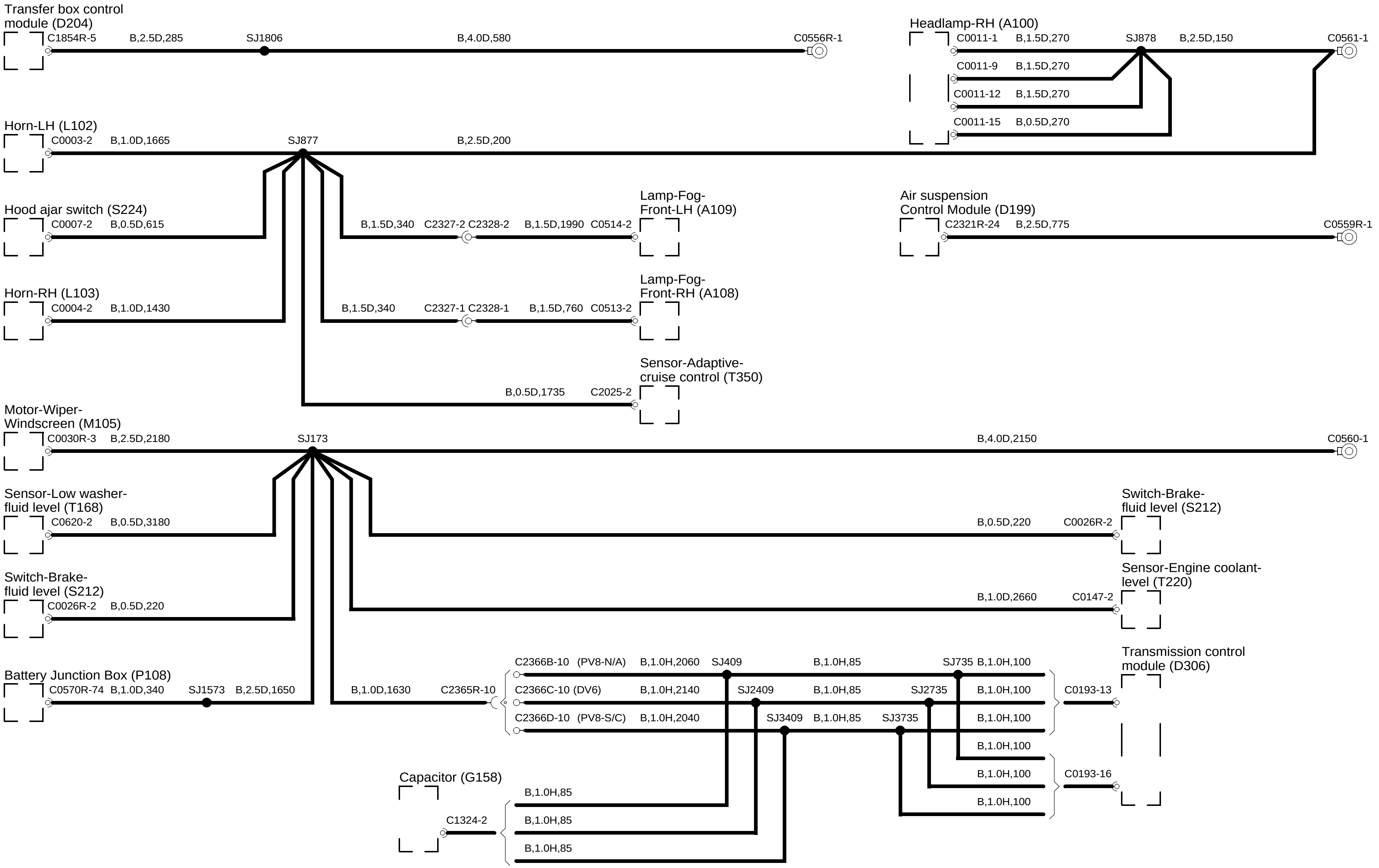

Central Junction Box (P101)
Switch-Ignition (S176)
C0028-5
(KEY IN SENSE) LGW,1.5D,2455 C0582-21
FUSE 40P
5.0 Amps
C0028-7
(CRANK) WR,2.5D,2455 C0582-5
FUSE 60P
5.0 Amps
Generic Electronic Module (D162)
Battery Junction Box (P108)
C0570R-83 R,1.5D,240 SJ1002 R,0.5D,705 C0584R-32
WIPER SLOW
C0570R-50 PU,1.5D,280 SJ1001 PU,0.5D,665 C0584R-17
WIPER FAST
C0570R-116 EJB (BATT 3) NU,4.0D,1140 C0583R-21
Relay-Auto Headlights
RL14 EP1
Relay-Side-lamp (R125)
MK
Mirror-Vanity-LH (B152)
C0737-2 LGW,0.75D,1435 SJ234
LGW,1.0D,1010
C0610-6 C0084R-6 LGW,0.75D,5605 C0585R-40
FUSE 1P
10.0 Amps
Relay-Battery-saver (R250)
MK
Lamp-Glove box (B109)
C0227-2 LGW,0.5D,875 C0582-39
Lighting control switch (S100)
C0041-16 RO,0.5D,2230 C0582-1
Battery Junction Box (P108)
C0570R-186 (EJB SUPPLY 2) NS,6.0D,1140 C0583R-22
Sheet4
BATT 2(1)
FUSE 48P
15.0 Amps
Parking Brake Module (D278)
LGW,0.5D,1025 C2178-F2
C0586R-22 LGW,0.5D,4280 C0376-17 C0390-17
Engine control-module (ECM) (D131)
C0584R-30
WR,0.5D,640 (PV8) C0635R-17
WR,0.5D,485 (DV6) SJ1479
Engine control-module (ECM) (D131)
WR,0.5D,495 C0872R-F3
Stop lamp-RH (A140)
C0585R-37 RO,1.0D,6390 C0125-4
FUSE 67P
10.0 Amps
Headlamp-RH (A100)
FUSE 2P
10.0 Amps
C0583R-6 RO,1.0D,4140 C0011-2
Stop lamp-LH (A139)
C0333-10 C0420-10 RB,1.5D,600 C0121-4
RB,1.0D,1440
FUSE 4P
10.0 Amps
C0585R-38 RB,1.0D,2840 SJ22
Headlamp-LH (A101)
C0583R-7 RB,1.0D,2210 C0009-2
FUSE 14P
10.0 Amps
C0583R-13 N,1.5D,695 C2243R-9 C2245R-9 N,1.5D,4055
C1643-3 C1642-3
Fuse-Trailer (P136)
RO,1.5D,595 SJ571 RO,1.5D,130 C1875-11
Relay-Trailer-Rear wiper (R273)
C0585R-12 SK,1.5D,2825 SJ28 SK,1.5D,1175 C2937-2
SK,0.5D,1175 C2937-5

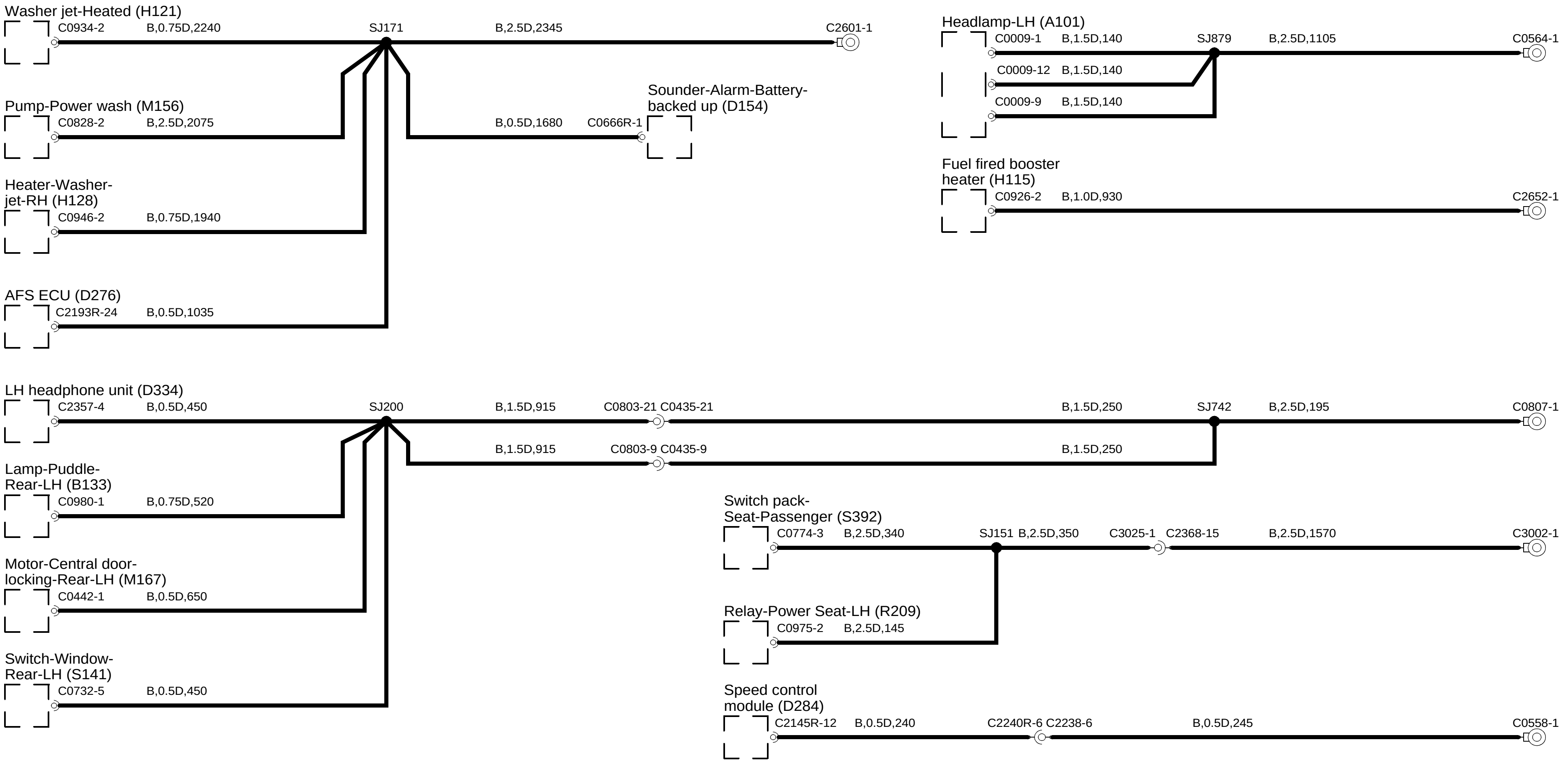

Roof opening panel control module (D117)
C0784-1
NR,1.5D,1880
C0585R-15
Central Junction Box (P101)
FUSE 20P
15.0 Amps
BATT 2(2)
Sheet4
Switch pack-Seat-Driver (S391)
NP,2.5D,160
SJ1
NP,2.5D,260
C0774-1
C3025-2
C2368-16
Motor-Window-Driver (M242)
C0740-3
GU,2.5D,1150
C0439-10
C0459R-10
GU,2.5D,2870
C0585R-30
FUSE 7P
25.0 Amps
FUSE 46P
30.0 Amps
C0585R-24
NG,2.5D,330
SJ1184
NG,2.5D,4335
Relay-Power Seat-LH (R209)
SJ1
NP,2.5D,235
C0975-3
NP,2.5D,160
Motor-Window-Passenger (M243)
C0741-3
GU,2.5D,1150
C0439-10
C0463R-10
GU,2.5D,820
C0585R-22
FUSE 21P
25.0 Amps
FUSE 29P
30.0 Amps
C0585R-28
NP,2.5D,2245
C2378-16
C3025-2
Navigation system module (D325)
U,0.5D,2005
C2114-18
Relay-Window-lift (R143)
Relay-Infotainment (R249)
SJ530
U,0.75D,1750
C2249-10
C2247-10
FUSE 58P
10.0 Amps
C0582-13
U,1.0D,705
SJ998
U,0.75D,1695
RL13 EP1
RL5 MICRO
Audio head unit (D282)
C0582-34
RU,0.5D,1530
C1354-8
Switch-Window-Driver door (S344)
REAR-LH
C0343-3
GU,2.5D,1140
C0439-52
C0459R-52
GU,2.5D,2870
C0585R-20
FUSE 31P
20.0 Amps
FUSE 57
10.0 Amps
C0582-12
N,0.75D,2400
C2247-1
C2249-1
REAR-RH
C0343-8
GN,2.5D,1140
C0439-12
C0459R-12
GN,2.5D,2870
C0585R-42
FUSE 17P
20.0 Amps
Rear seat entertainment module (D313)
N,0.5D,2975
C2116-1
Generic Electronic Module (D162)
Cigar lighter-Front (J112)
C0089-2
LGW,1.5D,455
C0903-12
C0868-12
FUSE 55P
15.0 Amps
FUSE 63P
10.0 Amps
C0582-43
LG,0.75D,2325
C0040-16
Diagnostic socket (V100)
LGW,1.5D,2845
FUSE 8P
30.0 Amps
C0585R-19
GN,4.0D,4300
C0473-4
C0498-4
P,4.0D,655
Relay-Cigar-lighter (R132)
C0047R-9
C0223-9
LGW,1.5D,815
C0582-36
Fuse-Trailer (P136)
SJ570
P,2.5D,70
C1875-3
P,2.5D,70
C1875-5
RL3 MICRO
Selector mechanism (D308)
C2658-7
LGO,0.5D,405
C2054-11
C2053-11
GK,0.5D,2970
Relay-Accessory-socket (R203)
FUSE 34
15.0 Amps
C0582-18
NOT USED
SJ1119
GK,1.5D,750
C0585R-14
FUSE 33P
5.0 Amps
RL1 MINI
Switch-Mirror (S156)
C0066-6
GK,0.75D,1200
C0439-13
C0459R-13
GK,1.0D,2460
Socket-Accessory-Centre (V115)
FUSE 19P
C0585R-31
PG,1.5D,3380
C0868-1
C0903-1
PG,1.5D,600
C1692-2
ACCESSORY 2nd ROW
15.0 Amps
Relay-Power Seat-LH (R209)
C0975-1
GK,1.5D,405
C3026-1
C2378-11
GK,1.5D,1835
FUSE 40P
C0585R-11
PG,1.5D,4510
Socket-Accessory-Rear (V113)
C0942-2
ACCESSORY 3rd ROW
15.0 Amps
AUX-1
Sheet3
GND(P)-2
Sheet3

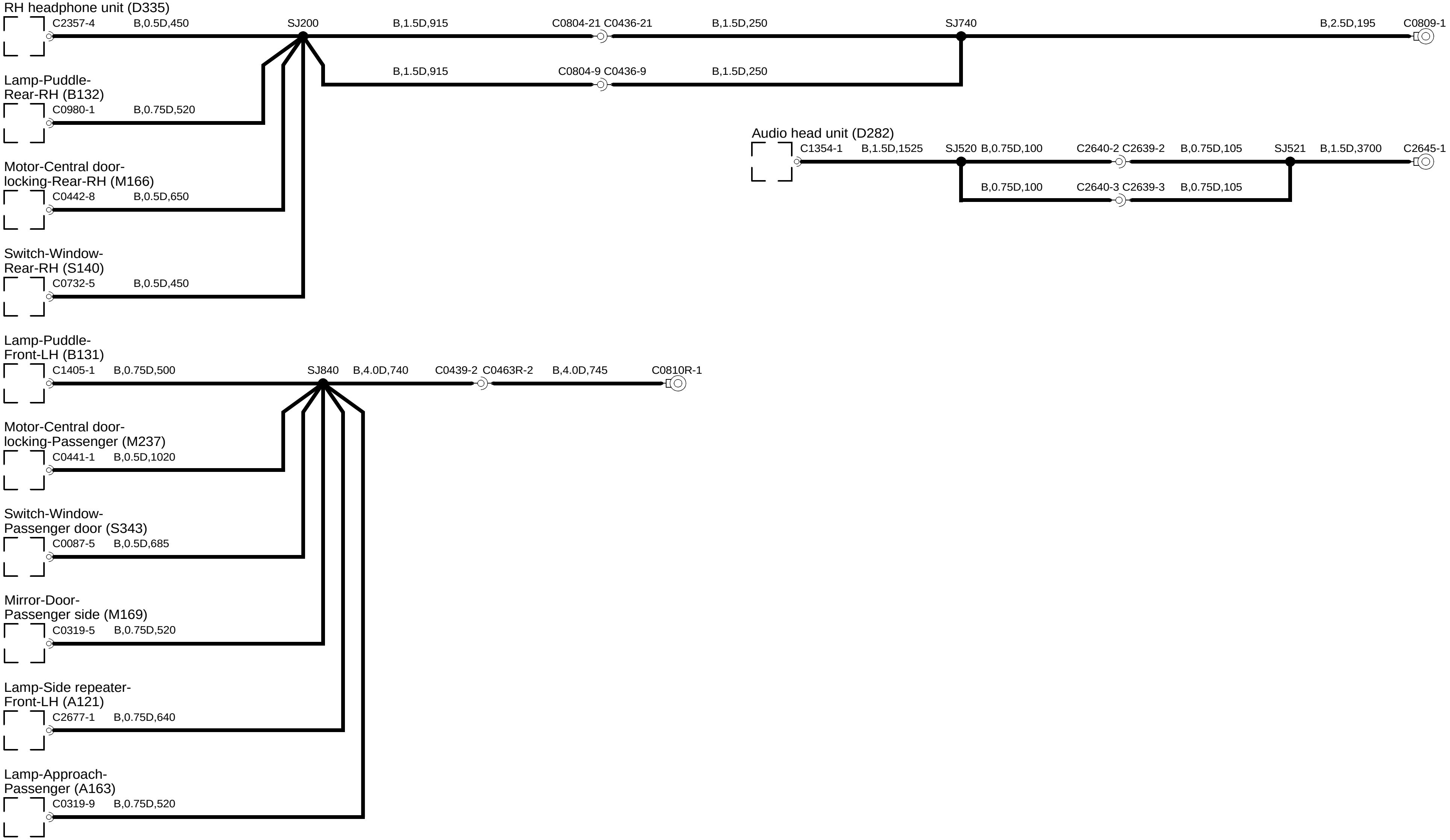

Central Junction Box (P101)
Generic Electronic Module (D162)
Sensor-Volumetric (T139)
C0358-3 R,0.5D,3190 C0610-14 C0084R-14 R,0.5D,5675 C0586R-20
C0358-4 G,0.5D,3190 C0610-15 C0084R-15 G,0.5D,5675 C0586R-27
C0358-2 GB,0.5D,3190 C0610-4 C0084R-4 GB,0.5D,5675 C0586R-23
Air suspension Control Module (D199)
C0867R-13 WK,0.5D,5320 C0586R-29
C0867R-3 WU,0.5D,5320 C0586R-26
Passive coil (D156)
C2524-8 R,MAPBB,2535 C0580-14
C2524-6 G,MAPBB,2535 C0580-30
SJ1033 SB,0.5D,885 C0586R-28
Motor-Window-Driver (M242)
C0740-6 SB,0.5D,1150 C0439-26 C0459R-26 SB,0.5D,2475
Headlamp-LH (A101)
C0009-3 GR,1.5D,2210 C0583R-28
Stop lamp-LH (A139)
C0121-3 GR,1.5D,600 C0420-8 C0333-8
GR,1.5D,2165
SJ1004 GR,1.5D,2115 C0585R-4
Instrument cluster (J100)
C0230-7 BS,0.5D,2050 C0580-22
Sounder-Alarm-Battery-backed up (D154)
C0666R-2 B,0.5D,2415 C0584R-8
VOLUMETRIC TRIGGER
AUTOLIGHTS SW
VOLUMETRIC POWER
VOLUMETRIC ARM
AUX DRIVE LAMP INPUT
AIR_SUS_CONT
DOOR_STAT
AUX DRIVE LAMP OUTPUT
LF_IN INPUT
RF_RX INPUT
LF_DAT OUTPUT
INDICATOR TRAILER LH
GLOBAL OPEN WINDOW
INDICATOR TRAILER RH
FET-Indicator-LH (G160)
LH INDICATOR O/P
RH INDICATOR O/P
TRANSPONDER GND
ALARM LED
BBUS COMMS
FET-Indicator-Trailer-LH (G162)
FET-Indicator-Trailer-RH (G161)
FET-Indicator-RH (G159)
Lighting control switch (S100)
C0580-26 R,0.5D,2320 C0041-4
Switch-Auxilary-driving lamp (S411)
C0580-13 R,0.5,1000 1
Relay-Auxiliary-driving lamp (R269)
C0584R-23 SK,0.75D,515 C3058R-2 C3059-2 SK,1.0D,1000 C0534-1
Receiver-Radio-frequency (RF) (T203)
C0586R-21 U,0.5D,3245 C0049-2
C0585R-16 Y,2.5D,4300 C0473-1 C0498-1 Y,2.5D,875
Trailer pick-up (P124)
C1390-2 C1414-2 Y,2.5D,1050 C1382-1
C1390-3 C1414-3 G,2.5D,1050 C1382-4
C0585R-17 G,2.5D,4300 C0473-2 C0498-2 G,2.5D,875
Headlamp-RH (A100)
C0583R-27 GW,1.5D,4140 C0011-3
Stop lamp-RH (A140)
C0585R-2 GW,1.5D,1695 SJ1003 GW,1.5D,4695 C0125-3
C0580-29
NOT USED

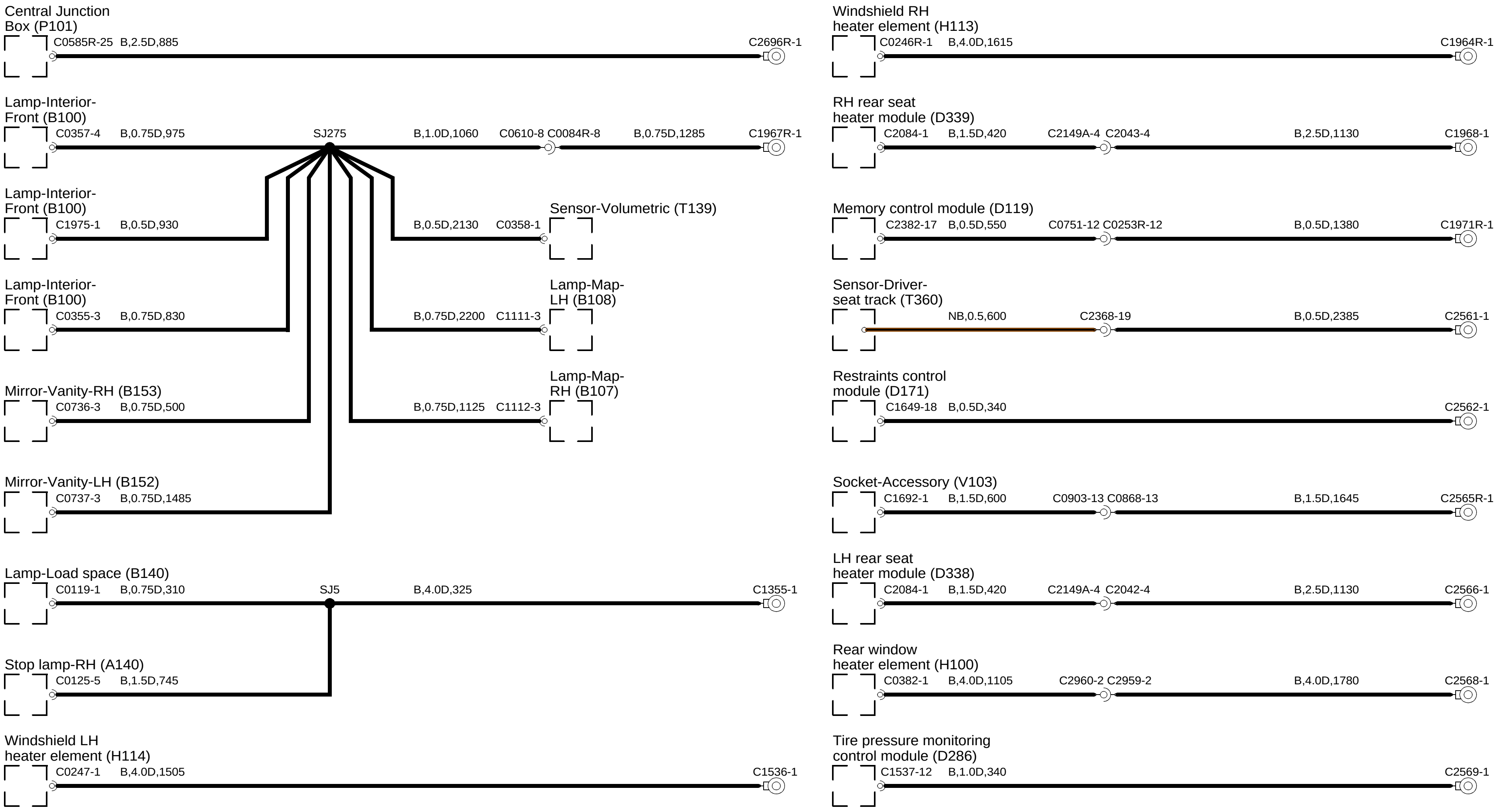

Central Junction
Box (P101)
Generic Electronic
Module (D162)
Hood ajar switch (S224)
C0007-1
PO,0.5D,4440
C0584R-15
BONNET AJAR SW
MASTER INT LIGHT SW
C0586R-17
PU,0.5D,5675
C0084R-16
C0610-16
PU,0.5D,1270
C0355-1
Lamp-Interior-
Front (B100)
ELECTRONIC GND
C0585R-18
B,2.5D,885
C2695R-1
TYPE 2
Motor-Central door-
locking-Passenger (M237)
C0441-4
BN,0.5D,1760
C0439-19
C0463R-19
BU,0.5D,890
C0586R-8
PASSENGER AJAR SW
C0441-2
BY,0.5D,1760
C0439-22
C0463R-22
BY,0.5D,890
C0586R-16
KEY LOCK SW
C0441-3
BW,0.5D,1760
C0439-23
C0463R-23
BW,0.5D,890
C0586R-14
KEY UNLOCK SW
Switch-Steering column-
Lighting (S175)
FLASH TO PASS SW
C0580-3
UR,0.35D,2680
C1393-6
HIGH BEAM SW
C0580-28
UR,0.35D,2680
C1393-4
TURN SIGNAL-RH
C0580-18
GW,0.35D,2680
C1393-2
TURN SIGNAL-LH
C0580-17
GR,0.35D,2680
C1393-3
Switch pack-
Centre facia (S425)
C2387-10
YK,0.5D,1615
C0580-20
MASTER UNLOCK
Lighting control
switch (S100)
LOW BEAM SW
C0580-25
Y,0.5D,2320
C0041-6
SIDE LIGHTS SW
C0580-24
R,0.5D,2320
C0041-13
Lamp-Approach-
Driver (A162)
C0319-8
PW,0.75D,1060
C0439-1
C0459R-1
PW,1.5D,2770
SJ1039
PW,1.5D,1110
C0585R-7
APPROACH LAMPS
BRAKE SW
C0586R-24
GP,0.75D,625
SJ1814
GP,1.5D,2355
C0075R-1
Stop lamp switch (S215)
C0584-19
NOT USED
PASSIVE START RLY
MSCANL
C0580-1
YU,MAPX,925
C1168-19
C1166R-19
MSCANH
C0580-15
YW,MAPX,925
C1168-18
C1166R-18
Motor-Central door-
locking-Driver (M236)
DRIVER DOOR LOCK STATUS
C0586R-18
UB,0.5D,2940
C0459R-20
C0439-20
BU,0.5D,1760
C0441-10
Roof opening panel
control module (D117)
LIN BUS
C0586R-32
R,0.5D,705
SJ1045
R,0.5D,2095
C0784-3
R,MAPFD,3920
Sensor-Rain-
Ambient light (T328)
R,0.5D,2220
C0961-2
Memory control module (D119)
C0253R-22
C0751-22
R,MAPDB,550
C2382-8

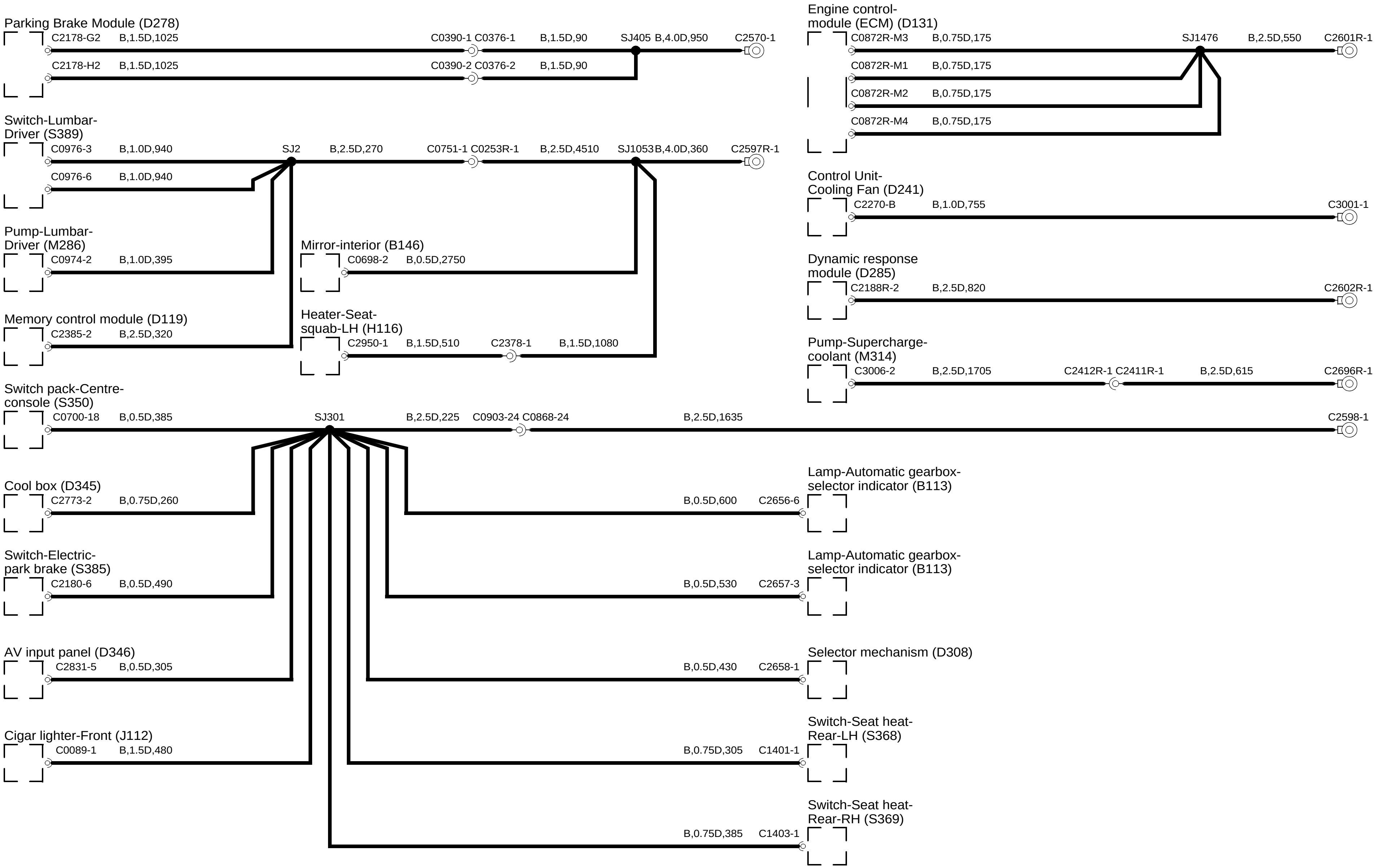

Central Junction Box (P101)
Generic Electronic Module (D162)
Motor-Central door-locking-Driver (M236)
C0441-4 BN,0.5D,1760
C0439-19 C0459R-19
BN,0.5D,2940
C0586R-9
DRIVER AJAR SW
HAZARD SW
C0580-19 LGR,0.5D,1615 C2387-8
Switch pack-Centre facia (S425)
MASTER LOCK
C0580-27 KR,0.5D,1615 C2387-4
Motor-Central door-locking-Rear-RH (M166)
C0442-4 PLG,0.5D,1565
C0804-3 C0436-3
PLG,0.5D,4020
C0586R-6
RR AJAR SW
Switch-Steering column-Wiper (S174)
FR WIPER INTERMITTENT SW
C0580-5 LGG,0.5D,2550 C0278-8
FR WIPER SLOW SW
C0580-2 GS,0.5D,2550 C0278-9
Motor-Central door-locking-Rear-LH (M167)
C0442-4 PLG,0.5D,1565
C0803-3 C0435-3
PLG,0.5D,2500
C0586R-7
RL AJAR SW
FR WIPER FAST SW
C0580-7 RLG,0.5D,2550 C0278-10
FR INTERMITTENT DATA 1
C0580-8 WLG,0.5D,2550 C0278-3
FR INTERMITTENT DATA 2
C0580-9 GS,0.5D,2550 C0278-4
Motor-CDL-Liftgate Glass (M316)
C1677-2 KP,0.75D,2145
C0385-6 C0144-6
BP,0.75D,4280
FR INTERMITTENT DATA 3
C0580-10 LGP,0.5D,2550 C0278-2
FET-Liftgate Glass (G177)
FR WASH SW
C0580-12 LG,0.5D,2550 C0278-5
C3008-2 C3007-2
BP,0.75D,1845
C0586R-30
UPPER TAILGATE MOTOR DRIVE
RR WIPER SW
C0580-6 GY,0.5D,2550 C0278-13
RR WASH SW
C0580-11 LGS,0.5D,2550 C0278-12
Motor-CDL-Liftgate (M315)
C2052-4 KR,0.75D,2320
C0385-1 C0144-1 KR,0.75D,140
SJ98
BR,0.75D,5425
C0586R-10
UPPER TAILGATE AJAR SW
Motor-Wiper-Rear screen (M106)
NG,0.5D,1945 C0388-2
C2052-1 KP,1.0D,2320
C0385-3 C0144-3
BP,1.5D,4280
FET-Liftgate (G176)
C3008-1 C3007-1
BP,1.5D,1775
C0585R-1
LOWER TAILGATE MOTOR DRIVE
RR WIPER PARK SW
C0586R-13 NG,0.5D,5845 C2739-3 C2740-3
Switch-Liftgate release (S443)
C0615-1 KS,0.5D,1865
C0385-4 C0144-4
BS,0.75D,5565
C0586R-15
TAILGATE RELEASE SW1
Relay-Trailer-Rear wiper (R273)
RR WIPER RELAY
C0586R-25 SP,0.5D,4070 C2937-3
Motor-Wiper-Windscreen (M105)
C0030R-5 WLG,0.5D,1680
SJ1415 WLG,0.5D,255
C0584R-16
FR WIPER PARK POS
Battery Junction Box (P108)
HEADLAMP WASHER
C0584R-18 G,0.5D,945 C0570R-27
FET-Interior-lamp (G173)
2
Lamp-Footwell-Front-RH (B135)
C0076-2 P,0.75D,1035
SJ740 P,0.75D,1230
C0582-35
TAILGATE RELEASE SW 2
C0580-4 KS,0.5D,925 C1168-20 C1166R-20
FET-Interior-lamp (G173)
1
SJ1040 P,0.75D,1440
C0585R-3
C2740-1 C2739-1 KS,0.5D,5210
P,0.75D,4165
Lamp-Interior-Front (B100)
C0355-4 P,0.75D,1270
C0610-7 C0084R-7
Switch-Liftgate Glass release (S444)
KS,0.5D,2100 C1678-1

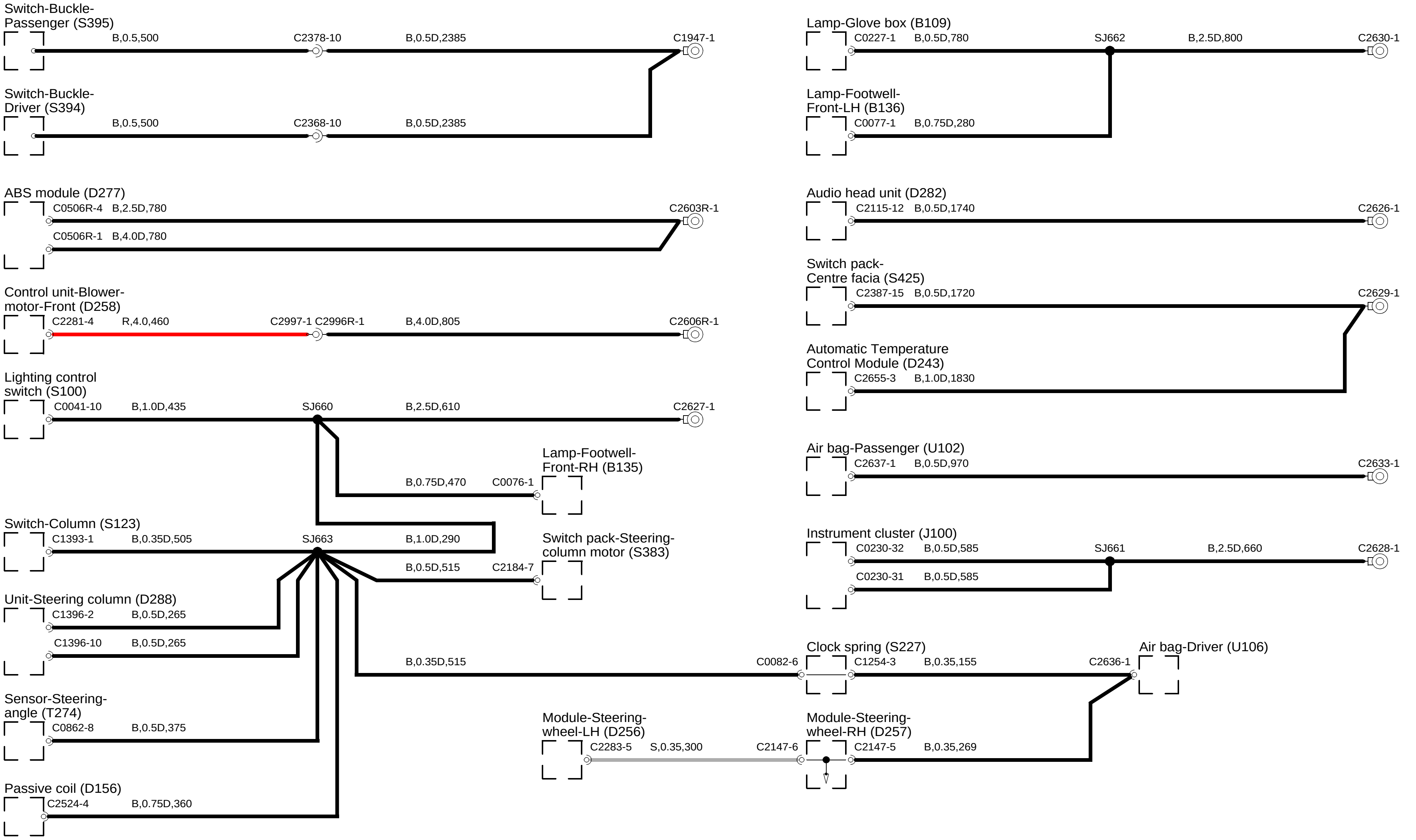

Transfer box control module (D204)
C1854R-5
B,2.5D,285
SJ1806
B,4.0D,580
C0556R-1
Headlamp-RH (A100)
C0011-1
B,1.5D,270
SJ878
B,2.5D,150
C0561-1
C0011-9
B,1.5D,270
C0011-12
B,1.5D,270
C0011-15
B,0.5D,270
Horn-LH (L102)
C0003-2
B,1.0D,1665
SJ877
B,2.5D,200
Hood ajar switch (S224)
C0007-2
B,0.5D,615
B,1.5D,340
C2327-2
C2328-2
B,1.5D,1990
C0514-2
Lamp-Fog-Front-LH (A109)
Air suspension Control Module (D199)
C2321R-24
B,2.5D,775
C0559R-1
Horn-RH (L103)
C0004-2
B,1.0D,1430
B,1.5D,340
C2327-1
C2328-1
B,1.5D,760
C0513-2
Lamp-Fog-Front-RH (A108)
Sensor-Adaptive-cruise control (T350)
B,0.5D,1735
C2025-2
Motor-Wiper-Windscreen (M105)
C0030R-3
B,2.5D,2180
SJ173
B,4.0D,2150
C0560-1
Sensor-Low washer-fluid level (T168)
C0620-2
B,0.5D,3180
B,0.5D,220
C0026R-2
Switch-Brake-fluid level (S212)
Switch-Brake-fluid level (S212)
C0026R-2
B,0.5D,220
Sensor-Engine coolant-level (T220)
B,1.0D,2660
C0147-2
Battery Junction Box (P108)
C0570R-74
B,1.0D,340
SJ1573
B,2.5D,1650
B,1.0D,1630
C2365R-10
C2366B-10 (PV8-N/A)
B,1.0H,2060
SJ409
B,1.0H,85
SJ735
B,1.0H,100
C2366C-10 (DV6)
B,1.0H,2140
SJ2409
B,1.0H,85
SJ2735
B,1.0H,100
C2366D-10 (PV8-S/C)
B,1.0H,2040
SJ3409
B,1.0H,85
SJ3735
B,1.0H,100
B,1.0H,100
B,1.0H,100
B,1.0H,100
Transmission control module (D306)
C0193-13
C0193-16
Capacitor (G158)
C1324-2
B,1.0H,85
B,1.0H,85
B,1.0H,85

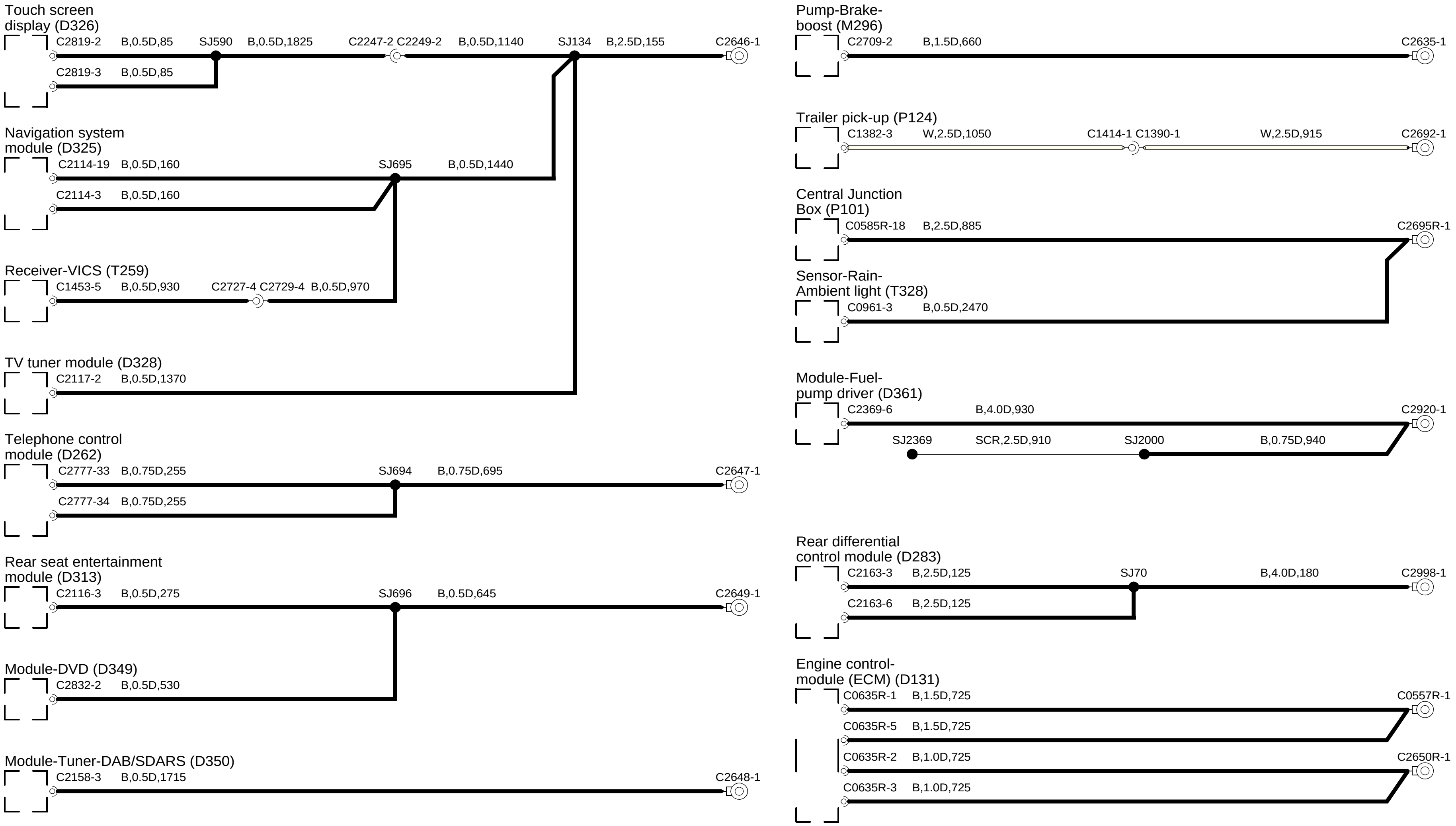

Washer jet-Heated (H121)
C0934-2
B,0.75D,2240
SJ171
B,2.5D,2345
C2601-1
Pump-Power wash (M156)
C0828-2
B,2.5D,2075
B,0.5D,1680
C0666R-1
Sounder-Alarm-Battery-backed up (D154)
Heater-Washer-jet-RH (H128)
C0946-2
B,0.75D,1940
AFS ECU (D276)
C2193R-24
B,0.5D,1035
Headlamp-LH (A101)
C0009-1
B,1.5D,140
SJ879
B,2.5D,1105
C0564-1
C0009-12
B,1.5D,140
C0009-9
B,1.5D,140
Fuel fired booster heater (H115)
C0926-2
B,1.0D,930
C2652-1
LH headphone unit (D334)
C2357-4
B,0.5D,450
SJ200
B,1.5D,915
C0803-21 C0435-21
B,1.5D,250
SJ742
B,2.5D,195
C0807-1
B,1.5D,915
C0803-9 C0435-9
B,1.5D,250
Lamp-Puddle-Rear-LH (B133)
C0980-1
B,0.75D,520
Motor-Central door-locking-Rear-LH (M167)
C0442-1
B,0.5D,650
Switch-Window-Rear-LH (S141)
C0732-5
B,0.5D,450
Switch pack-Seat-Passenger (S392)
C0774-3
B,2.5D,340
SJ151 B,2.5D,350
C3025-1 C2368-15
B,2.5D,1570
C3002-1
Relay-Power Seat-LH (R209)
C0975-2
B,2.5D,145
Speed control module (D284)
C2145R-12
B,0.5D,240
C2240R-6 C2238-6
B,0.5D,245
C0558-1

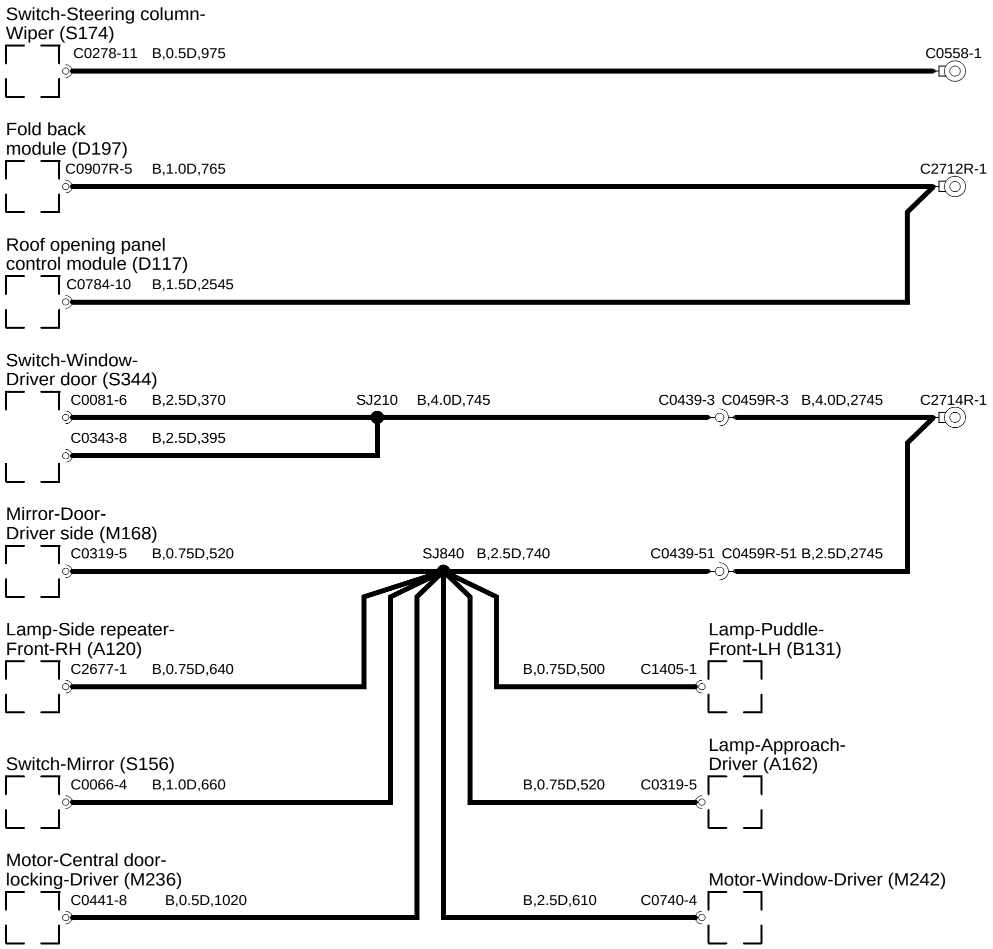

RH headphone unit (D335)
C2357-4
B,0.5D,450
SJ200
B,1.5D,915
C0804-21 C0436-21
B,1.5D,250
SJ740
B,2.5D,195
C0809-1
B,1.5D,915
C0804-9 C0436-9
B,1.5D,250
Lamp-Puddle-Rear-RH (B132)
C0980-1
B,0.75D,520
Audio head unit (D282)
C1354-1
B,1.5D,1525
SJ520
B,0.75D,100
C2640-2 C2639-2
B,0.75D,105
SJ521
B,1.5D,3700
C2645-1
B,0.75D,100
C2640-3 C2639-3
B,0.75D,105
Motor-Central door-locking-Rear-RH (M166)
C0442-8
B,0.5D,650
Switch-Window-Rear-RH (S140)
C0732-5
B,0.5D,450
Lamp-Puddle-Front-LH (B131)
C1405-1
B,0.75D,500
SJ840
B,4.0D,740
C0439-2 C0463R-2
B,4.0D,745
C0810R-1
Motor-Central door-locking-Passenger (M237)
C0441-1
B,0.5D,1020
Switch-Window-Passenger door (S343)
C0087-5
B,0.5D,685
Mirror-Door-Passenger side (M169)
C0319-5
B,0.75D,520
Lamp-Side repeater-Front-LH (A121)
C2677-1
B,0.75D,640
Lamp-Approach-Passenger (A163)
C0319-9
B,0.75D,520

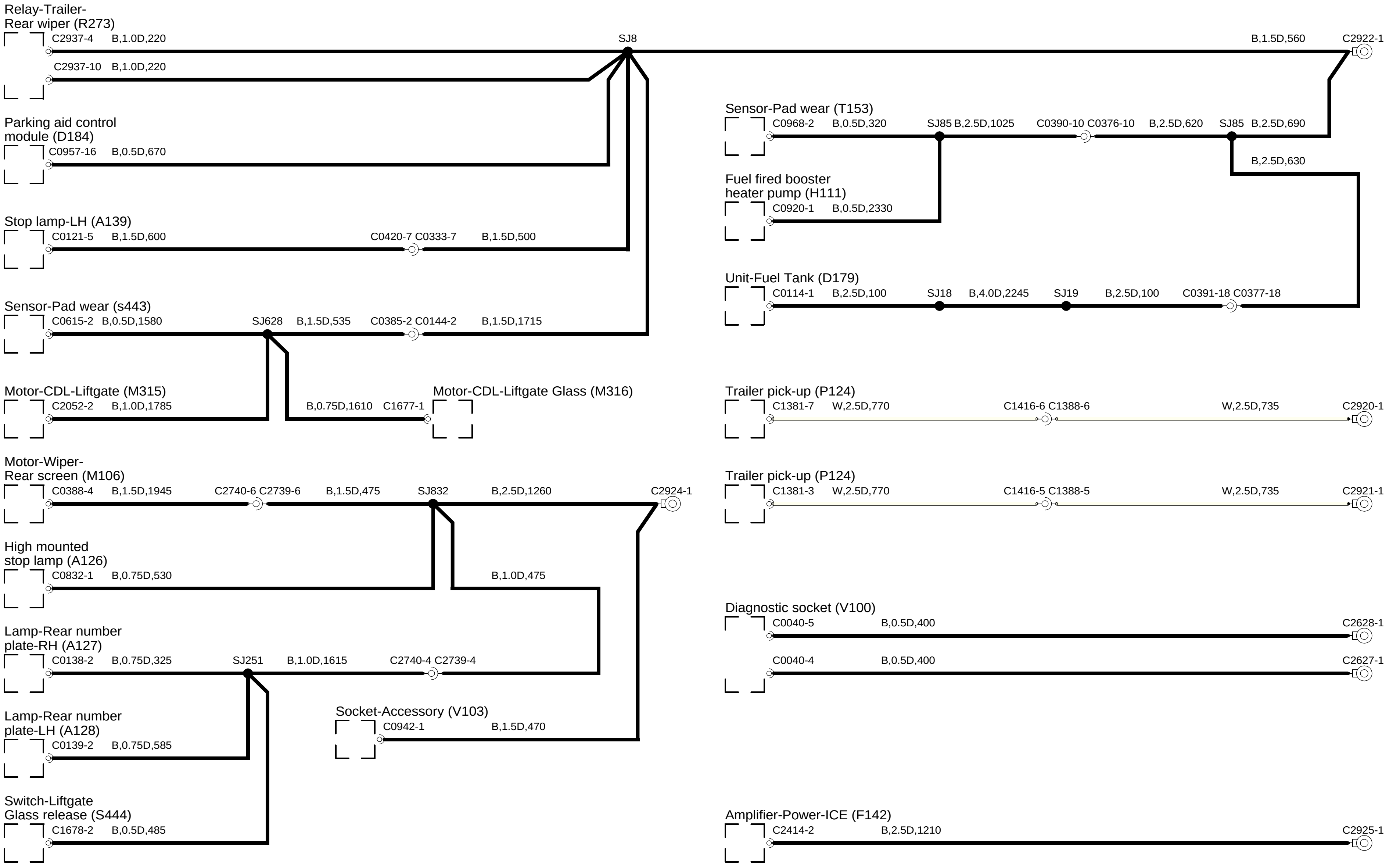

Central Junction Box (P101)
C0585R-25 B,2.5D,885
C2696R-1
Lamp-Interior-Front (B100)
C0357-4 B,0.75D,975
SJ275
B,1.0D,1060
C0610-8 C0084R-8
B,0.75D,1285
C1967R-1
Lamp-Interior-Front (B100)
C1975-1 B,0.5D,930
B,0.5D,2130 C0358-1
Sensor-Volumetric (T139)
Lamp-Interior-Front (B100)
C0355-3 B,0.75D,830
B,0.75D,2200 C1111-3
Lamp-Map-LH (B108)
Mirror-Vanity-RH (B153)
C0736-3 B,0.75D,500
B,0.75D,1125 C1112-3
Lamp-Map-RH (B107)
Mirror-Vanity-LH (B152)
C0737-3 B,0.75D,1485
Lamp-Load space (B140)
C0119-1 B,0.75D,310
SJ5
B,4.0D,325
C1355-1
Stop lamp-RH (A140)
C0125-5 B,1.5D,745
Windshield LH heater element (H114)
C0247-1 B,4.0D,1505
C1536-1
Windshield RH heater element (H113)
C0246R-1 B,4.0D,1615
C1964R-1
RH rear seat heater module (D339)
C2084-1 B,1.5D,420
C2149A-4 C2043-4
B,2.5D,1130
C1968-1
Memory control module (D119)
C2382-17 B,0.5D,550
C0751-12 C0253R-12
B,0.5D,1380
C1971R-1
Sensor-Driver-seat track (T360)
NB,0.5,600
C2368-19
B,0.5D,2385
C2561-1
Restraints control module (D171)
C1649-18 B,0.5D,340
C2562-1
Socket-Accessory (V103)
C1692-1 B,1.5D,600
C0903-13 C0868-13
B,1.5D,1645
C2565R-1
LH rear seat heater module (D338)
C2084-1 B,1.5D,420
C2149A-4 C2042-4
B,2.5D,1130
C2566-1
Rear window heater element (H100)
C0382-1 B,4.0D,1105
C2960-2 C2959-2
B,4.0D,1780
C2568-1
Tire pressure monitoring control module (D286)
C1537-12 B,1.0D,340
C2569-1


Parking Brake Module (D278)
C2178-G2
B,1.5D,1025
C0390-1 C0376-1
B,1.5D,90
SJ405
B,4.0D,950
C2570-1
C2178-H2
B,1.5D,1025
C0390-2 C0376-2
B,1.5D,90
Switch-Lumbar-Driver (S389)
C0976-3
B,1.0D,940
SJ2
B,2.5D,270
C0751-1 C0253R-1
B,2.5D,4510
SJ1053
B,4.0D,360
C2597R-1
C0976-6
B,1.0D,940
Pump-Lumbar-Driver (M286)
C0974-2
B,1.0D,395
Mirror-interior (B146)
C0698-2
B,0.5D,2750
Memory control module (D119)
C2385-2
B,2.5D,320
Heater-Seat-squab-LH (H116)
C2950-1
B,1.5D,510
C2378-1
B,1.5D,1080
Switch pack-Centre-console (S350)
C0700-18
B,0.5D,385
SJ301
B,2.5D,225
C0903-24 C0868-24
B,2.5D,1635
C2598-1
Cool box (D345)
C2773-2
B,0.75D,260
Switch-Electric-park brake (S385)
C2180-6
B,0.5D,490
AV input panel (D346)
C2831-5
B,0.5D,305
Cigar lighter-Front (J112)
C0089-1
B,1.5D,480
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,600
C2656-6
Lamp-Automatic gearbox-selector indicator (B113)
B,0.5D,530
C2657-3
Selector mechanism (D308)
B,0.5D,430
C2658-1
Switch-Seat heat-Rear-LH (S368)
B,0.75D,305
C1401-1
Switch-Seat heat-Rear-RH (S369)
B,0.75D,385
C1403-1
Engine control-module (ECM) (D131)
C0872R-M3
B,0.75D,175
SJ1476
B,2.5D,550
C2601R-1
C0872R-M1
B,0.75D,175
C0872R-M2
B,0.75D,175
C0872R-M4
B,0.75D,175
Control Unit-Cooling Fan (D241)
C2270-B
B,1.0D,755
C3001-1
Dynamic response module (D285)
C2188R-2
B,2.5D,820
C2602R-1
Pump-Supercharge-coolant (M314)
C3006-2
B,2.5D,1705
C2412R-1 C2411R-1
B,2.5D,615
C2696R-1

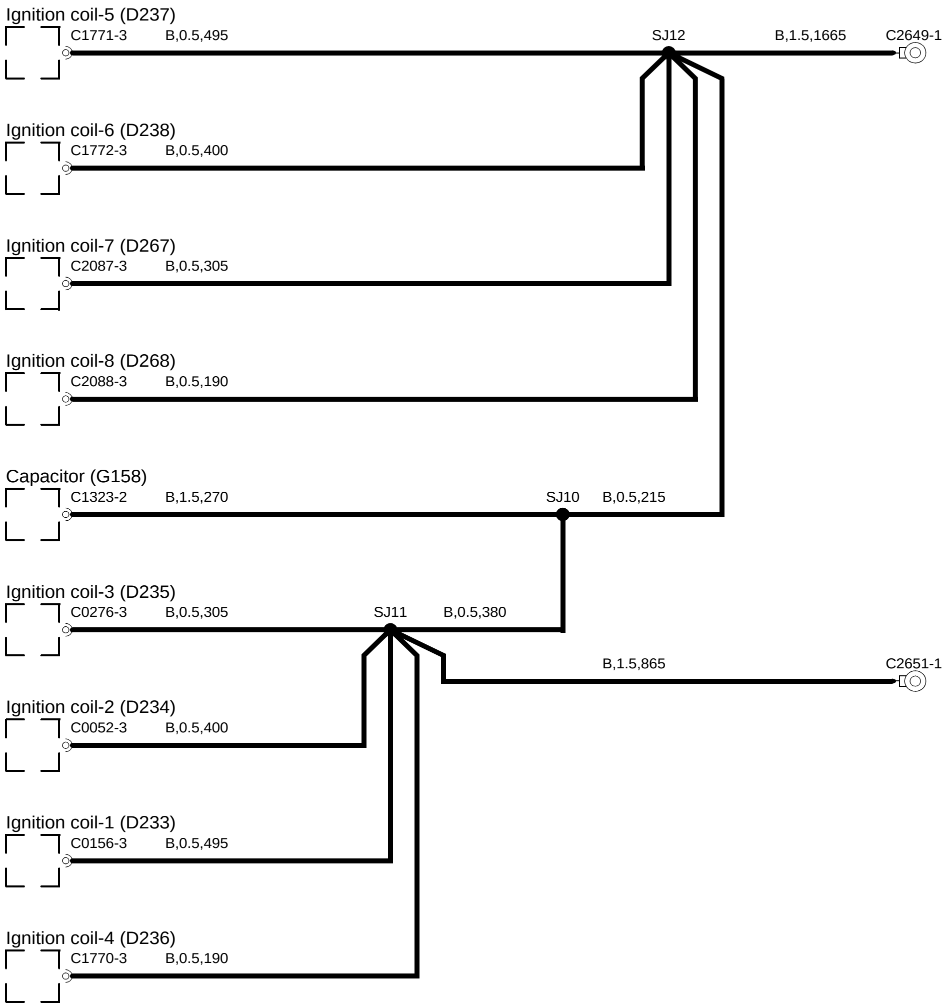

Switch-Buckle-Passenger (S395)
B,0.5,500
C2378-10
B,0.5D,2385
C1947-1
Switch-Buckle-Driver (S394)
B,0.5,500
C2368-10
B,0.5D,2385
ABS module (D277)
C0506R-4
B,2.5D,780
C2603R-1
C0506R-1
B,4.0D,780
Control unit-Blower-motor-Front (D258)
C2281-4
R,4.0,460
C2997-1 C2996R-1
B,4.0D,805
C2606R-1
Lighting control switch (S100)
C0041-10
B,1.0D,435
SJ660
B,2.5D,610
C2627-1
Lamp-Footwell-Front-RH (B135)
B,0.75D,470
C0076-1
Switch-Column (S123)
C1393-1
B,0.35D,505
SJ663
B,1.0D,290
Switch pack-Steering-column motor (S383)
B,0.5D,515
C2184-7
Unit-Steering column (D288)
C1396-2
B,0.5D,265
C1396-10
B,0.5D,265
B,0.35D,515
Sensor-Steering-angle (T274)
C0862-8
B,0.5D,375
Passive coil (D156)
C2524-4
B,0.75D,360
Module-Steering-wheel-LH (D256)
C2283-5
S,0.35,300
C2147-6
Lamp-Glove box (B109)
C0227-1
B,0.5D,780
SJ662
B,2.5D,800
C2630-1
Lamp-Footwell-Front-LH (B136)
C0077-1
B,0.75D,280
Audio head unit (D282)
C2115-12
B,0.5D,1740
C2626-1
Switch pack-Centre facia (S425)
C2387-15
B,0.5D,1720
C2629-1
Automatic Temperature Control Module (D243)
C2655-3
B,1.0D,1830
Air bag-Passenger (U102)
C2637-1
B,0.5D,970
C2633-1
Instrument cluster (J100)
C0230-32
B,0.5D,585
SJ661
B,2.5D,660
C2628-1
C0230-31
B,0.5D,585
Clock spring (S227)
C0082-6
C1254-3
B,0.35,155
C2636-1
Air bag-Driver (U106)
Module-Steering-wheel-RH (D257)
C2147-5
B,0.35,269


Touch screen display (D326)
C2819-2
B,0.5D,85
SJ590
B,0.5D,1825
C2247-2
C2249-2
B,0.5D,1140
SJ134
B,2.5D,155
C2646-1
C2819-3
B,0.5D,85
Navigation system module (D325)
C2114-19
B,0.5D,160
SJ695
B,0.5D,1440
C2114-3
B,0.5D,160
Receiver-VICS (T259)
C1453-5
B,0.5D,930
C2727-4
C2729-4
B,0.5D,970
TV tuner module (D328)
C2117-2
B,0.5D,1370
Telephone control module (D262)
C2777-33
B,0.75D,255
SJ694
B,0.75D,695
C2647-1
C2777-34
B,0.75D,255
Rear seat entertainment module (D313)
C2116-3
B,0.5D,275
SJ696
B,0.5D,645
C2649-1
Module-DVD (D349)
C2832-2
B,0.5D,530
Module-Tuner-DAB/SDARS (D350)
C2158-3
B,0.5D,1715
C2648-1
Pump-Brake-boost (M296)
C2709-2
B,1.5D,660
C2635-1
Trailer pick-up (P124)
C1382-3
W,2.5D,1050
C1414-1
C1390-1
W,2.5D,915
C2692-1
Central Junction Box (P101)
C0585R-18
B,2.5D,885
C2695R-1
Sensor-Rain-Ambient light (T328)
C0961-3
B,0.5D,2470
Module-Fuel-pump driver (D361)
C2369-6
B,4.0D,930
C2920-1
SJ2369
SCR,2.5D,910
SJ2000
B,0.75D,940
Rear differential control module (D283)
C2163-3
B,2.5D,125
SJ70
B,4.0D,180
C2998-1
C2163-6
B,2.5D,125
Engine control-module (ECM) (D131)
C0635R-1
B,1.5D,725
C0557R-1
C0635R-5
B,1.5D,725
C0635R-2
B,1.0D,725
C2650R-1
C0635R-3
B,1.0D,725

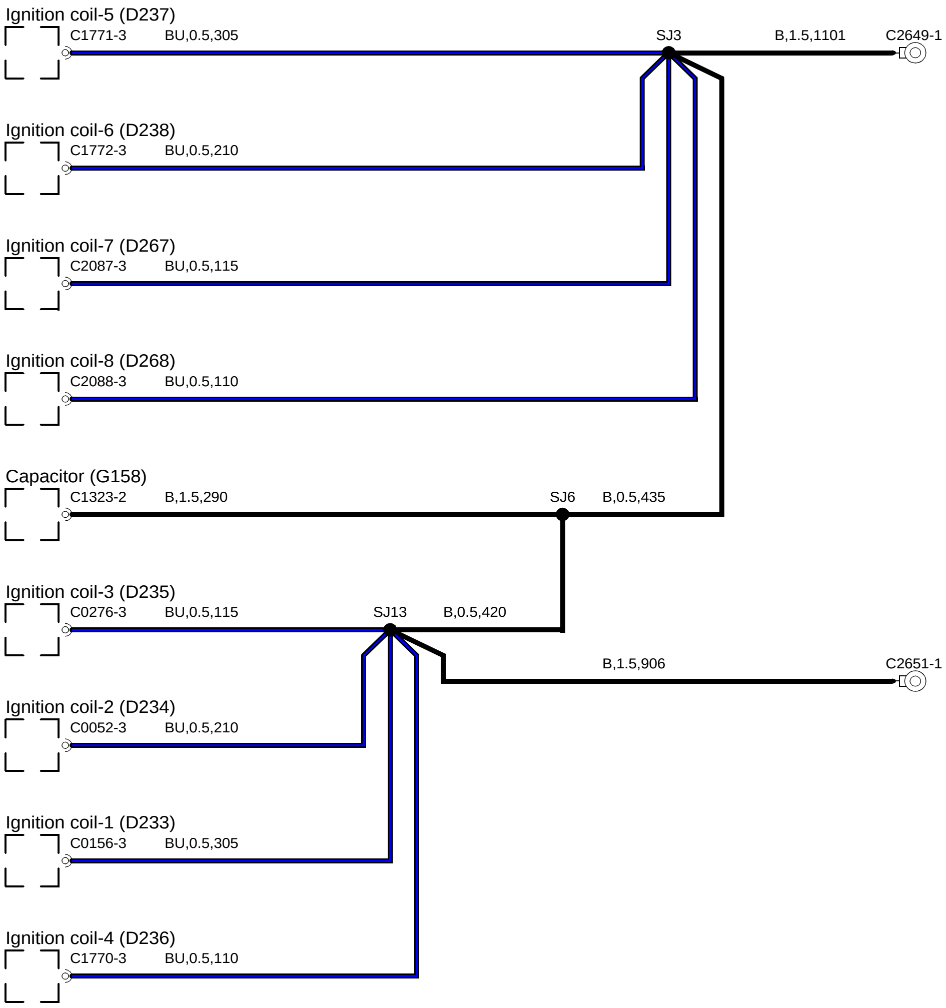

Switch-Steering column-Wiper (S174)
C0278-11
B,0.5D,975
C0558-1
Fold back module (D197)
C0907R-5
B,1.0D,765
C2712R-1
Roof opening panel control module (D117)
C0784-10
B,1.5D,2545
Switch-Window-Driver door (S344)
C0081-6
B,2.5D,370
SJ210
B,4.0D,745
C0439-3
C0459R-3
B,4.0D,2745
C2714R-1
C0343-8
B,2.5D,395
Mirror-Door-Driver side (M168)
C0319-5
B,0.75D,520
SJ840
B,2.5D,740
C0439-51
C0459R-51
B,2.5D,2745
Lamp-Side repeater-Front-RH (A120)
C2677-1
B,0.75D,640
Lamp-Puddle-Front-LH (B131)
B,0.75D,500
C1405-1
Switch-Mirror (S156)
C0066-4
B,1.0D,660
Lamp-Approach-Driver (A162)
B,0.75D,520
C0319-5
Motor-Central door-locking-Driver (M236)
C0441-8
B,0.5D,1020
Motor-Window-Driver (M242)
B,2.5D,610
C0740-4

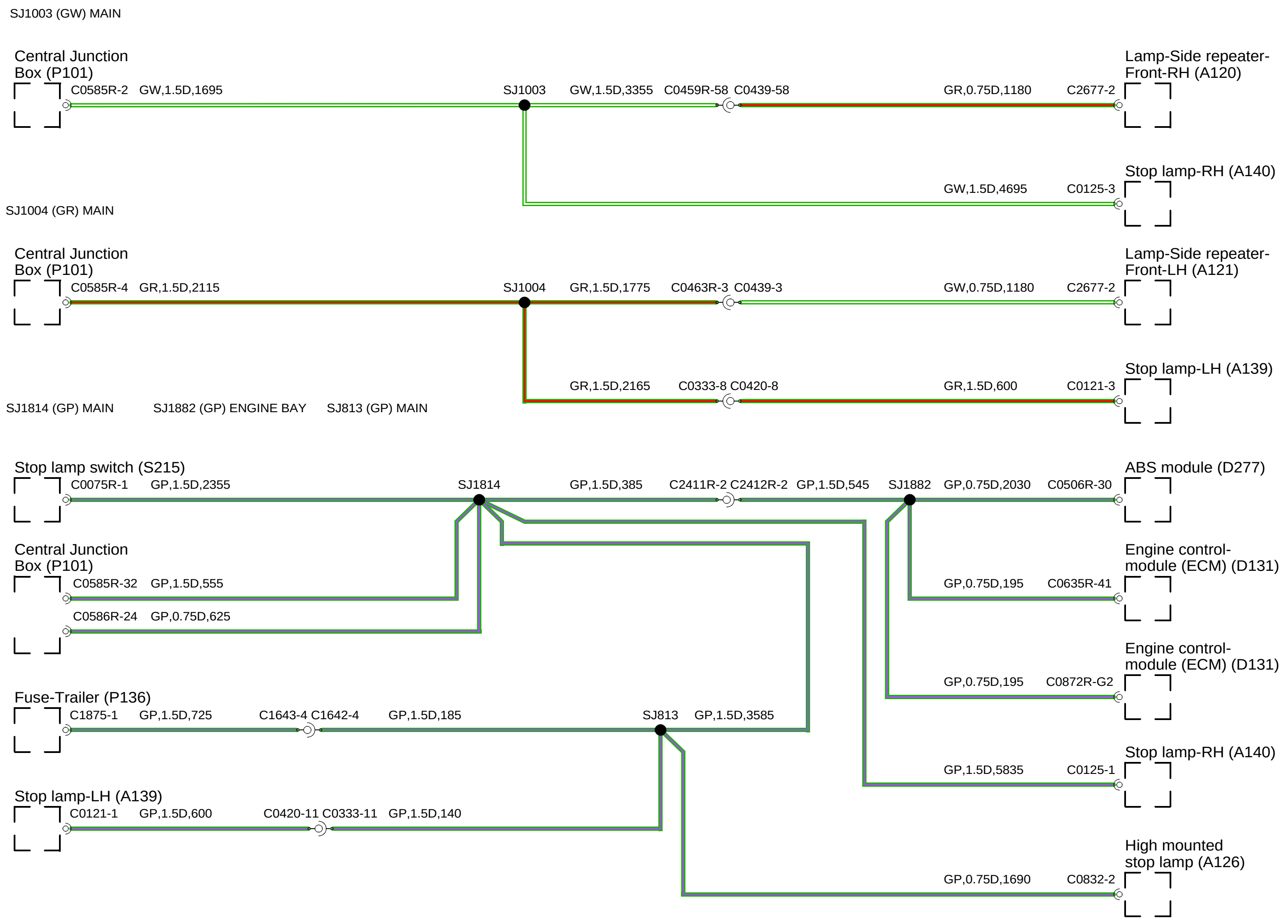

Relay-Trailer-
Rear wiper (R273)
C2937-4
B,1.0D,220
SJ8
B,1.5D,560
C2922-1
C2937-10
B,1.0D,220
Sensor-Pad wear (T153)
C0968-2
B,0.5D,320
SJ85
B,2.5D,1025
C0390-10
C0376-10
B,2.5D,620
SJ85
B,2.5D,690
Parking aid control
module (D184)
C0957-16
B,0.5D,670
B,2.5D,630
Fuel fired booster
heater pump (H111)
C0920-1
B,0.5D,2330
Stop lamp-LH (A139)
C0121-5
B,1.5D,600
C0420-7
C0333-7
B,1.5D,500
Unit-Fuel Tank (D179)
C0114-1
B,2.5D,100
SJ18
B,4.0D,2245
SJ19
B,2.5D,100
C0391-18
C0377-18
Sensor-Pad wear (s443)
C0615-2
B,0.5D,1580
SJ628
B,1.5D,535
C0385-2
C0144-2
B,1.5D,1715
Motor-CDL-Liftgate (M315)
C2052-2
B,1.0D,1785
B,0.75D,1610
C1677-1
Motor-CDL-Liftgate Glass (M316)
Trailer pick-up (P124)
C1381-7
W,2.5D,770
C1416-6
C1388-6
W,2.5D,735
C2920-1
Motor-Wiper-
Rear screen (M106)
C0388-4
B,1.5D,1945
C2740-6
C2739-6
B,1.5D,475
SJ832
B,2.5D,1260
C2924-1
Trailer pick-up (P124)
C1381-3
W,2.5D,770
C1416-5
C1388-5
W,2.5D,735
C2921-1
High mounted
stop lamp (A126)
C0832-1
B,0.75D,530
B,1.0D,475
Diagnostic socket (V100)
C0040-5
B,0.5D,400
C2628-1
Lamp-Rear number
plate-RH (A127)
C0138-2
B,0.75D,325
SJ251
B,1.0D,1615
C2740-4
C2739-4
C0040-4
B,0.5D,400
C2627-1
Socket-Accessory (V103)
C0942-1
B,1.5D,470
Lamp-Rear number
plate-LH (A128)
C0139-2
B,0.75D,585
Switch-Liftgate
Glass release (S444)
C1678-2
B,0.5D,485
Amplifier-Power-ICE (F142)
C2414-2
B,2.5D,1210
C2925-1

(PETROL-S/C)

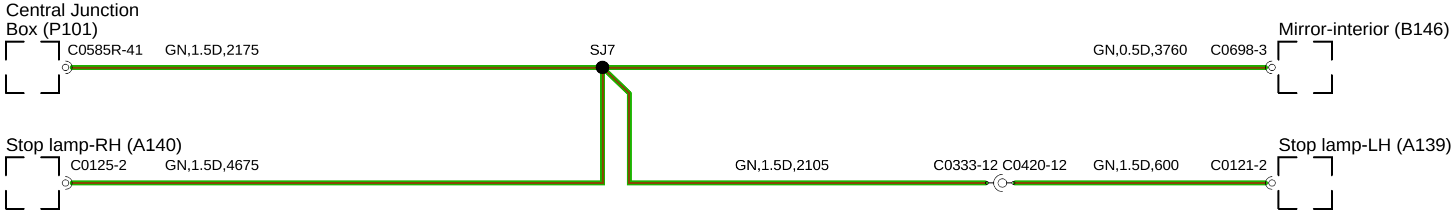

Ignition coil-5 (D237)
C1771-3
B,0.5,495
SJ12
B,1.5,1665
C2649-1
Ignition coil-6 (D238)
C1772-3
B,0.5,400
Ignition coil-7 (D267)
C2087-3
B,0.5,305
Ignition coil-8 (D268)
C2088-3
B,0.5,190
Capacitor (G158)
C1323-2
B,1.5,270
SJ10
B,0.5,215
Ignition coil-3 (D235)
C0276-3
B,0.5,305
SJ11
B,0.5,380
B,1.5,865
C2651-1
Ignition coil-2 (D234)
C0052-3
B,0.5,400
Ignition coil-1 (D233)
C0156-3
B,0.5,495
Ignition coil-4 (D236)
C1770-3
B,0.5,190

(PETROL-N/A)

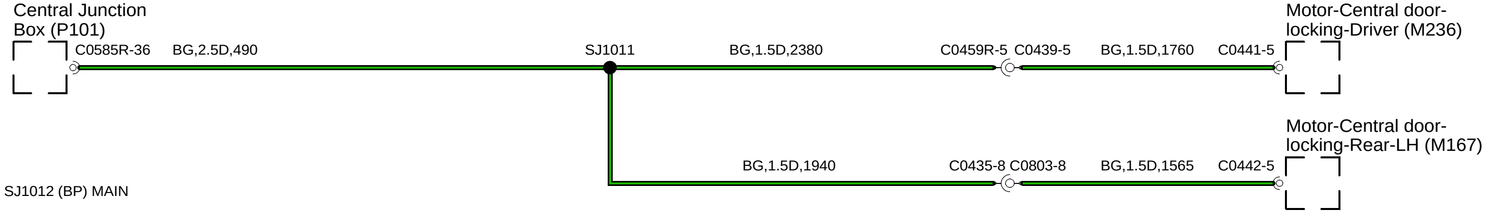

Ignition coil-5 (D237)
C1771-3
BU,0.5,305
SJ3
B,1.5,1101
C2649-1
Ignition coil-6 (D238)
C1772-3
BU,0.5,210
Ignition coil-7 (D267)
C2087-3
BU,0.5,115
Ignition coil-8 (D268)
C2088-3
BU,0.5,110
Capacitor (G158)
C1323-2
B,1.5,290
SJ6
B,0.5,435
Ignition coil-3 (D235)
C0276-3
BU,0.5,115
SJ13
B,0.5,420
B,1.5,906
C2651-1
Ignition coil-2 (D234)
C0052-3
BU,0.5,210
Ignition coil-1 (D233)
C0156-3
BU,0.5,305
Ignition coil-4 (D236)
C1770-3
BU,0.5,110


SJ1003 (GW) MAIN
Central Junction Box (P101)
C0585R-2
GW,1.5D,1695
SJ1003
GW,1.5D,3355
C0459R-58
C0439-58
GR,0.75D,1180
C2677-2
Lamp-Side repeater-Front-RH (A120)
GW,1.5D,4695
C0125-3
Stop lamp-RH (A140)
SJ1004 (GR) MAIN
Central Junction Box (P101)
C0585R-4
GR,1.5D,2115
SJ1004
GR,1.5D,1775
C0463R-3
C0439-3
GW,0.75D,1180
C2677-2
Lamp-Side repeater-Front-LH (A121)
GR,1.5D,2165
C0333-8
C0420-8
GR,1.5D,600
C0121-3
Stop lamp-LH (A139)
SJ1814 (GP) MAIN
SJ1882 (GP) ENGINE BAY
SJ813 (GP) MAIN
Stop lamp switch (S215)
C0075R-1
GP,1.5D,2355
SJ1814
GP,1.5D,385
C2411R-2
C2412R-2
GP,1.5D,545
SJ1882
GP,0.75D,2030
C0506R-30
ABS module (D277)
Central Junction Box (P101)
C0585R-32
GP,1.5D,555
C0586R-24
GP,0.75D,625
GP,0.75D,195
C0635R-41
Engine control-module (ECM) (D131)
GP,0.75D,195
C0872R-G2
Engine control-module (ECM) (D131)
Fuse-Trailer (P136)
C1875-1
GP,1.5D,725
C1643-4
C1642-4
GP,1.5D,185
SJ813
GP,1.5D,3585
GP,1.5D,5835
C0125-1
Stop lamp-RH (A140)
Stop lamp-LH (A139)
C0121-1
GP,1.5D,600
C0420-11
C0333-11
GP,1.5D,140
GP,0.75D,1690
C0832-2
High mounted stop lamp (A126)

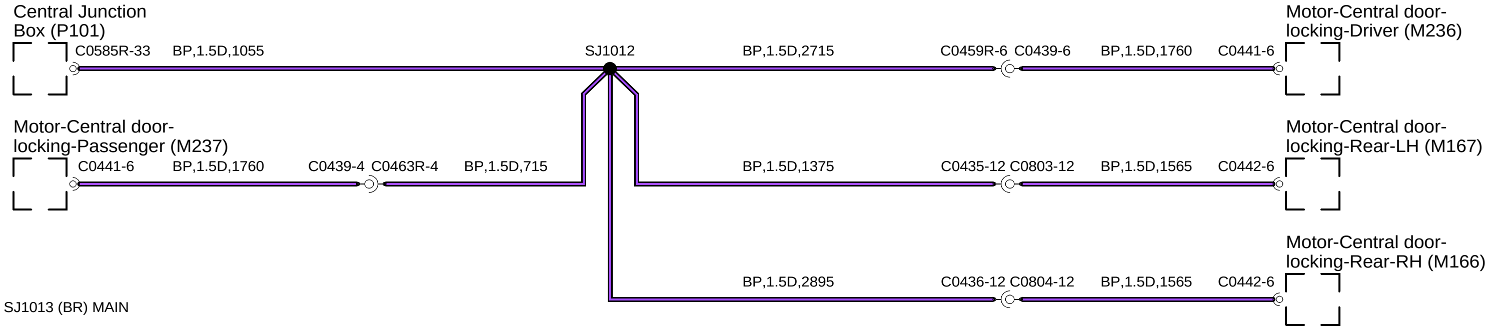
SJ 7 (GN) MAIN


Central Junction Box (P101)
C0585R-41
GN,1.5D,2175
SJ7
GN,0.5D,3760
C0698-3
Mirror-interior (B146)
Stop lamp-RH (A140)
C0125-2
GN,1.5D,4675
GN,1.5D,2105
C0333-12 C0420-12
GN,1.5D,600
C0121-2
Stop lamp-LH (A139)

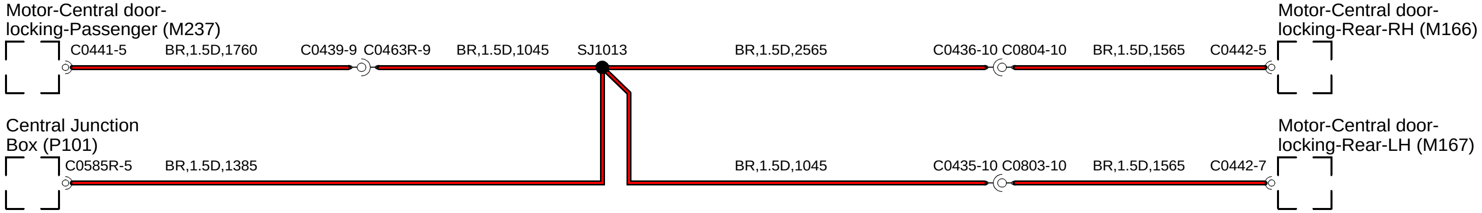
SJ1011 (KP) MAIN

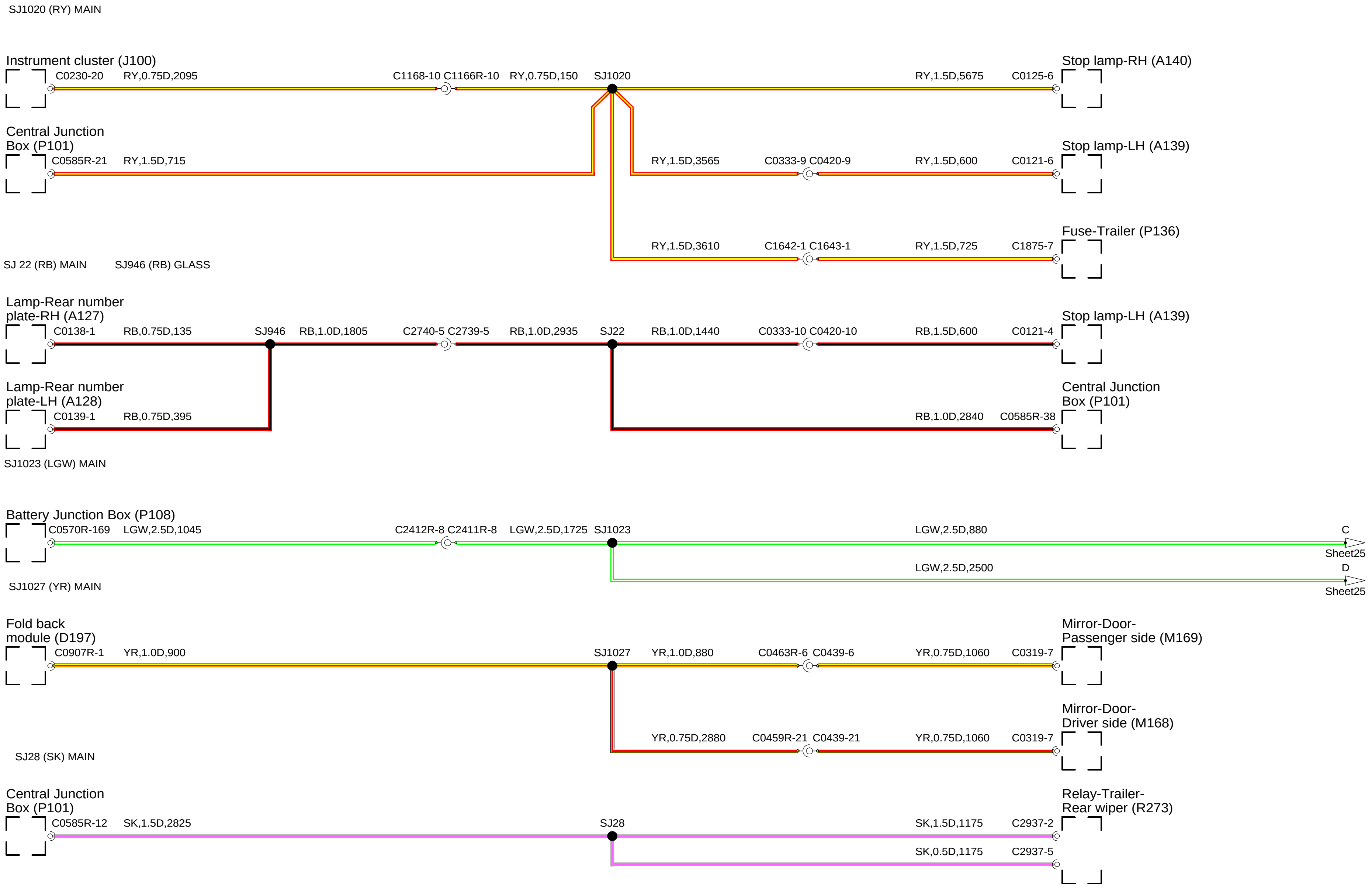

Central Junction Box (P101)
C0585R-36
BG,2.5D,490
SJ1011
BG,1.5D,2380
C0459R-5 C0439-5
BG,1.5D,1760
C0441-5
Motor-Central door-locking-Driver (M236)
BG,1.5D,1940
C0435-8 C0803-8
BG,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-LH (M167)

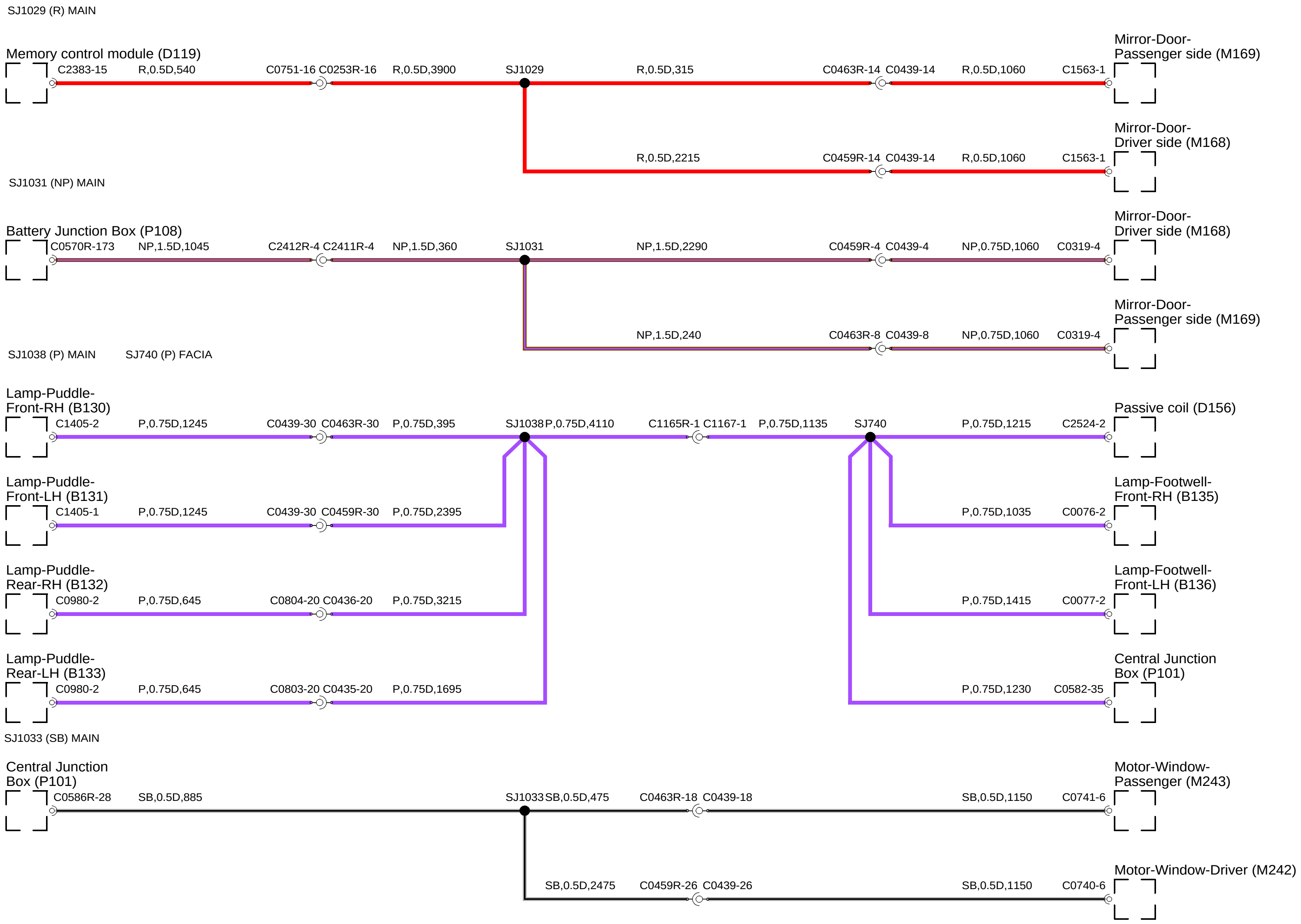
SJ1012 (BP) MAIN


Central Junction Box (P101)
C0585R-33
BP,1.5D,1055
SJ1012
BP,1.5D,2715
C0459R-6 C0439-6
BP,1.5D,1760
C0441-6
Motor-Central door-locking-Driver (M236)
Motor-Central door-locking-Passenger (M237)
C0441-6
BP,1.5D,1760
C0439-4 C0463R-4
BP,1.5D,715
BP,1.5D,1375
C0435-12 C0803-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-LH (M167)
BP,1.5D,2895
C0436-12 C0804-12
BP,1.5D,1565
C0442-6
Motor-Central door-locking-Rear-RH (M166)

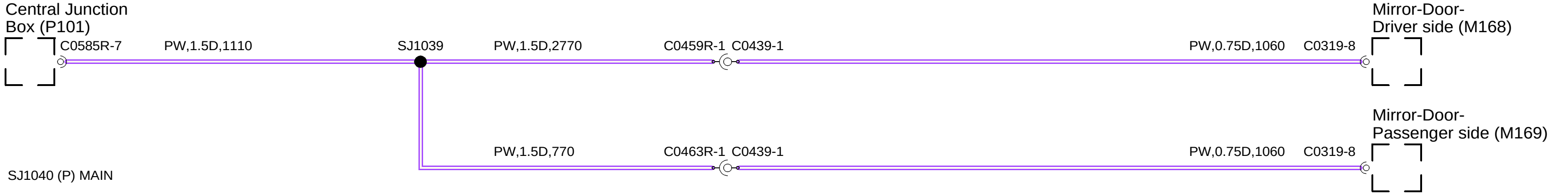
SJ1013 (BR) MAIN


Motor-Central door-locking-Passenger (M237)
C0441-5
BR,1.5D,1760
C0439-9 C0463R-9
BR,1.5D,1045
SJ1013
BR,1.5D,2565
C0436-10 C0804-10
BR,1.5D,1565
C0442-5
Motor-Central door-locking-Rear-RH (M166)
Central Junction Box (P101)
C0585R-5
BR,1.5D,1385
BR,1.5D,1045
C0435-10 C0803-10
BR,1.5D,1565
C0442-7
Motor-Central door-locking-Rear-LH (M167)

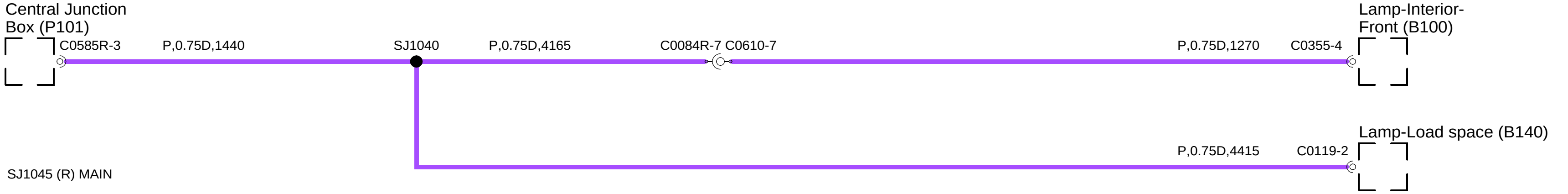

SJ1020 (RY) MAIN
Instrument cluster (J100)
C0230-20
RY,0.75D,2095
C1168-10 C1166R-10
RY,0.75D,150
SJ1020
RY,1.5D,5675
C0125-6
Stop lamp-RH (A140)
Central Junction Box (P101)
C0585R-21
RY,1.5D,715
RY,1.5D,3565
C0333-9 C0420-9
RY,1.5D,600
C0121-6
Stop lamp-LH (A139)
RY,1.5D,3610
C1642-1 C1643-1
RY,1.5D,725
C1875-7
Fuse-Trailer (P136)
SJ 22 (RB) MAIN
SJ946 (RB) GLASS
Lamp-Rear number plate-RH (A127)
C0138-1
RB,0.75D,135
SJ946
RB,1.0D,1805
C2740-5 C2739-5
RB,1.0D,2935
SJ22
RB,1.0D,1440
C0333-10 C0420-10
RB,1.5D,600
C0121-4
Stop lamp-LH (A139)
Lamp-Rear number plate-LH (A128)
C0139-1
RB,0.75D,395
RB,1.0D,2840
C0585R-38
Central Junction Box (P101)
SJ1023 (LGW) MAIN
Battery Junction Box (P108)
C0570R-169
LGW,2.5D,1045
C2412R-8 C2411R-8
LGW,2.5D,1725
SJ1023
LGW,2.5D,880
C
Sheet25
LGW,2.5D,2500
D
Sheet25
SJ1027 (YR) MAIN
Fold back module (D197)
C0907R-1
YR,1.0D,900
SJ1027
YR,1.0D,880
C0463R-6 C0439-6
YR,0.75D,1060
C0319-7
Mirror-Door-Passenger side (M169)
YR,0.75D,2880
C0459R-21 C0439-21
YR,0.75D,1060
C0319-7
Mirror-Door-Driver side (M168)
SJ28 (SK) MAIN
Central Junction Box (P101)
C0585R-12
SK,1.5D,2825
SJ28
SK,1.5D,1175
C2937-2
SK,0.5D,1175
C2937-5
Relay-Trailer-Rear wiper (R273)


SJ1029 (R) MAIN
Memory control module (D119)
C2383-15
R,0.5D,540
C0751-16 C0253R-16
R,0.5D,3900
SJ1029
R,0.5D,315
C0463R-14 C0439-14
R,0.5D,1060
C1563-1
Mirror-Door-Passenger side (M169)
R,0.5D,2215
C0459R-14 C0439-14
R,0.5D,1060
C1563-1
Mirror-Door-Driver side (M168)
SJ1031 (NP) MAIN
Battery Junction Box (P108)
C0570R-173
NP,1.5D,1045
C2412R-4 C2411R-4
NP,1.5D,360
SJ1031
NP,1.5D,2290
C0459R-4 C0439-4
NP,0.75D,1060
C0319-4
Mirror-Door-Driver side (M168)
NP,1.5D,240
C0463R-8 C0439-8
NP,0.75D,1060
C0319-4
Mirror-Door-Passenger side (M169)
SJ1038 (P) MAIN
SJ740 (P) FACIA
Lamp-Puddle-Front-RH (B130)
C1405-2
P,0.75D,1245
C0439-30 C0463R-30
P,0.75D,395
SJ1038
P,0.75D,4110
C1165R-1 C1167-1
P,0.75D,1135
SJ740
P,0.75D,1215
C2524-2
Passive coil (D156)
Lamp-Puddle-Front-LH (B131)
C1405-1
P,0.75D,1245
C0439-30 C0459R-30
P,0.75D,2395
P,0.75D,1035
C0076-2
Lamp-Footwell-Front-RH (B135)
Lamp-Puddle-Rear-RH (B132)
C0980-2
P,0.75D,645
C0804-20 C0436-20
P,0.75D,3215
P,0.75D,1415
C0077-2
Lamp-Footwell-Front-LH (B136)
Lamp-Puddle-Rear-LH (B133)
C0980-2
P,0.75D,645
C0803-20 C0435-20
P,0.75D,1695
P,0.75D,1230
C0582-35
Central Junction Box (P101)
SJ1033 (SB) MAIN
Central Junction Box (P101)
C0586R-28
SB,0.5D,885
SJ1033
SB,0.5D,475
C0463R-18 C0439-18
SB,0.5D,1150
C0741-6
Motor-Window-Passenger (M243)
SB,0.5D,2475
C0459R-26 C0439-26
SB,0.5D,1150
C0740-6
Motor-Window-Driver (M242)

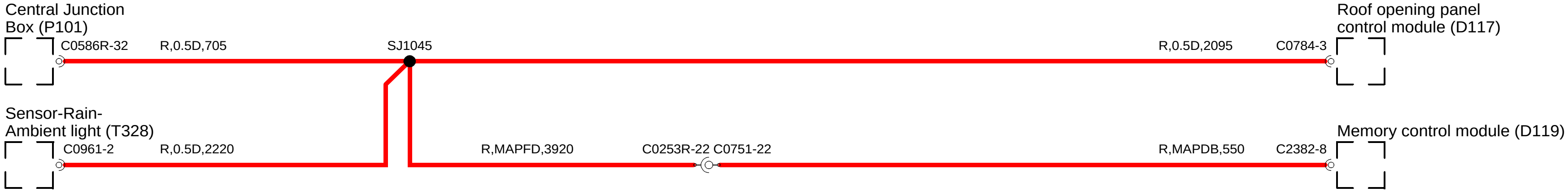
SJ1039 (PW) MAIN


Central Junction Box (P101)
C0585R-7
PW,1.5D,1110
SJ1039
PW,1.5D,2770
C0459R-1
C0439-1
PW,0.75D,1060
C0319-8
Mirror-Door-Driver side (M168)
PW,1.5D,770
C0463R-1
C0439-1
PW,0.75D,1060
C0319-8
Mirror-Door-Passenger side (M169)

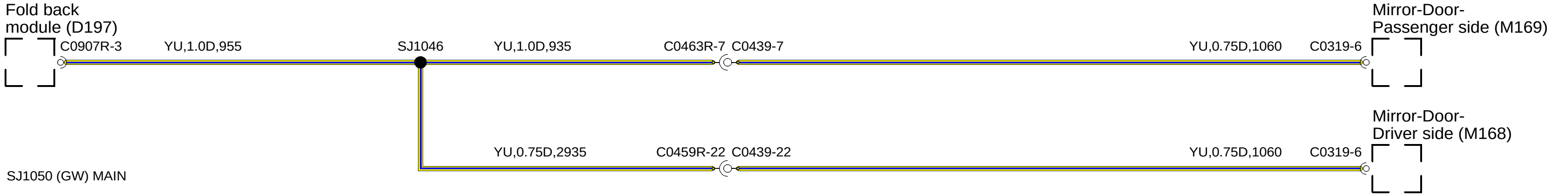
SJ1040 (P) MAIN


Central Junction Box (P101)
C0585R-3
P,0.75D,1440
SJ1040
P,0.75D,4165
C0084R-7
C0610-7
P,0.75D,1270
C0355-4
Lamp-Interior-Front (B100)
P,0.75D,4415
C0119-2
Lamp-Load space (B140)

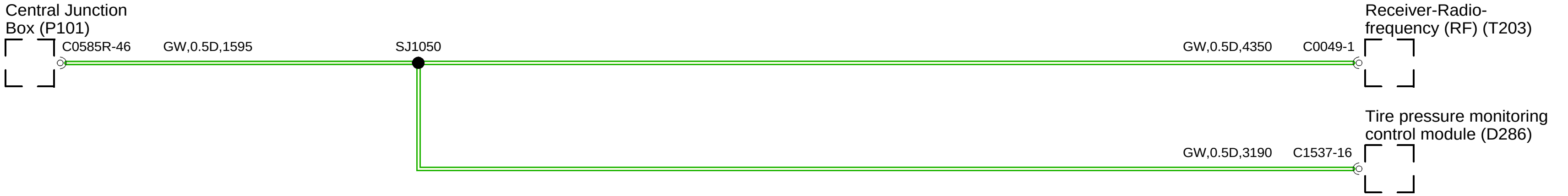
SJ1045 (R) MAIN

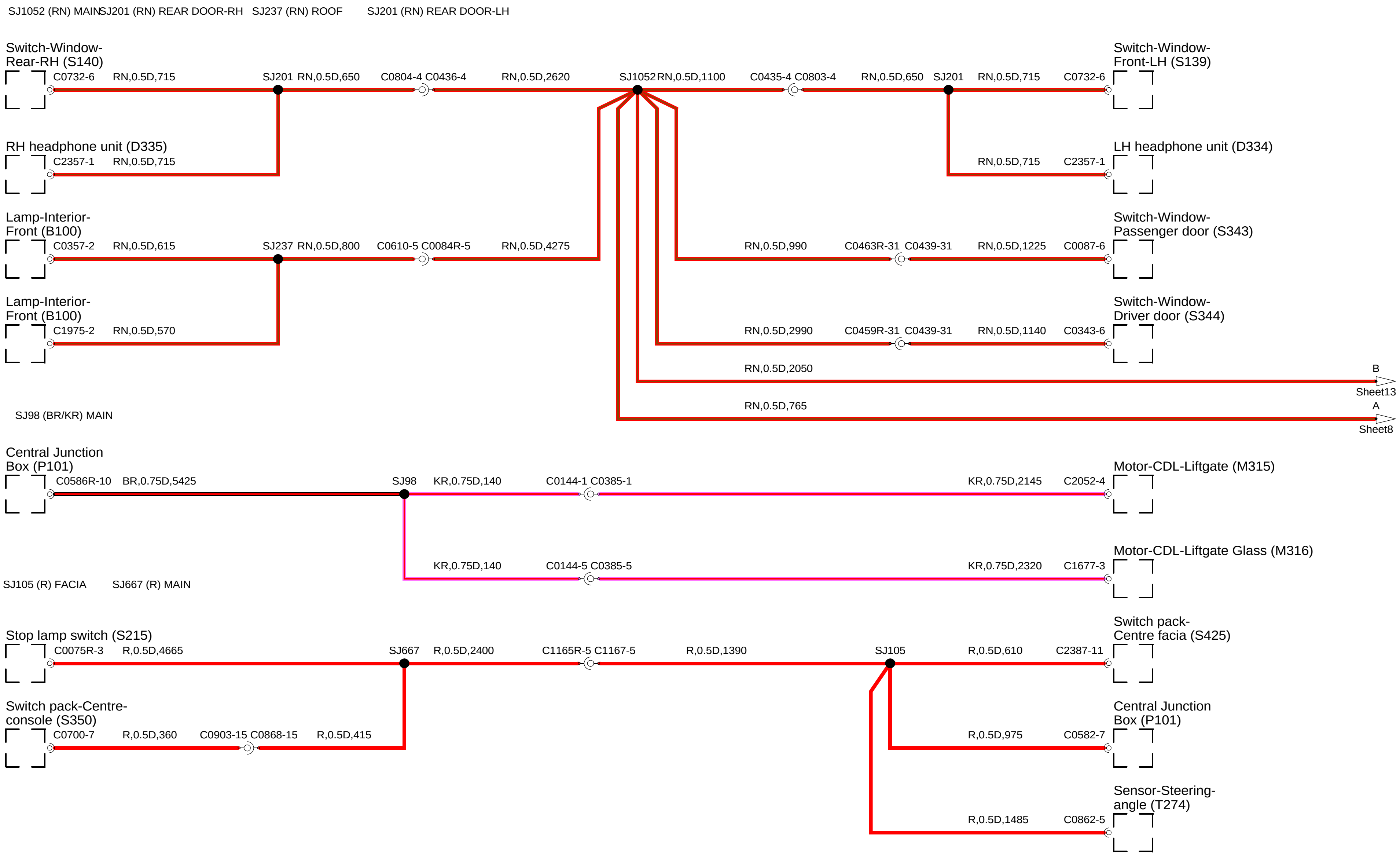

Central Junction Box (P101)
C0586R-32
R,0.5D,705
SJ1045
R,0.5D,2095
C0784-3
Roof opening panel control module (D117)
Sensor-Rain-Ambient light (T328)
C0961-2
R,0.5D,2220
R,MAPFD,3920
C0253R-22
C0751-22
R,MAPDB,550
C2382-8
Memory control module (D119)

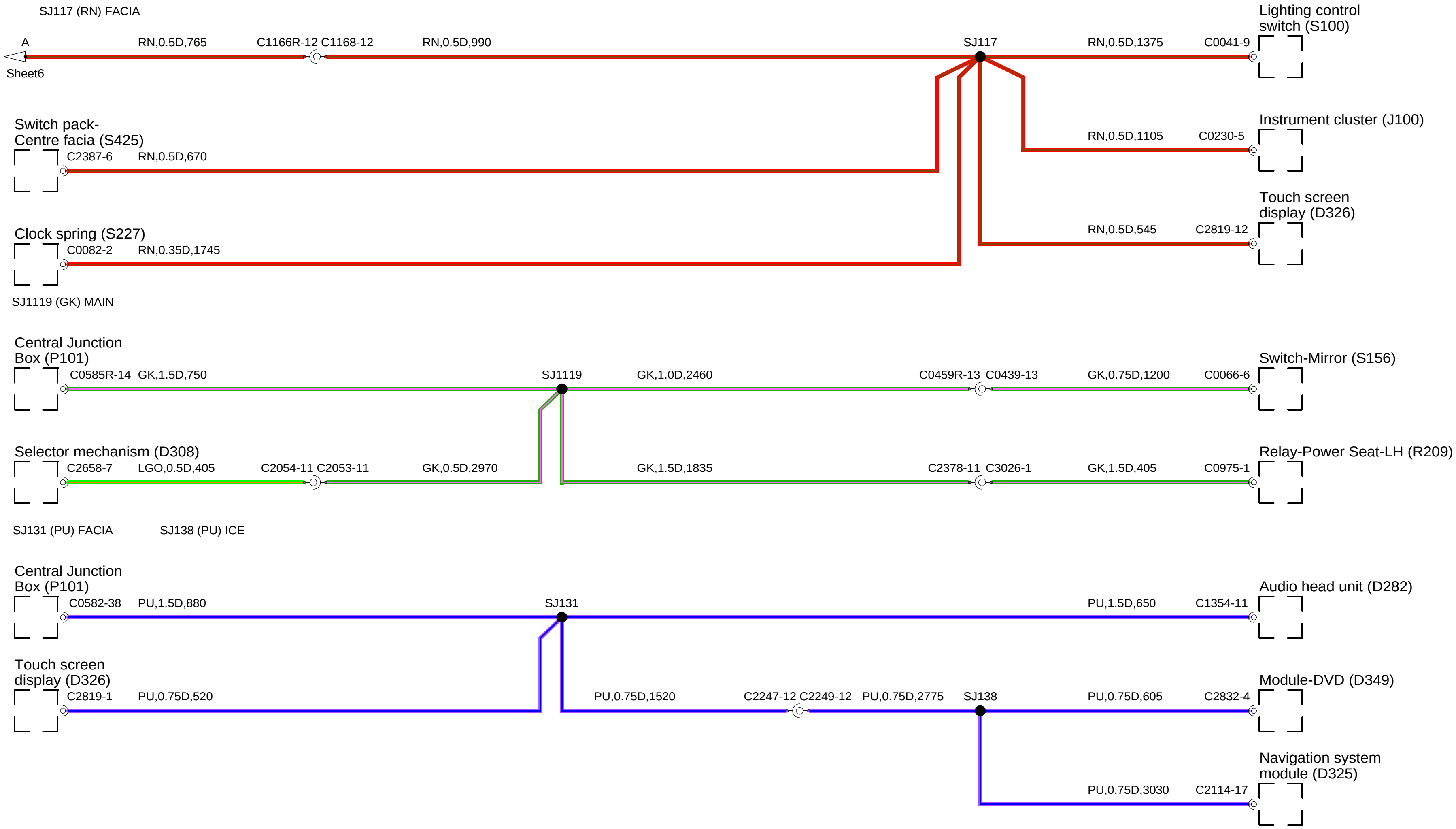
SJ1046 (YU) MAIN


Fold back module (D197)
C0907R-3
YU,1.0D,955
SJ1046
YU,1.0D,935
C0463R-7
C0439-7
YU,0.75D,1060
C0319-6
Mirror-Door-Passenger side (M169)
YU,0.75D,2935
C0459R-22
C0439-22
YU,0.75D,1060
C0319-6
Mirror-Door-Driver side (M168)

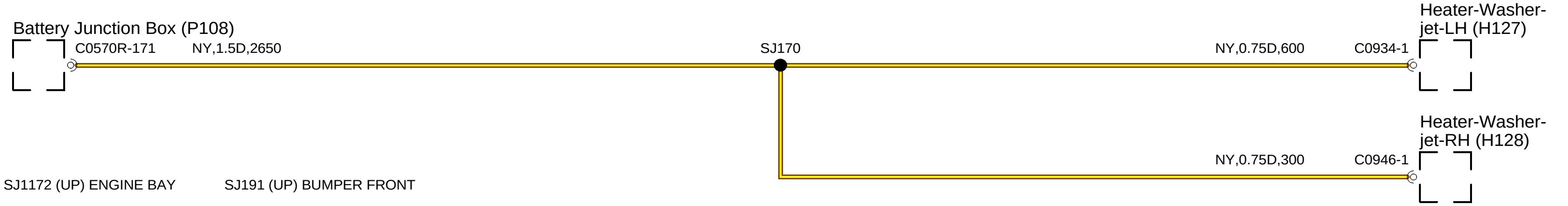
SJ1050 (GW) MAIN


Central Junction Box (P101)
C0585R-46
GW,0.5D,1595
SJ1050
GW,0.5D,4350
C0049-1
Receiver-Radio-frequency (RF) (T203)
GW,0.5D,3190
C1537-16
Tire pressure monitoring control module (D286)


SJ1052 (RN) MAIN
SJ201 (RN) REAR DOOR-RH
SJ237 (RN) ROOF
SJ201 (RN) REAR DOOR-LH
Switch-Window-Rear-RH (S140)
C0732-6
RN,0.5D,715
SJ201
RN,0.5D,650
C0804-4 C0436-4
RN,0.5D,2620
SJ1052
RN,0.5D,1100
C0435-4 C0803-4
RN,0.5D,650
SJ201
RN,0.5D,715
C0732-6
Switch-Window-Front-LH (S139)
RH headphone unit (D335)
C2357-1
RN,0.5D,715
LH headphone unit (D334)
RN,0.5D,715
C2357-1
Lamp-Interior-Front (B100)
C0357-2
RN,0.5D,615
SJ237
RN,0.5D,800
C0610-5 C0084R-5
RN,0.5D,4275
RN,0.5D,990
C0463R-31 C0439-31
RN,0.5D,1225
C0087-6
Switch-Window-Passenger door (S343)
Lamp-Interior-Front (B100)
C1975-2
RN,0.5D,570
RN,0.5D,2990
C0459R-31 C0439-31
RN,0.5D,1140
C0343-6
Switch-Window-Driver door (S344)
RN,0.5D,2050
B
Sheet13
RN,0.5D,765
A
Sheet8
SJ98 (BR/KR) MAIN
Central Junction Box (P101)
C0586R-10
BR,0.75D,5425
SJ98
KR,0.75D,140
C0144-1 C0385-1
KR,0.75D,2145
C2052-4
Motor-CDL-Liftgate (M315)
KR,0.75D,140
C0144-5 C0385-5
KR,0.75D,2320
C1677-3
Motor-CDL-Liftgate Glass (M316)
SJ105 (R) FACIA
SJ667 (R) MAIN
Stop lamp switch (S215)
C0075R-3
R,0.5D,4665
SJ667
R,0.5D,2400
C1165R-5 C1167-5
R,0.5D,1390
SJ105
R,0.5D,610
C2387-11
Switch pack-Centre facia (S425)
Switch pack-Centre-console (S350)
C0700-7
R,0.5D,360
C0903-15 C0868-15
R,0.5D,415
R,0.5D,975
C0582-7
Central Junction Box (P101)
Sensor-Steering-angle (T274)
R,0.5D,1485
C0862-5

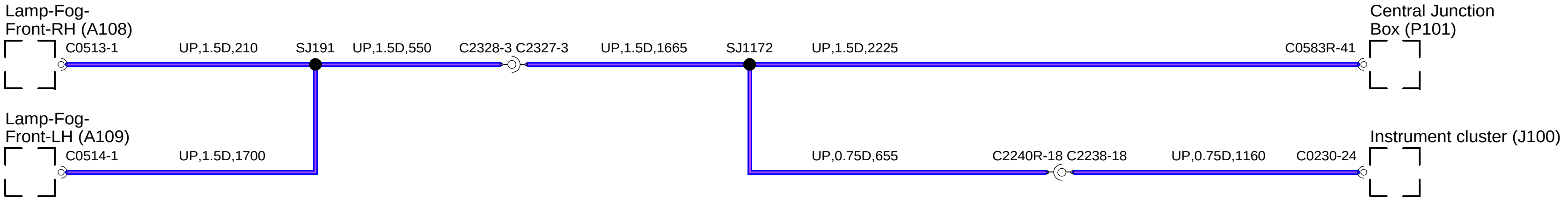

SJ117 (RN) FACIA
A
Sheet6
RN,0.5D,765
C1166R-12 C1168-12
RN,0.5D,990
SJ117
RN,0.5D,1375
C0041-9
Lighting control switch (S100)
Switch pack-Centre facia (S425)
C2387-6
RN,0.5D,670
Instrument cluster (J100)
RN,0.5D,1105
C0230-5
Touch screen display (D326)
RN,0.5D,545
C2819-12
Clock spring (S227)
C0082-2
RN,0.35D,1745
SJ1119 (GK) MAIN
Central Junction Box (P101)
C0585R-14
GK,1.5D,750
SJ1119
GK,1.0D,2460
C0459R-13 C0439-13
GK,0.75D,1200
C0066-6
Switch-Mirror (S156)
Selector mechanism (D308)
C2658-7
LGO,0.5D,405
C2054-11 C2053-11
GK,0.5D,2970
GK,1.5D,1835
C2378-11 C3026-1
GK,1.5D,405
C0975-1
Relay-Power Seat-LH (R209)
SJ131 (PU) FACIA
SJ138 (PU) ICE
Central Junction Box (P101)
C0582-38
PU,1.5D,880
SJ131
PU,1.5D,650
C1354-11
Audio head unit (D282)
Touch screen display (D326)
C2819-1
PU,0.75D,520
PU,0.75D,1520
C2247-12 C2249-12
PU,0.75D,2775
SJ138
PU,0.75D,605
C2832-4
Module-DVD (D349)
Navigation system module (D325)
PU,0.75D,3030
C2114-17

SJ170 (NY) ENGINE BAY

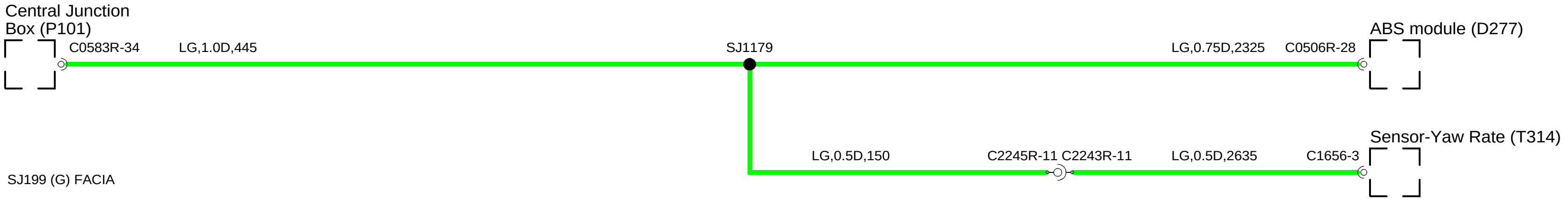

Battery Junction Box (P108)
C0570R-171
NY,1.5D,2650
SJ170
NY,0.75D,600
C0934-1
Heater-Washer-jet-LH (H127)
NY,0.75D,300
C0946-1
Heater-Washer-jet-RH (H128)

SJ1172 (UP) ENGINE BAY

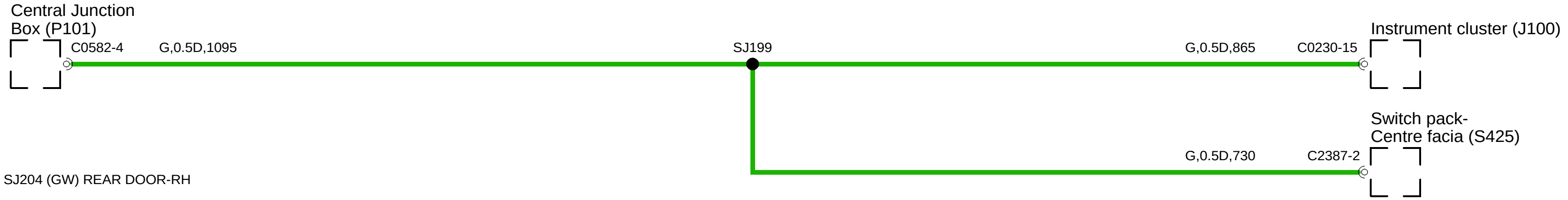
SJ191 (UP) BUMPER FRONT


Lamp-Fog-Front-RH (A108)
C0513-1
UP,1.5D,210
SJ191
UP,1.5D,550
C2328-3 C2327-3
UP,1.5D,1665
SJ1172
UP,1.5D,2225
C0583R-41
Central Junction Box (P101)
Lamp-Fog-Front-LH (A109)
C0514-1
UP,1.5D,1700
UP,0.75D,655
C2240R-18 C2238-18
UP,0.75D,1160
C0230-24
Instrument cluster (J100)

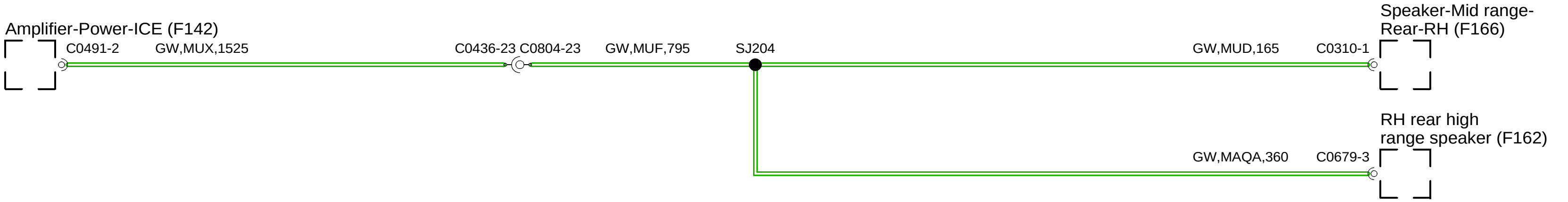
SJ1179 (LG) ENGINE BAY


Central Junction Box (P101)
C0583R-34
LG,1.0D,445
SJ1179
LG,0.75D,2325
C0506R-28
ABS module (D277)
LG,0.5D,150
C2245R-11 C2243R-11
LG,0.5D,2635
C1656-3
Sensor-Yaw Rate (T314)

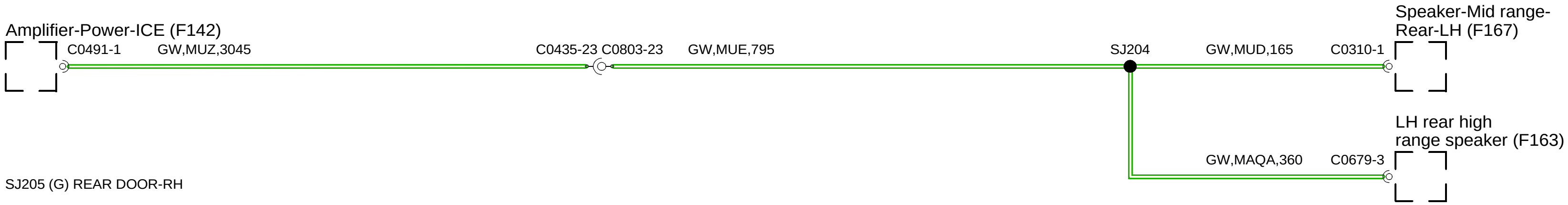
SJ199 (G) FACIA


Central Junction Box (P101)
C0582-4
G,0.5D,1095
SJ199
G,0.5D,865
C0230-15
Instrument cluster (J100)
G,0.5D,730
C2387-2
Switch pack-Centre facia (S425)

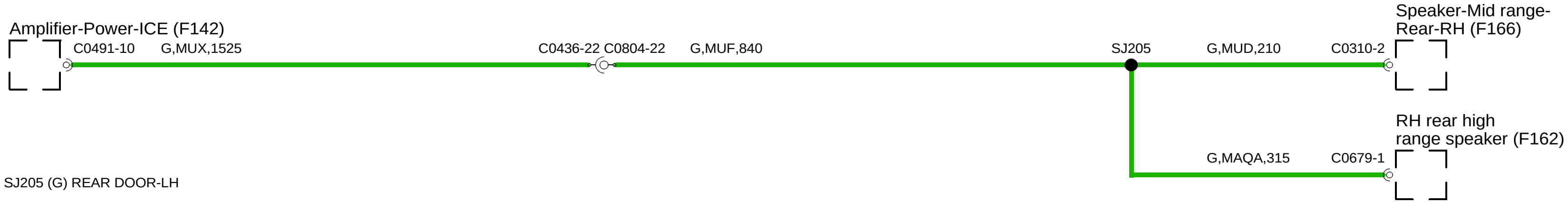
SJ204 (GW) REAR DOOR-RH


Amplifier-Power-ICE (F142)
C0491-2
GW,MUX,1525
C0436-23 C0804-23
GW,MUF,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-RH (F166)
GW,MAQA,360
C0679-3
RH rear high range speaker (F162)

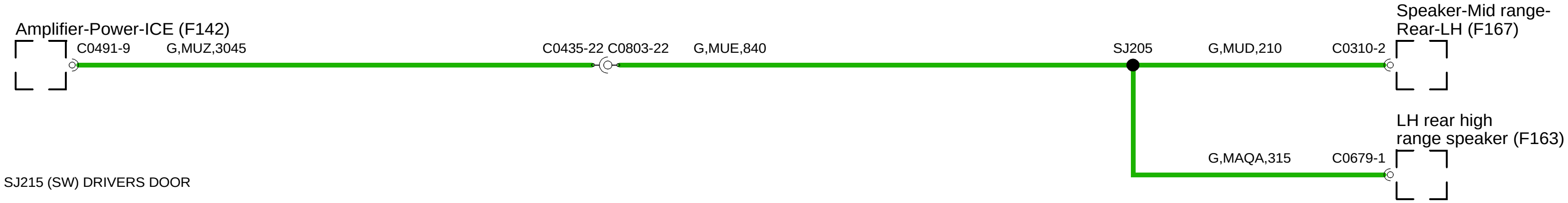
SJ204 (GW) REAR DOOR-LH


Amplifier-Power-ICE (F142)
C0491-1
GW,MUZ,3045
C0435-23 C0803-23
GW,MUE,795
SJ204
GW,MUD,165
C0310-1
Speaker-Mid range-Rear-LH (F167)
GW,MAQA,360
C0679-3
LH rear high range speaker (F163)

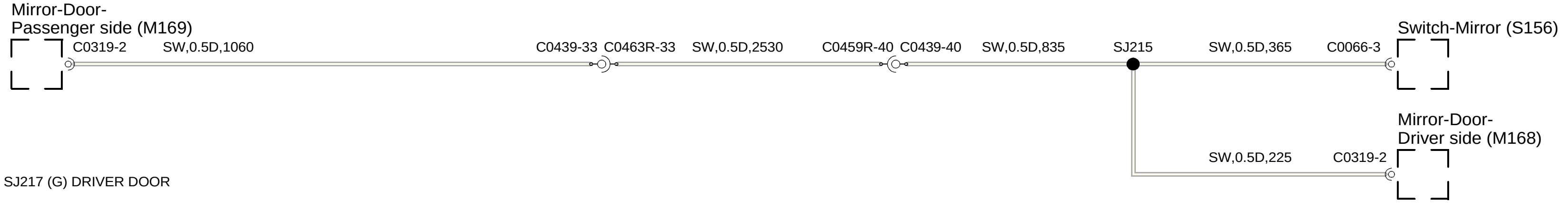
SJ205 (G) REAR DOOR-RH


Amplifier-Power-ICE (F142)
C0491-10
G,MUX,1525
C0436-22 C0804-22
G,MUF,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-RH (F166)
G,MAQA,315
C0679-1
RH rear high range speaker (F162)

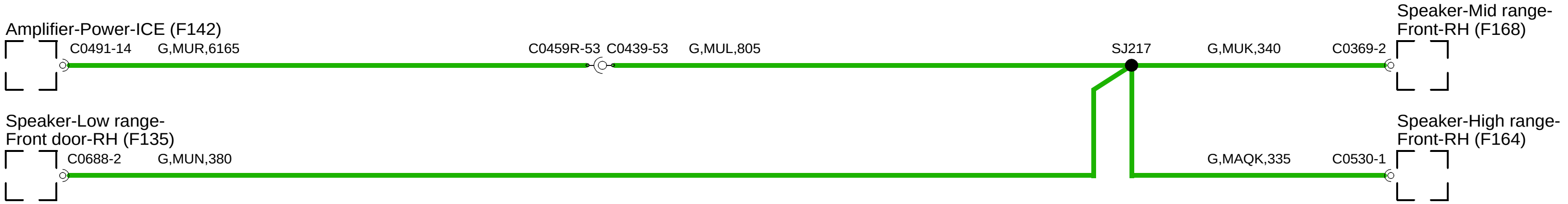
SJ205 (G) REAR DOOR-LH


Amplifier-Power-ICE (F142)
C0491-9
G,MUZ,3045
C0435-22 C0803-22
G,MUE,840
SJ205
G,MUD,210
C0310-2
Speaker-Mid range-Rear-LH (F167)
G,MAQA,315
C0679-1
LH rear high range speaker (F163)

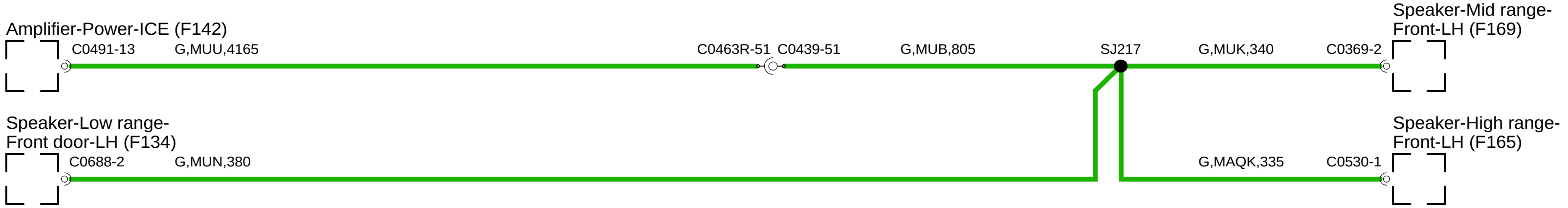
SJ215 (SW) DRIVERS DOOR


Mirror-Door-Passenger side (M169)
C0319-2
SW,0.5D,1060
C0439-33 C0463R-33
SW,0.5D,2530
C0459R-40 C0439-40
SW,0.5D,835
SJ215
SW,0.5D,365
C0066-3
Switch-Mirror (S156)
SW,0.5D,225
C0319-2
Mirror-Door-Driver side (M168)

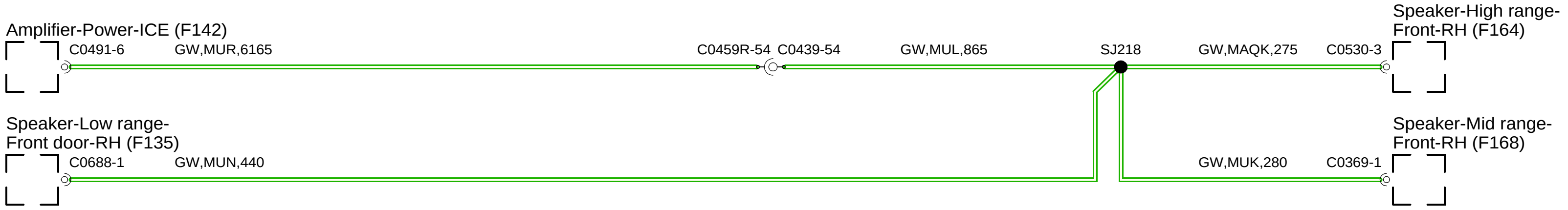
SJ217 (G) DRIVER DOOR


Amplifier-Power-ICE (F142)
C0491-14
G,MUR,6165
C0459R-53 C0439-53
G,MUL,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-Front-RH (F168)
Speaker-Low range-Front door-RH (F135)
C0688-2
G,MUN,380
G,MAQK,335
C0530-1
Speaker-High range-Front-RH (F164)

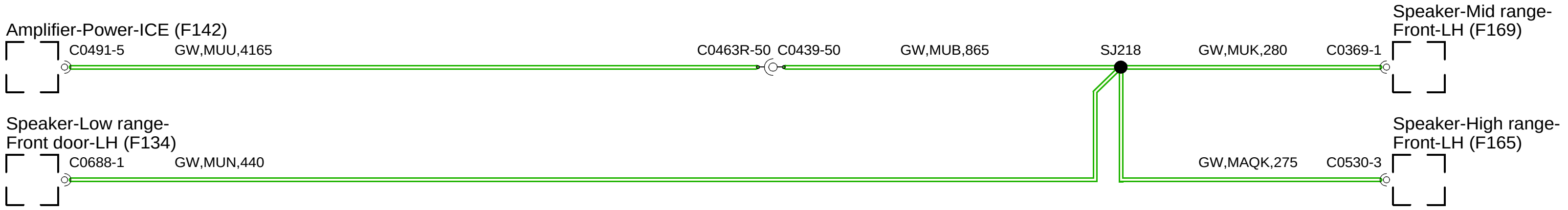
SJ217 (G) PASSENGER DOOR


Amplifier-Power-ICE (F142)
C0491-13
G,MUU,4165
C0463R-51
C0439-51
G,MUB,805
SJ217
G,MUK,340
C0369-2
Speaker-Mid range-Front-LH (F169)
Speaker-Low range-Front door-LH (F134)
C0688-2
G,MUN,380
G,MAQK,335
C0530-1
Speaker-High range-Front-LH (F165)

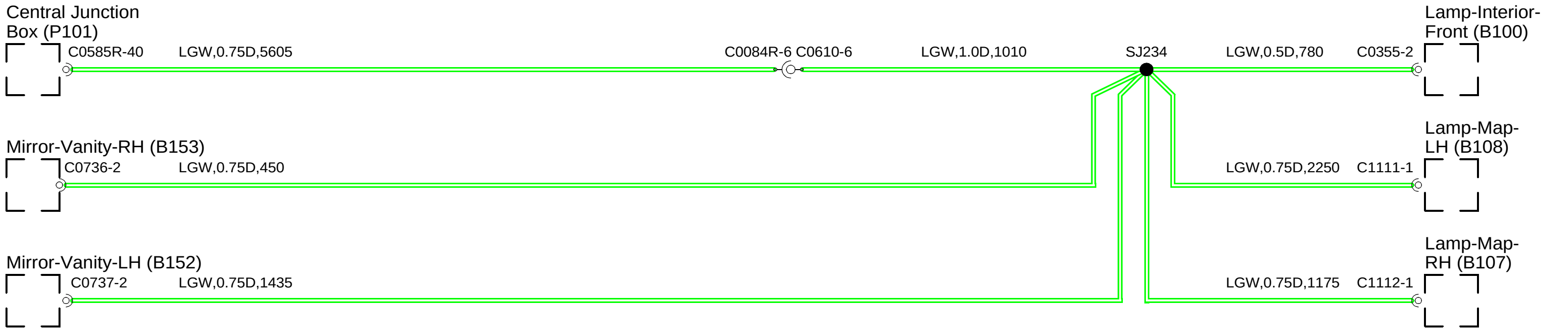
SJ218 (GW) DRIVER DOOR

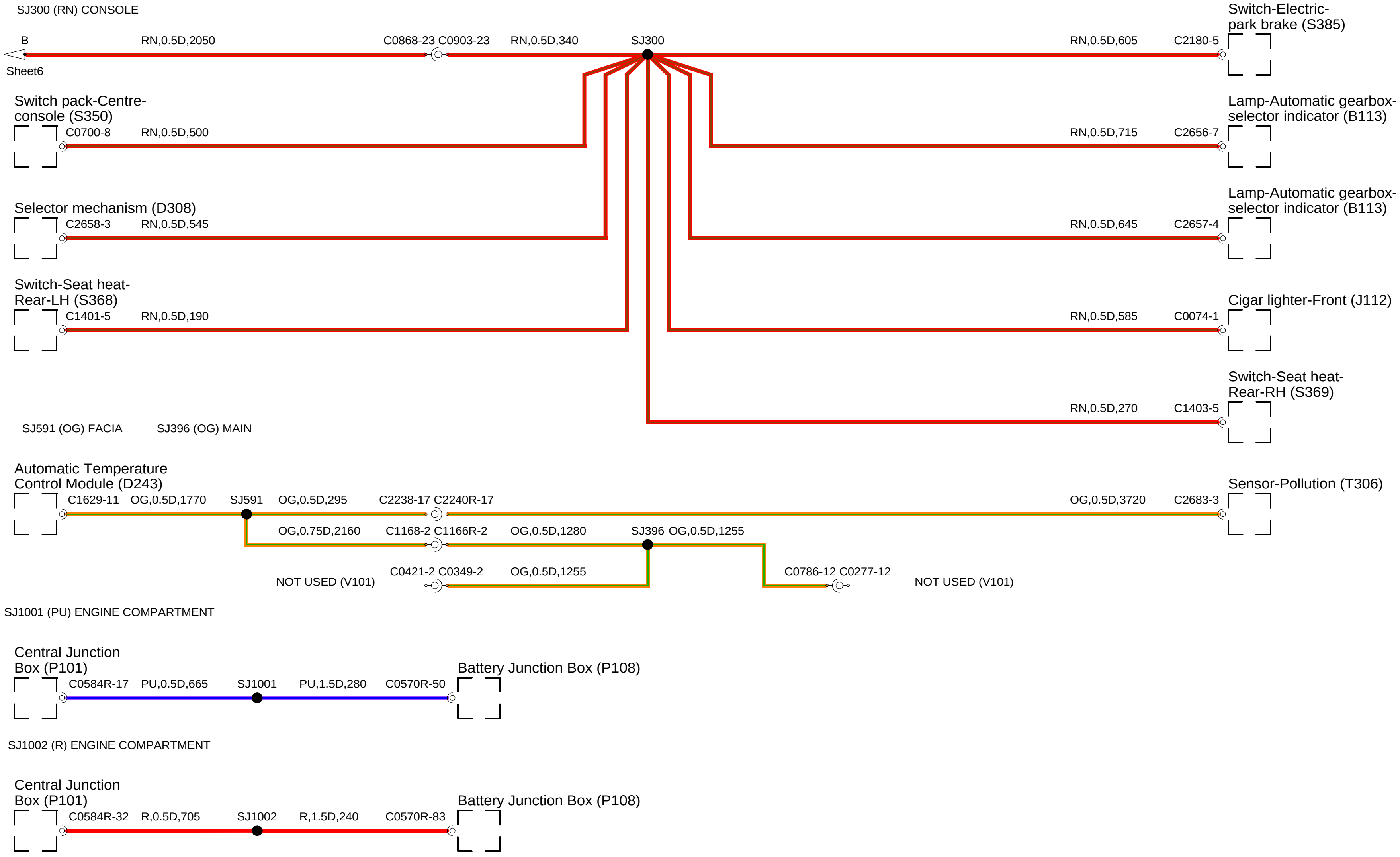

Amplifier-Power-ICE (F142)
C0491-6
GW,MUR,6165
C0459R-54
C0439-54
GW,MUL,865
SJ218
GW,MAQK,275
C0530-3
Speaker-High range-Front-RH (F164)
Speaker-Low range-Front door-RH (F135)
C0688-1
GW,MUN,440
GW,MUK,280
C0369-1
Speaker-Mid range-Front-RH (F168)

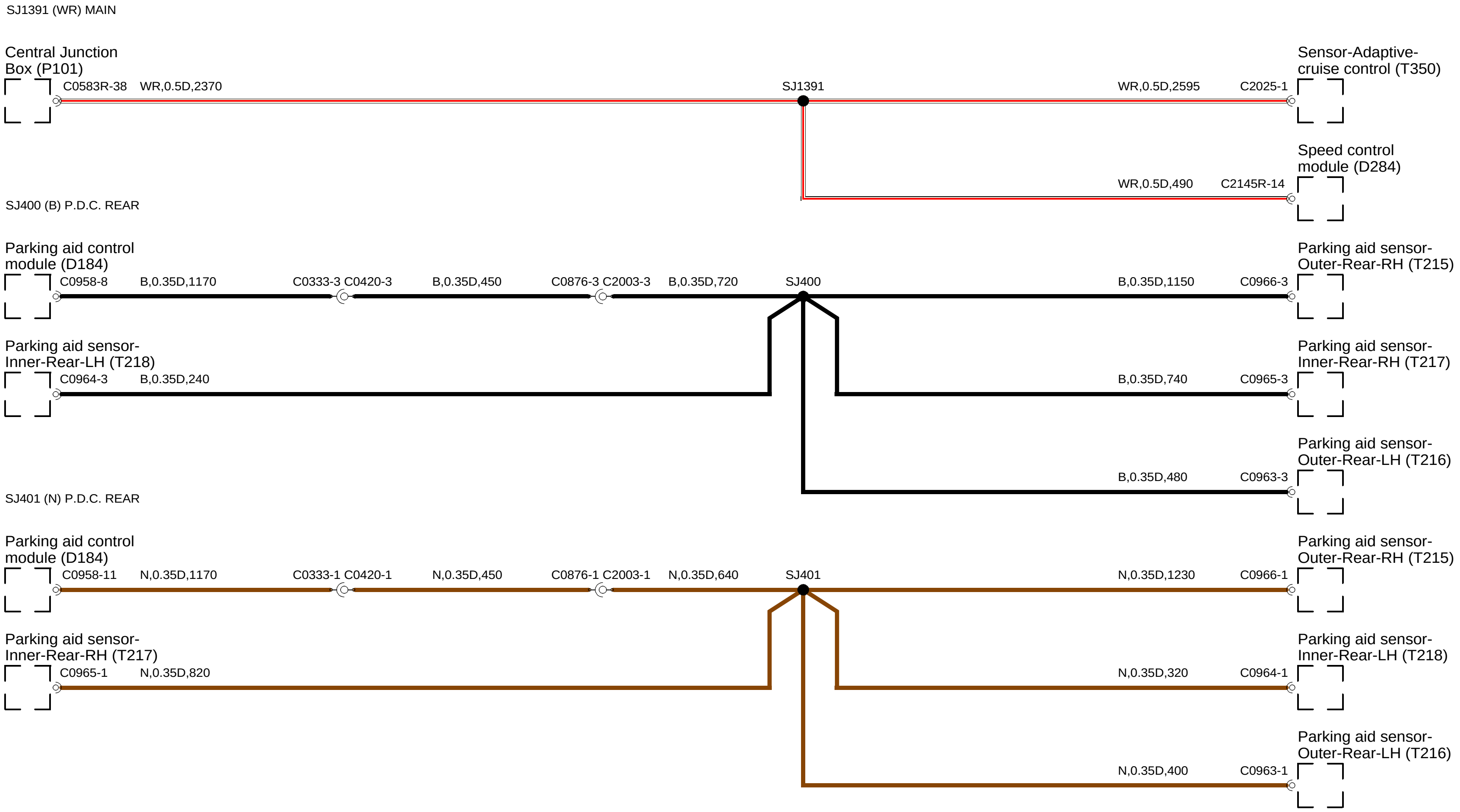
SJ218 (GW) PASSENGER DOOR


Amplifier-Power-ICE (F142)
C0491-5
GW,MUU,4165
C0463R-50
C0439-50
GW,MUB,865
SJ218
GW,MUK,280
C0369-1
Speaker-Mid range-Front-LH (F169)
Speaker-Low range-Front door-LH (F134)
C0688-1
GW,MUN,440
GW,MAQK,275
C0530-3
Speaker-High range-Front-LH (F165)

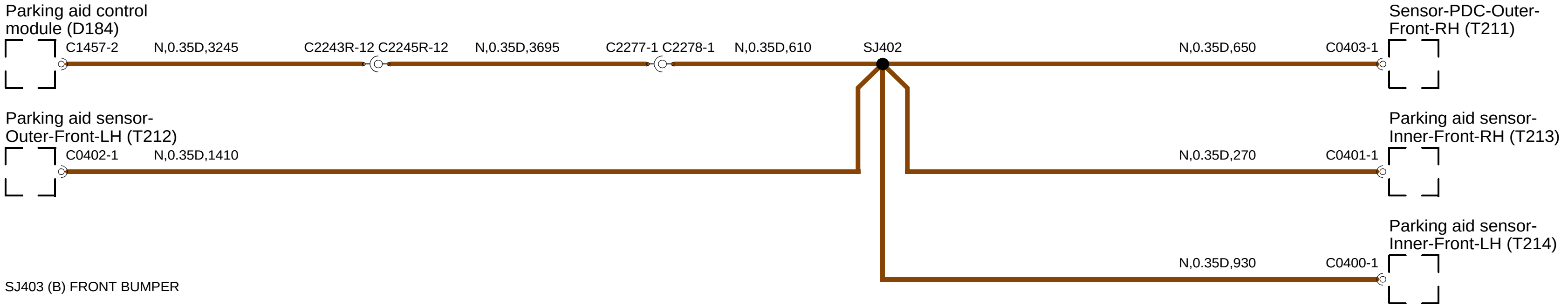
SJ234 (LGW) ROOF


Central Junction Box (P101)
C0585R-40
LGW,0.75D,5605
C0084R-6
C0610-6
LGW,1.0D,1010
SJ234
LGW,0.5D,780
C0355-2
Lamp-Interior-Front (B100)
Mirror-Vanity-RH (B153)
C0736-2
LGW,0.75D,450
LGW,0.75D,2250
C1111-1
Lamp-Map-LH (B108)
Mirror-Vanity-LH (B152)
C0737-2
LGW,0.75D,1435
LGW,0.75D,1175
C1112-1
Lamp-Map-RH (B107)

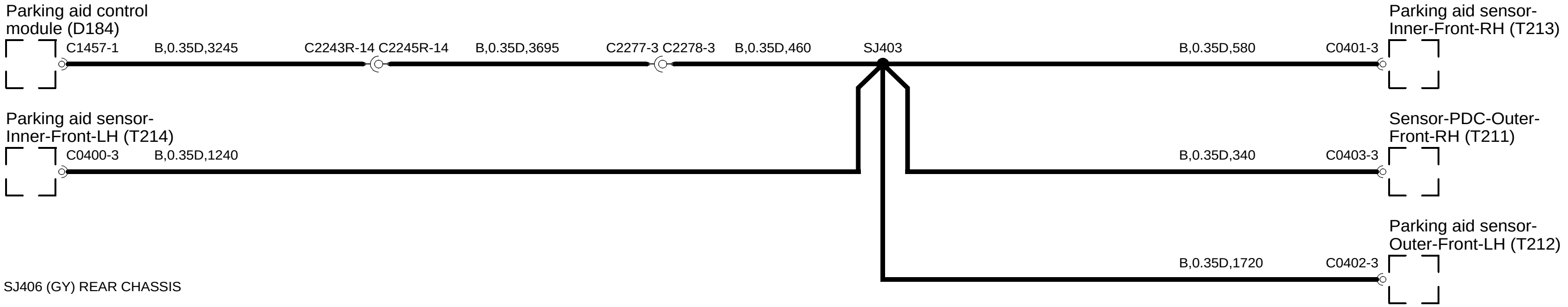

SJ300 (RN) CONSOLE
B
Sheet6
RN,0.5D,2050
C0868-23 C0903-23
RN,0.5D,340
SJ300
RN,0.5D,605
C2180-5
Switch-Electric-park brake (S385)
Switch pack-Centre-console (S350)
C0700-8
RN,0.5D,500
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D,715
C2656-7
Selector mechanism (D308)
C2658-3
RN,0.5D,545
Lamp-Automatic gearbox-selector indicator (B113)
RN,0.5D,645
C2657-4
Switch-Seat heat-Rear-LH (S368)
C1401-5
RN,0.5D,190
Cigar lighter-Front (J112)
RN,0.5D,585
C0074-1
Switch-Seat heat-Rear-RH (S369)
RN,0.5D,270
C1403-5
SJ591 (OG) FACIA
SJ396 (OG) MAIN
Automatic Temperature Control Module (D243)
C1629-11
OG,0.5D,1770
SJ591
OG,0.5D,295
C2238-17 C2240R-17
OG,0.5D,3720
C2683-3
Sensor-Pollution (T306)
OG,0.75D,2160
C1168-2 C1166R-2
OG,0.5D,1280
SJ396
OG,0.5D,1255
NOT USED (V101)
C0421-2 C0349-2
OG,0.5D,1255
C0786-12 C0277-12
NOT USED (V101)
SJ1001 (PU) ENGINE COMPARTMENT
Central Junction Box (P101)
C0584R-17
PU,0.5D,665
SJ1001
PU,1.5D,280
C0570R-50
Battery Junction Box (P108)
SJ1002 (R) ENGINE COMPARTMENT
Central Junction Box (P101)
C0584R-32
R,0.5D,705
SJ1002
R,1.5D,240
C0570R-83
Battery Junction Box (P108)


SJ1391 (WR) MAIN
Central Junction Box (P101)
C0583R-38
WR,0.5D,2370
SJ1391
WR,0.5D,2595
C2025-1
Sensor-Adaptive-cruise control (T350)
Speed control module (D284)
WR,0.5D,490
C2145R-14
SJ400 (B) P.D.C. REAR
Parking aid control module (D184)
C0958-8
B,0.35D,1170
C0333-3 C0420-3
B,0.35D,450
C0876-3 C2003-3
B,0.35D,720
SJ400
B,0.35D,1150
C0966-3
Parking aid sensor-Outer-Rear-RH (T215)
Parking aid sensor-Inner-Rear-LH (T218)
C0964-3
B,0.35D,240
Parking aid sensor-Inner-Rear-RH (T217)
B,0.35D,740
C0965-3
Parking aid sensor-Outer-Rear-LH (T216)
B,0.35D,480
C0963-3
SJ401 (N) P.D.C. REAR
Parking aid control module (D184)
C0958-11
N,0.35D,1170
C0333-1 C0420-1
N,0.35D,450
C0876-1 C2003-1
N,0.35D,640
SJ401
N,0.35D,1230
C0966-1
Parking aid sensor-Outer-Rear-RH (T215)
Parking aid sensor-Inner-Rear-RH (T217)
C0965-1
N,0.35D,820
Parking aid sensor-Inner-Rear-LH (T218)
N,0.35D,320
C0964-1
Parking aid sensor-Outer-Rear-LH (T216)
N,0.35D,400
C0963-1

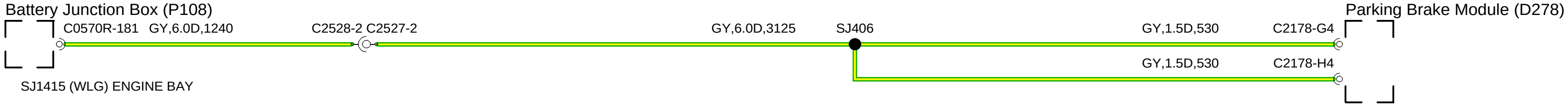
SJ402 (N) FRONT BUMPER


Parking aid control module (D184)
C1457-2
N,0.35D,3245
C2243R-12 C2245R-12
N,0.35D,3695
C2277-1 C2278-1
N,0.35D,610
SJ402
N,0.35D,650
C0403-1
Sensor-PDC-Outer-Front-RH (T211)
Parking aid sensor-Outer-Front-LH (T212)
C0402-1
N,0.35D,1410
N,0.35D,270
C0401-1
Parking aid sensor-Inner-Front-RH (T213)
N,0.35D,930
C0400-1
Parking aid sensor-Inner-Front-LH (T214)

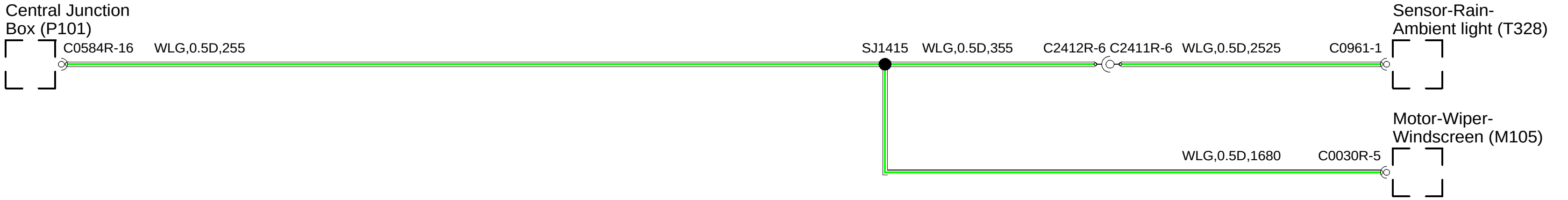
SJ403 (B) FRONT BUMPER


Parking aid control module (D184)
C1457-1
B,0.35D,3245
C2243R-14 C2245R-14
B,0.35D,3695
C2277-3 C2278-3
B,0.35D,460
SJ403
B,0.35D,580
C0401-3
Parking aid sensor-Inner-Front-RH (T213)
Parking aid sensor-Inner-Front-LH (T214)
C0400-3
B,0.35D,1240
B,0.35D,340
C0403-3
Sensor-PDC-Outer-Front-RH (T211)
B,0.35D,1720
C0402-3
Parking aid sensor-Outer-Front-LH (T212)

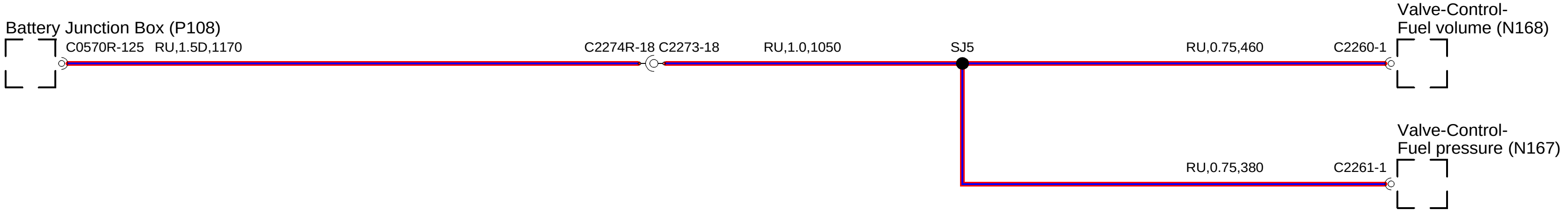
SJ406 (GY) REAR CHASSIS


Battery Junction Box (P108)
C0570R-181
GY,6.0D,1240
C2528-2 C2527-2
GY,6.0D,3125
SJ406
GY,1.5D,530
C2178-G4
Parking Brake Module (D278)
GY,1.5D,530
C2178-H4

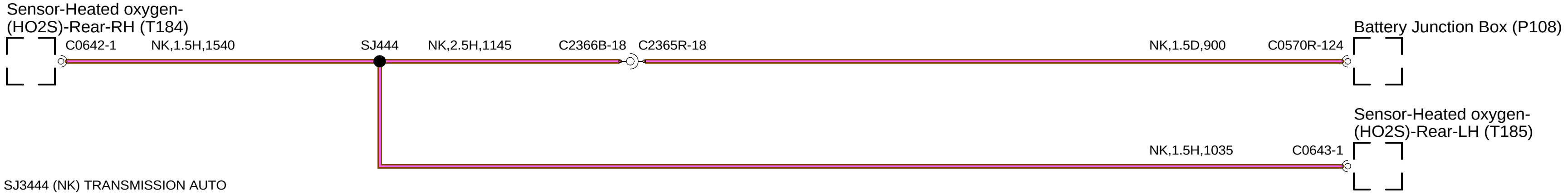
SJ1415 (WLG) ENGINE BAY


Central Junction Box (P101)
C0584R-16
WLG,0.5D,255
SJ1415
WLG,0.5D,355
C2412R-6 C2411R-6
WLG,0.5D,2525
C0961-1
Sensor-Rain-Ambient light (T328)
WLG,0.5D,1680
C0030R-5
Motor-Wiper-Windscreen (M105)

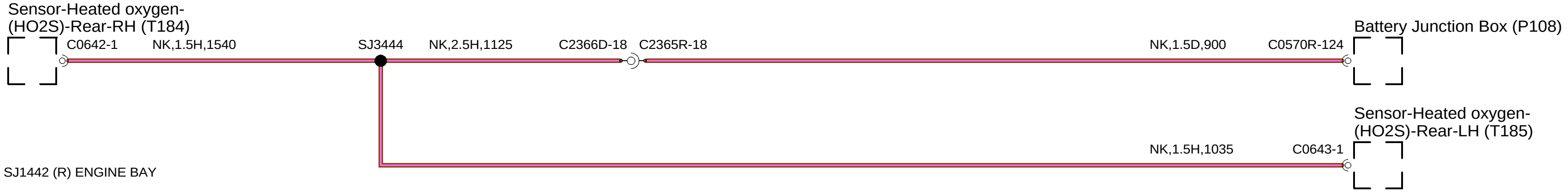
SJ5 (RU) DIESEL ENGINE


Battery Junction Box (P108)
C0570R-125
RU,1.5D,1170
C2274R-18
C2273-18
RU,1.0,1050
SJ5
RU,0.75,460
C2260-1
Valve-Control-
Fuel volume (N168)
RU,0.75,380
C2261-1
Valve-Control-
Fuel pressure (N167)

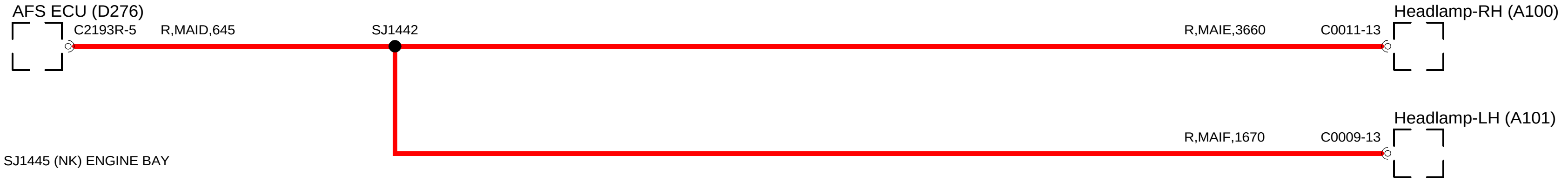
SJ444 (NK) TRANSMISSION AUTO


Sensor-Heated oxygen-
(HO2S)-Rear-RH (T184)
C0642-1
NK,1.5H,1540
SJ444
NK,2.5H,1145
C2366B-18
C2365R-18
NK,1.5D,900
C0570R-124
Battery Junction Box (P108)
NK,1.5H,1035
C0643-1
Sensor-Heated oxygen-
(HO2S)-Rear-LH (T185)

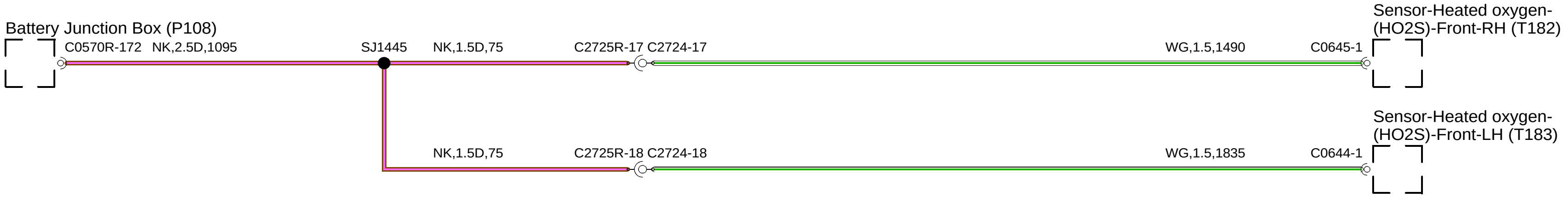
SJ3444 (NK) TRANSMISSION AUTO

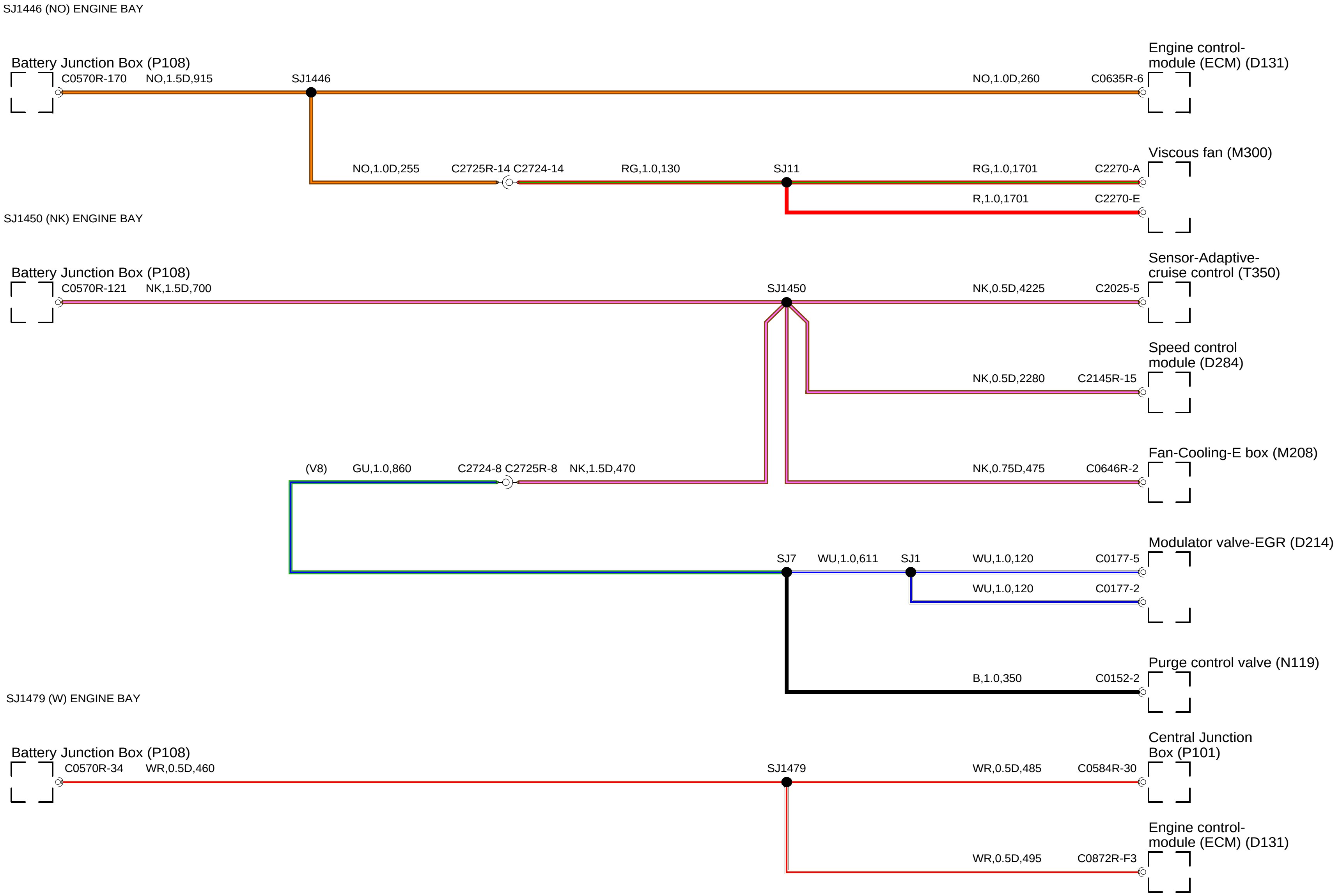

Sensor-Heated oxygen-
(HO2S)-Rear-RH (T184)
C0642-1
NK,1.5H,1540
SJ3444
NK,2.5H,1125
C2366D-18
C2365R-18
NK,1.5D,900
C0570R-124
Battery Junction Box (P108)
NK,1.5H,1035
C0643-1
Sensor-Heated oxygen-
(HO2S)-Rear-LH (T185)

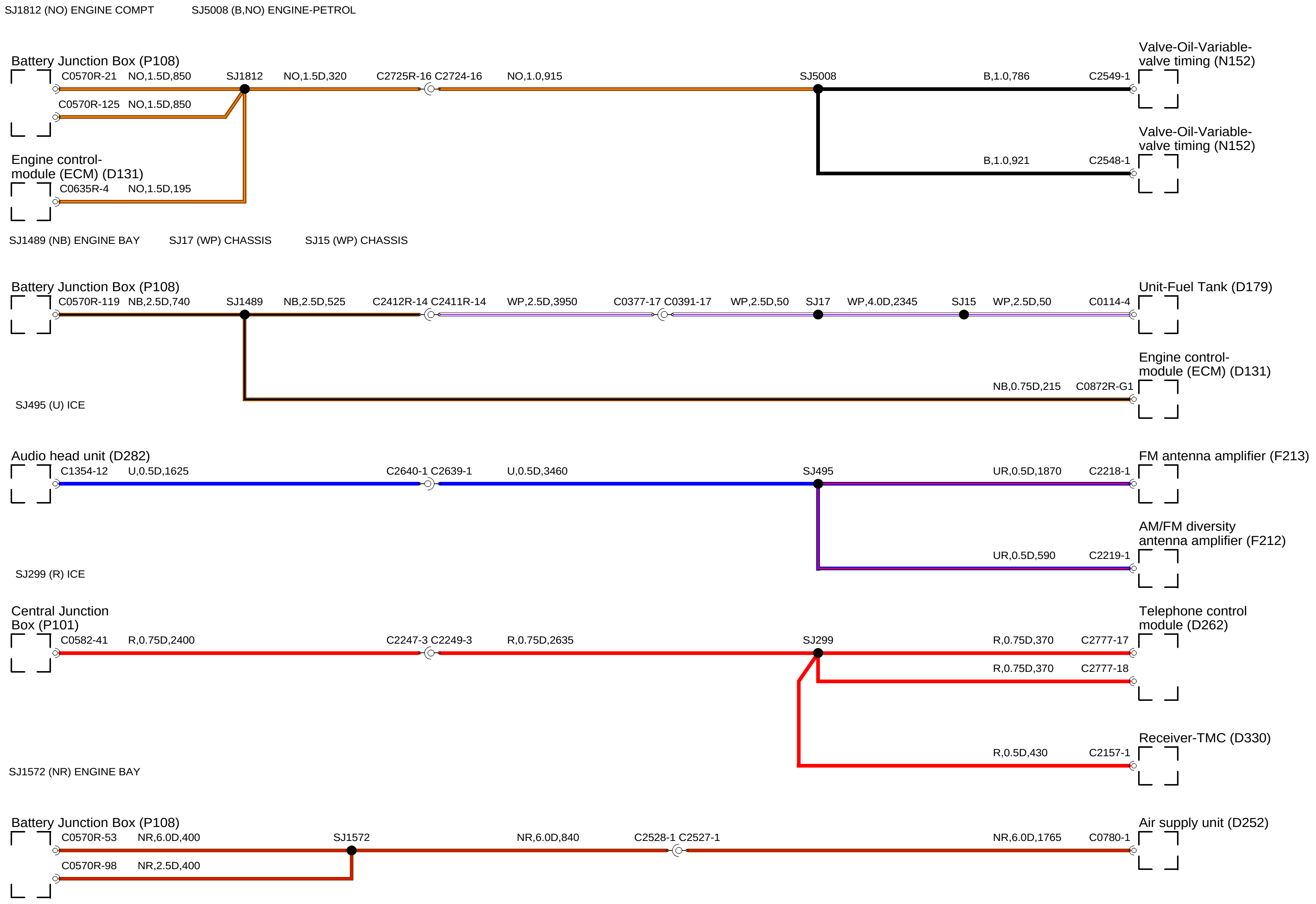
SJ1442 (R) ENGINE BAY

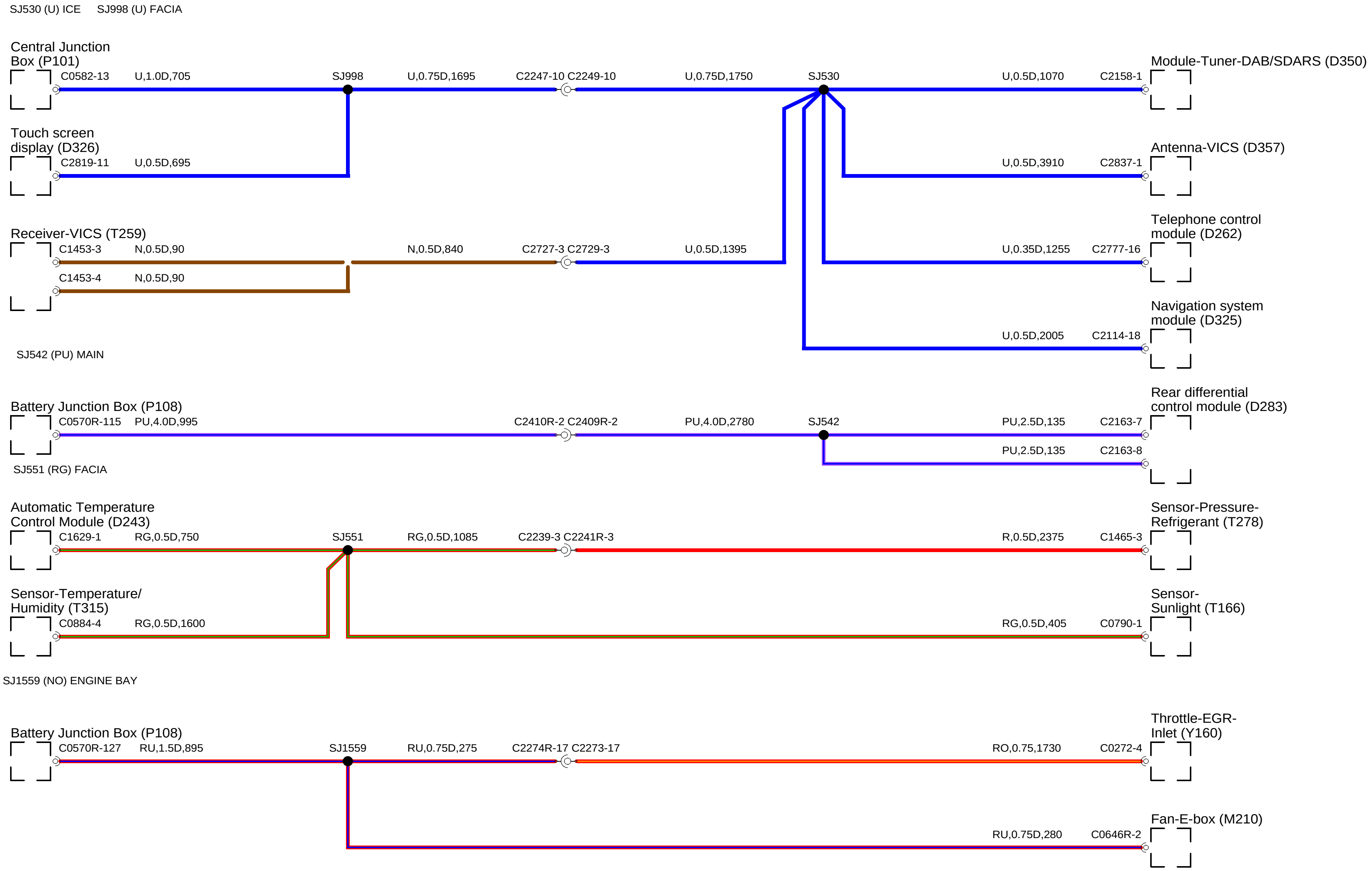

AFS ECU (D276)
C2193R-5
R,MAID,645
SJ1442
R,MAIE,3660
C0011-13
Headlamp-RH (A100)
R,MAIF,1670
C0009-13
Headlamp-LH (A101)

SJ1445 (NK) ENGINE BAY

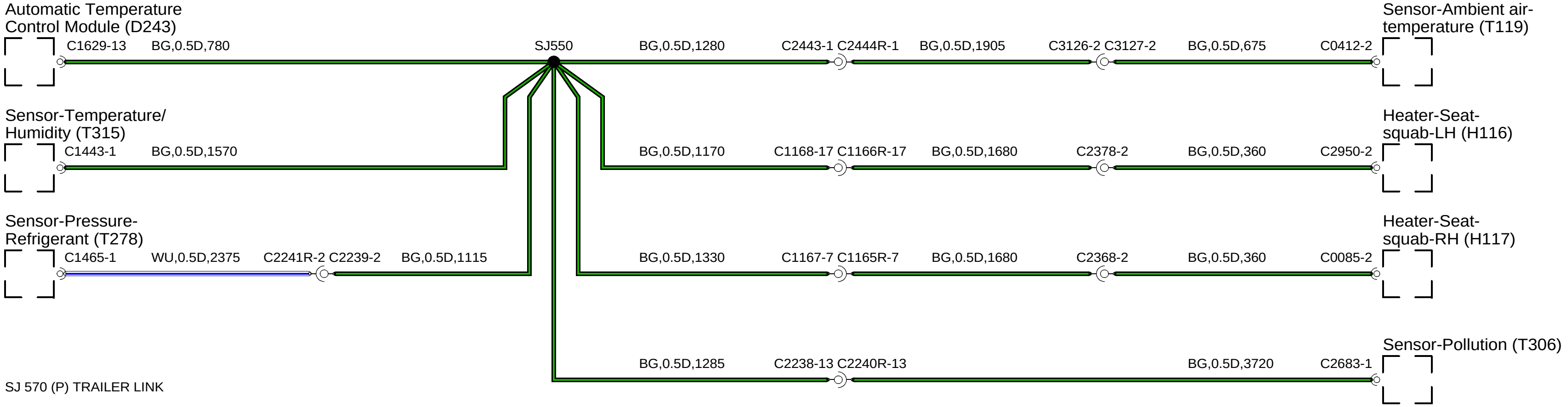

Battery Junction Box (P108)
C0570R-172
NK,2.5D,1095
SJ1445
NK,1.5D,75
C2725R-17
C2724-17
WG,1.5,1490
C0645-1
Sensor-Heated oxygen-
(HO2S)-Front-RH (T182)
NK,1.5D,75
C2725R-18
C2724-18
WG,1.5,1835
C0644-1
Sensor-Heated oxygen-
(HO2S)-Front-LH (T183)


SJ1446 (NO) ENGINE BAY
Battery Junction Box (P108)
C0570R-170
NO,1.5D,915
SJ1446
NO,1.0D,260
C0635R-6
Engine control-module (ECM) (D131)
NO,1.0D,255
C2725R-14 C2724-14
RG,1.0,130
SJ11
RG,1.0,1701
C2270-A
Viscous fan (M300)
R,1.0,1701
C2270-E
SJ1450 (NK) ENGINE BAY
Battery Junction Box (P108)
C0570R-121
NK,1.5D,700
SJ1450
NK,0.5D,4225
C2025-5
Sensor-Adaptive-cruise control (T350)
NK,0.5D,2280
C2145R-15
Speed control module (D284)
(V8)
GU,1.0,860
C2724-8 C2725R-8
NK,1.5D,470
NK,0.75D,475
C0646R-2
Fan-Cooling-E box (M208)
SJ7
WU,1.0,611
SJ1
WU,1.0,120
C0177-5
Modulator valve-EGR (D214)
WU,1.0,120
C0177-2
B,1.0,350
C0152-2
Purge control valve (N119)
SJ1479 (W) ENGINE BAY
Battery Junction Box (P108)
C0570R-34
WR,0.5D,460
SJ1479
WR,0.5D,485
C0584R-30
Central Junction Box (P101)
WR,0.5D,495
C0872R-F3
Engine control-module (ECM) (D131)

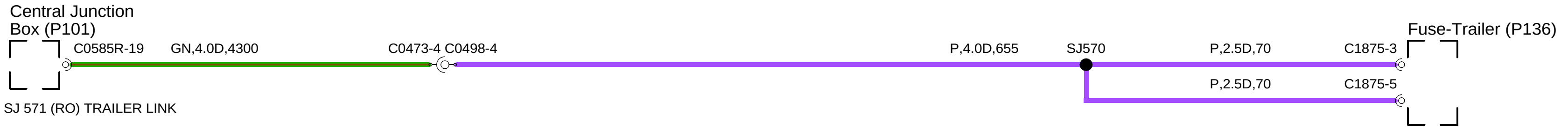

SJ1812 (NO) ENGINE COMPT
SJ5008 (B,NO) ENGINE-PETROL
Battery Junction Box (P108)
C0570R-21
NO,1.5D,850
SJ1812
NO,1.5D,320
C2725R-16 C2724-16
NO,1.0,915
SJ5008
B,1.0,786
C2549-1
Valve-Oil-Variable-valve timing (N152)
C0570R-125
NO,1.5D,850
Valve-Oil-Variable-valve timing (N152)
B,1.0,921
C2548-1
Engine control-module (ECM) (D131)
C0635R-4
NO,1.5D,195
SJ1489 (NB) ENGINE BAY
SJ17 (WP) CHASSIS
SJ15 (WP) CHASSIS
Battery Junction Box (P108)
C0570R-119
NB,2.5D,740
SJ1489
NB,2.5D,525
C2412R-14 C2411R-14
WP,2.5D,3950
C0377-17 C0391-17
WP,2.5D,50
SJ17
WP,4.0D,2345
SJ15
WP,2.5D,50
C0114-4
Unit-Fuel Tank (D179)
Engine control-module (ECM) (D131)
NB,0.75D,215
C0872R-G1
SJ495 (U) ICE
Audio head unit (D282)
C1354-12
U,0.5D,1625
C2640-1 C2639-1
U,0.5D,3460
SJ495
UR,0.5D,1870
C2218-1
FM antenna amplifier (F213)
AM/FM diversity antenna amplifier (F212)
UR,0.5D,590
C2219-1
SJ299 (R) ICE
Central Junction Box (P101)
C0582-41
R,0.75D,2400
C2247-3 C2249-3
R,0.75D,2635
SJ299
R,0.75D,370
C2777-17
Telephone control module (D262)
R,0.75D,370
C2777-18
Receiver-TMC (D330)
R,0.5D,430
C2157-1
SJ1572 (NR) ENGINE BAY
Battery Junction Box (P108)
C0570R-53
NR,6.0D,400
SJ1572
NR,6.0D,840
C2528-1 C2527-1
NR,6.0D,1765
C0780-1
Air supply unit (D252)
C0570R-98
NR,2.5D,400


SJ530 (U) ICE
SJ998 (U) FACIA
Central Junction Box (P101)
C0582-13
U,1.0D,705
SJ998
U,0.75D,1695
C2247-10 C2249-10
U,0.75D,1750
SJ530
U,0.5D,1070
C2158-1
Module-Tuner-DAB/SDARS (D350)
Touch screen display (D326)
C2819-11
U,0.5D,695
U,0.5D,3910
C2837-1
Antenna-VICS (D357)
Receiver-VICS (T259)
C1453-3
N,0.5D,90
N,0.5D,840
C2727-3 C2729-3
U,0.5D,1395
U,0.35D,1255
C2777-16
Telephone control module (D262)
C1453-4
N,0.5D,90
Navigation system module (D325)
U,0.5D,2005
C2114-18
SJ542 (PU) MAIN
Battery Junction Box (P108)
C0570R-115
PU,4.0D,995
C2410R-2 C2409R-2
PU,4.0D,2780
SJ542
PU,2.5D,135
C2163-7
Rear differential control module (D283)
PU,2.5D,135
C2163-8
SJ551 (RG) FACIA
Automatic Temperature Control Module (D243)
C1629-1
RG,0.5D,750
SJ551
RG,0.5D,1085
C2239-3 C2241R-3
R,0.5D,2375
C1465-3
Sensor-Pressure-Refrigerant (T278)
Sensor-Temperature/ Humidity (T315)
C0884-4
RG,0.5D,1600
RG,0.5D,405
C0790-1
Sensor-Sunlight (T166)
SJ1559 (NO) ENGINE BAY
Battery Junction Box (P108)
C0570R-127
RU,1.5D,895
SJ1559
RU,0.75D,275
C2274R-17 C2273-17
RO,0.75,1730
C0272-4
Throttle-EGR-Inlet (Y160)
RU,0.75D,280
C0646R-2
Fan-E-box (M210)

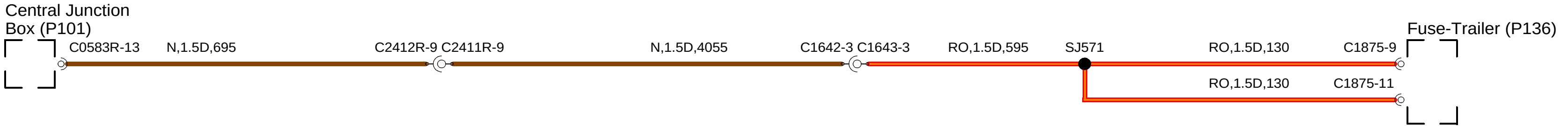
SJ550 (BG) FACIA


Automatic Temperature Control Module (D243)
C1629-13
BG,0.5D,780
SJ550
BG,0.5D,1280
C2443-1 C2444R-1
BG,0.5D,1905
C3126-2 C3127-2
BG,0.5D,675
C0412-2
Sensor-Ambient air-temperature (T119)
Sensor-Temperature/ Humidity (T315)
C1443-1
BG,0.5D,1570
BG,0.5D,1170
C1168-17 C1166R-17
BG,0.5D,1680
C2378-2
BG,0.5D,360
C2950-2
Heater-Seat-squab-LH (H116)
Sensor-Pressure-Refrigerant (T278)
C1465-1
WU,0.5D,2375
C2241R-2 C2239-2
BG,0.5D,1115
BG,0.5D,1330
C1167-7 C1165R-7
BG,0.5D,1680
C2368-2
BG,0.5D,360
C0085-2
Heater-Seat-squab-RH (H117)
BG,0.5D,1285
C2238-13 C2240R-13
BG,0.5D,3720
C2683-1
Sensor-Pollution (T306)

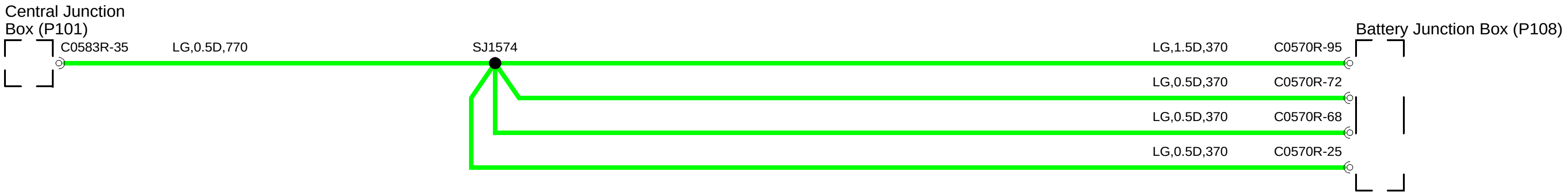
SJ 570 (P) TRAILER LINK


Central Junction Box (P101)
C0585R-19
GN,4.0D,4300
C0473-4 C0498-4
P,4.0D,655
SJ570
P,2.5D,70
C1875-3
Fuse-Trailer (P136)
P,2.5D,70
C1875-5

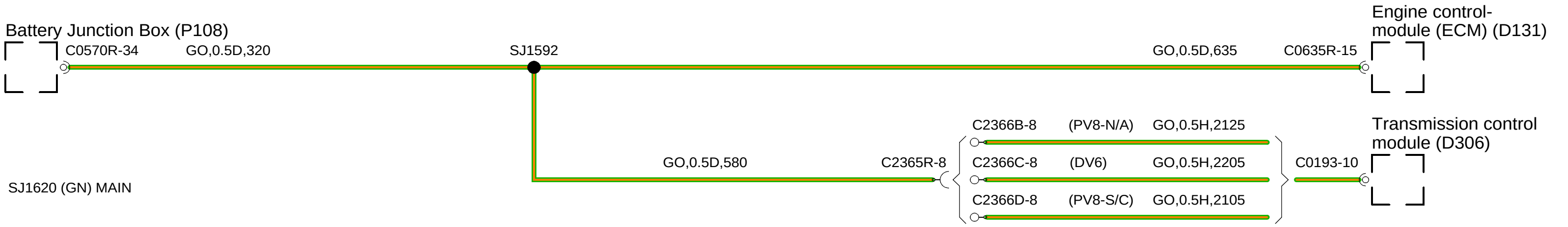
SJ 571 (RO) TRAILER LINK


Central Junction Box (P101)
C0583R-13
N,1.5D,695
C2412R-9 C2411R-9
N,1.5D,4055
C1642-3 C1643-3
RO,1.5D,595
SJ571
RO,1.5D,130
C1875-9
Fuse-Trailer (P136)
RO,1.5D,130
C1875-11

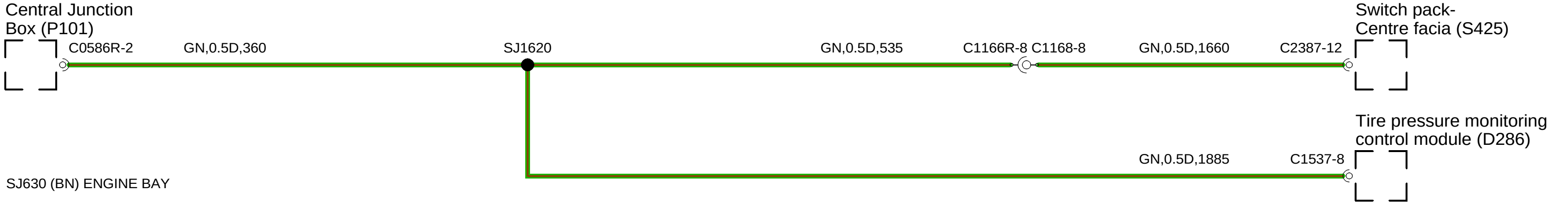
SJ1574 (LG) ENGINE BAY


Central Junction Box (P101)
C0583R-35
LG,0.5D,770
SJ1574
LG,1.5D,370
C0570R-95
Battery Junction Box (P108)
LG,0.5D,370
C0570R-72
LG,0.5D,370
C0570R-68
LG,0.5D,370
C0570R-25

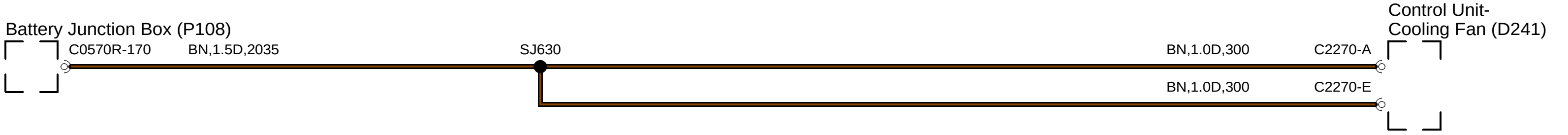
SJ1592 (GO) ENGINE BAY


Battery Junction Box (P108)
C0570R-34
GO,0.5D,320
SJ1592
GO,0.5D,635
C0635R-15
Engine control-module (ECM) (D131)
GO,0.5D,580
C2365R-8
C2366B-8
(PV8-N/A)
GO,0.5H,2125
C2366C-8
(DV6)
GO,0.5H,2205
C2366D-8
(PV8-S/C)
GO,0.5H,2105
C0193-10
Transmission control module (D306)

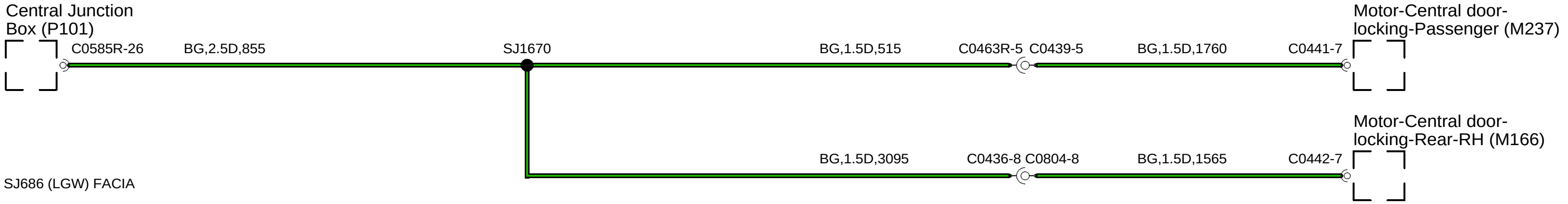
SJ1620 (GN) MAIN


Central Junction Box (P101)
C0586R-2
GN,0.5D,360
SJ1620
GN,0.5D,535
C1166R-8 C1168-8
GN,0.5D,1660
C2387-12
Switch pack-Centre facia (S425)
Tire pressure monitoring control module (D286)
GN,0.5D,1885
C1537-8

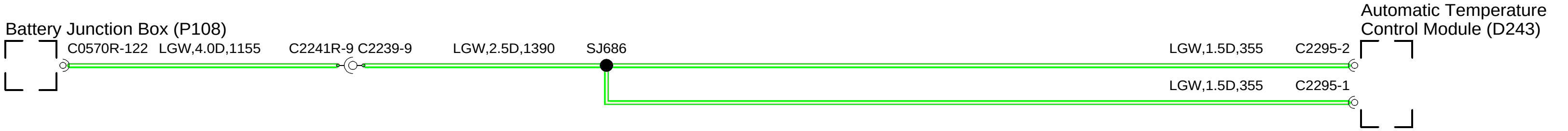
SJ630 (BN) ENGINE BAY

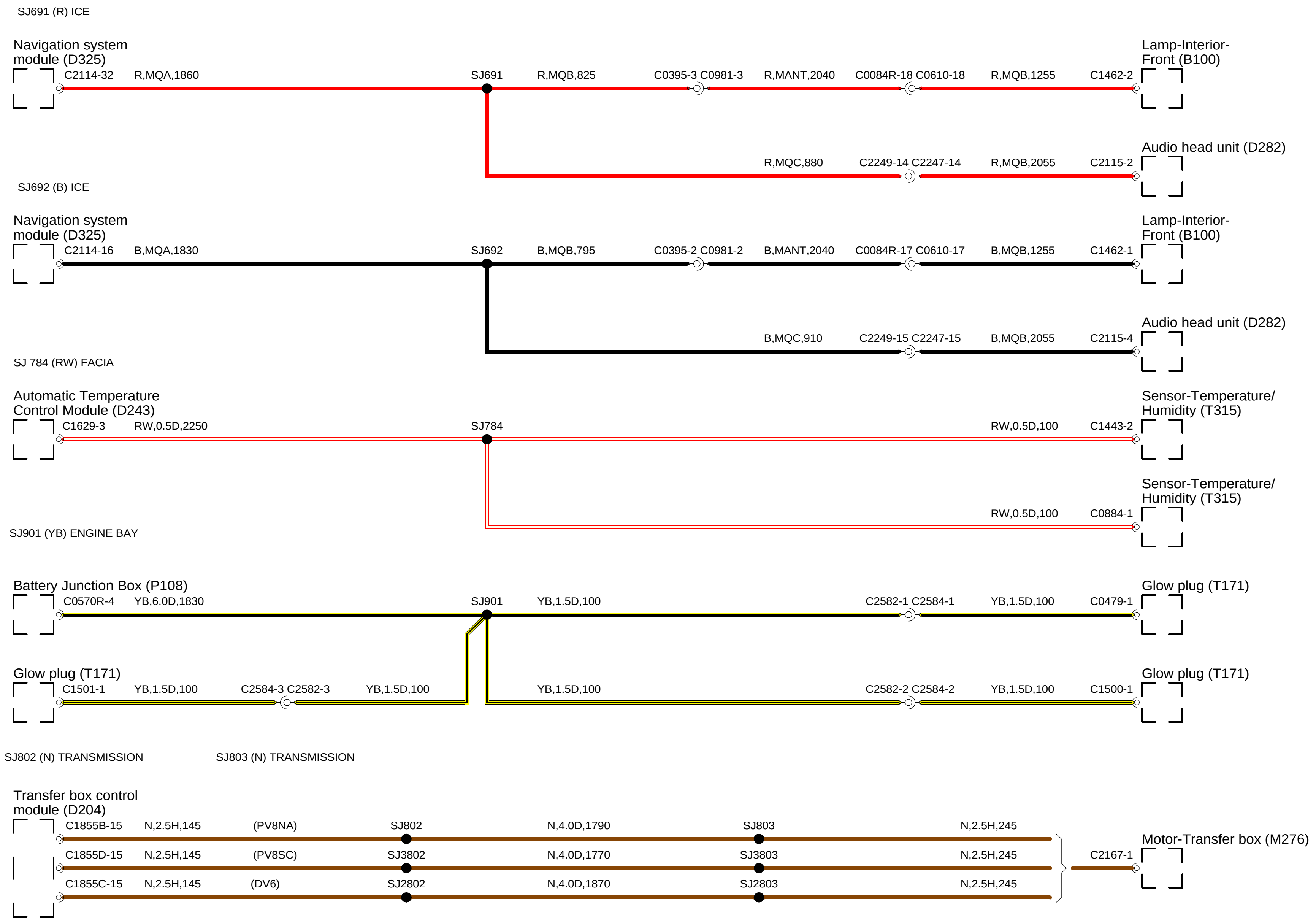

Battery Junction Box (P108)
C0570R-170
BN,1.5D,2035
SJ630
BN,1.0D,300
C2270-A
Control Unit-Cooling Fan (D241)
BN,1.0D,300
C2270-E

SJ1670 (KP) MAIN

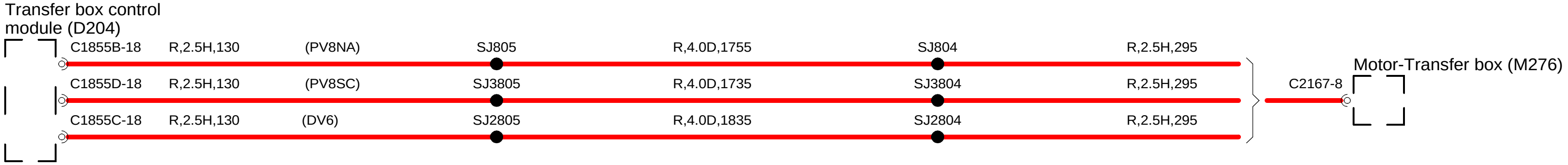

Central Junction Box (P101)
C0585R-26
BG,2.5D,855
SJ1670
BG,1.5D,515
C0463R-5 C0439-5
BG,1.5D,1760
C0441-7
Motor-Central door-locking-Passenger (M237)
Motor-Central door-locking-Rear-RH (M166)
BG,1.5D,3095
C0436-8 C0804-8
BG,1.5D,1565
C0442-7

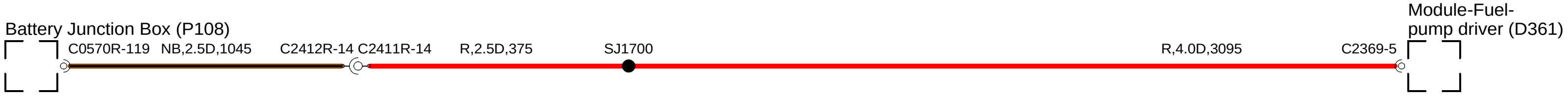
SJ686 (LGW) FACIA


Battery Junction Box (P108)
C0570R-122
LGW,4.0D,1155
C2241R-9 C2239-9
LGW,2.5D,1390
SJ686
LGW,1.5D,355
C2295-2
Automatic Temperature Control Module (D243)
LGW,1.5D,355
C2295-1

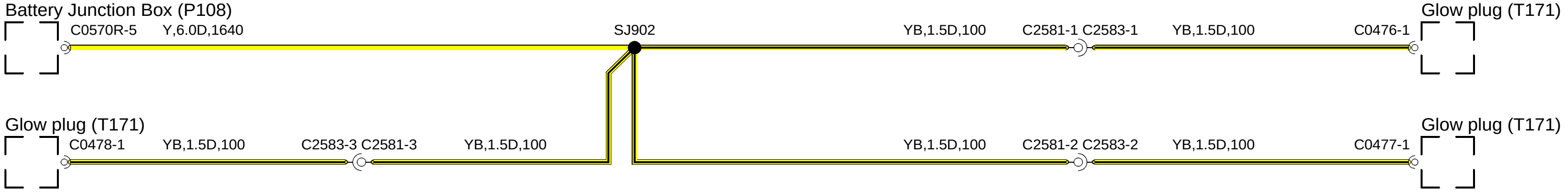

SJ691 (R) ICE
Navigation system module (D325)
C2114-32
R,MQA,1860
SJ691
R,MQB,825
C0395-3 C0981-3
R,MANT,2040
C0084R-18 C0610-18
R,MQB,1255
C1462-2
Lamp-Interior-Front (B100)
R,MQC,880
C2249-14 C2247-14
R,MQB,2055
C2115-2
Audio head unit (D282)
SJ692 (B) ICE
Navigation system module (D325)
C2114-16
B,MQA,1830
SJ692
B,MQB,795
C0395-2 C0981-2
B,MANT,2040
C0084R-17 C0610-17
B,MQB,1255
C1462-1
Lamp-Interior-Front (B100)
B,MQC,910
C2249-15 C2247-15
B,MQB,2055
C2115-4
Audio head unit (D282)
SJ 784 (RW) FACIA
Automatic Temperature Control Module (D243)
C1629-3
RW,0.5D,2250
SJ784
RW,0.5D,100
C1443-2
Sensor-Temperature/ Humidity (T315)
RW,0.5D,100
C0884-1
Sensor-Temperature/ Humidity (T315)
SJ901 (YB) ENGINE BAY
Battery Junction Box (P108)
C0570R-4
YB,6.0D,1830
SJ901
YB,1.5D,100
C2582-1 C2584-1
YB,1.5D,100
C0479-1
Glow plug (T171)
Glow plug (T171)
C1501-1
YB,1.5D,100
C2584-3 C2582-3
YB,1.5D,100
YB,1.5D,100
C2582-2 C2584-2
YB,1.5D,100
C1500-1
Glow plug (T171)
SJ802 (N) TRANSMISSION
SJ803 (N) TRANSMISSION
Transfer box control module (D204)
C1855B-15
N,2.5H,145
(PV8NA)
SJ802
N,4.0D,1790
SJ803
N,2.5H,245
C1855D-15
N,2.5H,145
(PV8SC)
SJ3802
N,4.0D,1770
SJ3803
N,2.5H,245
C1855C-15
N,2.5H,145
(DV6)
SJ2802
N,4.0D,1870
SJ2803
N,2.5H,245
Motor-Transfer box (M276)
C2167-1

SJ805 (R) TRANSMISSION SJ804 (R) TRANSMISSION

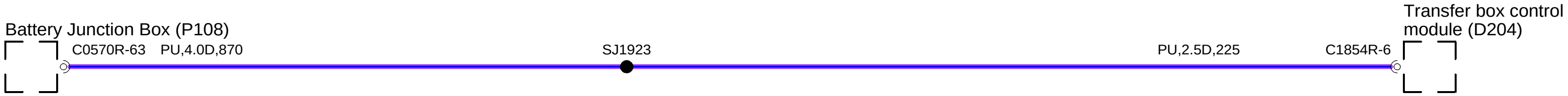

Transfer box control module (D204)
C1855B-18
R,2.5H,130
(PV8NA)
SJ805
R,4.0D,1755
SJ804
R,2.5H,295
C1855D-18
R,2.5H,130
(PV8SC)
SJ3805
R,4.0D,1735
SJ3804
R,2.5H,295
C1855C-18
R,2.5H,130
(DV6)
SJ2805
R,4.0D,1835
SJ2804
R,2.5H,295
Motor-Transfer box (M276)
C2167-8


Battery Junction Box (P108)
C0570R-119
NB,2.5D,1045
C2412R-14 C2411R-14
R,2.5D,375
SJ1700
R,4.0D,3095
C2369-5
Module-Fuel-pump driver (D361)

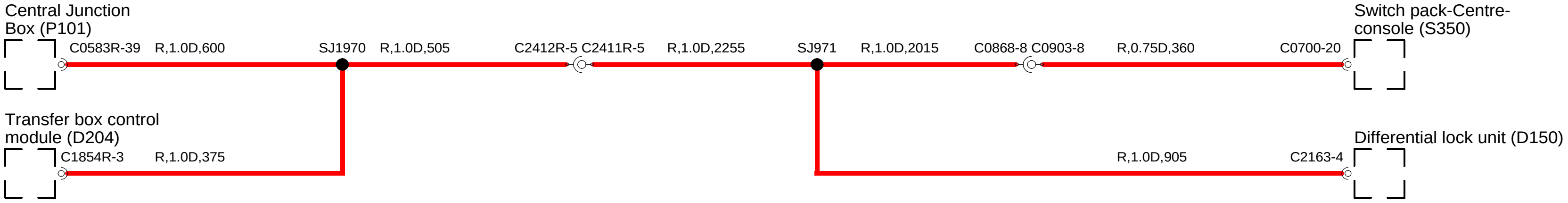
SJ902 (YB) ENGINE BAY


Battery Junction Box (P108)
C0570R-5
Y,6.0D,1640
SJ902
YB,1.5D,100
C2581-1 C2583-1
YB,1.5D,100
C0476-1
Glow plug (T171)
Glow plug (T171)
C0478-1
YB,1.5D,100
C2583-3 C2581-3
YB,1.5D,100
YB,1.5D,100
C2581-2 C2583-2
YB,1.5D,100
C0477-1
Glow plug (T171)

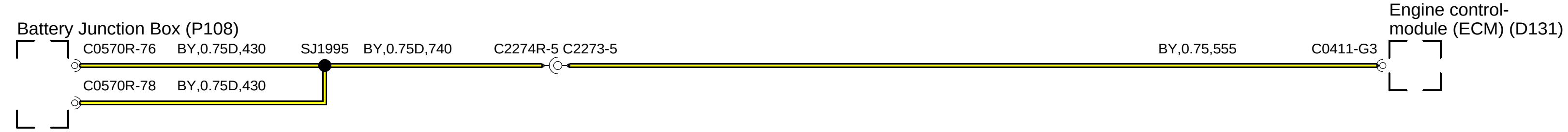
SJ1923 (PU) ENGINE BAY


Battery Junction Box (P108)
C0570R-63
PU,4.0D,870
SJ1923
PU,2.5D,225
C1854R-6
Transfer box control module (D204)

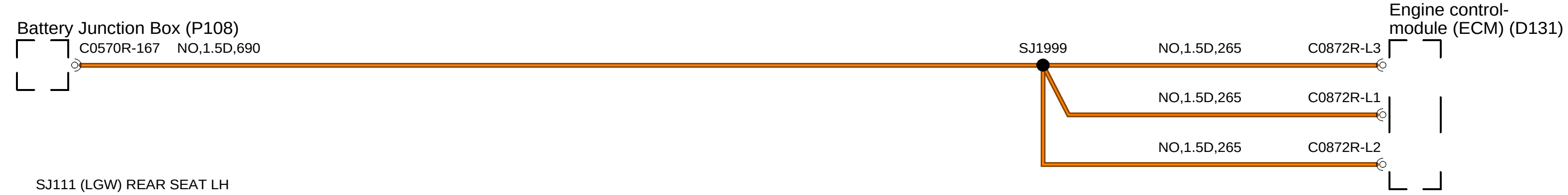
SJ1970 (R) ENGINE BAY SJ971 (R) MAIN


Central Junction Box (P101)
C0583R-39
R,1.0D,600
SJ1970
R,1.0D,505
C2412R-5 C2411R-5
R,1.0D,2255
SJ971
R,1.0D,2015
C0868-8 C0903-8
R,0.75D,360
C0700-20
Switch pack-Centre-console (S350)
Transfer box control module (D204)
C1854R-3
R,1.0D,375
R,1.0D,905
C2163-4
Differential lock unit (D150)

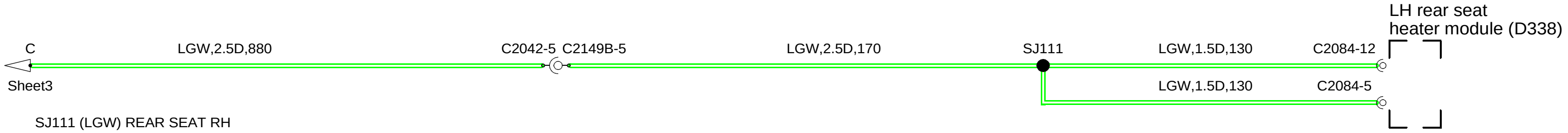
SJ1995 (R) ENGINE BAY


Battery Junction Box (P108)
C0570R-76
BY,0.75D,430
SJ1995
BY,0.75D,740
C2274R-5 C2273-5
BY,0.75,555
C0411-G3
Engine control-module (ECM) (D131)
C0570R-78
BY,0.75D,430

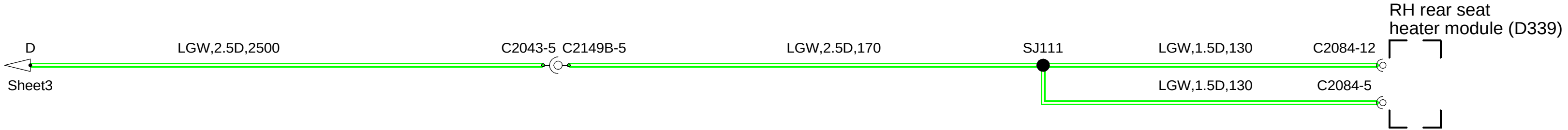
SJ1999 (NO) ENGINE BAY


Battery Junction Box (P108)
C0570R-167
NO,1.5D,690
SJ1999
NO,1.5D,265
C0872R-L3
Engine control-module (ECM) (D131)
NO,1.5D,265
C0872R-L1
NO,1.5D,265
C0872R-L2

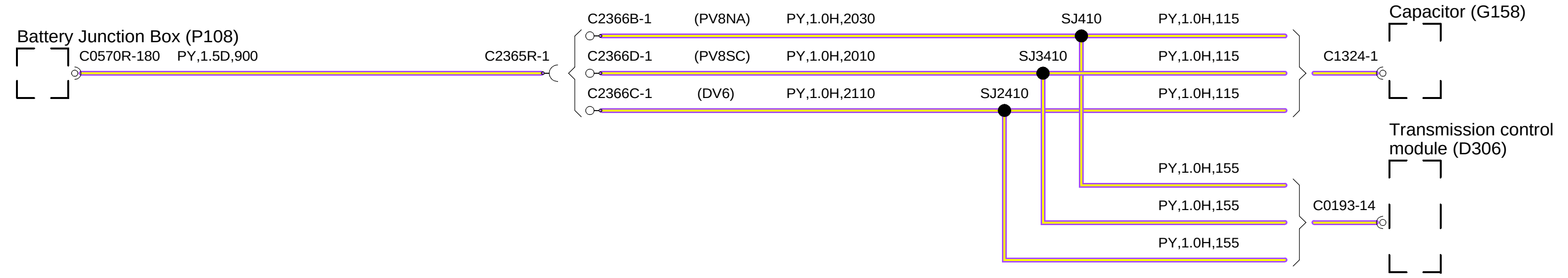
SJ111 (LGW) REAR SEAT LH

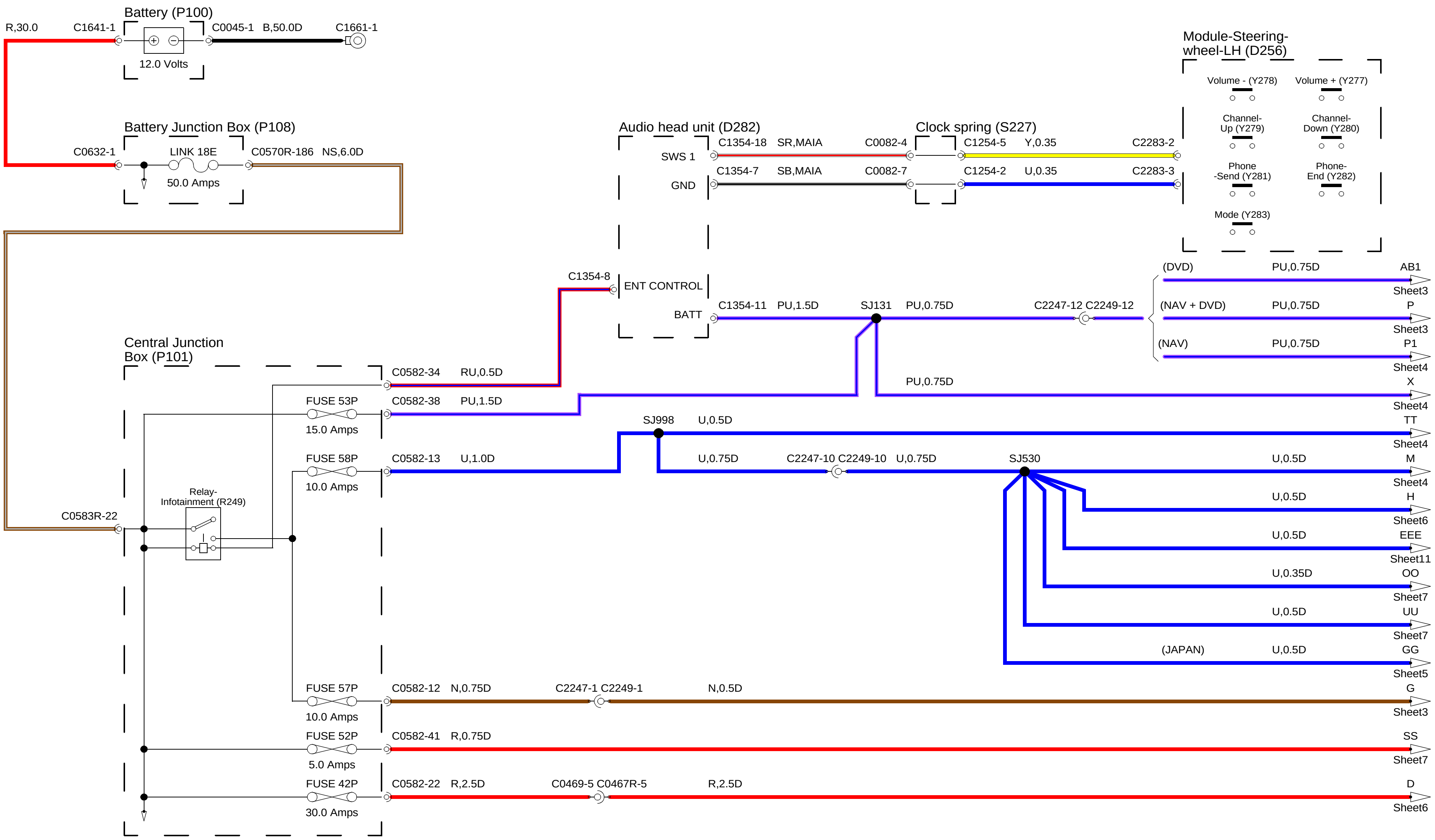

C
Sheet3
LGW,2.5D,880
C2042-5 C2149B-5
LGW,2.5D,170
SJ111
LGW,1.5D,130
C2084-12
LH rear seat heater module (D338)
LGW,1.5D,130
C2084-5

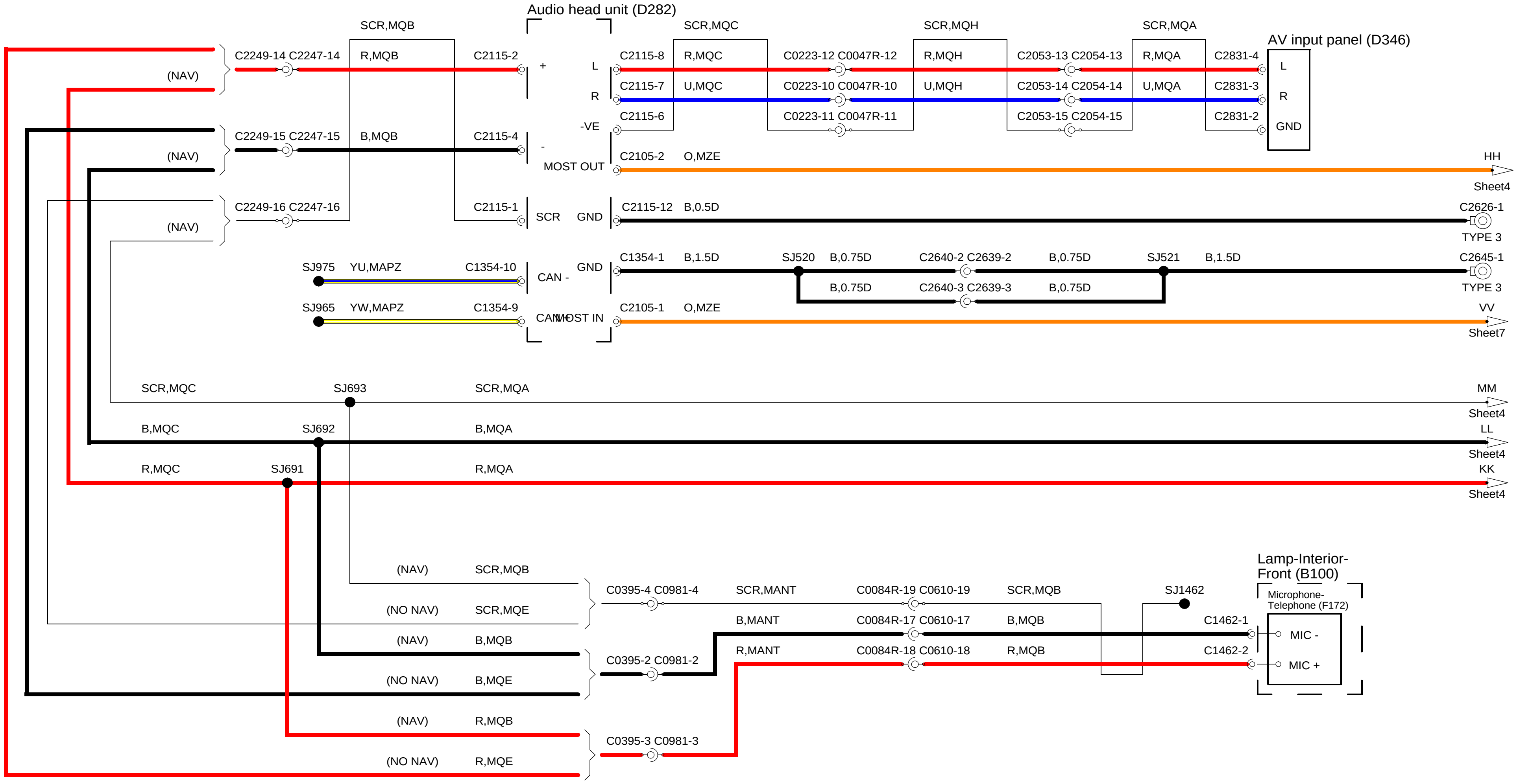
SJ111 (LGW) REAR SEAT RH

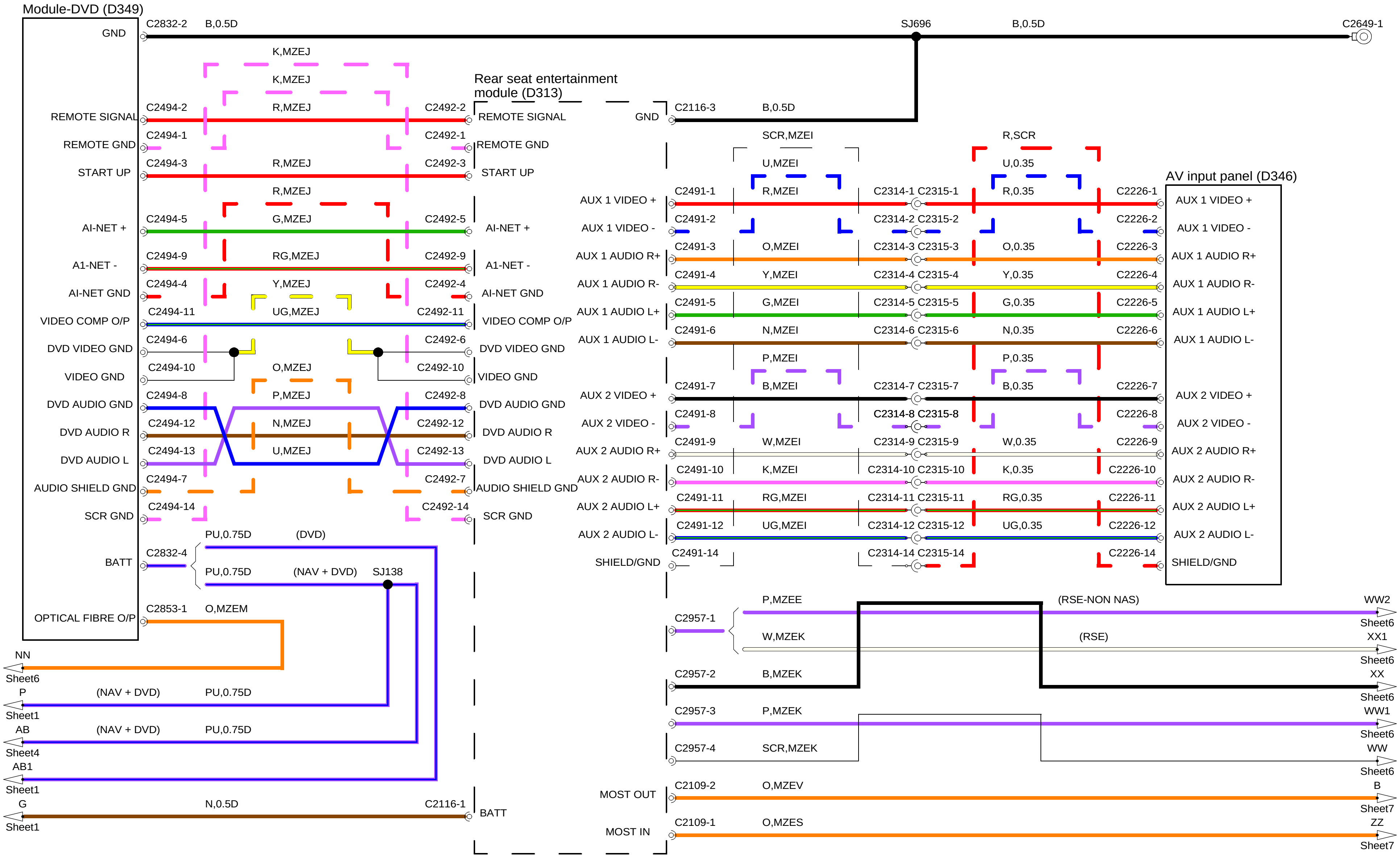

D
Sheet3
LGW,2.5D,2500
C2043-5 C2149B-5
LGW,2.5D,170
SJ111
LGW,1.5D,130
C2084-12
RH rear seat heater module (D339)
LGW,1.5D,130
C2084-5

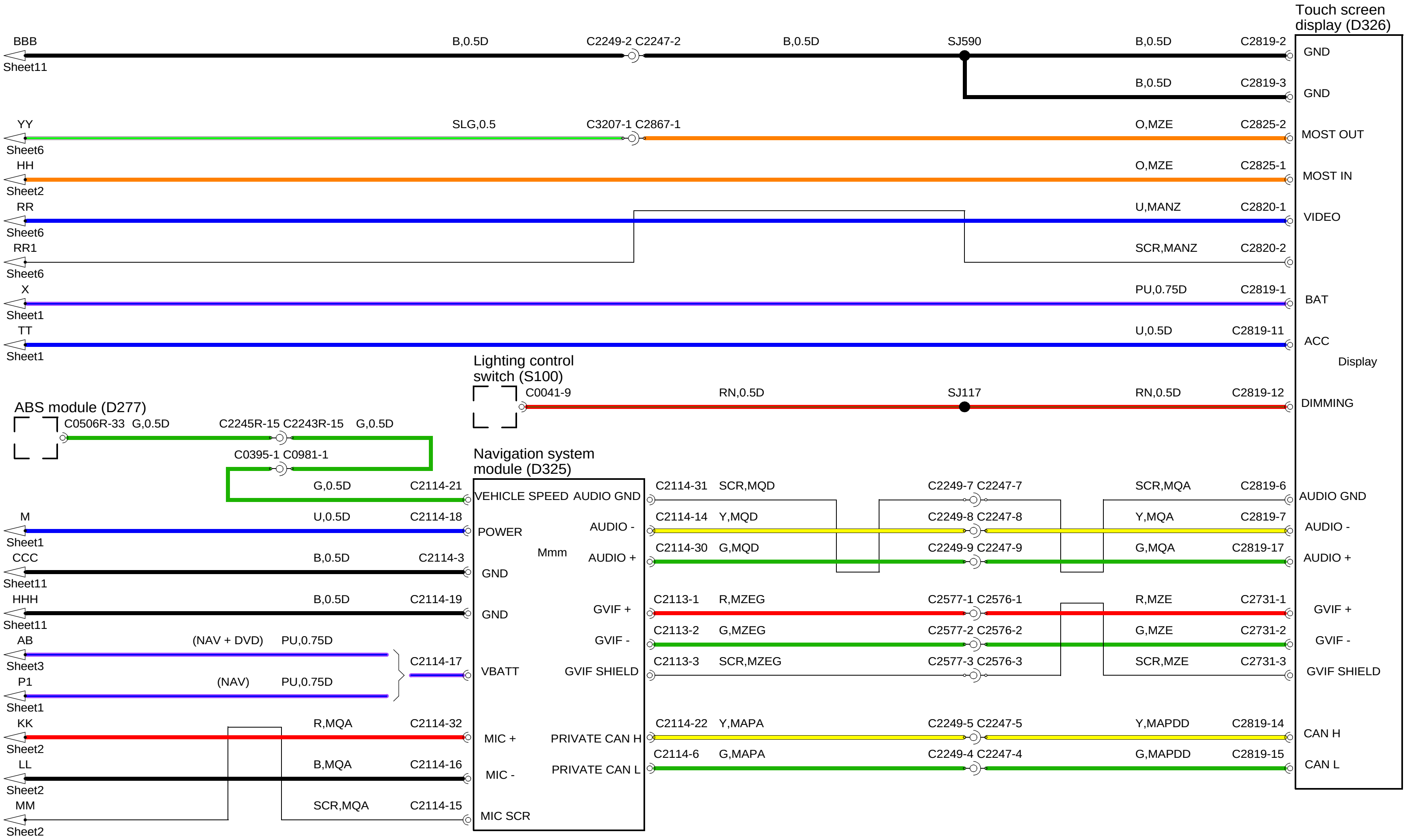
SJ410 (PY) AUTO TRANSMISSION SJ3410 (PY) AUTO TRANSMISSION SJ2410 (PY) AUTO TRANSMISSION

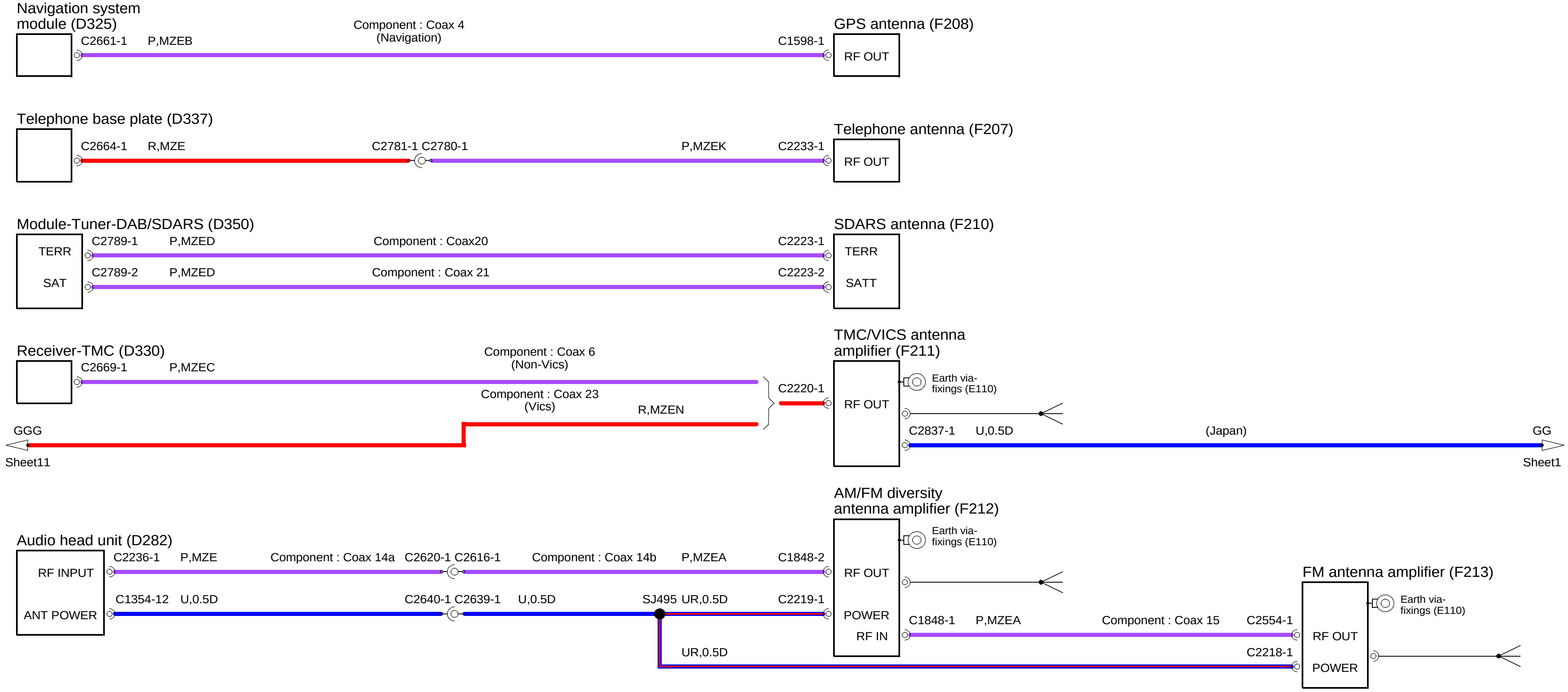

Battery Junction Box (P108)
C0570R-180
PY,1.5D,900
C2365R-1
C2366B-1
(PV8NA)
PY,1.0H,2030
SJ410
PY,1.0H,115
C2366D-1
(PV8SC)
PY,1.0H,2010
SJ3410
PY,1.0H,115
C1324-1
Capacitor (G158)
C2366C-1
(DV6)
PY,1.0H,2110
SJ2410
PY,1.0H,115
Transmission control module (D306)
PY,1.0H,155
PY,1.0H,155
C0193-14
PY,1.0H,155

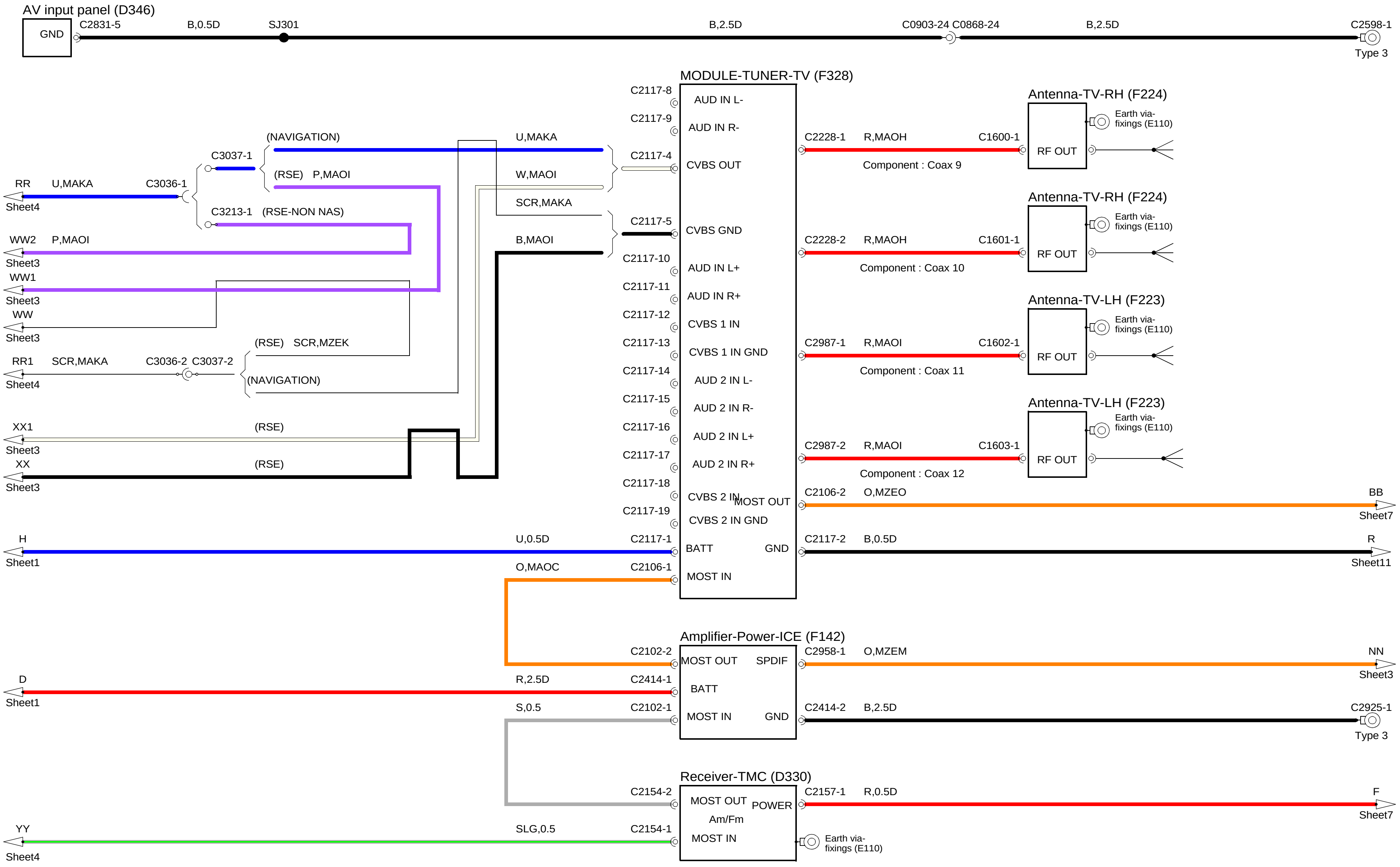

Battery (P100)
R,30.0
C1641-1
C0045-1 B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186 NS,6.0D
Audio head unit (D282)
SWS 1
GND
C1354-18 SR,MAIA
C0082-4
C1354-7 SB,MAIA
C0082-7
Clock spring (S227)
C1254-5 Y,0.35
C2283-2
C1254-2 U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone -Send (Y281)
Phone-End (Y282)
Mode (Y283)
C1354-8
ENT CONTROL
BATT
C1354-11 PU,1.5D
SJ131
PU,0.75D
C2247-12 C2249-12
(DVD)
PU,0.75D
AB1
Sheet3
(NAV + DVD)
PU,0.75D
P
Sheet3
(NAV)
PU,0.75D
P1
Sheet4
PU,0.75D
X
Sheet4
Central Junction Box (P101)
C0582-34 RU,0.5D
FUSE 53P
15.0 Amps
C0582-38 PU,1.5D
SJ998
U,0.5D
TT
Sheet4
FUSE 58P
10.0 Amps
C0582-13 U,1.0D
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet4
U,0.5D
H
Sheet6
U,0.5D
EEE
Sheet11
U,0.35D
OO
Sheet7
U,0.5D
UU
Sheet7
(JAPAN)
U,0.5D
GG
Sheet5
C0583R-22
Relay-Infotainment (R249)
FUSE 57P
10.0 Amps
C0582-12 N,0.75D
C2247-1 C2249-1
N,0.5D
G
Sheet3
FUSE 52P
5.0 Amps
C0582-41 R,0.75D
SS
Sheet7
FUSE 42P
30.0 Amps
C0582-22 R,2.5D
C0469-5 C0467R-5
R,2.5D
D
Sheet6

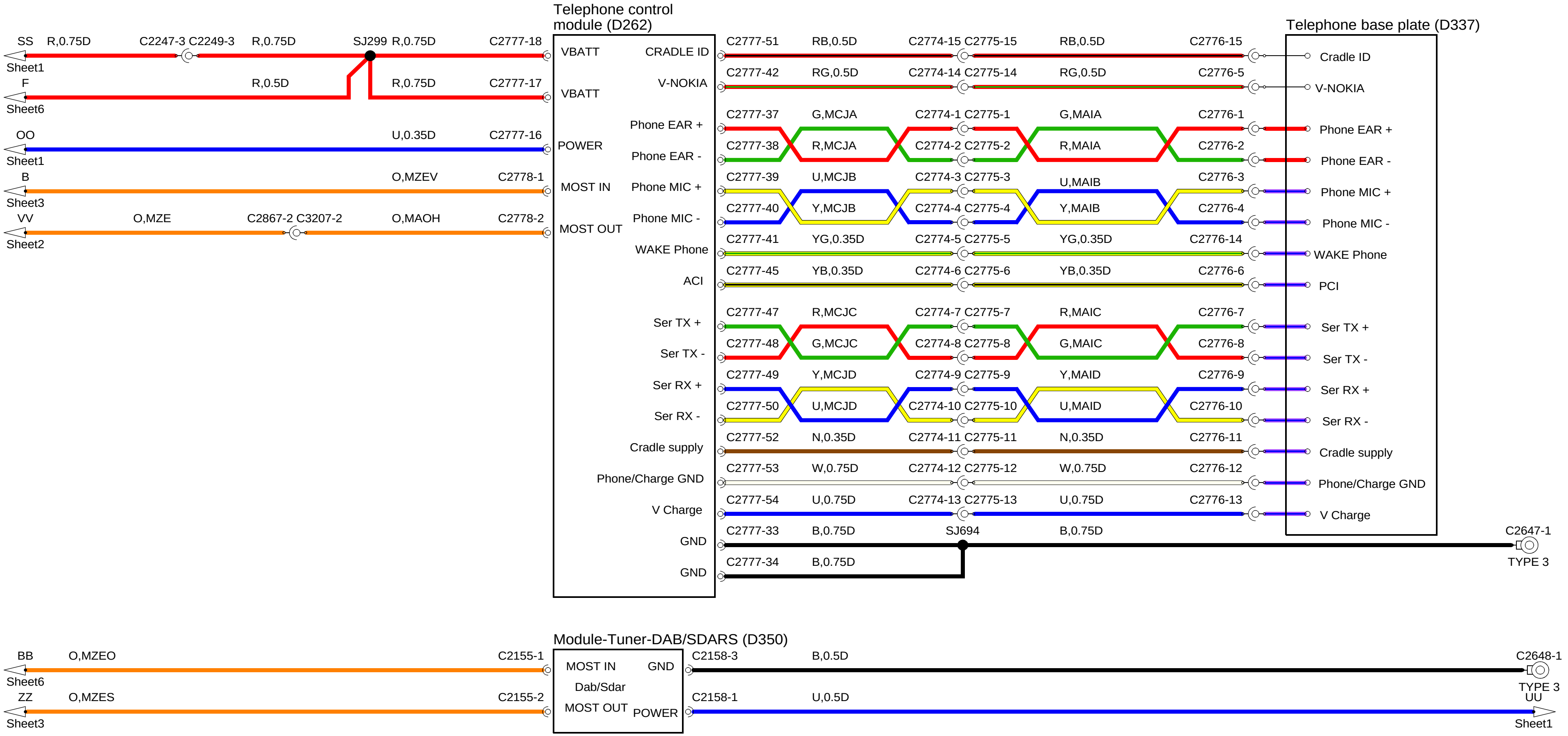

Audio head unit (D282)
SCR,MQB
SCR,MQC
SCR,MQH
SCR,MQA
AV input panel (D346)
C2249-14 C2247-14
R,MQB
C2115-2
+
L
C2115-8
R,MQC
C0223-12 C0047R-12
R,MQH
C2053-13 C2054-13
R,MQA
C2831-4
L
(NAV)
R
C2115-7
U,MQC
C0223-10 C0047R-10
U,MQH
C2053-14 C2054-14
U,MQA
C2831-3
R
C2115-6
C0223-11 C0047R-11
C2053-15 C2054-15
C2831-2
GND
-VE
C2249-15 C2247-15
B,MQB
C2115-4
-
(NAV)
C2105-2
O,MZE
MOST OUT
HH
Sheet4
C2249-16 C2247-16
C2115-1
SCR
GND
C2115-12
B,0.5D
C2626-1
(NAV)
TYPE 3
SJ975
YU,MAPZ
C1354-10
GND
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
CAN -
B,0.75D
C2640-3 C2639-3
B,0.75D
TYPE 3
SJ965
YW,MAPZ
C1354-9
C2105-1
O,MZE
VV
CAN +
MOST IN
Sheet7
SCR,MQC
SJ693
SCR,MQA
MM
Sheet4
B,MQC
SJ692
B,MQA
LL
Sheet4
R,MQC
SJ691
R,MQA
KK
Sheet4
Lamp-Interior-Front (B100)
(NAV)
SCR,MQB
C0395-4 C0981-4
SCR,MANT
C0084R-19 C0610-19
SCR,MQB
SJ1462
Microphone-Telephone (F172)
(NO NAV)
SCR,MQE
B,MANT
C0084R-17 C0610-17
B,MQB
C1462-1
MIC -
(NAV)
B,MQB
C0395-2 C0981-2
R,MANT
C0084R-18 C0610-18
R,MQB
C1462-2
MIC +
(NO NAV)
B,MQE
(NAV)
R,MQB
C0395-3 C0981-3
(NO NAV)
R,MQE

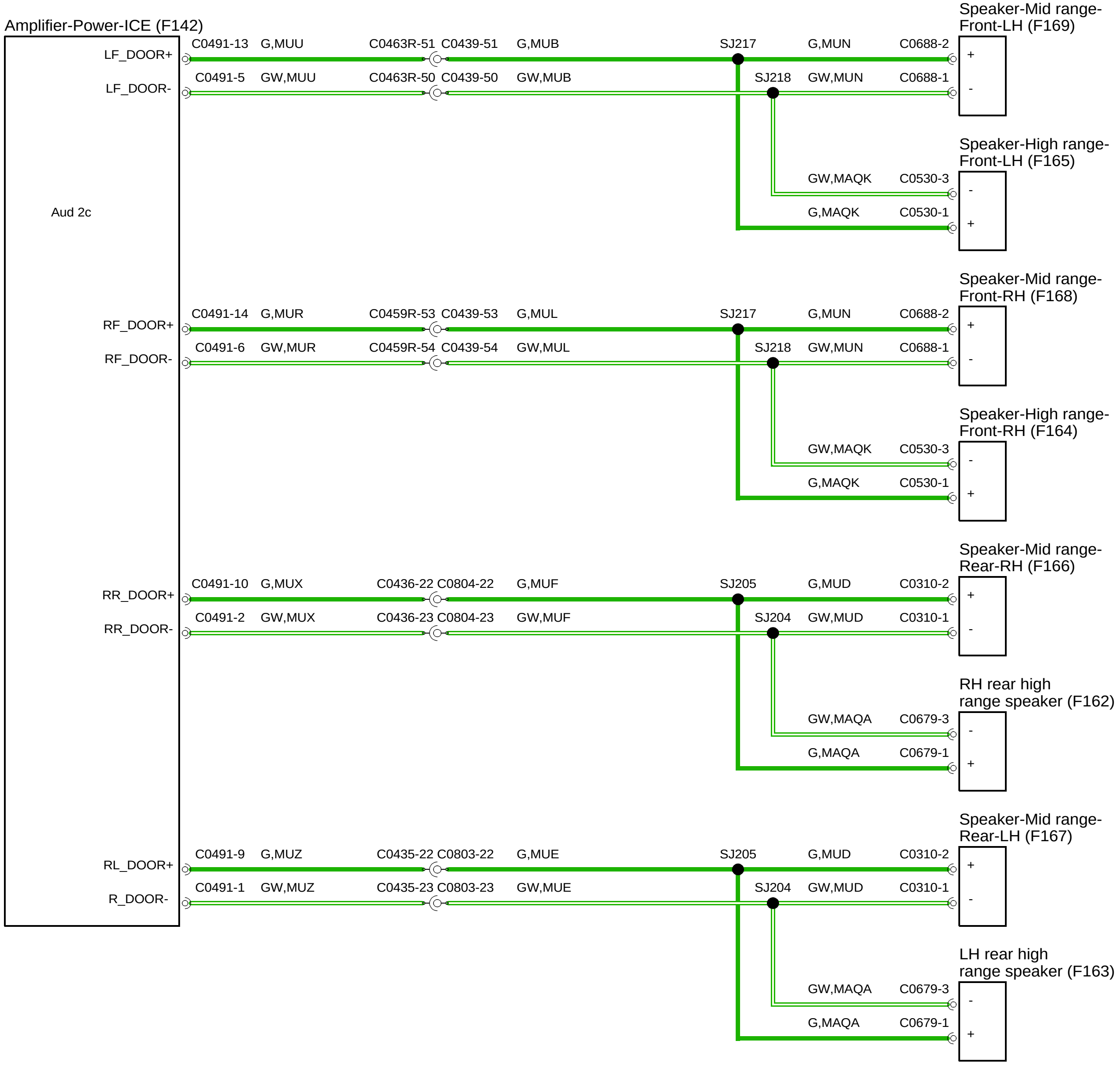

Module-DVD (D349)
GND
C2832-2
B,0.5D
SJ696
B,0.5D
C2649-1
K,MZEJ
K,MZEJ
Rear seat entertainment module (D313)
REMOTE SIGNAL
C2494-2
R,MZEJ
C2492-2
REMOTE SIGNAL
GND
C2116-3
B,0.5D
REMOTE GND
C2494-1
C2492-1
REMOTE GND
SCR,MZEI
R,SCR
START UP
C2494-3
R,MZEJ
C2492-3
START UP
U,MZEI
U,0.35
AV input panel (D346)
R,MZEJ
AUX 1 VIDEO +
C2491-1
R,MZEI
C2314-1 C2315-1
R,0.35
C2226-1
AUX 1 VIDEO +
AI-NET +
C2494-5
G,MZEJ
C2492-5
AI-NET +
AUX 1 VIDEO -
C2491-2
C2314-2 C2315-2
C2226-2
AUX 1 VIDEO -
A1-NET -
C2494-9
RG,MZEJ
C2492-9
A1-NET -
AUX 1 AUDIO R+
C2491-3
O,MZEI
C2314-3 C2315-3
O,0.35
C2226-3
AUX 1 AUDIO R+
AI-NET GND
C2494-4
Y,MZEJ
C2492-4
AI-NET GND
AUX 1 AUDIO R-
C2491-4
Y,MZEI
C2314-4 C2315-4
Y,0.35
C2226-4
AUX 1 AUDIO R-
VIDEO COMP O/P
C2494-11
UG,MZEJ
C2492-11
VIDEO COMP O/P
AUX 1 AUDIO L+
C2491-5
G,MZEI
C2314-5 C2315-5
G,0.35
C2226-5
AUX 1 AUDIO L+
DVD VIDEO GND
C2494-6
C2492-6
DVD VIDEO GND
AUX 1 AUDIO L-
C2491-6
N,MZEI
C2314-6 C2315-6
N,0.35
C2226-6
AUX 1 AUDIO L-
VIDEO GND
C2494-10
O,MZEJ
C2492-10
VIDEO GND
P,MZEI
P,0.35
DVD AUDIO GND
C2494-8
P,MZEJ
C2492-8
DVD AUDIO GND
AUX 2 VIDEO +
C2491-7
B,MZEI
C2314-7 C2315-7
B,0.35
C2226-7
AUX 2 VIDEO +
DVD AUDIO R
C2494-12
N,MZEJ
C2492-12
DVD AUDIO R
AUX 2 VIDEO -
C2491-8
C2314-8 C2315-8
C2226-8
AUX 2 VIDEO -
DVD AUDIO L
C2494-13
U,MZEJ
C2492-13
DVD AUDIO L
AUX 2 AUDIO R+
C2491-9
W,MZEI
C2314-9 C2315-9
W,0.35
C2226-9
AUX 2 AUDIO R+
AUDIO SHIELD GND
C2494-7
C2492-7
AUDIO SHIELD GND
AUX 2 AUDIO R-
C2491-10
K,MZEI
C2314-10 C2315-10
K,0.35
C2226-10
AUX 2 AUDIO R-
SCR GND
C2494-14
C2492-14
SCR GND
AUX 2 AUDIO L+
C2491-11
RG,MZEI
C2314-11 C2315-11
RG,0.35
C2226-11
AUX 2 AUDIO L+
PU,0.75D
(DVD)
AUX 2 AUDIO L-
C2491-12
UG,MZEI
C2314-12 C2315-12
UG,0.35
C2226-12
AUX 2 AUDIO L-
BATT
C2832-4
PU,0.75D
(NAV + DVD)
SJ138
SHIELD/GND
C2491-14
C2314-14 C2315-14
C2226-14
SHIELD/GND
OPTICAL FIBRE O/P
C2853-1
O,MZEM
P,MZEE
(RSE-NON NAS)
WW2
Sheet6
C2957-1
W,MZEK
(RSE)
XX1
Sheet6
NN
Sheet6
C2957-2
B,MZEK
XX
Sheet6
P
(NAV + DVD)
PU,0.75D
Sheet1
C2957-3
P,MZEK
WW1
Sheet6
AB
(NAV + DVD)
PU,0.75D
Sheet4
C2957-4
SCR,MZEK
WW
Sheet6
AB1
Sheet1
MOST OUT
C2109-2
O,MZEV
B
Sheet7
G
N,0.5D
C2116-1
BATT
Sheet1
MOST IN
C2109-1
O,MZES
ZZ
Sheet7

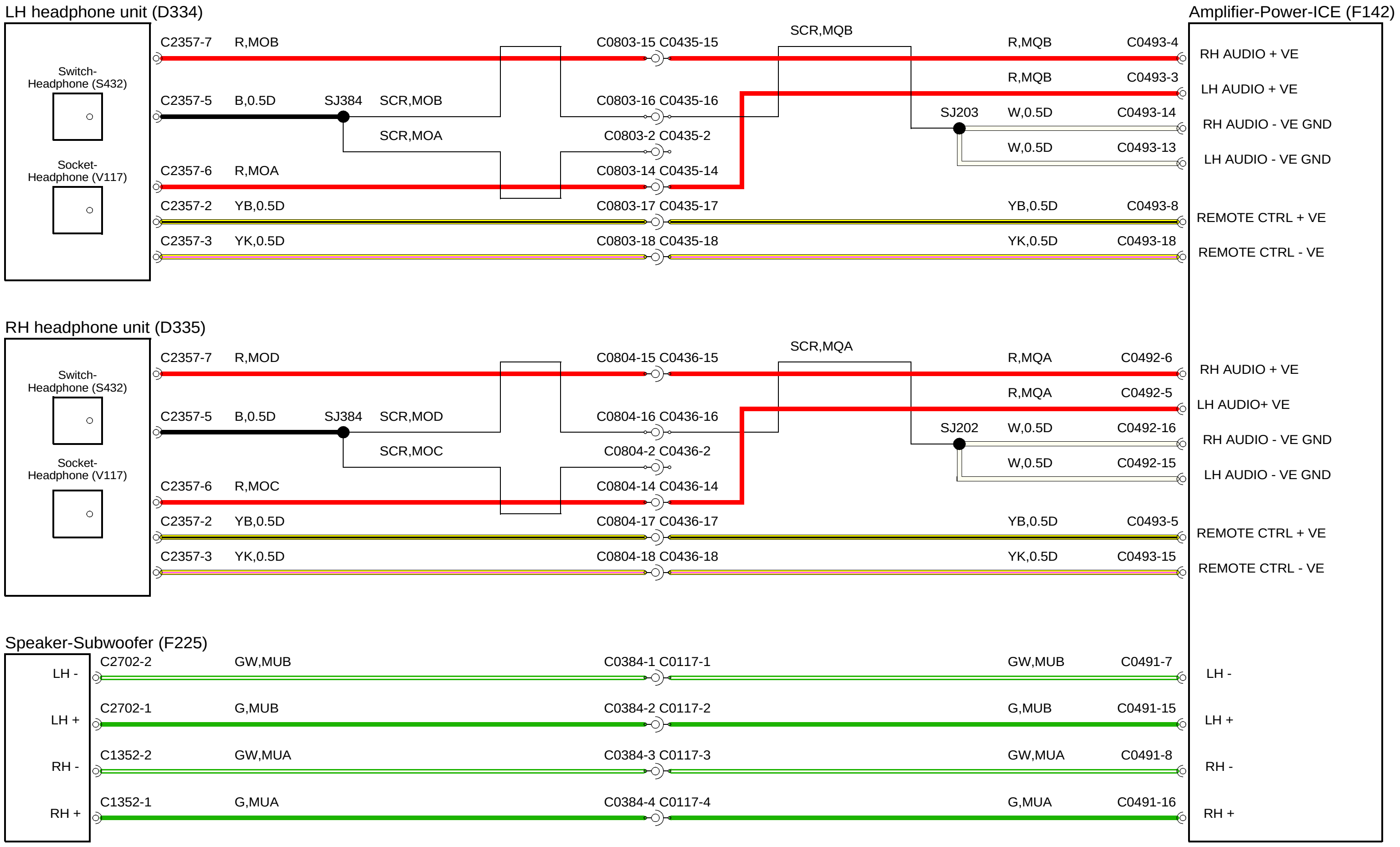

Touch screen display (D326)
BBB
Sheet11
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
YY
Sheet6
SLG,0.5
C3207-1 C2867-1
O,MZE
C2825-2
MOST OUT
HH
Sheet2
O,MZE
C2825-1
MOST IN
RR
Sheet6
U,MANZ
C2820-1
VIDEO
RR1
Sheet6
SCR,MANZ
C2820-2
X
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
ACC
Display
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
DIMMING
ABS module (D277)
C0506R-33
G,0.5D
C2245R-15 C2243R-15
G,0.5D
C0395-1 C0981-1
Navigation system module (D325)
G,0.5D
C2114-21
VEHICLE SPEED
AUDIO GND
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,MQD
C2249-8 C2247-8
Y,MQA
C2819-7
AUDIO -
Mmm
CCC
Sheet11
B,0.5D
C2114-3
GND
AUDIO +
C2114-30
G,MQD
C2249-9 C2247-9
G,MQA
C2819-17
AUDIO +
HHH
Sheet11
B,0.5D
C2114-19
GND
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2731-1
GVIF +
AB
Sheet3
(NAV + DVD)
PU,0.75D
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2731-2
GVIF -
C2114-17
VBATT
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MZE
C2731-3
GVIF SHIELD
P1
Sheet1
(NAV)
PU,0.75D
KK
Sheet2
R,MQA
C2114-32
MIC +
PRIVATE CAN H
C2114-22
Y,MAPA
C2249-5 C2247-5
Y,MAPDD
C2819-14
CAN H
LL
Sheet2
B,MQA
C2114-16
MIC -
PRIVATE CAN L
C2114-6
G,MAPA
C2249-4 C2247-4
G,MAPDD
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR

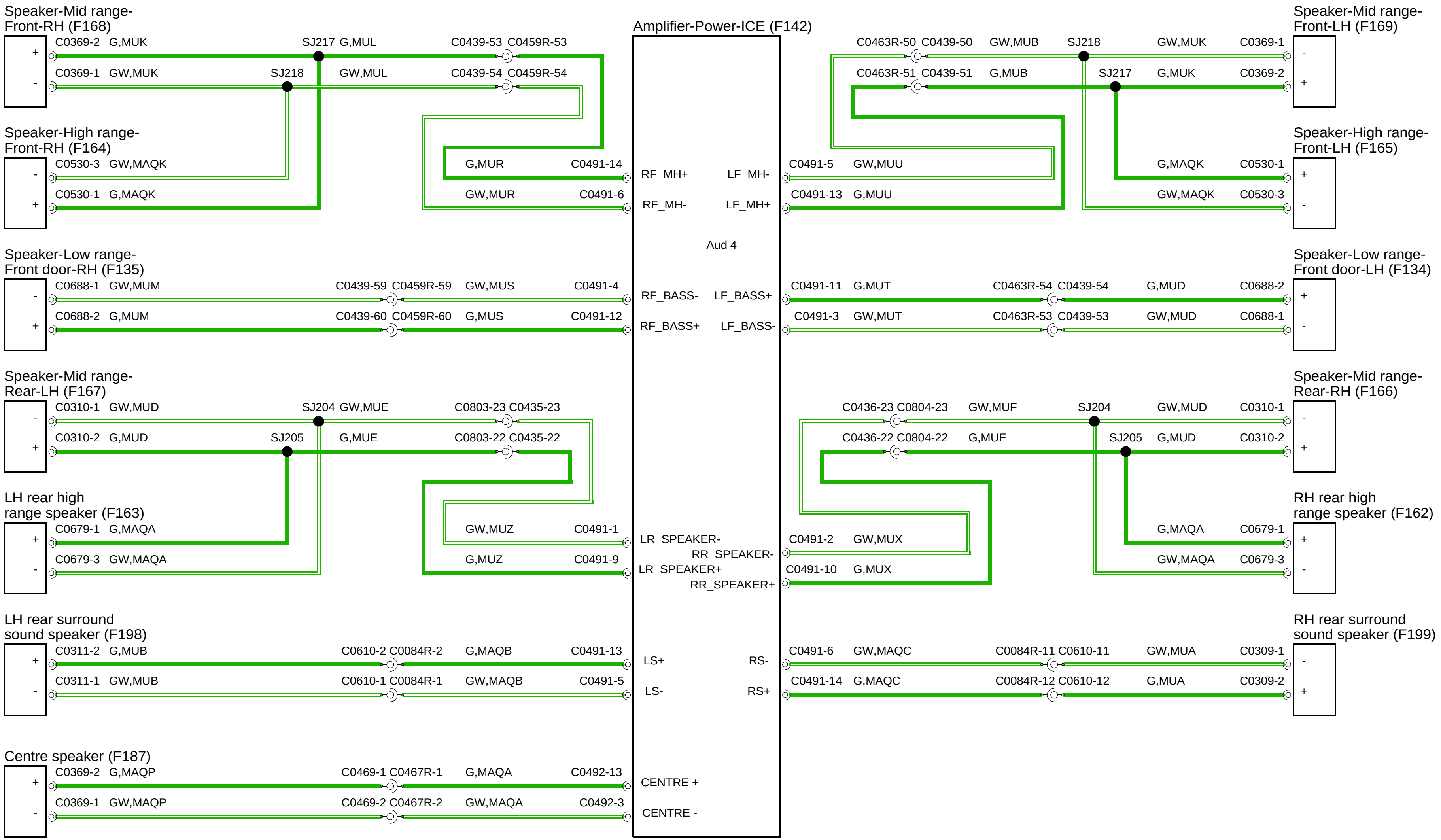

Navigation system module (D325)
C2661-1
P,MZEB
Component : Coax 4 (Navigation)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Module-Tuner-DAB/SDARS (D350)
TERR
SAT
C2789-1
P,MZED
Component : Coax20
C2223-1
C2789-2
P,MZED
Component : Coax 21
C2223-2
SDARS antenna (F210)
TERR
SATT
Receiver-TMC (D330)
C2669-1
P,MZEC
Component : Coax 6 (Non-Vics)
Component : Coax 23 (Vics)
R,MZEN
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via- fixings (E110)
GGG
Sheet11
C2837-1
U,0.5D
(Japan)
GG
Sheet1
AM/FM diversity antenna amplifier (F212)
Earth via- fixings (E110)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
Component : Coax 14a
C2620-1 C2616-1
Component : Coax 14b
P,MZEA
C1848-2
RF OUT
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495
UR,0.5D
C2219-1
POWER
RF IN
C1848-1
P,MZEA
Component : Coax 15
C2554-1
UR,0.5D
C2218-1
FM antenna amplifier (F213)
Earth via- fixings (E110)
RF OUT
POWER

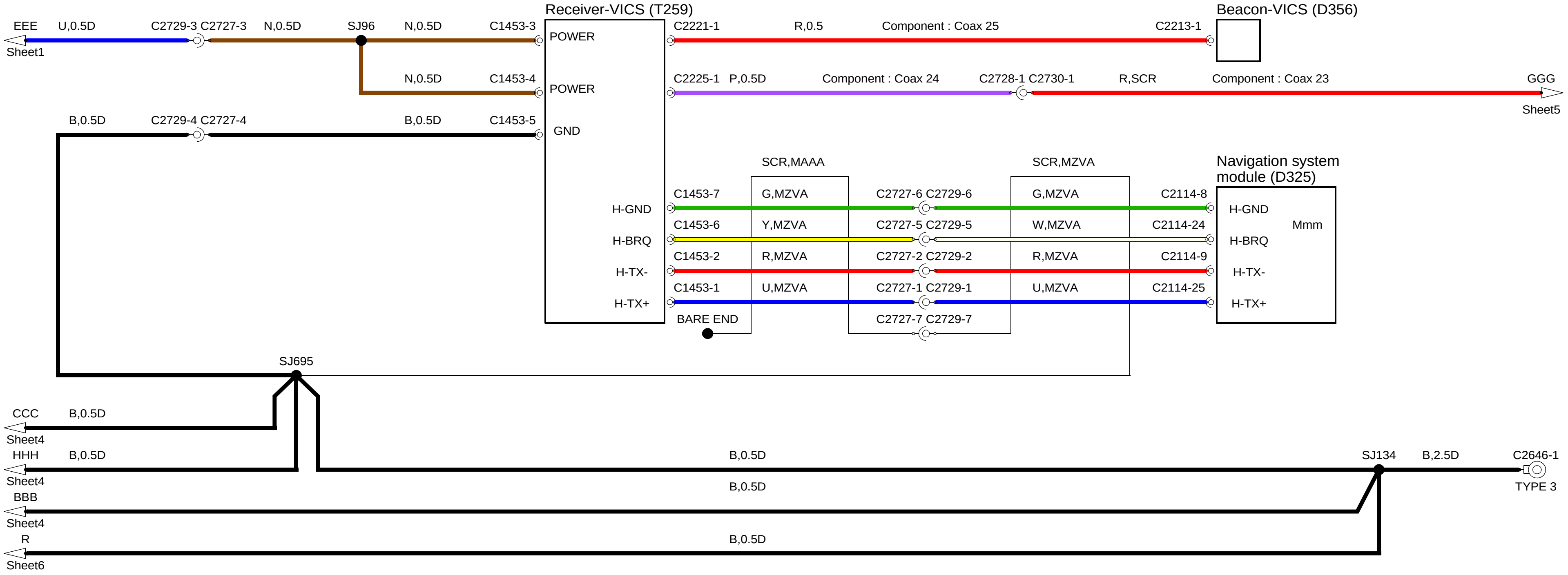

AV input panel (D346)
GND
C2831-5
B,0.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
Type 3
MODULE-TUNER-TV (F328)
C2117-8
AUD IN L-
C2117-9
AUD IN R-
C2117-4
CVBS OUT
C2117-5
CVBS GND
C2117-10
AUD IN L+
C2117-11
AUD IN R+
C2117-12
CVBS 1 IN
C2117-13
CVBS 1 IN GND
C2117-14
AUD 2 IN L-
C2117-15
AUD 2 IN R-
C2117-16
AUD 2 IN L+
C2117-17
AUD 2 IN R+
C2117-18
CVBS 2 IN
MOST OUT
C2117-19
CVBS 2 IN GND
C2117-1
BATT
GND
C2106-1
MOST IN
(NAVIGATION)
U,MAKA
C3037-1
(RSE) P,MAOI
W,MAOI
RR
U,MAKA
C3036-1
Sheet4
C3213-1 (RSE-NON NAS)
SCR,MAKA
WW2
P,MAOI
B,MAOI
Sheet3
WW1
Sheet3
WW
Sheet3
(RSE) SCR,MZEK
RR1
SCR,MAKA
C3036-2 C3037-2
Sheet4
(NAVIGATION)
XX1
(RSE)
Sheet3
XX
(RSE)
Sheet3
Antenna-TV-RH (F224)
Earth via-fixings (E110)
C2228-1
R,MAOH
C1600-1
RF OUT
Component : Coax 9
Antenna-TV-RH (F224)
Earth via-fixings (E110)
C2228-2
R,MAOH
C1601-1
RF OUT
Component : Coax 10
Antenna-TV-LH (F223)
Earth via-fixings (E110)
C2987-1
R,MAOI
C1602-1
RF OUT
Component : Coax 11
Antenna-TV-LH (F223)
Earth via-fixings (E110)
C2987-2
R,MAOI
C1603-1
RF OUT
Component : Coax 12
C2106-2
O,MZEO
BB
Sheet7
H
U,0.5D
Sheet1
C2117-2
B,0.5D
R
Sheet11
O,MAOC
Amplifier-Power-ICE (F142)
C2102-2
MOST OUT
SPDIF
C2958-1
O,MZEM
NN
Sheet3
D
R,2.5D
C2414-1
BATT
Sheet1
S,0.5
C2102-1
MOST IN
GND
C2414-2
B,2.5D
C2925-1
Type 3
Receiver-TMC (D330)
C2154-2
MOST OUT
POWER
Am/Fm
C2157-1
R,0.5D
F
Sheet7
YY
SLG,0.5
C2154-1
MOST IN
Earth via-fixings (E110)
Sheet4

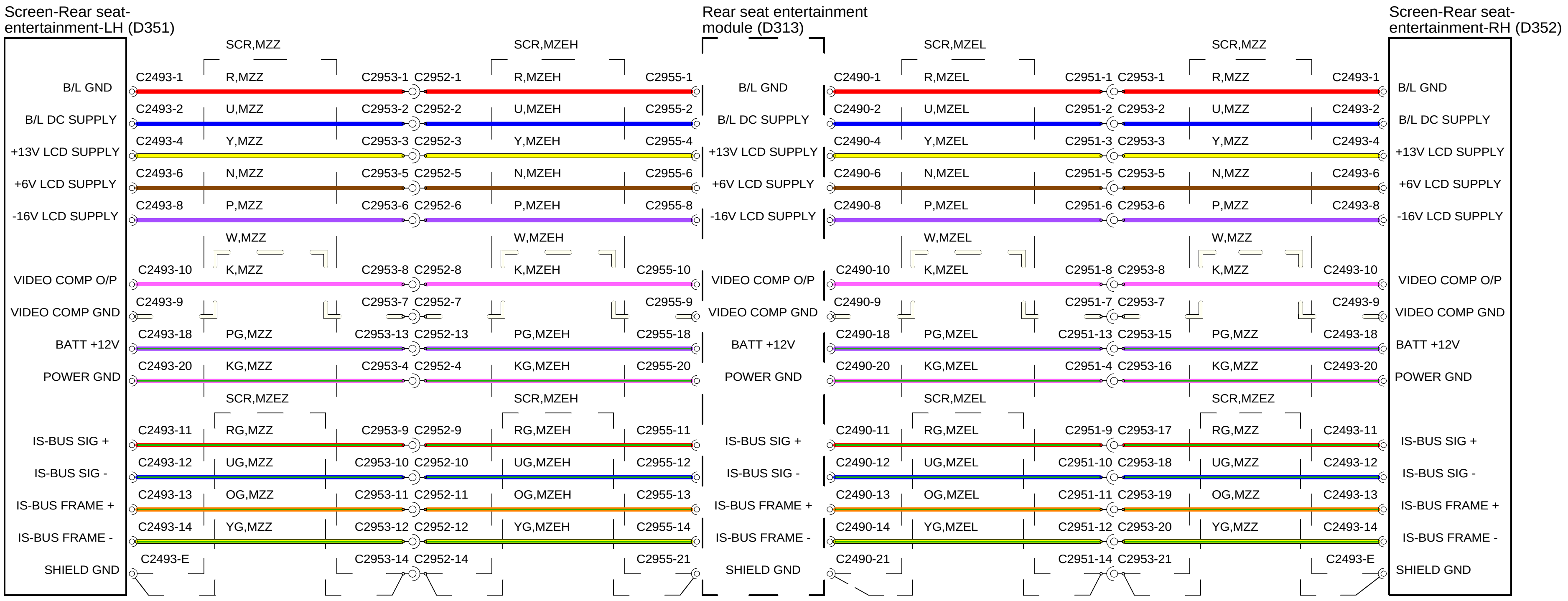

Telephone control module (D262)
Telephone base plate (D337)
Module-Tuner-DAB/SDARS (D350)
SS
R,0.75D
C2247-3 C2249-3
R,0.75D
SJ299
R,0.75D
C2777-18
Sheet1
F
R,0.5D
R,0.75D
C2777-17
Sheet6
OO
U,0.35D
C2777-16
Sheet1
B
O,MZEV
C2778-1
Sheet3
VV
O,MZE
C2867-2 C3207-2
O,MAOH
C2778-2
Sheet2
VBATT
VBATT
POWER
MOST IN
MOST OUT
CRADLE ID
V-NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE Phone
ACI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
GND
GND
C2777-51 RB,0.5D C2774-15 C2775-15 RB,0.5D C2776-15
C2777-42 RG,0.5D C2774-14 C2775-14 RG,0.5D C2776-5
C2777-37 G,MCJA C2774-1 C2775-1 G,MAIA C2776-1
C2777-38 R,MCJA C2774-2 C2775-2 R,MAIA C2776-2
C2777-39 U,MCJB C2774-3 C2775-3 U,MAIB C2776-3
C2777-40 Y,MCJB C2774-4 C2775-4 Y,MAIB C2776-4
C2777-41 YG,0.35D C2774-5 C2775-5 YG,0.35D C2776-14
C2777-45 YB,0.35D C2774-6 C2775-6 YB,0.35D C2776-6
C2777-47 R,MCJC C2774-7 C2775-7 R,MAIC C2776-7
C2777-48 G,MCJC C2774-8 C2775-8 G,MAIC C2776-8
C2777-49 Y,MCJD C2774-9 C2775-9 Y,MAID C2776-9
C2777-50 U,MCJD C2774-10 C2775-10 U,MAID C2776-10
C2777-52 N,0.35D C2774-11 C2775-11 N,0.35D C2776-11
C2777-53 W,0.75D C2774-12 C2775-12 W,0.75D C2776-12
C2777-54 U,0.75D C2774-13 C2775-13 U,0.75D C2776-13
C2777-33 B,0.75D SJ694 B,0.75D
C2777-34 B,0.75D
C2647-1
TYPE 3
Cradle ID
V-NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE Phone
PCI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
BB
O,MZEO
C2155-1
Sheet6
ZZ
O,MZES
C2155-2
Sheet3
MOST IN
Dab/Sdar
MOST OUT
GND
POWER
C2158-3
B,0.5D
C2648-1
TYPE 3
C2158-1
U,0.5D
UU
Sheet1

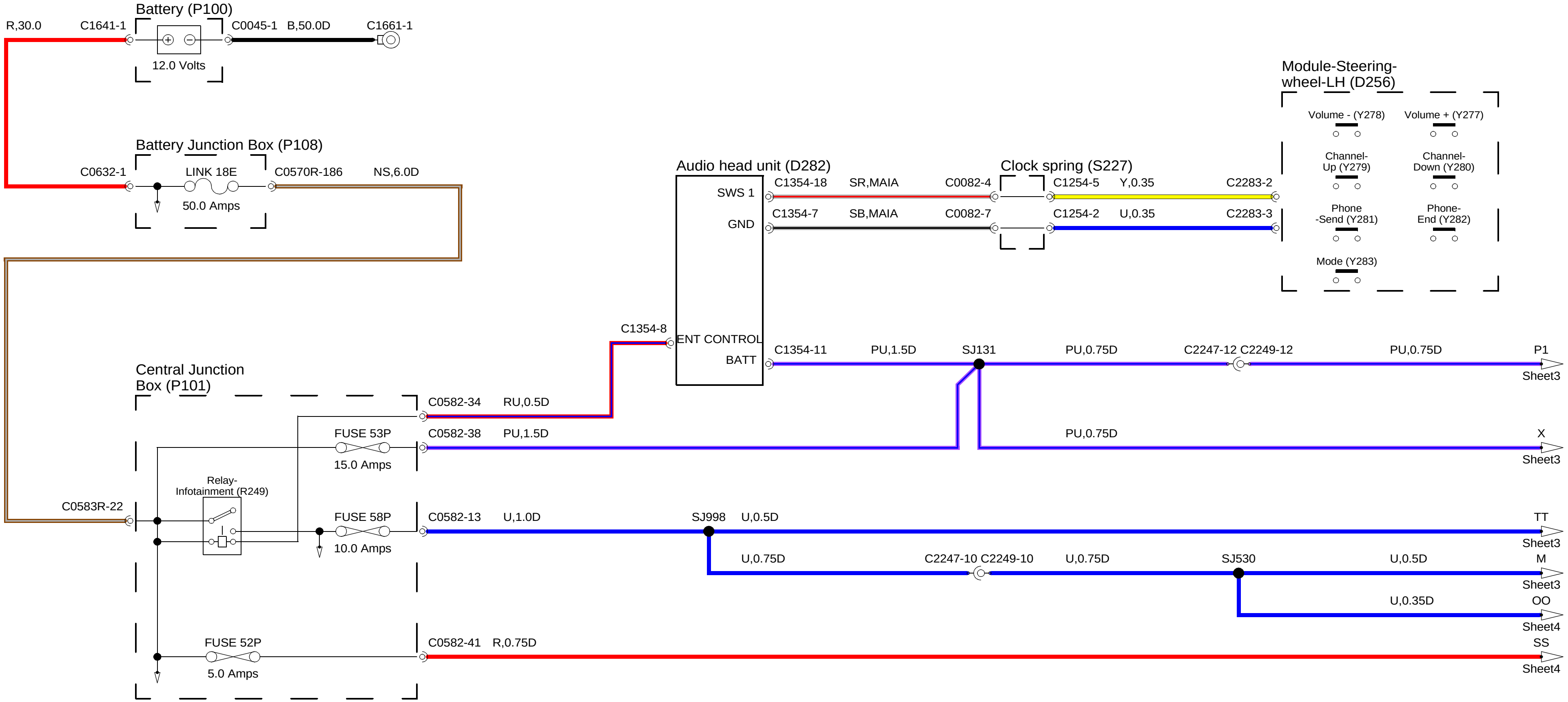

Amplifier-Power-ICE (F142)
Aud 2c
LF_DOOR+
LF_DOOR-
RF_DOOR+
RF_DOOR-
RR_DOOR+
RR_DOOR-
RL_DOOR+
R_DOOR-
C0491-13 G,MUU C0463R-51 C0439-51 G,MUB SJ217 G,MUN C0688-2
C0491-5 GW,MUU C0463R-50 C0439-50 GW,MUB SJ218 GW,MUN C0688-1
GW,MAQK C0530-3
G,MAQK C0530-1
C0491-14 G,MUR C0459R-53 C0439-53 G,MUL SJ217 G,MUN C0688-2
C0491-6 GW,MUR C0459R-54 C0439-54 GW,MUL SJ218 GW,MUN C0688-1
GW,MAQK C0530-3
G,MAQK C0530-1
C0491-10 G,MUX C0436-22 C0804-22 G,MUF SJ205 G,MUD C0310-2
C0491-2 GW,MUX C0436-23 C0804-23 GW,MUF SJ204 GW,MUD C0310-1
GW,MAQA C0679-3
G,MAQA C0679-1
C0491-9 G,MUZ C0435-22 C0803-22 G,MUE SJ205 G,MUD C0310-2
C0491-1 GW,MUZ C0435-23 C0803-23 GW,MUE SJ204 GW,MUD C0310-1
GW,MAQA C0679-3
G,MAQA C0679-1
Speaker-Mid range-Front-LH (F169)
Speaker-High range-Front-LH (F165)
Speaker-Mid range-Front-RH (F168)
Speaker-High range-Front-RH (F164)
Speaker-Mid range-Rear-RH (F166)
RH rear high range speaker (F162)
Speaker-Mid range-Rear-LH (F167)
LH rear high range speaker (F163)
+
-

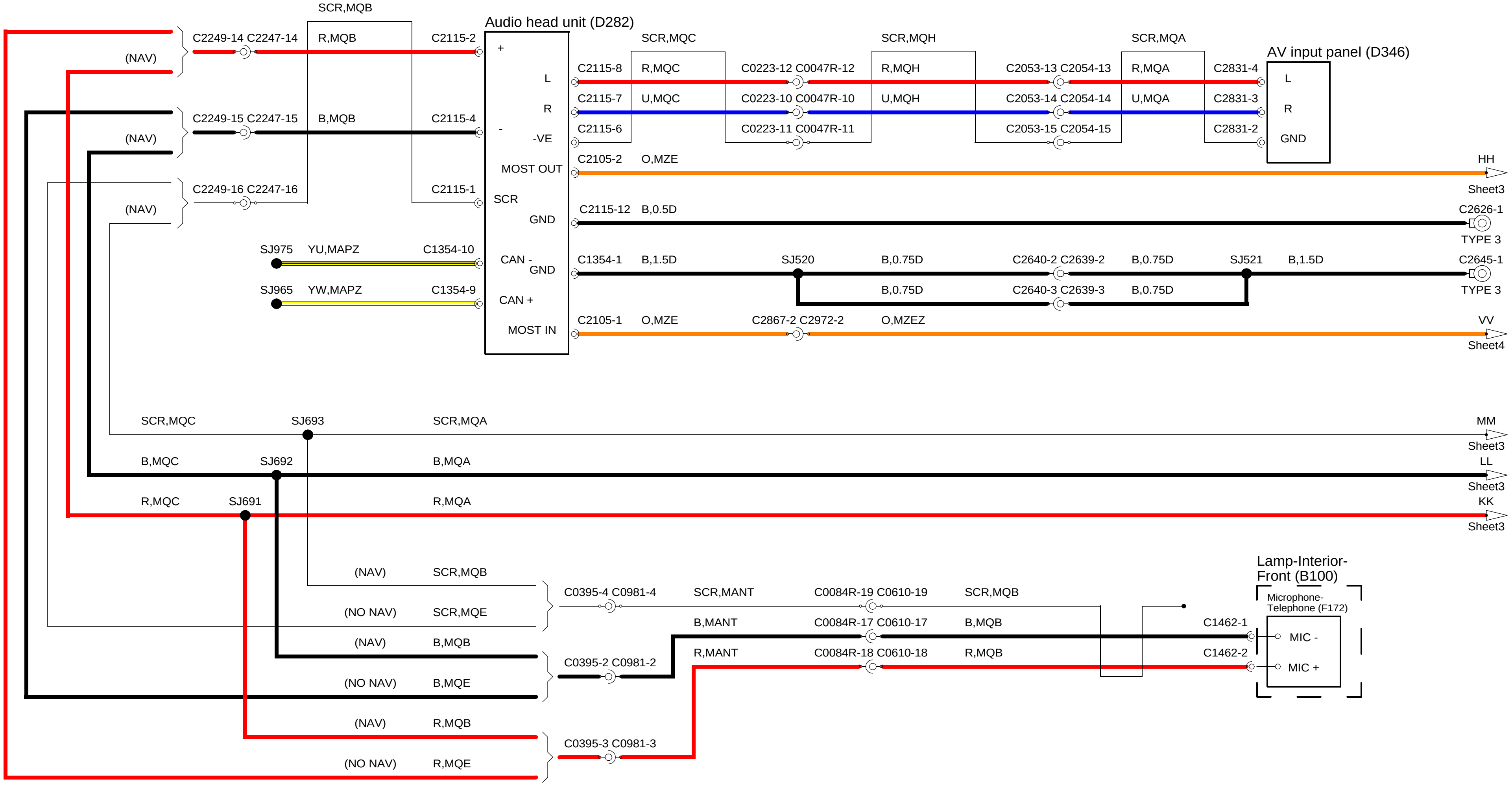

LH headphone unit (D334)
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOB
C2357-5 B,0.5D
SJ384 SCR,MOB
SCR,MOA
C2357-6 R,MOA
C2357-2 YB,0.5D
C2357-3 YK,0.5D
C0803-15 C0435-15
C0803-16 C0435-16
C0803-2 C0435-2
C0803-14 C0435-14
C0803-17 C0435-17
C0803-18 C0435-18
SCR,MQB
R,MQB C0493-4
R,MQB C0493-3
SJ203 W,0.5D C0493-14
W,0.5D C0493-13
YB,0.5D C0493-8
YK,0.5D C0493-18
Amplifier-Power-ICE (F142)
RH AUDIO + VE
LH AUDIO + VE
RH AUDIO - VE GND
LH AUDIO - VE GND
REMOTE CTRL + VE
REMOTE CTRL - VE
RH headphone unit (D335)
Switch-Headphone (S432)
Socket-Headphone (V117)
C2357-7 R,MOD
C2357-5 B,0.5D
SJ384 SCR,MOD
SCR,MOC
C2357-6 R,MOC
C2357-2 YB,0.5D
C2357-3 YK,0.5D
C0804-15 C0436-15
C0804-16 C0436-16
C0804-2 C0436-2
C0804-14 C0436-14
C0804-17 C0436-17
C0804-18 C0436-18
SCR,MQA
R,MQA C0492-6
R,MQA C0492-5
SJ202 W,0.5D C0492-16
W,0.5D C0492-15
YB,0.5D C0493-5
YK,0.5D C0493-15
RH AUDIO + VE
LH AUDIO+ VE
RH AUDIO - VE GND
LH AUDIO - VE GND
REMOTE CTRL + VE
REMOTE CTRL - VE
Speaker-Subwoofer (F225)
LH -
LH +
RH -
RH +
C2702-2 GW,MUB
C2702-1 G,MUB
C1352-2 GW,MUA
C1352-1 G,MUA
C0384-1 C0117-1
C0384-2 C0117-2
C0384-3 C0117-3
C0384-4 C0117-4
GW,MUB C0491-7
G,MUB C0491-15
GW,MUA C0491-8
G,MUA C0491-16
LH -
LH +
RH -
RH +

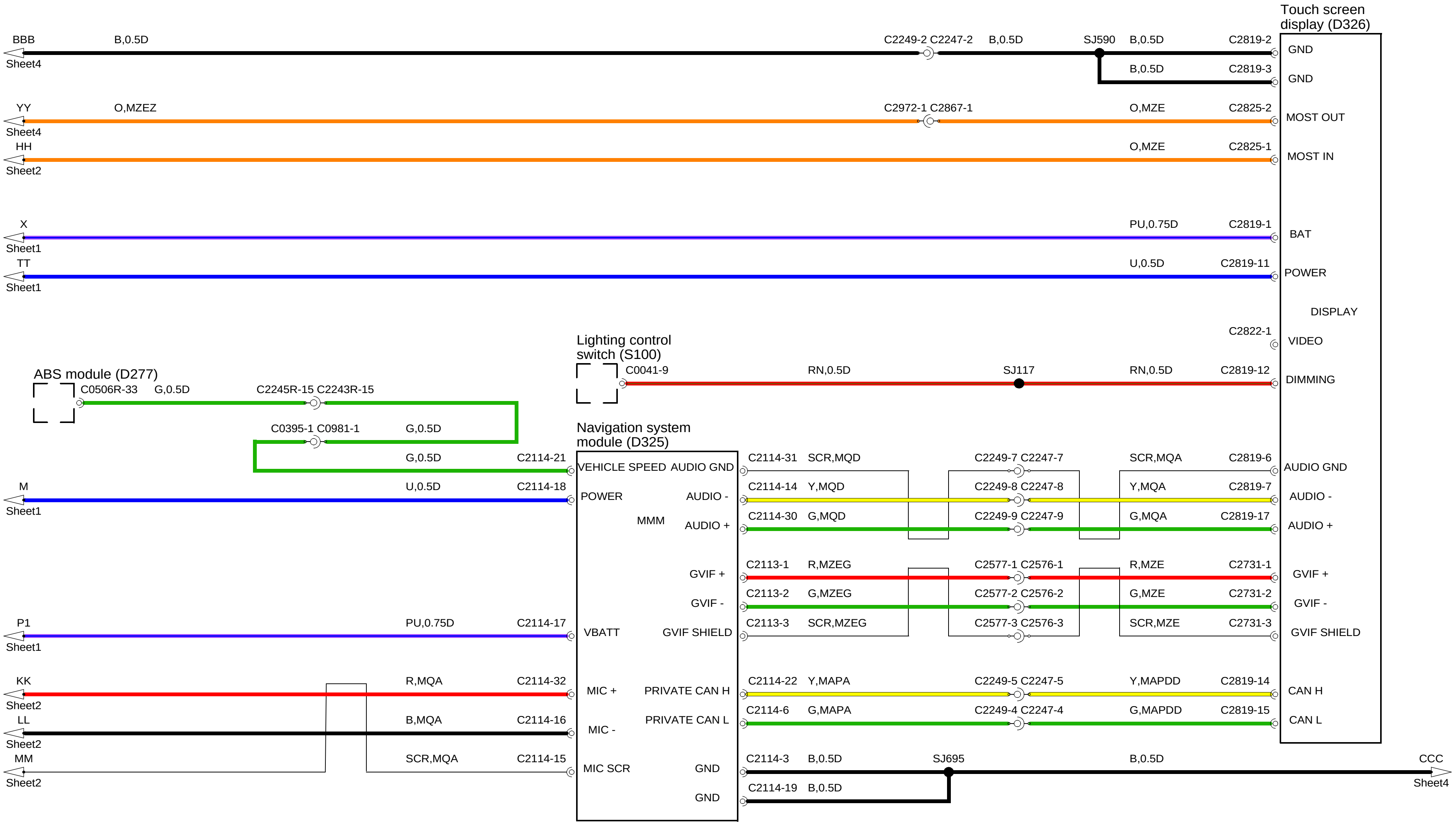

Speaker-Mid range-Front-RH (F168)
C0369-2 G,MUK
C0369-1 GW,MUK
SJ217 G,MUL
SJ218
GW,MUL
C0439-53 C0459R-53
C0439-54 C0459R-54
Speaker-High range-Front-RH (F164)
C0530-3 GW,MAQK
C0530-1 G,MAQK
G,MUR C0491-14
GW,MUR C0491-6
Speaker-Low range-Front door-RH (F135)
C0688-1 GW,MUM
C0688-2 G,MUM
C0439-59 C0459R-59 GW,MUS C0491-4
C0439-60 C0459R-60 G,MUS C0491-12
Speaker-Mid range-Rear-LH (F167)
C0310-1 GW,MUD
C0310-2 G,MUD
SJ204 GW,MUE
SJ205
G,MUE
C0803-23 C0435-23
C0803-22 C0435-22
LH rear high range speaker (F163)
C0679-1 G,MAQA
C0679-3 GW,MAQA
GW,MUZ C0491-1
G,MUZ C0491-9
LH rear surround sound speaker (F198)
C0311-2 G,MUB
C0311-1 GW,MUB
C0610-2 C0084R-2 G,MAQB C0491-13
C0610-1 C0084R-1 GW,MAQB C0491-5
Centre speaker (F187)
C0369-2 G,MAQP
C0369-1 GW,MAQP
C0469-1 C0467R-1 G,MAQA C0492-13
C0469-2 C0467R-2 GW,MAQA C0492-3
Amplifier-Power-ICE (F142)
RF_MH+
RF_MH-
LF_MH-
LF_MH+
Aud 4
RF_BASS-
RF_BASS+
LF_BASS+
LF_BASS-
LR_SPEAKER-
RR_SPEAKER-
LR_SPEAKER+
RR_SPEAKER+
LS+
LS-
RS-
RS+
CENTRE +
CENTRE -
Speaker-Mid range-Front-LH (F169)
C0463R-50 C0439-50 GW,MUB
SJ218
GW,MUK C0369-1
C0463R-51 C0439-51 G,MUB
SJ217
G,MUK C0369-2
Speaker-High range-Front-LH (F165)
C0491-5 GW,MUU
C0491-13 G,MUU
G,MAQK C0530-1
GW,MAQK C0530-3
Speaker-Low range-Front door-LH (F134)
C0491-11 G,MUT
C0491-3 GW,MUT
C0463R-54 C0439-54 G,MUD C0688-2
C0463R-53 C0439-53 GW,MUD C0688-1
Speaker-Mid range-Rear-RH (F166)
C0436-23 C0804-23 GW,MUF
SJ204
GW,MUD C0310-1
C0436-22 C0804-22 G,MUF
SJ205
G,MUD C0310-2
RH rear high range speaker (F162)
C0491-2 GW,MUX
C0491-10 G,MUX
G,MAQA C0679-1
GW,MAQA C0679-3
RH rear surround sound speaker (F199)
C0491-6 GW,MAQC
C0491-14 G,MAQC
C0084R-11 C0610-11 GW,MUA C0309-1
C0084R-12 C0610-12 G,MUA C0309-2
+
-

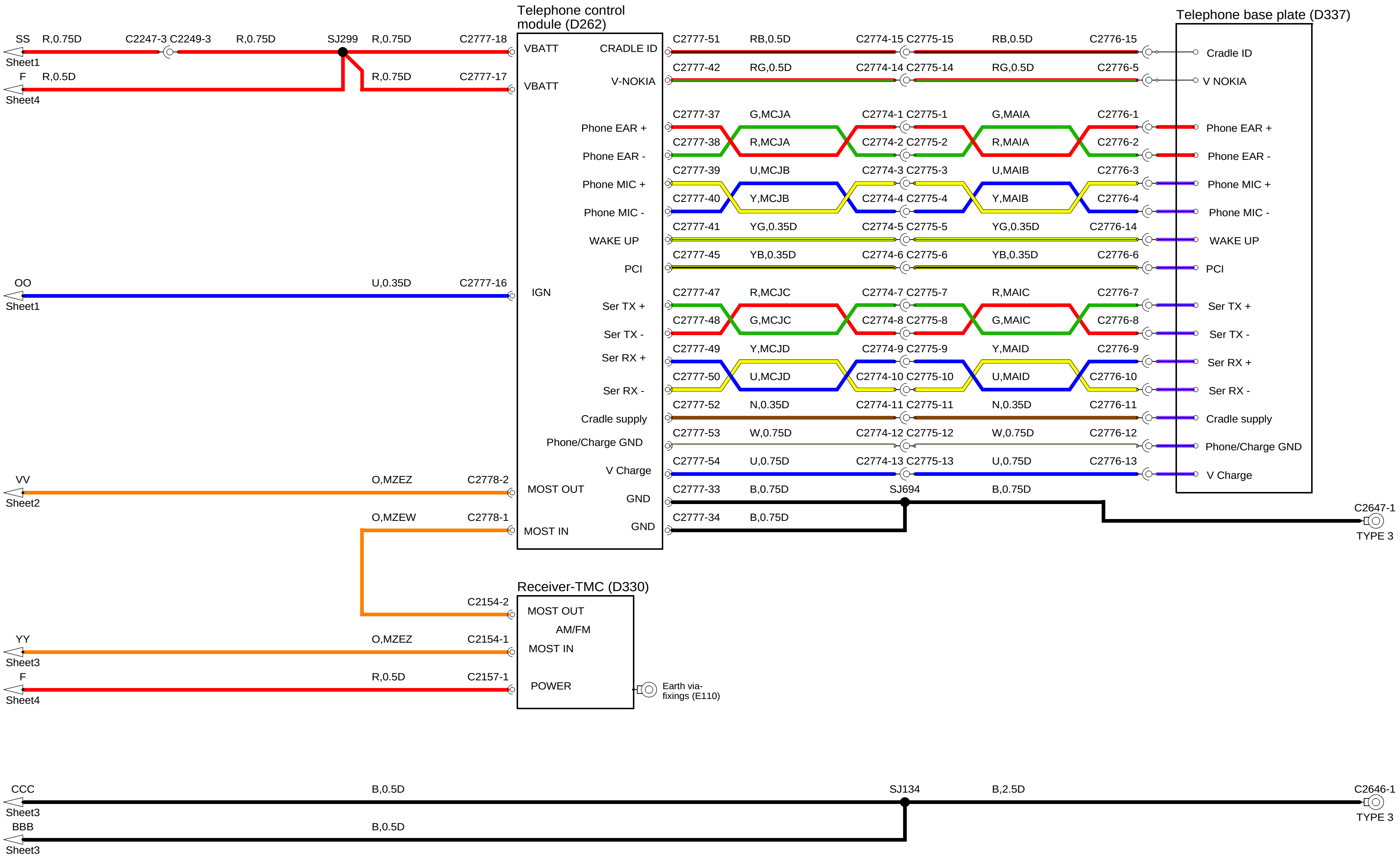

Receiver-VICS (T259)
Beacon-VICS (D356)
Navigation system module (D325)
EEE
U,0.5D
Sheet1
C2729-3 C2727-3
N,0.5D
SJ96
N,0.5D
C1453-3
POWER
C2221-1
R,0.5
Component : Coax 25
C2213-1
N,0.5D
C1453-4
POWER
C2225-1
P,0.5D
Component : Coax 24
C2728-1 C2730-1
R,SCR
Component : Coax 23
GGG
Sheet5
B,0.5D
C2729-4 C2727-4
B,0.5D
C1453-5
GND
SCR,MAAA
SCR,MZVA
C1453-7
G,MZVA
C2727-6 C2729-6
G,MZVA
C2114-8
H-GND
H-GND
C1453-6
Y,MZVA
C2727-5 C2729-5
W,MZVA
C2114-24
Mmm
H-BRQ
H-BRQ
C1453-2
R,MZVA
C2727-2 C2729-2
R,MZVA
C2114-9
H-TX-
H-TX-
C1453-1
U,MZVA
C2727-1 C2729-1
U,MZVA
C2114-25
H-TX+
H-TX+
BARE END
C2727-7 C2729-7
SJ695
CCC
B,0.5D
Sheet4
HHH
B,0.5D
Sheet4
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
BBB
B,0.5D
Sheet4
R
B,0.5D
Sheet6

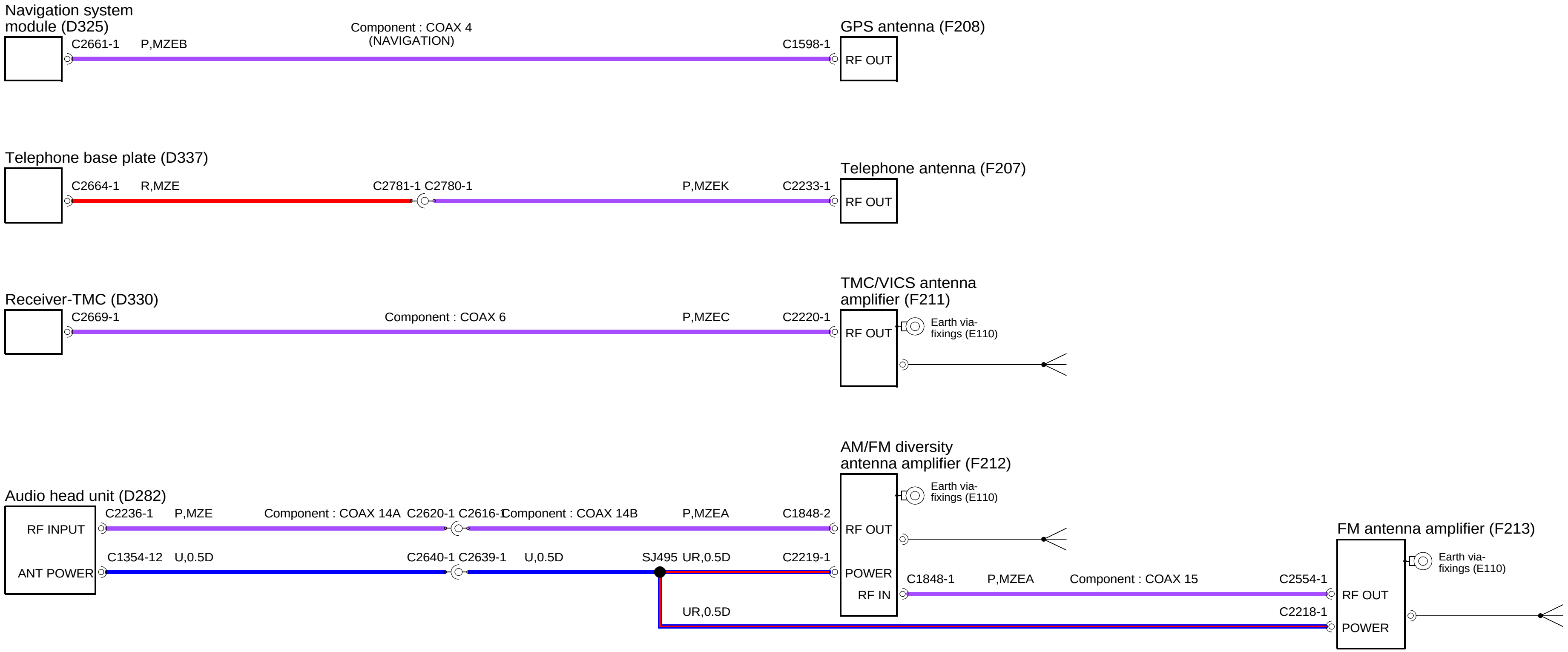

Screen-Rear seat-entertainment-LH (D351)
Rear seat entertainment module (D313)
Screen-Rear seat-entertainment-RH (D352)
SCR,MZZ
SCR,MZEH
SCR,MZEL
SCR,MZZ
B/L GND
C2493-1 R,MZZ C2953-1 C2952-1 R,MZEH C2955-1
C2490-1 R,MZEL C2951-1 C2953-1 R,MZZ C2493-1
B/L DC SUPPLY
C2493-2 U,MZZ C2953-2 C2952-2 U,MZEH C2955-2
C2490-2 U,MZEL C2951-2 C2953-2 U,MZZ C2493-2
+13V LCD SUPPLY
C2493-4 Y,MZZ C2953-3 C2952-3 Y,MZEH C2955-4
C2490-4 Y,MZEL C2951-3 C2953-3 Y,MZZ C2493-4
+6V LCD SUPPLY
C2493-6 N,MZZ C2953-5 C2952-5 N,MZEH C2955-6
C2490-6 N,MZEL C2951-5 C2953-5 N,MZZ C2493-6
-16V LCD SUPPLY
C2493-8 P,MZZ C2953-6 C2952-6 P,MZEH C2955-8
C2490-8 P,MZEL C2951-6 C2953-6 P,MZZ C2493-8
W,MZZ
W,MZEH
W,MZEL
W,MZZ
VIDEO COMP O/P
C2493-10 K,MZZ C2953-8 C2952-8 K,MZEH C2955-10
C2490-10 K,MZEL C2951-8 C2953-8 K,MZZ C2493-10
VIDEO COMP GND
C2493-9 C2953-7 C2952-7 C2955-9
C2490-9 C2951-7 C2953-7 C2493-9
BATT +12V
C2493-18 PG,MZZ C2953-13 C2952-13 PG,MZEH C2955-18
C2490-18 PG,MZEL C2951-13 C2953-15 PG,MZZ C2493-18
POWER GND
C2493-20 KG,MZZ C2953-4 C2952-4 KG,MZEH C2955-20
C2490-20 KG,MZEL C2951-4 C2953-16 KG,MZZ C2493-20
SCR,MZEZ
SCR,MZEH
SCR,MZEL
SCR,MZEZ
IS-BUS SIG +
C2493-11 RG,MZZ C2953-9 C2952-9 RG,MZEH C2955-11
C2490-11 RG,MZEL C2951-9 C2953-17 RG,MZZ C2493-11
IS-BUS SIG -
C2493-12 UG,MZZ C2953-10 C2952-10 UG,MZEH C2955-12
C2490-12 UG,MZEL C2951-10 C2953-18 UG,MZZ C2493-12
IS-BUS FRAME +
C2493-13 OG,MZZ C2953-11 C2952-11 OG,MZEH C2955-13
C2490-13 OG,MZEL C2951-11 C2953-19 OG,MZZ C2493-13
IS-BUS FRAME -
C2493-14 YG,MZZ C2953-12 C2952-12 YG,MZEH C2955-14
C2490-14 YG,MZEL C2951-12 C2953-20 YG,MZZ C2493-14
SHIELD GND
C2493-E C2953-14 C2952-14 C2955-21
C2490-21 C2951-14 C2953-21 C2493-E

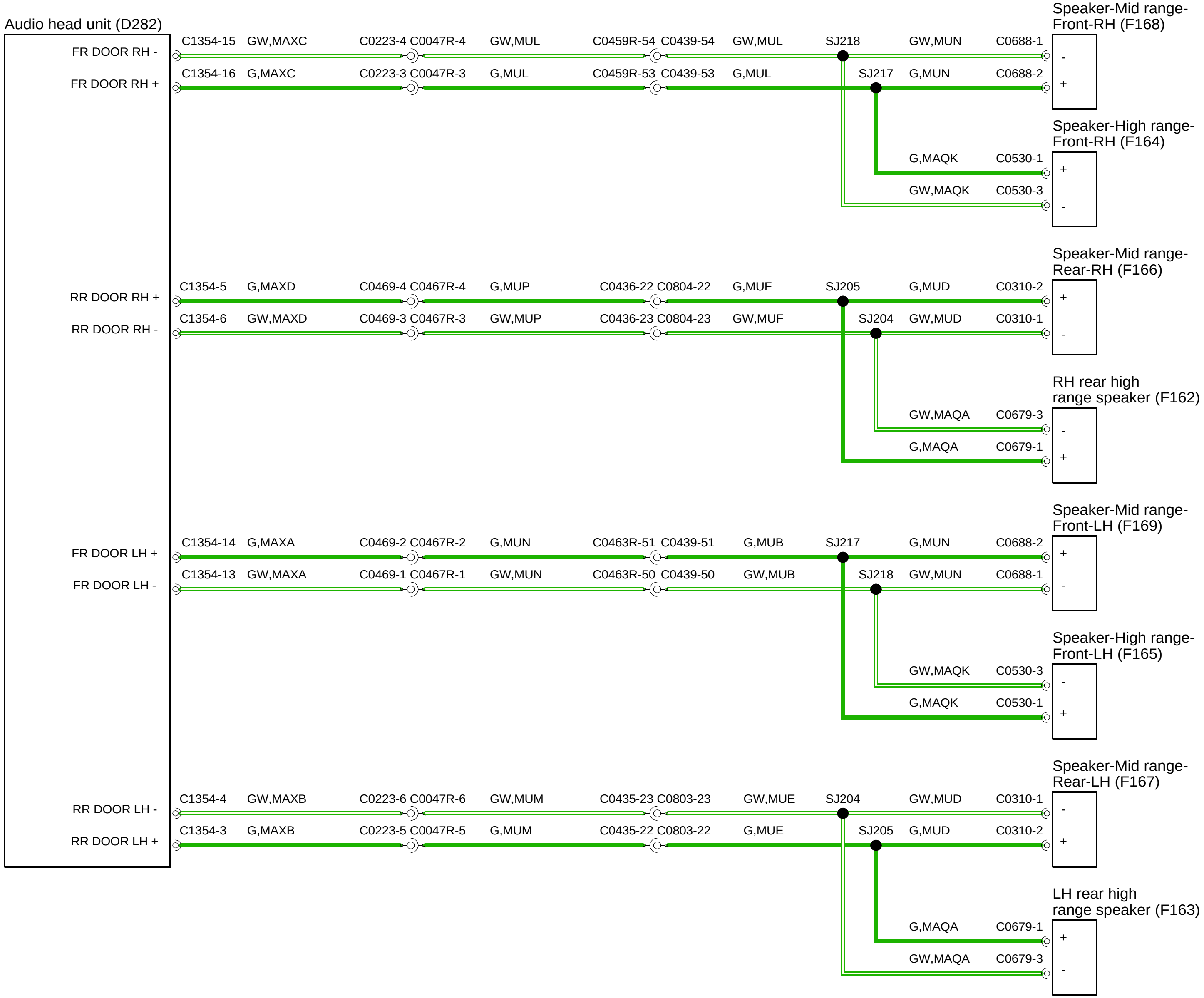

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
Audio head unit (D282)
SWS 1
GND
ENT CONTROL
BATT
C1354-18
SR,MAIA
C0082-4
C1354-7
SB,MAIA
C0082-7
Clock spring (S227)
C1254-5
Y,0.35
C2283-2
C1254-2
U,0.35
C2283-3
Module-Steering-wheel-LH (D256)
Volume - (Y278)
Volume + (Y277)
Channel-Up (Y279)
Channel-Down (Y280)
Phone -Send (Y281)
Phone-End (Y282)
Mode (Y283)
C1354-8
C1354-11
PU,1.5D
SJ131
PU,0.75D
C2247-12 C2249-12
PU,0.75D
P1
Sheet3
Central Junction Box (P101)
C0582-34
RU,0.5D
FUSE 53P
15.0 Amps
C0582-38
PU,1.5D
PU,0.75D
X
Sheet3
Relay-Infotainment (R249)
C0583R-22
FUSE 58P
10.0 Amps
C0582-13
U,1.0D
SJ998
U,0.5D
TT
Sheet3
U,0.75D
C2247-10 C2249-10
U,0.75D
SJ530
U,0.5D
M
Sheet3
U,0.35D
OO
Sheet4
FUSE 52P
5.0 Amps
C0582-41
R,0.75D
SS
Sheet4

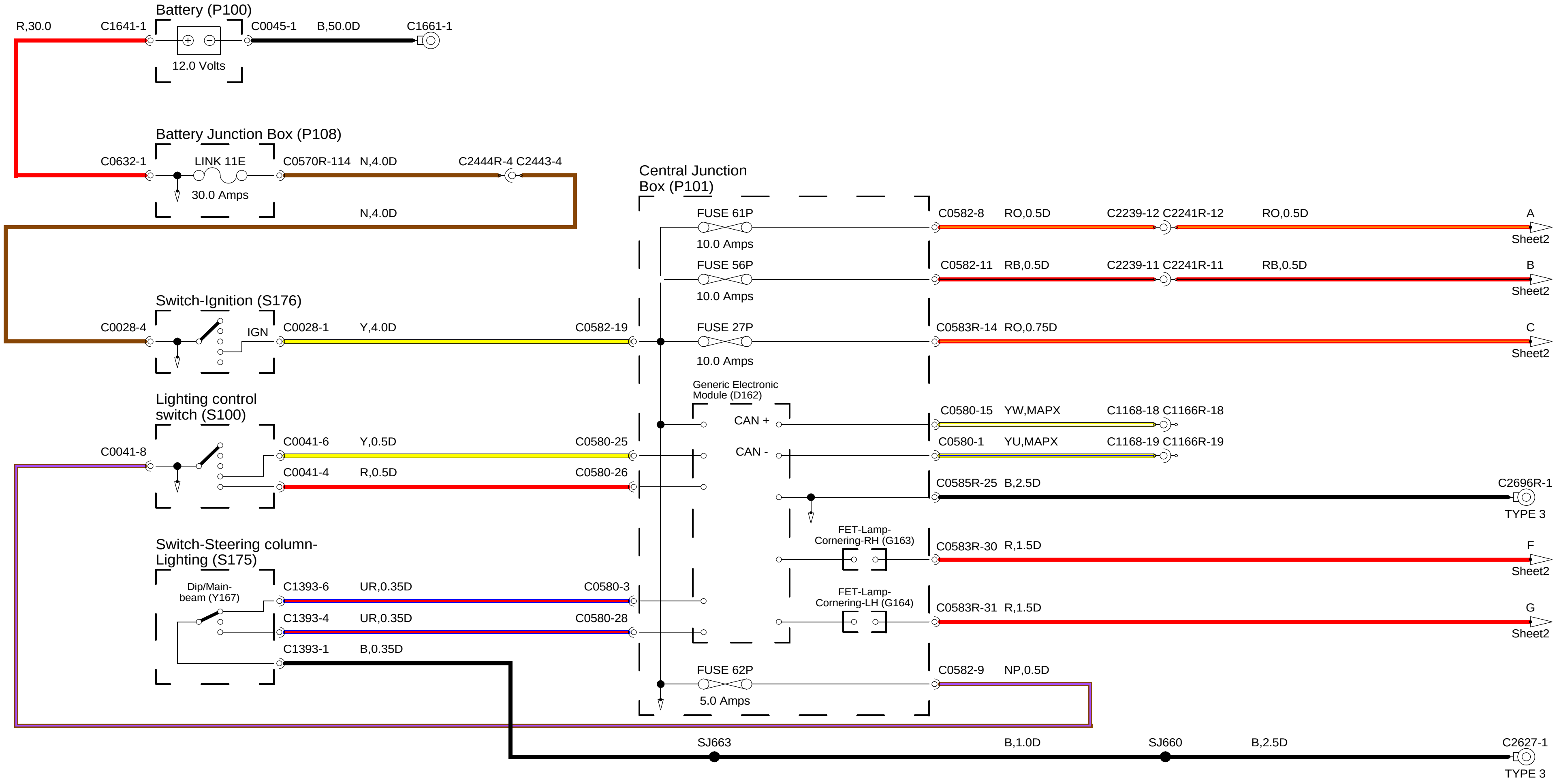

SCR,MQB
Audio head unit (D282)
(NAV)
C2249-14 C2247-14
R,MQB
C2115-2
+
L
R
-
-VE
MOST OUT
SCR
GND
CAN -
GND
CAN +
MOST IN
SCR,MQC
SCR,MQH
SCR,MQA
AV input panel (D346)
C2115-8
R,MQC
C0223-12 C0047R-12
R,MQH
C2053-13 C2054-13
R,MQA
C2831-4
C2115-7
U,MQC
C0223-10 C0047R-10
U,MQH
C2053-14 C2054-14
U,MQA
C2831-3
C2115-6
C0223-11 C0047R-11
C2053-15 C2054-15
C2831-2
GND
C2249-15 C2247-15
B,MQB
C2115-4
(NAV)
C2105-2
O,MZE
HH
Sheet3
C2249-16 C2247-16
C2115-1
(NAV)
C2115-12
B,0.5D
C2626-1
TYPE 3
SJ975
YU,MAPZ
C1354-10
C1354-1
B,1.5D
SJ520
B,0.75D
C2640-2 C2639-2
B,0.75D
SJ521
B,1.5D
C2645-1
TYPE 3
SJ965
YW,MAPZ
C1354-9
B,0.75D
C2640-3 C2639-3
B,0.75D
C2105-1
O,MZE
C2867-2 C2972-2
O,MZEZ
VV
Sheet4
SCR,MQC
SJ693
SCR,MQA
MM
Sheet3
B,MQC
SJ692
B,MQA
LL
Sheet3
R,MQC
SJ691
R,MQA
KK
Sheet3
Lamp-Interior-Front (B100)
(NAV)
SCR,MQB
C0395-4 C0981-4
SCR,MANT
C0084R-19 C0610-19
SCR,MQB
Microphone-Telephone (F172)
(NO NAV)
SCR,MQE
B,MANT
C0084R-17 C0610-17
B,MQB
C1462-1
MIC -
(NAV)
B,MQB
C0395-2 C0981-2
R,MANT
C0084R-18 C0610-18
R,MQB
C1462-2
MIC +
(NO NAV)
B,MQE
(NAV)
R,MQB
C0395-3 C0981-3
(NO NAV)
R,MQE

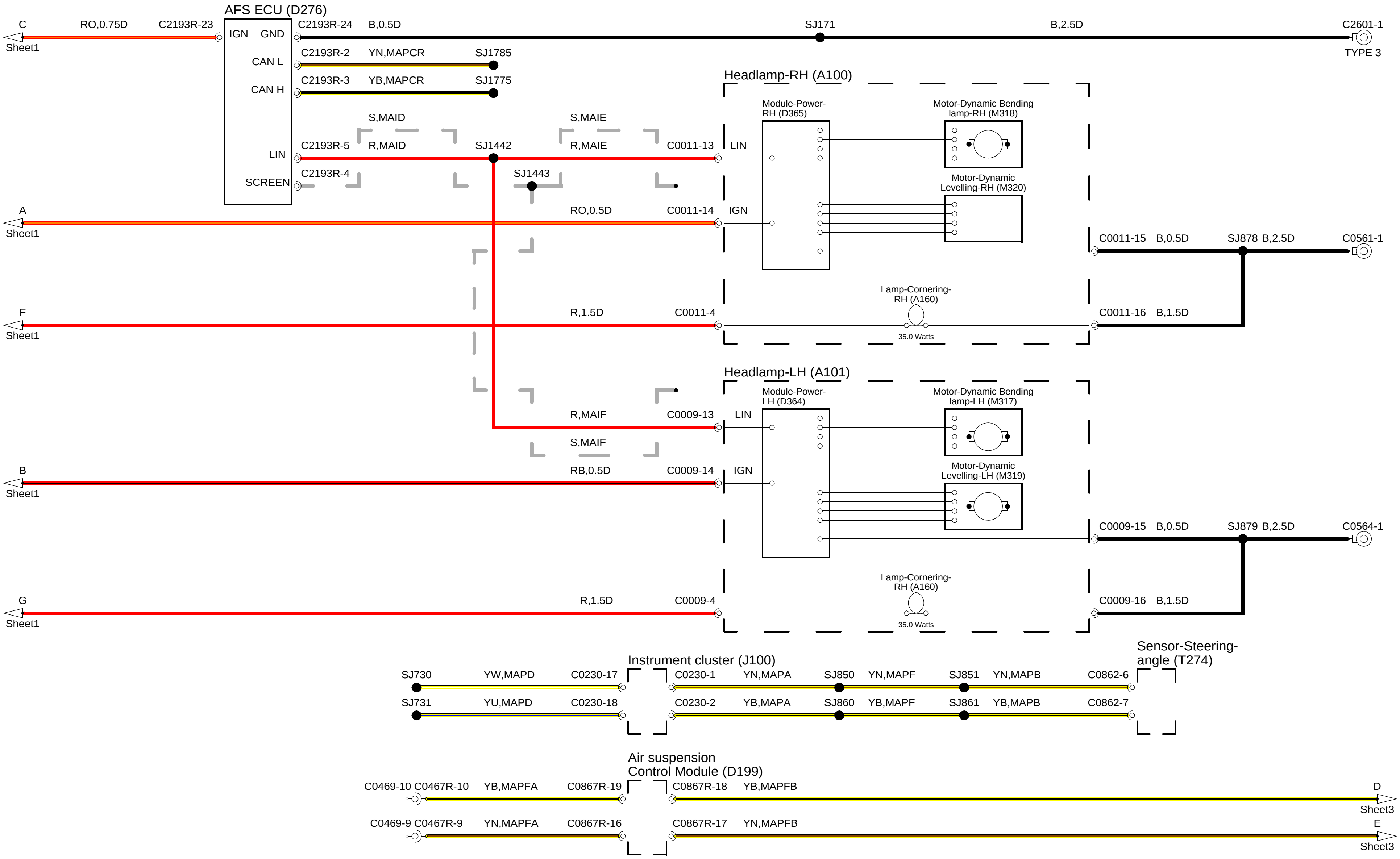

Touch screen display (D326)
BBB
Sheet4
B,0.5D
C2249-2 C2247-2
B,0.5D
SJ590
B,0.5D
C2819-2
GND
B,0.5D
C2819-3
GND
YY
Sheet4
O,MZEZ
C2972-1 C2867-1
O,MZE
C2825-2
MOST OUT
HH
Sheet2
O,MZE
C2825-1
MOST IN
X
Sheet1
PU,0.75D
C2819-1
BAT
TT
Sheet1
U,0.5D
C2819-11
POWER
DISPLAY
C2822-1
VIDEO
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C2819-12
DIMMING
ABS module (D277)
C0506R-33
G,0.5D
C2245R-15 C2243R-15
C0395-1 C0981-1
G,0.5D
Navigation system module (D325)
G,0.5D
C2114-21
VEHICLE SPEED
AUDIO GND
C2114-31
SCR,MQD
C2249-7 C2247-7
SCR,MQA
C2819-6
AUDIO GND
M
Sheet1
U,0.5D
C2114-18
POWER
AUDIO -
C2114-14
Y,MQD
C2249-8 C2247-8
Y,MQA
C2819-7
AUDIO -
MMM
AUDIO +
C2114-30
G,MQD
C2249-9 C2247-9
G,MQA
C2819-17
AUDIO +
GVIF +
C2113-1
R,MZEG
C2577-1 C2576-1
R,MZE
C2731-1
GVIF +
GVIF -
C2113-2
G,MZEG
C2577-2 C2576-2
G,MZE
C2731-2
GVIF -
P1
Sheet1
PU,0.75D
C2114-17
VBATT
GVIF SHIELD
C2113-3
SCR,MZEG
C2577-3 C2576-3
SCR,MZE
C2731-3
GVIF SHIELD
KK
Sheet2
R,MQA
C2114-32
MIC +
PRIVATE CAN H
C2114-22
Y,MAPA
C2249-5 C2247-5
Y,MAPDD
C2819-14
CAN H
LL
Sheet2
B,MQA
C2114-16
MIC -
PRIVATE CAN L
C2114-6
G,MAPA
C2249-4 C2247-4
G,MAPDD
C2819-15
CAN L
MM
Sheet2
SCR,MQA
C2114-15
MIC SCR
GND
C2114-3
B,0.5D
SJ695
B,0.5D
CCC
Sheet4
GND
C2114-19
B,0.5D

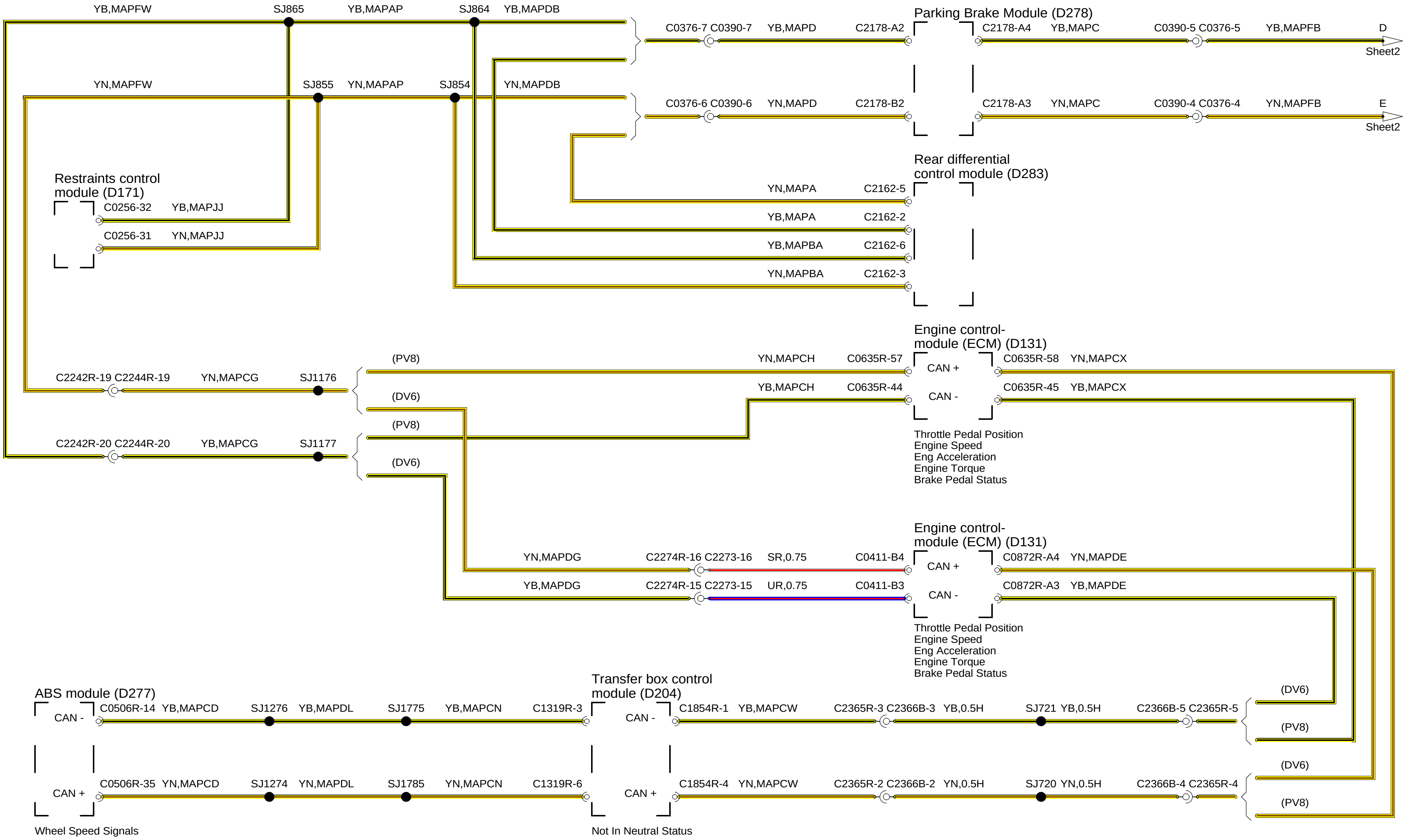

Telephone control module (D262)
Telephone base plate (D337)
SS
Sheet1
R,0.75D
C2247-3 C2249-3
R,0.75D
SJ299
R,0.75D
C2777-18
F
R,0.5D
Sheet4
R,0.75D
C2777-17
VBATT
VBATT
CRADLE ID
V-NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE UP
PCI
IGN
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
MOST OUT
GND
MOST IN
GND
C2777-51
RB,0.5D
C2774-15 C2775-15
RB,0.5D
C2776-15
C2777-42
RG,0.5D
C2774-14 C2775-14
RG,0.5D
C2776-5
C2777-37
G,MCJA
C2774-1 C2775-1
G,MAIA
C2776-1
C2777-38
R,MCJA
C2774-2 C2775-2
R,MAIA
C2776-2
C2777-39
U,MCJB
C2774-3 C2775-3
U,MAIB
C2776-3
C2777-40
Y,MCJB
C2774-4 C2775-4
Y,MAIB
C2776-4
C2777-41
YG,0.35D
C2774-5 C2775-5
YG,0.35D
C2776-14
C2777-45
YB,0.35D
C2774-6 C2775-6
YB,0.35D
C2776-6
C2777-47
R,MCJC
C2774-7 C2775-7
R,MAIC
C2776-7
C2777-48
G,MCJC
C2774-8 C2775-8
G,MAIC
C2776-8
C2777-49
Y,MCJD
C2774-9 C2775-9
Y,MAID
C2776-9
C2777-50
U,MCJD
C2774-10 C2775-10
U,MAID
C2776-10
C2777-52
N,0.35D
C2774-11 C2775-11
N,0.35D
C2776-11
C2777-53
W,0.75D
C2774-12 C2775-12
W,0.75D
C2776-12
C2777-54
U,0.75D
C2774-13 C2775-13
U,0.75D
C2776-13
C2777-33
B,0.75D
SJ694
B,0.75D
C2777-34
B,0.75D
C2647-1
TYPE 3
Cradle ID
V NOKIA
Phone EAR +
Phone EAR -
Phone MIC +
Phone MIC -
WAKE UP
PCI
Ser TX +
Ser TX -
Ser RX +
Ser RX -
Cradle supply
Phone/Charge GND
V Charge
OO
Sheet1
U,0.35D
C2777-16
VV
Sheet2
O,MZEZ
C2778-2
O,MZEW
C2778-1
Receiver-TMC (D330)
C2154-2
MOST OUT
AM/FM
MOST IN
POWER
Earth via-
fixings (E110)
YY
Sheet3
O,MZEZ
C2154-1
F
Sheet4
R,0.5D
C2157-1
CCC
Sheet3
B,0.5D
SJ134
B,2.5D
C2646-1
TYPE 3
BBB
Sheet3
B,0.5D

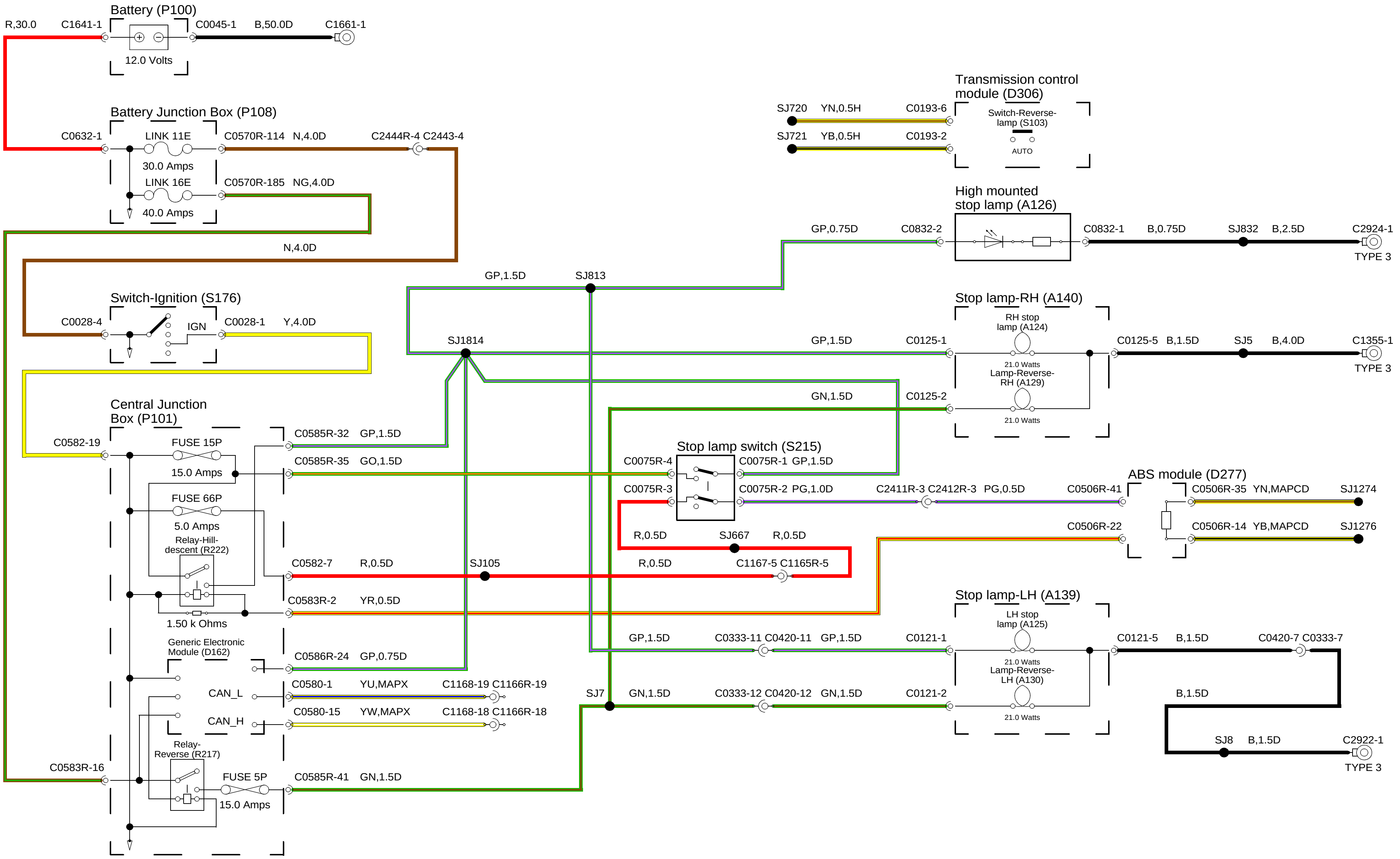

Navigation system module (D325)
C2661-1
P,MZEB
Component : COAX 4 (NAVIGATION)
C1598-1
GPS antenna (F208)
RF OUT
Telephone base plate (D337)
C2664-1
R,MZE
C2781-1 C2780-1
P,MZEK
C2233-1
Telephone antenna (F207)
RF OUT
Receiver-TMC (D330)
C2669-1
Component : COAX 6
P,MZEC
C2220-1
TMC/VICS antenna amplifier (F211)
RF OUT
Earth via-fixings (E110)
AM/FM diversity antenna amplifier (F212)
Earth via-fixings (E110)
Audio head unit (D282)
RF INPUT
ANT POWER
C2236-1
P,MZE
Component : COAX 14A
C2620-1 C2616-1
Component : COAX 14B
P,MZEA
C1848-2
RF OUT
C1354-12
U,0.5D
C2640-1 C2639-1
U,0.5D
SJ495
UR,0.5D
C2219-1
POWER
RF IN
C1848-1
P,MZEA
Component : COAX 15
C2554-1
UR,0.5D
C2218-1
FM antenna amplifier (F213)
Earth via-fixings (E110)
RF OUT
POWER

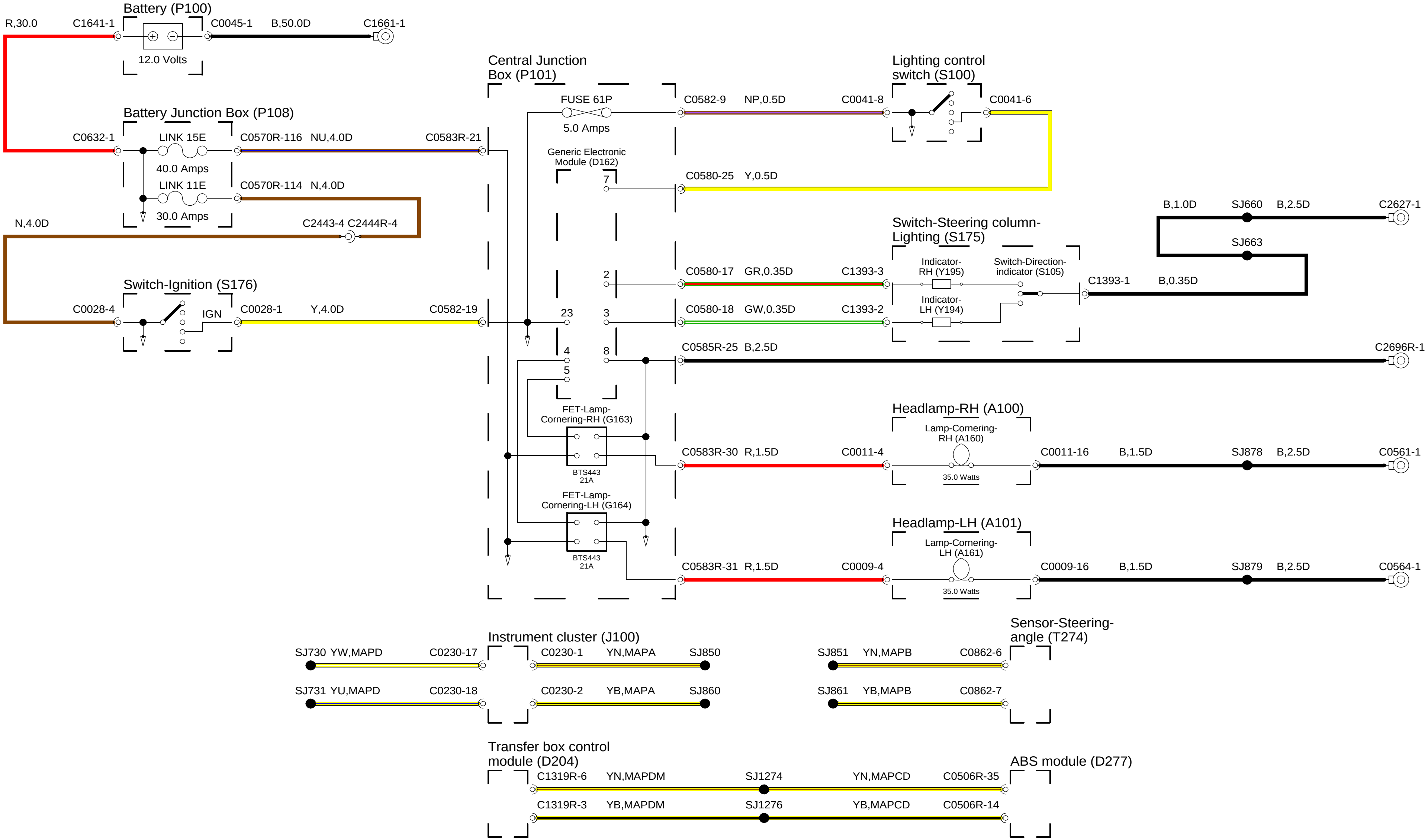

Audio head unit (D282)
FR DOOR RH -
FR DOOR RH +
RR DOOR RH +
RR DOOR RH -
FR DOOR LH +
FR DOOR LH -
RR DOOR LH -
RR DOOR LH +
C1354-15 GW,MAXC C0223-4 C0047R-4 GW,MUL C0459R-54 C0439-54 GW,MUL SJ218 GW,MUN C0688-1
C1354-16 G,MAXC C0223-3 C0047R-3 G,MUL C0459R-53 C0439-53 G,MUL SJ217 G,MUN C0688-2
Speaker-Mid range-Front-RH (F168)
-
+
Speaker-High range-Front-RH (F164)
G,MAQK C0530-1
GW,MAQK C0530-3
+
-
C1354-5 G,MAXD C0469-4 C0467R-4 G,MUP C0436-22 C0804-22 G,MUF SJ205 G,MUD C0310-2
C1354-6 GW,MAXD C0469-3 C0467R-3 GW,MUP C0436-23 C0804-23 GW,MUF SJ204 GW,MUD C0310-1
Speaker-Mid range-Rear-RH (F166)
+
-
RH rear high range speaker (F162)
GW,MAQA C0679-3
G,MAQA C0679-1
-
+
C1354-14 G,MAXA C0469-2 C0467R-2 G,MUN C0463R-51 C0439-51 G,MUB SJ217 G,MUN C0688-2
C1354-13 GW,MAXA C0469-1 C0467R-1 GW,MUN C0463R-50 C0439-50 GW,MUB SJ218 GW,MUN C0688-1
Speaker-Mid range-Front-LH (F169)
+
-
Speaker-High range-Front-LH (F165)
GW,MAQK C0530-3
G,MAQK C0530-1
-
+
C1354-4 GW,MAXB C0223-6 C0047R-6 GW,MUM C0435-23 C0803-23 GW,MUE SJ204 GW,MUD C0310-1
C1354-3 G,MAXB C0223-5 C0047R-5 G,MUM C0435-22 C0803-22 G,MUE SJ205 G,MUD C0310-2
Speaker-Mid range-Rear-LH (F167)
-
+
LH rear high range speaker (F163)
G,MAQA C0679-1
GW,MAQA C0679-3
+
-

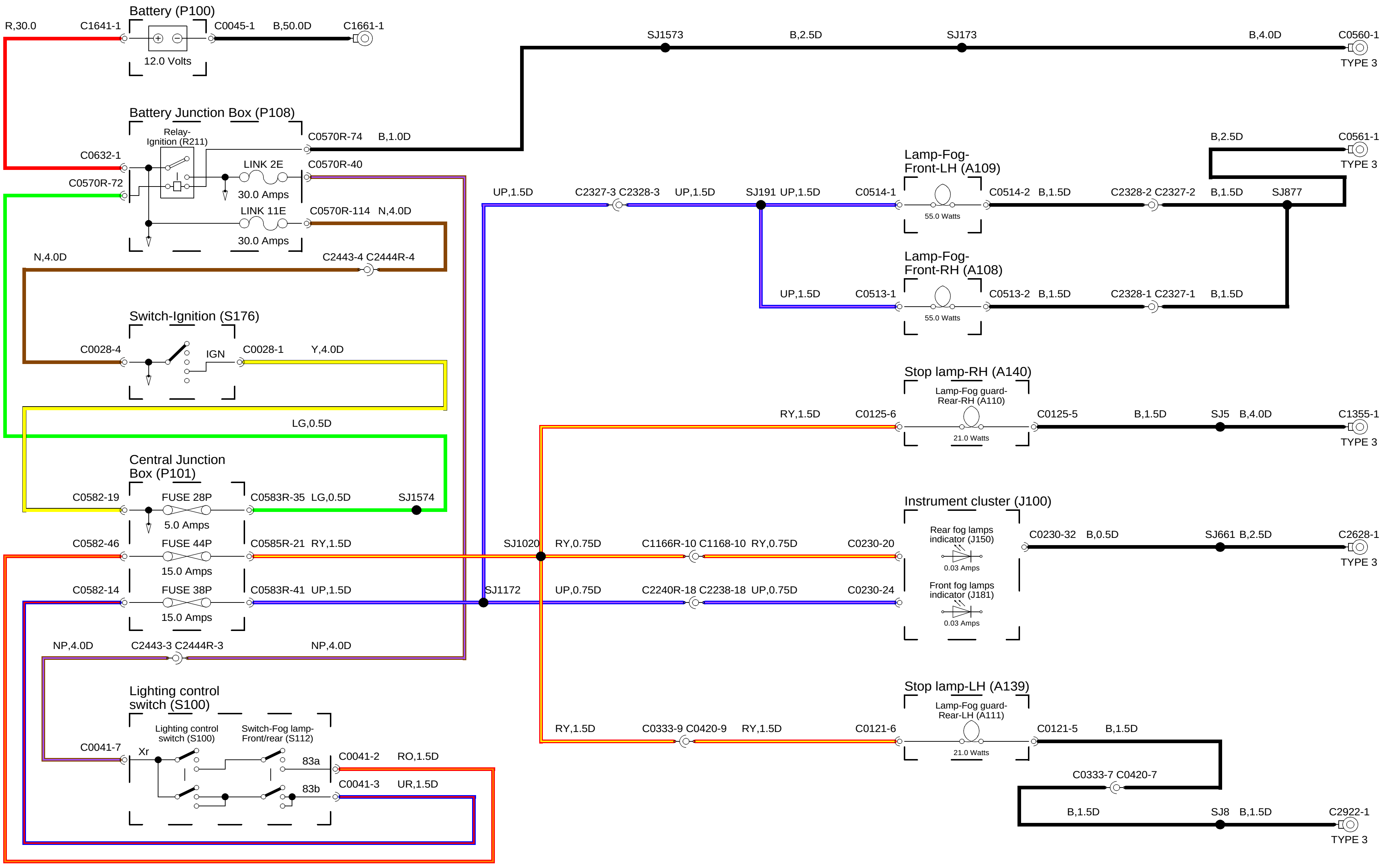

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Central Junction Box (P101)
FUSE 61P
10.0 Amps
C0582-8
RO,0.5D
C2239-12 C2241R-12
RO,0.5D
A
Sheet2
FUSE 56P
10.0 Amps
C0582-11
RB,0.5D
C2239-11 C2241R-11
RB,0.5D
B
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
FUSE 27P
10.0 Amps
C0583R-14
RO,0.75D
C
Sheet2
Generic Electronic Module (D162)
CAN +
CAN -
C0580-15
YW,MAPX
C1168-18 C1166R-18
C0580-1
YU,MAPX
C1168-19 C1166R-19
Lighting control switch (S100)
C0041-8
C0041-6
Y,0.5D
C0580-25
C0041-4
R,0.5D
C0580-26
C0585R-25
B,2.5D
C2696R-1
TYPE 3
FET-Lamp-Cornering-RH (G163)
C0583R-30
R,1.5D
F
Sheet2
Switch-Steering column-Lighting (S175)
Dip/Main-beam (Y167)
C1393-6
UR,0.35D
C0580-3
FET-Lamp-Cornering-LH (G164)
C0583R-31
R,1.5D
G
Sheet2
C1393-4
UR,0.35D
C0580-28
C1393-1
B,0.35D
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3

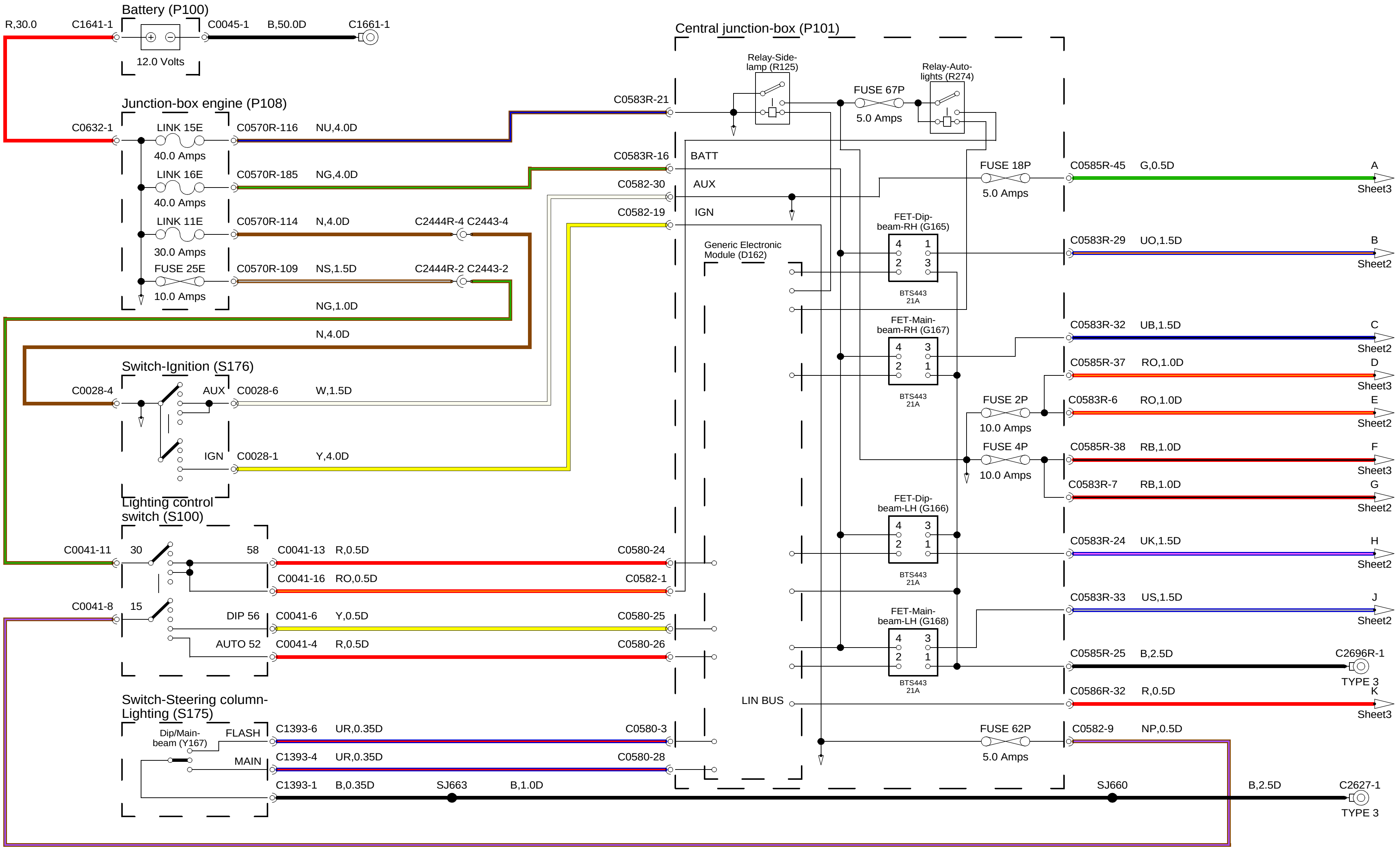

AFS ECU (D276)
C
Sheet1
RO,0.75D
C2193R-23
IGN
GND
C2193R-24
B,0.5D
SJ171
B,2.5D
C2601-1
TYPE 3
CAN L
C2193R-2
YN,MAPCR
SJ1785
CAN H
C2193R-3
YB,MAPCR
SJ1775
Headlamp-RH (A100)
Module-Power-RH (D365)
Motor-Dynamic Bending lamp-RH (M318)
S,MAID
S,MAIE
LIN
C2193R-5
R,MAID
SJ1442
R,MAIE
C0011-13
LIN
SCREEN
C2193R-4
SJ1443
Motor-Dynamic Levelling-RH (M320)
A
Sheet1
RO,0.5D
C0011-14
IGN
C0011-15
B,0.5D
SJ878
B,2.5D
C0561-1
Lamp-Cornering-RH (A160)
F
Sheet1
R,1.5D
C0011-4
35.0 Watts
C0011-16
B,1.5D
Headlamp-LH (A101)
Module-Power-LH (D364)
Motor-Dynamic Bending lamp-LH (M317)
R,MAIF
C0009-13
LIN
S,MAIF
Motor-Dynamic Levelling-LH (M319)
B
Sheet1
RB,0.5D
C0009-14
IGN
C0009-15
B,0.5D
SJ879
B,2.5D
C0564-1
Lamp-Cornering-RH (A160)
G
Sheet1
R,1.5D
C0009-4
35.0 Watts
C0009-16
B,1.5D
Instrument cluster (J100)
Sensor-Steering-angle (T274)
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
YN,MAPF
SJ851
YN,MAPB
C0862-6
SJ731
YU,MAPD
C0230-18
C0230-2
YB,MAPA
SJ860
YB,MAPF
SJ861
YB,MAPB
C0862-7
Air suspension Control Module (D199)
C0469-10 C0467R-10
YB,MAPFA
C0867R-19
C0867R-18
YB,MAPFB
D
Sheet3
C0469-9 C0467R-9
YN,MAPFA
C0867R-16
C0867R-17
YN,MAPFB
E
Sheet3

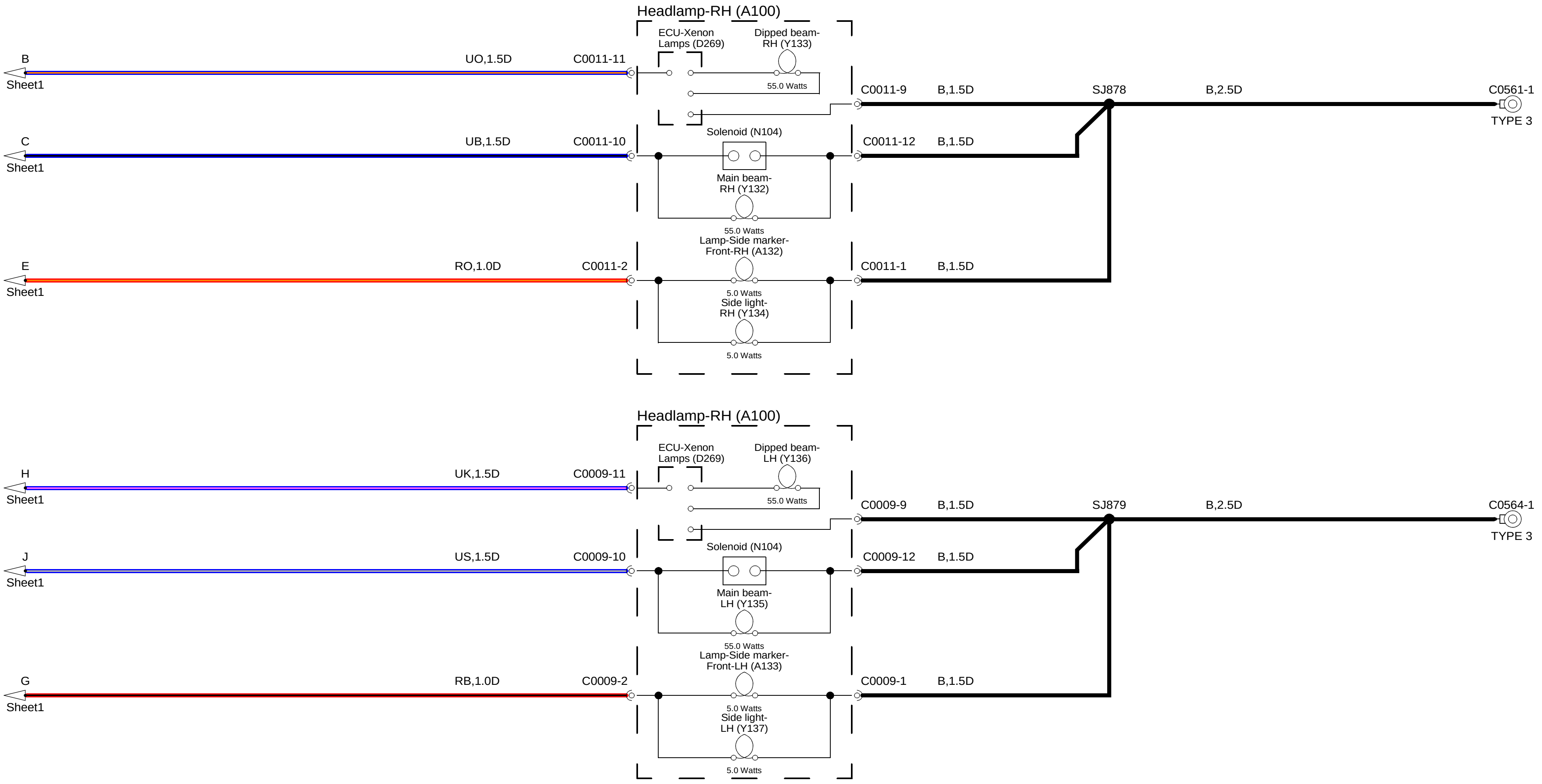

YB,MAPFW
SJ865
YB,MAPAP
SJ864
YB,MAPDB
Parking Brake Module (D278)
C0376-7 C0390-7
YB,MAPD
C2178-A2
C2178-A4
YB,MAPC
C0390-5 C0376-5
YB,MAPFB
D
Sheet2
YN,MAPFW
SJ855
YN,MAPAP
SJ854
YN,MAPDB
C0376-6 C0390-6
YN,MAPD
C2178-B2
C2178-A3
YN,MAPC
C0390-4 C0376-4
YN,MAPFB
E
Sheet2
Rear differential control module (D283)
Restraints control module (D171)
C0256-32
YB,MAPJJ
C0256-31
YN,MAPJJ
YN,MAPA
C2162-5
YB,MAPA
C2162-2
YB,MAPBA
C2162-6
YN,MAPBA
C2162-3
Engine control-module (ECM) (D131)
(PV8)
YN,MAPCH
C0635R-57
CAN +
C0635R-58
YN,MAPCX
C2242R-19 C2244R-19
YN,MAPCG
SJ1176
(DV6)
YB,MAPCH
C0635R-44
CAN -
C0635R-45
YB,MAPCX
(PV8)
C2242R-20 C2244R-20
YB,MAPCG
SJ1177
(DV6)
Throttle Pedal Position
Engine Speed
Eng Acceleration
Engine Torque
Brake Pedal Status
Engine control-module (ECM) (D131)
YN,MAPDG
C2274R-16 C2273-16
SR,0.75
C0411-B4
CAN +
C0872R-A4
YN,MAPDE
YB,MAPDG
C2274R-15 C2273-15
UR,0.75
C0411-B3
CAN -
C0872R-A3
YB,MAPDE
Throttle Pedal Position
Engine Speed
Eng Acceleration
Engine Torque
Brake Pedal Status
ABS module (D277)
CAN -
C0506R-14
YB,MAPCD
SJ1276
YB,MAPDL
SJ1775
YB,MAPCN
C1319R-3
Transfer box control module (D204)
CAN -
C1854R-1
YB,MAPCW
C2365R-3 C2366B-3
YB,0.5H
SJ721
YB,0.5H
C2366B-5 C2365R-5
(DV6)
(PV8)
CAN +
C0506R-35
YN,MAPCD
SJ1274
YN,MAPDL
SJ1785
YN,MAPCN
C1319R-6
CAN +
C1854R-4
YN,MAPCW
C2365R-2 C2366B-2
YN,0.5H
SJ720
YN,0.5H
C2366B-4 C2365R-4
(DV6)
(PV8)
Wheel Speed Signals
Not In Neutral Status

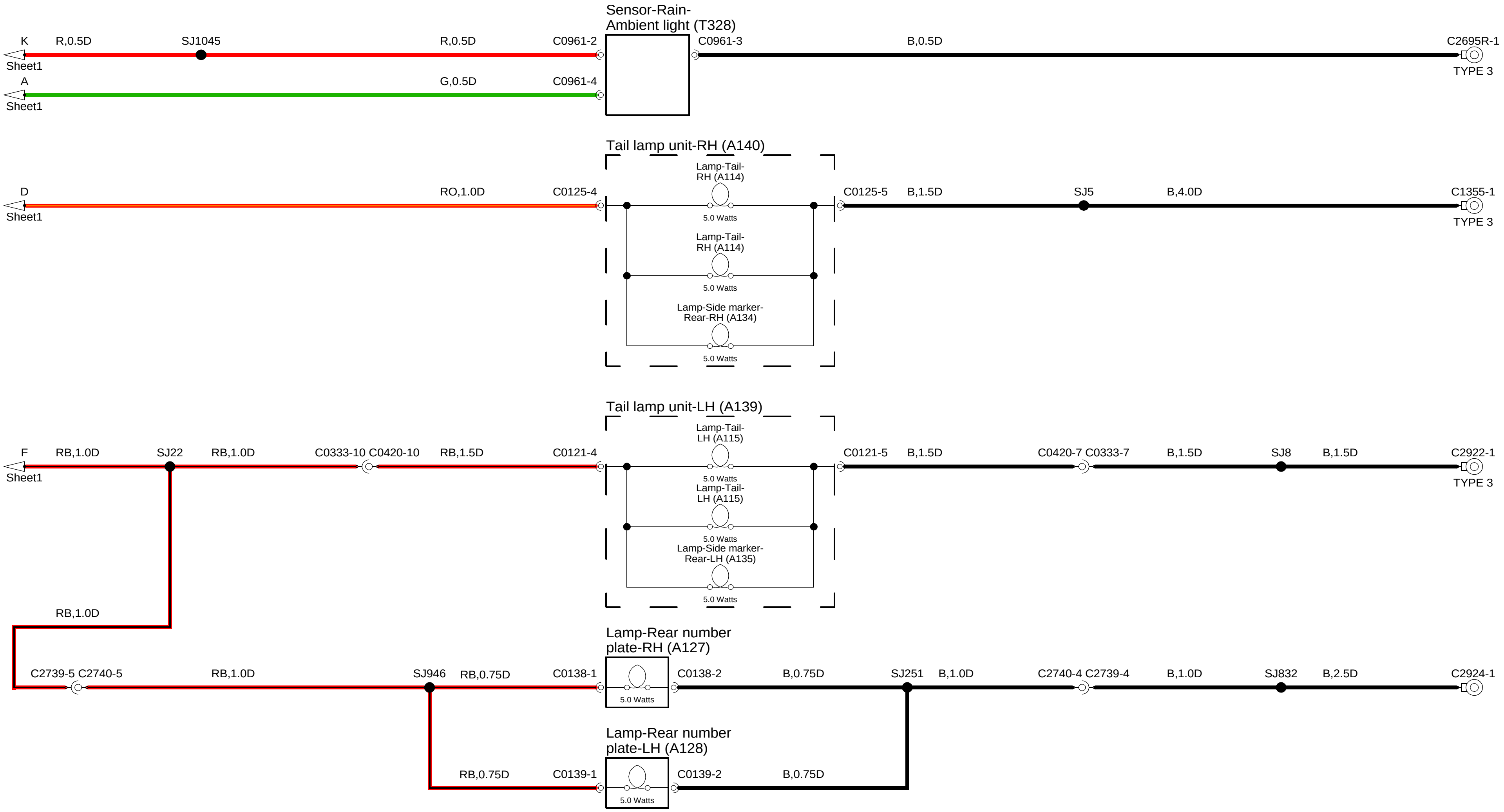

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 16E
40.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
C0570R-185
NG,4.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 15P
15.0 Amps
FUSE 66P
5.0 Amps
Relay-Hill-descent (R222)
1.50 k Ohms
Generic Electronic Module (D162)
CAN_L
CAN_H
Relay-Reverse (R217)
C0583R-16
FUSE 5P
15.0 Amps
C0585R-32
GP,1.5D
C0585R-35
GO,1.5D
C0582-7
R,0.5D
SJ105
C0583R-2
YR,0.5D
C0586R-24
GP,0.75D
C0580-1
YU,MAPX
C1168-19 C1166R-19
C0580-15
YW,MAPX
C1168-18 C1166R-18
C0585R-41
GN,1.5D
SJ7
GP,1.5D
SJ813
SJ1814
Transmission control module (D306)
SJ720
YN,0.5H
C0193-6
SJ721
YB,0.5H
C0193-2
Switch-Reverse-lamp (S103)
AUTO
High mounted stop lamp (A126)
GP,0.75D
C0832-2
C0832-1
B,0.75D
SJ832
B,2.5D
C2924-1
TYPE 3
Stop lamp-RH (A140)
RH stop lamp (A124)
21.0 Watts
Lamp-Reverse-RH (A129)
21.0 Watts
GP,1.5D
C0125-1
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
GN,1.5D
C0125-2
Stop lamp switch (S215)
C0075R-4
C0075R-1
GP,1.5D
C0075R-3
C0075R-2
PG,1.0D
C2411R-3 C2412R-3
PG,0.5D
C0506R-41
ABS module (D277)
C0506R-35
YN,MAPCD
SJ1274
C0506R-22
C0506R-14
YB,MAPCD
SJ1276
R,0.5D
SJ667
R,0.5D
R,0.5D
C1167-5 C1165R-5
Stop lamp-LH (A139)
LH stop lamp (A125)
21.0 Watts
Lamp-Reverse-LH (A130)
21.0 Watts
GP,1.5D
C0333-11 C0420-11
GP,1.5D
C0121-1
C0121-5
B,1.5D
C0420-7 C0333-7
GN,1.5D
C0333-12 C0420-12
GN,1.5D
C0121-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3

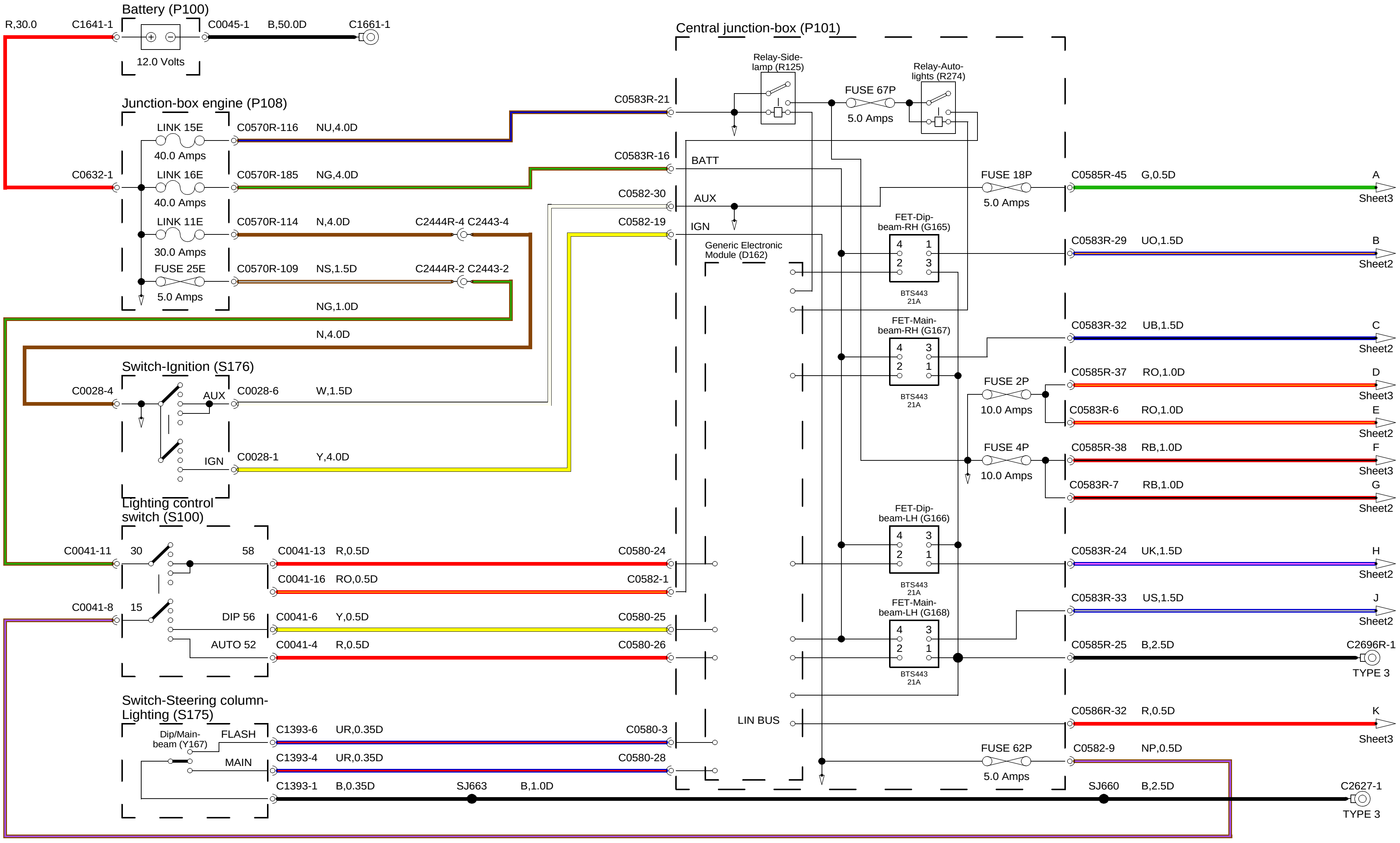

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central Junction Box (P101)
Lighting control switch (S100)
Battery Junction Box (P108)
FUSE 61P
5.0 Amps
C0582-9
NP,0.5D
C0041-8
C0041-6
C0632-1
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0583R-21
Generic Electronic Module (D162)
7
C0580-25
Y,0.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
B,1.0D
SJ660
B,2.5D
C2627-1
Switch-Steering column-Lighting (S175)
SJ663
Indicator-RH (Y195)
Switch-Direction-indicator (S105)
2
C0580-17
GR,0.35D
C1393-3
C1393-1
B,0.35D
Switch-Ignition (S176)
Indicator-LH (Y194)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
23
3
C0580-18
GW,0.35D
C1393-2
4
8
C0585R-25
B,2.5D
C2696R-1
5
FET-Lamp-Cornering-RH (G163)
Headlamp-RH (A100)
Lamp-Cornering-RH (A160)
C0583R-30
R,1.5D
C0011-4
C0011-16
B,1.5D
SJ878
B,2.5D
C0561-1
BTS443 21A
35.0 Watts
FET-Lamp-Cornering-LH (G164)
Headlamp-LH (A101)
Lamp-Cornering-LH (A161)
BTS443 21A
C0583R-31
R,1.5D
C0009-4
C0009-16
B,1.5D
SJ879
B,2.5D
C0564-1
35.0 Watts
Instrument cluster (J100)
Sensor-Steering-angle (T274)
SJ730
YW,MAPD
C0230-17
C0230-1
YN,MAPA
SJ850
SJ851
YN,MAPB
C0862-6
SJ731
YU,MAPD
C0230-18
C0230-2
YB,MAPA
SJ860
SJ861
YB,MAPB
C0862-7
Transfer box control module (D204)
ABS module (D277)
C1319R-6
YN,MAPDM
SJ1274
YN,MAPCD
C0506R-35
C1319R-3
YB,MAPDM
SJ1276
YB,MAPCD
C0506R-14

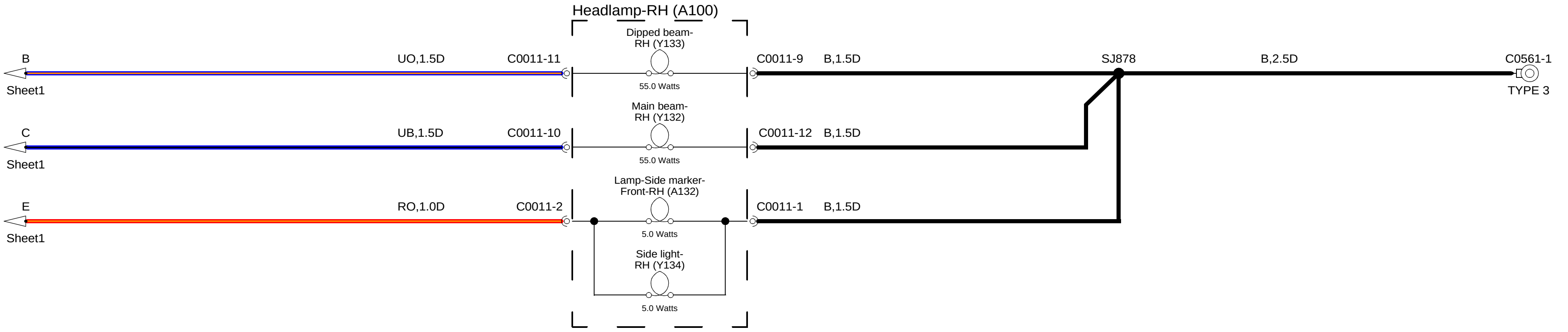

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ1573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Battery Junction Box (P108)
Relay-Ignition (R211)
C0570R-74
B,1.0D
C0632-1
LINK 2E
C0570R-40
C0570R-72
30.0 Amps
LINK 11E
C0570R-114
N,4.0D
30.0 Amps
N,4.0D
C2443-4 C2444R-4
B,2.5D
C0561-1
TYPE 3
Lamp-Fog-Front-LH (A109)
UP,1.5D
C2327-3 C2328-3
UP,1.5D
SJ191
UP,1.5D
C0514-1
C0514-2
B,1.5D
C2328-2 C2327-2
B,1.5D
SJ877
55.0 Watts
Lamp-Fog-Front-RH (A108)
UP,1.5D
C0513-1
C0513-2
B,1.5D
C2328-1 C2327-1
B,1.5D
55.0 Watts
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Stop lamp-RH (A140)
Lamp-Fog guard-Rear-RH (A110)
RY,1.5D
C0125-6
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
21.0 Watts
TYPE 3
LG,0.5D
Central Junction Box (P101)
C0582-19
FUSE 28P
C0583R-35
LG,0.5D
SJ1574
5.0 Amps
Instrument cluster (J100)
Rear fog lamps indicator (J150)
C0582-46
FUSE 44P
C0585R-21
RY,1.5D
SJ1020
RY,0.75D
C1166R-10 C1168-10
RY,0.75D
C0230-20
C0230-32
B,0.5D
SJ661
B,2.5D
C2628-1
0.03 Amps
TYPE 3
15.0 Amps
Front fog lamps indicator (J181)
C0582-14
FUSE 38P
C0583R-41
UP,1.5D
SJ1172
UP,0.75D
C2240R-18 C2238-18
UP,0.75D
C0230-24
15.0 Amps
0.03 Amps
NP,4.0D
C2443-3 C2444R-3
NP,4.0D
Lighting control switch (S100)
Stop lamp-LH (A139)
Lamp-Fog guard-Rear-LH (A111)
Lighting control switch (S100)
Switch-Fog lamp-Front/rear (S112)
RY,1.5D
C0333-9 C0420-9
RY,1.5D
C0121-6
C0121-5
B,1.5D
C0041-7
Xr
83a
C0041-2
RO,1.5D
21.0 Watts
C0333-7 C0420-7
83b
C0041-3
UR,1.5D
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3

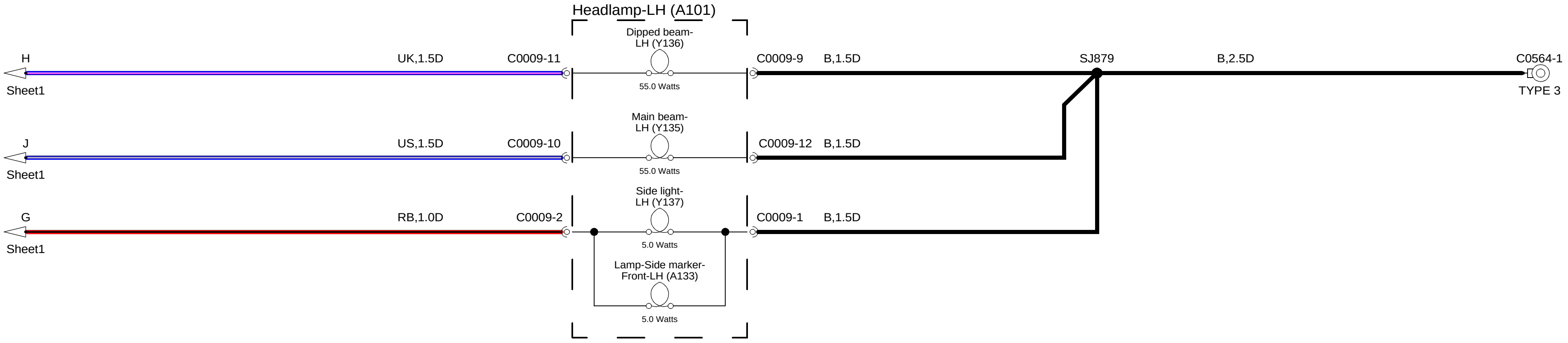

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Relay-Side-lamp (R125)
Relay-Auto-lights (R274)
FUSE 67P
5.0 Amps
Junction-box engine (P108)
C0583R-21
C0632-1
LINK 15E
C0570R-116
NU,4.0D
40.0 Amps
LINK 16E
C0570R-185
NG,4.0D
40.0 Amps
C0583R-16
BATT
C0582-30
AUX
FUSE 18P
5.0 Amps
C0585R-45
G,0.5D
A
Sheet3
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
30.0 Amps
C0582-19
IGN
FET-Dip-beam-RH (G165)
Generic Electronic Module (D162)
C0583R-29
UO,1.5D
B
Sheet2
FUSE 25E
C0570R-109
NS,1.5D
C2444R-2 C2443-2
10.0 Amps
NG,1.0D
BTS443 21A
N,4.0D
FET-Main-beam-RH (G167)
C0583R-32
UB,1.5D
C
Sheet2
Switch-Ignition (S176)
C0585R-37
RO,1.0D
D
Sheet3
C0028-4
AUX
C0028-6
W,1.5D
FUSE 2P
C0583R-6
RO,1.0D
E
10.0 Amps
Sheet2
FUSE 4P
C0585R-38
RB,1.0D
F
IGN
C0028-1
Y,4.0D
10.0 Amps
Sheet3
C0583R-7
RB,1.0D
G
Sheet2
Lighting control switch (S100)
FET-Dip-beam-LH (G166)
C0041-11
30
58
C0041-13
R,0.5D
C0580-24
C0583R-24
UK,1.5D
H
Sheet2
C0041-16
RO,0.5D
C0582-1
C0583R-33
US,1.5D
J
C0041-8
15
DIP 56
C0041-6
Y,0.5D
C0580-25
FET-Main-beam-LH (G168)
Sheet2
AUTO 52
C0041-4
R,0.5D
C0580-26
C0585R-25
B,2.5D
C2696R-1
TYPE 3
Switch-Steering column-Lighting (S175)
LIN BUS
C0586R-32
R,0.5D
K
Sheet3
Dip/Main-beam (Y167)
FLASH
C1393-6
UR,0.35D
C0580-3
FUSE 62P
C0582-9
NP,0.5D
MAIN
C1393-4
UR,0.35D
C0580-28
5.0 Amps
C1393-1
B,0.35D
SJ663
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
4
1
2
3
3
1

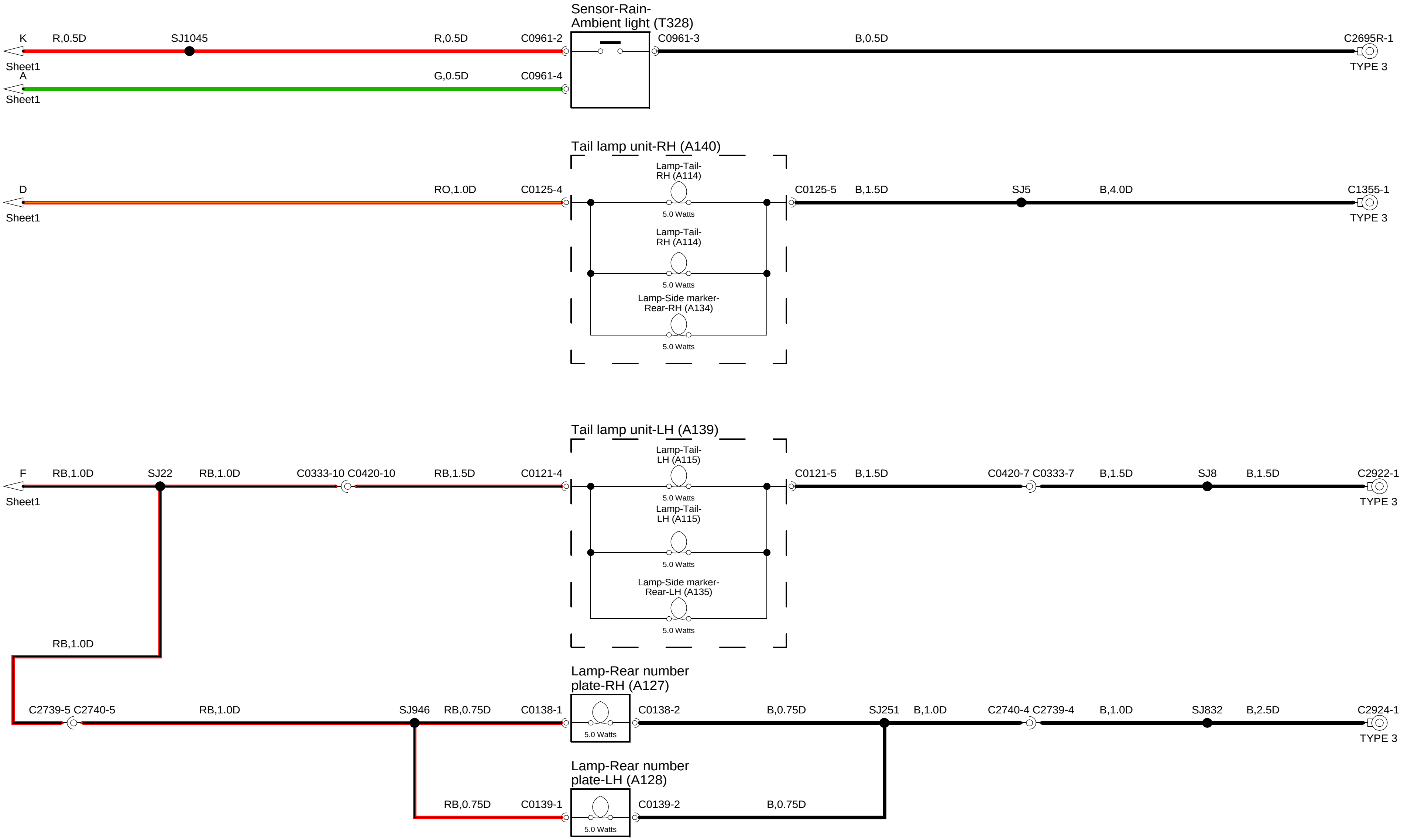

Headlamp-RH (A100)
ECU-Xenon Lamps (D269)
Dipped beam-RH (Y133)
55.0 Watts
B
Sheet1
UO,1.5D
C0011-11
C0011-9
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
Solenoid (N104)
C
Sheet1
UB,1.5D
C0011-10
C0011-12
B,1.5D
Main beam-RH (Y132)
55.0 Watts
Lamp-Side marker-Front-RH (A132)
E
Sheet1
RO,1.0D
C0011-2
C0011-1
B,1.5D
5.0 Watts
Side light-RH (Y134)
5.0 Watts
Headlamp-RH (A100)
ECU-Xenon Lamps (D269)
Dipped beam-LH (Y136)
55.0 Watts
H
Sheet1
UK,1.5D
C0009-11
C0009-9
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
Solenoid (N104)
J
Sheet1
US,1.5D
C0009-10
C0009-12
B,1.5D
Main beam-LH (Y135)
55.0 Watts
Lamp-Side marker-Front-LH (A133)
G
Sheet1
RB,1.0D
C0009-2
C0009-1
B,1.5D
5.0 Watts
Side light-LH (Y137)
5.0 Watts

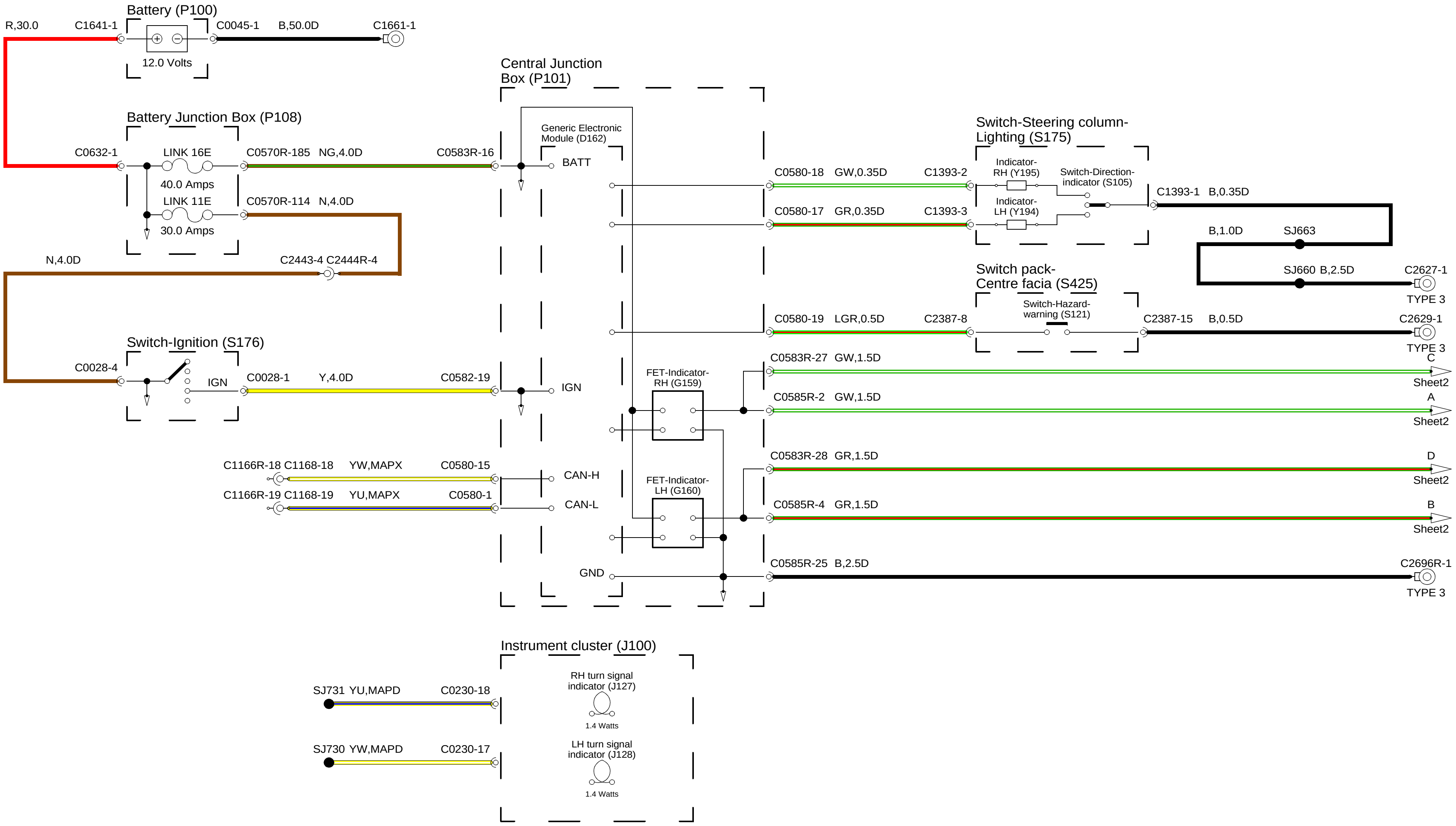

Sensor-Rain-
Ambient light (T328)
K
R,0.5D
SJ1045
R,0.5D
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 3
Sheet1
A
G,0.5D
C0961-4
Sheet1
Tail lamp unit-RH (A140)
Lamp-Tail-
RH (A114)
D
RO,1.0D
C0125-4
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Sheet1
5.0 Watts
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Side marker-
Rear-RH (A134)
5.0 Watts
Tail lamp unit-LH (A139)
Lamp-Tail-
LH (A115)
F
RB,1.0D
SJ22
RB,1.0D
C0333-10 C0420-10
RB,1.5D
C0121-4
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Sheet1
5.0 Watts
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Side marker-
Rear-LH (A135)
5.0 Watts
RB,1.0D
Lamp-Rear number
plate-RH (A127)
C2739-5 C2740-5
RB,1.0D
SJ946
RB,0.75D
C0138-1
C0138-2
B,0.75D
SJ251
B,1.0D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
5.0 Watts
Lamp-Rear number
plate-LH (A128)
RB,0.75D
C0139-1
C0139-2
B,0.75D
5.0 Watts

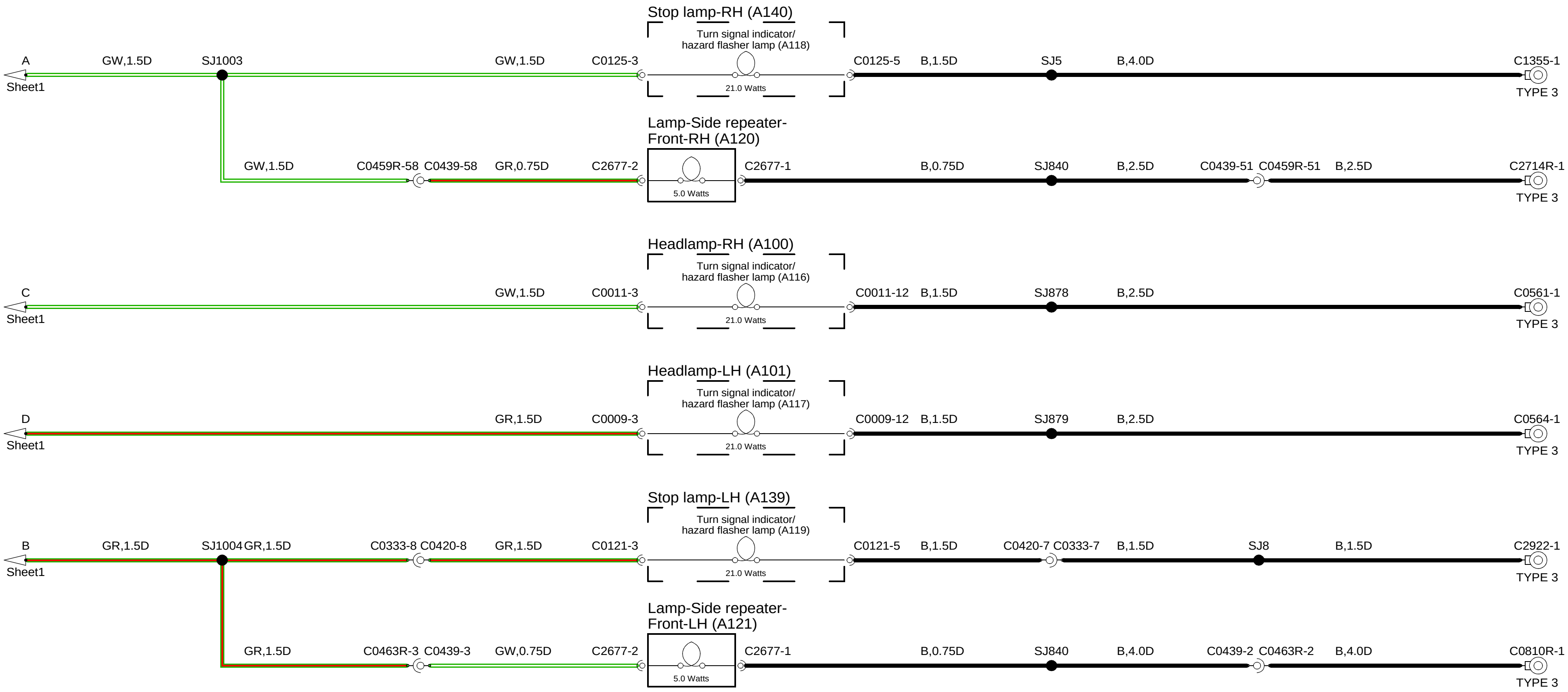

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Junction-box engine (P108)
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0632-1
LINK 16E
40.0 Amps
C0570R-185
NG,4.0D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
FUSE 25E
5.0 Amps
C0570R-109
NS,1.5D
C2444R-2 C2443-2
NG,1.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
IGN
C0028-1
Y,4.0D
Lighting control switch (S100)
C0041-11
30
58
C0041-13
R,0.5D
C0580-24
C0041-16
RO,0.5D
C0582-1
C0041-8
15
DIP 56
C0041-6
Y,0.5D
C0580-25
AUTO 52
C0041-4
R,0.5D
C0580-26
Switch-Steering column-Lighting (S175)
Dip/Main-beam (Y167)
FLASH
C1393-6
UR,0.35D
C0580-3
MAIN
C1393-4
UR,0.35D
C0580-28
C1393-1
B,0.35D
SJ663
B,1.0D
Central junction-box (P101)
C0583R-21
Relay-Side-lamp (R125)
FUSE 67P
5.0 Amps
Relay-Auto-lights (R274)
C0583R-16
BATT
C0582-30
AUX
C0582-19
IGN
Generic Electronic Module (D162)
FET-Dip-beam-RH (G165)
4 1
2 3
BTS443 21A
FET-Main-beam-RH (G167)
4 3
2 1
BTS443 21A
FET-Dip-beam-LH (G166)
4 3
2 1
BTS443 21A
FET-Main-beam-LH (G168)
4 3
2 1
BTS443 21A
LIN BUS
FUSE 18P
5.0 Amps
C0585R-45
G,0.5D
A
Sheet3
C0583R-29
UO,1.5D
B
Sheet2
C0583R-32
UB,1.5D
C
Sheet2
FUSE 2P
10.0 Amps
C0585R-37
RO,1.0D
D
Sheet3
C0583R-6
RO,1.0D
E
Sheet2
FUSE 4P
10.0 Amps
C0585R-38
RB,1.0D
F
Sheet3
C0583R-7
RB,1.0D
G
Sheet2
C0583R-24
UK,1.5D
H
Sheet2
C0583R-33
US,1.5D
J
Sheet2
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C0586R-32
R,0.5D
K
Sheet3
FUSE 62P
5.0 Amps
C0582-9
NP,0.5D
SJ660
B,2.5D
C2627-1
TYPE 3

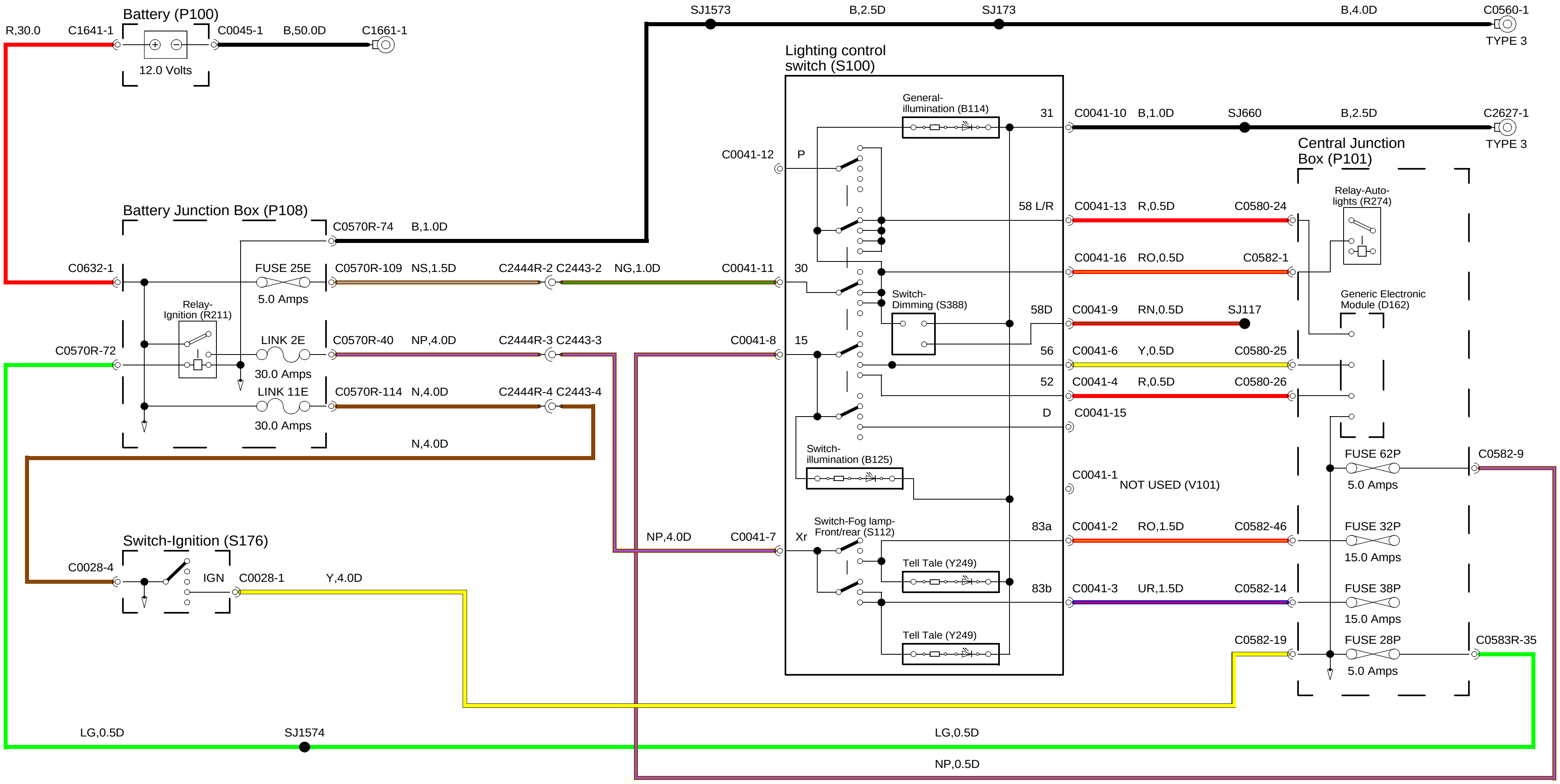

Headlamp-RH (A100)
B
Sheet1
UO,1.5D
C0011-11
Dipped beam-
RH (Y133)
55.0 Watts
C0011-9
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
C
Sheet1
UB,1.5D
C0011-10
Main beam-
RH (Y132)
55.0 Watts
C0011-12
B,1.5D
E
Sheet1
RO,1.0D
C0011-2
Lamp-Side marker-
Front-RH (A132)
5.0 Watts
C0011-1
B,1.5D
Side light-
RH (Y134)
5.0 Watts

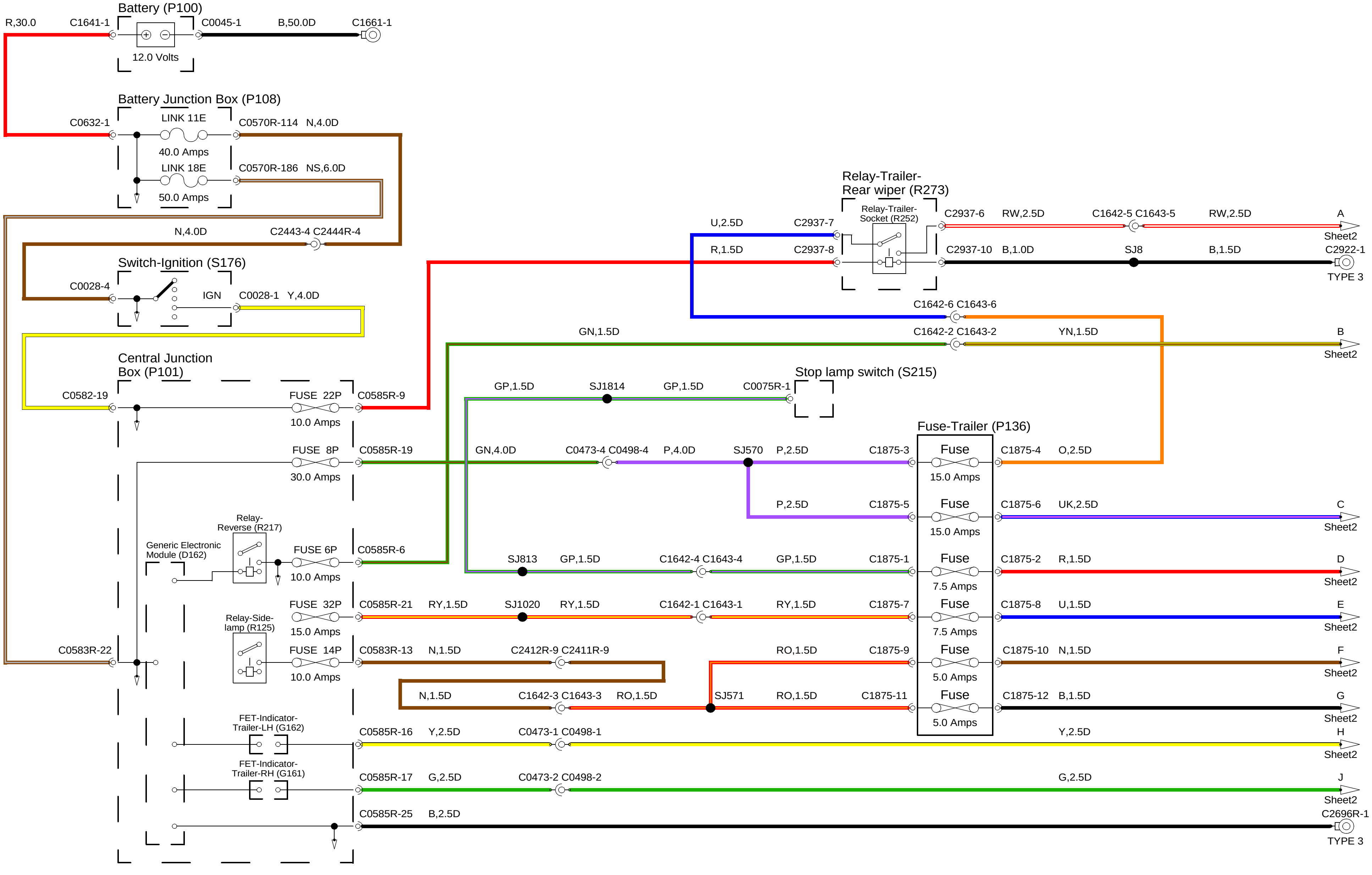

Headlamp-LH (A101)
H
Sheet1
UK,1.5D
C0009-11
Dipped beam-
LH (Y136)
55.0 Watts
C0009-9
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
J
Sheet1
US,1.5D
C0009-10
Main beam-
LH (Y135)
55.0 Watts
C0009-12
B,1.5D
G
Sheet1
RB,1.0D
C0009-2
Side light-
LH (Y137)
5.0 Watts
C0009-1
B,1.5D
Lamp-Side marker-
Front-LH (A133)
5.0 Watts

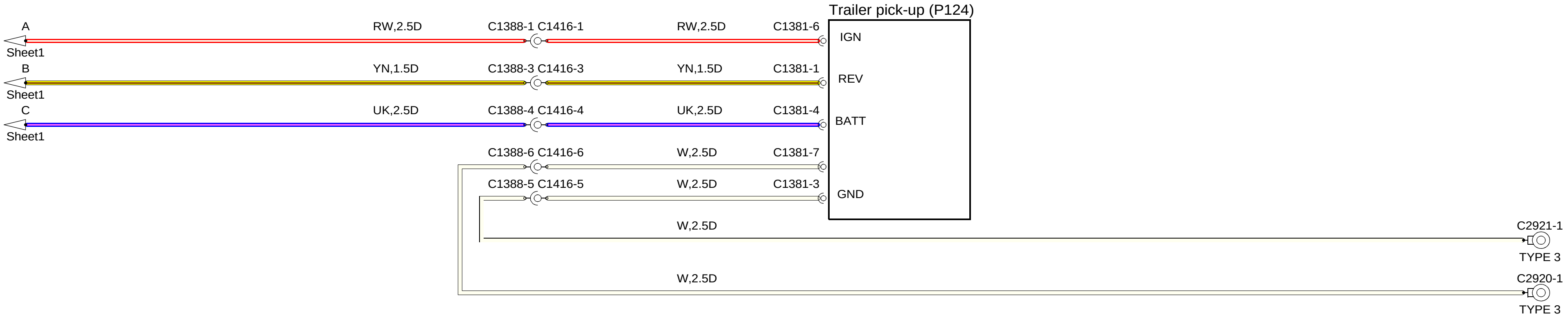

Sensor-Rain-
Ambient light (T328)
K
R,0.5D
SJ1045
R,0.5D
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 3
Sheet1
A
G,0.5D
C0961-4
Sheet1
Tail lamp unit-RH (A140)
Lamp-Tail-
RH (A114)
D
RO,1.0D
C0125-4
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
Sheet1
5.0 Watts
TYPE 3
Lamp-Tail-
RH (A114)
5.0 Watts
Lamp-Side marker-
Rear-RH (A134)
5.0 Watts
Tail lamp unit-LH (A139)
Lamp-Tail-
LH (A115)
F
RB,1.0D
SJ22
RB,1.0D
C0333-10 C0420-10
RB,1.5D
C0121-4
C0121-5
B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
Sheet1
5.0 Watts
TYPE 3
Lamp-Tail-
LH (A115)
5.0 Watts
Lamp-Side marker-
Rear-LH (A135)
5.0 Watts
RB,1.0D
Lamp-Rear number
plate-RH (A127)
C2739-5 C2740-5
RB,1.0D
SJ946
RB,0.75D
C0138-1
C0138-2
B,0.75D
SJ251
B,1.0D
C2740-4 C2739-4
B,1.0D
SJ832
B,2.5D
C2924-1
5.0 Watts
TYPE 3
Lamp-Rear number
plate-LH (A128)
RB,0.75D
C0139-1
C0139-2
B,0.75D
5.0 Watts

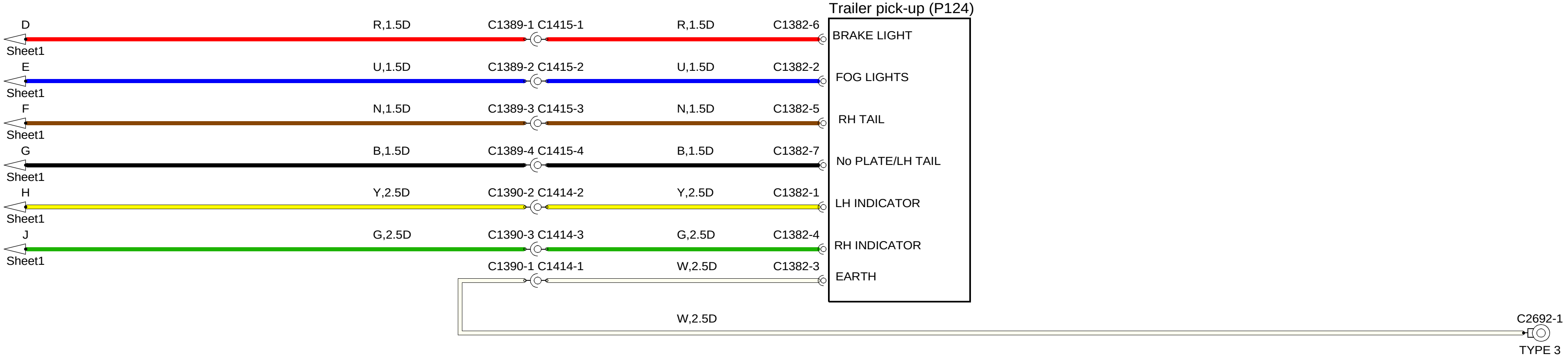

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central Junction Box (P101)
Battery Junction Box (P108)
Generic Electronic Module (D162)
C0632-1
LINK 16E
C0570R-185
NG,4.0D
C0583R-16
BATT
40.0 Amps
LINK 11E
C0570R-114
N,4.0D
30.0 Amps
N,4.0D
C2443-4 C2444R-4
Switch-Steering column-Lighting (S175)
Indicator-RH (Y195)
Switch-Direction-indicator (S105)
Indicator-LH (Y194)
C0580-18
GW,0.35D
C1393-2
C0580-17
GR,0.35D
C1393-3
C1393-1
B,0.35D
B,1.0D
SJ663
SJ660
B,2.5D
C2627-1
TYPE 3
Switch pack-Centre facia (S425)
Switch-Hazard-warning (S121)
C0580-19
LGR,0.5D
C2387-8
C2387-15
B,0.5D
C2629-1
TYPE 3
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C0582-19
IGN
FET-Indicator-RH (G159)
C0583R-27
GW,1.5D
C
Sheet2
C0585R-2
GW,1.5D
A
Sheet2
C1166R-18 C1168-18
YW,MAPX
C0580-15
CAN-H
C1166R-19 C1168-19
YU,MAPX
C0580-1
CAN-L
FET-Indicator-LH (G160)
C0583R-28
GR,1.5D
D
Sheet2
C0585R-4
GR,1.5D
B
Sheet2
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
Instrument cluster (J100)
RH turn signal indicator (J127)
SJ731
YU,MAPD
C0230-18
1.4 Watts
LH turn signal indicator (J128)
SJ730
YW,MAPD
C0230-17
1.4 Watts

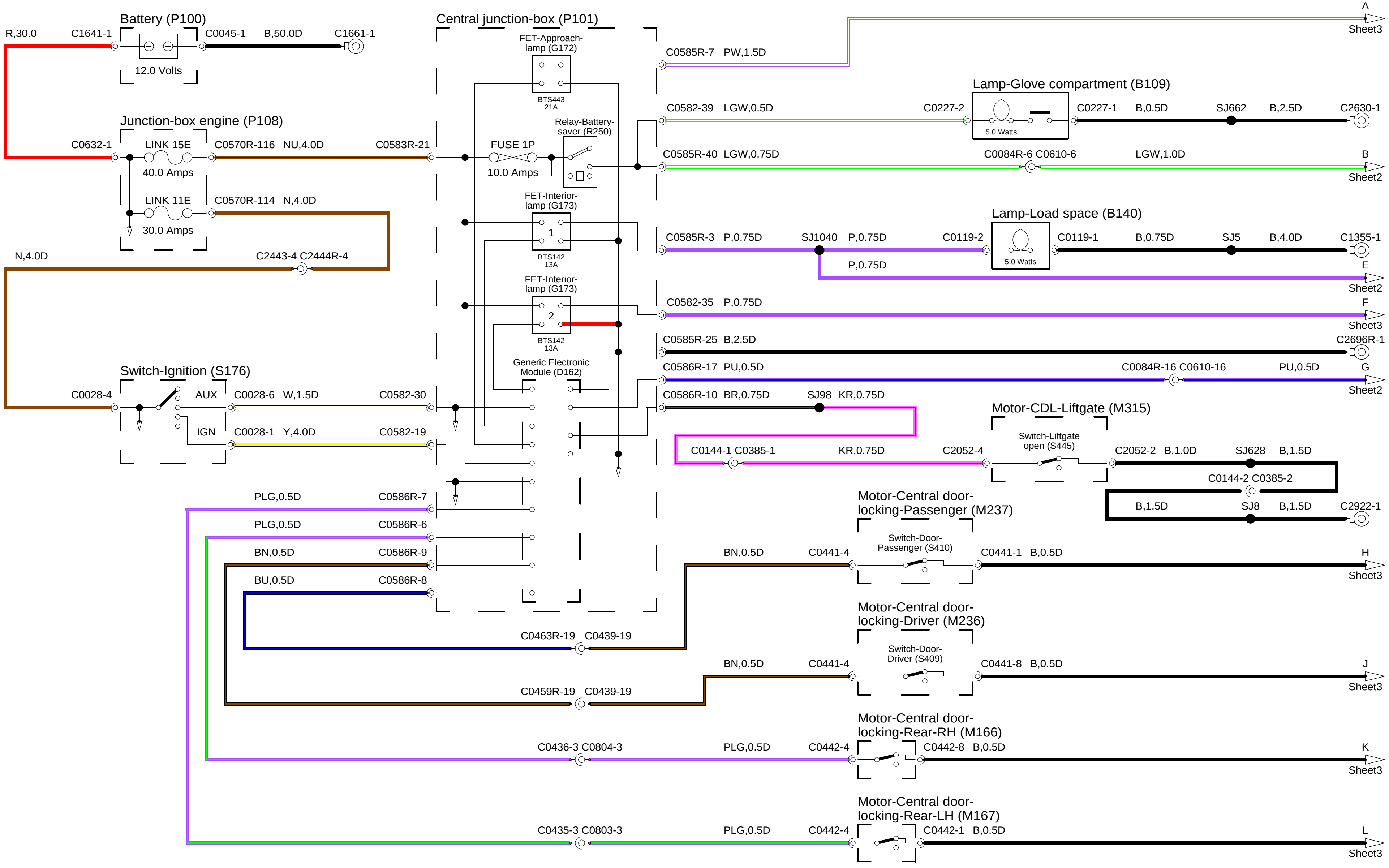

Stop lamp-RH (A140)
Turn signal indicator/
hazard flasher lamp (A118)
A
Sheet1
GW,1.5D
SJ1003
GW,1.5D
C0125-3
21.0 Watts
C0125-5
B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Lamp-Side repeater-
Front-RH (A120)
GW,1.5D
C0459R-58
C0439-58
GR,0.75D
C2677-2
5.0 Watts
C2677-1
B,0.75D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
Headlamp-RH (A100)
Turn signal indicator/
hazard flasher lamp (A116)
C
Sheet1
GW,1.5D
C0011-3
21.0 Watts
C0011-12
B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
Headlamp-LH (A101)
Turn signal indicator/
hazard flasher lamp (A117)
D
Sheet1
GR,1.5D
C0009-3
21.0 Watts
C0009-12
B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
Stop lamp-LH (A139)
Turn signal indicator/
hazard flasher lamp (A119)
B
Sheet1
GR,1.5D
SJ1004
GR,1.5D
C0333-8
C0420-8
GR,1.5D
C0121-3
21.0 Watts
C0121-5
B,1.5D
C0420-7
C0333-7
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
Lamp-Side repeater-
Front-LH (A121)
GR,1.5D
C0463R-3
C0439-3
GW,0.75D
C2677-2
5.0 Watts
C2677-1
B,0.75D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3

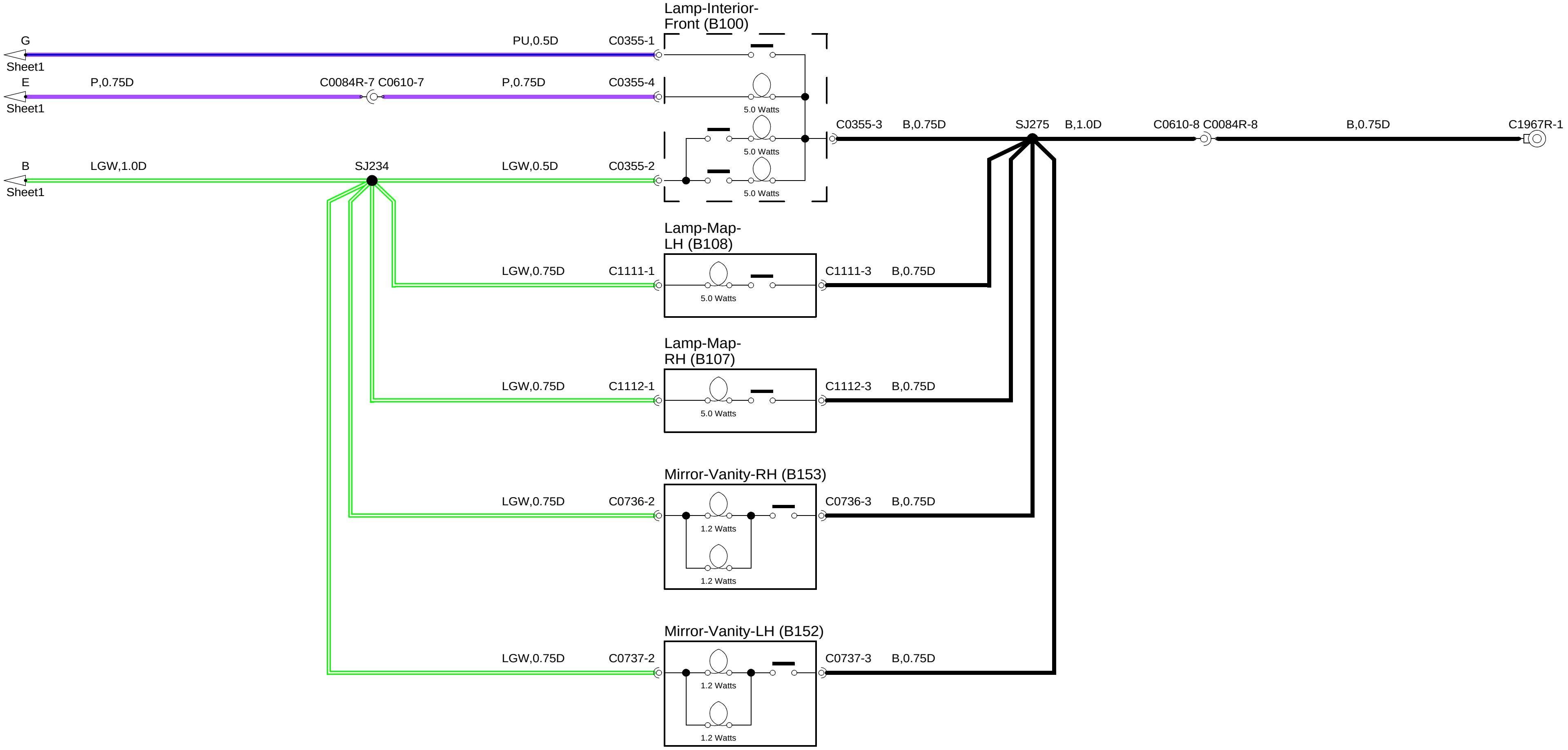

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ1573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Lighting control switch (S100)
General-illumination (B114)
31
C0041-10
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Central Junction Box (P101)
C0041-12
P
Battery Junction Box (P108)
C0570R-74
B,1.0D
58 L/R
C0041-13
R,0.5D
C0580-24
Relay-Auto-lights (R274)
C0632-1
FUSE 25E
5.0 Amps
C0570R-109
NS,1.5D
C2444R-2
C2443-2
NG,1.0D
C0041-11
30
C0041-16
RO,0.5D
C0582-1
Relay-Ignition (R211)
Switch-Dimming (S388)
58D
C0041-9
RN,0.5D
SJ117
Generic Electronic Module (D162)
C0570R-72
LINK 2E
30.0 Amps
C0570R-40
NP,4.0D
C2444R-3
C2443-3
C0041-8
15
56
C0041-6
Y,0.5D
C0580-25
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4
C2443-4
52
C0041-4
R,0.5D
C0580-26
D
C0041-15
N,4.0D
Switch-illumination (B125)
FUSE 62P
5.0 Amps
C0582-9
C0041-1
NOT USED (V101)
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
NP,4.0D
C0041-7
Xr
Switch-Fog lamp-Front/rear (S112)
83a
C0041-2
RO,1.5D
C0582-46
FUSE 32P
15.0 Amps
Tell Tale (Y249)
83b
C0041-3
UR,1.5D
C0582-14
FUSE 38P
15.0 Amps
Tell Tale (Y249)
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
SJ1574
LG,0.5D
NP,0.5D

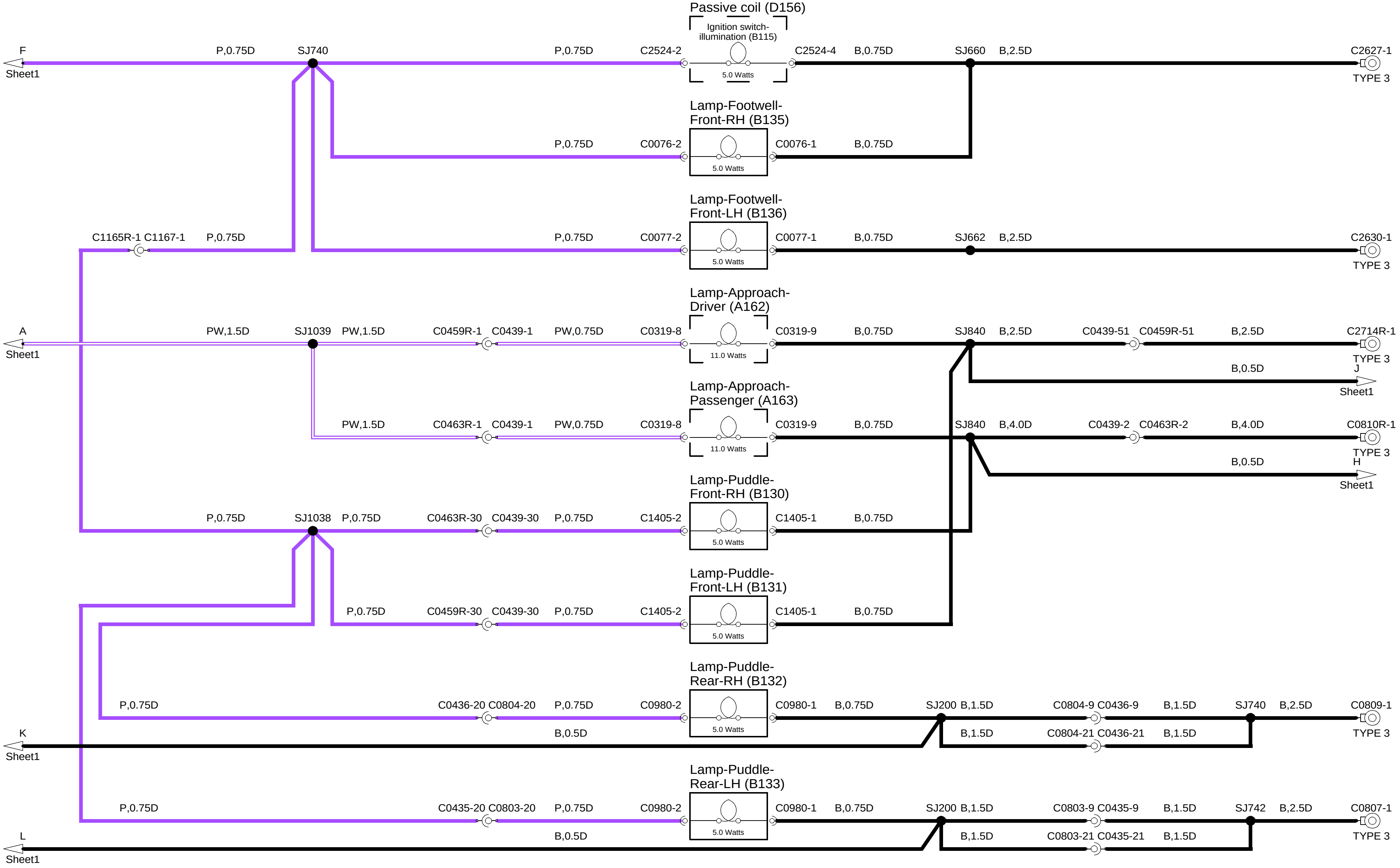

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
40.0 Amps
C0570R-114 N,4.0D
LINK 18E
50.0 Amps
C0570R-186 NS,6.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1 Y,4.0D
Central Junction Box (P101)
C0582-19
FUSE 22P
10.0 Amps
C0585R-9
FUSE 8P
30.0 Amps
C0585R-19
Relay-Reverse (R217)
Generic Electronic Module (D162)
FUSE 6P
10.0 Amps
C0585R-6
FUSE 32P
15.0 Amps
Relay-Side-lamp (R125)
C0585R-21
C0583R-22
FUSE 14P
10.0 Amps
C0583R-13
FET-Indicator-Trailer-LH (G162)
C0585R-16
FET-Indicator-Trailer-RH (G161)
C0585R-17
C0585R-25
Relay-Trailer-Rear wiper (R273)
Relay-Trailer-Socket (R252)
U,2.5D
C2937-7
R,1.5D
C2937-8
C2937-6
RW,2.5D
C1642-5 C1643-5
RW,2.5D
A
Sheet2
C2937-10
B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
C1642-6 C1643-6
GN,1.5D
C1642-2 C1643-2
YN,1.5D
B
Sheet2
Stop lamp switch (S215)
GP,1.5D
SJ1814
GP,1.5D
C0075R-1
Fuse-Trailer (P136)
GN,4.0D
C0473-4 C0498-4
P,4.0D
SJ570
P,2.5D
C1875-3
Fuse
15.0 Amps
C1875-4
O,2.5D
P,2.5D
C1875-5
Fuse
15.0 Amps
C1875-6
UK,2.5D
C
Sheet2
SJ813
GP,1.5D
C1642-4 C1643-4
GP,1.5D
C1875-1
Fuse
7.5 Amps
C1875-2
R,1.5D
D
Sheet2
RY,1.5D
SJ1020
RY,1.5D
C1642-1 C1643-1
RY,1.5D
C1875-7
Fuse
7.5 Amps
C1875-8
U,1.5D
E
Sheet2
N,1.5D
C2412R-9 C2411R-9
RO,1.5D
C1875-9
Fuse
5.0 Amps
C1875-10
N,1.5D
F
Sheet2
N,1.5D
C1642-3 C1643-3
RO,1.5D
SJ571
RO,1.5D
C1875-11
Fuse
5.0 Amps
C1875-12
B,1.5D
G
Sheet2
Y,2.5D
C0473-1 C0498-1
Y,2.5D
H
Sheet2
G,2.5D
C0473-2 C0498-2
G,2.5D
J
Sheet2
B,2.5D
C2696R-1
TYPE 3

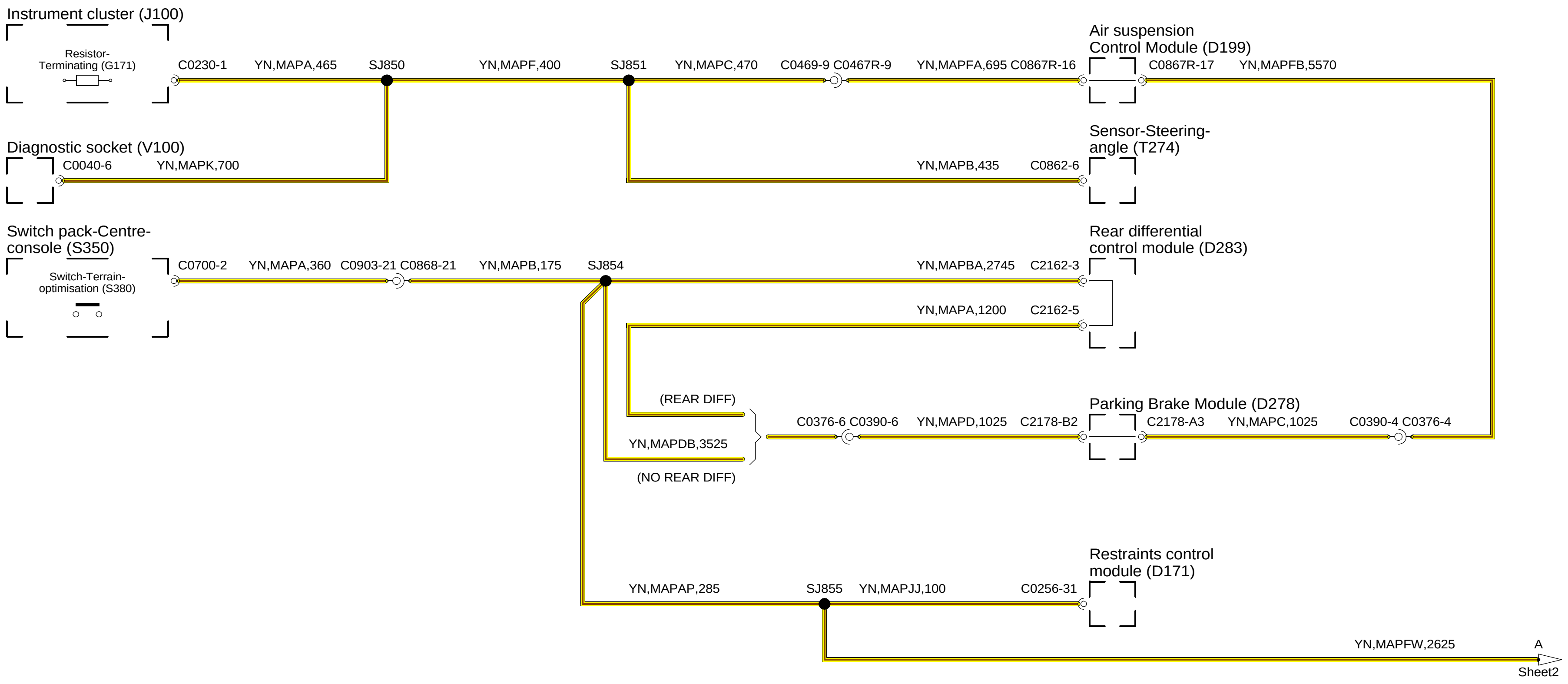

Trailer pick-up (P124)
A
Sheet1
RW,2.5D
C1388-1 C1416-1
RW,2.5D
C1381-6
IGN
B
Sheet1
YN,1.5D
C1388-3 C1416-3
YN,1.5D
C1381-1
REV
C
Sheet1
UK,2.5D
C1388-4 C1416-4
UK,2.5D
C1381-4
BATT
C1388-6 C1416-6
W,2.5D
C1381-7
C1388-5 C1416-5
W,2.5D
C1381-3
GND
W,2.5D
C2921-1
TYPE 3
W,2.5D
C2920-1
TYPE 3


Trailer pick-up (P124)
D
Sheet1
R,1.5D
C1389-1 C1415-1
R,1.5D
C1382-6
BRAKE LIGHT
E
Sheet1
U,1.5D
C1389-2 C1415-2
U,1.5D
C1382-2
FOG LIGHTS
F
Sheet1
N,1.5D
C1389-3 C1415-3
N,1.5D
C1382-5
RH TAIL
G
Sheet1
B,1.5D
C1389-4 C1415-4
B,1.5D
C1382-7
No PLATE/LH TAIL
H
Sheet1
Y,2.5D
C1390-2 C1414-2
Y,2.5D
C1382-1
LH INDICATOR
J
Sheet1
G,2.5D
C1390-3 C1414-3
G,2.5D
C1382-4
RH INDICATOR
C1390-1 C1414-1
W,2.5D
C1382-3
EARTH
W,2.5D
C2692-1
TYPE 3


Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
FET-Approach-lamp (G172)
BTS443 21A
C0585R-7
PW,1.5D
A
Sheet3
Junction-box engine (P108)
C0632-1
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0583R-21
FUSE 1P
10.0 Amps
Relay-Battery-saver (R250)
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Lamp-Glove compartment (B109)
C0582-39
LGW,0.5D
C0227-2
5.0 Watts
C0227-1
B,0.5D
SJ662
B,2.5D
C2630-1
C0585R-40
LGW,0.75D
C0084R-6 C0610-6
LGW,1.0D
B
Sheet2
FET-Interior-lamp (G173)
1
BTS142 13A
Lamp-Load space (B140)
C0585R-3
P,0.75D
SJ1040
P,0.75D
C0119-2
5.0 Watts
C0119-1
B,0.75D
SJ5
B,4.0D
C1355-1
P,0.75D
E
Sheet2
FET-Interior-lamp (G173)
2
BTS142 13A
C0582-35
P,0.75D
F
Sheet3
C0585R-25
B,2.5D
C2696R-1
Generic Electronic Module (D162)
C0586R-17
PU,0.5D
C0084R-16 C0610-16
PU,0.5D
G
Sheet2
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0582-30
IGN
C0028-1
Y,4.0D
C0582-19
C0586R-10
BR,0.75D
SJ98
KR,0.75D
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
C0144-1 C0385-1
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0144-2 C0385-2
B,1.5D
SJ8
B,1.5D
C2922-1
PLG,0.5D
C0586R-7
PLG,0.5D
C0586R-6
BN,0.5D
C0586R-9
BU,0.5D
C0586R-8
Motor-Central door-locking-Passenger (M237)
Switch-Door-Passenger (S410)
BN,0.5D
C0441-4
C0441-1
B,0.5D
H
Sheet3
C0463R-19
C0439-19
Motor-Central door-locking-Driver (M236)
Switch-Door-Driver (S409)
BN,0.5D
C0441-4
C0441-8
B,0.5D
J
Sheet3
C0459R-19
C0439-19
Motor-Central door-locking-Rear-RH (M166)
C0436-3 C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
K
Sheet3
Motor-Central door-locking-Rear-LH (M167)
C0435-3 C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
L
Sheet3


Lamp-Interior-Front (B100)
G
Sheet1
PU,0.5D
C0355-1
E
Sheet1
P,0.75D
C0084R-7 C0610-7
P,0.75D
C0355-4
5.0 Watts
5.0 Watts
5.0 Watts
C0355-3
B,0.75D
SJ275
B,1.0D
C0610-8 C0084R-8
B,0.75D
C1967R-1
B
Sheet1
LGW,1.0D
SJ234
LGW,0.5D
C0355-2
Lamp-Map-LH (B108)
LGW,0.75D
C1111-1
5.0 Watts
C1111-3
B,0.75D
Lamp-Map-RH (B107)
LGW,0.75D
C1112-1
5.0 Watts
C1112-3
B,0.75D
Mirror-Vanity-RH (B153)
LGW,0.75D
C0736-2
1.2 Watts
1.2 Watts
C0736-3
B,0.75D
Mirror-Vanity-LH (B152)
LGW,0.75D
C0737-2
1.2 Watts
1.2 Watts
C0737-3
B,0.75D


Passive coil (D156)
Ignition switch-illumination (B115)
5.0 Watts
F
Sheet1
P,0.75D
SJ740
P,0.75D
C2524-2
C2524-4
B,0.75D
SJ660
B,2.5D
C2627-1
TYPE 3
Lamp-Footwell-Front-RH (B135)
P,0.75D
C0076-2
C0076-1
B,0.75D
5.0 Watts
Lamp-Footwell-Front-LH (B136)
C1165R-1 C1167-1
P,0.75D
P,0.75D
C0077-2
C0077-1
B,0.75D
SJ662
B,2.5D
C2630-1
TYPE 3
5.0 Watts
Lamp-Approach-Driver (A162)
A
Sheet1
PW,1.5D
SJ1039
PW,1.5D
C0459R-1
C0439-1
PW,0.75D
C0319-8
C0319-9
B,0.75D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
11.0 Watts
B,0.5D
J
Sheet1
Lamp-Approach-Passenger (A163)
PW,1.5D
C0463R-1
C0439-1
PW,0.75D
C0319-8
C0319-9
B,0.75D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3
11.0 Watts
B,0.5D
H
Sheet1
Lamp-Puddle-Front-RH (B130)
P,0.75D
SJ1038
P,0.75D
C0463R-30
C0439-30
P,0.75D
C1405-2
C1405-1
B,0.75D
5.0 Watts
Lamp-Puddle-Front-LH (B131)
P,0.75D
C0459R-30
C0439-30
P,0.75D
C1405-2
C1405-1
B,0.75D
5.0 Watts
Lamp-Puddle-Rear-RH (B132)
P,0.75D
C0436-20 C0804-20
P,0.75D
C0980-2
C0980-1
B,0.75D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
5.0 Watts
K
Sheet1
B,0.5D
B,1.5D
C0804-21 C0436-21
B,1.5D
Lamp-Puddle-Rear-LH (B133)
P,0.75D
C0435-20 C0803-20
P,0.75D
C0980-2
C0980-1
B,0.75D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
5.0 Watts
L
Sheet1
B,0.5D
B,1.5D
C0803-21 C0435-21
B,1.5D


Instrument cluster (J100)
Resistor-Terminating (G171)
C0230-1
YN,MAPA,465
SJ850
YN,MAPF,400
SJ851
YN,MAPC,470
C0469-9 C0467R-9
YN,MAPFA,695 C0867R-16
Air suspension Control Module (D199)
C0867R-17
YN,MAPFB,5570
Diagnostic socket (V100)
C0040-6
YN,MAPK,700
Sensor-Steering-angle (T274)
YN,MAPB,435
C0862-6
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0700-2
YN,MAPA,360
C0903-21 C0868-21
YN,MAPB,175
SJ854
Rear differential control module (D283)
YN,MAPBA,2745
C2162-3
YN,MAPA,1200
C2162-5
(REAR DIFF)
YN,MAPDB,3525
(NO REAR DIFF)
Parking Brake Module (D278)
C0376-6 C0390-6
YN,MAPD,1025
C2178-B2
C2178-A3
YN,MAPC,1025
C0390-4 C0376-4
Restraints control module (D171)
YN,MAPAP,285
SJ855
YN,MAPJJ,100
C0256-31
YN,MAPFW,2625
A
Sheet2

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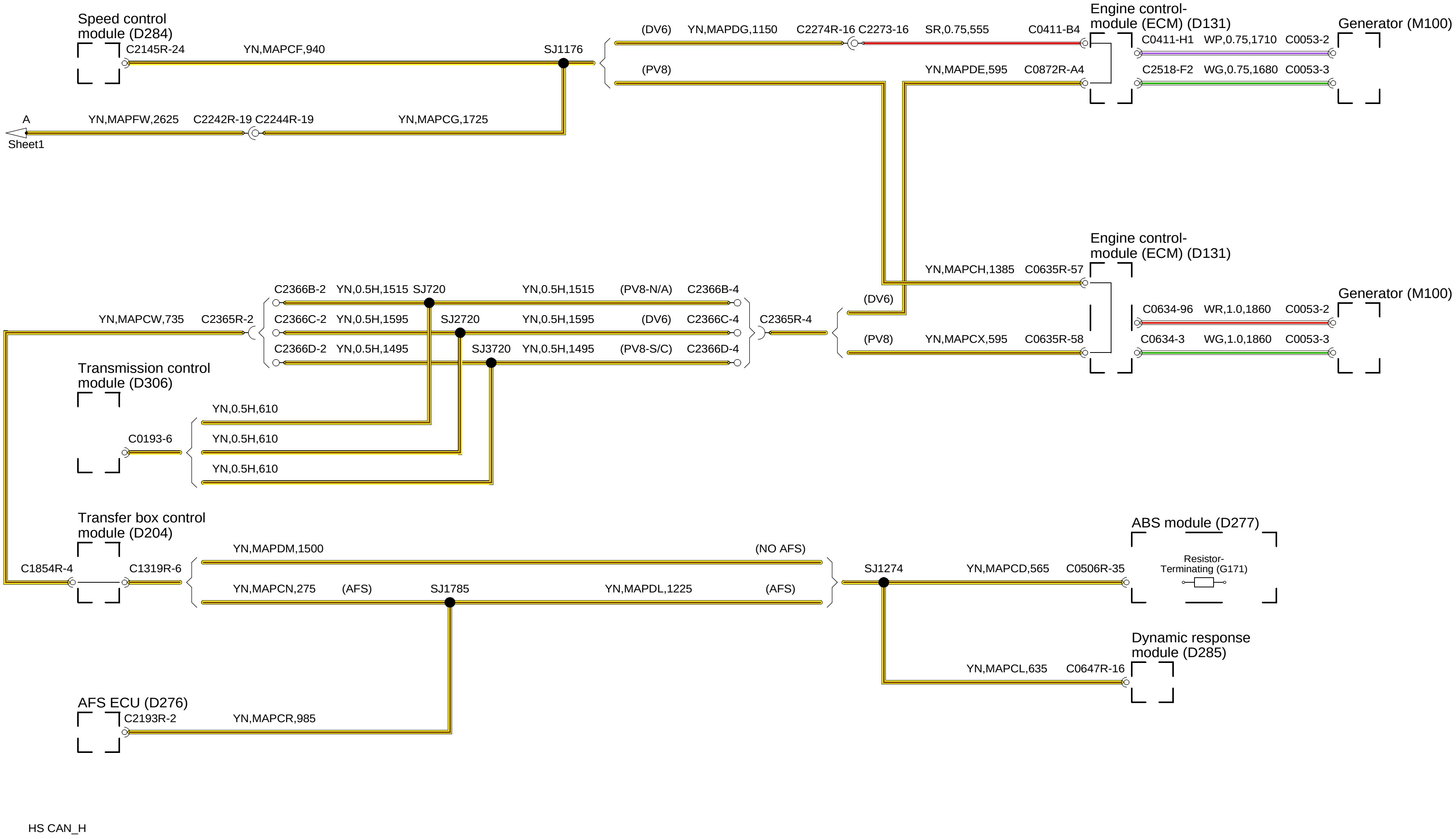
Speed control module (D284)
C2145R-24
YN,MAPCF,940
SJ1176
A
Sheet1
YN,MAPFW,2625
C2242R-19 C2244R-19
YN,MAPCG,1725
(DV6)
YN,MAPDG,1150
C2274R-16 C2273-16
SR,0.75,555
C0411-B4
(PV8)
YN,MAPDE,595
C0872R-A4
Engine control-module (ECM) (D131)
C0411-H1
WP,0.75,1710
C0053-2
C2518-F2
WG,0.75,1680
C0053-3
Generator (M100)
Engine control-module (ECM) (D131)
YN,MAPCH,1385
C0635R-57
(DV6)
(PV8)
YN,MAPCX,595
C0635R-58
C0634-96
WR,1.0,1860
C0053-2
C0634-3
WG,1.0,1860
C0053-3
Generator (M100)
YN,MAPCW,735
C2365R-2
C2366B-2
YN,0.5H,1515
SJ720
YN,0.5H,1515
(PV8-N/A)
C2366B-4
C2366C-2
YN,0.5H,1595
SJ2720
YN,0.5H,1595
(DV6)
C2366C-4
C2366D-2
YN,0.5H,1495
SJ3720
YN,0.5H,1495
(PV8-S/C)
C2366D-4
C2365R-4
Transmission control module (D306)
C0193-6
YN,0.5H,610
YN,0.5H,610
YN,0.5H,610
Transfer box control module (D204)
C1854R-4
C1319R-6
YN,MAPDM,1500
(NO AFS)
YN,MAPCN,275
(AFS)
SJ1785
YN,MAPDL,1225
(AFS)
SJ1274
YN,MAPCD,565
C0506R-35
ABS module (D277)
Resistor-Terminating (G171)
Dynamic response module (D285)
YN,MAPCL,635
C0647R-16
AFS ECU (D276)
C2193R-2
YN,MAPCR,985
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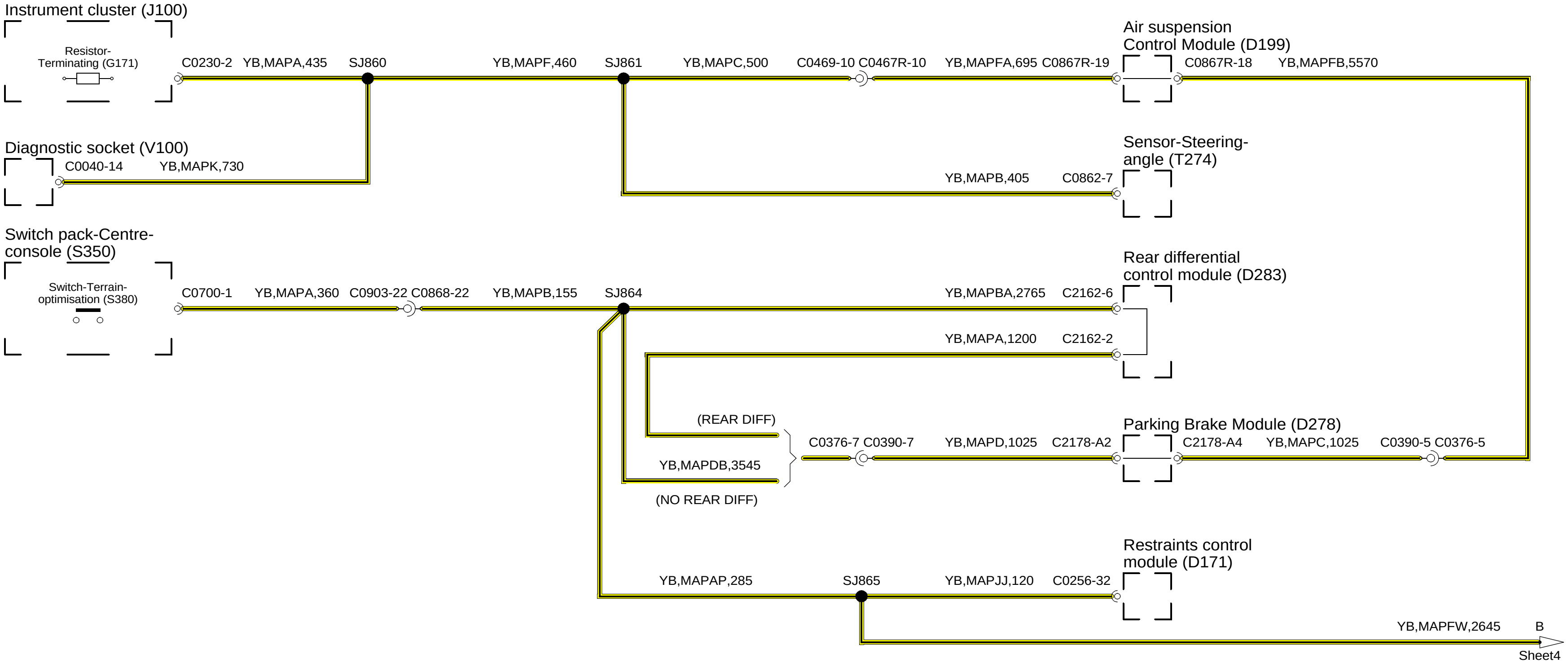
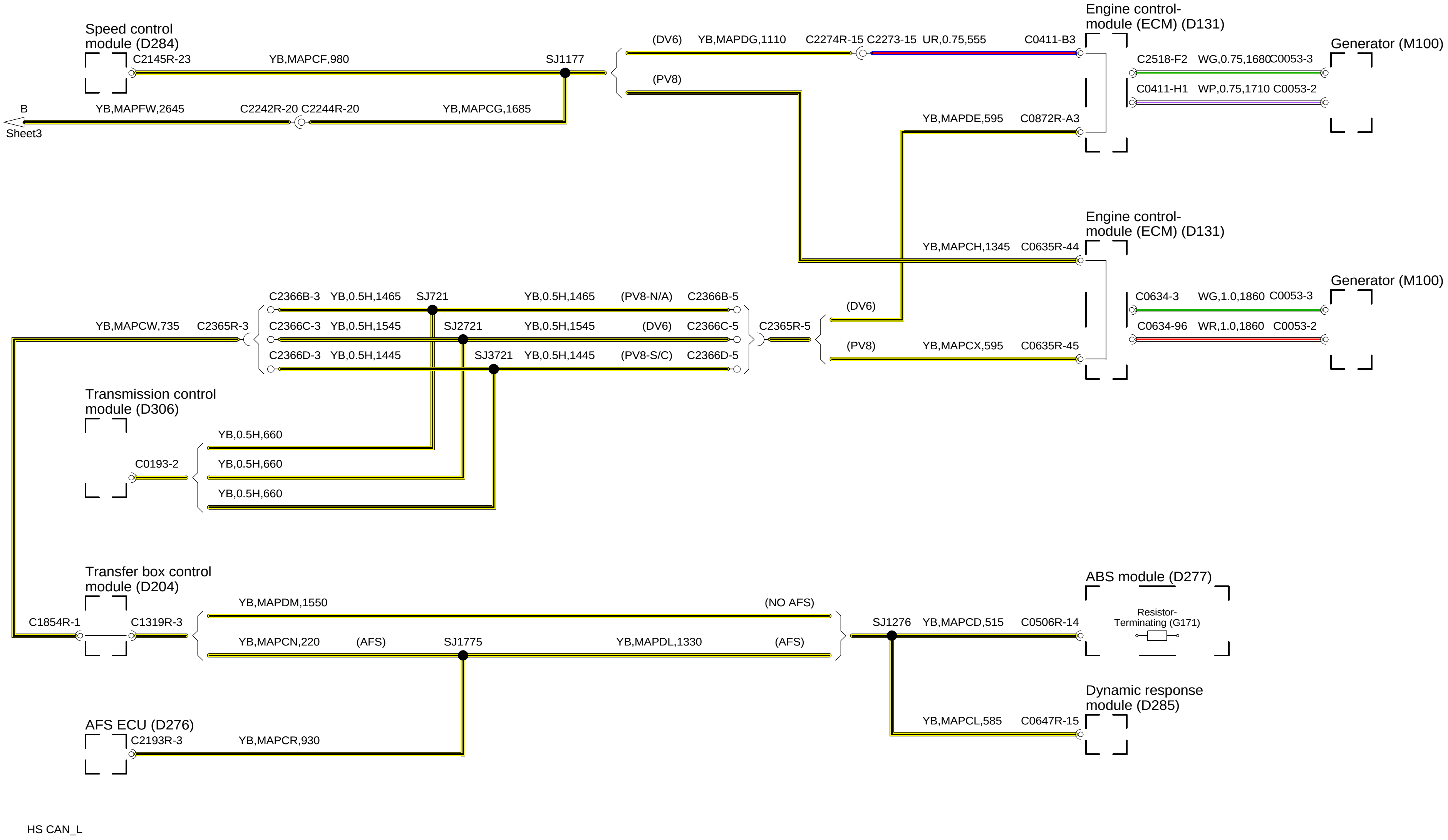
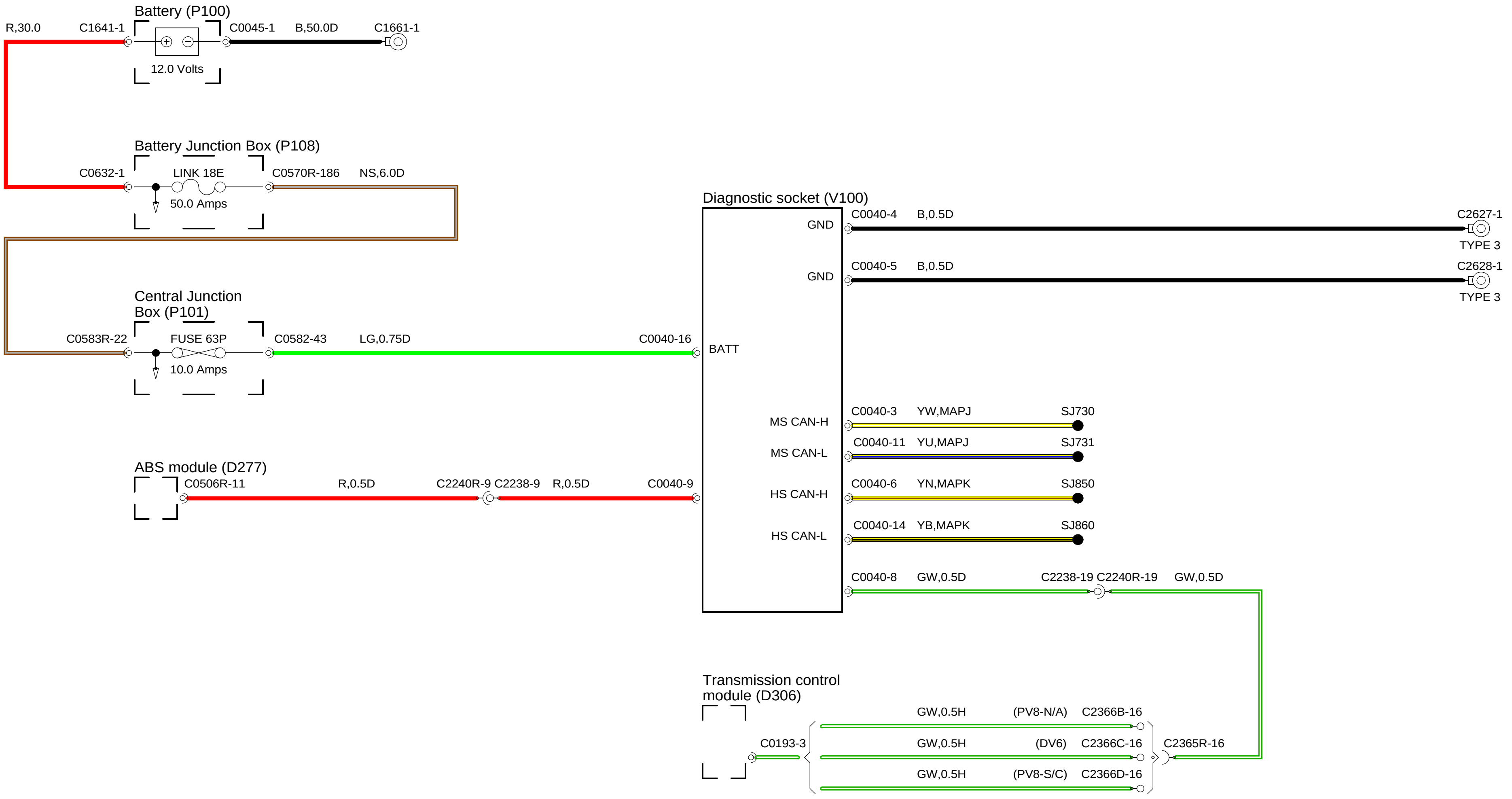
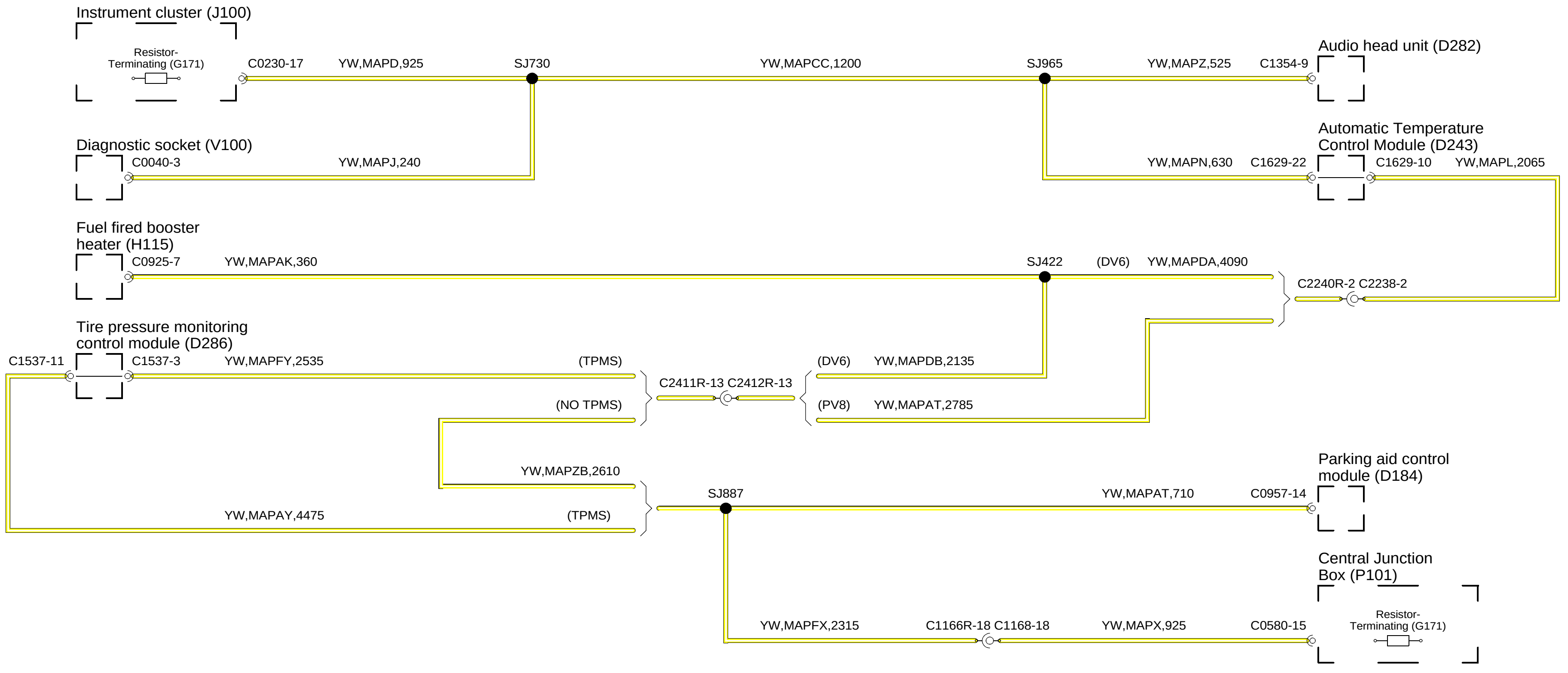

Instrument cluster (J100)
Resistor-Terminating (G171)
C0230-2
YB,MAPA,435
SJ860
YB,MAPF,460
SJ861
YB,MAPC,500
C0469-10 C0467R-10
YB,MAPFA,695
C0867R-19
Air suspension Control Module (D199)
C0867R-18
YB,MAPFB,5570
Diagnostic socket (V100)
C0040-14
YB,MAPK,730
Sensor-Steering-angle (T274)
YB,MAPB,405
C0862-7
Switch pack-Centre-console (S350)
Switch-Terrain-optimisation (S380)
C0700-1
YB,MAPA,360
C0903-22 C0868-22
YB,MAPB,155
SJ864
Rear differential control module (D283)
YB,MAPBA,2765
C2162-6
YB,MAPA,1200
C2162-2
(REAR DIFF)
YB,MAPDB,3545
(NO REAR DIFF)
C0376-7 C0390-7
YB,MAPD,1025
C2178-A2
Parking Brake Module (D278)
C2178-A4
YB,MAPC,1025
C0390-5 C0376-5
Restraints control module (D171)
YB,MAPAP,285
SJ865
YB,MAPJJ,120
C0256-32
YB,MAPFW,2645
B
Sheet4

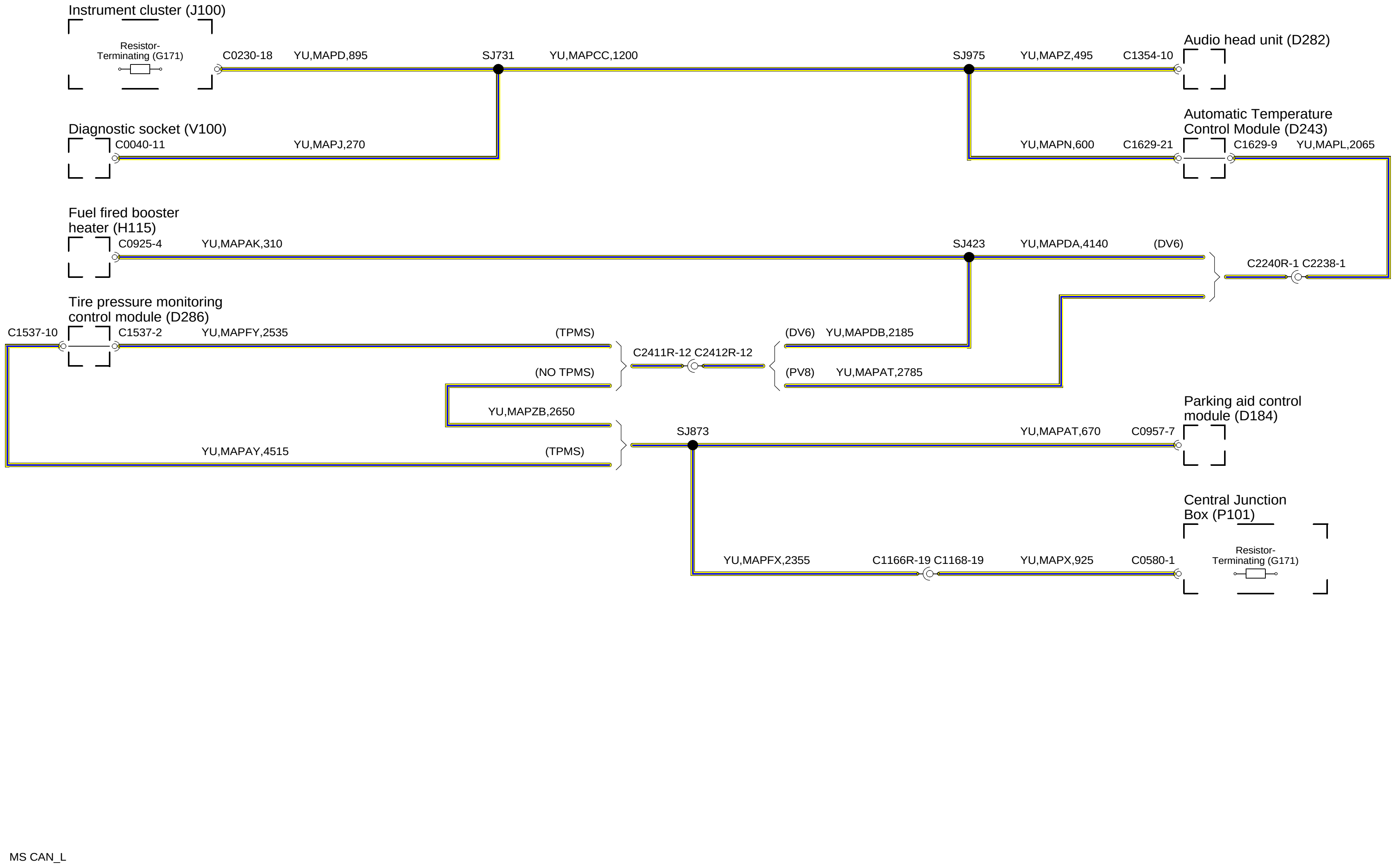
HS CAN_L

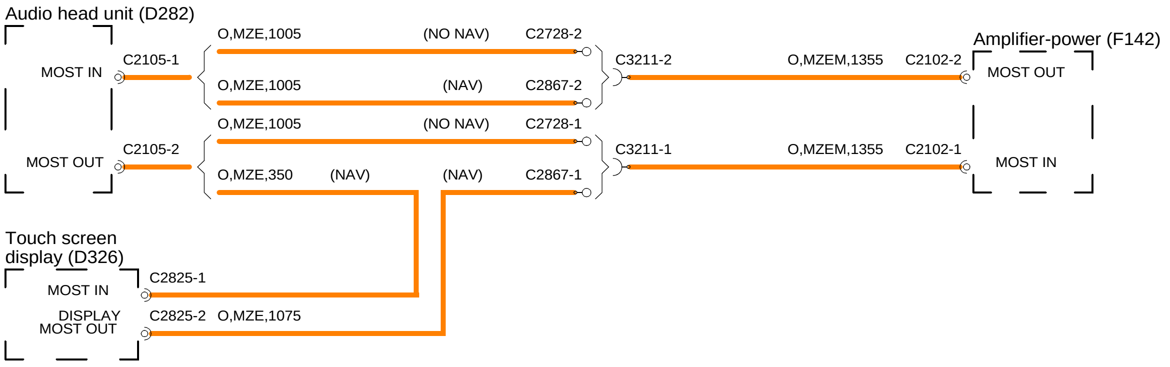

Speed control module (D284)
C2145R-23
YB,MAPCF,980
SJ1177
B
Sheet3
YB,MAPFW,2645
C2242R-20 C2244R-20
YB,MAPCG,1685
(DV6)
YB,MAPDG,1110
C2274R-15 C2273-15
UR,0.75,555
C0411-B3
(PV8)
Engine control-module (ECM) (D131)
C2518-F2
WG,0.75,1680
C0053-3
C0411-H1
WP,0.75,1710
C0053-2
Generator (M100)
YB,MAPDE,595
C0872R-A3
Engine control-module (ECM) (D131)
YB,MAPCH,1345
C0635R-44
Generator (M100)
C0634-3
WG,1.0,1860
C0053-3
C0634-96
WR,1.0,1860
C0053-2
(DV6)
(PV8)
YB,MAPCX,595
C0635R-45
C2366B-3
YB,0.5H,1465
SJ721
YB,0.5H,1465
(PV8-N/A)
C2366B-5
YB,MAPCW,735
C2365R-3
C2366C-3
YB,0.5H,1545
SJ2721
YB,0.5H,1545
(DV6)
C2366C-5
C2365R-5
C2366D-3
YB,0.5H,1445
SJ3721
YB,0.5H,1445
(PV8-S/C)
C2366D-5
Transmission control module (D306)
YB,0.5H,660
C0193-2
YB,0.5H,660
YB,0.5H,660
Transfer box control module (D204)
C1854R-1
C1319R-3
YB,MAPDM,1550
(NO AFS)
YB,MAPCN,220
(AFS)
SJ1775
YB,MAPDL,1330
(AFS)
SJ1276
YB,MAPCD,515
C0506R-14
ABS module (D277)
Resistor-Terminating (G171)
Dynamic response module (D285)
YB,MAPCL,585
C0647R-15
AFS ECU (D276)
C2193R-3
YB,MAPCR,930
HS CAN_L

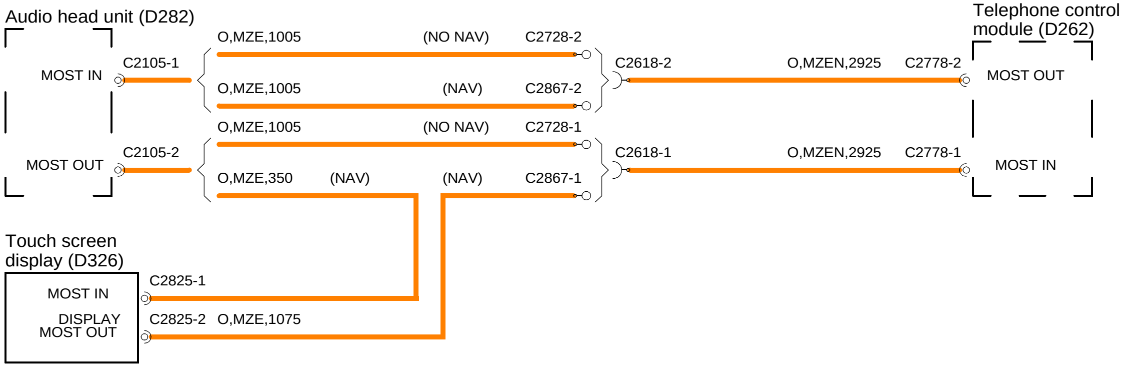

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Central Junction Box (P101)
C0583R-22
FUSE 63P
C0582-43
LG,0.75D
C0040-16
10.0 Amps
ABS module (D277)
C0506R-11
R,0.5D
C2240R-9 C2238-9
R,0.5D
C0040-9
Diagnostic socket (V100)
GND
C0040-4
B,0.5D
C2627-1
TYPE 3
GND
C0040-5
B,0.5D
C2628-1
TYPE 3
BATT
MS CAN-H
C0040-3
YW,MAPJ
SJ730
MS CAN-L
C0040-11
YU,MAPJ
SJ731
HS CAN-H
C0040-6
YN,MAPK
SJ850
HS CAN-L
C0040-14
YB,MAPK
SJ860
C0040-8
GW,0.5D
C2238-19 C2240R-19
GW,0.5D
Transmission control module (D306)
C0193-3
GW,0.5H
(PV8-N/A)
C2366B-16
GW,0.5H
(DV6)
C2366C-16
C2365R-16
GW,0.5H
(PV8-S/C)
C2366D-16

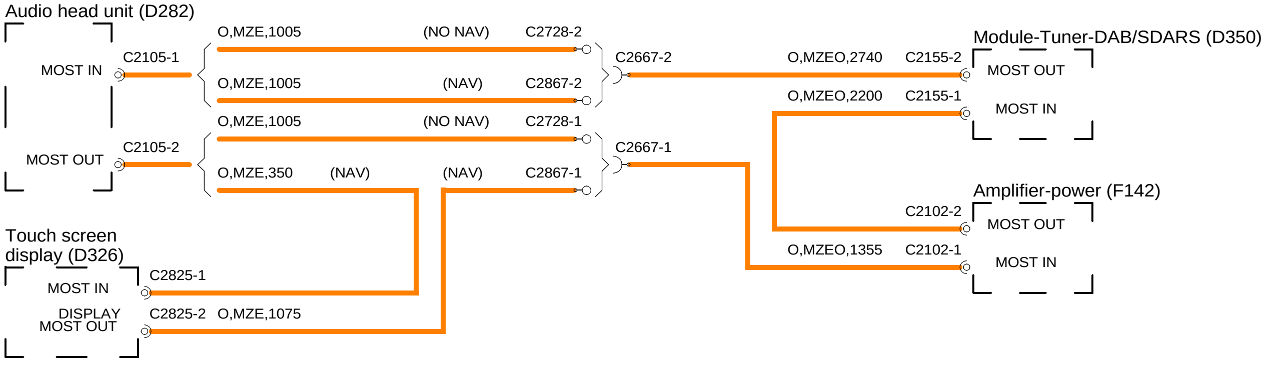

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-17
YW,MAPD,925
SJ730
YW,MAPCC,1200
SJ965
YW,MAPZ,525
C1354-9
Audio head unit (D282)
Diagnostic socket (V100)
C0040-3
YW,MAPJ,240
Automatic Temperature Control Module (D243)
YW,MAPN,630
C1629-22
C1629-10
YW,MAPL,2065
Fuel fired booster heater (H115)
C0925-7
YW,MAPAK,360
SJ422
(DV6)
YW,MAPDA,4090
C2240R-2 C2238-2
Tire pressure monitoring control module (D286)
C1537-11
C1537-3
YW,MAPFY,2535
(TPMS)
C2411R-13 C2412R-13
(DV6)
YW,MAPDB,2135
(NO TPMS)
(PV8)
YW,MAPAT,2785
YW,MAPZB,2610
SJ887
YW,MAPAT,710
C0957-14
Parking aid control module (D184)
YW,MAPAY,4475
(TPMS)
Central Junction Box (P101)
YW,MAPFX,2315
C1166R-18 C1168-18
YW,MAPX,925
C0580-15
Resistor-
Terminating (G171)

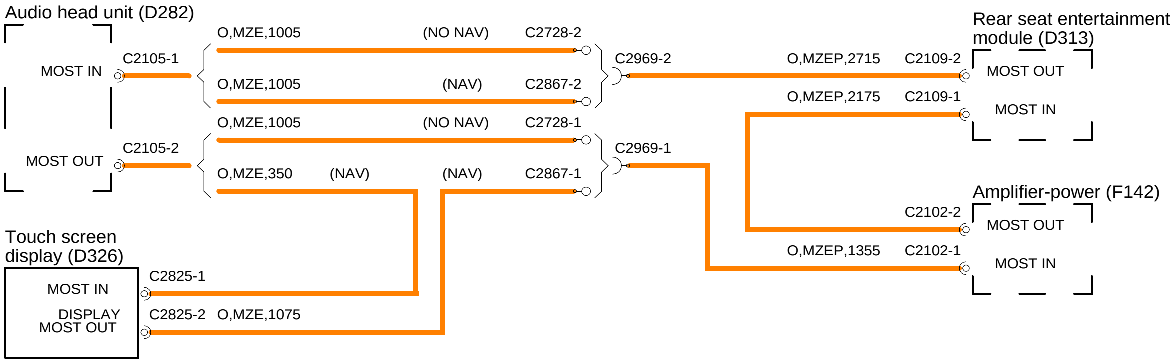
MS CAN_H

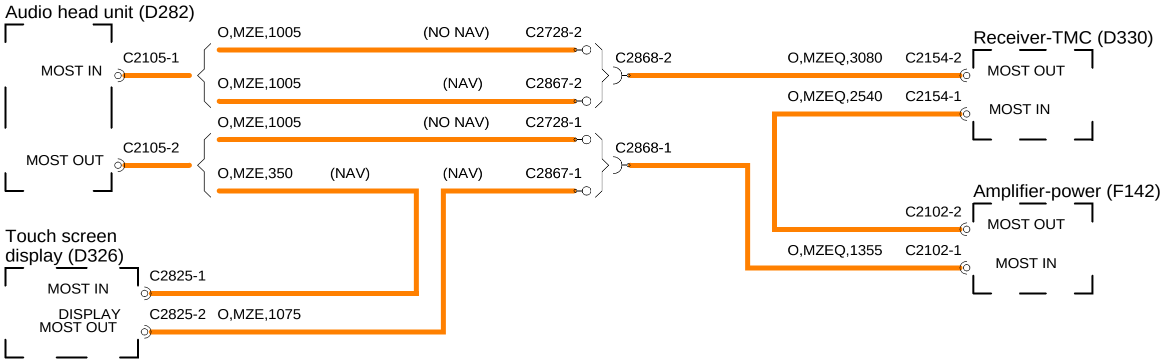

Instrument cluster (J100)
Resistor-
Terminating (G171)
C0230-18
YU,MAPD,895
SJ731
YU,MAPCC,1200
SJ975
YU,MAPZ,495
C1354-10
Audio head unit (D282)
Diagnostic socket (V100)
C0040-11
YU,MAPJ,270
Automatic Temperature
Control Module (D243)
YU,MAPN,600
C1629-21
C1629-9
YU,MAPL,2065
Fuel fired booster
heater (H115)
C0925-4
YU,MAPAK,310
SJ423
YU,MAPDA,4140
(DV6)
C2240R-1 C2238-1
Tire pressure monitoring
control module (D286)
C1537-10
C1537-2
YU,MAPFY,2535
(TPMS)
C2411R-12 C2412R-12
(DV6)
YU,MAPDB,2185
(NO TPMS)
(PV8)
YU,MAPAT,2785
YU,MAPZB,2650
Parking aid control
module (D184)
SJ873
YU,MAPAT,670
C0957-7
YU,MAPAY,4515
(TPMS)
Central Junction
Box (P101)
YU,MAPFX,2355
C1166R-19 C1168-19
YU,MAPX,925
C0580-1
Resistor-
Terminating (G171)
MS CAN_L

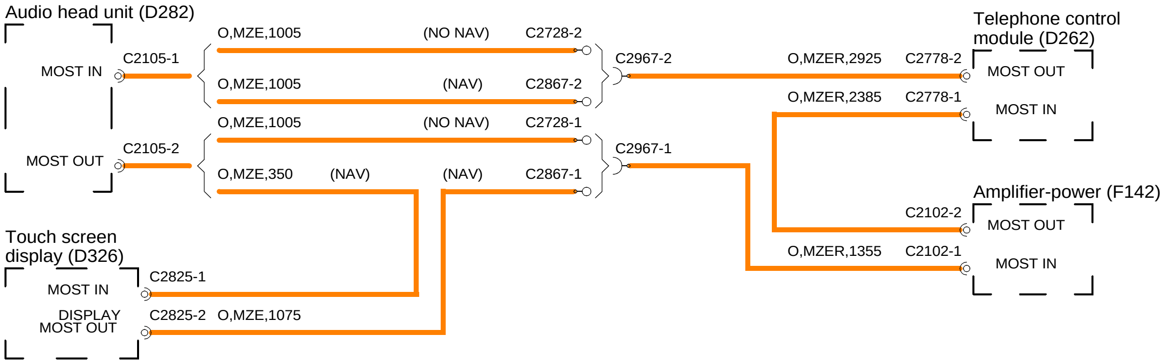

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3211-2
O,MZEM,1355
C2102-2
C3211-1
O,MZEM,1355
C2102-1
Amplifier-power (F142)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

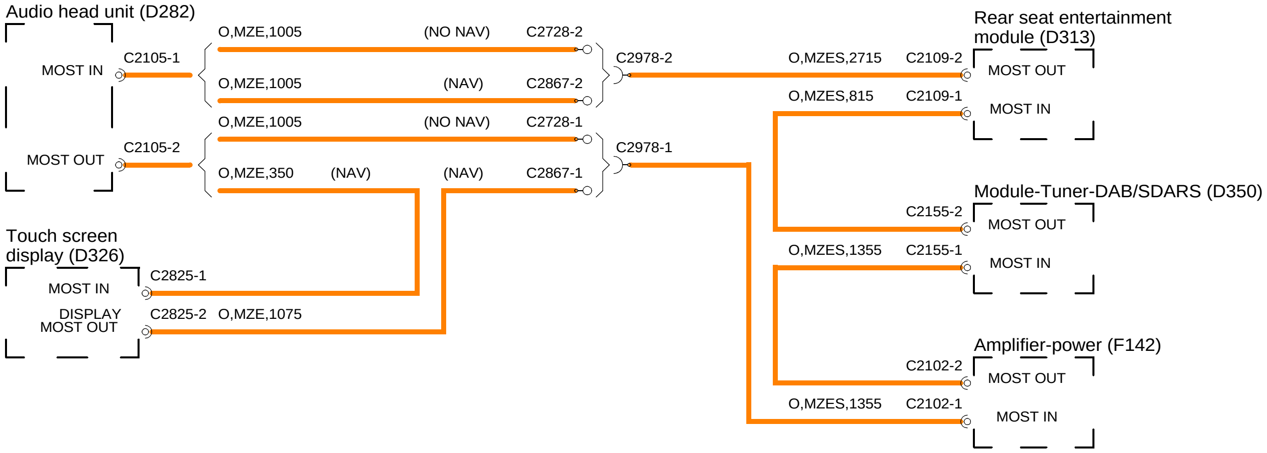

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2618-2
O,MZEN,2925
C2778-2
C2618-1
O,MZEN,2925
C2778-1
Telephone control module (D262)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

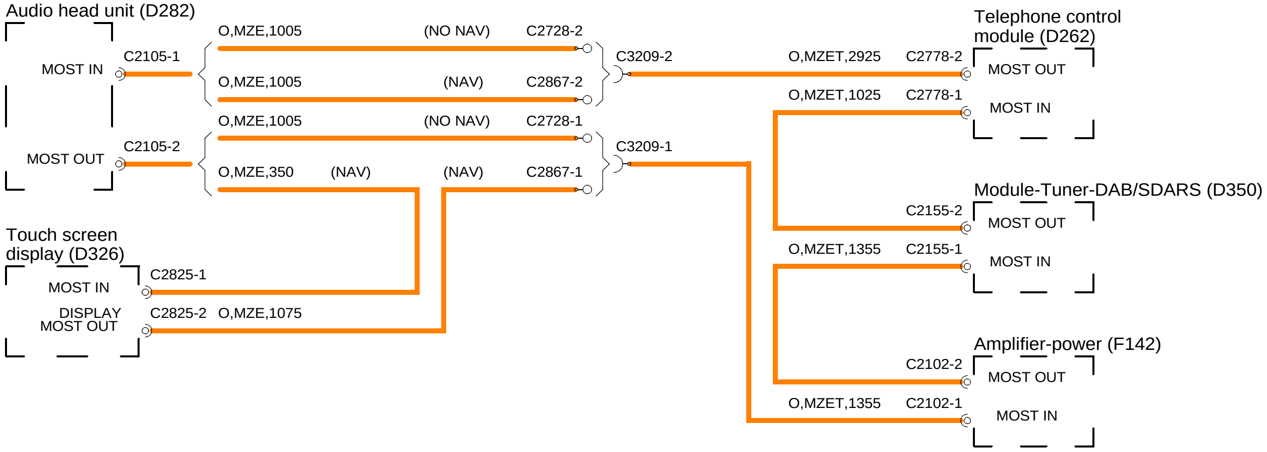

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2667-2
O,MZEO,2740
C2155-2
O,MZEO,2200
C2155-1
C2667-1
Module-Tuner-DAB/SDARS (D350)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEO,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

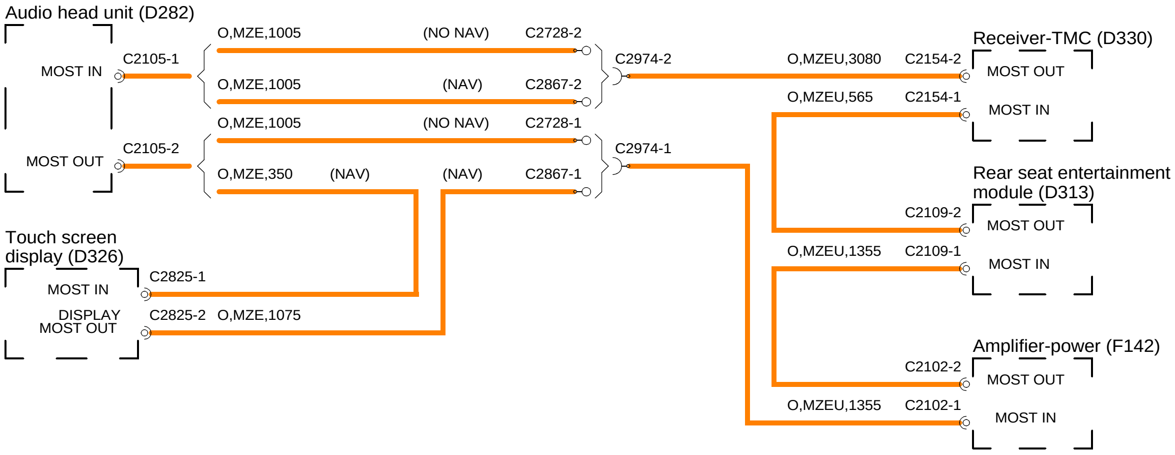

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2969-2
C2969-1
O,MZEP,2715
C2109-2
O,MZEP,2175
C2109-1
Rear seat entertainment module (D313)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEP,1355
C2102-1
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
DISPLAY MOST OUT
C2825-2
O,MZE,1075

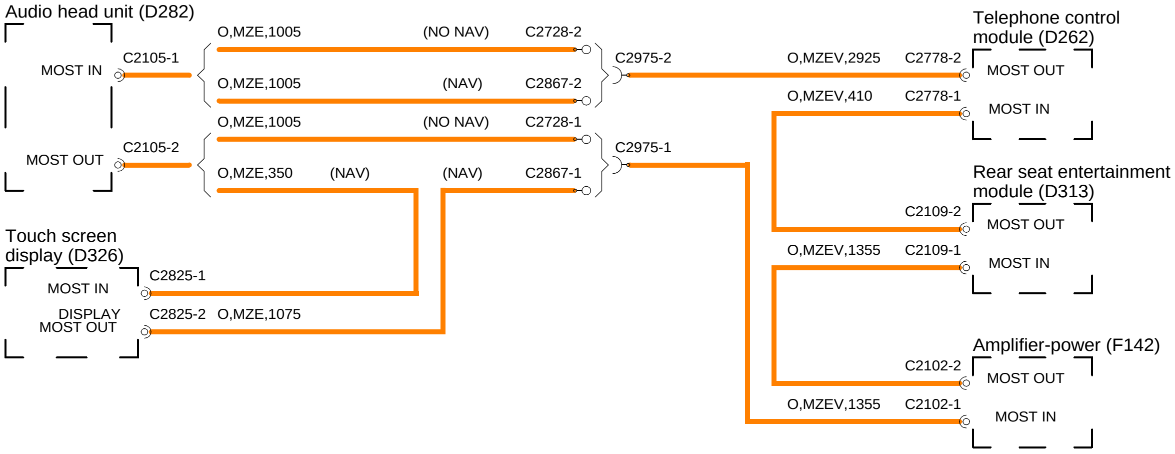

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2868-2
C2868-1
O,MZEQ,3080
C2154-2
O,MZEQ,2540
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEQ,1355
C2102-1
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
DISPLAY MOST OUT
C2825-2
O,MZE,1075

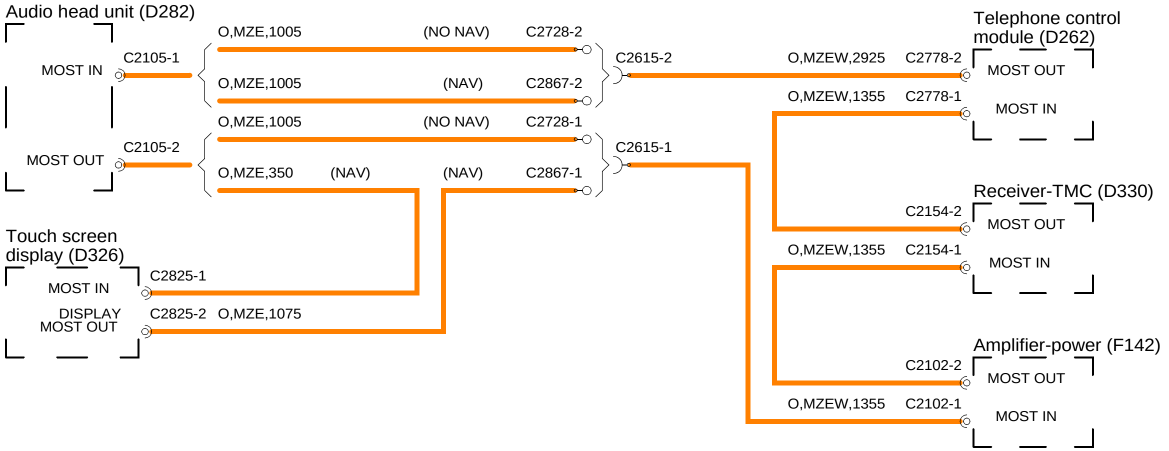

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2967-2
C2967-1
O,MZER,2925
C2778-2
O,MZER,2385
C2778-1
Telephone control module (D262)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZER,1355
C2102-1
MOST IN
Touch screen display (D326)
C2825-1
MOST IN
DISPLAY MOST OUT
C2825-2
O,MZE,1075

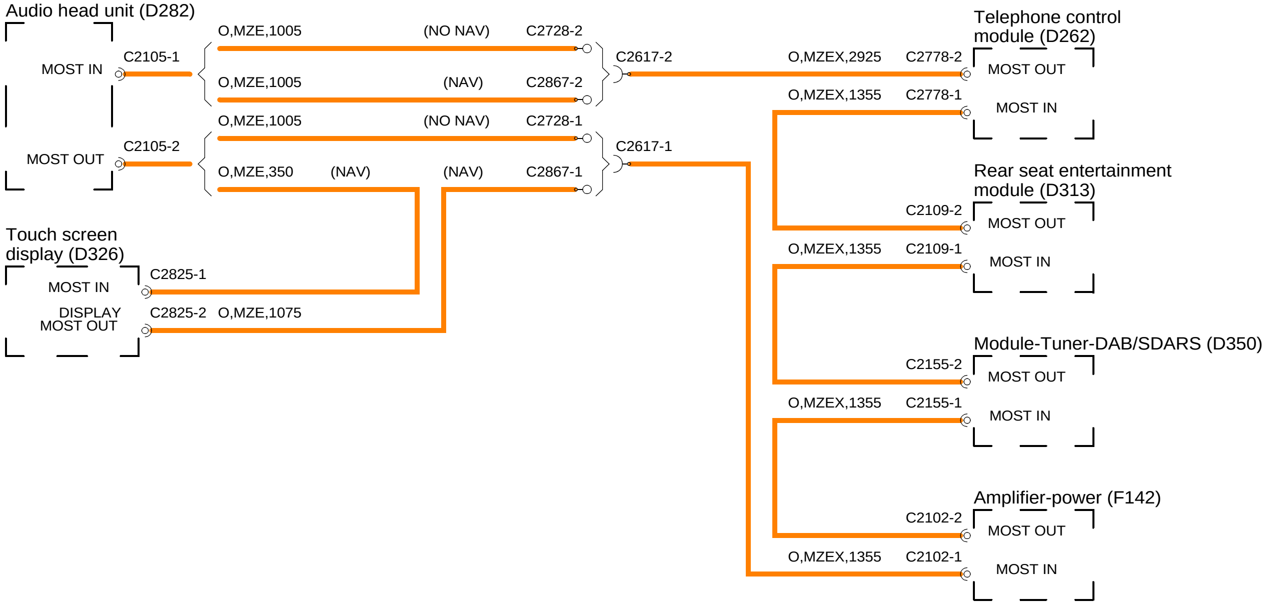

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2978-2
C2978-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
Rear seat entertainment module (D313)
O,MZES,2715
C2109-2
MOST OUT
O,MZES,815
C2109-1
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZES,1355
C2155-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZES,1355
C2102-1
MOST IN

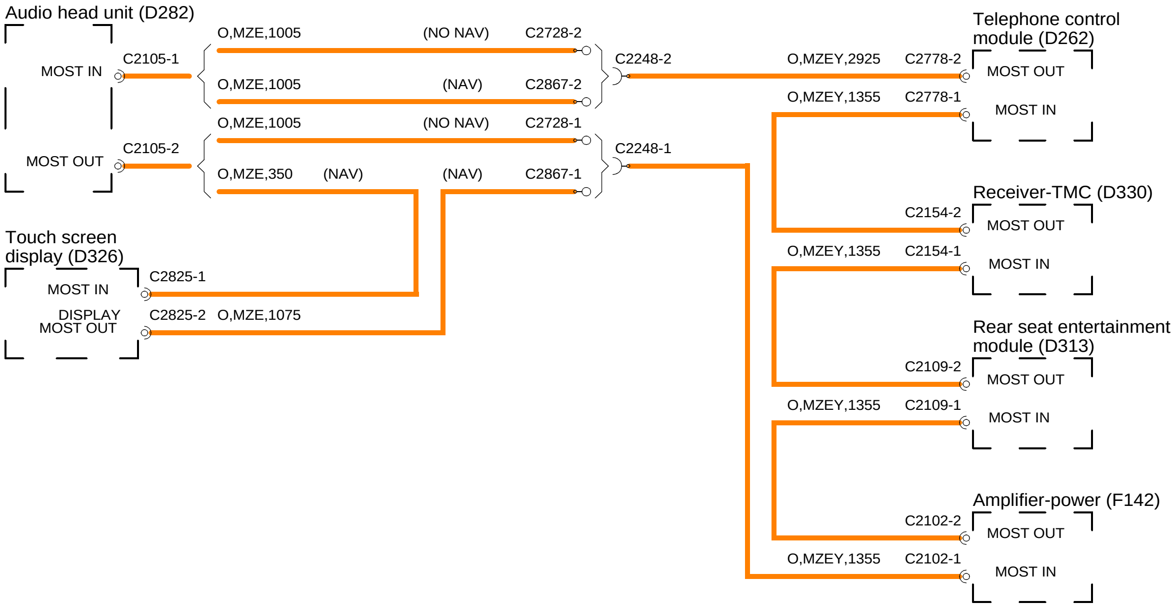

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3209-2
C3209-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
Telephone control module (D262)
O,MZET,2925
C2778-2
MOST OUT
O,MZET,1025
C2778-1
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZET,1355
C2155-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZET,1355
C2102-1
MOST IN

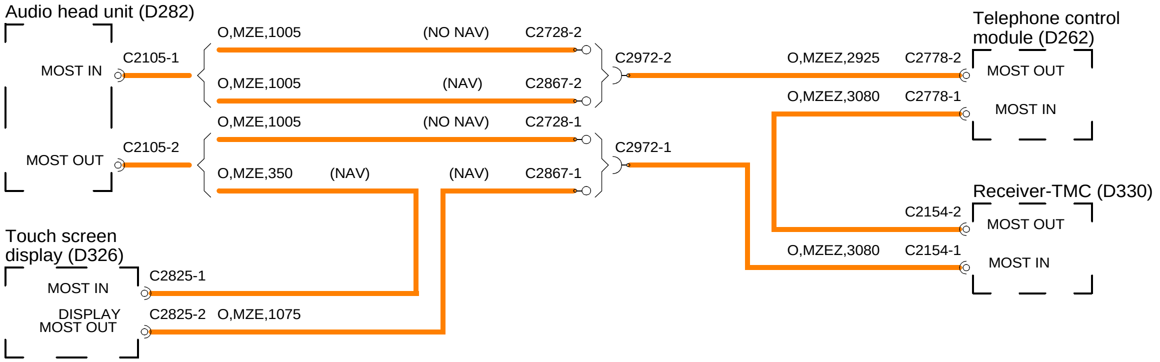

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2974-2
C2974-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
O,MZEU,3080
C2154-2
Receiver-TMC (D330)
MOST OUT
O,MZEU,565
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEU,1355
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEU,1355
C2102-1
MOST IN

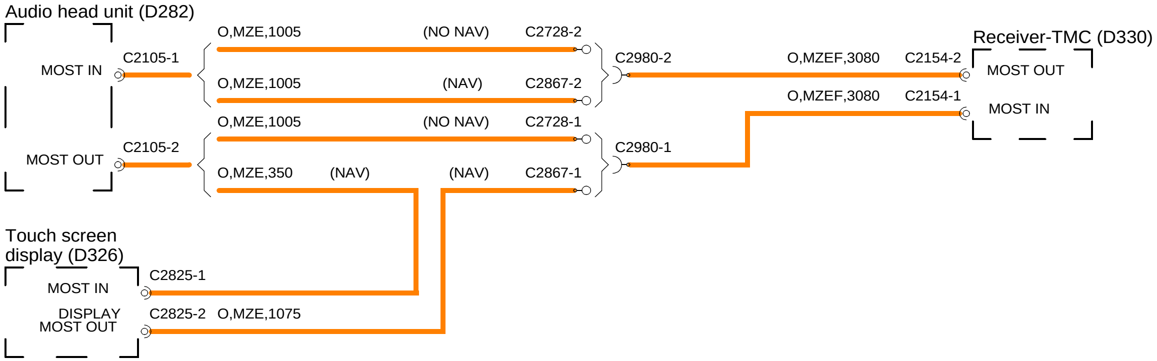

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2975-2
C2975-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
Telephone control module (D262)
O,MZEV,2925
C2778-2
MOST OUT
O,MZEV,410
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEV,1355
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEV,1355
C2102-1
MOST IN

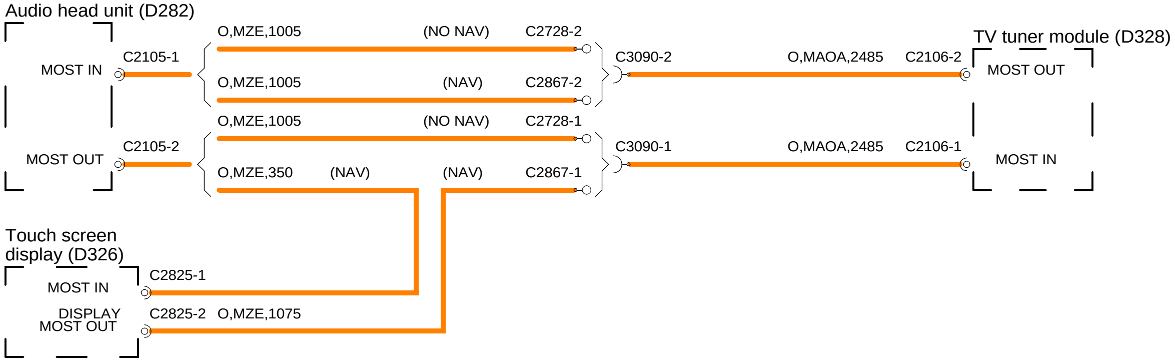

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2615-2
C2615-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
O,MZEW,2925
C2778-2
Telephone control module (D262)
MOST OUT
O,MZEW,1355
C2778-1
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEW,1355
C2154-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEW,1355
C2102-1
MOST IN

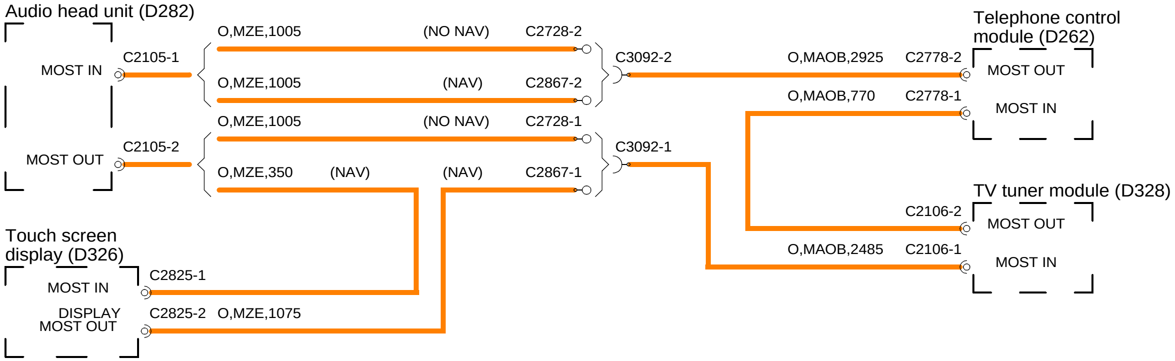

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2617-2
C2617-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
O,MZEX,2925
C2778-2
Telephone control module (D262)
MOST OUT
O,MZEX,1355
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEX,1355
C2109-1
MOST IN
Module-Tuner-DAB/SDARS (D350)
C2155-2
MOST OUT
O,MZEX,1355
C2155-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEX,1355
C2102-1
MOST IN

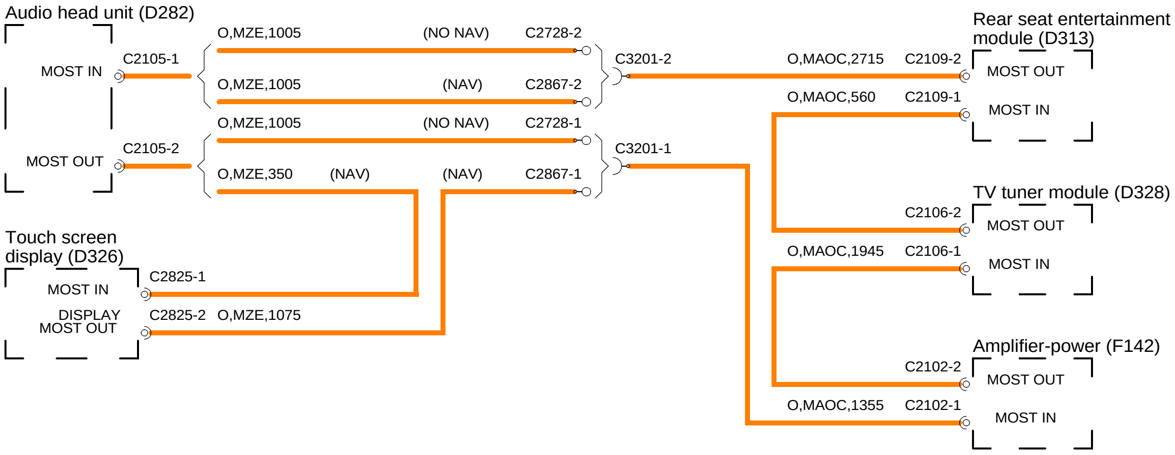

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2248-2
C2248-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
O,MZEY,2925
C2778-2
O,MZEY,1355
C2778-1
Telephone control module (D262)
MOST OUT
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEY,1355
C2154-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MZEY,1355
C2109-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MZEY,1355
C2102-1
MOST IN

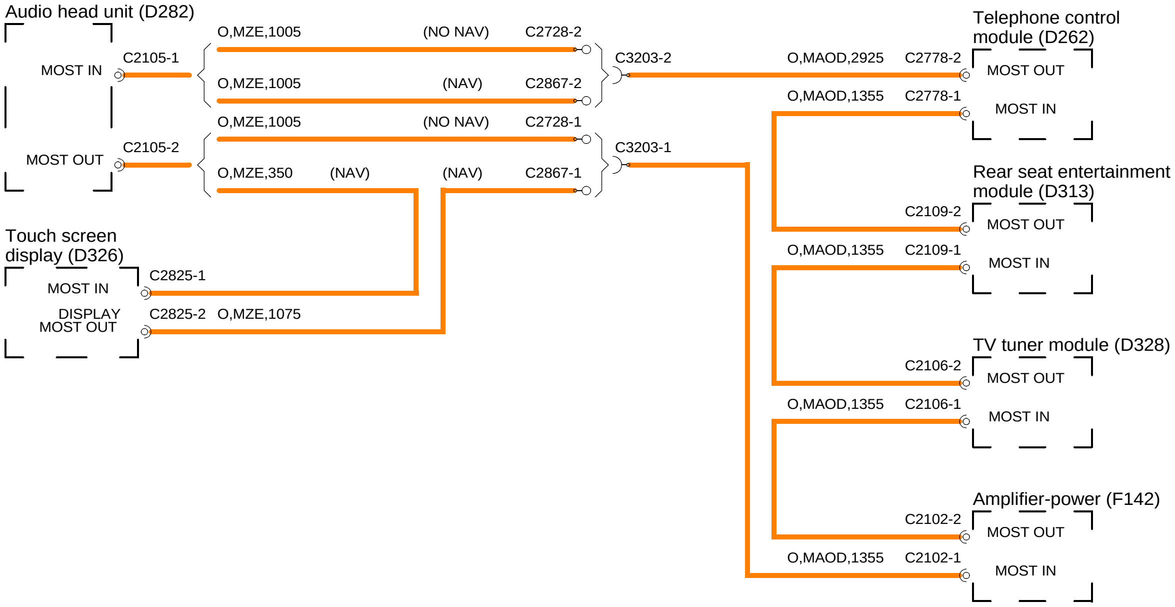

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2972-2
C2972-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
O,MZEZ,2925
C2778-2
O,MZEZ,3080
C2778-1
Telephone control module (D262)
MOST OUT
MOST IN
Receiver-TMC (D330)
C2154-2
MOST OUT
O,MZEZ,3080
C2154-1
MOST IN

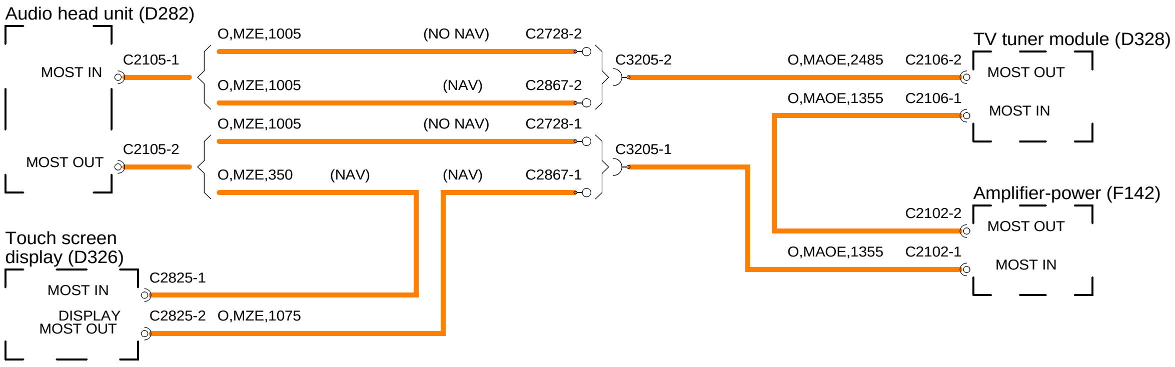

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C2980-2
C2980-1
O,MZEF,3080
C2154-2
O,MZEF,3080
C2154-1
Receiver-TMC (D330)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

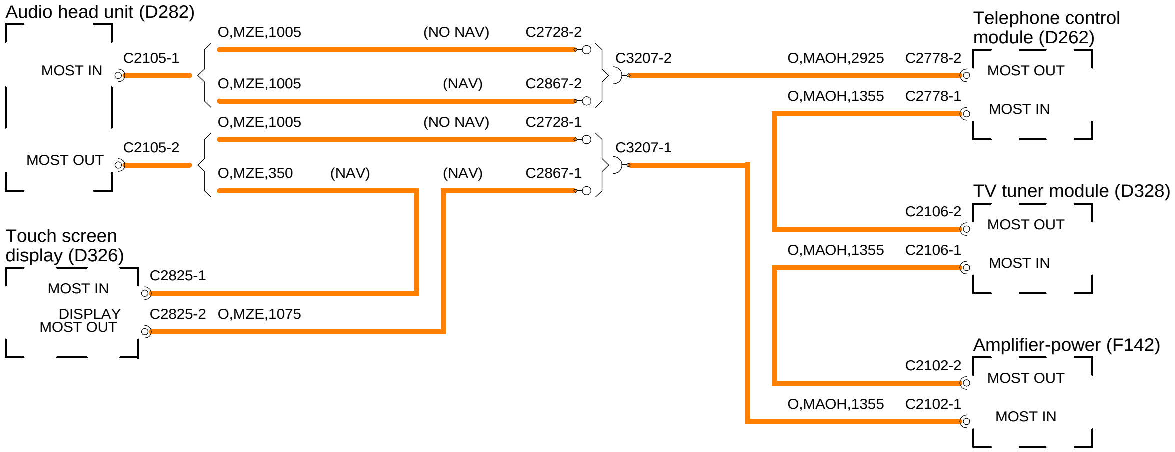

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3090-2
C3090-1
O,MAOA,2485
C2106-2
O,MAOA,2485
C2106-1
TV tuner module (D328)
MOST OUT
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

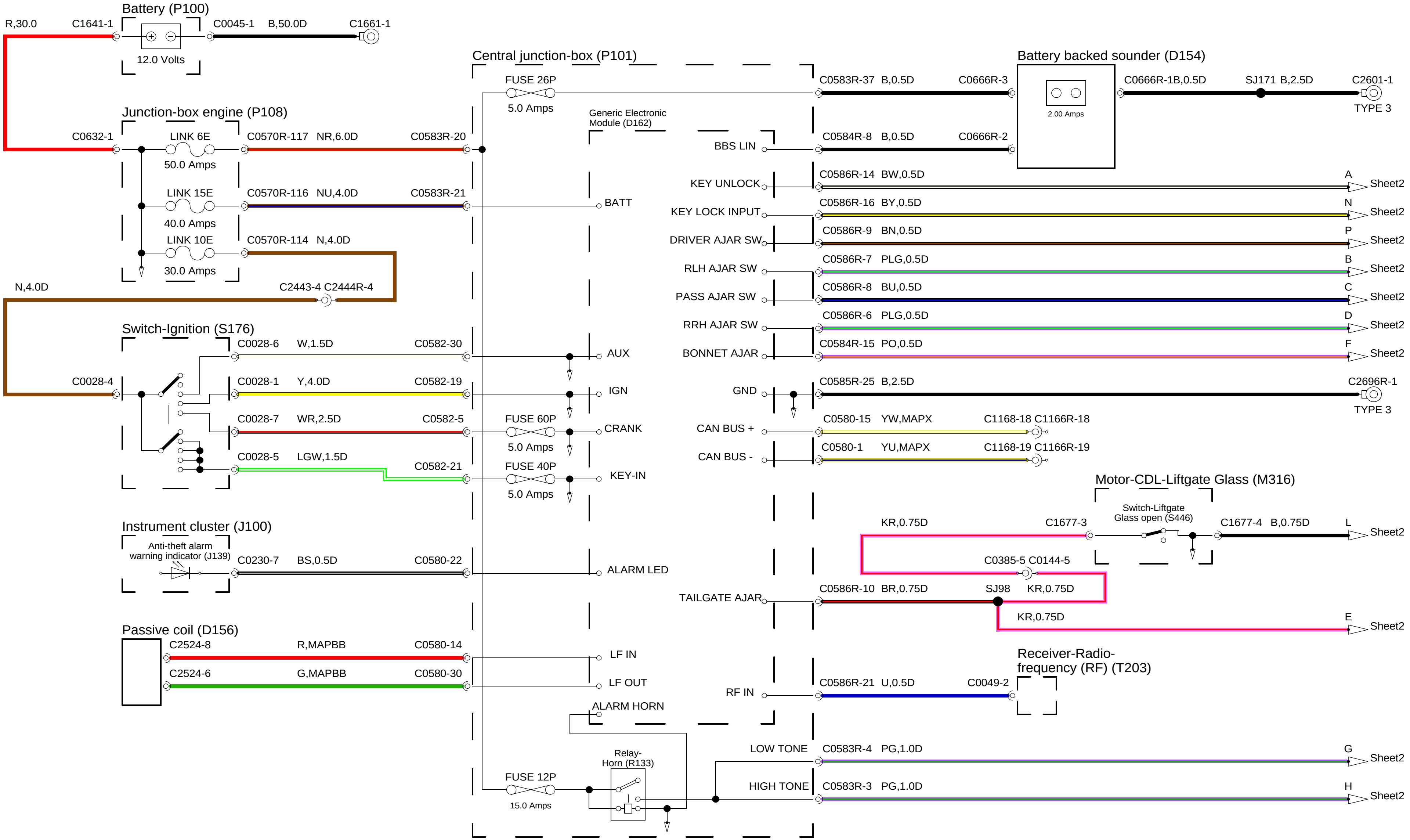

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3092-2
C3092-1
O,MAOB,2925
C2778-2
O,MAOB,770
C2778-1
Telephone control module (D262)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOB,2485
C2106-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

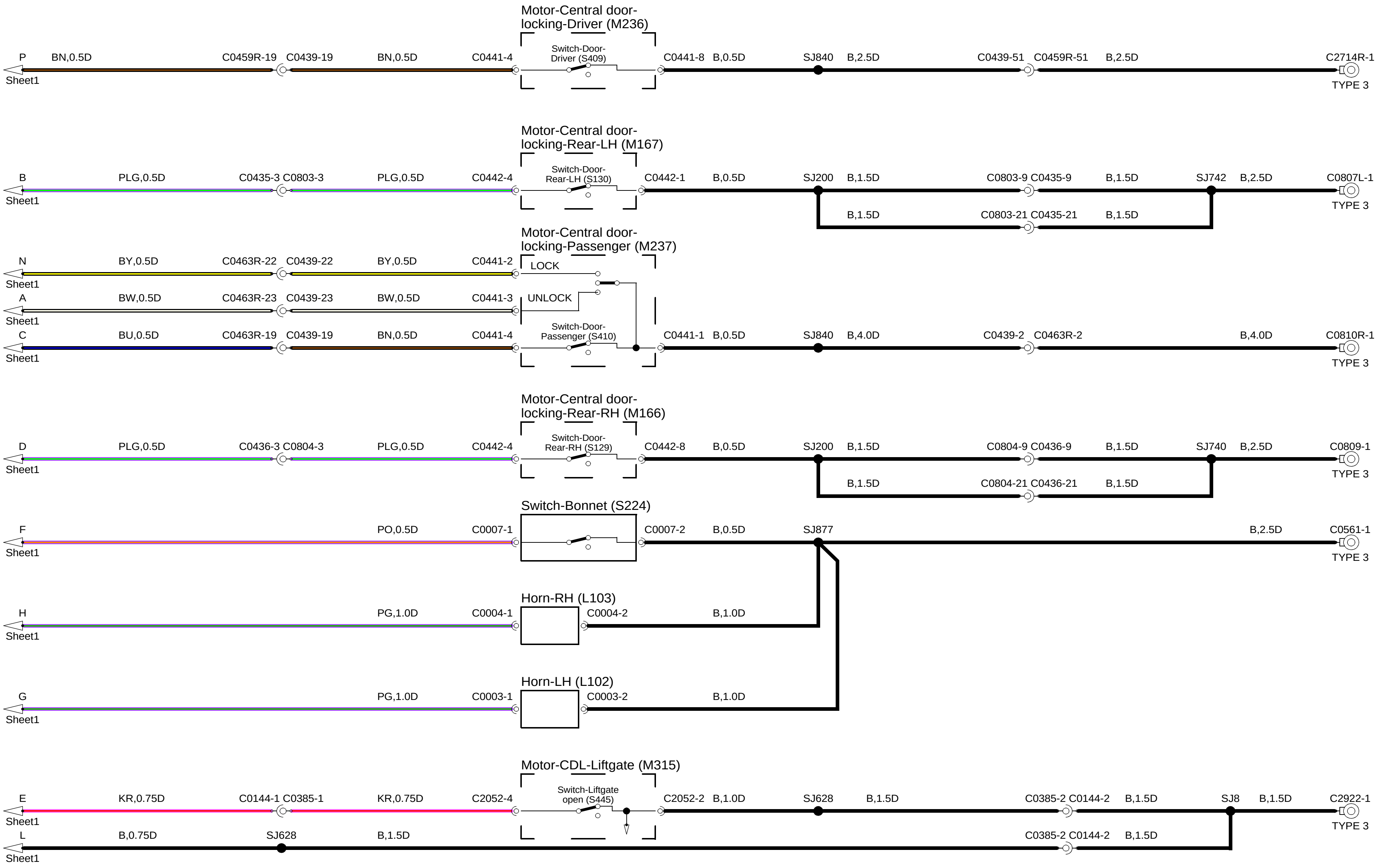

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3201-2
C3201-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
O,MAOC,2715
C2109-2
Rear seat entertainment module (D313)
MOST OUT
O,MAOC,560
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOC,1945
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOC,1355
C2102-1
MOST IN

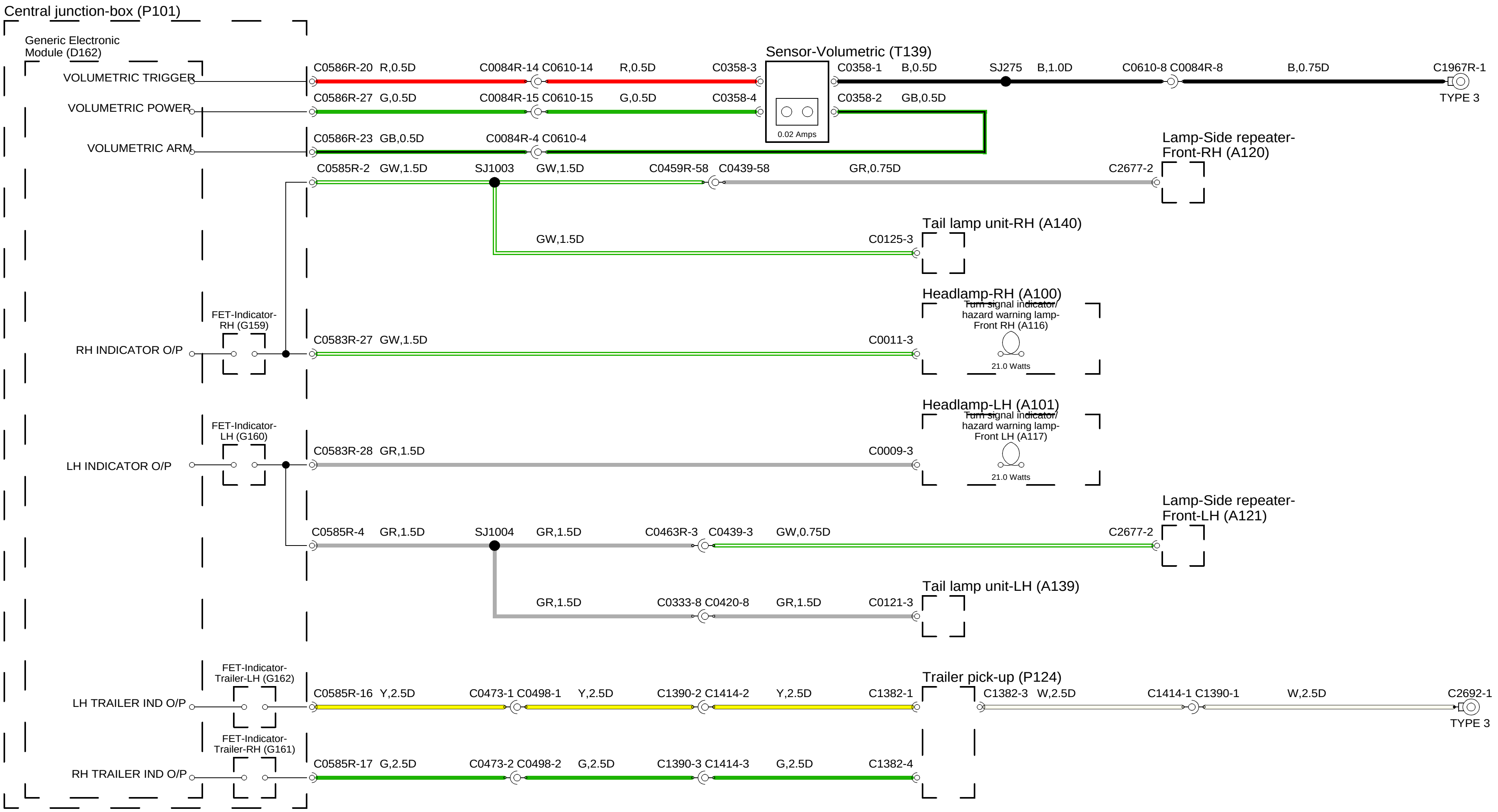

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3203-2
C3203-1
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075
O,MAOD,2925
C2778-2
Telephone control module (D262)
MOST OUT
O,MAOD,1355
C2778-1
MOST IN
Rear seat entertainment module (D313)
C2109-2
MOST OUT
O,MAOD,1355
C2109-1
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOD,1355
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOD,1355
C2102-1
MOST IN

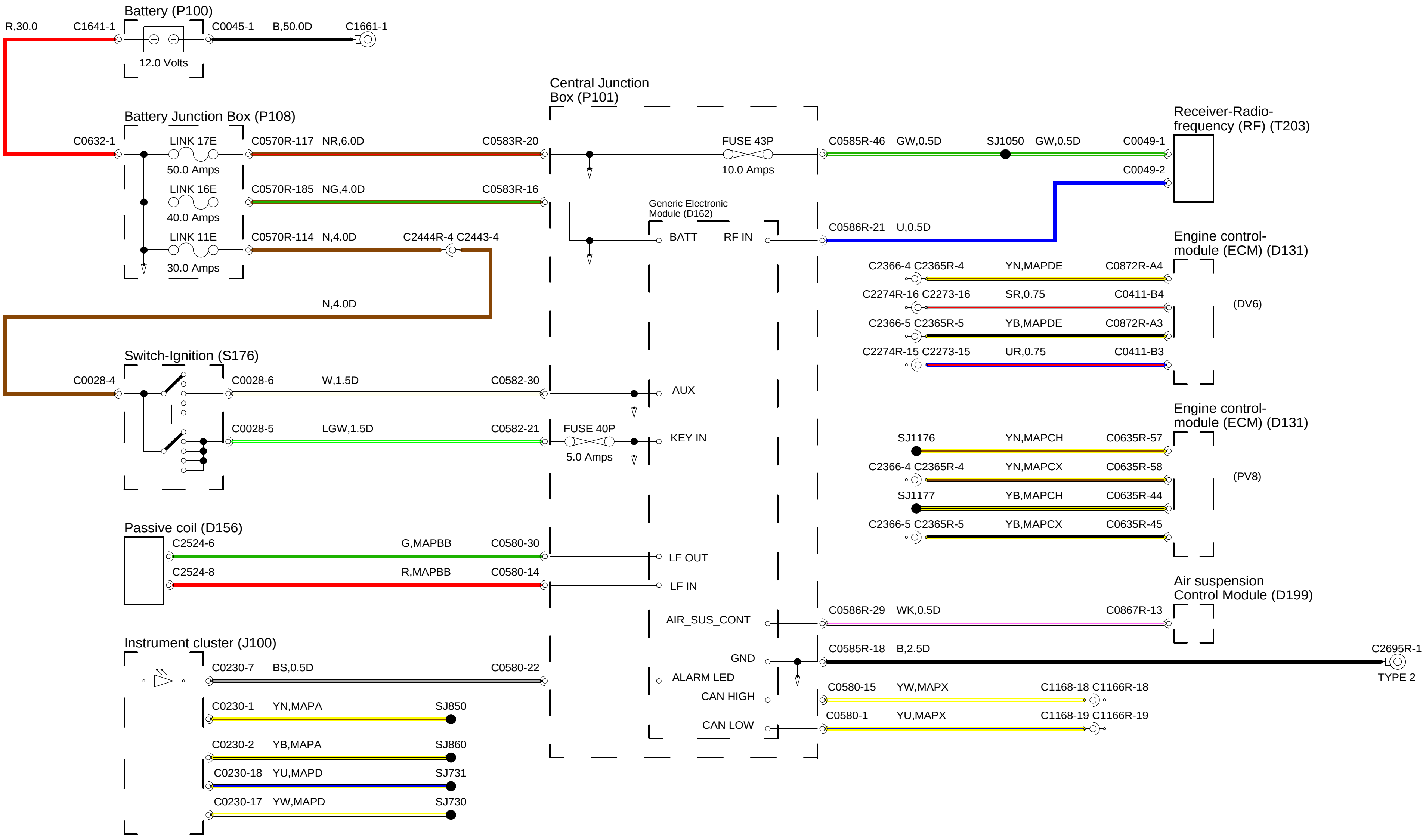

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3205-2
C3205-1
O,MAOE,2485
C2106-2
O,MAOE,1355
C2106-1
TV tuner module (D328)
MOST OUT
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOE,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

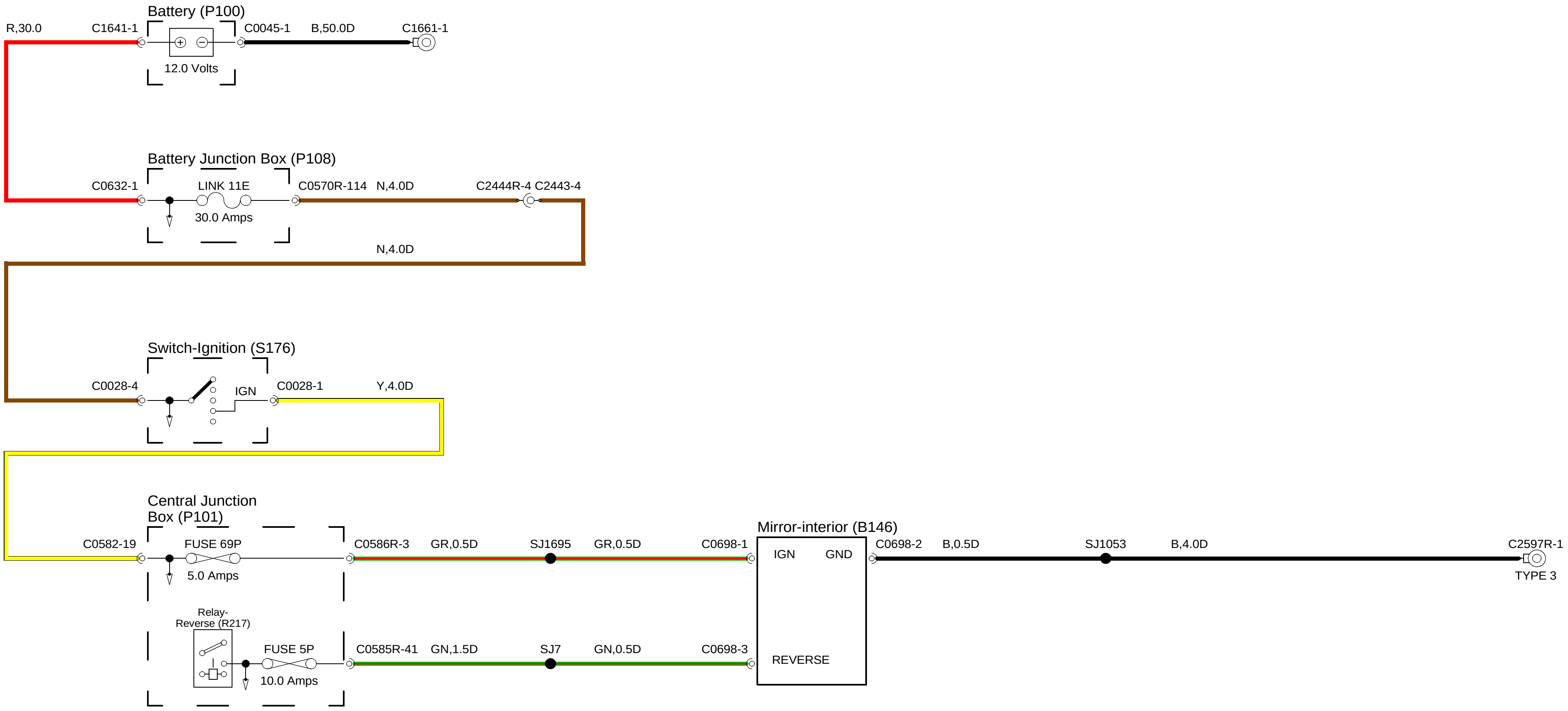

Audio head unit (D282)
MOST IN
C2105-1
MOST OUT
C2105-2
O,MZE,1005
(NO NAV)
C2728-2
O,MZE,1005
(NAV)
C2867-2
O,MZE,1005
(NO NAV)
C2728-1
O,MZE,350
(NAV)
(NAV)
C2867-1
C3207-2
C3207-1
O,MAOH,2925
C2778-2
O,MAOH,1355
C2778-1
Telephone control module (D262)
MOST OUT
MOST IN
TV tuner module (D328)
C2106-2
MOST OUT
O,MAOH,1355
C2106-1
MOST IN
Amplifier-power (F142)
C2102-2
MOST OUT
O,MAOH,1355
C2102-1
MOST IN
Touch screen display (D326)
MOST IN
C2825-1
DISPLAY MOST OUT
C2825-2
O,MZE,1075

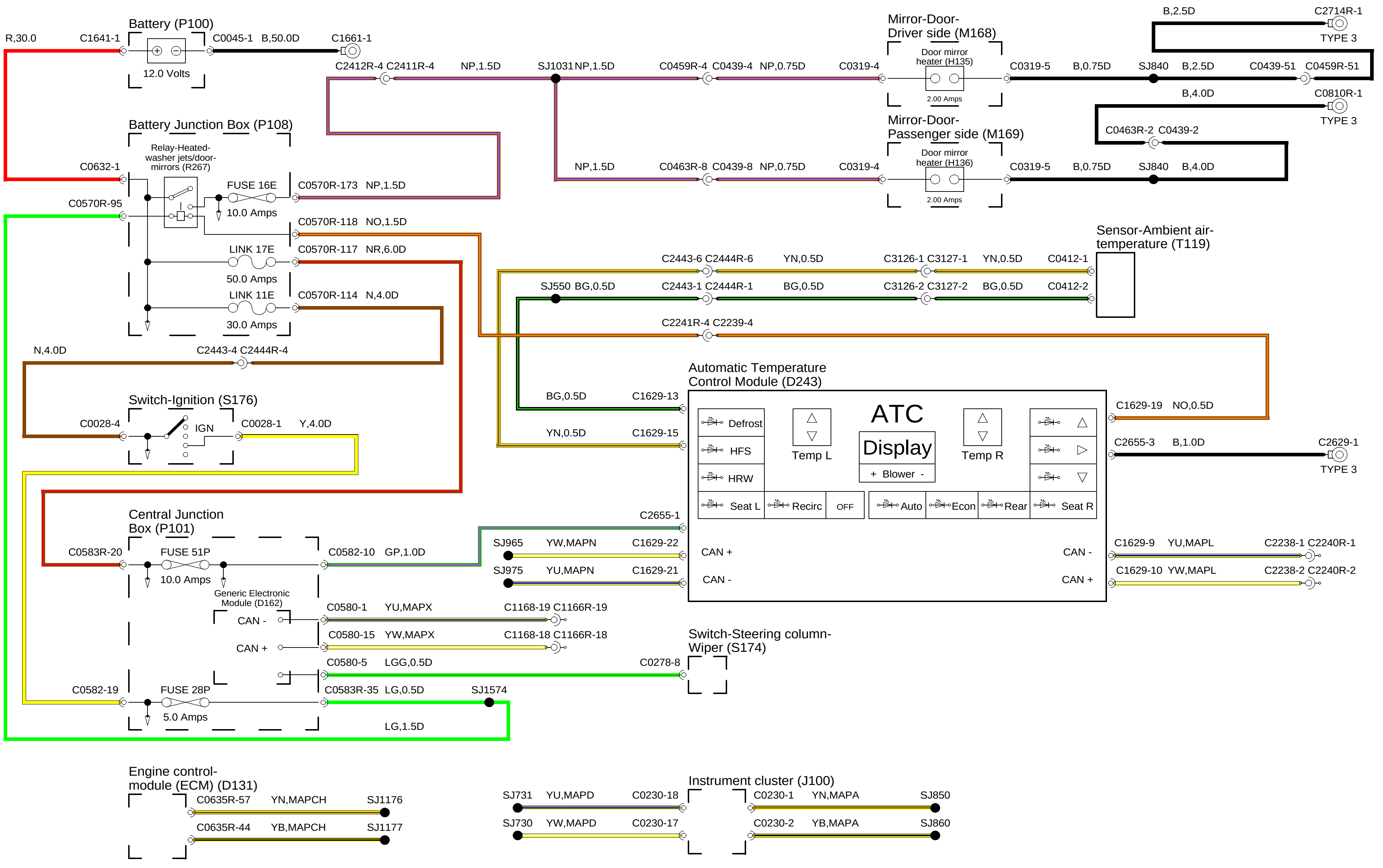

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central junction-box (P101)
Battery backed sounder (D154)
FUSE 26P
5.0 Amps
C0583R-37
B,0.5D
C0666R-3
C0666R-1B,0.5D
SJ171
B,2.5D
C2601-1
TYPE 3
2.00 Amps
Junction-box engine (P108)
Generic Electronic Module (D162)
C0632-1
LINK 6E
50.0 Amps
C0570R-117
NR,6.0D
C0583R-20
BBS LIN
C0584R-8
B,0.5D
C0666R-2
KEY UNLOCK
C0586R-14
BW,0.5D
A
Sheet2
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0583R-21
BATT
KEY LOCK INPUT
C0586R-16
BY,0.5D
N
Sheet2
LINK 10E
30.0 Amps
C0570R-114
N,4.0D
DRIVER AJAR SW
C0586R-9
BN,0.5D
P
Sheet2
RLH AJAR SW
C0586R-7
PLG,0.5D
B
Sheet2
N,4.0D
C2443-4 C2444R-4
PASS AJAR SW
C0586R-8
BU,0.5D
C
Sheet2
Switch-Ignition (S176)
RRH AJAR SW
C0586R-6
PLG,0.5D
D
Sheet2
C0028-6
W,1.5D
C0582-30
AUX
BONNET AJAR
C0584R-15
PO,0.5D
F
Sheet2
C0028-4
C0028-1
Y,4.0D
C0582-19
IGN
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
CAN BUS +
C0580-15
YW,MAPX
C1168-18 C1166R-18
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY-IN
CAN BUS -
C0580-1
YU,MAPX
C1168-19 C1166R-19
Motor-CDL-Liftgate Glass (M316)
Switch-Liftgate Glass open (S446)
Instrument cluster (J100)
KR,0.75D
C1677-3
C1677-4
B,0.75D
L
Sheet2
Anti-theft alarm warning indicator (J139)
C0230-7
BS,0.5D
C0580-22
ALARM LED
C0385-5 C0144-5
TAILGATE AJAR
C0586R-10
BR,0.75D
SJ98
KR,0.75D
KR,0.75D
E
Sheet2
Passive coil (D156)
C2524-8
R,MAPBB
C0580-14
LF IN
Receiver-Radio-frequency (RF) (T203)
C2524-6
G,MAPBB
C0580-30
LF OUT
RF IN
C0586R-21
U,0.5D
C0049-2
ALARM HORN
Relay-Horn (R133)
LOW TONE
C0583R-4
PG,1.0D
G
Sheet2
FUSE 12P
15.0 Amps
HIGH TONE
C0583R-3
PG,1.0D
H
Sheet2

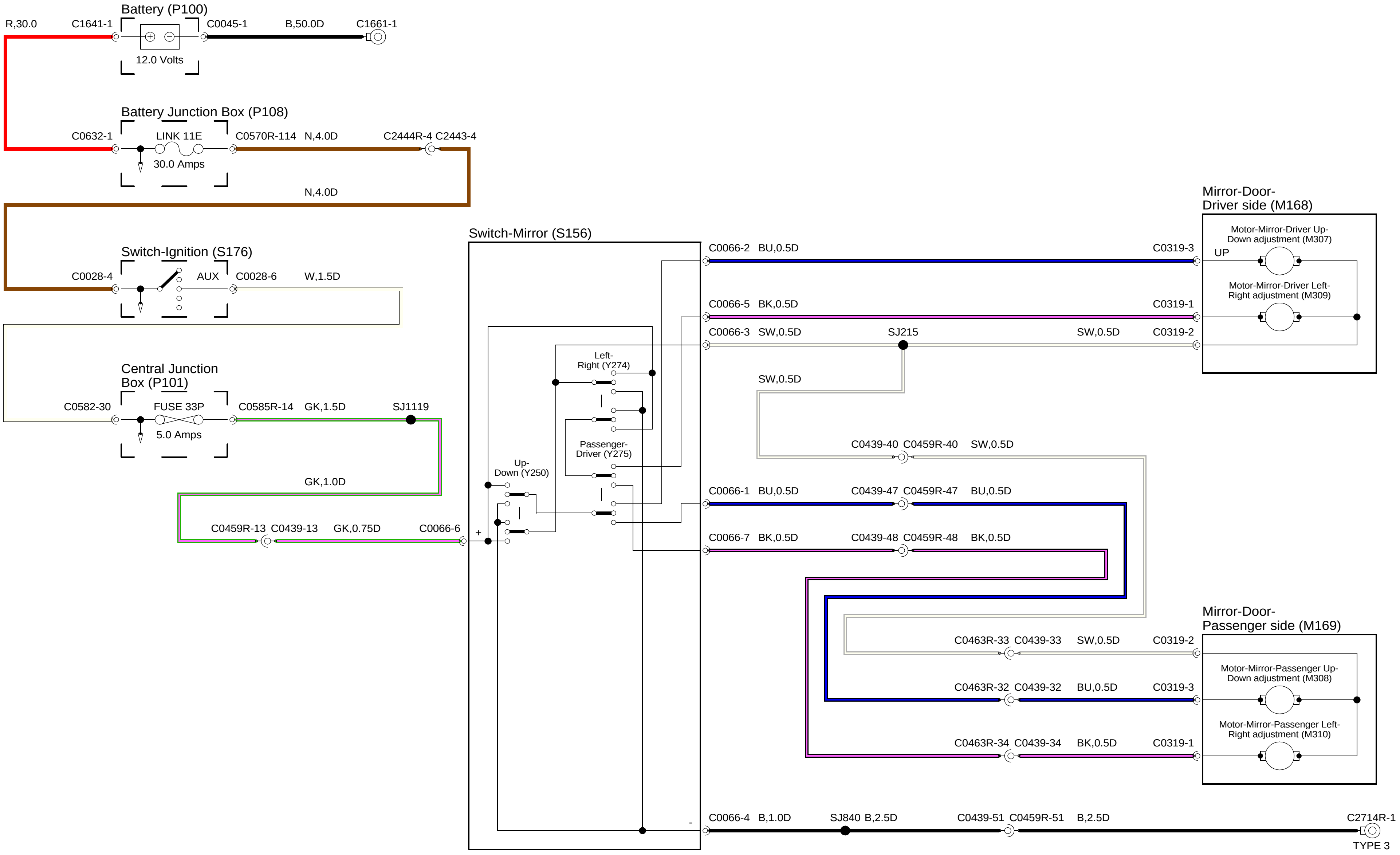

Motor-Central door-locking-Driver (M236)
Switch-Door-Driver (S409)
P
Sheet1
BN,0.5D
C0459R-19
C0439-19
BN,0.5D
C0441-4
C0441-8
B,0.5D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
B
Sheet1
PLG,0.5D
C0435-3
C0803-3
PLG,0.5D
C0442-4
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9
C0435-9
B,1.5D
SJ742
B,2.5D
C0807L-1
TYPE 3
B,1.5D
C0803-21
C0435-21
B,1.5D
Motor-Central door-locking-Passenger (M237)
LOCK
UNLOCK
Switch-Door-Passenger (S410)
N
Sheet1
BY,0.5D
C0463R-22
C0439-22
BY,0.5D
C0441-2
A
Sheet1
BW,0.5D
C0463R-23
C0439-23
BW,0.5D
C0441-3
C
Sheet1
BU,0.5D
C0463R-19
C0439-19
BN,0.5D
C0441-4
C0441-1
B,0.5D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3
Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
D
Sheet1
PLG,0.5D
C0436-3
C0804-3
PLG,0.5D
C0442-4
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9
C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21
C0436-21
B,1.5D
Switch-Bonnet (S224)
F
Sheet1
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
H
Sheet1
PG,1.0D
C0004-1
C0004-2
B,1.0D
Horn-LH (L102)
G
Sheet1
PG,1.0D
C0003-1
C0003-2
B,1.0D
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
E
Sheet1
KR,0.75D
C0144-1
C0385-1
KR,0.75D
C2052-4
C2052-2
B,1.0D
SJ628
B,1.5D
C0385-2
C0144-2
B,1.5D
SJ8
B,1.5D
C2922-1
TYPE 3
L
Sheet1
B,0.75D
SJ628
B,1.5D
C0385-2
C0144-2
B,1.5D

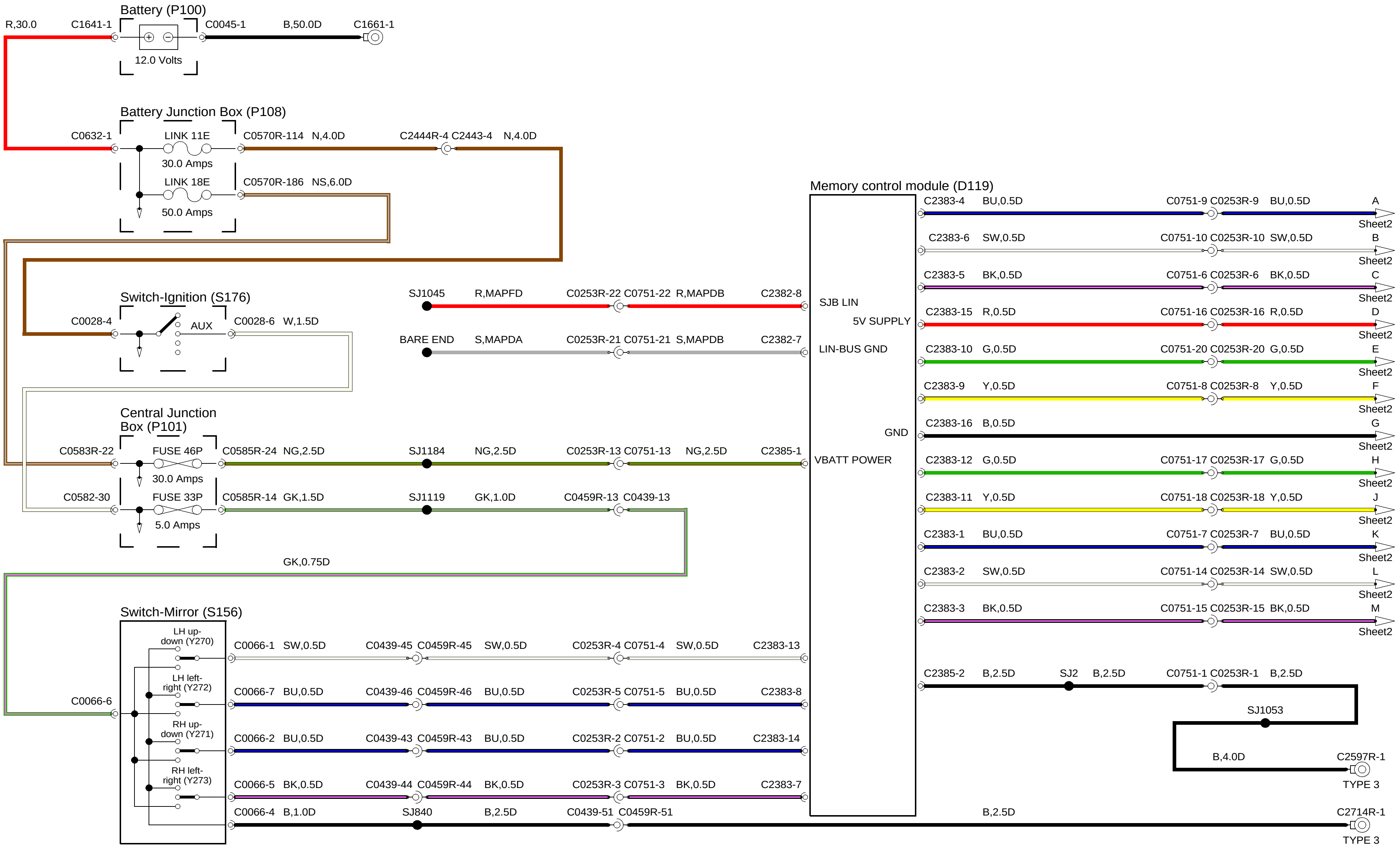

Central junction-box (P101)
Generic Electronic Module (D162)
VOLUMETRIC TRIGGER
VOLUMETRIC POWER
VOLUMETRIC ARM
RH INDICATOR O/P
LH INDICATOR O/P
LH TRAILER IND O/P
RH TRAILER IND O/P
FET-Indicator-RH (G159)
FET-Indicator-LH (G160)
FET-Indicator-Trailer-LH (G162)
FET-Indicator-Trailer-RH (G161)
Sensor-Volumetric (T139)
0.02 Amps
C0586R-20 R,0.5D
C0084R-14 C0610-14
R,0.5D
C0358-3
C0358-1 B,0.5D
SJ275 B,1.0D
C0610-8 C0084R-8
B,0.75D
C1967R-1
TYPE 3
C0586R-27 G,0.5D
C0084R-15 C0610-15
G,0.5D
C0358-4
C0358-2 GB,0.5D
C0586R-23 GB,0.5D
C0084R-4 C0610-4
Lamp-Side repeater-Front-RH (A120)
C0585R-2 GW,1.5D
SJ1003 GW,1.5D
C0459R-58 C0439-58
GR,0.75D
C2677-2
Tail lamp unit-RH (A140)
GW,1.5D
C0125-3
Headlamp-RH (A100)
Turn signal indicator/hazard warning lamp-Front RH (A116)
21.0 Watts
C0583R-27 GW,1.5D
C0011-3
Headlamp-LH (A101)
Turn signal indicator/hazard warning lamp-Front LH (A117)
21.0 Watts
C0583R-28 GR,1.5D
C0009-3
Lamp-Side repeater-Front-LH (A121)
C0585R-4 GR,1.5D
SJ1004 GR,1.5D
C0463R-3 C0439-3
GW,0.75D
C2677-2
Tail lamp unit-LH (A139)
GR,1.5D
C0333-8 C0420-8
GR,1.5D
C0121-3
Trailer pick-up (P124)
C0585R-16 Y,2.5D
C0473-1 C0498-1
Y,2.5D
C1390-2 C1414-2
Y,2.5D
C1382-1
C1382-3 W,2.5D
C1414-1 C1390-1
W,2.5D
C2692-1
TYPE 3
C0585R-17 G,2.5D
C0473-2 C0498-2
G,2.5D
C1390-3 C1414-3
G,2.5D
C1382-4

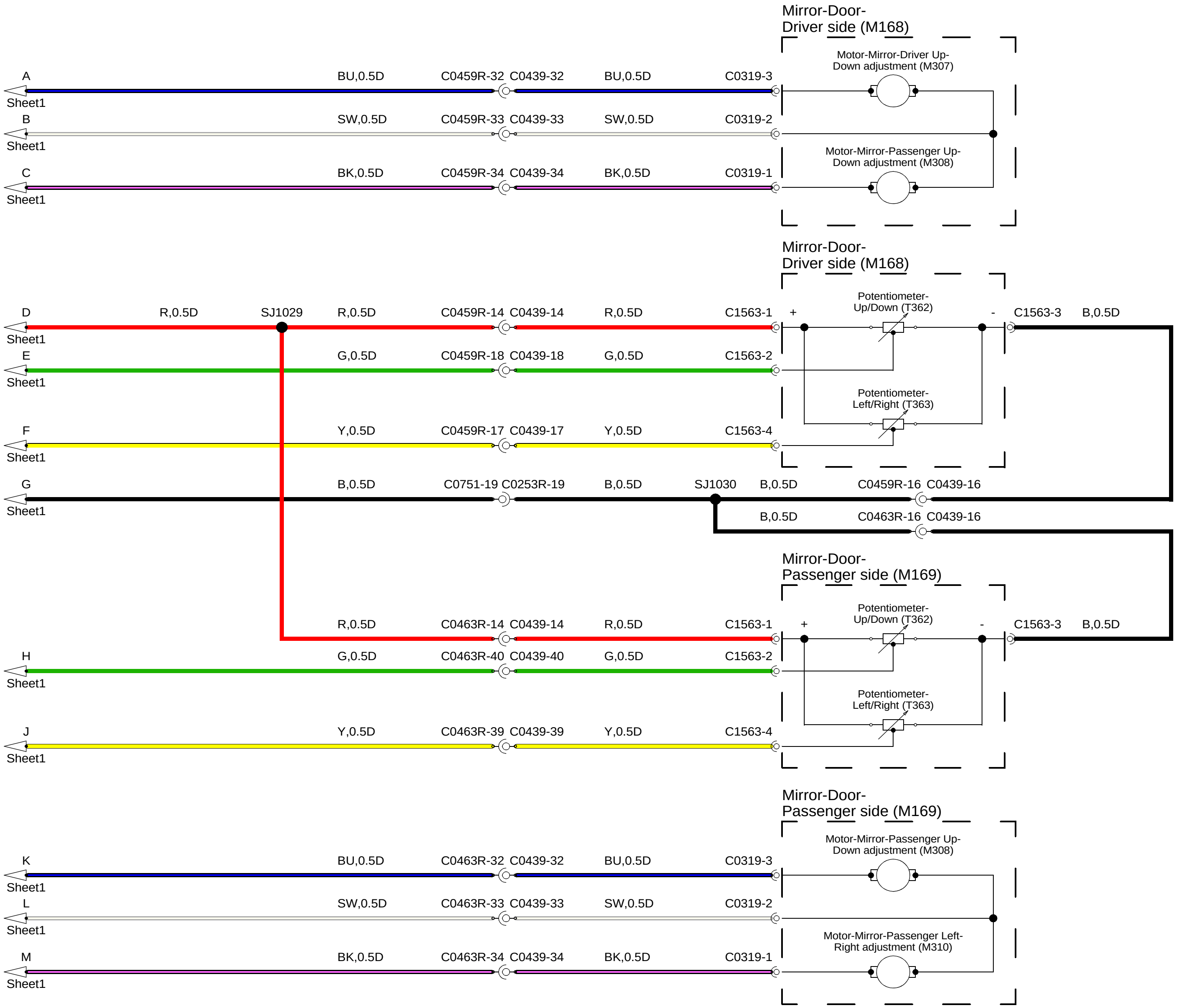

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Central Junction Box (P101)
Battery Junction Box (P108)
C0632-1
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
C0583R-20
FUSE 43P
10.0 Amps
C0585R-46
GW,0.5D
SJ1050
GW,0.5D
C0049-1
Receiver-Radio-frequency (RF) (T203)
C0049-2
LINK 16E
40.0 Amps
C0570R-185
NG,4.0D
C0583R-16
Generic Electronic Module (D162)
BATT
RF IN
C0586R-21
U,0.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
Engine control-module (ECM) (D131)
C2366-4 C2365R-4
YN,MAPDE
C0872R-A4
C2274R-16 C2273-16
SR,0.75
C0411-B4
(DV6)
N,4.0D
C2366-5 C2365R-5
YB,MAPDE
C0872R-A3
C2274R-15 C2273-15
UR,0.75
C0411-B3
Switch-Ignition (S176)
C0028-4
C0028-6
W,1.5D
C0582-30
AUX
C0028-5
LGW,1.5D
C0582-21
FUSE 40P
5.0 Amps
KEY IN
Engine control-module (ECM) (D131)
SJ1176
YN,MAPCH
C0635R-57
C2366-4 C2365R-4
YN,MAPCX
C0635R-58
(PV8)
SJ1177
YB,MAPCH
C0635R-44
C2366-5 C2365R-5
YB,MAPCX
C0635R-45
Passive coil (D156)
C2524-6
G,MAPBB
C0580-30
LF OUT
C2524-8
R,MAPBB
C0580-14
LF IN
Air suspension Control Module (D199)
AIR_SUS_CONT
C0586R-29
WK,0.5D
C0867R-13
Instrument cluster (J100)
GND
C0585R-18
B,2.5D
C2695R-1
TYPE 2
C0230-7
BS,0.5D
C0580-22
ALARM LED
CAN HIGH
C0580-15
YW,MAPX
C1168-18 C1166R-18
C0230-1
YN,MAPA
SJ850
CAN LOW
C0580-1
YU,MAPX
C1168-19 C1166R-19
C0230-2
YB,MAPA
SJ860
C0230-18
YU,MAPD
SJ731
C0230-17
YW,MAPD
SJ730

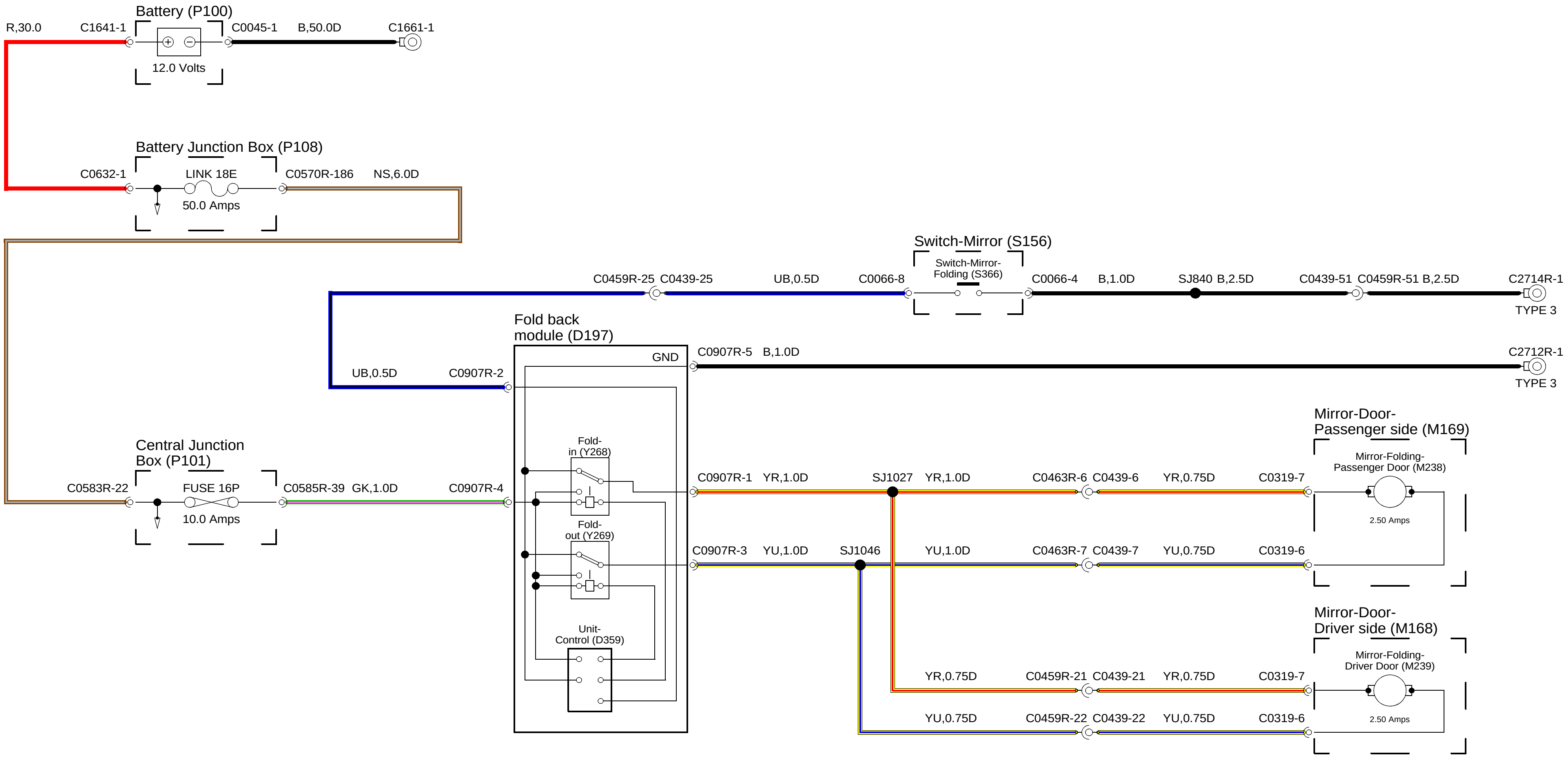

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction
Box (P101)
C0582-19
FUSE 69P
5.0 Amps
C0586R-3
GR,0.5D
SJ1695
GR,0.5D
C0698-1
Relay-
Reverse (R217)
FUSE 5P
10.0 Amps
C0585R-41
GN,1.5D
SJ7
GN,0.5D
C0698-3
Mirror-interior (B146)
IGN
GND
REVERSE
C0698-2
B,0.5D
SJ1053
B,4.0D
C2597R-1
TYPE 3

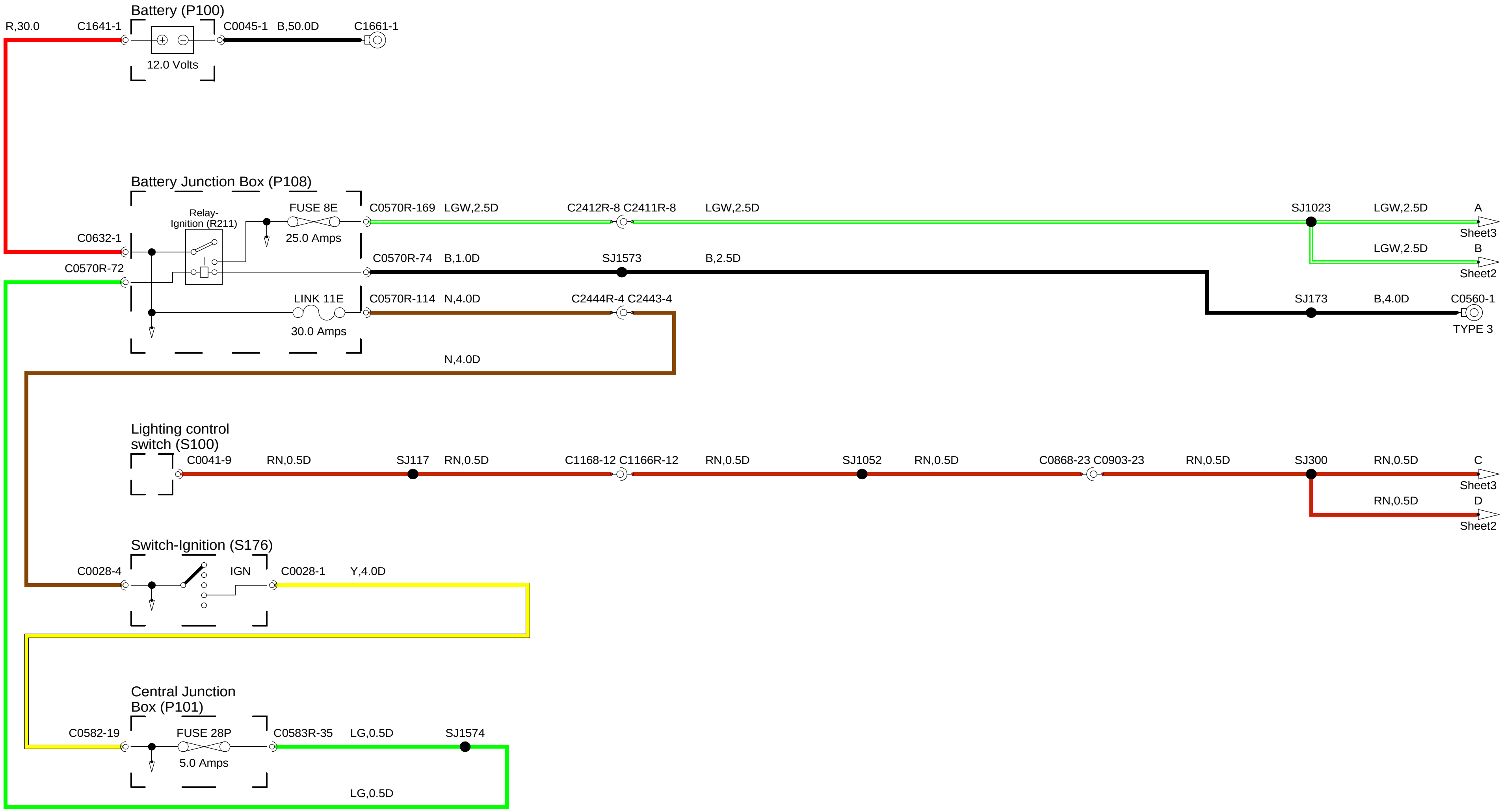

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
C2412R-4
C2411R-4
NP,1.5D
SJ1031
NP,1.5D
C0459R-4
C0439-4
NP,0.75D
C0319-4
Mirror-Door-Driver side (M168)
Door mirror heater (H135)
2.00 Amps
C0319-5
B,0.75D
SJ840
B,2.5D
B,2.5D
C2714R-1
TYPE 3
C0439-51
C0459R-51
B,4.0D
C0810R-1
TYPE 3
C0463R-2
C0439-2
Mirror-Door-Passenger side (M169)
Door mirror heater (H136)
2.00 Amps
NP,1.5D
C0463R-8
C0439-8
NP,0.75D
C0319-4
C0319-5
B,0.75D
SJ840
B,4.0D
Battery Junction Box (P108)
Relay-Heated-washer jets/door-mirrors (R267)
C0632-1
C0570R-95
FUSE 16E
10.0 Amps
C0570R-173
NP,1.5D
C0570R-118
NO,1.5D
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
Sensor-Ambient air-temperature (T119)
C2443-6
C2444R-6
YN,0.5D
C3126-1
C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2443-1
C2444R-1
BG,0.5D
C3126-2
C3127-2
BG,0.5D
C0412-2
C2241R-4
C2239-4
N,4.0D
C2443-4
C2444R-4
Automatic Temperature Control Module (D243)
BG,0.5D
C1629-13
YN,0.5D
C1629-15
C1629-19
NO,0.5D
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Defrost
HFS
HRW
Seat L
Recirc
OFF
Temp L
ATC
Display
+ Blower -
Auto
Econ
Temp R
Rear
Seat R
C2655-3
B,1.0D
C2629-1
TYPE 3
Central Junction Box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
C2655-1
SJ965
YW,MAPN
C1629-22
SJ975
YU,MAPN
C1629-21
CAN +
CAN -
CAN -
CAN +
C1629-9
YU,MAPL
C2238-1
C2240R-1
C1629-10
YW,MAPL
C2238-2
C2240R-2
Generic Electronic Module (D162)
CAN -
CAN +
C0580-1
YU,MAPX
C1168-19
C1166R-19
C0580-15
YW,MAPX
C1168-18
C1166R-18
C0580-5
LGG,0.5D
C0278-8
Switch-Steering column-Wiper (S174)
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
SJ1574
LG,1.5D
Engine control-module (ECM) (D131)
C0635R-57
YN,MAPCH
SJ1176
C0635R-44
YB,MAPCH
SJ1177
SJ731
YU,MAPD
C0230-18
SJ730
YW,MAPD
C0230-17
Instrument cluster (J100)
C0230-1
YN,MAPA
SJ850
C0230-2
YB,MAPA
SJ860

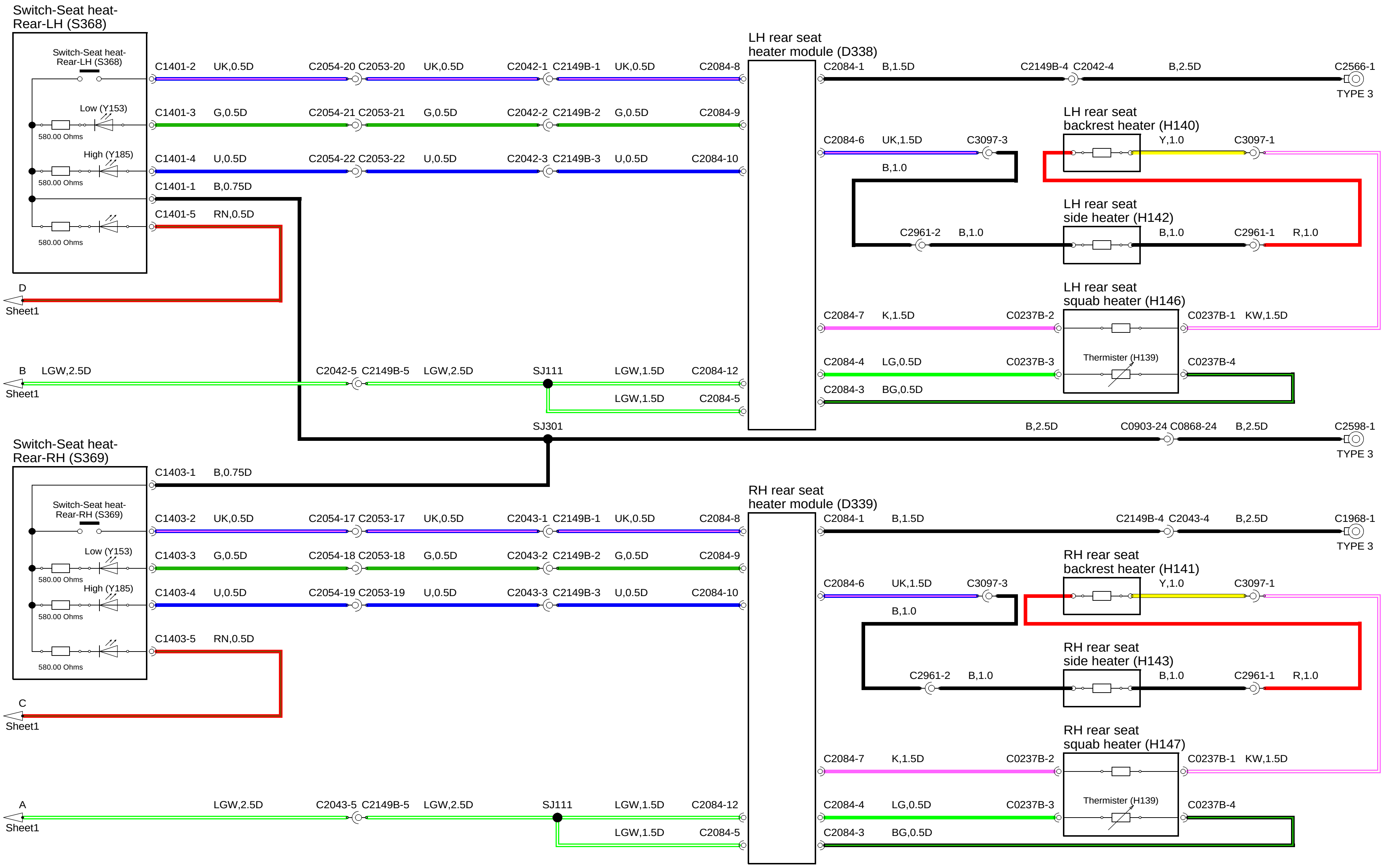

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central Junction
Box (P101)
C0582-30
FUSE 33P
5.0 Amps
C0585R-14
GK,1.5D
SJ1119
GK,1.0D
C0459R-13 C0439-13
GK,0.75D
C0066-6
Switch-Mirror (S156)
Left-
Right (Y274)
Passenger-
Driver (Y275)
Up-
Down (Y250)
+
-
C0066-2
BU,0.5D
C0066-5
BK,0.5D
C0066-3
SW,0.5D
SJ215
SW,0.5D
SW,0.5D
C0439-40 C0459R-40
SW,0.5D
C0066-1
BU,0.5D
C0439-47 C0459R-47
BU,0.5D
C0066-7
BK,0.5D
C0439-48 C0459R-48
BK,0.5D
C0066-4
B,1.0D
SJ840 B,2.5D
C0439-51 C0459R-51
B,2.5D
C2714R-1
TYPE 3
Mirror-Door-
Driver side (M168)
C0319-3
UP
Motor-Mirror-Driver Up-
Down adjustment (M307)
C0319-1
Motor-Mirror-Driver Left-
Right adjustment (M309)
SW,0.5D
C0319-2
Mirror-Door-
Passenger side (M169)
C0463R-33 C0439-33
SW,0.5D
C0319-2
Motor-Mirror-Passenger Up-
Down adjustment (M308)
C0463R-32 C0439-32
BU,0.5D
C0319-3
Motor-Mirror-Passenger Left-
Right adjustment (M310)
C0463R-34 C0439-34
BK,0.5D
C0319-1

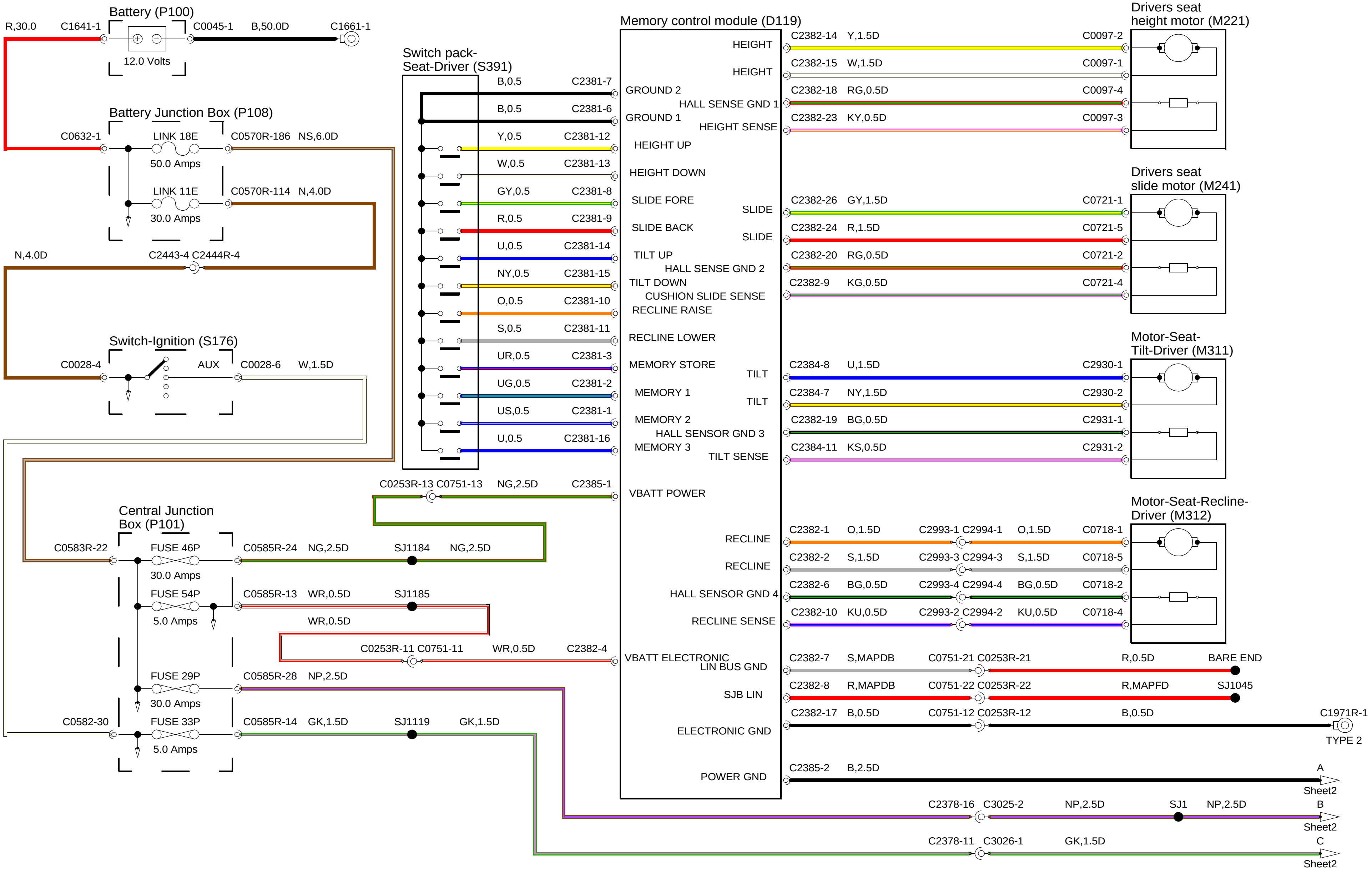

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114 N,4.0D
C2444R-4 C2443-4 N,4.0D
LINK 18E
C0570R-186 NS,6.0D
50.0 Amps
Switch-Ignition (S176)
C0028-4
AUX
C0028-6 W,1.5D
SJ1045 R,MAPFD
C0253R-22 C0751-22 R,MAPDB
C2382-8
BARE END S,MAPDA
C0253R-21 C0751-21 S,MAPDB
C2382-7
Central Junction Box (P101)
C0583R-22
FUSE 46P
30.0 Amps
C0585R-24 NG,2.5D
SJ1184 NG,2.5D
C0253R-13 C0751-13 NG,2.5D
C2385-1
C0582-30
FUSE 33P
5.0 Amps
C0585R-14 GK,1.5D
SJ1119 GK,1.0D
C0459R-13 C0439-13
GK,0.75D
Switch-Mirror (S156)
LH up-down (Y270)
LH left-right (Y272)
RH up-down (Y271)
RH left-right (Y273)
C0066-6
C0066-1 SW,0.5D
C0439-45 C0459R-45 SW,0.5D
C0253R-4 C0751-4 SW,0.5D
C2383-13
C0066-7 BU,0.5D
C0439-46 C0459R-46 BU,0.5D
C0253R-5 C0751-5 BU,0.5D
C2383-8
C0066-2 BU,0.5D
C0439-43 C0459R-43 BU,0.5D
C0253R-2 C0751-2 BU,0.5D
C2383-14
C0066-5 BK,0.5D
C0439-44 C0459R-44 BK,0.5D
C0253R-3 C0751-3 BK,0.5D
C2383-7
C0066-4 B,1.0D
SJ840 B,2.5D
C0439-51 C0459R-51
B,2.5D
C2714R-1
TYPE 3
Memory control module (D119)
SJB LIN
5V SUPPLY
LIN-BUS GND
GND
VBATT POWER
C2383-4 BU,0.5D
C0751-9 C0253R-9 BU,0.5D
A
Sheet2
C2383-6 SW,0.5D
C0751-10 C0253R-10 SW,0.5D
B
Sheet2
C2383-5 BK,0.5D
C0751-6 C0253R-6 BK,0.5D
C
Sheet2
C2383-15 R,0.5D
C0751-16 C0253R-16 R,0.5D
D
Sheet2
C2383-10 G,0.5D
C0751-20 C0253R-20 G,0.5D
E
Sheet2
C2383-9 Y,0.5D
C0751-8 C0253R-8 Y,0.5D
F
Sheet2
C2383-16 B,0.5D
G
Sheet2
C2383-12 G,0.5D
C0751-17 C0253R-17 G,0.5D
H
Sheet2
C2383-11 Y,0.5D
C0751-18 C0253R-18 Y,0.5D
J
Sheet2
C2383-1 BU,0.5D
C0751-7 C0253R-7 BU,0.5D
K
Sheet2
C2383-2 SW,0.5D
C0751-14 C0253R-14 SW,0.5D
L
Sheet2
C2383-3 BK,0.5D
C0751-15 C0253R-15 BK,0.5D
M
Sheet2
C2385-2 B,2.5D
SJ2 B,2.5D
C0751-1 C0253R-1 B,2.5D
SJ1053
B,4.0D
C2597R-1
TYPE 3

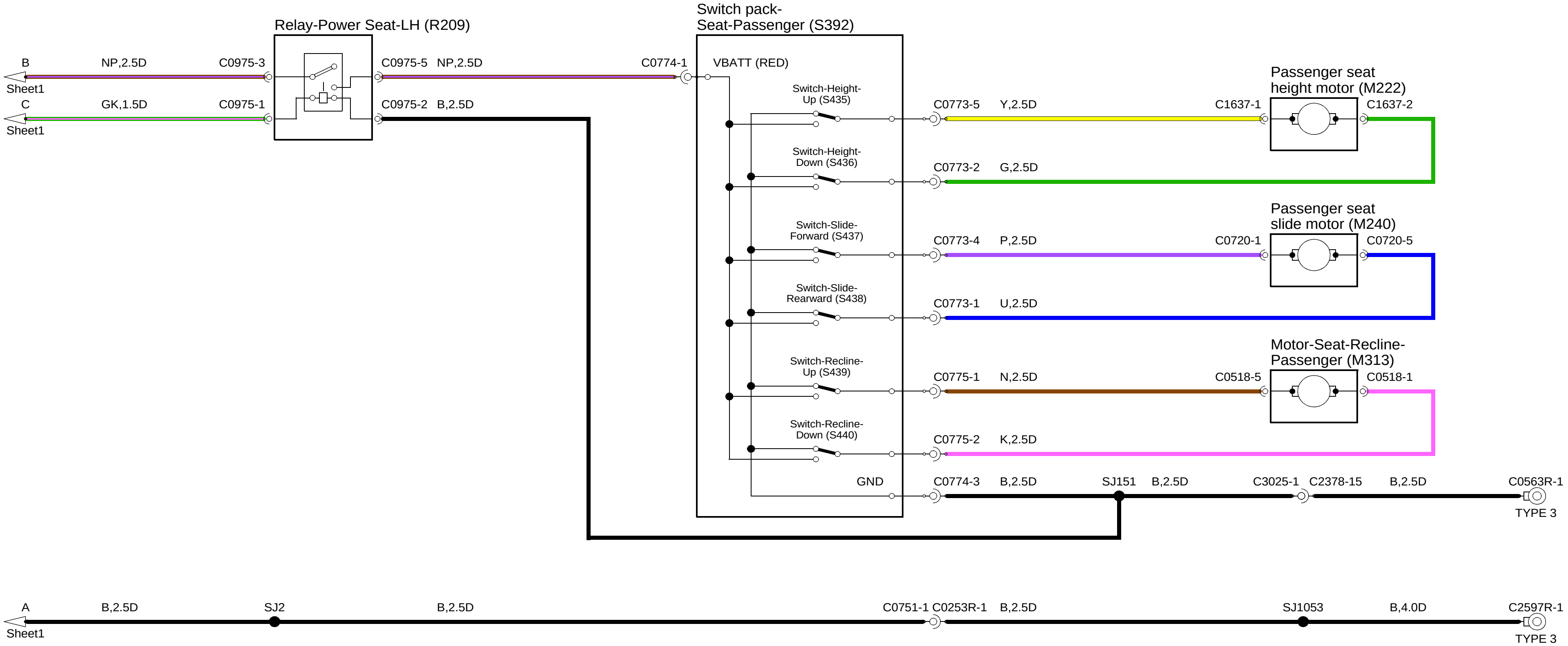

Mirror-Door-
Driver side (M168)
Motor-Mirror-Driver Up-
Down adjustment (M307)
Motor-Mirror-Passenger Up-
Down adjustment (M308)
A
Sheet1
BU,0.5D
C0459R-32
C0439-32
BU,0.5D
C0319-3
B
Sheet1
SW,0.5D
C0459R-33
C0439-33
SW,0.5D
C0319-2
C
Sheet1
BK,0.5D
C0459R-34
C0439-34
BK,0.5D
C0319-1
Mirror-Door-
Driver side (M168)
Potentiometer-
Up/Down (T362)
Potentiometer-
Left/Right (T363)
D
Sheet1
R,0.5D
SJ1029
R,0.5D
C0459R-14
C0439-14
R,0.5D
C1563-1
+
-
C1563-3
B,0.5D
E
Sheet1
G,0.5D
C0459R-18
C0439-18
G,0.5D
C1563-2
F
Sheet1
Y,0.5D
C0459R-17
C0439-17
Y,0.5D
C1563-4
G
Sheet1
B,0.5D
C0751-19
C0253R-19
B,0.5D
SJ1030
B,0.5D
C0459R-16
C0439-16
B,0.5D
C0463R-16
C0439-16
Mirror-Door-
Passenger side (M169)
Potentiometer-
Up/Down (T362)
Potentiometer-
Left/Right (T363)
R,0.5D
C0463R-14
C0439-14
R,0.5D
C1563-1
+
-
C1563-3
B,0.5D
H
Sheet1
G,0.5D
C0463R-40
C0439-40
G,0.5D
C1563-2
J
Sheet1
Y,0.5D
C0463R-39
C0439-39
Y,0.5D
C1563-4
Mirror-Door-
Passenger side (M169)
Motor-Mirror-Passenger Up-
Down adjustment (M308)
Motor-Mirror-Passenger Left-
Right adjustment (M310)
K
Sheet1
BU,0.5D
C0463R-32
C0439-32
BU,0.5D
C0319-3
L
Sheet1
SW,0.5D
C0463R-33
C0439-33
SW,0.5D
C0319-2
M
Sheet1
BK,0.5D
C0463R-34
C0439-34
BK,0.5D
C0319-1

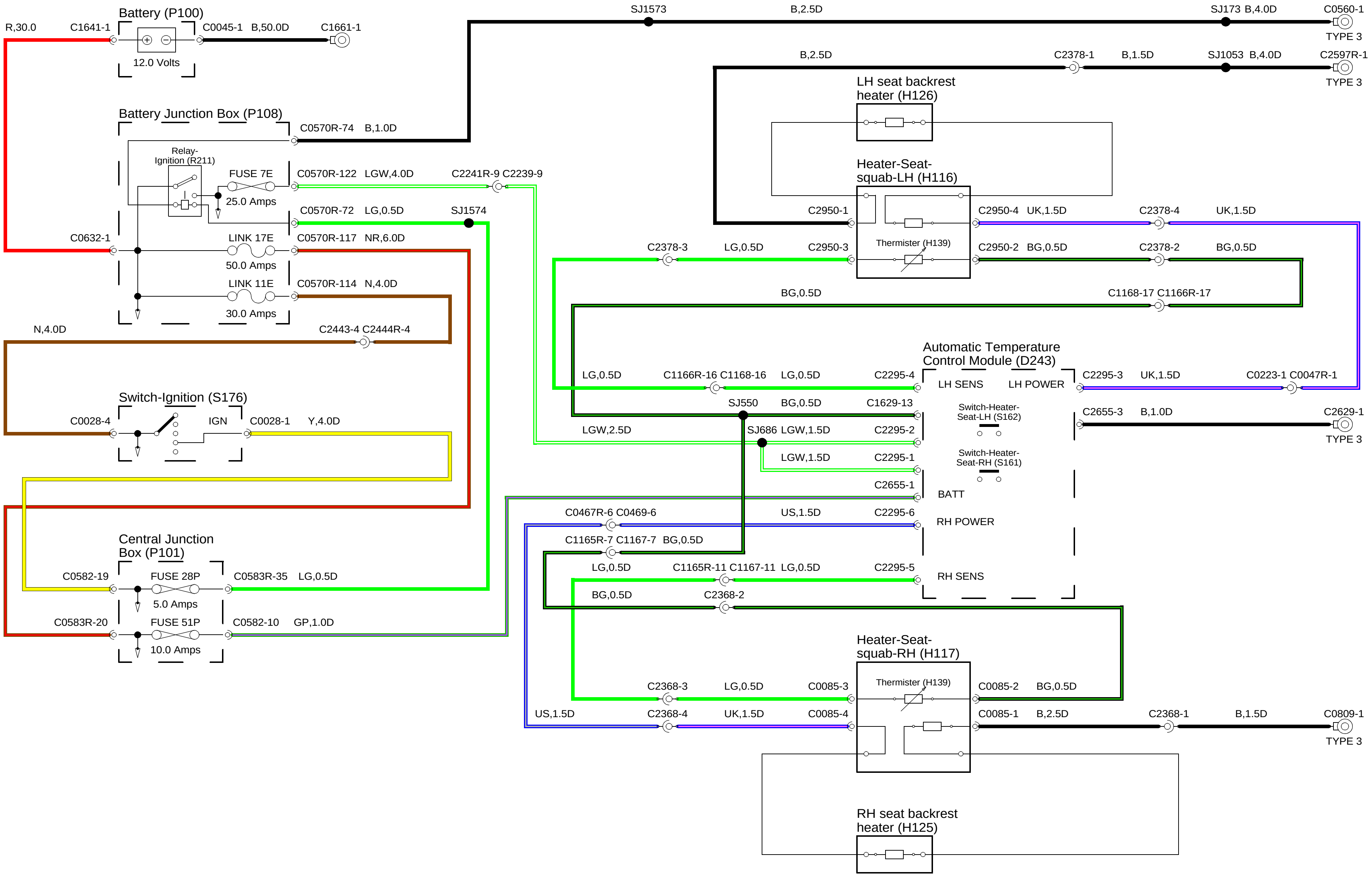

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
Switch-Mirror (S156)
Switch-Mirror-Folding (S366)
C0459R-25
C0439-25
UB,0.5D
C0066-8
C0066-4
B,1.0D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
Fold back module (D197)
GND
C0907R-5
B,1.0D
C2712R-1
TYPE 3
UB,0.5D
C0907R-2
Mirror-Door-Passenger side (M169)
Mirror-Folding-Passenger Door (M238)
Central Junction Box (P101)
C0583R-22
FUSE 16P
10.0 Amps
C0585R-39
GK,1.0D
C0907R-4
Fold-in (Y268)
Fold-out (Y269)
C0907R-1
YR,1.0D
SJ1027
YR,1.0D
C0463R-6
C0439-6
YR,0.75D
C0319-7
2.50 Amps
C0907R-3
YU,1.0D
SJ1046
YU,1.0D
C0463R-7
C0439-7
YU,0.75D
C0319-6
Unit-Control (D359)
Mirror-Door-Driver side (M168)
Mirror-Folding-Driver Door (M239)
YR,0.75D
C0459R-21
C0439-21
YR,0.75D
C0319-7
2.50 Amps
YU,0.75D
C0459R-22
C0439-22
YU,0.75D
C0319-6

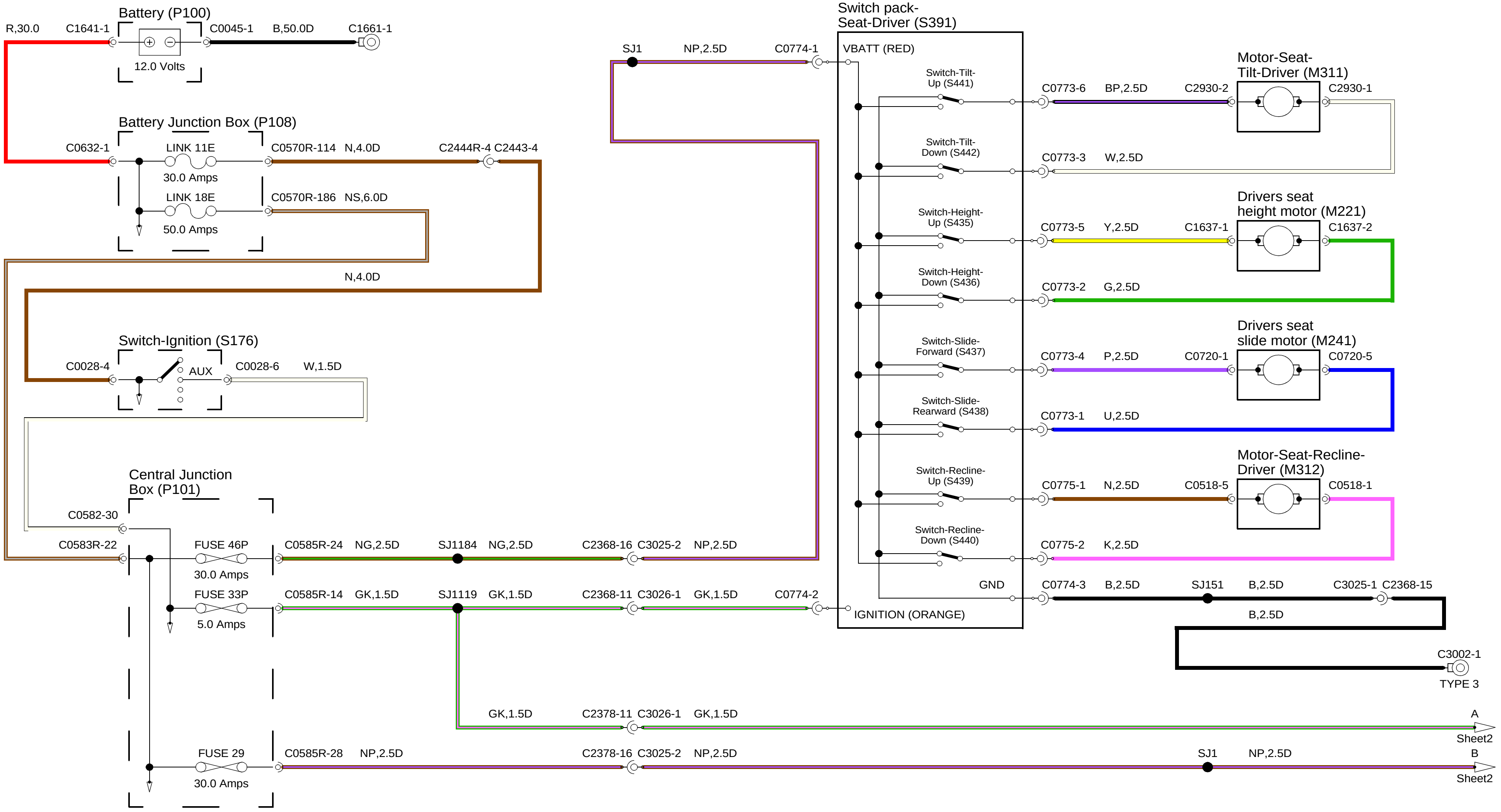

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-
Ignition (R211)
FUSE 8E
25.0 Amps
C0570R-169
LGW,2.5D
C2412R-8 C2411R-8
LGW,2.5D
SJ1023
LGW,2.5D
A
Sheet3
LGW,2.5D
B
Sheet2
C0632-1
C0570R-72
C0570R-74
B,1.0D
SJ1573
B,2.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
SJ173
B,4.0D
C0560-1
TYPE 3
N,4.0D
Lighting control
switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1168-12 C1166R-12
RN,0.5D
SJ1052
RN,0.5D
C0868-23 C0903-23
RN,0.5D
SJ300
RN,0.5D
C
Sheet3
RN,0.5D
D
Sheet2
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction
Box (P101)
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
SJ1574
LG,0.5D

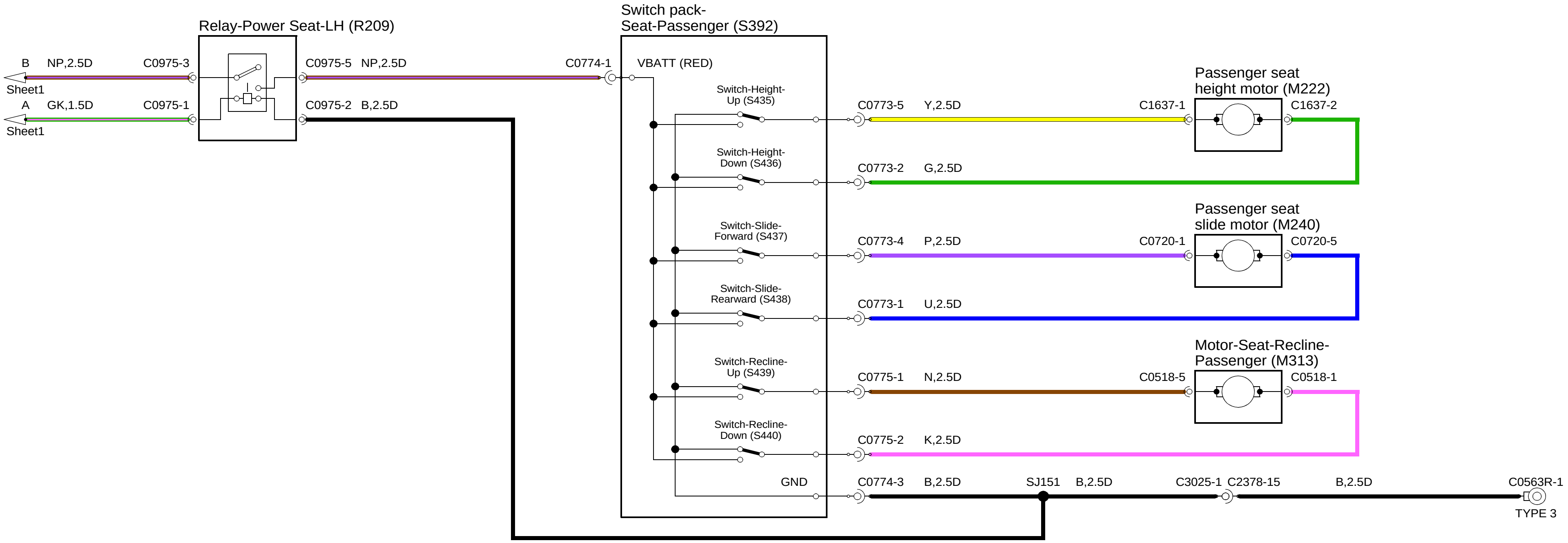

Switch-Seat heat-Rear-LH (S368)
Switch-Seat heat-Rear-LH (S368)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1401-2 UK,0.5D
C2054-20 C2053-20 UK,0.5D
C2042-1 C2149B-1 UK,0.5D
C2084-8
C1401-3 G,0.5D
C2054-21 C2053-21 G,0.5D
C2042-2 C2149B-2 G,0.5D
C2084-9
C1401-4 U,0.5D
C2054-22 C2053-22 U,0.5D
C2042-3 C2149B-3 U,0.5D
C2084-10
C1401-1 B,0.75D
C1401-5 RN,0.5D
D
Sheet1
B LGW,2.5D
Sheet1
C2042-5 C2149B-5 LGW,2.5D
SJ111
LGW,1.5D C2084-12
LGW,1.5D C2084-5
SJ301
LH rear seat heater module (D338)
C2084-1 B,1.5D
C2149B-4 C2042-4 B,2.5D
C2566-1
TYPE 3
LH rear seat backrest heater (H140)
C2084-6 UK,1.5D C3097-3
Y,1.0 C3097-1
B,1.0
LH rear seat side heater (H142)
C2961-2 B,1.0
B,1.0 C2961-1 R,1.0
LH rear seat squab heater (H146)
C2084-7 K,1.5D C0237B-2
C0237B-1 KW,1.5D
Thermister (H139)
C2084-4 LG,0.5D C0237B-3
C0237B-4
C2084-3 BG,0.5D
B,2.5D C0903-24 C0868-24 B,2.5D
C2598-1
TYPE 3
Switch-Seat heat-Rear-RH (S369)
Switch-Seat heat-Rear-RH (S369)
Low (Y153)
580.00 Ohms
High (Y185)
580.00 Ohms
580.00 Ohms
C1403-1 B,0.75D
C1403-2 UK,0.5D
C2054-17 C2053-17 UK,0.5D
C2043-1 C2149B-1 UK,0.5D
C2084-8
C1403-3 G,0.5D
C2054-18 C2053-18 G,0.5D
C2043-2 C2149B-2 G,0.5D
C2084-9
C1403-4 U,0.5D
C2054-19 C2053-19 U,0.5D
C2043-3 C2149B-3 U,0.5D
C2084-10
C1403-5 RN,0.5D
C
Sheet1
A LGW,2.5D
Sheet1
C2043-5 C2149B-5 LGW,2.5D
SJ111
LGW,1.5D C2084-12
LGW,1.5D C2084-5
RH rear seat heater module (D339)
C2084-1 B,1.5D
C2149B-4 C2043-4 B,2.5D
C1968-1
TYPE 3
RH rear seat backrest heater (H141)
C2084-6 UK,1.5D C3097-3
Y,1.0 C3097-1
B,1.0
RH rear seat side heater (H143)
C2961-2 B,1.0
B,1.0 C2961-1 R,1.0
RH rear seat squab heater (H147)
C2084-7 K,1.5D C0237B-2
C0237B-1 KW,1.5D
Thermister (H139)
C2084-4 LG,0.5D C0237B-3
C0237B-4
C2084-3 BG,0.5D

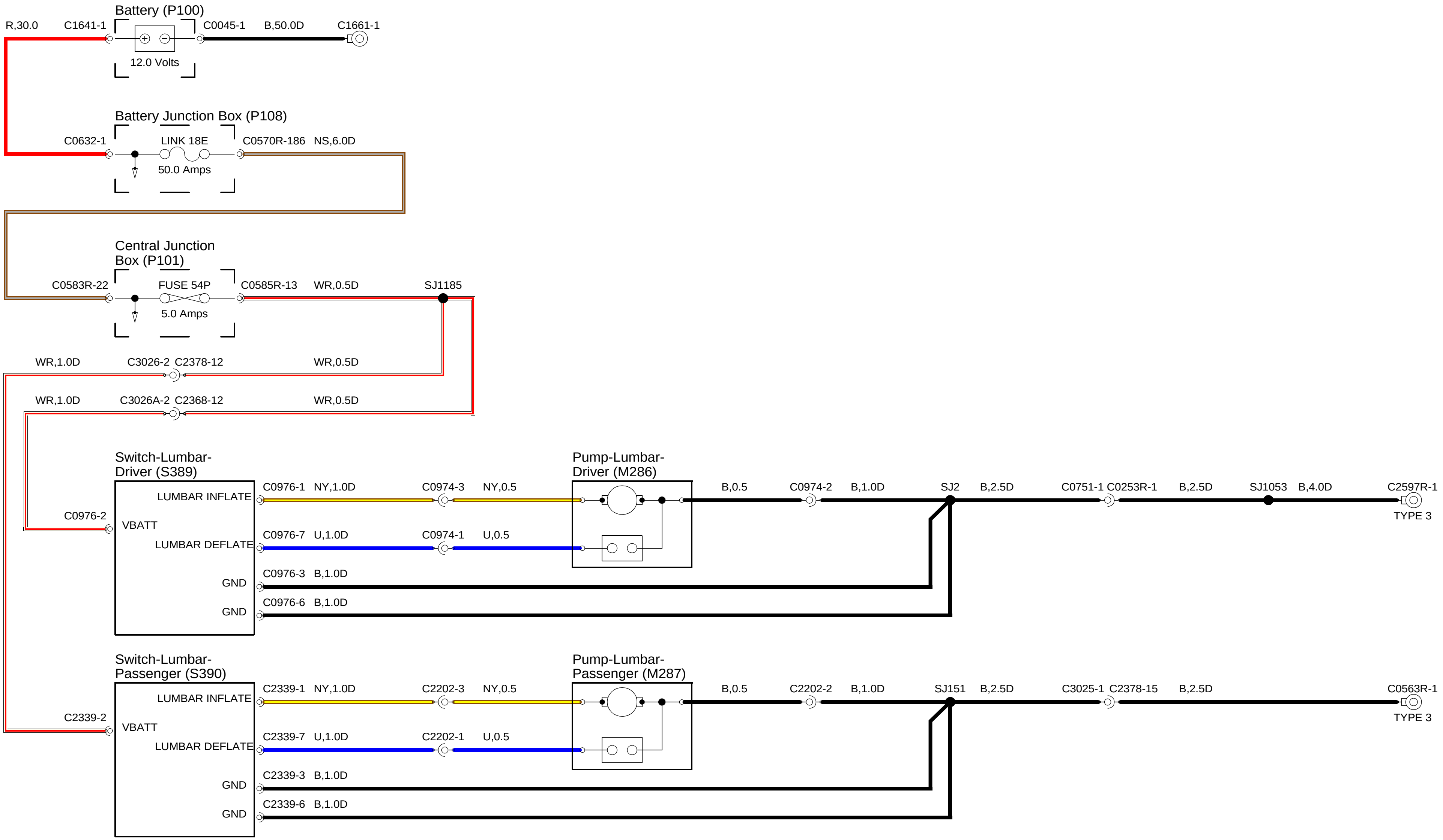

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central Junction Box (P101)
C0583R-22
FUSE 46P
30.0 Amps
C0585R-24
NG,2.5D
SJ1184
NG,2.5D
FUSE 54P
5.0 Amps
C0585R-13
WR,0.5D
SJ1185
WR,0.5D
C0253R-11 C0751-11
WR,0.5D
C2382-4
FUSE 29P
30.0 Amps
C0585R-28
NP,2.5D
C0582-30
FUSE 33P
5.0 Amps
C0585R-14
GK,1.5D
SJ1119
GK,1.5D
Switch pack-Seat-Driver (S391)
B,0.5
C2381-7
B,0.5
C2381-6
Y,0.5
C2381-12
W,0.5
C2381-13
GY,0.5
C2381-8
R,0.5
C2381-9
U,0.5
C2381-14
NY,0.5
C2381-15
O,0.5
C2381-10
S,0.5
C2381-11
UR,0.5
C2381-3
UG,0.5
C2381-2
US,0.5
C2381-1
U,0.5
C2381-16
C0253R-13 C0751-13
NG,2.5D
C2385-1
Memory control module (D119)
HEIGHT
HEIGHT
GROUND 2
HALL SENSE GND 1
GROUND 1
HEIGHT SENSE
HEIGHT UP
HEIGHT DOWN
SLIDE FORE
SLIDE
SLIDE BACK
SLIDE
TILT UP
HALL SENSE GND 2
TILT DOWN
CUSHION SLIDE SENSE
RECLINE RAISE
RECLINE LOWER
MEMORY STORE
TILT
MEMORY 1
TILT
MEMORY 2
HALL SENSOR GND 3
MEMORY 3
TILT SENSE
VBATT POWER
RECLINE
RECLINE
HALL SENSOR GND 4
RECLINE SENSE
VBATT ELECTRONIC
LIN BUS GND
SJB LIN
ELECTRONIC GND
POWER GND
Drivers seat height motor (M221)
C2382-14
Y,1.5D
C0097-2
C2382-15
W,1.5D
C0097-1
C2382-18
RG,0.5D
C0097-4
C2382-23
KY,0.5D
C0097-3
Drivers seat slide motor (M241)
C2382-26
GY,1.5D
C0721-1
C2382-24
R,1.5D
C0721-5
C2382-20
RG,0.5D
C0721-2
C2382-9
KG,0.5D
C0721-4
Motor-Seat-Tilt-Driver (M311)
C2384-8
U,1.5D
C2930-1
C2384-7
NY,1.5D
C2930-2
C2382-19
BG,0.5D
C2931-1
C2384-11
KS,0.5D
C2931-2
Motor-Seat-Recline-Driver (M312)
C2382-1
O,1.5D
C2993-1 C2994-1
O,1.5D
C0718-1
C2382-2
S,1.5D
C2993-3 C2994-3
S,1.5D
C0718-5
C2382-6
BG,0.5D
C2993-4 C2994-4
BG,0.5D
C0718-2
C2382-10
KU,0.5D
C2993-2 C2994-2
KU,0.5D
C0718-4
C2382-7
S,MAPDB
C0751-21 C0253R-21
R,0.5D
BARE END
C2382-8
R,MAPDB
C0751-22 C0253R-22
R,MAPFD
SJ1045
C2382-17
B,0.5D
C0751-12 C0253R-12
B,0.5D
C1971R-1
TYPE 2
C2385-2
B,2.5D
A
Sheet2
C2378-16
C3025-2
NP,2.5D
SJ1
NP,2.5D
B
Sheet2
C2378-11
C3026-1
GK,1.5D
C
Sheet2

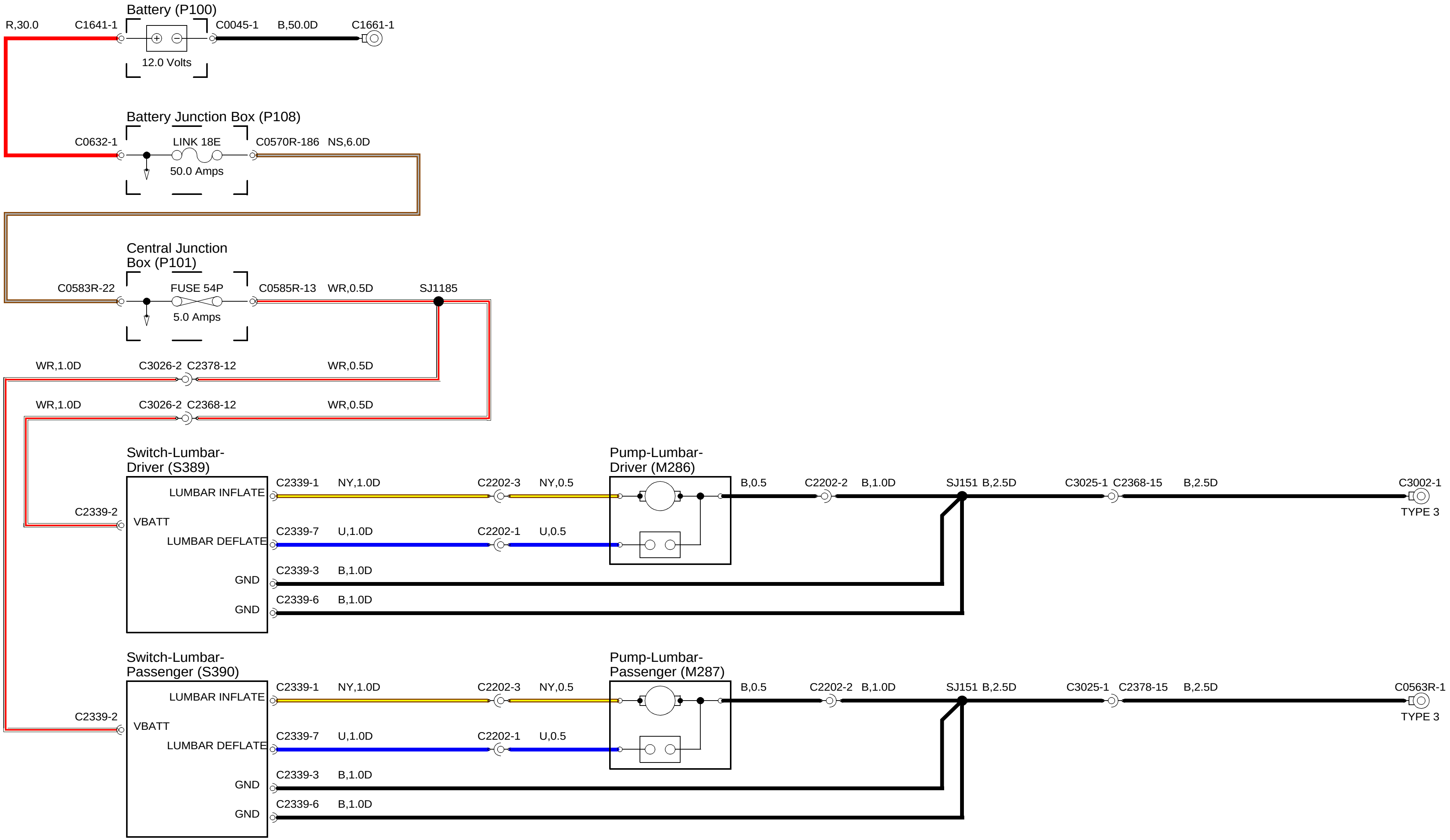

Relay-Power Seat-LH (R209)
Switch pack-
Seat-Passenger (S392)
B
NP,2.5D
C0975-3
Sheet1
C
GK,1.5D
C0975-1
Sheet1
C0975-5
NP,2.5D
C0975-2
B,2.5D
C0774-1
VBATT (RED)
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
C0773-5
Y,2.5D
C1637-1
Passenger seat
height motor (M222)
C1637-2
C0773-2
G,2.5D
Passenger seat
slide motor (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3
A
B,2.5D
SJ2
B,2.5D
C0751-1
C0253R-1
B,2.5D
SJ1053
B,4.0D
C2597R-1
Sheet1
TYPE 3

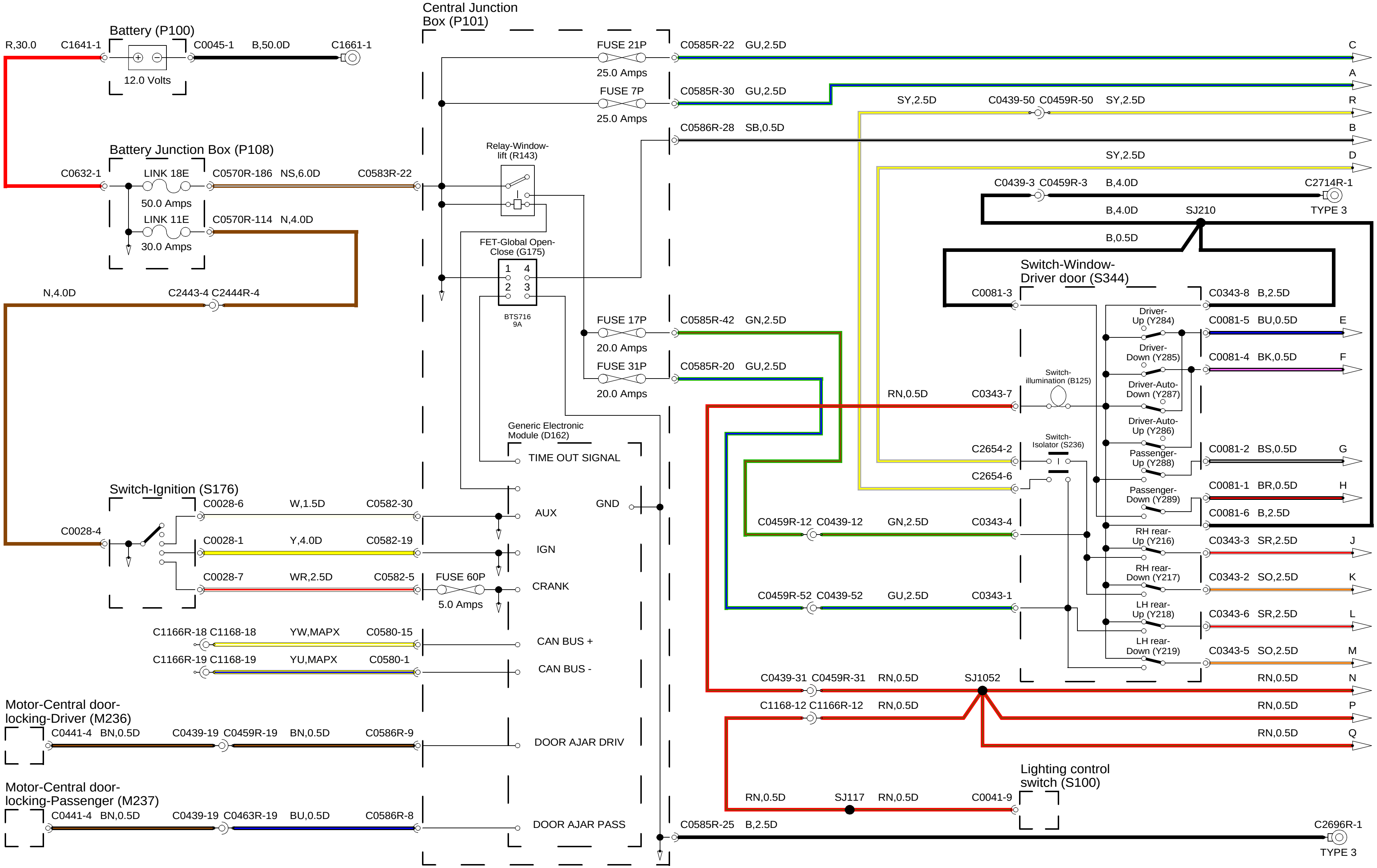

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
SJ1573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
B,2.5D
C2378-1
B,1.5D
SJ1053
B,4.0D
C2597R-1
TYPE 3
LH seat backrest heater (H126)
Battery Junction Box (P108)
C0570R-74
B,1.0D
Relay-Ignition (R211)
FUSE 7E
25.0 Amps
C0570R-122
LGW,4.0D
C2241R-9 C2239-9
Heater-Seat-squab-LH (H116)
C0570R-72
LG,0.5D
SJ1574
C2950-1
C2950-4
UK,1.5D
C2378-4
UK,1.5D
C0632-1
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
C2378-3
LG,0.5D
C2950-3
Thermister (H139)
C2950-2
BG,0.5D
C2378-2
BG,0.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
BG,0.5D
C1168-17 C1166R-17
N,4.0D
C2443-4 C2444R-4
Automatic Temperature Control Module (D243)
LG,0.5D
C1166R-16 C1168-16
LG,0.5D
C2295-4
LH SENS
LH POWER
C2295-3
UK,1.5D
C0223-1 C0047R-1
Switch-Ignition (S176)
SJ550
BG,0.5D
C1629-13
Switch-Heater-Seat-LH (S162)
C2655-3
B,1.0D
C2629-1
C0028-4
IGN
C0028-1
Y,4.0D
LGW,2.5D
SJ686
LGW,1.5D
C2295-2
TYPE 3
LGW,1.5D
C2295-1
Switch-Heater-Seat-RH (S161)
C2655-1
BATT
C0467R-6 C0469-6
US,1.5D
C2295-6
RH POWER
Central Junction Box (P101)
C1165R-7 C1167-7
BG,0.5D
LG,0.5D
C1165R-11 C1167-11
LG,0.5D
C2295-5
RH SENS
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
BG,0.5D
C2368-2
C0583R-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Heater-Seat-squab-RH (H117)
C2368-3
LG,0.5D
C0085-3
Thermister (H139)
C0085-2
BG,0.5D
US,1.5D
C2368-4
UK,1.5D
C0085-4
C0085-1
B,2.5D
C2368-1
B,1.5D
C0809-1
TYPE 3
RH seat backrest heater (H125)

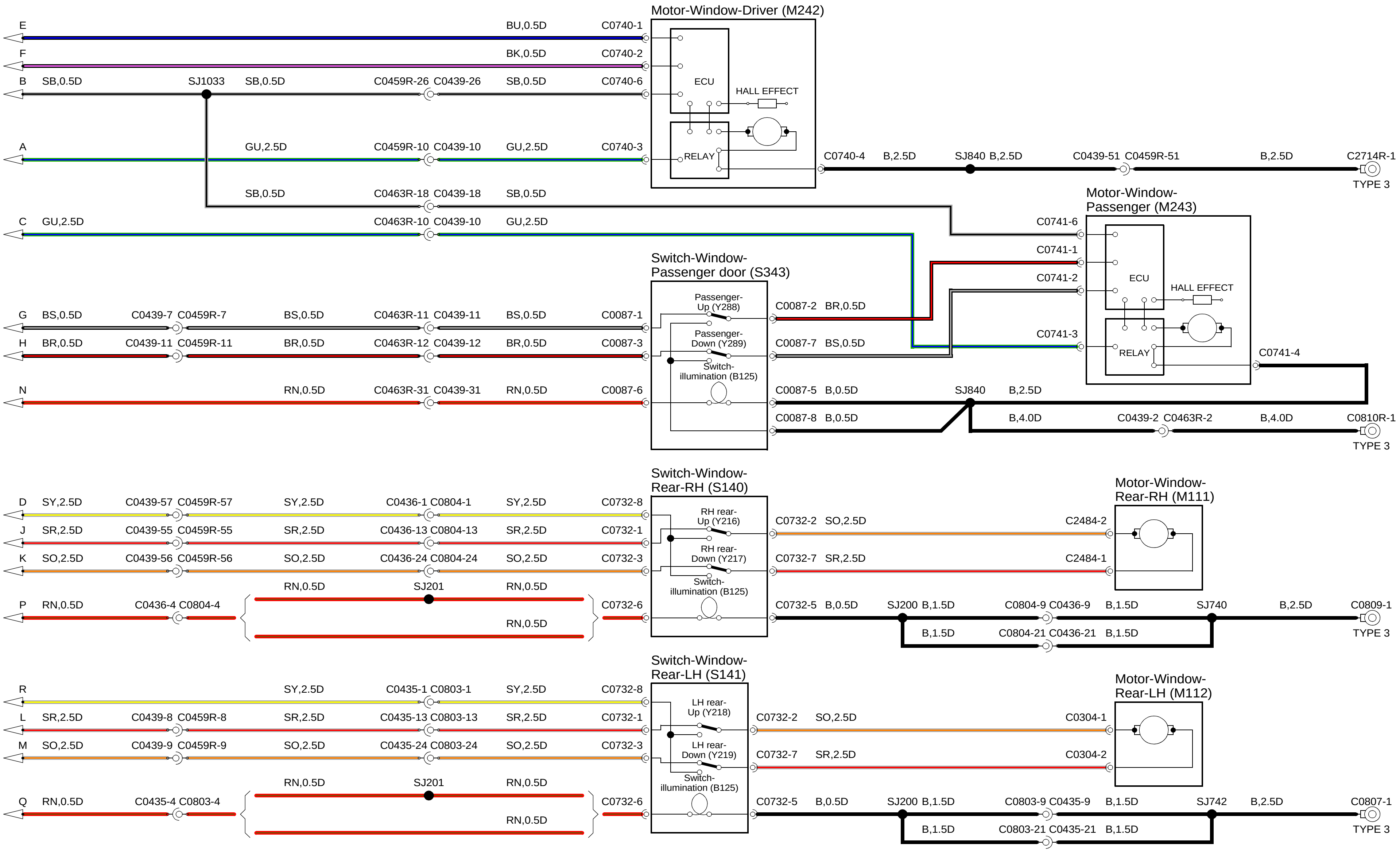

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 18E
50.0 Amps
C0570R-114
N,4.0D
C2444R-4
C2443-4
C0570R-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central Junction Box (P101)
C0582-30
C0583R-22
FUSE 46P
30.0 Amps
FUSE 33P
5.0 Amps
FUSE 29
30.0 Amps
C0585R-24
NG,2.5D
SJ1184
NG,2.5D
C2368-16
C3025-2
NP,2.5D
C0585R-14
GK,1.5D
SJ1119
GK,1.5D
C2368-11
C3026-1
GK,1.5D
C0774-2
GK,1.5D
C2378-11
C3026-1
GK,1.5D
A
Sheet2
C0585R-28
NP,2.5D
C2378-16
C3025-2
NP,2.5D
SJ1
NP,2.5D
B
Sheet2
SJ1
NP,2.5D
C0774-1
Switch pack-Seat-Driver (S391)
VBATT (RED)
Switch-Tilt-Up (S441)
Switch-Tilt-Down (S442)
Switch-Height-Up (S435)
Switch-Height-Down (S436)
Switch-Slide-Forward (S437)
Switch-Slide-Rearward (S438)
Switch-Recline-Up (S439)
Switch-Recline-Down (S440)
GND
IGNITION (ORANGE)
Motor-Seat-Tilt-Driver (M311)
C0773-6
BP,2.5D
C2930-2
C2930-1
C0773-3
W,2.5D
Drivers seat height motor (M221)
C0773-5
Y,2.5D
C1637-1
C1637-2
C0773-2
G,2.5D
Drivers seat slide motor (M241)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-Driver (M312)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C3002-1
TYPE 3

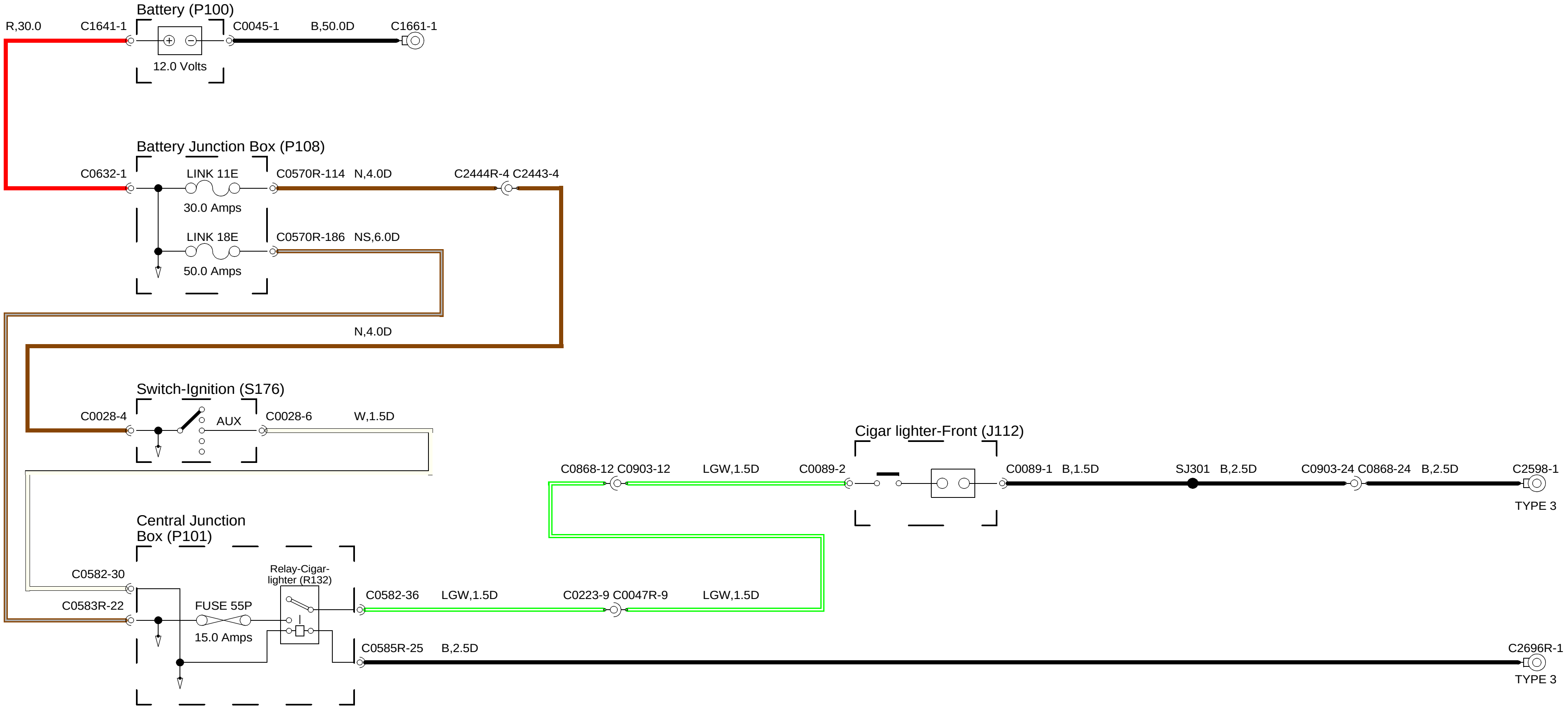

Relay-Power Seat-LH (R209)
Switch pack-
Seat-Passenger (S392)
B
NP,2.5D
C0975-3
Sheet1
A
GK,1.5D
C0975-1
Sheet1
C0975-5
NP,2.5D
C0975-2
B,2.5D
C0774-1
VBATT (RED)
Switch-Height-
Up (S435)
Switch-Height-
Down (S436)
Switch-Slide-
Forward (S437)
Switch-Slide-
Rearward (S438)
Switch-Recline-
Up (S439)
Switch-Recline-
Down (S440)
GND
C0773-5
Y,2.5D
C1637-1
Passenger seat
height motor (M222)
C1637-2
C0773-2
G,2.5D
Passenger seat
slide motor (M240)
C0773-4
P,2.5D
C0720-1
C0720-5
C0773-1
U,2.5D
Motor-Seat-Recline-
Passenger (M313)
C0775-1
N,2.5D
C0518-5
C0518-1
C0775-2
K,2.5D
C0774-3
B,2.5D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3

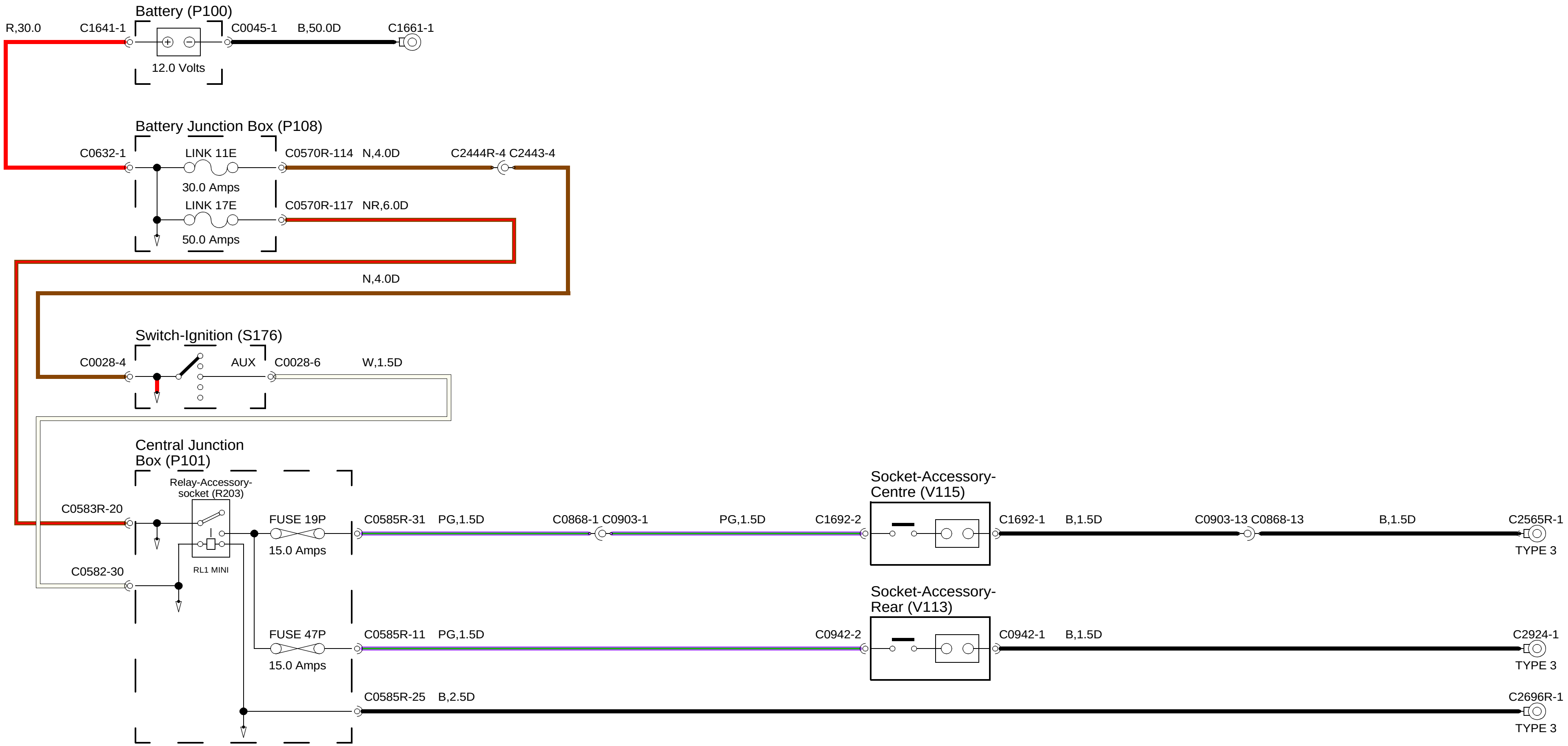

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
Central Junction Box (P101)
C0583R-22
FUSE 54P
5.0 Amps
C0585R-13
WR,0.5D
SJ1185
WR,1.0D
C3026-2
C2378-12
WR,0.5D
WR,1.0D
C3026A-2
C2368-12
WR,0.5D
Switch-Lumbar-Driver (S389)
C0976-2
VBATT
LUMBAR INFLATE
LUMBAR DEFLATE
GND
GND
C0976-1
NY,1.0D
C0974-3
NY,0.5
C0976-7
U,1.0D
C0974-1
U,0.5
C0976-3
B,1.0D
C0976-6
B,1.0D
Pump-Lumbar-Driver (M286)
B,0.5
C0974-2
B,1.0D
SJ2
B,2.5D
C0751-1
C0253R-1
B,2.5D
SJ1053
B,4.0D
C2597R-1
TYPE 3
Switch-Lumbar-Passenger (S390)
C2339-2
VBATT
LUMBAR INFLATE
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3

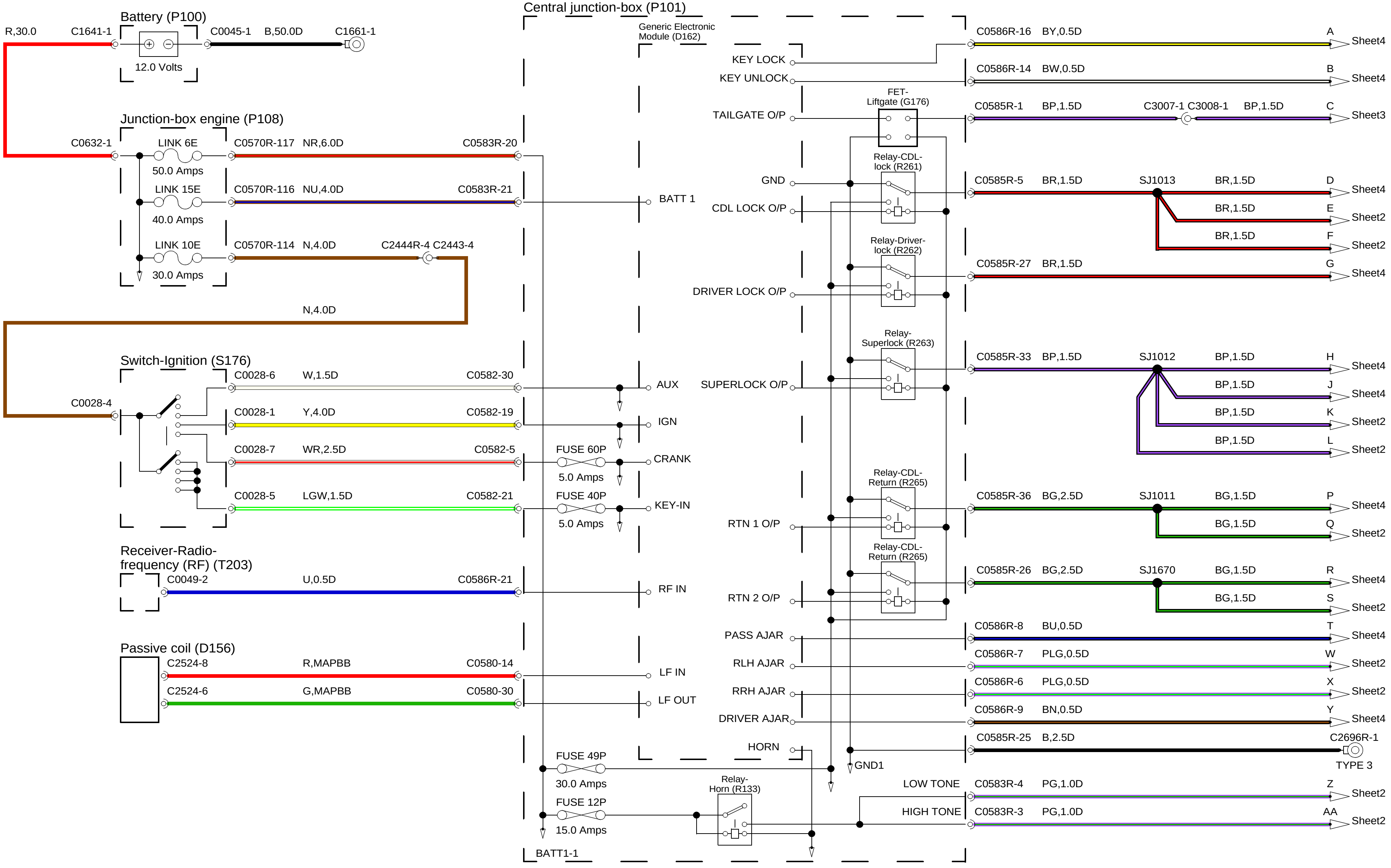

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 18E
C0570R-186
NS,6.0D
50.0 Amps
Central Junction
Box (P101)
C0583R-22
FUSE 54P
C0585R-13
WR,0.5D
SJ1185
5.0 Amps
WR,1.0D
C3026-2
C2378-12
WR,0.5D
WR,1.0D
C3026-2
C2368-12
WR,0.5D
Switch-Lumbar-
Driver (S389)
LUMBAR INFLATE
C2339-2
VBATT
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-
Driver (M286)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2368-15
B,2.5D
C3002-1
TYPE 3
Switch-Lumbar-
Passenger (S390)
LUMBAR INFLATE
C2339-2
VBATT
LUMBAR DEFLATE
GND
GND
C2339-1
NY,1.0D
C2202-3
NY,0.5
C2339-7
U,1.0D
C2202-1
U,0.5
C2339-3
B,1.0D
C2339-6
B,1.0D
Pump-Lumbar-
Passenger (M287)
B,0.5
C2202-2
B,1.0D
SJ151
B,2.5D
C3025-1
C2378-15
B,2.5D
C0563R-1
TYPE 3

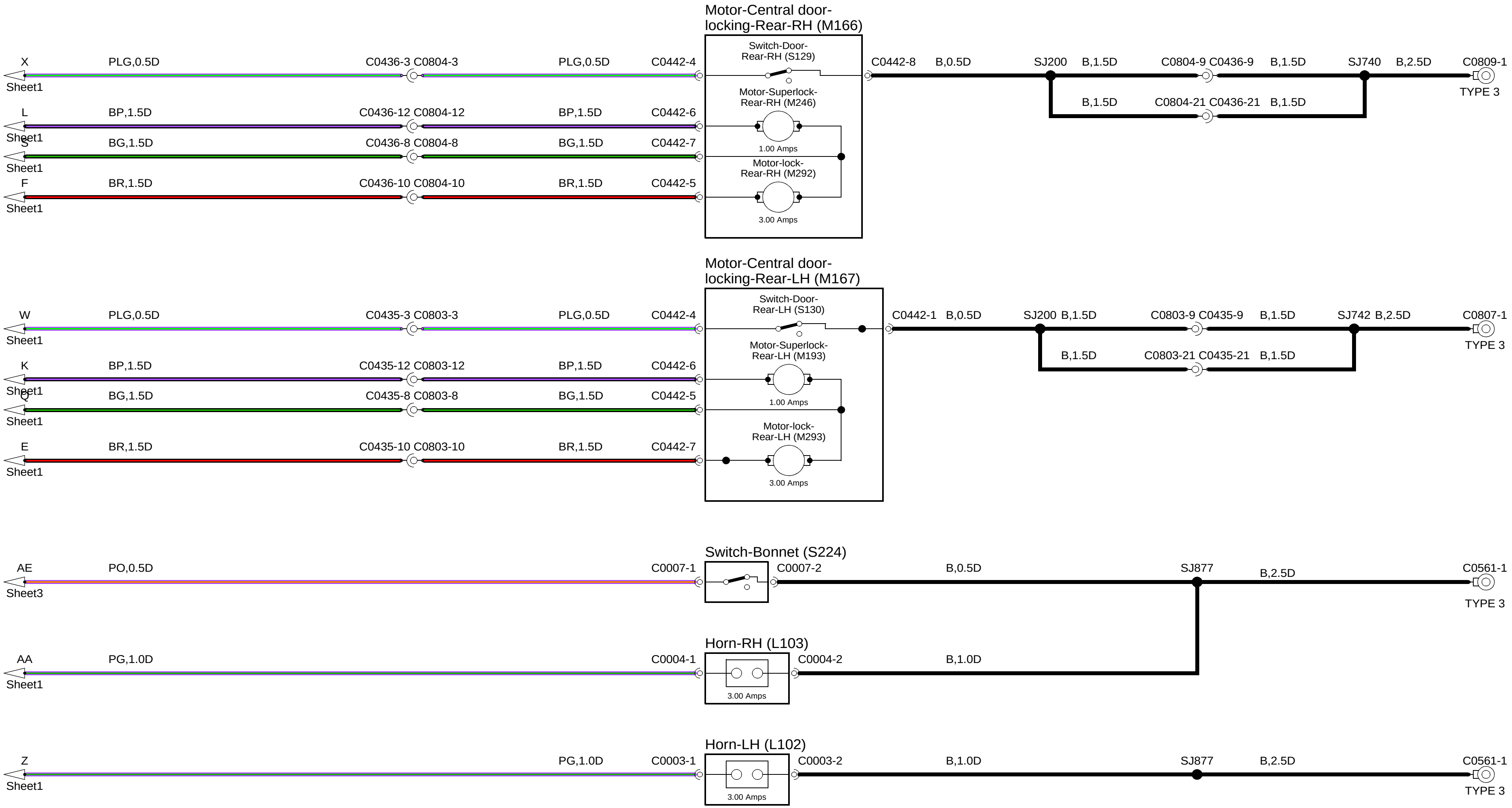

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central Junction Box (P101)
FUSE 21P
25.0 Amps
C0585R-22
GU,2.5D
C
A
FUSE 7P
25.0 Amps
C0585R-30
GU,2.5D
SY,2.5D
C0439-50
C0459R-50
SY,2.5D
R
C0586R-28
SB,0.5D
B
SY,2.5D
D
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
C0583R-22
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
Relay-Window-lift (R143)
C0439-3
C0459R-3
B,4.0D
C2714R-1
B,4.0D
SJ210
TYPE 3
B,0.5D
FET-Global Open-Close (G175)
1
4
2
3
BTS716
9A
N,4.0D
C2443-4
C2444R-4
Switch-Window-Driver door (S344)
C0081-3
C0343-8
B,2.5D
FUSE 17P
20.0 Amps
C0585R-42
GN,2.5D
Driver-Up (Y284)
C0081-5
BU,0.5D
E
Driver-Down (Y285)
C0081-4
BK,0.5D
F
FUSE 31P
20.0 Amps
C0585R-20
GU,2.5D
Switch-illumination (B125)
RN,0.5D
C0343-7
Driver-Auto-Down (Y287)
Driver-Auto-Up (Y286)
Generic Electronic Module (D162)
TIME OUT SIGNAL
Switch-Isolator (S236)
C2654-2
C0081-2
BS,0.5D
G
Passenger-Up (Y288)
C2654-6
Passenger-Down (Y289)
C0081-1
BR,0.5D
H
Switch-Ignition (S176)
C0028-6
W,1.5D
C0582-30
GND
AUX
C0081-6
B,2.5D
C0459R-12
C0439-12
GN,2.5D
C0343-4
C0028-4
RH rear-Up (Y216)
C0343-3
SR,2.5D
J
C0028-1
Y,4.0D
C0582-19
IGN
RH rear-Down (Y217)
C0343-2
SO,2.5D
K
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
C0459R-52
C0439-52
GU,2.5D
C0343-1
LH rear-Up (Y218)
C0343-6
SR,2.5D
L
C1166R-18
C1168-18
YW,MAPX
C0580-15
CAN BUS +
LH rear-Down (Y219)
C0343-5
SO,2.5D
M
C1166R-19
C1168-19
YU,MAPX
C0580-1
CAN BUS -
C0439-31
C0459R-31
RN,0.5D
SJ1052
RN,0.5D
N
Motor-Central door-locking-Driver (M236)
C1168-12
C1166R-12
RN,0.5D
RN,0.5D
P
C0441-4
BN,0.5D
C0439-19
C0459R-19
BN,0.5D
C0586R-9
DOOR AJAR DRIV
RN,0.5D
Q
Lighting control switch (S100)
Motor-Central door-locking-Passenger (M237)
RN,0.5D
SJ117
RN,0.5D
C0041-9
C0441-4
BN,0.5D
C0439-19
C0463R-19
BU,0.5D
C0586R-8
DOOR AJAR PASS
C0585R-25
B,2.5D
C2696R-1
TYPE 3

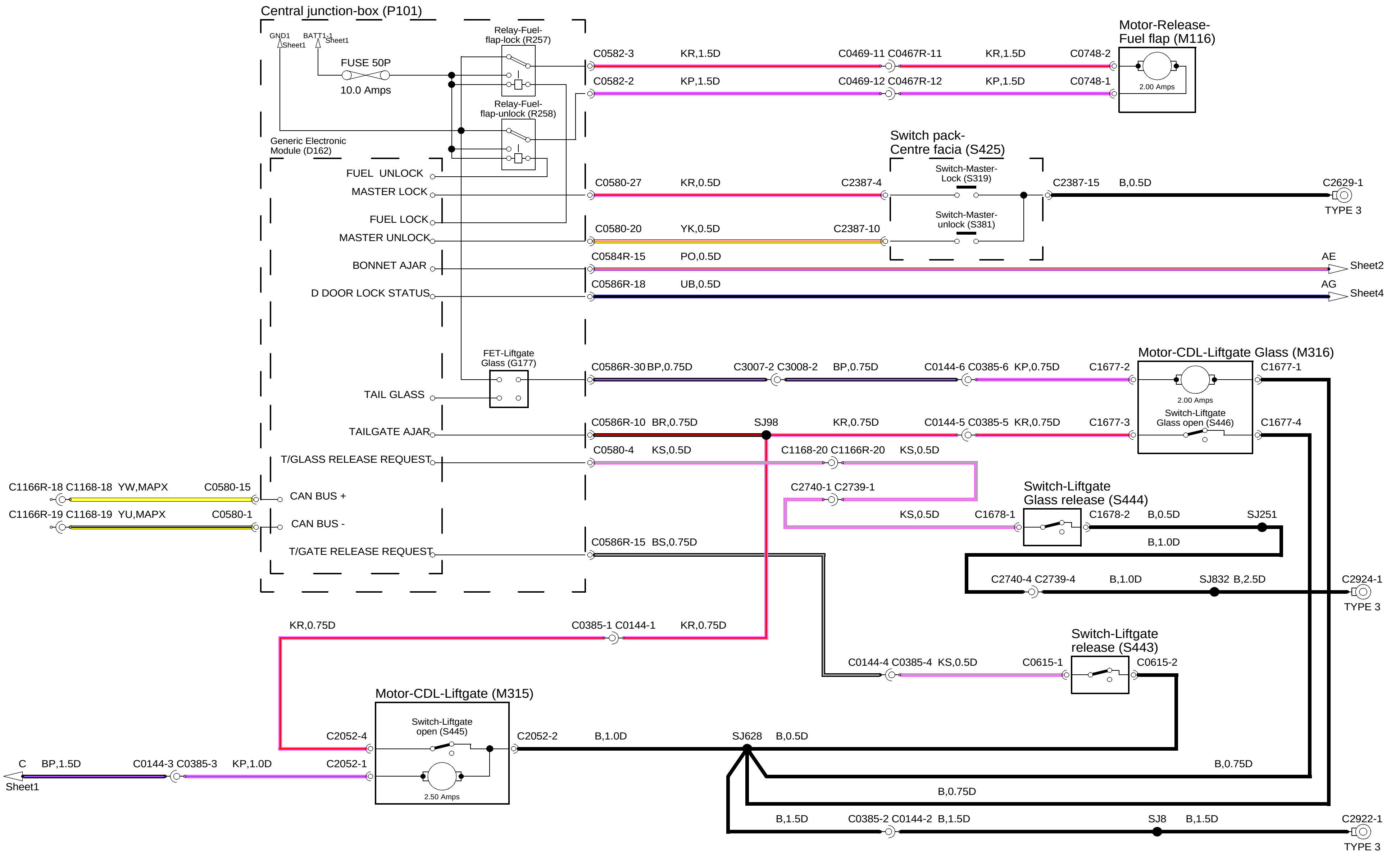

Motor-Window-Driver (M242)
E
BU,0.5D
C0740-1
F
BK,0.5D
C0740-2
B
SB,0.5D
SJ1033
SB,0.5D
C0459R-26
C0439-26
SB,0.5D
C0740-6
ECU
HALL EFFECT
A
GU,2.5D
C0459R-10
C0439-10
GU,2.5D
C0740-3
RELAY
C0740-4
B,2.5D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
SB,0.5D
C0463R-18
C0439-18
SB,0.5D
Motor-Window-Passenger (M243)
C
GU,2.5D
C0463R-10
C0439-10
GU,2.5D
C0741-6
C0741-1
C0741-2
ECU
HALL EFFECT
Switch-Window-Passenger door (S343)
Passenger-Up (Y288)
G
BS,0.5D
C0439-7
C0459R-7
BS,0.5D
C0463R-11
C0439-11
BS,0.5D
C0087-1
C0087-2
BR,0.5D
Passenger-Down (Y289)
C0741-3
H
BR,0.5D
C0439-11
C0459R-11
BR,0.5D
C0463R-12
C0439-12
BR,0.5D
C0087-3
C0087-7
BS,0.5D
RELAY
C0741-4
Switch-illumination (B125)
N
RN,0.5D
C0463R-31
C0439-31
RN,0.5D
C0087-6
C0087-5
B,0.5D
SJ840
B,2.5D
C0087-8
B,0.5D
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3
Switch-Window-Rear-RH (S140)
Motor-Window-Rear-RH (M111)
D
SY,2.5D
C0439-57
C0459R-57
SY,2.5D
C0436-1
C0804-1
SY,2.5D
C0732-8
RH rear-Up (Y216)
C0732-2
SO,2.5D
C2484-2
J
SR,2.5D
C0439-55
C0459R-55
SR,2.5D
C0436-13
C0804-13
SR,2.5D
C0732-1
RH rear-Down (Y217)
K
SO,2.5D
C0439-56
C0459R-56
SO,2.5D
C0436-24
C0804-24
SO,2.5D
C0732-3
C0732-7
SR,2.5D
C2484-1
Switch-illumination (B125)
RN,0.5D
SJ201
RN,0.5D
P
RN,0.5D
C0436-4
C0804-4
C0732-6
C0732-5
B,0.5D
SJ200
B,1.5D
C0804-9
C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
RN,0.5D
TYPE 3
B,1.5D
C0804-21
C0436-21
B,1.5D
Switch-Window-Rear-LH (S141)
Motor-Window-Rear-LH (M112)
R
SY,2.5D
C0435-1
C0803-1
SY,2.5D
C0732-8
LH rear-Up (Y218)
L
SR,2.5D
C0439-8
C0459R-8
SR,2.5D
C0435-13
C0803-13
SR,2.5D
C0732-1
C0732-2
SO,2.5D
C0304-1
M
SO,2.5D
C0439-9
C0459R-9
SO,2.5D
C0435-24
C0803-24
SO,2.5D
C0732-3
LH rear-Down (Y219)
C0732-7
SR,2.5D
C0304-2
Switch-illumination (B125)
RN,0.5D
SJ201
RN,0.5D
Q
RN,0.5D
C0435-4
C0803-4
C0732-6
C0732-5
B,0.5D
SJ200
B,1.5D
C0803-9
C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
RN,0.5D
TYPE 3
B,1.5D
C0803-21
C0435-21
B,1.5D

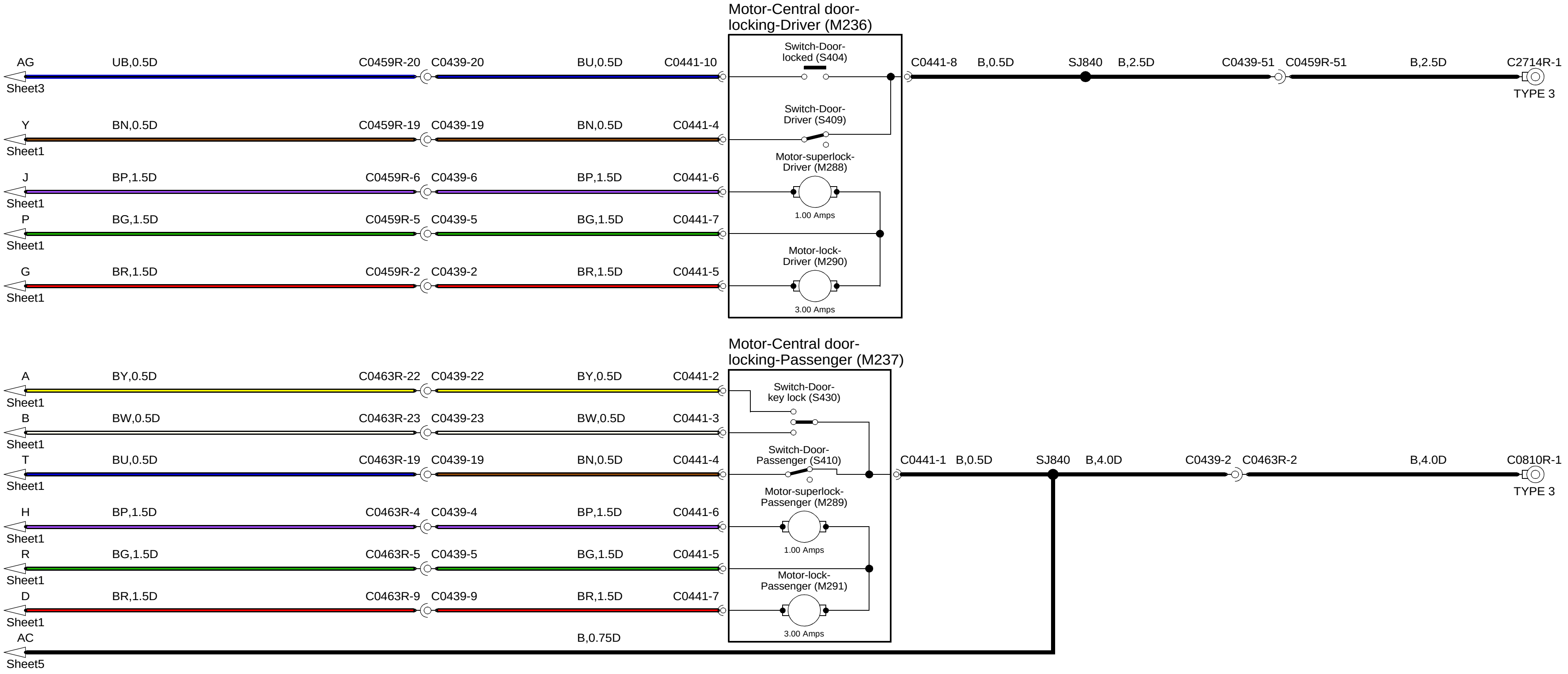

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Cigar lighter-Front (J112)
C0868-12 C0903-12
LGW,1.5D
C0089-2
C0089-1
B,1.5D
SJ301
B,2.5D
C0903-24 C0868-24
B,2.5D
C2598-1
TYPE 3
Central Junction Box (P101)
Relay-Cigar-lighter (R132)
C0582-30
C0583R-22
FUSE 55P
15.0 Amps
C0582-36
LGW,1.5D
C0223-9 C0047R-9
LGW,1.5D
C0585R-25
B,2.5D
C2696R-1
TYPE 3

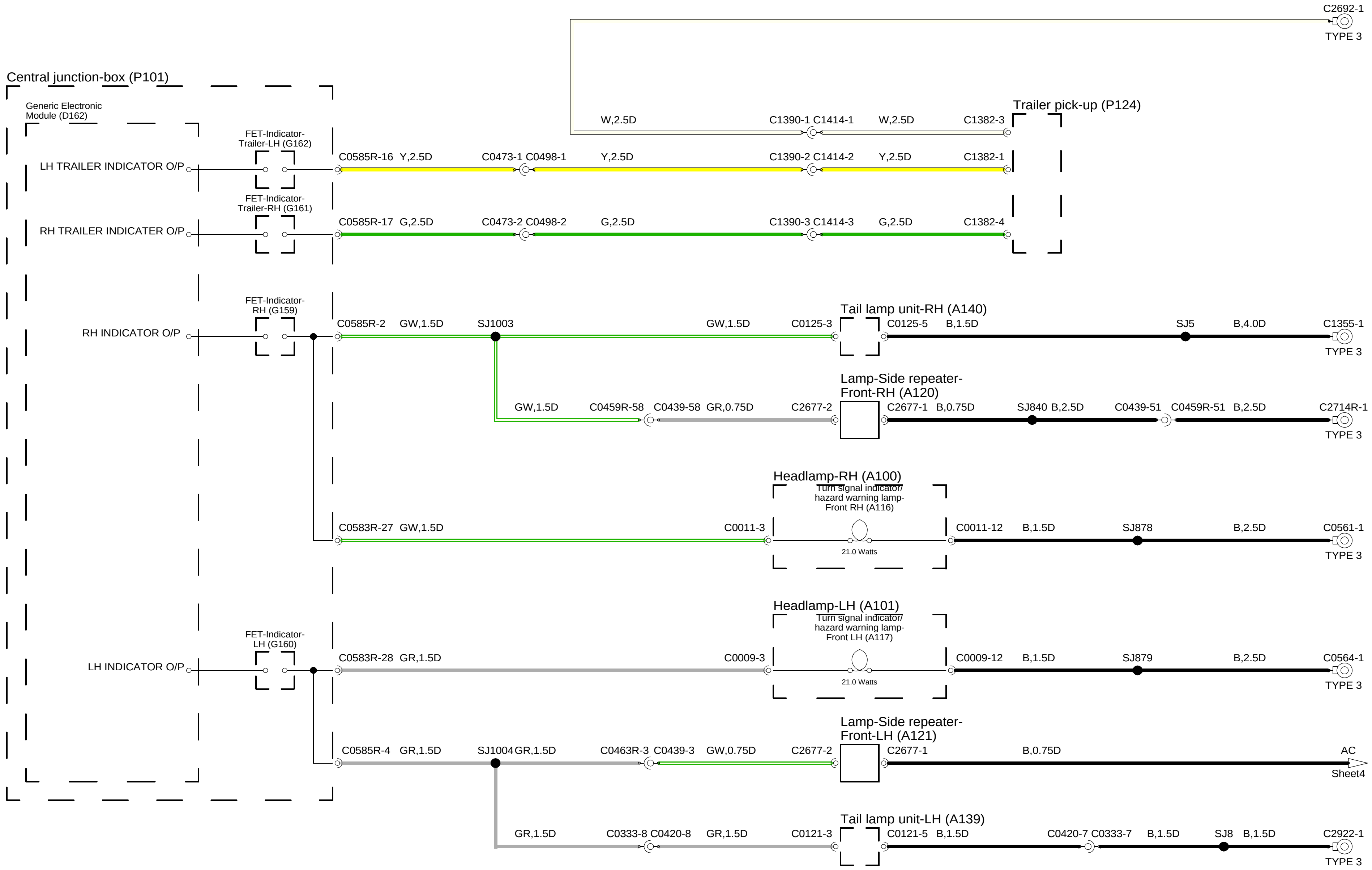

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
LINK 17E
50.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
C0570R-117
NR,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Central Junction Box (P101)
Relay-Accessory-socket (R203)
RL1 MINI
C0583R-20
C0582-30
FUSE 19P
15.0 Amps
FUSE 47P
15.0 Amps
C0585R-31
PG,1.5D
C0868-1 C0903-1
PG,1.5D
C1692-2
Socket-Accessory-Centre (V115)
C1692-1
B,1.5D
C0903-13 C0868-13
B,1.5D
C2565R-1
TYPE 3
C0585R-11
PG,1.5D
C0942-2
Socket-Accessory-Rear (V113)
C0942-1
B,1.5D
C2924-1
TYPE 3
C0585R-25
B,2.5D
C2696R-1
TYPE 3

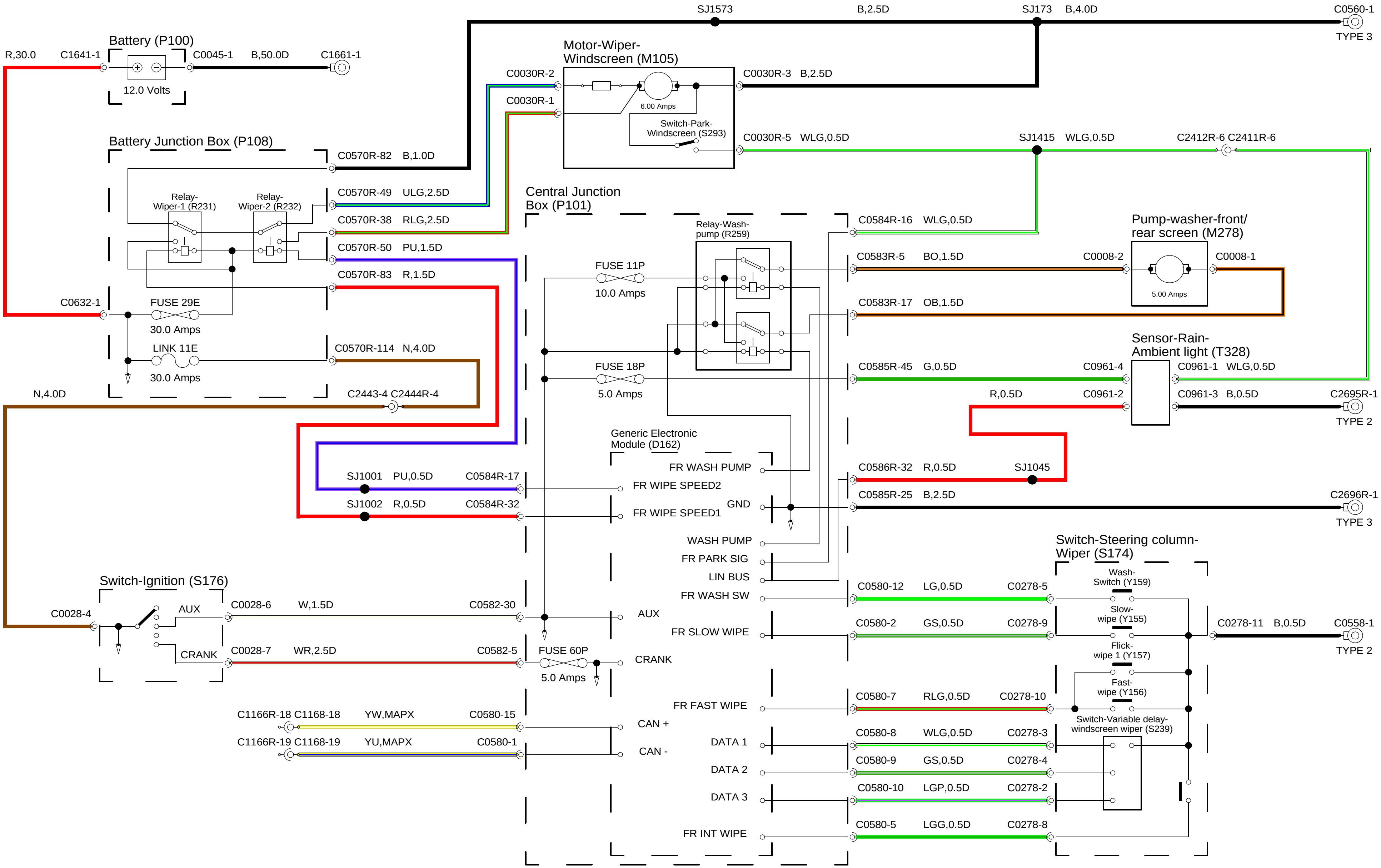

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central junction-box (P101)
Generic Electronic Module (D162)
Junction-box engine (P108)
C0632-1
LINK 6E
50.0 Amps
C0570R-117
NR,6.0D
C0583R-20
LINK 15E
40.0 Amps
C0570R-116
NU,4.0D
C0583R-21
LINK 10E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
N,4.0D
BATT 1
Switch-Ignition (S176)
C0028-4
C0028-6
W,1.5D
C0582-30
C0028-1
Y,4.0D
C0582-19
C0028-7
WR,2.5D
C0582-5
C0028-5
LGW,1.5D
C0582-21
FUSE 60P
5.0 Amps
FUSE 40P
5.0 Amps
AUX
IGN
CRANK
KEY-IN
Receiver-Radio-frequency (RF) (T203)
C0049-2
U,0.5D
C0586R-21
RF IN
Passive coil (D156)
C2524-8
R,MAPBB
C0580-14
C2524-6
G,MAPBB
C0580-30
LF IN
LF OUT
FUSE 49P
30.0 Amps
FUSE 12P
15.0 Amps
BATT1-1
KEY LOCK
KEY UNLOCK
TAILGATE O/P
GND
CDL LOCK O/P
DRIVER LOCK O/P
SUPERLOCK O/P
RTN 1 O/P
RTN 2 O/P
PASS AJAR
RLH AJAR
RRH AJAR
DRIVER AJAR
HORN
GND1
Relay-Horn (R133)
LOW TONE
HIGH TONE
FET-Liftgate (G176)
Relay-CDL-lock (R261)
Relay-Driver-lock (R262)
Relay-Superlock (R263)
Relay-CDL-Return (R265)
Relay-CDL-Return (R265)
C0586R-16
BY,0.5D
A
Sheet4
C0586R-14
BW,0.5D
B
Sheet4
C0585R-1
BP,1.5D
C3007-1 C3008-1
BP,1.5D
C
Sheet3
C0585R-5
BR,1.5D
SJ1013
BR,1.5D
D
Sheet4
BR,1.5D
E
Sheet2
BR,1.5D
F
Sheet2
C0585R-27
BR,1.5D
G
Sheet4
C0585R-33
BP,1.5D
SJ1012
BP,1.5D
H
Sheet4
BP,1.5D
J
Sheet4
BP,1.5D
K
Sheet2
BP,1.5D
L
Sheet2
C0585R-36
BG,2.5D
SJ1011
BG,1.5D
P
Sheet4
BG,1.5D
Q
Sheet2
C0585R-26
BG,2.5D
SJ1670
BG,1.5D
R
Sheet4
BG,1.5D
S
Sheet2
C0586R-8
BU,0.5D
T
Sheet4
C0586R-7
PLG,0.5D
W
Sheet2
C0586R-6
PLG,0.5D
X
Sheet2
C0586R-9
BN,0.5D
Y
Sheet4
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C0583R-4
PG,1.0D
Z
Sheet2
C0583R-3
PG,1.0D
AA
Sheet2

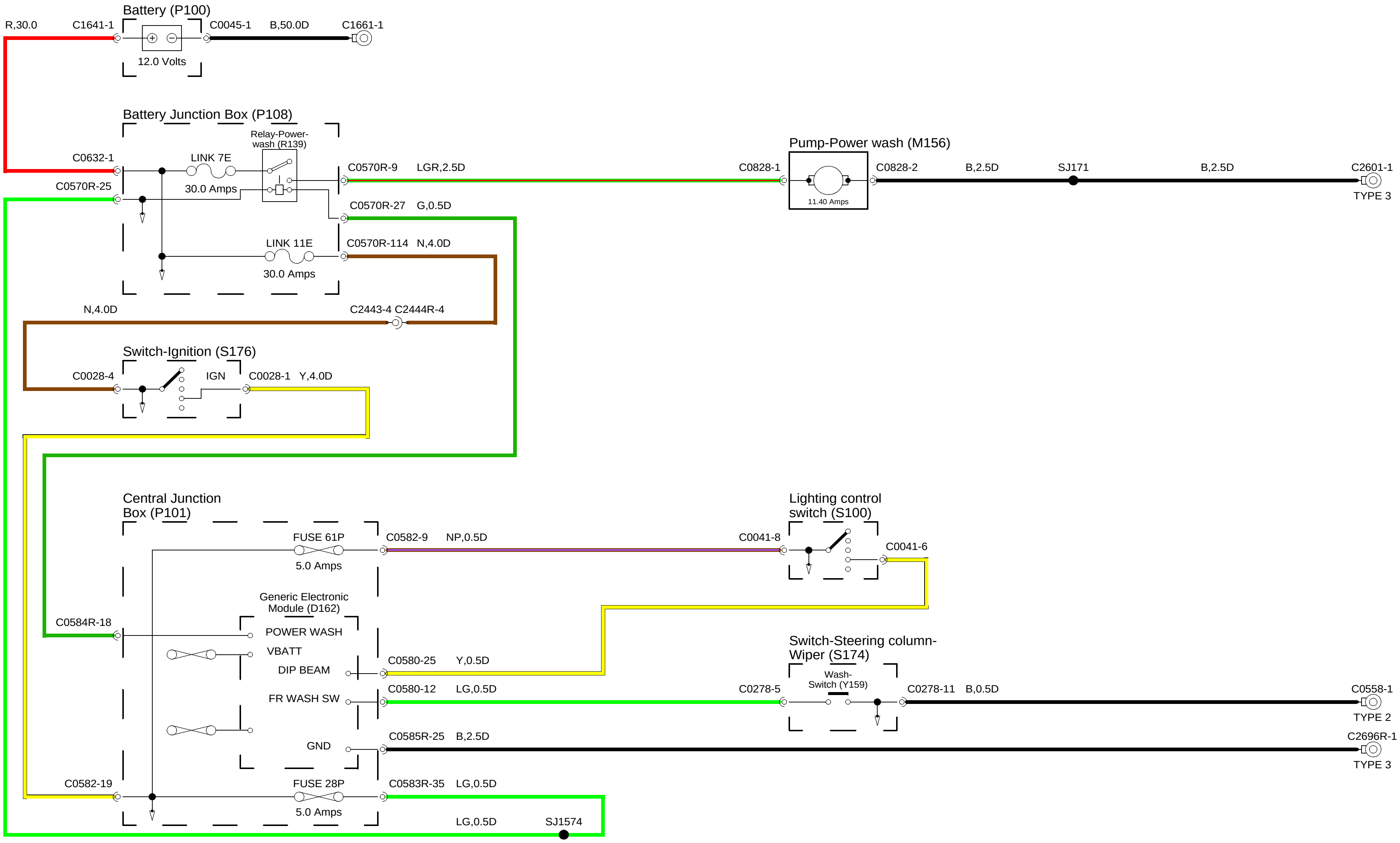

Motor-Central door-locking-Rear-RH (M166)
Switch-Door-Rear-RH (S129)
Motor-Superlock-Rear-RH (M246)
1.00 Amps
Motor-lock-Rear-RH (M292)
3.00 Amps
X
Sheet1
PLG,0.5D
C0436-3 C0804-3
PLG,0.5D
C0442-4
L
Sheet1
BP,1.5D
C0436-12 C0804-12
BP,1.5D
C0442-6
S
Sheet1
BG,1.5D
C0436-8 C0804-8
BG,1.5D
C0442-7
F
Sheet1
BR,1.5D
C0436-10 C0804-10
BR,1.5D
C0442-5
C0442-8
B,0.5D
SJ200
B,1.5D
C0804-9 C0436-9
B,1.5D
SJ740
B,2.5D
C0809-1
TYPE 3
B,1.5D
C0804-21 C0436-21
B,1.5D
Motor-Central door-locking-Rear-LH (M167)
Switch-Door-Rear-LH (S130)
Motor-Superlock-Rear-LH (M193)
1.00 Amps
Motor-lock-Rear-LH (M293)
3.00 Amps
W
Sheet1
PLG,0.5D
C0435-3 C0803-3
PLG,0.5D
C0442-4
K
Sheet1
BP,1.5D
C0435-12 C0803-12
BP,1.5D
C0442-6
Q
Sheet1
BG,1.5D
C0435-8 C0803-8
BG,1.5D
C0442-5
E
Sheet1
BR,1.5D
C0435-10 C0803-10
BR,1.5D
C0442-7
C0442-1
B,0.5D
SJ200
B,1.5D
C0803-9 C0435-9
B,1.5D
SJ742
B,2.5D
C0807-1
TYPE 3
B,1.5D
C0803-21 C0435-21
B,1.5D
Switch-Bonnet (S224)
AE
Sheet3
PO,0.5D
C0007-1
C0007-2
B,0.5D
SJ877
B,2.5D
C0561-1
TYPE 3
Horn-RH (L103)
AA
Sheet1
PG,1.0D
C0004-1
3.00 Amps
C0004-2
B,1.0D
Horn-LH (L102)
Z
Sheet1
PG,1.0D
C0003-1
3.00 Amps
C0003-2
B,1.0D
SJ877
B,2.5D
C0561-1
TYPE 3

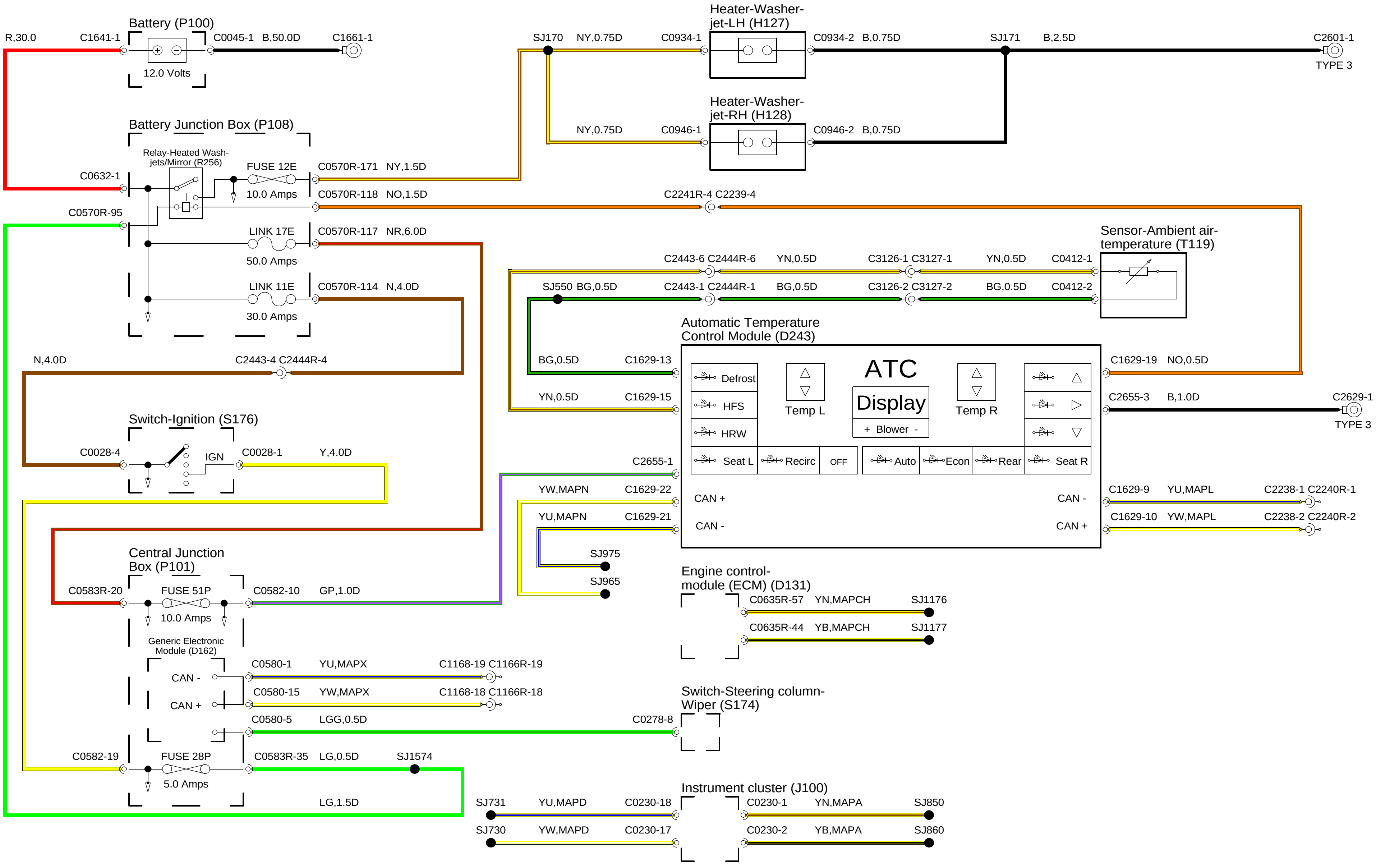

Central junction-box (P101)
GND1
Sheet1
BATT1-1
Sheet1
FUSE 50P
10.0 Amps
Relay-Fuel-flap-lock (R257)
Relay-Fuel-flap-unlock (R258)
Generic Electronic Module (D162)
FUEL UNLOCK
MASTER LOCK
FUEL LOCK
MASTER UNLOCK
BONNET AJAR
D DOOR LOCK STATUS
FET-Liftgate Glass (G177)
TAIL GLASS
TAILGATE AJAR
T/GLASS RELEASE REQUEST
CAN BUS +
CAN BUS -
T/GATE RELEASE REQUEST
C0582-3 KR,1.5D C0469-11 C0467R-11 KR,1.5D C0748-2
C0582-2 KP,1.5D C0469-12 C0467R-12 KP,1.5D C0748-1
Motor-Release-Fuel flap (M116)
2.00 Amps
Switch pack-Centre facia (S425)
Switch-Master-Lock (S319)
Switch-Master-unlock (S381)
C0580-27 KR,0.5D C2387-4
C2387-15 B,0.5D C2629-1
TYPE 3
C0580-20 YK,0.5D C2387-10
C0584R-15 PO,0.5D AE Sheet2
C0586R-18 UB,0.5D AG Sheet4
Motor-CDL-Liftgate Glass (M316)
C0586R-30 BP,0.75D C3007-2 C3008-2 BP,0.75D C0144-6 C0385-6 KP,0.75D C1677-2
C1677-1
2.00 Amps
Switch-Liftgate Glass open (S446)
C0586R-10 BR,0.75D SJ98 KR,0.75D C0144-5 C0385-5 KR,0.75D C1677-3
C1677-4
C0580-4 KS,0.5D C1168-20 C1166R-20 KS,0.5D
C1166R-18 C1168-18 YW,MAPX C0580-15
C1166R-19 C1168-19 YU,MAPX C0580-1
C2740-1 C2739-1
Switch-Liftgate Glass release (S444)
KS,0.5D C1678-1 C1678-2 B,0.5D SJ251
B,1.0D
C0586R-15 BS,0.75D
C2740-4 C2739-4 B,1.0D SJ832 B,2.5D C2924-1
TYPE 3
KR,0.75D C0385-1 C0144-1 KR,0.75D
Switch-Liftgate release (S443)
C0144-4 C0385-4 KS,0.5D C0615-1 C0615-2
Motor-CDL-Liftgate (M315)
Switch-Liftgate open (S445)
2.50 Amps
C2052-4
C2052-2 B,1.0D SJ628 B,0.5D
C BP,1.5D C0144-3 C0385-3 KP,1.0D C2052-1
Sheet1
B,0.75D
B,0.75D
B,1.5D C0385-2 C0144-2 B,1.5D SJ8 B,1.5D C2922-1
TYPE 3

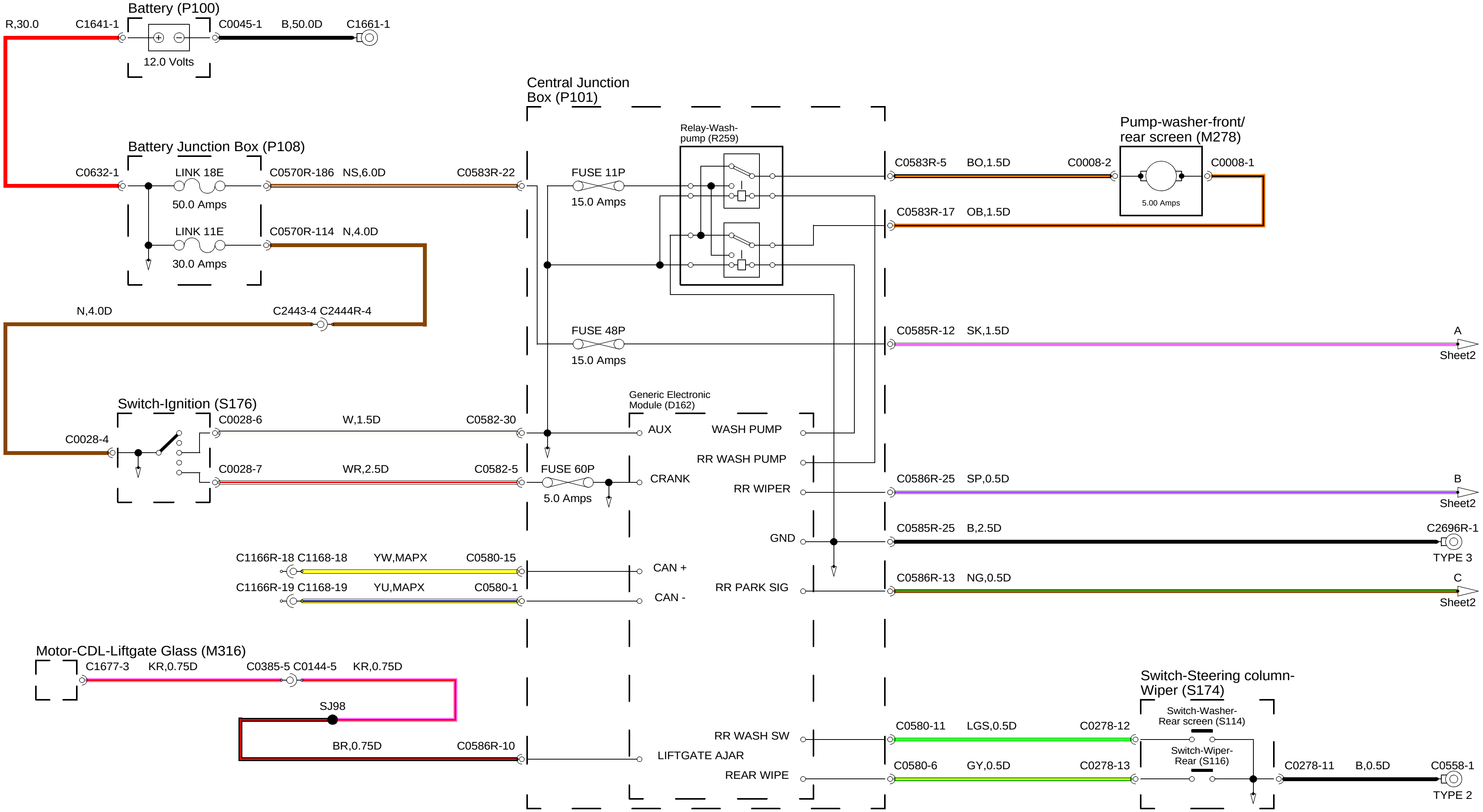

Motor-Central door-locking-Driver (M236)
Switch-Door-locked (S404)
Switch-Door-Driver (S409)
Motor-superlock-Driver (M288)
1.00 Amps
Motor-lock-Driver (M290)
3.00 Amps
AG
Sheet3
UB,0.5D
C0459R-20
C0439-20
BU,0.5D
C0441-10
Y
Sheet1
BN,0.5D
C0459R-19
C0439-19
BN,0.5D
C0441-4
J
Sheet1
BP,1.5D
C0459R-6
C0439-6
BP,1.5D
C0441-6
P
Sheet1
BG,1.5D
C0459R-5
C0439-5
BG,1.5D
C0441-7
G
Sheet1
BR,1.5D
C0459R-2
C0439-2
BR,1.5D
C0441-5
C0441-8
B,0.5D
SJ840
B,2.5D
C0439-51
C0459R-51
B,2.5D
C2714R-1
TYPE 3
Motor-Central door-locking-Passenger (M237)
Switch-Door-key lock (S430)
Switch-Door-Passenger (S410)
Motor-superlock-Passenger (M289)
1.00 Amps
Motor-lock-Passenger (M291)
3.00 Amps
A
Sheet1
BY,0.5D
C0463R-22
C0439-22
BY,0.5D
C0441-2
B
Sheet1
BW,0.5D
C0463R-23
C0439-23
BW,0.5D
C0441-3
T
Sheet1
BU,0.5D
C0463R-19
C0439-19
BN,0.5D
C0441-4
H
Sheet1
BP,1.5D
C0463R-4
C0439-4
BP,1.5D
C0441-6
R
Sheet1
BG,1.5D
C0463R-5
C0439-5
BG,1.5D
C0441-5
D
Sheet1
BR,1.5D
C0463R-9
C0439-9
BR,1.5D
C0441-7
AC
Sheet5
B,0.75D
C0441-1
B,0.5D
SJ840
B,4.0D
C0439-2
C0463R-2
B,4.0D
C0810R-1
TYPE 3

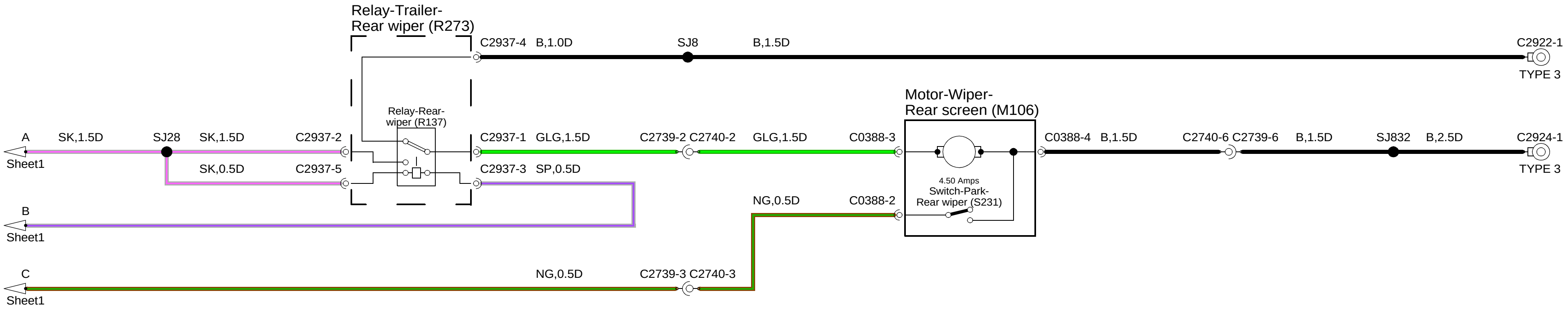

C2692-1
TYPE 3
Central junction-box (P101)
Generic Electronic Module (D162)
Trailer pick-up (P124)
W,2.5D
C1390-1 C1414-1
W,2.5D
C1382-3
FET-Indicator-Trailer-LH (G162)
LH TRAILER INDICATOR O/P
C0585R-16 Y,2.5D
C0473-1 C0498-1
Y,2.5D
C1390-2 C1414-2
Y,2.5D
C1382-1
FET-Indicator-Trailer-RH (G161)
RH TRAILER INDICATER O/P
C0585R-17 G,2.5D
C0473-2 C0498-2
G,2.5D
C1390-3 C1414-3
G,2.5D
C1382-4
FET-Indicator-RH (G159)
RH INDICATOR O/P
C0585R-2 GW,1.5D
SJ1003
GW,1.5D
C0125-3
Tail lamp unit-RH (A140)
C0125-5 B,1.5D
SJ5
B,4.0D
C1355-1
TYPE 3
Lamp-Side repeater-Front-RH (A120)
GW,1.5D
C0459R-58 C0439-58 GR,0.75D
C2677-2
C2677-1 B,0.75D
SJ840 B,2.5D
C0439-51 C0459R-51 B,2.5D
C2714R-1
TYPE 3
Headlamp-RH (A100)
Turn signal indicator/ hazard warning lamp-Front RH (A116)
C0583R-27 GW,1.5D
C0011-3
21.0 Watts
C0011-12 B,1.5D
SJ878
B,2.5D
C0561-1
TYPE 3
Headlamp-LH (A101)
Turn signal indicator/ hazard warning lamp-Front LH (A117)
FET-Indicator-LH (G160)
LH INDICATOR O/P
C0583R-28 GR,1.5D
C0009-3
21.0 Watts
C0009-12 B,1.5D
SJ879
B,2.5D
C0564-1
TYPE 3
Lamp-Side repeater-Front-LH (A121)
C0585R-4 GR,1.5D
SJ1004 GR,1.5D
C0463R-3 C0439-3 GW,0.75D
C2677-2
C2677-1
B,0.75D
AC
Sheet4
Tail lamp unit-LH (A139)
GR,1.5D
C0333-8 C0420-8
GR,1.5D
C0121-3
C0121-5 B,1.5D
C0420-7 C0333-7
B,1.5D
SJ8 B,1.5D
C2922-1
TYPE 3


SJ1573
B,2.5D
SJ173
B,4.0D
C0560-1
TYPE 3
Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Motor-Wiper-Windscreen (M105)
C0030R-2
C0030R-1
C0030R-3
B,2.5D
6.00 Amps
Switch-Park-Windscreen (S293)
C0030R-5
WLG,0.5D
SJ1415
WLG,0.5D
C2412R-6 C2411R-6
Battery Junction Box (P108)
C0570R-82
B,1.0D
Relay-Wiper-1 (R231)
Relay-Wiper-2 (R232)
C0570R-49
ULG,2.5D
C0570R-38
RLG,2.5D
C0570R-50
PU,1.5D
C0570R-83
R,1.5D
C0632-1
FUSE 29E
30.0 Amps
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
N,4.0D
C2443-4 C2444R-4
Central Junction Box (P101)
Relay-Wash-pump (R259)
C0584R-16
WLG,0.5D
Pump-washer-front/rear screen (M278)
FUSE 11P
10.0 Amps
C0583R-5
BO,1.5D
C0008-2
C0008-1
5.00 Amps
C0583R-17
OB,1.5D
Sensor-Rain-Ambient light (T328)
FUSE 18P
5.0 Amps
C0585R-45
G,0.5D
C0961-4
C0961-1
WLG,0.5D
R,0.5D
C0961-2
C0961-3
B,0.5D
C2695R-1
TYPE 2
Generic Electronic Module (D162)
FR WASH PUMP
FR WIPE SPEED2
GND
FR WIPE SPEED1
SJ1001
PU,0.5D
C0584R-17
SJ1002
R,0.5D
C0584R-32
C0586R-32
R,0.5D
SJ1045
C0585R-25
B,2.5D
C2696R-1
TYPE 3
WASH PUMP
FR PARK SIG
LIN BUS
FR WASH SW
Switch-Steering column-Wiper (S174)
Wash-Switch (Y159)
C0580-12
LG,0.5D
C0278-5
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
C0582-30
AUX
FR SLOW WIPE
Slow-wipe (Y155)
C0580-2
GS,0.5D
C0278-9
C0278-11
B,0.5D
C0558-1
TYPE 2
CRANK
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
Flick-wipe 1 (Y157)
Fast-wipe (Y156)
C0580-7
RLG,0.5D
C0278-10
FR FAST WIPE
C1166R-18 C1168-18
YW,MAPX
C0580-15
CAN +
Switch-Variable delay-windscreen wiper (S239)
C1166R-19 C1168-19
YU,MAPX
C0580-1
CAN -
DATA 1
C0580-8
WLG,0.5D
C0278-3
DATA 2
C0580-9
GS,0.5D
C0278-4
DATA 3
C0580-10
LGP,0.5D
C0278-2
FR INT WIPE
C0580-5
LGG,0.5D
C0278-8

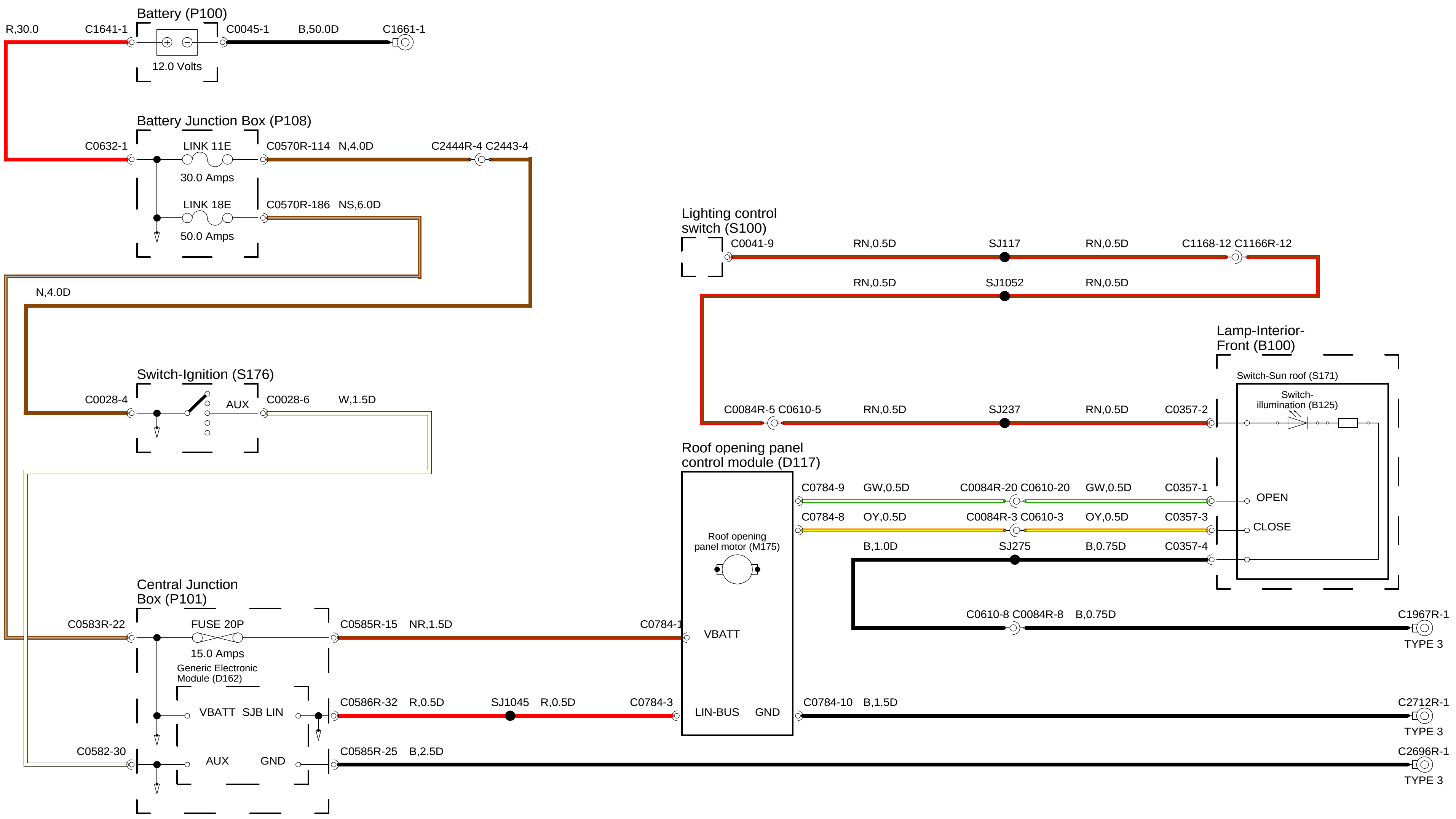

Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
Relay-Power-wash (R139)
C0632-1
LINK 7E
30.0 Amps
C0570R-25
C0570R-9
LGR,2.5D
C0570R-27
G,0.5D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
Pump-Power wash (M156)
C0828-1
11.40 Amps
C0828-2
B,2.5D
SJ171
B,2.5D
C2601-1
TYPE 3
N,4.0D
C2443-4 C2444R-4
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Central Junction Box (P101)
FUSE 61P
5.0 Amps
C0582-9
NP,0.5D
Lighting control switch (S100)
C0041-8
C0041-6
Generic Electronic Module (D162)
C0584R-18
POWER WASH
VBATT
DIP BEAM
C0580-25
Y,0.5D
FR WASH SW
C0580-12
LG,0.5D
Switch-Steering column-Wiper (S174)
Wash-Switch (Y159)
C0278-5
C0278-11
B,0.5D
C0558-1
TYPE 2
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
LG,0.5D
SJ1574

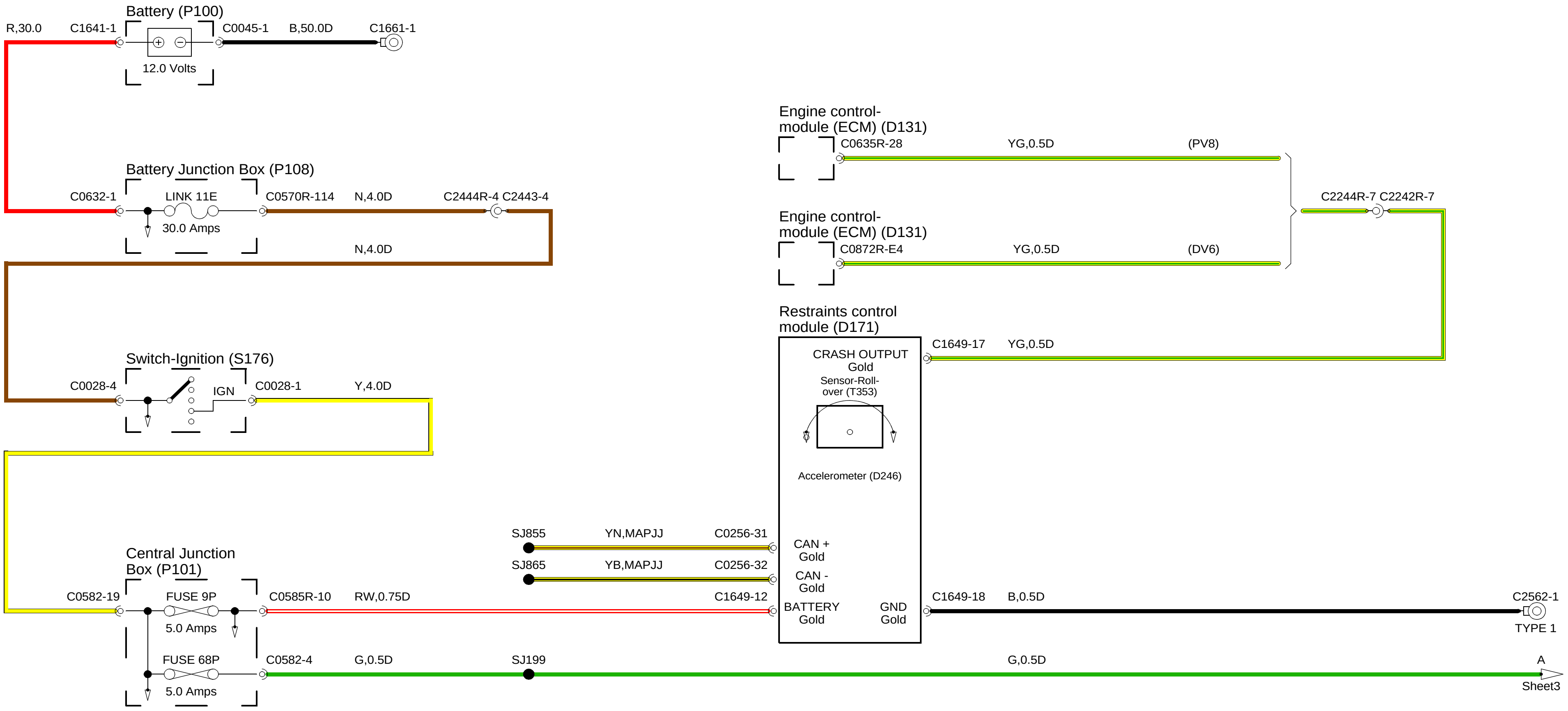

R,30.0
C1641-1
Battery (P100)
12.0 Volts
C0045-1
B,50.0D
C1661-1
SJ170
NY,0.75D
C0934-1
Heater-Washer-jet-LH (H127)
C0934-2
B,0.75D
SJ171
B,2.5D
C2601-1
TYPE 3
NY,0.75D
C0946-1
Heater-Washer-jet-RH (H128)
C0946-2
B,0.75D
Battery Junction Box (P108)
Relay-Heated Wash-jets/Mirror (R256)
FUSE 12E
10.0 Amps
C0570R-171
NY,1.5D
C0632-1
C0570R-118
NO,1.5D
C2241R-4 C2239-4
C0570R-95
LINK 17E
50.0 Amps
C0570R-117
NR,6.0D
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
Sensor-Ambient air-temperature (T119)
C2443-6 C2444R-6
YN,0.5D
C3126-1 C3127-1
YN,0.5D
C0412-1
SJ550
BG,0.5D
C2443-1 C2444R-1
BG,0.5D
C3126-2 C3127-2
BG,0.5D
C0412-2
Automatic Temperature Control Module (D243)
N,4.0D
C2443-4 C2444R-4
BG,0.5D
C1629-13
C1629-19
NO,0.5D
ATC
Defrost
Temp L
Display
Temp R
HFS
+ Blower -
HRW
Seat L
Recirc
OFF
Auto
Econ
Rear
Seat R
YN,0.5D
C1629-15
C2655-3
B,1.0D
C2629-1
TYPE 3
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
C2655-1
YW,MAPN
C1629-22
CAN +
CAN -
C1629-9
YU,MAPL
C2238-1 C2240R-1
YU,MAPN
C1629-21
CAN -
CAN +
C1629-10
YW,MAPL
C2238-2 C2240R-2
SJ975
SJ965
Central Junction Box (P101)
C0583R-20
FUSE 51P
10.0 Amps
C0582-10
GP,1.0D
Engine control-module (ECM) (D131)
C0635R-57
YN,MAPCH
SJ1176
C0635R-44
YB,MAPCH
SJ1177
Generic Electronic Module (D162)
CAN -
C0580-1
YU,MAPX
C1168-19 C1166R-19
CAN +
C0580-15
YW,MAPX
C1168-18 C1166R-18
Switch-Steering column-Wiper (S174)
C0580-5
LGG,0.5D
C0278-8
C0582-19
FUSE 28P
5.0 Amps
C0583R-35
LG,0.5D
SJ1574
LG,1.5D
Instrument cluster (J100)
SJ731
YU,MAPD
C0230-18
C0230-1
YN,MAPA
SJ850
SJ730
YW,MAPD
C0230-17
C0230-2
YB,MAPA
SJ860

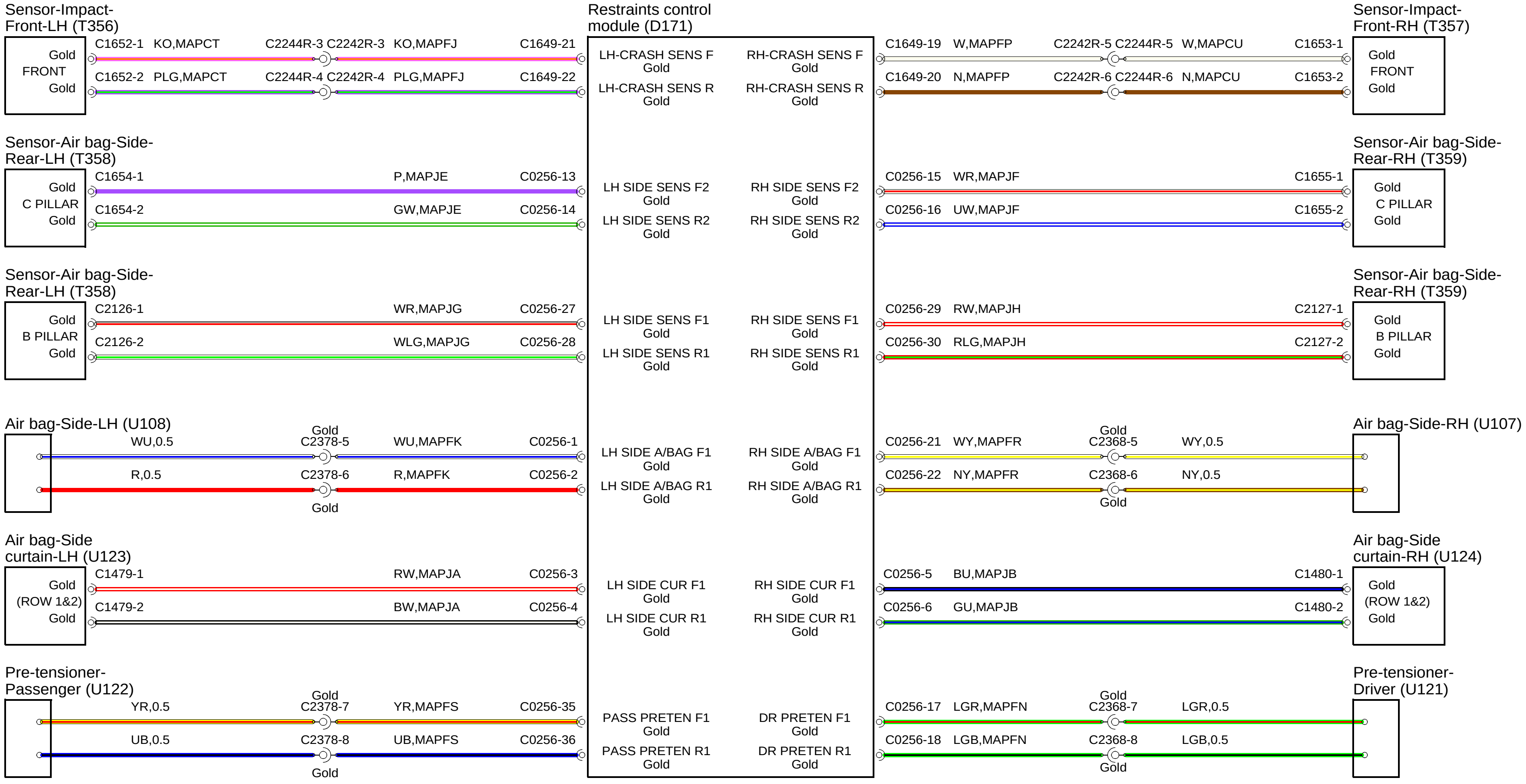

Battery (P100)
R,30.0
C1641-1
12.0 Volts
C0045-1
B,50.0D
C1661-1
Central Junction Box (P101)
Relay-Wash-pump (R259)
Pump-washer-front/ rear screen (M278)
5.00 Amps
Battery Junction Box (P108)
C0632-1
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
C0583R-22
FUSE 11P
15.0 Amps
C0583R-5
BO,1.5D
C0008-2
C0008-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C0583R-17
OB,1.5D
N,4.0D
C2443-4 C2444R-4
FUSE 48P
15.0 Amps
C0585R-12
SK,1.5D
A
Sheet2
Switch-Ignition (S176)
Generic Electronic Module (D162)
C0028-4
C0028-6
W,1.5D
C0582-30
AUX
WASH PUMP
RR WASH PUMP
C0028-7
WR,2.5D
C0582-5
FUSE 60P
5.0 Amps
CRANK
RR WIPER
C0586R-25
SP,0.5D
B
Sheet2
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3
C1166R-18 C1168-18
YW,MAPX
C0580-15
CAN +
C1166R-19 C1168-19
YU,MAPX
C0580-1
CAN -
RR PARK SIG
C0586R-13
NG,0.5D
C
Sheet2
Motor-CDL-Liftgate Glass (M316)
C1677-3
KR,0.75D
C0385-5 C0144-5
KR,0.75D
SJ98
BR,0.75D
C0586R-10
Switch-Steering column-Wiper (S174)
Switch-Washer-Rear screen (S114)
RR WASH SW
C0580-11
LGS,0.5D
C0278-12
LIFTGATE AJAR
Switch-Wiper-Rear (S116)
REAR WIPE
C0580-6
GY,0.5D
C0278-13
C0278-11
B,0.5D
C0558-1
TYPE 2

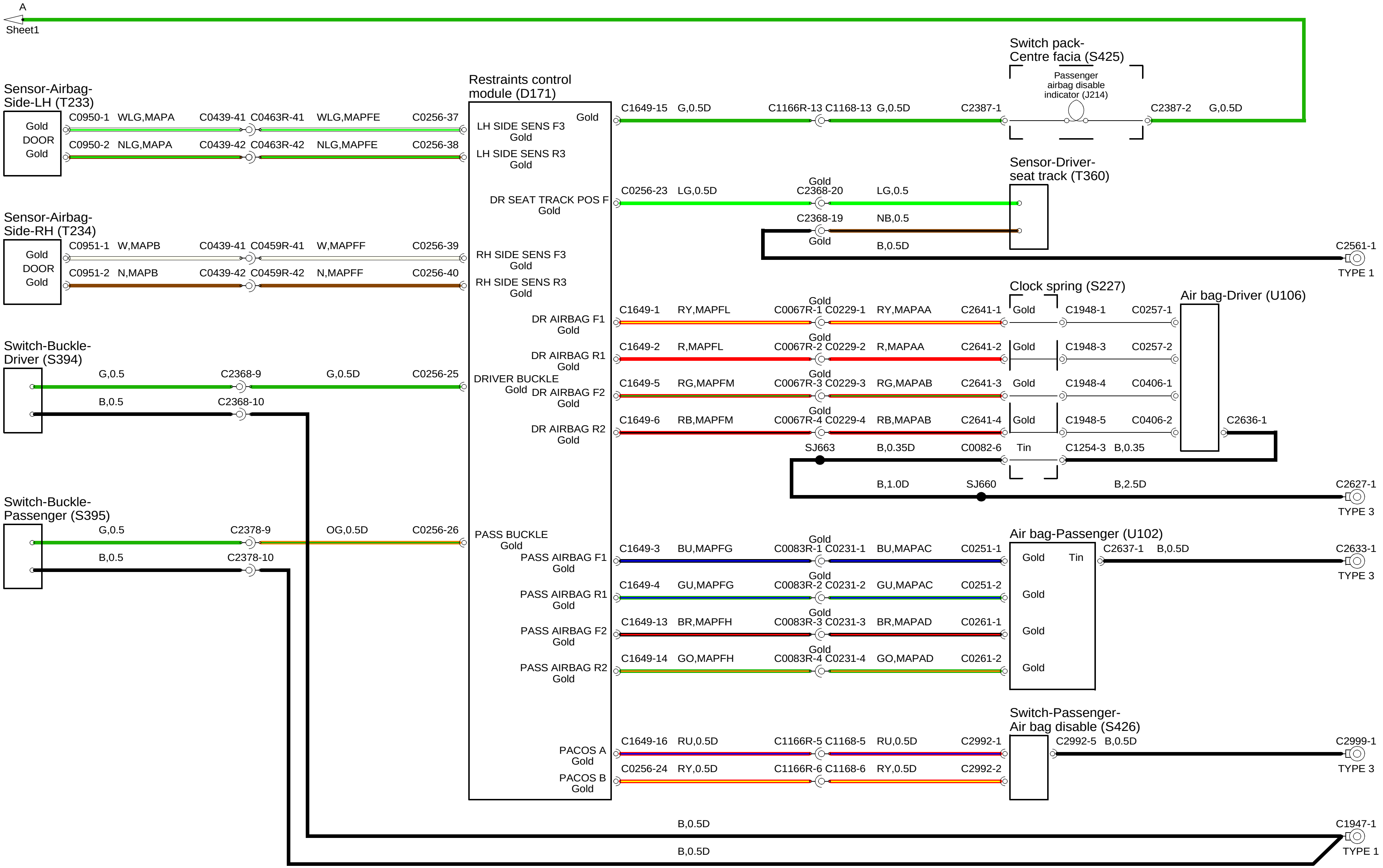

Relay-Trailer-
Rear wiper (R273)
C2937-4
B,1.0D
SJ8
B,1.5D
C2922-1
TYPE 3
Motor-Wiper-
Rear screen (M106)
Relay-Rear-
wiper (R137)
A
SK,1.5D
SJ28
SK,1.5D
C2937-2
C2937-1
GLG,1.5D
C2739-2 C2740-2
GLG,1.5D
C0388-3
C0388-4
B,1.5D
C2740-6 C2739-6
B,1.5D
SJ832
B,2.5D
C2924-1
Sheet1
SK,0.5D
C2937-5
C2937-3
SP,0.5D
TYPE 3
4.50 Amps
Switch-Park-
Rear wiper (S231)
NG,0.5D
C0388-2
B
Sheet1
C
NG,0.5D
C2739-3 C2740-3
Sheet1

501-17 ROOF OPENING PANEL


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Battery Junction Box (P108)
C0632-1
LINK 11E
30.0 Amps
C0570R-114
N,4.0D
C2444R-4 C2443-4
LINK 18E
50.0 Amps
C0570R-186
NS,6.0D
N,4.0D
Switch-Ignition (S176)
C0028-4
AUX
C0028-6
W,1.5D
Lighting control switch (S100)
C0041-9
RN,0.5D
SJ117
RN,0.5D
C1168-12 C1166R-12
RN,0.5D
SJ1052
RN,0.5D
Lamp-Interior-Front (B100)
Switch-Sun roof (S171)
Switch-illumination (B125)
C0084R-5 C0610-5
RN,0.5D
SJ237
RN,0.5D
C0357-2
Roof opening panel control module (D117)
C0784-9
GW,0.5D
C0084R-20 C0610-20
GW,0.5D
C0357-1
OPEN
C0784-8
OY,0.5D
C0084R-3 C0610-3
OY,0.5D
C0357-3
CLOSE
Roof opening panel motor (M175)
B,1.0D
SJ275
B,0.75D
C0357-4
C0610-8 C0084R-8
B,0.75D
C1967R-1
TYPE 3
Central Junction Box (P101)
C0583R-22
FUSE 20P
15.0 Amps
C0585R-15
NR,1.5D
C0784-1
VBATT
Generic Electronic Module (D162)
VBATT
SJB LIN
C0586R-32
R,0.5D
SJ1045
R,0.5D
C0784-3
LIN-BUS
GND
C0784-10
B,1.5D
C2712R-1
TYPE 3
C0582-30
AUX
GND
C0585R-25
B,2.5D
C2696R-1
TYPE 3


Battery (P100)
R,30.0
C1641-1
C0045-1
B,50.0D
C1661-1
12.0 Volts
Engine control-module (ECM) (D131)
C0635R-28
YG,0.5D
(PV8)
Battery Junction Box (P108)
C0632-1
LINK 11E
C0570R-114
N,4.0D
C2444R-4 C2443-4
C2244R-7 C2242R-7
30.0 Amps
Engine control-module (ECM) (D131)
C0872R-E4
YG,0.5D
(DV6)
N,4.0D
Restraints control module (D171)
C1649-17
YG,0.5D
CRASH OUTPUT Gold
Sensor-Roll-over (T353)
Switch-Ignition (S176)
C0028-4
IGN
C0028-1
Y,4.0D
Accelerometer (D246)
SJ855
YN,MAPJJ
C0256-31
SJ865
YB,MAPJJ
C0256-32
CAN + Gold
CAN - Gold
Central Junction Box (P101)
C0582-19
FUSE 9P
C0585R-10
RW,0.75D
C1649-12
BATTERY Gold
GND Gold
C1649-18
B,0.5D
C2562-1
5.0 Amps
TYPE 1
FUSE 68P
C0582-4
G,0.5D
SJ199
G,0.5D
A
5.0 Amps
Sheet3


Sensor-Impact-Front-LH (T356)
Gold
FRONT
Gold
C1652-1 KO,MAPCT
C2244R-3 C2242R-3 KO,MAPFJ
C1649-21
C1652-2 PLG,MAPCT
C2244R-4 C2242R-4 PLG,MAPFJ
C1649-22
Restraints control module (D171)
LH-CRASH SENS F
Gold
LH-CRASH SENS R
Gold
RH-CRASH SENS F
Gold
RH-CRASH SENS R
Gold
C1649-19 W,MAPFP
C2242R-5 C2244R-5 W,MAPCU
C1653-1
C1649-20 N,MAPFP
C2242R-6 C2244R-6 N,MAPCU
C1653-2
Sensor-Impact-Front-RH (T357)
Gold
FRONT
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
C PILLAR
Gold
C1654-1
P,MAPJE
C0256-13
C1654-2
GW,MAPJE
C0256-14
LH SIDE SENS F2
Gold
LH SIDE SENS R2
Gold
RH SIDE SENS F2
Gold
RH SIDE SENS R2
Gold
C0256-15 WR,MAPJF
C1655-1
C0256-16 UW,MAPJF
C1655-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
C PILLAR
Gold
Sensor-Air bag-Side-Rear-LH (T358)
Gold
B PILLAR
Gold
C2126-1
WR,MAPJG
C0256-27
C2126-2
WLG,MAPJG
C0256-28
LH SIDE SENS F1
Gold
LH SIDE SENS R1
Gold
RH SIDE SENS F1
Gold
RH SIDE SENS R1
Gold
C0256-29 RW,MAPJH
C2127-1
C0256-30 RLG,MAPJH
C2127-2
Sensor-Air bag-Side-Rear-RH (T359)
Gold
B PILLAR
Gold
Air bag-Side-LH (U108)
WU,0.5
Gold
C2378-5
WU,MAPFK
C0256-1
R,0.5
C2378-6
R,MAPFK
C0256-2
Gold
LH SIDE A/BAG F1
Gold
LH SIDE A/BAG R1
Gold
RH SIDE A/BAG F1
Gold
RH SIDE A/BAG R1
Gold
C0256-21 WY,MAPFR
Gold
C2368-5
WY,0.5
C0256-22 NY,MAPFR
C2368-6
NY,0.5
Gold
Air bag-Side-RH (U107)
Air bag-Side curtain-LH (U123)
Gold
(ROW 1&2)
Gold
C1479-1
RW,MAPJA
C0256-3
C1479-2
BW,MAPJA
C0256-4
LH SIDE CUR F1
Gold
LH SIDE CUR R1
Gold
RH SIDE CUR F1
Gold
RH SIDE CUR R1
Gold
C0256-5 BU,MAPJB
C1480-1
C0256-6 GU,MAPJB
C1480-2
Air bag-Side curtain-RH (U124)
Gold
(ROW 1&2)
Gold
Pre-tensioner-Passenger (U122)
YR,0.5
Gold
C2378-7
YR,MAPFS
C0256-35
UB,0.5
C2378-8
UB,MAPFS
C0256-36
Gold
PASS PRETEN F1
Gold
PASS PRETEN R1
Gold
DR PRETEN F1
Gold
DR PRETEN R1
Gold
C0256-17 LGR,MAPFN
Gold
C2368-7
LGR,0.5
C0256-18 LGB,MAPFN
C2368-8
LGB,0.5
Gold
Pre-tensioner-Driver (U121)


A
Sheet1
Switch pack-
Centre facia (S425)
Passenger
airbag disable
indicator (J214)
C2387-1
C2387-2
G,0.5D
Restraints control
module (D171)
Sensor-Airbag-
Side-LH (T233)
Gold
DOOR
Gold
C0950-1
WLG,MAPA
C0439-41
C0463R-41
WLG,MAPFE
C0256-37
C0950-2
NLG,MAPA
C0439-42
C0463R-42
NLG,MAPFE
C0256-38
LH SIDE SENS F3
Gold
LH SIDE SENS R3
Gold
C1649-15
G,0.5D
C1166R-13
C1168-13
G,0.5D
Sensor-Driver-
seat track (T360)
DR SEAT TRACK POS F
Gold
C0256-23
LG,0.5D
Gold
C2368-20
LG,0.5
C2368-19
NB,0.5
Gold
B,0.5D
C2561-1
TYPE 1
Sensor-Airbag-
Side-RH (T234)
Gold
DOOR
Gold
C0951-1
W,MAPB
C0439-41
C0459R-41
W,MAPFF
C0256-39
C0951-2
N,MAPB
C0439-42
C0459R-42
N,MAPFF
C0256-40
RH SIDE SENS F3
Gold
RH SIDE SENS R3
Gold
Clock spring (S227)
Air bag-Driver (U106)
DR AIRBAG F1
Gold
C1649-1
RY,MAPFL
Gold
C0067R-1
C0229-1
RY,MAPAA
C2641-1
Gold
C1948-1
C0257-1
DR AIRBAG R1
Gold
C1649-2
R,MAPFL
Gold
C0067R-2
C0229-2
R,MAPAA
C2641-2
Gold
C1948-3
C0257-2
Switch-Buckle-
Driver (S394)
G,0.5
C2368-9
G,0.5D
C0256-25
B,0.5
C2368-10
DRIVER BUCKLE
Gold
DR AIRBAG F2
Gold
C1649-5
RG,MAPFM
Gold
C0067R-3
C0229-3
RG,MAPAB
C2641-3
Gold
C1948-4
C0406-1
DR AIRBAG R2
Gold
C1649-6
RB,MAPFM
Gold
C0067R-4
C0229-4
RB,MAPAB
C2641-4
Gold
C1948-5
C0406-2
C2636-1
SJ663
B,0.35D
C0082-6
Tin
C1254-3
B,0.35
B,1.0D
SJ660
B,2.5D
C2627-1
TYPE 3
Switch-Buckle-
Passenger (S395)
G,0.5
C2378-9
OG,0.5D
C0256-26
B,0.5
C2378-10
PASS BUCKLE
Gold
Air bag-Passenger (U102)
PASS AIRBAG F1
Gold
C1649-3
BU,MAPFG
Gold
C0083R-1
C0231-1
BU,MAPAC
C0251-1
Gold
Tin
C2637-1
B,0.5D
C2633-1
TYPE 3
PASS AIRBAG R1
Gold
C1649-4
GU,MAPFG
Gold
C0083R-2
C0231-2
GU,MAPAC
C0251-2
Gold
PASS AIRBAG F2
Gold
C1649-13
BR,MAPFH
Gold
C0083R-3
C0231-3
BR,MAPAD
C0261-1
Gold
PASS AIRBAG R2
Gold
C1649-14
GO,MAPFH
Gold
C0083R-4
C0231-4
GO,MAPAD
C0261-2
Gold
Switch-Passenger-
Air bag disable (S426)
PACOS A
Gold
C1649-16
RU,0.5D
C1166R-5
C1168-5
RU,0.5D
C2992-1
C2992-5
B,0.5D
C2999-1
TYPE 3
PACOS B
Gold
C0256-24
RY,0.5D
C1166R-6
C1168-6
RY,0.5D
C2992-2
B,0.5D
C1947-1
TYPE 1
B,0.5D